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Digenea of Fishes from Lake Nicaragua

DONALD E. WATSON

Introduction

This paper covers a collection of helminths made during the summer of 1963. The Monogenea and Cestoda of elasmobranchs are reported in a separate paper (Watson and Thorson, 1976). Most of the teleosts were obtained (many still alive) from the fish market in Granada and were caught in Lake Nicaragua. The others were taken by seine or hook and line from the lake, from Tepetate and from San Carlos.

There have been relatively few studies on Digenea from Central America and most of the work has been done on helminths of vertebrates other than fishes. Brenes (1961) catalogued the parasites from Costa Rica, where most studies have been done, and listed only a single digenean from freshwater fishes: Acanthostomum guerri Szidat, 1954 from Rhamdia rogersi (Regan). Since then Bravo-Hollis and Arroyo (1962) reported Crassicutis cichlasomae Manter, 1936 from Cichlasoma sp., also from Costa Rica.

Materials and Methods

The helminths were relaxed in 0.4% chloretone, fixed in formol-acetic acid-alcohol and stored in 70% ethanol. They were stained with acidified alum carmine, trichrome or Delafield’s haematoxylin and mounted in either balsam or Permount. The sucker ratio is from the transverse diameter unless otherwise specified. Measurements are in micra unless indicated. Measurements in micra unless otherwise specified. The averages, in parentheses, follow the ranges. The rate of infection follows the host name, 12:5/10 meaning 12 worms from five of 10 fish.

Family Lepocreadiidae (Odhner, 1905) Nicoll, 1935

Crassicutis cichlasomae Manter, 1936

Hosts: Cichlasoma rostratum (Gill and Bransford) 24:5/10, C. citrinellum (Günther) 13:2/20, C. spilurum (Günther) 14:8/25, C. labiatum (Günther) 7:4/9, C. managuense (Günther) 2:2/12 and C. nicaraguense (Günther) 1:1/12.

Location: Intestine.

Locality: Fish market, Granada; Tepetate.

Specimens deposited: USNM Helm. Col. No. 61321 (C. citrinellum) and 61325 (C. rostratum).

Remarks: Manter (1936) described this species from specimens collected in 1932 by A. S. Pearse. The host was C. mayorum Hubs from a cenote at Chichén Itzá, Yucatán. Bravo-Hollis and Arroyo (1962) reported it from Cichlasoma sp. in Costa Rica and Moravec and Baru (1971) found it in C. tetracantha (Cuv. and Val.) in Cuba. This report adds six new host records and a new host locality.

Family Cryptogonimidae Ciurea, 1933

Neochasmus akeriti n. sp.

(Figures 1–2)

Host: Pomadasys boucardi (Steindachner) 2:1/3.

Location: Intestine.

Locality: Fish market, Granada.

Metacercaria: Probable metacercaria found in intestine of Gobiodorus dormitor Lacépède 1:1/15.


Description (Two specimens collected, one in poor condition; measurements on one specimen): Body oval; spinose; 705 long by 553 wide. Dorsal band of pigment granules extending transversely just anterior to pharynx, scattered granules as far posterior as acetabulum. Oral sucker subterminal, 71 long by 75 wide, single row of 33 spines, about 11 long, around oral sucker. Acetabulum sunken into body, smaller than oral sucker, circular, diameter 43; sucker ratio 1:0.57. Forebody 136 long. Prepharynx not visible; pharynx 41 long by 32 wide; esophagus very short; posterior extent of ceca not observed. Testes 175 long by 114 to 121 wide, symmetrical, in middle third of body, anterior ends slightly tipping toward median line; seminal vesicle bipartite, 98 long by 36 wide, free in parenchyma; posterior portion dorsal to acetabulum, anterior portion curving around acetabulum, emptying into median genital pore just anterior to acetabulum; gonotyl not seen, rudimentary if present. Ovary multilobed, transversely elongate, pretesticular; 89 long by 236 wide; diagonal seminal receptacle anterior to ovary, 89 long by 54 wide; vitellaria lateral, consisting of large follicles between testes and posterior end of acetabulum; yolk ducts forming yolk reservoir just anterior to ovary; excretory vesicle not visible. Genital pore becoming posterior end of acetabulum, extending posteriorly about four-fifths body length. Testes ovoid, almost equatorial, slightly diagonal, dorsal to ceca, anterior ends tapers toward median line, 55 to 57 long by 36 wide; circular gonotyl lying over anterior half of acetabulum and beyond, not well-developed. An-
FIGURES 1-2. Neochasmus ackerti. Fig. 1. Whole mount, ventral view. Fig. 2. Metacercaria, dorsal view. FIGURES 3-5. Oligogonotylus manderi. Fig. 3. Whole mount, ventral view. Fig. 4. Whole mount, ventral view, showing variation. Fig. 5. Sagittal section. Ce, Cecum; Es, Esophagus; Ev, Excretory vesicle; Gd, Genital duct; Gp, Genital pore; Gt, Gonotyl; O, Ovum; Ossp, Oral spines; Ov, Ovary; Pg, Pigment granules; Ph, Pharynx; Pp, Prepharynx; Sr, Seminal receptacle; Sv, Seminal vesicle; T, Testis; Ut, Uterus; Vt, Vitellaria.
lagen of ovary just postacetabular; vitellaria not differentiated. Excretory vesicle Y-shaped, branching just posterior to ovarian anlagen, arms extending to level of pharynx; excretory pore terminal.

This specimen is considered to be the probable metacercaria of *N. ackerti* because of apparent similarities in body shape, in presence and distribution of pigment granules and in both having the anterior end of the testes tipped medially. There is a difference in the number of spines, 33 in the adult and 36 in the metacercaria. However, this situation is not unusual in the genus in that differences in the number of oral spines among specimens of the same species occur in adult *N. magnus* with 34 to 36 and adult *N. sogandaresi* with 31 to 37. The gonotyl present in the metacercaria is not apparent in the adult. On the whole, the data indicate that they are the same species.

**Remarks:** *Neochasmus ackerti* resembles *N. labeosus* Bennett, 1935, *N. magnus* Winter, 1958 and *N. sogandaresi* Overstreet, 1971 in the number of oral spines and in having the acetabulum smaller than the oral sucker. *Neochasmus ackerti* differs from each of these in having a bipartite rather than a long and sinusoidal seminal vesicle and in having smaller oral spines. *Neochasmus labeosus* has numerous small vitelline glands which extend to the posterior end of the ceca in the third quarter of the body whereas *N. ackerti* has relatively few large follicles extending posteriorly only to the anterior end of the testes. In *N. sogandaresi* the vitellaria are comparatively numerous and extend posteriorly to the middle or posterior portion of the testes. Furthermore, *N. ackerti* lacks the muscular pad present in *N. sogandaresi*. *Neochasmus magnus* is much larger and has a seminal receptacle located posterior, rather than anterior, to the ovary.

The species is named in honor of the late helminthologist, Dr. James E. Ackert.

**Oligogonotylus manteri** n. gen., n. sp.

(Figures 3–5)

**Hosts:** *Cichlasoma nicaraguense* (Gunther) 28:4/12, *C. managuense* (Günther) 25:6/12, *C. labiatum* (Günther) 16:7/9, *C. citrinellum* (Günther) 7:2/20, *C. maculicuda* Regan 1:1/5 and *C. rostratum* (Gill and Bransford) 1:1/10.

**Location:** Intestine.

**Locality:** Fish market, Granada.

**Holotype:** USNM Helm. Col. No. 61322 (*C. managuense*).

**Paratypes:** USNM Helm. Col. No. 61324 (*C. nicaraguense*).

**Description** (Fifteen specimens measured): Body oval to elongate; spinose; without circumoral crown of spines or eyespots; 700 to 1385 (1184) long by 528 to 596 (440) wide. Oral sucker subterminal, 131 to 250 (159) long by 149 to 276 (189) wide. Acetabulum 84 to 147 (106) long by 94 to 164 (117) wide; somewhat sunken into body; no ventrogonital sac present; sucker ratio 1:0.49 to 1:0.70 (1:0.62). Median, ventral, longitudinal row of five to eight (seven) gonotyls between acetabulum and oral sucker, increasing in size from anterior to posterior. Forebody approximately one-third body length, 285 to 454 (358). Prepharynx extremely short, lacking pharyngeal glands; pharynx 64 to 118 (91) long by 57 to 168 (89) wide; esophagus about two-thirds as long as pharynx, very muscular; ceca extending to near posterior end of body. Testes tandem to oblique, intercalary, rounded to oval; anterior testis 77 to 146 (107) long by 93 to 225 (147) wide, posterior testis larger, 107 to 149 (116) long by 103 to 272 (162) wide; seminal vesicle sigmoid, undivided, mostly posterior and dextral to acetabulum. Medial genital pore immediately preacetabular; cirrus sac and cirrus lacking. Ovary median, pretesticular, six- or seven-lobed, partially overlapping (ventrally) anterior testis, 75 to 125 (106) long by 125 to 214 (168) wide; seminal receptacle median, pre-ovarian, ovoid, usually obliquely elongate, 71 to 143 (116) long by 61 to 75 (67) wide; vitellaria extraceal, between posterior portion of acetabulum and posterior portion of posterior testis, rarely intruding slightly into forebody; uterus filling posterior part of body, passing posteriorly on right side, then anteriorly on left side, passing medially between ovary and acetabulum and forward to genital pore; eggs 18 to 27 (23) long by 10 to 14 (12) wide, containing miracidia in terminal portion of uterus. Excretory pore terminal: excretory vesicle Y-shaped, branching at level of ovary, arms wide, extending to esophageal region.

**Remarks:** Two other cryptogonomid species have been described possessing several to numerous gonotyls. They are *Multigonotylus micropteri* Premvati, 1967 from the bass, *Micropterus salmoides* (Lacépède), in the Wakulla River, Florida, and *Polycryptocylix leonilae* Lamothe-Argumedo, 1970 from a snapper, *Lutjanus guttatis* (Steindachner), on the Pacific coast of Mexico. Lamothe-Argumedo (1970) placed *Polycryptocylix leonilae* in the Neochasminae and Premvati (1967) made *M. micropteri* the basis of a new subfamily, Multigonotylinae. The present species is best placed in the latter subfamily as the Neochasminae is characterized by the presence of circumoral spines; however, the present subfamily diagnosis is too narrow to contain it.

**Emended diagnosis of Multigonotylinae:** Cryptogonomidae; body oval to elongate; multiple gonotyls in pre-acetabular region. Acetabulum smaller than oral sucker, sunken into body, ventro-genital sac present or not. Oral sucker large, terminal to subterminal, circumoral crown of spines lacking; ceca simple, extending to near posterior end of body. Testes tandem to oblique, in posterior half of body; seminal vesicle long, divided or not. Ovary lobed, median to submedian; seminal receptacle and Laurer’s canal present; uterus extending to near posterior end of body; vitellaria follicular or branched, distribution variable. Excretory vesicle Y-shaped, bifurcation near ovary, arms wide, extending to pharyngeal region or a little less. Type species: *Multigonotylus micropteri* Premvati, 1967.

My specimens differ from *Multigonotylus* in several respects. The oral sucker is rounded and subterminal instead of funnel-shaped and terminal. They lack the pharyngeal glands and eyespots found in *Multigonotylus*. The acetabulum is merely sunken into the body parenchyma, not in a ventrogenital sac. The esophagus is quite muscular. I assume this is not so in *Multigonotylus* as Premvati neither mentioned it nor showed it in his figure, but stated only that it is short. The gonotyls extend more anteriorly and are fewer, five to eight compared with eight to eleven. The seminal vesicle is undivided rather than tripartite. There are more ovarian lobes, six or seven compared with three. The vitellaria are separate follicles rarely intruding into the forebody, whereas in *Multigonotylus* they are branched and pre-acetabular. Primarily on the basis of the lack of a ventro-genital sac, the differences in the shape of the seminal vesicle, the differences in the number of ovarian lobes and the differences in the vitellaria, I believe the present form to be sufficiently distinct to warrant the erection of a new genus to contain it.
**Generic diagnosis of Oligogonotylus:** Cryptogonimidae: Multigonotylinae. Body relatively small, spinose, without circumoral crown of spines, without evidence of eyespots. Acetabulum sunk into body parenchyma, in middle third of body, smaller than oral sucker. Single, median, ventral row of preacetabular gonotyls. Prepharynx present; esophagus muscular; ceca extending to near posterior end of body. Testes tandem to oblique, intersepal; seminal vesicle undivided; cirrus sac and cirrus lacking; genital pore median, immediately pre-acetabular. Ovary median, multilobed; seminal vesicle present; vitellaria follicular, in acetabulo-testicular zone, mostly lateral to ceca; uterine filling hindbody. Excretory vesicle Y-shaped. Parasites of fish.

The name *Oligogonotylus* indicates a reduced number of gonotyls as compared with *Multigonotylus*, the only other genus in the subfamily. The species is named in honor of the late helminthologist, Dr. Harold W. Manter.

**Family Acanthostomatidae Poche, 1926**

*Acanthostomum gnerii* Szidat, 1954

**Hosts:** Rhamdia nicaraguensis (Günther) 7:1/7 and *R. managuensis* (Günther) 1:1/10.

**Location:** Intestine

**Locality:** Fish market, Granada

**Specimen deposited:** USNM Helm. Col. No. 61328.

**Remarks:** Szidat (1954) described this species originally from *Rhamdia quelen* (Quoy and Gaimard) in Argentina. Caballero and Brenes (1958) reported it from *R. rogersi* (Regan) in Costa Rica. This report adds two new hosts and a new host locality.

*Acanthostomum astorquii* n. sp.

(Figures 6–7)

**Host:** Rhamdia nicaraguensis (Günther) 4:1/7.

**Location:** Intestine.

**Locality:** Fish market, Granada.

**Holotype:** USNM Helm. Col. No. 61327.

**Description** (Three specimens measured): Body oval, with broadly rounded anterior and posterior ends; 750 to 875 (825) long by 255 to 390 (300) wide; spinose, anterior spines about 18 long; posterior about 13 long; spines sometimes lost on posterior half of body. Oral sucker cup-shaped, terminal, 147 to 180 (169) long by 119 to 135 (130) wide, with single row of 20 stout spines, 32 to 36 (33) long by 9 to 13 (11) wide, surrounding mouth. Acetabulum smaller than oral sucker, 86 to 107 (99) long by 90 to 114 (103) wide; slightly dextral to midline, posterior edge at junction of anterior and middle thirds of body. Opening of oral sucker with a single row of closely aligned papillae; opening of acetabulum with few small papillae. Sucker ratio 1:0.76 to 1:0.85 (1:0.80). Prepharynx (from a single specimen) 46 long; pharynx large, 100 to 107 (104) long by 57 to 118 (88) wide; esophagus very short; left cecum five to six times as broad as right cecum, each cecum with anus at posterior end of body. Testes ovoid, diagonal, wider than long, in posterior one-fourth of body, anterior testis 96 to 121 (105) long by 116 to 132 (122) wide, posterior testis slightly larger, 107 to 121 (114) long by 107 to 144 (125) wide; seminal vesicle tubular, free in parenchyma, mostly posterior to acetabulum, 81 to 125 (103) long by 18 to 29 (24) wide; neither cirrus nor cirrus sac present; genital pore immediately pre-acetabular. Ovary nearly spherical, 82 to 93 (86) long by 52 to 100 (79) wide, dextral, slightly anterior to posterior testis; seminal receptacle 50 long by 54 to 71 (63) wide, posterior dorsal to ovary; vitellaria lateral, mostly extracecal, from level of seminal vesicle or slightly posterior to level of anterior testis; uterus not extending posterior to ovary, sometimes extending ventral to ceca laterally; eggs 29 to 32 (30) long by 18 to 20 (19) wide. Excretory vesicle saccular, extending to middle of anterior testis or slightly beyond; excretory pore terminal.

**Remarks:** The difference in widths of the ceca places this species in the subgenus *Atrophocaecum* (as defined by Khalil, 1963). Two other species have been described in this subgenus: *A. burminis* (Bhalerao, 1926) and *A. hindusthanensis* Baugh, 1957 (= *A. simhai* Khalil, 1963). Both species occur in water snakes in India; the former also occurs in water snakes in Burma. *Acanthostomum astorquii* differs from both in the type of host and in having oblique rather than tandem testes. *Acanthostomum burminis* further differs from *A. astorquii* in being very elongate, in having testes somewhat removed from the posterior end, in having the acetabulum in the anterior one-fifth of the body and in having more numerous vitellaria. *Acanthostomum hindusthanensis* differs from the present species in being elongate and in having testes almost as broad as the body.

The species is named in honor of Father Ignacio Astorqui, kibbutzologist at the Colegio Centro Americana, who identified the fish.

**Family Plagiorchidae Liibe, 1901**

*Allomacroderoides lepisostei* n. g., n. sp

(Figures 8–9)

**Host:** Lepisosteus trophicus (Gill) 6:2/2.

**Location:** Intestine.

**Locality:** Rio San Juan, San Carlos.

**Metacercaria:** Cichlasoma rostratum (Gill and Bransford); intestine; fish market, Granada.

**Holotype:** USNM Helm. Col. No. 61329.

**Metacercaria:** USNM Helm. Col. No. 61330.

**Description** (Most measurements on ventral view of two specimens, remainder on lateral view of one specimen): Body elongate, with rounded posterior end; blunt, somewhat truncate anterior end; 1,485 and 1,493 mm long by 300 and 360 wide at acetabulum; coarse spination over entire body, anterior spines 13 to 14 long, posterior 8 to 11 long. Oral sucker robust, terminal, elongate cup-shaped with two lateral lobes, each provided with a single anterior papilla about 7 long (easily seen in lateral view) on inner aspect of sucker; 330 and 390 long by 300 and 345 wide; no oral spines present. Acetabulum pre-equatorial, smaller than oral sucker, slightly wider than long, 157 and 173 long by 180 wide; sucker ratio 1:0.52 and 1:0.60. Forebody 585 and 593. Prepharynx short, 18 in lateral view, generally hidden by pharynx; pharynx slightly wider than long from ventral view, lying diagonally from posterior part of oral sucker to near dorsal surface in lateral view; 111 and 118 long by 114 and 125 wide; esophagus short, extending in dorsoventral direction; ceca fairly broad, extending to near posterior end. Testes smooth, tandem, in posterior quarter of body; anterior testis 87 and 107 long by 136 and 144 wide; posterior testis 125 and 135 long by 100 and 136 wide; seminal vesicle bi- or tripartite, 136 and 182 long by 57 and 59 wide, enclosed with well-developed prostatic
complex in cirrus sac dorsal to, and extending slightly pos-
terior to, acetabulum; muscular cirrus and muscular met-
traterm open into common genital sinus; genital pore me-
dian, just pre-acetabular. Ovary immediately postacetabu-
lar, slightly sinistral, wider than long, roughly ovoid, 57 and
64 long by 96 and 123 wide; seminal receptacle postero-
dextral to ovary; vitellaria follicular, mostly lateral with a
few extending across body dorsally near ovary, from pos-
terior edge of acetabulum to posterior edge of hind tests;
uterus extending to near posterior end of body; eggs 29 to
34 (31) long by 16 to 18 (16) wide. Excretory vesicle saccu-
lar, extending anteriorly to level of seminal receptacle, or a
shorter length. Genital anlagen for ovary present; both muscular cirrus and muscular met-
traterm present. Excretory vesicle swollen, filling posterior
half of body.

**Generic diagnosis of Allomacroderoides:** Body elongate,
spinoso. Oral sucker large, terminal, provided with two
lobes on inner lateral surface, each lobe bearing a single
papilla. Prepharynx present; pharynx well-developed;
esophagus short; ceca reaching posterior end of body.
Acetabulum smaller than oral sucker, in middle third of
body. Testes tandem, in posterior third of body, intercecal;
seminal vesicle bi- or tripartite; cirrus sac present, enclosing
seminal vesicle, prostatic complex and muscular cirrus; gen-
tal pore median, just pre-acetabular. Ovary postacetabular,
median or submedian, entire; seminal receptacle post-
median or submedian, entire; seminal receptacle post-
ovarian; vitellaria follicular, lateral, postacetabular; uterus
reaching posterior end of body; eggs small, fairly numer-
ous. Excretory vesicle saccular. Intestinal parasites of fish.

**Remarks:** Allomacroderoides most closely resembles the gen-
era Macroderoides Pearse, 1924 and Paramacroderoides
Vernard, 1941. It differs from both these genera in the
nature of the oral sucker, which is circular in the other two.
In addition, the oral sucker is provided with oral spines in
Paramacroderoides. Neither of the related genera possesses a
broad muscular cirrus and metraterm. The testes in All-
macroderoides are more posterior than in the other two
genera. Macroderoides differs in that it has a weakly de-
veloped prostatic complex and lacks a seminal receptacle.
Paramacroderoides has a shorter excretory vesicle and its vit-
ellaria follicles extend to the middle of the posttesticular
field.

The name Allomacroderoides is from the Greek (allo-
—different) plus Macroderoides, the name of a similar genus.
The species name, leptisostei, refers to the host.

**Family Haploporidae** Nicoll, 1914

*Saccocoeloides* sp.

(Figure 10)

**Host:** Roeboidea guatemalensis (Günther) 1:1/24.
**Location:** Intestine.
**Locality:** Lake Nicaragua, Granada.
**Specimen deposited:** USNM Helm. Col. No. 61331.
**Description** (Measurements from a lateral view of one
specimen in rather poor condition): Body containing
numerous pigment granules spreading dorsally and ven-
trally at level of pharynx; 465 long by 255 deep. Subter-
nal oral sucker 57 long by 58 deep. Acetabulum im-
mEDIATELY pre-equatorial, 100 by 100; sucker ratio (lengths)
1:1.75. Forebody 151. Prepharynx 11 long; pharynx 43
long by 57 deep; intestinal bifurcation not visible; ceca ex-
tending posteriorly about two-thirds of body length. Single,
ventral testis 68 long by 71 deep, its anterior margin at
junction of middle and posterior thirds of body; external
seminal vesicle not visible, internal seminal vesicle present
in what may be hermaphroditic sac which measures 63 long
by 22 deep. completely pre-acetabular; hermaphroditic
duct (?) somewhat extruded. Ovary dorsal, between
acetabulum and testis; vitellaria consisting of elongate folli-
cles, from posterior edge of acetabulum to near posterior
end of body; receptaculum seminis uterinum and terminal
portion of uterus not visible; four large eggs, 96 to 100 (98)
long by 61 to 63 (61) wide. Excretory vesicle appears saccu-
lar, extending anteriorly to level of posterior edge of testis;
excretory pore terminal.

**Remarks:** The condition of this specimen is too poor for a
complete comparison with previously described species or
for a specific designation. There are seven named species in
this genus, plus an additional three designated as Sac-
cocoeloides sp. only. The named species are *S. nani* Szidat,
1954; *S. elongatus* Szidat, 1954; *S. magniovatus* Szidat, 1954;
*S. magnus*, Szidat, 1954; *S. octavus* Szidat, 1970 and *S. sogan-
daresi* Lumaden, 1963. Overstreet (1971) tentatively trans-
ferred *Saccocoelium beauforti* Hunter and Thomas, 1961 to
*Saccocoeloides*. The first four are from fresh waters in
Brazil, *S. octavus* is from a brackish lake, also in Brazil.
*Saccocoeloides sogandaresi* occurs in brackish water ponds in
Galveston Bay, Texas, and Overstreet's specimens were
from the Gulf of Mexico.

The three species not designated were also by Szidat
(1954). Two are immature and no comparison is possible.
The third, from *Schizodon fasciatus* Agassiz, has suckers
equal to size, vitellaria extending posteriorly to a pretesticu-
lar level and eggs measuring 110 to 118 by 48 to 53.

As far as I can determine, the described species closest to
my specimen is *S. sogandaresi*; however, the eggs of the lat-
ter are smaller (78 to 87 by 37 to 55). The eggs in my
specimen are close to those of *S. beauforti* (70 to 107 by 47
to 57) and *S. magniovatus* (95 to 114 by 41 to 60). Sac-
cocoeloides beauforti, however, has pigment granules spread
throughout the body, concretions in the excretory vesicle and
a larger, more posterior hermaphroditic sac. In *S. mag-
niovatus* there are no pigment granules in the forebody and
vitellaria are distributed from the anterior edge of the
acetabulum to the anterior edge of the testis.

The present specimen apparently differs from all de-
scribed species and may well represent a new species.

**Family Hemiuroidae** Luhe, 1901

*Paraviellotrema astyanactis* n. g., n. sp.

(Figures 11–12)

**Host:** Astyanax fasciatus (Cuv.) 4:3/20.
**Location:** Stomach.
**Locality:** Tepetate.
**Holotype:** USNM Helm. Col. No. 61332.
**Description** (Measurements on three specimens): Body
elongate-oval, without ecsoma, 0.87 to 1.45 mm (1.175) long by 225 to 315 (280) wide at acetabulum. Pre-orval lobe present; subterminal oral sucker, 120 to 173 (148) long by 165 wide. Acetabulum nearly equatorial, 210 to 270 (248) long by 203 to 233 (215) wide, aperture longitudinal; sucker ratio 1:1.23 to 1:1.27 (1:1.25). Forebody 285 to 295 (407). Prepharynx absent; pharynx 64 to 82 (72) long by 66 to 71 (68) wide; esophagus very short; ceca extending to near posterior end of body. Testes intercelly, slightly diagonal, located about one-third distance between acetabulum and posterior end of body, subspherical, 46 to 79 (65) long by 46 to 89 (73) wide; seminal vesicle pre-acetabular, 114 to 179 (147) long by 32 to 50 (41) wide, forming a shallow "C" in holotype, tight "C" in others; prostatic complex free in parenchyma, cells few; prostatic vesicle tubular; sinus sac weakly developed; hermaphroditic duct short. Ovary posttesticular, in posterior one-fifth of body, ovoid to spherical, 96 to 104 (100) long by 89 to 96 (93) wide; vitellaria compact, paired, oblique, near posterior end, slight indications of lobing sometimes present, 104 to 116 (112) long by 79 to 93 (86) wide; proximal end of Laurer's canal expanded but no sperm visible; uterus posttesticular, ovoid, 89 to 107 (99) long by 82 to 107 (92) wide; seminal vesicle pre-acetabular, 136 to 295 (216) long by 41-43 (42) wide, "C"-shaped or "U"-shaped with dorsal portion of "U" extending more anteriorly than ventral portion, continuing into a slightly expanded, tubular prostatic vesicle surrounded by numerous prostate cells which are arranged in elongate diamond shape, free in parenchyma; ejaculatory duct emptying into muscular, protrusable sinus organ 170 long by 54 wide at its widest portion when not extended, 232 to 257 long by 43 to 62 at widest point when extended; sinus organ surrounded by thick-walled, muscular sinus sac 151 to 161 (158) long by 68 to 103 (80) in maximum width; genital pore at base of oral sucker, ventral to pharynx. Övary posttesticular, ovoid, 89 to 107 (101) long by 89 to 125 (105) wide; seminal receptacle not noted; vitellaria compact, slight indications of lobing may be present, diagonal, close together, anterior vitellarium 132 to 154 (141) long by 71 to 89 (82) wide, posterior one 89 to 144 (97) long by 79 to 100 (91) wide, postovarian, ventral to ceca, near posterior end of body; uterus extending to posterior end of ovary with loops in forebody, entering sinus sac to form hermaphroditic duct in sinus organ; eggs with long unipolar filament, 41 to 50 (45) long by 21 to 25 (22) wide excluding filament. Excretory pore terminal, excretory vesicle Y-shaped, arms united dorsal to pharynx, point of bifurcation not noted.


Dollfuscella is characterized by very large suckers, the acetabulum reaching the sides of the body, possession of a definite cirrus pouch and having nine distinctly separate vitelline follicles. Genarchopsis and Tangiopsus have the ceca united in the hindbody and the prostatic complex enclosed in a thin-walled sac. The latter genus has non-filamented eggs. Indoderogenes and Gonocercella apparently lack a seminal receptacle and have non-filamented eggs. Gonocercella has the genital pore posterior to the intestinal bifurcation and Indoderogenes has ceca which terminate anterior to the ovary and a disk-shaped seminal vesicle. Deropagus has non-filamented eggs and the uterus, which extends posterior to the vitellaria, lacks loops in the forebody. Vitellotrema has the prostatic cells enclosed in the sinus sac and the uterus is swollen to form a voluminous organ in the midbody. Halipegus lacks a sinus sac.

My specimens, thus, differ from all reported genera of Halipeginae, but appear closest to Halipegus and Vitellotrema. They have the prostatic complex free in the parenchyma as does Halipegus and a sinus sac as does Vitellotrema. Yamaguti (1958), Skrabin and Gushanskaja (in Skrabin et al., 1964) and Saoud and Rosdy (1970) all stress the lack of a sinus sac in the genus Halipegus. The latter authors also state that the lack of a sinus sac in Halipegus and the presence in Vitellotrema is the only basic difference between these two genera. It appears, then, that this character is of generic importance and its presence excludes my specimens from Halipegus. The prostatic complex is not enclosed in the sinus sac and this separates my specimens from Vitellotrema.

I propose the name Paravitellotrema (para from Greek —near) to include the present specimens. I do, however, consider Halipegus, Vitellotrema and Paravitellotrema to be closely related and future studies may indicate the latter two to be subgenera of Halipegus. The generic diagnosis of Paravitellotrema is deferred until after the next description. The species name, astyanacris, is from the host.

Paravitellotrema thorsoni n. sp.

(Figures 13-14)


Description (Measurements on three specimens): Body elongate, subcylindrical, without ecsoma, widest at acetabulum or slightly posterior to it; 1.310 to 1.613 mm (1.424) long by 495 to 510 (505) wide, 510 thick. Pre-orval lobe present; oral sucker subterminal, 150 to 210 (175) long by 188 to 195 (192) wide, 180 deep. Acetabulum posttesticular, 270 to 375 (310) long by 255 to 277 (263) wide, 315 deep; sucker ratio 1:1.36 to 1:1.39 (1:1.38). Forebody 638 to 750 (693). Prepharynx lacking; pharynx 68 to 71 (69) long by 61 wide, 75 deep; ceca extending to near posterior end of body. Testes postacetabular, slightly diagonal, about one-third the distance between acetabulum and posterior end of body, intercelly or overlapping inner edges of ceca, 86 to 118 (99) long by 82 to 107 (92) wide; seminal vesicle pre-acetabular, 136 to 295 (216) long by 41-43 (42) wide, "C"-shaped or "U"-shaped with dorsal portion of "U" extending more anteriorly than ventral portion, continuing into a slightly expanded, tubular prostatic vesicle surrounded by numerous prostate cells which are arranged in elongate diamond shape, free in parenchyma; ejaculatory duct emptying into muscular, protrusable sinus organ 170 long by 54 wide at its widest portion when not extended, 232 to 257 long by 43 to 62 at widest point when extended; sinus organ surrounded by thick-walled, muscular sinus sac 151 to 161 (158) long by 68 to 103 (80) in maximum width; genital pore at base of oral sucker, ventral to pharynx. Övary posttesticular, ovoid, 89 to 107 (101) long by 89 to 125 (105) wide; seminal receptacle not noted; vitellaria compact, slight indications of lobing may be present, diagonal, close together, anterior vitellarium 132 to 154 (141) long by 71 to 89 (82) wide, posterior one 89 to 144 (97) long by 79 to 100 (91) wide, postovarian, ventral to ceca, near posterior end of body; uterus extending to posterior end of ovary with loops in forebody, entering sinus sac to form hermaphroditic duct in sinus organ; eggs with long unipolar filament, 41 to 50 (45) long by 21 to 25 (22) wide excluding filament. Excretory pore terminal, excretory vesicle Y-shaped, arms united dorsal to pharynx, point of bifurcation not observed.

Remarks: Paravitellotrema thorsoni differs from P. astyanacris in the presence of an eversible sinus organ and a muscular, thick-walled sinus sac. Manter (1969, 1970) indicated that the presence or absence of a sinus organ is not of generic value in that it occurs in several species of Dinurus Looss, 1907, in a varying degree in Elytrophallus Sridat, 1953 and Ectenurus Looss, 1907; it also occurs as a prominent coiled feature in the genus Elytrophallus Manter, 1940. The above mentioned genera are members of the subfamily Dinurinae. This constitutes the first report of a sinus organ in the Halipeginae.
FIGURES 11-12. Paravitellotrema astyanactis. Fig. 11. Whole mount, ventral view. Fig. 12. Ovum. FIGURES 13-14. Paravitellotrema thorsoni. Fig. 13. Whole mount, lateral view. Fig. 14. Ovum. Hd, Hermaphroditic duct; Lc, Laurer's canal; Pr, Prostate; So, Sinus organ; Ss, Sinus sac; Yd, Yolk duct. Other abbreviations as before.
The species is named in honor of Dr. Thomas B. Thorson with whom I worked in Central America on several occasions.

**Generic diagnosis of Paravitellotrema:** Halipeginae. Body elongate, lacking ecosa. Pre-oral lobe present, oral sucker subterminal; acetabulum in middle third of body. Prepharynx lacking; esophagus short; ceca extending to near posterior end of body, not uniting. Testes diagonal, post-acetabular; seminal vesicle pre-acetabular; prostatic complex free in parenchyma; sinus sac present, with or without muscular sinus organ; genital pore ventral to pharynx. Ovary posttesticular, near posterior end of body; vitellaria postovarian, compact, may have indications of lobing; uterus not extending posterior to ovary, with loops in forebody, joining ejaculatory duct to form hermaphroditic duct in sinus sac; eggs numerous, with long uniparal filaments. Excretory pore terminal; excretory vesicle Y-shaped, arms united dorsal to pharynx. Stomach parasites of freshwater fishes.

**Discussion**

With the exception of two species of characids (Astyanax fasciatus and Roeboides guatemalensis), all fish examined were secondary division fishes such as catfishes, cichlids, eleotrids, pomadasyids and gars. The Digenea collected reflect this situation as they are primarily (six of nine species) from predominantly marine families (Cryptogonimidae, Haploporidae, Hemiuridae and Lepocreadiidae). Szidat (1954, subterminal; acetabulum in middle third of body. occasIOns.

This report lists nine species of Digenea belonging to six families from fishes of Lake Nicaragua. One of these, Sac- cocoeloides sp. (Haploporidae) from Roeboides guatemalensis (Günther, 1864) is identified only to genus and two, Acanthostomum gnerii Szidat, 1954 (Acanthostomatidae) from Rhamdia managuensis (Günther, 1869) and R. nicaraguensis (Günther, 1864) and Crassictis cichlasomae Manter, 1936 (Lepocreadiidae) from Cichlasoma citrinellum (Günther, 1864), C. labiatum (Günther, 1864), C. managuense (Günther, 1868), C. nicaraguense (Günther, 1864), C. rostratum (Gill and Bransford, 1877) and C. spilurum (Günther, 1862) are previously known. The remaining six are designated as new and include three new genera. These six are: Acanthostomum astorqui n. sp. from R. managuensis and R. nicaraguensis; Neochasmus ackerti n. sp. (Cryptogonimidae) from Pomadasys bicardi (Steindachner, 1869); Oligogonotylus manteri n. g., n. sp. (Cryptogonimidae) from C. citrinellum, C. labiatum, C. maculicauda Regan, 1905, C. managuense, C. nicaraguense and C. rostratum; Allomacroderoides lepisoster n. g., n. sp. (Plagiorchiidae) from Lepisosteus tropicus (Gill, 1863); Paravitellotrema thorsoni n. g., n. sp. (Hemiuridae) from R. managuensis; and P. astynactis n. sp. from Astyanax fasciatus (Cuvier, 1819). Possible metacercariae for N. ackerti from Gobiohorus dormitor Lacépède, 1800 and A. lepisosti from C. rostratum are also given.

**Acknowledgments**

I am indebted to the following persons for a variety of courtesies and services: The late Dr. Harold W. Manter, Mrs. Mary Lou Pritchard and Dr. Thomas B. Thorson, University of Nebraska; Father José Maria Gondra, at that time Rector, and Father Ignacio Astorqui, Ichthyologist and later Rector, Colegio Centro America; and Mrs. Hope D. Watson, University of Lagos. Financial support is gratefully acknowledged from the Wolcott Memorial Fund of the former Department of Zoology, University of Nebraska; the National Science Foundation (grant number G-25574); and the U.S.P.H.S., National Institutes of Health (grant number HE-09075).

**Summary**

This report lists nine species of Digenea belonging to six families from fishes of Lake Nicaragua. One of these, Sac- cocoeloides sp. (Haploporidae) from Roeboides guatemalensis (Günther, 1864) is identified only to genus and two, Acanthostomum gnerii Szidat, 1954 (Acanthostomatidae) from Rhamdia managuensis (Günther, 1869) and R. nicaraguensis (Günther, 1864) and Crassictis cichlasomae Manter, 1936 (Lepocreadiidae) from Cichlasoma citrinellum (Günther, 1864), C. labiatum (Günther, 1864), C. managuense (Günther, 1868), C. nicaraguense (Günther, 1864), C. rostratum (Gill and Bransford, 1877) and C. spilurum (Günther, 1862) are previously known. The remaining six are designated as new and include three new genera. These six are: Acanthostomum astorqui n. sp. from R. managuensis and R. nicaraguensis; Neochasmus ackerti n. sp. (Cryptogonimidae) from Pomadasys bicardi (Steindachner, 1869); Oligogonotylus manteri n. g., n. sp. (Cryptogonimidae) from C. citrinellum, C. labiatum, C. maculicauda Regan, 1905, C. managuense, C. nicaraguense and C. rostratum; Allomacroderoides lepisoster n. g., n. sp. (Plagiorchiidae) from Lepisosteus tropicus (Gill, 1863); Paravitellotrema thorsoni n. g., n. sp. (Hemiuridae) from R. managuensis; and P. astynactis n. sp. from Astyanax fasciatus (Cuvier, 1819). Possible metacercariae for N. ackerti from Gobiohorus dormitor Lacépède, 1800 and A. lepisosti from C. rostratum are also given.

**Resumen**

Se encontraron nueve especies de Digénea, pertenecientes a seis familias en peces del Lago de Nicaragua. Uno de los digéneos sólo se identificó hasta el género Sac- cocoeloides (Haploporidae) de Roeboides guatemalensis (Günther, 1864), y dos de ellos eran ya conocidos: Acanthostomum gnerii Szidat, 1954 (Acanthostomatidae) de Rhamdia managuensis (Günther, 1869) y R. nicaraguensis (Günther, 1864) y Crassictis cichlasomae Manter, 1936 (Lepocreadiidae) de Cichlasoma citrinellum (Günther, 1864), C. labiatum (Günther, 1864), C. managuense (Günther, 1868), C. nicaraguense (Günther, 1864), C. rostratum (Gill y Bransford, 1877), y C. spilurum (Günther, 1862). Tres géneros (Oligogonotylus, Allomacroderoides, y Paravitellotrema) y las siguientes especies son nuevas y se describen por primera vez: Acanthostomum astorqui de R. managuensis y R. nicaraguensis; Neochasmus ackerti (Cryptogonimidae) de Pomadasys bicardi (Steindachner, 1869); Oligogonotylus manteri (Cryptogonimidae) de C. citrinellum, C. labiatum, C. maculicauda Regan, 1905, C. managuense, C. nicaraguense, y C. rostratum; Allomacroderoides lepisoster (Plagiorchiidae) de Lepisosteus tropicus (Gill, 1863); Paravitellotrema thorsoni (Hemiuridae) de R. managuensis, y P. astynactis de Astyanax fasciatus (Cuvier, 1819). Se encontraron también posibles metacercarias de N. ackerti en Gobiohorus dormitor Lacépède, 1800 y A. lepisosti en C. rostratum.
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LITERATURE CITED


