1990

Binder 064, Echinostomatidae H-N [Trematoda Taxon Notebooks]

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Himasthlinae Odhner, 1910

Subfamily diagnosis. — Echinostomatidae: Body very long, slender, markedly attenuated between acetabulum and ovary, spinose. Head collar reniform, with a single crown of spines which is continuous or interrupted dorsally. Oral sucker small, esophagus short; ceca narrow, reaching posterior extremity. Acetabulum definitely larger than oral sucker, close to anterior extremity. Testes tandem; within posterior third of body. Cirrus pouch long, slender, extending far back of acetabulum or rather plump and not reaching beyond acetabulum. Ovary situated immediately or at varying distances anterior to fore testis. Vitellaria lateral, variable in extent. Uterus long; eggs large, exceptionally filamented; mature uterine eggs may be embryonated. Excretory stem rather short. Parasitic in birds and mammals, occasionally in fishes.

Key to genera of Himasthlinae from birds

1. Cirrus pouch long, slender, extending far back of acetabulum 2
   Cirrus pouch plump, not extending back of acetabulum ... 3
2. Vitellaria extending from posterior extremity as far forward as posterior end of cirrus pouch; eggs not filamented ..... *Himasthla*
   Vitellaria confined to posterior half of body and not extending back of testes; eggs with long filament at one pole ..... *Aporchis*
3. Collar spines interrupted dorsally; no end group spines; ovary about one third of body length from anterior extremity ..... *Dissurus*
   Collar spines not interrupted dorsally; end group spines present; ovary about one third of body length from posterior extremity ..... *Longicollia*

Bestimmungsschlüssel zu den Gattungen der Unterfamilie Himasthlinae:

1. Dotterstöcke vor dem Bereich der im Körperhinterende liegenden Testes; Eier mit Filament (Zahl der Kragenstacheln 31, 43, 55 bzw. 57):
   Aporchis Stossich, 1905
   – Dotterstöcke auch neben und hinter oder überhaupt nur hinter den Testes; Eier ohne Filament 2

2. Kragenstacheln zweireihig angeordnet (Zahl der Kragenstacheln 41); Testes tief fingerförmig gelappt:
   Artyfechinostomum Lane, 1915 (? = *Testisacculus* Bhalerao, 1927 = *Reptiliotrema* Baškirova, 1941)
   – Kragenstacheln einreihig angeordnet; Testes überwiegend ganzrandig, selten flach gelappt 3

3. Dotterstöcke auf den Bereich hinter den Testes beschränkt (Zahl der Kragenstacheln 23 bzw. 29):
   Cloeophora Dietz, 1909
   – Dotterstöcke auch neben den Testes und vor dem Bereich der Testes 4

4. Besondere Eckstachelgruppen sind nicht ausgebildet (Zahl der Kragenstacheln 23); Uterusbereich höchstens gleich der Hälfte der Länge des Hinterkörpers:
   Acanthoparyphium Dietz, 1909
   – Je eine durch größere Kragenstacheln abweichende Eckstachelgruppe vorhanden (Zahl der Kragenstacheln 29):
   Caballerotrema Prudhoe, 1960
   – Je eine durch kleinere Kragenstacheln abweichende Eckstachelgruppe vorhanden 5

5. Uterusbereich höchstens gleich der Hälfte der Länge des Hinterkörpers, maximale Eizahlen bis 80; Testes in der hinteren Hälfte des Hinterkörpers (Zahl der Kragenstacheln 29):
   Curtuteria Reimer, 1963

From Odening, 1963

HIMASTHLA Dietz, 1909

Diagnosis: From medium sized to very large, somewhat flattened, elongated, and in the small species curved. Collar spines in a simple, unbroken row. Skin armed over entire surface, characteristically arranged in rows in anterior end. Acetabulum usually small, spherical, near anterior end. Crura bifurcate anterior to acetabulum. Cirrus pouch long and slender reaching well behind acetabulum. Testes oval or elongated in posterior end, one behind the other. Ovary spherical or rectangular, median, in front of testes. Vitellaria lateral, not reaching anterior to acetabulum, often only to the posterior end of the cirrus pouch. Uterus long, coiled. Eggs numerous, oval, .07-.12 by .05-.078 mm.

Type species: Himasthala rhigedana Dietz

Other species: H. alincia Dietz
H. militaris (Rud., 1803)
H. leptosoma (Creplin, 1829)
H. elongata (Mehlis, 1831)
H. secunda (Nicoll, 1906)

H. harrisoni Johnston, 1916
H. incisa Linton, 1928
H. muehlensi Vogel, 1933
H. quissetensis (Miller and Northrup, 1926) Stunkard, 1934
H. ambigua Palombi, 1934

Reference: Stunkard, Horace W. 1938 ? Determination of species in the trematode genus Himasthla. Zeit. Paraslt. 10:719-721.

Life cycle: next page

The trematodes of the family Echinostomatidæ comprise a large number of genera which infest the alimentary tract of birds and mammals. The family and several genera were characterized by Dietz (1910). In a preliminary paper, Dietz (1909) had erected the genus *Himasthla*, with *H. rhigedana* as the type species, and in it he included *H. alincia* Dietz, *H. leptosoma* (Creplin), *H. militaris* (Rudolphi), *H. elongata* (Mehlis), and *H. secunda* (Nicoll). Linton (1928) described specimens which he identified as *H. elongata* (Mehlis), and others which he named *H. incisa* new species. A new human parasite, *H. muehlensi*, was described by Vogel (1933), who included a tabular description of all known species of *Himasthla*. Palombi (1934) described the metacercaria of a new species, *H. ambigua*, from the gills of *Tapes decussatus*.

Sprehn (1932) listed *H. militaris* (Rudolphi, 1803) and *H. secunda* (Nicoll, 1906) as synonyms of *H. leptosoma* (Creplin, 1829) and Palombi (1934) admitted the probable identity of *H. leptosoma* and *H. secunda*. Since three of the four species of *Himasthla* which bear 29 cephalic spines were regarded as identical by Sprehn, one is led to question why the other one, *H. elongata* (Mehlis, 1831) was accepted as valid. There appears to be no better reason for retaining *H. elongata* than the other specific names which were dropped in synonymy. If the opinion of Sprehn is correct, the name of the species is *H. militaris* and not *H. leptosoma*.

With reference to *H. quissetensis*, it is not impossible that this species is identical with *H. alincia* Dietz, 1909, which also has 31 cephalic spines. The description of the latter species is based on a single specimen from *Tringa cinclus*, collected in Brazil. The figure of Dietz suggests the appearance of a worm which was dead before fixation and consequently much elongated. The worm is much more extended than the specimens which I have studied but the only obvious morphological difference between them is in the anterior limits of the vitellaria, which in *H. alincia* do not extend to the level of the cirrus sac.

A further case of specific identity is suggested between *H. quissetensis* and *H. muehlensi*, the species described by Vogel (1933) from man. A comparison of the specimens at hand with the description of *H. muehlensi* shows much similarity especially in the distribution of the vitellaria. The worms studied by Vogel were slightly larger and apparently contained one more spine in the cephalic coronet. But those specimens were dead and somewhat macerated; in none of them was the crown of spines complete and intact, and the absence of lateral crenations in the body wall may be correlated with the greater length of the extended specimens. Indeed, a specimen of *H. quissetensis* which was fixed in a moribund condition, is much extended and measures 14.2 mm. in length. The tissues had absorbed water and all the organs are larger than corresponding ones in well-fixed speci-

Himasthla rhigedana Dietz, 1909

Hôte: Arenaria interpres (Lin.).

Localisation: Intestin grêle.

Matériel observé: Quatre exemplaires, mélangés à ceux d'*Aporchis mozambiquus* n. sp. ; E. R. Brygoo *leg.*, mai 1964.

Caractéristiques de l'espèce:

Les vers adultes mesurent de 10 à 15 mm × 0,45 à 0,6 mm de largeur maximale au niveau des glandes génitales, la zone comprise entre les glandes génitales et la ventouse orale s'allongeant démesurément. La cuticule est armée de fortes épines imbriquées jusqu'en dessous du niveau de la ventouse ventrale; puis elle s'organise en segments annulaires de 260 × 30-50 μ, épineux sur le pourtour de leur bord postérieur. Le plateau céphalique est réniforme et mesure transversalement 260 μ, et 130 μ de diamètre antéro-postérieur à l'échancrure. Le collier d'épines est interrompu ventralement et se dispose sur un seul rang latéralement et dorsalement et sur plusieurs rangs ventralement; on compte :

1° une couronne de 24 épines de 44-50 × 10-13 μ;

2° deux amas terminaux de six épines inégales superposées en trois plans principaux et mesurant 50, 50, 34, 37, 17 μ; elles sont agencées selon le schéma 1; les premières épines de la couronne ne mesurent que 34-37 μ. Le nombre total des épines du collier céphalique est par conséquent de $24 + (2 \times 6) = 36$.

L'extension antérieure des glandes vitellogènes s'arrête très loin en arrière du fond de la poche du cirre; elles s'interrompent nettement de part et d'autre de la zone équatoriale des testicules, mais s'étendent jusqu'à l'extrémité postérieure du corps. La poche du cirre, bien que dépassant largement le bord postérieur de l'acétabulum, ne mesure au total que 600-650 × 85-100 μ, soit environ deux fois le diamètre de la ventouse ventrale.

Les autres dimensions sont les suivantes : ventouse orale 80-100 μ; ventouse ventrale 290 × 115 μ; pharynx 90 × 60 μ, ovaire de 150 × 150 à 260 × 235 μ.

Testicules ovalaires très allongés longitudinalement de 700-800 × 300 μ, ou même 950 × 300 μ. Follicules vitellins arrondis de 50-60 μ de diamètre. Vésicule excrétrice tubulaire courte n'atteignant pas le testicule postérieur. Œufs sans filament polaire de 65 × 65 à 80 × 60 μ.

DISCUSSION

Les espèces du genre *Himasthla* auquel nous rapportons nos exemplaires ont fait l'objet d'une compilation en 1956 par Skriabine et Baschkirova (XII, p. 746-770) et d'une récente révision par Stunkard, 1960. Deux espèces présentent un collier de plus de 32 épines; l'espèce-type du genre *H. rhigedana* Dietz, et *M. macintoshi* Stunkard, 1960. L'espèce de Stunkard ne se confond pas avec l'espèce décrite pour les raisons suivantes : 35 épines au collier, d'un tiers plus grandes (78-84 × 20 μ, au lieu de 50 μ); ventouses un peu plus développées; œufs plus grands (100 × 76 μ); vitellogènes continus au niveau des testicules.

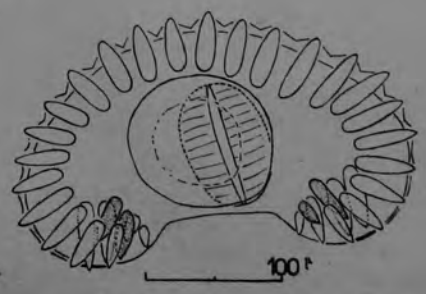


Fig. 1. — *Himasthla rhigedana* Dietz, 1909. — Collier céphalique; les épines des bouquets terminaux sont disposées sur trois plans; le plan moyen est indiqué en grisé.

– over –

Aussi rapportons-nous les trématodes d'Europa à l'espèce Eurasienne de DIETZ dont ils présentent toutes les caractéristiques spécifiques; l'ordonnance de la spinulation du plateau céphalique de la figure 1 d'*Himasthla rhigedana sensu* Adams et Martin, 1960 *nec* Dietz ne s'accorde ni avec nos observations, ni avec celles de DIETZ. Aussi proposons-nous pour cette espèce néarctique, que nous pensons différente, le nom de *H. californiensis n. sp.* (1).

(1) PRUDHOE (1944) a signalé la présence d'*H. rhigedana* Dietz à Ceylan, ne différant de l'espèce-type que par des œufs de plus grande taille (95-110 μ). En absence d'illustration du plateau céphalique, il est difficile de rapprocher ces exemplaires, soit de l'espèce de DIETZ comme l'a proposé l'auteur, soit de *H. californiensis n. sp.*

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. Mehlis' 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 Mehlis' gland. Uterus arising at Mehlis' 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.

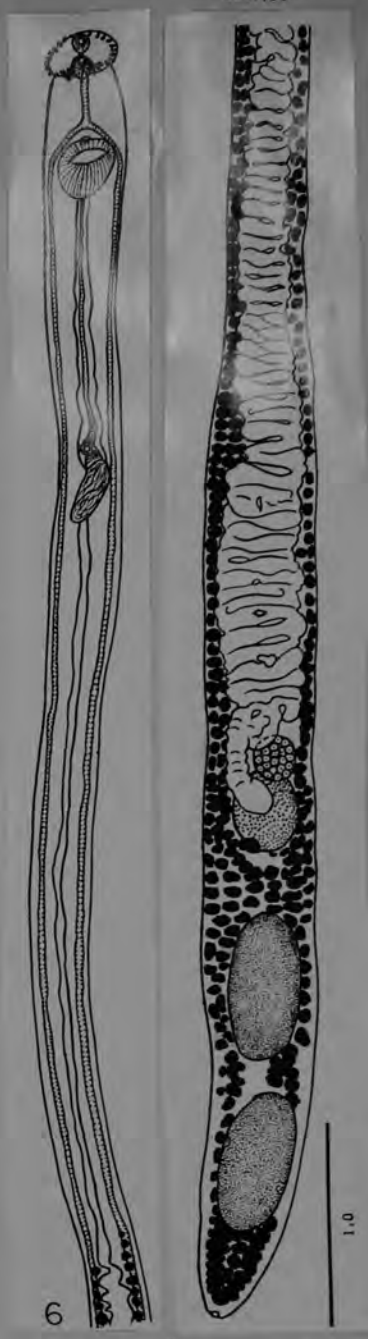
Discussion.—*Himasthla* spp. are usually parasites of sandpipers (Scolopacidae), though gulls, herons and oystercatchers have also been reported as hosts for certain members of this genus. A single case of human parasitism was reported by Vogel (1933), who described *H. muehlensi* from the feces of the 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.

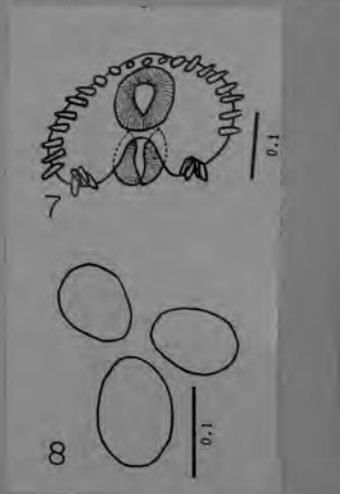
Various pelecypods serve as second intermediate hosts for these echinostomes. Stunkard (1934) exposed *Mya arenaria, Mytilus edulis, Modiola modiolas, Cumingia tellinoides, Pecten irradians, Ensis americana* and *Crepidula fornicata* to cercariae of *H. quissetensis* (Miller and Northrup, 1926) Stunkard, 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 decussalus* 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. muehlensi*, 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. muehlensi* Vogel, 1933; (6) *H. quissitensis* (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.

FROM LUMSDEN, 1962





Himasthla harrisoni Johnston, 1917

HIMASTHLA HARRISONI, sp. n. (Fig. 10.)

Diagnosis.—Elongated, attenuated worm, flattened dorso-ventrally. Integument closely beset with thick spines. Head-collar with *twenty-four* spines in a single row on its border. Ratio of oral to ventral sucker 1 : 4. Testes and ovary close together in the posterior fifth of the body length. Yolk-glands confined to the posterior half of the body. Eggs broad elliptical, but pointed at both ends, 0·091 × 0·069 – 0·096 × 0·074 mm.

Host—*Numenius cyanopus*, in the intestine.

Type specimen in the Australian Museum, Sydney, No. W, 427.

Three specimens of this worm were obtained from the Curlew, *Numenius cyanopus*, at Masthead Island, off the Queensland Coast, and one at Gladstone Q., by Launcelot Harrison, demonstrator of Zoology in Sydney University.

All reprint

sthla harrisoni
FROM JOHNSTON, 1917

Himasthla leptosoma (Creplin, 1829)
syn. Himasthla secunda (Nicoll, 1906)

IV. Fam *Echinostomidae.*

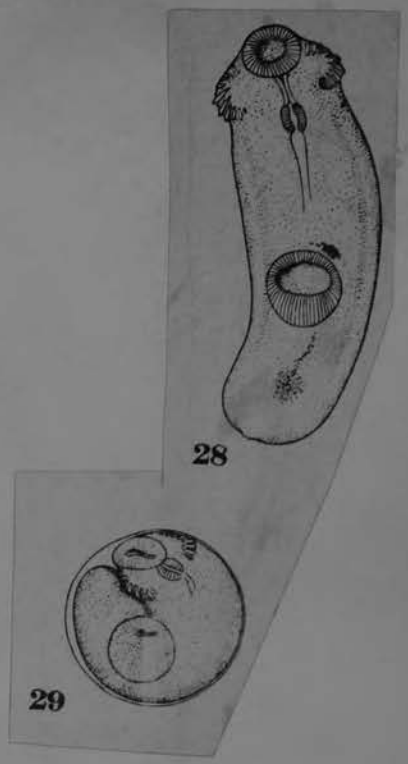
5) *Himasthla secunda* (Nicoll 1906) Taf. 14, Fig. 28, 29.

Bei *Cardium edule* habe ich 17 Fälle von Infizierung festgestellt. Die Zahl der Zysten bei einem Wirt schwankt von 1 bis 17. Die Enzystierung findet immer im Fuß des Mollusken statt. Die Zystenwände sind durchsichtig und elastisch. Gewöhnlich sind sie von den Geweben des Wirtstieres umgeben. Im Durchmesser messen die Zysten 195 × 195 μ (*in vivo:* 196 × 200 μ; 200 × 215 μ). Die im Innern befindliche Metazerkarie führt sehr lebhafte Bewegungen aus und kann verschiedene Lagen einnehmen.

Aus Zysten befreite Larven weisen folgende Ausmaße auf:

Körperlänge	465 μ
Körperbreite	150 μ
Länge des »Kopfes«	109 μ
Breite des »Kopfes«	144 μ
Mundsaugnapf	60 × 63 μ
Pharynx	27 × 33 μ
Bauchsaugnapf	79 × 79 μ

Die Zahl der Stacheln auf dem »Kopf« beträgt 30 Stück. Die Geschlechtsorgane sind noch nicht ausgebildet. Nur über dem Bauchsaugnapf läßt sich eine dunklere Zellengruppe unterscheiden. Die Larvalform aus *Cardium edule* und das reife Stadium aus Wasservögeln ist von Nicoll (1906) beschrieben worden.



28

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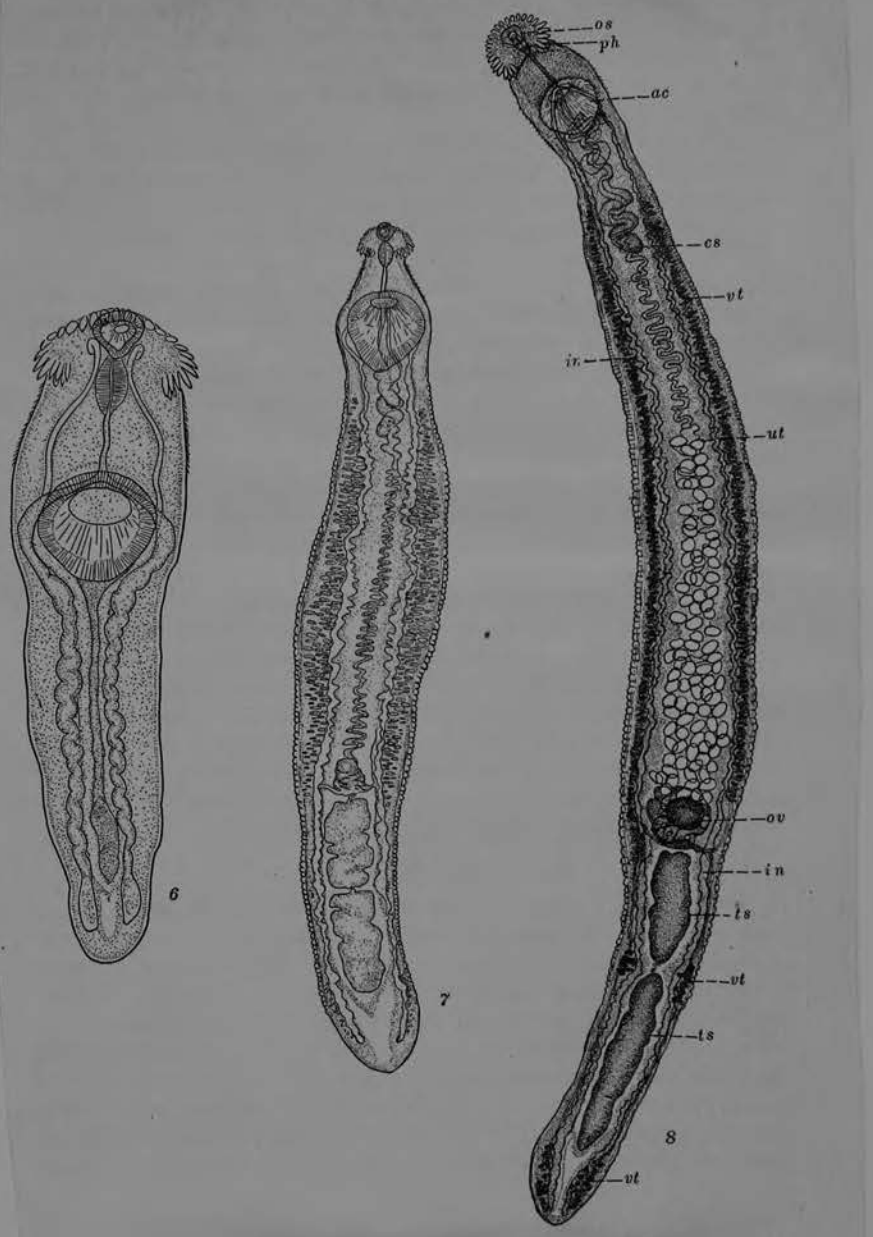
PLATE II

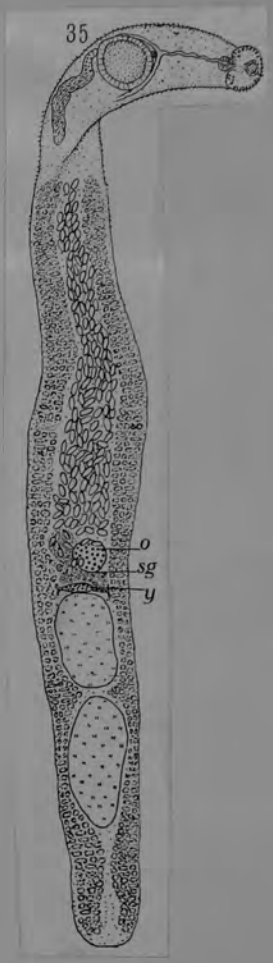


Stunkard 1938

Echinostomidae

HIMASTHLA TENSA, ~~n. sp.~~ LINTON, 1940

PLATE 4, FIGURE 35



Body nearly linear; neck short, covered with minute spines, about 0.02 mm. in length and continuing for a short distance back of the ventral sucker; pharynx small, close to oral sucker; esophagus long; intestines begin at anterior border of ventral sucker, indistinct in balsam mounts, but appear to extend to posterior end. Genital pore at anterior edge of ventral sucker on median line; cirrus pouch and seminal vesicle long, extending back of ventral sucker, the seminal vesicle more or less spirally curved; testes longer than broad, near posterior end, one following the other closely. In one of the specimens the testes are slightly irregular, the first having a deep notch on one side and the second being constricted about the middle of its length, the posterior half being distinctly narrower than the anterior. Ovary subglobular, a short distance in front of the first testis and a little to the right of the median line. An ample shell gland and vitelline reservoir lie between the ovary and first testis. The early folds of the uterus contain sperm. The vitellaria extend from the posterior end about to the posterior end of the seminal vesicle. The body is considerably elongated between the ovary and ventral sucker; numerous ova lie along the median line, between the marginal vitellaria, from the ovary to the anterior end of the vitellaria.

The ventral sucker is larger than the oral, and the mouth is surrounded by a single circle of spines, with two extra spines at the angles at each side. These extra spines are posterior to the others, and if continued would form an outer circle. The oral spines are about 0.02 mm. in length and 0.015 mm. in breadth; as near as could be determined the number of oral spines is about 32.

Measurements in balsam: Length, 5.32 mm.; maximum breadth, 0.59 mm.; breadth of circle of oral spines, 0.26 mm., of oral sucker, 0.11 mm.; pharynx, length, 0.11 mm., breadth, 0.07 mm.; ventral sucker, length, 0.31 mm., breadth, 0.31 mm.; ova somewhat variable, average of four 0.075 by 0.038 mm.; first testis, length, 0.5 mm., breadth, 0.32 mm.; second testis, length, 0.7 mm., breadth, 0.28 mm.; distance of second testis from posterior end, 0.7 mm.; length of esophagus, 0.35 mm.

Host.—Common codfish (*Gadus morrhua*).

Record of collections.—Three (U.S.N.M. No. 8214), collected January 22, 1915; 12 fishes examined.

From Linton, 1940

H.W. Manter

Reprinted from Biological Bulletin, Vol. 119, No. 3, pp. 529–549, December, 1960
Printed in U. S. A.

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.

HORACE W. STUNKARD[1]

The U. S. Bureau of Commercial Fisheries

The genus *Himasthla* is a member of the Echinostomatidae, a family which comprises a large number of genera and species that live in the digestive tracts of birds and mammals. Dietz (1909) erected the genus with *H. rhigedana*, a new species from the curlews, *Numenius arquatus* and *Numenius arabicus*, as type. He (1910) characterized the family and the several genera. As members of *Himasthla* he included *H. militaris* (Rudolphi, 1803) from the European curlew, *Scolopax (= Numenius) arquata; H. leptosoma* (Creplin, 1829) from *Tringa alpina (= variabilis); H. elongata* (Mehlis, 1831) from species of gulls, *Larus; H. secunda* (Nicoll, 1906) from the black-headed gull, *Larus ridibundus* and the herring gull, *Larus argentatus;* and *H. alincia* Dietz, 1909, based on specimens from the semipalmated sandpiper, *Tringa pusillus* collected by Natterer in Brazil. The first of these species was taken on the Sinai peninsula, the last in South America, while the others were European. As important criteria for specific determination, Dietz listed the number of spines on the collar, the extent of the vitellaria, and the structural details of the copulatory organs.

Subsequently described species include *H. harrisoni* Johnston, 1917 from *Numenius cyanopus* in Australia; *H. incisa* Linton, 1928 from the white-winged scoter, *Oidemia deglandi*, at Woods Hole, Massachusetts; *H. muehlensi* Vogel, 1933 from a human patient in Hamburg, Germany; *H. ambigua* Palombi, 1934, based on encysted metacercariae from the gills of *Tapes decussatus* in the Mediterranean; *H. kusasigi* Yamaguti, 1939 from *Tringa ochlopus* and *H. megacotyle* Yamaguti, 1939 from *Erolia alpina sakhalina*, both species taken in Japan; *H. multilecithosa* Mendheim, 1940 from a captive great crowned pigeon, *Goura coronata;* and *H. tensa* Linton, 1940 reported from a codfish, *Gadus morrhua*, at Woods Hole, Massachusetts. Stunkard (1934, 1937, 1938) showed that *Cercaria quissetensis* Miller and Northup, 1926 is the larval stage of a species of *Himasthla*, for which the larval name was adopted. The asexual generations occur in *Nassarius obsoletus*, the cercariae penetrate and encyst in different species of mollusks, and the worms become sexually mature in the intestine of gulls. Prudhoe (1944) described, but did not name, a single specimen from the yellow-wattled lapwing, *Lobipluvia malabarica*, and assigned it provisionally to the genus *Himasthla*.

Metacercariae from the foot of *Scrobicularia tenuis* were identified as *Cercaria leptosoma* by Villot (1878), who traced their development to maturity in the

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alimentary tract of the "allouette de mer à collier," *Tringa variabilis*. The number of collar-spines was not recorded, but the figure of the adult is very similar to that of *H. leptosoma* as given by Dietz. Cuénot (1892) reported metacercariae of *H. leptosoma* encysted in the circumoral tentacles of *Synapta inhaerens* and in the foot of *S. tenuis*, but since he found 31 or 32 collar-spines, it is obvious that he was dealing with some species other than *H. leptosoma*. Palombi (1925) identified metacercariae from *Mytilus galloprovincialis* as larvae of *Echinostomum secundum* (= *H. secunda*) Nicoll, 1906. Skrjabin (1956) included figures of the larval stages of *H. militaris* after the work of Zelikman, but there was no account of the life-cycle or reference to other published report.

There has been much difference of opinion concerning specific distinctions and the number of valid species in *Himasthla*. Stunkard (1939) reviewed the history of the genus and discussed the problem of specific determination. Linton (1928) had described specimens from four species of gulls (*Larus*) and others from the white-winged scoter, *Oidemia deglandi*, and from the black-crowned night heron, *Nycticorax nycticorax*. The worms from *O. deglandi* were described as a new species, *H. incisa*, while all the others were referred to *H. elongata*, despite differences in number of collar-spines and other morphological features. Some of the worms had 29, others 31 collar-spines, and it was clear that two distinct species were represented. Those with 31 spines were identified by Stunkard (1938) as *H. quissetensis*, whereas those with 29 spines were intermediate in size and morphology or overlapped the figures given by Dietz (1910) as characteristic for *H. elongata* and *H. militaris*. Stunkard (1938) stated, p. 190, "In my opinion the worms might with equal justification be referred to either of the two species. On the other hand, they may belong to neither." Sprehn (1932) listed *H. militaris* and *H. secunda* as synonyms of *H. leptosoma* and Palombi (1934) admitted the probable identity of *H. leptosoma* and *H. secunda*. Stunkard noted similarity between *H. alincia* and *H. quissetensis* and conceded their possible identity. Dawes (1946) regarded *H. leptosoma* and *H. elongata* as valid species, but listed *H. militaris* and *H. secunda* as synonyms of *H. leptosoma*.

In correspondence with Dr. Vogel, Dr. Mendheim accepted the opinion of Sprehn (1932) and in addition predicated the identity of *H. elongata* and *H. leptosoma*. With this proposal, all the specimens of *Himasthla* with 29 collar-spines were included in a single species, *H. elongata*. However, if the idea were correct, the name of the species must be *H. militaris* (Rudolphi, 1803), which has priority over *H. elongata* (Mehlis, 1831). In addition, Dr. Mendheim suggested the identity of *H. muehlensi* and *H. elongata*. The specimens of *H. muehlensi* had been recovered from the stool of a patient following a purgative after his arrival at the hospital of the Institut für Schiffs- und Tropenkrankheiten in Hamburg, Germany. The patient was a South American who had stopped at New York on his way to Germany and in sea-food restaurants had eaten many "clams," juvenile *Venus* (*Mercenaria*) *mercenaria* which are served raw on the half-shell under the designation "cherry stones." In his description of the specimens, Vogel (1933) noted that members of *Himasthla* are typically parasites of birds and that the human infection was a recent and probably an accidental one. In a monographic study of the Echinostomidae, Mendheim (1940) described *Himasthla multilecithosa* n. sp., from *Goura coronata*, a native of ...e Papuan and Solomon Islands. Mendheim reported

that the time and place of the infection were unknown, that the normal food of these birds is fruit, and since the infective larvae of *Himasthla* occur in marine mollusks, the infection must have been accidental or incidental. After redescriptions of *H. elongata* and *H. muehlensi* he wrote, p. 578, "Auf Grund einiger Befunde müssen *Himasthla leptosoma, Himasthla elongata* und *Himasthla muehlensi* zu einer Art vereinigt werden." But his account of *H. elongata* was obviously based on material of more than one species since he reported the number of collar-spines as 29–31. His report on the specimens of *H. muehlensi*, loaned by Dr. Vogel, adds nothing of significance to the original description. He noted that egg production had just begun and that the first eggs were smaller than those formed later, from which he concluded, p. 511, "Die Eimasse können also nicht als brauchbares Artkriterium gelten." The observation is not new (q.v., Beaver, 1937, p. 26) and the conclusion is equivocal.

The writer had the opportunity in Hamburg to study the specimens of *H. muehlensi*, several specimens of *H. leptosoma* from *Tringa alpina* in the collection of Dr. Vogel, and four specimens sent by Dr. Mendheim that were identified as *H. elongata*. In a report, Stunkard (1939) stated that the specimens of *H. muehlensi* have 31 collar-spines and while there is a possibility that they may be identical with *H. quissetensis*, they certainly are distinct from *H. elongata* which has 29 spines. Furthermore, although *H. elongata* and *H. leptosoma* both have 29 collar-spines, morphological differences, first listed by Dietz and manifested by specimens from the collections of Vogel and Mendheim, clearly differentiate the two species. Specimens of *H. leptosoma* are smaller, the structure is more delicate, the suckers, collar-spines and eggs are smaller, the vitellaria do not extend as far anteriad, and the gonads are larger. Mendheim (1943) reaffirmed the identity of *H. elongata*, *H. leptosoma* and *H. muehlensi*, which he derived from average measurements of 15 specimens which, according to the text, included the four worms identified by Stunkard as *H. elongata*. Since the author admittedly was unable to distinguish between *H. elongata* and *H. leptosoma*, and since it is apparent from his figures that the 15 specimens included representatives of both species, the average measurements are meaningless. In a key for determination of species, Mendheim (1943, p. 235) distinguished *H. incisa* on the basis of 27 collar-spines. In the original description Linton (1928) wrote, p. 12, "The exact number of oral spines could not be made out in the balsam mount. There are at least 27. There is a single row, except at the lateral angles." After examination of the type specimen, Stunkard (1938) reported that the worm has 31 spines. Re-examination of the specimen confirms that number; the spines are relatively stout and those in the single row measure 0.065 to 0.070 mm. in length. The slide bearing the single type specimen has a label written by Professor Linton noting that the worm was collected by Vinal Edwards, June 2, 1914, at Woods Hole, Massachusetts.

Linton (1940) described *H. tensa* as a parasite of *Gadus morrhua;* there are three specimens on the slide deposited in the U. S. National Museum and the notation, in Linton's handwriting, states that the worms were collected by Vinal Edwards, 1915. Mendheim apparently accepted the fish as a normal host. He stated, (1943, p. 235) "Besonders bemerkungswert ist *H. tensa* aus *Gadus morrhua*. Es ist dies seit dem von Diesing beschriebenen *Echinostoma annulatum* Diesing 1850 die einzige Echinostomiden-Art aus Fischen. Körperform, Lage des Bauch-

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PLATE II

FIGURE 7. *Himasthla tensa* Linton, 1940. Type and cotype specimens from *Gadus morrhua*, taken 22 January 1915 at Woods Hole, Mass., by Vinal Edwards. Linton material now in the U. S. National Museum, No. 8214; type specimen at bottom of photograph; length, 5.32 mm.

saugnapfes und Pseudosegmentierung lassen es vor allem seit Linton's Fund als durchaus wahrscheinlich erscheinen, dass Diesing eine *Himasthla*-Art vorgelegen hat." *Distomum annulatum* was described by Diesing (1850) from the intestine of the electric eel, *Gymnotus electricus*. The specimens had been collected by Natterer in Brazil, the 3rd of September, 1827. In his description and figures, Diesing (1855) gave the length as 6 lines and the maximum width as ½ line, which would be slightly more than 12 by 1 mm. Cobbold (1860) transferred the species to *Echinostoma* and Dietz (1910) listed it under *Species inquirendae*. Mendheim noted features in which it conforms to the diagnosis of *Himasthla*. The specific name, *annulatum*, is significant since this feature is a prominent characteristic of the genus. Examination of the figures of Diesing (1855) and comparison

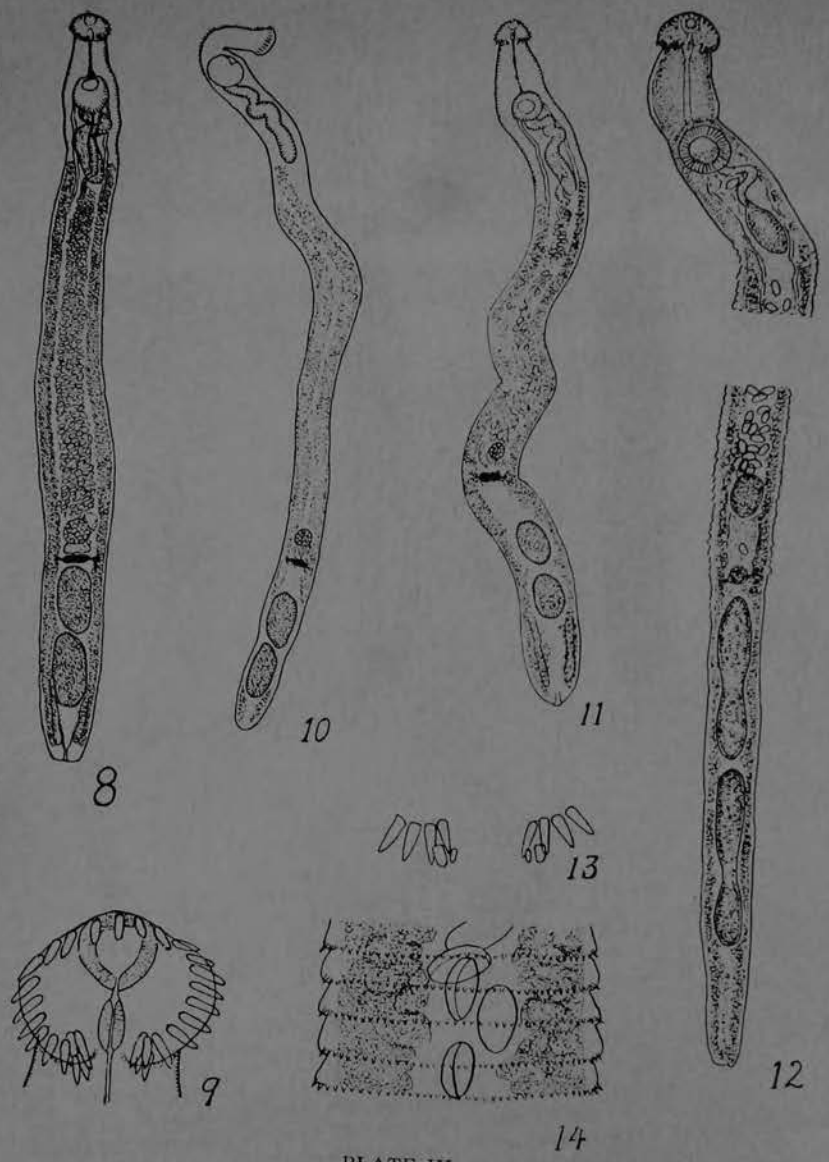


PLATE III

FIGURE 8. *Himasthla elongata*, drawing of specimen shown in Figure 5.
FIGURE 9. Collar and spines of specimen shown in Figure 8.
FIGURE 10. *Himasthla elongata*, drawing of specimen shown in Figure 3.

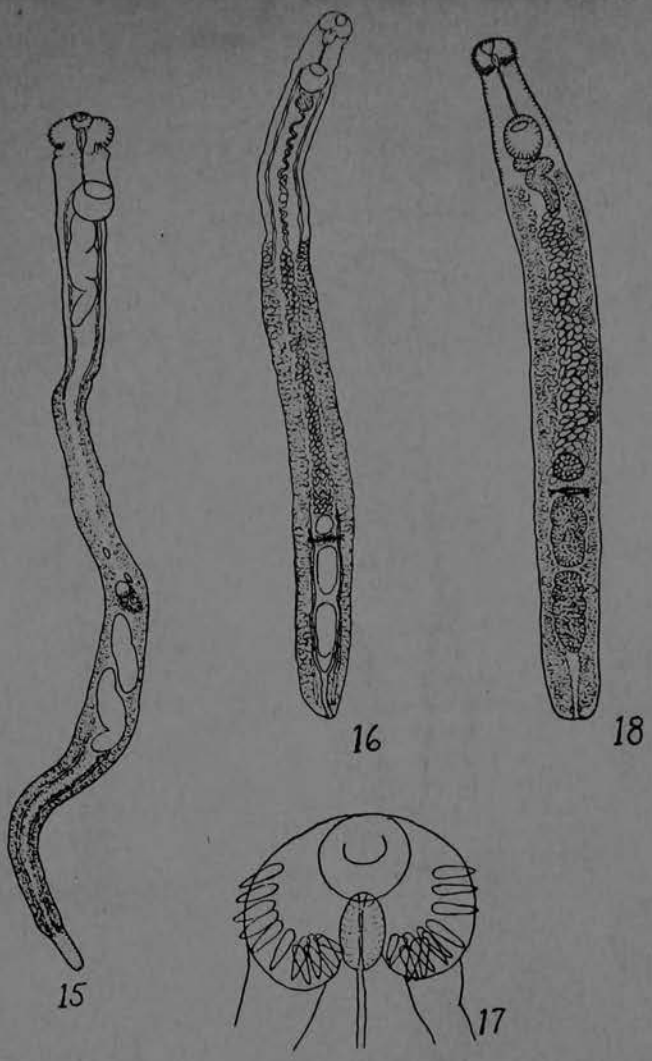
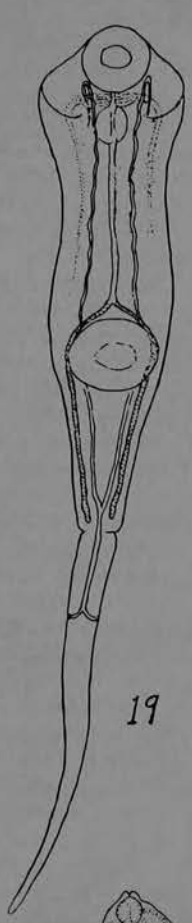


PLATE IV

FIGURE 15. *Himasthla piscicola*, type specimen, length 9.80 mm.
FIGURE 16. *Himasthla mcintoshi*, type specimen, length 8.00 mm.
FIGURE 17. Spines at the ventro-lateral corners of the collar of worm shown in Figure 16.
FIGURE 18. *Himasthla compacta*, drawing of specimen shown in Figure 1.



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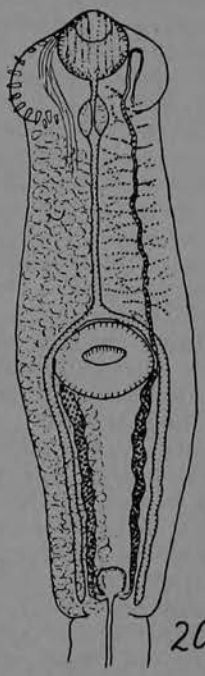

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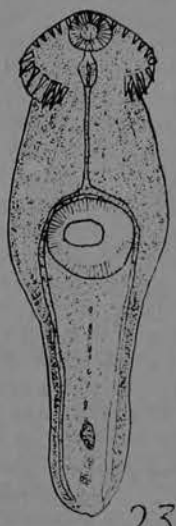

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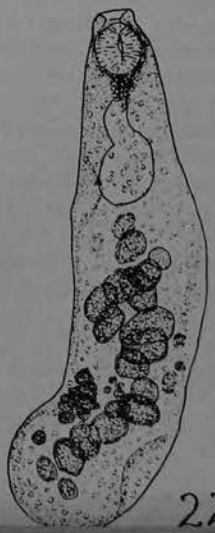

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and named by Miller and Northup (1926). The members of the other species were not identified although Stunkard noted that measurements of 12 representative specimens are intermediate between or overlap the figures given by Dietz (1910) as characteristic for *H. elongata* and *H. militaris*.

Certain of the adult worms recovered from the intestine of *L. argentatus* after feeding metacercariae encysted in the tissues of *M. arenaria* from Maine are identified as *H. elongata*. These worms unquestionably are specifically identical with those identified as *H. elongata* by Linton (1928). In most of the specimens the collar-spines are slightly larger and the testes considerably larger than the figures given by Dietz (1910) for *H. elongata* but there is considerable variation, and the location of the testes and ovary near the posterior end of the body clearly differentiates them from *H. militaris*. One specimen, killed in a very extended condition (Figs. 12, 13, 14), exhibits the pseudosegmentation characteristic of the postacetabular region of the body and the annular arrangement of the flattened, scale-like spines. In this specimen, the two median members of the corner-spines (Fig. 13) on the collar are very small, recalling the condition shown in Figure B^1 of Dietz. The worm measures 12.5 mm. in length and 0.45 mm. in greatest width. In Figure 12, 6 mm. and 110 annulations are omitted from the middle of the body. Five of the annuli are portrayed in Figure 14. Another, younger specimen, with a few eggs in the uterus gave the following measurements: length, 4.4 mm.; width, 0.5 mm.; width at collar, 0.3 mm.; spines, 0.058 mm. long; acetabulum, 0.31 mm. long and 0.26 mm. wide; oral sucker, diameter 0.11 mm.; pharynx, 0.098 mm. long and 0.056 mm. wide; vitellaria do not extend forward to the level of the cirrus-sac; ovary 0.156 mm. wide and 0.125 mm. long; anterior testis, 0.25 mm. long and 0.155 mm. wide; posterior testis, 0.28 mm. long and 0.15 mm. wide; eggs 0.090 to 0.100 mm. long and 0.060 to 0.068 mm. wide. Gravid worms vary in size from these measurements to older individuals that are twice as large with correspondingly larger organs, but the structural pattern of the species is always evident.

The single specimen from the night heron, *N. nycticorax*, shown in Figures 6 and 11, has 29 collar-spines but manifests certain differences from the worms found in *L. argentatus*. It is only slightly smaller than the worm shown in Figure 5; however, the collar-spines and suckers are smaller, the vitellaria do not extend as far anteriad, and the gonads are smaller and slightly farther forward. In this specimen the spines are 0.050 mm. long; the oral sucker measures 0.114 by 0.107 mm.; the acetabulum is 0.325 mm. long and 0.290 mm. wide; the ovary is spherical, 0.143 mm. in diameter; the anterior testis is 0.40 mm. long and 0.23 mm. wide; the posterior testis is 0.42 mm. long and 0.25 mm. wide; the eggs average 0.097 by 0.062 mm. The measurements are almost identical with those given by Nicoll for *Himasthla secunda*, and the small size of the gonads agrees well with the description of *H. elongata* as given by Dietz. The similarity suggests possible identity of *H. secunda* and *H. elongata*. Since the material at hand consists of a single specimen, it is referred for the present to *H. elongata*. When the life-history of that species is known and cercariae are available for experimental infections, it will be possible to determine definitely whether the present worm belongs in *H. elongata* or is a member of some other species.

The specimen from *Larus delawarensis* (Fig. 3) is referred to *H. elongata*, but it is juvenile and possibly members of that species do not attain sexual maturity in *L. delawarensis*.

Himasthla compacta n. sp.

Adult

Material of this species consists of worms recovered from laboratory-reared *L. argentatus* fed *M. arenaria* collected near Boothbay Harbor, Maine, and others from another laboratory-reared *L. argentatus*, five weeks after the beginning of an experiment in which the bird was fed metacercariae encysted in small *M. arenaria*. These clams had been exposed to echinostome cercariae from *H. minuta* collected in Sagadahoc Bay, near Boothbay Harbor, Maine, and the metacercariae were presumed to be encysted stages of the same cercariae. Most of the worms were sexually mature but several were juveniles. The bird had been fed five weeks, two weeks and one week before it was killed and the small worms shown in Figures 23 and 24 are probably from the last two feedings. A specimen 2.130 mm. long and 0.275 mm. wide does not have eggs in the uterus, although there are spermatozoa in the testes.

Gravid specimens, fixed and stained, measure 3.00 to 4.30 mm. in length and 0.35 to 0.44 mm. in width. For such a small species of *Himasthla*, the organs are large and compactly disposed. The sides of the body are almost parallel; the acetabulum protrudes; in the preacetabular region the lateral edges are often turned ventrad and mediad, forming a ventral depression. The anterior end has a reniform collar, open ventrally, which bears 29 spines, 25 arranged in a linear row and two smaller corner-spines on each side behind the terminal ones of the row. The lineal spines are 0.054 to 0.062 mm. in length and 0.012 to 0.014 mm. wide; the smaller corner ones are 0.026 to 0.032 mm. long and 0.009 mm. wide. In mature specimens the acetabulum is about one-seventh of the body length from the anterior end whereas in juvenile worms it is relatively farther back and in young worms it is near the middle of the body. The shift in relative position of the acetabulum results from development of the reproductive organs in the postacetabular portion of the body. The acetabulum is usually longer than broad, oriented with the opening at the antero-ventral face, just behind the common genital pore. The sucker measures 0.20 to 0.26 mm. in length and 0.18 to 0.22 mm. in width. The cuticula in the preacetabular area bears scale-like spines arranged in an imbricate pattern, while behind the sucker the spines are smaller and are arranged in the annular fashion characteristic of the genus.

The mouth is subterminal; the oral sucker measures 0.075 to 0.090 mm. in diameter. There is a short prepharynx; the pharynx is oval to pyriform, usually wider posteriorly, it measures 0.060 to 0.075 mm. in length and 0.040 to 0.050 mm. in width. The esophagus extends almost to the acetabulum and the ceca end blindly near the posterior end of the body.

The testes are almost contiguous, one behind the other, in the caudal one-third of the body. They are oval, with notched but not lobed surfaces. The posterior testis is usually somewhat larger than the anterior one. The anterior testis is 0.36 to 0.49 mm. in length and 0.18 to 0.21 mm. in width; the posterior testis is 0.40 to 0.58 mm. in length and 0.18 to 0.21 mm. in width. From each testis a sperm duct passes forward and the two unite just before reaching the cirrus-sac. The common duct, on entering the sac, expands into a coiled seminal vesicle, which fills the posterior one-half or more of the cirrus-sac. The vesicle is followed by a shorter prostatic portion of the duct and then by a protrusible cirrus armed with very small

spines. The cirrus-sac extends behind the acetabulum more than the diameter of that sucker and terminates between the anterior ends of the vitelline glands.

The ovary is spherical to oval, usually broader than long, situated from two-sevenths to three-eighths of the body length from the posterior end. It is about its diameter in front of the anterior testis. It measures 0.06 to 0.13 mm. in length and 0.08 to 0.16 mm. in width. The oviduct arises at the posterior face and passes backward where it enters the ootype region. It expands somewhat and gives off Laurer's canal, which passes to the dorsal surface of the body, after which it receives the common vitelline duct. This portion is partially enclosed in the cells of Mehlis' gland, which surrounds the ootype. The initial portion of the uterus is filled with masses of spermatozoa. The uterus coils about and passes forward to the level of the caudal end of the cirrus-sac where it joins the metraterm. Both metraterm and cirrus-sac pass forward above the acetabulum to open into a shallow genital sinus, and the genital pore is on the median ventral surface, immediately anterior to the acetabulum. The vitelline follicles are lateral to and partially overlap the digestive ceca; they extend from the caudal end of the body to a level about the length of the acetabulum behind that sucker. They are not interrupted at the levels of the testes. Longitudinal ducts connect the follicles and transverse ducts pass mediad at the level of the ootype, where they unite to form a vitelline receptacle from which a common duct leads to the initial portion of the ootype. The eggs are large, oval, thin-shelled, collapsed in the preserved specimens, 0.085 to 0.090 mm. in length and 0.050 to 0.058 mm. in width. Each egg contains an ovum and several vitelline cells. The ovum is situated toward the opercular end of the egg. Cleavage begins in the uterus, but development there does not go much beyond the four-cell stage.

Himasthla compacta differs from all other species of the genus in its smaller size, its compact structure and relatively larger gonads. The ovary is situated about one-third of the body length from the posterior end and the testes extend through most of the postovarian distance, a condition not found in any other species. Since *H. compacta* has not been reported previously from *L. argentatus*, some other avian species may be its normal host.

The type specimen (Figs. 1, 18) is deposited in the U. S. National Museum Helminthological Collection under the number 39,444.

Redia

In structure and behavior, the rediae are very similar to those of *H. quissetensis* as described by Stunkard (1938). Figure 21 is a drawing of a large, gravid redia of natural infection. It is 1.12 mm. long and 0.28 mm. wide; the pharynx is 0.028 mm. in diameter. Figure 22 shows a young redia recovered from one of the small specimens of *H. minuta* which had been exposed for four weeks to embryonated eggs of *H. compacta* taken from worms that had developed in the intestine of a laboratory-reared specimen of *L. argentatus*. Whether this is a first or second generation redia could not be determined, since the germ balls in it could be embryos of either rediae or cercariae. At this stage they are quite indistinguishable. The specimen measures, fixed, stained and mounted, 0.47 mm. long, 0.12 mm. wide, and the pharynx is 0.027 mm. in diameter. The young rediae have collars which become visible as the larvae move; they progress in a lumbricid manner, with temporary protrusions of foot-like projections to anchor one region while advancing another. In young rediae

and right components which meet and fuse at the posterior end of the body and the anterior portion of the tail. The two excretory pores are located on the sides of the tail, as shown in Figure 19. The vesicle is spherical to oval, thin-walled, and from either side a collecting duct passes forward, median to the digestive cecum, below the cecum at the level of the acetabulum, and then forward to the level of the oral sucker, where it recurves and passes posteriad. Near the middle of the body the recurrent duct divides into anterior and posterior branches. In the preacetabular area the collecting ducts have median and lateral branches and these branches subdivide in turn to form a ramified pattern as shown in Figure 20. In mature cercariae the collecting ducts contain spherical to oval concretions; in the postacetabular area the granules are larger, 0.005 to 0.01 mm. in diameter and more numerous, four or five at any level of the duct, whereas in the preacetabular ducts and their branches the granules are smaller, 0.003 to 0.005 mm. in diameter, and are arranged in single rows.

Himasthla mcintoshi n. sp.

This name is proposed for the seven specimens from the long-billed curlew, *Numenius americanus americanus*, collected by J. Bushman in Tooele County, Utah, on April 21, 1954 and deposited in the Helminthological Collection of the U. S. National Museum under the number 54,721. The species is named in honor of Dr. Allen McIntosh, Parasitologist in the Agricultural Research Service of the U. S. Department of Agriculture, in recognition of his contributions to helminthology and of the generous aid he has provided for other workers.

The worms are all sexually mature, with eggs in the uteri, chiefly in the initial one-half of the organ, with the terminal portion almost if not quite empty. Five of the worms are much bent or coiled and the one shown in Figure 16 is the only straight-bodied specimen. They vary from 6 to 11 mm. in length and from 0.5 to 0.7 mm. in greatest width. The anterior end bears a reniform collar which, in the two specimens in which they could be counted, is armed with 35 spines. There is a single row, interrupted ventrally, with 29 large spines, each 0.078 to 0.084 mm. in length and 0.02 mm. wide at the base, and at either end of the row, on the ventral side, there are three smaller corner-spines, about 0.055 mm. in length and 0.016 mm. wide at their bases. The lateral edges of the preacetabular region are curved ventrad and mediad, creating a median ventral depression (Fig. 17). When the body is contracted, the lateral walls are crenated and each annulus in the postacetabular region bears a circlet of small cuticular spines. In the preacetabular region the spines are closer together and arranged in an imbricated pattern, a cuticular arrangement characteristic of the genus *Himasthla*. The acetabulum is slightly less than twice its diameter from the anterior end of the body; it is directed antero-ventrad, protrudes slightly, and measures from 0.33 to 0.39 mm. in length and 0.31 to 0.35 mm. in width.

The mouth is subterminal, the oral sucker is 0.13 to 0.16 mm. in diameter, followed almost immediately by the pharynx, about 0.14 mm. long and 0.10 mm. wide. The esophagus extends almost to the acetabulum and the digestive ceca terminate blindly near the posterior end of the body.

The excretory pore is terminal, the vesicle is short and divides behind the posterior testis, with the collecting ducts passing forward just median to the

digestive ceca. They are clearly visible in the region between the anterior ends of the vitellaria and the acetabulum. Anterior to the acetabulum they are lateral in position and extend forward to the level of the oral sucker where they turn backward. Further details of the excretory system could not be observed.

The testes are oval, elongate, the posterior testis about its length from the posterior end of the body. There may be a short interval between the testes or they may be almost contiguous. The posterior testis is slightly larger than the anterior one and measures from 0.56 to 0.65 mm. in length and 0.22 to 0.28 mm. in width. Sperm ducts are not visible in the whole mounts; in most of the specimens the cirrus-sac extends about the diameter of the acetabulum behind that sucker; in the one shown in Figure 16, the cirrus-sac is coiled and consequently does not extend as far posteriad. The posterior one-half to two-thirds of the cirrus-sac is filled with a seminal vesicle and the anterior portion contains the eversible male duct, surrounded by secretory cells. The cirrus bears small recurved spines and the genital pore is median at the anterior margin of the acetabulum.

The ovary is spherical, 0.18 to 0.20 mm. in diameter, situated a short distance in front of the anterior testis. The oviduct arises at the posterior margin and the ootype and Mehlis' gland are posterior to the ovary. The vitellaria are lateral to and somewhat overlap the digestive ceca dorsally and ventrally. The follicles are spherical to oval, 0.04 to 0.065 mm. in diameter, continuous on both sides of the body, although somewhat reduced in one specimen at the level of the posterior testis. They extend from the posterior end of the body about two-thirds of the distance to the anterior end, terminating about two-thirds of the distance from the ovary to the acetabulum. Transverse ducts at the level of the ootype pass mediad to form a vitelline receptacle which discharges into the oviduct immediately before the ootype. The initial portion of the uterus is filled with spermatozoa. The eggs are broadly oval, those near the ovary average 0.100 by 0.076 mm., those farther along in the uterus are rounded, often collapsed, and may be slightly longer.

Himasthla mcintoshi agrees most closely with *H. rhigedana*, type of genus. Both are from species of *Numenius* and they are the only described species with more than 31 spines on the collar. Dietz reported a total of 34 to 38 spines in *H. rhigedana*, with 2, 3, or 4 corner-spines at each end of the row. In both of these species the corner-spines are very close together and often superimposed on those of the lineal row. Contractions of muscles in these locations produce variable orientation of the spines, so determination of their number and disposition is difficult. In Figure T of Dietz, the upper corner-spine on the left side could be interpreted either as a corner-spine or as the terminal spine in the collar-row. The two species differ in geographical distribution; *H. rhigedana* is from Arabia and *H. mcintoshi* from northwestern United States. Although the suckers do not differ greatly in size, *H. rhigedana* is more than twice as large as *H. mcintoshi*, the reproductive organs are much larger, although the eggs are smaller. The most obvious difference is in the disposition of the vitellaria; in *H. rhigedana* the vitellaria are interrupted at the testicular levels whereas in *H. mcintoshi* the follicles are continuous.

The type specimen is deposited in the U. S. National Museum Helminthological Collection under number 54,721.

digestive ceca. They are clearly visible in the region between the anterior ends of the vitellaria and the acetabulum. Anterior to the acetabulum they are lateral in position and extend forward to the level of the oral sucker where they turn backward. Further details of the excretory system could not be observed.

The testes are oval, elongate, the posterior testis about its length from the posterior end of the body. There may be a short interval between the testes or they may be almost contiguous. The posterior testis is slightly larger than the anterior one and measures from 0.56 to 0.65 mm. in length and 0.22 to 0.28 mm. in width. Sperm ducts are not visible in the whole mounts; in most of the specimens the cirrus-sac extends about the diameter of the acetabulum behind that sucker; in the one shown in Figure 16, the cirrus-sac is coiled and consequently does not extend as far posteriad. The posterior one-half to two-thirds of the cirrus-sac is filled with a seminal vesicle and the anterior portion contains the eversible male duct, surrounded by secretory cells. The cirrus bears small recurved spines and the genital pore is median at the anterior margin of the acetabulum.

The ovary is spherical, 0.18 to 0.20 mm. in diameter, situated a short distance in front of the anterior testis. The oviduct arises at the posterior margin and the ootype and Mehlis' gland are posterior to the ovary. The vitellaria are lateral to and somewhat overlap the digestive ceca dorsally and ventrally. The follicles are spherical to oval, 0.04 to 0.065 mm. in diameter, continuous on both sides of the body, although somewhat reduced in one specimen at the level of the posterior testis. They extend from the posterior end of the body about two-thirds of the distance to the anterior end, terminating about two-thirds of the distance from the ovary to the acetabulum. Transverse ducts at the level of the ootype pass mediad to form a vitelline receptacle which discharges into the oviduct immediately before the ootype. The initial portion of the uterus is filled with spermatozoa. The eggs are broadly oval, those near the ovary average 0.100 by 0.076 mm., those farther along in the uterus are rounded, often collapsed, and may be slightly longer.

Himasthla mcintoshi agrees most closely with *H. rhigedana*, type of genus. Both are from species of *Numenius* and they are the only described species with more than 31 spines on the collar. Dietz reported a total of 34 to 38 spines in *H. rhigedana*, with 2, 3, or 4 corner-spines at each end of the row. In both of these species the corner-spines are very close together and often superimposed on those of the lineal row. Contractions of muscles in these locations produce variable orientation of the spines, so determination of their number and disposition is difficult. In Figure T of Dietz, the upper corner-spine on the left side could be interpreted either as a corner-spine or as the terminal spine in the collar-row. The two species differ in geographical distribution; *H. rhigedana* is from Arabia and *H. mcintoshi* from northwestern United States. Although the suckers do not differ greatly in size, *H. rhigedana* is more than twice as large as *H. mcintoshi*, the reproductive organs are much larger, although the eggs are smaller. The most obvious difference is in the disposition of the vitellaria; in *H. rhigedana* the vitellaria are interrupted at the testicular levels whereas in *H. mcintoshi* the follicles are continuous.

The type specimen is deposited in the U. S. National Museum Helminthological Collection under number 54,721.

Himasthla piscicola n. sp.

This species is based on specimens found by Dr. H. O. Ewert, veterinarian of the Zoological Society, Toledo, Ohio, in the alimentary canal of a fish, *Arapaima gigas*, from the Amazon River, Brazil. They were sent for determination to Dr. Leonard Allison of the Institute for Fisheries Research at the State Fish Hatchery, Grayling, Michigan. With the specimens there was the following information: "HISTORY; the 24 inch specimen arrived here in September. The fish ate in the first weeks, four to five goldfishes three inches long, daily, and came gradually down to one fish a day until he stopped eating around the 18th of December. In this week he vomited several small balls of mucus. Under the microscope, these balls appeared to consist of cells, mucus and many flagellates, *Octomitus intestinalis*. AUTOPSY; the abdominal investigation showed inflammation of the intestinal tract as well as the abdominal lining (peritonitis). The stomach lining was highly inflamed and congested. The stomach cavity was filled with a tenacious mucus and a certain parasite, which will be found separated on the accompanying slide." According to Allison (*in litt.*), the parasite was a trematode which had been mounted in water under a cover-glass and arrived perfectly dry. Other specimens were removed from the contents of the stomach which was preserved in water. Allison identified the worms as members of the genus *Himasthla*. Professor S. Yamaguti examined certain of the specimens and agreed with the generic determination, noting differences between these specimens and *H. tensa* Linton, 1940. Subsequently, Allison wrote Dr. G. R. La Rue, at the Animal Parasite Research Laboratory, Beltsville, Maryland, and sent him two of the worms in the belief that La Rue would write the description. But Dr. La Rue suggested that the writer examine the specimens and make the report. They are here described as a new species, *Himasthla piscicola*.

The two specimens measure 8.2 and 9.8 mm., respectively, in length. The larger one, shown in Figure 15, is designated as type. The organs of the smaller worm are almost as large as those of the type specimen. In the smaller one there are masses of spermatozoa in the initial portion of the uterus but no eggs. There are two eggs, one of them collapsed, in the uterus of the larger worm. In these specimens the reniform collar, open ventrally, delimits a short, flattened area at the anterior end of the body. The collar-spines are intact but other spines have been lost. There are 29 spines on the collar, 25 in the lineal row and two on either side behind the terminal ones. Those at the ventral corners are as large as those in the lineal row; they measure 0.085 mm. in length and 0.025 in maximum width. Behind the collar there is a short, neck-like constriction. The specimens are much extended, a result of their protracted immersion in water, and the uterine region between the cirrus-sac and the ovary is especially narrow. In the larger worm the width at the collar is 0.875 mm. The acetabulum is 0.44 mm. long and 0.50 mm. wide; it is about its diameter behind the collar. The oral sucker protrudes slightly and measures 0.18 by 0.19 mm. The pharynx is large, 0.24 mm. long and 0.11 mm. wide. Th esophagus extends to the level of the acetabulum and the digestive ceca end blindly near the posterior end of the body. The testes are situated much nearer the middle than the posterior end of the body.

They partially overlap, the posterior third of the anterior testis is in the same zone as the anterior third of the posterior testis. They are elongate, slightly notched; the anterior one is 0.875 mm. long and 0.20 mm. wide, the posterior one is 0.89 mm. long and 0.20 mm. wide. The cirrus-sac extends posterior to the acetabulum more than twice the diameter of that sucker. A large seminal vesicle occupies the posterior half of the sac; the anterior portion of the vesicle and the succeeding duct are enclosed in a large, many-celled prostate gland. The cirrus is not protruded and no spines were observed. The ovary is situated near the middle of the body, only a short distance in front of the anterior testis, but would be relatively more posteriad if the uterus were filled with eggs. It measures 0.18 by 0.20 mm. The ootype complex is large, situated immediately posterior to the ovary; the initial portion of the uterus is filled with spermatozoa and there are two eggs in the uterus. One is collapsed, the other measures 0.114 by 0.064 mm. The vitelline follicles are continuous on each side of the body and extend from the posterior ends of the digestive ceca about three-fourths of the distance from the ovary to the posterior end of the cirrus-sac. The follicles would probably extend farther forward in more mature individuals.

Although the specimens are not mature, *H. piscicola* differs from all other adequately described species with 29 collar-spines in the position of the gonads, the shape and overlapping arrangement of the testes, and in the relative length of the posttesticular region of the body. *Himasthla piscicola* and *H. annulata* were found in the digestive tract of fishes from the Amazon River; it is possible that the two are identical, that some avian species is the natural host, and that the discovery of these worms in fish hosts is entirely incidental. The worms are similar in size, but the description and figures of Diesing give no information concerning internal morphology of *H. annulata* and it is quite impossible to determine whether the two are identical.

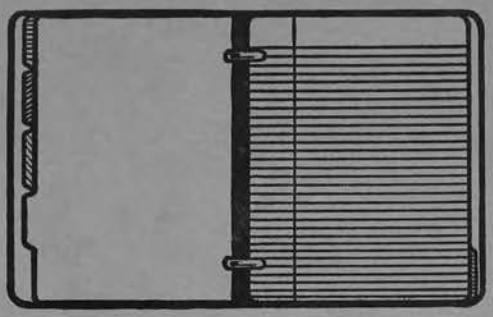
The type specimen of *H. piscicola* is deposited in the Helminthological Collection of the U. S. National Museum under the number 39,445.

Discussion

An investigation conducted by the U. S. Bureau of Commercial Fisheries is attempting to determine the causes for the decline in populations of *Mya arenaria* along the coast of New England and possible biological measures for control of the principal predators, the green crab (*Carcinus maenas*) and the horseshoe crab (*Limulus polyphemus*). *Mya arenaria* harbors the sporocysts and cercariae of *Cercaria myae* Uzmann, 1952; the larval stages of an as yet undetermined species of *Gymnophallus* (Stunkard and Uzmann, 1958). The palps and gills contain metacercariae of digenetic trematodes. Since the asexual generations of these metacercariae must occur in mollusks which live in the immediate vicinity of the infected clams, a survey of the more abundant species and those most likely to carry the trematode infections, is in progress. Furthermore, since the definitive hosts of these metacercariae are animals that feed on *M. arenaria*, examination of shore-birds has been started. To obtain precise information under controlled conditions, metacercariae from *M. arenaria* have been fed to laboratory-reared eider ducks,

HIMASTHLA

LOOSE LEAF INDEX



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PERIOD		FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH	SEVENTH	EIGHTH
MONDAY	COURSE								
	INSTRUCTOR								
TUESDAY	COURSE								
	INSTRUCTOR								
WEDNESDAY	COURSE								
	INSTRUCTOR								
THURSDAY	COURSE								
	INSTRUCTOR								
FRIDAY	COURSE								
	INSTRUCTOR								
SATURDAY	COURSE								
	INSTRUCTOR								

Echinostomidae

Hypoderaeum Dietz, 1909

Generic diagnosis. — Echinostomatidae, Echinostomatinae: Body elongate; forebody very short, strongly attenuated anteriorly. Head collar very poorly developed, with double, dorsally uninterrupted row of spines. Acetabulum large, strongly muscular. Esophagus very short. Ceca simple. Testes elongate, with smooth or indented margins, in mid-region of body. Cirrus pouch elongate, may reach to posterior end of acetabulum. Genital pore immediately postbifurcal. Ovary median, pretesticular. Uterus long, eggs numerous, large. Vitellaria in lateral fields of hindbody. Excretory system Y-shaped, with numerous side branches. Parasitic in various birds.

Genotype: *H. conoideum* (Bloch, 1782) Dietz, 1909 (Pl. 61, Fig. 736), in *Anas, Nyroca, Anser, Mergus, Gallus, Columba*, etc.; Europe. Also in anatids of Japan and Siberia. Anatomy — Rees (1932, 33). Cercaria and cyst in *Planorbis corneus, Limnaea stagnalis, L. limosa* — Mathias (1925); *Limnaea ovata, L. palustris, L. stagnalis, Planorbis corneus, P.* sp. — Wesenberg-Lund (1934).

Other species:

H. gnedini Baschkirova, 1941, in *Querquedula crecca, Spatula clypeata. Mareca penelope, Netta rufina, Fulica atra;* Russia.

H. magnicirrusa Verma, 1936, in pintail; Allahabad.

H. mainpuria Verma, 1936, in shoveller duck; India.

H. sinense Hsü, 1935, syn. of *H. conoideum* — Hsü & Chow (1938), in chicken and ducks; China.

H. vigi Basckkirova, 1941, in *Erolia ferruginea* and *Nyroca marila;* Russia.

Echinostomidae

HYPODERAEUM Dietz 1909

Body cylindrical, elongate and tapering behind. Ventral sucker relatively large and situated near the anterior end. The portion of the body in front of it is flattened and curved ventrally, and is much thinner than the posterior portion. The cuticle is spiny. The "head-crown" is poorly developed, but bears adouble row of spines, not interrupted dorsally. The ### esophagus is very short. The cirrus-sac is elongate, reaching posteriorly as far as the hinder edge of the ventral sucker. The testes are elongate and situated one behind the other in the middle line. The adilt worms usually live in the lower part of the intestine of birds.

Type species:

Hypoderaeum essexensis Khan, 1962

Adult
(Figs. 5–8)

The adult worms are elongate, dorsoventrally flattened, with the anterior end bluntly rounded and the posterior end pointed. The maximum breadth is attained at the level of the ventral sucker.

The collar is poorly developed and invariably bears forty-nine spines, of which five on each side constitute a corner group and the rest are arranged in two rows of alternating spines (Fig. 6). The body spines are arranged in diagonal rows, which on the ventral side extend up to the posterior margin of the ventral sucker. The body spines nearest to the collar extend up to near the mid-dorsal line, leaving a narrow naked area on the dorsal surface of the worm. This area becomes increasingly larger posteriorly, so that there are no spines on the mid-dorsal side of the worm (Fig. 7).

The oral sucker is subterminal; it is followed by a very short prepharynx, which is often completely obliterated in fixed and stained specimens. The muscular pharynx is slightly smaller than the oral sucker and is longer than broad. The oesophagus is short and divides some distance in front of the ventral sucker. The intestinal caeca are narrow and extend nearly to the posterior end of the body.

The ventral sucker is cup-shaped and strongly developed, with strong muscle bands originating from its inner side and extending to the dorsal body wall. The ventral sucker is about three times the size of the oral sucker and is located at about one fifteenth of the body length from the anterior end.

The ovary is elliptical or rounded and slightly pre-equatorial in position. Behind the ovary is a diffuse shell gland, nearly the same size as the ovary. The uterus is long with six to nine coils and contains numerous eggs. It passes over the ventral sucker slightly to the right of the middle line and opens into a common genital opening, which is immediately behind the bifurcation of the oesophagus. A true genital atrium is absent.

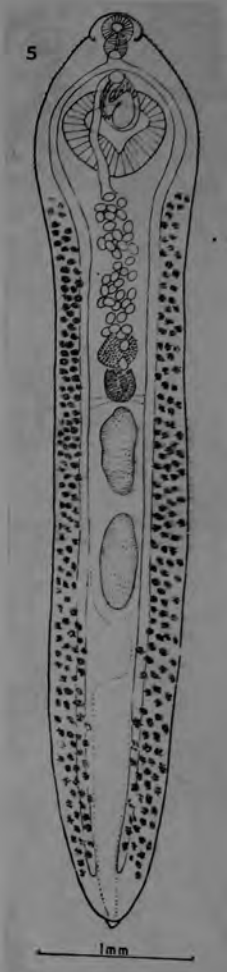
The vitellaria are in the form of small rosette shaped clusters, starting from the posterior border of the ventral sucker and extending to near the posterior end of the body. Up to the posterior end of the posterior testis the vitellaria are extra-caecal but behind the testes they cover the intestinal caeca and may at places extend slightly into the inter-caecal space, but always leave a wide gap in the middle.

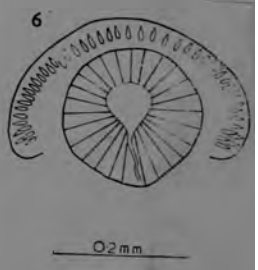
The two testes are elongate and occupy the third quarter of the body. In fixed and stained specimens they appear to be slightly twisted. This is probably because of uneven shrinkage of the testicular material during fixation. However, in the living worms they have a smooth and uniform outline. The posterior testis is slightly longer than the other. The cirrus sac is well developed and extends to the middle of the ventral sucker. It was never found to extend to the posterior end of the ventral sucker. The pars prostatica is poorly developed.

At the posterior end of the body there is a small appendage lying above the excretory pore, which is slightly dorsal in position.

Maturity is attained by the worms in thirteen days after feeding the cysts, when a small number of eggs are found in the faeces. After attaining maturity, the worms are retained by the hosts for a long time, at least for eleven days as shown in the second table.

The adult trematodes are always found within two to three inches from the anterior end of the small intestine. Only in one case the worms (two only) were outside this area; yet they were well within the first half of the small intestine.





MEASUREMENTS OF ADULT
(All measurements in millimetres)

Body length	4·05–6·52	Cirrus sac	0·35–0·43
Body breadth (maximum)	0·9–1·11	Oesophagus	0·06–0·12
		Anterior testis	0·45–0·63
Collar across	0·345–0·39		0·241–0·285
Oral sucker	0·195–0·21	Posterior testis	0·465–0·675
	0·15–0·165		0·24–0·33
Ventral sucker	0·615–0·675	Ovary	0·195–0·255
diameter			0·225–0·285
Proportion between oral sucker and ventral sucker	1 : 3		
Spines length			
Corner spines	0·026–0·03		
Edge spines	0·023–0·026		

COMPARISON OF *HYPODERAEUM ESSEXENSIS* N.SP. WITH RELATED SPECIES

H. butagensis (Tubangui, 1932) Baschkirova, 1941 can readily be distinguished from the present species in having seventy-two collar spines. *H. gnadini* Baschkirova, 1941 has fifty-one collar spines of which five constitute a corner group on each side, but its ventral sucker is six times as big as the oral sucker, while in the present species the ratio between them is 1 : 3. It also differs from the present species in the extent of its vitellaria behind the testes and in the size of its collar spines.

In *H. manipuria* Verma, 1936 and *H. magnicirrusa* Verma, 1936 the number of the collar spines is not known. The last of these has been regarded as a synonym of *H. conoideum* Bloch., 1783. However both these species differ from the present species in having a different proportion between its two suckers, in having comparatively larger cirrus sacs, and in the extension of their body spination to the region of ovary.

H. microspina (Singh, 1954) Skrjabin and Baschkirova, 1956 has forty-seven collar spines, which according to Singh (1954), are arranged in a single continuous row, although a group of at least three corner spines on each side has been shown in the figure. It also differs from the present species in the proportion between its two suckers and in the size of its collar spines.

H. skrjabini Oschmarin, 1946 differs in having a group of four corner spines on each side, in having a different proportion between its oral and ventral sucker and in that its vitellaria meet in the middle behind the testes.

H. vigi Baschkirova, 1941 has forty-three collar spines of much larger size. It further differs in having lobed testes, in having a different proportion between its two suckers and a comparatively larger cirrus sac.

H. sp. Oschmarin, 1956 has forty-seven ungrouped collar spines, and a different proportion between its two suckers.

H. conoideum (Bloch., 1782) Dietz, 1909 has been described as possessing forty-seven to fifty-three collar spines. Rees (1933) found that always there is a group of four corner spines, both in the cyst and the adult. The present species always has a group of five corner spines and it can also be distinguished from *H. conoideum* in having a proportion of 1 : 3 between its oral and ventral sucker as against 1 : 4 in *H. conoideum*; it also differs in having a comparatively smaller cirrus sac and in the permanent habitat in the first half of the small intestine of the final host, while *H. conoideum* always develops in the last half of the small intestine. These two species also have distinguishable miracidium, redia and cercaria stages.

The present species is therefore regarded as new and named *Hypoderaeum essexensis*.

FROM KHAN, 1962

HYPODERMA EUM

Ignaviinae ~~n. subfam.~~ YAMAGUTI, 1958

Subfamily diagnosis. — Echinostomatidae: Body long slender, cylindrical. Head collar reduced to bilateral lobes, with a single, dorsally interrupted row of spines. Oral sucker prominent, pharynx small, esophagus long, with sinuous walls. Acetabulum in anterior third of body. Testes tandem, in middle region of body. Cirrus pouch small, enclosing bipartite seminal vesicle. Ovary median, a little pretesticular. Uterus long, with numerous large eggs. Vitellaria extending in extracecal fields from behind acetabulum to posterior extremity. Excretory vesicle Y-shaped. Parasitic in ureter or urinary tubules of kidney of birds.

Ignavia Teixeira de Freitas, 1948

Syn. *Nephroechinostoma* Oshmarin et Belous, 1951

Generic diagnosis. — Echinostomatidae, Ignaviinae: Body long, slender, cylindrical. Head collar reduced to bilateral lobes, with a dorsally interrupted row of spines. Oral sucker prominent, prepharynx distinct, esophagus long, with irregularly sinuous wall, bifurcating in front of acetabulum. Ceca simple, terminating at posterior extremity. Acetabulum at about middle of anterior third of body. Testes somewhat indented or entire, in middle region of body, directly tandem or a little apart from each other. Cirrus pouch small, elongate, enclosing bipartite seminal vesicle, prostate complex and cirrus, anterodorsal to acetabulum. Ovary median, a little pretesticular. Uterus long, with numerous large eggs. Vitellaria extending chiefly in extracecal fields from behind acetabulum to posterior extremity. Excretory vesicle Y-shaped, stem bifurcating behind posterior testis. Parasitic in ureters or urinary tubules of kidney of birds.

Genotype: *I. venusta* Freitas, 1948 (Pl. 79, Fig. 967), in *Casmerodius albus egretta* and *Leucophoyx thula thula;* Brazil.

Other species:

I. aquilae (Oshmarin et Belous, 1951), syn. *Nephroechinostoma a.* O. et B., in *Aquila clanga;* Russia.

I. renalis (Yeh, 1954), syn. *Allechinostomum r.* Y., in *Pelecanus erythrorhynchos;* London Zoo.

-OVER-

Table 1

Comparison of representatives of the genus *Ignavia* after various authors (in microns)

Species:	*Ignavia venusta* after Freitas 1948	*Ignavia aquilae* after Ošm. et Bel 1951	*Ignavia renale* after Yeh 1954	*Ignavia erdeae* after Ševčenko 1954	*Ignavia ciconiae* ~~present paper~~ SULGOSTOWSKA, 1964
Body length, in mm	2.9–8.2	7.5	19.3	8.3	7.35–9.5
Number of spines	20	22	20	19	16
Size of spines	23–35	23–27 · 9–11	65–73 · 11–19	25–27 · 7–9	18–25 · 7–10
Position of testes Shape of testes	front body part round or oval, slightly lobar	central body part oval, unbranched	front body part round, lobar	front body part irregularly oval, 2nd testis lobar	front body part oval unbranched
Size of testes: I II		600 · 440 600 · 440	1,080 1,080	136–258 190–258	255–390 · 210–255 315–480 · 225–285
Shape of ovary Size of ovary		transversely oval 180–260	transversely oval 270–480	transversely oval 163–244	round 165–180 · 150–180
Oral sucker, shape Oral sucker, size	transversely oval 106–309 · 110–203	round 265	round 480	transversely oval 258–299	transversely oval 165–195 · 180–240
Ventral sucker, shape Ventral sucker, size	round 154–366 · 172–355	round 400	round 670	round 402	round 270–360 · 270–345
Size of eggs	115–128 · 62–79	107–76	90–98 · 50–62	108–6	108–117 · 59–63

From Sulgostowska, 1964
(Acta Parasitologica Polonica)

Ignavia venusta TEXEIRA DE FREITAS, 1948 (Fig. 5)

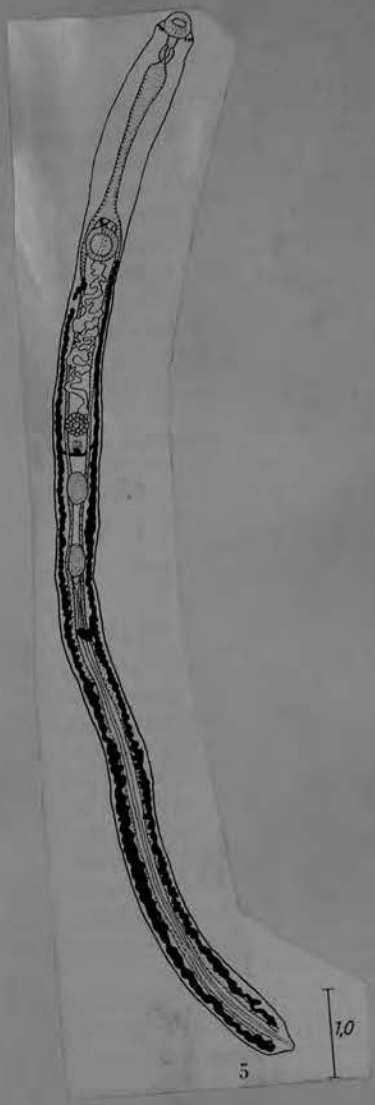
Host: *Nyctanassa violacea* (LINN.), yellowcrowned night heron (new host record).

Location: Ureter.

Locality: Goodhope oil field, near Norco, Louisiana (new locality record).

Diagnosis (based on one mature specimen). *Ignavia*. Body long, slender, 12.390 long by 0.531 wide at level of acetabulum. Cuticle aspinose. Weakly differentiated cephalic collar bearing approximately 20 small spines arranged in single, dorsally-interrupted row. Oral sucker 0.269 long by 0.307 wide. Acetabulum in anterior $^1/_4$ of body, 0.297 long by 0.384 wide. Sucker ratio 1:1.46. Prepharynx 0.089 long. Pharynx 0.192 long by 0.166 wide. Esophagus 1.728 long. Ceca two, one on each side of body, terminating blindly 0.154 from posterior end of body. Genital pore immediately preacetabular followed by short genital atrium. Testes two, oval shaped, tandem, preequatorial; anterior testis 0.358 long by 0.256 wide, posterior testis 0.384 long by 0.230 wide. Cirrus sac extending from anterior $^1/_4$ of acetabulum to genital atrium; containing bipartite internal seminal vesicle in posterior $^2/_3$ of sac, prostatic vesicle and weakly developed cirrus in anterior $^1/_3$ of sac. Ovary round, pretesticular, median, 0.243 long by 0.256 wide. Diffuse Mehlis' complex immediately postovarian. Seminal receptacle postovarian. Uterine coils mainly intercecal, between level of ovary and genital pore. Eggs 0.084 to 0.115 long by 0.056 to 0.070 wide. Vitellaria extracecal, extending from level of posterior border of acetabulum to posterior end of body. Vitelline reservoir median, between anterior testis and ovary, ventral to seminal receptacle. Excretory vesicle Y-shaped, bifurcating immediately behind posterior testis.

Discussion. *Ignavis venusta* was named and described by DE FREITAS (1948) from *Casmerodius albus egretta* and *Leucophoyx (=Florida) thula thula* in Brazil. WRIGHT (1957) subsequently reported this trematode from *Cancuma vocifer* and *Ardea goliath* in the Sudan. Our material from *Nyctanussa violacea* in Louisiana is morphologically similar to that described by DE FREITAS (1948) and WRIGHT (1957). The lack of body spines in our material is probably due to the cytolized condition of the single specimen. This record constitutes the first established occurrence of the genus *Ignavia* in North America, though YEH (1954) described *Allechinostomum renale*, later transferred by WRIGHT (1957) to the genus *Ignavia*, from a North American pelican, *Pelecanus erythrorhynchos*, of questionable origin in the London zoo.



Sulgostowska, 1964 Echinostomatidae

Description of *Ignavia ciconiae* ~~s. p. n.~~

The measurements given here are not very accurate because the author, not expecting to deal with a new species, fixed all collected trematodes in lactic acid carmine of Blachin without making measurements in vivo.

Body flat, strongly elongated, slightly broader at anterior due to the collar and slightly narrowed and rounded at the very end; on the average length equals to 15 widths. Body 7.35 to 9.5 mm in length, 0.39 to 0.585 mm in width. The whole anterior body surface to the posterior margin of the ventral sucker is densely covered with spines (144 to 162 by 3.6 to 5.4 μ); spines are distributed much more scanty from the ventral sucker to the posterior margin of the 2nd testis and then disappear.

Collar is rather well developed (width 300 to 330 μ) and provided with 16 small spines, 8 in one row on each lateral surface of the collar (it is possible that the number of spines is inaccurate because the dye used sometimes causes the loss of spines). Measurements of spines, 18 to 25 by 7 to 10 μ.

Oral sucker oval, its longer axis located transversally; the sucker occupies the whole center of the collar and measures 165 to 195 by 180 to 240 μ. Round ventral sucker, 270 to 360 by 270 to 345 μ, situated in the anterior body part.

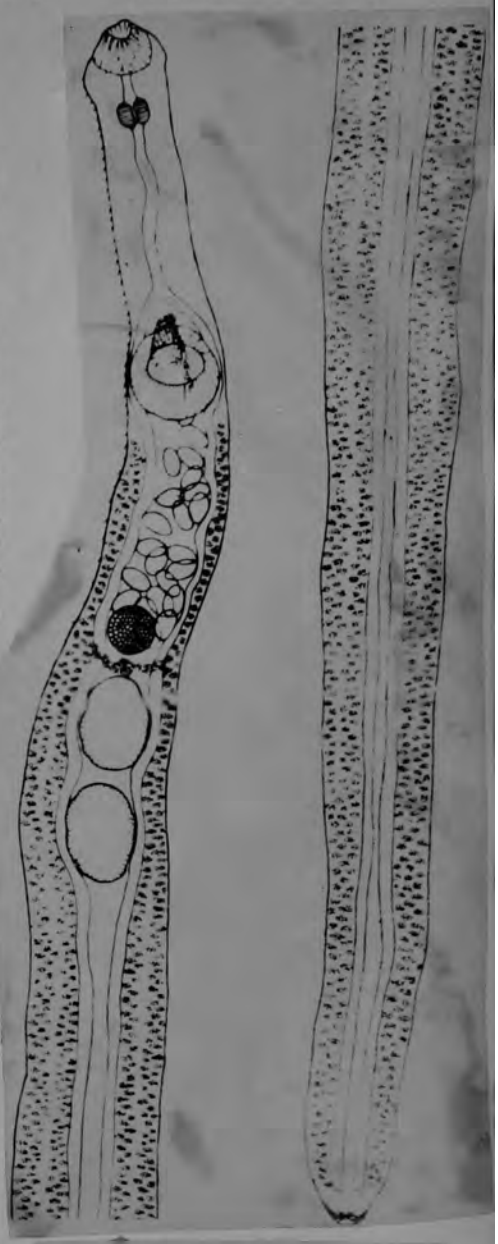
Short prepharynx, 90 to 150 μ long, is connected with oval pharynx, 90 to 135 by 105 to 120 μ, located behind the collar. Pharynx passes into esophagus, 390 to 645 μ long, with undulated walls; esophagus divides in front of the ventral sucker into two intestinal branches extending on both sides along the whole body.

Two oval testes situated in the front half of the body. No tendency to form lobular testes, so often in the genus *Ignavia*, was observed. Measurements of testes: anterior, 255 to 390 by 210 to 255 μ; posterior, 315 to 480 by 225 to 285 μ. Cirrus pouch, 270 by 105 μ, located dorsally in front of the ventral sucker. No other parts of male reproductive system were observed by the author.

Round ovary measures 165 to 180 by 150 to 180 μ and is situated in front of the testes in $^1/_4$ anterior body part. Mehlis' gland just near the ovary. Fine-grained vitellary glands extend on both sides of the body outside the intestine from the posterior margin of the ventral sucker to the body end; the vitellary glands' band is narrower between the posterior edge of the ventral sucker and the posterior margin of the posterior testis, whereas it broadens rather considerably behind the testes, due to this, the intestinal branches are shifted towards the body center. Uterus occupies the space between the ovary and the ventral sucker and is filled with large eggs, 108 to 117 by 59 to 63 μ. Genital pore in front of the ventral sucker. Only final sections of lateral ducts, fused behind the testes into the main duct and forming a characteristic of *Echinostomatidae* Y-shape, were observed by the author as regards the excretory system. The main excretory duct terminates in the papilla at the very body end.

The features given here indicate the specific separateness of the trematodes found by the present author. Some main features and measurements of *Ignavia ciconiae* sp. n. and four already known species are presented in Table I for the comparison. The measurements of *Ignavia venusta* Freitas, 1948 are quoted according to the work of Wright. The author asked Teixeira de Freitas several times but received no answer and the journal, in which his paper was published, is not available in Poland.

Fifty trematodes were found by the present author in July 1957 in the kidney of white storch (*Ciconia ciconia* L.) derived from the Mamry Północne lake (North Poland, Mazurian region); the parasites fit the diagnosis of the genus *Ignavia* Freitas, 1948 (syn. *Nephroechinostoma*) what was reported in a previous paper (Sulgostowska 1960). Further studies have proved that it is a new species which is described in this paper under the name of *I. ciconiae* sp. n.



From Acta Parasitologica Polonica

13. *Ignavia renalis orientalis* ~~n. subsp.~~ ODENING, 1963

Wirt/Herkunft: *Pelecanus philippensis* GMELIN / importiert aus der Indischen Union am 31.7.1961, Sektion am 9.4.1963.

Lokalisation: Ureteren.

Präparat-Nr.: kT 14/95-98 (4 Exemplare in Bruchstücken).

Beschreibung (vgl. Tabelle 10 und Abb. 13): Cuticula bis zum Bereich des hinteren Testis bestachelt; Körper langgestreckt mit zugespitztem Hinter- und Vorderende, 15,7 – 16,8 mm lang bei einer maximalen Breite im Bereich hinter dem hinteren Testis von 2,4 – 3 mm; vor dem Mundsaugnapf befindet sich ein papillenförmiger Fortsatz; Kopfkragen breitgestreckt elliptisch mit jederseits 10 Kragenstacheln, deren einreihige Anordnung durch einen breiten dorsalen Zwischenraum in der Mitte unterbrochen wird; Kragenstacheln 35 – 65 μm lang, maximale Breite an der Basis 16 – 26 μm; Ovarium breitgestreckt oval, elliptisch oder aus 3 großen Lappen bestehend, median oder submedian gelegen; Testes rundlich oder queroval, mit ziemlich tiefen Einkerbungen; Eigröße 79 – 95 × 44 – 59 μm.

Bemerkungen. Die vorliegende Art unterscheidet sich von *Ignavia aquilae* (OŠMARIN & BELOUS, 1951) und *I. ardeae* (ŠEVČENKO, 1954) durch wesentlich größere Körper- und Organmaße. Von diesen beiden aus der UdSSR beschriebenen Arten und von der amerikanisch-afikanischen *I. venusta* (TEIXEIRA DE FREITAS, 1948), der typischen Art des Genus, unterscheidet sich die vorliegende indische Form durch einen relativ kürzeren Ösophagus und größeren Pharynx. Überraschenderweise stimmen Habitus, Körper- und Organmaße und andere Einzelheiten (z.B. der papillenförmige Fortsatz am Körpervorderende) der indischen Form mit *I. renalis* (YEH, 1954) überein. *I. renalis* war beschrieben worden aus einem nordamerikanischen *Pelecanus erythrorhynchos*, der im Londoner Zoo gestorben war. Allerdings sind die Kragenstacheln der indischen Form kleiner, weshalb ich diese als Unterart von *I. renalis* auffasse: *Ignavia renalis orientalis* n. subsp.

Typus: Das der Abb. 13 b zugrundeliegende Exemplar, Helminthensammlung Zoologische Forschungsstelle im Berliner Tierpark Nr. kT 14/95.

Überblick über das Genus *Ignavia* TEIXEIRA DE FREITAS, 1948

Ursprünglich aufgestellt mit den Arten *Ignavia venusta* (typische Art) und *I. inops* (FREITAS, 1948). Letztgenannte Art gehört aber nicht hierher und wurde dementsprechend von YAMAGUTI (1958) nicht mit in die Gattung einbezogen. YAMAGUTI (1958) betrachtet *Nephroechinostoma* OŠMARIN & BELOUS, 1951

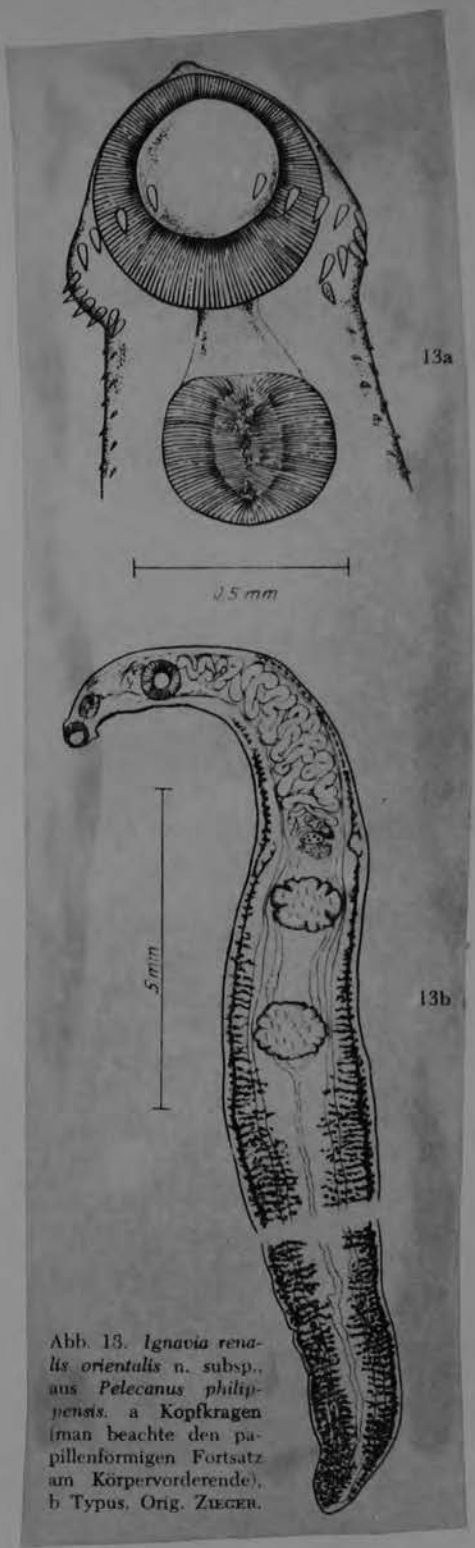


Abb. 13. *Ignavia renalis orientalis* n. subsp., aus *Pelecanus philippensis*. a Kopfkragen (man beachte den papillenförmigen Fortsatz am Körpervorderende), b Typus. Orig. ZIEGER.

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als Synonym von *Ignavia*, was völlig verständlich ist. Sowohl Ošmarin & Belous und Skrjabin & Baškirova (1956) als auch Yamaguti (1958) betrachten *Nephroechinostoma* bzw. *Ignavia* als einziges Genus einer eigenen Unterfamilie (Nephroechinostomatinae Ošmarin & Belous, 1951 = *Ignaviinae* Yamaguti, 1958). *Ignavia renalis* wurde ursprünglich als *Allechinostomum renale* Yeh, 1954 beschrieben. Bei Skrjabin und Baškirova (1956) sind die Vertreter der Gattung *Ignavia* auf 3 verschiedene Gattungen in 3 verschiedenen Unterfamilien verteilt. Nach der Ausbildung des Kopfkragens teile ich *Ignavia* der bisher nur eine Gattung umfassenden Unterfamilie Microparyphiinae Mendheim, 1943 zu. Die Gattung stellt eine morphologisch und biologisch (Nierenparasiten!) gut umrissene natürliche Gruppe dar. Es sind folgende Arten bekannt:

Ignavia venusta Teixeira de Freitas, 1948 (Südamerika; Nordamerika, siehe Lumsden & Zischke 1963; Afrika, siehe Wright 1957);
I. aquilae (Ošmarin & Belous, 1951), Syn. *Nephroechinostoma aquilae* Ošmarin & Belous, 1951 (UdSSR);
I. ardeae (Ševčenko, 1954), Syn. *Nephroechinostoma ardeae* Ševčenko, 1954 (UdSSR);
I. renalis renalis (Yeh, 1954), Syn. *Allechinostomum renale* Yeh, 1954 (Nordamerika ?);
I. renalis orientalis n. subsp. (Indien ?);
I. sp. (Sulgostowska, 1960b), Syn. *Nephroechinostoma* sp. Sulgostowska, 1960b (aus *Ciconia ciconia*, Polen).
Als Hilfswirte dürfen Fische vermutet werden.

Tabelle 10. *Ignavia renalis orientalis* n.subsp. aus *Pelecanus philippensis*, Maße von 3 zusammengesetzten Exemplaren in mm.

Kopfkragen			
Länge	0,316	0,367	0,382
Breite	0,602	0,719	0,712
Mundsaugnapf			
Länge	0,426	0,543	0,506
Breite	0,411	0,536	0,506
Pharynx			
Länge	0,352	0,360	0,338
Breite	0,297	0,404	0,382
Bauchsaugnapf			
Länge	0,668	0,851	0,800
Breite	0,646	0,697	0,734
Cirrusbeutel-			
Länge	0,518	0,609	0,573
Ovarium			
Länge	0,198	0,147	0,338
Breite	0,389	0,184	0,382
Vorderer Testis			
Länge	0,84	0,82	0,91
Breite	1,17	0,96	1,41
Hinterer Testis			
Länge	0,91	0,77	0,89
Breite	1,15	1,12	1,35

From Odening, 1963

IGNAVIA

Isthmiophora Lühe, 1909

Generic diagnosis. — Echinostomatidae, Echinostomatinae: Body medium-sized, lanceolate, spinose. Head collar reniform, with double, dorsally uninterrupted row of spines. Acetabulum large, close to anterior extremity. Testes irregular in shape, with more or less conspicuous indentations laterally, situated one directly behind the other at commencement of posterior half of body, or more anteriorly. Cirrus pouch elongate, reaching to middle of acetabulum. Ovary submedian, just pretesticular. Receptaculum seminis described and figured by Dietz (1916). [2]) **Uterus short, with few windings. Vitellaria not quite reaching to acetabulum, approaching median line behind posterior testis. Parasites of mammals.**

Genotype: *I. melis* (Schrank, 1788) (Pl. 87, Fig. 1051), syn. *Echinostoma trigocephalum* Rud, 1802, in *Lutra lutra*, *Lutreola lutreola* and other rodents, also in *Meles taxus*, *Canis vulpes*, *Felis maniculata domestica* and *Erinaceus europaeus;* Europe, North America.

Other species:

I. jassyensis (Leon et Ciurea, 1922), syn. *Euparyphium j.* L. et C., in man; Jassy.

I. malayana (Leiper, 1911), syn. *Echinostomum m.* L., in man; Malay states, Siam, India (Assam). Also in dog and cat.

Cercaria indica XXIII Sewell, 1922, in *Lymnaea luteola;* encysts in gills of *Barbus stigma*. When cysts were fed to cats and dogs adult flukes developed — Rao (1933).

I. murina (Tubangui, 1931) syn. *Euparyphium m.* T. (Pl. 94, Fig. 1136), in *Rattus norvegicus;* Manila.

Larval stages in *Lymnaea peregra*. Full-grown adults were recovered from white laboratory rats 10 to 15 days after feeding of cysts, which failed to develop in young pigeons and a monkey — Tubangui (1932); *Gyraulus chinensis*, *Lymnaea* (*Fossaria*) *ollula*, *Segmentina hemisphaerula*, *Hippeutis cantori*, *Parafossarulus striatulus*, *Viviparus* sp., tadpoles, ducklings — Wu (1951).

[2]) If this be really present, *Isthmiophora* should represent a well established genus in the family Echinostomatidae. Further, it differs from *Echinostoma* chiefly in the length of the uterus.

(over)

Die Gattung *Isthmiophora* Lühe 1909 (syn. *Echinocirrus* Mendheim 1943; syn. *Euparyphium* Dietz 1909 e. p. Autores)

Diagnose

Mittelgroße Echinostomatiden. Bauchsaugnapf ungefähr $^1/_4$—$^1/_5$ Körperlänge vom Vorderende entfernt. Cuticula im vorderen Körper-

bereich mit dachziegelförmigen Schüppchen, auf der Ventralseite auch im hinteren Körperbereich. Kopfkragen mit dorsal nicht unterbrochener Reihe alternierender Stacheln; die oralen (apicalwärts vorgerückten) Stacheln im Durchschnitt größer als die aboralen. Ventrolateral jederseits eine Gruppe von vier größeren Eckstacheln. Cirrusbeutel groß, nach hinten etwa bis zur Mitte des Bauchsaugnapfes reichend. Cirrus auffallend lang und mit (leicht abfallenden) kurzkegelförmigen (4,5 × 3,5 μ großen) Stacheln besetzt. Hoden glattrandig oder schwach gekerbt. Ovar rund oder ellipsoid, asymmetrisch rechts der Medianlinie gelegen. Uterusschlingen wenig zahlreich. Eier sehr groß, Länge im Durchschnitt 140 μ oder darüber.

EUPARYPHIUM MELIS (Schrank, 1788) Dietz, 1909.

(Figs. 1—5).

Synonyms. *E. beaveri* pro *E. melis* (Schrank, 1788) Beaver, 1941.

Echinostoma trigocephalum (Rud. 1802) Cobbold, 1861.

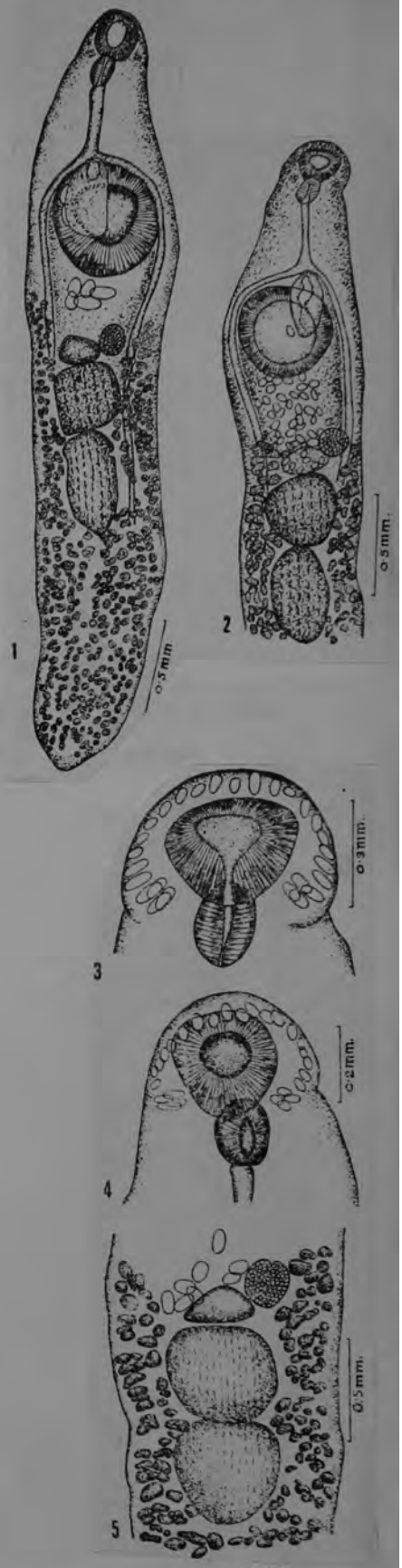
Isthmiaphora melis (Schrank, 1788) Lühe, 1909.

Description: Body elongate, rounded at the extremities, 3.17-7.13×0.73-1.2 mm. in size. Cuticle covered with spines. Oral sucker sub terminal, pyriform with narrowest part posterior. It is 0.19-0.36×0.21-0.34 mm. in size. Head collar kidney shaped and bears 27 large, stout spines with 4 on each angle, 6 in a single row on each side, 4 oral and 3 aboral on the dorsal side. Angle spines in 2 pairs, one over the other, the posterior pair being somewhat larger than the other. Ventral sucker larger than oral sucker and lies either close to bifurcation of caeca or a little posterior to it. It lies at 0.67-1.25 mm. from anterior extremity and measures 0.56-0.87 mm. in dia. Pharynx ovoid, 0.15-0.33×0.087-0.21 mm. in size. Oesophagus 0.33-0.54 mm. long and bifurcates immediately infront of ventral sucker. Genital pore lies infront of ventral sucker close to bifurcation at 0.69-1.4 mm. from anterior extremity. Excretory pore subterminal and dorsal in position. Testes median, tandem, contiguous, entire or slightly lobed. Anterior testis lies either at commencement of posterior half of body or more anteriorly and may be either approximately of equal size to hind testis or much smaller to it. Anterior testis measure 0.31-0.64×0.35-0.51 mm. and posterior testis 0.43-0.91×0.29-0.56 mm. in size. Length of post testicular region, 0.87-2.7 mm. Cirrus sac elongate, extending just beyond middle of acetabulum, 0.34-0.61×0.174-0.31 mm. in size. It contains vesicula seminalis, pars prostatica and a long spiny cirrus. Ovary round or transversely ovoidal, and lies to the right of median line infront of anterior testis. It lies at 0.25-0.3 mm. from acetabulum and measures 0.13-0.26×0.12-0.24 mm. in size. Mehli's gland broadly ovoid and lies opposite to ovary. Vitellaria extend either a little posterior to hind end of acetabulum or from level of anterior margin of ovary upto posterior end of body. Behind post testicular region the follicles may or may not intrude in the median line or may completely filling it. Uterus short with few windings. Eggs ovoidal, 0.088-0.128×0.064-0.088 mm. in size.

Material: Five specimens.
Host: Mink (*Mustela vison*).
Location: Duodenum.
Locality: U. S. A.

Discussion: *E. melis* (Schrank, 1788) Dietz, 1909 has been recorded in several species of European Mustelidae (*Mustela feina, Lutra vulgaris, Meles taxus*). Law & Kennedy, (1932) and Beaver (1941) have found this parasite in. N. America from *Mustela vison* and *Lutra canadensis*. Oshmani (1956) has found it in far Eastern U. S. S. R. in *Mustela sibirica, Lutra lutra* and *Mustela vison*. The present form belongs to *E. melis* (Schrank, 1788) Dietz, 1909 and coincides very much in morphological characters and dimensions with the descriptions given by Law & Kennedy, Beaver and Oshmani. However the present form differs from the above descriptions in the following characters;—

(i) The vitellaria extend either very close to posterior end of



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acetabulum or from the level of ovary instead of from the anterior level of ovary. The vitellaria either filling entire space behind the post-testicular region or restricted on the lateral sides of the body whereas in the forms described previously never completely filling the post testicular space.

(ii) Acetabulum either very close to bifurcation of caeca or a little posterior to it instead in never being close to bifurcation of caeca.

(iii) Anterior testis is situated at commencement of posterior half of body or more anteriorly instead being at mid region of the body. The testes are either approximately equal in dimensions or posterior testis may be larger while in the previous descriptions testes are never of equal size.

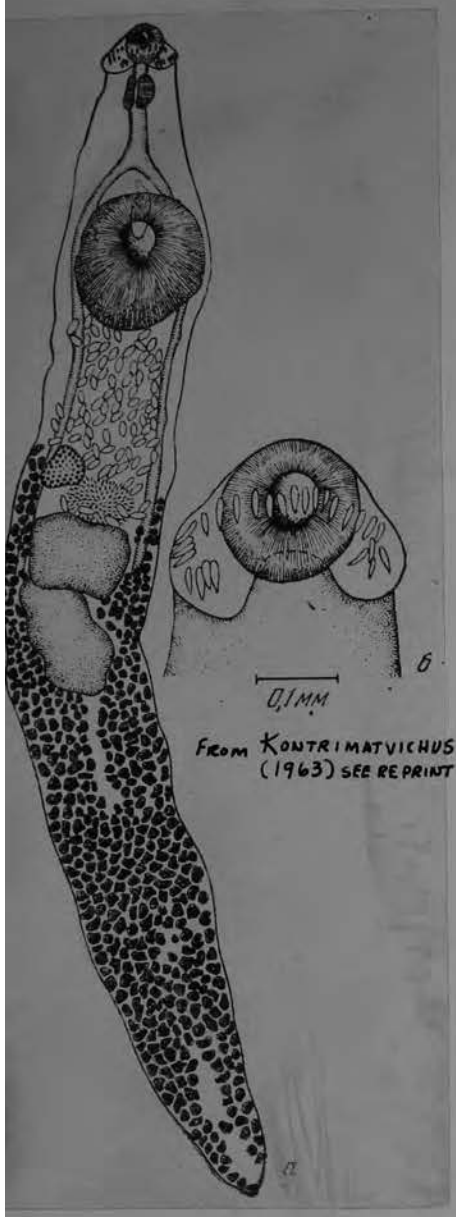
(iv) In the present form the number and arrangement of collar spines is identical to the description of Beaver (1941). However in the author's specimens the spines do not taper at outer ends. These differences may be considered as specific variations.

Yamaguti (1958) transferred *E. melis* to *Isthmiophora* Lühe, 1909 considering it a distinct genus on the basis of collar spines being abruptly tapered at outer ends, in having cirrus thickly spiny and in the possession of eggs narrower. The author does not agree with Yamaguti as these characters are variable within the species. Therefore the author suggests that *Isthmiophora* may be considered identical to *Euparyphium* and *E. beaveri* pro *E. melis* (Schrank, 1788) Dietz, 1909, *Echinostoma trigocephalum* (Rud, 1802) and *I. melis* (Schrank, 1788) Lühe, 1909 synonym to *E. melis* (Schrank, 1788) Dietz, 1909.

FROM: S.P. GUPTA, 1962
INDIAN J. HELMINTHOL. 14 (2): 77-85

as listed by Kontrimavichus (1968) (see note)

Euparyphium melis (Schrank, 1788)



FROM KONTRIMAVICHUS (1963) SEE REPRINT

146—DÖNGES, J., 1967. "Der modifizierende Einfluss des Endwirtes auf die Entwicklung des Darmegels *Isthmiophora melis* (Schrank 1788). Zugleich ein Beitrag zur taxonomischen Klärung des Genus *Isthmiophora* Lühe 1909 (Trematoda, Echinostomatidae)." *Z. ParasitKde*, **29** (1), 1–14.

Differences in the size, rate of development and size of the internal organs of *Isthmiophora melis*, from either *Rattus norvegicus* or *Putorius furo*, were compared. Worms from ferrets were bigger than those from rats but they had comparatively larger gonads and genitalia. The eggs from *I. melis* in rats were smaller by 3% than those from ferrets. The prepatent period is 3 days longer and the infestation does not persist for so long in rats when compared with ferrets. Results indicate that the morphologically modified form from rats corresponds with *Echinostoma spiculator*. The material from ferrets agrees well with previous descriptions of *I. melis*. *E. spiculator* is thus synonymized with *I. melis*. *Isthmiophora* is considered a valid genus. K.H.

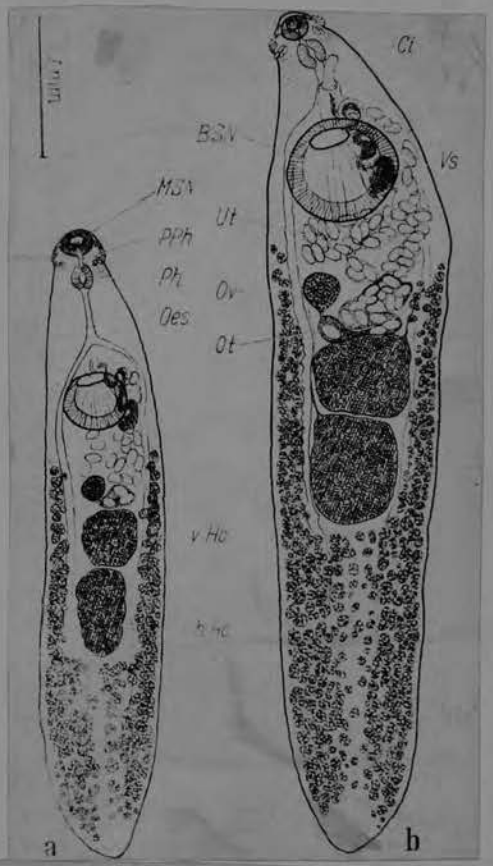


Abb. 2. Kopfkrone von *Isthmiophora melis* (Modifikation aus der weißen I

FROM DÖNGES (1967)

ISTHMIOPHORA

Liliatrematinae Gubanov, 1954

Subfamily diagnosis. — Cathaemasiidae: Body flattened subcylindrical, spinose. Oral sucker funnel-shaped, with pentagonal hood-like apical expansion. Esophagus without lateral diverticula. Ceca simple. Acetabulum in anterior half of body. Testes tandem, in posterior half of body. Cirrus pouch may or may not reach beyond acetabulum. Ovary lobate, submedian, about halfway between acetabulum and anterior testis. Uterus intruding into preacetabular area. Vitellaria extending in lateral fields of hindbody, may extend into forebody. Excretory vesicle V-shaped.

Liliatrema Gubanov, 1954

Generic diagnosis. — Cathaemasiidae: Liliatrematinae Gubanov, 1954: Body small to submedium-sized, flattened subcylindrical, spinose. Oral sucker funnel-shaped, with a pentagonal hood-like expansion at apex. Each of two lateral projections with one papilla or two at tip, but two subventrals and one middorsal with one papilla each. Prepharynx absent, pharynx longer than wide, esophagus short, ceca terminating near posterior extremity. Acetabulum comparatively small, in anterior or middle third of body. Testes entire or lobate, tandem, in posterior half of body. Cirrus pouch reaching backward to middle of acetabulum or beyond it, containing bipartite seminal vesicle. Genital pore immediately preacetabular. Ovary divided into two or three rounded lobes, submedian, halfway between acetabulum and anterior testis. Receptaculum seminis large, postovarian. Uterus coiled anterior as well as posterior to acetabulum; eggs oval, operculate at each end. Vitellaria extending in lateral fields from level of posterior end of pharynx or anterior end of ovary to posterior extremity. Excretory vesicle V-shaped. Parasitic in gastrointestinal tract of marine piscivorous birds.

Genotype: *L. skrjabini* Gubanov, 1954 (Pl. 104, Figs. 1264—1265), in *Phalacrocorax urile, P. pelagicus, Cepphus carbo, Larus argentatus;* larva in *Myzocephalus scorpius;* Kurile Islands.

Key to subgenera of *Liliatrema*

Vitellaria confined to hindbody; acetabulum far posterior to pharynx ..... *Liliatrematoides*

Vitellaria extending into forebody; acetabulum close to pharynx ..... *Liliatrema*

1. Subgenus *Liliatrema* (Gubanov, 1954) (Type: *Skrjabini*)
   L. (*Liliatrema*) *skrjabini* Gubanov, 1954. See above.
2. Subgenus *Liliatrematoides* n. subg. (Type: *sobolevi*)
   L. (*Liliatrematoides*) *sobolevi* Gubanov, 1954 (Pl. 104, Fig. 1266), in *Phalacrocorax pelagicus;* Russia.

Gubanov (1954) placed *Liliatrema* in the Allocreadiidae, but all the known members of this family have so far been reported from cold-blooded vertebrates and possess a tubular, but not V-shaped, excretory vesicle.

Cathaemasiidae

Lepocreadiidae

Liliatrema skrjabini Gubanov, ~~1953~~ 1954

Hosts: Phalacrocorax urile
P. pelagicus
Cepphus carbo

Published as the type genus is the subfamily Liliatreminae listed in the Allocreadiidae.

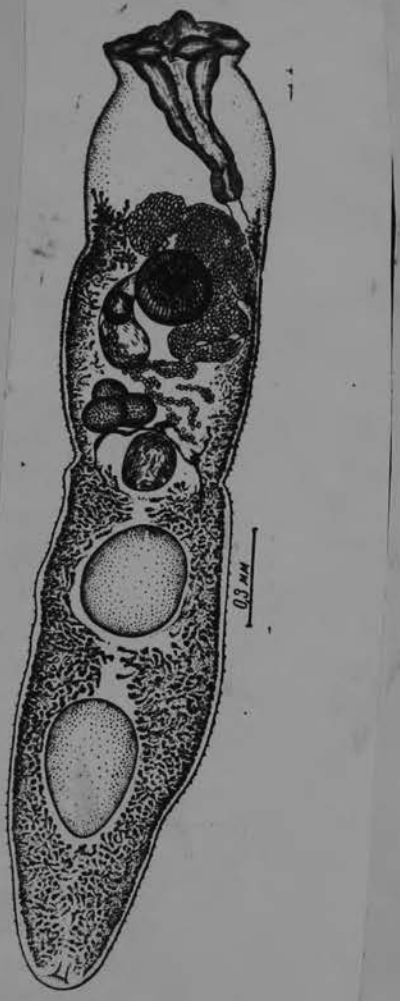


Рис. 1. *Liliatrema skrjabini* nov. sp.

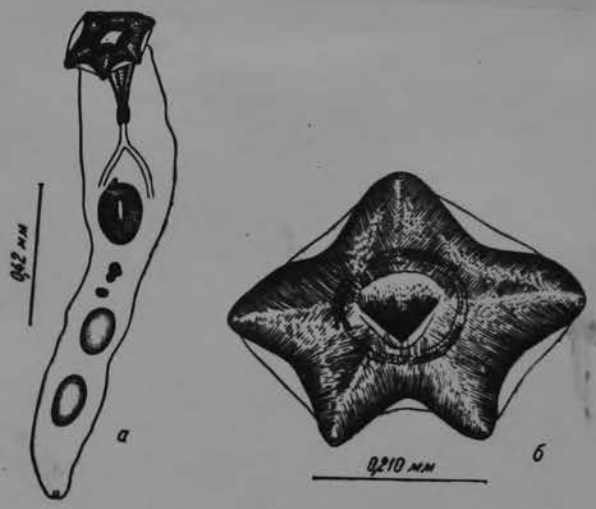
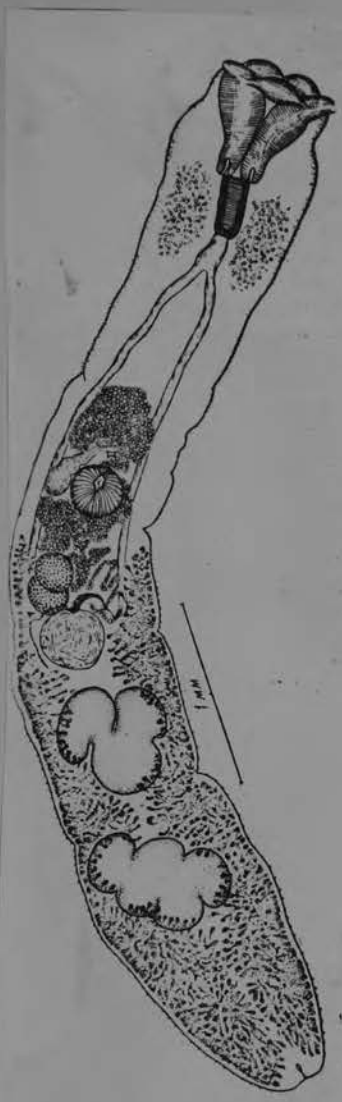


Рис. 2. *Liliatrema skrjabini* nov. sp.
а — метацеркарий; б — ротовая присоска мариты апикально

Liliatrema sobolevi Gubanov, 1954 (1953)

Allocreadiidae
Liliatrematinae
Gubanov, 1953
Cathaemasiidae

Hosts: Phalacrocorax urile
Phalacrocorax pelagicus



ис. 3. *Liliatrema sobolevi* nov. sp.

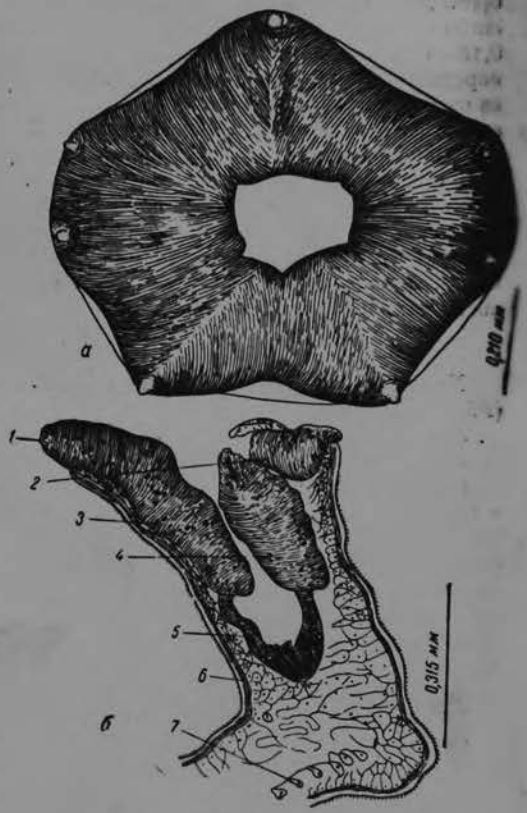


Рис. 4. *Liliatrema sobolevi* nov. sp.
а — ротовая присоска апикально; б — головной конец — продольный срез

From Skrjabin Memorial Volume p. 176 - 183

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METACERCARIA OF *LILIATREMA SOBOLEVI* GUBANOV, 1953, FROM *HEXAGRAMMOS OTAKII* JORDAN ET STARKS

Masashi OHBAYASHI and Jun ARAKI*

(Received for publication, July 24, 1973) Publ. 1974

MACHIDA (1966) reported *Liliatrema skrjabini* GUBANOV, 1953, and *L. sobolevi* GUBANOV, 1953, from a pelagic shag, *Phalacrocorax pelagicus* PALLAS, captured in Hokkaido, Japan. On the other hand, OHBAYASHI & KONNO (1966) found the metacercaria of *L. skrjabini* from a marine fish, *Sebastes schlegeli* HILGENDORF, in Hokkaido. Thereafter, OHBAYASHI and co-workers have also noticed metacercariae of this species in other marine fishes, e. g., *Sebastes taczanowskii* (STEINDACHNER) and *S. trivittatus* HILGENDORF (unpublished data).

Recently, the authors have obtained eight encysted metacercariae of *L. sobolevi* for the first time in Japan. The metacercariae were found in the muscle tissue of one specimen of *Hexagrammos otakii* captured at Shukuzu, Otaru, Hokkaido, on the coast of the Japan Sea, on May 27, 1973. The host fish was 28 cm in body length. The cyst was subspherical with one-layered wall, 4.9~5.2×3.5~3.9 mm in size, and was surrounded by a thin layer of connective tissue accompanied by a few pigment cells. The morphology of the metacercariae, based on specimens fixed by ethanol and stained by Delafield's hematoxylin, are as follows (measurement in mm):—Body elongated, 4.13~7.57×1.30~1.79, about middle portion narrower. Anterior body spined. Muscular oral sucker terminal, cup-shaped, 0.660~0.825 long and 0.990~1.073 wide, with 7 petal-like projections, each of them with a papilla. Acetabulum subglobular, at about middle of body, 0.325~0.455×0.357~0.423; a pair of apron-like projections anterior to acetabulum. Prepharynx up to 0.330 in length, but usually unrecognizable or very short, because of insertion into posterior part of oral sucker. Pharynx 0.297~0.412×0.198~0.248. Massive glandular cells around pharynx. Esophagus 0.248~0.709 long. Long ceca extend to posterior extremity, connecting with long Y-shape excretory vesicle. Testes transversely elongate and indented, tandem in posterior half of body: anterior testis sinistral to midline of body, 0.160~0.292×0.357~0.747, posterior testis 0.160~0.357×0.422~0.715. Ovary trilobular, 0.162~0.260×0.097~0.230, between acetabulum and anterior testis, dextral to midline. Vitellaria undeveloped. Anlage of uterus recognizable between acetabulum and ovary.

FIGURE
Metacercaria of Liliatrema sobolevi GUBANOV

In the genus *Liliatrema* GUBANOV, the absence of the prepharynx is pointed out by many authors. The present authors, however, recognized this organ in some stretched specimens. Presence of a pair of apron-like projections anterior to the acetabulum (MACHIDA, 1966) was also reconfirmed in this paper.

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LILIATREMA

Longicollia Bychowskaja-Pawlowskaja, 1954

Generic diagnosis. — Echinostomatidae, Himasthlinae: Body long, slender, spinose, markedly attenuated between acetabulum and ovary. Head collar with a single, dorsally uninterrupted crown of spines (27). Acetabulum large, in anterior third of body. Testes directly tandem, in posterior third of body. Cirrus pouch anterodorsal to acetabulum and not surpassing it. Ovary just pretesticular. Vitellaria extending in lateral fields from preovarian level to posterior extremity, confluent posterior to testes. Uterus long; eggs large. Parasites of birds.

Genotype: *L. echinata* Bychowskaja-Pawlowskaja, 1954 (Pl. 104, Figs. 1267—1268), in *Capella gallinago;* W. Siberia.

LONGICOLLIA

Microparyphium Dietz, 1909

Generic diagnosis. — Echinostomatidae, Echinochasminae: Body small to submedium-sized, plump or somewhat elongate, broadest at level of acetabulum or behind it. Head collar rudimentary, forming a mere ridge on each side of oral sucker, with double, dorsally interrupted crown of spines. Oral sucker very large, strongly muscular; pseudoesophagus present. Acetabulum large, strongly muscular, pre-equatorial. Testes indented or lobed, median, tandem, in anterior part of posterior half of body. Cirrus pouch small, almost entirely pre-acetabular. Ovary small, submedian. Uterus winding between shell gland and acetabulum; eggs large. Vitellaria extending in lateral fields of hindbody. Intestinal parasites of birds.

Genotype: *M. facetum* Dietz, 1909 (Pl. 80, Fig. 980), in *Gerontias oxycercus;* Brazil.

Other species:

M. asotum Dietz, 1909, in *Ichthyoburus nigricollis;* Brazil.

M. capellae Yamaguti, 1935, in *Capella solitaria;* Japan.

M. corvi Ozaki, 1923, in cloaca of *Corvus macrorhynchus japonensis;* Japan.

M. kyushuense Koga, 1952.

Though the experimental definitive host is the dog, the natural definitive host must be a bird. Snail host: *Semisulcospira libertina*. Vectors: *Misgurnus anguillicaudatus* (exp. and nat.), *Plecoglossus altivelis, Pseudogobio esocinus, Zacco platypus, Pungtungia hilgendorfi, Odontobutis obscurus, Pseudorasbora parva* (nat. h.) — Koga (1952).

M. montei Verma, 1936, in kingfisher; Bengal.

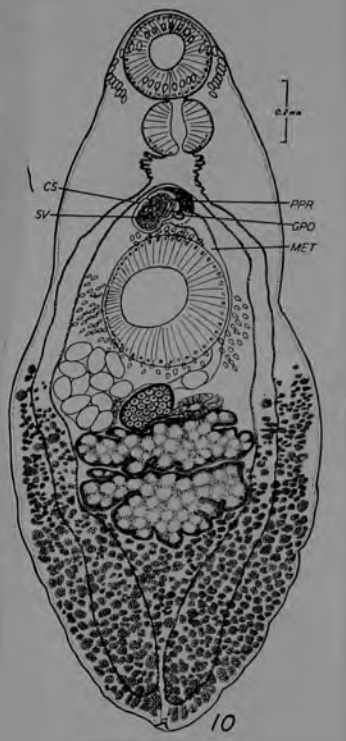
M. problematicum Baschkirova, 1941, in *Corvus levaillanti mandschuricus;* Russia. Also in *C. macrorhynchus*, Far Eastern Russia.

M. shigini Gubanov, 1954, in *Uria lomvia;* Russia. No morphological description given.

Microparyphium floridae n. sp. (FIGURE 10) Cable, Connor, & Balling, 1960

Specific diagnosis based on 2 ovigerous specimens with the characters of the genus. Body 2.27 to 2.36 long and 0.943 to 0.964 in maximum width at about level of ovary. Cuticle with large, quincunxially arranged spines, 0.023 to 0.025 by 0.011 to 0.014, extending to level of testes; head collar rudimentary, with 12 spines on each side of a wide dorsal interruption, 10

in line and 2 angle spines. Adoral spines 0.016 by 0.009, variable in number or easily lost; holotype with 7 in preoral row and 8 in postoral semicircle, second specimen with 10 in preoral row and no postoral spines. Oral sucker 0.278 to 0.293 by 0.278 to 0.321; ventral sucker 0.378 to 0.478 in diameter, situated just within anterior half of body length; prepharynx 0.027 to 0.054 long; pharynx subspherical, 0.164 to 0.179 by 0.221 to 0.236; esophagus 0.098 to 0.150 by 0.197 to 0.257, with prominent lateral folds; intestinal bifurcation just within anterior one fourth of body; ceca expanded posteriorly and extending to near posterior end of body; excretory pore terminal. Testes tandem and contiguous, well removed from posterior end of body, with very irregular contour; anterior testis 0.143 to 0.179 by 0.471 to 0.571; posterior testis 0.214 to 0.236 by 0.507 to 0.521. Cirrus sac ovoid, 0.161 to 0.251 by 0.109 to 0.143, diagonally placed immediately posterior to intestinal bifurcation and not overlapping ventral sucker appreciably; seminal vesicle elongate oval, with a shallow constriction; prostate cells well developed; cirrus small and pear-shaped; genital pore median or very slightly to left of midline, between intestinal bifurcation and ventral sucker. Ovary elongate oval, 0.168 to 0.190 by 0.107 to 0.113, immediately pretesticular and slightly to right of midline; Mehlis' gland a conspicuous mass just to left of ovary; uterine seminal receptacle close to ovary; uterus not extensive, confined to region between testes and ventral sucker; metraterm enters genital atrium from left. Vitellaria in small follicles, confined to hindbody or beginning near midlevel of ventral sucker and extending to posterior end of body, their fields intermingling posterior to testes. Eggs 0.063 to 0.098 by 0.048 to 0.063.



Host: *Florida caerulea caerulea* (little blue heron).

Site: posterior half of intestine.

Locality: Boquerón, Puerto Rico.

Type specimen: Holotype No. 38210.

This species may be differentiated from *Microparyphium facetum* by the sizes of the body, suckers, esophagus, pharynx, and testes; from *M. asolum* by the size and shape of the testes and by the size and position of the ovary; from *M. capellae* by the sizes of the suckers and ovary; and from *M. montei* by the sizes of the body, suckers, and ovary. *M. floridae* most closely resembles *M. corvi* but differs from that species in the sizes of the eggs and ventral sucker, in the extent of the vitellaria, and in the number and distribution of the collar spines.

The cercaria of *M. floridae* probably was not among those described by Cable (1956) and, in view of the range and habits of the host, could well develop in fresh-water mollusks. *Cercaria caribbea VI*, which has no collar spines, could conceivably be the larva of *M. floridae*, as instances are known in which development of collar spines is delayed until after the cercarial stage. It is unlikely that *Cercaria caribbea III* with 31 uninterrupted collar spines is the larva of *M. floridae* in view of studies on other echinostomes in which the number and arrangement of collar spines, if present in the cercaria, are known to persist in the adult.

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SCHEDULE

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Monilifer Dietz, 1909

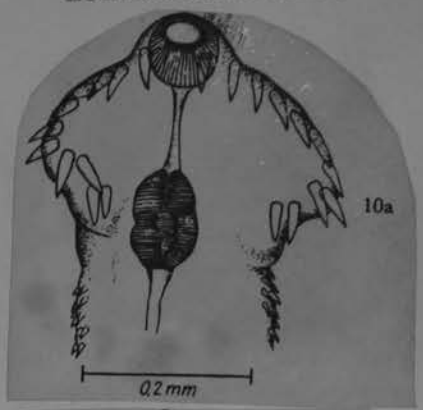
Generic diagnosis. — Echinostomatidae, Echinochasminae: Body small, plump, broadest at hindbody, Head collar well developed, with single, dorally interrupted row of spines. Acetabulum rather small, at commencement of second quarter of body. Testes comparatively large, transversely elongated, postequatorial, pressed one against the other. Cirrus pouch small, anterior or anterodorsal to acetabulum. Ovary round, submedian. Uterus very short; eggs few, of moderate size. Vitellaria extending from each side of testes to posterior extremity, nearly confluent along median line in posttesticular area. Intestinal parasites of birds.

Genotype: *M. spinulosus* (Rud., 1804) Dietz, 1909 (Pl. 65, Fig. 790). in *Colymbus cristatus, C. griseigena, C. auritus, Urinator lumme, U. arcticus;* Central Europe.

Other species: *M. gilberti* (Ward, 1917), syn. *Stephanoprora g.* W. pro *Echinostoma spinulosum* Gilbert nec Rud., syn. of *Stephanoprora spinosa* Odhner, 1910 — Beaver (1937), in *Gavia imber* and *Larus philadelphia;* Michigan.

Echinostomatidae

Monilifer spinulosus (Rudolphi,1809)



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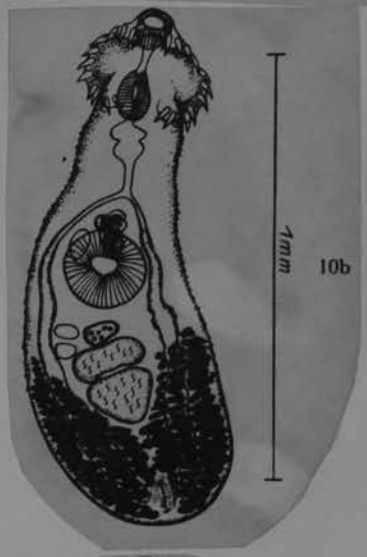

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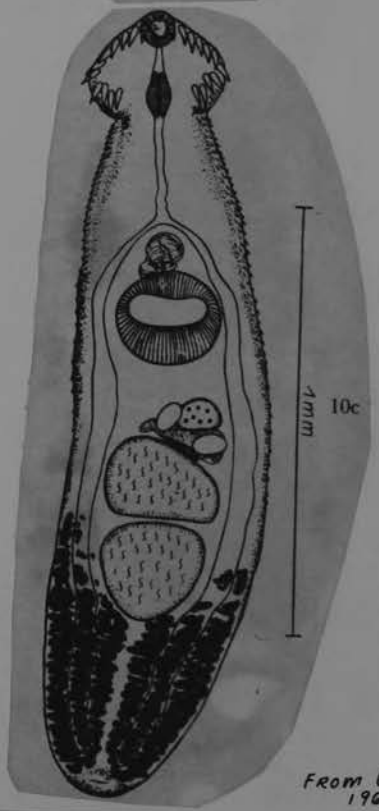

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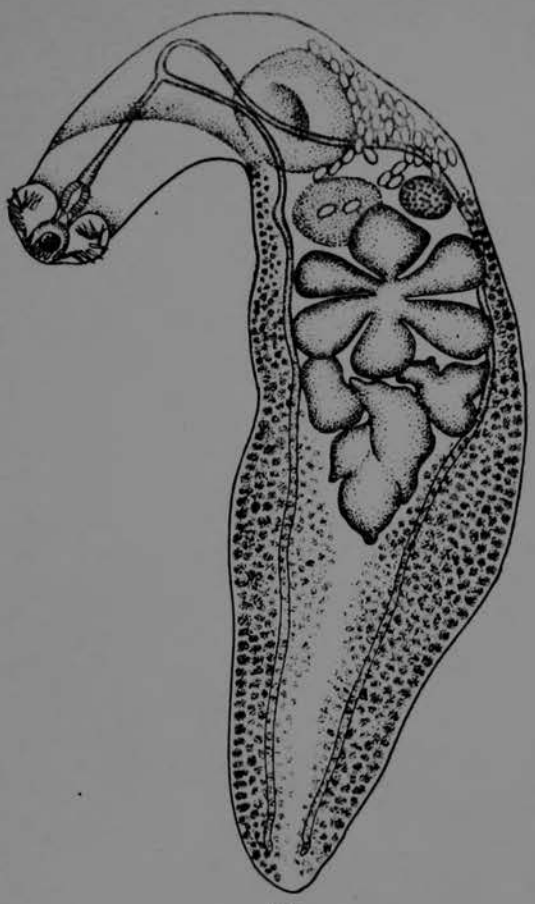
FROM ODENING 1963

Abb. 10. *Monilifer spinulosus* aus *Cavia arctica*. a kragen, b "*spinulosus*"-Form, c "*spinosus*"-Form. ZIEGER.



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312 *Monilifer pitangi* Lutz, 1924 (по Лютцу, 1924)


MONILIFER

Neoacanthoparyphium ~~n. g.~~ YAMAGUTI, 1958

Generic diagnosis. — Echinostomatidae, Echinostomatinae: Body flattened subcylindrical, with pronounced ventral concavity behind head collar. Head collar well developed, with double, dorsally uninterrupted crown of spines; corner spines definitely larger than marginal spines. Oral sucker and pharynx moderately developed. Esophagus long. Acetabulum fairly large, pre-equatorial. Testes rounded, directly tandem, at about middle of hindbody. Cirrus pouch oval, anterodorsal to acetabulum. Genital pore immediately preacetabular. Ovary submedian, immediately pretesticular. Vitellaria extending in extracecal fields of hindbody from level of anterior end of fore testis to cecal ends, forming on each side a longitudinal row of several large compact clusters of follicles. Uterus short; eggs few, very large. Parasites of birds.

Genotype: *N. petrovi* (Nevostrueva, 1954) n. comb., syn. *Echinoparyphium p.* N., (Pl. 104, Figs. 1257—1259) obtained experimentally from domestic fowl (chicken, duck and goose) which had been fed encysted metacercariae from *Viviparus viviparus* 5 to 8 days before; Russia.

NEOACANTHOPARYPHIUM

NEOARTYFECHINOSTOMUM Agrawal, 1963

Generic diagnosis: *Echinostomatinae*: Body elongate, spinose from anterior end to posterior end of hind testis. Head collar reniform with a crown of about 40 spines of which the marginal are arranged in a single rows laterally and 5 on each side as corner spines, arranged in double alternating row. Oral sucker small, prepharynx present or absent, pharynx globular, oesophagus short, intestinal caeca simple, terminating near posterior extremity. Acetabulum larger than oral sucker, lying in anterior part of body. Testes large, deeply lobed with several irregular limb branches, directly tandem and post equatorial. Cirrus pouch elongated, extending from genital pore to some distance behind acetabulum. Genital pore lying between intestinal bifurcation and anterior border of ventral sucker. Ovary pear-shaped and pretesticular. Vitellaria small, follicular extending in lateral fields behind acetabulum to posterior end, reaching in median line in post-testicular field. Uterine coils running between ovary and genital pore. Excretory vesicle pear-shaped. Eggs oval and non-operculated. Parasitic in the intestine of pigs.

Type species:—*Neoartyfechinostomum shubhrai* Gen. nov. et. sp. nov.

DISCUSSION

Neoartyfechinostomum shubhrai gen. nov. sp. nov. resembles closely *Testifrondosa cristata* from pigs in the branched nature of testes, in the position and shape of ovary, in the possession of a receptaculum seminis and in the extension and position of cirrus pouch. It differs, however, from the latter in having a reniform collar with about 40 spines, in having pharynx larger than oral sucker and in the extension of vitellaria, from hind end of ventral sucker to posterior extremity of body. The new form agrees in all important characters of the family Echinostomatidae except in the possession of a receptaculum seminis. The new form resembles closely the genus *Artyfechinostomum* of the subfamily *Echinostomatinae* but differs from it in having pharynx larger than the oral sucker, in the possession of a pear-shaped ovary and in the extension of vitellaria from hind end of ventral sucker upto hind end of body. The new form thus differs in important characters from the genus *Artyfechinostomum* and in the possession of a receptaculum seminis, from all the known genera of the family *Echinostomatidae*. It is, therefore, necessary to create a new genus *Neoartyfechinostomum shubhrai* gen. nov. sp. nov.

NEOARTYFECHINOSTOMUM SHUBHRAI AGRAWAL, 1963
(Figs. 2—6).

Host : *Sus crista* (Pig.)
Location : Intestine.
Locality : Lucknow.

Three specimens of this form were collected from the intestine of *Sus crista* pig) at Lucknow.

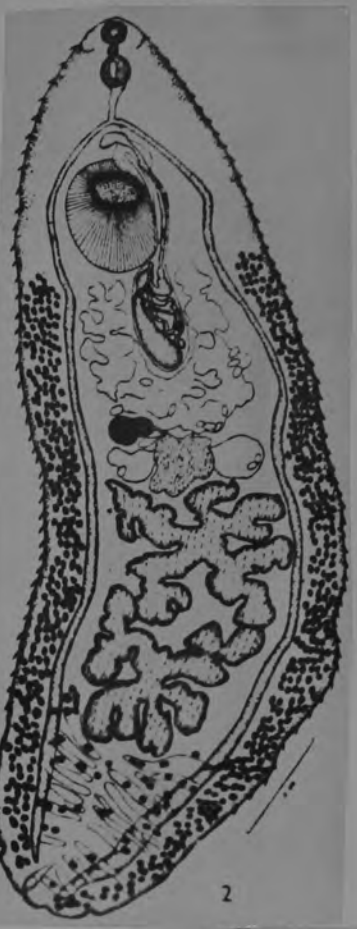
Body elongated, 8.07-11.29×2.52-4.30 mm in size, covered with backwardly directed scale-like spines extending from anterior to posterior end of hind testis. Head collar reniform, with a crown of about 40 spines of which the marginal are arranged in a single row laterally and 5 on each side as corner spines, arranged in double alterhating rows. Oral sucker small, subterminal and subspherical, 0.21-0.25×0.26-0.31 mm. in size. Prepharynx present or absent; globular, 0.11×0.09 mm. in size; pharynx globular, a little larger than oral sucker, 0.25-0.30×0.27-0.36 mm. in size; oesophagus short, 0.35-0.60 mm. long; intestinal caeca simple terminating near posterior extremity of body. Ventral sucker larger than oral sucker, subspherical, 1.01-1.04×0.91-1.35 mm. in size, laying at 1.26-1.29 mm. from anterior extremity.

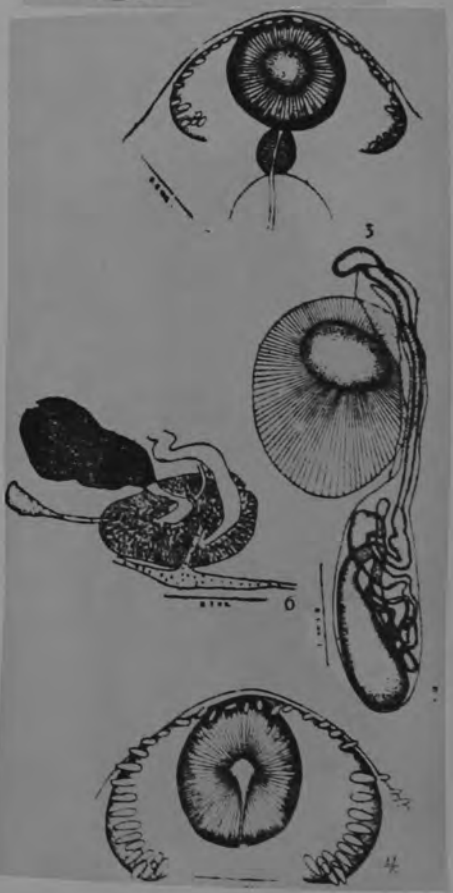
Excretory vesicle small and pear-shaped. Excretory pore lying dorsally in front of the notch at posterior end.

Genital pore median, lying in between intestinal bifurcation and anterior border of ventral sucker, at 0.97-1.14 mm. from anterior extremity.

Testes large, deeply lobed with several branched irregular limb branches, directly tandem and post equatorial. Anterior testis larger than posterior, 1.66-1.95×1.54-2.66 mm, in size at 4.24-5.15 mm. from anterior extremity. Posterior testis 1.09-1.47×1.27-1.58 mm. in size at 1.25-2.66 mm. from hind end. Cirrus pouch elongated broader posteriorly and narrower anteriorly extending from genital pore to some distance behind acetabulum. 1.19-2.54×0.40-44 mm. in size. Vesicula seminalis is a complicated structure consisting of a saccular basal part and an anterior part having several coils, 3.91×0.43 mm. in size. It continues forward as a long winding ejaculatory duct, 1.27 mm. long. A large number of prostate gland cells surround the vesicula seminalis. Cirrus muscular, non-spiny protruding out of the cirrus pouch, 0.30 mm. long.

Ovary pear-shaped, pre-equatorial and lying between ventral sucker and anterior testis, 0.43-0.66×0.26-0.38 mm. in size, at 3.62-4.45 mm. from anterior extremity. Oviduct arises from its median side and opens at the ootype. A pear-shaped receptaculum seminis, lies just behind the ovary, 0.18-0.22×0.09-0.13 mm. in size. Laurer's canal present. Mehli's gland broadly ovoid and lies behind ovary, 0.63×0.57 mm. in size.





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Vitellaria numerous, small, follicular extending in lateral fields behind acetabulum to posterior extremity, reaching in median line behind the posterior testis. Two transverse vitelline ducts meet in front of anterior testis and from a yolk reservoir at the junction. Uterus arises from anterior end of öotype and form several coils between ovary and genital pore. Eggs oval, non-operculated, 0.09-0.11×0 05-0.07 mm. in size.

NEOARTYFECHINOSTOMUM

NEOECHINOSTOMA Agrawal, 1963

Generic diagnosis: *Echinostomatinae*: Body elongate, spinose from anterior region to a little anterior to hind end. Head collar kidney-shaped, with a single row of uniform, very small spines not larger than body spines arranged in a single row. Oral sucker small. Prepharynx distinct, pharynx oval, oesophagus narrow, straight or slightly curved; Intestinal caeca narrow terminating short of posterior extremity. Acetabulum near anterior extremity. Testes lobed, tandem, ovoid, in posterior half of body. Cirrus pouch anterior to acetabulum or somewhat overlapping it. Genital pore posterior to intestinal bifurcation. Ovary median or submedian in front of anterior testis. Vitellaria extending in lateral fields, may or may not reach the median line in post-testicular field. Uterus winding, in intercaecal field, between ovary and acetabulum. Excretory vesicle 'Y' shaped, bifurcating behind posterior testis. Eggs oval and non-operculated. Parasitic in the intestine of owl.

Type species :—*Neoechinostoma spinosa* gen. nov. et. sp. nov.

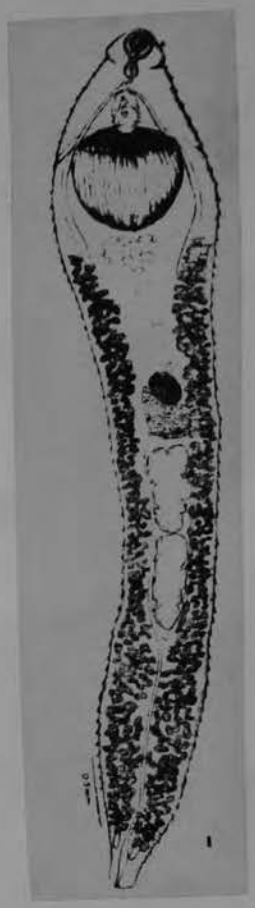
DISCUSSION

The new form having a kidney-shaped collar with a single row of spines belongs, to the family Echinostomatidae Poche, 1926, but differs from all the known genera in having collar spines, small, not longer than body spines, uniform and arranged in a single row. It resembles closely the genus *Echinostoma* Rud, 1809, in the general topography of organs but differs from it in the structure and position of cirrus pouch and in the arrangement of collar spines. In the new form the collar spines are arranged in a single row, not larger than body spines, while in *Echinostoma* there are large 37 spines of which 5 are on each side as corner spines arranged in a single or double alternate row. Further the new form is distinguished from *Echinostoma* in having a cirrus pouch ovoid instead of round. These differences are sufficient to create a new genus *Neoechinostoma spinosa* gen. nov. sp. nov.

FROM AGRAWAL, 1963

NEOECHINOSTOMA SPINOSA ~~gen. nov. sp. nov.~~ AGRAWAL, 1963
(Fig. 1)

Host — *Tyto alba* (Owl.
Location — Intestine
Locality — Lucknow.



Ten specimens of this form were collected from the intestine of *Tyto alba* (owl) at Lucknow.

Body elongated, rounded at extremities, 5.75-6.60 × 1.025-1.260 mm. in size. Cuticle spinose as far as 0.25-0.91 mm. from hind end of body. Anterior extremity with small spines, while region behind testes with large scale-like spines. Collar distinct, kidney-shaped, 0.275-0.32 × 0.39-0.43 mm. in size, provided with a single row of small spines. Oral sucker subterminal, oval or spherical, 0.20-0.21 × 0.19-0.22 mm. in size. Ventral sucker subspherical, much larger than oral sucker, lying a little posterior to intestinal bifurcation 0.69-0.79 × 0.75 mm. in size at 0.73-0.75 mm. from anterior extremity. Prepharynx distinct; pharynx ovoid, 0.15-0.16 × 0.10-0.13 mm. in size; oesophagus short straight or slightly curved, 0.10-0.11 mm. long; intestinal caeca tubular, extending upto hind end of body.

Genital pore lying at 0.56-0.57 mm. from anterior extremity, in front of ventral sucker, either close or slightly away from intestinal bifurcation.

Excretory pore subterminal and dorsal in position. Excretory system 'Y'-shaped. Main excretory stem extends upto posterior testis and divides into two branches.

Testes post equatorial, median, directly tandem and deeply lobed. Anterior testis 0.59-0.61 × 0.25-0.27 mm in size at 2.31-3.02 mm. from anterior extremity. Posterior testis larger than anterior, 0.68-0.71 × 0.26 mm. in size, at 1.64-1.78 mm. from hind end. Cirrus pouch ovoid, 0.276-0.31 × 0.168-0.200 mm. in size, lying in between intestinal bifurcation and a little posterior to anterior border of ventral sucker. Vesicula seminalis bean-shaped or somewhat globular, 0.22-0.32 × 0.084-0.10 mm. in size, divisible into two parts, anterior part narrow and spirally coiled while posterior part sac-like. Pars prostatica short, cirrus tubular or S-shaped, 0.14-0.15 mm. long opening at genital atrium. The space between the vesicula seminalis and cirrus pouch surrounded by a large number of prostate gland cells.

Ovary triangular or oval, pretesticular, 0.20-0.26 × 0.21-0.26 mm. in size at 2.34-2.49 mm. from anterior extremity. Oviduct arises from posterior region of ovary and opens at the oötype. Mehlis gland broadly ovoid and lying opposite to ovary. Vitellaria follicular extending from posterior region of acetabulum upto a little anterior to hind end of body. Behind testes the follicles either intrude in the median line or completely filling it. Two transverse vitelline ducts meet just in front of anterior testis and open at the oötype. Uterus arises from oötype and runs from anterior end of testis upto genital pore. Eggs few, ovoidal and non-operculated, 0.08-0.14 × 0.03-0.08 mm. in size.

NEOECHINOSTOMA

Nephrostomum Dietz, 1909

Generic diagnosis. — Echinostomatidae, Echinostomatinae: Body elongate, medium-sized to large. Head collar reniform, with shallow dorsal incision, and single, dorsally uninterrupted row of spines, which are very small dorsally and become larger toward the sides. Acetabulum produced backward, in first quarter of body. Testes rounded or irregular in shape, more or less indented, median, postequatorial. Cirrus pouch small, overreaching acetabulum. Ovary ovoid, sometimes indented, median, equatorial. Uterus long, strongly winding; eggs very numerous. Vitellaria lateral, extending from posterior extremity to level of posterior end of acetabulum. Intestinal parasites of birds.

Genotype: *N. ramosum* (Sons., 1895) Dietz, 1909 (Pl. 77, Fig. 931), in *Bubulcus ibis;* Nile Delta, Morocco. Cercaria with a crown of spines, liberated from *Planorbis boissyi*, invade tadpoles through skin; definitive host, *Ardeola ibis ibis*, feeds voraciously on fish and tadpoles. Morphology of cercaria — Azim (1934), Khalil (1934).

Other species:

N. bicolanum Tubangui, 1933, syn. of *N. ramosum* (Sons.) — Prudhoe (1944), in *Herodias timoriensis* and *Bubulcus cormorantus;* Philippines.

N. garzettae MacCallum, 1904, syn. of *ramosum* (Sons.) — Odhner (1910), in *Garzetta nigripes;* Sumatra(?)

N. limai Travassos, 1926, in *Syrigma sibilatrix;* Brazil.

N. robustum Vigueras, 1944, in *Colymbus dominicus dominicus;* Havana.

Family **ECHINOSTOMATIDAE** Looss, 1902.

[**Nephrostomum ramosum** (Sonsino, 1895).] From Prudhoe, 1957

Host and locality :

Kaupifalco monogrammicus meridionalis. [Kabenga, près Kaziba, 1.240-1.300 m, 8.IV.1949 (2241).]

N. ramosum has been hitherto known to occur as an adult only in Ciconiiform birds, and the occurrence of three mature specimens of this species in a Falconiform bird is of special interest, since it is again shown that, generally speaking, the degree of specificity in the adaptation of echinostome trematodes to particular hosts or even orders of hosts is rather low.

From Odhner, 1910

-over-

NEPHROSTOMUM RAMOSUM (Sonsino 1895) Dietz 1909

Description.

Une dizaine d'échantillons provenant d'*Ardea* sp. (*Ardeidae*) Sakaraka juillet 1962 (fig. 3).

Corps allongé mesurant 6,5 à 9 mm de longueur et 2 à 3 mm de largeur. Cuticule inerme. Plateau céphalique réniforme, marqué d'une dépression médio-dorsale peu profonde, et mesurant environ 1,2 à 1,5 mm transversalement et 400 à 600 µ longitudinalement (fig. 4). Couronne d'épines simple non interrompue dorsalement, comprenant 50 épines distribuées de la manière suivante : deux groupes de quatre épines angulaires ventrales (fig. 5 *a*), mesurant environ 35 × 65 µ auxquelles font suite, vers l'arrière, de fortes épines courtes et larges mesurant 50 × 80 µ (fig. 5 *b*), puis des épines dont les dimensions vont en diminuant vers le sillon dorsal où elles ne mesurent plus que 30 × 45 µ (fig. 5 *c*). Ventouse orale d'environ 260 × 330 µ.

Acetabulum en forme de cornet mesurant de 700 à 900 µ transversalement et 900 à 1 200 µ longitudinalement, situé dans le quart antérieur de la longueur du corps.

Appareil digestif : prépharynx absent ; pharynx globuleux mesurant 200 × 300 µ ; œsophage d'environ 350 µ de longueur ; cæca longs et grêles atteignant l'extrémité postérieure du corps.

Appareil génital femelle : ovaire peu ou pas lobé, généralement allongé transversalement, situé dans la moitié postérieure du corps et mesurant 200 × 300 µ. Oviducte, réceptacle séminal et glande de Mehlis situés dans la région post-ovarienne, mais peu discernables les uns des autres sur nos préparations. Vitellogènes composés de très nombreux petits follicules s'étendant latéralement de la limite postérieure de l'acetabulum à l'extrémité du corps. Vitelloductes en position transverse, entre ovaire et testicule antérieur. Utérus ascendant formant de nombreux replis depuis l'ovaire jusqu'au pore génital, soit sur un tiers de la longueur du corps. Œufs nombreux mesurant environ 70 × 100 µ.

Appareil génital mâle : testicules paires, lobés, disposés en tandem dans la moitié postérieure de la longueur du corps et mesurant 450 × 550 µ longitudinalement et 400 × 450 µ transversalement. Poche du cirre située dorsalement par rapport à l'acetabulum et mesurant 350-500 µ × 200-300 µ. Pore génital s'ouvrant au niveau de la limite antérieure de l'acetabulum.

Discussion.

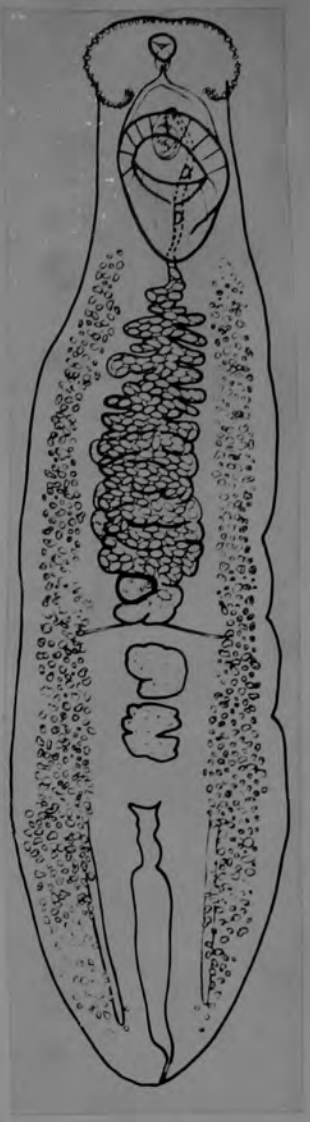
Les caractères qui précèdent indiquent une espèce du genre *Nephrostomum* Dietz 1909.

Par leur morphologie, nos échantillons se rapprochent beaucoup de *N. ramosum* (Sonsino 1895) tel qu'il a été redécrit par Dietz (1910, pp. 423-426, pl. 14, fig. 39 a) chez *Bubulcus ibis* (L.), (*Ardeidae*). Ils en diffèrent par le nombre des épines céphaliques qui est de 50 chez nos parasites et de 48 chez *N. ramosum*. Notons que ce nombre est difficile à déterminer, certaines épines pouvant échapper à l'observation ; les cicatrices laissées après leur chute n'étant pas toujours nettes, nous n'en avons compté que 48 et 49 chez certains échantillons, lors de nos premières observations. Nous avons pu comparer nos spécimens à un échantillon de *N. ramosum* que M. L.-Ph. Dollfus a bien voulu nous prêter, et qu'il a décrit du Maroc (1951, p. 166) chez *Bubulcus ibis* (L.). Cet échantillon, qui a perdu un grand nombre d'épines, est identique à ceux provenant d'*Ardea* sp. : la forme et la position des glandes génitales, l'étendue de l'utérus et des vitellogènes, les dimensions du corps et des différents organes, les dimensions des épines sont les mêmes.

Nous admettrons enfin les synonymies de *N. garzettae* Mc Callum 1904, reconnue par Odhner 1910, et de *N. bicolanum* Tubangui 1933, reconnue par Prudhœ 1944, avec *N. ramosum* (Sonsino 1895).

En conclusion, malgré la différence observée dans le nombre d'épines céphaliques, nous proposons de rapporter nos échantillons à *N. ramosum* (Sonsino 1895) Dietz 1910.

FROM RICHARD (1964)



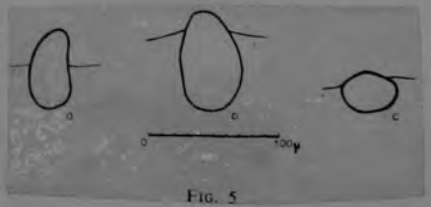


FIG. 5

Nephrostomum ramosum (Sonsino, 1895) Dietz, 1909

(Figures 4–5)

A single mature specimen was recovered from a grey heron (*Ardea cinerea*) at Marble Hall, and the following description is based on a whole mount of this specimen.

The body is elongate, somewhat ribbon-like and dorso-ventrally flattened. It is capped anteriorly by the characteristic armed head-crown of the echinostome trematodes. The total length of the body is about 17 mm and the maximum width 2,18 mm, at the level of the anterior testis. The width immediately behind the head-crown is about 1,5 mm, and from this point it slowly increases to the maximum width of 2,18 mm at the middle of the body, whence the width gradually decreases and finally the body tapers sharply. The surface of the body is aspinose, but this is, no doubt, due to spines having been lost. The head-crown is typically reniform, with a semi-circular ventral notch and a shallow dorsal depression. The crown measures up to 1,8 mm in transverse diameter, and bears 48 cuticular spines which are arranged in a single row dorsally and laterally, as shown in Figure 5, with a cluster of four peg-like spines disposed in a double row on each ventral lobe of the head-crown. The spines are largest on the ventral lobes (80 × 48 μm), and become smaller (73 × 37 μm) and more pointed along the lateral margin, with six small very stout ones (35 × 30 μm) along the dorsal depression on the head-crown. Spines are absent from the ventral indentation.

The oral sucker lies towards the anterior margin of the head-crown, and its shape is bluntly triangular with the narrow end directed postero-ventrally. The size of the oral sucker is 0,39 by 0,30 mm. The ventral sucker is well developed and somewhat funnel-shaped, with the narrow rounded margin directed posteriorly. It is situated at about one-eight of the body-length from the anterior end, 0,77 mm behind the head-crown, and is 1,48 mm in length and 1,38 mm in width.

A very short, but distinct, thin-walled prepharynx, 85 μm long, enters a well-developed oval pharynx subterminally and ventrally. The anterior region of the prepharynx is surrounded by a ring of muscles which is about 0,1 mm in diameter. The pharynx is elongate-oval and measures 0,37 × 0,26 mm, with walls 80 μm thick. The oesophagus extends along the median line and bifurcates dorsally to the anterior border of the ventral sucker. The intestinal caeca are rather thin-walled and indistinct, but have a lumen about 80 μm wide and extend to the posterior end of the body.

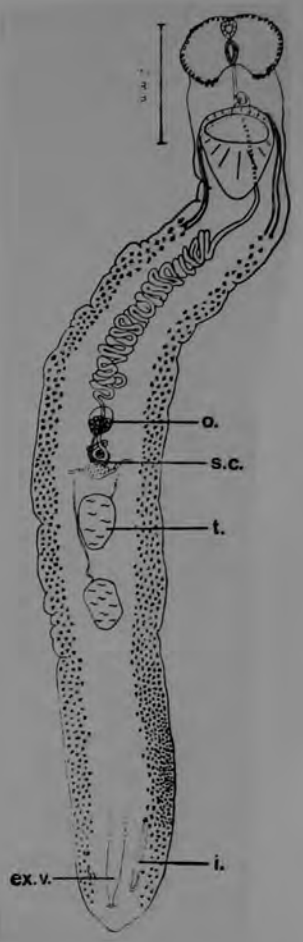
There is a distinct excretory pore situated in the median line on the dorsal surface of the body, at about 0,27 mm from the hinder end. The excretory vesicle is Y-shaped, bifurcating at about midway between the posterior testis and the hinder end.

The genital pore lies in the median line immediately in front of the ventral sucker. In the present specimen the cirrus is partially everted through the pore and has a smooth surface. The cirrus-sac lies dorsally to the anterior border of the ventral sucker and contains, in addition to the cirrus, a pars prostatica and a coiled seminal vesicle. The sac is oval and measures 0,38 mm long and 0,34 mm wide.

The testes lie one directly behind the other in the posterior half of the body at about 2,3 mm and 1,8 mm from the hinder end respectively. They are compact, elongate-oval structures, the anterior testis being 0,86 × 0,55 mm and the posterior 0,86 × 0,53 mm. The vasa efferentia run forward from the anterior margin of each testis, but after a short distance their passage becomes obscured by surrounding tissues.

The ovary is also oval, 0,46 × 0,50 mm. It lies in the median line, with its posterior border at about 1 mm in front of the anterior testis, at a point approximately in the middle of the body. In the present specimen the nucleated tissue of the ovary has degenerated until the organ occupies only about one half of its original area, which can be made out by the presence of a tunic which presumably invested the fully-developed ovary. The oviduct leaves the posterior edge of the ovary, but much of its course is obscured by the "shell"-gland complex and folds of the uterus. No details of Laurer's canal could be made out. The "shell"-gland complex exists as a diffuse area of numerous glands lying between the ovary and the vitelline reservoir, and is surmounted by coils of the uterus.

The vitellaria consist of many compact, globular masses ranging from 50 to 90 μm in diameter. They extend in two lateral fields from the level of the excretory pore forward to within about 0,65 mm of the ventral sucker. A yolk-duct from each field opens into an oval vitelline reservoir measuring 0,13 × 0,39 mm, which lies in the median line, 0,52 mm behind the ovary.



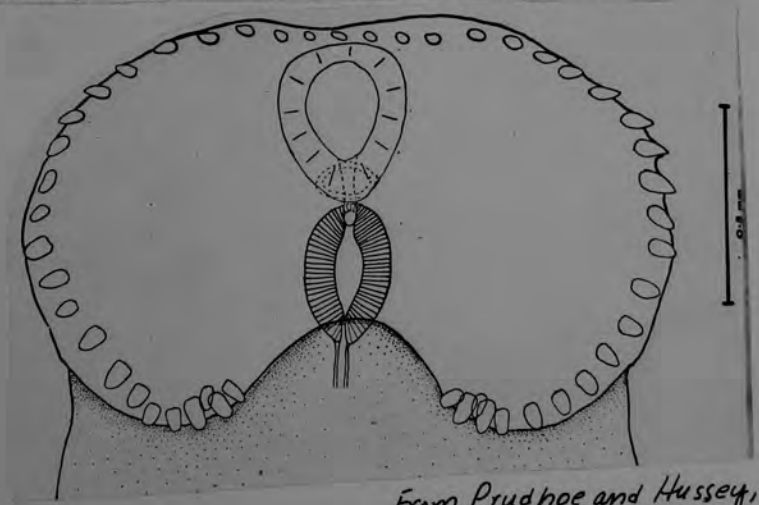
The uterus is thrown into several transverse folds lying between the intestinal caeca and between the ovary and the ventral sucker. It is filled with eggs 95–105 μm × 57–62 μm in size.

The shape of the body of the worm described above is different from that normally encountered in this species. Usually, the body of a fully-mature worm is elongate-oval, with the maximum width, which occurs at about the level of the ovary, being at least one-and-a-half times greater than the transverse diameter of the head-crown. The present specimen is rather elongate and the transverse diameter of the head-crown is only a little less than the maximum width of the body, but the histological condition of the specimen suggests that it was much relaxed when fixed, and thereby may have assumed an elongate shape. Moreover, *N. ramosum* appears to be normally a parasite of the cattle-egret (*Bubulcus ibis*), and possibly *Ardea cinerea* is an unusual host that has influenced the shape of the present worm.

The only details known, so far, of the life-history of *N. ramosum* are given by Azim (1934), who saw echinostome cercariae emerging from *Planorbis boissyi* in Egypt and found that, under laboratory conditions, they invaded tadpoles through the skin and encysted in the subcuticular tissues.

Mji (1951) has proposed the name *Nephrostomum ramosum* var. *tyumiensis* for trematodes found in the duodenum and ileum of *Ardea melanocephala* from the Tyumie Valley in Cape Province. This variety was distinguished from the typical form described by Dietz (1910) by a difference in the configuration of the Y-shaped excretory vesicle, which is normally exceedingly variable, by the shape of the oral sucker, by the length of the oesophagus, by the shape of the testes and by the size of the spines in the depression of the head-crown. All the differences enumerated by Mji are exceedingly superficial and have no systematic importance whatever, and for this reason the variety *tyumiensis* should be considered identical with typical specimens of *N. ramosum*.

A new species of *Nephrostomum*, *N. legonum*, was erected by Ukoli (1967) for specimens obtained from *Bubulcus ibis* in Ghana. This new species was said to differ from *N. ramosum* in the possession of 50 instead of 46–48 spines on the head-crown, including six corner-spines instead of four or five, and in a well-marked posterior process or tail. Usually, the head-crown of *N. ramosum* bears a row of 48 spines, but occasionally 46, 47, 49 or 50 may be present. Again, there may be four or five spines in each corner-group, but specimens fixed under pressure may be thought to have six spines in each group. Often the apparent difference in the number of spines in each group is a matter of interpretation, unless it is realized that the corner-spines are arranged in two alternate rows, and that one of them is a continuation of the main row of spines. The tail or posterior process is not an unusual feature among echinostomes, but its presence is fortuitous and is probably dependent upon the degree of relaxation of the body and the terminal position of the excretory pore at the time of fixation. It seems that the features used to substantiate the erection of a new species are not constant and therefore *N. legonum* Ukoli, 1967, is here regarded as a synonym of *N. ramosum*.



From Prudhoe and Hussey, 1977

Nephrostomum ramosum (Sons; 1895) Dietz, 1909

(Fig. 34)

The following study is based on four worms recovered from the intestine of one out of two specimens of *Bubulcus ibis* collected from Sialkot.

The body of the fluke is large, elongated with maximum breadth at the uterine region. The tegument is aspinose. There is a head collar at the anterior end with a depression on its dorsal side. The head collar bears 47 spines arranged in a single uninterrupted row. On each side there is a group of four corner spines. The dorsal spines are the smallest; whereas the lateral spines are the largest. The oral sucker is subterminal. The ventral sucker is well-developed, more than six times the size of the oral sucker and situated at a distance of 0.757 mm from the anterior end. Mesially it is produced into a cone. The oesophagus is short. The intestinal fork lies just in front of the ventral sucker. Intestinal caeca are long and terminate near the posterior end of the body.

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The testes are tandem, immediately postequatorial, with an intertesticular space of 0.098 – 0.107 mm. The margins of the anteroposteriorly elongated testes are slightly indented. The cirrus sac is small, oval, extending to about one third of the ventral sucker from its anterior end. Enclosed within the cirrus sac are the vesicula seminalis, ductus ejaculatorius, prostatic complex and the cirrus. The common genital aperture is preacetabular. The ovary is oval, broader than long, equatorial or just pre-equatorial and median. The vitellaria are follicular, extending from posterior border of the ventral sucker to slightly beyond the caeca. They are mostly extracaecal but at some places they protrude into the intercaecal space. The uterus is moderately extensive, forming numerous intercaecal coils between the ventural sucker and a little in front of the anterior testis. The eggs are numerous, large, oval, brown, operculate and unembryonated. The excretory vesicle is Y-shaped with several lateral branches.

MEASUREMENTS

(All measurements in millimetres)

Body length	10.605 – 12.423
Body breadth	1.666 – 2.272
Head collar	1.121 – 1.272
Cephalic spines	0.028 – 0.063
Oral sucker	0.225 – 0.254 × 0.196 – 0.205
Ventral sucker	1.302 – 1.424 × 0.909 – 1.272
Pharynx	0.245 × 0.196
Oesophagus	0.196
Ovary	0.343 – 0.424 × 0.441 – 0.636
Mehlis' gland	0.454 – 0.606 × 0·484 – 0.606
Anterior testis	0.545 – 1.121 × 0.454 – 0.636
Posterior testis	0.636 – 1.151 × 0.434 – 0.545
Cirrus pouch	0.441 × 0.352
Eggs	0.076 – 0.107 × 0.058 – 0.063

Host: *Bubulcus ibis*
Location: Intestine
Locality: Sialkot

DISCUSSION

The worms under present study resemble *Nephrostomum ramosum* (Sons; 1895) Dietz, 1909 in all essential features and have been identified as such. This species, however, is being reported for the first time from Pakistan.

From BHUTTA AND KHAN, 1975

NEPHROSTOMUM DUBASHI ~~n. sp.~~ Kaikobad and Bilqees, 1972

(Figs. 1—6)

HOST : Bird of unknown identity.

LOCATION : Intestine.

LOCALITY : Sind, West Pakistan.

NUMBER OF SPECIMEN OBSERVED—2.

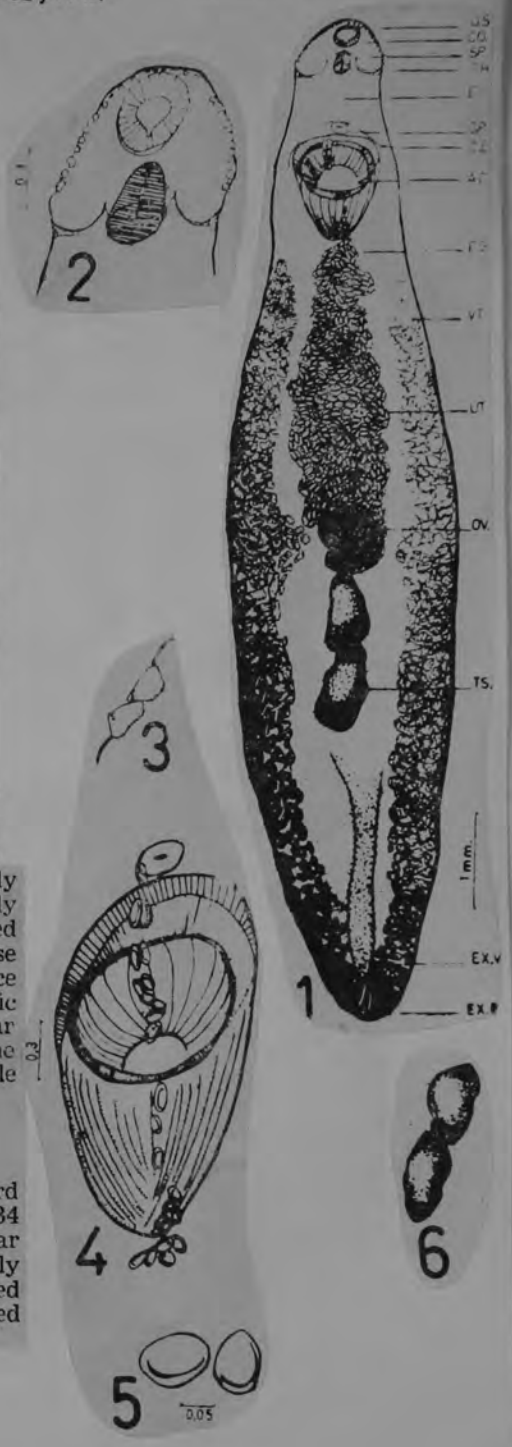
Body elongated, narrow anteriorly, broader posteriorly 9.05—10.90 long, 2.09—2.50 wide. Head collar well developed, 0.52—0.55 long, 0.85—0.86 wide, with a single row of uninterrupted blunt to conical spines, 27—34 in number, 0.03—0.06 long. Oral sucker small 0.25 long, equal in both specimens, 0.28—0.38 wide. Pharynx 0.49—0.50 long. Ceca long reaching to posterior end, although not clearly visible in the post acetabular region due to vitelline follicles. Acetabulum strongly muscular, cone shaped, double liped, 1.15—1.18 long, 0.90—0.91 wide, close to oral sucker in neck like region. Testis two, tandem median, irregular and slightly lobed, 0.80—0.82 long, 0.46—0.48 wide. Ovary median pretesticular. Uterus voluminous lying between ovary and acetabulum. Vitelline follicles large erregular, closly set together extending from behind acetabulum to posterior end of the body. Genital pore preacetabular lying close to it. Cirrus pouch small poorly developed entirly preacetabular. Excretory vesicle unbranched wide and muscular, excretory pore terminal provided with muscle sphincter. Eggs yellowish, oval, large 0.12 to 0.16 long, 0.6 to 0.8 wide.

REMARKS

Nephrostomum dubashi n.sp. differs from the previously described species which are, *N. bicolanum* Tubangui, 1933. (Syn. *N. ramosum*—Prudhoe, 1944). *N. garzettae* MacCallum, 1904 (Syn. *ramosum*—Odhner, 1910), *N. limae* Travassos, 1926 and *N. robustum* Vigueras, 1944, mainly by possessing 27—34 small, rounded to conicle blunt spines strongly muscular cone like acetabulum, entirly preacetabular poorly developed cirrus pounch and relatively delicate ceca. Although *N. dubashi* is close to the Philippine species *N. bicolanum* as far as body size and the absence of a shallow depression on the dorsal or anterior border of the cephalic collar is concerned, but is differenciated from it by having fewer collar spines, entirely preacetabular poorly developed cirrus pouch, large vitelline follicles overlaping ceca and an unbranched muscular excretory vesicle with a terminal opening guarded by strong muscle fibers.

SUMMARY

Nephrostomum dubashi n. sp. is described from an unidentified bird of West Pakistan. The new species is characterised by possessing 27—34 unequal, bluntly pointed or rounded collar spines, strongly muscular anteriorly placed cone shaped acetabulum, small poorly developed entirely preacetabular cirrus pouch, irregular elongated testis, wide unbranched posttesticular excretory vesicle and terminal excretory pore provided with sphincter muscles.



Nephrostomum robustum Vigueras,1944

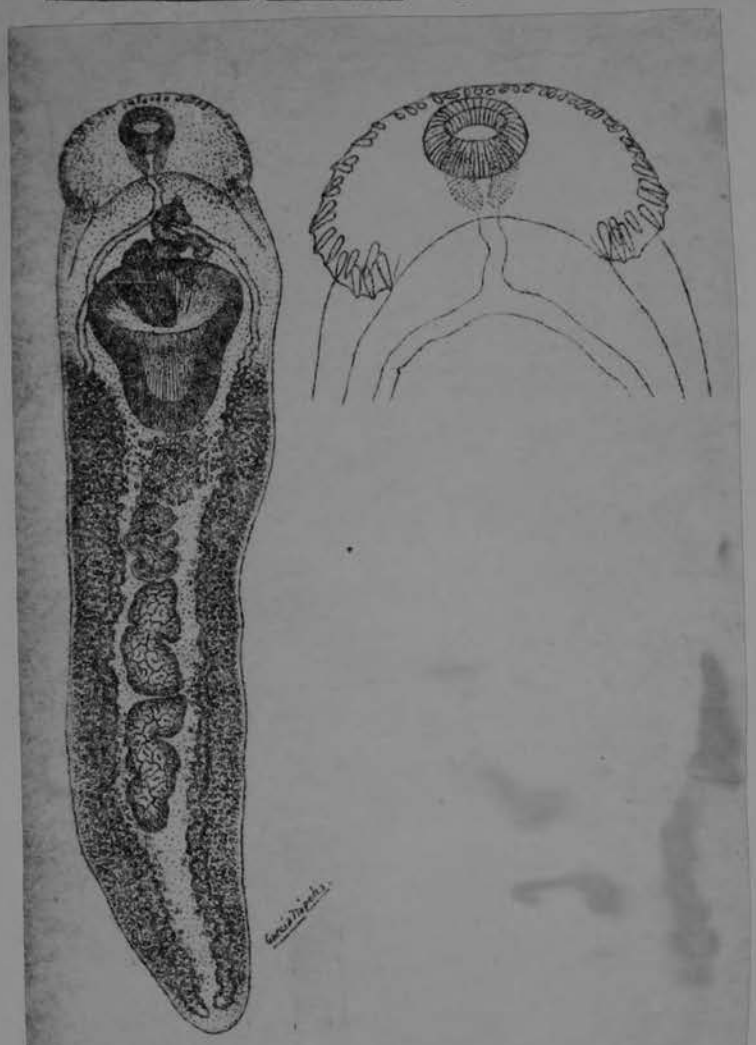


FIG. 7

Nephrostomum robustum n. sp. de *Colymbus dominicus dominicus*.

Echinostomatidae

Nephrostomum sinchirocai Ibanez, 1966

NOMENCLATURE — DIGENEA

150—IBÁÑEZ H., N., 1966. "Contribución al conocimiento de la fauna helmintológica peruana. *Nephrostomum sinchirocai* sp.n. (Trematoda, Echinostomatidae)." *Revta bras. Biol.*, **26** (1), 93–96.

Nephrostomum sinchirocai n.sp. is described from *Leucophoyx thula* in Peru. It has only 26 collar spines, while all other described species in the genus have more than 40, except for *N. australe* which has 32. G.D.S.

Nephrostomum skrjabini Kasimov, Vaidova, & Feizullaev, 1958

Host: Bubulcus ibis
Locality: Azerbaidzhan, USSR

1758—KASIMOV, G. B., VAIDOVA, S. M. & FEIZULLAEV, N. A., 1958. [Institut zoologii, Akademiya nauk Azerbaidzhanskoi SSR, U.S.S.R.] [A new trematode from *Bubulcus ibis*.] **Papers on Helminthology presented to Academician K. I. Skryabin on his 80th Birthday. Moscow: Izdatelstvo Akademii Nauk SSSR,** pp. 145–147. [In Russian.]

Nephrostomum skrjabini n.sp., from the intestine of *Bubulcus ibis* in Azerbaidzhan, differs from the four species in the genus by having cuticular spines along the whole body. It is nearest to *N. ramosum* and *N. bicolanum* (which Prudhoe, 1954, considers to be synonymous but Skryabin & Bashkirova in Skryabin, 1956, disagree with him) but differs from these in the shape of the testes, which are entire and oval rather than faintly lobed. G. I. Pozniak

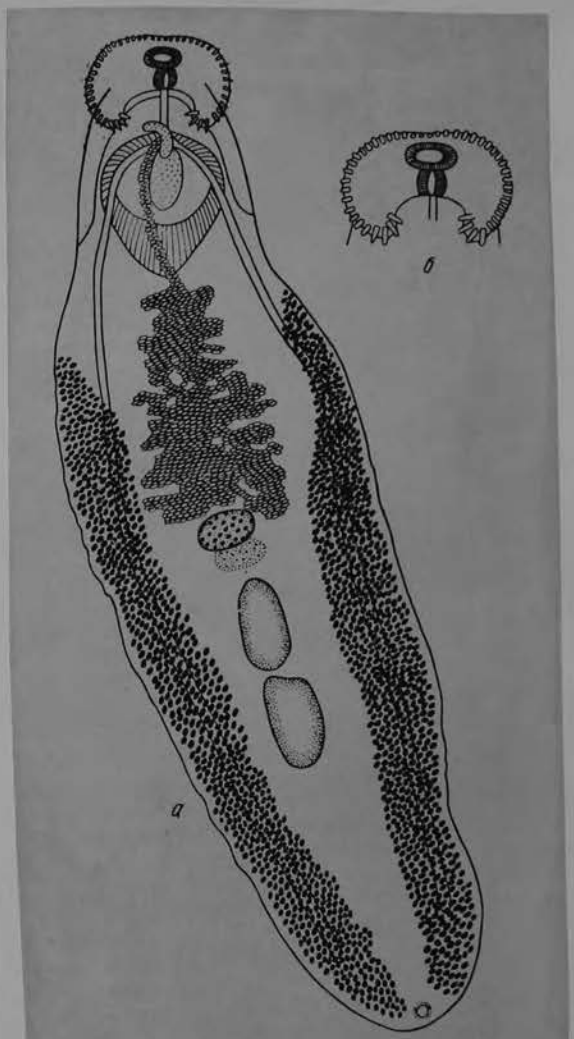


Рис. 1. *Nephrostomum skrjabini* nov. sp.
а — марита; б — головной воротник

NEPHROSTOMUM