A SURVEY OF CESTODES IN BIRDS OF MANITOBA

A Thesis

Presented to

the Faculty of Graduate Studies and Research

University of Manitoba

In Partial Fulfillment

of the Requirements for the Degree

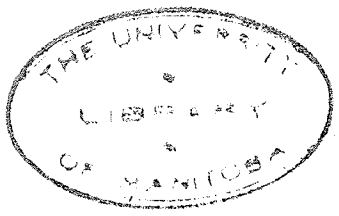
Master of Science

---

by

Nick Neufeld

April 1954



ACKNOWLEDGEMENTS

The writer wishes to express his sincere appreciation for the help and guidance of his adviser, Professor R. A. Wardle, and for the extensive use of his private library.

Thanks are also due to Professor R. K. Stewart-Hay for his advice and for the loan of personal scientific equipment, and to Dr. J. A. McLeod for the loan of private literature.

INTRODUCTION

A thorough knowledge of the fauna of a region must necessarily include an understanding of the parasitic forms of the area and their relationship to their hosts. The vertebrate forms in most regions are relatively well known, but a knowledge of the organisms that parasitize them is often quite scanty. For animals of major economic importance the parasite picture is well filled in, but this cannot be said for parasitism in our wildlife. Much remains to be done in this field.

There have been general surveys of cestode parasites in vertebrates of North America, but a search of the literature reveals that records for many parts of Canada are rare. The cestode parasites of Canadian animals were reviewed by Wardle in 1933, but the list indicated that research had investigated the fish as hosts to a greater extent than the birds.

Since many cestodes have a rather short adult life within the host animal there is bound to be a considerable change in the endoparasitic infestation in a migratory animal unless reinfection occurs. According to Shorb (1933) the patent period for Hymenolepis fraterna in rats is only eleven days. Also young animals are markedly more susceptible to infection than adults (Lang 1929, Boughton 1937) so that migratory birds examined away from their breeding grounds will not as frequently show infection as the nestling. An accumulation of data on the extent of the range of a parasite can

help to throw light on the intermediate hosts involved in the transmission of the organism.

During the summer of 1949, when the author was taking part in a biological survey of parts of the Nelson and Hayes rivers in northern Manitoba, the opportunity presented itself of collecting the helminth endoparasites from the animals acquired for the National Museum at Ottawa. In the following summer, 1950, supplementary collecting was undertaken at Whitewater Lake in southwestern Manitoba. The specimens collected in 1950 were obtained mostly from ducks. In addition some material in the collection of the Department of Zoology at the University of Manitoba was examined. A few birds obtained from hunters were also examined in the late fall of last year, 1953, and included in the summary.

Because of the small number of birds examined from any one area, no attempt will be made to evaluate quantitatively the results of these collections. In all, fifteen bird hosts are included in this survey.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (continued)

CHAPTER I

MATERIALS AND METHODS

Since most of the collecting was done in the field, 5 per cent formalin was used for the preservation of the material. If the cestodes were found in a living condition, they were freed of adhered extraneous material through repeated washings of water with decantation of the washings until clear. Extremely minute forms could not be completely separated from the gut contents but had to be preserved together with the material that could not be removed for fear of losing the specimens. When conditions allowed the practice, larger tapeworms were fixed on slides in a flattened condition. Smaller forms were fixed in a relaxed condition by the Looss shake method. On several occasions birds could not be examined until twenty-four to forty-eight hours after the death of the host animal. On a few occasions the entire gut of a small bird was preserved after first being slit. However this method was not satisfactory.

Specimens were preserved in glass vials with cork stoppers. Some material became cork-stained, but no group of specimens was uniformly damaged.

Since the tapeworms collected were all quite small species, no strobila exceeding a width of 10 mm, and the majority being less than 1 mm in width, all studies were undertaken on whole mounts. Borax carmine, a modified haematoxylin stain, and Coelestin blue B

were used to differentiate specimens. The Coelestin blue B was used as outlined by Nathan W. Riser (1951) and gave excellent results. However the haematoxylin stain proved to be superior for the smaller organisms - less than 300 u wide. The borax carmine was generally unsatisfactory for differentiating whole mounts. However an interesting polychrome effect was obtained by a combination of the carmine stain and coelestin blue B on some particularly refractory material. The specimens were first stained in the borax carmine and when this proved unsatisfactory, the worms were destained for twenty-four hours in seventy per cent alcohol and chlorine. The stain however, still tinted the yolk gland and the wall of the uterus. When restained in coelestin blue B, all nuclear material except that still stained red took on the blue stain. In this way the ovary could clearly be distinguished from the yolk gland, and the uterus outline became particularly clear.

It was found that some cork-stained specimens, when treated with chlorine alcohol, bleached out well, but the nuclear material of the gonads retained the tannic acid stain much more tenaciously than the remainder of the worm. For rapid examination and identification no further staining was required. The specimens could be dehydrated, cleared and mounted without further treatment.

All specimens were cleared in beechwood creosote and mounted in Permount. All measurements were made on mounted specimens treated in this way. However some particularly bulky scolices were stored in creosote rather than being mounted with the strobila.

For large worms that are markedly craspedote, observation of internal structures is often difficult if mounted as whole mounts. It was found that because of the hardening effect that the cleaner had on the specimen, the overlapping portions of the proglottids could be stripped from dorsal and ventral surfaces of the strobila without injuring the medullary portion of the animal. A fine glass needle was used and the work was observed under the binocular dissecting microscope. Naturally this technique can be employed only with species that have their genital ducts opening laterally.

Specimens that were much curled when removed from the preservative tended to retain that form and were found difficult to mount without crushing some internal structures. However, when first removed from the formalin to water the material became quite pliable. If the tapeworm was placed wet on a slide at this stage it was an easy matter to arrange it in a straight flattened position. A coverglass was then dropped over it - another slide was usually too heavy and crushed the specimen - and the dehydration carried out by adding the various gradations of alcohol by means of a pipette. By the time the ninety-five per cent alcohol was reached the specimen had hardened in its new position and could be handled without difficulty. Staining should be carried out before the dehydration is initiated.

With small specimens, difficulty was encountered in transferring them from the clearing solution to the slide and in applying the cover glass. When the mounting medium was added and the coverglass added, the tiny forms often slid right to the edge of the preparation and were lost. It was found that if a small drop of the clearer was first applied to the slide, specimens could easily be transferred with a needle. They were then arranged in an orderly manner on the glass, after which excess clearer was removed with a bit of filter paper. Now the cover glass was dropped into place, following which a thinned solution of the mounting medium was introduced at one edge of the cover glass. The mounting medium spread rapidly under the glass and more was added until the entire space was filled. Air bubbles were occasionally trapped under the glass, but the specimens were always well arranged, and could be examined under a microscope without tedious searching.

CHAPTER II

TAXONOMY AND DESCRIPTION

List of Cestodes Surveyed

The classification followed herein is that used by Wardle and McLeod (1952).

CLASS CESTODA

Order Cyclophyllidea Braun 1900

Family Davaineidae Fuhrmann 1907

Subfamily Davaineinae Braun 1900

Davainea proglottina (Davaine 1860)

Raillietina (*Raillietina*) *tetragona* Molin 1858

Family Hymenolepididae Railliet and Henry 1909

Subfamily Hymenolepidinae Perrier 1897

Hymenolepis megalops (Nitzsch in Creplin) Parona 1899

Hymenolepis tenerrima (v.Linstow 1882) Fuhrmann 1906

Hymenolepis mastigopraedita Polk 1942

Hymenolepis anceps Linton 1927

Hymenolepis robertsi Baylis 1934

Hymenolepis creplini (Krabbe 1869) Cohn 1901

Hymenolepis macracanthos (v.Linstow 1877) Fuhrmann 1906

Hymenolepis oligoproglottina new species

List of Cestodes (continued)

Family Hymenolepididae (continued)

Hymenolepis compressa (Linton 1892) Kowalewski 1904

Hymenolepis abortiva (v.Linstow 1904) v.Linstow 1905

Several other Hymenolepis species are also figured and described.

Diorchis americana Ransom 1909

Diorchis wigginsi Schultz 1940

Aploparaksis - two species

Subfamily Fimbriariinae Wolffhügel 1899, emend. Webster 1943

Fimbriaria fasciolaris Pallas 1781

Family Dilepididae Railliet and Henry 1909, emend. Lincicome 1939

Subfamily Dilepidinae Fuhrmann 1907

Paricterotaenia - two species

Anomotaenia sp.

Subfamily Paruterininae Fuhrmann 1907

Rhabdometra nullicollis Ransom 1909

Family Dioicocestidae Southwell 1930, emend. Burt 1939

Shipleya inermis Fuhrmann 1908

Order Pseudophyllidea Carus 1863

Family Dibothriocephalidae Lühe 1902

Schistocephalus solidus Creplin 1829

LIST OF PARASITE HOSTS

Holboell's Grebe: Colymbus grisegena holbölli
Schistocephalus solidus (?)

Canada Goose: Branta canadensis

Hymenolepis creplini

Mallard: Anas platyrhynchos platyrhynchos

Hymenolepis megalops Hymenolepis compressa

Hymenolepis mastigopraedita

Hymenolepis abortiva (see under detailed description below)

Diorchis americana

Gadwall: Anas strepera

Hymenolepis megalops

Pintail: Anas acuta tzitzihoa

Hymenolepis megalops Hymenolepis tenerrima

Hymenolepis compressa

Aploparaksis - two species

Fimbriaria fasciolaris

Shoveller: Spatula clypeata

Hymenolepis megalops

Lesser Scaup Duck: Aythya affinis

Hymenolepis anceps and two further Hymenolepis spp.

Hymenolepis robertsi

Diorchis wigginsi

Fimbriaria fasciolaris

Red-breasted Merganser; Mergus serrator

Hymenolepis macracanthos Fimbriaria fasciolaris

LIST OF PARASITE HOSTS (continued)

Ruffed Grouse: Bonasa umbellus umbelloides

Davainea proglottina

Sharptailed Grouse: Pedioecetes phasianellus

Raillietina tetragona

Rhabdometra nullicollis

Spotted Sandpiper: Actitis macularia

Anomotaenia sp.

Spotted Sandpiper (?)

Hymenolepis oligoproglottina

Lesser Yellowlegs: Totanus flavipes

Paricterotaenia sp.

Dowitcher: Limnodromus griseus

Shipleya inermis

Franklin Gull: Larus pipixcan

- Paricterotaenia sp.

Commom Tern: Sterna hirundo hirundo

Schistocephalus solidus

DETAILED DESCRIPTION

FAMILY DAVAINEIDAE Fuhrmann, 1907

Subfamily Davaineinae Braun, 1900

Genus Davainea Blanchard, 1891

Davainea proglottina (Davaine 1860)

A large number of these small cestodes was recovered on two seperate occasions from ruffed grouse at Wekusko Lake, Manitoba,

in August, 1949. They were located in the duodenum of the host animals. The parasite has been recorded from this host by R.V. Boughton (1937) and he has given a thorough description of the animal. In the present case no complete strobilae were found, the segments usually present in two's or three's. However, several gravid segments were found, measuring 1.8mm x 1.2 mm, in which definite egg pouches had begun to form. (see Plates I and II, pages 12 and 13)

Raillietina (Raillietina) tetragona Molin 1858

(Plate III)

A common parasite among sharp-tailed grouse in southern Manitoba. A thorough description is given by Boughton (1937). The specimens seen here were in the Zoology Department collection and had been collected in 1952.

FAMILY HYMENOLEPIDIDAE Railliet and Henry 1909

Subfamily Hymenolepidinae Perrier 1897

Genus Hymenolepis Weinland 1858

Hymenolepis megalops (Nitzsch in Creplin) Parona 1899

This parasite was found in four different anseriform hosts, Mallard, Pintail, Shoveller and Gadwall. It was always located in the lower large intestine, sometimes on the very rim of the cloaca, so that the strobila protruded somewhat from the cloaca. A more detailed description of this species will be given below.

Hymenolepis tenerrima (v.Linstow 1882) Fuhrmann 1906

(Plate IV)

Two Pintail ducks shot at Cape Tatnam, Hudson Bay, yielded this parasite from the investigation of the duodenum and small int-

PLATE I

Davainea proglottina

Fig. A. Holdfast

Fig. B. Spinous sucker

Fig. C. Rostellum armature

Fig. D. Detail of everted cirrus

Fig. E. Strobila fragment

Note

In this and most subsequent diagrams, the testes, ovary, and yolk gland will be indicated by conventionalized symbols, and not specially labelled. Testes are indicated by a series of short sinuous lines, ovary by a mass of dotted circles, and yolk gland by irregular stippled or blackened areas. Other abbreviations used in labelling: Please refer to the final page in the dissertation.

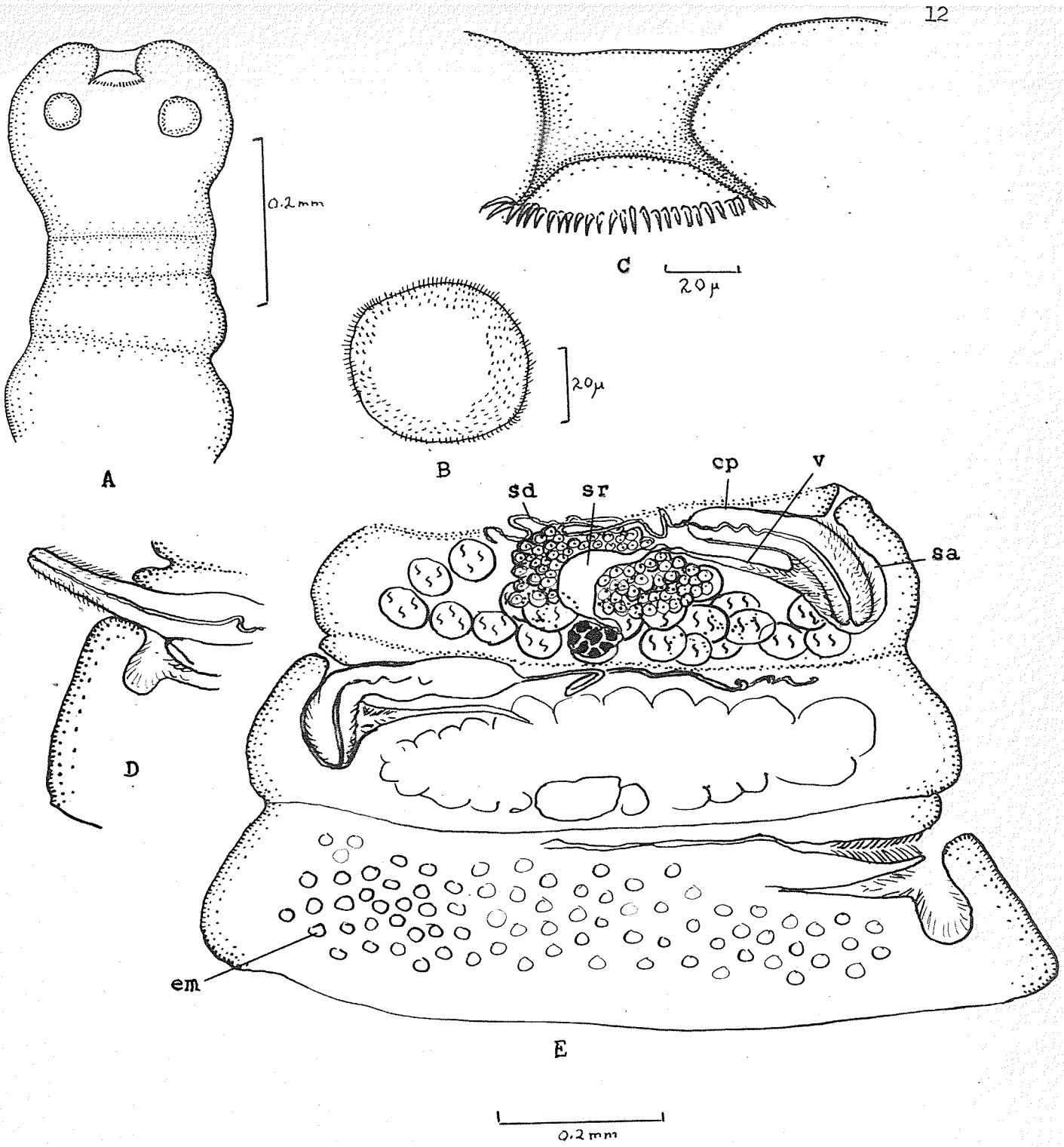

0.2mm
A
B
20μ
C
20μ
cp
v
sd
sr
sa
D
em
E
0.2mm

PLATE II

Davainea proglottina

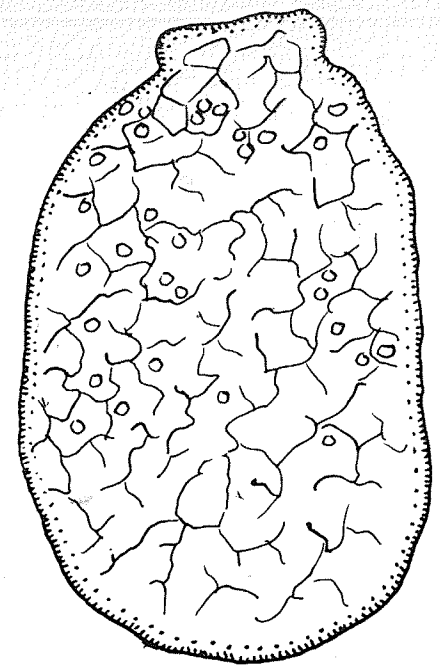
Fig. A. Gravid segment

Fig. B. Egg capsules in gravid segment

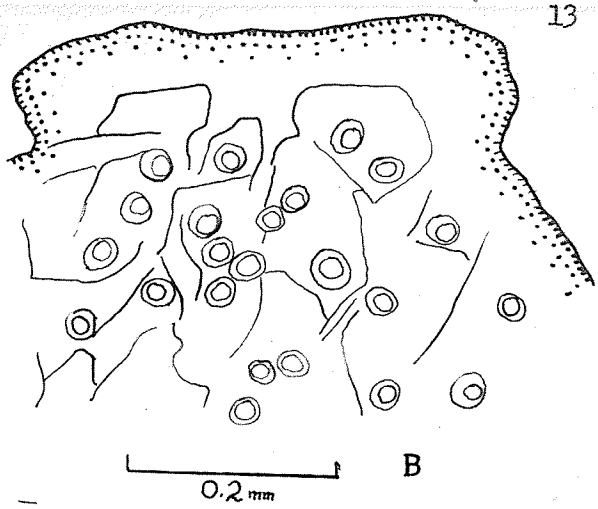
Fig. C. Eggs showing oncosphere

Fig. D. Younger gravid segment showing scattered eggs

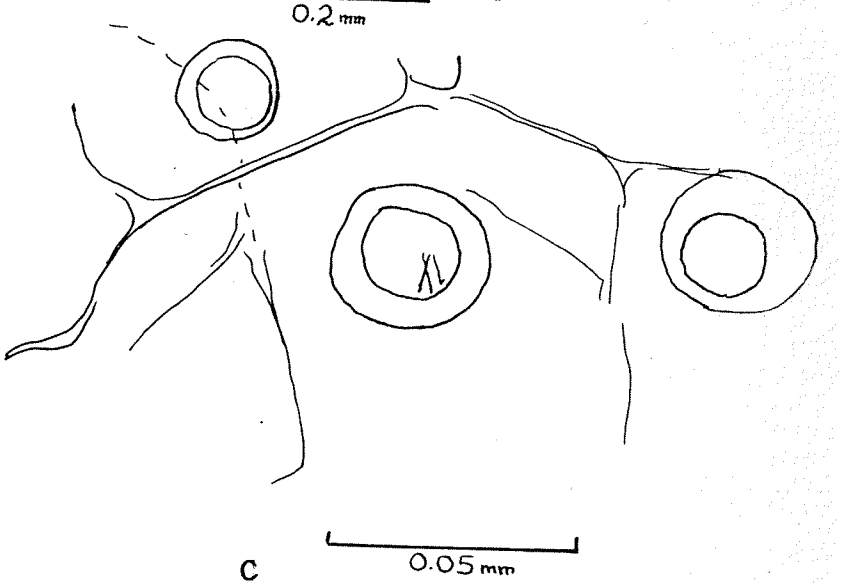
Fig. E. Enlarged view of scattered eggs in fig. D



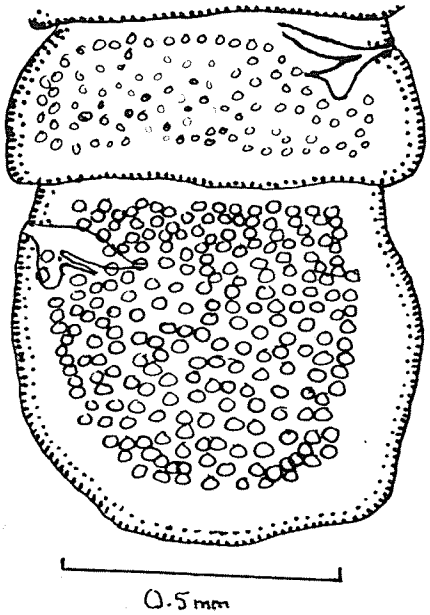
A



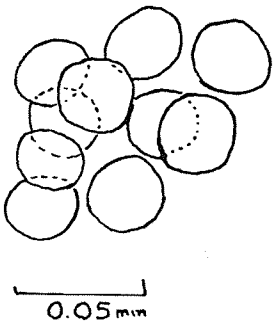
B



C



D



E

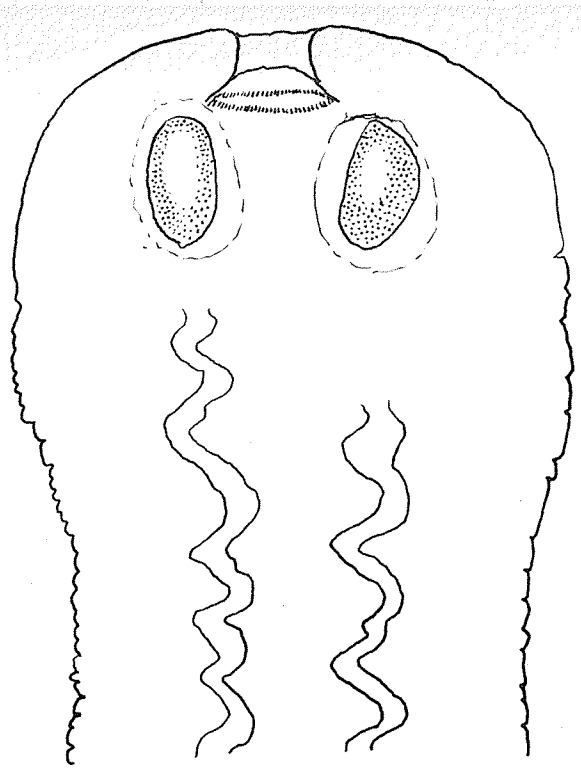
PLATE III

Raillietina (*Raillietina*) *tetragona*

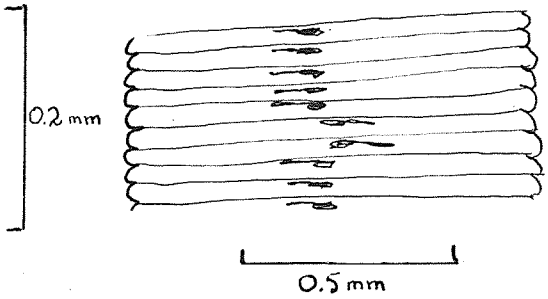
Fig. A. Holdfast

Fig. B. Immature strobila showing extreme irregularity in alternation of genital pores.

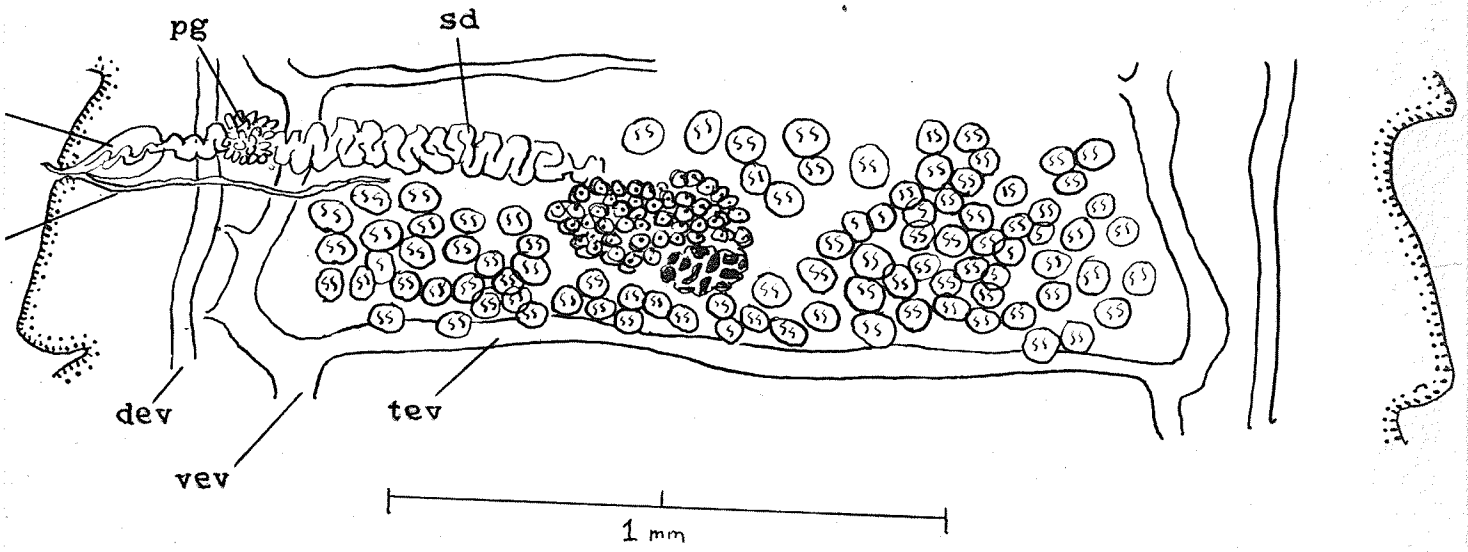
Fig. C. Mature segment



A



B



C

estine. Only immature specimens were found. Identification was made on hook size, number, and form, on scolex size, and on testes arrangement. The hooks, ten in number, were from 102.8 - 106.6u long, and were characterized by a sharp angle in the blade of the hook. The scolex ranged from 354-374u in diameter, and the suckers averaged 252 x 100u in size. The testes were arranged in a characteristic L-shape, one testis being poral, the other two antiporal. The developing cirrus pouch lay along the upper margin of the proglottis and reached to the center of the segment.

Hymenolepis mastigopraedita Polk 1942

(Plate V)

Several Mallards, not yet fully fledged, were obtained from Cape Tatnam. Since they had been dead for more than a day, the parasites found in them were not in a good state of preservation. No scolices were attached to the tapeworm bodies, and none could be found in the specimen vials. However, these strobilae took the stain very well, so that internal structures became extremely clear. The photograph in Plate VI illustrates the staining.

The longest strobila measured 42 x 1.2 mm. The spinous accessory sac is an especially prominent feature in each segment. The cirrus is equipped with a stylet. The ovary in mature segments appears broadly wedge-shaped, with the base of the wedge at the antiporal side of the proglottis, or else a much-lobed two-part form with a narrow joining band in front of the yolk gland. In mature and gravid segments the seminal receptacle fills the anteroporal

PLATE IV

Hymenolepis tenerrima

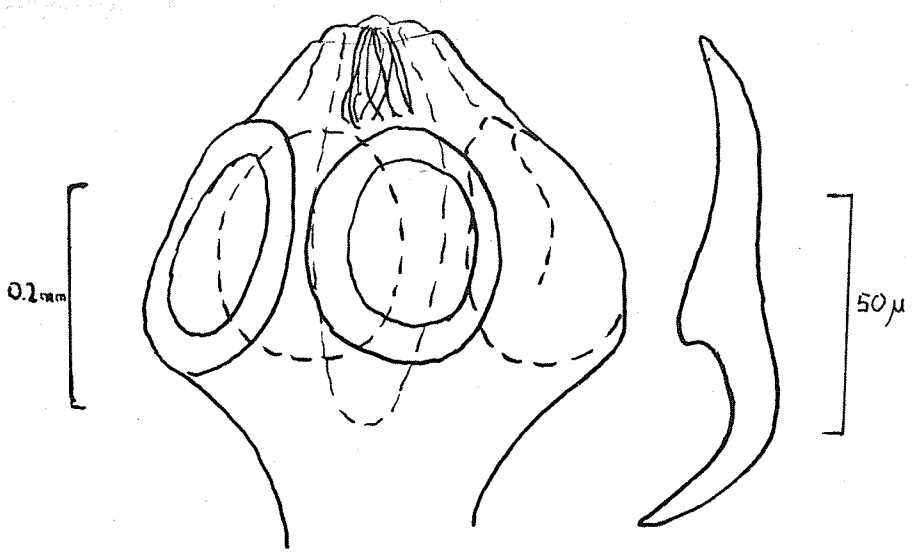
Fig. A. Holdfast with retracted rostellum and hooks

Fig. B. Hook from rostellum

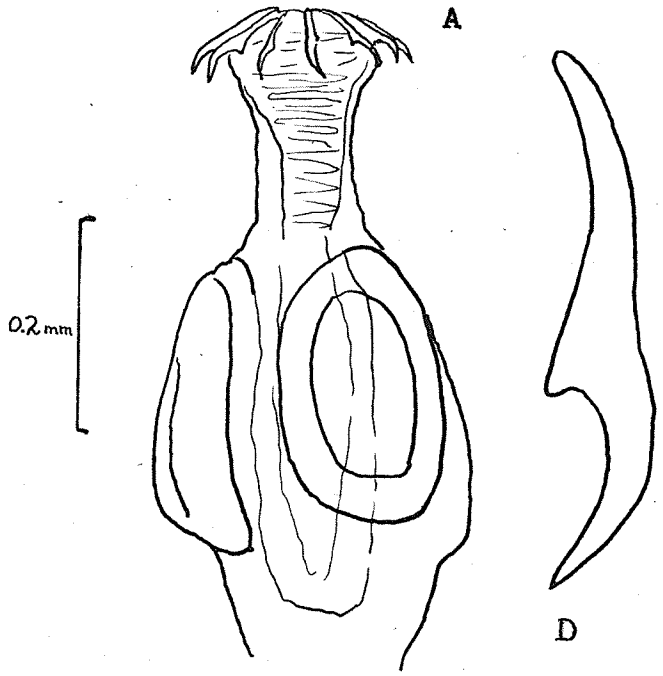
Fig. C. Holdfast with extended rostellum

Fig. D. Hook

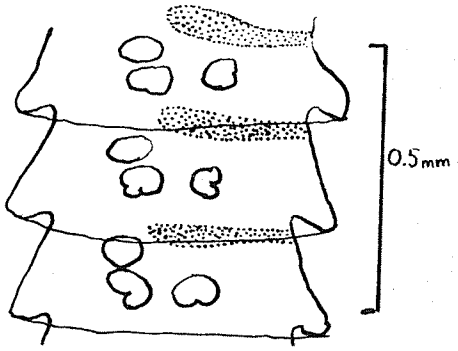
Fig. E. Immature strobila showing testes arrangement



A B



C D



E

PLATE V

Hymenolepis mastigopraedita

Fig. A. Proglottid with mature ovary

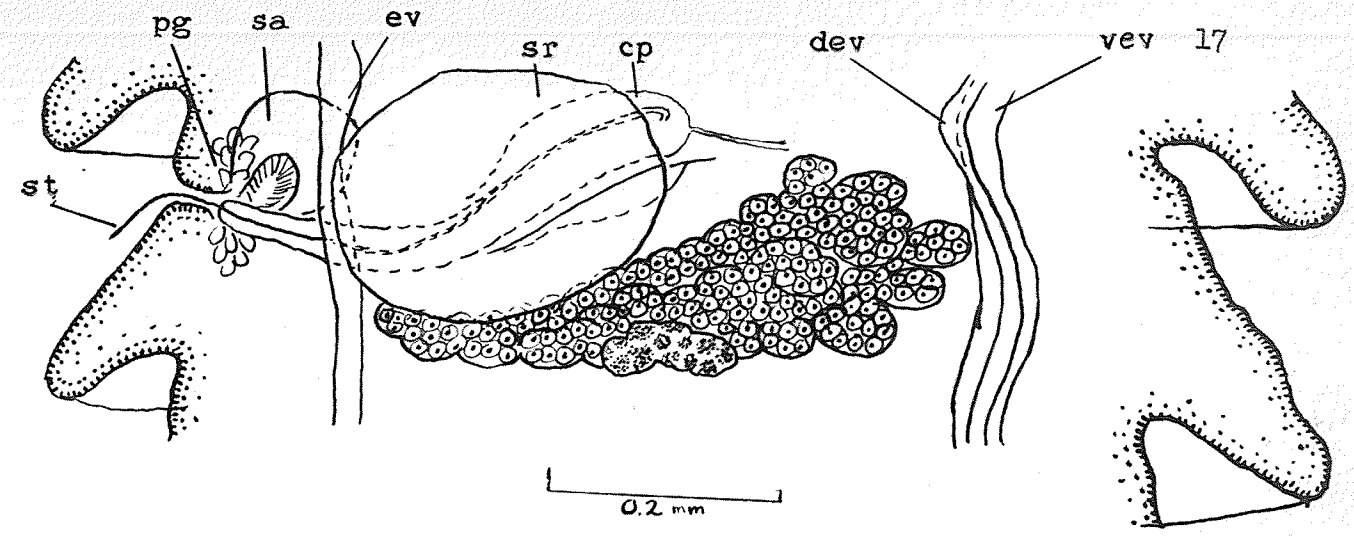
Fig. B. Immature segments showing testes arrangement

Fig. C. Proglottid with young ovary

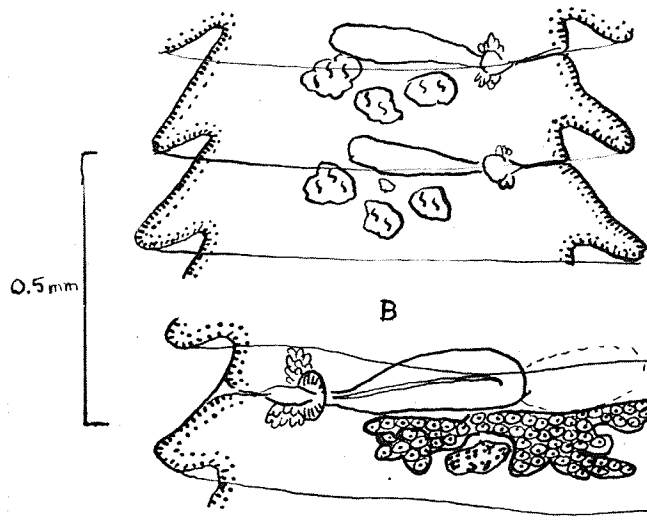
Fig. D. Proglottid showing bilobed ovary

Fig, E. Cirrus pouch and accessory sac

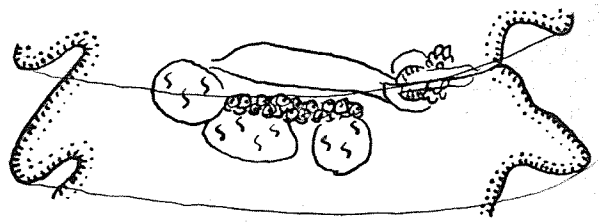
Fig. F. Cirrus with stylet and enlarged seminal receptacle.



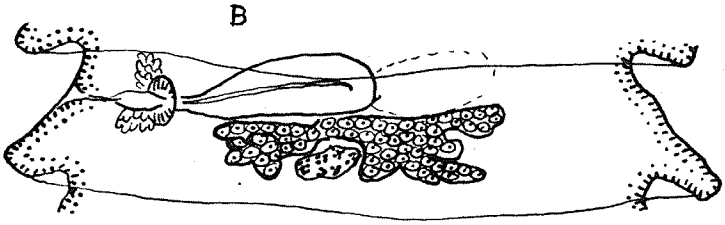
A



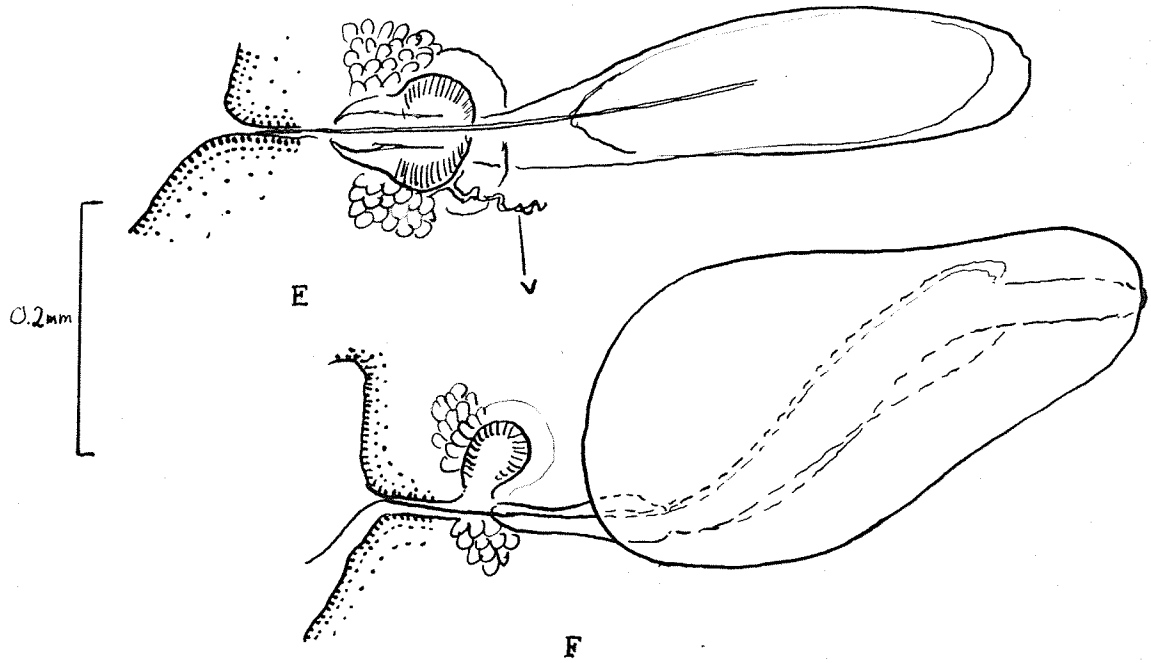
B



C



D



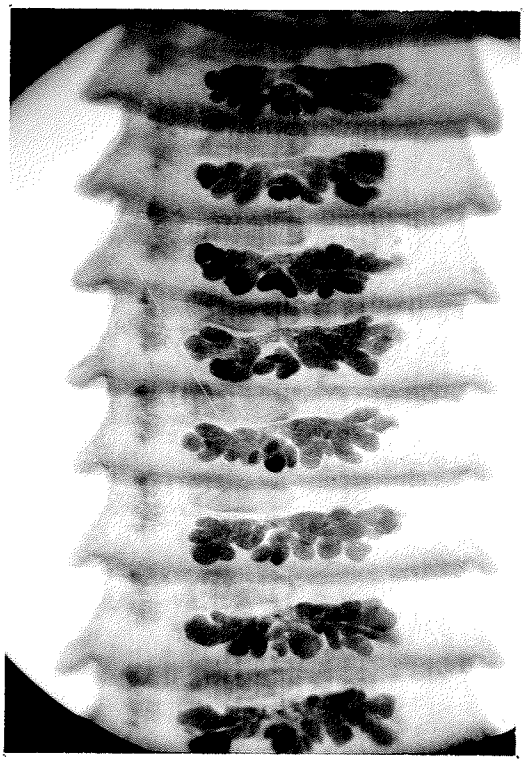
E

F

PLATE VI

Hymenolepis mastigopraedita

Fig. A.,Strobila showing bilobed ovary



A portion of the strobila showing the mature ovary.

Hymenolepis mastigopraedita

quarter of the segment on the ventral side. No fully gravid segments (containing eggs with formed oncospheres) were found. The testes have an L-shaped arrangement, two testes antiporal, one poral. The genital pores are unilateral and dextromarginal.

Hymenolepis anceps Linton 1927

(Plate VII)

Specimens of this helminth were recovered from a female Lesser Scaup duck at Whitewater Lake in southwestern Manitoba in late spring of 1950.

The length of the strobila was about 60mm, the maximum width 1.8mm. Proglottids were much wider than long, in mature examples having a length of .48 mm. The scolex measured 274u in diameter and the suckers about 116u. The rostellum, when extended, was globose, armed with twenty-four hooks. The diameter of the rostellum was seventy-two microns, and the hooks measured 10.8u in length. The distance from the holdfast to the first apparent proglottisation was 479u.

The testes were linear in arrangement, three in number, usually arranged with one poral and two antiporal to the ovary. However this arrangement was not constant, and at times all testes were antiporal to the ovary, or else only one testis was in that position. When mature, the testis measured 203 x 122u. The ovary was fan-shaped with the yolk-gland at the base of the fan. The cirrus pouch, 371x46u reached only to the poral excretory vessel. The ventral excretory vessel measured 50u in diameter, the dorsal vessel, 17u. The uterus in

PLATE VII

Hymenolepis anceps

Fig. A. Holdfast

Fig. B. Hooks from rostellum

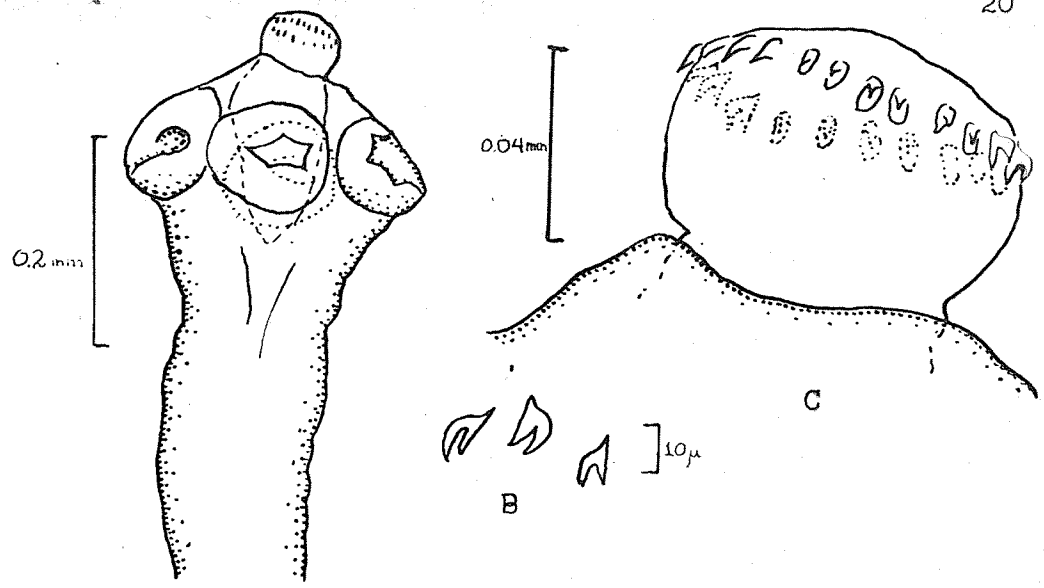
Fig. C. Armature of rostellum

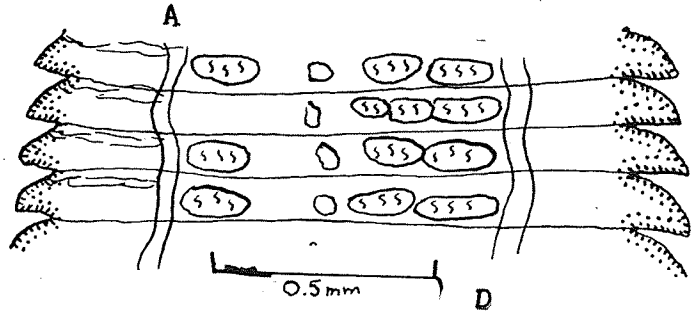
Fig. D. Variation in testes arrangement

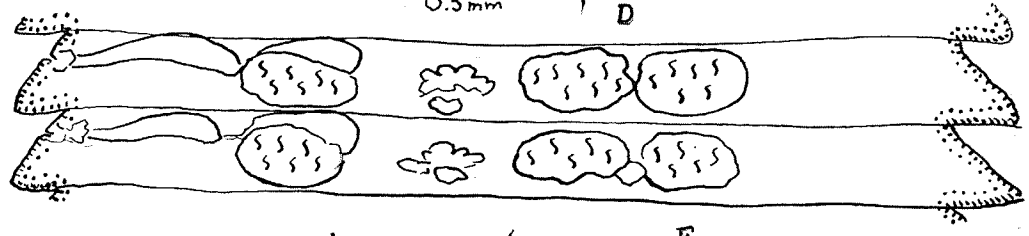
Fig. E. Proglottids with mature testes and cirrus sac

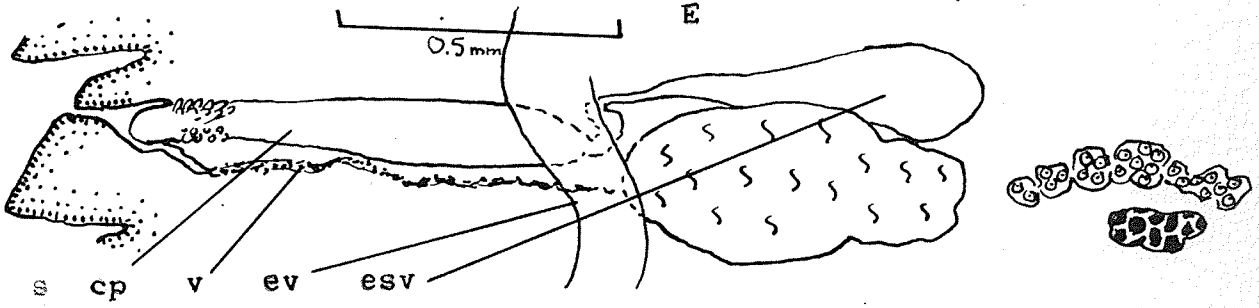
Fig. F. Detail of genital apparatus

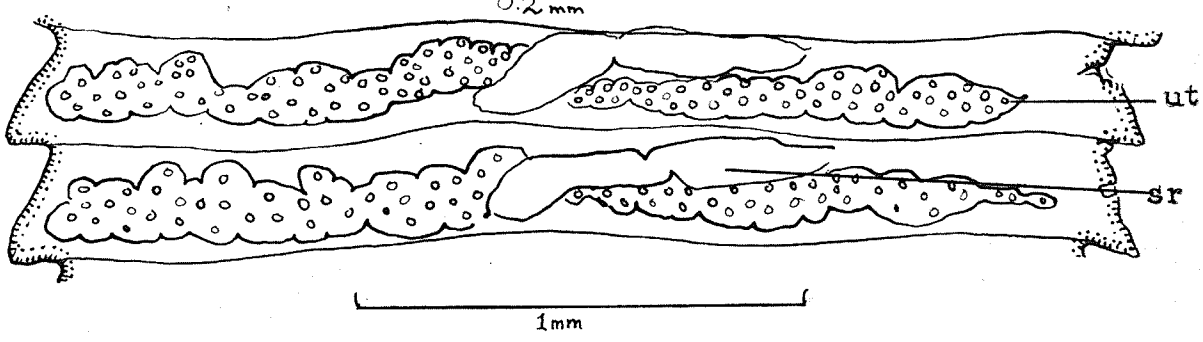
Fig. G. Gravid segments


0.2 mm
0.04mm
10μ
A
B
C


0.5 mm
D


E


0.5 mm
s
cp
v
ev
esv
F


0.2 mm
ut
sr
1mm
G

gravid proglottids is an undulating transverse sac, filling the entire segment.

Hymenolepis robertsi Baylis 1934

(Plate VIII)

Six highly contracted specimens were collected from the small intestine of a Lesser Scaup duck, which were tentatively identified as this species, on evidence of the hooks. The twelve hooks averaged about 160u in length. The holdfast was 435u in diameter and the suckers measured 195u across. The longest of the contracted strobilas measured 22 x 0.8mm. The testes were arranged in a straight line, one poral and two antiporal to the ovary. The cirrus sac measured one third of the width of the segment. The uterus in gravid segments was two-parted, with a heavy, much-indented wall.

Hymenolepis creplini (Krabbe 1869) Cohn 1901

(Plate IX)

One complete strobila and several fragments were obtained from a Canada Goose at Cape Tatnam in 1949. The immature worm measured 38 x 0.7 mm. A neck 577u long adjoined the holdfast. These fragments showed no mature proglottids. The diameter of the scolex was 275u and of the suckers 82u. The cirrus pouch did not extend quite to the midline of the segment. The three testes were in a straight line. The genital apertures were unilateral. The ten hooks of the rostellum measured 20.0 to 21.8u.

PLATE VIII

Hymenolepis robertsi

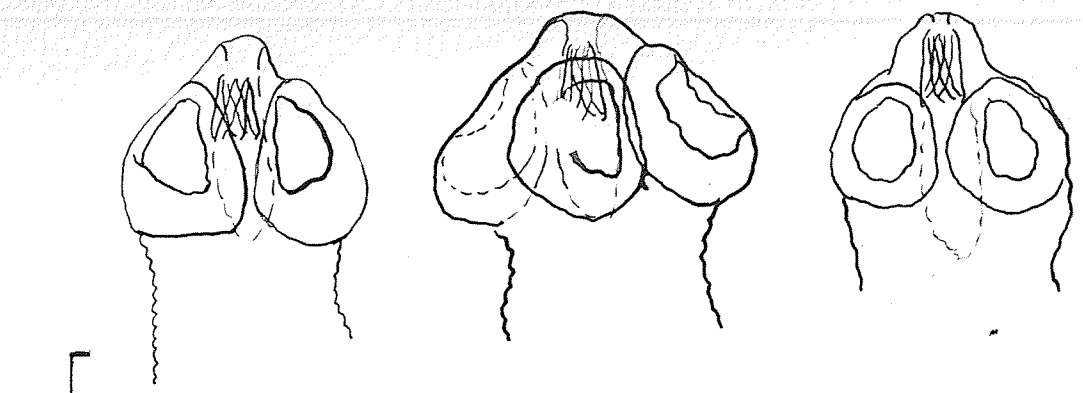
Fig. A. Holdfasts with retracted rostellum

Fig. B. Holdfast with extended rostellum

Fig. C. Hook from rostellum

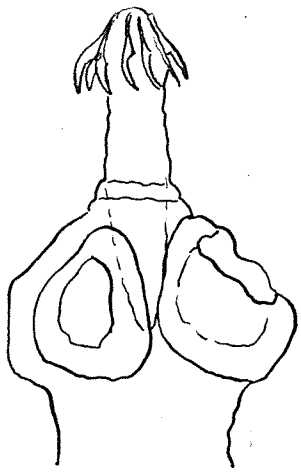
Fig. D. Gravid portion of strobila

Fig. E. Mature portion of strobila



A

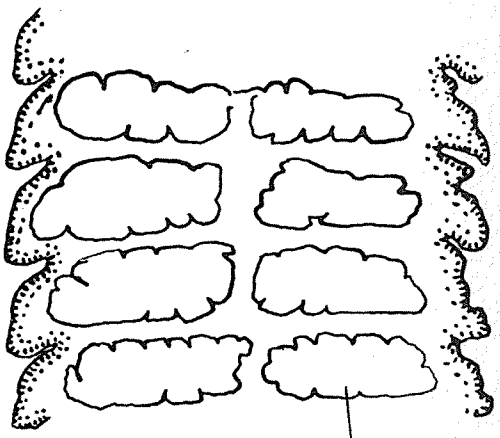
0.3mm



B

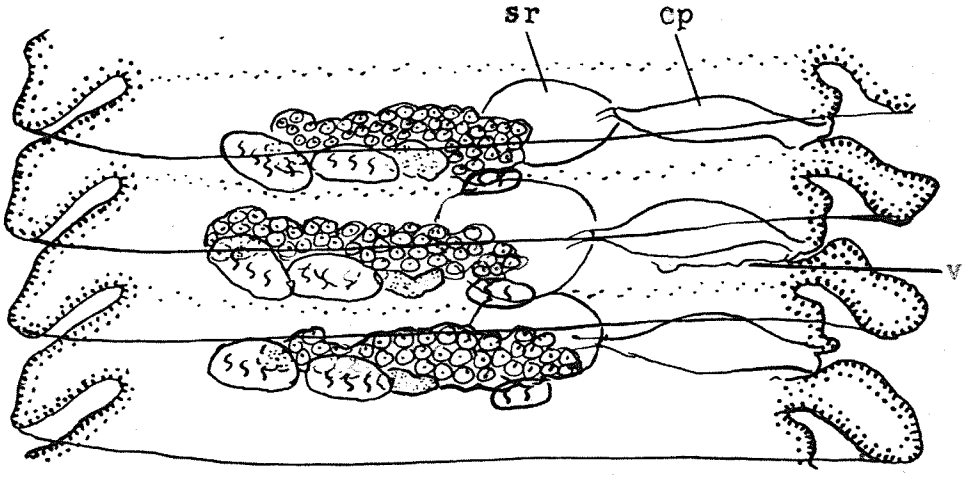
0.1 mm

C



0.3 mm

D ut



0.2 mm

E

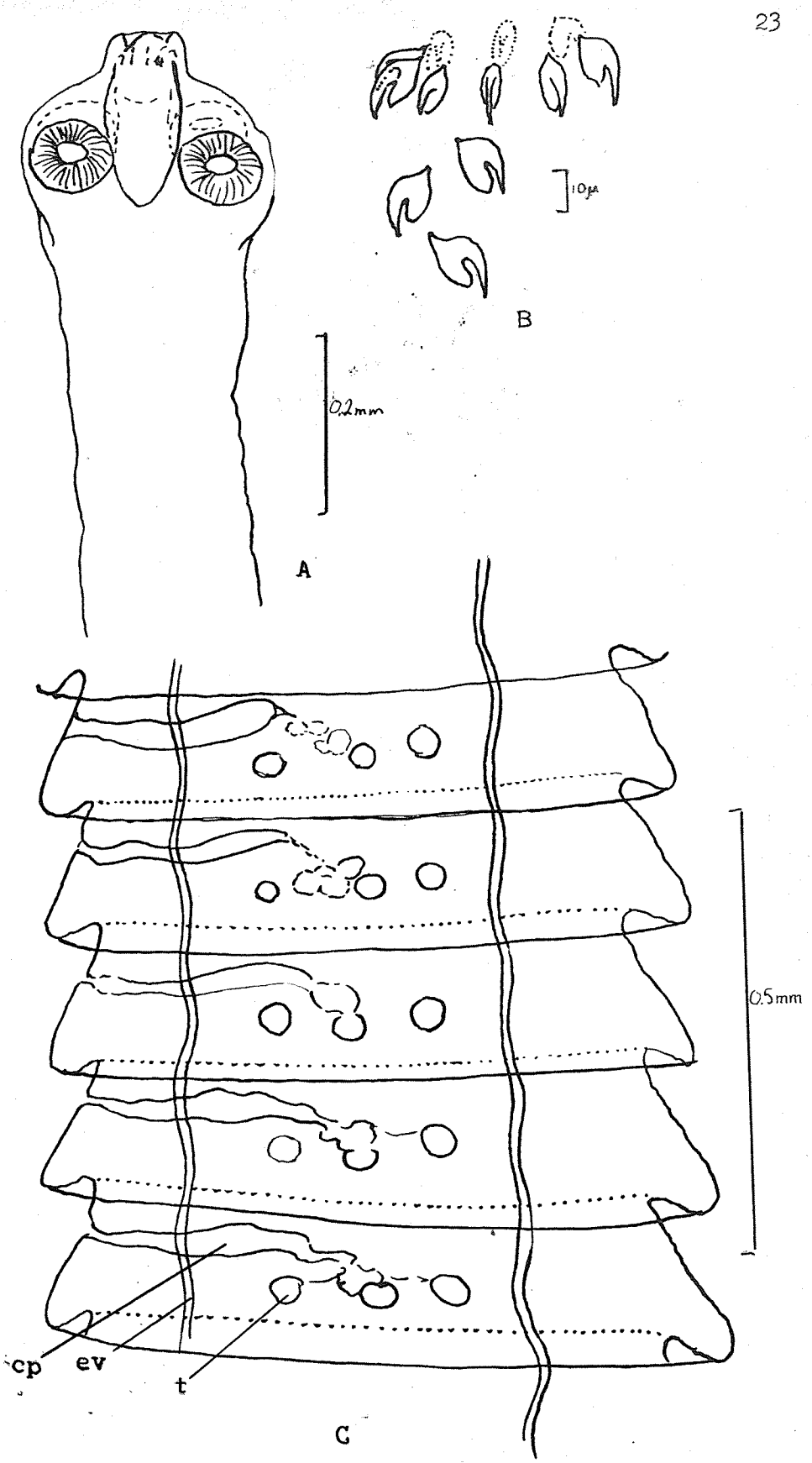
PLATE IX

Hymenolepis creplini

Fig. A. Holdfast

Fig. B. Hooks from rostellum

Fig. C. Immature strobila


10μ
B
0.2mm
A
0.5mm
cp
ev
t
C

Hymenolepis macracanthos (v. Linstow 1877) Fuhrmann 1906

(Plates X, XI)

A large number of these small worms was obtained from the duodenum, small intestine, large intestine and intestinal ceca of a Red-breasted Merganser shot on the Hayes river near Berwick Falls in the summer of 1949.

Strobila measurements: 4.2 x 0.47 mm; holdfast diameter: 232u; eight hooks 95.4 to 101.2u long; extended rostellum measured 155.6u beyond scolex; suckers 151 x 88u; cirrus pouch 333.9 x 42.3u, extending almost completely across the segment; cirrus unarmed but equipped with stylet. In some cases the everted cirrus appeared to have a collar surrounding its tip. Testes generally in a straight transverse line, but with the antiporal testis slightly anterior to the other two. Testes measured 88 x 73u; ovary bilobed, 257u maximum transverse diameter; yolk gland 80 x 58 u; uterus in final segments measuring 423 x 167u; Eggs measured 21.8u with the embryo 13.5u in diameter.

Hymenolepis oligoproglottina n.sp.

Eighteen examples of this extremely minute cestode were obtained from the intestine of a sandpiper, probably the Spotted Sandpiper, at York Factory, Manitoba, in July 1949. Unfortunately no strobila had the holdfast attached, and none could be located in the specimen bottle. Plates XII and XIII illustrate this cestode. An outline drawing was made of every specimen after mounting.

PLATE X

Hymenolepis macracanthos

Fig. A. Holdfasts, rostellum retracted, everted, with hooks lost

Fig. B. Hooks from holdfast

Fig. C. Strobila showing testes arrangement

Fig. D. Strobila showing young ovary

Fig. E. Mature bilobed ovary

Fig. F. Gravid proglottid

Fig. G. Detail of everted cirrus

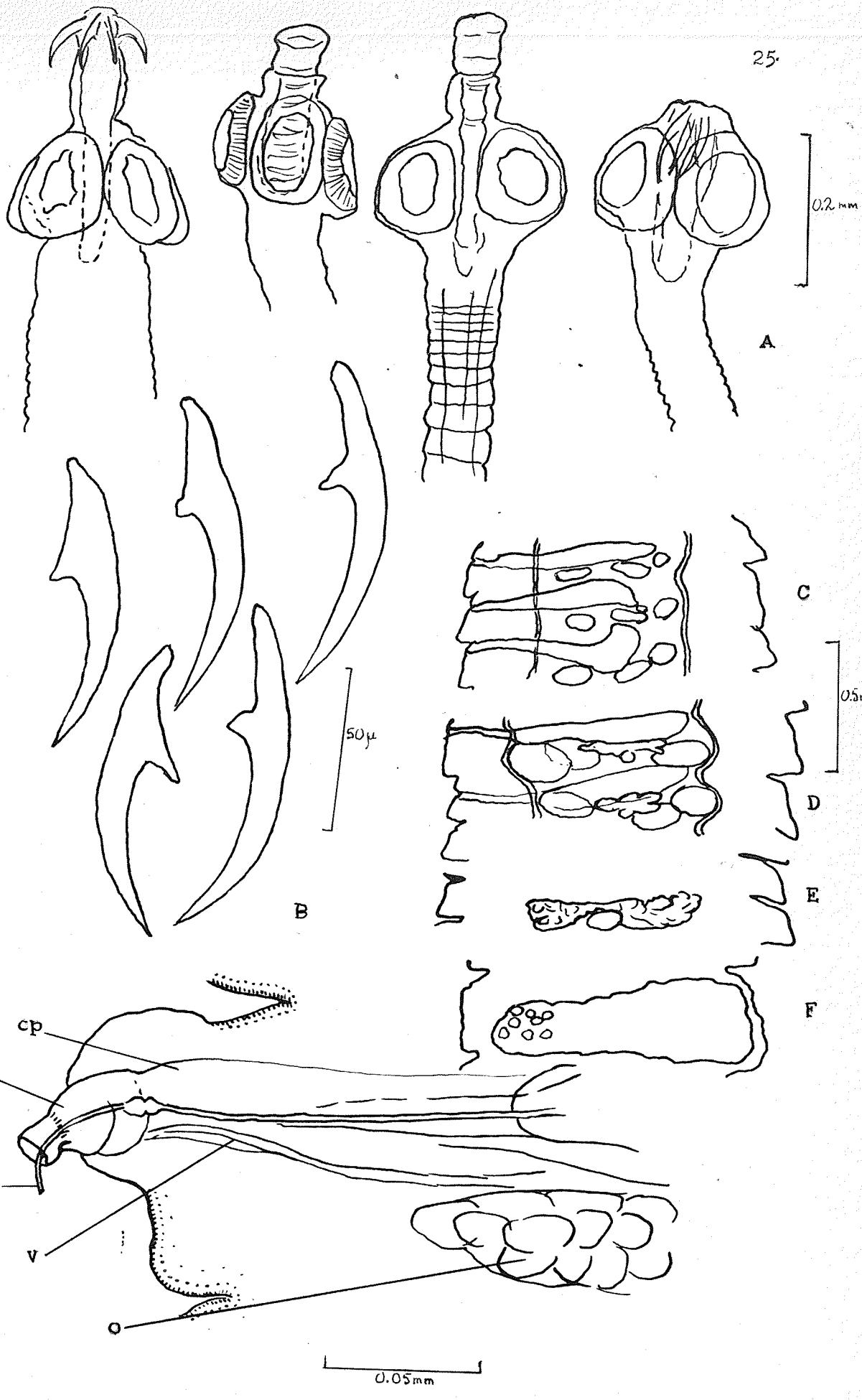

0.2 mm
A
50μ
B
C
0.5mm
D
E
F
cp
c
st
v
o
0.05mm
G

PLATE XI

Hymenolepis macracanthos

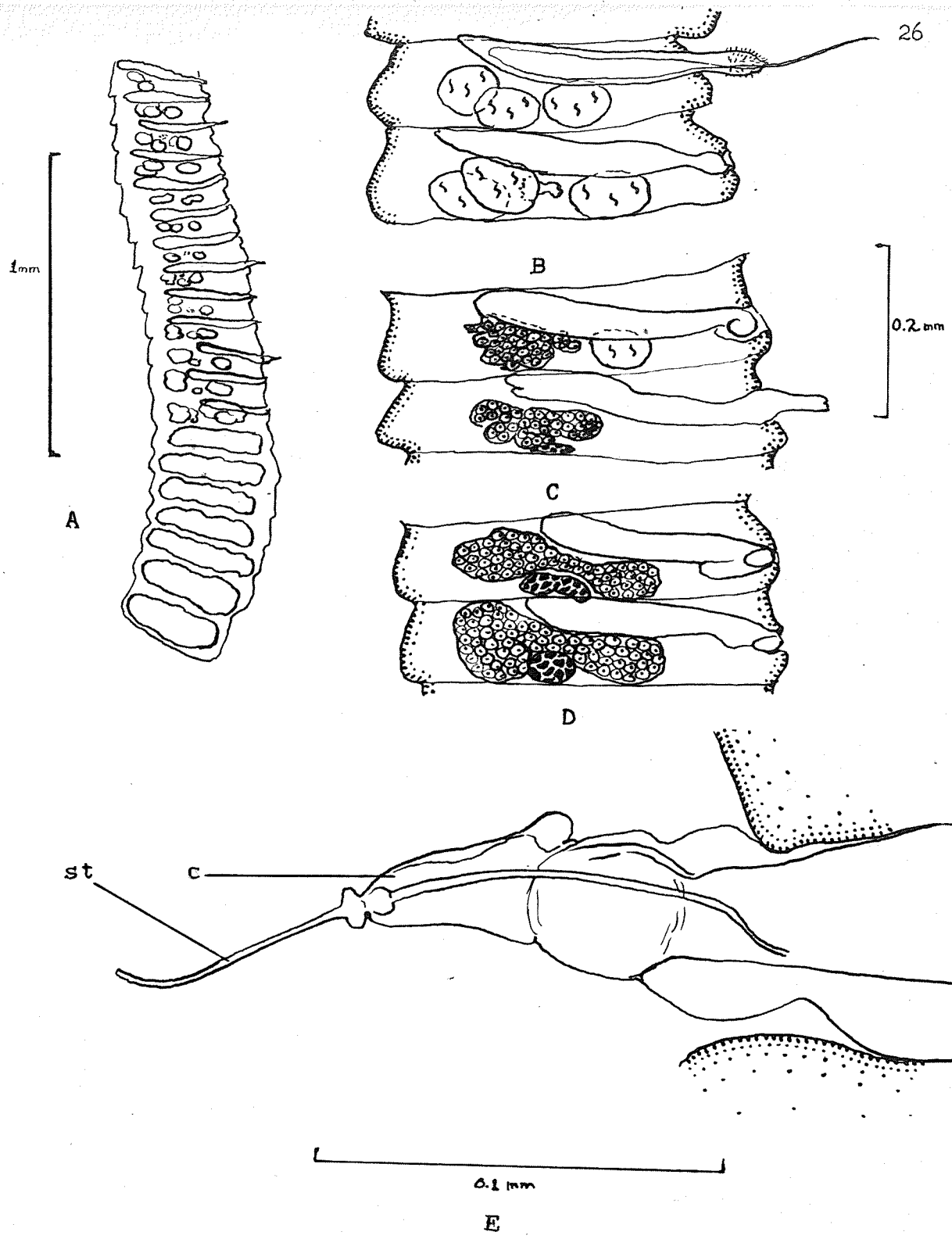
Fig. A. Strobila showing development of genitalia

Fig. B. Testes and cirrus pouch.

Fig. C. Developing ovary

Fig. D. Mature ovary

Fig. E. Detail of cirrus with whip


1mm
A
B
0.2 mm
C
D
st
c
0.1 mm
E

The longest strobila measured a little less than 1 mm in length, and the average greatest width was 200.9u. The average number of proglottids was eleven, the maximum sixteen. In every case the final segments were gravid. However no developed oncospheres were present in the uterus. The pattern of the genitalia was such that in each strobila two segments with a mature ovary were followed by two or three gravid segments and preceded by two or three segments in which the testes were discernible. All segments farther forward showed no internal structures. (see photographs, Plate XIV). Genital pores were unilateral and dextromarginal.

The three testes were arranged in a transverse line, but with the antiporal testis slightly anterior to the other two. The cirrus pouch passed diagonally across the segment so that its antiporal end sometimes caused the proglottis margin to bend outward. The measurements of the cirrus pouch were 200 x 20u. An external seminal vesicle lay dorsal to the cirrus pouch in the anteromedian area of the segment. The cirrus was spined and tapered to a point at its distal end. A spined accessory sac led immediately to the dilated seminal receptacle without a discernible vagina. Thus the seminal receptacle lay near the poral margin of the segment. From the seminal receptacle a short, undulating, rather wide tube passed back to the shell gland in the posteromedian area of the segment. The ovary was situated aporad from the testes although it tended to overlap the antiporal testis a s it increased in size. The mature ovary measured 83 x 45u, the shell gland lying just inside its median margin. The yolk gland measured approximately 34 x 24u. It was compact and subspherical in shape.

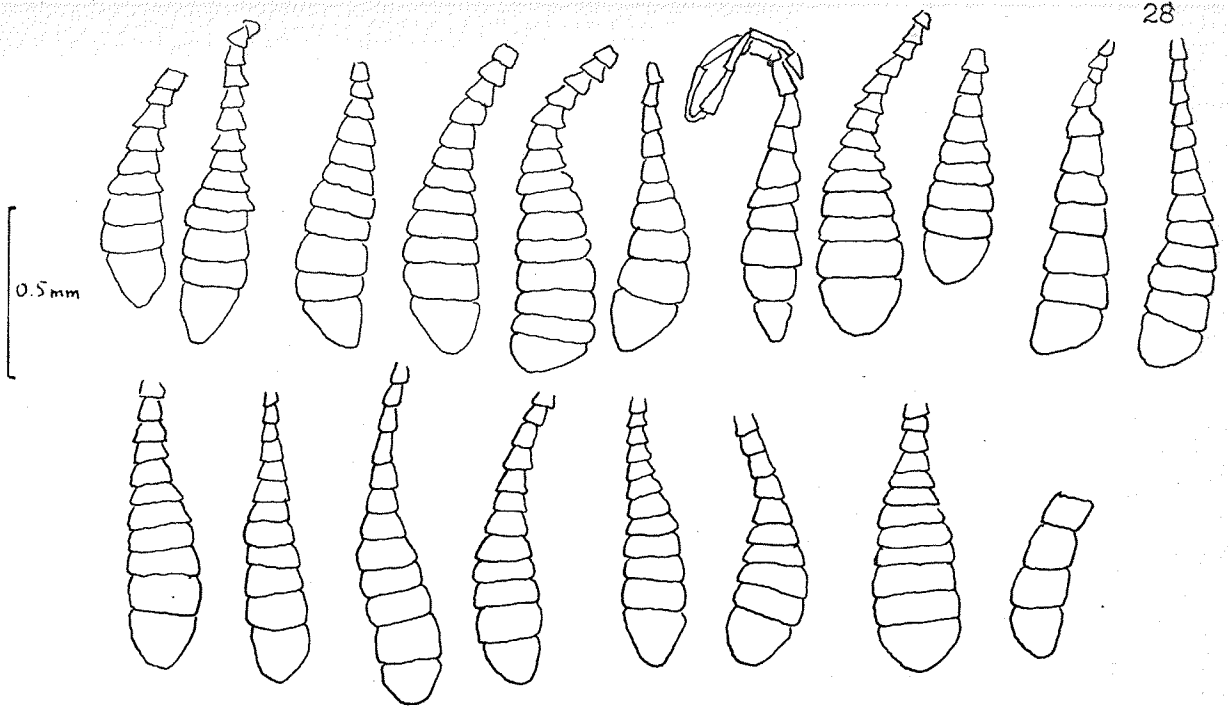
PLATE XII

Hymenolepis oligoproglottina

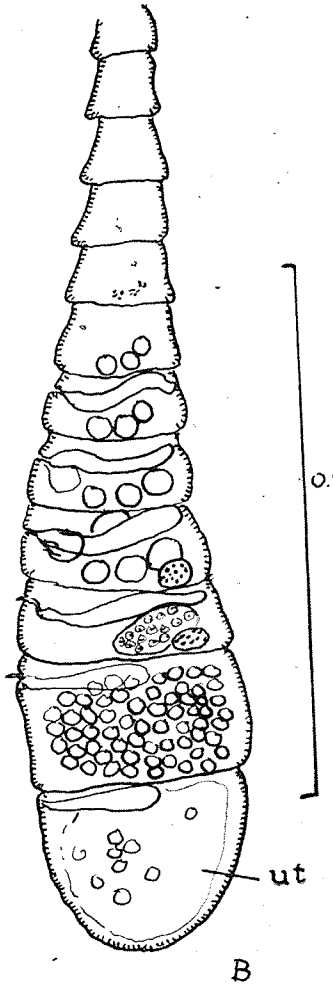
Fig. A. Outline of all strobilas illustrating segment number.

Fig. B. Development of genitalia in a strobila

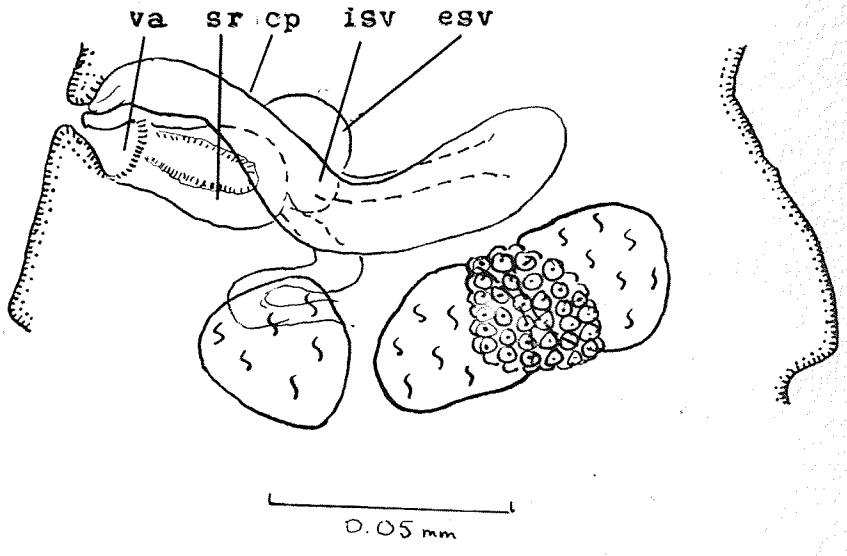
Fig. C. Segment with mature testes



A



B



C

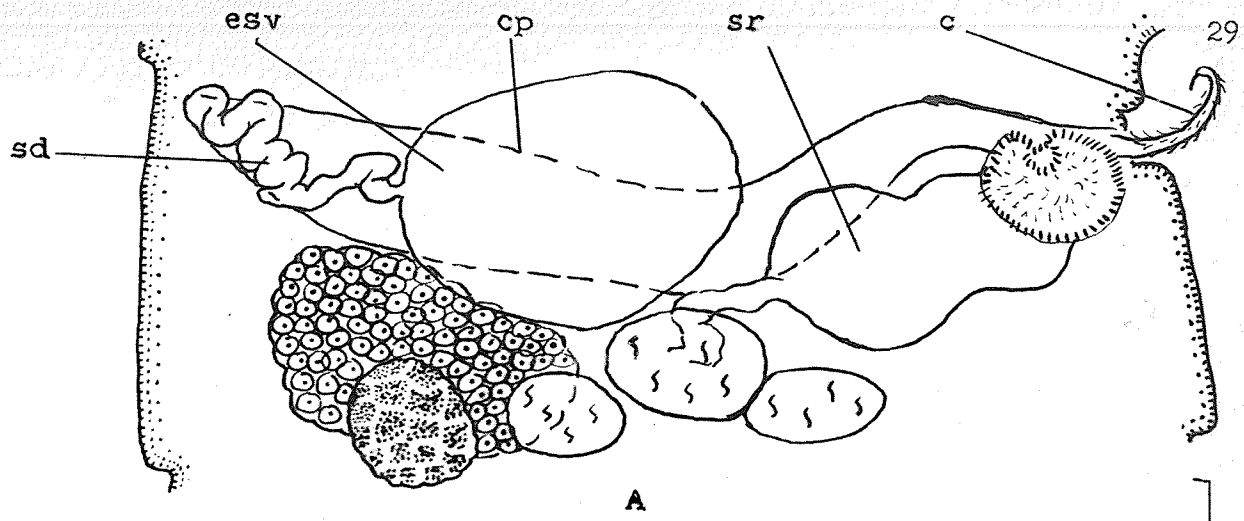
PLATE XIII

Hymenolepis oligoproglottina

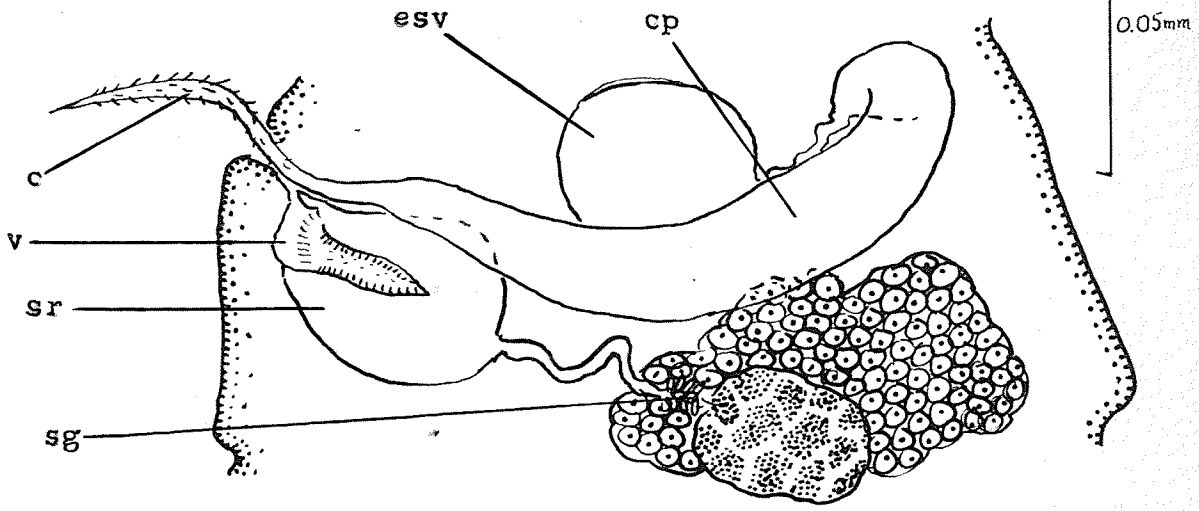
Fig. A. Mature segment, dorsal view

Fig. B. Mature segment, ventral view

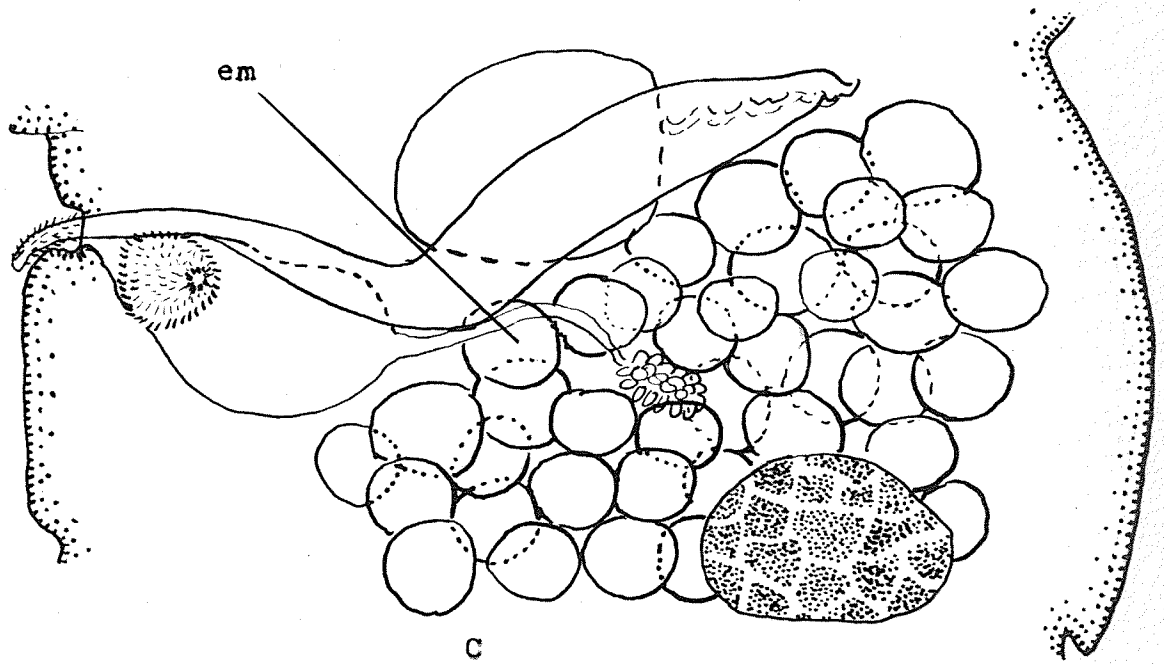
Fig. C. Segment showing developing egg mass



A



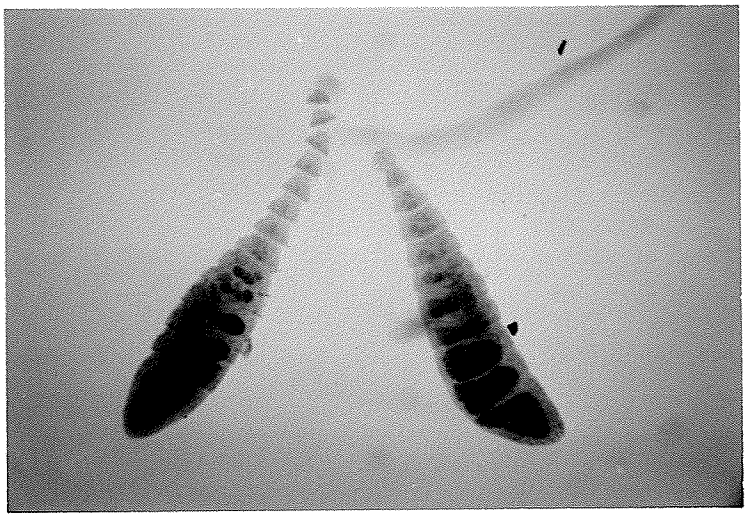
B



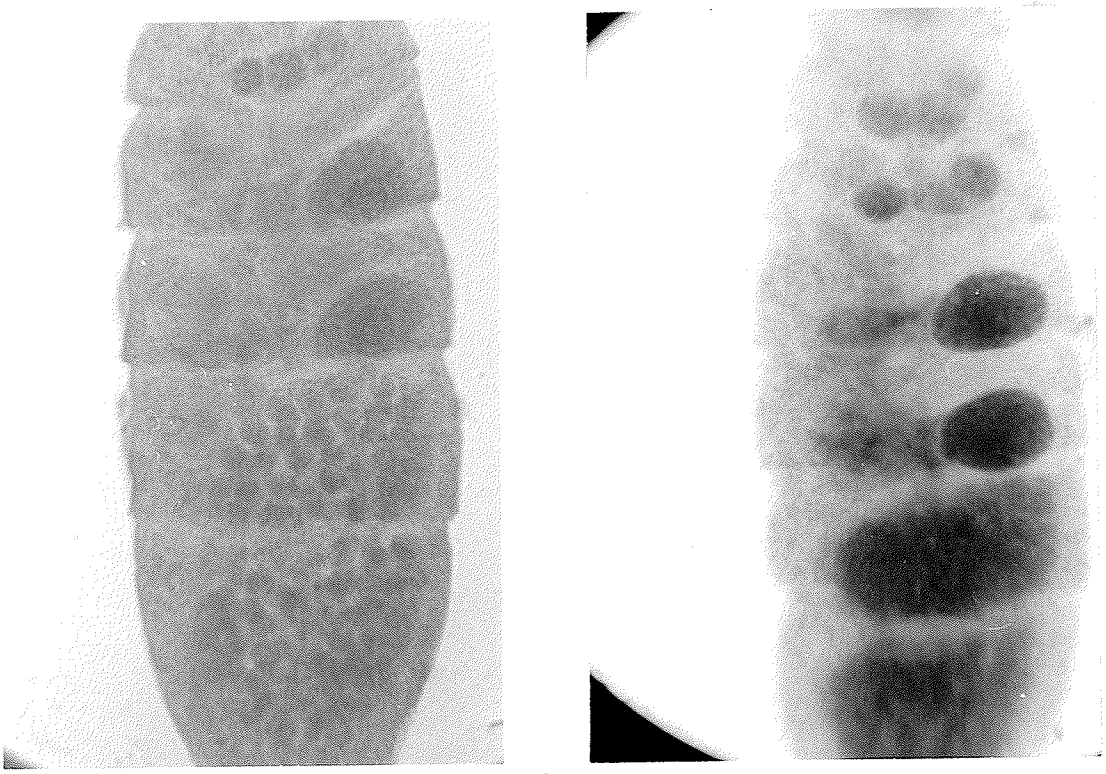
C

PLATE XIV

Hymenolepis oligoproglottina



Hymenolepis oligoproglottina



H.oligoproglottina Mature and gravid segments
Ventral view

This cestode has been assigned to the family Hymenolepididae because of its few testes, the large cirrus pouch, the accessory sac, the compact ovary and yolk gland. It has been referred to the genus Hymenolepis because of its three testes. The aporal position of the ovary, its minute size, and the peculiar arrangement of the seminal receptacle justify placing it into a new species. The only other small cestode with aporad ovary, Hymenolepis curiosa(Szpotanska 1931) Hughes 1940, has been recorded from anseriform birds in Australia, while the present form was recorded from a charadriiform bird. The specific name refers to the very small number of segments in the strobila.

Hymenolepis compressa (Linton 1892) Kowalewski 1904

(Plates XV, XVI)

An examination of two Pintail ducks at Whitewater Lake in the summer of 1950 and a Mallard from the Netley marshes in the late fall of 1953 yielded this species of cestode from the duodenum and small intestine of the host animals. The largest strobila measured 20 x 0.45mm. The scolex was from 224u to 270u in diameter. The rostellum carried ten hooks, from 45.8 to 51.5u long. The three testes, one poral, two antiporal, almost filled the dorsal portion of the mature proglottis. The cirrus pouch, 225 x 48u, passed diagonally forward from the right margin, extending to the midline of the segment. The internal seminal vesicle within the cirrus pouch was constricted so as to divide into two portions. The external seminal vesicle lay parallel to the cirrus pouch and dorsal to it. The ovary was centrally located and much lobed when fully developed. The seminal receptacle was medially located, ventral to the ovary.

PLATE XV

Hymenolepis compressa

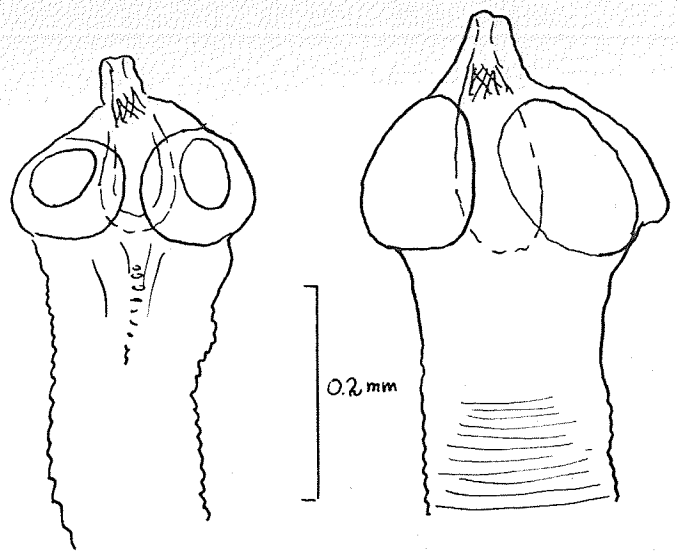
Fig. A. Holdfasts

Fig. B. Rostellum hooks

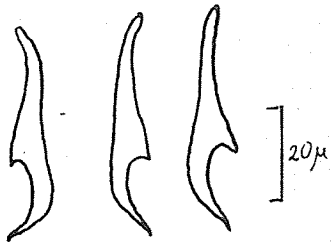
Fig. C. Immature segment

Fig. D. Developing ovary

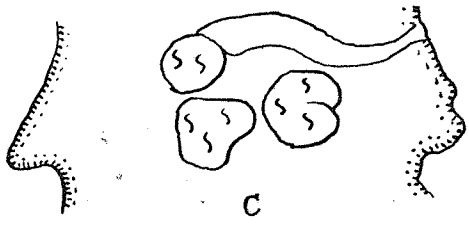
Figure E. Mature ovary



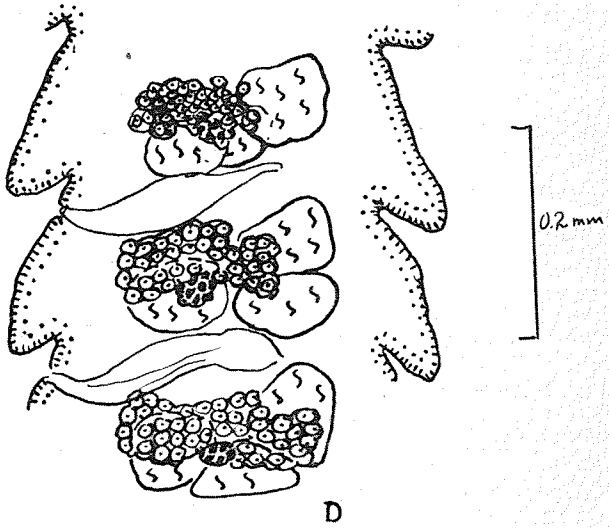
A



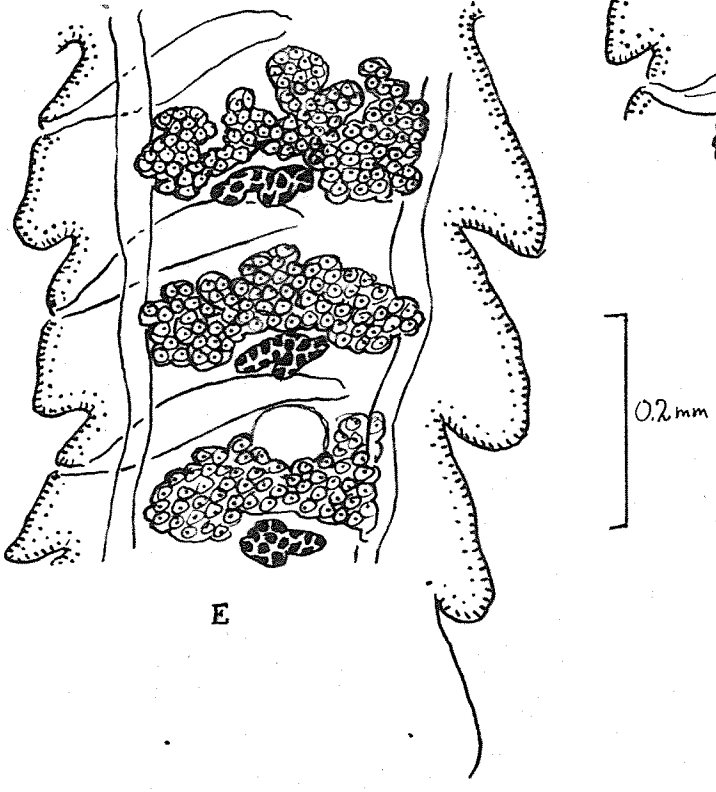
B



C



D

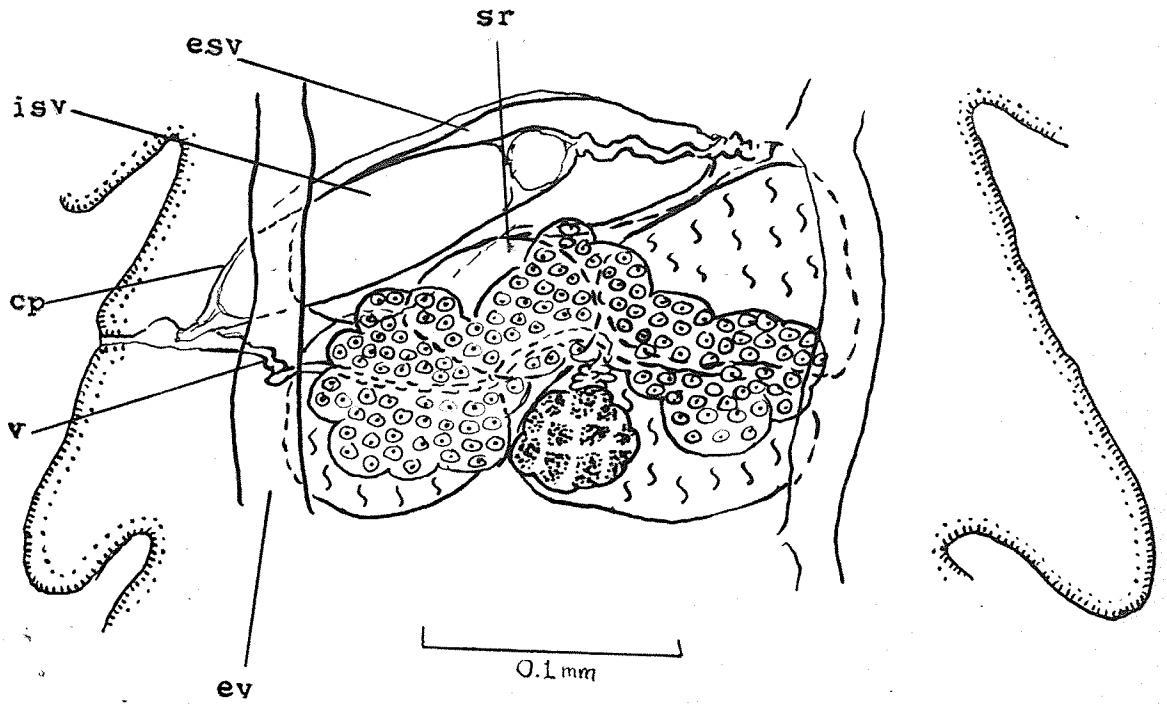


E

PLATE XVI

Hymenolepis compressa

Fig. A. Mature segment



A

Hymenolepis species

(Plate XVII)

In the small intestine of a Pintail from Cape Tatnam several immature cestodes were found that could not be fully classified. Two scolices with a diameter of 553u were found. The large powerful suckers measured 248u across, and the relatively small rostellum was armed with eight hooks. The hooks were 48.2u long. A search of the literature revealed the resemblance of the armature to that described for Hymenolepis innominata Meggitt 1927, but since that tapeworm was recorded from Recurvirostra avosetta, a charadriiform bird in Egypt, it is not likely that this is the same species.

.....

Another holdfast type was also recorded from the above host. The scolex measured 639.9u in diameter, with suckers 299.7u across. A small unarmed rostellum was present. The scolex had the appearance of an inverted pyramid, tapering off markedly to the relatively narrow strobila. The pouch at the base of the rostellum was quite large and contained a considerable aggregation of deeply staining nuclei, suggesting a glandular function. The whole aspect of the holdfast was chunky and angular, with very powerful suckers. The portion of the strobila attached to the scolex did not show any internal structure whatever. From this description the organism cannot be assigned with certainty to any one family in the Order Cyclophyllidea. Since two other cestode species were found in the host animal together with this one, strobila fragments could not be identified with certainty

PLATE XVII

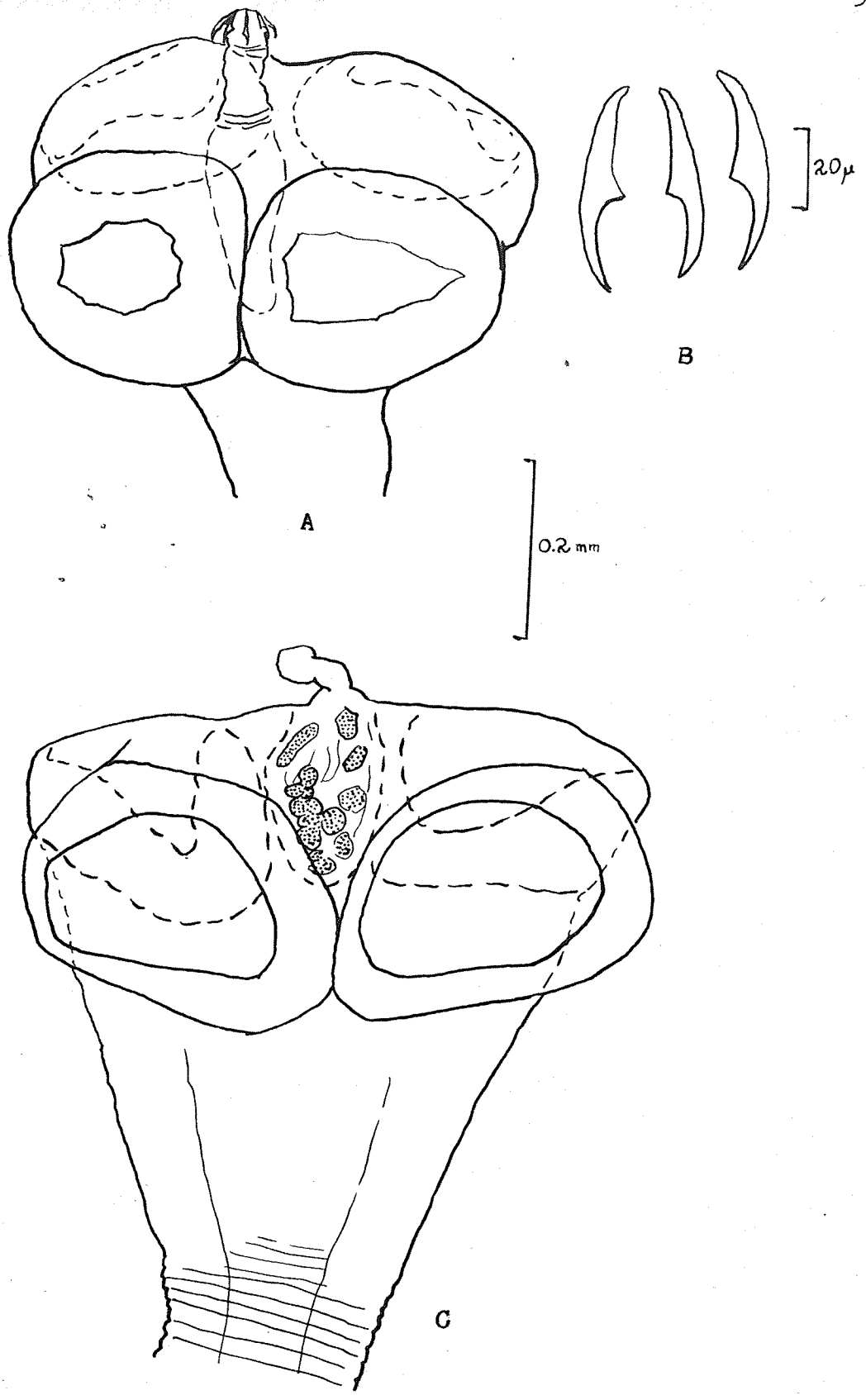
Hymenolepis species

Fig. A. Holdfast

Fig. B. Rostellar hooks

Unidentified Cyclophyllidean

Fig. C. Holdfast


20μ
B
A
0.2 mm
C

as belonging to this unknown species. (see Plate XVII C)

Hymenolepis species

(Plates XVIII, XIX)

This small helminth was found in large numbers in the intestinal ceca of a Mallard at Whitewater Lake in 1950. The strobila measured from 1.2 to 2 mm in length, and 211.5u in width. The rostellum, which measured 234.9u when fully extended, was armed with ten hooks measuring 25.4u in length. The width of the scolex was 169u, the width of the suckers 85.5u. Both external and internal seminal vesicles were present. The cirrus pouch was 80u long, and reached to or just beyond the midline of the proglottis. The testes, measuring 19.8u, were positioned in an inverted triangle, with the median testis more posteriad than the two lateral testes. The seminal receptacle was median and ventral in position. The uterus was horse-shoe shaped, with the remains of the seminal receptacle occupying the center of the horse-shoe. The mature ovary had a transverse diameter of 93.6u. This cestode has hooks that resemble those of Hymenolepis abortiva, but whereas this animal has hooks 25.4u long, H.abortiva is armed with hooks 33-36u long.

Hymenolepis abortiva (v.Linstow)1904) v.Linstow 1905

(Plates XX, XXI)

Several Lesser Scaup ducks were examined at Whitewater Lake in 1950 and a small tapeworm tentatively identified as H. abortiva was isolated from the duodenum and small intestine of the birds.

PLATE XVIII

Hymenolepis species

Fig. A. Complete strobila

Fig. B. Rostellar hooks

Fig. C. Segments with matures testes

Fig. D. Segment with mature ovary

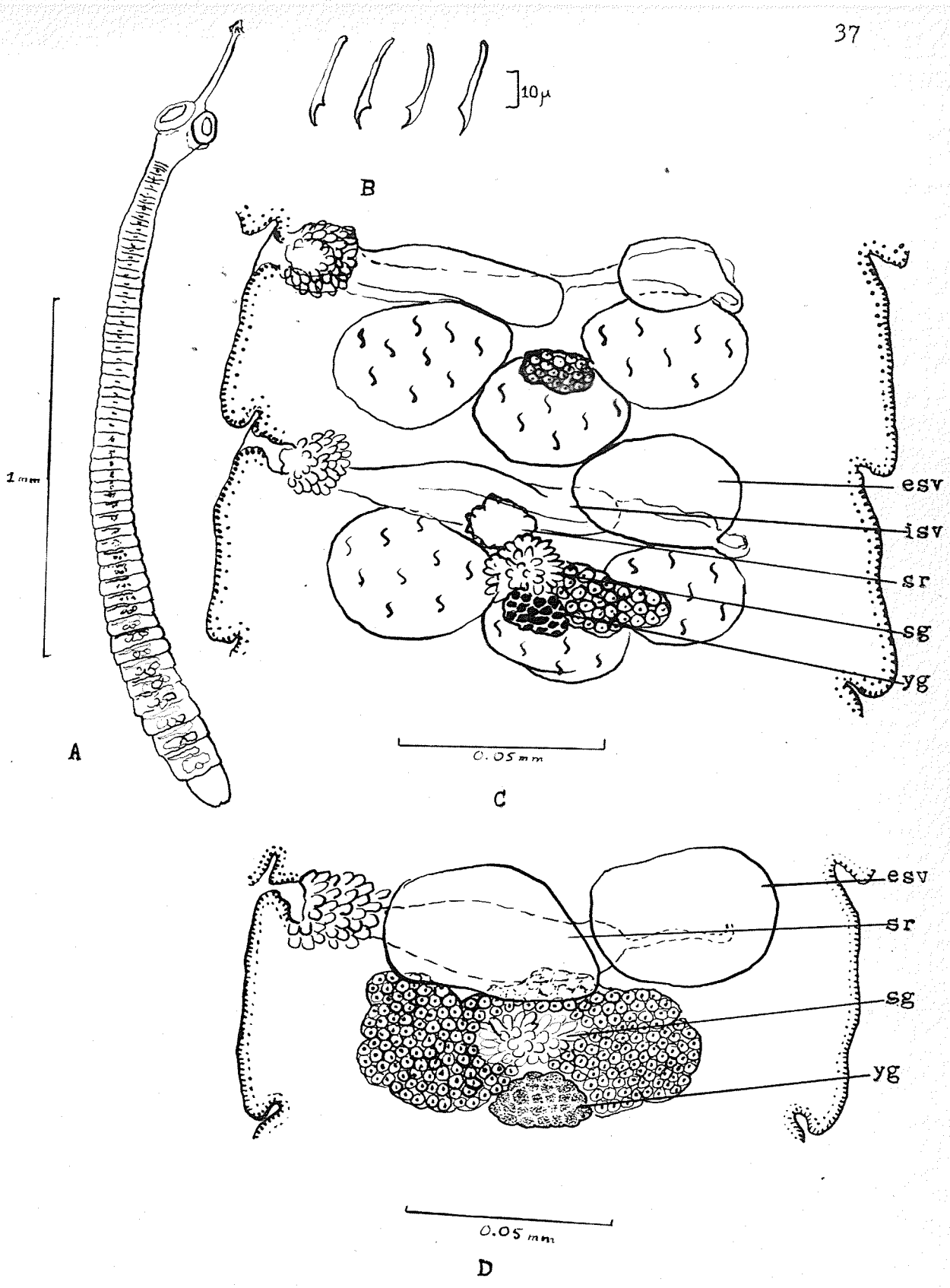

10μ
B
1mm
esv
isv
sr
sg
yg
A
0.05mm
C
esv
sr
sg
yg
0.05mm
D

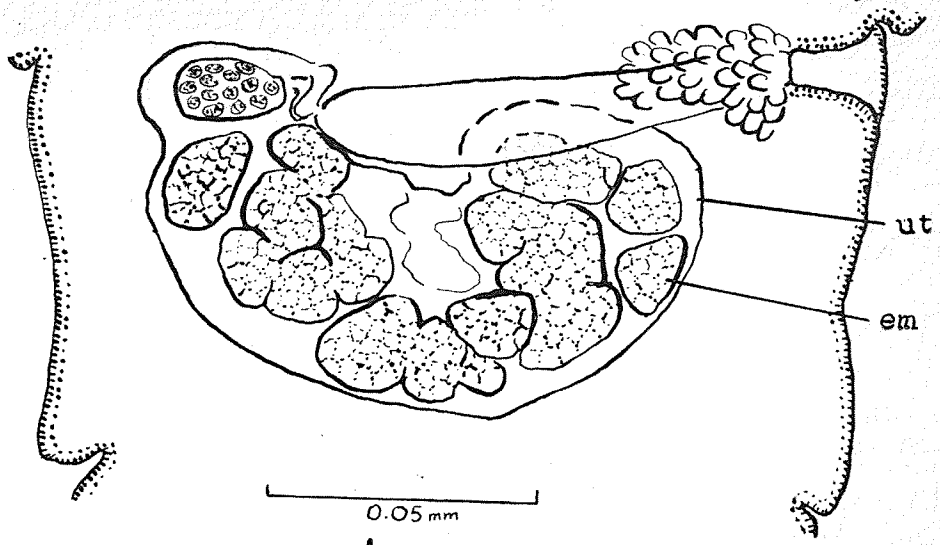
PLATE XIX

Hymenolepis species

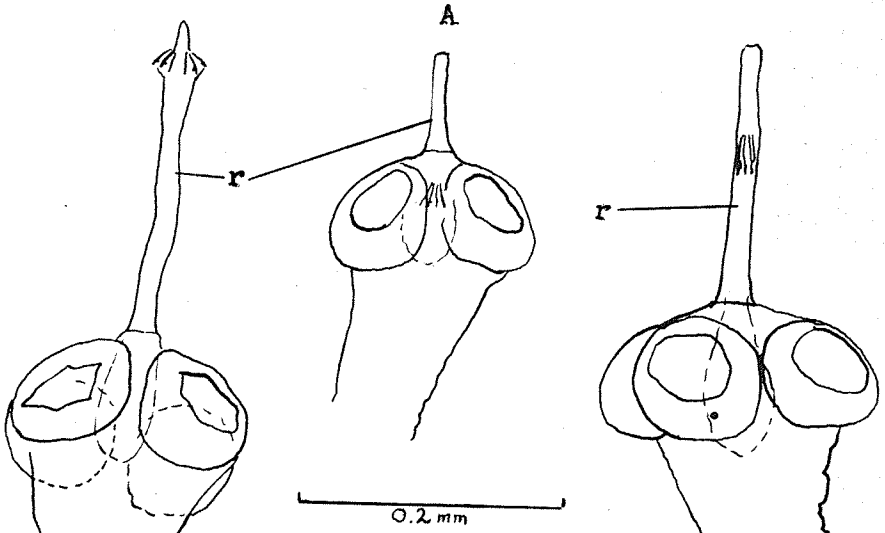
Fig. A. Gravid segment

Fig. B. Holdfasts with various degrees of rostellum extension

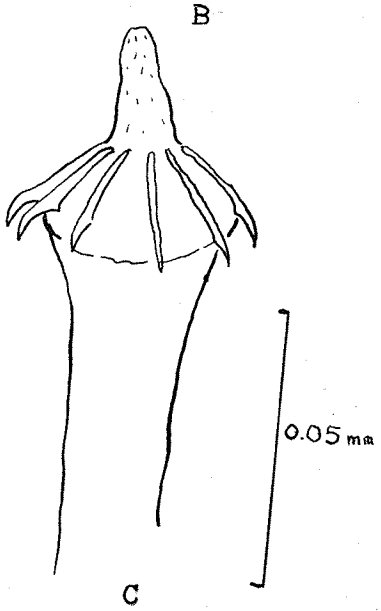
Fig. C. Detail of fully everted rostellum



A



B



C

The statistical data concerning this species as found in the present material is compared below with that given for the cestode in Hughes(1941) placed in parentheses. Strobila dimensions 5 x 0.3 mm (2.7 x 0.3mm); holdfast diameter 188u (220u); length of rostellum 180u (280u); ten (10) hooks, length 41.6u (36u); testes an inverted triangle(triangular); cirrus pouch one half to two thirds of proglottis width (two thirds); cirrus armed (armed); ovary two-lobed (two rounded lobes); yolk gland ovoid (globose); uterus U-shaped (inverted U-shape). In some of the present material the uterus may be a transverse sac. One discrepancy that is serious is that the hook shape in the present form is considerably different from that figured in Hughes. In the present form the blade of the hook is about two thirds the length of the handle. In Hughes the blade is no more than one third the length of the handle.

Hymenolepis species

(Plates XXII, XXIII)

Together with the species just described above, another small Hymenolepid was found . The length of the strobila was 1.6 mm and its maximum width 0.28 mm. The width of the holdfast was 136.4u and that of the suckers 48u. The rostellum was armed with ten fine sliver-like hooks 17u long. In contrast to the linear proglottids of of H.abortiva this species has rectangular segments that become square as they become gravid. The whole strobila consisted of approximately fourteen segments. A mature proglottis measured 279.9u wide and 142.2u long. The egg measured 27.2u andcthe embryo 16.4u. The cirrus pouch reached

PLATE XX

Hymenolepis abortiva

Fig. A. complete strobila

Fig. B. Holdfasts with rostellum in various stages of extension.

Fig. C. Rostellar hooks

Fig. D. Segments with mature ovary

Fig. E. Detail of everted cirrus

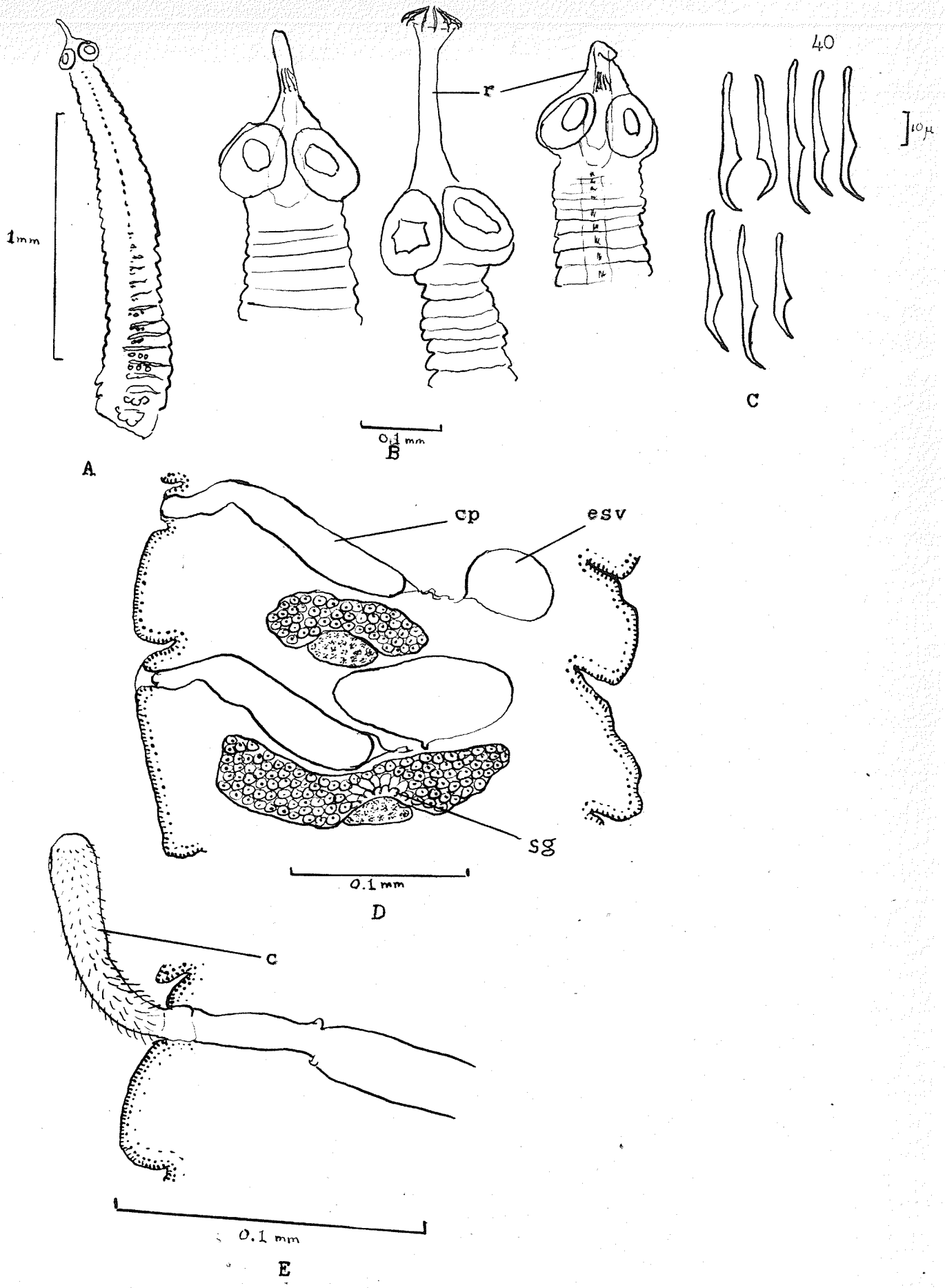
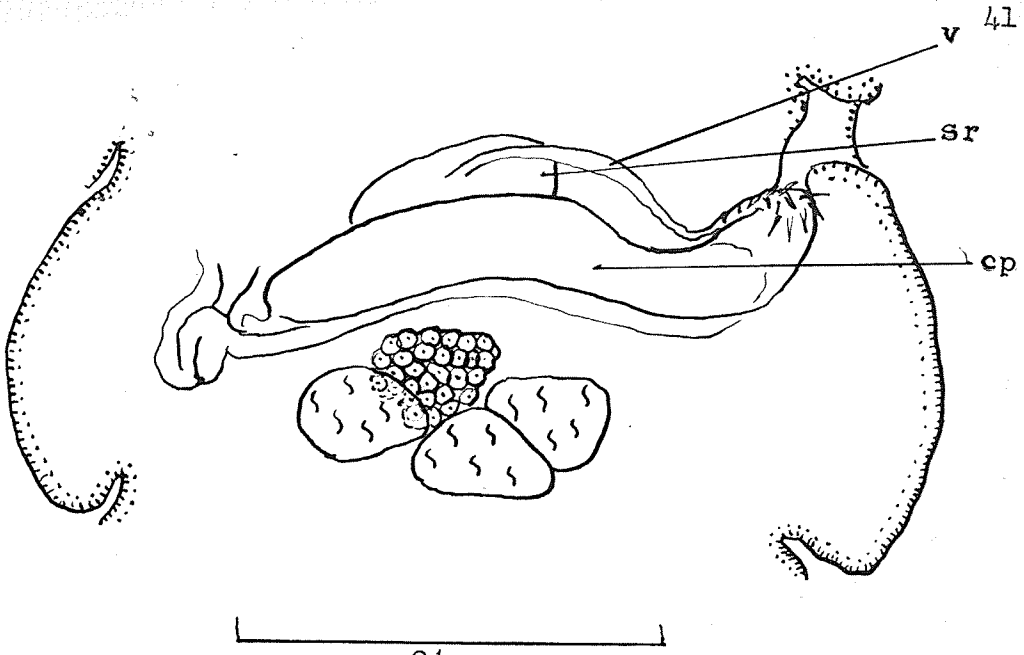

1mm
A
r
0.1 mm
B
40
10μ
C
cp
esv
sg
0.1 mm
D
c
0.1 mm
E

PLATE XXI

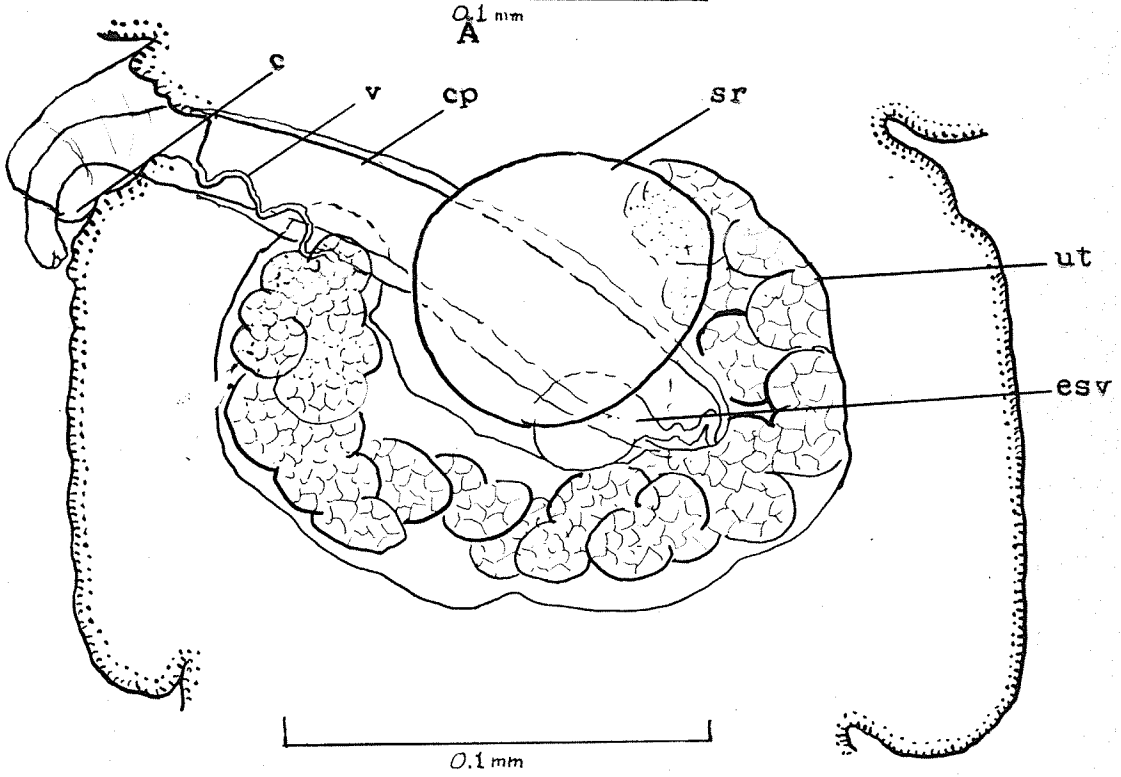
Hymenolepis abortiva

Fig. A. Segment showing testes arrangement

Fig. B. Gravid segment



A



B

just beyond the midline of the segment. A long convoluted vagina passed across the proglottis to the seminal receptacle which occupied a position to the aporal side of the segment anterior to the ovary and ventral to the cirrus pouch. A small seminal vesicle occupied the central portion of the segment. The ovary was bilobed and the yolk gland potato-shaped.

Hymenolepis species

(Plate XXIV)

A few large strobila fragments, without scolex, were also isolated from a Lesser Scaup duck at Whitewater lake, but could not be positively identified as to species. Figures depicting internal structure and giving an idea of the size are shown in the Plate. The excretory vessels were particularly prominent in this species.

Genus Diorchis Clerc, 1903

Diorchis americana Ransom 1909

(Plates XXV, XXVI)

Several immature strobilae, much contracted, were found in the lower large intestine and intestinal ceca of a Mallard at Cape Tatnam. The material was too fragmentary to allow measurement of strobila length. The scolex was 321u wide, the suckers 167u wide, and the rostellum 84.8u in diameter. The ten hooks measured from 67.6 to 69u. Although the testes could be seen in some portions of the strobila, no measurements were taken. The contracted state of the material made observation difficult.

PLATE XXII

Hymenolepis species

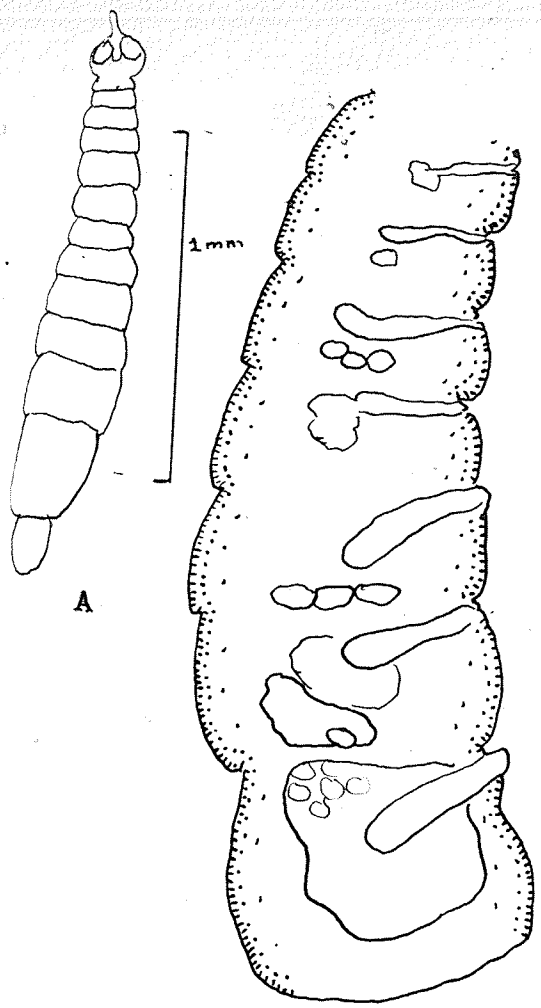
Fig. A. Complete strobila

Fig. B. Posterior portion of strobila

Fig. C. Holdfast

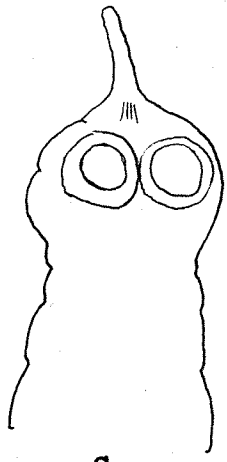
Fig. D. Rostellar hooks

Fig. E. Segment with mature testes

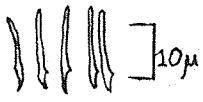


A

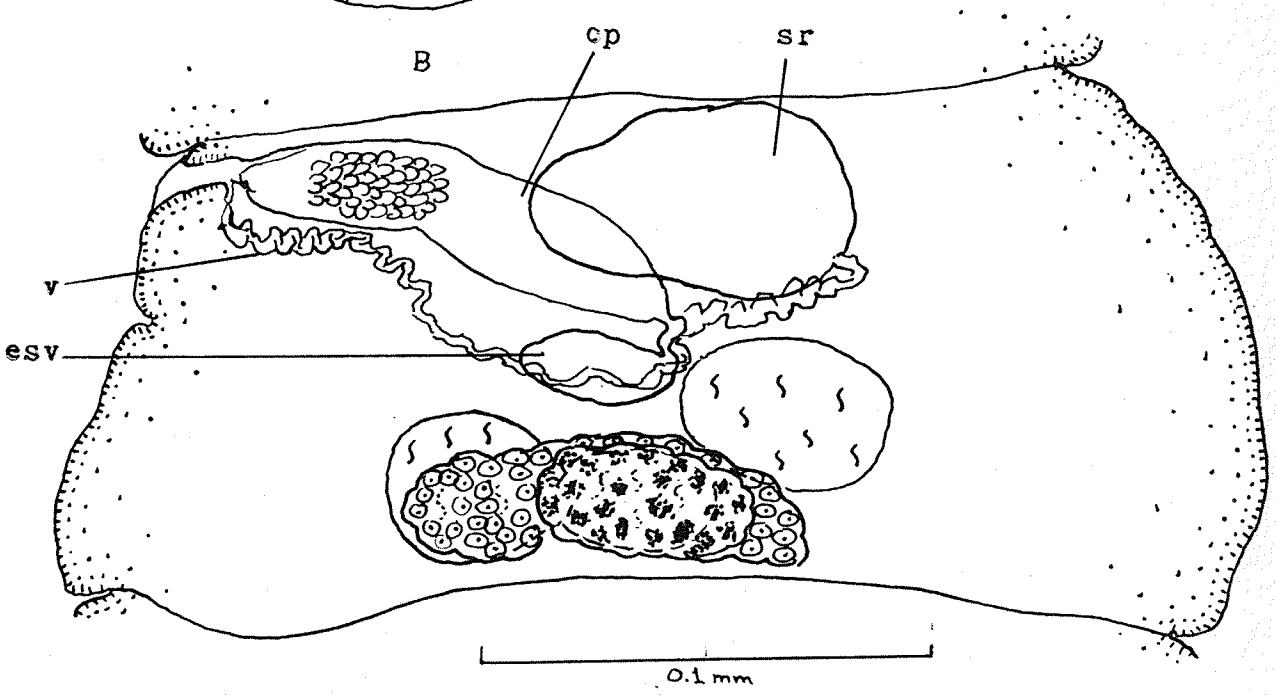
B



C



D



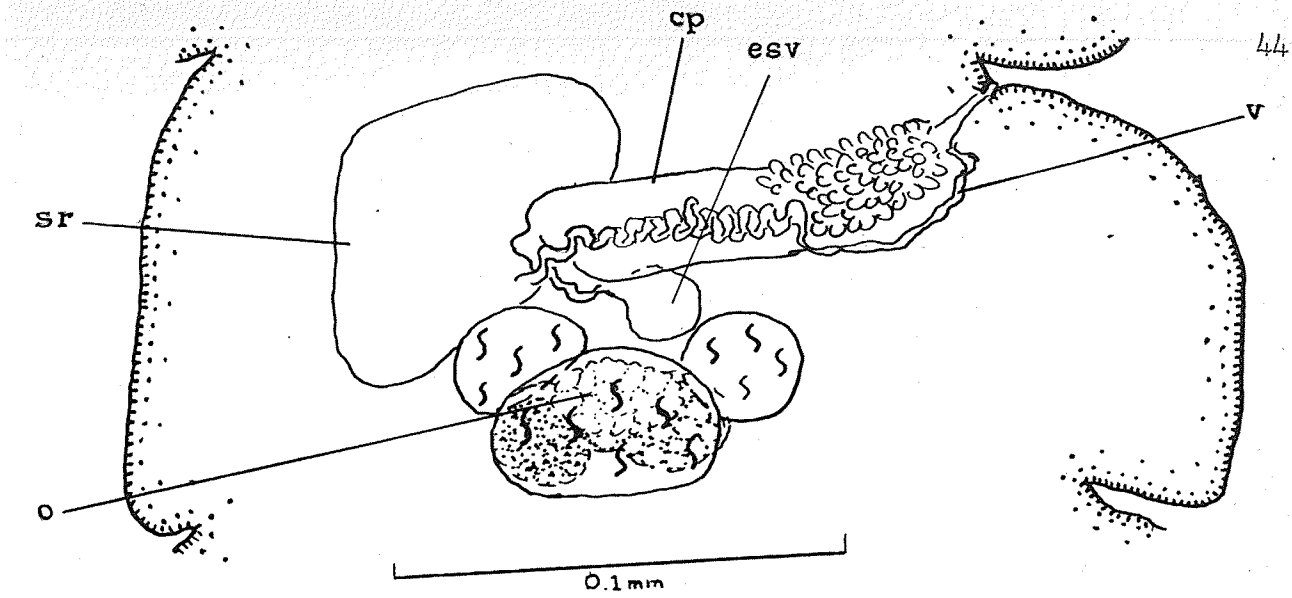
E

PLATE XXIII

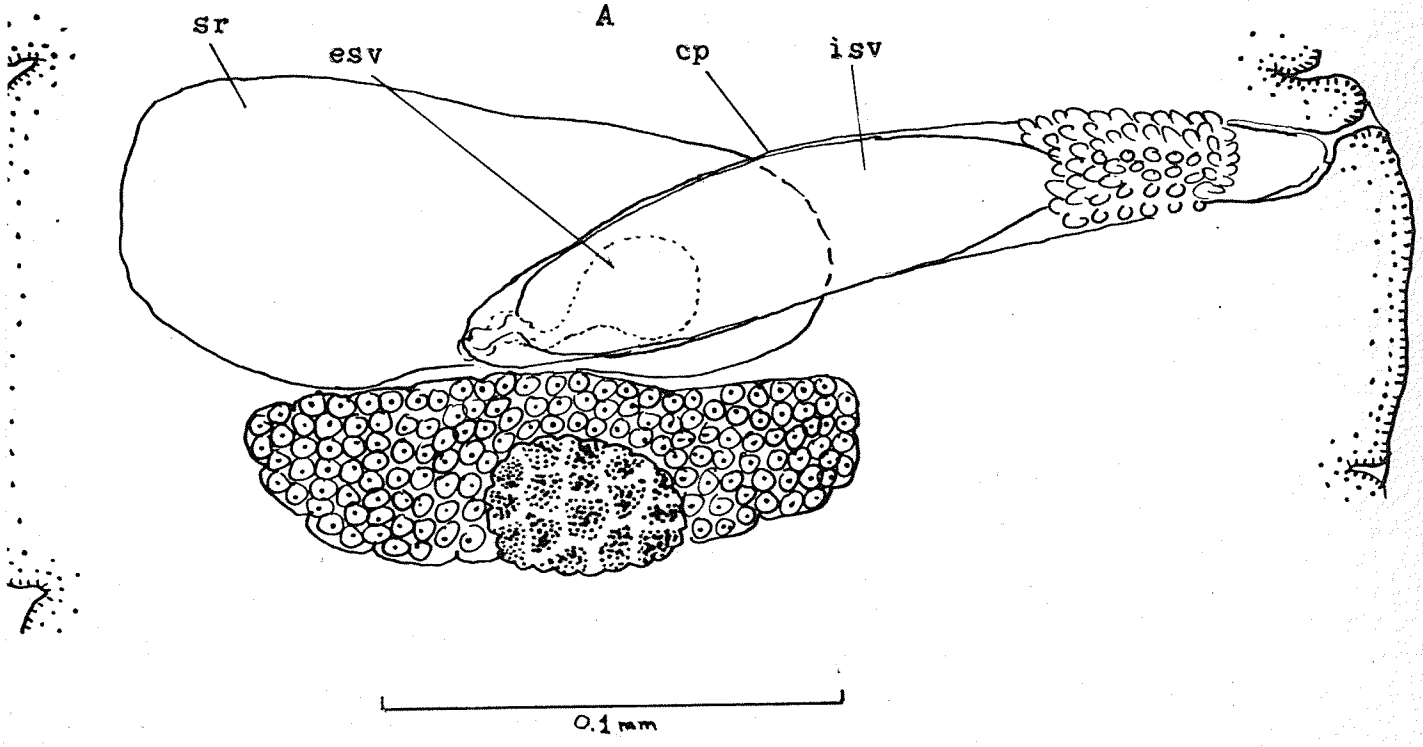
Hymenolepis species

Fig. A. Segment with mature testes, dorsal view

Fig. B. Segment with mature ovary, dorsal view



A



B

PLATE XXIV

Hymenolepis species

Fig. A. Immature strobila fragments

Fig. B. Testes arrangement

Fig. C. Immature ovary

Fig. D. Maturing ovary

Fig. E. Immature uterus

Fig. F. Gravid uterus

Fig. G. Detail of genitalia

Fig. H. Detail of cirrus pouch

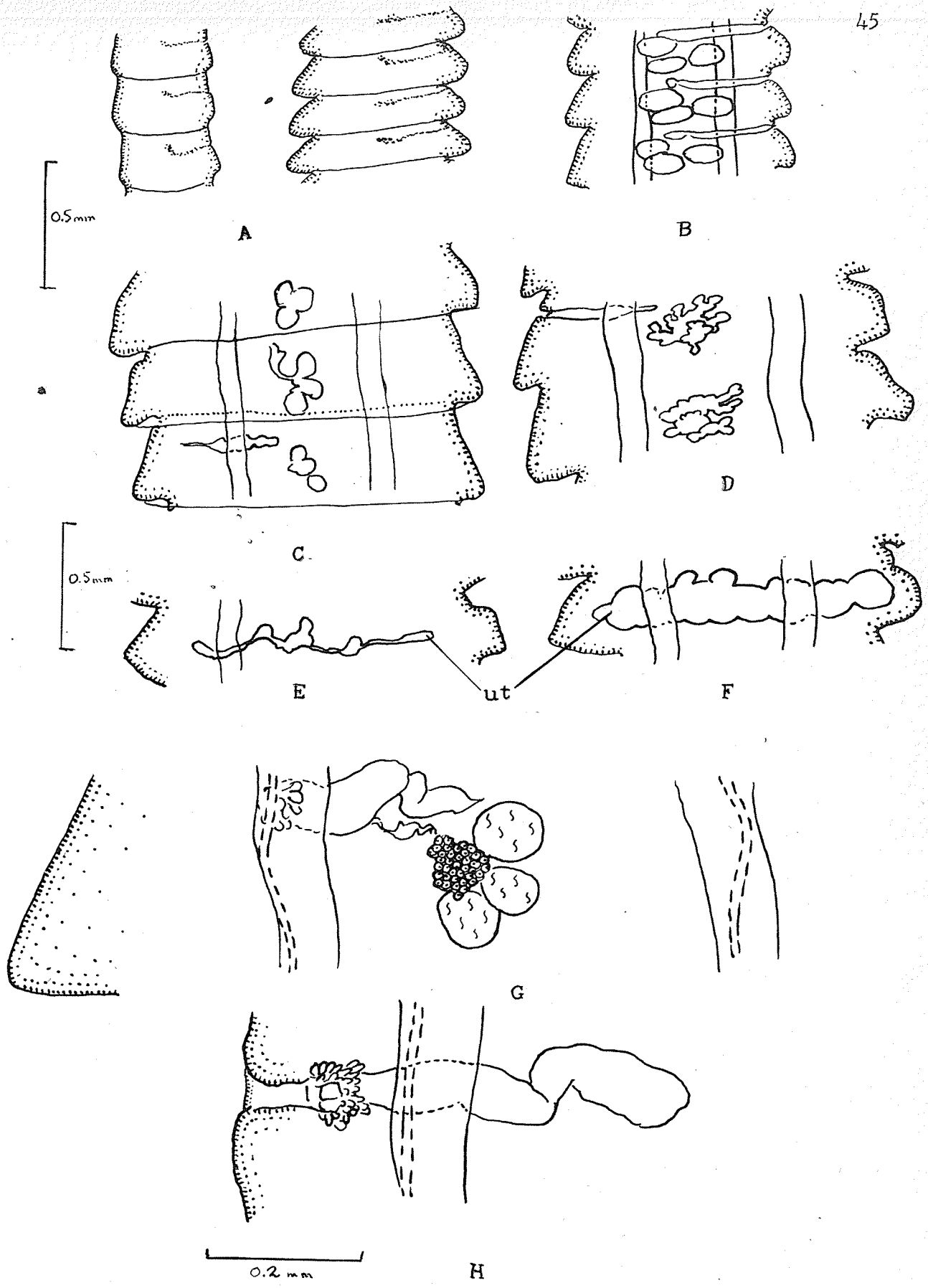
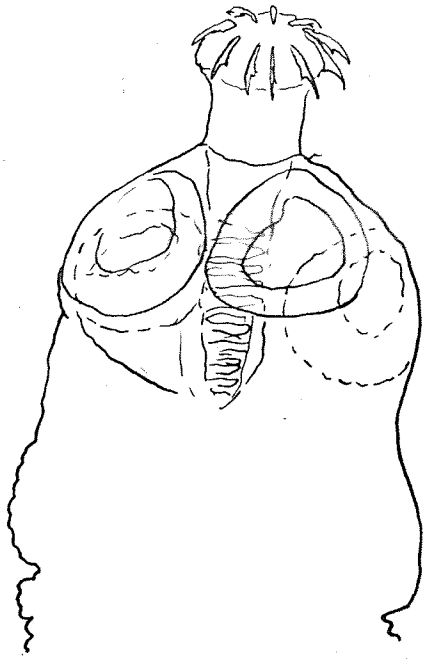

0.5mm
A
B
C
D
0.5mm
E
ut
F
G
0.2 mm
H

PLATE XXV

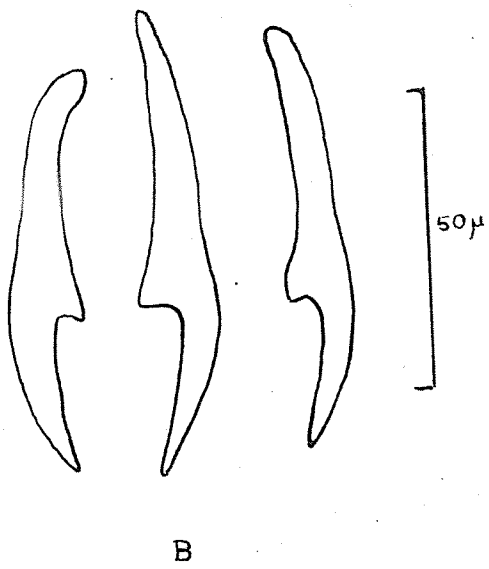
Diorchis americana

Fig. A. Holdfast

Fig. B. Rostellar hooks



A



B

Diorchis wigginsi Schultz 1940

(Plate XXVI)

This tapeworm was found in the small intestine of a Lesser Scaup duck at Whitewater Lake in 1950. No completely mature strobila was found. One cestode measured had a body 41 mm long and 0.8 mm wide. The proglottids were linear in shape, much wider than long. The ventral excretory vessel measured 38u in diameter and the dorsal vessel about seven microns. The cirrus pouch reached nearly to the midline of the proglottid. The ovary was three-lobed. The holdfast measured two hundred and seven microns in diameter; the suckers were 108u wide, and were armed with rows of spines along the margin; the hooks, ten in number, were 25.4u long.

Genus Aploparaksis Clerc 1903

Aploparaksis species

(Plates XXVII, XXVIII)

This tapeworm was recovered on two separate occasions in Pintail ducks at Whitewater Lake, 1950. No material showing a gravid uterus was found. The parasites were found in the large intestine and cloaca of the birds, although one very young form, not yet showing proglottidization, was found in the small intestine of the host. The largest whole helminth measured 12 x 0.6mm. Scolex measured from a minimum of 290u in diameter when the rostellum was fully extended, to a maximum of 364u. Sucker measurements ranged from 126u to 153u in diameter. A fully extended rostellum was 243u long and 135u wide. In every case in which the rostellum was everted the hooks had been lost. There were ten hooks, ranging from 37 - 39.6u in length.

PLATE XXVI

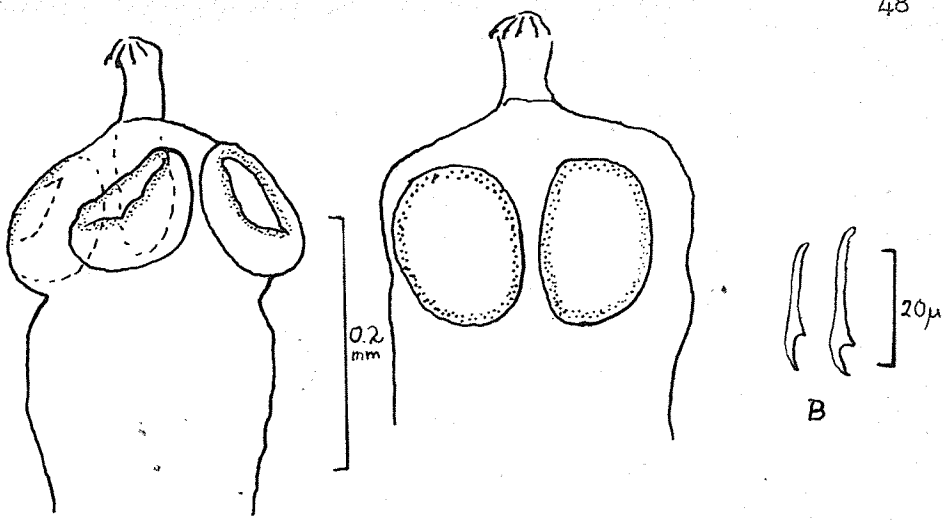
Diorchis wigginsi

Fig. A. Holdfasts

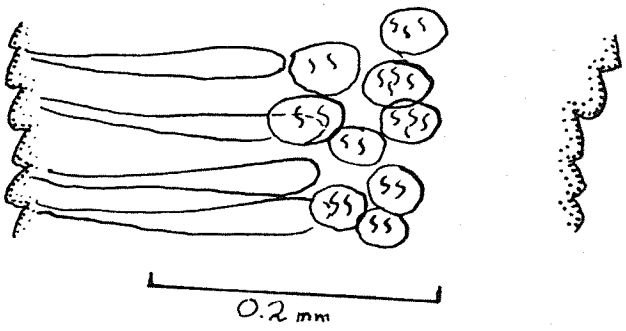
Fig. B. Rostellar hooks

Fig. C. Immature strobila

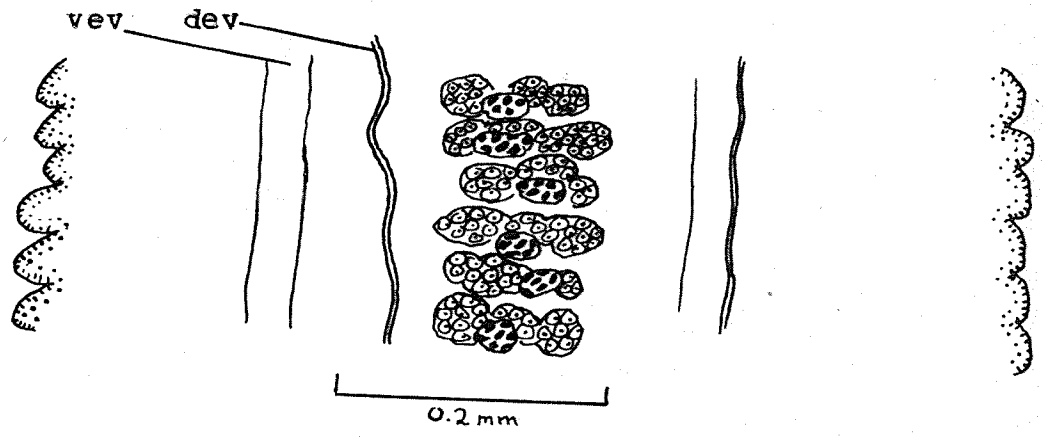
Fig. D. Strobila with three-lobed ovary



A B



C



D

PLATE XXVII

Aploparaksis species

Fig. A. Holdfast

Fig. B. Immature strobila

Fig. C. Mature ovary

Fig. D. Detail of genitalia

Fig. E. Immature individual

Fig. F. Testes and cirrus pouch

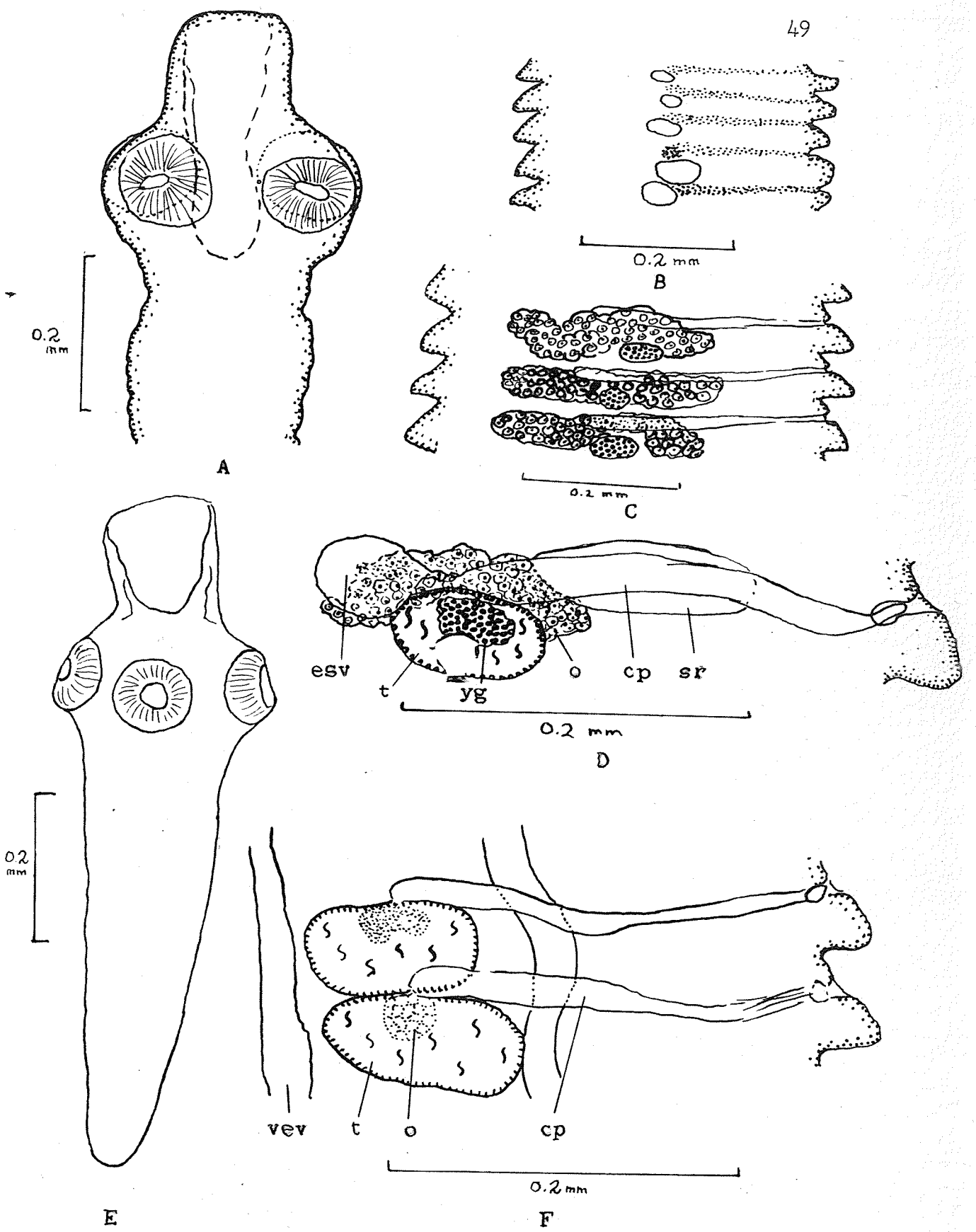

0.2 mm
A
0.2 mm
B
0.2 mm
C
esv
t
yg
o
cp
sr
0.2 mm
D
0.2 mm
E
vev
t
o
cp
0.2 mm
F

PLATE XXVIII

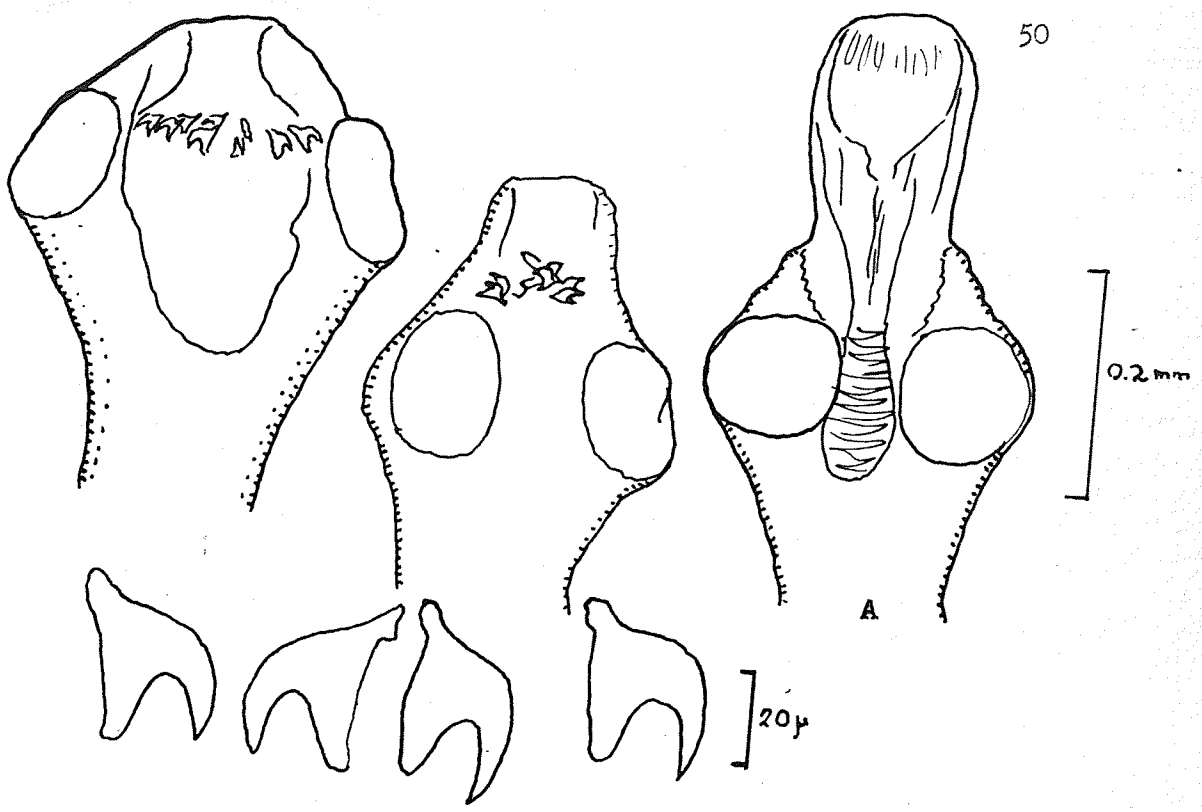
Aploparaksis species

Fig. A. Holdfasts with retracted and extended rostellum

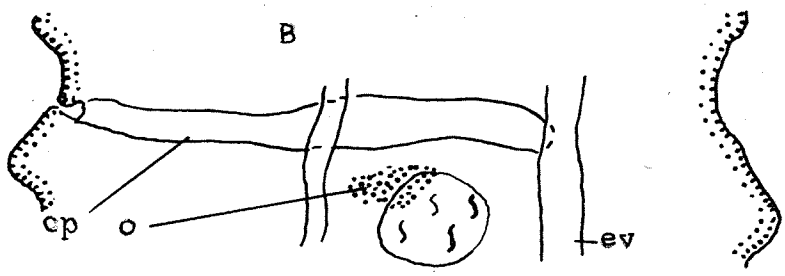
Fig. B. Rostellar hooks

Fig. C. Testis and cirrus pouch

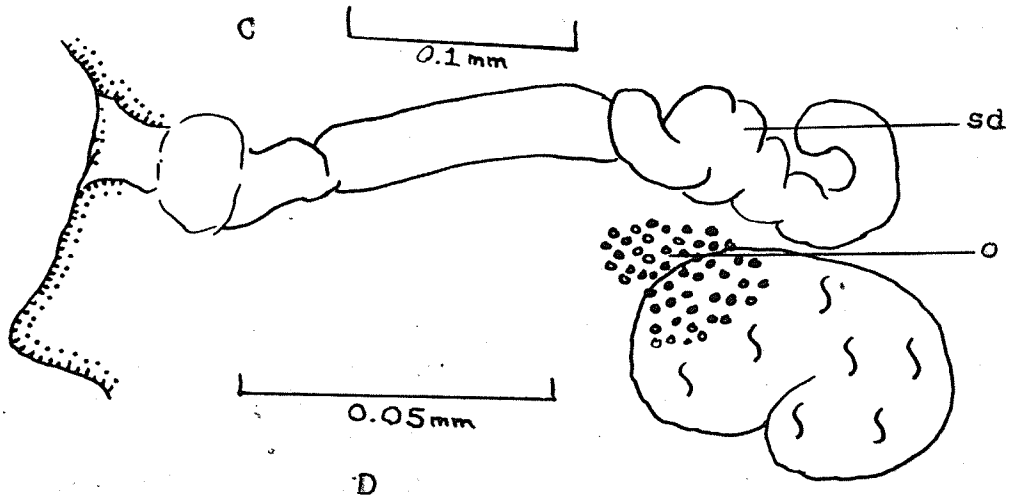
Fig. D. Detail of immature cirrus pouch



B



C



D

A mature testis measured 119 x 56u, the bilobed ovary was 153u in its transverse diameter. The yolk gland was spherical to ovoid. The cirru s pouch was 331u long. The diameter of the excretory vessel was 12u.

Aploparaksis species

(Plates XXIX, XXX)

Several examples of a second Aploparaksis species were found in the lower large intestine and intestinal ceca of several Pintail ducks from Cape Tatnam. All examples in which the rostellum was extended had lost their hooks. The ten hooks measured from 61.4u to 67u in thosexspecimens in which the rostellum was withdrawn. The holdfast width varied from 249 to 302u. Sucker dimensions were 167 x 122u. The cirrus pouch extended to just beyond the poral excretory vessel. The diameter of the excretory vessels fluctuated greatly at different levels of the strobila, but the ventral vessel was considerably wider than the dorsal vessel.

Subfamily Fimbriariinae Wolffhügel 1899, emend. Webster 1943

Fimbriaria fasciolaris Pallas 1781

(Plate XXXI)

This parasite was always located in the duodenum of an infected host, and was found in a Pintail and two Lesser Scaup ducks at Whitewater Lake, in a Pintail at Cape Tatnam, and in a Red-breasted Merganser on the lower Hayes river. In the Pintail from Whitewater Lake, the cestode was large, measuring more than 40mm in length and about 1.8mm in width. In all other instances, for each of the hosts

PLATE XXIX

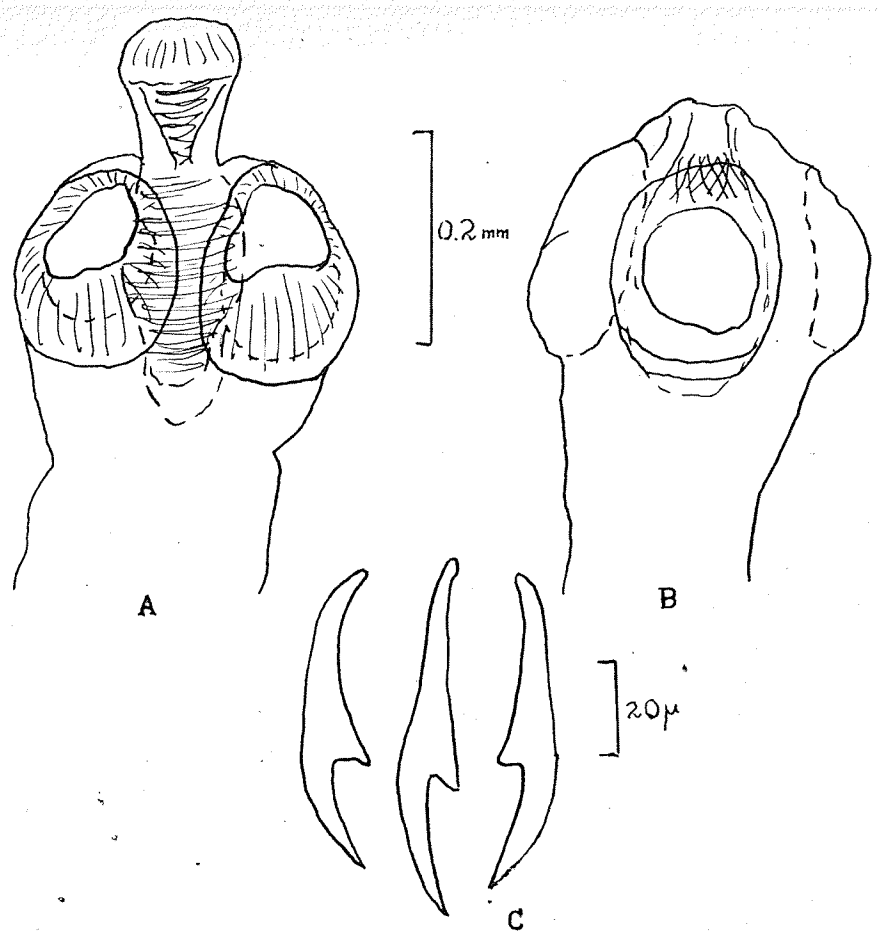
Aploparaksis species

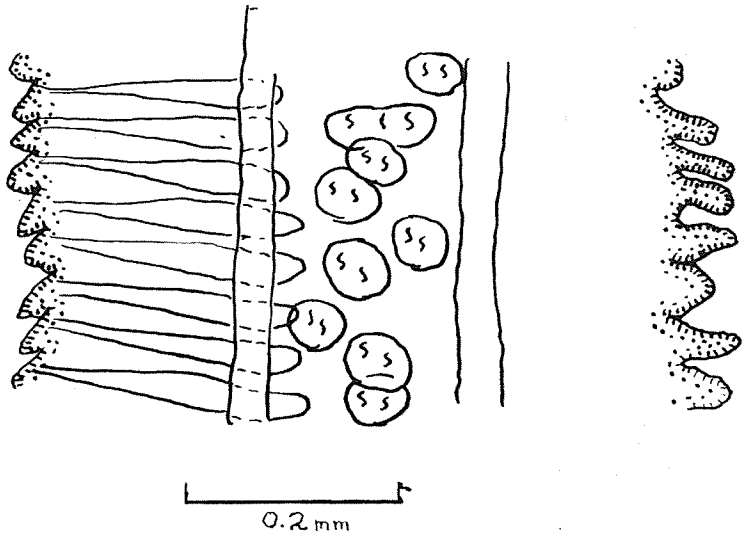
Fig. A. Holdfast with extended rostellum, hooks lost

Fig. B Holdfast with retracted holdfast

Fig. C. Rostellar hooks

Fig. D. Immature segments





D

PLATE XXX

Aploparaksis species

Fig. A. Holdfast, rostellum retracted

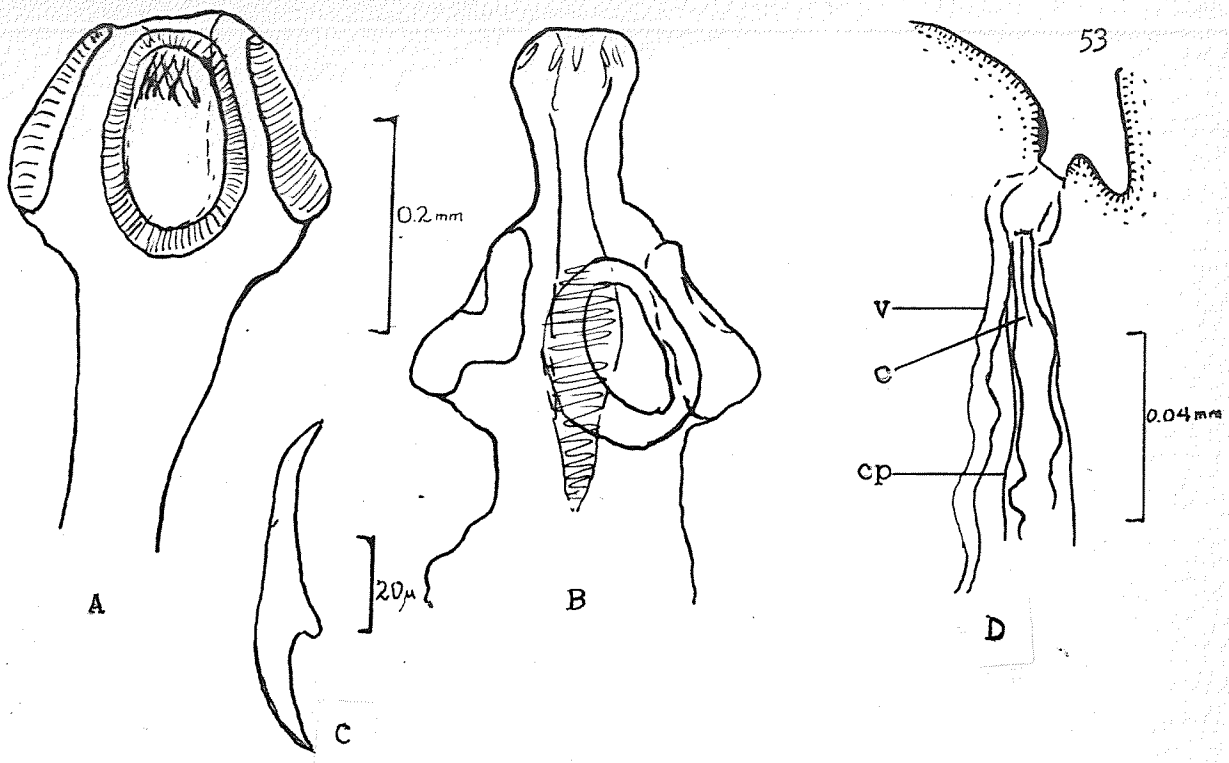
Fig. B. Holdfast, rostellum everted; hooks lost

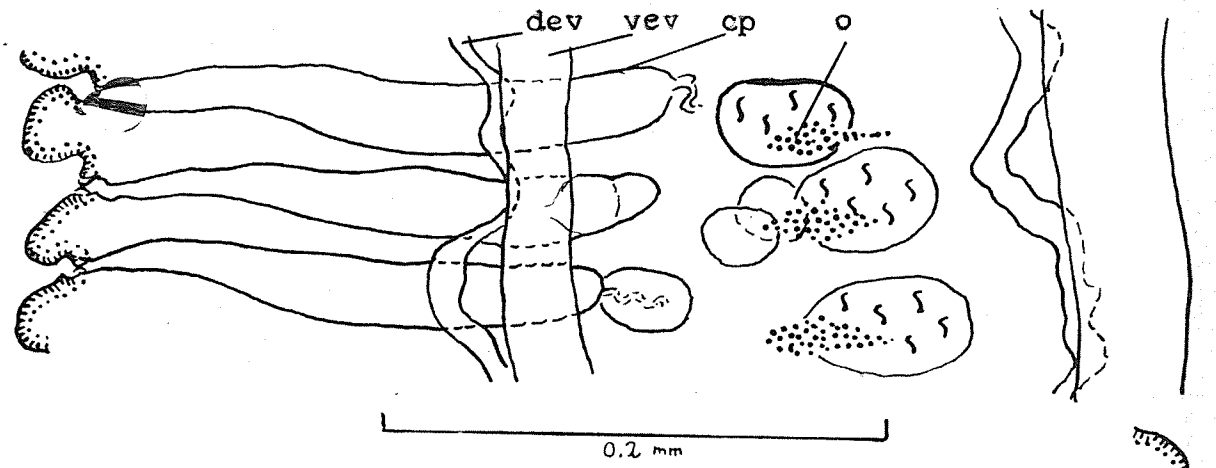
Fig. C. Rostellar hook

Fig. D. Detail of genital aperture

Fig. E. Testes and cirrus pouch

Fig. F. Three-lobed ovary


0.2 mm
20μ
A
B
C
v
c
cp
0.04 mm
D


dev
vev
cp
o
0.2 mm
E

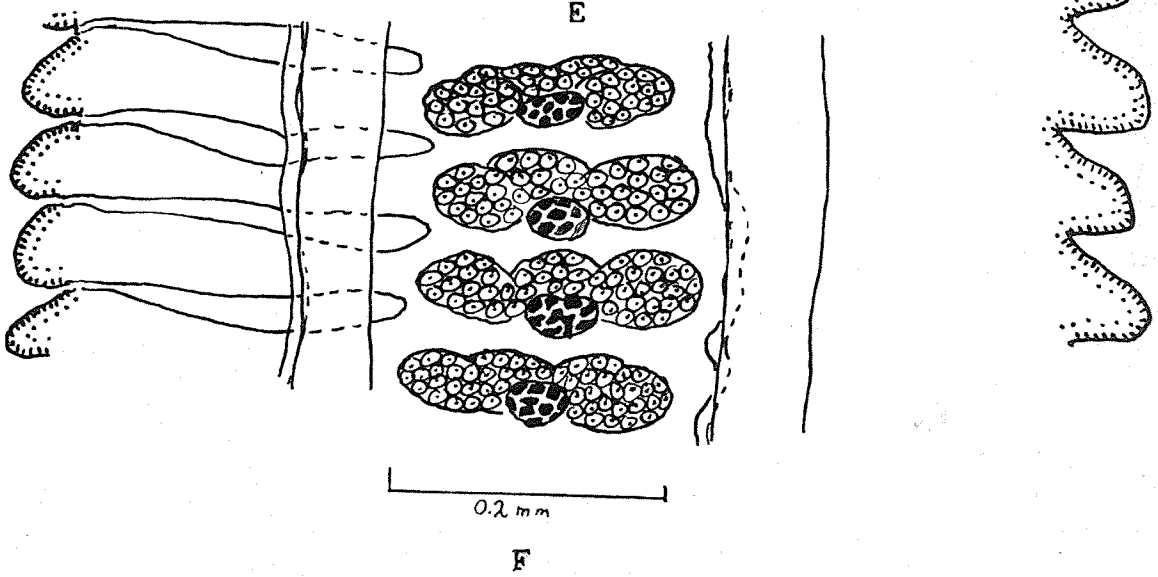

0.2 mm
F

PLATE XXXI

Fimbriaria fasciolaris

Fig. A. Specimen from Lesser Scaup Duck

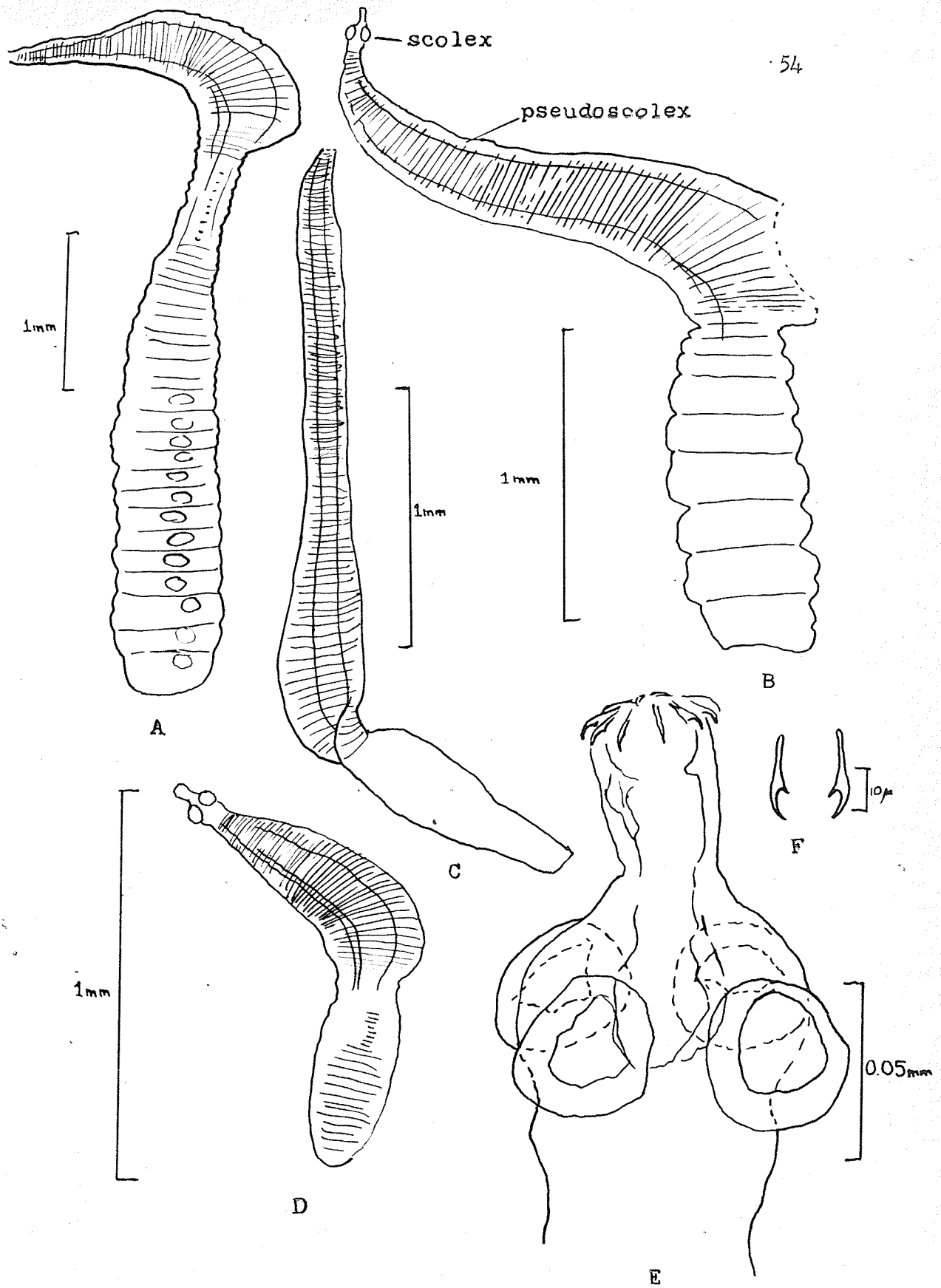
Fig. B. Specimen from Lesser Scaup duck

Fig. C. Specimen from Red-breasted Merganser

Fig. D. Specimen from Lesser Scaup duck

Fig. E. Scolex of specimen in fig. B.

Fig. F. Rostellar hooks


scolex
pseudoscolex
1mm
1mm
1mm
A
B
C
D
E
F
1mm
10μ
0.05mm

studied, the helminths were small, no more than 2mm long. Examples of the various forms are figured in the plate. The true scolex was also drawn and the 10 hooks of the rostellum drawn and measured. The length of the hooks was 20.6u.

FAMILY DILEPIDIDAE Railliet and Henry 19091 emend. Lincicome 1939

Subfamily Dilepidinae Fuhrmann 1907

Genus Paricterotaenia Fuhrmann 1932

Paricterotaenia species

Many fragments in all stages of development, but only a single holdfast, were obtained from the intestine of a Lesser Yellowlegs sandpiper at Whitewater Lake. One strobila measured 61 x 0.8mm. Immature proglottids are more wide than long, but the length increases relative to the length as the segment matures, until in gravid segments length exceeds width. The holdfast, 243u in diameter, bears four suckers measuring 117u across, and has a rostellum armed with about 16 hooks 16u in length. The genital apertures alternate irregularly. The ventral excretory vessels are broad, 34.2u in diameter. The highly branched ovary and the yolk gland are both anterior to the testes, which number approximately 21 to 28. The cirrus pouch reaches just beyond the poral excretory canal. This cestode is figured in plate XXXII.

Paricterotaenia species

A large number of specimens, all fragmentary, were obtained from a Franklin Gull at Whitewater Lake. Since no complete strobila

PLATE XXXII

Paricterotaenia species

Fig. A. Holdfast

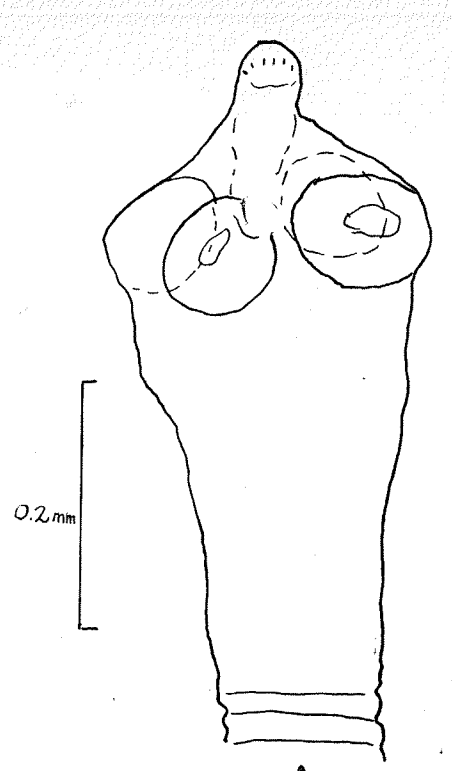
Fig. B. Rostellum and hook

Fig. C. Gravid proglottid

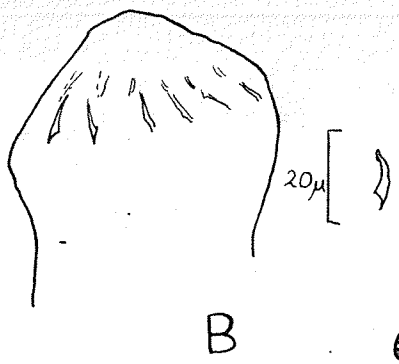
Fig. D. Detail of female genitalia

Fig. E. Mature proglottids

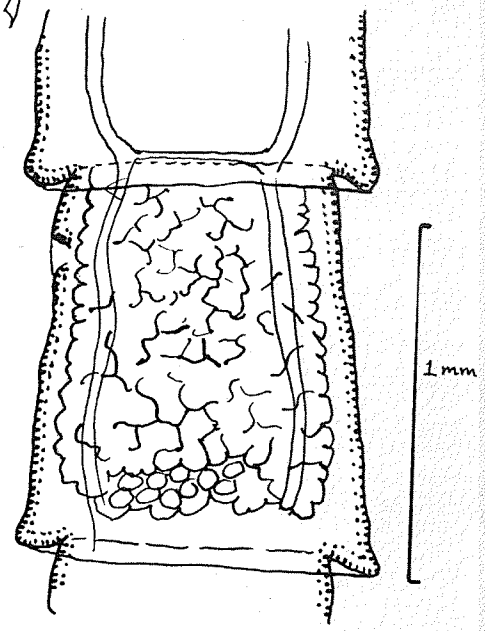
Fig. F. Mature proglottid



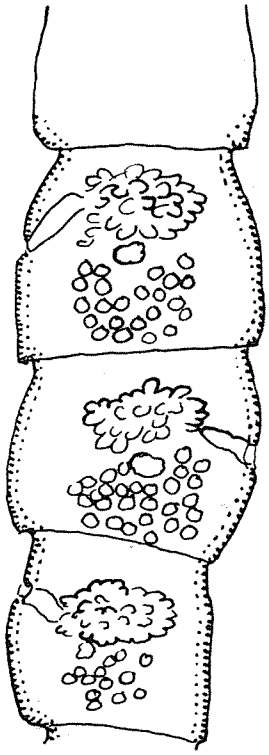
A



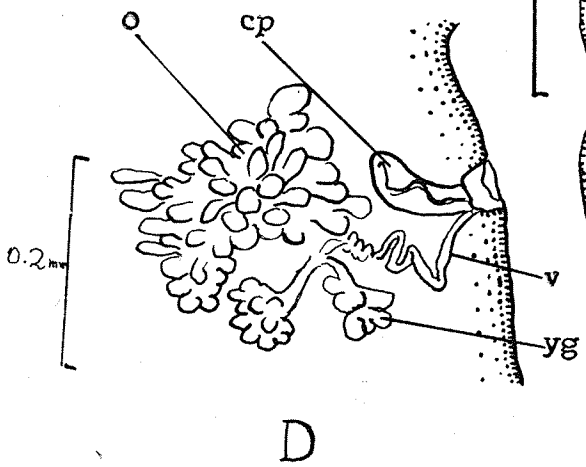
B



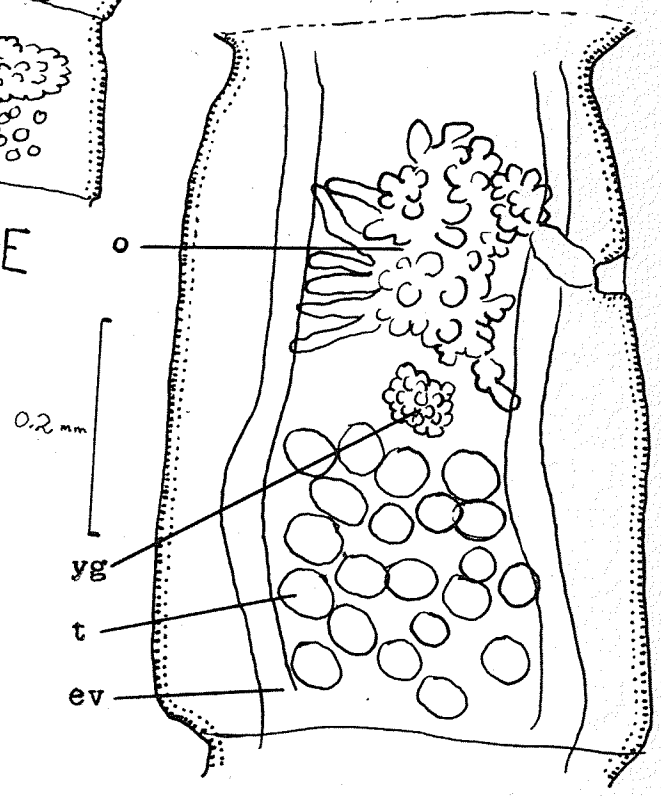
C



E



D



F

was found, length measurements cannot be given. No gravid segments were observed. The maximum width of the strobila was 1.3mm. Scolices ranged from 288u to 313u in width, while sucker measurements varied from 123u to 129u. The rostellum was armed with twelve hooks, which had a length of from 82u to 94.5u. The cirrus pouch extended diagonally forward about one third the width of the segment. A much coiled sperm duct occupied the anteromedian portion of the segment. The vagina, a short straight tube about 80u long dilated to form the seminal receptacle. The ovary, although generally divided into two masses, is made up of many radiating projections. The yolk gland lies immediately posterior to the ovary. The testes, although generally posterior to the ovary, are also found laterally on the aporal side of the ovary. There are about 20 testes. This species is figured in plate XXXIII.

Genus Anomotaenia Cohn 1900

Anomotaenia species

(Plate XXXIV)

Two small fragments, including a scolex, were isolated from the intestine of a Spotted Sandpiper at Berwick Falls on the Hayes river. The holdfast measured 166.5u , and the suckers were 115x77u. The stout rostellum was armed with twenty-two (?) hooks, measuring 32.6 - 34.8u in length. The genital apertures alternated irregularly. Mature segments were almost square in outline, the width only slightly exceeding the length. The cirrus pouch was provided with a large seminal vesicle. The seminal receptacle lay just posterior to the

c

PLATE XXXIII

Paricterotaenia species

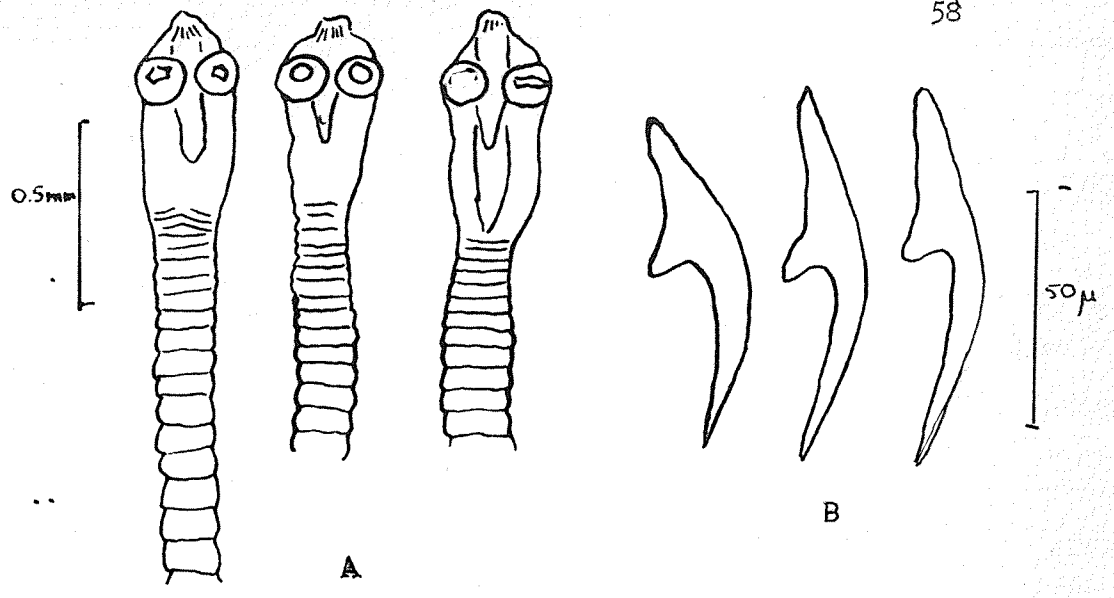
Fig. A. Holdfasts

Fig. B. Rostellar hooks

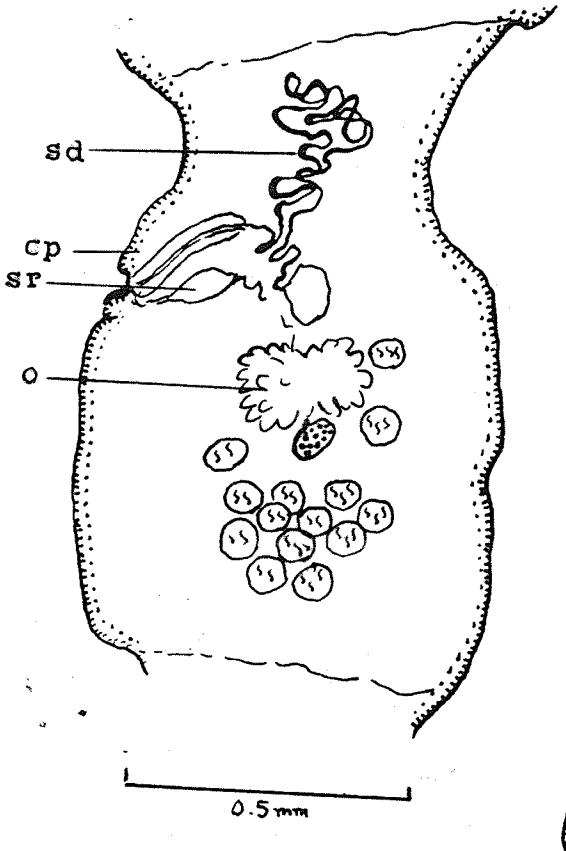
Fig. C. Mature segment

Fig. D. Detail of genital atrium

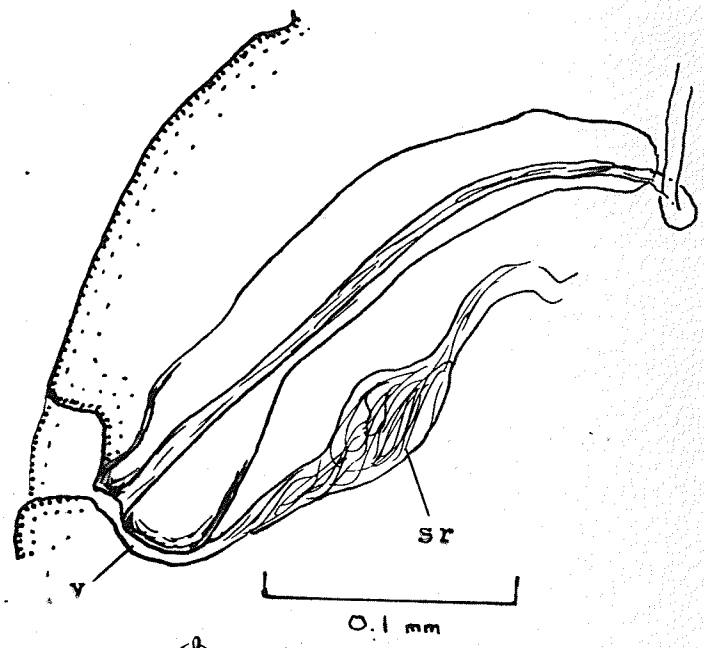
Fig. E. Mature segments



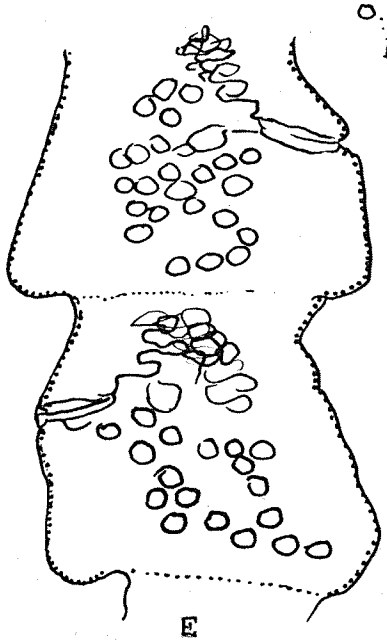
A B



C



D



E

PLATE XXXIV

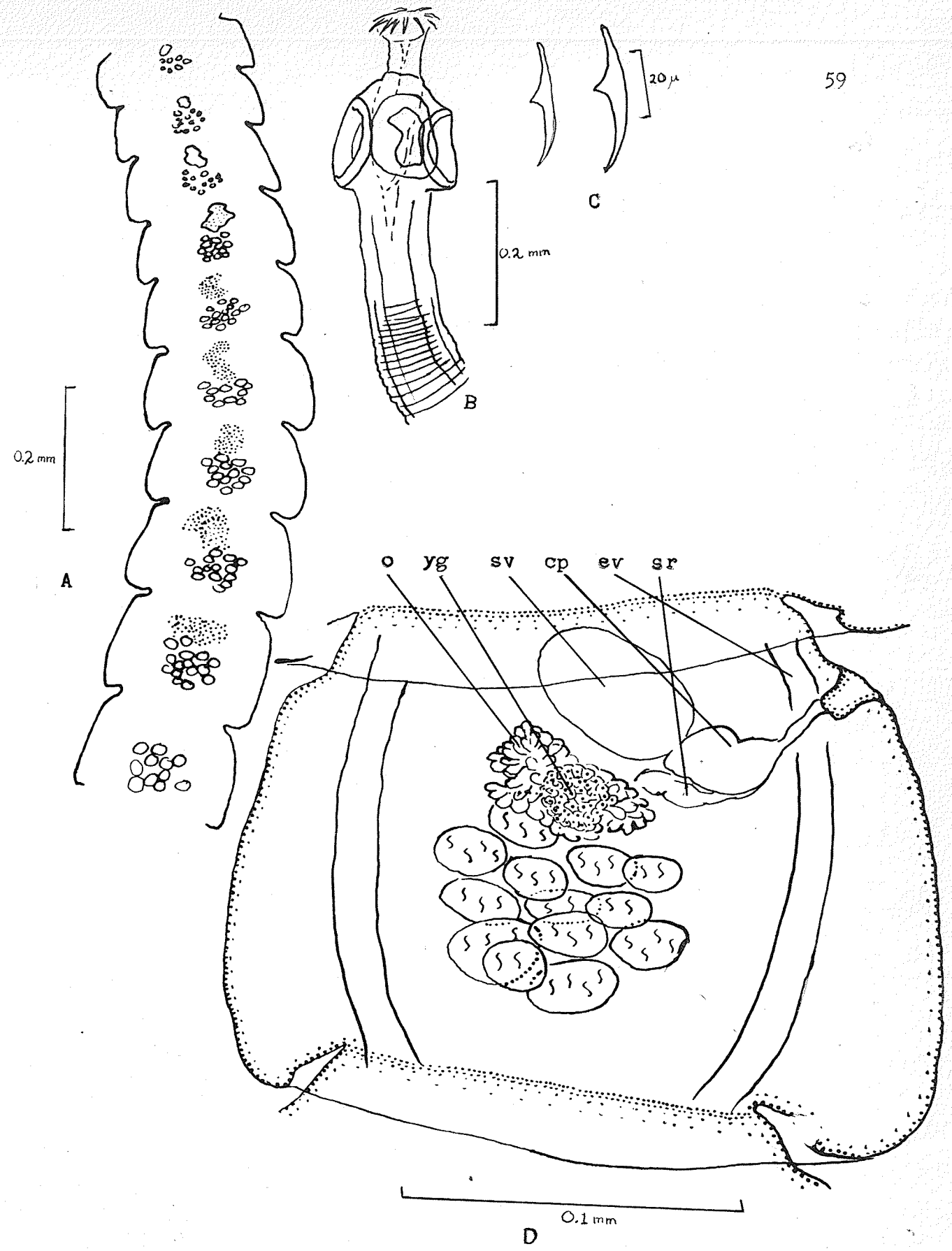
Anomotaenia species

Fig. A. Strobila fragment

Fig. B. Holdfast

Fig. D. Rostellar hooks

Mature proglottid Fig. D.


0.2 mm
A
0.2 mm
B
20 μ
C
o
yg
sv
cp
ev
sr
0.1 mm
D

cirrus pouch and parallel to it. The ovary was centrally located, with the yolk gland on its dorsal surface. The 13 or 14 testes were grouped compactly immediately posteriad to the ovary. The ventral osmoregulatory canals were prominent, but the dorsal vessels could not be observed.

Subfamily Paruterininae Fuhrmann 1907

Rhabdometra Cholodkovsky 1906

Rhabdometra nullicollis Ransom 1909

Specimens obtained from Sharptailed Grouse were examined in the Dept. of Zoology collection. These particular collections had been made in 1952. A detailed description of the species from this host has been made by Boughton (1937). Drawings to elucidate differences in holdfast shape, and details of the genital apparatus appear in plates XXXV and XXXVI.

FAMILY DIOICOCESTIDAE Southwell 1930, emend. Burt 1939

Genus Shipleya Fuhrmann 1908

Shipleya inermis Fuhrmann 1908

(Plates XXXVII to XLI)

A single complete specimen from a Dowitcher has been assigned to this genus and tentatively identified as S. inermis, although there are differences between this specimen and the species as described by Fuhrmann, whose paper was not available for direct comparison, and as redescribed by Baer (1940). After the present form has been described, the similarities and differences between the

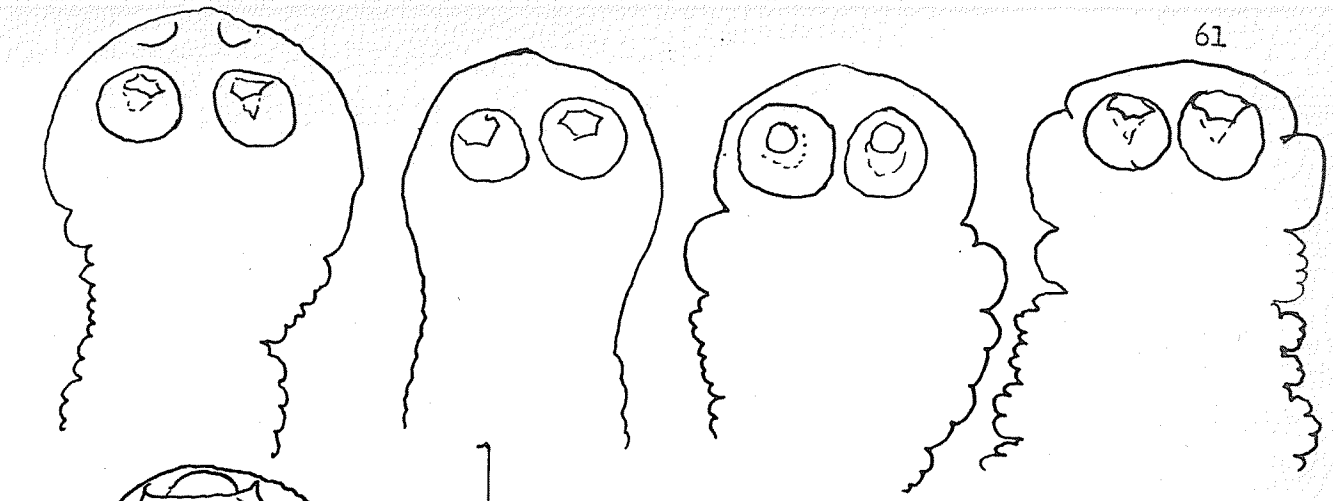
PLATE XXXV

Rhabdometra nullicollis

Fig. A. Different variations in holdfast form

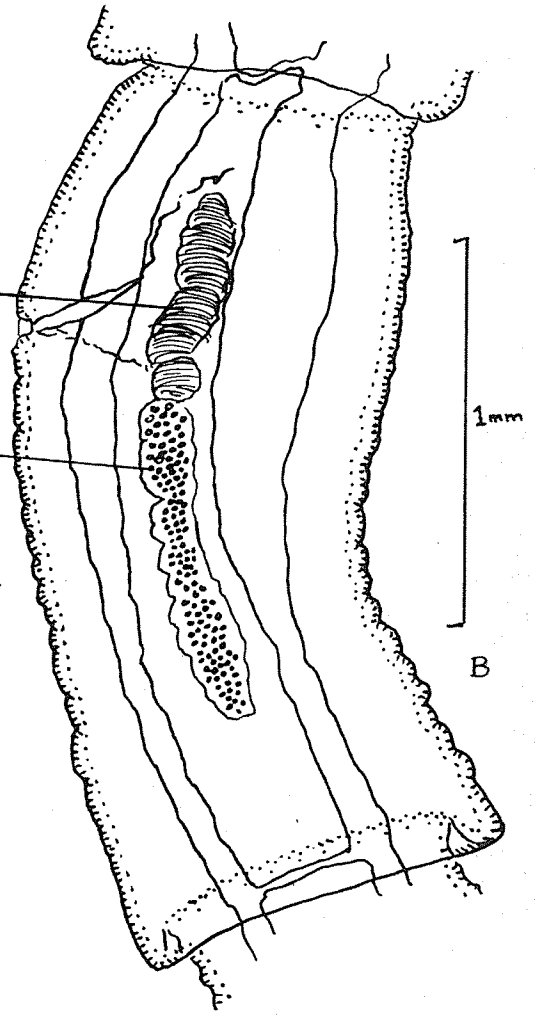
Fig. B. Older gravid segment

Fig. D. Younger gravid segment



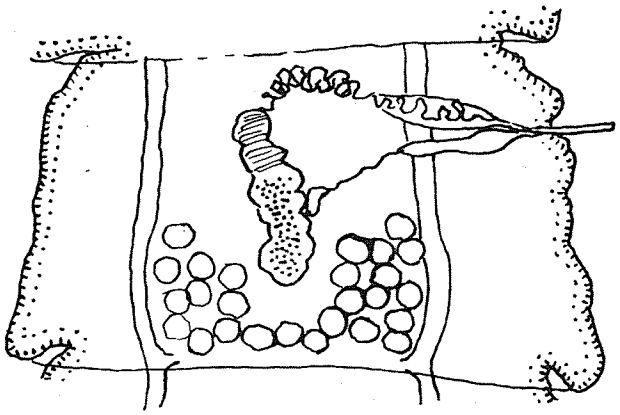
0.5mm

A



1mm

B



0.5mm

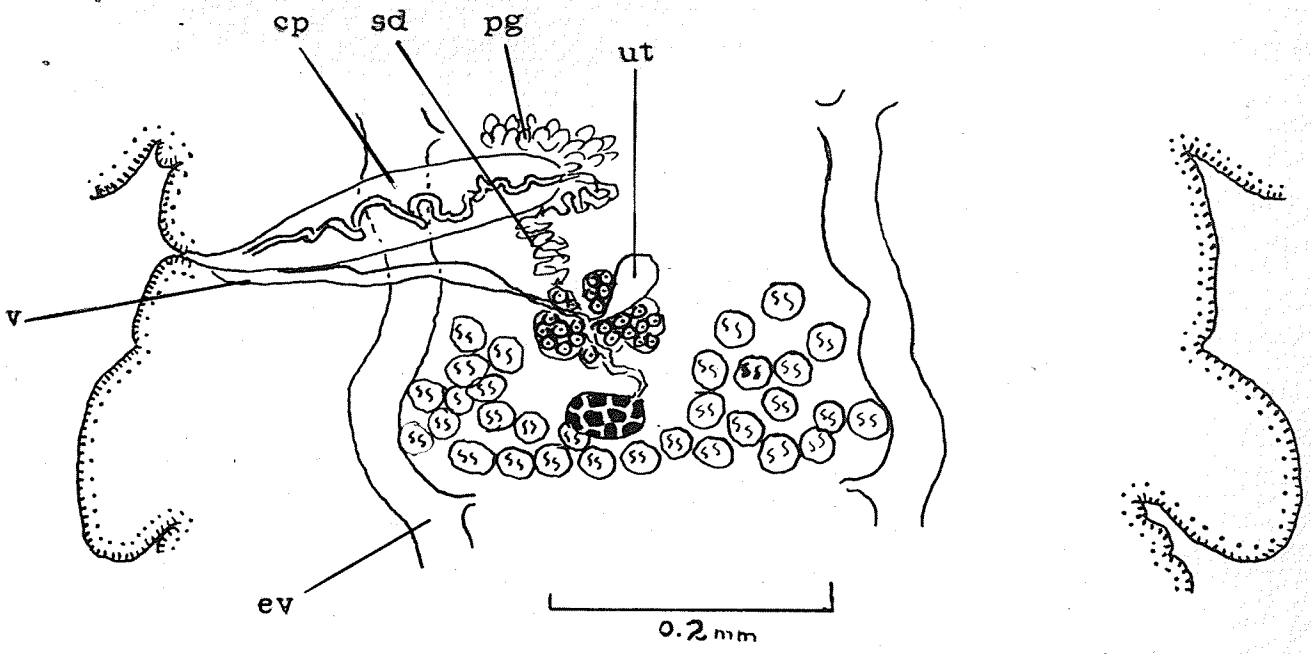
C

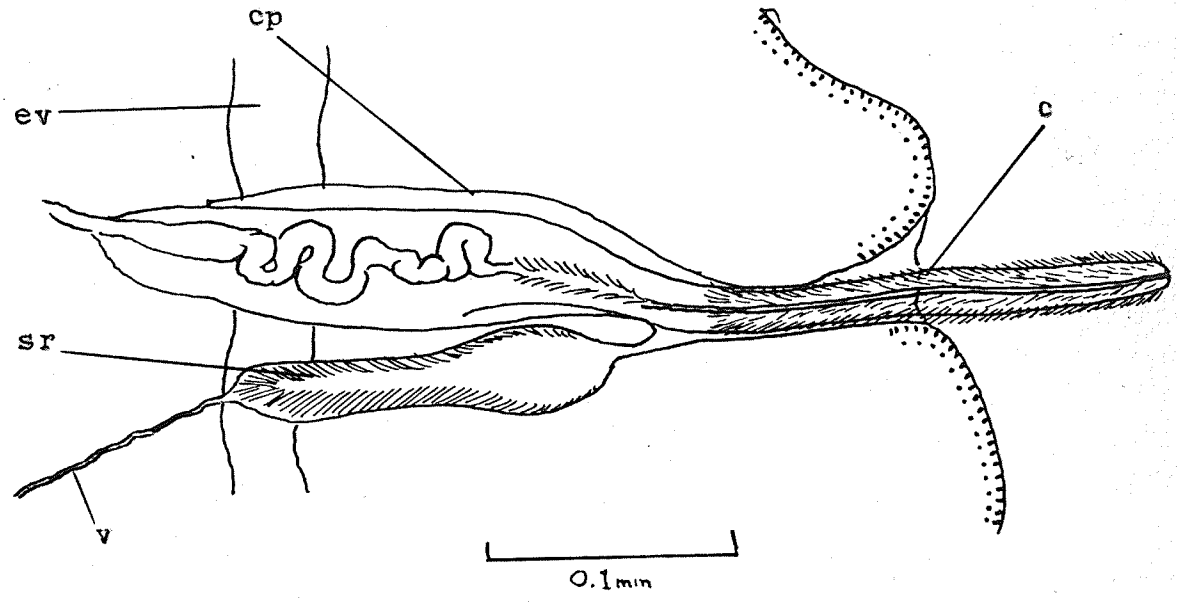
PLATE XXXVI

Rhabdometra nullicollis

Fig. A. Mature segment

Fig, B. Detail of cirrus pouch and vagina


cp
sd
pg
ut
v
ev
0.2 mm


cp
ev
c
sr
v
0.1 mm

Shipleya of Fuhrmann and Baer and the specimen here figured, will be discussed.

The specimen was removed in a living condition from the intestine of the host, in which it was found unattached, and fixed in an extended and flattened condition between glass slides with hot five per cent formalin. It was stored in 5 per cent formalin. When examined subsequently it was found to be darkened by cork-staining. It was bleached in chlorinated alcohol until it was a pale yellow color and lightly tinted with Coelestin blue B. The internal organs were clearly differentiated by this method.

The strobila measured 18 x 1.55mm, and consisted of 88 proglottids. The first 21 segments showed only indefinite genital primordia; the next 14 showed definite structures but no spines on the cirrus; the following 30 proglottids showed a fully developed but retracted cirrus, and the final 23 segments revealed the cirrus in progressive stages of evagination. The eighty-fourth proglottis was the largest, measuring 0.252mm long and 1.55mm wide. The holdfast had a diameter of 1028u and was armed with four suckers 311u wide. The suckers were not spined. The mature cirrus pouch measured 472x205u with thick muscular walls. It enclosed an internal seminal vesicle measuring 295 x 63u. From the cirrus pouch a short coiled tube ran back to the compact aggregate of testes. In younger segments the testes are deeply stained and solid, but in the mature proglottids they stain less deeply and were vesicular in appearance. The testes mass measured 252 x 95u in the 48th segment, 320 x 150u in the

PLATE XXXVII

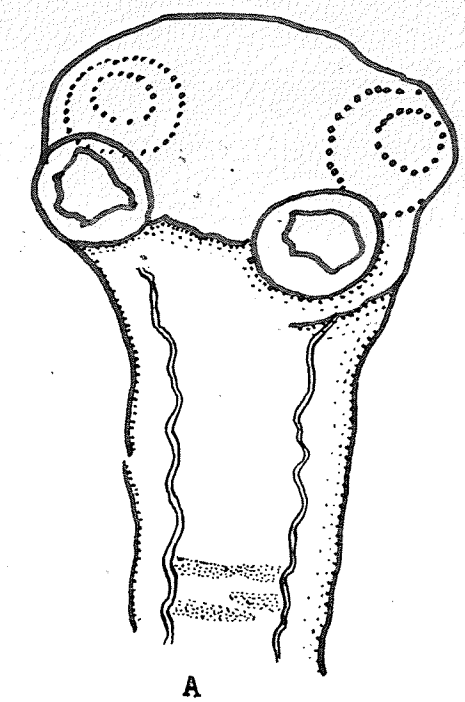
Shipleya inermis

Fig. A. Holdfast

Fig. B. Immature portion of strobila

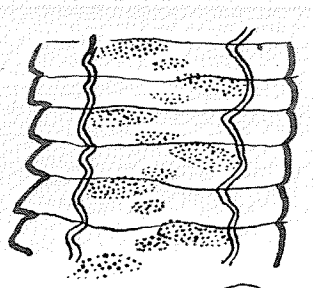
Fig. C. Portion of strobila with cirri invaginated

Fig. D. Posterior portion of strobila, cirri extended

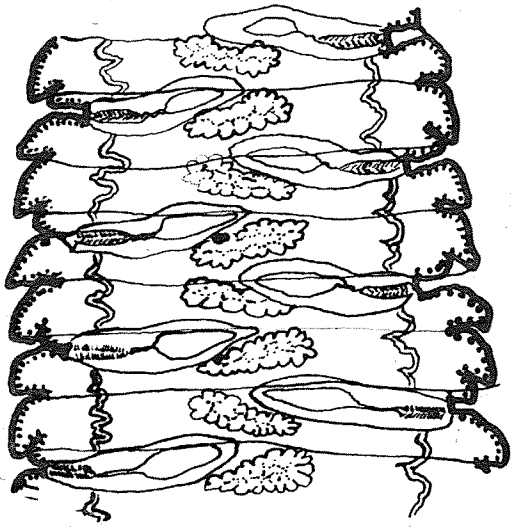


A

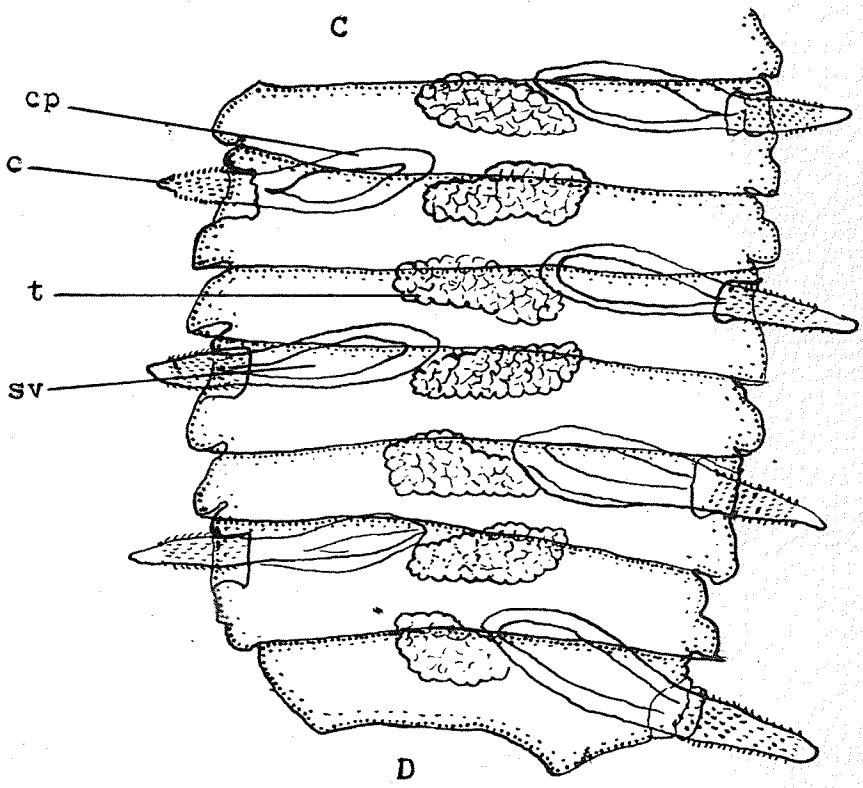
1 mm



B



C



D

PLATE XXXVIII

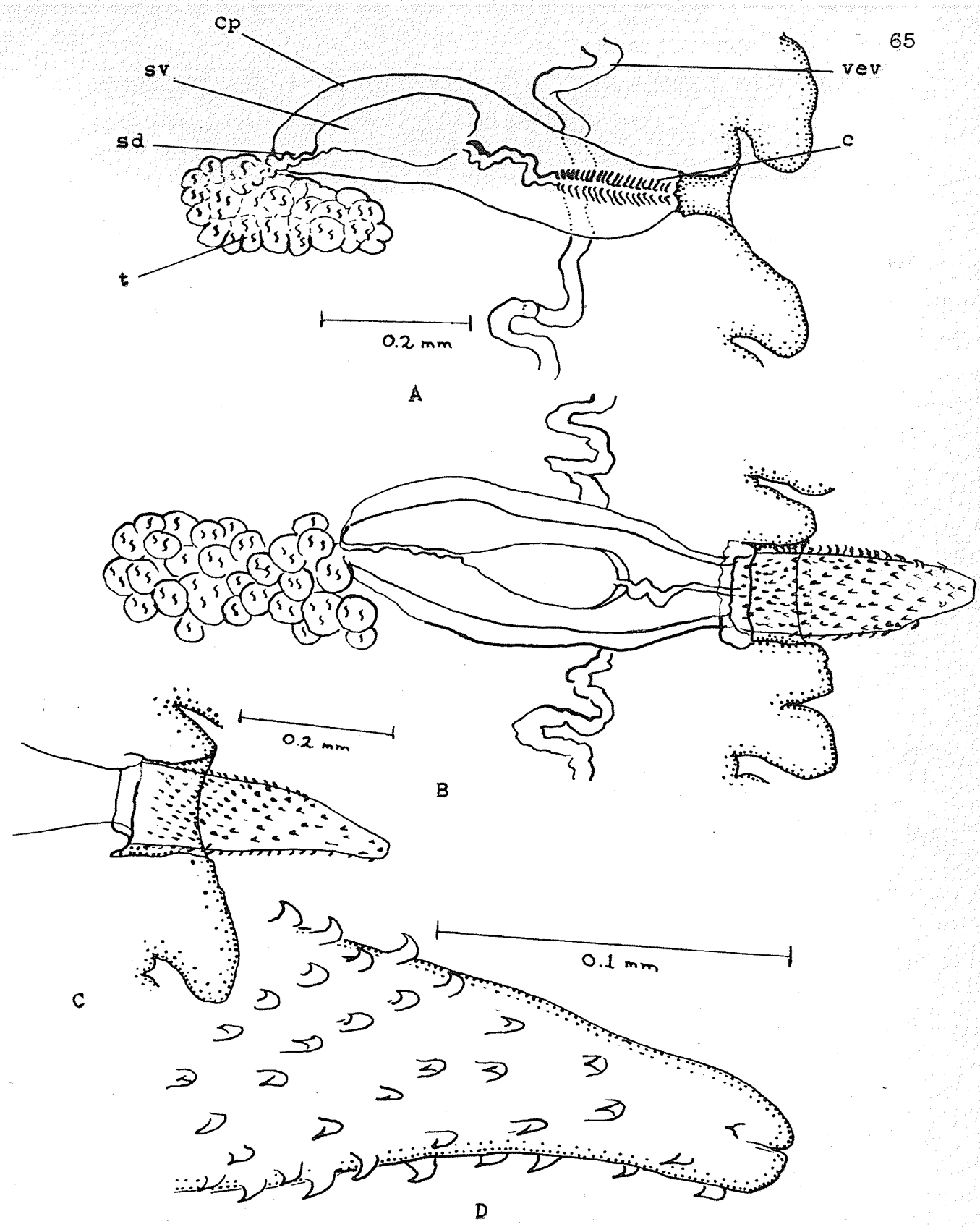
Shipleya inermis

Fig. A. Genitalia with cirrus retracted

Fig. B. Genitalia with cirrus everted

Fig. C. Fully extended cirrus

Fig. D. Detail of cirrus armature


cp
sv
sd
t
vev
c
0.2 mm
A
0.2 mm
B
0.1 mm
C
D

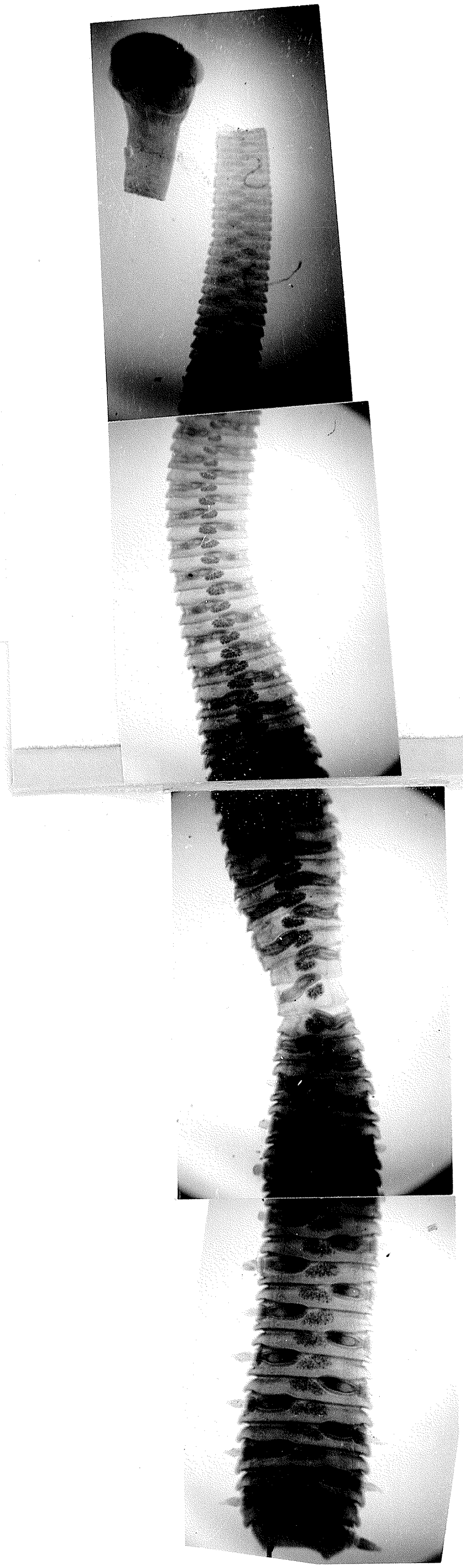
fifty-eighth segment, and 405 x 198u in the seventy-sixth segment. beyond this portion the mass showed no further increase in size. Both dorsal and ventral osmoregulatory canals were present, about equal in diameter. The cirrus pouch lay between the two vessels. The vessels measured about18u in diameter. The cirrus was large and heavily armed with stout spines. The spines were most closely set at the base of the cirrus, becoming more widely spaced towards the tip. They were J-shaped, with the longer base portion measuring 15u in length. The genital atrium was beaker-shaped, about 140u in diameter and 99u deep. In the final segment this atrium was also everted, forming a sleeve abou t the base of the cirrus. The extended cirrus measured 323u from the base of the genital atrium to the tip, and was 101u in diameter at its base. Other than the structures already mentioned, no organs could be discerned within the segments. Since the helminth was alive and free when found, and since the end portion shows no evidence of injury, it is assumed that this was a complete organism, not a fragment.

Discussion

The species Shipleya inermis was first recorded by Fuhrmann in 1908 from a Brazilian charadriiform bird, Gallinago gigantea. It has since been recorded by Baer (1940) from a Wilson's Snipe, Capella delicata, in Antigua. The present specimen was recovered from a Dowitcher, Limnodromus griseus, again a charadriiform bird, which belongs to the same family, Scolopacidae, as the Wilson's snipe. The close relationship of the hosts in these three records argues

PLATE XXXIX

Shipleya inermis

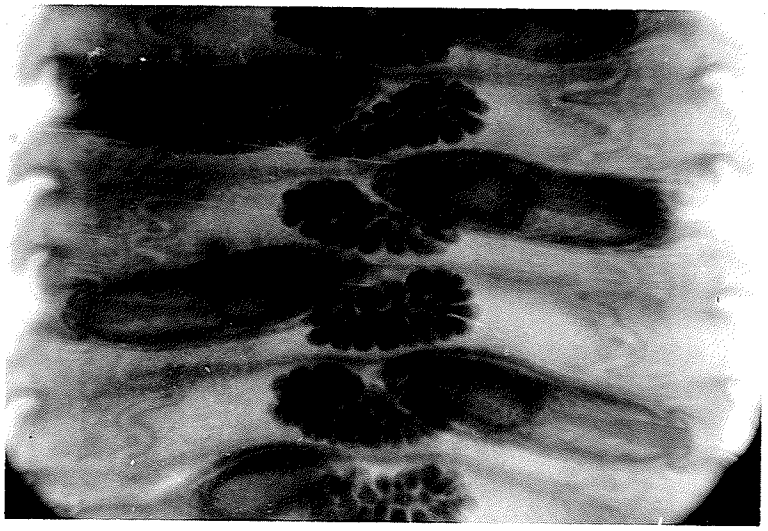


Shipleya inermis Fuhrmann, 1908

PLATE XL

Shipleya inermis

Shipleya inermis Holdfast

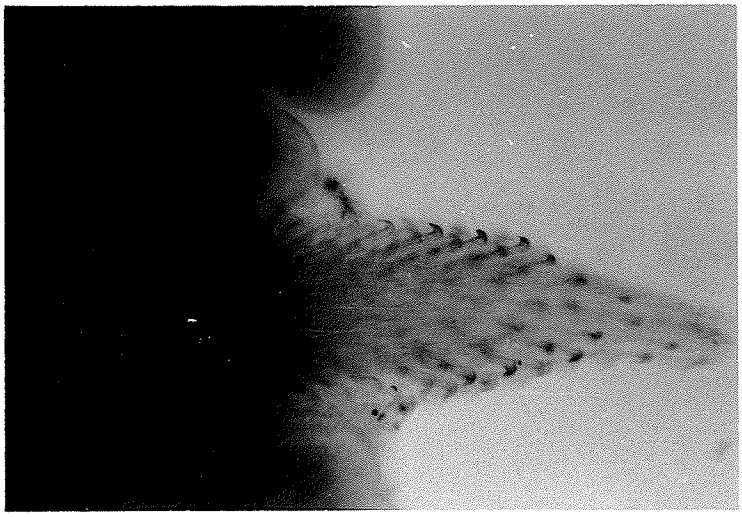


Shipleya inermis Segments with retracted cirrus

PLATE XLI

Shipleya inermis

S.inermis Cirrus pouch and everted cirrus



S.inermis Cirrus armature

for the identification of the present specimen as Shipleya inermis. Also, since both the snipe and the Dowitcher are migratory birds whose range extends from Canada to the northern shores of South America, the widely separated areas in which they were found - the Wilson's Snipe at Antigua and the Dowitcher at Whitewater Lake in Manitoba - does not preclude the possibility that they might have been infected at points much more closely related geographically.

According to Burt (1939), Fuhrmann in his description of Shipleya stated that he did not see testes in the strobilae, but presumed that they had been present in earlier proglottides and had degenerated. That is, Fuhrmann regarded Shipleya as a monoecious form. Baer (1940), in his description of the species, also makes no reference to the possibility of his dealing with a dioecious form.

> The internal anatomy of this worm is peculiar in many ways and especially in that the anterior part of the strobila which is entirely male, no female glands being visible although the uterus and receptaculum seminis are present.[1]

> The testes have completely disappeared in the segments in which the female genitalia are formed.[2]

Baer does not make clear whether the material that he is describing is fragmentary or complete from holdfast to uterus filled with eggs. He does refer to the fact that his material is well preserved, in contrast to Fuhrmann's original specimens, that Baer examined and found poorly preserved.

---

[1] Jean G. Baer, "Some Avian Tapeworms from Antigua", PARASITOLOGY, 32:174-197, June, 1940. p.180.

[2] Ibid. p.182.

One serious difference between the present specimen and the material described by Baer is that Baer figures and describes in the text a receptaculum seminis in a male segment. No similar structure could be made out in our specimen. Also Baer makes particular reference to the holdfast deeply imbedded in the mucosa of the intestinal wall. Our specimen was found free in the intestinal lumen.

Except for the above-mentioned discrepancies, this material agrees well with the description of Shipleya inermis, and is referred to that species.

It is interesting to note that three authors record but a single pair of dioecious cestodes per host animal, and this in five different instances. Burt (1939) in three cases and Singh (1952) in one case, record lone pairs of Infula burhini, and Meggitt (1933) records one male and one female Dioicocestus fevita in a host bird. This apparent lack of multiple infections may help to explain the relatively rare records of Dioicocestidae in the literature.

ORDER PSEUDOPHYLLIDEA Carus 1863

Family DIBOTHRIOCEPHALIDAE Lühe 1902

Schistocephalus solidus Creplin 1829

(Plates XLII, XLIII)

Two specimens of this parasite were isolated from two nestling Common terns at Wekusko Lake in 1949. They agree in all respects with the description by Wardle and McLeod (1952). Two contracted, cork-stained specimens from a Holboell's Grebe from Wekusko are also tentatively referred to this species.

PLATE XLII

Schistocephalus solidus

Fig. A. Anterior end of cestode

Fig. B. Strobila fragment, ventral view

Fig. C. Strobila, greater detail than fig. B

Fig. D. Ventral view of genitalia

Fig. E. Transverse section of segment

Fig. F. Egg in uterus

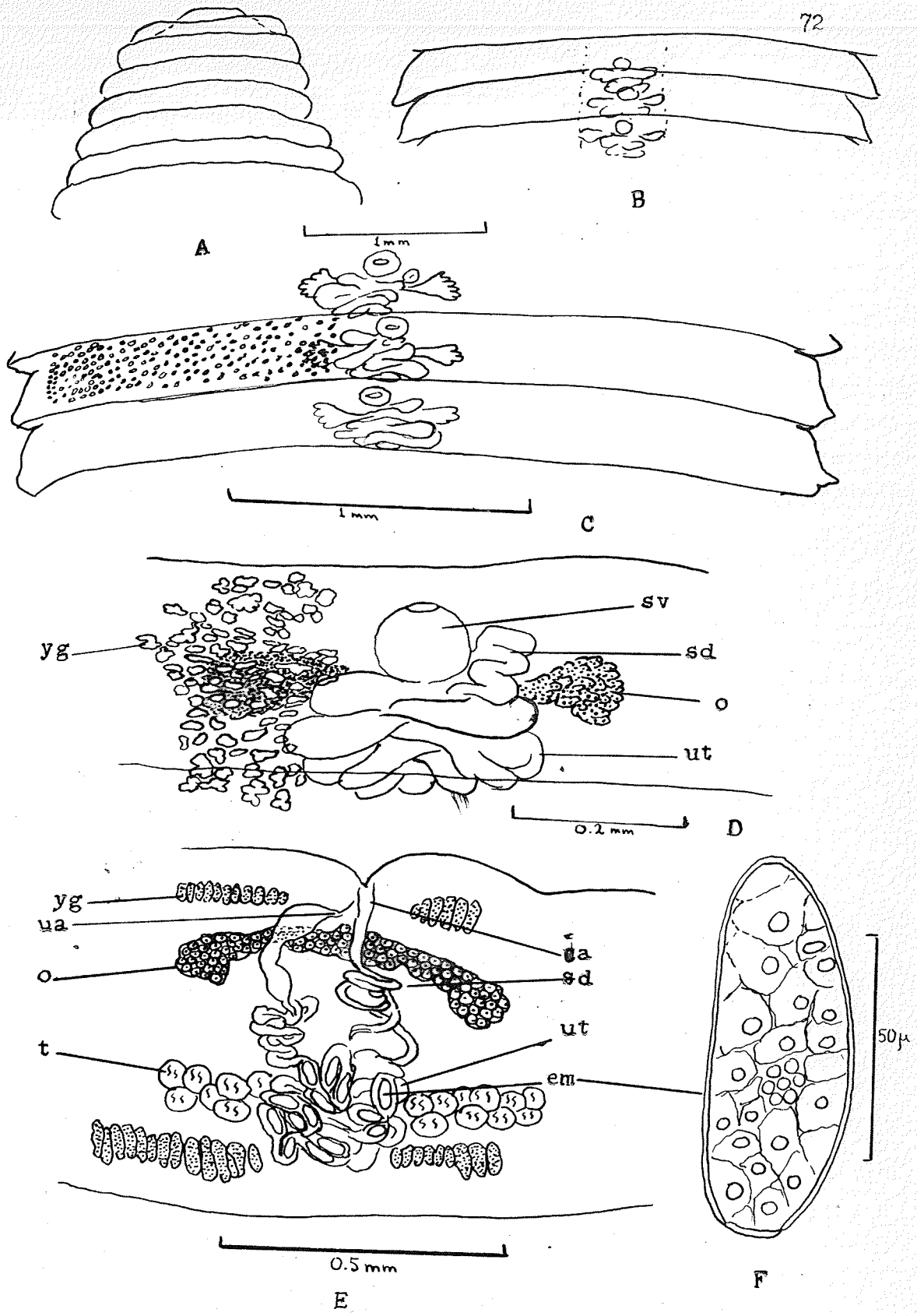

A
1mm
B
1mm
C
yg
sv
sd
o
ut
0.2mm
D
yg
ua
o
t
da
sd
ut
em
0.5mm
E
50μ
F

PLATE XLIII

Schistocephalus solidus

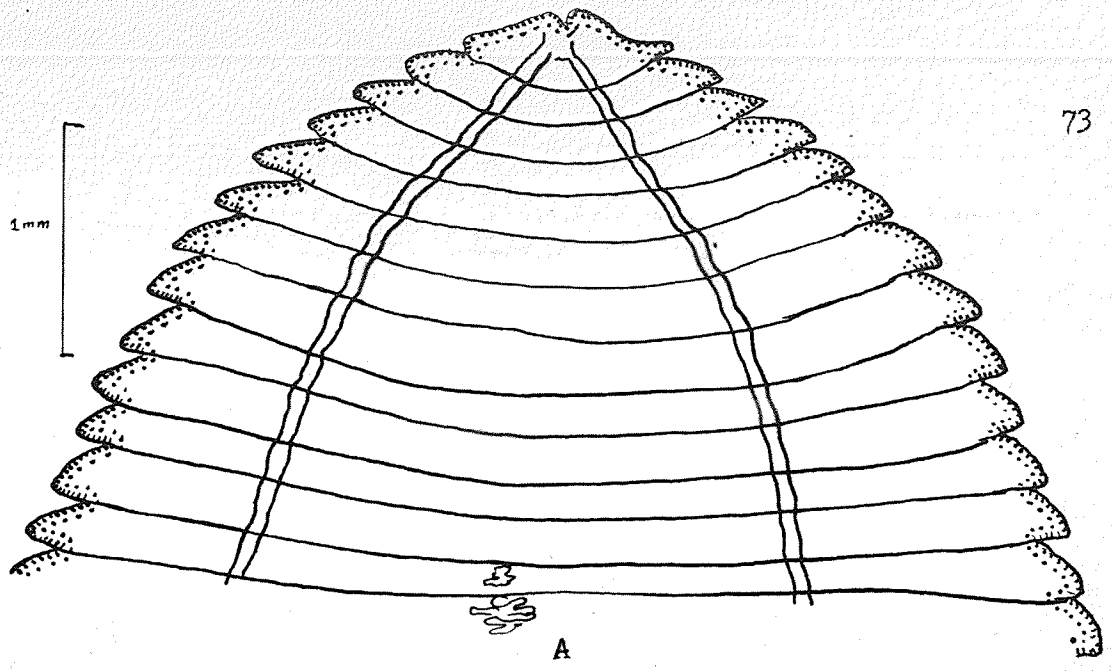
Fig. A. Anterior end of cestode

Fig. B. Posterior end of strobila

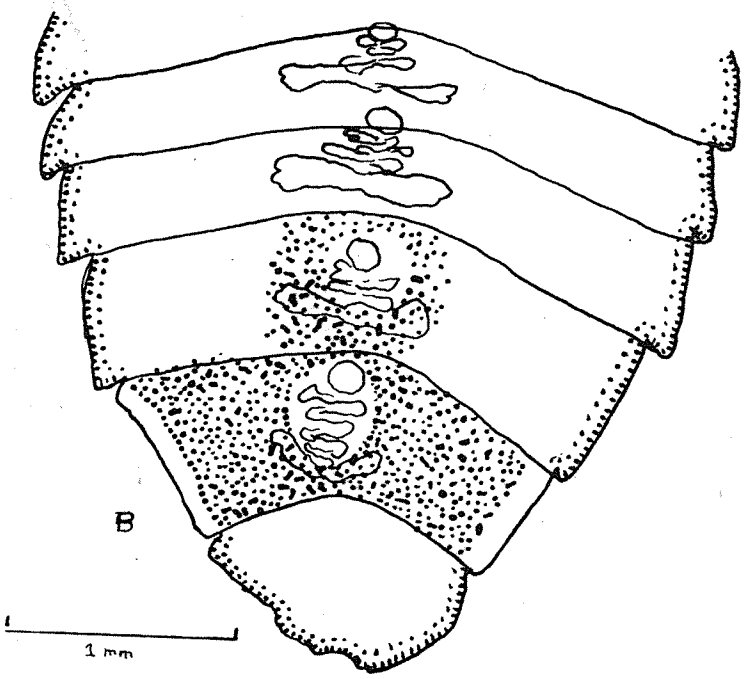
Fig. C. Detail of genitalia

Fig. D. Detail of anterior end of strobila

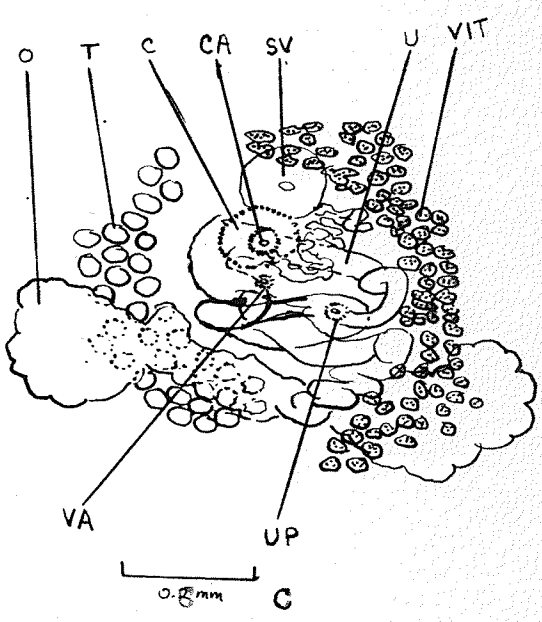
Fig. E. Entire strobila, x5



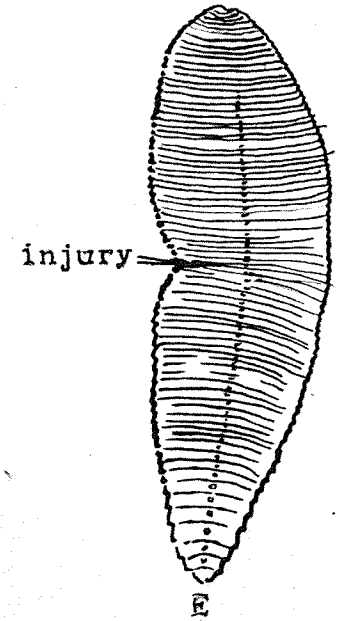
A



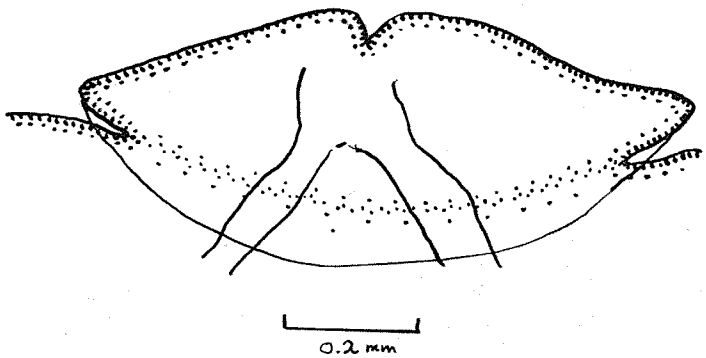
B



C



E



D

CHAPTER III

HYMENOLEPIS MEGALOPS

A Supplementary Description

The present survey revealed the presence of Hymenolepis megalops in four different anseriform hosts, the Mallard, the Pintail duck, the Shoveller, and the Gadwall. Two comprehensive studies on the genus Hymenolepis were available for a comparative analysis of this species, that of Mayhew (1925) and that of Hughes (1940). Both of these works list H. megalops, but each refers the reader back to Ransom's paper on the cestode, published in 1901. Hughes lists twelve anseriform birds as hosts of the parasite, including the Mallard, the Pintail, and the Shoveller. The Gadwall, Anas strepera, is not included in the list. Linton (1927) does not include H. megalops in his study of avian cestodes, and Ransom (1909) also refers back to his 1901 paper, and lists six bird hosts. Wardle and Mcleod (1952) list only Ransom (1902) as having recorded the cestode in America. Ransom's original description listed the following records of this tapeworm: first recorded by Nitzsch in Anas boschas and Dafila acuta, then by Creplin in 1825 in the rectum of Anas marila, and again by this author in 1829. Dujardin in 1845 recovered two specimens from Anas boschas, and Diesing, in 1850 and in 1864 added to the list of hosts. Stiles in 1896 gave a short syn-

opsis of Taenia megalops, and recorded Anas braziliensis as a host. Ransom himself recovered four specimens the rectum of a Pintail duck. [3]

Our present material was recorded from the following hosts: (please note that the number preceding each host is keyed to the table on the following pages.) 1)Pintail female, in the cloaca, at Whitewater Lake, June 15, 1950. 2)Pintail female, from cloaca, Whitewater Lake, June 12, 1950. 3)A second specimen from the same host as #2. 4)Pintail female, from the cloaca, Whitewater Lake, June 5, 1950. 5)a mounted specimen in the Manitoba University Department of Zoology collection, labelled as "Weinlandia sp.", from a Pintail duck, 1936. 6)a second mounted specimen from the same collection as #5, unidentified, but recorded from a Pintail, 1936. 7)a third mounted specimen from the collection as #5, unidentified, recorded from a Pintail at Ninette, Manitoba, 1936. 8)one complete and one partial strobila from a Gadwall intestine, Whitewater Lake, Aug. 14, 1950. 9) and 10) are two further specimens from the same host animal as #8. 11),12), and 13) are specimens from the cloaca of a Mallard male from the Netley marshes, Oct. 20, 1953. A further much contracted specimen was recorded from the cloaca of a Mallard male at Whitewater Lake, May 31,1950. This specimen, although it consisted of approximately sixty segments, was so highly contracted that it gave the appearance of a large strigeid

---

[3] Ransom, Brayton Howard. 1902. On Hymenolepis carioca (Magalhães) and H. megalops (Nitzsch), with remarks on the classification of the group. Trans. Am. Micr. Soc.,23: pp.151-172,pls.23-25, figs. 1-20

with the strobila little longer than the scolex. Two holdfasts were found in the intestine of a Shoveller on Aug. 6, 1950, at Whitewater Lake. These may have been recent infections, since the strobilar portion was no more than an appendage about a millimetre in length.

The table on the following pages contains measurements of thirteen individuals. All linear measurements except that of strobilar length is given in microns. The bodies of the helminths were measured in millimetres. In addition to the dimensions of the strobila and holdfast, the dimensions of a typical mature segment from each individual is given. The great overlapping of proglottids necessitated two measurements to be made for length and two for breadth. The smaller measurement indicated the dimensions of the central or medullary portion of the proglottid, while the larger includes the overhanging fringe of each section. To give an idea of the maturation rate of the genitalia, the table includes data on the first clear proglottid in which plainly appear respectively the testes, the ovary, and the uterus containing eggs. The term "egg" refers to that cell aggregate in which the shell is clearly discernible. For specimens not containing sufficiently matured eggs to show a shell, measurements are listed under "embryos". When the maturing egg has reached the oncosphere stage, both "egg" and "embryo" measurements are recorded. Other measurements were made on organs as nearly equivalent in the different helminth bodies as could be found. Where immaturity, distortion, or injury prevented the measurement of the corresponding organs, gaps have been left in the table.

TABLE I

HOST	STROBILA LENGTH	MAXIMUM WIDTH	NO. OF SEGMENTS	HOLDFAST DIAMETER	SUCKER DIAMETER
	(mm)	(u)		(u)	(u)
Pintail (1)	29	1313u	192	1215.2	520.8
Pintail (2)	42	1344	225	1148.0	543.2
Pintail (3)	10	840	124	1120	532
Pintail (4)	25	1512	139	1254.4	644
Pintail (5)	39	1198.4	201	1010.4	456.4
Pintail (6)	24	966	167	1215.2	490
Pintail (7)	44	1590	232	1526.0	504
Gadwall (8)	21	926.8	162	1150.8 1167.6	411.6 439.6
Gadwall (9)	24	1467.2	166	1419.6	468.8
Gadwall (10)	20	1232	154	1260	532
Mallard (11)	28	1165	142	1159.2	468
Mallard (12)	21	1240	166	1317.6	566
Mallard (13)	16	1680	170	1251.6	515.2

TABLE I (continued)

HOST	SEGMENT DIVISIONS					SEGMENT NUMBER		
	Long		Wide		Thick	First Testes Primordia	Ovary Appearance	Uterus Appearance
	t	c	t	c	t			
(1)	316	216	1008	647	304	82	90	108
(2)	274	180	820	484	200	80	--	--
(3)	--	--	--	--	--	75	--	--
(4)	364	204	1263	837	245	62	80	98
(5)	543	277	1022	446	566	42	84	110
(6)	378	168	966	613	424	75	104	136
(7)	350	196	1066	627	328	55	--	131
(8)	266	154	893	490	360	81	92	122
(9)	344	174	1338	860	220	67	83	114
(10)	212	162	1232	770	318	76	96	131
(11)	490	322	1056	650	200	60	82	121
(12)	333	190	977	585	370	80	104	129
(13)	--	--	--	--	--	74	88	--

t - total measurement of segment
c - measurement of central or medullary portion only
All linear measurements on this page in microns
Segment number refers to the position of the segment in body

TABLE I (continued)

HOST	MAXIMUM DIMENSIONS				EGGS			EMBRYOS		
	Testes	Ovary	yg	Uterus	max	min	avg	max	min	avg
(1)	--	297	90	840 x 336	32.0	38.4	35.5	17.2	22.4	20.9
(2)	120.6	369.9	125.1	450 x 812	34.4	40.0	37.5	--	--	--
(3)	--	--	--	--	--	--	--	--	--	--
(4)	107	313.6	110.7	700 x 252	22.6	24.8	23.7	--	--	--
(5)	--	--	117.0	750 x 367	38.2	47.0	44.3	20.8	32.0	24.3
(6)	180.2	198.2	63.9	366 x 179	--	--	--	--	--	15.6
(7)	94.5	261	128.7	--	35.5	40.4	37.4	19.4	25.6	22.2
(8)	136	351	99	385 x 218	30.0	31.4	30.7	--	--	--
(9)	144	279	131.4	392 x 210	27.4	37.4	33.6	15.4	25.0	19.3
(10)	135	261	112.5	405 x 189	23.8	27.6	24.7	--	--	--
(11))	178.2	234.9	111.6	504 x 231	--	--	--	--	--	13.8
(12)	121.5	241.2	108.9	480 x 195	--	--	--	--	--	--
(13)	--	--	--	--	--	--	38.0	--	--	24.8

All measurements in microns

TABLE I (continued)

HOST	CIRRUS POUCH Length	CIRRUS POUCH Width	CIRRUS Diameter	DIAMETER D.E.V.	DIAMETER V.E.V.
(1)	--	--	--	12.6	--
(2)	526.5	61.2	27	--	--
(3)	--	--	--	9	27.0
(4)	448.0	56.7	--	--	--
(5)	--	58.5	19.8-	18	--
(6)	625.5	70.2	22.5	11.7	29.7
(7)	--	58.6	18.0	11.7	27.0
(8)	495	49.5	22.5	7.2	18.0
(9)	701	58	24.3	13.5	23.4
(10)	--	49.5	27	9.9	28.8
(11)	695	54.0	19.8	23.4	33.3
(12)	610	39.6	20.7	10.8	22.5
(13)	--	--	--	--	--

Note: D.E.V. - Dorsal Excretory Vessel
V.E.V. - Ventral Excretory Vessel

All measurements in microns

These measurements agree well with those recorded by Ransom, and no significant differences have been found in the morphology of the individuals described by Ransom and those investigated in the present paper. Plates XLIV and XLV illustrate the typical morphology of this cestode.

Since no reference has been found to Anas strepera, this may be a new host record for Hymenolepis megalops.

In one mounted individual of this species it was noted that two long series of mature uteri containing well-developed eggs were interrupted at one point by a group of seven or eight proglottids in which no expanded uterus could be seen. These segments did contain mature ovaries and yolk glands, however. It is suggested that for some reason fertilization did not take place in these segments and no egg development could take place.

PLATE XLIV

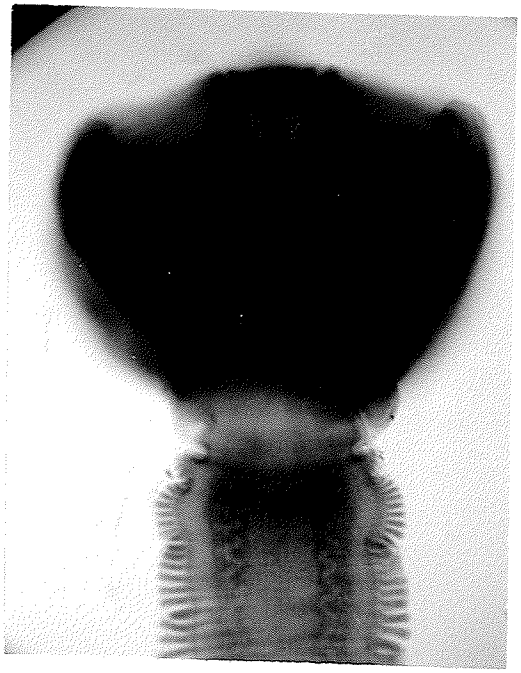
Hymenolepis megalops

Fig. A. Holdfast from a Pintail duck

Fig. B. Holdfast from a Gadwall

Fig. C. Holdfasts from a Mallard

Holdfast showing glandular area of rostellum.



Holdfast with pronounced "neck" region.

Large holdfast with relatively narrow attachment to strobila.

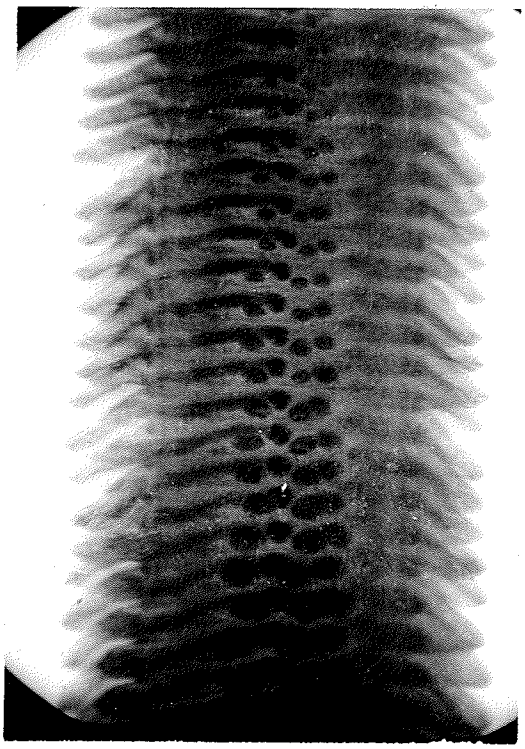
Hymenolepis megalops

PLATE XLV

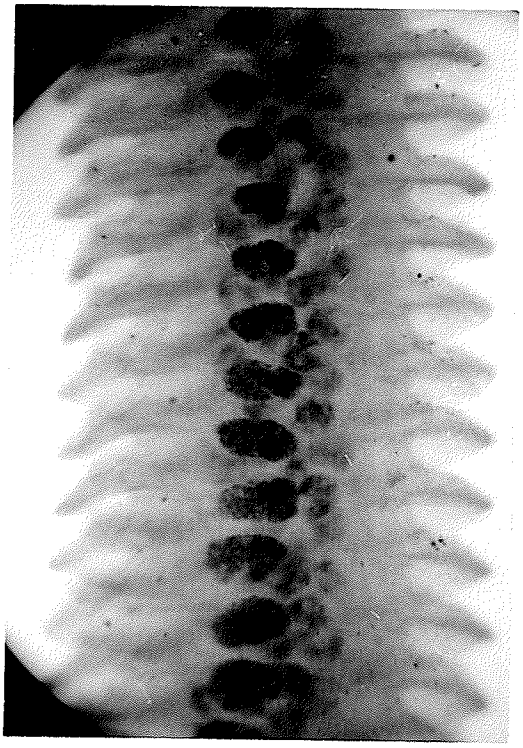
Hymenolepis megalops

Figures A, B, and C are different portions of the same strobila.

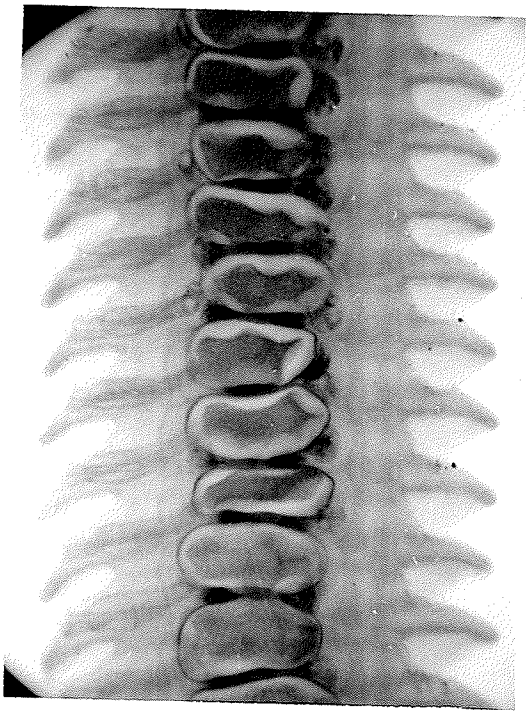
Fig. D. This is a strobila section from which the ventral and dorsal projections of the proglottis have been removed to increase the visibility of internal organs. The cirrus pouch and the seminal receptacle are seen parallel to each other in the photograph.



Area showing testes development.



Area showing ovary development.



Gravid portion

Area showing seminal receptacle

Hymenolepis megalops

SUMMARY

The techniques used in collecting the material for the present work are outlined, and variations in staining and mounting cestode material are described.

A systematic survey of tapeworms collected from bird hosts is made. This concerns mainly two collections, one made in the Nelson and Hayes River area in 1949, the other from the Whitewater Lake area of southern Manitoba in 1950. In all, twenty-six species from sixteen bird hosts are incorporated in the survey.

A new species, Hymenolepis oligoproglottina, is described from a sandpiper from York Factory at the mouth of the Hayes River.

A dioecious tapeworm from a Dowitcher is described and its identification as Shipleya inermis Fuhrmann 1908, discussed. The specimen is compared with material collected from a Wilson's Snipe by J. G. Baer in Antigua.

The species Hymenolepis megalops is redescribed in detail, and compared with the earlier description of Ransom (1902).

BIBLIOGRAPHY

Baer, Jean G., "Some Avian Tapeworms from Antigua," Parasitology, XXXII (June, 1940), 174-197.

Brock, Mason Eugene, "A New Hymenolepidid Tapeworm Hymenolepis filumferens, from the Blue-winged Teal," Transactions of the American Microscopical Society, LXI (April, 1942), 180-185.

Burt, D. R. R., "On the Cestode Family Acoleidae, with a Description of a New Dioecious Species, Infula burhini gen. et sp. nov.", Celon Journal of Science, Section B. Zoology and Geology, XXI (October 24, 1939), 195-209.

Hughes, R. Chester, "The Genus Hymenolepis Weinland 1858," Oklahoma A. and M. College Agr. Exp. Stat. Tech. Bull. No. 8, June, 1940,

_____, "A Key to the Species of Tapeworms in Hymenolepis," Trans. Am. Micr. Soc., LX (July 1941), 378-414.

Lang, Rudolf, "Vergleichende Untersuchungen an Hühnercestoden der Gattung Raillietina Fuhrmann 1920,"Zeitschrift für Parasitenkunde, I (March 26, 1929), 562-611.

Linton, Edwin, "Notes on Cestode Parasites of Birds", Proc. U. S. Nat. Museum,LXX (1927), 1-73, pl.1-15.

Mayhew, Roy Lewis, "Studies on the Avian Species of the Cestode Family Hymenolepididae," Illinois Biological Monographs, X, No,2, 125pp. January 1925.

Meggitt, F. J., "Cestodes Obtained from Animals Dying in the Calcutta Zoological Gardensduring 1931," Records of the Indian Museum, XXXXV (June 1933), 145-165.

Peterson, Roger Tory, A Field Guide to the Birds. Cambridge, Mass.: Second Revised and Enlarged Edition; Boston: Houghton Mifflin Company, 1947. 290 pp.

Polk, Seigul J., "Hymenolepis mastigopraedita, a New Cestode from a Pintail Duck," Journal of Parasitology, XXVIII (April 1942), 141-145.

Ransom, B. H., "On Hymenolepis carioca and H. megalops, with Remarks on the Classification of the Group", Trans. Am. Micr. Soc., XXXIII, 1901, 151-172.

_____, "The Taenioid Cestodes of North American Birds." U. S. Nat. Museum Bull.69 1-141, 1909.

Riser, Nathan W., "Notes on Tapeworm Staining", Proc. Helm. Soc. Wash., XVII (1952) 132-133.

Singh, Kunwar Suresh, "Cestode Parasites of Birds," Indian Journal of Helminthology, IV (March 1952), 1-72.

Wardle, Robert Arnold, "The Parasitic Helminths of Canadian Animals," I. The Cestodaria and Cestoda, Canadian Journal of Research, VIII (1933), 317-333.

_____, "On the Technique of Cestode Study," Parasitology, XXIV (June 22, 1932), 241-252.

Wardle, Robert A., and James Archie McLeod, The Zoology of Tapeworms. St. Paul: University of Minnesota, North Central Publishing Company, 1952. 780 pp.

Boughton, Rex V., "Endoparasitic infestations of Grouse, Their Pathogenicity and Correlation with Meteoro-Topographical Conditions", U. of Minn. Agr. Exp. St, Tech. Bull. 121, August 1937.

List of Abbreviations

c - cirrus

ca - cirrus aperture, cirrus pore

cp - cirrus pouch, cirrus sac

dev - dorsal excretory (osmoregulatory) vessel (canal)

em - embryo or egg

esv - external seminal vesicle

ev - excretory (osmoregulatory) vessel (canal)

isv - internal seminal vesicle

o - ovary (used occasionally)

pg - deeply staining cell aggregate surrounding cirrus sac

pu - paruterine organ

r - rostellum

sd - sperm duct

sg - shell gland, Mehlis' gland

sr - seminal receptacle

st - cirrus whip or stylet

t - testes (used occasionally)

tev - transverse excretory canal

up - uterine pore

ut - uterus

v - vagina

va - vaginal aperture

vev - ventral excretory (osmoregulatory) vessel

vit, yg - vitelline gland, yolk gland (used occasionally)