Monogenetic Trematodes of Some New Zealand Fishes

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MONOGENETIC TREMATODES OF SOME
NEW ZEALAND FISHES

by

WILLIAM ARTHUR DILLON

A THESIS
Submitted to the School of Marine Science
of the College of William and Mary
in partial fulfillment of the requirements
for the degree of
MASTER OF ARTS
1963

APPROVED
[Signature]
Grateful appreciation is expressed to Dr. William J. Hargis, Jr. for the guidance and assistance received throughout the course of this study. The writer also wishes to thank the following individuals for their valuable contributions to this study: Mr. W. Stanley Wilson for the collection and identification of host material and for translations of German literature, Mr. Robert S. Bailey for photographic work, Mrs. Patricia T. Blake of the Microbiology-Pathology Department for the preparation of sections, and Mr. Reinaldo Morales-Alamo for translations of Spanish literature. To his wife, Margie, the writer expresses his gratitude for her assistance in the preparation of the plates and for her never-failing moral support.
ABSTRACT

During March 1960, 616 specimens of 35 fishes were collected from marine waters of New Zealand and examined for monogenetic trematodes. Twenty-three host species were parasitized by 28 species of monogenetic trematodes.

Of these, 20 monogeneids from 16 host species are discussed. Six, Amphibdella acanthopharynx n. sp., Allocotylophora polyprionum n. sp., n. gen., Tagia gempyllis n. sp., Heteraxinoides jordanidia n. sp., Heteraxinoides novaeezealandus n. sp., and Cemocotyle trachuri n. sp., are described for the first time. Three are redescribed: Amphibdelloides maccallumi (Johnston and Tieg, 1922) Price, 1937, Merizocotyle diaphana Cerfontaine, 1894, and Megalocotyle helicoleni Woolcock, 1936. Four new host records are reported and six new locality records established.

The subfamily Anthocotylinae Price, 1936 is emended to accommodate the new genus, Allocotylophora. The subfamily Cemocotylinae Price, 1962 is adopted and transferred from the family Heteraxinidae Price, 1962 to the family Microcotylidae Taschenberg, 1879.

Comparisons of host-parasite relationships indicate a very high degree of host-specificity. Of the 20 parasite species studied only two (2) occurred on more than one host in the collection. Of these, one is restricted to a single host genus and the other is considered either an aberrant occurrence or erroneous record.
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TABLE I

PLATES I - VI
INTRODUCTION

This paper is based on studies of monogenetic trematodes (Order Monogenea Carus, 1863) taken from the gills of marine fishes collected in New Zealand.* These collections consisted of 616 host individuals representing 35 species and 25 families. Parasites representing 28 species, 18 genera, and 11 families were found on 23 of these host species. The remaining 12 host species were not parasitized by monogenetic trematodes. Only 20 parasite species from 16 host species are discussed here. The others will be the subject of a later work.

Examination of the literature reveals that little is known about the monogeneid fauna of the New Zealand area. Only five authors, Blanchard (1883), Johnson (1931), Manter (1955), Manter and Walling (1958), and Robinson (1961), have dealt with these ectoparasites. Up to the present time a total of 18 species has been reported from 16 host species belonging to 14 families from New Zealand waters. The present study is probably more extensive, as regards the number of collections and the geographical area covered, than any of those mentioned above. Because over 400 species of fish are known from New Zealand waters and because of the expectation of at least one monogeneid species per host species, it is clear that even after present studies are completed, much will remain to be done before this parasite fauna is well known.

* This research was supported by Grant No. 13853 from the United States Antarctic Research Program of the National Science Foundation.
The research reported here is a continuation of a long range study of certain aspects of host-specificity, zoogeography and phylogeny of monogenetic trematodes being conducted by members of the Parasitology Section of the Virginia Institute of Marine Science.
METHODS AND MATERIALS

Collections were made at several locations. These were: Timaru, Dunedin and Akaroa Harbor (Christchurch) on the east coast of the South Island, Cape Campbell in the Cook Strait area, and Auckland, North Island. The fish were obtained chiefly from the commercial fisheries in which trawls, gill nets and Danish seines were used.

The hosts were collected and identified for the most part by Mr. William Stanley Wilson during March, 1960. The collection was made as part of a broader study of monogeneids of fishes of the Antarctic Ocean and associated land masses. Host identifications were made using the keys and systematics of Waite (1923), Graham (1956), and Parrott (1957, 1958). Scientific names were corrected and made current by Miss M. K. McKenzie (Marine Department; Fisheries Research Station, Wingfield Street, Wellington, New Zealand) to whom our thanks are due.

Trematodes were collected using a technique outlined by Hargis (1953). The gills were removed from the host to a saturated solution of Chloretone (Parke-Davis) prepared with filtered sea water and kept in this solution for 1-2 hours during which they were usually agitated to free the relaxing monogeneids from the branchial arches. The use of the Chloretone-sea water relaxing technique was believed by Hargis (1953) to result in specimens which were more normal in shape and in the arrangement of external and internal organs than those prepared by pressure-fixation techniques. The trematodes were then killed and fixed in 10% formalin. This technique is very useful with large collections since it facilitates rapid handling of host specimens.
in the field, thus enabling processing and preservation of material from large numbers of hosts. The parasites are then separated from the host material in the laboratory where conditions are less rigorous and where careful microscopic examination is possible.

Using a stereomicroscope, the parasites were removed from the branchial material and stored in vials containing a solution of 5% glycerol in 70% ethanol. The glycerol served to prevent drying of the specimens should the ethanol evaporate.

For the preparation of whole mounts the worms were removed from the glycerol-ethanol preservative to 50% ethanol. Since large quantities of darkened vitelline material in many of the monogeneids obscured vital organs, it was necessary to bleach dark specimens in a chlorinated ethanol solution before hydration. This technique worked well and facilitated study of internal organs. The worms were then hydrated using a graded ethanol series.

After hydration, the worms were stained with one or more of the following stains: Reynold's double stain (Delafield's hematoxylin plus alum cochineal), alum cochineal, Harris' hematoxylin, or Harris' hematoxylin with eosin as a counterstain. These different stains were often used on the same groups of animals to delineate various structures that would otherwise go unnoticed were only one used for the entire aggregation. The results obtained using these stains were as follows:

(1) Reynold's double stain proved to be a very good general stain since it combined the qualities of Delafield's hematoxylin and alum cochineal. It was found to be most effective with the Superfamily Gyrodactylidae and the Superfamily Capsalidae, especially the latter.
(2) Harris' hematoxylin proved to be effective in facilitating study of the reproductive structures and did not obscure the hard parts.

(3) Harris' hematoxylin with eosin as a counterstain produced greater detail in the cuticularized structures, testes, vas deferens, Mehlis' glands, and cephalic glands, (4) alum cochineal produced specimens particularly suitable for locating vital ducts and for the study of the digestive tract. Unfortunately alum cochineal, which was used most widely because it produced the most generally useful whole mounts, sometimes obscured hard parts, especially the genital armament.

The worms were overstained, washed in distilled water and immediately destained with a weak solution of HCl in 30% ethanol. Overstaining followed by destaining technique allowed better control of the amount of stain retained by the object than progressive staining. Destaining was carried out carefully using a white background. After dehydration, the specimens were cleared in deacidified beechwood creosote, or in xylene, in a few cases, and mounted permanently in Piccolyte. Xylene proved a poor clearing agent because it made the specimens brittle and therefore difficult to mount without distortion of vital structures or breakage.

Frontal sections were made of a single specimen from most species to facilitate the study of the internal organs. Sections were stained with Harris' hematoxylin and counterstained with eosin.

Only those specimens with clear taxonomic characters were used for identifications. Adult specimens were used in the diagnoses, sexual maturity being the criterion for adulthood. In this study, sexual maturity was determined either by the presence of egg capsules or by the apparently mature condition of the ovary.
Measurements were taken of a specific number of worms from each species in order that comparisons could be made between members of a series or closely related forms. All measurements were made with the use of a calibrated ocular or filar micrometer and are given in millimeters. In indicating these measurements the mean is given, followed by the minimum and maximum in parentheses. The number of measurements used in deriving the mean appears in parentheses before the measurement. All measurements of curved structures were across the lines subtending the greatest arcs described by those structures. Width measurements were made at the level of the ovary. All egg lengths were taken of the egg capsule, exclusive of filaments. Since sizes of the filaments vary within a species, the taxonomic value of this measurement is doubtful. It is the writer's opinion that length measurements on eggs are probably not significant, and that they certainly cannot be relied on as specific differences unless they are very distinct and accompanied by other, more stable, morphological differences.

Camera lucida drawings were used to facilitate identification and in the preparation of the plates.

The taxonomic scheme employed in this report is essentially that of Sproston (1946), Price (1936-1962), and Hargis (1953-1959).

The morphological terminology used in the descriptions is that of Hargis (1958) who organized his list of useful terms from the works of Price (1934-1943), Sproston (1945, 1946), Dawes (1947) and from his own studies.
RESULTS AND DISCUSSION

The scientific, family and common names of the host fishes employed are given in TABLE I. Also shown are the numbers of host specimens examined, the numbers of monogeneids recovered, and the numbers of monogeneid species per host species.

Order Monogenea Carus, 1863
Suborder Monopisthocotylea Odhner, 1912
Superfamily Gyrodactyloidea Johnston and Teigs, 1922
Family Dactylogyridae Bychowsky, 1933

Subfamily Tetraonchinae Monticelli, 1903

In her monograph, Sproston (1946) included the genera Amphibdella Chatin, 1874 and Amphibdelloides Price, 1937 in the subfamily Tetraonchinae. In 1957, however, Bychowsky removed them from this subfamily and reinstated the family Amphibdellatidae Carus, 1885 for this small group. Llewellyn (1960) followed Bychowsky's separation from the Tetraonchinae, emended the diagnosis and changed the family name to Amphibdellidae (Bychowsky, 1957) Llewellyn, 1960. Hargis (1959) considered that Bychowsky's transfer of the "amphibdellid parasites" to a separate family might not be justified. The writer prefers to follow Sproston's (1946) arrangement leaving the "amphibdellid parasites" in Tetraonchinae.

Thus far amphibdellids are found only on the host family Torpedinidae.
Genus *Amphibdella* Chatin, 1874

*Amphibdella acanthopharynx* n. sp.

(Figs. 1 - 5)

Host: *Torpedo fairchildi* Hutton, Electric Ray; family Torpedinidae.

Location: Gill mucosa (embedded).

Locality: Timaru, New Zealand.

Number studied: 16.

Description: Body elongated, fusiform, (6) 4.36 (3.97-4.82) long by (6) 0.76 (0.56-0.97) wide. Cuticle fairly thick and smooth. Prohaptor consisting of 3 pairs of head organs, connected posteriorly to cephalic glands. Posthaptor lobed, separated from the body proper by a narrow neck; armed with two pairs of anchors and an undetermined number of hooks. Anchors dissimilar in shape and size; average anchor size about (14) 0.130 (0.094-0.161) long. Hooks (2) 0.010 (0.007-0.13) long. Transverse bar absent. Disk-like sclerites present on posthaptor. Posterior glands apparently not present.

Pharynx slightly muscular, (10)0.207 (0.187-0.216) long by (10) 0.194 (0.177-0.213) wide, and armed with a ring of 12 curved spines. Pharyngeal spines (3) 0.036 (0.031-0.042) long by (3) 0.013 (0.012-0.015) wide; spines not always clear but can be detected by careful observation. Esophagus short, with a group of anterior glands on each side. Gut bifurcated, crura connected medially, about 3/4 distance from bifurcation; connection (2) 0.137 (0.133-0.141) across; right crus extends further posteriorly than left crus.
Testis single, between intestinal crura, in mid-dorsal region of body; posterior limit of testis not observed. Vas deferens proceeding from anterior end of testis, passing around left side of the ovary and dilating slightly before expanding to form the seminal vesicle; seminal vesicle (6) 0.291 (0.272-0.325) long by (6) 0.135 (0.102-0.194) wide; sperm duct passes from seminal vesicle, receiving ducts from two prostate reservoirs before entering cirrus; three prostate glands present, two connected by ducts to the prostate reservoirs and the third which appears to open directly into the accessory pieces. Cirrus a cuticularized, curved tube which appears to originate on the anterior part of the right accessory sclerite; accessory sclerites complicated, (7) 0.101 (0.072-0.133) long.

Ovary saccate, pretesticular, (8) 0.382 (0.321-0.430) long by (8) 0.180 (0.161-0.215) wide, looping around right crus; oviduct short, fusing with ducts from the seminal receptacle and vitelline reservoir before entering the oötype. Oötype short, surrounded by Mehlis' glands; uterus passing anteriorly to genital pore. Vaginal pore dextromarginal; cuticularized vaginal tube passing medially to join the anterior portion of the seminal receptacle which is located along the right margin of the anterior portion of the ovary; seminal receptacle (3) 0.176 (0.171-0.179) long by (3) 0.187 (0.166-0.214) wide. Cuticularized cup-like plate surrounding the vaginal pore, (9) 0.026 (0.021-0.32) wide; vaginal glands apparently absent. Vitellaria contained in two long, slightly lobed tubes, extending from level of base of oötype to near posterior end of body proper; transverse vitelloducts fusing medially, sending a short duct to join with the
oviduct and the duct from seminal receptacle before entering oötype. 
Eggs not observed. No eye spots present.

Discussion: The present species is apparently very similar to 
Amphibdella flavolineata MacCallum, 1916 from the gills of Torpedo 
nobiliana Bonaparte (≡ Tetranarce occidentalis Storer), but differs 
in the following respects: (1) pharynx armed with a ring of curved 
spines, (2) cuticularized cup-like plate surrounding the vaginal pore, 
(3) crura connected medially by a "single" canal about 3/4 distance 
from bifurcation and, (4) host. Price (1937) and Sproston (1946) 
agreed that there were 14 marginal hooks present in the genus 
Amphibdella Chatin, 1874. Ruszkowski (1931) and Palombi (1949) stated 
that there were 16 marginal hooks present on the haptor. This was 
confirmed and supplemented by Bychowsky (1957) and Llewellyn (1960). 
I was unable to determine accurately the number of marginal hooks 
present in this species.

This description increases the number of species in the genus 
Amphibdella Chatin, 1874 to four. These species are: Amphibdella 
acanthopharynx n. sp. from Torpedo fairchildi Hutton (southwestern 
Pacific waters); Amphibdella flavolineata MacCallum 1916 from Torpedo 
nobiliana Bonaparte (northeastern and northwestern Atlantic waters); 
Amphibdella paronaperugiae Llewellyn, 1960 from Torpedo torpedo (L.) 
(northeastern Atlantic waters); Amphibdella torpedinis Chatin, 1874 
from Torpedo marmorata Risso (northeastern Atlantic waters). Members 
of the genus Amphibdella Chatin, 1874 are very similar morphologically. 
Hargis (1955, 1959) has pointed out that this close relationship of 
the parasites probably reflects a corresponding relationship between
their hosts despite their apparent discontinuous distribution.

Genus *Amphibdelloides* Price, 1937

Price (1937) erected this genus to accommodate those "amphibdellid parasites" with an unlobed postthaprator and with a transverse bar. Bychowsky (1957) refused to recognize this genus, claiming that the haptoral bar is always present during some stage of development in this group and that the lobed or unlobed condition depends on the stage of development or on the method of preparation of these worms for study. Llewellyn (1960) agreed with Bychowsky's rejection of the lobed or unlobed condition of the postthaprator as being of generic importance, but retained the genus *Amphibdelloides* Price, 1937 on the basis of the presence of a transverse bar. He also separated *Amphibdelloides* Price, 1937 from *Amphibdella* Chatin, 1874 by the following characters: (1) presence of transverse bar, (2) ovary lying entirely within the intercaecal field, (3) vitellaria always follicular, (4) vaginal pore opening on the dorsolateral surface, (5) vaginal glands absent, (6) vagina proceeding from anterior or posterior end of seminal receptacle, (7) no dilation in vas deferens, (8) cirrus complex, and (9) location on the secondary gill lamellae rather than being embedded in the gill mucosa.

*Amphibdelloides maccallumi* (Johnston and Tiegs, 1922) Price, 1937

(Figs. 6 - 10)

Synonyms: *Amphibdella maccallumi* Johnston and Tiegs, 1922.

*Amphibdella torpedinis* Chatin of MacCallum (1916).

Host: *Torpedo fairchildi* Hutton, Electric Ray; family Torpedinidae.
Location: Gills (secondary lamellae).

Locality: Timaru, New Zealand.

Previously reported host and localities: *Torpedo nobiliana* Bonaparte
(= *Tetranarce occidentalis* Storer) from the following localities: Irish Sea (Rees & Llewellyn, 1941); Irish Atlantic Slope (Williams, 1960); Sète Mediterranean (Euzet, 1957 c); Woods Hole (MacCallum, 1916), Plymouth (Llewellyn, 1960).

*Torpedo californica* Ayres from Cortes bank, off the coast of southern California (Alexander, 1954).

Number studied: 40.

Description: Body elongate, (11) 2.38 (1.64-3.20) long by (11) 0.53 (0.40-0.62) wide, rounded or bifid anteriorly, slightly narrowed posteriorly to a wedge-shaped posthaptor. Cuticle thin and smooth. Prohaptor consisting of three pairs of head organs connected by ducts to the cephalic glands; cephalic glands forming a band across body anterior to pharynx and extending backward on each side to near level of genital opening. Posthaptor wedge shaped, (11) 0.33 (0.28-0.41) wide; armed with 2 pairs of centrally placed anchors, 1 transverse bar, and 14-16 marginal hooks. Anchors slightly dissimilar in shape but similar in size, (21) 0.174 (0.162-0.185) long; hooks (4) 0.0085 (0.008-0.009) long; transverse bar slightly curved, (11) 0.082 (0.068-0.096) wide. Posterior glands very abundant near the junction of posthaptor and body proper in the smaller forms; posterior glands sparse or non-existent in the larger forms. Disk-like sclerites located on the posthaptor.
Mouth midventral, located about half-way between pharynx and the anterior end. Pharynx (10) 0.141 (0.119-0.157) long by (10) 0.143 (0.130-0.152) wide; esophagus short. Gut bifurcated, crura unramified, apparently not confluent posteriorly.

Testis single, between intestinal crura, in mid-dorsal region of body, extending from near posterior ends of vitelline fields to a level just posterior to ovary; vas deferens proceeding from anterior end of testis and passing around left side of ovary before expanding to form the seminal vesicle; seminal vesicle (3) 0.233 (0.217-0.264) long by (3) 0.120 (0.106-0.136) wide; sperm duct passes from seminal vesicle, receiving ducts from two prostate reservoirs before entering cirrus; two prostate glands present, one slightly to the left of midline and the other slightly to the right of the midline, connected by ducts to the prostate reservoirs. Cirrus a long, narrow tube, with a flange-like proximal base, (2) 0.124 (0.118-0.129) long; two pincer-like accessory sclerites present, the one on the left with a single curved tip and the one on the right appears to have a three-pronged tip, with a fourth projection just posterior to these. The accessory sclerite on the right apparently serves as a cirrus "bearer" and the cirrus passes through the one on the left; accessory piece (11) 0.138 (0.118-0.146) long.

Ovary saccate, pretesticular, lying entirely between the crura, (8) 0.122 (0.098-0.148) wide; oviduct short, fusing with ducts from the seminal receptacle and vitelline reservoir before entering oötype. Oötype short, apparently surrounded by Mehlis' glands; uterus not observed but apparently passes to genital pore. Vaginal pore dextro-marginal, (2) 0.0055 (0.005-0.006) in diameter; cuticularized vaginal
tube passing medially to join the posterior end of the seminal receptacle; seminal receptacle located along the right margin of the ovary. Vitellaria follicular, extending from level near anterior end of ovary and terminating near posterior ends of crura; transverse vitelloducts fusing a midline with a slight anterior extension joining with oviduct and duct from seminal receptacle before entering oötype. Eggs not observed. No eyespots present.

Discussion: The present study reveals that the worms in this collection are probably conspecific with *Amphidelloides maccallumi* (Johnston and Tiegs, 1922) Price, 1937. However, the sucker-like, muscular depression or "fibrous pad" mentioned by Alexander (1954) and Llewellyn (1960) was not observed in the specimens from this collection. Fourteen marginal hooks were observed in the worms in this collection. Price (1937) gives the number of marginal hook as 14, Alexander (1954) gives 12-14, and Llewellyn (1960) records 16 for this species.

The genus *Amphidelloides* Price, 1937 includes the type species *Amphidelloides maccallumi* (Johnston and Tiegs, 1922) Price 1937, and two others, *Amphidelloides valleii* Llewellyn, 1960 from the gills of *Torpedo marmorata* Risso (northeastern Atlantic) and *Amphidelloides narcine* Hargis, 1955 from the gills of *Narcine brasiliensis* (Olfers) (Gulf of Mexico). The presence of this species in southwestern Pacific waters, as well as in the other localities mentioned above, establishes a wide geographical range for this species. It is now recorded from both northern and southern hemispheres. Members of the genus *Amphidelloides* Price, 1937 are very similar morphologically. Hargis
(1955, 1959) has pointed out that this close relationship of the parasites probably reflects a corresponding relationship between their hosts despite their apparent discontinuous distribution and their differential evolutionary status.

According to Hargis (1955, 1959), Price (1937) and Sproston (1946) both give *Squalus acanthias* as a second host for this parasite but unless Price obtained later unpublished records from MacCallum's collections or some other source, this host record appears to be in error because MacCallum (1916) listed only *Torpedo nobiliana* (— *Tetranarce occidentalis*) as the host. Sproston took her record from Price.

This study establishes a new host and locality record for this species.

Superfamily Capsaloidea Price, 1936

Family Microbothriidae Price, 1936

Subfamily Microbothriinae Price, 1938

This subfamily is represented in this collection by a single species, belonging either to the genus *Microbothrium* Olsson, 1869 or the genus *Leptocotyle* Monticelli, 1905. According to Price (1938) the genus *Leptocotyle* differs from *Microbothrium* as follows: (1) pro-haptor in the form of a weakly developed oral sucker, and (2) crura unramified. The writer was unable to determine accurately if the crura in this species are branched or unbranched, therefore a more detailed study will be necessary before determining its taxonomic position. Examination of the existing literature dealing with the
five species in *Microbothrium* and the one species in *Leptocotyle* reveals that this species is new to science.

Family Monocotylidae Taschenberg, 1879

The writer accepts the family as characterized by Price (1938) and Sproston (1946) with the emendations of Hargis (1955).

Subfamily Merizocotylinae Johnston and Tieg, 1922

Type genus: *Merizocotyle* Cerfontaine, 1894

Discussion: Cerfontaine (1894, 1898), Pratt (1900), MacCallum (1916), and Brinkmann (1940) placed the type genus of *Merizocotylinae* in the family *Monocotylidae* Taschenberg, 1879. Monticelli (1903, 1905) included the genus *Merizocotyle* Cerfontaine, 1894 in his new subfamily *Anisocotylinae* of the family *Monocotylidae*. In 1922, the subfamily *Merizocotylinae* was established by Johnston and Tieg to include the type genus, *Merizocotyle* Cerfontaine, 1894, as well as *Empruthotrema* Johnston and Tieg, 1922. Fuhrman (1928), Kay (1940), and Palombi (1949) refused to recognize the subfamily *Merizocotylinae* and included the type genus in the subfamily *Monocotylinae*. The writer prefers to follow Price (1938), Sproston (1946), and Hargis (1955), and retain the subfamily *Merizocotylinae*. Bychowsky (1957) also retained the subfamily *Merizocotylinae*.

At the present time the subfamily contains four genera, *Merizocotyle* Cerfontaine, 1894, *Cathariotrema* Johnston and Tieg, 1922, *Thaumatocotyle* Th. Scott, 1904, and *Empruthotrema* Johnston and Tieg, 1922. *Merizocotyle*, *Thaumatocotyle*, and *Empruthotrema* are all apparently
parasitic on the gills of marine batoidids. Cathariotrema is parasitic on selachians.

Genus Merizocotyle Cerfontaine, 1894

The genus Merizocotyle includes the following species:

Merizocotyle diaphana Cerfontaine, 1894 (syn. Merizocotyle minor Cerfontaine, 1898), reported on the gills of Raja batis from Ostende, Belgium (Cerfontaine, 1894), Raja sp. from Roscoff (Cerfontaine, 1898), and Raja oxyrhynchus from Roscoff (St. Remy, 1898); Merizocotyle pugetensis Kay, 1942 on the gills of Raja binoculata (Girard) from Friday Harbor, Washington by Kay (1942), Bonham (1950), and Robinson (1961); Merizocotyle sp. Palombi, 1943, reported on the gills of Raja marginata from Trieste (Adriatic Sea) by Palombi (1943). The present collection contains Merizocotyle diaphana Cerfontaine, 1894 on the gills of Raja nasuta Muller and Henle from southwestern Pacific waters, thus increasing the geographical range for this group. It is now known to be present in the northern and southern hemispheres.

Members of the genus Merizocotyle are apparently all parasitic on the host genus Raja (family Rajidae), and, therefore, the genus-specific pattern (Hargis, 1957) among these merizocotylids probably reflects a correspondingly close relationship between their hosts.

Merizocotyle diaphana Cerfontaine, 1894

(Figs. 11 - 12)

Synonym: Merizocotyle minor, Cerfontaine, 1898.

Host: Raja nasuta Muller and Henle, Skate; family Rajidae.
Location: Gills.

Locality: Akaroa Harbor and Timaru, New Zealand.

Previously reported host and localities: *Raja batis* from Ostende, Belgium (Gerf., 1894); *Raja sp.* from Roscoff (Cerfontaine, 1898) and *Raja oxyrhynchus* from Roscoff (St. Remy, 1898).

Number studied: 2.

Redescription: Body elongate, somewhat cylindrical, (2) 3.91 (3.84-3.98) long by (2) 0.945 (0.88-1.01) wide, anterior end rounded or bifid, rounded posteriorly. Prohaptor three pairs of head organs connected by ducts to cephalic glands; cephalic glands located near posterior sides of pharynx. Cuticle thin and fairly smooth. Posthaptor a concavo-convex, oval disk, (2) 1.897 (1.87-1.92) long by (2) 1.635 (1.61-1.66) wide, opening ventrally; divided by septa into a central depression, 7 radial depressions and 18 marginal depressions of which the posterior marginal depression is largest; armed with two anchors and 14 marginal hooks. Anchors (3) 0.647 (0.64-0.65) long; marginal hooks (5) 0.018 (0.016-0.02) long. Disk-like sclerites located on or in the posthaptor with the largest ones slightly posterior to the central depression. Muscular-like bands present on the right and left side of each anchor.

Mouth ventral, subterminal. Pharynx (2) 0.245 (0.24-0.25) long by (2) 0.25 wide; esophagus very short or nonexistent. Gut bifurcated, without medial or lateral branches, not confluent posteriorly.

Testis large, postovarial except for a slight extension along right margin of ovary, (2) 0.76 (0.74-0.78) long by (2) 0.43 (0.38-0.48) wide; testis appears to be slightly folded. Vas deferens running
from testis, widening before passing under the vitelline ducts and proceeds anteriorly near left of midline; vas deferens apparently enters the cirrus bulb anteriorly. Genital pore common, slightly to right of midline at one-third level of body; cirrus cuticular, somewhat cone-shaped, approximately (1) 0.185 long by (2) 0.012 (0.007-0.017) wide, passing from cirrus bulb posteriorly with the distal end curving slightly anteriorly; cirrus partially surrounded by a spring-like structure; cirrus bulb oval, (1) 0.067 long by (1) 0.073 wide. What appears to be a large prostate body is present to the left of cirrus bulb. Members of the genus *Merizocotyle* are usually understood to possess two large prostate bodies external to cirrus bulb; however, the right side of the worms in the present collection were so obscured by vitellaria that the presence of this character was not determinable.

Ovary tubular to saccate, curves around right intestinal crus; short oviduct entering ootype-uterus complex. Ootype in midline just posterior to vitelline reservoir; uterus passing a short distance posteriorly then turning back on itself, twisting anteriorly in midline to exit via the genital pore. Vaginae not detected. Mehlis' glands around ootype base. Vitellaria follicular, near intestinal crura, extending from level of pharynx to about midway between distal limit of testis and posterior end of body proper; transverse vitelloducts fusing medially. Egg *in utero* somewhat triangular, with a long posterior filament; egg (2) 0.124 (0.12-0.13) long by (2) 0.11 wide, exclusive of filament. Eye spots absent.

Discussion: The present study indicates that the two parasites in this collection are conspecific with *Merizocotyle diaphana*. 

Cerfontaine, 1894. The worms in the present collection are slightly smaller than those in the original description. This size difference is probably due to the contracted state of the worms in the present collection and is not considered significant. The large prostate body on the right side and the vaginae were not detected. However, the obstruction by vitellaria and the contracted state of the worm prevented critical observation in those areas.

Cerfontaine (1898) described *Merizocotyle minor* from the gills of *Raja sp.* and *Raja oxyrhynchus*. These specimens were not as large as the maximum size of *Merizocotyle diaphana* given by Cerfontaine (1894) or the worms in the present collection, but apart from this their characteristics appear to agree. According to Dawes (1956) *Merizocotyle minor* shows only insignificant differences which are explicable in terms of its smaller size and state of contraction, and is regarded as a synonym of *Merizocotyle diaphana*. The writer agrees that these two forms are probably identical, thus supporting the conclusions of Dawes (1956).

Robinson (1961) reported *Empruthotrema raiæ* (MacCallum, 1916) Johnston and Tieg, 1922 from the nasal chamber of *Raja nasuta* collected at Portobello, Otago Harbor, New Zealand. It would be interesting to compare Robinson's specimens with those in the present collection because it is likely that Robinson misidentified his specimens and that they are, in reality *Merizocotyle diaphana* and not *Empruthotrema raiæ*. The reasons for this speculation are: (1) the genus *Empruthotrema* Johnston and Tieg, 1922 is separated from the genus *Merizocotyle* on the basis of the number of posthaptoral depressions and the absence of
anchors, but apparently agrees with Merizocotyle in other respects, and (2) Robinson's specimens and the specimens in the present collection were discovered on the same host.

This study, unless Robinson (1961) actually misidentified his specimens, establishes a new host and locality record for this species.

Family Capsalidae Baird, 1853

Subfamily Trochopodinae (Price, 1936) Sproston, 1946

Type genus: Trochopus Diesing, 1850, Price (1939a) and Sproston (1946) listed only three genera for this subfamily as follows:

Macrophyllida Johnston, 1929; Trochopus Diesing 1850; Megalocotyle Folda, 1928. Bychowsky (1957) erected a new subfamily (Megalocotylinae) for the genus Megalocotyle Folda, 1928, including therein Macrophyllida Johnston, 1929 and Sprostonia Bychowsky, 1957. He retained the subfamily Trochopodinae for the genus Trochopus Diesing 1850, including Benedenia Diesing, 1858 and Pseudobenedenia Johnston, 1931. Bychowsky (1957) contended that the subfamily Benedeniae Johnston, 1931 (in part), which is separated from other Capsalidae by the presence of an "aseptate" posthaptor, could not exist since the presence of septa is characteristic for the genera Benedenia Diesing, 1858 and Pseudobenedenia Johnston, 1931. Further, Bychowsky (1957, p. 452-453) indicated that more or less well-developed septa were present in all Benedenia and Pseudobenedenia species available to him. Apparently septa too weak or transparent to be detected in specimens mounted in Canada balsam or similar media were easily seen by him in glycerine-jelly mounts.
There is no doubt that this group needs re-examining. It is hoped that future works will result in clarification of this situation.

Genus *Megalocotyle* Folda, 1928

Type species: *Megalocotyle marginata* Folda, 1928

The genus *Megalocotyle* Folda, 1928 is separated from its closest relative, *Trochopus* Diesing, 1850, on the basis of the number of septa on the postshaptor (Price, 1939; Sproston, 1946). Price (1936) considered *Megalocotyle* Folda, 1928 a synonym of *Trochopus* Diesing, 1850. Later, at least for convenience, he reinstated the genus (Price, 1939). Because of this confusion, a careful study should be conducted to determine the validity of *Megalocotyle* Folda, 1928.

*Megalocotyle helicoleni* Woolcock, 1936

(Figs. 13 - 20)


Host: *Helicolenus percoideus* Richardson, Sea Perch; family Scorpaenidae.

Location: Gills.

Locality: Cape Campbell, New Zealand.

Previously reported host and localities: on the gills of *Helicolenus percoideus* from Port Philip Bay, Victoria, Australia (Woolcock, 1936) and Cook Strait and Portobello, Otago Harbor, New Zealand (Robinson, 1961).

Number studied: 5.

Redescription: Body elliptical, rounded anteriorly and posteriorly, (2) 1.455 (1.45-1.46) long by (3) 1.13 (1.03-1.20) wide; entire body
often seen curled into a concavo-convex disk. Cuticle fairly thin and smooth. Prohaptor a pair of ventrolateral suckers, (2) 0.331 (0.318-0.345) long by (3) 0.293 (0.280-0.301) wide; tissue in the anterior half glandular; prohaptor surmounted dorsally by a membranous flap. Posthaptor a concavo-convex, oval disk, opening ventrally, (2) 0.693 (0.645-0.74) long by (2) 0.709 (0.648-0.77) wide, divided by septa into a central depression and 6 peripheral depressions; margin of posthaptor a strong muscular rim, surrounded by a delicate, pleated marginal membrane; armed with three pairs of anchors and fourteen marginal hooks. Anterior-most anchors stout, (3) 0.150 (0.143-0.154) long by (2) 0.028 (0.027-0.029) wide; middle anchors elongate, (3) 0.131 (0.124-0.136) long by (1) 0.010 wide, with curved shaft and strongly recurved tips; posterior-most anchors elongate, (3) 0.108 (0.104-0.11) long by (1) 0.018 wide, with slightly tapered base which may be divided into two by a deep cleft, with nearly straight shaft and strongly recurved tips.

Pharynx, (3) 0.226 (0.221-0.237) long by (3) 0.258 (0.24-0.278) wide; esophagus short or nonexistent. Gut bifurcated, crura with medial and lateral dendritic branching.

Two testes, ovoid in outline, (3) 0.253 (0.225-0.278) long by (3) 0.201 (0.197-0.207) wide, with the anteromedial portion of the testes embracing the posterolateral portion of the ovary; vasa efferentia anastomose in midline to form the vas deferens; vas deferens passes to left of ovary and proceeds anteriorly to form a convoluted preovarial loop before entering cirrus bulb. Cirrus complex consisting of muscular cirrus, prostate reservoir, and seminal vesicle in cuticularized cirrus.
pouch. Cirrus bulb (2) 0.106 (0.097-0.115) long by (2) 0.199 (0.197-
0.201) wide; cirrus approximately (2) 0.561 (0.559-0.562) long,
containing two ducts, the upper one consisting of sperm and the lower
one with prostate material; two other ducts originating near proximal
end of cirrus. Glands of Goto, (2) 0.044 (0.038-0.05) long by (2)
0.069 (0.068-0.07) wide, in midline near level of posterior margin
of the testes. Cirrus and uterus apparently opening via a common genital
pore; vaginal pore separate, opening just posterior to genital pore.

Ovary oval-shaped, (3) 0.170 (0.159-0.183) long by (3) 0.154
(0.128-0.178) wide, located between the anterior portion of testes,
and possibly containing a secondary seminal receptacle; secondary
seminal receptacle (1) 0.084 long by (1) 0.082 wide; oviduct convoluted,
receiving duct from vitelline reservoir and then proceeding antero-
laterally to oötype. Oötype relatively large and apparently
surrounded by Mehlis' glands; uterus passing from oötype to genital
pore. Vaginal pore on left side near prohaphtoral sucker; vaginal
duct passes posteromedially from vaginal pore to the primary seminal
receptacle. Vitellaria follicular, situated in almost all parts of
the body; transverse vitelloducts fusing medially. Eggs not observed.
Excretory ducts parallel to intestinal crura at level of cirrus pouch.
Four eye spots present.

Discussion: The present study indicates that the worms in this
collection are probably conspecific with Megalocotyle helicoleni
Woolcock, 1936, from the gills of the same host species as ours,
Helicolenus percoideus Richardson. Since there appears to be some
errors of observation and in measurements in the original account, a
redescription of the species is given above.
Robinson (1961) studied a group of twenty-four (24) specimens, also from Helicolenus percoideus, collected by Dr. Manter at Cook Strait and Portobello, Otago Harbor, New Zealand. He described them as a new species, Trochopus australis. According to his report this action was based upon the following differences between his specimens and Woolcock's one specimen: (1) number of posthaptoral septa, (2) shape and size of the anteriormost anchors, and (3) position of the uterus.

The writer, however, does not feel that Robinson's action was justified because: (1) all specimens of the species in question were recovered from the same host species, (2) the slight difference in the position of the uterus is regarded as insignificant, (3) the anteriormost anchors reveal a wide range in shape, although most of them conform to the shape illustrated by Woolcock, (4) the side view of an anchor shown in Robinson's illustration would probably resemble more closely the anchor as shown by Woolcock in front view, and (5) the details of the posthaptor in Woolcock's description and figure are obscure.

Robinson (1961) placed his specimens in the genus Trochopus Diesing, 1850 sensu Bychowsky, 1957 on the basis of the following: (1) absence of a median anterior septum on the posthaptor, and (2) muscular prohaptoral suckers. However, the writer prefers to follow Price (1939) and Sproston (1946) and retain the genus Megalocotyle Folda, 1928 on the basis of the number of septa (6-7) on the posthaptor.

Suborder Polyopisthocotylea Odhner, 1912

Superfamily Polystomatoidea Price, 1936
Family Hexabothriidae, Price, 1942

Subfamily Hexabothriinae, Price, 1942, *sensu* Sproston, 1946

There are at present 6 genera in the subfamily Hexabothriidae as follows: *Hexabothrium* Nordmann, 1832; *Heteronchocotyle* Brooks, 1934; *Rajonchocotyle* Cerfontaine, 1899; *Squalonchocotyle* Cerfontaine, 1899; *Dasyonchocotyle* Hargis, 1955.

The writer agrees with Hargis (1955) that some of the present generic criteria need re-evaluation and that future study may show them to be invalid resulting in the reduction of some of the present genera to subgenera.

The subfamily is represented in this collection by four species belonging to the genus *Squalonchocotyle* Cerfontaine, 1899. Two of these will be discussed in this report. The other two, one from *Galeorhinus australis* (MacLeay) and the other from *Squalus lebruni* (Valliant), will be treated at a later date.

Genus *Squalonchocotyle* Cerf., 1899

*Squalonchocotyle antarctica* Hughes, 1928

Synonym: *Erpocotyle antarctica* (Hughes, 1928) Price, 1942

Host: *Mustelus antarcticus* (Guenther), Gummy Shark; family Mustelidae.

Location: Gills.

Locality: Timaru and Akaroa Harbor, New Zealand.

Previously reported host and locality: *Mustelus antarcticus* from Port Phillip Bay, Victoria, Australia (Hughes, 1928) and from New Zealand (Manter, 1955).
Number studied: 10.

Discussion: This species is in need of a complete redescription. Hughes (1928) published a superficial account of the worm, neglecting all measurements except body length, width and egg length. He failed to mention the exact position of the reproductive structures in his description and only superficially illustrated them in a sagittal section. Hughes' drawings lack detail and clarity.

Manter (1955) added a few details and a new locality record but made no improvements over the drawings of Hughes. Manter's additions to the descriptive details were as follows: (1) inner surface of oral cavity papillated, (2) haptor suckers with conspicuous ridges but either lack papillae or have only a few, faint and widely scattered, (3) haptor hooks with spines along the inner edge for about half their length, (4) appendix hooks, 52 to 54 microns long, (5) seminal receptacle present, (6) eggs approximately 166 to 194 microns long and egg filaments to about the same length as the egg, and (6) host.

Price (1942) and Sproston (1946) in their diagnosis stated that the vitellaria do not extend into the haptor appendix. Many of the specimens in this collection have vitellaria extending a short distance into the haptor appendage.

Squalonchocotyle callorhynchi Manter, 1955

Host: Callorhynchus mili Bory, Elephant Fish; family Chimaeridae.

Location: Gills.

Locality: Timaru, New Zealand
Previously reported host and locality: Callorhynchus capensis Dumeril from Capetown, South Africa and Callorhynchus milii Bory from Wellington, New Zealand.

Number studied: 8.

Discussion: This species was described by Manter (1955) from the gills of Callorhynchus capensis Dumeril and Callorhynchus milii Bory. The specimens in the present collection agree with Manter's description in almost every detail.

According to Manter (1955) this species is most closely related to Squalonchocotyle canis Cerfontaine, 1899 from which it differs in the following respects: (1) position of the vaginal pores, (2) lack of seminal receptacle, (3) egg size, (4) shape of appendix hooks, and (5) host. The lack of a seminal receptacle separates it from most members of the genus.

Prior to the report of Manter (1955), members of the genus Squalonchocotyle Cerf., 1899 had been found only on selachians. They are now known to be present on both selachians and chimaerids. This distribution may reflect an historic genetic relationship between these two groups of soft-bodied fishes.

Family Mazocraeidae Price, 1936

Price (1961) has proposed five new subfamilies for the family Mazocraeidae. This family is represented in this collection by a single species, which appears to agree with Price's subfamily Mazocraeoidinae. However, a more detailed study will be necessary before its precise and proper taxonomic position can be determined.

Superfamily Diclidophoroidea Price, 1936

Family Chimaericolidae Brinkmann, 1942
Genus Callorhynchicola Brinkmann, 1952

Callorhynchicola multitesticulatus Manter, 1955

Host: Callorhynchus mili Bory, Elephant Fish; family Chimaeridae, Physiculus bachus (Bloch & Schn.), Red Cod; family Gadidae.

Location: Gills.

Locality: Timaru, New Zealand.

Previously reported host and locality: Callorhynchus capensis Dumeril from Capetown, South Africa and Callorhynchus mili Bory from Wellington, New Zealand.

Number studied: 3.

Discussion: This species was originally described by Manter (1955) from the gill chamber of Callorhynchus capensis Dumeril and Callorhynchus mili Bory.

The New Zealand parasites recovered by Manter were broken off near the posthaptor and the posterior end was not recovered. The worms were more mature than the South African species and showed slight differences in structure. Until a more detailed study of the worms in the present collection is carried out and its taxonomic position determined, the writer will accept Manter's suggested conspecificity with the South African monogeneid.

According to Manter (1955) Callorhynchicola multitesticulatus differs from Callorhynchicola branchialis Brinkmann, 1952, the type and only other species in this genus, in the following characters: (1) number of testes, (2) size of eggs, (3) branches of uterus more distinct, (4) vitellaria do not extend posterior to testes but do
extend a little further anteriorly, (5) oral sucker more distinct, (6) haptoral clamps have a more muscular bowl, and (7) host.

In all cases, the specimens in this collection were found in the anterior-most hemibranch with the peduncle extending into the tissue beneath the dermis and with the posthaptor near the cartilagenous gill ray.

A single specimen was also recovered from Physiculus bachus (Bloch & Schn.) collected at Timaru, New Zealand. The appearance on Physiculus bachus is regarded as accidental. The reasons for this speculation are: (1) the specimen was recovered from the preservative rather than the gills, (2) the peduncle and posthaptor were missing, (3) the difference between the structure of the gills in holocephaleans and gadids, (4) both hosts were collected from the same locality at the same time and (5) only a single specimen was recovered from 30 host specimens.

Superfamily Diclidophoroidea Price, 1936

Family Discocotylidae Price, 1936

The writer accepts the family as characterized by Price (1936) and Sproston (1946) with the emendations of Hargis (1956). The emendations were made by Hargis in order to exclude the characters of the subfamily Vallisiinae Price, 1943 which he transferred to the family Gastrocoylidae Price, 1943 where it properly belongs by virtue of its accessory sclerites, etc. Hargis (1956) pointed out that
Discocotylidae is not an homogeneous aggregation, but whether Bychowsky's new arrangement resolves the dilemma is questionable.

Subfamily Anthocotylinae Price, 1936, diag. emend.

Diagnosis: Discocotylidae. Body elongate, flattened dorsoventrally, bilaterally symmetrical. Posthaptor bearing eight sessile or sub-sessile clamps; development of clamps on the posthaptor may be symmetrical or asymmetrical. Anchors present or absent. Accessory clamp sclerites always absent. Testicular follicles usually post-ovarian, but may be both in front of and behind the ovary. Genital atrium armed. Vaginae present or absent.

Type genus: Anthocotyle van Beneden and Hesse, 1863.

Discussion: The above emendation is made to accommodate characters of Allocotylophora polyprionum n. gen., n. sp.

At the present time the subfamily contains four genera, Allocotylophoragen., Anthocotyle van Beneden and Hesse, 1863, Tagia Sproston, 1946, and Hemitagia Sproston, 1946. Winkenthughesia Price, 1943 was previously attributed to this subfamily, but Price (1959) transferred it to the subfamily Gastrocotylinae Sproston, 1946. Because Winkenthughesia has accessory clamp sclerites, the writer feels that Price's proposal is justified. According to Hargis (1956), Tagia Sproston, 1946 and Hemitagia Sproston, 1946 are closely related, and perhaps congeneric.

Allocotylophora polyprionum n. gen., n. sp.

(Figs. 27 - 30)
Host: *Polyprionum oxygenios* (Bloch and Schneider), Grouper; family Serranidae.

Location: Gills.

Locality: Cape Campbell, New Zealand.

Number studied: 53.

Description: Body elongate, flattened dorsoventrally, (6) 6.18 (5.13-7.89) long by (6) 1.87 (1.71-2.03) wide, anterior part of body merging inconspicuously with the posthaptor. Prohaptor a pair of biloculate buccal suckers, (6) 0.154 (0.13-0.18) long by 0.098 (0.085-0.12) wide, placed laterally in the walls of the buccal funnel; prohaptor surmounted by a membranous flap. Posthaptor a cotylophore bearing four pairs of sessile, similar clamps and two pairs of dissimilar anchors; the clamp row on the right extends further posteriorly than the left clamp row (The clamp row with the greater posterior extension may be either right or left, but the internal organs maintain their relative position.). Clamps dissimilar in size: the anterior three pairs of clamps, (6) 0.326 (0.30-0.38) long by (6) 0.56 (0.50-0.61) wide; posterior pair of clamps, (6) 0.31 (0.29-0.35) long by (6) 0.43 (0.395-0.465) wide. Clamp sclerites typically discotyloid in nature; anterior and posterior loop elements incomplete medially, but not laterally; middle loop elements incomplete medially and laterally, center sclerite U-shaped, of approximately equal length ventrally and dorsally, and bifurcated at both ends. Terminal lobe armed with two pairs of anchors dissimilar in shape and size: larger pair (5) 0.056 (0.05-0.06) long, with stout, bifurcated base and curved tips; smaller pair (3) 0.042 (0.035-0.045) long, with elongate shaft.
and recurved tips. Accessory wall sclerites appear to be present in the posterior portion of each clamp.

Mouth subterminal, ventral; pharynx (5) 0.078 (0.07-0.095) long by (5) 0.075 (0.07-0.08) wide; esophagus short; intestine bifurcated, crura ramified medially and laterally; gut apparently not extending into posthaftor.

Testes numerous, follicular, mostly preovarial, a few paraovarial and postovarial; testes (6) 0.082 (0.07-0.095) long by (6) 0.085 (0.075-0.09) wide. Vas deferens tightly coiled posteriorly, loosely coiled anteriorly, running anteriorly in midline to genital atrium. Genital pore slightly posterior to gut bifurcation, opening into armed genital atrium. Genital corona, muscular, (6) 0.163 (0.13-0.18) long by 0.148 (0.13-0.17) wide, armed with 25 - 30 hooks. Vaginal openings lateral, near level of genital atrium; vaginal pore (6) 0.096 (0.08-0.115) long by (6) 0.13 (0.10-0.16) wide. Vaginal ducts proceed posteromedially to midline.

Ovary irregularly tubular, convoluted in midline; oviduct not clear, appearing to run medially from right ovarian lobe then turning posteriorly to join the oötype-uterus complex. Uterus ventral, running anteriorly in midline to the genital atrium. Mehlis' glands apparently present. Transverse vitellducts fusing midventrally to form the Y-shaped vitelline reservoir, sending a lateral branch to the vicinity of the right crus and a posterior branch to join the oötype-uterus complex. The lateral branch from the vitelline reservoir branches anteriorly and posteriorly in vicinity of the right crus, but does not appear to be the genito-intestinal canal. Vitelline bodies abundant, extending
from slightly posterior to vaginal pore to anterior portion of posthaptor. Eggs spherical, (5) 0.174 (0.17-0.175) long by (5) 0.087 (0.085-0.09) wide, with one terminal filament. Glandular area present anterior to oral aperture.

Genus Allocotylophora n. gen.

Diagnosis: Anthocotylinae. Body elongate, flattened dorsoventrally, anterior part of body merging inconspicuously with the opisthaptor. Prohaptor a pair of biloculate buccal suckers, placed laterally in the walls of the buccal funnel; prohaptor surmounted by a membrane. Posthaptor a cotylophore bearing four pairs of clamps and two pairs of dissimilar anchors; the clamp row on the right side extends further posteriorly than the left clamp row (the clamp row with the greater posterior extension may be either right or left, but the internal organs maintain their relative position). Clamp sclerites typically discotyloid in nature; anterior and posterior loop elements are incomplete medially, but not laterally; middle loop elements incomplete medially and laterally; center sclerite U-shaped of approximately equal length ventrally and dorsally, and bifurcated at both ends. Testes mostly preovarial, a few paraovarial and postovarial. Vaginal openings lateral. Genital atrium armed. Vitellaria extending a short distance into posthaptor.

Type species: Allocotylophora polyprionum n. sp.

Discussion: Allocotylophora n. gen. varies from every other group of the subfamily Anthocotylinae in characters that are presently regarded as generic in rank. These characters are as follows: (1) the clamp row on the right extends further posteriorly than the left clamp row,
(2) testes preovarial, paraovarial and postovarial, and (3) flap present on prohaptor.

Genus *Tagia* (Sproston, 1946) sensu Hargis, 1956

Type species: *Tagia ecuadori* (Meserve, 1938) Sproston, 1946

This genus now contains six species, two whose affinities are fairly clear, *Tagia gempyllis* n. sp. and *Tagia ecuadori* (Meserve, 1938) Sproston, 1946, and four whose positions are uncertain, *Tagia bairdiella* Hargis, 1956, *Tagia cupida* Hargis, 1956, *Tagia micropogoni* Pearse, 1949, and *Tagia otolithus* (Yamaguti, 1953) Hargis, 1954. The last four will probably require generic reassignment. According to Hargis (1959), *Tagia micropogoni* Pearse, 1949, *Tagia bairdiella* Hargis, 1956 and *Tagia cupida* Hargis, 1956, are closely related to each other and may belong to any of the following generic aggregations: *Hemitagia* Sproston, 1946; *Pterinotrema* Caballero et al., 1954; *Macrovalvitraema* Caballero and Hollis, 1955; *Pterinotrematoides* Caballero and Hollis, 1955. Caballero, Hollis and Grocott (1953) inferred that *Tagia micropogoni* Pearse, 1949 is not a representative of the genus *Tagia* Sproston, 1946. Superficial study of *Tagia otolithus* (Yamaguti, 1953) Hargis, 1954 indicates that this species, too, will probably require generic reassignment.

*Tagia gempyllis* n. sp.

(Figs. 21-24)

Host: *Jordanidia solandri* (Cuv. and Val.), Hake or Southern Kingfish; family Gempylilidae.
Location: Gills.

Locality: Cape Campbell, New Zealand.

Number studied: 28.

Description: Body elongate; flattened dorsoventrally, (11) 6.29 (4.5-8.2) long by (12) 1.22 (1.04-1.47) wide. Cuticle fairly thick and smooth. Prohaptor a pair of cylindrical, muscular suckers, (12) 0.174 (0.128-0.265) long by (10) 0.131 (0.115-0.177) wide, placed laterally in the walls of the buccal funnel. Posthaptor, a cotylophore, (6) 1.09 (0.89-1.40) long by (6) 0.65 (0.56-0.81) wide, usually pedunculated; peduncle (9) 1.26 (0.49-2.42) long, devoid of testes and vitellaria, and separating the posthaptor from the body proper; posthaptor armed ventrolaterally with 4 pairs of clamps, anterior-most clamp pair reversed in position dorsoventrally so that the ventral loop is actually dorsal. Clamps dissimilar in structure and size; anterior clamps smallest, (6) 0.238 (0.20-0.29) long by (6) 0.235 (0.21-0.27) wide; 3 pairs of posterior clamps, (14) 0.265 (0.20-0.32) long by (14) 0.274 (0.23-0.34) wide; ventral loop complete medially and laterally; dorsal loop elements unequal, complicated; middle loop is incomplete medially and laterally; center sclerite is almost entirely situated in the middle loop capsule, with extra center piece sclerites located at the base. Numerous short sclerites located in the valve wall of the clamps. Anchors absent.

Mouth slightly sub-terminal. Pharynx (4) 0.088 (0.072-0.10) long by (4) 0.069 (0.061-0.077) wide; esophagus relatively short, with lateral branches. Gut bifurcating immediately behind the genital atrium; crura ramified medially and laterally posterior limits of crura not observed.
Testes relatively numerous, postovarial, between intestinal crura; vas deferens passing anteriorly in midline to enter posterior end of the genital atrium. Genital atrium (12) 0.059 (0.052-0.065) long by (12) 0.055 (0.05-0.062) wide, armed with 6-8, usually 7, radially placed hooks, (11) 0.018 (0.014-0.023) long.

Ovary tubular, coiled in midline; oviduct running posteriorly from right ovarian lobe. Oötype large; uterus ventral to vas deferens, running anteriorly in midline to join the genital atrium. Genito-intestinal canal extending from right crus to vitelline reservoir. Vagina apparently absent. Mehlis' glands present. Vitellaria extending from level of genital atrium posteriorly to beginning of peduncle; transverse vitelloducts fusing near midline to form the vitelline reservoir. Eggs in utero somewhat distorted, with large filament at one end; filament not observed in all eggs present; eggs (9) 0.152 (0.124-0.187) long by (9) 0.071 (0.066-0.09) wide.

Discussion: Tagia gempyllis n. sp. is very similar to Tagia ecuadorii (Meserve, 1938) Sproston 1946, especially in the following characters: (1) prohaptoral suckers, (2) clamp structure (Figs. 23, 24, 25), (3) vaginae lacking in both, (4) anchors absent, (5) genital atrium armed with a circle of hooks (Figs. 22, 26), and (6) eggs with filament at one end. This species differs from Tagia ecuadorii (Meserve, 1938) Sproston, 1946 in the following particulars: (1) general body shape, (2) body length 4.5-8.2 rather than 2.9-3.4, (3) 6-8 hooks rather than 12-14 on the genital atrium, and (4) host.

Family Microcotylidae Taschenberg, 1879
Subfamily Microcotylineae Monticelli, 1892

Genus Microcotyle van Beneden and Hesse, 1863

According to Hargis (1956), "the systematic condition of the type genus, Microcotyle, is so poor that the subfamily Microcotylineae lacks clarity. In addition the taxonomic picture has been clouded by recent descriptions of several additional genera, e.g. Gonioplasius Sandars, 1944 and Metamicrocotyla Yamaguti, 1943, etc. whose differential characters are probably relatively insignificant and only of subgeneric rank". Recent works by Tripathi (1956) and Price (1962) have probably added to this confusion.

The genus is represented in this collection by seven species, three of which will be discussed in this report. It will be necessary to conduct a thorough study of the works of Hargis (1956), Tripathi (1956) and Price (1962) before final determinations of the taxonomic position of the other five species can be made.

Microcotyle constricta Robinson, 1961

Host: Parapercis colias (Forster), Blue Cod; family Parapercidae.

Location: Gills.

Locality: Dunedin, New Zealand.

Previously reported host and locality: Parapercis colias (Forster)

from Cook Strait, New Zealand.

Number studied: 20.

Discussion: It seems very likely that the 338 worms in this collection are conspecific with Robinson's (1961) species since they agree in almost all particulars.
Microcotyle pagrosomi Murray, 1931

Host: Chrysophrys auratus (Bloch and Schneider), Snapper; family Sparidae.

Location: Gills.

Locality: Auckland, New Zealand.

Previously reported host and locality: Chrysophrys auratus

(= Pagrosomus auratus) from Port Phillip Bay, Victoria, Australia.

Number studied: 15.

Discussion: Though the population studied herein is undoubtedly conspecific with Murray's (1931) this species needs a complete redescription. This applies particularly to the following: (1) genital atrium, (2) prohaptoral armament, (3) vaginal armament, (4) shape of the posthaptor, and (5) structure of the posthaptoral clamps.

This study establishes a new locality record for this species.

Microcotyle victoriae Woolcock, 1936

Host: Helicolenus percoides Richardson, Sea Perch; family Scorpaenidae.

Location: Gills.

Locality: Cape Campbell, New Zealand.

Previously reported host and locality: on the gills of Helicolenus percoides from Port Phillip Bay, Victoria, Australia.

Number studied: 12.

Discussion: A study of the original description of Microcotyle victoriae indicates that the worms in this collection are probably conspecific with Woolcock's species. The following additional information was obtained: (1) rim of buccal suckers armed with small, sclerotized, tooth-like papillae, (2) posthaptor 0.83 long, (3) posthaptoral clamps 0.047 long by 0.063 wide, (4) prohaptoral suckers
0.045 long by 0.052 wide, (5) genital atrium 0.189 long by 0.211 wide, (6) pharynx 0.050 long by 0.052 wide and (7) egg in utero 0.235 long by 0.055 wide.

This study establishes a new locality record for this species.

Subfamily Axininae Monticelli, 1903, sensu Hargis, 1956

Monogeneids included in this subfamily were previously assigned to the subfamily Microcotylinae. However, Hargis (1956) recognized important differences between these two groups and reinstated the subfamily Axininae Monticelli, 1903, based on the following characteristics: (1) cotylophore laterally asymmetrical, (2) embryonic posterior end directed laterally in mature specimens, (3) anchors usually retained by adults, (4) general triangular body shape. Price (1962) transferred the genera in this subfamily to the family Axinidae Unnithan, 1957 and to the family Heteraxinidae Price, 1962. The writer feels that Price's transfer of these genera into separate families may not be justified. Until a more detailed study of Price's work is conducted, the writer prefers to follow Hargis (1956) and retain the subfamily Axininae.

Genus Heteraxinoides Yamaguti

Heteraxinoides jordanidiae n. sp.

(Figs. 31 - 33)

1 According to Price (1962) the genus Heteraxinoides is being proposed in Vol. 4 of Yamaguti's Systema Helminthum, the Monogenea and Aspidocotylea, which is in press.
Host: *Jordanidia solandri* (Cuv. and Val.) Hake or Southern Kingfish; family Gempylidae.

Location: Gills.

Locality: Cape Campbell, New Zealand.

Number studied: 50.

Description: Body elongate, triangular (7) 5.29 (4.58-6.06) long by (7) 0.945 (0.703-1.07) wide; sides tapered gently anteriorly, anterior end bluntly rounded, body widened posteriorly to merge inconspicuously with coryphophore. Cuticle thin and smooth. Prohaptor a pair of bilocular, ovoid, buccal sucker, (7) 0.049 (0.045-0.055) long by (7) 0.07 (0.06-0.075) wide, in lateral walls of the buccal funnel. Dorsolateral head organs present on mouth rim, with ducts running posteriorly to cephalic glands. Posthaptor an asymmetrical coryphophore with laterally directed end (the direction of asymmetry may be either left or right but the internal organs appear to maintain a constant orientation regardless of this variance), (3) 2.03 (1.9-2.10) long; bearing 61-69 clamps in two unequal, lateral rows; 7-11 clamps on the short clamp row and 50-60 clamps on the long side. Anchors apparently not persistent in adult. Clamps similar in structure, dissimilar in size; middle clamps on long row (5) 0.075 (0.06-0.08) long by (5) 0.11 (0.10-0.115) wide; anterior and posterior clamps on long row (5) 0.044 (0.025-0.06) long by (5) 0.067 (0.05-0.08) wide; anterior, middle and posterior loop elements incomplete medially; center piece somewhat U-shaped and bifurcated at both ends; center piece longer ventrally than dorsally.
Mouth subterminal. Pharynx ovoid, (7) 0.059 (0.055-0.065) long by (7) 0.052 (0.045-0.06) wide; esophagus long, with lateral branches. Gut bifurcated immediately behind the genital atrium crura ramified medially and laterally, crura not confluent posteriorly, with left crus extending further than the right.

Testes postovarial, follicular, 30-40 in number, located between intestinal crura and extending posteriorly to the anterior part of the cotylophore; vas deferens running anteriorly in midline. Genital atrium (5) 0.076 (0.065-0.09) long by (5) 0.08 (0.07-0.095) wide, armed with 30-32 curved spines, (5) 0.014 (0.013-0.018) long; atrial spines arranged in three distinct rows, the anterior and middle rows bearing graded series of spines in two arcs, the posterior row bearing only two spines; the latter may be a part of the cirrus armament.

Ovary pretesticular, irregularly looped, located dorsal to vitelline reservoir; oviduct running posteriorly from right portion of ovary. Öotype dorsal to vitelline reservoir; uterus running anteriorly to genital atrium. Genito-intestinal canal proceeding from right crus to oviduct. Vagina not observed. Mehlis' glands present. Vitellaria follicular, extending from just posterior to genital atrium to a position approximately 0.025 from anterior end of short clamp row. Vitellaria extend further posteriorly on the side of the short clamp row. Transverse vitelloducts fusing medially to form the equatorial Y-shaped vitelline reservoir. Eggs not observed.

Discussion: Heteraxinoides jordanidia n. sp. appears to be most closely related to Heteraxinoides chinensis (Yamaguti, 1937) Yamaguti, especially in the nature of the genital atrium. It differs from
Heteraxinoides chinensis in the following respects: (1) entire length 4.58-6.06 rather than 3.64, (2) 30-40 testes rather than 12, (3) prolongation at the distal end of the center sclerite not observed, (4) genital atrium with 30-32 spines instead of 24, (5) genital atrium with three rows of spines instead of two, and (6) host.

Heteraxinoides novaezealandus n. sp.
(Figs. 34 - 36)

Host: Trachurus novae-zelandiae Richardson, Horse Mackerel; family Carangidae.

Location: Gills.

Locality: Cape Campbell, New Zealand.

Number studied: 15.

Description: Body elongate, triangular, (8) 2.28 (2.12-2.48) long by (7) 0.44 (0.38-0.53) wide; sides tapered gently anteriorly, anterior end bluntly rounded, body widened posteriorly to merge inconspicuously with cotylophore. Cuticle fairly thin and smooth. Prohaptor a pair of biloculate buccal suckers, (9) 0.063 (0.059-0.070) long by (9) 0.058 (0.046-0.066) wide, situated ventrolaterally in the walls of the buccal funnel. Distinct head organs not observed. Posthaptor an asymmetrical, triangular cotylophore with laterally directed end (the direction in which the end points, right or left, varies individually, but the internal organs appear to maintain a constant orientation regardless of this variance), (3) 0.97 (0.80-1.04) long; armed with 32-41 clamps in two unequal, lateral rows; 3-7 clamps on the short side and 26-37 clamps on the long clamp row. Anchors apparently not
persistent in adult. Clamps on the short row similar in structure, slightly dissimilar in size; average clamp size (6) 0.027 (0.025-0.029) long by (6) 0.032 (0.029-0.034) wide. Unfortunately, the clamps in the long row were arranged so that only their side aspects were visible. Thus, measurements were not possible. Clamp structure as follows: anterior, middle and posterior loop elements incomplete medially but not laterally; center sclerite somewhat U-shaped and bifurcated at both ends; a slight prolongation appears to be present at the distal end of the center sclerite. Framework of the clamps appears to be slightly asymmetrical.

Mouth subterminal. Pharynx (6) 0.038 (0.036-0.041) long by (6) 0.038 (0.035-0.041) wide; esophagus fairly short. Gut bifurcated at level of the genital atrium; crura ramified medially and laterally, not confluent posteriorly; left crus extending further posteriorly than right crus.

Testes postovarial, follicular, 6-10 in number, located between intestinal crura and extending posteriorly to the anterior part of the corylophore; vas deferens not observed; seminal receptacle present immediately posterior to the right end of the ovary. Genital atrium (5) 0.057 (0.055-0.058) long by (5) 0.053 (0.049-0.057) wide; armed with a circle of 14-18 atrial spines, (4) 0.008 (0.005-0.010) long. Cirrus armed with 6-8 spines, (4) 0.014 (0.012-0.017) long.

Ovary pretesticular, very long, folded; oviduct not clear but appears to run posteriorly from right end of ovary and fuse with the genito-intestinal canal. Oötype dorsolateral to the vitelline reservoir; uterus running anteriorly to genital atrium. Genito-intestinal
canal proceeding from right crus, apparently fusing with oviduct and the duct from the vitelline reservoir. Vagina and Mehlis' glands not observed. Vitellaria follicular, extending from level of genital atrium into posthaptor. Transverse vitellocytes fusing medially to form the Y-shaped vitelline reservoir. Eggs in utero fusiform, with filaments at both ends; eggs (2) 0.249 (0.232-0.265) long by (2) 0.069 (0.062-0.075) wide, exclusive of filaments.

Discussion: Heteraxinooides novaezealandus n. sp. appears to be most closely related to Heteraxinooides triangularis (Goto, 1894) Yamaguti from which it differs in the following respects: (1) genital atrium 0.055-0.058 long by 0.049-0.057 wide rather than 0.035 in diameter, (2) nature of the genital armament, (3) entire body length 2.12-2.48 rather than 1.5, (4) slight difference in shape, with the cotylophore relatively wider in Heteraxinooides triangularis, (5) clamps smaller, 0.029-0.034 wide rather than 0.04-0.06 wide, and (6) host.

Subfamily Cemocotylinae Price, 1962

Price (1962) erected this subfamily to include those genera with asymmetrical clamps and with larval anchors sometimes persistent in adult forms. The writer feels that Price's actions were justified, but prefers to place this subfamily under the family Microcotylidae rather than in Price's new family Heteraxinidae.

Genus Cemocotyle Sproston, 1946

The genus Cemocotyle Sproston, 1946 includes the following species: Cemocotyle borinquenensis Price, 1962 from the gills of Paratragus
caballus; Cemocotyle carangis (MacCallum, 1913) Sproston, 1946 from the gills of Caranx chryso, "Caranx ruber", and Trachinotus carolinus; Cemocotyle novaboracensis Price, 1962 from the gills of Caranx hippos and "Caranx ruber"; and Cemocotyle trachuri n. sp. from the gills of Trachurus novae-zelandiae.

Thus far the genus Cemocotyle Sproston, 1946 is found only on the host family Carangidae. Previous to this study the members of the genus Cemocotyle Sproston, 1946 all occurred on Northwestern Atlantic hosts (Massachusetts to Puerto Rico). The present study expands its range to the southwestern Pacific in the southern hemisphere.

Cemocotyle trachuri n. sp.

(Figs. 37 - 40)

Host: Trachurus novae-zelandiae Richardson, Horse Mackerel; family Carangidae.

Location: Gills.

Locality: Cape Campbell, New Zealand.

Number studied: 5.

Description: Body elongate, flattened dorsoventrally, (5) 3.28 (3.20-3.68) long by (5) 0.52 (0.40-0.65) wide; sides tapered gently anteriorly, anterior end bluntly rounded, body widened posteriorly to merge inconspicuously with the corylophore. Cuticle fairly thin and smooth. Prohaptor a pair of widely separated buccal suckers, (4) 0.037 (0.034-0.041) long by (3) 0.038 (0.037-0.039) wide, placed ventrolaterally in the walls of the buccal funnel. Posthaptor an asymmetrical corylophore with laterally directed end (the direction in which the end points,
right or left, varies individually, but the internal organs appear
to maintain a constant orientation regardless of the variance), (5)
0.744 (0.70-0.79) long; armed with \( \sqrt{28-32} \) clamps in two unequal lateral
rows; 8-9 clamps on the short side and 28-32 clamps on the long clamp
row. Posthaptoral languette persistent in adults; armed with three
pairs of anchors; outer pair (3) 0.035 (0.029-0.043) long, with a stout,
bifurcated base and recurved tips; inner pair (2) 0.020 (0.010-0.030),
with elongate shaft and recurved tips; intermediate pair much smaller
than the other two pairs, with elongate shaft and recurved tips.
Clamps dissimilar in size, middle ones larger than the anterior or
posterior ones: average clamp size about (11) 0.044 (0.036-0.058)
long by (11) 0.055 (0.044-0.070) wide. Clamp structure as follows;
anterior, middle and posterior loop elements incomplete medially but
not laterally; center sclerite somewhat U-shaped and bifurcated at
both ends; a slight prolongation appears to be present at the distal
end of the center sclerite. Framework of clamps asymmetrical; the
dorsal and ventral loop elements on the outer side are longer than
those of the inner side; the outer branch of the bifurcated, proximal
end of the center sclerite is longer than the inner branch.

Mouth subterminal. Pharynx (3) 0.044 (0.041-0.048) long by (3)
0.042 (0.039-0.047) wide; esophagus fairly short. Gut bifurcating
immediately in front of the genital atrium; crura ramified medially
and laterally; crura not confluent posteriorly, with the left crus
extending further than right crus.

Testes postovarial, follicular, 11-17 in number, located between
crura and extending posteriorly to the anterior part of the cotylophore;
vag deferens not observed; seminal receptacle present just posterior
to the right end of the ovary. Genital atrium (4) 0.037 (0.039-0.057) long by (4) 0.051 (0.044-0.062) wide; armed with numerous spines that are apparently dissimilar in shape and size; the atrial spines occupy the anterolateral part of the genital atrium. Cirrus armed.

Ovary pretesticular, very long, folded; oviduct passes around the right side of the seminal receptacle and joins with the genito-intestinal canal. Óotype dorsolateral to the vitelline reservoir; uterus running anteriorly to genital atrium. Genito-intestinal canal passes from the right crus and fuses with the oviduct; that portion of the genito-intestinal canal between the fusion with the oviduct and the duct from the vitelline reservoir was not clearly observed. Mehlis' glands present. Vagina apparently absent. Vitellaria follicular, extending from just posterior to the level of the genital atrium into the posthaptor. Transverse vitelliducts fusing medially to form the Y-shaped vitelline reservoir. Eggs *in utero* fusiform, with filaments at both ends; eggs (3) 0.199 (0.177-0.217) long by (3) 0.089 (0.072-0.116) wide, exclusive of filaments.

Discussion: *Cemocotyle trachuri* n. sp. appears to be most closely related to *Cemocotyle novaboracensis* Price, 1962 because the posthaptoral clamps are relatively similar in size and shape in both species. It differs from *Cemocotyle novaboracensis* Price, 1962 in the following respects: (1) entire body length 3.20-3.68 rather than 5.5-7.5, (2) vagina apparently absent, (3) long clamp row with 28-32 clamps rather than 43-54, (4) short clamp row with 8-9 clamps rather than 15-17, (5) nature of the genital armament, (6) genital atrium 0.051 wide rather than 0.200 wide, (7) testes 11-17 instead of 45-65, and (8) host.
Family Gastrocotylidae Price, 1943
Subfamily Gastrocotylinae Sproston, 1946
Genus Pseudaxine Parona and Perugia, 1890

Pseudaxine trachuri Par. and Per., 1890
Host: Trachurus novae-zelandiae Richardson, Horse Mackerel; family Carangidae.
Location: Gills.
Locality: Cape Campbell, New Zealand.
Previously reported host and locality: on the gills of Trachurus trachuri from Genoa (Par. & Per., 1890), Plymouth (Baylis, 1939) and Tarumi, Japan (Yamaguti, 1938).
Number studied: 10.

Discussion: The worms in the present collection have been tentatively identified as Pseudaxine trachuri Parona and Perugia, 1890. Restaining of this material and close observation will be necessary in order to determine whether or not this is a new species.

Genus Winkenthughesia Price, 1943

Winkenthughesia thyrsitae (Hughes, 1928) Price, 1943
Synonym: Octobothrium thyrites Hughes, 1928.
Host: Thyrsites atun (Euphasen), Barracouta; family Gempylidae.
Location: Gills.
Locality: Cape Campbell and Timaru, New Zealand.
Previously reported host and locality: Thyrsites atun from Victoria,
Number studied: 6.

Discussion: Winkenth Hughesia thyreitae was originally described on the gills of Thyrisites atun from San Remo, Victoria, Australia. This species is in need of a complete redescriptions.

Robinson (1961) described Winkenth Hughesia australis on the gills of Lepidopus caudatus (Euphrasesen) from Cook Strait, New Zealand. A study of Robinson's description and the specimens in the present collection indicates that these worms are very closely related and probably synonymous, but further study is necessary before verification of this will be possible.

Family Diclidophoridae Fuhrmann, 1928; sensu Price, 1943

Subfamily Choricotylinae Sproston, 1946

Genus Choricotyla van Beneden and Hesse, 1863

Choricotyla chrysophryi van Beneden and Hesse, 1863

Synonym; Cyclocotyla chrysophryi (van Beneden and Hesse, 1863) Price, 1943.

Host: Chryso Phrys auratus (Bloch and Schneider); Snapper; family Sparidae.

Location: Gills

Locality: Auckland, New Zealand.

Previously reported host and locality: On the gills of Chryso Phrys aurata from the Belgian coast (van Beneden and Hesse, 1863) and Pagellus centrodontus from the Irish Atlantic Slope (Llewellyn, 1941).
Number studies: 1.

Discussion: Superficial examination of the brief description and drawings given by Llewellyn (1941) and Sproston (1946) (since the original description is probably from the same host, Chrysophrys auratus (Bloch and Schneider), as our monogeneid) indicates that the one juvenile specimen in this collection is probably conspecific with Choricotyle chrysophryi van Beneden and Hesse, 1863.

Genus Euryorchis Manter and Walling, 1958

Diagnosis: Choricotylineae. The posthaptor bears pedunculated clamps, each with one papillated pad; genital atrium armed with ring of hooks; testes both proovarial and postovarial, extending into the posthaptor. Terminal lobe absent. Vagina absent. Vitellaria extending into the posthaptor.

According to Manter and Walling (1958) the genus Euryorchis is most closely related to Echinopeima Raecke, 1945 and Cyclobothrium Cerfontaine, 1895 from which it differs for the most part in the characteristics mentioned above, especially the genital atrium. All other genera in the family Diclidophoridae do not possess a spined atrium.

Euryorchis australis Manter and Walling 1958

Host: Seriolella brama (Gunther), Warehou and Seriolella porosa Guichenot, Silver Warehou; family Stromateidae.

Location: Gills.

Locality: Akaroa Harbor and Cape Campbell, New Zealand.
Previously reported host and locality: *Seriolella brama* (Gunther) from Wellington, New Zealand (Manter and Walling, 1958).

Number studied: 20.

Discussion: Manter and Walling (1958) reported *Eurysorchis australis* from Wellington, New Zealand and it was originally described from the gills of *Seriolella brama* (Gunther). In the present study this species was taken from the gills of *Seriolella brama* (Gunther) and *Seriolella porosa*, thus establishing a new host record for this parasite.

The worms in this collection differ from the original description in the following respect: (1) slight differences in measurements, and (2) cirrus armed with a ring of 9 hooks instead of 8 hooks.

Subfamily Diclidophorinae Cerfontaine, 1896

Genus *Diclidophora* Diesing, 1850

*Diclidophora coelorhynchi* Robinson, 1961

Host: *Coelorhynchus australis* (Richardson), Rat Fish; family Macrouridae.

Location: Gills.

Locality: Cape Campbell, New Zealand.

Previously reported host and locality: *Coelorhynchus australis* (Richardson) from Cook Strait, New Zealand (Robinson, 1961).

Number studied: 43.

Discussion: It seems very likely that the 88 worms in this collection are conspecific with Robinson's (1961) species since they agree in almost all particulars. The only discrepancy is that I have
been unable to locate the two pairs of minute anchors present on a small terminal lappet which were mentioned by Robinson in his description. Robinson's whole-mount drawing of *Diclidophora coelorhynchi* places the anchors in a dorsal position, therefore, it is possible that the anchors were not observable in the present collection since they were all mounted with the ventral side up. A pair of small anchors were observed in one juvenile specimen. However, this could not be checked since Robinson did not make enlarged drawings of the anchors. Since Robinson's description was made so recently it will not be redescribed in this report.

This study confirms the presence of the following characteristics of *Diclidophora coelorhynchi* which Robinson (1961) used to separate it from other members of the genus: (1) muscular projection inside clamps, to which extrinsic muscles are attached, (2) lamellate extension of center piece of clamps not fused with peripheral sclerite of anterior jaw, and (3) host.
SUMMARY

The results obtained from using different stains to delineate various structures are described.

Twenty-eight species of monogenetic trematodes were recovered from the marine fishes of New Zealand, twenty of which are discussed herein.

The subfamily Anthocotylinae Price, 1936 is emended to accommodate the new genus, Allocotylophora.

Six new species are described: Amphibdella acanthopharynx, Allocotylophora polyprionum, Tagia gempyllis, Heteraxinoides jordanidia, Heteraxinoides novaezealandus, and Cemocotyle trachuri.

Redescriptions are given of Amphibdelloides maccallumi (Johnston and Tiegs, 1922) Price, 1937, Merizocotyle diaphana Cerfontaine, 1894, and Megalocotyle helicoleni Woolcock, 1936.

Trochopus australis Robinson, 1961 and Winkenthughesia australis Robinson, 1961 are considered as synonyms of Megalocotyle helicoleni Woolcock, 1936 and Winkenthughesia thyrsitae (Hughes, 1928) Price, 1943, respectively.

New host records are reported for Euryorchis australis Manter and Walling, 1958, Amphibdelloides maccallumi (Johnston and Tiegs, 1922) Price 1937, Merizocotyle diaphana Cerfontaine, 1894, and Pseudaxine trachuri Parona and Perugia, 1890. New locality records are established for Amphibdelloides maccallumi (Johnston and Tiegs, 1922) Price, 1937, Merizocotyle diaphana Cerfontaine, 1894, Microcotyle pagrosomi Murray, 1931, Microcotyle victoriae Woolcock, 1936,
Pseudaxine trachuri Parona and Perugia, 1890, and Choricotyle
chrysophryi van Beneden and Hesse, 1863.

The subfamily Cernocotylinae Price, 1962 is adopted and transferred from the family Heteraxinidae Price, 1962 to the family Microcotylidae Taschenberg, 1879.

Host-specificity of monogenetic trematodes is discussed to some degree, and the following situations noted: (1) the genus Amphibdella Chatin, 1874 and the genus Amphibdelloides Price, 1937 are found only on the host family Torpedinidae, (2) the genus Merizocotyle Cerfontaine, 1894 are apparently all parasitic on the host genus Raja, (3) members of the genus Squalonchocotyle Cerfontaine, 1899 are now known to be present on selachians and chimaerids, (4) Eurysorchie australis Manter and Walling, 1958, is restricted to the host genus Seriolella, (5) members of the genus Cemocotyle are found only on the host family Carangidae, and (6) the occurrence of the genus Callorrhynchicola Brinkmann, 1952 on the host family Chimaeridae. The appearance of Callorrhynchicola multitesticulatus Manter, 1955 on Physiculus bachus is considered accidental.

The host-specific relationships mentioned above probably involve ecological and phylogenetic considerations.
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<td>Carcharhinidae</td>
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<td>Galeorhinus australis Macleay,</td>
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<td>Southern Tope or School Shark.</td>
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<td>Mustelidae</td>
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<td>Mustelus antarcticus Guenther,</td>
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<td>Gummy Shark.</td>
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<td>Scyliorhinidae</td>
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<td>Cephaloscyllium isabella Bonnaterre,</td>
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<td>Carpet Shark.</td>
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<td>Squalidae</td>
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<td>Squalus lebruni (Valliant),</td>
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<td>Dogfish shark.</td>
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<td>Torpedidae</td>
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<td>Torpedo fairchildi (Hutton),</td>
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<td>Electric Ray.</td>
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<td>Rajidae</td>
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<tr>
<td>Raja nasuta Muller and Henle,</td>
<td>17</td>
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<td>Skate.</td>
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<td>Chimaeridae</td>
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<td>Callorhynchus mili Bory,</td>
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<td>Elephant Fish</td>
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</table>
**Leptocephalidae**

*Leptocephalus conger* (L.)  
1 0 0

**Macrouridae**

*Coelorhynchus australis* (Richardson),  
40 88 1  
Rat Fish.

**Gadidae**

*Physiculus bachus* (Bloch and Schn.)  
29 1 1  
Red Cod.

**Zeidae**

*Zeus australis* Richardson,  
1 0 0  
John Dory.

**Pleuronectidae**

*Caulopsetta scapae* (Bloch and Schn.)  
26 0 0  
New Zealand Megrin or Witch.

*Colistium nudipinnis* Waite,  
8 0 0  
New Zealand Turbot.

*Colistium guntheri* Hutton,  
2 0 0  
Brill.

*Rhombosolea plebeia* (Richardson),  
32 0 0  
Sand Flounder.

*Rhombosolea millari* Waite,  
27 0 0  
Yellowbelly Flounder.

*Peltorhampus novae-zeelandiae* Guenther,  
30 41 1  
English Sole.

*Pelotretus flavilatus* Waite,  
30 53 1  
Lemon Sole.
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<th>Species</th>
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<th>Length</th>
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<td>Stromateidae</td>
<td><em>Seriolella brama</em> (Gunther),</td>
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<td>Warehou.</td>
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<td><em>Seriolella porosa</em> Guichenot,</td>
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<td>Silver Warehou.</td>
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<td>Serranidae</td>
<td><em>Polyprionum oxygeneios</em> (Bloch and Schn.),</td>
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<td>Carangidae</td>
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<td>Trevally.</td>
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<td><em>Trachurus novae-zelandiae</em> Richardson,</td>
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<td>80</td>
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<td>Horse mackerel.</td>
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<td>Sciaenidae</td>
<td><em>Arripis trutta</em> (Forster),</td>
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<td>Kahawai.</td>
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<td>Sparidae</td>
<td><em>Chrysophrys auratus</em> (Bloch and Schn.)</td>
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<td>Snapper.</td>
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<td>Cheilodactylidae</td>
<td><em>Nemadactylus macropterus</em> (Bloch and Schn.), Tarakihi.</td>
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<td>Latridae</td>
<td><em>Latridopsis ciliaris</em> (Forster),</td>
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<td>Moki.</td>
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<td>Family</td>
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<td>Scaridae</td>
<td><em>Pseudolabrus</em></td>
<td><em>pittensis</em> Waite,</td>
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<td>Banded Parrotfish.</td>
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<td>Paraperclidae</td>
<td><em>Parapercis</em></td>
<td><em>colias</em> (Forster),</td>
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<td>Blue Cod.</td>
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<td><em>Thyrsites</em></td>
<td><em>atun</em> (Euphrasen),</td>
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<td>Barracouta.</td>
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<td><em>Jordanidja</em></td>
<td><em>solandri</em> (Cuv. and Val.),</td>
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<td>Hake or Southern Kingfish.</td>
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<td>Family Blenniidae</td>
<td><em>Tripterygion</em></td>
<td><em>varium</em> (Forster),</td>
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<td>Cockabully.</td>
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<td><em>Genypterus</em></td>
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<td>Family Scorpaenidae</td>
<td><em>Helicolenus</em></td>
<td><em>percoide</em> (Richardson),</td>
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<td>Sea Perch.</td>
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<td>Triglidae</td>
<td><em>Trigla</em></td>
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<td>Red Gurnard.</td>
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</table>

* Four of the parasite species occur on more than one host.
EXPLANATION OF PLATE I

*Amphibdella acanthopharynx* n. sp.

Figs.

1. Whole mount, ventral view.
2. Armed pharynx.
3. Reproductive organs and terminal genitalia, ventral view.
4. Ventral anchor.
5. Dorsal anchor.
EXPLANATION OF PLATE II

*Amphibdeloides maccallumi* (Johnston and Teigs, 1922) Price, 1937

Figs.

6. Whole mount, ventral view.

7. Transverse bar.

8. Cirrus complex.

9. Ventral anchor.

10. Dorsal anchor.

*Merizocotyle diaphana* Cerfontaine, 1894

Figs.

11. Whole mount, ventral view.

Megallocotyle helicoleni Woolcock, 1936

Figs.
13. Whole mount, ventral view.
14. Right anterior-most anchor.
15. Right anterior-most anchor.
16. Left anterior-most anchor.
17. Left anterior-most anchor.
18. Middle anchor.
19. Right posterior-most anchor.
20. Left posterior-most anchor.
EXPLANATION OF PLATE IV

Tagia gempyllis n. sp.

Figs.
21. Whole mount, ventral view.
22. Genital corona.
23. Anterior-most clamp, ventral view.
24. Posterior clamp, ventral view.

Tagia ecuatori (Meserve, 1938) Sproston, 1946

Figs.
EXPLANATION OF PLATE V

Allocorylophora polyprionum n. sp.

Figs.
27. Whole mount, ventral view.
28. Genital corona.
29. Clamp, ventral view.
30. Anchors.

Heteraxinoides jordanida n. sp.

Figs.
31. Whole mount, ventral view.
32. Genital corona.
33. Clamp, ventral view.
EXPLANATION OF PLATE VI

**Heteraxinoides novaegaelandus** n. sp.

Figs.
34. Whole mount, ventral view.
35. Genital corona.
36. Clamp, ventral view.

**Gemocotyle trachuri** n. sp.

Figs.
37. Whole mount, ventral view.
38. Clamp, ventral view.
39. Clamp, ventral view.
40. Anchors.