PARASITES OF SCOMBROID FISHES. PART I. MONOGENETIC TREMATODES, DIGENETIC TREMATODES, AND CESTODES

By E. G. Silas
Central Marine Fisheries Research Institute, Mandapam Camp

CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>799</td>
</tr>
<tr>
<td>Monogenetic trematodes of scombroid fishes</td>
<td>801</td>
</tr>
<tr>
<td>Host-parasite list No. 1 (Monogenea)</td>
<td>817</td>
</tr>
<tr>
<td>Digenetic trematodes of scombroid fishes</td>
<td>820</td>
</tr>
<tr>
<td>Host-parasite list No. 2 (Digenia)</td>
<td>842</td>
</tr>
<tr>
<td>Cestode parasites of scombroid fishes</td>
<td>845</td>
</tr>
<tr>
<td>Host-parasite list No. 3 (Cestoda)</td>
<td>855</td>
</tr>
<tr>
<td>Preliminary analysis of occurrence of scombroid hosts and their trematode and cestode parasites, with special reference to Indian seas</td>
<td>857</td>
</tr>
<tr>
<td>References</td>
<td>859</td>
</tr>
<tr>
<td>Appendix I. Ichthyological references</td>
<td>867</td>
</tr>
<tr>
<td>Addendum I-III</td>
<td>869</td>
</tr>
</tbody>
</table>

INTRODUCTION

Recent works on helminth parasites, notably by Southwell (1925, 1930), Dollfus (1912-1949), Price (1936-1943), Manter (1926-1954), Nagaty (1937), Dawes (1941, 1946), Sproston (1946), Wardle and McLeod (1952), Yamaguti (1934, 1955, 1958, 1959), and several others have helped in establishing a sounder classification of helminth parasites, especially those infesting fishes. Detailed observations on the ecology and biology of helminth parasites infesting fishes lag far behind as compared to medical helminth parasitology, as the stage of discovering and describing new species of helminths, the reporting of new host records and distributional records, life history studies, etc., is not over since many groups of fishes still remain uninvestigated for parasites.

The scombroid fishes, which as a whole constitute a very important or in fact the most important single element in the marine fishery resources of the world has received some attention from workers engaged in the study of fish parasites. It may be safely said that in view of the commercial importance of this group of fishes more and more species may be subjected to the scrutiny of those interested in fish parasites. Only within the last decade has our knowledge about the species of scombroid fishes crystallised into some definiteness and this should greatly aid precise host determination.

*Published with the permission of the Director, Central Marine Fisheries Research Institute, Mandapam Camp.
There is not a single endemic species of scombroid fish (mackerels, seerfishes or Spanish mackerel, tunas and billfishes) in the Indian seas. Several are very widely distributed in the Indo-Pacific (e.g., Rastrelliger kanagurta, Scomberomorus commerson, Thunnus (N.) maccoertes, etc.), while a few evince pantropical distribution (e.g., Katsuwonus pelamis, Scomber japonicus, Xiphias gladius, Istiophorus gladius, etc.), and as such it was felt that to serve any useful purpose, this coverage of parasites of scombroid fishes should be on a world-wide basis. The lack of any comprehensive work of this nature on this group of fishes, has made the completion of the present task all the more necessary.

Both structural and physiological adaptations are involved on the part of the parasite species which may occupy diverse situations on or within the body of the host species. The common sites to look for them are the peritoneum, muscles, mesentery, mucous membrane of the branchial cavity or the skin of the head or body, or beneath scales where they may be encysted, or found free in the stomach, pyloric caeca, intestine, anal region, base of branchial arches, mouth, on gill lamellae, inside of operculum, submental groove, etc. In the marine environment, especially amongst cestodes, where at least two intermediate hosts are present, only late larval stages infest teleostean fishes, cephalopods, etc. while adults are generally found in elasmobranchs. No doubt this state of affairs has given rise to the chaos in species nomenclature in Cestoda, which thanks to some of the works mentioned earlier has been straightened to a certain extent. In the other groups dealt with also, at the species level the nomenclature is in a nebulous state in many instances, as the criteria for distinguishing the different species are not well defined, and variations seen in the same parasite species from host to host (of closely related host species or ‘unrelated’ host species), and from different geographical areas have tended to complicate matters. One good instance is that given by Wardle and McLeod (1952) also involving scombroid fishes as host species. They remark that ‘There occurs, also, in hosts as far separated taxonomically and geographically as Tetrapterus albidus, Histiocephalus grados, and Tarpon atlanticus of the north Atlantic, Histiocephalus sp. of the Indian and Pacific Ocean, a bothriocephalid cestode characterised by a clubshaped holdfast, a broad, frilled body, and a gravid uterus at least one-third of the segment width. At present this form is separated according to host distribution and certain alleged differences into a number of species—plicatus Rudolphi, manubriformis Linton, occidentalis Linton, laciniatus Linton, histiocephalus Shipley, and so forth; but it is not improbable that these, again, are merely forms of the originally described plicatus’.

The need for examining good series of specimens before describing new species of helminths is well stressed in the following observation by Hargis (1956) based on his experience of species of the monogenetic trematode genus Lithiodocotyle. ‘In the early part of the study it was suspected by the writer that several species of Lithiodocotyle were represented in the collection because those from S. maculatus were smaller than those from S. cavalla. However, later studies revealed overlaps in many of the countable and measurable characters and such a similarity of organs that it is impossible to consider either of the populations from these two host species as new.’ This finding, no doubt, shows also the close affinities between the two host species belonging to the genus Scomberomorus. Another point it stresses is the great need to be cautious and as far as possible refrain from describing new species of helminths of the same genus from one or more than one closely related host species based on single specimens!

Considering the number of species of scombroid fishes left uninvestigated for parasite species, and in the absence of proper distributional data on the known species of parasites, it is rather premature to discuss matters pertaining to host specificity, zoogeography of scombroid fishes and their parasites, and so forth. However, investigations on helminth parasites as a whole indicate that the monogenetic trematodes evince host specificity to the greatest degree, while the cestodes show the least, reflecting on the complicated life cycle of the latter. This general trend is evident in helminth parasites of scombroid fishes also. Meserve (1938) described 22 species of monogenetic trematodes from the Galapagos Islands and vicinity, after examining five hundred fish specimens belonging to at least one hundred species, and all 22 parasite species were from single host species respectively showing the high degree of host specificity. Multiple
Infestation is rather less frequent in this group, but is more common among digenetic trematodes and cestodes.

For obtaining a proper perspective of host-parasite relationship, especially of scombroid fishes and their parasites, information about the non-scombroid hosts of the parasite species is also necessary. In all instances this may not be complete, but data of this nature while throwing light on the adaptability of the parasite species to infect successfully different hosts of closely related species or species belonging to widely different families in the same habitat or widely different habitats, will also aid in our understanding of the natural spatial distribution of the parasite species.

The appeal made to parasitologists by Baylis (1926) and several others for the correct use of host names is again repeated. One purpose of this work has been to straighten out the nomenclature of the host species. Often names 'non-existent' are used (e.g. Cybium lanceolatus the host of Pricea multae Chauhan, 1945), and as the systematics of scombroid fishes in days gone by was not sound, mis-identifications of host species do exist. Careful evaluation based on recent researches on the taxonomy of scombroid fishes, the distributional ranges of the different species, etc., has been made in order to give up-to-date names for host species. Where doubt exists as in the case of Cybium lanceolatus, which could be meant to 'represent' any one of the three species of Scomberomorus from Indian seas, the host is given here as Scomberomorus sp., and in the host-parasite list the parasite species name is also given with a query under the names of the three Indian species of Scomberomorus. It will be desirable to have it so until fresh collections could be made to determine the host species.

In the absence of any recent monographic work covering all species of scombroid fishes (mackerels, seerfishes or Spanish mackerels, tunas, and billfishes), which would have aided in the identification of host species, the next best that could be thought of is to give a list of important references pertaining to the systematics of scombroid fishes published in recent years from various parts of the world. This list is appended at the end after a list of references to scombroid fish parasites. Where it has not been possible to check up original host names of scombroid fishes as given when a parasite was first described, I have used the name as given by Yamaguti (1958 and 1959) for digenetic trematodes and cestodes and also indicated the up-to-date names along side. I shall welcome suggestions and shall be most thankful to readers for drawing my attention to any omissions.

**MONOGENETIC TREMATODES**

**Order:** MONOGENEA

**Suborder:** Monopisthocotylea

**Superfamily:** Gyrodactyloidea

**Family:** Dactylogyridae

**Subfamily:** Dactylogyrinae

**Genus** Dactylogyrus Diesing, 1850

*Dactylogyrus inversus* Goto and Kikuchi, 1917

**Scombroid host:** Scomber japonicus [=Scomber japonicus japonicus Houttuyn]

**Locality:** Japan.

**Non-scombroid host:** Lateolabrax japonicus [Japan].

**Location:** Gillia.

**Reference:** Ishii and Sawada (1938).
Superfamily: Capsaloidea
Family: Capsalidae
Subfamily: Capsalinae

Genus Capsala Bosc, 1811, emend. Price, 1939

(Syn. Phylline Oken, 1815 in part; Tristoma Cuvier, 1817 in part; Tricatyle Guiart, 1938; Tristomella Guiart, 1938; Capsala Guiart, 1938 in part)

Recent reviews on the genus Capsala by Price (1938) and Sproston (1946), and later records of new species referable to this genus indicate that less than thirty valid species are known. Out of these, I have been able to find references to at least eighteen species which occur on scombroid fishes (see also addendum).

Capsala biparadica (Goto, 1894)

(Syn. Tristomum biparasiticum Goto, 1894)

Scombroid host: Thynnus albacora [=Thunnus (Neothunnus) albacores macropterus (Temminck and Schlegel)]
Locality: Misaki, Japan, Pacific.
Non-scombroid hosts: None.
Location: On carapace of copepod Parapetalus sp. on gills of tuna.
Remarks: See also Dollfus (1922, p. 292).

Capsala caballero Winter, 1955

Scombroid host: Sarda orientalis (Temminck and Schlegel)
Locality: Pacific coast of Mexico.
Non-scombroid hosts: None.
Location: Gills.

Capsala gouri Chauhan, 1951

Scombroid host: Thynnus thunhina* [=Euthynnus affinis affinis (Cantor)]
[*not T. thunhina as given in Zool. Rec. 1954, p. 91 (1957).]
Locality: Bombay, India (Arabian Sea).
Non-scombroid hosts: None.
Location: Operculum of host.

Capsala katsuwoni (Ishii, 1936), Sproston, 1946
(Syn. Tristoma katsuwonum Ishii, 1936)

Scombroid host: Katsuwonus vagans [=Katsuwonus pelamis (Linnaeus)]
Locality: Japan, Pacific.
Non-scombroid hosts: None.
Location: Gills.
**Capsula laevis** (Verrill, 1874), Johnstone, 1929, Price, 1939

(Syn. Tristoma laeve, Verrill, 1874; *Tristomum histophori* Bell, 1891; *Tristoma laeve* var. *armata* Goto, 1899)

_Scombroid hosts:_
1. _Histiophorus* (sic) *brevirostris* (Day) [= _Makaira indica_ (Cuvier)]
2. _Gymnosarda pelamys_ [= _Katsuwonus pelamis_ (Linnaeus)]
3. _Tetrapturus lessonae_ [= _Tetrapturus belone_ Rafinesque]
4. _Tetrapturus albidus_
5. _Xiphias gladius_

_Localities:_ (1) Madras, E. coast of India, Bay of Bengal; (2) South of Martha's Vineyard, N.W. Atlantic; (3) N.W. France; (4) Block Is.; (5) Atlantic.

_Non-scombroid hosts:_ _Coryphaena hippurus_ (from Atlantic).

_Remarks:_ See for discussions on nomenclature, Johnston (1929), Price (1939) and Sproston (1946).

**Capsula manteri** Price, 1952

_Scombroid host:_ _Euthynnus alletteratus_ (Rafinesque)


_Non-scombroid hosts:_ None.

_Location:_ Gills.

**Capsula megacotyle** (von Linstow, 1906), Johnston, 1929, emend. Price, 1939

(Syn. _Tristoma megacotyle_ von Linstow, 1906; _Capsula megacephala_ Johnston _megacephala_ for _megacotyle—an error; Tristomella megacotyle_ Guiart, 1938)

_Scombroid host:_ 'Sword fish, _Histiophorus_ sp.' [= _Istiophorus gladius_ (Broussonnet) or _Makaira_ sp.]

_Locality:_ Beruwala, W. coast of Ceylon.

_Non-scombroid hosts:_ None.

_Location:_ On surface of body.

_Remarks:_ Accurate host identification is not possible for the following reasons: The popular name 'swordfish' is not used for _Histiophorus_ (= _Istiophorus_), which is well known as the 'sailfish'. The swordfish, _Xiphias gladius_, is extremely rare in these waters, but on the contrary, species of marlins or spearfishes ( _Makaira_ and _Tetrapturus_) are not uncommon along the Ceylon coast and in the past have often been mistakenly identified as swordfish. As the host of _C. megacotyle_ could thus as well be a marlin, this is indicated. The matter may be settled by making fresh collections.

**Capsula nozawae** (Goto, 1894)


_Scombroid host:_
1. _Thunnus sibi_ [= _Thunnus_ ( _T._) _alalunga_ (Bonnaterre), or _Thunnus_ ( _Parathunnus_) _obesus_ mebach ! Kishinouye]_
2. _Thunnus thynnus_ [= _Thunnus_ ( _T._) _thynnus_ _thynnus_ (Linnaeus)]
3. _Katsuwonus vagans_ [= _Katsuwonus pelamis_


_Non-scombroid hosts:_ None.

_Location:_ On fins.
Remarks: The specific name *sibi* of the host species has been used to denote more than one species of tuna. Boeseman (1947) considered it to be synonymous with *Thunnus alalunga*. However, Rivas (1961) feels that *T. sibi* is a valid species of which *Parathunnus mabachi* Kishinouye is a synonym and *Parathunnus* Kishinouye a subgenus of *Thunnus*. In keeping with Boeseman’s findings and a recent review of Indian tunas (Jones and Silas, 1960), two host names are given with query as likely hosts of *C. nozawae* from Japanese waters. Baylis’ record as mentioned by him is doubtful.

*Capsala ovalis* (Goto, 1894), Price, 1938, emend. Sproston, 1946

(Syn. *Tristomum ovalis* Goto, 1894; *Tristoma ovala* Goto, 1899; *Capsala ovale* Price, 1938)

*Scombroid hosts*: 1. *Histophorus orientalis* [= *Istophorus gladius* (Broussonnet)]
2. *Cybium niphonium* [= *Scomberomorus niphonius* (Cuvier and Valenciennes)]
3. *Histophorus* sp. [= *Istophorus gladius* (Broussonnet) or *Makaira* sp.]


*Non-scombroid hosts*: None.

*Location*: On surface of body.

Remarks: Earlier comments about identity of host species from Ceylon given under *Capsala megacotyle* are also applicable here. For discussion on the nomenclature of the parasite species, reference is invited to Price (1938), Sproston (1946), and Chauhan (1951).

*Capsala pelamydis* (Taschenberg, 1878)

(Syn. *Tristoma pelamydis* Taschenberg, 1878)

*Scombroid host*: *Pelamys sarda* [= *Sarda sarda* (Bloch)]

*Locality*: Naples, Mediterranean.

*Non-scombroid hosts*: None.

*Location*: ?

*Capsala thynni* (Guiart, 1938)

(Syn. *Tricotyla thynni* Guiart, 1938)

*Scombroid host*: 1. *Thynnus albacora* [= *Thunnus* (*Neothunnus*) *albacares* *albacares* (Bonnerre)]
2. *Germo alalunga* [= *Thunnus* (*T.*) *alalunga*]


*Non-scombroid hosts*: None.

*Location*: Gills.

Remarks: Sproston (1946, p. 525) refers to *Germo alalunga* as the host of *C. thynni*. *Thynnus albacares* is the Atlantic yellowfin, and that from the Indo-Pacific has generally been considered to be distinct and denoted as ‘*Neothunnus macropterus*’. Provisionally *Neothunnus* is considered subgenerically distinct from *Thunnus* s.str., (Rivas, 1961), and in this work, the Atlantic yellowfin and Indo-Pacific yellowfin tunas will be denoted as *T. (N.) albacares albacares* and *T. (N.) albacares macropterus*, respectively.
Capsala poeyi (Vigueras, 1935), Price, 1938  
(Syn. Tristoma poeyi Vigueras, 1935)

Scombroid host: Makaira ampla (Poey) [=Terrapartus ampla Poey]  
Locality: Cuba.  
Non-scombroid hosts: None.  
Location: Gills.

Capsala magronum (Ishii, 1936) emend. Price, 1938  
(Syn. Tristoma magronum—also T. magnronum (misprint) Ishii, 1936)

Scombroid host: Thynnus orientalis [=Thunnus (T.) thynnus orientalis (Tomminck and Schlegel)]  
Locality: Japan, Pacific.  
Non-scombroid hosts: None.  
Location: On body?

Capsala onchidiocotyle (Setti, 1899)  
(Syn. Tristoma onchidiocotyle Setti, 1899)

Scombroid host: 1. Thynnus thynnus [=Thunnus (T.) thynnus thynnus (Linnaeus)]  
2. Parathynnus obesus [=Thunnus (P.) o. obesus]  
Non-scombroid hosts: None.  
Location: ?

Capsala maccallumi Price, 1939

Scombroid host: Euthynnus alletteratus (Rafinesque)  
Locality: Woods Hole, Massachusetts, U.S.A.  
Non-scombroid hosts: None.  
Location: Gills.

Capsala interrupta (Monticelli, 1891), Price, 1938  
(Syn. Tristoma interrupta Monticelli, 1891)

Scombroid hosts: Thynnus thynnus [=Thunnus (T.) thynnus thynnus (Linnaeus)]  
Katsuwonous pelamis (Linnaeus)  
Locality: Mediterranean.  
Non-scombroid hosts: None.  
Location: Gills.  
Capsala lintoni Price, 1939
(Syn. Tristoma laeve Verrill of Linton, 1898. See Price, 1939)

*Scombroid host*: Gymnosarda pelamys [=Katsuwonus pelamis (Linnaeus)]
*Locality*: Martha's Vineyard, Mass. U.S.A.
*Non-scombroid hosts*: None.
*Location*: Gills.

Genus Capsaloïdes Price, 1936

[[Syn. Capsala Bosc, 1811, in part; Tristoma Cuvier, 1817 in part; Calasloïdes Price, 1936 (typographical error)]]

Capsaloïdes perugiai (Setti, 1898).
(Syn. Tristoma perugiai Setti, 1894)

*Scombroid host*: Tetrapterus belone Rafinesque
*Locality*: Spezia, Mediterranean.

Capsaloïdes cornuatus (Verrill, 1875)
(Syn. Tristoma cornuatum Verrill, 1875)

*Scombroid host*: Tetrapterus albidus [=Tetrapterus albidus Poey]
*Locality*: Block Island, N. America (N.W. Atlantic).
*Non-scombroid hosts*: None.
*Location*: ? On body.

Capsaloïdes megaspinosus* Price, 1939

*Scombroid host*: Tetrapterus imperator [=Tetrapterus belone Rafinesque]
*Non-scombroid hosts*: None.
*Location*: Nares.
*Remarks*: For long the host T. imperator (Bloch and Schneider), had remained a problematic species, the status of which has been well clarified in a recent work by Robins and de Sylva (1960). It is shown that the species has been confused with T. belone, but in fact, Schneider’s imperator was based on a poor drawing of a juvenile specimen of Xiphius gladius Linneaus. However, in the present case, there can be no doubt that the host meant could be anything other than T. belone.

Capsaloïdes sinuatus (Goto, 1894) emend. Price, 1938
(Syn. Tristomum sinuatum Goto, 1894)

*Scombroid host*: Histiophorus sp. [=Istiophorus gladius (Broussonnet)]
*Locality*: Miasaki, Japan, Pacific.
*Non-scombroid hosts*: None.
*Location*: Gills.

* Sproston (1946) emended the spelling of this species as C. magnaspinosa,
Genus **Tristoma** Cuvier, 1817
(Syn. **Capsala** Bosc, 1811 in part)

**Tristoma integrum** Diesing, 1836
(Syn. **Tristoma coccineum** Cuvier, 1817 in part ; **T. coccineum** Cuvier of Taschenberg, 1879 ;
**T. rotundum** Goto, 1894)
**Scombrid host** : *Xiphius gladius* Linnaeus
**Locality** : Genova, Naples, Messina, Venice (Adriatic and Mediterranean); U.S. Coast
of N.W. Atlantic; Japan (Pacific).
**Non-scombrid hosts** : None.
**Remarks** : See Price (1939) for differences between genotype *T. coccineum* and *T. integrum*;
also Dawes (1946).

**Tristoma coccineum** Cuvier, 1817
[Syn. *Tristomum papillosum* Diesing, 1836; *Capsala papillosa* (Diesing) of Nordmann, in
Lamark, 1840]
**Scombrid host** : *Xiphius gladius* Linnaeus
**Locality** : Atlantic.
**Non-scombrid host** : Hammerhead shark (Woods Hole, Massachusetts, U.S.A.)
**Location** : Gills in *X. gladius*.

**Tristoma levinseni** Monticelli
**Scombrid host** : *Thynnus* sp. (= *Thynnus* sp.)
**Locality** : Mediterranean.

**Suborder** : Polypristhocotylea
**Superfamily** : Diclidophoridae
**Family** : Mazocraeidae
**Genus** **Kuhnia** Sproston, 1945
(Syn. **Octostoma** Kuhn, 1829, nec Otto, 1823; **Octobothrium** Leucart, 1827 of Leuckart,
1842 in part; *Octocotyle* Diesing, 1850 in part, nec Goto, 1894; *Octoplectanum* Diesing,
1858, in part)

**Kuhnia scombrí** (Kuhn, 1829), Sproston, 1945
[Syn. **Octostoma scombrí** Kuhn, 1829; **Octobothrium scombrí** (Kuhn) of Nordmann, 1832
and other writers; *Octocotyle scombrí* of Dujardin, 1845; *O. truncata* Diesing, 1850;
*Octoplectanum truncatum* of Diesing, 1858; *Pleuracotyle scombrí* of Taschenberg, 1878;
*Octocotyle major* Goto, 1894; *Octocotyle scombrí*, of Nicoll, 1915; *Mazocrae* (Octo-
bothrium) scombrí of Baylis, 1939]
**Scombrid hosts** :
1. *Scomber scombrus* Linnaeus
2. *Pneumatophorus colias* [= *Scomber japonicus colias* Gmelin]
3. *Rastrelliger kanagurta* (Cuvier)
4. Mackerel
5. *Scomber japonicus* japonicus Hottuyun

Non-scombroid hosts: None.

Location: Gills.

Remarks: For details of variations in this species reference may be made to Sproston (1945), Dawes (1946), and Yamaguti (1953).

Kuhnia minor (Goto, 1894) Sproston, 1945, 1946
(Syn. Octocotyle minor Goto, 1894)

Scombroid host: Scomber colias [=Scomber japonicus japonicus Hottuyun or ? Scomber japonicus colias Gmelin]

Locality: Hagi, and Misaki, Japan.

Non-scombroid hosts: None.

Location: Gills.

Remarks: Although Scomber colias is mentioned as the host, in all probability it may be the typical race of S. japonicus rather than S. japonicus colias, that could be the original host species, as the type locality of the former is Nagasaki, Japan. Kishinouye (1923) remarks that two types of S. japonicus occurs in Japanese waters, a deeper bodied form commonly known as 'hirasaba', and a rounded bodied form known as 'marusaba'. Slight differences in finray counts are said to exist, but it is not known whether these as well as the differences in body form has anything to do with the different size groups of the typical race.

Kuhnia macracanthus (Meserve, 1838)
(Syn. Mazocra macracanthus Meserve, 1938)

Scombroid host: ‘An unidentified species of mackerel.’


Non-scombroid hosts: None.

Location: Gills.

Remarks: The host identification is incomplete. However, from the pattern of distribution of mackerels, it is likely that the host could be a race of Scomber japonicus.

FAMILY: DISCOCOTYLIDÆ

Subfamily: DISCOCOTYLINE

Genus Grubea Diesing, 1858
(erected for 'Octobothrium scombri Nordmann' of Grube, 1855)

Grubea cochlear Diesing, 1858
(Syn. Pleurocotyle scombri of Pratt, 1900)

Scombroid host: Scomber scombrus Linnaeus

Locality: Naples, Mediterranean.

Non-scombroid host: Trachurus trachurus (Linnaeus) (Mediterranean).

Location: Gills.
Family: Gastrocotylidae

I have followed Hargis (1956) in recognizing Gastrocotylidae as a distinct family with the subfamilies Gastrocotylineae, Vallisiineae, and Priceineae.

Subfamily: Gastrocotylineae

Genus Gastrocotyle van Beneden and Hesse, 1863

Gastrocotyle japonica Ishii and Sawada, 1938 emend. Sproston, 1946

Scombroid host: Scomber japonicus [=Scomber japonicus japonicus Hottuyun]
Locality: Japan, Pacific.
Non-scombroid hosts: None.
Location: Gills.

Genus Pseudaxine Parona and Perugia, 1890

Pseudaxine katsuwonis Ishii, 1936

Scombroid host: Katsuwonus vagans [=Katsuwonus pelamis (Linnaeus)]
Locality: Japan, Pacific.
Non-scombroid hosts: None.
Location: Gills.

Pseudaxine mexicanus Meserve, 1938

Scombroid host: 1. Scomberomorus maculatus (Mitchill) 2. Scomberomorus cavalla (Cuvier) 3. Scomberomorus maculatus (Mitchill)
Localities: 1. Tangola-Tangola, Mexico (Pacific Coast); 2 & 3. Gulf of Mexico.
Non-scombroid hosts: None.
Location: Gills.
Remarks: See Hargis (1956) and also addendum-II.

Pseudaxine texana Koratha, 1955

Scombroid host: Scomberomorus maculatus (Mitchill)
Non-scombroid hosts: None.
Location: Gills.
Remarks: Hargis (1956) opines that P. texana could probably be a synonym of P. mexicanus, but as the description and figures given by Koratha (1955) are inadequate to settle this question, both are treated as distinct.
Pseudaxine vagans Ishii, 1936

_Scombroid host:_ Katsuwonus vagans [=Katsuwonus pelamis (Linnaeus)]
_Locality:_ Japan, Pacific.
_Non-scombroid hosts:_ None.
_Location:_ Gills.

_Genus Lithidocotyle_ Sproston, 1946, emend. Hargis, 1956

_Lithidocotyle acanthophallus_ (MacCallum and MacCallum, 1913), Sproston 1946
_(Syn. Microcotyle acanthophallus MacCallum and MacCallum, 1913)_

_Scombroid host:_ Scomberomorus cavalla (Cuvier)
_Scomberomorus maculatus_ (Mitchill)
_Non-scombroid hosts:_ Roccus saxatilis (==R. lineatus) (New York Aquarium or New York fish market?).
_Location:_ Gills.
_Remarks:_ Refer to rediagnosis of certain characters given by Hargis (1956), who also draws attention to the possibility of _Microcotyle scomberomori_ Koratha (1955) being a synonym of this species, but as the original descriptions and figures of _M. scomberomori_ are inadequate to settle this question, they are treated at present as distinct.

_Lithidocotyle secundus_ Tripathi, 1954

_Scombroid host:_ Cybium guttatum [=Scomberomorus guttatus guttatus (Bloch and Schneider)]
_Locality:_ Puri, Orissa Coast, India (Bay of Bengal).
_Non-scombroid hosts:_ None.
_Location:_ Gills.

_Genus Pseudomicrocotyle_ Sanders, 1947

_Pseudomicrocotyle elagatis_ Sanders, 1947

_Scombroid host:_ Cybium guttatum [=Scomberomorus guttatus guttatus (Bloch and Schneider)]
_Locality:_ Madras, India (Bay of Bengal).
_Non-scombroid host:_ Elagatis bipinnulata [Australia].
_Location:_ Gills.

_Remarks:_ Sanders (1947) did not assign his genus to any subfamily, but Tripathi (1954) on the basis of its affinities to _Thoracocotyle, Pricea_, and _Lithidocotyle_ relegated it to the subfamily Gastrocotylinae. Incidentally, _Pricea_ is now placed under a separate subfamily Pricinidae.

Ramalingam (1951) mentions _S. g. guttatus_ (as Cybium guttatum) as a host of _P. elagatis_, but offers no further comments. In view of the fact that monogenetic trematodes are more host specific and are rarely met with in host species of different families, it would have been desirable to know of variations if any in this parasite species from such widely different hosts.
Parasites of Scombroid Fishes. Part I

Genus Neothoracocytele Hargis, 1956

Neothoracocytele acaanthyocybii (Meserve, 1938)
(Syn. Gotocotyle acaanthyocybii Meserve, 1938)

Scombrid host: Acanthocybiium solandri (Cuvier and Valenciennes)
Locality: Galapagos Islands (E. Pacific).
Non-scombrid hosts: None.
Location: Gills.

Genus Gotocotylea Ishii, 1936 emend. Hargis, 1956

Gotocotylea sawara Ishii, 1936

Scombrid host: Sawara, Cybium niphoniium [= Scomberomorus niphonius (Cuvier and Valenciennes)]
Locality: Japan, Pacific.
Non-scombrid hosts: None.
Location: Gills.

Genus Scomberocytele Hargis, 1956

Scomberocytele scomberomorii (Koratha, 1955), Hargis, 1956
(Syn. Heteraxine scomberomorii Koratha, 1955)

Scombrid host: Scomberomorus maculatus (Mitchill)
Locality: Texas Coast, Atlantic.
Non-scombrid host: None.
Location: Gills.
Remarks: See Hargis (1956) for rediagnosis of species as well.

Genus Thoracocytele MacCallum, 1913, emend. Hargis, 1956

Thoracocytele crocea MacCallum, 1913, Sproston, 1946
(Syn. Thoracocytele paradoxica Meserve, 1938; ? Thoracocytele paradoxica Pearse, 1949)

Scombrid hosts: 1. Scomberomorus maculatus (Mitchill)
2. ? Scomberomorus cavalla (Cuvier)
Non-scombrid hosts: None.
Location: Gills.
Remarks: Hargis (1956) gives reasons for considering T. paradoxica a synonym of T. crocea, thereby extending the distribution of the latter species to the Pacific. Pearse's specimens were obtained from Scomberomorus cavalla, although erroneously he mentioned that 'it occurred in the same host as Meserve's species' (S. maculatus). Hargis (1956) while drawing attention to this discrepancy comments that perhaps Pearse's T. paradoxica could be the same as T. crocea.
Thracocotyle ovale Tripathi, 1954

Scombrid host: Cybium guttatum [=Scomberomorus guttatus guttatus (Bloch and Schneider)]
Locality: Puri, Orissa Coast, India (Bay of Bengal).
Non-scombrid hosts: None.
Location: Gills.

Thracocotyle sp. Ramalingam, 1951

Scombrid host: Cybium guttatum [=Scomberomorus guttatus guttatus (Bloch and Schneider)]
Locality: Madras, India (Bay of Bengal).
Non-scombrid hosts: None.
Location: Gills.
Remarks: Name only. See Ramalingam (1951).

Subfamily: PRICINÆ

Genus: Pricea Chauhan, 1945

Pricea armatum Ramalingam, 1951

Scombrid host: Cybium guttatum [=Scomberomorus guttatus guttatus (Bloch and Schneider)]
Locality: Madras, India (Bay of Bengal).
Non-scombrid hosts: None.
Location: Gills.
Remarks: Known from a single specimen obtained after examining five host specimens (Ramalingam, 1951).

Pricea melane Ramalingam, 1951

Scombrid host: Cybium guttatum [=Scomberomorus guttatus guttatus (Bloch and Schneider)]
Locality: Madras, India (Bay of Bengal).
Non-scombrid hosts: None.
Location: Gills.
Remarks: Known from a single specimen obtained after examining four host specimens (Ramalingam, 1951).

Pricea minimæ Chauhan, 1945

Scombrid host: Thynus pelamys [=? Katsuwonus pelamis (Linnæus)]
Locality: Bombay, India (Arabian Sea).
Non-scombrid hosts: None.
Location: Gills.
Remarks: The host record needs confirmation as the Oceanic skipjack Katsuwonus pelamis is rarely ever landed at Bombay. On the other hand, Euthynnus affinis affinis, and Kishinaiella tonggoi, the little tuna and the northern bluefin tuna respectively, are usually landed at
BOMBAY. Hence, in the list on ‘hosts and parasites’ given at the end of this section, I have placed *P. minima* with a query under *K. pelamis*.

**Pricea minutum** Ramalingam, 1951

*Scombrid host: Cybium guttatum* [= *Scomberomorus guttatus* (Bloch and Schneider)]

*Locality*: Madras, India (Bay of Bengal).

*Non-scombroid hosts*: None.

*Location*: Gills.

*Remarks*: Known from a single specimen obtained after examining three host specimens (Ramalingam, 1951).

**Pricea microcotyle** Chauhan, 1945

*Scombrid host: Scomber microlepidotus* [= *Rastrelliger kanagurta* (Cuvier)]

*Locality*: Bombay, India (Arabian Sea).

*Non-scombroid hosts*: None.

*Location*: Gills.

**Pricea multae** Chauhan, 1945

*Scombrid host*: 1. *Cybium lanceolatum* (= *Scomberomorus* sp.) See remarks.

2. *Cybium guttatum* [= *Scomberomorus guttatus* (Bloch and Schneider)]


*Non-scombroid hosts*: None.

*Location*: Gills.

*Remarks*: *P. multae* is the genotype and was described from a single specimen obtained from ‘*Cybium lanceolatum*’. I am not aware of any species of *Cybium* (= *Scomberomorus*) with this name. Quite likely, Chauhan has erroneously used ‘*lanceolatus*’ for *Scomberomorus lineolatus* (Cuvier and Valenciennes)! Three species of *Scomberomorus*, namely, *S. commerson* (Lacépède), *S. guttatus* (Bloch and Schneider), and *S. lineolatus* are at present known to occur along the Indian coast (Jones and Silas, 1961) and Ramalingam (1951) records *P. multae* (no description) from *S. g. guttatus*. While admitting that the same species could occur on two, or more closely related host species, it is my contention that the ‘host type’ could be any one of these three and as such upon confirmed on further material I have indicated the first mentioned host as corresponding to *Scomberomorus* sp.

**Pricea robusta** Ramalingam, 1951

*Scombrid host: Cybium guttatum* [= *Scomberomorus guttatus* (Bloch and Schneider)]

*Locality*: Madras, India (Bay of Bengal).

*Non-scombroid hosts*: None.

*Location*: Gills.

*Remarks*: Known from many specimens obtained from three host specimens (Ramalingam, 1951).
**Pricea tetracanthum** Ramalingam, 1951

*Scombroid host*: *Cybium guttatum* [=*Scomberomorus guttatus guttatus* (Bloch and Schneider)]

*Locality*: Madras, India (Bay of Bengal).

*Non-scombroid hosts*: None.

*Location*: Gills.

*Remarks*: Known from a single specimen obtained after examining seven host specimens (Ramalingam, 1951).

**Pricea triacanthum** Ramalingam, 1951

*Scombroid host*: *Cybium guttatum* [=*Scomberomorus guttatus guttatus* (Bloch and Schneider)]

*Locality*: Madras, India (Bay of Bengal).

*Non-scombroid hosts*: None.

*Location*: Gills.

*Remarks*: Known from a single specimen obtained after examining six host specimens (Ramalingam, 1951).

**FAMILY: MICROCOTYLIDÆ**

**Subfamily: MICROCOTYLINEÆ**

**Genus**: MICROCOTYLE Beneden and Hesse, 1863

**Microcotyle scomberomori** Koratha, 1955

*Scombroid host*: *Scomberomorus maculatus* (Mitchill)

*Locality*: Texas Coast, U.S.A.

*Non-scombroid hosts*: None.

*Location*: Gills.

*Remarks*: Hargis (1956) opines that it is very probable that *Microcotyle scomberomori* Koratha, 1955, is a synonym of *Lithidocotyle acanthophallus* (MacCallum and MacCallum).

**Microcotyle sp.** Ramalingam, 1951

*Scombroid host*: *Cybium guttatum* [=*Scomberomorus guttatus guttatus* (Bloch and Schneider)]

*Locality*: Madras, India (Bay of Bengal).

*Non-scombroid hosts*: None.

*Location*: Gills.

*Remarks*: Name only. See Ramalingam (1951).
PARASITES OF SCOMBROID FISHES. PART I

FAMILY: HEXOSTOMATIDÆ

Genus: hexostoma Rafinesque, 1815

nec Hexastoma Rudolphi, 1809; nec Hexastoma Kuhn, 1828
(Syn. Hexocotyle Blainville, 1828)

Hexostoma auxidi Palombi, 1943

Scombroid host: Auxis thazard (Lacépède)
Locality: Mediterranean.
Non-scombroid hosts: None.
Location: Gills.

Hexostoma pricei Koratha, 1955

Scombroid host: Sarda sarda (Bloch)
Locality: Texas Coast, U.S.A.
Non-scombroid hosts: None.

Hexostoma grossum (Goto, 1894)
(Syn. Hexocotyle grossa Goto, 1894)

Scombroid hosts: Thynnus sp. [=Thynnus sp.]
Parathunnus sibi [=? Thunnus alalunga (Bonnaterre) or ? Thunnus (Parathunnus) obsesus mebach (Kishinouye)]
Katsuwonus vagans [=Katsuwonus pelamis (Linneus)]
Thunnus orientalis [=Thunnus (T.) thynnus orientalis (Temminck and Schlegel)]

Locality: Japan, Pacific.
Non-scombroid host: Seriola quinqueraudiata [Japan].
Location: Gills.
Remarks: See Ishii and Sawada (1938); and Sproston (1946) for discussion on the species.

Hexostoma macracanthum Fujii, 1944

Scombroid host: Euthynnus alletteratus (Rafinesque)
Locality: Tortugas, Florida.
Non-scombroid hosts: None.
Location: Gills.
Remarks: This species may prove to be a synonym of H. euthynni Meserve (1938).

Hexostoma acutum (Goto, 1894)
(Syn. Hexocotyle acuta Goto, 1894)

Scombroid host: Thynnus sibi [=? Thunnus alalunga (Bonnaterre) or ? Thunnus (Parathunnus) obsesus mebach (Kishinouye)] and Thynnus thynnus [=Thunnus (T .) thynnus orientalis].
Locality: Hagi, Osatsube, Hokkaido, Japan.
Non-scombroid hosts: None.
Location: Gills.
Hexostoma dissimilis (Yamaguti, 1937)

_Scombroid host: Thynnus thynnus [=Thynnus (T.) thynnus orientalis (Temminck and Schlegel)]_

*Locality:* Numadu, Sibuoka Prefecture, Japan.
*Non-scombroid hosts:* None.
*Location:* Gills.

Hexostoma extensicaudum (Dawes, 1940)

(Syn. Hexacotyle extensicauda Dawes, 1940; ? Hexacotyle ? acuta (Goto) of Baylis, 1939)

_Scombroid host: Thynnus thynnus [=Thynnus (T.) thynnus thynnus Linnaeus]_

*Locality:* North Sea.
*Non-scombroid hosts:* None.
*Location:* Gills.
*Remarks:* Dawes (1946) comments that the British form listed by Baylis (1939) as Hexacotyle ? acuta (Goto) is probably _H. extensicaudum._

Hexostoma euthynni Meserve, 1938

_Scombroid host:* 1. Euthynnus alletteratus (=Euthynnus affinis yaito Kishinouye ? or _E. a. lineatus_ Kishinouye ?)
   2. Euthynnus lineatus (=Euthynnus affinis lineatus Kishinouye).

*Localities:* 1. James Island, Galapagos Islands, E. Pacific (Meserve, 1938); 2. Baja, California (Millelmann, 1956).
*Non-scombroid hosts:* None.
*Location:* Gills.
*Remarks:* The host species, _E. alletteratus_ as given by Meserve is incorrect as it is known only from the Atlantic. The Indo-Pacific representatives of _Euthynnus_ may be said to fall under three subspecies of _E. affinis_ of which Galapagos Islands is within the distributional range of the two mentioned above. Millemann's collection of this parasite from _E. a. lineatus_ would indicate that the host type could also be the same.

Hexostoma thunni (Parona and Perugia, 1889)

(Syn. Octocotyle thunni Parona and Perugia, 1889; Octobothrium thunni (Parona and Perugia) of St. Remy, 1891; Hexacotyle thunni (Parona and Perugia) of Goto, 1899)

_Scombroid hosts: Thynnus thynnus [=Thynnus (T.) thynnus thynnus (Linnaeus)]_

*Locality:* Genova, Italy, Mediterranean.
*Non-scombroid hosts:* None.
*Location:* Gills.
*Remarks:* Palombi (1943) redescribed this species from the same host from the Mediterranean.
**Hexostoma thynni** (Delaroche, 1811), Rafinesque, 1815

(Syn. *Polystoma thynni* Delaroche, 1811; *P. duplicatum* Rudolphi, 1819; *Hexacotyle thynni* (Delaroche), Blainville, 1828; *Plagiopeltis duplicata* (Rudolphi) Diesing, 1850; ? *Hexacotyle thynni* (Delaroche) Linton, 1901; *Summer et al.* 1913).

**Scombroid host**: 1. Tunny, *Thunnus thynnus* [≡ *Thunnus (T.) thynnus thynnus* (Linnaeus)], and *Sarda sarda* (Bloch)
2. *Sarda sarda* (Bloch)


**Non-scombroid hosts**: None.

**Location**: Gills.

**Remarks**: Palombi (1943) redescribed this species from specimens taken from *Pelamys sarda* (≡ *Sarda sarda*) from the Mediterranean. The larve of *H. thynni* were described recently by Euzet (1956).

### HOST-PARASITE LIST No. 1

(List of names of scombroid hosts and their monogenetic trematode parasites. Genera are alphabetically arranged. (?) indicates doubtful record of parasite species from host)

<table>
<thead>
<tr>
<th>Host</th>
<th>Parasite</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acanthocybium solandri</em> (Cuvier and Valenciennes)</td>
<td><em>Neothorocotyle acanthocybii</em> (Meserve)</td>
</tr>
<tr>
<td><em>Auxis thazard</em> (Lacépède)</td>
<td><em>Hexostoma auxidi</em> Palombi</td>
</tr>
<tr>
<td><em>Euthynmus affinis affinis</em> (Cantor)</td>
<td><em>Capsala gouri</em> Chauhan</td>
</tr>
<tr>
<td></td>
<td>? <em>Pricea minima</em> Chauhan</td>
</tr>
<tr>
<td><em>Euthynmus affinis lineatus</em> Kishinouye</td>
<td><em>Hexostoma euthynni</em> Meserve</td>
</tr>
<tr>
<td><em>Euthynmus affinis yaito</em> Kishinouye</td>
<td>? <em>Hexostoma euthynni</em> Meserve</td>
</tr>
<tr>
<td><em>Euthynmus alletteratus</em> (Rafinesque)</td>
<td><em>Capsala maccalumi</em> Price</td>
</tr>
<tr>
<td></td>
<td><em>Capsala manteri</em> Price</td>
</tr>
<tr>
<td></td>
<td><em>Hexostoma macracanthum</em> Fujii</td>
</tr>
<tr>
<td><em>Istiophorus gladius</em> (Broussonnet)</td>
<td>? <em>Capsala megacotyle</em> (von Linstow)</td>
</tr>
<tr>
<td></td>
<td><em>Capsala ovalis</em> (Goto)</td>
</tr>
<tr>
<td></td>
<td><em>Capsaloides sinatus</em> (Goto)</td>
</tr>
<tr>
<td><em>Katsuwonus pelamis</em> (Linnaeus)</td>
<td><em>Capsala interrupta</em> (Monticelli)</td>
</tr>
<tr>
<td></td>
<td><em>Capsala katsuwonii</em> Ishii</td>
</tr>
<tr>
<td></td>
<td><em>Capsala lavis</em> (Verrilli)</td>
</tr>
<tr>
<td></td>
<td><em>Capsala lintoni</em> Price</td>
</tr>
<tr>
<td></td>
<td><em>Capsala nozawa</em> (Goto)</td>
</tr>
<tr>
<td></td>
<td><em>Capsala pelamydii</em> (Taschenberg)</td>
</tr>
<tr>
<td></td>
<td><em>Hexostoma grossum</em> (Goto)</td>
</tr>
<tr>
<td></td>
<td>? <em>Pricea minima</em> Chauhan</td>
</tr>
<tr>
<td></td>
<td><em>Pseudaxine katsuwonii</em> Ishii</td>
</tr>
<tr>
<td></td>
<td><em>Pseudaxine vagans</em> Ishii</td>
</tr>
<tr>
<td>‘Mackerel’</td>
<td><em>Kuhnia scombri</em> (Kuhn)</td>
</tr>
</tbody>
</table>
Mackerel—unidentified species of .......................... Kuhnia macracanthus Meserve
Makaira spp. .................................................. ? Capsala megacotyle (von Linstow)
                                                      ? Capsala ovalis (Goto)
Makaira indica (Cuvier) ................................... Capsala levis (Verrill)
Rastrelliger kanagura (Cuvier) ......................... Kuhnia scombri (Kuhn)
                                                      Pricea microcotyle Chauhan
Sarda orientalis (Temminck and Schlegel) .......... Capsala caballerio Winter
Sarda sarda (Bloch) ........................................ Capsala pelanydis (Taschenberg)
                                                      Hexostoma pricei Koratha
                                                      Hexostoma thynnii (Delaroche)
Scomber japonicus japonicus Hottuyn ............. Dactylogyrus inversus Goto and Kikuchi
                                                      Gastrocotyle japonicus Ishii and Sawada
                                                      Kuhnia scombri (Kuhn)
                                                      ? Kuhnia macracanthus Meserve
Scomber japonicus colias Gmelin .................... ? Kuhnia macracanthus Meserve
                                                      Kuhnia scombri (Kuhn)
Scomber scombrus Linnaeus ............................. Kuhnia minor (Goto)
                                                      Kuhnia scombri (Kuhn)
                                                      Grubea cochlear Diesing
Scomberomorus cavalla (Cuvier) ....................... Lithidocotyle acanthophallus (MacCallum and
                                                      MacCallum)
                                                      Pseudaxine mexicana Meserve
                                                      Thoracocotyle corcea MacCallum
Scomberomorus commerson (Lacépède) ............... ? Pricea multa Chauhan
Scomberomorus guttatus guttatus (Bloch and      Lithidocotyle secundus Tripathi
                                                      Schneidner)
                                                      Mictocotyle sp. Ramalingam
                                                      Pricea armatum Ramalingam
                                                      Pricea melane Ramalingam
                                                      Pricea minutum Ramalingam
                                                      Pricea multa Chauhan
                                                      Pricea robustum Ramalingam
                                                      Pricea tetracanthum Ramalingam
                                                      Pricea triacanthum Ramalingam
                                                      Thoracocotyle ovale Tripathi
                                                      Thoracocotyle sp. Ramalingam
Scomberomorus lineolatus (Cuvier and Valenciennes) ................. ? Pricea multa Chauhan
Scomberomorus maculatus (Mitchill) ................. Lithidocotyle acanthophallus (MacCallum and
                                                      MacCallum)
                                                      Microcotyle scomberomori Koratha
                                                      Pseudaxine mexicana Meserve
Pseudaxine texana Koratha
Scomberocotyle scomberomori (Koratha)
Thoracocotyle crocea MacCallum

Scomberomorus niphonius (Cuvier and Valenciennes) ........................................ Capsala ovalis (Goto)
Gotoctylea sawara Ishii

Scomberomorus sp. (=Cybium lanceolatus) ......................................................... Pricea multa Chauhan

Tetrapurus amplus (Poe) ........................................................................ Capsala poeyi (Vigueras)

Tetrapurus albida (Poe) ........................................................................ Capsala levis (Verrill)
Capsaloides cornutus (Verrill)

Tetrapurus belone Rafinesque ................................................................. Capsala levis (Verrill)
Capsaloides perugini (Setti)

Thunnus (Neothunnus) albacares albacares (Bonnaterre) ............................... Capsala thynni (Guiart)

Thunnus (Neothunnus) albacares macroptera (Temminck and Schlegel) ........ Capsala biparasitica (Goto)

Thunnus (Parathunnus) obesus mebachi (Kishi-riouye) ................................ Capsala nozawae (Goto)
? Hexostoma acutum (Goto)

Thunnus (Parathunnus) obesus obesus Lowe ........................................ Capsala onchidiocotyle (Setti)

Thunnus (Thunnus) alalunga (Bonnaterre) ................................................ Capsala nozawae (Goto)
Capsala thynni (Guiart)
Hexostoma acutum (Goto)
Hexostoma grossum (Goto)

Thunnus (Thunnus) thynnus orientalis (Temminck and Schlegel) ................ Capsala magronum (Ishii)
Capsala nozawae (Goto)
Hexostoma dissimilis (Yamaguti)
Hexostoma grossum (Goto)

Thunnus (Thunnus) thynnus thynnus (Linnaeus) ........................................... Capsala interrupta (Monticelli)
? Capsala nozawae (Goto)
Capsala onchidiocotyle (Setti)
Hexostoma acuta (Goto)
Hexostoma extensicaudum (Dawes)
Hexostoma thynnina Parona and Perugia
Hexostoma thynnii Delaroche

Thunnus sp. ........................................................................................................ Hexostoma grossum (Goto)
Tristoma levisentii Monticelli

Xiphias gladius Linnaeus ........................................................................... Capsala levis (Verrill)
Tristomum coccineum Cuvier
Tristomum integrum Diesing
DIGENETIC TREMATODES

ORDER DIGENEA

Suborder GASTEROSTOMATA

FAMILY : BUCEPHALIDÆ

Subfamily : BUCEPHALINÆ

Genus BUCEPHALUS Baer, 1826
(Syn. Gastrostomum Siebold 1848 ; Eubucephalus Diesing 1885)

Bucephalus heterotentaculatus Bravo-Hollis and Sogandes-Bernal, 1956
(Scombrid host : Scomberomorus sierra Jordan and Starks [=Scomberomorus maculatus (Mitchill)]
Locality : Pacific coast of Mexico.
Non-scombrid hosts : None.
Location : Intestine.

Bucephalus jagannathi Verma 1936
(Scombrid host : Cybium guttatum. [=Scomberomorus guttatus guttatus (Bloch and Schneider)]
Locality : Bay of Bengal.
Non-scombrid hosts : None.
Location : In intestines of Adults.

Genus RHIPIDOCOTYLE Diesing 1858
(Syn. Nannoenterum Ozaki, 1924)

Rhipidocotyle adbaculum Manter, 1940
Scombrid host : Scomberomorus regalis [=Scomberomorus regalis (Bloch)]
Locality : Florida Coast, U.S.A.
Non-scombrid hosts : None.

Rhipidocotyle angusticollis Chandler, 1941
Scombrid host : Sarda sarda [=Sarda sarda (Bloch)]
Locality : Texas Coast, U.S.A.
Non-scombrid hosts : None.

Rhipidocotyle baculum (Linton, 1905) Eckmann, 1932
(Syn. Gasterostomum Baculum Linton ; Nannoenterum Baculum Linton)
Scombrid hosts : Scomberomorus maculatus [=Scomberomorus maculatus (Mitchill)]
Scomberomorus regalis ? [=Scomberomorus regalis (Bloch) ?]
Locality : Beaufort, North Carolina ; Florida, U.S.A.
Non-scombrid hosts : None.
PARASITES OF SCOMBROID FISHES. PART I

Rhipidocotyle capitatum (Linton, 1940)

Scombroid host: Auxis rochei [= Auxis thazard (Lacépède)]
Euthynmus alletteratus (Rafinesque)
Locality: Woods Hole, Massachusetts, U.S.A.
Non-scombroid hosts: Holocentrus ascensionis [Bahamas, Atlantic] see Sparks (1957)

Rhipidocotyle nagatyi Manter, 1940

Scombroid host: Euthynmus alletteratus [= Euthynmus alletteratus (Rafinesque)]
Locality: Florida, U.S.A.
Non-scombroid hosts: None.
Remarks: R. nagatyi and R. capitatum are very closely related and may prove to be conspecific.

Rhipidocotyle pentagonum (Ozaki, 1924)
(Syn. Nannoenterum pentagonum Ozaki)

Scombroid hosts: 1. Scomberomorus nipponicus [= Scomberomorus niphonius (Cuvier & Valenciennes)]
                  2. Thynnus thynnus [= Thynnus (T.) thynnus thynnus (Linnaeus)].
Localties: 1. Takamatsu, Shikoku Islands, Japan, Pacific Ocean; 2 Mediterranean.
Non-scombroid hosts: Caranx sp., Caranx compressus [Red Sea].
Remarks: See also Eckmann (1932) and Nagaty (1937)

Rhipidocotyle septapapillata Krull, 1934

Scombroid host: Thynnus thynnus [= Euthynmus affinis affinis (Cantor)]
Locality: Red Sea.
Non-scombroid hosts: Chrysophrys berda [Bombay, India]; Eupomotis gibbosus, Fundulus diaphanus [Virginia, U.S.A.].
Remarks: Also refer Nagaty (1937).

Subfamily: PROSORHYNCHIDAE

Genus Bucephalopsis Diesing, 1855
(Syn. Bucephaloides Hopkins; Prosorhynchoides Dollfus)

Bucephalopsis arcuata (Linton, 1900)
(Syn. Gasterostomum arcuatum Linton; G. pusillum Stafford; Bucephalopsis pusilla (Stafford)

Scombroid hosts: Sarda sarda [= Sarda sarda (Bloch)]
Scomberomorus regalis [= Scomberomorus regalis (Bloch)]
Localities: Woods Hole; Beaufort, North Carolina.
Non-Scombroid hosts: Caranx hippos; Trichiurus lepturus; Gadus morrhua; Sphyraena barracuda. [Woods Hole; Beaufort, N. Carolina; and Florida, U.S.A.]; Brevoortia tyrannus; Carcharhinus obscurus [Atlantic coast of Panama; Bahamas; Puerto Rico].
Remarks: Also see Sumner et al. (1913). B. arcuata has been found to occur in the pylorus, stomach, intestine and pyloric caeca of S. sarda. For detailed discussion on B. arcuata see Sogandares-Bernal and Sogandares (1961) and Ward (1954).

Bucephalopsis cybii Park, 1939

Scombroid host: (1) Cybium coreanum [= Scomberomorus guttatus koreanus (Kishinouye)]
(2) Sarda orientalis (Temminck and Schlegel).
(3) Scomberomorus sp.


Non-scombroid host: Acanthogobius hastata (Korean waters).

Remarks: Chauhan (1943) does not refer to this as well as the following species in his ‘key’ to the species of Bucephalopsis.

Bucephalopsis sibi Yamaguti, 1940

Scombroid host: Thynnus thynnus [= Thynnus (T.) thynnus orientalis (Temminck & Schlegel)]
Locality: Hamazima, Japan.

Non-scombroid host: None.

Suborder: PROSTOMATA

Family: FELLODISTOMIDAE

Subfamily: TERGESTINAE

Genus TERGESTIA Stossich, 1899
(Syn. Cithara MacCallum; Theledera Linton)

TERGESTIA LATICOllIS (Rudolphi, 1819) Stossich 1899

Scomber scombrus Linnaeus

Scombroid hosts: Scomber japonicus [= Scomber japonicus japonicus Houttuyn]
Aulaxis thazard [= Aulaxis thazard (Lacépède)], and
Euthynnus alletteratus [= Euthynnus alletteratus (Rafinesque)]

Localities: Japan; Florida, U.S.A.

Non-scombroid hosts: Caranx trachurus [Naples and Arimini]; Trachurus trachurus;
Apolon lineatus [Japan].

Location: Intestine.
Remarks: See Dawes (1946) and Baylis (1939).

TERGESTIA ACANTHOCEFALA (Stossich, 1887)

Scombroid host: Scomber japonicus [= Scomber japonicus japonicus Houttuyn].
Locality: Toyama Bay, Japan.

Non-scombroid hosts: Belone acus [Trieste, Mediterranean]; Trachurus trachurus, Apogon lineatus [Pacific Coast, Japan].

Location: Intestine.
PARASITES OF SCOMBROID FISHES. PART I

FAMILY: OPISTHORCHIIDAE

Subfamily: Aphallinae

Genus Aphallus poche, 1826

Aphallus tubaum (Rudophli, 1819)

Scombroid host: Scomber japonicus (= Scomber japonicus colias Gmelin).
Locality: Adriatic, Mediterranean.
Non-scombroid hosts: Sciaena umbra [Speiza, Mediterranean: Poche, 1926]; Dentex dentex, Morone labrax [Adriatic, Mediterranean: Janiszewski, 1953].
Location: Intestine.
Remarks: Dolfin (1951) found the metacercaria of this species encysted in Gobius (Zostericola) ophicephalus. Scombroid host record is by Janiszewski (1953).

FAMILY: ALLOCREADIIDAE

Subfamily: Allocreadiinae

Genus Decemtestis Yamaguti, 1934

Decemtestis bicatabulatus Srivastava, 1936

Scombroid host: Scomber micropiditorus [= Rastelliger kanagurta (Cuvier)]. (Microlepidotus misspelt as micropiditorus).
Locality: India.
Non-scombroid hosts: None.

Genus Helicometrina Linton, 1910

Helicometrina orientalis Srivastava, 1936

Scombroid host: Scomber micropiditorus [= Rastelliger kanagurta (Cuvier)].
(microlepidotus misspelt as micropiditorus).
Locality: Bay of Bengal, India.
Non-scombroid hosts: None.

Genus Podoctyle (Dujardin, 1845: subgeneric name) Odhner, 1905
(Syn. Sinistroporus Stafford, 1904; Podocotyloides Yamaguti, 1934)

Podoctyle simplex (Rudolphii, 1809) Stafford, 1904
(Syn. Distomum simplex Rudolphii)

Scombroid host: Scomber scombrus [= Scomber scombrus Linnaeus].
Locality: Atlantic coast of Canada.
Non-scombroid hosts: Gadus aeglefinus, Acanthocottus scorpins, Salmo salar, Sebastes marinus, Gastrosternus aculeatus, Phycis chius, Hemitruperus americanus, Leptocephalus conger, Limanda ferruginea, Microgadus tomcod [Canada; Woods Hole, U.S.A.].
Location: Generally intestine and pyloric caeca.
Subfamily: Lepocreadiinae

Genus Lepocreadium Stossich, 1904
(Syn. Lepotrema Ozaki, 1932)

Lepocreadium retrusum Linton, 1940

Scombroid host: Pneumatophorus grex [=Scomber japonicus japonicus Houttuyn].
Locality: Woods Hole, Massachusetts, U.S.A.
Non-scombroid hosts: None.

Genus Opechona Looss, 1907
(Syn. Pharyngora Lebour 1908, Prodistorum Linton 1910)

Opechona bacillaris (Molin, 1859) Looss, 1907
(Syn. Distoma bacillare Molin, 1859; Distoma (Dicrocoelium) bacillare (Molin) Stossich, 1886; Pharyngora bacillaris Nicoll, 1914)
Scombroid host: Scomber scombrus [=Scomber scombrus Linnaeus]
Scomber japonicus [=Scomber j. colias Gmelin]
Locality: Mediterranean; Atlantic.
Non-scombroid hosts: Centrolephas pompilius [Batavii]; Pleurobranchus pileus [North America]; Gadus merlangus, Rhombus laevis, Onas mustela [Lebour, 1908]; Cyclopterus lumpus, Clupea sprattus, C. lavengus, and Capros aper [Nicol, 1910]. See also Ward and Fellingham (1934), and Janiszewska (1953).
Location: Intestine and pyloric caeca.
Remarks: See also Dawes (1946).

Opechona olssoni (Yamaguti, 1934)
(Syn. Pharyngora olssoni Yamaguti, 1934)
Scombroid host: Scomber japonicus [=Scomber japonicus japonicus Houttuyn].
Locality: Pacific coast of Japan and Toyama Bay.
Non-scombroid hosts: None.
Location: Stomach, intestine.

Opechona orientalis (Layman, 1930)
(Syn. Pharyngora orientalis Layman, 1930)
Scombroid hosts: 1. Scomber japonicus [=Scomber japonicus japonicus Houttuyn].
2. Small mackerel [=Scomber japonicus japonicus Houttuyn ?].
3. Scomber scombrus Linnaeus.
Localities: 1. Peter the Great Bay, Sea of Japan (original description); 2. Galapagos Islands (small mackerel); Toyama Bay, Japan; and Inland Sea of Japan; 3. Adriatic, Mediterranean (Janiszewska 1953).
Non-scombroid hosts: Angelichthys (loc. unknown); Paranthias furcifer [Mexico]; Spheroides rubripes, Engraulis japonicus [Toyama Bay, Japan]; and Girella nigricans [California coast, U.S.A.].
Location: Stomach, intestine and pyloric caeca.
Remarks: See for more details Ward and Fellingham (1934).
PARASITES OF SCOMBROID FISHES. PART 1

Opechona scombr i Yamaguti, 1938

Scombroid hosts: Scomber japonicus [=Scomber japonicus japonicus Houttuyn]
Scomber kanagurta [=Rastrelliger kanagura (Cuvier)]. (kanagurta misspelt as kanagurta).

Localities: Inland Sea of Japan; Macassar, Indonesia.
Non-scombroid hosts: None.
Location: Pyloric caeca, Intestine.

Subfamily: OPECOELINAE

Genus OPECOELIDES Odhner, 1928

Opecoelides vitellosus (Linton, 1900)
(Syn. Distomum vitellosus Linton, 1900)

Scombroid hosts: Scomber [=Scomber scombris Linnaeus]
Sarda [=Sarda sarda (Bloch)].
Localities: Woods Hole, Massachusetts, U.S.A.
Non-scombroid hosts: Anguilla, Brevoortia tyrannus, Clupea harengus, Cynoscion regalis,
Decapterus macarellus, Leptocephalus conger, Limanda ferruginea, Lophopsetta maculata, Men-ticirrhis saxatilis, Merluccius bilinearis, Microgadus tomcod, Morone americana, Paralichthys
dentatus, Paralichthys olivaceus, Pomatomus saltatrix, Pomolobus pseudoharengus, Prionotus caro-linus, Pseudopleuronectes americanus, Spheroidees maculatus, Sthenotomus chrysops, Tautoga onitis,
Tautogolabrus adspersus, and species of Alosa, Ammodytes, Lagodon, Leistonyx, Mullus, Uro-phytis, Syrictes, Trachinotus, and Trachurus [Woods Hole, Massachusetts, U.S.A.].
Location: Generally intestine, pyloric caeca.

FAMILY: ACANTHOCOLPIDAE

Subfamily: ACANTHO COLPINA E

Genus TORMOPSOLUS Poche, 1926

Tormopsolus orientalis Yamaguti, 1934

Yamaguti (1934) described this species from the small intestine of Seriola quinquergiadiata,
and S. aureovittata from the Inland Sea and Mutu Bay, Japan; and Pacific coast of Wakayama
Prefecture and Toyama Bay, Japan, respectively. Later (1958) he referred to Zonichthys fas-ciatus from Bermuda, Atlantic as an additional host. However, Hanson (1950) lists the 'Bonito'
and possibly Zonichthys fasciatus as hosts of T. orientalis from Bermuda. I am unable to find
any other reference to the bonito [in Atlantic, Sarda sarda (Bloch)] listed as a host of T. orientalis,
and feel that this may be a doubtful host record.
**FAMILY: HIRUDINELLIDAE**

**Genus Hirudinella Garsin, 1730**

*Hirudinella marina* (Garsin, 1730)

*Scombroid host*: *Scomber pelamys* [= *Katsuwonus pelamis* (Linnaeus)]

*Locality*: Not known.

*Non-scombroid hosts*: None.

*Location*: Stomach.

*Remarks*: Reference is invited to Nigrelli and Stunkard (1947), who on the basis of a thorough study of the genus *Hirudinella*, recognise only two species, *H. marina* and *H. ventricosa* (Pallas), the latter found only in the wahoo, *Acanthocybium solandri*, and also covers other species of *Hirudinella* hitherto reported from that fish. Yamaguti (1958) has listed six species of *Hirudinella*, some of which as pointed out by Nigrelli and Stunkard (1947) may be synonyms of *H. marina* or *H. ventricosa*. However, as Ward (1954) mentions, the difficulties of species discrimination in this genus is considerable which may be 'explained partly by the fact that never more than a few individuals are found in a single host, and also by the fact that the worms are so large and muscular that the arrangement of the internal organs is easily distorted.' The following list of species of *Hirudinella* as given by Yamaguti (1958) should be appraised in the light of the points raised above.

*Hirudinella beebei* Chandler, 1937

*Scombroid host*: *Acanthocybium petus* [= *Acanthocybium solandri* (Cuvier and Valenciennes)].

*Acanthocybium solandri* [= *Acanthocybium solandri* (Cuvier and Valenciennes)].

*Localities*: Bermuda; Galapagos Islands and Panama Bay.

*Non-scombroid hosts*: None.

*Location*: Stomach.

*Hirudinella poiiri* (Moniez, 1891) Dollfus, 1935

*Scombroid host*: *Thynnus alalunga* [= *Thunnus (T.) alalunga* (Bonnaterre)].

*Locality*: Atlantic.

*Non-scombroid hosts*: None.

*Location*: Stomach.

*Hirudinella spinulosa* Yamaguti, 1938

*Scombroid host*: *Thynnus alalunga* [= *Thunnus (T.) alalunga* (Bonnaterre)].

*Locality*: Pacific coast of Japan.

*Non-scombroid hosts*: None.

*Location*: Stomach.
**Parasites of Scrombroid Fishes, Part I**

**Hirudinella ventricosa** (Pallas, 1774) Baird, 1853

(Syn. *Fasciola ventricosa* Pallas, 1774; *Fasciola fusca* Bosc, 1902; *Fasciola coryphaenae hippocrus*Tilesius in Litt. Rudolphi 1809)

*Scombroid hosts*: *Xiphias gladius* [= *Xiphias gladius* Linnaeus].

*Locality*: Atlantic.

*Non-scombroid host*: *Coryphaena hippurus* [Amboyna; Europe; Florida]. See also Linton (1940) for hosts of *F. fusca* Bosc. Nigrelli (1938) reported this species from *X. gladius*.

**Hirudinella clavata** (Menzies, 1791) Blainville, 1928

(Syn. *Fasciola clavata* Menzies, 1791; *Distoma clavatum* Rudolphi)

*Scombroid hosts*: *Gymnosarda alletterata* [= *Euthynnus affinis* yaito Kishinouye].

*Pelamys sarda* [= *Sardina sarda* (Bloch)];

*Thynnus thynnus* [= *Thunnus (T.) thynnus thynnus* (Linnaeus)];

*Thynnus vulgaris* [= *Thunnus (T.) thynnus thynnus* (Linnaeus)];

*Xiphias gladius* [= *Xiphias gladius* Linnaeus].

*Localities*: Pacific Ocean; Atlantic Ocean.

*Location*: Stomach.

*Remarks*: See for host species Manter (1940), and for a discussion on the parasite species Nigrelli (1938).

**Family: Bathycotylidae**

**Genus Bathycotyle** Adolf Darr, 1902

**Bathycotyle branchialis** Adolf Darr, 1902

*Scombroid host*: ? Mackerel [= *Scomber* sp.]

*Locality*: German East Africa (Pemba).

*Non-scombroid hosts*: None.

*Location*: Gills.

*Remarks*: Host identification is incomplete. See Dollfus (1932) for a detailed account on *B. branchialis*.

**Family: Hemiuridae**

**Subfamily: Hemiurinae**

**Genus Hemiurus** Rudolphi, 1809

(Syn. *Parahemiurus* Vaz and Pereira, 1930)

Yamaguti (1958) recognises the genus *Parahemiurus* Vaz and Pereira, 1930, but Dawes (1946) has pointed out that the main distinguishing feature between *Hemiurus*, and *Parahemiurus*, namely the bipartite nature of the seminal vesicle in the former and its undivided state in the latter are not sound characters for generic distinction, for 'In *Hemiurus levinseni*, the seminal vesicle has a non-muscular wall, and no doubt under certain conditions of extension or contraction of the body it may assume a variety of shapes, including that attributed to ' *Parahemiurus*'.
As such "All species of Vaz & Pereira’s ‘genus’ are under suspicion of being species of *Hemiurus*, and many of them will prove to be known species insufficiently described" (Dawes 1946). On these grounds, until a thorough study could clarify the matter, *Parahemiurus* is treated here as a synonym of *Hemiurus*.

**Hemiurus appendiculatus** (Rudolphi, 1802) Looss, 1899
(Syn. *Apolema appendiculatum* Rudolphi, 1802 Blanchard, 1847)

*Scombroid host*: *Scomber scombrus* [= *Scomber scombrus* Linnaeus].

*Locality*: Woods Hole, Massachusetts, U.S.A.

*Non-scombroid hosts*: *Clupea alosa* [Europe]; *Salmo salar*, *Osmerus mordax*, *Clupea harengus*, *Gadus callarias*, *Pollachius virens*, *Amodytes tobianus*, *Anguilla anguilla*, *Acanthocottus scorpins*, *Hippoglossus hippoglossus*, *Platystomachthys hippoglossoides* [Canada], *Achirus fasciatus*, *Anchovia brownii*, *Brevoortia tyrannis*, *Clupeanodon pseudohispanicus*, *Clupea harengus*, *Cynoscion regalis*, *Decapterus macrellus*, *Microgadus tomcod*, *Myxocephalus aureus*, *Paralichthys dentatus*, *Pomolobus mediocris*, *P. pseudoharengus*, *Prionotus carolinus*, *Pseudopleuronectes americanus*, *Stenotomus chrysops*, *Trachurus crumenophthalmus*, *Urophycis chuss* [Woods Hole]; *Gadus merlangus* [Australia]; *Alosa finita* [Egypt-Mediterranean]; *Caspialis* spp. [Black Sea]. For additional hosts see Nicoll (1907), Mola (1928), Zschokke (1933).

*Location*: Stomach, intestine and oesophagus.

**Hemiurus sardiniae** (Yamaguti, 1934)
(Syn. *Parahemiurus sardiniae* Yamaguti, 1934)

*Scombroid hosts*: *Istiophorus orientalis* [= *Istiophorus gladius* (Broussonet)]

*Locality*: Toyama Bay, Japan.

*Non-scombroid hosts*: *Sardinia melanosticta*, *Engraulis japonicus* [Toyama Bay, Japan].

*Location*: Stomach.

*Remarks*: See Manter (1940) wherein *Parahemiurus sardiniae* Yamaguti, is considered a probable synonym of *P. merus* (Linton).

**Subfamily**: *Dinurinae*

**Genus**: *DINURUS* Looss 1907

**Dinurus barbatus** (Cohn, 1902) Looss, 1907

*Scombroid host*: *Pelamys sarda* [= *Sarda sarda* (Bloch)]

*Locality*: Atlantic.

*Non-scombroid hosts*: *Corlyphaena equisittis*, *C. hippurus* [Atlantic]; *C.hippurus* [Secas Island, Panama].

*Remarks*: See Dawes (1946). It is likely that *Dinurus barbatus* along with *D. breviductus* Looss, 1907, and *D. longisimus* Looss, 1907 may be synonyms of *Distoma tornatum* Rudolphi, 1819 [= *Dinurus tornatum* (Rudolphi)]. Of these, *D. breviductus* was also described from *Pelamys sarda* (= *Sarda sarda*) and also from *Corlyphaena hippurus* from the Atlantic (latter from Beaufort, N. Carolina, U.S.A.), and Yamaguti (1938) recognises this as a distinct species, a course which was also taken earlier by Manter (1947). Following Dawes (op. cit.), Ward (1954) recognises *Dinurus tornatus* (Rudolphi).
Dinurus euthymi Yamaguti, 1934

*Scombroid host: Euthynnus pelamys [=Katsuwoynus pelamis (Linnaeus)]
Locality: Pacific coast, Japan.
Non-scombroid hosts: None.
Location: Stomach.

Dinurus scombrl Yamaguti, 1934

*Scombroid hosts: Scomber japonicus [=Scomber japonicus japonicus Houttuyn]
Euthynnus alletteratus [=Euthynnus alletteratus (Rafinesque)]
Localities: Toyama Bay, Japan; Florida, U.S.A.
Non-scombroid hosts: None.
Location: Stomach.

Genus ECTENURUS Looss, 1907
(Syn. Erilepturus Woolcock, 1905)

ECTENURUS LEPIDUS Looss, 1907

*Scombroid host: Scomber colias [=Scomber japonicus colias Gmelin].
Locality: Mediterranean.
Non-scombroid hosts: Lichia amia, Atherina hepsetus, Caranx trachurus, Cepola rubescens, Lophius piscatorius, Maena vulgaris, Samaris alcede, Trachypteron taenia, [Mediterranean]; Trachurus trachurus [Scotland and Black Sea—see Vlasenko, 1931]; Helicolenus percoideus, Trachurus novaeezelandiae [New Zealand—see Manter, 1954].
Location: Stomach.

Genus LECTHOCLASTUM Lühle, 1901

LECTHOCLASTUM EXCLUSUM (Rudolphi, 1819) Lühle, 1901

(Syn. Distoma excisum Rudolphi, 1819; Distoma cristatum Rudolphi, 1819; ? Distomum crenatum Molin, 1859)
*Scombroid hosts: Scomber scombrus [=Scomber scombrus Linnaeus]
Spanish mackerel (see Dawes, 1946). [=Scomber japonicus colias Gmelin]
Localities: Mediterranean, Atlantic, Baltic, Pacific; Sea of Japan, and New Zealand.
Non-scombroid hosts: Immature flukes in Trachurus trachurus, Box boops, Lophius piscatorius, Cepola rubescens, etc.
Remarks: Dawes (1946) mentions Lecthocolastum excisiforme Cohen (1903) as a synonym of L. excisum following Looss (1907). Distomum crenatum Molin (1859) is considered a doubtful synonym, and so also Distomum gulatum Linton (1901). The last said is a relatively larger form than L. excisum (6-8 mm. versus 10 mm. extended). I have followed Yamaguti (1958) in treating L. excisiforme, and L. gulatum (Linton) as separate species.
Location: Stomach.
Lecithocladium excisiforme Cohn, 1903

Scombroid host: Scomber scomber [=Scomber scombrus Linnaeus]
Locality: Mediterranean.
Non-scombroid hosts: Stromateoides argenteus [Inland Sea of Japan]
Location: Stomach.

Lecithocladium gulosum (Linton, 1901)

Scombroid host: Pneumatophorus grex [=Scomber japonicus japonicus Houttuyn]
Scomber scombrus [Scomber scomberus Linnaeus].
Locality: Woods Hole, Massachusetts, U.S.A.
Non-scombroid hosts: Poronotus triacanthus [Woods Hole, Massachusetts, U.S.A.].
Location: Stomach.
Remarks: See Linton (1940); Dawes (1946).

Lecithocladium angustiovum Yamaguti, 1953

Scombroid host: Scomber kanagurta [=Rastrelliger kanagurta (Cuvier)]
Locality: Celebes (Macassar).
Non-scombroid hosts: None.
Location: Stomach.

Lecithocladium pariovum Yamaguti, 1953

Scombroid host: Scomber kanagurta [=Rastrelliger kanagurta (Cuvier)]
Localities: Celebes (Macassar).
Non-scombroid hosts: None.
Location: Stomach.

Lecithocladium scombri Yamaguti, 1953

Scombroid hosts: Scomber kanagurta [=Rastrelliger kanagurta (Cuvier)]
Scomber microlepidotus [=Rastrelliger kanagurta (Cuvier)]
Locality: Celebes (Macassar).
Non-scombroid hosts: None.
Location: Stomach.

Subfamily: Hysterolecithinæ

Genus Aponurus Looss, 1907

Aponurus tschugunowi Issaitsch, 1928
(Syn. A. tschugunovi Vlasenko, 1931)

Scombroid host: Sarda sarda [=Sarda sarda (Bloch)]
Locality: Black sea?
Non-scombroid hosts: Several species (see Yamaguti, 1958).
Subfamily: Serrhurinae

Genus Serrhurus Looss, 1907

(Syn. Sepiaogertiductus Skjralin and Guschanskaja, 1955; Lectichthirum Lühe, 1901, in part).

Serrhurus monococu Looss, 1907

Scombroid host: Thynnus sp. [=Thynnus (T.) thynhus thynnus (Linnaeus) ?]
Locality: Alexandria, Mediterranean.
Non-scombroid hosts: None.

Serrhurus monticelli (Linton, 1898) Linton, 1910

(Syn. Distomum monticelli Linton, 1898)

Scombroid host: Gymnosarda alleterata [=Euthynnus alleteratus (Rafinesque)]
Locality: Woods Hole, Massachusetts, U.S.A.

Non-scombroid hosts: Cynoscion regalis, Paralichthys dentatus, Pomatomus saltatrix, Remora remora Woods Hole; For additional hosts from Bermuda; Beaufort, North Carolina, and Tortugas, reference is invited to Linton (1940), Manter (1931, ’34), and Pearson (1949).
Location: Intestine.

Genus Lectichthirium Lühe, 1901

(Syn. Synaptobothrium Linstow, 1904; Pleurus Looss, 1907)

Sprehn (1933) regards Synaptobothrium Linstow to be a synonym of Lectichthirium Lühe, which course is also followed by Yamaguti (1958). However, Dawes (1946) considers the two as generically distinct.

Lectichthirium caudiporum (Rudolphi, 1819)

(Syn. Distoma caudiporum Rudolphi, 1819; Synaptobothrium caudiporum (Rudolphi) of Linstow 1904 and Dawes, 1946)
Scombroid host: Sarda sarda [=Sarda sarda (Bloch)]
Scomber scombrus Linnaeus
Locality: Black Sea.
Non-scombroid hosts: Zeus faber, Pleuronectes platessa, Lophius piscatorius, Trigla lucerna, Gadus callarias, G. luscus, Scophthalmus rhombus, Conger conger [Atlantic (Europe), Mediterranean.] Larvae in Blennius pholis, Labrus bergylta, Crenilabrus melops (See Dawes, 1946).
Location: Adults in stomach; larvae encysted in viscera.
Remarks: See also Butzkaya (1952).

Lectichthirium magnaporum Manter, 1940

Scombroid host: Euthynnus alleteratus [=Euthynnus affinis yaito Kishinouye ? or E. a. lineatus Kishinouye ?]
Locality: Galapogos Islands (E. Pacific).
Non-scombroid hosts: Paralabrax humeralis, Seriola dorsalis [Galapogos Islands, E. Pacific],
Leechthorium microstomum Chandler, 1935

*Scombroid host: Euthynnus alletteratus* [=*Euthynnus affinis yaito* Kishinouye? or *E.a. lineatus* Kishinouye?]

*Locality:* Galapagos Islands, E. Pacific.

*Non-scombroid hosts:* Trichiurus lepturus [Galveston Bay, Louisiana], Galeichthys milberti [Beaufort, North Carolina], Anisurus arisea, Prioncrops itaiara, Tarpon atlanticus [Florida], Calamus brachysomus, Caudolatiles sp., Paralabrax humeralis, Paranthias furcifer [Galapagos Islands, E. Pacific].

Leechthorium texanum (Chandler, 1941) Manter, 1947

*Scombroid hosts:* Sarda sarda [Sarda sarda (Bloch)]

Euthynnus alletteratus [=Euthynnus alletteratus (Rafinesque)]

*Localities:* Texas coast; and Florida, U.S.A.

*Non-scombroid hosts:* None.

**Family: Syncoeliidae**

Subfamily: Syncoeliinae

Genus *Syncoelium* Looss, 1899

(Syn. Capiatistes Crowcroft, 1948)

Syncoelium Katuwo Yamaguti, 1938

*Scombroid host:* Euthynnus pelamis [=Katsuwonus pelamis (Linnaeus)]

*Locality:* Pacific coast of Japan.

*Non-scombroid hosts:* None.

*Location:* Gills and Pharynx.

**Family: Didymozoidae**

Subfamily: Didymozoinae

Genus *Didymozocon* Taschenberg, 1878, emend. Odhner, 1907

Didymozocon auxis Taschenberg, 1879

(Syn. Didymozoum auxis Taschenberg of Ishii, 1935)

*Scombroid host:* Auxis rochei [=Auxis thazard (Lacépède)]

Auxis thazard [=Auxis thazard (Lacépède)]

*Localities:* Naples, Mediterranean; Taiz, Japan.

*Non-scombroid hosts:* None.

*Location:* Gills and outer side of gill lamellae.
Didymozoon filicole Ishii, 1935

Scombroid hosts: Thynnus orientalis [=Thunnus (T.) thynnus orientalis (Temminck and Schlegel)]
                    Euthynnus pelamys [=Katsuonymus pelamis (Linnaeus)]
Locality: Pacific coast of Japan.
Non-scombroid hosts: Seriola quinqueradiata [Pacific coast of Japan]
Location: Gills.

Didymozoon longicole Ishii, 1935

Scombroid hosts: Euthynnus pelamys [=Katsuonymus pelamis (Linnaeus)]
                    Thynnus orientalis [=Thunnus (T.) thynnus orientalis (Temminck and Schlegel)]
                    Scomber japonicus [=Scomber japonicus japonicus Houttuyn]
Locality: Pacific coast of Japan.
Non-scombroid hosts: None.
Location: Gills.

Didymozoon minor Yamaguti, 1934

Scombroid host: Euthynnus pelamys [=Katsuonymus pelamis (Linnaeus)]
Locality: Pacific coast of Japan.
Non-scombroid hosts: None.
Location: Cysts in pairs on gills.
Remarks: Species name spelt as D. minus Yamaguti, 1958.

Didymozoon pretiosum Ariola, 1902

Scombroid host: Thynnus vulgatilis [=Thunnus (T.) thynnus thynnus (Linnaeus)]
Locality: Naples, Mediterranean.
Non-scombroid hosts: None.
Location: Gills.

Genus Didymocylindrus Ishii, 1935.

Didymocylindrus filliformis Ishii, 1935

Scombroid hosts: Euthynnus pelamys [=Katsuonymus pelamis (Linnaeus)]
                    Thynnus orientalis [=Thunnus (T.) thynnus orientalis (Temminck and Schlegel)]
Locality: Japan, Pacific Ocean.
Non-scombroid hosts: None.
Location: Encysted on gills.
Genus Didymocystis Ario, 1902

Didymocystis abdominalis Yamaguti, 1938

Scombroid host : Euthynnus pelamys [=Katsuwonus pelamis (Linnaeus)]
Locality : Pacific coast of Japan.
Non-scombroid host : None.
Location : Body cavity.

Didymocystis acanthocybii Yamaguti, 1938

Scombroid host : Acanthocybium sara [=Acanthocybium solandri (Cuvier and Valenciennes)]
Locality : Pacific Ocean, Japan.
Non-scombroid hosts : None.
Location : Base of gill arch.

Didymocystis aalongae Yamaguti, 1938

Scombroid host : Thynnus aalonga [=Thunnus (T.) aalonga (Bonnaterre)]
Locality : Pacific Ocean, Japan.
Non-scombroid hosts : None.
Location : Occurs in pairs in rounded somewhat flattened cysts about 15 mm. in diameter along gill arch.

Didymocystis bilobata Ishii, 1935

Scombroid host : Euthynnus pelamys [=Katsuwonus pelamis (Linnaeus)]
Locality : Pacific Ocean, Japan.
Non-scombroid hosts : None.
Location : Gills.

Didymocystis coatesi Nigrelli, 1939

Scombroid host : Acanthocybium solandri [=Acanthocybium solandri (Cuvier and Valenciennes)]
Locality : Florida.
Non-scombroid hosts : None.
Remarks : It is quite likely that this species may turn out to be a synonym of D. acanthocybii Yamaguti, (1938).

Didymocystis crassa Ishii, 1935

Scombroid host : Thynnus orientalis [=Thunnus (T.) thynnus orientalis (Temminck and Schlegel)]
Locality : Pacific Ocean, Japan.
Non-scombroid hosts : None.
**Didymocystis dissimilis** Yamaguti, 1938

*Scombroid host*: *Euthynnus pelamys* [= *Katsuwonus pelamis* (Linnaeus)]
*Locality*: Pacific Ocean, Japan.
*Non-scombroid hosts*: None.
*Location*: Oesophagus, stomach.

*Remarks*: Yamaguti (1934) reported this as *D. reniformis* Ariola, 1902, but in 1938, with more material described this as a new species, distinguishing it from *D. reniformis* in the unequal sizes of two individuals enclosed in a cyst.

**Didymocystis lanceolata** Guiart, 1938

*Scombroid host*: *Thynnus alalunga* [= *Thunnus* (*T.*) *alalunga* (Bonnaterre)]
*Locality*: Atlantic.
*Non-scombroid hosts*: None.

**Didymocystis macrorchis** Guiart, 1938

*Scombroid host*: *Thynnus alalunga* [= *Thunnus* (*T.*) *alalunga* (Bonnaterre)]
*Locality*: Atlantic.
*Non-scombroid hosts*: None.

**Didymocystis miliaris** Yamaguti, 1938

*Scombroid host*: *Acanthocybium sara* [= *Acanthocybium solandri* (Cuvier and Valenciennes)]
*Locality*: Pacific Ocean, Japan.
*Non-scombroid hosts*: None.
*Location*: Base of gill arch.

**Didymocystis opercularis** Yamaguti, 1938

*Scombroid host*: *Thynnus alalunga* [= *Thunnus* (*T.*) *alalunga* (Bonnaterre)]
*Locality*: Pacific Ocean, Japan.
*Non-scombroid hosts*: None.
*Location*: Encysted in pairs on fleshy lobe of inner surface of operculum.

**Didymocystis ovata** Ishii, 1935

*Scombroid hosts*: *Thynnus orientalis* [= *Thunnus* (*T.*) *thynnus orientalis* (Temminck and Schlegel)]

*Euthynnus pelamys* [= *Katsuwonus pelamis* (Linnaeus)]
*Locality*: Pacific Ocean, Japan.
*Non-scombroid hosts*: None.
*Location*: Mouth cavity.

_Scombroid host:_ Scomberomorus maculatus [= Scomberomorus maculatus (Mitchell)]  
_Locality:_ Atlantic.  
_Non-scombroid hosts:_ None.  
_Location:_ On gill lamellae.

**Didymycystis semiglobularis** Ishii, 1935

_Scombroid host:_ Thynnus orientalis [= Thunnus (T.) thynnus orientalis (Temminck and Schlegel)]  
_Locality:_ Pacific, Japan.  
_Non-scombroid hosts:_ None.  
_Location:_ On gills.

**Didymycystis simplex** Ishii, 1935

_Scombroid host:_ Euthynnus pelamys [= Katsuwonus pelamis (Linnaeus)]  
_Locality:_ Pacific Ocean, Japan.  
_Non-scombroid hosts:_ None.  
_Location:_ On gills.

**Didymycystis soleiformis** Ishii, 1935

_Scombroid hosts:_ Euthynnus orientalis [= Thunnus (T.) thynnus orientalis (Temminck and Schlegel)]  
_Euthynnus pelamys [= Katsuwonus pelamis (Linnaeus)]  
_Locality:_ Pacific Ocean, Japan.  
_Non-scombroid hosts:_ Seriola quinqueradiata [Pacific Ocean, Japan]  
_Location:_ On gills.

**Didymycystis submentalis** Yamaguti, 1938

_Scombroid host:_ Euthynnus pelamys [= Katsuwonus pelamis (Linnaeus)]  
_Locality:_ Pacific Ocean, Japan.  
_Non-scombroid hosts:_ None.  
_Location:_ Submental groove.

**Didymycystis thynni** (Taschenberg, 1879)

(Syn. Didymozoon thynni Taschenberg, 1879; Didymycystis reniformis Ariola, 1902)  
_Scombroid host:_ Thynnus vulgaris [= Thunnus (T.) thynnus thynnus (Linnaeus)]  
_Locality:_ Naples, Trieste, Genova, Nice—Mediterranean.  
_Non-scombroid hosts:_ None.  
_Location:_ Encysted on gills and inside of operculum.
Didymocystis welbi Ariola, 1902
(Syn. Wedila katsuuniocola Okada, 1926; Didymocystis sp. Kobayashi, 1921; Didymocystis kobayashii Dollfus, 1926)

Scombroid hosts: Thynnus vulgaris [=Thunnus (T.) thynnus thynnus (Linnaeus)]
Euthynnus pelamys [=Katsuwonus pelamis (Linnaeus)]

Locality: France, Italy, near Algiers (Mediterranean); Pacific Ocean and Toyama Bay, Japan.
Non-scombroid hosts: None.
Location: Gill and gill lamellae.


Scombroid host: Xiphus gladius [=Xiphias gladius (Linnaeus)]
Locality: Woods Hole, Massachusetts, U.S.A.
Non-scombroid hosts: None.
Location: Gill cavity and muscles.
Remarks: See Linton (1940).

Genus Didymoprolema Ishii, 1935

Didymoprolema fusiforme Ishii, 1935

Scombroid hosts: Thynnus orientalis [=Thunnus (T.) thynnus orientalis (Temminck and Schlegel)]
Euthynnus pelamys [=Katsuwonus pelamis (Linnaeus)]
Locality: Pacific Ocean, Japan.
Non-scombroid hosts: None.

Genus Lobatozoum Ishii, 1935

Lobatozoum multisserulatum Ishii, 1935

Scombroid hosts: Thynnus orientalis [=Thunnus (T.) thynnus orientalis (Temminck and Schlegel)]
Euthynnus pelamys [=Katsuwonus pelamis (Linnaeus)]
Locality: Pacific Ocean, Japan.
Non-scombroid hosts: None.
Location: Gill.

Genus Platocystis Yamaguti, 1938

Platocystis alalongae Yamaguti, 1938

Scombroid host: Thynnus alalonga [=Thunnus (T.) alalonga (Bonnaterre)]
Locality: Pacific Ocean, Japan.
Non-scombroid hosts: None.
Location: Encysted in pairs in skin.
Subfamily: Atalostrophinae

Genus Atalostrophion G. A. MacCallum, 1915

Atalostrophion sardae MacCallum, 1915

Scombroid host: Sarda sarda [=Sarda sarda (Bloch)]
Locality: Woods Hole, Massachusetts, U.S.A.
Non-scombroid hosts: None.
Location: Under mucous membrane of branchial cavity.
Remarks: Yamaguti (1958) has given reasons for considering Atalosparganum Ishii (1935) originally proposed as the type subgenus of Atalostrophion to be a synonym of the latter. Ishii described Atalostrophium (Atalosparganum) sp., from the branchial cavity of Katsuwonus vagans [=Katsuwonus pelamis (Linnaeus)], but on account of certain discrepancies in the original description, Yamaguti (1958) provisionally refers this form to the genus Metanematobothrium Yamaguti, 1938 (Subfamily Nematobothriinae).

Subfamily: Colocyntotreminae

Genus Colocyntotrema Yamaguti, 1951

Colocyntotrema auxis Yamaguti, 1951

Scombroid host: Auxis thazard [=Auxis thazard (Lacépède)]
Locality: Taizi, Wakayama Prefecture, Japan.
Non-scombroid hosts: None.
Location: Pyloric caeca.

Genus Phaceotrema Yamaguti, 1951

Phaceotrema claviforme Yamaguti, 1951

Scombroid host: Auxis thazard [=Auxis thazard (Lacépède)]
Locality: Taizi, Wakayama Prefecture, Japan.
Non-scombroid hosts: None.
Location: Pyloric caeca.

Subfamily: Glomeritreminae

Genus Glomeritrema Yamaguti, 1942

Glomeritrema subcuticola Yamaguti, 1942

Scombroid host: Tetrapturus mitsukuitii [=Tetrapturus audax (Phillipi)]
Locality: Naha, Okinawa, Pacific.
Non-scombroid host: None.
Location: Subcutaneous tissue.
Subfamily: Koellikerinae

Genus Koellikeria Cobbold, 1860
(Syn. Wedilia Cobbold, 1860; Didymostoma Ariola, 1902)

Koellikeria bipartita (Wedl, 1855)
Syn. Didymostoma bipartium (Wedl, 1855; Ariola, 1902)

Scombroid hosts: Thynnus vulgaris [=Thunnus (T.) thynnus thynnus (Linnaeus)]
Thynnus secundo-dorsalis [=Thunnus (T.) thynnus thynnus (Linnaeus)]

Localities: Trieste, Nice, Naples [Mediterranean]; Atlantic coast, U.S.A.
Non-scombroid hosts: None.
Location: Gills, gill arches, skin of head.

Koellikeria globosa Ishii

Scombroid hosts: Thynnus orientalis [=Thunnus (T.) thynnus orientalis (Temminck and Schlegel)]
Euthynnus pelamys [=Katsuwonus pelamis (Linnaeus)]

Locality: Tokyo, Japan.
Non-scombroid host: Seriola quinqueradiata [Tokyo, Japan].

Koellikeria orientalis (Yamaguti, 1934)
(Syn. Wedilia orientalis Yamaguti, 1934)

Scombroid hosts: Germa macropterus [=T.(N.)albacares macropterus (Temminck and Schlegel)]
Euthynnus pelamys [=Katsuwonus pelamis (Linnaeus)]
Thynnus thynnus [=Thunnus (T.) thynnus orientalis (Temminck and Schlegel)]

Localities: Küki, Japan; Küki and Inland Sea, Japan; Toyama Bay, Japan.
Non-scombroid host: None.
Location: Small and large intestine, anus, oesophagus, stomach, gills.

Koellikeria reniformis Ishii, 1935

Scombroid hosts: Thynnus orientalis [=Thunnus (T.) thynnus orientalis (Temminck and Schlegel)]
Euthynnus pelamys [=Katsuwonus pelamis (Linnaeus)].

Locality: Tokyo, Japan.
Non-scombroid hosts: Seriola quinqueradiata (Tokyo, Japan).
Location: Gills.

Genus Coeliotrema Yamaguti, 1938

Coeliotrema thymi Yamaguti, 1938

Scombroid host: Thynnus thynnus [=Thunnus (T.) thynnus orientalis (Temminck and Schlegel)]
Locality: Suruga Bay, Japan.
Non-scombroid hosts: None.
Location: Mesentery.
Subfamily: Nematobothriinae

Genus Nematobothrium van Beneden, 1858

Nematobothrium faciale (Baylis, 1938)
(Syn. Didymozoon faciale, Baylis, 1938)

Scombroid host: Scomber scombrus [=Scomber scombrus (Linnaeus)]
Locality: English Channel.
Non-scombroid hosts: None.
Location: Cysts beneath outer skin of head, behind eye.

Nematobothrium filiforme Yamaguti, 1934
(Syn. Nematobothrium sabae Ishii, 1935)

Scombroid host: Scomber japonicus [=Scomber japonicus japonicus Houttuyn]
Locality: Toyama Bay, and Pacific, Japan.
Non-scombroid hosts: None.
Location: Encysted in pairs on gills.

Nematobothrium latum Guiart, 1938

Scombroid host: Thynnus alalunga [=Thunnus (T.) alalunga (Bonnaterre)]
Locality: Atlantic.
Non-scombroid hosts: None.
Location: Encysted on stomachal peritoneum.

Nematobothrium pelamydis (Taschenberg, 1879)
(Syn. Didymozoon pelamydis Taschenberg, 1879)

Scombroid host: Pelamys sarda [=Sarda sarda (Bloch)]
Locality: Naples, Genova, Portoferro, [Mediterranean].
Non-scombroid hosts: None.
Location: Between gill lamellae.

Nematobothrium scombris (Taschenberg, 1879)
(Syn. Didymozoon scombris Taschenberg, (1879)

Scombroid hosts: Scomber colias [=Scomber japonicus colias Gmelin];
Scomber scomber [=Scomber scombrus Linnaeus];
Scomber japonicus [=Scomber japonicus japonicus Houttuyn].
Localities: Naples, Genova, Venice, Trieste, Krestenberg, Ireland, Pacific Ocean, Japan.
Non-scombroid hosts: None.
Location: Cysts on roof of buccal cavity between pharyngo-branchial elements; external surface of basibranchials; parts of gill arch and inner surface of operculum.
Genus *METANEMATOBOtherium* Yamaguti, 1938

*Metanematobothrium guernel* (Moniez, 1891)

(Syn. *Nematobothrium (Benedénozoëum) guernel* Moniez of Ishii, 1935)

**Scombroid host**: *Thynnus alalunga* [= *Thynnus (T.) alalunga* (Bonnaterre)]

**Locality**: Atlantic coast of France; Pacific Ocean, Japan.

**Non-scombroid hosts**: None.

**Location**: Gills; submaxillary muscles, intestine.

Genus *UNITUBULOTESTES* Yamaguti, 1952


**Scombroid host**: *Sarda sarda* [= *Sarda sarda* (Bloch)]

**Locality**: Woods Hole, Massachusetts, U.S.A. (N.W. Atlantic); Black Sea.

**Non-scombroid hosts**: None.

**Location**: Pharyngo-branchial region or gills.

**Remarks**: See Grabda and Siwak-Grabda (1948) for redescription of species from same host from Black Sea.

Subfamily: *NEODIPOLOMATINAe*

Genus *NEODIPOLOREMA* Yamaguti, 1938

(Syn. *Diplotrema* Yamaguti, 1938 *nec* Spencer; 1900)

*Neodiptrema pelamides* (Yamaguti, 1938)

(Syn. *Diplotrema pelamides* Yamaguti, 1938)

**Scombroid host**: *Euthynnus pelamys* [= *Katsuwonus pelamis* (Linnaeus)]

**Locality**: Pacific Ocean, Japan.

**Non-scombroid hosts**: None.

**Location**: Fifth gill arch.

Subfamily: *OPEPHEROTREMAINAE*

Genus *OpepheroTreema* Yamaguti, 1951

*OpepheroTrema planum* Yamaguti, 1951

**Scombroid host**: *Auxis thazard* [= *Auxis thazard* (Lacépède)]

**Locality**: Taiz, Wakayama Prefecture, Japan.

**Non-scombroid hosts**: None.

**Location**: Pyloric caeca.
HOST-PARASITE LIST NO. II

(List of names of scombroid hosts and their trematode parasites. Genera are alphabetically arranged. (?) indicates doubtful record of parasite species from host.)

<table>
<thead>
<tr>
<th>Host</th>
<th>Parasite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acanthocybium solandri (Cuvier and Valenciennes)</td>
<td>Didymocystis acanthocybii Yamaguti</td>
</tr>
<tr>
<td></td>
<td>Didymocystis coaest Nigrelli</td>
</tr>
<tr>
<td></td>
<td>Didymocystis milliart Yasaguti</td>
</tr>
<tr>
<td></td>
<td>Hirudinella beebei Chandler</td>
</tr>
<tr>
<td></td>
<td>? Hirudinella ventricosa (Pallas)</td>
</tr>
<tr>
<td>Auxis thazard (Lacépède)</td>
<td>Colocynotrema auxis Yamaguti</td>
</tr>
<tr>
<td></td>
<td>Didymozoon auxis Taschenberg</td>
</tr>
<tr>
<td></td>
<td>Opephoretrema planum Yamaguti</td>
</tr>
<tr>
<td></td>
<td>Phacilotrema claviforme Yamaguti</td>
</tr>
<tr>
<td></td>
<td>Rhipidocotyle capitata (Linton)</td>
</tr>
<tr>
<td></td>
<td>Tergestia laticollis (Rudophi)</td>
</tr>
<tr>
<td>Euthynus alletteratus (Rafinesque)</td>
<td>Euthynus affinis affinis (Cantor)</td>
</tr>
<tr>
<td></td>
<td>Rhipidocotyle septapapillata Krull</td>
</tr>
<tr>
<td>Euthynus affinis lineatus Kishinouye</td>
<td>? Lechichirium magnaporum Manter</td>
</tr>
<tr>
<td></td>
<td>? Lechichirium microstomum Manter</td>
</tr>
<tr>
<td>Euthynus affinis yaito Kishinouye</td>
<td>? Lechichirium magnaporum Manter</td>
</tr>
<tr>
<td></td>
<td>? Lechichirium microstomum Manter</td>
</tr>
<tr>
<td>Istiophorus gladius (Broussonnet)</td>
<td>Hemirus sardiniae (Yamaguti)</td>
</tr>
<tr>
<td>Katsuwonus pelamis (Linnaeus)</td>
<td>Atalostrophion sardae MacCallum</td>
</tr>
<tr>
<td></td>
<td>Atalostrophium (Atalospar garum) sp. Ishii (1935)</td>
</tr>
<tr>
<td></td>
<td>Didymocystis filiforms Ishii</td>
</tr>
<tr>
<td></td>
<td>Didymocystis abdominalis Yamaguti</td>
</tr>
<tr>
<td></td>
<td>Didymocystis albifrons Ishii</td>
</tr>
<tr>
<td></td>
<td>Didymocystis simplex Ishii</td>
</tr>
<tr>
<td></td>
<td>Didymocystis soleiforms Ishii</td>
</tr>
<tr>
<td></td>
<td>Didymocystis submentalis Yamaguti</td>
</tr>
<tr>
<td></td>
<td>Didymocystis wedii Ariola</td>
</tr>
<tr>
<td></td>
<td>Didymoproblema fusiformes Ishii</td>
</tr>
<tr>
<td></td>
<td>Didymozoon filicolle Ishii</td>
</tr>
<tr>
<td></td>
<td>Didymozoon longicolle Ishii</td>
</tr>
<tr>
<td></td>
<td>Didymozoon minor Yamaguti</td>
</tr>
<tr>
<td></td>
<td>Dinurus euthyni Yamaguti</td>
</tr>
<tr>
<td></td>
<td>Hirudinella marina (Garsin)</td>
</tr>
<tr>
<td></td>
<td>Koellikeria globosa Ishii</td>
</tr>
<tr>
<td></td>
<td>Koellikeria orientalis (Yamaguti)</td>
</tr>
<tr>
<td></td>
<td>Koellikeria reniformis Ishii</td>
</tr>
<tr>
<td></td>
<td>Lobatozoon multisacculatum Ishii</td>
</tr>
<tr>
<td></td>
<td>Neodiploctrema pelamides (Yamaguti)</td>
</tr>
<tr>
<td></td>
<td>Syncocellum katuwo Yamaguti</td>
</tr>
</tbody>
</table>
**Rastrelliger kanagurta** (Cuvier)............  
Decemtestis biacetabulatus Srivastava  
Helicometrina orientalis Srivastava  
Lechthocladium angustiorum Yamaguti  
Lechthocladium parviovum Yamaguti  
Lechthocladium scombri Yamaguti  
Opechona scombri Yamaguti

**Sarda orientalis** (Temminck and Schlegel).  
Bucephalopsis cybii Park

**Sarda sarda** (Bloch).........................  
Aponurus tschugunowii Issaitisch  
Atalostrophion sardae MacCallum  
Bucephalopsis arculata (Linton)  
Dinurus barbatus (Cohn)  
Hirudinella clava (Menzies)  
Lechthocladium caudiporum (Rudolphi)  
Lechthocladium texanum (Chandler)  
Nematobothrium pelamynis (Taschemberg)  
Opecoelides vitellus (Linton)  
Rhipidocotyle angusticollis Chandler  
? Tormopsolas orientalis Yamaguti  
Unitubulotestes sardae (MacCallum and Mac-Callum)

**Scomber japonicus japonicus** Houttuyn......  
Didymozoon longicolle Ishii  
Dinurus scombri Yamaguti  
Lechthocladium gulosum (Linton)  
Lepocreadium retrium Linton  
Nematobothrium filiforme Yamaguti  
Nematobothrium scombri (Taschemberg)  
Opechona olsoni (Yamaguti)  
Opechona orientalis (Layman)  
Opechona scombri Yamaguti  
Tergestia acanthocephala (Stossich)  
Tergestia laticollis (Rudolphi)

**Scomber japonicus collas** Gmelin ..........  
? Aphallus tubarium (Rudolphi, 1819)  
Ectemurus lepidus Looss  
Lechthocladium excisium (Rudolphi)  
Nematobothrium scombri (Taschemberg)  
Opechona bacillaris (Molin)

**Scomber scombrus** Linnaeus..................  
Hemiurus appendiculatus (Rudolphi)  
Lechthocladium caudiporum (Rudolphi)  
Lechthocladium excisium (Rudolphi)  
Lechthocladium excisiforme Cohn  
Lechthocladium gulosum (Linton)  
Opechona bacillaris (Molin)  
Opechona orientalis (Layman)  
Opecoelides vitellus (Linton)  
Nematobothrium faciale (Baylis)  
Nematobothrium scombri (Taschemberg)  
Podocotyle simplex (Rudolphi)  
Tergestia acanthocephala (Stossich)  
Tergestia laticollis (Rudolphi)

**Scomber sp.**.................................  
Bathycotyle branchialis Darr
<table>
<thead>
<tr>
<th>Fish Species</th>
<th>Genus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scomberomorus guttatus guttatus (Bloch and Schneider)</td>
<td>Bucephalus jaggannathi Verma</td>
</tr>
<tr>
<td>Scomberomorus guttatus koreanus (Kishinouye)</td>
<td>Bucephalopsis cybii Park</td>
</tr>
<tr>
<td>Scomberomorus maculatus (Mitchill)</td>
<td>Bucephalus heterotentaculatus Bravo-Hollis &amp; Sogandares-Bernal</td>
</tr>
<tr>
<td></td>
<td>Didymocythis scomberomori (MacCallum and MacCallum)</td>
</tr>
<tr>
<td></td>
<td>Rhipidocotyle baculum (Linton)</td>
</tr>
<tr>
<td></td>
<td>Rhipidocotyle pentagonum (Ozaki)</td>
</tr>
<tr>
<td>Scomberomorus niphoni us (Cuvier and Valenciennes)</td>
<td>Bucephalopsis arcuata (Linton)</td>
</tr>
<tr>
<td>Scomberomorus regalis (Bloch)</td>
<td>Rhipidocotyle adbaculum Manter</td>
</tr>
<tr>
<td></td>
<td>Rhipidocotyle baculum (Linton)</td>
</tr>
<tr>
<td>Scomberomorus sp.</td>
<td>Bucephalopsis cybii Park</td>
</tr>
<tr>
<td>Tetrapturus audax Philippis</td>
<td>Glomeritema subcuticola Yamaguti</td>
</tr>
<tr>
<td>Thunnus (Thunnus) alalunga (Bonnaterre)</td>
<td>Didymocythis alalongae Yamaguti</td>
</tr>
<tr>
<td></td>
<td>Didymocythis lanceolata Guiart</td>
</tr>
<tr>
<td></td>
<td>Didymocythis macrorhitis Guiart</td>
</tr>
<tr>
<td></td>
<td>Didymocythis opercularis Yamaguti</td>
</tr>
<tr>
<td></td>
<td>Hirudinella spinulosa Yamaguti</td>
</tr>
<tr>
<td></td>
<td>Hirudinella poirieri (Moniez)</td>
</tr>
<tr>
<td></td>
<td>Metanematobothrium guernei (Moniez)</td>
</tr>
<tr>
<td></td>
<td>Nematobothrium latum Guiart</td>
</tr>
<tr>
<td></td>
<td>Platocystis alalongae Yamaguti</td>
</tr>
<tr>
<td>Thunnus (Neothunnus) albacare macropterus (Tem. &amp; Sch.)</td>
<td>Koellikeria orientalis (Yamaguti)</td>
</tr>
<tr>
<td>Thunnus (Thunnus) thynnus orientalis (Temminck and Schlegel)</td>
<td>Bucephalopsis sibi Yamaguti</td>
</tr>
<tr>
<td></td>
<td>Coelotrema thynnii Yamaguti</td>
</tr>
<tr>
<td></td>
<td>Didymocylindrus filiformis Ishii</td>
</tr>
<tr>
<td></td>
<td>Didymocythis crassa Ishii</td>
</tr>
<tr>
<td></td>
<td>Didymocythis ovata Ishii</td>
</tr>
<tr>
<td></td>
<td>Didymocythis semiglobularis Ishii</td>
</tr>
<tr>
<td></td>
<td>Didymocythis soleiformis Ishii</td>
</tr>
<tr>
<td></td>
<td>Didymoprelema fistiformis Ishii</td>
</tr>
<tr>
<td></td>
<td>Didymozoon filicolle Ishii</td>
</tr>
<tr>
<td></td>
<td>Didymozoon longicolle Ishii</td>
</tr>
<tr>
<td></td>
<td>Koellikeria globosa Ishii</td>
</tr>
<tr>
<td></td>
<td>Koellikeria orientalis (Yamaguti)</td>
</tr>
<tr>
<td></td>
<td>Koellikeria reniformis Ishii</td>
</tr>
<tr>
<td>Thunnus (Thunnus) thynnus thynnus (Linnaeus)</td>
<td>Bucephalopsis xiphioides (MacCallum and MacCallum)</td>
</tr>
<tr>
<td></td>
<td>Hirudinella clavata (Menzies)</td>
</tr>
<tr>
<td></td>
<td>Hirudinella ventricosa (Pallas)</td>
</tr>
<tr>
<td>Xiphias gladius Linnaeus</td>
<td>Bucephalopsis xiphioides (MacCallum and MacCallum)</td>
</tr>
<tr>
<td></td>
<td>Hirudinella clavata (Menzies)</td>
</tr>
<tr>
<td></td>
<td>Hirudinella ventricosa (Pallas)</td>
</tr>
</tbody>
</table>
Bothrioccephalus manubriiformis (Linton, 1889)

[Syn. Dibothrium manubriiformis Linton, 1889; Acanthobothrium lactintatum Linton, 1898; Bothrioccephalus histiophorus Shipley 1909; B. plicatum (Rudolphi) Shipley 1906]

Scombroid hosts: 1. Istiophorus nigricans [=Istiophorus gladius (Broussonnet)]
2. Tetraudipterus imperator [=Tetraudipterus albidus Poey]
3. Tetraudipterus albidus [do-]
4. Histiophorus gladius [=Istiophorus gladius (Broussonnet)]
5. Histiophorus sp. [do-]
6. Histiophorus grayei [do-]

Localities: 1-4 from Woods Hole, New England Coast, N.W. Atlantic; 5 from Indian and Pacific Oceans; and 6 from Pacific coast of Mexico.


Location: Spiral valve in elasmobranchs; intestine in teleosts.

Bothrioccephalus scorpil (Mueller, 1776)

[Syn. Taenia scorpil Mueller, 1776; Vermis multiembris rhombi Leeuwenhoek 1722; Bothrioccephalus punctatus Rudolphi 1810; Dibothrium punctatus Diesing, 1850; and Bothrioccephalus bipunctatus (Zeder, 1800) Lühe, 1899]

Scombroid host: Scopem scombrus Linnaeus


Location: Pleurocercus in stomach and intestine of teleostean hosts.

Remarks: See also Sumner et al. (1913).
**FAMILY: TRIAENOPHORIDAE**

*Genus fistulicola* Lühe, 1899

**Fistulicola plicatus** (Rudolphi, 1819), Lühe, 1899

[Syn. *Echinorhynchus xiphiæ* Gmelin, 1790; *Bothriocephalus plicatus* Rudolphi, 1819; *Bothriocephalus xiphiæ* (Gmelin) Goode, 1883]

*Scombroid host*: *Xiphias gladius* Linnaeus


*Non-scombroid hosts*: None.

*Location*: Walls of intestine and rectum.

*Remarks*: Refer also Linton (1901), and Cooper (1918). Dollfus (1935) regarded this species and *Bothriocephalus truncatus* Leuckart, 1819, as conspecific with *F. xiphiæ* (Gmelin, 1790).

**Order: TETRAPHYLLIDEA**

*Genus scolex* Rudolphi, 1919

**Scolex pleuronectis** Mueller, 1788

(Syn. *Scolex polymorphus* Rudolphi, 1819; *Scolex delphinus* Stossich, 1898)

*Scombroid hosts*: *Sarda sarda* (Bloch)

*Scomber scombrus* Linnaeus

*Xiphias gladius* Linnaeus

*Localties*: Woods Hole, Massachusetts, N.W. Atlantic.


*Location*: Larvae free in intestine.

*Remarks*: See also Sumner *et al.* (1913), Southwell (1925, 1930), Ronald (1959) and Wardle and McLeod (1952).

**FAMILY: PHYLLOBOTHRIIDAE**

*Genus pelichnibothrium* Monticelli, 1889

**Pelichnibothrium speciosum** Monticelli, 1889

[Syn. *P. caudatum* (Zschokke and Heitz, 1914); *Phyllobothrium salmonis* Fujita, 1922]

*Scombroid host*: *Thunnus thynnus* [= *Thunnus* (T.) *thynnus orientalis* (Temminck and Schlegel)]
Locality: Pacific coast of Japan.

Non-scombroid hosts: Aspidosaurus ferox [Madeira, E. Atlantic]; Prionace glauca, Lampris regia [Pacific coast of Japan].

Location: Adults in elasmobranchs, tailed larvae in teleosts.

Remarks: Also refer Southwell (1925), and Wardle and McLeod (1952).

Genus Phyllobothrium Beneden, 1849

[Syn. Crossobothrium Linton, 1889; Anthocephalum Linton, 1890; Calyptobothrium Monticelli 1893; Bilocularia Obersteiner, 1914]

Phyllobothrium loligini (Leidy, 1887) Linton, 1897

Scombroid host: Xiphius gladius Linnaeus


Location: Adults in the stomach of squids Omnomastephes illecebrus [Massachusetts coast, U.S.A.], and O. sagittatus [Mediterranean]. Immature specimens in stomachs of fish hosts.

Remarks: See also Sumner et al. (1913).

Order: Trypanorhyncha

Family: Tentaculariidae

Genus Tentacularia Bosc, 1797

Tentacularia coryphaena Bosc, 1797

[Syn. Stenobothrium macrobothrium [Rudolphi, 1810] Diesing; Tentacularia bosci Siebold, 1850]

Scombroid hosts: Larvae in

Xiphius gladius Linnaeus;

Pelamys [=Sarda sarda (Bloch)];

Thynnus [=Thunnus sp.];

Scomber [=Scomber sp.]

Locality: Atlantic.

Non-scombroid hosts: Coryphaena hippurus; Lophius sp.; Pleuronectes sp., Hippoglossus hippoglossus, Hippoglossus sp., Paralichthys dentatus [Atlantic]; Adults in Prionace glauca, Scylla dor walbechmi [Pacific coast of Japan].

Remarks: See Winninger (1929, '30) for list of a variety of hosts for Stenobothrium macrobothrium Diesing; Wardle and McLeod (1952) for discussion.

Tentacularia bicolor (Bartels, in Nordmann, 1832)

Scombroid hosts: 1. Scomber pelamys [=? Katsuwonus pelamis (Linnaeus)]

2. Sarda sarda [=Sarda sarda (Bloch)]

3. Xiphius gladius Linnaeus


Location: Cysts and scolexes found in all above mentioned hosts in peritoneum, mesentery, stomach and alimentary canal. In scombroids in peritoneum and mesentery. Adult taken in Carcharhinus obscurus.

Genus Nybelinia Poche, 1926

(Syn. Acoleorhynchus Poche, 1926; Aspiderhynchus Molin, 1858-preoccupied; Congeria Guiart, 1935; Rufferia Guiart, 1927; Stenobothrium Diesing of Pintner, 1913)

Yamaguti (1959) subdivides the genus into two subgenera, Nybelinia s.str., and Syngen, and we are concerned here with species referable to the former.

Nybelinia (Nybelinia) lingualis (Cuvier, 1817)

Scombroid hosts: Xiphas gladius Linnaeus

Locality: Atlantic.

Non-scombroid hosts: Solea vulgaris, Pleuronectes platessa, Pleuronectes gen?., and sp?, Scophthalmus maximus, S. rhombus, Solea solea, Lophius piscatorius, Trigla gurnardus, Oxyrhina spallanzani, Galeus canis, Raja sp., Acanthias vulgaris, Squatina angelus, Scylium stellare [Atlantic]. For additional hosts see Joyeux and Bear (1936).

Nybelinia (Nybelinia) bisulcata (Linton, 1889)

(Syn. Rhynchobothrium bisulcatus Linton, 1889)

Scombroid hosts: Xiphas gladius Linnaeus

Scomber scomber [=Scomber scombrus Linnaeus]

Localities: Woods Hole, North West Atlantic.


Location: Cysts and scolexes in viscera of hosts mentioned above; adults abundant in pyloris and intestine of Cararchinhus obscurus.

Remarks: See Summer et al. (1913), and Ronald (1959) for host records. Refer also Dollfus (1942) for detailed studies on species of the genus Nybelinia. Yamaguti (1959) mentions that the species has also been noted to occur in the Cephalopod Sepiella maindorini in Japanese waters.

Nybelinia (Nybelinia) lamontae Nigrelli, 1938

Scombroid host: Xiphas gladius Linnaeus


Non-scombroid hosts: None.
FAMILY: DASYRHYNCHIDAE

Genus CALLITETRARHYNCHUS Pintner, 1931
(Syn. Acanthocephalus Rudolphi, 1819, in part; Lintoniella Yamaguti nec Woodland, 1927)

Callitetrarhynchus gracilis (Rudolphi, 1819)
(Syn. Anthocephalus gracile Rudolphi, 1819; Rhynchobothrium speciosum Linton, 1897; Lintoniella speciosa Yamaguti, 1934; Tentacularia lepida Chandler, 1935; Callitetrarhynchus gracillimum Pintner, 1931, and Tentacularia pseudodera Shuler, 1938)

Scombroid hosts: Scomber rocheus [=Auxts thazard (Lacépède)]
Scomber scombrus Linnaeus
Scomberomorus maculatus [=Scomberomorus maculatus (Mitchill)]
Thynnus sp. [=Thunnus sp.]

Localities: Mediterranean, Atlantic.


Location: In scombroids and other teleosts larvae encysted in viscera. Adults in elasmobranchs (e.g. Carcharhinus obscurus).

Remarks: Shuler (1938) records adults of this species as Tentacularia pseudodera from Hypoprion brevirostris. For host records see Chandler (1935).

FAMILY: GYMNORHYNCHIDAE

Genus GYMNORHYNCHUS Rudolphi, 1819
Two subgenera, Gymnorhynchus s.str., and Mollicola Dollfus, are recognised by Dollfus (1935).

Gymnorhynchus (Gymnorhynchus) gigas Cuvier, 1817
(Syn. Gymnorhynchus gigas Southwell, 1930 in part)

Scombroid host: Xiphius gladius Linnaeus
Locality: North East Atlantic and Mediterranean.

Non-scombroid hosts: Brama raii; Paralichthys dentatus (see Wardle and McLeod, 1952; Ronald, 1959).

Location: Pleurocercus in muscles.

Remarks: According to Wardle and McLeod (1952) this species is rarely found in the swordfish Xiphius gladius, but not from American waters.

Gymnorhynchus (Mollicola) uncinitatus (Linton, 1924)
[Syn. Rhynchobothrium uncinitatus Linton, 1924; Floriceps uncinitatus (Linton) Yamaguti, 1952; Mollicola uncinitatus (Linton) Yamaguti, 1959; ? Mollicola horridus (Goodsir, 1841), Dollfus, 1935]

Scombroid host: Xiphius gladius Linnaeus
Locality: Woods Hole, Massachusetts, U.S.A.

Non-scombroid hosts: Mola mola [Atlantic]; Vulpecula marina [North Western Atlantic and Pacific]; ? Monochirus hispidus.
Location: Pleurocercus in muscles of teleosts; adult in V. marina.
Remarks: Wardle and McLeod (1952) comment that Molicola horridus may turn out to be the earlier stages of Linton's R. uncinatus. However, until we know more about the life-history of the latter species, it will be desirable to follow the present course, but if proven to be the same, then the specific name M. horridus should have priority.

Family: LACISTORHYNCHIDAE

Created by Guiart in 1927, the family definition was emended by Dollfus in 1935, and more recently by Yamaguti (1959) to include Eulacistorhynchus Subhapradha, 1957.

Genus: Grillotia Guiart, 1927
(Syn. Heterotetrarhynchus Pintner, 1929; Pintnerielia Yamaguti, 1934)

Grillotia erinacea (van Beneden, 1858)
(Syn. Rhynchobothrium imparispinum Linton, 1890; Tetrarhynchus erinaceus van Beneden, 1858)

Scombroid hosts: Scomber scombrus Linnaeus
Sarda sarda (Bloch)
Xiphius gladius Linnaeus


Location: Adults in spiral valve of elasmobranchs. Cysts and larvae in viscera, stomach wall, peritoneum, serous coat of intestine, and intestinal wall of teleosts. Both adults and larvae are recorded from Raja erinacea.

Remarks: For detailed work on the genus as well as this species reference is invited to Johnstone (1912). Ruskowski (1932) has studied the life cycle of this species, and considers that as in Diphyllodobothriidae, G. erinaceus has two intermediate hosts, the first a copepod either Acrithia longicornis, Pseudocalamus elongatus, Paraceramus parus, or Temora longicornis. Anguilla vulgaris, and the salmon are recorded as freshwater hosts of this otherwise marine species. For host records see Sumner et al. (1913), Ronald (1959), and for general discussions and identification of related species, Dollfus (1942) and Wardle and McLeod (1952).

Genus: LACISTORHYNCHUS Pintner, 1913

Lacistorhynchus tenus (van Beneden, 1858)
(Syn. L. planticeps (Leuckart, 1819); Rhynchobothrium gracile Diesing, 1863; Rhynchobothrium bulbiifer Linton, 1889; Rhynchobothrium benedeni (Crety, 1890)

Scombroid hosts: Gymnosarda alleterata [=Euthynnus alleteratus (Rafinesque)]
Sarda sarda (Bloch)
Scomber scombrus Linnaeus
Scomberomorus maculatus (Mitchill)

Non-scombroid hosts: Mustelus canis, Alutera schoepfi, Ammodytes americanus, Anguilla sp., Cynoscion regalis, Elops saurus, Gadus callarias, Menidia menidia notata, Menticirrhus saxatilis, Merluccius bilinearis, Microgadus tomcod, Myoxocephalus aeneus, Paralichthys dentatus, Pomatomus saltatrix, Poronotus triacanthus, Raja erinacea, Spheroide maculatus, Squalus acanthias, Tetronarce octocephala, Urophycis chrys, Hippoglossus hippoglossus, Monocrinus hispidus, Platichthys dentatus, Pleuronectes platessa, Pseudopleuronectes americanus, Scophthalmus aquosus, S. maximus, Solea lascaris, Vulpes marina, and Triakis seminasciatus [Atlantic, Mediterranean and Pacific].

Location: Adults common in spiral valve of elasmobranchs (e.g. Mustelus canis); Cysts in stomach and muscles of back (e.g. Scomber scombrus).

Remarks: For details of life cycle of this species see Young (1954).

Family: OTOBOTRIIDAE

Genus OTOBOTRHIUM Linton, 1890

Two subgenera, Otothrium s.str., and Pseuotothrium Dollfus, 1942, Yamaguti, 1959 are recognised.

Otothrium (Otothrium) crenacolle Linton, 1890

Scombroid hosts: Pelamys [=Sarda sarda (Bloch)]
Xiphias gladius Linnaeus
Scomberomorus regalis (Bloch)

Locality: Woods Hole, Massachusetts, U.S.A.

Non-scombroid hosts: Sphyra zygaena, Alutera schoepfi, Carcharhinus obscurus, Cynoscion regalis, Fundulus heteroclitus, Mustelus canis, Paralichthys dentatus, P. albigutta, Poronotus triacanthus, Trichurus lepturus. [Woods Hole and N.W. Atlantic].

Location: Adults in spiral valves of elasmobranchs (e.g., Sphyra zygaena). Cysts in flesh and viscera of teleosts.

Otothrium (Otothrium) balli Southwell, 1929

Scombroid host: Cybium guttatum [=Scomberomorus guttatus guttatus (Bloch and Schneider)]

Locality: Pearl Banks off Ceylon, Gulf of Mannar.

Non-scombroid host: Leiurus ornatus and Balistes stellatus [Pearl Banks off Ceylon, Gulf of Mannar]; Apron pristipomona [Nagapatnam, Tanjore Dt., India, Bay of Bengal].

Location: Larvae in teleosts.

Otothrium (Pseuotothrium) dipsaceum Linton, 1897

(Syn. Otothrium insigne Linton, 1905; Otothrium insigne Southwell, 1912)

Scombroid hosts: Xiphias gladius Linnaeus

Locality: Atlantic.

Non-scombroid hosts: Carcharhinus obscurus, Pomatomus saltatrix, Centropristis striatus, Chelidonichthys kumu [Atlantic and Pacific]; Serranus undulosus, Diagranum crassispinum, Balistes mitis, Lutjanus odoracanthus, and Leithrus ornatus [Pearl Banks off Ceylon, Gulf of Mannar].

Location: Adult in elasmobranchs (e.g., C. obscurus); Larvae in teleosts.
**Family: Pterobothriidae**

**Genus Pterobothrium** Diesing, 1850  
(Syn. *Synbothrium* Diesing, 1850 ; *Syndesmobothrium* Diesing, 1854)

**Pterobothrium filicolle** (Linton, 1889)  
(Syn. *Syndesmobothrium filicolle* Linton ; *Synbothrium filicolle* Linton ; *Gymnorhynchus gigas* Southwell, 1930 in part)

- **Scombroid hosts:**  
  1. *Scomberomorus maculatus* (Mitchill)  
  2. *Scomberomorus regalis* (Bloch)  
  3. *Scomberomorus cavalla* (Cuvier)  
  4. *Cybium guttatum [=Scomberomorus guttatus guttatus* (Bloch and Schneider)]

**Locality:** 1-3. North Western Atlantic; 4. Pearl Banks, Gulf of Mannar, India.


**Location:** Scolex in spiral valve of elasmobranchs (e.g., *Dasyatis centrura*). Larvae in teleosts

**Remarks:** Southwell (1930) relegated *Pterobothrium filicolle* (Linton) to the synonymy of *Gymnorhynchus gigas* (Cuvier) along with several other species, giving the following fish hosts: *Dasylabrus valga* (adult); Larvae from *Cybium guttatum*, *Chorinemus toloco*, *C. lysan*, *Chirocentrus dorab*, *Serranus sp.*, *Balistes sp.*, *Lutjanus sp.*, *Pristis cuspisatus*, *Arius gogora*, *Harpodon nehereus*, *Hemigaleus balfouri*, *Trichiurus savala*, and *Clupea ilisha*, all from Indian waters. Of these, Yamaguti (1959) only mentions *C. lysan*, *C. ilisha*, *C. guttatum*, and *H. nehereus* as hosts for *P. filicolle*. The following three species of *Pterobothrium* are also treated by Southwell (1930) as synonyms of *Gymnorhynchus gigas*, but I have followed Yamaguti (1959) in considering them as distinct.

**Pterobothrium heteracanthus** Diesing, 1850

- **Scombroid host:** *Cybium guttatum [=Scomberomorus guttatus guttatus* (Bloch and Schneider)]

**Locality:** Pearl Banks off Ceylon, Gulf of Mannar.

**Non-scombroid hosts:** *Micropogon lineatus* [Brazil]; *Pristipoma coro*, *Drepane punctata* [Indian seas].

**Pterobothrium platycephalum** (Shipley and Hornell, 1906)

[Syn. *Tetricrhychnus platycephalus* Shipley and Hornell, 1906 ; *T. rubromaculatus* Diesing, 1863 ; *Tentaculacia rubromaculata* (Diesing, 1863) Southwell, 1930]

- **Scombroid hosts:** *Cybium guttatum [=Scomberomorus guttatus guttatus* (Bloch and Schneider)]

**Locality:** Pearl Banks off Ceylon, Gulf of Mannar.

**Non-scombroid hosts:** *Chorinemus toloco*, *Chirocentrus dorab*, *Serranus sp.*, *Lutjanus sp.*, *Pristis cuspisatus*, *Trachinotus botia* [Gulf of Mannar, off Ceylon Pearl Banks]; *Arius gogora*
PARASITES OF SCOMBROID FISHES. PART I

(Part of Ganges, Bengal, India); Hemigobius balfouri, Trichiurus savala [East Coast of India]; Dasybatis wagra [Gulf of Mannar, off Pearl Banks of Ceylon].

Location: Adults in elasmobranchs (e.g. D. wagra); Larvae in telecots.

Pterobothrium tangoli (MacCallum, 1921)
(Syn. Rhynchobothrium tangoli MacCallum, 1921)

Scombroid host: 'Scomberiform fish.' (The specific name in vernacular is applied for the little tuna Euthynnus affinis affinis, or to the northern bluefin tuna T. (Kishinouella) tonggol in Indonesia. The host could be any one of these or some other species of tuna).

Locality: Borneo.
Non-scombroid hosts: None.
Location: Encysted in peritoneum.

SPECIES INCERTE SEDIS

According to Yamaguti (1959), the following are the species whose generic assignment is obviously incorrect or doubtful or those which were referred to heterogenous genera that have no right of standing in modern taxonomy. Of the several listed by him, the following given in their original combination have also scombroid fishes as hosts. Species are given in alphabetical order.

Rhynchobothrium ambiguum Diesing, 1863

Scombroid host: Xiphias gladius Linnaeus
Non-scombroid hosts: Heptanchus sp., Pristiurus sp., Raja sp.

Tetrarhychus attenuatus Rudolphi, 1819

Scombroid host: Xiphias gladius Linnaeus
Non-scombroid hosts: Carcharhinus sp., Vulpicula sp., Squalus ferdinandus, Thysites atun, Merluccius capensis.

Bothriocephalus claviger Leuckart, 1819

Scombroid host: Xiphias gladius Linnaeus

Rhynchobothrium longispine Linton, 1890

Scombroid hosts: Scomber scombrus Linnaeus

Scomberomorus maculatus (Mitchill)

Non-scombroid hosts: Adult in spiral valve of Trygon centura; Larvae in Leptocephalus, Menidia dubia, Paralichthys dentatus, Poronotus triacanthus, Prionotus striatus, Stenotomus chrysops, Urophycis chuss.
Tentacularia maciei Southwell, 1929

Scombroid host: Cybium guttatus [=Scomberomorus guttatus guttatus (Bloch and Schneider)]

Non-scombroid hosts: Chorinemus lysan, C. iloo, Lutjanus argentimaculatus, L. gibbus, Serranus undulosus, Balistes mittis, B. stellatus, Balistes sp., Psettodes erumei, Cossyphus axillaris, Trichiurus savala [Ceylon Pearl Banks, Gulf of Mannar]

Tetrarhynchus megabothrius Rudolphi, 1819

Scombroid host: Scomber sarda [=Sarda sarda (Bloch)]

Tetrarhynchus pearsoni Southwell, 1929

Scombroid host: Cybium guttatus [=Scomberomorus guttatus guttatus (Bloch and Schneider)] (Pearl Banks off Ceylon, Gulf of Mannar; Orissa coast, India).

Tetrabothriorchynchus scombri Diesing, 1854

Scombroid host: Scomber scomber (=Scomber scombrus Linnaeus)

? Tetrarhynchus scomber-gobius Wagener, 1854

Tetrarhynchus scomber-pelamys Wagener, 1854

Scombroid host: Scomber pelamys [=Sarda sarda (Bloch)]

Tetrarhynchus scomber-rochei Wagener, 1854

Scombroid host: Scomber rochei [=? Auxis thazard (Lacépède)]

Tetrarhynchus scomber-thynnus Wagener, 1854

Scombroid host: ? Thunnus thynnus thynnus (Linnaeus)

Rhynchobothrium spiracornatus Linton, 1907

Scombroid host: Thynnus sp. (=‘Thunnus sp.’) [Gulf of Mannar off Ceylon].

Non-scombroid hosts: Epinephalus maculosus, Paranthias furcifer (N.W. Atlantic); Caranx sp. [Gulf of Mannar].

Remarks: Thynnus sp. is from the Gulf of Mannar and this could represent any one of the following species which are fairly common in the Pearl Banks off Ceylon and India in the Gulf of Mannar: Euthynnus affinis affinis (Cantor), T. (Kishinouella) tonggoi (Bleeker), and T. (Neothynnus) albacares macropterus (Temminek and Schlegel). For the description of larvae infesting Caranx sp., and Thunnus sp., reference may be made to Southwell (1930).

Tetrarhynchus thynnii Wagener, 1854

Scombroid host: Thynnus sp. (=Thunnus sp.)
**Dibothriorchysus xiphiæ** MacCallum, 1921

*Scombroid host:* *Xiphius gladius* Linnaeus

*Remarks:* Nigrelli (1938) considers this a synonym of *Dibothriorchysus attenuatus* (Rudolphi, 1819) (= *Rhynchobothrium attenuatum* Rudolphi, 1819). Wardle and McLeod (1952) consider *Dibothriorchysus*, a synonym of *Hepatoxylyon* Bosc, 1811. Besides these species listed by Yamaguti (1959) the following should also be mentioned as known from scombroid fishes.

Cestode cysts and larvae from *Scomberomorus regalis* (Bloch). See Linton (1904).

*Rhynchobothrium* sp. Cysts in viscera of *Scomberomorus maculatus* (Mitchill), and *S. regalis* (Bloch), besides a few other teleosts. See Linton (1904).

*Dibothrium* sp. Cysts in intestine of *Scomber scombrus* Linnaeus and other teleosts, adults in elasmobranch. See Linton (1901) and Sumner, et al. (1913).

*Tetrahyranchus* sp. (Linton, 1901). Cysts from *Sarda sarda* (Bloch), and *Scomberomorus regalis* (Bloch) in addition to several other teleosts from the Woods Hole area (see Sumner et al. 1913).

*Tetrahyranchus* sp. I. Cysts from *Cybium guttatum* [= *Scomberomorus guttatus guttatus* (Bloch and Schneider)]. (Gulf of Mannar). See Shipley and Hornell, (1906). Larval form of uncertain generic position (Southwell, 1930).

*Tetrahyranchus* sp. II. From *Cybium guttatum* [= *Scomberomorus guttatus guttatus* (Bloch and Schneider)] (Gulf of Mannar). See Shipley and Hornell, (1906). Larval form of uncertain generic position (Southwell, 1930).

It is likely that helminth literature may contain descriptions of a few more such unidentifiable larval cestodes which are also known from Scombroid fishes.

**HOST-PARASITE LIST No. III**

[List of names of scombroid hosts and their cestode parasites. Genera are arranged alphabetically. (?) indicates doubtful hosts; species incerte sedis: (*) forms unidentifiable.]

- **Auxis thazard** (Lacépède).......................... *Callitetrochynus gracilis* (Rudolphi)
  * Tetrochynchus scomber-rochei Wagener
- **Istiophorus gladius** (Broussonnet).............. *Bothriocephalus manubriformis* (Linton)
- **Katsuwonus pelamis** (Linnaeus).................. *Tenatularia bicolor* (Bartels)
- **Sarda sarda** (Bloch).............................. *Grillotia ernaceus* (van Beneden)
  * Lacistorchynchus tenus* (van Beneden)
  * Scolex peluronectis* Mueller
  * Tenatularia bicolor* (Bartels)
  * Tenatularia coryphaena* Bosc
  * Tetrochynchus megabothrium* Rudolphi
  * Tetrochynchus scomber-pelamys* Wagener
  ** Tetrochynchus sp. (Linton, 1901)
* Scomber scombrus Linnaeus
  * Bothriocephalus scorpii (Mueller)
  * Callistearynchus gracilis (Rudolph)
  * Grillotia erinaceaus (van Beneden)
  * Lacistorynchus tenus (van Beneden)
  * Nybelinia (Nybelinia) bisulcata (Linton)
  * Scolecomeris Mueller
  * Rhynchobothrium longispine Linton
  * Tetrarhynchus scombris Diesing
  * Dipothrium sp. (Linton, 1901)

* Scomber sp.
  * Tentacularia coryphæna Bosc

* Scomberomorus cavalla (Cuvier)
  * Pterobothrium filicolle (Linton)

* Scomberomorus guttatus guttatus (Bloch and Schneider)
  * Otobothrium (Otobothrium) balli Southwell
  * Pterobothrium filicolle (Linton)
  * Pterobothrium heteracanthus Diesing
  * Pterobothrium platycephalum (Shipley and Hornell)
  * Tentacularia macfie Southwell
  * Tetrarhynchus pearsoni Southwell
  * Tetrarhynchus sp. I. (Shipley and Hornell, 1906)
  * Tetrarhynchus sp. II. (Shipley and Hornell, 1906)

* Scomberomorus maculatus (Mitchill)
  * Callitarhynchus gracilis (Rudolph)
  * Lacistorynchus tenus (van Beneden)
  * Pterobothrium filicolle (Linton)
  * Rhynchobothrium longispine Linton
  * Rhynchobothrium sp. (Linton, 1904)

* Scomberomorus regalis (Bloch)
  * Octobothrium (Octobothrium) crenacolle Linton
  * Pterobothrium filicolle (Linton)
  * Rhynchobothrium sp. (Linton, 1904)
  * Tetrarhynchus sp. (Linton, 1901)
  * Cestode cysts (Linton, 1904)

* Scombriform fish
  * ? Euthynnus spp. or Kisinoella tongol

* Tetraopterus abides Poey
  * Bothriocephalus manibriformis (Linton)

* Thunnus (Thunnus) thynnus orientalis (Temminck and Schlegel)
  * Pelichthobothrium speciosum Monticelli

* Thunnus (Thunnus) thynnus thynnus (Linnaeus)
  * ? Tetrarhynchus scomber-thynnus Wagener

* Thunnus sp.
  * Callitarhynchus gracilis (Rudolph)
  * Tentacularia coryphaenæ Bosc
  * Rhynchobothrium spirocornuæus Linton
  * Tetrarhynchus thyrsi Wagener
**PRELIMINARY ANALYSIS OF SCOMBROID HOSTS AND THEIR TREMATODE AND CESTODE PARASITES, WITH SPECIAL REFERENCE TO INDIAN SEAS**

As already mentioned, it is too early to speculate on the zoogeography of scombroid fishes and their parasites. This paper lists, (excluding the numerous synonymies) 206 species and forms of Monogenea, Digenea, and Cestoda. A preliminary analysis of this data, especially with reference to scombroid fishes from Indian seas, which is no doubt also true of several other geographical areas, shows that:

1. The scombroid parasite data are very incomplete for this area and there is considerable scope for more intensive investigations.

2. Several scombroid species have not been examined for their parasites from this area, while many parasite species have been described from these hosts from extra-Indian waters.

---

*Fig. 1. Map showing areas hatched from where the great majority of trematode and cestode parasites of scombroid fishes have been described.*
Tables I and II are given to emphasise the need for more intensive work on Scombroid fishes and their parasites on a world wide basis. At present the areas where a reasonable amount of work has been carried out are (1) the east coast of U.S.A., including the Gulf of Mexico (N.W. Atlantic); (2) British waters, French coast (N.E. Atlantic), and Western Mediterranean; (3) Red Sea; (4) Gulf of Mannar between India and Ceylon (For mostly Cestodes); (5) Japanese Sea; and (6) Galapagos Islands and adjacent Pacific. The intervening areas, from where only stray works are available on scombroid fish parasites, (Fig. 1) will give some idea of the considerable gaps yet to be filled in.

**Table I**

*Total number of helminth parasites listed in this work along with the numbers occurring in Indian seas*

<table>
<thead>
<tr>
<th>Parasite group</th>
<th>Total Number</th>
<th>In Indian Seas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monogenea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species</td>
<td>76</td>
<td>22</td>
</tr>
<tr>
<td>Species unidentifiable</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Digena</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>Species unidentifiable</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Cestoda</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species</td>
<td>27</td>
<td>7*</td>
</tr>
<tr>
<td>Species unidentifiable</td>
<td>21±</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>226</td>
<td>40</td>
</tr>
</tbody>
</table>

*Additions given in Addendums I, II and III are also included in Tables I and II.*

*Few of the Indian records are from non-scombroid fishes as well.

**Table II**

*Species and subspecies of scombroid fishes listed parasite group-wise*

<table>
<thead>
<tr>
<th>Parasite group</th>
<th>Species and subspecies of Scombroid fishes (Host records only)</th>
<th>Total No.</th>
<th>Occurring in Indian seas</th>
<th>No. examined for parasites from Indian seas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monogenea</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Valid scombroid sp. &amp; sub. spp. and hosts</td>
<td>..</td>
<td>..</td>
<td>32</td>
<td>19*</td>
</tr>
<tr>
<td>B. Host identifiable only up to genus .</td>
<td>..</td>
<td>..</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Digena</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. . .</td>
<td>. .</td>
<td>. .</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>B. . .</td>
<td>. .</td>
<td>. .</td>
<td>2</td>
<td>..</td>
</tr>
<tr>
<td>Cestoda</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. . .</td>
<td>. .</td>
<td>. .</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>B. . .</td>
<td>. .</td>
<td>. .</td>
<td>3</td>
<td>..</td>
</tr>
</tbody>
</table>

*Scyphopomorus connerson (Lacépède), and S. lincolatus (Cuvier and Valenciennes), probable hosts of Priscia mullae Chauhan are also included.*
REFERENCES


——— 1941. Two new trematodes from the bonito Sarda sarda, in the Gulf of Mexico. J. Parasit., 27 (2) : 183-184.


DAWES, BEN 1940. Hexoctyle extensicauda n.sp. a monogenetic trematode from the gills of the tunny (Thunnus thynnus). Parastology, 32 : 271-286.


PARASITES OF SCOMBROID FISHES. PART I


Lebour, M. V. 1908. Fish trematodes of the Northumberland Coast. Northumberland Sea Fish. Rept., (1907) 3-47.


PARASITES OF SCOMBROID FISHES. PART I


—— 1810. Ibid., Vol. 2. paras 2. xii+386 pp. Amsterdam.


Spreston, N. G. 1945. The genus *Kudina* n.g. (Trematoda: Monogenea). The examination of the value of some specific characters, including factors of relative growth. *Parasitology*, 36: 176-190.


APPENDIX I

(List of Ichthyological references that may be consulted)


For easy reference, these are annotated below, both group-wise as well as region-wise. The numbers refer to those given in the above list.

Group-wise.

General: 1, 2, 3, 7, 8, 14, 19, 22.
Mackerels: 1, 3, 7, 8, 10, 17.
Spearfishes or Spanish mackerels: 1, 3, 4, 6, 7, 8, 13, 17.
Tunas: 1, 3, 4, 5, 7, 8, 17, 18, 21, 24.
Billfishes: 1, 7, 9, 11, 12, 15, 16, 20, 23.

Region-wise.

Indo-Pacific: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, 19, 20, 21, 22, 23.
Atlantic (Including Mediterranean): 3, 9, 16, 17, 18, 19, 24.
ADDENDUM—I

Since this paper was sent to the press, the following works dealing with trematode parasites, some of which infest scombroid fishes, have come to my notice. In order to make this account up-to-date and useful, these additional references are listed below and the parasites and their hosts are indicated as given in the main paper.

ADDITIONAL REFERENCES


MONOGENETIC TREMATODES

FAMILY: CAPSALIDAE


Scombroid host: 1. Makaira mizukurii (Jordan and Snyder) (=Tetrapturus audax Philippi) 2. Makaira marlina [=Makaira indica (Cuvier)].


Non-scombroid hosts: None.

Location: Ventral side of body.

Remarks: Price (1960) redescribed and figured this species.

FAMILY: MICROCOTYLIDAE

Unnithan (1957) created the family Axinidae and placed it with Microcotyliidae and Gastrocotyliidae in the superfamly Microcotyloidea. A new genus Uraxine was described by him under the family Axinidae. In view of the doubtful validity of some of the higher categories, I have adopted here the emendations of Hargis (1956) placing subfamily Axininae under the family Microcotyliidae.

Genus Uraxine Unnithan, 1957

Uraxine chura chura Unnithan, 1957

Scombroid host: Euthynnus afromus (Cantor) [=Euthynnus a. afromus (Cantor)].

Locality: Trivandrum, S.W. coast of India.

Non-scombroid hosts: None.

Location: Gills.
Urajine chura macrova Unnithan, 1957

Scombroid host: Euthynnus affinis (Cantor) [=Euthynnus a. affinis (Cantor)]
Locality: Trivandrum, S.W. coast of India.
Non-scombroid hosts: None.
Location: Gills.

Remarks: Unnithan (1957) described from the same host a second subspecies, Urajine chura macrova and as such the forma typica should have been designated by him as Urajine chura chura. The subspecies U.c. macrova is said to differ from the forma typica, U.c. chura in being relatively smaller in size, but having larger eggs; the shape of the body; the size of the haptorial units in relation to the length of the body; the anchors of the lappet; the disposition of the testes in the parovarian rows and in the shape and extent of the vitelline duct. In spite of these differences Unnithan (1957) opines that "... the close similarity of Urajine chura macrova to Urajine chura suggests a more reasonable subspecific rank for Urajine chura macrova." Ramalingam's recent works (1961a, 1961b) on species of Lithidocotyle are very suggestive drawing attention to the extent to which some of the abovementioned characters, such as body shape, number and disposition of haptorial units, etc. could be variable in the same species collected from different parts of the gill arch of a host specimen.

Family: MAZOCRAEIDAE Harmann, 1782

Genus Kuhnia Sproston

Kuhnia indica Tripathi, 1957 (Pp. 86-89, figs. 41a-d)

Scombroid host: Cybium guttatum Bloch and Schneider [=Scomberomorus guttatus guttatus (Bloch and Schneider)]
Locality: Puri, Orissa Coast, Bay of Bengal.
Non-scombroid host: None.
Location: ? (Gills and buccal cavity?).

Genus Indomazocares Tripathi, 1957

Indomazocares jagannath Tripathi, 1957

Scombroid host: Rastrelliger kanagaru (Cuvier) [=Rastrelliger kanagaru (Cuvier)]
Locality: Puri, Orissa Coast, Bay of Bengal.
Non-scombroid hosts: None.
Location: ? (Gills and buccal cavity?).
Remarks: This genus is considered a synonym of Pseudoacanthocotyle Bychowsky and Nagibina (1954) by Price, 1961 (see reference under Addendum-III).

Genus Lithidocotyle Sproston, 1946. emend. Hargis, 1956

Lithidocotyle secunda Tripathi, 1954

Scombroid host: Scomberomorus guttatus [=Scomberomorus g. guttatus (Bloch and Schneider)]
Locality: Madras Coast.
Non-scombroid hosts: None.
Location: Gills.
Remarks: The species is redescribed by Ramalingam (1961a).
Lithidocotyle bivaginalis Ramalingam, 1961b

Scombrid host: Scomberomorus guttatus [= Scomberomorus g. guttatus (Bloch and Schneider)]
Locality: Madras Coast.
Non-scombrid hosts: None.
Location: Gills.

HOST-PARASITE LIST NO. I—(Contd.)

Scombrid Host

Euthynus affinis affinis (Cantor)...........................................

Makaira indica (Cuvier).....................................................

Rastrelliger kanagurta (Cuvier)..........................................%

Scomberomorus guttatus guttatus (Bloch and Schneider)

Tetrapturus audax Philippsi.............................................

Parasite (Monogenea)

Uroxine chura chura Unniyan
Uroxine chura macrova Unniyan

Capsula pricei Hidalgo Escalante

Indomazocares jagannath Tripathi

Kuhnia indica Tripathi

Lithidocotyle bivaginalis Ramalingam

Lithidocotyle secunda Tripathi. (This species has already been mentioned in the host-parasite list on p. 818)

Capsula pricei Hidalgo Escalante

REMARKS

Since the above additions refer to monogenetic trematodes, I wish to offer a few comments. As already mentioned, species of this group appear to evince host specificity to a greater degree than digenetic trematodes or cestodes. A glance at the host-parasite list no. I would show that up to now the greatest number of species (eleven plus two doubtful = 13) has been reported from the spotted Spanish mackerel Scomberomorus guttatus guttatus (Bloch and Schneider), from India and the absence of any definite records of monogenetic trematodes from the two other Spanish mackerels from this area, namely S. commerson (Lacépède) and S. lineolatus (Cuvier and Valenciennes) is glaringly conspicuous. Either these species have not been investigated for monogenetic trematode parasites or there is the possibility of faulty host identification. The latter possibility cannot be completely overlooked as it is not uncommon for juveniles and adults of these three species of Scomberomorus to be landed with the same gear at the same time, and to the untrained, the identification, especially of the juveniles may be difficult.

ADDENDUM—II

Between 1962 and 1965, a few more papers have appeared wherein references to helminth parasites of scombrid fishes are made. Most of the papers listed below appeared in the Proceedings of the “World Scientific Meeting on the Biology and Related Species,” published as FAO Fishery Report No. 6, Volumes 1-3 (1963). The helminth species (Trematodes and Cestodes) mentioned are listed under each reference with additional remarks wherever necessary. A separate “Host-Parasite” list is not given here as most of the species have already been dealt with in the main part of this paper and there are very few new host records.


Hemichordyla guerri (Several adult worms in cysts up to 15 mm long under serosa of the stomach; and reproductive bodies from minute to 4 mm in diameter on the gill filament, arches and rakers); Eudistomella fusca (from stomach); and monogenetic trematode Tricotyle thynei (from gills).
Trematode *Didymozoon pelamysis* Taschenberg, and cestode *Calliterarychnus gracilis* (Rud.) as parasites of *S. sarda*.

Trematodes *Capsula biparistis* (Goto) and *Hirudinella marina* Garcin from the yellowfin.

Trematode *Hirudinella ventricosa* (Pallas) from stomach of *Acanthocybium solandri*. Also details on rate of infestation.

Trematode *Hirudinella sibi* Garcin, from stomach of *Parathunnus sibi* [= *Thunnus (Parathunnus) obesus mebachii*]; also details on rate of infestation.

Trematode *Dictostomum* sp., from *Acanthocybium solandri*; and cestode *Rhynebothrium* from *Katsuwonus pelamis*.

Records the following four species from the gills of *Scomberomorus maculatus* (Mitchill): *Scomberocoelus scomberomori* (Korath, 1955) Hargis 1956; *Pseudaxine mexicana* Meserve, 1938; *Lithothoece acanthophallus* (MacCallum and McCallum, 1913); and *Thoracocelus croceus* MacCallum, 1913.

Lists the undermentioned trematodes and cestodes: Trematode—*Didymocystis gruei* (from branchiae, muscles and other parts of body); *Platycystis alalongae* (from pectoral and posterior dorsal region); *Nematobothrium gruei* (from musculature perioesophagine); *Hirudinella fuscus*. *H. poirieri*, and *H. ventricosa* (from stomach); and the monogenetic trematode *Tricostoma thyeni* from the gills. Cestodes—*Hexocephalus trichiuri*—*H. squall* (postlarvae) (from stomach, rectum and liver); *Sphyrocephalus tergestinus* (postlarvae) (from pyloric caeca); and *Pseudobothrium grimaldii* (from pyloric caeca and duodenum).


Records *Hirudinella marina* Garcin from stomach of *Katsuwonus pelamis* and *Neothunnus macropterus* (= *T. (N.) albacares macropterus*) (from Minicoy Island, Laccadive Sea) and from *Euthynnus a. affinis* (from Tuticorin, Gulf of Mannar) and *Hirudinella ventricosa* Pallas from the stomach of *Acanthocybium solandri* (from Minicoy Island, Laccadive Sea and Tuticorin, Gulf of Mannar). Details of rate of infestation are also given.

Trematode *Hirudinella* sp. in gut; infection light, intensity ranging from 0 to 2 per individual.

Lists the Monogenetic trematodes *Hexocephalus thyeni* (Delaforce, 1811) v. Nordmann, 1840 (from gill lamellae of first gill arch); and *Tricostoma onchiodactyle* Setti 1899 (from copulae connecting gill arches of both body sides) Digenetic trematodes listed are: *Didymocystis wedli* Ariola, 1902 found encysted in small capsules of each two individuals on gill lamellae; and *Hirudinella clavata* Menzies, 1791 (from intestine).

Describes one new genus and species—*Scomerocola eyela*—from the gills of the Indian mackerel *Rastrelliger kanagurta* (Cuvier).


The detailed list contains the undermentioned species of trematode and cestode parasites not given as infesting this species in *Host-Parasite Lists* Nos. 2 and 3 in this paper. Trematodes—Didymozoon aunira Tschernich; Turgesta laticolli; *Hirudinella* clava; *Hirudinella ventricosa* and *Tristomum laeve*. All these have been recorded from other scombroid hosts as will be seen from *Host-Parasite List* No. 2. The cestodes recorded are: *Tentacularia coryphaenae* (Bosc, 1802); *Callocephalorchus speciosus* (Linton, 1897); *Pelichthyobothrium* (larva) (Yamaguti, 1934); and *Rhyncobothrium* (Kishinouye, 1923).


Records: Trematode *Hirudinella* marina Garce and cestode *Bothrioccephalus manubriformis* (Linton) from the yellowfin; and *Hirudinella ventricosa* from the stomach of *Acanthocybium solandri*. Details of rates of infestation of *H. ventricosa* are also given.


Lists trematodes *Hirudinella spinulosa* (from stomach); *Didymocystis alalongae* from gill arch; and *Platocystis alalongae* (on skin); and the cestode *Melanematothrium guerney* (in sub-maxillary muscles).

To sum up, the additional helminth parasites with scombroid host records not mentioned earlier in this paper are:

**Monogenetic Trematoda**:

1. *Scomerocola eyela* from *Rastrelliger kanagurta* from S.W. Coast of India.

**Digeneic Trematoda**:

1. *Hirudinella sibi* from *Parathunnus sibi* (= *Thunnus (Parathunnus)* obesus *mehachi*) from Central Pacific.

**Cestoda**:

1. *Heptoxyylon trichuli* = *H. squali* (postlarvae);  
2. *Sphyriocephalus tergestinus* (postlarvae); and  
3. *Pseudobothrium grimaldii* from *Germo alalunga* [= *Thunnus (T.) alalunga*] from Eastern Atlantic,  
ADDENDUM—III

Five recent works pertaining to Monogenea are given here. Of these, Price (1960a) has been already mentioned under Addendum-I. However, the works of Price (1960a, 1960b, 1961) and Yamaguti (1963) contain some emendations in the classification of some of the divisions of Monogenea in addition to descriptions of new taxonomic higher categories. Those concerning species which infest scombroid fishes are briefly dealt with below. Five new species of monogenean trematodes (three nom. nov., and two new species) are described in these works.


Describes a new genus and species—Pseudocanthocythae pavlovskyi from the scombroid host Scomber canunagira (=Rastrelliger kanagurta) (Cuvier) from Ryukyu Islands, Pacific.


Besides the new scombroid host record for Capsula pricei, a new genus Caballeroctoyle with Capsula biparastis (Goto) as genotype is described. Seven other species listed in the present work under the genus Capsula, namely C. caballero Winter (1954), C. gouri Chauhan (1952), C. katsuwonii (Ishii, 1936), C. magronum (Ishii, 1936), C. manteri Price (1952), C. megacotyle (von Listow, 1906), and C. pelamidyth (Taschenberg, 1878) are relegated to Caballeroctoyle. At the same time, C. levis (Verrill 1874), C. interrupta (Monticelli, 1891), C. lintoni Price (1939), C. nivosae (Gotto, 1894), C. onchidocotyle (Setti, 1899), C. ovalis (Goto, 1894), C. poeyi (Viguera, 1923) and C. pricei Hidalgo Escalante (1959) are included under the genus Tristomella Guiart (1938).


Considers Hexostoma macracanthum Fuji (1944) a synonym of Neohexostoma euthymi (Meserve, 1938). Describes a new genus Neohexostoma with Octotyle thunninum Parona and Perugia, 1889 (= Hexostoma thunninum as given vide supra p. 816) as the genotype. In addition, Hexostoma extensorium (Dawes, 1940), and H. pricei Koritha (1955) are also placed under this genus. The following are the new species:

(i) Neohexostoma robustum Price, 1960: On Parathynnus stbi (= Thunnus (Parathunnus) obesus mebachii (Kishinouye)) from tropical Pacific.

(ii) Hexostoma lintoni Price, 1960: nom. nov. for Hexoctyle thynni Linton, 1901 (new Polystoma thynni Delaroche) given as a doubtful synonym under Hexostoma thynniii, vide supra, p. 817.


Two new names have been proposed as follows:


(ii) Grubes pneumatophori Price, 1961: (nom. nov.) For Pneumoctyle scombrill Linton, 1940 found on Pneumoctyleyurus greg (Mitchell) from Woods Hole, Massachusetts, U.S.A.


(i) Regarding Kunkha thynni (Ishii and Sawada, 1938) Sproston, 1946, Yamaguti remarks: 'syn. Dactylocotyle minor Ishii, 1936, nec Dactylocotyle minor (Olsson, 1868) St. Remy, 1898, Dactylocotyle thynni Ishii 1936, in Ishii and Sawada, 1938, on Thunnus orientalis ; Japan. Price (1943, foot note) stated: "Dactylocotyle minor Ishii, 1936, renamed D. twanni Ishii in Ishii and Sawada, 1938, does not belong to the genus Dactylocotyle (=Dictilidophora) but is a species of Mazocerae," but he is now of the opinion (personal communication) that it is a species of Kunkha.'

(ii) Uraxine Unnithan, 1957 is considered a synonym of Alloporudaxinayamaguti, 1943, the type species being Pseudaxine katsuwonii Ishii, 1946. Yamaguti (1963) considers Uraxine chura Unnithan (1957) a synonym of this species. Uraxine 'chura macroa Unnithan (1957) is given a specific rank as Alloporudaxinayamaguti (Unnithan).

(iii) Lithidocotyle Sproston, 1946 is considered a synonym of Gotocotyle Ishii, 1936. Consequently, the two species L. acanthophallus (MacCallum and MacCallum, 1913) and L. secundus Tripathi, 1954 given on p. 810 in this account are placed under the genus Gotocotyle.

In addition to the above five references, I would like to also mention the following reference:


As regards the six species of *Pricea* described by Ramalingam (1952) from *Cyphium guttatum* Hargis opines that "in all probability he merely described normal infraspecific variability and most of his species are not valid."