

pressed head. On account of the very distinctive combination of all characters, its immediate relationship is not patent. Its nearest relatives are possibly *spilota* or *chiquita*, but the divergence is wide.

**Garmannia pallens**, n. sp.

Scales 9–12, extending forward to a point under bases of sixth to eighth dorsal rays; 4 scales in caudal row. First spine of male prolonged. D. 11, A. 9, P. 15–16. Head compressed. End of maxillary in male reaching a point under posterior margin of eye. Light yellowish, crossed by 13–14 narrow, dark bands.

*Holotype*.—U. S. N. M. 107327. Barahona Harbor, Santo Domingo; in 2–4 feet; rocky bottom; John C. Armstrong; July 9, 1933; male 15 mm.

This species is nearest to *G. macrodon* (Beebe and Tee-Van), differing in a notably greater extent of squamation, fewer fin rays, and a paler color.

**Gobulus myersi**, n. sp.

D. 11, A. 10, P. 15. Head 30.5, depth of head 14, depth 18, depth of caudal peduncle 10.5. Ventral aspect darker than dorsal aspect.

*Holotype*.—U. S. N. M. 107283. Gulf of Mexico, off Cape Sable; Albatross station 2374, lat. 29° 11' 30", long, 85° 29'; 26 fathoms; February 7, 1885; male 27 mm.

This is the first species of its genus now to be made known from the east coast. It is evidently nearest to *G. crescentalis* (Gilbert), from the Gulf of California, differing in having a deeper body and head, and one or two fewer rays in the pectoral.

It is a pleasure to name this species after Professor George S. Myers of Stanford University, who discovered and salvaged the type from a lot of neglected, unidentified, miscellaneous material while he was in charge of the Division of Fishes in the National Museum.

LITERATURE CITED

- GILBERT, CHARLES H. and EDWIN C. STARKS. *The fishes of Panama Bay*. Mem. California Acad. Sci. 4. 1904.
- GINSBURG, ISAAC. *A revision of the genus Gobiosma (family Gobiidae), with an account of the genus Garmannia*. Bull. Bingham Ocean. Coll. 4(5). 1933.
- *Eight new species of gobioid fishes from the American Pacific coast*. Univ. South. California Pub., Hancock Pacific Exp. 2: 109–121. 1938.
- JORDAN, DAVID STARR and CHARLES H. GILBERT. *Descriptions of nineteen new species of fishes from the Bay of Panama*. Bull. U. S. Fish. Comm. 1: 306–335. 1882.
- MEEK, SETH E. and SAMUEL F. HILDEBRAND. *The marine fishes of Panama*. Publ. Field Mus. Nat. Hist. 15(3). 1928.

ZOOLOGY.—*North American monogenetic trematodes. III. The family Capsalidae (Capsaloidea)*.<sup>1</sup> EMMETT W. PRICE, U. S. Bureau of Animal Industry.

This paper is the third of a series on the North American mono-

<sup>1</sup> Received November 19, 1938.

genetic trematodes and deals only with the family Capsalidae; it also completes the general consideration of the suborder Monopisthocotylea Odhner. The organization and purpose of this paper are the same as for parts I and II (Price 1937, 1938).

#### Family CAPSALIDAE Baird, 1853

*Synonyms*.—Phyllinidae Johnston, 1846; Tristomidae Cobbold, 1877; Tristomatidae Gamble, 1896; Encotyllabidae Monticelli, 1888.

*Diagnosis*.—Body elliptical, oval or cordate, flattened. Cuticula smooth or provided with papilliform projections, sometimes with spines along lateral margins of dorsal surface. Anterior portion of body constricted, forming a cephalic lobe. Anterior haptors in form of a pair of suckers, or of glandular areas, or both. Posterior haptor disc-like or sucker-like, armed with 1 to 3 pairs of large hooks and 14 marginal hooklets. Oral aperture ventral, never surrounded by an oral sucker; pharynx well developed; intestine usually with median and lateral dendritic diverticula. Special sense organs consisting of a pair of papillae at anterior margin of cephalic lobe and of 2 pairs of eyes. Excretory apertures dorso-lateral, at or near level of pharynx. Male and female genital apertures separate, or opening into a common genital atrium, usually lateral. Testes 2 or more. Ovary median, pre-testicular. Vagina present or absent.

*Type genus*.—*Capsala* Bosc, 1811.

#### KEY TO SUBFAMILIES OF CAPSALIDAE

1. Posterior haptor with septa . . . . . 2  
     Posterior haptor without septa . . . . . 3
2. Two testes . . . . . Trochopinae Price  
     Numerous testes . . . . . Capsalinae Johnston
3. Two testes . . . . . Benedeniinae Johnston  
     Numerous testes . . . . . Nitzschiinae Johnston

#### Subfamily BENEDENIINAE Johnston, 1931

*Synonyms*.—Encotyllabinae Monticelli, 1892; Ancyrocotylinae Monticelli, 1903.

*Diagnosis*.—Anterior haptors in form of suckers or glandular areas, or both; posterior haptor sucker-like, subsessile or pedunculated, without septa, armed with 2 to 3 pairs of hooks and 14 marginal hooklets. Testes 2 or, rarely, 1. Ovary entire. Vagina present or absent.

*Type genus*.—*Benedenia* Diesing, 1858.

#### KEY TO GENERA OF BENEDENIINAE

1. Lateral margins of body inrolled ventrally . . . . . *Encotyllabe* Diesing  
     Lateral margins of body not inrolled ventrally . . . . . 2
2. Intestinal tract consisting of simple unbranched ceca . . . . .  
     . . . . . *Ancyrocotyle* Parona and Monticelli  
     Intestinal tract consisting of ceca with dendritic lateral and median  
     branches . . . . . 3
3. Anterior haptors consisting of glandular areas only. *Entobdella* Blainville

- Anterior haptors consisting of suckers, or of both glandular areas and suckers . . . . . 4
4. Anterior haptors consisting of suckers . . . . . *Benedenia* Diesing
- Anterior haptors consisting of both suckers and glandular areas . . . . .
- . . . . . *Pseudobenedenia* Johnston

#### Genus *BENEDENIA* Diesing, 1858

*Synonyms*.—*Epibdella* Beneden, 1856, in part; *Phylline* Oken, 1815, not Abildgaard, 1790, in part; *Tristoma* Cuvier, 1817, in part.

*Diagnosis*.—Anterior haptors in form of suckers or sucker-like discs; posterior haptor sucker-like, without septa, armed with 3 pairs of dissimilar hooks and 14 marginal hooklets. Testes 2, with zones coinciding and fields separate or touching. Vas deferens usually not forming preovarial loop. Ovary immediately pretesticular, not separated from testes by wide band of vitelline follicles. Vagina present or absent.

*Type species*.—*Benedenia elegans* Diesing, 1858 (= *Epibdella sciaenae* Beneden, 1856, renamed).

Johnston (1929) proposed a division of the genus *Benedenia* into 3 subgenera, *Benedenia*, *Parabenedenia* and *Benedeniella*, but since "the position of the vaginal aperture in relation to the common genital duct" is the only character given on which these subgenera are based, the writer feels that this division is unwarranted.

The genus *Benedenia* contains the following species: *Benedenia adenea* Meserve, 1938 (syn. *B. anadenea* Meserve, 1938), from *Mycteroperca* sp.; *B. convoluta* (Yamaguti, 1937), n. comb., from *Epinephelus akaara*; *B. derzhavini* (Layman, 1930), from *Sebastodes schlegelii*; *B. epinepheli* (Yamaguti, 1937), from *Epinephelus akaara*; *B. hendorffii* (Linstow, 1889), from *Coryphaena hippurus*; *B. ishikawae* (Goto, 1894), from *Lethrinus* sp.; *B. isabellae* Meserve, 1938, from "grouper-like fish"; *B. macrocolpa* (Lühe, 1906), from *Rhinoptera javanica*; *B. madai* (Ishii and Sawada, 1938), n. comb., from *Pagrosomus major*; *B. melleni* (MacCallum, 1927), from *Spheroides annulatus*, etc.; *B. muelleri* (Meserve, 1938), n. comb., from *Cratinus agassizii*; *B. monticellii* (Parona and Perugia, 1895),<sup>2</sup> from *Mugil auratus*; *B. ovata* (Goto, 1894), from *Anthias schlegelii*; *B. pacifica* (Guberlet, 1936), n. comb., from *Aetobatus californicus*; *B. pagrosomi* (Ishii and Sawada, 1938), n. comb., from *Pagrosomus major*; *B. sciaenae* (Beneden, 1856), from *Sciaena aquilla*; *B. sebastodis* (Yamaguti, 1934), from *Sebastodes inermis*; *B. seriolae* (Yamaguti, 1934), from *Sebastodes aureovittata*; and *B. sekii* (Yamaguti, 1937), from *Pagrosomus unicolor*. Of these species, only *B. adenea*, *B. hendorffii*, *B. isabellae*, *B. melleni*, and *B. pacifica* are known from North America.

#### *Benedenia adenea* Meserve, 1938

*Synonym*.—*Benedenia anadenea* Meserve, 1938.

This species was described by Meserve (1938) from specimens collected

<sup>2</sup> *Benedenia monticellii*, as described by Parona and Perugia (1895), is unrecognizable; the description is little more than generic and the measurements, especially those of the organs and hooks, obviously erroneous. These authors stated that only two pairs of haptor hooks were present, but if this be true, it is very exceptional as all other species of this group have three pairs of hooks. The size of the large hooks was given as 0.016 mm and of the smaller hooks as 0.011 mm; these probably should have been 0.16 and 0.11 mm, respectively.

by H. W. Manter from the gills of *Mycteroperca* sp. taken at Socorro Island, Mexico. The description and figures are adequate and a redescription will not be given here. A figure of the haptoral hooks (Fig. 10) is given for comparison with others of this genus from North America. Meserve has also described as a distinct species, *B. anadenea*, a form from the same host and locality as *B. adenea*. The principal difference given for the separation of the two species was the absence of the "glands of Goto" in the former. A study of the type specimen of *B. anadenea* (U. S. N. M. No. 9179) and of three paratypes kindly loaned by Dr. Manter has shown that these glands are present in both species. *B. anadenea* is, therefore, dropped as a synonym of *B. adenea*.

***Benedenia isabellae* Meserve, 1938**

This species was described by Meserve (1938) from specimens collected from the gills of an unidentified "spotted, grouper-like fish" taken by H. W. Manter at Isabel Island, Mexico. The description is very complete and little can be added beyond the fact that marginal haptoral hooklets (larval hooks) are present; they are 14 in number and distributed as in other members of the family Capsalidae. A figure of the haptoral hooks (Fig. 11) is included, however, since it is on the basis of the hooks that this form can best be distinguished from closely related species.

***Benedenia pacifica* (Guberlet, 1936), n. comb.**

*Synonym.*—*Epibdella pacifica* Guberlet, 1936.

This species was adequately described and figured by Guberlet (1936). However, this author failed to locate the smaller pair of haptoral hooks and their apparent absence was used as one of the differential characters. A study of the type specimens, kindly loaned by Prof. Guberlet, revealed the presence of the small hooks as well as the marginal hooklets which were not mentioned in the original description. This study also revealed that the species had been misallocated and must on the basis of the anterior haptors be assigned to the genus *Benedenia* instead of *Epibdella* (= *Entobdella*).

*B. pacifica* is quite distinct from all other members of the genus in that the hooks of the first pair (Fig. 12) are extremely small as compared with those of related species. The hooks of the second pair have blunt tips instead of the usual pointed recurved tips. The hooks of the third pair are smaller than in most species, being only  $37\mu$  long; they are situated near the margin of the haptor and removed a considerable distance from the tips of the second pair, the usual location. This species also appears to be unique in being devoid of eyes.

***Benedenia melleni* (MacCallum, 1927) Johnston, 1929**

*Benedenia melleni* has been so adequately described by MacCallum (1927) and by Jahn and Kuhn (1932) that a redescription need not be given here. However, a figure of the haptoral hooks (Fig. 13) is included for comparison with those of related species.



*B. melleni* differs from most species of the genus in lacking a vagina. There are, however, three other species, *B. adenea* Meserve, *B. isabellae* Meserve and *B. muelleri* (Meserve)<sup>3</sup> that also appear to lack vaginae. In addition to the absence of vaginae, the haptoral hooks of these four species are so similar that these two characters taken together may ultimately be found adequate for the erection of a separate genus to contain them.

*B. melleni* is the least host specific of any monogenetic trematode so far described, at least 57 species of fishes representing 17 families being reported as hosts. As a rule monogenetic flukes show a high degree of host specificity, usually only one or at least only a few closely related species being susceptible to infestation. In view of the observations at the New York aquarium of Jahn and Kuhn, as well as those of Nigrelli and Breder (1934) specificity in this species is either lacking to a large extent or more apparent than real. The large variety of susceptible fish hosts suggests that infestation is perhaps a matter of opportunity, the type of circulation in the tanks where the observations were made being such as to afford a greater chance for infestation than would be possible under natural conditions.

#### **Benedenia hendorffii** (Linstow, 1889) Stiles and Hassall, 1908

*Benedenia hendorffii* was originally described by Linstow (1889) from specimens collected from the skin of *Coryphaena hippurus* taken at "Caleta buena, Chile." Recently the writer (Price, 1938) redescribed and reillustrated what is regarded as this species from a specimen collected by E. E. Wehr from an undetermined species of fish at Spokane, Washington. The haptoral hooks (Fig. 15) are quite different from those of other species of *Benedenia*, and these alone are sufficient to permit an identification of the species.

#### Genus PSEUDOBENEDENIA Johnston, 1931

*Diagnosis*.—Anterior haptors consisting of a pair of suckers in addition to well defined anterior glandular areas. Vagina extremely short. Other characters as in *Entobdella* and *Benedenia*.

*Type species*.—*Pseudobenedenia nototheniae* Johnston, 1931.

The type and only species was described by Johnston (1931), the specimens being collected from the skin of *Notothenia macrocephala* from New Zealand.

#### Genus ENTOBDELLEA Blainville in Lamarek, 1818

*Synonyms*.—*Epibdella* Blainville, 1828; *Ertopdella* Rathke, 1843; *Phylline* Oken, 1815, not Abildgaard, 1790; *Phyllonella* Beneden and Hesse, 1863.

*Diagnosis*.—Anterior haptors in form of elongate, slightly depressed, glandular areas at anterior margin of cephalic lobe; posterior haptor sucker-

<sup>3</sup> *Benedenia muelleri* was described by Meserve (1938) as *Entobdella muelleri*, the species being based on a single specimen from the gills of *Cratinus agassizii* collected at Tagus Cove, Albemarle Island, Galapagos Islands. An examination of the type specimen shows that the anterior haptors are of the *Benedenia* type rather than of the *Entobdella* type, and the species is, therefore, transferred to *Benedenia*. *B. muelleri* appears on the basis of the haptoral hooks (Fig. 14), to be quite distinct from all others of the genus.

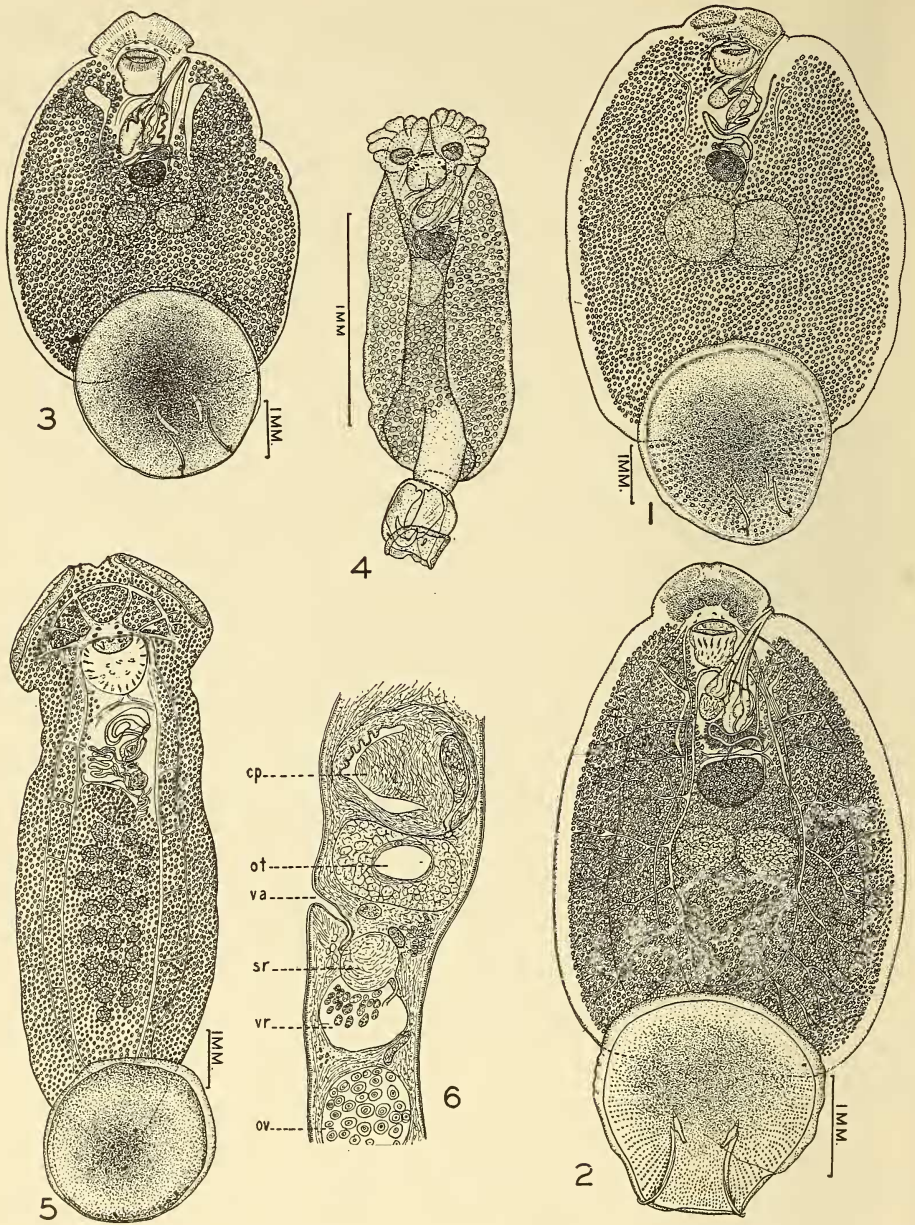


Fig. 1.—*Entobdella hippoglossi*, ventral view; Fig. 2.—*E. squamula*, ventral view; Fig. 3.—*E. bumpusii*, ventral view; Fig. 4.—*Encotyllabe lintonii*, ventral view; Figs. 5-6.—*Nitzschia superba*, 5, complete worm, ventral view; 6, section through region of genitalia (cp. cirrus pouch; ot. ootype; ov. ovary; sr. seminal receptacle; va. vaginal aperture; vr. vitelline reservoir).



like, armed with hooks as in *Benedenia*. Ovary usually separated from testes by a relatively wide band of vitelline follicles. Vas deferens forming a pre-ovarial loop. Other characters as in *Benedenia*.

*Type species*.—*Entobdella hippoglossi* (O. F. Müller, 1776) Johnston, 1856.

This genus is better known in the literature as *Epibdella*, but Johnston (1929) has shown that this name is antedated by *Entobdella* Blainville, in Lamarck, 1818. *Entobdella* Blainville on the other hand is antedated by *Phylline* Oken, 1815, but as the latter name had been previously used by Abildgaard (1790) for a tapeworm, *Entobdella* is the oldest available name for the genus. As Johnston has pointed out, the correct date for *Entobdella* has been difficult to establish, and the following quotation from Lamarck's (1818) discussion of "PHYLLINÉ (Phylline)" is given, since it is on the basis of this statement that *Entobdella* is regarded as the correct name of the genus: "Ce genre est établi par M. Ochen, sous le nom que nous lui conservons; et néanmoins M. de Blainville, que l'avait déjà reconnu, lui assigna celui de *Entobdella*, dans ses manuscrits."

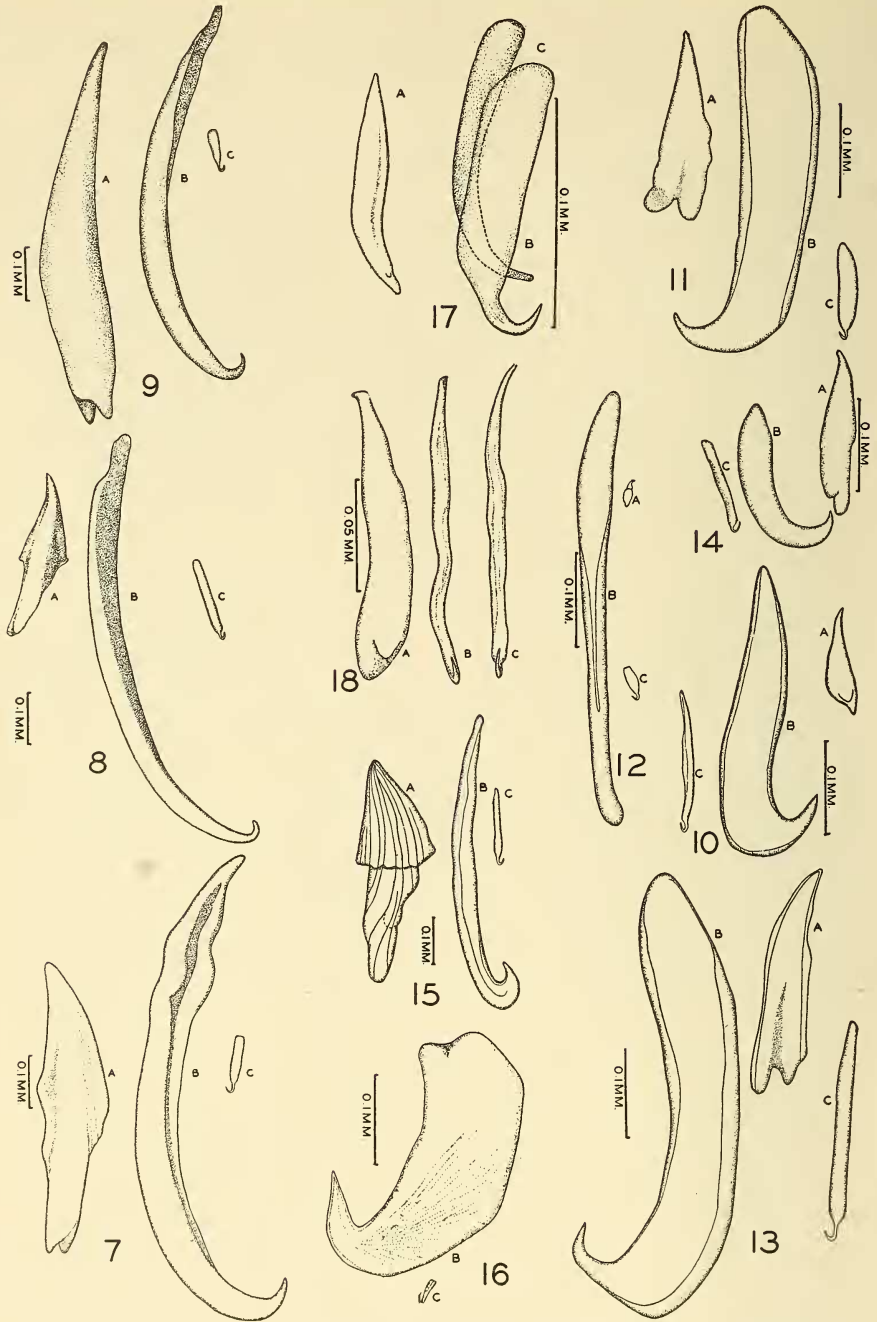
Johnston (1929) has proposed a division of the genus into 2 sub-genera, *Entobdella* and *Parepibdella*. Aside from the fact that the genus is so small that a subdivision seems unnecessary, the proposed subdivision is illogical since the species *E. diadema* and *E. bumpusii*, which bear such a close resemblance to each other that they require extremely careful study in order to find characters upon which to separate them, are placed in different subgenera.

The genus *Entobdella* contains the following species: *Entobdella bumpusii* (Linton, 1900), from *Pastinachus centrourus*; *E. diadema* (Monticelli, 1902), from *Trygon violacea*; *E. hippoglossi* (O. F. Müller, 1776), from *Hippoglossus hippoglossus*; *E. soleae* (Beneden and Hesse, 1863), syn. *E. producta* (Linstow, 1903), from *Solea vulgaris*; *E. squamula* (Heath, 1902), from *Paralichthys californicus*; and *E. steingröveri* (Cohn, 1916), from an undetermined fish. Three of these species, *E. bumpusii*, *E. hippoglossi* and *E. squamula*, occur on North American hosts.

***Entobdella hippoglossi* (O. F. Müller, 1776) Johnston, 1856** Figs. 1, 7

*Synonyms*.—*Hirudo hippoglossi* O. F. Müller, 1776; *Phylline hippoglossi* (O. F. Müller, 1776) Oken, 1815; *Epibdella hippoglossi* (O. F. Müller, 1776) Blainville, 1828; *Tristoma hamatum* Rathke, 1843; *Nitzschia hippoglossi* (O. F. Müller, 1776) Taschenberg, 1878; *Phyllonella hippoglossi* (O. F. Müller, 1776) Goto, 1899; *Epibdella bumpusii* of Canavan, 1934.

*Description*.—Body elliptical, 13 to 18 mm long by 3.6 to 4.8 mm wide (up to 24 mm long and up to 11 mm wide, according to various authors); cephalic lobe set off from rest of body by slight marginal constrictions. Anterior haptors in form of 2 elongate, slightly depressed, glandular areas, 1 on each side of median line near anterior margin of cephalic lobe. Posterior haptor sucker-like, 3.6 to 4.8 mm in diameter, surrounded by marginal membrane about 170 $\mu$  wide; ventral surface concave, the posterior half covered with radiating rows of more or less prominent papillae, and armed with 3



Figs. 7-18.—Haptor hooks of: 7, *Entobdella hippoglossi*; 8, *E. squamula*; 9, *E. bumpusii*; 10, *Benedenia adenea*; 11, *B. isabellae*; 12, *B. pacifica*; 13, *B. melleni*; 14, *B. muelleri*; 15, *B. hendorffii*; 16, *Encotyllabe lintonii*; 17, *Nitzschia superba*; 18, *Megalocotyle marginata*. (A—hook of first pair; B—hook of second pair; C—hook of third pair.)



pairs of large hooks and 14 marginal hooklets. Hooks of first pair spearhead-shaped, median margin slightly curved, 510 to 640 $\mu$  long; hooks of second pair slender, 815 to 935 $\mu$  long, tips recurved; hooks of third pair 95 to 122 $\mu$  long, tips slender and recurved; marginal hooklets about 20 $\mu$  long. Oral aperture ventral, at level of lateral constrictions of body. Pharynx 680 to 850 $\mu$  long by 850 $\mu$  to 1.1 mm wide. Intestine as in species of *Benedenia*. Common genital aperture at left marginal constriction. Cirrus pouch club-shaped, its base to right of median line and about midway between base of pharynx and anterior margin of ovary. Testes globular, 1.7 to 2 mm in diameter, equatorial. Ovary transversely oval, 595 to 695 $\mu$  long by 850 $\mu$  to 1 mm wide, pretesticular, separated from anterior margins of testes by wide band of vitelline follicles. Vitelline follicles occupying almost entire body from level of oral aperture to posterior end of body proper. Vagina slender, opening postero-median of common genital aperture. Ootype oval, lying in median line posterior to cirrus pouch; metraterm slender. Egg tetrahedral, about 228 $\mu$  wide, with long, slender filament.

*Host*.—*Hippoglossus hippoglossus* (Linn.).

*Location*.—Skin.

*Distribution*.—United States (Woods Hole, Mass., Swans Island, Me.), Alaska, Canada (Nova Scotia) and Greenland.

*Specimens*.—U. S. N. M. Helm. Coll. Nos. 6883, 6884, 6974, 7151, 7177, 7181, 7188, 7627, and 25051.

The specimens available to the writer correspond in all essentials with those described by earlier writers. It is the best known and most widely distributed of all species of the genus, and further comment appears unnecessary.

Canavan (1934) reported *Epibdella bumpusii* (Linton) from a member of the family Gadidae. However, an examination of the specimen by the writer showed it to be *E. hippoglossii* and not *E. bumpusi*.

#### *Entobdella squamula* (Heath, 1902) Johnston, 1929 Figs. 2, 8

*Synonyms*.—*Epidella squamula* Heath 1902; *Phylline squamula* (Heath, 1902) Linstow, 1903; *Epibdella (Phylline) squamula* (Heath, 1902) Monticelli, 1905; *Entobdella (Entobdella) squamula* (Heath, 1902) Johnston, 1929.

*Description*.—Body more or less elliptical, 5 to 12 mm long by 3 to 6 mm wide (3.6 to 18 mm long by 1.5 to 10 mm wide, according to Heath (1902)). Anterior haptors in form of 2 elliptical, slightly depressed, glandular areas near anterior margin of cephalic lobe. Posterior haptor sucker-like, 1.5 to 2.9 mm long by 1.4 to 2.9 mm wide, surrounded by delicate marginal membrane 170 to 240 $\mu$  wide; posterior two-thirds of ventral surface covered with radiating rows of small papillae similar to those in *E. hippoglossii* and *E. steingröveri*, and armed with 3 pairs of large hooks and 14 marginal hooklets. Hooks of first pair spearhead-shaped, 197 to 274 $\mu$  long; hooks of second pair slender, 595 to 986 $\mu$  long, tips recurved; hooks of third pair 121 to 163 $\mu$  long, tips slender and recurved; marginal hooklets about 15 $\mu$  long. Oral aperture median, slightly posterior to marginal constrictions of body. Pharynx with slight constriction, 304 to 756 $\mu$  long by 342 to 850 $\mu$  wide; esophagus absent; intestinal limbs slender, uniting posteriorly, each limb with about 9 lateral and fewer median diverticula. Common genital aperture at left lateral constriction; cirrus pouch club-shaped, its base to right

of median line about midway between base of pharynx and anterior margin of ovary. Testes usually spherical,  $510\mu$  to 1.1 mm in diameter, equatorial. Ovary ovoid, 230 to  $800\mu$  long by  $510\mu$  to 1 mm wide, pretesticular and separated from testes by wide band of vitelline follicles. Vitelline follicles occupying greater part of body from level of oral aperture to posterior end of body proper. Vagina long and slender, opening at level of base of pharynx about midway between median line and left margin of body. Ootype relatively large, its base median and immediately posterior to cirrus pouch; metraterm relatively long. Egg triangular, about  $150\mu$  wide, with long, slender apical filament.

*Host*.—*Paralichthys californicus* (Ayres).

*Location*.—Under surface of body, rarely gill chambers.

*Distribution*.—United States (Monterey Bay, Calif., and Gulf of Mexico).

*Specimens*.—U. S. N. M. Helm. Coll. Nos. 6973 (paratypes), 39579 and 39581.

This description is based on specimens collected by Prof. Harold Heath and donated to the U. S. National Museum, as well as on specimens donated to the writer by E. E. Wehr, which had been collected by Ralph A. Coombs from an undetermined fish presumably from the Gulf of Mexico.

*Entobdella squamula* resembles *E. hippoglossi* and *E. steingröveri* more closely than any of the other species of the genus. These species show radiating rows of papillae on the posterior haptor and, except for size, agree closely in other respects. *E. squamula* may be distinguished from both *E. hippoglossi* and *E. steingröveri* by the haptoral hooks, those of the first pair of *E. squamula* being much shorter as compared with those of the second pair than in the other two species.

#### **Entobdella bumpusii** (Linton, 1900) Johnston, 1929 Figs. 3, 9

*Synonyms*.—*Epibdella bumpusii* Linton, 1900; *Phylline bumpusii* (Linton, 1900) Linstow, 1903; *Entobdella* (*Parepibdella*) *bumpusii* (Linton, 1900) Johnston, 1929.

*Description*.—Body ovoid, 8.5 to 9 mm long by 5 to 5.5 mm wide (living specimen 12.5 mm long by 8.35 mm wide, according to Linton (1900)). Anterior haptors in form of 2 glandular areas at anterior end of cephalic lobe, each haptor crossed antero-posteriorly by about 20 relatively deep grooves. Posterior haptor sucker-like, 2.4 to 3 mm in diameter, surrounded by a delicate marginal membrane; ventral surface without papillae, armed with 3 pairs of large hooks and 14 marginal hooklets. Hooks of first pair robust, 646 to  $795\mu$  long, slightly curved, gradually attenuated anteriorly; hooks of second pair slender, 731 to  $765\mu$  long, tips recurved; hooks of third pair about  $76\mu$  long, tips slender and recurved; marginal hooklets  $15\mu$  long. Oral aperture median, at level of lateral constrictions of body. Pharynx somewhat beaker-shaped,  $680\mu$  long by  $850\mu$  wide; intestinal tract as in *E. squamula*. Common genital aperture sinistral, at level of oral aperture. Cirrus pouch club-shaped, its base to right of median line and separated from ovary by a loop of the vas deferens. Testes globular or transversely oval, 595 to  $765\mu$  long by 765 to  $850\mu$  wide. Ovary median,  $595\mu$  long by  $680\mu$  wide, pretesticular and separated from testes by wide band of vitelline follicles. Vitelline follicles occupying almost entire body width from level of oral aperture to posterior end of body proper. Vagina long, muscular,

opening at side of common genital aperture. Ootype elliptical, median; metraterm slender, opening into genital atrium near common genital aperture. Eggs not observed; tetrahedral, with long, slender filament, according to Linton.

*Host*.—*Pastinachus centrourus* (Mitchill).

*Location*.—Skin and gills.

*Distribution*.—United States (Woods Hole, Mass.) and Canada (Labrador).

*Specimen*.—U. S. N. M. Helm. Coll. No. 6509.

This species is closely related to *Entobdella diadema* (Monticelli) but is easily separated from that species by the relation of the ovary to the testes; in *E. bumpusii* the ovary is separated from the testes by a wide band of vitelline follicles, while in *E. diadema* the ovary is situated immediately in front of, and in contact with, the testes. Both species resemble each other in having the anterior haptors crossed antero-posteriorly by about 20 grooves, a condition not known to occur in any of the other species.

#### Genus ENCOTYLLABE Diesing, 1850

*Synonym*.—*Cheloniella* Beneden and Hesse, 1863.

*Diagnosis*.—Body with lateral margins turned ventrally. Anterior haptors muscular, sucker-like, elliptical, surrounded by a wide, more or less pleated membrane. Posterior haptor campanulate, without radial septa, armed with 2 pairs of large hooks (1 pair massive) and a number (?14) of marginal hooklets, situated on a relatively long pedicel attached to the ventral surface of body. Genital aperture submedian to lateral; genital organs arranged as in *Trochopus*.

*Type species*.—*Encotyllabe nordmanni* Diesing, 1850.

The genus *Encotyllabe* contains seven species as follows:<sup>4</sup> *Encotyllabe lintonii* Monticelli, 1909, from *Calamus calamus*; *E. masu* Ishii and Sawada, 1938, from *Oncorhynchus masou*; *E. nordmanni* Diesing, 1850, from *Brama mediterranea*, *B. raii*, and *Heliastes chromis*; *E. pagelli* Beneden and Hesse, 1863, from *Pagellus centrodontus*; *E. pagrosomi* MacCallum, 1917, from *Pagrosomus auratus*; *E. paronae* Monticelli, 1907, from *Crenilabrus pavo*; *E. spari* Yamaguti, 1934, from *Sparus macrocephalus*, *Plectorhynchus pictus*, and *Epinephelus akaara*; and *E. valleii* Monticelli, 1907, from *Chrysophrys aurata*. Only one of these species, *E. lintonii*, is known from a North American host.

#### *Encotyllabe lintonii* Monticelli, 1909

Figs. 4, 16

*Synonym*.—*Encotyllabe* sp. Linton, 1907.

*Description*.—Body ellipsoidal, 2 mm long by 765 $\mu$  wide disregarding infolded margins, or about 1.2 mm wide if spread out. Margins of body infolded ventrally forming a spacious groove. Anterior haptors sucker-like, 76 $\mu$  long by 84 $\mu$  wide, incompletely surrounded by a pleated membrane about 306 $\mu$  across. Posterior haptor pedunculated, bell-shaped, about 340 $\mu$  long, and surrounded by a delicate marginal membrane; large hooks robust, 274 $\mu$  long, small hooks 30 $\mu$  long; marginal hooklets 10 $\mu$  long, number not ascer-

<sup>4</sup> Perrier (1897) in a discussion of the shape of eggs of tristomes mentioned the name *Encotyllabe fragile*, but so far as the writer has been able to ascertain no such species has ever been described. *E. fragile*, therefore, must be regarded as a *nomen nudum* and without nomenclatural status.



tainable; pedicel  $380\mu$  long by  $237\mu$  wide. Pharynx almost rectangular,  $152\mu$  long by  $190\mu$  wide. Genital aperture at side of pharynx, a short distance posterior to left anterior haptor. Cirrus pouch robust, its base lying posterior to pharynx and to right of median line. Right testis oval,  $228\mu$  long by  $190\mu$  wide; left testis missing, its location marked by a small scar-like mass of tissue. Ovary  $114\mu$  long by  $190\mu$  wide, median, pretesticular. Vitelline follicles occupying almost entire body width from level of pharynx to posterior end of body proper. Vaginal aperture preovarial and slightly sinistral. Ootype indistinct, immediately posterior to, and partly overlying, cirrus pouch. No eggs present.

*Host*.—*Calamus calamus* (Cuvier and Valenciennes).

*Location*.—Gills.

*Distribution*.—Bermuda.

*Specimen*.—Collection of Prof. Edwin Linton, University of Pennsylvania, Philadelphia, Pa. (type).

This species is represented by a single, somewhat immature specimen collected by Prof. Edwin Linton, July 16, 1903, at the Bermuda Biological Station for Research, Flatts, Bermuda. As Linton's description of this form was incomplete in certain details, Monticelli (1908) secured the specimen and redescribed it, naming the species for the collector. Monticelli's description was brief and inaccurate as the writer has found on studying the specimen kindly loaned him by Prof. Linton; the inaccuracies are as follows: The figure given by Monticelli, labelled ventral view, is actually a dorsal view and shows 2 testes situated side by side, while the specimen, being anomalous, has only 1 testis, a small scar-like mass representing the other testis; the ovary is much larger than Monticelli's description would indicate; the genital aperture is at the left side of the pharynx and not posterior to it as Monticelli stated; and the ratio of the hook lengths is 1:9 instead of 1:8.

Both Monticelli and Linton overlooked the small marginal haptoral hooklets. These hooklets have previously been reported as present on only one species of the genus, *E. pagrosomi* MacCallum (Price, 1937), but in view of the fact that they are now known to occur on two of the seven species it may be assumed that they are present on all.

Yamaguti (1934) has described a species, *Encotyllabe spari*, from Japanese fishes, which appears to be very close to, if not actually the same as, *E. lintonii*. The measurements given for *E. spari* are slightly in excess of those of *E. lintonii* but these slight differences may not be significant, especially since the latter species is known from only a single anomalous specimen. However, since our knowledge of *E. lintonii* is inadequate, the writer prefers to retain Yamaguti's species until more specimens of *E. lintonii* are available, or until a more adequate description based on new material has been given.

#### Genus ANCYROCOTYLE Parona and Monticelli, 1903

*Diagnosis*.—Anterior haptors in form of 2 muscular suckers, each situated on a fleshy pad. Posterior haptor sucker-like, with marginal membrane, bearing 3 pairs of large hooks and 14 marginal hooklets; hooks of third pair



lateral to those of second pair. Intestinal tract consisting of 2 ceca, without lateral or median branches and not united posteriorly. Testes 2, postovarial, or (?) 1, preovarial. Vagina present.

*Type species*.—*Ancyrocotyle vallei* (Parona and Perugia, 1895) Parona and Monticelli, 1903.

Only one species, *Ancyrocotyle bartschi*, in addition to the genotype, has been allocated to this genus. This species was described by the writer (Price, 1934) from two immature specimens collected from the gills of *Naucrates ductor* taken in West Indian Waters. The original description is regarded as adequate for the purpose of identification and further consideration of *A. bartschi* will not be given in this paper.

#### Subfamily NITZSCHIINAE Johnston, 1931

*Diagnosis*.—Anterior haptors in form of 2 sucker-like grooves, 1 on each side of median line of cephalic lobe. Posterior haptor sucker-like, surrounded by well developed marginal membrane; ventral surface strongly concave, without papillae or septa, and armed with 3 pairs of hooks and 14 marginal hooklets. Genital aperture postpharyngeal, median or sinistral. Testes numerous (up to 27 or more), in interintestinal field. Ovary entire. Vagina present.

*Type genus*.—*Nitzschia* Baer, 1826.

#### Genus NITZSCHIA Baer, 1826

*Diagnosis*.—Characters of subfamily.

*Type species*.—*Nitzschia elegans* Baer, 1826 (= *N. sturionis* (Abildgaard, 1794)).

Up to the present time only two species have been included in the genus *Nitzschia*, namely, *Nitzschia sturionis* (Abildgaard, 1794), from *Acipenser sturio*, and *N. superba* MacCallum, 1921, from *A. brevirostris*. In addition to these two species, a third, *N. monticellii*, n. sp.,<sup>5</sup> is here proposed for the "forma giovane" of *N. elongata* (Nitzsch) (= *N. sturionis* described from Europe by Monticelli (1909)).

#### *Nitzschia superba* MacCallum, 1921 Figs. 5-6, 17

*Description*.—Body elongated, 8 to 15 mm long by 2.1 to 3.5 mm wide, somewhat constricted in region of pharynx. Anterior haptors in form of elongated grooves, 1.6 to 1.8 mm long, 1 on each side of median line and lying along margins of cephalic lobe. Posterior haptor sucker-like, surrounded by well developed marginal membrane 170 $\mu$  wide; ventral surface strongly concave, without radial septa or papillae, armed with 3 pairs of hooks and 14 marginal hooklets. Hooks of first pair straight, somewhat fusiform, 85 to 120 $\mu$  long; hooks of second and third pairs equal, 106 to 167 $\mu$  long, those of second pair with slender recurved tips and those of third pair with relatively thick, blunt tips, not recurved; marginal hooklets 20 $\mu$  long. Oral aperture median, at level of posterior ends of anterior haptors. Pharynx subglobular, 765 $\mu$  to 1 mm long by 765 $\mu$  to 1.2 mm wide. Genital

<sup>5</sup> *N. monticelli* is regarded as new on the basis of inequality of the lengths of the haptoral hooks on Monticelli's "forma giovane" of *N. elongata* (= *N. sturionis*). The haptoral hooks of *N. sturionis* are equal in length, or nearly so, and as it has been the writer's experience that the hooks of monogenetic trematodes do not exhibit material variation due to age, it seems reasonably certain that two species were represented in Monticelli's material.

aperture sinistral, 340 to 510 $\mu$  posterior to base of pharynx. Cirrus pouch short and thick, directed transversely; testes 26 to 27 in number, in median field, postovarial. Ovary oval to somewhat reniform, 346 to 595 $\mu$  long by 680 to 800 $\mu$  wide, median, preequatorial. Vitelline follicles very numerous, occupying entire body width from anterior end of cephalic lobe to posterior end of body proper. Vaginal aperture median, near base of ootype; vagina short and relatively wide, connected with a large, globular seminal receptacle lying antero-lateral of vitelline reservoir. Ootype piriform, its base lying in median line posterior to cirrus pouch; metraterm very short. Egg triangular in outline, 171 $\mu$  wide, with moderately long, slender filament.

*Hosts.*—*Acipenser brevirostris* Le Sueur, *A. sturio* Linnaeus, and *A. oxyrhynchus* Mitchill.

*Location.*—Gills.

*Localities.*—United States (New York Aquarium, Woods Hole, Mass., and Block Island) and Canada (Gulf of St. Lawrence).

*Specimens.*—U. S. N. M. Helm. Coll. Nos. 4873, 7153, 7742, 35639, 35640 (cotypes) and 35641.

*Nitzschia superba* was described by MacCallum (1921) from specimens collected at the New York Aquarium from a short-nosed sturgeon taken along the Atlantic Coast. MacCallum did not give any very clear differences between this species and the other species of the genus except for the character of the vitellaria which he stated "was very different from that of other members of the genus, inasmuch as instead of being a mass of more or less circular glands, they are here in the form of tubes with only at short distances a circular gland here and there." A study of the specimens on which MacCallum's description of *N. superba* was based shows that the character of the vitellaria is not different from that of other species, since the tubes he mentioned were the small collecting ducts and not the vitelline follicles. The principal difference between *N. superba* and the European species lies in the morphology of the hooks of the posterior haptor.

So far as the writer has been able to ascertain *N. superba* is the only species known from American hosts. Specimens (U. S. N. M. No. 4873) collected by Linton, as well as specimens collected by MacCallum, and labelled *N. elegans* were found on examination to be *N. superba*. One additional specimen (U. S. N. M. No. 7153), the host of which was not given, proved to be also *N. superba*. In view of the fact that all of the specimens so far examined have proved to be *N. superba*, it seems reasonable to assume that the records of *N. elegans* by Verrill (1875) from *Acipenser oxyrhynchus*, by Linton (1898 and 1901) and by Stafford (1904) from *A. sturio* are probably those of *N. superba* also.

#### Subfamily TROCHOPINAE Price, 1936

*Diagnosis.*—Anterior haptors in form of suckers or glandular areas; posterior haptor sucker-like, subsessile, its ventral surface divided into central and marginal areas by ridges or septa. Other characters as in Benedeniinae.

*Type genus.*—*Trochopus* Diesing, 1850.

## KEY TO GENERA OF TROCHOPINAE

1. Anterior haptors in form of glandular areas . . . . . *Macrophyllida* Johnston  
     Anterior haptors in the form of suckers . . . . . 2
2. Posterior haptor with 10 rays . . . . . *Trochopus* Diesing  
     Posterior haptor with 6 to 7 rays . . . . . *Megalocotyle* Folda

## Genus TROCHOPUS Diesing, 1850

*Diagnosis.*—Anterior haptors disc-like, medium-sized, subsessile, varying in form and appearance. Posterior haptor disc-like, subsessile, with marginal membrane; ventral surface divided into cavities by 10 ridges or septa, armed with 2 to 3 pairs of large hooks and 14 marginal hooklets. Genital aperture at level of posterior margin of left anterior haptor; genital atrium long; cirrus pouch curved, its base usually to right of median line; testes 2, oval, with zones coinciding and with fields abutting or separate, usually equatorial or preequatorial. Ovary globular, pretesticular. Vagina slender, opening immediately posterior to common genital aperture.

*Type species.*—*Trochopus longipes* Diesing, 1850 (= *Tristoma tubiporum* Diesing, 1836, renamed).

There are at present 10 species in the genus *Trochopus* as follows: *Trochopus brauni* Mola, 1912, from *Cottus gobio*; *T. differens* Sonsino, 1891, from *Cantharus lineatus*; *T. diplacanthus* Massa, 1903, from *Trigla hirundo*; *T. gaillimhe* Little, 1929, from *Trigla hirundo* or *T. lucerna*; *T. heteracanthus* Massa, 1903, from *Trigla corax*; *T. lineatus* Scott, 1901, from *Trigla lineata*; *T. micrachanthus* Massa, 1903, from *Trigla hirundo*; *T. onchacanthus* Massa, 1906, from undetermined fish host; *T. pini* (Beneden and Hesse, 1863), from *Trigla pini*, *T. hirundo* and *T. corax*; and *T. tubiporus* (Diesing, 1835), from *Trigla hirundo*. No member of this genus has been reported from North America.

## Genus MEGALOCOTYLE Folda, 1928

*Diagnosis.*—Posterior haptor with (?) 6 to 7 septa. Other characters as in *Trochopus*.

*Type species.*—*Megalocotyle marginata* Folda, 1928.

The present writer (Price, 1936) has previously stated that *Megalocotyle* Folda was a synonym of *Trochopus* Diesing. This position would not be difficult to maintain, but since *Trochopus* (*sensu lato*) can be separated on the basis of the haptoral rays into two distinct groups of species it now seems desirable, at least for convenience, to regard *Megalocotyle* as valid.

Five species may be included in the genus *Megalocotyle*: *M. hexacanthus* (Parona and Perugia, 1889), n. comb., from *Serranus gigas*; *M. marginata* Folda, 1928, from *Sebastes nebulosis*; *M. rhombi* (Beneden and Hesse, 1863), n. comb., from *Rhombus maximus*; *M. squatinae* (MacCallum, 1921) n. comb., from *Squatina squatina*; and *M. zschokkei* (Mola, 1912), n. comb., from *Cottus gobio*. Of these species only *M. marginata* is known from North America.

***Megalocotyle marginata* Folda, 1928**

This species has been adequately described by Folda (1928) and a re-description need not be given here. A study of some of the paratype specimens

(U. S. N. M. No. 39580) kindly donated by Prof. J. E. Guberlet, University of Washington, Seattle, Wash., however, shows that Folda apparently erred in describing and figuring the first pair of haptoral hooks. These were shown to have posteriorly directed projections at or near the middle of the hooks, but these projections are apparently wrinkles of the cuticula at the opening of the hook sheath and not a part of the hook proper (Fig. 18).

Genus *MACROPHYLLIDA* Johnston, 1929

*Synonym.*—*Macrophylla* Hughes, 1928, not Hope, 1837.

*Diagnosis.*—Anterior haptors in form of fan-like glandular areas. Posterior haptor similar to that of *Trochopus*. Testes 2, preequatorial, one slightly anterior to other.

*Type species.*—*Macrophyllida antarctica* (Hughes, 1928) Johnston, 1929.

The type and only species of this genus was described by Hughes (1928) from *Mustelus antarcticus* in Australia.

Subfamily CAPSALINAE Johnston, 1929

*Synonyms.*—*Tristominae* Braun 1893; *Tristomatinae* Gamble, 1896.

*Diagnosis.*—Anterior haptors sucker-like. Posterior haptor sucker-like, subsessile, its ventral surface divided by septa into a central polygonal area and 7 marginal, more or less triangular areas, usually armed with 1 pair of large spine-like hooks and 14 marginal hooklets. Testes numerous, confined to interintestinal field or extending into extraintestinal fields. Ovary lobulate.

*Type genus.*—*Capsala* Bosc, 1811.

KEY TO GENERA OF CAPSALINAE

1. Pharynx with constriction; testes usually, if not always, extending into extraintestinal fields . . . . . *Capsala* Bosc  
Pharynx without constriction; testes confined to interintestinal field . . 2
2. Posterior rays of haptor bifid distally; haptoral hooks with claw-like tips; dorsal marginal spines crown-shaped, in single longitudinal row . . . . . *Capsaloides* Price  
Posterior rays of haptor not bifid distally; haptoral hooks without claw-like tips; dorsal marginal spines, when present, not crown-like, in numerous short transverse rows . . . . . *Tristoma* Cuvier

Genus *CAPSALA* Bosc, 1811

*Synonym.*—*Tristoma* Cuvier, 1817, in part.

*Diagnosis.*—Dorsal marginal spines present or absent. Posterior rays of haptor not bifid distally; hooks, when present, simple, without claw-like tips. Pharynx with a definite constriction at or posterior to middle. Testes numerous, usually, if not always, extending into extraintestinal fields.

*Type species.*—*Capsala martinieri* Bosc, 1811.

The following species may be included in the genus *Capsala*; *Capsala biparasitica* (Goto, 1894), from carapace of a copepod, probably *Parapetalus* sp., parasitic on the gills of *Thynnus albacora*; *C. foliaceae* (Goto, 1894), from undetermined Japanese fish; *C. interrupta* (Monticelli, 1891), from *Thynnus brachypterus*; *C. katsuwona* (Ishii, 1936), from *Katsuwonus vagans*; *C. laevis*



(Verrill, 1875), from *Tetrapturus imperator*, *T. brevirostris* and *Coryphaena hippurus*; *C. lintoni*, n. sp., from *Gymnosarda pelamis*; *C. maccallumi*, n. sp., from *Euthynnus alletteratus*; *C. magrona* (Ishii, 1936),<sup>6</sup> from *Thynnus orientalis*; *C. martinieri* (Bosc, 1811), from *Mola mola*; *C. megacotyle* (Linstow, 1906), from *Histiophorus* sp.; *C. nozawae* (Goto, 1894), from *Thynnus sibi*; *C. onchidiocotyle* (Setti, 1899), from *Thynnus thynnus*; *C. ovale* (Goto, 1894), from *Histiophorus orientalis*, *Histiophorus* sp., and (?) *Cybius* sp.; *C. pelamydis* (Taschenberg, 1878), from *Pelamys sarda*; *C. poeyi* (Vigueras, 1935), from *Makaira ampla*; and possibly *C. squali* (E. Blanchard, 1847), at present unrecognizable, from *Squalus* sp.

*Capsala martinieri*, *C. laevis*, *C. lintoni*, *C. maccallumi* and *C. poeyi* are the North American representatives of this genus.

### *Capsala martinieri* Bosc, 1811

Figs. 19-21

*Synonyms*.—*Phylline diodontis* Oken, 1815, *P. coccinea* of Schweigger, 1820; *Tristoma maculatum* Rudolphi, 1819; *T. coccineum* of Rudolphi, 1819; *T. coccineum* of Bremser, 1824; *T. coccineum* of Diesing, 1836; *T. cephalo* Risso, 1826; *T. mola* E. Blanchard, 1847; *T. rudolphianum* Diesing, 1850; *Capsala maculata* (Rudolphi, 1819) Nordmann, in Lamarck, 1840; *C. rudolphiana* (Diesing, 1850) Johnston, 1865; *C. sanguinea* Diesing, 1850; *C. cephalo* (Risso, 1826) Johnston, 1929; *C. mola* (E. Blanchard, 1847) Johnston, 1929.

*Description*.—Body cordate to almost circular, 15 to 21 mm long by 16 to 21 mm wide, posterior end deeply notched; dorsal surface convex, smooth except near margins, the margins with a relatively wide longitudinal band of irregularly placed spines, the majority of spines 4-cuspid; ventral surface concave, covered with minute papilliform projections. Anterior haptors sucker-like, circular or slightly oval, 1.4 to 1.8 mm in diameter. Posterior haptor circular, 8 to 10 mm in diameter, surrounded by pleated marginal membrane 500 $\mu$  wide; ventral surface covered with minute papilliform projections; central area an irregular heptagon with 7 ridges or septa radiating from it; no hooks present; marginal hooklets present, small. Oral aperture median, at level of posterior margins of anterior haptors. Pharynx 2 to 2.1 mm long by 1 to 1.8 mm wide, with distinct constriction. Intestine as in other capsalids. Genital aperture sinistral, at level of equator of pharynx. Cirrus pouch club-shaped, its base lying in median line posterior to pharynx. Testes very numerous, occupying greater part of central area of body and extending laterally to within about 1.5 mm of body margins and anteriorly to about level of base of pharynx. Ovary lobulate, 1.5 to 2.1 mm long by 2 to 3.2 mm wide, median, about 1.5 to 2 mm posterior to base of pharynx. Vitelline follicles occupying greater part of body and extending into cephalic lobe. Vagina slender, opening 400 to 450 $\mu$  posterolateral of genital aperture. Ootype oval, immediately posterior to cirrus pouch. No eggs observed.

*Host*.—*Mola mola* (Linnaeus).

<sup>6</sup> Through the courtesy of Prof. Ishii the writer has been permitted to examine the type specimens of both *C. magrona* and *C. katsuwana*. The figures and descriptions of these forms by Ishii (1936) and the redescriptions by Ishii and Sawada (1938) are quite complete except in the case of *C. magrona*. In neither of the papers referred to is there any mention of the presence of dorsal marginal spines or of haptor papillae in this species. These spines are small, unicuspid, and distributed in much the same manner as in *C. martinieri*. The haptor papillae are relatively large, not numerous, and irregularly distributed in the depressions between the haptor radii.

*Location.*—Skin.

*Distribution.*—United States (Atlantic and Pacific Coasts).

*Specimens.*—U. S. N. M. Helm. Coll. Nos. 3989, 4879, 7164, 7186, 7187, 7338, 7741, 35266, 35332, 35642 and 35643.

La Martinière (1787) described an ectoparasitic fluke, which he did not name, from a fish of the genus *Diodon*. The complete account of this worm is as follows:

L'insecte suivant (*fig. 4 et 5*) a à peu près la forme d'un verre de montre qui serait échanuré dans un point de sa circonférence; son corps est d'une consistance cartilagineuse, d'une couleur blanche un peu terne; sa partie supérieure (*fig. 4 [A]*) est couverte par de petites taches ovales, de couleur de lie de vin. La *fig. 5 [B]* le représente vu par-dessous, où l'on aperçoit trois élévations en forme de godets, deux vers la trompe de l'animal, et une troisième beaucoup plus grande, vers la partie échanurée de son corps; ce dernier est divisé par sept petites côtes blanchâtres; le centre fait un peu saillie. C'est à la faveur de ces différens godets qu'il se fixe d'une manière très-forte sur le corps de différens poissons ou animaux marins; vraisemblablement c'est en faisant le vide, et non avec une humeur glutineuse et tenace qu'on pourrait lui supposer. Peut-être est-ce par cette même cause que les lépas et les moules se fixent si fortement aux rochers. Sa trompe, qui est située entre ses deux petits godets supérieurs, a son extrémité supérieure hérissée de pointes, qui doivent être autant de pouches par où cet animal suce le sang des poissons sur lesquels il est fixé. On voit, au-dessous, à travers sa substance, plusieurs circonvolutions d'intestins qui aboutissent à un petit réservoir de forme presque carrée. Quoique cet animal soit sans jambes, il jouit d'un mouvement progressif à la faveur de ses trois espèces de godets, qu'il fixe alternativement. Il peut aussi aller au fond de l'eau, quoique sa forme paraisse devoir s'y opposer; et voici de quelle manière il l'exécute: il se roule en papillote, et se maintient dans cette situation, en fixant ses deux godets supérieurs sur la partie postérieure et supérieure de son corps; alors, présentant moins de surface, il descend au fond par son propre poids. Je l'ai trouvé fixé sur le corps d'un poisson du genre des diodons de Linné, que nous avons rencontré assez souvent depuis Nootka jusqu'à Monterey en Californie.

Bosc (1811) on the basis of La Martinière's description proposed for this species the name *Capsala martinieri*. Later Oken (1815) renamed this worm *Phylline diodontis*, and still later Rudolphi (1819) renamed it *Tristoma maculatum*. The descriptions given by Oken and by Rudolphi were taken apparently from that of La Martinière's as nothing in their descriptions indicated that they had ever seen the parasite. Bosc gave the size of the worm as 3 cm. but this measurement was evidently taken from La Martinière's illustration. Dujardin (1845) and Saint-Remy (1891) gave the size as 22.5 mm long by 18 mm wide, but just how they arrived at this is not given.

As will be noted from the original description, no details are given by which the species can be recognized. However, on the basis of circumstantial evidence the writer feels convinced that the species is identical with that commonly known as *Tristoma molae*; the evidence that led him to this con-

clusion is briefly this: The general body form, relative size of the haptors and body proportions are the same as those for *T. mola*; the only fish occurring in Monterey Bay and northward that would fit the diagnosis of the genus *Diodon* as given in the literature of that time, according to Dr. G. S. Myers formerly of the U. S. National Museum, would be *Diodon mola* (= *Mola mola*); the only tristome definitely known to occur on *Mola mola* is the species commonly known as *Tristoma mola*; the "spots" referred to in La Martinière's description probably were mottling commonly present in specimens and due to the contrast between the darker intestinal ramifications and the lighter body tissue; and finally, the "trompe, que est situé entre ses deux petits godets supérieurs, a son extrémité supérieure hérissé de pointes" was probably the pharynx which was protruded through the oral aperture, a condition which the writer has observed in a few specimens of *T. mola*.

The most outstanding characters which differentiate this species from others in the genus are the absence of large hooks on the posterior haptor and the arrangement of the spines occurring dorsally along the margins of the body. These spines have a haphazard arrangement and do not occur in either longitudinal or transverse rows. Parona and Perugia (1889) state that these spines occur in a regular series ("Invece questa armatura chitinoso e disposta regolarmente a serie sul margini dell'animale . . ."), but the writer has not observed such an arrangement in any of the specimens available to him.

**Capsala maccallumi, n. sp.**

Figs. 22-23

*Description.*—Body oblong, 2.6 mm long by 1 mm wide; dorsal and ventral surfaces smooth. Anterior haptors about  $350\mu$  in diameter. Posterior haptor about  $900\mu$  in diameter, with pleated marginal membrane about  $120\mu$  wide; ventral surface covered with prominent conical papillae; central area of haptor an irregular heptagon; hooks  $95\mu$  long, their free ends slender and hooked; marginal hooklets 14 in number, about  $22\mu$  long. Oral aperture at level of posterior margins of anterior haptors; pharynx constricted, about  $300\mu$  long by  $266\mu$  wide; intestinal tract as in other species of genus. Common genital aperture lateral; testes apparently extending beyond confines of intestinal tract; remainder of genitalia not developed sufficiently to be made out with certainty.

*Host.*—*Euthynnus alletteratus* (Rafinesque).

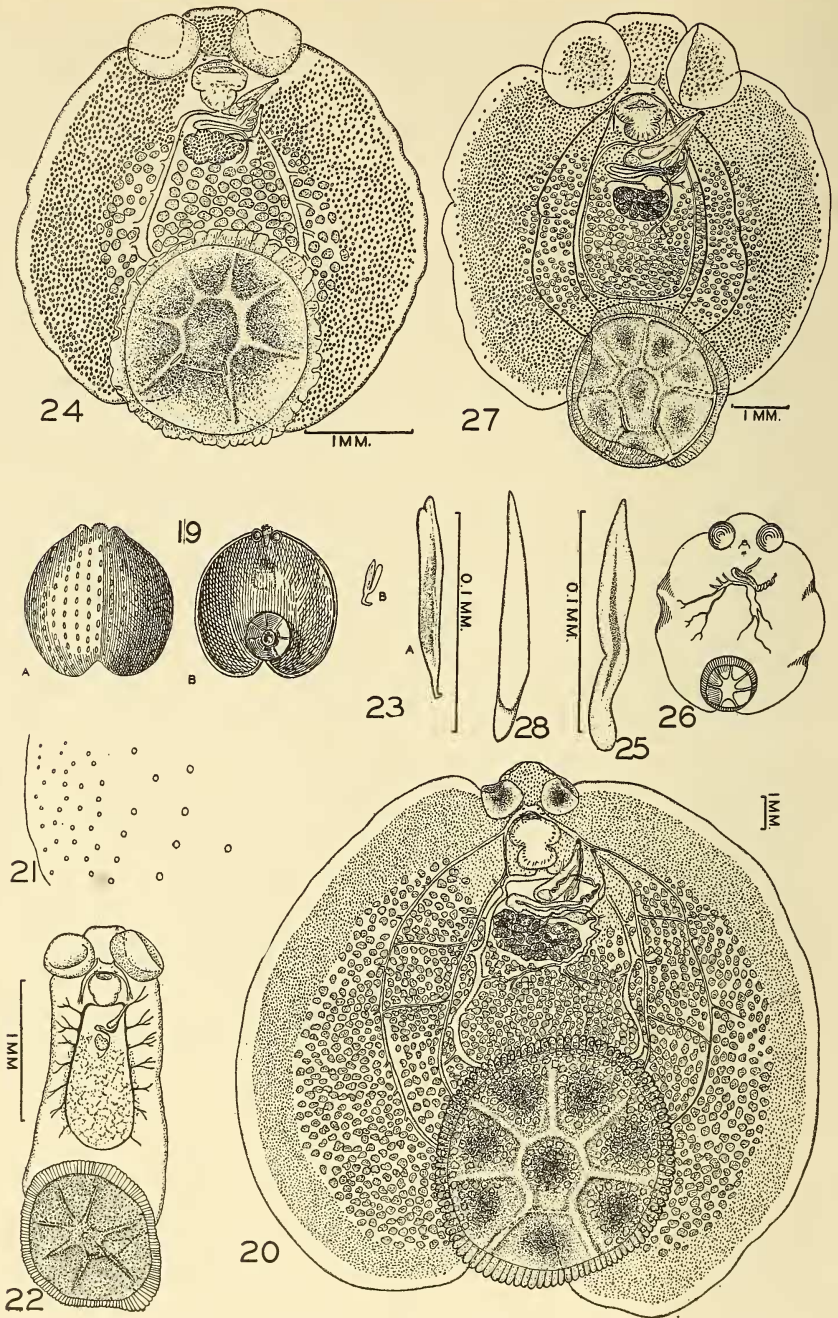
*Location.*—Gills.

*Distribution.*—United States (Woods Hole, Mass.).

*Type specimen.*—U. S. N. M. Helm. Coll. No. 35644.

This species is represented by a single immature specimen collected by G. A. MacCallum, July 20, 1915, at Woods Hole, Mass., from "*Thunnus thynnus*—Horse mackerel." The species is regarded as new on the basis of the large haptoral hooks, the free tips being hooked instead of straight or slightly curved as in the other species. The papillate condition of the ventral surface of the haptor suggests a relationship with *C. onchidiocotyle*, described by Setti (1899) from a "tonno" in Italy, and it is possible that the two spe-





Figs. 19-21.—*Capsala martinieri*. 19, complete worm (A—dorsal view, B—ventral view) after La Martinière (1797?); 20, ventral view, original; 21, diagram showing distribution of dorsal marginal spines; Figs. 22-23.—*C. maccallumi*. 22, complete worm, ventral view; 23, haptor hooks (A—large hook, B—marginal hooklet); Figs. 24-25.—*C. lintoni*. 24, complete worm, ventral view; 25, large haptor hook; Figs. 26-28.—*C. laevis*. 26, complete worm, after Verrill, 1885; 27, ventral view of type specimen, original; 28, large haptor hook.



cies may be identical; however, since Setti's description is lacking in essential details, it appears necessary to regard the two forms as distinct until a re-study of *C. onchidiocotyle* is possible.

***Capsala lintoni*, n. sp.**

Figs. 24-25

*Synonym.*—*Tristoma laeve* Verrill of Linton, 1898.

*Description.*—Body outline almost circular, 3.7 mm long by 3.5 mm wide, deeply notched posteriorly; dorsal and ventral surfaces without papillae. Anterior haptors circular, about 600 $\mu$  in diameter; posterior haptor about 1.6 mm in diameter, surrounded by a more or less pleated membrane 85 $\mu$  wide. Central area of posterior haptor an irregular heptagon with 7 ridges or septa radiating from it as in other species of genus; ventral surface of haptor covered with papillae. Hooks blade-like, slightly sinuous, about 115 $\mu$  long; marginal hooklets present, about 20 $\mu$  long. Oral aperture median, slightly anterior to level of posterior margins of anterior haptors; pharynx constricted, 510 $\mu$  long by 595 $\mu$  wide; intestinal tract as in other species of genus. Genital aperture at level of middle of pharynx and a short distance from posterior margin of left anterior haptor. Cirrus pouch club-shaped, its base in contact with posterior end of pharynx. Testes numerous, occupying interintestinal field and extending for a short distance into extraintestinal fields. Ovary lobulated, about 340 $\mu$  long by 510 $\mu$  wide, median, about 510 $\mu$  posterior to base of pharynx. Vitelline follicles extending to near margins of body and into cephalic lobe and anterior haptors. Vagina muscular, its aperture postero-median of genital aperture. Ootype immediately posterior to base of cirrus pouch. Eggs not observed.

*Host.*—*Gymnosarda pelamis* (Linnaeus).

*Location.*—Gills.

*Distribution.*—United States (Atlantic Ocean, south of Martha's Vineyard, Mass.).

*Specimen.*—U. S. N. M. Helm. Coll. No. 4878 (type).

This species is based on a single, somewhat immature specimen described by Linton (1898) as probably *Tristoma laeve* Verrill. The specimen was not in the best possible condition for study, being very dark and contracted. However, enough detail could be made out to show that it is distinct from *C. laevis* (syn., *T. laeve*), although closely related to that species. The chief differences between the two species are absence of dorsal marginal spines, and of papillae from the ventral surface of body, in *C. lintoni*. There is also a difference in the proportional sizes of the haptors; in *C. laevis* the ratio of the diameter of the anterior haptors to that of the posterior haptor is about 1:1.5, while in *C. lintoni* the ratio is about 1:2.6.

***Capsala laevis* (Verrill, 1875) Johnston, 1929**

This species as originally described by Verrill (1875) was unrecognizable; it was later figured by Verrill (1885) but no specific details were shown. A redescription of this form has recently been given by the writer (Price, 1938), the redescription being based on specimens collected by Fr. Gunther in São Paulo, Brazil. The Brazilian specimens were compared with the type (U. S. N. M. No. 7179) and found to agree in all essentials; a further con-

sideration of this species, therefore, appears unnecessary. However, figures (Figs. 26–28) of the type specimen are included for comparison with other American species.

#### Genus TRISTOMA Cuvier, 1817

*Synonym.*—*Capsala* Bosc, 1811; in part.

*Diagnosis.*—Dorsal marginal spines present or absent; when present, in numerous short transverse rows of similar or dissimilar spines. Posterior septa of haptor not bifid distally; large hooks when present, without claw-like tips. Pharynx globular or subglobular, never with constriction. Testes numerous, confined to interintestinal fields.

*Type species.*—*Tristoma coccineum* Cuvier, 1817.

The genus as present constituted contains four species as follows: *Tristoma coccineum* Cuvier, 1817, from *Xiphias gladius* and *Sphyrna zygaena* (new host); *T. integrum* Diesing, 1850, from *X. gladius*; *T. levinseni* Monticelli, 1891, from *Thynnus* sp.; and *T. uncinatum* Monticelli, 1889, from ?*Pleuronectes* sp. The first two of these species occur on North American hosts and descriptions of them are included in this paper.

#### *Tristoma coccineum* Cuvier, 1817

Figs. 29–32

*Synonyms.*—*Tristoma papillosum* Diesing, 1836; *Capsala papillosa* (Diesing, 1836) Nordmann, in Lamarek, 1840.

*Description.*—Body bluntly oval, 10 to 12 mm long by 7 to 9.5 mm wide, convex dorsally and concave ventrally. Dorsal surface, especially of postovarial region, covered with prominent papillae, and with 43 to 54 rows of marginal spines, each containing from 2 to 4 spines; innermost spine 1-cuspid, second and third spines 2- to 7-cuspid, and outermost spine comb-like. Anterior haptors more or less circular, sucker-like, 1.27 to 1.69 mm in diameter. Posterior haptor disc-like, 1.8 to 2.38 mm in diameter, provided with marginal membrane 170 to 365 $\mu$  wide, posterior margin not reaching posterior end of body; central area of haptor a complete heptagon with 7 septa radiating from it as in related species; large hooks straight, 133 to 152 $\mu$  long; marginal hooklets 15 $\mu$  long. Oral aperture median, slightly prepharyngeal, at or slightly anterior to level of posterior margins of anterior haptors. Pharynx almost globular, 1 to 1.3 mm long by 1.1 to 1.5 mm wide; intestine as in related species. Genital aperture slightly posterior to left anterior haptor. Cirrus pouch club-shaped, its base lying to left of median line posterior to pharynx. Testes numerous, confined to interintestinal field. Ovary lobulate, 680 to 795 $\mu$  long by 1.1 to 1.59 mm wide, median, about 500 to 700 $\mu$  posterior to pharynx. Vitelline follicles largely in extraintestinal fields except for relatively few follicles along course of median intestinal diverticula. Vagina slender, its proximal end expanded to form a seminal receptacle; vaginal aperture about 1 mm posterior to genital aperture. Ootype ovoid, to left of median line; metraterm slender. Eggs 114 $\mu$  long by 95 $\mu$  wide, more or less triangular and with 4 prolongations.

*Hosts.*—*Xiphias gladius* Linnaeus and *Sphyrna zygaena* (Linnaeus).

*Location.*—Gills.

*Distribution.*—United States (Woods Hole, Mass.).

*Specimens.*—U. S. N. M. Helm. Coll. Nos. 4877, 7168, 35124, 35645, 35646 and 35647.

In attempting to trace the synonymy of *Tristoma coccineum*, a complication has arisen which appears to necessitate questioning the validity of the species generally regarded as *T. coccineum* and *T. papillosum*. The situation is briefly as follows:

Cuvier (1817) erected the genus *Tristoma* for certain ectoparasitic flukes occurring on *Mola mola* and *Xiphias gladius*, and in this description he named one species, *T. coccineum*; the description was illustrated by a rather diagrammatic figure. This description is as follows:

“TRISTOME. (TRISTOMA. CUV.)”

Leur corps est un disque large et plat; à sa face inférieure est en avant un grand suçoir cartilagineux, que ne tient au corps par un court pédicule, et sous son bord postérieur s'en trouvent deux petits. Dans le parenchyme du corps rampe un vaisseau circulaire ramifié dont la nature est difficile à déterminer.

Une espèce d'un pouce et plus de largeur, colorée en rouge vif (*tristoma coccineum*. Cuv.), s'attache aux branchies de plusieurs poissons de la Méditerranée, tels que la môle, le xiphias, etc.

In this description the anterior end of the body was mistaken for the posterior end but this error was corrected in a later description (Cuvier, 1847).

From our present knowledge of the tristomes it is clear that at least 2 species were confused under the name *T. coccineum*, one from *Mola mola*, later described as *T. mola* by E. Blanchard (1847), and the other from *Xiphias gladius*, which was either the *T. coccineum* of authors or the species later described by Diesing (1836) as *T. papillosum*. Unfortunately, however, Cuvier's description is so general that it is of little value and the identity of his *T. coccineum* rests mainly upon the figure which accompanies it. This figure shows that the form which he selected could not have been from *Mola mola* but was one of the species from the sword fish, since the form from *Mola mola* is more or less cordate in shape and the posterior haptor relatively large as compared with the length of the body; the posterior end of the body of the species from *M. mola* also shows a deep notch. In the species figured by Cuvier the body was longer than wide, the posterior haptor relatively small as compared with the length of the body and no posterior notch was shown. These details eliminate E. Blanchard's *T. mola* from further consideration.

In 1826, Risso added to the description of *T. coccineum* as given by Cuvier the following: “Aux caractères donnés par M. Cuvier j'ajouterai que la partie supérieure de ce tristome est munie de petits tubercules blancs, contractiles su gré de l'animal, et que son suçoir est blanchâtre.”

Later, Diesing (1836) described as *T. papillosum* a species from *Xiphias gladius*, which was provided with tubercles or papillae on its dorsal surface, a condition which corresponded to Risso's (1826) observation of the form which he regarded as *T. coccineum*. Previous to describing *T. papillosum*, Diesing (1836) redescribed *T. coccineum*, but the species he had was the one



from *Mola mola*, and very clearly the species which E. Blanchard described as *T. mola*.

The most complete accounts of the two species from *Xiphias gladius* are those given by Taschenberg (1879) who described as *T. coccineum* a form almost circular in shape and bearing on its dorsal surface, along the lateral margins numerous, short, closely approximated, transverse rows of similar spines, while *T. papillosum* was described as a form longer than wide, with the dorsal marginal spines in less numerous rows, each row composed of dissimilar spines. Subsequent writers have adhered to the descriptions of these species as given by Taschenberg.

From the above review of the pertinent facts bearing on the identity of *T. coccineum*, it appears that in view of the illustration given by Cuvier and the addition to the description given by Risso, both in agreement with the form now generally known as *T. papillosum* Diesing, *T. papillosum* must fall as a synonym of *T. coccineum* Cuvier, and the species described by Taschenberg as *T. coccineum* must be regarded as a separate species and take the oldest available synonym which is *Tristoma integrum* Diesing.

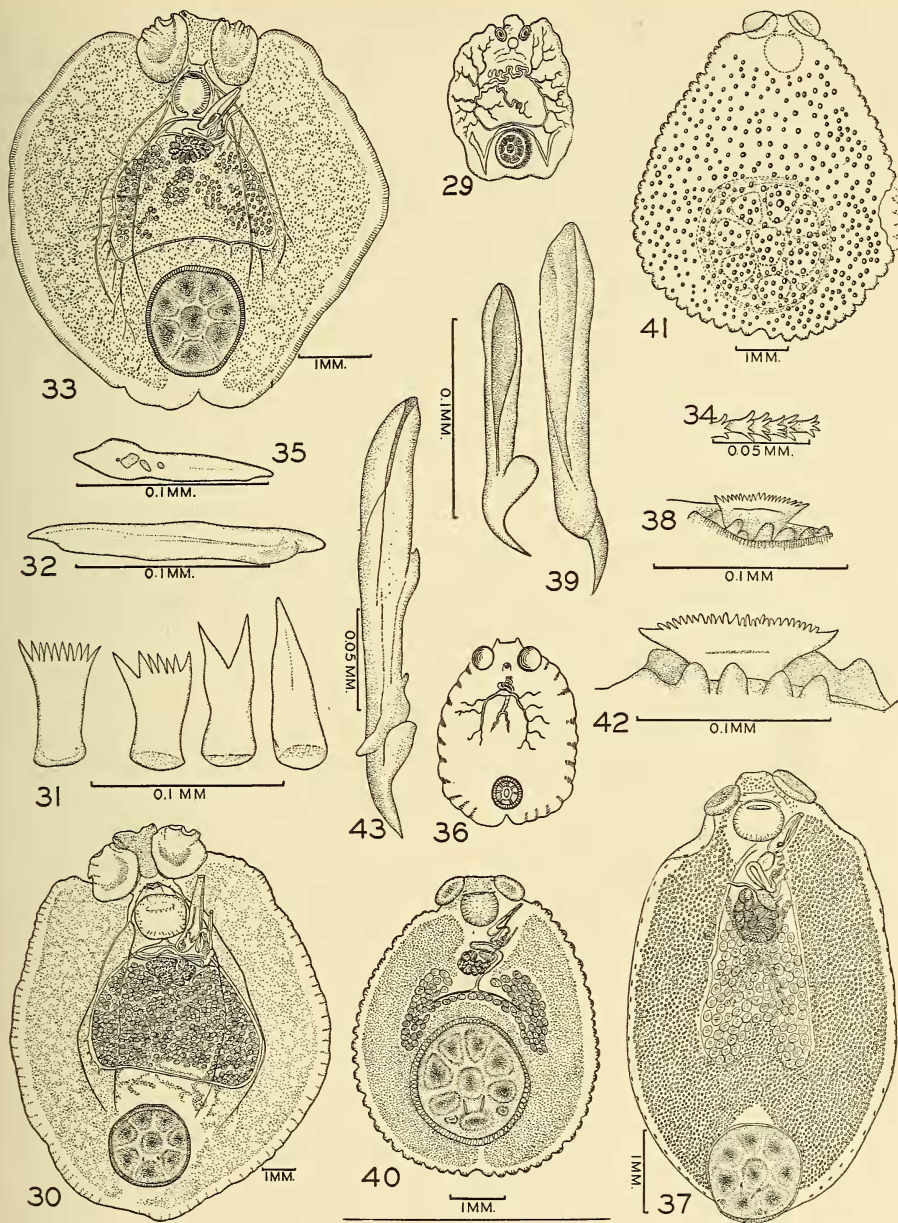
*Tristoma coccineum* (syn. *T. papillosum* of authors) is the most abundant species occurring on the sword fish. It is apparently quite host specific and probably occurs rarely on hosts other than *Xiphias gladius*. All of the specimens of this species in the United States National Museum Collections, with the exception of 1 specimen in the MacCallum collection from the hammer-head shark, *Sphyrna zygaena*, are from *Xiphias gladius*. The fact that this parasite occurs so rarely on hosts other than the sword fish makes the reported occurrences of this species from *Mola mola* doubtful.

***Tristoma integrum* Diesing, 1850**

Figs. 33-35

*Synonyms*.—*Tristoma coccineum* Cuvier, 1817, in part; *T. coccineum* Cuvier, of Taschenberg, 1879 and of subsequent authors; *T. rotundum* Goto, 1894.

*Description*.—Body more or less circular, 575 $\mu$  to 7 mm long by 6 to 6.5 mm wide. Dorsal surface convex, without papillae, with numerous transverse rows (more than 300 in one specimen) of spines along lateral margins, usually 6 spines to each row, the number per row diminishing towards the anterior and posterior ends of body. Spines similar, 3- to 5-, usually 4-cuspid, about 20 to 26 $\mu$  long by 11 $\mu$  wide at base. Ventral surface concave, smooth. Anterior haptors somewhat elliptical, 850 to 935 $\mu$  long by 765 to 850 $\mu$  wide. Posterior haptor disc-like, 1.4 to 1.6 mm in diameter, surrounded by a pleated membrane about 300 $\mu$  wide; ventral surface without papillae; central area a regular heptagon with 7 septa radiating from it as in related species; large hooks blade-like, 110 to 133 $\mu$  long, marginal hooklets 15 $\mu$  long. Oral aperture median, slightly anterior to level of posterior margins of anterior haptors. Pharynx more or less globular, without constriction, about 510 $\mu$  in diameter. Intestine as in other species of genus; anterior branches not extending into anterior haptors. Male genital aperture immediately posterior to margin of left anterior haptor. Cirrus pouch club-shaped, its base lying posterior to pharynx and slightly to left of median line. Testes numerous, confined to interintestinal field. Ovary lobulate, 255



Figs. 29-32.—*Tristoma coccineum*. 29, complete worm, after Cuvier, 1817; 30, ventral view, original; 31, dorsal marginal spines; 32, large haptor hook; Figs. 33-35.—*T. integrum*. 33, ventral view; 34, dorsal marginal spines; 35, large haptor hook; Figs. 36-39.—*Capsaloides cornutum*. 36, complete worm, after Verrill, 1885; 37, ventral view, original; 38, dorsal marginal spines; 39, large haptor hooks; Figs. 40-43.—*Capsaloides magnaspinosus*. 40, ventral view; 41, dorsal view; 42, dorsal marginal spine; 43, large haptor hook.

to  $370\mu$  long by  $680$  to  $765\mu$  wide, median, about  $400\mu$  posterior to pharynx. Vitelline follicles largely in extraintestinal fields except for few follicles along course of median intestinal branches, extending into cephalic lobe but not into anterior haptors. Vagina slender, opening postero-median of genital apertures. Ootype immediately posterior to cirrus punch; metraterm slender, opening, according to Taschenberg (1879) and Goto (1894), immediately posterior to male aperture; opening not observed by the present writer. Egg more or less triangular,  $90\mu$  wide, with 4 prolongations.

*Host.*—*Xiphias gladius* Linnaeus.

*Location.*—Gills.

*Distribution.*—United States (Woods Hole, Mass.).

*Specimens.*—U. S. N. M. Helm. Coll. No. 35299.

This species apparently is quite rare on the sword fish, *Xiphias gladius*, from American waters, as only 2 specimens were found in the collections of the United States National Museum, in spite of the fact that a number of lots of specimens of *T. coccineum* (syn. *T. papillosum*) were available from that host. Both of these specimens of *T. integrum* were collected July 9, 1913, by G. A. MacCallum at Woods Hole, Mass.; the above description is based on these specimens. This description corresponds in general to that given by Taschenberg (1879) and by Goto (1894), except that the specimens available were considerably smaller than those described by Taschenberg and by Goto, the size given by the former being 17 mm long by 19 mm wide and that by the latter 11.5 mm long by 13 mm wide.

The most outstanding differences between *T. integrum* and *T. coccineum* are in the number of rows of dorsal marginal spines, and in the morphology of these spines. The rows of spines on *T. integrum* are very numerous (more than 300 on each side of the body in one specimen) and the spines in each row are similar in form. There are fewer rows of spines on *T. coccineum* (43 to 54 in the specimens examined) and the spines are dissimilar; the most median spines have only 1 cusp, the outermost spine has 10 or more cusps, and the others have from 2 to 7 cusps.

#### Genus CAPSALOIDES Price 1938

*Synonyms.*—*Capsala* Bosc, 1811, in part; *Tristoma* Cuvier, 1817, in part; *Calsaloides* Price, 1936 (printer's error).

*Diagnosis.*—Dorsal marginal spines present, crown-like, in a single longitudinal row. Posterior septa of posterior haptor bifid distally; large hooks with claw-like tips. Pharynx globular or subglobular, never with constriction. Testes numerous, forming a W-like pattern, confined to interintestinal field.

*Type species.*—*Capsaloides cornutum* (Verrill, 1875), Price, 1938.

Four species are included in the genus *Capsaloides* as follows: *Capsaloides cornutum* (Verrill, 1875), from *Tetrapturus imperator*; *C. magnaspinosus*, n. sp., from *T. imperator*; *C. sinuatum* (Goto, 1894), from *Histiophorus* sp.; and *C. perugiai* (Setti, 1898), from *Tetrapturus belone*. Only first two of these are from North America.



**Capsaloides cornutum** (Verrill, 1875) Price, 1938 Figs. 36-39

*Synonyms.*—*Tristoma cornutum* Verrill, 1875; *Capsala cornuta* (Verrill, 1875) Johnston, 1929.

*Description.*—Body elongate oval, 5.3 to 8 mm long by 3.8 to 6 mm wide, dorsal and ventral surfaces covered with minute papillae, margins entire or slightly sinuate. Dorsal marginal spines crown-shaped, 38 to 76 $\mu$  wide, arranged in a single row of 21 spines on right side and 26 on left; anterior spines on left side smaller than others, in a group of 4 to 6, and separated from larger spines by a relatively wide space at level of genital aperture. Anterior haptors sucker-like, 595 to 850 $\mu$  in diameter. Posterior haptor disc-like, 1.19 mm in diameter, surrounded by a festooned marginal membrane about 85 $\mu$  wide, sometimes projecting slightly beyond posterior margin of body. Central area of posterior haptor an irregular heptagon with 7 ridges or septa radiating from it; each of the posterior septa bifurcating distally and enclosing a small triangular lacuna. Large hooks 133 to 178 $\mu$  long, tips claw-like and slightly curved; marginal hooklets 14 in number, 15 $\mu$  long. Oral aperture median, slightly anterior to level of posterior margins of anterior haptors. Pharynx more or less globular, 434 to 510 $\mu$  long by 510 $\mu$  to 595 $\mu$  wide; intestine as in related species. Common genital aperture slightly posterior to margin or left anterior haptor, about midway between body margin and pharynx. Cirrus pouch club-shaped, its base lying to left of median line at posterior margin of pharynx. Testes numerous, in inter-intestinal field, forming a pattern suggestive of the letter W. Ovary lobulated, 340 $\mu$  long by 680 $\mu$  wide, median, pretesticular. Vitelline follicles largely in extraintestinal fields. Vagina slender, opening at level of ootype and ventral to left intestinal branch. Ootype large, oval, postero-median of base of cirrus pouch; metraterm slender. No eggs observed.

*Host.*—*Tetrapturus imperator* (Bloch and Schneider).

*Location.*—Gills.

*Distribution.*—United States (Block Island, and Woods Hole, Mass.).

*Specimens.*—U. S. N. M. Helm. Coll. Nos. 7178 (type) and 35136.

In 1875, Verrill described an ectoparasitic trematode which he named *Tristoma cornutum* as follows:

Body thin, broad elliptical, or oblong emarginate posteriorly; anterior end narrowed, produced, and with a short, tapering, tentacle-like process at each angle; upper surface with minute rounded granules and small scale-like wrinkles; smooth beneath. Posterior sucker small, less than one fourth breadth of the body, its border divided into much fewer and larger teeth than in the preceding species [*T. laeve*]; anterior suckers two thirds as broad as the posterior, nearly two diameters apart.

Color light red or flesh color.

Neither the host name nor an illustration of the species accompanied the description. Later Verrill (1885) gave a rather diagrammatic figure of the species and stated that the host was *Tetrapturus albidus* (= *T. imperator*). Owing to the incompleteness of the description and figure the species has not been identifiable, and up to the present time no additional reports of its occurrence have been made.

In going over the monogenetic trematodes in the Helminthological Collection of the U. S. National Museum, 1 specimen (U. S. N. M. 7176) labelled

"*Tristoma cornutum* Verrill, type, gill of bill fish, Block Island" was found, and in the MacCallum collection there were several specimens (U. S. N. M. 35136) labelled "*Tristomum coccineum*, gills, Spear fish—*Tetrapturus imperator*," which proved to be the same species as that described by Verrill as *T. cornutum*. The type specimen was not in good condition, but sufficient detail could be made out to show that the specimens collected by MacCallum were *T. cornutum*. The above description is based largely on the specimens collected by MacCallum.

There are several characters which *Tristoma cornutum* shares with certain other members of the family; these seem to be constant and for that reason the genus *Capsaloides* was proposed to include *Tristoma sinuatum* Goto, *T. perugiai* Setti, and *T. cornutum*, the latter being designated as type; to this genus is also added *C. magnaspinosus*, n. sp. The species described as *T. papillosum* Diesing by Kölliker (1849) also belongs in this genus, but whether it represents a distinct species or is identical with one of the other species included in the genus *Capsaloides* cannot be determined from the original description; it bears considerable resemblance to *C. cornutum*, but may possibly be identical with *C. perugiai* which was described from the same host as Kölliker's *T. papillosum*.

***Capsaloides magnaspinosus* n. sp.**

Figs. 40–43

*Description*.—Body oval to piriform in outline, 5.4 to 6.6 mm long by 4.6 to 5.3 mm wide. Dorsal surface covered with relatively large, wart-like papillae about  $85\mu$  in diameter; ventral surface smooth. Margins of body serrate, each projection bearing dorsally a crown-shaped spine 95 to  $125\mu$  wide; about 30 spines on each side, each spine set in a depression bearing a number of small papillae on its margins. Anterior haptors sucker-like, oval,  $425\mu$  by  $595$  to  $680\mu$ . Posterior haptor 2.1 to 2.38 mm in diameter, surrounded by a festooned marginal membrane about  $510\mu$  wide; posterior margin of haptor not reaching posterior end of body. Central area of haptor an irregular heptagon with 7 septa radiating from it as in other tristomes; each of the posterior septa bifurcates distally and encloses a small triangular lacuna. Large hooks 161 to  $311\mu$  long, tips claw-like and curved; marginal hooklets (?) 14 in number, about  $15\mu$  long. Oral aperture median, near level of posterior margins of anterior haptors. Pharynx globular,  $510\mu$  to 1 mm long by  $730\mu$  to 1.19 mm. wide. Intestine as in other tristomes. Common genital aperture near posterior margin of left anterior haptor. Cirrus pouch club-shaped, its base at median line posterior to pharynx. Testes numerous, in 2 lateral groups connected medially, forming a W-shaped pattern, confined to interintestinal field. Ovary lobulate, median, 510 to  $850\mu$  long by  $680\mu$  to 1.02 mm wide, about midway between posterior end of pharynx and connecting band of testes. Vitelline follicles occupying greater part of body except for portions occupied by other organs. Vagina slender, opening some distance posterior to genital aperture. Ootype oval, posterior to base of cirrus pouch; metraterm slender. Eggs not observed.

*Host*.—*Tetrapturus imperator* (Bloch and Schneider).

*Location*.—"Nares."

*Distribution*.—United States (Woods Hole, Mass.).

*Specimens*.—U. S. N. M. Helm. Coll. No. 35648 (type and paratypes).

This description is based on 3 specimens collected "ex nares" of *Tetrapturus imperator*, by G. A. MacCallum, July 25, 1924, at Woods Hole, Mass. *Capsaloides magnaspinosus* is easily distinguished from all other species by the relatively large posterior haptor and by the size of the dorsal marginal spines, which are very large as compared with those on other species of the genus. The dorsal papillae are quite prominent and much larger than those of *C. cornutum* (Verrill).

## LITERATURE CITED

- ABILDGAARD, PETER CHRISTIAN. *Almindelige Betragtninger over Indvolde-Orme, Bemærkninger ved Hundsteilens Baendelorm, og Beskrivelse med Figurer af nogle nye Baendelorm.* Skr. Naturh. Selsk., Kjøbenhavn, 1(1): 26-64. 1790.
- BLANCHARD, ÉMILE. *Recherches sur l'organisation des vers.* Ann. d. sc. nat., Par., Zool., 3. s., 8: 271-341. 1847.
- BOSC, LOUIS AUGUSTINE GUILLAUME. *Sur deux nouveau genres de vers.* N. Bull. d. sc. Soc. Philom., Paris, An. 4(51), 2: 384-385. 1811.
- CANAVAN, W. P. N. *On a trematode Allopyge undulatus n. sp. parasitic in Lilford's crane (Megalornis grus lilfordi).* Parasitology 26(1): 117-120. 1934.
- CUVIER, G. *Le règne animal distribué d'après son organisation, pour servir de base à l'histoire naturelle des animaux et d'introduction à l'anatomie comparée.* 4: viii+255 pp., 15 pls. Paris. 1817.
- . *Le règne animal (etc.)*.<sup>1</sup> Disciples edit. 19 (Zoophytes): 72-80. 1836-49.
- DIESING, KARL MORITZ. *Monographie der Gattung Tristoma.* Nova acta Phys.-med. Acad. nat. curios., Vratislaviae et Bonnae 18(1): 1-16. 1836.
- DUJARDIN, FELIX. *Histoire naturelle des helminthes ou vers intestinaux.* xvi+654+15 pp., 12 pls. Paris. 1845.
- FOLDA, FLORENCE. *Megalocotyle marginata, a new genus of ectoparasitic trematodes from the rock fish.* Publications Puget Sound Biol. Station, Univ. Washington, (Seattle) 6: 195-206. 1928.
- GOTO, SEITARO. *Studies on the ectoparasitic trematodes of Japan.* J. Coll. Sc. Imp. Univ., Japan, Tokyo 8(1): 1-273. 1894.
- GUBERLET, JOHN E. *Two new ectoparasitic trematodes from the sting ray, Myliobatis californicus.* Amer. Midl. Nat. 17: 954-964. 1936.
- HEATH, HAROLD. *The anatomy of Epidella squamula, sp. nov.* Proc. Calif. Acad. Sc. San Fran., Zool. 3. s. 3(4): 109-136. 1902.
- HUGHES, WINIFRED KENT. *Some trematode parasites on the gills of Victorian fishes.* Proc. Roy. Soc. Victoria, Melbourne, n. s. 41(1): 45-54. 1928.
- ISHII, N. *Some new ectoparasitic trematodes of marine fishes (Japanese text; English summary).* Zool. Mag., Tokyo 48(8-10): 781-790. 1936.
- ISHII, N., and SAWADA, T. *Studies on the ectoparasitic trematodes.* In Livro Jubilar Prof. Travassos. Rio de Janeiro, Brasil, 231-243. 1938.
- JAHN, TH. L., and KUHN, L. ROLAND. *The life history of Epibdella melleni MacCallum, 1927, a monogenetic trematode parasitic on marine fishes.* Biol. Bull. 62(1): 89-111. 1932.
- JOHNSTON, T. HARVEY. *Remarks on the synonymy of certain tristomatid trematode genera.* Tr. and Proc. Roy. Soc. South Australia 53: 71-78. 1929.
- . *New trematodes from the subantarctic and antarctic.* Austral. J. Exper. Biol. and Med. Sc. 8(2): 91-98. 1931.
- VON KÖLLIKER, RUDOLF ALBERT. *Ueber Tristoma papillosum Dies.* Ber. v. d. k. zootom. Anst. zu Würzb., Leipz. (1847-48) 2: 21-27. 1849.
- LAMARCK, JEAN-BAPTISTE-PIERRE-ANTOINE DE MONET. *Histoire naturelle des animaux sans vertèbres.* 5: 612 pp., Paris. 1818.
- VON LINSTOW, O. F. B. *Beitrag zur Anatomie von Phylline Hendorffi.* Arch. f. mikr. Anat., Bonn 33(2): 163-180. 1889.
- LINTON, EDWIN. *Notes on the trematode parasites of fishes.* Proc. U. S. Nat. Mus., Wash. (1133) 20: 507-548. 1898.
- . *Fish parasites collected at Woods Hole in 1898.* pp. 267-304. 1900.
- . *Parasites of fishes of the Woods Hole Region.* pp. 405-492. 1901.

<sup>1</sup> Sherborn (1922, Ann. & Mag. Nat. Hist., 9. s. (59), 555-556) has supplied the dates for this edition of Cuvier, being those recorded by the British Museum at the time the various parts were received. Pages 72-80, the part referred to in this paper appeared in 1847.



- MACCALLUM, G. A. *Studies in Helminthology. Part 1. Trematodes. Part 2. Cestodes. Part 3. Nematodes.* Zoopathologica, N. Y. 1(6); (137)–284. 1921.
- . *A new ectoparasitic trematode, Epibdella melleni, sp. nov.* Zoopathologica, N. Y. 1(8): 291–300. 1927.
- DE LA MARTINIÈRE. *Mémoire sur quelques insectes.* Obs. sur Phys. (etc.) 31: 207–209. 1787.
- . *Atlas du voyage de la Pérouse.* 69 pls. (1797?).
- MESERVE, FRANK G. *Some monogenetic trematodes from the Galapagos Islands and the neighboring Pacific.* Allan Hancock Pacific Expeditions 2(5): 31–73. 1938.
- MONTICELLI, F. S. *Il genere Nitzschia von Baer.* Ann. mus. zool. d. r. Univ. di Napoli, n. s. 2(27): 19 pp. 1908.
- . *Identificazione di una r. sp. del genere Encotyllabe (lintonii Montic.).* Boll. Soc. di nat. in Napoli (1908), 22, 2. s., 2: 86–88. 1909.
- NIGRELLI, ROSS F., and BREDER, CHARLES M., Jr. *The susceptibility and immunity of certain marine fishes to Epibdella melleni, a monogenetic trematode.* J. Parasitol. 20(5): 259–269. 1934.
- OKEN, LORENZ. *Lehrbuch der Naturgeschichte.* 3. Theil: Zoologie. 1. Abt.: Fleischlose Thiere. 1 p. 1., 842+xviii pp.; Atlas, iv pp., 40 pls. Leipzig & Jena. 1815.
- PARONA, C., and PERUGIA, A. *Di alcuni trematodi ectoparassiti di pesci marini.* Nota preventiva. (Res. Ligusticae. 8). Ann. mus. civ. di storia nat. di Genova, 27, 2. s. 7: 740–747. 1889.
- . *Sopra due nuove specie di trematodi ectoparassiti di pesci marini.* (Phylline monticellii e Placunella vallei). Atti Soc. Ligust. di sc. nat. e geogr., Genova 6(1): 84–87. 1895.
- PERRIER, EDMOND. *Traité de zoologie.* Pt. 2, fasc. 4, pp. 1345–2136. Paris. 1897.
- PRICE, EMMETT W. *New monogenetic trematodes from marine fishes.* Smithsonian Misc. Coll. 91(18): 1–3. 1934.
- . *North American monogenetic trematodes.* Geo. Wash. Univ. Bull. (Summaries of Doctoral Theses, 1934–36), pp. 10–11. 1936.
- . *Redescriptions of two exotic species of monogenetic trematodes of the family Capsalidae Baird from the MacCallum Collection.* Proc. Helminth. Soc. Wash. 4(1): 25–27. 1937.
- . *North American monogenetic trematodes. I. The superfamily Gyrodactyloidea.* Jour. Wash. Acad. Sci. 27(3): 114–130; (4): 146–164. 1937.
- . *North American monogenetic trematodes. II. The families Monocotylidae, Microbothriidae, Acanthocotylidae and Udonellidae (Capsaloidea).* Jour. Wash. Acad. Sci. 28(3): 109–126; (4): 183–198. 1938.
- . *The monogenetic trematodes of Latin America.* In Livro Jubilar Prof. Travassos. Rio de Janeiro, Brasil 407–413. 1938.
- RISSE, A. *Histoire naturelle des principales productions de l'Europe meridionale et principalement de celles des environs de Nice et des Alpes-Maritimes.* 5: viii+402 pp., 10 pls., Paris. 1826.
- RUDOLPHI, CARL ASMUND. *Entozoorum synopsis cui accedunt mantissa duplex et indices locupletissimi.* x+811 pp., 3 pls. Berolini. 1819.
- SAINT-REMY, GEORGES. *Synopsis des trematodes monogènes.* Rev. biol. du nord de la France, Lille 3(12): 449–457. 1891.
- SETTI, ERNESTO. *Secondo contributo per una revisione dei tristomi e descrizione di una nuova specie.* Atti Soc. Ligust. di sc. nat. e geogr., Genova 10(2): 117–125. 1899.
- STAFFORD, J. *Trematodes from Canadian fishes.* Zool. Anz., Leipz. 27(16–17): 481–495. 1904.
- TASCHENBERG, OTTO. *Zur Systematik der monogenetischen Trematoden.* Ztschr. f. d. ges. Naturw., Berl. 52, 3. F. 4: 232–265. 1879.
- VERRILL, A. E. *Brief contributions to zoology from the museum of Yale College. 33. Results of dredging expeditions off the New England coast in 1874.* Am. J. Sc. and Arts, N. Haven, 110, 3. s. (55), 10: 36–43. 1875.
- . *Results of explorations made by the steamer "Albatross," off the northern coast of the United States, in 1883.* Rep. U. S. Fish Com., Wash. (1883), pt. 11, pp. 503–699, pls. 1–44. 1885.
- YAMAGUTI, S. *Studies on the helminth fauna of Japan. Part 2. Trematodes of fishes, I.* Japan J. Zool. 5(3): 249–541. 1934.
- . *Studies on the helminth fauna of Japan. Part 19. Fourteen new ectoparasitic trematodes of fishes.* (Published by author.) Lab. of Parasitol., Kyoto Imp. Univ., pp. 1–28, pls. 1–6. 1937.