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Lists of Larval Worms from Marine Invertebrates of the Pacific Coast of North America

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ABSTRACT: Immature stages of 73 digenetic trematodes are listed by their families, marine invertebrate hosts, and localities and then cross listed according to their molluscan hosts. The list contains many new host records, and larval stages of 15 digenetic trematodes were newly recorded from gastropods from British Columbia and California. A list of immature stages of 14 cestodes, acanthocephalans, and nematodes is also included.

KEY WORDS: Digenea, Cestoda, Acanthocephala, Nematoda, marine mollusks, invertebrate hosts, Pacific coast, North America.

Although immature stages are recognized to be as important as adults in the descriptions of parasites, few studies focus on larval helminths in marine invertebrates. Stunkard (1983) pointed out the difficulties in conducting studies on marine parasites but the necessity to do so should concern all biologists interested in making inventories of parasites and in conserving biodiversity (Pritchard, 1989). The marine ecosystem has become particularly vulnerable to physical changes which in turn can affect both host and parasite populations. My studies of larval digenetic trematodes began in 1957 at Friday Harbor, Washington. Since then, many parasites were found in marine invertebrates from British Columbia to California. Additional sampling was not possible, or when recent collections were attempted, snails and clams were found to be scarce due to oil pollution, or successive changes in the physical environment, or the use of lead-based paints on boats. In this paper I provide lists of larval stages of digenetic trematodes, cestodes, acanthocephalans, and nematodes along with their hosts and localities.

Methods and Materials
Snails, clams, and other invertebrates have been collected by the author at Friday Harbor, Washington (WA), and Vancouver, British Columbia (BC). Eric Cabot collected subtidal snails at Saturnina Island, BC; W. P. Sousa provided infected Cerithidea snails from Bolinas Lagoon, California (CA), and G. M. Ruiz gave specimens from clams from Bodega and San Francisco bays, CA. Mollusks were isolated to find free-swimming parasites and then dissected to obtain larval stages. The parasites were studied alive with the use of vital dyes. For permanent preparations, they were usually fixed in hot seawater, transferred to alcohol-formalin-acetic acid and stored in 70% ethanol. They were stained with Semichon's carmine and mounted in permount. Most of the measurements were made on preserved specimens. Measurements are given in micrometers unless otherwise indicated with the mean in parentheses. Drawings were made with the aid of a camera lucida.

Stages that I have reported for the first time are designated with *mihi*. Host and distribution records not previously published are indicated in the list with asterisks. The names of the molluscan hosts and common names when given are cited according to Abbott (1974) and those of other invertebrates are cited according to Austin (1985). Accession numbers are given for specimens in the United States National Museum Helminthological Collections.

List 1. Larval Digeneans from Marine Invertebrates from the North American Pacific Coast

Class TREMATODA
Subclass DIGENEA
Order STRIGEIFORMES
Family CYATHOCOTYLIDAE
Stage: Furcocercous cercaria
Location: Sporocyst in mantle
Host: *Cerithidea californica* Haldeman, California
Horn Shell

Localities: Upper Newport Bay, Bolinas Lagoon, CA
Records: Martin (1961, 1972), Ching and Sousa, 1986*
USNM Helm. Coll. No. 81066

2. Cyathocotylid species
Stage: Furcocercous cercaria
Location: Sporocyst in digestive gland
Host: *Cerithidea californica*
Localities: Upper Newport Bay, Bolinas Lagoon, CA


Family SCHISTOSOMATIDAE

3. *Austrobilharzia variglandis* (Miller and Northup, 1926) Penner, 1953
Stage: Furcocercous cercaria
Location: Sporocyst in gonads
Host: *Ilyanassa obsoleta* (Say), Eastern Mud Nassa
Locality: Vancouver, BC
Record: Ching, 1964*, identification according to Stunkard and Hinchliffe (1952)

4. *Austrobilharzia* sp.
Stage: Furcocercous cercaria
Location: Sporocyst in digestive gland
Host: *Cerithidea californica*
Locality: Upper Newport Bay, CA
Record: Martin (1972)
5. *Cercaria littorinalinae* Penner, 1950
   Stage: Furcocercous cercaria
   Location: Not mentioned, sporocyst in digestive gland?
   Host: *Littorina planaxis* Philippi, Eroded Periwinkle
   Locality: Southern California
   Record: Penner (1950)

Order HEMIURIIFORMES

Family HEMIURIIDAE

6. *Cercaria B* Miller, 1925
   Stage: Cystophorous cercaria
   Location: Redia in digestive gland
   Host: *Nucella lamellosa* (Gmelin), Frilled Dogwinkle
   Locality: Friday Harbor, WA
   Records: Miller (1925), Ching (1960)

7. *Cercaria C* Ching, 1960
   Stage: Cystophorous cercaria
   Location: Redia in digestive gland
   Host: *Dentalium dalli* Pilsbry and Sharp
   Locality: Friday Harbor, WA
   Record: Ching (1960)

8. Hemiuriid Metacercaria
   Stage: Metacercaria
   Location: Hemocoel
   Host: *Mesamphiascus parvus*
   Locality: Friday Harbor, WA
   Record: Ching (1960). The generic name of the host is not listed by Austin (1985), and the co-popod may be *Amphiaccus parvus*.

9. Hemiuriid Metacercaria
   Stage: Metacercaria
   Location: Unknown
   Host: *Bolinopsis microptera*
   Locality: Puget Sound, WA
   Record: Lloyd (1938). *Bolinopsis microptera* is a synonym of the ctenophore, *B. infundibulum* (Muller), according to Austin (1985).

10. Hemiuriid Cercaria *mihi* 1 (Fig. 1)
    Stage: Cystophorous cercaria
    Location: Redia in digestive gland
    Host: *Alvania compacta* Carpenter, Compact Alvania
    Locality: Saturnina I., BC
    Record: Ching, 1977*
    USNM Helm. Coll. No. 81068
    Notes: The prevalence was 3 of 487 of the subtidal snails. The rediae are elongate about 1 mm in length. The cercaria has a delivery tube and 3 appendages.

11. *Lecithaster salmonis* Yamaguti, 1934
    Stage: Cystophorous cercaria
    Location: Redia in digestive gland
    Hosts: *Nucella canaliculata* Duclos, Channeled Dogwinkle; *N. emarginata* (Deshayes), Emarginate Dogwinkle
    Localities and records: Friday Harbor, WA, by Miller as *Cercaria A* (1925) and Ching (1960); BC, by Boyce (1966) as *L. gibbous*.
    Family BUCEPHALIDAE

    Stage: Furcocercous cercaria
    Location: Sporocyst in digestive gland
    Host: *Mytilus californianus* Conrad, Californian Mussel
    Locality: Dillon Beach, CA
    Record: Giles (1962)

13. Bucephalid Cercaria *mihi* 2
    Stage: Furcocercous cercaria
    Location: Sporocyst in digestive gland
    Host: *Lyonsia* sp.
    Locality: Friday Harbor, WA
    Record: Ching, 1958*
    Note: The cercaria and host species are similar to those of *Rhipidocotyle* spp. described by Stunkard (1976).

Family FELLODISTOMIDAE

    Stage: Trichocercous cercaria
    Location: Sporocyst in digestive gland
    Host: *Macoma marginata* (Broderip and Sowerby), Inconspicuous *Macoma*
    Locality: Vancouver, BC
    USNM Helm. Coll. No. 81069
    Notes: The prevalence 1963 was 2.7% or 27 of 1,138 clams. The cercaria resembled young forms found in smelt hosts in the arrangement and development of the gonads (Margolis and Ching, 1965).

15. Fellodistomid Metacercaria *mihi* 3
    Stage: Metacercaria
    Location: Digestive gland
    Host: *Tapes philippinarum* (Adams and Reeve), Japanese Littleneck
    Locality: Vancouver I., BC
    Record: Ching, 1987*
    Notes: About 150 clams from 15 areas were sampled with 1–2 metacercariae found in 7 of 15 clams in 1 area.

Family GYMNOPHALLIDAE

16. *Cercaria margaritensis* Ching, 1982
    Stage: Furcocercous germinal sac
    Location: Germinal sac in extrapallial cavity
    Hosts: *Margarites costalis* (Gould), Northern Rosy Margarite; *M. helicinus* (Phipps), Helicina Margarite; *M. pupillus* (Gould), Puppet Margarite
    Localities: Saturnina I., BC
    Record: Ching (1982)
    USNM Helm. Coll. No. 81070

17. *Gymnophallus delicatus* (Olsson, 1893) Odhner, 1900
    Stage: Metacercaria
    Location: Extrapallial cavity
    Host: *Mytilus edulis* L., Blue Mussel
    Locality: Vancouver, BC
    Record: Ching, 1963*, identified from Stunkard and Uzmann (1958)
    USNM Helm. Coll. No. 81071

18. *Gymnophallus somateriae* (Levinson, 1881) Odhner, 1900
    Stage: Furcocercous cercaria
    Location: Sporocyst in digestive gland
    Stage: Metacercaria
    Location: Extrapallial cavity
Host for 2 stages: *Macoma inconspicua*
Locality: Vancouver, BC
USNM Helm. Coll. Nos. 81072, 81073

19. *Gymnophallus* sp.
Stage: Metacercaria
Location: Extrappallial cavity
Hosts: *Cryptomya californica* (Conrad), California
Glass Mya, *Mya arenaria* (L.), Soft-shell Clam
Record: Ching, 1962*, identified from Stunkard and Uzmann (1958)
USNM Coll. No. 81074

20. *Lacunovermis conspicuus* Ching, 1965
Stage: Furcocercous cercaria
Location: Sporocyst in digestive gland
Host for 2 stages: *Macoma inconspicua*
Locality: Vancouver, BC
Record: Ching (1965a)

Stage: Metacercaria
Location: Sporocyst in digestive gland
Host: *Macoma inconspicua*
Locality: Vancouver, BC
Record: Ching (1965a)

22. *Parvatrema borealis* Stunkard and Uzmann, 1958
Stage: Furcocercous cercaria
Location: Sporocyst in digestive gland
Stage: Metacercaria
Location: Extrapallial cavity
Hosts for 2 stages: *Nuticola tantilla* (Gould), Tantilla Transennella; *Gemma gemma* (Totten), Amethyst Gem Clam
Localities and records: Friday Harbor, WA, by Ching, 1959*; San Francisco Bay, CA, by Oglesby (1965); Bodega Bay, CA, by Ching and Ruiz, 1986*
USNM Helm. Coll. No. 81075

23. *Parvatrema obscurus* (Ching, 1960) James, 1964
Stage: Metacercaria
Location: Digestive gland
Hosts: "*Collisella* scabra" (Gould), Rough Limpet; *Lottia digitalis* (Rathke), Fingered Limpet
Localities: Bodega Bay to San Nicholas I., CA
Record: Ching and Grosholz (1988)
USNM Helm. Coll. No. 79923

24. Gymnophallid Metacercaria
Stage: Metacercaria
Location: Gills, mantle
Host: *Crassostrea gigas* (Thunberg), Giant Pacific Oyster
Localities: Broughton I., Fanny Bay, Vancouver I., BC
Record: Bower, 1987, pers. comm., Pacific Biological Station, Nanaimo, BC

Order PLAGIORCHIIFORMES
Family ACANTHOCOLPIDAE
25. *Cercaria foliatae* Miller, 1925
Stage: Oculate cercaria
Location: Sporocyst in digestive gland
Host: *Ceratostoma foliatum* (Gmelin), Foliated Thorn Purpura
Locality: Friday Harbor, WA
Record: Miller (1925). This cercaria is placed in this family because of its resemblance to the cercaria of *Stephanostomum baccatum* described by Wolfgang (1955) and the close relationship of the hosts.

Family ENENTERIDAE
26. Enenterid *Cercaria mihi 4* (Fig. 2)
Stage: Tail-less cercaria
Location: Redia in digestive gland
Host: *Alvania compacta*
Locality: Saturnina L., BC
Record: Ching, 1978*
USNM Helm. Coll. No. 81076
Notes: A single infection was found in 487 snails. The cercaria appears to be similar to that of *Neophisus lagenaformis* as described by Koie (1973). Some opecoelid-like genera with body spination including *Neophisus* have been placed in this family by Gibson and Bray (1982).

Family MICROPHALLIDAE
Tribe MARITREMATIDI
27. *Maritrema gratiosum* Nicoll, 1907
Stage: Metacercaria
Location: Hemocoel
Host: *Balanus glandula* Darwin
Locality: Vancouver, BC
Record: Ching (1978)

Stage: Xiphidiocercaria
Location: Sporocyst in digestive gland
Hosts: *Littorina scutulata* Gould, Cheekered Periwinkle; *L. sitkana* Philippi, Sitka Periwinkle
Stage: Metacercaria
Location: Digestive gland
Hosts: *Hemigrapsus nudus* (Dana), *H. oreonensis* (Dana)
Localities: Vancouver, BC; Bodega Bay, CA
Records: Ching (1962b), Ching, 1986*

Stage: Metacercaria
Location: Hemocoel
Hosts: *Telorchestia traskiana* Simpson, Gnornosphaeroma oregonense Dana
Locality: Vancouver, BC
Record: Ching (1974)
USNM Helm. Coll. No. 81077

30. *Maritrema pacifica* Ching, 1974
Stage: Metacercaria
Location: Hemocoel
Host: *Megalorchestia corniculata* (Stout)
Locality: Santa Barbara, CA
Record: Ching (1974)
USNM Helm. Coll. No. 81078

Stage: Xiphidiocercaria
Location: Sporocyst in digestive gland
Host: *Cerithidea californica*
Stage: Metacercaria
Location: Muscles
Host: *Uca crenulata* (Lockington)
Localities: Upper Newport Bay, Bolinas Lagoon, CA
32. Pseudospelotrema japonicum
Stage: Metacercaria
Location: Thoracic ganglion
Localities: Willapa Bay, WA; Vancouver, BC
Records: Sparks and Hibbert (1981), identified by Ching, 1988*

33. Ascorhytis charadriformis (Young, 1949) Ching, 1965
Stage: Xiphidiocercaria
Location: Sporocyst in digestive gland
Hosts: Littorina scutulata, L. sitkana
Records: Ching, 1957; Ching, 1974*

34. Microphallus nicolli (Cable and Hunninen, 1940)
Baer, 1943
Stage: Xiphidiocercaria
Location: Sporocyst in digestive gland
Host: Olivella placita (Sowerby), Purple Dwarf Olive
Records: Ching, 1959*. Three of 6 snails were infected.

35. Microphallus pirum (Afanassew, 1941)
Belopol'skii, 1952
Stage: Xiphidiocercaria
Location: Sporocyst in digestive gland
Host: Nucella emarginata
Records: Miller (1925) (6 specimens), Ching and Sousa (1981) for cercarial stage, 1986*

36. Microphallus pygmaeus (Levinsen, 1881)
Baer, 1943
Stage: Metacercaria
Location: Sporocyst in digestive gland
Locality: Saturnina I., BC
Records: Ching, 1977*

37. Microphallus similis (Jagerskiold, 1900)
Baer, 1943
Stage: Metacercaria
Location: Digestive gland
Host: Cancer magister
Locality: Vancouver, BC
Records: Ching, 1988*; many specimens from avian hosts have been recovered.

38. Microphallus sp. mihi 5 (Fig. 3)
Stage: Metacercaria
Location: Sporocyst in digestive gland
Host: Alvania compacta Carpenter, Compact Alvania
Locality: Saturnina I., BC
Record: Ching, 1977*

39. Microphallid Ceraria mihi 6
Stage: Xiphidiocercaria
Location: Sporocyst in digestive gland
Host: Lacuna marmorata Dall
Locality: Friday Harbor, WA
Record: Ching, 1959*. Two of 108 snails were infected.

40. Microphallid Ceraria mihi 7
Stage: Xiphidiocercaria
Location: Sporocyst in digestive gland
Host: Trichotropis cancellata (Hinds), Cancellate Hairy-shell
Locality: Friday Harbor, WA
Record: Ching, 1959*. Two of 108 snails were infected.

41. Microphallid Ceraria mihi 8 (Fig. 4)
Stage: Xiphidiocercaria
Location: Sporocyst in digestive gland
Host: Littorina scutulata
Locality: Vancouver, BC
Record: Ching, 1974*

Notes: I have found only 2 infections in many years of sampling littorine snails. Measurements on 10: Body length by width, 120-171 by 26-30 (37 by 7). Tail short, used for creeping, 26-39 by 5-9 (37 by 7).

42. Cercaria searlesiae Miller, 1925
Stage: Cotylocercous cercaria
Location: Redia in digestive gland
Host: Searlesia dira (Reeve)
Locality: Friday Harbor, WA
Record: Miller (1925)

43. Metacercaria A Thompson and Margolis, 1987
Stage: Metacercaria
Location: Somatic musculature
Host: Pandalus jordani Rathburn, Smooth Pink Shrimp
Locality: Vancouver I., BC
Record: Thompson and Margolis (1987)

44. Neolebouria tinkerbelli Thompson and Margolis, 1987
Stage: Metacercaria
Location: Heart
Host: Pandalus jordani
Locality: Vancouver I., BC
Record: Thompson and Margolis (1987)

45. Podocotyle enophrysi Park, 1937
Stage: Cotylocercous cercaria
Location: Redia in digestive gland

Tribe MICROPHALLIDAE

46. Cerithidea californica
Stage: Metacercaria
Location: Thoracic ganglion
Hosts: Cancer magister, H. oregonensis, H. nudus
Records: Maxon and Pequegnat (1949), Yamaguti, 1939

47. Trientaliidea californica
Stage: Metacercaria
Location: Thoracic ganglion
Host: Cancer magister
Records: Maxon and Pequegnat (1949), Yamaguti, 1939

48. Pseudotrematidae
Stage: Xiphidiocercaria
Location: Hemocoel
Hosts: Littorina scutulata, L. sitkana
Records: Ching (1961)

49. Operculiferidae
Stage: Metacercaria
Location: Thoracic ganglion
Host: Cancer magister
Records: Maxon and Pequegnat (1949), Yamaguti, 1939

50. Cercaria searlesiae Miller, 1925
Stage: Cotylocercous cercaria
Location: Redia in digestive gland
Host: Searlesia dira (Reeve)
Locality: Friday Harbor, WA
Record: Miller (1925)
46. Opecoelid Cercaria mihii 9
Stage: Stumpy-tailed cercaria
Location: Sporocyst in digestive gland
Hosts: Margarites sp., M. helicinus
Locality: Friday Harbor, WA; Saturnina I., BC
Records: Ching, 1957*, 1977*
Notes: The cercaria has a short tail with 5-6 glands forming a striated appearance at the tip which is unlike the tails of the cotylolecercid cercariae listed above.

47. Opecoelid Metacercaria
Stage: Metacercaria
Location: Hemocoeel
Host: Traskortesia traskiana
Locality: Vancouver, BC
Record: Ching, 1977*

48. Opecoelid Metacercaria
Stage: Metacercaria
Location: Abdominal muscles
Host: Crangon alaskensis Lockington
Locality: Sinclair Inlet, WA
Record: Morado and Sparks (1983). I have placed this metacercaria in the family Opecoelidae.

Family MONORCHIIDAE

49. Telolecithus pugetensis Lloyd and Guberlet, 1932
Stage: Brevicuricate cercaria
Location: Sporocyst in digestive gland
Host: Nutricula tantilla (Gould)
Stage: Metacercaria
Location: Extrapallial cavity
Hosts: N. tantilla; Macoma nasuta, Conrad Bent­
nose Macoma; Tellina nuculoides (Reeve), Salmon Tellin
Locality: Yaquina Bay, OR; Friday Harbor, WA
Record: DeMartini and Pratt (1964)

Family RENICOLIDAE

50. Renicola buchanani Martin and Gregory, 1951
Stage: Magnascoercerc cercaria
Location: Sporocyst in mantle
Host: Cerithidea californica
Locality: Upper Newport Bay, Bolinas Lagoon, CA
Records: Martin and Gregory (1951), Martin (1955), Yoshino (1975) as Renicola sp., Ching and Sousa, 1986*
USNM Helm. Coll. No. 81082

51. Renicola certhidicola Martin, 1971
Stage: Gymnocephalous cercaria
Location: Sporocyst in digestive gland
Host: Cerithidea californica
Record: Martin (1971)

52. Renicola thaidus Stunkard, 1964
Stage: Xiphidiocercaria
Location: Sporocyst in digestive gland
Host: Nucella lamellosa
Stage: Metacercaria
Location: Digestive gland
Host: Mytilus edulis
Locality: Vancouver, BC

53. Renicolid Cercaria mihii 10 (Fig. 5)
Stage: Xiphidiocercaria
Location: Sporocyst in digestive gland
Host: Cerithidea californica
Locality: Bolinas Lagoon, CA
Record: Ching and Sousa, 1986*
USNM Helm. Coll. No. 81083
Notes: Sporocyst with yellow pigment, sparsely filled with 2-14 (8) cercariae, 676 by 298 in length and width. Cercarial body finely spined, 179-230 by 38-78 (199 by 69). Suckers equal in size, about 30 in diameter. Short stylet present. Excretory bladder U-shaped with long stem, arms lateral to ventral sucker. Flame cells 2[(3 + 3 + 3) + (3 + 3 + 3)]. Tail length by width, 110-150 by 13-16 (133 by 15).

Order LEPOCREADIIFORMES
Family LEPOCREATIDAE

54. Lepocreadiid Cercaria mihii 11 (Figs. 6, 7)
Stage: Tritochercerc cercaria
Host: Nidikella carinata (Hinds), Carinate Dove­shell
Location: Saturnina I., BC
Record: Ching, 1979*
USNM Helm. Coll. No. 81084
Notes: The prevalence was 5% or 4 of 73 snails. The cercaria has a trumpet-shaped oral sucker, prominent eye spots, and excretory bladder reaching to the ventral sucker. The tail has 36 pairs of setae.

Order ECHINOSTOMATIFORMES
Family NOTOCOTYLIDAE

55. Catenopisthis johnstoni Martin, 1956
Stage: Oculate, monostome cercaria
Location: Redia in digestive gland
Host: Cerithidea californica
Locality: Upper Newport Bay, Bolinas Lagoon, CA

56. Notocotylid Y cercaria mihii 12 (Fig. 8)
Stage: Oculate, monostome cercaria
Location: Redia in digestive gland
Host: Littorina scutulata
Locality: Vancouver, BC
Records: Ching (1962a), 1977*
USNM Helm. Coll. No. 81085
Notes: The prevalence was 0.49% or 21 of 4,322 snails sampled in 1977-1978 from 3 locations in Vancouver. Measurements on 10 cercariae: Body length by width, 330-595 by 145-244 (419 by 216). Tail length by width, 376-508 by 33-66 (422 by 43). Three eye spots present.

Family ECHINOSTOMATIDAE

57. Acanthoparyphium spinulosum Johnston, 1917
Stage: Cercaria with collar spines
Location: Redia in gonads
Host: Cerithidea californica
Stage: Metacercaria

Location: Radular pockets
Host: Cerithidea californica
Localities: Upper Newport Bay, Bolinas Lagoon, CA

58. Acanthopharyphium sp.
Stage: Cercaria with collar spines
Location: Redia in gonads
Host: Cerithidea californica
Locality: Upper Newport Bay, CA
Record: Martin (1972)

59. "Echinoparyphium" sp.
Stage: Cercaria with collar spines
Location: Redia in gonad, digestive gland

Host: Cerithidea californica
Localities: Upper Newport Bay, Bolinas Lagoon, CA
Records: Martin (1972), Sousa (1983), Ching and Sousa, 1986*. Martin (1972) placed this echi­nostome in this genus, but the 31 spines around the head collar are arranged in a single ring dor­sally and laterally, with 2 clustered at each side ventrally.
USNM Helm. Coll. No. 81087

60. Himasthla rhigedana Dietz, 1909
Stage: Oculate cercaria with collar spines
Location: Redia in digestive gland
Host: Cerithidea californica
Localities: Upper Newport Bay, Bolinas Lagoon, CA

61. Himasthla sp. Cercaria mihl 13 (Fig. 9)
Stage: Cercaria with collar spines
Location: Redia in digestive gland
Host: Littorina scutulata
Localities: Friday Harbor, WA; Vancouver, BC

USNM Helm. Coll. No. 81089

Notes: The prevalence was 2.5% or 21 of 835 snails at Vancouver and Friday Harbor from 1975 to 1978. At 1 lagoon site at Friday Harbor in 1988, 11% or 23 of 207 snails were infected. Cercarial body spined, with head collar of 29 spines in single continuous row, with 2 ventrally in each corner. Body length by width, 352–454 by 123–217 (400 by 158). Oral sucker 51–59 by 51–56 (57 by 52), ventral sucker, 64–70 by 66–102 (75 by 82). Tail length by width, 237–409 by 33–57 (319 by 41).

62. Echinostomatid Metacercaria
Stage: Metacercaria with collar spines
Location: Gut, mantle, base of gills
Host: Protoscence stamine (Conrad), Common Pacific Littleneck
Locality: Sooke, BC
Record: Bower, 1986* pers. comm., Pacific Biological Station, Nanaimo, BC

Family PHILOPHTHALMIDAE

63. Clocicretrea michiganensis McIntosh, 1938
Stage: Megalurus cercaria
Host: Cerithidea californica
Locality: Upper Newport Bay, CA
Records: Robinson (1952), Martin (1955, 1972), LeFlore et al. (1985)

64. Parorchis acanthus (Nicoll, 1906) Nicoll, 1907
Stage: Megalurus cercaria
Location: Redia in digestive gland
Host 1: Cerithidea californica
Localities: Upper Newport Bay, Bolinas Lagoon, CA
Host 2: Nucella lamellosa, N. emarginata
Locality: Theis I., BC
Record: Ching (1978)

USNM Helm. Coll. No. 81091

Family PSIOLOSTOMIDAE

65. Psilostomum magnivum Ching, 1980
Stage: Cercaria with caudal fin fold
Location: Redia in digestive gland
Host: Littorina scutulata
Stage: Metacercaria
Location: Extrapallial cavity
Host: Mytilus edulis L., Blue Mussel
Locality: Vancouver, BC
Record: Ching (1980)

Order OPISTHORCHIFORMES
Family HETEROPHYIDAE

66. Cercaria purpuracauda Miller, 1925
Stage: Magnacercous cercaria
Location: Redia in digestive gland
Host: Bittium escherichtii (Middendorf), Giant Pacific Coast Bittium
Locality: Friday Harbor, WA
Record: Miller (1925)

67. Cryptocotyle lingua (Crepin, 1825) Fisschoeder, 1903
Stage: Pleurolophocercous cercaria
Location: Redia in gonads
Host: Littorina scutulata
Locality: Vancouver, BC
Record: Ching (1978)

USNM Helm. Coll. No. 81092

68. Euhaplorchis californiensis Martin, 1950
Stage: Pleurolophocercous cercaria
Location: Gonad (redial stage in digestive gland)
Host: Cerithidea californica
Localities: Upper Newport Bay, Bolinas Lagoon, CA

69. Parastictodora hancocki Martin, 1950
Stage: Pleurolophocercous cercaria
Location: Redia in gonads
Host: Cerithidea californica
Locality: Upper Newport Bay, CA

70. Phototrema ovaline Martin, 1950
Stage: Pleurolophocercous cercaria
Location: Redia in gonads
Host: Cerithidea californica
Localities: Upper Newport Bay, Bolinas Lagoon, CA

71. Pygidiovoides spinalis Martin, 1951
Stage: Pleurolophocercous cercaria
Location: Redia in gonads
Host: Cerithidea californica
Locality: Upper Newport Bay, CA
Record: Martin (1951)

72. Heterophyid Cercaria mihl 14 (Fig. 10)
Stage: Pleurolophocercous cercaria
Location: Redia in gonads
Host: Batillaria zonalis (Bruguerei) Cumings, False Cerith
Locality: Vancouver, BC
Notes: The prevalence was 10% or 8 of 77 in 1978 and 22% or 12 of 54 in 1989 in 2 sites in BC. Measurements of 10 cercariae: Body finly-spined, length by width, 139–211 by 66–99 (184 by 80). Tail with finfold ending in small fan around the tip, length by width, 297–475 by 17–36 (366 by 27). Oral sucker with subterminal opening with glandular openings, crenulated walls, 25–46 by 31–37 (31 by 36). Eyespots al-
most square. Penetration glands 14 in total. A pleurolophocercous cercaria reported from this host in California by Whithatch (1974) may be the same species.

73. Heterophyid Cercaria mili 15 (Fig. 11)
Stage: Pleurolophocercous cercaria
Location: Redia in gonads
Host: Bittium escherichtii
Locality: Vancouver, BC
Record: Ching, 1974*

Notes: The prevalence was 9.6% or 5 of 52 snails. Measurements on 9 cercariae: Body length by width, 164–188 by 60–66; tail with short anterior folds, fin folds continuing around bent tip, length by width, 248–409 by 25–30. Oral sucker with 8 spines on the dorsal edge followed by 5 tubular spines in the opening of the mouth. Penetration glands filling body, about 16 in total.

List 2. Molluscan Hosts of Larval Digeneans of the North American Pacific Coast
(Name of mollusc: number of larval digenean in List 1)

GASTROPODA:
Avania compacta: 10, 26, 38
Balillaria zonalis: 72
Bittium escherichtii: 66, 73
Ceratostoma foliatum: 25
Centrodia californica: 1, 2, 4, 31, 50, 51, 53, 55, 57, 58, 59, 60, 63, 64, 68, 69, 70, 71
"Collisella" scabra: 23
Ilyanassa obsOLEta: 3
Lacuna marmorata: 39, 45
Liottorina planaxis: 5
Liottorina scutulata: 28, 33, 36, 41, 56, 61, 65, 67
Liottorina sitkana: 28, 33, 36
Lottia digitalis: 23
Margarites costalis: 16
Margarites helicinus: 16, 46
Margarites papillat: 16
Margarites sp.: 46
Nittilda carinata: 54
Nicella canaliculata: 11
Nucella emarginata: 11, 35, 64
Nucella lamellosa: 6, 52, 64

List 3. Larval Tapeworms, Acanthocephalans, and Roundworms from Marine Invertebrates of the North American Pacific Coast

Class CESTODA
Order TETRAPHYLLIDEA
Family PHYLLOBOTHRIIDAE
1. Anthobothrium sp.
Stage: Larva
Location: Foot
Hosts: Tresus nutalli (Conrad), Pacific Gaper; Macoma nasuta, Bent-nose Macoma; Protothaca staminea (Conrad), Common Pacific Littleneck
Locality: Elkhorn Slough, CA
Record: MacGinitie and MacGinitie (1968)

2. Echeneibothrium sp.
Stage: Proceroid larva
Location: Mantle, foot
Host: Protothaca staminea
Locality: Humboldt Bay, CA
Record: Sparks and Chew (1966)

3. Echeneibothrium sp.
Stage: Larva
Location: Foot
Host: Protothaca laciniata
Locality: Morro Bay, CA
Record: Warner and Katkansky (1969a)

4. Echeneibothrium sp.
Stage: Smaller larva
Location: Peripheral and mantle area
Host: Protothaca staminea
Locality: Humboldt Slough, CA
Record: Warner and Katkansky (1969b)

5. Echeneibothrium sp.
Stage: Larger larva
Location: Viscera
Host: Protothaca staminea
Locality: Humboldt Bay, CA
Record: Warner and Katkansky (1969b)
Order TETRARHYNCHIDEA
Family TETRARHYNCHIDAE
6. Tetrarhynchus sp. 1 and 2
   Stage: Larvae
   Location: Muscle
   Host: Dosidicus gigas
   Locality: Newport Bay, CA
   Record: MacGinitie and MacGinitie (1968)

Order CYCLOPHYLLIDEA
Family HYMENOLEPIDAE
7. Hymenolepid Cysticercoid mihi 16
   Stage: Cysticercoid
   Location: Hemocoel
   Host: Traskorchestia traskiana
   Locality: Newport Bay, OR
   Record: Ching, 1974*

Phylum ACANTHOCEPHALA
Order PALAEACANTHOCEPHALA
1. Polymorphus kenti Van Cleave, 1947
   Stage: Cystacanth
   Location: Hemocoel
   Host: Emerita analoga (Stimpson)
   Locality: Oregon
   Record: Reish (1950)

   Stage: Cystacanth
   Location: Rectal ceca
   Host: Hemigrapsus oregonensis
   Locality: Bodega Bay, CA to Vancouver, BC
   Record: Ching (1974)

3. Unidentified Cystacanth
   Stage: Cystacanth
   Location: Midgut
   Host: Paralithodes camtschaticus (Tilesius)
   Locality: Alaska
   Record: Sparks (1987)

Phylum NEMATODA
Order ASCARIDIDA
1. Contracaecum sp.
   Stages: Juvenile and adult
   Location: Hemocoel
   Host: Pandalis borealis
   Locality: Open ocean, BC
   Record: Margolis and Butler (1954)

2. Echinobothrium pseudoequisetaceum Millemann, 1963
   Stage: Juvenile
   Location: Foot
   Host: Hallois corrugata Wood
   Locality: San Clemente I., CA
   Record: Millemann (1963)

Order SPIRURIDA
Family GNATHOSTOMATIDAE
2. Echinobothrium pseudoequisetaceum Millemann, 1963
   Stage: Juvenile
   Location: Foot
   Host: Hallois corrugata Wood
   Locality: San Clemente I., CA
   Record: Millemann (1963)

   Host: Argosoma aequisulcatus (Carpenter)
   Locality: Baja California, Mexico
   Record: McLean (1983)

   Family CYSTIDICOLIDA

3. Ascarophis sp. 1 and 2
   Stage: Juvenile
   Location: Adductor muscle
   Host: Pagurus samuelis (Stimpson), P. granosianus (Stimpson)
   Locality: Bodega Bay, CA
   Record: Poinar and Thomas (1976)

4. Ascarophis sp.
   Stage: Juvenile
   Location: Hemocoel
   Host: Pachycheles pubescens Holmes, P. rudit, Pugettia producta (Randall), Hemigrapsus oregonensis
   Locality: Bodega Bay, CA
   Records: Poinar and Thomas (1976), Poinar and Kuris (1976)

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