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A preliminary report on a study of the parasites of marine fishes of Burke Channel, British Columbia

by

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INTRODUCTION

For periods during the summers of 1964, 1965, and 1966, a survey of the parasites of fishes of Burke Channel, British Columbia was conducted in conjunction with the studies on the early sea life of pink salmon, Oncorhynchus gorbuscha (Walbaum). The study was made to assess the kinds and degrees of parasitism which exist in the resident fishes of the area and to determine whether these fishes act as reservoir hosts for the parasites occurring in and on the young pink salmon migrating through Burke Channel-Fitz Hugh Sound on their way to the open sea. A separate study of the parasites of pink salmon was carried out in 1964 by Boyce (1966).

A total of 542 fishes representing 49 species from 38 genera in 20 families were examined in the course of the work.

MATERIALS AND METHODS

Host specimens were usually collected with a purse seine along with samples of fingerling pink salmon. However, additional materials were taken with an otter trawl, hook and line, poisons, and a common sense (minnow) seine. The fishes were maintained in live tanks or were frozen until examined for parasites. Except for the species of Sebastodes which were identified by John Thomson of the Biological Station, host fishes were identified by use of keys in Clemens and Wilby (1961). However, the names used in the present report follow those suggested in "A List of Common and Scientific Names of Fishes From the United States and Canada" (Bailey et al., 1960).

The parts of the fishes examined for parasites (metazoan only) included the entire digestive tract, gills, body cavity, and the external surface of the body. The sex, standard length, and general condition of the fishes were also noted at the time of examination.

Examinations of fish were made with the use of a stereoscopic microscope at magnifications of 6-60X. The parasites recovered were heat- or cold-killed and preserved in a mixture of alcohol-formalin-acetic acid or in 70% ethanol. Representative specimens of trematodes, cestodes, and acanthocephalans from the various collections were stained with haematoxylin or with acetocarmine and mounted in Canada balsam. Nematodes were cleared in lactophenol or in glycerine and identified in temporary mounts in these clearing agents. Identifications of the copepoda were made by Dr. Z. Kabata of the Biological Station and the Monogenea have been submitted to Mr. Charles E. Price, Augusta College, Augusta, Georgia for further identification. All specimens of Philonema were referred to Dr. A. K. M. Bashirullah, formerly with the Department of Zoology, University of British Columbia. Some of the other identifications reported here are

tentative, especially those remaining at the generic level which were made with the aid of Yamaguti's (1958, 1959, 1961, 1963a, 1963b) Systema Helminthum.

RESULTS

The results obtained in this study are presented in the two lists which follow. In the first, which is a list of the parasites by host species, the hosts are tabulated in phylogenetic order as indicated by Bailey et al. (1960). The parasites are grouped into their respective taxa for each host species from which they were recovered. The numbers following each parasite species indicate the incidence of infection and the range in intensity of infection, respectively, for that specific parasite. In cases where only a single value is given, it represents the incidence of infection. The second is a list of the parasites; numbers following the names of the parasites refer to the host species as numbered in the host list. Locations in the hosts from which the parasites were recovered are also included.

LIST OF PARASITES BY HOST SPECIES

CLUPEIDAE

1 - Clupea harengus pallasi Valenciennes, Pacific herring

Examined: 28 Infected: 24

Digenea:

Lecithaster gibbosus (Rud., 1802) (19; 1-17)

Parahemiurus merus (Linton, 1910) (1; 3)

Pentagramma petrowi (Layman, 1930) (3; 1-3)

Monogenea:

Gyrodactyloidea (9)

Cestoda:

Phyllobothrium sp. larva (10; 1-2)

Nematoda:

Anisakis sp. larva (2; 1-2)

Contracaecum sp. larva (4; 2-16)

Copepoda:

Caligus clemensi Parker and Margolis, 1964 (2; 1)

Parabomolochus cuneatus (Fraser, 1920)

SALMONIDAE

2 - Oncorhynchus gorbuscha (Walbaum), pink salmon

Examined: 81 Infected: 27

Digenea:

Lecithaster gibbosus (Rud., 1802) (18; 1-9)

Cestoda:

Phyllobothrium sp. larva (9; 1-2)

Nematoda:

Anisakis sp. larva (4; 1)

3 - Oncorhynchus keta (Walbaum), chum salmon

Examined: 34 Infected: 17

Digenea:

Galactosomum sp. metacercaria (1; 2)

Lecithaster gibbosus (Rud., 1802) (16; 1-15)

Cestoda:

Phyllobothrium sp. larva (2; 1)

Nematoda:

Anisakis sp. larva (2; 1-2)

Contracaecum sp. larva (3; 1-7)

Acanthocephala:

Echinorhynchus sp. (1; 1)

4 - Oncorhynchus kisutch (Walbaum), coho salmon

Examined: 60 Infected: 42

Digenea:

Crepidostomum farionis (Mueller, 1784) (14; 1-23)
Lecithaster gibbosus (Rud., 1802) (27; 1-40)
Parahemiurus merus (Linton, 1910) (5; 1-8)

Monogenea:

Gyrodactyloidea (1)

Cestoda:

Diphyllobothrium sp. larva (9; 1-2)
Phyllobothrium sp. larva (8; 1-2)
Proteocephalus sp. larva (1; 1)

Nematoda:

Capillaria sp. (7)
Contracaecum sp. larva (8; 1-5)
Philonema sp. (10)

Acanthocephala:

Echinorhynchus sp. (4)

Copepoda:

Salmincola falculata (Wilson, 1908) (1; 1)

5 - Oncorhynchus nerka (Walbaum), sockeye salmon

Examined: 8 Infected: 7

Digenea:

Lecithaster gibbosus (Rud., 1802) (7; 4-43)

Cestoda:

Diphyllobothrium sp. larva (3; 1)

Phyllobothrium sp. larva (2; 2-3)

Nematoda:

Contracaecum sp. larva (5; 1)

Acanthocephala:

Echinorhynchus sp. (3)

6 - Oncorhynchus tshawytscha (Walbaum), chinook salmon

Examined: 1 Infected: 1

Digenea:

Lecithaster gibbosus (Rud., 1802) (1; 28)

Cestoda:

Phyllobothrium sp. larva (1; 1)

Nematoda:

Contracaecum sp. larva (1; 3)

Philonema sp. (1; 2)

Acanthocephala:

Echinorhynchus sp. (1; 1)

7 - Salvelinus malma (Walbaum), Dolly Varden

Examined: 2 Infected: 2

Digenea:

Crepidostomum farionis (Mueller, 1784) (1; 1)

Lecithaster gibbosus (Rud., 1802) (2; 10-21)

Tubulovesicula lindbergi (Layman, 1930) (2; 1-2)

Cestoda:

Phyllobothrium sp. larva (1; 1)

Nematoda:

Contracaecum sp. larva (1; 1)

Acanthocephala:

Echinorhynchus sp. (1; 6)

OSMERIDAE

8 - Thaleichthys pacificus (Richardson), eulachon

Examined: 7 Infected: 3

Digenea:

Lecithaster gibbosus (Rud., 1802) (1; 2)

Cestoda:

Phyllobothrium sp. larva (1; 1)

Nematoda:

Contracaecum sp. larva (1; 1)

GADIDAE

9 - Gadus macrocephalus Tilesius, Pacific cod

Examined: 18 Infected: 18

Digenea:

Lecithaster gibbosus (Rud., 1802) (18; 3-51)

Parahemiurus merus (Linton, 1910) (8; 1-5)

Cestoda:

Phyllobothrium sp. larva (5; 1-2)

10 - Theragra chalcogrammus (Pallas), walleye pollock

Examined: 2 Infected: 2

Digenea:

Lecithaster gibbosus (Rud., 1802) (1; 6)
Lepidapedon sp. (1; 1)
Podocotyle sp. (1; 6)

Cestoda:

Bothriocephalus sp. larva (2; 2-3)
Nybelinia sp. larva (1; 26)
Phyllobothrium sp. larva (1; 1)

Nematoda:

Contracaecum sp. larva (2; 13-15)

Acanthocephala:

Echinorhynchus sp. (2; 7-41)

GASTEROSTEIDAE

11 - Gasterosteus aculeatus Linnaeus, threespine stickleback

Examined: 23 Infected: 23

Digenea:

Derogenes varicus (Mueller, 1784) (1; 3)
Lecithaster gibbosus (Rud., 1802) (5; 1-4)
Podocotyle sp. (1; 1)

Monogenea:

Gyrodactyloidea (21)

Cestoda:

Bothriocephalus sp. larva (2; 2-3)
Phyllobothrium sp. larva (8; 1-7)

Nematoda:

Anisakis sp. larva (1; 1)
Contracaecum sp. larva (4; 1)

Copepoda:

Ergasilus auritus Markevich, 1940 (22; 4-16)

AULORHYNCHIDAE

12 - Aulorhynchus flavidus Gill, tube-snout

Examined: 5 Infected: 5

Digenea:

Lecithaster gibbosus (Rud., 1802) (4; 2-50)

Podocotyle sp. (1; 8)

Cestoda:

Phyllobothrium sp. larva (2; 1)

Nematoda:

Contracaecum sp. larva (1; 1)

Philometra sp. (3; 2-15)

SYNGNATHIDAE

13 - Syngnathus griseolineatus Ayres, bay pipefish

Examined: 20 Infected: 17

Digenea:

Lecithaster gibbosus (Rud., 1802) (8; 1-2)

Podocotyle sp. (9; 1-2)

Tubulovesicula lindbergi (Layman, 1930)

Monogenea:

Gyrodactyloidea (1)

Cestoda:

Phyllobothrium sp. larva (1; 1)

Nematoda:

Anisakis sp. larva (1; 1)

Contracaecum sp. larva (2; 1)

EMBIOTOCIDAE

14 - Brachyisteus frenatus Gill, kelp perch

Examined: 4 Infected: 1

Digenea:

Lecithaster gibbosus (Rud., 1802) (1; 2)

15 - Cymatogaster aggregata Gibbons, shiner perch

Examined: 56 Infected: 56

Digenea:

Galactosomum sp. metacercaria (1; 8)

Lecithaster gibbosus (Rud., 1802) (22; 1-2)

Neozoogonus californicus Arai, 1954 (20; 1-80)

Telolecithus pugetensis Lloyd and Guberlet, 1932 (4; 1-100)

Monogenea:

Gyrodactyloidea (28)

Cestoda:

Phyllobothrium sp. larva (1; 1)

Acanthocephala:

Corynosoma sp. juvenile (1; 1)

Echinorhynchus sp. (1; 1)

Copepoda:

Ergasilus turgidus Fraser, 1920 (44; 1-105)

Parabomolochus cuneatus (Fraser, 1920) (1; 1)

GOBIIDAE

16 - Coryphopterus nicholsi (Bean), bluespot goby

Examined: 1 Infected: 1

Digenea:

Lecithaster gibbosus (Rud., 1802) (1; 3)

SCORPAENIDAE

17 - Sebastodes alutus (Gilbert), Pacific ocean perch

Examined: 3 Infected: 3

Digenea:

Podocotyle sp. (2; 3-5)

Cestoda:

Bothriocephalus sp. larva (1; 1)

Nematoda:

Anisakis sp. larva (1; 1)

18 - Sebastodes diploprora (Gilbert), splitnose rockfish

Examined: 1 Infected: 1

Cestoda:

Phyllobothrium sp. larva (1;3)

19 - Sebastodes maliger (Jordan and Gilbert), quillback rockfish

Examined: 7 Infected: 4

Digenea:

Podocotyle sp. (4; 1-3)

Cestoda:

Phyllobothrium sp. larva (1; 1)

20 - Sebastodes melanops (Girard), black rockfish

Examined: 1 Infected: 0

ANOPLOPOMATIDAE

21 - Anoplopoma fimbria (Pallas), sablefish

Examined: 1 Infected: 0

HEXAGRAMMIDAE

22 - Hexagrammos decagrammus (Pallas), kelp greenling

Examined: 1 Infected: 0

23 - Hexagrammos stelleri Tilesius, whitespotted greenling

Examined: 3 Infected: 3

Digenea:

Anisorchis opisthorchis Polyansky, 1955 (1; 11)
Lecithaster gibbosus (Rud., 1802) (3; 1-5)
Parahemiurus merus (Linton, 1910) (1; 3)
Podocotyle sp. (1; 3)

Cestoda:

Phyllobothrium sp. larva (1; 1)

24 - Hexagrammos superciliosus (Pallas), rock greenling

Examined: 31 Infected: 31

Digenea:

Anisorchis opisthorchis Polyansky, 1955 (7; 1-6)
Galactosomum sp. metacercaria (2; 1)
Genolinea sp. (5; 1-2)
Lecithaster gibbosus (Rud., 1802) (16; 1-17)
Podocotyle sp. (1; 1)

Monogenea:

Polyopisthocotyloidea (3; 2-9)

Cestoda:

Bothriocephalus sp. larva (1; 1)

Phyllobothrium sp. (21; 2-32)

Nematoda:

Anisakis sp. larva (7; 1-4)

Capillaria sp. (1; 3)

Contracaecum sp. larva (15; 1-8)

25 - Ophiodon elongatus Girard, lingcod

Examined: 31 Infected: 29

Digenea:

Lecithaster gibbosus (Rud., 1802) (27; 1-52)

Parahemiurus merus (Linton, 1910) (2; 1)

Rhipidocotyle sp. (1; 6)

Stephanostomum sp. (1; 8)

Tubulovesicula lindbergi (Layman, 1930) (2; 1-52)

Cestoda:

Nybelinia sp. larva (1; 100 plus)

Phyllobothrium sp. larva (14; 1-2)

Nematoda:

Contracaecum sp. (1; 300 plus)

COTTIDAE

26 - Artedius harringtoni Starks, scalyhead sculpin

Examined: 1 Infected: 1

Nematoda:

Capillaria sp. (1; 22)

Contracaecum sp. larva (1; 1)

27 - Blepsias cirrhosus (Pallas), silverspotted sculpin

Examined: 6 Infected: 6

Digenea:

Genolinea sp. (4; 1-3)
Lecithaster gibbosus (Rud., 1802) (1; 3)
Podocotyle sp. (5; 1-4)

Cestoda:

Phyllobothrium sp. larva (2; 1)

Nematoda:

Contracaecum sp. larva (2; 1)

Copepoda:

Haemobaphes sp. juvenile (2)

28 - Dasycottus setiger Bean, spinyhead sculpin

Examined: 1 Infected: 1

Digenea:

Lecithophyllum sp. (1; 1)
Stephanostomum sp. (1; 4)

29 - Hemilepidotus hemilepidotus (Tilesius), red Irish lord

Examined: 22 Infected: 17

Digenea:

Anisorchis opisthorchis Polyansky, 1955 (11; 1-12)
Genolinea sp. (3; 1)
Lecithaster gibbosus (Rud., 1802) (1; 5)
Lepidophyllum sp. (11; 1-7)
Podocotyle sp. (7; 1-5)

Nematoda:

Capillaria sp. (4; 2-9)

30 - Icelinus filamentosus Gilbert, threadfin sculpin

Examined: 3 Infected: 3

Cestoda:

Phyllobothrium sp. larva (1; 1)

Nematoda:

Contracaecum sp. larva (2; 1)

Acanthocephala:

Echinorhynchus sp. (1; 1)

31 - Icelinus tenuis Gilbert, spotfin sculpin

Examined: 2 Infected: 2

Digenea:

Hemiuridae, immature (1; 1)

Cestoda:

Phyllobothrium sp. larva (1; 1)

32 - Leptocottus armatus Girard, Pacific staghorn sculpin

Examined: 2 Infected: 2

Digenea:

Bucephalopsis sp. (1; 4)

Nematoda:

Contracaecum sp. (2; 1)

Acanthocephala:

Corynosoma sp. larva (1; 1)

33 - Myoxocephalus polyacanthocephalus (Pallas), great sculpin

Examined: 4 Infected: 4

Digenea:

Genolinea sp. (3; 2-20)

Tubulovesicula lindbergi (Layman, 1930) (1; 2)

Cestoda:

Bothriocephalus sp. (4; 1-52)

Phyllobothrium sp. larva (1; 2)

Nematoda:

Capillaria sp. (2; 5-35)

Contracaecum sp. larva (2; 4-9)

Acanthocephala:

Corynosoma sp. larva (1; 1)

Echinorhynchus sp. (3; 1-10)

Copepoda:

Chondracanthus irregularis Fraser, 1920 (1; 2)

Lepeophtheirus sp. (1; 1)

Naobranchia occidentalis (1)

34 - Malacocottus kincaidi Gilbert and Thompson, blackfin sculpin

Examined: 1 Infected: 0

35 - Nautichthys oculofasciatus (Girard), sailfin sculpin

Examined: 1 Infected: 1

Cestoda:

Bothriocephalus sp. (1; 1)

36 - Oligocottus maculosus Girard, tidepool sculpin

Examined: 6 Infected: 3

Monogenea:

Gyrodactyloidea (2)

Nematoda:

Contracaecum sp. larva (1; 1)

Copepoda:

Haemobaphes sp. juvenile (1)

37 - Psychrolutes paradoxus Gunther, tadpole sculpin

Examined: 1 Infected: 0

38 - Triglops pingeli Reinhardt, ribbed sculpin

Examined: 4 Infected: 4

Digenea:

Podocotyle sp. (3; 4-8)

Cestoda:

Phyllobothrium sp. larva (2; 1)

Nematoda:

Anisakis sp. larva (2; 1-2)
Contracaecum sp. larva (3; 3)

AGONIDAE

39 - Agonus acipenserinus Tilesius, sturgeon poacher

Examined: 3 Infected: 2

Digenea:

Podocotyle sp. (1; 1)

Cestoda:

Phyllobothrium sp. larva (1; 1)

Nematoda:

Contracaecum sp. larva (1; 2)

Acanthocephala:

Echinorhynchus sp. (2)

Copepoda:

Haemobaphes sp. juvenile (2)

40 - Xeneretmus latifrons (Gilbert), blacktip poacher

Examined: 1 Infected: 1

Cestoda:

Phyllobothrium sp. larva (1; 1)

AMMODYTIDAE

41 - Ammodytes hexapterus Pallas, Pacific sandlance

Examined: 23 Infected: 22

Digenea:

Galactosomum sp. metacercaria (7; 1-7)

Lecithaster gibbosus (Rud., 1802) (21; 1-115 plus)

Monogenea:

Gyrodactyloidea (10)

Cestoda:

Phyllobothrium sp. larva (11; 1-16)

Nematoda:

Contracaecum sp. larva (1; 1)

Copepoda:

Lepeophtheirus sp. (1; 1)

BATHYMASTERIDAE

42 - Ronquilus jordani (Gilbert), northern ronquil

Examined: 3 Infected: 2

Digenea:

Lecithaster gibbosus (Rud., 1802) (1; 8)

Nematoda:

Cucullanus sp. (1; 1)

PHOLIDAE

43 - Pholis laeta (Cope), crescent gunnel

Examined: 6 Infected: 4

Digenea:

Podocotyle sp. (1; 2)

Cestoda:

Bothriocephalus sp. larva (1; 2)

Nematoda:

Philometra sp. (2; 1)

44 - Pholis ornata (Girard), saddleback gunnel

Examined: 7 Infected: 5

Digenea:

Lecithaster gibbosus (Rud., 1802) (1; 2)

Podocotyle sp. (2; 1-3)

Monogenea:

Gyrodactyloidea (1)

Nematoda:

Anisakis sp. larva (1; 1)

Contracaecum sp. larva (4; 3-22)

ZOARCIDAE

45 - Aprodon cortezianus Gilbert, bigfin eelpout

Examined: 2 Infected: 2

Digenea:

Lecithaster gibbosus (Rud., 1802) (1; 5)

Parahemiurus merus (Linton, 1910) (1; 1)

Podocotyle sp. (2; 9-29)

Cestoda:

Phyllobothrium sp. larva (2; 3-147)

Nematoda:

Contracaecum sp. larva (1; 2)

Acanthocephala:

Echinorhynchus sp. (1; 2)

BOTHIDAE

46 - Citharichthys stigmaeus Jordan and Gilbert, speckled sanddab

Examined: 1 Infected: 1

Digenea:

Tubulovesicula lindbergi (Layman, 1930) (1; 1)

Nematoda:

Anisakis sp. larva (1; 6)

PLEURONECTIDAE

47 - Lepidopsetta bilineata (Ayres), rock sole

Examined: 6 Infected: 6

Digenea:

Lecithaster gibbosus (Rud., 1802) (1; 1)

Cestoda:

Bothriocephalus sp. larva (1; 1)

Phyllobothrium sp. larva (2; 1)

Nematoda:

Capillaria sp. (1; 4)

Cucullanus sp. (4)

Copepoda:

Haemobaphes sp. juvenile (1)

48 - Parophrys vetulus Girard, English sole

Examined: 1 Infected: 1

Digenea:

Podocotyle sp. (1; 1)

49 - Platichthys stellatus (Pallas), starry flounder

Examined: 6 Infected: 6

Digenea:

Lecithaster gibbosus (Rud., 1802) (1; 9)

Podocotyle sp. (3; 1-6)

Monogenea:

Gyrodactyloidea (1)

Cestoda:

Phyllobothrium sp. larva (2; 1-3)

Nematoda:

Contracaecum sp. larva (1; 6)

Cucullanus sp. (4; 1-3)

Philometra sp. (1; 2)

Acanthocephala:

Echinorhynchus sp. (1; 2)

Copepoda:

Lepeophtheirus sp. (1)

CHECK LIST OF PARASITES WITH HOST REFERENCES

Digenea:

Anisorchis opisthorchis Polyansky, 1955 (23, 24, 29) - pyloric caeca, intestine, stomach

Bucephalopsis sp. (32) - pyloric caeca

Crepidostomum farionis (Mueller, 1784) (4, 7) - intestine

Deroqenes varicus (Mueller, 1784) (11) - intestine

Galactosomum sp. metacercaria (3, 15, 24, 41) - gill arches (encysted)

Genolinea sp. (24, 27, 29, 33) - stomach, intestine

Lecithaster gibbosus (Rud., 1802) (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 23, 24, 25, 27, 29, 41, 42, 44, 45, 47, 49) - intestine, pyloric caeca, stomach

Lecithophyllum sp. (28) - intestine

Lepidapedon sp. (10) - pyloric caeca

Lepidophyllum sp. (29) - urinary bladder

Neozoogonus californicus Arai, 1954 (15) - intestine

Parahemiurus merus (Linton, 1910) (1, 4, 9, 23, 25, 45) - stomach, intestine

Pentagramma petrowi (Layman, 1930) (1) - pyloric caeca

Podocotyle sp. (10, 11, 12, 13, 17, 19, 23, 24, 27, 29, 38, 39, 43, 44, 45, 48, 49) - intestine, pyloric caeca

Rhipidocotyle sp. (25) - intestine

Stephanostomum sp. (25, 28) - intestine, pyloric caeca

Telolecithus pugetensis Lloyd and Guberlet, 1932 (15) - intestine

Tubulovesicula lindbergi (Layman, 1930) (7, 13, 25, 33, 46) - stomach

Monogenea:

Gyrodactyloidea (1, 4, 11, 13, 15, 41, 44, 49) - gills, body surface

Polyopisthocotylidea (24) - gills

Cestoda:

Bothriocephalus sp. larva and adult (10, 11, 17, 24, 33, 35, 43, 47) - intestine, pyloric caeca, stomach

Diphyllobothrium sp. larva (4, 5) - mesenteries

Nybelinia sp. larva (10, 25) - mesenteries, stomach

Phyllobothrium sp. larva (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 18, 19, 23, 24, 25, 27, 30, 31, 33, 38, 39, 40, 41, 45, 47, 49) - intestine, pyloric caeca, gall bladder, stomach

Proteocephalus sp. larva (4) - intestine

Nematoda:

Anisakis sp. larva (1, 2, 3, 11, 13, 17, 24, 38, 44, 46) - intestine, pyloric caeca, mesenteries, stomach

Capillaria sp. (7, 24, 26, 29, 33, 47) - intestine, stomach

Contracaecum sp. larva and adult (1, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 24, 25, 26, 27, 30, 32, 33, 36, 38, 39, 41, 44, 45, 49) - intestine, mesenteries, stomach

Cucullanus sp. (42, 47, 49) - intestine, pyloric caeca

Philometra sp. (12, 43, 49) - intestine, coelom

Philonema sp. (4, 6) - swim bladder

Acanthocephala:

Echinorhynchus sp. (3, 4, 5, 6, 7, 10, 15, 30, 33, 39, 45, 49) - intestine, pyloric caeca

Corynosoma sp. juvenile (15, 32, 33) - coelom, intestine

Copepoda:

Caligus clemensi Parker and Margolis, 1964 (1) - body surface

Chondracanthus irregularis Fraser, 1920 (33) - gills

Ergasilus auritus Markevich, 1940 (11) - gills, body surface

Ergasilus turgidus Fraser, 1920 (15) - gills

Haemobaphes sp. juvenile (27, 36, 39, 47) - gills

Lepeophtheirus sp. (33, 41, 49) - body surface

Naobranchia occidentalis (33) - gills

Parabomolochus cuneatus (Fraser, 1920) (1, 15) - gills

Salmincola falculata (Wilson, 1908) (4) - pectoral fin

In summarizing the results presented above, 42 taxa of parasites have been identified to one level or another. These parasites include representatives from: Digenea (18), Monogenea (2), Cestoda (5), Nematoda (6), Acanthocephala (2), and Copepoda (9). Since specific identifications of all forms have not been completed, the total number of species will exceed that which is presently stated. Taxa for which further numbers of species can be expected include: Podocotyle, Gyrodactyloidea, Cucullanus, Echinorhynchus, and possibly Bothriocephalus and Capillaria; others which undoubtedly consist of more than one species are Phyllobothrium, Anisakis, and Contracaecum. These latter forms, however, are mainly represented by larval stages so that specific identifications may not be possible.

DISCUSSION

According to Boyce (1966) Lecithaster gibbosus (Rud., 1802) and larval Phyllobothrium were the two parasites which showed the highest incidences of infection in young pink salmon examined from Burke Channel. My findings corroborate his results on Oncorhynchus gorbuscha and, in addition, show that these parasites are ones which are most frequently encountered in a variety of other host species. From this information it is possible to conclude that resident fishes are responsible for the perpetuation of these species in Burke Channel, acting as reservoirs, while the pink salmon acquire the parasites during their migration to the open sea. The other three parasites reported by Boyce, Parahemiurus merus Linton, 1910, Pentagramma petrowi (Layman, 1930) and Contracaecum sp., although encountered much less frequently, probably assume the same or comparable pattern in their host relations.

Aside from the considerations above, two main points become apparent when the results of this study are examined; these are: 1) that certain parasites appear to have a wide range of hosts, i.e., are not host specific; and 2) that fishes occupying the same or similar niche tend to harbour parasites which are common to many of them. However, before considering either of these points, the limitations of this discussion should be reemphasized, i.e., forms allocated to a number of the taxa could represent more than one species. This consideration is especially important for forms referred to Podocotyle, Echinorhynchus, Phyllobothrium, Cucullanus, and Contracaecum.

Since its specific identity has been established and since it is one of the forms most frequently encountered in this study, the best example to use in discussing the two points above is Lecithaster gibbosus. As indicated previously, this intestinal trematode was recovered from 27 host species of which 225 of 401 (56.1%) of the individuals harboured the parasite. The data show that pelagic fishes commonly taken in purse seines with pink salmon are those which are most frequently parasitized by Lecithaster. Juvenile Gadus macrocephalus (100%), Ammodytes hexapterus (91%), juvenile Ophiodon elongatus (87%), and Clupea harengus pallasi (64%) were host species which showed the higher levels of infection. These results indicate clearly that fishes which share a common niche, i.e. have competitive feeding habits, harbour parasites which are common to them. In addition, it would be interesting to speculate as to how fishes which are usually considered benthic and sedentary acquire infections with Lecithaster; however, the feeding habits, as well as the other aspects of the biology, of these hosts are not well known so that further comment is not justified.

Reports in the literature frequently allude to the importance of gyrodactyloid Monogenea in contributing to mortality in fishes. Members of this group of ectoparasites were collected from individuals of eight host species. However, no detrimental effects were observed in the field-caught parasitized fishes and none of these parasites was recovered from O. gorbuscha. On the other hand, when samples of Clupea harengus pallasi and Gasterosteus aculeatus were maintained in aquaria to determine if interspecific cross-infections could occur with pink salmon, light to moderate mortality was recorded in the natural hosts. Examinations of the dead or dying fishes showed that the intensity of infection

with gill flukes was much greater than that recorded for hosts examined immediately after capture. The inference that these parasites are contributing to mortality is further supported when examination of the surviving fish showed that the extent of parasitism was much less in the latter cases. In the cross-infection experiments only one specimen of pink salmon became infected with a single parasite.

The only example in the entire series of examinations where there was any evidence pertaining to possible detrimental effects of parasites was the case of a specimen of lingcod (Ophiodon elongatus). This fish was a large (length in excess of three feet), adult female which harboured five species of parasites; of these, nematodes of the genus Contracaecum were found in three large (nearly three cm. in diameter) ulcerous cavities in the stomach wall. The wall was not perforated, but only the outer connective tissue layer remained intact. No weights nor precise measurements of the fish were made; however, comparisons with other specimens collected in the past indicate that the fish was very emaciated and appeared to weigh about half the usual for a fish of comparable length in "healthy condition".

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