United States Department of the Interior, Fred A. Seaton, Secretary
Fish and Wildlife Service, Arnie J. Suomela, Commissioner

Fishery Leaflet 486

Washington 25, D. C. April 1959

RECOMMENDED TREATMENT FOR FISH PARASITE DISEASES

By
Glenn L. Hoffman 1/
Parasitologist
Branch of Fishery Research
Bureau of Sport Fisheries and Wildlife

At the present the best single source of information for aid in the diagnosis of fish parasite diseases in North America is Davis (1953). Sometimes it is difficult to determine whether the parasites present cause or contribute to the disease condition. Therefore, in general, until more is known about this phase of fish parasitology, it is advisable to control or eliminate the parasites of fish in fish hatcheries if they are present in large numbers.

Following is a compilation of treatment methods which have been reported in the literature.

I. EXTERNAL
(body, fins, gills)

A. PROTOZOA

Costia

(1) Formalin 1:4000 for 1-hour (Fish, 1940). Some hatcheries use 1:5000 and 1:6000.

(2) Pyridylmercuric acetate (PMA) 1:500,000 for 1-hour for salmonids (Burrows and Palmer, 1949), and the same (2 p.p.m. for 1-hour) for catfish (Clemens and Sneed, 1958). PMA is toxic to rainbow and cutthroat trout (Rodgers, et al, 1951; L. Allison, 1957).

Chilodonella (Chilodon)

(1) Formalin 1:4000 for 1-hour (Davis, 1953: 208).

Colponema

(1) PMA 2 p.p.m. for 1-hour (Clemens and Sneed, 1958).

Ichthyopthirius

(1) Formalin 1:4000 for 1-hour (Davis, 1953: 211).
(2) PMA 2 p.p.m. for 1-hour (Clemens and Sneed, 1958).
(3) Either (1) or (2) recommended daily until parasites disappear. Holding fish in swift flowing water helps to remove young parasites. Infected ponds should be thoroughly dried for at least 8 days or disinfected with quicklime or chlorine.

1/ Headquarters: Eastern Fish Disease Lab., Leetown, West Virginia (P. O. Kearneysville)

(4) In aquaria (tropical fish, etc.) - Van Duijn (1956) recommends the following: (a) raise the temperature slowly to 32°- 33° C. (90°F.) daily for several days, but this can be used for tropical fish only, (b) quinine hydrochloride (4.2 cc. of 1 percent solution per gal. added to the same water 3 times at half-day intervals), (c) atibrine - stock solution: add one 100 mg. (1 1/2 grain) tablet to 100 cc. of water - add 3.8 cc (3.8 mg.) per gal. (3.79 liter) to the same water for three times at 48 hr intervals, (d) methylene blue - 1 cc. of 1 percent aqueous solution per gal.; repeat at 2-day intervals until 4 cc. has been added; this usually does not kill the plants. All of these kill the motile forms but not the cysts. Treatments should be repeated until the parasites can no longer be seen.
(5) Formalin 15 p.p.m. for pondfish (R. Allison, 1957a).

Scyphidia

Same as for Costia.

Trichodina

(1) Same as for Costia.
(2) Potassium permanganate 2 p.p.m. or formalin 15 p.p.m. for pondfish (R.Allison, 1957a).
(3) Malachite green 1:200,000 to 1:400,000 for 30 minutes in dirt ponds; allow to dissipate naturally to 1/2 of this concentration in one hour. (Hublou, 1958).

General (external protozoa)

(1) One oz. of salt to each 150 cubic inches of water (11.52 oz. per cubic foot; 1 1/2 oz. per gal.) until weaker fish turn over about 6 - 10 minutes for trout (Fish, 1938). Tripathi (1954) used 2 - 3 percent salt (3 - 4 oz. per gal.) and 1:5000 to 1:6000 formalin.

B. MONOGENETIC TREMATODES (Gyrodactylus and dactylogyrids)

(1) Formalin 1:4000 for 1 hour (Davis, 1953: 196).
(2) Potassium permanganate 2 p.p.m. or formalin 5.5 p.p.m. in ponds (R.Allison, 1957).

C. PARASITIC COPEPODS (Argulus, Lernaea, Salmincola, etc.)

(1) Gamma isomer of benzene hexachloride (Gammexane) = Lindane 0.1 - 0.2 p.p.m. in ponds - kills Argulus (Saha and Sen, 1955; Hindle, 1948); this concentration may be toxic to bass and bluegills (Snow, 1958).
(2) Potassium permanganate 13 - 16 mg. per gallon removed Argulus (Van Duijn, 1956).
(3) DDT 1:50 million to - 1:100 million (.01 to .02 p.p.m.), well mixed with pond water (Schaperclaus 1943: 169).
(4) Formalin 1:4000 for 1-hour kills larvae (Davis, 1953: 200).
(5) Salt 0.76 - 1.1 percent for 3 days removes Lernaea; fish can stand 1.4 percent salt (Nakai and Kokai, 1931).
(6) Remove larvae with sand filters (Davis, 1953: 200).
(7) Gambusia (top minnow) to eat Argulus (Van Duijn, 1956).
(8) Salt ($NaCl$) 1.2 - 2 percent for 3 months kills larvae of Salmincola, but eradication of infested trout probably more economical (Allison, L. N., 1950).

D. PARASITIC LEECHES

(1) Lindane 0.1 p.p.m. in ponds killed leeches (Saha and Sen, 1958).
(2) A one-hour treatment with sea water killed all leeches (Earp and Schwab, 1954).

E. GLOCHIDIA

No chemical treatment known. Remove larvae from water supply with sand filters (Davis, 1953: 203).

II. INTERNAL

A. PROTOZOA

Hexamitus (Octomitus)

(1) Carbarsone (arsenical) or Calomel (mercurous chloride) 0.2 percent of food by weight for several days.
(2) Phenothiazine - 3 or 4 times; may cause "back peel" H. Wolf (cf. Rucker, 1957).

B. HELMINTHS

(1) Adult cestodes (Corallobthrium) and trematodes (Alloglossidium) in the alimentary canal can be removed with di-n-butyl tin oxide (250 mg. per kilogram of fish) (R. Allison, 1957b). Kamala (1.5 - 2 percent of food for 1 - 2 weeks) removed intestinal Proteocephalus from trout (McKernan, 1940).
(2) Adult Contracaecum bidentatum (nematoda) were removed from sturgeon in Russia with 0.04 gm. santonin and 0.25 gm. sugar, coated with animal fat. (Agapova, 1957).

REFERENCES

Agapova, A. I.
1957. Trudi Inst. Zool. Akad. Nauk Kazakhskoi SSR 7, pp. 121 - 130.

Allison, L. N.
1950. Common diseases of fish in Michigan. Mich. Dept. Cons. Misc. Publ. No. 5, 27 pp.

1957. Variation in strength of pyridylmercuric acetate technical and its effect on rainbow trout. Prog. Fish.-Cult., Vol. 19, No. 3, pp. 108 - 111.

Allison, R.
1957a. Some new results in the treatment of ponds to control some external parasites of fish. Prog. Fish-Cult., Vol. 19, No. 2, pp. 58 - 63.

1957b. A preliminary note on the use of di-n-butyl tin oxide to remove tapeworms from fish. Prog. Fish-Cult., Vol. 19, No. 3, pp. 128 - 130; Vol. 19, No. 4, p. 192.

Burrows R. E. and D. D. Palmer
1949. Pyridylmercuric acetate; its toxicity to fish, efficacy in disease control, and applicability to a simplified treatment technique. Prog. Fish-Cult., Vol. 11, No. 3 pp. 147 - 151.

Chen, Tung-Pai
1933. A study on the methods and treatment of fish lice in pond culture. Lignan Sci. Jour., Vol. 12, No. 2, pp. 241-244.

Clemens, H. P. and K. E. Sneed
1958. The chemical control of some diseases of channel catfish. Prog. Fish-Cult., Vol. 20, No. 1, pp. 8 - 15.

Davis, H. S.
1953. Culture and diseases of game fishes. Univ. Calif. Press. 332 pp.

Earp, B. J. and R. L. Schwab
1954. An infestation of leeches on salmon fry and eggs. Prog. Fish-Cult., Vol. 16, No. 3, pp. 122-124.

Fish, F. F.
1938. Treat - think - and be wary, for tomorrow they may die. Prog. Fish-Cult., Vol. 39, pp. 1-9.

1940. Formalin for external protozoan parasites. Prog. Fish-Cult., Vol. 48, pp. 1-10.

Hindle, E.
1948. Notes on the treatment of fish infected with Argulus. Proc. Zoo. Soc. London. 119, pp. 374-379.

Hublou, W. F.
1958. The use of malachite green to control Trichodina. Prog. Fish-Cult., Vol. 20, No. 3, pp. 129-132.

McKernan, D. L.
1940. A treatment for tapeworms in trout. Prog. Fish-Cult., Vol. 50, pp.33-35.

Nakai, N. and E. Kokai
1931. On the biological study of a parasitic copepod, Lernaea elegans Leigh-Sharpe, infesting on Japanese freshwater fishes. Jour. Imp. Fisheries Exp. Station Tokyo. 2. Japanese original, pp. 93-121; English abstract, pp. 123-128.

Rodgers, E. O. et al
1951. The toxicity of pyridylmercuric acetate technical (PMA) to rainbow trout (Salmo gairdnerii). Prog. Fish-Cult., Vol., 13, No. 2, pp. 71-74.

Rucker, R. R.
1957. Some problems of private trout hatchery operators. Trans. Amer. Fish. Soc. 87, pp. 374-379.

Saha, K. C. and D. P. Sen
1958. Gammexane in the treatment of Argulus and fish leech infection in fish. Ann. of Biochem. and Exper. Med., Vol. 15, No. 1, pp. 71-72.

Schaperclaus, W.
1954. Fisch-Krankheiten. Akademic - Verlag, Berlin, 708 pp.

Snow, J.
1958. Personal communication.

Tripathi, Y. R.
1954. Studies on parasites of Indian Fishes. III Protozoa 2 (Mastigophora and Ciliphora). Rec. Ind. Mus. 52, 2 - 4, pp. 221-230.

Van Duijn, C.
1956. Diseases of fish. Water Life, Dorset House (London). 174 pp.

INT.-DUP., D.C.-54744-59