Original: Fish Division
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INSTITUTE FOR FISHERIES RESEARCH
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COOPERATING WITH THE
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REPORT NO. 413

BLUEGILL MORTALITY IN NOLAN LAKE, MACOMB COUNTY

A large loss of bluegills in Nolan Lake (T. 5 N., R. 12 E., Section 29), a short distance northwest of Romeo, Macomb County, Michigan, was reported to the Institute by Conservation Officer O'Brien through Mr. A. T. Stewart. On March 24, 1937 the writer in company with Dr. Hazzard and Mr. Stewart visited this lake with the view of obtaining specimens and ascertaining the approximate losses. Though most of the dying fish had been removed from the lake by local residents, it was estimated by Mr. O'Brien that the mortality of bluegills had reached several thousand by the time of our visit. However, we were able to obtain four fresh specimens in addition to some which had been collected and preserved by Mr. O'Brien and Mr. Stewart.

No information as to the history of this epizootic is available at the moment and as the ice on the lake had only recently disappeared from the greater part of the surface, it is possible that this condition had been extant though unobserved for some time. Presumably the turnover of the water had not occurred yet as the surface temperature at shore was but 38°F. The lake at the time of examination was windswept and there was apparently no question of asphyxiation as might have occurred under very thick opaque ice.

Examination of Fish

Two of the four fresh fish removed from the water were alive at the time of capture but were very weak and sick, being found lying on their side or back and barely moving. On examination at the time, the gills were found

to be normal in appearance.

On return to the laboratory, several of the fish were examined in great detail for all parasitological and pathological conditions and the remainder checked in some detail for certain of these conditions. Following is given the detailed report on a typical fish with a summary of the examinations of the rest.

CASE REPORTS

Fish #4, Bluegill, lengths (standard, fork and total) 168 - 198 - 210 mm. Wt. 162.1 grms. Head length 54, 4M, K 3.42, B/H 3.11, Annuli III.

External appearance: Fish apparently normal as to color and proportions, no physical abnormalities. Lower edge of eyeballs and flesh surrounding eye, inflammed. Both pectoral and pelvic fins at junction of fin rays and fin muscle badly inflammed as were the bases of the dorsal and anal fins and the anus and abdominal pore. A bloody exudate had emerged from the lateral line pores.

Gills and mouth normal in appearance; arteries on inside of cheek moderately injected. General erythema over lower half of body. Eyes clear and no sign of cloudiness.

Internal Examination: Pectoral fins: Activating muscle of fin badly inflammed through a large part of area; small hemorrhagic spots present. Numerous small white myxosporidian cysts subsequently identified as Myxobolus sp. were present in connective and muscle tissue. Occasionally the fins ulcerate due to breaking down of the cysts and the invasion of bacteria.

Gills and Mouth: Examination failed to reveal anything abnormal in this region.

Pelvic fins: Area of inflammation as seen from exterior extended down into muscle tissue. Few Myxobolus cysts found, but scraping revealed the presence of spores.

Eye socket: Left socket normal and clean, right socket inflammed and containing 3 trematode metacercaria. The inflammation of the eye socket is not to be attributed to the metacercaria (Neascus sp.) as they were well encapsulated and no evidences of reaction to the cysts was present. No Myxobolus spores were found, but they may have been present but were obscured by the numerous fat globules.

Heart: Two Strigeid metacercaria of the Neascus group were encysted on the ventricle of the heart.

Brain: Apparently normal; no inflammation; hypophysis very blood shot but it was impossible to say whether this is normal or due to post-mortem degeneration.

Anal fin: Inflammed area at base of spines contains numerous spores of Myxobolus though no cysts were found.

Dorsal fin: A badly inflammed, almost necrotic area of flesh at posterior end of dorsal fin contained numerous Myxobolus cysts.

Eyes: One eye normal and negative; the other contained 3 trematode metacercaria Diplostomulum sp.

Stomach: Normal and negative.

Intestine: Occasional patches of inflammation present along walls, one unidentified nematode present.

Anus and rectum: Badly inflammed area from anus down some distance inside of rectum.

Ovary: One Proteocephalus larva encysted on the ovary, but had caused no damage. Ovary otherwise normal.

Air bladder: Badly inflammed and hemorrhagic.

Liver: One Proteocephalus larva present and several Neascus metacercaria.

Peritoneum: Marked areas of inflammation on walls and air bladder.

The picture presented by the above examination was duplicated to a greater or lesser extent in all the fish examined. The condition was one of an acute toxemia due to a wide spreading virulent infection accompanied by a severe inflammation which at times approached a necrosis. The inflammation for the most part was confined to the muscular and connective tissue, and spores or cysts of Myxobolus could usually be found associated with the inflammation. Death was probably due to the severe toxemia with its accompanying effects.

General Summary of Examinations:

No.	Standard Length	Weight	K	Presence or absence or numbers of parasites				
				Myxobolus	Diplost.	Meas. vancl.	Proteo.	Clin.
1	114 mm.	50.69	3.41	+	3	+		
2	124	64.3	3.37	+	0	+		
3	150	119.0	3.52	+	2	+	-	-
4	168	162.1	3.42	+	3	+	+	-
5	170	169.0	3.44	+	0	+	+	-
6	155	133.7	3.59	+	0	+	-	-
7	148	97.7	3.01	+	0	-	-	-
8	172	185.0	3.64	+	27	+	-	-
9	146	107.5	3.45	+	0	+	-	-
10	158	125.3	3.18	+	0	+	-	+
11	165	155.1	3.45	+	9	+	+	+
12	163	153.7	3.55	+	8	+	+	-
% of infestation				100	50	92	40	20

Myxobolus: This parasite was found in 100% of the fish examined, and the spores were present in immense numbers.

It belongs to a group of protozoa known as myxosporidia, family myxobolidae. The genus is characterized by the spore which is very small, 7-15 microns in length, oval in shape with two polar capsules and an iodinophilous vacuole.

No attempt was made to identify this form with one of the 63 or more known species, as the classification is rather complex and requires a special technique and knowledge.

This group is parasitic for the most part on fish, causing a variety of diseases, and is occasionally responsible for widespread epidemics.

The particular species involved is histogenic, that is it is confined to tissues as contrasted to forms that inhabit hollow organs such as the gall bladder. The net result is that the spores are confined to the region in which they are formed and are not released until the fish dies and disintegrates or until it is eaten by some animal. This suggests that a possible way of partially controlling this disease would be to remove all dead or dying fish from the water and dispose of them in such a manner that no spores could return to the lake.

Inasmuch as this parasite is not infective to man or other mammals, it is perfectly safe and desirable that the fish be gathered up by local residents for use as food.

Diplostomum sp.: This is the name for a group of trematode metacercaria found in the lens and vitreous humour of fish eyes. This parasite may cause cataract of the lens with consequent blindness, but this is only occasional and an eye may contain large numbers of parasites without apparent damage. This parasite was found in 50% of the fish examined.

Neascus vancleevei (Neas. vancl. in table): is a small white trematode metacercaria found usually on the heart or in the kidney or liver. It may cause some damage to the fish but is not usually responsible for serious mortality.

Proteocephalus: This is a larval tapeworm of the bass tapeworm group and under favorable conditions might do considerable damage, especially to the ovaries. In this case no special damage had been done.

Clinostom marginatum: Clinostomum or the "yellow grub" was so rare in these fish that no consideration of it is necessary.

Growth history and tabular data: With a view to obtaining data with which to evaluate the effect other than pathological of the parasite on the fish, the data tabulated below were obtained. The infection was, however, an acute case and no effects were discernible.

The growth was rapid and steady and the other constants determined were normal or well within the limits of variation.

Bluegills, Nolan Lake, March 24, 1937

Number	Stand. Length	Total Length	Total Stand.	Weight	K	Head Length	B/H	
1	114	144	1.27	50.6	3.41	37	3.08	
2	124	158	1.27	64.3	3.37	40	3.10	
3	150	190	1.27	119.0	3.52	46	3.26	
4	168	210	1.25	162.1	3.42	54	3.11	
5	170	212	1.25	169.0	3.44	52	3.27	Preserved
6	155	196	1.26	133.7	3.59	50	3.10	"
7	148	183	1.24	97.7	3.01	48	3.08	"
8	172	217*		185.0	3.64	54	3.18	"
9	146	186	1.27	107.5	3.45	48	3.04	"
10	158	199*		125.3	3.18	50	3.16	"
11	165	207	1.25	155.1	3.45	53	3.11	"
12	163	205*		153.7	3.55	53	3.07	"
Totals			11.33		41.03			
Average			1.26		3.419		3.13	

* Calculated from relationship Total length = 1.26 x Stand. length.

Bluegills, Nolan Lake, March 24, 1937

Annuli	Average Standard Length - mm.	Average Total Length - in.	Number of Specimens	Average Calculated Standard Length at End Of Each Year of Life					
				I	II	III	IV	V	VI
VI	172	8.55	1	46	83	95	129	151	161
V	163	8.25	2	34	68	104	135	150	
IV	163	8.07	1	63	106	137	154		
III	156	7.71	5	56	97	130			
II	146	7.33	1	72	109				
I	119	5.94	2	70					
Aver. Calc. St. L. growth (mm.)				56	92	121	138	151	161
Aver. Calc. Growth Total Length, inches*				2.78	4.56	6.00	6.84	7.49	7.98

* An approximate figure to convert standard length in mm. to total length in inches for bluegills of this lake is 0.0496. This is obtained by multiplying the average ratio between total and standard length (= 1.26) by the factor to convert mm. to inches (= 0.0394). Multiply standard length by 0.0496 to get answer.

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