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AN EPIDEMIC OF LEECHES ON FISHES IN ROCK RIVER

DAVID H. THOMPSON

IN the course of field work in aquatic biology on Rock River it was noticed in the winter of 1925-1926 that almost every red-mouth buffalo (*Ictiobus cyprinella* Cuv. & Val.) was heavily infested with the leech, *Piscicola punctata* Verrill.* This leech had not been taken during the two preceding years of almost continuous work on this river, which included the collecting of hundreds of samples of the bottom fauna and the handling of many thousands of red-mouth buffalo at all seasons of the year. Moreover, fishermen at many points on the river reported that no such infestation had occurred in the last half-century and that the only time they had ever seen any such leeches on the buffalo was about ten years ago when a few were noticed during some early spring fishing. The first appearance of *Piscicola punctata* in epidemic proportions was on February 25, 1926, about four miles above Rockford. The river's winter covering of ice having "gone out" of most of the channel the previous day, the remaining ice was moved off an eddy, and a seine haul was made which included, among a number of other fishes, 45 red-mouth buffalo weighing one to two pounds each, 38 of which were infested with this leech. The number of leeches on each of the infested fishes ranged from 1 or 2 up to 50 or more with an average of about 20.

The point of attack was most often in the axils of the fins and about the anus, where the cuticle is relatively thin; however, clusters of leeches were often found attached to other parts of the body, especially in places where the cuticle had been broken by injuries. A missing scale or a cut usually offered a place of attachment for several leeches. Those which had penetrated the cuticle or had found an opening in it were usually well filled with blood and mucus; others contained mucus only or were quite empty.

Extent of the Epidemic

During the remainder of February and throughout March, leeches were found on the red-mouth buffalo in much the same numbers and proportions as just described for the first haul. Seine hauls made in this period over a 20-mile stretch of Rock River in the vicinity of Rockford netted 2831 red-mouth buffalo, averaging about 2 pounds in weight. The leeches were so numerous that the bottom of a boat in which fishermen had handled a few hundred pounds of fishes was almost completely covered with them.

* Preserved specimens of this leech were identified by Professor J. Percy Moore.

"Thin" fishes usually bore more leeches than "fat" ones. Whether the leeches made the fishes thin, or whether thin fishes were predisposed to leeches, is uncertain. The fishermen picked off the leeches before the fishes were sold on the retail market. When the leeches were removed, the place of attachment was raw and bleeding and was surrounded by a halo of inflamed flesh. Fishes infested with leeches were less desirable for market, partly because the wounds and blood-shot flesh injured their appearance and partly because the mere thought of leeches was repulsive to buyers. Many thin, infested buffalo were thrown back by the fishermen while sorting the marketable fishes out of the seine.

At this same time fishermen seining farther down the river near Oregon also found the red-mouth buffalo very heavily infested with leeches. Those taken in the channel of the river were reported to have about the same number of leeches as described for the Rockford region, but those taken in sloughs and backwaters were much more heavily infested, individual fishes often bearing more than a hundred leeches.

Fishermen at other points on Rock River found leeches on the buffalo during the same winter, but there is no evidence that the epidemic extended into other streams of the State. One commercial fisherman, of many years experience in catching buffalo at all seasons of the year on the lower Illinois River near Meredosia and on the Mississippi River near Savanna, reported that he had never seen leeches in any considerable numbers on the fishes. The most that he had ever seen were on some red-mouthed buffalo taken on the Mississippi during some early spring fishing five years ago, but they numbered only two or three to a fish. Fishermen on the Wabash River at Lafayette, Indiana, saw no such epidemic.

During the epidemic on the red-mouth buffalo, other fishes were occasionally found infested with small numbers of the same leech. The small-mouth buffalo *(Ictiobus bubalus)* was thus attacked, most often in the axils of the fins and about the anus. The common red-horse *(Moxostoma aureolum),* which is somewhat more abundant in Rock River than the small-mouth buffalo, was affected even less; on it, no leeches were seen which were filled with blood, although many were well filled with mucus. The mongrel buffalo, the European carp, the common river carp (or quillback), and the common (or black) sucker were found with small numbers of leeches on them. It is possible that the leeches attached themselves to these other fishes after having been dislodged from red-mouth buffalo in the seine.

SEASONAL HABITS OF THE LEECHES

The epidemic began while the river was covered with ice and ended soon after the ice had gone and the water temperature had risen a few degrees above freezing. There were no leeches on any of the 1481 red-mouth buffalo taken by the writer during November, 1925, in the same locality. Fishing was continued by the commercial fishermen in the same locality until late in December, when the river froze over for the winter, but no leeches were noticed. It seems probable, therefore, that the red-

mouth buffalo became infested with the leeches sometime during the month of January.

At the end of March, a decline in the number of leeches was evident. This was preceded by a sharp rise in the water temperature (see Table I). Since the river was covered with ice, water temperatures between 0° C.

TABLE I

ROCK RIVER WATER TEMPERATURES* (C.) ABOVE ROCKFORD DAM, 1926

Day of month	February	March	April	May
1			1.3	13.55
2			1.3	
3		0.5	1.35	14.65
4		0.25		
5		0.0	4.4	
6		0.15		15.05
7		0.0		
8		0.1	3.45	
9		0.65	4.75	
10		0.15		
11		0.4	7.0	
12				
13				
14				
15				
16				
17		1.1		
18	0.1	2.85		
19	0.15		7.15	
20	—0.05	2.3		
21	0.05	2.9	12.2	
22	0.1	2.55	12.5	
23	0.1	3.25		
24	0.45	6.65		
25	0.6	6.2		
26	1.2	4.55	9.45	
27				
28			9.2	
29			10.9	
30				
31		0.05		

* Each temperature is an average of two readings:
(a) 1 foot below surface, and (b) 1 foot above bottom.

and 1° C. must have obtained throughout January and February. On March 18, a rise in temperature began which reached a maximum of 6.7° C. on March 24. During the last days of March the temperature fell again to freezing and then rose steadily through the first three weeks of April, reaching a maximum for the month of 12.5° C. on April 22. The number of leeches declined through the first half of April, until on April

17 only 2 leeches were seen on 51 red-mouth buffalo, and the last leech was seen on a buffalo on April 30, although several hundred red-mouth buffalo were examined for them during the summer.

An effort was made to find out what became of these leeches after they left the fishes. The bottom of the river was sampled in many places where the leech-infested buffalo had been abundant. A number of them were found on April 29 among the fauna living on the vegetation in Long Slough above Rockford. There, on clumps of Elodea, they appeared empty and quite active, in contrast to their well-filled and sluggish condition when found on fishes. Earlier in the spring the fishermen had taken many leech-infested buffalo from this slough. Late in April in the same place, red-mouth buffalo were seen with fungous infections in wounds evidently made by the leeches.

Since the leeches had not been found until late in February, it is not known exactly when they first attacked the buffalo, there having been no fishing since December, when the river had frozen over. It was with considerable interest, therefore, that the buffalo were examined in the fall and early winter of 1926. Leeches first reappeared on them at Rockford and Sterling on November 30, which was after the temperature of the water had dropped to less than 1° C. and the more quiet parts of the river had frozen over. They were also taken by the writer on December 5 and on following days, near Sterling and Oregon, from buffalo in seine hauls made where the ice had been moved away.

The leeches at this time were very small and active, translucent and apparently empty. They measured 8-10 mm. in length, as contrasted with those measuring 20-30 mm. which were taken the preceding spring. They grew rapidly and reached adult size during January. While young, they apparently fed on mucus alone, but as they became larger they were seen to be filled with blood as well as mucus. The number found during this winter was only a small fraction of the number found the preceding winter. Counts made at Sterling in December showed that about one-fourth of the buffalo were infested, and that the average number of leeches per fish was 2. Just as in the preceding spring, they left their hosts as soon as the water temperature had risen a few degrees above freezing. The river remained at or near the freezing point and the leeches remained on the fishes up to March 19, when a three-day rain melted the ice and raised the temperature of the water. On March 22, when the temperature was 40° F. (4.4° C.), very few leeches were left on the fishes, and a few days later there were none.

Since that time, a very thorough search has been made for *Piscicola punctata*, including more than 100 collections taken in all sorts of situations in the river and adjacent waters, but not a single individual has been found.

Moore[1] sums up what is known of the habits of this leech, as follows: "This is our commonest fresh water fish leech. It is common in the ponds

[1] Moore, J. Percy. Classification of the Leeches of Minnesota. Geological and Natural History Survey of Minnesota, Zoological Series, No. V, Part III, p. 105 (1912.)

and lakes of the northern states and the Mississippi Valley and is especially abundant along the Ohio shore of Lake Erie. It lives upon the exterior of the body of various species of small fishes, feeding upon the mucus which covers the surface as well as upon their blood. It appears to be in no way injurious to its hosts. Many examples may also be found living among water plants, to the stems of which there is good reason to believe its stalked cocoons are attached."

Description

The following description, which is based in all particulars on examination of specimens taken on the red mouth buffalo in Rock River, includes the external characteristics only, and in a few items, where there is no disagreement, uses language earlier employed by Moore.

Usual size 15 to 25 mm., but extensible to a greater length; greatest diameter 2 or 3 mm. A narrow neck-like constriction embracing the first few somites behind the anterior sucker; the posterior two-thirds much flattened when the animal is contracted. The posterior sucker when expanded is wider than the widest portion of the body, and normally three or four times the diameter of the anterior sucker. One pair of eyes, with conspicuous bar-like pigment cups, which are place obliquely, converging anteriorly, and which in length are each equal to more than a fourth of the breadth of the anterior sucker. Behind these are two smaller pigment spots, also somewhat bar-like, and easily mistaken for a second pair of eyes.

Living specimens had a translucent greenish ground-color, as described by Verrill, when containing little or no blood; both the upper and lower surfaces of both body and suckers were densely covered nearly everywhere with minute black specks, irregularly arranged. Along each side are eight or more sub-equally spaced pale spots which are partly visible from above, and which are connected with each other lengthwise by narrower pale areas, forming a continuous pale lateral stripe for most of the animal's length. The pale dorsal stripe found by Verrill is only faintly developed or wholly absent in a majority of the specimens which were closely examined. When filled with blood the greenish groundcolor is largely submerged, except on the two suckers, and the general appearance is speckled brownish.

Color Variant

During this epidemic on the red-mouth buffalo, a different-appearing leech, provisionally identified as a color variant of *P. punctata*, was found on the small-mouth black bass and the wall-eyed pike. It is smaller than the buffalo leech and is dark brown instead of an iridescent pale green. It occurred almost exclusively on the head of its host; fifty were once found about the mouth and branchial region of a small-mouth black bass weighing 1½ pounds. These leeches moved about rather actively and were closely applied to the host throughout their length, while the buffalo leech was usually seen hanging by its caudal sucker, the remainder of the body dangling in the water. These smaller brown leeches apparently fed upon mucus alone, since none were seen filled with blood and no injuries

were found on the host which could be attributed to them. They curl up tightly when killed in formalin while the buffalo leech dies straight or but slightly bent. These leeches disappeared from the small-mouth black bass at the same time as did those on the buffalo, and they reappeared in reduced numbers in the following winter.

OTHER SPECIES OF *Piscicola*

Another leech of this genus, *P. milneri* Verrill, is reported by Milner[2] to have been taken in large numbers on fishes in Lake Michigan: "The Ichthyobdellan, a leech of three-fourths of an inch long, grayish white in color, with brown tesselated markings, was seen in great numbers in the month of April, while the fishermen were lifting their nets from about fifty fathoms some fifteen miles out from Kenosha, Wis. They covered the nets and fishes of all species, and fell in such numbers on the deck that it became slippery, and an old coat was thrown down for the man who was lifting the gang to sand upon. They were very tenacious of life, living for a long time on the deck, and for several days in the bilge-water of the fish-boats. They were in such numbers that it was difficult to decide whether they had a preference for any species, and were found filled with blood both in the gills and while attached to the body, though it was difficult to imagine that they could fill themselves with blood from the epidermal sheath of the scales. They were thought to be most numerous on the white-fishes, as they were in greater numbers on them than on the trout, the lawyer, or the cisco, the only other fishes taken. A prevailing but mistaken opinion in the vicinity was that the white-fish fed upon the leech. Dr. Hoy's investigations disproved the notion, and all examinations of stomach-contents confirmed this fact."

Dr. F. B. Adamstone is quoted by Moore[3] in regard to *P. milneri* in Lake Nipigon as follows: "this leech *(piscicola)* is found by hundreds on whitefish, and the decks of the tugs are strewn with them when the nets are lifted." This species is parasitic on whitefish throughout the year, although it is also found free-living (presumably in summer) on floating vegetation and in the more shallow waters. In view of the fact that *P. punctata* infests the red-mouth buffalo only when the water is cold, it may be of some significance that the whitefish spends the warmer months in the deep waters of the lakes where the temperature is close to 4° C.

The European species, *P. geometra* L., is a common pest and well known to fish culturists. According to Plehn,[4] it not only seriously dam-

[2] Milner, James W. Report on the Fisheries of the Great Lakes; the Results of Inquiries Prosecuted in 1871 and 1872. Rept. U. S. Comm. Fish & Fisheries, Part II, for 1872 and 1873, p. 64.

[3] Moore, J. Percy. The Leeches (Hirudinea) of Lake Nipigon. University of Toronto Studies, Biological Series, No. 25: Publications of the Ontario Fisheries Research Laboratory, XXII-XXVI, page 18. (1924.)

[4] Plehn, Marianne. Praktikum der Fischkrankheiten. Handbuch der Binnenfischerei Mitteleuropas. Band I. Page 339. (1924.)

ages its hosts but also transmits the blood parasite *Trypanoplasma cyprini*. This leech apparently attacks the fishes at all seasons and does not have its parasitic habit restricted to a narrow temperature range.

No evidence of any special seasonal relationship to the host has been found in the literature on other species of this genus occurring in various parts of the world.

Effect on Fish Yield

The epidemic of *Piscicola punctata* appreciably affected the fish yield of Rock River for the spring of 1926, and the possibility of its continuing to do so should be considered, since the red-mouth buffalo is second only to the carp in commercial importance. While other species of this genus regularly appear in large numbers on fishes in other waters, this is the only known instance where this species assumed the proportions of a pest with which it would be necessary to reckon. Within the memory of the oldest fishermen of Rock River, it has never been seen except in small numbers and at long intervals. During the winter of 1926-1927, it was present in only about one-tenth of the numbers found the previous winter. There were no unusual conditions known to be prevalent in Rock River during these years which could obviously predispose to such an epidemic. Considering these things, it seems likely that *Piscicola punctata* will not continue to occur in sufficient numbers to affect the fish yield and that it may again be relegated to the rarer species of the river fauna.

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