

CNIDOSPORIDIA IN THE VICINITY OF URBANA¹

R. KUDO, UNIVERSITY OF ILLINOIS

The writer has been studying, for some time, Cnidosporidian parasites of fishes and insects from the vicinity of Urbana, Ill. The object of this study is to determine: 1) what forms do occur in this locality; 2) to what extent is the infection carried on; and 3) what is the effect of infection upon the host body. The study is still under way; the brief summary of the results obtained up to the present will be stated in the following pages.

¹ Contributions from the Zoological Laboratory of the University of Illinois, No. 164.

I. MYXOSPORIDIA²

The following eighteen species of fish and one species of reptile have been subjected to careful examination. It may be understood that the fish were collected from the drainage at Urbana, unless otherwise stated.

Host-species	Locality	Month of examination	Number of individuals examined	Number of individuals infected	Organs infected	Myxosporidian
<i>Ambloplitis rupestris</i>	Stony Creek	November	2	0	....	....
<i>Ameiurus melas</i> . . . . .	.....	Oct. and Nov.	5	0	....	....
<i>A. natalis</i>	Stony Creek	November	3	0	....	....
<i>Carpododes difformis</i> . . . . .	.....	May	1	1	Branchia	<i>Myxobolus discrepans</i> Kudo
<i>C. thompsoni</i>	Stony Creek	November	1	1	Gall-bladder	<i>Myxobolus</i> sp. (?) Few spores
<i>Catostomus commersonii</i> . . . . .	.....	October	5	4	Gall-bladder	<i>Chloromyxum catostomi</i> Kudo <i>Myxidium</i> sp.
<i>C. nigricans</i>	Stony Creek	November	1	0	....	....
<i>Eupomotis gibbosus</i>	Crystal Lake	June	1	1	Gall-bladder	<i>Chloromyxum trigugum</i> Kudo
					Ovary	<i>Wardia ovinocua</i> Kudo
<i>Lepomis cyanellus</i>	Stony Creek	November	3	1	Urinary bladder	<i>Henneguya microspora</i> Kudo
	Crystal Lake	June, July	36	7	Mesentery, etc.	<i>Myxobolus mesentericus</i> Kudo
				36	Kidney	<i>Mitraspora elongata</i> Kudo
<i>L. humilis</i>	Stony Creek	November	2	1	Urinary bladder	<i>Henneguya microspora</i> Kudo
					Ovary	<i>Wardia ovinocua</i> Kudo
<i>L. megalotis</i>	Stony Creek, Homer	November	6	6	Gall-bladder	<i>Chloromyxum trigugum</i> Kudo
<i>L. pallidus</i>	Crystal Lake	June, July	8	3	Gall-bladder	<i>Chloromyxum trigugum</i> Kudo
<i>L.</i> sp. ³ . . . . .	.....	October	26	5	Gall-bladder	<i>Myxidium</i> sp. A few spores <i>Myxobolus</i> sp. (?) Few spores
<i>Micropterus dolomieu</i>	Stony Creek	November	1	0	....	....
<i>M. salmoides</i>	Stony Creek	November	1	1	Urinary bladder	<i>Henneguya microspora</i> Kudo

² Descriptions of the Myxosporidia mentioned here are published in the writer's work on Myxosporidia (Illinois Biological Monograph Vol. V) which is now in press.

³ The fish were less than three centimeters in length, and could not be identified.

Host-species	Locality	Month of examination	Number of individuals examined	Number of individuals infected	Organs infected	Myxosporidian
<i>Notropis blennioides</i>	Homer	November	2	2	Gall-bladder	<i>Sphaerospora</i> sp. (?) A few spores
				1	Muscle	<i>Myxobolus orbiculatus</i> Kudo
<i>N. gilberti</i>	Stony Creek	November	1	1	Muscle	<i>Myxobolus orbiculatus</i> Kudo
<i>Pomoxis annularis</i>	Crystal Lake	July	1	1	Gall-bladder	<i>Chloromyxum trjugum</i> Kudo
<i>Trionyx spiniferus</i>	Crystal Lake	July	1	1	Kidney	<i>Myxidium americanum</i> Kudo

As will be seen from the above, the myxosporidian infection among the common fish in this locality is heavy. Only five out of eighteen species of fish were proved to be free from infection at the time of examination. Yet too much emphasis can not be laid upon the absolute absence of Myxosporidia in these fish, as the number of individuals in each of these five species was not great and besides observations were not made during the summer months.

The writer could not collect, and study the fish throughout the year. In the fish obtained during colder months, there was strong evidence which suggested that only plasmodious multiplication of the parasites took place. On the other hand, in the specimens collected in June and July, remarkably rapid growth of parasites due to plasmodious as well as sporogonic development were clearly noticed. This was well demonstrated in the case of *Mitraspora elongata* Kudo, parasitic in the kidney of *Lepomis cyanellus* caught in Crystal Lake. Early in June vegetative forms and spores were seen to be present in the lumen of the urinary tubules of the kidney of host, while in the latter part of June and in July the vegetative forms became considerably larger and larger, and appeared as more or less conspicuous cysts in the tissue of the kidney, forming frequently numerous small whitish pustules on the surface of the organ. These observations simply verify similar observations made by several investigators especially on such a form as *Myxobolus pfeifferi* Thélohan.

As to the effect of the parasites upon the host-body, the writer has but little to state. In the case of infection of the gall-bladder or urinary bladder, the host fish did not show any recognizable effect which may be attributed to the myxosporidian infection. This has been true in almost all cases of the so-called "free" forms. In the tissue-infecting species, however, some effect was noticed. The heavy infection of *Myxobolus discrepans* Kudo on the branchial lamellae, apparently reduced the activity of the host, *Carpionodes difformis*, so that the host fish was caught with a small net without much trouble, and also seemed to have quickened the death of the host which occurred shortly after its capture.

It is noticeable that even very young fish, *Lepomis* sp. which were less than three centimeters in length harbored a few spores in their gall-bladder which fact must be considered seriously when they are used as experiment animals. It is also noticeable that so far the writer has not encountered any species which would produce cysts in the subcutaneous tissues of the body or fins of the host.

II. MICROSPORIDIA⁴

Little is known about North American Microsporidia. In connection with Myxosporidia, the writer has also been studying Microsporidia. The study has just begun, yet the writer feels justified in stating that this group of Cnidosporidia plays some rôle in certain aquatic arthropods.

The larvae of *Culex pipiens* and *Anopheles punctipennis* and the nymphs of *Baetis* sp. (?), which were collected in October from the drainage at Urbana, have been found to be infected by three different Microsporidia respectively.

Out of 38 larvae of *Culex pipiens* examined, six were found to be infected by *Thelohania magna* Kudo. The adipose tissue and body cavity were the seat of infection, other organs being so far free from the infection.

⁴ Full account of these Microsporidia will be published in the Journal of Morphology.

Twenty-two larvae were kept in the laboratory, and metamorphosed into pupae and adults. Thirteen pupae and nine adults were examined. In one adult were seen a few spores in fresh smears. Careful examination of numerous sections of larvae failed to reveal the slight infection whatsoever. This may be interpreted as indicating that the larvae became infected either when they were very young or when they swallowed a large amount of infected tissue of the larva dead from the infection and underwent decaying at the bottom of the pool where they were found, so that the heavy infection resulted in a comparatively short time.

The infected larvae were more whitish opaque in color than normal, with more or less distended thorax. Yet they were as active as normal ones. However, they died more rapidly than majority in the laboratory. Although there has been one case of ambiguous slight infection in an adult, the parasites seem to exercise a fatal effect upon the host, and the larvae once infected, perish without completing their life cycle.

This is the second Microsporidian found parasitic in the dipterous insects under discussion, although there have been some doubtful cases which did not furnish the necessary proof to show their belonging to Microsporidia. The first microsporidian parasite of mosquitoes was described by Hesse in 1904 from France, who noticed a few larvae of *Anopheles maculipennis* infected by *Thelohania legeri* Hesse. The seat of infection was adipose tissue as in the American form. Hesse however states that the infection was rare and the infected larvae did not seem to suffer at all from the parasites.

In two out of twelve larvae of *Anopheles punctipennis* examined, another Microsporidian was noted to occur in the adipose tissue. The small number of specimens and the smear preparation do not allow the writer to report the details as the observation is still incomplete. The effect of the parasite upon the host also remains to be determined in future.

In nine out of thirty nymphs of *Baetis* sp. (?). examined, third Microsporidian was found to occur exclu-

sively in adipose tissue. The infected nymphs could easily be distinguished from the healthy ones by their opaque appearance. They however did not seem to suffer from the infection. Further details still are needed to complete the observations.

The Microsporidian nature of the latter two forms can not be doubted, because the writer could determine every characteristic of Microsporidian spores in both of them; i. e., the characteristic appearance of spores and the presence of a polar filament in the spore which can be made to extrude under suitable treatment.

SUMMARY

Myxosporidia are common parasites among fish in the vicinity of Urbana, Ill. The infection is heavy in many cases. The effect of the parasites on the host body is in some cases fatal.

Microsporidia seem to be also common among some aquatic insects in the same locality. The larvae of *Culex pipiens* appear to receive mortal influence by its parasites, *Thelohania magna* Kudo.
