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E. A. Bogdanova

VIRGINIA INSTITUTE OF MARINE SCIENCE
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ON CERTAIN ASPECTS OF THE BIOLOGY OF *DACTYLOGYRUS SKRJABINI* ACHMEROV, 1954--PARASITE OF AMUR *HYPOPHTHALMYCHTHYS*

by

E. A. Bogdanova

Edited
by
William J. Hargis, Jr.

Translated
by
Pierre C. Oustinoff

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Preface to Translation[1]

Translation of this paper was undertaken as part of a long-term research project on the systematics, host-specificity and zoogeography of monogenetic trematodes.[2] Translation and editing were accomplished in the following manner:

1. Oustinoff[3] read translation on tape.
2. Mrs. Morales transcribed translation from tape to first typescript.
3. Hargis edited typescript.
4. Typescript retyped by Mrs. Morales.
5. Hargis again edited typescript for final corrections.

A conscious effort has been made to keep this translation as near the original as possible. It is probably inevitable, however, that some of the nuances of meaning in the original have been distorted or lost. For this we apologize to the author and the reader.

Certain passages were difficult to translate. Where a different English phrase seems to fit the author's meaning better or serves to clarify the text, it has been inserted in brackets. Certain obvious errors or misspellings in the original text were changed, less obvious ones are noted with (sic).

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[2]Translation and editing supported by funds from Grant No. E-2389 of the National Institutes of Health.

[3]Chairman, Department of Modern Languages, College of William and Mary, Williamsburg.

For convenience in referring to the Russian text the original pagination is given in the margin of the translation opposite the place where the new page begins. Occasionally figures or tables are somewhat displaced from their original page location; however, since they, themselves, are numbered sequentially, no confusion should result.

The citation of numbers for measurements and numbered sturctures are generally given in the translation as they were in the authors' paper. This should further facilitate checking with the Russian. Unless otherwise noted, all measurements are in millimeters.

This translation is intended as a service to researchers. Though effort has been made to make it comprehensible, accurate and useful, it is likely that improvements can be made. Should literary improvements or verification appear desirable it is suggested that the researcher make his own translation. Pagination is arranged to facilitate such activity. We will appreciate constructive suggestions for improvements in this and future translations.

Thanks are due to Mrs. Patricia C. Morales of the Virginia Institute of Marine Science who transcribed, typed, and assembled the manuscript, and to Miss Evelyn Wells who assisted with final editing.

William J. Hargis, Jr.

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PARASITOLOGY

E. A. Bogdanova

ON CERTAIN ASPECTS OF THE BIOLOGY OF DACTYLOGYRUS SKRJABINI ACHMEROV, 1954--PARASITE OF AMUR HYPOPHTHALMYCHTHYS

(Presented by Academician E. N. Pavlovsky, March 11, 1957)

The Amur River with its sizable and singular ichthyofauna is p1391
attracting the attention of Soviet researchers more and more. It has been learned that certain Amur fishes can be acclimatized to the western part of the Soviet Union (1-3). Importation of Amur carp to the fish ponds of Kursk began in 1937 and transfer of the Amur fishes /Hypophthalmychthys and Ctenopharyngodon idella (Valenciennes)/ into fish ponds of the Moscow and Ukranian regions began in 1951.

Experience has shown that parasites may be transferred along with the fish and that some of these parasites can cause serious damage to the fish pond industry.

In cases of mass infection a number of species of the genus Dactylogyrus cause diseases. D. vastator and D. solidus are particularly troublesome. The latter has an exceedingly wide distribution in the fish ponds of the European part of the Soviet Union. D. solidus differs from other dactylogyrids in its large dimensions and in the fact that its reproduction is more rapid /at temperatures/ below 13 - 15°C. This parasite possesses a high degree of resistance against immersion in a 5% solution of NaCl for an exposure of five minutes (4,5).

The monogenetic trematode fauna of Amur fishes has been studied in considerable detail (6-8). During this study Dactylogyrus hypophthalmychthys, D. magnihamatus and a recently described new species D. skrjabini, were found on Hypophthalmychthys (9).

The first two species of dactylogyrids are usually encountered on gill filaments. In contrast, D. skrjabini occurs on the gill rakers. The latter, among the Hypophthalmychthys, have an unusual shape, appearing like finely honey-combed reticular plates which resemble sponges. These plates are formed by the fusion of lateral ramifications of the separate threads of the rakers. Each gill arch of Hypophthalmychthys has two rows of such grids (or screens) along the entire extension of the hard skeletal part. These (the two rows of screens) tightly adjoin each other, widening in the middle of the gill and narrowing toward its ends.

These screens serve as plankton catchers (10) and for this reason are sometimes called "filters." D. skrjabini is encountered on the interior surface of the above-mentioned screens and, as a rule, in the narrowest places of the screens, that is along the edge of the gills. At the same time the attaching disc /posthaptor/ of D. skrjabini is located in the depths of the mesh of the screen, with its entire body in the lumen between the two rows of screens. An almost complete absence of parasites along the entire length /reach of the middle/ of the filters may be accounted for by the constant fast stream of water through the screens which hampers the attachment of eggs and, subsequently, of the larvae of the parasite. In this connection it is interesting to examine the change in the localization of D. skrjabini during subsequent rearing of this species of fishes in fish ponds, where the flow of water is rather weak in contrast to that of the Amur River.

D. skrjabini is the largest of the dactylogyrids. Its length p1392
reaches 2.5 - 3.0; the width, 0.5. Experiments have shown that this parasite possesses very high resistance to immersion for five minutes in a 5% solution of NaCl. In this regard D. skrjabini is similar to D. solidus, which causes mass diseases among fish pond fishes.

Because Hypophthalmychthys is being acclimatized to the western part of the SSSR, clarification of certain questions of the biology of D. skrjabini is of interest.

For this purpose we conducted 56 experiments at different temperatures: 39 of them to clarify the tempo of deposition of eggs and 17 to determine the rate of embryonic development. The work was conducted in June and July 1954 at the fish factory located on the Amur River in the village of Elabug, 90 km south of Khabarovsk.

The tempo of the deposition of eggs of D. skrjabini and its fertility were determined by previously developed techniques (11). In this worms were carefully removed from the gill screens /rakers/ and placed into beakers of water. Experiments were conducted at temperatures varying from 10 to 26°C. Low temperatures were achieved by placing the beakers with worms into a box constantly cooled by ice.

Observations showed that the parasites deposite eggs at temperature varying from 14 to 26°C. Deposition takes place more intensively when the temperature is 20 - 24°C. Slowing down of the tempo of the deposition of eggs occurs when the temperature is lowered to 14 - 17°C or raised to 25 - 26°C. During the experiments one specimen of D. skrjabini deposited one egg every 15-20 minutes at temperatures of 20 - 24°C. Such speed of deposition continued scmetimes 3-4 hours, followed by a slowing of the process. At 14 - 16°C deposition was considerably slower. During the first 6 hours the parasites deposited one egg every 30 - 40 minutes, later this process took more than 100 minutes (Table 1).

These data show that the process of formation and of deposition of eggs takes longer at low temperatures (11 - 12 hours) than at high temperatures (about 8 hours), although in the second case more eggs were deposited than in the first (17 versus 12).

The lengths of the eggs of D. skrjabini varied from 55.0 to 80.0 μ (average 70.0 μ), the width from 47.0 - 55.0 μ (average 50.7 μ). The eggs usually were of elongated form, somewhat widened at one end and narrowed at the other. At the widened end of the body there is a small filament measuring 5.0 - 10.0 μ (average 8.1 μ). Among the mass of deposited eggs only rarely did we notice aborted eggs which were almost round. We did not notice any embryonic development in them.

In our experiments development of the larval parasites took place in 57.1 - 66.7% of the eggs which were deposited. The periods of the embryonal development of D. skrjabini depended directly on the temperature of the medium. Thus, at 20 - 22°C formation of the larvae in the eggs took place in 3-4 days. At first a clear spot appeared at the anterior end of the egg and then 4 pigmented spots. During experiments at lower temperatures (16 - 18°C), and also at temperatures higher than 24°C the process of the formation of the larvae in the eggs took place in from 7 to 8 days.

The experiments of B. E. Bychowsky (12) established that two p1393
periods can be distinguished in the development of the larvae of gill trematodes. The first period is characterized by a non-functional attaching apparatus and sharply expressed positive reaction to light; the second, by the existence of a functioning attaching apparatus and by negative reaction to light.

These two periods are also observed in the development of the larvae of D. skrjabini. When completely formed the larva usually moves strenuously through still in the egg. Soon after this the small operculum at the narrow terminal of the egg opens. After several active movements the larva leaves the egg and continues rather active and quick movements through the water, stopping very rarely. When exposed to light after emerging from the egg, the larva quickly perishes, whereas, it may last for several days in the dark.

Our data indicate that both the tempo of the deposition of eggs and the development of larvae of D. skrjabini take place more intensively at 20 - 24°C. Deviation from this optimum in either direction causes retardation of all stages of development of this parasite.

It is known that a temperature varying from 20 - 24°C represents the optimum for the development of a different parasite, D. vastator, which is pathogenic for the small carp and for the Amur carp. During acclimatization of Hypophthalmychthys to the reservoirs of the European part of the Soviet Union, certain favorable conditions for the development of D. skrjabini may arise, particularly in the southern zone.

It must be mentioned that neither A. V. Gussev (8) nor A. Kh. Achmerov (7,9) found D. skrjabini during their detailed studies of the monogenetic trematodes of Amur fishes except on Hypophthalmychthys and this indicates the strict specificity of this trematode. On the other hand, the occurrence of this species of parasite on a less important part of the gill, insofar as breathing is concerned, on the raker screens--and even then on the small section of the gill--may indicate that it is not dangerous to Hypophthalmychthys.

All Union Scientific Research Institute
of the Fish Industry of Lakes and Rivers,
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TABLE 1

The influence of temperature on the tempo of the deposition

of eggs of Dactylogyrus skrjabini

Duration from the beginning of deposition	at 14 - 16°		Duration from the beginning of depos.	at 20 - 24°	
	Time of depos. of one egg (minutes)	No. of eggs deposited per hour		Time of depos. of one egg (minutes)	No. of eggs deposited per hour
3 hrs. 30 min.	33.0	1.7	2 hrs.	15.0	4.0
6 hrs. 45 min.	39.0	1.5	4 hrs.	20.0	3.0
11 hrs. 45 min.	100.0	0.6	7 hrs. 30 min.	110.0	0.5