STUDIES ON BLOOD FLUKES OF THE FAMILY SPIRORCHIDAE. I. PRELIMINARY REPORT[1]

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Following the suggestion of Dr. H. W. Stunkard of New York University, who was kind enough to read an unpublished manuscript in which the writer had described a new blood fluke from a turtle collected at Athens, Georgia, the writer has undertaken a restudy of the blood flukes of turtles. With this study in mind, one hundred turtles have been autopsied during the past summer in order to secure as many specimens of the various species of these blood flukes as possible. In this work we have been constantly on the lookout for morphological features which would be helpful in elucidating certain generic and specific characters peculiar to the reptilian blood flukes. It is in the light of these new observations that we hope to make a revision of the family Spirorchidae in a subsequent publication. In the present preliminary report it is our purpose to give a list of hosts examined, the incidence of parasitism and the approximate host distribution of the species of blood flukes encountered.

All turtle hosts herein reported to harbor blood flukes were collected from Reelfoot Lake, and all autopsies were done at the Reelfoot Lake Biological Station during the summer of 1937. Most of the collections were made during the month of June, although some were made during July and August. Living turtles were kept in aquaria for varying lengths of time before being autopsied, but no turtle was maintained in the laboratory for more than six weeks before being examined for its parasites.

All parasites were removed to physiological saline solution on being freed from the host tissue and were examined for morphological details while still alive. The worms were divided into two batches, one for mounting *in toto*, the other to be preserved for sectioning. Worms to be mounted were killed under pressure of the coverslip by drawing a six per cent solution of formalin under the coverslip to replace the saline solution. Worms killed in such a manner were removed to a fresh solution of formalin for preservation before being stained with Bullard's hematoxylin, dehydrated in alcohol and cleared in cedar oil. Worms to be sectioned were killed by placing them in six per cent formalin that had been heated to 60° C. A preliminary study of the mounted specimens of blood flukes has been made prior to the present writing.

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Incidence of Parasitism

The incidence of parasitism with blood flukes is given in Table 1. A total of eight species of turtles is recorded. The box turtle (*Terrapene carolina*) is the only species examined that showed totally negative results. Whether or not this is due to the insignificant number examined, it is not possible to say. Of the remaining seven species

TABLE 1

Turtle Hosts and the Incidence of Blood Flukes in Each Species

Turtle Host	Negative		Adult blood flukes		Eggs only in tissues		Positive for blood flukes	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Sternotherus odoratus (Latreille). Stinkpot	5	20.8	18	76.6	1	4.1	19	79.2
Chelydra serpentina (Linné). Common snapping turtle	4	16.6	18	76.6	2	8.2	20	83.4
Terrapene carolina (Linné). Box turtle	2	100.0						
Graptemys pseudogeographica pseudogeographica (Gray). Map turtle	1	10.0	5	50.0	4	40.0	9	90.0
Chrysemys picta dorsalis (Agassiz). Painted turtle	2	16.6	5	41.6	5	41.6	10	83.4
Pseudemys hieroglyphica (Holbrook)			2	66.6	1	33.4	3	100.0
Pseudemys troostii (Holbrook) Red-eared turtle			14	77.7	4	22.3	18	100.0
Amyda spinifera (Le Sueur). Spiny soft-shelled turtle	1	14.3	5	71.4	1	14.3	6	85.7
All turtles examined	15	15.0	67	67.0	18	18.0	85	85.0

of turtles examined only *Sternotherus odoratus*, the stinkpot, drops below 80 per cent in incidence of infection. In two species, *i. e.*, *Pseudemys pseudogeographica pseudogeographica* and *Pseudemys troostii*, the incidence is 100 per cent if we consider the turtle to be infected with blood flukes when eggs only are found. We have assumed the turtle to be positive for blood flukes when we are able to demonstrate the presence of blood fluke eggs in the tissues even when no adult blood flukes could be found.

Blood Flukes

In the present study we have encountered three subfamilies of the family Spirorchidae Stunkard, 1921, as follows: (1) Spirorchinae

Stunkard, 1921; Hapalotreminae Stunkard, 1921; and Unicaecuminae Mehra, 1934. At least five genera are represented in the collection, *i. e., Spirorchis* MacCallum, 1918, and *Henotosoma* Stunkard, 1922, belonging to the subfamily Spirorchinae; *Hapalorhynchus* Stunkard, 1922, and *Vasotrema Stunkard*, 1926, belonging to the subfamily Hapalotreminae; and *Unicaecum* Stunkard, 1925, belonging to the subfamily Unicaecuminae. A total of sixteen species of blood flukes, belonging to the five genera listed above, *i. e., Spirorchis, Henotosoma, Hapalorhynchus, Vasotrema* and *Unicaecum*, have been collected from the turtles of Reelfoot Lake. In addition to these sixteen species we have two additional species, one from a turtle collected at Raceland, Louisiana, and one species from a turtle from Athens, Georgia. The specific identification of these species of blood flukes will be forthcoming in a subsequent publication.

Distribution of Blood Flukes (Genera) in the Turtle Hosts Examined

Blood Flukes:

1. *Spirorchis MacCallum*, 1918. Represented by six species in the collection.
   TURTLE HOSTS:
   Graptemys pseudogeographica pseudogeographica (Gray).
   Chrysemys picta dorsalis (Agassiz).
   Pseudemys hieroglyphica (Holbrook).
   Pseudemys troostii (Holbrook).
2. *Henotosoma* Stunkard, 1922. Represented by three species in the collection.
   TURTLE HOSTS:
   Chelydra sepentina (Linné).
3. *Vasotrema* Stunkard, 1926. Represented by two species in the collection.
   TURTLE HOSTS:
   Amyda spinifera (Le Sueur).
4. *Hapalorhynchus* Stunkard, 1922. Represented by four species in the collection.
   TURTLE HOSTS:
   Sternotherus odoratus (Latreille).
   Chelydra serpentina (Linné).
   Chrysemys picta dorsalis (Agassiz).
   Amyda spinifera (Le Sueur).
5. *Unicaecum* Stunkard, 1925. Represented by a single species in the collection.
   TURTLE HOSTS:
   Graptmys pseudogeographica pseudogeographica (Gray).
   Pseudemys troostii (Holbrook).

Summary

1. Of the eight species of turtles examined at the Reelfoot Lake Biological Station in Tennessee, seven are reported as serving as hosts for blood flukes.

2. The incidence of infection with blood flukes is given for each species of turtle. The incidence of infection for all turtles examined was found to be 85 per cent.

3. Three subfamilies and five genera of the family Spirorchidae are represented in the collection.

4. Sixteen species of blood flukes are indicated from turtles collected in Tennessee.

5. The host distribution for the five genera of blood flukes encountered is given.

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