Rev. Biol. Trop., 12(1): 59-65, 1964

Seasonal incidence of larval Trematodes in Costa Rica *

by

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(Received for publication April 23, 1964)

There is little published information generally available on the distribution of snails and their parasites in Costa Rica. BRENES (1) has catalogued the intestinal helminths and GOODMAN *et al.* (9) have listed various types of larval trematodes that may be expected in the snail fauna of Costa Rica. However, our preliminary surveys indicated a general paucity of snails compared with many other areas of the world. Since no ecological studies on snails have been recorded in Costa Rica, it was decided to investigate one area intensively over a period of a year or more.

A collecting site was finally decided upon near Coris which is a few miles southwest of Cartago in the Province of Cartago[1]. There were four collecting sites situated in an area of approximately 80 square meters; all were tributaries of the same stream system and some had actually been modified to serve as irrigation ditches. Additional data were occasionally secured from two others in the same region. Beginning in May 1962 and extending through June of the following year a total of 14 collecting trips were made, one each month.

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* The personnel of the International Center for Medical Research and Training (ICMRT) who collaborated in this investigation were supported by Public Health Service Grant 8RO7 GM 11330-02 from the Office of International Research.

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1 Thanks are due Prof. Rodrigo Ramón Brenes, Departamento de Parasitología, Facultad de Microbiología, Universidad de Costa Rica for suggesting this area and for showing us its location.

MATERIALS AND METHODS

Collections were made in each area by walking along the bank, in the water, or in the swampy area and picking up snails from the bottom, vegetation, logs or stones. An attempt was made to collect at least 100 of each species. Collections were made by area and the snails sorted later in the laboratory putting about 10-15 snails of a given species into a 200 ml jar which was observed for 18-24 hours for the shedding of cercariae. The snails from all positive jars were then isolated individually in shell vials and observed again at the end of 12 and 24 hours in order to detect the number of positive snails. In addition all snails dying during this interval were crushed and examined; further checks were made by crushing 20 of the negative snails of each species (selected at random) and examining these for parasites. Cercariae were studied microscopically, drawn and classified to major group. Their activities were observed and representative specimens preserved; metacercariae were treated in the same manner.

It should be pointed out that is was not always possible to collect the desired number of snails. In some instances one area would be dry and no living snails could be detected even though the soil was examined. Approximately the same amount of time was spent collecting snails on each trip.

RESULTS

The numbers of snails collected and examined for cercariae from May 1962 through June 1963 are recorded in Table I. During this 14 month period a total of 4902 snails mostly *Helisoma caribaeum guatemalense* (Clessin) and *Stenophysa pliculosa* Martens were examined. Some idea of the variation in availability of the two commonest species can be seen from this table for at certain periods no snails of one or the other could be detected.

Figures 1 and 2 reveal the variations in the per cent of snails that shed different types of cercariae. The graphs represent a consolidated report of all four areas considered as a single plot. In some cases there seemed to be some correlation between the ease with which snails could be found and the extent to which they were infected.

In *Helisoma* monthly infections of Xiphidiocercariae varied from the complete absence of all cercariae during the dry season (November - February) to a peak of 40 per cent in October 1962. Gymnocephalous cercariae were not as abundant as a maximum of 6.2 per cent were infected in June 1962.

Stenophysa, on the other hand, was more apt to be infected although the incidence of Xiphidiocercariae did not run as high as in *Helisoma,* being only 27 per cent in February 1963. However, the gymnocephalid's peak of 16 per cent in June was considerably higher than in *Helisoma.* Strigeid cercariae were isolated once from *Stenophysa* and once from *Helisoma* in May 1962 and June 1963 respectively.

In June 1963, 100 specimens of *Aroapygyrus costaricensis* (Mörch) were collected from the same general area; however, these were negative for parasites. During the same month 240 *Physapolakowsky* Clessin were encountered on the

TABLE I

Record of snail collections over a 14 month period from Coris, Cartago, Costa Rica in 1962-1963

Area	No. 1		No. 2		No. 3		No. 4		
Month	*Helisoma**	*Stenophysa*+	*Helisoma**	*Stenophysa*+	*Helisoma**	*Pliculosa*+	*Helisoma**	*Pliculosa*+	Totals
1962									
May	2	320	0	70	0	140	NC[1]	NC[1]	432
June	—	—[2]	0	100	0	108	64	67	339
July	0	16	9	114	126	20	123	31	439
Aug.	NC[3]	NC[3]	0	40	2	118	60	14	234
Sept.	0	20	0	100	6	0	101	146	373
Oct.	0	126	0	100	0	100	10	110	446
Nov.	0	100	0	100	0	100	0	100	400
Dec.	0	100	0	100	0	100	0	100	400
1963									
Jan.	NC[3]	NC[3]	0	100	0	100	0	100	300
Feb.	0	100	0	100	0	100	0	100	400
Mar.	0	10	0	100	53	42	1	100	306
Apr.	0	41	6	93	0	84	0	100	324
May.	NC[3]	NC[3]	100	85	0	1	0	0	286
June	NC[3]	NC[3]	94	100	9	0	20	0	223
Totals	2	833	209	1302	196	1013	379	968	4902

* *Helisoma caribaeum guatemalense* (Clessin)

\+ *Stenophysa pliculosa* Martens

1 No collection made.

2 Only pot holes left - small feeder ditch was dry

3 No collections, dry.

regular plots and another 100 in a neighboring marsh. Four or 1.6 per cent shed cercariae, 2 yielding Xiphidiocercariae and the other two gymnocephalous cercariae.

DISCUSSION

Even though aquatic snails have been recognized over the years as a host for larval trematodes relatively little work has been carried out on their seasonal prevalence in freshwater snails. Investigators at various summer biological stations have collected snails intensively over a period of a few months, usually in connection with their studies on various trematode life cycles. However, few of these persons present their data in such a way as to stress fluctuations in cercarial numbers. HUNTER and BIRKENHOLZ (10) reported on the changes in the shedding pattern of larval trematodes during an interval of two summer months; they noted a sharp increase in the number of snails shedding echinostome cercariae. This appeared to be correlated with the influx of wild ducks that habitually nest in the area.

Various surveys have been made such as those of BYRD (2, 3, 4) who found some 28 species of snails in Reelfoot Lake, Tennessee and some 28 and 12 per cent respectively of the *Physa gyrina* and *Helisoma trivolvis* shedding cercariae. GOODMAN (7,8) who studied the same area found only 9.3 and 8 per cent of the same species of snails shedding cercariae. Whether or not this difference was due to a change in the overall ecology of the lake is not known. DAVIS (5) collected data on several species of snails and their cercariae from the Columbia River basin.

GAMBINO (6) was of the few to study the seasonal variations in prevalence of cercariae in the common marine and brackish water snail, *Nassa obsoletus* (= *Nassarius obsoletus* [Say]; he noted considerable variation. However, there appears to be no information on the shedding of strictly fresh-water cercariae over an extended period, at least not in Costa Rica where we worked.

Two species of snails were common to the four adjacent areas we surveyed, *Stenophysa pliculosa* and *Helisoma caribaeum guatemalense.* These collecting stations were ecologically similar being all part of the same watershed and were all located in an area of approximately 80 square meters. It was for these and other reasons that they were considered as one (Table I).

During the dry season, the end of November through January, there was a drop in the percentage of infected snails. This is of interest since both species of snails harbored the same two groups of cercariae, xiphidio- and gymnocephalous cercariae.

Data were collected on variations in the weather, air and water temperatures, pH of the water and wind velocity. However, none of these seemed to be related to the appearance of the various cercarial species, nor to explain their shedding pattern. Neither was it possible to identify the cercariae encountered to species; this would have necessitated carefully executed life history studies. However, the Xiphidiocercariae probably represent parasites belonging to the

Plagiorchoidea while the second group belongs to the Fascioloidea. Although feeding experiments were planned to verify these hypotheses, it was not possible to carry them out in the time available for this study.

SUMMARY

The shedding pattern of cercariae in several species of snails was followed over a period of 14 months in Coris, Cartago, Costa Rica.

RESUMEN

Los autores presentan observaciones sobre la incidencia mensual estacional de caracoles de agua dulce, a través de un período de 14 meses, en un área situada en Coris de Cartago, Costa Rica. Las especies colectadas fueron: *Helisoma caribaeum guatemalense* (Clessin), *Stenophysa pliculosa* Martens, *Physa polakowskyi* Classin y *Aroapygyrus costaricensis* (Mörch). De las tres primeras especies se observó la producción de tres tipos de cercarias en el laboratorio y se anota el porcentaje de caracoles infectados cada mes.

REFERENCES

1. BRENES, R. R.
1961. Catálago de los helmintos parásitos de Costa Rica. *Rev. Biol. Trop.*, 9: 67-95.

2. BYRD, E. E.
1940. Larval flukes from Tennessee. II. Studies on cercariae from *Physa gyrina* Say, with description of two new species. *Rept. Reelfoot Lake Biol. Sta.*, 4: 124-131.

3. BYRD, E. E.
1940. Larval flukes from Tennessee. III. Studies on cercariae from *Helisoma trivolvis* Say, with descriptions of new species. *Rept. Reelfoot Lake Biol. Sta.*, 4: 132-156.

4. BYRD, E. E., NORTON, E. M. and J. F. DENTON
1940. Studies on the gastropod fauna of the Reelfoot Lake Region. *Rept. Reelfoot Lake Biol. Sta.*, 4: 157-163.

5. DAVIS, A. D.
1958. Occurrence of larval trematodes in the Columbia basin. *J. Parasitol.*, 44: 467-470.

6. GAMBINO, J. J.
1959. The seasonal incidence of infections of the snail, *Nassarius obsoletus* (Say) with larval trematodes. *J. Parasitol.*, 45: 440-456.

7. GOODMAN, J. D.
1951. Studies on trematode cercariae at Reelfoot Lake, Tennessee. I *J. Tenn. Acad. Sci.*, 26: 22-25.

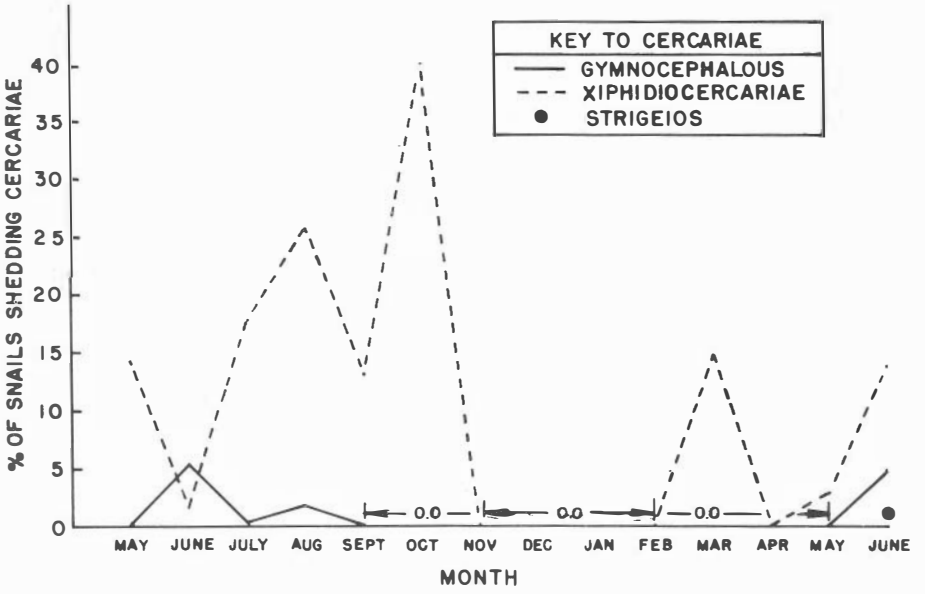
8. GOODMAN, J. D.
1951. Studies on trematode cercariae at Reelfoot Lake, Tennessee. II. *J. Tenn. Acad. Sci.*, 26: 55-72.

9. GOODMAN, J., BRENES, R. R. y G. ARROYO
1963. Llave para algunas formas de cercaria que pueden encontrarse en Costa Rica. *'O Bios*, 2: 12-23.

10. HUNTER, G. W. III and D. E. BIRKENHOLZ
1961. Notes on larval Trematodes of Gunnison County, Colorado. *Trans. Amer. Micr. Soc.*, 80: 358-364.

Fig. 1. Summary of groups of cercariae shed by months from *Helisoma caribaeum guatemalense* (Clessin) during 1962-63.

Fig. 2. Summary of groups of cercariae shed by months from *Stenophysa pliculosa* Martens during 1962-63.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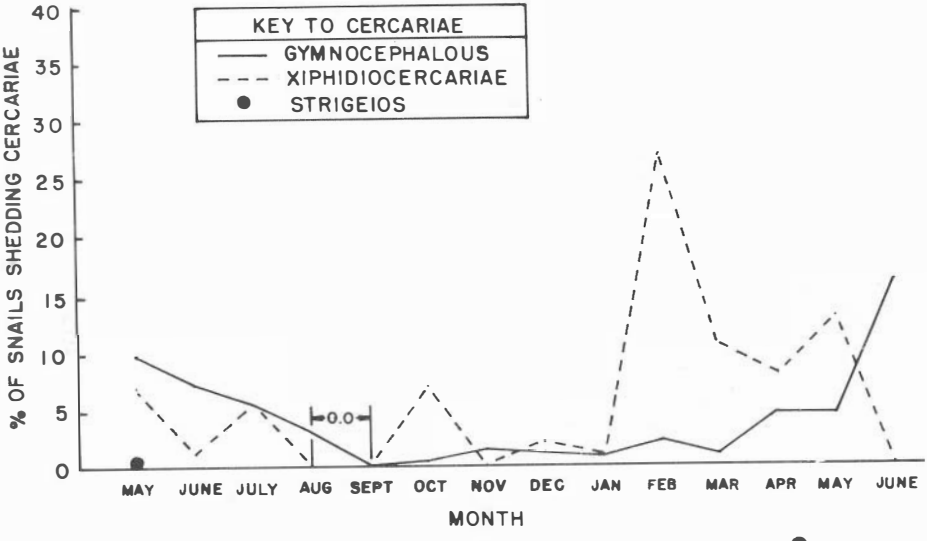
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