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GROWTH DYNAMICS AND SEASONAL PREVALENCE OF *Crepidostomum isostomum* AND *Phyllodistomum pearsei* IN *Aphredoderus sayanus*

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Abstract: A trematode survey of pirate perch, *Aphredoderus sayanus*, in Louisiana demonstrated a seasonal periodicity of *Crepidostomum isostomum* with regard to prevalence, worm burden, and maturation. The prevalence of *Phyllodistomum pearsei* showed no discernable periodicity and only the worm development followed a seasonal pattern.

INTRODUCTION

Pirate perch, *Aphredoderus sayanus*, from Whisky Bay, Louisiana, were infected with two species of digenetic trematodes: *Crepidostomum isostomum* from the pyloric ceca and the intestine and *Phyllodistomum pearsei* in the urinary bladder. This study was undertaken to determine seasonal prevalence and growth dynamics of the two parasites. The pirate perch was an ideal host for this study since it is possible to correlate the age and growth of the fish with changes in the character of the trematode infections.

MATERIALS AND METHODS

A small population of pirate perch were sampled from Whisky Bay, a permanent pond, 0.8 km long by 18 m wide, located approximately 2.4 km west of the Intercoastal Canal in West Baton Rouge Parish. Fish were collected with dip nets because excessive vegetation did not permit seining.

Pirate perch were placed in three age groups (0-1 year, 1-2 year, and 2-3 year) using total length, standard length, and relative position of the anus after the criteria of Hall and Jenkins[2] and Mansueti.[3]

Trematodes removed from the fish were fixed in AFA under slight cover slip pressure and subsequently studied as mounted specimens. Drawings were made with the aid of a microprojector and measurements are given in microns.

RESULTS

Growth dynamics of Crepidostomum isostomum

Four distinct growth phases in *C. isostomum* were categorized using the development and maturation of the reproductive system (Figure 1).

Phase A.

Collected March through July. Length 498 (240-752). These worms had only slight genital development. Testes, though recognizable, were not clearly defined. The ovarian complex appeared as a dark staining region with no differentiation of ovary, oviducts and associated structures. This phase represented the youngest worms recovered and indicated recruitment occurs March through July.

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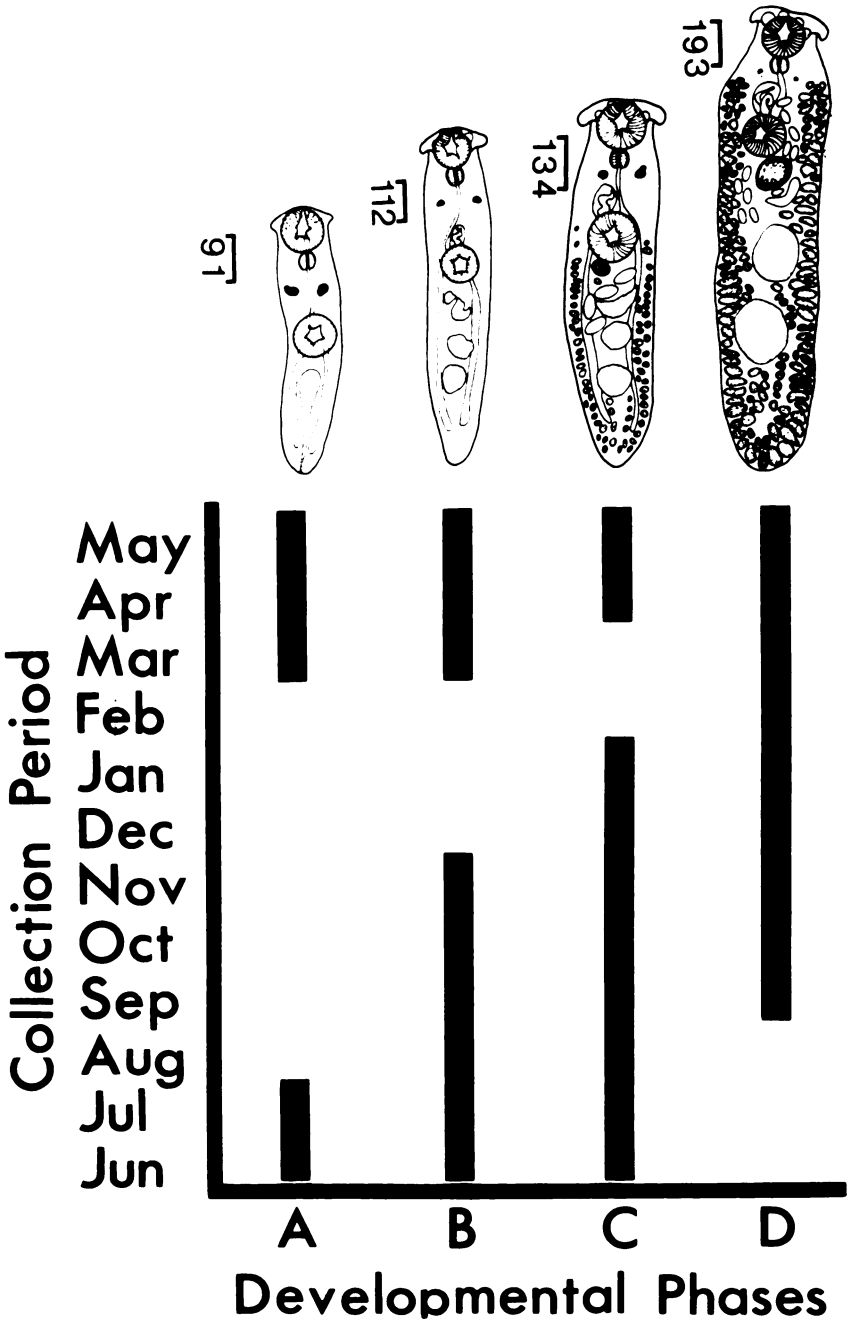

FIGURE 1. Collection periods of the growth phases of **Crepidostomum isostomum** from **Aphredoderus sayanus** with sketches of each phase. Measurements indicated are in microns.

Phase B.

Collected in March through November. Length 668 (312-1264). Genitalia appeared as well stained structures. Sperm was observed in both the testes and the seminal vesicle of some specimens. No eggs were visible in the oviduct and the vitellaria were absent or appeared as poorly developed follicles.

Phase C.

Collected April through January. Length 1105 (672-1632). Worms in this group were characterized as having fully developed male structures and with a fully mature and functional female system. Five, or fewer newly formed eggs were in the uterus, posterior to the acetabulum. No eggs were shed by these worms when placed in saline.

Phase D.

Collected September through May. Length 2637 (1312-3768). At this stage, worms had more than five eggs in the uterus and eggs were present in the uterus anterior to the acetabulum. When these worms were placed in saline, eggs were shed.

Growth dynamics of Phyllodistomum pearsei

Six growth phases of *P. pearsei* were categorized using growth and development of the reproductive systems (Figure 2).

Phase A.

Collected March through July. Length 538 (188-911). Worms in this phase did not have any genital development. One specimen was found in the intestine but all others were recovered from the urinary bladder.

Phase B.

Collected June through August. Length 1359 (823-1728). Paired vitellaria and testicular anlage were apparent.

Phase C.

Collected June through August. Length 1566 (1208-2139). Worms in this phase of development had fully differentiated male and female reproductive complexes; however, eggs were not present in the uterus.

Phase D.

Collected July through November. Length 1882 (1168-2584). This phase was marked by the appearance of tanned eggs in the uterus but none was located anterior to the level of the acetabulum.

Phase E.

Collected September through November. Length 2253 (1776-2656). At this stage of maturation, eggs completely filled the uterus in the hind body and anterior to the acetabulum. When removed from the host, these worms readily shed eggs.

Phase F.

Collected October through June. Length 3189 (2064-4287). The major distinction that can be made in this phase is the apparent regression of the testes as indicated by their failure to react with the stains employed and their decrease in size.

Worm Burden and Prevalence

The percentage of fish infected with *C. isostomum* was 90 to 100% from April through July but dropped to 38% in December (Table 1). The mean number of parasites was 25.5 to 26.0 worms per fish in April and May. During this period only very young worms in Phase A and B development were present. June through March, the worm burden ranged from 2.1 to 4.8 worms per fish and consisted of mixed immature/mature infections except for November through January when only mature forms (Phase C-D) were present. The level and type of worm burden throughout the year appeared to be host-age independent since all three age groups of fish were involved as hosts.

Unlike infections with *C. isostomum*, *P. pearsei* did not show a seasonality in the percentage of fish infected. Furthermore, only in March and April was there

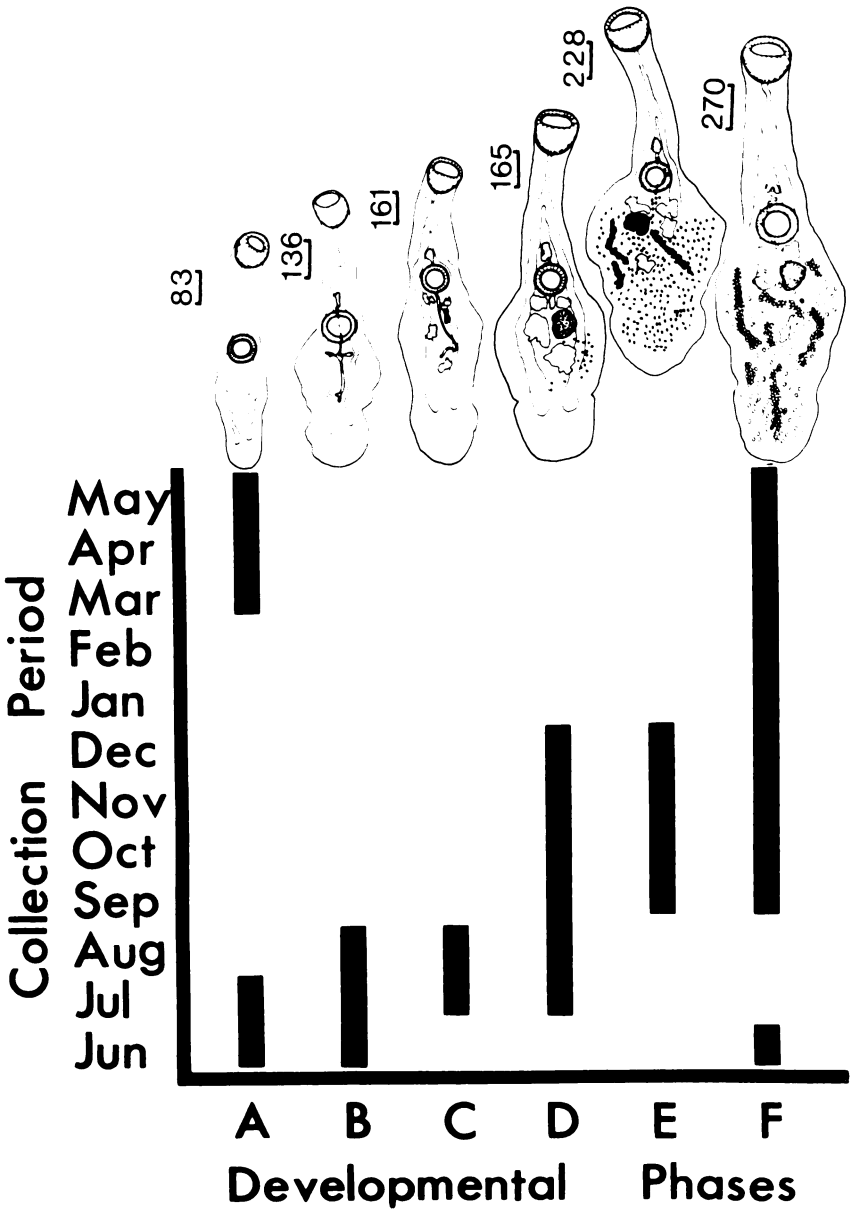

FIGURE 2. Collection periods of the growth phases of **Phyllodistomum pearsei** from **Aphredoderus sayanus** with sketches of each phase. Measurements indicated are in microns.

TABLE 1. Seasonal occurrence of **Crepidostomum isostomum** (Ci) and **Phyllodistomum pearsei** (Pp) in the pirate perch, **Aphredoderus sayanus** from Louisiana.

Month Sampled	No. Exam.	% Infected		% Immature Infections		% Mature Infections		% Mixed Infections		Total No. Parasites		Infected Fish Mean No./ (Range)	
		Ci	Pp	Ci	Pp	Ci	Pp	Ci	Pp	Ci	Pp	Ci	Pp
J	11	91	27	45	67	22	33	33	0	53	5	4.8 (1-17)	1.6 (1-2)
J	21	100	66	29	85	14	15	57	0	102	17	4.8 (1-16)	1.2 (1-2)
A	14	85	64	58	67	42	33	0	0	37	12	3.1 (1-10)	1.3 (1-2)
S	26	65	62	12	0	70	100	18	0	54	30	3.2 (1-13)	1.9 (1-4)
O	23	52	48	25	0	67	100	8	0	29	14	2.4 (1-9)	1.3 (1-2)
N	9	55	78	0	0	100	100	0	0	9	11	3.6 (1-3)	1.6 (1-3)
D	8	38	63	0	0	100	100	0	0	6	6	2.0 (1-3)	1.2 (1-2)
J[1]	5	80	80	0	0	100	100	0	0	10	7	2.5 (1-5)	1.8 (1-3)
F[1]	1	—	—	—	—	—	—	—	—	5	2	— —	— —
M	13	78	31	50	25	50	75	0	0	21	9	2.1 (1-4)	2.3 (1-4)
A[2]	10	90	30	44	100	0	0	56	0	234	8	26.0 (1-52)	2.7 (1-4)
M	11	100	91	45	100	0	0	55	0	280	18	25.5 (2-75)	1.8 (1-3)

[1] Data unreliable due to small sample.

[2] All 1974 young of year.

a slight shift from the average worm burden per individual (Table 1). There was, however, a marked seasonal change in the character of the infections. In September through January, all infections consisted of worms at the Phase C-F development. In March, immature worms appeared in the collections and by April and May, 100% of the worms observed were in Phase A and B. From June through August, the worms began to mature (Phase C-F). Interestingly, immature and mature worms were never collected from the same individual.

Relationship of Fish Age and Infection

There is an inverse relationship between the age of the fish and the prevalence of *C. isostomum*. *C. isostomum* showed a decrease in the percentage of the total number of fish infected from a high of 84% in the 0-1 year old group to a low of 55% in the 2-3 year old pirate perch. The mean total number of worms per fish in each age group decreased from the 0-1 year group to the 1-2 year group only to increase again in the 2-3 year group. The largest worm burden per individual (75) was recovered from the 0-1 year class fish but worm burdens of 30 and 26 were recovered from 1-2 year class and 2-3 year class fish respectively.

Both the percentage of infection and the mean number of *P. pearsei* per host showed a slight increase from the 0-1 year group to the 1-2 year class but with a decrease in the older fish (2-3 year class).

DISCUSSION

C. isostomum shows a seasonal fluctuation both in prevalence and mean number of parasites. The prevalence of infection in pirate perch was previously reported to be 90%.[2] In the present study prevalence is indeed 90-100% in April through July but then decreases from August through December. The mean number of parasites per fish also showed a seasonal fluctuation. The number of parasites decreased from June through March and increased in April and May. Maximum numbers of parasites correlate with the increase in prevalence. The cycle is demonstrated in all three age groups of fish. These data (Table 1, Figure 1) suggest that *A. sayanus* is infected each year from March through July with maximum infection in April and May.

Prevalence of infection decreased in the older fish but a decrease was not seen in the mean number of parasites per infected fish. All three classes of fish harbored worms in all stages of development. Mixed mature and immature infections were not uncommon. These data indicate that fish can be infected each year. There is apparently a short period of superinfection followed by replacement of the previous season adults with immature worms.

There is substantial evidence of an annual pattern in the infection of *A. sayanus* with *P. pearsei*. The population of *P. pearsei* remains relatively stable throughout the year with recruitment taking place only in the Spring. There is a shift from the occurrence of both mature and immature infections in June through August (Table 1, Figure 2) to completely mature infection from September to January. There is another shift in March with only immature infections being found in April and May. No mixed infections were found at any time. The shift from 100% mature infections to 100% immature infections coincides with the slight peak in the mean number of parasites per fish in March through April. The change from immature to mature infections suggests that from March through May the older *P. pearsei* die and are replaced by immature forms. There was very little difference among the three age groups of fish in regard to rate of infection and the mean number of parasites per fish. Each age group of fish is equally susceptible to infection and there is no barrier to annual reinfection of all three age groups of fish.

In this study, not only was prevalence and worm burden followed throughout the year, but also the character of both parasite infections with respect to size and maturity of worms was monitored. The

majority of individuals in both parasite populations complete that phase of their life cycle in the fish within approximately one year. *C. isostomum* demonstrates a three-fold annual cycle as evidenced by prevalence, worm burden and level of maturity. In *P. pearsei* prevalence remains more or less constant through the year but there is a seasonal cycle in worm development.

Acknowledgement

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