

Parasitic trematode larvae in the turbinid gastropod *Turbo brunneus* (Röding, 1798) from Tuticorin, India

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The occurrence of trematode parasites in the turbinid gastropod *Turbo brunneus* was analysed from May 1998 to April 1999. The males showed higher rate of parasitic infection than the females. The percentage infection was high in the month of October. In both sexes the gonads were found to be the primary site of infection. The infection was highest in large-size gastropods. Histological studies showed that the gonadal tissues were completely destroyed and the developing sporocysts and cercariae occupied the whole gonad.

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INTRODUCTION

The soft body of mollusc with its mantle cavity seems to offer attractive condition for potential parasites (Fretter & Graham 1962). The molluscs are known to harbour intermediate stages of developing helminth parasites which are harmful to man and his domestic animals. As many of the molluscan representatives are known for their edibility, the studies on the adverse effects of these parasites on the snails must be given much importance. But, in contrast most of the physiological and biochemical works have been done without considering the effect of these parasites.

Among the Archaeogastropoda members of the suborders Patellae and Trochacea have been reported particularly as first intermediate hosts of larval trematodes. Infestation of gastropods with larval trematodes may exhibit considerable spatial, annual and seasonal fluctuations; it may also vary according to the age, size, sex and gonad cycle of the host (Lauckner 1980).

Seasonal fluctuations in trematode parasitic infestation levels in various mollusc have been reported in *Cerithidea californica* (Martin 1955); *Nassarius obsoletus* (Gambino 1959), *Littorina* sp. (Robson & Williams 1970; Lauckner 1980); *Buccinum undatum* (Koie 1969) and *Nassarius pygmaeus* (Koie 1975). There is only a limited literature concerned with the infection of trematodes in turbinids (Shimura 1980). In the present study observations were made on the seasonal incidence of trematode cercariae and its infection rate in different size groups of *Turbo brunneus*.

MATERIALS AND METHODS:

Monthly random collection of *T. brunneus* was made from the intertidal zone adjacent to Tuticorin harbour from May-1998 to April-1999. The size and weight of the snails were divided into size classes to study the incidence of infection in different size groups.

The shells were broken and soft body removed. The tissues and muscles were

examined carefully to identify any malformation. The infestations in the gonadal region were identified by colour change. Gonadal smears were examined under a microscope. The mean percentage infection, percentage larval incidence during different months and different size groups were calculated for both males and females. For histopathological studies tissue samples with high infestation, such as digestive gland and gonad were fixed in 10 % formalin and sections were made by standard histological procedures.

RESULTS

The infection level of trematode cercariae was higher in males than in females. Out of 1629 snails examined from May-98 to April-99, 779 were males and 750 were females and among these 69 males and 20 females showed parasitic infection.

Seasonal variation in the infection rate

Trematode infections in *T. brunneus* exhibit a clear seasonal variation in the infection rate with a peak in October 1998. Table 1 shows the monthly variation in the percentage infection in male and female *T. brunneus*. The

Table 1. Monthly variation in larval incidence rate in male and female *Turbo brunneus*.

Year & Month	Percentage of infection	
	Male	Female
May 1998	8.06	1.42
June	0.6	1.72
July	10.52	3.13
August	13.09	5.72
September	4.76	1.44
October	19.40	6.25
November	7.46	3.64
December	2.22	0.00
January 1999	0.00	0.00
February	6.25	1.47
March	7.14	2.60
April	5.97	3.51

Table 2. Monthly variation in the infection rate of different size groups of *Turbo brunneus* (Male)

Month	Size groups (mm)			
	35-40	40-45	45-50	50-55
May 1998	-	1	3	1
June	-	-	3	1
July	-	-	3	1
August	-	1	4	6
September	1	-	-	2
October	-	4	6	3
November	1	2	1	1
December	-	1	-	-
January '99	-	-	-	-
February	-	1	2	1
March	1	2	1	1
April	-	-	3	1
Total	3	12	26	20
Infection (%)	4.92	19.67	42.62	32.79

Table 3. Monthly variation in the infection rate of different size groups of *Turbo brunneus* (Female)

Months	Size groups (mm)	
	45-50	50-55
May 1998	-	1
June	-	1
July	1	1
August	3	1
September	1	-
October	2	2
November	1	1
December	-	-
January '99	-	-
February	-	1
March	1	1
April	-	2
Total	9	11
Infection (%)	45	55

average parasitic infestation in male was (8.26 %) It varied from a low degree in December 1998 (2.2 %) to a high degree in October 1998 (19.4 %) and no infection was observed during January 1999. Heavy infestation was noted in males during October while females had an average infection of 3.46 %. No parasitic infestation was observed during December 1998 and January 1999.

Seasonal variation of percentage infection in different size groups

Seasonal variation of the infection rate in different size groups of male and female *T. brunneus* is shown in Tables 2 and 3. The percentage infestation in male was high in the size group 45-50 mm (42.62 %) and in female in the 50-55 mm size group (55%). Males with

shell size below 35 mm and above 55 mm, and females below 45 mm and above 55 mm never showed any parasitic infection.

Histology of a heavily infested gonad showed that the cercariae and sporocysts have replaced the entire gonadal tissue and the production of germ cells is totally stopped. The sections of the ovary and testis also revealed that the larval cercariae have similar effects on gonads of both sexes. Heavily infested gonads appear undistinguishable sex wise (Figs. 1-4).

DISCUSSION

Gastropods are hosts for a great variety of helminth parasites, in particular larval digenetic trematodes. In some areas, naturally occurring populations of snails have a high and variable incidence of digenetic trematode

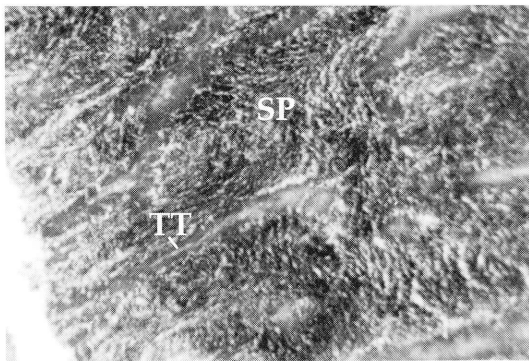


Fig. 1. *Turbo brunneus*. Normal testis (x 40). SP = spermatocyte. TT = testicular trabaeculae.

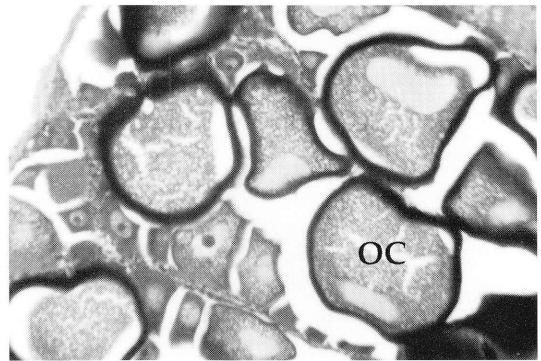


Fig. 3. *Turbo brunneus*. Normal ovary (x 100). OC = oocyte.

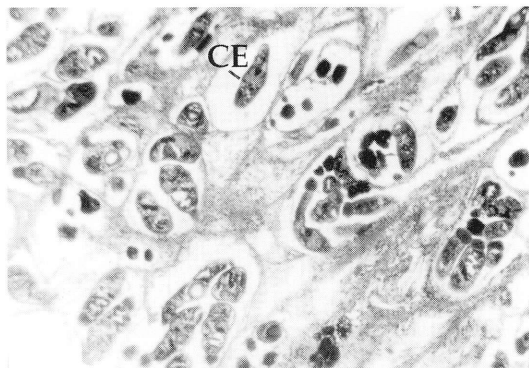


Fig. 2. *Turbo brunneus*. Parasitized testis (x 100). CE = cercaria.

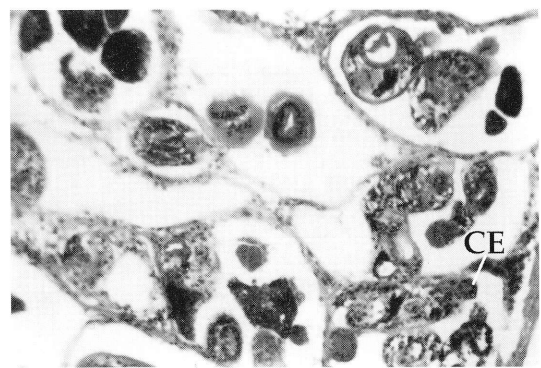


Fig. 4. *Turbo brunneus*. Parasitized ovary (x 100). CE = cercaria.

parasitism. Fretter and Graham (1962) stated that gregarious prosobranchs mainly afford ample opportunity for infection.

In the present study, male *T. brunneus* showed higher infection rate than the females in agreement with findings in *Littorina neritoides* (Lysaght 1941). Local variation in the level of trematode infestations may be correlated with the density of intermediate hosts, as well as with the abundance of final hosts (James 1968; Werdning 1969). Unfortunately, the secondary and final hosts are unknown for the present parasite so the larval incidence rate could not be correlated with seasonal abundance of hosts.

In the present study snails above 45 mm showed highest rate of infection and this may be due to their abundance in the upper shore region. Snails from higher shore levels are usually more heavily parasitised than animals from lower level (Berry 1962; Sindermann & Farrin 1962).

In *T. brunneus* the parasitic infestation was less in December and January and this may be due to drop in temperature. Koie (1975) reported a slight seasonal variance in *Buccinum undatum*. Intermediate cercariae were seen in low abundance during winter as well as at the end of breeding season. Sinderman & Farrin (1962) believed that seasonal changes in the incidence of infection of *Littorina littorea* on the coast of Maine was due to differential seaward movement of uninfected and infected periwinkles in early winter and return movement the following spring.

In *T. brunneus*, immature and maturing snails were not infected. Robson & Williams (1971) found that snails became more susceptible to infection while spent after their spawning season.

From the studies on the reproductive biology of *T. brunneus* it was found that in October the snails have stopped their reproductive activity and they are in resting condition.

T. brunneus with shell length less than 35 mm in males and below 45 mm in females were not found infested with larvae and it may be

due to their presence in the lower shore line area. For instance *Turritella communis*, a gregarious prosobranch living on sublittoral mud banks is infected with various cercariae, but individuals of shell length less than about 30 mm appear to be unparasitised, perhaps because the young live away from the adults and do not come in contact with the eggs of the parasite (Wright 1956). Owing to their larger size, adults are more attractive to the vertebrate host as food, and so more advantageous to the parasite. However, the age at which a mollusc becomes a successful host for the development of cercariae probably varies with the species of trematode as well as host (Fretter & Graham, 1962). In *T. brunneus* the percentage infection was high in snails which are comparatively larger in size and are well matured. Robson & Williams (1971) Hughes & Answer (1982) found no infection of juvenile *L. littorea*, but beyond the size at first maturity (11-6 mm shell height) the total annual incidence of infection increased in a quasi-exponential manner as shell height increased.

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