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Tetrochetus coryphaenae (Digenea : Accacoeliidae) Infection of *Diodon hystrix* (Pisces : Diodontidae)

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The nature of infection of the rectum of the porcupine fish, *Diodon hystrix*, by the digenetic trematode, *Tetrochetus coryphaenae*, has been studied. The parasite is tissue specific, and this is the first report of *T. coryphaenae* from the South-west coast of India. Both the incidence and intensity of infection showed differences during different months of occurrence of the host fish as well as in relation to their length (age), whereas both male and female fish were more or less equally infected. The histopathological change as a result of the infection is, typically, a local, connective tissue reaction with infiltration of inflammatory cells at and around the site of attachment of the parasite.

Key Words: *Diodon hystrix*, **Fibroplasia, Histopathology, Inflammatory cells, Plasmacyte,** *Tetrochetus coryphaenae*

Introduction

In spite of present knowledge of fish parasites and diseases, information on the actual effects of many parasites on fish hosts is still fragmentary. Adult digenetic trematodes are common parasites in the digestive tract of fishes (see Yamaguti 1971). Although much is known about the parasites themselves, only very little is available on the pathogenicity of these parasites (see Williams 1967). From India the only works which have given importance at least to the incidence and intensity of infection are those of Devaraj and Ranganathan (1967) and Rao and Rao (1970) and the one which has dealt with the histopathological aspects is that of Bose and Sinha (1979). The present paper deals with the nature of infection of the rectum of porcupine fish, *Diodon hystrix* Linnaeus, with the digenetic trematode, *Tetrochetus coryphaenae* Yamaguti.

Materials and Methods

Host fishes were collected from shore-seines operating at Shankumughom and Valiyathurai, Trivandrum. Specimens brought to the laboratory were examined

for the presence of parasites after noting the standard length, total weight and the sex of the fish. The infected rectal region was carefully cut open and the number and position of attachment of the parasites were noted. Parts of infected rectum, with the parasites *in situ*, and their normal counterparts were fixed in 10% neutral buffered formalin. Paraffin sections cut at 7 to 10 μ were stained in Azan (Heidenhain) or in Harris haematoxylin-Aqueous eosin, to study the histopathology of the infection.

Observations

Incidence and intensity of infection

Of the 563 specimens of *D. hystrix* examined during November 1974 to April 1975 period 66.8% were infected, the percentage in males (68.5) being slightly higher than in females (65.8). On an average 7.6 worms per fish (=intensity of infection) were recovered. Intensity of infection in the male fish (6.6) was lower than that in the female (8.1). The monthly incidence and intensity of infection from November 1974 to April 1975 were as shown in table 1.

Host fish examined ranged from 9.5 to 21.5 cm in standard length. They were classified into six length groups with 2 cm class interval, to study the nature of incidence and intensity of infection in relation to the length of the fish.

As is noticeable from table 2, a regular pattern of incidence or intensity of infection in relation to length of host is not discernible though it is clear that both incidence and intensity were the lowest in the smallest fish (9.5–11.5 cm group) and the highest in the largest fish (19.5–21.5 cm group).

Pathology of infection

The worms, which are dark in colour and highly contractile, aggregate towards the posterior end (=rectum) of the intestine. The infected region appears slightly swollen and dark in colour. These changes are more pronounced when the rectum harbours more than 12 parasites. Usually the worms are seen lying freely in the rectal lumen. However, a few were found attached to the mucosal ridges with the help of the acetabulum.

Structure of uninfected rectum

In basic structure the rectum resembles the intestine being made up of the four basic layers—the mucosa, the submucosa, the muscularis and the serosa (figure 1).

The mucosal epithelium is made up of simple coulmnar cells with basal nuclei. Active mucous cells (goblet cells) are seen dispersed among the epithelial cells. The lamina propria supporting the epithelium is formed of a relatively thin layer of loose fibrous connective tissue. It contains a rich assortment of blood elements. The lamina propria is produced into irregular primary ridges (comparable to the intestinal villi), from which arise secondary ridges, projecting into the rectal lumen. The epithelial layer is continuous, running along the ridges. The epithelial layer with the underlying lamina propria constitute the mucosa.

The submucosa consists of areolar connective tissue. It contains fewer cells than in the lamina propria. Blood elements, especially lymphocytes, are dispersed in the submucosa also.

The muscularis consists of an inner layer of circular muscle and an outer layer of longitudinal muscle. Both muscle layers are thin, compared to other parts of the intestine, and the longitudinal muscle layer is thinner than the circular muscle layer.

The serosa or the adventitia forms the outermost coat of the alimentary canal. At the rectal region the serosa is made up of areolar connective tissue and a mesothelium of simple squamous cells.

The spaceous lumen of the rectum is often filled with mucus and faecal matter. A very

Table 1 *Incidence and intensity of* T. coryphaenae *infection during different months*

Months	Number of fish examined			Number of fish infected			Number of parasites collected from		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Nov. 74	36	59	95	33 (91.67)	55 (93.22)	88 (92.63)	364 (11.03)	622 (11.31)	986 (11.20)
Dec. 74	41	67	108	24 (58.54)	47 (70.15)	71 (65.74)	186 (7.75)	484 (10.30)	670 (9.44)
Jan. 75	24	70	94	15 (62.50)	43 (61.43)	58 (61.70)	93 (6.20)	288 (6.70)	381 (6.57)
Feb. 75	56	88	144	34 (60.71)	49 (55.68)	83 (57.64)	118 (3.47)	268 (5.47)	386 (4.65)
Mar. 75	27	32	59	19 (70.37)	18 (56.25)	37 (62.71)	84 (4.42)	110 (6.11)	194 (5.24)
Apr. 75	22	41	63	16 (72.73)	23 (56.10)	39 (61.90)	82 (5.13)	142 (6.17)	224 (5.74)
Total	206	357	563	141 (68.45)	235 (65.83)	376 (66.79)	927 (6.57)	1914 (8.14)	2841 (7.56)

Percentage incidence and intensity of infection are given in parentheses in the respective columns

Table 2 *Incidence and intensity of* T. coryphaenae *infection in different length groups of the fish*

Length group (cm)	Number of fish examined			Number of fish infected			Number of parasites collected from		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
9.5–11.5	18	32	50	9 (50.00)	11 (34.38)	20 (40.00)	29 (3.22)	81 (7.36)	110 (5.50)
11.5–13.5	42	31	73	19 (45.24)	22 (70.97)	41 (56.16)	157 (8.26)	256 (11.64)	413 (10.07)
13.5–15.5	126	243	369	95 (75.40)	170 (69.96)	265 (71.82)	606 (6.38)	1302 (7.66)	1908 (7.20)
15.5–17.5	11	34	45	10 (90.90)	19 (55.88)	29 (64.44)	57 (5.70)	120 (6.32)	177 (6.10)
17.5–19.5	1	3	4	—	2 (66.67)	2 (50.00)	—	10 (5.00)	10 (5.00)
19.5–21.5	8	14	22	8 (100.00)	11 (78.57)	19 (86.36)	78 (9.75)	145 (13.18)	223 (11.74)
Total	206	357	563	141 (68.45)	235 (65.83)	376 (66.79)	927 (6.57)	1914 (8.14)	2841 (7.56)

Percentage incidence and intensity of infection are given in parentheses in the respective columns

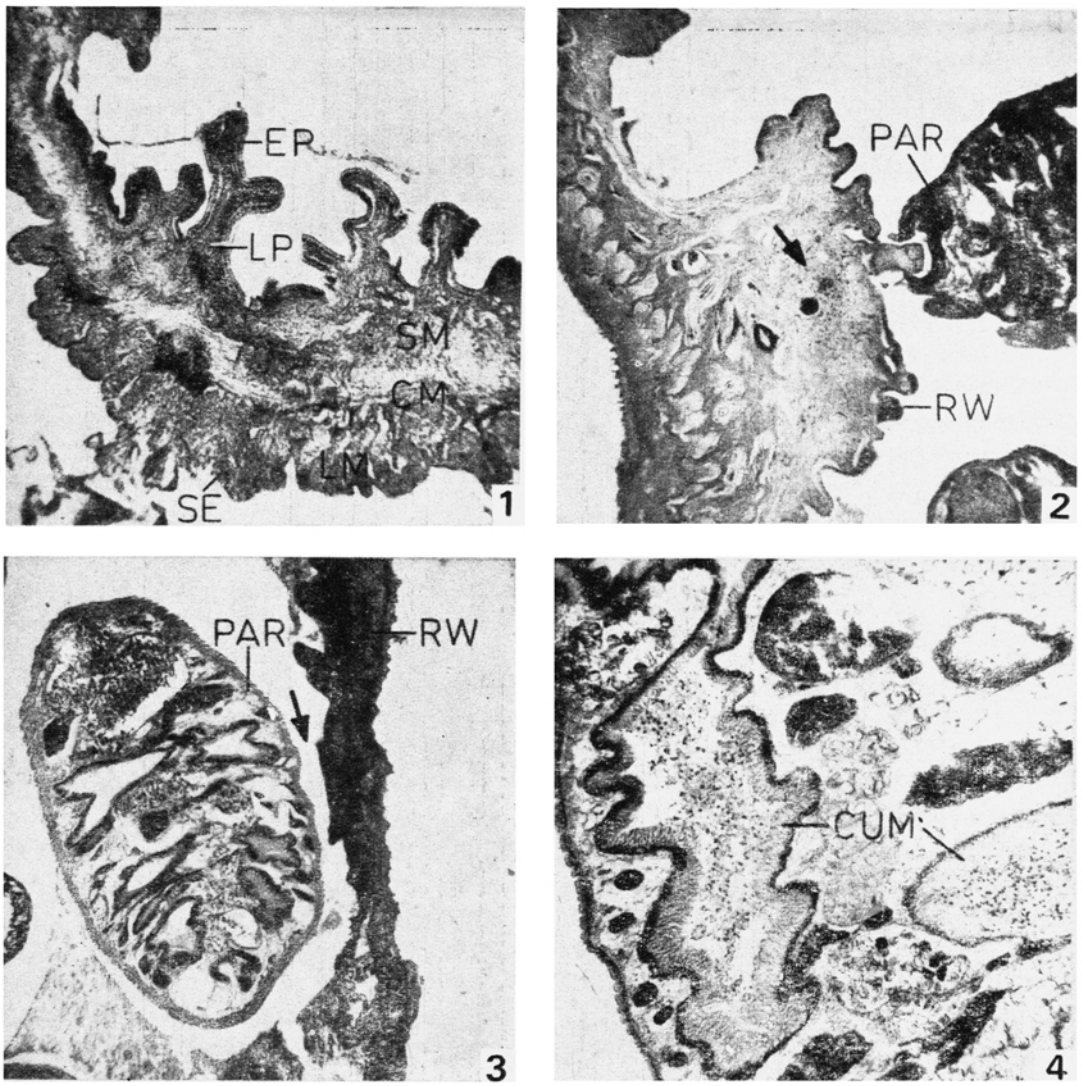

Figure 1 *D. hystrix*—L.S. of uninfected rectal wall (× 48). **CM**, circular muscle; **EP**, epithelial layer; **LM**, longitudinal muscle; **LP**, lamina propria; **SE**, serosa; **SM**, submucosa

Figure 2 *D. hystrix*—L.S. of rectal wall infected with *T. coryphaenae* showing attachment of parasite to the mucosal ridge. Note hypertrophy of lamina propria at the site of attachment and accumulation of inflammatory cells (arrow) (× 48). **PAR**, parasite; **RW**, rectal wall

Figure 3 *D. hystrix*—L.S. of rectal wall infected with *T. coryphaenae* showing erosion of mucosal ridges (arrow) (× 48). **PAR**, parasite; **RW**, rectal wall

Figure 4 Caecum (CUM) of *T. coryphaenae* containing rectal contents of the fish (× 124). The black spots in the rectal contents are deep-staining acidophilic plasmacytes

sparse distribution of blood elements is also discernible in the rectal contents.

Histopathology

While many of the worms, *T. coryphaenae*, lie freely in the rectal lumen, at least some are attached to the inner rectal wall. The attachment is effected by gripping the mucosal ridge by the acetabulum (figure 2). Heavy infiltration of plasmacytes and other inflammatory cells occurs in the submucosa adjoining the site of attachment of the parasite. Hypertrophy of the lamina propria and the submucosa near the site of attachment is evident.

A conspicuous increase in the number of goblet cells is discernible in the infected rectum and the rectal lumen is invariably charged with mucus in which a large number of inflammatory cells are seen, the major element being the mature acidophilic plasmacyte. In heavy infections, it seems that, the pressure exerted by the parasite leads to erosion of the mucosal ridges. Sections of heavily infected rectum often present areas virtually devoid of mucosal ridges where the body of the parasite was in close contact with the rectal wall (figure 3).

Attempts to detect changes in the peripheral blood and in the biochemical composition of the fish did not yield any reliable results.

Discussion

Diodon hystrix is commonly available along the South-west coast of India during November–April period. Observations have shown that this fish is the reservoir of a rich parasite fauna, mainly helminths. The histopathological changes at the site of infection with *Tetrochetus coryphaenae* is essentially one on inflamation with conspicuous fibroplasia and copious infiltration of inflammatory cells. The histopathological changes in the infected rectum are, probably, not of any serious consequence to the fish. Whether there is any tissue damage consequent on the feeding activity of the parasites is doubtful, since the food of the parasite is evidently, the copious mucous secretion of the infected host, rich in blood elements as well. In sections the caeca of the parasites are seen filled with the rectal contents of the host (figure 4).

Though there is no evidence to accuse the parasite of causing gross pathology in the host, aggregation of a large number of parasites will certainly cause occlusion of the vent leading to distress and thereby general weakness of the fish rendering them more vulnerable to other infections.

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