A DIGENIC TREMATODE INFECTION IN THE EDIBLE OYSTER *CRASSOSTREA MADRASENSIS* (PRESTON)

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ABSTRACT

The cercaria of *Bucephalopsis haimeanus* (Lacaze-Duthiers), a digenic trematode, parasitic on the edible oyster *Crassostrea madrasensis* (Preston) from Karapad oyster farm at Tuticorin is reported. The cercaria belongs to Gasterostome type having forked caudal rami. The morphology of the parasite is described, and the effect of parasitism, namely, sterility and change in flesh weight in the oyster is discussed.

INTRODUCTION

Our knowledge of the trematode parasites on marine animals of Indian waters is limited. Recently, Silas (1962) reviewed the trematodes parasitic on scomberoid fishes, but, as yet, nothing is known about parasitic larval trematodes in the edible oyster. Mass mortality of oysters due to parasitic cercaria is reported from several other places. Howell (1967) observed that the decline in abundanc of oysters in New Zealand beds was largely due to epidemical outbreak of *Bucephalus longicornutus*. The mortality of *Ostrea lutaria* in Scotland, which were imported from New Zealand for breeding studies, was attributed to the infection of larval trematodes (Millar 1963). Massive invasion of the American oyster beds in the Southern Texas by metacercaria was reported by Little *et al* (1966). With the introduction of edible-oyster culture in recent years in India, the study of the effect of parasitism on these animals gains considerable importance as parasitism can cause a serious threat to the farm. The present study throws some light on a possible role played by the cercarian parasite, *Bucephalopsis haimeanus* on the Indian edible oyster *Crassostrea madrasensis*.

MATERIAL

Of a total of 302 oysters of the species *Crassostrea madrasensis* examined for routine maturity studies, from the oyster farm and its surrounding waters at Karapad Creek, Tuticorin, three were found with gonadal infection by larval cercaria. Although the parasites were harbouring in the gonads of the

oysters, almost all of the tissues of the latter, except the adductor muscles and labial palps, were affected, indicating an advanced stage of infection as noted by McCardy (1874). The cercariae which were densely packed in the gonads were carefully removed for their morphological studies and the hosts were examined in detail for studying the effect of parasitism.

Morphology of Parasite

The morphological study revealed that the parasite is a bucephalid, *Bucephalopsis haimeanus* (Lacaze-Duthiers), a trematode of the order Digenea. Although the tail is forked as in Furcocerous type, because of the presence of the medially placed mouth, the cercariae are designated as Gasterostome type, following the classification of Lühe (1909).

The cercariae are pear-shaped (Fig. 1) and reasonably motile. They were in the length range 0.29-0.41 mm and breadth range 0.06-0.11 mm. However, being very contractile, the length of an individual is highly variable; a live cercaria with a length of 0.34 mm, for instance, was noticed to contract to 0.21 mm. On preservation, even in as weak a solution as 1% formalin in sea water, there was much further reduction in length. But, the breadth re-

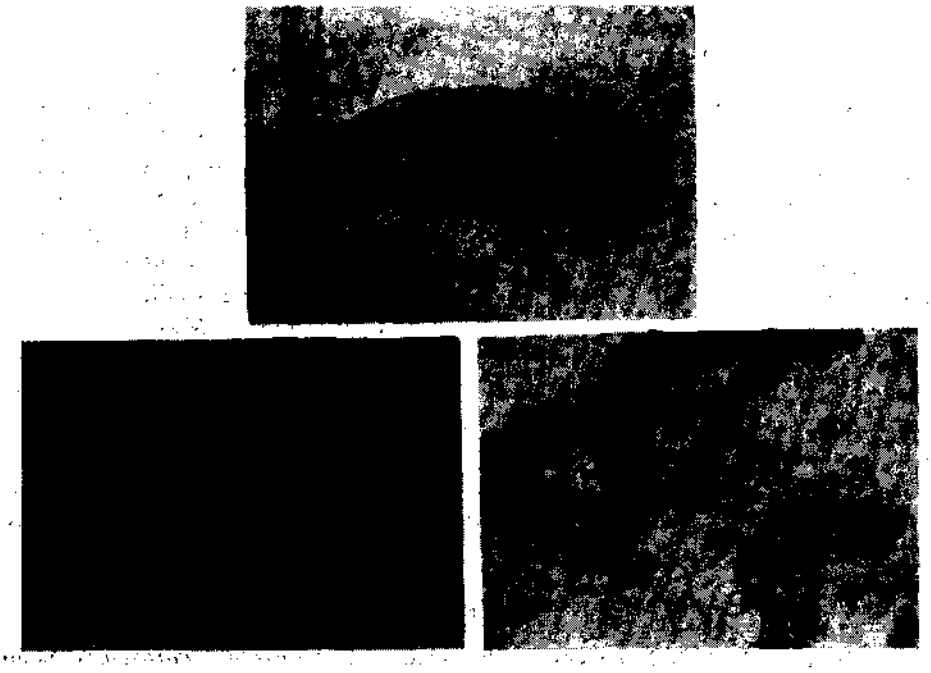

Fig. 1. Photographs showing the preserved cercariae of *Bucephalopsis haimeanus*. (Top) Enlarged dorsal view, (A) ventral view of cercariae teased out of the gonad of the oyster, (B) concentration of cercariae in a system of ramified tubules.

mained more or less unaffected. The mouth is situated more or less midventrally and is connected with a simple sac-like intestine which is visible externally as a lighter area surrounding the mouth (Figs 1, 2 and 3). The median part of the posterior end is slightly expanded and is cushion-like, which bears on each side a thin elastic process, the furcal ramus. The rami constitute the tail. They are symmetrical, flexible and highly contractile. When expanded they reach several times the length of the body. The cercariae are attached to the tissue of the host by these rami. Perhaps they function as a tactile organ and also as an aid in attachment to the host. The rami are so delicate that they get easily broken off.

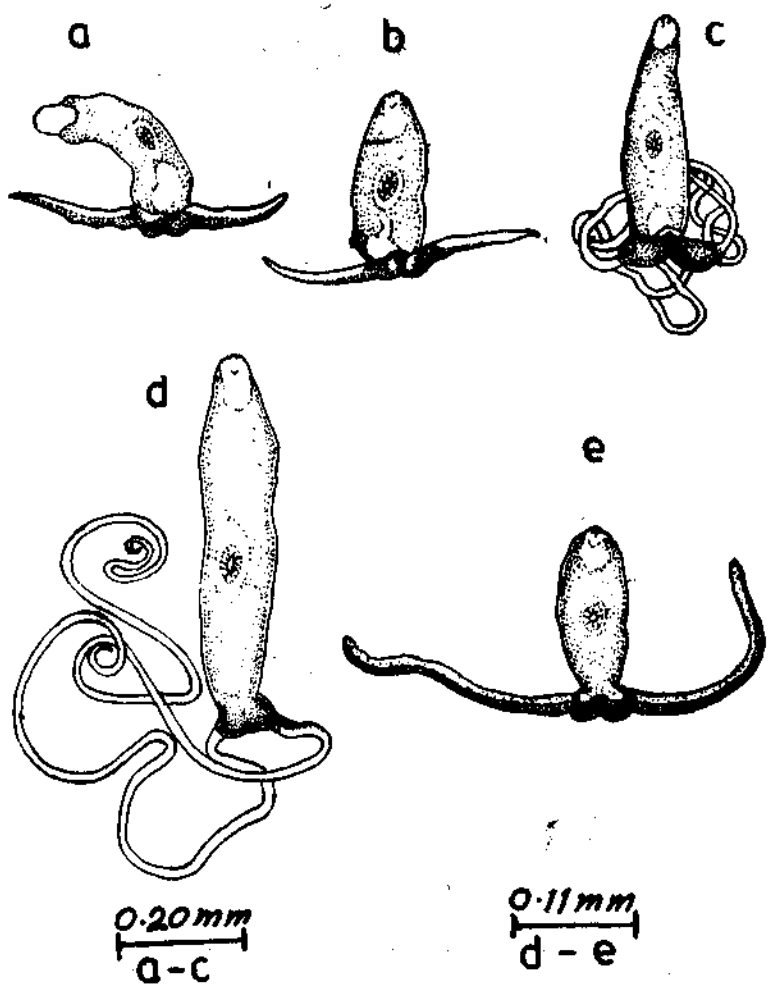

FIG. 2. Cercariae of *Bucephalopsis haimeanus* in different views. (a-b. normal live specimens — furcal rami contracted, c-d. live specimens — furcal rami expanded, e. preserved specimen)

Effects on the Host

Sterility

The most significant effect is sterility. In the infected condition the gonad externally appears well-developed and mature. But internally it is devoid of eggs or sperms; the only contents being the cercariae and tissue fluids. The parasites are observed densely packed in a system of ramified tubules (Fig. 1, B).

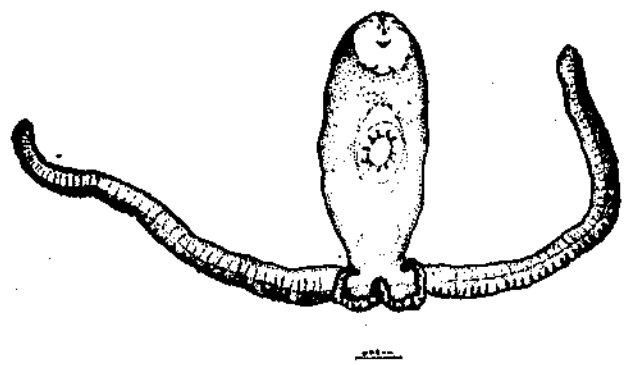

Fig. 3. Detailed view of *Bucephalopsis haimeanus*.

Gigantism

In two of the infected oysters the flesh weight was higher compared to the flesh weight of the uninfected ones of the same size group (Table 1). This might have been the result of parasitic castration. However, one infected oyster was found to be very feeble and the flesh weight was low. The colour of the meat of this oyster was darker than the other two infected ones.

Table 1. *Comparison of flesh weight of infected oysters with noninfected oysters.*

Shell length of infected oysters	Flesh weight of inflected oysters (wet weight)	Range of flesh weight of uninfected oysters of same size range (wet weight)
180 mm	15.25 g	8.76-12.00 g
87 mm	9.49 g	5.91-7.55 g
85 mm	5.04 g	5.91-7.55 g

Discussion and Conclusion

The occurrence of cercarian larvae of bucephalid trematodes is reported from various parts of the world. Lacaze-Duthiers (1854) described *Bucephalus haimeanus* from the Mediterranean oysters and *Bucephalopsis haimeanus* from the American oysters. McCardy (1874) described *Bucephalus cuculus* also from American oysters. But Dawes (1956) opined that both *Bucephalus haimeanus* Lacaze-Duthiers and *Bucephalus cuculus* McCardy are synonimous to *Bucephalopsis haimeanus* (Lacaze-Duthiers).

McCardy (1874) observed that as a result of parasitism by these trematodes, *Ostrea virginica* (= *Crassostrea virginica*) become sterile. Hoshina and Ogina (1951) found that as a result of parasitism the physiology of the host is impaired, growth is halted, and reproduction is inhibited. Cheng and Burton (1956) go further in concluding that the ova present in the parasitized ovaries are resorbed. The condition noticed in present gonads does not support any particular view; the sterility may either be due to parasitic castration or absorption of reproductive cells. In any case, once this condition is reached obviously it is the end of the oyster's capacity to propagate.

Menzel and Hopkins (1955b) state that in heavily infected oysters the growth ceased and the oysters even lost their length and weight increments for several weeks or months resulting in mortality. Hoshina and Ogina (1951) report that metacercaria in Japanese oysters halt growth. Hopkins (1957) on the contrary made an interesting observation. According to him the parasite is gastronomically beneficial since he observed that the infected oysters are fat-looking and glycogen-rich and possess an excellent flavour throughout the year unlike the normal ones which, as a result of spawning, are thin and unpalatable during part of the year. In the present study, two of the three infected ones had better flesh weight and appearance than the normal ones. It is therefore likely that the early stage of infection temporarily stimulates growth of the oysters but the later stage of infection retards growth. Several explanations have been put forward to account for the phenomenon of gigantism of the host due to parasitism. Wesenberg-Lund (1934) states that it is the result of excessive consumption of food due to the demand of the parasite. Wright (1971) is of the opinion that it is an indirect manifestation of parasitic castration — implying that nutrients normally utilized by gonadal tissues are utilized for general growth. McClelland and Bourns (1969) are, however, holding a different view in that they believe that some substance produced by the parasite exerts a hormonal influence on the host effecting in poor development of the reproductive system and enhanced growth of certain other systems. Mohandas (1973) says that the parasites may bring about metabolic changes in the infected snails resulting in the release of growth-promoting factor(s). It appears from the present study that the initial betterment in condition of the infected oysters can be due to parasitic castration because of which the energy,

which would normally have been spent for reproduction, has been used for other physiological needs. But, with increasing infection, the oyster begins to lose weight till finally mortality sets in.

Hoshina and Ogina (1951) reported that 10% of the oysters in Hiroshima Bay were infected with larval trematodes in the gonadal tissue. Hopkins (1954 and 1957) reported parasitization of more than one-third of the oyster population in localized areas in United States. Although the incidence of infection in the Karapad Creek oysters is at present only 1%, it remains to be seen whether the incidence would increase with the change of season or with change of environmental conditions.

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