

STUDIES ON "CROWDING EFFECT" ON *GASTROTHYLAX CRUMENIFER* AND *FISCHOEDERIUS ELONGATUS*, THE COMMON AMPHISTOME PARASITES OF RUMINANTS, OBSERVED UNDER NATURAL CONDITIONS

R. S. TANDON

(Department of Zoology, Lucknow University, Lucknow, India)

ABSTRACT: It has been found in the case of *Gastrothylax crumenifer* and *Fischoederius elongatus*, the two common amphistome parasites (Trematodes) from the rumen of buffalo, that "Crowding has a definite effect on their size, and the development of reproductive organs. When the intensity of infection, either by its own species or other parasites also, is low they attain a very large size and remain immature. On the other hand in a heavily crowded state very small worms become fully mature and gravid. The reproductive organs and the eggs, however, are normal in the dwarfs.

INTRODUCTION

"Crowding Effect" has been studied in a number of cestodes by several workers like READ (1951), READ, SCHILLER and PHIFER (1958), READ (1959), READ and PHIFER (1959), HOLMES (1951), and ROBERTS (1961 & 1966). These investigators concluded that crowding results in decrease, in size of the parasite, its weight and the number of eggs produced by it. The various factors supposed to be involved in the affair are deficiency of nutrition and oxygen, larger production of toxic substances by the parasites themselves, and the age of the host. Hardly any study has been made on "Crowding Effect" in trematodes, living under similar or varying conditions as the cestodes. Besides, unlike the cestodes, the trematodes have their own digestive systems also and as adults they live in all parts of the body of their hosts.

MATERIALS AND METHODS

The two amphistomes studied in this case, *Gastrothylax crumenifer* and *Fischoederius elongatus*, are common parasites of buffaloes here in India. The conclusions have been arrived at after examining thousands of worms from the buffaloes slaughtered at Lucknow, during different parts of the year. Typical specimens were collected from different lots for these studies.

Received for publication Dec. 20, 1970

RESULTS AND DISCUSSIONS

The two amphistomes live in a closed chamber like the rumen of buffalo (and other ruminants also). A high incidence of amphistome infection is found in different parts of India and often the intensity of infection is also very high. The hosts generally sacrificed for their meat are either weak and old males or females with poor or no milk yield or are sterile.

The following three selected samples, show the different sizes of the two species of parasites under varying conditions of infection by their own species and those of the other parasites. The observations have been put in the following table to economise and facilitate space and reading (Table 1).

The intensity of infection or thinness and thickness of *crowd* of the parasites in that particular organ of the host at a time has been found to have a direct effect on the size of the worm. Besides the size, the development of the reproductive organs is also influenced. The same species may attain a very large size, as much as four to five times more than that of the same species in the crowd and remain immature or have poorly developed reproductive organs when plenty of living space, food, and other amenities are available.

It may become a dwarf or small sized worm and have fully developed reproduc-

Table 1. Showing the effect of crowding on *G. crumenifer* and *F. elongatus*

Parasite	No. of parasites per buffalo	Size of parasite (mm)	Condition of reproductive organs	Total No. of parasites in that buffalo
(A) I <i>Fischoederius elongatus</i>	567	8.2×3	Fully developed and gravid	24,319 (12 species of trematodes, nematodes and cestodes)
II <i>F. elongatus</i>	42	37×5.8	Immature with poorly developed organs	1,048 (5 species of other worms)
(B) I <i>Gastrothylax crumenifer</i>	20,038	6.2×2.4	Fully developed and gravid	24,319 (12 species of other worms)
(C) I <i>F. elongatus</i>	2,476	13-16×3.4-4	Fully developed and gravid	7,790 (8 species of other worms)
II <i>G. crumenifer</i>	3,990	9.5-13×3-4.5	Fully developed and gravid	7,790 (8 species of other worms)

tive organs and uterus full of eggs, when in a crowd or in a host organ heavily infected either by its own species or other parasites like nematodes, cestodes and other amphistomes in a multiple infection.

The example of Axolotl larva growing to a large size, remaining in a prolonged larval stage, and finally developing reproductive organs when plenty of living space, food and other optimum conditions are available, can well be imagined here. It throws a light on the existence of large sized individuals in an absolutely immature condition when plenty of or more food and living space and lesser competition are there. On the other hand when these facilities are not available and when large number of parasites of the same species and other competitors and lesser space and food are there, the dwarfs are forced to become mature and gravid. It clearly shows the effect of crowding on the size of the parasite and development of reproductive organs - the main organs of the worm.

It can not, however, be said from these

studies that the production of eggs decreases with the increased intensity of infection by the parasite, because dwarfs have been known to live longer and produce equally well like the normal individuals, in different groups of lower and higher animals. The uteri of dwarf worms examined in these studies were found to be full of normal eggs.

The size of the testes, ovary and eggs in the large sized worms and dwarfs being nearly the same, disapproves the general contention about the effect of crowding on the size of the gonads and eggs. In many dwarfs the testes and ovaries were found to be larger than those of the large sized worms.

The differences between the natural and experimental host also produce differences in the size and organs of the parasites. Small experimental hosts like rats, guinea-pigs and rabbits have shown a marked effect on the size of the parasites as shown by the author (THAPAR and TANDON, 1952 and TANDON, 1969) in the case of *Fasciola indica*.

Thus the studies on the experimental hosts do not give as valuable and correct results as we find in investigations under natural conditions.

REFERENCES

- 1) HOLMES, J. C. (1961): Effects of concurrent infections on *Hymenolepis* (Cestoda) and *Moniliformis dubius* (Acanthocephala). I. General effects and comparison with crowding. *J. Parasit.*, 47 (2), 209-216.
- 2) READ, C. P. (1951): The crowding effect on tapeworm infections. *J. Parasit.*, 37 (2), 174-178.
- 3) ——— (1959): The role of carbohydrates in the biology of cestodes. VIII. Some conclusions and hypotheses. *Exptl. Parasit.*, 8 (4), 365-382.
- 4) ——— and PHIFER, K. O. (1959): The role of carbohydrates in the biology of cestodes. VII. Interactions between individual tapeworms of the same and different species. *Phys. Rev.*, 8 (1), 46-50.
- 5) ———, SCHILLER, E.L. and PHIFER, K. O. (1958): The role of carbohydrates in the biology of cestodes. V. Comparative studies on the effect of host dietary carbohydrate on *Hymenolepis* sp. *Exptl. Parasit.*, 7 (3), 198-216.
- 6) ROBERTS, L. S. (1961): The influence of population density on patterns and physiology of growth in *Hymenolepis diminuta* (Cestoda: Cyclophyllidea) in the definitive host. *Exptl. Parasit.*, 11 (4), 332-371.
- 7) ——— (1966): Developmental physiology of cestodes. I. Host dietary carbohydrate and the crowding effect in *Hymenolepis diminuta*. *Exptl. Parasit.*, 18 (4), 305-310.
- 8) TANDON, R. S. (1969): Observations on the germinal development in the life cycle of the Indian liver fluke, *Fasciola indica* VARMA, 1953. *Dr. H.D. SRIVASTAVA Commem. Vol.* 537-544.
- 9) THAPAR, G. S. and TANDON, R. S. (1952): On the life history of the liver fluke, *Fasciola gigantica* COBBOLD, 1855, in India. *Ind. J. Helm.*, 4 (2), 1-36.