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72

Seasonal prevalence of some zoonotic trematode infections in cattle and pigs in the north-east montane zone in India

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ABSTRACT

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Seasonal variations in the prevalence of *Fasciola gigantica* and *Eurytrema pancreaticum* in cattle, and *Opisthorchis noverca, Artyfechinostomum malayanum, Fasciolopsis buski* and *Gastrodiscoides hominis* in pigs, were studied post-necropsy over a 1 year period in a humid, subtropical north-east hilly region in India. The overall prevalence rate was 53.02% in cattle ($n=960$) and 12.92% in pigs ($n=960$). *Fasciola gigantica* and *E. pancreaticum* occurred throughout the year with peaks during cold winter months. Both species showed a high intensity of infection in winter and a low intensity during summer and autumn. The rate of infection due to *A. malayanum, Fasciolopsis buski* and *G. hominis* rose to a peak during June–September and thereafter declined to a low level (November–March). Except for the month of February, *O. noverca* occurred throughout the year, with the highest rate of infection in late autumn and winter. The abundance of infection due to *A. malayanum, Fasciolopsis buski* and *G. hominis* was high during late summer and early autumn. *Opisthorchis noverca* showed a higher density during late autumn and winter.

INTRODUCTION

The digenetic trematode infections of cattle with *Fasciola gigantica* in the bile passages of the liver and *Eurytrema pancreaticum* in the pancreatic duct and of pigs with *Opisthorchis noverca* in the liver and *Artyfechinostomum malayanum, Fasciolopsis buski* and *Gastrodiscoides hominis* occurring in the intestine are significant not only in terms of their economic importance, but also as a veterinary and public health problem owing to their zoonotic potential (Endrejat, 1964; Bhattacharyya et al., 1972; Chandra, 1984; Sharma and Gogoi, 1986). The rearing of these two animals is a common household practice amongst the tribal populations of Shillong (Meghalaya), a hilly city of north-east India.

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Several effective anthelmintics are available for controlling the trematode infections in domesticated stock (Knight and Colglazier, 1977; Foreyt et al., 1980; Gupta et al., 1981, 1988; Craig and Huey, 1984; Guerrero, 1984; Kotetel'nikov and Varenichev, 1988; Ghandour et al., 1989; Malviya and Verma, 1989; Onar, 1990). However, in view of the cost of drugs, chemotherapeutic means may not be financially viable in this region. Therefore, to formulate suitable recommendations concerning appropriate control measures, the seasonal transmission pattern of these parasitic infections in the enzootic areas must be determined. The present study was undertaken to determine the seasonal prevalence and population density of the above-mentioned digenean trematode infections in local pigs (*Sus scrofa domestica* L.) and bovine stocks (*Bos indicus* L.) in this subtropical, high-rainfall, hilly zone of India.

MATERIALS AND METHODS

Study area

The study area, situated in the north-eastern part of India, lies approximately 1524 m above sea level and experiences a subtropical monsoon-type climate with rainfall distributed throughout the year. The meteorological data for total monthly rainfall and mean minimum and maximum temperature for the area (Fig. 1) during the survey period were supplied by the Meteorological Station, Indian Meteorological Department, Shillong. Four defined seasons, namely spring (February–April), summer (May–July), autumn (August–October) and winter (November–January), occur. The pigs represent an indigenous stock raised by local people under the free-range system, while

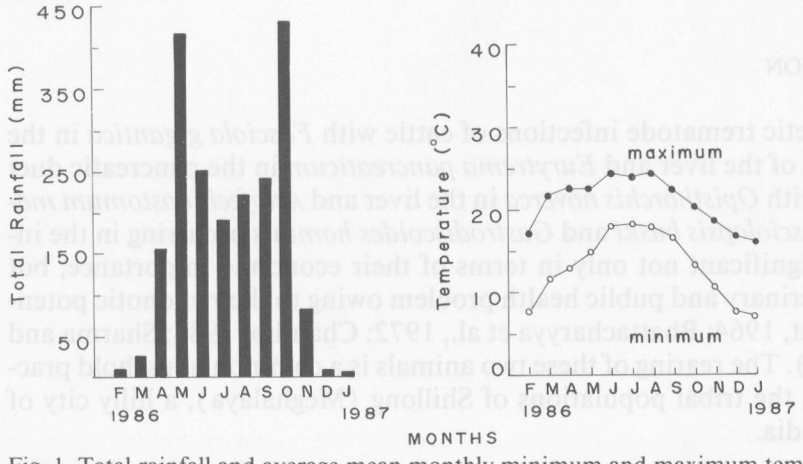

Fig. 1. Total rainfall and average mean monthly minimum and maximum temperature during the study period.

beef cattle are a mixed population stock of indigenous animals and those brought from neighbouring Assam.

Collection and processing of samples

In a 1 year period from February 1986 to January 1987, 80 pigs (in the age group 1–2 years) and 80 cattle (generally between 6 and 8 years of age) were necropsied at different slaughterhouses in and around Shillong at regular monthly intervals. Bile ducts and their fine branches in the liver, the pancreatic duct and the gastrointestinal tract of each animal were incised and

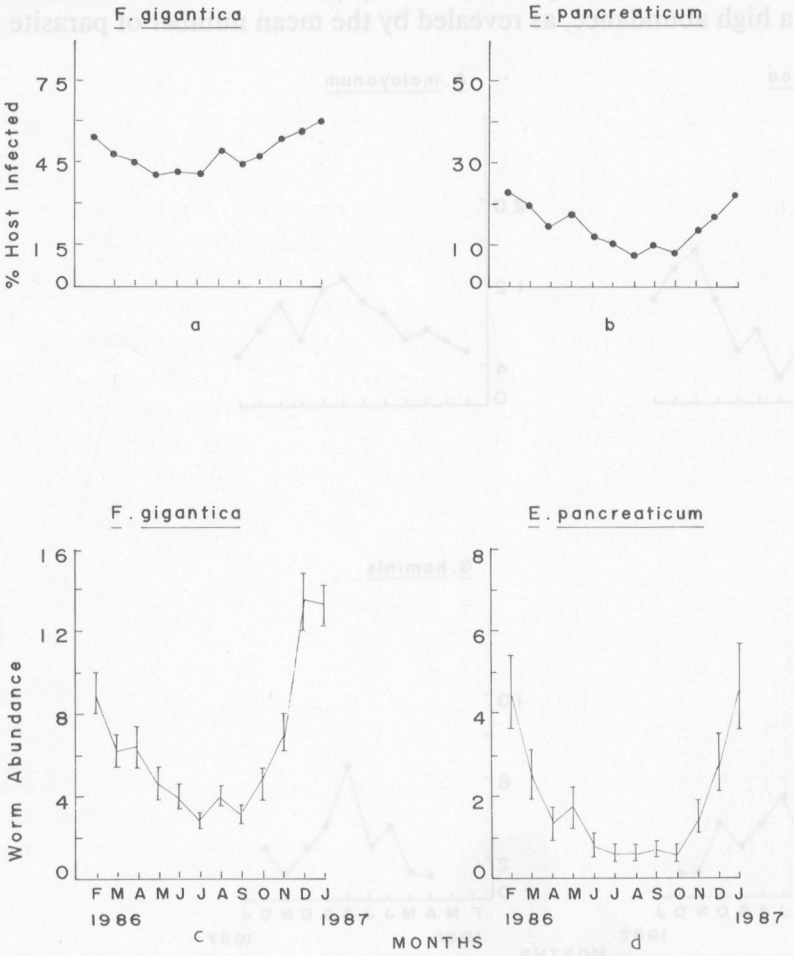

Fig. 2. Seasonal fluctuations in the occurrence (a,b) and abundance (c,d) of *Fasciola gigantica* and *E. pancreaticum* in cattle over a period of 1 year.

examined for the recovery of trematodes. Data were also recorded regarding the numbers of flukes of each species per infected host.

RESULTS

Of the total of 960 cattle and 960 pigs examined, the overall rate of infection due to digenetic trematodes of potential zoonotic significance was 53.02% and 12.92%, respectively.

Fasciola gigantica and *E. pancreaticum* were recorded in cattle throughout the year. They did not show marked seasonal fluctuations in their occurrence, although slightly pronounced peaks were observed during cold winter months from December to February (Figs. 2(a) and 2(b)). These trematode infections showed a high abundance, as revealed by the mean number of parasite

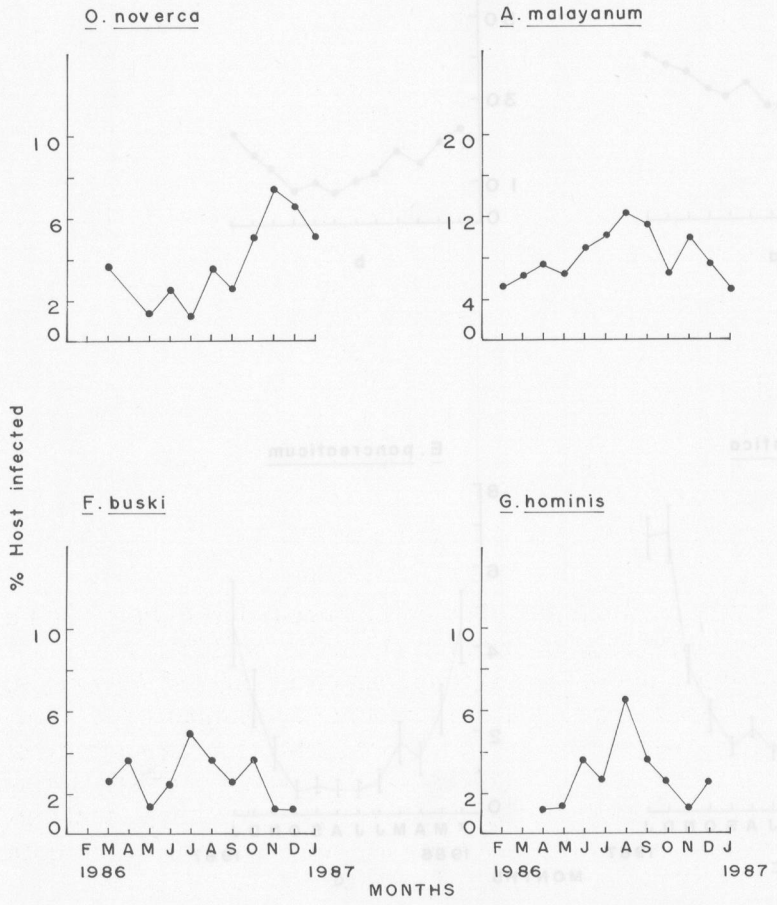

Fig. 3. Seasonal fluctuations in the occurrence of trematode species in pigs over a period of 1 year.

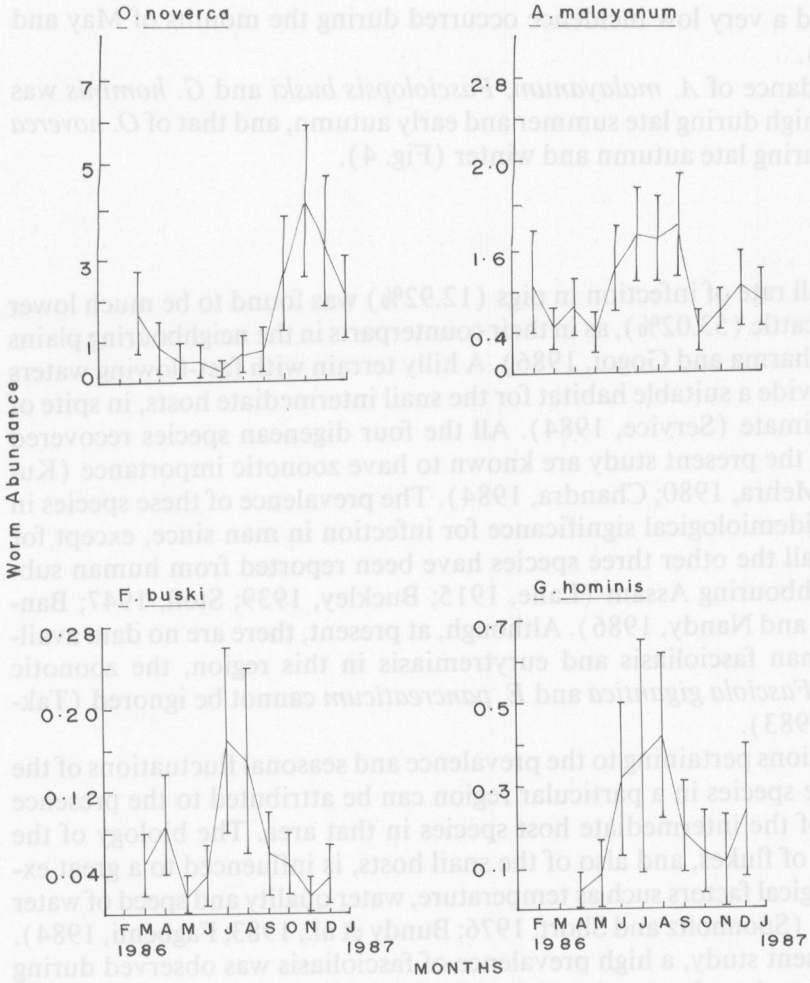

Fig. 4. Seasonal variation in the abundance of trematode species in pigs.

species present in the total number of cattle examined, during winter and a low abundance during summer and autumn (Figs. 2(c) and 2(d)).

The trematode infections of the digestive tract of the pigs (*G. hominis, A. malayanum* and *Fasciolopsis buski*) had a more or less similar trend of occurrence and during the months from June to September their prevalence rose to a peak, declining thereafter to a low level during winter and early spring (November–March). *Gastrodiscoides hominis* infection was not present during the first 3 months of the year and, likewise, *Fasciolopsis buski* infection was conspicuous by its absence during January and February (Fig. 3).

Except for the month of February, *O. noverca* occurred throughout the year, but a higher incidence was recorded in late autumn and winter (October–

January) and a very low incidence occurred during the months of May and July (Fig. 3).

The abundance of *A. malayanum, Fasciolopsis buski* and *G. hominis* was found to be high during late summer and early autumn, and that of *O. noverca* to be high during late autumn and winter (Fig. 4).

DISCUSSION

The overall rate of infection in pigs (12.92%) was found to be much lower than that in cattle (53.02%), as in their counterparts in the neighbouring plains of Assam (Sharma and Gogoi, 1986). A hilly terrain with fast-flowing waters may not provide a suitable habitat for the snail intermediate hosts, in spite of a suitable climate (Service, 1984). All the four digenean species recovered from pigs in the present study are known to have zoonotic importance (Kumar, 1980; Mehra, 1980; Chandra, 1984). The prevalence of these species in pigs is of epidemiological significance for infection in man since, except for *O. noverca*, all the other three species have been reported from human subjects in neighbouring Assam (Lane, 1915; Buckley, 1939; Stoll, 1947; Bandyopadhyay and Nandy, 1986). Although, at present, there are no data available on human fascioliasis and eurytremiasis in this region, the zoonotic potential of *Fasciola gigantica* and *E. pancreaticum* cannot be ignored (Takaoka et al., 1983).

The variations pertaining to the prevalence and seasonal fluctuations of the various fluke species in a particular region can be attributed to the presence or absence of the intermediate host species in that area. The biology of the larval stages of flukes, and also of the snail hosts, is influenced to a great extent by ecological factors such as temperature, water quality and speed of water currents, etc. (Sponholtz and Short, 1976; Bundy et al., 1983; Fagbemi, 1984).

In the present study, a high prevalence of fascioliasis was observed during winter (December–January), although the infection was encountered throughout the year to a considerable extent, i.e. 40–60% prevalence. Similar results have also been obtained from several places in India (Sharma and Lal, 1983; Gupta et al., 1985), in Puerto Rico (Chiriboga et al., 1980), Pakistan (Hayat et al., 1986) and the USA (Hoover et al., 1984). Perhaps, with the rise in ambient temperature during late spring/early summer, there is an enhanced recruitment of infection by the miracidial stage in the snails, which is followed by the emergence of a larger number of cercariae and their encystment during the late summer/autumn months. The occurrence of *Fasciola* infections throughout the year is suggestive of the fact that essential requirements for the completion of the life cycle of the fluke, i.e. high moisture, moderate temperature and availability of the snail intermediate host, are continually present in the region. Even though the majority of the slaughtered cattle are not raised locally, the infected animals may become a potential source of

infection for the indigenous stock of milk cattle and other livestock when the molluscan intermediate host is available (Rajkhowa, 1980). Further, under the prevailing climatic conditions, the metacercariae can survive for months without losing their infectivity (Malone, 1986).

A higher prevalence of *E. pancreaticum* in winter may also be attributed to an increase in the availability of the insect second intermediate hosts, i.e. grasshoppers (Paul, 1965) and recruitment of infection during the preceding summer/early autumn months.

In the present study, except for *O. noverca*, the pigs showed a higher prevalence of infections with the remaining three trematode species during late summer with minor fluctuations during other months. Emergence of a larger number of cercariae from snail hosts during late spring leads to a higher prevalence and intensity of mature worms during late summer. Sharma and Gogoi (1986) observed the pre-monsoon months to be the period with a higher rate of infection in these hosts.

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