

Nematode Parasite Infections of Domestic Pigs in a Sub-tropical and High-rainfall Area of India

ARUN K. YADAV and VEENA TANDON*

Department of Zoology, North-Eastern Hill University, Shillong 793 014, Meghalaya (India)

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ABSTRACT

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Fourteen hundred and ninety-six domestic pigs, *Sus scrofa domestica* L., from a sub-tropical and high-rainfall area of India were examined over a period of 18 months to ascertain their nematode parasite spectrum. The eleven species recovered, arranged in descending order of prevalence, are as follows: *Ascaris suum*, *Oesophagostomum dentatum*, *Bourgelatia diducta*, *Stephanurus dentatus*, *Globocephalus connorfili*, *Physocephalus sexalutus*, *Ascarops dentata*, *A. strongylina*, *Pseudocruzia orientalis*, *Setaria bernardi* and *Gnathostoma hispidum*. This is also the first report of the occurrence of *Setaria bernardi* in pigs in India. *A. suum*, the most prevalent species (51.67%) found in the pigs of the region, is presumably of zoonotic importance. Another species of public health significance that was encountered in the survey was *Gnathostoma hispidum*.

The overall infection rate was considerably higher (76.42%) in the low-altitude region than in the high-altitude one (62.50%). The highest level of infection (73.2%) was observed during autumn and the lowest (63.0%) in winter.

INTRODUCTION

Helminth parasite infections are known to be localized in nature and it is often possible to relate the nature and level of infections to particular habitat types (Kennedy, 1975). Although several reports have been published on nematode parasite spectra of pigs from various climatic regions of India (Endrejat, 1964; Gupta and Sood, 1968; Varma et al., 1977; Sarma and Gogoi, 1986) and of the world (Shoho and Machida, 1979; Morris et al., 1984) there is no information about these parasites in pigs of a sub-tropical and high-rainfall area of India. The objective of this study was to investigate the nematode parasite spectrum of domestic pigs in this region of the country.

*Author to whom correspondence should be addressed.

MATERIALS AND METHODS

Study area

The region under the East and West Khasi Hills districts (with Shillong and Nongstoin as the district headquarters, respectively) is geographically situated in the eastern and central parts of the state of Meghalaya, and lies between $25^{\circ}5'N$ – $26^{\circ}10'N$ and $90^{\circ}45'E$ – $92^{\circ}15'E$ (Fig. 1) at an altitude range of 400–1600 m ASL. In the present study, this region was divided into two areas: a low-altitude region (400–750 m) and a high-altitude region (750–1600 m). The region experiences a sub-tropical monsoon climate (data made available by the meteorological station of the State Agricultural Department, Nongstoin). During the 18-month period of study (i.e. March 1986–August 1987) the mean maximum and minimum monthly temperatures during summer were $25.6^{\circ}C$ (23.9–27.6) and $21.2^{\circ}C$ (18.7–22.2), and during winter were $17.0^{\circ}C$ (16.5–20.1) and $10.8^{\circ}C$ (9.6–13.4), respectively. The mean daily relative humidity at 8.30 a.m. was 67.4% (40–86) and at 5.30 p.m. was 79.5% (37–91). The rains are well distributed throughout most of the year with a very short dry season but are comparatively heavier between April and mid-October. The average

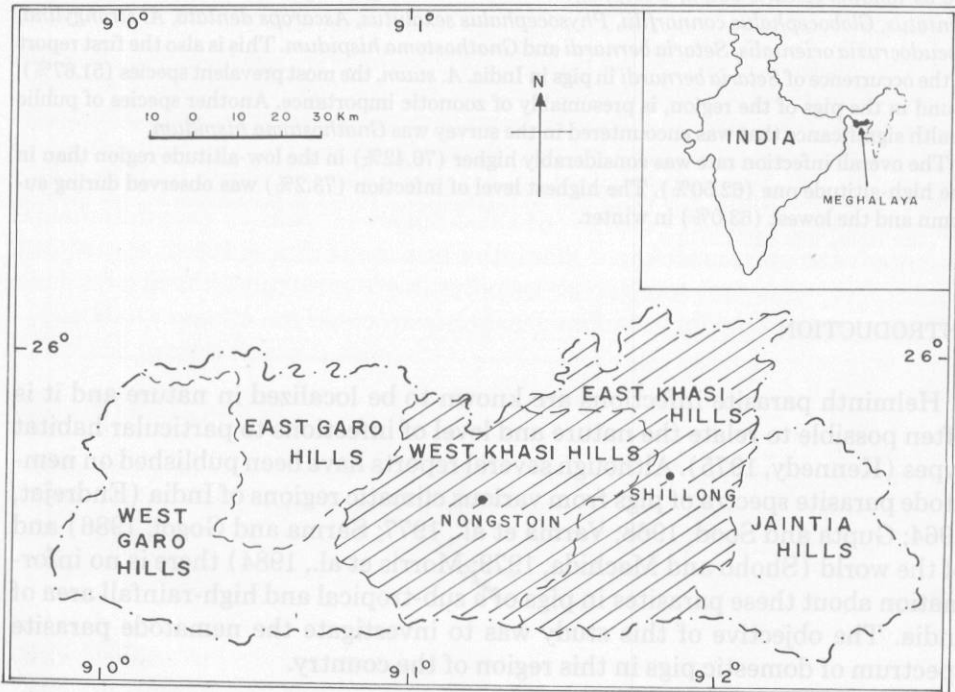


Fig. 1. Study area (hatched) in the State of Meghalaya, India.

annual rainfall of the region is 400 cm but in certain parts it reaches 1143 cm, as recorded around Cherrapunji and Mawsynram, the world's rainiest spots (Rao and Neogi, 1980).

Collection and processing of samples

The investigation was carried out on a total of 1496 randomly selected domestic pigs, *Sus scrofa domestica* L., generally in the 1-2-year age group, slaughtered at various abattoirs in the region. The majority of animals slaughtered in these places are those reared by local people under the free-range system. After careful visual examination of the body cavity and other organs of the slaughtered animals for the presence of parasites, the gastrointestinal tract, the lungs, heart and liver were removed from the body and brought to the laboratory for further examination. Different parts - stomach, small intestine and large intestine (caecum and colon treated as a single organ) - were separated, slit open lengthwise and their contents washed gently in separate buckets. The drained gut contents were passed through a graded series of sieves (diameter 20.5 cm; aperture size 450, 250 and 150 μm) under running water as described by Reinecke (1984), and the worms retained on different sieves were collected. Simultaneously, the lungs, liver and heart were examined for the presence of nematodes by standard laboratory techniques. The worms were preserved in 70% ethanol, cleared in glycerin-alcohol solution and identified light microscopically according to Baylis (1936, 1939), Yamaguti (1961) and CIH Keys to the Nematode Parasites of Vertebrates (1974-1983).

Representatives of most species found in this survey have been deposited in the helminthological collections at the Eastern Regional Station of the Zoological Survey of India at Shillong.

RESULTS

Of the 1496 domestic pigs examined, 1023 (68.38%) were found to be infected with one or more species of nematode. No sex-related incidence was observed during the study, therefore the prevalence and incidence of all the species recorded in this survey are presented together in Table 1. The most commonly recorded species in the region was *Ascaris suum*, followed by *Oesophagostomum dentatum*, *Bourgelatia diducta* and *Stephanurus dentatus* in descending order. The least prevalent species were *Gnathostoma hispidum*, *Setaria bernardi* and *Pseudocruzia orientalis*, which were present in <2% of the hosts examined. *Ascarops strongylina*, *A. dentata*, *Physocephalus sexalatus* and *Globocephalus connorfili* showed a prevalence rate of between 2 and 8.22%. The prevalence and incidence of various species recorded were studied with regard to low- and high-altitude regions and show an inverse relationship with altitude. The overall infection rate was considerably higher in the low-altitude

TABLE 1

Prevalence of nematode parasites in domestic pigs of a sub-tropical and high-rainfall area of India

Location and species	Animals examined in the whole region (n=1496)		Animals examined in low-altitude region (n=632)		Animals examined in high-altitude region (n=864)	
	No. infected	% Infection	No. infected	% Infection	No. infected	% Infection
Stomach	1023 ¹	68.38	483	76.42	540	62.50
<i>Ascarops strongylina</i>	34	2.27	20	3.16	14	1.62
<i>A. dentata</i>	52	3.47	34	5.37	18	2.08
<i>Gnathostoma hispidum</i>	4	0.26	4	0.63	—	—
<i>Physocephalus sexalatus</i>	68	4.54	42	6.64	26	3.00
Small intestine						
<i>Ascaris suum</i>	773	51.67	422	66.77	351	40.62
<i>Globocephalus connorfilii</i>	123	8.22	93	14.71	30	3.47
<i>Pseudocruzia orientalis</i>	17	1.13	16	2.53	1	0.11
Large intestine						
<i>Bourgelatia diducta</i>	324	21.65	142	22.46	182	21.06
<i>Oesophagostomum dentatum</i>	413	27.60	303	47.94	110	12.73
Perirenal fat and ureter wall						
<i>Stephanurus dentatus</i>	146	9.75	51	8.06	95	10.99
Peritoneal cavity						
<i>Setaria bernardi</i>	12	0.80	10	1.58	2	0.23

¹Each animal may be infected with more than one species of parasite.

TABLE 2

Seasonal incidence of nematode parasite infections in domestic pigs of a sub-tropical and high-rainfall area of India

Season	No. of animals examined	No. of animals containing parasites	% Infection
Winter (Nov.-Jan.)	346	218	63.0
Spring (Feb.-Apr.)	428	298	69.6
Summer (May-July)	386	261	67.6
Autumn (Aug.-Oct.)	336	246	73.2

region than in the high-altitude region. With respect to individual nematode species, the prevalence of some species, namely *A. suum*, *O. dentatum*, *B. diducta*, *G. connorfilii* and *A. dentata* was markedly higher in the low-altitude region compared with that in the high-altitude region (Table 1). Little variation in the incidence of infection between the two regions was noted in case of

the following species: *A. strongylina*, *S. dentatus* and *S. bernardi*. *G. hispidum* was only present in the lower altitude region and its rate of infection was very low.

The seasonal incidence of nematode infections was monitored by recording the numbers of animals infected with one or more nematode species per quarter during one calendar year (Table 2). The highest level of infection was noted during autumn and the lowest in winter. As a general observation the intensity of infection was found to be higher in older animals than in young.

DISCUSSION

The aim of the study was to ascertain the nematode parasite spectrum of domestic pigs in a part of the north-eastern region of India. Eleven nematode species were found, ten of which have previously been reported. The presence of *S. bernardi* in Indian pigs is reported here for the first time. Of the other species, although *P. orientalis* and *G. hispidum* have been reported earlier (Maplestone, 1930), recent surveys pertaining to several regions in the country do not indicate their occurrence in pigs (Varma et al., 1977, 1979; Sarma and Gogoi, 1986). It is worth mentioning here that *P. orientalis*, *G. hispidum*, *G. connofilii* and *B. diducta* were not encountered during earlier screenings of pigs for helminth parasites in the neighbouring state of Assam (Endrejat, 1964; Sarma and Gogoi, 1986), whereas certain other species, such as *Simondsia paradoxa* and *Trichuris suis*, were recorded by these workers. These differences may be due to the climatic differences between the two regions. The findings of the present authors are close to those of Shoho and Machida (1979) who reported the nematode parasites of wild boars from Japan. Except for *Capillaria riukiensis*, all the other species recorded by them have also been encountered in pigs in our study region. The findings of the present study are also in agreement with those of Morris et al. (1984) who studied gastrointestinal parasitism in Oklahoma swine and found *Ascaris* spp. to be the most prevalent (53.0%) worm type in their helminth spectrum.

In the present investigation the overall nematode infection rate was found to be 68.38%, which is more than that reported by Sarma and Gogoi (1986) for pigs in the Kamrup district of Assam, representing a temperate climate. These workers also found *A. suum* to be the most prevalent helminth infection, although the infection rate was lower (33.8%) than that prevailing in our study. In the pigs of Haryana state, *A. strongylina* was found to be the most prevalent species (with a 100% infection rate) and *P. sexalatus* also constituted a fairly common infection (Varma et al., 1979). However, both these species presented a low profile in the present study.

The high frequency of nematode parasite infections (68.38%) in the pigs of the area under study is an indication of both a favourable environment for the survival and development of pre-infective stages of nematodes and the limited

veterinary care of these animals in the region. The high rainfall in the region coupled with the very short dry season results in the persistent high humidity in the environment. This satisfies the optimum requirements needed for the development of nematode eggs and, by ensuring a prolonged survival of eggs and larvae in the soil, increases the possibility of host infection. To some extent the feeding habit of pigs is also one of the factors for such a high infection rate of nematodes, *Ascaris* spp. in particular, in these hosts. Information collected from various medical agencies of the region indicated a high prevalence of ascariasis in the human population of the region. As is known, establishment of cross-infections with *A. suum* in human hosts is possible; pigs thus appear to act as reservoir hosts for disseminating human ascariasis in the region. Furthermore, the presence in pigs of *G. hispidum*, which is of public health significance, is also noteworthy. The present study suggests that in a community setting, where pigs are reared and pork is consumed by a large section of the population (as revealed in the area under this study), pigs could be significantly involved in zoonotic helminthiasis.

The seasonal pattern of overall nematode infections observed in the investigation is attributable to one factor – the presence of larvae in the soil during the wet season (July–September). A climate with warmth and wetness is the most congenial for the majority of nematode parasites (Rogers, 1962). During the wet season there is sufficient moisture for development of the pre-parasitic stages of the nematodes. Thus, in the present study the highest level of infection was noted in autumn (August–October). Relatively low infections recorded during winter could be associated with the absence of or low level of infection. However, the seasonal pattern of incidence of infection did not show a wide fluctuation (i.e. remained between 63.0 and 73.2%) in the present study and followed a more or less uniform pattern throughout the year. A possible explanation may be that the region lacks the extreme climatic conditions, as the average monthly maximum and minimum temperatures do not fluctuate much and, in addition, rains are distributed throughout the year.

The above results are based on autopsied animals which do not necessarily reflect the overall field situation.

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