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STUDIES ON EARTHWORM POPULATION IN SALINE AND NON-SALINE SOILS OF MIDNAPORE AND BARDDHAMAN DISTRICTS OF WEST BENGAL

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INTRODUCTION

Earthworms are found in all types of soil provided there is sufficient moisture and food. Organic materials like municipal dumps, cow dung dumps, forest litter, humus and kitchen drainage are attractive sites to some species. They are much less frequent in acidic soil. The feeding activities of these soil inhabiting worms have a considerable effect on the fertility of the soil. Burrowing earthworm species transport a huge quantities of organic materials from the soil surface to deeper parts of the soil profile through their burrows and thus play a profound role in agriculture and crop productivity.

Several research works in the form of review papers, books and monographs have been published by the European workers like Satchell (1967), Edwards and Lofty (1972), Bouche (1972), Atlavinyte (1975) and Lavelle (1978). In India Ali *et al.*, (1973), Dash *et al.*, (1974), Dash and Patra (1977) are the pioneer workers who studied the earthworm dynamics in grassland ecosystem. Several papers have been published on seasonal activity, population density and biomass of earthworms in many Indian ecosystem by Kale and Krishnamoorthy (1978 a & b), Senapati *et al.*, (1979), Dash and Senapati (1980, 1986, 1991), Chouhan (1980), Sahu and Senapati (1986), Pani (1987), Julka and Senapati (1987), Krishnamoorthy and Ramchandra (1988), Sahu *et al.*, (1988), Ismail *et al.*, (1990). But no works have been done on the population dynamics of earthworm in different soil types. So the present work was undertaken to ascertain the population structure of earthworm in alluvial soil of Barddhaman district and coastal soil of Midnapore district, West Bengal.

MATERIALS AND METHODS

The present study was under taken during June 2003 to January 2006 and the collections were made in 10 different localities of Barddhaman and Midnapore districts of West Bengal. The

collection of earthworm was made by digging soil with spade. For the comprehensive survey, the earthworms were collected from different ecological niches like paddy field, understraw stack, near cow dung stack and from grassy fields. For the collection and counting of the earthworm one m^2 plot was selected in a $10 m^2$ plot and was dug with a spade and the earthworms were sorted out. From a $10 m^2$ plot the average number of five one m^2 plot was taken. Collected specimens were narcotized and fixed in 70% alcohol or 4% formaline solution for taxonomic studies using a hand lens and by dissecting the specimens.

Apart from the collection of earthworms from soil, the soil samples of the collection sites were also analysed to determine the pH and soil moisture. The soil temperature was also recorded in the field by inserting a soil thermometer in the soil.

RESULT AND DISCUSSION

The seasonal average population along with edaphic factors of different habitat types in alluvial soil of Bardhaman district and in saline coastal soils of Midnapore district is presented in Table 1. It has been observed that the range of soil temperature in different seasons in both the districts were more or less same varying from 30°C to 33°C in summer, 28°C to 31°C in monsoon and 20°C to 24°C in winter (Table 1). As regards the moisture contents of the soil it was found that in summer the moisture content was high in the coastal soil (7.8% to 17.5%) than the alluvial one (3.8% to 8.5%) and in winter and monsoon it was slightly high (13% to 22%, 19.8% to 26.2%) in alluvial soil than the coastal soil (7.2% to 19.2%, 14.6% to 22.7%). In both the districts the soil was acidic in nature.

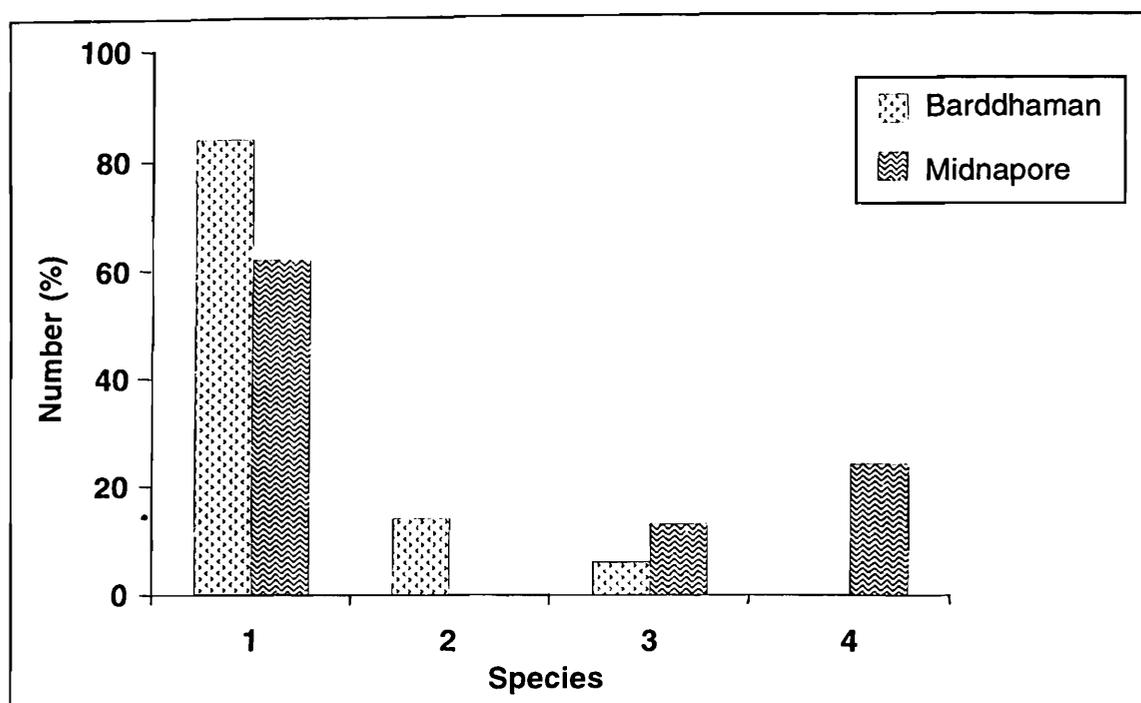
Table 1. : Shows the different edaphic factors, vegetation and average earthworm population in different seasons of the collecting spots in Bardhaman and Midnapore districts.

District	Season	Soil temperature (Range)	Soil moisture (Range)	Soil pH (Range)	Vegetation	Average population
Bardhaman	Summer	30°C – 33°C	3.8%–8.5%	5.25–5.45	Rotton straw	54.7
					Grass	45.6
Midnapore	Summer	30°C – 33°C	7.8%–17.5%	6.3–7.42	Grass	26.5
Bardhaman	Monsoon	28°C – 31°C	19.8%–26.2%	5.25–5.45	Rotton straw	31.3
					Grass	51.5
Midnapore	Monsoon	28°C – 31°C	14.6%–27.2%	6.3–7.42	Grass	34.7
Bardhaman	Winter	20°C – 24°C	13%–22%	5.25–5.45	Rotton straw	33.5
					Grass	25
Midnapore	Winter	20°C – 24°C	7.2%–19.2%	6.3–7.42	Grass	31.3

The collections of the earthworm were mainly made from the uncultivated land, paddy field after harvest, under straw hips and from the boarder line of the paddy fields. As regards the total population it was observed that under the straw hips the earthworm population was higher in summer than in the grassy field of Barddhaman district. In the grassy field the average earthworm population was higher in the soil of Barddhaman district than that of Midnapore district (Table 1). In Barddhaman district the grassland population was much higher. In monsoon low population under straw hips may be due to low porosity and bad drainage of the soil which was apparently better in the grassyfield than the earthworm population of under the straw hips and also from the grassland population of Midnapore district in monsoon. In winter the grassland population was lower than the population of straw hips in Barddhaman district while in Midnapore district the grassland population was higher than the grassland population of Barddhaman district but it was lower than that of under straw hips of Barddhaman district. Some collections had also been made from the cultivated paddy field after harvesting the paddy and it was found that in summer not only the population was very poor but also the population migrated vertically below one ft. from the surface and at the same time the earthworms were found in the upper surface in the adjacent grassland in the border line of the paddy field.

Seven species of earthworm have been identified from the collection sites namely, *Lampito mauritii*, *Perionyx excavatus*, *Polypheretima elongata*, *Metaphire posthuma*, *Drawida nepalensis*, *Eutyphoeus orientalis* and *Glyphidrilus tuberosus*. These species occurred in different frequency in different seasons and in both the districts. Among the seven species four species namely *Lampito mauritii*, *Polypheritima elongata*, *Perionyx excavatus* and *Metaphire posthuma* were very frequent in occurrence in three collecting samples. Of the four frequently occurring species *Lampito mauritii* showed dominance in both the districts in summer, occupying 84% and 62% of the total population in Barddhaman and Midnapore districts respectively (Fig. 1). As regards the frequency of this species it occurred in every habitat type in every seasons in the Barddhaman district, while in Midnapore district, it was present in 50% to 90% sampling plots in different seasons. In Midnapore district *Metaphire posthuma* showed the dominance, occupying about 48% and 47% of the total population in monsoon and winter seasons respectively and the *Lampito mauritii* occupying the second position. *Perionyx excavatus* occurred in both the districts but very few in numbers and the *Polypheritima elongata* was not found in Midnapore district but it was occupying the second position in Barddhaman district and occurring in 12%, 23% and 19% of total population in summer, monsoon and winter seasons respectively. Higher population of earthworms under straw hips in summer than the grassland in Barddhaman district was due to low soil temperature and unexposed condition of the soil to the direct sunlight which enable the soil to keep more moisture than that of the grassyfield and the winter also showed the same trend. In the monsoon low population under straw hips may be due to the low porosity and bad drainage of the soil which was apparently better in the grassyfield (Raw, 1967).

The higher population of the grassland soil in Bardhaman district than that of the Midnapore district might be due to the salinity of the soil as the collection was made in the coastal region. Low population in the upper layer of the paddy field may probably be due to the effect of the different agricultural practices for the cultivation and the earthworms were migrated to the lower layer to avoid the hazards (Satchell, 1967; Hunter, 1966; Wallwork, 1970).



A = *Lampito mauritii*, B = *Polypheritima elongata*, C = *Perionyx excavatus*,
D = *Metaphire posthuma*

Fig. 1. : Relative abundance of four species of earthworm in Bardhaman and Midnapore districts in summer

SUMMARY

1. The earthworm populations of saline and non-saline (alluvial) soil of Midnapore and Bardhaman districts were studied based on seasonal surveys from cultivated and uncultivated grassland.
2. Seven species were found in different frequency in different seasons in both the districts.
3. Among the seven species namely *Lampito mauritii*, *Perionyx excavatus*, *Polypheretima elongata*, *Metaphire posthuma*, *Drawida nepalensis*, *Eutyphoeus orientalis* and *Glyphidrilus tuberosus* the species *Lampito mauritii* showed the dominance.

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