INTRODUCTION

The word soil which is derived from the latin word "Solum" meaning floor, is a natural product of weathered rock acted upon by climate and living organisms, and a mixture of minerals and organic matter that supports life.

The formation of soil involves two processes occurring in succession. The first one which includes weathering of primary rock is mainly a physical process in which the rock is transformed into an unconsolidated mass of internally unaltered grains (Thompson and Troeh, 1979); and this product is known as the parent material. The second process begins after the formation of the parent material which then undergoes a process of biochemical weathering. As the parent material lies on the surface, it bears the brunt of the influence of living organisms as well as that of nature. Such a naturally occurring biochemical influence transforms the parent material gradually to soil. In the process even the individual mineral may get altered and new minerals are formed. So soil is a dynamic material which goes on changing continually. Thus it can be said that the soil is a decomposition product, the solid phase of which has two main constituents, one is the mineral material and the other is the organic material. The vegetation growing in the soil provides the organic material that remains closely associated with the mineral part of soil. The decomposition of organic matter (litter) which is mainly influenced by the soil organisms (Wallwork, 1970), takes place in two phases. In the first phase the litter is fragmented and chemically altered by various organisms into a complex substance called "humus", which in the second phase this relatively stable complex is slowly broken down into various components (Handley, 1954; Burges, 1965, 1967). Different workers have reported that the decomposition of vegetable material originates with the infestation of micro-organisms like fungi and bacteria. But the decomposition by them only cannot proceed indefinitely, their activity decreases gradually along with the decrease of the amount of easily oxidizable
carbon. However, by their action a radical change in the texture and chemical composition of the organic material takes place, which becomes more acceptable as food by soil animals like earthworms, insect larvae, millipedes, collembolans, mites, etc. (Wallwork, 1970). The action of these soil animals not only accelerates the physical disintegration of the organic material, but also appears to be necessary for the continued activity of the micro-organisms (Burges, 1965). The various biotic forms living in the soil are mutually interdependent. The plant tissue serves as food for animal life both on and in the soil. Plant and animal waste remains return to the soil where they are processed by insects, earthworms, fungi, bacteria and other living beings. Eventually the cycle is completed and the nutrients are again available for growth of the plants. The soil will run out of nutrients and become sterile if the cycle is not completed. As the soil animals play a key role in this process of cycling, they may be considered as the part and parcel of the dynamic soil system.

To understand in details the intrinsic nature of the role of soil animals on the formation and maintainance of the soil, it is necessary to identify the animals inhabiting the soil, study their life-histories and to assess their impact on the soil and vice-versa.

That the soil fauna exert profound influence in the formation and maintainance of a healthy soil, started gaining appreciation since the latter half of the eighteenth century. Since then studies on the soil fauna showed an upward trend, as a result the recognition of general soil fauna and their identity went on increasing progressively. But the study of soil ecosystem with special reference to soil dwelling animals, was made first in the thirties of the nineteenth century. In the meantime, rapid urbanisation and industrialisation created a lot of problems of which pollution posed to be the most important and it increased along with the increase of human population which followed an exponential pattern.
Urbanization is invariably associated with the production of sewage which contains toxic elements as potential soil pollutants in various forms (Thompson and Troeh, 1979). Soil normally contains small amounts of heavy metals like lead, zinc, copper and mercury and some other essential elements. But excessive amounts of these and other heavy metals are detrimental to life and can sterilize the soil. Heavy metal pollution is serious because it can persist for many decades (Thompson and Troeh, 1979).

Heavy metals reach the soil in several ways. Repeated application of sewage on to the soil is one way. Some industrial wastes contain such high concentrations of heavy metals that they should neither be spread on land nor dumped in water. Lead and other heavy metals used in fuels and lubricants find their way into the atmosphere and drift across the areas of heavily congested traffic (Thompson and Troeh, 1979). Mac Lean and Langille (1973) reported substantial increase in the lead, copper and molybdenum contents of soil and plants growing on it along road side plots. It is difficult to remove heavy metals from soil because they are strongly held on cation-exchange sites. The concentrations in solution are therefore low and leaching is relatively ineffective for removing them from the soil.

The average garbage production per day from Indian cities is estimated at 41,000 tonnes, and such a production per year is of the order of 15 million tonnes. A total of 142 class - I cities produce around 9000 million litres of sewage per day and only one-third of this waste receives some treatment. That the primary treatment of sewage can remove 60% of solids and perhaps a third of BOD, is well established (Foster, 1959). The great metropolitan city of Calcutta which has a high population density and a good number of industries does not unfortunately possess waste treatment plant (Sharma, 1984).
The problem of the effect of heavy metals on the soil organisms received due attention of the scientists in some countries recently. A review of such works shall be dealt with in the next chapter. In India, no such attempts has yet been made, to assess the impact of heavy metals on the soil arthropods.

In the aforesaid background the present investigation has been undertaken to achieve the following objectives -

1. To estimate both qualitatively and quantitatively the arthropod population in sewage polluted embankment [For this purpose three open sewage canals namely Bagjola canal also known as Dum Dum canal (North Calcutta), Beliaghata canal (East Calcutta) and Tollygunge Nulah (South Calcutta) were selected], and to estimate also the arthropod population from a non-polluted area at Shibpur Botanical Garden, Howrah (western side of Calcutta).

2. To study the seasonal changes in the population structure of the arthropods in both polluted and non-polluted sites.

3. To make bio-chemical studies and measurements that can be used to monitor and assess current environmental status with a view to forecasting future consequences of pollution.

4. To evaluate the role of edaphic factors like, temperature, moisture, pH, organic carbon and heavy metals like copper, chromium and lead on the soil arthropods and their concentrations in both polluted and non-polluted areas.

5. To establish a pollution tolerant arthropod group.