MATERIALS AND METHODS

TRAPS

Unfortunately there is no standard size of pitfall traps. Different authors utilized different sizes of traps in their experiments. Moreover, some authors neglected to mention the size of the trap in the description of their methodology. Miller (1954) used a gallon syrup can for a trap; Doane (1961) used stainless steel funnel traps whose diameter of the funnel and total depth of the trap from the rim of the funnel to the bottom of the can was $7\frac{7}{8}$ inches; Banta (1962) utilized 55-gallon drums; Greensdale (1964a) used 1 lb. jam jars (11'5 cm high with a diameter at the mouth 6'5 cm); Pearson and White (1964) placed honey jars with an internal diameter of 6 cm and 10% glycerol in water at the bottom to reduce carnivores activities of the trapped animals; Stewart (1967) used 1 pound coffee cans; Rickard (1970a) used metal cans of 4-inch diameter and 6 inches height; Gist and Crossley (1973) utilized 5 oz paper cups; Evans (1971) placed 1 lb. jam jars in line; Oppenheimer and Tikader (1976) used a backet of 22 cm height, 23'5 cm in diameter at the top and 15'5 cm in diameter at the lower rim which extended 1 cm below below the bottom; Thomas and Sleeper (1977) utilized 30 cm x 15 cm metal metal cylinder, and recently Rogers and Fitzner (1980) sampled their study area by twenty five 15 cm x 15 cm metal cans with 30 cm boards placed over the opening of the traps to serve as a rainguard.

In the present study the pitfall traps used for

collection, were made out of galvanised metal sheet. Each pitfall trap consisted of 21 cm deep by 9 cm diameter pit or hole. Its opening flushed with the soil surface. Two small holes (1 cm in diameter) in opposite directions were punched into just above the bottom of the can to allow water from rainy periods to percolate into the underlying soil. These two holes were covered with a fine mesh nylon gauge to prevent loss of specimens during percolation (Fig. 2). A 9 cm diameter metal lid was used to close the trap during transportation of the same back to the field laboratory from the field. When the trap was open, a wooden shade (22 cm x 12 cm) was positioned over the trap to prevent litter deposition inside it. During 1976 when the experiment was started for standardisation, it was observed that mice entered some traps and fed on the trapped beetles and bait, especially in fish baited traps. However, this type of predation was nearly eliminated the following years by using a wire net having 2 cm diameter pore fastened in the mouth of the traps when it was open. Kirk (1971 a) also noted this type of predation by mice during the study in the field.

Initially, 9 traps, 3 of which were baited with 100 grams of fish, 3 with 100 grams of fresh cow dung and 3 without any bait (empty pitfall traps), were placed in three rows, more than 250 feet apart from the nearest edge in each of the forest floor, tea garden and paddy field. Each pitfall trap of the respective rows was 15 feet apart from each other and the distance between

the rows was 12 feet in each of the three areas. In the forest floor the traps were placed in the shrub layer, within a cleared area of 60 cm diameter from which all vegetation and leaf litter had been removed. In the tea garden the traps were placed inside the tea bushes and in the paddy field traps were placed in the crop row to avoid breakage and disturbance during cultivation or harvest. Since the study started, the traps were replaced in the original holes each trapping period, and adjacent were limited to packing soil firmly around the upper rim of the bucket to make it flush with the soil surface.

In a study of phenology of arthropods, Pearson and White (1964, p.250), stated "the phenological data recorded in this paper largely corroborate the findings of other European authors, Dahl (1908), Duffey (1962) Lohmander (1942), Palmgren (1939), Tretzel (1954, 1955) and Williams (1962) for the spiders and Larssen (1940), Linderth (1946-1949) and Williams (1959) for carabids. Unfortunately, some of these authors used inadequate numbers on which to base their conclusions. It is clear from our data that the trapping should be continuous. Collecting for only one week in four would have resulted in a number of anomalies. The maximum numbers of Phaulothrix hardyi could have been halved, the period of maximum numbers of the lycosids displaced by a month, and species such as Amaurobius atropos, which occur only in

small numbers over a long period, mixed altogether". In the present study collections were made continuously throughout the year from the three areas, viz., Forest floor, tea garden and paddy field. The traps were emptied and replaced with new baits between 0800 and 1000 hours every forthightly throughout the study. The cow dung for the dung baited traps was collected primarily from the local inhabitent pet Indian cow and the fish for the fish baited traps was bought from the local market. The cow dung was collected each day morning of the trapping scheduled but the fish was bought in the evening, day before the trapping scheduled because the fish market used to open in the evening in that locality.

The galvanised metal can of the pitfall traps were engraved with the code marks, namely FFB (Forest Floor Fish Bait) (Fig. 2B), FDB (Forest Floor Dung Bait) and FEP (Forest Floor Empty Pitfall) and likely TFB, TDB, TEP and PFB, PDB, PEP were used for tea garden and paddy field respectively. Throughout the study the traps were used according to its code marks. The traps, marked with FFB were never used for dung baited or empty pitfall traps. Hence, the idea of maintaining the sanctity of particular trap for particular bait and also for empty pitfall trap, was another precautionary measure to observe the validity of catches.

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TREATMENT OF SPECIMENS

Every fortnightly, when the collection was made, the lids were placed firmly on the traps to avoid mixing and escape of live beetles during transportation. The traps were brought back to the field laboratory at Birpara High School, 15 km apart from the trapping site.

In the laboratory the content from each trap was filtered in a wood framed box 30 cm square and 8 cm deep with wire mesh top and the bottom. The trap, being emptied was washed under running water and kept aside in an inverted position to make it dry. Sorting out of material and spot identification along with all required data collection was made immediately. Alive beetles along with dead ones were kept in 70% alcohol and later were pinned, labelled and identified to the species level in the laboratory (Zoological Survey of India). Quantitative data were recorded for each species from the label on each pin where, in addition to the normal informations, other requisite informations such as bait or empty pitfall trap, season and area of collection, were also mentioned. Identification and taxonomic works have been carried out while the author was a research scholar in Zoological Survey of India. During this period author contacted and received much help from various Coleopterists of the world for confirmation of species especially, Scarabaeidae, Carabidae and Histeridae. A taxonomic series of beetles was deposited in the National Collection of Coleoptera,

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WEATHER AND MICROCLIMATE

Throughout the year during this study weather data were recorded at the field laboratory, Birpara High School, Birpara, Jalpaiguri, which was 15 km South East of the trapping site. Temperatures were recorded with the use of maximum and minimum thermometer and rainfall was measured with rain gauges. The data were recorded each morning between 0700 and 0800 hours. These data were also confirmed from Nagrakata Meteorological Station, Nagrakata, Jalpaiguri, 42 km North East of the trapping site.

Microclimatic factors in each of the three areas during this study were observed. The forest floor had the lowest sub-soil and soil temperatures. The tea garden had slightly higher sub-soil and soil surface temperature than forest floor, because the exposure of sunlight in the tea garden was slightly higher than the forest floor. The paddy field which had the highest exposure to sunlight than the tea garden and forest floor, resulted in highest subsoil temperatures amongst all. But the shade provided by the thin layer of grass on the crop row where the traps were placed, resulted in slightly lower soil surface temperatures than the original cultivated plot during the day light hours. The chemical and physical analysis of soil of the forest floor, tea garden and paddy field were estimated with the help of

Bose Institute, Calcutta. The soil analysis of these three studied areas revealed that the tea garden soil had more sand (48'61%) than paddy field (38'11%) and forest floor (35'32%) and organic carbon was higher in the forest floor (2'2584%) than tea garden (0'958%) and paddy field (0'513%) (Table 1).

TREATMENT OF DATA

The data of annual incidence of each species was maintained in a data sheet. The comparative incidence of the species, seasonal incidence, food preference of each species in different areas were estimated from this data sheet. These incidences were represented by graphs and histograms where needed.

PRECAUTIONARY MEASURES

1) Uniformity of the traps was maintained throughout the study.

2) Traps were placed uniformly.

3) To ensure equal catch the distance between the traps was properly maintained in every trap period. This was important to avoid overtrapping and also to help the disruption of the normal behaviour.

4) The length of the trap period was carefully maintained throughout the year.