

SEASONAL VARIATIONS OF NEST POPULATION IN
MICROCEROTERMES BEESONI SNYDER*

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Considerable fluctuations in the nest population of *Microcerotermes beesoni* Snyder have been recorded in this study. Fluctuations of worker population can be related to the foraging activity, intensity of which varies in different seasons. There is an inverse relationship between the worker population and population of young stages which primarily comprises of nymphs of workers. Regression study undertaken to find the relationship between the weight of the nest and number of workers show that no positive correlation can be established between them.

INTRODUCTION

Termites are of great economic importance in tropical countries, for they consume and destroy anything that is organic. However, notwithstanding the abundance of termites in nature, a fact which has been noted by many, there is very little on records of work on the numerical estimations of termite population. Holdaway *et al.* (1935) studied the population of a mound colony of *Eutermes exitiosus* Hill (*Nasutitermes exitiosus*) in Australia. Gay and Greaves (1940) estimated the population of a mound colony of *Coptotermes lacteus* (Frogg.) in Australia. Hartwig (1956) determined the population distribution of *Trinervitermes* nests in South Africa. Sands (1965) studied the mound population movement and fluctuations in *Trinervitermes abenerianus* Sjöd. in Nigeria. In India, Gupta (1953) estimated the mound population in *Odontotermes obesus* (Rambur) in Dehra Dun. Andrews (1911), Andrews and Middleton (1911), Grassé (1939), Lüscher (1955) and Skaife (1955) gave rough estimates of population of termite nests. Except the contribution by Sands (1965) no other work seems to have been carried out on seasonal variations of nest population in termites. Also such information is entirely wanting in any Indian species of termites. To fill up these lacunae, fluctuations of nest population in *Microcerotermes beesoni* Snyder were studied for one year. In

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addition, as this species is used in this institute as test termites for the laboratory evaluation of termite resistance of material, estimates of seasonal variations of population of worker caste in a nest are very useful data for the purpose.

MATERIAL AND METHODS

Microcerotermes beasoni Snyder builds wood-carton nests and is a common termite in North India. The carton nests are generally found buried in the soil with a small portion protruding out (Mathur and Sen-Sarma 1960). In Dehra Dun, the nests are very common in the 'sal' (*Shorea robusta*) forests. These nests vary in size depending on the age of the colony. The shape varies from spherical to oblong.

For the present study, nests were collected from the 'sal' forests of Jhajra Forest Range, Dehra Dun Forest Division, every month for a period of twelve months. Nests were collected as they were encountered. All nests, after having been brought to the laboratory, were broken into small pieces and all the termites were extracted from them. These were then sorted out to different castes and stages. Population estimates were made volumetrically which were checked and corrected by actual counts of small representative samples. The estimates presented here are the number of termites present in the nests at the time of collection. Thus total expected population of workers and soldiers in a nest will fall short by the number foraging away from the nest at the time of its collection.

DISCUSSION

Total population of nests varied from 7,000 to 45,000. The seasonal occurrence of different castes and stages has been depicted in Fig. 1. It will be seen that workers, soldiers and nymphs or larvae of workers and soldiers were recorded in nests every month. Nymph of alate were present in nests for four months, namely March to June. Alates were recorded for three months, May to July.

Workers

Workers were the dominant caste in colony and constituted nearly 63.43 per cent to 98.08 per cent of the total population. The lowest population density of workers was recorded in the months of April-May. As there was a preponderance in the number of nymphs or larvae of workers and soldiers, and nymphs of alates in these months, very active foraging is envisaged for maintaining improved nutrition for the development of young stages to maturity. From April onward there was a gradual increase in the percentage of workers in the nest till August-September (Fig. 2). A reference to Figs. 2 and 3 indicates two peak periods, namely January-February and August-September, when high density of worker population has been recorded.

This seems to be directly related to the weather condition which in turn regulates the foraging activity. In winter months in Dehra Dun the above ground activity of subterranean termites is the minimum (Chatterjee and Sen-Sarma 1962). Also during rains, foraging activity of subterranean termites becomes very much restricted resulting in high population density of

MONTH	W	S	WN	IN	IMA
JANUARY	■	■	■		
FEBRUARY	■	■	■		
MARCH	■	■	■	■	
APRIL	■	■	■	■	
MAY	■	■	■	■	■
JUNE	■	■	■	■	■
JULY	■	■	■	■	■
AUGUST	■	■	■		
SEPTEMBER	■	■	■		
OCTOBER	■	■	■		
NOVEMBER	■	■	■		
DECEMBER	■	■	■		

FIG. 1. Occurrence of different castes and stages of *Microcerotermes beesoni* Snyder through the year. W, worker caste; S, soldier caste; WN, nymph or larvae of worker-soldier; IN, nymph of imago caste; IMA, imago caste or alate.

workers in the nest. In the month of October, the number of nymphs of workers and soldiers increases and population of workers declines. Sands (1965) has also made a similar observation in *Trinervitermes ebenerianus* Sjödt. and related it to very active foraging by workers. It may also be mentioned that during active foraging, workers face the hazard of being predated by ants,

etc., and many may not return to the nest at all. From the months of November till February, the population percentage of workers again gradually increases and the foraging seems to be occasional in these months, as is indicated by lower population density of immature stages. The graph presented in Fig. 2 shows that an increase in the population density of young stages is associated, almost inversely, with a decrease in the population of workers. If it is assumed that the worker population in the nest is maintained at constant proportion at all times, then the increased production of nymphs of workers in

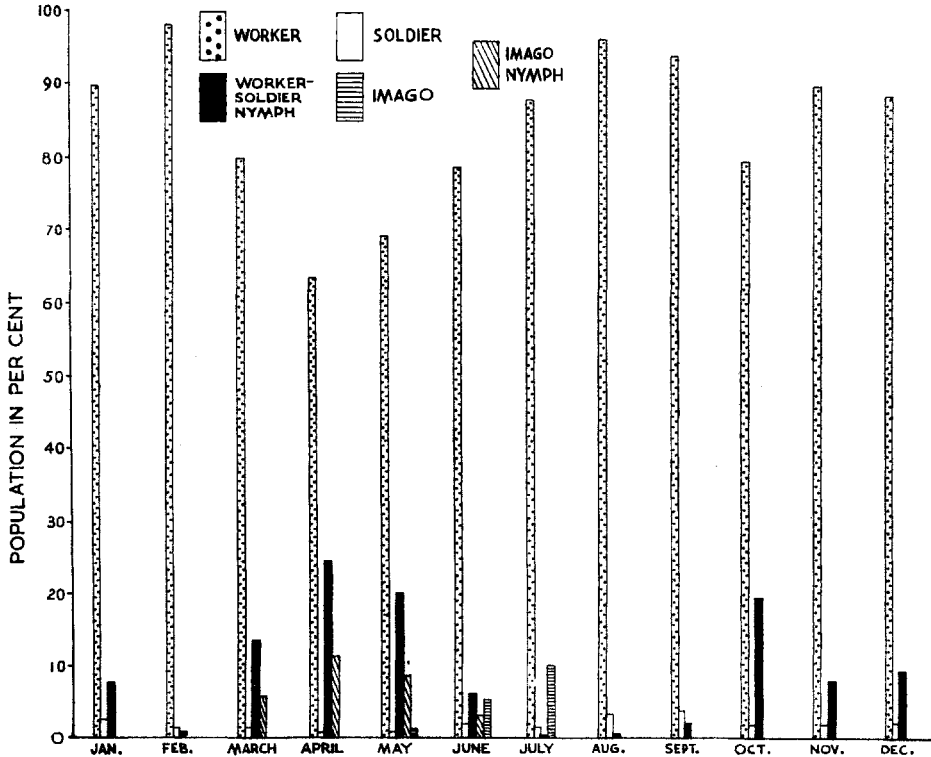


FIG. 2. Fluctuations of population (in per cent) of different castes and stages in wood-carton nests of *Microcerotermes besoni* Snyder through the year.

certain months may result from a fall in the proportion of worker caste which may be caused by natural mortality or due to predation by small predators like ants while foraging out.

Soldiers

Soldier population was found very low and fluctuated from 0.55 per cent to 3.80 per cent (Fig. 2). The lowest percentage of soldier population in the nest was recorded in the month of April when, due to intense foraging by workers as explained earlier, worker population was also the lowest. As the

soldiers accompany the workers in foraging, a decline of soldier population in the nest is expected at the time of intense foraging activity. The highest density of population of the soldiers was recorded in the month of September when foraging appeared to have almost stopped as is indicated by the high proportion of workers in the nest. In general, fluctuations in the population of soldiers in different months had not been very wide (Fig. 2). As the risks of soldiers becoming prey to small predators like ants are lesser than in the case of workers while foraging out (Sands 1965), the proportion of soldiers in the nest can be maintained at a more or less constant level throughout the year.

Immature stages

The immature stages have been separated into two, viz. nymphs or larvae of workers and soldiers, and nymphs of alates having rudiments of wings. As the nymphs or larvae of workers and soldiers were recorded throughout the year, breeding seems to be a continuous process in the colony. The highest percentage of nymphs of workers and soldiers was recorded in the month of April (Fig. 2) when intense foraging activity was indicated by the reduced worker population. The lowest population of worker-soldier nymphs was observed in the month of July when the highest percentage of residual population of alates was recorded. The population percentage of worker-soldier nymphs gradually increased from August to October when another peak period was recorded. In the month of November the population of worker-soldier nymphs declined and this population level was maintained more or less uniformly till the month of February (Figs. 2 and 3).

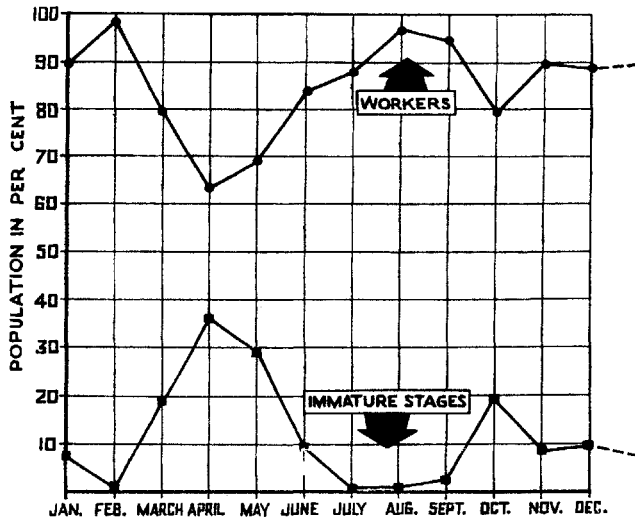


FIG. 3. Relationship between populations of worker caste and immature or young stages in *Microcerotermes beesoni* Snyder through the year.

Nymphs of alates had been recorded for four months, viz. March–June. Percentage of nymphs of alates shows an unimodal curve, the peak occurring in the month of April and thereafter population declined steadily till July when no alate nymphs were recorded (Fig. 2).

Alates

The alates were recorded in the nest in the months of May, June and July, the maximum population of alates having been recorded in the month of July. No alate was found in the nest in the month of August, indicating that major swarming takes place in the month of July.

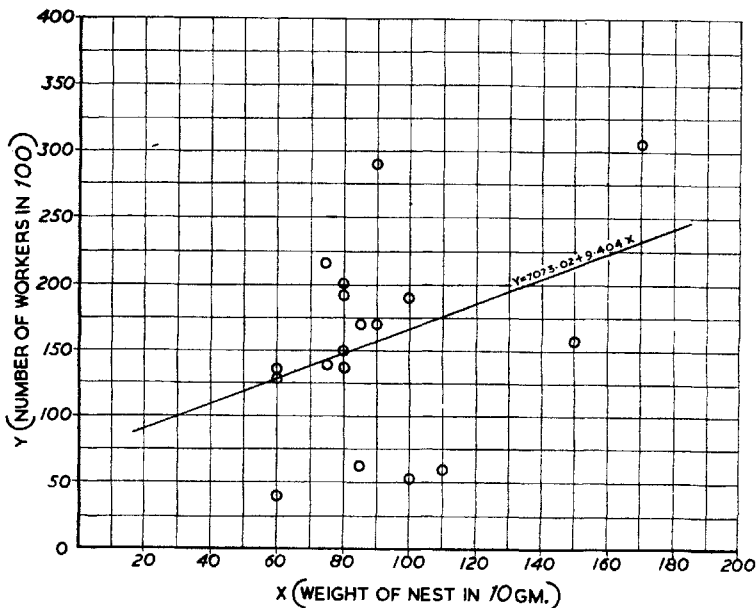


FIG. 4. Relationship between the weight of nests and number of workers in *Microcerotermes beesoni* Snyder.

WEIGHT OF NEST AND NUMBER OF WORKERS

To find out the relationship between the weight of the nest and the number of workers, a regression study was undertaken. A regression equation of the form $y = a + bx$ was fitted to the data on the weight of the nest (x) and the number of workers (y) (Fig. 4). The estimated values of the regression constants (a) and (b) were 7073.02 and 9.40 respectively. The correlation coefficient between the weight of the nest and the number of workers was also determined and the value obtained was 0.37 which is not statistically significant. Therefore, the prediction of the number of workers on the basis of the weight of the nest may not be reliable. This may be due to the fact

that considerable fluctuations of intensity of foraging activity occur in different months and number of workers estimated in the nest is the residual worker population which excludes the number of workers foraging away from the nest at the time of collection.

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* Not seen in original.