

SOME ASPECTS OF THE BIOLOGY OF THE TEA TERMITE *GLYPTOTERMES DILATATUS*†

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The swarmers of *Glyptotermes dilatatus* Bugnion & Popoff (Isoptera: Kalotermitidae) gain access into a tea plant only through pruning snags that have died back and suffered wood-rot. The proportion of brachypterous nymphs was found to increase with increase in colony size. Although there is no definite periodicity in the swarming pattern, there is some indication of a peak swarming time just prior to the onset of the long monsoonal months.

INTRODUCTION

The biology of this pest species has been studied intermittently since its first description (Bugnion and Popoff, 1910) and a variety of control measures attempted (Jepson, 1926, 1919; Danthanarayana and Fernando, 1970). Severe damage to tea plants results from the progressive development and ultimate coalescence of its galleries. At low altitudes these seldom extend into the root system. Colony foundation by dealate reproductive pairs was believed to take place mainly in small rotten pruning snags high in the bush. The association between die-back, wood-rot and frequency of colonisation required further study and the periodicity of production and swarming by the alates was also unknown.

These aspects were investigated as described below.

Colony foundation and gallery development

Penetration by swarming alates of pruning snags in three stages of deterioration was tested experimentally. Tea branches with; 1. healthy wood and clean-cut surface, 2. healthy wood and die-back from the cut surface and 3. rot in the dead tips, were exposed in cages with termite reproductives for two weeks. Successful penetration assessed by dissection.

Young clonal plants were sampled from a field known to have been recently infested with termites because of its proximity to older infested seedling tea. Plants were selected for availability of likely access points, i.e. the number of pruning snags, uprooted and carefully dissected in the laboratory to expose the gallery systems.

Attempts at excavation were observed only on branch tips that had suffered die-back and rot, and more than one pair of alates were found to explore at such tips. Within 24 h. the dealate imagos were barely visible due to the presence of excavated wood particles. On the other hand, in the cages containing the cleaner branches swarmers made no attempts at excavation. On dissecting the branches after two weeks, dealate imagos that had entered the rotted tips were found in the initially constructed royal cell (Fig. 1).

† Reprinted from the journal PANS Vol. 23 (1) 9-12, (1977) by courtesy of the Authors and Editors.

Dissections of field collected plants have shown the presence of small incipient colonies at the interface of rotted tissue and healthy wood. Only eggs and larvae were encountered at this stage. With further progress into apparently healthy wood more active pseudergates were observed along with a very few soldiers (Fig. 2).

Colony composition

Six plants were taken weekly from a 12 year old clonal tea field and dissected completely to extract all termites. The plants were selected as showing signs of termite attack and the counts are therefore biased towards more mature colonies. This was unavoidable since random selection would have produced a proportion of healthy sample plants and lead to greater denudation of the sampling area. Since these were productive fields unnecessary destruction was unacceptable.

Eggs could not be included in the colony counts since their recovery rate was proportionately lower than other stages. The instars without wing rudiments are recorded as larvae or pseudergates according to size, the latter being larger. Two instars with wing rudiments are included in the category of brachypterous nymphs. Supplementary reproductives (neotenics) were recognised by their degree of sclerotisation.

Very young colonies found just beneath the pruning snags consisted of dealate imagos, eggs and undifferentiated larvae. Soldiers began to appear only when the galleries had progressed further into sound wood. Soldiers account for about 4% of the total colonies.

Supplementary reproductives are very rare and account for less than 0.5 % of the total colony. The mean assessments of colony composition is presented in Table 1. The proportion of brachypterous nymphs was found to increase with increasing colony size and a highly significant positive linear correlation was observed between them ($r = 0.782^{***}$) (Fig. 3). Large colonies (over 2000 individuals) were encountered only in the collar region of the plant and more than one independent galleries were found to have merged here in some of the sampled plants. A large proportion of final instar brachypterous nymphs and in some instances a proportionate number of alates were often encountered in the collar region.

TABLE 1 — Colony composition in varying colony sizes of *Glyptotermes dilatatus* in tea*

Mean colony size	Mean composition					
	Larvae	Pseudergates	Soldiers	Neotenics	Brachypterous nymphs	Alates
16.2	6.0	6.0	3.5	1.4	2.8	1.6
27.5	10.8	22.3	5.3	1.8	6.4	2.5
35.8	11.9	30.3	6.4	2.0	12.9	2.2
41.8	19.9	31.8	7.4	1.6	12.4	2.2
48.5	19.5	36.6	8.4	3.0	16.6	5.7

data transformed to $\sqrt{n+1}$



Fig. 1. — Dealate imagos of Glytotermes dilatatus initiating new gallery in pruning snag.

P. Sivapalan & K. A. D. W. Senaratne



Fig. 2.—Young colony of *Glyptotermes dilatatus* in gallery that has progressed into sound wood via rotted snag.

P. Sivapalan, K. A. D. W. Senaratne

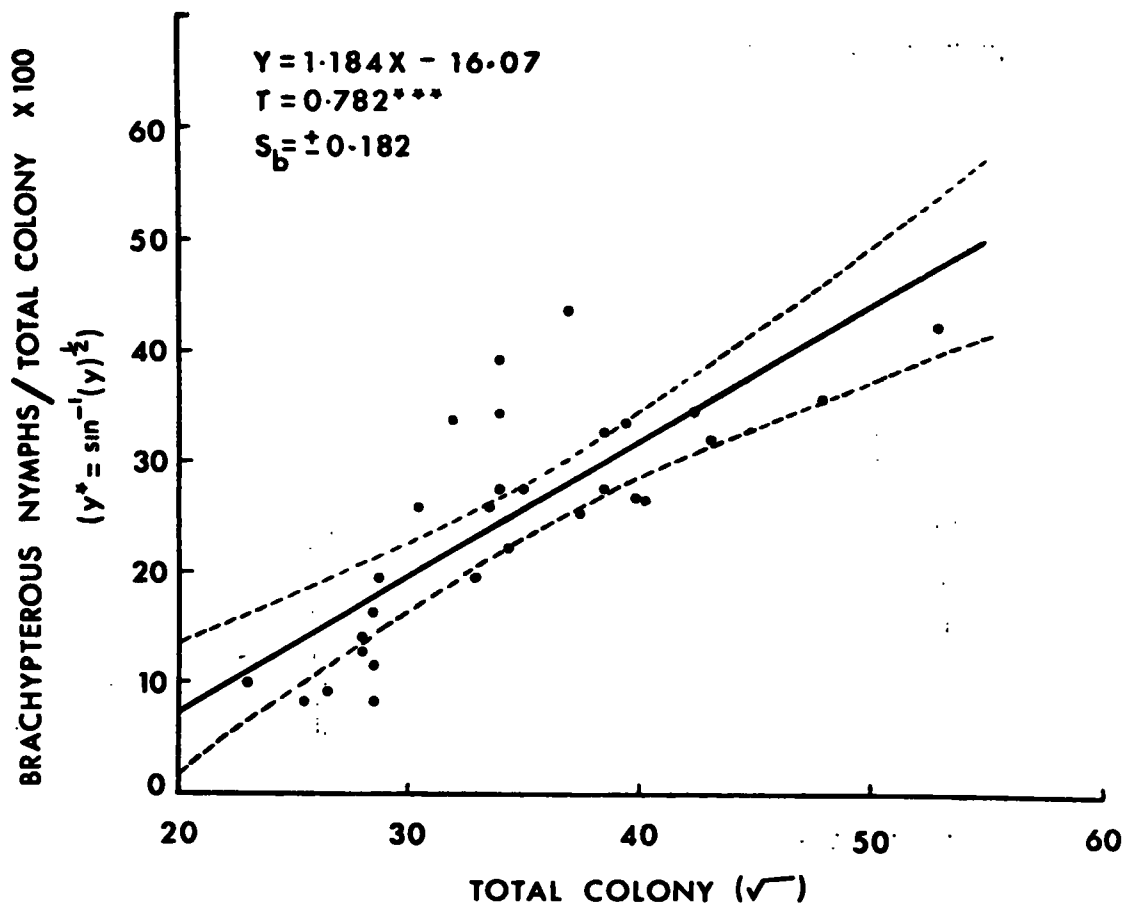


Fig. 3—Relationship of the proportions of brachypterous nymphs of *Glyptotermis* *dilitatus* to colony size.

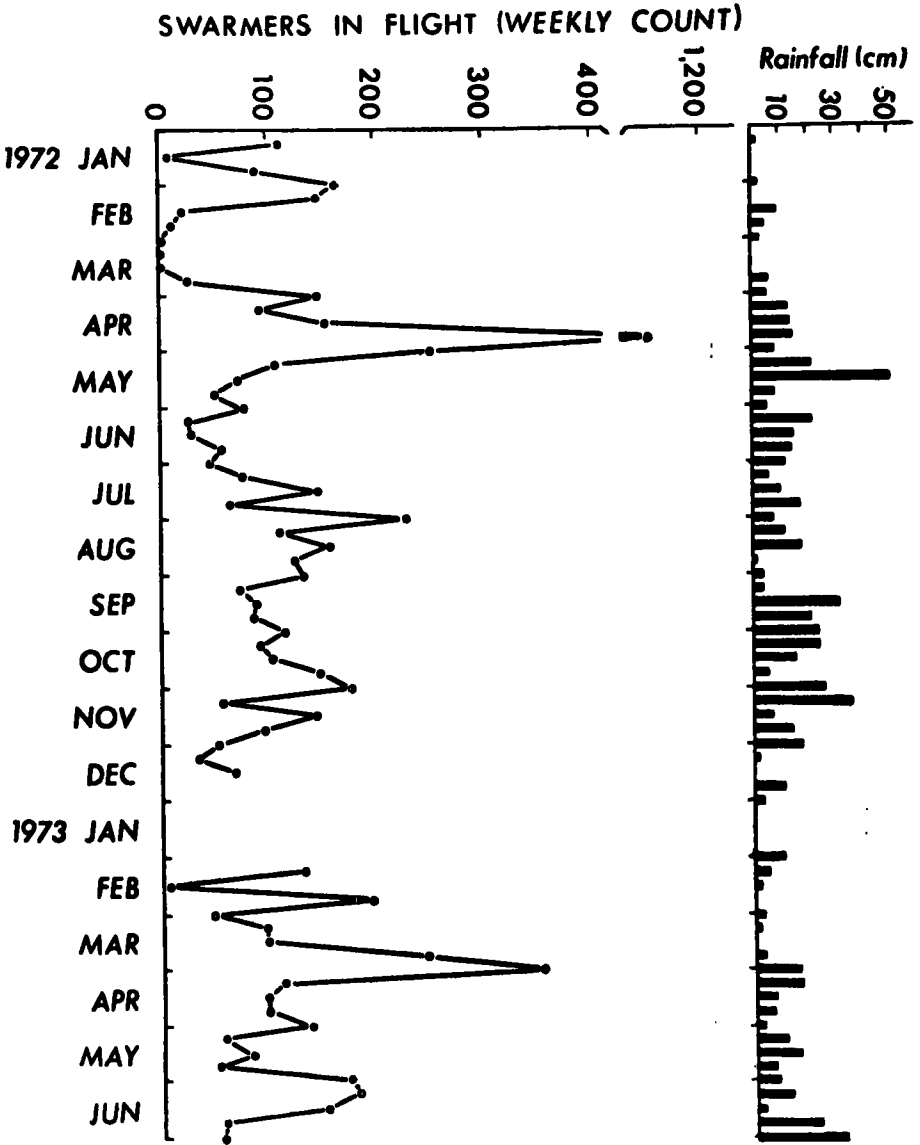


Fig. 4—Swarming periodicity of *Glyptotermes dilatatus* in tea field.

Swarming

Light traps powered by 60 W incandescent bulbs were suspended about 2 m high in the centre of a clonal tea field known to be infested, and kept lit from 1800 to 0600 h. Trapped swarmer were recorded daily for one year. The development of brachypterous nymphs in the colony composition samples indicated when swarming was imminent.

The frequency of swarming was observed to be staggered and the numbers caught in light traps were generally low. Increases in the frequency and numbers per swarm, however, were observed around March to April, before the onset of the longer monsoonal period (May to August) (Fig. 4). Swarmer were not encountered in newly attacked fields and were trapped only from fields that had suffered prolonged termite damage.

DISCUSSION

The results of our present study have shown that the alates of *Glyptotermes dilatatus* gain entry into a living tea plant only through pruning snags that have died back and suffered rot. Laboratory observations have shown that alates do not show any interest in moving towards clean-cut surfaces nor towards branch tips that have died back but not suffered rot. Various workers have observed positive responses by different species of termites to fungus-invaded wood (Esenher *et al.*, 1961; Smythe *et al.*, 1967). It is possible that the rotted branch tips of tea plants may be attractive to this species of termite.

Colonies of *G. dilatatus* seldom seem to exceed more than 3000 individuals in tea plants. Even with the merging of independent galleries in the collar region very little exploration has been observed into the root system. The collar region seems to be a dead end for further explorative activities and in this condition large numbers of brachypterous nymphs are produced. Brachypterous nymphs and alates have seldom been encountered among colonies in branches. Limitation space and crowded conditions seem to promote the production of brachypterous nymphs.

Final instar brachypterous nymphs have been encountered throughout the year and their production seems not to be influenced by weather factors. On the other hand, winged adults are encountered less frequently and it appears that the transformation to the winged adult is fast and seems to be regulated by weather factors.

Although swarming appears to be staggered throughout the year there is a definite increase in the frequency and numbers per swarm prior to the onset of the long monsoonal months. Very wet weather appears to discourage swarming activities. Besides weather factors the numbers of swarmer per swarm seems to be determined by the availability of tea plants in an advanced state of attack.

ACKNOWLEDGEMENTS

The authors are grateful to Mr. N. J. B. Wadugodapitiya, Manager of Maliboda Group, for his kind assistance in maintaining the records of trapped swarmer. They also thank Mr. T. Thevasadan for his assistance in the statistical analysis of data and Mr. D. J. M. Hettiaratchie, who helped in the photographic work.

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