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Community and succession of the round-head borers (Coleoptera: Cerambycidae) infesting the felled logs of White Dhup, *Canarium euphyllum* Kurz

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Abstract. Succession and assemblage of the round-head borers infesting *Canarium euphyllum* Kurz have been described. The borer pests have been categorized into two major groups. The first group includes the borers of standing trees and freshly felled logs, while the second constitutes the species infesting the dead logs after some seasoning. Even among the borers belonging to each of these groups, there is a clear sequence of succession of species infesting the logs depending upon the period lapse after felling and subsequent conditions of the host.

Keywords. *Canarium euphyllum* Kurz; Cerambycidae; community and ecological succession; overlapping of species

1. Introduction

It is well known that various stages of a gradually disintegrating log or tree harbour particular groups of insects, some in the living or dying parts, some in the recently dead material, others in the moderately dry wood and still others in the wood which has seasoned for several years (Shelford 1913; Adams 1915). Round-head borers are generally recognized as the 'second group of invaders', preceded by the bark- and ambrosia-beetles (Scolytidae and Platypodidae), infesting the host-material when it is still green (Howden and Vogt 1951; Sen-Sarma 1983; Maiti *et al* 1983).

However, the round-head borers themselves exhibit a clear succession of species in infesting the wood, depending upon its progressive drying and decaying due to many physico-chemical and biological factors (Khan 1984). The present communication summarizes the succession and assemblage of the round-head borers infesting the logs of different period lapse after felling of an economically important timber yielding plant, *Canarium euphyllum* Kurz.

2. Materials and methods

The work was carried out in several localities of Andaman and Nicobar islands (latitude 6°40′ to 13°41′ N and longitude 92°11′ to 94°10′ E) from 1978 to 1981. Observations were made in different forest areas, timber extraction and logging centres, timber depots, wood-based industries, etc. The frequency of infestation of different round-head borers attacking the standing trees and felled logs of *C. euphyllum* was regularly

recorded. The period lapse after the felling of the logs was also recorded, as could be ascertained from the authorities of the Forest Department. Population density of different stages of borers per log or tree was determined by random samplings from unit-area of 25 cm × 25 cm.

In all these localities, several batches of trees of *C. euphyllum* (girth varying from 1·38 m to 2·87 m) were felled and were cut into billets of uniform size. The number of adult beetles active on each of these logs and the number of females observed ovipositing thereon on the subsequent days were recorded. For each day, the egg-nitches made by females on each logs were also counted and were marked with flags. The infested logs were dissected every week till the entire development of the invader species was completed. The population density of the developmental stages was also determined. The number of emerged adults of different species was determined from the emergence-hole counts.

Insectary studies were conducted at Port Blair using portions of the infested logs collected from both the extensive and intensive study areas. They were kept in spacious galvanized iron cages (1 m × 50 cm × 50 cm) and were examined each day between 1000 and 1100 hours IST, prior to which the newly emerged adults were collected. Insectary studies permitted observation of the characteristic features of larval galleries, pupal chambers and exit-holes, duration of development and periods of adult emergence. These were finally correlated with those collected from the field.

The immature stages of different species were identified following Khan and Maiti (1983).

3. Results

3.1 *Categories of the round-head borers and their succession*

The round-head borers assembled in standing trees and felled logs of *C. euphyllum* are listed in table 1. It is worthy of mention that this tree is the most preferred host of round-head borers and harbours nearly 10% of the total cerambycid-fauna of these islands. About 36% of these borers attack unhealthy or dying trees in the forest stands. These species are *Plocaederus obesus* Gahan, *Pharsalia* (*Cycos*) *subgemmata* (Thomson), *Acalolepta rusticator* (Fabricius) and *Olenecamptus bilobus* (Fabricius).

Table 1. Grouping of round-head borers on the basis of their infestation to standing trees and logs of different period lapse after felling.

Group-I	Group-II
Infesting living trees and freshly felled logs of 15 to 40 days after felling	Infesting recently dead trees and logs after 40 to 80 days of felling
Plocaederus obesus Gahan, *Epepeotes* sp., *Pharsalia* (*Cycos*) *subgemmata* (Thomson), *Acalolepta andamanica* (Breuning), *Acalolepta rusticator* (Fabricius), *Batocera rufomaculata* var. *andamana* Thomson, *Olenecamptus bilobus* (Fabricius)	*Clyzomedus annularis* Pascoe, *Coptops rufa* Thomson, *Macrochenus atkinsoni* Gahan and *Marmaroglypha nicobarica* Redtenbacher

On the basis of the community composition on the living trees and logs of different period lapse after felling, Khan (1984) categorized the round-head borers of these islands into four major groups. In the present study, two of these groups have been recognized to infest the living trees and felled logs of *C. euphyllum* (table 1).

Figure 1 (a,b) presents the succession and assemblage of the round-head borers belonging to each of these two groups. It clearly shows that most of the borers belonging to group-I infest the logs within the period from about two weeks to two months of felling and their populations in the host attain a maximum density within this period. After that, the population declines gradually as a result of the completion of development and mortality due to parasites, predators, competitors, diseases and other environmental factors. The representatives of group-II, on the other hand, attack the logs after about five weeks of felling. Their infestation continues upto about $3\frac{1}{2}$ months of felling (figure 1a).

3.2 *Succession and assemblage of species*

Further observations suggest that even among the borers belonging to each of the two groups, there is a clear sequence of succession of species infesting the logs depending

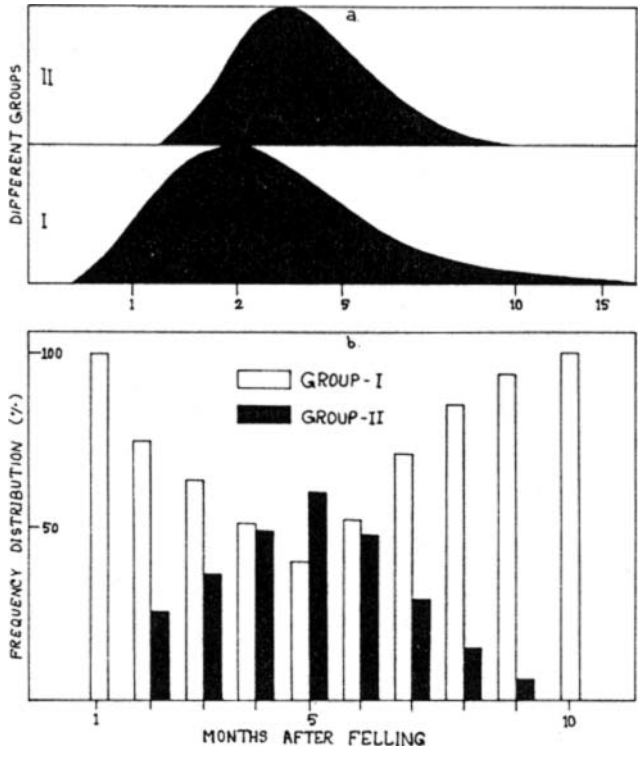

Figure 1. Succession and assemblage of round-head borers belonging to different groups in the logs after different period lapse of felling; (**a**) infestation and continuation of existence; (**b**) frequency distribution.

upon the period lapse after felling and subsequent conditions. A brief account of this phenomenon is furnished below.

3.2a *Group-I:* The data on succession and assemblage of the species constituting this group are presented in figure 2 (a,b). Figure 2a presents the cumulative number of eggs and early instar larvae harboured per unit-area of the bark and wood-surface of the logs. *Acalolepta rusticator* has been recognized as the first cerambycid to infest the logs within 15 to 30 days of felling, while *Plocaederus obesus* is the last one invading after 30 to 45 days. Other species, *viz Olenecamptus bilobus, Acalolepta andamanica, Epepeotes* sp., *Pharsalia* (*Cycos*) *subgemmata* and *Batocera rufomaculata* var *andamana* infest the logs in succession between the two extremities (figure 2a).

Almost all the species in general exhibit a definite period of infestation. Amongst them *Plocaederus obesus* has the longest period of existence inside the wood, while *Acalolepta rusticator* and *Epepeotes* sp. have the shortest life cycle. Other species continue their destructive activities inside the wood for a varying period from 5 to 8 months (figure 2b).

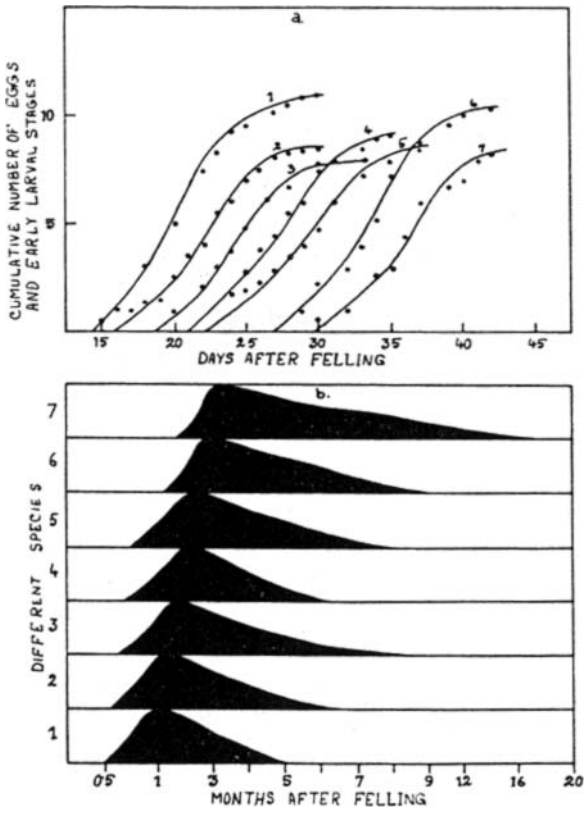

Figure 2. Successive infestation (**a**) and distribution and existence (**b**) of round-head borers belonging to group-I; 1. *Acalolepta rusticator*, 2. *Olenecamptus bilobus*, 3. *Acalolepta andamanica*, 4. *Epepeotes* sp, 5. *Pharsalia* (*Cycos*) *subgemmata*, 6. *Batocera rufomaculata* var *andamana* and 7. *Plocaederus obesus*.

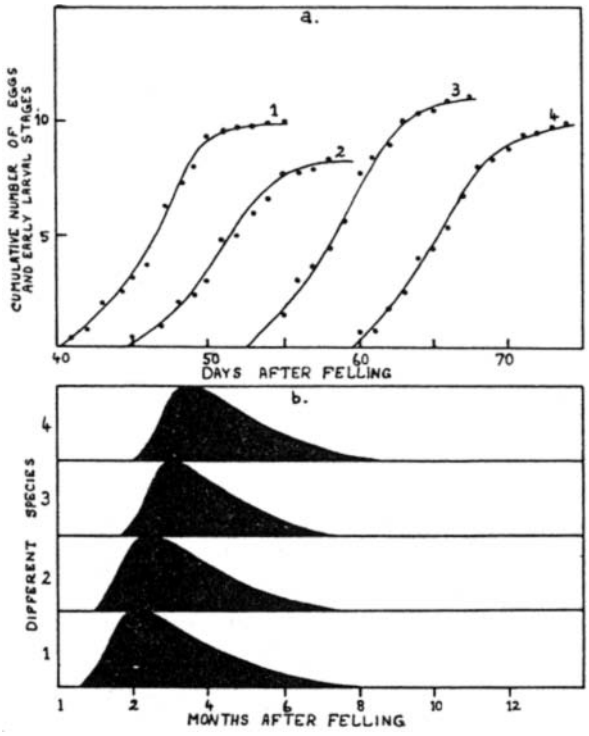

Figure 3. Successive infestation (**a**) and distribution and existence (**b**) of round-head borers belonging to group-II; 1. *Macrochenus atkinsoni* 2. *Marmaroglypha nicobarica* 3. *Clyzomedus annularis* and 4. *Coptops rufa*.

3.2b *Group-II:* Figure 3 (a,b) shows the succession and assemblage of the borers constituting Group-II. All these species exhibit a similar pattern of succession as shown by those of the group-I. However, in this group the sequence of succession of species is more pronounced. *Macrochenus atkinsoni* is the first invader of the group (infesting after 40 to 55 days of felling), followed by *Marmaroglypha nicobarica* (stepping in after 45 to 60 days). *Coptops rufa*, on the other hand, is the last invading the logs of more than two months old, being preceeded by *Clyzomedus annularis* (figure 3a).

Amongst these borers, *Macrochenus atkinsoni* and *Coptops rufa* exist inside the wood for a longer period of more than 9 months (figure 3b). *Clyzomedus annularis* is the least survivor (survival period 6 months).

4. Discussion

The results clearly reveal that the cerambycid-community colonizing in the felled logs of *C. euphyllum* is rather poor, and this is expected in islands which support depauperate faunal elements. Moreover, the period between felling, extraction and storage is too short to permit development of climax community. The logs situated inside forests, normally harbour a higher number of species with higher population densities than in those located in non-forested areas for the same duration.

On the other hand, the existence of different round-head borers almost simultaneously appears to be influenced by the microhabitat differences among themselves. Thus, *Rhaphipodus* (*s. str.*) *andamanicus* is dominant in and around the pith, *Batocera rufomaculata* var *andamana* inside comparatively upper layers of the heartwood, *Pharsalia* (*Cycos*) *subgemmata* inside deeper layers of the sapwood and outer heartwood, *Acalolepta andamanica* inside the sapwood, while *Coptops rufa* is restricted to inside the bark. Such co-existence is obviously due to availability of different food-material in different zones of the wood. Thus, a bark or superficial wood borer feeds mostly on the soluble sugars and simple carbohydrates, while a deep heartwood borer feeds on the cellulose, as pointed out by Beeson and Bhatia (1939).

With regard to the succession, *Acalolepta rusticator* is the first to invade, while *Coptops rufa* is the terminal one. The invasion of these two species is bridged up by succession of other invaders. However, an overlapping of their infestations is not very uncommon. Such overlapping is more pronounced among the species constituting the group-I than in those belonging to the group-II. The higher frequency of overlapping among the members of the group-I may, at least in part, be attributed to the higher degree of competition for suitable oviposition-sites as should normally be expected from a higher number of species.

Lastly, it is clear that round-head borers colonizing in the felled logs of *Canarium euphyllum* utilize dying or recently dead green host for oviposition, but complete their development at a period when the wood becomes comparatively drier. The advanced developmental stages are, thus, associated with the exploiting efficiencies of drier wood for their nourishment. It, therefore, appears that these borers requiring fresh tissues for their early immature stages, can continue their growth and development in the drier wood in the later phases of their life indicating an increase in their digestive power with the progressive age (Graham 1925).

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