effects of intraspecific competition on the location of pits. Further study with just one ant lion per replicate may show even stronger patterns in ant-lion substrate choice.

Contrary to our predictions, soil preference did not correlate with capture efficiency. This result may be due to low sample size for pits in coarse soil (n = 3). However, Perlroth et al. (1995) also found no significant difference in ant capture time for ant lion pits built in either fine or coarse soil. Despite these findings that capture efficiency was not different, greater diameter increases the probability that an ant will encounter a pit, which should influence overall predation success.

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Resource availability in *Nasutitermes* nest sites

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Abstract: Nasutitermes species consume leaf and wood litter, building large nests from digested wood. Termites may select nesting sites based on immediate resource availability, or colonies may survive better in high resource areas. In either case, plots containing *Nasutitermes* nests would have a greater volume of coarse woody debris (CWD) than plots with no *Nasutitermes* nests. We measured the volume of coarse woody debris within a 10m radius of 10 viable termite nests, and in 10 equal sized control plots without nests. Plots with nests had a significantly higher volume of CWD than controls. The spatial distribution of termite colonies may be predictable based on local dead wood abundance.

Key Words: carton, coarse woody debris, dry forest, Isoptera, Palo Verde, termitaria, termites

Introduction

Nasutitermes are common in habitats throughout the Neotropics. Termites build dark brown nests (termitaria) from digested wood ("carton") on trees, rocks, and lianas, as well as on the ground (Lubin 1983). Bansak et al. (1993) examined 55 *Nasutitermes* nests at the Palo Verde National Park and found more uninhabited, damaged nests closer to the ground, concluding that higher nests are less subject to predation. However, distribution relative to resource availability has not been documented. We expected that food resources will influence the location of termite colonies. Thus, plots containing *Nasutitermes* nests should have a greater volume of coarse woody debris than plots of equal size with no *Nasutitermes* nests.

Methods

We selected 10 *Nasutitermes* nest sites and 10 control plots along Sendero Venada at Palo Verde National Park, using the absence of other nests within a 10m radius and current residency by a *Nasutitermes* colony as criteria for experimental plots. Control plots without nests were chosen at random along the trail. Residency was established by the condition of the nest (no holes, cracks, or broken fragments) as well as visual inspection of *Nasutitermes* tunnels. We measured the height of the nest from the ground and nest diameter.

Coarse woody debris (CWD), which we defined as fallen or standing dead wood with a diameter ≥ 5 cm, was measured in each plot. The length of each piece of CWD and the diameter at each end were recorded. The height of standing CWD was determining using a clinometer and triangulation. The total volume of CWD per plot was calculated, as well as the average size of unit CWD. Total CWD volume and nest height were log transformed for analysis.

Results

Termite plots did not differ significantly from controls in the number of CWD units ($t = 0.71$, $df = 18$, $P = 0.48$), but plots with termite nests did have a significantly higher CWD volume than control plots ($t = 3.47$, $df = 18$, $P = 0.003$, Fig. 1). There was no significant correlation between nest size (vertical diameter) and log CWD volume ($r^2 = 0.03$, $df = 9$, $P = 0.30$). Log nest height was weakly correlated with higher log CWD volume ($r^2 = 0.26$, $df = 9$, $P = 0.07$, Fig. 2).

Discussion

Termite nests are located in areas with a high volume of coarse woody debris. We

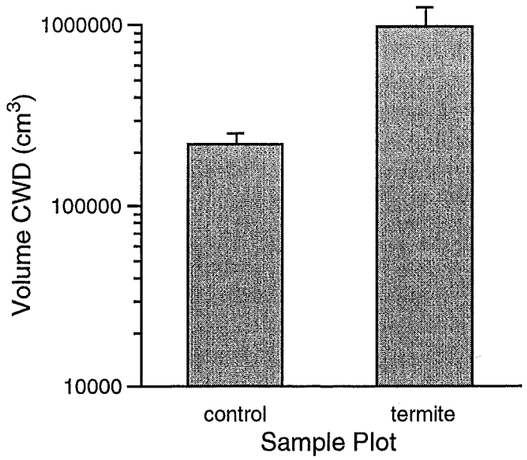

Fig. 1. Volume of coarse woody debris (CWD) within 10m of termite nests and within 10m of randomly chosen control locations at Palo Verde National Park, Costa Rica. (Means ± 1 SE; n = 10).

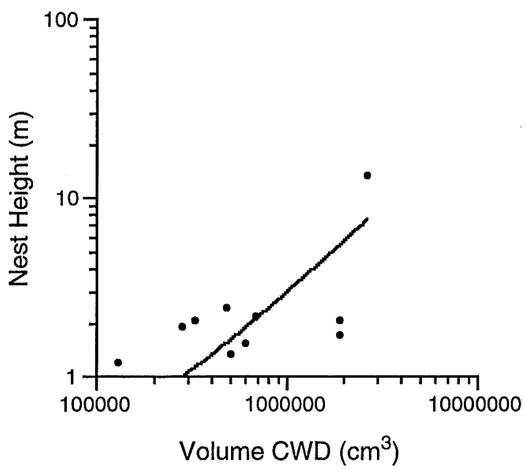

Fig. 2. Relation between height of nests above ground and volume of coarse woody debris within a 10m radius at Palo Verde National Park, Costa Rica. (n = 10).

do not know whether termites colonize areas of existing high resource availability, or if some threshold quantity of CWD must be present to sustain an active colony. We observed *Nasutitermes* trails on live vegetation, and suggest termites may contribute to dead wood by damaging healthy plants. We observed a similar number of pieces of CWD in termite and control plots. Termites may have no net effect on the number of pieces by consuming wood and creating new debris.

Bansak, et al. (1993) showed that the height of the nests farther from the ground had lower incidence of predator damage. Our CWD volume data suggest that height may also be positively related to resource availability. Future research could focus on the relationship between nest height and overall colony condition, and on the contribution of leaf litter to the resource pool (McMahon 1996).

Termites play an important role in wood decomposition, and thus in forest biogeochemistry (Kricher 1989), by enriching soil with recycled nutrients and generating methane and carbon dioxide by digestion of plant matter. An increase in termite abundance as forests are felled for agricultural use further contributes to greenhouse gas production (Zimmerman 1982). The ability to predict termite distribution based on local dead wood abundance contributes to a framework for understanding the effects of converting dry forest to agricultural land, an increasingly prevalent process around Palo Verde National Park.

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