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BAIT STAKE DETECTION OF THE FORMOSAN TERMITE IN SOUTH FLORIDA

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ABSTRACT

The Formosan termite, *Coptotermes formosanus* Shiraki, was detected in Florida in a Hallandale (Broward Co.) condominium in July, 1980. A two year (1981-1983) bait stake survey was undertaken. Of 41 building lots included in the survey, grounds, 14 were infested with Formosan termites, 4 with *Retiticulitermes flavipes* (Kollar), and 2 by both species. A stake location was rarely abandoned once found by termites, and the number of infested stakes increased with successive inspections. A stake occupied by one subterranean species was seldom subsequently occupied by the other.

RESUMEN

El comején de Formosa, *Coptotermes formosanus* Shiraki, fue descubierto por primera vez en la Florida en un condominio de Hallandale (Condado de Broward) en Julio de 1980. Se inició un estudio de dos años (1981-1983) con estacas cebadas colocadas cerca de los cimientos de edificios. De los 41 lotes incluidos en el censo, 14 terrenos estaban infestados con comején de Formosa, 4 con *Reticulitermes flavipes* (Kollar), y 2 por las dos especies. Una vez que la estaca era localizada por el comején, raramente era abandonada, y el número de estacas infestadas aumentaba con inspecciones sucesivas. Una estaca ocupada por una especie subterránea era raro que posteriormente fuera ocupada por la otra especie.

A flight of Formosan termites, *Coptotermes formosanus* Shiraki, was found in the recreation room of a Hallandale condominium in July, 1980. Since that time a gradually escalating number of infestations has been found within 2 km of this building.

Ettershank *et al.* (1980) determined that subterranean termites detect the thermal shadows of potential food sources, and find soil surface food sources more effectively than subsoil food. Studies of the foraging and distribution of subterranean termites most often have involved use of bait stakes, particularly in insecticide and wood preservative studies (Johnston *et al.* 1971; Gjovik and Davidson 1979). In Australia, French and Robinson (1981) concluded that stakes must be used for thorough detection of *Coptotermes* foraging activities.

The Formosan termite can forage ca. 50 m from its nest and is most active from 1-3 a.m. (Lai 1977). Li *et al.* (1976) estimated a foraging radius of 57 m for this termite in China. Su (1982) reported that Formosan termites appear to forage randomly, and show no foraging site preferences. Most information concerning Formosan termite foraging, however, has come from painstaking nest excavation. King and Spink (1975) excavated a Formosan termite nest in Louisiana and found galleries up to 61 m long. There were 580 m of galleries occupying 0.6 ha. Excavations of the nests of two Australian *Coptotermes* species (Greaves 1962) revealed maximum gallery lengths of 46 and 48 m within an occupied area of 0.16 ha. The spatial distibution of the colonies, 91 m between nests, appeared to reflect the maximum 46 m radius of the foraging galleries.

In 1981, a survey was initiated using bait stakes to determine the distribution and foraging patterns of Formosan termites in Hallandale, Florida. The problem of detection was exacerbated by the infested area itself, which consisted of high rise condominiums, parking lots, swimming pools and tennis courts.

Methods and Materials

Southern yellow pine stakes, 4.0 by 2.0 by 60 cm long, were driven 30 cm into the soil, at approximately 30 m intervals, near the foundations of buildings on 43 condominium and home lots in Hallandale, FL (Fig. 1). Other than the soil near foundations,

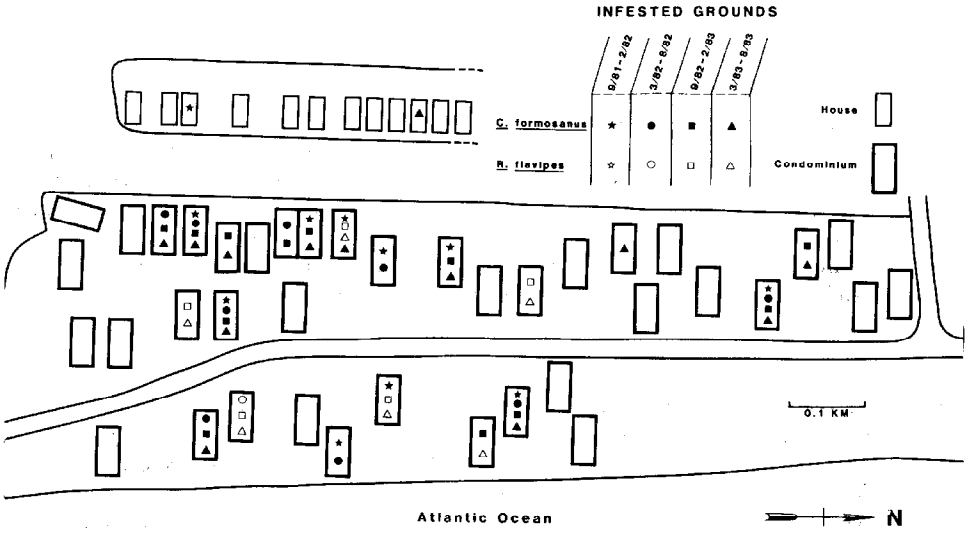

Fig. 1. Building lots surveyed for subterranean termites (Sept. 1982-Aug. 1983) with bait stakes located around outside of buildings in Hallandale, FL.

the only available soil areas that could be staked were hedge rows and ornamental plantings. The number of stakes on a building lot varied from 5 to 54 primarily as a function of building size and available open-soil, ornamental plantings. All of the buildings were within 1.0 km of the first reported Hallandale infestation. A total of 790 stakes was installed. Stakes were mapped, and marked with building and individual numbers.

At 2 month intervals stakes were pulled and checked, at which time infested stakes were replaced with fresh ones. Infested stakes were returned to the laboratory, the termites identified and a voucher series retained. Each survey site was staked for 2 years. Since 5 months were needed initally to place the 790 stakes, the complete survey required 29 months.

Results and Discussion

After one month, a condominium manager informed me that someone had pulled up a termite-infested stake. Those termites were the first collection (Nov. 17, 1981) of Formosan termites in the survey, which finally included 157 infested stakes. Of those, 110 had Formosan termites, 47 had eastern subterranean termites, *Reticulitermes flavipes*, and 4 contained drywood termites, *Incisitermes* sp. An infested stake contained only one species at a time. It was not possible to determine termite species by their damage. Although Formosan damage was often rapid, it was necessary to identify species by examining soldiers.

The survey revealed definite patterns of distribution (Fig. 1). Of the 29 condominium lots in the study, 12 had only Formosan termite-infested stakes, 4 contained only eastern subterranean termites and 2 lots contained both termite species. Of the 12 home lots surveyed, 2 had Formosan termite-infested stakes, but none had eastern subterranean termites. Only one stake site at one condominium underwent a change in species. This stake was originally infested by Formosan termites, then was abandoned for at least 4 months before it was occupied by *R. flavipes*. Stake studies on Formosan termites in Louisiana had to be discontinued when they were overrun by *R. flavipes* (R. H. Beal, 1984, pers. comm.). Native termite competition was predicted by Weldon (1970) based on reports from South Africa where pressure from native termites has helped limit Formosan termite spread.

Of the 14 Formosan termite-infested building lots, stakes on 9 were infested within 2 months. Two additional building lots had infested stakes within 4 months, while infestations at the remaining 3 building lots were found after 6, 10 and 22 months. In one case, a stake contained Formosan termites, while a stake slightly more than a meter away did not. These data suggest that the termites forage randomly in the soil, a conclusion also reached by Su (1982). Most (94%) stake locations never became infested with Formosan termites, even when nearby stakes remained infested for long periods of time. Having found a stake location, however, the termites rarely abandoned the site, even when the stake was replaced. The 157 infested stakes were from only 51 stake locations. Infested stake locations had a 60% probability of remaining infested. It was not unusual for a single stake location to contain Formosan termites for up to 10 consecutive months, yet to be one of only 1-4 infested stakes on a building lot. No condominium lot had more than 4 infested stakes at one time, nor any homesite more than one.

Termite activity during the early months of 1982 was low, compared with 1983, suggesting a seasonal response to the dry, cold, late winter. In Hawaii, Fujii (1975) found no seasonal differences in Formosan termite foraging. In Louisiana, King and Spink (1975) reported a vertical distribution shift: colonies moved downward during the winter. The predominant pattern in my study, however, was a gradual escalation in the numbers of stakes which became and remained infested. Ettershank, *et al.* (1980) also

reported an escalation of infested baits at 150 days over the number found at 100. The indication is that the foraging area increased as the termites located new food sources. An initial lag in discovery time, rather than a seasonal response, would also explain the low activity levels in early 1982.

An indeterminable number of stakes were lost to gardeners, and to other interference, and 2 infested sites were destroyed by chemical treatment. One building lot contained 3 infested stake sites for 8 months but, between mid-June and mid-August, the soil was treated and termites were not found during the remaining 4 months of the study.

A question which arises from study of the data concerns the number of Formosan colonies which might have occupied the study area. An accurate count, if attainable, would require much longer study and probably the use of radioisotope tracers. As a matter of academic curiosity, and using the published foraging radius estimates of 50-57 m, the most conservative estimate that can be made from the data in Fig. 1 is 8 colonies in the condominium area and 2 occupying the home lots area.

Formosan termite nymphs were found in stakes on December 30, 1982, January 17, May 18, and November 21, 1983, and alates on May 18, 1983 from 4 different condominium properties. In addition, one stake (October 5, 1983) contained a Formosan termite male and female, but no brood or workers. Formosan termite alates apparently have a long development period and may fly during much of the year. This is confirmed by Fujii (1975) who reported an alate development time of 60 weeks, while Higa and Tamashiro (1983) determined tht Formosan termite flights occurred every month of the year in Hawaii. Light traps in Hallandale, FL, over the past 2.5 years have trapped formosan termite alates from late March through late August.

The bait stake method is a simple, cost-effective way for building owners, or pest control operators, to detect Formosan termite-infested areas.

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BIOLOGY OF *SIMYRA HENRICI* (LEPIDOPTERA: NOCTUIDAE) IN SOUTHWEST FLORIDA

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ABSTRACT

Field and laboratory studies on the life history of *Simyra henrici* were conducted to determine some aspects of its population dynamics, host specificity and associated parasites in southwest Florida. The seasonal occurrence of immature *S. henrici* feeding on *Typha* at three sites in Lee County Florida was monitored for a two year period. Eight species of parasites representing six families were reared from field collected eggs, larvae and pupae of which four represent new parasite records for *S. henrici*. The seasonal occurrence of the parasites and other behavioral associations with the host *S. henrici* were also determined. Tests with second and fifth instar larvae on five species of plants indicated that *S. henrici* can complete development on *Polygonum hydropiperoides* and *Salix caroliniana* in addition to its more common host plant *Typha* spp. The duration of the immature life stages for *S. henrici* reared on *Typha* was determined in the laboratory and head capsule width and body length measurements were made on larvae. The number of eggs oviposited in the laboratory ranged from 326-1703 per female. The potential for manipulating *Typha* density by a mass release of *S. henrici* is considered minimal.

RESUMEN

Se hicieron estudios de campo y de laboratorio sobre la historia de la vida de *Simyra henrici* para determinar algunos aspectos del dinamismo de su población, especificidad de su hospedero, y sus asociados parásitos en el suroeste de la Florida. La incidencia estacional de inmaduros de *S. henrici* alimentandose de *Typha* en 3 lugares del condado de Lee en la Florida, fue observado por un período de 2 años. Ocho especies de parásitos representando a 6 familias, fueron criadas de huevos, larvas, y pupas colectadas del