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Native Subterranean Termites: *Reticulitermes flavipes* (Kollar), *Reticulitermes virginicus* (Banks), *Reticulitermes hageni* Banks (Insecta: Blattodea: Rhinotermitidae)[1]

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The Featured Creatures collection provides in-depth profiles of insects, nematodes, arachnids and other organisms relevant to Florida. These profiles are intended for the use of interested laypersons with some knowledge of biology as well as academic audiences.

Introduction

Most pest species of subterranean termites in North America belong to the endemic genus *Reticulitermes* which, as a group, are often referred to as "native subterranean termites." All *Reticulitermes* species in the United States can be found associated with dead trees and rotting wood in natural habitats (Figure 1), but also have the ability to feed on structural wood material. *Reticulitermes* species are found in every state in the continental United States except Alaska but are most common in the warm and humid southeastern region. While the invasive Formosan subterranean termite, *Coptotermes formosanus* Shiraki (EENY121), has a distribution primarily restricted to the subtropical climate of the southeastern United States, endemic *Reticulitermes* species are distributed across temperate climates (Janowiecki et al. 2021). *Reticulitermes* species most often associated with structures in the United States are within these five following species.

Figure 1. Individuals from a *Reticulitermes flavipes* colony infesting a rotten log in the forest, with a worker (top) and a soldier (bottom). Credits: Thomas Chouvenc, UF/IFAS

- The eastern subterranean termite, *Reticulitermes flavipes* (Kollar), is the most widely distributed species and is found in the entire eastern region of North America as far north as Ontario, Canada, and south to Key Largo, Florida. It has a pest status across its native range but is also a pest species with an invasive status in France, Chile, and Spain (Eyer et al. 2021). It was also found in two locations in California.

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- The western subterranean termite, *Reticulitermes hesperus* Banks, is found along the entire Pacific Coast ranging from southern California to British Columbia.
- The arid-land subterranean termite, *Reticulitermes tibialis* Banks, occurs in the inter-mountain region of the West.
- The dark southern subterranean termite, *Reticulitermes virginicus* (Banks), is distributed in the southeastern United States.
- The light southern subterranean termite, *Reticulitermes hageni* Banks, is also distributed in the southeastern United States.

In Florida, *Reticulitermes flavipes* and *Reticulitermes virginicus* are both found statewide (Figure 2). In comparison, *Reticulitermes hageni* is not observed as often as the two other *Reticulitermes* species found in Florida (Scheffrahn *et al.* 1988). Of the $20 billion annually spent for termite control and repairs in the United States, subterranean termites account for 80% share, and the majority of this is attributed to *Reticulitermes flavipes*, *Reticulitermes virginicus*, *Reticulitermes hesperus*, and *C. formosanus* (Rust and Su 2012).

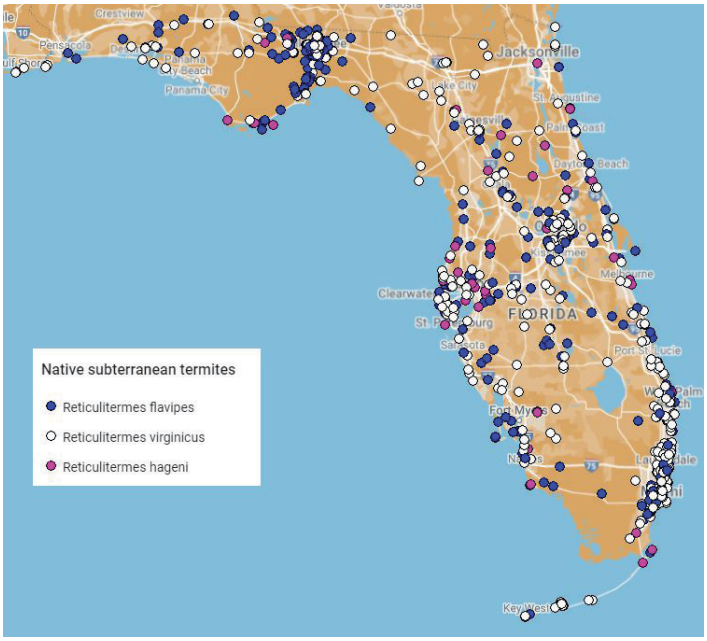

Figure 2. Distribution of *Reticulitermes* sp. in Florida, according to the UF Termite Collection as of Jan 2024. Records indicate locations from where a termite sample was submitted to the UF Termite Collection. Absence of data points on the map does not imply an absence of the species distribution but may reflect the lack of sampling efforts in these areas.
Credits: Thomas Chouvenc, Rudolf Scheffrahn UF/IFAS

Pest Status and Detection in Structures

Because termites consume cellulose (the main structural components of plant cells), any wood material in a house is a potential food source. Termites may also damage non-wood material while foraging for food. However, due to their cryptic nature, structural infestations by a subterranean termite colony are usually not readily visible. Damage to structural wood from *Reticulitermes* sp. may be observed during house remodeling (Figure 3A), or if signs of foraging activity become obvious, such as the construction of shelter tubes (=mud tubes) from the ground up (Figure 3B). Subterranean termite colonies form a network of interconnected feeding sites beneath or above the soil surface. A single colony of subterranean termites, especially those of *Reticulitermes flavipes*, may contain 100,000–1,000,000 termites and forage up to 150ft in search of food (Su *et al.* 1993). When subterranean termites search for food aboveground, they may enter a house through small cracks or joints in the foundation or by building shelter tubes along the foundation wall. These tubes are the equivalent of highways connecting the underground termite population with aboveground food sources.

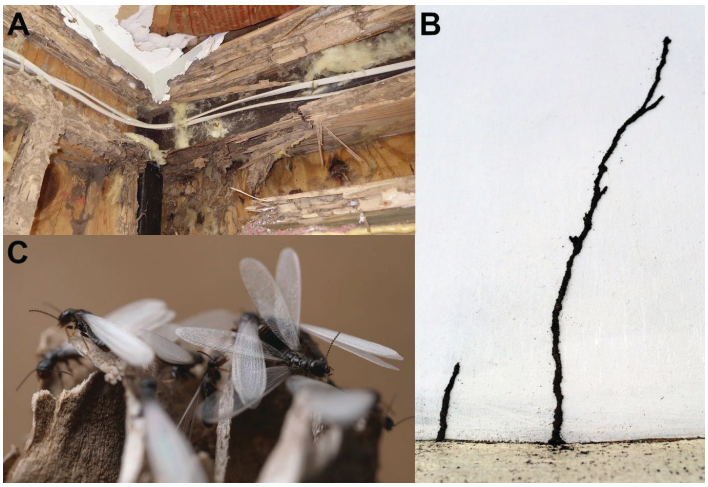

Figure 3. A) Extensive damage from *Reticulitermes flavipes* in a structure, discovered upon removing drywalls during remodeling. B) Mud tubes from *Reticulitermes flavipes*, coming from the ground. C) Dispersal flight event of *Reticulitermes flavipes*, with the emergence of winged individuals (alates).
Credits: A) Rudolf Scheffrahn UF/IFAS; B and C) David Mora del Poso

Most often, residents of an infested structure may become aware of the infestation when annual dispersal flights of winged termites (called alates) occur, as hundreds to thousands of individuals can emerge during these events (Figure 3C). To inspect for active subterranean termite infestation or damage, wood material can be probed with a screwdriver or an equivalent to locate infested wood. The surface of severely damaged wood may appear blistered or peeling, as

termites hollow out the wood leaving a paper-thin surface. If a structural infestation by a subterranean termite colony is suspected, an inspection should be performed by a licensed professional (see ENY2044).

Identification

From a pest management perspective, identifying *Reticulitermes* sp. samples as "native subterranean termites" is often sufficient, as protocols for management are similar for all *Reticulitermes* sp. However, it is necessary to distinguish them from other subterranean termites found in Florida (*Coptotermes*, *Heterotermes*, *Prorhinotermes*, see ENY2079), as detection and management approaches may vary. As with other termite species, *Reticulitermes* colonies contain three primary castes; the reproductives (king, queen, alates, nymphs, and supplementary reproductives), soldiers, and workers (see life colony life cycle below). Alates and soldiers are the two primary castes used for species identification for all termite species in Florida (Scheffrahn and Su 1994).

Alates

Reticulitermes alates can be identified by wing characters which separate them from all other termite genera in Florida. First, like all other subterranean termites (Rhinotermitidae), wings possess two sclerotized veins (costal margin and radial sector) along the entire front end (Figure 4, arrows). Second, wings are not covered with hair and the median and cubitus veins are present within the front-central part of the wing. Finally, the wing displays a nonpigmented "reticulated" texture (Figure 4).

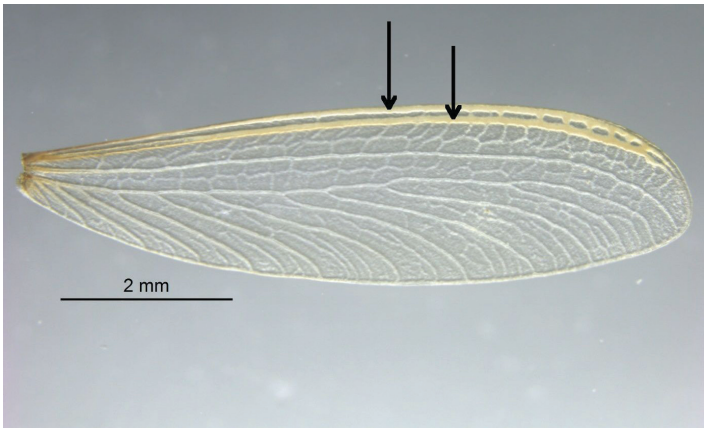

Figure 4. Example of a wing of *Reticulitermes* sp., with two sclerotized veins on the costal edge (arrows), a median and cubitus veins across the middle of the wing, and a reticulated texture.
Credits: Rudolf H. Scheffrahn, UF/IFAS

The alates of *Reticulitermes flavipes* and *Reticulitermes virginicus* are dark brown (almost black to the naked eye), while those of *Reticulitermes hageni* are yellowish brown (Figure 5). Alates of *Reticulitermes flavipes* are generally larger (approximately 0.4" long including wings) than those of *Reticulitermes virginicus* or *Reticulitermes hageni* (approximately 0.3" long) (Figure 5A). However, the anterolateral pronotum edge is rounded in *Reticulitermes virginicus*, while relatively angular in *Reticulitermes flavipes* (Figure 5A). Furthermore, in alates of *Reticulitermes flavipes*, the diameter of the ocellus is smaller than the distance between the ocellus and the compound eye, while in alates of *Reticulitermes virginicus*, the diameter of the ocellus is equal or wider than the distance between the ocellus and the compound eye (Figure 5B). After indoor flights, most *Reticulitermes* sp. alates are found dead (dried up) near windows or in sinks and bathtubs—usually with their wings still attached.

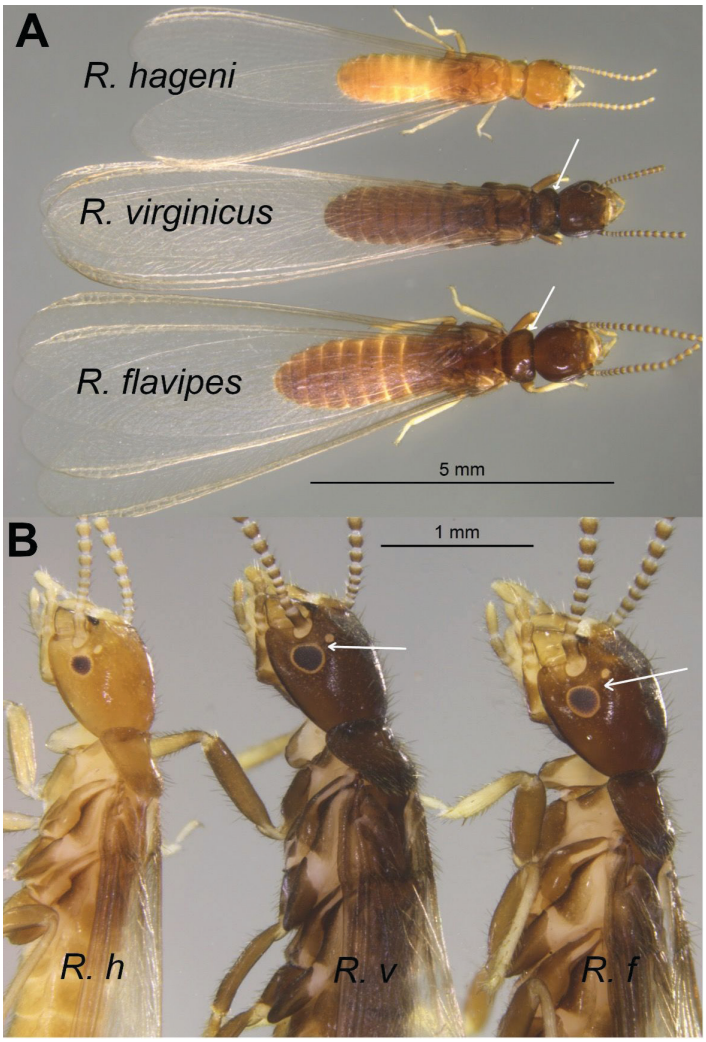

Figure 5. Alates of *Reticulitermes flavipes*, *Reticulitermes virginicus,* and *Reticulitermes hageni*. A) Dorsal view of the three species, with *Reticulitermes hageni* being smaller and lighter in color than the two other species, and a difference in pronotum shape between *Reticulitermes virginicus* and *Reticulitermes flavipes*. B) Lateral view showing *Reticulitermes flavipes* alates with an ocellus width smaller than its distance to the compound eye and Reticulitermes virginicus with an ocellus width equal or wider than its distance to the compound eye.
Credits: Rudolf H. Scheffrahn, UF/IFAS

Soldiers

In Florida, *Reticulitermes* sp. soldiers are recognized by the combination of three primary morphological characters. First, the soldiers of all Florida subterranean termites (Rhinotermitidae) are distinguished from those of drywood or dampwood termites (Kalotermitidae) by their relatively smaller size and the relative width of the pronotum. In subterranean termites, the pronotum (segment immediately behind the head) is narrower than the head width, while in Kalotermitidae, the pronotum is equally or wider than the head. Second, when comparing Florida subterranean termite genera, *Reticulitermes* spp. soldiers display a rectangular-shaped head while *Coptotermes* sp. soldiers (EENY128) and *Prorhinotermes* soldiers (EENY282) display an oval-shaped head (Figure 6). Third, *Heterotermes* sp. soldiers also display a rectangular-shaped head, but the mandibles in *Reticulitermes sp.* soldiers are curved at the tip in an S shape, while mandible curvature in *Heterotermes* sp. is less pronounced (EENY127). In addition to morphological difference, the soldier ratio and soldier behavior differ among subterranean genera. When conducting an inspection for live subterranean termite activity, if many soldiers accumulate at the intrusion point, it most likely is *Coptotermes* sp. (~10% soldiers in the colony), and if little to no soldiers can be found, it most likely is *Reticulitermes* sp. (1% to 2% soldiers in the colony).

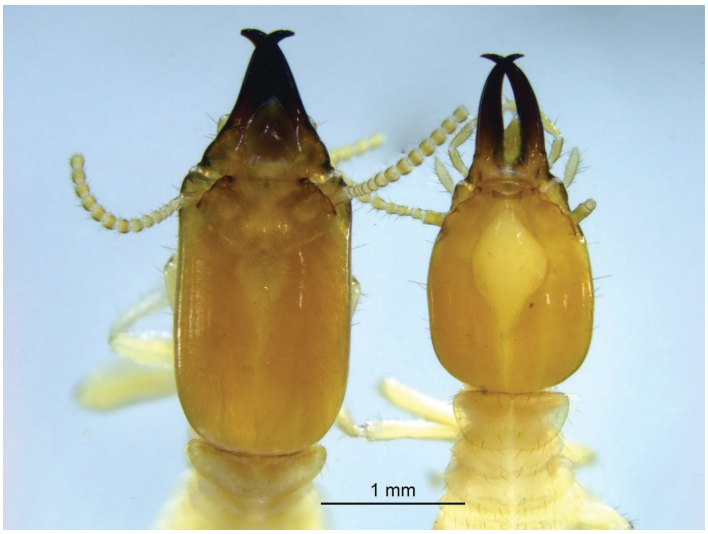

Figure 6. Comparison of soldier head shape. On the left, *Reticulitermes* sp. soldiers have rectangular-shaped head, while on the right, *Coptotermes* sp. soldiers have an oval-shaped head.
Credits: Rudolf H. Scheffrahn, UF/IFAS

Life Cycle

Termites are eusocial insects belonging to the order Blattodea (cockroaches). They form colonies with an established reproductive division of labor (few individuals are in charge of reproduction), overlapping generations of individuals, and cooperative brood care. The queen(s) and king(s) (Figure 7) are in charge of reproduction, and the queen lays eggs that can develop into various castes, depending on the need of the colony. Workers are in charge of finding and digesting food, nest maintenance and brood care, while soldiers are in charge of colony defense. Nymphs are produced seasonally to become alates (winged adults) which fly away from the parental nest to establish new colonies. *Reticulitermes* possess a bifurcated development which implies that adult imagoes (alates) can only be produced through the nymphal pathway (Figure 8). *Reticulitermes* therefore have a "true" worker caste, which is contrary to drywood and dampwood termites, which have a linear development pathway, where pseudergates (false workers) have the potential to become alates. However, *Reticulitermes* can produce secondary reproductives (supplementary queens and kings) as some nymphs become reproductively active without completing their development toward the alate (=nymphoid reproductives). In addition, *Reticulitermes* can also produce a third form of reproductives via the worker development path (=ergatoid reproductives).

Figure 7. Queen and king of *Reticulitermes* sp.
Credits: Lyle Buss, UF/IFAS

Dispersal flight season

In Florida, established *Reticulitermes* sp. colonies feed on wood resources year-long. However, they engage in seasonal dispersal flights, which differ among the three *Reticulitermes* species in Florida (Figure 9). *Reticulitermes hageni* alate flights begin in early December and last until early February, while *Reticulitermes flavipes* flights start in early January and end in April. Dispersal flights of *Reticulitermes virginicus* occur between early February and late May. Dispersal by *Reticulitermes flavipes* and *Reticulitermes virginicus* occurs during warm, sunny, and windless early

afternoons usually after rain, while *Reticulitermes hageni* alates disperse in the evening.

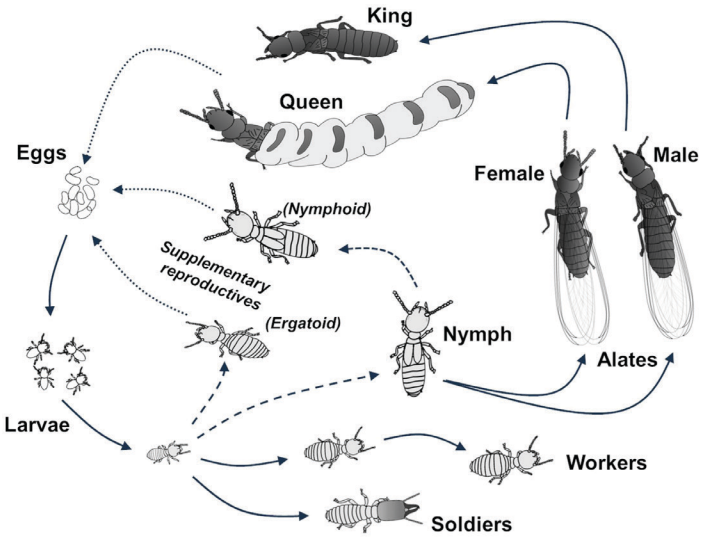

Figure 8. Life cycle (simplified) of *Reticulitermes* sp. Nymphs and Alates are produced seasonally in mature colonies.
Credits: Thomas Chouvenc, UF/IFAS

After a brief flight, alates drop to the ground and shed their wings. Females begin to search for potential nesting sites such as moist crevices with wood, and males follow closely behind in a tandem. The pair forms a royal chamber in a moist site near wood and the queen begins laying eggs, thus starting the life cycle of a subterranean termite colony. It may take five to 10 years for a newly founded colony to form a mature colony that produces alates.

Management

Preventive Practices

Because subterranean termites forage in soil, it is important to keep structural lumber from direct contact with soil. Keeping the lower foundation walls and siding clear of vegetation or mulch makes it easier to inspect for termite shelter tubes. Subterranean termites need moisture for survival. Leaky plumbing, air conditioning condensate, and any portion of a building and its perimeter that collects excessive amounts of moisture should be corrected to maintain an environment that is less favorable for subterranean termite activity.

Termite Management

Currently in the US, there are two primary ways to manage subterranean termite populations: 1) non-repellent liquid termiticides and 2) chitin-synthesis inhibitor (CSI) baits. Both methods are widely used in the US but use different modes of action and different approaches (see ENY2044 for further details). Liquid termiticides treatments prevent the subterranean termite colonies from accessing the protected structure, while CSI baits eliminate a colony that feeds on the bait (Su 2005, Chouvenc 2018, Shults et al. 2021). Subterranean termite treatments must be applied by a licensed pest management provider.

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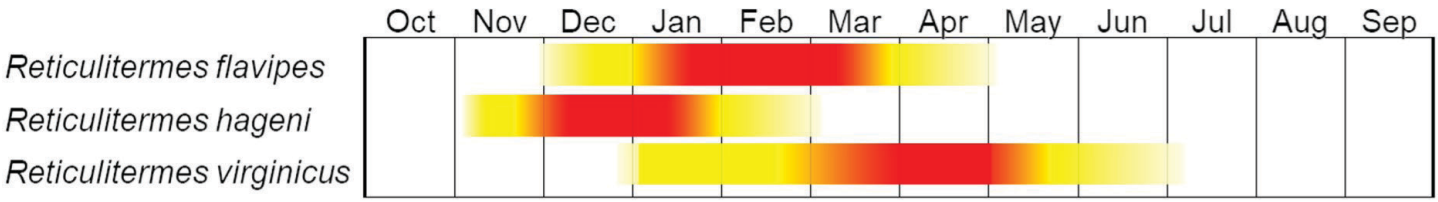

Figure 9. Dispersal flight season of the three *Reticulitermes* spp. in Florida. For a given species, populations located in southern Florida may fly earlier within the season than populations located in Northern Florida.
Credits: Rudolf H. Scheffrahn and Thomas Chouvenc, UF/IFAS

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