

Insec(tc)ure*:

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A UT Urban IPM Lab Newsletter for the Pest Management Industry

The Formosan Subterranean Termite In Tennessee?

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The Formosan subterranean termite (FST), *Coptotermes formosanus* Shiraki, is an exotic species believed to be native to Taiwan and southern China. Ships were suspected of delivering FST to Hawaii in the late 1880s and crated materials post-WWII were possibly responsible for its arrival on the U.S. mainland (Louisiana, South Carolina and Texas) in the 1950s/60s. FST has since spread to much of the U.S.'s southeastern coastal states. Occasional introductions occur elsewhere; this past month, it was reported from California. This article discusses the differences between FSTs and native subterranean termites and the history of Formosan subterranean termites in Tennessee.

Our native subterranean termites and FST are social insects that live in colonies comprised of many members, most of them in the immature stage. Colonies are often located in soil that helps protect them and prevents members from desiccating, or drying out. Workers feed on cellulose which includes anything that is/was a plant and they share these resources with the rest of the colony (larvae, workers, soldiers, nymphs and reproductive) through trophallaxis.

Formosan subterranean termites are very similar to our native subterranean termites, but they differ in several ways. For one thing, mature Formosan subterranean termite colonies are much more numerous. FST colonies may contain millions of members, while our mature native subterranean termite colonies only reach several hundred thousand members. This greater number of workers allows an FST colony to consume wood 4 – 6 times as quickly as native subs. In addition, while native subterranean termite feeding gives lumber a layered appearance as they consume the soft spring wood, FST is less discriminating and may hollow out a section of wood. **We are concerned about these larger and thus faster-eating FST colonies establishing in Tennessee. I don't believe Formosan subterranean termites have ever been eliminated from an area once they are established.**



Figure 1. The yellow-brown *Reticulitermes hageni* alate is 7 - 8 mm long. Credit: K. Vail



Figure 2. The yellow-brown *Coptotermes formosanus* alate is 12 - 15 mm long. Its wings are covered with hairs. Credit: K. Vail

Taxonomically speaking, FST is easily distinguished from our native subterranean termites. The FST alates are much larger than the native subterranean termites and the FST alates are lighter colored than two of the three native species that infest structures. The native subterranean termite, *Reticulitermes hageni*, has similarly colored yellow-brown alates as the FST, but *R. hageni* is much smaller (7 – 8 mm, Figure 1) than FST (12 – 15 mm, Figure 2) when measured from the tip of the head to the tip of the intact wings. In addition, FST wings are covered with many hairs and the native subterranean termites' are nearly bare. Also, FST alates fly at night and are attracted to lights, whereas the native subterranean termites are day fliers. A comparison of FST and native subterranean termites is found in Table 1.

Subterranean termites are easily distinguished from drywood termites by the pronotum being narrower than the head capsule in both the worker and the soldier castes. But that's all the help a worker termite will be to distinguish species unless molecular techniques are used. Soldiers help distinguish FST from native subterranean termites in several ways. The most obvious is the shape of the head capsule. FST has an oval or tear-dropped head capsule, while the native subterranean termites are rectangular. A forward-facing fontanel (opening) on the soldier's head capsule also distinguishes FST from *Reticulitermes*. In addition, another distinguishing feature is the percentage of soldiers in a colony. Soldiers make up 15% of a FST colony and only 1 – 2 % of a *Reticulitermes* colony. Many aggressive soldier termites should catch your attention and cause you to look closer.

Table 1. Comparison of the Formosan subterranean termite with native subterranean termites. Modified from UT Extension PB 1703 Wood-destroying Organism Licensing Manual.

Characteristic	Formosan Subterranean Termite	Native Subterranean Termite
Soldier head shape	Oval	Rectangular
Wings	Hairy	Nearly bare
% soldiers in colony	10 – 15 %	1 – 2 %
Swarm time	Dusk to midnight	Day
Alate color	Yellow-brown	Dark brown (<i>R. flavipes</i> or <i>R. virginicus</i>) or yellow-brown (<i>R. hageni</i>)
Length of alates including wings	12 – 15 mm (1/2 – 5/8 inch)	7 – 10.5 mm (1/4 – 7/16 inch)

Distribution maps appear to include Tennessee in the range of FST (Figure 3). If you viewed the FST map produced by the ARS Formosan Subterranean Research Unit from the early 2000s it would appear that Shelby County was infested with FST. Not long after my arrival in Tennessee, I had asked Steve Powell, the Tennessee Department of Agriculture's entomologist, for the history of FST in our state and if FST was established. FST was detected in the FedEx airport facility on four occasions from 1984 – 2010 (Table 2). In most cases, pallets from FST territory further south were responsible for the introduction, but there was no evidence that FST had established.



Figure 3. Estimated distribution of the Formosan subterranean termite. Credit: Su and Scheffrahn 2020.



Figure 4. Panelling and ceiling removed to reveal Formosan subterranean termite damage in a Henderson County, TN garage. Credit: TDA

Around Mother's Day in 2018, an FST infestation was found in Henderson County. Termites were feeding in a garage and room above. Once the garage panelling was removed (Figure 4), FST feeding evidence was apparent in a garage stud, but no mud tubes extended to the soil (Figure 5). When the ceiling/floor and part of the drywall in the room above were removed, wood damage was apparent (Figure 6A) and a carton nest was found (Figure 6B). A leaking window provided the moisture needed for aboveground survival (Figure 6C). Aboveground nests are a fairly common occurrence for FST. In one Florida study, 25% of the FST infestations had no ground connection and were considered aerial nests (Su and Schreffrahn 2019). Aerial nests present challenges because mud tubes aren't seen between the ground and structure and infestations often go undetected until a swarm occurs. Also,

treating the soil for an aerial nest would be ineffective. Either the infested areas need to be treated directly with a spray, dust or foam or aboveground bait stations can be used (Figure 7). FSTs may also be living in trees near the structure. Trees should be inspected and treated by drilling and injecting termiticide or, more easily, by treating with termite baits.



Figure 5. Damage is evident in the garage stud but no mud tubes or other activity reach the ground. Credit: TDA

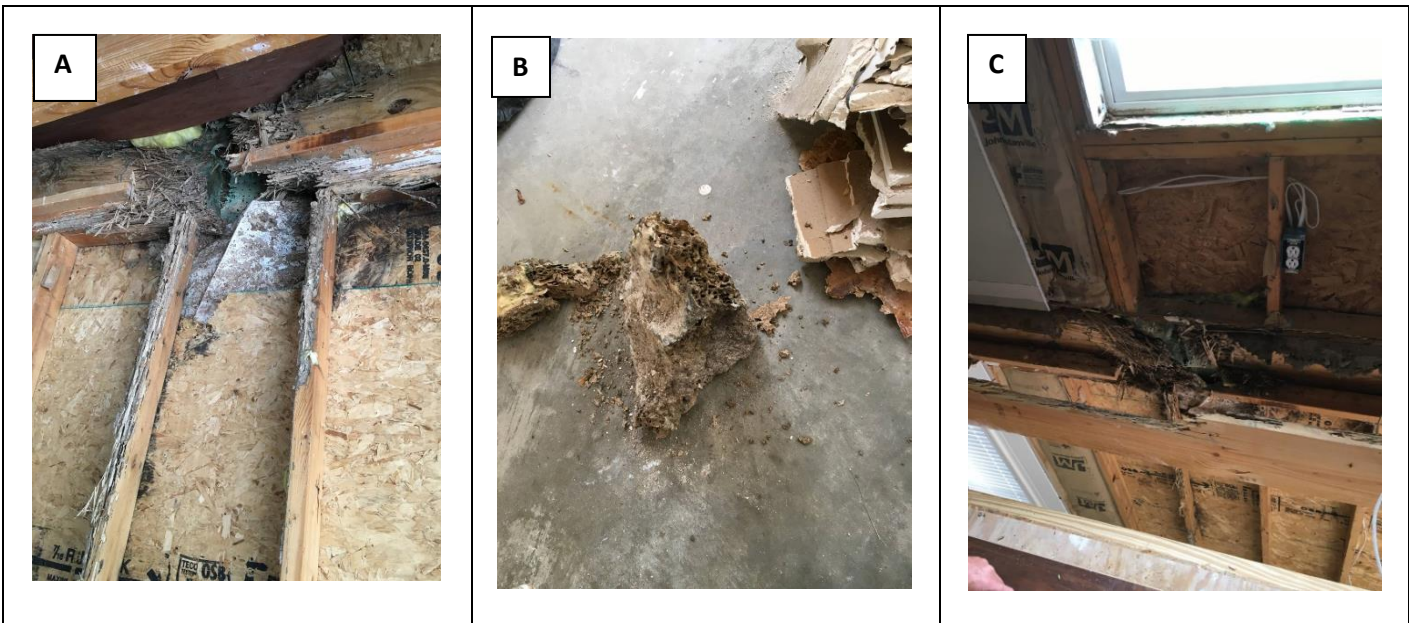


Figure 6. More FST damage to the top of the garage stud (A); carton nest removed from the top of the stud (B); and water damage to paper lining of insulation and to area below the window that allowed the termites to survive without ground contact. Credit: TDA

Table 2. History of Formosan subterranean termite detections in Tennessee. In most cases, alates were found, except for the boat where the soldiers were detected in a screw hole.

Date	Location Type	County
1984	FedEx Facility	Shelby
1984	FedEx Facility	Shelby
1992	FedEx Facility	Shelby
2010	FedEx Facility	Shelby
May 11 -23, 2018	Home	Henderson
June 17, 2019	Home	Shelby
June 18, 2020	Home	Shelby
June 17-20, 2022	Home	Shelby
~July 27, 2022*	Boat	Roane

termites on a boat that had traveled from Pensacola, FL, via waterways in November 2020 to Watts Bar Lake in Roane County. Soldiers were seen popping their heads out of a screw hole. Low-resolution images of the specimens made me suspect FST but I couldn't confirm it. Luckily, two soldiers were sent to me for identification. The oval-shaped head and fontanel were easily seen (Figure 8). It's possible this was another species of *Coptotermes*. The Asian subterranean termite, *Coptotermes gestroi* is also present in Florida, but only in coastal south Florida. *Coptotermes gestroi* can be discerned from FST by the number of hairs around the fontanel. In one soldier, the secretion from the fontanel covered the opening and the surrounding areas, so I could not observe the hairs. In the other specimen, some hairs were present, but I couldn't determine if others were present but broken. Since FST is well established in the Pensacola area, it is the more likely the culprit.

Formosan subterranean termites can also start as an aerial nest on boats which is especially challenging to manage. Fumigating the boat on the water is an option but Tennessee pest management professionals lack experience as this isn't common. If you're interested in boat fumigation, see <https://www.pctonline.com/article/pct0312-performing-termites-treatments/>, check your



Figure 8. *Coptotermes* species removed from a boat stored in Roane County, TN. Credit: K. Vail

Around the same day (June 17/18) in 2019 and 2020, FSTs were found in different homes within a block of a northeast Shelby County neighborhood. We took this as a sign the FSTs were established here, but in 2021 no FSTs were reported. Hoping that the infestation had been eliminated, we were disappointed when FSTs were again found nearby in Shelby County around the same day in 2022. If you're working in the Shelby County area, be watching for FSTs.

Shelby and Henderson counties aren't the only areas where FSTs have been detected in the state. Towards the end of July 2022, I was made aware of



Figure 7. Aboveground termite bait stations can manage aerial nests of Formosan subterranean termites. Credit: TDA

fumigation manual, or speak to your fumigant rep. In the Roane County case, aboveground bait stations were placed on the boat over the FST's areas of activity. It takes about 3 to 5 years to produce alates, so let's hope alates have not been created yet. That said, FST may fly up to 460 meters (Messenger and Mullins 2005) and boats aren't stationary. So, if you service Roane County and other areas adjoining Watts Bar Lake, please be on the lookout for FST that more readily establish aerial nests and damage wood more quickly than our native subterranean termites. By the way, the Tennessee Department of Agriculture requires you to inform them of any Formosan subterranean termites in the state.

Sources

Messenger, M. T and A. J. Mullins. 2005. New flight distance for *Coptotermes formosanus* (Isoptera: Rhinotermitidae). Fla. Entomol. 88: 99 – 100.

Su, N.Y. and R. H. Scheffrahn. 2019. Formosan Subterranean Termite, *Coptotermes formosanus* Shiraki (Insecta: Isoptera: Rhinotermitidae) https://entnemdept.ufl.edu/creatures/urban/termites/formosan_termite.htm

The Invasive Species Story Continues: Reminder to Report the Joro Spider and the Spotted Lanternfly Too!

Many people get excited as football season nears. But, as an entomologist, I'm holding my breath to see what new exotic pests are brought to the region via vehicles. Cars, trucks and boats from the southeast and beyond made their way to Knoxville on Thursday, September 1, for the University of Tennessee's first game of the season. The University of Tennessee monitors exotic agricultural pests through the Cooperative Agricultural Pest Survey (CAPS). Still, the more eyes searching, the more likely we are to find these pests. It often takes a while for pest populations to increase before they are noticed, but if we actively search for them, they may not get a chance to establish. Recently, citizen science has grown in popularity and has been beneficial in delimiting the distribution of many insect species. So, here we call upon you to aid in the discovery of these unwanted arthropods.



Figure 9. A female Joro spider, *Trichonephila clavata* on the hand of a female Georgia Extension Specialist. Note the size of the spider and its golden web. Credit: Carly Mirabile, University of Georgia College of Agricultural and Environmental Sciences

We are watching for many invasive species, including the Joro spider (Figure 9) and the Spotted Lanternfly. You'll recall I wrote about the Joro spider in the 2021 November issue of this newsletter (<https://epp.tennessee.edu/wp-content/uploads/2021/12/2021-11JoroSpider.pdf>). I'm cooperating with researchers in Tennessee, South Carolina and Georgia to delimit the Joro spider's distribution and need your help. If you find a Joro spider, please take an image, and upload it to iNaturalist.org and then send me the photo, along with the GPS coordinates and the date collected.



Figure 10. Adult spotted lanternfly adult on the side of a house. Photo: N. Vail

The spotted lanternfly (SLF) is an exotic planthopper that sucks sap from branches and twigs of many plant species and is especially damaging to grape vines and other crops. The tree of heaven is a preferred host. When SLFs build up in large numbers, their honeydew or sticky excrement allows sooty mold to grow, thus discoloring plants and many other surfaces below the plants and further irritating people. In the U.S., SLF was first discovered in Pennsylvania in 2014 and is now established in Massachusetts, Connecticut, New Jersey, New York, Pennsylvania, Maryland, Delaware, Virginia, North Carolina, West Virginia, Ohio and Indiana. Yes, that's northwest North Carolina and southwest Virginia. It's expected to continue spreading and could make its way into Tennessee at any moment. Right now, the spotted lanternfly is in the adult stage (Figures 10 and 11), and females are depositing egg masses. The spread of SLF is often due to egg masses (Figure 12) which can be laid on many surfaces and easily transported by vehicles. See

<https://nysipm.cornell.edu/sites/nysipm.cornell.edu/files/shared/documents/SLF-checklist.pdf> for a list of locations the egg masses and other SLF stages may be found.

So be on the lookout for this pest too. If you visit any infested states in the next two months, be sure you aren't bringing any SLF egg masses back with you. And inspect any plants purchased. Find an egg mass? Email a photo to your county Extension agent with its location and then crush the eggmass!

More information on SLF can be found at

<https://extension.tennessee.edu/publications/Documents/W1032.pdf>

<https://extension.psu.edu/spotted-lanternfly>

<https://nysipm.cornell.edu/environment/invasive-species-exotic-pests/spotted-lanternfly/>



Figure 11. Crushed adult spotted lanternfly showing the red, black and white hind wing. Credit: N. Vail



Figure 12. Spotted lanternfly eggmass. Credit: Lawrence Barringer, Pennsylvania Department of Agriculture, Bugwood.org

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