

KALOTERMES APPROXIMATUS HABITAT IN SOUTH CAROLINA

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ABSTRACT

Kaloterme s approximat us (Snyder) habitat was studied in South Carolina. This species was found in live and dead, standing, hardwood trees. Height and girth of infested trees were variable with a mean (\pm SD) of 11.51 ± 7.41 m and 72.60 ± 41.41 cm, respectively. Moisture content was the only measured parameter that was predictable at $23.74 \pm 5.05\%$. Ten of the 19 (52.6%) trees infested with *K. approximat us* had tree holes. Tree holes were on the southwest, south, southeast, or east side of the tree. *Kaloterme s approximat us* is not a common species in South Carolina. Approximately 1200 trees having characteristics similar to the 19 infested trees were inspected without positive results.

Key Words: Drywood termites, Kalotermitidae, Isoptera

RESUMEN

El hábitat de *Kaloterme s approximat us* (Snyder) fue estudiado en Carolina del Sur. Esta especie fue encontrada en árboles verticales, de madera dura, vivos y muertos. La altura y circunferencia de árboles infestados fueron variables con un promedio \pm DS de 11.51 ± 7.41 m y 72.60 ± 41.41 cm, respectivamente. El contenido de humedad fue el único parámetro medido que fue consistente a $23.74 \pm 5.05\%$. Diez de los 19 árboles infestados con *K. approximat us* tenían huecos de árbol. Huecos de árbol estaban al suroeste, sur, sureste, o lado este del árbol. *Kaloterme s approximat us* no es una especie común en Carolina del Sur. Aproximadamente 1200 árboles con características similares a los árboles infestados fueron inspeccionados sin obtener resultados positivos.

Little is known about the ecology and behavior of the drywood termite, *Kaloterme s approximat us* (Snyder). This species was first described from a soldier found in northern Florida (Banks and Snyder 1920). A dealated adult found in a dead bald cypress tree from Cape Henry, Virginia was described in 1924 (Snyder). Snyder (1925) later provided a complete description of a winged *K. approximat us* adult, also collected in Virginia. This species is now recorded in coastal areas of the southeastern United States from Virginia to Florida, and along the Gulf Coast to New Orleans, Louisiana (Potter 1997).

Ecological studies on *K. approximat us* are limited to reports of types of trees in which they are found (Table 1). Nalepa (1998) reported the distribution of *K. approximat us* in North Carolina based on extension records. From these extension records, this species is known to infest dead or damaged trees, primarily hardwood. It is unknown if termites caused the initial damage or if damage was pre-existing. A record as far inland as Charlotte, NC is also reported. This is significant because all previous records in the U.S. were from coastal areas. This species is not considered a major pest, however it does occasionally infest structures (Potter 1997).

This research was conducted as part of a larger study to catalog the termite fauna and their dis-

tribution in South Carolina (Hathorne et al. 2000). Only three *K. approximat us* records for the state were held in the Clemson University Arthropod Collection (CUAC) when this project began. None of the records had accompanying habitat data. The purpose of this research was to describe the habitats in which *K. approximat us* was found. Emphasis was placed on infested tree species, size and condition, and moisture content.

MATERIALS AND METHODS

Kaloterme s approximat us was collected from various wooded areas in South Carolina. A systematic grid sampling scheme was originally attempted but proved to be ineffective. Many of the randomly selected grids were located on properties that were inaccessible or impractical to survey. Sites were selected by driving on major highways and stopping periodically to search in accessible wooded areas. These included state parks, frontage roads, campgrounds, and private properties located, in most cases, within five miles of a major highway. Approximately 40 sites were sampled in 27 counties.

Termite presence was indicated by large galleries packed with frass (Snyder 1924) and large worker castes. The workers were similar in size and appearance to pre-alates of *Reticuliterme s fla-*

TABLE 1. PUBLISHED RECORDS OF TREE SPECIES INFESTED BY *KALOTERMES APPROXIMATUS* (SNYDER).

Tree species	Location	Reference
Walnut— <i>Juglans nigra</i> L.	North Carolina	Nalepa 1998
Red Cedar— <i>Juniperus virginia</i> L.	North Carolina	Nalepa 1998
Sweet Gum— <i>Liquidambar stryaciflua</i> L.	Florida	Banks and Snyder 1920
	Florida	Miller 1949
Magnolia— <i>Magnolia spp.</i>	Florida	Miller 1949
Cherry— <i>Prunus serotina</i> Ehrh	Florida	Hetrick 1961
Pear— <i>Pyrus communis</i> L.	Florida	Hetrick 1961
White Oak— <i>Quercus alba</i> L.	North Carolina	Nalepa 1998
Oak— <i>Quercus spp.</i>	Florida	Miller 1949
Bald Cypress— <i>Taxodium distichum</i> L.	Virginia	Snyder 1925
Elm— <i>Ulmus spp.</i>	North Carolina	Nalepa 1998

vipes (Kollar), the Eastern subterranean termite, but did not have wing pads. Once an infested tree was found, soldiers or alates were collected, and placed in a plastic, 2-dram vial containing 95% ethanol. Date, location, and sample number were recorded and also placed into each vial. Leaves, if available, were collected to determine tree species. Samples were returned to Clemson University for identification. Global Positioning System (GPS) coordinates (longitude/latitude) were recorded using a Garmin® GPS 12 Personal Navigator™ (Garmin International, Inc., Olathe, KS 66062) which has an accuracy of 1-5 M.

Measurements of infested trees included location, tree species, height, girth, and position of damaged area, if applicable. Tree height was estimated with a tangent height gauge (Kager Inc. Lunenburg, MA). Tree girth and damaged area were measured. A compass was used to determine the ordinal position of the tree hole. A single reading of moisture content of the damaged area was taken using a Protimeter® Minor IV (Marlow, Bucks. SL7 1LX, England). The variability of moisture meter readings is unknown, but may be influenced by wood type, ambient temperature and other unidentified factors. Vegetation surrounding infested trees was evaluated on a scale of 1-3; 1 = little to no surrounding vegetation, sporadic spacing of trees, 2 = some surrounding trees and little underbrush, and 3 = heavy underbrush. Voucher specimens were deposited in the CUAC. GPS data labels were included.

RESULTS AND DISCUSSION

A total of 19 infested trees were found after searching in 27 counties (Hathorne et al. 2000). *Kaloterme s approximatus* was found in 16 of those counties (Fig. 1). Counties in which sampling occurred, but *K. approximatus* was not found include Anderson, Beaufort, Cherokee, Greenville, Hampton, Kershaw, Laurens, Oconee, Pickens, Richland, and Spartanburg Counties in South Carolina. We are not implying that *K. ap-*

proximatus does not occur in counties in which we did not find it, nor that it does not occur outside the area sampled. Table 2 gives tree species from which *K. approximatus* were collected. Of the trees infested, 13 (68%) were alive and 6 (32%) were dead snags. Snags are defined as standing dead trees with few to no limbs, leaves, or top. Tree height ranged from 1.36 to 22.86 m. Average tree height (\pm SD) was 11.51 ± 7.41 m. Tree girth ranged from 2.82 to 157.48 cm. Average tree girth (\pm SD) was 72.60 ± 41.41 cm. Moisture content ranged from 13 to 29%. Average moisture content (\pm SD) was $23.74 \pm 5.06\%$ at damaged area.

Tree holes were present in ten (52.6%) of the infested trees that were still alive. Tree hole height ranged from 6.40 to 39.37 cm. Tree hole width ranged from 15.00 to 188.00 cm. Average tree hole height (\pm SD) was 17.28 ± 11.50 cm. Average tree hole width (\pm SD) was 56.60 ± 52.26 cm. The positions of the tree holes were southwest (1), south (2), southeast (4), and east (2). Eleven (58%), six (32%), and two (10%) samples had surrounding vegetation levels of 3, 2, and 1, respectively.

A description of *K. approximatus* habitat becomes more clear when observations from sampled areas that did not produce *K. approximatus* are included. This termite species was not common in the areas sampled. Approximately 330 person-h were spent searching areas in 27 counties in South Carolina. Many potential habitats were explored. Approximately 1200 trees were sampled. Data on location, tree species, height, girth, and position of damaged area were not taken on trees not infested. All samples collected were from hardwood trees, although other tree species (about 30%) such as Pine (*Pinus spp.*), Palm (*Sabal palmetto* (Walt.)), Conifers (*Juniperus spp.*), and Rhododendrons (*Rhododendron spp.*) were sampled. The exact number of each sampled tree species is unknown. Other sampled habitats include large vines and galls. Felled trees also were examined, but all specimens found were from standing, live or dead trees.

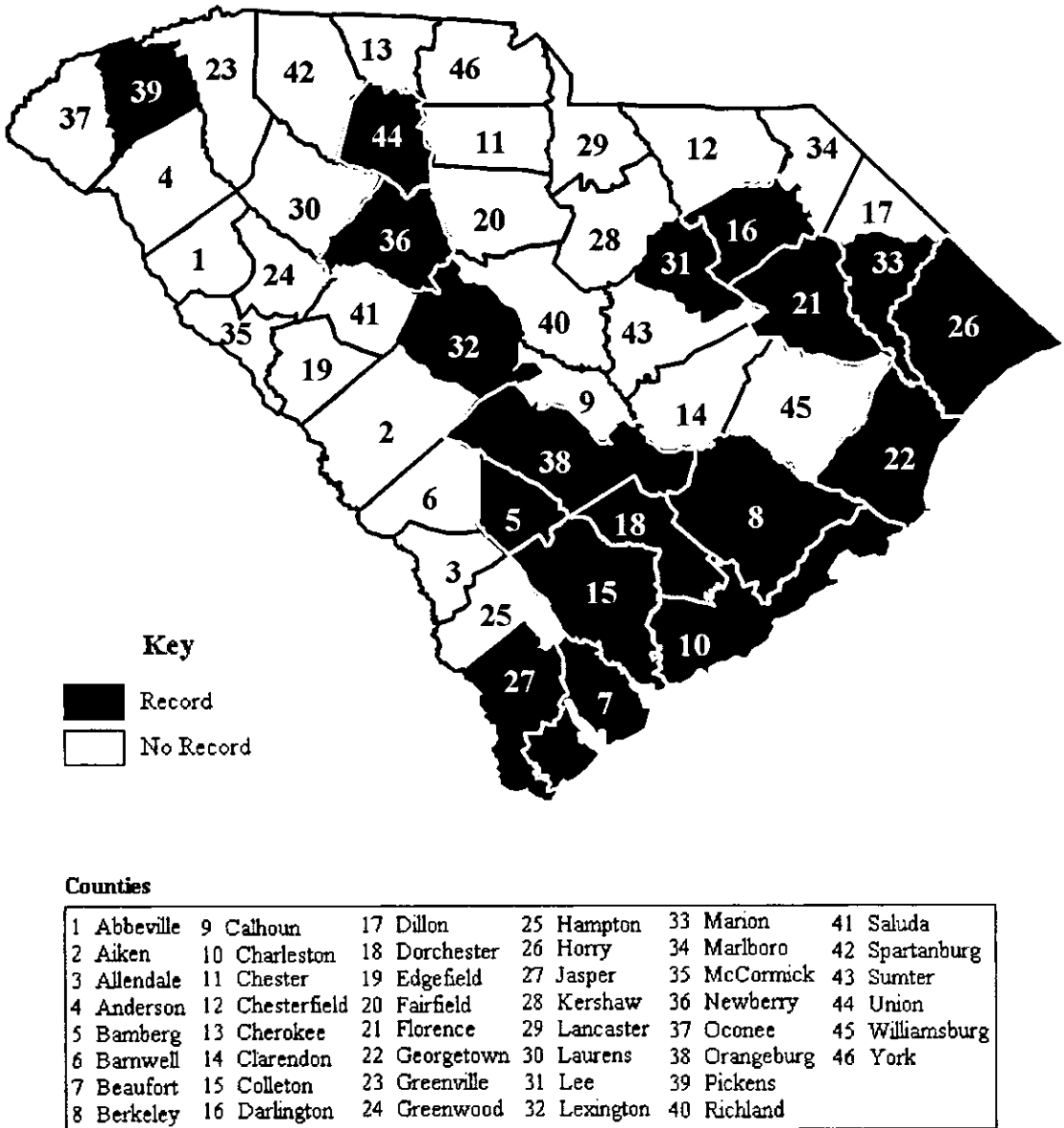


Fig. 1. Known distribution of *Kalotermes approximatus* (Snyder) in South Carolina by county.

Tree holes of many different sizes were examined; those that contained termites had a height ≥ 6.0 cm and a width ≥ 15.0 cm. The range of these measurements was due to the varied habitats from which they were taken. All tree holes were facing southern positions between east and southwest. Perhaps position of the tree hole with regard to amount of sunlight or rainfall from the prevailing southwestern direction affects termite presence, but the true significance is unknown. Some *K. approximatus* specimens were found living in close proximity to subterranean termites

(*Reticulitermes* spp.) (2), black carpenter ants (*Camponotus pennsylvanicus* (De Geer)) (2), and an undetermined ant species (1).

SUMMARY

Kalotermes approximatus collected from standing, live or dead hardwood trees occurred most frequently (63%) in Oak (*Quercus* spp.). If tree holes were present, they measured larger than 6.0 cm \times 15.0 cm and were facing east, southeast, south, or southwest. Average tree height and

TABLE 2. SPECIES OF TREES INFESTED WITH *K. APPROXIMATUS* IN SOUTH CAROLINA IN 1999.

Tree species	Condition	Number of samples
Dogwood (<i>Cornus</i> spp.)	alive	2
Maple (<i>Acer</i> spp.)	alive	1
Water Tupelo (<i>Nyssa aquatica</i> L.)	alive	1
Sweet Gum (<i>Liquidamber styraciflua</i> L.)	alive	1
Water Oak (<i>Quercus nigra</i> L.)	alive	1
Laurel Oak (<i>Quercus laurifolia</i> Michx.)	alive	1
Virginia Live Oak (<i>Quercus virginiana</i> Mill.)	alive	1
Post Oak (<i>Quercus stellata</i> Wangenh.)	alive	1
undet. Oak (<i>Quercus</i> spp.)	alive	4
undet. Oak (<i>Quercus</i> spp.)	dead	4
undetermined	dead	2

girth, and tree hole width and height, were not dependable indicators of *K. approximat us* habitat because of their large standard deviations. The average moisture content was relatively stable and may be an important characteristic in providing *K. approximat us* suitable habitat.

None of the characteristics measured guaranteed termite presence. Many trees were sampled that had these characteristics (approximately 1200), or similar ones, and yet termites were found in only 1.6% of those sampled. Some sampled trees appeared to have damage made by *K. approximat us*, but no termites were found. Also, termites may have been present, but deep in the wood and inaccessible.

A more in-depth study should be conducted to include comparisons of trees having *K. approximat us* and trees that do not. Research into cohabitation with other insect species, flight and dispersal patterns, and substrate preference are all possible areas for investigation.

ENDNOTE

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