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Abstracts

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Advances in forest entomology. Evan Nebeker. Professor Emeritus, Forest Entomology, Dept. of Entomology and Plant Pathology, Mississippi State University.

[Abstract not on file]

Advances in medical entomology. Jerome Goddard. Associate Professor of Entomology, Mississippi State University.

[Abstract not on file]

Advances in row crop entomology. Scott Stewart, University of Tennessee.

[Abstract not on file]

An introduction to the design and analysis of site-specific experiments with a research farm environment. J. L. Willers and G. A. Milliken. USDA-ARS, Mississippi State University; Milliken and Associates, Manhattan, KS.

[Abstract not on file]

Bean leaf beetle resistance to pyrethroids. F. Musser and A. Catchot. Dept. of Entomology and Plant Pathology, Mississippi State University.

[Abstract not on file]

Regulatory radar for 2008/2009. Harry Fulton. MDAC Bureau of Plant Industry, Starkville, MS.

[Abstract not on file]

The present state of art for lignocellulose-feeding insects: an emerging and promising area of entomological science. Jian-Zhong Sun, Coastal Research and Extension Center, Mississippi State University, Poplarville, MS.

Most insects are unable to use plant cell wall biomass as their main food sources, but some rely on the these biomass from agricultural crops to forest woody substrates as their only foods, such as in the case of termites (lower and higher), beetles (Anobiidae, Scarabaeidae, Cerambycidae), wood wasps, silver fish, etc. Cellulose digestion has been demonstrated in the Thysanoptera, Orthoptera, Isoptera, Coleoptera, Hymenoptera, as well as in the Lepidoptera. The ability of these insects to feed on wood, foliage and detritus has recently stimulated extensive investigations of the mechanisms for how these species are able to digest the structural and recalcitrant lignocellulose biomass in their food and therefore, these studies for the discovery of novel lignocellulolytic enzymes involved in cellulose, hemicellulose, and lignin digestions in insect guts is emerging as a new research area in entomological science that could be very valuable for biofuels production made from plant biomass or other organic sources of bioenergy. It is becoming increasingly clear world-wide that biofuels represent a potentially important replacement for non-renewable fossil fuels and the associated greenhouse effects that result from using traditional energy sources. It is believed that the guts of these lignocellulose-feeding insects harbor diverse symbiotic microbes and endogenous enzymes that could be used as a rich source of enzymes for improving the conversion of wood or waste plant biomass to valuable biofuels. Clearly, understanding the mechanisms of digestion in these insects could potentially shed light on efficient, low cost, lignocellulose-based biofuel production systems. This review addresses the potential values, various challenges, and opportunities for using wood-feeding insects in the production for viable biofuels.

The invasive species, *Scirtothrips dorsalis*, its current status and threat. J. T. Reed. Dept. of Entomology and Plant Pathology, Mississippi State University.

[Abstract not on file]

Male sex scales of moths: Natural wicks for scent dispersal. Richard L. Brown and Joaquin Baixeras. Dept. of Entomology and Plant Pathology, Mississippi State University; Institut Cavanilles de Biodiversitat i Biologia Evolutiva, Universitat de Valencia, Valencia, Spain.

Males of some species of moths (Lepidoptera) are known to disperse pheromones that have a short range effect on females during courtship. Specialized scales, termed male sex scales, are involved in the production and dissemination of these pheromones in some species. Although these sex scales have been used as taxonomic characters since the 19th century, very little attention has been given to their fine structure. Examples of the high diversity of male sex scales can be found within a single species as well as in many genera of Tortricidae. Examinations of these sex scales with scanning electron microscope has revealed several modifications for increasing surface area for dispersing chemicals as well as modifications of protective pockets for these scales.

Student Paper Competition

Spotted cucumber beetle (*Diabrotica undecimpunctata* howardi) larval feeding damage on sweetpotato roots. D. E. Fleming and J.T. Reed. Dept. of Entomology and Plant Pathology, Mississippi State University.

Intra and inter-crop movement of tarnished plant bug. A. Kumar and F. Musser. Dept. of Entomology and Plant Pathology, Mississippi State University.

A key economic and primary pest of cotton in the mid south is the tarnished plant bug, (TPB) *Lygus lineolaris (Hemiptera: Miridae)*. It is believed that early season crops like corn plays a major role in building up TPB populations which moves to nearby cotton fields when it's squaring. Populations within cotton fields are often much higher near a corn field, but the degree of movement between corn and cotton, or the range at which corn influences movement is not known. A better understanding of this movement could play a key role in managing TPB. We have conducted an experiment using two marking techniques to address these questions. First we released lab reared- marked bugs (with chicken egg albumen protein) in corn, cotton and at the corn-cotton interface and sampled the habitats at a distance of 2, 5, 10, and 16 mts from the release line, 1, 3 and 6th days after release. For the 2nd marking technique we sprayed the corn and cotton habitats using the same chicken egg albumen protein. The interface was sprayed with two different proteins, chicken egg albumen on the cotton and soybean milk on the corn. Habitats were sampled the same way as done in the lab reared mark- release- recapture technique. Field collected samples were identified for the protein markers present on them using an ELISA (Enzyme linked ImmunoSorbent Assay) protocol. The marked TPB caught at different distances on different dates will be presented in relation to TPB movement in time and space in corn, cotton and at the interface of these two crops.

Role of the gulf coast tick, *Amblyomma maculatum*, and cattle in the natural history of the newly described *Rickettsia parkeri* infection (American Boutonneuse Fever). Kristine T. Edwards[1*], Jerome Goddard[2], Christopher D. Paddock[3] and Andrea S. Varela-Stokes[4]. [1]Dept. of Entomology and Plant Pathology, Mississippi State University, [2]Dept. of Entomology and Plant Pathology, Mississippi State University, [3]Centers for Disease Control and Prevention, Atlanta, GA, [4]Department of Basic Sciences, Mississippi State University.

At least twelve cases of the newly described *Rickettsia parkeri* infection have been reported (tentatively called American Boutonneuse Fever based on similarities to Old World Boutonneuse Fever). This spotted fever group rickettsia is uniquely associated with the Gulf Coast tick, *Amblyomma maculatum,* a significant pest of cattle. Since rickettsiae are generally transmitted transstadially and transovarially in their tick vectors, *A. maculatum* may serve as a reservoir for *R. parkeri* and cattle may be involved in the ecology of *R. parkeri* in *A. maculatum*. In this study, we evaluated the role of cattle as *R. parkeri* hosts. Three Holstein bull calves were experimentally injected with *R. parkeri* and three were exposed by feeding adult *R. parkeri*-infected *A. maculatum* ticks injected as engorged nymphs. One calf in each group was a negative control. All eight calves were monitored for disease signs for 30 days. None of the calves exposed to *R. parkeri* was PCR positive. Both negative control calves were seronegative and the remaining six calves developed titers to *R. parkeri*. No significant blood changes occurred in either calf group for the duration of the study. All four tick-infested calves developed lesions on the ears at tick attachment sites, none of the ears without ticks developed lesions, and no ear lesions occurred in injected calves. However, injected calves developed indurated swellings at the injection sites and biopsy revealed *R. parkeri.* The study demonstrated calves artificially exposed to *R. parkeri* produced antibodies to *R. parkeri* without developing hematologic or clinical disease signs. Also, *A. maculatum* ticks produced lesions at attachment sites independent of *R. parkeri* infection. Since *A. maculatum* ticks readily fed to repletion on the calves and the calves produced antibodies to *R. parkeri,* cattle may serve as important hosts for this tick vector and thus help maintain *R. parkeri* in nature.

Three cornered alfalfa hopper injuries to soybeans. Ishakh Pulakkatu-Thodi, Fred Musser and Jeff Gore. Dept. of Entomology and Plant Pathology, Mississippi State University.

Three cornered alfalfa hopper (TCAH) *Spissistilus festinus* (Say) is a common pest of soybean during early vegetative growth as well as during reproductive growth. The primary damage from this pest is girdling of the main stem during vegetative stages of plant development and girdling of the petioles during reproductive stages. Both adults and late nymphal instars cause girdling injuries to the soybean plants. Previous research determined that yield losses are greater during reproductive stages of plant development than vegetative stages. However, it is likely that some reproductive stages of soybean are more vulnerable to damage than other stages. We infested soybean plants with varying pest pressures (0, 1 and 3 TCAH adult/plant) each at reproductive stages starting from R3 through R7, using 6ft X 6ft field cages. Plant samples were collected at each growth stage and examined for stem and leaf petiole girdling. Data collected included number of girdles on main stem/leaf petiole and relative position of these girdles with respect to nodes on the plant. Later in the season, we harvested the treated plots to compare whole plot yields and quality of beans. The recorded data are being analyzed and will be presented to explain feeding preference of TCAH and extend of damage with respect to the reproductive stages under study.

Effects of seed treatments, Temik, and foliar insecticides on spider mite densities in seedling cotton. J. F. Smith, A. L. Catchot, F. R. Musser. Dept. of Entomology and Plant Pathology, Mississippi State University.

[Abstract not on file]

Quantifying tarnished plant bug resistance to acephate in Louisiana cotton. J. T. Copes, G. L. Snodgrass, R.D. Bagwell, J.W. Sharp. LSU AgCenter, Macon Ridge Station, Winnsboro, LA.

[Abstract not on file]

Impact of plant height on insecticide efficacy to control tarnished plant bug, *lygus lineolaris (*P d B) in cotton. J. W. Sharp, R.D. Bagwell, J. T. Copes. LSU AgCenter, Macon Ridge Station, Winnsboro, LA.

[Abstract not on file]

Tarnished plant bug feeding evidence on cotton squares: Another tool for triggering insecticide applications. K. A. Fontenot[1], B. R. Leonard[2], J. H. Temple[1], P. P. Price[2] and K. D. Emfinger[2. 1]Dept. of Entomology, LSU AgCenter, Baton Rouge, LA, [2]LSU AgCenter, Macon Ridge Station, Winnsboro, LA.

Chemical control is the primary management strategy used in cotton against tarnished plant bug (TPB), *Lygus lineolaris* (Palisot de Beauvois). For insecticides to be effective, proper application timing is critical. Several direct and indirect sampling methods are currently being used to estimate populations and/or damage levels for action thresholds to initiate treatments against this pest (Musser et al. 2007). Frequently, tarnished plant bugs re-infest fields and these thresholds are further used to schedule subsequent treatments throughout the season. Several recently registered products recommended for TPB management in cotton demonstrate novel modes of action, which make them more difficult to evaluate for actual performance compared to older established insecticides. Therefore, new or revised sampling protocols coupled with existing action

thresholds are needed to successfully schedule applications of these new products. Gore (2005) suggested the presence of frass-stained squares or squares with evidence of damage may provide precise estimates of TPB injury in cotton fields. Therefore, the objective of this study was to evaluate TPB feeding evidence (SFE; presence of external frass or internal necrotic anthers) on squares as a trigger to schedule insecticide applications during the flowering to boll maturation period of cotton plant development.

Insecticide efficacy against red banded stink bug, *Piezodorus guildinii* (Westwood), a new stink bug pest of Louisiana soybean. J. H. Temple, B. R. Leonard, J. Davis, and K. Fontenot. LSU AgCenter Dept. of Entomology, LSU AgCenter, Macon Ridge Station, Winnsboro, LA.

Stink bugs are key pests in soybean production systems across the Mid-South and Southeastern regions of the United States. Complexes of phytophagus stink bugs are common in soybeans across these areas. Historically, the predominant species have included the green stink bug, *Acrosternum hilare* (Say), Southern green stink bug, *Nezara viridula* L., and the brown stink bug, *Euschistus servus* (Say). Several other *Euschistus sp.* and *Thyanta sp.* are occasionally present but very seldom at threshold levels. Recently, the red banded stink bug, *Piezodorus guildinii* (Westwood), has emerged as a major pest on Louisiana soybean. This species was first reported in Southern parishes on soybean during 2000. The initial reports misidentified those samples as red shouldered stink bug (*Thyanta accerra* McAtee.). The red shouldered stink bug is a similar species found scattered across the state. During 2002, populations of the red banded stink bug exceeded the established economic thresholds and required insecticide sprays. The distribution of the red banded stink bug has continued to expand north and west until soybean fields in all the major soybean production parishes across Louisiana are now considered to be infested. Producers, consultants, and cooperative extension personnel have reported differential susceptibility between the red banded stink bug and the southern green stink bug with currently labeled insecticides. The objective of this study was to determine the susceptibility of red banded stink bug and southern green stink bug to insecticides in field and laboratory studies.

Field experiments were initiated during 2005-2008 to determine the efficacy of several classes of insecticides against the red banded stink bug and southern green stink bug. Post-treatment sampling results were converted to percent control using mean values from the non-treated and insecticide-treated plots for both species. Candidate insecticides included pyrethroids, organophosphates, and neonicotinoids, as well as pre-mixes, and co-applications of these compounds. Mean level of control with all pyrethroids was 94% for southern green and 72% for red banded stink bug. Average level of control with organophosphates was 95% for southern green and 83% for red banded stink bug. Neonicotinoid insecticides provided 80 and 56% levels of control for southern green and red banded stink bug, respectively.

An additional laboratory experiment was performed to further substantiate the results of these field trials. Adult southern green and red banded stink bugs were exposed to several pyrethroid and organophosphate insecticides in an adult vial test bioassay. These results show that the red banded stink bug is less susceptible than the southern green stink bug to all compounds. The red banded stink bug was 4-8 fold less susceptible for the pyrethroids, cyfluthrin, lambda-cyhalothrin, and cypermethrin, compared to southern green stink bug. The red banded stink bug was also 3-9 fold less susceptible to the organophosphates, methamidophos and acephate, compared to the southern green stink bug.

The results of field trials and laboratory bioassays show the red banded stink bug was less susceptible to selected insecticides when compared to the southern green stink bug. The red banded stink bug has become a key stink bug pest in Louisiana soybean and will likely continue to expand its range as an important pest in Arkansas and Mississippi. This differential susceptibility between stink bug species has required

changes in economic thresholds and insecticide recommendations for Louisiana soybean pest management.

Estimating fall armyworm survivors on Bt cotton technologies. Jarrod T. Hardke, B. Rogers Leonard, Josh H. Temple, Kyle A. Fontenot, and K. Emfinger. LSU AgCenter, Macon Ridge Station, Winnsboro, LA.

The fall armyworm is a migratory pest of multiple crops across the U.S., including cotton. In 2006, fall armyworm was the seventh most damaging pest in the U.S. (fifth in Louisiana). The purpose of this trial was to evaluate fall armyworm, *Spodoptera frugiperda* (J.E. Smith), larval mortality on selected transgenic cotton, *Bacillus thuringiensis* var. *kurstaki* [Berliner] (Bt), lines including Bollgard® (Cry1Ac), Bollgard II® (Cry1Ac + Cry2Ab), WideStrike™ (Cry1Ac + Cry1F), and a conventional non-Bt. Larvae (L3 stage, 30-45 mg) were removed from a laboratory colony and offered freshly harvested reproductive structures (squares, flowers, or bolls) from cotton plants. Plant tissues were replaced every two to three days and a record of larval mortality was recorded at the same intervals. Patterns of fall armyworm mortality on individual plant structures varied among Bt lines and the conventional non-Bt cultivar. Significant differences in larval mortality among treatments were detected at the endpoint of the experiment (final larval pupation in the control).

Posters

Ant Diversity and Habitat Associations at the Noxubee National Wildlife Refuge in Mississippi. Joe A. MacGown, JoVonn G. Hill, Terence L. Schiefer, and Richard L. Brown. Mississippi Entomological Museum, Mississippi State University Box 9775, Mississippi State, MS 39762.

The Mississippi Entomological Museum conducted a survey of ants at the Noxubee National Wildlife Refuge in Oktibbeha, Noxubee, and Winston Counties, Mississippi. The refuge, which occupies approximately 47,000 acres, can be separated into three primary habitats: forests, fields and grasslands, and wetlands. The majority of the refuge is composed of forests, which cover approximately 45,000 acres (about 93%). In this study we examined eight terrestrial habitats to determine ant species compositions. Habitat types for this study included pine forests (both mature and young forests, and recently burned or unburned); bottomland hardwood forests; upland hardwood forests; mixed pine/hardwood forests; cypress dominated areas (sloughs and lake borders); cedar woods (with mixed hardwoods and pines); open habitats including fields, grasslands, roadsides, and a sand pit; and disturbed, open mixed forests located near buildings and picnic areas. Our survey revealed a diverse fauna of 90 species representing 29 genera in 7 subfamilies. This total is more than half of the 175 species known to occur in the entire state. We collected 55 species in bottomland hardwood forests, 54 in pine/hardwood forests, 43 in upland hardwood forests, 42 in pine forests, 33 in disturbed mixed forests, 31 in cypress forests, 25 in cedar forests, and 18 in fields, grasslands, and mowed roadsides. Seven new state records were collected including *Crematogaster vermiculata* Emery), *Pyramica abdita* (Wesson and Wesson), *Pyramica pergandei* (Emery), *Solenopsis abdita* Thompson, *Stenamma impar* Forel, *Strumigenys silvestrii* Emery, and *Temnothorax longispinosus* Roger. Two of the species collected, *Pheidole* sp. and *Brachymyrmex* sp. (also found at some other localities in Mississippi), appear to be undescribed species. Only seven of the species collected are considered to be exotic: *Brachymyrmex patagonicus* Mayr, *Hypoponera opaciceps* (Mayr), *Linepithema humile* (Mayr), *Paratrechina vividula* (Nylander), *Pyramica membranifera* (Emery), *Solenopsis invicta x richteri*, and *Strumigenys silvestrii* Emery. Exotic species generally were found only in disturbed areas.

The Grasshopper (Orthoptera: Acrididae) Fauna of Sand Dunes Along the Little Ohoopee River, Emanuel County, Georgia. JoVonn G. Hill. Mississippi Entomological Museum, Department of Entomology and Plant Pathology, Box 9775, Mississippi State University 39762
jgh4@entomology.msstate.edu

Vegetated inland sand dunes occupy thousands of square kilometers on the coastal plain of the southeastern United States. Though they occur in a hot, humid environment today, these dunes were formed by west winds depositing sand from dry river bottoms on eastern banks during glacial periods. They are often characterized by the unique scrub flora and fauna that inhabit them. Because the grasshopper fauna of these dunes had not been well documented, a faunal survey was initiated. Collections focused on sand dunes along the Little Ohoopee River in eastern Georgia. Twenty-two species of grasshoppers were collected in scrub-like habitat of the dunes. Comparison of the fauna of this scrub habitat to scrub habitat in Florida revealed that two have different faunas. Eight species found in the dunes are typically restricted to sandy soils in the southeastern United States. Of these, several rare species including *Melanoplus bispinosus*, *M quercicola*, (both new state records for Georgia), *M. carnegiei*, and *M. stegocercus* were found to inhabit the Ohoopee Dunes. Previously unillustrated diagnostic characters are provided for *M. carnegiei* and *M. quercicola*.

Bt Resistance and Potential Mechanisms in the Sugarcane Borer, *Diatraea saccharalis*
Fangneng Huang, Xiaoyi Wu, Yunlong Yang. Department of Entomology, Louisiana State University Agricultural Center, Baton Rouge, LA 70803, USA.

In recent years, the sugarcane borer has expanded its geographic range and has become a dominant corn borer species in some areas in the mid-south of the United States, especially in Louisiana and Texas. Transgenic Bt corn has been rapidly adopted in Louisiana since 1999 because of emerging lepidopteran pest problems, especially with the sugarcane borer. A Bt-resistant strain of sugarcane borer capable of completing larval development on commercial Cry1Ab corn has been selected using novel F2 screening techniques. This Bt-resistant strain provides opportunities to explore the physiological mechanisms of Bt resistance in this species and may serve as a model for other corn stalk boring caterpillar pests. This study was conducted to determine the susceptibility of the Cry1Ab-resistant sugarcane borer to other Bt Cry proteins including Cry1Aa, Cry1Ac, to examine enzymatic activities of midgut proteinases (trypsins and chymotrypsins), aminopeptidase, and alkaline phosphatase, to clone and compare cDNA sequences and gene expression levels of Bt resistance related genes in *Bt*-susceptible and -resistant strains of sugarcane borer. Results indicated that the LC_{50} of the Cry1Ab-resistant strain was estimated to be >80- and 45-fold greater than that of the susceptible larvae to the Cry1Aa and Cry1Ac, respectively. The susceptible and resistant strains showed different enzyme activities. In addition, three aminopeptidase cDNAs, three alkaline phosphatase cDNAs, and one cadherin cDNA were cloned and sequenced.

Ants (Hymenoptera: Formicidae) of the Little Ohoopee River Dunes, Emanuel County, Georgia.
Joe A. MacGown[1], JoVonn G. Hill[1], and Mark Deyrup.[2] Mississippi Entomological Museum, [1]Department of Entomology and Plant Pathology, Mississippi State University, Box 9775, Mississippi State, MS 39762
[2]Archbold Biological Station, P.O. Box 2057, Lake Placid, FL 33862

A survey of ants was conducted at the Ohoopee Dunes Natural Area and the Ohoopee Dunes Preserve in Emanuel County, Georgia. Collections were made primarily in sand dune habitats (evergreen scrub forests and evergreen scrub-lichen forests), although some collecting also was done at the margins of the dunes in transitional zones leading

to oak hammocks and longleaf pine forests. Our surveys were made on five separate occasions: 16-22 June 2002, 15-16 May 2007, 17-18 July 2007, 5-9 October 2007, and 21 and 26 July 2008. Seventy-seven species were collected from the dunes. Sixteen of the species are sand specialists that represent species that might have been more widespread in the area during a drier climatic regime: *Dorymyrmex bureni* (Trager), *D. grandulus* (Forel), *D. smithi* Cole, *Forelius pruinosus* (Roger), *Forelius* n. sp., *Paratrechina phantasma* Trager, *Camponotus socius* Roger, *Monomorium viride* Brown, *S. pergandei* Forel, *Pogonomyrmex badius* (Latreille), *Aphaenogaster floridana* Smith, *A. umphreyi* Deyrup and Davis, *Pheidole adrianoi* Naves, *P. davisi* Wheeler, *P. metallescens* Emery, and *P. morrisii* Forel. Two of these species, *P. phantasma* and the undescribed species of *Forelius,* represent new state records for Georgia. In general, native ants dominated the sites, with exotic species generally being relegated to disturbed areas along the margins of the sites.

Spatial-temporal dynamics of tarnished plant bugs in irrigated cotton (2001 - 2003). Patrick J. English, and Sherri L DeFauw. Mississippi State University, Delta Research & Extension Center, 82 Stoneville Rd., Stoneville MS 38776. (662)686-3536. penglish@drec.msstate.edu

Three years of tarnished plant bug (TPB) counts from 20 - 32 stations are compared with management zones defined using normalized difference vegetation index (NDVI) and soil apparent bulk conductivity Veris. Bivariate Local Moran's I Spatial Autocorrelation (BiLISA) comparing NDVI and Veris with TPB counts revealed high TPB counts with high NDVI and low Veris values and low TPB counts with low NDVI and high Veris. The areas where no significant spatial autocorrelation occurred with NDVI or Veris corresponded to areas of no significant relationship between TPB counts and NDVI or Veris.

A Case Study of the Formosan Subterranean Termite Spreading with a Non-cellulosic Carrier in South Mississippi. K.C. Lee, Jian-Zhong Sun, Eldon J. Mallette. Mississippi State University Coastal Research and Extension, South Mississippi Branch, P.O. Box 193, Poplarville, MS 39470. 601-795-4525 ext 8779. kcl61@msstate.edu

The Formosan subterranean termite, *Coptotermes formosanus* Shiraki, was accidentally introduced to south Mississippi and has significantly infested more counties over the past decade. Traditionally, it has been accepted that the movement of infested wood products has led to the establishment and spread of *C. formosanus* in this state. However, this invasive species could also be introduced into a new area with certain non-cellulosic products as its carry means. This report provides new evidence that the spread of *C. formosanus* is also attributed to commercial activity with non-wood products.

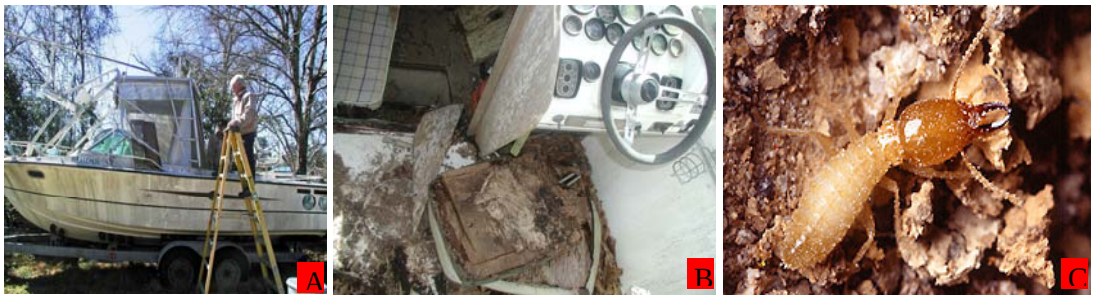

Figure 1. Fiberglass Fishing Boat purchased from New Orleans inadvertently with a colony of *C. formosanus*. A: The boat rested on a trailer at a residential area in Poplarville, MS, B: Driving room of the boat with termite infestation, C: A soldier termite.