

Survey of Ants (Hymenoptera: Formicidae) of the Tombigbee National Forest in Mississippi

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ABSTRACT: A survey of Formicidae was conducted in the Tombigbee National Forest (Ackerman Unit) in Winston and Choctaw Counties, Mississippi. Collections were made with pitfall traps from 15 March 1999 to 6 March 2000 and with other collecting methods on various dates from the spring of 2002 through the fall of 2004. A total of 27 genera and 72 species representing 7 subfamilies are reported from the Tombigbee National Forest. Seven new state records are given, as well as records of several rare and uncommon species. Habitat and microhabitat information are given for each species.

KEY WORDS: Hymenoptera, Formicidae, Mississippi, Tombigbee National Forest, inventory, pitfall traps, new state records

The Tombigbee National Forest (Ackerman Unit) covers an area of 15,972 hectares and lies in the adjacent counties of Choctaw, Winston, and Oktibbeha in east-central Mississippi. The majority of the Tombigbee National Forest is found in the North Central Plateau Physiographic Region of the state with only a few hectares found in an edge of the Flatwoods Region. The topography varies from the nearly flat floodplains of the Noxubee River and its tributaries to very dissected hills and steep ravines, with elevations ranging 91–183 m. Whereas slopes are well drained, low lying areas may be inundated seasonally. Springs and seeps occur sporadically throughout this region. The soils are typically acid to neutral and are mostly clays, sandy clays, or occasionally gravelly clays. The landscape of the Tombigbee National Forest is dominated by a mixture of deciduous trees and pines with a few cleared areas, power-line cuts, and roads. Upland areas include a variety of oaks (Fagaceae: *Quercus* spp.) and hickories (Juglandaceae: *Carya* spp.) mixed with loblolly pine (Pinaceae: *Pinus taeda* L.), and some shortleaf pine (*P. echinata* Miller). The trees typically seen on ravine slopes and their bases and near smaller streams are a variety of oaks, hickories, cucumber magnolia (Magnoliaceae: *Magnolia acuminata* L.), tulip poplar (Magnoliaceae: *Liriodendron tulipifera* L.), beech (Fagaceae: *Fagus grandifolia* Ehrhart), and sweetgum (Hamamelidaceae: *Liquidambar styraciflua* L.) (McDaniel, 1992).

The Mississippi Entomological Museum (MEM) conducted a survey of ants in the Tombigbee National Forest (Ackerman Unit) from March 1999 through the fall of 2004 to document species present in the National Forest and to give habitat and nesting information about species found there. This survey adds to earlier formicid surveys done in Mississippi by Marion Smith (1924a, b, c, 1927, 1928a, b, 1931, 1932). Since Smith's time, there have been many additions to the state's formicid fauna due to changes in taxonomy, the availability of newer collecting techniques, and the introduction of exotic species.

Methods

Survey Sites

Collections were made in 21 sites in Tombigbee National Forest (NF) in Winston and Choctaw Counties from March 1999 through June 2004 (Appendix 1). Several sites were

selected based on McDaniel's (1992) listing of sites containing rare and threatened plants and unique habitat qualities. Additional sites were selected in the field based on their potential of containing diverse habitats suited for various species of ants.

Site 1 is located on the south side of Highway 25, and it was sampled only in 1999/2000 before the widening of the highway into four lanes and subsequent loss of some of this habitat. This area consisted of an old-growth forest on steep slopes with bigleaf magnolia (Magnoliaceae: *Magnolia macrophylla* Michaux), cucumber magnolia tree, Florida maple (Aceraceae: *Acer saccharum* Marshall subsp. *floridanum* (Chapm.) Desmarais), and basswood (Tiliaceae: *Tilia americana* L.), and a rich herbaceous understory.

Site 2 is an old growth hardwood ravine found on Poplar Flat Road at NF Road 953A.

Site 3 is a hardwood ravine located near Little Rock Cemetery off Pigeon Roost Road (NF Road 971-1). This area has a steep sloped ravine with a creek running through the broad floor. The oak-hickory-beech-tulip poplar forest is mixed with a rich herbaceous flora.

Site 4, located near the intersection of NF Roads 955 and 955A, is a low-lying seepage area in a woodland dominated by pine, but with some deciduous trees, sweetbay magnolia (Magnoliaceae: *Magnolia virginiana* L.), and many ferns present.

Site 5 is a hardwood ravine near the intersections of Sheep Ranch Road (NF Road 956) and Pigeon Roost Road (NF Road 971-1). This site has a canopy of oak-hickory-beech-tulip poplar with some cucumber magnolia tree, sweetgum, basswood, and oak-leaved hydrangea (Hydrangeaceae: *Hydrangea quercifolia* Bartr.) present. The ridges are somewhat sandy with a mix of pines and hardwoods.

Site 6, at Rock Crusher Road (NF Road 956-C) off Pigeon Roost Road (NF Road 971-1) is a dirt road that extends through an area of cutover pines and into a richer mixed forest.

Site 7 is a power-line cut on Webster Road (NF Road 955).

Site 8, located near the Noxubee Hill Cemetery on Sheep Ranch Road (NF Road 956), is a flat, high, and dry area with a mixture of hardwoods and pines.

Site 9, on Sheep Ranch Road (NF Road 956), is on both sides of the road in a mixed forest that had received damage from a severe storm several months to a year prior to collecting.

Site 10 is a bike trail that runs between Sheep Ranch Road (NF Road 956) and Pigeon Roost Road (NF Road 971-1). Collections were made on a ridge with mixed pines and hardwoods.

Site 11 is at a sand bar on a small creek near the intersection of Pigeon Roost Road (NF Road 971-1) and Webster Road (NF Road 955).

Site 12 is located in an open area near the shore of Choctaw Lake (a 41 hectare reservoir).

Site 13, located off of Sheep Ranch Road (NF Road 956), is a mixed forest with steep ravines. Maples, oaks, hickories, and pines dominate this area and several species of ferns and mosses are present in low areas.

Site 14 is located on a ridge trail and ravine slopes off of Sheep Ranch Road (NF Road 956) and is dominated by *Pinus echinata* and *P. taeda*.

Site 15 is a power-line cut with reddish clay and sandy soil located on Sheep Ranch Road (NF Road 956).

Site 16 is on an old gated road off Sheep Ranch Road (NF Road 956) that runs on the top of a ridge in an area dominated by pines with some hardwoods present.

Site 17 is a mixed mesic forest off of Sheep Ranch Road (NF Road 956).

Site 18 is a dry sandy ridge located near Turner Cemetery at the intersection of Sheep Ranch Road (NF Road 956) and NF Road 956-A.

Site 19 is a cleared area adjacent to Sheep Ranch Road (NF Road 956).

Site 20 is a sweetbay bog adjacent to NF Road 965 and in an old-growth hardwood ravine with sphagnum moss (Sphagnaceae: *Sphagnum* sp.), poison sumac (Anacardiaceae: *Toxicodendron vernix* (L.) Kuntze), and black haw (Caprifoliaceae: *Viburnum prunifolium* L.) present in the understory.

Site 21, located north of Highway 25, is a hardwood ravine with mixed forest on ridges, much of which was destroyed after 1999 by the highway expansion.

Sampling Methods

Pitfall traps were run weekly in sites 1–3 from 22 March 1999 to 6 March 2000, with one exception when they were checked after a two-week period from 7 June to 21 June. At each site five traps were placed in the vicinity of one another with the contents of all traps from a given site combined into a single sample. Each pitfall trap consisted of two plastic delicatessen cups, three steel guide vanes, and a hexagonal steel cover. Each cup had an inner diameter of 11 cm at the top, an inner diameter of 8.8 cm at the bottom, and a depth of 7.8 cm. Cups were placed in holes in the ground that were dug with a golf course cup cutter, which minimized impact to the surrounding area. Two cups, one inside the other, were placed in each hole so that any rain water would fill the bottom cup and float the top cup upwards to prevent loss of the trap contents. Each of the three steel guide vanes used per trap measured 7.2 cm by 30.6 cm and were placed equilaterally around the cups and sunk in the ground approximately 2.0 cm. A hexagonal steel cover, made by bending the corners of an equilateral triangle to form downward projecting points, was placed over the top of the nested cups to help divert rain. The trap cup was filled approximately halfway with a 50/50 mixture of propylene glycol and 70% ethanol, with a pinch of denatonium benzoate added to deter mammals from drinking the solution.

Additional collections using other methods were made on 21 days during 2002–2004 at a variable number of sites on each day. Soil and leaf litter were placed into a white pan, and observed ants were placed into vials of 95% ethyl alcohol, which would permit future use for DNA analysis. Other litter samples were collected, sifted, placed in one-gallon (3.79 liters) ziploc plastic bags, and brought to the laboratory for extraction of ants with Berlese funnels. Rotting wood and hollow stems of grasses and other plants were torn apart and searched for ants. A beating sheet was used to collect arboreal species from trees and shrubs. Various baits, including cookies (Keebler Sandies Pecan Shortbread[®]), tunafish (StarKist[®] chunk light in water), hotdogs (Bar S[®], chicken, beef, & pork), and peanut butter (various brands) were used on the ground and on tree trunks to attract ants. Other species were found by searching for nests in the ground and visual inspection of plants. A small percentage of ants, especially alates, were collected at sheets with blacklights. Some ants were collected with malaise traps, which were run at sites 1, 2, and 3 from 22 March 1999 to 6 March 2000.

Processing and Data Analysis

All ants were removed from each pitfall sample, placed into a vial of 70% alcohol, labeled with collection data, given a sample number, then counted and identified. Ants collected by other methods were placed in 95% alcohol, labeled with collection data, and identified, but not counted. Voucher specimens of all species and all specimens of rare and uncommon species were pinned and labeled with collection data. A total of 2132

pinned specimens and 761 vial collections from this study are stored in the Mississippi Entomological Museum.

Results

This survey yielded 70 species in 27 genera and seven subfamilies: Dolichoderinae, Formicinae, Pseudomyrmecinae, Amblyoponinae, Ponerinae, Proceratiinae, and Myrmicinae. A total of 6439 specimens representing 37 species in 18 genera were collected in pitfall traps, whereas 69 species in 27 genera were collected by other methods. Only one species, *Camponotus discolor* (Buckley), was collected solely in pitfall traps. Two additional species, *Stenamma foveolocephalum* Smith and *Temnothorax tuscaloosae* Wilson, were not collected during this study, but are known to occur in the Tombigbee National Forest. *Stenamma foveolocephalum*, an uncommonly collected cool weather species, was reported by DuBois and Davis (1998). One specimen of *T. tuscaloosae*, a new state record, was collected after the study on 5 September 2005 in Choctaw County by Tim Menzel and it was donated to the MEM. With the addition of these two species, 72 species of ants are now known to occur in the Tombigbee National Forest.

For the 6439 specimens collected with pitfall traps, the number of specimens for each species as a percent of the total was as follows: *Prenolepis imparis* (Say), 31.43%; *Camponotus chromaiodes* Bolton, 13.99%; *C. americanus* Mayr, 8.91%; *C. pennsylvanicus* (DeGeer), 8.20 %; *Aphaenogaster* sp. cf. *carolinensis* Wheeler, 6.23%; *Pheidole dentata* Mayr, 5.76%; *Solenopsis* sp. cf. *molesta* (Say), 5.57%; *Aphaenogaster fulva* Roger, 3.59%; *Camponotus castaneus* (Latreille), 3.52%; *Paratrechina faisonensis* (Forel), 3.21%; *Camponotus subbarbatus* Emery, 1.99%; *Pheidole tysoni* Forel, 1.50%; *P. dentigula* Smith, 1.41%; with the remaining 25 species comprising the final 4.70% (Appendix 2). The relative abundance of each species varied somewhat from site to site compared to the percentages for all sites combined, but this is probably due to placement of individual pitfall traps. Although there was considerable overlap in the species from site to site in the pitfall traps, several species were found at only one site. However, when conducting later collections, most of those species were found at all sites.

Seven new state records for Mississippi are reported: *Camponotus subbarbatus* Emery, *Ponera exotica* Smith, *Discothyrea testacea* Roger (a new genus and species for Mississippi), *Stenamma meridionale* Smith, *Myrmica punctiventris* Roger, *Pheidole tetra* Creighton, and *Temnothorax tuscaloosae*.

Camponotus subbarbatus was collected in pitfall traps at site 3 (126 specimens) and site 2 (1 specimen), on dead trees and coming to tuna bait at site 9 (20 specimens), in hickory nuts at site 5 (2 specimens), and on tree foliage that was beat (1 specimen). Smith (1979) gave the distribution of *C. subbarbatus* as New York south to North Carolina, and west to Michigan, Iowa, and Kansas. Although Snelling (1988) wrote that *C. subbarbatus* was found as far south as Mississippi, he did not give any specimen records, so this species is presented as a new record for the state.

Ponera exotica was considered it to be an exotic species by M. R. Smith (1962), but Johnson (1987) argued that it was, in fact, just an under-collected native ant. This small ant was found in soil and litter samples at sites 3, 4, 5, 7, 8, and 9. *Ponera exotica* has a southern distribution and was expected to be found in Mississippi.

Discothyrea testacea was described in 1863, probably from the Carolinas, but was not collected again until 1948 (Smith and Wing, 1955). This genus was not mentioned in M. R. Smith's (1947) treatment of genera in the United States or in the last monograph of

North American ants (Creighton, 1950). Due to increased use of the Berlese funnel and Winkler sac as collecting techniques, this ant has been found in the southeastern United States with regularity and is no longer even considered rare. This species was found in soil and litter at the bases of *Carya* sp. (2 specimens) and *Pinus taeda* (3 specimens); all specimens were extracted with a Berlese funnel. This species has previously been reported from North Carolina south to Florida, and in Oklahoma (Smith, 1979).

Stenammina meridionale has been reported from Virginia south to Georgia, and west to Illinois, and Arkansas (Smith, 1979). This species has been collected in several counties in Mississippi during the cooler months and appears to be fairly common. Forty specimens of this species were collected Tombigbee National Forest in pitfall traps, litter samples, and by general collecting at sites 2, 3, 4, 5, and 9.

Myrmica punctiventris has been reported from Massachusetts south to Georgia, and west to Iowa, Nebraska, and Arkansas (Smith, 1979). This species was collected in pitfall traps at site 1 (27 specimens) and in litter samples at site 5 (1 specimen), site 4 (2 specimens), and site 6 (6 specimens).

Pheidole tetra was found nesting in the soil at sites 8 and 18, and this is the first reported occurrence for the species east of the Mississippi River. Both colonies of this species were found in sandy soil on open ridgetops in mixed forest; coincidentally, both areas were at old cemetery sites. Previously, this ant was only known from St. Louis, Missouri, the Quachita Mountains of Arkansas, central and western Texas, and the mountains of southern Arizona at 1280–1580 m (Wilson, 2003).

One specimen of *Temnothorax tuscaloosae* was collected after the conclusion of this study by Tim Menzel on 5 September 2005 in Choctaw County. This specimen was collected at peanut butter bait on the ground in a sloped hardwood forest near a creek. This species has been collected in similar habitat in Tishomingo County, Mississippi. Formerly, *T. tuscaloosae* was only known to occur in Alabama and North Carolina (Smith, 1979).

Other significant and/or interesting species collected include: *Formica dolosa* Buren, *Polyergus lucidus longicornis* Smith, *Pyramica angulata* (M. R. Smith), *P. metazytes* Bolton, *P. ohioensis* (Kennedy & Schamm), *P. reflexa* (Wesson & Wesson), *P. talpa* (Weber), and *Aphaenogaster mariae* Forel.

Formica dolosa and *Polyergus lucidus longicornis* have been reported recently from several locations in Mississippi (Hill and Brown, 2005; Trager *et al.*, in press). *Formica dolosa* was collected at site 5 on a ridgetop nesting in the soil in the middle of a trail, in an open area near Choctaw Lake (site 12), at site 8 in a large nest of *Polyergus lucidus longicornis*, at site 18 nesting in sandy soil on a ridge, and at site 6 running on the ground on an old dirt road on a ridge. This species has been previously reported from Virginia south to Florida, and west to Iowa, Colorado, and Texas (Smith, 1979).

The nest of *Polyergus lucidus longicornis* was found in the soil at the base of *Quercus pagoda* Rafinesque (Fagaceae) in an open area at site 8. The nest was found just beneath the leaf litter in the soil and was interwoven around roots. The nest was at least 50 cm in diameter and at least 30 cm deep, but its complete dimensions are unknown because roots prevented further digging. Alate females were present, and a large chamber with pupae was discovered about 20 cm below the soil surface. The slaves present were all *Formica dolosa*. Previous records of *Polyergus lucidus longicornis* are from North Carolina (Carter, 1962), South Carolina, Georgia (Smith, 1979), and Mississippi (Hill and Brown, 2005, Trager *et al.*, in press).

Pyramica angulata is considered to be a rare species with a limited distribution (Bolton, 2000). *Pyramica metazytes*, *P. ohioensis*, *P. reflexa*, and *P. talpa* were reported from

Mississippi for the first time in 2005 (MacGown *et al.*, 2005). *Pyramica metazytes* is a rare species previously known only from Monroe Co., Alabama (MacGown and Forster, 2005), Edmonton Co., Kentucky, and Sevier Co., Tennessee (Bolton, 2000). *Pyramica ohioensis*, *P. reflexa*, and *P. talpa* all have a southeastern distribution and were not unexpected in Mississippi.

Aphaenogaster mariae is a somewhat rare myrmicine ant that is thought to be a temporary parasite of *Aphaenogaster fulva* Roger (Smith, 1979), an ant species commonly found in this survey. A nest of *A. mariae* was found in a dry, dead tree at site 9, a series of workers was collected at peanut butter bait on the bark of *Quercus pagoda* and *Q. velutina* Lam. at site 8, two dealate queens were found in soil at the base of *Q. pagoda* at site 8, one dealate queen was found in soil at the base of *Fagus grandifolia* at site 5, and a single dealate queen was collected in a pitfall trap in deciduous forest at site 2. The 3 queens from both sites 5 and 8 were extracted with Berlese funnels from soil samples containing nests of *A. fulva*.

List of Species

The following list is arranged by subfamily and genus according to Bolton (2003). Names follow Bolton (1995), except where they follow the authors of recent generic revisions: *Dorymyrmex* (Snelling, 1995), *Pyramica* (Bolton, 2000), *Aphaenogaster* (Umpfrey, 1996), *Pheidole* (Wilson, 2003), and *Crematogaster* (Johnson, 1988). Site numbers for collection localities are given for each species, and new state records are noted. Each species is annotated with information on habitats, microhabitats, and trapping method. Information on relative abundance in the National Forest is given as follows: species with less than 10 specimens collected were considered rare, 11–100 specimens were considered uncommon, more than 100 specimens at a limited number of sites were considered to be common, and species with over 100 specimens and recorded from many localities were considered to be very common. The total number of pinned specimens and castes, and number of vials of uncounted specimens are given for each species.

Formicidae

Subfamily Dolichoderinae

Tribe Dolichoderini

Forelius mccooki (McCook). Edges of mixed forests; nests in soil on roadsides, trails (especially on ridges), and other open areas. Sites 6, 7, 9, 12, 18, and 19. Very common; 30 workers pinned, 2 vial collections.

Subfamily Formicinae

Tribe Lasiini

Lasius (Lasius) alienus (Foerster). In mixed mesic forest; crawling on shrubs; nests in leaf litter and rotting logs in low, wet areas. Site 4. Common in wet areas; 17 workers pinned, 2 vial collections.

Tribe Plagiolepidini

Brachymyrmex depilis Emery. In deciduous and mixed forests; pitfall traps, in hollow stump, soil under rotting logs, and soil and litter at base of *Q. pagoda*; nests in soil.

- Sites 1, 2, 3, 5, 8, 13, 14, and 17. Very common; 2 queens (dealate) and 17 workers pinned, 19 vial collections.
- Paratrechina (Nylanderia) arenivaga* (Wheeler). In mixed forest; nests in soil on sandy ridge tops and other open areas. Sites 8, 18, and 19. Uncommon; 6 queens (alate) and 16 workers pinned, 1 vial collection.
- Paratrechina (Nylanderia) faisonensis* (Forel). In deciduous and mixed forests; pitfall traps, at hotdog bait, in soil and litter in seepage area, and under dead hardwood logs; nests in soil under leaf litter and at base of *Q. pagoda*. Sites 1, 2, 3, 4, 5, 8, 9, 13, 14, 16, and 17. Very common; 7 queens (alate), 6 males (alate), and 84 workers pinned, 55 vial collections.
- Paratrechina (Nylanderia) parvula* (Mayr). In mixed forest; nests in sandy soil under leaf litter at edges of openings. Sites 5 and 18. Uncommon; 1 queen (alate), 2 males (alate), and 27 workers pinned, 1 vial collection.
- Paratrechina (Nylanderia) vividula* (Nylander). Roadsides, fields, and other open areas near mixed forest; nests under bark, and in soil in open areas and at base of *Q. pagoda*. Sites 6, 8, and 9. Very common; 3 queens (alate), 2 males (alate), and 21 workers pinned, 5 vial collections.
- Prenolepis imparis* (Say). In deciduous and mixed forests; pitfall traps, tending aphids on downed *Pinus* sp., on herbaceous and woody plants, and at base of *Q. pagoda*; nests in rotting logs and in soil at base of *Carya* sp. with a large number of *Longistigma caryae* (Harris) (Aphididae) present. Sites 1, 2, 3, 4, 5, 8, and 9. Very common, especially in cooler months; 1 queen (dealate), 3 males (alate), and 33 workers pinned, 98 vial collections.

Tribe Camponotini

- Camponotus (Camponotus) americanus* Mayr. In deciduous and mixed forests; pitfall traps, in soil under litter on ridge, and crawling on and under bark of dead trees; nests in soil under leaf litter and in rotting logs and stumps. Sites 1, 2, 3, 5, 8, 9, and 17. Very common, 2 queens (1 alate, 1 dealate), 2 males (alate), 1 major worker, and 18 minor workers pinned, 74 vial collections.
- Camponotus (Camponotus) chromaiodes* Bolton. In deciduous and mixed forests; pitfall traps, at hotdog bait near roadside, crawling on dead hardwoods and *Pinus* sp., and in litter at base of *Pinus* sp.; nests in rotting wood and in soil at base of *Quercus* sp. Sites 1, 2, 3, 7, 9, 14, and 18. Very common; 43 minor workers and 17 major workers pinned, 63 vial collections.
- Camponotus (Camponotus) pennsylvanicus* (DeGeer). In open areas and deciduous and mixed forests; pitfall traps, at hotdog bait, at cookie bait on trunk of *Q. pagoda*, on ground in open area on ridge, crawling on ground near lake, on recently killed *Carya* sp., and in soil at base of *Q. pagoda*; nests in rotting logs. Sites 1, 2, 3, 4, 5, 8, and 12. Very common; 2 males (alate), 18 major workers, and 12 minor workers pinned, 53 vial collections.
- Camponotus (Colobopsis) impressus* (Roger). In mixed forest; on branches of dead trees near roadside and on ridge in woods. Sites 5 and 9. Uncommon; 3 minor workers pinned.
- Camponotus (Myrmentoma) decipiens* Emery. In mixed forest; crawling on branches of dead trees near roadside and in woods. Site 9. Uncommon; 3 minor workers pinned.

- Camponotus (Myrmentoma) discolor* (Buckley). In deciduous forest; pitfall trap. Site 3. Rare, 1 major worker pinned.
- Camponotus (Myrmentoma) nearcticus* Emery. In mixed forest; at peanut butter bait on *Q. pagoda*, on branches of dead trees near roadside, and on dead *Pinus* sp. Sites 8 and 9. Uncommon; 2 major workers and 11 minor workers pinned.
- Camponotus (Myrmentoma) snellingi* Bolton. In deciduous and mixed forests; at cookie bait on *Q. pagoda*, under bark of dead *Cornus florida* Linnaeus (Cornaceae) and dead portion of live *Q. pagoda* on ridge, and in dead twigs of *Q. pagoda*; nests in standing dead trees and logs on ground. Sites 5, 7, 8, 9, and 18. Common; 1 queen (alate), 5 major workers, and 24 minor workers pinned, 2 vial collections.
- Camponotus (Myrmentoma) subbarbatus* Emery. **New state record.** In deciduous and mixed forests; pitfall traps, at tuna bait on ridge, on dead trees at road edge, crawling on shrubs in seepage area, in rotting nuts of *Carya glabra* (Miller) on ground at ravine bottom, and on dead *Pinus* sp. Sites 2, 3, 4, 5 and 9. Common; 9 major workers and 67 minor workers pinned, 7 vial collections.
- Camponotus (Tanaemyrmex) castaneus* (Latreille). In deciduous and mixed forests; pitfall traps and on dead *Pinus* sp., nest in soil at base of *F. grandifolia* in seepage area. Sites 1, 2, 3, 4, and 9. Very common; 1 queen (alate) and 9 workers pinned, 49 vial collections.

Tribe Formicini

- Formica pallidefulva* Latreille. In deciduous and mixed forests; pitfall traps and at peanut butter bait on *Q. pagoda*; nests in soil under leaf litter. Sites 3 and 8. Common; 1 queen (alate) and 23 workers pinned, 9 vial collections.
- Formica dolosa* Buren. In open areas and mixed forests; on ground on trails, clear cuts, power-line cuts, and other open areas, crawling on *Q. pagoda*, and enslaved in nest of *Polyergus lucidus longicornis* in soil at base of *Q. pagoda*; nests in soil under leaf litter on ridgetop trails. Sites 3, 5, 6, 8, 12, and 18. Common; 14 workers pinned, 3 vial collections.
- Formica subsericea* Say. In deciduous and mixed forests; pitfall traps. Sites 1, 2, 3, and 5. Common; 20 workers pinned, 2 vial collections.
- Polyergus lucidus longicornis* Smith. In mixed forest; nest at base of *Q. pagoda* with *Formica dolosa* slaves. Site 8. Rare; 2 queens (alate) and 9 workers pinned, 1 vial collection.

Subfamily Pseudomyrmecinae

Tribe Pseudomyrmecini

- Pseudomyrmex pallidus* (Smith). Pine forest; nests in culms of *Sorghum halepense* (Linnaeus) (Poaceae) on ridgetop trail/old road. Site 6. Uncommon; 2 queens (alate) and 6 workers pinned, 1 vial collection.

Subfamily Amblyoponinae

Tribe Amblyoponini

- Amblyopone pallipes* (Haldeman). In deciduous and mixed forests; pitfall traps, in soil and litter at base of *P. taeda*, and under rotting *Quercus* sp. and other hardwood logs

on ground. Sites 3, 4, 5, and 17. Uncommon; 2 queens (dealate) and 14 workers pinned.

Subfamily Ponerinae
Tribe Ponerini

- Cryptopone gilva* (Roger). In deciduous forest; in soil and leaf litter. Site 3. Rare; 5 workers pinned.
- Hypoponera opaciceps* (Mayr). Roadside at edge of mixed forest on ridge; in piles of pine bark in clear-cut area. Site 6. Uncommon, but locally abundant; 16 workers pinned (many more individuals were observed at the site).
- Hypoponera opacior* (Forel). In deciduous and mixed forests; pitfall traps, under bark and in rotten branches of dead trees, in soil at bases of *Q. pagoda*, *Carya* sp., and *Pinus* sp., in soil under rotting logs of *Quercus* sp. and *Pinus* sp., and crawling on sand by creek. Sites 1, 2, 3, 4, 5, 8, 9, 13, 14, 16, and 17. Very common; 12 queens (dealate) and 43 workers pinned, 8 vial collections.
- Ponera exotica* Smith. **New state record.** In mixed and deciduous forests; in soil under *Quercus* sp. log, and in soil and litter at bases of *F. grandifolia*, *Nyssa sylvatica* Marshall (Nyssaceae), *Carya* sp., and *P. taeda*. Sites 3, 4, 5, 7, 8, and 9. Uncommon; 36 workers pinned.
- Ponera pennsylvanica* Buckley. In deciduous and mixed forests; pitfall traps, in soil and leaf litter in seepage area, inside rotting logs, and in soil and litter under rotting logs and at base of *Q. pagoda*; nests in nuts of *C. glabra* on ground. Sites 1, 2, 3, 4, 5, 8, 13, 14, 16, and 17. Very common; 7 queens (dealate) and 80 workers pinned, 12 vial collections.

Subfamily Proceratiinae
Tribe Proceratiini

- Discothyrea testacea* Roger. **New state record.** In mixed forest; in soil of hollow base of *Carya* sp. on slope and in litter at base of *P. taeda* on slope. Sites 3 and 5. Rare, 5 workers pinned.
- Proceratium croceum* (Roger). In mixed mesic forest; at blacklights in sweetbay bog, in seepage area, and on ravine slope near creek. Sites 4, 20, and 21. Uncommon; 12 males pinned.
- Proceratium pergandei* (Emery). In mixed forest; in soil and litter at base of rotting *P. taeda* stump. Site 8. Rare; 1 worker pinned.
- Proceratium silaceum* Roger. In mixed forest; in soil of hollow base of *Carya* sp. and in soil and litter at bases of *P. taeda* on ravine slope and *Q. pagoda*. Sites 3, 5, and 8. Rare; 1 queen (dealate) and 2 workers pinned.

Subfamily Myrmicinae
Tribe Dacetini

- Pyramica angulata* (Smith). In deciduous and mixed forests; in soil and leaf litter and in soil and litter at base of *Q. pagoda*. Sites 7, 8, 9, and 17. Rare; 1 queen (dealate) and 9 workers pinned.
- Pyramica clypeata* (Roger). In deciduous forest; in soil under rotting log at bottom of ravine and in soil and litter at base of *Carya ovata* (Miller) K. Koch. Sites 5 and 9. Rare; 3 workers pinned.

- Pyramica creightoni* (Smith). In mixed forest; in litter at base of *P. taeda* on ridge. Site 5. Rare; 6 workers pinned.
- Pyramica dietrichi* (Smith). In mixed forest; in soil and leaf litter at bases of *C. ovata* and *Q. pagoda*. Sites 5, 8, and 9. Rare; 3 queens (dealate) and 1 worker pinned.
- Pyramica metazytes* Bolton. In deciduous forest; in soil and leaf litter at base of *Carya* sp. at ravine bottom. Site 5. Rare; 1 worker pinned.
- Pyramica ohioensis* (Kennedy and Schramm). In deciduous and mixed forests; in soil and litter and soil and litter at base of *Carya* sp. on ravine slope. Sites 2, 5, and 16. Rare; 3 workers pinned.
- Pyramica ornata* (Mayr). In deciduous and mixed forests; pitfall traps, in soil under *Quercus* sp. log and in soil and litter at base of *Carya* sp. on ravine slope and at base of *Q. pagoda*. Sites 3, 5, 8, 16, and 17. Uncommon; 3 queens (2 alate, 1 dealate) and 51 workers pinned.
- Pyramica pulchella* (Emery). In deciduous and mixed forests; in soil and litter at bases of *Q. pagoda* and dead *Quercus* sp. Sites 8 and 17. Rare; 1 queen (dealate), 3 workers pinned.
- Pyramica reflexa* (Wesson and Wesson). In deciduous forest; in soil and leaf litter at base of *Carya* sp. at bottom of ravine. Site 5. Rare; 1 queen (dealate) and 1 worker pinned.
- Pyramica rostrata* (Emery). In deciduous and mixed forests; pitfall traps, litter in seepage area, soil and litter under rotting log and at base of *Carya* sp. on ravine slope, and litter at base of *P. taeda* on ridge. Sites 1, 2, 4, 5, 16, and 17. Uncommon; 3 queens (dealate) and 60 workers pinned.
- Pyramica talpa* (Weber). In deciduous and mixed forests; in pitfall trap and in soil and leaf litter beside road cut. Sites 2 and 8. Rare; 1 queen (dealate) and 1 worker pinned.
- Strumigenys louisianae* Roger. In deciduous and mixed forests; pitfall traps, in leaf litter at seepage area, soil in hollow base of *Carya* sp. and under *Quercus* sp. log, and litter and soil at bases of *Pinus* sp., *Q. pagoda*, and standing dead *Quercus* sp. Sites 1, 2, 3, 4, 5, 8, 14, and 17. Common; 5 queens (dealate) and 47 workers pinned, 1 vial collection.

Tribe Attini

- Trachymyrmex septentrionalis* (McCook). In open areas and deciduous and mixed forests; pitfall traps; nests in soil on ravine slopes, open ridgetops with pines, clear cuts, power-line cuts, and at base of *Q. pagoda*. Sites 1, 3, 8, and 10. Common; 22 workers pinned, 6 vial collections.

Tribe Stenammini

- Stenamma foveolocephalum* Smith. On road cuts in mixed forest. Rare. No specimens were collected during this study, but it was recorded by DuBois and Davis (1998) as occurring in the Tombigbee National Forest.
- Stenamma meridionale* Smith. **New state record.** In deciduous and mixed forests; pitfall traps and litter at base of *P. taeda*; nests in soil under litter. Sites 2, 3, 4, 5, and 9. Uncommon; 2 queens (dealate) and 40 workers pinned.

Tribe Solenopsidini

- Monomorium minimum* (Buckley). In mixed forests (with little understory); at tuna bait near roadside, cookie bait on *Q. pagoda*, and in soil and leaf litter in seepage area;

nests under bark of dead *Pinus* sp. and *Q. pagoda*, in soil on roadsides and in low areas, in litter in mixed forest, and in culms of Johnson grass (*Sorghum halepense*) on open ridge. Sites 4, 6, 7, 8, 9, 12, 16, and 19. Very common; 1 queen (dealate) and 28 workers pinned, 4 vial collections.

Solenopsis invicta × *richteri*. On roadsides and in open areas in deciduous and mixed forests; pitfall traps, at tuna bait on ridge, at cookie bait on trunk and in soil at base of *Q. pagoda*, and tending aphids on grass stems; nests in rotting logs and in ground along roadsides and other open areas throughout the National Forest. Sites 1, 4, 6, 8, 9, 12, 18, 19. Very common; 1 dealate queen, 23 major workers, and 36 minor workers pinned, 5 vial collections.

Solenopsis sp. cf. *molesta* (Say). In deciduous and mixed forests; pitfall traps, in soil in open areas, in hollow stump, in sand and litter by creek, in soil and litter at bases of *F. grandifolia*, *P. taeda*, and *Q. pagoda*, and under bark of *Q. pagoda*; small nests in soil under leaf litter and rotting logs, and in rotting nuts of *C. glabra*. Sites 1, 2, 3, 4, 5, 8, 9, 13, 14, 16, and 17. Very common; 2 queens (dealate) and 37 workers pinned, 67 vial collections. (Note there is some question whether or not this species is actually *S. molesta*. Identification in this species group is difficult as this group is in drastic need of revision).

Tribe Myrmicini

Myrmica punctiventris Roger. **New state record.** In deciduous and mixed forests; pitfall traps, at base of *F. grandifolia* in seepage area, and under rotting log at ravine bottom. Sites 1, 4, 5, and 6. Uncommon; 36 workers pinned.

Tribe Pheidolini

Aphaenogaster sp. cf. *carolinensis* Wheeler. In deciduous and mixed forests; pitfall traps, in soil and litter on ridges, in seepage area, and at base of *Q. pagoda*; nests in soil and under rotting logs. Sites 1, 2, 3, 4, 5, 7, 8, 13, 16, and 17. Very common; 5 queens (dealate) and 70 workers pinned, 68 vial collections. This species is in the very difficult *A. fulva-texana-rudis* complex and is very similar morphologically to the form *Aphaenogaster* N19 proposed by Umphrey (1996). It is possible that there is a mix of the two forms included here.

Aphaenogaster fulva Roger. In deciduous and mixed forests; pitfall traps, in litter near seep, soil and litter in hollow base of *Carya* sp. and at base of dead *Quercus* sp., and in *Pinus* sp. log; nests in rotting logs, hollow stumps, and in soil at bases of trees and under logs. Sites 1, 2, 3, 4, 5, 8, 9, 13, 17, and 18. Very common; 5 queens (3 dealate, 2 alate), 3 males, and 74 workers pinned, 43 vial collections.

Aphaenogaster lamellidens Mayr. In deciduous and mixed forests; pitfall traps, in soil at the bases of dead and live trees and under rotting *Quercus* sp. log, and under bark of dead area of live *Q. pagoda*; nests in rotting logs and in standing dead *Pinus* sp. and other trees. Sites 3, 4, 5, 7, 8, 17, and 18. Very common; 23 workers pinned, 12 vial collections.

Aphaenogaster mariae Forel. In deciduous and mixed forests; pitfall trap, at peanut butter on *Q. pagoda* and *Q. velutina*, and in soil at bases of *F. grandifolia* and *Q. pagoda*; nest in dead hardwood tree. Queens in soil were near colonies of *A. fulva*. Sites 2, 5, 8, and 9. Uncommon; 4 queens (dealate) and 62 workers pinned; 1 vial collection.

- Aphaenogaster treatae* Forel. In mixed forest; nest in soil at edge of trail on ridge. Site 5. Uncommon; 9 workers pinned.
- Pheidole bicarinata* Mayr. In mixed forest; at cookie bait in open area on ridge, under litter on ravine slope, and soil and litter at base of *Q. pagoda*; nests in ground at edges of roadsides and open areas. Sites 5, 7, 8, 9, 16, and 18. Very common; 16 major workers and 55 minor workers pinned, 1 vial collection.
- Pheidole dentata* Mayr. In deciduous and mixed forests; pitfall traps, crawling on shrubs, and in soil and litter at base of *Quercus* sp.; nests in *P. taeda* log suspended above ground, in and under rotting logs on ground, and in soil at base of *Q. pagoda*. Sites 1, 2, 3, 4, 5, 8, 10, 16, and 17. Very common; 5 queens (alate), 6 major workers, and 43 minor workers pinned, 28 vial collections.
- Pheidole dentigula* Smith. In deciduous and mixed forests; pitfall traps, in soil and leaf litter near seepage area, and under rotting *Pinus* sp. and other logs; nests in soil under leaf litter and at base of *Q. pagoda*. Sites 1, 2, 3, 4, 5, 8, 13, 14, 16, and 17. Very common; 5 queens (dealate), 18 major workers and 109 minor workers pinned, 15 vial collections.
- Pheidole metallescens* Emery. In mixed forest and power-line cut; crawling on ground; nest in sandy soil in open area on ridge. Sites 7 and 18. Uncommon; 4 major workers and 6 minor workers pinned, 1 vial collection.
- Pheidole tetra* Creighton. **New state record.** In mixed forest; nests in sandy soil under litter at edges of open areas on ridges. Sites 8 and 18. Uncommon; 17 major workers and 24 minor workers pinned, 1 vial collection with 17 major workers and 96 minor workers.
- Pheidole tysoni* Forel. In open areas and deciduous and mixed forests; pitfall traps, in soil and litter at base of *Q. pagoda*, and in open fields; nest in soil under litter on dirt pile. Sites 1, 2, and 8. Uncommon; 8 major workers and 47 minor workers pinned, 7 vial collections.

Tribe Crematogastrini

- Crematogaster (Crematogaster) ashmeadi* Mayr. In deciduous and mixed forests; pitfall traps, in litter, crawling on trees and shrubs, and on dead *Pinus* sp. Sites 1, 3, 4, 5, and 9. Common; 27 workers pinned.
- Crematogaster (Crematogaster) lineolata* (Say). In deciduous and mixed forests; pitfall traps, at tuna, cookie, and hotdog baits on ground, crawling on dead trees, and in soil and litter at bases of *P. taeda* and *Q. pagoda*; nests in soil under litter and in nuts of *C. glabra*. Sites 3, 5, 8, 9, and 17. Very common; 45 workers pinned, 17 vial collections.
- Crematogaster (Crematogaster) pilosa* Emery. In mixed forest; in hollow stems of *Vernonia gigantea* (Walt.) Trel. (Asteraceae) on ridge and on foliage of trees and shrubs at spring seep. Sites 4 and 6. Common; 12 workers pinned, 2 vial collections.
- Crematogaster (Orthocrema) minutissima* Mayr. In deciduous and mixed forests; pitfall traps and beating standing dead *Carya* sp.; nests in nuts of *C. glabra* and in soil under dead *Pinus* sp. Sites 3, 5, 14, and 17. Very common; 7 workers pinned, 4 vial collections.

Tribe Formicoxenini

- Temnothorax curvispinosus* (Mayr). In deciduous and mixed forests; pitfall traps, in soil and leaf litter at base of *P. taeda* and *Q. pagoda*, and on foliage of trees and shrubs;

nests in nuts of *C. glabra*. Sites 1, 2, 3, 4, 5, 7, and 8. Very common; 1 queen (dealate) and 32 workers pinned, 9 vial collections.

Temnothorax pergandei (Emery). In deciduous and mixed forests; nests in soil under leaf litter on ridgetop trail and in nuts of *C. glabra*. Sites 5 and 8. Uncommon; 16 workers pinned, 2 vial collections.

Temnothorax schaumii (Roger). In deciduous forest and mixed forests; pitfall trap and at peanut butter bait on *Q. pagoda*. Sites 2 and 8. Rare; 9 workers pinned.

Temnothorax tuscaloosae Wilson. **New state record.** At peanut butter bait on the ground in hardwood forest near creek. This species was not collected during this study, but was collected later on 5 September 2005 by Tim Menzel in Choctaw County at 89°07'39"W 33°12'46"W. Rare; 1 worker pinned.

Tribe Myrmecini

Myrmecina americana Emery. In deciduous and mixed forests; pitfall traps, leaf litter in seepage area, soil under rotting logs, sand and litter by creek, and litter at bases of *Nyssa sylvatica*, *P. taeda*, and *Q. pagoda*; nests in soil and litter. Sites 3, 4, 5, 8, 9, 13, 14, 16, and 17. Very common; 16 queens (dealate) and 63 workers pinned, 4 vial collections.

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Appendix 1. Sites and dates of ant collections in Tombigbee National Forest.

County	Site name	Latitude/Longitude	Site #	Collecting dates
Winston	HWY 25 Site	33°10'20"N 89°03'55"W	1	15 Mar 1999–6 Mar 2000
Winston	Poplar Flat Rd.	33°11'50"N 89°03'20"W	2	15 Mar 1999–6 Mar 2000
Winston	Little Rock Cemetery	33°13'01"N 89°05'42"W	3	15 Mar 1999–6 Mar 2000, 23 May 2002, 13 Aug 2002, 20 Mar 2003, 26 June 2003, 15 July 2003
Winston	Spring Seep	33°15'18"N 89°05'29"W	4	10 Aug 1999, 20 Mar 2003, 29 Apr 2003, 26 June 2003
Winston	Tanksley Cemetery	33°12'53"N 89°06'10"W	5	15 April 2003, 15 July 2003, 26 Sept 2003, 13 Oct 2003, 21 Oct 2003, 21 Nov 2003
Winston	Rock Crusher Rd.	33°14'19"N 89°05'58"W	6	20 Mar 2003, 26 June 2003, 15 July 2003
Winston	Power line cut on Webster Rd.	33°15'15"N 89°06'21"W	7	20 Mar 2003
Winston	Noxubee Hill Cemetery	33°12'30"N 89°04'32"W	8	23 May 2002, 10 July 2003, 15 July 2003, 13 Oct 2003, 21 Oct 2003, 11 Nov 2003, 21 Nov 2003
Winston	Storm cut on Sheep Ranch Rd.	33°12'20"N 89°04'18"W	9	28 Mar 2003, 15 Apr 2003
Winston	Sheep Ranch Rd., bike trail	33°13'03"N 89°06'35"W	10	13 Aug 2002
Winston	Pigeon Roost & Webster Rd., near Crk.	33°15'11"N 89°05'38"W	11	20 Mar 2003
Choctaw	Choctaw Lake	33°16'23"N 89°08'38"W	12	29 June 2003
Choctaw	Choctaw site1 on Sheep Ranch	33°13'42"N 89°07'58"W	13	10 July 2003
Choctaw	Choctaw site 2 on Sheep Ranch Rd.	33°13'29"N 89°07'22"W	14	10 July 2003
Winston	Power-line cut on Sheep Ranch Rd.	33°12'55"N 89°06'24"W	15	10 July 2003
Winston	Gated road off Sheep Ranch Rd & opposite Tanksley Site	33°12'43"N 89°06'12"W	16	11 Sept 2003
Choctaw	Choctaw site 3 on Sheep Ranch Rd.	33°13'47"N 89°08'07"W	17	11 Sept 2003
Choctaw	Turner Cemetery	33°13'34"N 89°08'36"W	18	11 Sept 2003, 26 Sept 2003
Choctaw	Clear cut on Sheep ranch	33°13'03"N 89°06'36"W	19	26 Sept 2003
Winston	Site on Hwy 25	33°16'05"N 89°06'01"W	20	8 July 1999
Winston	Bog Site	33°10'31"N 89°02'38"W	21	2 Aug 1999

Appendix 2. Number of individuals of ant species collected in pitfall traps in Tombigbee National Forest and relative abundance as indicated by percent of total individuals for each of the three sites 1, 2, and 3, and for all three sites combined.

Species	No. ants site 1	% ants site 1	No. ants site 2	% ants site 2	No. ants site 3	% ants site 3	No. ants all sites	% ants all sites
<i>Amblyopone pallipes</i>	0	0%	0	0%	2	0.07%	2	0.03%
<i>Aphaenogaster fulva</i>	197	8%	19	1.51%	15	0.52%	231	3.59%
<i>Aphaenogaster lamellidens</i>	0	0%	0	0%	3	0.10%	3	0.05%
<i>Aphaenogaster mariae</i>	0	0%	1	0.08%	0	0%	1	0.02%
<i>Aphaenogaster</i> sp. cf. <i>carolinensis</i>	163	7.71%	29	2.30%	209	7.30%	401	6.23%
<i>Aphaenogaster</i> sp. male	1	0.04%	0	0%	0	0%	1	0.02%
<i>Brachymyrmex depilis</i>	16	0.69%	4	0.32%	27	0.94%	47	0.73%
<i>Camponotus americanus</i>	93	4.01%	110	8.76%	371	12.95%	574	8.91%
<i>Camponotus castaneus</i>	63	2.71%	104	8.29%	60	2.09%	227	3.52%
<i>Camponotus chromatodes</i>	93	4.01%	155	12.35%	653	22.80%	901	13.99%
<i>Camponotus discolor</i>	0	0%	0	0%	1	0.03%	1	0.02%
<i>Camponotus pennsylvanicus</i>	238	10.25%	74	5.90%	216	7.54%	528	8.20%
<i>Camponotus subbarbatus</i>	0	0%	1	0.08%	126	4.40%	127	1.99%
<i>Crematogaster ashmeadi</i>	8	0.34%	0	0%	2	0.07%	10	0.16%
<i>Crematogaster lineolata</i>	0	0%	0	0%	10	0.35%	10	0.16%
<i>Crematogaster minutissima</i>	0	0%	0	0%	1	0.03%	1	0.02%
<i>Formica pallidefulva</i>	0	0%	0	0%	30	1.05%	30	0.47%
<i>Formica subsericea</i>	2	0.09%	20	1.75%	10	0.35%	32	0.50%
<i>Hypoponera opacior</i>	7	0.30%	5	0.40%	1	0.03%	13	0.20%
<i>Myrmecina americana</i>	0	0%	0	0%	14	0.49%	14	0.22%
<i>Myrmica punctiventris</i>	27	1.16%	0	0%	0	0%	27	0.42%
<i>Paratrechina faissonensis</i>	24	1.03%	116	9.24%	67	2.34%	207	3.21%
<i>Pheidole dentata</i>	321	13.83%	22	1.75%	28	0.98%	371	5.76%
<i>Pheidole dentigula</i>	20	0.86%	58	4.62%	13	0.45%	91	1.41%
<i>Pheidole tysoni</i>	93	4.01%	4	0.32%	0	0%	97	1.50%
<i>Ponera pennsylvanica</i>	2	0.09%	9	0.72%	11	0.38%	22	0.34%
<i>Prenolepis imparis</i>	816	35.16%	308	24.52%	900	31.42%	2024	31.43%
<i>Pyramica ohioensis</i>	1	0%	1	0.08%	0	0%	2	0.02%
<i>Pyramica ornata</i>	0	0%	0	0%	1	0.03%	1	0.02%
<i>Pyramica rostrata</i>	3	0.13%	5	0.40%	0	0%	8	0.12%
<i>Pyramica talpa</i>	0	0.04%	1	0.08%	0	0%	1	0.03%
<i>Solenopsis invicta</i> × <i>richteri</i>	1	0.04%	0	0%	0	0%	1	0.02%
<i>Solenopsis</i> sp. cf. <i>molesta</i>	101	4.35%	188	14.98%	70	2.44%	359	5.57%
<i>Stenamma meridionale</i>	0	0%	4	0.32%	16	0.52%	20	0.31%
<i>Strumigenys louisianae</i>	9	0.39%	7	0.56%	3	0.10%	19	0.30%
<i>Temnothorax curvispinosus</i>	2	0.09%	3	0.24%	2	0.07%	7	0.11%
<i>Temnothorax schaumii</i>	0	0%	2	0.16%	0	0%	2	0.03%
<i>Trachymyrmex septentrionalis</i>	17	0.73%	0	0%	0	0%	17	0.26%
undetermined Formicidae (winged)	2	0.09%	5	0.40%	2	0.07%	9	0.14%
Total ants	2320		1255		2864		6439	