

# The Status of the Ant *Leptothorax pergandei* Emery (Hymenoptera: Formicidae)

by

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## ABSTRACT

A single, highly variable species *Leptothorax pergandei* Mayr, is recognized in the subgenus *Dichothorax*. *Leptothorax floridanus* Emery is synonymized under *L. pergandei*. Workers may be distinguished from others in the genus *Leptothorax* in that the region surrounding the mesopropodeal suture is strongly depressed. The reproductives can be separated from many other *Leptothorax* spp. as the wing venation is reduced and the wing does not have a marginal or discoidal cell. This species appears to show affinities with the ant genus *Stenamma*. The species is distributed throughout eastern United States at least as far west as Nebraska, Kansas, Oklahoma and Texas, and south into the state of Nuevo León, México.

## INTRODUCTION

*Leptothorax pergandei* Emery is the sole known member of the subgenus *Dichothorax* Emery. It is considered a member of *Leptothorax* Mayr, although the workers are quite different from other members of the genus. The females and males are similar to those of other species of *Leptothorax*, suggesting it could be a species of *Leptothorax* with somewhat aberrant workers. On the other hand, the sexual forms, together with the workers, may be distinct enough that this form should be recognized as a member of a separate genus. The closest affinities of the subgenus *Dichothorax* are Palearctic species, especially *L. schaufussi* Forel, in which the structure of the mesosoma is almost identical.

I conclude that there is a single, variable species in *Dichothorax* in North America. Further treatment of *Leptothorax* will probably include European species in *Dichothorax* or may recognize this North American species as belonging to a European taxon.

## METHODS AND MATERIALS

Specimens were obtained from the following institutions through the assistance of the curators indicated (abbreviations from Arnett & Samuelson, 1986):

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AMNH American Museum of Natural History, Marjorie Favreau.  
 CASC California Academy of Sciences, Wojciech Pulawski, Darrell Ubick and Vincent Lee.  
 CAFQ Collection of André Francoeur.  
 CJTU Collection of James Trager.  
 CMDU Collection of Mark DuBois.  
 CUCC Clemson University, Michael Heyn.  
 CWEM Collection of William and Emma MacKay.  
 DEFW University of Minnesota, Philip Clausen.  
 DEUN University of Nebraska, Brett Ratcliffe.  
 ESUW University of Wyoming, Jeffrey Burne.  
 FMNH Field Museum of Natural History, Cynthia Salvino.  
 FSCA Florida State Collection of Arthropods, Lionel Stange.  
 INHS Illinois Natural History Survey, Kathryn McGiffen.  
 ISUI Iowa State University, Robert Lewis.  
 MCZC Museum of Comparative Zoology, Stefan Cover.  
 MVIC Mississippi State University, Richard Brown, Terence Lee Schiefer.  
 NCSU North Carolina State University, Robert Blin.  
 PSUC Pennsylvania State University, Frost Museum, Thomas Miller.  
 SIVC Southern Illinois University, J. E. McPherson.  
 USNM United States National Museum, Smithsonian Institution, David Smith.

Specimens were measured using an ocular micrometer in a dissection microscope. The following abbreviations are used (all measurements in mm):

HL Head length (maximum), anterior of median lobe of clypeus to vertex.

HW Head width, maximum excluding eyes.

EL Eye length, maximum dimension in lateral view.

SL Scape length, excluding basal condyle.

WL Weber's length, anterior border of pronotum to posterior border of lobe of metapleural gland.

PW Maximum width of petiole.

PPW Maximum width of postpetiole.

CI Cephalic Index,  $HW/HL \times 100$

OI Ocular index,  $EL/HL \times 100$ .

SI Scape index,  $SL/HL \times 100$ .

Characters used in statistical analysis include HL, sculpture of pronotum, sculpture of metapleural region, length of propodeal spines, shape of node of petiole, length of ventral tooth on anterior peduncle of petiole, width of node of postpetiole, color, latitude and longitude of collection site (degrees converted to decimal equivalents). Size related characters were highly correlated and therefore of lesser importance in statistical analysis. I was unable to use discriminate analysis as the most of the characters were bimodally distributed (pronotum sculptured or not, propodeal spines short or long, peduncular tooth short or long, color yellow or brown) and none were normally distributed (Kolmogorov-Smirnov one sample test). Color and shape of the node of the petiole were coded (from yellow = 1 to dark brown = 5; 2 = sharp node, 5 = rounded). Individuals used in statistical analysis were chosen to represent the

extremes in the character states.

*Leptothorax (Dichothorax) pergandei* Emery

Figs. 1 - 8

*Leptothorax (Dichothorax) pergandei* Emery 1895: 318, 323-324, worker, female, male, USA: Washington, D.C. (AMNH, USNM) [seen]. Wheeler, 1903: 256; Smith 1929:549.

*Leptothorax (Dichothorax) floridanus* Emery 1895:324, worker, USA: Florida (USNM) [seen], **new synonymy**. Wheeler 1903:259.

*Leptothorax (Dichothorax) pergandei* var. *flavus* M. R. Smith 1929: 549, worker, female, (CASC, USNM) [seen], synonymy by Creighton 1950: 260.

*Leptothorax (Dichothorax) pergandei floridanus* var. *spinosus* M. R. Smith 1929: 551 worker (types apparently lost), synonymy by Creighton 1950: 260.

*Leptothorax (Dichothorax) manni* Wesson 1935: 208, worker, female, male [not seen], synonymy by Wesson 1939:180.

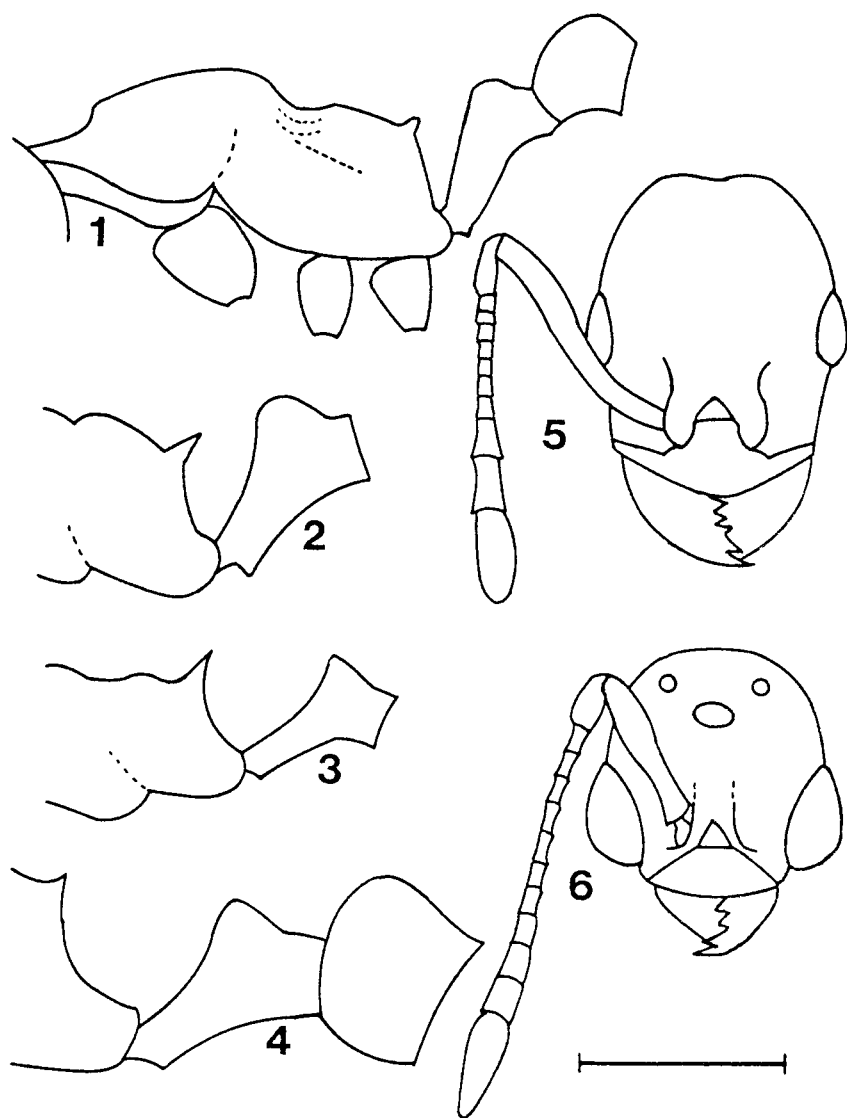
**Description.**

**WORKER.** HL 0.65 - 0.91, HW 0.54 - 0.71, EL 0.14 - 0.19, SL 0.54 - 0.71, WL 0.99 - 1.03, PW 0.19 - 0.26, PPW 0.23 - 0.33, CI 74 - 88, OI 18 - 25, SI 71 - 95.

Mandible striate with 5 or 6 teeth, apical and usually preapical teeth longer and more developed than other teeth (Fig. 5); clypeus with 12 - 14 parallel carinae, median carina well developed; head with dorsum ranging from almost smooth to lightly punctate; antenna with 12 segments; pronotum finely punctate; pronotum and mesonotum convex; mesopleuron and metapleuron striate or rugose, with punctate sculpture; mesosoma strongly impressed at mesopropodeal suture (Fig. 1); basal face of propodeum usually convex (but somewhat flattened in cotype series, USNM, Fig. 1); propodeal spines ranging from small angles (Fig. 1) to spines 0.1mm long (Fig. 2); petiole usually rounded (in profile) with well developed node (Figs. 1 & 2), or angular with node either flattened or with median concave impression and pointed lateral angles (posterior view); anterior peduncle very long (Figs. 1 - 3) with ventral tooth ranging in length from 0.01 - 0.04mm; gaster mostly smooth and shining. Erect hairs present over entire body surface, length on dorsum of head 0.07 - 0.14mm, hairs on scapes and tibiae 0.06mm long, decumbent, suberect or completely erect. Concolorous, ranging from pale yellow to dark brown.

**FEMALE.** HL 0.83 - 0.89, HW 0.76 - 0.80, EL 0.23 - 0.25, SL 0.68 - 0.70, WL 1.41 - 1.45, PW 0.30, PPW 0.41 - 0.44, CI 90 - 92, OI 25 - 30, SI 76 - 85.

As in worker except as follows: dorsum of head striate to rugose with punctures in interrugal spaces; 3 well developed ocelli; pronotum shining; mesoscutum and scutellum somewhat shining, but slightly shagreened; parapsidal sutures present, but not obvious; metapleural region and propode-

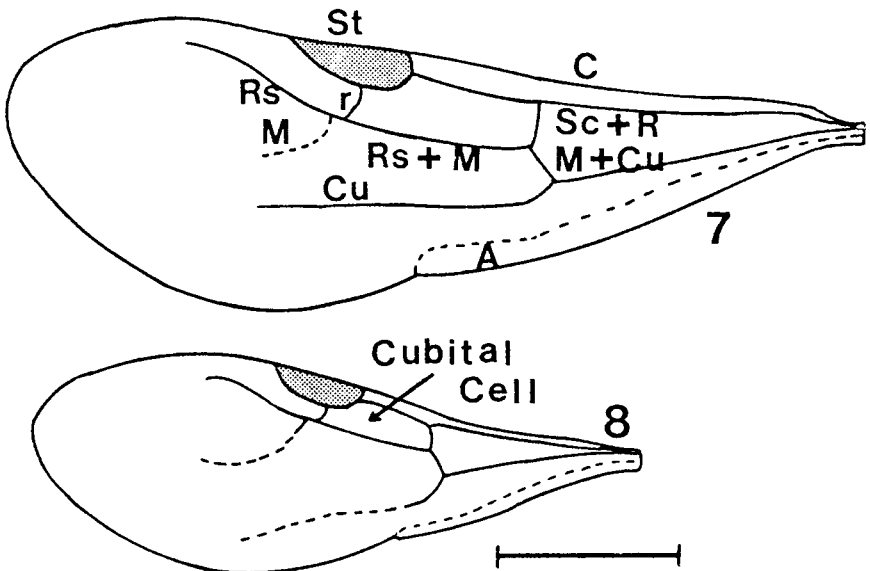


Figs. 1-6. *Leptothorax pergandei*, all drawn to same scale, which is 0.5 mm long. Fig. 1, lateral view of the mesosoma, petiole and postpetiole of the lectotype of *Leptothorax pergandei* Mayr worker (USNM). Fig. 2, lateral view of propodeum and petiole of the *L. flavus* lectotype (USNM). Fig. 3, lateral view of propodeum of *L. pergandei* worker from Bernham, NC (CASC) which is somewhat intermediate between *L. pergandei* and *L. floridanus*. Fig. 4, lateral view of propodeum and petiole of a female from Elkader, IA (USNM). Fig. 5, frontal view of the head of a cotype *L. pergandei* worker (USNM). Fig. 6, frontal view of head of male *L. pergandei* male from Elkador, IA (USNM).

um rugose and punctate; propodeal armature ranging from angles to small spines (Fig. 4); anterior peduncle of petiole long, with small ventral flange; shape of node of petiole variable as in worker, but usually somewhat more angulate; gaster predominantly smooth and shining. Hairs and color similar to those of worker. Wing venation somewhat reduced (Fig. 7) when compared to many other members of the genus *Leptothorax*. Specifically marginal and discoidal cells absent; cubital cell well developed and elongate; stigma well developed.

MALE. HL 0.46 - 0.58, HW 0.41 - 0.44, EL 0.24, SL 0.28 - 0.38, WL 1.08 - 1.30, PW 0.18, PPW 0.26 - 0.29, CI 76 - 89, OI 41 - 51, SI 59 - 65.

Mandible striate with 4 teeth, apical tooth well developed, basal teeth smaller (Fig. 6); clypeus convex with poorly developed medial carina; dorsum of head punctate with some striae; eyes very large (Fig. 6); ocelli well developed; antenna with 13 segments, first segment of funiculus enlarged and about twice as wide as second segment (Fig. 6); pronotum punctate; mesoscutum smooth and shining, parapsidal sutures present but not obvious; scutellum strongly punctate; metapleuron and propodeum somewhat rugose; anterior peduncle of petiole long, node of petiole low in height and poorly developed; gaster smooth and shining. Erect hairs present on entire body surface, those on scapes and tibiae suberect. Concolorous dark brown. Wing



Figs. 7, 8. Left forewings of *Leptothorax pergandei* reproductives from El Salvador, IA (USNM). Both drawn to same scale, which = 1 mm. Fig. 7. Female. Fig. 8. Male. A = anal, C = costal, Cu = cubital, M = median, r = second radial crossvein (first is absent), R = radial, Rs = radial sector, Sc = subcostal, St = stigma (wing venation based on Brown & Nutting, 1950).

venation very similar to that of female (Fig. 8).

**Distribution:** UNITED STATES: eastern half west to Nebraska, Kansas, Oklahoma and Texas; MEXICO: Nuevo León (Fig. 9). Records (followed by collector and institution) include ARKANSAS: Hot Springs (Read USNM), 16 K W Crossett (MacKay CWEM); FLORIDA: Gainesville (Van Pelt AMNH), Archibald Biological Station (Trager, Deyrup CWEM), Lake Placid, 8 mi. S Archibald Biological Station (Deyrup CWEM), Ocala Nat. Forest (CWEM), Putnam Co. (Van Pelt FSCA), 7.4 mi. S Narcoossee (Woodruff FSCA), 20 mi. E. Ocala (Trager, CWEM), Florida (no locality) (one cotype worker of *L. floridanus* USNM); GEORGIA: Athens (Decolles USNM); ILLINOIS: Fountain Bluff (Frison, Ross & Mohr INHS); IOWA: Boone Co. (Buren ISUI), Elkader (Buren USNM); KANSAS: Chase Co., State Lake, (DuBois CMDU), Clay Co., Milford Reservoir (DuBois CMDU), Douglas Co., New Lake (DuBois CMDU), Johnson Co., New Lake Olathe (DuBois CMDU), Labette Co., Big Hill Reservoir (DuBois CMDU), Marion Co., Florence (DuBois CMDU), Marshall Co., Alcove Springs (DuBois CMDU), Morris Co., Council Grove Reservoir (DuBois CMDU), Morton Co., 9.7 K W K-27 hwy at Cimarron River (DuBois CMDU), Russell Co., Wilson Reservoir Overlook (DuBois CMDU), Shawnee Co. State Lake (DuBois CMDU), Wilson Co., 3.2 K E Coyville (DuBois CMDU)

Distribution of *Leptothorax pergandei*  
in North America.

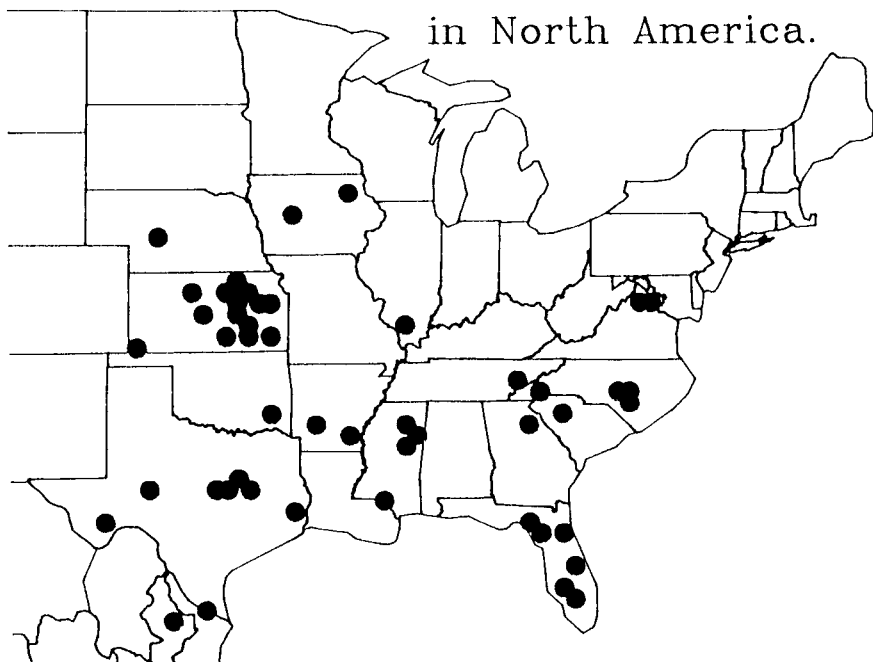


Fig. 9. The distribution of *D. pergandei* in North America.

(all previous records in Kansas provided by Mark DuBois), Woodson Co., State Lake (DuBois CWEM); LOUISIANA: Slidell (Brown PSUC); MISSISSIPPI: Ackerman (FMNH), Adaton (Smith, 9 cotype workers of *L. flavus*, CASC [3], USNM [6]), Longview (Smith FMNH, MVIC), Starkville (Smith DEFW, FMNH, MVIC), 4 K NE Starkville (MacKay CWEM); NEBRASKA: Lincoln (DEUN); NORTH CAROLINA: Burgaw (Wray CASC), Faisons (Forel AMNH), Faisons, Reedy Branch (SIVC), Morgantown (Forel AMNH), Raleigh (Young NCSU), Onslow Co. (Cornell NCSU); OKLAHOMA: Nashoba (Nailon USNM), Osage Co. IBP Site (Blocker & Reed ESUW); SOUTH CAROLINA: Clemson (Smith CUCC, FMNH), Landrum (Read CUCC); TENNESSEE: Montvale (Kennedy USNM); TEXAS: Austin (Wheeler AMNH), 1.6 K E Bastrop (DuBois CMDU), 4 K N Kurten (MacKay CWEM), Brazos Co., Deer Lick Park, (MacKay CWEM), 2.6 K W La Feria (MacKay CWEM), 18.7 K NW Sour Lake (Lewis CWEM), San Angelo (Wheeler AMNH), Toronto Creek (Wheeler AMNH); VIRGINIA: Vienna (Ross CASC, Bridwell CASC); WASHINGTON DC: Washington (9 cotype workers of *L. pergandei*, USNM [7], AMNH [2]). MEXICO: Nuevo León, 146 K N Monterrey (MacKay CWEM).

*Material examined*: 479 workers, 11 females and 39 males, including cotypes of *L. pergandei* (USNM, AMNH), *L. pergandei flavus* (USNM, CASC), and *D. floridanus* (USNM). Lectotypes of each of these 3 taxa are designated and deposited in the USNM. Types of *L. pergandei floridanus* var. *spinosus* could not be located and are presumed lost.

*Biology*: (Based primarily on Smith 1931; Dennis 1938; Van Pelt 1958, DuBois 1985 and unpublished field notes.) This species nests in stumps, logs, nutshells and in the soil. It is widely distributed and is usually found in plant associations on higher, dry sites, but also nests in low, flat woods and low hummocks, but also occurs in shaded deciduous forests or shaded prairie sites. It is active above ground throughout the year in Florida. Nests contain 36 or more workers (Trager, pers. comm.) and are monogynous. Reproductives were collected in nests throughout the year, specifically on April 25, 1902 (Wheeler AMNH), June 23, 1941 (Buren USNM), November 18, 1932 (DeRead USNM) and December 4, 1928 (Smith MVIC). A flight occurred in Raleigh, NC on June 26, 1969 (specimens in NCSU).

## DISCUSSION

This is a highly variable species, especially with regards to color, pilosity, sculpture, size and shape of the propodeal spines and shape of the petiolar node. Creighton (1950) recognized 2 subspecies, *floridanus* with longer propodeal spines and a well formed, rounded petiolar node, and *pergandei* with very short propodeal spines and a lower, truncate petiolar node which is often concave in the center. The differences between these forms are trivial and integrades appear throughout the range of the species (Fig. 10). Dark

specimens (e.g. E, D, K, S, V on Fig. 10) often have long spines. The shape of the node varies from sharp to completely round (in profile). One series (6 specimens) captured from a pitcher plant at Burgaw, Pender Co. NC (CASC), shows almost the entire range of variability in shape of the node (Specimens E, U, and V on Fig. 10). The specimens are obviously sympatric and cannot represent two subspecies and probably came from the same nest. Specimens of all three "subspecies" have been collected near Starkville, MS, also occurring sympatrically (specimens J, K, L, and M on Fig. 10). The cotypes of *L. pergandei* and *L. floridanus* are surprisingly similar (specimens A, B and D on Fig. 10). The cotypes of *Leptothorax pergandei flavus* are lighter in color, have longer propodeal spines and somewhat more rounded petiolar nodes (specimen C on Fig. 10). Many other *L. pergandei* that I have seen have a much more angulate node than those of the type series (Fig. 3). There is considerable variation in the shape of the petiolar node in females and males. A series of 5 females and 35 males from Raleigh, NC (NCSU) shows variation

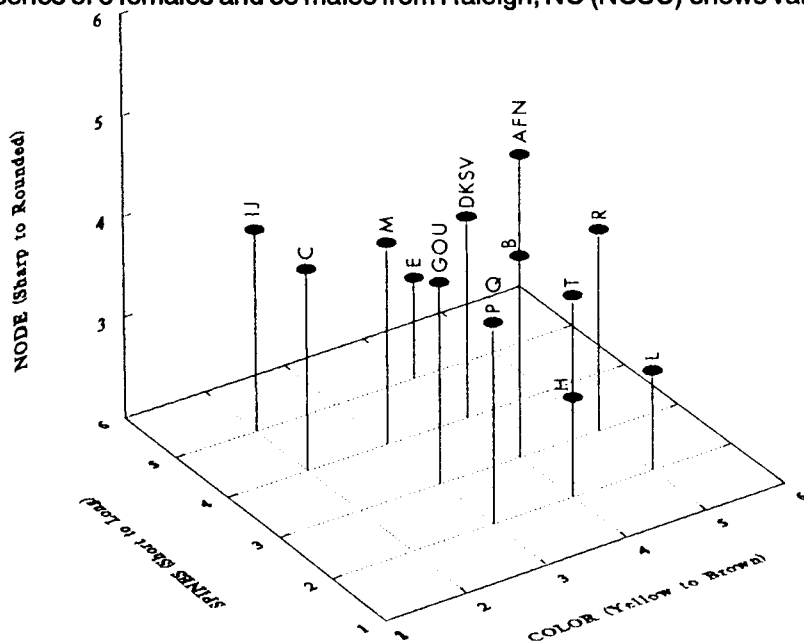


Fig. 10. A 3-dimensional scatterplot of the relationships of shape of node, length of propodeal spines and color of 22 specimens of *L. pergandei*. Localities and institutions are as follows: A. Washington, D. C. (cotype of *L. pergandei* USNM); B. Washington, D. C. (lectotype of *L. pergandei* USNM); C. (lectotype of *L. pergandei flavus*, USNM); D. FL (sin loc., lectotype of *L. pergandei floridanus*, USNM); E. Burgaw, NC (CASC); F. Fountain Bluff, IL (INHS); G. Faisons, NC (AMNH); H. San Angelo, TX (AMNH); I. Longview, MS (MVIC); J. Adatum, MS (MVIC); K. Starkville, MS (MVIC); L, M. 4 K NE Starkville, MS (CWEM); N. Woodson Co. KS (CWEM); O. Highlands Co. FL (CWEM); P. Lake Placid, FL (CWEM); Q. Archibald Field Station, FL (CWEM); R. Gainesville FI (USNM); S. Putnam Co., FL (CWEM); T. Cameron Co. TX (CWEM); U, V. Burgaw, NC (CASC).



from a strongly angulate node to a completely rounded node. The bimodal distribution of many of the characters suggested two separate taxa, but statistical analysis of the data shows no correlations in any of the character states (Table 1). There are no significant geographical patterns (Fig. 10). Therefore, although the extremes in the ranges of characters are quite different, there is no correlation between any of the characters, and there is but a single species which shows considerable morphological variability, especially in the length of the propodeal spines, shape of the petiole and color. The existence of separate subspecies is not possible due to sympatry of different forms in at least two localities. If different species were to be recognized, they would have to be defined on the basis of a single variable character (color) or other as yet undiscovered characters (possibly biochemical or genetic).

The determination of the affinities of this ant are difficult. It is not closely related to any of the other North American species of *Leptothorax* and can

Table 1. Pearson correlation matrix of character states with Bonferroni probabilities in parentheses.

Character States	HL	Pron.	Meta.	Spin.	Node	Tooth	PPW	Color	Lat.	Long.
Head Length	1.00									
Pronotum	0.64 (0.17)	1.00								
Metapleural Region	-0.00 (1.00)	0.35 (1.00)	1.00							
Spines	0.58 (0.54)	0.17 (1.00)	-0.27 (1.00)	1.00						
Node	0.24 (1.00)	0.46 (1.00)	0.32 (1.00)	0.00 (1.00)	1.00					
Tooth	0.59 (0.46)	0.14 (1.00)	0.08 (1.00)	0.34 (1.00)	0.17 (1.00)	1.00				
Post Petiole Width	0.62 (0.27)	0.52 (1.00)	0.17 (1.00)	0.60 (0.38)	0.40 (1.00)	0.21 (1.00)	1.00			
Color	-0.34 (1.00)	-0.12 (1.00)	0.09 (1.00)	-0.49 (1.00)	-0.11 (1.00)	-0.39 (1.00)	-0.25 (1.00)	1.00		
Latitude	0.68 (0.08)	0.66 (0.13)	-0.05 (1.00)	0.31 (1.00)	0.25 (1.00)	0.08 (1.00)	0.54 (0.89)	0.05 (1.00)	1.00	
Longitude	-0.10 (1.00)	0.08 (1.00)	0.18 (1.00)	-0.24 (1.00)	-0.07 (1.00)	0.07 (1.00)	-0.26 (1.00)	-0.08 (1.00)	-0.12 (1.00)	1.00

easily be separated from them by the deep depression at the mesopropodeal suture. It seems to be most closely related to some of the European species, especially *L. schaufussi*. When the Palearctic species are carefully examined, some of them may be included in the subgenus *Dichothorax* and the group may be eventually recognized as a valid genus, or *L. pergandei* may be recognized as a member of an Old World taxon. *Leptothorax pergandei* may have affinities to *Stenamma*, based on similarities in the shape of the mesosoma and on the wing venation of the reproductives. Workers of *L. pergandei* are often misidentified as *Stenamma* spp. in collections. It can be easily distinguished from *Stenamma* spp. in that it has a very wide clypeus whereas species of *Stenamma* which are sympatric with *L. pergandei* have a very narrow clypeus. Some western species have a wider clypeus that is similar to that of *L. pergandei*.

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