A REVISION OF THE GENUS *Paratrechina* (HYMENOPTERA: FORMICIDAE) OF THE CONTINENTAL UNITED STATES

By

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Protection under the articles and appendices of the Code is hereby claimed for this dissertation.

I dedicate this study to the memory of Dr. William F. Buren, who first suggested the subject and gave me the initial nudging necessary to get it underway. It is my hope that this will constitute a suitable tribute to his contributions to ant taxonomy.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Abstract of Dissertation Presented to the Graduate School of the University of Florida in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

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The taxonomy of the ant genus *Paratrechina* in the contenental United States is revised. Identity of previously published taxa is determined, and the workers and males are redescribed. The workers and males of the new species *P. concinna*, *P. phantasma* and *P. wojciki* from the Southeast and *P. austroccidua* and *P. hystrix* from the Southwest are described. *P. fulva pubens*, *P. melanderi arenivaga* and *P. arenivaga faisonensis* are raised to full species. *P. parvula grandula* is transferred to *Conomyrma*. The establishment of *P. flavipes* of temperate eastern Asia, in Pennsylvania and New York, and of *P. guatemalensis* of the Caribbean region, in southern Florida, is reported for the first time. The synonomy of *P. kincaidi* with *P. vividula* and the sibling species relationship of *vividula* to *P. terricola* are

discussed as are the reasons for resurrecting Buckley's name *terricola* for the species described by Wheeler as *melanderi*. Biological and distributional data for each species are also presented. Keys are given for the workers and males of all species.

CHAPTER I
INTRODUCTION

Paratrechina is a common though often inconspicuous element of the ant faunas of almost all continental areas habitable by ants. Native species are lacking or nearly so from Europe (Brown, 1973) and colder temperate, Mediterranean climate and desert regions of other continents. The genus is most diverse in tropical Asia and Australia, which together have the greatest number of species groups, including one-third of the described forms (Emery, 1925). Based on my acquaintance with the New World forms, I estimate that perhaps three-fourths of the true number of species has been described. For the Old World tropics, the proportion may be much smaller.

A number of species have been transported by shipping activity to localities well beyond their places of origin. Some of these species have attained at least minor pest status through their invasion of nurseries, greenhouses, laboratories, insectaries, homes, and other buildings (Smith, 1965). Foremost among such species in the New World are longicornis, vividula, bourbonica, and members of the fulva group. Other species have been transported by man and become established in new localities, but the taxonomy of the genus

is so poorly known at present that it would be impossible to state with certainty which species are involved. Wilson and Taylor (1967) discussed the taxonomic difficulties in Paratrechina with special reference to Polynesia.

This study is the first attempt to monograph Paratrechina and constitutes Part I of a worldwide revision. I expect that this will lend a degree of clarity to a group for which the taxonomy "looks very much like a hopeless muddle" (Creighton, 1950). Apart from the purely academic interest in unravelling the taxonomic tangle of this difficult genus, it is hoped that the keys and descriptions will provide nursery and quarantine inspectors and other applied entomologists a means to readily identify the species of this frequently encountered genus.

In the next chapter, I review the nomenclatural history of Paratrechina and discuss what is known about its relationships to other ant genera. In the third chapter, I describe the methods and equipment used in examining the specimens studied and give a complete listing of abbreviations used in the text. In Chapter IV, I tentatively synonymize the subgenera of Paratrechina and give my reasons for doing so. In Chapter V, I describe the workers, males, and queens of Paratrechina at the generic level. Chapter VI contains a list of the U.S. species of Paratrechina and those introduced to the region, as well as their authors and known synonyms. Also in Chapter VI are keys to workers and

males of these species. Chapter VII establishes the format of the treatment of each species and includes my reasons for the use of the term "complex" for groups of related species. The remainder of the chapters contain the descriptions of the species of each complex. A brief diagnosis of the complex treated is at the beginning of each of these chapters.

CHAPTER II
NOMENCLATURAL HISTORY AND AFFINITIES

The name Paratrechina was first used in the combination P. currens Motschulsky (1863). The species name was not used for over sixty years, until Emery (1925) published his treatise on the formicine genera. In the interim, the great majority of species known today were described and were assigned to Prenolepis Mayr (1862), as was Formica longicornis Latreille (1802), the senior synonym of Motschulsky's species.

In 1906, Emery published a note, unusual for its time in that it truly made clear the identity of vividula and pointed out its probable place of origin and close relationship to terricola (melanderi), shown below to be its sibling species. More germane to the immediate discussion is that in his note, Emery erected the subgenera Prenolepis s.s., Euprenolepis and Nylanderia. The first two of these are today considered distinct genera. Euprenolepis is not in the scope of this paper. Prenolepis and Nylanderia are discussed presently.

Prenolepis s.s. was distinguished by Emery in that all castes lack erect pilosity on the scapes and tibiae and instead possess long, dense, oblique (i.e., subdecumbent)

pubescence on these segments. In workers, the mesothorax is extremely constricted, such that it is less than half as broad as the pronotum in dorsal view. The pronotum and propodeum are broad and globular, yielding in Prenolepis workers a "dumbell-shaped" mesosoma. Later, Emery (1925) separated Prenolepis s.s. as a full genus and added to its distinguishing features the placement of the eyes posterior to the middle of the head and the possession of cerci by the males. In North America, at least, the short scape of the males of Prenolepis (about equal to or less than length of head) and the size of the females (10 or more mm vs. 5 mm or less) further distinguish it from our species of Paratrechina.

Nylanderia was construed by Emery in 1906 to contain all of what are now called Paratrechina. In 1925, Emery established the genus Paratrechina with Paratrechina and Nylanderia as subgenera, containing longicornis and the remainder of the species, respectively. Wheeler (1936) elevated Nylanderia to generic level. Though Donisthorpe (1943) and Kempf (1972) followed this arrangement in major taxonomic publications, most other authors have used Emery's (1925) arrangement. Donisthorpe (1947) proposed a third subgenus, Paraparatrechina, to include his New Guinean species pallida. Brown (1973) and Snelling (1981) listed Nylanderia as a synonym of Paratrechina without discussion. The validity of the subgenera is discussed in Chapter V.

Paratrechina is said to be most closely related to Prenolepis, Pseudolasius, Lasius and Formica (Wilson, 1975)--to the last two certainly more distantly than to the first. Unfortunately, our knowledge of Pseudolasius is insufficient to state the degree of relation to Paratrechina. Future investigation should be directed toward reconstruction of the phylogeny of these apparently related genera and the rest of the Formicinae.

The relationship of Paratrechina and Prenolepis is clear. Together they form a monophyletic group. The larvae of these genera share a plump, dolichoderoid appearance, indistinct segmentation, lack of a "neck," and relatively few and short head hairs (G.C. and J. Wheeler, 1953, 1968). These last authors place the two genera in Forel's tribe Prenolepidini. (The larvae of Brachymyrmex appear related to the Prenolepidini, but other characters suggest differently and the larval similarities may be due to convergence.) Both prenolepidine genera have nude pupae, an unusual trait in Formicinae. In addition, the workers show similar reduced sculpture and restricted patterns of thoracic pilosity (and often of pubescence). The single-toothed male mandibles and 5- or 6-toothed female mandibles of the two are virtually indistinguishable, as is the structure of their proventriculi (Eisner, 1957). Workers of both groups have a reduced mesothorax, a trait much further developed in Prenolepis. Finally, both groups contain, with well-known exceptions, mostly smallish, soil or

litter-dwelling inhabitants of more or less undisturbed mesic areas. All known species in this pair of genera can readily be placed in one genus or the other.

CHAPTER III
METHODS, MEASUREMENTS AND ABBREVIATIONS

About one-third of the specimens studied were collected by myself in Florida, primarily in the vicinity of Gainesville and at Archbold Biological Station in Highlands County. The remainder of the specimens were obtained by loan or gift from the collections listed below, thanks to the cooperation of the individuals listed beside each collection (Table 1).

Table 1. Reference collections of *Paratrechina*, abbreviations for the collections used in the text, and individuals responsible for the loan or gift of specimens.

AMNH	American Museum of Natural History	M. Favreau
BMNH	British Museum (Natural History)	B. Bolton
CAF	Private Collection	A. Francoeur
CAS	California Academy of Science	W. Pulawski
FEM	Frost Entomological Museum	K. Kim
FSCA	Florida State Collection of Arthropods	E. Nickerson
HM	Helsingfors Zoological Museum	O. Biström
GJW	Private Collection	G. & J. Wheeler
JCT	Private Collection	J. Trager

Table 1--continued

JFL	Private Collection	J. Lynch
LACM	Natural History Museum of Los Angeles County	R. Snelling
MCZ	Harvard Museum of Comparative Zoology	A. Newton
MHNG	Muséum d'Histoire Naturelle, Geneva	C. Besuchet
NCSU	North Carolina State University	C. Parron
PSW	Private Collection	P. Ward
REG	Private Collection	R. Gregg
RJL	Private Collection	R. Lavigne
RMC	Private Collection	R. Chew
RWK	Private Collection	R. Klein
SBSK (MDB)	State Biological Survey of Kansas and Private Collection	M. DuBois
TPN	Private Collection	T. Nuhn
TTU	Texas Tech University (Collection funded by Texas Department of Agriculture)	O. Francke
USNM	United States National Museum	D. Smith
UARK	University of Arkansas	C. Carlton
USDA (DPW)	USDA Fire Ant Project Collection and Private Collection	D. Wojcik
WFB	Private Collection	W. Buren
WMK	Private Collection	W. McKay

Point-mounted specimens were measured at 50X with an ocular micrometer. A computer program was used to convert the measurements from micrometer units to the nearest 0.01 mm equivalent, to calculate indices of relationship between the length of certain body parts and to calculate summary statistics. Only summarized, rounded-off, data are presented in the text, but the full raw data set has been reproduced in Appendix A. All measurements are reported in mm. Measurements are counts taken were as follows:

TL--HL + WL + GL (see below)

HL--Head length in full face view from a line perpendicular to sagittal axis and tangent to the posteriormost parts of the rear border to such a line tangent to the anterior most parts of the clypeal border

HW--Maximum width of head (including eyes) in full face view

EL--Maximum diameter of compound eye

SL--Length of scape (chord if curved) from base (exclusive of basal radicle) to its terminus

PW--Maximum width of pronotum

WL--Weber's length of thorax, from anterior edge of pronotum (exclusive of anterior flange) to posterior corner of metapleuron

MCL--Length (chord if curved) of largest pronotal macrochaeta

FL--Length of fore femur

GL--Length of gaster in dorsal view (exclusive of cone of acidopore in worker or of genitalia in males)

SM--Number of standing barbulate macrochaetae on scape

PM--Number of barbulate macrochaetae on pronotum to one side of sagittal plane

MM--Number of barbulate macrochaetae on mesonotum to one side of sagittal plane

$$CI = \frac{HW}{HL} \times 100$$

$$OI = \frac{EL}{HL} \times 100$$

$$SI = \frac{SL}{HL} \times 100$$

$$FI = \frac{FL}{HL} \times 100$$

Illustrations were prepared with the aid of a Nikon SMZ10 stereo dissecting microscope with drawing tube attachment. All are diagrammatic and are modelled on more than one specimen; proportions and macrochaetal counts were drawn at or near their mean values for the species. The pubescence patterns indicated on the head drawings are actual setal maps of the middorsal portion of the head of a specimen chosen for its "typical" pubescence.

Slide preparations of genitalia prepared by Dr. Arnold Van Pelt, loaned by USNM, were consulted in preparation of the drawings of the genitalia of <u>faisonensis</u> and <u>arenivaga</u>.

The drawings of the genitalia of guatemalensis and phantasma are based on my own dissections but were positioned as though based on slide mounts.

CHAPTER IV
SYNONYMY OF THE SUBGENERA OF *Paratrechina*

As has been shown by Wilson (1955) and Snelling (1976), subgenera may be useful taxonomic tools when they represent clearcut phyletic trends comprising major monophyletic groupings of species within a genus. It seems clear to me that the nominate subgenera of *Paratrechina* do not live up to this criterion. Indeed, some of the species groups described in 1925 by Emery such as his *caledonica* group, and *microps* and its relatives in the Caribbean region come closer to meeting it, but it would be premature to describe subgenera for such groups without a better knowledge of the world fauna.

I have studied workers of *longicornis*, *pallida* and *cisipa* to determine their relationship and to determine the validity of the subgenera. *Longicornis* is an unusual member of the genus in many respects, including its large eyes, great elongation of the scapes and tibiae, reduction of pilosity, unusual microsculpture (see Fig. 1 and description) and unique biology. *Pallida* appears related to *longicornis*. *Pallida*, too, has 5-tooth mandibles, long scapes and tibiae and even longer maxillary palps, further reduced pilosity (except that there are two pairs of macrochaetae on the propodeum not found on *longicornis*), fine very short

Fig. 1. Cephalic microsculpture of *longicornis* worker.

pubescence, and slight bluish reflections. The thorax of the two species is of virtually identical conformation. The single type specimen of pallida available to me could not be subjected to study in the SEM to determine microsculptural details, but the macroscopic appearance of the integument and the thick, blunt appearance of the macrochaetae are similar to those of longicornis.

Smith and Lavigne (1973) described cisipa from Puerto Rico, noting that its elongated, flattened thorax and long legs and scapes resembled those of longicornis but that its 6-toothed mandibles and bristly scapes forced them to place cisipa in Nylanderia. In fact, cisipa, while not related to longicornis, is not close to any other member of Paratrechina either. Some cisipa workers I have seen (RJL, RWK), including one in the type colony, have 5-toothed mandibles. The bristles on the scapes and tibiae are not the usual barbulate macrochaetae but are in fact thickened, oblique pubescence very much like that of Prenolepis. Interestingly, the eyes of cisipa are placed further back on the head than usual for a Paratrechina (but not as far back as in Prenolepis), and the mesothorax is quite constricted. On the other hand, the lack of cerci on the male and the pattern of thoracic pilosity on the worker of cisipa are typical of Paratrechina. The microsculpture and nature of the barbulation of the macrochaetae are as found in "Nylanderia," but this species cannot otherwise be to closely linked to that grouping of species.

Thus, longicornis and pallida appear to form a real species-group but hardly constitute a major phyletic trend. Nylanderia is a paraphyletic group including all the remaining diversity within the genus, including some species-groups at least as removed phenetically from the mainstream of the genus as are longicornis and pallida. I, therefore, consider the subgenera Paraparatrechina and Nylanderia synonymous with Paratrechina and recommend that the names no longer be used. The only feasible alternative is a more restricted Nylanderia and the erection of several new subgenera, but this must await further study.

CHAPTER V
GENERIC DESCRIPTION

The males and workers of Paratrechina have been characterized by M.R. Smith (1943, 1947, 1965). Some important points from his diagnoses are included below. In addition, characters not discussed by him and a description of the female are included.

Worker

Small, 1.5-3.5 mm (4 mm in one Australian form). Antenna 12-segmented, arising from a fossa placed close to but not confluent with rear border of clypeus; scape longer than head, usually with two to four rows of subdecmebent to erect barbulate macrochaetae (as in Fig. 2) (lacking in parvula, opaca, longicornis, etc.); funiculus filiform to very weakly clavate, segments longer than broad, terminal one almost twice as long as the others. Eye typically well-developed, about one/fifth or more as long as head (much smaller in subterranean microps group of Caribbean region, caledonica, etc.). Ocelli usually indistinct, or absent; often only median ocellus is visible. Mandible striate 6- or 5-toothed; typical dentition as in vividula (Fig. 4) (Smith, 1939, was in error in stating that myops had four

Fig. 2. Cephalic macrochaeta of faisonensis male.

mandibular teeth.) Palpal formula 6, 4; palpal segments most often subequal in length. Clypeus bears 6-20 slender, barbed macrochaetae of varying lengths and a smoothly rounded median longitudinal angle. Clypeus emarginate or evenly rounded anteriorly; in side view with a declinate anterior face. Frontal carinae very short, extending little beyond antennal fossae, thus, the frontal area often indicated only by its possession of four longitudinal rows of regularly spaced thick, barbulate macrochaetae (the inner two, often, and the outer rows, occasionally, reduced to a pair or so of bristles); the rows extending back through the ocellar area to the rear border. Sides of head in full face view nearly parallel, or more often, rounded and weakly convergent anteriad; rarely broader before than behind the eyes. Sides of head with macrochaetae shorter than those on preocellar area, subdecumbent and often greatly reduced in number. Posterior border straight or rounded, often weakly emarginate medially, with somewhat longer, more curved, erect pilosity than on sides. Venter of head with fine flexuous pilosity similar to that on clypeus, or none.

Pronotum convex or subangular. Mesonotum usually nearly flat in profile, the latter with a very short anterior and posterior face in many species such that the flat dorsal surface is slightly raised above pronotum, at least anteriorly. Mesonotum somewhat reduced, about 1/2 to 3/5 as broad as pronotum seen from above. Metanotum a narrow band usually in a distinct furrow, bordered laterally by mesothoracic

spiracles which are nearly dorsal in position and orientation of their openings. Pronotum and mesonotum each with two pairs of large macrochaetae like those on head (Fig. 2) and usually one or more (rarely up to 16) pairs of smaller macrochaetae on pronotum and usually one or 2 (up to 8) such ancillary pairs on mesonotum.

Propodeum weakly angular with a short, low, dorsal face, or convex and of varying height relative to thoracic dorsum. Propodeum without pilosity except in caledonica group, and in glabra, dugasi (Emery, 1925), microps, hystrix and pallida. Some caledonica-group species may have only one pair of macrochaetae on mesonotum. Petiole cuneate with crest varying from sharp to truncate or rounded in profile; in dorsal view, crest flat, angular or convex, only rarely notched in workers (e.g., sakurae). Petiole glabrous or with one or a few short erect macrochaetae on the crest.

Gaster ovate, acuminate terminally, relatively voluminous, with more or less abundant flexuous pilosity with less barbs per macrochaetae (Fig. 3) than on those of thorax. Anterior face of gastral tergite 1 impressed and overhanging petiole, concealing it partially from dorsal view. Border of impression distinctly angular. Acidopore conspicuous and conical, with a distinct corona.

Pubescence typically dense on the head and appendages, shorter and more dilute or lacking on much of thorax and gaster, the patterns of vestiture forming important diagnostic characters of some species or species-groups.

Fig. 3. Abdominal macrochaeta and sculpture of faisonensis male.

Sculpture usually limited to shallow pubigerous foveolation on head, delicate shagreening on gaster, and honeycomb-like reticulation on terminal segments. Some species in caledonica group are heavily punctate, opaque forms which contrast strongly with the typical shining appearance (when not obscured by pubescence) of other Paratrechina.

Queen

In general, fitting the worker description but differing as follows. TL 4-7 mm, scape relatively shorter and with less pilosity than in conspecific workers. Eye a little larger to much larger in subterranean forms, 1/4 or more HL. Ocelli fully developed.

Thorax of normal alate formicine type. Pronotum and other dorsal surfaces invested with barbulate macrochaetae like those found on workers but not in so regular an array.

Propodeum with relatively shorter dorsal face than in worker. Petiole typically broader, sharper in profile, and often with at least a weak median notch.

Gaster much more massive and more thoroughly hiding petiole in its impressed anterior face.

Pubescence longer, thicker and more dense, usually covering entire body, except petiole and rear face of propodeum.

Male

With the important generic characters noted for females, i.e., barbulate pilosity; the impressed first gastric tergite and antennal scapes longer than head. In overall size, approximating that of conspecific worker.

Mandibles well-developed, though smaller and less heavily sclerotized than in workers; with a single apical tooth and occasionally a small adjacent cleft, and one or more inconspicuous subapical denticles. Antennal scapes with less macrochaetae than conspecific workers or queens. Antennae 13-segmented, with conformation of segments generally resembling that of female castes.

Petiole of same conformation as in workers but broader and more blunt, sometimes notched like that of queen.

External genitalia prominent, varying greatly between species-groups and interspecifically and, thus, useful in taxonomy. Cerci (as in *Prenolepis*) lacking.

Pubescence distributed as in queens, but in length and density more like that of workers. Thoracic pilosity usually limited to mesometanotum, rarely more generally distributed; typically sparse and decumbent on gastral dorsum.

CHAPTER VI
IDENTIFICATION OF *Paratrechina* OF THE UNITED STATES

Preface to Keys

In this chapter, I provide what will undoubtedly be the most frequently read portion of this study, namely the keys for identification of the workers and males of *Paratrechina* in the United States. Also included is a taxonomic synposis of the species included in the keys and formally treated in the later chapters (see Table 2).

The key contains a number of species which occur outside of the United States but in many cases cannot be used to identify them outside of this country. There are many *Paratrechina* species not treated in this revision, which makes the use of these keys futile outside of the geographic region for which they are designed.

The characters which separate *Paratrechina* species are more subtle than those used to separate species in some other insect groups. One will not find here the simple, one-feature alternatives of older keys to *Paratrechina*. My keys assume the user has possession of a stereo dissecting microscope fitted with a calibrated ocular micrometer and of a calculator to expedite the calculation of indices. The reader is urged to read carefully the definitions of

the measurements in Chapter III and the following remarks on possible difficulties one may encounter with certain measurements and counts before attempting to use the keys.

Remarks. Certain difficulties were encountered in taking some of the measurements, and the following comments may help the user of the keys in selecting the appropriate alternative at a given couplet (and in reading the descriptions).

The posteroventral portion of the head is excised and, thus, in certain positions obscures the front of the pronotum making it difficult or impossible to measure WL from the side. In such cases, WL was taken from a dorsal view. As a check, the measurement was taken on a number of specimens in which WL was visible from both views. The two measurements never differed by more than 0.01 mm and usually by no more than 0.005 mm.

Macrochaeta counts proved to have certain unforeseen pitfalls. Only barbulate setae of the sort shown in Figs. 2 and 3 were counted. These were usually discerned by their greater length and diameter and their different color (usually darker than pubescence and body color), but in some species the macrochaetae are nearly the color of the substrate and are rather short. Compounding the problem in such cases is that there may occur simple setae of nearly the same macroscopic appearance. Through observation at high magnification and checking back at lower power, I learned to discriminate these setal types. The discrimination turned out to have

a slightly different "Gestalt" for each of the "difficult" species. In addition, the macrochaetae are all visible only at certain angles of viewing and illumination or where SM is large, only by rotating the scape. Though this particular count is undoubtedly the one for which the most errors were made, I feel confident that the high end of the ranges reported are close to correct. The count recorded was the highest repeatable one from among either of the two scapes resulting in an inherent bias against low counts, whether natural or due to damage. The scapes of a single specimen often differed in SM, even on fresh, undamaged specimens.

PM and MM also proved to be asymmetrical in many specimens. Always present (or at least indicated by a socket) were the 8 largest hairs (the "major thoracic macrochaetae"), but the number of ancillaries might be different on each side. The highest repeatable count of hairs and/or unmistakable hair-sockets was the one recorded. On occasion, smaller barbulate setae resembled pubescence, but I learned to discriminate these as above. The discrimination was much easier on pale species with dark macrochaetae, and most counting errors were certainly made on dark species.

I refer loosely to the middle tagma of ants as the thorax which is the current usage by many hymenopterists for the homologous body region of ants and other Hymenoptera. In practice, there is little need to refer specifically to the thorax and propodeum collectively, for which more accurate terms would be alitrunk or mesosoma.

Table 2. Synopsis of taxonomy and authorship of U.S. *Paratrechina*.

Vividula Complex
- *vividula* (Nylander)
- --*kincaidi* (Wheeler) syn. n.
- *terricola* (Buckley) stat. rev.
- --*melanderi* (Wheeler) syn. n.

Parvula Complex
- *concinna* sp. n.
- *faisonensis* (Forel) stat. n. & rev.
- *flavipes* (F. Smith)
- *parvula* (Mayr)
- *wojciki* sp. n.
- *austroccidua* sp. n.

Arenivaga Complex
- *arenivaga* (Wheeler) stat. rev.
- *phantasma* sp. n.

Bruessi Complex
- *bruesii* (Wheeler)

Hystrix Complex
- *hystrix* sp. n.

Section Guatemalensis
- *guatemalensis* (Forel)

Section Fulva
- *pubens* (Forel) stat. n. & rev.

Section Bourbonica
- *bourbonica* (Forel)

Section Longicornis
- *longicornis* (Latreille)

Excluded from *Paratrechina*
- *parvula grandula* (Forel)
- --becomes *Conomyrma grandula* (Forel) comb. n.

Pilosity refers to the large, standing, barbulate setae (macrochaetae) characteristic of this group (though by no means exclusive to it). The unbarbed macrochaetae on the parameres of males are also referred to as pilosity. Simple, appressed to subdecumbent setae of small diameter are referred to as pubescence. Otherwise, terminology used here is that which has become standard in recent revisions of formicine genera (Wilson, 1955; Wing, 1968; Bolton, 1973; Snelling, 1976).

Key to Workers

1a. Species of eastern U.S. and Great Plains, including pains and woodlands of east Texas 2

1b. Species of Southwest including west Texas mountains and deserts 14

2a. Scapes and legs unusually long (SI>165, FI>115); weakly shining black or gray with bluish reflections; with sparse, short, barely visible pubescence; near human dwellings, Gulf Coast states, urban areas, sporadic elsewhere ..... *longicornis*

2b. Scapes and legs of usual proportions (SI<130, FI<105); colored variously but never with bluish reflections; shiny, or if dull, this due to dense pubescence; habitat various 3

3a. Yellow to pale whitish; nests in sandy soil or dunes with entrances surrounded by conspicuous crater of subsoil in clearings between vegetation 14

3b. Uniformly dark-colored or bicolored; nests inconspicuous; in more mesic microhabitats under moss, rocks, logs, in litter; or near man-made structures (parvula may have crater nests in sandy areas but is never uniformly yellow) 5

4a. Yellow with gaster infuscated posteriorly; thoracic pilosity flexuous and dark brown (notably darker than body color); scapes with 5-17 (usually 7-12) macrochaetae and suberect pubescence; New Jersey, Florida, Gulf Coast, sandhills of Midwest ..... arenivaga

4b. Yellow or whitish with gaster, at most, only slightly darker, thoracic pilosity nearly straight, nearly the same color or only slightly darker than body color; scapes with 0-4 (usually 1-3) standing macrochaetae and short, appressed pubescence (Florida scrub and dunes) ..... phantasma

5a. Scapes with not more than 4 standing macrochaetae 6

5b. Scapes with at least 4 (usually 7 or more) standing macrochaetae 7

6a. Typically bicolored, with thorax yellowish to reddish-brown, head and gaster darker; middle and hind coxae pale, much lighter than fore coxae or rest of legs; scapes with 1-4 suberect macrochaetae; in full face view eyes reaching sides of head or failing to do so by 1 or 2 facet-widths; small (HL usually 0.51-0.57); (Florida) ..... wojciki

6b. Body typically uniform dark brown (at most weakly bicolored); appendages somewhat lighter or even yellowish; scapes never with standing macrochaetae; in full face view outer edge of eyes failing to reach sides of head by 1/4 of eye width; larger (HL$\geq$0.57, usually >0.60) (eastern U.S.) ..... parvula

7a. Thorax and gaster mostly covered with pubescence or lacking it only on pleura and disk of pronotum; dull 8

7b. Thorax and gaster with greatly reduced pubescence; shiny 10

8a. Body light reddish-brown with slender flexuous light brown pilosity (Fig. 33) ..... pubens

8b. Body dull brown to nearly black or if faded, pilosity shorter, stouter, straighter, and dark (Figs. 31 and 34) 9

9a. Uniform dark brown or black, thoracic macrochaetae thick, often nearly straight, relatively short and abundant (PM 5-15); entire body pubescent; large (HL usually 0.70-0.81); Florida, disturbed habitats, mangrove islands, occasional along Gulf Coast, in greenhouses, etc., elsewhere ..... bourbonica

9b. Yellowish-brown to dark brown with middle and hind coxae distinctly lighter; thoracic macrochaetae more slender, weakly flexuous and tapering, longer (at least relatively) and less abundant (PM 3-7); disk and sometimes sides of pronotum and pleura glabrous and shining; smaller (HL usually 0.56-0.66); Homestead, Florida ..... guatemalensis

10a. Uniform dark brown with appendages somewhat lighter; propodeum with a dense row of longitudinally aligned pubescence along anterior edge; mesonotum and front of pronotum with at least some dilute pubescence; head with shallow pubigerous punctae and dense pubescence which is mostly aligned with long axis of head; marshes, ditches, damp pastures, swamp edges; in rotten

wood, cow dung or tussocks; Florida, Alabama, Georgia, Carolinas ..... concinna

10b. Middle and hind coxae and/or thorax and legs lighter than gaster and head; pubescence very sparse or absent from promesonotum and often from propodeum; head smooth and shining or irregularly and weakly punctate beneath pubescence; cephalic pubescence may be very dilute with some setae markedly not parallel to long axis of head; not typically inhabiting marshes or poorly-drained pastures 11

11a. Cephalic pubescence dilute; preoccipital area with most spaces between setae as wide as length of setae or wider, anterior 1/2 of head (except, perhaps, frons) lacking pubescence 12

11b. Cephalic pubescence denser; preoccipital area with most spaces between setae no wider than length of setae, usually less 13

12a. Eye about 1/4 HL or slightly larger (OI usually 24-27) inhabiting old fields, cultivated areas, gardens, disturbed habitats across southern half of U.S. or greenhouses, etc., further north;

also in native scrub vegetation in southern Texas, New Mexico, northern Mexico ..... vividula

12b. Eye smaller (OI 20-24), under stones, moss clumps or bark in forest openings and other open or disturbed habitats in Texas and Plains states, and at lower elevations in Southwest mountains, Arkansas and Tennessee ..... terricola

NOTE: The workers of terricola and vividula cannot always be reliably separated on morphological grounds. See male key for separatory characters. See also descriptions of these two species.

13a. Thorax, legs, antennae yellow; head averaging broader (CI usually 85-90) and with rounded sides (Fig. 16); wooded areas, Pittsburg, Philadelphia, Long Island ..... flavipes

13b. Uniform brown or with slightly lighter head and thorax; middle and hind coxae usually markedly lighter than fore coxae; head narrower (CI usually 83-87) and less convex-sided (Fig. 15); mesic woodlands, southeastern U.S., north along the Atlantic coastal plain to southern New Jersey ..... faisonensis

14a. Scapes and legs very long and thin (SI>165, FI>115), Gulf Coast, sporadic elsewhere ..... longicornis

14b. Scapes and legs of more usual length (SI<130, FI<105) 15

15a. Cephalic pubescence dense, partially obscuring the sheen of the integument beneath; the pubescence arising from fine punctae; weak bluish reflections often present on head and pronotum; pronotum angular, with short, steep anterior face and longer, flattened or concave dorsal face (Fig. 17); mid-elevation woodlands, mountains of Southwest, Mexico ..... austroccidua

15b. Cephalic pubescence very short, dilute or absent, the integument strongly shining and easily seen between the setae; pronotum convex in profile, or if angular only weakly so and otherwise not fitting above description 16

16a. SM≤10, PM≤7, HL≤0.65 ..... terricola or vividula, see couplet 12

16b. SM≥13, PM≥7, HL≥0.65 17

17a. Brown to dark brown, or if partly yellowish then with notably darker pleura, propodeum and gaster; SM 13-19,

PM 7-11; desert washes and riparian woodlands, Mexico and southern parts of adjacent Texas, New Mexico and Arizona ..... bruesii

17b. Uniform yellow to yellowish brown with abundant black pilosity; SM 21-29; PM usually 12-16; deserts of east-central California, Nevada and Utah ..... hystrix

Key to Males

1a. Parameres broad margined (Figs. 42 and 43) 2

1b. Parameres triangular or digitiform (Figs. 39-41, 44) 3

2a. Scapes long (SI 168-174), 3/5 or more of their length protruding beyond posterior margin of head and completely lacking standing macrochaetae; parameres entire-margined (Fig. 42); urban areas, sporadic elsewhere ..... longicornis

2b. Scapes shorter (SI 128-135) a little over 1/2 of their length protruding beyond posterior margin of head, bearing 7-10 suberect macrochaetae; parameres emarginate (Fig. 43); Florida, disturbed habitats, mangrove islands, occasional in greenhouses, etc., elsewhere ..... bourbonica

3a. Scapes with 0-1 standing macrochaetae; parameres relatively short, subtriangular (Fig. 48); eastern U.S. 4

3b. Scapes with 4 or more standing macrochaetae; or if with less, then either a western species (see lug 14b), or an eastern one with elongate, triangular parameres and with prominent cuspides (Fig. 47) 6

4a. Digiti straight, lying close to aedeagus 5

4b. In posterior view digiti curved laterad distally (Fig. 48); scrubland and dunes of Florida ..... phantasma

5a. Small (TL<1.9); usually with 1-2 standing macrochaetae on scape; middle hind coxae distinctly paler than fore coxae; peninsular Florida ..... wojciki

5b. Larger (TL>1.9); scape lacking standing macrochaetae, middle and hind coxae usually same color as fore coxae; Midwest and eastern U.S (except south Florida) ..... parvula

6a. Parameres elongate, triangular, cuspides long and prominent, reaching to about 3/4 or more of the length of the aedeagus; sandy areas, Midwest, Gulf and East Coast states ..... arenivaga

6b. Parameres variously formed; cuspides not reaching to 3/4 the length of the aedeagus, smaller and not prominent 7

7a. Antennal segment IV crooked or curved (Fig. 6); aedeagus in side view relatively slender and tapering but spatulate (Figs. 7 and 8) 8

7b. Antennal segment IV straight, aedeagus in side view tapering to a point, which may be rounded but is never spatulate 9

8a. Parameres viewed from the side tapering, triangular, rounded truncate to subacuminate, viewed from behind distinctly curved mesad, aedeagus in the form of a weakly spatulate narrow triangle which is notably shorter than the parameres (Fig. 8); southern half of U.S., disturbed areas, in greenhouses further north ..... vividula

8b. Parameres viewed from the side tapering rapidly over their basal 1/2, then digitiform over the distal 1/2, from behind only weakly curved mesad, or straight; aedeagus with distal portion drawn out into a thin blade with a broadened upcurved terminus, extending well beyond parameres (Fig. 7); Arizona, New Mexico, Texas, Louisiana, Arkansas, Tennessee, Central Plains states ..... terricola

9a. Dark species with at least gaster nearly black, head and thorax piceous brown or darker, and appendages dark brown; larger spp. (HL>0.60) 10

9b. Lighter in color; or if nearly black, then with brownish-yellow antennae and legs, or pale middle and hind coxae, and overall size is smaller (HL≤0.57) 11

10a. Propodeum and gaster elongate (Fig. 39); scapes usually with 7-10 macrochaetae; parameres strongly tapering basally, then slender and digitiform over most of their length, notably longer than volsellae and aedeagus but not concealing the latter entirely in side view; Mexican border region, south to Hidalgo, Nayarit, also Baja California Sur ..... bruesii

10b. Body of more usual conformation, gaster short (Fig. 41); scapes with 5-7 macrochaetae, parameres triangular, as long or a little longer than volsellae and aedeagus and concealing the latter in side view; Florida, Georgia, Carolinas ..... concinna

11a. Seen from behind, digiti straight and lying parallel to aedeagus 12

11b. Seen from behind, digiti notably curved laterad distally (Fig. 46); Homestead, Florida (also Antilles, Central and South America, Cocos Islands) ..... *guatemalensis*

12a. Scapes with 6 or more (usually 8-10) standing macrochaetae 10

12b. Scapes with 6 or less (usually 1-5) standing macrochaetae 14

13a. Body densely pubescent; pale reddish-brown; eye large (OI$\geq$40); parameres with more than 30 long blondish macrochaetae forming a dense fringe (Fig. 44); Miami, Florida, in green-houses further north (also Antilles) ..... *pubens*

13b. Body nearly free of pubescence; shiny yellowish-brown; eye smaller (OI$\leq$32); parameres with about 15 brown, slender macrochaetae of varying lengths which do *not* form a dense fringe (Fig. 40) ..... *hystrix*

14a. Scapes with 4-7 standing macrochaetae; eastern states 15

14b. Scapes with 2-3 standing macrochaetae; Southwest and Mexican mountains ..... *austroccidua*

15a. Uniform dark brown to nearly black (less often) gaster slightly darker than the blackish-yellow thorax and head;

appendages yellowish-brown; wooded areas near Philadelphia and Pittsburg, Pennsylvania, and Long Island ..... *flavipes*

15b. Thorax and usually the head notably lighter brown than the dark brown gaster; middle and hind coxae pale relative to fore coxae and remainder of leg segments; woodlands of southeastern U.S. north to New Jersey pine barrens ..... *faisonensis*

CHAPTER VII
FORMAT OF SPECIES DESCRIPTIONS

In the following chapters, I describe the 11 nearctic Paratrechina species and the five introduced into the region. I have seen a few series I cannot place, in every case consisting of only a few workers. Thus, it has been possible for me to identify virtually all nearctic Paratrechina material in good condition as belonging to one of the 16 species treated or, at the very worst, into one of the species complexes (see below). Only workers and males are formally described. A diagnosis of the queen follows that of the conspecific male. The queens of most of the native eastern species are best distinguished by association with workers or males.

It has become increasingly common in ant systematics to describe holotypes individually, followed by a section on variation, as is standard in taxonomic works on nonsocial insects. This procedure is followed here although I believe members of a caste from a single colony are essentially equivalent as name-bearers for ant species in view of their close genetic relationship and obvious conspecificity. There is no known case of a mixed colony of ants comprised of species which are anything less than

clearly distinct from each other. On the other hand, it often happens that not all syntypes of earlier authors are concolonial nor even conspecific. I have designated and described lectotype workers (and allolectotype males wherever possible) for species described by earlier authors. Holotypes and allotypes of the 5 species described as new are in every case progeny of a single queen to the best of my ability to determine so. Males and workers of the 3 new eastern species have been deposited at MCZ, AMNH, USMN, LACM and FSCA. Material of the 2 new western species is deposited only at MCZ, USNM and LACM.

It has been stated repeatedly that the male genitalia offer the best characters for separation of Paratrechina species (Creighton, 1950; and included references), and indeed, they are useful. The generally accepted corollary to this is that Paratrechina workers are barely or not at all distinguishable. In fact, within species complexes, some of our species are quite similar in the structure of the male genitalia while the workers are readily distinguished. The males of these species are best distinguished by non-genitalic characters.

All but 2 of our native species form a rather homogeneous group. On a world-wide basis, they appear to belong to the vividula group of Emery (1925). This group includes all native eastern U.S. species and 2 western species, plus a number of tropical forms not treated here. Also in the group are the introduced flavipes and a few other Asian

forms. The workers of these species share reduced thoracic and abdominal pubescence (but, except in the Vividula Complex itself, fully pubescent heads); reduced thoracic pilosity; somewhat shortened legs and scapes with reduced pilosity; and fairly uniform size in the medium range for the genus. The external male genital apparatus typically includes isoceles-triangular parameres which are curved mesad and relatively simply constructed volsellae approximating the structure of those of faisonensis (Fig. 42).

Since only a small part of Paratrechina is treated here, no attempt was made to reconstruct a phylogeny for the species. Even a thorough knowledge of the all extant species would most likely yield only an approximation of the events leading to the present taxonomic structure of the genus, in view of the extinctions that have undoubtedly occurred.

All species are grouped in complexes containing groups of what I believe are ecological or geographical cognate species. The names of the complexes are simply the names of their oldest described species. The term "complex" is used here to avoid confusion with the "species groups" of Emery (1925) which are larger and more heterogeneous assemblages within the genus.

Only when I have seen specimens studied by a previous author or where his description is sufficiently thorough and clear to make certain the identification have I included any reference to a Paratrechina species in the synonymies presented here. Such a conservative approach undoubtedly

will result in omissions but is necessitated by the following conditions: (1) Certain taxa, especially vividula and fulva have been used as catch-alls for new forms which may not even be closely related and (2) later authors have rarely bothered to study types or reliably type-compared material in making identifications. Under such circumstances, synonymies based purely on nomenclatural similarity, without reference to specimens, were considered unreliable.

I have dispensed with the usual practice of listing the collection data of all specimens studied. Instead, I have listed states from which specimens studied originated in the sections on specimens examined, have described the preferred altitudes and habitats based on my collecting experience and information gleaned from labels and the literature in the sections on natural history, and have provided range maps. In my opinion, these present as much of the truly useful information as a complete listing of localities but in a far more readily assimilable form. Those wishing to collect Paratrechina would do better to find them in previously uncollected localities than to reduplicate past efforts.

The descriptions follow a format that is standard in systematic literature on ants. Except where otherwise indicated, the descriptions of the head refer to it in full face view, as in the figures. Descriptions of the thorax, on the other hand, refer to it in lateral view. Descriptions of the male genitalia, in general, refer to them as

they appear, intact, on the preserved specimen. The vestiture of vividula is described in greatest detail; vestiture of other species is briefly described in as much as it differs from that of vividula.

Measurements of the type speciemns are presented in the following order: TL, HL, HW, SL, EL, PW, MCL, WL, FL, GL, SM, PM, MM, CI, OI, SI and FL. These are listed at the start of each worker description. All measurements, counts, and indices taken are likewise listed at the start of the description of the type male, but note that PW, MCL, FL, PM and MM were not recorded for the males. In the sections on variation and in composite descriptions, the ranges of all measurements are reported at the head of the section. For a complete listing of the measurements and summary statistics, refer to Appendices A and B, respectively.

The section on natural history of the species is necessarily rather short. There is little published on any of these species, including the tramps, and the observations reported are primarily my own made in Florida. The term "disturbed" has been used to characterize habitats of some species. Mild or light disturbance includes grazing activity, human foot traffic, or selective clearing of vegetation. Heavy, disturbance refers to more thorough clearing of vegetation, tilling of soil, construction of buildings, and temporary flooding. It is my hope that this revision will help other investigators to more thoroughly characterize the lifeways of Paratrechina species.

CHAPTER VIII
VIVIDULA COMPLEX

Diagnosis of Complex

Worker weakly bicolored, very shiny; cephalic pubescence sparse, limited mostly to rear 1/2 of head; scape pilosity usually subdecumbent to suberect, sometimes inconspicuous, SM usually 7 or 8. Nests in open, often disturbed habitats, under stones, logs, trash, moss clumps, etc.

Male shiny except thoracic dorsum; antennal segment IV distinctly bent or curved; parameres triangular; digitus boomerang-shaped; cuspis short; aedeagal lobes triangular with a spatulate or otherwise broadened tip.

Paratrechina vividula

(Figs. 4, 8, 10; Map-Fig. 49)

Formica vividula Nylander, 1846, Acta Soc. Fenn. 2: 900. Type loc., Botanical Garden, Helsinfors, Finland.

Tapinoma vividula (sic): F. Smith, 1858, Cat. Hym. Brit. Mus. 6: 56 (in part ?)

Prenolepis vividula: Mayr, 1861, Europ. Formicid., p. 52.

Prenolepis kincaidi Wheeler, 1906, Bull. Amer. Mus. Nat. Hist. 22: 350. Fig. 1, ☿, ♀, ♂. NEW SYNONOMY. Type loc., Bermuda.

Prenolepis vividula: Emery, 1906, Am. Soc. Ent. Belg. 50: 130-134. Figs. 1-4, ☿, ♀, ♂; Emery, 1910, Deutsch Ent. Z., p. 131. Figs. 6, 7, ☿, ♀, ♂.

Paratrechina vividula: Emery, 1925, Gen. Insectorum, Faxc. 183: 223, Creighton, 1950, Bull. Mus. Comp. Zool. Harvard 104: 409 (in part).

Diagnosis

Worker. TL usually 2.0-2.5, OI usually 24-27. A Southern species of disturbed habitats. Weakly bicolored; head and gaster yellowish-brown to piceous, thorax and appendages yellow to dark reddish-brown. Head subquadrate, sides weakly convex, subparallel. Cephalic pubescence, mostly limited to rear half of head and often rather varied in length and spacing.

Male. TL about 1.9-2.25, OI usually 38-40. Body color dingy yellow to dark brown, thorax usually lighter. Antennal segment IV curved or bent. Parameres, viewed from the rear, strongly curved mesad. Aedeagus as short or shorter than parameres, spatulate, hyaline.

Queen. Not readily distinguishable from those of terricola, faisonensis or concinna. In contrast to the latter two species, often bicolored as in worker. Normally has larger eyes than queen of terricola.

Description

Allolectotype worker. TL 2.15, HL, 0.62, HW 0.53, SL 0.71, EL 0.15, PW 0.38, MCL 0.16, WL 0.77, FL 0.57, GL 0.77, SM 8, PM 4, MM 4, CI 85, OI 25, SI 115, FI 92.

In full face view, clypeus arcuate and entire. Dorsum of clypeus with sides meeting in a rounded, median angle. Head, exclusive of clypeus, subquadrate, the apparent squareness accentuated by the anterior 3/4 of the sides being virtually parallel except where they curve inward to meet the mandibular insertions. Eyes in full face view appearing about 1/4 as long as distance from mandibular insertions to rear border, though in fact their greatest diameter is longer. Distance between front of eye and mandibular insertion slightly greater than EL, eyes separated from sides of head by less than 1/3X eye width. Scapes curved over basal 1/4 of their length and over short distal section, otherwise nearly straight. Scapes of about average length for vividula group. No ocelli visible.

Pronotum in profile weakly angular; the anterior and dorsal faces flat, the dorsal a little longer than the anterior. Promesonotal suture clearly visible, though barely impressed. Mesonotum flat-topped with short anterior and posterior faces rising steeply to meet the dorsal face in rounded angles, the posterior face a little longer and steeper than the anterior. In profile, the propodeum nearly evenly rounded, its highest point distinctly lower than that of pronotum, the angle between its anterior and descending

faces weakly obtuse. Legs of about average length for vividula group.

Petiole sharp-crested, cuneate in profile. In dorsal view, with straight sides weakly divergent dorsad; crest comprised of two nearly straight sides meeting in a blunt angle.

Clypeus with 12 forward-projecting macrochaetae, those closer to the front and center as long as clypeus in dorsal view, and with a few appressed hairs just to the sides of the median ridge. Front half of head with a few macrochaetae, those on frons somewhat shorter than longest clypeal macrochaetae and those on infraocular region much shorter and subdecumbent. Rear half of head with longer more abundant macrochaetae and pubescence composed of 4 or 5 dozen unevenly spaced appressed simple hairs of varying length. Scape macrochaetae suberect, less than half as long as greatest width of scape and of the same color as the scape; most easily seen in posterolateral view. The eight major thoracic macrochaetae weakly curved; the remaining ones half or less as long and straight. Forelegs with 3-6 macrochaetae on flexor surfaces of femora and tibiae and 1-2 on extensor surfaces. Middle and hindlegs with the reverse pattern, namely several hairs on extensor surfaces and 1 or 2 on flexors. Propodeum with a narrow patch of longitudinally oriented pubescence, along its front edge. Gaster with sparse, very fine, appressed hairs and the usual complement of macrochaetae.

Smooth and shining from head to first gastral tergite. Weakly shagreened posterior to this.

Head and gaster light yellowish-brown. Thorax, brownish-yellow. Mandibles light brownish-yellow with dark reddish-brown teeth. Legs and scapes yellow.

Lectotype male. TL 1.89, HL 0.52, HW 0.48, SL 0.59, EL 0.19, WL 0.81, GL 0.57, SM 4, CI 94, OI 37, SI 114.

Mandibles apically unidentate, without subapical denticles in this specimen. Clypeus, in dorsal view with a very shallow median emargination and median raised portion narrower than in worker, evenly rounded, subumbonate. Sides of head weakly convex, convergent anteriad, meeting the rear border through slightly obtuse rounded corners. Limits of weakly convex rear border lie approximately behind inner border of eyes. Eyes convex, apparently about 1/3 as long as head. Median and lateral ocelli separated by about 2X their diameter. Scapes slenderer than worker's. Antennal segment IV bent as in Fig. 6.

Petiolar crest more blunt than worker's. Petiole broader than worker's in posterior view.

Parameres about 2X as long as broad in side view, nearly triangular, but slightly recurved over distal 1/3 of their length. In rear view, parameres sickle-shaped, curving mesad distally. Digitus shaped like a short boomerang, i.e., narrow throughout, bent downward at the middle through a broadly obtuse angle and tapering gently to a rounded terminus. Cuspides of the usual shape for

vividula group, i.e., like an inverted bowl of a round spoon. Aedeagal lobes shorter than parameres, slender, triangular, weakly spatulate and splayed (as is normal in preserved males of this species).

Vestiture as in worker but cephalic pubescence more abundant and evenly distributed over rear half of head and on frons. Scapes less pubescent than worker's and with a row of 3, plus 1 offset, macrochaetae; these suberect, short and pale, inconspicuous as in worker. Parameres with about 25 simple, decurved, yellow macrochaetae on their outer surface.

Head, thorax, front of gaster and appendages uniform yellowish-brown. Gaster increasingly darkening brown from middle of first gastral tergite posteriad. Genitalia yellowish-brown, except aedeagal lobes, which are yellowish-hyaline.

Variation

Workers. TL 1.90-2.64, HL 0.55-0.69, HW 0.44-0.61, SL 0.61-0.77, EL 0.13-0.17, PW 0.32-0.44, MCL 0.12-0.19, WL 0.66-0.90, FL 0.46-0.62, GL 0.56-1.17, SM 6-9, PM 3-7, MM 2-5, CI 80-91, OI 21-27, SI 105-118, FI 83-93, (n=58).

The clypeus may have a shallow concave or flat median emargination in dorsal view. The sides of the head are usually subparallel (in eastern specimens) or are wekaly convex (especially in material from Texas westward). OI is almost always greater than 24, but two series from separate

localities in the Guadalupe Mountains, Texas, have unusually small eyes. These may represent a hybrid swarm of vividula x terricola or simply are aberrant. Mean OI for the species, including six specimens from Guadalupe Mountains is 25. The rear face of petiole in lateral view is often convex or subangular, rather than straight as in type, and the crest may be rounded or with a flat top and sloping sides in rear view.

The pilosity of the scapes is often longer (almost equal to width of scape) and brown, thus, much more conspicuous than in type; this is especially true in Gulf Coast and Florida material. The latter specimens have more abundant cephalic pubescence distributed further forward, especially on frons, and may have some long sparse appressed hairs on the pronotum and mesonotum. Specimens from Arizona and California typically have the cephalic pubescence short, very fine and more evenly spaced but still limited to rear portion of head.

Western material is generally colored about as type, and most eastern material is darker. However, I have seen series from Arizona and Mississippi which are nearly uniform very dark brown, thus, recognizable only by head shape, eye size, and pattern of pubescence.

The types and one additional series of kincaidi from Jamaica, here synonymized with vividula, have color and vestiture like that of peninsular Florida specimens. European greenhouse material tends to look more like vividula from Texas or Northern Mexico. It should be recalled

that Emery (1906) suggested Mexico as the provenience of vividula.

Males. TL 1.89-2.25, HL 0.46-0.55, HW 0.45-0.52, SL 0.54-0.62, EL 0.18-0.21, WL 0.69-0.85, GL 0.57-0.98, SM 4-6, CI 91-98, OI 33-42, SI 107-119, (n=11).

The mandibles of the males of vividula vary from simple apically unidentate to having an apical tooth, a small cleft, then a subapical denticle or two. The crook in antennal segment IV is sometimes manifest only as an even curve. Very few specimens lack the splaying of the aedeagal lobes typical of preserved males in this species. Most specimens are significantly darker than the type ranging from a dingy yellow to a dark reddish-brown, often with the thorax somewhat lighter.

Material Studied

The type material (HM) was collected in a greenhouse; Helsinki, Finland; 2-25/X/1845. Included are the lectotype, allolectotype, three paralectotype workers and a paralectotype queen (minus gaster). I have deposited conspecific material from Texas and Florida at HM. In addition, I have studied many hundreds of specimens from across the southern U.S. and Europe. The material was loaned or donated from LACM, USNM, TPN, DPW, and TTU. JCT contains Florida material. European material and types of kincaidi (here synonymized with vividula) are at MCZ. The material from TTU was particularly valuable (in addition

to the suggestions of Emery, 1906), in helping me make a correct guess about the identity of vividula even before I saw the types, because of the large number and size of the series, many of them containing associated males. TTU also contained a similar large amount of terricola, thus helping to preserve the latter from being synonymized, as was my initial inclination.

Discussion

This species is very closely related to terricola; isolated workers cannot always be assigned to one or the other species with certainty. The larger OI and more straight-sided head will suffice to separate the great majority of vividula workers. The ranges of the two species are different (Fig. 49). I collected one series of concinna, normally uniform dark brown, which I mistook in the field for vividula because they were bicolored. The specimens were in all other characters typical concinna. Males of vividula are distinguished from terricola by genital characters as described above. Most of the vividula material I have seen in collections has been identified as "melanderi," while most of the material identified as vividula previous to this study does not belong to vividula (see discussion of faisonensis). I believe this is due to the long standing dogma stated in Creighton's key (1950, p. 404), "erect hairs on the antennal scapes [are] abundant and occurring on the sides as well as the front of the scape" in vividula. In

fact, the macrochaetae on the scape are almost always limited to two rows on the anterodorsal part of the scape comprised of 3 or 4 hairs each. The macrochaetae themselves are often inconspicuous, giving the casual observer the impression that there are less of them than, in fact, occur. It should be noted that the scape pilosity of terricola is of the same character as that of vividula and cannot be used as a separatory feature for the two species.

The type series of kincaidi (MCZ) unfortunately lacks the male that originally belonged to it, and he could not be found in the unit tray in which the series had been stored by MCZ staff who searched for it upon my request. Nevertheless, it seems unquestionable to me, based on the features of the workers and queens in the series and upon Wheeler's (1906) description and figure of the genitalia of male kincaidi, that kincaidi can be none other than a synonym of vividula.

Natural History

Under conditions of sufficient warmth, alates may be present at any time of year and may fly any warm day when humidity is high. In most of the range in the U.S., flights are restricted to the months May-October. Females are occasionally attracted to lights at this time of year, though flights, from the little available evidence, occur during the day. I observed a group of six males patrolling a fence post at 1300 hr in Lake Placid, Florida, in January,

and I have alates of both sexes collected from the surface of a pool in a Juniper-oak woodland in Texas on 7 September (PSW).

This ant is characteristic of open, usually rather disturbed habitats including beaches, parks and other landscaped areas, crop fields, fallow fields, vacant lots, parking lots, etc. Nuhn and Wright (1979) reported finding vividula (as Paratrechina sp.) in fields and other open, disturbed habitats in North Carolina. It commonly establishes colonies in plant pots or mulch piles and is transported in these materials to greenhouses and nurseries far from the areas where it survives outside. It has apparently been established as a greenhouse ant in Europe for nearly 150 years. This ant occurs in less disturbed rangeland and other open habitat in southern Texas and northern Mexico, where it overlaps with and may occur in a mosaic distribution with respect to its sibling species, terricola.

Paratrechina terricola

(Figs. 5, 6, 7; Map-Fig. 49)

Formica (Tapinoma) terricola Buckley, 1966, Proc. Ent. Soc. Phila. 6: 168. ☿, ♀, ♂. Type loc., Austin, TX.

Prenolepis melanderi Wheeler, 1903, Psyche 10: 104. Fig. 8, ☿, ♀, ♂. NEW SYNONYMY. Type loc., New Braunfels, TX (designated by Creighton, 1950).

Prenolepis (Nylanderia) vividula melanderi: Emery, 1906, Ann. Ent. Soc. Belg. 50: 132. Fig. 5, ♂; Emery, 1925, Gen. Insectorum, Fasc. 183: 223.

Paratrechina (Nylanderia) melanderi: Creighton, 1950, Bull. Mus. Comp. Zool. 104: 407; G.C. and J. Wheeler, 1953, Ann. Ent. Soc. Amer. 46: 144. Pl. II, Figs. 16-20, larva.

Diagnosis

Worker. TL usually 1.9-2.4 (southern part of range), 2.2-2.7 (north), OI 20-24. A vividula-like species of open habitats and disturbed areas of northern Mexico, Arizona and Louisiana, north to Illinois and South Dakota and in the foothills of the Smoky Mountains. Particularly abundant in Texas. Yellowish-brown with darker head and gaster (more common south) to piceous with yellowish-brown appendages (more common north). Cephalic pubescence very sparse, head shiny. Eye small.

Male. TL 2.1-2.4, OI usually 35-37. Piceous brown to nearly black. Eye relatively small (compared to vividula). Parameres only weakly curved mesad. Distal portion of digitus about 2X as broad as that of aedeagus. Aedeagus longer than parameres, curved upward distally. Crook in antennal segment IV conspicuous.

Queen. Averages smaller and smaller-eyed than vividula, often not distinguishable.

Description

Alloneotype worker. TL 1.98, HL 0.61, HW 0.52, SL 0.68, EL 0.13, PW 0.36, MCL 0.16, WL 0.77, FL 0.54, GL 0.61, SM 8, PM 4, MM 3, CI 86, OI 22, SI 112, FI 88.

Clypeus lentiform; anterior clypeal border arcuate with a faint, narrow median concavity; rear border less strongly arched than front border, also with a small median concave emargination. Sides of head weakly convex along most of their length and slightly convergent anteriad. Rear border of head rounded with a shallow median notch a little wider than the distance between the frontal carinae. Head of about average breadth for the species. Eyes smaller than in vividula, approximately their rear 1/5 overlapping the midpoint of the postmandibular head length; separated from sides of head by about 1/2X eye width and from mandibular insertions by about 1 1/3X EL. Scapes weakly curved near the ends, straight over most of their length; of about the mean relative length for the species.

Pronotum broadly angular, the somewhat shorter anterior face flat and the dorsal face weakly convex. Mesonotum flat on top, sloped downward to the rear, its short anterior face meeting pronotal dorsum face at about the same angle as that between 2 faces of the pronotum. The posterior mesonotal face shorter and much steeper than the anterior mesonotal face. Propodeum low and arched, its highest point only about as high as the rear edge of the mesonotal dorsum. Legs of about average length for the species.

Rear face of petiole obscured by anterior face of gaster, but petiole apparently cuneate with a blunt rounded crest and flat front face in profile. From above, petiolar crest is flat across the middle with rounded corners, and the sides are straight and weakly divergent dorsad.

Cephalic vestiture resembling that of small vividula workers but sparser than in most individuals of the latter species. Cephalic pilosity is rather short, weakly curved, and sparse, especially on the sides of the head. Cephalic pubescence sparse, widely spaced, the spaces between the hairs wider than the length of the hairs in most cases. The appressed hairs themselves are longer than those of other U.S. species. Thoracic macrochaetae about half as long as the greatest width of the scape, of the same color as the scape, protruding above the finer subdecumbent pubescence which covers the scape. Ancillary thoracic macrochaetae about half as long as the shortest major macrochaetae and of the same dark brown color (pronotum) or somewhat lighter (mesonotum). Gaster covered with thick, dark brown rearward-curved macrochaetae of about even length and spacing throughout; and with some very sparse, long pubescence.

Body very shiny and smooth, except gaster which has some very fine almost indetectable (at 40X) shagreening.

Head piceous brown becoming a little lighter on the sides and clypeus. Scapes and mandibles brownish-yellow, the latter with dark brown teeth. Thorax, except mesonotum,

colored like sides of head, mesonotum lighter and yellower. Legs brownish-yellow with the middle and hind coxae paler. Gaster piceous brown.

Neotype male. TL 2.27, HL 0.53, HW 0.48, SL 0.59, EL 0.18, WL 0.74, GL 1.01, SM 6, CI 92, OI 35, SI 112.

Mandible with an apical tooth, a sharp subapical denticle and a crenulate masticatory border. Anterior border of clypeus arcuate, rear border with straight sides and a narrow median concave emargination. Sides of head convex from posterior corners to just before the eyes, straight from there to mandibular insertions. Head narrower than that of vividula. Rear border of head less convex than sides, about as broad as the distance between the mandibular insertions. Eyes apparently only about 1/3X HL (in fact a little longer) but strongly convex, protruding well beyond sides of head. Ocelli not large but fairly close set, median and laterals separated by about 2X their width. Scape weakly sigmoid, a little shorter than average for the species. Antennal segment IV longer than adjacent segments and distinctly bent at the middle.

Petiole cuneate with a blunt rounded crest, thicker than that of worker. In dorsal view, the crest is flat across the top and about twice as wide as that of the worker with straight sides weakly divergent dorsad; the anterior face is concave.

Genitalia distinctive, even from those of closely related vividula. In side view, paramere is about twice

as long as its basal breadth, but it tapers quickly in the basal 1/3 of its length and is digitiform over the distal 2/3. Cuspis curved mesad to overlie the digitus in posterior view and is a little larger and more prominent than in vividula, faisonensis, etc. but much shorter and less prominent than in arenivaga. Digitus not decurved as in vividula but with basal edge straight. Distal portion of digitus about 2X as broad as narrowest portion of aedeagus; the former subtriangular with angles rounded. Outer face of digitus convex. Aedeagus distinctly longer than parameres; the lobes closely appressed (not splayed, as in vividula); conspicuously broadened dorsad and truncate distally, resembling a miniature inverted tomahawk (Fig. 7).

Pilosity finer than worker's, brown to dark brown, of approximately equal spacing and length over entire dorsal surface, except on anterior half of gaster. Pilosity virtually lacking on sides of head and thorax. Parameres with more than 20 yellowish, weakly decurved hairs. Pubescence on head sparse not obscuring sheen of integument. Pubescence of thoracic dorsum denser.

Sculpture much as on workers, but shagreening on gaster consisting of larger, more conspicuous integumental plates.

Eyes grey. Body and appendages uniform piceous, except articulations and tarsi of legs and post-mandibular mouthparts, all of which are light yellowish-brown.

Variation

Worker. TL 1.87-3.03, HL 0.54-0.73, HW 0.44-0.63, SL 0.58-0.84, EL 0.11-0.16, PW 0.30-0.44, MCL 0.12-0.19, WL 0.65-0.93, FL 0.45-0.67, GL 0.61-1.37, SM 5-10, PM 3-6, MM 2-4, CI 80-92, OI 20-24, SI 106-118, FI 83-93, (n=42).

This species is sympatric (or more precisely, mosaically parapatric) with arenivaga and parvula in the western half of the latter two species' ranges. Interestingly, terricola exhibits the same tendency as these other species in having larger overall body size and a broader head in the northern and eastern parts of its range. TL of Arizona specimens averages about 1.9, that of Texas and Oklahoma specimens about 2.2, that of Kansas and South Dakota specimens about 2.4, and that of Tennessee specimens almost 2.6. CI of specimens from southern states ranges 80-87, while CI of Kansas and South Dakota specimens ranges 84-92. Correlated with size trends is a greater degree of investiture of northern material. Four of the five workers with SM 10 and five of the eight workers with SM 9 are from northern states, as are all individuals with PM>5 and MM>3. Greater density of cephalic pubescence is normal on larger specimens wherever they occur. Specimens from Arkansas (UARK), predictably, span the gap between the large, hairy, Tennessee material and the smaller, nearly glabrous Texas material.

Male. TL 2.12-2.40, HL 0.49-0.59, HW 0.46-0.54, SL 0.57-0.69, EL 0.17-0.21, WL 0.73-0.93, GL 0.85-1.05, SM 4-6, CI 90-94, OI 31-37, SI 110-117, (n=9).

These numbers describe fairly well the metric variation of terricola males. Most males have CI 35-37. The two specimens with CI 31 and 33 are unusually small-eyed. I have seen no terricola males from Arizona but would expect them to have small eyes as do workers from that area.

The paramere is generally narrower and straighter (i.e., more digitiform) than in vividula males. While it is always less curved, the shape may closely resemble the weakly recurved triangular form of the vividula paramere. The aedeagus of terricola males is normally considerably longer than the parameres, and the lobes of the aedeagus are closely approximated in preserved material. In side view, in the intact animals, the aedeagus normally projects below the parameres. Occasionally, especially in Tennessee material, the aedeagus more closely resembles that of vividula in being shorter than the parameres and having its halves splayed and projecting above the parameres. In such cases, the structure of the volsella is that typical of terricola, and the specimens have in each case belonged to series in which other males have the aedeagal structure more typical of terricola.

Material Studied

The neotype male and alloneotype worker were designated from a nest series (TTU) labeled Texas, Real Co. 12 mi NE Leakey. Among small rocks. 19 Mar 1979. O. Francke

et al. #3725. The pins bearing the neotype and alloneotype are deposited at LACM, and the remaining three pins from the series are deposited at MCZ. Other series, containing at least males and workers, from nearby Texas localities (all from TTU) are deposited at these and the other usual depositories.

Material from North Dakota and Oklahoma was from GJW. Kansas material was from JCT and SBSK. A large amount of Texas material and smaller samples from other states is at LACM and USNM. Wheeler's types of melanderi (here synonymized with terricola) are at MCZ and AMNH. A large sample of workers from Arkansas (UARK) seems to fill in the middle portion of the size and hairiness clines between Texas and Tennessee and upper midwestern specimens.

Discussion

The resurrection of Buckley's (1866) name terricola for the ant which has been known for 80 years as melanderi is based on several considerations. The first is that despite an adequate description and fine drawings accompanying Wheeler's (1903) description, the name melanderi has been applied recklessly to almost every native species of nearctic Paratrechina. Most references to "melanderi" in the literature apply either to other species or to a mix of species which may or may not include the melanderi of Wheeler's description. In its modern usage, the name has become at worst meaningless and at best highly ambiguous.

Of course, this is true for many names in this genus and would not alone constitute sufficient reason for bringing into use a name of apparently uncertain identity in place of melanderi.

Another problem concerning melanderi is Creighton's designation of New Braunfels, Texas, as its type locality. Among the syntypes of melanderi at AMNH are seven workers and parts of two others from New Braunfels, but no males. MCZ contains no syntype material from New Braunfels. The only male in the entire syntype series, as presently construed, is a rubbed, headless male from Austin.

The importance of the lack of suitable male specimens among the melanderi syntypes becomes clear when we consider that vividula and terricola are separable with certainty only in the males. It is for this reason that I have designated males as lectotype and neotype, respectively, for these two species.

There is considerable overlap in the phenology of workers of terricola and vividula, so much so that lacking associated males, worker specimens often cannot be identified. The differences in the males, contained in the descriptions and in Figs. 7 and 8, need no elaboration. What follows is a listing of hints for identifying workers of these two species in the absence of males. The list is, of course, based on the assumption that all other possibilities besides terricola or vividula have been eliminated.

1. Specimens collected outdoors from north of the Mason-Dixon line, from undisturbed or moderately disturbed habitats are almost certainly terricola. Specimens collected in Gulf or Atlantic coast states east of Louisiana are almost certainly vividula.

2. In Mexico and Arizona, terricola averages about 2.0 mm in length while vividula from the same area averages a little larger, about 2.25 mm.

3. Specimens with OI 24 or less are usually terricola. Workers with OI 25 or more are certainly vividula.

4. Specimens with very sparse cephalic pubescence are usually terricola, though small vividula specimens may have the pubescence on the head quite dilute. Specimens with denser (though very fine) pubescence on the rear portion of the head are probably vividula.

Finally, we consider Buckley's description itself and enumerate the reasons why it must concern the ant Wheeler redescribed as melanderi.

1. The name Formica (Tapinoma) terricola--Creighton (1950, p. 24) points out that Buckley was strongly influenced by the British hymenopterist Frederick Smith. Smith called the Paratrechinas he described Tapinoma (e.g., flavipes). It is possible that Buckley would have used the name in the same way.

2. The size of the castes--The size reported for the queen is certainly too large for a Paratrechina (6.86 mm). The sizes for the worker and male (2.0 mm) are appropriate.

(Buckley gave the queen measurement as 0.27 inch which may be a misprint for 0.17 inch which equals about 4.32 mm, approximately the size of a Paratrechina queen).

3. Coloration--The color of the queen is described as piceous, and the males are said to be "like the female." The worker is described as dark brown above, lighter below and on the petiole and legs. Fully sclerotized Texas material of this species fits these descriptions.

4. Head shape--The head of the queen is described as "small, triangular," i.e., strongly convergent anteriad. The worker's head is said to be "little wider than the thorax." While the latter is an understatement of the true width, it does suggest that he observed the relative narrowness of the head of many workers from Texas.

5. Vestiture--The queen is described as "thickly sprinkled with short grey hairs," probably referring to her dense pubescence. No such pubescence is mentioned for workers or males, as is appropriate.

6. Venation--Buckley says the wings have one marginal and two submarginal cells (i.e., a submarginal and a median cell) and that the discoidal cells are obsolete--as in Paratrechina.

7. Petiole--In Buckley's words, "pedicle short, inserted in the base of the abdomen . . . inclined forward, wedge-shaped." This describes the petiole of Paratrechina perfectly.

8. Ecology--Terricola is described as "very active" (i.e., fast-moving) "with shallow nests in soil. Winged males and females captured in March" and as "rare," which reflects the great difficulty in encountering nests except in early spring. Among ants that could fit the rest of Buckley's description, only Paratrechina has alates in the nest in March. The color is inappropriate for arenivaga, the locality is inappropriate for bruesii, and the alate season is inappropriate for vividula. Melanderi is the only suitable Texas Paratrechina for the description.

Any one or a few of these points, except perhaps number 8, would leave us in doubt, but considered together, I believe they describe, however poorly, Wheeler's melanderi which must, therefore, be relegated to synonym. It is probable that Buckley's Formica picea (1866, p. 163) is in fact a description of terricola minims or other unusually small workers. Lacking sufficient evidence, I do not include picea in the synonymy. While I realize that resurrecting terricola from the ranks of Buckley's numerous nomina nuda constitutes a virtual myrmecological apostasy, I trust that the evidence presented shows this to be the best course for eliminating confusion and stabilizing the taxonomy of the nearctic Paratrechina.

Natural History

Alates of terricola overwinter in the nest and, as indicated in both Buckley's and Wheeler's descriptions, are

commonly found in March in Texas. Texas alate records range from January through April. A Kansas record is from April, and I collected a colony with male pupae from Lawrence, Kansas, on 2 August. Series from Tennessee and Missouri with alates are dated March and April, respectively. Collections of alates in May from Tennessee and Arkansas are both from mountainous areas.

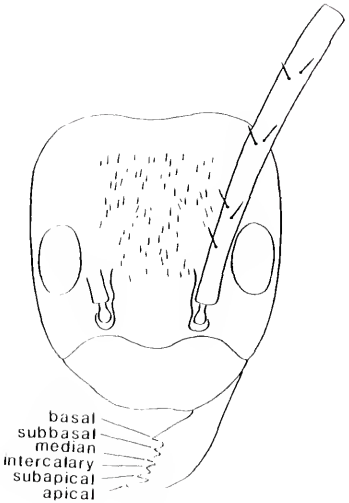
Mitchell and Pierce (1912) reported "large numbers of winged forms were collected running, flying and mating, March 2, 1909." This description recalls to me my observation of a mating swarm of vividula in which males ran about on the substrate, periodically flying up then quickly circling back into the swarm and running about on the substrate with wings vibrating.

Buckley (1866), Wheeler (1903), Mitchell and Pierce (1912) and Van Pelt (1983) state that this species nests in soil, usually beneath a stone, log or cow dung. Records from the TTU collection indicate they are found in most soil types, except very sandy soils, and in vegetation varying from open disturbed areas and pasture to mesquite and post-oak woodland and occasionally in denser more mesic woods. Specimens from South Dakota (GJW) were from Juniper--Rhus trilobata--Chrysothamnus woodland. Kansas collections are from woodland edges and openings, pastures and meadows.

Fig. 4. Head of *vividula* worker, dorsal view.

Fig. 5. Head of *terricola* worker, dorsal view.

Fig. 6. Head of *terricola* male, dorsal view.



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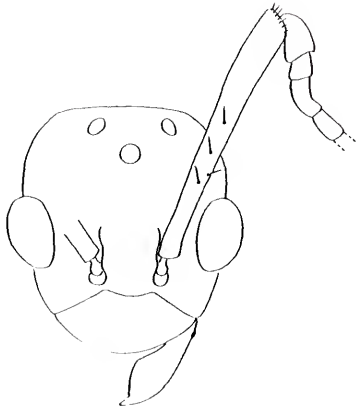

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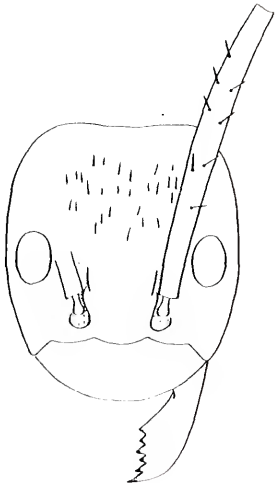

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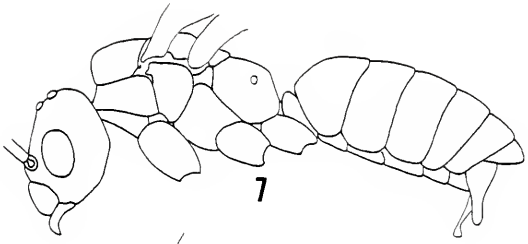
Fig. 7. Male *terricola*, lateral view.

Fig. 8. Male *vividula*, lateral view.

Fig. 9. Worker of *terricola*, lateral view.

Fig. 10. Worker of *vividula*, lateral view.



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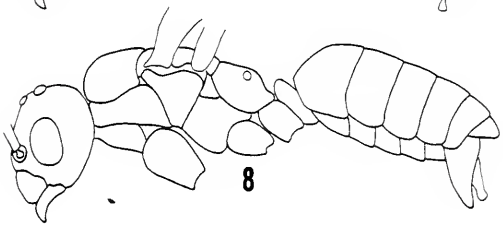

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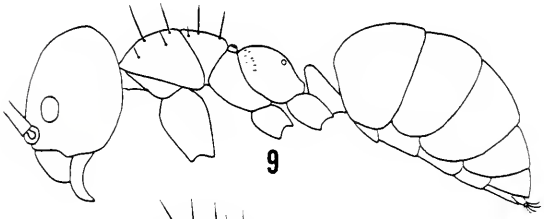

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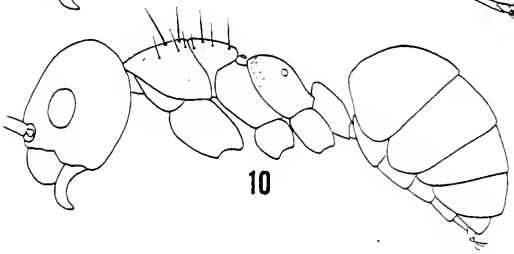

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CHAPTER IX
PARVULA COMPLEX

Diagnosis of Complex

Worker brown or bicolored, shiny; head with dense pubescence, this arising from very fine to rather conspicuous punctae; scape pilosity reduced in some species, suberect to erect. Nests in a variety of undisturbed or lightly disturbed, moist habitats in leaf litter, rotten wood, clumping plants or in soil.

Male shiny, but thoracic and cephalic dorsum usually dulled by pubescence; parameres triangular; digitus boomeranged-shaped; cuspis short; aedeagus triangular, acuminate.

Paratrechina concinna, New Species

(Figs. 11, 14, 38; Map-Fig. 50)

Diagnosis

Worker. TL usually 2.3-2.9, CI usually 84-89, OI 24-28. A species found from Florida to North Carolina, usually found in marshes, wet grasslands and pastures, and swamp edges. Uniform brown or with thorax and legs slightly lighter than gaster and head. Scapes and middle and hind coxae brown (never tan or whitish). Overall size large

among native eastern U.S. species. Cephalic pubescence arising from small foveolae giving punctate appearance. Pubescence of pronotum and proprodeum usually conspicuous, that on front of pronotum subdecumbent.

Male. TL 2.25-2.5, OI usually 34-37. Closely resembling faisonensis but darker in color, has larger body and eyes and cephalic sculpture as in workers.

Queen. Resembles vividula and faisonensis. Differs in having uniform dark color, cephalic punctation, and slightly larger size.

Description

Holotype worker. TL 2.72, HL 0.72, HW 0.65, SL 0.81, EL 0.19, PW 0.46, MCL 0.20, WL 0.91, FL 0.65, GL 1.09, SM 12, PM 7, MM 4, CI 90, OI 27, SI 113, FI 90.

In full face view, clypeus lentiform, anterior border arcuate with a shallow concave emargination across the middle 1/4; rear border also arcuate. Dorsum of clypeus with sides meeting in a rounded median angle. Sides of head rounded, convergent anteriad; widest just behind the eyes. Rear border of head straight with rounded corners; the corners about as far apart as the width of the clypeus. Head subquadrate, broader than usual for the species (CI 90 versus mean CI 86 for the species). Eyes longer and somewhat broader than in faisonensis, slightly more convex. Eyes separated from sides of head by less than 1/3 their width; from mandibular insertions by slightly over 1X EL.

Scapes a little shorter than average for the species, which has SI slightly but probably insignificantly longer than average for vividula group. Scape very slightly but evenly curved over its entire length, distal portion tapering giving the illusion of greater curvature. Small round markings at the positions of the ocelli probably represent vestiges of those organs.

Pronotal profile evenly curved, somewhat more convex than in faisonensis. Anterior face of mesonotum rising from promesonotal suture to dorsal face through about a 50% slope; posterior declivity steeper and longer than usual in the faisonensis; mesonotal dorsum slightly sloped to the rear. Propodeum low and evenly rounded, only a little higher in profile than metathoracic spiracles, the angle between its anterior and declivious faces slightly obtuse.

Petiole sharp-crested, cureate in profile; in dorsal view broader and with more rounded sides and crest than faisonensis.

Cephalic pilosity as in faisonensis. Cephalic pubescence very dense, reminiscent of queens of other species, and neatly aligned, giving a combed appearance. Thoracic macrochaetae conspicuous like those of faisonensis. Thorax appears quite bristly because the macrochaetae are less curved than those of faisonensis, and the eight major hairs are subtended by ancillary hairs about 3/4X as long and these in turn (on the pronotum) by smaller hairs about 1/2 length of the latter. Pubescence of thorax is diagnostic:

subdecumbent and unusually abundant (for the vividula group) on the anterior portion of the pronotum, scattered appressed hairs on the metanotum and metapleuron, and abundant suppressed hairs on the anterior portion of the propodeum. Gaster with a few appressed hairs, unlike faisonensis. Petiole with two small macrochaetae on the crest.

Thorax and gaster strongly shining, the former very smooth, the latter delicately shagreened. Head and appendages punctate, feebly shining, the sheen reduced by the denser pubescence which arises from tiny foveolae.

Uniform castaneous brown with only the articulations of the appendages and the blade of the mandibles a little lighter.

Allotype male. TL 2.46, HL 0.65, HW 0.61, SL 0.73, EL 0.22, WL 0.97, GL 0.85, SM 6, CI 94, OI 34, SI 112.

Head large compared to all other males in vividula group. Head shape, including that of clypeus, strikingly like that of worker. Though CI indicates head is proportionately wider than worker, this is because the head width is taken across the eyes which are much larger than workers' and protrude beyond the sides of the head. Head is, in fact, a little narrower than workers' minus the eyes. Mandibles strongly sclerotized, dark colored with an apical tooth, cleft and a subapical denticle, the dentical larger than in any specimen of vividula having it. Scape a little shorter and with fewer macrochaetae than workers but pilose for a vividula-group species. Eyes larger and more

prominent than faisonensis. Median ocellus notably larger than laterals.

Upper portion rear face of petiole concave. Petiole otherwise as in worker but broader. Gaster contracted, shorter than thorax. Genitalia closely resembling those of faisonensis but with cuspis a little more convex and generally heavier and darker colored.

Vestiture as in workers with the usual differences. Parameres with decurved pilosity as in faisonensis but this less abundant, about 20 hairs.

Not as shiny as workers, due to occurrence of pubigerous punctation on thoracic dorsum and coxae. Gaster also appearing somewhat roughened, this due to a slightly coarser version of the usual shagreening.

Darker in color than all other vividula group species, expect flavipes, from which concinna differs by larger size and having dark colored appendages. Head, thorax, and appendages dark brown, gaster piceous.

Variation

Worker. TL 2.13-3.10, HL 0.61-0.76, HW 0.52-0.65, SL 0.71-0.85, EL 0.15-0.20, PW 0.37-0.49, MCL 0.16-0.20, WL 0.77-0.93, FL 0.57-0.71, GL 0.65-1.41, SM 7-16, PM 4-8, MM 2-6, CI 83-90, OI 24-28, SI 110-125, FI 88-97, (n=41).

This species seems to be quite uniform in general appearance throughout its range. Head shape somewhat variable as indicated by the large range of CI. This seems to

have no relationship to overall size, as even large workers may have heads in the narrow end of the range. The abundance and degree of appression of the pronotal pubescence, which occasionally consists of only a few appressed hairs is also somewhat variable. The macrochaetae on the petiolar crest vary from 0-2. The color of the thorax is not uncommonly a little lighter and yellower than that of the head and gaster. This is probably the normal condition of younger workers.

Male. TL 2.24-2.46, HL 0.59-0.67, HW 0.55-0.63, SL 0.67-0.74, EL 0.20-0.24, WL 0.87-1.01, GL 0.69-0.85, SM 5-7, CI 92-97, OI 33-38, SI 108-117, (n=8).

The large size, dark color, distinctly short gaster and worker-like aspect of the head of concinna males show little variation in the specimens from Florida and North Carolina I have seen. Most have the ocelli more equal in size than those of type.

Material Studied

Holotype and allotype and a large series of paratypes, including queens, were collected 15 April 1980, 1.5 miles ESE of Gainesville, Florida, under a plant pot on a damp lawn at the edge of a sweetgum swamp. Holotype and allotype are deposited at FSCA. Paratypes are deposited in the usual depositories.

Most of the material studied was collected by myself in Alachua County and Highlands County, Florida. A number

of collections made by Van Pelt (1957) are stored at FSCA. Additional small series were found in LACM, USNM, AMHN, DPW (USDA) and TPN, these from Florida, Georgia, and North Carolina.

Discussion

The name concinna (Latin--neat, orderly) refers to the neatly aligned appearance of the cephalic pubescence.

This species falls into Creighton's concept of vividula, but I do not believe he ever saw it and, thus, have not included his vividula treatment in the synonomy. There are only a few specimens of concinna in the major collections due to its preference for habitats rarely collected by ant hunters. My collection contains many more concinna than all other collections together except FSCA, which reflects both the poor representation of Florida ants in these collections and the unlikelihood of collectors' entering marshy areas to find ants.

Concinna could be confused in the field with vividula, faisonensis or bourbonica. Fiasonensis lacks thoracic pubescence and is smaller, while bourbonica is more uniformly covered with dense grey pubescence and is larger. Large, dark specimens of vividula can be recognized by their smooth heads, less abundant cephalic and thoracic pubescence and lower SM.

Based on the overall similarity of the workers and of the genitalia of the males, I believe concinna is most closely related to faisonensis.

Natural History

Like vividula, this ant may, under appropriate conditions, produce alates at any time of year. I have records of alates and alate pupae in nest series from south Florida in December (Highlands County) and May (Dade County), and I have alates from North Carolina collected in April and September. In the Gainesville, Florida, area, these ants seem not to raise alates during the cool months; the peak rearing of sexual brood occurs March-July.

I believe, based on the collections of Van Pelt (FSCA) and myself in relatively pristine habitats, that concinna was originally a species of marshy areas and of openings in flatwoods and swamp. In such habitats, it nests in grass tussocks and in pieces of rotten wood that have fallen from nearby wooded areas. Today, it probably is more readily found in pastures and lawns of high water-table areas and along ditches and drainage canals where it nests in tussocks, cow dung and discarded wood. I found one colony at a laboratory complex in Gainesville, nesting in leaf litter beneath shrubbery. Vividula is abundant at this site, which is adjacent to a low pasture. A collection from "xeric mixed woods" is Seminole County, Georgia (LACM), is unusual and possibly mislabeled.

Paratrechina faisonensis

(Figs. 1, 2, 12, 15, 42; Map-Fig. 50)

Prenolepis arenivaga var. faisonensis Forel, 1922. Rev. Suisse Zool. 30: 98. ☿. Type loc. Faison, NC.

Paratrechina vividula: Creighton, 1950. Bull. Mus. Comp. Zool. Harvard 104: 408 (in part?); Nuhn and Wright, 1979, Amer. Mid. Nat. 102: 353-362; Thompson et al., 1979, Psyche 86: 321-325.

Paratrechina melanderi: Lynch, Balinsky and Vail, 1980, Ecol. Ent. 5: 353-371; Lynch, 1981, Oikos 37: 183-198.

Diagnosis

Worker. TL usually 2.0-2.5, CI usually 83-87, OI usually 20-23. A deciduous woodland species of the southeast U.S. north to the New Jersey Pine Barrens. Brown with tan to whitish middle and hind coxae. Head narrow, CI usually 83-87. Eye small, weakly convex. Cephalic pubescence dense, partly obscuring sheen of head. Erect macrochaetae on scape conspicuous, almost as long as width of scape. Thorax and propodeum normally completely lacking pubescence, very shiny. SM 8-13.

Male. TL usually 2.0-2.25, OI usually 31-33. Color as in worker. Head narrow due to small, weakly convex eyes. CI usually around 90 (94+ in sympatric species). Scape macrochaetae conspicuous, MS 4-7.

Queen. Small eyes, light coxae and very shiny integument of head and thorax (visible even through dense

pubescence when specimens are clean) distinguish this species from vividula, concinna and arenivaga.

Description

Lectotype worker. TL 2.10, HL 0.59, HW 0.48, SL 0.69, EL 0.13, PW 0.35, MCL 0.16, WL 0.71, FL 0.53, GL 0.81, SM 9, PM 3, MM 2, CI 83, OI 22, SI 117, FI 90.

In full face view, clypeus subtrapezoidal, anterior border truncate, its straight portion about half as wide as its sinuate rear border. Sides of head rounded, slightly convergent anteriad, widest just behind eyes. Middle half of rear border of head nearly straight except for narrow median concavity. Head, exclusive of clypeus, longer than broad, narrower than that of related species. Eyes small, weakly convex separated from the sides by more than 1/2 the eyes' width, and separated from mandibular insertions by about 1 1/2X EL. Scapes a little longer than average for the species, evenly and very slightly curved for about the basal 85% of their length, a little more strongly curved distally. No ocelli visible.

Pronotal profile an even, very weakly convex upward slope toward the rear. Promesonotal suture feebly impressed. Mesonotal profile almost flat, parallel to long axis of thorax and lacking an anterior face, thus yielding a hemi-parabolic profile together with the pronotum.

Posterior portion of mesonotal profile bearing a small setigerous swelling, followed by a posterior declivity.

Proprodeum partly crushed on the left side but in profile appears evenly rounded like that of vividula. The angle between its base and its rearmost portion near the petiole weakly obtuse. Legs of usual length for vividula group.

Petiole partly imbedded in glue, appears cuneate, but more rounded than in vividula. In posterior view, crest is an even curve.

Cephalic pilosity as in vividula; the pubescence fine, more densely and more uniformly distributed over entire head but difficult to see in this callow specimen. Scape macrochaetae brown, suberect, a little longer and stouter than those of vividula and quite visible. Thoracic macrochaetae dark brown, gently and evenly curved mesad. Pilosity of gaster and legs just as in vividula. Thorax and abdomen lacking appressed pubescence.

Head and thorax shiny (in the former case even through the pubescence). Gaster delicately shagreened.

Head and gaster light brown, thorax, legs and scapes a shade lighter, middle and hind coxae very pale yellow.

Variation

Worker. TL 1.83-3.00, HL 0.53-0.69, HW 0.44-0.61, SL 0.63-0.80, EL 0.12-0.16, PW 0.29-0.44, MCL 0.14-0.20, WL 0.65-0.89, FL 0.47-0.65, GL 0.57-1.49, SM 8-13, PM 2-6, MM 2-5, CI 81-90, OI 20-24, SI 112-119, FI 87-97, (n=40).

TL is typically less than 2.5; the 3.0 specimen's length largely due to its very distended gaster. CI is usually less than 87; only one specimen had CI 90.

The clypeal shape described in lectotype is common, but the anterior border may range from arcuate and virtually entire to having two straight sides with a narrow concave emargination. The eyes of some specimens are larger and more convex, approximating the condition of related species (see discussion). A vestigial median ocellus is rarely present. The rear border of the head of larger specimens in full face view usually has a broader emargination than the type (and most other smaller specimens), yielding a weakly subcordate appearance. The widest portion of head is directly across eyes in many larger specimens. The promesonotal profile is usually hemiparabolic as described in type, but often the parabola is broken by a short, steep anterior mesonotal face. Rarely, the pronotum is very obtusely subangular. The sides of the petiole appear to diverge a little more toward the crest than in vividula (the latter feature not visible in lectotype).

Pilosity is often a little more abundant than on the type, particularly on the clypeus and promesonotum. In the latter case, the eight major macrochaetae are 2X or more as long as the six or eight adjacent ancillary hairs, and a few still shorter hairs may be present. Some large specimens may have a small amount of pubescence along the anterior edge of the propodeum, or rarely on the anteromedian portion of the pronotum.

The color of fully sclerotized individuals varies from nearly uniform dark brown to dark yellowish-brown. The

middle and hind coxae are less contrastingly pale in the lighter specimens. Occasionally, the thorax and, less often, the head are a little lighter than the gaster. The color described for the type is typical of callows. Many darker specimens may have some faint bluish reflections on the pronotum.

Description and Variation

Male. (Composite description, no males in syntype series. Two males from my collection have been deposited at MHNG. I have not formally designated them as allopara-types, since they are not from the type locality.)

TL 1.96-2.24, HL 0.52-0.57, HW 0.46-0.51, SL 0.61-0.65, EL 0.16-0.18, WL 0.73-0.83, GL 0.65-0.93, SM 4-7, CI 87-92, OI 31-35, SI 113-123, (n=8).

Anterior border of clypeus arcuate, often with a shallow median concavity or truncation. Rear border of clypeus more arcuate than worker's, yielding a lenticular general form to the clypeus in full face view. Median portion of clypeus rounded, subumbonate. In full face view, rear border of head straight with rounded corners. Mandibles with smooth masticatory border, apical tooth often only indistinctly set off from this border. Eyes smaller and less convex than any other sympatric Paratrechina in full face view. Eyes less than 1/3 the length of the head, and in some specimens, barely protruding beyond the sides of the head. Head narrower than in sympatric species.

Petiole shaped as in worker but broader. Genitalia (Fig. 45) have the form that I consider most generalized among nearctic species. Parameres in side view triangular, about 2X as long as broad. In rear view, parameres weakly curved mesad over their distal half. Volsella weakly sclerotized, of simple structure; the digitus resembling the boomerang shape of that of vividula but shorter, less strongly bent and less tapered distally; cuspis thumb-like in appearance and not convex in dorsal aspect, appearing more truncate than rounded distally. Aedeagus resembling paramere in shape but narrower at the base and less tapering, less sclerotized and slightly decurved near the tip (Fig. 45 does not show this clearly because it is a more dorsal view). In rear view, the aedeagal lobes are normally closely appressed in preserved specimens and are about equal in length to the parameres.

Vestiture, color and sculpture almost like those of the workers with the usual differences in the vestiture of the scapes and thorax. In colonies with fully sclerotized workers at the lighter end of the color range, the males tend to be lighter, as well. Parameres with about 25 decurved brown hairs, like those of vividula, except for their darker color.

Material Studied

Syntype material (MHNG) consists of nine workers on three pins collected in a forest at Faison, North Carolina,

on 24 July 1922, by Forel. The topmost specimen on the pin with Forel's red "Typus" label is the lectotype. The letter B is written on the point upon which this specimen is mounted. One specimen on the middle point of another of the pins is a worker of Lasius flavus. The syntype series is hereby restricted, with appropriate pertinent labeling, to the eight faisonensis workers. The specimens are callows and probably minims, so I have deposited two pins containing a male and two workers each from Florida at MHNG for reference of later students of Paratrechina.

Also studied were series from Mississippi, Alabama, Florida, Georgia, North Carolina, Virginia, Maryland and New Jersey. Most of the material is at LACM, TPN, JCT and MCZ. The Robert E. Gregg collection, cursorily examined in August 1982, contains numerous samples of this faisonensis from Great Smoky Mountains National Park and from near Memphis, Tennessee, and one from Arkansas. One silt-encrusted series at UARK is probably faisonensis.

Discussion

Forel's (1922) description of faisonensis, though scant, clearly points out the features by which even the small, crumpled and poorly mounted specimens which served as his syntype series may be readily distinguished from arenivaga. The faisonensis types resemble arenivaga in vestiture, thoracic shape and (because they are callows) color but have smaller, flatter eyes and a darker gaster and were collected

in a forest. Creighton (1950) synonymized Forel's variety without even seeing the types. As we shall see, his concept of arenivaga was so confused (see discussion of arenivaga) that even seeing Forel's types might not have prevented him from sinking faisonensis. I believe he would have considered them representatives of his supposed intermediates between arenivaga and "melanderi" (i.e., terricola) though he stated the intermediates he saw came from Alabama. In fact, the rather large pale faisonensis material from Florence, Alabama, in his collection (LACM) may be what he had in mind when he discussed these "intermediates." By not considering some of the subtler but no less important characters which separate these three species elucidated in this study, it is easy to see why he made such a determination of paler faisonensis material. I gather from his discussion of the characters separating "melanderi" and "vividula" (p. 408) that most of what Creighton called vividula was in fact fully sclerotized material of faisonensis. Thus, Creighton synonymized faisonensis because he believed the material rightly belonging to it to be vividula, while true vividula specimens were considered to be "melanderi" (terricola) in most cases. Now we can see why he so vehemently defended the distinctiveness of terricola and vividula in the face of Emery's (1906) having made "melanderi" a race of vividula. Suffice it here to point out that Emery's decision was based on having seen and illustrated authentic type material of both species.

This species closely resembles parvula in the field but may be easily distinguished by the macrochaetae on the scape, light coxae, and its preference for shaded habitats. Males of parvula and faisonensis may be separated in the same way. Colonies of concinna are normally found in open areas such as moist pastures or marshy areas, and the workers are larger and have relatively larger eyes, small punctae from which the cephalic pubescence arises, dark brown middle and hind coxae and conspicuous pubescence on the thorax. Males of concinna have most of the same differences and, like the workers, average significantly larger than those of faisonensis.

Natural History

In Florida, alates are reared from the end of August through December. Flights of faisonensis occur in March at the southern end of its range and from the end of April through May in the northern part of its range. Alate females appear to gain weight during the cool season and have large, heavy gasters during the mating season.

Virtually all records of faisonensis with accompanying habitat data make reference to deciduous or mixed woodland, often with the modifiers moist or mesic. Lynch et al. (1980), Lynch (1981), and Nuhn and Wright (1979) contain details on some aspects of this species' ecology and corroborate the observation that this is a woodland species. The colony queen generally lives in a rotting branch or

tree root beneath leaf litter, while colony fragments comprised mostly of partially sclerotized nurse workers and later-instar larvae and pupae are commonly found near the surface of the leaf litter or under bark of a rotting log. Such colony fragments are commonly encountered by collectors. They were called intermediates between the "yellow form" (i.e., arenivaga) and the "dark form" (i.e., fully sclerotized faisonensis, concinna, parvula or wojciki) by Van Pelt (1947). Later Van Pelt (1956, 1958) recognized arenivaga as a separate species and referred all dark species of the area studied to P. parvula. I have examined his material at FSCA and find that the majority of it is faisonensis, and most of the series are accompanied by labels indicating they originated in "mesic hammock," Floridian for moist broadleaf or mixed forest.

Lynch et al. (1980) found faisonensis to be a codominant ant in hardwood forest in Maryland, where it managed to coexist with Prenolepis imparis and Aphaenogaster rudis, distinguished ecologically by differences in seasonality, food preference and handling, and foraging and recruitment strategies. In Florida, I have collected it in mixed pine-hardwood forests with the same codominants and in shadier flood plain forests where Lasius alienus and Formica pallidefulva were virtually the only other ants.

Thompson et al. (1979) reported on the possible association of this species (reported as vividula) with the cixiid homopteran, Oliarus vicarius (Walker).

Paratrechina flavipes

(Figs. 13, 16; Map-Fig. 50)

Tapinoma flavipes F. Smith, 1874, Trans. Ent. Soc. Lond., p. 404. ☿, ♀. Type loc., Hyogo, Japan.

Prenolepis flavipes: Wheeler, 1906, Bull. Amer. Mus. Nat. Hist. 22: 321. Fig. 1, ☿, ♀, ♂.

Paratrechina flavipes: Emery, 1910, Deutsch. Ent. Z., p. 132. Figs. 8-9, ☿, ♀, ♂; Emery, 1925, Gen. Insectorum Fasc. 183: 220.

Diagnosis

Worker. TL usually 2.0-2.25, CI usually 86-90, OI 21-25. A temperate Asian deciduous woodland species, introduced on Long Island and in southern Pennsylvania. Head yellowish-brown, darker on top, broad with convex sides and rear border covered with fine dense pubescence. Mandible with subbasal tooth almost as, or indeed as large as median and basal teeth. Thorax yellow to yellowish-brown, arched in profile with relatively few yellowish-brown macrochaetae. Propodeum almost as high in profile as mesonotum. Gaster brown or with tergite 1 yellow and posterior tergites banded yellow and brown. Legs short, FI<90.

Male. TL 1.95-2.2, OI 34-36. Uniform dark brown to nearly black with blackish or brownish-yellow appendages. Rear border of head usually convex in full face view.

Ocelli small, 2 1/2-3X their width between the median and laterals.

Queen. Very close to faisonensis in appearance, but mandible with basal and subbasal teeth subequal in size.

Description

Lectotype worker. TL 2.09, HL 0.56, HW 0.48, SL 0.61, EL 0.12, PW 0.33, MCL 0.14, WL 0.65, FL 0.46, GL 0.89, SM 5, PM 3, MM 2, CI 87, OI 22, SI 109, FI 84.

Clypeus sublentiform, its anterior border with arcuate sides, the middle third truncate and slightly concave. Dorsum of clypeus convex with only a trace of the median angle near the front edge. Sides of head rounded, slightly convergent toward the front, more convex than other species in vividula group. Head broadest across the rear half of the eyes. Rear border convex except for a narrow, median concavity. Bulging aspect of sides of head and convexity of rear border gives an unusually broad look to the head for a worker of this small size, CI 87. Mandible with subbasal tooth notably larger than intercalary, almost as large as basal. Eyes small, OI 22, closer to the sides of head than in faisonensis, separated from them by less than 1/2X eye width. Eyes separated from mandibular insertions by about 1 1/4 EL, their rear edge lying anterior to the midpoint of distance from the rear border to the mandibular insertions. Ocelli indistinct, small, but all three visible from

posterodorsal view. Scapes shorter than usual for vividula group, SI 109, reminiscent of the condition in parvula.

Pronotal profile more convex than faisonensis. Metanotal profile sloping to the rear, slightly concave, with a short, steep anterior face and slightly steeper rear face about 2X as long as the anterior. Propodeum evenly rounded, the angle between its anterior and declivious faces about 90°, giving it a more arched appearance than other vividula group species. Legs relatively short.

Petiole cuneate, formed like that of faisonensis in side view but flat across the top in rear view.

Cephalic and thoracic pilosity mostly rubbed off of the left side of the specimen; that remaining on the right side is a little less abundant, lighter in color, and shorter (see MCL) than that found on faisonensis, PM 3, MM 2. The anterior macrochaeta on the metanotum about 1/2 as long as the posterior pronotal macrochaeta. Cephalic pubescence shorter, finer, and denser than in faisonensis, thinning a little toward the front. Pubescence on scapes long, subdecumbent and partially obscuring the macrochaetae, some of which have perhaps fallen off (SM 4, see Variation). Thorax and gaster without pubescence. Gastral pilosity relatively short, light-colored and sparse.

Specimen shining throughout, duller on head where obscured by pubescence. Even the gastral shagreening is finer than usual in the group.

Eyes grey. Head yellowish-brown, a little darker on top. Gaster banded, the first tergite testaceous yellow; the posterior tergites with their front edge the same light color and their rear 2/3 brown as the head. Thorax of same color as light portions of gaster. Appendages somewhat yellower.

Variation

Worker. TL 1.71-2.81, HL 0.51-0.67, HW 0.41-0.61, SL 0.54-0.73, EL 0.11-0.16, PW 0.29-0.41, MCL 0.13-0.17, WL 0.57-0.82, FL 0.42-0.58, GL 0.63-1.33, SM (5) 7-12, PM 2-4, MM 2-4, CI 82-94, OI 21-25, SI 105-116, FI 80-92, (n=45).

Thirty-seven of the flavipes workers measured had CI 86 or greater. Not surprisingly, the 8 with narrower heads were at the low end of the TL range. Most specimens have vestiges of all 3 ocelli. The rounded aspect and fine dense yellow pubescence of the head are virtually invariable. Clypeus, unlike the type, sometimes retains the subangular interface between the sloping sides. All specimens other than the type have SM 7 or greater, and it seems likely that the type has lost some of the macrochaetae. The pubescence on scape usually is not so long or erect as in type.

The pronotum is always high in profile but occasionally is somewhat angular rather than evenly convex. The mesonotal profile sometimes lacks the anterior face and/or is flat, both of which enhance the high arched appearance of

the promesonotum. The propodeum at its highest point varies from notably lower than the mesonotum to about the same height, with most specimens tending toward the higher propodeum and having approximately a right angle between its base and its rear face between the metapleural glands. The petiolar crest varies from flat to convex in dorsal view.

On some specimens, a few, very fine, yellow, appressed hairs are detectable on the anterior edge of the propodeum and/or some short erect hairs on the petiole. Some fine pubescence may occur on the sides of the gastral tergites. The promesonotum generally has only the 8 major macrochaetae conspicuous, and even these are yellowish and shorter and finer than in other species. The anterior mesonotal macrochaetae are sometimes longer than in the type, up to 3/4X the length of the posterior ones. The ancillary macrochaetae, when present, are typically 1/3X or less as long as the major hairs.

Japanese specimens of flavipes from Fukuoka, graciously collected for me by Dr. Masaki Kondoh, are darker colored than American specimens. On the other hand, specimens kindly donated by Dr. Masao Kubota, collected on Taiwan, closely resemble the American specimens in color. This may indicate that the American population originated in Taiwan or adjacent mainland. These specimens and another series from Japan (in MCZ) are quite uniform in size; e.g., HL 0.57-0.62 in all but one specimen, WL 0.69-0.73 (n=20). By contrast, a series of eight workers from Pittsburg have

ranges for the same measurements HL 0.51-0.63, WL 0.57-0.82! Ranges nearly as broad occur in specimens collected in Philadelphia in 1939 (FEM) and 1964 (MCZ).

Male. (Composite description--no male in syntype series.)

TL 1.96-2.20, HL 0.48-0.53, HW 0.44-0.48, SL 0.54-0.58, EL 0.17-0.18, WL 0.72-.079, GL 0.75-0.89, SM 4-6, CI 92-100, OI 34-36, SI 110-115, (n=9).

Clypeus lentiform, anterior border more arcuate than posterior, with a conspicuous concave or subangular notch across about the middle 1/4 of clypeal width. Sides of head convex; rear corners strongly rounded off; rear border slightly convex or nearly straight across, lying directly behind the inner borders of the eyes; i.e., rear border comparatively narrower between the corners than in other species, emphasizing convexity of sides of head. Mandibles edentulous or with a short apical tooth, in either case having one or two very short, blunt denticles. Eyes more convex than in faisonensis apparently occupying about the middle 1/3 of standard HL. Ocelli small, medians separated from laterals by 2 1/2-3X their width.

Petiole as in workers, though a little broader.

Genitalia close in form to those of faisonensis (Fig. 45) and concinna, but parameres shorter, only about 1 1/2X as long as broad and with a slightly concave rear border in side view. Cuspidal terminus a little smaller and more convex than in faisonensis but more readily visible because

the convexity faces more dorsad and is very shiny; in side view, it often may be seen barely protruding above the paramere. Aedeagus as long or slightly longer than paramere, in the latter case protruding a bit beyond them as seen from dorsal view. Pilosity obscures this in side view.

Pilosity comprised of yellowish-brown macrochaetae over the entire body, short and less abundant on the first gastral tergite than behind. Pubescence a little longer than worker's, except on scapes where it is sparser and shorter. A few scattered appressed hairs may be found on the lateral portions of the gastral tergites. Parameres with about 15-20 of the usual sort of long decurved simple macrochaetae.

Very dark brown to nearly black. (Occasional specimens are bicolored, a dark version of the worker coloration.) Appendages light to dark brownish- or blackish-yellow.

Sculpture almost nonexistent--very shiny with faint gastral shagreening.

Material Studied

The lectotype (BMNH) is a single worker mounted on a card labeled "*T. flavipes* Sm. Hiogo/syntype." (Locality probably Hyogo Prefecture, Japan.) A queen labeled "*Tapinoma flavipes* Smith, Type/syntype" on a second pin, accompanies the worker. Also studied were specimens from Pittsburg (USNM), Philadelphia (FEM, MCZ), Long Island (MCZ) and the Japanese and Taiwanese series mentioned above (JCT).

Specimens from the Asian collections have been donated to BMNH and FEM in addition to the usual depositories.

Discussion

The presence of flavipes on Long Island and in the vicinity of Pittsburg and Philadelphia (in the latter since at least the late 1930s) suggests that the species entered the country with potted plant materials or logs for growing mushrooms brought in by immigrants from Japan and China early in this century. This is another tribute to the success of this genus in sending immigrant species to many parts of the world. As mentioned above, I believe the American population originated in China. Its success in forests near cities at the periphery or just beyond the periphery of the range of faisonensis also suggests it may be found in woodlands further from these cities and that it eventually may be found in sympatry with faisonensis.

I believe that flavipes is the temperate Asian cognate of faisonensis. They both prefer moist deciduous forests and have small eyes, nearly the same range of SM, similarly distributed cephalic pubescence, virtual lack of thoracic pubescence, and polished appearance. The statistical difference in CI, while significant, obscures a broad range of overlap. Indeed, narrow-headed, dark flavipes so closely resembles broad-headed, bicolored faisonensis that I, at one point, thought flavipes might be a northern variant of faisonensis. The shorter scapes and legs, arched appearance

of the thorax and propodeum, and the more intense yellow chroma of flavipes will serve to separate them. I originally placed flavipes in a "Section Faisonensis" along with faisonensis and concinna, based on ecological features and scape pilosity. It is significant that in flavipes SI and FI and the proportion WL/HL are closer to those of parvula, austroccidua and wojciki. Also, our only other native form which regularly has 3 visible ocelli is austroccidua. Perhaps flavipes represents something closer to the common ancestor of both groups of species. For this reason, I have placed the 6 species together in Section Parvula.

The resemblance in color of vividula material, which might be found in the area where flavipes occurs, should cause a little confusion as the habitat preference of the 2 species are so different; likewise for arenivaga.

Natural History

Fully sclerotized, well-fattened alate queens and abundant males have been collected in May in Pennsylvania and in April in Fukuoka. The Taiwan series contains a callow male and is dated 8 August. I presume flavipes alates pass the winter in the nest as do faisonensis.

The preference for either primary or old secondary hardwood or mixed forest or forest reminants is apparently characteristic of both the Japanese and American populations. Dr. Kondoh (personal communication) states that he

Fig. 11. Worker of concinna, lateral view.

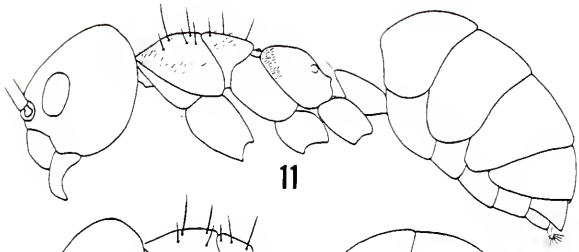
Fig. 12. Worker of faisonensis, lateral view.

Fig. 13. Worker of flavipes, lateral view.

Fig. 14. Head of concinna worker, dorsal view.

Fig. 15. Head of faisonensis worker, dorsal view.

Fig. 16. Head of flavipes worker, dorsal view.



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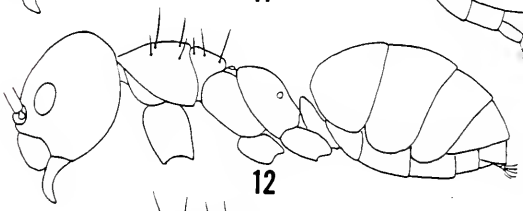

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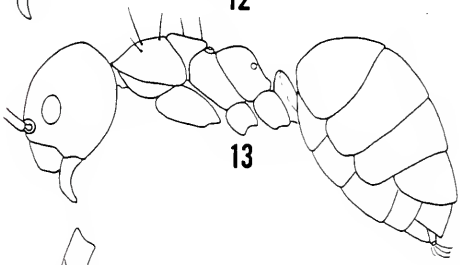

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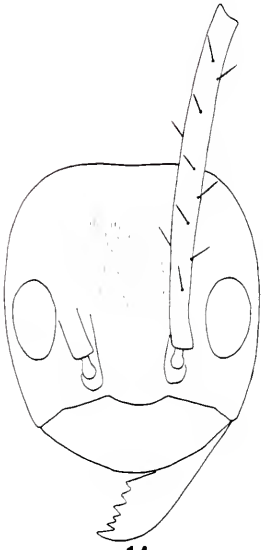

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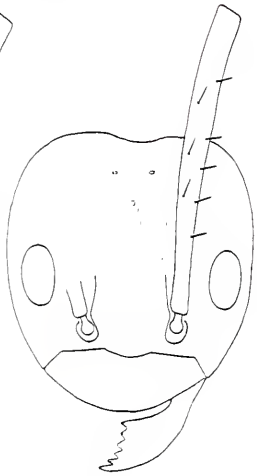

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considers "flavipes" from open habitats in Japan a different species.

It may be that faisonensis has prevented the spread of flavipes further south, where the latter could very likely thrive, as it occurs in warm temperate forests in Japan and China. In this light, it is interesting to note that wojciki expands into moist shaded habitats from its usual more xeric habitats in south Florida where faisonensis is uncommon. It appears that the abundant native woodland species faisonensis has a strong competitive edge over related species in its preferred habitat.

Paratrechina parvula

(Figs. 19, 22; Map-Fig. 51)

Prenolepis parvula Mayr, 1870, Vehr. Zool. Bot. Ges. Wien. 20: 948. ☿, ♀, ♂; Emery, 1893, Zool. Jahrb. Syst. 7: 636. Pl. 22, Fig. 23, ♂; Wheeler, 1905, Bull. Amer. Mus. Nat. Hist. 21: 390. Fig. 2, ♂. Type loc., United States (New York?).

Prenolepis vividula parvula: Forel, 1884, Bull. Soc. Vaud. Sci. Nat. 20: 348.

Paratrechina (Nylanderia) parvula: Emery, 1925, Gen. Insectorum, Fasc. 183: 222; Buren, 1944, Iowa State College J. of Science 18: 295; M.R. Smith, 1947, Amer. Mid. Nat. 21: 390. Pl. 20, Fig. 76, ☿; Creighton, 1950, Bull. Mus. Comp. Zool. 104: 409 (in part ?).

not Prenolepis parvula var. grandula (Forel, 1923, Rev. Suisse Zool. 30: 98. ☿) which should properly be referred to as Conomyrma grandula Forel, NEW COMBINATION (see Discussion below).

Diagnosis

Worker. TL usually 1.85-2.25, OI usually 23-27. Probably found in every U.S. state from North Dakota to Texas eastward and in Ontario, usually in open habitats on loamy soils. Uniform dark brown to brown to piceous (lighter, Oklahoma and Texas). Scapes short, SI usually 105-110, completely lacking standing macrochaetae.

Male. TL usually 1.9-2.25, OI 34-36. Uniform dark brown (including middle and hind coxae). Scapes without standing pilosity.

Queen. Uniform dark brown. Scapes short, without standing pilosity. In Florida, larger and broader-headed than wojciki, which usually has SM 1-2.

Description

Lectotype worker. TL 1.86, HL 0.56, HW 0.47, SL 0.60, EL 0.13, PW 0.34, MCL 0.14, WL 0.66, FL 0.47, GL 0.65, SM 0, PM 4, MM 3, CI 85, OI 23, SI 107, FI 85.

Clypeus lentiform; anterior clypeal border arcuate, entire though somewhat flattened medially; the rear border arcuate with a narrow concave median emargination. Clypeal dorsum with median angle rounded, a little sharper than in vividula but not carinate. Sides of head weakly convex,

broadest just behind the eyes. Posterior corners of head lie behind inside margins of eyes and enclose the shallowly concave rear border. Head notably longer than broad. Eyes separated from mandibular insertion by a little over 1X EL and from sides of head by about 3/5X eye width. Rear border of eyes lies right at the midpoint of the postclypeal length of the head. Scapes short, gently curved over the basal and distal thirds of their length, straight in the middle. Ocelli lacking.

Pronotum in lateral view convex. Mesonotum flat-topped and sloping to the rear with short anterior and posterior faces more gently sloped and meeting the dorsum in more broadly rounded angles than in vividula. Propodeum smooth and rounded, its highest point about as high as that of pronotum. Legs shorterthan in vividula or faisonensis.

Petiole cuneate in side view, with a very flat front face, convex rear face and a narrow but blunt crest. In rear view, crest is concave and meets the straight sides through smooth round corners.

Cephalic pilosity about as abundant as vividula but shorter, flexuous. Scapes completely lack standing macrochaetae. On this specimen, one or two suberect hairs on each scape resemble short macrochaetae, but these proved at 200X to lack barbulation and, in any case, are inconspicuous. Cephalic pubescence moderately dense and uniformly distributed on dorsal surface. Some of the thoracic pilosity broken or lost on this speciemn. PM and MM reported

above are estimated based on hair sockets, etc. Thoracic macrochaetae curved, longer and thicker than those on head, the ancillary hairs over 1/2X the length of the 8 major hairs. Major macrochaetae of pronotum distinctly larger than those of mesonotum. Gastral pilosity as long as, but more slender than, major thoracic hairs. Pilosity dark brown. Thorax, propodeum, and gaster free of pubescence. Scapes and legs with the usual dense pubescence, that on the scapes varying from fully appressed to suberect.

Generally shiny; with even the pubescence of the head obscuring the sheen only partially.

Uniform dark brown with appendages a little lighter and yellowish.

Variation

Worker. TL 1.78-2.68, HL 0.55-0.66, HW 0.44-0.59, SL 0.57-0.71, EL 0.12-0.16, PW 0.33-0.43, MCL 0.13-0.20, WL 0.64-0.81, FL 0.46-0.58, GL 0.55-1.21, SM 0, PM 2-6, MM 2-4, CI 79-91, OI 21-27, SI 100-115, FI 81-90, (n=52).

This widespread species shows considerable variation. As in arenivaga, there is a tendency for specimens from the northwestern part of the range to be large in size and more pilose, but any combination of size and pilosity can be found virtually anywhere in the range. Specimens from Iowa (WFB) are particularly large and broad-headed. The placement of the eyes with the rear margin at the midway point of the postclypeal head length is almost universal. The

eyes extend a trifle posterior to this in some specimens with large OI. The distance between the sides of the head and the outer margins of the head varies from about 1/4 to 1/2X the apparent width of the eye in full face view, again varying somewhat with eye size. The pronotal profile is broadly angular in many specimens. Many specimens have pubescence on the propodeum. The general aspect of the thorax in profile is short and arched as in flavipes. Mean WL/HL in parvula is 1.18 (cf. 1.20 in flavipes, 1.24 in vividula).

Color is surprisingly constant in this species. Uniform dark brown body and somewhat lighter, yellowish appendages are the rule. Typically, the middle and hind coxae are as dark as the fore coxa, though sometimes they are lighter as in faisonensis or wojciki. Many fully sclerotized Georgia and Gulf Coast state specimens are very dark piceous brown. In these dark individuals, even the appendages are dark brown but appear lighter due to the pubescence. In Texas and Oklahoma, this species appears smaller than usual and is bicolored with a yellowish thorax and yellowish-brown head and gaster.

Male. (Composite description--no syntype males studied though they probably exist in the Mayr collection at Vienna.)

TL 1.86-2.24, HL 0.51-0.57, HW 0.46-0.56, SL 0.54-0.63, EL 0.17-0.20, WL 0.69-0.85, GL 0.61-0.93, SM 0, CI 91-98, OI 34-36, SI 104-115, (n=11).

Clypeus sublentiform; anterior border arcuate with median 1/4 to 1/3 ranging from flat to concave or even notched; rear border evenly arcuate except for shallow concavity at the anterior edge of the frons. Sides of head convex and distinctly convergent in front of the eyes, subparallel behind the eyes or at least less strongly convergent than in front. Head widest across the middle of the eyes. Posterior corners of head lie directly behind anterior corners or are a little further apart. Rear border or head ranging from slightly concave, especially on broader-headed specimens, to straight or weakly convex. Eyes appear to occupy about 1/3 of the postclypeal head length; with the rear 1/4 or less of the eye extending beyond that midpoint. Eyes placed relatively centrally on the face, protruding only slightly or not at all beyond the greatest width of the head except in the most narrow-headed specimens. Scapes without erect barbulate macrochaetae, though an occasional specimen has a thick suberect simple seta as in the lectotype worker. Mandibles with a short equilateral or short isosceles triangular tooth and in most specimens a broad, lobose subapical denticle.

Petiole very much like worker's, with a narrow but blunt crest which is flat or slightly concave from dorsal view.

Genitalia resembling those of flavipes or a shorter version of faisonensis. Parameres subtriangular, with concave rear border in side view; curved mesad in rear

view. Base of volsella meets rear edge in a rounded-off right angle. Rear edge of volsella vertical; cuspis arises at about 150° angle to rear edge. This is best seen in slide preparations or in side view on the specimen by chipping off one paramere. Aedeagus subtriangular, with a somewhat concave ventral edge and slightly deflected tip.

Cephalic and abdominal pilosity shorter, finer, less erect and less abundant than in workers; that on thoracic dorsum similar to that of head. Pilosity on parameres comprised of about 20 decurved yellow hairs. Cephalic pubescence fine, dense and light brown as in worker; that on thoracic dorsum similar. Appendages with usual dense pubescence; gaster lacks it entirely.

Shining deep brown throughout. Often head and thorax are a little lighter than gaster. Appendages may be lighter than body, though not as conspicuously so as in workers. One group of three males from Wood County, Texas, is light yellowish-brown, as are the workers that accompany them (see Discussion).

Material Studied

The lectotype is one of two workers on a card (the lectotype indicated by a small arrow) labeled Verein St. Coll. G. Mayr/*Pr. parvula* G. Mayr Type/Brit. Mus. 1922-501/ Syntype. By inference from Mayr's description, I assume the collection was taken in New York state. There are at least a few series of *parvula* in almost every lot of *Paratrechina*

material loaned to me for this study, coming from North Dakota south to Texas and eastward including the southern tip of Ontario (CAF). I lack records from Minnesota and Wisconsin, some New England states, Ohio, Kentucky, and Alabama. Careful collecting in these states will very likely produce records of parvula in the future.

Discussion

Of the nearctic Paratrechina, only parvula occurs in the northern tier of states and in Ontario under natural conditions. There is little chance for confusing it with any other species outside of Florida. In the Gainesville, Florida, area, it is collected only occasionally and is largely replaced by the tiny, related form wojciki. To the south of Gainesville, it has never been collected, to my knowledge. In the zone of overlap of these two species (northern peninsular Florida), parvula is usually easily recognized by its larger size, dark color, greater distance of the eyes from the sides of the head, more rounded sides of the head, and barely or not at all excised rear border of the head. It also tends to have the pronotal pilosity much longer than the mesonotal rather than subequal to it as in wojciki.

Creighton's (1950, p. 409) comments on color variation in parvula seem to be based on his belief that any Paratrechina (other than longicornis) without standing macrochaetae on the scapes is parvula. However, this condition is found

in workers of phantasma and wojciki as part of their normal variation. Furthermore, the inconspicuous nature of the scape macrochaetae of some arenivaga, melanderi, and vividula workers has caused some investigators to overlook them and call individuals of these species parvula.

In the field, parvula is indistinguishable from faisonensis except by its prevailing but not absolute preference for more open habitats. It also resembles the dark colored melanderi variants found in Tennessee and Arkansas, which occur in open areas. In both of these cases, only microscopic inspection will allow certain identification.

TTU series I have identified as parvula from Wood and Cherokee Counties, Texas (about half way between Shreveport and Dallas), are rather small bicolored and rather dolichocephalic for parvula. The workers, in fact, are much more like the Floridian wojciki in appearance. The males in the Wood County series, however, are metrically and morphologically clearly parvula, except for thier unusual pale coloration.

Forel's (1922) Paratrechina parvula var. grandula does not belong in Paratrechina. The types closely resemble an inconspicuous dark colored Conomyrma of glades in woodlands of sandy soils in southeastern U.S. It should hereby be considered formally transferred to Conomyrma.

Natural History

I have little personal experience with this northern species. The following account is based largely on information

from Cole (1940) and from a summary of unpublished observations on Parvula provided by Dr. Mary Talbot (in litt.).

Alates are reared in July and August in Michigan. Based on the few southern collections I have made, the alates are reared about a month later in Florida and Georgia. As in most of our native species, the sexuals overwinter in the nest and are frequently found near the surface on the warm days of early spring, i.e., late March and April in Tennessee, May in Michigan and Iowa. I have one collection of a winged queen and male, collected separately on low vegetation in western Alachua County, Florida, on March 14, 1984. A newly mated queen was collected under cow dung the same day, and she had reared out her first workers by the first week in May. Flights have not been observed elsewhere but must occur in April or early May since alates are never found in the nests from mid-May to early July.

Nests are usually found in open areas, often with trees nearby, such as forest edges and openings. In northern Florida, they are limited to open woodlands on loamy soils overlying limestone. The nests may be under cover-objects such as stones and logs. When these are unavailable, burrows in open soil are usually cryptic but may be rendered more conspicuous by a small crater of soil around the entrance. Cole found a few nests in stumps and logs in deep woods in Tennessee, but lacking specimens, I am forced to wonder if these were not faisonensis. Curiously, there is

no material of parvula in Cole's collection at LACM, though he stated it to be one of the most common ants in the Great Smoky Mountains National Park. Most of the nest consists of small chambers near the surface, but burrows may extend 30 cm into the soil.

This ant has been collected from as high as 1425 m elevation in the Smoky Mountains, but most collections are from well below 600 m.

Paratrechina wojciki, New Species

(Figs. 18, 21; Map-Fig. 51)

Paratrechina (Nylanderia) bruesi (sic): Creighton, 1950, Bull. Mus. Comp. Zool. 104: 406 (in part?).

Diagnosis

Worker. TL usually 1.7-2.2, OI usually 23-25. A very small Florida and eastern Gulf Coast species usually of open woodlands. Bicolored, head and gaster brown, thorax yellowish. Middle and hind coxae pale. Scapes short, SI usually 102-108; SM 1-4 (rarely 0). Head narrow, CI usually 85 or less; sides of head subparallel; rear border with distinct median notch. Eyes lie close to sides of head.

Male. TL usually less than 1.9, OI 33-38. Resembles small parvula in color and morphology but usually with SM 1-2 and SI 100-109. Middle and hind coxae pale.

Queen. Resembles small parvula but with PM 1-2.

Description

Holotype worker. TL 1.87, HL 0.53, HL 0.43, SL 0.58, EL 0.12, PW 0.32, MCL 0.13, WL 0.63, FL 0.44, GL 0.72, SM 4, PM 3, MM 2, CI 83, OI 23, SI 110, FI 85.

Anterior border of clypeus arcuate except for the flattened middle 1/5; rear border of clypeus nearly straight behind the median raised portion of the clypeus, curved forward later to this. Sides of head weakly convex and subparallel. Rear corners of head notably closer together than inner border of eyes and delimiting a broad, shallow notch across slightly more than the middle 1/3 of the rear edge of the head. Head narrow, subrectangular. Eyes small, their rear margin lying slightly anterior to the midpoint of the postclypeal head length. Eyes close to sides of head, their lateral margins separated from sides of head by about 1/4X their width and separated from the mandibular insertions by about 1/4X their length. No ocelli present. Scapes near the upper end of the range of relative length for this species but short compared to species outside of the Parvula Complex.

Pronotum in profile angular, with a straight anterior face and a distinctly longer convex dorsal face. In lateral view, mesonotal convexity contiguous and equal in curvature to that of pronotum. Mesonotum with a short rear face descending at about 135° to the dorsal face. Propodeal profile with ascending face flat and about 1/2X as long as convex rear face. Legs short, as in parvula.

Petiole in side view cuneate with convex posterior face and blunt, rounded crest. Viewed from behind, petiole has straight sides only slightly divergent dorsad and a smooth rounded crest.

Cephalic and gastral pilosity about as abundant as in parvula and, as in that species, rather short and somewhat curved. Left scape with 4 barbulate macrochaetae; right one with 3, but these short, decumbent to subdecumbent and the same color as the scape, thus, difficult to discern; most easily seen in anterior view. Thoracic pilosity sparse and only weakly curved, the pronotal ancillary hairs very short and pale. Pilosity on body is brown; on the legs a little darker. Fine yellowish-brown pubescence covers dorsal surface of head. Finer yellow pubescence covers appendages. Thorax and gaster lack pubescence.

Pubescence of head obscures the shining integument beneath. Thorax and gaster smooth and shiny, with fine shagreening on the gaster obscuring the sheen only slightly.

Head yellowish-brown, darker on top. Mesopleuron and propodeum same color as sides of head; pronotum and mesonotum are brownish-yellow. Gaster as dark as top of head. Appendages as light as promesonotum, with middle and hind coxae even paler.

Allotype male. TL 1.86, HL 0.48, HW 0.45, SL 0.51, EL 0.17, WL 0.65, GL 0.73, SM 1, CI 94, OI 35, SI 104.

Clypeus nearly perfectly lentiform, its anterior and posterior edges equally arcuate and both with a shallow

median concave emargination. Sides of head convex, tapering more quickly in front of the widest part of the head (across the eyes) than it does behind, as in parvula. Middle 1/2 of rear border of head straight; meeting sides of head in rounded corners which lie almost directly behind the anterior corners. Eyes separated from mandibular insertions by about 2/3X their length; protruding beyond sides of head a little more than in parvula males. Ocelli smaller than typical for the species; the median and laterals separated by about 2 1/2X their width. Mandible only partly visible, but apical tooth and part of blunt subapical denticle (as in parvula) can be seen.

Petiole shaped as in worker in lateral view. In dorsal view, it is much broader but has straight sides and a smooth rounded crest, as in the worker.

Genitalia resembling a small version of those of parvula with the following differences. Parameres with shorter less abundant pilosity; less curved, their inner (rear) border less concave to nearly straight. Volsella with base and outer rear edge meeting in a rounded obtuse angle; posterior edge of cuspis (in lateral view) is a mere continuation of rear edge of volsella, as in faisonensis (Fig. 45).

Pilosity as in worker, with the usual greater abundance on the thoracic dorsum and reduction on the anterior dorsum of the gaster. Macrochaetae on scape short and inconspicuous as in worker. Pilosity on parameres appears a

little shorter than in other species, even for this small ant, and not abundant, 15-17 hairs per paramere. Cephalic pubescence a little sparser than in worker. Pubescence occurring elsewhere only on mesonotum and appendages.

A very shiny ant with even the gaster lacking visible shagreening.

Eyes grey. Body uniform castaneous brown, femora and fore coxae same color. Scapes, tibiotarsi and middle and hind coxae light brownish-yellow.

Variation

Worker. TL 1.48-2.29, HL 0.48-0.58, HW 0.40-0.48, SL 0.53-0.62, EL 0.11-0.14, PW 0.30-0.36, MCL 0.12-0.15, WL 0.59-0.71, FL 0.40-0.48, GL 0.40-1.01, SM 0-4, PM 2-4, MM 2-4, CI 78-87, OI 22-26, SI 100-112, FI 80-88, (n=44).

This species is normally less than 2 mm long. The specimens with greater lengths in the range have the gaster distended. The head is narrower than in any other of our native species, with CI exceeding 85 in only a few specimens. The broader-headed specimens tend to have the eyes separated from the sides of their heads by a little over 1/4X eye width, while most specimens have the eyes closer to the sides, even almost reaching them. SI exceeds 108 in only 2 of the specimens measured. SM usually 1-4, but macrochaetae are completely lacking on one specimen. In the northern part of the range, the macrochaetae tend to number one or 2 and are shorter, decumbent and the color

of the scape, thus, difficult to see. Towards the South, the macrochaetae more often number 2 to 4 and are longer, darker and more erect. However, variation in scape pilosity is not strictly geographical. Propodeal profile usually an even convexity.

Color varies from almost uniformly dark brown with the thorax and appendages only slightly lighter and with pale middle and hind coxae (i.e., the faisonensis pattern) to very light yellowish with the head and gaster only slightly darker (i.e., a little darker than arenivaga). The most common coloration in fully sclerotized workers is a brown head and gaster, brownish-yellow thorax and appendages and pale yellowish middle and hind coxae.

Male. TL 1.67-1.93, HL 0.45-0.48, HW 0.42-0.46, SL 0.48-0.53, EL 0.16-0.19, WL 0.61-0.73, GL 0.54-0.79, SM 0-2, CI 91-98, OI 33-38, SI 100-109, (n=7).

Metric variation in male wojciki needs little explanation beyond the figures given above. However, additional material checked since the above measurements were taken indicates the SM=0 is relatively uncommon and that SM 1-2 is the rule. Ocelli usually larger than in type, median and laterals separated by only 2X their width. The length of the parameres variable from about 1X to around 1 1/2X their basal width.

Coloration of fully mature individuals ranges from castaneous as in the type to nearly black but always with pale middle and hind coxae.

Material Studied

The types come from a collection donated by DPW labeled Florida, Franklin Co. 3 mi N. Alligator Pt. Oak-pine litter berleseates. 22 Mar. 1975. G.B. Marshall/75-223. The entire series includes 3 queens, 4 males, and 11 workers. The holotype and allotype are deposited at FSCA, and the remainder will be split between MCZ and USNM. FSCA contains the collections of Van Pelt (1956). Series containing males and workers from all over Florida were also studied, and some of these will be distributed to the usual depositories. One large series of workers from Citronelle, Alabama, collected by Creighton (LACM) is the only extra-Floridian sample I have seen (but see Discussion).

Discussion

This species is named for Dr. Daniel P. Wojcik, who contributed the types and who has, through providing access to his literature files and collecting specimens for me, substantially aided this study. The name wojciki is the genitive case of Dr. Wojcik's name and should be pronounced /wō' jik ī/ in English (symbols as in American Heritage Dictionary). In the unlikely event of transfer to a genus of neuter or masculine gender, the name is invariant in form.

Most material of this species loaned to me has arrived identified as bruesii due to Creighton's use of the character of short scapes as a definitive feature of bruesii.

Suffice it to say here that the possibility of confusing bruesii, a larger-than-average Southwestern and Mexican species with wojciki, a tiny Floridian species, is remote.

The scapes of wojciki are quite short, much shorter than those of bruesii and statistically a little shorter than those of parvula or austroccidua, wojciki's closest relatives. This, in addition to its low SM, yellowish thorax and even paler middle and hind coxae, combine with its small size to make this a distinctive ant.

I have 2 series from northern Florida; a large one from DPW and a smaller one from LACM--which fall into the wojciki size range and coloration but which differ as follows from typical wojciki: pilosity on the scapes and thorax a little longer, that on scapes more abundant (SM 4-7); propodeum with pubescence along the anterior edge; eyes small; sides of head more convex so CI is a little larger. Three males associated with the larger series have unusually small eyes, abundant scape pilosity (SM 3-5) and are bicolored, with the head, thorax, and legs light brown, the middle and hind coxae pale, and the gaster dark brown. Whether these represent part of the normal variation of wojciki, a sibling species deserving description or products of hybridization (say, with faisonensis) cannot be determined with certainty at this point. The hybridization hypothesis is unlikely in view of the concordance of males (haploids) with the workers (diploids) in the apparently intermediate characteristics. I suspect that there hairy-scaped, small-eyed,

broad-headed series are simply aberrant wojciki, since similarly atypical individuals or series are sometimes seen in other Paratrechina species. The DPW specimens have been placed with other wojciki series in FSCA with determination labels as follows: Paratrechina prob. wojciki. Det. J.C. Trager, 1984.

Natural History

As in most Florida Paratrechina, wojciki sexuals are produced in the early fall months, overwinter in the nest, and fly in the early spring. I have two separate collections of microgynes from nests which also reared normal-sized queens. Interestingly, microgynes have been captured in flight traps in late fall at Archbold Biological Station in Highlands County, Florida, by Dr. Mark A. Deyrup (personal communication) with whom I have collaborated in studying ants at the station for nearly 2 years. The microgynes are intermediate between workers and queens in color and proportions. It is unlikely that microgynes ever found colonies since no male wojciki fly at this unusual time.

This ant has very broad habitat preferences and nests in a wide variety of situations including submerged rotting wood in the most xeric scrub, grass clumps in temporary ponds and flatwoods, and beneath stones in the marl-based pinelands of the Everglades region. In north Florida, it seems, based on my collecting experience and Van Pelt's records, to be limited to sandhills and flatwoods. In

south Florida, where faisonensis is uncommon, wojciki expands into mesic woodlands and bayheads.

Wojciki is attracted to baits such as tunafish. When the bait is discovered by larger, more aggressive species such as Solenopsis geminata, Pheidole dentata or P. morrisi, wojciki workers sneak in between these species and fill their gasters with the oil. They do not appear to cut up such baits unless recruited in large numbers and free of competition.

Paratrechina austroccidua, New Species

(Figs. 17, 20; Map-Fig. 51)

Diagnosis

Worker. TL usually 2.0-2.75, OI usually 21-25. Found in woodlands at 1400-2000 m in mountains of southwest and subtropical Mexico. Gestalt is parvula-like, but SM 2-9. Yellowish-brown to deep castaneous (less often, bicolored), often with bluish reflections on head and thorax. Head with dense pubescence (not found on workers of other southwestern species). Dorsal face of pronotum flat or with a transverse concavity.

Male. TL about 2.0-2.5, OI 36-37. Colored as worker. Mandible with a sharp subapical denticle and blunt denticles along entire masticatory border. Genitalia resemble those of parvula; parameres not long and slender (cf. bruesii); aedeagus not longer than parameres and spatulate and upturned distally (cf. terricola).

Queen. Virtually indistinguishable from melanderi. Sides of head probably more convex. Found at higher altitudes in more shaded habitat.

Holotype worker. TL 2.26, HL 0.63, HW 0.53, SL 0.69, EL 0.14, PW 0.38, MCL 0.16, WL 0.73, GL 0.91, FL 0.55, SM 4, PM 3, MM 3, CI 84, OI 23, SI 110, FI 87.

Anterior border of clypeus evenly arcuate with a narrow median concavity; rear border undulating and less strongly arched. Dorsum of clypeus with a smooth rounded median angle. Sides of head weakly convex. Head broadest about 1/2X EL behind the eye. Head of about average width for the species. Cephalic rear border with rounded corners which lie almost directly behind anterior corners, nearly flat across middle 1/2 with a faint median concavity. Eyes of about average length for species, separated from sides of head by about 1/3X eye width, and from mandibular insertions by a little over EL. All 3 ocelli present, though indistinct. Scapes rather thick and gently curved throughout their length. Scapes relatively short, as in parvula, protruding beyond posterior corners of head by only about 2/5X SL.

Pronotum angular in side view, with a slightly concave anterior face and a longer, nearly flat dorsal face bearing a shallow transverse furrow between the anterior macrochaetae. Mesonotal dorsum weakly convex, approximately parallel to long axis of thorax, and higher than the pronotum. Anterior and posterior faces of mesonotum meeting the dorsal

face through very rounded corners, as in parvula; the posterior face over 2X as long as the anterior face. Propodeum low, evenly convex in profile, with all but its short anterior portion sloping to the rear and its highest point only about as high as the anterior angle of the pronotum. Legs long relative to parvula, but short compared to other species.

Petiole in profile sharp-crested with 2 short erect hairs on the crest and with a convex rear face. In posterior view, it is about 1 1/2X as broad at the top as at the base, and the crest is smooth and weakly convex.

Head and appendages densely pubescent. Pubescence apparently lacking elsewhere, except for scattered appressed hairs on pronotum, anterior edge of propodeum and gaster. Scape macrochaetae short, suberect and about the color of the scapes, most easily seen in anterdorsal view.

PM 3, MM 3; these the most common values in this species. Dorsum of head with fine pubigerous punctae, which obscure the sheen. Sides of small head and remainder of body very shiny.

Specimen is deep castaneous brown with lighter yellowish-brown appendages. Cephalic dorsum and sides of thorax with faint bluish reflections.

Allotype male. TL 2.55, HL 0.57, HW 0.55, SL 0.63, EL 0.20, WL 0.89, GL 1.09, SM 2, CI 96, OI 36, SI 111.

Clypeus lentiform, with short front and rear borders about equally arched; the front border flat across the

middle 1/3, the rear border with only a faint, narrow prefrontal concavity. Median angle of clypeus, as in worker, a trifle sharper than that of parvula. Sides of head convex; head broadest at the middle. Rear border of head about as convex as sides; set off from them by rounded corners which lie almost directly behind inner border of the eyes. Eyes rather elongate and relatively weakly convex, protruding only a little beyond sides of head in full face view. Median ocellus separated from the laterals by about 2 1/2X their width. Scapes a little longer than in parvula but shorter than in faisonensis; and weakly sigmoid as in most Paratrechina males. Mandible with the usual apical tooth, a sharp subapical denticle, a median diastema and 2 blunt subbasal denticles.

Petiole in profile has sharp crest and short erect hairs as in the worker. In posterior view, crest is weakly concave and broader than worker's.

Parameres (one removed) are isosceles-triangular, about 1 1/2X as long as broad, with rounded tips and slightly concave rear edge. Parameres weakly curved mesad and longer than volsella and aedeagus. Digitus has the short 3/4-of-a-boomerang shape of parvula, faisonensis, etc. and cuspis arises at about 145° angle to the vertical rear edge of the volsellar base. In side view, the base of the volsella has its ventral and rear edge meeting in a rounded right angle, as in parvula. Aedeagus triangular with concave ventral edge and decurved tip.

Distribution of vestiture much as in parvula, except that scapes and petiolar crest bear suberect macrochaetae, and gaster has a few widely spaced fine appressed hairs.

Sculpture consists of fine pubigerous punctation on head, thoracic dorsum and delicate gastral shagreening.

Eyes grey. Specimen is teneral but not structurally distorted. Entire body is greyish-yellow with the gaster and cephalic dorsum a little darker. Fully colored specimens probably approximate the coloration of the worker.

Variation

Worker. TL 1.94-3.04, HL 0.56-0.69, HW 0.45-0.60, SL 0.60-0.75, EL 0.12-0.17, PW 0.33-0.44, MCL 0.12-0.18, WL 0.65-0.85, FL 0.47-0.61, GL 0.69-1.56, SM 2-9, PM 2-5, MM 2-4, CI 79-89, OI 19-27, SI 100-120, FI 81-95, (n=64).

The montane woodlands that are home to austroccidua exist as isolated bands ringing mountain ranges throughout the species' geographic range. Therefore, it comes as no surprise that this species exhibits considerable variation. Specimens from the periphery of the range of austroccidua (Utah, Hidalgo) are smaller than those from the central portion of the range (southern Arizona, Texas, Nuevo León). Those from Texas and northern Mexico tend to have larger, more distended gasters. Specimens from Chihuahua and Arizona have larger eyes, CI 23-27, while those from Texas and eastern Mexico have small eyes, with CI usually 21-24 (19 in one specimen). Specimens from northern Mexico, Texas,

and Utah are dark reddish-brown, while those from Arizona are lighter yellowish-brown, and the Hidalgo specimens have a dark gaster, lighter head and still lighter, more yellow thorax. Specimens from most areas have the middle and hind coxae paler than the fore coxae, but Texas and Nuevo León specimens are variable, even within nest series in this trait. In my opinion, these non-concordant variations have no taxonomic significance.

Head shape is variable, and larger specimens from Texas and Nuevo León have heads with strongly convex sides and deeply emarginate rear borders.

Most specimens of all series have the characteristic thoracic shape, with the angular pronotum transversely furrowed between the anterior macrochaetae. Occasional specimens have the furrow indistinct or absent, but the angularity and flatness of the dorsal surface of the pronotum remain. The petiole may be less sharply crested than usual, but its possession of one or 2 short erect hairs is the rule. The cephalic punctation varies from conspicuous to rather fine, but the blue reflections between the punctae and on the sides of the thorax can be seen, at least faintly, on any clean specimen.

Male. TL 2.07-2.55, HL 0.53-0.57, HW 0.48-0.55, SL 0.56-0.64, EL 0.19-0.21, WL 0.70-0.89, GL 0.71-1.09, SM 2-3, CI 91-96, OI 36-37, SI 106-113, (n=4).

The four males of austroccidua I have seen belong to 3 nest series, and it is doubtful that I would have

recognized them as belonging to the same species had I not had the associated workers. In certain characters, they are strikingly uniform. All but the allotype have SM 3, and OI is 36-37 in all 4 specimens. The structure of the genitalia is essentially identical in the 4 males I have seen. The coloration of the specimens is essentially like that of the workers with which they are associated. The type and its brother are callows, but they are matched in their uniform greyish-yellow coloration by callow workers in the series. The specimen from Hidalgo is smaller than the rest, has much shorter scapes (106 versus 111-113), and lacks the denticles on the mandibular border. The masticatory border is, however, faintly crenulate on this specimen. Further statements on the variation in austroccidua males must await more specimens.

Material Studied

The two pins containing the holotype and allotype and four paratype workers are deposited at LACM. They are labeled TEX: Boot Springs, Chisos Mts. 2040 m. 26. vii. 1979 P. Ward #3771/under stone, mesic oak-maple forest. The remaining three pins, containing eight workers and one male paratype are deposited at MCZ. The Hidalgo specimens are stored at MCZ, the Utah specimens and a series in alcohol from the Chisos Mountains at USNM. Material from Arizona is at LACM, including a male and a queen. Material from Chihuahua was donated by WMK, and the types plus material from

Nuevo León by PSA. Most of this material will be placed in the usual depositories.

Discussion

The name of this ant refers to its geographic distribution in the United States (Lat. *auster*--south, plus *occiduus*--western). *Austroccidua* is an adjective and must be appropriately declined in the event of a transfer to a genus of masculine or neuter gender.

Paratrechina austroccidua, once known, is unlikely to be confused with any other species. The unique pronotal profile, petiole with short erect hairs on a sharp crest, densely pubescent head with the pubescence arising from punctae, and the blue reflections of the head and thorax can be found on most workers of any series, though one or two of the characters may be indistinct on some individuals.

That it has remained unrecognized up to this time is due to the paucity of collections, in part, since general collectors have tended to overlook or ignore *Paratrechina*, especially in the West, in favor of more "glamorous" genera. In addition, whenever *austroccidua* has been collected, it has been assumed to be *melanderi* (relatively small size and sparse pilosity), *bruesii* (relatively short scapes) or *parvula* (general habitus, dark color, inconspicuousness of scape pilosity). It is a fairly common species which shows up in any serious collecting effort from within its range (e.g., Eastlake-Chew and Chew, 1980; Van Pelt, 1983). With

human population growth and the inevitable increase in collecting activity that accompanies it in the areas where austroccidua lives, it will undoubtedly become known as a characteristic Southwestern and Mexican Paratrechina.

Natural History

The timing of alate production and flights seems to correspond to the usual nearctic pattern. The callow males in the type series were collected in late July and alates from Arizona (at LACM) in September. I collected an alate queen in late May in the Chiricahua Mountains. That no other queens and no males were present in that nest may be due to their having flown already. The male from Hidalgo is dated 25 July.

Austroccidua is a species of mesic habitats at 1400-2400 m altitude. The types were collected in mesic oak-maple forest; specimens from Nuevo León were from mesic oak-pine gully, and specimens I collected in the Chiricahuas were in a pine forest on a north-facing slope. Van Pelt (1983) reports austroccidua (as P. probably melanderi) being abundant in "high forest" and canyons in the Chisos Mountains. Eastlake-Chew and Chew (1980), on the other hand, found this species lacking on the north slope of a 1855 m hill in southeastern Arizona but collected it (along with melanderi and bruesii) at honey-bait transects on slopes facing the other cardinal directions. It is not clear whether the 3 species were segregated according to slope

preference from the Chews's specimens loaned to me or from their published account (op. cit.).

Fig. 17. Worker of austroccidua, lateral view.

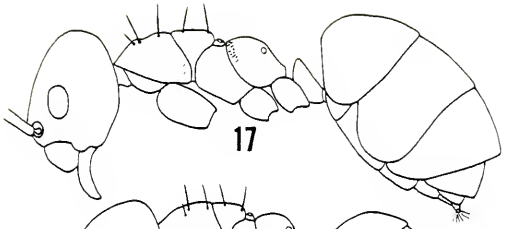
Fig. 18. Worker of wojciki, lateral view.

Fig. 19. Worker of parvula, lateral view.

Fig. 20. Head of austroccidua worker, dorsal view.

Fig. 21. Head of wojciki worker, dorsal view.

Fig. 22. Head of parvula worker, dorsal view.



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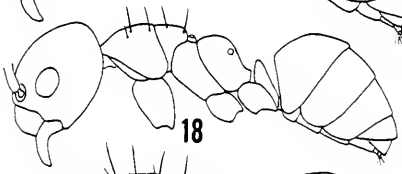

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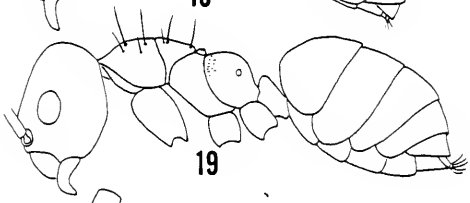

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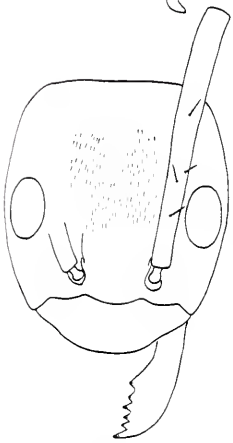

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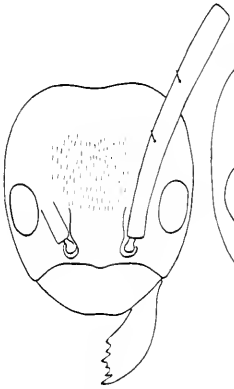

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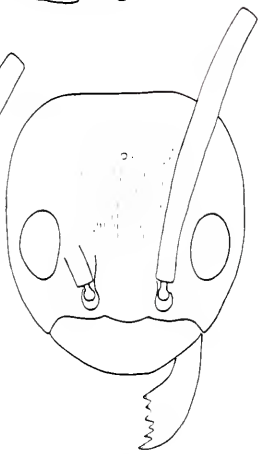


22

CHAPTER X
ARENIVAGA COMPLEX

Diagnosis of Complex

Worker yellow or whitish, shiny; cephalic pubescence dense but fine and pale; scape pilosity subdecumbent to suberect, sometimes inconspicuous. Nests deep vertical tunnels with lateral branches in well-drained sand.

Male shiny except thoracic dorsum; parameres triangular; digitus boomerang-shaped but more elongate than in Parvula Complex; cuspis nearly as long as digitus; aedeagus triangular, acuminate.

Paratrechina arenivaga

(Figs. 23, 25, 47; Map-Fig. 52)

Prenolepis arenivaga Wheeler, 1905, Bull. Amer. Mus. Nat. Hist. 21: 391. Fig. 3, ☿, ♂. Type loc., Lakehurst, N.J.

Paratrechina (*Nylanderia*) *arenivaga*: Emery, 1925, Gen. Insectorum, Fasc. 183: 221; Buren, 1944, Iowa State Coll. J. of Science 18: 295; Van Pelt, 1958, Amer. Midl. Nat. 59: 50.

Paratrechina (Nylanderia) melanderi arenivaga: Creighton, 1950, Bull. Mus. Comp. Zool. 104: 408.

Formica perminuta Buckley, 1866, Proc. Ent. Soc. Phila. 6: 162. ♀ (questionable synonymy). Type loc., central Texas.

Diagnosis

Worker. TL 2.0-2.25 (Gulf and East Coasts), 2.2-2.7 (Midwest), OI 25-28 (East), 24-27 (West). A widely distributed nocturnal eastern and midwestern species which makes crater nests in sand. Yellow with large black eyes and slightly infuscate gastral apex. Head densely pubescent, thorax usually lacking pubescence but bearing relatively long and abundant brown flexuous macrochaetae--mean PM 6, mean MM 4, PM 4-9, MM 2-7. Smells acrid when crushed (phantasma smells sweet).

Male. TL 1.9-2.4 (larger specimens from North and Midwest), OI usually 35-39. Uniform brown with yellowish legs and scapes. Genitalia distinctive (Fig. 47). Parameres elongate with slender distal portion curved mesad. Cuspides very large and prominent, reaching at least 2/3X, often more than 3/4X length of aedeagus.

Queen. Uniform brownish-yellow to yellowish-brown with large black eyes and broad head. Most likely to be confused with phantasma but has macrochaetae on scape (SM 3 or more; body deeper yellow or brownish) in arenivaga.

Description

Lectotype worker. TL 2.17, HL 0.64, HW 0.56, SL 0.73, EL 0.16, PW 0.40, MCL 0.20, WL 0.81, FL 0.59, GL 0.73, SM 8, PM 6, MM 3, CI 88, OI 25, SI 114, FI 92.

Clypeus has an arcuate front border with a narrow median concavity; rear border undulating but not arcuate. Sides of dorsal face of clypeus meet in a rounded median angle. Anterior 1/2 of sides of head nearly straight and slightly convergent; rear half somewhat more rounded, especially posteriorly. Rear border of head a shallow concavity across the middle 1/3 of HW between the rounded corners. Head about as broad as in flavipes, but eyes larger. Eyes separated from mandibular insertions by slightly more than their length and from sides of head by about 3/5 their width. Scapes of about the usual length for vividula group, with about 1/2 their length extending beyond posterior corners of head; gently curved. Ocelli lacking. Mandibles with a single large apical tooth and masticatory border which meets inner edge of tooth in an even curve.

Promesonotal profile a nearly even convexity, broken only by a shallow impression formed by the portions of the pro- and mesonotum adjacent to the promesonotal suture. Angle between dorsum and rear face of mesonotum more rounded and obtuse than other vividula group species. Propodeum low, with dorsal face nearly flat and meeting posterior face in a very rounded yet detectable obtuse angle.

Propodeum appears a little longer than in other species. Legs a little longer than usual for vividula group, though a little shorter than average for this species.

Petiolar profile cuneate with a blunt, rounded crest. In dorsal view, flat across the top with a shallow median impression.

Cephalic vestiture distributed very much as in faisonensis, pilosity longer and lighter in color, and pubescence a little denser and yellow. Scape macrochaetae short, oblique and pale; best seen against a pale background from posterior view. Thoracic macrochaetae long (cf. MCL of arenivaga and faisonensis), dark brown and flexuous. Pubescence completely lacking on thorax and propodeum. Macrochaetae on legs a little longer and more abundant than usual in vividula group, and a few are present on the lateral as well as flexor and extensor surfaces. Gaster without pubescence but with numerous flexuous macrochaetae.

Head and appendages dulled by pubescence, thorax and gaster very shiny.

Eyes black; head light brownish-yellow; thorax and front 1/2 of gaster clear yellow; rear 1/2 of gaster a little darker than head.

Allolectotype male. TL 2.41, HL 0.55, HW 0.53, SL 0.61, EL 0.21, WL 0.86, GL 1.01, SM 3, CI 96, OI 39, SI 111.

Clypeus like a flattened hexagon in dorsal view; the anterior border truncate across the middle 1/3 of the clypeal width; the rear border truncate across the portion

anterior to the frontal carinae. Head narrower and differently shaped from that of worker. Sides convex, equally broad at mandibular insertions and at posterior corners. Head broadest across the middle of the sides of the head. Rear border of head more convex than the sides and meeting them in rounded but abruptly angular (about 100°) corners. Eyes large, convex, occupying about 40% of the sides of the head and about equidistant from mandibular insertions and posterior corner (notably further from rearmost part of convex rear border). Ocelli as in vividula, median and laterals separated by about 2X their width. Mandibles with a large sclerotized apical tooth and a smooth straight masticatory border.

Petiole a little shorter but not much broader than in workers, in contrast to most other species.

Genitalia prominent and distinctive (Fig. 47). Parameres tapering and slightly recurved in side view, as in vividula but longer and less strongly curved mesad in rear view. Volsellar lobes very elongate; the digitus boomerang-shaped (but longer and more slender than the usual shorter boomerang-shape of males in the Parvula Complex); but this more easily seen in other specimens due to the way the lectoallotype is mounted; the convex cuspidal terminus about 2X the size of that of other species and only a little shorter than the digitus; the opposing surfaces of these lobes papillose (again, more readily seen in other specimens

or cleared and mounted preparations). Aedeagal lobes triangular with weakly decurved tips.

Body with relatively long, abundant, weakly flexuous golden brown pilosity. Pilosity of parameres yellow, comprised of about 25 decurved hairs per paramere. Pubescence of head and thorax appressed, shiny and yellow. Pubescence of legs and scapes subdecumbent, partially obscuring the relatively short yellow pilosity. Gastral pubescence limited to sparse appressed hairs.

Head and thorax slightly dulled by pubescence, gaster with the usual shagreening.

Eyes black. Body, scapes, legs and parameres yellowish-brown. Middle and hind coxae and volsella pale yellow, aedeagus hyaline.

Variation

Worker. TL 1.92-2.75, HL 0.56-0.71, HW 0.47-0.65, SL 0.64-0.85, EL 0.14-0.19, PW 0.33-0.44, MCL 0.16-0.21, WL 0.69-0.91, FL 0.49-0.68, GL 0.57-1.29 SM 5-17, PM 4-9, MM 2-7, CI 79-92, OI 23-28, SI 110-127, FL 88-102, (n=61).

It will come as little surprise that this species, with its wide distribution but rather specific habitat requirements, exhibits considerable variation. The ranges of SI and FI are skewed toward the high end due to a Florida series of 4 workers and one worker from Louisiana with unusually long appendages. SI exclusive of these 5 individuals ranges 110-119 and FI 88-95. Series from peninsular

Florida tend to be overall smaller than specimens from the Midwest. Specimens from Texas and New Jersey are approximately intermediate in body size. Western specimens have more pilosity on the scapes; SM 8-17 in Louisiana, Texas and Midwestern material versus SM 5-10 in Florida and New Jersey material. Western specimens have broader heads CI 88-96 (versus 81-90 in the East). Specimens from Louisiana and Iowa have shorter lighter-colored thoracic pilosity, while Texas specimens have somewhat less dense cephalic pubescence. Iowa material and one of the Louisiana series studied have small eyes, in these 2 series OI 23-25 in all specimens, while in all other series the majority of workers have OI greater than 25. The usual color of arenivaga is clear yellow with a slightly deeper yellow head and infuscated gastral apex, but a series from northern Florida and 2 from Illinois are much more brownish than usual.

Male. TL 1.87-2.41, HL 0.49-0.58, HW 0.46-0.54, SL 0.54-0.62, EL 0.18-0.21, WL 0.73-0.86, GL 0.65-1.05, SM 0-13, CI 91-100, OI 32-41, SI 107-116, (n=9).

Males of arenivaga show variation parallel to that found in the workers. They are generally larger in the West, but the type from New Jersey is the largest of the specimens measured overall, though it falls slightly short of this in a few measurements. One clear trend is that Western specimens have hairy scapes; SM 6-13 for Illinois and Texas specimens, 3-4 in New Jersey, 0-2 in Florida.

Illinois specimens have the genitalia less elongate but retaining the distinctive form and have the appropriate habitat preference and associated workers.

Material Studied

Lectotype and lectoallotype form a series of 5 workers and 4 males (3 badly mutilated) on cards on a single pin with an unnumbered AMNH cotype label, collected by W.M. Wheeler, 24-26 September 1904 at Lakehurst, New Jersey. Labels written directly on the cards indicate the selected specimens. Another pin with 2 males and 2 workers (MCZ) with the same collection date has been labeled paralectotype. Though all syntype material with the same date should technically be so designated, I do not have the entire series available to do so at this time. One pin included in the arenivaga syntype series at MCZ contains specimens of parvula and has been so labeled. Additional material studied includes material from Louisiana and Iowa (WFB), Illinois and Kansas (MBD, SBSK), Texas and Mississippi (USNM), New Jersey, Alabama, and Nebraska (LACM). A large amount of Florida material is contained in JCT, and there are a few series in other collections.

Discussion

Creighton's (1950) evaluation of arenivaga as a subspecies of "melanderi" (terricola) has already been mentioned in the discussion of faisonensis, but some additional points can be made here. A sizable series of arenivaga from

Lakehurst, New Jersey, in the Creighton collection (LACM) contains males whose genitalia have been particularly dissected, so it is evident that he had familiarity with the species in the field and that he had studied the genitalia. Thus, it is difficult for me to understand how he could state that the genitalia of the Lakehurst specimens are "much more like Wheeler's figure of melanderi than his figure of arenivaga" (p. 408). What remains of the genitalia of these specimens is typical arenivaga genital apparatus, differing from Wheeler's (1905, p. 392) figure only in that the papillae on the rami of the volsellae are rather inconspicuous. Creighton's statements concerning the form of the volsellae on these specimens are erroneous and could only have followed mislabeling of slides or some other such error. Creighton (p. 403) had high regard for zoogeographical analysis as a possible solution to taxonomic difficulties in Paratrechina, but he apparently did not consider that analysis of habitat preference would be important. The very strict preference of arenivaga for making crater nests in sand is a diagnostic feature Creighton overlooked. The fact that terricola nests in finer textured soils, normally under a stone, log or other object, distinguishes it readily for arenivaga where their ranges overlap, even without microscopic examination.

Darker-colored series of arenivaga such as those mentioned above are not likely to be confused with any other species due to their habitat preference. In the absence of

such information, dark arenivaga might be confused with faisonensis, terricola or vividula. Larger eyes will distinguish it from the first 2, denser cephalic pubescence from the latter 2, and the long, slightly more abundant thoracic pilosity from all 3 other species. In Florida, arenivaga might be confused with phantasma. Means of distinguishing those species are given in the description and discussion of phantasma.

I have opted against resurrecting Buckley's name perminuta though it must have applied to arenivaga, if indeed to any Paratrechina. Buckley's description leaves too few clues for me to comfortably use his name.

Natural History

Arenivaga appears, like most of our native species, to rear sexuals in the late summer and fall, which fly the next spring. I have often collected alates near the nest entrance on sunny days in December and January in Florida. Apparently, they fly before April in Florida, for I have never collected them from April to October. Further north they fly in May. I have series collected in Hartley County, Texas (from TTU), which had alates remaining in the nest on 8-9 May. This becomes less surprising when one takes into account that that part of Texas experiences the same number of frostfree days in an average year as does Lakehurst, New Jersey (Visher, 1954).

Wheeler's name arenivaga is very appropriate, for this species nests almost exclusively in highly drained sands of

low nutrient content with well-spaced vegetation. The only exception to this that I know of is Buren's collection (now in JCT) of arenivaga from the loess bluffs along the Missouri River in Iowa. These bluffs are more closely analogous in soil characteristics and ant fauna to sandy areas much further south than to those of the surrounding heavier soils.

Arenivaga seems to need relatively undisturbed samples of its preferred habitat to survive. Paradoxically, it often inhabitats the more disturbed or harsh areas within these habitats, such as areas swept by fire, fire lanes, footpaths, primitive road-beds, dune blowouts, and openings between vegetation subject to high temperature fluctuations. It does not usually tolerate conversion to pasture or other such modifications. Nest entrances are surrounded by a small crater of sand, usually of a color different from that of the surface or immediate subsurface, indicating that the nests may be quite deep. Unfortunately, I have never succeeded in following one in the crumbly sand in which they occur more than a two or three dm down.

In the scrublands of Florida, colonies are usually polydomous, and individuals collected from an opening in vegetation or group of adjacent openings may be placed together with ensuing aggression. However, more than one colony may inhabit large clearings, and members from these will fight, even when from adjacent entrances within 1 m of each other. The "territory" of a single colony may have as

many as 20 entrances ranging from a few centimeters to over a meter apart. Where the two species overlap, phantasma, which has nearly similar habitat preference and nesting habits, has its territories interspersed with those of arenivaga.

I have often collected this species (as well as phantasma and wojciki) with cixiid homopterans in their nests. Apparently, the homopterans are associated with the roots of the palmetto, Serenoa repens. The details of the interactions are not known.

Mealybugs (Homoptera: Pseudococcidae) are often associated with roots of Serenoa and other plants in the scrub and probably provide food (honeydew) for P. arenivaga, but they are much more commonly tended by Brachymyrmex and small Solenopis in these areas. Arenivaga workers bring in insect carcasses (often cooperating in the effort) which presumably form their main protein source. Unfortunately, their strictly nocturnal foraging habits, small size and pale color make it most difficult to observe them in the field. In the lab, colonies grow in size, though slowly, producing full-sized workers on a diet of honey-water and fresh-killed insects (cockroaches, caterpillars, and houseflies).

Van Pelt (1956, 1958) has given a careful account of his observations on arenivaga in Florida. See Discussion of ecology of phantasma for comparison of these two closely related species.

Paratrechina phantasma, New Species

(Figs. 24, 26, 48; Map-Fig. 52)

Diagnosis

Worker. TL usually 1.8-2.2, OI 25-27. A small, pale, nocturnal Florida-peninsula species of xeric sandy habitats. Very pale whitish to light yellow, with pilosity of approximately the same color. Very slight or no infuscation on gaster. SM 1-4, PM 4-5, MM usually 3. Smells sweet when crushed.

Male. TL usually around 2.0, OI usually 37-40. Uniform brown or with gaster darker, appendages lighter than body, middle and hind coxae pale. SM always 0. Genitalia distinctive (Fig. 48). Parameres short, weakly deflected, subtriangular with concave rear border. Volsellae with terminus of digitus curved laterad, cuspis less prominent than in arenivaga. Aedeagus reaching or protruding a little beyond parameres.

Queen. Looks very much like arenivaga but with SM 1-2, paler in color, and larger than Florida arenivaga queens. Some phantasma queens have a small supernumerary tooth either between the basal and subbasal mandibular teeth or arising from a common base with the subbasal tooth. One paratype has such a tooth between the median and subbasal teeth.

Description

Holotype worker. TL 1.92, HL 0.57, HW 0.48, SL 0.66, EL 0.15, PW 0.34, MCL 0.16, WL 0.71, FL 0.55, GL 0.65, SM 1, PM 5, MM 3, CI 85, OI 27, SI 116, FI 96.

Anterior border of clypeus with very weakly convex sides and a narrow median concavity; rear border shaped like a baseless trapezoid with a median concave emargination. Clypeus with the usual broadly rounded median angle. Sides of head weakly round, subparallel; apparently convergent toward the rear because posterior corners placed behind inner borders of eyes, i.e., much closer together than mandibular insertions. Rear border of head straight, narrow due to proximity of corners, about 1/3X HW, the latter is greatest across the middle of the eyes. Head sub-rectangular. Eyes large, convex and close to sides of head, separated from sides of head by less than 1/4X their width and from mandibular insertions by a little over their length. Scapes of about median length for the species, slightly curved near base, straight beyond.

Pronotal profile weakly convex. Mesonotal profile flat, sloping to the rear, its anterior slightly raised above rear portion of pronotum. Propodeum low and angular, the weakly convex dorsal face meeting the flat rear face in about a 120° rounded angle. Legs rather long and slender.

Petiole cuneate with a moderately sharp crest and convex rear face in lateral view. In posterior view, crest rounded.

Vestiture very much like that of arenivaga; the macrochaetae flexuous and relatively long over the entire body. Petiole with 2 small macrochaetae. Pilosity very pale whitish, not at all darker than body color; in fact, lighter than color of gaster; pilosity substantially less abundant on scape and slightly less abundant on thorax than in arenivaga. Pubescence on head very pale but fairly dense; that on scapes and anteriomedian portion of pronotum sub-decembent.

No detectable sculpture other than the usual gastral shagreening.

Eyes dark grey. Body pale whitish yellow, gaster a little darker, but this apparently due to color of contents and not to infuscation of the tergites. Mandibular teeth red, rather than the usual dark brown or black.

In the field, this species has a distinctive sweet odor when crushed (type not sampled for this character).

Allotype male. TL 1.94, HL 0.53, HW 0.53, SL 0.60, EL 0.20, WL 0.79, GL 0.63, SM 0, CI 100, OI 38, SI 113.

Anterior clypeal border with weakly arcuate sides and straight median truncation across the middle 1/3 of its width; rear border roughly bell-shaped with a median concave emargination at what would be the top of the bell. Clypeal sides meet in a broadly rounded median angle. Head

with sides more convex than in worker. Mandibular insertions closer together and lying directly anterior to posterior corners of head. Rear border about as convex as sides but a little less broad than they are long. Eyes large, bulging, making head seem broader (see CI). Ocelli a little smaller than in arenivaga, the median and laterals separated by about 2 1/4X their width. Mandible with a short apical tooth whose inner border curves without interruption into the straight masticatory edge.

Petiole a little broader and blunter than in worker.

Genitalia rather like a foreshortened version of those of arenivaga (cf. Figs. 47 and 48). Parameres tapering and recurved in side view but are only about as long as they are broad at the base. In posterior view the parameres conceal more of the inner genital appendages because of their greater relative width than in arenivaga and are somewhat curved mesad as in arenivaga. The volsellae have digiti with straight-line length a little longer than that of aedeagus but curved laterad near their terminus and, thus, do not protrude. This formation of the digiti, common in the fulva group, is unique to this species in the vividula group (in North America, at least). Cuspides, as in arenivaga, about 3/4X as long as digiti, papillose on their tip (and on the opposing portion of the digiti). Aedeagus triangular with a rounded tip not decurved.

Body with pale yellow pilosity, relatively shorter than in arenivaga, but flexuous. Parameres with about 20 decurved

yellowish macrochaetae. Gaster less pilose than worker's, especially toward the front, and with long but widely scattered appressed pubescence on the rear half. Pubescence of scapes short and subdecumbent.

Eyes grey. Thoracic dorsum and appendages dulled by pubescence. Sides of the thorax and legs brown. Scapes brownish-yellow. Middle and hind coxae pale tan. Gaster piceous brown.

Variation

Worker. TL 1.78-2.26, HL 0.57-0.61, HW 0.46-0.55, SL 0.65-0.73, EL 0.14-0.16, PW 0.32-0.38, MCL 0.16-0.18, WL 0.69-0.77, FL 0.52-0.59, GL 0.53-0.89, SM 0-4, PM 4-6, MM 2-4, CI 80-90, OI 25-27, SI 113-121, FI 91-100, (n=37).

Aside from minor variations in size and proportions, there is little notable variation among the workers of phantasma.

A series from Gainesville, Florida, is deeper yellow than south Florida specimens, thus, closely resembling arenivaga from the same locality. The normal range of CI appears to be 83-90. The two specimens with narrower heads may have undergone shriveling upon desiccation.

Male. TL 1.92-2.13, HL 0.48-0.53, HW 0.48-0.53, SL 0.54-0.60, EL 0.17-0.20, WL 0.73-0.83, GL 0.63-0.81, SM 0, CI 94-100, OI 35-40, SI 108-113, (n=8).

The males of phantasma are quite uniform in size, setation, and structure of the genitalia. The main variation in

body is in color which ranges from uniform brown to having head and thorax light brown with the gaster piceous, and all intermediate conditions.

Material Studied

Holotype and allotype, deposited in FSCA, were collected at Archbold Biological Station, 12 December 1982, in *Quercus inopina* scrub by myself. Other than a small collection from the same locality collected by T.C. Schnierla in 1943 (USNM), all material of this species known to me is in JCT or in the ant collection of Archbold Biological Station where I have been collaborating with Dr. Mark Deyrup on an ecological and distributional study of the ants of the Station. In addition to collections from the Station, JCT contains a large series from Gainesville, Florida, and a smaller one from Jupiter, northeast Palm Beach County, Florida (WFB). Gifts of this material from JCT will be placed in the usual depositories.

Discussion

This pale *Paratrechina* well deserves the name *phantasma* (Latinized Greek meaning ghost of phantom). The name is a noun in apposition and, thus, invariant in the unlikely event of change in placement to a genus of masculine or neuter gender.

Only *arenivaga* resembles in any way closely this small, delicate pale yellow species of Florida's xeric sandy scrub

and dune vegetation. Even the darker yellow specimens from the Gainesville area may be recognized in the field by crushing one or a few workers, which yield a sweet, to me rather rose-like odor, quite unlike the acrid odor of arenivaga. Under microscopic examination, the pale color of the pilosity and the paucity of bristles on the scapes will separate phantasma from the dark-haired, bristly-scaped arenivaga.

The males are easily separated from arenivaga and all other nearctic species by their distinctive genitalia, especially the outward curvature of the digiti.

Faded workers of another small Florida species, wojciki, with similar chaetotaxy of the scapes may be confused with phantasma, but wojciki has the 8 major thoracic macrochaetae short, subequal in size to each other and less abundant than in phantasma, and always has at least a trace of infuscation on the head. (For other characters, see description of wojciki.)

Phantasma seems likely to have arisen from a population of arenivaga during a warmer era when higher sea levels isolated parts of south central Florida. The two species seem to be coexisting without exchange of genes today, despite their very similar ecologies providing ample opportunity for this. However, Florida workers of arenivaga are more similar in metric and meristic characters to phantasma than are arenivaga from other areas, so the two species do not exhibit character displacement in at least this set of

traits. Cole (1968) noted similar situations in the myrmicine genus Pogonomyrmex. In the case of phantasma and arenivaga, the situation seems best explained by the mechanism of centrifugal speciation (Brown, 1957).

Natural History

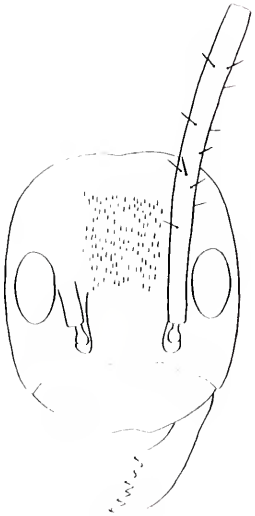
The ecology of phantasma so closely matches that of sympatric arenivaga that it is a wonder to me that they manage to coexist. Alates are produced October through December and fly in late winter. Colonies are polydomous, and nest entrances are marked by craters of subsoil. The nests often contain cixiid homopterans like those in the nests of arenivaga. Phantasma workers forage at night all year long, even at temperatures below 15°C in winter months, as do those of arenivaga. The only slight, but perhaps important, ecological difference between the two species is that phantasma is limited to more xeric, fire-swept, scrub vegetation, while arenivaga can exist in later successional, more shaded stages of the vegetation and near the edges of temporary ponds where the sand may be quite damp.

Fig. 23. Worker of *arenivaga*, lateral view.

Fig. 24. Worker of *phantasma*, lateral view.

Fig. 25. Head of *arenivaga* worker, dorsal view.

Fig. 26. Head of *phantasma* worker, dorsal view.



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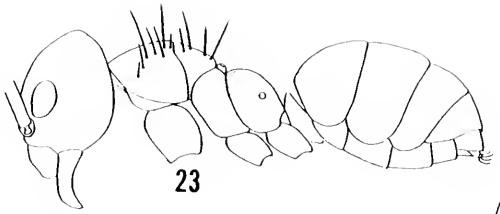

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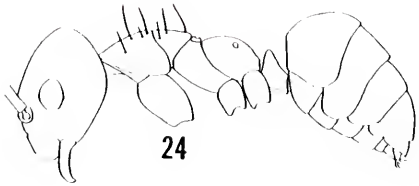


24

26

CHAPTER XI
BRUESII COMPLEX

Diagnosis of Complex

Worker usually larger than sympatric forms; brown and shining gaster often appears massive; cephalic pubescence sparse, thoracic pubescence lacking or with a little on the sides in larger individuals; scape pilosity suberect to erect, usually conspicuous and abundant, SM>10. Nests under stones or wood, often near stream beds in lowlands and foothills of Chihuahuan desert area.

Male large, with long cylindrical gaster; parameres slender, digitiform; digitus and aedeagus essentially as in Parvula Complex.

Paratrechina bruesii

(Figs. 27, 29, 39; Map-Fig. 50)

Prenolepis bruesii Wheeler, 1903, Psyche 10: 106. ☿, ♀, ♂. Type loc., Fresno Canyon, Presidio Co., TX.

Paratrechina (*Nylanderia*) *bruesi* (sic): Creighton, 1950, Bull. Mus. Comp. Zool. 104: 406; in part.

Prenolepis anthracina var. nodifera: Pergande, 1895. Proc. Calif. Acad. Sciences 5: 860. ☿, ♀, ♂. Not Mayr, 1870, Sitzber. Akad. Wiss. Wien 61: 338. ☿.

Prenolepis (Nylanderia) mexicana: Wheeler, 1914, J. N. Y. Ent. Soc. 22: 55.

Diagnosis

Worker. TL usually 2.5-3.0, OI usually 20-22. Large, dark brown Mexican and border-region species of riparian habitats in scrub desert and desert grasslands at 750-1800 m. SM 13-19, PM usually 7-11. Scape thick, appearing even thicker due to subdecumbent pubescence, but not notably shorter than in other species as reported elsewhere (Creighton, 1950; Wheeler, 1903)--mean SI of Texas bruesii about 112, or about the same as that of vividula.

Male. TL 2.6-3.3, OI usually 35-36. Elongate, black, form vaguely reminiscent of Formica males, especially the long cylindrical gaster. Head narrow, CI 88-92. Scapes long, SI usually 125+, pilose, SM 7-10. Parameres slender, digitiform, much longer than volsella and aedeagus. Wings dusky.

Queen. Large, dusky brown, with dusky wings. SM 9 or more.

Description

Lectotype worker. TL 2.51, HL 0.73, HW 0.61, SL 0.81, EL 0.15, PW 0.43, MCL 0.22, WL 0.89, FL 0.63, GL 0.89, SM 13, PM 10, MM 4, CI 83, OI 21, SI 111, FI 86.

Anterior border of clypeus arcuate, flattened across the middle portion lying directly anterior to the frons; rear border scalloped and much less arched. Sides of head subparallel from an imaginary line across the rear edge of the antennal fossae to one about 1/2 way between the rear border of the eyes and the posterior corners of the head. Rear border of head convex except for a distinct notch behind the frons. Eyes small, separated from sides of head by about 1/2X eye width and from the mandibular insertions by about 2X EL. Scapes slender at the base, thickening to about 2X their basal diameter at their thickest portion, nearly straight out to thickest point, slightly curved beyond. SI about average for Texas material.

Pronotum in profile smoothly convex. Mesonotum flat; its anterior edge raised only slightly above rear edge of pronotum, its rear face meeting the dorsal face through a rounded, strongly obtuse angle (about 155°). Propodeum evenly arched, its highest point about as high as pronotum. Legs short for this species about comparable to those of parvula in length (normally somewhat longer).

Petiole scale-like, quite different from cuneate form of species considered thus far. Anterior face convex; rear face less convex, becoming concave near the sharp crest which bears a few small erect hairs. From above, the petiolar crest is weakly rounded.

Pilosity long and abundant over entire body. Numerous shorter bristles occur on the cheeks. Scape macrochaetae

notably longer than greatest width of scape, partially obscured by subdecumbent pubescence which is not as long but quite abundant. The 8 major thoracic macrochaetae dark brown with large barbules detectable even at 40X; the ancillary hairs 1/2X or less the length of the major hairs and of much finer diameter. Gaster with abundant, long, curved, noticeably barbulate macrochaetae. Pubescence dense, subdecumbent on scapes; short and appressed on legs, apparently non-existent on body.

Entire body shiny but lacking the highly polished appearance of the sympatric austroccidua.

This specimen, probably not fully sclerotized, has grey eyes and is yellowish-brown on the top of the head and on the gaster, a little lighter elsewhere. Gasterless specimen on the point beneath the lectotype is uniform brown.

Allolectotype male. TL 2.92, HL 0.62, HW 0.57, SL 0.78, EL 0.22, WL 1.01, GL 1.29, SM 8, CI 92, OI 36, SI 126.

Clypeus lentiform, its front and rear borders about equally arcuate and with shallow median concavities. Sides of head straight, subparallel, anterior to eyes, curving inward behind the eyes to meet the posterior corners. Posterior corners of head lie behind inner margin of eyes and delimit the straight rear border. Eyes large, convex, protrude well beyond sides of head. Though CI is about the same as faisonensis and melanderi, this specimen, in fact, has a narrower head than either of these species--the CI

being due to the strongly protruding eyes. Lateral ocelli smaller than median, separated from it by about 2X the greatest width of the latter. Scapes long and with shorter, less conspicuous macrochaetae than in worker.

Petiole viewed from the side with a thick, blunt, smooth top, but apparently flat front and rear faces. Viewed from above, front and rear faces are concave in the middorsal area. Crest bears some short curved hairs. Petiole very broad with rounded sides.

Genitalia distinctive. Parameres slender (Fig. 39), digitiform, weakly curved mesad and considerably longer than volsellae or aedeagus. In side view, convex aedeagal dorsum may be seen above paramere, and deflected tip of aedeagus protrudes below paramere. Base of volsella may also be seen protruding beneath basal portion of paramere. Ventral and rear edge of volsellar base meet in a weakly obtuse angle in side view, the angle not rounded off but sharp and distinct.

Pilosity dark brown, finer and much less abundant than on worker, especially sparse (but coarsely barbulate) on gaster. Appendages, head and mesometathorax with fine, light-colored pubescence. Gaster with sparse appressed hair. Parameres with long curved yellowish-brown pilosity.

Body shiny, a little duller where pubescence occurs. Gaster lightly shagreened with individual cuticular plates larger than in other nearctic species.

Eyes black. Body uniform castaneous brown. Specimen is faded, since Wheeler (1903) described it as black.

Variation

Worker. TL 2.34-3.37, HL 0.61-0.84, HW 0.53-0.73, SL 0.69-0.97, EL 0.12-0.18, PW 0.36-0.56, MCL 0.16-0.24, WL 0.77-1.07, FL 0.55-0.79, GL 0.89-1.52, SM 13-19, PM 6-13, MM 3-8, CI 81-90, OI 17-25, SI 107-119, FI 86-99, (n=31).

Head shape may be quite variable in this species, especially with respect to breadth and convexity of the sides. I have 2 small series from Arizona (not measured) in which the smaller workers of the series have narrow, straight-sided heads and the larger ones have the heads quite broad and convex-sided. One of these large workers has CI obviously higher than the upper value of 90 reported above. In general, a straight to weakly-convex-sided head of moderate breadth (CI around 85) is characteristic of the great majority of bruesii workers. The petiole of the type is atypical in having a sharp crest, as most workers have a blunt, rounded crest in side view. The gaster of bruesii workers is usually quite voluminous, and only rarely is it a little longer than the thorax as is shown in Fig. 27. Comparison of the ranges of WL and GL above should give some indication of this.

The vestiture varies considerably, but it can safely be said that within the U.S. this ant has notably more pilosity on the scapes and thorax than any sympatric form

(unless bruesii should be found to be sympatric with hystrix in the future). The pilosity of the scapes is often not as long as in the type, and in such cases, the scape pubescence is usually shorter and less erect. The larger ancillary macrochaetae of the thorax are often up to 3/4X as long as the major macrochaetae. There is usually some sparse pubescence on the head and gaster, and not uncommonly, especially in larger workers, there is decumbent to suberect pubescence on the front and sides of the pronotum, the mesometapleural area, and the propodeum.

The only notable geographic variation in bruesii is that Arizona specimens have longer scapes (mean SI about 115.5) than specimens from Mexico and Texas (mean SI about 111.7).

Male. TL 2.61-3.28, HL 0.61-0.69, HW 0.54-0.63, SL 0.73-0.89, EL 0.19-0.24, WL 0.95-1.09, GL 1.05-1.54, SM 7-10, CI 87.5-92, OI 32-36, SI 120-131, (n=8).

The major obvious variation in bruesii males is in gaster length. This may be geographically determined since individuals of a series of 8 males from Nayarit, Mexico (only 2 measured), appear to have shorter gasters than the males from the U.S. Scape length is at the high end of the range in males from Arizona, as in workers.

The angle formed in side view by the meeting of the basal and rear edges of the volsella ranges from about 85° to 120°, or so. The left and right parameres of the type are quite different in this respect. Most specimens

have the angle nearly a right angle with the rear edge slightly concave to very slightly convex and the lower edge straight to slightly convex.

Material Studied

The lectotype and lectallotype are mounted on the middle and upper points of a single pin at AMNH labeled: Fresno Canyon, Presidio Co., Tex., Dec. 19, '01/Wm. M Wheeler Collection/Cotype No. (no number) AMNH. Two other pins containing 2 queens, 2 males and a worker, at AMNH; plus a pin with one member of each caste (male gasterless), at MCZ; comprise the rest of the syntype series in the U.S. A series of 3 workers and a male from Fresno Canyon at USNM appears not to belong to the syntype series, based on the handwriting on the label. USNM contains most of the Mexican material studied. A large series from Arizona in the Creighton collection (LACM) contains good representation of all castes. Most other material studied is duplicate material donated to me from TTU.

Discussion

The name bruesii or the misspelling bruesi (Creighton, 1950; Emery, 1925) has been so widely misapplied that perhaps all references to it, aside from the original description, do not, in fact, concern bruesii. Aside from the type material and perhaps one other series, all material loaned to me belonging to this species was either unidentified or

misidentified. On the other hand, most of the material labeled bruesii has been wojciki, terricola or austroccidua.

As mentioned above, bruesii is a large species, the largest among our species. Most of the misidentifications of bruesii can be traced to Creighton's (1950) key which states that bruesi (sic) has "scapes surpassing the occipital margin by not more than one-third their length." This was contrasted with "scapes surpassing the occipital margin by only a little less than half their length." It is, in fact, the latter description which better fits bruesii (and all other native U.S. species except wojciki, parvula and austroccidua). I believe it was Creighton's misconception that bruesii is an eastern U.S. species that blinded him to its real identity, even though he had seen genuine bruesii material (his Plate 51 is bruesii, as can be seen from the form of the male). This species is, in fact, primarily Mexican and extends its range into southern Texas, Arizona and probably New Mexico. Pergande's collections from Baja California identified as the neotropical species nodifera (USNM) are unmistakably bruesii, as they were treated by Emery (1925). Curiously, Wheeler (1914) failed to recognize his own species, bruesii, when he saw specimens collected by Mann in Mexico, some years after the original description.

Natural History

The collections I have studied indicate that bruesii rears alates during summer and fall. Collection with fully

sclerotized alates date from April in Arizona and early August in Texas. The types were collected in December. On the other hand, I have callow males from 1670 m in Arizona collected in September. Unfortunately, Pergande's Mexican material is not dated. Apparently, the alates remain in the nest through the cool months and fly at the onset of hot weather (or late spring rains?).

Bruesii is a riparian species of the warm deserts of Mexico and far southern U.S. It is found up to 1800 m elevation in the desert grasslands and even in juniper-oak or juniper-cottonwood woodlands. At lower elevations, it is found in Chihuahuan type desert. The vegetation of the Mexican localities where Pergande collected this species is subtropical thorn forest. All nest series which include nesting information indicate the nests were under stones near streambeds or in desert washes.

CHAPTER XII
HYSTRIX COMPLEX

Diagnosis of Complex

Worker larger than those of Parvula Complex; light brownish-yellow, shiny; pubescence virtually lacking over entire body; pilosity stout, black, abundant on dorsum, legs, scapes, SM usually > 20. Nests deep in soil (perhaps entirely hypogaeic).

Male larger than those of Parvula Complex; dark brown, shiny; virtually free of pubescence on body; SM>15; genitalia like those of Parvula Complex.

Paratrechina hystrix, New Species

(Figs. 28, 30, 40; Map-Fig. 50)

Paratrechina species B Snelling and George, 1979, California Desert Ants, p. 200. Figs. 228-229, ♀. (Unpub. rep. to Bur. Land Management)

Diagnosis

Worker. TL usually 2.5-2.9, OI 19-23. A distinctive, probably hypogaeic species of the sagebrush deserts of eastern California, Nevada, and Utah. Yellow to light

yellowish-brown with abundant dark brown pilosity and almost no pubescence on body and legs. SM 17-29, PM 9-17.

Male. TL about 2.3-2.7, OI 28-32. Dark yellowish-brwon. Eyes small. Scapes long, SI 134-137. Pilosity abundant, SM 15-21.

Queen. Yellow with brownish-yellow head. Pilosity brown, abundant, shorter and less erect than on workers. Grooved, yellow median carina on clypeus distinctive.

Description

Holotype worker. TL 2.47, HL 0.70, HW 0.61, SL 0.94, EL 0.15, PW 0.44, MCL 0.20, WL 0.97, FL 0.72, GL 0.81, SM 21, PM 16, MM 8, CI 87, OI 22, SI 135, FI 103.

Clypeus sublentiform, anterior border more strongly arched than posterior border, and truncate; the rear border a nearly perfect arch except for a narrow median concave emargination. Clypeus with a weak, medially grooved, median carina. Sides of head convex, widest in front of the eyes, weakly convergent posteriad. Posterior corners of head lie approximately behind inner borders of eyes and delimit the broadly, shallowly notched rear border. Head longer than broad, relatively wide for this species. Eyes small, placed far back, near the middle of the sides of the head; separated from sides of head by about 1/2X eye width, and from mandibular insertions by a little less than 2X EL. Ocelli lacking. Scapes long, even for this species, bent at about 1/3X their length from the base.

Pronotum broadly and very weakly angular, the anterior and the slightly longer dorsal face flat, connected by a subtle rounded angle. Promesonotal suture feebly impressed, the front edge of the mesonotum virtually confluent with the rear edge of the pronotum. Mesonotal dorsum very weakly convex and weakly sloped to the rear relative to the long axis of the thorax. Rear face of mesonotum meets dorsal in about a 130° angle, is relatively long among U.S. species, and gives rise to several barbulate macrochaetae. Propodeum high and arched, its highest point about as high as that of pronotum; the angle between tangents to the ascending and descending faces about 90°. Legs a little longer than other U.S. species.

Petiole stout, squamose in side view, with straight, nearly parallel front and rear faces and a blunt convex crest. Viewed from above, the petiole is straight-sided with rounded corners and flat across the crest.

Vestiture distinctive among North American *Paratrechina*. Straight to weakly curved, dark brown pilosity abundant on head and thorax, gaster and appendages; SM 21 is near the low end of the range for this species. Pilosity on scapes lighter and shorter than on legs. Even propodeum has a small barbed macrochaeta on each side positioned behind the metathoracic spiracles. Pubescence sparse, limited to a few subdecumbent yellow setae on scapes, femora, tibiae and propodeum, a few erect setae on the anterior pronotum, and a small patch of appressed hairs near the eye.

Head and thorax shiny, gaster and femora a little less so due to fine indistinct shagreening. Scapes and tibiae weakly shining.

Yellow with head and posterior half of gaster a little darker. Mandibles brownish-yellow with castaneous edges and teeth. Dark brown pilosity very conspicuous due to its abundance and contrast with the yellow body and limbs.

Allotype male. TL 2.64, HL 0.62, HW 0.56, SL 0.84, EL 0.19, WL 0.97, GL 1.05, SM 19, CI 90, OI 31, SI 136.

Mandible with a well-sclerotized apical tooth and straight, edentulous masticatory border. Anterior clypeal border arcuate with a deep but narrow median concavity which itself has a narrow median tooth. Rear border shaped as a bell-curve with the top excised by the median concavity; the median arch of the curve conspicuously more strongly arcuate than the front border. Sides of head convergent anteriad, concave in front of the eyes, convex behind. Posterior corners lie behind the mandibular insertions and delimit the convex rear border. Eyes small, notably less than 1/3X HL, but strongly convex and protruding distinctly beyond sides of head. Ocelli close-set, median and laterals separated by about 1 1/2X their width. Scapes long, weakly curved, lacking the weakly signoid curvature of many other Paratrechina males.

Petiole blunt and squamose in side view, as in worker; the crest convex. Viewed from above crest flat across the top. Petiole broader and heavier than worker's.

Parameres triangular in side view, about 2X as long as their basal breadth; curved mesad in rear view. Volsellar basal edge almost perpendicular to rear edge. Cuspis stout, thumb-like; projecting dorsoposteriad as in bruesii or austroccidua. Digitus blunt, broader than cuspis and weakly deflected. Aedeagal lobes triangular in side view, with weakly convex dorsal edge, in posterior view thickened and slightly divergent distally.

Pilosity long, dark brown and abundant over most of body, including on gastral dorsum unlike males of most other nearctic species. Even pronotum, propodeum and petiole bear a few short macrochaetae. Pubescence sparser on scapes but more abundant on legs than in worker. Pubescence virtually lacking on body; appendages pubescent. Parameres with 15-18 slightly sinuate decurved macrochaetae.

Body shiny, appendages slightly dulled by pubescence.

Head dark yellowish-brown; thorax and gaster a little lighter. Coxae and petiole light brown. More recently mounted specimens (JCT) are deeper brown.

Variation

Worker. TL 2.35-2.94, HL 0.63-0.73, HW 0.53-0.63, SL 0.81-0.95, EL 0.13-0.16, PW 0.37-0.44, MCL 0.17-0.20, WL 0.80-0.98, FL 0.61-0.73, GL 0.77-1.25, SM 17-29, PM 9-18, MM 4-10, CI 81-88, OI 19-23, SI 119-135, FI 90-103, (n=18).

Specimens of hystrix from Nevada and Utah are smaller and have less thoracic pilosity, PM 9-13, MM 4-7. One Nevada specimen has a convex, rather than flat, petiolar

crest. One specimen in the type colony has relatively short appendages. Lacking this specimen, the ranges for SI and FI are 126-135 and 97-103, respectively. Color varies from yellow to yellowish-brown.

Male. TL 2.30-2.68, HL 0.58-0.63, HW 0.51-0.56, SL 0.76-0.85, EL 0.17-0.19, WL 0.85-1.00, GL 0.85-1.08, SM 15-21, CI 87-93, OI 28-32, SI 132-137, (n=9).

The known males of *hystrix* are all in the type series and are quite uniform in appearance.

Material Studied

The holotype and allotype are among a large series (LACM) of workers and males, and the colony queen, labeled CAL-316. Inyo Co. DVNM (i.e., Death Valley National Monument). Grapevine Ranger Station, 2100'. 4-III-1968. G.C. and J. Wheeler. The worker and male types are further labeled "HOLOTYPE *Paratrechina hystrix* Det. Trager, 1984" and "ALLOTYPE *Paratrechina hystrix* Det. Trager, 1984." Specimens from Washoe and Lincoln Counties, Nevada, and San Juan County, Utah, are at LACM. Dr. G.C. Wheeler kindly gave me the remainder of the type series from his alcohol collection, including the colony queen. The queen will go to LACM, and the rest of the series to JCT and the usual depositories.

Discussion

The name *hystrix* (Greek--porcupine) refers to the abundant, tapering pilosity characteristic of this species. It is a noun in apposition and, thus, invariant in form.

There is little likelihood hystrix will be confused with any other nearctic species. The Utah specimens (LACM) were determined as guatemalensis, but the later is strictly tropical, much smaller, more pubescent and less pilose. The Mexican cavernicole, P. pearsei has a superficial resemblance to hystrix but has scapes and legs longer, scape pilosity more abundant, eyes smaller, and body covered with short dense whitish pubescence. Whether hystrix and pearsei are related must await collection of pearsei males and further study.

Natural History

The type series was collected in March. In view of the locality, it seems most likely the males were reared in the warmer months of the preceeding fall, as in other nearctic species.

The type colony was collected under adjacent large stones in an old wash (i.e., not the current channel) in creosote-bush desert. The locality is only a few kilometers from sites with sagebrush desert, the vegetation characteristic of the Nevada and Utah collection sites. From available information, the species' range straddles the transition areas between the warmer Mojavean and Arizonan deserts and the colder Great Basin desert. The species may be mostly hypogaeic, as the stones under which the types were collected were deeply imbedded in the soil, and the nest extended downward from under the deepest parts

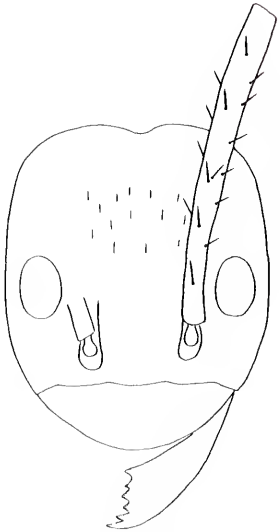
of the stones. This cryptic nesting habit and its occurrence in an area which has been poorly collected by myrmecologists have probably caused hystrix to remain unknown for so long.

Fig. 27. Worker of *bruesii*, lateral view.

Fig. 28. Worker of *hystrix*, lateral view.

Fig. 29. Head of *bruesii* worker, dorsal view.

Fig. 30. Head of *hystrix* worker, dorsal view.



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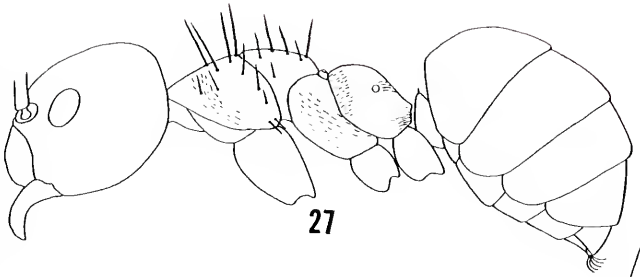
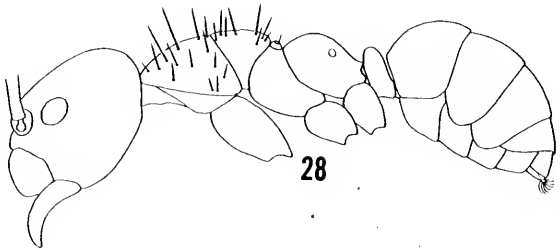


27



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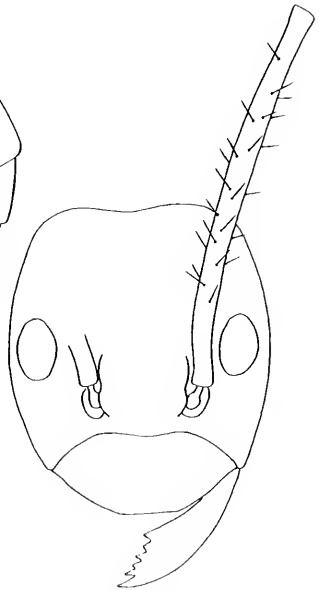

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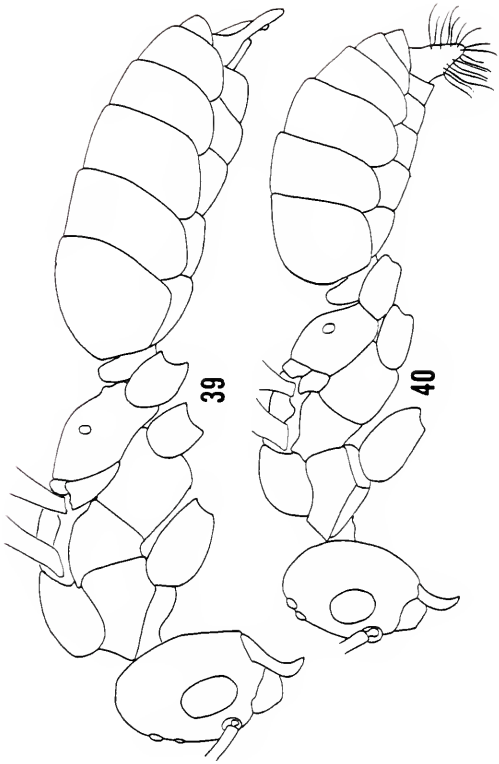
Fig. 39. Male of *bruesii*, lateral view.

Fig. 40. Male of *hystrix*, lateral view.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CHAPTER XIII
GUATEMALENSIS COMPLEX

Diagnosis of Complex

Yellowish-brown to dark brown, shiny, but this obscured by pubescence on dorsal surfaces of head, thorax, and gaster; pubescence dilute on sides; scape pilosity suberect to erect, conspicuous, SM usually 17-25; mandible slender, weakly curved, usually with small subbasal tooth. Nests in rotting wood, litter, or epiphytes in tropical woodlands.

Male smaller than worker and shinier; pubescence distributed as in worker but sparser. Parameres triangular, blunt-tipped, about as long as broad; digitus curved outward distally; cuspis short; aedeagus shaped about like parameres.

Paratrechina guatemalensis

(Figs. 34, 35, 46; Map-Fig. 49)

Prenolepis vividula var. *guatemalensis* Forel, 1884, Bull. Soc. Vaud. Sci. Nat. 20: 348. ☿, ♀; Forel, 1912, Mem. Soc. Ent. Belg. 20: 66. Type loc., Retaluleu, Guatemala.

Prenolepis guatemalensis Forel, 1893, Trans. Ent. Soc. Lond., p. 340; Wheeler, 1905, Bull. Amer. Mus. Nat. Hist. 21: 392. Fig. 4, ♂.

(All other citations only questionably refer to the true guatemalensis.)

Diagnosis

Worker. TL usually 2.0-2.5, OI 23-26. A neotropical species which nests in rotting wood or moist soil beneath logs or stones, typically in second growth; established at Homestead, Florida. Light brownish-yellow to castaneous brown with pale yellowish or whitish mid and hind coxae. Greyish or whitish pubescence dulls the dorsal surface. Head narrow, CI usually 77-83. Scapes long, SI 117-127; pilose, SM 17-25. Mandible slender, weakly curved; subbasal tooth, small, separated by a large gap from basal tooth.

Male. TL about 1.8-2.2, OI usually 36-38. Color as in worker, but thorax paler. Pubescence more dilute on gaster. Scapes long, SI usually 130-140. Parameres short, nearly equilateral-triangular. Digiti with broad apex; curved laterad distally.

Queen. Very similar to other fulva-group species, but smaller with narrower head. Color, mandibular dentition as in workers.

Description

Lectotype worker. TL 2.43, HL 0.62, HW 0.49, SL 0.73, EL 0.15, PW 0.39, MCL 0.18, WL 0.77, FL 0.58, GL 1.05, SM 20, PM 7, MM 3, CI 80, OI 25, SI 118, FI 93.

Mandible as shown in Fig. 35; note small size and approximation of subbasal tooth to median tooth and large gap between basal and subbasal teeth. Clypeus subtrapezoidal; anterior border truncate, sides slightly convex, median emargination slightly concave, shorter than sides. Posterior clypeal border sinuate and weakly convex in full face view. (Fig. 35 shows clypeus as it appears with head somewhat tilted forward.) Sides of head weakly convex, a little more strongly convergent in front of the eyes. Rear border of head straight (conspicuously concave in many other speciment), confluent with the sides through rounded corners. Head narrow. Eyes of about average length for the species; their posterior margin at about the midpoint of the postmandibular head length; their lateral margins separated from sides of head by about 1/3 eye width; their anterior margin separated from mandibular insertion by only a little over EL. Ocelli lacking. Scapes near the low end of range of relative length for the species.

Pronotal profile with a straight, relatively steeply sloped anterior face and a weakly convex dorsal face which are confluent through a gradually increasing curvature of the rear part of the anterior face. Anterior portion of mesonotum slightly higher than adjacent pronotal dorsum.

Mesonotal dorsum slightly convex and only a little shorter than pronotum (may be shorter in other specimens but is always proportionately longer than in native species). Propodeum smoothly convex, the angle between its base and rearmost portion slightly obtuse. Highest point of propodeum about as high as that of pronotum. Legs, as scapes, near the low end of the range of relative length for this species; nevertheless, a little longer than those of most native species.

Petiole cuneate with a moderately sharp crest in profile. In dorsal view, petiole narrow, straight-sided with a convex crest.

Pilosity not abundant except on scapes, but conspicuous due to stoutness and dark color. Scape macrochaetae suberect and longer than greatest width of scape. The ancillary thoracic macrochaetae 1/3 or less as long as the major macrochaetae and lighter in color. Pubescence covering top and sides of head, thorax and gaster; but is of fine diameter and very pale, thus, difficult to see expect at certain angles of viewing and illumination. Pubescence on propodeum is directed dorsad rather than posteriad. This orientation of the propodeal pubescence is unique in U.S. species, though it is found in other members of the Guatemalensis Complex. Appendages with dense pubescence.

All pubescent surfaces dulled by irregular shagreening and pubigerous punctation. Other surfaces smooth and shining.

This specimen is pale, slightly brownish-yellow. The thorax is a little lighter than the head, gaster and legs. The trochanters and middle and hind coxae are very pale and completely lack any brownish tint. Pilosity is dark greyish-brown. The specimen is probably very faded, as it is much lighter than even the other syntypes.

Variation

Worker. TL 1.91-2.70, HL 0.56-0.64, HW 0.44-0.53, SL 0.69-0.78, EL 0.13-0.16, PW 0.32-0.40, MCL 0.14-0.19, WL 0.72-0.85, FL 0.51-0.64, GL 0.57-1.21, SM 17-24, PM 3-7, MM 2-3, CI 77-86, OI 23-26, SI 117-127, FI 91-100, (n=36).

Clypeal shape is rather variable in this species, ranging from that reported for the type to a more rounded-off lentiform shape. The rear border is typically weakly arched or, in any case, less so than the front border, The rear cephalic border is often conspicuously emarginate, but this varies from worker to worker, even within nest series. Petiole in profile may have a blunter crest than described, but this is the less common condition.

Color is particularly variable, ranging from the pale brownish-yellow of the lectotype to castaneous brown. Some specimens are bicolored with a brown gaster and lighter, yellower head and thorax. The middle and hind coxae are always notably lighter, though less so in pale specimens. On the paler specimens, the femora and tibiae are often darker than the body color. In a series of foraging

workers collected in Florida at bait (RWK), the color ranges from light yellowish-brown to rich reddish-brown. The middle and hind coxae are nearly white in all specimens of this series, though they may be yellower or more tan in some individuals of other series.

Male. I have seen no males of this species from Florida, and there are none among the syntypes. The key is based on Central American specimens believed to be guatemalensis (see Discussion).

Material Studied

Syntypes of this species include 2 queens and 7 workers. All but one of the workers are at MHNG. The remaining worker (MCZ) is designated the lectotype. The specimens were collected some time shortly before 1884 by Stoll at Retaluleu, Guatemala. Florida material consists of workers in 3 series from Homestead, (GJW, RWK) and one series from Miami (FSCA). Types of guatemalensis antillana, steinheili and steinheili minuta (MHNG, USNM), specimens which are probably nidotypes of guatemalensis itinerans and guatemalensis cocoensis (USNM) and samples believed to be guatemalensis from various Central and South American localities (MCZ, JCT) and from Cocos Islands (LACM) were also studied.

Discussion

The treatment given here of this introduced species is less than satisfactory. The problems associated with

separating guatemalensis and its relatives cannot be sorted out without careful revisionary work. Based on types and a small amount of other material, the taxonomic situation in this genus appears to break down as outlined below. It should be remembered that this is a preliminary scheme and not a formal proposal (see Table 3).

Features of the males seem to corroborate a four-species hypothesis. On the other hand, the genitalia (Fig. 46) on these forms are essentially identical in form and are similar to those of several other species which may belong outside this species complex. I believe that the forms guatemalensis cocoensis and guatemalensis itinerans will eventually have to be synonymized with guatemalensis (sensu stricto) and minuta, respectively. Guatemalensis appears to belong in the fulva group as stated by Forel (1893).

Guatemalensis in Florida is unlikely to be confused with any other species. Within its size range, it is the only highly pubescent form with SM 18 or more. Among the pubescent species, the pale coxae, paucity of thoracic pilosity and small size are diagnostic.

A specimen in the Pergande collection (USNM) labeled guatemalensis from Phoenix, Arizona, is vividula, not "melanderi" as stated in Smith (1979).

Natural History

No information is available on seasonality of alate production and flight activity in guatemalensis. The few

Table 3. Selected characteristics of members of the Guatemalensis Complex of *Paratrechina*.

	HL	CI	OI	SU	SM	WLx100/HL	Size of Subbasal Tooth Relative to Basal and Median	Color	n
guatemalensis	0.58-0.63	77-83	23-26	118-125	18-23	103-108	small	yellowish-brown or darker, coxae variable pale to yellow	10
steinheili	0.65-0.69	81-87	25-28	123-131	19-26	104-113	small	dark brown, coxae pale	10
minuta	0.55-0.60	81-84	25-27	112-118	14-18	100-102	large	dark brown, coxae reddish	7
antillana	0.63-0.65	84-87	24-25	124-128	20-22	100-103	intermediate	yellowish-brown, coxae pale	2

alates available are either undated or so scattered through the year that no pattern is evident. This species may produce alates throughout the year and fly whenever appropriate conditions are present, as in other tropical species.

The nests are often in rotting wood but may be found under stones or in litter. This species has been found in semiopen or secondarily wooded habitats and, apparently, is not a primary rain forest species. Accounts of "*guatemalensis*" in the literature are not reliable, in view of the taxonomic confusion prevalent with respect to *Paratrechina* in the tropics.

CHAPTER XIV
FULVA COMPLEX

Diagnosis of Complex

Worker large; reddish-brown; densely pubescent on thorax and gaster, a little less so on head, appearing dull; pilosity same color as body, abundant, SM usually 20-30. Nests in disturbed areas under trash, plant litter, abandoned termite or ant mounds, etc.

Male large; reddish-brown; SM usually > 15; genitalia similar to those in Guatemalensis Complex but a little more elongate, especially parameres, and digitus not curved in most species.

Paratrechina pubens

(Figs. 33, 36, 44; Map-Fig. 49)

Prenolepis fulva pubens Forel, 1893, Trans. Ent. Soc. Lond., p. 338. ☿, ♀, ♂. Type loc., St. Vincent, Antilles.

Prenolepis fulva pubens: Emery, 1893, Zool. Jahrb. Syst. 7: 636. Pl 22, Fig. 24, ☿, ♂.

Paratrechina (*Nylanderia*) *fulva*: Creighton, 1950, Bull. Mus. Comp. Zool. 104: 406.

Diagnosis

Worker. TL usually 2.75-3.0, OI 24-26. A large reddish-brown West Indian species established in the Miami, Florida, area. Occasionally in greenhouses further north. Scapes long, SI 116-125, bristly, SM usually 20-30. Head shiny, sparsely pubescent; subcordate. Thorax densely pubescent with long, abundant, light brown flexuous pilosity, PM 9-15.

Male. TL 2.6-3.2, OI 40-42. Uniform reddish-brown. Head shiny, sparsely pubescent. Scapes long, SI 141-145, bristly, SM usually 16-19. Unrubbed specimens have a dense fringe of long, sandy-blonde hairs on the border of bluntly rounded, weakly recurved parameres.

Queen. Apparently not discernible from *fulva*. Easily recognized in U.S. fauna by large size and reddish-brown coloration.

Description and Variation

Worker. (Composite description--no types available.)

TL 2.55-3.10, HL 0.77-0.85, HW 0.65-0.77, SL 0.91-1.01, EL 0.18-0.21, PW 0.46-0.57, MCL 0.23-0.28, WL 0.97-1.09, FL 0.73-0.81, GL 0.80-1.71, SM 19-34, PM 9-15, MM 3-6, CI 84-92, OI 24-27, SI 116-125, FI 95-100, (n=35).

Mandibles robust, their outer margin strongly convex such that the angle between the basal and distal portions of the outer margin is only weakly obtuse (95-105° versus 110° or more in other species). Clypeus lentiform, front

and rear borders about equally arcuate; median concavity of front border indistinct, that of rear border distinct but small. Head subcordate, broadest behind the eyes; the convex sides strongly convergent anterior to the eyes and confluent with the rounded posterior lobes; the latter meeting in a distinct median notch. Eyes about 1/4X HL, high on the face, separated from sides of head by over 1/2 eye width and from mandibular insertion by about 1 1/3X EL. No trace of ocelli visible. Scapes long and bristly.

Pronotum weakly convex. Anterior portion of mesonotum with a short rounded anterior face; the mesonotal dorsum higher than adjacent pronotum. Mesonotal dorsum flat, sloping strongly to the rear. Propodeum rounded, low; its highest point about as high as the low rear portion of the mesonotal dorsum. Legs rather long; femora robust basally, tapering to a slender apex.

Petiole in profile chisel-shaped, the rear face appearing "beveled" near the top; the crest narrow but blunted by rounding or truncation. In dorsal view, petiole with concave or straight sides, the crest with convergent, weakly convex sides and a flat or weakly concave top.

Pilosity long, abundant, light reddish-brown. Scape macrochaetae suberect to erect, often longer than width of scape. Pilosity on all body surfaces and even on legs long, flexuous, and of relatively fine diameter. Pubescence on head sparse, not obscuring the shiny surface beneath. Remainder of body and appendages covered with

dense yellowish pubescence; that on promesonotum decumbent or subdecumbent, that on propodeum, gaster and legs appressed.

Body surface smooth and shiny but this obscured by dense pubescence, except on head.

Body and appendages uniform light to dark ferruginous brown. Head may appear a little darker because of the lesser reflectivity of the sparser pubescence.

Male. (Composite description--no types available.)

TL 2.64-3.16, HL 0.66-0.69, HW 0.63-0.67, SL 0.93-0.98, EL 0.26-0.28, WL 1.01-1.13, GL 0.97-1.37, SM (10) 16-19, CI 94-97, OI 40-42, SI 141-145, (n=6).

Outer border of mandible more strongly curved than in other species, less conspicuously so than in workers. Mandible with a sharp narrow apical tooth and three or more short blunt denticles on the masticatory border giving it a crenulate appearance. Clypeus subtrapezoidal; with a weakly arcuate front border; and rear border with straight sides and a shallowly concave median truncation. Sides of head largely obscured by eyes but are weakly convex and distinctly convergent anteriad. Head widest at about the rear edge of the eyes. Posterior border weakly convex, delimited by indistinct corners which lie behind the inner border of the eyes or somewhat further apart. Scapes long, straight and more pilose than any sympatric form.

Petiole in profile cuneate to chisel-like, with a blunter, more rounded crest than in worker. In dorsal view,

petiole is broader than worker's, with straight sides and an evenly convex crest.

Parameres in side view are broadly triangular as in guatemalensis but are very rounded off distally and may appear weakly recurved. The border of the parameres is clothed with a dense fringe of long, curved light brown hairs in clean, unrubbed specimens. In rear view, the parameres have their outer surface convex and are weakly curved mesad. Volsellae and aedeagus very close in form to those of guatemalensis (Fig. 46) in structure, but the digiti are straight, not curved laterad.

Vestiture, sculpture and pilosity as in worker with the usual sexual differences.

Material Studied

A large series of pubens from Washington, D.C. in the Pergande collection (USNM) forms the basis for the major part of the above descriptions. These specimens are a part of the same collection which Emery (1893) studied when he said that greenhouse collections from eastern U.S. were conspecific with Forel's West Indian pubens. Also studied were series (WFB, FSCA) collected in Coral Gables and Miami, Florida, in the period 1953-1973 and series from Puerto Rico, Guadeloupe and Anguilla.

Discussion

This species was synonymized by Creighton (1950) on the basis of the "startling" similarity between workers

of pubens from the U.S. and from Brazil. I have seen samples of fulva from Brazil, Argentina and Mexico (JCT, LACM) which may comprise more than one species, but all can be distinguished from pubens by the straight or at least less strongly emarginate rear border and denser pubescence and punctation of the worker head; and the coarser and often shorter and darker thoracic pilosity. Males associated with these workers invariably have more elongate, tapering parameres with sparse pilosity of uneven length and orientation which in no way resembles the characteristic fringe of pubens. The cephalic pubescence of these males is denser than that characteristic of pubens. While thorough revision of Fulva Complex must await a later study, I feel the conclusion is inescapable based on present evidence that pubens is a separate species within this group which was probably originally endemic to the West Indies.

The Brownsville, Texas, specimens studied by Creighton are "fulva," not pubens. Since no other fulva-group species have been collected in southern Texas since 1938, it is likely that no Fulva Complex species other than pubens is established in the U.S. Pubens in the USDA greenhouses in Washington, D.C. from which Pergande collected them have undoubtedly succumbed to pesticides and replacement by more modern structures.

Natural History

I have no direct experience with pubens in the field. The field notes of H.H. Smith (in Forel, 1893) indicate

that the nesting habits of this ant are very much like those of fulva I have collected in South America. The colonies are large, with several hundred individuals, and are found under cover objects such as stones or logs. Smith states this species is limited to open land not far from the sea and may even be found on beaches above the surf line.

CHAPTER XV
BOURBONICA COMPLEX

Diagnosis of Complex

Worker large; dark brown to black with dense greyish pubescence on all surfaces; pilosity stout, black, nearly straight, abundant, SM usually 28-34, eyes large, OI 26-30. Nests in distrubed habitats near buildings, in cultivated areas, etc.

Male grey with dense pubescence; scape pilose, SM 10-16; eyes large; parameres broad-margined, notched, very black and heavily sclerotized; volsellar rami heavily sclerotized, cuspis longer than the coarsely punctate digitus and closely approximated to paramere; aedeagus hyaline, ovate with decurved tip.

Paratrechina bourbonica

(Figs. 31, 37, 43; Map-Fig. 52)

Prenolepis nodifera bourbonica Forel, 1886, Ann. Soc. Ent. Belg. 30: 210. ☿, ♀, ♂. Type loc. St. Denis, Réunion.

Prenolepis bourbonica Forel, 1891, In Grandidier, Hist. Nat. Madagascar 20: 82. Fig. 2, ☿, ♀, ♂; Emery, 1914, Nova Caledonia Zool. 1: 422.

Paratrechina (Nylanderia) bourbonica: Emery, 1925, Gen. Insectorum, Fasc. 183: 219; Creighton, 1950, Bull. Mus. Comp. Zool. 104: 406; Wilson and Taylor, 1967, Pacific Ins. Monog. 14: 87-89.

Diagnosis

Worker. TL usually 2.6-3.2, OI 26-30. A large introduced species, especially abundant in disturbed habitats in southern Florida, also marshes and mangroves, Everglades National Park and Florida Keys. Dark brown to nearly black with dense grey pubescence. Pilosity stout and straight, black, abundant. SM 24-38, PM usually 7-12. Head punctate, broad, with large eyes.

Male. TL about 2.5-2.75, OI 44-48. Larger than any other dark colored male in Florida. Eyes very large, scapes long (SI 128-136) and pilose (SM 10-16). Parameres broad-margined, margin bilobate. Digitus heavily sclerotized, black and coarsely sculptured.

Queen. Large, finely punctate, charcoal-colored (browner under magnification). SM>20. Eyes very large.

Description

Lectotype worker. TL 2.90, HL 0.74, HW 0.67, SL 0.93, EL 0.21, PW 0.46, MCL 0.19, WL 1.01, FL 0.73, GL 1.15, SM 33, PM 9, MM 4, CI 90, OI 29, SI 126, FI 99.

Clypeus sublentiform; the anterior border a truncate arch with the middle half of its width flattened and, on this specimen, bearing a median concave emargination which

is distinctly narrower than the least distance between the frontal carinae. Posterior clypeal border a sinuate curve, more strongly arcuate than front border, and with a narrow median emargination. Sides of head convex, notably convergent anteriad. Posterior corners behind and slightly laterad of the inner margins of the eyes, and delimit the weakly concave rear border. Head broader than most native U.S. species. Eyes larger than all other species except longicornis, separated from sides of head by less than 1/3X eye width, and from mandibular insertions by slightly over EL. Three ocelli present, though small. Scapes of about average length for the species, longer than any native species.

Pronotum evenly convex. Mesonotum weakly convex, raised above adjacent edge of pronotum, but sloping to the rear; with short, indistinct front and rear faces. Propodeal profile a low, rounded angle; the angle between the base and the rear face obtuse, about 120°. The highest point of the propodeum about as high as the rear portion of the mesonotal dorsum. Thorax long, about 1.35X HL. This proportion 1.30 or less in native species.

Petiole chisel-like in profile; with a sharp crest, straight anterior face, and weakly convex rear face with upper third "beveled." From above, petiole relatively narrow with straight sides meeting the flattened top through rounded corners.

Pilosity abundant, relatively short and stout, straight or weakly curved and coarsely barbed. Scape pilosity conspicuous, a little shorter than maximum diameter of scape; dark brown. Thoracic pilosity blackish; the 8 major macrochaetae weakly curved, less than 2X as long as the straighter, next-largest ancillaries. Pilosity on legs and gaster blackish, subdecumbent to erect. Crest of petiole with a few short, erect hairs. All surfaces invested with greyish pubescence, except rear face of propodeum and petiole. Pubescence dense on all dorsal surfaces, sparser on the sides.

Head with fine, dense pubigerous punctation. Other surfaces strongly shining, though this obscured by pubescence.

Mandibles deep yellow with brown edges and teeth. Trochanters and tarsi brownish-yellow. Femorotibiae and antennae yellowish-brown. Body dark brown, but appears greyish unmagnified, due to dense pubescnece.

Allolectotype male. TL 2.47, HL 0.58, HW 0.58, SL 0.74, EL 0.27, WL 0.97, GL 0.93, SM 15, CI 100, OI 46, SI 128. (This is the smallest bourbonica male among those studied. It is one of two syntype males in the Forel collection. The other has the genitalia removed and could not be used for description.)

Mandible with a large, blunt apical tooth which has a small denticle arising from the inner side of its base. Masticatory border concave, indistinctly crenulate. Clypeus

sublentiform, the rear border more strongly arcuate than the front border; both with a median concave emargination, that on the front border wider. Sides of head straight and convergent in front of the eyes, convex behind. Posterior corners of head rounded, indistinct, notably further apart than anterior corners. Rear border of head convex. Head broad; even exclusive of eyes, it is less elongate than in other species. Eyes very large, easily filling more than half of the sides of the head. Ocelli large, the median and laterals separated by about 1 1/2X the ocellar width. Scapes long and straight; over half of their length protruding beyond posterior corners of head.

Petiole chisel-like in profile with a blunt but relatively narrow crest; the beveled upper portion of the rear face concave. In dorsal view, the petiole is broader than the worker's and weakly concave across the top.

Genitalia distinctive within the U.S. fauna. Parameres and volsellae heavily sclerotized, aedeagus hyaline. Parameres wider than long; their outer face convex; the broad distal margin bilobate. Mesal lobe of the paramere conceals cuspis at most viewing angles on the intact specimen. Cuspis long; its outer face of the same length and convexity as the mesal lobe of the paramere; the two structures lie close together and must work as a functional unit in copulation. Digitus with weakly bilobate distal margin, coarsely punctate on its irregularly concave lateral surface, smoothly convex on its mesal surface. Aedeagus subovate; the distal

portion of the ventral edge concave, giving rise to a deflected tip. Tips of aedeagal lobes curved outward as well as downward.

Cephalic pilosity like that of the worker's; that on thoracic dorsum short, bristly; that on gaster sparse, longer and of finer diameter. Scape pilosity abundant, shorter than width of scape, suberect. Gastral pilosity light brown; pilosity elsehwere blackish. Pubescence distributed as in worker but sparser, especially on the gaster.

Shinier on head than worker because pubescence and punctation from which it arises sparser and finer. Punctation dense on thoracic dorsum; barely noticeable on sides of gaster.

Uniform dark brown, except for lighter trochanters, middle and hind coxae and extremities of legs.

Variation

Worker. TL 2.26-3.25, HL 0.65-0.81, HW 0.55-0.79, SL 0.78-1.01, EL 0.18-0.24, PW 0.40-0.58, MCL 0.17-0.20, WL 0.83-1.14, FL 0.61-0.81, GL 0.79-1.45, SM 24-38, PM 5-15, MM 3-9, CI 84-98, OI 26-30, SI 120-130, FI 94-104, (n=39).

The anterior clypeal emargination of bourbonica workers varies from barely evident to quite distinct as in the type. Head width is quite variable for the species as a whole, but 33 of the specimens measured had CI in the range

88-92. The petiole in profile often lacks the beveling of the upper portion of the rear face and, thus, has a cuneate form and a blunter crest. Most Florida material has the appendages more uniformly dark than in the type, but the yellowish coloration of the appendages may be typical of populations in the Pacific region, as I have seen fresh material from Hawaii and Hong Kong with yellow feet.

Male. TL 2.47-2.77, HL 0.58-0.65, HW 0.58-0.65, SL 0.74-0.87, EL 0.27-0.29, WL 0.97-1.09, GL 0.89-1.13, SM 10-16, CI 100-102, OI 44-48, SI 128-136, (n=8).

As indicated above, the type male is the smallest of the bourbonica males measured. It is notably smaller than the emasculated specimen (presumably its brother) on the same pin. Petiole shape in the males has about the same variation as in the workers (see above). The rear edge of the digitus is straight rather than weakly emarginate in many specimens, but even in these there may be the illusion of the bilobate condition due to the concavity of the digital lateral face.

Material Studied

The lectotype and allolectotype were chosen from among Forel's syntypes (MHNG) consisting of a pin each of queens, males and workers with red "Typus" labels and another with a single worker labeled "Cotypus." The original labels have been removed and refolded numerous times. I have deciphered them and written out new labels in permanent ink so that the

originals can be better preserved by lack of handling. The new labels read as follows: P. bourbonica Forel. ☿, ♀, or ♂ (as appropriate) syntypes. St. Denis, Réunion. 30 Mai, 1886. Also studied were numerous Florida samples (JCT, FSCA, USDA and some in the major ant collections), several from islands in the Indian and Pacific Oceans (MCZ), and a series from Cuba (WFB).

Discussion

Creighton's (1950) treatment of bourbonica has been of no help to those encountering this insect since the publication of his monograph. Since he did not include bourbonica in his key, it has been almost uniformly misidentified as fulva by those attempting to use his key. There is no comfortable manner in which this species could be identified as vividula in Creighton's key, as he stated it would. A large, pubescent Paratrechina could only come out as fulva. Creighton's excuse for his treatment of bourbonica was that he believed the ant in question might by typical bourbonica rather than the subspecies amia, as was supposed by Wheeler (1932). I have not seen any type material of amia, but inspection of the bourbonica cotype at MCZ (#22959), which was available to Creighton at the time when he treated Paratrechina, leaves no doubt that our Florida population is typical bourbonica. (Forel's MHNG material from Réunion merely confirms this.) In other words, Creighton could have settled the issue with material available to him, and it is

unfortunate that he did not do so, as this species is second only to longicornis in the frequency with which it is transported from place to place with plant materials.

The species was first noted in the U.S. by M.R. Smith (1930a, 1930b) and a little later by Wheeler (1932). Apparently, it was well-established in Florida already when these authors became aware of its presence.

Wilson and Taylor (1967) synonymized two of Forel's subspecies of bourbonica--bengalensis and hawaiiensis. I have not seen the types of these forms but regard their synonymization as premature for two reasons. First, Wilson and Taylor point out that they were not always able to distinguish bourbonica and vaga. I have examined some of their Polynesian and Melanesian "vaga" material and find that it contains some workers of bourbonica as well as those of at least two other distinct species, differing in vestiture and proportions, and only one (or perhaps none) of which can be true vaga. In view of their admitted lack of clarity as to the identity of these species, I believe the more prudent course would have been not to engage in any taxonomic decisions of this nature. Secondly, I have a large series of ants from Taiwan which closely resembles bourbonica, but in my opinion is a related, but distinct species, separated in all castes by subtle but consistent differences in color, size, head width, pubescence and genitalic structure. It is just the latter sort of population to which a name such as amia or bengalensis may

apply, for Forel was a very keen observer of the types of differences separating species in Paratrechina (though he often called them "varieties"). Without the careful revisionary work necessary to determine whether the varietal and subspecific names in question apply to truly distinct forms, Wilson and Taylor's synonymizations should not be accepted unquestioningly at this time.

Workers of bourbonica are larger-eyed, more pubescent and have more erect hairs on longer scapes than any of the native species with which they might be confused in the U.S. Pubens may always be distinguished from faded bourbonica specimens by its longer, finer and more flexuous thoracic pilosity, which is light brown. Furthermore, the head of pubens is much less pubescent and has a conspicuous median emargination of the rear border. (The difference in orientation of pronotal pubescence of bourbonica and pubens, shown in Figs. 30 and 31 is not significant. The pattern shown for bourbonica is the more common one for both species.) The male of longicornis may be easily distinguished from that of bourbonica by its longer hairless scapes, though the general form of the body and genitalia of the two are quite similar.

Natural History

Bourbonica, like other tropical species, produces alates at any time of year. Alates are attracted on warm mornings, before sunrise, and following rains to blacklights.

Mating has not been observed but may occur in the air previous to their coming to lights, as females trapped at lights rear workers after capture. Apparently, after mating, females are attracted to areas of high reflectivity such as walkways, buildings and bodies of water. Females captured near lights are very prone to desiccation, and die within a few hours unless provided with conditions near 100% relative humidity. At laboratory temperatures fluctuating between 25° and 30°C, a brood of 6-12 minims is reared out in just over four weeks.

Workers of bourbonica attack aggressively small insects and injured larger insects. The prey is carried or dragged to the nest in pieces. Group carrying is a much less concerted affair in bourbonica than in longicornis. Honeydew and other sweets are readily taken. In the field, bourbonica recruits over distances of five or more meters to rich food sources but is apparently unable to defend them from Solenopsis invicta. During cooler weather, bourbonica may seek food and shelter inside buildings.

Bourbonica also occurs in certain natural habitats. Simberloff and Wilson (1969, 1970) found bourbonica on mangrove islands off the Florida Keys and noted that it rapidly recolonized defaunated islands. Dr. Mark Deyrup of the Archbold Biological Station informs me (personal communication) that bourbonica is abundant along the intermittently flooded Coastal Prairie Trail in Everglades National Park. I have collected them in lakeside marshes near Leesburg

(Lake County) and Sebring (Highlands County), Florida. All of these areas have in common frequent flooding and clumping vegetation, part of which normally remains above the high water mark, and an absence of other terrestrial ants of similar habits (except perhaps concinna). Wilson and Taylor (1967) report bourbonica from rain forest on Samoa.

CHAPTER XVI
LONGICORNIS COMPLEX

Diagnosis of Complex

Worker grey or black with bluish or purplish reflections, feebly shining; pubescence very sparse; pilosity sparse (absent on scapes); legs and scapes very long and slender. Nests in buildings, rubble, etc. near man-made structures.

Male greyish with long, slender scapes and legs and reduced pilosity as in worker; genitalia somewhat like in Bourbonica Complex, but parameres entire margined; digitus less coarsely sculptured; aedeagus not deflected.

Paratrechina longicornis

(Figs. 32, 38, 42)

Formica longicornis Latreille, 1802, Hist. Nat. Fourmis, p. 113. ☿. Type loc., Senegal, Africa.

Formica vagans Jerdon, 1851, Madras Jour. Lit. Sci. 17: 124. ☿.

Formica gracilescens Nylander, 1856, Ann. Sci. Ant. Zool. 5: 73. ☿.

Tapinoma gracilescens: F. Smith, 1858, Cat. Hym. Brit. Mus. 6: 56.

Paratrechina currens Motschulsky, 1863, Bull. Soc. Nat. Moscou 36: 14. ☿.

Prenolepis longicornis: Roger, 1863, Verz. Formicid., p. 10; Mayr, 1865, Reise Novara Formicid., p. 50. ☿; Mayr, 1867, Tijdschr. v. Ent. 10: 72. ☿, ♀; Andre, 1882, Spec. Hym. Europe 2: 203. ☿, ♀, ♂; Andre, 1891, Ann. Soc. Ent. Fr. 1: 60. ♂; Forel, 1894, Jour. Bombay Nat. Hist. Soc. 8: 406. ☿, ♂; Bingham, 1903, Fauna Brit. India Hym 2: 326. ☿, ♀, ♂; Arnold, 1922, Ann. S. African Mus. 14: 605. ☿, ♀, ♂.

Prenolepis (Nylanderia) longicornis: Emery, 1910, Deutsch. Ent. Zeitschr., p. 129. Figs. 2 and 3, ☿, ♀, ♂; Emery, 1914, Nova Caledonia Zool. 1: 422. ☿.

Paratrechina (Paratrechina) longicornis: Emery, 1925, Gen. Insectorum, Fasc. 183: 217. ☿; Creighton, 1950, Bull. Mus. Comp. Zool. 104: 404; Wilson and Taylor, 1967, Pacific Ins. Monog. 14: 87. Fig. 72, ☿.

Diagnosis

Worker. TL 2.3-2.9, OI 29-31. A fast-moving urban species of the tropics and subtropics worldwide. In U.S., most abundant in Florida and Gulf Coast States. Grey to black with bluish reflections and flattened, whitish thoracic pilosity. Scapes and legs slender and very long, SI about 170, FI about 120. Scapes lack erect hairs.

Male. TL 2.24-2.44, OI 39-44. Head and gaster dark brown; thorax and appendages lighter. Scapes long, SI about 175, without erect hairs. Pilosity sparse. Parameres broad-margined, not emarginate.

Queen. Scapes notably longer than head. Scapes and entire dorsal surface lack pilosity, except for a few macrochaetae on frons and clypeus. Eyes large, strongly convex.

Description and Variation

Worker. (Composite description--no types seen.)

TL 2.29-2.89, HL 0.64-0.71, HW 0.51-0.57, SL 1.07-1.19, EL 0.19-0.22, PW 0.36-0.41, MCL 0.14-0.18, WL 0.91-1.05, FL 0.77-0.87, GL 0.73-1.13, SM 0, PM 3-5, MM 2-5, CI 76-81, OI 29-31, SI 166-175, FI 118-126, (n=15).

Mandible 5-toothed, more elongate than in most species. Clypeus lentiform, the anterior border arcuate, entire or with a small median notch about as wide as median clypeal carina. Rear clypeal border less strongly arcuate, with a median concave emargination about as wide as the frons between the antennal fossae. Sides of clypeal dorsum convex; the median carina ranging from rounded and nearly obsolete to a distinct raised angle. Sides of head weakly convex; head broadest behind the eyes. Posterior corners of head indistinct, the sides grading into the convex rear border through smooth curves. Head narrow. Eyes large and convex, protruding beyond sides of head. Three whitish ocelli are small, but distinct. Scapes long and slender,

about 2/3 of their length protruding beyond the rear border of the head.

Thorax elongate, depressed; WL about 1.5X HL. Promesonotum weakly convex; propodeum more strongly so; the upper surfaces of all three about on the same plane in side view. Metanotum high, only a little lower than adjacent mesonotum and propodeum. Legs elongate; fore coxae long and slender; the normally-proportioned (relative to other Paratrechina) middle and hind coxae appearing disproportionately robust by contrast.

Petiole, in side view cuneate, blunt-crested, with a broad base. In dorsal view, petiole slender from side to side; the sides weakly concave and only weakly divergent dorsad. Upper corners of petiole often with a small tubercle, or this lacking. Crest rounded to subtrapezoidal.

Pilosity whitish, apparently blunt, flattened, only weakly tapering on dorsal surfaces; slightly browner, finer and more tapering on coxae, venter of head and gaster. Pubescence very sparse, fine, not readily visible.

Most surfaces lightly shagreened. At very high magnification, each of the cuticular plates is marked with longitudinal microrugulae; yielding in macroscopic appearance a feebly shining surface with conspicuous bluish or purplish iridescence (Fig. 1).

Greyish-brown to piceous brown with appendages a little lighter.

Male. (Composite description)

TL 2.24-2.44, HL 0.55-0.57, HW 0.53-0.57, SL 0.95-0.97, EL 0.22-0.24, WL 0.92-1.01, GL 0.73-0.89, SM 0, CI 95-100, OI 39-44, SI 168-174, (n=8).

Mandible with a convex outer border, a large but weakly sclerotized apical tooth with a broad base and a convex masticatory edge; apical tooth and masticatory border separated by a distinct cleft. Clypeus irregularly subhexagonal to subrhombiform; anterior border weakly arched and broadly truncate or truncate with straight sides; posterior border with nearly straight sides and a straight or weakly concave prefrontal portion. Sides of head in front of eyes straight, convergent anteriad. Posterior to eyes, sides of head confluent with convex rear border; yielding a hemispherical appearance to the rear half of the head, in dorsal view. Head a little broader than worker's; but large convex eyes cause head to appear much wider. Ocelli large, median and laterals separated by only about 1 1/2X ocellar width. Scapes long, very slender, nearly straight throughout their length.

Petiole in lateral view broad-based, bluntly cuneate as in worker. In posterior view, sides of petiole straight, weakly divergent dorsad, meeting the flat dorsal edge through rounded corners. Petiole broader than worker's, but relatively narrow in comparison with that of other Paratrechina males.

At a glance, genitalia reminiscent of those of bourbonica, differing as follows. Parameres a little longer, entire-margined, nearly diamantiform in outline from side view. Cuspis only about half as long as digitus and not as closely associated mesal portion of parameres as in bourbonica. Digitus with coarse black tubercles on the lateral and dorsal surfaces. Digitus longer than aedeagus, distal half with a concave dorsal edge and convex ventral edge; slightly turned upward distally; tapering to a broadly rounded-off or truncate tip. Only the tip is visible in side view without removal of a paramere, but when thus exposed, digitus is bluntly falcate. In posterior view, digitus has a flat mesal side, except near the tip, which is curved laterad. Aedeagus ovate, the tip not deflected.

Pilosity relatively sparse; finer and browner than that of workers. Thoracic dorsum with 12 or less macrochaetae. Scapes lack pilosity; femora have only 1 or 2 hairs. Parameres with 15-20 of the usual sort of long decurved hairs. Pubescence very sparse on body. Appendages with short, dense pubescence.

Entire body shiny; the only detectable sculpture is faint gastral shagreening.

Head and gaster tan to sandy brown. Gaster, parameres and volsellae (except black tubercles) dark brown. Appendages a little lighter than head and thorax.

Material Studied

Most of the longicornis material seen in this study was collected by me in Florida. Specimens from Mexico and Brazil (CAF) proved to be remarkably similar to the Florida material.

Discussion

Longicornis is so distinctive that it is one of the few Paratrechina that is not consistently misidentified in collections. As indicated in Chapter IV, longicornis appears to be closely related to pallida, of New Guinea. Pallida is clearly distinct from longicornis in the pale yellow color of the worker, the smaller eyes, the longer maxillary palps, the propodeal pilosity and the abundant erect macrochaetae on the queen. The queen of pallida is furthermore colored a striking tiger-striped brown and yellow. The male is unknown.

Natural History

Longicornis may raise sexuals at any time of year in warmer regions, but in the seasonal climate of Gainesville, Florida, alate production is apparently limited to the warm, rainy months of May through September. From my observations, the nuptial flights of longicornis are abortive. On warm, humid evenings, large numbers of males gather outside nest entrances and may mill about excitedly. Workers patrol vegetation and other structures nearby. Periodically, a dealate queen emerges. I have not observed mating,

but I believe it occurs in such gatherings about the nest entrance. Wings of queens are removed while they are still callow. I have never seen males fly or use their wings in any way.

Such an approach to reproduction partially explains the vast success of longicornis as a colonizer of urban areas throughout the tropics and subtropics. Perhaps no large city in the tropics is without this ant, and they are very successful in warm temperate towns from Florida to Texas, and even in New York City, inside buildings (Creighton, 1950).

Another contributing factor to the success of longicornis is its tolerance (preference?) for nesting sites with relatively low humidity, including crannies in walls, board and trash piles, palm thatching and dry litter. Wilson and Taylor (1967) report that longicornis penetrates rain forest in areas with depauperate native ant faunas. Interestingly, the related species pallidus, though a rain forest inhabitant, seems to select dry nest sites such as dry frass in a hollow tree or among fronds in palm litter (E.O. Wilson, personal communication).

In Gainesville, longicornis thrives at filling stations, convenience stores and sidewalk cafés, where they may be seen transporting crumbs and dead insects attracted to lights, etc. They apparently have a seasonal preference for a high-protein diet, and during the summer months may refuse honey or sugar baits. They are highly attracted

to honeydew-producing homopterans in spring and fall, however. A large laboratory colony consumed far less honey and more dead insects than a similar-sized colony of concinna. Large prey items are carried in a highly concerted group action. I have occasionally observed large dead insects gliding slowly over the substrate, which turned out upon closer observation to be being transported by several dozen longicornis workers. H.H. Smith (in Forel, 1893) reports seing a lizard transported in like manner.

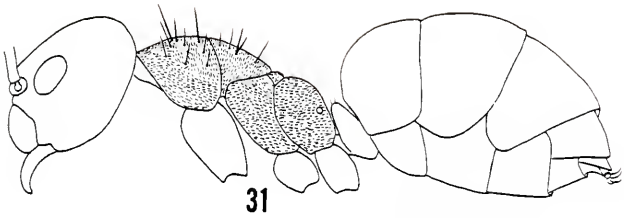
Wheeler (1910, p. 156) reported observations by earlier authors of the association of longicornis with two species of myrmecophiles from India: Myrmecophila acervorum var. flavocincta (Orthoptera: Gryllidae) and Coluocera maderae (Coleoptera: Lathridiidae). I have a single collection record of a cricket which is very likely the above form, as it was black with a yellowish band across the thorax. It was found emigrating with a large swarm of longicornis which had been flooded out of its nest near a sprinkler head. Unfortunately, the cricket specimen was sacrificed for a study of the alimentary tracts of Gryllidae before I realized its significance.

Fig. 31. Worker of bourbonica, lateral view.

Fig. 32. Worker of longicornis, lateral view.

Fig. 33. Worker of pubens, lateral view.

Fig. 34. Worker of guatemalensis, lateral view.



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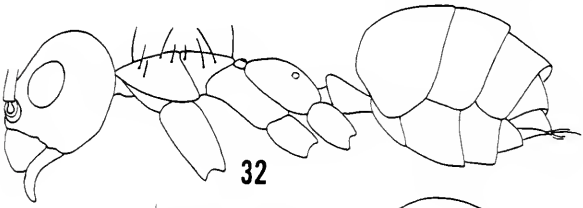

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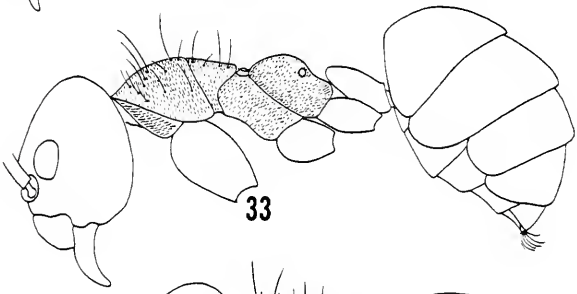

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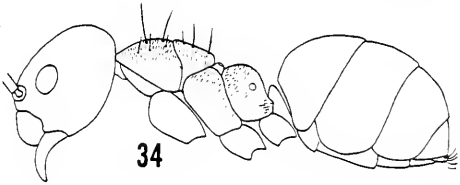

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Fig. 35. Head of guatemalensis worker, dorsal view.

Fig. 36. Head of pubens worker, dorsal view.

Fig. 37. Head of bourbonica worker, dorsal view.

Fig. 38. Head of longicornis worker, dorsal view.

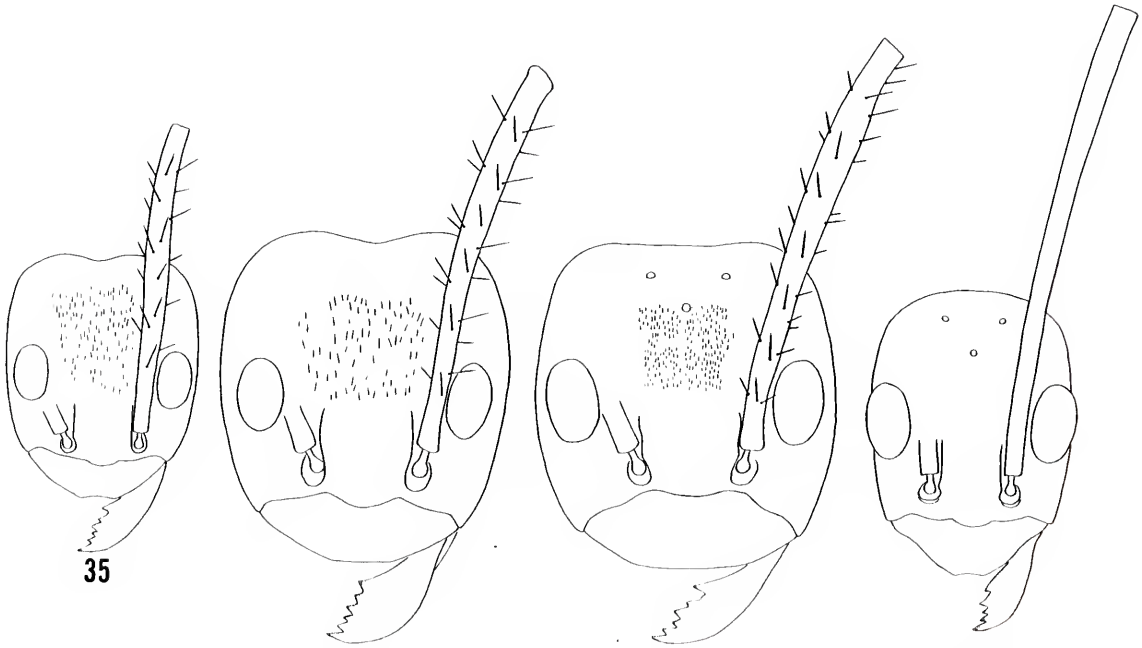

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Fig. 41. Male of concinna, lateral view.

Fig. 42. Male of longicornis, lateral view.

Fig. 43. Male of bourbonica, lateral view.

Fig. 44. Male of pubens, lateral view.

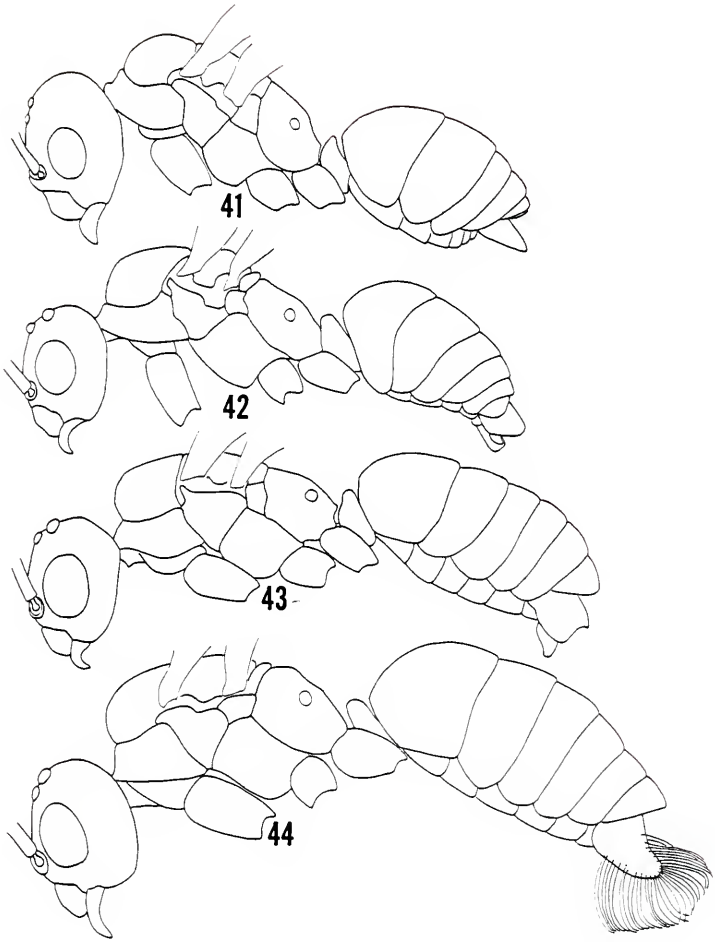
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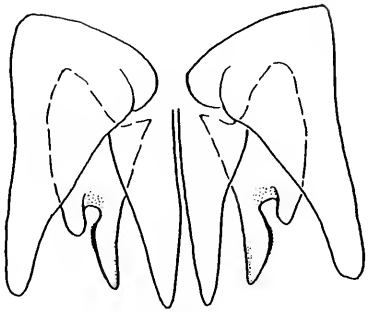
Fig. 45. Genitalia of *faisonensis* male, dorsal view, slide mounted.

Fig. 46. Genitalia of *guatemalensis* male, dorsal view, slide mounted.

Fig. 47. Genitalia of *arenivaga* male, dorsal view, slide mounted.

Fig. 48. Genitalia of *phantasma* male, dorsal view, slide mounted.



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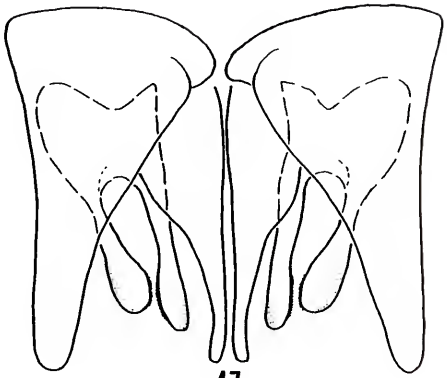

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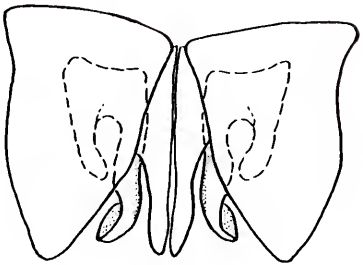

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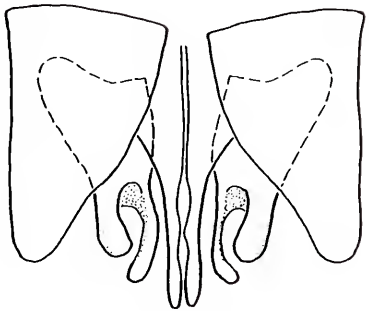

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Fig. 49. Distribution in North America of *vividula* (●), *terricola* (○), *guatemalensis* (△) and *pubens* (□).

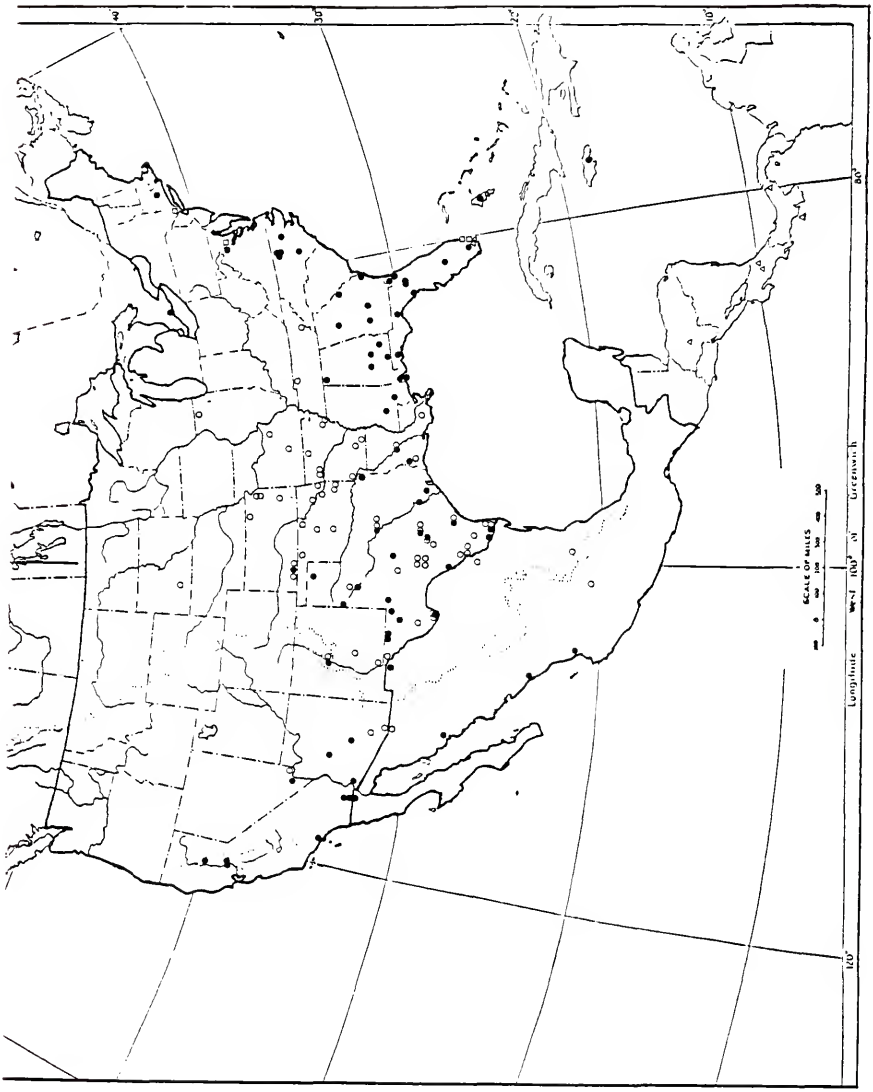
SCALE OF MILES
0 50 100 150 200 250
Longitude West 100° N Greenwich
120°
80°

Fig. 50. Distribution in North America of *concinna* (o), *faisonensis* (●), *flavipes* (■), *hystrix* (△) and *bruesii* (□).

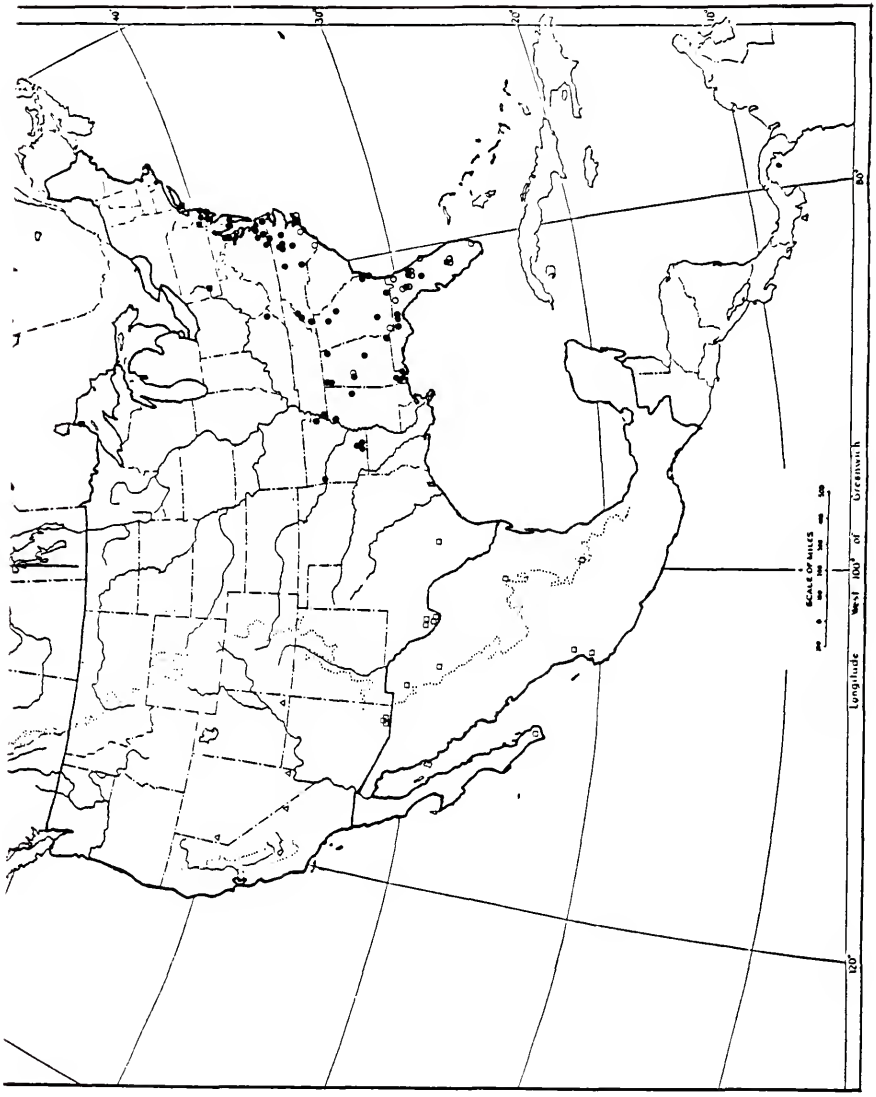
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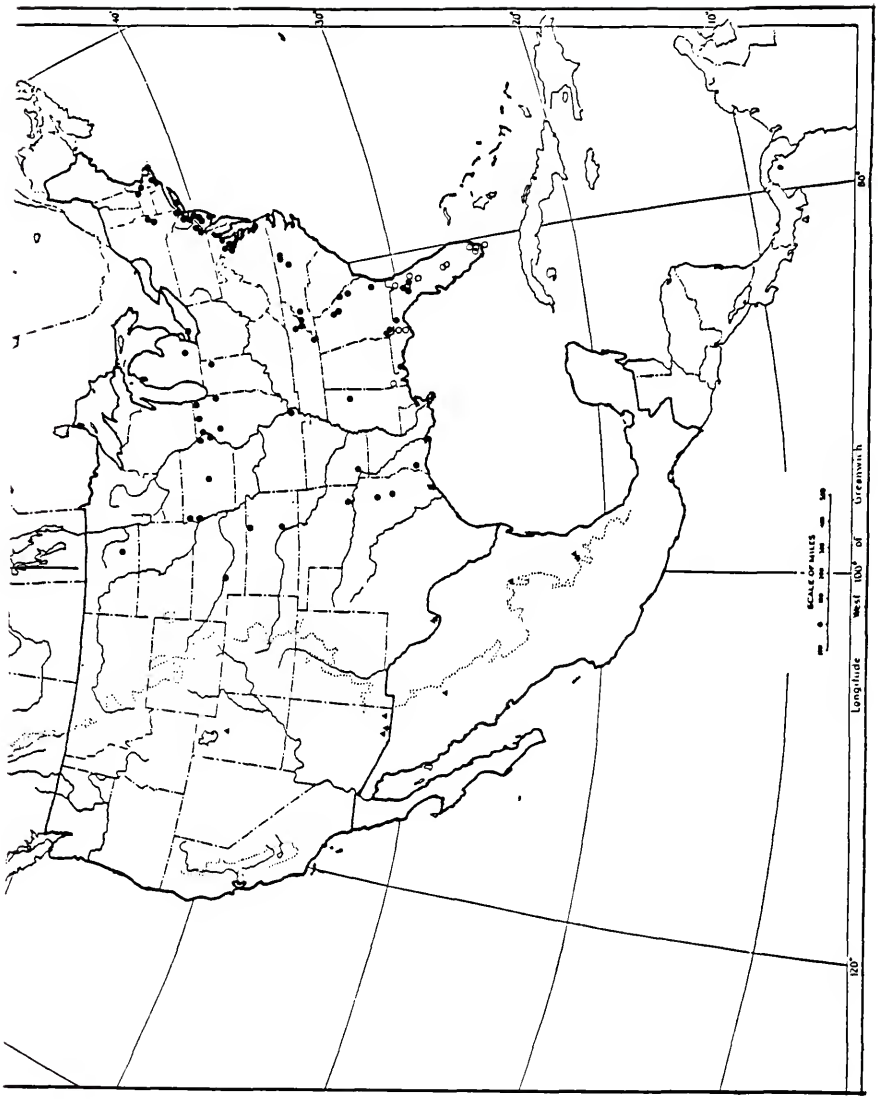
Fig. 51. Distribution in North America of parvula (●), wojciki (o) and austroccidua (▲).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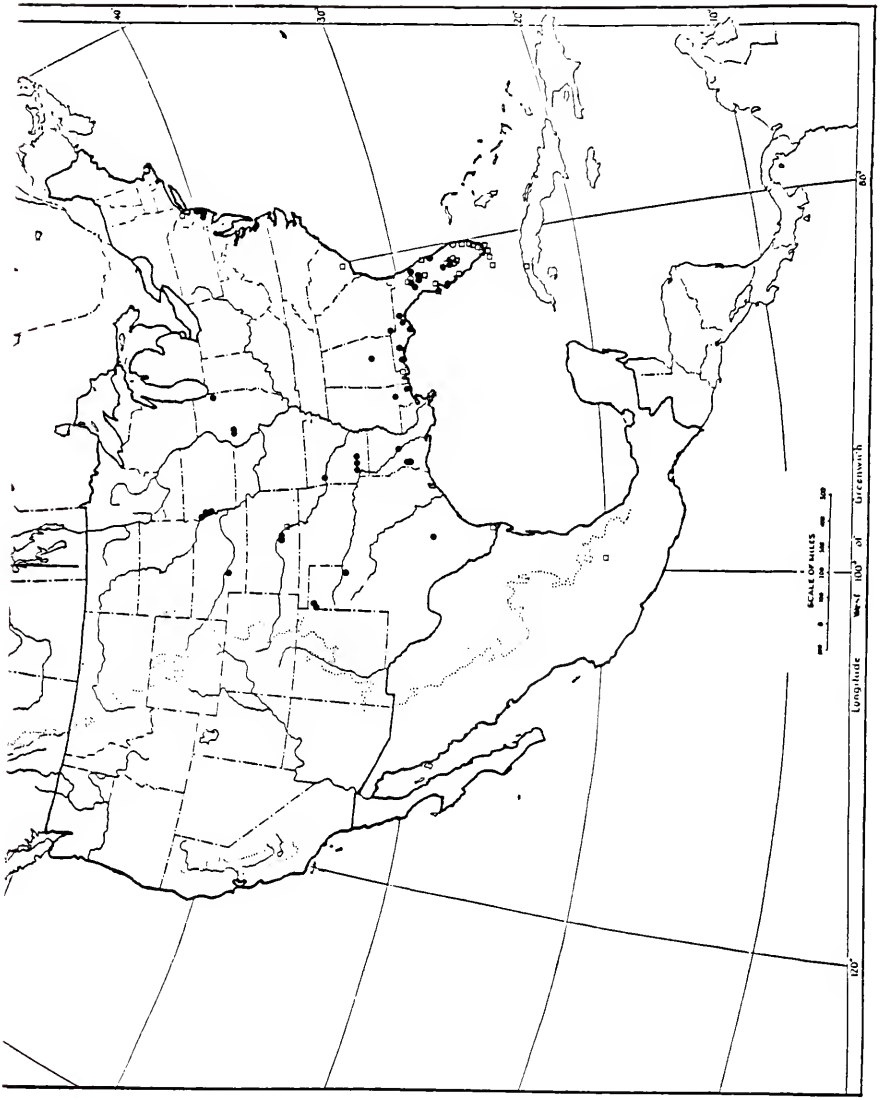
SCALE OF MILES

Fig. 52. Distribution in North America of *arenivaga* (●), *phantasma* (○) and *bourbonica* (□).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SCALE OF MILES
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APPENDIX A
MEASUREMENTS OF *Paratrechina* SPECIES TREATED IN THIS REVISION

ORDER=1 SPECIES=VIV

GOS	STATE	MC	YR	CASTE	FL	HW	SL	EL	PW	MCI	WL	GL	TL	SM	PM	MM	CI	CI	SI	FI	TL
2	AZ	10	73	WO	0.65	0.57	0.74	0.16	0.41	0.16	0.91	0.81	0.60	9	5	3	87	25	114	92	2.26
3	AZ	10	73	WO	0.59	0.51	0.67	0.15	0.36	0.13	0.72	0.75	0.53	6	5	2	86	26	114	90	2.05
4	AZ	10	73	WO	0.62	0.54	0.73	0.16	0.40	0.15	0.77	0.71	0.58	7	5	3	87	26	118	93	2.09
5	AZ	10	73	WO	0.65	0.57	0.74	0.16	0.41	0.16	0.80	0.69	0.59	7	5	3	87	25	114	91	2.13
6	BR	10	25	WO	0.65	0.57	0.73	0.17	0.40	0.18	0.83	0.93	0.58	8	6	4	87	27	112	89	2.30
7	BR	10	25	WO	0.65	0.57	0.74	0.17	0.41	0.16	0.84	0.87	0.59	7	6	4	87	27	114	91	2.35
8	BR	6	5	AL	0.61	0.52	0.69	0.15	0.36	0.16	0.77	0.86	0.57	7	6	3	85	25	113	93	2.23
9	BR	6	5	AL	0.57	0.48	0.67	0.15	0.32	0.15	0.71	0.89	0.53	7	6	3	86	27	118	93	2.16
10	CA	10	58	WO	0.64	0.55	0.71	0.16	0.39	0.15	0.79	0.97	0.57	6	5	3	85	25	110	88	2.40
11	CA	10	50	WO	0.69	0.59	0.77	0.17	0.44	0.16	0.85	0.93	0.62	6	6	4	85	25	112	90	2.46
12	CA	10	58	WO	0.65	0.55	0.73	0.16	0.40	0.15	0.81	0.97	0.59	8	5	2	84	25	112	91	2.42
13	CA	10	58	WO	0.65	0.56	0.73	0.17	0.40	0.16	0.83	0.97	0.59	7	5	3	86	26	112	91	2.43
14	CA	4	67	WO	0.63	0.53	0.69	0.15	0.39	0.17	0.77	0.85	0.55	8	5	2	84	24	110	87	2.24
15	CA	4	67	WO	0.65	0.59	0.75	0.17	0.43	0.17	0.85	0.89	0.59	8	4	3	91	27	116	91	2.38
16	CA	4	67	WO	0.67	0.60	0.74	0.17	0.44	0.17	0.85	1.01	0.61	7	5	3	89	25	111	91	2.53
17	CA	10	82	AL	0.63	0.53	0.69	0.16	0.37	0.16	0.77	0.99	0.56	8	5	4	84	26	110	89	2.38
18	CA	10	82	AL	0.55	0.45	0.61	0.14	0.34	0.14	0.66	0.93	0.46	7	3	3	83	26	111	85	2.13
19	CA	10	82	AL	0.60	0.53	0.69	0.16	0.36	0.17	0.77	0.88	0.54	8	5	5	88	26	115	90	2.24
20	CA	10	82	AL	0.61	0.53	0.69	0.16	0.37	0.16	0.77	1.05	0.56	7	5	4	87	27	113	92	2.42
21	CA	10	82	AL	0.61	0.53	0.70	0.16	0.37	0.16	0.77	0.89	0.56	9	4	3	87	27	115	92	2.26
22	CA	10	82	AL	0.61	0.53	0.70	0.16	0.37	0.16	0.75	0.85	0.55	7	5	3	87	27	115	90	2.20
23	CA	10	82	AL	0.50	0.48	0.66	0.15	0.35	0.15	0.73	1.09	0.53	7	5	2	84	26	114	91	2.35
24	CA	3	65	AL	0.60	0.51	0.64	0.15	0.36	0.16	0.71	0.85	0.52	8	6	4	85	25	107	86	2.15
25	NC	8	72	WO	0.59	0.49	0.65	0.16	0.36	0.16	0.71	0.69	0.49	7	3	3	84	27	110	84	1.98
26	NC	8	72	WO	0.59	0.51	0.66	0.14	0.38	0.15	0.73	0.69	0.53	7	5	3	86	24	112	90	2.00
27	NC	0	72	WO	0.61	0.53	0.69	0.16	0.37	0.15	0.73	0.57	0.54	8	5	3	87	26	113	89	1.90
28	FL	12	82	WO	0.61	0.53	0.69	0.16	0.38	0.17	0.77	1.07	0.57	7	5	4	87	27	113	93	2.44
29	FL	12	82	WO	0.58	0.48	0.65	0.15	0.35	0.16	0.71	0.95	0.53	8	4	4	84	26	112	91	2.23
30	FL	12	82	WO	0.65	0.53	0.73	0.16	0.38	0.16	0.76	0.77	0.57	8	5	4	81	25	112	87	2.17
31	FL	12	82	WO	0.63	0.53	0.71	0.16	0.36	0.16	0.76	0.68	0.55	8	5	4	84	26	113	87	2.06
32	FL	12	82	WO	0.56	0.44	0.61	0.14	0.32	0.14	0.68	0.77	0.47	6	4	3	80	25	109	85	2.00
33	FL	6	82	AL	0.65	0.57	0.73	0.16	0.40	0.18	0.82	0.95	0.59	8	5	5	87	24	112	91	2.41
34	FL	6	82	AL	0.68	0.59	0.77	0.16	0.43	0.18	0.87	0.74	0.61	7	7	5	87	24	113	90	2.28
35	FL	6	82	AL	0.63	0.56	0.72	0.15	0.40	0.17	0.78	1.17	0.55	7	6	3	89	24	115	87	2.58
36	FL	6	82	AL	0.69	0.60	0.77	0.17	0.44	0.18	0.87	1.01	0.61	8	6	4	87	25	112	88	2.57
37	FL	6	82	AL	0.69	0.61	0.77	0.17	0.42	0.18	0.89	0.97	0.61	8	5	5	88	25	112	88	2.55
38	FL	6	82	AL	0.69	0.61	0.77	0.17	0.43	0.19	0.90	0.99	0.62	7	7	5	88	25	112	90	2.57
39	FL	7	75	AL	0.61	0.52	0.70	0.15	0.38	0.17	0.77	0.77	0.56	8	4	3	85	25	115	92	2.14
40	FL	7	75	AL	0.63	0.53	0.71	0.16	0.40	0.17	0.78	0.89	0.57	7	6	4	84	26	113	90	2.29
41	FL	7	75	AL	0.62	0.53	0.70	0.15	0.38	0.17	0.77	0.79	0.57	8	5	4	85	25	113	92	2.17
42	FL	7	75	AL	0.65	0.57	0.73	0.16	0.40	0.18	0.82	0.89	0.58	8	6	5	87	25	112	89	2.35
43	GA	10	75	AL	0.62	0.53	0.70	0.15	0.37	0.16	0.76	0.97	0.56	7	7	3	85	25	113	90	2.34
44	GA	10	75	AL	0.65	0.57	0.73	0.17	0.40	0.16	0.79	0.97	0.59	6	6	5	87	27	112	91	2.40
45	GA	10	75	AL	0.64	0.54	0.73	0.16	0.34	0.16	0.81	0.92	0.58	8	5	4	84	25	114	90	2.36
46	GA	10	75	AL	0.57	0.47	0.65	0.14	0.32	0.15	0.73	0.75	0.51	7	4	3	84	25	114	89	2.04
47	HL	0	0	AL	0.65	0.56	0.71	0.16	.	.	.	0.99	0.55	6	.	.	86	24	109	84	.
48	HL	0	0	AL	0.62	0.53	0.71	0.15	0.38	0.16	0.77	0.77	0.57	8	4	4	85	25	115	92	2.15
49	HL	0	0	AL	0.61	0.52	0.67	0.15	0.36	0.16	0.74	.	0.53	7	5	3	85	25	110	87	.
50	NM	6	62	AL	0.62	0.53	0.69	0.15	0.38	0.15	0.77	0.61	0.56	8	6	4	85	25	111	90	1.99
51	NV	6	75	WO	0.65	0.57	0.71	0.16	0.38	0.17	0.81	1.17	0.57	8	4	3	87	25	109	87	2.63
52	NV	6	79	WO	0.66	0.57	0.73	0.17	0.40	0.17	0.81	1.17	0.57	7	4	3	86	25	111	86	2.64
53	NV	6	79	WO	0.66	0.58	0.73	0.16	0.40	0.18	0.81	1.03	0.58	8	4	2	88	25	111	88	2.49
54	TX	5	78	AL	0.62	0.52	0.68	0.13	0.35	0.16	0.78	0.81	0.54	6	3	2	84	21	110	87	2.28
55	TX	5	78	AL	0.59	0.48	0.64	0.13	0.35	0.13	0.71	0.97	0.48	7	4	2	83	22	109	83	2.26
56	TX	5	78	AL	0.59	0.48	0.62	0.13	0.36	0.12	0.73	0.91	0.48	7	3	3	83	22	105	81	2.22
57	TX	5	78	AL	0.58	0.48	0.63	0.13	0.32	0.14	0.69	0.89	0.48	7	3	2	83	23	109	84	2.15
58	TX	5	78	AL	0.62	0.53	0.68	0.13	0.36	0.15	0.77	1.01	0.51	7	4	2	85	21	110	85	2.41
59	TX	5	78	AL	0.61	0.53	0.69	0.14	0.37	0.15	0.77	1.03	0.54	9	4	3	87	22	113	88	2.40

ORDER=2 SPECIES=ITR

OBS	STATE	MC	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	CL	FL	SW	PM	MM	CI	OI	SI	FI	TL
60	AZ	8	71	WO	0.57	0.47	0.62	0.12	0.35	0.13	0.68	0.63	0.40	9	4	3	84	21	109	86	1.87
61	AZ	8	71	WO	0.57	0.46	0.63	0.11	0.32	0.12	0.69	0.62	0.51	5	5	3	82	20	111	89	1.87
62	AZ	8	71	WO	0.58	0.47	0.65	0.12	0.35	0.14	0.67	0.69	0.52	7	3	3	82	21	112	89	1.93
63	KS	8	79	WO	0.67	0.60	0.77	0.14	0.41	0.18	0.82	0.96	0.61	6	5	3	89	21	115	91	2.44
64	KS	8	79	WO	0.61	0.53	0.69	0.14	0.36	0.16	0.76	0.81	0.56	7	3	2	87	23	113	92	2.17
65	KS	8	79	WO	0.63	0.54	0.73	0.13	0.39	0.16	0.80	1.01	0.57	9	6	3	85	21	116	90	2.43
66	KS	8	79	WO	0.62	0.55	0.71	0.13	0.38	0.17	0.82	0.89	0.57	8	5	4	89	21	115	92	2.32
67	KS	8	79	WO	0.60	0.52	0.67	0.13	0.35	0.16	0.73	0.99	0.53	8	4	3	86	22	112	89	2.31
68	KS	10	80	AL	0.65	0.57	0.75	0.14	0.40	0.18	0.81	1.33	0.59	10	5	3	87	22	116	91	2.79
69	KS	10	00	AL	0.65	0.57	0.75	0.14	0.40	0.18	0.85	0.89	0.59	7	5	3	87	22	116	91	2.38
70	KS	10	00	AL	0.68	0.59	0.78	0.15	0.42	0.19	0.86	1.17	0.61	9	5	4	87	22	115	90	2.71
71	KS	10	80	AL	0.64	0.55	0.73	0.13	0.40	0.17	0.79	1.17	0.57	7	4	4	86	21	114	89	2.60
72	OK	6	51	WO	0.57	0.48	0.63	0.13	0.34	0.14	0.69	1.01	0.51	7	3	2	86	22	111	89	2.26
73	OK	6	51	WO	0.57	0.48	0.64	0.13	0.34	0.15	0.68	0.79	0.49	8	4	3	86	23	112	88	2.03
74	OK	6	51	WO	0.59	0.48	0.65	0.13	0.35	0.15	0.69	1.05	0.49	8	4	2	83	21	110	84	2.32
75	SD	0	0	WO	0.69	0.59	0.77	0.15	0.44	0.17	0.89	1.21	0.62	6	6	3	85	22	112	90	2.79
76	SD	0	0	WO	0.62	0.57	0.71	0.14	0.40	0.16	0.79	1.05	0.57	8	5	3	92	23	115	92	2.45
77	SD	0	0	WO	0.65	0.55	0.71	0.13	0.39	0.18	0.83	1.09	0.57	10	6	3	84	20	109	87	2.57
78	SD	0	0	WO	0.63	0.54	0.71	0.13	0.38	0.18	0.79	0.73	0.55	9	5	3	85	20	113	87	2.14
79	SD	0	0	WO	0.61	0.55	0.69	0.14	0.37	0.16	0.78	0.93	0.56	9	5	3	90	22	113	92	2.31
80	SD	0	0	WO	0.65	0.56	0.73	0.15	0.40	0.17	0.82	0.73	0.59	8	5	3	86	22	112	91	2.19
81	SD	0	0	WO	0.67	0.58	0.75	0.15	0.42	0.19	0.85	1.13	0.61	9	4	2	86	23	112	91	2.65
82	TN	3	38	AL	0.73	0.63	0.84	0.16	0.44	0.19	0.93	1.37	0.67	7	5	3	86	21	115	92	3.03
83	TN	3	38	AL	0.68	0.59	0.79	0.14	0.42	0.19	0.86	1.17	0.63	7	5	2	87	21	116	93	2.71
84	TN	3	38	AL	0.64	0.55	0.74	0.13	0.36	0.18	0.79	0.97	0.58	7	5	2	86	21	116	90	2.39
85	TN	3	38	AL	0.69	0.59	0.81	0.15	0.42	0.19	0.85	1.01	0.64	10	6	4	85	22	110	93	2.55
86	TN	3	38	AL	0.66	0.57	0.78	0.13	0.41	0.17	0.82	0.97	0.61	10	5	3	86	20	118	92	2.44
87	TX	4	3	AL	0.57	0.46	0.61	0.13	0.32	0.17	0.69	1.33	0.47	7	4	3	82	23	107	84	2.59
88	TX	4	3	AL	0.57	0.48	0.62	0.14	0.34	0.15	0.67	0.89	0.47	8	3	2	86	24	109	84	2.12
89	TX	4	3	AL	0.55	0.46	0.61	0.13	0.32	0.14	0.67	1.01	0.48	8	4	3	85	24	111	89	2.22
90	TX	4	3	AL	0.54	0.44	0.58	0.13	0.30	0.15	0.65	1.21	0.45	7	4	3	83	23	108	85	2.39
91	TX	3	79	AL	0.57	0.45	0.63	0.13	0.32	0.15	0.67	0.65	0.48	8	4	2	80	22	111	86	1.88
92	TX	3	79	AL	0.59	0.48	0.66	0.13	0.36	0.17	0.71	0.81	0.53	8	3	2	83	22	112	90	2.10
93	TX	3	79	AL	0.59	0.48	0.65	0.13	0.34	0.16	0.73	0.73	0.51	9	4	2	83	22	110	86	2.04
94	TX	3	79	AL	0.57	0.47	0.63	0.13	0.33	0.16	0.69	0.85	0.48	8	4	2	84	22	111	86	2.10
95	TX	3	79	AL	0.61	0.52	0.68	0.13	0.36	0.16	0.77	0.61	0.54	8	4	2	86	22	112	88	1.98
96	TX	3	79	AL	0.63	0.53	0.67	0.15	0.39	0.16	0.76	1.00	0.53	9	5	3	84	23	106	84	2.38
97	TX	3	79	AL	0.61	0.53	0.66	0.14	0.36	0.15	0.73	1.05	0.53	8	5	3	87	23	108	87	2.38
98	TX	3	79	AL	0.59	0.48	0.63	0.13	0.34	0.14	0.69	0.79	0.48	8	3	2	83	21	107	83	2.06
99	TX	3	79	AL	0.59	0.49	0.64	0.14	0.36	0.15	0.69	0.91	0.48	8	4	3	84	23	109	83	2.18
100	TX	3	79	AL	0.59	0.49	0.63	0.13	0.36	0.15	0.69	0.88	0.48	10	4	3	84	22	107	83	2.15

ORDER=3 SPECIES=CON

OBS	STATE	MC	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	CL	FL	SW	PM	MM	CI	OI	SI	FI	TL
101	FL	1	76	WO	0.60	0.57	0.78	0.17	0.41	0.17	0.81	1.17	0.62	9	6	3	84	25	115	91	2.66
102	FL	1	76	WO	0.73	0.64	0.85	0.20	0.44	0.19	0.87	1.17	0.68	9	6	4	87	28	117	93	2.77
103	FL	1	76	WO	0.68	0.60	0.80	0.17	0.42	0.19	0.85	0.97	0.65	11	5	3	88	25	118	96	2.49
104	FL	7	75	WO	0.64	0.53	0.73	0.16	0.38	0.18	0.80	0.85	0.61	9	5	4	83	25	114	95	2.28
105	FL	7	75	WO	0.67	0.57	0.77	0.16	0.40	0.18	0.85	1.05	0.63	7	6	3	85	24	115	94	2.57
106	FL	7	75	WO	0.70	0.59	0.80	0.18	0.41	0.17	0.89	1.15	0.65	15	6	3	84	26	114	93	2.74
107	FL	4	80	AL	0.71	0.62	0.80	0.19	0.47	0.17	0.91	1.21	0.66	10	5	3	85	26	110	90	2.85
108	FL	4	80	AL	0.72	0.65	0.81	0.18	0.47	0.17	0.92	1.09	0.66	11	7	6	90	25	113	92	2.73
109	FL	4	00	AL	0.72	0.65	0.81	0.19	0.46	0.20	0.91	1.09	0.65	12	7	4	90	27	113	90	2.72
110	FL	6	82	AL	0.66	0.57	0.77	0.17	0.40	0.18	0.85	0.89	0.62	13	4	4	86	26	117	94	2.39
111	FL	6	82	AL	0.65	0.55	0.77	0.17	0.40	0.18	0.85	0.89	0.60	10	5	3	84	27	119	92	2.38
112	FL	6	82	AL	0.64	0.55	0.74	0.16	0.40	0.17	0.81	0.72	0.58	9	6	3	86	25	116	90	2.16
113	FL	8	01	AL	0.66	0.57	0.77	0.17	0.42	0.17	0.83	0.95	0.62	11	6	3	86	26	117	94	2.43
114	FL	0	81	AL	0.68	0.57	0.78	0.18	0.42	0.17	0.85	0.77	0.61	12	4	3	84	27	115	90	2.29
115	FL	8	81	AL	0.61	0.52	0.71	0.16	0.37	0.17	0.77	0.77	0.57	11	4	3	85	27	117	93	2.14
116	FL	8	01	AL	0.66	0.57	0.77	0.17	0.41	0.18	0.85	0.83	0.61	11	4	3	86	26	117	92	2.33
117	FL	7	02	AL	0.66	0.56	0.70	0.17	0.39	0.18	0.85	0.77	0.63	10	5	3	85	26	118	95	2.27
118	FL	7	82	AL	0.70	0.60	0.82	0.18	0.42	0.19	0.90	1.01	0.65	11	6	4	86	26	117	93	2.61
119	FL	7	82	AL	0.70	0.61	0.83	0.18	0.44	0.18	0.90	0.99	0.65	12	7	6	87	26	119	93	2.59
120	FL	7	02	AL	0.65	0.55	0.79	0.17	0.39	0.16	0.85	0.99	0.63	13	6	4	84	27	122	97	2.48
121	FL	12	82	WO	0.70	0.60	0.81	0.18	0.44	0.19	0.89	0.77	0.65	10	4	3	86	26	116	93	2.35
122	FL	12	82	WO	0.68	0.58	0.79	0.17	0.42	0.17	0.87	0.77	0.63	15	5	5	85	25	116	93	2.31
123	FL	12	82	WO	0.73	0.63	0.83	0.18	0.47	0.20	0.81	0.77	0.65	12	5	3	86	25	114	89	2.38
124	FL	12	82	AL	0.72	0.62	0.90	0.18	0.44	0.18	0.89	0.77	0.64	10	4	2	86	25	111	89	2.37
125	FL	12	82	AL	0.70	0.61	0.01	0.17	0.44	0.19	0.89	0.80	0.65	14	4	3	87	25	116	93	2.38
126	FL	12	82	AL	0.67	0.57	0.75	0.16	0.41	0.18	0.81	0.93	0.61	11	5	4	85	24	112	91	2.40
127	FL	12	82	AL	0.72	0.64	0.83	0.17	0.44	0.19	0.91	0.91	0.67	10	6	3	89	24	115	93	2.54

ORDER=3 SPECIES=CON

OBS	STATE	MO	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	C1	O1	S1	F1	TL
128	FL	11	11	WO	0.66	0.57	0.77	0.16	0.40	0.19	0.03	0.65	0.59	7	5	4	86	25	117	89	2.13
129	GA	7	72	WO	0.62	0.49	0.71	0.15	0.38	0.16	0.73	0.97	0.57	8	5	3	80	25	115	92	2.31
130	GA	6	53	WO	0.68	0.50	0.79	0.17	0.43	0.20	0.81	0.80	0.64	7	6	3	85	25	116	94	2.30
131	GA	6	53	WO	0.65	0.55	0.76	0.17	0.41	0.18	0.79	0.91	0.60	10	6	3	84	27	117	92	2.34
132	GA	6	53	WO	0.76	0.65	0.85	0.19	0.49	0.20	0.93	1.41	0.71	8	6	3	85	25	112	93	3.10
133	GA	6	53	WO	0.71	0.61	0.82	0.17	0.44	0.20	0.88	1.03	0.66	12	4	3	86	24	116	93	2.62
134	GA	6	53	WO	0.74	0.65	0.85	0.19	0.48	0.20	0.89	0.97	0.69	11	6	3	88	26	115	93	2.60
135	GA	6	53	WO	0.66	0.59	0.78	0.17	0.44	0.16	0.86	0.89	0.64	9	6	3	89	26	118	97	2.40
136	NC	5	81	WO	0.73	0.65	0.83	0.18	0.45	0.18	0.93	1.13	0.69	10	7	4	89	25	114	94	2.79
137	NC	5	81	WO	0.65	0.55	0.81	0.16	0.40	0.18	0.83	1.01	0.57	11	4	3	84	25	125	87	2.48
138	NC	5	81	WO	0.67	0.57	0.77	0.16	0.40	0.17	0.83	1.05	0.61	10	6	3	85	24	115	91	2.55
139	NC	5	81	WO	0.69	0.61	0.79	0.18	0.41	0.18	0.87	1.05	0.65	12	4	4	88	26	115	94	2.61
140	NC	5	81	WO	0.62	0.52	0.71	0.15	0.38	0.17	0.79	0.97	0.57	9	5	3	84	25	115	92	2.37
141	NC	5	81	WO	0.64	0.55	0.73	0.16	0.37	0.17	0.81	0.93	0.59	16	5	4	86	25	114	92	2.37

ORDER=4 SPECIES=FAI

OBS	STATE	MO	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	C1	O1	S1	F1	TL
142	FL	11	81	WO	0.67	0.57	0.77	0.15	0.40	0.18	0.83	0.73	0.61	9	5	2	85	23	115	91	2.22
143	FL	11	81	WO	0.61	0.53	0.72	0.14	0.36	0.17	0.73	0.81	0.57	10	3	2	87	23	118	93	2.14
144	FL	11	81	WO	0.66	0.56	0.76	0.14	0.39	0.18	0.83	0.75	0.61	9	4	3	85	22	115	92	2.23
145	FL	12	81	AL	0.67	0.57	0.77	0.14	0.41	0.16	0.85	0.65	0.65	9	6	4	85	21	115	97	2.16
146	FL	12	81	AL	0.69	0.58	0.80	0.15	0.41	0.17	0.09	0.73	0.64	11	5	4	84	22	116	93	2.30
147	FL	12	81	AL	0.58	0.47	0.67	0.12	0.35	0.16	0.71	0.77	0.53	8	4	3	82	21	116	91	2.05
148	FL	12	82	AL	0.63	0.55	0.73	0.14	0.39	0.18	0.80	0.97	0.60	10	4	2	87	23	116	95	2.39
149	FL	12	82	AL	0.61	0.52	0.70	0.14	0.36	0.16	0.74	1.01	0.57	10	4	2	85	23	115	93	2.35
150	FL	12	82	AL	0.62	0.53	0.72	0.14	0.39	0.16	0.77	0.81	0.58	8	4	3	85	23	116	93	2.19
151	GA	8	81	WO	0.65	0.54	0.74	0.14	0.38	0.18	0.77	1.13	0.59	11	5	2	83	22	114	91	2.55
152	GA	8	81	WO	0.68	0.59	0.79	0.15	0.41	0.18	0.83	1.25	0.61	13	5	4	87	22	116	90	2.76
153	GA	8	81	WO	0.63	0.53	0.73	0.14	0.36	0.17	0.76	0.73	0.57	8	4	2	84	23	116	90	2.11
154	GA	2	81	AL	0.63	0.53	0.73	0.13	0.38	0.18	0.77	0.97	0.59	9	4	2	84	21	116	94	2.36
155	GA	2	81	AL	0.61	0.52	0.70	0.14	0.38	0.18	0.74	1.05	0.59	10	4	3	85	23	115	97	2.39
156	GA	2	81	AL	0.58	0.48	0.67	0.12	0.36	0.16	0.69	1.01	0.53	12	5	2	84	21	116	91	2.27
157	GA	2	81	AL	0.64	0.55	0.74	0.15	0.40	0.10	0.80	1.09	0.59	11	4	2	86	24	116	92	2.53
158	MD	5	80	AL	0.59	0.49	0.68	0.13	0.34	0.16	0.73	0.85	0.53	10	2	2	84	22	116	90	2.16
159	MD	5	80	AL	0.65	0.57	0.75	0.14	0.38	0.17	0.82	0.85	0.59	10	3	3	87	22	116	91	2.31
160	MD	5	80	AL	0.66	0.57	0.77	0.13	0.40	0.18	0.81	0.88	0.61	9	4	3	86	20	117	92	2.34
161	MD	5	80	AL	0.57	0.48	0.66	0.13	0.34	0.16	0.71	0.57	0.53	12	3	2	86	23	116	93	1.84
162	MD	2	25	AL	0.64	0.55	0.73	0.14	0.38	0.16	0.79	0.93	0.59	11	4	3	86	22	114	92	2.35
163	MD	2	25	AL	0.68	0.59	0.77	0.15	0.44	0.18	0.83	1.13	0.61	11	4	3	87	22	111	90	2.64
164	MD	2	25	AL	0.64	0.55	0.73	0.15	0.38	0.18	0.78	1.15	0.57	10	4	2	86	24	114	89	2.57
165	NC	8	72	WO	0.60	0.49	0.69	0.13	0.37	0.17	0.71	0.81	0.54	9	5	2	83	22	115	90	2.11
166	NC	8	72	WO	0.61	0.51	0.69	0.13	0.36	0.16	0.71	0.67	0.54	10	3	2	83	22	113	88	1.98
167	NC	8	69	AL	0.69	0.61	0.77	0.16	0.43	0.18	0.80	0.81	0.63	10	5	5	88	24	112	91	2.37
168	NC	8	69	AL	0.68	0.59	0.77	0.16	0.41	0.18	0.83	0.85	0.63	5	4	3	85	24	113	93	2.35
169	NC	0	69	AL	0.69	0.58	0.77	0.15	0.41	0.18	0.85	0.97	0.62	9	4	3	84	22	112	90	2.51
170	NC	8	30	AI	0.68	0.61	0.77	0.14	0.42	0.17	0.83	1.49	0.61	11	4	3	90	21	113	90	3.00
171	NC	8	30	AL	0.61	0.53	0.69	0.13	0.36	0.16	0.76	1.21	0.53	10	3	3	87	22	113	87	2.58
172	NC	8	30	AL	0.58	0.48	0.69	0.12	0.36	0.16	0.73	0.81	0.53	11	3	2	84	21	119	91	2.11
173	NC	7	22	WO	0.55	0.44	0.64	0.12	0.30	0.14	0.65	0.69	0.48	10	2	2	81	22	117	89	1.88
174	NC	7	22	WO	0.59	0.48	0.69	0.13	0.35	0.16	0.71	0.81	0.53	9	3	2	83	22	117	90	2.10
175	NC	7	22	WO	0.53	0.46	0.63	0.12	0.29	.	0.66	0.81	0.47	10	2	2	88	23	119	93	1.99
176	NC	7	22	WO	0.55	0.46	0.63	0.12	0.30	0.14	0.66	0.85	0.48	10	2	2	85	22	115	89	2.05
177	NJ	5	68	WO	0.69	0.58	0.77	0.15	0.40	0.17	0.83	1.22	0.61	9	4	4	84	22	112	88	2.74
178	NJ	5	68	WO	0.69	0.59	0.78	0.15	0.39	0.18	0.83	1.01	0.61	11	4	3	85	22	113	88	2.53
179	VA	5	20	AL	0.67	0.59	0.75	0.14	0.40	0.20	0.84	0.81	0.61	10	4	3	88	21	112	91	2.31
180	VA	5	20	AL	0.65	0.59	0.74	0.15	0.40	0.20	0.80	0.81	0.57	9	3	3	89	23	114	87	2.25
181	VA	5	20	AL	0.65	0.57	0.73	0.15	0.40	0.19	0.79	0.81	0.57	9	3	2	87	23	112	87	2.24

ORDER=5 SPECIES=FUA

OBS	STATE	MO	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	C1	O1	S1	F1	TL
182	FU	4	83	AL	0.57	0.47	0.63	0.12	0.34	0.14	0.69	0.75	0.48	10	3	2	84	21	111	86	2.00
183	FU	4	83	AL	0.57	0.51	0.63	0.12	0.34	0.14	0.69	0.77	0.48	9	3	2	89	21	111	86	2.02
184	FU	4	83	AL	0.58	0.51	0.66	0.13	0.34	0.14	0.72	0.73	0.51	9	3	2	87	22	113	87	2.02
185	FU	4	83	AL	0.58	0.48	0.63	0.13	0.35	0.16	0.70	0.85	0.48	8	3	2	84	23	109	84	2.12
186	FU	4	83	AL	0.62	0.57	0.69	0.14	0.38	0.16	0.78	1.09	0.53	10	4	2	92	22	111	85	2.44
187	FU	4	83	AL	0.60	0.55	0.66	0.13	0.37	0.16	0.71	0.89	0.51	11	4	2	91	22	109	84	2.20
108	FU	4	83	AL	0.58	0.51	0.63	0.13	0.34	0.15	0.71	1.01	0.48	12	3	2	88	22	109	84	2.29
189	FU	4	83	AL	0.65	0.57	0.69	0.14	0.38	0.16	0.78	1.20	0.53	9	4	3	87	22	106	81	2.63

ORDER=5 SPECIES=FLA

OBS	STATE	MO	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	C1	O1	S1	F1	TL
190	FU	4	83	AL	0.60	0.55	0.65	0.14	0.36	0.15	0.74	0.77	0.52	10	3	3	91	24	108	86	2.11
191	FU	4	83	AL	0.61	0.56	0.68	0.14	0.37	0.16	0.74	0.69	0.53	11	4	3	92	23	112	87	2.03
192	HG	0	0	WO	0.56	0.48	0.61	0.12	0.33	0.14	0.65	0.89	0.46	5	3	2	87	22	109	84	2.09
193	PA	5	39	AL	0.67	0.61	0.73	0.16	0.41	0.17	0.81	1.31	0.57	9	3	2	91	24	109	85	2.81
194	PA	5	39	AL	0.61	0.53	0.67	0.15	0.36	0.16	0.76	1.13	0.52	9	2	2	87	25	110	85	2.49
195	PA	5	39	AL	0.61	0.53	0.66	0.14	0.36	0.14	0.69	1.21	0.49	9	2	2	87	23	108	82	2.51
196	PA	5	39	AL	0.65	0.58	0.69	0.15	0.40	0.16	0.77	1.21	0.56	9	3	3	89	23	108	86	2.63
197	PA	5	39	AL	0.67	0.58	0.72	0.15	0.40	0.16	0.80	1.13	0.54	8	3	3	86	23	108	80	2.60
198	PA	5	39	AL	0.62	0.55	0.69	0.15	0.36	0.15	0.73	1.23	0.52	5	2	2	89	25	111	84	2.58
199	PA	5	39	AL	0.59	0.53	0.65	0.14	0.35	0.14	0.69	1.13	0.40	7	2	2	90	24	110	83	2.40
200	PA	5	39	AL	0.60	0.51	0.65	0.15	0.36	0.14	0.69	1.05	0.51	7	2	2	88	25	108	85	2.13
201	PA	5	39	AL	0.62	0.55	0.69	0.15	0.36	0.16	0.77	1.12	0.53	7	2	3	89	25	111	85	2.51
202	PA	5	39	AL	0.61	0.53	0.66	0.14	0.36	0.15	0.72	1.16	0.53	9	3	2	87	23	108	87	2.48
203	PA	8	64	WO	0.65	0.58	0.69	0.14	0.39	0.16	0.77	1.05	0.53	8	3	3	89	22	106	80	2.46
204	PA	8	64	WO	0.62	0.56	0.65	0.14	0.39	0.16	0.75	0.95	0.52	7	3	2	90	23	105	84	2.31
205	PA	8	64	WO	0.58	0.51	0.65	0.14	0.36	0.13	0.70	0.94	0.51	7	2	2	88	25	112	88	2.21
206	PA	8	64	WO	0.59	0.51	0.65	0.13	0.37	0.14	0.71	0.65	0.51	7	2	2	86	22	110	86	1.94
207	PA	8	64	WO	0.65	0.57	0.69	0.15	0.40	0.16	0.78	1.09	0.55	7	3	3	87	23	106	84	2.52
208	PA	8	64	WO	0.61	0.53	0.65	0.14	0.37	0.16	0.70	0.93	0.51	7	3	3	87	23	107	83	2.23
209	PA	5	83	WO	0.51	0.41	0.55	0.11	0.29	0.13	0.57	0.64	0.42	7	2	2	82	22	108	84	1.71
210	PA	5	83	WO	0.62	0.56	0.69	0.15	0.38	0.15	0.77	0.85	0.55	7	2	2	90	25	111	89	2.23
211	PA	5	83	WO	0.54	0.46	0.61	0.12	0.32	0.14	0.67	0.67	0.46	7	2	2	87	23	113	87	1.87
212	PA	5	83	WO	0.63	0.57	0.73	0.15	0.39	0.16	0.82	0.89	0.58	6	3	3	90	24	116	92	2.33
213	PA	5	83	WO	0.63	0.59	0.72	0.14	0.40	0.16	0.81	0.99	0.57	10	3	3	94	23	115	90	2.42
214	PA	5	83	WO	0.54	0.44	0.62	0.12	0.32	0.14	0.65	0.65	0.47	7	2	2	83	23	115	99	1.83
215	PA	5	83	WO	0.63	0.59	0.73	0.15	0.40	0.17	0.81	0.85	0.57	7	4	4	94	24	116	90	2.28
216	PA	5	83	WO	0.63	0.57	0.69	0.14	0.38	0.17	0.77	0.80	0.55	8	3	2	90	23	110	87	2.19
217	PA	5	83	WO	0.61	0.53	0.65	0.14	0.36	0.15	0.73	0.85	0.53	7	3	2	87	23	107	87	2.18
218	PA	5	83	WO	0.61	0.49	0.65	0.14	0.34	0.16	0.69	0.73	0.53	8	3	2	82	23	107	87	2.02
219	PA	5	83	WO	0.61	0.54	0.65	0.13	0.36	0.14	0.73	0.82	0.51	7	3	3	89	22	107	93	2.15
220	PA	5	83	WO	0.61	0.51	0.65	0.14	0.35	0.15	0.69	0.73	0.52	7	2	2	83	23	107	85	2.02
221	PA	5	83	WO	0.58	0.52	0.64	0.14	0.35	0.15	0.71	0.77	0.51	7	2	2	89	25	111	88	2.05
222	PA	5	83	WO	0.58	0.51	0.63	0.13	0.34	0.15	0.69	0.93	0.51	7	3	3	88	23	109	80	2.19
223	PA	5	83	WO	0.60	0.51	0.65	0.13	0.35	0.16	0.69	0.83	0.52	7	3	3	85	22	108	86	2.21
224	PA	5	83	WO	0.60	0.53	0.64	0.14	0.36	0.16	0.71	1.01	0.52	7	3	3	88	24	107	86	2.31
225	PA	5	83	WO	0.61	0.53	0.65	0.14	0.36	0.15	0.73	0.67	0.51	8	2	2	87	23	107	83	2.00
226	PA	5	83	WO	0.59	0.51	0.65	0.13	0.35	0.15	0.69	0.72	0.51	8	3	2	86	22	110	86	1.99

ORDER=6 SPECIES=PAR

OBS	STATE	MO	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	C1	O1	S1	F1	TL
227	AR	10	68	WO	0.61	0.52	0.67	0.16	0.38	0.16	0.73	0.91	0.55	0	3	3	85	27	110	90	2.24
228	AR	10	68	WO	0.63	0.55	0.70	0.16	0.39	0.19	0.80	0.96	0.57	0	3	3	87	26	111	90	2.38
229	AR	10	68	WO	0.60	0.51	0.65	0.14	0.36	0.16	0.71	1.01	0.53	0	4	3	85	24	109	88	2.31
230	AR	10	68	WO	0.60	0.51	0.64	0.15	0.36	0.16	0.71	0.97	0.53	0	3	3	85	25	107	88	2.27
231	AR	10	68	WO	0.59	0.48	0.63	0.14	0.35	0.15	0.68	0.97	0.51	0	3	2	83	24	107	86	2.23
232	AR	10	68	WO	0.59	0.48	0.63	0.14	0.36	0.16	0.70	0.93	0.53	0	2	2	83	24	107	90	2.21
233	FL	1	80	WO	0.60	0.52	0.65	0.15	0.36	0.16	0.75	0.85	0.53	0	3	2	86	25	108	88	2.19
234	FL	1	80	WO	0.61	0.49	0.64	0.16	0.35	0.16	0.73	1.01	0.51	0	3	3	82	27	105	83	2.34
235	FL	1	80	WO	0.58	0.49	0.61	0.15	0.33	0.16	0.71	0.97	0.48	0	3	2	86	26	105	84	2.25
236	GA	3	76	WO	0.57	0.48	0.64	0.13	0.37	0.17	0.69	0.89	0.49	0	4	2	86	23	112	88	2.14
237	GA	3	76	WO	0.59	0.51	0.65	0.14	0.37	0.14	0.71	0.89	0.53	0	4	3	86	24	110	90	2.18
238	GA	3	76	WO	0.59	0.49	0.62	0.15	0.37	0.16	0.69	0.77	0.49	0	4	3	84	26	105	84	2.04
239	GA	3	76	WO	0.59	0.52	0.64	0.15	0.36	0.16	0.72	0.71	0.49	0	4	2	88	26	109	84	2.01
240	GA	3	76	WO	0.57	0.49	0.61	0.13	0.34	0.16	0.69	0.97	0.48	0	3	2	86	23	107	86	2.22
241	IN	5	32	WO	0.63	0.56	0.67	0.16	0.40	0.15	0.77	1.09	0.55	0	4	4	89	26	106	87	2.48
242	IN	5	32	WO	0.63	0.56	0.67	0.15	0.40	0.16	0.73	0.97	0.56	0	5	3	89	24	106	89	2.32
243	IN	5	32	WO	0.62	0.54	0.65	0.14	0.38	0.16	0.71	1.01	0.53	0	5	2	87	23	105	85	2.33
244	IN	5	32	WO	0.61	0.53	0.65	0.14	0.17	0.16	0.71	0.89	0.52	0	4	3	87	23	107	85	2.20
245	IN	5	32	WO	0.61	0.53	0.65	0.14	0.38	0.16	0.71	0.91	0.53	0	4	3	87	23	107	87	2.24
246	KS	5	81	WO	0.61	0.52	0.64	0.14	0.37	0.16	0.73	0.89	0.51	0	4	3	85	23	105	83	2.22
247	KS	5	81	WO	0.58	0.48	0.63	0.14	0.36	0.15	0.69	0.81	0.49	0	4	3	84	25	109	86	2.07
248	KS	5	81	WO	0.61	0.52	0.64	0.14	0.36	0.16	0.73	1.11	0.53	0	4	3	85	23	105	87	2.44
249	LA	5	79	WO	0.60	0.52	0.68	0.14	0.37	0.18	0.73	0.75	0.53	0	3	2	86	24	115	88	2.07
250	LA	5	79	WO	0.61	0.53	0.69	0.16	0.37	0.18	0.71	0.88	0.55	0	4	3	87	27	113	90	2.21
251	LA	5	79	WO	0.61	0.53	0.71	0.16	0.38	0.20	0.77	0.99	0.57	0	5	3	84	26	113	90	2.28
252	LA	5	79	WO	0.60	0.51	0.67	0.15	0.36	0.18	0.73	0.77	0.52	0	4	3	85	25	112	86	1.99
253	MD	6	68	WO	0.57	0.49	0.63	0.14	0.34	0.17	0.69	0.69	0.51	0	4	3	88	25	111	89	1.94
254	MD	6	68	WO	0.59	0.52	0.62	0.14	0.36	0.18	0.67	0.75	0.52	0	4	3	89	24	105	88	2.00
255	MD	6	68	WO	0.62	0.54	0.65	0.15	0.36	0.16	0.71	0.85	0.53	0	6	4	87	25	105	85	2.19
256	NB	9	50	WO	0.65	0.57	0.69	0.16	0.42	0.17	0.77	1.03	0.57	0	6	3	87	25	106	87	2.44
257	NB	9	50	WO	0.59	0.51	0.63	0.15	0.38	0.16	0.69	0.79	0.51	0	5	3	86	26	107	86	2.06

ORDER=6 SPECIES=PAR

OBS	STATE	MO	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	CI	OI	SI	FI	TL
258	NB	9	50	WO	0.63	0.55	0.60	0.15	0.40	0.17	0.76	0.83	0.55	0	5	4	87	24	108	87	2.21
259	NB	9	58	WO	0.62	0.53	0.66	0.16	0.39	0.17	0.73	0.76	0.53	0	3	3	85	26	107	85	2.10
260	NB	9	58	WO	0.65	0.57	0.66	0.16	0.40	0.16	0.75	1.02	0.53	0	5	3	87	25	102	81	2.41
261	NB	9	50	WO	0.65	0.59	0.71	0.16	0.43	0.18	0.81	1.05	0.57	0	6	3	91	25	109	87	2.51
262	ND	8	61	WO	0.57	0.46	0.65	0.13	0.34	0.16	0.68	0.61	0.48	0	3	2	82	23	114	06	1.85
263	ND	8	61	WO	0.59	0.49	0.62	0.13	0.34	0.15	0.72	0.64	0.48	0	4	3	84	22	105	83	1.94
264	ND	8	61	WO	0.57	0.46	0.61	0.13	0.34	0.16	0.67	0.55	0.48	0	3	2	82	23	107	86	1.70
265	NY	0	0	WO	0.56	0.47	0.60	0.13	0.34	0.14	0.66	0.65	0.47	0	4	3	85	24	107	85	1.86
266	NY	0	0	WO	0.55	0.47	0.59	0.13	0.34	0.15	0.65	0.67	0.49	0	3	2	87	24	107	89	1.86
267	NY	9	25	WO	0.61	0.52	0.65	0.14	0.37	0.16	0.71	0.90	0.52	0	4	3	85	23	107	85	2.11
268	NY	9	25	WO	0.63	0.54	0.69	0.16	0.40	0.16	0.75	0.97	0.55	0	4	4	85	26	110	87	2.34
269	NY	9	25	WO	0.61	0.52	0.63	0.14	0.37	0.16	0.73	0.81	0.53	0	5	3	85	23	103	87	2.14
270	ON	7	75	WO	0.62	0.55	0.65	0.15	0.38	0.17	0.73	0.89	0.53	0	3	4	89	25	105	85	2.23
271	PA	7	41	WO	0.66	0.59	0.69	0.16	0.42	0.17	0.81	1.21	0.50	0	5	4	89	25	105	88	2.68
272	PA	7	41	WO	0.60	0.52	0.62	0.14	0.36	0.16	0.72	0.97	0.53	0	4	3	86	24	103	88	2.20
273	PA	7	41	WO	0.62	0.54	0.66	0.16	0.39	0.18	0.76	1.07	0.53	0	4	3	87	26	107	85	2.44
274	PA	7	41	WO	0.65	0.58	0.69	0.15	0.41	0.17	0.78	0.86	0.56	0	4	3	89	23	106	86	2.29
275	TX	3	72	AL	0.57	0.47	0.61	0.14	0.35	0.14	0.67	0.91	0.47	0	4	2	84	25	107	84	2.14
276	TX	3	72	AL	0.57	0.44	0.57	0.12	0.33	0.13	0.64	0.94	0.46	0	3	2	79	21	100	92	2.04
277	TX	.	72	AL	0.61	0.40	0.62	0.14	0.36	0.14	0.67	0.91	0.51	0	3	2	80	23	102	83	2.20
278	TX	3	72	AL	0.57	0.46	0.61	0.14	0.34	0.14	0.67	0.85	0.48	0	3	2	82	25	107	86	2.08

ORDER=7 SPECIES=WOJ

OBS	STATE	MO	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	CI	OI	SI	FI	TL
279	FL	12	80	AL	0.53	0.43	0.56	0.12	0.32	0.13	0.63	0.81	0.44	0	2	2	83	23	106	85	1.96
280	FL	12	80	AL	0.55	0.45	0.58	0.13	0.34	0.13	0.65	0.53	0.45	2	2	2	83	24	106	83	1.72
281	FL	12	80	AL	0.53	0.43	0.57	0.12	0.31	0.15	0.63	0.61	0.44	2	2	2	83	23	108	85	1.76
282	FL	12	80	AL	0.52	0.43	0.55	0.13	0.32	0.13	0.61	0.61	0.42	2	3	2	84	25	106	82	1.73
283	FL	12	80	AL	0.53	0.43	0.57	0.12	0.32	0.13	0.63	0.53	0.44	1	3	2	82	23	108	85	1.68
284	FL	12	80	AL	0.48	0.41	0.54	0.11	0.32	0.12	0.60	0.40	0.42	2	2	2	85	23	110	87	1.48
285	FL	12	80	AL	0.52	0.43	0.55	0.12	0.32	0.13	0.62	0.76	0.42	1	3	2	84	24	106	82	1.89
286	FL	12	80	AL	0.51	0.43	0.57	0.13	0.32	0.13	0.63	0.79	0.44	1	2	2	86	26	112	89	1.92
287	FL	12	80	AL	0.52	0.43	0.57	0.12	0.32	0.14	0.63	0.73	0.44	1	2	2	84	24	110	86	1.87
288	FL	1	83	AL	0.57	0.46	0.60	0.13	0.34	0.15	0.65	0.91	0.47	2	2	2	82	23	105	84	2.12
289	FL	1	83	AL	0.57	0.47	0.61	0.13	0.34	0.15	0.68	0.53	0.47	3	3	2	84	23	107	84	1.77
290	FL	1	83	AL	0.58	0.48	0.62	0.13	0.35	0.15	0.71	1.01	0.48	3	4	2	84	22	107	84	2.29
291	FL	1	83	AL	0.51	0.45	0.57	0.12	0.33	0.14	0.64	0.93	0.45	3	2	2	87	23	108	87	2.09
292	FL	3	75	AL	0.51	0.40	0.55	0.12	0.30	0.12	0.60	0.89	0.42	1	3	3	80	24	108	84	1.99
293	FL	3	75	AL	0.55	0.44	0.58	0.14	0.32	0.14	0.66	0.95	0.46	2	3	2	81	25	106	85	2.15
294	FL	3	75	AL	0.49	0.40	0.51	0.12	0.30	0.12	0.62	0.75	0.40	2	3	2	82	24	106	82	1.86
295	FL	3	75	AL	0.53	0.43	0.58	0.12	0.32	0.13	0.63	0.72	0.44	4	3	2	83	23	110	85	1.87
296	FL	3	75	AL	0.53	0.44	0.57	0.13	0.32	0.13	0.62	0.72	0.44	1	2	2	85	25	108	85	1.86
297	FL	3	75	AL	0.55	0.46	0.59	0.14	0.36	0.13	0.67	0.97	0.46	2	3	2	85	25	107	85	2.18
298	FL	3	75	AL	0.57	0.46	0.60	0.13	0.35	0.13	0.67	0.95	0.47	3	2	2	82	23	105	84	2.18
299	FL	3	75	AL	0.58	0.46	0.61	0.13	0.35	0.13	0.66	0.99	0.48	4	3	3	81	23	105	83	2.22
300	FL	3	75	AL	0.54	0.44	0.57	0.13	0.34	0.12	0.64	0.87	0.46	1	3	2	83	25	106	87	2.04
301	FL	3	75	AL	0.57	0.46	0.61	0.13	0.36	0.13	0.65	0.97	0.48	2	4	2	82	23	107	86	2.18
302	FL	3	75	AL	0.52	0.42	0.55	0.13	0.30	0.12	0.59	0.89	0.42	3	3	2	82	25	105	82	1.99
303	FL	3	83	AL	0.57	0.45	0.59	0.14	0.34	0.14	0.69	0.73	0.46	2	3	3	80	24	104	82	1.98
304	FL	3	83	AL	0.57	0.46	0.59	0.13	0.35	0.14	0.69	0.76	0.47	2	3	3	82	23	104	84	2.01
305	FL	3	83	AL	0.53	0.44	0.55	0.13	0.32	0.13	0.63	0.81	0.44	2	1	3	85	25	104	85	1.95
306	FL	3	83	AL	0.53	0.44	0.56	0.13	0.34	0.13	0.61	0.67	0.44	2	3	2	85	25	106	85	1.80
307	FL	3	83	AL	0.55	0.44	0.57	0.13	0.32	0.13	0.65	0.81	0.47	2	3	3	81	24	104	87	2.00
308	FL	3	83	AL	0.54	0.44	0.57	0.14	0.33	0.13	0.65	0.74	0.44	1	3	3	83	26	106	83	1.96
309	FL	12	75	WO	0.55	0.44	0.57	0.13	0.33	0.13	0.65	0.99	0.45	2	2	2	81	24	107	83	2.08
310	FL	12	75	WO	0.57	0.48	0.61	0.14	0.35	0.13	0.68	1.01	0.46	3	3	3	86	25	107	82	2.25
311	FL	12	75	WO	0.53	0.42	0.57	0.12	0.32	0.13	0.62	1.01	0.43	2	2	2	81	23	108	83	2.15
312	FL	12	82	AL	0.56	0.43	0.57	0.14	0.34	0.14	0.67	0.73	0.44	1	2	2	78	24	102	80	1.95
313	FL	12	82	AL	0.54	0.43	0.56	0.13	0.32	0.14	0.65	0.69	0.44	4	3	2	81	25	104	83	1.87
314	FL	12	82	AL	0.54	0.44	0.57	0.13	0.33	0.14	0.65	0.61	0.44	1	4	3	83	25	106	81	1.79
315	FL	12	82	AL	0.57	0.44	0.57	0.14	0.35	0.14	0.67	0.77	0.45	1	3	2	79	24	100	80	2.00
316	FL	12	82	AL	0.56	0.44	0.57	0.13	0.34	0.13	0.66	0.77	0.44	2	3	3	80	24	102	80	1.98
317	FL	12	82	AL	0.55	0.44	0.57	0.13	0.34	0.14	0.67	0.67	0.45	1	3	2	81	24	104	81	1.88
318	FL	12	82	AL	0.54	0.43	0.57	0.13	0.32	0.13	0.65	0.79	0.44	2	3	2	81	25	106	83	1.97
319	FL	12	82	AL	0.57	0.47	0.59	0.14	0.35	0.13	0.68	0.77	0.46	2	4	4	84	24	104	82	2.01
320	FL	12	82	AL	0.54	0.43	0.56	0.13	0.32	0.14	0.61	0.65	0.41	2	3	2	81	25	104	81	1.79
321	FL	12	82	AL	0.57	0.44	0.57	0.13	0.34	0.13	0.67	0.70	0.45	2	4	2	79	23	100	80	1.93
322	FL	12	82	AL	0.53	0.42	0.54	0.12	0.32	0.13	0.61	0.65	0.42	4	3	2	81	23	102	81	1.78

ORDER=8 SPECIES=AUS

CBS	STATE	MO	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	DM	HM	CI	OI	SI	FI	TL
323	AZ	7	70	WO	0.59	0.47	0.63	0.14	0.37	0.14	0.71	1.03	0.51	3	3	3	81	24	107	86	2.32
324	AZ	7	70	WO	0.63	0.52	0.67	0.14	0.30	0.16	0.73	1.15	0.55	6	4	3	82	23	106	87	2.51
325	AZ	7	70	WO	0.63	0.49	0.65	0.15	0.38	0.14	0.73	0.95	0.53	5	4	3	79	24	103	84	2.30
326	AZ	7	70	WO	0.59	0.48	0.65	0.13	0.35	0.15	0.73	0.85	0.53	5	2	2	83	22	110	90	2.16
327	AZ	7	70	WO	0.63	0.52	0.67	0.15	0.38	0.16	0.77	1.03	0.55	4	4	3	82	24	106	87	2.42
328	AZ	7	70	WO	0.61	0.51	0.67	0.14	0.38	0.16	0.74	1.01	0.54	5	4	3	83	23	110	88	2.35
329	AZ	5	76	AL	0.65	0.55	0.70	0.16	0.40	0.18	0.77	1.11	0.56	3	5	3	84	25	108	86	2.53
330	AZ	5	76	AL	0.63	0.53	0.69	0.15	0.38	0.14	0.76	0.93	0.55	4	4	3	84	24	110	87	2.31
331	AZ	5	76	AL	0.65	0.53	0.71	0.15	0.40	0.16	0.79	1.05	0.55	4	3	3	81	23	109	84	2.40
332	AZ	5	76	AL	0.65	0.54	0.70	0.15	0.41	0.17	0.77	0.75	0.57	5	3	2	83	23	108	87	2.16
333	AZ	5	76	AL	0.65	0.54	0.71	0.16	0.40	0.16	0.79	1.01	0.55	5	3	3	83	25	109	84	2.44
334	AZ	9	76	WO	0.66	0.57	0.73	0.16	0.40	0.16	0.81	1.09	0.59	2	4	3	86	25	111	89	2.56
335	AZ	9	76	WO	0.62	0.51	0.69	0.14	0.37	0.16	0.75	0.85	0.56	5	3	3	82	23	111	90	2.21
336	AZ	9	76	WO	0.61	0.52	0.69	0.15	0.36	0.13	0.73	0.89	0.54	6	3	3	85	25	113	88	2.22
337	AZ	9	76	WO	0.63	0.53	0.69	0.15	0.36	0.15	0.77	0.73	0.57	5	3	3	84	24	110	90	2.12
338	AZ	9	76	WO	0.65	0.53	0.69	0.15	0.38	0.16	0.75	0.73	0.57	4	3	3	81	23	106	87	2.12
339	AZ	7	56	WO	0.65	0.53	0.69	0.15	0.38	0.16	0.81	0.89	0.57	2	4	4	81	23	106	87	2.34
340	AZ	7	56	WO	0.67	0.57	0.74	0.16	0.42	0.17	0.81	0.81	0.61	3	3	3	85	24	111	91	2.20
341	AZ	9	71	AL	0.64	0.53	0.69	0.16	0.40	0.15	0.79	1.01	0.57	4	3	3	83	25	108	89	2.43
342	AZ	9	71	AL	0.65	0.53	0.69	0.16	0.38	0.17	0.77	0.91	0.55	4	5	3	81	25	106	84	2.32
343	AZ	9	71	AL	0.63	0.53	0.69	0.16	0.38	0.16	0.77	0.97	0.58	4	2	3	84	26	110	92	2.36
344	AZ	9	71	AL	0.67	0.57	0.73	0.16	0.41	0.17	0.85	0.97	0.59	3	3	3	85	24	109	88	2.48
345	AZ	9	71	AL	0.66	0.56	0.71	0.16	0.40	0.10	0.79	0.77	0.59	4	3	3	85	25	108	88	2.21
346	AZ	9	71	AL	0.65	0.55	0.71	0.16	0.40	0.16	0.77	1.01	0.59	3	3	3	84	25	109	91	2.42
347	AZ	8	58	WO	0.67	0.55	0.73	0.16	0.40	0.16	0.80	0.81	0.57	4	3	2	82	24	109	85	2.27
348	AZ	8	58	WO	0.64	0.53	0.69	0.16	0.40	0.16	0.77	0.77	0.56	3	4	3	83	25	108	87	2.17
349	AZ	8	58	WO	0.62	0.52	0.69	0.15	0.36	0.16	0.76	0.71	0.56	5	2	2	84	25	111	90	2.10
350	AZ	8	58	WO	0.65	0.53	0.69	0.16	0.40	0.16	0.77	0.75	0.58	3	3	3	81	25	106	89	2.16
351	AZ	8	58	WO	0.58	0.47	0.65	0.14	0.34	0.12	0.69	0.69	0.53	7	3	2	82	25	112	91	1.95
352	AZ	8	58	WO	0.66	0.55	0.73	0.16	0.40	0.16	0.79	1.01	0.58	3	4	3	83	25	111	88	2.45
353	CH	7	81	WO	0.68	0.57	0.73	0.16	0.41	0.14	0.81	1.56	0.58	4	4	3	84	24	107	85	3.04
354	CH	7	81	WO	0.65	0.55	0.71	0.16	0.42	0.16	0.77	1.29	0.57	4	3	2	84	25	109	87	2.71
355	CH	7	81	WO	0.69	0.58	0.74	0.16	0.43	0.15	0.81	1.37	0.61	5	4	3	84	24	107	88	2.97
356	CH	7	81	WO	0.69	0.57	0.75	0.16	0.42	0.17	0.83	0.97	0.61	7	4	3	82	24	109	88	2.40
357	CH	7	81	WO	0.65	0.56	0.71	0.17	0.41	0.17	0.81	1.07	0.58	4	4	3	86	27	109	89	2.53
358	CH	7	81	WO	0.65	0.53	0.69	0.15	0.39	0.14	0.77	0.77	0.57	3	4	2	81	23	106	87	2.18
359	CH	7	81	WO	0.69	0.57	0.69	0.16	0.41	0.16	0.81	1.29	0.57	3	5	2	82	24	100	82	2.79
360	HI	7	65	AL	0.57	0.48	0.61	0.13	0.34	0.14	0.69	0.73	0.48	3	3	3	86	22	107	86	1.98
361	HI	7	65	AL	0.57	0.46	0.60	0.12	0.34	0.15	0.65	0.89	0.47	4	3	2	92	21	105	84	2.10
362	NL	7	79	WO	0.69	0.59	0.71	0.15	0.41	0.16	0.81	1.21	0.57	5	3	3	85	22	103	82	2.71
363	NL	7	79	WO	0.67	0.59	0.71	0.14	0.41	0.16	0.79	0.95	0.56	6	3	3	88	21	106	83	2.40
364	NL	7	79	WO	0.68	0.57	0.71	0.14	0.38	0.16	0.79	1.21	0.55	4	3	3	84	21	104	81	2.60
365	NL	7	79	WO	0.69	0.59	0.70	0.15	0.42	0.17	0.82	1.21	0.57	5	3	3	85	22	101	82	2.72
366	NL	7	79	WO	0.66	0.59	0.70	0.14	0.40	0.16	0.81	1.09	0.57	4	3	2	89	22	106	86	2.56
367	NL	7	79	WO	0.69	0.59	0.73	0.14	0.42	0.17	0.81	1.13	0.57	5	3	3	87	21	107	84	2.62
368	NL	7	79	WO	0.69	0.59	0.71	0.14	0.44	0.17	0.81	1.03	0.57	5	4	3	85	21	103	82	2.53
369	TX	7	79	AL	0.65	0.57	0.69	0.14	0.41	0.14	0.77	1.19	0.55	3	2	3	87	22	106	84	2.61
370	TX	7	79	AL	0.69	0.60	0.71	0.14	0.42	0.16	0.81	1.29	0.58	4	3	3	87	21	103	84	2.79
371	TX	7	79	AL	0.65	0.56	0.73	0.15	0.39	0.16	0.81	0.97	0.57	3	4	3	86	23	112	87	2.42
372	TX	7	79	AL	0.66	0.57	0.73	0.15	0.42	0.16	0.81	1.13	0.57	3	3	3	86	23	111	86	2.60
373	TX	7	79	AL	0.62	0.51	0.69	0.13	0.38	0.16	0.75	0.89	0.53	4	3	2	82	21	111	85	2.25
374	TX	7	79	AL	0.65	0.53	0.69	0.15	0.38	0.16	0.77	0.85	0.53	3	2	2	81	23	106	81	2.26
375	TX	7	79	AL	0.69	0.59	0.73	0.13	0.41	0.16	0.81	1.29	0.58	6	3	3	85	19	106	84	2.79
376	TX	7	79	AL	0.63	0.55	0.69	0.14	0.40	0.16	0.77	0.97	0.58	3	4	3	87	23	110	92	2.36
377	TX	7	79	AL	0.63	0.53	0.69	0.14	0.38	0.16	0.73	0.91	0.55	4	2	3	84	23	110	87	2.26
378	TX	7	79	AL	0.64	0.53	0.69	0.14	0.39	0.16	0.77	0.89	0.56	4	3	3	83	22	108	87	2.29
379	TX	7	79	AL	0.67	0.57	0.69	0.14	0.40	0.15	0.81	1.01	0.57	5	3	3	85	21	103	85	2.48
380	TX	7	79	AL	0.63	0.53	0.69	0.15	0.39	0.17	0.79	1.01	0.57	3	3	3	84	24	110	93	2.42
381	UT	.	67	WO	0.59	0.51	0.67	0.12	0.36	0.17	0.69	0.81	0.51	9	3	3	86	21	114	86	2.08
382	UT	.	67	WO	0.57	0.46	0.68	0.13	0.34	0.14	0.65	0.91	0.54	6	2	2	82	23	120	95	2.12
383	UT	.	67	WO	0.61	0.51	0.69	0.13	0.36	0.17	0.79	0.85	0.53	5	3	3	83	22	111	87	2.14
384	UT	.	67	WO	0.57	0.46	0.67	0.13	0.34	0.14	0.65	0.89	0.53	7	3	3	82	23	118	93	2.10
385	UT	.	67	WO	0.58	0.46	0.65	0.12	0.34	0.14	0.65	0.87	0.52	5	3	3	81	21	112	89	2.19
386	UT	.	67	WO	0.56	0.45	0.63	0.13	0.33	0.14	0.66	0.97	0.53	6	2	2	82	24	113	95	2.18

ORDER=9 SPECIES=AKE

OBS	STATE	MC	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	CI	OI	SI	FI	TL
387	FL	4	83	WO	0.60	0.53	0.69	0.16	0.38	0.20	0.79	0.81	0.57	16	6	4	88	27	115	95	2.19
388	FL	4	83	WO	0.59	0.53	0.69	0.15	0.38	0.20	0.79	0.80	0.55	13	7	3	90	26	117	93	2.25
389	FL	4	83	WO	0.58	0.51	0.66	0.15	0.35	0.20	0.76	0.81	0.53	12	5	3	88	25	114	91	2.14
390	FL	4	83	WO	0.61	0.54	0.71	0.16	0.38	0.20	0.81	0.82	0.57	13	5	3	88	27	117	93	2.28
391	FL	4	83	WO	0.61	0.53	0.70	0.16	0.36	0.20	0.81	0.97	0.57	13	5	3	87	27	115	93	2.38
392	FL	4	83	WO	0.58	0.51	0.66	0.15	0.36	0.19	0.76	0.85	0.53	13	5	3	88	26	114	91	2.18
393	FL	1	82	AL	0.50	0.49	0.66	0.15	0.33	0.18	0.74	0.65	0.54	7	5	3	86	26	114	93	1.96
394	FL	1	82	AL	0.60	0.49	0.67	0.16	0.35	0.18	0.77	0.95	0.57	9	6	2	82	27	112	95	2.31
395	FL	1	82	AL	0.60	0.49	0.66	0.16	0.34	0.19	0.70	0.69	0.54	8	4	2	83	26	110	90	2.06
396	FL	1	82	AL	0.60	0.49	0.66	0.15	0.35	0.18	0.77	0.68	0.55	10	5	2	83	25	110	92	2.04
397	FL	12	80	WO	0.57	0.48	0.67	0.16	0.36	0.18	0.75	0.77	0.54	9	6	3	86	27	118	95	2.08
398	FL	12	80	WO	0.56	0.49	0.65	0.15	0.34	0.17	0.72	0.77	0.53	10	5	3	87	27	116	95	2.04
399	FL	12	80	WO	0.57	0.47	0.65	0.15	0.34	0.17	0.71	0.77	0.53	7	5	2	84	27	114	93	2.04
400	FL	12	80	WO	0.56	0.48	0.65	0.15	0.35	0.17	0.70	0.73	0.53	5	4	2	87	27	116	95	1.98
401	FL	12	73	AL	0.60	0.51	0.69	0.16	0.36	0.18	0.76	0.61	0.56	8	4	2	85	27	115	93	1.96
402	FL	12	73	AL	0.58	0.48	0.65	0.16	0.34	0.18	0.73	0.85	0.54	9	5	3	84	28	112	93	2.15
403	FL	99	82	AL	0.67	0.53	0.85	0.16	0.40	0.17	0.89	0.69	0.68	9	5	3	79	24	127	102	2.23
404	FL	99	82	AL	0.67	0.57	0.82	0.16	0.40	0.18	0.89	0.71	0.65	8	6	3	85	24	123	97	2.26
405	FL	99	82	AL	0.63	0.53	0.77	0.16	0.37	0.17	0.84	0.76	0.64	8	6	3	84	26	123	103	2.22
406	FL	99	82	AL	0.65	0.55	0.80	0.16	0.39	0.17	0.85	0.69	0.64	10	6	3	84	25	123	99	2.18
407	FL	1	83	AL	0.59	0.48	0.67	0.15	0.36	0.17	0.73	0.85	0.57	8	4	3	83	26	114	97	2.16
408	FL	1	83	AL	0.59	0.48	0.65	0.15	0.35	0.17	0.72	0.53	0.56	9	6	4	84	26	112	96	2.22
409	FL	1	83	AL	0.60	0.51	0.69	0.16	0.36	0.20	0.77	0.73	0.57	9	6	4	85	27	115	95	2.09
410	FL	1	83	AL	0.57	0.48	0.67	0.16	0.34	0.18	0.73	0.77	0.53	8	5	3	86	27	118	93	2.06
411	FL	1	83	AL	0.57	0.48	0.65	0.15	0.34	0.17	0.76	0.77	0.53	7	6	3	86	27	114	93	2.09
412	FL	1	83	AL	0.60	0.48	0.67	0.15	0.35	0.17	0.75	0.69	0.56	11	6	3	81	25	112	93	2.03
413	IA	7	40	WO	0.67	0.61	0.75	0.16	0.41	0.20	0.83	0.89	0.61	12	7	4	91	24	112	91	2.38
414	IA	7	40	WO	0.68	0.62	0.77	0.16	0.41	0.21	0.85	1.03	0.61	13	6	4	91	24	113	90	2.56
415	IA	7	40	WO	0.66	0.60	0.73	0.16	0.40	0.20	0.85	0.89	0.61	12	7	3	92	25	111	92	2.39
416	IA	7	40	WO	0.62	0.56	0.70	0.15	0.40	0.20	0.77	0.97	0.57	11	6	4	90	25	113	92	2.35
417	IL	8	78	AL	0.63	0.57	0.73	0.16	0.39	0.20	0.81	1.13	0.50	16	8	5	90	26	116	92	2.57
418	IL	8	78	AL	0.65	0.58	0.74	0.16	0.40	0.20	0.82	1.21	0.61	17	9	5	89	25	114	94	2.68
419	IL	8	78	AL	0.67	0.61	0.75	0.16	0.43	0.20	0.85	0.97	0.61	16	8	5	91	24	112	91	2.48
420	IL	8	78	AL	0.65	0.60	0.75	0.17	0.43	0.21	0.84	1.13	0.61	15	9	6	92	27	116	94	2.62
421	IL	8	78	AL	0.68	0.61	0.77	0.17	0.43	0.20	0.80	1.05	0.61	17	8	6	90	25	113	90	2.61
422	KS	7	79	WO	0.65	0.58	0.73	0.17	0.40	0.20	0.83	0.98	0.57	9	6	4	89	26	112	87	2.37
423	KS	7	79	WO	0.60	0.54	0.69	0.16	0.39	0.18	0.74	1.05	0.54	10	7	4	90	27	115	90	2.38
424	KS	7	79	WO	0.62	0.57	0.69	0.16	0.40	0.19	0.77	1.09	0.57	11	6	4	92	26	111	92	2.47
425	LA	5	43	WO	0.57	0.51	0.69	0.14	0.36	0.18	0.76	0.79	0.55	11	5	3	89	25	121	96	2.11
426	LA	5	43	WO	0.61	0.54	0.70	0.15	0.37	0.21	0.79	0.87	0.58	11	6	4	88	25	115	95	2.26
427	LA	5	43	WO	0.61	0.53	0.71	0.14	0.37	0.21	0.76	0.93	0.57	11	6	4	87	23	117	93	2.29
428	LA	5	43	WO	0.57	0.49	0.66	0.14	0.35	0.18	0.75	0.76	0.55	10	4	3	88	25	116	96	2.07
429	LA	8	43	WO	0.66	0.57	0.76	0.16	0.41	0.20	0.85	0.88	0.62	12	6	3	86	25	115	94	2.38
430	LA	8	43	WO	0.59	0.51	0.69	0.15	0.36	0.17	0.75	0.77	0.55	14	5	3	87	26	117	93	2.10
431	LA	8	43	WO	0.65	0.60	0.77	0.16	0.40	0.18	0.85	0.97	0.62	12	7	3	92	25	119	95	2.46
432	LA	8	43	WO	0.61	0.54	0.71	0.15	0.37	0.17	0.75	0.57	0.57	12	6	4	88	25	117	93	1.92
433	NB	6	31	WO	0.71	0.65	0.91	0.18	0.44	0.20	0.91	1.13	0.66	12	8	7	91	26	114	93	2.75
434	NB	6	31	WO	0.70	0.63	0.81	0.19	0.44	0.20	0.85	1.01	0.64	8	6	4	90	28	116	91	2.56
435	NB	6	31	WO	0.66	0.60	0.77	0.17	0.40	0.19	0.81	0.89	0.61	10	5	4	91	26	117	92	2.35
436	NB	6	31	WO	0.69	0.60	0.77	0.17	0.40	0.20	0.89	0.77	0.62	10	6	3	87	25	112	90	2.34
437	NJ	9	4	AL	0.74	0.56	0.73	0.16	0.40	0.20	0.81	0.73	0.59	8	6	3	88	25	114	92	2.17
438	NJ	9	4	AL	0.65	0.57	0.73	0.17	0.36	0.20	0.89	0.81	0.61	9	6	3	87	27	112	94	2.29
439	NJ	9	4	AL	0.65	0.55	0.73	0.16	0.39	0.20	0.86	1.21	0.61	8	6	3	84	25	112	94	2.70
440	NJ	7	54	WO	0.66	0.57	0.75	0.18	0.40	0.21	0.85	0.81	0.61	7	8	5	86	28	114	92	2.31
441	NJ	7	54	WO	0.68	0.58	0.77	0.17	0.41	0.20	0.85	0.62	0.62	9	6	4	85	25	111	91	2.38
442	NJ	7	54	WO	0.68	0.58	0.77	0.17	0.40	0.21	0.87	0.89	0.63	7	6	4	85	25	113	93	2.43
443	NJ	7	54	WO	0.63	0.53	0.73	0.17	0.38	0.20	0.79	0.63	0.58	10	5	4	84	27	116	92	2.04
444	TX	5	79	AL	0.61	0.55	0.70	0.16	0.38	0.17	0.77	0.61	0.57	11	5	4	90	27	115	93	2.28
445	TX	5	79	AL	0.56	0.48	0.64	0.14	0.34	0.16	0.69	0.93	0.49	11	4	3	87	25	115	89	2.17
446	TX	5	79	AL	0.60	0.53	0.68	0.16	0.37	0.17	0.76	0.90	0.55	12	5	4	88	27	114	92	2.25
447	TX	5	79	AL	0.62	0.55	0.69	0.16	0.37	0.18	0.79	1.29	0.57	12	6	4	89	26	111	92	2.70

ORDER=10 SPECIES=PHA

OBS	STATE	MC	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	CI	OI	SI	FI	TL
448	FL	8	43	WO	0.59	0.49	0.69	0.15	0.35	0.16	0.73	0.69	0.56	1	4	3	84	25	117	95	2.00
449	FL	8	43	WO	0.57	0.48	0.66	0.15	0.33	0.16	0.69	0.71	0.53	2	4	3	86	27	116	93	1.96
450	FL	8	43	WO	0.57	0.46	0.65	0.15	0.33	0.16	0.69	0.76	0.53	1	4	3	82	26	114	93	2.04
451	IL	8	43	WO	0.57	0.48	0.65	0.15	0.34	0.16	0.70	0.66	0.54	1	5	3	86	26	114	93	1.92
452	FL	11	81	AL	0.59	0.51	0.69	0.15	0.35	0.16	0.73	0.77	0.55	2	5	3	88	26	119	95	2.07
453	FL	11	81	AL	0.57	0.48	0.69	0.14	0.35	0.16	0.69	0.57	0.54	2	5	3	86	25	121	95	1.82
454	FL	11	81	AL	0.59	0.53	0.69	0.15	0.36	0.18	0.74	0.97	0.57	2	4	2	90	26	117	97	1.89

ORDER=10 SPECIES=PHA

OBS	STATE	MC	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	CI	CI	SI	FI	TL
455	FL	11	81	AL	0.57	0.48	0.66	0.14	0.33	0.17	0.70	0.81	0.53	1	4	3	86	25	116	93	2.07
456	FL	11	81	AL	0.60	0.51	0.69	0.15	0.36	0.16	0.74	0.81	0.55	2	5	3	85	25	115	93	2.15
457	FL	11	81	AL	0.60	0.53	0.70	0.16	0.36	0.17	0.73	0.65	0.57	1	5	2	88	27	117	95	1.97
458	FL	11	81	AL	0.57	0.48	0.66	0.14	0.33	0.18	0.69	0.69	0.53	2	4	2	86	25	116	91	1.94
459	FL	11	81	AL	0.61	0.54	0.73	0.16	0.36	0.17	0.77	0.79	0.59	2	4	3	88	27	120	97	2.16
460	FL	11	81	AL	0.58	0.51	0.69	0.15	0.36	0.16	0.74	0.65	0.55	0	5	2	88	26	119	95	1.96
461	FL	11	81	AL	0.61	0.55	0.71	0.16	0.38	0.10	0.77	0.78	0.57	2	4	3	90	27	117	93	2.15
462	FL	11	81	AL	0.59	0.52	0.69	0.15	0.36	0.16	0.71	0.68	0.55	2	4	3	88	26	117	93	1.99
463	FL	11	81	AL	0.57	0.48	0.67	0.15	0.34	0.16	0.69	0.57	0.54	3	4	3	86	27	118	95	1.82
464	FL	11	81	AL	0.57	0.48	0.65	0.14	0.33	0.17	0.69	0.73	0.52	1	4	3	85	25	114	91	1.98
465	FL	11	81	AL	0.59	0.51	0.69	0.15	0.35	0.17	0.73	0.73	0.56	2	5	3	87	26	117	95	2.04
466	FL	11	81	AL	0.60	0.52	0.69	0.16	0.35	0.17	0.73	0.01	0.55	4	5	3	87	27	115	92	2.13
467	FL	11	81	AL	0.57	0.48	0.65	0.14	0.33	0.17	0.69	0.53	0.53	1	4	3	86	25	114	93	1.78
468	FL	12	82	AL	0.57	0.48	0.66	0.14	0.33	0.16	0.73	0.61	0.55	1	4	3	86	25	116	96	1.90
469	FL	12	82	AL	0.57	0.48	0.66	0.15	0.34	0.16	0.71	0.65	0.55	1	4	3	85	27	116	96	1.92
470	FL	12	82	AL	0.61	0.48	0.69	0.16	0.35	0.16	0.75	0.77	0.57	0	5	4	80	26	113	93	2.12
471	FL	12	82	AL	0.57	0.47	0.65	0.14	0.33	0.16	0.73	0.57	0.53	3	5	3	84	25	114	93	1.86
472	FL	12	82	AL	0.57	0.48	0.68	0.15	0.36	0.16	0.73	0.73	0.57	1	4	3	66	27	120	100	2.02
473	FL	12	82	AL	0.58	0.51	0.69	0.16	0.36	0.16	0.73	0.69	0.55	1	5	3	88	27	119	95	1.99
474	FL	12	82	AL	0.59	0.49	0.69	0.15	0.35	0.16	0.76	0.61	0.57	2	5	3	84	25	117	97	1.95
475	FL	1	82	AL	0.57	0.47	0.66	0.15	0.32	0.16	0.69	0.57	0.53	1	4	3	84	27	116	93	1.82
476	FL	1	82	AL	0.57	0.48	0.67	0.15	0.32	0.16	0.74	0.65	0.54	1	4	3	86	27	118	95	1.95
477	FL	1	82	AL	0.58	0.48	0.67	0.15	0.32	0.17	0.73	0.85	0.53	3	4	3	84	26	116	91	2.15
478	FL	1	82	AL	0.57	0.48	0.66	0.14	0.32	0.16	0.70	0.65	0.55	3	4	3	86	25	116	96	1.91
479	FL	1	82	AL	0.58	0.48	0.66	0.15	0.34	0.16	0.73	0.70	0.56	4	5	3	84	26	114	96	2.00
480	FL	1	82	AL	0.61	0.51	0.70	0.16	0.36	0.16	0.77	0.89	0.57	0	4	3	83	26	115	93	2.26
481	FL	1	82	AL	0.58	0.49	0.69	0.15	0.35	0.16	0.74	0.71	0.56	3	4	3	86	26	119	96	2.03
482	FL	1	82	AL	0.58	0.48	0.69	0.15	0.35	0.16	0.74	0.69	0.57	3	5	3	84	26	119	98	2.00
483	FL	1	82	AL	0.60	0.49	0.69	0.15	0.35	0.17	0.77	0.77	0.57	3	5	3	83	25	115	95	2.13
484	FL	1	82	AL	0.58	0.48	0.67	0.14	0.33	0.16	0.73	0.85	0.55	4	6	4	84	25	116	95	2.15

ORDER=11 SPECIES=BRU

OBS	STATE	MC	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	CI	CI	SI	FI	TL
485	AZ	4	59	AL	0.81	0.71	0.93	0.18	0.53	0.23	1.01	1.49	0.76	15	11	6	87	22	115	94	1.31
486	AZ	4	59	AL	0.81	0.73	0.94	0.18	0.52	0.22	1.05	1.52	0.77	13	11	5	90	22	116	95	1.37
487	AZ	4	55	AL	0.81	0.71	0.93	0.17	0.53	0.23	1.01	1.07	0.77	16	10	6	87	21	115	95	2.89
488	AZ	4	59	AL	0.84	0.73	0.97	0.17	0.56	0.22	1.07	1.13	0.79	18	10	6	87	20	116	95	3.04
489	AZ	4	59	AL	0.79	0.69	0.93	0.16	0.52	0.22	0.99	1.45	0.77	18	10	4	87	21	118	97	3.23
490	AZ	10	76	WO	0.73	0.62	0.85	0.16	0.44	0.20	0.95	1.21	0.69	17	9	4	85	22	117	94	2.09
491	AZ	10	76	WO	0.61	0.53	0.69	0.15	0.36	0.16	0.77	0.97	0.55	16	7	3	87	22	113	90	2.34
492	AZ	10	76	WO	0.65	0.51	0.77	0.14	0.38	0.18	0.81	0.97	0.62	14	6	3	81	22	119	95	2.42
493	AZ	10	76	WO	0.77	0.66	0.89	0.16	0.47	0.20	0.99	1.13	0.76	18	10	4	86	21	116	99	3.09
494	AZ	10	76	WO	0.77	0.67	0.90	0.17	0.46	0.21	0.95	1.01	0.73	17	6	3	87	22	117	95	2.73
495	AZ	10	76	WO	0.75	0.65	0.86	0.16	0.48	0.20	0.97	1.25	0.73	16	7	4	86	22	115	97	2.97
496	AZ	10	76	WO	0.77	0.65	0.89	0.17	0.46	0.22	0.93	1.17	0.73	17	10	5	84	22	116	95	2.87
497	AZ	9	82	WO	0.69	0.57	0.79	0.15	0.40	0.20	0.85	1.05	0.67	15	9	4	82	22	115	97	2.59
498	AZ	9	82	WO	0.65	0.53	0.75	0.14	0.37	0.19	0.77	0.95	0.61	18	7	4	81	22	116	94	2.36
499	AZ	9	82	WO	0.68	0.57	0.79	0.14	0.40	0.20	0.85	0.97	0.66	18	7	3	84	21	116	97	2.49
500	CH	7	81	WO	0.77	0.65	0.86	0.14	0.46	0.28	0.95	1.13	0.70	15	12	8	84	18	112	91	2.85
501	CH	7	81	WO	0.73	0.64	0.81	0.12	0.44	0.21	0.89	1.01	0.65	14	9	4	87	17	111	89	2.63
502	CH	7	81	WO	0.77	0.65	0.85	0.13	0.47	0.21	0.91	1.25	0.69	15	9	6	84	17	111	89	2.93
503	GU	0	0	WO	0.65	0.57	0.73	0.13	0.40	0.21	0.77	1.25	0.60	16	10	3	87	20	112	92	2.67
504	GU	0	0	WO	0.65	0.57	0.74	0.15	0.41	0.20	0.81	1.27	0.61	19	8	4	87	21	114	94	2.73
505	GU	0	0	WO	0.67	0.56	0.75	0.16	0.42	0.21	0.79	1.21	0.61	18	9	4	83	24	113	91	2.67
506	HI	0	0	AL	0.80	0.65	0.88	0.16	0.48	0.23	1.00	1.11	0.73	15	13	5	81	20	110	91	2.91
507	TX	12	1	AL	0.69	0.58	0.74	0.14	0.40	0.21	0.85	1.05	0.61	14	11	4	84	21	107	88	2.59
508	TX	12	1	AL	0.71	0.61	0.81	0.15	0.43	0.22	0.89	0.89	0.63	13	10	4	85	21	111	86	2.51
509	TX	12	1	AL	0.70	0.61	0.79	0.15	0.41	0.21	0.89	0.93	0.65	14	11	3	87	22	113	93	2.47
510	TX	8	79	WO	0.69	0.59	0.77	0.15	0.42	0.22	0.85	1.09	0.65	17	10	4	85	22	112	94	2.63
511	TX	8	79	WO	0.64	0.53	0.71	0.15	0.37	0.21	0.77	1.21	0.57	15	10	5	84	24	111	89	2.64
512	TX	8	79	WO	0.65	0.54	0.71	0.14	0.36	0.20	0.81	0.89	0.57	15	9	6	83	22	109	87	2.34
513	TX	6	53	WO	0.75	0.65	0.84	0.15	0.46	0.21	0.93	1.01	0.71	19	10	6	86	20	112	95	2.69
514	TX	6	53	WO	0.80	0.69	0.91	0.16	0.40	0.24	0.97	1.21	0.73	19	10	8	86	20	114	91	2.98
515	TX	6	53	WO	0.73	0.63	0.85	0.16	0.44	0.24	0.91	0.95	0.69	14	8	6	86	22	117	94	2.59

ORDER=12 SPECIES=HYS

OBS	STATE	MO	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	CI	DI	SI	FI	TL
516	CA	3	68	AL	0.70	0.61	0.94	0.15	0.44	0.20	0.97	0.81	0.72	21	16	8	87	22	135	103	2.47
517	CA	3	68	AL	0.68	0.57	0.88	0.15	0.41	0.18	0.91	0.77	0.67	23	13	6	84	21	130	97	2.35
518	CA	3	68	AL	0.69	0.57	0.87	0.14	0.41	0.19	0.90	1.05	0.69	22	16	6	82	21	126	100	2.64
519	CA	3	68	AL	0.69	0.57	0.90	0.14	0.40	0.20	0.91	1.05	0.70	23	14	6	82	21	131	101	2.65
520	CA	3	68	AL	0.71	0.60	0.93	0.15	0.42	0.19	0.95	1.09	0.70	29	15	8	84	21	131	99	2.75
521	CA	3	68	AL	0.67	0.57	0.86	0.14	0.40	0.17	0.87	1.01	0.65	24	17	8	85	21	129	97	2.55
522	CA	3	68	AL	0.73	0.61	0.95	0.16	0.44	0.20	0.93	1.22	0.73	27	16	7	83	21	131	100	2.88
523	CA	3	68	AL	0.69	0.61	0.93	0.16	0.43	0.20	0.93	1.20	0.71	23	17	7	88	23	135	103	2.92
524	CA	3	68	AL	0.69	0.60	0.93	0.16	0.43	0.20	0.93	1.21	0.71	23	16	7	87	23	135	103	2.93
525	CA	3	68	AL	0.70	0.57	0.89	0.15	0.42	0.20	0.85	1.09	0.69	23	16	10	81	22	128	99	2.64
526	CA	3	69	AL	0.68	0.57	0.81	0.13	0.40	0.10	0.85	1.13	0.61	29	16	6	84	19	119	90	2.70
527	CA	3	68	AL	0.70	0.60	0.92	0.15	0.43	0.20	0.89	1.13	0.71	24	14	8	86	22	132	101	2.72
528	CA	3	68	AL	0.63	0.53	0.83	0.14	0.37	0.17	0.81	1.01	0.63	17	14	5	84	22	132	100	2.44
529	CA	3	68	AL	0.73	0.63	0.93	0.16	0.44	0.20	0.95	1.20	0.73	24	13	9	86	22	128	109	2.88
530	NV	5	70	WO	0.71	0.59	0.91	0.16	0.43	0.20	0.98	1.25	0.69	23	13	7	83	23	129	97	2.94
531	NV	5	68	WO	0.65	0.55	0.86	0.14	0.40	0.19	0.85	0.97	0.65	23	12	6	84	22	131	100	2.46
532	UT	0	0	WO	0.65	0.55	0.87	0.15	0.41	0.19	0.83	1.13	0.65	21	9	4	84	23	134	100	2.61
533	UT	0	0	WO	0.65	0.55	0.84	0.15	0.40	0.20	0.80	1.01	0.65	25	10	4	84	23	130	100	2.54

ORDER=13 SPECIES=GUA

OBS	STATE	MO	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	CI	DI	SI	FI	TL
534	FL	1	82	WO	0.58	0.49	0.73	0.15	0.35	0.16	0.76	0.77	0.54	22	4	3	86	26	126	93	2.10
535	FL	1	82	WO	0.62	0.51	0.77	0.15	0.39	0.16	0.81	1.11	0.60	21	5	2	82	25	125	97	2.54
536	FL	1	82	WO	0.61	0.51	0.76	0.15	0.38	0.17	0.79	1.09	0.58	20	4	2	83	25	125	95	2.48
537	FL	1	82	WO	0.62	0.52	0.75	0.15	0.40	0.17	0.81	0.89	0.61	17	3	2	84	25	121	98	2.31
538	FL	1	82	WO	0.61	0.51	0.77	0.15	0.37	0.18	0.82	0.77	0.60	18	5	3	83	25	127	90	2.19
539	FL	1	82	WO	0.61	0.51	0.77	0.16	0.38	0.17	0.82	1.05	0.61	21	4	2	83	26	127	100	2.47
540	FL	1	82	WO	0.64	0.52	0.77	0.16	0.40	0.18	0.82	1.03	0.62	20	6	2	81	24	121	97	2.48
541	FL	1	82	WO	0.60	0.48	0.73	0.14	0.38	0.16	0.77	0.79	0.57	20	4	3	81	24	122	95	2.15
542	FL	1	82	WO	0.57	0.44	0.69	0.13	0.34	0.16	0.73	0.72	0.54	24	4	2	79	23	121	95	2.01
543	FL	1	82	WO	0.61	0.52	0.78	0.16	0.38	0.17	0.82	0.81	0.61	21	5	2	82	25	124	97	2.25
544	FL	1	82	WO	0.59	0.46	0.73	0.15	0.37	0.16	0.75	0.91	0.57	18	5	3	79	26	124	97	2.24
545	FL	1	82	WO	0.61	0.51	0.77	0.15	0.40	0.16	0.82	1.01	0.61	21	5	3	83	25	127	100	2.43
546	FL	1	82	WO	0.64	0.53	0.77	0.16	0.40	0.17	0.85	1.21	0.61	22	5	3	83	24	121	95	2.70
547	FL	1	82	WO	0.64	0.53	0.77	0.16	0.40	0.18	0.83	1.17	0.64	23	6	3	83	25	121	100	2.64
548	FL	1	82	WO	0.61	0.49	0.76	0.15	0.38	0.16	0.80	0.93	0.59	24	4	2	82	25	125	97	2.33
549	FL	1	83	WO	0.61	0.49	0.73	0.15	0.35	0.17	0.80	1.01	0.59	19	4	2	80	25	120	97	2.41
550	FL	1	83	WO	0.56	0.45	0.69	0.13	0.32	0.14	0.72	0.85	0.51	22	4	2	82	24	124	91	2.12
551	FL	1	83	WO	0.60	0.44	0.70	0.14	0.34	0.14	0.75	0.77	0.53	18	3	3	77	25	121	91	2.09
552	FL	1	83	WO	0.57	0.44	0.70	0.14	0.33	0.14	0.73	0.81	0.53	22	5	2	79	25	123	93	2.10
553	FL	1	83	WO	0.59	0.45	0.71	0.14	0.35	0.16	0.76	0.77	0.57	20	4	2	78	24	121	97	2.11
554	FL	1	83	WO	0.60	0.45	0.71	0.14	0.34	0.15	0.77	0.57	0.57	23	4	2	79	25	121	93	1.91
555	FL	1	83	WO	0.60	0.44	0.69	0.14	0.34	0.15	0.74	0.65	0.54	22	4	2	77	25	119	93	1.96
556	FL	1	83	WO	0.56	0.45	0.69	0.13	0.33	0.15	0.74	0.73	0.53	20	4	2	82	24	124	95	2.02
557	FL	1	83	WO	0.61	0.48	0.72	0.15	0.36	0.17	0.79	0.81	0.57	18	4	2	80	25	118	93	2.19
558	FL	1	83	WO	0.61	0.40	0.74	0.14	0.36	0.16	0.81	0.89	0.58	24	5	2	80	23	122	95	2.30
559	FL	1	83	WO	0.59	0.46	0.72	0.14	0.35	0.15	0.77	0.63	0.56	23	3	2	81	25	125	96	1.97
560	FL	1	83	WO	0.61	0.47	0.71	0.14	0.35	0.16	0.77	0.72	0.56	23	5	3	70	21	117	92	2.09
561	FL	12	75	WO	0.58	0.45	0.71	0.15	0.35	0.14	0.76	0.77	0.55	21	3	2	79	25	123	95	2.10
562	FL	12	75	WO	0.61	0.51	0.75	0.14	0.36	0.16	0.78	0.85	0.59	18	5	2	83	23	123	97	2.23
563	FL	12	75	WO	0.60	0.48	0.73	0.14	0.36	0.16	0.77	0.81	0.56	20	3	2	81	24	122	93	2.17
564	FL	12	75	WO	0.61	0.48	0.73	0.14	0.35	0.14	0.77	0.71	0.57	20	3	2	80	23	120	93	2.10
565	RE	0	0	AL	0.63	0.51	0.75	0.15	0.39	0.19	0.81	0.61	0.60	19	7	3	81	24	119	95	2.04
566	RE	0	0	AL	0.60	0.40	0.73	0.15	0.37	.	0.77	0.83	0.56	18	5	3	81	25	122	93	2.25
567	RE	0	0	AL	0.61	0.48	0.73	0.14	0.37	0.18	0.75	0.95	0.57	25	7	2	80	23	120	93	2.30
568	RE	0	0	AL	0.61	0.49	0.73	0.14	0.36	0.17	0.77	0.73	0.57	21	5	3	82	23	120	93	2.10
569	RE	0	0	AL	0.62	0.49	0.73	0.15	0.39	0.18	0.77	1.05	0.58	20	7	3	80	25	118	93	2.43

ORDER=14 SPECIES=PUM

OBS	STATE	MO	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	CI	DI	SI	FI	TL
570	DC	11	86	AL	0.81	0.71	0.94	0.20	0.48	0.24	0.99	1.07	0.77	26	11	5	87	25	116	95	2.87
571	DC	11	86	AL	0.77	0.65	0.94	0.20	0.47	0.24	0.98	1.17	0.77	22	10	3	84	26	122	100	2.92
572	DC	11	86	AL	0.78	0.69	0.96	0.21	0.49	0.25	1.01	1.09	0.77	22	10	3	88	27	121	99	2.88
573	DC	11	86	AL	0.73	0.69	0.95	0.20	0.48	0.24	0.99	1.07	0.77	26	10	3	87	26	121	97	2.85
574	DC	11	86	AL	0.79	0.69	0.93	0.20	0.47	0.23	1.01	1.01	0.75	26	13	4	87	26	119	95	2.81
575	DC	11	86	AL	0.77	0.65	0.91	0.19	0.48	0.24	0.97	0.93	0.74	22	10	4	84	25	118	96	2.67
576	DC	11	86	AL	0.81	0.69	0.96	0.20	0.48	0.23	1.03	1.05	0.77	23	10	3	85	25	116	95	2.99
577	DC	11	84	AL	0.73	0.69	0.93	0.20	0.48	0.24	1.02	1.09	0.74	27	11	4	88	26	119	95	2.88

ORDER=14 SPECIES=PUB

OBS	STATE	MC	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	C1	C1	S1	F1	TL
578	OC	11	84	AL	0.84	0.77	0.98	0.20	0.53	0.28	1.09	1.17	0.90	30	11	3	92	24	117	95	3.10
579	OC	11	84	AL	0.83	0.75	0.97	0.21	0.52	0.25	1.00	1.13	0.80	30	11	6	90	26	117	96	3.04
580	FL	4	73	WO	0.81	0.69	0.97	0.19	0.51	0.28	1.05	0.99	0.90	28	10	4	85	24	120	99	3.95
581	FL	4	73	WO	0.83	0.73	0.90	0.20	0.53	0.28	1.05	0.91	0.98	30	13	6	88	24	113	96	2.79
582	FL	4	73	WO	0.82	0.72	0.98	0.20	0.56	0.28	1.04	1.05	0.79	24	14	3	88	25	120	96	2.91
583	FL	4	73	WO	0.78	0.71	0.94	0.19	0.52	0.28	1.01	1.05	0.76	27	10	4	51	25	121	97	3.84
584	FL	4	73	WO	0.80	0.71	0.97	0.20	0.53	0.26	1.02	1.13	0.77	27	10	4	89	25	122	96	2.95
585	FL	4	73	WO	0.77	0.69	0.95	0.20	0.53	0.28	1.03	1.09	0.77	26	10	5	89	26	124	100	2.89
586	FL	4	73	WO	0.78	0.69	0.94	0.20	0.53	0.24	1.01	1.05	0.77	30	10	5	88	26	121	99	2.84
587	FL	4	73	WO	0.81	0.73	0.97	0.19	0.55	0.24	1.05	1.01	0.77	27	15	4	90	24	120	95	2.87
588	FL	4	73	WO	0.81	0.72	1.01	0.20	0.54	0.28	1.07	1.13	0.81	31	11	4	89	25	125	100	1.01
589	FL	4	73	WO	0.82	0.73	0.97	0.20	0.57	0.26	1.05	1.01	0.81	26	14	4	89	25	119	99	2.88
590	FL	4	73	WO	0.78	0.67	0.94	0.20	0.53	0.28	1.01	0.97	0.75	29	15	4	86	26	121	96	2.76
591	FL	4	73	WO	0.83	0.74	1.01	0.20	0.57	0.28	1.05	1.13	0.91	34	12	4	89	24	122	98	3.05
592	FL	4	73	WO	0.79	0.71	0.97	0.20	0.55	0.26	1.07	1.11	0.79	25	12	5	90	26	123	100	2.97
593	FL	4	73	WO	0.81	0.71	0.98	0.20	0.56	0.28	1.08	1.05	0.80	26	12	6	87	25	121	99	2.94
594	FL	4	73	WO	0.81	0.73	0.97	0.20	0.53	0.28	1.05	1.11	0.77	26	10	5	90	25	120	95	2.97
595	NY	12	25	WO	0.77	0.66	0.94	0.18	0.48	0.26	0.99	1.03	0.75	26	12	3	86	24	122	97	2.79
596	NY	12	25	WO	0.77	0.65	0.93	0.20	0.46	0.24	1.00	1.01	0.74	26	10	3	84	26	121	96	2.78
597	NY	12	25	WO	0.81	0.69	0.97	0.19	0.49	0.24	1.03	1.04	0.77	23	11	3	85	24	120	95	2.88
598	NY	12	25	WO	0.77	0.65	0.95	0.19	0.47	0.24	1.01	1.06	0.75	24	11	4	84	25	124	97	2.84
599	PR	2	52	WO	0.81	0.73	1.01	0.21	0.53	0.24	1.05	0.94	0.79	21	10	6	90	26	125	97	2.80
600	PR	2	52	WO	0.85	0.75	1.01	0.21	0.54	0.28	1.09	0.95	0.91	21	10	5	88	25	119	95	2.89
601	PR	2	52	WO	0.77	0.66	0.91	0.18	0.47	0.24	0.98	0.80	0.73	23	12	4	86	24	119	95	2.55
602	PR	2	52	WO	0.77	0.67	0.93	0.20	0.48	0.24	0.99	0.83	0.75	19	10	5	87	26	121	97	2.58
603	PR	2	52	WO	0.84	0.73	0.98	0.20	0.53	0.28	1.07	0.97	0.80	24	11	3	87	24	117	95	2.88
604	PR	2	52	WO	0.81	0.72	0.97	0.19	0.51	0.25	1.03	0.92	0.77	21	9	5	89	24	120	95	2.76

ORDER=15 SPECIES=ROU

OBS	STATE	MC	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	C1	C1	S1	F1	TL
605	CU	11	47	WO	0.78	0.73	0.97	0.20	0.53	0.19	1.00	0.79	0.77	28	9	4	94	26	125	99	2.65
606	CU	11	47	WO	0.77	0.69	0.93	0.20	0.48	0.18	1.02	0.81	0.73	26	9	4	89	26	121	95	2.60
607	EI	5	71	AL	0.81	0.73	1.01	0.22	0.53	0.20	1.08	1.25	0.78	33	10	5	90	27	125	96	3.14
608	EI	5	71	AL	0.77	0.67	0.97	0.20	0.49	0.19	1.01	1.17	0.75	30	9	4	87	26	126	97	2.95
609	FL	11	80	WO	0.73	0.65	0.93	0.21	0.48	0.20	0.97	0.97	0.73	32	7	4	89	29	129	100	2.67
610	FL	11	80	WO	0.71	0.63	0.89	0.20	0.44	0.20	0.95	0.84	0.71	24	7	3	89	29	126	100	2.49
611	FL	11	80	WO	0.76	0.67	0.95	0.21	0.51	0.20	1.01	0.97	0.75	32	10	3	88	28	125	99	2.74
612	FL	11	80	WO	0.75	0.69	0.94	0.20	0.48	0.20	1.02	0.96	0.75	32	9	4	92	27	126	100	2.73
613	FL	11	80	WO	0.70	0.63	0.89	0.20	0.46	0.20	0.96	0.93	0.69	28	7	3	90	29	128	99	2.59
614	FL	11	80	WO	0.77	0.69	0.97	0.21	0.49	0.20	1.05	0.88	0.77	32	9	4	89	28	126	100	2.62
615	FL	11	80	WO	0.73	0.65	0.93	0.20	0.48	0.20	1.00	1.09	0.73	33	8	5	89	28	128	103	2.82
616	FL	12	82	AL	0.77	0.70	0.97	0.21	0.53	0.20	1.08	0.93	0.79	24	10	4	51	28	126	103	2.78
617	FL	12	82	AL	0.75	0.67	0.97	0.21	0.51	0.19	1.05	1.45	0.77	30	10	6	89	28	130	103	3.25
618	FL	12	82	AL	0.77	0.69	0.99	0.22	0.51	0.18	1.07	1.41	0.79	30	10	5	89	29	129	103	3.25
619	FL	12	82	AL	0.76	0.69	0.97	0.22	0.49	0.20	1.05	0.89	0.77	28	12	4	91	29	128	101	2.70
620	FL	12	82	AL	0.68	0.61	0.86	0.19	0.44	0.19	0.91	1.27	0.69	26	7	4	90	28	127	101	2.88
621	FL	12	82	AL	0.74	0.66	0.95	0.22	0.48	0.19	1.02	1.44	0.77	29	9	5	89	30	129	104	3.20
622	FL	12	82	AL	0.77	0.68	0.97	0.21	0.48	0.19	1.01	1.39	0.76	30	10	6	88	28	126	99	2.87
623	FL	12	82	AL	0.77	0.69	0.97	0.22	0.52	0.19	1.05	1.21	0.77	28	9	5	89	29	126	100	3.03
624	FL	12	82	AL	0.77	0.68	0.97	0.21	0.51	0.18	1.02	1.21	0.77	28	10	5	88	28	126	100	3.00
625	FL	12	82	AL	0.77	0.69	0.97	0.21	0.49	0.17	1.04	1.09	0.77	35	10	5	89	27	126	100	2.90
626	FL	9	75	AL	0.79	0.73	0.97	0.21	0.53	0.18	1.05	1.25	0.79	32	9	5	92	27	123	100	3.09
627	FL	9	75	AL	0.79	0.72	1.01	0.21	0.53	0.18	1.10	1.13	0.79	30	10	5	91	26	129	100	3.02
628	FL	9	75	AL	0.79	0.72	0.98	0.22	0.53	0.19	1.07	1.29	0.78	32	15	7	91	28	124	99	3.15
629	FL	9	75	AL	0.78	0.71	0.99	0.21	0.53	0.18	1.05	1.25	0.79	32	11	5	91	27	127	101	3.09
630	FL	9	75	AL	0.77	0.69	0.97	0.22	0.53	0.17	1.03	1.01	0.77	33	11	5	89	29	126	100	2.91
631	FL	9	75	AL	0.78	0.71	0.99	0.22	0.49	0.18	1.09	1.13	0.79	30	11	5	91	29	127	101	3.00
632	FL	9	75	AL	0.74	0.69	0.94	0.21	0.51	0.18	1.03	0.88	0.75	33	11	6	93	29	127	101	2.65
633	FL	9	75	AL	0.77	0.69	0.95	0.21	0.48	0.19	1.05	0.95	0.75	28	12	6	89	28	124	97	2.77
634	FL	9	75	AL	0.80	0.73	1.01	0.23	0.54	0.19	1.09	1.23	0.91	34	12	5	91	29	127	101	3.12
635	FL	9	75	AL	0.79	0.73	0.98	0.21	0.53	0.20	1.05	1.19	0.77	34	11	6	92	27	124	97	3.03
636	FL	12	81	AL	0.73	0.66	0.89	0.20	0.46	0.17	0.97	1.07	0.69	27	10	4	50	27	122	94	2.77
637	FL	12	81	AL	0.81	0.77	1.01	0.24	0.57	0.19	1.13	1.13	0.81	24	11	5	95	30	125	100	3.07
638	FL	12	81	AL	0.81	0.79	1.00	0.23	0.58	0.20	1.14	1.17	0.81	24	12	9	97	29	124	100	3.12
639	FL	12	81	AL	0.81	0.73	0.98	0.22	0.54	0.20	1.09	1.17	0.79	28	11	6	90	27	121	97	3.07
640	RE	4	86	AL	0.74	0.67	0.93	0.21	0.46	0.19	1.01	1.15	0.73	33	9	4	90	29	126	99	2.90
641	RE	4	86	AL	0.77	0.71	0.97	0.20	0.49	0.20	1.05	1.41	0.77	38	11	5	92	26	126	100	3.23
642	RE	4	86	AL	0.73	0.65	0.89	0.23	0.44	0.18	0.98	0.97	0.69	33	10	5	89	28	122	94	2.68
643	RE	4	86	AL	0.65	0.55	0.78	0.18	0.40	0.18	0.83	0.79	0.61	30	5	3	84	28	120	94	2.26

---------- ORDER=16 SPECIES=LON ----------

OBS	STATE	MC	YR	CASTE	HL	HW	SL	EL	PW	MCL	WL	GL	FL	SM	PM	MM	C1	O1	S1	F1	TL
644	AD	8	39	WO	0.65	0.51	1.09	0.19	0.39	0.16	0.91	0.91	0.77	0	4	4	78	30	169	119	2.46
645	BR	3	68	WO	0.66	0.52	1.15	0.20	0.38	0.18	0.95	1.10	0.81	0	5	3	78	31	175	123	2.71
646	BR	3	68	WO	0.67	0.52	1.13	0.20	0.40	0.18	0.94	0.56	0.80	0	3	2	77	30	170	120	2.57
647	FL	6	82	AL	0.69	0.53	1.15	0.20	0.39	0.18	0.99	0.80	0.81	0	3	3	76	29	168	118	2.47
648	FL	6	82	AL	0.65	0.51	1.09	0.20	0.36	0.16	0.93	0.73	0.77	0	4	4	78	31	169	119	2.30
649	FL	6	82	AL	0.67	0.51	1.11	0.20	0.38	0.16	0.95	0.75	0.81	0	3	3	76	29	167	121	2.36
650	FL	6	82	AL	0.67	0.52	1.13	0.19	0.38	0.17	0.97	0.77	0.81	0	3	3	77	29	170	121	2.40
651	FL	3	80	WO	0.67	0.54	1.15	0.20	0.39	0.17	0.99	0.97	0.84	0	4	4	80	30	173	126	2.63
652	FL	3	80	WO	0.65	0.51	1.10	0.19	0.37	0.17	0.97	0.97	0.81	0	5	5	78	30	170	125	2.59
653	FL	3	80	WO	0.67	0.52	1.13	0.20	0.37	0.10	0.99	0.84	0.83	0	4	4	79	30	170	124	2.49
654	FL	3	80	WO	0.71	0.57	1.19	0.22	0.41	0.18	1.05	1.11	0.87	0	5	4	80	31	169	123	2.89
655	MX	4	78	WO	0.65	0.52	1.11	0.20	0.37	0.16	0.91	0.74	0.81	0	4	3	80	30	172	125	2.29
656	MX	4	78	WO	0.65	0.52	1.09	0.20	0.37	0.16	0.93	0.81	0.79	0	3	3	80	31	169	122	2.38
657	MX	12	75	WO	0.66	0.53	1.09	0.19	0.38	0.16	0.97	0.75	0.80	0	5	4	80	29	166	122	2.37
658	MX	12	75	WO	0.64	0.52	1.07	0.20	0.37	0.14	0.91	0.85	0.77	0	5	3	81	31	168	121	2.39

ORDER=1 SPECIES=VIV STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	CI	OI	SI	TL
2	88	88	MA	0.52	0.48	0.59	0.19	0.81	0.57	4	94	37	114	1.89
3	88	88	MA	0.53	0.52	0.63	0.20	0.84	0.80	6	98	38	119	2.16
4	88	88	MA	0.53	0.48	0.58	0.21	0.75	0.98	6	92	39	110	2.25
5	88	88	MA	0.46	0.45	0.54	0.20	0.69	0.77	4	98	42	115	1.92
6	88	88	MA	0.55	0.49	0.59	0.18	0.78	0.89	4	91	33	107	2.21
7	88	88	MA	0.53	0.49	0.63	0.20	0.77	0.70	5	94	38	119	2.07
8	88	88	MA	0.53	0.49	0.62	0.20	0.77	0.75	5	94	38	117	2.04
9	88	88	MA	0.51	0.46	0.59	0.20	0.73	0.73	4	92	40	116	1.96
10	88	88	MA	0.51	0.48	0.57	0.20	0.77	0.67	5	96	40	112	1.94
11	88	88	MA	0.53	0.49	0.63	0.20	0.77	0.61	5	94	38	119	1.90
12	88	88	MA	0.55	0.52	0.61	0.21	0.85	0.77	4	94	39	111	2.16

ORDER=2 SPECIES=TER STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	CI	OI	SI	TL
13	88	88	MA	0.53	0.48	0.61	0.18	0.75	0.85	4	92	35	115	2.12
14	88	88	MA	0.59	0.54	0.69	0.21	0.91	0.88	4	91	36	117	2.37
15	88	88	MA	0.54	0.48	0.61	0.18	0.77	1.05	5	91	33	113	2.35
16	88	88	MA	0.55	0.51	0.61	0.17	0.76	1.01	6	93	31	111	2.31
17	88	88	MA	0.59	0.54	0.69	0.21	0.93	0.89	6	91	35	117	2.40
18	88	88	MA	0.51	0.46	0.59	0.18	0.73	0.93	4	92	35	116	2.16
19	88	88	MA	0.52	0.46	0.57	0.19	0.73	0.94	4	90	37	110	2.18
20	88	88	MA	0.53	0.48	0.59	0.18	0.74	1.01	6	92	35	112	2.27
21	88	88	MA	0.49	0.46	0.57	0.18	0.71	0.99	5	94	37	114	2.21

ORDER=3 SPECIES=CON STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	CI	OI	SI	TL
22	88	88	MA	0.64	0.61	0.74	0.23	0.94	0.73	6	95	37	116	2.30
23	88	88	MA	0.65	0.63	0.74	0.24	0.97	0.85	7	97	37	114	2.46
24	88	88	MA	0.65	0.60	0.70	0.23	0.93	0.81	7	92	36	108	2.38
25	88	88	MA	0.67	0.62	0.74	0.24	1.01	0.69	6	92	36	111	2.36
26	88	88	MA	0.61	0.59	0.71	0.22	0.91	0.93	7	97	37	117	2.34
27	88	88	MA	0.59	0.56	0.67	0.20	0.87	0.81	5	95	34	114	2.26
28	88	88	MA	0.65	0.61	0.73	0.22	0.97	0.85	6	94	34	112	2.40
29	88	88	MA	0.61	0.58	0.68	0.20	0.91	0.71	7	95	33	112	2.24

ORDER=4 SPECIES=FAI STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	CI	OI	SI	TL
30	88	88	MA	0.57	0.51	0.65	0.18	0.83	0.81	4	89	32	114	2.20
31	88	88	MA	0.54	0.49	0.64	0.18	0.81	0.69	6	92	33	119	2.03
32	88	88	MA	0.53	0.47	0.61	0.17	0.75	0.81	7	90	33	115	2.09
33	88	88	MA	0.54	0.48	0.61	0.17	0.76	0.73	7	91	32	113	2.02
34	88	88	MA	0.54	0.46	0.63	0.17	0.78	0.93	7	87	32	117	2.24
35	88	88	MA	0.52	0.47	0.61	0.16	0.74	0.91	5	91	31	118	2.18
36	88	88	MA	0.53	0.47	0.63	0.18	0.73	0.93	7	90	35	119	2.18
37	88	88	MA	0.53	0.47	0.65	0.18	0.79	0.65	7	90	35	123	1.96

ORDER=5 SPECIES=FLA STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	CI	OI	SI	TL
38	88	88	MA	0.53	0.48	0.58	0.18	0.79	0.89	4	92	35	110	2.20
39	88	88	MA	0.51	0.48	0.57	0.18	0.77	0.86	6	95	36	112	2.13
40	88	88	MA	0.49	0.47	0.55	0.17	0.74	0.89	6	96	35	110	2.12
41	88	88	MA	0.48	0.45	0.55	0.17	0.73	0.77	5	94	35	112	1.98
42	88	88	MA	0.48	0.46	0.55	0.17	0.73	0.75	4	96	35	112	1.96
43	88	88	MA	0.48	0.46	0.54	0.17	0.72	0.76	4	96	35	110	1.96
44	88	88	MA	0.48	0.44	0.56	0.17	0.73	0.75	6	92	34	115	1.96

ORDER=5 SPECIES=FLA STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	C1	O1	S1	TL
45	88	88	MA	0.48	0.48	0.55	0.17	0.74	0.77	5	100	35	112	1.99
46	88	88	MA	0.51	0.48	0.58	0.18	0.77	0.81	5	96	36	114	2.00

ORDER=6 SPECIES=PAR STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	C1	O1	S1	TL
47	88	88	MA	0.51	0.48	0.55	0.18	0.73	0.83	0	96	36	108	2.06
48	88	88	MA	0.54	0.48	0.57	0.19	0.75	0.81	0	91	36	106	2.09
49	88	88	MA	0.51	0.46	0.54	0.17	0.69	0.77	1	92	34	106	1.96
50	88	88	MA	0.51	0.46	0.56	0.17	0.75	0.81	0	92	34	110	1.96
51	88	88	MA	0.53	0.48	0.61	0.18	0.79	0.85	0	92	35	115	2.16
52	88	88	MA	0.51	0.49	0.57	0.18	0.73	0.85	0	98	36	112	2.00
53	88	88	MA	0.57	0.56	0.63	0.20	0.85	0.77	0	98	36	111	2.18
54	88	88	MA	0.56	0.55	0.63	0.20	0.85	0.73	0	98	36	113	2.13
55	88	88	MA	0.54	0.48	0.59	0.19	0.73	0.67	0	91	36	109	1.93
56	88	88	MA	0.54	0.48	0.59	0.19	0.73	0.77	0	91	36	109	2.03
57	88	88	MA	0.55	0.50	0.57	0.19	0.77	0.63	0	91	34	104	2.24

ORDER=7 SPECIES=WOJ STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	C1	O1	S1	TL
58	88	88	MA	0.48	0.44	0.48	0.17	0.68	0.54	1	92	35	100	1.70
59	88	88	MA	0.48	0.46	0.53	0.19	0.73	0.68	0	96	38	108	1.89
60	88	88	MA	0.46	0.42	0.51	0.16	0.61	0.76	1	91	35	109	1.83
61	88	88	MA	0.48	0.45	0.51	0.17	0.65	0.73	1	94	35	104	1.86
62	88	88	MA	0.48	0.44	0.52	0.17	0.66	0.79	0	92	35	106	1.93
63	88	88	MA	0.45	0.44	0.49	0.16	0.61	0.61	2	98	36	105	1.67
64	88	88	MA	0.48	0.46	0.49	0.16	0.70	0.57	1	95	33	102	1.75

ORDER=8 SPECIES=AUS STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	C1	O1	S1	TL
65	88	88	MA	0.53	0.48	0.56	0.19	0.70	0.85	3	92	37	106	2.07
66	88	88	MA	0.57	0.52	0.64	0.21	0.86	0.71	3	91	36	112	2.13
67	88	88	MA	0.57	0.55	0.63	0.20	0.89	1.09	2	96	36	111	2.55
68	88	88	MA	0.55	0.52	0.62	0.20	0.86	1.01	3	94	37	113	2.41

ORDER=9 SPECIES=ARE STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	C1	O1	S1	TL
69	88	88	MA	0.55	0.53	0.61	0.21	0.86	1.01	3	96	39	111	2.41
70	88	88	MA	0.51	0.51	0.59	0.18	0.81	0.91	4	100	36	116	2.22
71	88	88	MA	0.49	0.46	0.54	0.20	0.73	0.65	0	94	41	108	1.87
72	88	88	MA	0.52	0.49	0.57	0.20	0.78	0.80	2	96	39	110	2.09
73	88	88	MA	0.53	0.52	0.58	0.20	0.81	0.73	1	98	38	110	2.06
74	88	88	MA	0.57	0.53	0.62	0.20	0.77	0.89	7	93	35	109	2.22
75	88	88	MA	0.57	0.54	0.62	0.20	0.78	1.05	6	95	36	109	2.39
76	88	88	MA	0.58	0.53	0.62	0.19	0.78	0.85	8	91	32	107	2.20
77	88	88	MA	0.56	0.52	0.61	0.19	0.81	0.89	13	93	35	109	2.25

ORDER=10 SPECIES=PMA STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	C1	O1	S1	TL
78	88	88	MA	0.49	0.48	0.55	0.17	0.81	0.64	0	98	35	110	1.94
79	88	88	MA	0.53	0.49	0.58	0.20	0.83	0.65	0	94	38	110	2.00
80	88	88	MA	0.52	0.49	0.57	0.20	0.77	0.77	0	96	39	110	2.05
81	88	88	MA	0.51	0.51	0.57	0.20	0.80	0.81	0	100	40	112	2.13
82	88	88	MA	0.49	0.48	0.54	0.18	0.73	0.70	0	98	37	108	1.92
83	88	88	MA	0.48	0.48	0.54	0.18	0.77	0.69	0	100	37	110	1.94
84	88	88	MA	0.53	0.53	0.60	0.20	0.79	0.83	0	100	38	113	1.94
85	88	88	MA	0.52	0.52	0.57	0.20	0.79	0.69	0	100	38	110	1.99

ORDER=11 SPECIES=BRU STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	CI	OI	SI	TL
86	88	88	MA	0.61	0.55	0.73	0.21	0.97	1.25	7	90	35	120	2.83
87	88	80	MA	0.62	0.57	0.78	0.22	1.01	1.29	8	92	36	126	2.92
88	88	88	MA	0.66	0.61	0.85	0.23	1.09	1.54	9	92	35	129	3.28
89	88	88	MA	0.69	0.63	0.86	0.24	1.09	1.49	10	91	35	125	3.27
90	88	88	MA	0.69	0.61	0.89	0.23	1.09	1.43	10	88	34	129	3.21
91	88	88	MA	0.65	0.57	0.85	0.23	1.05	1.25	7	87	36	131	2.95
92	88	88	MA	0.61	0.55	0.77	0.21	0.96	1.15	7	90	35	127	2.72
93	88	88	MA	0.61	0.54	0.76	0.19	0.95	1.05	8	88	32	125	2.61

ORDER=12 SPECIES=HYS STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	CI	OI	SI	TL
94	88	88	MA	0.61	0.53	0.81	0.17	0.97	0.99	20	87	28	133	2.57
95	88	80	MA	0.61	0.55	0.81	0.18	0.91	0.98	16	90	30	133	2.49
96	88	88	MA	0.58	0.51	0.77	0.17	0.85	0.91	19	88	30	133	2.33
97	88	88	MA	0.61	0.53	0.83	0.19	0.88	0.97	16	87	32	137	2.45
98	88	88	MA	0.61	0.54	0.81	0.18	0.80	0.80	15	88	30	133	2.36
99	88	88	MA	0.58	0.54	0.76	0.18	0.89	0.85	18	93	32	132	2.30
100	88	88	MA	0.62	0.56	0.84	0.19	0.97	1.05	19	90	31	136	2.64
101	88	88	MA	0.63	0.55	0.85	0.19	1.00	1.01	16	87	31	135	2.64
102	88	88	MA	0.62	0.55	0.83	0.19	0.98	1.08	21	89	31	134	2.68

ORDER=14 SPECIES=PUB STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	CI	OI	SI	TL
103	88	88	MA	0.66	0.63	0.93	0.26	1.01	0.97	18	95	40	142	2.64
104	88	88	MA	0.66	0.64	0.93	0.26	1.09	1.26	17	97	40	142	3.01
105	88	88	MA	0.69	0.67	0.98	0.28	1.13	1.17	19	97	41	143	2.99
106	88	88	MA	0.69	0.65	0.97	0.28	1.11	1.17	16	94	41	141	2.97
107	88	88	MA	0.68	0.65	0.98	0.28	1.11	1.37	10	96	42	145	3.16
108	88	88	MA	0.67	0.64	0.97	0.27	1.13	1.17	17	95	41	145	2.97

ORDER=15 SPECIES=BOV STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	CI	OI	SI	TL
109	88	88	MA	0.58	0.58	0.74	0.27	0.97	0.93	15	100	46	128	2.47
110	88	88	MA	0.65	0.65	0.85	0.29	1.09	1.01	13	100	45	131	2.75
111	88	88	MA	0.59	0.59	0.80	0.28	0.97	0.93	13	100	48	136	2.48
112	88	88	MA	0.61	0.61	0.81	0.28	1.02	1.13	16	100	47	133	2.76
113	88	88	MA	0.59	0.60	0.77	0.27	1.03	0.89	12	102	47	131	2.51
114	88	88	MA	0.61	0.62	0.82	0.28	1.05	0.89	10	100	47	135	2.55
115	88	88	MA	0.65	0.65	0.86	0.29	1.07	1.05	10	100	45	133	2.77
116	88	88	MA	0.65	0.65	0.07	0.28	1.09	1.01	16	100	44	134	2.75

ORDER=16 SPECIES=LON STATE=ZZ

OBS	MO	YR	CASTE	HL	HW	SL	EL	WL	GL	SM	CI	OI	SI	TL
117	88	88	MA	0.57	0.57	0.97	0.22	1.01	0.83	0	100	39	171	2.40
118	88	88	MA	0.57	0.54	0.95	0.24	0.95	0.73	0	95	43	168	2.24
119	88	88	MA	0.57	0.57	0.97	0.23	0.97	0.89	0	100	41	171	2.42
120	88	88	MA	0.57	0.57	0.97	0.24	0.99	0.89	0	100	42	171	2.44
121	88	88	MA	0.56	0.54	0.97	0.24	0.99	0.85	0	96	42	173	2.40
122	88	88	MA	0.57	0.54	0.95	0.24	0.94	0.87	0	95	43	168	2.37
123	88	88	MA	0.57	0.54	0.97	0.24	0.93	0.79	0	95	43	171	2.28
124	88	88	MA	0.55	0.53	0.95	0.24	0.92	0.85	0	96	44	174	2.31

Conventions for abbreviations:

1. State abbreviations are U.S. Postal Service standardized two-letter codes.

2. Measurement abbreviations are as listed in Chapter III.

3. Species abbreviations are first three letters of specific names.

4. Caste abbreviations:
   AL--alate present in series
   WO--workers only in series

5. Others:
   BR--Bermuda
   FU--Fukuoka, Japan
   HG--Hyogo, Japan
   ON--Ontario, Canada
   CH--Chihuahua, Mexico
   HI--Hidalgo, Mexico
   NL--Neuvo Léon, Mexico
   GU--Guerrero
   RE--Retaluleu, Guatemala (*guatemalensis* data)
   RE--Réunion Island, Indian Ocean (*bourbonica* data)
   CU--Havana, Cuba
   EI--Easter Island
   AD--Addan, Arabia
   BR--Brazil
   MX--Mexico
   ZZ--states not tabulated for males

APPENDIX B
SUMMARY STATISTICS OF MEASUREMENTS LISTED IN APPENDIX A

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
ORDER=1 SPECIES=VIV									
TL	56	2.28596601	0.17957267	1.89098990	2.63636364	0.02399641	128.0141414	0.03224635	7.855
HL	58	0.62180425	0.03404875	0.54545455	0.68686869	0.00447082	36.0646465	0.00115932	5.476
HW	58	0.53340300	0.03702311	0.44444444	0.66666061	0.00486137	30.9373737	0.00137071	6.941
SL	58	0.69818878	0.04102297	0.60606061	0.76767677	0.00538658	40.4949495	0.00168288	5.876
EL	58	0.15579937	0.01141594	0.13131313	0.17171717	0.00149899	9.0363636	0.00130382	7.327
PW	57	0.38408648	0.03059996	0.32323232	0.44444444	0.00405306	21.8929293	0.00093616	7.967
MCL	57	0.16140351	0.01420150	0.12121212	0.19191919	0.00188103	9.2000000	0.00020168	8.799
WL	57	0.77476520	0.05262304	0.65656566	0.89898990	0.00697020	44.1615162	0.00276927	6.792
FL	58	0.55363905	0.03617100	0.46464646	0.61616162	0.00474948	32.1111111	0.00130034	6.533
GL	57	0.88809809	0.13566708	0.56565657	1.17171717	0.01796954	50.6666667	0.01840556	15.263
SM	58	7.34462759	0.73869786	6.00000000	9.00000000	0.09699578	426.0000000	0.54567453	10.057
PM	57	4.91220070	1.00500003	3.00000000	7.00000000	0.13311551	280.0000000	1.01002506	20.459
MM	57	3.36842105	0.89903875	2.00000000	5.00000000	0.11908059	192.0000000	0.80827068	26.690
CI	58	85.72729178	1.96268048	80.00000000	90.62500000	0.25771257	4972.1830393	3.85211465	2.289
OI	58	25.05869661	1.29713746	21.31147541	26.78571429	0.17032249	1453.4044034	1.68256559	5.176
SI	58	112.28222424	2.41276000	105.17241379	118.03278689	0.31601091	6512.3690058	5.82141081	2.149
FI	58	89.01503044	2.61607670	82.75862069	93.44262295	0.34350770	5162.9181658	6.84385728	2.939
ORDER=2 SPECIES=TER									
TL	41	2.32323232	0.27647075	1.08860887	3.03030303	0.04317748	95.2525253	0.07643608	11.900
HL	41	0.61295806	0.04491481	0.53535354	0.72727273	0.00701451	25.1313131	0.00201734	7.328
HW	41	0.52362651	0.04626929	0.44444444	0.62626263	0.00722605	21.4686869	0.00214085	8.836
SL	41	0.68705415	0.06474916	0.57575758	0.83838384	0.01011212	28.2020202	0.00419245	9.413
EL	41	0.13956516	0.00977116	0.11111111	0.15555556	0.00152600	5.5171717	0.00009548	7.261
PW	41	0.37457502	0.03636637	0.30303030	0.44444444	0.00567947	15.3575758	0.00132251	9.709
MCL	41	0.16380273	0.01752573	0.12121212	0.19191919	0.00271706	6.7191919	0.00030715	10.694
WL	41	0.75712939	0.07479141	0.66666465	0.92929291	0.01168046	31.0505051	0.00559375	9.876
FL	41	0.54249815	0.05326997	0.45454545	0.66666667	0.00831937	22.2424242	0.00283769	9.819
GL	41	0.95294407	0.20166142	0.66666061	1.37371717	0.03149472	39.0707071	0.04066733	21.162
SM	41	8.02439024	1.17234391	5.00000000	10.00000000	0.18303936	329.0000000	1.17439024	14.610
PM	41	4.43902439	0.86743243	3.00000000	6.00000000	0.13547015	182.0000000	0.75243902	19.541
MM	41	2.78040780	0.61207010	2.00000000	4.00000000	0.09571423	114.0000000	0.37560976	22.042
CI	41	85.35113154	2.26100497	80.35714286	91.80327869	0.35342200	3499.3964752	5.12119148	2.651
OI	41	21.98051134	1.07234564	19.64285714	24.07407407	0.17059570	901.2017849	1.19321826	4.970
SI	41	112.07420738	3.14560791	106.45161290	118.46151846	0.49122266	4595.0425024	9.89610743	2.807
FI	41	88.37320175	3.02162101	82.75862069	92.54705882	0.47189792	3623.3012710	9.13019354	3.419

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
				ORDER=3	SPECIES=CON				
TL	41	2.47844297	0.20517432	2.13131313	3.10101010	0.01204285	101.6161616	0.04209650	8.278
HL	41	0.67824587	0.03659864	0.60606061	0.75757576	0.00571575	27.8090000	0.00133246	5.396
HW	41	0.58216309	0.04026213	0.49494949	0.64646465	0.00628789	23.8686869	0.00162104	6.916
SL	41	0.78492239	0.03767581	0.70707071	0.84848485	0.00588397	32.1818182	0.00141947	4.800
EL	41	0.17368810	0.01134274	0.15151515	0.20202020	0.00177144	7.1212121	0.00012866	6.531
PW	41	0.42522789	0.03062163	0.37373737	0.49494949	0.00478230	17.4343434	0.00093760	7.201
MCL	41	0.18181818	0.01173631	0.16161616	0.20202020	0.00183290	7.4545455	0.00013774	6.455
WL	41	0.85390490	0.04601770	0.72727273	0.92929293	0.00718676	35.0101010	0.00211763	5.389
FL	41	0.62700172	0.03516474	0.56565657	0.70707071	0.00549181	25.7070707	0.00123656	5.608
GL	41	0.96629219	0.15986932	0.64646465	1.41414141	0.02481122	38.7979798	0.02523946	16.789
SM	41	10.70731707	2.14760218	7.00000000	16.00000000	0.33539911	439.0000000	4.61219512	20.057
PM	41	5.41463415	1.02409984	4.00000000	8.00000000	0.15993752	222.0000000	1.04878049	18.914
MM	41	3.43902439	0.80773690	2.00000000	6.00000000	0.12614732	141.0000000	0.65243902	23.487
CI	41	85.77742099	2.01280216	80.32786885	90.14084507	0.31434609	3516.8742605	4.05137294	2.347
OI	41	25.60665104	0.88304195	23.94366197	27.77777778	0.13790798	1049.8727255	0.77976708	3.448
SI	41	115.79134511	2.71519679	109.72222222	125.00000000	0.42404250	4747.4451494	7.37229360	2.345
FI	41	92.45668647	2.10050319	87.50000000	96.92307692	0.32804349	3790.7241454	4.41211365	2.272
				ORDER=4	SPECIES=FAI				
TL	40	2.30833333	0.24504313	1.83838384	3.00000000	0.03874472	92.3333333	0.06004614	10.616
HL	40	0.62870788	0.04469274	0.52525253	0.68686869	0.00706654	25.1515152	0.00199744	7.108
HW	40	0.53686869	0.04276625	0.44444444	0.60606061	0.00676195	21.4747475	0.00182896	7.966
SL	40	0.72297980	0.04557023	0.62626263	0.79797980	0.07205529	28.9191919	0.00207665	6.303
EL	40	0.14051152	0.01147995	0.12121212	0.16161616	0.00181514	5.6060606	0.00013179	8.191
PW	40	0.38232323	0.03397043	0.29292929	0.44444444	0.00537120	15.2929293	0.00115399	8.885
MCL	39	0.17301217	0.01334820	0.14141414	0.20202020	0.00213742	6.7474747	0.00017817	7.715
WL	40	0.77398990	0.06242155	0.64646465	0.88888889	0.00986971	30.9595960	0.00389645	8.065
FL	40	0.57196970	0.04314016	0.47474747	0.64646465	0.00682106	22.8787879	0.00186107	7.542
GL	40	0.90555556	0.19356226	0.56565657	1.49494949	0.03060488	36.2222222	0.03746635	21.375
SM	40	9.92500000	1.11832063	8.00000000	13.00000000	0.17682202	397.0000000	1.25064103	11.268
PM	40	3.80000000	0.93917585	2.00000000	6.00000000	0.14849674	152.0000000	0.88205128	24.715
MM	40	2.65800000	0.76961529	2.00000000	5.00000000	0.12168686	106.0000000	0.59230769	29.042
CI	40	85.34718070	1.87911560	81.48148148	89.55223881	0.29711426	3413.8872281	3.53107542	2.202
OI	40	22.29101522	0.94376267	20.00000000	23.88059701	0.14922198	891.6414090	0.89068797	4.234
SI	40	115.05757373	1.87339931	111.76470588	119.29824561	0.29621044	4602.3029491	3.50362496	1.628
FI	40	90.96289951	2.35275642	86.66666667	96.96969697	0.37200353	3638.5159805	5.53546513	2.597
				ORDER=5	SPECIES=FLA				
TL	45	2.24359147	0.24270663	1.70707071	2.80808081	0.03610057	100.9616162	0.05890651	10.818
HL	45	0.60071829	0.03290386	0.50505051	0.66666667	0.00490502	27.0323232	0.00108266	5.477
HW	45	0.52817059	0.03897985	0.41414141	0.60606061	0.00581077	23.7676768	0.00151943	7.380
SL	45	0.65760777	0.03598558	0.54545455	0.72727273	0.00536441	29.5959596	0.00129496	5.472
EL	45	0.13890011	0.01101600	0.11111111	0.16161616	0.00164217	6.2505051	0.00012135	7.931
PW	45	0.36586103	0.02501160	0.29292929	0.41414141	0.00372851	16.4646465	0.00062558	6.836
MCL	45	0.15340067	0.01052728	0.13131313	0.17171717	0.00156931	6.9030303	0.00011082	6.863
WL	45	0.72255892	0.05021034	0.56565657	0.81818182	0.00748492	32.5151515	0.00252108	6.945
FL	45	0.51335578	0.02931421	0.42424242	0.57575758	0.00436990	23.1010101	0.00085932	5.710
GL	45	0.92011425	0.18948999	0.63636364	1.33333333	0.02824750	41.4141414	0.03590646	20.590
SM	45	7.95555556	1.50688055	5.00000000	12.00000000	0.22463338	358.0000000	2.27070707	18.941
PM	45	2.77777778	0.63564173	2.00000000	4.00000000	0.09475587	125.0000000	0.40404040	22.883
MM	45	2.37777778	0.53465745	2.00000000	4.00000000	0.07970203	107.0000000	0.28585859	22.486
CI	45	87.85455533	2.74324884	81.66666667	93.54838710	0.40893790	3953.4725401	7.52535934	3.122
OI	45	23.10683136	1.04862130	21.42857143	25.42372881	0.15636396	1039.8074110	1.10023590	4.539
SI	45	109.51579758	2.78440725	104.91803279	116.12903226	0.41507493	4928.3308910	7.75292376	2.542
FI	45	85.48219051	2.49267141	79.68750000	91.93548387	0.37158552	3846.6985730	6.21341070	2.916

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
				ORDER=6	SPECIES=PAR				
TL	52	2.19327894	0.16354878	1.77777778	2.67676768	0.02545364	114.0505051	0.03369016	8.369
HL	52	0.59965035	0.02615959	0.54545455	0.65656566	0.00362767	31.1818182	0.00068432	4.362
HW	52	0.51371776	0.03206902	0.44444444	0.58585859	0.00443717	26.7171717	0.00102842	6.242
SL	52	0.64316739	0.03140301	0.56565657	0.70707071	0.00436591	33.4444444	0.00099118	4.895
EL	52	0.14704740	0.01084845	0.12121212	0.16161616	0.00150441	7.6464646	0.00011769	7.378
PW	52	0.37315462	0.02420399	0.33333333	0.43434343	0.00335648	19.4040404	0.00058593	6.486
MCL	52	0.16297501	0.01312123	0.13131313	0.20202020	0.00181959	8.4747475	0.00017217	8.051
WL	52	0.71600622	0.03948519	0.63636364	0.80808081	0.00547561	37.2323232	0.00155908	5.515
FL	52	0.51845377	0.02703891	0.46464646	0.57575758	0.00374962	26.9595960	0.00073110	5.215
GL	52	0.87762238	0.13958661	0.54545455	1.21212121	0.01935718	45.6363636	0.01948442	15.905
SM	52	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00000000	.
PM	52	3.92307692	0.92558734	2.00000000	6.00000000	0.12835587	204.0000000	0.85671192	23.593
MM	52	2.80769231	0.62742741	2.00000000	4.00000000	0.08700853	146.0000000	0.39366516	22.347
CI	52	85.63117335	2.34515337	78.57142857	90.62500000	0.32521426	4452.8210140	5.49974431	2.739
OI	52	24.50907656	1.22652988	21.42857143	26.66666667	0.17008909	1274.4719813	1.50437555	5.004
SI	52	107.27481025	3.13949127	100.00000000	115.25423729	0.43536911	5578.2901230	9.85640543	2.927
FI	52	86.45164597	2.17013933	81.25000000	90.32258065	0.30094418	4495.4855902	4.70950470	2.510
				ORDER=7	SPECIES=WOJ				
TL	44	1.95293048	0.16945606	1.48484848	2.29292929	0.02554646	85.9292929	0.02871536	8.677
HL	44	0.53879706	0.02263306	0.48484848	0.57575758	0.00341206	23.7070707	0.00051226	4.201
HW	44	0.44444444	0.01835586	0.40404040	0.48484848	0.00276725	19.5555556	0.00033694	4.130
SL	44	0.56932966	0.02079137	0.52525253	0.61616162	0.00313442	25.0505051	0.00043228	3.652
EL	44	0.12920110	0.00623741	0.11111111	0.14141414	0.00094033	5.6848485	0.00003891	4.828
PW	44	0.33379247	0.01570209	0.30303030	0.36363636	0.00236718	14.6868687	0.00024656	4.704
MCL	44	0.13452709	0.00889454	0.12121212	0.15151515	0.00121879	5.9191919	0.00006536	6.610
WL	44	0.64141414	0.02785508	0.58585859	0.70707071	0.00419931	28.2222222	0.00077591	4.343
FL	44	0.45064279	0.01476697	0.40404040	0.48484848	0.00282923	19.8282828	0.00035220	4.164
GL	44	0.77272727	0.14764456	0.40404040	1.01010101	0.02225825	34.0000000	0.02179891	19.107
SM	44	2.00000000	0.94006432	0.00000000	4.00000000	0.14172003	88.0000000	0.88372093	47.003
PM	44	2.81818182	0.62030477	2.00000000	4.00000000	0.09351446	124.0000000	0.38477801	22.011
MM	44	2.27272727	0.49947118	2.00000000	4.00000000	0.07529811	100.0000000	0.24947146	21.977
CI	44	82.51522672	2.00827755	78.18181818	86.53846154	0.30275923	3630.6699757	4.03317871	2.434
OI	44	23.99089776	0.95584454	21.75438596	26.41509434	0.14409899	1055.5905016	0.91363878	3.984
SI	44	105.71979391	2.53168819	100.00000000	112.00000000	0.38166636	4651.6709322	6.40044510	2.395
FI	44	83.66303562	1.98006260	80.00000000	88.00000000	0.29850567	3681.1735673	3.92064790	2.367
				ORDER=8	SPECIES=AUS				
TL	64	2.38210227	0.23053915	1.94949495	3.04040404	0.02881739	152.4545455	0.05314830	9.678
HL	64	0.63715278	0.03560140	0.55555556	0.68686869	0.00445017	40.7777778	0.00126746	5.588
HW	64	0.53330177	0.03613756	0.45454545	0.59595960	0.00451720	34.1313131	0.00130592	6.776
SL	64	0.69034091	0.03044799	0.59595960	0.74747475	0.00380600	44.1818182	0.00092708	4.411
EL	64	0.14826189	0.01234680	0.12121212	0.17171717	0.00154336	9.4848889	0.00015245	8.328
PW	64	0.39236111	0.02609428	0.33333333	0.44444444	0.00326178	25.1111111	0.00068091	6.651
MCL	64	0.15852273	0.01211035	0.12121212	0.18181818	0.00151379	10.1454545	0.00014666	7.640
WL	64	0.76357323	0.04934433	0.64646465	0.84848485	0.00616804	48.8686869	0.00243486	6.462
FL	64	0.55429293	0.02629714	0.47474747	0.60606061	0.00328714	35.4747475	0.00069154	4.744
GL	64	0.98137626	0.18000206	0.68686869	1.55555556	0.02250036	62.8080808	0.03240103	18.342
SM	64	4.32812500	1.32203172	2.00000000	9.00000000	0.16525396	277.0000000	1.74776786	30.545
PM	64	3.23437500	0.72903910	2.00000000	5.00000000	0.09112989	207.0000000	0.53149802	22.540
MM	64	2.79687500	0.44292274	2.00000000	4.00000000	0.05536534	179.0000000	0.19618056	15.836
CI	64	83.66255620	2.02729645	79.03225806	89.23076923	0.25341206	5354.4957566	4.10993088	2.423
OI	64	23.27595210	1.54309950	19.11764706	26.56250000	0.19298744	1489.6609345	2.38362566	6.633
SI	64	108.46800987	3.52906157	100.00000000	119.64285714	0.44113270	6941.9576876	12.45427559	3.254
FI	64	87.08741085	3.08791590	80.59701493	94.64285714	0.38598949	5573.5942943	9.53522458	3.546

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
				ORDER=9	SPECIES=ARE				
TL	61	2.27587349	0.20603371	1.91919192	2.74747475	0.02637991	138.8262828	0.04244989	9.053
HL	61	0.61765193	0.04077423	0.55555556	0.70707071	0.00522061	37.6767677	0.00166254	6.601
HW	61	0.53863222	0.04435277	0.47474747	0.64646465	0.00567879	32.8565657	0.00196717	8.234
SL	61	0.71071369	0.05130705	0.61636364	0.84848485	0.00656930	43.3535354	0.00263250	7.219
EL	61	0.15575467	0.00991550	0.14141414	0.19191919	0.00126955	9.7474747	0.00009832	6.205
PW	61	0.38205001	0.02057497	0.33333333	0.44444444	0.00263865	23.3050505	0.00081653	7.479
MCL	61	0.18986587	0.01470957	0.16161616	0.21212121	0.00188337	11.5818182	0.00021637	7.747
WL	61	0.79317768	0.05430330	0.68686869	0.90909091	0.00696307	48.3830304	0.00295754	6.856
FL	61	0.57542640	0.03929311	0.49494949	0.67676768	0.00501097	35.1010101	0.00154395	6.829
GL	61	0.86504380	0.15700473	0.56565657	1.29292929	0.02020483	52.7676768	0.02490213	18.242
SM	61	10.57377049	2.67991925	5.00000000	17.00000000	0.34312850	645.0000000	7.18196721	25.345
PM	61	5.88524590	1.10460065	4.00000000	9.00000000	0.15167257	359.0000000	1.40327869	20.128
MM	61	3.54098361	0.99287076	2.00000000	7.00000000	0.12712407	216.0000000	0.98579235	28.039
CI	61	87.15556610	2.96088202	78.78787879	92.18750000	0.37910221	5316.4895320	8.76682767	3.397
OI	61	25.90095228	1.09541249	23.33333333	28.07017544	0.14025320	1579.9580089	1.19992953	4.229
SI	61	115.06720212	3.25429712	110.16949153	127.27272727	0.41667005	7019.0993294	10.59044977	2.828
FI	61	93.18561509	2.59867534	87.50000000	101.61290323	0.33277628	5684.3225203	6.75311355	2.789
				ORDER=10	SPECIES=PHA				
TL	37	1.99972700	0.11500883	1.77777778	2.26262626	0.01890734	73.9898990	0.01322703	5.751
HL	37	0.57821458	0.01416653	0.56565657	0.60606061	0.00232896	21.3919394	0.00020069	2.450
HW	37	0.49484029	0.01796192	0.46464646	0.54545455	0.00295292	18.3090909	0.00032263	3.630
SL	37	0.67458367	0.01965233	0.64646465	0.72727273	0.00323082	24.9595960	0.00038621	2.913
EL	37	0.14982255	0.00627229	0.14141414	0.16161616	0.00103116	5.5434343	0.00003934	4.186
PW	37	0.34752935	0.01514393	0.32323232	0.38383838	0.00249965	12.8585859	0.00022934	4.358
MCL	37	0.16505597	0.00615093	0.16161616	0.18181818	0.00101121	6.1070707	0.00003783	3.727
WL	37	0.72317772	0.02602189	0.68686869	0.76767677	0.00427797	26.7575758	0.00067714	3.598
FL	37	0.54627155	0.01723077	0.51515152	0.58585859	0.00283272	20.2121212	0.00029690	3.154
GL	37	0.69833470	0.09252101	0.52525253	0.88888889	0.01521036	25.8383838	0.00856014	13.249
SM	37	1.83783784	1.09124903	0.00000000	4.00000000	0.17972917	68.0000000	1.19519520	59.446
PM	37	4.45945946	0.55750409	4.00000000	6.00000000	0.09165811	165.0000000	0.31081081	12.502
MM	37	2.94594595	0.40455366	2.00000000	4.00000000	0.06650821	109.0000000	0.16366366	13.733
CI	37	85.57496107	2.01501199	80.00000000	90.00000000	0.33126593	3166.2735594	4.06027331	2.155
OI	37	25.90836035	0.78782614	24.56140351	27.11864407	0.12951732	958.6083331	0.62067003	3.041
SI	37	116.66860297	1.97904949	113.33333333	121.42857143	0.32515373	4316.7393098	3.91663690	1.696
FI	37	94.47706113	1.95702992	91.07142857	100.00000000	0.32173174	3495.6513727	3.82996609	2.071
				ORDER=11	SPECIES=BRO				
TL	31	2.75495905	0.27625807	2.34343434	3.37373737	0.04961741	85.4040404	0.07631852	10.028
HL	31	0.72466601	0.06377611	0.60606061	0.83838384	0.01145453	22.4646465	0.00406719	8.801
HW	31	0.61779081	0.06259893	0.52525253	0.72727273	0.01124310	19.1515152	0.00391863	10.133
SL	31	0.82502444	0.07246643	0.68686869	0.96969697	0.01427259	25.5757576	0.00631491	9.632
EL	31	0.15444770	0.01455630	0.12121212	0.18181818	0.00261620	4.7878788	0.00021210	9.431
PW	31	0.44574780	0.05155422	0.36363636	0.55555556	0.00925941	13.8181819	0.00265784	11.566
MCL	31	0.21212121	0.01669979	0.18181818	0.24242424	0.00299937	6.5757576	0.00027888	7.873
WL	31	0.89564158	0.08992870	0.76767677	1.07070707	0.01615167	27.8888889	0.00808717	9.996
FL	31	0.67448580	0.06089006	0.54545455	0.78787879	0.01237302	20.9090909	0.00474584	10.214
GL	31	1.13066145	0.17189448	0.88888889	1.51515152	0.03086598	35.0505051	0.02953176	15.199
SM	31	16.03225806	1.77921089	13.00000000	19.00000000	0.31955571	497.0000000	3.16559140	11.098
PM	31	5.32258065	1.68101352	6.00000000	13.00000000	0.30191894	280.0000000	2.82580645	18.032
MM	31	4.67741935	1.39969275	3.00000000	8.00000000	0.25110224	145.0000000	1.95913978	29.924
CI	31	85.17793485	2.25333877	81.01265823	90.00000000	0.40582039	2640.5161044	5.10036490	2.651
OI	31	21.37647175	1.79031402	16.66666667	25.00000000	0.32154989	662.6706864	3.20522428	8.375
SI	31	113.77710614	2.73598624	107.35294118	118.75000000	0.49119764	3527.7102903	7.49562072	2.404
FI	31	93.00388415	3.19156972	86.11111111	98.68421053	0.57332284	2883.1204085	10.18611730	3.432

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
				ORDER=12	SPECIES=HYS				
TL	18	2.65824916	0.16892455	2.35153535	2.93939394	0.03981590	47.8484848	0.02853550	6.355
HL	18	0.68294052	0.02796247	0.62626263	0.72727273	0.00659082	12.2929293	0.00078190	4.094
HW	18	0.57631874	0.02716407	0.52525253	0.62626263	0.00640263	10.3737374	0.00073789	4.713
SL	18	0.09057219	0.04175547	0.00808081	0.94949495	0.00984186	16.0303030	0.00173352	4.689
EL	18	0.14070912	0.00849047	0.13131313	0.16161616	0.00200122	2.6767677	0.00007209	5.709
PW	18	0.41575309	0.01904665	0.37373737	0.44444444	0.00448034	7.5555556	0.00036277	4.538
MCL	18	0.19349046	0.01135540	0.16565657	0.20202020	0.00267649	3.4828283	0.00012895	5.869
WL	18	0.90067340	0.04816317	0.80808081	0.97979798	0.01135217	16.2121212	0.00231969	5.347
FL	18	0.67557351	0.03580571	0.60606061	0.72727273	0.00843949	12.2323232	0.00128205	5.269
GL	18	1.07463524	0.13392166	0.76767677	1.25252525	0.03156564	19.3434343	0.01793501	12.462
SM	18	23.55555556	2.81220496	17.00000000	29.00000000	0.66284107	424.0000000	7.90843673	11.939
PM	18	14.55555556	2.43073996	9.00000000	18.00000000	0.57293090	262.0000000	5.90849673	16.700
MM	18	6.77777778	1.59246592	4.00000000	10.00000000	0.37534782	122.0000000	2.53594771	23.495
CI	18	84.38472245	1.80230506	81.15942029	88.23529412	0.42480738	1518.9250040	3.24810354	2.136
DI	18	21.78085288	1.01657826	19.40298507	23.43750000	0.23960979	392.0553518	1.03343136	4.667
SI	18	130.42511572	3.96458193	119.40290507	135.29411765	0.91080070	2347.6520830	14.93499349	2.963
FI	18	59.49973200	3.05182141	89.55323881	102.94117647	0.71912120	1790.9951761	9.31361393	3.067
				ORDER=13	SPECIES=GUA				
TL	36	2.23232323	0.19605324	1.90909091	2.69696970	0.03267654	80.3636364	0.03843923	8.783
HL	36	0.59884885	0.02191510	0.55555556	0.63636364	0.00365252	21.5454545	0.00048027	3.662
HW	36	0.48456790	0.02468170	0.44444444	0.52525253	0.00411362	17.4444444	0.00060919	5.094
SL	36	0.73120090	0.02766568	0.68686869	0.77777778	0.00461095	26.3232323	0.00076539	3.784
EL	36	0.14646465	0.00744231	0.13131313	0.16161616	0.00124038	5.2727273	0.00005539	5.081
PW	36	0.36869687	0.02204322	0.32323232	0.40404040	0.00367220	13.2727273	0.00052181	6.196
MCL	35	0.16346320	0.01330496	0.14141414	0.19191919	0.00224895	5.7212121	0.00017702	8.139
WL	36	0.77805836	0.03261825	0.71717172	0.84848485	0.00543630	28.0101010	0.00106395	4.192
FL	36	0.57042649	0.02991440	0.50505051	0.63636364	0.00498573	20.5353535	0.00089487	5.244
GL	36	0.85578002	0.16081350	0.56565657	1.21212121	0.02680225	30.8080000	0.02586098	18.791
SM	36	20.77777778	2.05789228	17.00000000	25.00000000	0.34298205	748.0000000	4.23492063	9.904
PM	36	4.52777778	1.10405134	3.00000000	7.00000000	0.18467522	163.0000000	1.22777778	24.472
MM	36	2.33333333	0.47809144	2.00000000	3.00000000	0.07968191	84.0000000	0.22857143	20.490
CI	36	80.94058006	2.03473461	77.19298246	85.96491228	0.33912244	2913.8600821	4.14014493	2.514
DI	36	24.47077948	0.81694503	23.21420571	26.31578947	0.13615750	880.9480611	0.66739918	3.338
SI	36	122.19651517	2.56445742	116.66666667	126.66666667	0.42740957	4399.0745460	6.57644188	2.099
FI	36	95.27604145	2.42123130	90.90909091	100.00000000	0.40353855	3429.9374920	5.86236103	2.541
				ORDER=14	SPECIES=POB				
TL	35	2.86118326	0.11657661	2.54545455	3.10101010	0.01970504	100.1414141	0.01359011	4.074
HL	35	0.79769130	0.02431235	0.76767677	0.88484848	0.00410954	27.9191919	0.00059109	3.048
HW	35	0.65898990	0.03211096	0.64646465	0.76767677	0.00542773	24.4646465	0.00103111	4.594
SL	35	0.96017316	0.02694204	0.90909091	1.01010101	0.00455404	33.6060606	0.00072587	2.806
EL	35	0.20000000	0.00726744	0.18181818	0.21212121	0.00122842	7.0000000	0.00005282	3.634
PW	35	0.51197591	0.02875543	0.46464646	0.56565657	0.00486056	17.9191919	0.00082687	5.617
MCL	35	0.26060606	0.01862534	0.23232323	0.29292929	0.00314826	9.1212121	0.00034690	7.147
WL	35	1.03116883	0.03570166	0.96969697	1.09090909	0.00601466	36.0909091	0.00127464	3.462
FL	35	0.77229437	0.02366985	0.72727273	0.80808081	0.00400080	27.0303030	0.00056022	3.065
GL	35	1.03232323	0.08886593	0.79797980	1.17171717	0.01502108	36.1313131	0.00789715	8.608
SM	35	25.94285714	3.52255637	19.00000000	34.00000000	0.59542070	908.0000000	12.40840336	13.578
PM	35	11.17142857	1.54321502	9.00000000	15.00000000	0.26085095	391.0000000	2.38151261	13.814
MM	35	4.17142857	0.98475779	3.00000000	6.00000000	0.16645445	146.0000000	0.96974790	23.607
CI	35	87.60011425	2.08836667	84.21052632	91.56626506	0.35290040	3066.0039906	4.36127534	2.384
DI	35	25.00448093	0.94463230	23.60421053	27.27272727	0.15967200	877.9569725	0.89233019	3.766
SI	35	120.39788922	2.26850506	116.25000000	125.00000000	0.38351495	4213.9261226	5.14793019	1.885
FI	35	96.83077286	1.75013375	94.73684211	100.00000000	0.29582660	3389.0770499	3.06296815	1.807

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
				ORDER=15	SPECIES=000				
TL	39	2.80862989	0.23517752	2.26262626	3.25252525	0.03765854	112.6565657	0.05530847	8.141
HL	39	0.75861176	0.03558403	0.64646465	0.80000001	0.00569001	29.5858586	0.00126622	4.691
HW	39	0.68505569	0.04353078	0.54545455	0.78787879	0.00697050	26.7171717	0.00189493	6.354
SL	39	0.95363895	0.04696343	0.77777778	1.01010101	0.00752017	37.1919192	0.00220556	4.925
EL	39	0.21191401	0.01173215	0.18181818	0.24242424	0.00187865	8.2646465	0.00013764	5.536
PW	39	0.49535250	0.03348482	0.40404040	0.57575758	0.00536186	19.4747475	0.00112123	6.706
MCL	39	0.19140119	0.00981759	0.17171717	0.20202020	0.00157207	7.4646465	0.00009638	5.129
WL	39	1.03315203	0.05311599	0.82828203	1.14141414	0.00930601	40.2929293	0.00337747	5.625
FL	39	0.75394975	0.04142044	0.60606061	0.00308081	0.00663258	29.4040404	0.00171565	5.494
GL	39	1.09606610	0.18808558	0.78787879	1.45454545	0.03011780	42.7777778	0.03537619	17.148
SM	39	30.07692308	3.31173842	24.00000000	38.00000000	0.53030256	1173.0000000	10.96761134	11.011
PM	39	9.82051282	1.78991024	5.00000000	15.00000000	0.28661502	383.0000000	3.20377050	18.226
MM	39	4.82051282	1.16690763	3.00000000	9.00000000	0.18685476	188.0000000	1.36167341	24.207
CI	39	90.24737629	2.22425620	84.37500000	97.50000000	0.35616604	3519.6476753	4.94731564	2.465
OI	39	27.94342284	1.06074787	25.97402597	30.13696610	0.16985560	1089.7934908	1.12518604	3.796
SI	39	125.70996165	2.23644357	120.31250000	129.72972973	0.35651630	4902.6885823	4.99705099	1.771
FI	39	99.36891706	2.36981862	93.75000000	104.10958904	0.37947468	3875.3838655	5.61604028	2.385
				ORDER=16	SPECIES=LOK				
TL	15	2.40821549	0.16294845	2.29292929	2.88888889	0.04207311	37.3232323	0.02655220	6.549
HL	15	0.66606606	0.01822985	0.63636364	0.70707071	0.00470693	9.9090909	0.00033211	2.760
HW	15	0.51870788	0.01555874	0.50505051	0.56565657	0.00401725	7.7818182	0.00024207	2.999
SL	15	1.11906532	0.03250969	1.07070707	1.19191919	0.00841462	16.7979798	0.00106299	2.910
EL	15	0.19905724	0.00770658	0.19191919	0.22222222	0.00198983	2.9858586	0.00005934	3.872
PW	15	0.38116498	0.01235151	0.36363636	0.41414141	0.00318915	5.7474747	0.00015256	3.224
MCL	15	0.16619529	0.01025757	0.14141414	0.17575758	0.00264849	2.4929293	0.00010522	6.172
WL	15	0.95690236	0.03902156	0.90909091	1.05050505	0.01007532	14.3535354	0.00152268	4.078
FL	15	0.80471300	0.02717546	0.76767677	0.86860687	0.00701667	12.0707071	0.00073851	3.377
GL	15	0.87070707	0.13093519	0.72727273	1.13131313	0.03380732	13.0606061	0.01714402	15.038
SM	15	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00000000	-
PM	15	4.00000000	0.84515425	3.00000000	5.00000000	0.21821789	60.0000000	0.71428571	21.129
MM	15	3.46666667	0.74322335	2.00000000	5.00000000	0.19189944	52.0000000	0.55238095	21.439
CI	15	78.64129041	1.51235124	75.75757576	80.95238095	0.39048741	1178.1193561	2.28720628	1.926
OI	15	30.13513621	0.89729830	28.52941176	31.42857143	0.21168141	452.0300431	0.80514474	2.978
SI	15	169.52048438	2.36354606	166.15384615	175.38461538	0.61026407	2542.9332657	5.59634998	1.394
FI	15	121.81671460	2.49641217	117.64705882	125.75757576	0.64457095	1827.2507191	6.23207372	2.049

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
ORDER=1 SPECIES=VIV STATE=ZZ									
TL	11	2.04591368	0.13372789	1.88888889	2.25252525	0.04032047	22.5050505	0.01788315	6.536
HL	11	0.51882461	0.02225559	0.46464646	0.54545455	0.00671031	5.7070707	0.00049531	4.290
HW	11	0.48943985	0.01827341	0.45454545	0.51515152	0.00550964	5.3838384	0.00033392	3.734
SL	11	0.59412305	0.02921207	0.53535354	0.62626263	0.00880777	6.5353535	0.00085335	4.917
EL	11	0.20000000	0.00787620	0.18181818	0.21212121	0.00237476	2.2000000	0.00006203	3.938
WL	11	0.77318641	0.04636073	0.68686869	0.84848485	0.01398070	8.5050505	0.00215006	5.997
GL	11	0.75392266	0.11738684	0.56565657	0.97979798	0.03539346	8.2929293	0.01377967	15.571
SM	11	4.72727273	0.78624539	4.00000000	6.00000000	0.23706191	52.0000000	0.61818182	16.632
CI	11	94.38234930	2.26958044	90.74074074	98.07692308	0.68430485	1038.2058423	5.15099536	2.405
OI	11	38.61163275	2.16324861	33.33333333	42.17391304	0.65224400	424.7279603	4.67964454	5.603
SI	11	114.55243497	4.12621916	107.40740741	119.23076923	1.24410189	1260.0767846	17.02568457	3.602
ORDER=2 SPECIES=TER STATE=ZZ									
TL	9	2.26599327	0.10151390	2.12121212	2.46464040	0.03383797	20.3939394	0.01030507	4.480
HL	9	0.53535354	0.03233901	0.49494949	0.58585859	0.01077967	4.8181818	0.00104581	6.041
HW	9	0.49158249	0.02812002	0.46464646	0.53535354	0.00937334	4.4242424	0.00079074	5.720
SL	9	0.61054994	0.04604308	0.56565657	0.66686869	0.01534769	5.4949495	0.00211997	7.541
EL	9	0.18653199	0.01406908	0.17171717	0.21212121	0.00468969	1.6787879	0.00019794	7.542
WL	9	0.78114478	0.07969563	0.72727273	0.92929293	0.02656521	7.0303030	0.00635139	10.202
GL	9	0.94949495	0.06943297	0.84848485	1.05050505	0.02314432	8.5454545	0.00482094	7.313
SM	9	4.88888889	0.92796073	4.00000000	6.00000000	0.30932024	44.0000000	0.86111111	18.981
CI	9	91.84514057	1.11415731	90.13960783	93.87755102	0.37138577	826.6662651	1.24134650	1.213
OI	9	34.85681617	1.83096521	31.48148148	37.25490196	0.61032174	313.7113456	3.35243359	5.253
SI	9	113.97934774	2.73056633	109.80392157	117.24137931	0.91018878	1025.8141297	7.45599247	2.396
ORDER=3 SPECIES=CON STATE=ZZ									
TL	8	2.35353535	0.08364431	2.24242424	2.46464646	0.02957273	18.82828283	0.00699637	3.554
HL	8	0.63005051	0.02749760	0.58585859	0.66666667	0.00972187	5.04040404	0.00075612	4.364
HW	8	0.59595960	0.02290694	0.55555556	0.62626263	0.00809883	4.76767677	0.00052473	3.844
SL	8	0.71085859	0.02853007	0.66666667	0.73737374	0.01008973	5.68686869	0.00081442	4.015
EL	8	0.22474747	0.01597110	0.20202020	0.24242424	0.00564664	1.79797980	0.00025508	7.106
WL	8	0.93813131	0.04433855	0.88888889	1.01010101	0.01567605	7.50505051	0.00196591	4.726
GL	8	0.78535354	0.06244213	0.68686869	0.84848485	0.02207663	6.28282828	0.00389902	7.951
SM	8	6.37500000	0.74402381	5.00000000	7.00000000	0.26305214	51.00000000	0.55357143	11.671
CI	8	94.62113632	1.74596271	92.18750000	96.87500000	0.61729104	756.96909054	3.04838578	1.845
OI	8	35.64585394	1.42121596	33.33333333	37.50000000	0.50247572	285.16683149	2.01985481	3.987
SI	8	112.87256416	2.87838111	107.81250000	116.66666667	1.01766140	902.98051326	8.28507701	2.550
ORDER=4 SPECIES=PAI STATE=ZZ									
TL	8	2.11303636	0.10254960	1.95959596	2.24242424	0.03625676	16.90909091	0.01051642	4.852
HL	8	0.53282828	0.01503078	0.51515152	0.56565657	0.00531418	4.26262626	0.00022592	2.821
HW	8	0.48030303	0.01373355	0.46464646	0.50505051	0.00485554	3.84242424	0.00018861	2.859
SL	8	0.62500000	0.01744332	0.60606061	0.64646465	0.00616714	5.00000000	0.00030427	2.791
EL	8	0.17474747	0.00708101	0.16161616	0.18181818	0.00250351	1.39797980	0.00005014	4.052
WL	8	0.77272727	0.01457186	0.72727273	0.82828283	0.01223300	6.18181818	0.00019571	4.476
GL	8	0.80808081	0.11427908	0.64646465	0.92929293	0.04040404	6.46463646	0.01305989	14.142
SM	8	6.25000000	1.16406475	4.00000000	7.00000000	0.41187724	50.00000000	1.35714286	18.639
CI	8	90.15390417	1.61911744	86.79245283	92.45283019	0.57244446	721.23127335	2.63154130	1.796
OI	8	32.80245140	1.20255912	31.37254902	34.61538462	0.42516885	262.41961516	1.44614944	3.666
SI	8	117.33521057	3.14583335	113.20754717	123.07692308	1.11222181	939.68168458	9.89629892	2.681

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
ORDER=5 SPECIES=FLA STATE=ZZ									
TL	9	2.04264971	0.09240876	1.95959596	2.20202020	0.03080292	18.38383884	0.00853938	4.524
HL	9	0.49494949	0.01428499	0.48484848	0.52525253	0.00476166	4.4545455	0.00020406	2.886
HW	9	0.47070707	0.01460296	0.44444444	0.48484848	0.00486762	4.2363636	0.00021374	3.102
SL	9	0.55443322	0.01467643	0.53535354	0.57575758	0.00489214	4.9898990	0.00021540	2.647
EL	9	0.17441077	0.00588985	0.16565657	0.18181818	0.00196328	1.5696970	0.00003469	3.377
WL	9	0.74410774	0.02422137	0.71717172	0.78787879	0.00807379	6.6969697	0.00058667	3.255
GL	9	0.80359147	0.05978209	0.74747475	0.88888889	0.01992736	7.2323232	0.00357390	7.439
SM	9	5.00000000	0.86602540	4.00000000	6.00000000	0.28867513	45.0000000	0.75000000	17.321
CI	9	95.12326589	2.45096076	91.66666667	100.00000000	0.81696692	856.1093930	6.00720862	2.577
OI	9	35.23806617	0.62454477	34.16666667	36.00000000	0.20818159	317.1425955	0.39005617	1.772
SI	9	112.03549625	1.68923096	109.61538462	114.58333333	0.56311299	1008.3194662	2.85386613	1.508
ORDER=6 SPECIES=PAP STATE=ZZ									
TL	11	2.06611570	0.11537844	1.85858586	2.24242424	0.03470791	22.7272727	0.01331219	5.584
HL	11	0.52892562	0.02179232	0.50505051	0.56565657	0.00657063	5.8181818	0.00047491	4.120
HW	11	0.49531680	0.02930084	0.46464646	0.55555556	0.00883454	5.4484848	0.00085854	5.916
SL	11	0.57851240	0.03066814	0.53535354	0.62626263	0.00924679	6.3636364	0.00094053	5.301
EL	11	0.18677686	0.01035494	0.17171717	0.20202020	0.00312213	2.0545455	0.00010722	5.544
WL	11	0.75849403	0.05139708	0.68686869	0.84848485	0.01549680	8.3434343	0.00264166	6.776
GL	11	0.77869605	0.09005826	0.60606061	0.92929293	0.02715359	8.5656566	0.00811049	11.565
SM	11	0.09090909	0.30151134	0.00000000	1.00000000	0.09090909	1.0000000	0.09090909	331.662
CI	11	93.62576281	3.26022009	90.56603774	98.21428571	0.98299933	1029.8833909	10.62903505	3.482
OI	11	35.30132278	0.92406265	34.00000000	36.36363636	0.27861537	388.3145506	0.85389178	2.618
SI	11	109.36892540	3.40114637	103.70370370	115.38461538	1.02548421	1203.0581794	11.56779660	3.110
ORDER=7 SPECIES=WCJ STATE=ZZ									
TL	7	1.80230880	0.09997060	1.66666667	1.92929293	0.03778534	12.61616162	0.00999412	5.547
HL	7	0.47763348	0.01266229	0.45454545	0.48484848	0.00478589	3.34343434	0.00016033	2.651
HW	7	0.44790765	0.01312946	0.42424242	0.46464646	0.00496247	3.13535354	0.00017238	2.931
SL	7	0.50360750	0.01358773	0.48484848	0.52525253	0.00513568	3.52525253	0.00018463	2.698
EL	7	0.16948837	0.00883890	0.16161616	0.18585859	0.00334079	1.18585859	0.00007813	5.218
WL	7	0.65945166	0.04506541	0.60606061	0.72727273	0.01703312	4.61616162	0.00203089	6.834
GL	7	0.66522367	0.09818067	0.53535354	0.78787879	0.03710881	4.65656566	0.00963944	14.759
SM	7	0.85714286	0.69006556	0.00000000	2.00000000	0.26082027	6.00000000	0.47619048	80.508
CI	7	93.79746651	2.44621231	91.30434783	97.77777778	0.92458135	656.58212560	5.98395466	2.608
OI	7	35.46497595	1.48616988	33.33333333	38.33333333	0.56171941	248.25483092	2.20870070	4.191
SI	7	105.48826777	3.51158710	100.00000000	108.88888889	1.32725517	738.41787440	12.33124398	3.329
ORDER=8 SPECIES=AUS STATE=ZZ									
TL	4	2.29040404	0.22652327	2.07070707	2.54545455	0.11326163	9.16161616	0.05131279	9.890
HL	4	0.55050505	0.01934196	0.52525253	0.56565657	0.00967098	2.20202020	0.00037411	3.513
HW	4	0.51515152	0.02474232	0.48484848	0.54545455	0.01237116	2.06060606	0.00061218	4.803
SL	4	0.60850506	0.03630279	0.55555556	0.63636364	0.01815140	2.43434343	0.00131789	5.965
EL	4	0.20050505	0.00603248	0.19191919	0.20606061	0.00301624	0.80202020	0.00003639	3.009
WL	4	0.82575758	0.02703803	0.69696970	0.88888889	0.01351941	3.30303030	0.00757576	10.540
GL	4	0.91414141	0.17092310	0.70707071	1.09090909	0.08546155	3.65656566	0.02921471	18.698
SM	4	2.75000000	0.50000000	2.00000000	3.00000000	0.25000000	11.00000000	0.25000000	18.182
CI	4	93.56303419	2.36447101	91.07142857	96.42857143	1.18223551	374.25213675	5.59072317	2.527
OI	4	36.42958093	0.54543749	35.71420571	37.03703704	0.27271875	145.71835572	0.29750206	1.497
SI	4	110.48661986	3.29097506	105.76923077	112.96296296	1.64548793	441.94647945	10.83052211	2.979
ORDER=9 SPECIES=ARE STATE=ZZ									
TL	9	2.19191919	0.16872013	1.86868687	2.41414141	0.05624004	19.72727273	0.02846648	7.697
HL	9	0.53872054	0.02944925	0.49494949	0.57575758	0.00981642	4.84848485	0.00086726	5.467
HW	9	0.51178851	0.02142748	0.46464646	0.53535354	0.00714249	4.60606061	0.00045914	4.187
SL	9	0.59147026	0.02817037	0.53535354	0.61616162	0.00939012	5.32323232	0.00079357	4.763
EL	9	0.19730640	0.00942160	0.18181818	0.21212121	0.00314053	1.77575758	0.00008877	4.775
WL	9	0.79012346	0.03634181	0.72727273	0.85858586	0.01211394	7.11111111	0.00132073	4.600
GL	9	0.86307520	0.12748010	0.66666667	1.05050505	0.04249337	7.76767677	0.01625118	14.770
SM	9	4.00888889	4.07567309	0.00000000	13.00000000	1.35855770	44.00000000	16.61111111	83.366
CI	9	95.08717163	2.79764381	91.22807018	100.00000000	0.93254794	855.78454467	7.82681090	2.942
OI	9	36.72952659	2.76190514	32.28070175	40.01632653	0.92063505	330.56573931	7.62912000	7.520
SI	9	109.85103093	2.56447415	107.01754386	116.00000000	0.85493472	989.65927841	6.57652765	2.335

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
ORDER=10 SPECIES=PHA STATE=ZZ									
TL	8	1.98863636	0.07212301	1.91919192	2.13131313	0.02549934	15.90909091	0.00520173	3.627
HL	8	0.50757576	0.01503078	0.48484848	0.52525253	0.00531418	4.06060606	0.00022592	2.961
HW	8	0.49873737	0.01521152	0.48484848	0.52525253	0.00537808	3.98989099	0.00023139	3.050
SL	8	0.56060606	0.02091108	0.53535354	0.59595560	0.00739318	4.48484848	0.00043727	3.730
EL	8	0.19242424	0.01215723	0.17171717	0.20202020	0.00429823	1.53939394	0.00014780	6.318
WL	8	0.78661616	0.03259155	0.72727273	0.82828283	0.01152205	6.29292929	0.00106221	4.143
GL	8	0.69444444	0.06405529	0.62626263	0.80808081	0.02264696	5.55555556	0.00410308	9.224
SM	8	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	*
CI	8	98.27844599	2.18051767	94.23076923	100.00000000	0.77092942	786.22756795	4.75465731	2.219
OI	8	37.88831079	1.62951045	34.69387755	40.00000000	0.57611895	303.10655031	2.65530431	4.301
SI	8	110.43359740	1.61651617	108.16326531	113.46153846	0.57152477	883.46877982	2.61312451	1.464
ORDER=11 SPECIES=BRU STATE=ZZ									
TL	8	2.97348485	0.25842671	2.60606061	3.28282828	0.09136764	23.7878788	0.06678437	8.691
HL	8	0.63888889	0.03530196	0.60606061	0.68686869	0.01248113	5.1111111	0.00124623	5.526
HW	8	0.57449495	0.03390670	0.53535354	0.62626263	0.01198783	4.5959596	0.00114966	5.902
SL	8	0.80934343	0.05051055	0.72727273	0.88888889	0.02068660	6.4747475	0.00342308	7.229
EL	8	0.22222222	0.01619765	0.19191919	0.24242424	0.00572673	1.7777778	0.00026236	7.299
WL	8	1.02651515	0.06201759	0.94549495	1.09090909	0.02192653	8.2121212	0.00384618	6.042
GL	8	1.30808081	0.16893597	1.05050505	1.53535354	0.05972788	10.4646465	0.02853936	12.915
SM	8	8.25000000	1.28173989	7.00000000	10.00000000	0.45316348	66.0000000	1.64285714	15.536
CI	8	89.91950863	1.77488328	87.50000000	92.30769231	0.62751600	719.3560690	3.15021066	1.974
OI	8	34.77150036	1.43059854	31.66666667	36.06557377	0.50579297	278.1720029	2.04661220	4.114
SI	8	126.59658860	3.49021408	120.00000000	131.25000000	1.23397702	1012.7887088	12.18159431	2.757
ORDER=12 SPECIES=HYS STATE=ZZ									
TL	9	2.49607183	0.14136403	2.30303030	2.67676768	0.04712134	22.4646465	0.01998379	5.663
HL	9	0.60381594	0.01733271	0.57575758	0.62626263	0.00577757	5.4343434	0.00030042	2.871
HW	9	0.53580247	0.01487210	0.50505051	0.55555556	0.00495737	4.8222222	0.00022118	2.776
SL	9	0.81032548	0.03062863	0.75757576	0.84848485	0.01020954	7.2929293	0.00093811	3.780
EL	9	0.18406285	0.00941751	0.17171717	0.19191919	0.00280584	1.6565657	0.00007085	4.573
WL	9	0.92368126	0.05603810	0.84848485	1.00000000	0.01867937	8.3131313	0.00314027	6.067
GL	9	0.96857464	0.07716611	0.84848485	1.08080808	0.02572204	8.7171717	0.00595461	7.967
SM	9	17.77777778	2.10185511	15.00000000	21.00000000	0.70272817	160.0000000	4.44444444	11.859
CI	9	88.75782072	1.99505607	86.66666667	92.98245614	0.66501869	798.8203865	3.98024871	2.248
OI	9	30.48263911	1.06259577	28.33333333	31.66666667	0.35419859	274.3437520	1.12910977	3.486
SI	9	134.17273573	1.62526066	131.57894737	136.66666667	0.54175622	1207.5546216	2.64149821	1.211
ORDER=14 SPECIES=PUB STATE=ZZ									
TL	6	2.95622996	0.17256672	2.63636364	3.16161616	0.07045007	17.73737374	0.02977927	5.837
HL	6	0.67171717	0.01392328	0.65656566	0.68686869	0.00568416	4.03030303	0.00019386	2.073
HW	6	0.64309764	0.01360061	0.62626263	0.66666667	0.00553407	3.85858586	0.00019046	2.146
SL	6	0.95959596	0.02390335	0.92929293	0.97979798	0.00975850	5.75757576	0.00057137	2.491
EL	6	0.27441077	0.00993123	0.26262626	0.28282828	0.00405441	1.64646465	0.00009863	3.619
WL	6	1.09764310	0.04547325	1.01010101	1.13131313	0.01856438	6.58585859	0.00206792	4.143
GL	6	1.18686869	0.13304990	0.96969697	1.37373737	0.05431739	7.12121212	0.01770228	11.210
SM	6	16.16666667	3.18852108	10.00000000	19.00000000	1.30170828	97.00000000	10.16666667	19.723
CI	6	95.74351607	1.09782138	94.11764706	97.05882353	0.44818370	574.4610941	1.20521178	1.147
OI	6	40.84217948	0.71370248	40.00000000	41.79104478	0.29136782	245.0530766	0.50917123	1.747
SI	6	142.85518622	1.83169777	141.17647059	145.45454545	0.74778749	857.1311735	3.35511674	1.282
ORDER=15 SPECIES=BOV STATE=ZZ									
TL	8	2.62878788	0.13667060	2.47474747	2.76767677	0.04832035	21.0303030	0.01867885	5.199
HL	8	0.61237374	0.03003125	0.57575758	0.64646465	0.01061765	4.8989899	0.00090188	4.904
HW	8	0.61363636	0.02895008	0.57575758	0.64646465	0.01023540	4.9090909	0.00083811	4.718
SL	8	0.81313131	0.04549461	0.73737374	0.86868687	0.01608477	6.5050505	0.00206776	5.595
EL	8	0.28207071	0.00896579	0.26666667	0.25252929	0.00316989	2.2565657	0.00008039	3.179
WL	8	1.03661616	0.04857420	0.96969697	1.09090909	0.01717357	8.2929293	0.00235945	4.686
GL	8	0.97979798	0.08570941	0.88888889	1.13131313	0.03030303	7.8383838	0.00734619	8.748
SM	8	13.12500000	2.41646140	10.00000000	16.00000000	0.85434812	105.0000000	5.83928571	18.411
CI	8	100.21551724	0.60957481	100.00000000	101.72413793	0.21551724	801.7241379	0.37158145	0.608
OI	8	46.10646363	1.33039715	43.75000000	48.27586207	0.47036642	368.8517090	1.76995658	2.885
SI	8	132.76029851	2.59368331	128.07017544	136.20689655	0.91708553	1062.0823881	6.72719309	1.954

ORDER=16 SPECIES=LON STATE=ZZ

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
TL	8	2.36035354	0.07251000	2.24242424	2.44444444	0.02563616	18.8828283	0.00525770	3.072
HL	8	0.56237374	0.00715779	0.54545455	0.56565657	0.00253066	4.4989899	0.00005123	1.273
HW	8	0.54595960	0.01678974	0.52525253	0.56565657	0.00593607	4.3676768	0.00028190	3.075
SL	8	0.96212121	0.01045554	0.94949495	0.96969697	0.00369659	7.6969697	0.00010932	1.087
EL	8	0.23787879	0.00738332	0.22222222	0.24242424	0.00261040	1.9030303	0.00005451	3.104
WL	8	0.96212121	0.03273101	0.91919192	1.01010101	0.01157216	7.6969697	0.00107132	3.402
GL	8	0.83585859	0.05499521	0.72727273	0.88888889	0.01944374	6.6866667	0.00302447	6.575
SM	8	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.0000000	0.00000000	.
CI	8	97.07507793	2.47948537	94.64285714	100.00000000	0.87663046	776.6070235	6.14784771	2.554
OI	8	42.31000372	1.57806005	39.28571429	44.44444444	0.55792848	338.4800298	2.49027353	3.730
SI	8	171.09848051	2.23875834	167.85714286	174.07407407	0.79152060	1368.7878441	5.01203893	1.308

BIOGRAPHICAL SKETCH

James Crowell Trager was born 5 September 1952 in Washington, D.C. He is married to Kim Annette Trager, and they have three sons, Matthew David, Loren Emery and Geoffrey Lorance.

In 1974, James received his B.S. in biology from Northern Illinois University at DeKalb. He proceeded directly to graduate studies at the University of Kansas at Lawrence, where he completed his M.A. in entomology in 1977. He then was a partner for two years in a landscape maintenance business in Santa Barbara, CA. In 1979, James entered the Ph.D. program in entomology at the University of Florida. He speaks fluent Spanish and also took sufficient course work at the University of Florida to become fluent in Brazilian Portuguese. He has worked as an interpreter and field assistant on entomological expeditions in Brazil, Bolivia and Argentina.

James is a member of the American Entomological Society, Florida Entomological Society, Cambridge Entomology Club, and the International Union for the Study of Social Insects.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

J. L. Stimac, Chairman
Associate Professor of
Entomology and Nematology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

J. Reiskind
Associate Professor of Zoology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

D.P. Wojcik
Assistant Professor of
Entomology and Nematology

This thesis was submitted to the Graduate Faculty of the College of Agriculture and to the Graduate School, and was acceptated as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

August 1984

Dean, College of Agriculture

Dean for Graduate Studies and
Research