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A Review of the New World Ants of the Genus Dolichoderus (Hymenoptera: Formicidae)

By
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A Review of the New World Ants of the Genus *Dolichoderus* (Hymenoptera: Formicidae)

by

William P. MacKay[1]

ABSTRACT

The genus *Dolichoderus* includes 64 New World species, primarily tropical in distribution. Species are almost exclusively arboreal in the New World; the *quadripunctatus* species complex is the only one in which members nest in the soil.

Twelve New World species complexes are defined and keys are provided for workers, females and males, including species formerly placed in the synonymous genera *Monacis* and *Hypoclinea*. Eleven new species are described, 24 new synonyms are proposed. The New World members of the complexes (with new synonymies) include:

***attelaboides* complex** - *D. attelaboides* (Fabricius) (= *D. imbecillus* Mann = *D. imbecillus* var. *heterogaster* Santschi), ***D. longicollis* new species** and *D. rosenbergi* Forel.

***bidens* complex** - *D. abruptus* F. Smith (= *D. ursus* Mayr), *D. bidens* (Linnaeus) (= *D. bidens* var. *bahianus* Santschi, = *D. bidens* subsp. *attenuatus* Forel), *D. cogitans* Forel *D. ferrugineus* Forel (= *D. bidens inferior* Mann), *D. primitivus* (Wilson), *D. quadridenticulatus* (Roger) (= *D. analis* (Emery), = *D. gibbosus* var. *gibbosoanalis* Forel = *D. gibbosus* var. *integra* Forel = *D. gibbosus* var. *nitidior* Emery), and *D. spurius* Forel (= *D. bidens* subsp. *albatus* Viehmeyer).

***bispinosus* complex** - *D. andinus* (Kempf), *D. bispinosus* (Olivier), *D. curvilobus* (Lattke), *D. doloniger* (Roger), *D. epetreia* (Lattke), *D. haradae* **new species**, *D. mesonotalis* Forel (= *D. grandii* Menozzi = *D. simplex* Forel), *D. mucronifer* (Roger), *D. obscurus* (F. Smith)(?), *D. omacanthus* (Kempf), *D. septemspinosus* Emery *D. spinicollis* (Latreille), *D. superaculus* (Lattke) and *D. validus* (Kempf).

***debilis* complex** - *D. debilis* Emery *D. gagates* Emery, *D. inermis* **new species**, *D. inpai* (Harada), and *D. rufescens* Mann.

***decollatus* complex** - *D. decollatus* F. Smith (= *D. decollatus* subsp. *neglectus* Menozzi = *D. capitatus* Santschi) and *D. fernandezi* **new species**.

***diversus* complex** - *D. baenae* **new species**, *D. caribbaea* (Wilson), *D. diversus* Emery (= *D. championi* Forel = *D. championi* var. *ornatus* Mann = *D.*

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championi race *trinidadensis* Forel = *D. championi* race *trinidadensis* var. *taeniatus* Forel = *D. germaini* subsp. *garbei* Forel = *D. germaini* subsp. *leviusculus* Emery = *Iridomyrmex mazaruni* Donisthorpe), *D. germaini* (Emery), *D. ghilianii* Emery *D. laurae* **new species**, *D. luederwaldti* Santschi, *D. lujae* Santschi, *D. lutosus* (F. Smith) (= *D. lutosus* var. *nigriventris* Forel = *D. lutosus* var. *ruficauda* Wheeler), *D. piceus* **new species** and *D. voraginosus* **new species**.

***Imitator* complex** - *D. imitator* Emery.

***laminatus* complex** - *D. lamellosus* (Mayr), *D. laminatus* (Mayr), *D. lobicornis* (Kempf), *D. prolaminatus* (Wilson), *D. schulzi* Emery, *D. setosus* (Kempf), *D. smithi* **new species**, *D. tristis* Mann and *D. varians* Mann.

***lugens* complex** - *D. lugens* Emery.

***quadripunctatus* complex** - *D. antiquus* Carpenter, *D. mariae* Forel, *D.* (?) *obliteratus* (Scudder), *D. plagiatus* (Mayr), *D. pustulatus* Mayr, *D. rohweri* Carpenter and *D. taschenbergi* (Mayr).

***rugosus* complex** - *D. dibolius* Wilson, *D. intermedius* **new species** and *D. rugosus* (F. Smith).

***shattucki* complex** - *D. shattucki* **new species**.

INTRODUCTION

Ants of the genus *Dolichoderus* are common in the New World, and form one of the most complex and confusing groups of ants. A number of subspecies and varieties have been named. Many of the common species do not appear in any keys. There are several partial revisions of the genus in the New World. Mann (1916) and Kempf (1969) provided keys to *Dolichoderus s.st.* Wheeler (1905a) and Creighton (1950) revised the species in the United States, Kempf (1959a, 1972a) provided revisions of the species of *Monacis.* Lattke (1986) and Harada (1986) provided updated versions of Kempf's keys and described new species. Wilson (1985a) described 3 fossil species. Johnson (1989) provided further details on the North American species. The remaining species of *Hypoclinea* have not been subjected to adequate revision. It is presently a taxonomic tangle of poorly defined species, subspecies and varieties, often distinguished only on the basis of color.

Furthermore, it is an especially difficult group of ants as there is much variability within species, specifically with regards to size, sculpture and color. This has resulted in the recognition of numerous subspecies and varieties. The nanitic workers of incipient nests have been especially troublesome, as these are often so different from "normal" workers that they can be easily differentiated. They are not only smaller, but are usually more roughly sculptured and have rounder heads, which is especially striking in species where the larger workers have oblong or cordate shaped heads. A number of taxa based on nanitics were synonymized, including forms of *D. attelaboides* (= *D. imbecillis)*

and *D. bidens* (= *D. bidens attenuatus*). Other species are undoubtedly synonyms (*D. cogitans* probably represents nanitics of *D. quadridenticulatus*; *D. spurius* of *D. bidens*), but due to the limited material available, I have regarded them as valid taxa for the present time. Fortunately species complexes are relatively well defined (at least for the extant species), and small enough that species identification is usually possible.

There are at least four separate lineages in the New World: 1) Neotropical *Hypoclinea*; 2) most *Monacis*, together with the Nearctic *Hypoclinea*; 3) the *bispinosus* species complex of *Monacis* and 4) *Dolichoderus s.s. Monacis* and *Hypoclinea* cannot be separated by any morphological characters found during this study. Two species of "*Hypoclinea*" (*D. piceus* and *H. caribbaea*) have well developed pronotal angles, the characteristic that formerly distinguished "*Monacis*" from the remainder of the genus. Other *Hypoclinea* spp. have less developed pronotal angles (*D. germaini*, *D. ghilianii* etc.). A species of the *bispinosus* complex of *Monacis* (*mesonotalis*) lacks these spines. In addition, *D. shattucki* would have to be considered a member of "*Monacis*", although it is very closely related to the *rugosus* complex of *Dolichoderus s.s.* Fortunately we have a very good fossil record of the group. Species from the Dominican amber are especially well preserved and since most distinguishing characteristics can be seen, they are included in the key. Characteristics of species from the Florissant shale are difficult to see and they are not included in the keys. Based on the characteristics of the extant and extinct taxa, it is clear this is a single, monophyletic group, *Dolichoderus*, and that the previously recognized genera (*Monacis* and *Hypoclinea*) are synonyms (Shattuck 1992).

MATERIALS AND METHODS

Specimens were borrowed from various institutions, supplemented with specimens from my personal collection. Those institutions and curators who loaned specimens are as follows (most abbreviations from Arnett & Samuelson 1986):

AMNH American Museum of Natural History, Marjorie Favreau, Eric Quinter.

ANSP Academy of Natural Sciences, Philadelphia, Donald Azuma.

BMNH British Museum of Natural History, Barry Bolton.

CAFC Collection of André Francoeur (Canada).

CASC California Academy of Sciences, Wojciech Pulawski, Darrell Ubick & Vincent Lee.

CELM Colección Entomológica "Luís María Murillo", Instituto Colombiano Agropecuario, Tibaitatá, Ingeborg Zenner de Polonía (Colombia).

CEMU Cleveland Museum of Natural History, Sonja Teraguchi.

CFCC Collection of Francisco Castaño L. (Colombia).

CFFC Collection of Fernando Fernández C. (Colombia).
CJTU Collection of James Trager (USA).
CMDU Collection of Mark DuBois (USA).
CUCC Clemson University, Michael Heyn.
CWEM Collection of William & Emma MacKay (USA).
DEFW University of Minnesota, Philip Clausen.
DENH University of New Hampshire, Don Chandler.
DEUN University of Nebraska, Brett Ratcliffe.
EMAU Ernst-Moritz-Arndt Universität Greifswald, G. Müller (Mayr collection) (Germany).
ESUW University of Wyoming, Jeffrey Burne.
FMNH Field Museum of Natural History, Cynthia Salvino.
FSCA Florida State Collection of Arthropods, Harold Denmark, Lionel Stange.
GBFM Graham Fairchild Museo de Invertebrados, Diomedes Quintero (Panamá).
INHS Illinois Natural History Survey, Kathryn McGiffen.
INPA Instituto Nacional de Pesquisas da Amazonia, Ana Yoshi Harada and José Albertino Rafael (Brazil).
ISUI Iowa State University, Robert Lewis.
LACM Los Angeles Co. Museum of Natural History, Roy Snelling (USA).
LEMQ Lyman Entomological Museum and Research Laboratory, McGill Univ., St. Anne de Bellevue, Quebec, F. Génier (Canada).
LNKD Landessammlungen für Naturkunde Karlsruhe, Manfred Verhaagh (Germany).
MACN Museo Argentino de Ciéncias Naturales, Axel Bachman.
MCSN Museo Civico di Storia Naturale, Valter Raineri (Emery collection) (Italy).
MCZC Museum of Comparative Zoology, Stefan Cover, Edward Wilson.
MELN Museo Entomológico de León, Jean-Michel Maes (Nicaragua).
MHNC Museo de Historia Natural, Universidad Nacional de Colombia, Fernando Fernández, Isabel de Arévalo & Rubén Restrepo.
MHNG Muséum d'Histore naturelle, Genéve, Cl. Besuchet (Forel collection) (Switzerland).
MICR Museo de Insectos, Universidad de Costa Rica, Humberto J. Lezama.
MIZA Instituto de Zoología Agrícola, John Lattke (Venezuela).
MNHN Museum National d'Histoire Naturelle (France).
MVIC Mississippi State University, Richard Brown, Terence Lee Schiefer.
MZSP Museu de Zoología da Universidade de São Paulo, Carlos Roberto Brandão (Brazil).
NCSU North Carolina State University, Robert L. Blin.
NDSU North Dakota State University, Edward Balsbaugh.

NHMB Naturhistorisches Museum Basel, Michel Brancucci (Santschi collection) (Switzerland).

NHRS Naturhistoriska Riksmusset, Stockholm (Sweden).

NYSM New York State Museum, Tim McCabe.

OXUM Oxford Univ. Museum, Christopher O'Toole (United Kingdom).

PSUC Pennsylvania State University, Frost Museum, Thomas Miller.

SEMC Snow Entomological Museum, University of Kansas, Jon Gelhaus.

SIVC Southern Illinois University, J. E. McPherson.

SUEL Bakowyi Termeszettudomanyi Museum, J. Papp (Hungary).

UAVC Universidad Autónoma del Valle, Marta Baena (Colombia).

UDSB Università Delgi Studi di Bologna, M. Principi, E. Mellini (Menozzi collection) (Italy).

UICM University of Idaho, Frank Merickel (W. F. Barr Collection).

UNAM Instituto de Biología, Universidad Nacional Autónoma de México, Harry Brailovsky.

UNCM Museo de Entomología "Francisco Luís Gallego", Raul Vélez Angel (Colombia).

USBV Universidad Simón Bolívar, Klaus Jaffé (Venezuela).

USNM United States National Museum of Natural History, Smithsonian Institution, David Smith.

VPIC Virginia Polytechnic Institute, Michael Kosztarab.

WSUC Washington State University, James collection, Richard Zack.

WVUC West Virginia University, James Amrine.

ZMHB Museum für Naturkunde der Humboldt Universitat (Germany).

ZSMC Zoologische Staatssammlung des Bayerischen Staates München, Erich Diller (Germany).

Specific locality data for common species were omitted to save space, but are available from the author. All localities are included in the maps. Closed symbols represent localities for specimens actually seen, open symbols are based on literature records (Wheeler & Wheeler 1963, 1987; Kempf 1969, 1972a; Warren & Rouse, 1969; Swain 1977; Johnson 1986, 1989; Lattke 1986; DuBois & LaBerge, 1988). A "series" includes specimens collected by a single individual at a specific locality and on a specific date. In some cases a "series" consists of a single specimen. In other cases, a series could conceivably be members of more than a single nest.

Specimens were measured using an ocular micrometer in a dissecting microscope at magnifications of either 37.5 or 60 X.

The following abbreviations are used (all measurements in mm.):

HL Head length, anterior margin of median lobe of clypeus to vertex.

HW Head width, maximum width excluding eyes. (Measured immediately posterior to eyes in males.)

EL Eye length, maximum dimension.

SL Scape length, excluding basal condyle.

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

ML Total length of mesonotum.

MW Total width of mesonotum.

PW Maximum width of petiole.

PL Maximum length of petiolar node (not recorded for species where node is poorly defined).

CI Cephalic Index, HW/HL X 100.

OI Ocular index, EL/HL X 100. (Note I prefer HL to HW).

SI Scape index, SL/HL X 100. (Note I prefer HL to HW).

MI Mesonotal index, ML/MW X 100.

The digitiform process of the aedeagus is the most distal section, which is usually toothlike and directed ventrally, but may be even be pointed anteriorly.

I have taken a very conservative approach to the genus. Several "forms" I mention in the discussions may ultimately be considered valid species. I have synonymized taxa only when it was considered completely justified, leaving a few questionable forms for further consideration when more material and winged individuals become available. The synonymy of several taxa described from nanitic workers is based on the following evidence: 1) presence of mixed series of "normal" and nanitic workers, especially when intermediates are present, 2) series with a "normal" female and a few nanitic workers, 3) nanitic workers that are very similar to "normal" workers, except for rougher sculpture and a more rounded head [commonly encountered, especially in *D. attelaboides*, *D. decollatus*, *D. bidens*, *D. quadridenticulatus*, and *D. bispinosus*], and 4) absence of winged reproductives in series consisting of only nanitic workers.

DOLICHODERUS LUND

Formica (in part) Linnaeus 1758:581; Fabricius 1775:394; F. Smith 1858:42-45.

Atta (in part) Fabricius 1804:422.

Ponera (in part) Illiger 1807:194.

Dolichoderus Lund 1831:130; Forel 1878:386, 1911:282; Emery 1865: 9, 58-59, 1886:434-436, 1894:227-230, 234-239, 1912:7-9; Mann 1916:460-461; Wheeler 1921a:89-103; Smith 1947:593-594; Brown 1950:249; Wheeler & Wheeler 1951:169-178, 1966:726-728; Kusnezov 1959:41-42, 50; Kempf 1969:289, 292; Smith 1979:1415-1417; Johnson 1989:1-9; MacKay & Vinson, 1989:13-14; Shattuck 1992:66-77.

Hypoclinea Mayr 1855:377, 1862:704-705, 1870a:953-959; Emery 1865:9; Forel 1878: 386; Brown 1950:249, 1973:182; Eisner 1957:453-454; Snelling 1981:401; Wheeler & Wheeler 1985:258; MacKay & Vinson, 1989:17.

Polyrhachis (in part) F. Smith 1858:74.

Monacis Roger 1862a: 233-234; Brown 1950:249, 1973:181; Kempf 1959a: 225-232, 1972a: 253; Snelling 1981:401; Wheeler & Wheeler 1985: 258; Wilson 1985a: 18-19; Harada 1986: 602-604; MacKay & Vinson, 1989: 20.

Type species: *Formica attelaboides* Fabricius 1775 (by monotypy).

Diagnosis of the genus Dolichoderus.

Description. Worker: Head often strongly sculptured with foveolae, rarely punctate or with rugae only, or smooth; maxillary palpi 6 -segmented (Fig. 1), labial palpi 4 segmented (Fig. 1); mandible with well defined basal and masticatory borders, well defined teeth on both borders in addition to small denticles on basal border (Fig. 60a), which may give it a serrate appearance (Fig. 56); clypeus often with median emargination (Fig. 57); mesosoma often elongate (Fig. 14); pronotum sometimes with foveolate punctures, but may be rugose or punctate, or even smooth and shining; spines often present on mesosoma, especially on the propodeum (Figs. 1, 3), occasionally on the pronotum and/or mesonotum (Fig. 1); lower mesopleural border with a tooth (Fig. 1) or bump (Fig. 43); basidorsal tubercle often developed on hind coxa (Fig. 12); petiole usually with a well formed node, often with an apical spine or teeth (Figs. 1, 13); dorsum of gaster usually punctate and with both erect hairs and decumbent pubescence. Scape (Fig. 60a) and tibiae with numerous long erect or suberect hairs in most species. Cuticle hard and mostly sculptured. New World species are typically medium sized, active, conspicuous ants in tropical rain forests.

There is considerable variation in workers. Spines and teeth may be present on the pronotum, mesonotum or propodeum, but are absent in most species. The propodeum usually projects posteriorly over the petiole (Figs. 52, 77), at least in the Nearctic and Old World species.

Female: Similar to worker, but larger and with three well developed ocelli, and mesosoma modified for flight. Mandible with teeth on basal and masticatory border, those on masticatory border directed posteriorly; maxillary palpi with 6 subequal segments; labial palpi with 4 subequal segments (in *D. rugosus* apical segment longer than others); spine or tubercle on lower mesopleural surface usually not as well developed as in worker; propodeal spines often well developed; basidorsal tubercle present on hind coxa in many species. Long, erect pointed hairs on most of body surface of most species (including scapes and tibiae). Body often with decumbent pubescence. Sculpture often coarse, with foveolate punctures on head and much of mesosoma, remainder of mesosoma with rugae, sculpture of gaster variable, but is at least partially, densely and evenly punctate. Wing is of the basic ant form, the first and second cubital cells and a discoidal cell are present (Fig. 90). The discoidal cell is usually square, but is pentagonally shaped in some species. It is occasionally

subdivided into two cells (Fig. 94), but this is not an important character as the cell of one wing of a specimen may be divided whereas the other is not.

Male: Similar to worker in many aspects; mandible with teeth on masticatory and basal borders, but most are small, giving borders a serrated appearance (Fig. 117), usually only apical tooth and possibly a few others near apex developed; maxillary palpi long, 6 segmented, at least last 4 subequal in length, extending at least to occipital foramen in most species; labial palpi with 4 segments; 3 ocelli large and well developed (Fig. 118); eyes very large, protruding past lateral margins of head (Fig. 120); vertex convex (frontal view); antennae with 13 segments; lower mesopleural spine poorly developed or absent; propodeum without spines or with relatively poorly developed spines (Fig. 95). Wings similar to those of female, genitalia variable (Figs. 131-149), stipites rudimentary or absent (in most species), volsella very well developed, with a ventrally projecting digitus; aedeagus often with well developed digitiform process, directed ventrally or recurved anteriorly; subgenital plate usually small (Fig. 130) or absent, but may be well developed and consisting of two long, knobbed processes (Fig. 127). Males are relatively large (up to one cm. in total length), moderately hairy, with a few erect hairs on all surfaces, those on scapes and tibiae few in number (0 - 10), usually short, fine and suberect.

The males do not appear to separate easily among the complexes and are unknown in many species. Four distinct groups are recognizable. The first consists of those species in *Dolichoderus* in the strict sense (*attelaboides, decollatus*, *imitator*, and *rugosus* complexes), which have enlarged, bilobed subgenital plates (Fig. 127). Group two includes most species previously recognized as members of the Neotropical *Hypoclinea* in the strict sense (except *D. mesonotalis* which is a member of the *bispinosus* species complex), including the *bidens*, *lugens* and *diversus* species complexes. The digitus of the volsella is elongate (Fig. 136). The genitalia of the third and fourth groups are similar. The volsella terminates in a sharp hook (Fig. 87) in the third group, which includes the *laminatus*, *debilis*, and *quadripunctatus* species complexes. The volsella is similar in the fourth group, which includes the *bispinosus* species complex, but the digitiform process of the aedeagus is abruptly bent and forms a lateral platelike structure (Fig. 138). This structure defines this species complex, instead of the mesosomal form of the worker. Males of the *shattucki* group are unknown.

CHARACTERISTICS OF THE SPECIES COMPLEXES

attelaboides species complex

The workers, females and males of this species complex have elongated, tubular occipital necks (Fig 14), which easily distinguishes them from mem-

bers of other complexes. The sculpture is rough, with rugae and foveolate punctures. The gaster is densely punctate in most species (except *rosenbergi*). There are numerous erect hairs, especially on the scapes. The maxillary palps are relatively short, the mesopleural spine is poorly developed. The subgenital plate of the male has two long processes (Fig. 127). The stipites are well developed (Fig. 131) and the lateral tooth of the aedeagus is poorly developed (Fig. 131). The volsellae are strongly hooked (Fig. 132).

These ants attack aggressively when the nest is disturbed.

Included species

D. attelaboides (Fabricius 1775)
= *D. attelaboides* var. *pulla* Santschi 1923
= *D. (Dolichoderus) imbecillus* Mann 1916 **new synonymy**
= *D. imbecillus* var. *heterogaster* Santschi 1923 **new synonymy**
D. longicollis new species
D. rosenbergi Forel 1911

bidens species complex

This is taxonomically the most difficult complex. It consists of a bewildering array of forms which intergrade into one another. I have synonymized several taxa and have tentatively considered the remainder to be good species. In the discussions of *D. bidens* and *D. quadridenticulatus* I have indicated species which will probably become synonyms when more material, especially males, becomes available. We are fortunate that the vast majority of the specimens collected are either *D. bidens* or *D. quadridenticulatus*, which are usually easily distinguished.

Workers and females of these species are small to moderate sized ants (WL 3.3 to 5.0mm); mandibles usually moderately shining with scattered punctures, usually with only 8 to 10 teeth on masticatory border, apical tooth usually more developed; 2 - 10 teeth on basal border, first two well developed, others usually reduced and may appear as a serrated edge only; clypeus rarely with medial emargination, anterior border usually slightly convex; mesosoma robust, metanotal area strongly constricted; propodeum often with teeth or tubercles on lateral corners, which are not connected by a carina; petiolar node usually bidentate.

These are abundantly hairy ants, with long, erect hairs on most body surfaces, including the scapes, as well as decumbent pubescence on many areas, especially the gaster. Length of erect hairs on scape greater than twice the diameter of scape.

Male genitalia are similar to those of other species of group 2 (above). Males of this complex are occasionally difficult to distinguish from those of the *diversus* complex. They are larger (WL>2.5mm) than those of the *diversus*

species complex, and are not completely punctate as are those of the *lugens* species complex. The aedeagus is large and toothed (Fig. 144), the digitiform process is bent laterally and ends in a sharp point (Fig. 143). The volsella is well developed, the digitus points ventrally and is usually enlarged at the end. The stipites are rudimentary or absent, as in most of the ants of this genus. These ants are moderately aggressive when the nest is disturbed.

Included species

D. abruptus (F. Smith 1858)
= *D. ursus* Mayr 1866 **new synonymy**
D. bidens (Linnaeus 1758)
= *D. auromaculatus* Forel 1885
= *D. bidens attenuatus* Forel 1903 **new synonymy**
= *D. bidens var. bahianus* Santschi 1921 **new synonymy**
= *Formica perditor* Fabricius 1804
D. cogitans Forel 1912
D. ferrugineus Forel 1903
= *D. bidens var. inferior* Man 1916 **new synonymy**
D. primitivus (Wilson 1985)
D. quadridenticulatus (Roger 1862)
= *Formica gibbosa* F. Smith 1858
= *D. analis* Emery 1894 **new synonymy**
= *D. gibbosus var. integra* Forel 1911 **new synonymy**
= *D. gibbosus var. gibbosoanalis* Forel 1922 **new synonymy**
= *D. gibbosus var. nitidior* Emery 1894 **new synonymy**
D. spurius Forel 1903
= *D. bidens albatus Viehmeyer* 1922 **new synonymy**

bispinosus species complex

The workers of all of the species in this complex, except *D. mesonotalis* (= *D. simplex*, = *D. grandii*) have pronotal spines and the petiolar scale is produced as a needlelike spine. Females of most of the species are similar, except that the pronotal and petiolar spines are smaller. Males have neither of these characteristics; they are easily recognized as the volsellae are as in groups 3 and 4, but the digitiform process of the aedeagus is bent laterally and forms a flat, rounded plate (Fig. 138). *Dolichoderus mesonotalis* is an unusual member of the complex as the workers do not have spines on the pronotum or on the petiolar scale. It is clearly a member of the complex as the males are typical of the group and are very similar to those of *D. bispinosus*. There are a number of characters that have been used in species recognition of workers, especially the sculpture of the dorsal face of the propodeum and the shape of the posterior margin of the propodeum, but that are not important, due to

variability within species. Nanitics are smaller, are more coarsely sculptured, the head is rounded and not strongly concave (especially obvious in species in which the vertex is concave), and the mesosoma is relatively more elongated.

These ants attack very aggressively when the nest is disturbed. They do not sting, of course, but the biting of hundreds of ants can drive away all but the most persistent myrmecologist. They have a strong "dolichoderine" odor when they attack.

Included species

D. andinus (Kempf 1962)
D. bispinosus (Olivier 1792)
= *Formica fungosa* Fabricius 1798
= *Polyrhachis arboricola* Norton 1868
D. curvilobus (Lattke 1986)
D. doloniger (Roger 1862)
D. epetreia (Lattke 1986)
***D. haradae* new species**
D. mesonotalis Forel 1907
= *D. grandii Menozzi* 1924 **new synonymy**
= *D. simplex Forel* 1912 **new synonymy**
D. mucronifer (Roger 1862)
= *D. spinicollis ensiger* Forel 1910
D. obscurus (F. Smith 1858)
D. omacanthus (Kempf 1972)
D. septemspinosus Emery 1894
D. spinicollis (Latreille 1832)
D. superaculus (Lattke 1986)
D. validus (Kempf 1959)

debilis species complex

Workers of this complex are closely related, small ants (WL slightly greater than 1mm). All known species have well developed, but small pronotal spines. The metanotal groove is very wide and deep. The basidorsal coxal tubercle is never developed. The anterior surface of the petiolar node is smooth and weakly shining. The node is rarely marginate and usually terminates in a small tooth or angle. The females lack pronotal spines and could be easily confused with females of the *diversus* species complex, as was pointed out by Kempf (1959). *Dolichoderus schulzi* is not a member of this species complex and is placed with the *laminatus* species complex, together with the closely related *D. tristis*.

These ants are timid and lack the "dolichoderine" odor.

Included species

D. debilis Emery 1890
= *D. debilis* var. *sieversi* Forel 1901
= *D. debilis* var. *parabiotica* Forel 1912
D. gagates Emery 1890
***D. inermis* new species**
D. inpai Harada 1986
D. rufescens Mann 1912

decollatus species complex

This complex is very closely related to the *attelaboides* complex and could probably be considered as members of that complex. They differ, however, in that the vertex is short, not elongated into a tubular neck. All of the species have greatly elongated mesosomal regions, as do species of the *attelaboides* complex. The sculpture is very coarse, consisting in most cases of foveolate punctures. The males are unknown, but would probably be similar to those of the *attelaboides* complex.

These ants can become aggressive when the nest is disturbed.

Included species

D. decollatus F. Smith 1858
= *D. capitatus* Santschi, 1921 **new synonymy**
= *D. decollatus neglectus* Menozzi 1935 **new synonymy**
***D. fernandezi* new species**

diversus species complex

This species complex consists of relatively small species found from México south to Brazil. Workers are distinguished from those of other species complexes in that they are only moderately hairy, the dorsal face and propodeal declivity are usually separated by a transverse carina, and the petiolar node is thin in profile and is rarely bidentate.

These ants are smaller (WL<2.3mm) than most of the other members of the genus. The antennal scapes are either without erect hairs (*D. ghilianii*, *D. lutosus*, and *D. piceus*) or the longest erect hairs are about equal to the diameter of the scape (Fig. 72). The propodeal angles are usually poorly developed and connected by a transverse carina (Fig. 46). The node of the petiole is rarely bidentate (Fig. 42). Females are similar to workers. Males resemble those of the *bidens* species complex, but are smaller (WL<2.3mm).

These ants are usually not aggressive, and attempt to escape when the nest is disturbed. They do not have a notable "dolichoderine" smell.

Included species

***D. baenae* new species**
D. caribbaea (Wilson 1985)
D. diversus Emery 1894
= *D. championi* Forel 1899 **new synonymy**
= *D. championi* var. *ornatus* Mann 1916 **new synonymy**
= *D. championi* race *trinidadensis* Forel 1899 **new synonymy**
= *D. championi* race *trinidadensis* var. *taeniatus* Forel 1899 **new synonymy**
= *D. germaini* var. *garbei* Forel 1911 **new synonymy**
= *D. germaini leviusculus* Emery 1906 **new synonymy**
= *Iridomyrmex mazaruni* Donisthorpe 1939 **new synonymy**
D. germaini Emery 1894
D. ghilianii Emery 1894
***D. laurae* new species**
D. luederwaldti Santschi 1921
D. lujae Santschi 1923
D. lutosus (F. Smith 1858)
= *Hypoclinea cingulata* Mayr 1862
= *D. lutosus var. nigriventris* Forel 1893 **new synonymy**
= *D. lutosus var. ruficauda* Wheeler 1936 **new synonymy**
***D. piceus* new species**
***D. voraginosus* new species**

Imitator species complex

The single species in this complex, *imitator* is easily recognized. The propodeum of the worker and female are armed with auricle-like structures (Fig. 18), and the descending face of the propodeum is covered with transverse costulae (Fig. 1). The subgenital plate of the male consists of two flattened appendages which are each bi-lobed (Fig. 129). The stipites are rudimentary and the digitiform process of the aedeagus is a long, curved structure (Fig. 133).

Included species

D. imitator Emery 1894

Laminatus species complex

Workers and females of this species complex have broad, platelike pronotal angles, and the propodeum overhangs the petiole. The apex of the petiolar node is usually acuminate, rarely with a small median spine (except in *D. tristis* and *D. schulzi*). The anterior surface of the node is opaque and covered with rough sculpture. Females are very similar to the workers and can usually be identified by simple comparison. There are apparently no characters which

distinguish males from those of the *quadripunctatus* species complex. Fortunately the two complexes are allopatric, which greatly assists in their separation. The parameres are relatively large (Fig. 148). The volsellae are thickened and the stipites are small (Fig. 134).

These ants are not aggressive and usually lack the "dolichoderine" odor (except for *D. tristis*).

Included species

D. lamellosus (Mayr 1870)
= *D. lamellosus* var. *missionensis* Santschi 1916
D. laminatus (Mayr 1870)
= *D. laminatus luteiventris* Emery 1894
D. lobicornis (Kempf 1959)
D. prolaminatus (Wilson 1985)
D. schulzi Emery 1894
= *D. biolleyi* Forel 1908
= *D. schulzi* var. *colombica* Forel 1912
D. setosus (Kempf 1959)
***D. smithi* new species**
D. tristis Mann 1916
D. varians Mann 1916

lugens species complex

These ants are easily recognized as the worker and both sexual castes are completely covered with coarse punctures, and are concolorous dark brown or black. They are also very different in that the metanotal groove of the worker is very deep, the pronotum is rounded, and the petiole is rounded and thickened in lateral view (Fig. 31). They are clearly members of *Dolichoderus* as the genitalia of the male (Fig. 136) are similar to those of the *bidens* and *diversus* species complexes. In addition they share all of the other characteristics of the genus (Shattuck 1982). The stipites are rudimentary, the posterior of the aedeagus is rounded, but a dorsal, lateral tooth is present. The digitus of the volsella is elongate and knobbed as it is in members of the *bidens* and *diversus* species complexes.

Included species

D. lugens Emery 1894

quadripunctatus species complex

The *quadripunctatus* species complex consists of species in which the propodeum overhangs the petiole, and the pronotum is without angles (Fig. 77). The extant New World species of the complex are found only in North America; it consists of 4 closely related species which are very similar to the

European and Siberian *D. quadripunctatus* (L.). Mayr (1866) suggested that the 4 New World species could be conspecific. Based on numerous characteristics of the workers, females and especially the male genitalia, there are clearly 4 distinct species. In addition all 4 species co-occur in Michigan with no evidence of hybridization (Kannowski 1959a). Wheeler (1905a) revised this species complex, but had a number of misconceptions about the group (Creighton 1950).

The workers in this complex are closely related to some of the Old World and Australian species of the genus. The propodeum of the worker extends over the petiole as an overhanging shelf (Fig. 77). The females are similar, except the propodeum does not overhang the petiole to such an extent (Fig. 78). The male genitalia (Figs. 84-87) of this complex are similar to those of the *laminatus* species complex (Fig. 148), showing a possible relationship between this complex and many species of "*Monacis*".

The worker mandibles usually have scattered punctures, often mixed with fine striae or very fine punctures, 10 - 20 teeth, most poorly defined, except 2 - 4 apical teeth (Fig. 81); clypeus with indented region in the medial anterior border, with 10 - 15 parallel longitudinal carinae; sculpture of head and mesosoma varies from almost smooth and shining to with deep foveolate punctures; mesosoma deeply impressed at metanotal suture; dorsal face of propodeum extends posteriorly above petiole (Fig. 77); gaster usually weakly smooth and shining. Erect hairs vary from none, to hairs on most surfaces, decumbent pubescence essentially absent, color ranges from light yellowish red to concolorous dark brown.

The female is similar to worker, mandibles usually with few teeth or only apical tooth well defined; ocelli large and well developed; sculpture of head, mesosoma and gaster as in worker; propodeal declivity concave and slightly overhanging petiole (Fig. 78). Pilosity and color as in worker.

The male has mandibles with 10 - 15 teeth, all are small except the apical (Fig. 80). The clypeus has little or no evidence of parallel carinae, eyes and ocelli are large and well developed. The sculpture of the head and mesosoma is rough and densely and evenly punctate; propodeum rounded and not extending even a slight amount over the petiole (Fig. 79); gaster mostly smooth and shining. Parameres and stipites considerably reduced in most species (Figs. 84-86).

These ants can become aggressive when the nest is disturbed. This is the only species complex in the New World which always nests in the soil. *Dolichoderus bispinosus* will occasionally nest in the soil, but always in association with dead wood. The *quadripunctatus* species complex in the New World consists of 7 species (three extinct) whose distribution is limited to North America.

Included species

D. antiguus Carpenter 1930
D. mariae Forel 1885
= *D. mariae davisi* Wheeler 1905
= *D. mariae* var. *blatchleyi* Wheeler 1916
D. obliterus (Scudder 1877)
D. plagiatus (Mayr 1870)
= *D. plagiatus* var. *inornatus* Wheeler 1905
= *Tapinoma boreale* Provancher 1889
D. pustulatus Mayr 1886
= *D. plagiatus pustulatus* var. *beutenmuelleri* Wheeler 1904
D. rohweri Carpenter 1930
D. taschenbergi Mayr 1866
= *D. taschenbergi* var. *gagates* Wheeler 1905
= *D. taschenbergi* var. *aterrimus* Wheeler 1915
= *D. taschenbergi* var. *wheeleriella* Forel 1916

rugosus species complex

The workers and females of this complex are easily recognized as the spine on the lower mesopleural border is well developed (Fig. 20) and the maxillary palps are greatly elongated (Fig. 6). The propodeum is armed with long, well developed spines (Fig. 19). The female is very similar to the worker. The males are similar to those of the *attelaboides* complex, except the appendages on the subgenital plate are wider (Fig. 128). In addition, the digitiform process of the aedeagus is strongly recurved (Fig. 132), with a well developed lateral tooth.

Included species

D. dibolia (Wilson 1985)
***D. intermedius* new species**
D. rugosus (F. Smith 1858)

shattucki species complex

There is a single species, *D. shattucki*, in this species complex. The workers and females of this complex are among the most easily recognized Neotropical ants. The presence of long spines on the pronotum, propodeum (and mesonotum of worker), in addition to the spine on the petiole (Fig. 1), distinguish this species from all others. The long maxillary palps distinguish it from any of the similar members of the *bispinosus* species complex. The males are unknown.

Included species

***D. shattucki* new species**

Name excluded from *Dolichoderus*

D. granulatus Pergande 1896:866 (1 syntype worker, CASC) [seen] = *Camponotus striatus* (F. Smith) (synonymy by M. Smith 1953:211)

KEY TO WORKERS OF NEW WORLD *DOLICHODERUS*:

As the species complexes are easily recognized, I have provided the following list to allow for going directly to the first couplet of each complex.

attelaboides complex, go to couplet 15.
bidens complex, go to couplet 44.
bispinosus complex, go to couplet 18 (or 12 for *D. mesonotalis*).
debilis complex, go to couplet 29.
decollatus complex, go to couplet 17.
diversus complex, go to couplet 51.
imitator complex, go to couplet 2.
laminatus complex, go to couplet 33.
lugens complex, go to couplet 10.
quadripunctatus complex, go to couplet 41.
rugosus complex, go to couplet 13.
shattucki complex, go to couplet 7.

1. Mesonotum much longer than wide (MI>180); mesopleuron at least twice as long as broad (Fig. 14); mesosoma extremely long and narrow, resulting in bizarre looking ants; pronotum without angles or spines (Fig. 14) 2
— Mesonotum wider than long or only slightly longer than width (MI<180, Figs. 10, 11, 16); mesopleuron usually not long and narrow; mesosoma not usually narrowed 5

2(1). Propodeal spines well developed (Fig. 3) 3
— Propodeal spines poorly developed, consisting of small auricles or angles (Fig. 18b) (*imitator* complex) ..... *imitator*

3(2). Maxillary palps not elongated, extending halfway to foramen magnum; mesopleural spine very small (Fig. 5) 4
— Maxillary palps very long, extending nearly to foramen magnum; mesopleural spine well developed (Fig. 20) (*rugosus* complex) 13

4(3). Vertex elongated as a long, tubular neck (Fig. 57) (*attelaboides* complex) 15
— Vertex not elongated as a tubular neck (Fig. 53) (*decollatus* complex) 17

5(1). Pronotum always with spines or at least is sharply angulate (Fig. 1, 10); scale of petiole often terminating in a long spine (Fig. 13); surface of mesonotum usually concave 6
— Pronotum without spines or angles in workers (Fig. 44), or if angles

present, they are small (Fig. 40) and the dorsal face of the propodeum is at least 1.5 times longer than broad (Fig. 40); scale never terminating in a long spine, although a small, median tooth may be present 9

6(5). Petiolar scale produced apically as a long, needlelike spine (Figs. 1, 52) 7

— Petiolar scale not produced apically as a long, needlelike spine (Fig. 32), although it may be produced apically as a small spine 8

7(6). Mesosoma with three pairs of long, acute spines (Fig. 1) (*shattucki* complex) ..... *shattucki*

— Mesosoma with at most one or two pairs of long, erect spines, if 3 pairs are present, at least mesonotal spines are short (Fig. 16) or tuberculiform (*bispinosus* complex, in part) 18

8(6). Anterior surface of petiolar node nearly smooth and shining, usually with a small, apical, median tooth; pronotum with distinct teeth; basidorsal tubercles on hind coxae never present; dorsal face of propodeum narrower than mesonotum (Fig. 10); metanotal groove broad and deeply impressed (Fig. 9) (*debilis* complex) 29

— Petiolar scale opaque, strongly and densely sculptured, usually with an acuminate crest (Fig. 12) (short medial spine in *D. tristis* and *D. schulzi*, see Fig. 8); pronotum angulate, without teeth; basidorsal tubercles often present; dorsal face of propodeum usually at least as broad as mesonotum; metanotal groove narrow and shallowly impressed (*laminatus* complex) 33

9(5). Propodeum not strongly overhanging petiole (Fig 32); tropical México (including states of Tamaulipas and San Luís Potosí) south throughout Latin America 10

— Propodeum strongly overhanging petiole in lateral view (Fig. 77); northern México (Nuevo León) and eastern half of United States (*quadripunctatus* complex) 41

10(9). Petiolar node thickened and rounded (in lateral view) and never apically bidentate (Fig. 31), and length of longest erect hairs on scape less than half diameter of scape (Fig. 73); entire ant heavily, densely and uniformly covered with coarse punctures; concolorous dark brown or black (mandibles, legs and antennae lighter) (*lugens* complex) ..... *lugens*

— Petiolar node not thickened as above, or if thickened (Fig. 29), it is usually bidentate (Fig. 23b) and length of longest erect hairs on scape usually at least as long as diameter of scape (Fig. 61) (occasionally shorter or completely absent); sculpture ranging from lightly punctate to foveolate, but varying considerably on different body surfaces; usually light colored or at least not concolorous dark brown 11

11(10). Length of longest erect hairs on scape less than or about equal to diameter of scape (Figs. 69, 74), or absent (occasionally a few hairs are

almost as long as two scape diameters, but the majority are much shorter); dorsal and declining faces of propodeum usually completely separated by a transverse carina (Figs. 43, 44); propodeal spines poorly developed or absent (Fig. 46); node of petiole rarely bidentate 12
— Length of longest erect hairs on scape nearly twice diameter of scape (Fig. 62); dorsal face and propodeal declivity not separatedby transverse carina; propodeum usually ith pair of well developed tuberles (Fig. 25); node of petiole usually bidentate (Fig. 26) (*biden* complex) 44

12(11). Concolorous blck (except base of scape, mandibular teth and tarsi); metanotal grooveshallow (Fig. 32); clypeus with dene, decumbent pubescence; uncommon (*ispinosus* complex - in part) ..... *mesnotalis*
— Rarely concolorous black, when an is dark, at least most of legs, parts of antenna and mandibles lighter; metanotal groove deeply developed (Fig. 41); clypeus without dense, decumbent pubescence (*diversus* complex) 51

***rugosus* complex:**

13(3). Extinct taxa, Dominican Republic 14
— Extant taxon, continental South America. ..... *rugosus*

14(13). Mesonotum strongly protruding (Fig. 6); pronotum not elongated at point of attachment to head (Fig. 6) ..... *intermedius*
— Mesonotum not strongly protruding (Fig. 4); pronotum elongated at the attachment of head (Fig. 4) ..... *dibolius*

***attelaboides* complex:**

15(4). Occipital neck about as long as the minimum width as seen from above (Fig. 54); in full face view, eyes do not extend past lateral margins of the head (Fig. 59); mesonotum usually not strongly protruding (Fig. 14); dorsum of gaster usually entirely punctate; common, widely distributed species . ..... *attelaboides*
— Occipital neck at least two times as long as the minimum width as seen from above (Fig. 57); in full face view, eyes extend past lateral margins of head (Fig. 57); anterior part of mesonotum often strongly protruding (Figs. 17, 21); sculpture on dorsum of gaster variable; rarely collected ants, Colombia, Peru and Ecuador 16

16(15). Dorsum of gaster completely smooth and strongly shining .... *rosenbergi*
— Dorsum of gaster completely and strongly punctate ..... *longicollis*

***decollatus* complex:**

17(4). Pronotal disk with coarse foveolae; antennal scape with more than 40 erect hairs (Fig. 53); pronotum with more than 20 erect hairs; common and widely distributed ..... *decollatus*

— Pronotal disk mostly smooth and glossy; antennal scape with less than 30 erect hairs (Fig. 59) (usually less than 10); pronotum with less than 10 erect hairs; not commonly collected ..... *fernandezi*

***bispinosus* complex:**

18(7). Posterior corners of mesonotum and dorsal face of propodeum with spines, the mesonotal spines shorter and suberect ..... *septemspinosus*
— Posterior corners of mesonotum and dorsal face of propodeum without spines, at most with a very small tooth on either or both 19

19(18). Dorsal face of propodeum with the posterior border marginate or crested, overhanging the excavate declivous face (Fig. 52); hind coxae with well developed basidorsal tooth (Fig. 12) 20
— Dorsal face of propodeum with posterior border emarginate, not overhanging the flat or convex declivous face; hind coxae without well developed tubercle 27

20(19). Scape and legs without erect hairs; color yellowish-brown .... *doloniger*
— Scape and legs with abundant erect hairs; usually dark in color 21

21(20). Petiolar summit (anterior view) more or less transversely truncate, usually crenulate, with lateral margins well differentiated from those of spine (Fig. 33); commonly collected 22
— Petiolar summit not transversely truncate, lateral margin continuing and tapering into spine (Fig. 34); not commonly collected 25

22(21). Sculpture of clypeus consisting of widely dispersed, fine punctures, sometimes with fine, longitudinal costulae; very common and widely distributed from México to Brazil 23
— Sculpture of clypeus consisting of well defined, foveolate punctures (Fig. 67); rarely collected (Northern South America) 24

23(22). Pronotal spines long (>0.2mm); common and widely distributed .... *bispinosus*
— Pronotal angles short (<0.12mm, see Fig. 158), uncommon (Brazil: Amazonas) ..... *haradae*

24(22). Gaster with delicate, silver pubescence; legs orange in color, strongly contrasting with the dark black remainder of the ant ..... *epetreia*
— Gaster with golden pubescence; legs nearly concolorous with remainder of ant ..... *andinus*

25(21). Vertex strongly concave ..... *validus*
— Vertex straight or very weakly concave 26

26(25). Pronotal spines projecting anteriorly and slightly upwards .... *curvilobus*
— Pronotal spines projecting obliquely upwards ..... *superaculus*

27(19). Sides of head, antennal scapes, femora and tibiae with erect hairs;

pronotal spines as long as width of mesonotum ..... *omacanthus*
— Sides of head, antennal scapes, femora and tibiae without erect hairs; pronotal spines either much longer or much shorter than width of mesonotum 28

28(27). Posterior corners of dorsal face of propodeum dentate; pronotal spines huge, greatly exceeding width of mesonotum (Fig. 16) ..... *spinicollis*
— Posterior corners of dorsal face without teeth; pronotal spines much shorter than width of mesonotum ..... *mucronifer*

***debilis* complex:**

29(8). Posterior border of dorsal face of propodeum bluntly marginate; scapes (except apex) and superior border of petiole without erect hairs (very small, white, erect hairs may be present), less than 2 erect hairs on each femur; dorsum of gaster with sparse, finely appressed pubescence in addition to scattered erect hairs ..... *debilis*
— Posterior border of dorsal face of propodeum usually sharply marginate, forming a narrow, weakly elevated crest (Fig. 10); scapes, legs and superior border of petiole with erect or suberect hairs; dorsum of gaster lacking appressed pubescence, although some of the shorter hairs may be suberect 30

30(29). Integument of head and dorsum of mesosoma strongly sculptured; mandibles without fine and dense striae, but with scattered punctures; light ferruginous in color ..... *rufescens*
— Integument of head and dorsum of mesosoma nearly smooth and shining; mandibles finely and densely striate or nearly smooth; color reddish-brown to dark brown 31

31(30). Mesonotum longer than wide (1.15<MI<1.56, Fig. 11); mandibles smooth with few scattered punctures; petiolar scale conspicuously broader than propodeal declivity; rarely collected brown ant (Brazil, Venezuela) .. .. *inpai*
— Mesonotum wider than long (MI<0.97, Fig. 10); mandibles roughened, finely and densely striate; petiolar scale not conspicuously broader (only slightly broader) than propodeal declivity (Fig. 10); occasionally collected, widely distributed 32

32(31). Posterior border of propodeum with a sharply marginate, elevated crest; relatively common black ant (Brazil and Bolivia) ..... *gagates*
— Posterior border of propodeum rounded, lateral corners angulate (Fig. 10); rarely collected (Costa Rica) ..... *inermis*

***laminatus* complex:**

33(8). Mesonotum as long as, or longer than broad, concave in middle, its lateral margins slightly elevated; hind coxa without basidorsal tubercle 34

— Mesonotum broader than long, flat, its lateral margins not elevated; hind coxa with well developed basidorsal tubercle (Fig. 12) 36

34(33). Mesosoma lacking erect hairs (erect hairs present near mouthparts, on fore coxa and on gaster); common species 35

— Mesosoma with short (3 - 3.5mm), fine, erect hairs; uncommon ..... *varians*

35(34). Common extant species; dorsal border of petiolar node convex in full face view ..... *laminatus*

— Extinct taxon (Dominican Republic); dorsal border of petiolar node concave in full face view ..... *prolaminatus*

36(33). Dorsum of mesosoma finely and densely reticulate-punctate; transverse border of petiolar summit sharply marginate, but not crested nor lamellate, usually with a short spine arising abruptly from the middle ..37

— Dorsum of mesosoma coarsely reticulate-rugose and foveolate; border of petiolar apex with an inclined, mesially acuminate crest 38

37(36). Petiolar node thickened (Fig. 13) (in profile) with well developed dorsal tooth; gaster with dense, silver pubescence ..... *tristis*

— Petiolar node thin, usually with poorly developed dorsal tooth (Fig. 8); gaster with dilute, silver or golden pubescence ..... *schulzi*

38(36). Scape flattened and broadened at base as a rounded lobe (Fig. 76) ..... *lobicornis*

— Scape cylindrical, not broadened at base as rounded lobe 39

39(38). Body thickly covered with short, fine, erect hairs ..... *setosus*

— Body essentially without erect hairs, except for a few on head, fore coxa and gaster 40

40(39). Posterior border of propodeum broadly rounded (as seen from above); petiole without a distinct, acuminate crest (Fig. 12) ..... *lamellosus*

— Posterior border of propodeum bilobed (as seen from above, Fig. 37); petiole with a distinct, acuminate crest ..... *smithi*

***quadripunctatus* complex:**

41(9). Dorsal face of propodeum subquadrate, less than 1.2 times longer than broad (Fig. 89) ..... *taschenbergi*

— Dorsal face of propodeum more than 1.4 times longer than broad (Fig. 88) 42

42(41). Usually at least 10 erect hairs on scape (Fig. 81) and 10 on pronotum; cephalic foveolae usually obvious and often coarse, deep and very closely set so that the surface between them forms a reticulate-rugose pattern; pronotal disc coarsely sculptured with foveolate punctures or rugae; often bicolored with head darker than mesosoma ..... *plagiatus*

— No erect hairs (or less than 9, excluding a few at apex) on the scape and pronotum; dorsum of head usually densely and heavily punctate with little

or no evidence of foveolae; pronotal disc finely sculptured, usually with fine, dense, and closely set punctures; often bicolored with gaster darker than concolorous head and mesosoma 43

43(42). Often concolorous dark brown, when bicolored, head and mesosoma are usually brown, gaster dark brown; dorsal face of propodeum with coarse, deep, close-set foveolae forming a reticulate-rugose pattern ... *pustulatus*
— Usually bicolored with head and mesosoma reddish, gaster dark brown; dorsal face of propodeum granulose or densely shagreened ..... *mariae*

***bidens* complex:**

44(11). Apex of petiolar node pointed (Fig. 28); clypeus overhangs mandibles (Fig. 27); taxon from Dominican amber ..... *primitivus*
— Apex of petiolar node bidentate, or rounded (Figs. 30, 31); extant species 45

45(44). Head cordate in shape (full face view), widest portion of head posterior to eye (Fig. 61) 46
— Head oval-elongate, with widest portion of head near eye (Fig. 62), or orbiculate (Fig. 63) and HL less than 1.5mm 47

46(45). Pronotum and gaster mostly or entirely smooth and shining, with little or no pubescence; usually concolorous ferruginous red; uncommon ..... *abruptus*
— Pronotum and gaster moderately or densely sculptured, usually at least gaster with moderately dense pubescence; usually bicolored (head and mesosoma reddish brown, gaster black) or concolorous dark brown; common ..... *quadridenticulatus*

47(45). Head elongate and oval in shape (Fig. 62), HL>1.40mm 48
— Head orbiculate in shape (Fig. 63), HL usually less than 1.40mm ... 49

48(47). Apex of petiolar node bluntly rounded (in profile), teeth absent or poorly developed (Fig. 24b); head often with dense, decumbent, golden pubescence; concolorous reddish yellow; relatively uncommon ..... *ferruginous*
— Apex of petiolar node with sharp margin (in profile) (Fig. 22a), petiolar teeth usually well developed (Fig. 23b); head with little or no decumbent pubescence; usually concolorous dark brown or black; very common ..... *bidens*

49(47). Head with decumbent, golden pubescence; usually concolorous reddish-yellow ..... *ferruginous*
— Head with little or no golden pubescence; or if golden pubescence is present, ant not concolorous reddish-yellow 50

50(49). Head slightly cordate in shape (Fig. 63); head usually reddish brown with remainder of ant dark brown; propodeal spiracle more than 1 diameter from propodeal declivity (Fig. 24a) ..... *cogitans*
— Head narrowly rounded at vertex; usually dark brown or grey-brown with

dense, golden pubescence on gaster; propodeal spiracle about 1 diameter from propodeal declivity (Fig. 29) ..... *spurius*

***diversus* complex:**

51(12). Scape without erect hairs (except for a few at the apex), occasionally with suberect or decumbent hairs (Fig. 75) 52
— Entire scape with numerous completely erect hairs, whose maximum length is approximately equal to the maximum diameter of scape (Fig. 71) 56

52(51). Scapes and tibiae completely lacking hairs; pronotum never angulate; common species ..... *lutosus*
— Scapes and tibiae with suberect or decumbent hairs (Fig. 74), especially near apex of scape; pronotum weakly angulate at shoulders; uncommon species 53

53(52). Concolorous light brown pale yellow or bicolored (head, mesosoma light, gaster dark); pronotum with poorly defined angles; widely distributed 54
— Concolorous black extant species or reddish-brown fossil taxon; pronotal angles well defined (Fig. 40) 55

54(53). Posterior border of dorsal face of propodeum with strongly upturned flange (Fig. 35), dorsal surface concave; widely distributed ..... *ghilianii*
— Posterior border of propodeum rounded (Fig. 36), dorsal surface convex; rarely collected (Colombia) ..... *baenae*

55(53). Concolorous black; Colombia ..... *piceus*
— Concolorous reddish-brown fossil taxon from Dominican Republic ..... *caribbaea*

56(51). First gastral tergite with dense, appressed pubescence, in addition to numerous silver or yellowish erect hairs; malar area usually without foveolate punctures; rarely collected 57
— First gastral tergite without dense, appressed pubescence, or if pubescence present, malar area with numerous deep, foveolate punctures; very common ants 59

57(56). HL<1.53mm (Figs.70, 151); mesonotum elongate (MI>129) 58
— HL>1.58mm (Fig.71); mesonotum round in shape (MI<128) ..... *lujae*

58(57). Vertex concave; medial clypeal margin strongly emarginate (Fig. 70); SE Brazil ..... *luederwaldti*
— Vertex not concave (Fig. 151); medial margin of clypeus almost straight; Colombia ..... *laurae*

59(56). Dorsum of head and malar area moderately punctate, usually with few or no foveolae; MI>130 (Fig. 50); area between dorsal face of propodeum and sides usually rounded; generally bicolored with head and mesosoma reddish-brown and gaster darker, or with alternating light and dark brown

bands on gaster; common, widely distributed species (México to Bolivia) ..... *diversus*

— Dorsum of head and malar area with numerous coarse foveolae, in addition to dense punctures; MI<130 (Fig. 51); dorsal face of propodeum separated from sides by sharp angle or carina (Fig. 48); usually predominantly concolorous dark reddish-brown or black, if bicolored, head and gaster dark brown or black, mesosoma lighter, or head and mesosoma concolorous, gaster striped light and dark brown; uncommon (southern Brazil) 60

60(59). Pronotum with foveolae; head orbiculate in shape (Fig. 72); gastral terga with moderately dense, appressed, silver pubescence ..... *voraginosus*

— Pronotum without foveolae, but very roughened in sculpture; head triangular in shape; gaster without silver pubescence ..... *germaini*

KEY TO FEMALES OF NEW WORLD *DOLICHODERUS*:

(Note: Worker key may be useful for identification of undescribed females. Females are often difficult to identify, but are usually similar to workers and identifications can often be verified by comparing them to workers.)

This key is prefaced as was the worker key.
attelaboides complex, go to couplet 2.
bidens complex, go to couplet 19.
bispinosus complex, go to couplet 8.
debilis complex, go to couplet 28.
decollatus complex, go to couplet 3.
diversus complex, go to couplet 25.
imitator complex, go to couplet 5.
laminatus complex, go to couplet 15.
lugens complex, go to couplet 18.
quadripunctatus complex, go to couplet 12.
rugosus complex, go to couplet 4.
shattucki complex, go to couplet 4.

1. HL>2.7mm; discoidal cell usually shaped as a pentagon; propodeal spines well developed 2

— HL<2.6mm; discoidal cell usually rectangular; propodeal spines usually reduced to small angles 5

2(1) Occiput drawn out as a long, tubular neck (*attelaboides* complex) ..... *attelaboides*

(Undescribed females of *rosenbergi* and *longicollis* may key to this couplet.)

— Occiput not drawn out as a tubular neck 3

3(2). Maxillary palps short, extending about half the distance to foramen

magnum; mesopleural spine poorly developed (*decollatus* complex) .... *decollatus*
(Undescribed females of *fernandezi* may key to this couplet.)
— Maxillary palps long, extending nearly to foramen magnum; mesopleural spine well developed 4
4(3). Pair of spines present on pronotum; petiole with a single spine (*shattucki* complex) ..... *shattucki*
— Without spines on pronotum and petiole (*rugosus* complex) .. *rugosus*
5(1). Propodeal declivity with numerous coarse, transverse striae; petiole strongly inclined anteriorly and node bidentate (*imitator* complex) .... *imitator*
— Propodeal declivity without coarse, transverse striae (if present, they are very fine and only near spines); if petiole is bidentate, it is not strongly inclined anteriorly 6
6(5). Pronotum armed with spines or angles 7
— Pronotum without spines or angles 11
7(6). Pronotum armed with spines, although they may be small; petiolar node usually armed with an apical tooth (*bispinosus* complex) 8
— Pronotum armed with flattened angles; petiole node without spine, usually flattened, roughened and with an acuminate crest (*laminatus* complex) 15

***bispinosus* complex**

8(7). Propodeum unarmed, completely rounded posteriorly ..... *mucronifer*
— Propodeum with at least a carina separating the dorsal and posterior faces 9
9(8). Scape with numerous erect hairs 10
— Scape without any erect hairs (possibly a few at apex) ..... *curvilobus*
10(9). Scape relatively short (SI<96); Mexico south to Brazil, very common ..... *bispinosus*
— Scape relatively long (SI>99), Costa Rica south to Colombia, uncommon ..... *validus*
11(6). Found in North America (including temperate northern Mexico) (*quadripunctatus* complex) 12
— Found in Latin America (including tropical areas in northern Mexico) 17

***quadripunctatus* complex:**

12(11). Scapes with more than 10 erect hairs; dorsum of head with foveolae ..... *plagiatus*
— Scapes without erect hairs; dorsum of head with poorly defined foveolae or mostly smooth and shining 13
13(12). Mesoscutum and mesopleuron densely punctate; dorsal face of

propodeum coarsely foveolate ..... *pustulatus*
— Mesoscutum and mesopleuron smooth and shining; dorsal face of propodeum smooth or finely punctate 14
14(13). Usually concolorous dark brown; first tergum of gaster with 10 or more erect and suberect hairs ..... *taschenbergi*
— Usually bicolored, with gaster darker than head and mesosoma; first tergum with less than 5 erect hairs, usually none ..... *mariae*

***laminatus* complex**

15(7). Basidorsal coxal tooth well developed 16
— Basidorsal coxal tooth not developed ..... *laminatus*
16(15). Posterior border of propodeal declivity concave; commonly collected ..... *lamellosus*
— Posterior border of propodeal declivity convex; rarely collected ..... *schulzi*
17(11). HL>1.75mm, HW>1.55mm 18
— HL<1.65mm, HW<1.50mm 24

***lugens* complex**

18(17). Entire ant densely and evenly punctate; color dark reddish-brown; petiole thickened with rounded apex ..... *lugens*
— Sculpture variable, but at least sculpture on gaster not as coarse as that of head; color variable, but may be concolorous dark reddish-brown; petiole usually not notably thickened and without rounded apex 19

***bidens* complex**

19(18). Concolorous ferruginous yellowish-red, gaster smooth and strongly shining, essentially without appressed pubescence ..... *abruptus*
— Other coloration, or gaster not smooth and shining and with abundant appressed pubescence 20
20(19). Head weakly cordate, with concave vertex; head usually reddish-brown, remainder of ant darker in color ..... *quadridenticulatus*
— Head usually oval-elongate, with vertex straight or only slightly concave; concolorous dark brown, reddish-brown or grey-brown 21
21(20). Petiole thickened in profile, without well defined teeth on node; concolorous reddish or ferruginous brown ..... *ferrugineus*
— Petiole not thickened in profile, usually with 2 well defined teeth on node; usually concolorous dark reddish-brown or greyish-brown 22
22(21). Teeth on node of petiole well developed; usually dark reddish brown; commonly collected 23
— Teeth on node of petiole not well developed; usually greyish-brown; uncommonly collected ..... *spurius*
23(22). Propodeum with pair of angles; head elongate (82<CI<85); pronotum

punctate ..... *bidens*
— Propodeum with pair of lobes; head not elongate (CI = 96); pronotum with transverse rugae ..... undescribed species near *bidens*
24(17). HL>1.20mm 25
— HL<1.10mm 28

***diversus* complex**

25(24). Scapes with erect hairs; HL>1.4mm 26
— Scapes without erect hairs (may have few appressed hairs); HL<1.4mm 27
26(25). Propodeum with small angles connected by carina; petiolar node with carina or ridge; common, widely distributed (Mexico to Brazil) ... *diversus*
— Propodeum with large, blunt tubercles (Fig. 154), not connected by carina; petiolar node blunt, truncate in profile (Fig. 154); uncommon (Colombia) ..... *laurae*
27(25). Scapes without standing or appressed hair; commonly collected .... *lutosus*
— Scapes with appressed hairs; rarely collected ..... *ghilianii*

***debilis* complex**

28(24). Concolorous brown; scape without erect hairs; relatively commonly collected ..... *debilis*
— Concolorous yellowish-red; scape with erect hairs; rarely collected .... *rufescens*

KEY TO MALES OF NEW WORLD *DOLICHODERUS*:

(Note: males of the *shattucki* and *decollatus* complexes are unknown, use key with caution as the males of many species are unknown and males of *Dolichoderus* species are often very similar.) This key is prefaced as were the others to facilitate identifications.

attelaboides complex, go to couplet 3.
bidens complex, go to couplet 12.
bispinosus complex, go to couplet 15.
debilis complex, go to couplet 26.
decollatus complex, go to couplet 4 (males unknown).
diversus complex, go to couplet 8.
imitator complex, go to couplet 2.
laminatus complex, go to couplet 22.
lugens complex, go to couplet 6.
quadripunctatus complex, go to couplet 19.
rugosus complex, go to couplet 4.
shattucki complex, males unknown.

1. Subgenital plate large, well developed, with 2 large fingers or flattened processes (Fig. 127) 2
— Subgenital plate small, poorly developed, consisting at the most of only a single rounded lobe (Fig. 130) 5

2(1). Subgenital plate formed into 2 elongate fingers (Fig. 127) 3
— Subgenital plate consisting of 2 flattened processes which are bidentate (Fig. 129) (*imitator* complex) ..... *imitator*

3(2). Occipital neck well formed (Fig. 115) ..... *attelaboides*
(The unknown males of *rosenbergi* and *longicollis* from Colombia, Ecuador and Peru may key to this couplet.)
— Occipital neck not tubular or elongated 4

4(3). Petiolar node twice as long as broad ..... *rugosus*
(and probably the unknown males of *dibolia* and *intermedius*)
— Petiolar node about as long as broad ..... unknown males of *decollatus* and *fernandezi* would probably key here.

5(1). Digitus of volsella elongate and usually enlarged at apex (Fig. 136) ... 6
— Digitus of volsella beak-like and not elongate (Fig. 134) 14

6(5). Entire body strongly and evenly punctate ..... *lugens*
— Sculpture variable on different parts of body 7

7(6). HL<1.06mm; ocelli project above vertex in full face view (Fig. 117) (*diversus* complex) 8
— HL>1.06mm; ocelli do not project (or only slightly) above vertex in full face view (Fig. 120) (*bidens* complex) 12

***diversus* complex**

8(7). Ocelli strongly protruding (Fig. 117); scape with subdecumbent to erect hairs (Fig. 118) 9
— Ocelli not as strongly protruding; scape without erect or even subdecumbent hairs (very rarely 1 - 2 small, subdecumbent hairs) ..... *lutosus*

9(8). With at least some hairs erect on scape (Fig. 117); usually concolorous dark brown; relatively common 10
— Most hairs on scape subdecumbent or appressed (Fig. 118, 121); head and mesosoma concolorous yellowish-brown, gaster darker brown; very rarely collected 11

10(9). Propodeum completely rounded at border of dorsal and declining faces; entire ventral margin of aedeagus with teeth (Fig. 140); common and widely distributed (Mexico south to southern Brazil) ..... *diversus*
— Propodeum with well developed tubercles; only posterior half of aedeagus with teeth (Fig. 157); Colombia ..... *laurae*

11(9). Scape subequal in length (or longer) to length of second funicular segment (Fig. 118) ..... *ghilianii*
— Scape about 1/2 length (0.58 - 0.59 X length) of second funicular segment

(Fig.121b) ..... undescribed species near *D. ghilianii*

***bidens* complex**

12(7). Concolorous golden yellow; most surfaces glossy and shining .... *abruptus*
— Concolorous brown; all surfaces dull 13
13(12). Lateral corners of apex of node of petiole weakly rounded (Fig. 103), area between corners flat or weakly concave; spiracle located low on petiole (Fig.102) ..... *bidens*
— Lateral corners of apex of node of petiole more angulate (Fig.101), area between them concave; spiracle located higher on petiole (Fig.100) .... *quadridenticulatus*
14(5). Digitiform process of aedeagus terminating in a laterally twisted, flattened plate (Figs.138, 147) (*bispinosus* complex) 15
— Digitiform process of aedeagus usually terminating as a sharp, hook-like structure, which is not laterally twisted (Fig. 87, 141) 18

***bispinosus* complex**

15(14). HL<1.2mm; Mexico south to Brazil, common 16
— HL>1.2mm; Costa Rica south to Colombia; rarely collected ..... *validus*
16(15). Apex of petiolar node convex, without angulate corners (Fig.107); uncommon 17
— Apex of petiolar node usually concave, weakly angulate on each corner (occasionally flat and truncate); commonly collected ..... *bispinosus*
17(16). Node of petiole well developed, without strongly protruding spiracles (Fig.108) ..... *mucronifer*
— Node of petiole low, poorly developed (Fig. 96b), with strongly protruding spiracles (Figs. 96a) ..... *mesonotalis*
18(14). Occurring in North America, primarily in the United States (also state of Nuevo León, Mexico) (*quadripunctatus* complex) 19
— Occurring in Latin America in tropical areas 22

***quadripunctatus* complex**

19(18). First tergum and posterior edge of pronotum with at least 3 erect or suberect, short hairs; aedeagus with 5 or 6 very small teeth (Fig. 86) .... *taschenbergi*
— First tergum and posterior edge of pronotum without erect hairs; teeth on aedeagus long and well developed (Fig. 84), or more than 6 teeth present 20
20(19). Distance from median ocellus to lateral ocellus equal to maximum diameter of median ocellus (Fig. 80); wings with media attached to radius at the same point with cross vein from stigma, and extends almost to margin of wing (Fig. 82) ..... *mariae*

— Distance from median ocellus to lateral ocellus about 1.4 times maximum diameter of median ocellus; distance from connection of media to radius at least 1/3 as long as length of crossvein, median often does not extend to margin of wing (Fig. 83) 21

21(20). Distance from connection of media to radius of fore wing often subequal in length to crossvein (Fig. 83); aedeagus with teeth only on posterior border; volsella large and well developed (Fig. 87) ... *pustulatus*

— Distance from connection of media to radius usually about 1/3 the length of crossvein; aedeagus with teeth over entire ventral border in addition to posterior border; volsella small and poorly developed (Fig. 84) ..... *plagiatus*

***laminatus* complex**

22(18). Node of petiole often with sharp apex, anterior face of petiole rugose or roughly sculptured 23

— Apex of node of petiole usually completely rounded and blunt (Fig 109b), or with median tooth (Fig. 114), anterior face of petiole almost smooth or only lightly punctate 24

23(22). Ocelli not strongly protruding (Fig. 125); WL<1.5mm ..... *lamellosus*

— Ocelli strongly protruding (Fig. 126); WL>2.0mm ..... *varians*

24(22). Anterior surface of petiole lightly punctate, apex of node terminating in a tooth (Fig.114b), or node thickened with an acuminate border (Fig. 110) 25

— Anterior surface of petiole mostly smooth and moderately shining, apex of node not terminating in a tooth (Fig.113) 26

25(24). Apex of petiole terminating in a tooth (Fig.114b) ..... *tristis*

— Apex of node terminating in an acuminate border (Fig.109a) ... *schulzi*

***debilis* complex**

26(24). Scutum densely, but shallowly punctate; concolorous dark brown ... *debilis*

— Scutum roughly sculptured, foveolate; yellowish-brown with gaster somewhat lighter in color ..... *rufescens*

DESCRIPTIONS OF SPECIES

Dolichoderus abruptus (F. Smith)

Figs. 22a, 22b, 61, 104, 105, 122; Map 21

Formica abrupta F. Smith 1858:45, worker, BRAZIL: Pará (BMNH) [not seen].

Formica abrupta: Roger 1862b:285 [as junior synonym of *H. bidens*; status revived by Mayr 1870b:391-392].

Hypoclinea ursus Mayr 1866:499-500, female, ECUADOR: Quito [not seen, presumably lost], **new synonymy.**

Hypoclinea abrupta: Mayr 1870a:956, 1870b:391-392; Kempf 1972b:118; Jones & Blum 1981: 891.

Dolichoderus (*Hypoclinea*) *ursus*: Emery 1894:228, 1912:12.

Dolichoderus (*Hypoclinea*) *abruptus*: Emery 1894:236-237; Emery 1912:11.

Hypoclinea ursus: Kempf 1972b:120.

Dolichoderus abruptus: Shattuck 1992:77.

Dolichoderus ursus: Shattuck 1992:77.

Description.

Worker measurements (mm): HL 1.58 - 2.10, HW 1.72 - 2.16, SL 1.90 - 2.24, EL 0.35 - 0.44, WL 2.24 - 2.90, PW 0.63 - 0.78, PL 0.28 - 0.38, ML 0.75 - 0.95, MW 0.56 - 0.74. Indices: SI 107 - 120, CI 103 - 109, MI 129 - 139.

Mandibles smooth and shining with scattered punctures; vertex concave, especially in larger workers (Fig. 61); propodeal angles poorly formed; petiole with two well developed, blunt teeth. Entire insect with numerous erect hairs, but with very little appressed pubescence. Head with roughened sculpture, dorsum of mesosoma and gaster mostly or entirely smooth and shining. Light ferruginous red, gaster slightly darker.

Female measurements (mm): HL 2.24 - 2.30, HW 2.44 - 2.52, SL 2.26 - 2.28, EL 0.53 - 0.54, WL 3.66 - 3.76, PW 0.84 - 0.89. Indices: SI 98 - 102, CI 109 - 110.

Similar to worker in most aspects, with 10 teeth on the masticatory border of mandible; clypeus with straight anterior margin; vertex straight, head wider posteriorly than anteriorly; propodeal spines well formed; crest of petiole with several irregular angles. Mandibles smooth and shining, with scattered punctures, most of mesosoma and gaster smooth and shining, with parts of mesosoma weakly punctate (especially the scutum and propodeum). Erect hairs present on all surfaces. Concolorous light ferruginous red.

Male measurements (mm): HL 1.39, HW 1.43, SL 0.66, EL 0.65, WL 2.94, PW 0.58. Indices: SI 48, CI 103.

Masticatory border of mandible with 23 teeth, basal border with 11, teeth relatively distinct (Fig.122) compared to males of most other species; anterior border of clypeus rounded; second segment of funiculus about 0.55 X SL; eyes and ocelli large, strongly protruding; mesosoma similar to those of other species; propodeum without bumps; wing with subquadrate discoidal cell; petiolar node thick in profile (Fig.104); genitalia (not dissected from the only male seen) appear to be very similar to those of *D. quadridenticulatus*. All surfaces with erect and suberect hairs, concolorous golden yellow, most surfaces glossy and shining.

Discussion. This species is very closely related to *D. quadridenticulatus*, the sculpture on head and shape of mesosoma almost identical. Workers, females

and males of *D. abruptus* can be distinguished by the shiny, polished surface of the pronotum and gaster, and the color (golden yellow to ferruginous red). In addition, there is little or no appressed pubescence on the gaster, whereas the gaster of *D. quadridenticulatus* always has at least moderate appressed pubescence. It is also much lighter in color than the typical *D. quadridenticulatus*. Wheeler's undescribed type (MCZC #21183 - 1 worker) differs in having slightly more pubescence than normal, but is considered to be a conspecific. Another of Wheeler's undescribed types (MCZC #21182 1 worker) is a typical *D. abruptus*.

I have not been able to find the type specimen of *Dolichoderus ursus*, known only from the female, but have concluded that it is a synonym of *D. abruptus*. My justification follows: Of all of the females that are known, it is most similar to that of *D. abruptus* (based on Mayr's description). The color (pale yellow with shining gold colored gaster) eliminates affinity with all other species in the genus. The *D. ursus* female and *D. abruptus* female are both abundantly hairy species. The head of *D. ursus* is punctate with the appearance of a thimble (as in *D. abruptus*), and the mesosoma is primarily smooth and glossy as in *D. abruptus*. There is a small tubercle in the center of each puncture from which a hair arises (as in *D. ursus*). The gaster of *D. abruptus* is as Mayr described *D. ursus*. They are similar in size.

Other species with light colored females (or would be expected to be, when they become known) would include *D. doloniger*, *D. ferrugineus*, *D. ghilianii* and *D. rufescens*. It could not be the female of *D. doloniger*, as at least the workers of *D. doloniger* are not abundantly hairy and the gaster is not shining. It cannot be the female of *D. ferrugineus* as the gaster of the *D. ferrugineus* female is not shiny. The female of *D. ghilianii* is not hairy and is smaller than *D. ursus*. I would expect the female of *D. rufescens* to be much smaller than *D. ursus*. Thus by a process of elimination, it appears that *D. ursus* could be a female of none of the described species, except *D. abruptus*. It doesn't seem to be exactly identical to *D. abruptus*, but seems to be reasonably similar. It is difficult to evaluate the variation of females based on 2 female specimens of *D. abruptus*. The evidence seems to be strong that it is a synonym of *D. abruptus*.

Distribution. COLOMBIA and VENEZUELA south to BOLIVIA (Map 21).

Type Series. Two worker syntypes (BMNH) BRAZIL: Pará [not seen].

Material Examined. Thirty-nine series consisting of 193 workers, 2 females (MCZC, MZSP) and 1 male (LACM).

Biology. Constructs carton nests in trees at elevations below 1500 meters. One series was mixed with *D. ferrugineus*. One stray female was collected in Aug, 1962 (Peru) [MCZC], a second in July, 1922 (Brazil) [MZSP].

Dolichoderus andinus (Kempf)
Fig. 67; Map 10

Monacis andina Kempf 1962:36-37, worker, PERU: Pichita, Caluga (MZSP, MCZC) [seen]. Kempf 1972b:142.

Dolichoderus andinus: Shattuck 1992:77.

Discussion. Dolichoderus andinus is easily confused with nanitics of *D. bispinosus*. It differs in that the clypeus has strongly foveolate sculpture (Fig. 67). *Dolichoderus bispinosus* usually has a lightly punctate clypeus, or at most it is weakly and longitudinally striate. If there is some evidence of foveolae, they are very poorly developed, and distinctly different from those of *D. andinus*. In addition, the border of the vertex is not concave (which also may be the situation in nanitics of *D. bispinosus*) and the eyes are very close to the lateral borders of the head (which also occurs in nanitics of *D. bispinosus*). The petiolar spine is often not distinctly separate from the petiole as it is in *D. bispinosus*; such specimens of *D. andinus* may key to *D. curvilobus* or *D. superaculus*. It differs from both of these species by the sculpture of the clypeus. Actually, the sculpturing of the clypeus will probably separate this species from all others except *D. epetrius*, from which it differs in color (see discussion of *D. epetrius*). Also the vertex of the head of *D. epetrius* is concave. Specimens from the Canal Zone of Panamá are much smaller than the type specimens (HL 0.88 - 0.90, HW 0.89 - 0.94, WL 1.04 - 1.10), and concolorous black, but the sculpturing of the clypeus is similar (but with somewhat fewer foveolate punctures), but I believe them to be *D. andinus*. Two workers from Venezuela are similar, but concolorous brown.

Distribution. PANAMA, Canal Zone: 5 Miles up Chagres River, Aug. 24, 1918, Juan Mina (USNM, CWEM). PERU, Pichita: Caluga [10°46'S, 77°46'W] (MZSP, MCZC). VENEZUELA, Orinoco Delta, Jan 31-15b [?] 1935, N. A. Weber (MCZC) (Map 10).

Type Series. Holotype and 9 paratype workers (MZSP) [not seen] and 3 paratype workers (MCZC) [seen], Peru, Pichita, Caluga.

Material Examined. Three paratype workers and 4 additional workers.

Biology. Worker specimens from Panama were swept from young avocado plants.

Dolichoderus antiquus Carpenter

Dolichoderus (*Hypoclinea*) *antiquus* Carpenter, 1930:39-40, female, USA: Colorado (MCZC, BMNH, AMNH, Peabody Mus. Princeton Univ.) [not seen]. Burnham 1978:112.

Discussion. This is one of the North American fossil taxa from the Florissant shale. Most of the diagnostic characters are not visible, so detailed comparisons with extant taxa are difficult. It appears to be a member of the

quadripunctatus species complex.

Distribution. USA, Colorado (Oligocene fossil).

Type Series. Holotype (MCZC #2798) and ergatotype (MCZC #2803), paratypes in Peabody Museum (#10,000), Princeton Univ. (#7824), BMNH (#1700a), Univ of Colorado (#2) and AMNH (#22,973) [none seen].

Material Examined. None

Dolichoderus attelaboides (Fabricius)
Figs. 14, 54, 55, 95, 115, 127, 131; Map 1

Formica attelaboides Fabricius 1775:394, worker, BRAZIL (Univ of Copenhagen) [not seen]. Latreille 1802:288, 1804:410.

Ponera attelaboides: Illiger 1807:194.

Dolichoderus attelaboides: Lund 1831:130; Smith 1858:75, female, male, BRAZIL (BMNH) [not seen]. Mayr 1862:698, 1865:59; Forel 1878:381, 1907a:9,1908a:384; Wheeler 1916a:329, 1916b:12, 1921b:162, 1922:14, 1923:4; Luederwaldt 1926:283; Borgmeier 1934:109; Brown & Nutting 1950:127; Wheeler & Wheeler 1951:178; Kempf 1959b:216, 1961:520, 1969:289-290, 1970:337, 1972b:98; Jutsum *et al.*, 1981:188; Wilson 1987:248.

Dolichoderus (*Dolichoderus*) *attelaboides*: Emery 1894:227, 1896:1, 1912:8; Mann 1916: 460.

Dolichoderus (*Dolichoderus*) *imbecillus* Mann 1916:459-460, worker, BRAZIL: Manaus (LACM, MCZC, USNM) [seen], **new synonymy.**

Dolichoderus attelaboides var. *pulla* Santschi, 1923:269, worker, BRAZIL: Minas Gerais, Piracicabo (MZSP, NHMB) [seen], synonymy by Kempf 1969:289.

Dolichoderus imbecillus var. *heterogaster* Santschi 1923:269, worker, BRAZIL: Upper Purus (NHMB) [seen], **new synonymy.** Kempf 1969:290, 1972b:98.

Dolichoderus imbecillus: Kempf 1969:290, 1972b:98; Davidson, 1988:804.

Description. Worker measurements (mm): HL 2.48 - 3.10, HW 1.68 - 2.22, SL 2.82 - 3.30, EL 0.36 - 0.44, WL 3.40 - 4.66, PW 0.48 - 0.54, PL 0.63 - 0.69. Indices: SI 106 - 114, CI 68 - 71, PI 116 - 145.

Mandibles finely striate, weakly shining with widely scattered punctures; clypeus rugose with moderate anteromedian notch; most of remainder of head heavily and densely foveolate; median ocellus usually very obvious (absent in Colombian specimens), 2 lateral ocelli often present although not as well developed; occipital neck well developed, about as long as broad at the narrowest width (top view); scape covered with long (0.13mm) erect mostly truncate hairs; pronotum usually densely foveolate, occasionally weakly rugose; mesopleuron rugose; sides of propodeum rugose with foveolate punctures, dorsal face rugose, declivous face with parallel transverse striae; spines usually long and well developed (reduced in some specimens); gastral sculpture variable, ranging from relatively smooth and shining to completely

punctate. Erect hairs cover body surfaces, gaster with some decumbent pubescence. Color medium to dark brownish-red, often with contrasting reddish legs, mesosoma often lighter, many specimens have violet colored reflections.

Female measurements (mm): HL 2.86 - 3.04, HW 2.10 - 2.18, SL 2.96 - 3.24, EL 0.46 - 0.51, WL 4.40 - 4.70, PW 0.70 - 0.79, PL 0.68 - 0.80. Indices: SI 100 - 107, CI 69 - 75, PI 87 - 114.

Similar to worker in most details. Mandibles shining, with fine costulae and coarse punctures, about 12 teeth, apical 4 or 5 well defined; clypeus strongly rugose and foveolate, most of head strongly foveolate; eyes large, protruding, but do not extend past lateral margins of head; occipital neck well developed; pronotum and mesoscutum strongly foveolate, scutellum mostly rugose; propodeum transversely porcate (descending face and sides especially); propodeal spines well developed; mesopleuron porcate around edges with central region smooth and shining; top of node of petiole strongly sculptured with rugae; gaster finely and densely punctate except for posterior margins of tergites which are smooth and shining. Forewing with pentagonal shaped discoidal cell (Fig. 92), first cubital, second cubital and marginal cells well formed and elongate. Erect hairs cover most body surfaces, gaster with some decumbent pubescence. Usually concolorous medium or dark reddish brown, legs and antennae sometimes lighter and gaster often darker in color than the rest of the ant.

Male measurements (mm): HL 1.75 - 1.78, HW 1.29 - 1.38, SL 0.54 - 0.56, EL 0.70 -0.72, WL 3.42 - 3.68, PW 0.64, PL 0.70 - 0.80. Indices: SI 30 - 32, CI 73 - 79, PI 109 - 125.

Mandibles smooth and shining between scattered punctures, apical tooth large, remaining teeth very small (Fig. 115); clypeus and anterior section of head rugose, posterior surface foveolate; antenna 13-segmented, scape weakly shining, funiculus dull, without standing hairs, first segment of funiculus about 0.25 X SL, remaining segments subequal in length and longer than scape; eyes large, protruding; ocelli well formed; occipital neck lengthened as in worker and female; maxillary palp extending to within 0.03mm of foramen magnum; mesosoma with strongly foveolate punctures, propodeal spines poorly developed and represented by simple angles; petiole elongated and without a well formed node; dorsum of gaster lightly punctate and mostly shining; fore wing as in female, except the stigma is proportionally larger; genitalia small and relatively simple in structure (Fig. 131); volsella sharply pointed and directed downward; stipes strongly hooked with the hook directed anteriorly; aedeagus with very tiny teeth. There are few erect hairs except on the head (0.02mm in length), mesosoma and anterior part of petiole. Gaster with a few short decumbent hairs. Concolorous dark brown.

Discussion. This is one of the most commonly collected species in the

genus. It is also highly variable. The shape of the occipital neck seems to be reasonably constant, being about as long as the minimum width. This species can also be separated from others with a long neck in that the eyes do not surpass the lateral margin of the head. The sculpture on the pronotum is usually foveolate, but may be rugose. The propodeal spines vary in size, shape and length, but are always well developed. The dimensions of the node of the petiole are variable and cannot be used to separate this species from others, as has been done in the past. Another poor character often used is the sculpture of the gaster. Three series from the Monson Valley of Peru show sculpturing ranging from completely and heavily punctate to specimens with the posterior border of the terga smooth and shining to specimens with the gaster lightly punctate and shiny.

I can group specimens of this species into four forms. The first is the "typical form" which has most of the characteristics included in the description. Most of the varieties designated by Wheeler are members of this group. Occasional specimens have vertically directed propodeal spines. Minims of this group may cause some confusion. Mixed series of typical "*imbecillus*" and *attelaboides* are commonly seen in collections. Such series show similarities in the placement of hairs on the mesosoma and structure of the petiole, and as they are members of the same colony it seems clear that *D. imbecillus* simply represents minims of *attelaboides*. This same phenomenon is seen in series of other species, especially *D. decollatus*.

Mann's (1916) description of *imbecillus* is misleading. His description and key suggest that the occipital neck is about as long as that of *D. rosenbergi*, which is not true. The petiolar node is also longer than broad (which he later correctly states in his key, although it is not twice as long as broad as he states). The dorsum of the gaster is not shining, a character he used to separate this species from *D. attelaboides*. I have seen specimens of *D. attelaboides* in which the gaster is much more strongly shining than that of *D. imbecillus*. Finally, the holotype of *D. heterogaster* is a normal specimen of *D. attelaboides*.

The second form has a lightly punctate, shining gaster, which is more shining than the gaster of *D. imbecillus*. This form is simply an extreme in a range of variants, which fall within my concept of this species. The third form differs from the typical form in that the propodeal spines are smaller and the pronotum is rugose. I conclude that it is within the range of variation for both of these characters.

The fourth variant, represented by *D. attelaboides* var. *pulla*, is covered with thick, strongly truncate hairs. Additional specimens were collected at São Bento, Rio de Janeiro, BRAZIL (USNM). The integument of some specimens, especially those in this group, reflect a bluish or purple color. Other than these characters, they are not notably different from my concept of *D. attelaboides*. Collection of the reproductives could result in the recognition of the fourth

variant as a separate species.

A number of Wheeler's undescribed taxa (MCZC # 21165 - 1 worker, # 21166 - 6 workers & 3 females (MCZC, USNM) [all seen]) are obvious synonyms.

Distribution. Widely distributed, from COLOMBIA and VENEZUELA south to BOLIVIA and southern BRAZIL (Map 1).

Type series. Presumably in the Zoological Museum, University of Copenhagen [not seen], from an unspecified locality in Brazil. Eleven syntype workers of *D. imbecillus* (LACM, MCZC, USNM) [seen], Brazil, Amazonas: Manaus, three worker syntypes of *D. attelaboides* var. *pulla* (1 in MZSP # 528, 2 in NHMB) [seen]; Minas Gerais [actually São Paulo State]: Piracicabo [=Piracicaba], holotype of *D. imbecillus* var. *heterogaster* (NHMB) [seen]: (Bresil [Brazil], Haut Pazon, Huecz [Amazonas, Alto Purus, Hüber]).

Material examined. Two hundred thirteen series, consisting of 704 workers, 93 females and 18 males.

Biology. Although *D. attelaboides* is one of the most common species in the genus, we know almost nothing about it. Luederwaldt (1926) presented the most extensive notes on the biology of this species. Most collections are stray workers. Carton nests are constructed between leaves or in branches of *Cecropia*. Lattke (pers. comm.) found one nest in a rolled leaf of a species of Morantuaceae, about one meter from the ground. He found another nest made of plant fibers and pink toilet paper, about one meter from the ground. It tends membracids on shoots of young tachigalias and Melastomaceae (Wheeler 1921b), as well as coccids (Luederwaldt 1926), and is found in the litter (Kempf 1961). The types of *D. imbecillus* were collected feeding on the exudation of a small shrub along a trail in the forest (Mann 1916). This species is common in dense shade, especially in coffee and cacao plantations and is primarily arboreal (Wilson 1987) and forages along forest trails, especially at night. It is occasionally found in mixed series with *D. decollatus*. *Dolichoderus attelaboides* preys on termites and other insects, as well as eats fruits of *Passiflora edulis* (Luederwaldt 1926). It is often found at extrafloral nectaries. Some nests (possibly incipient?) are very small (Lattke pers. comm.). The thousands of individuals in a large nest are very aggressive when the nest is disturbed (Luederwaldt 1926). Loose sexuals have been collected in Jan., Feb., Mar. (most often), June, July, Oct. and Nov. (all in Brazil) (INPA, LACM, MCZC, MZSP).

Dolichoderus baenae new species

Fig. 36; Map 32

Description. Worker measurements (mm): HL 1.05 - 1.10, HW 0.95 - 0.96, SL 1.26 - 1.28, EL 0.26 - 0.28, WL 1.46 - 1.50, ML 0.38 - 0.40, MW 0.25 - 0.26, PW 0.30 - 0.33. Indices: SI 116 - 120, CI 88 - 90, MI 150 - 152.

Nine teeth on masticatory border of mandible; clypeus indented at median anterior border; frontal area poorly defined; pronotal angles well defined; metanotal area strongly depressed; propodeum rounded posteriorly; petiolar node with poorly developed spine. Dorsum of ant with sparse, long (up to 0.3mm), erect hairs, scape with abundant short, appressed hairs (few near apex nearly erect). Anterior fore coxa with few erect hairs and abundant short, appressed hairs, remainder of legs with scattered, long hairs and sparse appressed hairs, propodeum with two prominent, long, erect hairs on lateral angles, in addition to a few others which are shorter; petiole with 6 very prominent, erect hairs (similar to Fig. 28). Concolorous light brown.

Female: Unknown.

Male: Unknown.

Discussion. This species is similar to *D. ghilianii*, except the erect hairs are longer and the area anterior to the angle of the propodeum is completely convex (strongly concave in *D. ghilianii*). It somewhat resembles *D. primitivus*, but differs in numerous characteristics (propodeum not toothed, short maxillary palps). It is similar to *D. piceus*, except the pronotal angles are not well formed, the metanotal area is not as strongly constricted, and it is much lighter in color. The elongate mesonotum separates it from *D. caribbaea*. It differs from all other members of the genus in having abundant, appressed pubescence on the scapes.

Distribution. COLOMBIA, Valle de Cauca (Map 32).

Type Series. Holotype worker (UAVC) and 4 paratype workers (MCZC, MHNC, MZSP, CWEM), COLOMBIA, Valle de Cauca: Puerto Merizalde, xii-8-88, Marta Baena, #MQP-16.

Material Examined. Type series.

Etymology. Named in honor of my friend and coworker Marta Baena of INDERENA (Instituto Nacional de Recursos Naturales, Colombia) who has given me several packages of fascinating Neotropical ants.

Biology. Unknown.

Dolichoderus bidens (Linnaeus)
Fig. 23a, 23b, 62, 102, 103, 143; Map 22

Formica bidens Linnaeus 1758:581, worker, SURINAM (LSUK) [not seen]. Smith 1858:48.

Formica perditor Fabricius 1804:402 [not seen], synonymy by Roger 1862b:285. Smith 1858:49.

Atta bidens: Fabricius 1804:422.

Hypoclinea bidens: Mayr 1862:707, 1870a:956; Kempf 1959b:216, 1961:520, 1970:338, 1972b:119; Jones & Blum 1981:891; Wilson 1987:248.

Dolichoderus auromaculatus Forel 1885:350-351. Female, BRAZIL: Rio Negro (MHNG) [not seen], synonymy by Emery 1894:235.

Dolichoderus (*Hypoclinea*) *bidens*: Emery 1894:234-235,1912:12; Mann 1916:465; Wheeler 1922:14; Menozzi 1935:199.

Dolichoderus bidens: Forel 1903:257-258, 1912:33-34; Wheeler 1916a:329, 1916b:12, 1923:4; Wheeler & Wheeler 1951:173-174; Jutsum *et al.*, 1981:190-194; Shattuck 1992:77.

Dolichoderus bidens race *attenuatus* Forel 1903:258-259, worker, female, BRAZIL: Pará (MHNG, NHMB) [seen], **new synonymy**. Emery 1912:12; Shattuck 1992:77.

Dolichoderus (*Hypoclinea*) *bidens* var. *bahiana* Santschi, 1921:101, worker, BRAZIL: Bahia, Ilhéus (MZSP, NHMB) [seen], **new synonymy**. Shattuck 1992:77.

Hypoclinea bidens attenuata: Kempf 1972b:119.

Hypoclinea bidens var. *bahiana*: Kempf 1972b:119.

Dolichoderus bidens var. *bahiana*: Shattuck 1992:77.

Description. Worker measurements (mm): HL 1.59 - 1.82, HW 1.26 - 1.54, SL 1.68 - 2.00, EL 0.35 - 0.39, WL 2.26 - 2.56, PW 0.51 - 0.61, PL 0.29 - 0.38, ML 0.73 - 0.76, MW 0.53 - 0.60. Indices: SI 106 - 116, CI 82 - 85, MI 127 -138.

Head narrowed at vertex; angles on propodeum strongly protruding; propodeal spiracle (inside diameter) 0.07 - 0.08mm and located about two diameters from edge of propodeal declivity; petiole usually thickened in profile, with two well defined teeth on posterior edge of node (Fig. 23b). Sculpture very rough and granular, especially on head and mesosoma; gaster punctate or finely granulate. Abundant long, erect hairs (up to 0.6mm) on all body surfaces, gaster with varying amounts of yellowish or golden pubescence. Color variable, ranging from concolorous ferruginous red to completely black. Usually head, mesosoma and legs are dark reddish-brown, gaster lighter in color due to the golden hue from the pubescence.

Female measurements (mm): HL 1.90 - 2.08, HW 1.66 - 1.76, SL 1.90 - 2.12, EL 0.44 - 0.45, WL 3.24 - 3.62, PW 0.69 - 0.79. Indices: SI 100 - 102, CI 85 - 87.

Similar to worker in most aspects, head usually not as strongly narrowed behind; propodeal angles not as developed; petiole more thickened in lateral view. Sculpture and pilosity as in worker.

Male measurements (mm): HL 1.20 - 1.21, HW 1.15 - 1.16, SL 0.58 - 0.59, EL 0.60, WL 2.64 - 2.68, PW 0.53 - 0.56. Indices: SI 48, CI 96.

Clypeus with rugae which converge to middle; head rounded posteriorly, ocelli do not strongly protrude past vertex; scutellum and metanotum strongly protruding; propodeum without angles; petiole relatively small (Fig. 102), angles on node rounded, spiracle relatively low; most of body surface punctate, erect hairs present on all bodily surfaces, including scapes and legs; gaster with appressed, golden pubescence. Concolorous medium brown with mandibles and anterior median border of scutum pale brown.

Discussion. This is a highly variable species. The elongate and very rough sculptured head, and dark coloration usually separate this species from all others. Occasionally specimens are ferruginous red in color, especially series from the Amazon of Brazil. A number of forms have been described. Santschi (1921) differentiated the variety *bahiana* based on a more concave propodeal declivity, and that the petiolar node is thicker than normal and the petiolar teeth are relatively small. It is dark brown with abundant golden pubescence on the gaster. The type material falls within the variation found within the species. Other specimens can be found with thicker petiolar nodes and with more concave propodea. It is without doubt a synonym of *D. bidens*. *Dolichoderus bidens attenuatus* is very similar to *bahianus*, except that it is a dark reddish-brown. Forel distinguished it as having a distinctly elongate head, but the CI falls within the range of *D. bidens* (CI of three syntypes ranges from 82 - 85). The head is narrowed posterior to the eyes and is not rectangular as Forel stated. The vertex is also weakly concave, as in the typical *D. bidens*. The node of the petiole is not flattened any more than normal. It is lighter in color than "normal" specimens of *D. bidens*. The diameter of the propodeal spiracle in the lectotype is 0.06mm, the distance from the propodeal declivity is 0.13mm. I can find no characteristics to separate the females from those of *D. bidens*. It is clearly a synonym of *D. bidens*. Other obvious synonyms include Wheeler's undescribed types (MCZC #21184 - 8 workers, and USNM # 1042, 21188, 3 workers).

Females and males of *D. bidens* can usually be distinguished from those of *D. quadridenticulatus* in that they are smaller. Males can often be distinguished by the form of the petiole (compare Figs. 100 & 101 with 102 & 103). A female of an undescribed species is deposited in the MCZC (Guiana, Oronoque River 2°42', 21-vii-36, #583, N. A. Weber). It is not particularly closely related to *D. bidens*, but both key to couplet 23. The petiole is typical of the *bidens* complex, with two well defined teeth. It is concave in the area between where a tooth or spine would be present in the *bispinosus* complex. The pronotum is also similar to that of the *bidens* complex, completely lacking of any bumps or spines. On the other hand, the shape of the head and the lobes on the propodeum are in the form of females of the *bispinosus* complex. It apparently forms a link between the *bispinosus* complex and the *bidens* complex. Collection of the workers and males of this species will undoubtedly help to clarify the relationships between these two species complexes.

Distribution. COLOMBIA and VENEZUELA south to BOLIVIA and southern BRAZIL (Map 22).

Type Series. Unspecified types, presumably in the collection of the Linnean Society, London (LSUK). *Dolichoderus bidens* subsp. *attenuatus*: lectotype worker (here designated), 2 paralectotype workers, 3 paralectotype females (MHNG) [all seen], 3 paralectotypes workers (MCZC #21186) [seen], BRAZIL,

Para: Goldi. *Dolichoderus bidens* var. *bahianus* 23 worker syntypes (one worker syntype MZSP, 22 worker syntypes NHMB) [all seen], BRAZIL, Bahia: Ilheus, Garbe #19.997.

Material Examined. Two hundred twenty one series, consisting of 1109 workers, 39 females, and 3 males.

Biology. Nests in dry stems and leaves of various species of plants (Kempf 1970). Commonly collected low in the vegetation at the edge of rain forests or in coffee and cacao plantations, up to 1500 meters. One series was found nesting with unidentified wasps (Manaus, Bequart) [MCZC]. Workers tend Homoptera (especially membracids) on branches of large trees in open areas (Harada pers. comm.). Loose sexuals were collected in April (Brazil), May (Surinam), June-July (Ecuador, Guiana, Brazil), Sept. and Dec. (Brazil) (ANSP, MCZC, MZSP).

Dolichoderus bispinosus (Olivier)
Figs. 33, 52a,b, 159; Map 9

Formica bispinosa Olivier 1792:502, worker, GUIANA: Cayenne [not seen].

Formica fungosa Fabricius 1798:281, worker [not seen], synonymy by Latreille 1802a:133.

Polyrhachis bispinosus: F. Smith 1858:74.

Hypoclinea vestita Mayr 1862:707-708, female, VIRGIN ISLANDS: St. Thomas (EMAU) [not seen], synonymy by Emery 1894:232.

Hypoclinea bispinosa: Mayr 1862:708, 1870a:955; Fisher & Zimmerman, 1988:15; Fisher *et al.*,1990:264-266.

Monacis bispinosa: Roger 1862a:235-236, female, GUIANA: Cayenne [not seen]. Kempf 1959a:240-244, 1959b:216,1961:520, 1972b:142; Wilson & Pavan, 1959:72-75; Bentley, 1977:32; Swain 1977:1-251.

Polyrhachis arboricola Norton 1868:60, synonymy by Emery 1891:167.

Dolichoderus bispinosus: Emery 1890a:69, 1890b:55, 1896:1, 1906:173; Forel 1907a:9, 1908b:60-61, male, COSTA RICA: El Mosquito (MHNG) [not seen]. Wheeler 1908a:149-150, 1936:229; Luederwaldt 1926:284; Weber 1944:119; Wheeler & Wheeler 1951:177; Benzing, 1970:113.

Dolichoderus (*Monacis*) *bispinosus*: Emery 1894:232; Mann 1916:461; Wheeler 1922:14; Menozzi 1935:199.

Discussion. This is a very common, widely distributed species. The transversely truncate lateral margin of the petiole and the punctate or weakly striate clypeus (not foveolate and reticulo-rugose as in *D. epetrius* and *D. andinus*) separates it from all others. The sculpture on the remainder of the body and the shape of the posterior border of the propodeum are extremely variable and of no value in separating this species from others. Sculpture ranges from punctate-rugose to foveolate punctate. Smaller specimens (incipient nests)

are usually more coarsely sculptured, with foveolate punctures on the mesosoma, especially the dorsal face of the propodeum. Smaller workers also have the eyes closer to the lateral margins of the head. Such specimens could be easily mistaken as a separate species, but they are consistently found in mixed series with "normal specimens" and with "normal females". The posterior edge of the propodeum ranges from rounded in shape, truncated and straight to bell-shaped with an indentation in the middle. Series of workers with rounded and notched propodeal borders are common. For example, in the USNM there are such series from México, Costa Rica, Panamá, Surinam and Bolivia. An undescribed Wheeler cotype series in the USNM (MCZC # 21170) is a synonym.

Distribution. MEXICO south to URUGUAY, southern BRAZIL and northern ARGENTINA; and ST. THOMAS ISLAND (Wheeler 1908 [not seen]) (Map 9).

Material Examined. Two hundred eighty six series, including 1135 workers, 71 females and 29 males.

Biology. This is one of the most common and widely distributed species in the genus, occurring especially in disturbed habitats (coffee, cacao plantations) in second growth forest, as well as virgin rain forests, up to 2100m. They are commonly found during quarantine on banana debris and on orchids. *Dolichoderus bispinosus* nests in cavities in trees or in hollow logs on the ground and occasionally in carton termite nests on branches of trees (Swain 1977), especially those of *Nasutitermes ephratae*, *N. columbicus* and *N.* sp. (pers. obs.). This species also nests in myrmecophytes such as *Cordia* and *Tillandsia.* Myrmecophiles include cockroaches and thysanurans (both unidentified - Swain 1977). *Dolichoderus bispinosus* is polygynous (Kempf 1959; Swain 1977); several de-alate females and workers are often found within series. It is also polydomous; new nests are formed by fission (Swain 1977). A mature nest contains thousands of workers and sexuals (Swain 1977). These ants are very aggressive, especially when the nest is disturbed (Mann 1916; Wheeler 1936; pers. obser.). Workers produce a strong odor similar to that of *Liometopum* spp. when they are disturbed. They look and act similar to *Liometopum* in the field under such circumstances. They often nest together with *Crematogaster limata parabiotica* and with *Dolichoderus lamellosus.* Worker specimens have been collected almost 50 meters inside the mouth of a cave in Yucatan. Workers have been found in extrafloral nectaries of *Bixa orellana* (Bentley, 1977) and in the facultative, myrmecophytic orchid, *Caularthron bilamellatum* (Fisher *et al.*, 1990), as well as several other species of plants (Swain 1977). This species tends scale insects on *Prioria*, coccids, membracids and rioninid larvae, and are also effective predators, especially of termites (Swain 1977). They are preyed upon by ant eaters and armadillos. Swain (1977) presents much more detailed information on this species. Sexuals are commonly collected in light traps. Stray sexuals have been

collected in Jan. (Venezuela), Apr. (Surinam), May (Mexico, Panamá, Venezuela), June (Costa Rica), July (Mexico, Guiana, Venezuela), Aug. (Trinidad, Peru, Venezuela), Aug.-Sept. (Brazil), Sept.-Oct. (Panama) and Oct. (Ecuador) [AMNH, CWEM, LACM, MCZC, USNM].

Dolichoderus caribbaea (Wilson)
Map 4

Monacis caribbaea Wilson 1985a:19-20, worker, DOMINICAN REPUBLIC: Palo Quemado, Bayaguana (MCZC, FSCA) [seen].

Dolichoderus caribbaea: Shattuck 1992:77.

Discussion. Wilson (1985a) was incorrect in considering this species to be a member of the *debilis* complex, closely related to *D. rufescens*. It is apparently a member of the *diversus* complex as it has relatively small pronotal angles (not distinct spines as are found in the *debilis* complex), the mesonotum is similar (round, separated from remainder of mesosoma) and the dorsal face of the propodeum is elongate (subquadrate in the *debilis* complex). It is most closely related to *D. piceus*, the mesonotum is very similar in profile and the petiole is almost identical. It differs in that the pronotal angles are more developed and at least the fossils are reddish-brown. It also shares similarities with the *laminatus* complex. The pronotal angles are similar, the boundary between the dorsal and posterior faces of the propodeum is marginate, elevated, and overhangs the posterior face. The mesonotum is concave in the middle. Although this species appears to be a member of the *diversus* species complex, it is similar to *D. lamellosus* and may be actually be a member of the *laminatus* complex. Hopefully additional specimens will clear the relationship of this species.

Distribution. DOMINICAN REPUBLIC, Palo Quemado, Bayaguana (Map 4).

Type Series. Holotype and 10 paratypes from Palo Quemado, Bayaguana and an unknown locality (MCZC and FSCA) [7 paratypes seen].

Material Examined. 7 paratypes.

Dolichoderus cogitans Forel
Fig. 63; Map 23

Dolichoderus bidens race *cogitans* Forel 1912:34-35, worker, BRAZIL: Amazonas (NHMB) [seen].

Hypoclinea bidens cogitans: Kempf 1972b:119.

Dolichoderus bidens cogitans: Shattuck 1992:77.

Description. Worker measurements (mm): HL 1.32 - 1.34, HW 1.22 - 1.34, SL 1.46 - 1.48, EL 0.30 - 0.36, WL 1.84 - 1.92, ML 0.44 - 0.56, MW 0.38 - 0.44, PW 0.51. Indices: SI 109 - 112, CI 91 - 102, MI 117 - 129.

Head orbiculate, vertex slightly concave; propodeal angles poorly devel-

oped; petiole relatively thick, very weakly bidentate, if at all. Erect hairs on all body surfaces (up to 0.4mm in length), decumbent pubescence moderately abundant on head and dorsum of mesosoma, abundant on gaster. Color ranging from concolorous dark brown to a more common combination of a reddish brown head and the remainder dark reddish brown.

Female: Unknown.

Male: Unknown.

Discussion. This species was originally described as a race of *D. bidens*, but the shape of the head suggests close affinity with *D. quadridenticulatus*, as it appears to be a small *D. quadridenticulatus* with an oval shaped head. It may only represent workers from incipient nests of *D. quadridenticulatus*. It can be distinguished from *D. bidens* and *D. quadridenticulatus* by the orbiculate-shaped head and smaller size. It could be easily confused with *D. ferrugineus* or *D. spurius*, but differs in color. *Dolichoderus cogitans* is very similar to a specimen of *D. quadridenticulatus* identified by Roger (ZSMC) [seen] (not part of type series), which supports the hypothesis that *D. cogitans* is a synonym of *D. quadridenticulatus*. An apparent worker of *D. cogitans* is pinned together with what appears to be a typical female of *D. bidens* in the MCZC (Guiana, Forest Settlement, R. Mazaruni, viii-ix-1935, N. A. Weber #3131). It is probably a mixed series. There is little justification for considering this a valid species, other than maintaining the situation as is until more evidence is available, especially the form of the reproductives.

Distribution. COLOMBIA, ECUADOR and VENEZUELA south to BOLIVIA and BRAZIL (Map 23).

Type Series. Lectotype (here designated - missing gaster) (NHMB) [seen] and unspecified material from Vila Nova, possibly lost [not seen], Brazil, Amazonas, Goldi.

Material Examined. Twenty two series, consisting of 79 workers.

Biology. Unknown. There are a few series which are mixtures of this species and *D. quadridenticulatus*, which suggests they are conspecific and not two species cohabiting a nest site.

Dolichoderus curvilobus (Lattke)
Map 10

Monacis bispinosa: Koptur, 1984:1789 (misidentification).

Hypoclinea curviloba Lattke 1986:259-261, worker, COLOMBIA: Chocó (MIZA) [not seen].

Dolichoderus curvilobus: Shattuck 1992:77.

Description. Female measurements (mm): HL 1.53 - 1.63, HW 1.74 - 1.79, SL 1.55 - 1.69, EL 0.46 - 0.48, WL 2.68 - 2.86, PW 0.80 - 0.86. Indices: SI 96 - 110, CI 107 - 114.

Mandible with 9 or 10 well-formed teeth on masticatory border; mesial

border of clypeus straight (but appearing indented due to dense pubescence); vertex straight or weakly convex; eyes reaching lateral borders of head; pronotum with well formed spines; posterior propodeal border angulate (without carina) with well formed lateral spines; petiolar spine well formed and smoothly merged into lateral borders of node. Dark brown, scapes, pronotum, areas on mesonotum, legs and sides of gaster lighter brown. Entire ant lightly and evenly punctate. Erect hairs sparse and short (>1mm) on head, funiculus, mesosoma, legs, petiole and gaster, absent on scape; appressed golden pubescence on all surfaces, including scapes.

Male: Unknown.

Discussion. This species is similar to *D. validus*, but can usually be distinguished by the straight vertex (usually strongly concave in *D. validus*, even in nanitic workers). This species will probably be considered a synonym of *D. validus* when more material, including males, becomes available. The upturned, bilobed posterior propodeal border is a poor character, as it is also found in other species, including *D. validus* and *D. bispinosus*, where it can even be upturned and bilobed to a greater extreme. Color ranges from reddish-brown to concolorous dark brown. The legs are usually conspicuously lighter in color than the remainder of the ant. Occasionally specimens of other species, including *D. bispinosus* and especially *D. validus*, have similar colored legs. This species differs from *D. superaculus* in the form of the pronotal spines (see worker key, couplet 26). The dorsal face of the propodeum is usually roughly sculptured and may have foveolae. The gaster usually bears golden, appressed pubescence. This appears to be the only species in the *bispinosus* species complex in which the females have no erect hairs on the scapes (worker has long erect hairs on scapes, as do other members of the complex), which allows them to be easily recognized. One female (USNM) has scapes with erect hairs, and is indistinguishable from females of *D. validus*. It was collected on bananas in quarantine (New York), together with workers of *D. curvilobus*. It may be a mixed species series.

Distribution. COSTA RICA, Cartago Prov.: Turrialba, 600m, 3 Mar. 1980, S. Koptur (1 worker voucher specimen # 50, LACM). PANAMA, Bugaba: 800 - 1600ft., Champion, 2 workers, V. de Chiriqui, 25 - 4000ft. Champion, 1 worker (MCZC). COLOMBIA, Dept. Valle: Munc. Buenaventura, 17 Mar 1967, Plant. Palmeras d. Pacífico, lowland rainforest, R. Root and W. Brown 5 workers (MCZC); Dept. Valle: Bajo Calima, 2 workers, Root & Brown (MCZC); Dept. Valle: Cent. H.d. Anachicayá, 400 m, iv 1969 (MHNC); Carare, quebrada Mate Plátano, I. Cabrera (Colombia?) (MHNC); Dept. Antioquia: Providencia Estación Biol., Sta. clearing, R. Anorí, 520 m, 30-31 Dec. 1977, C. Kugler, 7 workers (MCZC); Dept. Boyacá: Muzo, 11-vi-1936, 900 m, J. Bequart, 3 workers, 3 females (MCZC). USA, California: intercepted at Marysville (Yuba Co.), 4-iii-1935 (LACM); New York: intercepted in quarantine on 6-4-34 in banana debris

from Costa Rica, 3 workers (USNM), another series from unspecified locality, intercepted at New York on Jan. 18, 1916, workers from Hawaiian Islands, on bananas, H. Crane, 2 workers (LACM) (Map 10). Specimens labeled as coming from the Hawaiian Islands are undoubtedly mislabeled.

Type Series. Holotype worker and one worker paratype (MIZA) [not seen], Colombia, Chocó, from between Río San Juan and Río Baudo.

Material Examined. Nine series, consisting of 32 workers and 3 females.

Biology. Two workers (type series) collected in a malaise trap, specimens from Costa Rica were on *Inga punctata* (Koptur, 1984). Most specimens were collected in lowland rainforest. Those in quarantine were collected on banana debris.

Dolichoderus debilis Emery
Figs. 113, 142; Map 27

Dolichoderus debilis Emery 1890a:69, worker, VENEZUELA: San Esteban (MCSN) [not seen]. Emery 1896:1; Wheeler & Wheeler 1951:176-177; Shattuck 1992:77.

Dolichoderus debilis var. *sieversi* Forel 1901:65, worker, VENEZUELA, Puerto Cabello (Nat. Hist. Mus. of Hamburg) [not seen], synonymy by Kempf 1959a:247.

Dolichoderus debilis var. *parabiotica* Forel 1912:33, female, male, COLOMBIA: Santa Marta (MHNG) [not seen], synonymy by Kempf 1959a:247. Wheeler 1936:229; Weber 1943:400.

Dolichoderus (*Monacis*) *debilis*: Wheeler 1922:14

Monacis debilis: Kempf 1959a:247-251, 1972a:254, 1972b:142; Wilson 1987:248; Swain 1977:109-112, 186-221, 1980:377-389.

Hypoclinea debilis: Lattke 1986:264.

Discussion. The lack of erect hairs on the scape and petiole easily separates this species from all others in the complex, except *D. inpai*, from which it differs in the shape of the mesonotum (see key). Wheeler considered an undescribed black form to be a separate species (USNM #21171, one worker), but it is clearly conspecific.

Distribution. GUATEMALA south to BOLIVIA (Map 27).

Type Series. Two syntype workers (MCSN) [not seen], VENEZUELA, San Esteban.

Material Examined. Eighty four series, consisting of 532 workers, 13 females, and 7 males.

Biology. This species is usually collected in wet forest. It is a timid ant which nests in twigs, branches, trunks and fence posts, often in a facultative association with *Crematogaster limata parabiotica* (Swain 1977, 1980). Nests are found in termitaria of *Nasutitermes ephratae*, *N. corniger*, and *N. columbicus* (Wheeler 1936; Swain 1977). Workers are found at extrafloral nectaries of

Catostemma (Bombacaceae) (Lattke 1986). It tends coccids and membracids. A single female was collected in March (Costa Rica - LACM). It is occasionally collected in quarantine on banana debris.

Dolichoderus decollatus F. Smith
Figs. 2, 3, 15, 53, 92; Map 2

Dolichoderus decollatus F. Smith 1858:75, female, GUIANA: Demerara (BMNH) [seen], worker [BMNH? AMNH? 3 worker "types" from Rio Frio, COLOMBIA, undoubtedly not true types]. Forel 1878:382; Wheeler 1916a:329,1916b:12, 1922:14; Wheeler & Wheeler 1951:178; Kempf 1960:397, 1969:290, 1970:337, 1972b:98; Wilson 1987:248.

Dolichoderus (*Dolichoderus*) *decollatus*: Emery 1894:227-230, 1896:1, 1912:9; Mann 1916:459.

Dolichoderus capitatus Santschi 1921:99-100, worker, GUIANA: St. Jean du Maroni (MNHN) [seen], **new synonymy.** Kempf 1969:290, 1972b:98.

Dolichoderus (*Dolichoderus*) *decollatus* subsp. *neglectus* Menozzi 1935:197-199, worker, GUIANA: Demerara (UDSB) [seen], **new synonymy.**

Dolichoderus decollatus subsp. *neglectus*: Kempf 1969:291,1972b:98.

Description. Worker measurements (mm): HL 2.04 - 3.00, HW 1.80 - 2.46, SL 2.30 - 3.06, EL 0.38 - 0.50, WL 3.30 - 4.88, PW 0.39 - 0.85, PL 0.25 - 0.50. Indices: SI 86 - 113, CI 86 - 99, PI 44 - 83.

Mandibles punctate, striate and partially smooth and shining; clypeus notched and rugose; remainder of head densely foveolate; ocelli not obvious; pronotum foveolate; mesopleuron and side of propodeum rugose; dorsal face of propodeum foveolate, infraspinal facet and descending face with transverse parallel rugae, propodeal spines directed caudad; anterior and posterior faces of petiole mostly smooth and shining, top of node rough with rugose-like sculpture; gaster evenly punctate. Erect hairs present on all body surfaces, decumbent pubescence present on gaster. Head and mesosoma reddish-brown, gaster brownish-black with yellow pubescence which partially obscures the surface. Legs slightly lighter in color than rest of the body.

Female measurements (mm): HL 2.80 - 2.84, HW 2.32 - 2.38, SL 2.82 - 3.00, EL 0.50 - 0.53, WL 4.80 - 4.90, PW 0.84 - 1.00, PL 0.52 - 0.60. Indices: SI 99 - 107, CI 83 - 84, PI 60 - 62.

Similar to worker in most details; ocelli very obvious; occipital neck absent; scutum and scutellum with foveolae; propodeal spines well developed with poorly defined transverse striae on both faces of propodeum; gaster finely and densely punctate; wing venation as in *D. attelaboides* (see Fig. 92); erect hairs abundant on all body surfaces, color medium to dark brown with contrasting black gaster.

Male: Unknown.

Discussion. This is a relatively common species which is easily separated

from most others by the lack of an occipital neck and a relatively short antennal scape. The angle of the propodeal spines is an unimportant variable, as in *D. attelaboides*. The angle can vary considerably even within a single series. Thus the vertically directed spines of "*neglectus*" are of no importance; typical *D. decollatus* may have even more vertically directed spines. The node of the petiole is not notably higher than is found in the range of specimens of *D. decollatus*. The decumbent pubescence is less dense and yellowish in the "typical" *decollatus* (more dense and golden in *D. neglectus*), but there is also considerable variation in this character. *Dolichoderus capitatus* is based simply on an exceptionally large specimen, which are commonly collected throughout Latin America together with smaller nest mates. Individuals from incipient nests are usually smaller and bicolored, similar to the phenomenon found in *D. attelaboides*. Wheeler's undescribed forms (MCZC #'s 21167 - 3 workers, 21168 - 6 workers, 21169 - 2 workers and 22915 - 1 worker) [all seen], are all *D. decollatus*.

Distribution. PANAMA south to BOLIVIA and BRAZIL (Map 2).

Type series. Holotype female (BMNH) [seen], Dem; type F. Sm Col 79-22; Dolichoderus decollatus Sm; BM type Hym 11-495 [Guiana, Demerara]. Lectotype worker (here designated, upper specimen of two on same pin) and one paralectotype worker (lower specimen) of *Dolichoderus decollatus neglectus*, Guiana, Demerara (UDSB) [seen]. Holotype of *D. capitatus*, Surinam, St. Jean du Maroni (MNHN) [seen].

Material examined. One hundred twenty nine series, consisting of 529 workers and 25 females.

Biology. Arboreal, nest in leaves of *Iriartea exorrhiza*, slow in motion, drop when disturbed (Mann 1916; Kempf 1970; Wilson 1987; pers. obser.). Most specimens are strays collected on vegetation, especially in riparian habitats and mountain rain forests up to 800 meters. It occasionally nests together with *D. attelaboides*. Loose females have been collected in July (Venezuela, Brazil), August (Brazil), and Sept. - Nov. (Guiana, Brazil) [INPA, MIZA, MCZC, MZSP].

Dolichoderus dibolius Wilson
Fig. 4; Map 3

Dolichoderus dibolia Wilson 1985a:18, worker, DOMINICAN REPUBLIC (FSCA) [seen].

Description. Worker measurement: WL 4.2mm; scapes exceptionally long as in *D. rugosus*; occipital neck absent, but with a well developed flange; pronotum lengthened with a poorly developed bump (Fig. 4); lower mesopleural border with a well developed acute spine; propodeal spines long and well developed; petiole with a poorly developed node, long and low as in *D. rugosus*, and not pedunculate as illustrated by Wilson (1985a), anterior border

of node rounded. Long erect hairs present on most of the body surfaces.

Female: Unknown.

Male: Unknown

Discussion. Unfortunately the holotype is the only known specimen and it is poorly preserved, distorted and in a dark amber matrix. The propodeum is twisted and the petiole is separated from the mesosoma. Most of the head is absent. Wilson erroneously placed this specimen in the *attelaboides* species complex; it is clearly a member of the *rugosus* complex and is very similar to *D. rugosus*. The occipital neck is not developed. The apparent elongation is actually the pronotum. The maxillary palps are very long as in *D. rugosus*. One of them extends at least 0.1 mm past the posteroventral border of the head. The lower mesopleural spine is well developed as in *D. rugosus*. The propodeal spines are long and sharp, and the petiole has a long low node as in *D. rugosus*. This species is difficult to separate from *D. rugosus*. The pronotum seems to be greatly lengthened anteriorly, but this may be due to the distortion of the specimen. The anterior border of the petiolar node is rounded; it is weakly angulate in *D. rugosus*. Additional specimens in a better state of preservation may show additional characteristics or may actually show it to be conspecific with *D. rugosus*.

Distribution. Known only from the DOMINICAN REPUBLIC (Map 3).

Type series. Holotype imbedded in amber (FSCA, temporarily deposited in MCZC) [seen].

Material examined. Holotype.

Biology. Unknown, but probably arboreal, as was imbedded in tree resin.

Dolichoderus diversus Emery
Figs. 41, 42, 50, 69, 117, 140; Map 29

Hypoclinea abrupta Mayr 1870b:391-392.

Dolichoderus (*Hypoclinea*) *diversus* Emery 1894:237, worker, NEW GRENADA [=COLOMBIA] [not seen], new species name for material of *H. abrupta* (Smith) *sensu* Mayr which was a misidentification; Emery 1912:12.

Dolichoderus championi Forel 1899:100, worker, female, male, COSTA RICA (MHNG) [seen], **new synonymy**. Wheeler & Wheeler 1951:175; Shattuck 1992:77.

Dolichoderus championi race *trinidadensis* Forel 1899:100, worker, TRINIDAD (MHNG, BMNH) [seen], **new synonymy**. Forel 1907a:9; Emery 1912:12; Shattuck 1992:77.

Dolichoderus germaini: Emery 1906:173; Wheeler & Wheeler 1973:397 (misidentifications).

Dolichoderus germaini subsp. *leviusculus* Emery 1906:173-174, worker, BRAZIL: Mato Grosso, Urucù (MCSN, MCZC) [seen], **new synonymy**. Forel 1909:260, 1911:306; Emery 1912:12; Shattuck 1992:77.

Dolichoderus germaini subsp. *garbei* Forel 1911a:305-306, worker, BRAZIL: Bahia, Joazeiro (MHNG, MZSP) [seen], **new synonymy**. Emery 1912:12; Shattuck 1992:77.

Dolichoderus (*Hypoclinea*) *championi*: Emery 1912:12.

Dolichoderus (*Hypoclinea*) *championi* var. *taeniatus* Wheeler 1916a:329 [First available name of *Dolichoderus championi* race *trinidadensis* var. *taeniatus* Forel 1899:101, unavailable name], worker, female, COLOMBIA: Magdalena, Río Frio (MHNG) [seen], **new synonymy**. Forel 1912:33; Emery 1912:12; Wheeler 1942:213.

Dolichoderus championi subsp. *trinidadensis*: Wheeler 1916a:329.

Dolichoderus (*Hypoclinea*) *germaini* var. *garbei*: Mann 1916:465.

Dolichoderus (*Hypoclinea*) *championi* var. *ornatus* Mann 1916:466-467, worker, female, BRAZIL: Pará, Belém (USNM, MCZC, BMNH) [seen], **new synonymy**.

Dolichoderus (*Hypoclinea*) *championi* var. *taeniatus*: Wheeler 1922:14.

Dolichoderus (*Hypoclinea*) *championi* subsp. *trinidadensis* Wheeler 1922:14.

Iridomyrmex mazaruni Donisthorpe 1939:152, worker, female, GUYANA (BMNH) [seen], **new synonymy**.

Hypoclinea championi: Kempf 1972b:119; Wilson 1987:248.

Hypoclinea championi var. *ornata*: Kempf 1972b:119.

Hypoclinea championi trinidadensis: Kempf 1972b:119.

Hypoclinea championi trinidadensis var. *taeniata*: Kempf 1972b:119.

Hypoclinea diversa: Kempf 1972b:119.

Hypoclinea germaini garbei: Kempf 1972b:119.

Hypoclinea germaini leviuscula: Kempf 1972b:119.

Dolichoderus diversus: Shattuck 1992:77.

Dolichoderus championi var. *ornatus*: Shattuck 1992:77.

Description. Worker measurements (mm): HL 1.25 - 1.46, HW 1.09- 1.30, EL 0.31 - 0.35, SL 1.28 - 1.50, WL 1.94 - 2.10, ML 0.46 - 0.65, MW 0.34- 0.53, PW 0.39 - 0.49. Indices: SI 90 - 106, CI 87 - 90, OI 25 - 30, MI 124 - 138.

Mandible with 13 - 15 teeth (Fig. 69); head lightly punctate with interspersed coarser punctures; clypeus punctate between poorly defined longitudinal carinae; sculpture of dorsum of head ranging from essentially smooth and shining to lightly punctate or very lightly costulate; eyes do not extend to lateral margins of head in full face view; middle of vertex weakly depressed; pronotum lightly punctate or striate with scattered, darker tubercles, each with a hair, pronotum flattened dorsally, sides almost perpendicular and marked by a slightly protruding margin; mesonotum and dorsum of propodeum with sculpture similar to that of pronotum; mesopleural region similarly sculptured, but strongly shining as are sides of pronotum and propodeum; propodeal declivity with transverse costulae; apex of petiolar node usually convex, or flat, occasionally concave, but rarely could be considered bidentate; gaster with

fine coriarious costulae which do not obscure shiny surface.

Color variable, ranging from concolorous golden brown to concolorous dark brown. Often the head and mesosoma range from light brown to dark brown legs light yellow and the gaster usually darker, varying from brown with yellowish markings to banded light and dark brown to completely black.

Erect hairs usually numerous and long, always present on scape, mesosoma and dorsum of gaster.

Female measurements (mm): HL 1.48 - 1.58, HW 1.38 - 1.48, EL 0.43 - 0.45, SL 1.30 - 1.48, WL 2.54 - 2.64, PW 0.50 - 0.64. Indices: SI 86 - 92, CI 91 - 94, OI 29 - 30.

Similar to worker in most respects, notably differing in the following: mesoscutum, scutum and dorsal face of propodeum densely and finely punctate, with larger scattered punctures. Color and pilosity similar to that of worker.

Male measurements (mm): HL 0.98 - 1.03, HW 0.89 - 0.94, EL 0.51 -0.53, SL 0.41 - 0.43, WL 1.96 - 2.10, PW 0.28 - 0.29. Indices: SI 41 - 42, CI 91, OI 51 - 53.

Mandible moderately shining with scattered punctures, apical tooth larger than others, which give mandible a serrate appearance (Fig. 117); eyes very large, protruding beyond side of head; ocelli large, well developed, all subequal in diameter; maxillary palps long, extending to occipital foramen; scutellum and metanotum strongly protruding; propodeum completely rounded at border of declining and dorsal face; petiolar node thickened in profile; genitalia typical of the others in the complex, aedeagus with several well developed teeth (Fig. 140). Most of surface finely punctate, light brown with darker brown gaster; few short, erect hairs present on scape, head, propodeum and gaster.

Discussion. The types of this species could not be located and are apparently lost. Mayr (1870b) misidentified this species as *H. abrupta*. Emery (1894) realized the misidentification and proposed a new species name, *Dolichoderus diversus*, for the Mayr material. This species is presently in a taxonomic jumble, with a number of obvious synonyms. It is variable in color and sculpture of the integument, and density and length of erect hairs on the body surfaces, especially the malar area and the gaster. This has resulted in the naming of a number of species, subspecies and varieties based on color and sculpture differences. A comparison of the various taxa which have been named and synonymized easily demonstrates a single variable species (Fig. 160). A series I collected in the state of Huila, Colombia covers most of the variation in color. An undescribed form (MCZC # 21200 - 1 worker) is also conspecific.

Dolichoderus germaini is closely related, but differs in characteristics listed in the *D. germaini* discussion. It separates from all of the other taxa on Fig. 160.

Perhaps in the future intermediates will be found to also synonymize *D. germaini* with *D. diversus*, but until then it will be considered as a valid species.

Distribution. MEXICO south to BOLIVIA and southern BRAZIL (Map 29).

Type Series. Dolichoderus diversus presumably lost; *Dolichoderus championi* lectotype worker (here designated) and 5 paralectotype workers, 2 paralectotype females (MHNG) [all seen], Costa Rica, Tonduz [collector], one paralectotype worker (MHNG) [seen]; MEXICO, Tabasco, Teapa, March, H. H. Smith; Panamá, Caldera Chiriqui, Champion; *Dolichoderus championi* var. *ornata* three worker syntypes (USNM) [seen], nine syntype workers (MCZC) [not seen], three syntype workers (BMNH) [not seen]; Brazil, Pará: Belém; *Dolichoderus championi* race *trinidadensis* three worker syntypes (MHNG) [seen], one syntype (BMNH) [not seen], Trinidad, Urich; *Dolichoderus championi* race *trinidadensis* var. *taeniata* 6 syntype workers and three syntype females (MHNG) [seen, note that the original of the name is unavailable (infrasubspecific), but that the name was made available by Wheeler and thus takes his authorship and date]; Colombia, Magdalena, Río Frio, Forel; *Dolichoderus germaini* subsp. *leviusculus* one syntype worker (MCZC) [seen], Mato Grosso; *Dolichoderus germaini* subsp. *garbei* two worker syntypes (MHNG), one syntype worker (MZSP) [all seen], Brazil, Bahia, Joazeiro, Garbe; *Iridomyrmex mazaruni* 9 syntype workers, 1 syntype female (BMNH) [all seen], British Guiana, coll. Richards & Smart, Bm. 1937-776.

Material examined. One hundred seventy four series, consisting of 1024 workers, 123 females and 44 males.

Biology. Little is known of this common species. Nests are usually found in hollow twigs, at elevations of up to 800 meters. It commonly occurs in disturbed habitats and is often imported into the United States on banana debris and on orchids. Workers rapidly escape when the nest is opened. This species nests together with stingless bees (Harada pers. comm.) and with *Camponotus* sp. in mangrove swamps. Loose sexuals have been collected in Feb. (Guatemala, Guiana), April (Panamá, Peru), May (México), June (Guiana), Sept. and Nov. (Brazil) [INPA, MCZC, MZSP, USNM].

Dolichoderus doloniger (Roger)
Map 10

Monacis dolonigera Roger 1862a:237-238, worker, VENEZUELA: Carabobo, Valencia (Museum of Berlin) [not seen]. Kempf 1959a:246-247, 1972b:142.

Hypoclinea doloniger. Mayr 1862: 707, 1870a:955; Lattke 1986:262, female, VENEZUELA, Barinas (MIZA) [not seen].

Dolichoderus doloniger. Emery 1894:228; Shattuck 1992:77.

Discussion. This is a very unusual species and is easily recognized. It is concolorous light ferruginous red in color. The petiolar spine is similar to that of *D. validus*. The region between the faces of the propodeum is almost

rounded, not carinate as in most other members of the *bispinosus* complex. The vertex is straight.

Distribution. VENEZUELA, Valencia, Sta. Elena, La Gran Sabana, G. O. Jones; Carabobo: Hda. Bucarito, Montalban, 13-xi-1983, 8 workers, Otero. BOLIVIA, Ixiamus, 1921-22, W. Mann; (Map 10).

Type Series. Venezuela, Valencia, Museum of Berlin [not seen].

Material examined. Three series consisting of 43 workers (USNM, LACM, MIZA, USBV).

Biology. Unknown.

Dolichoderus epetreia (Lattke)
Map 10

Hypoclinea epetreia Lattke 1986:262, worker, VENEZUELA: Amazonas: Río Baría (MIZA, BMNH, MCZC, MZSP, LACM) [seen].

Dolichoderus epetreia: Shattuck 1992:77.

Discussion. This species is closely related to *D. bispinosus*, differing primarily in having a foveolate-sculptured clypeus, but it also has yellow legs which strongly contrast with the remainder of the body (a pattern rarely seen in *D. bispinosus*), and the gastral pubescence is more dilute and is silver in color (usually golden and dense in *D. bispinosus*). The petiolar spine is similar to that of *D. bispinosus*. It is very closely related to *D. andinus*, and differs primarily in color. The vertex is strongly concave, not straight as in *D. andinus*. Further collections of the *D. epetreia* and *D. andinus* may reveal that they are conspecific. The yellow legs and dark brown color of the remainder of the ant, used as the only character, will not distinguish this species from *D. bispinosus* and *D. validus*, which are occasionally similarly colored.

Distribution. VENEZUELA, known only from the type locality (Map 10).

Type Series. Holotype and 69 paratypes (MIZA, BMNH, MCZC, MZSP, LACM, CWEM) [6 paratypes seen], Venezuela, Territorio Federal Amazonas, Río Baría, L. J. Joly.

Material examined. 6 paratypes.

Biology. Unknown, the type series was collected in a suitcase.

***Dolichoderus fernandezi* new species**
Fig. 5, 59; Map 3

Description. Worker measurements (mm): HL 2.48 - 2.50, HW 2.26 - 2.28, SL 2.54 - 2.66, EL 0.45, WL 3.80, PW 0.64 - 0.68, PL 0.42 - 0.44. Indices: SI 102 - 106, CI 91, PI 65 - 66.

Mandible finely striate with scattered punctures, four apical teeth large and well formed, other teeth poorly developed: clypeus with parallel striae and an

obvious well formed V - shaped impression (Fig. 59), anterior border emarginate; remainder of head with large diameter (0.05mm) punctures (sides) or foveolae (dorsum, posterior); occipital neck lacking; scapes with less than 15 erect hairs (including those on apex); pronotum primarily smooth and shining with scattered large punctures (0.03 - 0.09mm), dorsum with less than 10 erect hairs; mesonotal protuberance large, mostly smoothly rounded (Fig. 5); propodeal spines well formed and pointing caudad (Fig. 5), dorsal face with rugae, descending face with transverse striae; petiole with posterior face poorly separated from top of node, thus node is poorly defined; gaster with fine, dense punctures. Erect hairs sparse on the body (except gaster); strongly contrasting with *D. decollatus*, gaster with numerous erect hairs in addition to moderately dense, decumbent pubescence. Color reddish - brown, gaster black.

Female: Unknown.

Male: Unknown.

Discussion. This species is similar to *D. decollatus*, but differs in a number of characters: *D. fernandezi* has 15 or fewer erect hairs on the scape, *D. decollatus* more than 40, *D. fernandezi* has fewer than 10 erect hairs on the dorsum of the pronotum, *D. decollatus* has more than 20 and the pronotum of *D. fernandezi* is mostly smooth and shining, that of *D. decollatus* is coarsely sculptured with foveolate punctures.

Distribution. COLOMBIA, Meta: Reserva Nacional "La Macarena", Municipio de San Juan de Arama, La Curia Canyon at the INDERENA (Instituto Nacional de los Recursos Naturales) Field Station, 580 m, and the Guamalito Canyon (near La Curia Canyon) [MHNC, MCZC]; Meta: Caño Curia [MHNC]. GUIANA: Courantyne River, N. Weber (MCZC). BRAZIL, Amazonas: Manaus, K. Lenko [MZSP], 24 KNE Manaus, Rio Branco Rd., W. Brown [MCZC]; Ilhas Ana Vilhanaus, H. Schubert [INPA], Pará: Belém, J. Oliviera [MZSP], Amapá: Serra do Norte [MZSP] (Map 3).

Type series. Holotype worker from the INDERENA Field Station, 11- VII-1986, #WPM 001 (Fernández) (MHNC); paratype worker from Guamalito Canyon, 16-I-1987, #WPM 005 (Fernández) (MCZC).

Material examined. Nine collections, including holotype and paratype, and 32 additional workers.

Etymology. Named in honor of my friend and colleague, Fernando Fernández C., who has collected numerous interesting ants, including both specimens of the type series of this new species.

Biology. Both specimens were captured in gallery forest, the holotype was in a tree tending homopteran nymphs.

Dolichoderus ferrugineus Forel new status

Figs. 24a, 24b, 65; Map 24

Dolichoderus bidens subsp. *ferrugineus* Forel 1903:258, worker, BRAZIL: Pará (MHNG, MCZC, BMNH, OXUM) [seen]. Emery 1912:12; Shattuck 1992:77.

Dolichoderus (*Hypoclinea*) *bidens* var. *inferior* Mann 1916:465, worker, BRAZIL: Rio Madeira, Abuna (MCZC, LACM, USNM) [seen], **new synonymy.**

Hypoclinea bidens subsp. *ferrugineus*: Kempf 1960:397, 1972b:119.

Hypoclinea bidens var. *inferior*: Kempf 1972b:119.

Dolichoderus bidens var. *inferior*: Shattuck 1992:77.

Description. Worker measurements (mm): HL 1.38 - 1.52, HW 1.26 - 1.32, SL 1.50 - 1.66, EL 0.29 - 0.34, WL 1.98 - 2.22, PW 0.41 - 0.51, ML 0.54 - 0.64, MW 0.48 - 0.51. Indices: SI 109 - 111, CI 87 - 91, MI 113 - 124.

Head usually orbiculate, often weakly elongate; propodeal angles well formed; propodeal spiracle diameter 0.05mm, about 2 diameters from edge of descending face; petiole thickened with little or no evidence of teeth. Entire insect with long, erect hairs (up to 0.4mm); appressed, long, golden pubescence on most body surfaces, especially head, dorsum of mesosoma and particularly abundant on gaster. Sculpture roughened; gaster lightly punctate. Concolorous ferrugineous red.

Female measurements (mm): HL 1.76 - 1.82, HW 1.58 - 1.64, SL 1.78 - 1.84, EL 0.44 - 0.45, WL 2.70 - 2.78. Indices: SI 101, CI 90. Similar to worker, except propodeal angles well developed; petiole thickened with 2 well defined bumps or teeth.

Male: Unknown.

Discussion. This species can be easily confused with *D. bidens*, but the head is usually more orbiculate than that of *D. bidens*. *Dolichoderus bidens* is rarely ferrugineous in color, but when it is, the head is elongate and the petiolar node has well developed teeth. In addition, *D. bidens* is larger. The sculpture of *D. ferrugineus* is similar to that of *D. quadridenticulatus*, but is easily separated by the color and the shape of the head. It can be easily separated from *D. spurius* by the smaller propodeal spiracle and ferrugineous color. The females are similar to those of *D. bidens*, but can be separated by color and the presence of only small tubercles (no defined teeth) on the petiole. *Dolichoderus inferior* is identical and is easily synonymized.

Distribution. ECUADOR, PERU, GUIANA, BOLIVIA and BRAZIL (Map 24).

Type Series. Lectotype worker (here designated) and 5 paralectotype workers, 3 paralectotype females (MHNG) [all seen]; 3 paralectotype workers (MCZC # 21187) [seen]; 2 worker syntypes (BMNH) [not seen]; 3 syntype workers (OXUM) [not seen], Brazil, Pará A. Goeldi; 2 additional worker specimens labeled as types (Brazil, Amazonas; Rio Negro; Ducke; #MCZC

21187) [seen, not considered as types as they were not mentioned by Forel (1903)]; 2 additional workers (not labeled as types - but locality labels identical to type series) (USNM #96) [seen]. Types of *D. inferior*, Rio Madeira, Abuna, Brazil, Mann & Baker are deposited in the MCZC, LACM and USNM [seen].

Material examined. Twenty nine series, consisting of 83 workers and four females.

Biology. Nest in carton shelters on trees, diurnal foragers tend scale insects (Swain 1977). A loose female was collected in April (Brazil) [MZSP].

Dolichoderus gagates Emery
Map 28

Dolichoderus gagates Emery 1890a:69-70, worker, BRAZIL: Pará, Bragança (MCSN) [not seen]. Shattuck 1992:77.

Monacis gagates: Kempf 1959a:251-252, 1959b:216, 1972b:142; Swain 1977:221.

Hypoclinea gagates: Lattke 1986:264.

Discussion. This species is closely related to *D. inpai*, but differs in the shape of the mesonotum (see couplet number 31 of worker key). It is much darker in color than *D. rufescens*. The erect hairs on the scape easily separate it from *D. debilis* and *D. inermis*.

Distribution. VENEZUELA, Amazonas: Río Negro, L. Godlin [USBV]. BRAZIL, Pará: Bragança, Amapá: Serra do Navio (MCZC); Pará: Taperinha, Santarem (Swain 1977). BOLIVIA, Río Colorado, Huachi Beni [USNM] (Map 28).

Type Series. Two workers (MCSN), Brazil, Pará, Bragança [not seen].

Material Examined. Three series, consisting of 12 workers.

Biology. Unknown.

Dolichoderus germaini Emery
Fig. 47, 48 Map 31

Dolichoderus (*Hypoclinea*) *germaini* Emery 1894:237-238, worker, BRAZIL: Mato Grosso (MCSN, BMNH) [seen].

Dolichoderus germaini: Emery 1906:173; Shattuck 1992:77.

Hypoclinea germaini: Kempf 1972b:119.

Description. Worker measurements (mm): HL 1.56 - 1.59, HW 1.48 - 1.50, SL 1.48 - 1.64, EL 0.39 - 0.41, WL 2.16 - 2.28, ML 0.70 - 0.71, MW 0.58 - 0.59, PW 0.55 - 0.58. Indices: SI 93 - 105, CI 93 - 96, MI 121 -122.

Mandible with 8 to 10 teeth on masticatory border; clypeus moderately indented in medial anterior border, striae converge to indentation; frontal area defined; head triangular, vertex broadly concave; pronotum (from above) with angulate shoulders (Fig. 48), and with lateral carina which extends from both shoulders across anterior edge of pronotum, strongly depressed at anterior

medial border (Fig. 48); mesonotum oval shaped, almost as wide as long (Fig. 48); metanotal groove deeply indented; petiolar node flattened or rounded and with a sharp crest.

Mandible with scattered punctures and rugulose at base; clypeus with longitudinal striae; malar area and most of remainder of head with large, foveolate punctures (5 - 6 between ventral margin of eye and base of mandible), surrounded by punctate sculpture; dorsum of mesosoma granulate with roughened "sand paper" like sculpture; sides of mesosoma coriarious; anterior face of petiole, coxae, legs and gaster, moderately smooth and shining.

Entire body covered with short, erect hairs. Concolorous dark reddish-brown except coxae and legs which are reddish brown.

Female: Unknown.

Male: Unknown.

Discussion. This species is very similar to the highly variable *D. diversus*. It differs in the more coarsely sculptured head with foveolae, and the almost circular mesonotum. The erect hairs are also shorter, most less than 0.1mm long. *Dolichoderus diversus* is also much more common.

Distribution. BRAZIL, Mato Grosso (type series), Paraíba: Independencia, Mann & Baker (USNM) (Map 31).

Type Series. Lectotype worker (here designated) and three paralectotype workers (MCSN) [seen], one labeled syntype worker (BMNH) [not seen], two additional workers (not labeled as types) (USNM) [seen], Brazil, Mato Grosso, Germain.

Material examined. Lectotype, 3 paralectotypes and 3 workers.

Biology. Unknown.

Dolichoderus ghilianii Emery
Fig. 35, 39, 74, 99a,b, 118, 141; Map 32

Dolichoderus (*Hypoclinea*) *ghilianii* Emery 1894:238-239, worker, BRAZIL: Pará and Mato Grosso (MCSN) [seen]. Emery 1912:12; Mann 1916:465-466.

Hypoclinea ghilianii: Kempf 1969:293, 1972b:119.

Dolichoderus ghilianii: Shattuck 1992:77.

Description. Worker Measurements (mm): HL 0.90 - 1.14, HW 0.68 - 0.89, SL 0.95 - 1.10, EL 0.23 - 0.30, WL 1.19 - 1.48, ML 0.23, MW 0.25 - 0.26; PW 0.28 - 0.34. Indices: SI 97 - 106, CI 75 - 78, MI 85 - 90.

Mandibles smooth and shining, with scattered punctures, 8 - 9 teeth on masticatory border, 2 - 3 on basal border; clypeus with slightly concave medial anterior border; frontal area poorly defined; head elongate, vertex straight or feebly convex; eyes almost reach lateral margins of head; pronotum (from above) usually weakly angulate on shoulders; mesonotum round, posterior border defined by two darkened tubercles, each with a hair, this border located

at a distance about equal to diameter of mesonotum from the metanotal groove, lateral edges of metanotum upturned; posterior edge of propodeum formed into strongly upturned flange (Fig. 35); metanotal groove broad and rounded in form; petiolar node rounded. Integument mostly smooth and shining, with some fine punctures on head and dorsum of mesosoma. Scattered erect and suberect hairs on all parts of body, those on pronotum and petiole arising from dark, small tubercles; petiole usually with a row of 2 or 3 hairs along the lateral border; scape with appressed hairs, except for a few suberect hairs at or near the apex. Concolorous pale yellow to concolorous dark brown, usually reddish-brown with a dark brown gaster.

Female measurements (mm): HL 1.29, HW 1.10 - 1.13, SL 1.18 - 1.20, EL 0.44 - 0.46, WL 2.32 - 2.44, PW 0.34 - 0.35. Indices: SI 91 - 93, CI 85 - 87.

Similar to worker, except sculpture more roughened; ocelli well defined; occipital corners more angulate; keel on propodeum not as developed, reduced to a transverse carina. Color (from a series of pale yellow workers, thus may not be the normal color) light yellow with a yellow-brown gaster.

Male measurements (mm): HL 0.93 - 1.04, HW 0.81 - 0.90, SL 0.43 - 0.44, EL 0.53 - 0.54, WL 1.86 - 2.10, PW 0.39 - 0.40. Indices: SI 42 - 46, CI 87 - 88.

Very similar to that of *D. diversus*. Differs only in having subappressed hairs on scape, usually a slightly angulate propodeum (where faces meet), and in lighter coloration. The genitalia are typical of the complex; aedeagus without teeth (Fig. 141).

Discussion. Workers of this species may be confused with those of *D. lutosus*, but are easily distinguished by the appressed hairs on the scape and the upturned flange on the propodeum. It differs from *D. baenae* in the presence of the flange on the propodeum. It differs from *D. piceus* in color (it is never shiny black) and by having less angulate pronotal shoulders. The petiole is often like that of *D. primitivus*, but it differs in several characters (see discussion of *D. primitivus*). The lectotype is concolorous light brown with a dark brown gaster. The border of the petiole is rounded with slight bumps where angles might be expected. An undescribed type series (MCZC #21203, 3 workers) differs in that it is concolorous light yellowish brown and has small denticles on the node of the petiole. Another undescribed type series (MCZC #21202 - 2 workers, 2 males (MCZC, USNM) are typical *D. ghilianii*. The hairs on the apical 1/3 of the scape are suberect to a greater degree than is normal. The subspecies *dentinodis* (worker) has two denticles on the petiole. It is brown with darker gaster (lighter at base). It has suberect hairs on the apical 1/3 of the scape. A second specimen in the series has little evidence of denticles on the petiole and is concolorous light brown.

Females could be confused with those of *D. lutosus*, but are larger and have appressed hairs on the scape. The scape also surpasses the vertex by a distance greater than the diameter (less than the diameter in *D. lutosus*).

Males could be easily confused with those of *D. diversus*, but differ by the predominantly subappressed hairs on the antenna, the slightly angulate propodeum and the lighter coloration. They differ from males of *D. lutosus* in that the ocelli protrude more strongly and are larger in size. The petiolar node is also thicker in profile than it is in the other species in the complex. Males of an undescribed species (Mato Grosso, Serra do Urucum, Lorumbá, 26-xi-1960, K. Lenko, # 1237, 3 specimens - MZSP) differ in being smaller (HL 0.78 - 0.85, HW 0.73 - 0.79, SL 0.19 - 0.20, WL 1.46 - 1.48) (see Fig. 98) and in having a much shorter scape (Fig. 121b). There are also fewer erect hairs on the head and none on the scape. The petiole is quadrate with two long, erect hairs on each corner (Fig. 98) (rounded and without these hairs in *D. ghilianii*). It is light in color as are males of *D. ghilianii*. The workers and females would be expected to be light in color, have a subquadrate petiolar node, with four long, erect hairs near the apex, and lack erect hairs on the scape. It does not seem to represent undescribed males from any of the known species.

Distribution. COLOMBIA and PERU south to BOLIVIA and BRAZIL (Map 32).

Type series. Lectotype worker (here designated) and 2 paralectotype workers (MCSN) [seen], Brazil, Pará, Belém, and Mato Grosso.

Material Examined. sixteen series, consisting of 44 workers, 5 females and two males (MCZC, USNM).

Biology. Usually collected as strays in vegetation (Kempf 1969). Occurs on citrus. A single female was collected in Nov. (Brazil) [MCZC].

***Dolichoderus haradae* new species**

Fig. 158

Description. Worker measurements (mm): HL 1.54 - 1.64, HW 1.86 - 2.06, SL 1.48 - 1.58, EL 0.35 - 0.36, WL 1.98 - 2.10, PW 0.60 - 0.74, PL 0.28 - 0.33. Indices: SI 96 - 99, CI 121 - 126, PI 44 - 46.

Mandibles with 7 large teeth on masticatory border; anterior border of clypeus strongly emarginate, clypeus with shining, golden, bristly hairs, without foveolate punctures; vertex strongly emarginated; eyes large, but do not reach lateral margin of head; scape with numerous erect hairs, most shorter than diameter of scape; pronotum with short angles, which are not developed into spines; propodeum bell-shaped, strongly overhanging vertical face, posterolateral corners upturned; petiole with long erect spine, separated from truncate remainder of node; gaster punctate. Hairs long (up to 0.5mm), erect, golden; golden decumbent pubescence on all surfaces, especially gaster. Mostly concolorous black, except coxae, and mandibles, which are brown.

Female: Unknown.

Male: Unknown.

Discussion. This species is similar to *D. bispinosus* and could only be confused with this species. It is easily separated by the tiny pronotal angles (compare Figs. 158 & 159).

Distribution. BRAZIL: Amazonas, known only form type locality.

Type series. Holotype worker (INPA), two paratype workers (MCZC, CWEM), BRAZIL/AM-Terra firme; Reserva Flor. A. Ducke; 2°55' S, 59°59' W; Adis et al colls; 21-ii-1992; #14

Material examined. Type series

Biology. Unknown

Etymology. Named in honor of my colleague and fellow myrmecologist, Ana Harada of Manaus, who send me this series in addition to numerous interesting ants from Brazil.

Dolichoderus imitator Emery
Figs. 18a,b, 56, 93, 129, 133; Map 5

Dolichoderus (*Dolichoderus*) *imitator* Emery 1894:230-231 worker, female, male, BRAZIL: Pará, Belém (MCSN) [seen]. Emery,1912:9; Mann 1916:460.

Dolichoderus imitator: Kempf 1969:291, 1972b:98.

Description. Worker measurements (mm): HL 1.28, HW 0.80 - 0.81, SL 1.92 - 2.01, EL 0.33 - 0.38, WL 2.28 - 2.52, ML 0.64 - 0.76, MW 0.34 - 0.39, PW 0.35 - 0.43, PL 0.46 - 0.51. Indices: SI 150 - 158, CI 63 - 64, MI 189 - 197, PI 121 - 132.

Mandibles punctate and opaque; anterior border of clypeus convex with medial notch, punctate, opaque; remainder of head punctate and with foveolate punctures; insertions of antennae exposed; head elongated, nearly twice a long as broad, wider anteriorly than posteriorly; eyes protruding past lateral margins of head; cephalic neck not developed, upturned flange present; maxillary palps very long, extending to posterior part of head, apical 4 segments subequal in length and longer than two basal segments, second segment about 3 times as long as first; labial palps with apical segment twice as long as the others, which are subequal in length; mesosoma greatly elongated and narrow; pronotum punctate with a longitudinal sulcus; mesopleuron mostly smooth and shining, the remainder of mesosoma punctate (except declivous face of propodeum which has transverse parallel rugae); propodeal spines poorly developed, simply auricles connected by a transverse carina; anterior petiolar face perpendicular, with angles on each side of node and a long sloping posterior face covered with transverse striae, bidentate apex; gaster punctate and weakly shining. A few erect hairs on dorsum of body, but absent on scapes and tibiae, some very fine decumbent pubescence on gaster. Concolorous light yellow to brown.

Female measurements (mm): HL 1.40 - 1.54, HW 0.90 - 1.02, SL 1.80 - 2.00, EL 0.40 - 0.42, WL 2.46 - 2.66, PW 0.49 - 0.51, PL 0.72 - 0.75. Indices:

SI 129 - 130, CI 64 - 66, PI 146 - 149.

Similar to worker in most details, basal and masticatory borders of mandible with small teeth, giving edge of mandible a serrate appearance, apical 4 to 10 teeth relatively well defined; clypeus indented in the median anterior border; mesopleural tooth well developed; auricles on propodeum well developed and connected by carina, descending face with transverse rugae, coarser than those of worker; top of petiolar node with similar transverse rugae; petiole strongly inclined anteriorly with two well formed teeth at apex. Erect hairs sparse over most of body, absent on scapes (except apex) and tibiae. Sculpture mostly coarse, head with foveolate punctures, pronotum and scutum coarsely punctate, scutellum and dorsal face of propodeum punctate and granular; mesopleural area glabrous; propodeal declivity with transverse rugae, dorsum of gaster finely and densely punctate. Head and mesosoma light brown, gaster lighter or with contrasting light and medium brown bands, coxae and legs lighter than mesosoma. Wing similar to most other species in genus, except that discoidal cell is subquadrate or rectangular.

Male measurements (mm): HL 1.04 - 1.05, HW (posterior to eye) 0.76 - 0.80, SL 0.65 - 0.68, EL 0.48 - 0.49, WL 2.10 - 2.16, PW 0.36 - 0.40, PL 0.31 - 0.33. Indices: SI 63 - 64, CI 73 - 76, PI 81 - 86.

Basal and masticatory borders of mandible moderately serrate, only apical tooth well developed; median anterior border of clypeus slightly indented; scape shorter than first 3 segments of funiculus; 3 ocelli protruding from head; mesopleural tooth poorly defined; propodeum armed with 2 bumps, without carina between them; petiole anteriorly inclined, but basically in form of cone (bilobed); genitalia very characteristic (Fig. 133): aedeagus large and well developed with ventrally directed tooth, volsellae with a large, apparently muscular base, subgenital plate consisting of two bidentate lobes. Few erect hairs on head and fore coxae, very few hairs on remainder of body, none on scape (except apex) or tibiae. Head and most of mesosoma densely punctate, not as coarsely as female; mesopleuron lightly punctate, but sculpture finer than remainder of mesosoma; dorsal face of propodeum with longitudinal rugae, descending face with transverse reticulations; petiole with anterior face punctate, side foveolate, posterior face with transverse rugae; gaster lightly punctate and slightly shining; wing and color similar to that of female.

Discussion. This is a very easily recognized species and differs from other *Dolichoderus* in a number of characteristics. It lacks erect hairs on the scape and tibiae, it has very tiny propodeal angles, and a shiny mesopleuron. The discoidal cell of the wing is rectangular. The head of the female is greatly elongated and there are numerous transverse costulae on the propodeal declivity (absent in all other New World species except *D. shattucki*). The male genitalia are very distinctive (Fig. 133). The subgenital plate is easily seen and consists of two flat, bilobed processes (Fig. 129). The plates are absent or not

flat and bilobed in all other species of *Dolichoderus* (male unknown in *D. shattucki*, may be similar in structure). The volsella is very massive at the base, considerably different than that found in other species of *Dolichoderus* (Fig. 133). The digitiform process of the aedeagus is not directed anteriorly as it is in some of the other *Dolichoderus* species.

Distribution. PANAMA south to BOLIVIA and BRAZIL (Map 5).

Type series. Lectotype worker (here designated) (MCSN) [seen], Brazil, Pará, Belém, de Mahin [?] (worker and female) and Bolivia, Coroico e Chilumani, Yungas, Bazzan, 1891 (presumed male, and three workers) (MCSN) [workers seen].

Material examined. Fifty two series, consisting of 130 workers, 12 females and 9 males.

Biology. Found in lowland forests, nesting among rotten leaves. Loose sexuals have been collected in May and July (Ecuador) and Nov. (Brazil) [FSCA, MZSP].

Dolichoderus inermis new species

Figs. 9, 10; Map 28

Description. Worker (Holotype measurements first, (mm): HL 0.76 - 0.81, HW 0.78 - 0.83, SL 0.75 - 0.78, EL 0.20 - 0.21, WL 0.96 - 1.05, PW 0.35, MW 0.35 - 0.36, ML 0.34. Indices: SI 95 - 98, CI 102, MI 93 - 97.

Anterior margin of clypeus straight, eyes nearly reach lateral margins of head; vertex very slightly concave; pronotal spines well developed; mesonotum almost circular (Fig. 10), but slightly narrower posteriorly; metanotal groove wide and deep (Fig. 9); propodeal angles developed, space between them completely rounded, without carina; petiole narrow, posterior face almost straight (Fig. 9); basidorsal coxal tubercle absent. Entire ant punctate, but moderately shining throughout. Erect hairs on all surfaces, including scapes, tibiae and gaster, irregular in length, those on gaster mostly of two lengths, the shorter are pubescence-like, but erect or suberect.

Discussion. This species is most similar to *D. gagates*, but also shows similarities to *D. debilis* and *D. inpai*. It can easily be separated from *D. debilis* due to the abundant erect hairs on the scape, and the lack of appressed pubescence on the gaster. It differs from *D. inpai* in the shape of the mesonotum and the lack of a transverse carina between the dorsal and posterior faces of the propodeum, which is found in *D. inpai*. It differs from *D. gagates* in having rougher sculpture (many surfaces are smooth and polished in *D. gagates*), the area between the faces of the propodeum rounded (with carina in *D. gagates* and *D. inpai*), and the gaster is densely covered with erect hairs (scattered erect hairs in *D. gagates*). The apical petiolar tooth is absent or poorly developed (well developed in *D. gagates*), the posterior face of the petiole is straight (as in *D. inpai*, it is concave in *D. gagates*, due primarily to

the somewhat posteriorly bent apical tooth).

Distribution. COSTA RICA, known only from type locality (Map 28).

Type series. Holotype worker and one paratype worker; Costa Rica, Osa Peninsula, Corcovado, Llorona, 23-iii-1981, J. Longino; 930, tending membracids; Dolichoderus c. f. gagates [LACM].

Material examined. Holotype and one paratype.

Etymology. From Latin, unarmed, referring to the propodeum, which is without the transverse carina between the faces, which is present in closely related species.

Biology. Type specimens were tending membracids.

Dolichoderus inpai (Harada)
Fig. 11; Map 28

Monacis inpai Harada 1986:600-602, worker, BRAZIL: Amazonas, Manaus (INPA, MZSP) [seen].

Dolichoderus inpai: Shattuck 1992:77.

Discussion. This species can be distinguished from all others in the *debilis* complex in that the mesonotum is longer than broad, and by other characteristics mentioned in the key.

Distribution. BRAZIL (type locality) and VENEZUELA, Amazonas: San Carlos de Río Negro, 16 Oct. 1981, L. Carling (MCZC, LACM, CWEM) (Map 28).

Type Series. Holotype worker and 3 worker paratypes (INPA, MZSP) [holotype and 1 paratype seen], Brazil, Amazonas; Manaus-ZF-3; km. 24, ENZ Esteio (Forestal); Monacis inpai; Harada and Silva, 1986.

Material Examined. Holotype, 1 paratype and 3 additional workers.

Biology. Unknown.

***Dolichoderus intermedius* new species**
Fig. 6; Map 3

Description. Worker measurements (mm): HL 2.3, EL 0.4, WL 3.9, PL 0.5.

Mandible punctate and finely striate, with about 14 teeth, the apical much more developed than the others; clypeus without anterior notch and along with the remainder of head, primarily rugose; eyes very strongly protruding and weakly constricted around base; occipital neck absent, but an upturned flange present; surface of mesosoma without sculpture and weakly shagreened; mesonotum strongly protruding; lower mesopleural spine well developed (Fig. 6); propodeal spines well developed, large and pointed caudad; propodeum large and massive when compared to other species of the *rugosus* complex; petiolar node low and elongate; dorsum of gaster weakly punctate. Coarse erect hairs on all surfaces, especially the scapes, dorsal surface of head and dorsum of gaster. Moderately dense decumbent pubescence on most of body,

especially the gaster.

Female: Unknown.

Male: Unknown.

Discussion. The holotype is unfortunately missing the right third of the head, but is otherwise a beautifully preserved specimen. It has all the characteristics of the *rugosus* complex as well as three major characteristics of the *decollatus* complex: a strongly protruding mesonotum, a thick, robust mesosoma and a massive propodeum. The protruding mesonotum easily separates this species from other species in the *rugosus* complex. The long maxillary palps and the lower mesopleural spine separate it from other species complexes. I consider it to be intermediate between the *decollatus* and *rugosus* complexes and due to synapomorphies (long maxillary palps, lower mesopleural spine), have placed it in the *rugosus* complex.

Distribution. Known only from the DOMINICAN REPUBLIC (Map 3).

Type series. Holotype, preserved in amber, purchased from Susan Hendrickson in Key West, FL, 1986 (MCZC).

Material examined. Holotype worker.

Etymology. From Latin, referring to the intermediate status of this species between the *decollatus* and *rugosus* species complexes.

Biology. Unknown, probably arboreal.

Dolichoderus lamellosus (Mayr)
Figs. 12, 125, 134; Map 13

Hypoclinea lamellosa Mayr 1870b:390-391, female, NEW GRENADA [=COLOMBIA] (Mus. of Vienna) [not seen]. Emery 1890b:55; Lattke 1986:264.

Dolichoderus (*Monacis*) *lamellosus*: Emery 1894:233, worker, COLOMBIA; COSTA RICA; BRAZIL: Pará; BOLIVIA [not seen].

Dolichoderus lamellosus: Forel 1899:99; Shattuck 1992:77.

Dolichoderus lamellosus var. *missionensis* Santschi 1916:390, worker, ARGENTINA: Misiones, Iguazu (NHMB, MACN) [seen], synonymy by Kempf 1959a:263.

Dolichoderus (*Monacis*) *schulzi* var. *missionensis*: Santschi,1923:269.

Monacis lamellosa: Kempf 1959a:263-266, male, BRAZIL: Rio de Janeiro, Pernambuco; COSTA RICA: Limón (MZSP) [not seen]. Kempf 1972a:254, 1972b:142; Swain 1977:234-238.

Discussion. The foveolate sculpture and broadly rounded posterior propodeal margin (as seen from above) separate the workers of this species from others in the complex. There is considerable variation in color, ranging from concolorous black to specimens with pale yellow legs and antennae, with brownish gaster and the remainder dark brown. There is also considerable variation in size, with specimens from Central America to northern South American often larger and darker. Sides of the mesosoma range from punctate

to foveolate. The pronotum of the male is very slightly angulate.

Distribution. GUATEMALA south to northern ARGENTINA (Map 13).

Type Series. Female holotype, COLOMBIA, without specific locality, presumably in Natural History Museum of Vienna, Austria [not seen]. *Dolichoderus lamellosus* var. *missionensis*: one syntype worker, Argentina, Misiones Providence (MACN) [seen].

Material Examined. Thirty series, consisting of 249 workers, 12 females and 6 males.

Biology. Swain (1977) reported on the biology of this species. These ants are often found on trunks and in canopies of tropical trees, especially mango trees, and are often together with workers of *D. bispinosus*. Workers are primarily active at night. They seem to be most common in riparian sites and areas with waterlogged soils where few other ant species occur. Nests are found in and under bark of trees (Lattke 1986), especially of caracolí (*Anacardium excellsum*, pers. obser.), and in hollow stems, at a height of 0.5 - 25 meters. The nest may be constructed of fine carton. Nests are apparently monogynous and populations are not known to exceed 80 workers. They also nest in bromeliads, among roots of orchids and in abandoned moth cocoons, often together with *D. bispinosus*. Workers move rapidly, but are relatively non-aggressive when disturbed and dedicate themselves to rescue brood instead of defend the nest. Workers do not produce a dolichoderine odor. Females are attracted to lights.

Dolichoderus laminatus (Mayr)
Fig. 110; Map 14

Hypoclinea laminata Mayr 1870a:389-390, worker, NEW GRENADA [= COLOMBIA] (EMAU) [not seen]. Mayr 1870b:956; Lattke 1986:264; Swain 1977:225-234.

Dolichoderus laminatus: Forel 1878:386, 1899:99; Wheeler,1936:229; Wheeler & Wheeler 1951:177; Shattuck,1992:77.

Dolichoderus (*Monacis*) *laminatus* subsp. *luteiventris* Emery 1894:232, worker, BRAZIL: Pará, Belém (MCSN) [not seen], synonymy by Kempf 1959a:259.

Monacis laminata: Kempf 1959a:259-261, 1972a:142,1972b:254.

Discussion. The long, concave mesonotum which has no (or few) erect hairs easily separates this species from all other extant species in the complex. The subspecies *luteiventris* differs in that the gaster is striped transversely with light and dark brown but there is considerable variation in color in this species and it is obviously not a valid taxon. The undescribed male would be expected to be very similar to that of *D. varians*, but would have few or no erect hairs on the mesosoma.

Distribution. COSTA RICA south to BRAZIL (Map 14).

Type Series. Unspecified series of workers from Colombia (EMAU) [not seen].

Material Examined. Thirty three series of 106 workers and 3 females. Swain (1977) mentioned that males are deposited in the MCZC, but they could not be located.

Biology. Nests are found under bark of trees, especially *Leuhea* sp. and *Bombacopsis* sp. (Swain 1977), and are frequently found in arboreal termitaries of *Nasutitermes ephratae* (Wheeler 1936; Lattke 1986; Swain 1977). They also nest in *Cattleya*. This species is common along rivers in Costa Rica; one nest had 1000+ workers, 168 males, 28 alate females and one dealate female (Swain 1977). Colonies may be polydomic (Swain 1977). Workers are nocturnal and forage in the canopy of the tropical forest. This species is not aggressive and does not have the "tapinoma" odor of many of the other species in the genus.

Dolichoderus laurae new species

Figs. 150 - 157

Description. Worker measurements (mm): HL 1.44 - 1.48, HW 1.15 - 1.24, SL 1.64 - 1.70, EL 0.30 - 0.34, WL 2.24 - 2.38, MW 0.41 - 0.45, ML 0.55 - 0.63, PW 0.44 - 0.50, PL 0.24 - 0.26. Indices: SI 114 - 115, CI 80 - 84, MI 134 - 139, PI 53 - 57.

Mandibles smooth with scattered punctures, 11 teeth on masticatory border, apical largest, next 4 - 5 teeth subequal in size, remainder of teeth smaller; anterior border of clypeus almost straight, but with slight medial emargination, somewhat upturned as a flange; vertex somewhat elongate and not concave posteriorly; eyes large, almost reaching lateral margins of head (Fig. 151); scape with numerous long (up to 0.25mm), erect hairs; mesosoma elongate with numerous long (0.1mm) erect hairs (Fig. 150); dorsum of pronotum depressed, concave, smooth with scattered fine punctures; mesonotum smooth, shining; mesopleuron coarsely sculptured, rugose with scattered punctures, tooth poorly developed; propodeal spines blunt, truncate, auricle-like processes (Figs. 150 & 153); dorsal face of propodeum smooth with scattered fine punctures, descending face smooth with a few fine transverse costulae near base of tubercles; hind coxa without tubercle; petiole with anterior face strongly convex, posterior face almost straight, meeting at top of node as ridge or carina; gaster smooth, finally punctate, similar to surface of pronotum and propodeum. All surfaces with scattered, long, erect, golden hairs; sparse, decumbent, golden pubescence on head, dorsum and sides of pronotum. Dorsum of pronotum, of propodeum and of gaster with abundant, appressed pubescence. Head, antennae, mesosoma and gaster concolorous black; mandibles brown, legs reddish brown, strongly contrasting with remainder of ant.

Female measurements (mm): HL 1.58, HW 1.36, SL 1.76, EL 0.43, WL 2.70, PW 0.55, PL 0.36. Indices: SI 111, CI 86, PI 65.

Head, including mandibles and clypeus as in worker, except for presence of 3 ocelli; pronotum elongate (length at midline 0.53mm), concave in profile; propodeum with large, well developed, blunt tubercles directed vertically (Fig. 154); petiolar node thick, blunt in profile (Fig. 154); hairs, pubescence, sculpture and color as in worker.

Male measurements (mm): HL 0.94 - 0.98, HW (posterior to eye) 0.95 - 0.99, SL 0.44 - 0.48, EL 0.49 - 0.53, WL 2.22 - 2.34, PW 0.43 - 0.45, PL 0.28 - 0.29. Indices: SI 45- 51, CI 101, PI 64 - 65.

Mandible with apical tooth largest, but not well differentiated from remainder of poorly developed, serrate teeth; median anterior border of clypeus straight, slight median emargination; eyes large, extending well beyond lateral margins of head; 3 ocelli protruding from head; scape subequal in length to third segment; maxillary palps long, extending past foramen magnum; propodeum with 2 tubercles on posterior margin; anterior petiolar face rounded, convex, posterior face almost straight, no carina on dorsum. Genitalia typical of *diversus* species complex: parameres large, apex with numerous erect hairs; aedeagus similar to others in complex, with well developed, but weak teeth on posterior half; volsellae similar to others of the complex, except process not knob-shaped; subgenital plate slightly emarginate in medial posterior border as in other species. Scattered, erect, long (0.25mm), golden hairs on most surfaces; decumbent pubescence on essentially all surfaces, especially dorsum of mesosoma, somewhat more dilute on gaster. Smooth throughout, with scattered fine punctures. Mostly concolorous dark brown mandibles and genitalia yellow-brown.

Discussion. In general form, workers appear similar to those of *D. imitator.* It is clearly not closely related to this species, and based on the female and male, is closely related to *D. diversus.* Workers are easily distinguished from those of *D. imitator* using a number of characters: numerous erect hairs on scape, head not elongate, sculpture finer, posterior face of propodeum without coarse, transverse costulae (fine costulae present near base of tubercles), petiole shaped differently and not bidentate, similar to that of species in the *diversus* complex. It is obvious that this species only superficially resembles *D. imitator.* The elongate form of the worker distinguishes it from most other species in the genus. It is similar to *D. luederwaldti* in the shape of the mesosoma, especially the depressed pronotum. In addition it has abundant appressed, golden pubescence on the gaster. The shape of the head easily separates *D. luederwaldti* and *D. laurae* (see couplet 58, and compare Figs. 70 and 151).

The female is similar to those of *D. diversus*, differing from other species in this complex in the shape of the petiole (thickened) and the presence of

large, blunt tubercles on the propodeum. The male also appears similar to that of *D. diversus*, but is easily distinguished by the presence of tubercles on the propodeum. The genitalia are similar to those of the *diversus* complex.

Distribution. COLOMBIA: known only from type locality.

Type series. Holotype worker, 12 paratype workers, 1 paratype female (winged), 3 paratype males (MHNC), 96 additional paratype workers, 9 paratype males (AMNH, BMNH, CWEM, INPA, LACM, MCSN, MCZC, MHNG, MIZA, MZSP, NHMB, UAVC, UNCM, USBV, USNM). COLOMBIA: Risaralda, Puerto de Oro, Rio Totumo, 980 m, 30-viii-1991, F. Fernández.

Material examined. Type series.

Biology. Nest in tree below masses of leaves attached to tree. The workers are aggressive, tend Homoptera.

Etymology. Named in honor of my colleague and fellow myrmecologist, Laura Schneider of Santa Fé de Bototá, Colombia.

Dolichoderus lobicornis (Kempf)
Fig. 76; Map 15

Monacis lobicornis Kempf 1959a:267, worker, BRAZIL: Santa Catarina, Goiás (MZSP, NHMB, MCZC) [seen]. Kempf 1969:293, 1972b:142; Wilson 1987:248.

Dolichoderus lobicornis: Shattuck 1992:77.

Discussion. The lobate base of the scape (Fig. 76) easily separates this species from all others in the genus. Specimens from Peru are smaller, but appear to be within the variability to be expected of this species.

Distribution. PERU, Madre de Dios: Río Tambopata Res., T. Erwin *et al.* 12° 50' N, 06° 20' W, 290 m [MCZC]. BRAZIL, type localities, Goiás, Anapolis, Pará, Tucurui [LACM]; Amazonas: Reserva Ducke, J. Rafael (INPA); Guanabara, Floresta da Tijuca (Rio de Janeiro), Feb 1960, 1 worker, São Paulo, Boa Esperança do Sul, Mato Grosso: Utuariti, Rio Papagaio, Oct. 1966 1 worker (Map 15).

Type Series. Holotype and 22 paratype workers, Brazil, Santa Catarina, Blumenau, 12-x-1921, M. Witte (MZSP, NHMB, MCZC) [12 paratypes seen].

Material Examined. 5 series, consisting of 12 paratypes and 8 workers (INPA, LACM, MCZC).

Biology. Unknown. Stray females collected in February and October (Kempf 1969).

***Dolichoderus longicollis* new species**
Figs. 17, 57; Map 3

Description. Worker measurements (mm): HL 2.60 - 2.84, HW 1.70 - 1.90, SL 2.94 - 3.10, EL 0.41, WL 4.02 - 4.50, PW 0.51 - 0.61, PL 0.48 - 0.56. Indices: SI 109 - 113, CI 65 - 68, PI 105 - 111.

Mandibles striate with scattered punctures, with 13 teeth, the apical 4 well formed, the others not as well defined; clypeus rugose with a moderate anteromedial excision; remainder of head heavily and densely foveolate; eyes large, protruding and extending past the lateral borders of the head in full face view; occipital neck about twice as long as the minimum width (Fig. 57); pronotum predominantly rugose, side of pronotum smooth and shining in areas between large deep punctures; mesonotum strongly protruding; mesopleuron rugose, interrugal spaces shining; sides of propodeum and descending face rugose, dorsal face with large foveolate punctures; node of petiole rugose on top and sides, anterior part of node convex with 2 well formed angles on both lateral corners; anterior peduncle with an angle below the anterior face of the node, with a few erect downward directed hairs, area below node completely smooth and shining; dorsum of gaster completely and heavily punctate, including the posterior borders of the terga, sides weakly shining, although they are also punctate. Numerous standing, truncate, silvery hairs on head (including mandibles and clypeus), and mesosoma (including legs), and gaster. Antennal scapes with numerous long, thick, truncate, suberect hairs. Gaster also with decumbent pubescence which does not obscure the surface sculpturing. Entire ant is concolorous dark brown.

Female: Unknown.

Male: Unknown.

Discussion. The extremely long neck and the strongly protruding mesonotum separate this species from all known species except *D. rosenbergi.* It is easily separated from the latter species as the dorsum of the gaster of *D. longicollis* is densely punctate (completely smooth and polished in *D. rosenbergi*).

Distribution. Known only from the Department of Valle de Cauca, COLOMBIA (Map 3).

Type Series. Holotype worker, Colombia: 12 Mi. E. Buenaventura, Valle, 20 m, 27-iii-1955, Schlinger & Ross (CAS), 5 paratype workers from same series as holotype, 3 workers (CAS), 1 worker (USNM), 1 worker (MZSP) [all seen].

Material examined. 5 series, consisting of 13 workers, including the type series, 4 additional workers from 3.2km above R. Aguaclara on old road to Cali, Municipio de Buenaventura, 17-19.vi.1971, W. Brown (MCZC); Anchicayá Viejo, 15.vi.1982, M. Corn (CWEM); Central Anchicayá, 13-vii-1975, J. Lattke (MIZA).

Etymology. From Latin, referring to the extremely long neck.

Biology. One worker was tending membracids, otherwise unknown. This species was featured on the cover of Sociobiology 16(1) (top photograph).

Dolichoderus luederwaldti Santschi
Figs. 43, 44, 70; Map 31

Dolichoderus (*Hypoclinea*) *luederwaldti* Santschi,1921:100-101, worker, BRAZIL: São Paulo, Salto Grande (NHMB) [seen].

Hypoclinea luederwaldti: Kempf 1969:293, 1972b:120.

Dolichoderus luederwaldti: Shattuck 1992:77.

Description. Worker measurements (mm): HL 1.28 - 1.52, HW 1.19 - 1.84, SL 1.25 - 1.46, EL 0.29 - 0.33, WL 1.66 - 2.06, ML 0.58, MW 0.41 - 0.45, PW 0.39 - 0.45. Indices: SI 96 - 99, CI 87 - 109, MI 129 - 139.

Mandibles lightly punctate with interspersed larger punctures, 9 teeth on masticatory border; clypeus emarginate in anterior medial border, with striae converging to anterior indentation; frontal area poorly defined; vertex concave; pronotum marginate on sides, with a conspicuous depressed region on anterior medial edge where carina passes over pronotum; mesonotum oval (L = 0.75mm, W = 0.54mm, MI = 1.39 in holotype). Erect hairs on all body surfaces, gaster with abundant appressed pubescence, which mostly obscures surface. Sculpture of head and pronotum heavily punctured with interspersed foveolae on head and transverse rugae on dorsum of mesosoma; sides of pronotum, anterior coxae and mesopleural region moderately shining.

Female: Unknown.

Male: Unknown.

Discussion. This species is part of a group of three closely related species (together with *D. lujae* and *D. germaini*), and is apparently closely related to *D. voraginosus*. The petiole of these 4 species are similar in being weakly flattened anterior-posteriorly. The pronotum is angulate in a form similar to that of *D. ghilianii*. It is easily separated from most members of the *diversus* complex as it, *D. lujae* and *D. laurae* are the only species in the *diversus* complex which have abundant appressed pubescence on the gaster. The three closely related species (*D. luederwaldti*, *D. lujae* and *D. germaini*) also have a carina which passes from the side of the pronotum anteriorly to a strongly depressed medial area. (The carina on the pronotal sides is only moderately developed in a series of specimens from São Paulo, Brazil.) It differs from *D. lujae* in being smaller and having a more elongate metanotum. The holotype is larger than the other specimens I have seen (HL = 1.52, HW = 1.66, WL = 2.06). *Dolichoderus voraginosus* is smaller and has a number of foveolate punctures on the pronotum. *Dolichoderus ghilianii* is separated from these species by a strongly upturned pronotal flange.

Distribution. BRAZIL (Map 31).

Type Series. Holotype worker (NHMB) [seen], Brazil, São Paulo, Salto

Grande, Luederwaldt; 15 Aug; Brazil, SP, Salto Grande, Luederwaldt, 11-1911; Dolichoderus Hypoclinea luederwaldti type Sant. [in blue ink on white label]; Dr. F. Santschi Rairouan.

Material Examined. Holotype; 3 workers (Brazil, São Paulo, Mun. Anhembi, Barreiro Rico farm, 14-II-1969, W. Kempf J. Magalhaes, M. Kuhlman (MZSP) (200km east of type locality).

Biology. Kempf (1969) collected 9 workers on a freshly felled tree in primary forest.

Dolichoderus lugens Emery
Fig. 31, 73, 97, 119, 135, 136, 137; Map 6

Dolichoderus (*Hypoclinea*) *lugens* Emery 1894:239, worker, BOLIVIA: Río Beni, Salinas (MCSN) [seen]. Emery 1912:12; Shattuck,1992:77.

Dolichoderus (*Hypoclinea*) *lugens*: Mann 1916:464-465.

Hypoclinea lugens: Kempf 1972b:120.

Description. Worker measurements (mm): HL 1.78 - 1.84, HW 1.76 - 1.84, SL 2.00 - 2.08, EL 0.44 - 0.45, WL 2.64 - 2.66, ML 0.93 - 1.00, MW 0.61 - 0.70, PW 0.55 - 0.61. Indices: SI 112 - 113, CI 96 - 103, MI 143 - 151.

Masticatory border with 8 teeth, head (including mandibles) cordate, vertex strongly indented; mesosoma strongly indented at metanotal suture; propodeum smoothly rounded with bumps where spines are present in other species; petiole very thick in profile. Entire ant strongly and densely punctate, surface dull. Few short erect hairs (up to 0.1mm) on most bodily surfaces, golden, decumbent pubescence present on upper bodily surfaces. Ant predominantly black with tarsi, mandibles and antennae lighter.

Female measurements (mm): HL 1.96 - 2.06, HW 1.72 - 1.82, SL 2.38 - 2.42, EL 0.48 - 0.51, WL 3.28 - 3.38, PW 0.60 - 0.61. Indices: SI 116 - 123, CI 83 - 93.

Similar to worker with following exceptions: head more elongate, ocelli prominent; vertex not as strongly indented; anterior face of petiole perpendicular to attachment, rising to a node and strongly curved posteriorly. Concolorous dark reddish-brown.

Male measurements (mm): HL 1.07 - 1.11, HW 1.11 - 1.29, SL 0.51 - 0.65, EL 55, WL 2.84 - 3.02, PW 0.44 - 0.46. Indices: SI 48 - 51, CI 101 - 104.

Similar to worker in many aspects, except 3 ocelli prominent; vertex of head convex; petiole similar to that of worker, although weakly directed anteriorly; genitalia (Figs. 136, 137) similar to those of the *diversus* and *bidens* species complexes. There seem to be two forms of genitalia in this species (Figs. 136, 137), which may represent different species. Otherwise the males appear to be identical. Concolorous dark reddish-brown.

Discussion. This is an easily recognized species which will not be confused with any of the other *Dolichoderus*, due to the heavily punctate body and the

thickened petiole.

Distribution. VENEZUELA south to BOLIVIA (Map 6).

Type Series. Lectotype (here designated) and three paralectotype workers (MCAN), Bolivia, Río Beni, Salinas.

Material Examined. Twenty five series, consisting of 141 workers, 6 females and 6 males.

Biology. This species is most common in wet forests below 500 meters in elevation. Data on one series indicated that it is subterranean. Large colonies nest in trees, but forages more often on the ground than other Neotropical species in the genus. Workers exude drops of mustard yellow secretion from their gasters (Mann 1916). Stray sexuals were collected in April (Brazil) and May (Ecuador) [MZSP].

Dolichoderus lujae Santschi new status
Figs. 45, 46, 71; Map 31

Dolichoderus (*Hypoclinea*) *luederwaldti* subsp. *lujae* Santschi, 1923:269-270, worker, BRAZIL: MG, Piracicaba (NHMB) [seen].

Hypoclinea luederwaldti lujae: Kempf 1972b:120.

Dolichoderus luederwaldti subsp. *lujae*: Shattuck 1992:77.

Description. Worker measurements (mm): HL 1.58 - 1.78, HW 1.44 - 1.74, SL 1.50 - 1.66, EL 0.36 - 0.41, WL 1.96 - 2.36, ML 0.69 - 0.88, MW 0.68 - 0.69, PW 0.54 - 0.61. Indices: SI 92 - 95, CI 91 - 99, MI 101 -127. Identical to *D. luederwaldti* with the exceptions listed in the discussion.

Female: Unknown.

Male: Unknown.

Discussion. This species is larger than *D. luederwaldti* (HL, SL, EL, and PW are greater, SI and MI are smaller). The metanotum is essentially round. The sculpture is coarser with more foveolate punctures on the head. It is probable that when more specimens of the two species become available, it will be considered a synonym of *D. luederwaldti*.

Distribution. BRAZIL (Map 31).

Type Series. Lectotype (here designated) and 3 paralectotypes (NHMB), Brazil, MG, Piracicaba [?, State of São Paulo?], 1922, Luja.

Material Examined. Lectotype and 3 paralectotypes.

Biology. Unknown.

Dolichoderus lutosus (F. Smith)
Fig. 130, 139; Map 30

Formica lutosa F. Smith 1858:42-43, worker, BRAZIL: Amazonas, Vila Nova (BMNH) [not seen].

Hypoclinea cingulata Mayr 1862:705-706, worker, BRAZIL: Amazon River (USNM) [seen], synonymy by Mayr 1886a:356. Mayr 1870b:957.

Hypoclinea lutosa: Mayr 1862:706; Kempf 1972b:120; Fisher & Zimmerman, 1988:15.

Dolichoderus lutosus: Mayr 1886a:356; Emery 1890a:70,1890b:55, 1912:12; Forel 1899:99-100,1907a:9; 1912:33; Wheeler 1942:213; Skwarra 1934:133-134; Shattuck 1992:77.

Dolichoderus lutosus var. *nigriventris* Forel 1893:351, worker, ANTILLA: St. Vincent (MHNG) [seen], **new synonymy**. Forel 1899:100; Shattuck 1992:77.

Dolichoderus (*Hypoclinea*) *lutosus*: Emery 1894:228; Mann 1916:468, female, male, BRAZIL: Natal, Baiza Verde (MCZC) [not seen]. Wheeler 1922:14.

Dolichoderus (*Hypoclinea*) *lutosus* var. *ruficauda* Wheeler 1936:229 (nom. nud.), **new synonymy.**

Hypoclinea lutosa var. *nigriventris*: Kempf 1972b:120.

Description. Worker measurements (mm): HL 0.84 - 1.10, HW 0.73 - 1.04, SL 0.78 - 0.96, EL 0.20 - 0.28, WL 1.08 - 1.45, PW 0.26 - 0.35, ML 0.38 - 0.39, MW 0.35 - 0.43. Indices: SI 88 - 93, CI 82 - 94, MI 91 - 107.

Mandibles relatively smooth between scattered, small punctures, 8 - 9 teeth on masticatory border, 4 on basal border; anterior clypeal border straight or with moderate indentation; mesonotum circular in shape; propodeum with slightly upturned transverse carina; petiolar node rounded. Lightly punctate throughout, head and gaster weakly shining, entire ant almost devoid of erect hairs, few on head and gaster, no hairs on scape, very little decumbent pubescence on mesosoma and gaster. Color ranging from concolorous light brown to concolorous dark brown, usually medium brown with a dark or striped (alternating bands of brown and yellow-brown) gaster.

Female measurements (mm): HL 1.24 - 1.28, HW 1.15 - 1.21, SL 0.94 - 0.95, EL 0.34 - 0.35, WL 1.88 - 1.90, PW 0.29 - 0.43. Indices: SI 74 - 77, CI 93 - 95.

Similar to worker in most aspects, ocelli well developed; sculpture more coarse; color and pilosity similar.

Male measurements (mm): HL 0.71 - 0.73, HW 0.70 - 0.74, SL 0.15 - 0.28, EL 0.39 - 0.43, WL 1.35 - 1.41, PW 0.26 - 0.28. Indices: SI 21 - 38, CI 98 - 102.

Mandibles smooth with scattered punctures, apical tooth well developed, others only serrations; eyes large, extending past lateral sides of head; ocelli large, subequal in diameter, strongly protruding. Few erect hairs on mandible, clypeus, maxillary palps and apex and venter of gaster. Concolorous brown with lightly punctate sculpture.

Discussion. The workers and females of this species are easily recognized as there is only one other species in which the workers have no hairs on the scape. The males are also easily recognized as they have no erect hairs on the scape, and essentially lack erect hairs on the entire body. It would not be

confused with those of *D. diversus* or *D. ghilianii* as they are darker and the ocelli are not as large and protruding. Typically the diameter of the ocellus is much less than (about 1/2) the diameter of the distance between the medial and lateral ocelli. Occasional specimens have larger ocelli (diameter subequal to distance between them) and may represent an undescribed species.

The members of this species differ considerably in color and also in minor differences in sculpture. The varieties *nigriventris* and an undescribed Wheeler variety (USNM & MCZC numbers 20207 - 6 workers) have black gasters. Other undescribed "subspecies" series are similar, but have striped gasters (MCZC numbers 21206 - 9 workers, 21208 - 6 workers, 21209 - 3 workers). All of these forms fall well within the range of color variation of this species and are considered conspecific.

Distribution. MEXICO south to BOLIVIA and southern BRAZIL (Map 30).

Type Series. Formica lutosa, 11 syntype workers, 2 syntype males (BMNH) [not seen], Brazil, Amazonas, Vila Nova. *Dolichoderus lutosus* var. *nigriventris* 1 syntype worker (MHNG) [seen], Antilla, St. Vincent [Windward Islands]; *Dolichoderus cingulata*, [Brazil] Amazon River, 1 syntype worker (USNM) [seen].

Material Examined. One hundred seventy four series, consisting of 891 workers, 67 females and 42 males.

Biology. This is a common species, found in disturbed habitats (especially coffee plantations) as well as virgin forest up to 800 meters in elevation. It is common in riparian sites. Nests are found in hollow, dead twigs in trees or in abandoned arboreal termite nests or in spines of *Acacia bursaria* (Wheeler 1936, 1942; pers. obser.). It is commonly intercepted in quarantine on orchids, in pseudo bulbs and in banana debris. These ants are not aggressive when the nest is disturbed, they escape very rapidly into the leaf litter. Sexuals are commonly collected in light traps. Stray sexuals have been collected in Jan. (Panamá), Jan., Mar. and May (Brazil), May and June (México), and July (Guiana) [CWEM, MCZC, MZSP, Cornell Univ.).

Dolichoderus mariae Forel
Figs. 78, 80, 82, 85, 88; Map 17

Dolichoderus mariae Forel 1885:349-350, worker, USA: New Jersey (NHMB) [not seen]. Mayr 1886b:437, female, USA: New Jersey, District of Colombia, Virginia [not seen]. Wheeler 1904:304, 1905a:306-308, female, male, USA: New Jersey, Lakehurst [not seen]. Wheeler 1905a:306, 1905b:304, 1905c:387-388, 1913:115, 1916c:589; Emery 1912:11; Logier 1923:247-249; Smith 1918:23, 1924:81; Cole 1940:60; Gregg 1944:468; Creighton 1950:333-335; Kannowski, 1959a:119-120, 129-133, 1959b:759-760; Carter 1962:190; Talbot 1956:134-139, 1963:552, 1965:35-36, 1971:170; Van Pelt 1966:43; Wheeler & Wheeler 1966:726-727; Warren & Rouse 1969:43; DuBois 1980:44,

1981:37; Whitford & Gentry, 1981:184; Palmer & Bennett, 1988:225; Henderson & Jeanne, 1989:517-518; Johnson 1989:2-3; Hood & Tschinkel 1990:26.

Dolichoderus mariae subsp. *davisi* Wheeler 1905a:306, 308, worker, USA: New Jersey [not seen], synonymy by Creighton 1950:334. Wheeler 1905c:388; Emery, 1912:11.

Dolichoderus mariae var. *blatchleyi* Wheeler 1916d:462, worker, USA: Indiana [not seen], synonymy by Creighton 1950:334.

Description. Worker measurements (mm): HL 1.08 - 1.16, HW 0.94 - 0.96, SL 0.88 - 0.89, EL 0.25 - 0.28, WL 1.31 - 1.34, PW 0.40 - 0.41. Indices: SI 75 - 83, CI 81 - 90.

Dorsum of head, mesosoma (including dorsal face of propodeum) and gaster finely punctate. Essentially without standing hairs except for ventral surface of gaster. Color variable, usually reddish with strongly contrasting black gaster. Occasionally specimens are medium brown, but gaster is darker. Gaster may have lighter markings, including a 4 spotted pattern similar to that of the Old World *D. quadripunctatus*.

Female measurements (mm): HL 1.07 - 1.09, HW 0.97 - 0.99, SL 0.90 - 0.92, EL 0.28 - 0.30, WL 1.52 - 1.59, PW 0.41 - 0.44. Indices: SI 83 - 85, CI 88 - 91.

Similar to worker in most characters; head very lightly punctate and strongly shining, mesosoma (including dorsal face of propodeum) mostly smooth and shining. Erect hairs absent on scape, but a few are present on head, coxae and lower surface of gaster. Color variable, similar to worker.

Male measurements (mm): HL 0.85 - 0.90, HW 0.90 - 0.93, SL 0.31 - 0.33, EL 0.43 - 0.46, WL 1.94 - 2.00, PW 0.40 - 0.41. Indices: SI 35 - 38, CI 103 - 106.

Mandibles with 11 - 14 teeth, the apical tooth much larger than others, smooth and shining with scattered punctures; head finely and densely punctate, feebly shining; eyes and ocelli very large and well developed; mesosoma densely punctate, feebly shining; gaster lightly punctate and more shiny than remainder of body. Few standing hairs except on legs and dorsum of gaster. Medium brown with scapes, mandibles, legs and area surrounding genitalia lighter yellowish-brown.

Discussion. See *D. taschenbergi*.

Distribution. Eastern UNITED STATES (Map 17).

Type Series. One syntype (= holotype) (NHMB) [not seen], USA, New Jersey, Vineland.

Material Examined. Thirty one series, consisting of 252 workers, 24 females and 9 males.

Biology. See *D. taschenbergi*.

Dolichoderus mesonotalis Forel
Figs. 32, 68, 96a,b, 138; Map 11

Dolichoderus mesonotalis Forel 1907b:26, worker, BRAZIL: Amazonas, Tunantins (SUEL) [seen]. Emery 1912:12; Shattuck 1992:77.

Dolichoderus simplex Forel 1912:35-36, worker, PERU: Callanga (MHNG, MCZC) [seen], **new synonymy**. Shattuck,1992:77.

Dolichoderus (*Hypoclinea*) *grandii* Menozzi 1924:119-120, worker, PERU: Callanga (UDSB) [seen], **new synonymy**.

Hypoclinea grandii: Kempf 1972b:120.

Hypoclinea mesonotalis: Kempf 1972b:120.

Hypoclinea simplex: Kempf 1972b:120.

Dolichoderus grandii: Shattuck 1992:77.

Description. Worker measurements (mm): HL 1.20 - 1.33, HW 1.30 - 1.40, SL 1.24 - 1.28, EL 0.26 - 0.29, WL 1.51 - 1.61, ML 0.50 - 0.55, MW 0.48 - 0.58, PW 0.59 - 0.60. Indices: SI 96 - 103, CI 106 - 108, MI 95 - 105.

Clypeus with concave medial border and two rounded lateral lobes; vertex straight or very slightly concave; pronotum with very small bumps or angles at position where spines would be in other species, marginate at posterior edge but slightly angulate (*i.e.*, not completely rounded posteriorly); mesonotum with slightly elevated posterior lateral angles; basidorsal tubercle of posterior coxa moderately well developed; petiole flattened in profile with apex rounded or with a very small spine. Concolorous black; entire ant covered with erect hairs (1 - 2.5mm). Decumbent pubescence on all surfaces, especially clypeus, mesosoma and gaster. Entire surface densely punctate.

Female: Unknown.

Male measurements (mm): HL 0.90, HW 0.93, SL 0.36, EL 0.39, WL 1.93, PW 0.48. Indices: CI 103, PI 40.

Mandible with serrate edge with apex angulate, in form of apical tooth; clypeus with convex anterior border; eyes very large; vertex slightly concave, with large, protruding ocelli; propodeum rounded; basidorsal tubercles of hind coxa not developed; petiole with low node and protruding spiracles (Fig. 96a). Volsella not bent at right angle as in other species in complex, almost straight, pointing posteriorly (Fig. 138), narrower than in other species. Concolorous brown with short (>0.1mm), erect hairs on all surfaces. Entire ant lightly and evenly punctate.

Discussion. This is an easily recognized species, due to the black coloration and the shallowly impressed metanotal suture (Fig. 32) and the dense punctation on all surfaces. It is a member of the *bispinosus* species complex, but does not have spines on the pronotal shoulders or a needlelike spine on the apex of the petiole. It may be most closely related to *D. mucronifer*, the

propodeum is similar in shape, both species have protruding spiracles, the posterior corners of the mesonotum are raised and the mesonotum has tiny bumps where spines would occur. The tubercle of the hind coxa is moderately well developed as it is in several other species in this complex. The male is obviously a member of the *bispinosus* species complex (with laterally twisted digitiform process on aedeagus - see Fig. 138), and is very similar to that of *D. bispinosus*. The petiole of the male is very different from that of *D. bispinosus*. The node of the petiole (side view, Fig. 96b) is much lower than that of *D. bispinosus*. In addition, two lateral bumps are present at the sites of the spiracles (best seen from above, Fig. 96a).

There are 2 obvious synonyms of *D. mesonotalis*. The first is *D. simplex*. In the description of *D. simplex*, Forel (1912) mentions it differs from *D. mesonotalis* in that it lacks the occipital groove or ridge, by the structure of the clypeus, by the sides of the head, the form of the mesonotum and the petiole. Except for the occipital groove, he was not specific as to the differences. I have compared the types of both species and can find few differences. The type of *D. mesonotalis* has a depressed medial posterior occipital border and some evidence of a nuchal carina. In addition, the clypeus has fewer hairs than the typical *D. mesonotalis*, the mesonotal protuberances are also slightly larger than usual. On the other hand, specimens from BRAZIL (São Paulo - MZSP) are similar, but have a relatively hairy clypeus. Other abundantly hairy specimens from Perú (Cuzco) have well developed mesonotal bumps. I conclude that the variation found within *D. simplex* is well within that of the range of *D. mesonotalis* and do not hesitate in synonymizing it. *Dolichoderus grandii* was described from specimens collected from the type locality of *D. simplex*, and possibly came from the same series. It is identical and is synonymized with no further comment.

Distribution. PERU, Callanga, Stadlinger; Cusco, J. Escalente [MZSP]; Madre de Dios, D. Davidson [LACM]; BRAZIL, Acre: Cruzeiro do Sul, T. Zimmerman [MZSP] (Map 11).

Type Series. Holotype worker, in poor shape, dirty and with petiole separated from mesosoma, right antenna broken at third segment of funiculus, Brazil, Amazonas: Tunantins (SUEL) [seen]; *D. simplex* worker lectotype (here desig.), (MHNG) [seen], 2 worker paralectotypes (MCZC # 21212) [seen], PERU, Callanga, Strandinger [= Stadlinger], #990; *D. grandii* lectotype worker (here designated, top worker of series of three on one pin) and 2 paralectotype workers, Perú: Callanga (UDSB) [seen].

Material examined. Six series, consisting of 13 workers and 1 male.

Biology. Unknown.

Dolichoderus mucronifer (Roger)
Figs. 106, 107, 108, 146, 147; Map 11

Monacis mucronifera Roger 1862a:236-237, worker, FRENCH GUIANA: Cayenne (MNHN) [not seen]. Kempf 1959a:235-237, male, BRAZIL: Pará, Alto Guamá (MZSP) [not seen]. Kempf 1972b:142.

Hypoclinea mucronifera: Mayr 1863:423, 1870a:955.

Dolichoderus mucronifer: Emery 1894:228; Forel 1911a:306; Shattuck 1992:77.

Dolichoderus spinicollis subsp. *ensiger* Forel 1910:31, worker, GUIANA: Cayenne (MHNG) [not seen], synonymy by Forel 1911a:306.

Dolichoderus (*Monacis*) *mucronifer*: Santschi, 1921:100, female, FRENCH GUIANA: Oyapok, near Saint George, (MNHN) [not seen].

Discussion. This species is easily recognized by the rounded posterior surface of the propodeum, together with the long petiolar spine which joins the lateral margin of the petiole in a smoothly rounded curve (as in *D. validus*). It is similar to *D mesonotalis* (see discussion of *D. mesonotalis*). The aedeagus of the male is very distinctive (Figs. 146, 147). The lower surface has several very small teeth, and the posterior edge is laterally twisted as in the other species in the *bispinosus* complex, but it is twisted along the entire posterior edge.

Distribution. SURINAM, Coppername R., Geiskses [MZSP, USNM]; Paramibo, Geijskes [LACM, USNM]. PERU, Middle Río Ucayali, Bassley [AMNH, MZSP]. BRAZIL, PA: Alto Guamá, Elias-Sefer [AMNH, USNM]; Alto Guamá, N. Silva [MCZC, USNM]; Mato Grosso: Faz. Junqueira, Mun. Diamantino, W. Brown (MCZC) (Map 11).

Type Series. Holotype (MNHN) [not seen], FRENCH GUIANA, Cayenne.

Material Examined. Nine series, consisting of 48 workers and 1 male (MZSP).

Biology. Unknown.

Dolichoderus obliteratus (Scudder)

Hypoclinea obliterata Scudder, 1877:267, female, CANADA: British Columbia (MCZC) [not seen]. Scudder, 1890:616, 1891:711.

Dolichoderus obliteratus: Forel 1878:386; Carpenter, 1930:21.

Discussion. The holotype consists of a gaster, posterior half of the mesosoma and a forewing. It is probably in the Dolichoderinae, but there is no evidence that it belongs to *Dolichoderus* (Carpenter, 1930). If it is a *Dolichoderus*, it may be a member of the *quadripunctatus* species complex.

Distribution. CANADA, British Columbia.

Material Examined. None

Type Series. Obverse holotype (Canadian Geological Survey, # 6179) [not seen], reverse (MCZC # 2938) [not seen], Canada, British Columbia, Quesnel.

Dolichoderus obscurus (F. Smith)

Formica obscura F. Smith 1858:42, female, BRAZIL (deposition unknown) [not seen], preoccupied by Heer 1850:119.

Dolichoderus obscurus: Mayr 1886a:356; Shattuck 1992:77.

Dolichoderus (*Monacis*) *obscurus*: Emery 1894:233.

Monacis obscura: Kempf 1959a:268, 1972b:142.

Discussion. This species is based on a single female. The type could not be located in the BMNH or OXUM, and is presumably lost. The description is poor; Emery (1894) suggested it was closely related to *D. lamellosus*, but Kempf (1959a) considered this highly improbable. We will probably never know the identity of this species. I did not provide a replacement name because it would further confuse the issue.

Distribution. BRAZIL (no specific locality).

Type Series. Single type specimen, probably lost [BMNH? OXUM?], cannot be located in either of the English museums.

Material Examined. None.

Dolichoderus omacanthus (Kempf)
Map 11

Monacis omacantha Kempf 1972a:251-253, worker, BRAZIL: Pará, Manaus (MZSP) [not seen]. Swain 1977:179-182.

Dolichoderus omacanthus: Shattuck 1992:77.

Discussion. This species is closely related to *D. mucronifer* and *D. spinicollis*, but can be easily distinguished. The scapes, femora and tibiae of *D. omacanthus* have numerous erect hairs, which are not present in *D. mucronifera*. It differs from *D. spinicollis* in that the pronotal spines are much shorter.

Distribution. BRAZIL, Amazonas: near Manaus, Reserva Ducke; known only form type locality (Map 11).

Type Series. Holotype and 17 paratypes [MZSP, collection of Universidade Estadual in Rio Claro (SP), Brazil, Amazonas, Manaus, Reserva Ducke [not seen].

Material Examined. One series, consisting of 9 workers, Reserva Ducke, 20-vii-1978, W. F. Buren (LACM).

Biology. Swain (1977) reported on the biology of this species. It constructs carton shelters around the shoots of trees. Workers are very aggressive when the shelters are disturbed. It appears to be common at the type locality, although it has not been reported from anywhere else.

Dolichoderus piceus new species
Fig. 38, 40, 75; Map 7

Description. Worker measurements (mm): HL 1.26 - 1.34, HW 1.15 - 1.24, SL 1.35 - 1.45, EL 0.28 - 0.30, WL 1.61 - 1.66, PW 0.39 - 0.40. Indices: SI 107 - 111, CI 91 - 94.

Mandibles moderately shining with scattered punctures 11 - 12 teeth on masticatory border; clypeus with broad indentation on medial anterior border (Fig. 75); pronotum with small, but very distinct lateral angles; mesonotum circular with small, upturned lateral corners, depression at metanotal groove long and broad (Fig. 38); propodeum with upturned transverse carina between the 2 faces; petiolar node angulate. Entire ant lightly punctate, sides of pronotum and mesopleuron weakly shining. Erect hairs present on all body surfaces, those on scape limited to less than 10 on the apical 1/5 of scape, other hairs on scape are very short and decumbent. Concolorous black, except for mandibles, condyle of antenna and tarsi which are dark brown.

Female: Unknown.

Male: Unknown.

Discussion. This species is closely related to *D. ghilianii* and *D. caribbaea*, but can be easily distinguished by the darker color. These 3 species constitute a distinct lineage, characterized by the angulate pronotal corners, the broad emargination at the metanotal area and by the combination of appressed hairs along the scape with a few erect hairs at the apex of the scape. These species demonstrate possible affinities to those previously considered to be members of the genus *Monacis*. The angulate pronotum of *D. piceus* is similar to that found in the *D. laminatus* complex (but is much less developed). The petiolar node of *D. piceus* and *D. caribbaea* is similar to that of the *debilis* complex.

Distribution. COLOMBIA, known only from type locality (Map 7).

Type Series. Holotype and 9 paratypes from Colombia, Valle de Cauca, Represa Calima below dam, canyon bottom at 1200m, 21-III-1967, R. Root and W. L. Brown. Holotype and 4 paratypes in MCZC, additional paratypes in MIZA, LACM, MHNC, MZSP, USNM, CWEM.

Material Examined. Holotype and 9 paratypes.

Etymology. Latin, referring to pitch black color of specimens.

Biology. Unknown.

Dolichoderus plagiatus (Mayr)
Figs. 77, 81, 84; Map 18

Hypoclinea plagiata Mayr 1870a:960, worker, USA: Illinois, (Museum of Stockholm) [not seen].

Dolichoderus plagiatus: Mayr 1886b:436; Wheeler 1905a:310-312, female, male, USA: New York, New Jersey, Rhode Island (MCZC) [seen]. Wheeler 1905c:388, 1916c:590; Emery 1912:11; Smith 1918:23; Talbot 1934:420, 1965:37; Cole 1940:60, 1952:155; Wesson & Wesson 1940:99; Gregg 1944:468; Wheeler & Wheeler 1951:175-176, 1963: 149-150, 1966:727, 1987:203; Knnowski, 1959a:119-120, 133; Carter 1962:190; Francoeur & Béique, 1966:142-143; Letendre *et al.*, 1971:599; Culver 1974:978; Deyrup *et al.*, 1989:99; Johnson 1989:3.

Tapinoma boreale Provancher 1889:238, worker, female, CANADA: Ottawa [not seen], synonymy implied by Wheeler 1905a:310.

Dolichoderus plagiatus var. *inornatus* Wheeler 1905a:306, 313, worker, USA: Illinois, New Jersey [not seen], synonymy by Creighton 1950:335. Wheeler 1905c:388; Emery 1912:11; Gregg 1944:468.

Description. Worker measurements (mm): HL 0.85 - 0.86, HW 0.73 - 0.74, SL 0.69 - 0.73, EL 0.19 - 0.23, WL 1.04 - 1.11, PW 0.28 - 0.33. Indices: SI 81 - 84, CI 84 - 87.

Dorsum of head with numerous deep, well defined foveolate punctures; scapes usually with at least 20 erect hairs, in addition to those on apex (Mexican specimens have no erect hairs on scape, others from various locations have fewer than 20); dorsum of mesosoma with foveolae on all surfaces, especially on dorsal face of propodeum, which is twice as long as broad; gaster lightly punctate and shining. Abundant erect hairs on all surfaces. Color variable, head usually dark reddish-brown, scapes and mandibles lighter brown mesosoma reddish-brown and contrasting with the darker head, gaster dark brown with yellowish-brown markings, legs concolorous with mesosoma.

Female: Measurements (mm): HL 0.99 - 1.10, HW 0.81 - 0.86, SL 0.78 - 0.79, EL 0.28 - 0.30, WL 1.44 - 1.55, PW 0.35 - 0.40. Indices: SI 72 - 78, CI 77 - 87. Similar to worker in most details; head and most of mesosoma, including dorsal face of propodeum, with coarse, foveolate punctures. Erect hairs present on all surfaces including scapes (usually more than 30) and dorsum of gaster. Color dark brown, antennae, scapes, legs, pronotum, petiole and much of gaster lighter.

Male measurements (mm): HL 0.73, HW 0.78, SL 0.28, EL 0.43, WL 1.56, PW 0.28. Indices: SI 38, CI 107.

Very similar to *D. pustulatus*, scape with only 1 or 2 erect hairs; distance between lateral ocellus and median ocellus about 1.3 times diameter of median ocellus; distance from connection of media to radius of forewing about 1/2 length of crossvein; aedeagus with numerous small teeth on ventral border (Fig. 84).

Discussion. See *D. taschenbergi*.

Distribution. Northern and eastern UNITED STATES and northern MEXICO (Nuevo León) (Map 18).

Type Series. One worker syntype (NHRS) [not seen], USA Illinois.

Material Examined. Sixty three series, consisting of 190 workers, 14 females, 1 male, Newport RI, Joseph Leidy (MCZC, not in Collection of the American Entomological Society [Philadelphia] as stated by Wheeler).

Biology. See *D. taschenbergi.*

Dolichoderus primitivus (Wilson)
Figs. 27, 28, 64; Map 3

Hypoclinea primitiva Wilson 1985a:22-23, DOMINICAN REPUBLIC (MCZC) [seen].

Dolichoderus primitivus: Shattuck 1992:77.

Description. Worker measurements (mm): HL 0.84 - 0.90, HW 0.88 SL 0.92 - 0.94, EL 0.2, WL 1.28 - 1.30, ML 0.33, MW 0.28. Indices: SI 112, CI 104, MI 118.

Head subquadrate; clypeus overhanging mandibles (Fig. 27); eyes surpassing lateral margins of head in full face view; maxillary palps very long, reaching the posterior border of head (Fig. 27); pronotum rounded, without angles or spines; metanotal suture relatively shallow; mesopleural tooth poorly developed; propodeum with well developed, teeth-like spines, which are not connected by carina; basidorsal tubercle on hind coxa not developed; lateral edge of petiolar node sharp, with large, erect hairs along margin (Fig. 28). Erect hairs long (up to 0.6mm) and numerous on all bodily surfaces, including scapes. Pubescence very dilute. One paratype appears to have coarse, foveolate punctures at least on sides of head and pronotum, but the other paratype does not appear to have such rough sculpture. Concolorous dark brown.

Female: Unknown.

Male: Unknown.

Discussion. This species is easily distinguished from all extant species by the teeth on the propodeum, the long maxillary palps, the margins of the eyes that pass the lateral cephalic margins, the poorly developed mesopleural teeth and the sharply pointed petiolar node. It probably belongs to a separate species complex, but as it has many of the characteristics of the *bidens* complex, it is tentatively considered to be a member of this complex. This species is not closely related to *D. germaini*, as has been suggested (Wilson 1985a). It is intermediate between the *bidens* species complex and the *diversus* species complex. The long hairs on the scape are as those of the *bidens* complex. The teeth on the propodeum are well formed as in the *bidens* complex, but are much more tooth-like than they are in extant species. The shape of the petiole is not typical of the *bidens* complex and is most similar to that of *D. ghilianii* or *D. baenae.* A *D. ghilianii* specimen from Cavinas Beni, Bolivia collected by Mann (USNM) has a petiole identical to that of the paratype of *D. primitivus.*

The pronotum is not angulate as it is in many of the species related to *D. ghilianii*.

Distribution. DOMINICAN REPUBLIC (no further locality, fossils in amber) (Map 3).

Type Series. Holotype and 4 paratype workers (MCZC) [2 paratypes seen].

Material Examined. Two paratype workers.

Biology. Unknown

Dolichoderus prolaminatus (Wilson)
Map 4

Monacis prolaminata Wilson 1985a:20-22, worker, DOMINICAN REPUBLIC (MCZC, FSCA) [not seen].

Dolichoderus prolaminatus: Shattuck 1992:77.

Discussion. This species appears to be closely related to *D. laminatus* and is distinguished from the remainder of the species in the complex primarily by the concave dorsal border of the petiolar node.

Distribution. DOMINICAN REPUBLIC (Map 4).

Type Series. Holotype (MCZC) and 5 paratype workers, no specific locality in Dominican Republic except for 1 paratype from Palo Quemado, all fossils in amber (MCZC, FSCA) [not seen].

Material Examined. None

Dolichoderus pustulatus Mayr
Figs. 83, 87; Map 19

Dolichoderus pustulatus Mayr 1886b:436, worker, female, USA: District of Columbia, Virginia, New Jersey (BMNH, EMAU) [not seen]. Wheeler 1905a:313, 1908b:621-622; Talbot 1934:420, 1965:36-37; Creighton 1950:335; Kannowski, 1959a:119-120, 133-134; Carter 1962:190; Wheeler & Wheeler 1966:727-728; Nielsson *et al.*,1971:247; Lynch, 1981:187; DuBois & LaBerge 1988:144; Johnson 1986:245 (*D. mariae* - misidentification), 1989:3-4.

D. plagiatus pustulatus var. *beutenmuelleri* Wheeler 1904:304, worker, USA: North Carolina [not seen], synonymy by Creighton 1950:334. Wheeler 1905a:313,1905b:304, 1905c:388; 1913:116, 1916d:462, 1932:12; Emery 1912:11; Smith 1931:22; Wesson & Wesson 1940:99.

Dolichoderus plagiatus subsp. *pustulatus*: Wheeler 1905a:313, synonymy by Creighton 1950:336. Wheeler 1905c:388, 1932:12; Emery 1912:11; Smith 1918:23, 1924:82; Talbot 1934:420; Gregg 1944:468.

Hypoclinea pustulata: Eisner 1957:453.

Description. Worker measurements (mm): HL 0.90 - 0.94, HW 0.78 - 0.85, SL 0.73 - 0.80, EL 0.23 - 0.26, WL 1.06 - 1.20, PW 0.28 - 0.33. Indices: SI 81

- 85, CI 86 - 91.

Mandibles with dense, fine punctures in addition to numerous larger, coarse punctures; dorsum of head densely punctate with poorly defined foveolae; scapes without erect hairs, except for a few at apex; mesosoma mostly punctate except for dorsal face of propodeum which also has foveolate punctures; dorsum of gaster punctate, and feebly shining. Sparse erect hairs present on most body surfaces except scapes, femora and tibiae. Usually concolorous dark brown, occasionally bicolored dark reddish brown with a darker gaster.

Female measurements (mm): HL 0.88 - 0.94, HW 0.76 - 0.81, SL 0.71 - 0.75, EL 0.28 - 0.31, WL 1.30 - 1.43, PW 0.31 - 0.33. Indices: SI 78 - 81, CI 84-89.

Similar to worker, head punctate with poorly defined foveolate punctures; most of mesosoma punctate and feebly shining; dorsal face of propodeum with coarse foveolate punctures. Erect hairs sparse with usually none on scape (except for a few at apex), few or none on dorsum of first gastral segment. Light yellowish brown with darker markings, especially on mesoscutum and scutellum, gaster usually concolorous light brown.

Male measurements (mm): HL 0.78 - 0.80, HW 0.78 - 0.80, SL 0.26 - 0.30, EL 0.39 - 0.40, WL 1.60 - 1.68, PW 0.30 - 0.31. Indices: SI 33 - 38, CI 100.

Head shallowly, but densely punctate, ocelli large, well developed, distance between lateral ocellus and median ocellus about 1.4 times diameter of median ocellus; most of mesosoma roughened and densely, but lightly punctate; gaster lightly punctate with shining dorsum. Erect hairs sparse, few near ocelli, on dorsum of mesosoma, ventral surface of gaster and legs. Concolorous brown.

Discussion. See *D. taschenbergi.* Species "A" (Johnson 1989:5-6) is darker and has fewer erect hairs than "normal" specimens. I have seen specimens from Canada that are even darker and have essentially no erect hairs. This variation is trivial when compared to the variability found in Neotropical species. I conclude that these characteristics are not important enough to warrant the recognition of a separate taxon.

Distribution. Eastern UNITED STATES (Map 19). It is doubtful that this species occurs in Brownsville, Texas (Johnson 1989) as was reported by Creighton (1950). Creighton's collection is deposited in the LACM and there are no specimens from Brownsville (Snelling pers. comm.).

Type Series. Presumably in the EMAU [not seen]. Type locality is USA, New Jersey, restricted by Creighton (1950).

Material Examined. Fifty three series, consisting of 141 workers, 21 females and 12 males (including one worker of species "A", Mass., Plymouth Co., pine barren-heath, June 28, 1988).

Biology. See *D taschenbergi.*

Dolichoderus quadridenticulatus (Roger)
Figs. 25, 26, 66, 100, 101, 120, 144, 145; Map 25

Formica gibbosa F. Smith 1858b:19, worker, BRAZIL: Amazonas, Ega (=Tefé) (BMNH) [not seen], preoccupied by Latreille 1798:50, synonymy with *Dolichoderus gibbosus* by Mayr 1886a:354, see Shattuck 1992:77.

Formica quadridenticulata Roger 1862b:287.

Hypoclinea quadridenticulata: Mayr 1862:706-707, Mayr 1870a:956.

Dolichoderus quadridenticulatus: Forel 1878:386.

Dolichoderus (*Hypoclinea*) *gibbosus*: Mayr 1886a:354 (in part); Emery 1894:235.

Dolichoderus (*Hypoclinea*) *gibbosus* var. *nitidior* Emery 1894:235, worker, BRAZIL: Pará, Belém (MCSN) [seen], **new synonymy**. Emery 1912:12; Shattuck 1992:77.

Dolichoderus (*Hypoclinea*) *analis* Emery 1894:236, worker, female, BRAZIL: Pará; PERU; BOLIVIA; VENEZUELA (MCSN) [not seen], **new synonymy**. Mann 1916:465.

Dolichoderus gibbosus var. *integra* Forel 1911a:306, worker, BRAZIL: Goiás, Grixas (MHNG, MZSP) [seen], **new synonymy**. Emery 1912:12; Luederwaldt 1926:284; Shattuck 1992:77.

Dolichoderus gibbosus race *analis*: Forel 1912:34, worker, BRAZIL: Ipitinga, Río Tiara (MHNG) [not seen], **new synonymy**. Shattuck,1992:77.

Dolichoderus analis: Emery 1912:12; Shattuck 1992:77.

Delichoderus (!) (*Hypoclinea*) *gibbosus* var. *gibbosoanalis* Forel 1922:98, worker, BRAZIL: Pará, Belém (MCZC, MHNG) [seen].

Hypoclinea analis: Kempf 1960:397, 1972b:118; Jones & Blum 1981:891.

Hypoclinea gibbosa: Kempf 1970:338, 1972b:119.

Hypoclinea gibbosa var. *gibbosoanalis*: Kempf 1972b:119.

Hypoclinea gibbosa var. *integra*: Kempf 1972b:120.

Hypoclinea gibbosa var. *nitidior*: Kempf 1972b:120.

Dolichoderus gibbosus var. *nitidior*: Shattuck 1992:77.

Description. Worker measurements (mm): HL 1.74 - 1.84, HW 1.66 - 1.88, SL 1.92 - 1.96, EL 0.40 - 0.43, WL 2.44 - 2.60, ML 0.74 - 0.90, MW 0.56 - 0.73, PW 0.65 - 0.70. Indices: SI 107 - 110, CI 95 - 102, MI 124 - 131.

Anterior edge of clypeus weakly concave; head cordate (Fig. 67), vertex concave; propodeal teeth well formed; petiole usually relatively thin in profile (Fig. 25) with 2 well defined teeth (Fig. 26). Sculpture roughened on head and mesosoma; gaster punctate. Entire body with erect hairs (most less than 0.4mm); all surfaces (except legs) with decumbent yellowish or golden pubescence, especially dense on gaster. Color ranging from light to dark concolorous reddish-brown, most common coloration reddish-brown head with darker mesosoma and gaster, gaster usually with golden sheen due to

pubescence.

Female measurements (mm): HL 2.12 - 2.16, HW 2.14 - 2.24, SL 2.24 - 2.26, EL 0.55 - 0.58, WL 3.58 - 3.64 PW 0.76 - 0.84. Indices: SI 105 - 106, CI 99 - 106.

Very similar to worker except petiole more thickened in profile, teeth well developed.

Male measurements (mm): HL 1.66 - 1.74, HW 1.68 - 1.70, SL 0.66 - 0.70, EL 0.80 - 0.84, WL 3.26 - 3.52, PW 0.65 - 0.68. Indices: SI 40, CI 98 - 101.

Mandible smooth with few scattered punctures, scutellum strongly protruding; propodeum rounded with no evidence of angles or teeth, petiole thickened with small bumps in place of teeth. Erect hairs sparse on body and short (up to 0.15mm), restricted primarily to head and mesoscutum; gaster with only a few very short erect hairs (0.1mm). Decumbent pubescence restricted primarily to clypeus, pronotum, fore coxae, propodeum and gaster. Genitalia typical of the complex, large, well developed, but with widely spaced teeth on aedeagus (Fig. 144). Dark reddish-brown with lighter markings on scutum (medial anterior area and 2 longitudinal stripes along parapsidal sutures), mandibles and apex of gaster light yellow.

Discussion. The workers and females of this species can be easily confused with *D. cogitans* and *D. bidens*. *Dolichoderus cogitans* may actually represent the workers from incipient nests of *D. quadridenticulatus*, which is always larger than *D. cogitans* and can therefore be distinguished in most cases. At least part of the ant is usually reddish-brown (*D. bidens* is usually dark brown); the head is cordate (oval-elongate in *D. bidens)*. The males could be confused with those of *D. bidens*, but can be usually distinguished by the characters in the key.

This is an exceedingly variable species. I have synonymized a number of taxa which appear to fall within the range of variation of this species. One of these, *D. analis* is at one end of the range of variation (larger and darker than the typical *quadridenticulatus*) of which *D. gibbosoanalis* is an intermediate to the typical *D. quadridenticulatus*. It is surprising that Forel chose to name the intermediate as a new variety rather than simply synonymizing *D. analis*. Emery (1894) stated that *D. analis* is very similar to *D. quadridenticulatus* and could have been considered as only a subspecies. Forel (1912) considered *analis* as only a race of *D. quadridenticulatus*. *D. gibbosus* var. *nitidior* is another obvious synonym. The type series consists of two small workers. The smallest (lectotype) is a minum of *D. quadridenticulatus*, with a smooth gaster with less pubescence than normal. The second specimen (paralectotype) is larger, with pubescence and sculpture similar to the typical *D. quadridenticulatus*. The pronotum is smoother, with less pubescence than normal. These specimens are much less smooth and glossy than is *D. abruptus*. They are obviously minimums of *D. quadridenticulatus*. An undescribed subspecies type series

from Peru, Perene, 20 June 1920, J. C. B., #832 (MCZC #21205, 6 workers) is probably another synonym. It differs from the typical *D. quadridenticulatus* in that the head is not cordate (it is somewhat oval shaped and smoothly rounded behind), is concolorous dark reddish-brown (not uncommon in the "typical" *D. quadridenticulatus*) and has abundant golden, appressed pubescence (much more than the "typical" *D. quadridenticulatus*). It somewhat resembles *D. spurius*. I collected additional specimens of this form in Colombia (Meta: 75 KE Pto. López, 26 Jan 1973, #73-44). Until we have more material, including males and females, it will not be possible to evaluate the status of this form.

Distribution. COLOMBIA and VENEZUELA south to BOLIVIA and BRAZIL (Map 25).

Type Series. Formica gibbosa, 6 worker syntypes, 2 from Brazil, Amazonas, Ega (= Tefé), two from "Ind" and 2 from an unrecorded locality, BMNH [not seen]; *D. gibbosus* var. *gibbosoanalis* lectotype worker and 5 paralectotypes (here desig.) (3 in MCZC #21204, 3 in MHNG No. 45) [all seen], Brazil, Para, Belém, Monratán [?], 12-xi-1902, Col. D.[?] Hagmann and Venezuela, Puerto Cabello, Forel; *D. gibbosus* var. *integra* 4 syntype workers (2 in MHNG #10.869, 2 in MZSP) [seen], Brazil, Goias, Grixas, Ihering; *Dolichoderus gibbosus* var. *nitidor*, lectotype (top specimen), and paralectotype (bottom specimen) (here designated), Brazil, Pará: Belém, 2 worker syntypes (MCSN) [seen].

Material Examined. One hundred seventy five series, consisting of 820 workers, 29 females and 13 males.

Biology. Nest in cavities in trees, especially of *Gustavia augusta*, *Eschweilera matamata*, *Protium heptaphyllum*, and in carton nests (Forel 1912; Luederwaldt 1926; Kempf 1970). Common in lowland rain forests and cacao plantations, where they forage on the soil surface as well as in the vegetation. They are found in flowers of *Eriogonum lumatella* as well as the nectaries of *Zygia longifolia*. Stray sexuals were collected in March (Perú, Trinidad), April - May (Trinidad), July (Brazil) and Sept. (Bolivia) [MCZC, MZSP, USNM].

Dolichoderus rohweri Carpenter

Dolichoderus (*Hypoclinea*) *rohweri* Carpenter, 1930:40-41, worker, female, USA: Colorado (MCZC, Peabody Mus.) [not seen]. Burnham 1978:112.

Discussion. This species is based on fossils from the Florissant shale (Miocene). Most of the important diagnostic characters are not visible, but this species appears to be a member of the *quadripunctatus* complex.

Distribution. USA, Colorado: Florissant.

Type Series. Holotype female (MCZC #2801) and at least four paratype females and one paratype worker (Peabody Mus. #10,001, Princeton Univ. #2825, Univ. of Colorado #22,974, AMNH #3, BMNH).

Material Examined. None.

Dolichoderus rosenbergi Forel
Fig. 21; Map 3

Dolichoderus rosenbergi Forel 1911b:282-283, worker, ECUADOR: Cachati (ZSMC) [seen]. Emery 1912:9 Kempf 1969:290, 1972b:98.

Dolichoderus (*Dolichoderus*) *rosenbergi*: Mann 1916:460-461.

Description. Worker measurements (mm): HL 3.06 - 3.20, HW 2.00 - 2.10, SL 3.18 - 3.40, EL 0.43 - 0.48, WL 4.36 - 4.72, PW 0.35 - 0.55, PL 0.44 - 0.54. Indices: SI 104 - 106, CI 65 - 66, PI 98 - 125.

Mandibles striate with heavy punctures and 7 - 8 moderately well defined teeth; clypeus with well developed anterior median notch, predominantly rugose, but with some foveolate punctures in the middle; remainder of head densely foveolate; occipital neck extremely long, about twice as long as its minimum width, as in *D. longicollis*; pronotum rugose and foveolate on sides; mesopleuron and sides of propodeum rugose; mesonotum strongly protruding; dorsal face of propodeum and infraspinal facet longitudinally porcate, with 4 - 5 longitudinal parallel ridges, lower part of descending face with 6 - 7 transverse parallel rugae; propodeal spines well developed and directed caudad, dorsal half flattened with a sharp dorsal edge; petiolar node with two lateral angles with concavity between them; dorsal surface of gaster polished and shining, with no sign of sculpturing, except for a slight coriarious surface. Erect hairs on all body surfaces, many with blunt ends. Very little appressed pubescence and only on gaster, which does not interfere with reflections from the strongly shining, glossy surface. Concolorous black with brownish-red legs and funiculus.

Female: Unknown.

Male: Unknown.

Discussion. This species is a member of the *attelaboides* species complex and differs from all other known species in the complex (except *D. longicollis*) in the extremely long occipital neck. It is easily separated from *D. longicollis* as the gaster is almost completely smooth and strongly shining (strongly punctate in *D. longicollis*). Mann (1916) had no specimens of *D. rosenbergi* available when he described *D. imbecillus* and suggested they were very similar. The neck of *D. rosenbergi* is much longer and there is no comparison between the 2 taxa with regards to the lack of sculpturing on the gaster of *D. rosenbergi*. The shape of the funicular segments are not significantly different from the range found in *D. attelaboides* and there is also considerable variation in the shape of the petiolar node, which results in these characters being of no value in separating the 2 species.

Distribution. Northwestern ECUADOR, Cachati. Western COLOMBIA, Valle: Bajo Calima, 16-ix-1982, F. Castaño (CFCC, CWEM). Northern PERU,

Loreto: Boquerón, 500 m, 7-14-vi-1965, S. Schunke, (LACM, MCZC, MZSP) (Map 3).

Type series. Holotype worker (ZSMC) [seen], Ecuador, Cachati.

Material examined. Three series, consisting of holotype and 8 workers.

Biology. Unknown, 2 individuals in Colombia collected as strays.

Dolichoderus rufescens Mann
Figs. 112, 121a; Map 28

Dolichoderus (*Monacis*) *debilis* var. *rufescens* Mann 1912:40-41, worker, female, male, BRAZIL: Rio Madeira (MCZC, LACM, BMNH) [seen].

Monacis rufescens: Kempf 1959a:252-254, 1972a:254,1972b:142; Brown 1976:124.

Dolichoderus rufescens: Shattuck 1992:77.

Discussion. This species is easily recognized as a reddish-brown member of the *debilis* species complex.

Distribution. BRAZIL, Rondônia: Rio Madeira, Mann & Baker; Amazonas: Benjamin Constant, W. Brown [MCZC] (Map 28).

Type Series. Lectotype worker (here desig.) [MCZC], 2 paralectotype workers, 2 paralectotype females and 1 paralectotype male [MCZC # 8663] [all seen], Rio Madeira, Brazil, Mann & Baker; Madeira-Mamore RR Co. Camp 41; 10 paralectotype workers, 3 paralectotype females [LACM] [all seen], same labels plus Stanford Univ. Colln. via Oakland Museum (T. W. Cook colln.), accessioned 1971; syntype Dolichoderus debilis var. rufescens, W. M. Mann 1916; additional syntype worker and syntype female in BMNH [not seen].

Material examined. Two series consisting of lectotype worker, 12 paralectotype workers, 5 paralectotype females, 1 paralectotype male and 12 additional workers.

Biology. Lives parabiotically with *Odontomachus mayi* (Mann 1916; Brown 1976), rarely collected.

Dolichoderus rugosus (F. Smith)
Figs. 19, 20, 58, 94, 116, 128, 132; Map 4

Polyrhachis rugosus F. Smith 1858:74, worker, BRAZIL: Amazonas (BMNH) [seen].

Dolichoderus rugosus: Mayr 1886a:357; Emery 1912:9; Wheeler 1923:4; Kempf 1969:292, 1972b:98; Wilson 1987:248.

Dolichoderus (*Dolichoderus*) *rugosus*: Emery 1894:227; Mann 1916:461.

Description. Worker measurements (mm): HL 2.46 - 2.52, HW 2.06 - 2.10 (posterior to eyes), SL 4.22 - 4.30, EL 0.46 - 0.49, WL 4.56 - 4.70, PW 0.50 - 0.56, PL 0.88. Indices: SI 167 - 175, CI 83 - 84, PI 156 - 175.

Mandibles punctate, moderately shining; clypeus and most of remainder of

head rugose, some evidence of foveolae on side of head; anterior edge of clypeus convex with little evidence of notch; eyes very strongly protruding and constricted around the base; scapes very long; occipital neck absent, but with a large, upturned, posterior flange; mesosomal surfaces primarily rugose; propodeal spines long and directed caudad, little evidence of rugae on propodeal declivity; petiole node very low, much elongated; gaster dorsum densely punctate. Erect hairs on all body surfaces and also moderately dense decumbent pubescence over entire surface, especially on mesosoma and gaster. Concolorous black with tip of gaster yellowish-brown.

Female measurements (mm): HL 2.84 - 3.20, HW (Posterior to eyes) 1.78 - 1.92, (HW at cheek level 2.30 - 2.54), SL 4.32 - 4.64, EL 0.53 - 0.58, WL 4.90 - 5.90, PW 0.46 - 0.78, PL 0.88 - 1.25. Indices: SI 138 - 163, CI (HW posterior to eye) 56 - 68, PI 129 - 200.

Similar to worker in most characteristics, mandibles with 15 teeth on masticatory border, apical tooth well developed, alternate teeth of remainder of mandible more developed than those between them, teeth on basal border very small, giving the border a serrate appearance; anterior clypeal border entirely convex; eyes strongly protruding and constricted around base; lower mesopleural spine poorly developed; propodeal spines well developed; node of petiole elongated as in worker. Sculpture and pilosity as in worker.

Male measurements (mm): HL 1.54 - 1.62, HW 1.40 - 1.44, SL 0.64 - 0.74, EL 0.79 - 0.81, WL 3.90 - 4.20, PW 0.51 - 0.55, PL 0.86 - 1.00. Indices: SI 40 - 48, CI 89 - 91, PI 157 - 195.

Basal and masticatory borders of mandible with small teeth, giving a serrate appearance, apical 6 teeth larger and well formed; anterior edge of clypeus convex; scape twice as long as first segment of funiculus, 0.7 times as long as second; ocelli well developed and subequal in diameter, interocular distance about equal to maximum diameter; posterior margin of vertex reflexed; occipital neck not developed; mesopleural spine poorly developed; propodeum armed by slight bumps and one or two carinae which cross at the point where the spine would be expected, and extend to the base of attachment of petiole; petiolar node very similar to that of worker, about twice as long as broad; wings as in female with 5 sided discoidal cell (posterior side may be reduced to point where cell is essentially a square); subgenital plate consisting of 2 long, slightly knobbed processes; aedeagus with digitiform process well developed and directed anteriorly (Fig. 132).

Discussion. This species is easily separated from all other extant species in the genus. The most important characters include the convex anterior border of the clypeus, the greatly lengthened scapes, strongly protruding eyes, decumbent pubescence over entire body surface, the long, low node of the petiole, and especially the well developed spine on the mesopleuron (Fig. 20). The spine is less developed and more blunt in some specimens, including the

reproductives and the holotype worker. Although most other species have a small, poorly developed bump or knob on the lower margin of the mesopleuron, it is never as well developed in other species as it is in the *rugosus* species complex. It is easily separated from *D. intermedius* by characters listed with the latter species, but could be easily confused with *D. dibolia* (see discussion of *D. dibolia*).

Mann (1916) was wrong in his characterization of *D. rugosus* as a species with a well developed occipital neck (in his key). It definitely does not have an occipital neck.

Distribution. COLOMBIA south to BOLIVIA (Map 4).

Type series. Holotype worker (BMNH #11-496) [seen], Brazil, Amazonas, Ega (= Tefé).

Material examined. Forty two series, consisting of 57 workers, 4 females (LNKD, MZSP) and 5 males (MCZC, MZSP, USNM).

Biology. May be arboreal (Wilson 1987). Collected most commonly loose on vegetation or on dead trees. Stray sexuals have been collected in June (Perú), July (Ecuador) and Oct. (Brazil) [MZSP, USNM]. This species was featured on the cover of Sociobiology 16(1) (bottom photograph).

Dolichoderus schulzi Emery
Figs. 7, 8, 109a, b, 123, 149; Map 15

Dolichoderus (*Monacis*) *schulzi* Emery 1894:233-234, worker BRAZIL: Pará, Belém (MCSN) [not seen].

Dolichoderus biolleyi Forel 1908b:61, worker, COSTA RICA: Manglares (MHNG) [not seen], synonymy by Kempf 1959a:254.

Dolichoderus schulzi biolleyi var. *columbica* Forel 1912:35, 1914:12, synonymy by Kempf 1959a:254.

Monacis schulzi: Kempf 1959a:254-256, female, BRAZIL: Pará, Belém (MZSP) [not seen]. Kempf 1972b:143.

Dolichoderus schulzi: Shattuck 1992:77.

Description. Male measurements (mm): HL 0.79 - 0.84, HW 0.98 - 0.99, SL 0.34 - 0.35, EL 0.40 - 0.41, WL 1.54 - 1.59, PW 0.39 - 0.41. Indices: SI 40 - 44, CI 118 - 124.

Anterior margin of clypeus almost straight (slightly indented at medial anterior border); scape slightly longer than second funicular segment (1.17 - 1.27 X as long); ocelli weakly protruding past vertex (Fig. 123); pronotum angulate at humeral corners; posterior border of propodeum concave, but border rounded; petiole thickened with acuminate border (Fig. 109a). Concolorous dark reddish-brown few short (0.06 - 0.20mm) erect hairs on head and mesosoma.

Discussion. This species is most closely related to *D. tristis*, and I have moved it to the *laminatus* species complex (from the *debilis* species complex).

It can be easily distinguished by the shape of the petiole. In addition, the pubescence on the gaster is dilute (dense in *D. tristis*) and the gaster is moderately shining (densely punctate and dull in *D. tristis*). It is bicolored, whereas all *D. tristis* that I have seen are concolorous black. Two workers in the MCZC (PERU, Madre de Dios, T. Irwin *et al.*) are somewhat unusual as they are smaller with finer sculpture (reversal of normal trend of rougher sculpture in smaller workers), head is almost smooth, petiole is slightly thinner. I conclude these are *D. schulzi*, although when more specimens and sexuals become available, these specimens may be found to represent a new species. The females are very similar to those of *D. lamellosus*, differing primarily in the shape of the posterior border of the propodeum (see female key, couplet 16). The male genitalia are similar to those in other species of the *laminatus* complex (Fig. 149). The aedeagus has a rounded apex, the teeth are small and the volsella is small with a small digitus.

Distribution. COSTA RICA, Osa Penin.: Sirena, 50m, 28-iv-1981, J. Longino (LACM). COLOMBIA, Medellin, 1800m, No. 944, NA Weber 1938, [following on bottom of label] 14-vii-1939, 580ft. 1944 [MCZC, CWEM, MHNC, MZSP], Santa Anna [sic!], Feb 1924, W. Mann (USNM). PERU, Madre de Dios: Río Tambopata Res., 30 K (air) SW Pto. Maldonato, 290m, T. Erwin *et al.*, 9 - iii - 82, 02/063/05 (MCZC). BRAZIL, Pará: Belém (MCSN, USNM); Amazonas: Ihla de Curari Várzea, J. Adis, 18-iii-76 [LACM] (Map 15). The Santa Ana locality is not on map due to the large number of Santa Anas in Colombia.

Type Series. Several worker syntypes (MCSN) [not seen], Brazil, Pará, Belém; one probable syntype worker (without head) ex. Emery coll. (USNM) [seen].

Material Examined. Five series, consisting of 18 workers, 2 females and 4 males.

Biology. Unknown.

Dolichoderus septemspinosus Emery
Map 11

Dolichoderus (*Monacis*) *septemspinosus* Emery 1894:231-232, worker, BRAZIL: Pará, Belém (MCSN) [not seen].

Monacis septemspinosa: Kempf 1959a:237-240, 1960:397, 1970:338, 1972b:143; Wilson 1987:248; Swain 1977:182-183.

Hypoclinea septemspinosa: Lattke 1986:264.

Dolichoderus septemspinosus: Shattuck 1992:77.

Discussion. This species is easily recognized by the presence of 3 pairs of spines on the mesosoma, and an almost complete lack of erect hairs. It may be a species complex, as 3 forms can be distinguished, based on the form of the propodeal spines. Typically the spines are abruptly raised from the plane of the dorsal face of the propodeum (as seen in profile) and curved inwards (as

seen from above). One of Wheeler's undescribed varieties (see Kempf 1959:240) has short spines which are not strongly incurved. A third form (USNM, Bolivia, Ivon Beni, W. M. Mann) has spines in the same plane as the dorsal face of the propodeum, and the spines diverge posteriorly. Specimens from one series (Perú, MCZC) are intermediate between these and the typical form. One specimen has essentially parallel spines, the others have spines which diverge posteriorly and are weakly bent obliquely upwards. It seems prudent to recognize a single species at this time, until we can evaluate the variability of this rarely collected species and compare the reproductives of different populations.

Distribution. ECUADOR, Tena on Napo River (MCZC). PERU, Madre de Dios: near Pto. Maldonado (MCZC). VENEZUELA, Amazonas: Marawaca (USBV). GUIANA, Bartica Kalakoon (MCZC), Kartabo (LACM). BRAZIL, Rio Madeira, Abuná (LACM); Bahia, Agua Preta, Pará, Belém (MCZC); Pará, Taperinha (Swain 1977). BOLIVIA, Ivon Beni (USNM); Songa (MCZC) (Map 11).

Type Series. Two syntype workers (MCSN) [not seen], Brazil, Pará, Belém.

Material Examined. Eleven series, consisting of 48 workers.

Biology. Nests in trees (*Cecropia* sp., *Astrocaryum* sp., *Symphonia globulifera*, (?) *Hirtella* sp., *Mouriria guianensis*, *Eschweilera polyantha)*, and in an unidentified epiphytic bromeliad (Kempf 1970; Lattke 1986).

Dolichoderus setosus (Kempf)
Map 15

Monacis setosa Kempf 1959a:267-268, worker, BRAZIL: Pará, Cachoeira do Breu (MZSP) [not seen]. Kempf 1972b:143.

Dolichoderus setosus: Shattuck 1992:77.

Discussion. Kempf (1959) states that this species is closely related to *D. lamellosa*, but differs in that most of body is covered with short, pointed, pale yellowish, erect hairs, in addition to other characters (see Kempf 1959 for details).

Distribution. BRAZIL, known only from type locality (Map 15).

Type Series. Holotype (MZSP) [not seen], Brazil, Pará, Cachoeira do Breu. Known only from holotype.

Material Examined. None.

Biology. Unknown.

***Dolichoderus shattucki* new species**
Figs. 1, 60a, b, 90, 91; Map 8

Description. Worker measurements (mm): HL 1.28 - 1.44, HW 1.08 - 1.22, SL 1.48 - 1.56, EL 0.23 - 0.24, WL 1.92 - 2.04, ML 0.53 - 0.75, MW 0.49 - 0.81, PW 0.35 - 0.36, PL 0.34 - 0.40. Indices: SI 108 - 116, CI 84 - 85, MI 92 - 108,

PI 96 - 110.

Mandible with parallel striae, 10 teeth on masticatory border, 2 teeth and numerous small denticles on basal border (Fig. 60a); maxillary palp very long, extending 2/3 the distance to the occipital foramen (Fig. 1); clypeus with numerous striae which unite along median line; frontal area elongate; frontal carinae very well developed (Fig. 60a), but not completely covering insertions of the antennae; remainder of head with costulae or rugae; eyes strongly protruding from side of head (Fig. 60b); pronotum, mesonotum and propodeum each with a pair of long, well developed spines (Fig. 1), metanotum (holotype) 0.48mm long, 0.51mm wide; entire mesosoma and anterior coxae covered with rugae, propodeal declivity with transverse, parallel costulae; petiole with long, well developed spine (Fig. 1); gaster predominantly smooth, shining, with scattered small punctures. Entire ant covered with long, erect or suberect hairs, gaster with fine decumbent pubescence. Color very dark brown except mandibular teeth, insertions of antennae and femora which are light yellowish-brown strongly contrasting with the rest of the ant.

Female measurements (mm): HL 1.54 - 1.58, HW 1.34 - 1.42, SL 1.72 - 1.94, EL 0.29 - 0.31, WL 2.52 - 2.58, PW 0.43 - 0.53, PL 0.48 - 0.51. Indices: SI 112 - 123, CI 87 - 90, PI 98 - 112.

Similar to worker in most aspects, except three ocelli present, spines on mesosoma not as long, no spines on metanotum, sculpture and color as in worker.

Male: Unknown.

Discussion. This species cannot be confused with any other New World species. No other New World dolichoderine has 3 pairs of long acute spines on the mesosoma. It is intermediate between the *rugosus* complex and the *bispinosus* complex, having more characteristics in common with the latter. The mesosoma is not as elongate as that of *rugosus* complex, but it possesses the lower mesopleural spine of the *rugosus* species complex. In addition the head is similar to that of the *rugosus* species complex with strongly protruding eyes. The maxillary palps are very long, also a characteristic of the *rugosus* species complex. It has transverse costulae on the propodeal declivity, a characteristic found only in the *imitator* species complex. It shares a number of characteristics with the *bispinosus* complex: spines on the pronotum, lacks an elongated mesonotum, has a spine on the petiole and possesses basidorsal tubercles on the hind coxae. The frontal carinae are much larger and more developed than any of the other New World species. The discoidal cell is shaped as a square (Fig. 90). Clearly this species possesses a number of characteristics of other species complexes, and I therefore hypothesize that it is similar to the ancestor of all of the New World species.

This new species clears up a number of problems with the definition of the genera *Dolichoderus*, *Hypoclinea* and *Monacis*. It possesses a number of

sympleisomorphic characters which unite all 3 of these taxa into a single group. These characters include a mesopleural spine, a basidorsal tubercle on the hind coxa and a rectangular discoidal cell. These characters, in addition to several others mentioned above, demonstrate that this new species is near the ancestor of the group, and that the group is monophyletic. Therefore *Hypoclinea* and *Monacis* must be retained as synonyms of *Dolichoderus*, as they have been previously considered by various authors, most recently by Shattuck (1992). The separation of any of the taxa from the remainder of *Dolichoderus* would leave the remainder of the group paraphyletic.

Distribution. PANAMA, Poe, 5 Jan 1968, J. Buff (USNM). ECUADOR, Pichincha Prov.: Río Palenque Research Station, 200m, 11-1983, M.Sharkey leg. (LEMQ) (Map 8).

Type Series. Holotype worker, 2 paratype workers and 4 paratype females (USNM) [seen], Panamá, Poe.

Examined. Two series, consisting of 4 workers and 7 females.

Etymology. Named in honor of my friend and colleague, Steven Shattuck who has been extremely helpful to me in this revision, and who called my attention to this phylogenetically important species.

Biology. The type series was intercepted from unidentified bromeliads in Miami.

***Dolichoderus smithi* new species**

Fig. 37; Map 16

Description. Worker measurements (mm): HL 1.10 - 1.19, HW 1.05 - 1.20, SL 0.96 - 1.01, EL 0.29 - 0.33, WL 1.36 - 1.58, ML 0.35 - 0.40, MW 0.58 - 0.60, PW 0.51 - 0.61. Indices: SI 85 - 88, CI 95 - 101, MI 61 - 67.

Mandible with 9-10 teeth on masticatory border; clypeus indented on anterior mesial border; vertex broadly concave; frontal area poorly defined; pronotum with well defined angles; mesonotum with posterolateral angles; propodeum bilobate, strongly overhangs declining face; entire dorsal surface of mesosoma flat; petiole thickened, but with well defined, acuminate, sharp crest, which extends down sides of petiole; basidorsal tubercle of hind coxa well developed; gaster strongly concave at point of attachment of petiole. Sculpture rough, punctate and foveolate, especially on sides of head, vertex and entire mesosoma, anterior face of petiole, foveolae have shiny silver centers; gaster shallowly punctate. Devoid of erect hairs, except on mandibles, maxillary palps and ventral surface of gaster. Dorsum of gaster with very fine, appressed pubescence, giving the gaster a silver sheen. Black, with mandibles and funiculus brown, legs pale brown and strongly contrasting with color of body.

Female: Unknown.

Male: Unknown.

Discussion. This species is most similar to *D. lamellosus*, but differs in that the propodeum is bilobed posteriorly (Fig. 37), the petiole is very acuminate with the border distinctly separated from the remainder of the petiole, similar to that of *D. laminatus*, but the mesonotum is flat and not concave as in *D. laminatus*. The bottoms of the foveolate punctures are shiny silver in *D. smithi* (densely punctate in *D. lamellosus*).

Distribution. BOLIVIA, Known only from type locality (Map 16).

Type Series. Holotype worker (USNM) and 22 paratype workers (USNM, BMNH, CWEM, INPA, MIZA, MCZC, MHNC, MZSP) [all seen], Bolivia, Tumupasa, Wm. Mann 1921-1922, Dec., Mumford Biol. Exp.

Material Examined. Type series.

Etymology. Named in honor of my friend David Smith who has been very helpful to me in my career, and always ready to loan ant specimens and identify the most difficult ant species.

Biology. Unknown.

Dolichoderus spinicollis (Latreille)
Fig. 16; Map 12

Formica spinicollis Latreille 1832:99, worker, VENEZUELA: Río Negro (ZMHB) [not seen].

Polyrhachis spinicollis: F. Smith 1858:74.

Hypoclinea spinicollis: Mayr 1862:708, 1870a:955.

Monacis spinicollis: Roger 1862a:234-235; Kempf 1959a:232-234, 1972b:143.

Dolichoderus (*Monacis*) *spinicollis*: Mann 1916:461-462.

Dolichoderus spinicollis: Shattuck 1992:77.

Discussion. This species is easily recognized, by the extremely long pronotal spines and the upwardly directed propodeal angles.

Distribution. VENEZUELA, Alto Río Negro. BRAZIL, Rondônia: Rio Madeira (USNM); Amazonas: Upper Río Negro; Pará: Santarem (Map 12).

Type Series. Venezuela, Río Negro (ZMHB) [not seen].

Material Examined. One series of 18 workers.

Biology. Apparently nests in trees (Mann 1916).

***Dolichoderus spurius* Forel new status**
Figs. 29, 30; Map 26

Dolichoderus bidens var. *spurius* Forel 1903:258, worker, female, TRINIDAD (MHNG, NHMB) [seen]. Emery 1912:12; Shattuck 1992:77.

Dolichoderus (*Hypoclinea*) *bidens*: Wheeler 1922:14.

Dolichoderus (*Hypoclinea*) *bidens* subsp. *albatus* Veihmeyer 1922:213-214, worker, PERU (unknown) [not found], **new synonymy.**

Hypoclinea bidens var. *spuria*: Kempf 1972b:119.

Hypoclinea bidens albata: Kempf 1972b:119.

Dolichoderus bidens subsp. *albatus*: Shattuck 1992:77.

Description. Worker measurements (mm): HL 1.34 - 1.40, HW 1.11 - 1.22, SL 1.54 - 1.62, EL 0.30 - 0.31, ML 0.48 - 0.51, MW 0.35 - 0.38, WL 1.79 - 1.98, PW 0.40 - 0.44. Indices: SI 115 - 116, CI 83 - 87, MI 136 - 137.

Head usually orbiculate in shape; propodeal angles poorly developed; petiole thickened in profile, 2 small teeth on posterior edge of node (Fig. 30); propodeal spiracle diameter 0.06mm, located about 1 diameter from edge of propodeal declivity. Erect hairs on all surfaces (up to 0.6mm), sparse pubescence on most body surfaces, except gaster, which is covered with thick, golden pubescence. Sculpture roughened, light brown, gaster with golden hue due to pubescence.

Female (dealated) measurements (mm): HL 2.04, HW 1.76, SL 1.98, EL 0.49, WL 3.22 PW 0.76. Indices: SI 97, CI 86.

Similar to worker, except propodeum with bumps only; petiole thickened with 2 bumps on posterior edge of node. Concolorous reddish-brown.

Male: Unknown.

Discussion. This species is very closely related to *D. bidens*, and may actually represent individuals from incipient nests. It can be distinguished from similar species (*D. bidens*, *D. ferrugineus*, *D. cogitans*) in that the propodeal spiracle is larger and located only about 1 diameter from the propodeal declivity. It is usually at least 2 diameters away in all of the other species. The female of *D. spurius* is very similar to that of *D. bidens*. The teeth on the petiole are well developed in *D. bidens*, they are reduced to only bumps in *D. spurius*. The propodeal spiracle does not appear to be useful in separating females of the 2 species, the diameter is 0.07mm in the paralectotype female of *D. spurius*, and is located about 3 diameters from the edge of the descending face. One series (MCZC) has workers with shiny, black gasters, but otherwise appear to be identical to the typical *D. spurius*. The female (dealate) with the series appears to be indistinguishable from that of *D. bidens*. The series may represent an undescribed species, but due to the state of confusion of members of the *bidens* species complex, I will consider them to be *D. spurius* until additional material becomes available. I have not been able to locate the types of *D. bidens albatus*, but the description agrees with the types of *D. spurius*, and with none of the other specimens I have seen; therefore I am considering it to be a synonym.

Distribution. VENEZUELA and TRINIDAD south to PERU and BOLIVIA (Map 26).

Type Series. Lectotype worker (here designated), 5 paralectotype workers and 1 paralectotype female (MHNG) [seen], 1 paralectotype worker (NHMB) [seen], Trinidad, Urich.

Material Examined. Eleven series, consisting of 46 workers and 2 females.

Biology. Stray individuals were collected on coffee tree and on *Ficus benjaminia* var. *cornosa* (USNM).

Dolichoderus superaculus (Lattke)
Map 12

Hypoclinea superacula Lattke 1986:261-262, worker, COLOMBIA: Cauca, near Guapí (MIZA) [seen].

Dolichoderus superaculus: Shattuck 1992:77.

Discussion. This species is very similar to *D. validus* (especially to nanitic workers), but differs in that the vertex is almost straight (strongly concave in *D. validus*) and the appressed pubescence on the gaster is silvery in color, rather than dense and golden as in *D. validus*. It is similar to *D. curvilobus* (especially the nanitics of *D. curvilobus*), but differs in that the pronotal spines project obliquely upwards. This character will not always distinguish it from *D. validus* or *D. andinus*. It is not closely related to *D. andinus*, and can be distinguished by the punctate clypeus (foveolate in *D. andinus*). When more material becomes available, *D. superaculus* may prove to be a synonym of *D. validus* or *D. curvilobus*.

Distribution. COLOMBIA, known only from type locality (Map 12).

Type Series. Holotype (MIZA) [seen], Colombia, Cauca, near Guapí.

Material Examined. Holotype and 1 worker, ovar. [= quar (antine)?] Louisiana, Winterhaven [?] Cal. 7-iii-1959; on stalk banana; Dewhirst col. (LACM)

Biology. One worker collected on banana stalk, from some unknown area, apparently collected during quarantine inspection.

Dolichoderus taschenbergi (Mayr)
Figs. 79, 86, 89; Map 20

Hypoclinea taschenbergi Mayr 1866:498-499, worker, NORTH AMERICA (EMAU) [not seen]. Mayr 1870a:958.

Dolichoderus taschenbergi: Mayr 1886b:437; Wheeler 1904:304, 1905a:309, 1905b:304, 1915a:206; Emery 1912:11; Smith 1918:23, 1924:81-82, 1947:590; Dennis 1938:292-293; Wheeler & Wheeler 1951:173, 1963:151-154, 1966:726, 1987:203; Kannowski, 1959b:755-760; Carter 1962:190-191; Talbot 1963:552; Maldague *et al.*, 1967:251-252; Bradley & Hinks 1968:40-50; Warren & Rouse, 1969:43-44; Letendre *et al.*, 1971:599; Bradley 1972:245-249; Burnes 1973:97-104; Martin *et al.*, 1976:331; Francoeur & Elias, 1985:303-306; Johnson 1989:4-5.

Dolichoderus taschenbergi var. *gagates* Wheeler 1905a:310, worker, USA: New Jersey [not seen], preocc. by Emery 1890a:69-70. Wheeler 1905c:388, 1908b:662; Wesson & Wesson 1940:99.

Dolichoderus taschenbergi var. *aterrimus* Wheeler 1915b:417 (*nomen nov.*

for *taschenbergi gagates*), synonymy by Creighton 1950:336-337. Logier 1923:247-249; Cole 1940:60-61, 1952:155.

Dolichoderus taschenbergi var. *wheeleriella* Forel 1916:458, *nomen nov.* for *taschenbergi gagates*, junior synonym of *atterimus*.

Description. Worker measurements (mm): HL 0.86 - 0.95, HW 0.81 - 0.90, SL 0.73 - 0.78, EL 0.21 - 0.23, WL 1.09 - 1.15, PW 0.29 - 0.40, PL 0.13 - 0.16. Indices: SI 82 - 84, CI 94 - 95.

Mandibles weakly smooth and shining with scattered punctures; head evenly and shallowly punctate; pronotum shallowly punctate; mesonotum and dorsal face of propodeum more strongly punctate and with evidence of foveolate punctures, dorsal face subquadrate; gaster lightly punctate and mostly smooth and shining. Erect hairs sparse, with exception of a few on gaster, pronotum, coxae and head, absent on scape (except few on apex). Concolorous dark brown.

Female measurements (mm): HL 1.00 - 1.03, HW 0.91 - 0.94, SL 0.69 - 0.71, EL 0.29 - 0.30, WL 1.50 - 1.51, PW 0.39 - 0.41. Indices: SI 69 - 70, CI 89 - 94.

Similar to worker, mandibular teeth poorly defined, except apical tooth; most of body surface with scattered punctures, but primarily smooth and shining; dorsal face of propodeum subquadrate (from above). Erect hairs sparse on body, none on scapes (except apex), 5 - 10 on pronotum, 10 - 30 on dorsum and anterior face of first gastral tergite. Concolorous dark medium brown.

Male measurements (mm): HL 0.73 - 0.79, HW 0.79 - 0.81, SL 0.28 - 0.29, EL 0.41, WL 1.65 - 1.83, PW 0.29 - 0.30. Indices: SI 37 - 38, CI 103 - 109.

Head and mesosoma with roughened sculpture, lightly, but evenly punctate; diameter of median ocellus approximately equal to distance between median and lateral ocellus; gaster lightly punctate, but smooth and weakly shining. Few erect hairs present including the dorsum of first gastral tergite, but absent on scapes.

Discussion. The following suggestions may be helpful for separating workers of the 4 New World species of the *quadripunctatus* complex. The subquadrate dorsal face of the propodeum easily separate *D. taschenbergi* from all others. In the vast majority of specimens, numerous erect hairs on the scapes easily separates *D. plagiatus* from all others. Occasionally the number of hairs is reduced in part of a nest series, and in the specimens from the state of Nuevo León, México, the scapes have no erect hairs. In such cases, *D. plagiatus* can be separated from the others by the roughly sculptured pronotal disc. It is possible that the Mexican specimens represent an undescribed species; examination of sexuals will be necessary. I have collected in the locality (Nuevo León, Parque Chipinque, southern edge of Monterrey) 3 times and have not found it. My colleagues Jaime Garcia and David González have

done intensive collecting in this area and have not found it either. It will only be confused with the closely related *D. pustulatus*, which occasionally has a few erect hairs on the scape. *Dolichoderus pustulatus* and *D. mariae* are occasionally difficult to separate, *D. mariae* is larger and usually bicolored (gaster darker, rest of body light), although *D. plagiatus* is occasionally bicolored.

The following suggestions may be useful for separating females of the species of *Dolichoderus* found in the United States. *Dolichoderus plagiatus* is easily distinguished by erect hairs on the scape, foveolate punctures on the head, and the light reddish-brown pronotum, which contrasts strongly with the darker mesoscutum. The pronotum and mesoscutum are concolorous in the other species. *Dolichoderus pustulatus* is the smallest species, the dorsal face of the propodeum has coarse, foveolate punctures (which also occurs in the larger *D. plagiatus)*. The pronotum and mesoscutum are similar in color: light brown with darker brown markings. *Dolichoderus mariae* is light red with darker gaster, the other species are usually concolorous medium brown, or if bicolored, the colors are dark. The shape of the propodeum is not useful in separating the females of *D. taschenbergi* from those of the other species.

The males of the North American species can be separated into three groups: 1) *D. taschenbergi*, 2) *D. mariae*, and 3) the other two species. The first two species can be separated using characters in the key. Separation of *D. plagiatus* and *D. pustulatus* is difficult without dissection of the genitalia. The distance from the connection of the media to the radius is usually subequal in *D. pustulatus*, but shorter in *D. plagiatus*, although there is considerable variation in this character (compare Figs. 82 and 83). The aedeagus has well defined teeth on the ventral border whereas the males of *D. pustulatus* have no teeth or slight indication of any teeth. The volsella is smaller in *D. plagiatus* than in *D. pustulatus* (compare Figs. 84 and 87). The stipites are apparently absent in both species. Males of *D. pustulatus* are much more commonly collected than males of *D. plagiatus*, thus the majority of the specimens that key to this group are *D. pustulatus*.

Distribution. Eastern USA (Map 20).

Type Series. Presumably in the EMAU [not seen].

Material Examined. Sixty two series, consisting of 192 workers, 33 females and 8 males.

Biology. The natural history of the *quadripunctatus* complex in North America is relatively well known, due especially to the intensive work of Dr. Mary Talbot. *Dolichoderus mariae* is found in sandy soils in open grassy areas or in old fields, where it forms small mounds (Smith 1924; Talbot 1956, 1965, 1971; Carter 1962), with a central cavity (10cm high X 17cm dia.) usually filled with roots (Talbot 1956, 1965). Mounds are usually at the base of a shrub or clump of grass (Smith 1924; Cole 1940; Carter 1962). It occasionally nests

under stones or logs (Wheeler 1905b; Van Pelt 1966). *Dolichoderus plagiatus* is not as common, but is more widely distributed (Talbot 1965). It is found in a variety of soils and habitats ranging from open areas to woods, and also occurs in bogs (Talbot 1934, 1965; Cole 1940; Carter 1962). Nests are usually located in soil under leaf litter. Colonies are small (Cole1940). *Dolichoderus pustulatus* has similar habits to the previous species, occurring in habitats ranging from sunny, grassy fields to areas with scattered pines, and bogs (Wesson & Wesson 1940; Carter 1962; Talbot 1965). It is found in soils ranging from sandy to clay loam (Carter 1962). Occasionally the nest is partially constructed of carton (Wesson & Wesson 1940). Colonies are usually small (Wheeler 1908b; Talbot 1965), probably in the range of a few hundred individuals (Smith 1924). Nests are also found under wood and in the stems of sedges (Wheeler 1932). *Dolichoderus taschenbergi* has habits similar to those of *D. mariae* (Smith 1924). It is found in habitats ranging from grassy fields to shaded forests and usually occurs in sandy soils (Logier 1923; Cole 1940; Wesson and Wesson 1940; Carter 1962) or bogs (Wheeler 1915a). Nests are in the soil under litter (Cole 1952) or in the form of mounds as in *D. mariae* (Kannowski 1959b), but may also be found in hollow stems, especially during floods (Talbot 1965). Populations are about 50,000 individuals per nest (Bradley 1972; Bradley & Hinks, 1968) and the nests are polygynous. This species may be important in biological control (Bradley 1972). It is a very aggressive species (Logier 1923). Lepidoptera larvae (Noctuidae: Hypeninae?) were found in a nest (Logier 1923).

All of the species tend Homoptera and scavenge dead arthropods (Mayr 1886; Logier 1923; Smith 1924, 1931; Kannowski, 1959b; Bradley & Hinks, 1968; Nielsson *et al.*1971; Burnes 1973; Bristow, 1984a, b; Francoeur & Elias, 1985).

Details of the mating flights are known for all of the species (Kannowski, 1959b). Flights occur in the morning during air temperatures ranging from 14.4°C - 24°C, when the relative humidity is high (Talbot 1956, 1963, 1965; Kannowski,1959a, 1959b). Flights of *D. mariae* occur from early July to mid Sept. (Talbot 1965; Kannowski, 1959a); those of *D. plagiatus* in mid Aug. (Wesson & Wesson 1940; Kannowski, 1959a; Talbot 1965); those of *D. pustulatus* from late July to Sept. (Wheeler 1908b; Smith 1931; Kannowski, 1959a); those of *D. taschenbergi* from mid June to the end of July (Wheeler 1908b, Kannowski, 1959b). Up to 15,000 alates are released from each nest (Kannowski, 1959b). Spiders are important predators of the alates (Talbot 1956). Reproductives overwinter in nests (Wheeler 1932). The *quadripunctatus* species complex nests only in the soil (or in logs on soil surface) which contrasts sharply with the remainder of the New World species complexes which are almost exclusively arboreal.

Dolichoderus tristis Mann
Fig. 13, 114a,b, 124; Map 16

Dolichoderus (*Monacis*) *tristis* Mann 1916:463-464, worker, BRAZIL: Rondônia, Abuná (MCZC, LACM) [seen].

Monacis tristis: Kempf 1959a:256-259, 1972b:143; Wilson 1987:248; Swain 1977:238-239.

Dolichoderus tristis: Shattuck 1992:77.

Description. Male measurements (mm): HL 0.94, HW 0.98, SL 0.46, EL 0.36, WL 1.78, PW 0.39. Indices: SI 49, CI 104.

Mandibles with small teeth, giving serrate appearance; anterior border of clypeus slightly convex; scape longer than second funicular segment (0.40mm); three ocelli well developed, but not strongly protruding; propodeum without spines or angles; petiole thickened (in profile) with apical spine; genitalia appear to be similar to those of *D. varians* (Fig. 148) and *D. schulzi* (Fig. 149) (not dissected in only available specimen). Entire surface shallowly, but evenly and densely punctate. Without erect hairs except for near mouthparts and genitalia. Dilute, appressed pubescence on all surfaces, especially gaster. Concolorous dark brown.

Discussion. The thickened petiole (viewed in profile) together with the well developed apical tooth (Fig. 13) without an acuminate crest easily separates the workers and males (and undoubtedly the undescribed female) of this species from all others in the *laminatus* complex. The male was not associated with workers, but is undoubtedly a member of this species. It is obviously a member of the *debilis* species or *laminatus* complexes. *Dolichoderus tristis* is the only member of these species complexes in which the petiolar node is thickened, and the apex terminates in a well developed spine and is not acuminate. The node of the male is very similar to that of workers, and thus I conclude it belongs to this species.

Distribution. PERU, Madre de Dios: Río Tambopata Res., 30k, SW Pto. Maldonado, 290m, 10 Nov. 1983 (LACM). BRAZIL, Amazonas: Reserva Ducke, J. Rafael, 1 worker (INPA); Rondônia: Rio Madeira, Abuná, Mann & Baker (LACM, MCZC); Amapá: Serra do Norte, R. Bicolli, 1 male (MZSP); Pará: Santarem Taperinha, 12 July 1975, R. Jeanne, 1 worker (MCZC) (Map 16).

Type Series. Lectotype worker (here desig.), 2 paralectotype workers (MCZC # 9103) [seen], 2 paralectotype workers (LACM) [seen], Brazil, Rondônia, Abuná, Mann & Baker.

Material Examined. Five series, consisting of lectotype, 4 para-lectotype workers and 13 additional workers and 1 male.

Biology. Arboreal, fogged from canopy by T. Erwin *et al.* A nest was found 18m high beneath a clump of unidentified silken cocoons (Swain 1977). This is the only species in the *laminatus* complex which is known to have the dolichoderine odor. The single male was collected in Nov. 1959 in Brazil.

Dolichoderus validus (Kempf)
Fig. 34; Map 12

Monacis valida Kempf 1959a:244-246, worker, female, COSTA RICA: Zent and Limón; PANAMA: Canal Zone (MZSP, MCZC) [seen]. Kempf 1972b:143; Swain 1977: 146-179.

Dolichoderus vilidus: Shattuck 1992:77.

Description. Male measurements (mm): HL 1.31- 1.34, HW 1.48 - 1.54, SL 0.68 - 0.70, EL 0.69 - 0.70, WL 3.24 - 3.46, PW 0.88 - 0.89.

Anterior clypeal margin convex; vertex convex; eyes large; ocelli strongly protruding; mandible serrate with poorly defined tooth at apex; propodeum with bumps on lateral corners; petiole concave in middle of apex. Concolorous dark reddish-brown. Scattered erect hairs and golden appressed pubescence on all surfaces. Entire ant shallowly and densely punctate.

Discussion. The shape of the petiole (lateral margins continue unbroken, tapering into the spine) distinguishes the workers and females of this species from the common *D. bispinosus.* In addition, the scape (excluding the condyle) is about as long as the maximum length of the head (shorter in *D. bispinosus*). It can be distinguished from *D. curvilobus* and *D. superaculus* as the vertex is strongly concave. The male can be easily distinguished from that of *D. bispinosus* by its large size, it is about as large as the female.

Wheeler first recognized this form as a new species (specimens labeled as types in USNM, # MCZ 21172, from type locality: Río Chenilo, Ap. 6, 1913, W. Wheeler 6 workers), but did not publish a description.

Distribution. COSTA RICA south to COLOMBIA (Valle, Medio and Bajo Calima) (Map 12).

Type Series. Holotype worker and 40 paratype workers and 4 paratype females (MZSP, MCZC) [most seen], Costa Rica, Zent, Limón, and Panamá, Canal Zone, Río Chinillo, Río Agua Salud.

Material Examined. Twenty three series, consisting of 174 workers, 11 females and 5 males, including 33 worker paratypes, 3 female paratypes (in addition to 12 worker and 1 female from the same series as the paratypes, but which do not have Kempf's labels) from both type localities in Panamá (MCZC, LACM).

Biology. Swain (1977) reported extensively on the biology of this species. Nests are completely different than those of *D. bispinosus.* They are arboreal, 1.5 - 6 meters above the surface, constructed of coarse plant fibers (3 cm long) woven together like burlap. These ants apparently never nest in termite nests.

They build shelters to enclose membracids. This species is probably monogynous; a nest contained 2,200 workers. They are aggressive when defending the nest. Nectar is the principal food source. They tend membracids and coccids, and visit extrafloral nectaries of plants including *Inga edulis*. They also collect bird droppings, insect fragments, seeds and unidentified material. They have a crepuscular foraging rhythm. Flights occur at dawn.

Dolichoderus varians Mann
Figs. 111, 126, 148; Map 16

Dolichoderus (*Monacis*) *varians* Mann 1916:462-463, worker, BRAZIL: Rondônia, Pôrto Velho (MCZC) [seen].

Monacis varians: Kempf 1959a:261-262, 1972a:254, 1972b:143.

Dolichoderus varians: Shattuck 1992:77.

Description. Male measurements (mm): HL 1.06 - 1.11, HW 1.01 - 1.05, SL 0.59 - 0.61, EL 0.59 - 0.65, WL 2.10 - 2.18, PW 0.43 - 0.54. Indices: SI 55, CI 94 - 95.

Approximately 20 teeth on masticatory border, alternate teeth near apex larger; anterior clypeal margin straight; ocelli large, protruding; scape much longer than second segment of funiculus (0.38 - 0.41mm); propodeum without carina or angles; petiole thickened, not acuminate (Fig. 111), anterior surface with roughed sculpture; basidorsal coxal tubercle absent; discoidal cell square; genitalia similar to those of *D. debilis* and *D. quadripunctatus* complexes: volsella hook-like, aedeagus small with few well developed teeth (Fig. 148). Abundant erect and suberect hairs on all surfaces. Mesosoma dark reddish-brown to brown head, scutellum and gaster pale brown, legs, antennae pale yellow.

Discussion. This species is similar to *D. laminatus*, but the mesosoma has abundant erect hairs and the sculpture is somewhat rougher.

Distribution. GUIANA, Forest settlement, 3-12-35, # 348, N. Weber (MCZC). BRAZIL, Rondônia: Porto Velho, Rio Madeira, Mann & Baker; Amazonas: Rio Taruma, m-114, W. Brown; 80km NNE Manaus, P. Ward, #9160-6 (INPA) (Map 16).

Type Series. Holotype (labeled cotype, but Mann [1916] stated it was described from a single specimen), Brazil, (MCZC #21195) [seen], Brazil, Rondônia, Porto Velho.

Material Examined. Three series consisting of the holotype and 11 workers, 2 males (MCZC). Kempf (1972a) reported additional males, but they were not located.

Biology. Unknown, 1 male captured at light in rainforest (Amazonas) on 15-ix-1987.

Dollchoderus voraginosus new species
Figs. 49, 51, 72; Map 7

Description. Worker measurements (mm): HL 1.20, HW 1.03, SL 1.08, EL 0.28, WL 1.46, ML 0.49, MW 0.40, PW 0.35. Indices: SI 90, CI 85, MI 122.

Mandible with 9 teeth on masticatory border; head orbiculate in shape; mesonotum round in shape (L = 0.51mm, W = 0.40mm - Fig. 51); transverse carina on propodeum with upturned lateral corners; petiole weakly thickened and with a blunt apical edge. Mandibles with scattered punctures; clypeus with parallel rugae; entire head and dorsum of pronotum and mesonotum with strong, dense foveolae; dorsum of propodeum granulate; sides of pronotum and propodeum coriarious; mesopleural region granulated; katepisternum weakly smooth and shining; gaster lightly punctate.

Erect hairs (1.0 - 1.3mm) present on all body surfaces, including scapes and tibiae; gaster with moderately dense, decumbent, silvery pubescence. Most of insect concolorous dark reddish-brown legs (including coxae), lower margin of mesosoma and base of scapes light yellow-orange, contrasting strongly with the darker remainder of the body, mandibles light brown.

Female: Unknown.

Male: Unknown.

Discussion. This distinctive species is most closely related to *D. germaini.* It differs in that the head is orbiculate in shape, the sculpture (especially on dorsum of mesosoma) is strongly foveolate, the clypeus is not indented on the medial border, the petiolar node is without a sharp apex and the gaster is covered with decumbent pubescence. It differs from *D. diversus* in that the sculpture is much coarser, the mesonotum is not as elongated, the gaster has decumbent pubescence and the node of the petiole is thicker. It differs from *D. luederwaldti* in all of these characteristics except the decumbent pubescence on the gaster.

Distribution. BRAZIL, known only from type locality (Map 7).

Type Series. Holotype worker (MZSP) [seen], Brazil, São Paulo, Agudos, G. Gilbert leg. V-1959 [22°28'N, 49°00'W].

Material Examined. Holotype.

Etymology. Latin, meaning full of pits.

Biology. Unknown.

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Table 1. List of the New World species of *Dolichoderus*, indicating the castes which have been described, the couplet in the key s, the Figure numbers and the map number which shows their distribution. att = *attelaboides* complex, bid = *bidens* complex, bis = *bispinosus* complex, deb = *debilis* complex, dec = *decollatus* complex, div = *diversus* complex, imi = *imitator* complex, lam = *laminatus* complex, lug = *lugens* complex, qua = *quadripunctatus* complex, rug = *rugosus* complex, sha =*shattucki* complex.

Species	Complex	Described castes			Couplet of keys			Map	Page
		w	f	m	w	f	m		
abruptus	bid	+	+	+	46	19	12	21	31
andinus	bis	+			24			10	34
antiquus	qua?		+			--		--	34
attelaboides	att	+	+	+	15	2	3	1	35
baenae	div	+			54			32	38
bidens	bid	+	+	+	48	23	13	22	39
bispinosus	bis	+	+	+	23	10	16	9	42
caribbaea	div	+			55			4	44
cogitans	bid	+			50			23	44
curvilobus	bis	+	+		26	9		10	45
debilis	deb	+	+	+	29	28	26	27	47
decollatus	dec	+	+		17	3		2	48
dibolius	rug	+			14			3	49
diversus	div	+	+	+	59	26	10	29	50
doloniger	bis	+			20			10	53
epetreia	bis	+			24			10	54
fernandezi	dec	+			17			3	54
ferrugineus	bid	+	+		48,49	21		24	56
gagates	deb	+			32			28	57
germaini	div	+			60			31	57
ghilianii	div	+	+	+	54	27	11	32	58
haradae	bis	+			23			--	60
imitator	imi	+	+	+	2	5	2	5	61
inermis	deb	+			32			28	63
inpai	deb	+			31			28	64
intermedius	rug	+			14			3	64
lamellosus	lam	+	+	+	40	16	22	13	65
laminatus	lam	+	+		35	15		14	66
laurae	div	+	+	+	58	26	10	--	67
lobicornis	lam	+			38			15	69
longicollis	att	+			16			3	70

Table 1 (continued)

Species	Complex	Described castes			Couplet of keys			Map	Page
		w	f	m	w	f	m		
leuderwaldti	div	+			58			31	71
lugens	lug	+	+	+	10	18	6	6	72
lujae	div	+			57			31	73
lutosus	div	+	+	+	52	27	8	30	73
mariae	qua	+	+	+	43	14	20	17	75
mesonotalis	bis	+		+	12		17	11	77
mucronifer	bis	+	+	+	28	8	17	11	79
obliteratus	qua?		+			--		--	79
obscurus	bis?	+				--		--	80
omacanthus	bis	+			27			11	80
piceus	div	+			55			7	81
plagiatus	qua	+	+	+	42	12	21	18	81
primitivus	bid?	+			44			3	83
prolaminatus	lam	+			35			4	84
pustulatus	qua	+	+	+	43	13	21	19	84
quadridenti-culatus	bid	+	+	+	46	20	13	25	86
rohweri	qua?		+			--		--	88
rosenbergi	att	+			16			3	89
rufescens	deb	+	+	+	30	28	26	28	90
rugosus	rug	+	+	+	13	4	4	4	90
schulzi	lam	+	+	+	37	16	25	15	92
septemspinosus	bis	+			18			11	93
setosus	lam	+			39			15	94
shattucki	sha	+	+		7	4		8	94
smithi	lam	+			40			16	96
spinicollis	bis	+			28			12	97
spurius	bid	+	+		50	22		26	97
superaculus	bis	+			26			12	99
taschenbergi	qua	+	+	+	41	14	19	20	99
tristis	lam	+		+	37		25	16	103
validus	bis	+	+	+	25	10	15	12	104
varians	lam	+		+	34		23	16	105
voraginosus	div	+			60			7	106

Table 2. List of the New World taxa in *Dolichoderus*.

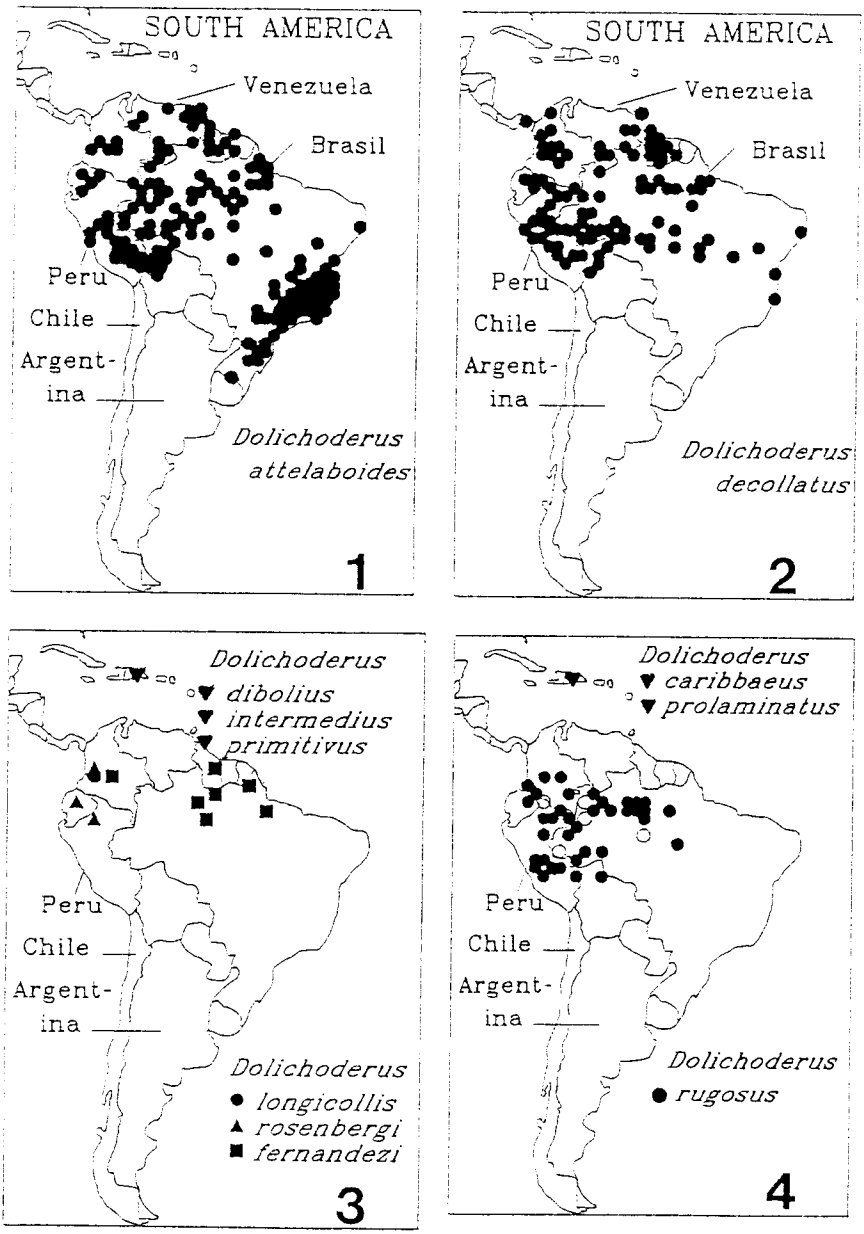
abruptus, *analis* = *quadridenticulatus*,
antiquus,
arboricolus = *bispinosus*,
attelaboides,
auromaculatus = *bidens*,
beutenmuelleri = *pustulatus*,
baenae, *bidens*, *bidens* var. *bahiana* = *bidens*,
bidens var. *inferior* = *ferrugineus*,
bidens var. *spuria* = *spurius*,
bidens albata = *spurius*,
bidens attenuata = *bidens*,
bidens cogitans = *cogitans*,
bidens ferruginea = *ferrugineus*,
biolleyi = *schulzi*,
bispinosus, *borealis* = *plagiatus*,
bradleyi ? Wilson 1987:248 = *Camponotus*? = *Pseudomyrmex*?,
capitatus = *decollatus*,
caribbaea, *championi* = *diversus*,
championi var. *ornata* = *diversus*,
championi trinidadensis = *diversus*,
championi trinidadensis taeniata = *diversus*,
cogitans, *columbicus* = *schulzi*,
curvilobus, *debilis*, *debilis* var. *sieversi* = *debilis*,
debilis var. *parabiotica* = *debilis*,
debilis var. *rufescens* = *rufescens*,
decollatus,
dibolius,
diversus,
doloniger,
epetreia,
fernandezi,
ferrugineus,
fungosus = *bispinosus*,
gagates,
germaini,
germaini garbei = *diversus*,
leviuscula = *diversus*,
ghilianii,
gibbosus = *quadridenticulatus*,
gibbosus var. *gibbosoanalis* = *quadridenticulatus*,

Table 2. List of the New World taxa in *Dolichoderus* (continued)

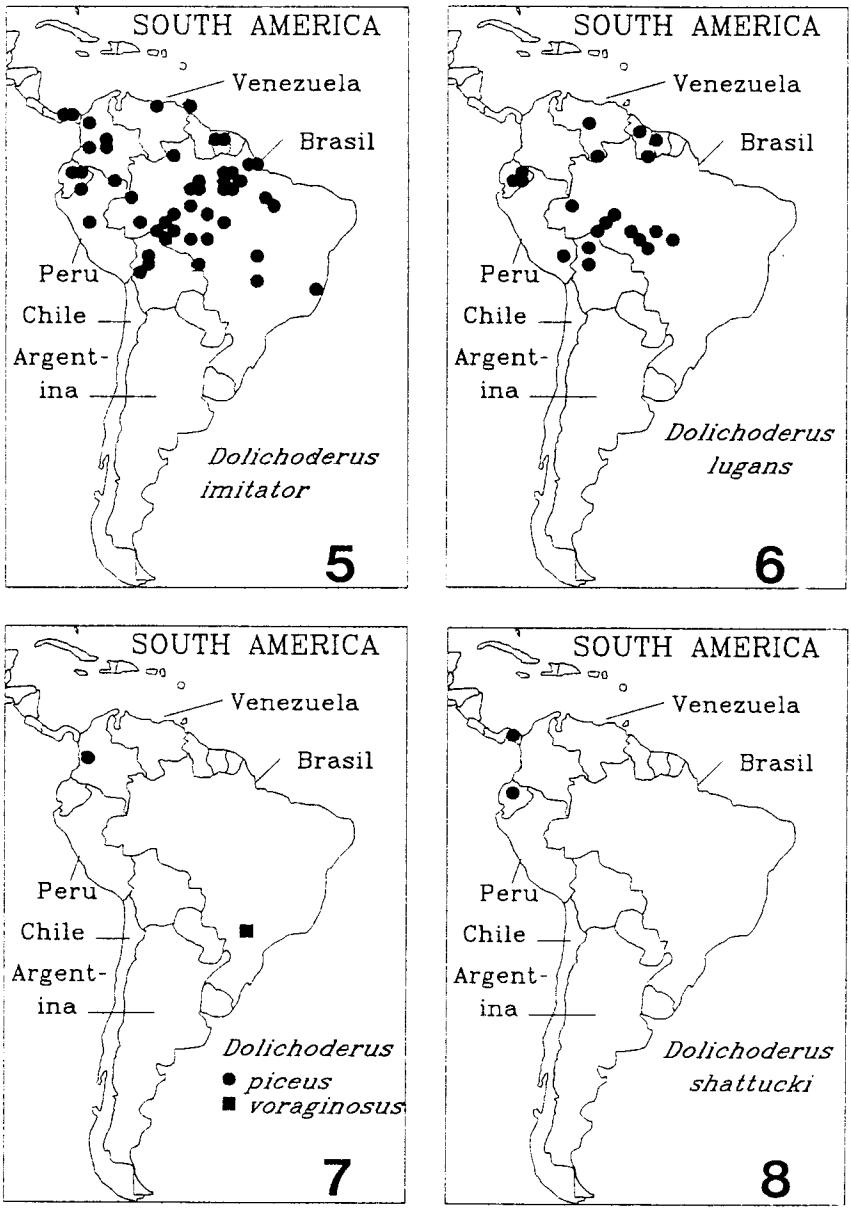
gibbosus var. *integra* = *quadridenticulatus*,
gibbosus var. *nitidior* = *quadridenticulatus*,
grandii = *mesonotalis*,
granulatus Pergande 1896:866 = *Camponotus striatus* (F. Smith) (syn. by M. Smith 1953:211),
imbecillus = *attelaboides*,
imbecillus var. *heterogaster* = *attelaboides*,
haradae,
imitator,
inermis,
inpai,
intermedius,
lamellosus,
lamellosus var. *missionensis* = *lamellosus*,
laminatus,
laminatus luteiventris = *laminatus*,
laurae,
lobicornis,
longicollis,
luederwaldti,
luederwaldti lujae = *lujae*,
lugens,
lujae,
lutosus,
lutosus var. *nigriventris* = *lutosus*,
lutosus var. *ruficauda* = *lutosus*,
mariae,
mariae subsp. *davisi* = *mariae*,
mariae subsp. *blatchleyi* = *mariae*,
mesonotalis,
mucronifer,
neglectus = *decollatus*,
obliteratus,
obscurus,
omacanthus,
piceus,
plagiatus,
plagiatus var. *inornatus* = *plagiatus*,
plagiatus subsp. *pustulatus* = *pustulatus*,
perditor = *bidens*,

Table 2. List of the New World taxa in *Dolichoderus* (continued)

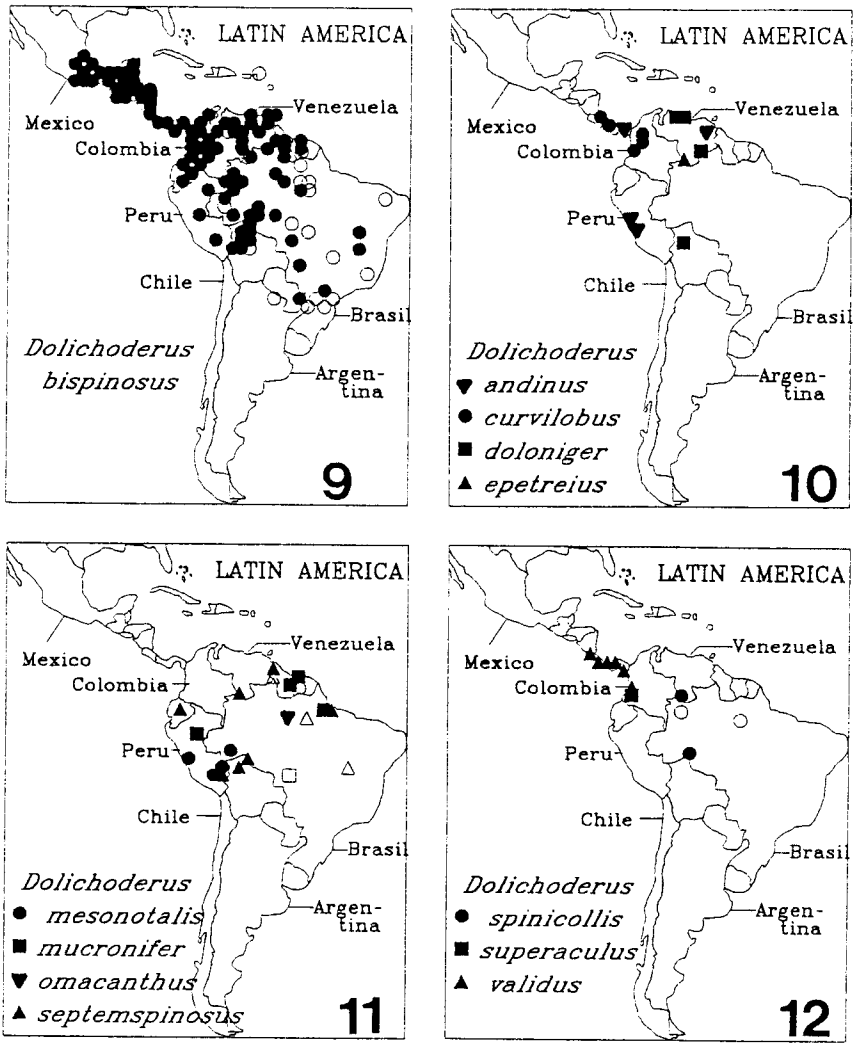
primitivus,
prolaminatus,
pustulatus,
quadridenticulatus,
rohweri,
rosenbergi,
rufescens,
rugosus,
schulzi,
schulzi var. *missionensis* = *lamellosus*,
septemspinosus,
setosus,
shattucki,
simplex = *mesonotalis*,
smithi,
spinicollis,
spinicollis ensiger = *mucronifera*,
spurius,
superaculus,
taschenbergi,
taschenbergi var. *gagates* = *taschenbergi*,
taschenbergi var. *aterrimus* = *taschenbergi*,
taschenbergi var. *wheeleriella* = *taschenbergi*,
tristis,
validus,
varians,
vestitus = *bispinosus*,
voraginosus.



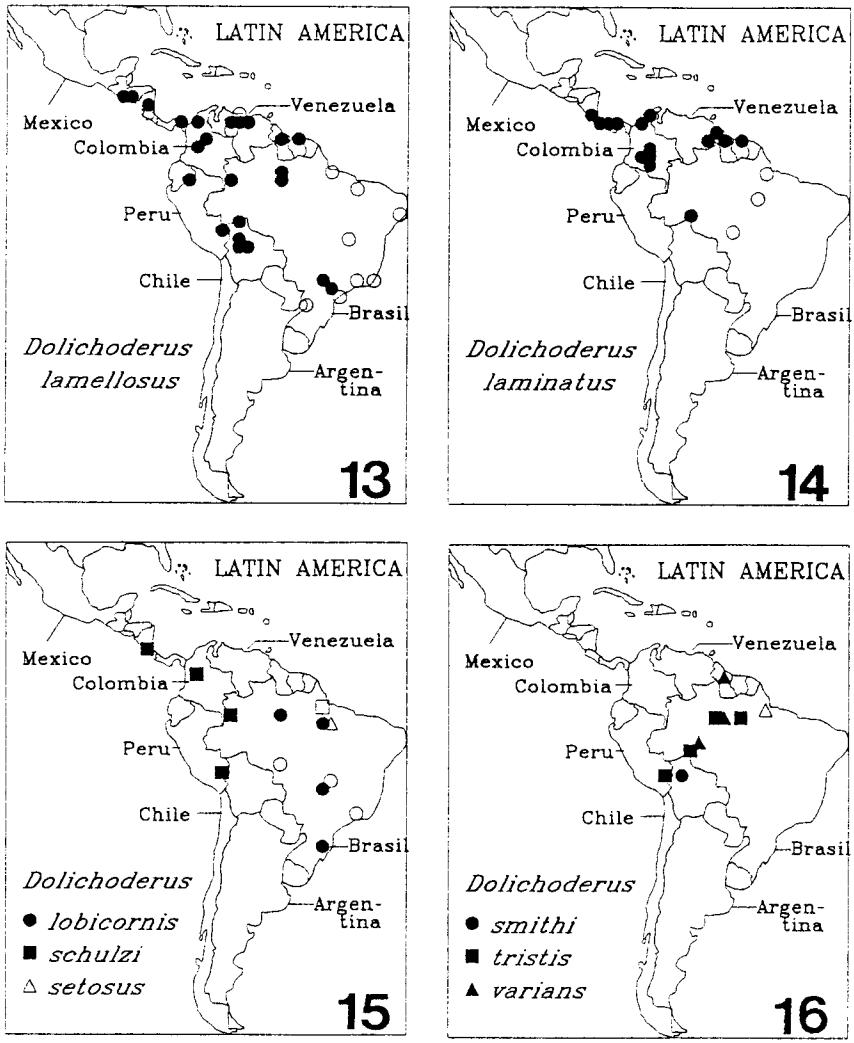
Maps 1 - 4. Distributions of: 1) *Dolichoderus attelaboides*; 2) *D. decollatus*; 3) *D. dibolius*, *D. intermedius*, *D. primitivus*, *D. longicollis*, *D. rosenbergi*, *D. fernandezi*; and 4) *D. caribbaea*, *D. prolaminatus*, *D. rugosus*. Open symbols indicate literature records, closed symbols represent specimen records.



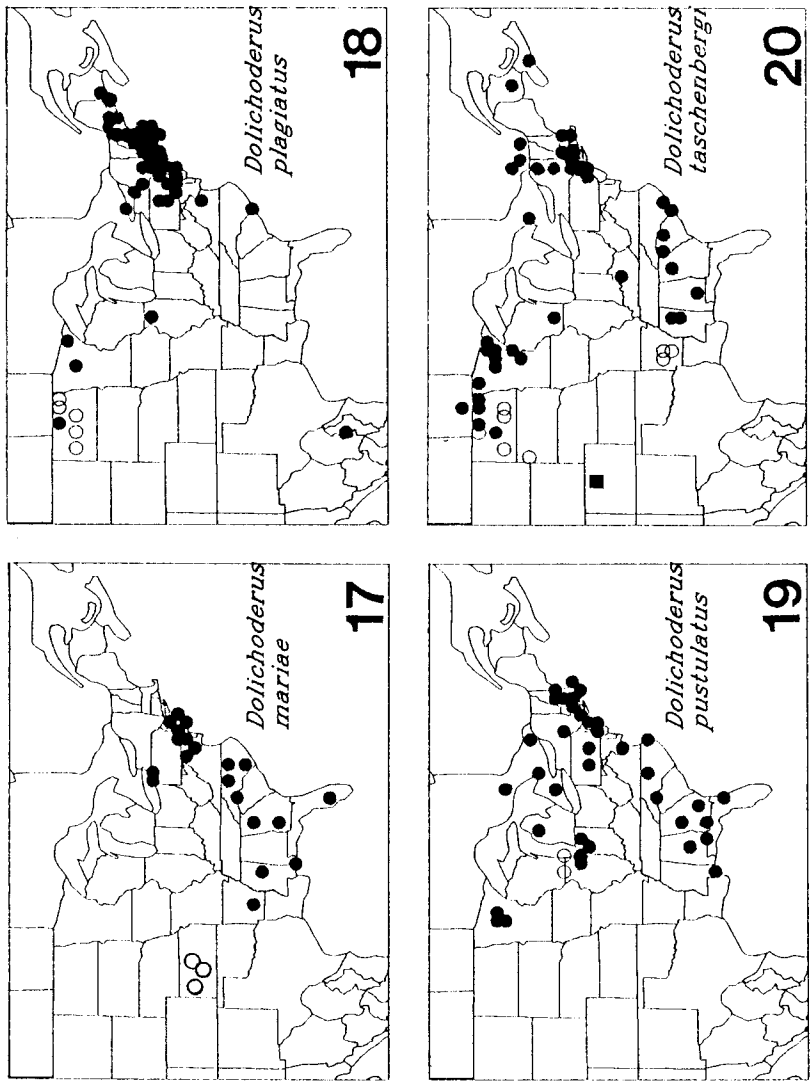
Maps 5 - 8. Distributions of: 5) *Dolichoderus imitator*; 6) *D. lugens*; 7) *D. piceus*, *D. voraginosus*; and 8) *D. shattucki*.



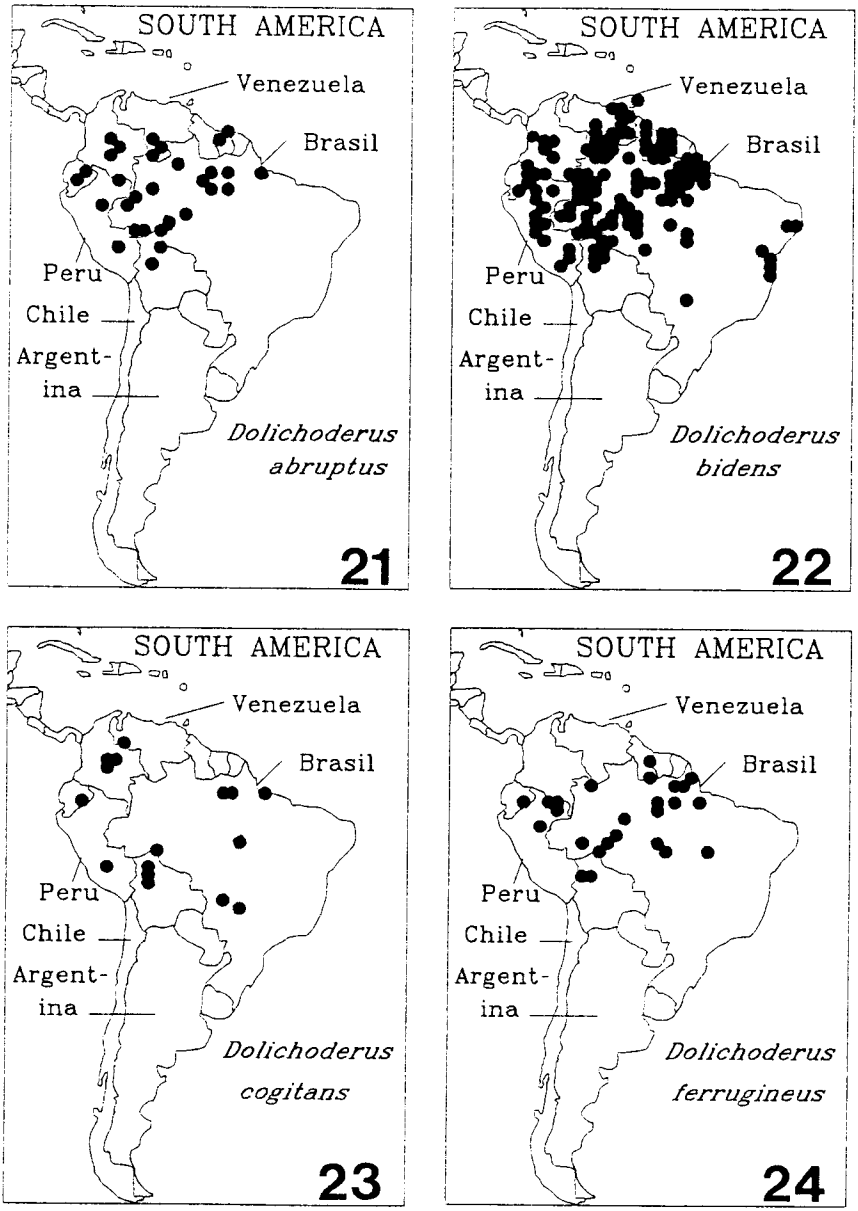
Maps 9 - 12. Distributions of: 9) *Dolichoderus bispinosus*; 10) *D. andinus*, *D. curvilobus*, *D. doloniger*, *D. epetreia*; 11) *D. mesonotalis*, *D. mucronifer*, *D. omacanthus*, *D. septemspinosus*; and 12) *D. spinicollis*, *D. superaculus*, *D. validus*.



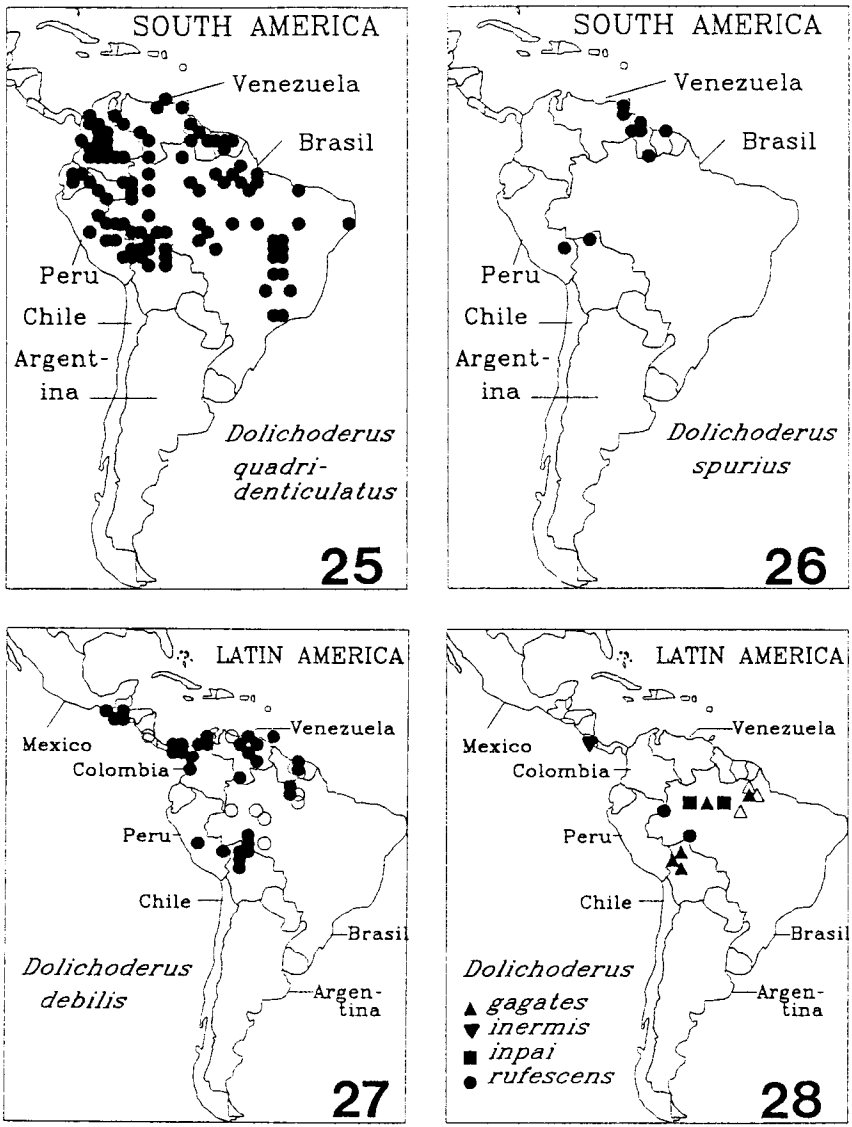
Maps 13 - 16. Distributions of: 13) *Dolichoderus lamellosus*; 14) *D. laminatus*; 15) *D. lobicornis*, *D. schulzi*, *D. setosus*; and 16) *D. smithi*, *D. tristis*, *D. varians*.



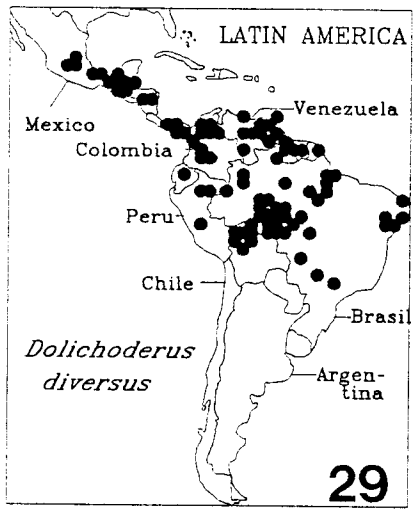
Maps 17 - 20. Distributions of: 17) *Dolichoderus mariae*; 18) *D. plagiatus*; 19) *D. pustulatus*; and 20) *D. taschenbergi*. The filled square indicates a fossil record.

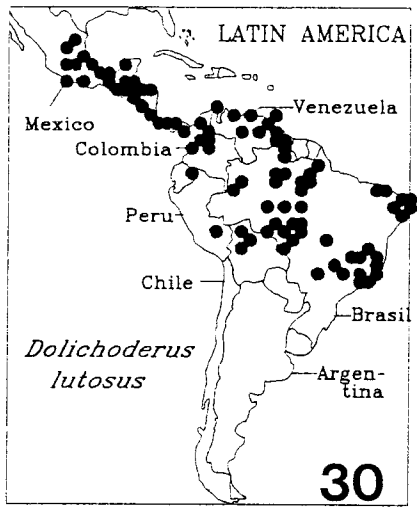


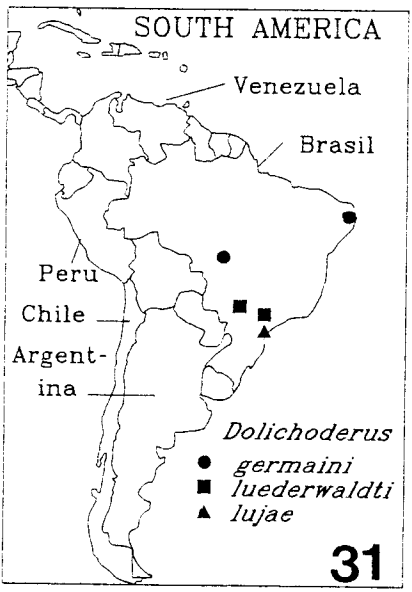
Maps 21 - 24. Distributions of: 21) *Dolichoderus abruptus*; 22) *D. bidens*; 23) *D. cogitans*; and 24) *D. ferrugineus*.

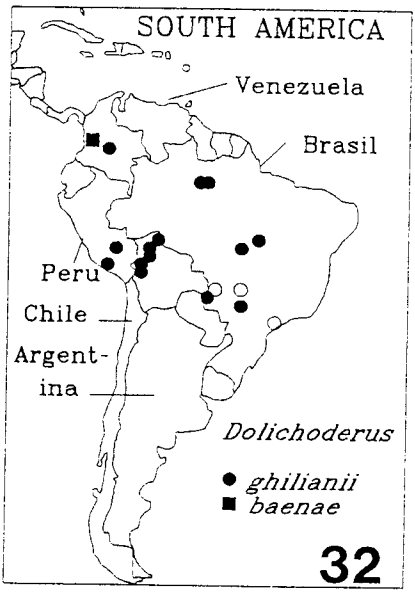


Maps 25 - 28. Distributions of: 25) *Dolichoderus quadridenticulatus*; 26) *D. spurius*; 27) *D. debilis*; and 28) *D. gagates*, *D. inermis*, *D. inpai*, *D. rufescens*.

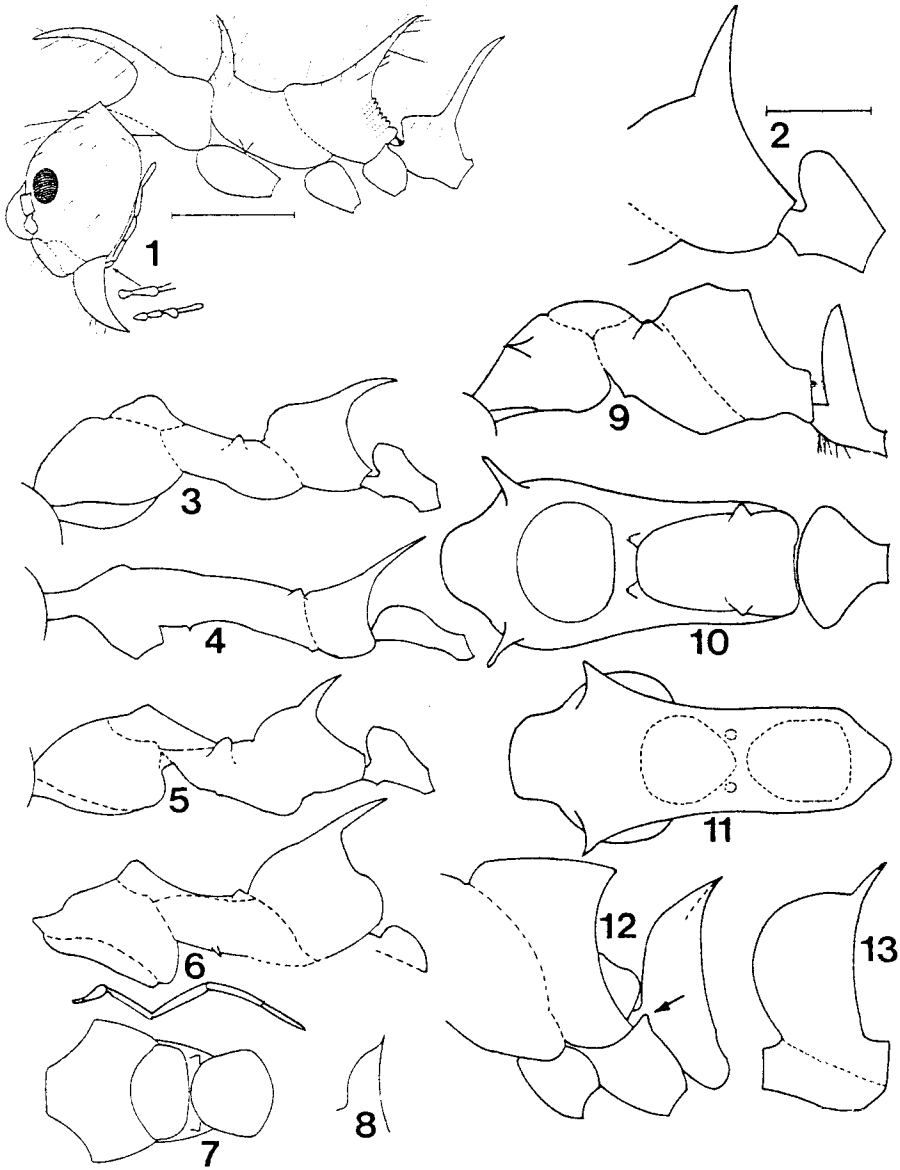




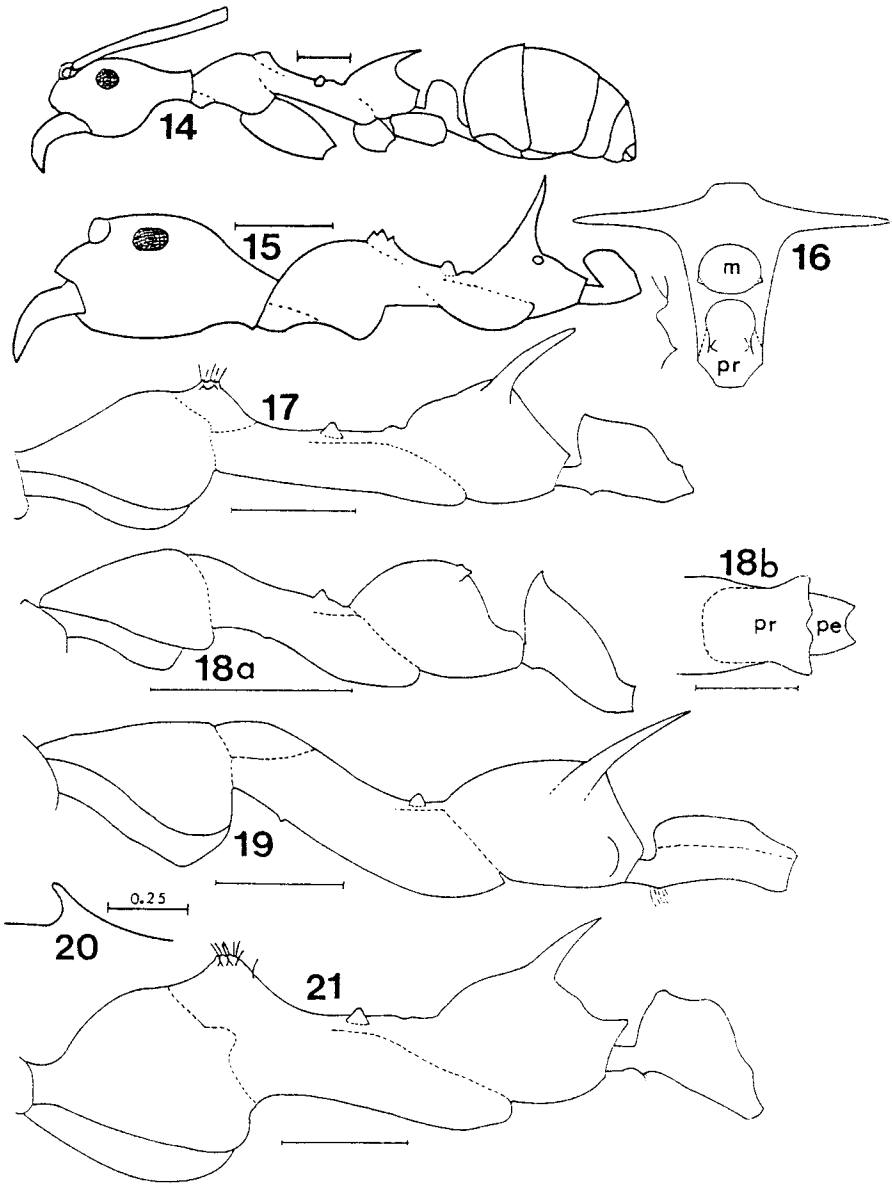




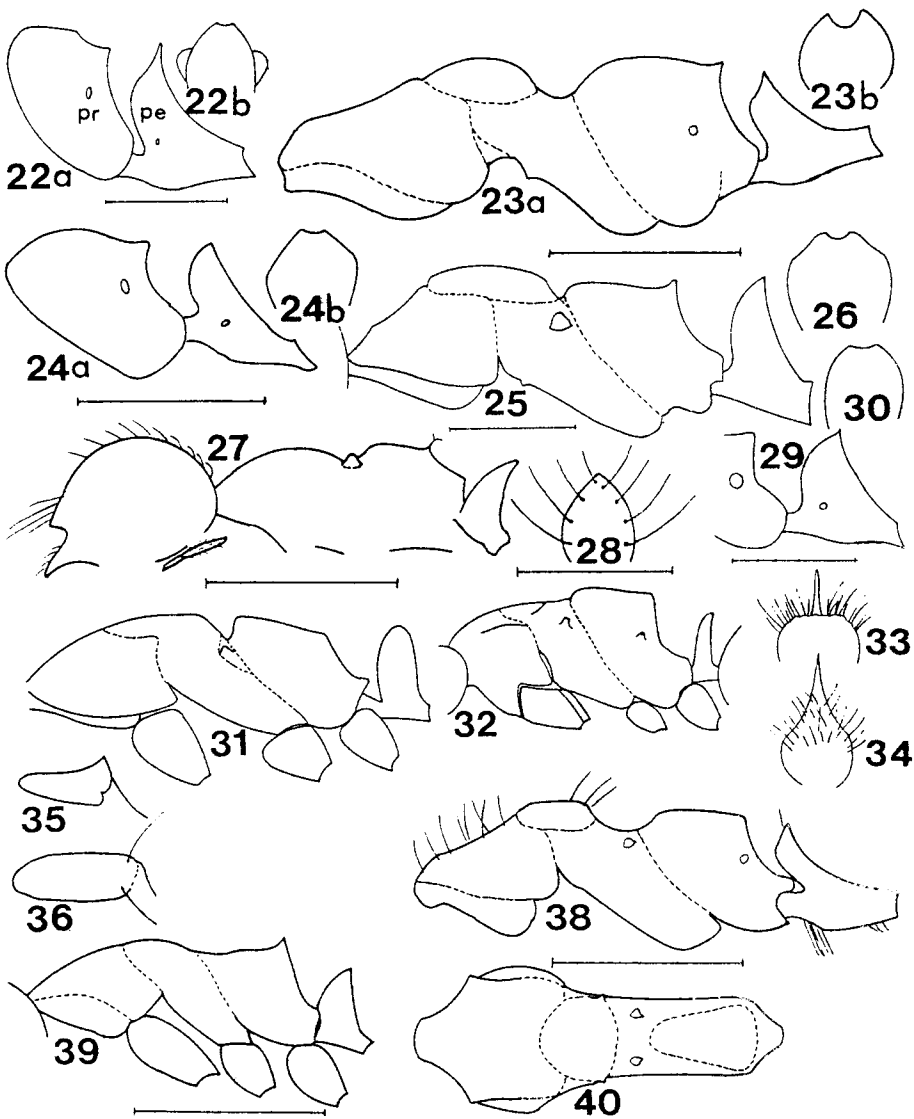
Maps 29 - 32. Distributions of: 29) *Dolichoderus diversus*; 30) *D. lutosus*; 31) *D. germaini, D. luederwaldti, D. lujae*; and 32) *D. ghiliani, D. baenae.*



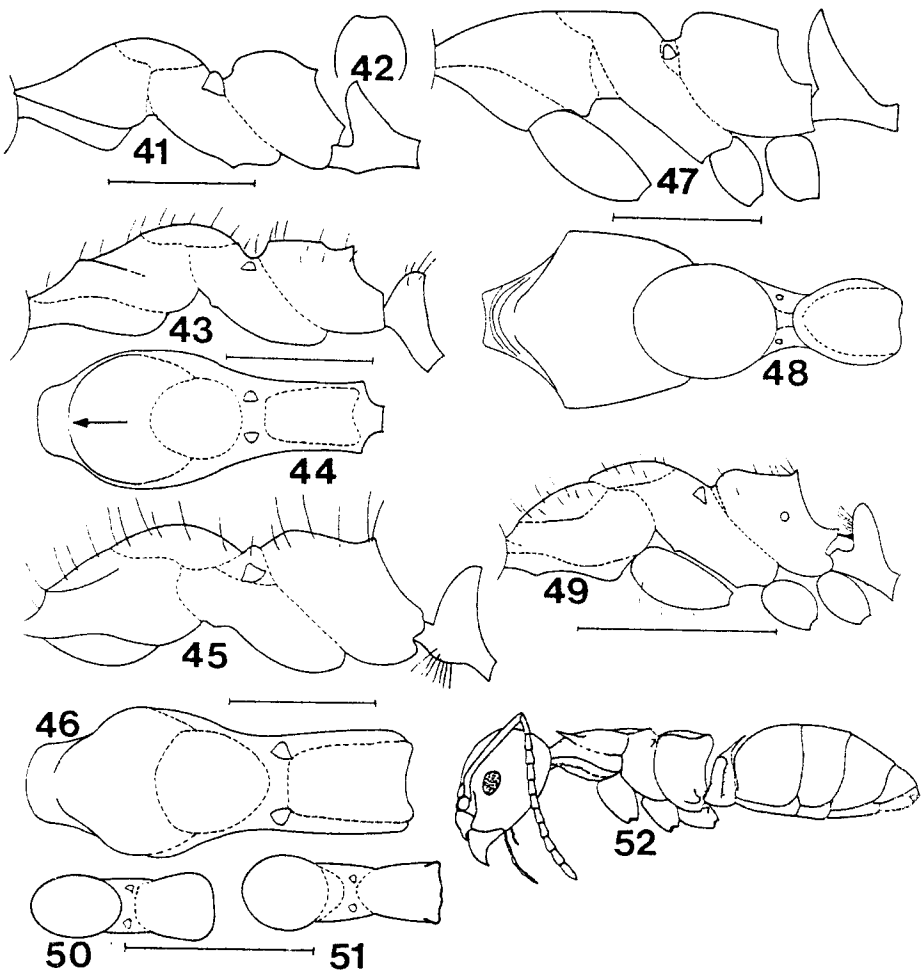
Figs. 1 - 13. Profiles and top views (7, 10, 11) of the mesosomata of *Dolichoderus* workers (bars = 1mm): 1) *D. shattucki* holotype; 2) typical *D. neglectus*; 3) typical *D. decollatus*; 4) *D. dibolius* holotype; 5) *D. fernandezi* holotype; 6) *D. intermedius* holotype, with maxillary palp; 7) *D. schulzi*; 8) *D. schulzi* petiole; 9) *D. inermis* holotype; 10) *D. inermis* holotype; 11) *D. inpai* holotype; 12) *D. lamellosa* (arrow indicates basidorsal tubercle); 13) *D. tristis* petiole.



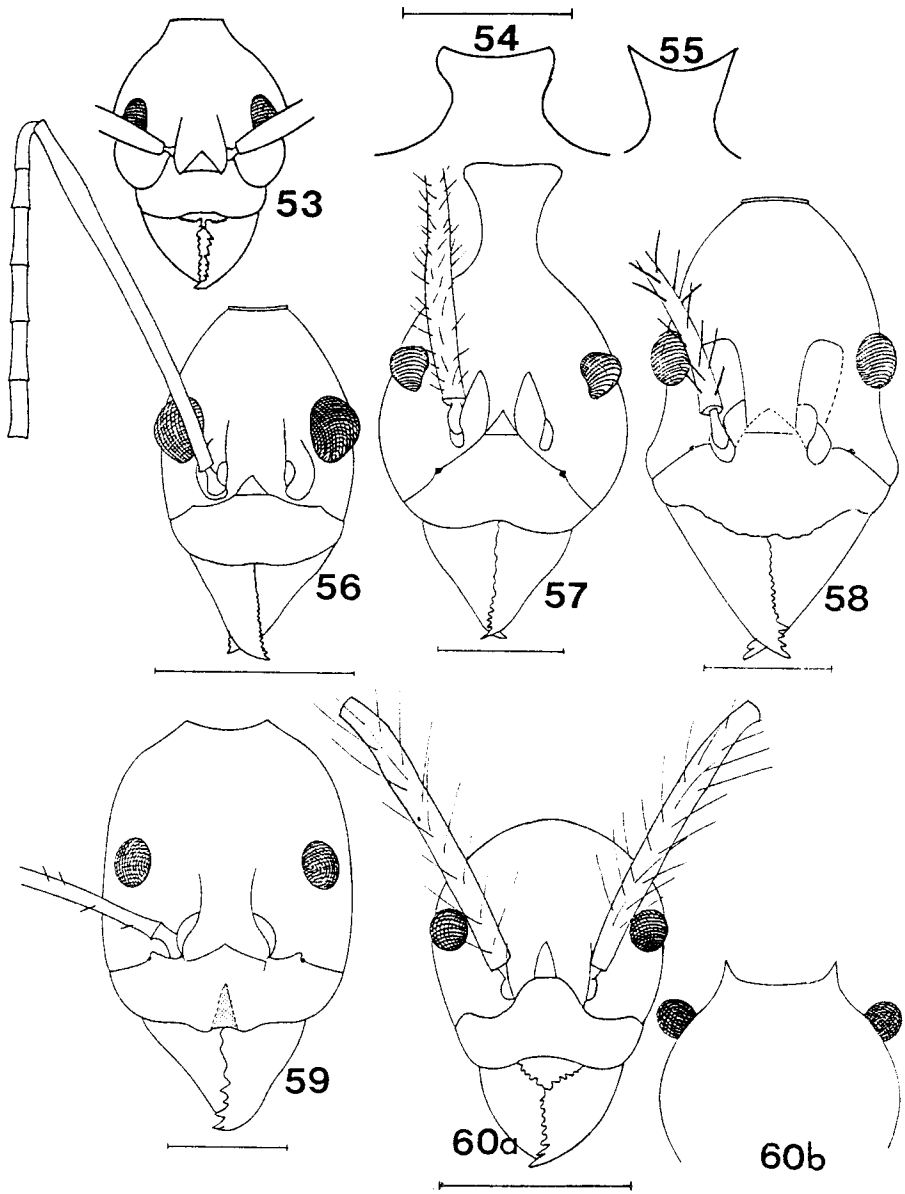
Figs. 14 - 21. Profiles and top views (16, 18b) of *Dolichoderus* workers (bars = 1mm, except for Fig. 20): 14) *D. attelaboides*; 15) *D. decollatus*; 16) *D. spinicollis* top view and profile (m = mesonotum, pr = propodeum); 17) *D. longicollis* paratype; 18a) *D. imitator* lectotype; 18b) *D. imitator* lectotype, top view of propodeum (pr) and petiole (pe); 19) *D. rugosus* holotype; 20) *D. rugosus* top view of mesopleural spine; 21) *D. rosenbergi* holotype.



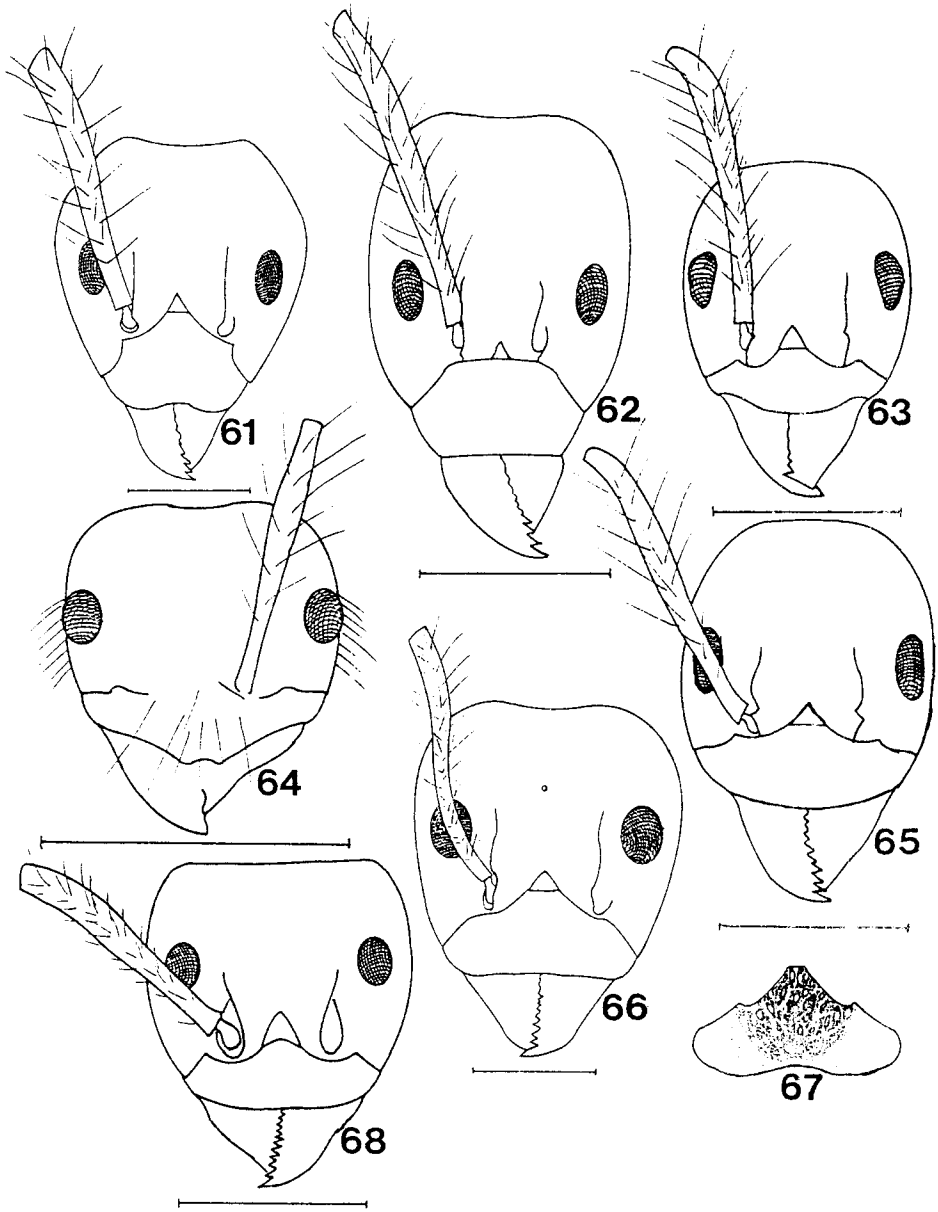
Figs. 22 - 40. Mesosomata and petioles of *Dolichoderus* workers (bars for Figs. 28, 33, 34 = 0.5mm, all others = 1mm): 22a) *D. abruptus* propodeum (pr) and Petiole (pe); 22b) *D. abruptus* frontal view of petiole; 23a&b) *D. bidens*; 24a&b) *D. ferrugineus*; 25) *D. quadridenticulatus*; 26) *D. quadridenticulatus*; 27) *D. primitivus* paratype; 28) *D. primitivus* paratype, frontal view of petiole; 29) *D. spurius* lectotype; 30) *D. spurius* lectotype, frontal view of petiole; 31) *D. lugens* lectotype; 32) *D. mesonotalis* (lectotype of *D. simplex*); 33) *D. bispinosus* frontal view of petiole; 34) *D. validus* frontal view of petiole; 35) *D. ghilianii*, oblique view of propodeum; 36) *D. baenae* holotype, oblique view of propodeum; 37) *D. smithi* paratype, propodeum; 38) *D. piceus* holotype; 39) *D. ghilianii* lectotype; 40) *D. piceus* holotype, dorsal view of mesosoma.



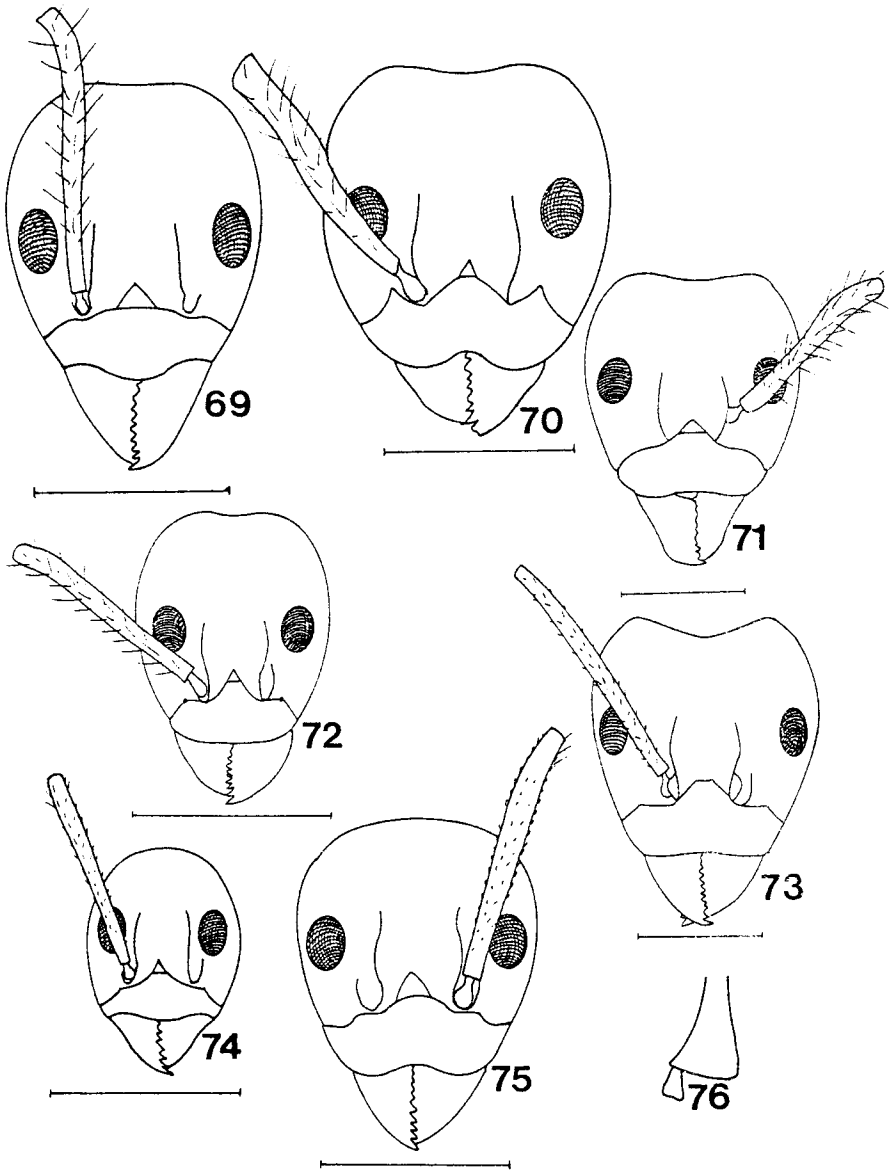
Figs. 41 - 52. Mesosomata of *Dolichoderus* workers (bars = 1mm): 41) *D. diversus*; 42) *D. diversus* petiole; 43) *D. luederwaldti* holotype; 44) *D. luederwaldti* holotype, top of mesosoma, arrow indicates depressed area; 45) *D. lujae* lectotype; 46) *D. lujae* lectotype; 47) *D. germaini* lectotype; 48) *D. germaini* lectotype, top of mesosoma; 49) *D. voraginosus* holotype; 50) *D. diversus* top of mesosoma; 51) *D. voraginosus* holotype, top of mesosoma; 52a) *D. bispinosus*; 52b) *D. bispinosus* top of mesosoma.



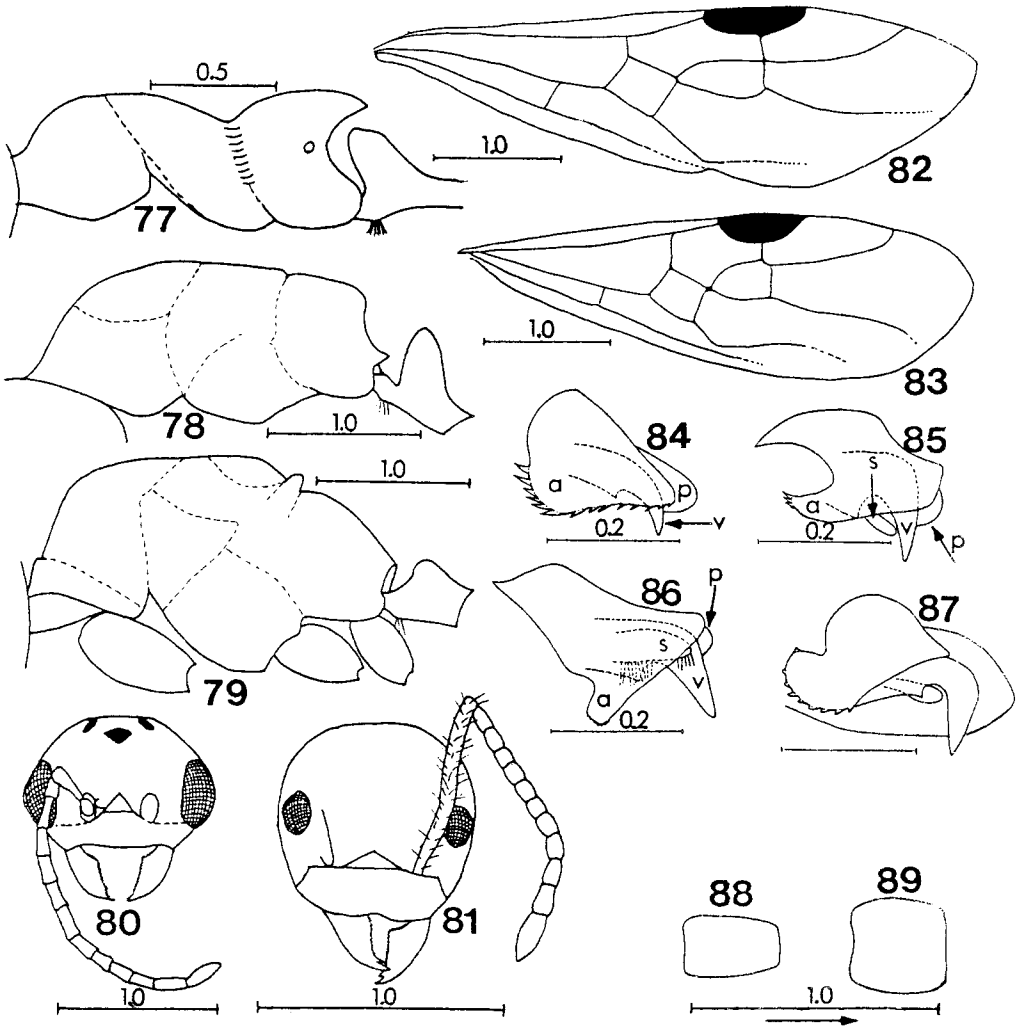
Figs. 53 - 60. Heads of *Dolichoderus* workers (bars = 1mm): 53) *D. decollatus*; 54) *D. attelaboides* neck; 55) *D. imbecillus* cotype, neck; 56) *D. imitator* lectotype, remainder of scape is missing in specimen; 57) *D. longicollis* paratype; 58) *D. rugosus*; 59) *D. fernandezi* holotype, stippled area indicates depression in clypeus; 60a) *D. shattucki* holotype; 60b) *D. shattucki* holotype, indicating hypothetical cross-section of head.



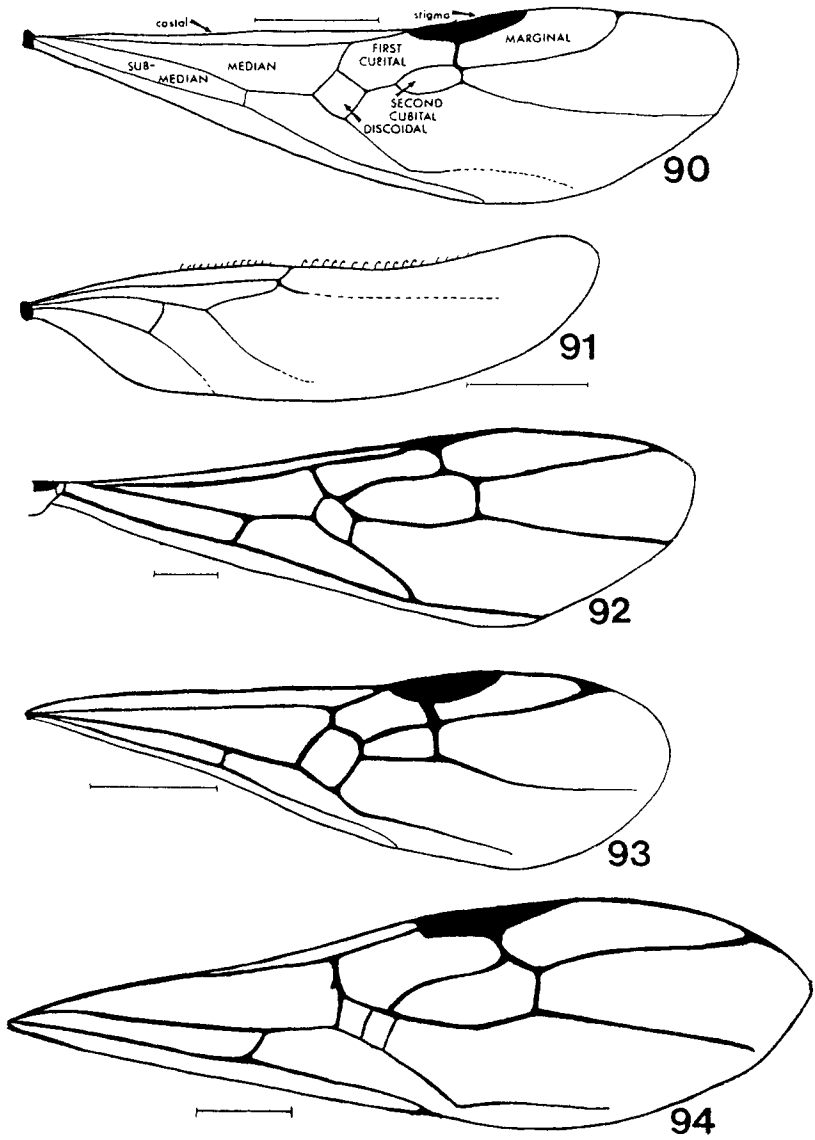
Figs. 61 - 67. Heads of *Dolichoderus* workers (bars = 1mm): 61) *D. abruptus*; 62) *D. bidens*; 63) *D. cogitans* lectotype, end of left mandible is broken in specimen; 64) *D. primitivus* paratype; 65) *D. ferrugineus* lectotype; 66) *D. quadridenticulatus*; 67) *D. andinus* paratype, clypeus; 68) *D. mesonotalis* (*D. simplex* lectotype).



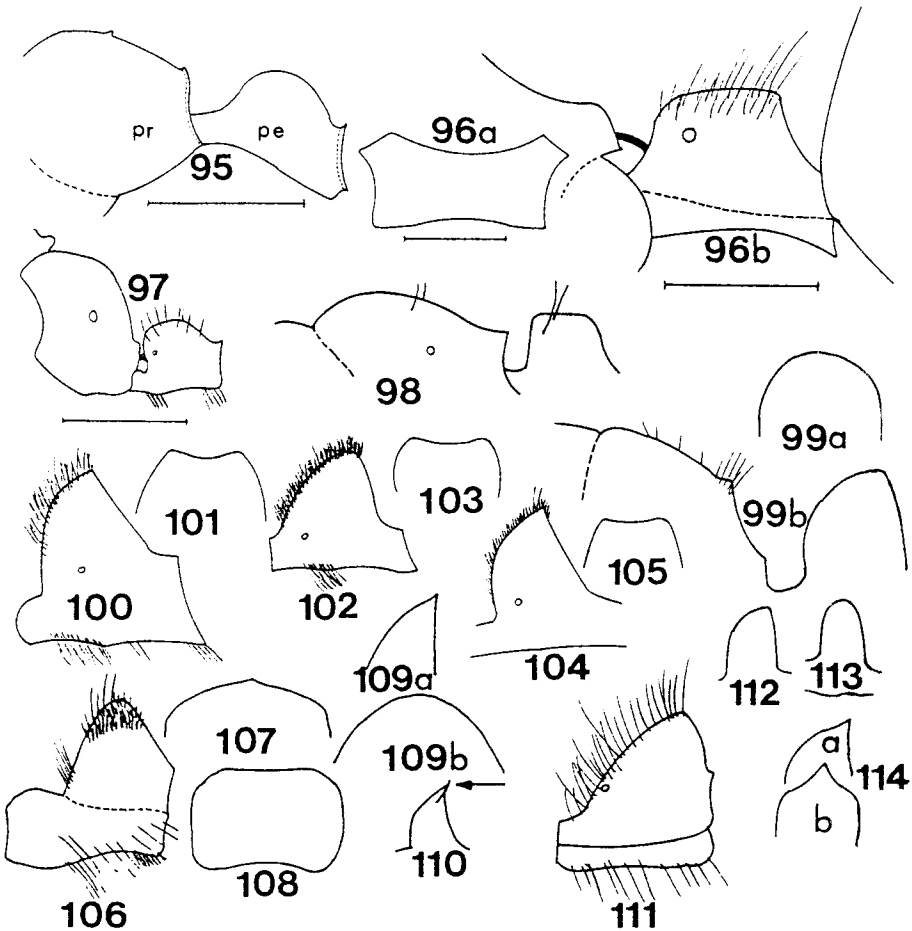
Figs. 69 - 76. Heads of *Dolichoderus* workers (bars = 1mm): 69) *D. diversus*; 70) *D. leuderwaldti* holotype; 71) *D. lujae* lectotype; 72) *D. voraginosus* holotype; 73) *D. lugens* lectotype; 74) *D. ghilianii* lectotype; 75) *D. piceus* holotype; 76) *D. lobicornis* paratype, base of scape.



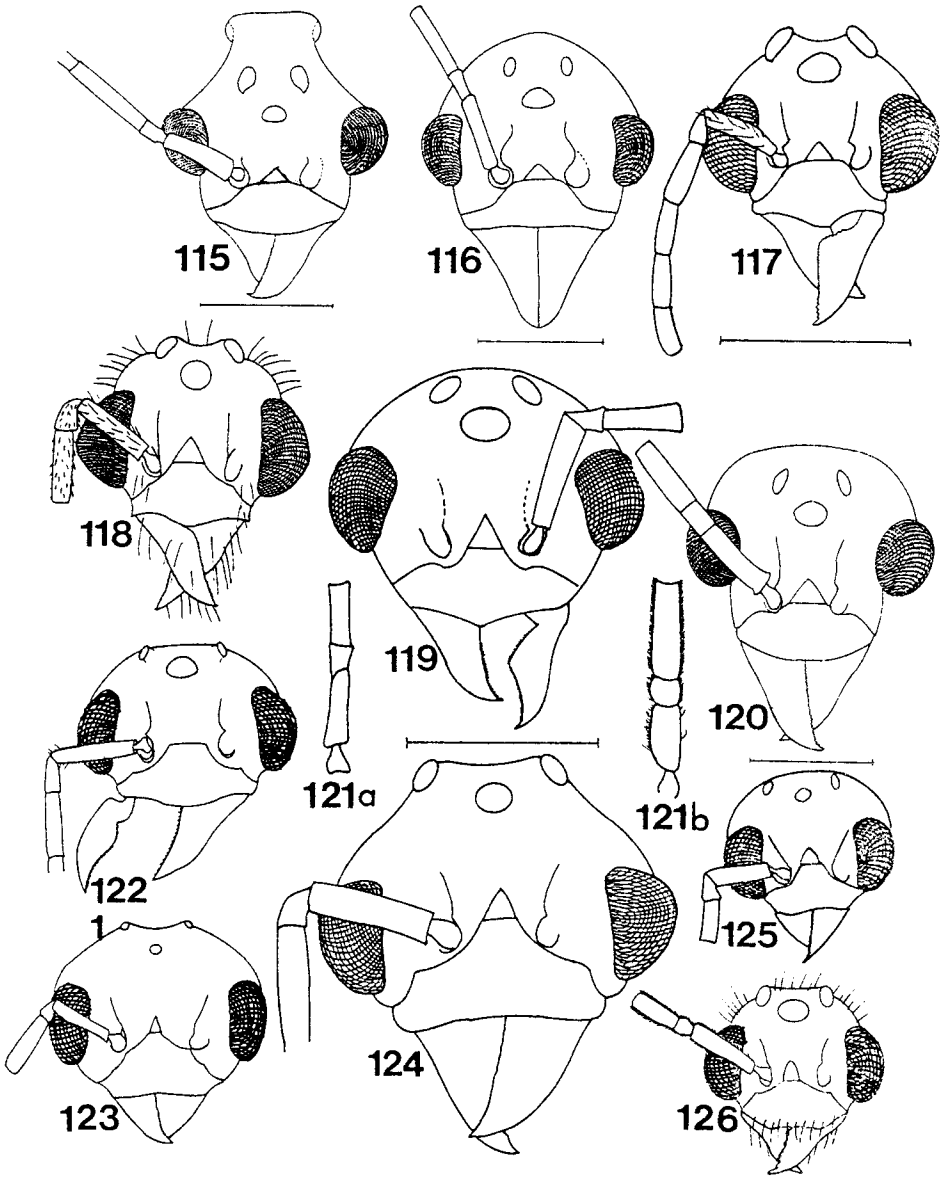
Figs. 77 - 89. Illustrations of the *quadripunctatus* species complex (bars for Figs. 84 - 87 = 0.2mm, all others = 1.0mm): 77) *D. plagiatus* worker mesosoma; 78) *D. mariae* female mesosoma; 79) *D. taschenbergi* male mesosoma; 80) *D. mariae* male head; 81) *D. plagiatus* worker head; 82) *D. mariae* male wing; 83) *D. pustulatus* male wing; 84) *D. plagiatus* right genital capsule; 85) *D. mariae* right genital capsule; 86) *D. taschenbergi* right genital capsule; 87) *D. pustulata* right genital capsule; 88) *D. mariae* top view of propodeum; 89) *D. taschenbergi* top of propodeum.



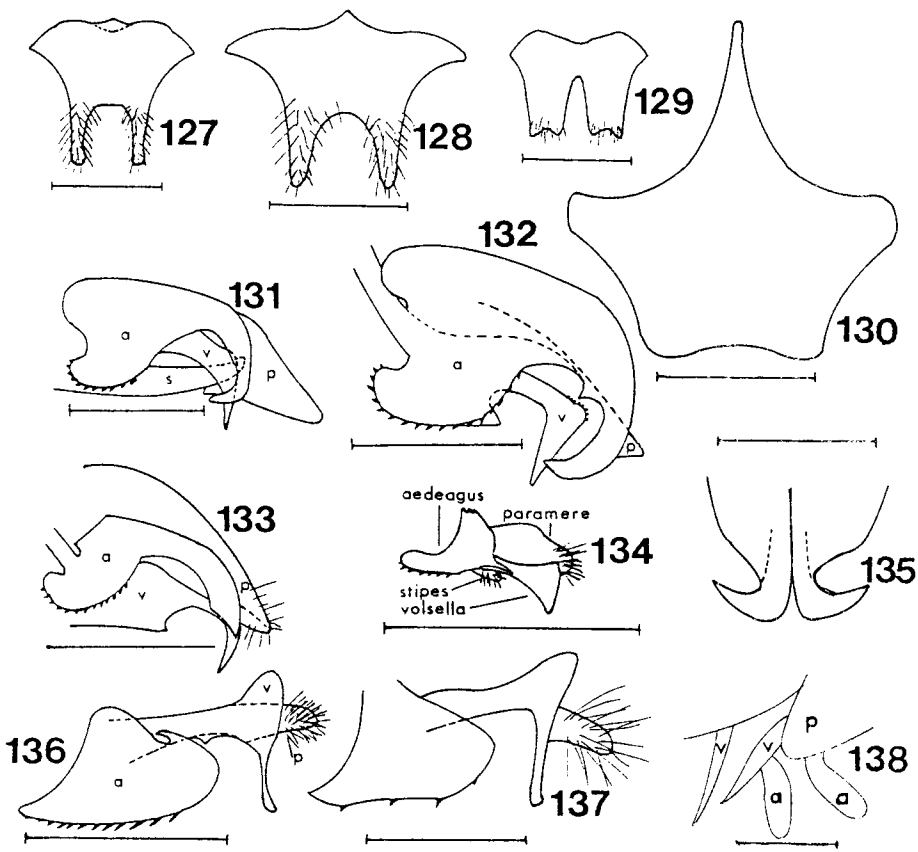
Figs. 90 - 94. Right wings of reproductives of *Dolichoderus* (bars = 1 mm, cells indicated in upper case, veins in lower case): 90) *D. shattucki* paratype, forewing; 91) *D. shattucki* paratype, hindwing; 92) *D. decollatus* forwing; 93) *D. imitator* forewing; 94) *D. rugosus* forewing.



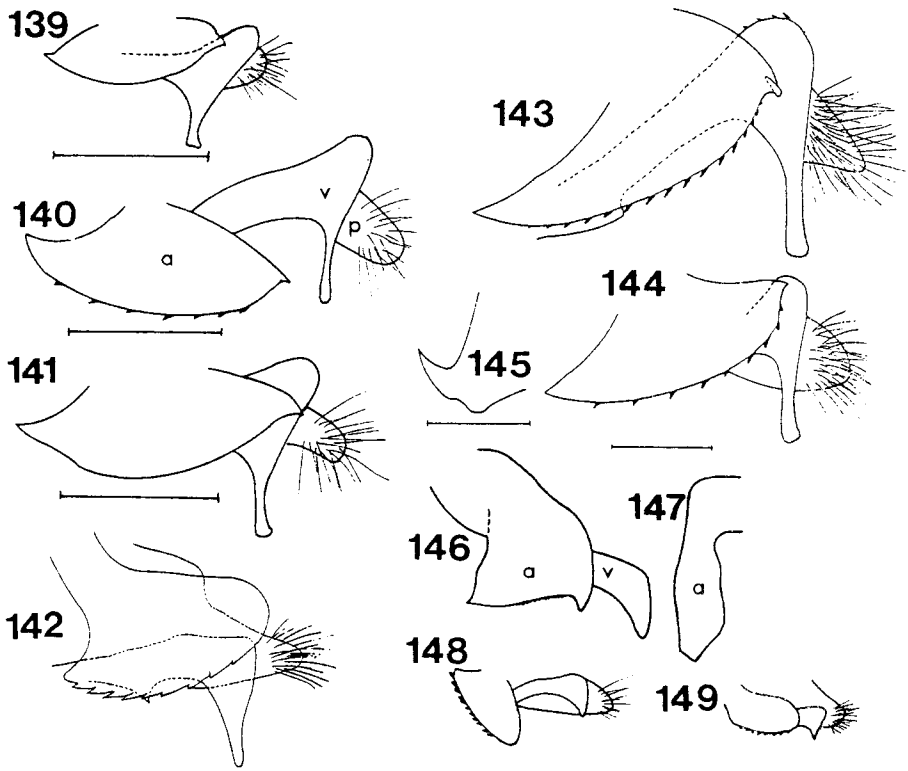
Figs. 95 - 114 Petioles of males of *Dolichoderus* (bars = 1mm in Figs. 95 and 97, 0.5mm in the others): 95) *D. attelaboides* (pr = propodeum, pe = petiole); 96a&b) *D. mesonotalis*, top and side views of petiole; 97) *D. lugens*; 98) undescribed species near *D. ghilianii*; 99a&b) *D. ghilianii* frontal and side view; 100) *D. quadridenticulatus*; 101) *D. quadridenticulatus*; 102 *D. bidens*; 103) *D. bidens*; 104) *D. abruptus*; 105) *D. abruptus*; 106) *D. mucronifer*; 107) *D. mucronifer* frontal view of petiole; 108) *D. mucronifer* top view of petiole; 109a&b) *D. schulzi*; 110) *D. laminatus* (arrow shows accuminate crest); 111) *D. varians*; 112) *D. rufescens* paralectotype; 113) *D. debilis*; 114a&b) *D. tristis*.



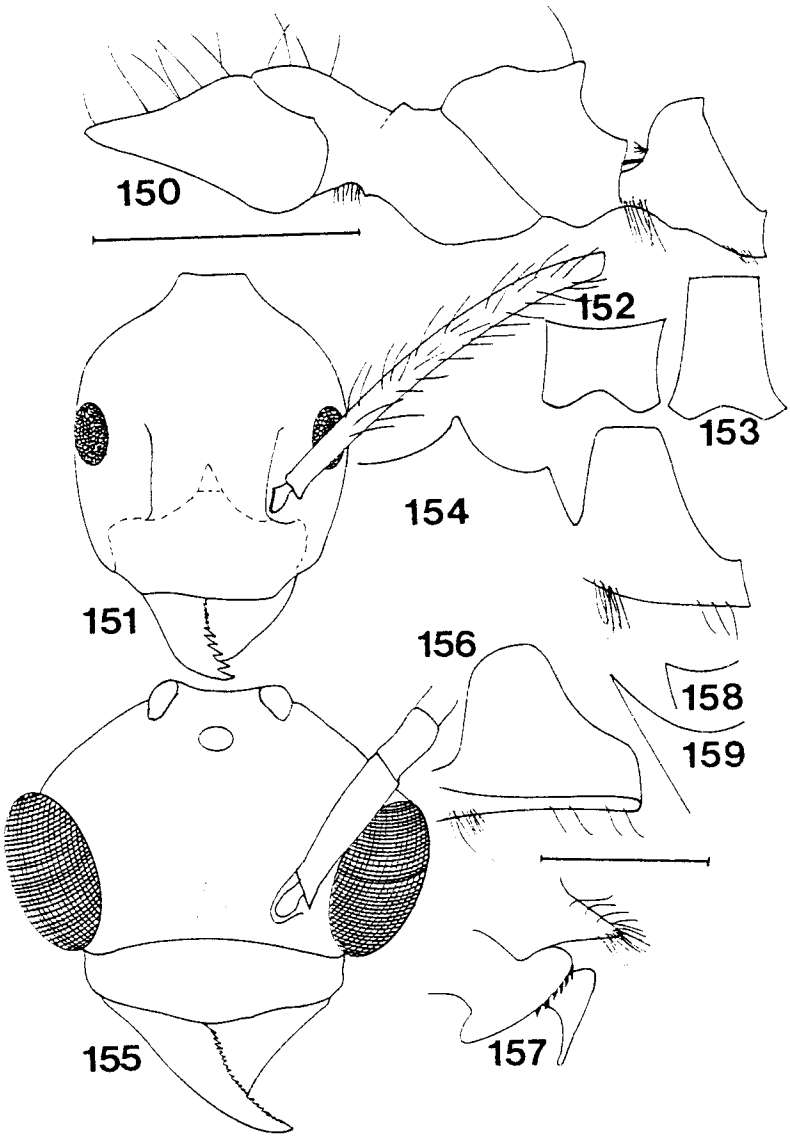
Figs. 115 - 126. Heads of males of *Dolichoderus* (bars = 1mm): 115) *D. attelaboides*; 116 *D. rugosus*; 117) *D. diversus*; 118) *D. ghilianii*; 119) *D. lugens*; 120) *D. quadridenticulatus*; 121a) *D. rufescens*, paralectotype, base of antenna; 121b) *D.* undescribed species near ghilianii, base of antenna; 122) *D. abruptus*; 123) *D. schulzi*; 124) *D. tristis*; 125) *D. lamellosus*; 126) *D. varians*.



Figs. 127 - 138. Genitalia of males of *Dolichoderus*, including subgenital plates (127 - 130) and right genital capsules (131 - 134, 136 - 137, a = aedeagus, v = vosella, s = stipes, p = paramere) (bars = 0.5mm): 127) *D. attelaboides*; 128) *D. rugosus*; 129) *D. imitator*; 130) *D. lutosus*; 131) *D. attelaboides*; 132) *D. rugosus*; 133) *D. imitator*; 134) *D. lamellosus*; 135) *D. lugens*, lateral view of digitiform process of aedeagus; 136) *D. lugens*; 137) *D. lugens*; 138) *D. mesonotalis*, posterior lateral view of genitalia.



Figs. 139 - 149. Genitalia of males of *Dolichoderus*, including right genital capsules (139 - 144, 146, 148 - 150, a = aedeagus, v = vosella, p = paramere) (bars = 0.5mm): 139) *D. lutosus*; 140) *D. diversus*, aedeagus pulled down to expose volsella; 141) *D. ghilianii*; 142) *D. debilis*; 143) *D. bidens*; 144) *D. quadridenticulatus*; 145) *D. quadridenticulatus*, top view of digitiform process of aedeagus; 146) *D. mucronifer*; 147) *D. mucronifer*, posterior border of aedeagus; 148) *D. varians*; 149) *D. schulzi*.



Figs. 150 - 159. Illustrations of *D. laurae* (150 - 157), *D. haradae* (158) and *D. bispinosus* (159) (bars for Figs. 150 - 155 = 1mm, 0.5mm for Figs. 156 - 159): 150) *D. laurae*, mesosoma of holotype worker; 151) *D. laurae*, head of holotype worker; 152) *D. laurae*, top view of propodeum of paratype female; 153) *D. laurae*, top view of propodeum of holotype worker; 154) *D. laurae*, propodeum and petiole of paratype female; 155) *D. laurae*, head of paratype male; 156) *D. laurae*, petiole of paratype male; 157) *D. laurae*, genitalia of paratype male, aedeagus and volsella pulled down to expose paramere; 158) *D. haradae*, left side of pronotum; 159) *D. bispinosus*, left pronotal spine (COLOMBIA: Chocó).

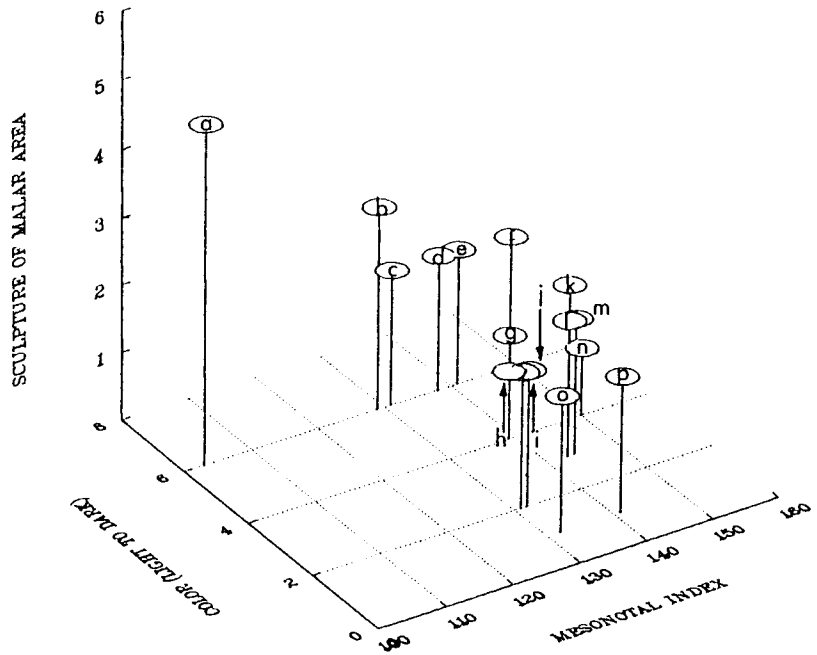


Fig. 160. Three dimensional distribution of the taxa related to *D. diversus* and *D. germaini*. Sculpture of the malar area was quantified as: 1 = weakly punctate, 2 = coarsely punctate, 3 = punctate and foveolate, 4 = strongly foveolate. Color was quantified as 1 = all reddish-yellow with striped gaster (light and dark brown), 2 = bicolored with striped gaster, 3 = bicolored with black gaster, 4 = brown with light yellow coxae, 5 = dark brown with light yellow coxae, 6 = concolorous dark brown. Mesonotal index (length / width X 100) is also plotted. The following are the taxa: a) *D. germaini* lectotype; b) *Hypoclinea championi* from México; c) *H. germaini garbei* syntype; d) *H. germaini laeviscula* syntype; e) Undescribed MCZC type # 21197; f) Undescribed MCZC type # 21199; g) typical *D. diversus*; h) Undescribed MCZC type # 21198; i) *Hypoclinea championi* from Panamá; j) Undescribed MCZC type # 21193; k) Undescribed MCZC type # 21200; l) *H. championi* from Paraguay; m) *H. championi* from Venezuela; n) *H. ornata* syntype (Brazil); o) *H. championi* syntype; p) *H. taeniata* syntype.

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