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**A revision of the Neotropical ant genus
Monacis Roger (Hym., Formicidae)**

By Walter W. Kempf, O.F.M.

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**A Revision of the Neotropical Ant Genus *Monacis* Roger
(Hymenoptera: Formicidae)**

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(With 64 figures on 5 plates)

The Dolichoderine ants of the genus *Monacis* Roger form a rather small group of species that are confined to the warmer parts of the Neotropical region. All of them lead an arboreal existence, building their nests on trees or inside cavities of the same. In the tropical rain forests, where these insects are seemingly more abundant both in species and in colonies, they appear to have taken to the ill-accessible tree canopy. This fact accounts for the relative scarcity of these ants in collections, except the common and widely dispersed species, such as *bispinosa* and *lamellosa*. It also suggests the prediction that at least a few more species will eventually be discovered when a thorough canvassing of the tree top fauna becomes possible.

From a systematic viewpoint, the genus does not offer appreciable difficulties. Most of the species are unusually well differentiated from each other. In the middle of the past century, the group also nearly escaped from the despairing flood of descriptions rendered by Frederick Smith, who in this group authored only a single species, still *inquirenda*. Likewise the heedless infraspecific splitting, which has done so much harm in other groups of ants, never went very far in this genus. The timid attempts made along this line by Forel and Santschi can now safely be tucked away into synonymy.

However, the lack of a recent synthesis and of up-to-date keys to the species still called for a revision. Having seen material of all hitherto described species, except two, and of three additional forms apparently new to science, I was able to perform this investigation, the results of which are presented on the following pages.

It must be emphasized that this study deals mainly with species-level problems. Generic differences merely received an incidental and cursory treatment, which does not preempt a future genus-level review deemed necessary for the entire subfamily Dolichoderinae.

Acknowledgements. — A fellowship granted by the "Conselho Nacional de Pesquisas" of Brazil and the loan, gift or exchange of specimens from several sources made this synopsis possible. Most of the material was received from the collection of Father Thomas Borgmeier, O.F.M., of Jacarepagua, D. F., Brazil [CTB], to whom I am particularly indebted for the generous gift of all pertinent specimens, now incorporated in my collection [WWK]. Dr. W. L. Brown, Jr., of the Museum of Comparative Zoology at Harvard University [MCZ], Dr. Delfa Guiglia, of the Museo Civico di Storia Naturale at Genova, Italy [MCSN], Dr. M. R. Smith, of the U. S. National Museum at Washington [USNM] are thanked for loan, exchange of, or information on, specimens under their care. Likewise I gratefully acknowledge the free use of the collections at the Departamento de Zoologia de São Paulo [DZSP].

Note on measurements. — *Total length* is the sum of the linear measurements of the head with closed mandibles, Weber's length of thorax, length of petiole and length of normally contracted gaster. *Length of head* consists in the maximum length of the head capsule proper, as measured from a transverse through the posteriormost point of the occipital border to a transverse through the anteriormost point of the clypeal border. *Width of head*, of course, is the maximum distance between the sides of the head. *Length of scape* is the maximum straight-line distance between the tip and the base of the scape, excluding the distinctly separated basal condyle or articular ball. *Length of thorax* is Weber's measurement, *i. e.* the distance between the foremost point of the anterior pronotal margin and the posterior extremity of the metapleural lobe, as seen from the side.

I neglected proportional measurements or indices, although in some instances these could furnish additional good characters.

Note on drawings and magnification. — All drawings were made with the aid of a Leitz binocular stereoscopic wide-field microscope and an O.P.L. (Optique de Précision de Levallois, Paris) Camera Lucida at the following magnifications:

- Eyepiece 8× and objective 1×: Pl. 5, figs. 3, 4, 8.
- Eyepiece 8× and objective 2×: Pl. 5, figs. 1, 2, 5.
- Eyepiece 8× and objective 4×: Pl. 1, fig. 11; Pl. 2, figs. 3, 4; Pl. 3, fig. 10; Pl. 4, figs. 2, 6, 7, 9, 10.
- Eyepiece 8× and objective 8×: Pl. 5, figs. 10, 12.
- Eyepiece 12.5× and objective 2×: Pl. 1, figs. 1-6; Pl. 2, figs. 1, 2, 5-7, 9; Pl. 3, figs. 1-4, 6, 7; Pl. 5, figs. 6, 7.
- Eyepiece 12.5× and objective 4×: Pl. 1, figs. 7-10, 12; Pl. 2, figs. 8, 10-14; Pl. 3, figs. 5, 8, 9; Pl. 4, figs. 1, 3-5, 8, 11-13; Pl. 5, figs. 9, 11.
- Eyepiece 12.5× and objective 8×: Pl. 5, figs. 14-16.

Abbreviations. — A capital letter is used to indicate the caste of the specimens mentioned in the bibliography and in the list of the material examined: W = worker; F = female; M = male.

Genus *Monacis* Roger

- Monacis* Roger, 1862, Berl. Ent. Zeitschr. 6 : 233-234. — Roger, 1863, Verz. Formicid. p. 15.
Hypoclinea (part.) Mayr, 1862, Verh. Zool.-bot. Ges. Wien 12 : 704-705. — Mayr, 1863, Verh. Zool.-bot. Ges. Wien 13 : 423-424. — Mayr, 1870, Verh. Zool.-bot. Ges. Wien 20 : 953-956 (Key).
Dolichoderus (part.), Forel, 1878, Bull. Soc. Vaud. Sci. Nat. 15 : 386. — Dalla Torre, 1893, Cat. Hym. 7 : 158-161.
Dolichoderus (*Monacis*), Emery, 1894, Bull. Soc. Ent. Ital. 26 : 228, 231-234. — Emery, 1812, Gen. Ins. Subf. Dolichoderinae, fasc. 137, pp. 9-10.
Monacis, Brown, 1950, Wasmann Journ. Biol. 8 : 249.

Type of the genus: *Formica bispinosa* Olivier, 1791 (W; French Guiana: Cayenne) [= *Monacis bispinosa* (Olivier, 1791)], designation by Wheeler, 1911 (1912).

Historical Note

Olivier (1791) described the first species of the genus under the name of *Formica bispinosa* upon a worker from Cayenne. In 1823, Latreille made known the second and certainly the most bizarre species of the group, *Formica spinicollis*. Mislead by the long spines on thorax and petiole, Frederick Smith (1858) transferred both species from the protean genus *Formica* to the paleotropical genus *Polyrhachis* (Oriental, Australian and Ethiopian regions), which today even belongs to a different subfamily.

Describing two more species of the same complex, *mucronifera* and *dolonigera*, Roger (1862) decided to create for it a special genus which he named *Monacis*. Roger's definition of the new genus is rather restrictive, applying strictly to the *bispinosa*-group, inasmuch as none of the forms of the other species complexes had then been discovered. Still in the same year, Mayr voiced his disagreement, declaring that *Monacis* is scarcely distinguishable from *Hypoclinea*, and therefore sunk it as a synonym of the latter. Roger, in his catalogue of Formicidae (1863), partly yielded to Mayr's protest, but strangely enough kept *Monacis* alive, leaving it with a lone species, *mucronifera*, perhaps on account of the completely unarmed epinotum. However, this arbitrary measure fell flat, since nobody accepted it.

In 1870, Mayr described two forms of a different species-group, *laminata* and *lamellosa*, both captured in Colombia. In the same year he offered a key to the species for workers of *Hypoclinea* (in a very broad, now completely obsolete sense), including all known forms of the present group.

In the meantime Forel was working on the structure of the formicid proventriculus and as a result of his findings published in 1878 a new arrangement of the subfamilies and genera of Formicidae. As far as *Hypoclinea* was concerned, it was dropped as a synonym and most of its species, including those of the present assembly, were shifted to *Dolichoderus*.

Emery entered the scene in 1890 with the description of the first members of the *debilis*-group, which in turn conspicuously broadened the genus concept. In 1894 he also resolved to split up again the unwieldy genus *Dolichoderus*, as proposed by Forel, reviving *Hypoclinea* in the strict sense and *Monacis* as valid subgenera. This system was published in its final form in the Dolichoderinae section of Genera Insectorum (1912).

Excepting the accretion of several new forms, nothing else happened until 1950, when Brown, in a short and perhaps a little informal note, suggested to treat as distinct genera at least the New World forms of the three subgeneric groups of *Dolichoderus*: *Dolichoderus s. str.*, *Monacis* and *Hypoclinea*. Although it rests merely on a reappraisal of data already known, this proposal appears to be sound and is adopted in this paper.

Generic Features

Worker. — Monomorphic. Medium-sized, 3-8 mm. Integument rather heavily sclerotized and hard. Mandibles triangular, the chewing border with 8-10 small teeth, the inner border multidenticulate. Maxillary palpi with 6, labial palpi with 4 segments. Antennae 12-segmented. Usually no ocelli (exception: *spenicollis* and rarely *lamellosa*). Thorax relatively short, compact and depressed (as compared with *Dolichoderus*!). Anterolateral corners of pronotum either sharply angulate, or dentate, or spinous. Mesonotum more or less transverse (several exceptions, especially *laminata* and *varians*!). Mesoepinotal suture always deeply impressed. Petiole scalelike, higher than long, its anterior face more or less convex, the posterior face flat or slightly concave, the summit either with a long, needlelike spine, or with a short single tooth, or with a transverse, mesially more or less acuminate, inclined crest. Base of gaster more or less excavate. The proventriculus, presenting in its cuticular framework an ovoid bulb and a flattened dome, constitutes the simplest type in the subfamily, and does not seem to differ from that of *Dolichoderus* and *Hypoclinea*, according to Forel and Emery (Eisner, in a recent and excellent survey of the principal types of formicid proventriculus, published in 1957, does not mention *Monacis*).

Female. — Resembling the worker as regards distinctive traits. Ocelli always present. Pronotal humeri angulate or dentate (exceptions: *debilis*, *rufescens* and presumably also *gagates*!). Alate; fore wing usually with 2 cubital (submarginal) cells (exception: *schulzi* with 1 cubital cell!) and 1 discoidal cell. Radial (marginal) cell closed and appendiculate.

Male. — Integument as in worker, wings as female. Smaller than female, having the size of the worker. Mandibles triangular, elongate, chewing and basal borders multidenticulate. Palpi 6 resp. 4-segmented. Antennae 13-segmented. Scape approximately as long as, never longer than, funicular segments I and II combined. Shoulders rounded. Mesonotal scutum with parapsidal sutures, lacking Mayrian furrows. Petiole either with a low

node or scale. Genitalia: base of outer claspers (parameral plate = *lp*) short and broad, apex (paramere = *Pmr*) short and small; volsellae with greatly retracted and scarcely distinguishable cuspis (*cus*) and long, hooklike digitus (*dig*). Aedoeagal valves (*pv*) shorter than high (Cf. Pl. 4, figs. 14-16; Pl. 5, figs. 9-12).

Monacis shares a great many of these features with *Dolichoderus* s. str. and *Hypoclinea*. To mention the strictly differential characters, these may be stated as follows:

The distinctive traits of the workers consist in the shape of the thorax, especially the angulate, dentate or spinous pronotal angle, the generally transverse and laterally marginate mesonotum, the situation of the metathoracic spiracles next to the anterior border of epinotum, the shape of the petiolar scale.

Females have similar features, but *debilis*, *rufescens* and probably *gagates* are lacking dentate or angulate shoulders. These three species, as a group, are scarcely separable from the *lutosa*-complex of Neotropical *Hypoclinea*, according to our present knowledge.

The generic differences for the males have not been worked out because this caste is too little known, of only a few species. While it is too early for generalized statements, it seems safe to say that at least details of the genitalia offer usable group characters.

List of *Monacis* Species with Synonyms

- bispinosa* (Olivier, 1791) — S. Mexico to N. Argentina
 = *fungosa* (Fabricius, 1798)
 = *vestita* (Mayr, 1862)
 = *arboricola* (Norton, 1868)
debilis (Emery, 1890) — Guatemala to Amazon
 = *debilis* var. *sieversi* (Forel, 1901) — nov. syn.
 = *debilis* var. *parabiotica* (Forel, 1912) — nov. syn.
dolonigera Roger, 1862 — Venezuela
gagates (Emery, 1890) — NE. Brazil to Bolivia
lamellosa (Mayr, 1870) — Costa Rica to N. Argentina
 = *lamellosa* var. *missionensis* (Santschi, 1916) — nov. syn.
laminata (Mayr, 1870) — Amazon to Panama
 = *laminata luteiventris* (Emery, 1894) — nov. syn.
lobicornis, n. sp. — Brazil: Goiás, Santa Catarina
mucronifera Roger, 1862 — Guianas to NE. Brazil
 = *spinicollis ensiger* (Forel, 1910)
obscura (F. Smith, 1858) — Brazil
rufescens (Mann, 1916) — nov. stat. — Brazil: Rondônia
schulzi (Emery, 1894) — Amazon to Costa Rica
 = *schulzi* var. *columbica* (Forel, 1911) — nov. syn.
 = *biolleyi* (Forel, 1908) — nov. syn.
septemspinosa (Emery, 1894) — NE. Brazil, Guianas, Bolivia, Ecuador
setosa, n. sp. — Brazil: Pará
spinicollis (Latreille, 1832) — Brazil: Amazon basin
tristis (Mann, 1916) — Brazil: Rondônia
valida, n. sp. — Costa Rica, Panama
varians (Mann, 1916) — Brazil: Rondônia

Species relationships based on workers. — According to petiole characters the genus is divisible into three major groups:

I. *bispinosa*-group, characterized by the long, needlelike spine on the petiolar summit. This group contains the largest species of the genus and comprises (a) *spinicollis* and *mucronifera*, both with oblique, flat declivous face of epinotum; (b) *septemspinosa*, *dolonigera*, *bispinosa* and *valida*, that have the declivous face vertical and distinctly excavate. The pair of long epinotal spines of *septemspinosa* and the narrow, elongate head of *dolonigera* make these two isolated species, whereas *bispinosa* and *valida* are very closely related.

II. *debilis*-group, marked by the scarcely sculptured, shining petiole, which bears apically a very short, often quite rudimentary tooth. Included are (a) *debilis*, *gagates*, *rufescens*, all lacking a basidorsal tubercle on hind coxae, having a broad metanotal groove, and obtusely marginate lateral borders of the pronotum (their females, devoid of angulate pronotal humeri, form the closest approach to the genus *Hypoclinea* through the *lutosa*-group of the latter); (b) *schulzi*, with opposite characters, connecting in many ways with the following group through *tristis*.

III. *laminata*-group, having the petiole strongly sculptured and at least partly opaque. The petiolar summit either bears in the middle a short spine as in (a) *tristis*, or a transverse, mesially more or less acuminate crest. The latter species split into two divisions: (b) of *laminata* and *varians*, lacking a basidorsal tubercle on hind coxae and having the mesonotum at least as long as broad; (c) of the closely related assembly of *lamellosa*, *lobicornis* and *setosa*, distinguished by the presence of a basidorsal tubercle on hind coxae, short and slightly transverse intermediate funicular segments, and a transverse mesonotum. The thorax of the latter species is reticulate-rugose and foveolate, as the head.

Key to the Species for Workers

1. Petiolar scale produced apically as a long, needlelike spine (Pl. 4, figs. 4, 5) 2
- Apex of petiole without a long, needlelike spine 7
2. Posterior corners of mesonotum and basal face of epinotum with a spine, the mesonotal spines shorter and suberect, the epinotal spines longer and obliquely raised upward (Pl. 3, fig. 2) 3. *septemspinosa* (Emery)
- Posterior corners of mesonotum and epinotum without such a spine, at most with a very short tooth or else unarmed 3
3. Basal face of epinotum elongate, its maximum width subequal to width of mesonotum, its posterior border marginate or crested, overhanging the excavate declivous face (Pl. 2, figs. 1, 7, 9; Pl. 3, figs. 3, 6, 7) 4
- Basal face of epinotum subquadrate, its posterior border immarginate, not overhanging the flat, not excavate, declivous face (Pl. 2, figs. 5, 6; Pl. 3, figs. 1, 4) 6
4. Head capsule longer than broad, little expanded behind; standing hairs practically absent on head and thorax, none on scapes and legs; color yellowish-brown (Pl. 1, fig. 4) 6. *dolonigera* Roger
- Head capsule at most as long as broad, usually broader than long, conspicuously expanded behind; standing hairs abundant, also on scapes and legs; color predominantly black (Pl. 1, figs. 5, 6) 5

5. Scape, excluding articular condyle, distinctly shorter than maximum length of head; petiolar summit more or less transversely truncate and slightly crenulate (Pl. 4, fig. 4); promesonotum reticulate-rugose
4. *bispinosa* (Olivier)
- Scape, excluding articular condyle, about as long as maximum length of head; petiolar summit gradually tapering off as a needlelike spine (Pl. 4, fig. 5); promesonotum only densely and coarsely punctate 5. *valida*, n. sp.
6. Pronotal spines huge and strong, extending laterad much beyond the maximum width of head; posterior corners of basal face of epinotum dentate (Pl. 2, fig. 6) 1. *spiniollis* (Latreille)
- Pronotal spines much shorter, extending obliquely forward and laterad not beyond the maximum width of head; posterior corners of basal face of epinotum unarmed (Pl. 2, fig. 5)
2. *mucronifera* Roger
7. Petiolar scale nearly smooth and shiny, its summit mesially with a very small, often vestigial, tooth, laterally usually not sharply marginate (Pl. 3, fig. 8), or else thorax with a broad, deeply impressed metanotal groove (Pl. 3, figs. 5, 9) 8
- Petiolar scale opaque, strongly and densely sculptured, its summit either with a transverse, inclined, mesially acuminate crest, or only transversely sharply marginate, with a short spine in the middle. 11
8. Hind coxae lacking a basidorsal tubercle; basal face of epinotum conspicuously narrower than mesonotum (Pl. 2, figs. 11, 14); metanotal groove broad and deeply impressed (Pl. 3, figs. 5, 9) . . 9
- Hind coxae with a basidorsal tubercle; basal face of epinotum nearly as broad as mesonotum (Pl. 2, fig. 10); metanotal groove narrow (Pl. 3, fig. 8) 10. *schulzi* (Emery)
9. Posterior border of basal face of epinotum bluntly marginate (Pl. 3, fig. 5); scapes, legs and superior border of petiole without standing hairs; dorsum of gaster with sparse, fine appressed hairs besides scattered standing hairs 7. *debilis* (Emery)
- Posterior border of basal face of epinotum sharply marginate, forming a narrow, somewhat elevated crest (Pl. 3, fig. 9); scapes, legs and superior border of petiole with standing or oblique hairs; dorsum of gaster lacking appressed hairs 10
10. Integument of head and dorsum of thorax nearly smooth and shiny; mandibles finely and densely striate; color black . . 8. *gagates* (Emery)
- Integument of head and dorsum of thorax rather strongly sculptured; mandibles without fine and dense striae; color light ferruginous
9. *rufescens* (Mann)
11. Mesonotum as long as, or longer than, broad, concave in the middle, its lateral borders slightly elevated (Pl. 2, fig. 4); basidorsal tubercle lacking on hind coxae 12
- Mesonotum conspicuously broader than long, flat, its lateral borders not elevated (Pl. 2, figs. 3, 8, 12, 13); basidorsal tubercle of hind coxae present 13
12. Body with short, fine, standing hairs 13. *varians* (Mann)
- Body lacking standing hairs 12. *laminata* (Mayr)
13. Dorsum of thorax finely and densely reticulate-punctate; transverse border of petiolar summit sharply marginate but not crested nor lamellate, with a short spine arising abruptly from the middle (Pl. 4, fig. 2) 11. *tristis* (Mann)
- Dorsum of thorax coarsely reticulate-rugose and foveolate; border of petiolar apex with an inclined, mesially acuminate crest 14

14. Scape flattened and broadened at base as a rounded lobe (Pl. 1, fig. 10)..... 15. *lobicornis*, n. sp.
 — Scape cylindrical, not broadened nor flattened at base (Pl. 1, fig. 12) 15
 15. Body thickly covered with short, fine standing hairs.....
 — Body practically lacking standing hairs..... 16. *setosa*, n. sp.
 — Body practically lacking standing hairs..... 14. *lamellosa* (Mayr)

1. *Monacis spinicollis* (Latreille)

(Pl. 1, fig. 1; Pl. 2, fig. 6; Pl. 3, fig. 1)

- Formica spinicollis* Latreille, 1832, in: Voy. Humboldt & Bonpland, Zool. 2 : 99, Pl. 38, figs. 6-12 (W; Brazil: Rio Negro).
Polyrhachis spinicollis, F. Smith, 1858, Cat. Hym. Brit. Mus. 6 : 74.
Monacis spinicollis, Roger, 1862, Berl. Ent. Zeitschr. 6 : 234-235 (W; Brazil).
Hypoclinea spinicollis, Mayr, 1862, Verh. Zool.-bot. Ges. Wien 12 : 708. — Mayr, 1863, Verh. Zool.-bot. Ges. Wien 13 : 424. — Roger, 1863, Verz. Formicid. p. 14. — Mayr, 1870, Verh. Zool.-bot. Ges. Wien 20 : 955 (Key).
Dolichoderus spinicollis, Dalla Torre, 1893, Cat. Hym. 7 : 161.
Dolichoderus (Monacis) spinicollis, Emery, 1894, Bull. Soc. Ent. Ital. 26 : 228. — Emery, 1912, Gen. Ins. Subf. Dolichoderinae, fasc. 137, p. 10, Pl. 1, fig. 2 (W). — Mann, 1916, Bull. Mus. Comp. Zool. Harvard, 60 : 461-462 (W; Brazil, Rondônia: Madeira-Mamoré RR., Camp 41).
Polyrhachis bispinosus F. Smith, 1858 (*nec* Olivier, 1791), Cat. Hym. Brit. Mus. 6 : 74, Pl. 13, figs. 1-3 (W; Brazil, Pará: Santarém).

Types. — This remarkable species was proposed upon specimen(s) collected by Humboldt on the upper Rio Negro in southwestern Venezuela. According to Roger (1862), it was described and figured by Klug, who sent the diagnostic data to Latreille for inclusion in Humboldt's work. Hence it is probable that the specimen in the collection of the Museum of Berlin, seen by Roger, represents the type. Latreille, however, judging that the excellent figures were enough by themselves for recognition of the species, dropped the description and only published the drawings. For that matter, Roger believes that the author should be Klug and not Latreille. Unless it can be proved that Klug is also responsible for the name of the species, one must continue to ascribe it to Latreille, which has been consistently done by all subsequent authors.

Worker. — Total length 6.8-7.3 mm; length of head 1.68-1.75 mm; width of head 1.85-2.04 mm; length of thorax 2.28-2.39 mm; distance between tips of pronotal spines 3.43-3.68 mm. Color reddish-brown; gaster brownish-black. Integument finely granulated, opaque; sculpture more superficial and somewhat shiny on mandibles, scapes, tips of pronotal spines, legs and petiole. The entire insect is rather densely clothed with conspicuous golden-yellow pubescence, heaviest on gaster, where it nearly conceals the integument. Standing hair very scarce, a few hairs on clypeus, front, mesonotum, coxae, flexor face of femora, ventral face of petiole, apex and ventral face of gaster.

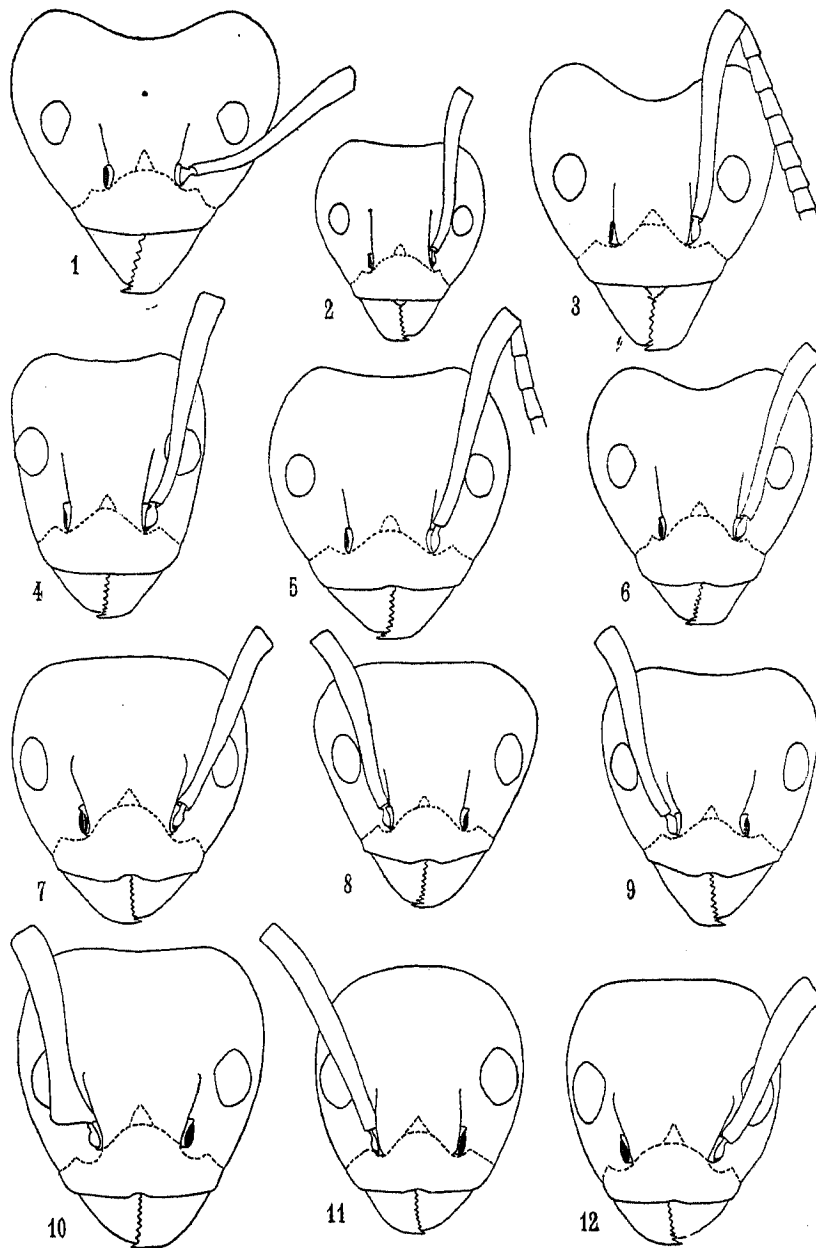


Plate 1

Monacis: head of workers. — Fig. 1. *spinicollis*. — Fig. 2. *septemspinosa*. — Fig. 3. *mucronifera*. — Fig. 4. *dolonigera*. — Fig. 5. *valida*. — Fig. 6. *bispinosa*. — Fig. 7. *schulzi*. — Fig. 8. *gagates*. — Fig. 9. *debilis*. — Fig. 10. *lobicornis*. — Fig. 11. *laminata*. — Fig. 12. *lamellosa*. (Figs. 7-12 drawn to a larger scale).

Head (Pl. 1, fig. 1) cordate, broader than long, with conspicuously diverging occipital lobes and excised occipital border. Mandibles with 8-9 triangular teeth, acute at apex, becoming gradually broader and blunter toward base. Frontal carinae diverging caudad. Frontal area impressed. Frontal suture vestigial. A single median ocellus usually present. Scape, when reflexed over the occipital lobe, exceeding the posterior border by a distance greater than its maximum thickness. Pronotum (Pl. 2, fig. 6) with a huge, acute spine at each side, projecting laterad and slightly upward. Mesonotum broader than long, the lateral borders distinctly marginate with an obtuse, slightly raised tooth at the posterior corner. A deep constriction (Pl. 3, fig. 1) between mesonotum and epinotum. Basal face of the latter half as long as declivous face, having at its posterior corners a small, pointed tooth, its posterior and lateral borders immarginate. Declivous face not excavate. Hind coxae lacking a basidorsal tubercle. Petiolar scale armed at summit with a slender, needlelike spine, as long as the petiole proper, gently curved caudad.

Female and male. — Unknown.

Distribution. — The little collected species is known only from Brazil, having been taken at three different stations: Upper Rio Negro (Humboldt leg., type-locality); upper Madeira river (Mann leg.); Santarém, Pará State (Bates leg., F. Smith, 1858); all in the Amazon river valley.

Specimens examined. — 6 workers from the upper Madeira river, Madeira-Mamoré RR. camp 41, 306 km SW of Pôrto Velho, Rondônia territory, Brazil, W. M. Mann leg., 1911 [WWK, from USNM].

Discussion. — The huge pronotal spines characterize at once the worker of *spinicollis*. As previous authors (first: Mayr, 1862) already pointed out, this is also the species which Bates collected on the lower Amazon river near Santarém, which was identified by Fr. Smith (1858) as *Polyrhachis bispinosus* (Ol.). Fortunately, Smith's figures leave no doubt about the true identity of Bates' specimens.

Bionomics. — This is an arboreal species. According to Mann (1916), his specimens "were found shortly before twilight, moving in a file along a slanting tree-trunk and going into a tangled mass of vines. Each was carrying in its mandibles a portion of fluffy, waxy substance". I believe that the peculiar material these ants were carrying is nothing but the stuff with which they build their nest. I have similar material taken from the nest of a related species, *Monacis mucronifera*, to be mentioned farther below. Incidentally, this also agrees with Bates' observation, who mentions in his famous book, that the natives of the lower Amazon river used the feltlike, fluffy substance, prepared by this ant, as touchwood.

2. *Monacis mucronifera* Roger

(Pl. 1, fig. 3; Pl. 2, fig. 5; Pl. 3, fig. 4; Pl. 4, figs. 6, 9, 12, 16;
Pl. 5, figs. 2, 3, 9, 11)

Monacis mucronifera Roger, 1862, Berl. Ent. Zeitschr. 6 : 296-237 (W; French Guiana: Cayenne). — Roger, 1863, Verz. Formicid. p. 15.
Hypoclinea mucronifera, Mayr, 1863, Verh. Zool.-bot. Ges. Wien 13 : 423. — Mayr, 1870, Verh. Zool.-bot. Ges. Wien 20 : 955 (Key).
Dolichoderus mucronifer, Dalla Torre, 1893, Cat. Hym. 7 : 160. — Forel, 1911, Deutsch. Ent. Zeitschr., p. 306 (Syn.).
Dolichoderus (Monacis) mucronifer, Emery, 1894, Bull. Soc. Ent. Ital. 26 : 228 ("mucronatus" = lapsus!). — Emery, 1912, Gen. Ins. Subf. Dolichoderinae, fasc. 137, p. 10. — Santschi, 1921, Bull. Soc. Vaud. Sci. Nat. 54 : 100 (F, W; French Guiana: Oyapoque, nr. St. Georges).
? *Formica bispinosa*, Latreille, 1802 (nec Olivier, 1791), Hist. Nat. Fourmis, p. 133-137, Pl. 4, fig. 20 (W; French Guiana: Cayenne).
Dolichoderus spinicollis ensiger Forel, 1910, Ann. Soc. Ent. Belg. 44 : 31 (W; French Guiana: Cayenne).

Type. — A unique worker (holotype) from Cayenne, French Guiana, deposited in the Museum of Paris, according to Roger (1862). Not seen. Diagnostic traits for the species are given by Roger (1862), Forel (1910) and Santschi (1921). Its closest relative is *spinicollis*, from which it will be differentiated in the subjoined paragraphs.

Worker. — Total length 6.6-7.2 mm; length of head 1.50-1.71 mm; width of head 1.61-1.75 mm; length of thorax 2.07-2.32 mm; distance between tips of pronotal spines 1.50-1.64 mm. Opaque; integument finely granulated. Fuscous-brown to black; thorax reddish or yellowish-brown, usually more or less infuscated especially on epinotum and sides. Chewing border of mandibles, apical 3-4 funicular segments, trochanters, apical 4 tarsites, ferruginous. Lateral lobe of clypeus and occipital lobes of head sometimes reddish-brown. Differs from *spinicollis* as follows:

Pubescence slightly sparser and shorter. Standing hair more abundant, all over dorsum of head and thorax but equally lacking on scapes and legs (the latter with a few hairs on coxae and flexor face of femora). Head (Pl. 1, fig. 3) also cordate, but usually about as long as broad, with the occipital lobes less diverging laterad, and the occiput more deeply excised. Frontal carinae subparallel. Scapes a trifle longer, more projecting over the occipital lobes when reflexed caudad. Pronotal spines much shorter (Pl. 2, fig. 5) and more delicate, pointing obliquely forward. Mesonotum about as long as broad, more highly elevated over epinotum (Pl. 3, fig. 4), having the posterior corners obliquely truncated and marginate and slightly raised. Epinotum unarmed, lacking any kind of margination between basal and declivous face. Petiolar spine shorter, not projecting over dorsum of epinotum, more strongly recurved backward.

Female. — I have only a greatly damaged specimen (head missing and the rest partly crushed), so that, in part, I have to rely on Santschi's description (1921) of this caste.

Weber's length of thorax 4.1 mm; length of fore wing 12 mm (Santschi says: 10 mm!). Yellowish-brown; antennae, femora, tibiae and tarsi strongly infuscated. Pilosity as in worker. Posterior border of head scarcely excised. Mandibles nearly smooth, yet very finely sculptured, subopaque, with 12 teeth. Eyes noticeably convex, situated in the middle third of head length. Pronotum anterolaterally angulate or dentate. Mesonotum broader than head, with a more or less vestigial longitudinal furrow. Parapsidal sutures present. Epinotum unarmed, as in worker. Apex of petiolar scale with a small tooth, lacking the needlelike spine of the worker. Wings pale-yellowish; veins brown; pterostigma fuscous-brown. Venation of fore wing as shown on Pl. 5, fig. 3.

Male (undescribed). — Total length 7.0-7.1 mm; length of head 1.08-1.12 mm; width of head (eyes included) 1.45 mm; length of thorax 2.68-2.72 mm. Fuscous-brown or black; mandibles, antennae, thorax, tarsi, petiole, yellowish-brown or testaceous. Integument opaque, finely and densely punctate or granulate. Standing hair very scarce except on mesothorax and epinotum, none on scapes, femora and tibiae. The whole insect rather densely covered with fine, short, appressed pubescence. Head (Pl. 4, fig. 6) distinctly transverse, with eyes and ocelli protruding. Mandibles somewhat shining; chewing and basai borders with numerous, crowded, indistinct denticles and one larger apical tooth. Frontal suture and area vestigial. Scape slightly longer than funicular segment II; segments III-XI progressively decreasing in size, apical segment about as long as segment III. Scutellum, in profile, bulging. Basal face of epinotum (Pl. 4, fig. 9) much shorter than half the length of declivous face. Petiolar node rounded at apex. Wings diaphanous, slightly tinted with yellow, veins brown, pterostigma black. Venation of fore wing as shown on Pl. 5, fig. 2. Details of genitalia represented by the following figures: Pl. 4, fig. 12. Subgenital plate. Fig. 16. Aedeagus in profile (*pv* = penis valve; *e* = "ergot"; *apa* = basal apodeme of aedeagus). Pl. 5, fig. 9. Genitalia in dorsal (*D*) and ventral (*V*) aspect (*BR* = basal ring; *lp* = parameral plate; *Pmr* = paramere; volsella with apical hook or digitus = *dig*; *pv* = penis valve). Fig. 11. Outer and intermediate genital claspers seen from the inside (*lp* = parameral

plate; *Pmr* = paramere; *lv* = volsellar plate with *cus* = cuspis and *dig* = digitus at apex). [Nomenclature of genitalia according to Snodgrass, 1941].

Distribution. — Previously known only from the type locality in French Guiana; the new records visibly extend the range of the species from Dutch Guiana to the Amazon delta.

Specimens examined. — 32 workers, 1 female, 2 males, as follows: Surinam (exact locality not given), 1944, D. C. Geijskes: W, F, M [CTB]. — Brazil, Pará State: Alto Guamá, August 1953, Elias Sefer: W (received from Dr. C. R. Gonçalves [CTB]).

Discussion. — *Monacis mucronifera* is quite distinctive and easily recognized. As Santschi (1921) already pointed out, the color of workers is quite variable. The type specimen is said to be dark red with fuscous gaster, the mandibles, anterior border of head, apex of flagellum, sides of thorax, trochanters and tarsi being light ferruginous. Nevertheless all specimens examined by myself are much darker, and greatly infuscated.

Bionomics. — Both series examined were accompanied by nest material, a fluffy, beige, felt or cottonlike substance. Latreille (1802), who investigated this substance in connection with a species which he considered identical with *bispinosa* (Ol.), reached the conclusion that the material was derived from the seed fibers of a bombaceous plant, perhaps *Ceiba pentandra*. Inasmuch as this kind of substance, as far as I am aware, has never been found with the much better known *Monacis bispinosa*, I suspect that Latreille's specimens and nest material really belonged to the present species. This suspicion is not original, since Roger (1862) already surmised the possibility when describing *mucronifera*.

3. *Monacis septemspinosa* (Emery)

(Pl. 1, fig. 2; Pl. 2, fig. 2; Pl. 3, fig. 2)

Dolichoderus (Monacis) septemspinus Emery, 1894, Bull. Soc. Ent. Ital. 26 : 231-232 (W; Brazil, Pará: Belém). — Emery, 1912, Gen. Ins. Subf. Dolichoderinae, fasc. 137, p. 10.

Types. — Two workers, collected by A. Schulz at Belém, Pará State, Brazil, deposited in the Emery collection at Genova [MCSN]. Not seen.

Worker. — Total length 5.0-5.9 mm; length of head 1.18-1.28 mm; width of head 1.18-1.32 mm; length of thorax 1.57-1.82 mm. Black; mandibles, antennae and legs usually ferruginous, sometimes more or less infuscated. Opaque; finely and densely punctate. Head — especially posterior portion — and thorax — especially basal face of epinotum and sides —

foveolate. Standing hairs extremely scarce, a few on front and vertex, for the rest practically confined to coxae and gaster, where they are sparsely disseminated. Pubescence yellowish-gray, very long, appressed, rather dense, especially on clypeus, dorsum of thorax and gaster.

Head (Pl. 1, fig. 2) subcordate, about as long as broad, occiput very shallowly excised. Mandibles finely and superficially reticulate-punctate, chewing border smooth and shining, with 8-9 small, triangular teeth. Frontal carinae subparallel, almost reaching the level of posterior orbits of eyes. Frontal area impressed. Scapes, excluding basal condyle, about as long as maximum length of head capsule. Thorax (Pl. 2, fig. 2; Pl. 3, fig. 2) with 3 pairs of spines: a pair of long, horizontal, strongly acuminate spines at each side of pronotum, projecting obliquely forward, the distance between their tips equalling or even slightly exceeding the maximum width of head; a pair of shorter, sub-erect spines on each side of mesonotum; a pair of long, less acute spines on posterior corners of basal face of epinotum, about half as long as the basal face, gently raised and usually scarcely diverging toward apex. Mesonotum, in profile, at a higher level than epinotum, broader than long. Mesoepinotal suture impressed. Basal face of epinotum somewhat longer than broad, the lateral borders distinctly, yet not sharply marginate, the posterior border, between the spines, without a crest nor sharply marginate. Epinotal spiracle opening on top of a projecting tubercle. Posterior coxae with only a feeble basidorsal tubercle. Petiole with a broad, antero-posteriorly compressed scale and a long, needlelike, dorsal spine, which is strongly constricted off the scale proper at base.

Female and male. — Unknown.

Distribution. — The range of this seldom collected species is not well known. According to presently available records, it occurs in the Guianas, the Amazon river basin, up to eastern Ecuador, northern Bolivia, and eastern Brazil.

Specimens examined. — 20 workers, as follows: Brazil, Bahia State: Água Preta, May 1943, Pedrito Silva: 12 W [CTB]. — British Guiana, Bartica district: Kalakoon, Aug. 23, 1920, W. M. Wheeler: 6 W [MCZ, WWK]. — Ecuador: Tena on Napo river, March 27, 1923, F. X. Williams: 1 W [MCZ]. — Bolivia: Songo: 1 W [MCZ].

Discussion. — This species is readily identified by the peculiar shape of the thorax, bearing three pairs of spines. It is related with *spiniollis* and *bispinosa*, yet quite distinctive. The critical characters are stated in the keys and in the preceding description.

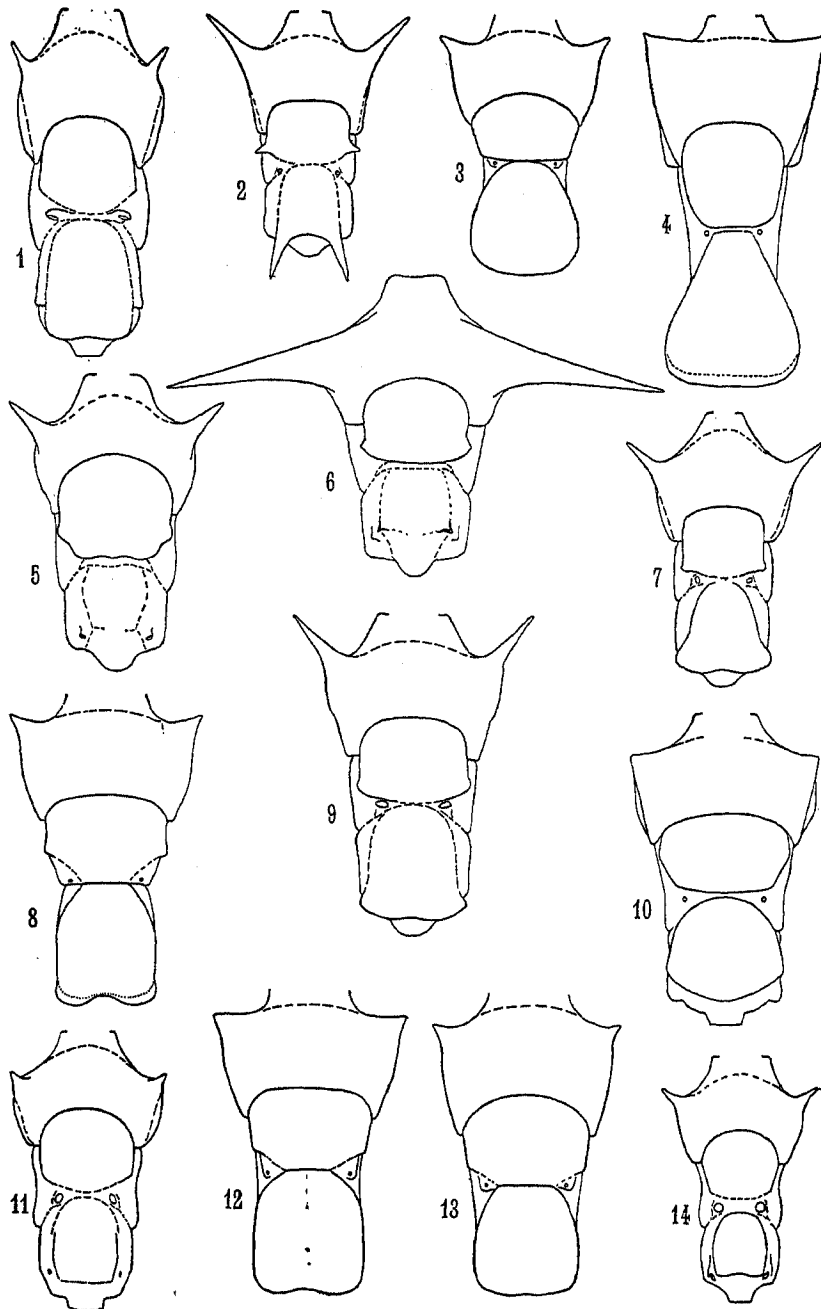


Plate II

Monacis: thorax of worker in dorsal view. — Fig. 1. *dolonigera*. — Fig. 2. *septemspinosa*. — Fig. 3. *tristis*. — Fig. 4. *laminata*. — Fig. 5. *mucronifera*. — Fig. 6. *spiticollis*. — Fig. 7. *bispinosa*. — Fig. 8. *setosa*. — Fig. 9. *valida*. — Fig. 10. *schulzi*. — Fig. 11. *debilis*. — Fig. 12. *lamellosa*. — Fig. 13. *lobicornis*. — Fig. 14. *gagates*. (Figs. 3, 4, 8, 10-14 drawn to a larger scale).

Wheeler (*in litt.*) considered the specimens from Ecuador, Bolivia and British Guiana as belonging to three different varieties. I have seen specimens of all three series, and failed to find a significant difference upon which one could separate them taxonomically. They are just plain *septemspinosa* specimens. Only two stray workers from Bolivia (one examined) differ more strikingly in the more convex sides of the basal face of epinotum, which is constricted in front of the unusually short and more strongly erect epinotal spines. But even these specimens are best kept with *septemspinosa*, with which they agree in all essential features. For this reason I am withholding Wheeler's manuscript names.

4. *Monacis bispinosa* (Olivier)

(Pl. 1, fig. 6; Pl. 2, fig. 7; Pl. 3, fig. 3; Pl. 4, figs. 4, 7, 10, 13, 15; Pl. 5, figs. 1, 8)

- Formica bispinosa* Olivier, 1791, Encycl. Méthod. Insect. 6 : 502 (W; French Guiana: Cayenne. — ?Latreille, 1802, Hist. Nat. Fourmis, pp. 133-137, Pl. 4, fig. 20 (W, nest; French Guiana: Cayenne; Syn.). — Fabricius, 1804, Syst. Piez. p. 410.
- Monacis bispinosa*, Roger, 1862, Berl. Ent. Zeitschr. 6 : 235-236 (W, F; Cayenne, Brazil, Colombia, Mexico).
- Hypoclinea bispinosa*, Mayr, 1862, Verh. Zool.-bot. Ges. Wien 12 : 708 (Surinam). — Roger, 1863, Verz. Formicid. p. 14. — Mayr, 1870, Sitz.-ber. Akad. Wiss. Wien 61 : 371 (Colombia). — Mayr, 1870, Verh. Zool.-bot. Ges. Wien 20 : 955 (Key).
- Dolichoderus bispinosus*, Emery, 1890, Ann. Soc. Ent. France (6) 10 : 69 (Venezuela: S. Esteban); 1891, Bull. Soc. Ent. Ital. 23 : 167 (Syn.). — Dalla Torre, 1893, Cat. Hym. 7 : 158. — Forel, 1899, Biol. Centr.-Amer. Hym. 3 : 98-99 (Mexico, Vera Cruz: Atoyac, Orizaba; Tabasco: Teapa; Brit. Honduras: R. Hondo; Panama: Bugaba, S. Miguel on Isla del Rey; Trinidad; Bion.) — Wheeler, 1907, Bull. Amer. Mus. Nat. Hist. 23 : 275 (Brit. Honduras: Manatee; Bion.). — Forel, 1907, Mitt. Naturhist. Mus. Hamburg 24 : 9 (Panama: Colón). — Forel, 1908, Bull. Soc. Vaud. Sci. Nat. 44 : 60-61 (M; Costa Rica: El Hiquito, Cangrejal de Aserri). — Forel, 1909, Deutsch. Ent. Zeitschr. p. 260 (Paraguay: S. Bernardino). — Mann, 1912, Psyche 19 : 36-37 (Brasil, Pará: Belém; Bion.).
- Dolichoderus (Monacis) bispinosus*, Emery, 1894, Bull. Soc. Ent. Ital. 26 : 228, 232 (Syn.). — Emery, 1912, Gen. Ins. Subf. Dolichoderinae, fasc. 137, p. 9. — Wheeler, 1916, Bull. Mus. Comp. Zool. Harvard 60 : 330 (Trinidad: Port of Spain, Erin). — Mann, 1916, Bull. Mus. Comp. Zool. Harvard 60 : 461 (Brazil, Pará: Belém; Amazonas: Itacoatiara; Rondônia: Porto Velho; Bion.). — Santschi, 1916, Physis 2 : 389 (Argentina: Misiones). — Luederwaldt, 1918, Rev. Mus. Paul. 10 : 46 (Brazil, São Paulo: Ituverava, Salto Grande). — Wheeler, 1921, Ecology 2 : 92 (Bion.). — Borgmeier, 1923, Arch. Mus. Nac. Rio 24 : 81 (Brazil, Mato Grosso: Cuiabá; Ceará). — Wheeler, 1923, Ark. f. Zool. 15 (7) : 4 (Brazil, Amazonas: Manaus). — Luederwaldt, 1926, Rev. Mus. Paul. 14 : 284 (Bion.). — Borgmeier, 1934, Arq. Inst. Biol. Veget. Rio 1 : 109 (Surinam: Paramaribo; Bion.). — Wheeler, 1942, Bull. Mus. Comp. Zool. Harvard 90 : 213 (Panama C. Z.; Bion.).
- Formica fungosa* Fabricius, 1798, Suppl. Ent. Syst. p. 281 (W). — Coquebert, 1804, Illustr. Icon. Ins. 3 : 99, Pl. 22, fig. 10.
- Hypoclinea vestita* Mayr, 1862, Verh. Zool.-bot. Ges. Wien 12 : 707-708 (F; Virgin Islands; St. Thomas).
- Polyrhachis arboricola* Norton, 1868, Amer. Nat. 2 : 60, Pl. 2, fig. 3 (W; S. Mexico; Bion.). — Norton, 1868 (1871), Proc. Essex Inst. vol. 6, Comm. p. 4, fig. (W).

Type. — Being quite clear the identity of the present species I have not tried to find out where the type, if still extant, is presently located. The same applies to the types of *fungosa* (F.) and *arboricola* (Norton), surely synonyms of *bispinosa*. The type of *vestita* (Mayr), a female, probably still exists in the Naturhistorisches Museum of Vienna, Austria. None of the aforesaid specimens was available for examination.

Worker. — Total length 4.4-6.5 mm; length of head 1.35-1.78 mm; width of head 1.39-1.86 mm; length of scape 1.21-1.61 mm; length of thorax 1.64-2.10 mm. Black; chewing border of mandibles, often also funiculus and legs partly or completely ferruginous. Head and thorax coarsely and heavily punctate-rugose or even reticulate-rugose, especially on occiput and dorsum of thorax. Sides of thorax posteriorly with a few longitudinal rugae. Gaster, legs and scapes finely and superficially reticulate-punctate, somewhat shining and smooth. Declivous face of epinotum with weak, more or less transverse rugosities. Standing hairs abundant, yellowish, also on scapes and legs (more or less oblique on the latter). Pubescence yellowish, long, moderately abundant on head and thorax, very dense on gaster.

Head (Pl. 1, fig. 6) cordate, slightly broader than long, noticeably excised between occipital lobes, strongly narrowed in front. Frontal carinae diverging caudad. Scape, excluding basal condyle, always distinctly shorter than maximum length of head capsule. Eyes usually moderately convex. Pronotal spines (Pl. 2, fig. 7) relatively short, the distance between their tips never equalling nor exceeding maximum width of head. Mesonotum transverse, the posterior corner in the form of a slightly upturned tooth. Basal face of epinotum bell-shaped, the lateral borders rather sharply marginate and conspicuously diverging toward the projecting, rounded posterior corners, the posterior border forming a sharp, slightly raised, mesially impressed crest which overhangs the excavate declivous face (Pl. 3, fig. 3). Upper border of petiolar scale nearly transverse, marginate and somewhat crenulate, giving off abruptly in the middle the needlelike spine (Pl. 4, fig. 4). Hind coxae with a well-developed basidorsal tubercle.

Female. — Total length 8.3-10.0 mm; length of head 1.72-1.85 mm; width of head 1.85-2.04 mm; length of scape 1.50-1.64 mm; length of thorax 2.92-3.39 mm; length of fore wing 8-9 mm. Black; legs, lateral lobes of clypeus, apical funicular segments often fuscous-brown or ferruginous. Opaque, strongly punctate; occiput scutellum, sides of thorax in part, foveolate and reticulate-rugose. Standing hairs long, abundant, also on scapes and legs. Pubescence long, conspicuous, yellowish, very dense on gaster.

Head as in worker, but occiput shallowly excised. Scape distinctly shorter than maximum length of head capsule. Anterior ocellus situated slightly in front of posterior orbit of eyes.

Anterolateral tooth of pronotum always developed, variable in size, its base posteriorly prolonged or not as a blunt carina reaching the posterior corner of pronotum. Metanotum and basal face of epinotum posteriorly sharply marginate, with a faint median impression. Declivous face slightly excavate. Hind coxae with a basidorsal tubercle. Superior border of petiolar scale rather blunt at each side of the very short and variably developed apical tooth. Wings brownish, veins dark brown, stigma and subcosta nearly black. Venation of fore wing as shown on Pl. 5, fig. 8.

Male. — Total length 4.8-6.1 mm; length of head 0.95-1.08 mm; width of head (eyes included) 1.12-1.34 mm; length of thorax 1.70-2.17 mm; length of fore wing 4.4-5.4 mm. Fuscous-brown or black; mandibles, antennae and legs brown or testaceous. Resembling closely the male of *mucronifera*, from which it differs as follows:

Integument shinier, not really opaque nor densely granulate. Pleura, epinotum and gaster finely and superficially reticulate and quite shiny. Vertex, promesonotum more heavily reticulate-punctate, the pits shiny. Pubescence longer, more conspicuous, not always appressed. Standing hairs also on pronotum and petiole. Femora and tibiae with a few longer, oblique hairs. Head (Pl. 4, fig. 7) relatively longer, eyes and ocelli less protruding. Mandibles shorter and broader. Basal face of epinotum (Pl. 4, fig. 10) longer than half the length of declivous face, its posterior border submarginate. Superior transverse border of petiolar node marginate. Wings slightly more infuscated, veins brown, stigma fuscous or black. Venation of fore wing as shown on Pl. 5, fig. 1. Genitalia quite similar to those of *mucronifera*, but with more obvious differences in the shape of the subgenital plate (Pl. 4, fig. 13) and the penis valves (Pl. 4, fig. 15).

Distribution. — This is by far the most common species of the genus and occurs from Vera Cruz in Mexico to northern Argentina.

Specimens examined. — Several hundreds of workers, 6 females and 6 males, as follows: Argentina, Misiones province: Iguazu (N. Kusnezov); Formosa province: Puerto Pilcomayo (N. Kusnezov). — Brazil, São Paulo State: Agudos (C. Gilbert, W. W. Kempf), Ituverava (E. Garbe), Salto Grande (H. Luederwaldt), Teodoro Sampaio (O. P. Forattini); Minas Gerais State: Lassance (J. C. Bradley); Goiás State: Campinas (J. S. Schwarzmaier); Mato Grosso State: Ponce (J. Lane),

S. Luís de Cáceres (E. Garbe); Rondônia Territory: Abunã (W. M. Mann); Amazonas State: Pôrto América (J. C. Bradley), Coari (A. Vidal Araújo); Pará State: Belém (F. Baker), Cachoeira Grande do Rio Paru (A. J. Sampaio), Cachoeira do Breu (A. J. Sampaio), Alto Cuminá (A. J. Sampaio), Belterra (C. R. Gonçalves), Serra do Cachimbo (H. Sick); Amapá Territory: Serra do Navio (K. Lenko); Ceará State: loc. unknown (Dias da Rocha). — Bolivia: San Antonio (H. Marcus). — British Guiana: Kartabo (W. M. Wheeler), Cuyuni river (W. J. Lavarre), Winama river (W. J. Lavarre). — Dutch Guiana: Paramaribo (G. H. Buenzli). — Trinidad: loc. unknown (W. M. Wheeler), Savannah (D. Fairchild), Port of Spain (R. Thaxter), Erin (F. W. Ulrich). — Colombia: Saraime (H. Apolinar Maria), Buenaventura (C. Brues), Rio Frio (G. Salt). — Panama and Canal Zone: Red Tank (W. M. Wheeler), Barro Colorado Island (W. C. Allen), Las Sabanas (W. M. Wheeler). — Costa Rica: Escobal (A. Alfaro), Hamburg Farm nr. Limón (F. Nevermann). — Guatemala: Quirigua (W. M. Wheeler), Puerto Barrios (W. M. Wheeler). — British Honduras: Manatee (J. D. Johnson). — Mexico, Chiapas State: Palenque ruins (C. Goodnight). The females are from Agudos, S. P., Coari, Am., Brazil; from Hamburg Farm, Costa Rica; from Chiapas, Mexico. The males were taken at Serra do Cachimbo, Pa., Brazil; at Erin, Trinidad; at Hamburg Farm, Costa Rica [CTB, DZSP, MCZ, WWK].

Discussion. — The present species is quite distinct from the preceding *spinicollis*, *septemspinosa* and *mucronifera*, the hairy scapes and legs, the basidorsal tubercle on hind coxae and the shape of the basal face of epinotum being the chief differential characters for the worker. Much closer are the following *valida* and *dolonigera*. Their separation from *bispinosa* is discussed under these two species.

As said before, there is no doubt concerning the synonymy of *fungosa* Fabricius (first established by Latreille, 1802) and *arboricola* Norton (proposed by Emery, 1891). The situation of the third synonym, *vestita* Mayr, established upon the original description by Emery (1894), who did not see the type, is a little different. That species, coming from the outlying Virgin Island St. Thomas, was based upon a stray female. The large size (11.5 mm) and the very heavy pubescence make its association with *bispinosa* rather uncertain. Perhaps it is the same as *valida*, a species described as new on a following page. Only the examination of the type will definitely prove or dispel these doubts. For the time being, I leave *vestita* as a synonym of *bispinosa*.

Bionomics. — Among the literature cited in the bibliographical synonymy of the species, the following contain information (usually brief and fragmentary) on the habits and ecology of *Monacis bispinosa*: Latreille (1802), Norton (1868), Forel (1899, 1909), Wheeler (1907, 1921, 1942), Mann (1912, 1916), Luederwaldt (1924), Borgmeier (1934).

Foregoing Latreille's contribution which may have to be referred to a different species (cf. under *mucronifera*), I have tried to present in the subjoined paragraphs a condensed account of the pertinent facts and observations.

Nests of fully developed colonies are made of paper or carton inside cracks or apertures of larger trees, or also upon forks of branches. Likewise these ants do not shrink from taking over deserted arboreal termitaria. Incipient colonies have been found nesting in myrmecophytes, such as *Cordia alliodora* and *Tillandsia* spp. Small nests within forking branches of young trees measured 10-15 cm in diameter.

Colonies may attain an enormous number of individuals. In this case they show pleometrosis, harboring up to 60 dealated queens in a single nest. Young colonies, however, seem to have only one queen.

Not too lively and swift in their movements, the ants become very excited and pugnacious when disturbed in their nests. They defend themselves by biting and spreading a strong "*Tapinoma*-odor". Mann (1912) gives the following rather vivid account of his experiences with this species:

"After a couple of attempts I gave up investigating the larger nests, for when these were disturbed myriads of ants swarmed out, literally tumbling over one another to the ground, where they scattered in all directions in search of the disturber. On hurriedly leaving the vicinity of one nest, I happened to leave my net lying on the ground. On my return, a few minutes later, it was covered with ants, each gripping so tightly, that when I pulled it away its head often remained attached to the net" (p. 36).

Little is known about their feeding habits. They have been observed to attend coccids (Forel, 1909) and membracids (Wheeler, 1907). Luederwaldt (1924) tells us that in the interior of the State of São Paulo, Brazil, he found workers of this species eating from a mushroom.

All the nests examined by Mann (1912) in the vicinity of Belém, Pará State, Brazil, contained besides the *Monacis* also a colony of a small *Crematogaster* (*C. limata parabiota* For., cf. Wheeler, 1921), grouped in certain chambers of the nests, and representing to all appearances a case of what has been termed parabiosis by Forel.

5. *Monacis valida*, n. sp.

(Pl. 1, fig. 5; Pl. 2, fig. 9; Pl. 3, fig. 7; Pl. 5, fig. 4)

Upon a cursory glance this species looks like a large and robust *bispinosa*, to which, indeed, it bears an intimate and very close resemblance. For this reason I decided to forego a full description and to present instead merely separatory characters.

Worker (holotype and paratypes). — Total length 7.4 mm (6.3-7.4 mm); length of head 1.71 mm (1.53-1.86 mm); width of head 1.82 mm (1.64-1.96 mm); length of scape 1.71 mm (1.50-1.78 mm); length of thorax 2.35 mm (2.14-2.50 mm); distance between tips of pronotal spines 1.71 mm (1.46-2.07 mm). Black; mandibles, antennae and legs more or less ferruginous. Differs from *bispinosa* in the following traits:

(1) Averaging larger; between both species there is a small amount of overlap concerning most measurements, but a distinct, perhaps definite gap, as regards the length of thorax. The latter, as compared with the length of head, is also relatively longer in *valida* than in *bispinosa*. (2) Head (Pl. 1, fig. 5) less narrowed in front, having a broader and shorter clypeus; occipital excision shallower. (3) Scape, excluding basal condyle, as long (holotype and paratypes from Costa Rica) or nearly as long (Panama specimens) as maximum length of head capsule. (4) Pronotal spines usually longer, always more delicate, slightly raised towards apex, either projecting obliquely forward beyond the anterior border of pronotum proper or else more conspicuously raised upward. Distance between tips of pronotal spines usually equal to the maximum width of head, except in very small specimens (Pl. 2, fig. 9; Pl. 3, fig. 7). (5) Lateral border of basal face of epinotum obtusely marginate, either gently diverging caudad with posterior corners a little projecting (Pl. 2, fig. 9) as in holotype and paratypes from Costa Rica, or subparallel with the posterior corners almost flush with the sides, as in the paratypes from Panama Canal Zone. (6) Petiolar node rather gradually tapering apically as a needlelike spine (Pl. 4, fig. 5); upper border at each side of the spine oblique, blunt, not crenulate nor distinctly marginate. (7) Pubescence denser, nearly concealing integument, also on head and dorsum of thorax. (8) Occiput and dorsum of thorax densely and heavily punctate, but never coarsely reticulate-rugose.

Female (paratypes). — Total length 10.5-11.2 mm; length of head 1.93-2.00 mm; width of head 2.07-2.21 mm; length of scape 1.85-2.00 mm; length of thorax 3.57-3.85 mm; length of fore wing 10.8-11.2 mm. Closely resembling the same caste of *bispinosa*, exhibiting, however, the following distinctive features:

(1) Of larger size. According to the scanty material examined there is a slight gap between both species as regards all measurements. (2) Scape as long or nearly as long as maximum length of head capsule. (3) Occipital border of head almost straight, the excision extremely feeble. (4) Occiput, sides of thorax, scutellum not conspicuously foveolate. (5) Development of pubescence as strong as in worker. (6) Wings more strongly infumated, all veins fuscous brown. Venation of fore wing as shown on Pl. 5, fig. 4 (Costa Rica specimen, showing vein stubs and an incompletely divided 2nd submarginal or cubital

cell; these features are variable, lacking completely in the Panama specimens).

Male. — Unknown.

Distribution. — So far, this species has been recorded from eastern Costa Rica and Panama Canal Zone.

Specimens examined. — 41 workers and 4 females, as follows: Costa Rica: Zent, Limón, on cocoa tree, Jan. 20, 1957, F. Lara E.: 4 W, 1 F (holotype and paratypes) [CTB]. — Panama Canal Zone: Rio Chinillo, Apr. 6, 1923, W. M. Wheeler, n. 304: 31 W, 3 F (paratypes) [MCZ, WWK]; Barro Colorado Island, July 30, 1924, W. M. Wheeler, n. 791: 2 W (paratypes) [MCZ]; Rio Agua Salud, Nov. 6, 1923, W. M. Wheeler, n. 124: 4 W (paratypes) [MCZ].

6. *Monacis dolonigera* Roger

(Pl. 1, fig. 4; Pl. 2, fig. 1; Pl. 3, fig. 6)

Monacis dolonigera Roger, 1862, Berl. Ent. Zeitschr. 6 : 237-238 (W; Venezuela: Valencia).
Hypoclinea dolonigera, Mayr, 1862, Verh. Zool.-bot. Ges. Wien 12 : 707 (Venezuela: Puerto Cabello). — Roger, 1863, Verz. Formicid. p. 15. — Mayr, 1863, Verh. Zool.-bot. Ges. Wien 13 : 423. — Mayr, 1870, Verh. Zool.-bot. Ges. Wien 20 : 955 (Key).
Dolichoderus doloniger, Dalla Torre, 1893, Cat. Hym. 7 : 158.
Dolichoderus (Monacis) doloniger, Emery, 1894, Bull. Soc. Ent. Ital. 26 : 228. — Emery, 1912, Gen. Ins. Subf. Dolichoderinae, fasc. 137, p. 9.

Types. — Several workers from Valencia, Venezuela, deposited in the collection of the Museum of Berlin (Roger, 1862). Not seen.

In general habitus this pretty and large species resembles *bispinosa* and *valida*. Only the worker is known. This caste differs rather strikingly from its closest relatives just cited in the following characters:

(1) Body and appendages yellowish-brown throughout. (2) Standing hairs practically absent. (3) Head (Pl. 1, fig. 4) distinctly longer than broad, not conspicuously expanded behind. (4) Eyes, when head is seen in frontal view, nearly touching the lateral border. (5) Pronotal spines (Pl. 2, fig. 1) shorter, very delicate, little diverging laterad. (6) Basal face of epinotum (Pl. 2, fig. 1; Pl. 3, fig. 6) convex both longitudinally and transversely, the lateral borders feebly marginate, subparallel, posterior border weakly excised in the middle, not very sharply marginate laterad. (7) Hind coxae without a developed basidorsal tubercle.

Specimens examined. — 1 worker from unknown locality in Venezuela (Emery det.), purchased many years ago from Staudinger [DZSP]. This specimen has the following critical measurements: Total length 8.0 mm; length of head 1.75 mm; width of head 1.50 mm; length of scape 1.84 mm; length of thorax 2.53 mm.

Additional material. — After finishing this paper I received from the U. S. National Museum in Washington, courtesy of Dr. M. R. Smith, six additional workers of the same species, as follows: Venezuela: Santa Elena, La Gran Sabana, Jan. 20, 1945, G. O. Jones leg.: 3 workers [USNM, n. 48-9790]. — Bolivia: Ixiamas, 1921-22, W. M. Mann leg.: 3 workers [USNM].

These specimens are of smaller size, and have the lateral portions of the posterior border of the basal face of epinotum more sharply marginated and crested. Their measurements are as follows: Total length 6.3-7.0 mm; head length 1.52-1.66 mm; head width 1.38-1.52 mm; scape length 1.55-1.66 mm; thorax length 2.17-2.35 mm.

7. *Monacis debilis* (Emery)

(Pl. 1, fig. 9; Pl. 2, fig. 11; Pl. 3, fig. 5)

- Dolichoderus debilis* Emery, 1890, Ann. Soc. Ent. France (6) 10 : 69-70 (W; Venezuela: S. Esteban). — Forel, 1904, Zool. Jahrb. Syst. 20 : 683 (Bion.).
Dolichoderus (Monacis) debilis Emery, 1894, Bull. Soc. Ent. Ital. 26 : 228. — Emery, 1912, Gen. Ins. Subf. Dolichoderinae, fasc. 137, p. 9. — Wheeler, 1912 (1913), Trans. Second Ent. Congr. Oxford, p. 126 (Bion.). — Wheeler, 1916, Bull. Mus. Comp. Zool. Harvard 60 : 330 (Trinidad: Matura, Sangre Grande). — Mann, 1916, Bull. Mus. Comp. Zool. Harvard 60 : 464 (Brasil, Rondônia: Madeira-Mamoré RR. Camp 37).
Dolichoderus sp., Forel, 1898, Bull. Soc. Vaud. Sci. Nat. 34 : 380-384.
Dolichoderus debilis var. *sieversi* Forel, 1901, Mitt. Nat.-hist. Mus. Hamburg 18 : 65 (W; Venezuela: Puerto Cabello). — Forel, 1905, Ann. Soc. Ent. Belg. 49 : 159 (Venezuela). — N. v. s. y. n.
Dolichoderus debilis var. *parabiotica* Forel, 1912, Mém. Soc. Ent. Belg. 20 : 33 (W, F. M; Colombia: Santa Marta, Ouriheka; Panama). — Wheeler, 1921, Ecology 2 : 89-92 (Panama; Guatemala; Bion.). — N. v. s. y. n.

Types. — 2 workers collected by E. Simon at San Esteban, Venezuela, deposited in the Emery collection at Genova [MCSN]. Not seen during the present investigation.

Worker. — Total length 3.4-4.3 mm; length of head 0.75-0.93 mm; width of head 0.75-1.00 mm; length of scape 0.68-0.82 mm; length of thorax 0.93-1.18 mm. — Dark ferruginous; occiput, femora, tibiae, petiole and especially gaster more or less strongly infuscated, occasionally also the thorax. Chewing border of mandibles yellowish-brown. Rather shining; integument of head and thorax lightly reticulate-punctate, with larger punctures and vestigial rugosities on vertex of head. Petiole and gaster finely and superficially reticulate. Sides of thorax with a few rather inconspicuous rugae, having the sculpture

decidedly smoother than in the following two species (*gagates*, *rufescens*). Standing and oblique hair scarce, lacking on clypeus, sides of head, scape, femora, tibiae, border of petiolar scale; pointing forward over neck on anterior portion of pronotum. Pubescence fine, small, sparse on head, thorax and gaster, quite distinct from standing hairs.

Head (Pl. 1, fig. 9) subcordate, lateral borders convex, occipital border gently emarginate in the middle. Mandibles smooth and shining; piliferous punctures small and inconspicuous. Anterior border of clypeus slightly excised in the middle. Scape, without basal condyle, distinctly shorter than maximum length of head capsule. Pronotal humeri with a short spine or only a rather blunt tooth (Pl. 2, fig. 11). Mesonotum not much broader than long, the posterior corners not marked nor dentate. Mesoepinotal constriction deep in profile, not as broad as in *gagates* and *rufescens* (Pl. 3, fig. 5). Basal face of epinotum subrectangular, longer than broad, its lateral and posterior borders not sharply marginate, the latter not upturned in the form of a crest. Anterior border of mesopleura without an impression above. Hind coxae lacking a basidorsal tubercle. Petiole apically with a very short, usually almost obsolete tooth; borders of petiole at each side of the tooth not crested nor sharply marginate; posterior face of scale not distinctly excavate.

Female. — Total length 5.0 mm; length of head 0.96 mm; width of head 1.07 mm; length of scape 0.80 mm; length of thorax 1.71 mm. Differs from the females of the *bispinosa*-group in having the pronotum rounded anterolaterally, lacking a scapular tooth. Distinguishing characters as in worker, especially as regards sculpture, pilosity, length of scape. Mesopleura highly polished and devoid of pubescence. Basal face of epinotum not separated from declivous face by a pronounced margination. Petiolar scale almost rounded at summit, apical tooth indistinct. Wings somewhat infumated, veins brown, subcosta and pterostigma fuscous or black.

Male. — This caste was diagnosed by Forel (1912) for the var. *parabiotica*. Unfortunately the description is very poor and does not contain any indication of useful specific characters except size (= 3.5-3.7 mm). I have not seen specimens of this sex.

Distribution. — *Monacis debilis* is not uncommon in the Amazon basin (N. Brazil, N. Bolivia and E. Peru), the Guianas, Venezuela, Trinidad and northern Colombia. From

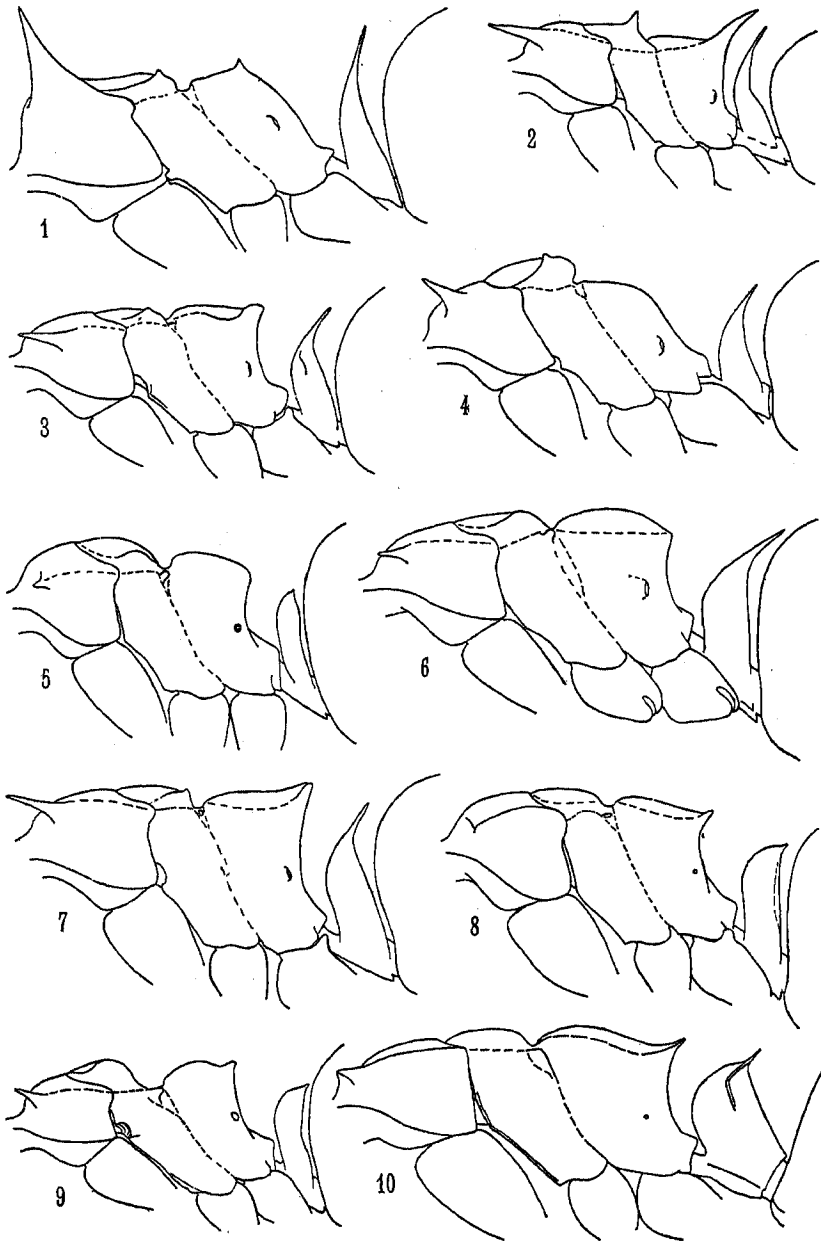


Plate III

Monacis: thorax of worker in profile. — Fig. 1. *spinicollis*. — Fig. 2. *septemspinosa*. — Fig. 3. *bispinosa*. — Fig. 4. *mucronifera*. — Fig. 5. *debilis*. — Fig. 6. *dolonigera*. — Fig. 7. *valida*. — Fig. 8. *schulzi*. — Fig. 9. *gagates*. — Fig. 10. *laminata*. (Figs. 5, 8-10 drawn to a larger scale).

there its range is extended northward through Central America to at least Guatemala.

Specimens examined. — 120 workers and 1 female, as follows: Brazil, Pará State: Santarém (E. Garbe), Alto Paru (A. J. Sampaio); Amazonas State: Tefé (P. Tastevin) [CTB]; Rondônia Territory: Madeira-Mamoré RR. Camp 31 [WWK]. — Bolivia: loc. unknown (from Staudinger) [DZSP]. — Peru: El Campamiento, Perené river (J. C. Bradley) [MCZ]. — Surinam: no other data [CTB]. — Venezuela: S. Felipe de Yaracuy (F. A. McGuire) [WWK]. — Panama and Canal Zone: Barro Colorado Island (W. M. Wheeler, W. C. Allee, P. Rau), Ancon (W. M. Wheeler), Culebra (W. M. Wheeler): W, F [WWK]. — Guatemala: Patalul (W. M. Wheeler), Escuintla (W. M. Wheeler) [WWK].

Discussion. — This and the following two species — *gagates* and *rufescens* — form a tightly knit complex of intimately related species. The worker, aside from lacking a needlelike process on the apex of the highly shining petiolar scale, resemble each other in general habitus, especially the shape of the thorax, *i. e.* the pronotal spines, the more or less slanting mesonotum, the deeply impressed and broad metanotal groove, the elongated and elevated basal face of epinotum, the lack of a basidorsal tubercle on hind coxae. The females have rounded pronotal humeri and lack a scapular tooth, present in all other known females of the genus. The specific differences between *debilis*, *gagates* and *rufescens* are given under the latter two species.

Synonymy. — I have been unable to secure types of the two varieties *sieversi* and *parabiotica*, described by Forel. Unless the descriptions are completely misleading, both forms are nothing but ill-defined variants of *debilis* and do not deserve, by any means, taxonomic recognition. Hence I decided to drop them as synonyms of the typical species.

Bionomics. — During a short trip to northern Colombia in 1896, Forel made the startling observation that the present species shows a remarkable tendency to live together in a strange mode of association with *Crematogaster limata parabiotica* For. He found both species inhabiting a termite nest on a mango tree, almost completely appropriated by the ants. Very few of the termites were left in the nest. Upon foraging both species of ants mixed freely, running very generally in common files, splitting only at the terminal where each species took to its own feeding ground. Inside the nest, however, they kept strictly apart, there being always only one kind of ants and their brood in each of the many intertwining chambers, which opened freely one into another. The chambers tenanted by one species were mixed with those occupied by the other, and nearly the smallest fragment of the nest contained chambers of both species. Publishing his findings in 1898 (without specific identifications, which he gave later, in 1904, resp. 1912), he coined the term "parabiosis" for this special type of symbiosis, where colonies of species belonging to different taxonomic groups "actually live in the same nest in a state of mutual toleration or even amity" (Wheeler, 1921, p. 89).

In the winter of 1911-1912, while collecting ants in Panama and Guatemala, Wheeler (1912, 1921) was able to confirm Forel's observation upon the same species. Nests containing both species in parabiotic association were found in dead wood of larger trees, in abandoned termite nests, in fence posts, in dead trunks of palms even in a rotten branch of about 3 cm in diameter. In the latter case the nest chambers of each species were partly separated, *Monacis* being concentrated mainly in the basal portion of the branch, *Crematogaster* in the distal portion. In addition, Wheeler found out that *Monacis debilis* workers were attending coccids (*Lecanium* sp.) and membracids.

The association in parabiiosis between both species is only facultative. Forel and Wheeler, upon several occasions, have discovered nests where *Monacis* and *Crematogaster* were living by themselves. Furthermore, it is known that *Crematogaster limata parabiotica* lives in parabiiosis also with other ants, viz. *Monacis hispinosa* (Ol.) and *Camponotus femoratus* (F.).

8. *Monacis gagates* (Emery)

(Pl. 1, fig. 8; Pl. 2, fig. 14; Pl. 3, fig. 9)

Dolichoderus gagates Emery, 1890, Ann. Soc. Ent. France (6) 10 : 69 nota (W; Brazil, Pará: Bragança).
Dolichoderus (Monacis) gagates Emery, 1894, Bull. Soc. Ent. Ital. 26 : 228. — Emery, 1912, Gen. Ins. Subf. Dolichoderinae, fasc. 137, p. 9.

Types. — 2 workers taken at Bragança, Pará State, Brazil, by M. de Mathan; in the Emery collection at Genova [MCSN]. These specimens were not examined.

Worker. — Total length 3.2-4.0 mm; length of head 0.78-0.96 mm; width of head 0.82-1.07 mm; length of scape 0.71-0.89 mm; length of thorax 0.96-1.28 mm. Black; chewing border of mandibles, funiculi, trochanters, tarsi testaceous, often more or less infuscated.

This species is very close to *debilis*, from which it diverges principally in the following set of characters: (1) Head and dorsum of thorax practically smooth and shiny. Gaster faintly and very finely reticulate and shiny. Sides of thorax coarsely reticulate-rugose. Mandibles subopaque, finely and densely striolate. (2) Pubescence extremely scarce, practically confined to bottom of thorax and coxae. Erect and suberect long hairs abundant, present also on sides of head, occiput, clypeus, scapes, legs, superior petiolar border. Gaster lacking small, sparse appressed hairs. (3) Head (Pl. 1, fig. 8) with rather straight, conspicuously diverging sides; occipital border straight, not excised in the middle. (4) Pronotal spines slender, pointed (Pl. 2, fig. 14). Anterior border of mesopleura with a strong incision near the top (Pl. 3, fig. 9). Metanotal groove broader. Basal face of epinotum subrectangular; lateral borders marginate;

posterior border forming a sharp, elevated crest; posterior corners subdentate. (5) Petiole a trifle thicker, the apical tooth small but always developed and slightly curved caudad; posterior face gently excavate in the middle.

Female and male. — Unknown.

Distribution. — So far this species has been found only on the lower Amazon river in Brazil and in Bolivia.

Specimens examined. — 51 workers, as follows: Brazil, Amapá Territory: Serra do Navio, Sept. 30, 1947, K. Lenko: 50 W [WWK and in the collection of C. A. de Campos Seabra e Karol Lenko]. — Bolivia: locality, date and collector unknown (received from Staudinger, Emery det.: "*debilis*"): 1 W [CTB].

Observation. — The Bolivian specimen is by far the largest and has the vertex slightly sculptured. Maybe for this reason Emery mistook it for a *debilis*. Nevertheless, this worker possesses all essential characters of *gagates*.

9. *Monacis rufescens* (Mann), n. stat.

(Pl. 5, fig. 5)

Dolichoderus (Monacis) debilis var. *rufescens* Mann, 1912, Psyche 19 : 40-41 (W. F. M.; Brazil, Rondônia: Madeira-Mamoré RR. Camp 41). — Mann, 1916, Bull. Mus. Comp. Zool. Harvard 60 : 464. — Wheeler, 1921, Ecology 2 : 92-94 (Bion.). — Wheeler, 1942, Bull. Mus. Comp. Zool. Harvard 90 : 213.

Types. — Many specimens — workers, females and males — from a single colony found at Madeira-Mamoré RR. Camp 41, Rondônia Territory, Brazil, by Dr. W. M. Mann. Syntypes are in the collections of the U. S. National Museum, Washington, and the Museum of Comparative Zoology, Harvard University. I have examined two workers and one female of this series [WWK, received from MCZ].

Worker (syntypes). — Total length 4.0-4.1 mm; length of head 0.93 mm; width of head 0.96-1.00 mm; length of scape 1.00 mm; length of thorax 1.28-1.32 mm. Ferruginous-red; mandibular teeth black, tibiae slightly infuscated.

Differs from both *gagates* and *debilis* in (1) the light color; (2) the long scape which exceeds the length of head capsule; (3) the shape of the petiolar scale, which has the upper border sharply marginate at each side of the mesial tooth; (4) the coarser, reticulate-rugose sculpture of head.

Additional separatory characters from *debilis* are the following: (1) Hairs on scapes and legs not appressed but oblique, more abundant and longer. Clypeus, sides of head,

thorax, superior border of petiole with conspicuous, long, often somewhat inclined hairs. Gaster with only one type of hairs, *i. e.* long conspicuous, oblique hairs; lacking short, sparse, appressed pubescence. Long hairs on anterior portion of pronotum never pointing forward. (2) Setigerous punctures on mandibles large and conspicuous. (3) Anterior border of clypeus and occipital border of head not excised in the middle. (5) Sides of thorax strongly reticulate-rugose. (6) Profile of thorax and shape of epinotum as in *gagates*.

Complementary differences from *gagates*: (1) Long hairs always more inclined and oblique, usually not quite upright. (2) Mandibles not finely striated. (3) Lateral border of head slightly more convex, as in *debilis*. (4) Dorsum of thorax strongly sculptured.

Female (syntype). — Total length 6.2 mm; length of head 1.07 mm; width of head 1.21 mm; length of scape 1.14 mm; length of thorax 2.07 mm; length of fore wing 5.6 mm. With the same differential traits as the worker, especially the light color, the pilosity, the long scape, the sharp superior border of petiolar scale, the strongly sculptured vertex of head and dorsum of thorax. As in *debilis*, this caste lacks the tooth on the humeral angle of the pronotum. Venation of fore wing as shown on Pl. 5, fig. 5.

Male. — This sex was diagnosed by Mann, but the description is of little help, presenting as it does only group characters. I have not seen a specimen of this sex.

Distribution. — Only the type series from the upper Madeira river, Rondônia, Brazil, is known.

Discussion. — This "very distinct variety" (Mann, 1916), as shown above in the descriptions, differs rather strikingly from both *debilis* and *gagates*, its closest relatives. At any rate, its greatest affinity is with *gagates*, not *debilis*. However, *rufescens* seems sufficiently distinct from both to be ranked as a full-fledged species.

Bionomics. — Mann has given in the original account (1912) a very interesting description of his observations on this species, which was found living parabolically with *Odontomachus affinis mayi* Mann in the same nest of the "ant-garden" type. Instead of presenting a dry summary I prefer to cite from the original:

"In August, while collecting along a trail near Camp No. 41 on the Madeira-Mamoré Railroad in the State of Mato Grosso, my attention was attracted to a number of small red *Dolichoderus*. They were moving excitedly about, holding the abdomen up and a little to one side, so that they had a comically asymmetrical appearance. A tree by the trail had been felled, and in a fork of its branches, at what had been a

height of approximately forty feet, I found the nest, an earthy structure, ovate in form, about a foot in length and eight inches in diameter. Fine roots of a plant ramified through this nest in all directions in such a manner as to make it quite firm, despite the nature of its component material. When I dug into the structure, numbers of the *Dolichoderus* rushed out. While collecting these I had a momentary glimpse of another ant, colored similarly to the *Dolichoderus*, but much larger, and with long legs. It emerged from one chamber and immediately disappeared into another. Hoping to collect this, as well as all phases of the *Dolichoderus*, I brought to the place a large quinine can, containing a piece of cotton saturated with chloroform, and began to dig and throw into this fragments of the nest. Hereupon numbers of the large ants rushed out, and my hand was severely stung before I realized that two colonies of ants, one of them a stinging form, were occupying the nest. On examination, the fragments thrown into the can were seen to contain large numbers of both species, together with many larvae and pupae of each. The larger ant proved to be a Ponerine, of the genus *Odontomachus*. Males and females of *Dolichoderus* were also found, but there was none of these phases of the other. But the presence of many larvae in all stages showed that the sexual forms of both species must have been present. During the two days following I revisited the nest frequently, and stirred it up. Each time both species of ants sallied out. Touching the nest lightly would bring out *Dolichoderus*, but it required a more vigorous prod to excite the other. My first examination had so disarranged the nest that I could make no close study of its structure, but was able to ascertain definitely that the *Odontomachus* were gathered together in its deeper recesses, while the smaller species occupied the peripheral chambers and galleries. No other nest was found, nor did I again find either of the ants. This may be readily explained by the usual inaccessibility of tree tops to the collector, so failure to find more in no wise proves that the species are uncommon" (Mann, 1912, pp. 37-38).

10. *Monacis schulzi* (Emery)

(Pl. 1, fig. 7; Pl. 2, fig. 10; Pl. 3, fig. 8; Pl. 5, fig. 7)

Dolichoderus (Monacis) schulzi Emery, 1894, Bull. Soc. Ent. Ital. 26 : 233-234 (W; Brazil. Pará: Belém). — Emery, 1912, Gen. Ins. Subf. Dolichoderinae, fasc. 137, p. 10.
Dolichoderus biolleyi Forel, 1908, Bull. Soc. Vaud. Sci. Nat. 44 : 61 (W; Costa Rica: Manglares, mouth of Jesus Maria river). — [N o v. S y n.]
Dolichoderus schulzi biolleyi Forel, 1912, Mém. Soc. Ent. Belg. 20 : 35.
Dolichoderus schulzi biolleyi var. *columbica* Forel, 1912, Mém. Soc. Ent. Belg. 20 : 35. — [N o v. S y n.]

Types. — *M. schulzi*: several syntype workers in the Emery collection at Genova [MCSN], one syntype examined; *biolleyi* and var. *columbica*, presumably in the Forel collection at Geneva, Switzerland, were not seen.

Worker (lectotype). — Total length 3.6 mm; length of head capsule 0.79 mm; width of head 0.82 mm; length of scape 0.71 mm; length of thorax 1.07 mm. Black; mandibles, funiculi, trochanters, tip of femora, tibiae and tarsi more or less fuscous-

brown to ferruginous. Standing hairs sparse: present on clypeus, vertex of head, dorsum of thorax, summit of petiole, gaster; lacking on sides of head and thorax, on scapes and legs. Pubescence yellowish-white, appressed, sparse and inconspicuous on head, quite visible, denser, longer on dorsum of thorax, sparser again on top of petiole and on gaster. Head and thorax subopaque, finely and densely punctate, head also shallowly and sparsely foveolate and somewhat rugose. Mandibles, petiole and gaster shining and nearly smooth, the sculpture being vestigial or superficial.

Head (Pl. 1, fig. 7) subcordate, lateral borders convex, occipital border straight, not excised in middle. Chewing border of mandibles with about 9 small, triangular teeth. Anterior border of clypeus mesially shallowly impressed. Frontal carinae somewhat diverging caudad. Scape a bit shorter than maximum length of head capsule. Dorsum of thorax flat, all three parts at approximately the same level. Pronotum transverse (Pl. 2, fig. 10), anterior corners acute but not in the form of a tooth constricted off the thorax proper; lateral borders distinctly marginate and converging caudad, yet not forming a sharp edge. Mesonotum elliptical, almost twice as broad as long. Metanotal groove narrow, deeply impressed. Basal face of epinotum about as long as broad, its sides diverging caudad, the posterior angles rounded, posterior border convex, sharply marginate, mesially not excised, overhanging the excavate, rather shiny and finely rugulose declivous face (Pl. 3, fig. 8). Basidorsal tubercle on hind coxae well developed. Petiolar scale as in *debilis*; anterior face convex, posterior face scarcely excavate; summit without a lamellate crest but with a short tooth in the middle.

Female (undescribed). — Total length 4.9 mm; length of head 1.02 mm; width of head 1.07 mm; length of scape 0.86 mm; length of thorax 2.07 mm; length of fore wing 3.1 mm. Color, sculpture, pilosity and differential characters as in worker, with the following noteworthy details: Prothoracic humeri rectangular, subdentate, lateral borders of pronotum obtusely marginate. Mesothoracic scutum conspicuously transverse, about 1 1/2 times as broad as long. Basal face of epinotum at least twice as broad as long, lateral borders marginate, subparallel, posterior corners rounded, posterior border slightly convex and sharply marginate, not excised in the middle. Wings subhyaline, veins brown. Only one cubital (submarginal) cell present in fore wing (Pl. 5, fig. 7).

Male. — Unknown.

Distribution. — The range of the little known species seems to reach from Pará State in Brasil (= "*schulzi* s. str.") over northern Colombia (= "var. *columbica*") to Costa Rica (= "*biolleyi*").

Specimens examined. — 3 workers and 1 female, as follows: Brazil, Pará State: Belém, Albert Schulz leg.: 1 W ("cotype" — lectotype) [MCSN]. — Costa Rica: San José, 1940, H. Schmidt: 2 W, 1 F [WWK, from CTB].

Variation and Synonymy. — The worker specimens from Costa Rica differ from the lectotype specimen of *schulzi* only in somewhat larger size. Their critical measurements are the following: Total length 4.1-4.2 mm; length of head 0.93-0.96 mm; width of head 0.98-1.00 mm; length of scape 0.82 mm; length of thorax 1.21-1.25 mm. Otherwise, excepting the shorter, more rounded basal face of epinotum, the more convex pronotum, they agree in all essentials both with *schulzi* and with the original diagnosis of *biolleyi*, described by Forel upon specimens which likewise had been captured in Costa Rica. I consider both forms as synonyms. Incidentally, Forel (1912) conceded this fact implicitly when lowering his *biolleyi* to racial category and attaching it to *schulzi*. Both *biolleyi* and var. *columbica* are doubtless conspecific with *schulzi*. The few specimens collected so far preclude all chances of keeping the Forelian forms as geographic races.

Discussion. — On first describing the present species Emery clearly and correctly pointed out its affinities. In many ways it bridges the gap between the *debilis*-group and the *laminata*-group. The thoracic structure and to some extent the sculpture of the dead tie it to *lamellosa*, whereas in petiolar structure and sculpture it obviously approaches *debilis* and affines. Its closest relative however is *tristis*, which it resembles in cephalic and thoracic structure and sculpture and also in pilosity. But *schulzi* disagrees strikingly with *tristis* in the shape and sculpture of the petiole, and in the shiny and nearly smooth integument of the gaster.

Observation. — The drawings of this species were made from the Costarican specimens inasmuch as the syntype specimen received on loan from the Emery collection, due its very bad mounting, did not lend itself to this purpose.

11. *Monacis tristis* (Mann)

(Pl. 2, fig. 3; Pl. 4, fig. 2)

Dolichoderus (Monacis) tristis Mann, 1916, Bull. Mus. Comp. Zool. Harvard 60 : 463-464, Pl. 2, fig. 17 (W; Brazil, Rondônia Territory: Abunã).

Types. — Several workers taken by Dr. W. M. Mann at Abunã, Rondônia territory, Brazil, on the upper Madeira river nearly opposite the mouth of the Rio Abunã.

Worker (syntypes). — Total length 5.0-5.1 mm; length of head 1.10 mm; width of head 1.10-1.14 mm; length of scape

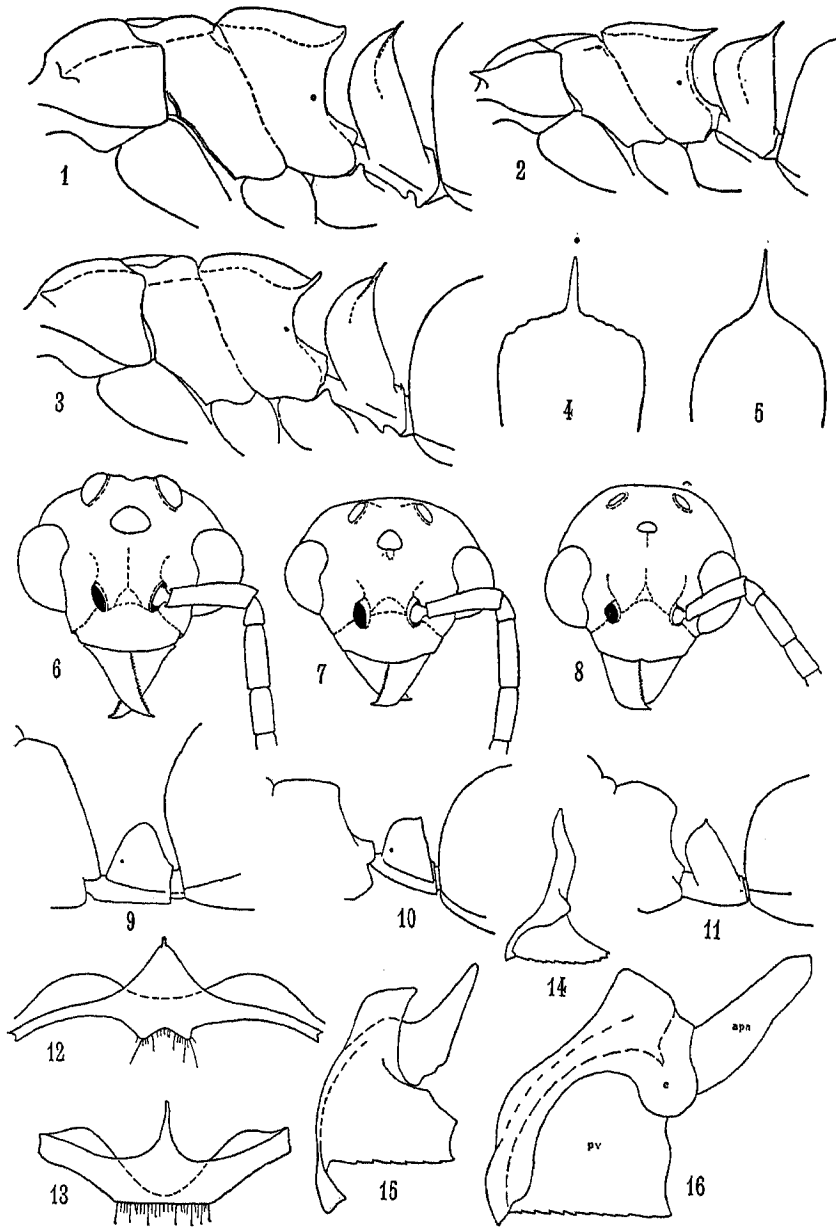


Plate IV

Monacis: Figs. 1-3. Thorax of worker in profile. — Figs. 4-5. Petiole of worker in front view. — Figs. 6-8. Head of male. — Figs. 9-11. Epinotum and petiole of male in profile. — Figs. 12-13. Male: Subgenital plate. — Figs. 14-16. Male: Aedeagus in profile. — Figs. 1, 8, 11, 14. *lamellosa*. — Fig. 2. *tristis*. — Fig. 3. *setosa*. — Figs. 4, 7, 10, 13, 15. *bispinosa*. — Fig. 5. *valida*. — Figs. 6, 9, 12, 16. *mucronifera*.

1.07 mm; length of thorax 1.57-1.64 mm. Black; inner border of mandibles, part of funiculus and legs fuscous-brown. Short, pointed, standing hairs fairly abundant on front and posterior portion of sides of head, dorsum of thorax, petiole and gaster; a few erect hairs also on flexor face of femora. Pubescence appressed, yellowish-gray, conspicuous, dense and sericeous on dorsum of thorax, petiole and gaster. Subopaque. Head coarsely reticulate-rugose, the meshes encircling shallow foveolate. Mandibles rather shiny, finely reticulate, with scattered setigerous punctures. Scape, dorsum of thorax and gastric tergites I-III densely granulate or punctate. Sides of thorax reticulate-punctate, somewhat shining, with irregular rugae on the posterior half. Petiolar node with the relatively broad dorsal face strongly granulated, rugose and opaque, the rest coarsely and irregularly rugose and somewhat shiny.

Head subcordate, about as long as broad, narrowed in front, the sides gently convex and diverging caudad, the occipital corners broadly rounded, the occipital border scarcely concave in the middle. Anterior border of clypeus slightly impressed at the middle. Frontal carinae nearly straight, little diverging caudad. Thoracic dorsum conspicuously flattened. Pronotum (Pl. 2, fig. 3) more than twice as broad as long, the anterior angles (humeri) drawn out as an acute, flattened tooth, the lateral borders sharply marginate. Mesonotum slightly less than twice as broad as long, with lateral borders less sharply marginate, the posterior corners subrectangular, but scarcely raised. Mesoepinotal suture narrow, deeply impressed. Basal face of epinotum ovoid, narrower in front than behind, lateral borders distinctly, not sharply, marginate, diverging caudad, gently convex; posterior corners broadly rounded; posterior border sharply marginate and conspicuously overhanging the excavate, rugulose and shining declivous face. Hind coxae with a basidorsal tubercle. Petiolar scale (Pl. 4, fig. 2) relatively thick, *i. e.* antero-posteriorly little compressed, anterior face gently convex, distinct from flattened upper face; the latter separated from the straight posterior face by a sharp transverse margination, which at the middle is drawn out abruptly as a short, slender spine.

Female and male. — Unknown.

Distribution. — Only the type series from Abunã, Rondônia, Brazil, is known. I have examined three syntype workers [MCZ, WWK].

Discussion. — *Monacis tristis* resembles both *schulzi* and *lamellosa*. It differs from the former in larger size, more strongly sculptured head, presence of standing hairs on the sides of head, acutely dentate humeri and sharply marginate border of pronotum, incrassate, apically spinous and strongly sculptured petiolar node, granulate gaster. The longer scape, the presence of standing hairs on head and thorax, the finely granulate dorsum of thorax, the shape and sculpture of the petiole, separate *tristis* workers from those of *lamellosa* and relatives.

Mann states in the original description that the dorsal portions of the first gastric tergite are finely striate, longitudinally in front, transversely behind. Even under high power magnification I was unable to see this feature. Instead all three syntypes examined have the aforesaid sclerite merely granulate or densely punctate, with no trace of striae or fine rugosities.

12. *Monacis laminata* (Mayr)

(Pl. 1, fig. 11; Pl. 2, fig. 4; Pl. 3, fig. 10)

- Hypoclinea laminata* Mayr, 1870, Sitz.-ber. Akad. Wiss. Wien 61 : 389-390, Pl. fig. 8 (W; Colombia). — Mayr, 1870, Verh. Zool.-bot. Ges. Wien 20 : 954, 956 (Key).
Dolichoderus laminatus, Dalla Torre, 1893, Cat. Hym. 7 : 159. — Forel, 1899, Biol. Centr.-Amer. Hym. 3 : 99, Pl. 4, figs. 12, 12A (F; Panama: David, Tolé; Colombia; Bion.).
Dolichoderus (Monacis) laminatus, Emery, 1894, Bull. Soc. Ent. Ital. 26 : 228. — Borgmeier, 1923, Arch. Mus. Nac. Rio 24 : 82 (Brazil).
Dolichoderus (Monacis) laminatus luteiventris Emery, 1894, Bull. Soc. Ent. Ital. 26 : 232 (W; Brazil, Pará: Belém). — Mann, 1916, Bull. Mus. Comp. Zool. Harvard 60 : 462 (F; Brazil, Rondônia: Madeira-Mamoré RR. Camp 41). — [N o v. S y n.]

Types. — *Monacis laminatus s. str.*: workers captured by Lindig somewhere in Colombia, deposited in the Mayr collection, Vienna; *laminatus luteiventris*: workers from Belém, Pará State, Brazil, deposited in the Emery collection at Genova [MCSN]. None of these specimens were seen.

Worker. — Total length 5.8-6.6 mm; length of head 1.28-1.43 mm; width of head 1.14-1.30 mm; length of scape 1.43-1.50 mm; length of thorax 2.00-2.21 mm. Black; mandibles, funiculi, tip of femora, tibiae, tarsites II and III fuscous brown; palpi, coxae, femora, tarsites IV and V testaceous. Brazilian and Guianian specimens have the gaster testaceous, each tergite with a broad, brown apical, transverse band (= "*luteiventris*"). Standing hairs absent, excepting those one apical segments of gaster. Dilute, fine, appressed pubescence on head, legs and gaster, rather dense on antennae. Integument opaque. Head, thorax and anterior half of petiole covered with dense, minute, deeply impressed punctures. The superimposed macrosculpture consists of dense, fine, more or less longitudinal striae on clypeus; vertex and sides of head foveolate; occiput and dorsal face of petiole reticulate-rugose; promesonotum more or less longitudinally

rugose; basal face of epinotum irregularly rugose, *i. e.* rugae usually longitudinal in front, more or less transverse in the rear. Mandibles, declivous face of epinotum and legs rather finely and superficially reticulate or coriaceous and somewhat shiny. Posterior face of petiole shining, yet rather strongly and transversely rugulose. Gaster finely reticulate-punctate, subopaque.

Head (Pl. 1, fig. 11) longer than broad, ovate; occipital corners completely rounded; both occipital and lateral borders gently convex. Clypeus mesially gently impressed at the anterior border. Frontal carinae subparallel. Scapes longer than length of head capsule. All funicular segments distinctly longer than broad. Promesonotum (Pl. 2, fig. 4) trapeziform, broadest in front, slightly excavated anterolaterally, gently convex discally. Anterior border (except in the middle, behind neck) and lateral borders very sharply marginate, forming a projecting, cutting edge; anterolateral corner forming an acute angle. Mesonotum at least as long as broad, transversely concave, lateral borders raised, rather bluntly marginate. Thorax strongly constricted at the level of the narrow, deeply impressed mesoepinotal suture. Basal face of epinotum trapeziform, narrowest in front, gradually broadening caudad; diverging lateral borders more bluntly marginate; posterior angles rounded; posterior border gently convex, with a broad, obliquely raised, laminate crest, overhanging the excavate declivous face (Pl. 3, fig. 10). Hind coxae without a basidorsal tubercle. Petiolar scale incrassate; anterior and dorsal face forming a continuous curvature in profile; summit posteriorly with a thin, inclined, mesially slightly and bluntly produced, transverse, laminate crest; posterior face oblique, not excavate. Ventral face of petiole posteriorly without a tooth. Base of gaster conspicuously excavate.

Female. — This sex was pictured by Forel (1899) and mentioned again by Mann (1916: *l. luteiventris!*), yet there is no description of it. Forel's figure seems to indicate that this caste has the same differential characters as the worker. I have not seen any specimens.

Male. — Still unknown.

Distribution. — From northern South America (Guianas, Amazon river and Madeira river) over Colombia to Panama and Costa Rica (according to Dr. Brown, personal communication).

Specimens examined. — 7 workers, as follows: Brazil, Pará State: Cachoeira do Breu, Oct. 1928, A. J. Sampaio: 3 W [CTB]. — British Guiana: Kartabo, July-Aug. 1920, W.

M. Wheeler: 3 W [CTB]. — Colombia: on orchid *Cattleya trianae*, U. S. Plant Quarantine interception at Washington D. C., Oct. 7, 1935: 1 W [WWK, from USNM].

Discussion. — The ovate head, the long scapes, the straight and subparallel frontal carinae, the long, excavate mesonotum, the strong mesoepinotal constriction, the lack of a basidorsal tubercle on hind coxae, separate *laminatus* from *lamellosa* and related forms. *Monacis varians* seems to be closest species, but is quite distinct on account of the abundant standing hair. Other differences will be taken up farther below.

The race *luteiventris* was erected by Emery (1894) upon specimens from the lower Amazon river, distinguished by slightly smaller size, more distinct longitudinal rugae on pronotum, and the testaceous gaster, traversed by brown bands. Although I have seen very little material, I still suspect that only the last feature, the light color of the gaster, is significant, characterizing a population which seems to replace the dark-gaster variant of southern Central America and Colombia in the Amazon basin and the Guianas. This however is mainly theorizing and wishful thinking. Therefore I propose to drop, as least for the time being, the race *luteiventris*, until the nature of this variability is more thoroughly understood.

Bionomics. — Forel (1899) states that *laminata* nests under the bark of trees, according to his personal observations made in Colombia. He adds that he picked up specimens occasionally on the foot of the same trees, and that the insect does not spread the peculiar "Tapinoma-odor" of related forms.

13. *Monacis varians* (Mann)

Dolichoderus (Monacis) varians Mann, 1916, Bull. Mus. Comp. Zool. Harvard 60 : 462-463 (W; Brazil, Rondônia: Pôrto Velho).

Type. — *Monacis varians* was described upon a single worker taken by Dr. W. M. Mann at Pôrto Velho on the upper Madeira river. This specimen is now in the collection of the Museum of Comparative Zoology at Harvard University. Being unique, it could not be sent on loan. No other specimens are known.

Mann's description is sufficiently detailed to permit immediate recognition and is transcribed completely below. I also append a further description of the same holotype worker, kindly furnished at my request by Dr. W. L. Brown, Jr. Due to the long scapes, the long excavate mesonotum, the triangular, elongate basal face of the epinotum, *variens* is definitely much closer to *laminata* than to *lamellosa*. It differs from the former in the more slender habitus, the conspicuously coarser sculpture and the dense, fine, erect pilosity on the body and legs.

Original description: "Worker. — Length 5 mm. Near *D. lamellosus* Mayr. Head oval, excluding mandibles, a little longer than

broad, the sides very convex; occipital angles narrowly rounded, the border narrowly concave. Clypeus flat above, with rounded anterior border. Frontal area very large, triangular. Frontal carinae thin, slightly elevated, extending to opposite posterior third of eye. Eyes small, convex, located in front of sides of head, a little behind middle. Antennae slender, the scape thickened toward apex, extending a third its length beyond the occipital corners; all the funicular joints longer than broad. Pronotum transverse, broadest in front, the anterior angles drawn out to form acute triangular spines, which are flattened above; anterior border convex at the middle, concave at sides; sides sharply but not broadly margined. Mesonotum one and a half times as long as broad, narrowed behind; the surface slightly concave; sides with a narrow elevated margin. Base of epinotum from above triangular, one and a half times as long as broad, sides roundly margined; apical portion transversely depressed and posterior to this elevated into a very thin lamella; declivity a little shorter than the base. Petiolar node twice as broad as long; in profile twice as high as thick; anterior and posterior surfaces slightly convex, the apex rounded in front, behind elevated into a very thin broad lamella. Gaster short and thick. Subopaque. Head, thoracic dorsum and anterior surface of petiolar node shallowly, densely rugulose. Posterior surface of node and the gaster finely, densely punctate, the latter regularly granulose. Body thickly covered with short, fine, erect pile. Antennae minutely pubescent. Color black; antennae and legs ferruginous" (Mann, 1916, pp. 462-463).

Worker (holotype) [MCZ] (After W. L. Brown, Jr., personal communication). — Total length 7.3 mm; length of head 1.48 mm; width of head (with slightly bulging eyes) 1.29 mm, (without eyes) 1.26 mm; length of scape 1.73 mm; length of thorax 2.28 mm. Similar in habitus to *laminata*, less so to *lamellosa*. As compared to *laminata*, *varians* is as large as the largest workers, but more slender, much more coarsely, irregularly and rugosely sculptured, and densely hairy. Head as in *laminata*, but even more slender, with a feebly suggested development of a "neck" in the cervical area, i. e. cervical flange prominent and narrowly rounded as seen in full-face view. Thorax slender, the dorsal surface gently depressed or concave, with raised, irregularly crenulate lateral margins. Pronotal teeth large and acute. Mesonotum distinctly longer than broad. Petiolar flange broadly rounded and similarly crenulate as margins of thorax. Gaster densely punctate and opaque, with conspicuous piligerous tubercles. Upper surface of hind coxae unarmed. Hairs very abundant, inclined-erect, yellowish-brown, tapered, mostly confined to dorsal surfaces of body and all surfaces of legs, absent on scapes. Hair length ranges from about 0.10 mm on legs to about 0.28 mm on thorax. The entire antennae, including scapes, are dull yellow like the legs.

14. *Monacis lamellosa* (Mayr)

(Pl. 1, fig. 12; Pl. 2, fig. 12; Pl. 4, figs. 1, 8, 11, 14; Pl. 5, figs. 6, 10, 12)

- Hypoclinea lamellosa* Mayr, 1870, Sitz.-ber. Akad. Wiss. Wien 61 : 390-391 (F; Colombia).
Dolichoderus lamellosus, Dalla Torre, 1893, Cat. Hym. 7 : 159. — Forel, 1899, Biol. Centr.-Amer. Hym. 3 : 99 (Costa Rica). — Forel, 1912, Mém. Soc. Ent. Belg 20 : 35 (Colombia: Sierra Nevada de Santa Marta).
Dolichoderus (Monacis) lamellosus, Emery, 1894, Bull. Soc. Ent. Ital. 26 : 233 (F, W; Colombia; Costa Rica; Brasil: Pará; Bolivia). — Emery, 1912, Gen. Ins. Subf. Dolichoderinae, fasc. 137, p. 10.
Dolichoderus (Monacis) lamellosus var. *missionensis* Santschi, 1916, Physis 2 : 390, fig. (W; Argentina, Misiones: Iguazu). — Nov. Syn.
Dolichoderus (Monacis) schulzi var. *missionensis* Santschi, 1923, Rev. Suisse Zool. 30 : 269.

Type. — A stray female, collected by Lindig in Colombia, now presumably in the Mayr collection at the Naturhistorisches Museum of Vienna, Austria. Not seen.

Worker. — Total length 4.0-4.7 mm; length of head 0.89-1.07 mm; width of head 0.86-1.03 mm; length of scape 0.71-0.82 mm; length of thorax 1.21-1.43 mm. Black; mandibles, funiculi, and legs ferruginous or brown. Standing hairs confined to mandibles, coxae, flexor face of femora, tip and venter of gaster; one pair of erect, short, fine setae posteriorly on vertex. Gray appressed pubescence minute on scapes on legs; denser, longer, sericeous on gaster. Mandibles, legs and gaster slightly shining, lightly and finely reticulate or coriaceous. Head, scape, thorax (especially dorsum) opaque, finely and densely reticulate-punctate. Clypeus with fine longitudinal striae between punctures. Head and dorsum of thorax rather densely foveolate; vertex of head more or less longitudinally rugulose; dorsum of thorax reticulate-rugose between foveolae. Sides of thorax less coarsely sculptured, bottom of mesopleura somewhat shiny, finely reticulate. Petiolar apex sparsely and irregularly rugose, usually not distinctly and coarsely reticulate-rugose in front of transverse lamina.

Head (Pl. 1, fig. 12) slightly longer than broad, ovate; occipital corners more narrowly rounded; lateral borders gently convex; occipital border almost straight, very feebly excised at most. Frontal carinae noticeably diverging caudad. Frontal area impressed. Scapes distinctly shorter than length of head. Funicular segments IV-X never longer than broad, rather transverse toward apex of funiculus. Pronotum (Pl. 2, fig. 12) gently convex, anterior corners acutely angulate, subdentate; lateral borders not sharply marginate, converging caudad. Mesonotum transverse, flat; lateral borders obtusely marginate; posterolateral corners slightly raised. Basal face of epinotum with a more or less vestigial longitudinal carina in the middle; somewhat longer than broad; lateral borders obtusely marginate; posterior corners

rounded; posterior border produced over strongly excavate declivous face (Pl. 4, fig. 1), sharply marginate, scarcely convex, usually very little excised in the middle; obliquely upturned and narrowly crested. Hind coxae with a basidorsal tubercle. Petiolar scale lengthwise strongly compressed; anterior and dorsal face convex in profile, separated from scarcely excavate posterior face by an inclined, short, mesially acuminate, transverse lamina. Ventral face of petiole posteriorly with a distinct tooth following a shallow notch. Gaster anteriorly conspicuously impressed in the middle.

Female. — Total length 4.7-5.3 mm; length head 1.02-1.14 mm; width of head 0.96-1.07 mm; length of scape 0.75-0.82 mm; length of thorax 1.57-1.78 mm; length of fore wing 3.6-3.9 mm. Quite similar to the worker, especially as regards color, sculpture, pilosity, and shape of head, hind coxae, and petiole. Ocelli nearly flush with head surface, sunk in pits, small, the distance between anterior and lateral ocelli more than thrice their diameter; anterior ocellus behind level of posterior orbit of eyes. Occipital border straight. Anterolateral corners of pronotum angulate or dentate; lateral borders very obtusely marginate. Mesothoracic scutum with a few stiff erect hairs; slightly broader than long. Basal face of epinotum slightly broader than long; lateral borders subparallel, often a little converging behind; median longitudinal carina usually obsolete; posterior corners rounded; posterior border sharply marginate and crested, scarcely emarginate in the middle, overhanging the excavate declivous face. Hind coxae with a basidorsal tubercle. Wings short, subhyaline, veins light brown; pterostigma darker. Venation of fore wing as shown on Pl. 5, fig. 6.

Male (undescribed). — Total length 3.9-4.6 mm; length of head 0.73-0.82 mm; width of head (eyes included) 0.82-0.91 mm; length of thorax 1.32-1.53 mm; length of fore wing 2.8-3.4 mm. More or less fuscous-brown; mandibles, antennae, legs testaceous. Standing hairs extremely scarce as in worker and female; pubescence feeble, except on epinotum, petiole and gaster. Head, pronotum, dorsum of mesothorax, epinotum and petiole opaque and more heavily sculptured; mandibles, mesopleura, gaster finely and superficially reticulate, shining and nearly smooth. Head (Pl. 4, fig. 8) not conspicuously transverse, yet somewhat broader than long. Eyes situated in front of middle of the sides; ocelli little projecting. Mesothoracic scutum slightly broader than long, finely and densely granulate and more coarsely

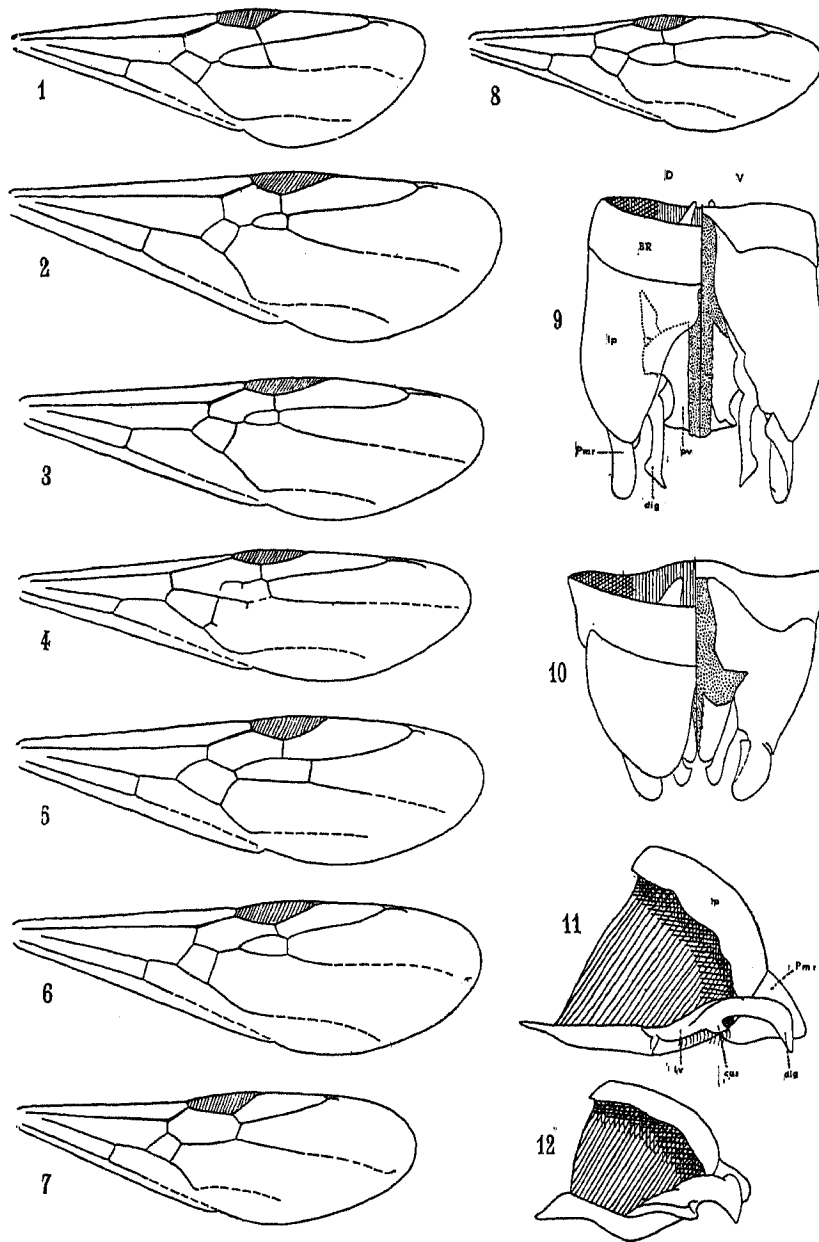


Plate V

Monacis: Figs. 1-8. Fore wing (Figs. 1-2. Male. — Figs. 3-8. Female). — Figs. 9-10. Male genitalia, dorsal and ventral. — Figs. 11-12. Male genitalia, paramere and volsella. — Figs. 1, 8. *bispinosa*. — Figs. 2, 3, 9, 11. *mucronifera*. — Fig. 4. *valida*. — Fig. 5. *rufescens*. — Fig. 6, 10, 12. *lamellosa*. — Fig. 7. *schulzi*. (Wings not drawn to the same scale)

foveolate, with a few longitudinal rugulae between the pits. Basal face of epinotum reticulate-rugose, transverse, nearly as long as the slightly excavate and shiny declivous face (Pl. 4, fig. 11); posterior border obtusely marginate. Petiole shorter and stouter than in worker, but similarly sculptured; summit with a sharp transverse margination or narrow crest, mesially produced as a short tooth. Genitalia in general as in *mucronifera*, but parameral plates and parameres shorter and broader (Pl. 5, figs. 10, 12), volsellae of somewhat different shape, especially the digitus; the cuspis equally retracted. Penis valves (Pl. 4, fig. 14) extremely short with long apodeme. Wings hyaline, venation as in female, with small details quite variable.

Distribution. — The range of the present not uncommon species nearly equals and overlaps that of *bispinosa*. It occurs from northern Argentina to Guatemala (according to personal communication from Dr. Brown).

Specimens examined. — Over a hundred workers, 6 females, and 6 males, as follows: Argentina, Misiones province (C. Bruch) [CTB]. — Brazil, São Paulo State: Agudos (R. Mueller) [WWK]; Federal District: Rio de Janeiro (T. Borgmeier, W. W. Kempf): W, F, M [CTB, WWK]; Rio de Janeiro State: Niterói (T. Borgmeier); Pernambuco State: Tapera (B. Pickel): W, M [WWK]; Goiás State: Aragarças (H. Sick): F; Pará State: Soure (C. R. Gonçalves): W, F [CTB]. — British Guiana: Kartabo (W. M. Wheeler [WWK]. — Costa Rica: Hamburg Farm nr. Limón (F. Nevermann): W, F, M; San José (H. Schmidt) [CTB].

Discussion. — *Monacis lamellosa* was first described upon a lone female. The worker was made known by Emery in 1894. Differential characters that separate the present species from *laminata* and *tristis* have already been treated under these species and in the key. Despite its vast territory, *lamellosa* does not present unusual variations, being rather constant in all essential features. The only difference that deserves special mention is that the specimens from Costa Rica appear a bit larger in measurements than the South American populations. This holds for all castes and sexes. Two forms that at the first glance are surprisingly similar to *lamellosa*, differing however in several significant details are proposed as new species on a following pages. Since they are very closely related to *lamellosa*, only differential characters are given.

Synonymy. — Santschi's description, Bruch's photograph, and also material from the Argentine republic that was seen, leave no doubt that the var. *missionensis* is nothing but the common and widespread *lamellosa*. Santschi tried to confuse the issue when in 1923 he shifted this variety from *lamellosa* to *schulzi*. He had no direct knowledge of the latter species, and at any rate this move is definitely wrong. There is no doubt concerning this case of synonymy.

15. *Monacis lobicornis*, n. sp.

(Pl. 1, fig. 10; Pl. 2, fig. 13)

Worker (holotype and paratypes). — Total length 4.3 mm (4.1-4.4 mm); length of head 1.00 mm (0.96-1.03 mm); width of head 0.98 mm (0.93-1.02 mm); length of scape 0.82 mm (0.72-0.85 mm); length of thorax 1.34 mm (1.28-1.39 mm). Very close to *lamellosa* from which it differs as follows:

(1) Antennal scape flattened and broadened at base as a rounded lobe (Pl. 1, fig. 10); (2) occipital border always shallowly but distinctly emarginate in the middle; (3) vertex with two pairs of standing hairs, each hair of the anterior pair arising close to posterior end of frontal carinae, posterior pair situated as in *lamellosa*; (4) apex of petiolar scale distinctly and coarsely reticulate-rugose and foveolate in front of the acuminate transverse lamina.

Female and male. — Unknown.

Specimens examined. — 123 workers, as follows: Brazil, Santa Catarina State: Blumenau, Oct. 12, 1921, M. Witte, O.F.M.: 116 W (holotype and paratypes) [CTB, n. 180]; Goiás State: Anápolis, Franciscan Seminary, Febr. 12, 1958, W. W. Kempf: 7 W (paratypes) [WWK, n. 2261].

Observation. — The paratype specimens from Goiás have all the scape a trifle shorter.

16. *Monacis setosa*, n. sp.

(Pl. 2, fig. 8; Pl. 4, fig. 3)

Worker (holotype). — Total length 4.2 mm; length of head 0.96 mm; width of head 0.90 mm; length of scape 0.79 mm; length of thorax 1.32 mm. Black; mandibles, basal tarsites ferruginous; rest of legs and funiculi testaceous; scape brown. Extremely close to *lamellosa*, differing however significantly in the following characters:

(1) head, dorsum of thorax, petiole and gaster thickly covered with short, pointed, pale yellowish standing hairs; femora and apical half of tibiae with a few oblique hairs; (2) pubescence rather long and conspicuous on top of petiole and gaster; (3) head and dorsum of thorax coarsely reticulate-rugose and densely foveolate; (4) pronotal corners (Pl. 2, fig. 8) drawn out as a very acute tooth; (5) posterior border of basal face of epinotum laminate, upturned, mesially strongly excised (Pl. 2, fig. 8; Pl. 4, fig. 3); (6) apex of petiole drawn out as a sharp, mesially strongly pointed and acute transverse crest.

Female and male. — Unknown.

Specimen examined. — 1 worker, as follows: Brazil, Pará State: Cachoeira do Breu, Oct. 1928, A. J. Sampaio: 1 W (holotype) [CTB].

On account of its body covered with abundant standing hair this species is already sufficiently characterized to be proposed as a new species, although only a single specimen is known.

17. *Monacis obscura* (Fr. Smith)

Formica obscura Fr. Smith, Cat. Hym. Brit. Mus. 6 : 42 (F; Brazil).
Dolichoderus obscurus, Mayr, 1886, Verh. Zool.-bot. Ges. Wien 36 : 356.
Dolichoderus (Monacis) obscurus, Emery, 1894, Bull. Soc. Ent. Ital. 26 : 228, 233.
 — Emery, 1912, Gen. Ins. Subf. Dolichoderinae, fasc. 137, p. 10.

Type. — A female from Brazil (exact locality unknown), received from the collection of D. Swainson, now in the British Museum (Natural History). Not seen. The original description is as follows:

"Female. — Length 3 lines. — Black: with the legs, thorax on the sides and beneath, the emargination of the metathorax and the peduncle, ferruginous. Head closely and strongly punctured, thinly covered with pale pubescence; the extreme base and apex of the scape and also the base of the flagellum, the clypeus anteriorly and the mandibles, ferruginous; the antennae and mandibles pubescent. Thorax strongly punctured, oblong-ovate, with the metathorax abruptly truncated; wings fusco-hyaline, the anterior pair with one marginal, three sub-marginal and one discoidal cell. Abdomen smooth, shining, and thinly covered with cinereous pubescence".

In a note, Fr. Smith remarks that on account of its peculiar venation of the fore wings, the species should properly be placed in a separate genus (i. e. distinct from *Formica*).

During a visit to the British Museum, made in 1884, Mayr was able to have a look at this specimen, about which he wrote the following note in 1886:

"*Form. obscura* Sm. ist ein *Dolichoderus*-Weibchen, dessen Metanotum zwei stumpfe Zaehnchen hat, die Schuppe des Petiolus ist oben etwas schneidig und schwach zurueckgekrueemmt, die Tibien sind abstehehend behaart".

Emery, in 1894, assigned the species to the group of *Monacis*, and ventured the opinion of its identity with *lamellosa*, being perhaps a subspecies or variety distinguished by larger size.

I believe that this latter surmise is highly improbable. But instead of adding another guess, I propose to leave this species aside as *inquirenda* until its identity through examination of the type can be established.

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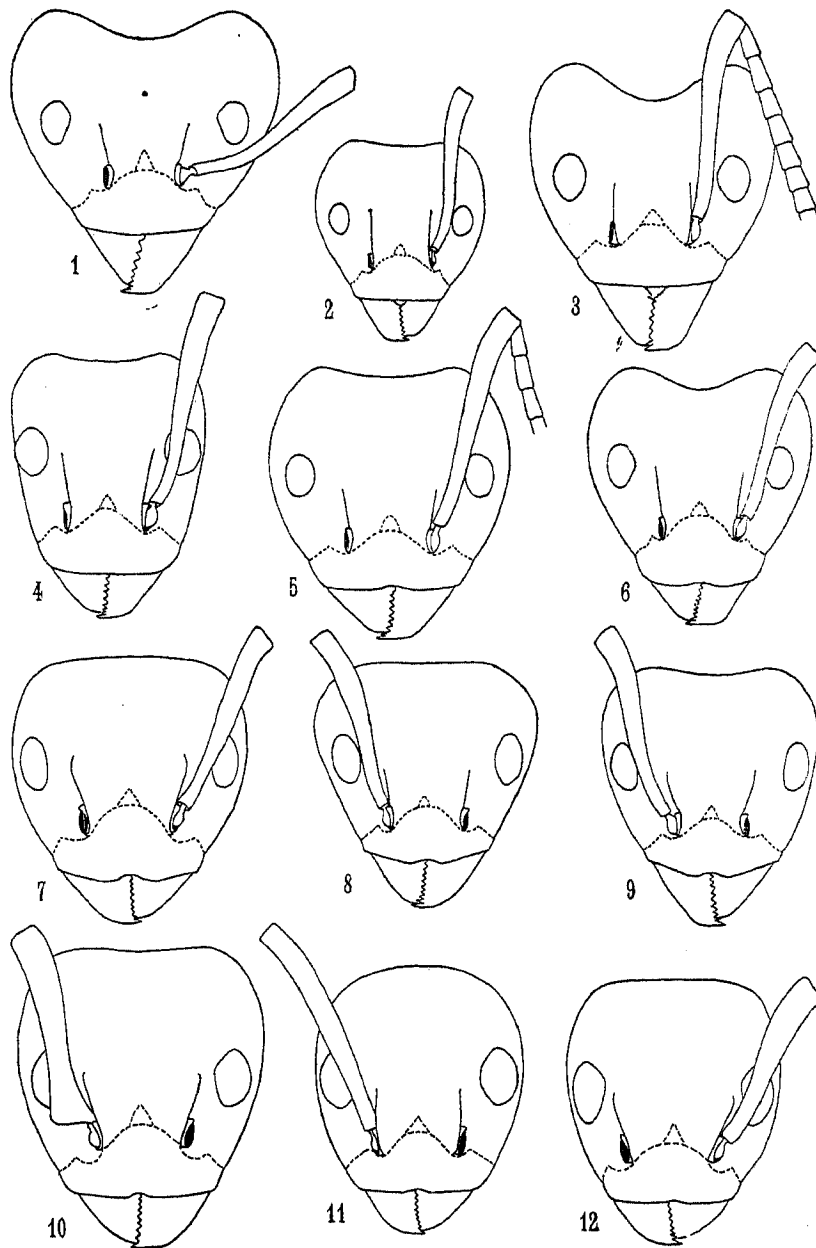


Plate 1

Monacis: head of workers. — Fig. 1. *spinicollis*. — Fig. 2. *septemspinosa*. — Fig. 3. *mucronifera*. — Fig. 4. *dolonigera*. — Fig. 5. *valida*. — Fig. 6. *bispinosa*. — Fig. 7. *schulzi*. — Fig. 8. *gagates*. — Fig. 9. *debilis*. — Fig. 10. *lobicornis*. — Fig. 11. *laminata*. — Fig. 12. *lamellosa*. (Figs. 7-12 drawn to a larger scale).

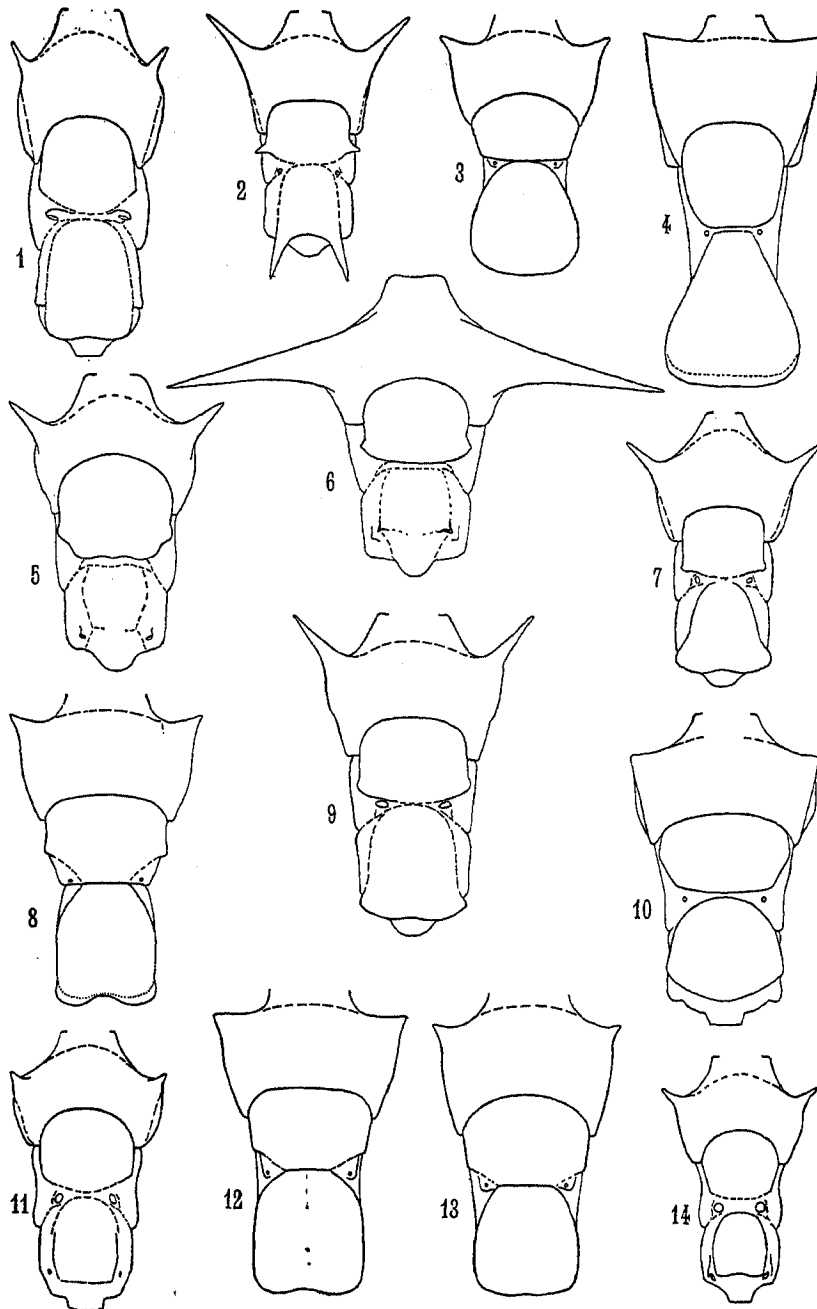


Plate II

Monacis: thorax of worker in dorsal view. — Fig. 1. *dolonigera*. — Fig. 2. *septemspinosa*. — Fig. 3. *tristis*. — Fig. 4. *laminata*. — Fig. 5. *mucronifera*. — Fig. 6. *spiticollis*. — Fig. 7. *bispinosa*. — Fig. 8. *setosa*. — Fig. 9. *valida*. — Fig. 10. *schutzi*. — Fig. 11. *debilis*. — Fig. 12. *lamellosa*. — Fig. 13. *lobicornis*. — Fig. 14. *gagates*. (Figs. 3, 4, 8, 10-14 drawn to a larger scale).

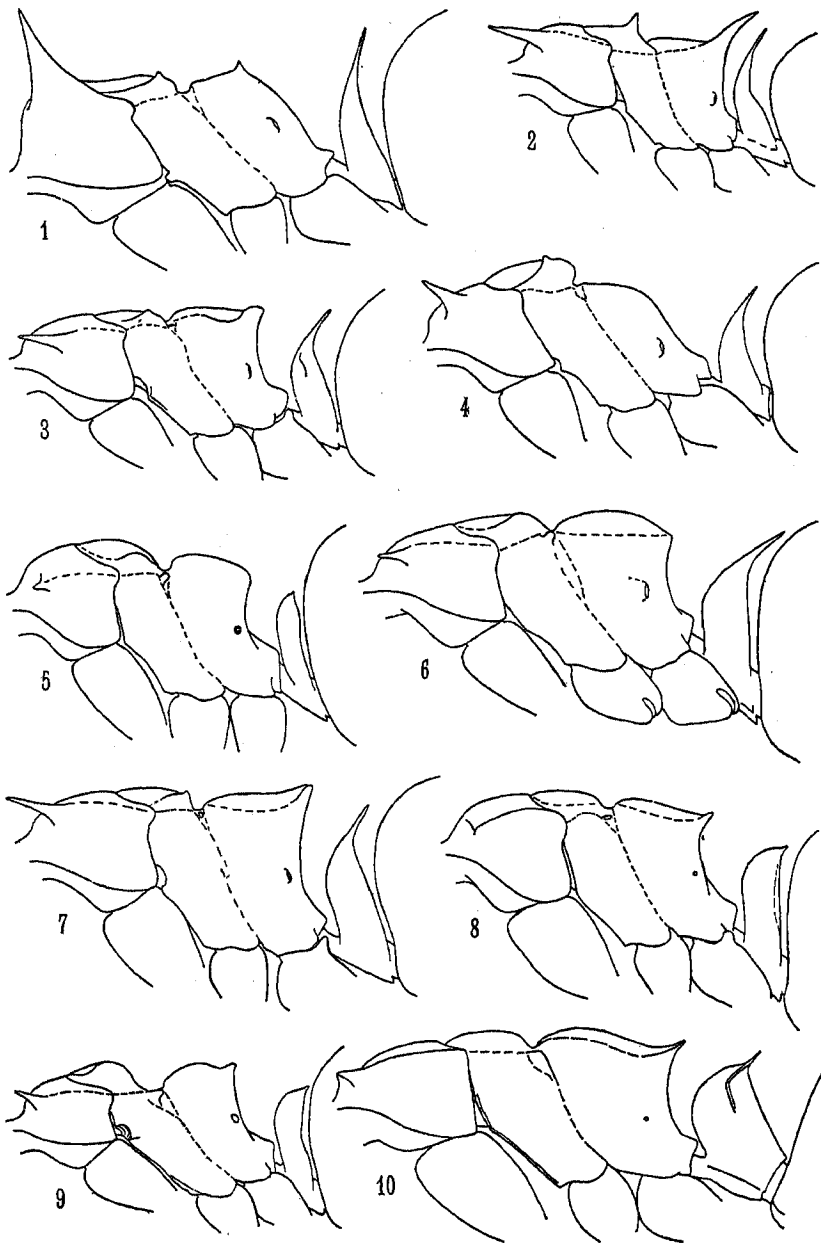


Plate III

Monacis: thorax of worker in profile. — Fig. 1. *spinicollis*. — Fig. 2. *septemspinosa*. — Fig. 3. *bispinosa*. — Fig. 4. *mucronifera*. — Fig. 5. *debilis*. — Fig. 6. *dolonigera*. — Fig. 7. *valida*. — Fig. 8. *schulzi*. — Fig. 9. *gagates*. — Fig. 10. *laminata*. (Figs. 5, 8-10 drawn to a larger scale).

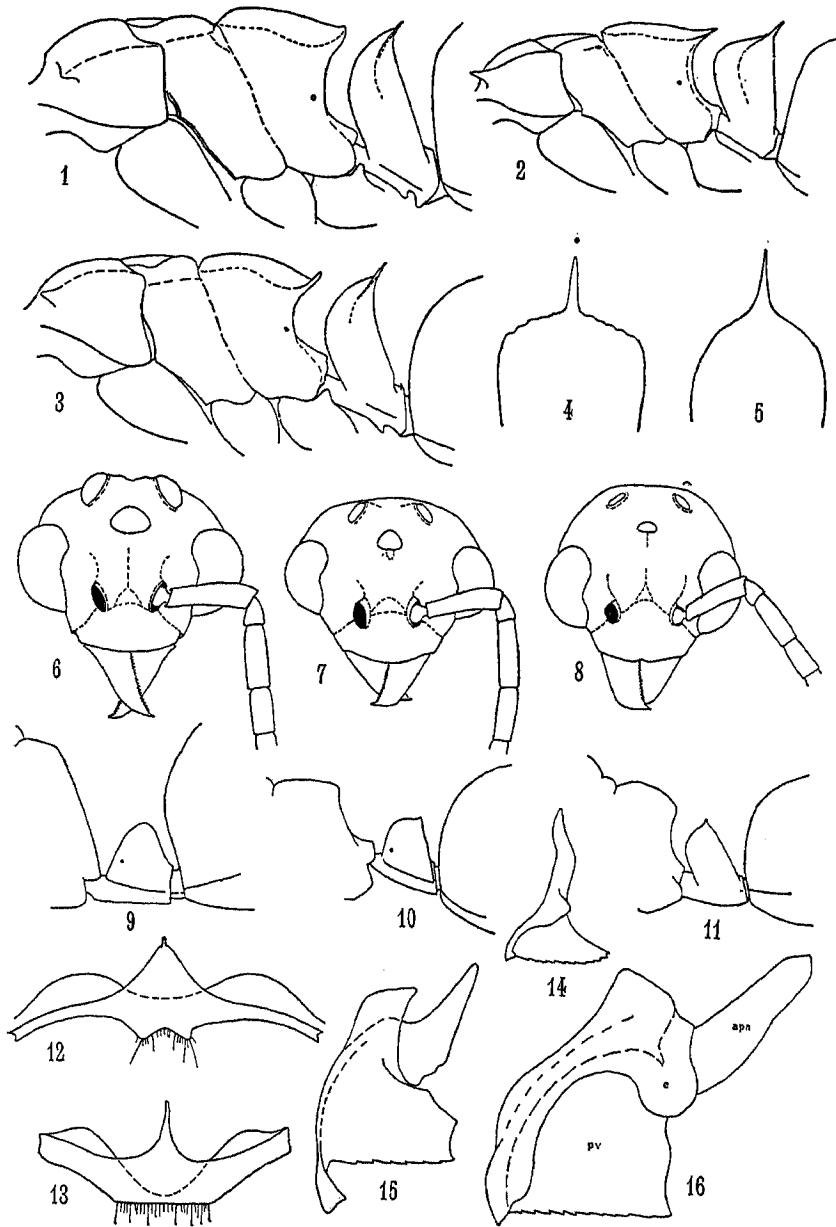


Plate IV

Monacis: Figs. 1-3. Thorax of worker in profile. — Figs. 4-5. Petiole of worker in front view. — Figs. 6-8. Head of male. — Figs. 9-11. Epinotum and petiole of male in profile. — Figs. 12-13. Male: Subgenital plate. — Figs. 14-16. Male: Aedeagus in profile. — Figs. 1, 8, 11, 14, *lamellosa*. — Fig. 2, *tristis*. — Fig. 3, *setosa*. — Figs. 4, 7, 10, 13, 15, *bispinosa*. — Fig. 5, *valida*. — Figs. 6, 9, 12, 16, *mucronifera*.

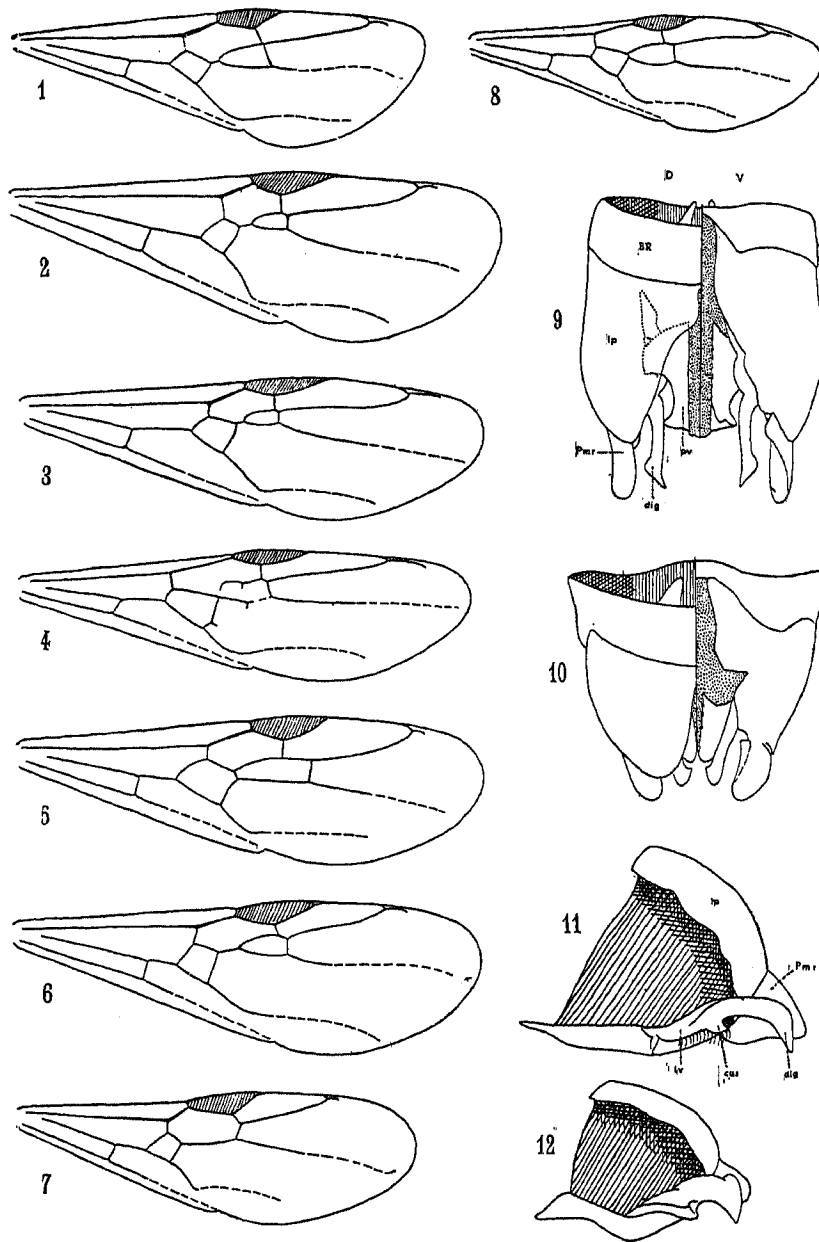


Plate V

Monacis: Figs. 1-8. Fore wing (Figs. 1-2. Male. — Figs. 3-8. Female). — Figs. 9-10. Male genitalia, dorsal and ventral. — Figs. 11-12. Male genitalia, paramere and volsella. — Figs. 1, 8. *bispinosa*. — Figs. 2, 3, 9, 11. *mucronifera*. — Fig. 4. *valida*. — Fig. 5. *rufescens*. — Fig. 6, 10, 12. *lamellosa*. — Fig. 7. *schulzi*. (Wings not drawn to the same scale)