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No. 3.— *A Second Revision of the Ants of the Genus Leptomyrmex Mayr*

By William Morton Wheeler

Since the publication in 1915 of my paper on Leptomyrmex[1] so many additional specimens have come to light that it seems advisable to make a second revision of the genus. Most of this new material was obtained by Dr. P. J. Darlington and myself while on the Harvard Expedition to Australia in 1931–'32, and by Mr. F. H. Taylor, Mr. H. Hacker, Dr. R. J. Tillyard and Mr. A. M. Lea, who have generously sent me collections of ants from time to time. Mr. H. Stevens, who was a member of the Australian Expedition, and Messrs. W. J. Eyerdam and L. Wagner also secured a few very interesting forms in New Guinea. It has not seemed necessary to repeat all of the bibliographic and synonymic citations prior to 1915 or the detailed account of what was known of the morphology and ethology of Leptomyrmex at that time. I have, however, combined all the older with the newer habitat records in the following paper for the purpose of giving a more adequate picture of the known geographical range of the various species and subspecies.

To the myrmecologist the genus Leptomyrmex is of unusual interest. It is so unlike the other genera of the subfamily Dolichoderinæ that it constitutes an independent tribe (Leptomyrmicini Emery). Its phylogenetic age is attested by the fact that its only near relative among the Formicidæ is an extinct genus, Leptomyrmula, which was described by Emery (1891) from a male specimen in the Sicilian Amber (Middle Miocene). Among the more striking specializations of Leptomyrmex are the great attenuation of the body and appendages, the distinct separation of the antennal and clypeal foveæ, the singular shape of the proventriculus (gizzard), the peculiarly simplified venation of the fore wing of the male — very unlike that of any other ants, the unusual form and pilosity of the larva, the assumption by certain workers of a replete, or honey-storing rôle — unknown among other Dolichoderinæ, the habit of foraging singly, instead of in files — unusual in the subfamily, of carrying the gaster folded forward over the thoracic dorsum, of occupying preformed cavities in the soil or in logs, instead of excavating nests like other ants, etc.[2] Very interesting also is the geographical distribution of the genus, which is confined to forested, hilly or mountainous country in a rather narrow zone extending from the equator to 37° south latitude and embracing New

[1] The Australian Honey Ants of the Genus Leptomyrmex Mayr. Proc. Amer. Acad. Arts Sci., **51**, 1915, pp. 255–286, 12 figs.

[2] Owing to the unusual position in which the gaster is carried the Australian naturalists call these ants "*motorcar ants.*" The thorax represents the tonneau of the motor car, the upturned or overhanging, black gaster the hood, and the bright red or yellow head of certain common forms (*L. erythrocephalus, varians ruficeps*, etc.), the headlight.

South Wales and Queensland in Eastern Australia, New Caledonia, the Loyalty Islands, New Guinea, the Aru Islands, and Ceram. At the present time 14 species are known. Several of them exhibit well-marked color forms, which Emery, Forel and I regarded as "varieties." Their constancy and local distribution, however, have convinced me that we are really dealing with distinct races or "Formenkreise." I have therefore raised all these varieties to subspecific rank. The following table gives a list of the known forms with their general distribution: —

Species and Subspecies of Leptomyrmex	New South Wales	Queensland	New Caledonia	Loyalty Islands	New Guinea	Aru Islands	Ceram
L. erythrocephalus (Fabr.)	x	x	*	*	*	*	*
unctus subsp. nov.	x	*	*	*	*	*	*
mandibularis Whlr.	x	*	*	*	*	*	*
venustus subsp. nov.	x	*	*	*	*	*	*
brunneiceps subsp. nov.	x	*	*	*	*	*	*
basirufus subsp. nov.	*	x	*	*	*	*	*
rufithorax Forel	*	x	*	*	*	*	*
decipiens Whlr.	*	x	*	*	*	*	*
cnemidatus Whlr.	x	x	*	*	*	*	*
L. nigriventris (Guérin)	x	*	*	*	*	*	*
tibialis Emery	x	x	*	*	*	*	*
hackeri subsp. nov.	*	x	*	*	*	*	*
L. wiburdi Whlr.	x	*	*	*	*	*	*
pictus Whlr.	x	*	*	*	*	*	*
L. froggatti Forel	x	*	*	*	*	*	*
L. varians Emery	*	x	*	*	*	*	*
rothneyi Forel	*	x	*	*	*	*	*
ruficeps Emery	x	x	*	*	*	*	*
rufipes Emery	x	x	*	*	*	*	*
quadricolor subsp. nov.	*	x	*	*	*	*	*
L. darlingtoni sp. nov.	*	x	*	*	*	*	*
jucundus subsp. nov.	*	x	*	*	*	*	*
fascigaster subsp. nov.	*	x	*	*	*	*	*
L. unicolor Emery	*	x	*	*	*	*	*
L. mjöbergi Forel	*	x	*	*	*	*	*
L. pallens Emery	*	*	x	x	x	*	*
geniculatus Emery	*	*	x	*	*	*	*
nigriceps Emery	*	*	x	*	*	*	*
L. lugubris sp. nov.	*	*	*	*	x	*	*
L. puberulus sp. nov.	*	*	*	*	x	*	*
L. niger Emery	*	*	*	*	x	*	*
L. fragilis (F. Smith)	*	*	*	*	x	x	x
femoratus Santschi	*	*	*	*	x	*	*
melanoticus subsp. nov.	*	*	*	*	x	*	*
L. gracillimus sp. nov.	*	*	*	*	x	*	*
Total number of subspecies	13	17	3	1	8	1	1
Number of species represented	5	6	1	1	6	1	1

It will be noticed that New South Wales, Queensland and New Guinea have each very nearly the same number of species — five, six and six respectively, though the total number of subspecies in New South Wales (13) and especially in Queensland (17) is considerably greater than in New Guinea (8). But the numbers for New Guinea may not be very significant, because so much of that great island is still a myrmecological *terra incognita*. I am unable to throw much additional light on the interesting problems suggested by this distribution and therefore quote my former statement. "Did the species of Leptomyrmex like so many of the animals and plants of Eastern Queensland and New South Wales, originate in New Guinea and migrate into Australia, or is it an indigenous Australian genus, which, like some of the Eucalypti, Epacrideæ and phyllodineous Acacias among plants, has spread to New Guinea and New Caledonia? The larger size of the species and their greater number in Australia certainly indicate that this is the center of distribution, but whichever view we take, we are bound to assume that the genus could only have reached its present distribution at a time when land connections existed between New Guinea, Australia and New Caledonia, if I am right in maintaining that winged females do not occur in the genus." As I shall show in the sequel, the apterous female of Leptomyrmex has now been discovered, so that the existence of the genus in both Eastern Australia and Papua must have antedated the breaking of their former land-connection. An analogous case is furnished by the Doryline genus Aenictus, which also has apterous females and occurs in both Queensland and New Guinea. In this case, however, as there are only a few species of Aenictus in Queensland and these confined to the tropical scrub of its northern portion, whereas the great majority of the species occur in Papua, Indonesia, India and Africa, we are justified in assuming that the genus must have entered Australia from New Guinea. The same interpretation applies to the Ponerine genus Diacamma, which has apterous, ergatomorphic females and is represented by only a single species in northern Queensland but by several in Papua and especially in Indonesia. On the other hand, in another Ponerine genus, Rhytidoponera, which has ergatomorphic females and is represented by numerous species, particularly in arid districts throughout Australia, and by only a few species in the Papuan Region and none elsewhere, we assume an Australian origin and ancient emigration from Queensland to New Guinea and the Solomon Islands. Though there is much less numerical disparity between the Australian and Papuan species of Leptomyrmex, and though the genus is repre-

sented only in Eastern Australia, I am inclined to regard the mountains of New South Wales and Queensland as its center of origin and distribution. In my former paper I pointed to the development of repletes, or honey-storing workers in the Australian Leptomyrmex as an adaptation to arid conditions, and in that connection called attention to the absence of repletes in *L. unicolor* Emery, which lives in the moist, tropical scrub of northern Queensland. Similarly, none of the Papuan species, which I have since examined, shows any traces of having developed repletes. But these considerations are of no assistance in determining the original home of the genus, since if we assume an Australian origin, the habit might be said to have been lost by the forms that immigrated into the humid forests of Northern Queensland and Papua, and if we assume a Papuan origin, it might be said to have been acquired in adaptation to the more xerothermal conditions of Southern Queensland and New South Wales.

Although the foregoing discussion adds little to our previous knowledge of the general geographical distribution of the genus Leptomyrmex, I am able to supply information on three important matters, which, owing to lack of material, were insufficiently discussed in my previous revision. These are the phylogenetic sequence of the color patterns in the subspecies and the interesting peculiarities of the female and male.

The workers of Leptomyrmex, like those of other Dolichoderine genera, are poor in plastic taxonomic characters and these are mostly differences in size and rather subtle peculiarities in the shape of the head, petiole and tibiæ. The head, and especially the genitalia, of the males furnish more pronounced characters. The color patterns of the workers are very useful for recognition of the subspecies, which are known to exist in fully half of the species. These patterns, however, keep recurring in different species, so that considerable care must be exercised in the identification of specimens. An inspection of all the known forms shows that the color-patterns of the body may be reduced to eight, which may be arranged in a nearly continuous series, beginning with almost total melanism and ending in a complete absence of black pigment except in the eyes or portions of the femora and tibiæ. The pale colors are brownish red, rufotestaceous, testaceous or yellow and as a rule replace the black in an anteroposterior direction, with an "all or none" tendency, at least so far as the head, thorax and petiole are concerned. This is shown in the diagram of the eight patterns (fig. 1), which may be designated by Roman numerals and briefly described as follows:

I. Entirely black or dark brown forms, like *unicolor, niger, lugubris,* etc., which I regard as representing the primitive type of coloration and the initial stage of the series.

II. This stage resembles I, except in having the thorax rufotestaceous, with more or less black remaining on the pro- and mesonotum.

III. This stage, which is derived from II and has the thorax entirely rufotestaceous, with the head, petiole and gaster black, is rare, occurring only in one subspecies, *pallens nigriceps.*

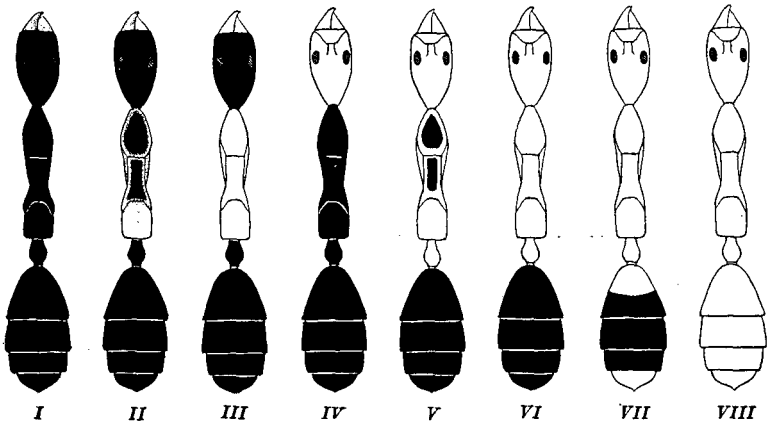

Fig. 1. Eight stages in the demelanization of the body of various forms of Leptomyrmex. For explanation see text.

IV. Forms of this pattern, derived directly from I, by a change of the head alone to rufotestaceous or testaceous, are much more frequent and constitute the beginning of the remainder of the series (V to VIII).

V. Resembles II but the head is rufotestaceous as well as the thorax, with more or less infuscation of the pro- and mesonotum.

VI. In this pattern only the gaster remains black.

VII. The pale coloration invades the gaster, most frequently at the base of the first segment or at the anal end, but the whole gaster may lose the black pigment, except at the sides (*fragilis femoratus*) or on the first and at the bases of the second and following segments (*darlingtoni fascigaster*).

VIII. In this final stage, as above stated, the black pigment disappears entirely except from the eyes and the body is testaceous or reddish yellow throughout.

The following table shows the occurrence and recurrence of the various color-patterns in the fourteen species of Leptomyrmex and their subspecies. In no species is the whole series represented though *erythrocephalus* and *varians* each show five of the stages of demelanization. No doubt others will be added in the course of future explorations. The femora and tibiæ also undergo progressive demelanization, beginning at their bases, but a regular sequence of stages is not so readily detected as in the color-pattern of the body. The tarsi are pale in all the species and subspecies and may even be white in the most melanic forms. It is possible to recognize similar but less striking color-pattern series in other ant-genera, notably in Iridomyrmex, Formica and Camponotus.

Leptomyrmex Species	Color Patterns of Workers							
	I	II	III	IV	V	VI	VII	VIII
erythrocephalus	*	x	*	x	x	x	x	*
nigriventris	*	*	*	*	x	x	*	*
wiburdi	*	*	*	x	x	*	*	*
froggatti	x	*	*	*	*	*	*	*
varians	*	x	*	x	x	x	x	*
darlingtoni	*	*	*	x	*	x	x	*
unicolor	x	*	*	*	*	*	*	*
mjöbergi	x	*	*	*	*	*	*	*
pallens	*	*	x	*	*	x	x	*
lugubris	x	*	*	*	*	*	*	*
puberulus	x	*	*	*	*	*	*	*
niger	x	*	*	*	*	*	*	*
fragilis	x	*	*	*	*	*	x	x
gracillimus	*	*	*	*	*	*	*	x

Of course, the series might be read in the opposite direction as a progressive acquisition instead of a progressive loss of black pigment, but I believe that in Leptomyrmex at least we must regard the completely melanic forms, which all occur in the tropical rain-forests of Northern Queensland and New Guinea, as the most primitive, the red and black forms as more recently adapted to the xerophyllous forest regions of Southern Queensland, New South Wales, and New Caledonia, and the very pale forms (*fragilis* and *gracillimus*) as probably crepuscular or nocturnal species of the more open tropical bush. Only the second of these groups seems to have developed honey-storing repletes.

Many specimens of Leptomyrmex have been collected since Mayr established the genus in 1862, but the female remained quite unknown till very recently. Although I examined several living colonies and many preserved specimens in 1914, I failed to detect any form sufficiently different from the typical worker to be regarded as a fertile female, or queen. I therefore inferred that this caste must be apterous and so highly ergatomorphic as to be indistinguishable from the worker, as in certain genera of Ponerine ants (Leptogenys *sens. str.*,

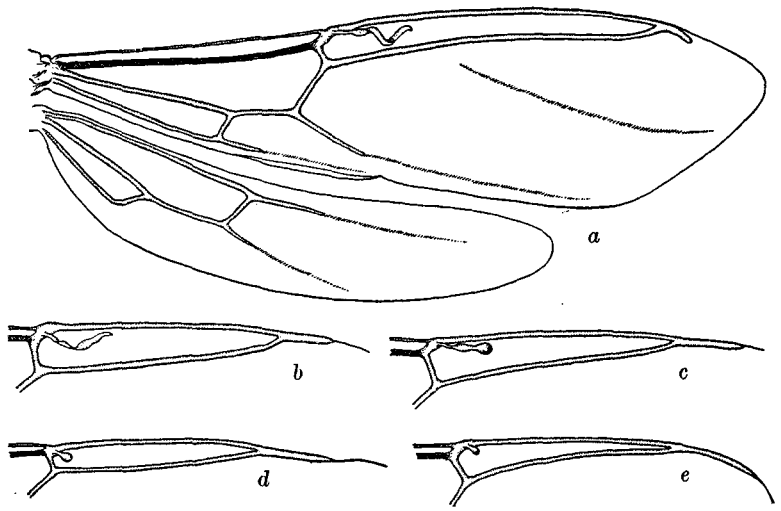

Fig. 2. *a*, Fore and hind wings of *Leptomyrmex nigriventris tibialis* Emery; *b*, radial cell of *L. varians ruficeps* Emery; *c*, of *L. erythrocephalus cnemidatus* Wheeler; *d*, of *L. darlingtoni* sp. nov; *e*, of *L. fragilis melanoticus* subsp. nov.

Rhytidoponera, Dinoponera, etc.). I am now obliged to admit that I was partially mistaken: Leptomyrmex *does* have an apterous and highly ergatomorphic female, but it is nonetheless distinguishable from the worker, at least in certain species, by its stouter build, larger gaster, broader legs, higher petiolar node and developed ocelli. As if to celebrate the seventieth anniversary of the establishment of the genus, Mr. Frank H. Taylor of the School of Tropical Medicine at Sydney, on February 2, 1932 captured a female of *L. erythrocephalus venustus* subsp. nov. on Mt. Tomah, New South Wales, and a few weeks later in the same month Dr. P. J. Darlington secured one of *L. nigriventris tibialis* Emery at an altitude of 3000 ft. in the Dorrigo,

in the same state. These very interesting insects, which are clearly analogous to the females of the Ponerine subgenus Lobopelta, are described and figured below (pp. 88 and 96, figs. 5 and 9).

My revision of 1915 contained another serious lacuna, owing to my insufficient acquaintance with the very interesting males. At that time the males of only four species were known to me from brief descriptions, those of *L. erythrocephalus* (?) and *fragilis*, described by Emery and those of *froggatti* and *varians ruficeps*, described by Forel. I possessed only a single male specimen, which could not be referred to any of the described workers. There are now before me males of several species, accompanied by workers from the same colonies, so that it is possible to give a much more accurate account of the generic characters of this caste.

Unquestionably, the most singular and intriguing feature of the male is its wing venation. Emery, in the Dolichoderine fascicle of the "Genera Insectorum" (1912, p. 16) suggests the following interpretation which the reader may follow with the aid of my Fig. 2*a* of the wings of *L. nigriventris tibialis* and Fig. 3, which is a reproduction of Emery's figure of the male *Leptomyrmula maravignæ* from the Sicilian Amber. "The venation of the fore wing presents a condition found in no other ant. What strikes one at first sight is the vestigial pterostigma, then the extraordinarily long and narrow radial cell and the cubital cell reduced to a branch which arises from the radial vein and passes in a curve towards the tip of the wing. But what is the meaning of the transverse vein that arises from the pterostigma and joins the medius? This vein is divided into two parts, one of which, between the pterostigma and the radius is properly the base of the radius, the other of which, following and eventually attaining the medius, corresponds to a tranverse cubital vein and the recurrent vein combined. Hence, in my opinion, Leptomyrmex lacks the discoidalis, that is, the very important transverse vein (fundamental in the anterior wing of Hymenoptera) which unites the costa with the medius and gives rise at its middle to the cubital vein." And he adds in a foot-note: "This interpretation is supported by a species which I described from the Sicilian amber (*L. maravignæ* Emery, Mem. Accad. Sc. Bologna, **5**, Vol. I, p. 578, pl. 2, fig. 22, 1891), in which a rudiment of the discoidalis is present, arising from the medius. Formerly I referred this ant to the genus Leptomyrmex, but the radial cell is much larger and there is a developed pterostigma. On account of these differences I establish for this fossil species a new genus, Leptomyrmula, closely related to Leptomyrmex."

Essentially the same interpretation is advanced by Emery in his paper of 1913.[1] "In the genus Leptomyrmex, the venation of the anterior wing undergoes a singular metamorphosis: the pterostigma is very narrow, almost *nil;* the radial cell is long and very narrow; from the middle of the radius arises a curved, sometimes interrupted vein, which joins the medius. I interpret this latter vein as a vestige of the cubitus which has been fused with the recurrent vein; consequently,

Fig. 3. Male of *Leptomyrmula maravignæ* Emery, from the Sicilian Amber (After Emery).

the cell enclosed by this vein, the subcosta and the medius, which reaches to the base of the wing, comprises in itself the first cubital, the discoidal and the median cell. There is therefore no discoidal (or basal) vein. As a proof of my contention, there is in the wing of the male Leptomyrmula, a fossil ant from the Sicilian amber, which I figured in my memoir of 1891, a rudiment of the discoidal vein, arising from the subcosta; moreover, in this ant, the venation is almost identical with that of Leptomyrmex. The reduction of the discoidal

[1] La Nervulation des Ailes Antérieures des Formicides. Rev. Suisse Zoöl., **21**, 1913, pp. 577–587, 4 figs.

vein is found in no other ant-genus except Leptomyrmex and its fossil ally Leptomyrmula."

Emery's interpretation of the venation of the fore wing of Leptomyrmex seems to me to be very artificial. Professor C. T. Brues, whose wide knowledge of many families of Hymenoptera lends weight to his opinion, has aided me in working out a simpler and much more natural interpretation. The vein which Emery calls the "discoidal," that is, the basal of most Hymenopterists,[1] is, in our opinion, not absent but present as the cross-vein connecting the apical pterostigmal end of the subcosta with the medius and giving rise to the radius, which in turn gives rise to the cubitus. The large cell between the subcosta and the medius is not, therefore, as Emery supposed, equivalent to the medial, *plus* the first cubital *plus* the discoidal cell but the medial cell alone, which is of much the same size and shape in most other Formicidæ. This interpretation is supported both by the configuration of the discoidal and subdiscoidal veins of most authors, which form a continuation of the medius, and have the same appearance in Leptomyrmex as in other ants, and also by the presence of a basal vein ("basella" of Rohwer and Gahan) in the hind wing. Owing to the great reduction of the pterostigma in the fore wing, the base of the radius arises from the basal vein near its junction with the subcosta. Thus the fore wing of Leptomyrmex has four closed cells, the subcostal, radial, median and submedian. The cubital cells are represented by the space between the radius and the feeble cubitus, which is usually interrupted at the base. The discoidal cell, if present, would lie distally to the basal and discoidal veins, while the first and second brachial cells are confluent as in other ants and are represented by the area bounded proximally by the closed submedian cell, the medius and brachius (anal), and distally by the discoideus and subdiscoideus anteriorly and the anal border of the wing posteriorly. We believe that the same interpretation applies to the wing of Leptomyrmula, since we do not regard the small stump at the middle of the median vein (not the subcosta, as stated by Emery in the last quotation) as a vestige of the basal vein. [2]

There are certain other peculiarities in both the fore and hind wings that were overlooked by both Emery and myself. The anterior border

[1] For the venation of the ant wing see my "Ants, their Structure", etc., 1910, pp. 24–26 and for the wings of Hymenoptera in general, S. A. Rohwer and A. B. Gahan, "Horismology of the Hymenopterous Wing", Proc. Ent. Soc. Washington, **18**, 1916, pp. 20–76, 3 pls.

[2] After this article had gone to the printer I received from Dr. Santschi a paper entitled "Sur l'origine de la nervure cubitale chez les Formicides", Mitteil. Schweiz. Ent. Gesell. 15, 1933, pp. 557–566, which contains an interpretation of the wing venation of Leptomyrmex, essentially the same as the one here adopted. I do not, however, accept Dr. Santschi's phylogenetic derivation of the Hymenopterous venation from such a highly specialized condition as that of the termite wing.

of the base of the fore wing, comprising the whole narrow subcostal cell as far as the pterostigmal region is bent ventrally at a right angle to the plane of the remainder of the wing and the costa forming its border is extremely tenuous and weak, whereas the subcostal vein is stout and often more deeply pigmented than any of the other veins. At its tip the subcostal vein swells slightly but perceptibly to form the vestigial pterostigma. Attached to the distal end of this swelling on the ventral side of the wing is a peculiar structure which is indicated in Emery's diagram in the Genera Insectorum (Pl. I, Fig. 13) and more clearly in Fig. 3 of my paper of 1915.[1] This structure, which I call the 'pterostigmal appendage' and which exists in no other genus of ants, nor indeed, to my knowledge, in any other insects, is a hollow sac with constricted base and of variable length in different species, depending from the costa on the ventral side in contact but not united with the membrane of the radial cell. When it is highly developed this appendage may be swollen and somewhat sausage-shaped (fig. 2*c*) or collapsed and shaped like a ribbon, which may be more or less twisted or folded (fig. 2*a*, *b*). When vestigial it may be reduced to a mere rounded tubercle (fig. 2*d*, *e*), but I have found it in all the males I have examined. I am unable to suggest any homologue of this structure, unless it be a peculiarly modified remnant of what was a large pterostigma in the ancestors of the genus. There is no trace of such an appendage in Leptomyrmula, which has a distinctly developed pterostigma. The radial cell, as Emery observed, is very long and narrow. At its tip the gradually converging costa and radius fuse to form an appendicular vein of variable length which strengthens the anterior border of the wing apex. The cubitus is rarely complete, its basal fourth to half being usually absent. Although the frenal fold of the hind border of the fore wing is present, the hamuli along the anterior border of the hind wing are either completely absent or very small and weak. The frenal apparatus, therefore, is vestigial and, I believe, quite functionless. The great simplification of the wing venation and the degeneration of the frenal apparatus in the male Leptomyrmex is probably correlated with the absence of a true marriage flight and the fecundation of the females either in the nest or on the ground in its vicinity.

The males of Leptomyrmex exhibit a number of other interesting characters. The mandibles appear at first sight to be well-developed but they cannot be very efficient organs because their denticles are

[1] The specimen from which this wing was drawn was erroneously identified as *L. erythrocephalus*. I now find that it is really a male of *L. varians ruficeps* Emery.

either extremely minute or entirely absent and their tips are usually blunt. The antennæ are very long, with distinctly developed scapes, the first funicular joint cylindrical and usually somewhat longer than broad, the third to sixth joints much elongated and more or less bent, especially near one end. The thorax is conspicuously long and narrow, with the mesonotum convex anteriorly and overhanging the short pronotum, the epinotum with very long base and short declivity, the mesepisterna large and protuberant, especially below. The legs are long, the middle tibiæ uniformly bowed, the hind tibiæ and sometimes also the hind basitarsi more or less flexuous, or sigmoidally bent. The genitalia, which are either retracted or exserted in dried specimens, have the stipes hairy, subtriangular or more rarely bilobed (*L. darlingtoni*), the lacinia small, simple, styliform and concealed, the volsella large and highly variable, usually bifurcate (boot-shaped, T-shaped or Y-shaped, with two acute prongs) but in one species (*darlingtoni*) trifurcate, and in one (*fragilis*) simple and uncinate, the sagitta compressed, with straight dorsal and convex, serrate ventral border.

Key to the Workers of Leptomyrmex

1. Eyes hairless; pubescence on body very short and appressed.....2
   Eyes hairy; pubescence longer and oblique; color black.....34
2. Tibiæ broad, distinctly compressed and flattened; postocular portion of head rather short and broad.....3
   Tibiæ slender, either not or less distinctly flattened; postocular portion of head longer and narrower.....17
3. Postocular portion of head subtrapezoidal, the sides behind the eyes rather straight, converging posteriorly; ventral surface of petiole feebly convex; larger species (8–12 mm.).....4
   Postocular portion of head shorter and more rounded; ventral surface of petiole strongly convex; smaller species (6.5–9 mm.).15
4. Head without the mandibles twice as long as broad.....5
   Stouter; head without the mandibles less than twice as long as broad.....13
5. Thorax entirely black.....6
   Thorax entirely or largely rufotestaceous.....8
6. Mandibles and clypeus rufotestaceous like the head. Length 9–10 mm. New South Wales.....*erythrocephalus* (Fabr.) typical
   Mandibles darker than the head.....7

7. Mandibles brown; surface of the body shining, with an oily luster. Length 11–12 mm. New South Wales, subsp. *unctus* subsp. nov.
   Mandibles and clypeus black; surface of body less shining, as in the typical *erythrocephalus*. Length 11 mm. New South Wales.....subsp. *mandibularis* Wheeler
8. Pro- and mesonotum partly black.....9
   Thorax entirely rufotestaceous, rarely with pronotum slightly infuscated.....10
9. Head entirely rufotestaceous. Length 8–9 mm. New South Wales.....subsp. *venustus* subsp. nov.
   Posterior portion of head brown. Length 8–9 mm. New South Wales.....subsp. *brunneiceps* subsp. nov.
10. First gastric segment rufotestaceous. Length 10–10.5 mm. Queensland.....subsp. *basirufus* subsp. nov.
    Gaster entirely black.....11
11. Petiole black. Length 9–10.7 mm. Queensland.....subsp. *rufithorax* Forel
    Petiole rufotestaceous.....12
12. Femora black throughout. Length 9 mm. Queensland.....subsp. *decipiens* Wheeler
    Femora black only at tips. Length 8–9.5 mm. Queensland, New South Wales.....subsp. *cnemidatus* Wheeler
13. Legs entirely rufotestaceous. Length 9–12 mm. New South Wales.....*nigriventris* (Guérin), typical
    Tibiæ and tips of femora black or dark brown.....14
14. Thorax entirely rufotestaceous. Length 9–11 mm. Queensland, Northern New South Wales.....subsp. *tibialis* Emery
    Pronotum with a large black spot. Length 10–11 mm. Queensland.....subsp. *hackeri* subsp. nov.
15. Head black. Length 8–9 mm. New South Wales.....*froggatti* Forel
    Head rufotestaceous.....16
16. Head with brownish vertex; thorax brown black, except inferior border of epinotum. Length 6.5–8 mm. New South Wales.....*wiburdi* Wheeler
    Thorax rufotestaceous; dorsal portions of pro- meso- and epinotum black. Length 7–8 mm. New South Wales, subsp. *pictus* Wheeler
17. Head distinctly constricted at the occiput.....18
    Head not constricted at the occiput, the sides of its postocular portion nearly straight or feebly convex and very gradually converging to a narrow occipital border.....25

18. Occipital constriction short and not very pronounced; larger species (8.5–11 mm.) 19
    Occipital constriction longer and more pronounced; smaller species (6.5–7.5 mm.) 23
19. Thorax entirely or very largely rufotestaceous 20
    Thorax entirely or very largely black or dark brown 22
20. Pronotum and sometimes a spot on the mesonotum black. Length 8.5–10 mm. Queensland ..... *varians* Emery, typical
    Thorax and anal segments entirely rufotestaceous 21
21. First gastric segment with a yellow spot at its base. Length 9–10 mm. Queensland ..... subsp. *rufipes* Emery
    Femora largely dark brown; tibiæ pale yellow; first gastric segment without a yellow spot. Length 9–10 mm. Queensland ..... subsp. *quadricolor* subsp. nov.
22. Head, excepting the mandibles, brown black; thorax partly rufotestaceous. Length 11 mm. Queensland ..... subsp. *rothneyi* Forel
    Head rufotestaceous, thorax entirely black. Length 9–11 mm. Queensland ..... subsp. *ruficeps* Emery
23. Body entirely pale testaceous, often with an elongate brown spot on each side of the gaster. Length 6.5–7 mm. New Guinea, Aru Islands, Ceram ..... *fragilis* (F. Smith) typical
    Body and legs with more or less dark brown or black pigment .. 24
24. Spots on sides of gaster and the middle and hind femora fuscous. New Guinea ..... subsp. *femoratus* Santschi
    Body almost entirely dark brown. Length 6.5–7.5 mm. New Guinea ..... subsp. *melanoticus* subsp. nov.
25. Black species 26
    At least the head or thorax rufotestaceous or pale testaceous .. 28
26. Very small species (5.3–6 mm.); petiole nearly twice as high as long, strongly inclined forward. Queensland ..... *mjöbergi* Forel
    Larger (6–7 mm.); petiole longer than high, not inclined forward 27
27. Head without the mandibles two-fifths as high as long at the front; eyes rather small, elliptical; frontal carinæ low, not closely approximated. Length 8 mm. New Guinea ..... *niger* Emery
    Head longer and narrower, with narrower occipital border, without the mandibles only half as high as long; eyes larger and more

nearly circular; frontal carinæ high and closely approximated. Length 6–7 mm. New Guinea ..... *lugubris* sp. nov.

28. Entirely pale testaceous; very slender, with very long legs; head more than twice as long as broad, without the mandibles. Length 9–9.5 mm. New Guinea ..... *gracillimus* sp. nov.
Gaster at least in part black; smaller and stouter with shorter head and legs 29
29. Petiole broader than long 30
Petiole distinctly longer than broad 32
30. Head, thorax and petiole pale rufotestaceous; gaster black. Length 6–7.5 mm. New Caledonia, New Guinea, Loyalty Islands ..... *pallens* Emery, typical
Other parts besides the gaster black 31
31. Head, excepting the mandibles, black. Length 7.5 mm. New Caledonia ..... subsp. *nigriceps* Emery
Rufotestaceous, with the two first gastric segments and the distal halves of the femora black. Length 8 mm. New Caledonia ..... subsp. *geniculatus* Emery
32. Black, with the head rufotestaceous. Length 7.5–9 mm. Queensland ..... *darlingtoni* sp. nov., typical
All or most of the thorax as well as the head rufotestaceous 33
33. Pronotum clouded with brown on sides, mesonotum fuscous; gaster black, with extreme base of first segment yellow. Length 7 mm. Queensland ..... subsp. *jucundus* subsp. nov.
Pronotum not clouded with brown, first gastric segment and posterior borders of three following segments rufotestaceous. Length 7.5 mm. Queensland ..... subsp. *fascigaster* subsp. nov.
34. Head without the mandibles only about one and one-half times as long as broad, with broad occipital border. Length 7–8.5 mm. Queensland ..... *unicolor* Emery
Head without the mandibles fully twice as long as broad, with narrow occipital border. Length 7–7.5 mm. New Guinea ..... *puberulus* sp. nov.

Key to the Known Males of Leptomyrmex

1. Second funicular joint scarcely longer than the first 2
Second funicular joint much longer than the first 4
2. Stipes of genitalia subtriangular; volsella stout, simple and hook-shaped 3

Stipes of genitalia bilobed; volsella biramous, pickaxe-shaped with an accessory tooth at the base of the posterior prong..... .....*darlingtoni* sp. nov.

3. Body yellowish testaceous.....*fragilis* F. Smith
   Body dark brown.....subsp. *melanoticus* subsp. nov.
4. Second funicular joint nearly as long as the scape; cheeks anteriorly converging; tips of mandibles sharply truncated..... .....*varians ruficeps* Emery
   Second funicular joint much shorter than the scape; cheeks subparallel; tips of mandibles not sharply truncated.....5
5. Eyes and ocelli rather small, the former not much longer than the cheeks; volsellæ T-shaped, very slender; wings strongly infuscated.....6
   Eyes and ocelli very large, the former much longer than the cheeks; volsellæ stouter, Y-shaped or boot-shaped; wings paler.....7
6. Stipes subtriangular with acuminate tip; volsella with its anterior prong longer than the posterior.....*nigriventris* (Guérin)
   Tip of the stipes acute but not acuminate; anterior prong of volsella shorter and thinner than the posterior..subsp. *tibialis* Emery
7. Second funicular joint only twice as long as the first; stipes with broadly rounded tip. Wing membranes dull.....8
   Second funicular joint more than twice as long as the first; stipes more pointed; wing membranes smooth and shining.....9
8. Wings brown; stipes triangular.....*froggatti* Forel
   Wings yellowish; stipes oval.....*wiburdi* Wheeler
9. Rufotestaceous throughout; wings slightly smoky..*pallens* Emery
   At least the gaster black or dark brown; wings yellowish, with yellow veins.....10
10. Tips of mandibles and stipes broad and bluntly rounded; volsellæ T-shaped, with the anterior prong longer than the posterior.....*erythrocephalus* (Fabr)
    Tips of mandibles and stipes narrower and more pointed.....11
11. Volsellæ T-shaped with nearly equal prongs; tips of mandibles acute.....subsp. *decipiens* Wheeler
    Volsellæ boot-shaped, with posterior prong reduced to an acute point; tips of mandibles very narrow but blunt..... .....subsp. *cnemidatus* Wheeler

LEPTOMYRMEX ERYTHROCEPHALUS (Fabricius)

Fig. 4

Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 265, fig. 5 ♀.

New South Wales: Blue Mts. (Beccari and E. D'Albertis); Sydney (Lowne, L. M. D'Albertis, W. W. Froggatt); Katoomba and Wentworth Falls (W. M. Wheeler); Wentworth Falls (W. M. Mann; P. J. Darlington); Jenolan Caves (J. C. Wiburd); Mittagong (A. M. Lea; W. W. Froggatt); Mt. Wilson (P. J. Darlington); National Park, near Sydney (W. M. Wheeler); Lawson (A. M. Lea).

Queensland: Rockhampton (W. W. Froggatt); Peak Downs (Museum Godeffroy); Mackay (G. Turner).

As I have seen specimens of the typical form of this species only from New South Wales, I still believe that the foregoing Queensland records refer to some of the following subspecies or even more probably to *L. varians ruficeps* Emery which has a very similar coloration.

Male.— Length nearly 10 mm.

Head without the mandibles fully twice as long as broad, the large prominent eyes at the middle of its sides; postocular portion subtrapezoidal, its sides feebly convex, slightly longer than the straight occipital border, cheeks straight, parallel, about two-thirds as long as the eyes. Mandibles narrow, with very blunt, rounded tips, their masticatory border microscopically denticulate, longer than the internal border which forms with it a distinct obtuse angle. Clypeus large, nearly as long as broad, rather flat, with broadly rounded anterior border and rounded, projecting anterior corners. Ocelli moderately large. Antennal scapes about four times as long as broad, with slender base, only slightly thicker than the funiculus, the first joint of which is slightly longer than broad, the second three times as long as broad; remaining joints missing in the specimen. Thorax very long and narrow; mesonotum nearly one and one-half times as long as broad, strongly convex anteriorly where it overarches the pronotum; base of epinotum long and sloping, transversely concave just in front of the declivity, which continues the slope of the base and is not clearly marked off from it. Petiole resembling that of the worker, but the node is lower and subangular in profile, with straight instead of convex anterior slope, the ventral surface feebly convex. Gaster narrow; genitalia small and retracted; stipes subtriangular, slightly longer than broad, with bluntly rounded tip, convex anterior and concave posterior border; volsellæ with straight, narrow shaft, bifurcated at summit and T-shaped, the anterior prong straight, very

slender and acute, the posterior prong shorter and broader, curved and acute. Legs long and slender, hind femora, tibiæ and basitarsi distinctly flexuous. Wings long and narrow, measuring nearly 9 mm; cubital and median veins complete in one of the forewings of the specimen; middle portion of cubitus lacking in the other; pterostigmal appendage long, pendunculate at the base, knob-shaped at the tip. Hamuli present on anterior border of hind wing, but small and often merely setiform and not distinctly hooked at the tip.

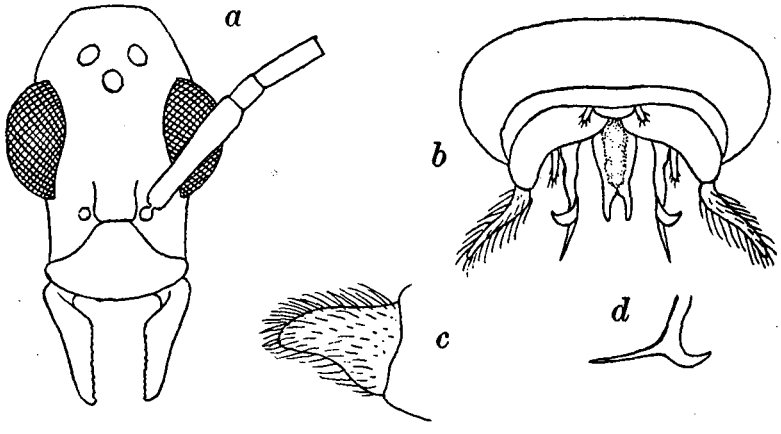

Fig. 4. *Leptomyrmex erythrocephalus* Fabr. *a*, head of male, dorsal aspect; *b*, genitalia of same, posterior aspect; *c*, stipes, lateral aspect; *d*, tip of volsella, lateral aspect.

Surface subopaque, finely shagreened or punctulate. Wing membranes smooth and shining.

Pilosity consisting of a few stiff black hairs at the tips of the mandibles and on the ventral surface of the petiole and gaster. Stipes covered and fringed with delicate, glistening white hairs. Pubescence white, fine and appressed, distinct on the thorax, gaster and legs, longest on the gaster, almost lacking on the head.

Dull brownish yellow, genitalia more reddish; gaster, epinotum, median portions of coxæ, femora and tibiæ, except their tips and bases, brown-black; sides of thorax clouded with brown. Wing membranes and veins yellow.

Described from a single defective specimen labelled New South Wales (Staudinger). Since it is not accompanied by the worker I am not sure that it is the male of the typical *erythrocephalus*. Emery also

described and figured in his paper on the ants of the Sicilian amber what he supposed to be a male of this species from Queensland. The specimen, which lacked the two last gastric segments, the ends of the antennæ and portions of the legs, was described as "tutto testaceo." I have already expressed my doubt of the occurrence of the true *erythrocephalus* in Queensland. Judging by its coloration, Emery's male would seem to belong to some one of the following subspecies, probably *rufithorax* Forel (*vide infra* p. 92).

Subsp. UNCTUS subsp. nov.

Worker.— Length 11–12 mm.

Differing from the typical form of the species in its distinctly larger size, in having the head and often also the funiculi and tarsi of a deeper rufotestaceous tint, the antennal scapes and first funicular joint dark brown or black; the mandibles brown, darker than the head, the surface of the whole body distinctly more shining, with an oily luster, and the fine pubescence less developed on all parts of the body than in the typical *erythrocephalus*.

Described from numerous specimens, including a number of repletes, taken by Dr. R. J. Tillyard from a large colony nesting under a stone at Condor Creek, alt. 2800 ft., near Canberra in the Federal Commonwealth Territory.

Subsp. MANDIBULARIS Wheeler

L. erythrocephalus var. *mandibularis* Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 268 ♀.

New South Wales: Sydney (H. Ashton.)

The worker of this subspecies is very similar to the preceding and of the same size, but the mandibles, clypeus and frontal carinæ are black and the funiculi and tarsi brown. The surface of the body is more subopaque as in the typical *erythrocephalus*.

Subsp. VENUSTUS subsp. nov.

Fig. 5

Worker.— Length 8–9 mm.

Head and antennal scapes bright rufotestaceous, almost orange yellow; thorax, petiole, funiculi, coxæ, trochanters, basal third of femora, knees, tarsi and tibial spurs paler yellow; apical two-thirds of

femora, tibiæ, palpi and a large subtriangular spot on the middle of the pronotum black. Base of epinotum in profile with a distinct median impression. Hairs black, pubescence grayish, very fine, not concealing the shagreened surface of the body which is somewhat shining.

Female.— Length 10 mm.

Differing from the worker in its decidedly more robust stature, broader head, stouter thorax, larger gaster, broader scapes, femora and tibiæ, the scapes distinctly enlarged near the base and at the tips. Occipital border slightly impressed in the middle. Clypeus with nearly straight, transverse, anterior border. Eyes slightly larger than in the worker. There are three crowded, rather deeply impressed ocelli on the vertex, the anterior one large, those of the posterior pair small and abortive. Pro- and mesonotum much higher and more convex than in the worker, so that they appear shorter, the mesonotum set off more sharply from the epinotum, which is higher and broader, with the median transverse impression of its base much feebler. Petiolar node decidedly broader and higher than in the worker, broader than long, its summit with a distinct median longitudinal impression posteriorly.

Surface of body duller and more opaque throughout than in the worker, very indistinctly shagreened.

Hairs as in the worker but longer and more abundant on the mandibles, where they are fine and pale, as contrasted with the stiff black hairs on the clypeus and venter; on the flexor surface of the tibiæ very short, forming a sparse series as in the worker. Pubescence yellowish, longer than in the worker, especially on the gaster, so that the surface of the body appears somewhat dusty or pollinose.

Color like that of the worker but only the basal fourth of the femora yellow, the black spot on the pronotum larger, the clypeus with a pair of fuscous spots, the mesonotum with two pairs, the mandibles fuscous, with yellow masticatory borders.

Described from six workers and a single female taken Feb. 2, 1932, by Mr. Frank H. Taylor on Mt. Tomah, New South Wales.

Subsp. BRUNNEICEPS subsp. nov.

Worker.— Length 8-9 mm.

Very similar to the subsp. *venustus* but the head posteriorly and the mandibles brown, the yellow of the thorax and legs distinctly brownish and the basal pale portions of the femora less extensive. There is an elongate black or dark brown spot on the middle of the mesonotum

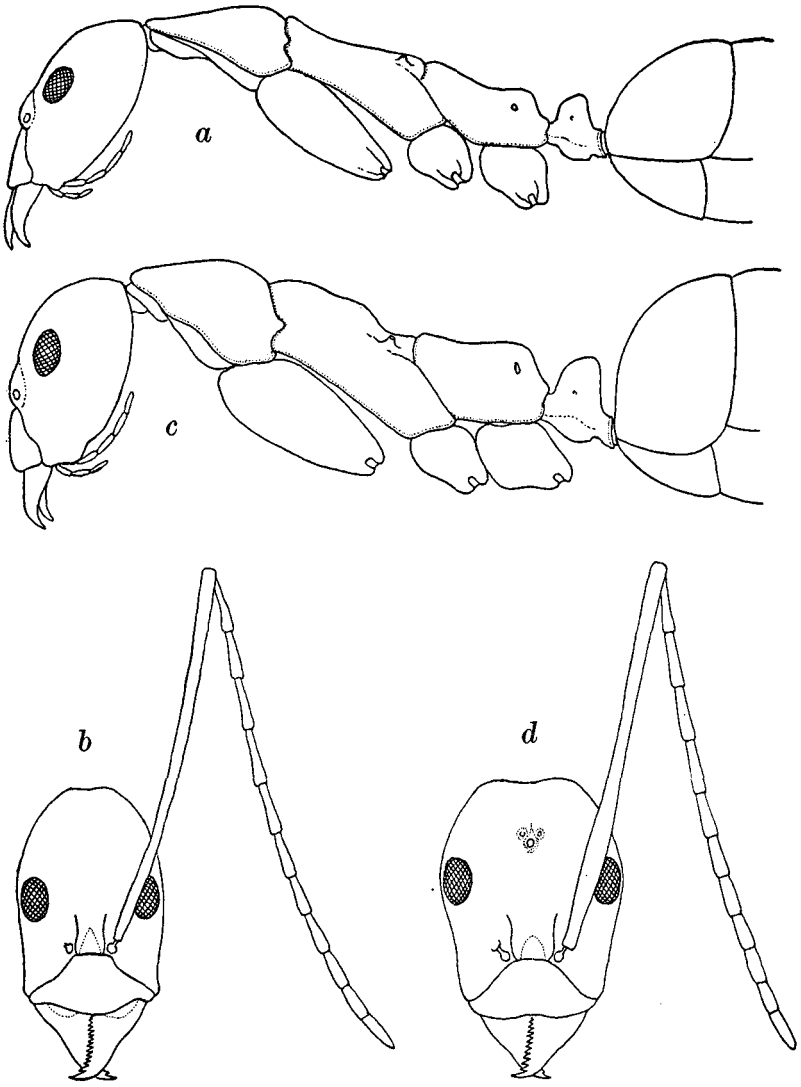

Fig. 5. *Leptomyrmex erythrocephalus venustus* subsp. nov. *a*, worker in profile; *b*, head of same, dorsal aspect; *c*, female in profile; *d*, head of same, dorsal aspect.

and the pronotum is black, with the exception of its border. The surface of the body is decidedly more shining and less pubescent than in *venustus*.

Described from nine workers taken by Dr. P. J. Darlington in the Blue Mts. of New South Wales, seven on Mt. Wilson (type-locality) and two at Wentworth Falls.

Subsp. BASIRUFUS subsp. nov.

Worker.— Length 10–10.5.

Head, antennæ, thorax, petiole and first gastric segment brownish rufotestaceous, the head slightly darker; remainder of gaster black; lower surfaces of prosterna, the coxæ, trochanters, femora, tibiæ, palpi and sometimes the mandibles, castaneous brown; tarsi and tibial spurs yellow. Surface of body slightly shining, very finely, grayish pubescent.

Two specimens taken by Mr. H. Hacker in the Buderim Mts., Queensland (type-locality) and a single worker taken by Mr. A. M. Lea at Bundaberg, in the same state. The latter specimen has the antennæ dark brown, like the legs, and the inferolateral portions of the first gastric segment black.

Subsp. DECIPIENS Wheeler

Fig. 6

L. erythrocephalus var. *decipiens* Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 268 ☿ .

Queensland: Gin Gin (W. W. Froggatt); Dawson River (A. M. Lea); McPherson Range, National Park (P. J. Darlington).

The worker of this subspecies is evidently very similar to that of *rufithorax* Forel and was described in the same year. In my specimens, however, the head, thorax and petiole are sordid rufotestaceous and the femora and tibiæ are dark brown. Forel described the petiole as black in his *rufithorax*.

Male (undescribed).— Length 7.5–8 mm.

Resembling the male of the typical *erythrocephalus* but smaller. Tips of mandibles acute. Antennæ nearly as long as the body, with joints 3–5 of the funiculus distinctly bent. Thorax shorter, with more distinct and less sloping declivity. Genitalia exserted; stipes with more acute and more acuminate tip; volsellæ with nearly equal prongs,

the anterior being shorter than in *erythrocephalus*. Middle tibiæ bowed; hind femora, tibiæ and basitarsi flexuous. Wings as in *erythrocephalus* but the basal third of the cubitus is absent; pterostigmal appendage rather long and ribbon-shaped.

Sculpture, pilosity and color much as in the typical form but the head and mandibles are covered with white pubescence like the remainder of the body. Tibiæ paler and the dark markings on the thorax and coxæ variable; in one specimen the whole epinotum, mesepisterna and coxæ are black, in two others the dark markings are much reduced

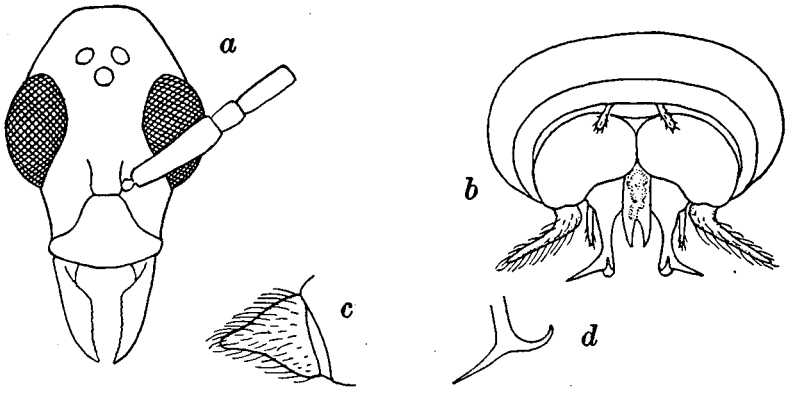

Fig. 6. *Leptomyrmex erythrocephalus decipiens* Wheeler; *a*, head of male, dorsal aspect; *b*, genitalia of same, posterior aspect; *c*, stipes, lateral aspect; *d*, volsella, lateral aspect.

in extent and intensity; in two the summit of the petiolar node is infuscated. Wings with smooth and shining membranes, tinged with grayish yellow; veins yellowish brown.

Described from four specimens taken by Dr. Darlington in the McPherson Range, National Park, Queensland, during March 1932. They are not accompanied by workers but certainly belong to some form of *erythrocephalus*, *decipiens* being indicated by elimination of the other subspecies.

Subsp. RUFITHORAX Forel

L. erythrocephalus var. *rufithorax* Forel, Ark. f. Zoöl., **9**, 1915, p. 83, ♀.
Queensland: Mt. Tambourine (E. Mjöberg, A. M. Lea).

Forel described the worker of this subspecies very briefly as measuring 9–10.7 mm. and as being "entirely like the type of the species but

with the whole thorax and not only the head red. Legs, petiole and gaster black."

A single male taken by Mr. A. M. Lea on Mt. Tambourine, Queensland seems to belong to this species. It has lost its gaster but must have measured about 10 mm. Head, thorax and petiole uniformly pale rufotestaceous (the missing gaster may have been black), the tibiæ and apical two-thirds of femora dark brown. Structurally very similar to the male of *decipiens*, but the second funicular joint is only two and one-half times as long as broad, the very long joints 4–7 distinctly bent, the seventh quite strongly. Petiole small, its node low and rounded in profile. Mandibles pointed and very finely denticulate. Middle tibiæ strongly bowed; hind tibiæ and basitarsi flexuous. Wings 8.5 mm. long, smooth and shining, their membranes and veins yellow; pterostigmal appendage knob-shaped, with a slender peduncle. Very delicately shagreened and more shining than the male of *decipiens*. Pubescence white, appressed, abundant on the thorax, tibiæ, antennæ and mandibles, almost absent on the head.

Subsp. CNEMIDATUS Wheeler

Fig. 7

L. erythrocephalus var. *cnemidatus* Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 268 ♀.

I described this form from a single worker specimen received from Staudinger and Bang-Haas, presumably from New South Wales, but without precise locality label. Numerous fresh specimens, including several males, recently received from the following localities, now enable me to give a more adequate description:

New South Wales: Dorrigo (W. Heron); same locality, 3,000 ft. (P. J. Darlington).

Queensland: Mt. Tambourine and National Park (H. Hacker).

Worker.— Length 8–9.5 mm.

Head and antennæ rather clear rufotestaceous; thorax, coxæ, trochanters, femora, knees, tibial spurs and anal segments yellow; tarsi whitish yellow; gaster black, with bluish reflections; tibiæ and a spot at the tip of each femur dark brown or black. Some specimens have also an ill-defined median fuscous spot on the pronotum. Surface moderately shining, somewhat pruinose, with very fine, grayish pubescence. Erect hairs on venter and clypeus black; flexor borders of tibiæ with a sparse series of minute bristles.

Male (undescribed).— Length 7–8 mm.

Head decidedly longer than its transverse diameter through the eyes, which are very large and prominent, subreniform, with sinuate

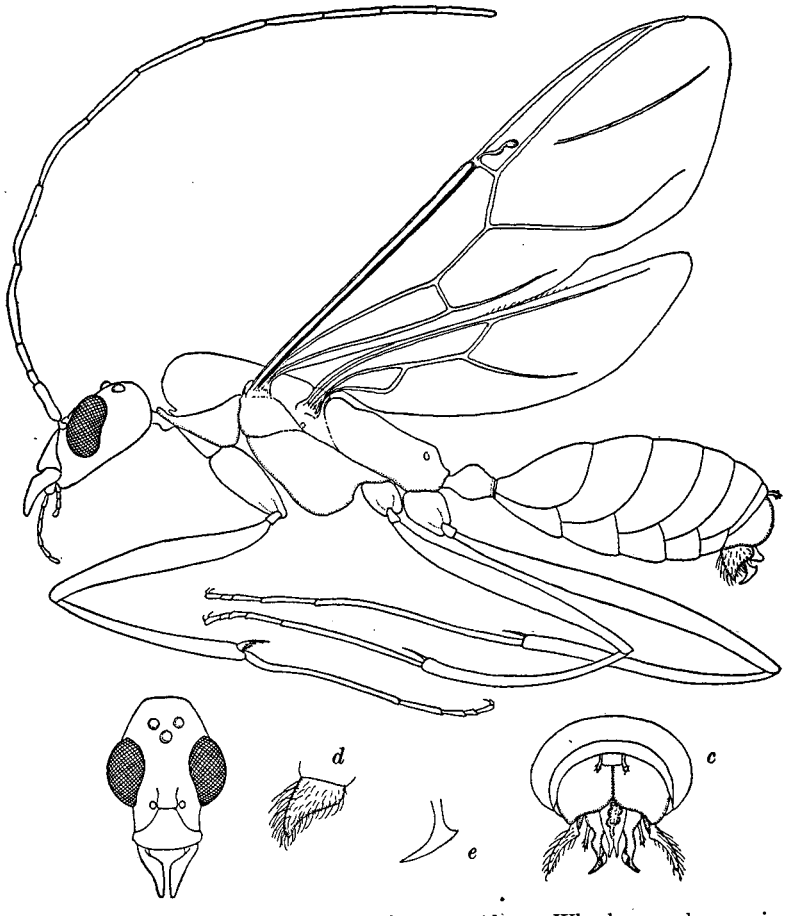

Fig. 7. *Leptomyrmex erythrocephalus cnemidatus* Wheeler, male; *a*, in profile; *b*, head, dorsal aspect; *c*, genitalia, posterior aspect; *d*, stipes and *e*, tip of volsella, lateral aspect.

mesial and external orbits. Ocelli large. Posterior portion of head subtrapezoidal, with rather straight lateral and posterior borders. Cheeks very short, concave, not more than one-third as long as the

eyes. Mandibles with blunt tips, the angle between the internal and longer masticatory border broadly rounded, the latter without any traces of denticles. Clypeus flattened, its anterior border straight in the middle, sinuate on each side. Antennæ somewhat shorter than the body; scapes subcylindrical, fully three times as long as broad, slightly stouter than the filiform funiculus; first funicular joint a little longer than broad, second joint about three times as long as broad; joints 3–5 much longer, each of them constricted and bent, the fourth near the base, the two others near the apex; remaining joints gradually decreasing in length to the tip. Pronotum produced and narrowed anteriorly; mesonotum subelliptical, somewhat longer than broad, strongly convex dorsally and overarching the pronotum anteriorly; scutellum nearly twice as broad as long, convex in the middle, depressed and narrowed on each side; mesosterna very long and convex; epinotum very long, from above one and three-fourths times as long as broad, as broad behind as in front, the sides slightly concave in the middle. Base of epinotum in profile very long and sloping, with two sinuate, transverse impressions, the declivity very short, rounded and not distinctly marked off from the base. Petiole evenly convex dorsally and ventrally. Gaster narrowed at the base, enlarged toward the tip. Genitalia extruded; squamulæ large, convex, smooth and shining; stipites rather large, with broadly excised posterior border; volsellæ boot-shaped; Legs very long, middle tibiæ strongly bowed. Wings long (8 mm.); pterostigmal appendage well-developed, pedunculate and sausage-shaped; basal third of cubitus absent.

Shagreened, the thorax more coarsely than the head and gaster, subopaque, except the epinotum and gaster which are distinctly shining.

Hairs absent, except on the ventral surface of the gaster where they are black, coarse and stiff, and on the mandibles and stipites, where they are fine, short, abundant and white. Pubescence very fine, short, white and appressed, visible on the pleuræ, epinotum, gaster and appendages and sufficiently abundant to produce a pruinose effect.

Brownish testaceous or brown; epinotum, gaster, mesopleuræ and femora dark brown; tibiæ, tarsi and genital valves yellow; veins and membranes of wings yellowish; palpi brownish.

Dorrigo, New South Wales, may be regarded as the type-locality of this subspecies. Some of the workers collected by Darlington are repletes. The males, of which there are four taken by Heron and three taken by Darlington, show some variation in the infuscation of the

thorax and those taken by Heron are decidedly more yellow and less brownish. The same is true of the accompanying workers. The large size of the eyes and ocelli and the very different shape of the volsellæ, as compared with the corresponding organs of the typical *erythrocephalus* and the subspecies *decipiens*, suggest that *cnemidatus* may be a distinct species. But since the males of more than half of the subspecies of *erythrocephalus* are still unknown, the value of these characters cannot be determined.

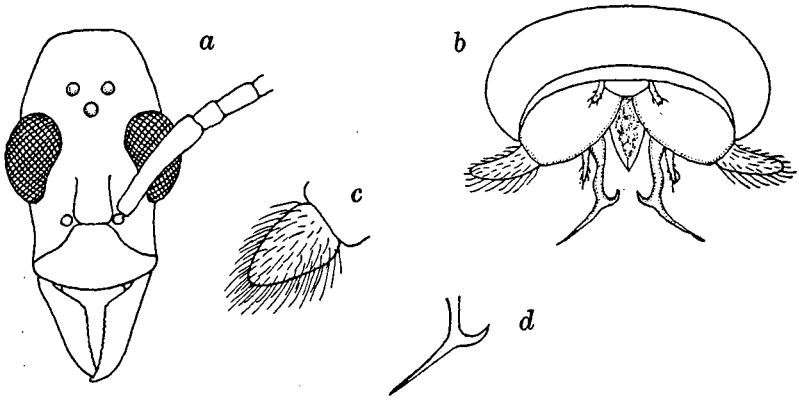

Fig. 8. *Leptomyrmex nigriventris* (Guérin), male. *a*, head, dorsal aspect; *b*, genitalia, posterior aspect; *c*, stipes enlarged, lateral aspect; *d*, tip of volsella, enlarged, lateral aspect.

LEPTOMYRMEX NIGRIVENTRIS (Guérin)

FIG. 8

Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915 p. 270, fig. 6. ♀.

New South Wales: Blue Mts. (Beccari and E. D'Albertis); Mt. Victoria (L. M. D'Albertis); Leura, Katoomba and Wentworth Falls (W. M. Wheeler); Wentworth Falls and Mt. Wilson (P. J. Darlington).

The typical form of this species seems to be known only from the Blue Mts. of New South Wales. Stitz's citation of its occurrence in New Guinea must be due either to misidentification or an erroneous locality label. In 1932 Darlington took a male specimen with workers on Mt. Wilson.

Male (undescribed).— Length 9.5 mm.

Head twice as long as broad through the eyes and shaped much like that of *erythrocephalus cnemidatus* but the mandibles with the blunt tips and masticatory borders very minutely denticulate. Eyes small compared with those of *cnemidatus*, scarcely longer than the cheeks. Ocelli small, with impressed internal orbits. Antennæ long; scapes fully four times as long as broad; first funicular joint longer than broad, second twice as long as broad; joints 3–6 much longer and each distinctly bent near its distal end. Thorax shaped as in *cnemidatus*. Petiole like that of the worker, with the node subrectangular in profile. Gaster short, elongate-elliptical. Genitalia smaller and more retracted; the stipites small, triangular and pointed; volsellæ very slender, pickaxe-shaped, the anterior prong long and acutely pointed, the posterior curved and much shorter; sagittæ uncinate. Legs very long; median tibiæ bowed; hind femora somewhat angularly bent in the middle; hind tibiæ slightly flexuous at their tips. Wings rather small and narrow, only 7 mm. long. Pterostigmal appendage small, pedunculate, sausage-shaped; cubital vein completely absent in both fore wings.

Finely shagreened and subopaque; gaster somewhat more shining.

Hairs and pubescence whitish, the former absent, except on the mandibles and external genital valves; pubescence very fine and appressed, rather uniform over the surfaces of the body and appendages.

Yellowish brown; mesonotum with an anteromedian and a pair of lateral darker brown spots; gaster black, base of its first segment yellow; distal two-thirds of middle and hind femora blackish. Wings distinctly and uniformly infuscated; their veins pale yellow, with brown outlines.

Subsp. TIBIALIS Emery

Figs. 9 and 10

L. nigriventris var. *tibialis* Emery, Ann. Soc. Ent. Belg., **39**, 1895, p. 39 ♀; Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915 p. 272 ♀.

Queensland: Northern part of the commonwealth (Podenzana), type-locality; Mt. Tambourine (A. M. Lea); National Park (H. Hacker).

New South Wales: The Dorrigo (W. Heron, P. J. Darlington).

Female (undescribed).— Length nearly 9 mm.

Resembling the female of *erythrocephalus venustus* and exhibiting similar differences from the worker. Body and appendages stouter. Head as broad in front as behind, with the sides concave just anterior

to the eyes and the occipital border slightly emarginate in the middle. Clypeus with straight, transverse anterior border. Eyes slightly larger than in the worker. All three ocelli present, each lying in an impression, the posterior pair smaller than the anterior ocellus. An-

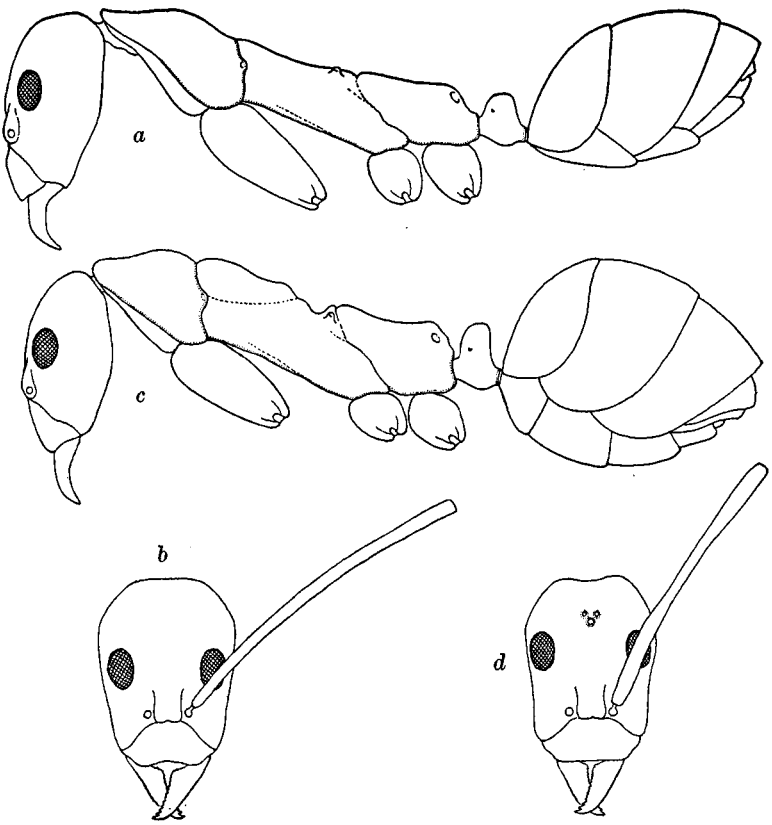

Fig. 9. *Leptomyrmex nigriventris tibialis* Emery. *a*, worker, in profile; *b*, head of same, dorsal aspect; *c*, female, in profile; *d*, head of same, dorsal aspect.

tennal scapes shorter than in the worker, distinctly enlarged near the base and at the tip, as in the female *venustus*. Pronotum nearly as broad as long, strongly convex; promesonotal suture deeply impressed; mesonotum convex anteriorly, with indistinct lateral sutures. A scutellar sclerite, bounded by a crescentic groove posteriorly, is

clearly indicated by a rounded projection just behind the convexity of the mesonotum. Metanotum short and concave rising behind in the form of a point to the distinct meta-epinotal suture. Epinotum only about one-fourth longer than broad, subcuboidal, as broad behind as in front, its base in profile horizontal, distinctly concave, twice as long as the sloping declivity, with which it forms on each side a distinct angle. Petiolar node broader and higher than long, rounded anteriorly, with a longitudinally grooved summit and flat, perpendicular posterior surface. Gaster much larger than that of the worker, nearly as high as long, laterally somewhat compressed. Legs decidedly shorter and perceptibly stouter than in the worker.

Subopaque and very indistinctly shagreened.

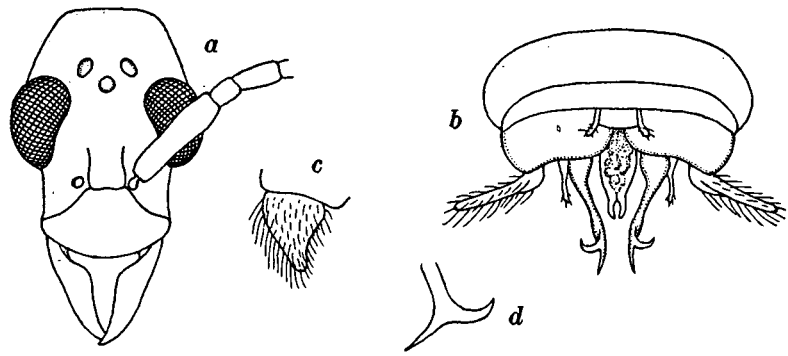

Fig. 10. *Leptomyrmex nigriventris tibialis* Emery, male; *a*, head, dorsal aspect; *b*, genitalia, posterior aspect; *c*, stipes, lateral aspect; *d*, tip of volsella enlarged, lateral aspect.

Pilosity and pubescence as in the worker, but the pubescence somewhat longer and denser on the gaster and less conspicuous on the thorax.

Head and thorax of a deeper rufotestaceous coloration than in the worker of the typical *nigriventris*, with the tibiæ and distal ends of the femora, except the knees, black and therefore darker than in the worker *tibialis*.

Male (undescribed).— Length 8–10.3 mm.

Differing from the male of the typical *nigriventris* in having the head shorter, especially behind the eyes, in lacking the dark spots on the mesonotum, in having the tibiæ and tips of the femora dark brown and the wings of a distinctly more yellow tinge. There is also a differ-

ence in the shape of the volsellæ of the genitalia, which have the prongs of their pickaxe-shaped tips stouter and much more nearly of the same length.

The female is described from a single specimen taken by Dr. Darlington in the Dorrigo, New South Wales, at an altitude of 3000 ft., between Feb. 15 and March 1, 1932, a male which was taken with it and several workers, a male taken in the same locality by Mr. W. Heron and three males taken by Mr. H. Hacker in the National Park, Queensland.

Subsp. HACKERI subsp. nov.

Worker.— Length 10–11 mm.

Differing from *tibialis* in its distinctly narrower head, which is therefore more like that of the typical *nigriventris*, and in having a large black spot on the middle of the pronotum. The tibiæ and apical halves of the femora are black and therefore decidedly darker than in the worker *tibialis*, and the rufotestaceous color of the head and thorax is perhaps a shade deeper.

Two workers from Stradbroke Island, Queensland (H. Hacker).

LEPTOMYRMEX WIBURDI Wheeler

Fig. 11

Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 272, fig. 7, ♀.
New South Wales: Jenolan Caves (J. C. Wiburd); Bulli Pass and Wentworth Falls (W. M. Wheeler); Mt. Wilson, 3500 ft. (P. J. Darlington).

Male (undescribed).— Length 7 mm.

Head, including the mandibles, twice as long as broad, the postocular portion subtrapezoidal, with straight posterior and lateral borders and rounded posterior corners. Eyes very convex, subreniform, with sinuate internal orbits, only about twice as long as the concave, subparallel cheeks and therefore intermediate in size between the eyes of *L. erythrocephalus cnemidatus* and *L. nigriventris*. Ocelli also intermediate. Mandibles short and thick, with obtuse tips, their masticatory border short and not distinctly denticulate, scarcely longer than the basal border with which it forms a rounded obtuse angle. Antennal scapes nearly four times as long as broad; first funicular joint slightly longer than broad, second joint twice as long; joints 3–6 much longer, bent near their base. Thorax shaped as in the species previously described, but the base of the epinotum in profile straight and only

twice as long as the straight sloping declivity and forming a distinct obtuse angle with it. Petiole very slightly longer than broad, its node much lower and less differentiated than in the worker; in profile somewhat higher and feebly angular in the middle; ventral surface only slightly convex anteriorly. Gaster clavate, narrow at the base, enlarged at the tip. Genitalia large, extruded; stipites oval, or rounded-triangular, longer than broad, punctate, densely and finely pilose; volsellæ rather broad, boot-shaped. Legs short; tibiæ terete, median pair bowed, hind pair feebly flexuous. Wings rather small (7 mm.) pterostigmal appendage pedunculate, sausage-shaped; basal two-fifths of cubitus absent.

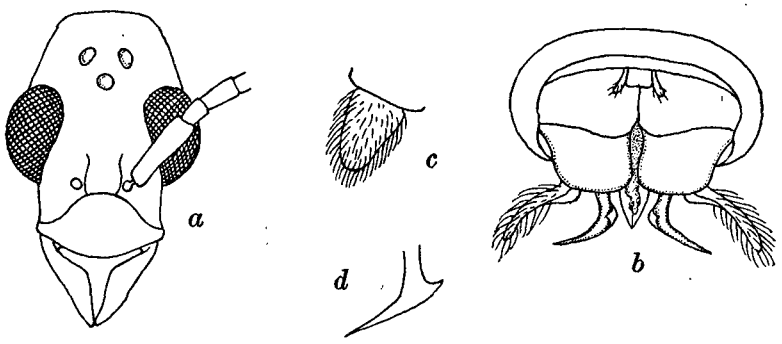

Fig. 11. *Leptomyrmex wiburdi* Wheeler, male. *a*, head, dorsal aspect; *b*, genitalia, posterior aspect; *c*, stipes and *d* tip of volsella, lateral aspect.

Subopaque; gaster more shining, rather finely and sharply shagreened.

Hairs almost absent, except on the stipites and cerci; very few on the mandibles. Pubescence yellowish, very fine, appressed, most distinct on the gaster, head, epinotum and mesopleuræ.

Pale brownish yellow; gaster dark brown, except the base of its first segment, which is yellow, and the genital squamulae, which are rich castaneous brown, very smooth and shining. Pleuræ, epinotum and dorsal surface of petiole clouded with fuscous. Wings yellow, with pale yellow veins.

Described from a single specimen taken by Dr. Darlington with several workers on Mt. Wilson, New South Wales, in January, 1932. These workers have the head, funiculi and tarsi of a deeper, slightly more brownish red than the types taken by Wiburd at Jenolan Caves

and specimens taken by myself at Wentworth Falls in December, 1931. I possess a second male captured by Wiburd at Jenolan Caves, but it is immature and was therefore not described in my former paper.

Subsp. PICTUS Wheeler

L. wiburdi var. *pictus* Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 274 ♀.
New South Wales: Bulli Pass (W. M. Wheeler).

This subspecies may be easily confused with *L. erythrocephalus venustus* which has a very similar color pattern, but the latter has the head longer and less rounded behind the eyes and decidedly longer legs, with more compressed tibiæ.

LEPTOMYRMEX FROGGATTI Forel

Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 269 ♀ ♂.
New South Wales: Noundoc (W. W. Froggatt).

I have not been able to recognize this species among my material. Forel's description of the worker suggests that it may be a black-headed form of what I have called *wiburdi,* but he says that the external genital valves (stipites) of the male have "the form of an obtuse equilateral triangle" and that "one of the rami (volsella) of the median valves is prolonged into a narrow style forked like a Y, the inferior branch of which is sharp and pointed like a needle." This description, as will be seen from Fig. 11 does not apply very closely to the *wiburdi* male. There is still a possibility, however, that this species and its subspecies *pictus* may have to be regarded eventually as subspecies of *froggatti,* which was described in 1910.

LEPTOMYRMEX VARIANS Emery

Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 278 ♀.
Queensland: Rockhampton (Museum Godeffroy).

The typical form of this species has not been taken, to my knowledge, since it was described by Emery in 1895. He described the head, thorax, petiole and antennæ as rufotestaceous and the legs, with the exception of the tarsi, the gaster, the pronotum and in some specimens a spot on the mesonotum as black. This is a color pattern surprisingly like that of *L. erythrocephalus venustus,* but the typical *varians* has a differently shaped head and its tibiæ are slender and terete and not

strongly compressed as in all the varieties of *erythrocephalus*. I have seen numerous specimens of the four following subspecies of *varians*, all of which have yellow tibiæ.

Subsp. ROTHNEYI Forel

L. varians var. *rothneyi* Forel, Rev. Suisse Zoöl., **10**, 1902 p. 473, ☿ ; Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 281, ☿ .

Queensland: Brisbane (Rothney, H. Hacker, F. H. Taylor); Enoggera (W. M. Wheeler); Blackal Range (E. Mjöberg); Caloundra.

My specimens of this subspecies show some variation in coloration. In topotypes from Brisbane taken by Hacker and Taylor, the head, pronotum, dorsum of mesonotum, summit of petiolar node, gaster, fore coxæ and all the femora are dark brown; the mandibles, sides of clypeus, antennæ, pleuræ, epinotal declivity, ventral portions of petiole and anus are red, the tibiæ and tarsi yellow. In the specimen from Enoggera the red portions are paler and more yellowish and in those from Coloundra the head is almost entirely deep red, so that they may be said to represent a transition to the typical *varians*.

Subsp. RUFICEPS Emery

Fig. 12

L. varians var. *ruficeps* Emery, Ann. Soc. Ent. Belg., **39**, 1895, p. 352 ☿ ; Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 28, fig. 11, ☿ ; Forel, Ark. f. Zoöl., **9**, 1915, p. 84 ☿ ♂.

Queensland: Mt. Bellenden Ker, type-locality (Podenzana); Cairns (W. W. Froggatt, A. M. Lea); Kuranda (W. M. Wheeler); Glen Lamington, Logan Village, Atherton, Malanda, Cedar Creek, Herberton (E. Mjöberg); Cooktown (Staudinger).

New South Wales: Katoomba, Blue Mts. (F. Silvestri).

Male.— Length 9 mm.

Head elongate-elliptical, including the mandibles twice as long as its transverse diameter through the eyes, the latter very large and protuberant, somewhat nearer the anterior clypeal than the occipital border, which is straight; the sides behind the eyes evenly rounded and gradually converging posteriorly; cheeks nearly straight, half as long as the eyes, converging anteriorly. Ocelli large and prominent. Mandibles small, with sharply truncated tips, their masticatory border short, without denticles, scarcely longer than the basal border. Cly-

peus nearly as long as broad, rather flat, indistinctly subcarinate, with broadly rounded anterior border. Antennal scapes short, not more than three times as long as broad; first funicular joint as broad as long, second joint slightly shorter, third longer than the scape. Thorax resembling that of the other species but more slender, with less overhanging and narrower mesonotum and much less protuberant mesepisterna; epinotum very low, its base concave in profile, passing into the short and very sloping declivity without a distinct angle. Petiole nearly as broad as long, its node low and indistinct, in profile with longer anterior slope meeting the posterior slope at an obtuse

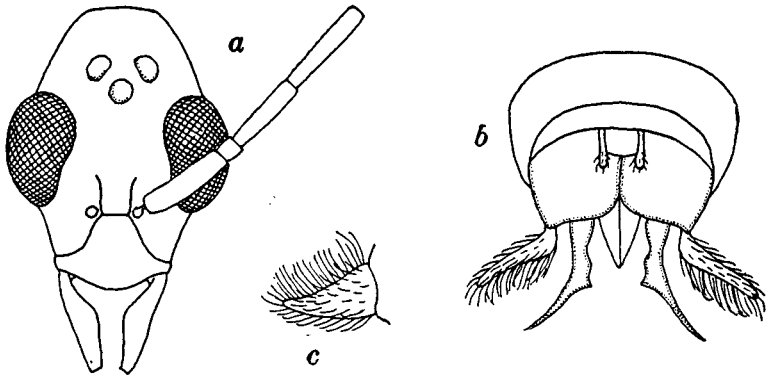

Fig. 12. *Leptomyrmex varians ruficeps* Emery; male; *a*, head, dorsal aspect; *b*, genitalia, posterior aspect; *c*, stipes, lateral aspect.

angle. Gaster narrow, elongate-elliptical. Genitalia small but extruded; stipites triangular, longer than broad, with rather acute tips; volsellæ rather stout, boot-shaped, the anterior prong very long, slender and aciculate, the posterior prong reduced to a point. Legs long and slender; middle tibiæ and hind femora bowed. Wings short, measuring only 6 mm.; pterostigmal appendage long and ribbon-shaped; cubitus complete.

Moderately smooth and shining throughout, very delicately shagreened; mandibles opaque; squamulæ of genitalia very smooth and shining.

Hairs almost absent, present on the venter where they are very short, and on the stipites where they are very fine, long and dense. Pubescence delicate and dilute, most distinct on the gaster.

Yellow throughout, except the squamulæ which are reddish brown, even the wings tinged with yellow and with yellow veins.

I have redescribed this sex from two specimens, one taken by Mr. A. M. Lea at Cairns, Queensland, with workers and a defective specimen from Cooktown obtained from Staudinger.

Subsp. RUFIPES Emery

Emery, Ann. Soc. Ent. Belg., **39**, 1895, p. 352 ♀ ; Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 279 ♀ .

Queensland: Laidley, Brisbane (Podenzana), type-locality; Mackay (G. Turner); Brisbane (F. H. Taylor); Brisbane Botanical Garden, Darra, Toowong (W. M. Wheeler); Blackal Range (E. Mjöberg); Mt. Tambourrine (A. M. Lea).

New South Wales: Gosford (F. Silvestri).

I doubt the occurrence of this and the preceding subspecies in New South Wales as far south as Gosford and Katoomba.

Subsp. QUADRICOLOR subsp. nov.

Worker.— Length 9–10 mm.

Averaging larger than *rufipes*. Head, antennæ, thorax, petiole, middle and hind coxæ brownish red, decidedly darker than the corresponding parts of *rufipes;* gaster black, prosterna, fore coxæ and all the femora, except their extreme bases, dark brown or blackish; anal segments yellowish brown; tibiæ and tarsi pale or whitish yellow. Antennæ and legs much longer than in *rufipes;* anterior surface of petiolar node with a distinct transverse impression, the posterior surface flat and with a rather sharp lateral and superior border.

Described from numerous specimens taken by Dr. P. J. Darlington at Lankelly Creek in the McIlthwaite Range, Cape York Peninsula, Queensland.

LEPTOMYRMEX DARLINGTONI sp. nov.

Fig. 13

Worker.— Length 7.5–9 mm.

Head, without the mandibles, one and two-thirds times as long as the ocular diameter, the sides straight and parallel anteriorly, behind the eyes feebly convex and gradually narrowed to the straight posterior border. Mandibles with nearly straight external borders. Clypeus

feebly convex in the middle, its anterior border nearly straight. Eyes moderately large and convex, at the median transverse diameter of the head. Antennæ very long and slender; scapes extending fully three-fifths their length beyond the posterior border of the head.

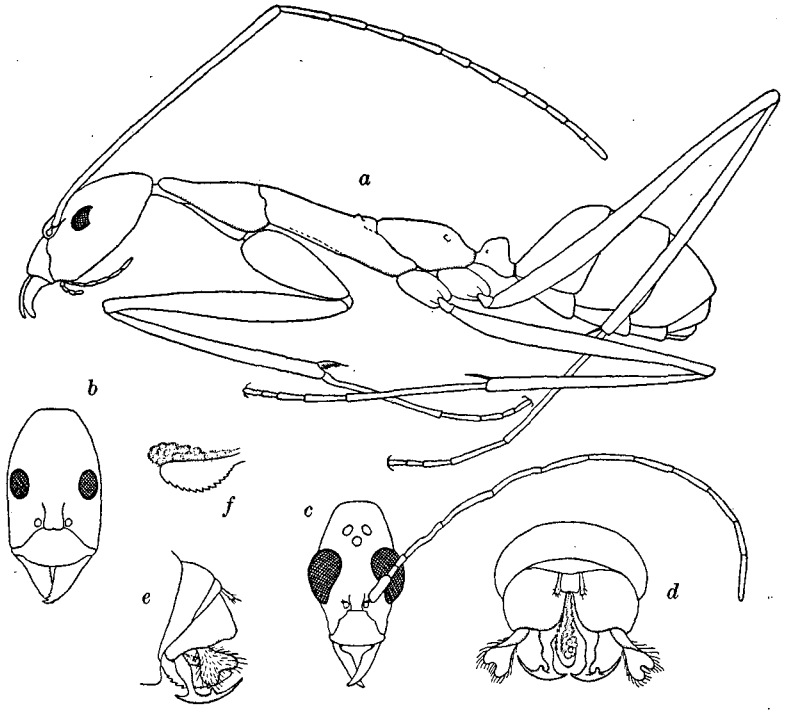

Fig. 13. *Leptomyrmex darlingtoni* sp. nov. *a*, worker in profile; *b*, head of same, dorsal view; *c*, head of male; *d*, genitalia of same, posterior view; *e*, same, lateral view; *f*, sagitta in profile.

Thorax slender, of the usual conformation, epinotum short, not much longer than broad, its base straight and horizontal in profile, twice as long as the sloping declivity with which it forms a very rounded angle. Anterior and posterior surfaces of petiolar node in profile meeting at a sharp rectangle, the former somewhat shorter than the latter which is very flat or even slightly concave, with marginate border, ventral surface only feebly convex posteriorly. Gaster elongate-elliptical.

Legs very long and slender, the tibiæ distinctly though not strongly compressed.

Very finely shagreened and somewhat shining throughout.

Hairs and pubescence white, the former sparse, largely confined to the venter, coxæ and legs, very short on the tibiæ, forming a sparse series on their flexor surface; pubescence moderately dense, rather uniform over the whole surface.

Head and antennæ rufotestaceous; remainder of body, femora and tibiæ brown-black, with the sutures of the thorax and the trochanters brownish yellow; knees, tibial spurs and tarsi very pale yellow, nearly white.

Male.— Length 6.5–7 mm.

Head narrow, without the mandibles nearly twice as long as the ocular diameter. Eyes very large and prominent, placed at the middle of the sides; postocular region subtrapezoidal, its posterior border straight, as broad as the length of the adjacent sides; cheeks *plus* the outer corners of the clypeus nearly as long as the eyes, feebly concave and somewhat converging anteriorly. Ocelli large and prominent. Mandibles slender with acute tips, their masticatory border without denticles, much longer than the internal border and forming with it a distinct but rounded angle. Clypeus nearly as long as broad, with straight anterior border. Antennæ as long as the body; scapes somewhat less than three times as long as broad; first funicular joint slightly longer than broad, the second only a little longer; joints 3–5 much longer, the third bent near its apex, the fourth and fifth more uniformly bowed. Thorax rather short compared with that of other species, mesepisterna very prominent; mesonotum longer than broad, narrowed anteriorly, epinotum less than twice as long as broad, its base in profile rather straight, sloping, twice as long as the more sloping declivity and passing into it without a perceptible angle. Petiole somewhat longer than broad, its node much lower than in the worker, in profile straight and horizontal in the middle, convex in front and sloping behind. Gaster clavate, its first segment narrowed anteriorly, the genitalia large and extruded, of a very different structure from those of the other species; squamulæ separated at the base; stipites narrowed at the base, with broad, bilobed tips; volsellæ large, flattened, bearing at their tips a curved three-pronged crosspiece, the longest slender and acute prong directed posteriorly; sagittæ forming a large keel-shaped structure, with its ventral border regularly serrate. Legs very long and slender, hind femora constricted and flexed in the middle; all the tibiæ bisinuately bent. Wings short and narrow,

measuring only 6 mm.; pterostigmal appendage vestigial, reduced to a mere nodule; basal half of cubitus absent.

Sculpture, pilosity and pubescence as in the worker, but the coxæ and legs without hairs; squamulæ very smooth and shining; hairs on the borders of the stipites long and delicate but not dense.

Described from numerous workers and two males taken by Dr. P. J. Darlington from a single colony at Lankelly Creek, in the McIlthwaite Range, Cape York Peninsula, Queensland. There are several fine repletes among the workers.

The male of this species is easily distinguished by the very unusual structure of the genitalia, the very short second funicular joint, pointed mandibles, etc. The worker differs from *varians* and its varieties in its smaller size, differently shaped head and distinctly compressed tibiæ. It is more closely related to *pallens* Emery, which has the head of the same conformation, but its tibiæ are more slender and terete and the petiole is longer. Except in its smaller size and the coloration of the tibiæ, *darlingtoni* bears a close superficial resemblance to *erythrocephalus* and *varians ruficeps*.

Subsp. JUCUNDUS subsp. nov.

Worker.— Length 7 mm.

Like the typical *darlingtoni*, except in color. Thorax, coxæ, petiole and extreme anterior end of the gaster, as well as the head and antennæ, brownish yellow, with a poorly defined spot on each side of the pronotum and the dorsum of the mesonotum fuscous; legs colored as in the typical *darlingtoni* but their black portions more brownish and the femora yellow at the base.

Two specimens taken by Dr. P. J. Darlington at Coen, Cape York Peninsula, Queensland.

Subsp. FASCIGASTER subsp. nov.

Worker.— Length 7.5 mm.

Resembling the preceding subspecies in the yellow coloration of the head, thorax, petiole and coxæ, but the femora, bases of the tibiæ, entire first gastric segment and a band at the posterior border of the second and third segments are also of the same color. The pro- and mesonotum are immaculate.

Two specimens taken by P. J. Darlington at Coen, Cape York Peninsula, Queensland.

LEPTOMYRMEX UNICOLOR Emery

Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 282, ☿.
Queensland: Cairns (Podenzana), type-locality; Kuranda (W. M. Wheeler, F. P. Dodd).

The worker of this black species is quite unlike those described in the preceding pages in the shape of the head of both the adult and larva, in possessing hairy eyes and in probably not developing repletes. On reëxamining the long series of specimens which I collected at Kuranda, Queensland in 1914, I find that all possess a small anterior ocellar pit and that two others have a small ocellus and also a considerably larger gaster. If these two specimens represent the fertile female, as seems probable, this caste is decidedly more ergatomorphic than in *erythrocephalus* and *nigriventris*.

LEPTOMYRMEX MJÖBERGI Forel

Forel, Ark. f. Zoöl., **9**, 1915, p. 84, ☿; Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 285 ☿.
Queensland: Colosseum, Tolga, Herberton (E. Mjöberg).

This black species, which I know only from Forel's description, is not only the smallest of the genus, measuring only 5.3–6 mm., but also unique in the structure of the petiole which "is rather strongly inclined forward, nearly twice as high as long and has about the form of an anteriorly inclined parallelopipedon, which is, however, somewhat convex above and with flat, but anteriorly inclined anterior and posterior surface." The description seems to imply that the petiolar node is thinner and more nearly squamiform than in the other species of the genus.

LEPTOMYRMEX PALLENS Emery

Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 276, ☿ ♂.
New Caledonia: Oubatche, Yambé, Hienghiéne, Coné, Canale, Valley of the Négropo, Coindé, La Foa, Valley of Ngoi, Nouméa (Sarasin and Roux).
Loyalty Islands: Ouvea, Fayaoué (Sarasin and Roux).
German New Guinea: (Lauterbach).
Dutch New Guinea: Tana (Moszkowski).

The worker of this species is very similar to that of *darlingtoni* in size and in the shape of the head, thorax and petiole, but the tibiæ are thinner and terete, instead of compressed. Unfortunately, Emery's description of the male is very brief and contains no mention of the genitalia.

Subsp. GENICULATUS Emery

L. pallens var. *geniculatus* Emery in Sarasin and Roux, Nova Caledonia, Zoöl., **1**, 1914, p. 418, ♀ ; Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 278 ♀ .

New Caledonia: Tchalabel, Coula-Borearé (Sarasin and Roux).

Subsp. NIGRICEPS Emery

L. pallens var. *nigriceps* Emery, in Sarasin and Roux, Nova Caledonia, Zoöl., **1**, 1914, p. 418 ♀ ; Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 278, ♀ .

New Caledonia: La Madelaine (Sarasin and Roux).

The color pattern of this variety is unlike that of any of the other forms of Leptomyrmex, the head, except the mandibles, and the whole of the gaster being black, the remainder of the body and the appendages rufotestaceous.

LEPTOMYRMEX NIGER Emery

Fig. 14, *a*, *b*

Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 274 ♀ ; Emery, Nova Guinea, Zoöl. **9**, 1911, p. 249 ♀ ; Santschi, Formicidæ in Result. Sci. Voy. Ind. Orient. Neerland., **4**, 1932, p. 16, ♀ .

New Guinea: (L. Biró); Huongolf (Neuhaus); Siwi and forest between Lomira and Lake Kamakahwalla (Prince Leopold of Belgium); Merauki; Mt. Misim, 5850 ft. in rain forest (H. Stevens).

There are in New Guinea at least four black forms of Leptomyrmex of so nearly the same size, color and structure as to pass on superficial examination for *L. niger* Emery. Only one of these belongs to Emery's species, another proves to be a melanotic subspecies of *L. fragilis* F. Smith and two are independent, unpublished species. I here redescribe *niger* from a cotype received from Emery and two specimens recently collected by Mr. Stevens on Mt. Nizim, New Guinea at an elevation of 5850 ft., with emphasis on certain details not mentioned by Emery, but of importance in comparison with the two species described below.

Worker.— Length 8 mm.

Head, including the mandibles, twice as long as broad, and excluding these fully two-fifths as high as long at the front, the anteocular portion with slightly sinuate, subparallel cheeks, the postocular portion with rounded sides gradually converging to the slightly concave occipital border. Eyes distinctly behind the middle of the head,

small and elliptical, but convex. Mandibles broad and flat, their masticatory borders coarsely denticulate. Clypeus large, feebly convex in the middle, flattened at the sides, the anterior border straight, thick and bevelled. Frontal carinæ low, parallel, not closely approximated; frontal area distinct. Antennal scapes extending fully three-fifths their length beyond the occipital border, distinctly compressed. Thorax of the usual shape; pronotum fully one and two-thirds as long as broad, sharply truncated anteriorly, with straight, posteriorly diverging sides; mesonotum more than twice as long as broad, flattened, its dorsal surface straight in profile; epinotum rounded-rectangular, nearly as broad as long, with a pronounced transverse depression near its anterior end. Petiole nearly twice as long as broad, broader in front than behind, its node thick, with short perpendicular anterior surface, its summit rounded, with a shallow, longitudinal, median groove, its posterior surface long, flat and sloping, the ventral surface nearly straight, not projecting. Legs long and slender, both the femora and tibiæ rather distinctly compressed. Gaster broadly elliptical.

Distinctly shagreened and moderately shining throughout; mandibles more subopaque.

Hairs black, bristle-like, sparse, long on the venter, clypeus and coxæ, short on the tips of the femora, shorter, more delicate and oblique on the surfaces of the femora and tibiæ. Pubescence brownish, long, generally distributed but most abundant on the gaster and anterior portion of the head, on both these regions longer and less appressed, especially on the sides of the gaster, cheeks, clypeus and mandibles. Eyes hairless.

Brown black; palpi black; funiculi, knees and inner borders of the mandibles, except the teeth, yellowish brown; fore tarsi yellow, middle and hind tarsi white.

L. niger closely resembles *unicolor* but is at once distinguished by its longer, narrower head, less elongate gaster, different pilosity, pubescence, etc. Emery's figure of the head of *niger*, reproduced in my former paper, is too long and more like the head of the two following species.

Leptomyrmex lugubris sp. nov.

Fig. 14, *c*, *d*

Worker.— Length 6–7 mm.

Differing from *niger* in the following particulars: smaller and decidedly more slender, the integument, especially of the thorax thinner,

collapsible. Head narrower and longer, with larger, more nearly circular and more convex eyes. Cheeks straight and parallel, occipital border much narrower; dorsoventral diameter of head at front much shorter, only half its length without the mandibles. Frontal carinæ

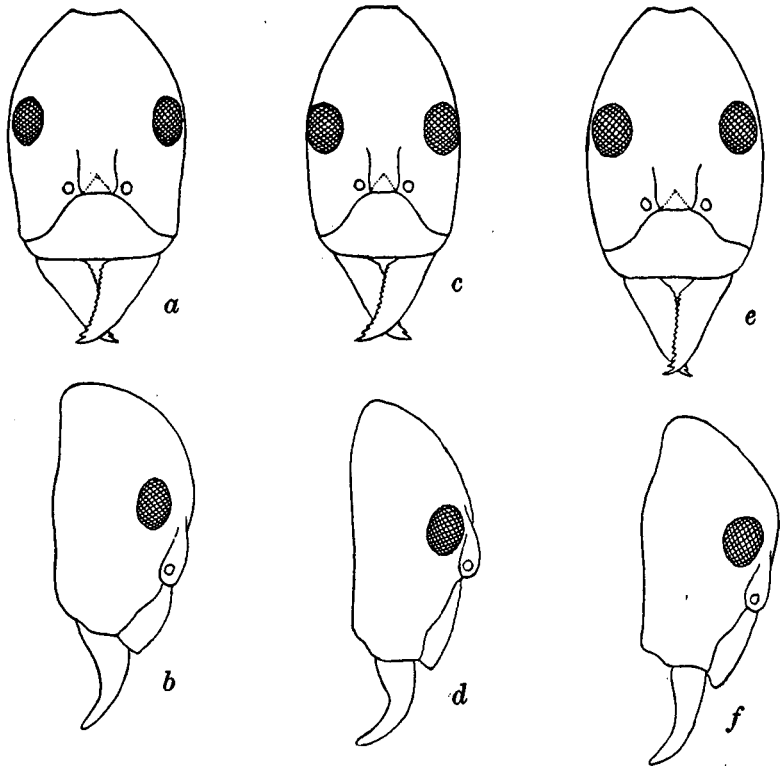

Fig. 14. *a* and *b*, dorsal and lateral aspects of head of *Leptomyrmex niger* Emery, worker; *c* and *d* of *L. lugubris* sp. nov., worker; *e* and *f* of *L. puberulus* sp. nov., worker.

more elevated and more approximated. Clypeus even flatter. Antennal scapes and legs more slender though compressed. Dorsal surface of pronotum very flat. Petiole much like that of *niger* but shorter, the longitudinal groove on the summit of the node more distinct, the posterior surface shorter and less sloping. Gaster more elongate elliptical.

Surface of body and appendages smoother and more shining. Pubescence grayish, not dense even on the gaster; hairs as in *niger*, except that they are fewer on the clypeus and absent on the tibiæ except in a very sparse and irregular row along the flexor borders. Eyes hairless.

Deep brownish black; palpi black; mandibles yellowish piceous, with blackish external borders; antennæ and legs dark brown, slightly paler than the body; tarsi and tibial spurs white.

Described from six workers taken by Mr. H. Stevens at the junction of Bulolo and Watut Creeks, Biolowat, 2000–3000 ft., New Guinea.

LEPTOMYRMEX PUBERULUS sp. nov.

Fig. 14, *e*, *f*

Worker.— Length 7–7.5 mm.

Somewhat larger than *lugubris* and intermediate in the width and thickness of the head between that species and *niger*, but more like the former in the slenderness of the thorax. Eyes even larger, more nearly circular and more convex than in *lugubris*. Frontal carinæ and area as in *niger*. Petiole like that of *lugubris* but with the groove in the summit of the node even deeper and broader. Scapes and tibiæ very slender, only slightly compressed. Gaster rather narrow, as in *lugubris*.

Very finely and superficially shagreened and with the exception of the gular surface distinctly less shining than *niger* and especially than *lugubris*.

Erect hairs as in the latter. Pubescence gray, long and abundant on all parts of the body and appendages, but especially on the head and gaster, oblique or suberect, even longer and more abundant on the scapes. Eyes hairy.

Brown black; sides and anterior portion of head somewhat paler, more castaneous brown; palpi, anterior border of clypeus, mandibles, except their teeth, and antennæ brownish yellow; bases of scapes dark brown; femora blackish brown; tibiæ somewhat paler, with their bases and spurs, and the tarsi white.

Described from fifteen specimens taken by Mr. H. Stevens, eleven in the Morobe District (type locality) and four at Biolowat, 2000–3000 ft., New Guinea. In possessing hairy eyes and in the abundant, oblique or suberect pubescence of the body and appendages this species is most like *L. unicolor* but is in other respects very different.

LEPTOMYRMEX FRAGILIS (F. Smith)

Wheeler, Proc. Amer. Acad. Arts Sci., **51**, 1915, p. 275, fig. 9, ♀ ♂; Emery, Nova Guinea, Zoöl., **5**, 1910, p. 532; *ibid.* **9**, 1911, p. 249 ♀.
Aru Islands: (A. R. Wallace).
Ceram: (Tavern).
British New Guinea: Moroka, Bujakori, Haveri, Paumomu River (L. Loria).
Dutch New Guinea: Mt. Cyclope, Manikion, Moaif, Senbani, Merauki, Baie Etna, Bivak-Leuvel.

This species seems to be closely related to the Australian *varians* but the postocular portion of the head of the worker is more elongated, with a longer constriction near the occipital border, which is shorter, and the genital appendages of the male are very different. Both worker and male of the typical *fragilis* have the body yellowish testaceous throughout. The gaster of the worker often has a yellowish brown spot on each side.

Subsp. FEMORATUS Santschi

L. fragilis var. *femorata* Santschi, Formicidæ in Result. Sci. Voy. Ind. Orient. Neerland., **4**, 1932, p. 17 (?) ♀ fig.
Dutch New Guinea: Siwi (Prince Leopold of Belgium).

In the worker of this subspecies the general color of the body is more reddish than in the typical form, the lateral spots on the gaster are nearly black and the middle and hind femora are brown.

Subsp. MELANOTICUS subsp. nov.

Fig. 15

Worker.— Length 6.5–7.5 mm.

Differing from the two preceding forms in its much darker color. Head, palpi, thorax, petiole, gaster and coxæ brown-black; sides of head, coxæ and femora more castaneous brown; scapes and tibiæ pale brown; mandibles, except the teeth, anterior border and corners of clypeus and funiculi brownish yellow; tarsi and extreme bases of tibiæ white or yellowish white.

Male.— Length 6.5 mm.

Head without the mandibles nearly twice as long as its width through the eyes, which are unusually large and convex, with feebly sinuate internal orbits and situated distinctly in front of the middle of the head. Cheeks more than half as long as the eyes, concave, con-

verging anteriorly. Postocular borders of head long, very feebly concave, rapidly converging to the short, straight occipital border. Ocelli large but not prominent. Mandibles small and narrow, with pointed tips, their masticatory border without denticles, somewhat longer than the basal border and curving into it without a perceptible angle. Clypeus as long as broad. Antennæ very long and slender, fully as long as the body; scapes two and one-half times as long as broad; first funicular joint half as long as the scapes, joint 2 of the same length as the first, succeeding joints much longer, feebly flexuous. Thorax long, mesonotum one and one-half times as long as broad,

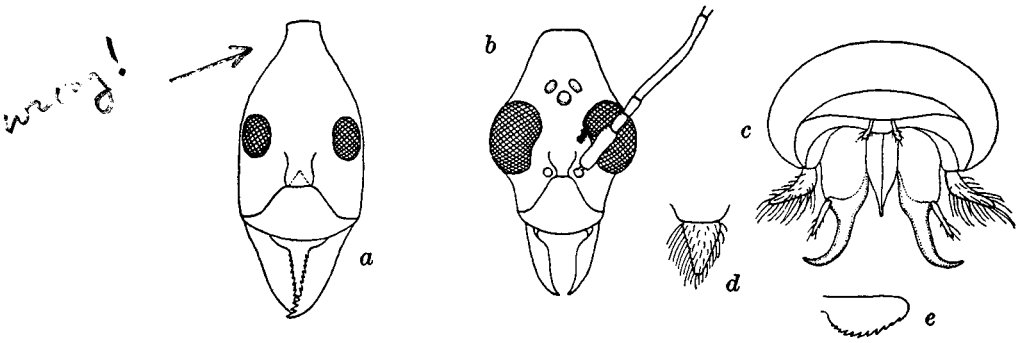

Fig. 15. *Leptomyrmex fragilis melanoticus* subsp. nov. *a*, head of worker, dorsal aspect; *b*, head of male, dorsal aspect; *c*, genitalia, posterior aspect; *d*, stipes and *e*, sagitta, lateral aspect.

narrowed anteriorly where it is very convex and strongly overarching the pronotum; mesepisterna very protuberant as in the other species; epinotum low, its base straight in profile, nearly three times as long as the straight, sloping declivity, with which it forms a distinct angle, marked on each side by the projecting epinotal stigma. Petiole from above twice as long as broad, broader behind than in front, with straight sides; in profile without a distinct node, its dorsal and ventral surfaces nearly parallel, the dorsal slightly convex, the ventral straight. Genitalia retracted basally, their appendages exserted and spread; stipites small, subtriangular, longer than broad, with bluntly rounded tip, their ventral border with numerous long cilia; volsella long, flattened, hook-shaped, membraneous at the base where it bears a slender, styliform lacinia; sagittæ flattened, subtriangular, with straight dorsal border, rounded tip and convex, serrate ventral border. Legs ex-

tremely long and slender, middle tibiæ bowed, fore and hind tibiæ flexuous, the latter very strongly so. Wings short, measuring only 5 mm.; apterostigmal appendage minute, nodiform; basal half of cubital vein absent.

Lustrous or somewhat shining, very finely shagreened or punctulate.

Hairs and pubescence pale, the former short, absent, except on the stipites, lower surface of petiole and anterior border of clypeus; pubescence rather long, appressed, not very dense, generally distributed.

Head, thorax, gaster, dorsal surface of petiole and coxæ dark brown; mandibles, clypeus, scapes, front, sutures of thorax, wing-insertions, ventral portion of petiole and genital appendages yellowish brown or brownish yellow; femora paler brown than the coxæ, their tips, the tibiæ, tarsi and funiculi white. Wings distinctly infuscated, with brown veins.

Described from six workers and two males taken by Mr. W. J. Eyerdam at China Straight, New Guinea (Papua).

That this is really only a dark form of *fragilis* and not a distinct species is shown by the close agreement of the genitalia with Emery's description of these appendages in the typical *fragilis*. The male of this species, as will be seen from my description and figures is quite as unlike any of the other Leptomyrmex males as that of *darlingtoni*.

LEPTOMYRMEX GRACILLIMUS sp. nov.

Fig. 16

Worker.— Length 9–9.5 mm.

Very slender; head without the mandibles somewhat more than twice as long as broad, with the moderately large and convex eyes distinctly in front of the middle; preocular portion subrectangular, broader than long, with straight, parallel cheeks, the postocular with feebly convex sides very gradually converging to the short, straight, delicately marginate occipital border. Mandibles large and flat, their external borders nearly straight, their masticatory borders with only the larger apical denticles set at right angles to the blade, the others serrate and directed backward. Clypeus large, feebly convex but not subcarinate in the middle, depressed on the sides, the anterior border thin, straight in the middle, broadly rounded at the corners. Frontal carinæ parallel; frontal area distinct. Antennæ very long and slender, scapes feebly and uniformly curved, distinctly compressed, extending more than three-fifths their length beyond the occipital border.

Thorax very long and slender; pronotum nearly twice as long as broad, its sides and anterior border straight, its dorsal surface straight in front and very feebly convex behind; mesonotum fully twice as long as its width at its dorsal junction with the epinotum, its dorsal outline in profile somewhat concave anteriorly; epinotum one and two-thirds times as long as its posterior width, subrectangular behind, semicircularly rounded in front, its base in profile straight, twice as long as the very sloping declivity and arcuately rounding into it. Petiole twice as long as broad, with nearly parallel sides, the node in

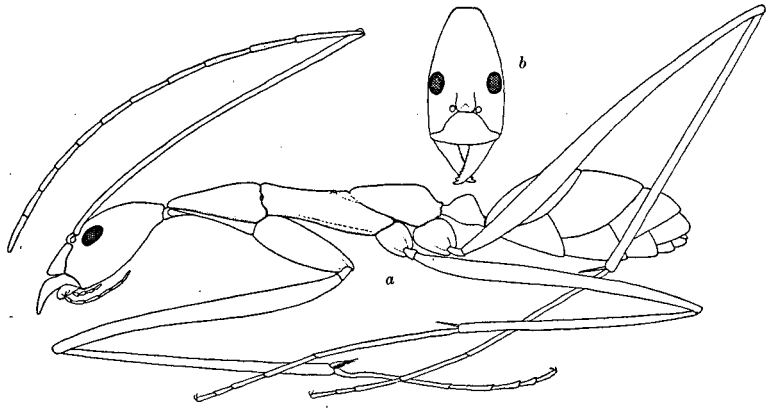

Fig. 16. *Leptomyrmex gracillimus* sp. nov., Worker. *a*, profile aspect; *b*, head, dorsal aspect.

profile with the anterior and posterior surfaces straight and subequal, meeting at a rounded right angle, the anterior surface feebly, longitudinally grooved; ventral surface not strongly convex. Gaster elongate-elliptical, fully three times as long as broad, the first segment longer than broad, narrowed anteriorly. Legs very slender and greatly elongated, especially the fore and hind pairs; tibiæ distinctly compressed.

Very finely and indistinctly shagreened, almost subopaque, the gula and sides of head more shining; mandibles granular, with a row of coarse punctures along the masticatory border.

Hairs reddish brown, few, sparse, long and erect, confined to the venter, fore coxæ and clypeus; tibiæ with an uneven row of short, pale, oblique hairs or bristles along their flexor border. Pubescence whitish, appressed, distinct and moderately long and dense on the

head and gaster, shorter and much more dilute on the thorax, petiole and appendages.

Pale testaceous or brownish yellow, sides of gaster indistinctly clouded with brown; middle and hind tarsi white, mandibular teeth red.

Described from five specimens taken by Mr. L. Wagner at Finschhafen, New Guinea.

This species is rather closely related to *L. fragilis*, but is decidedly larger and more slender and the sides of the long, attenuated postocular portion of its head are very feebly and evenly convex throughout their length, without any indications of a constriction.

ADDENDA

Among some ants received from Mr. John Clark, Curator of Entomology in the Melbourne Museum, I find two workers labelled "*L. froggatti*". They prove to belong to a new form of *erythrocephalus*, which is here briefly described as

Subsp. *clarki* subsp. nov.

Worker.— Length 8–8.5 mm.

Differing from all the previously described forms of the species in coloration, being brown black, with the funiculi beyond the first joint, the thoracic sutures, metanotal region, posterior half of the epinotum, petiole, trochanters, middle and hind coxae and tips of fore coxae, tarsi and extreme bases of tibiae rufotestaceous. Spurs of the middle and hind tibiae black. Pilosity black, very short and sparse, confined to the mandibles, clypeus, venter and flexor surfaces of the tibiae. Pubescence very short, dilute and indistinct.

Two specimens from Fletcher, Queensland (E. Sutton). This is the only form of *erythrocephalus* with an entirely black head.

I find that I have overlooked an important account of *Leptomyrmex niger* and *fragilis* by Karawaiew (Ameisen aus dem Indo-Australischen Gebiet. Treubia, **8**, 1926, pp. 430–433). He took many workers and males of the former species on Kobror Island, in the Aru Archipelago, and describes the male in detail with two figures (Figs. 5 and 6), one of which shows the genitalia. The volsellæ terminate in a simple hook as in *fragilis melanoticus*. The single very flourishing colony of *niger*, which Karawaiew found, was inhabiting a nest one and one-half to

two meters long and consisting of loose earth on each side of a decayed log, into which the ants' galleries partially extended.

He took workers of *L. fragilis* on both Kobror and Wammar Islands, in the Aru Archipelago, and describes one of the nests as consisting of earth between two roots at the base of a tree trunk, above and below a termitarium, which was also inhabited by the ants. The whole structure, including the termitarium was 35 cm. high and half as broad. The descriptions indicate that the two Papuan species of *Leptomyrmex*, unlike the Australian species which I have observed, are able to construct nests, but the occupation of the deserted termite galleries by *fragilis* and of possibly preformed cavities in the log by *niger*, suggests that the earthen portions of the nests may also have been constructed by previous occupants.