

II—THE ANTS COLLECTED BY THE AMERICAN MUSEUM CONGO EXPEDITION

By WM. M. WHEELER

Dorylinæ

WORKER AND SOLDIER.—Clypeus as a rule very short and not limited by sutures. Frontal carinæ vertical, not covering the insertions of the antennæ. Antennæ inserted near the mouth and close to each other, often less than 12-jointed. Palpi at most 3-jointed, in *Leptanilla* only one-jointed. Ocelli and eyes often absent (without exception in all African genera). Sutures of the thorax more or less vestigial; mesonotum touching the epinotum on the dorsal face, without interposed metanotum. Spurs of the tibiæ pectinate or rudimentary. Postpetiole not always separated by a constriction from the third segment; however, in *Eciton*, *Enictus*, and *Leptanilla*, narrowed into the second joint of a two-jointed pedicel. Sting developed.

FEMALE.—Permanently apterous, with the abdomen much enlarged and swollen; very different morphologically from the worker. Clypeus as in the worker. Frontal carinæ more or less separated. Antennæ 10- to 12-jointed. No ocelli; eyes not more developed than in the worker; female blind when the worker is so. Segmentation of the thorax more or less rudimentary; no traces of wings or a rudiment left at the tegulæ (*Dorylus*). Postpetiole never separated from the third segment, the pedicel always composed of one segment. Gaster long and voluminous.

MALE.—Clypeus and frontal carinæ much as in the female. Mandibles developed, as a rule large; in *Leptanilla* very short. Antennæ 13-jointed; scape long, in *Leptanilla* only slightly longer than the second joint. Eyes and ocelli well developed. Thorax with normal segmentation, winged. Postpetiole and pedicel much as in the female. Genitalia completely retractile (*Dorylini* and *Ecitini*) or exerted and not retractile (*Leptanillini*); subgenital lamina split or fureate; cerci absent.

LARVÆ more or less cylindrical, with short hairs, without hooked setæ; mandibles small, slender, falcate.

NYMPHS usually naked; enclosed in a cocoon in some species of *Eciton*.

The three castes in this subfamily are so different from one another that their true relations remained for a very long time unsettled. The winged males were the first to be known and were originally placed with the Mutillidæ. The workers and females were recognized as ants but at first classified in genera by themselves. Though their relations were more or less suspected by Lepeletier de Saint-Fargeau, Haliday, and Shuckard, the true affinities of the male and worker became only gradually known after 1850, when Savage observed for the first time in West Africa *Dorylus* males walking in an army of *Anomma* workers. The females, leading a permanently subterranean life, are still excessively rare in collections and known only for a few species; their capture in the smaller species is rather fortuitous, whereas in such fierce army ants as *Anomma* it is a very troublesome operation.

G. Arnold¹ gives the following general account of the habits of this subfamily:

The members of this subfamily are commonly known as driver or legionary ants. The males, which are winged and provided with eyes, are frequently taken at lights; on the other hand, the workers are blind, with the exception of some species of *Eciton*, in which there is a pair of single-faceted eyes, and the females (excepting one species of *Eciton*) are both blind and wingless. The members of the genus *Dorylus* are almost entirely subterranean in their mode of life, rarely coming to the surface except in dull, cloudy weather. The species of the subgenus *Anomma*, which live in the more tropical and forested regions of Africa, and to which the term driver ants was originally applied, and the Ecitini of South America, are, however, usually seen above the surface, although, should the rays of the sun prove too powerful, they will construct temporarily tunnels with particles of earth held together by their saliva. The species of *Eciton* are not so shy of the light and may be seen foraging about even in bright sunlight. It is probable that all, or at least the majority of the species are carnivorous, although *D. orientalis* has been shown by Green to feed also on tubers and the bark of trees.

As far as known the members of this subfamily do not as a rule make permanent nests. This course is determined by their exceedingly predatory habits, which compel the adoption of a migratory form of life together with the formation of temporary nests in localities which are sufficiently productive of animal life to detain them for any length of time. Ranging far and wide in search of prey, which consists of any animal they are strong enough to overpower, these ants must sooner or later exhaust the areas round their nests, and are forced to remove the latter to new and more productive hunting grounds.

But little is known of the habits of the Leptanillini; all species are hypogæic. Santschi found the nest of *Leptanilla nana* Santschi 40 cm. beneath the surface in clay soil; he caught females and workers by inundating the soil so as to force them to come out of their burrows; workers have also been taken by sifting decayed leaves. The males are attracted by lights.

A detailed account of the migrations and habits of some of the African species is given below (see under *Dorylus bequaerti*, *D. opacus*, *D. kohli*, *D. nigricans*, *D. wilverthi*, and *D. fulvus*).

The Dorylinae are abundantly found in all tropical parts of the world, with the exception of the Antilles and the Malagasy Region; they are absent from the larger part of Australia. A few species reach North Africa, the coasts of Asia Minor, and the central and southern United States.

¹1915, Ann. South African Mus., XIV, p. 110.

DORYLUS Fabricius

WORKERS small or of medium size, without eyes or ocelli, highly polymorphic, constituting a series of forms which may be grouped as maximæ, or soldiers, mediæ and minimæ. In the maxima the head is very large and usually broader in front than behind, the mandibles are long and narrow, with a small number of teeth on the inner border, the clypeus is very short and not marked off from the remainder of the head by sutures. Frontal carinæ very short, erect, close together, not concealing the insertions of the antennæ. Antennæ short, inserted very near the mouth, 9- to 12-jointed, according to the species. Mediæ smaller, with much smaller and shorter head, but the latter not narrowed in front; anterior border of clypeus more or less projecting in the middle over the mouth. Antennæ as in the maxima. Minima very small, with the head narrowed anteriorly and the anterior border of the clypeus strongly projecting in the middle. Number of antennal joints reduced, seven being the minimum. Promesonotal suture distinct in all three forms of worker; meso-epinotal suture obsolete. Epinotum always unarmed. Petiole nodiform; postpetiole narrowed anteriorly, not or only indistinctly separated from the first gastric segment. Pygidium with a dorsal impression and terminating in three points. Posterior tibiæ each with a pectinated spur.

FEMALE very much larger than the worker, dichthadiiform, i. e. wingless, with long and voluminous abdomen. The head has the occipital lobes swollen and rounded, separated by a median longitudinal furrow. Eyes and ocelli absent, as in the workers. Clypeus as in the worker maxima, or soldier. Mandibles narrow, edentate. Antennæ 11-jointed (12-jointed in the subgenus *Dichthadia*). Thorax segmented, but the mesonotum without differentiated scutum and scutellum; alar insertions vestigial. Petiole large, its posterior corners prolonged as blunt points. Postpetiole shorter than the first gastric segment, but not followed by a constriction. Pygidium and hypopygium gaping or separated so as to expose to view the eighth pair of abdominal spiracles, the anal segment and sting; the pygidium not impressed; the hypopygium surpassing the pygidium considerably and terminating in two lobes or appendages.

MALE very large, with very large eyes and ocelli. Clypeus short, prolonged backward between the short, diverging frontal carinæ. Mandibles edentate. Antennæ 13-jointed; scape one-third or one-fourth as long as the funiculus which is filiform. Legs short; femora flattened, tibiæ narrow. Wings with narrow, poorly defined pterostigma, placed near the apical third; radial cell elongate and open; one closed cubital cell, usually one recurrent nervure (two in the subgenus *Rhogmus* and in some anomalies). Petiole nodiform or saucer-shaped, its concavity turned toward the postpetiole, the latter not separated from the gaster by a constriction. Gaster long, cylindrical or club-shaped. Pygidium rounded or split at the posterior border (*Rhogmus fimbriatus*). Genital armature voluminous, completely retractile; annular lamina narrow; stipes and volsella simple; lacinia absent; subgenital plate deeply furcate.

Emery, who has devoted much careful study to the Dorylinæ, divides *Dorylus* into six subgenera (*Dorylus*, *sensu stricto*; *Dichthadia* Gerstæcker; *Anomma* Shuckard; *Typhlopone* Westwood; *Rhogmus* Shuckard; *Alaopone* Emery) mainly on the number of antennal joints and structure of the pygidium in the worker, the number of antennal

joints and shape of the hypopygium in the female, and the shape of the mandibles and petiole in the male. The genus (Map 4) occurs throughout Africa, India, Indochina, the Malayan Region, and Indonesia (Borneo, Java, Sumatra, and Celebes). All but one of the subgenera and most of the species are found in Africa; in Asia there are less than half a dozen species belonging to the subgenera *Dichthadia*, *Typhlopone*, and *Alaopone*.

In the 'Genera Insectorum' (Dorylinae, 1910, p. 7) Emery makes the following statement on the ethology of the genus *Dorylus*:



Map 4. Distribution of the genus *Dorylus*.

Apart from the subgenus *Anommia* all the species of *Dorylus* lead a subterranean life and come to the surface of the soil only on exceptional occasions, as, e. g., during inundations or in order to accompany the males when they take flight. Their societies are very populous. The soldiers and workers make subterranean expeditions for the purpose of capturing insects and other small animals, and exploit manure piles, cadavers and probably also the nests of termites. The males come to lights at night. Search for the heavy and voluminous apterous females is beset with difficulties so that they are rare in collections. It may be noted that in all the specimens hitherto described, with the exception of the female of *D. fimbriatus* described by Brauns, the terminal tarsal joints are lacking. I infer that the workers tear them off during the underground forays, while they are dragging the colossal queen by all her legs through the narrow galleries.

***Dorylus atratus* F. Smith**

A single male from Stanleyville (Lang and Chapin).

***Dorylus brevipennis* Emery variety *marshalli* Emery**

A single male from Medje (Lang and Chapin).

***Dorylus bequaerti* Forel**

I refer to this species, originally taken by Dr. Bequaert at Sankisia in the Katanga, numerous workers from two colonies, one taken by Mr. Lang at Banana, the other by Dr. Bequaert at Pasaconde near Zambi "in galleries under ground and in a fallen trunk of *Hyphæne*." The largest workers of the former colony are only 4 mm. long and therefore somewhat smaller than those seen by Forel (5 mm.) and the color is paler. They are probably not the largest workers of the colony. The largest individuals taken by Dr. Bequaert are fully 5 mm. long and darker in color. The head is deeply and broadly excavated behind and has straight, subparallel sides; the first funicular joint is distinctly longer than broad, the remaining joints, except the last, broader than long, and the petiole is also slightly broader than long. The whole body is evenly and sharply punctate, the punctures on the gaster somewhat smaller but very distinct. The large workers are rich ferruginous red, with somewhat paler gaster; the smaller workers are decidedly paler, like those taken by Mr. Lang at Banana.

***Dorylus depilis* (Emery)**

Faradje, ♂; Medje, ♂; Stanleyville, ♂ (Lang and Chapin). Seven specimens, all belonging to the typical form of this well-known species.

***Dorylus mæstus* (Emery)**

A single male from Stanleyville (Lang and Chapin).

***Dorylus staudingeri* Emery**

A single male from Medje (Lang and Chapin).

***Dorylus (Anomma) emeryi* Mayr subspecies *opacus* Forel**

A fine series of workers of all sizes from a single colony taken at Ngayu (Lang and Chapin). "They appeared during the night, apparently attracted by some bones of large mammals, which they completely covered." The sides of the head of the largest workers are less convex than indicated by Santschi's figure and like that which he gives of *D.*

emeryi, though slightly narrower and much more deeply excavated behind. The preapical tooth of the mandibles is lacking in the largest, though present in the mediæ and smallest workers. There are also three workers from Medje, taken from the stomach of a toad (*Bufo funereus*).

***Dorylus (Anomma) funereus* Emery**

Medje, ♂; Stanleyville, ♂; Bolobo to Lukolela, ♂ (Lang and Chapin). Single specimens from each of these localities agree closely with Emery's description of the types from the Gold Coast.

***Dorylus (Anomma) kohli* Wasmann**

Twenty workers from Akenge and Niangara, taken from the stomachs of toads (*Bufo funereus*) and frogs (*Kassina senegalensis* and *Hemisus marmoratum*), and a fine series of workers of all sizes from Avakubi (Lang and Chapin) with the following note: "They usually appear in great masses, coming right out of the ground, underneath a piece of meat. Even palm oil, poured on the floor, will attract them in the same way." This observation shows that the species is hypogæic like the species of *Dorylus*, *sensu stricto*, and not epigæic like *Dorylus (Anomma) nigricans* and its various subspecies and varieties, and agrees with the observations of Father Kohl, quoted by Wasmann: "This species seems to be intermediate between the subterranean *Dorylus*, *sensu stricto*, and the driver ants. Its discoverer, Father Kohl, who found it at St. Gabriel near Stanleyville on the Upper Congo, writes as follows: "The ants just mentioned seem always to wander about beneath the surface of the ground; at any rate, I have seen them on the surface only on three occasions and always after a rain.'" Wasmann adds the interesting statement: "The subterranean mode of life of *D. kohli* may also be inferred from its guests, which are much less like those of *Anomma* than of *Dorylus helvolus* L. The development of the eyes of *Pygostenus pusillus* Wasm., which lives with *D. kohli*, is about half way between the small eyes of *P. raffrayi* Wasm., a guest of *D. helvolus* L., and the very large eyes of the *Pygostenus* species which live with *Anomma wilwerthi* Emery. Here, too, there is a hint in regard to the habits of the host." The remarkable wingless phorid *Hexacantherophora cohabitans*, recently described by H. Schmitz,¹ was also found with *Dorylus kohli* by Father Kohl at St. Gabriel near Stanleyville.

¹1914, Zool. Jahrb. Abt. Syst., XXXVII, pp. 512-515, Pl. xxix, fig. 1.

***Dorylus (Anomma) kohli* variety *congolensis* Santschi**

Two series of workers, one taken at Leopoldville by Mr. Lang, the other at Thysville by Dr. Bequaert, evidently belong to this variety, in which the head of workers measuring 7 mm. is as broad as long, whereas in the typical *kohli* it is longer than broad in individuals of the same size, with somewhat less pointed posterior angles.

The Leopoldville specimens were found "under a piece of tin on the shore of Stanley Pool," those from Thysville were "marching in a subterranean burrow in a forest gallery."

***Dorylus (Anomma) kohli* variety *langi*, new variety**

A series of more than a hundred workers from Malela (Lang and Chapin), taken beneath the prostrate trunk of a palm, represent a new variety near variety *frenisyi* Forel and variety *minor* Santschi. They range in size from 3 to 8 mm. The largest are very probably the true maxima workers as they lack the preapical mandibular tooth. In *frenisyi* the largest workers attain a length of 8.5 mm., in *minor* 8 mm.

The head of *langi* is nearly as broad as long, its sides convex and distinctly converging behind so that the occipital border, which is deeply and rather angularly excised, is about three-fourths as long as the anterior. The dorsal and ventral surfaces of the head are somewhat flattened. The whole body is finely, sharply, and rather uniformly shagreened or minutely and densely punctate and subopaque; the mandibles smooth and shining; the gaster behind its first segment feebly shining. The upper surface of the head, thorax, and gaster are uniformly but sparsely punctate, the punctures nonpiligerous for the most part. The suberect, yellow hairs are very sparse and confined to the gaster and the same is true of the dilute appressed pubescence. Legs and scapes with short stiff and appressed hairs, absent or very sparse on the extensor surfaces of the femora and tibiae. In some specimens a few very fine short hairs can be detected, under a magnification of 20 diameters, arising from the coarse punctures on the vertex or posterior corners of the head. Color rather bright reddish ferruginous, with the legs paler and the mandibles and the upper surface of the head, except the cheeks and occiput, dark brown or blackish. The upper surface of the thorax and gaster, except the posterior borders of the segments of the latter, are darker and more brownish than the pleurae and venter. The petiole is scarcely longer than broad, its ventral tooth small, compressed and directed backward. The smaller workers have the head of nearly the same shape and proportions as the larger but less deeply excised behind and more shining, as is also the body. The pubescence is also a little more abundant. The color is very similar but paler in the smallest individuals.

***Dorylus (Anomma) kohli* variety *chapini*, new variety**

This is a very distinct form, represented by a series of two dozen workers from Stanleyville (Lang and Chapin), without further data. They measure 1.5 to 6 mm. in length. The largest specimens are probably not the maxima forms as they have a preapical mandibular tooth.

The body is only slightly shining and very similar in sculpture to the preceding variety except that the punctures are coarser, sharper and piligerous. They are evenly distributed over the dorsal surface of the head and pronotum, similar but smaller and shallower on the epinotum and gaster, and very indistinct or absent on the petiole. Mandibles and legs smooth and shining. The head, pro- and mesonotum, gaster, scapes, and legs are covered with short, subappressed, yellow hairs arising from the punctures and forming a conspicuous, rather abundant, coarse pubescence. The body is brownish ferruginous, the head slightly darker, and appendages paler, the mandibles blackish. The head is scarcely longer than broad in front, the sides very feebly convex and converging to the posterior border, which is only slightly excised and about four-fifths as long as the anterior border. The petiole is as broad as long. The smaller workers closely resemble the larger, except that the head is a little longer and the color paler.

Dorylus (Anomma) nigricans Illiger subspecies **arcens** (Westwood)

Eleven maxima and media workers from Medje (Lang and Chapin), taken from the stomach of a toad (*Bufo funereus*), are very dark, almost black, and are evidently referable to this subspecies, though the largest specimens are only about 10.5 mm. long, whereas the largest workers, according to Emery and Santschi, measure 13 mm. The surface of the body is very shining, the head more opaque in front.

Dorylus (Anomma) nigricans subspecies **burmeisteri** (Shuckard)

Seven workers from the stomach of a toad (*Bufo regularis*) taken at Stanleyville; a series of workers of all sizes from Stanleyville and Lukolela to Basoko (Lang and Chapin); also workers from Katala (J. Bequaert).

Dorylus nigricans is the famous driver or army ant, which has so greatly impressed all the African explorers. In my ant-book I have quoted some of the accounts of the earlier observers. To the field naturalist the various races of *D. nigricans* and *D. wilverthi* are so similar in appearance and habits that he designates them all as "driver" or "army" ants. It is not surprising therefore that Mr. Lang's notes refer indifferently to both species. The four fine photographs (Pls. II, III, and IV) belong undoubtedly to *D. wilverthi* (*vide infra*) but the following note probably refers to both species: "Wherever they go, even though the file be very small, the army ants clear a road that can be easily seen. But when a large army is passing, they not only build a road but also bridges and frequently even fill in all the depressions between the dried grass with particles of sand or soil until a perfect road has been constructed. Across a pathway used by pedestrians, where they are often disturbed, they build walls and regular tunnels even in

the hardest ground. Particle by particle is carried out by the steady stream of small workers and the soldiers, large and small, watch on both sides of the line, ever ready to attack anything that may approach. They assume a very peculiar attitude, with mandibles wide open and the head and thorax bent up and back till it forms a right angle with the abdomen. When they seize anything, the abdomen can be torn off without their loosening their grip. They are greatly feared by the natives and even the greatest laggard moves rapidly when passing 'the line.'"

In connection with the fact cited by the early explorers, that the drivers are able to kill large animals when confinement prevents their escape, Santschi's quotation of the following observation of Cruchet concerning *D. nigricans* in Benguela is of interest: "Twice during the course of the year we have been compelled to take the cows out of the kraal and drive them elsewhere, because they bellowed so piteously. On looking into the matter we found that the *Anommæ* caused all this disturbance by crawling into the natural orifices of the animals, especially the anus and vulva. A brooding hen had her head half eaten away, but would not abandon her eggs. On three occasions one of my comrades had to quit his chamber during the night and take up his quarters in the work shop."

According to Forel,¹ a very interesting account of the habits of *Dorylus nigricans* in East Africa has been published by Vosseler,² but I have not had access to this paper. Forel's paper, however, contains reproductions of three of Vosseler's photographs, one showing the *Anomma* overwhelming a white rabbit and the others showing its army on the march and crossing a stream. Prof. Emery, some years ago, kindly sent me copies of these photographs, which seem to me worthy of being again reproduced for the benefit of my American readers (Pl. V, figs. 1 and 2; Pl. VI, fig. 1).

The singular dichthadiigyne, or female of *D. nigricans*, was discovered by H. Schultze in Uganda. It measures 29 to 31 mm. and has been carefully figured and described by Forel in the work cited above (p. 177).

***Dorylus (Anomma) nigricans* subspecies *burmeisteri* variety *rubellus*
(Savage)**

Several workers from Boma (Lang and Chapin).

¹1912, Mitt. Naturh. Mus. Hamburg, XXIX, p. 174, footnote.

²Pflanz. Nov. 4, 1905, pp. 280-302.

Dorylus (Anomma) nigricans subspecies **sjøestedti** Emery

Three large workers from Faradje, Niangara, and Medje, taken from the stomachs of toads (*Bufo regularis* and *B. superciliaris*) and a frog (*Rana occipitalis*); also a large series of workers from Faradje (Lang and Chapin).

This form closely resembles subspecies *burmeisteri* variety *molestus* (Gerstæcker) in having the inferoposterior angles of the petiole prolonged outward as distinct tubercles, but is readily distinguished by having the head of the larger workers (7 to 12.5 mm.) opaque instead of shining and that of the smaller workers elongate.

An interesting account of the habits of *rubellus* and *sjøestedti* has been published by Sjøstedt.¹

Dorylus (Anomma) wilverthi Emery

Plates II, III, and IV

This fine species, the workers of which are easily recognized by the elongated and divergent posterior corners of the head (Fig. 1b), is represented by a large series from Avabuki and a single small worker from

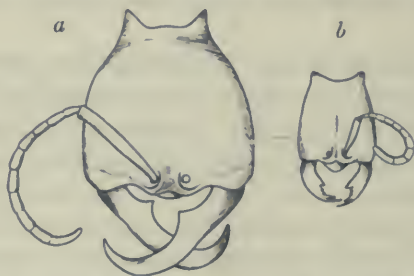


Fig. 1. *Dorylus (Anomma) wilverthi* Emery. a, head of soldier; b, head of worker.

Faradje; also by five workers from Medje and Akenge taken from the stomachs of toads, *Bufo polycercus* and *B. funereus* (Lang and Chapin).

The temporary nest is shown in Plate II, the ants massed on the ground in Plate III. Concerning these ants Mr. Lang says: "We had considerable trouble with them, for they started a nest near our camp at the base of a coffee bush where some pineapple plants were growing. I took two photos before burning the place. One shows the masses of army ants heaped on top of the other. It was impossible to see what they had beneath them, but after the fire, we found that they covered in-

¹1908, 'Akaziengallen und Ameisen auf den ostafrikanischen Steppen.' In Sjøstedt, Exped. Kili-mandjaro, Meru, etc., II, 8, pt. 4, pp. 111-114.

numerable eggs and larvæ. The other photo shows the mounds or heaps of earth particles carried out by the workers. They come on steadily, each one with a particle of soil in its jaws, and, as soon as they arrive at the summit of the mound, they open their mandibles and the grain of sand rolls into place. After the fire they began to emigrate in enormous numbers, building their roads as they proceeded. There was one main line about an inch wide, excluding the soldiers. I followed this particular line for a distance of about 500 yards into the forest. Sometimes the ants seemed to have disappeared entirely into the ground, since they traveled in tunnels, but by searching I discovered their course some distance beyond. I was unable to ascertain where the huge army deposited its eggs and larvæ. For three days the workers carried larvæ and eggs out of the old nest. The brood was carried under the body so that it could not be seen by the superficial observer." These observations were made at Avakubi.

***Dorylus (Typhlopone) fulvus* (Westwood) subspecies *badius*
(Gerstæcker) variety *obscurior* Santschi**

Vankerekhovenville, ♀, ♂; Faradje, ♀; Garamba, ♀; Batama, ♂; Stanleyville, ♂ (Lang and Chapin); Avakubi, ♂ (Lieut. Boyton). Both the worker and male of this form have a characteristic color. Santschi described only the worker from Konakry, French Guinea. The Congo specimens measure 5 to 13 mm. and have the head, thorax, petiole, and legs rich chestnut brown, the gaster brownish yellow, the mandibles and antennæ nearly black. The smallest workers are more uniformly brownish yellow. The differences in form between this and the typical *badius* of South Africa are slight. Santschi describes the head, the base of the epinotum, and the petiole as broader in *obscurior*. In my specimens the head of the soldier (Fig. 2a) closely resembles that of the variety *eurous* from East Africa as figured by Emery.

The males (Fig. 2b-f) taken from the same colony as the workers are also much darker than those of the subspecies *badius* and variety *eurous* or the typical *fulvus* from North Africa. They measure 33 to 36 mm., with the thorax somewhat less than 6 mm. broad, and are chocolate brown, with the head blackish and the gaster a shade paler than the thorax and petiole. The wing membranes are also of a little duller and deeper tint. The hairs and pubescence are less golden and less shining, more grayish. The male genitalia are intermediate in the structure of the stipes between those of the typical *fulvus* and the subspecies *badius*, as will be seen by

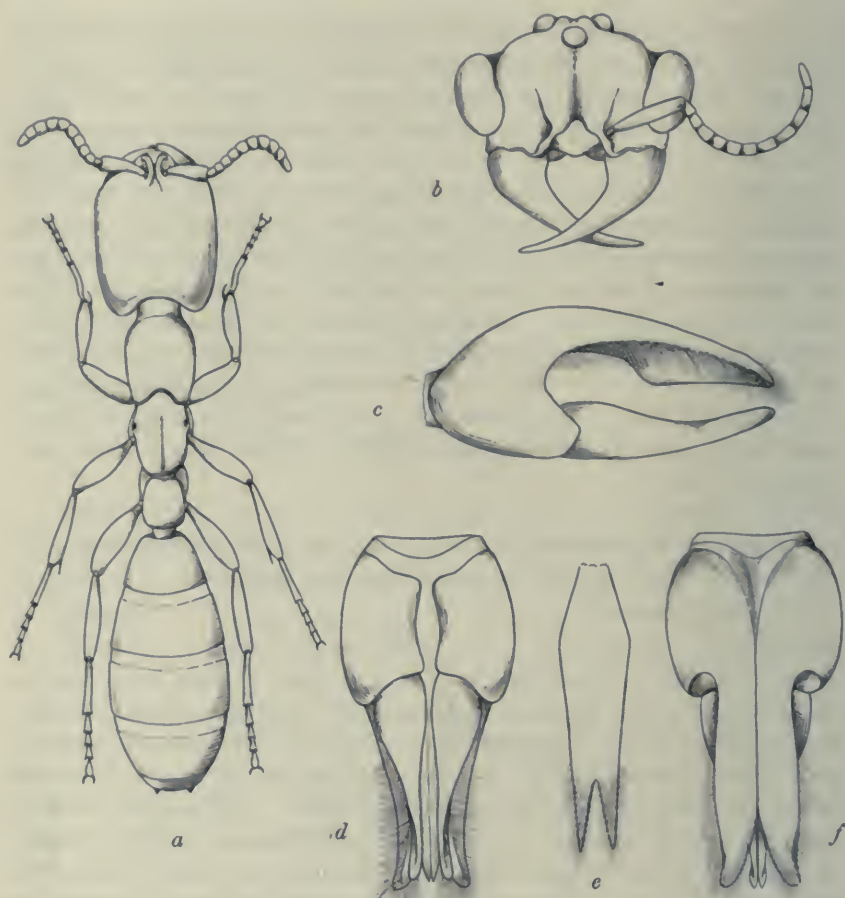


Fig. 2. *Dorylus (Typhlopone) fulvus* subspecies *badius* variety *obscurior* Santschi a, soldier, b, head of male; c-f, genitalia of male.

comparing my figures with Emery's.¹ The specimens from Batama and Avakubi are distinctly paler than the others in the series but can hardly be regarded as belonging to a different variety.

Concerning the Vankerekhovenville colony from which both workers and males were taken, Mr. Lang writes: "These ants were collected on the floor of an Azande hut. The workers and big males were swarming out of a hole in the ground during the night. These driver ants are not annoying to human beings, but have subterranean habits. They never

¹1895, Zool. Jahrb. Abt. Syst., VIII, figs. Q and R, pp. 727, 728.

walk in columns on the surface like the others, but whenever a piece of meat or even a jar of oil is deposited on the ground they immediately appear from below, without a tunnel or a gallery being visible from the outside."

***Dorylus (Alaopone) atriceps* Shuckard**

Text Figure 3

Three males from Faradje and two from Stanleyville (Lang and Chapin).



Fig. 3. *Dorylus (Alaopone) atriceps* Shuckard. Head of male.

***Dorylus (Alaopone) conradti* Emery**

Five soldiers and ten smaller workers from Niangara (Lang and Chapin), taken from the stomach of a frog (*Hemiscus marmoratum*), agree perfectly with Emery's description and figures of the types from Togo, except that the largest workers measure only 4.5 to 5 mm., whereas Emery's specimens attained a length of 6.5 mm. The soldier is easily recognized by the coarsely punctate thorax and the very elongate head, which, with the closed mandibles, is nearly twice as long as broad.

Cerapachyinae

I have recently proposed to regard Forel's tribe "Cerapachysii" as constituting an independent subfamily, the larvæ of these ants being so different from those of the true Ponerinae and much more like the larvæ of the Dorylinae.¹ The limits of this new subfamily agree with those of Emery's section Prodorylinae, and Emery was probably right in contending that the Cerapachyinae are intermediate between the Dorylinae and Ponerinae.

The WORKER caste has a ponerine habitus, but is often long and slender. The postpetiole is separated from the third abdominal segment by a well-marked constriction, and as broad as the third segment. In the Indoaustralian *Eusphinctus* even the gastric segments are marked off from one another. A powerful sting is present.

The characters of the FEMALE in the various genera are peculiarly diverse. In some cases (*Phyracaces*), this caste is winged and not unlike the females of certain Ponerinae; in others (*Parasyseia*, *Eusphinctus*), the female is wingless and ergatomorphic; and, in still others (*Acantho-*

¹Wheeler, Wm. M., 1920. "The subfamilies of Formicidae, and other taxonomic notes." *Psyche*, XXVII, pp. 46-55.

stichus, *Nothosphinctus*), the female is so much like the corresponding caste in the Dorylinæ that it might be regarded as a diehthadiigyne. The MALE, on the other hand, though lacking the cerci, has a decidedly ponerine habitus. The male genitalia are completely retractile; the subgenital lamina deeply and broadly furcate.

The LARVÆ are extremely like those of the Dorylinæ; they are elongate and almost cylindrical, uniformly covered with short hairs, and without piliferous tubercles. The mandibles are small, narrow, pointed, and rather feebly chitinized, and I have failed to find a trophorhinium, or tritürating organ in the mouth. Apparently the young are fed only on soft food. Moreover, the foraging habits at least of certain Australian Cerapachyinae (*Phyracaces*) resemble those of the Dorylinæ.¹

Dr. W. M. Mann has recently sent me specimens of his *Cerapachys majusculus* from Fiji, with several worker pupæ which are enclosed in well-developed, brown cocoons. The Cerapachyniæ seem, therefore, to agree with the Ponerinæ in this character.

CERAPACHYS F. Smith

WORKER.—Small ants with peculiar, long, subcylindrical body; the head excavated behind, with prominent, depressed posterior corners and very short clypeus, with which the closely approximated frontal carinæ are fused. The latter are erect, leaving the articulations of the antennæ exposed. The antennal fovea is bounded externally by a distinct carina. Mandibles with distinct, obscurely denticulate apical border. Antennæ stout, 9- to 12-jointed, the scape incrassated distally, the terminal funicular joint large, swollen, oval or glandiform, at least as long as the three preceding joints together, thus forming a one-jointed club. Eyes small, sometimes wanting. Thorax with the promesonotal and mesoepinotal sutures absent or indistinct. Petiole and postpetiole not marginate on the sides, the latter strongly constricted off from the gaster which is largely formed by its first segment.

FEMALE scarcely larger than the worker and very similar, sometimes apterous and ergatoid. Fore wings when present with a discoidal and a single cubital cell.

MALE with the clypeus and frontal carinæ much as in the female. Antennæ filiform, 13-jointed; basal funicular joints short. Mesonotum without Mayrian furrows. Wing venation like that of the female.

The genus has been divided by Emery into four subgenera, distinguished by the number of antennal joints: *Cerapachys*, *sensu stricto*, having 12; *Parasyscia*, 11; *Ooceræa*, 10; and *Syscia*, 9. The distribution of these subgenera is peculiar. The species of *Cerapachys*, *sensu stricto*, are known to occur only in the Ethiopian, Malagasy, Indomalayan, and Papuan Regions; those of *Parasyscia* occur in Texas, Guatemala,

¹Wheeler, Wm. M. 1918. 'The Australian ants of the ponerine tribe Cerapachyini.' Proc. American Ac. Arts Sc., LIII, p. 223.

Syria, Ceylon, India, and Burma; those of *Syscia* have been recorded from Ceylon, Singapore, New Guinea, Queensland, and Hawaii; while *Ooceraea* is known only from Ceylon. As these ants form small colonies and live a subterranean life, they are very rarely seen and this probably accounts for the peculiar discontinuous distribution in the accompanying map (Map 5). It seems hardly possible that species of *Cerapachys*, *sensu latiore*, are entirely lacking in South America, but none has been found in any of the many extensive collections that have been made on that continent. Practically all that is known of the habits of the genus is contained in a paper which I published many years ago on the Texan *Parasyscia augustæ* Wheeler.¹



Map 5. Discontinuous distribution of the genus *Cerapachys*.

Cerapachys cribrinodis Emery

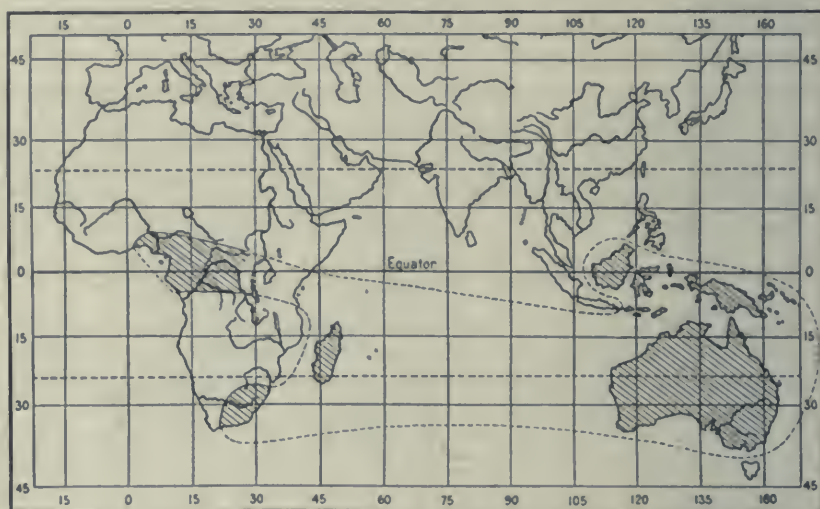
Two workers found in the stomach of a toad (*Bufo funereus*) taken by Lang and Chapin at Medje.

PHYRACACES Emery

Closely related to *Cerapachys*. The worker and female have 12-jointed antennæ. The terminal funicular joint, however, is not enlarged but tapers from the base to the tip and is not longer or scarcely longer than the two preceding joints together. The eyes of the worker are much larger than in *Cerapachys* and the sides of the petiole and often also of the postpetiole are strongly marginate. The female is winged or apterous and ergatoid; the male is known in certain Australian species.

¹1902, 'An American *Cerapachys*, with remarks on the affinities of the *Cerapachyinae*,' Biol. Bull., III, pp. 184-191, 5 figs.

This genus is known only from the Ethiopian, Malagasy, Indo-malayan, Papuan, and Australian Regions (Map 6) and is represented by the greatest number of species in Australia. The little that is known concerning the habits of the species is recorded in my paper entitled 'The Australian ants of the ponerine tribe Cerapachyini.'¹ The workers forage in small armies on the surface of the soil, like many Dorylinae, and prey on other ants or possibly on any small insects they may encounter.



Map 6. Distribution of the genus *Phyracces*.

Phyracces langi, new species

WORKER (Fig. 4).—

Length 4 to 5 mm.

Head subrectangular, a little longer than broad and a little broader behind than in front, its sides feebly and evenly convex, its posterior border broadly and rather deeply concave and somewhat truncate, the occipital border sharply marginate with the margination surrounding the blunt but projecting inferoposterior corners and continued forward along each side of the gula to the insertion of the mandible. Eyes moderately large, flat, in front of the middle of the head. Mandibles with slightly concave external and very finely and evenly denticulate apical borders. Carinae of cheeks very prominent, in the form of blunt, rectangular teeth. Frontal carinae erect, subparallel in front, more approximated but not truncate behind. Antennae rather robust; scapes three-fifths as long as the head, slender at the base but rather abruptly enlarged before the middle; joints 2 to 9 of funiculus

¹1918, Proc. American Ac. Arts Sc., LIII, pp. 215-265, 17 figs.

broader than long, tenth joint larger, distinctly longer than broad, terminal joint tapering, not broader than the preceding and not longer than the two preceding joints together. Thorax subrectangular from above, about twice as long as broad, a little broader through the epinotum than more anteriorly, evenly convex above, without traces of dorsal sutures, truncated and sharply marginate anteriorly and posteriorly. The margination separating the base and declivity of the epinotum is enlarged to form a small blunt tooth on each side. The lateral borders of the dorsum are indistinctly marginate, especially in the epinotal region, but the sloping epinotal declivity is sharply marginate laterally. Petiole as broad as the epinotum, rectangular, about one and two-thirds as broad as long, with bluntly dentate posterior corners, marginate in front and on the sides, with truncated, slightly concave anterior, feebly convex dorsal and sloping posterior surface. Ventrally in front it bears a large, triangular, compressed, subtranslucent tooth. Postpetiole as broad as the petiole, as long as broad, very regularly rectangular, flattened above, with only its anterior border marginate. First gastric segment a little larger than the postpetiole, of a similar shape but broader than long, anteroventrally with a blunt tooth or tubercle. Pygidium subcircular, truncate, minutely and indistinctly spinulate on the sides. Legs rather slender, hind coxæ with a large rounded, translucent expansion at the tip on the inner side.

Shining; mandibles coarsely and sparsely punctate. Head with a large, smooth and very shining space on each side between the eye and frontal carinæ; remaining surface with coarse, elongate punctures or foveolæ and posteriorly with a few coarse rugæ. Thorax above and on the sides rather regularly longitudinally rugose, with indications of elongate foveolæ on the humeri and truncated anterior surface; epinotal declivity more finely and regularly longitudinally striated. Sculpture of petiole above similar to that of the thoracic dorsum but with more numerous elongate foveolæ in the interrugal spaces; on the postpetiole the foveolæ are larger and more abundant and the longitudinal rugæ much less distinct; first gastric segment, pygidium and posterior portions of remaining segments coarsely and evenly punctate, the basal portions of these segments more shining and very evenly striolate. Scapes finely, legs more coarsely and much more sparsely punctate.

Hairs grayish, bristly, suberect, moderately long, rather evenly distributed on the body, more abundant on the tip of the gaster, more appressed on the legs; tibiae and scapes with a few long, suberect hairs. Pubescence short, visible only on the punctate portions of the gaster.

Black; mandibles, antennæ, legs, tip of gaster and sting piceous, coxæ and middle portions of femora and tibiae darker.

FEMALE.—

Length 5 to 5.5 mm.

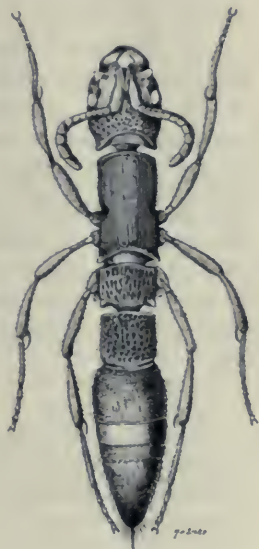


Fig. 4. *Phyracaea langi*, new species. Worker

Very similar to the worker. Pronotum coarsely foveolate; mesonotum small, flat, somewhat pointed anteriorly, with its rugæ converging in front. Postpetiole distinctly broader than the petiole and a little broader than long. Wings whitish hyaline, with very pale yellow veins and large, conspicuous, dark brown pterostigma.

Described from seven workers and eight females taken from a single colony at Lubila, "nesting in a mushroom-shaped termitarium against a tree in the forest" (Lang and Chapin).

Of the four described Ethiopian species of *Phyracaces*, *langi* is most closely related to *P. foreli* Santschi of the Gold Coast. The worker of this species, however, measures only 3.5 mm. and, judging from Santschi's description, has a nearly straight occipital border, shorter antennal scapes, and different sculpture, especially of the head, petiole, and postpetiole. His figure of the petiole shows much longer posterior teeth than in *langi*. The specimen from Samkita, Gaboon, described by Santschi as the female of *foreli* measures 4 mm. and is so different from the worker in the shape of the petiole that I feel sure that it belongs to a distinct species, which may be designated as *Phyracaces santschii*, new species.

Ponerinæ

Postpetiole separated from the third abdominal segment by a constriction which is more or less marked (except in the Odontomachini and in certain males of Ponerini), almost always as broad as the third segment (except in *Myrmecia* and a few others). WORKER and FEMALE with a powerful sting. As a rule there is a stridulating organ on the basal surface of the tergite following the postpetiole; it consists of very fine transversal striæ of the articulating surface. Median spur of the tibiæ pectinate, when present, except on the middle tibiæ of a few genera; lateral spur simple. Fore wing as a rule with two closed cubital cells; but there are many exceptions.

The dimorphism of the worker is feebly marked (except in *Megaponera* *fatens*, where it is very pronounced) and the female as a rule is not very different from the worker; ergatoid females exist in many genera. In a few cases the MALE has no constriction behind the postpetiole; such males can usually be recognized from male Doli-choderinæ by the feeble development of the mandibles. Ergatoid males are known for certain Ponerini.

LARVÆ with the mandibles powerfully developed for ant larvæ; the anterior portion of the body long, slender and neck-like, folded over the swollen abdominal portion; the segments are either densely hairy all over or covered with rows of peculiar tubercles beset with more or less prominent bristles; the larvæ of *Megaponera* and *Bothroponera* are hairless.

NYMPHS enclosed in a resistant cocoon, which may be opened by the adult without intervention of the worker. The West African *Discothyrea oculata* Emery is the only case in which the nymphs are described as having no cocoon.

In the Ponerinæ the larvæ are nearly always fed with pieces of solid food, which is almost invariably animal matter. Arnold says that *Euponera sennaarensis* (Mayr) is possibly an exception to the rule:

This ant preys unceasingly on termites, but its nest very often contains considerable accumulations of grass seeds, which may perhaps be used as food.¹

The economic value of the Ponerinae in tropical countries can hardly be overestimated, for it may be safely asserted that at least 80 per cent. of their food consists of termites, and they thereby constitute one of the chief checks to these pests of the tropics. Certain species are exceptional, such as *Plectroctena mandibularis*, which feeds chiefly on millipedes and beetles, and *Platythyrea arnoldi* Forel, whose food consists entirely of small beetles, mostly Tenebrionidae.

The colonies are usually small in ponerine ants, but may be very numerous in some species, such as *Paltothyreus tarsatus*, *Megaponera fatens*, *Euponera sennaarensis*, many species of *Leptogenys* and *Odontomachus hematoda*.

The habit of foraging in files has been observed in several species of Ponerinae in different parts of the world. In our region this habit is displayed by *Megaponera fatens*, and to a slight extent by *Paltothyreus tarsatus*. The former marches in double file, and the striking disparity in size between the two forms composing the colony has a very singular appearance. Their prey consists entirely of termites, and when a suitable hunting-ground containing these animals has been found, the columns break up and pour into every hole and crack which leads to the invaded galleries. The method then adopted is as follows: each ant brings to the surface one or more termites, and then re-enters the galleries to bring up more victims. This is continued until each ant has retrieved about half a dozen termites, which, in a maimed condition, are left struggling feebly at the surface. The whole army reassembles again outside and each marauder picks up as many termites as it can conveniently carry, usually 3 or 4. The columns are then re-formed and march home. Less order is shown by *P. tarsatus*, but I have often seen this ant carrying termites, in short single files composed of about a dozen workers. (G. Arnold, *op. cit.*, pp. 7-8).

PLATYTHYREA Roger

WORKER.—Small or medium-sized, slender, monomorphic, opaque black ants, with pruinose surface and very poorly developed pilosity, with flat clypeus often without a posterior suture, indistinct frontal area and large, thick, expanded and widely separated frontal carinae. Mandibles large, triangular, with edentate or finely denticulate apical border. Maxillary palpi 6-jointed, labial palpi 4-jointed. Antennae stout, funiculi without a distinct club. Eyes rather large; ocelli absent. Promesonotal suture distinct, other thoracic sutures feeble or obsolete. Petiole massive, not squamiform, its posterior articulation at the middle of the anterior surface of the petiole. The constriction between the latter and the gaster moderately pronounced. Middle and hind tibiae with two spurs; claws with a single tooth.

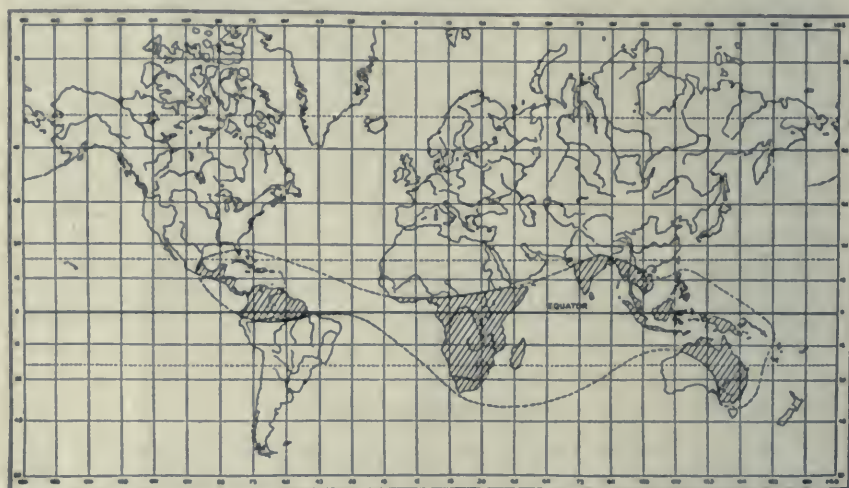
FEMALE winged, very similar to the worker and but little larger; eyes larger, but ocelli not always developed. Pronotum large; mesonotum depressed. Wings with two closed cubital cells, a discoidal cell and a closed radial cell as in many other Ponerinae.

MALE more like the female than in most genera of the subfamily; clypeus more convex than in the worker and female; frontal carinae not dilated anteriorly. Mandibles triangular, with sharp apical border. Antennae 13-jointed; scape a little shorter

¹1915, Ann. South African Mus., XIV, p. 7.

than the second funicular joint. Eyes and ocelli very large. Pronotum large, not overarched by the mesonotum, the latter convex, with indistinct Mayrian furrows. Petiole much as in the worker. Pygidium rounded; cerci developed.

This genus, of which more than 35 species are known, ranges over the tropics of both hemispheres (Map 7) and is represented by more species in Africa and Madagascar than in the Indoaustralian or Neotropical Regions. Our American and many of the African species seem to feed largely or exclusively on termites. I have found *P. punctata* (Smith) of the West Indies nesting in termitaria. Arnold gives some notes on the habits of two of the African forms. Of *P. lamellosa* (Roger) subsp. *longinoda* Forel variety *rhodesiana* Forel he says:



Map 7. Distribution of the genus *Platythyrea*.

The nest of this species is so distinctive that it cannot be mistaken for that of any other Ponerinae. The entrance is surmounted by a dome, from 6 to 8 inches high, by about 12 inches broad at the base. The dome is built up of very even-sized small pebbles, about 5 to 8 mm. in their largest diameter. The entrance is situated in the center above, and this is generally the only entrance, very exceptionally there may be a smaller and less regular opening at the base of the mound.

He gives the following account of *P. arnoldi* Forel:

I have met with this species on only one occasion. The nest, situated on an open piece of ground, was surmounted by a mound with the entrance at the apex, as in *lamellosa* variety *rhodesiana*, but unlike that species the mound of *arnoldi* contains no large pebbles. The surface of the mound was covered with the elytra and carcasses of hundreds of beetles, mostly Tenebrionidae. Workers were seen carrying live beetles to the nest; the prey being held by its mandibles in a position above and parallel to the body of the ant. Since a careful examination of the rubbish-heap of this nest

failed to show the remains of other insects, it is probable that this species feeds entirely on Coleoptera, differing in this respect from most of the other members of the genus, which in Rhodesia, at any rate, are entirely termitophagous.

***Platythyrea conradti* Emery**

A single worker from Risimu (Lang and Chapin).

***Platythyrea gracillima*, new species**

WORKER (Fig. 5a and b).—

Length 9 mm.

Very slender. Head, excluding the mandibles, fully one and one-half times as long as broad, a little broader in front than behind, with very feebly convex sides and feebly excised posterior border. Mandibles rather long, moderately convex, their apical border with about 10 distinct teeth. Clypeus large, rather flat, more convex

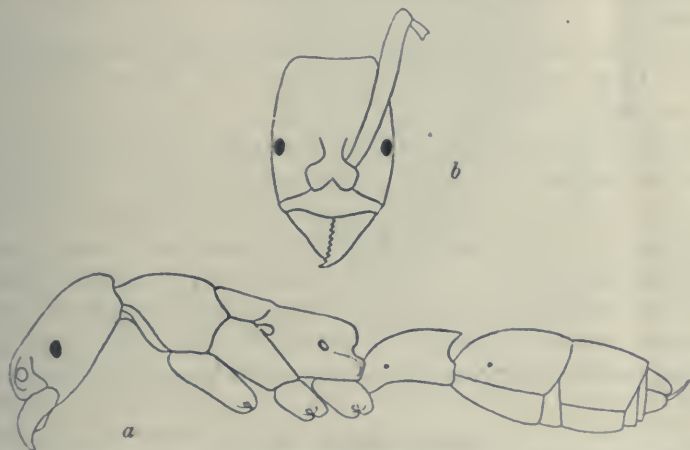


Fig. 5. *Platythyrea gracillima*, new species. Worker. a, lateral view of body; b, head of same from above.

in the middle behind, with broadly rounded, entire anterior border and distinct posterior suture. Frontal carinae very prominent, fused posteriorly. Eyes small, a little in front of the middle of the sides of the head. Antennal scapes long and stout, extending fully one-fourth their length beyond the posterior corners of the head; funiculi lacking, except the first joint, which is three times as long as broad. Thorax long and narrow, laterally compressed, especially in the meso- and epinotal regions; broadest through the pronotum, which is as broad as long and as broad as the head, rounded in front and on the sides. Mesonotum longer than broad. Promesonotal suture very distinct, mesoepinotal suture obsolete. In profile the dorsal outline of the thorax is nearly straight and horizontal; the base of the epinotum nearly twice as long as the declivity. The latter is abrupt, submarginate on the sides, which are obtusely angulate. Petiole laterally compressed; seen from above a little more than twice as long as broad, with straight, parallel sides; in profile evenly rounded in

front, straight above and very sharply and deeply concave behind, the ridge between the dorsal and posterior surface being narrow, transverse and feebly emarginate in the middle. At its posterior end the petiole is fully three-fifths as high as long. Postpetiole distinctly longer than broad, as broad as the gaster behind and not separated from it by a perceptible constriction, narrowed to the breadth of the petiole in front. First gastric segment as long as broad, the remaining segments short, telescoped into it. Legs rather long.

Slightly shining; mandibles more shining, finely and densely punctate; remainder of body even more finely and densely punctate; with a few larger, but very shallow and indistinct, superadded punctures on the head, thorax and petiole.

Hairs absent; pubescence yellowish gray, very short and fine, rather evenly distributed like dust over the whole body and the appendages, longer and more oblique on the mandibles.

Black; mandibles, clypeus, frontal carinae, antennae, legs, including the coxae, posterior corners of the head, dorsal surface of pronotum, epinotum and petiole, and posterior border of postpetiole and first gastric segment, red; remaining gastric segments yellow.

Described from a single rather poorly preserved specimen from Avakubi (Lang and Chapin), taken from the stomach of a toad (*Bufo regularis*).

This species is unlike any of which I have seen specimens or descriptions in the shape of the head and body and especially of the petiole and gaster. In certain respects it approaches *viehmeyeri* Santschi of German East Africa, but is much smaller (*viehmeyeri* measures 13 mm.), and has densely punctate instead of striolate and sparsely punctate mandibles; the latter are denticulate; the head and antennae are longer; the thorax not submarginate on the sides; the pronotum is not longer than broad; the mesonotum is longer than broad; the color is very different; etc.

PALTOTHYREUS Mayr

WORKER.—Large black ants, with monomorphic workers. Clypeus in the middle with an elevated lobe, which is truncated anteriorly and projecting over the anterior clypeal border, marginate on the sides, excavated in the middle and extending back like a spearhead between the frontal carinae which are moderately dilated and subtriangularly lobate. Mandibles elongate, triangular, their apical borders finely denticulate. Antennal funiculi slightly thickened distally. Eyes situated in front of the middle of the head. Thorax unarmed, not impressed dorsally; promesonotal suture distinct, mesoepinotal suture obsolete dorsally. Petiole surmounted by an erect scale. Constriction between the postpetiole and the gaster feeble; gaster rather long. Claws with a tooth in the middle.

FEMALE very similar to the worker but considerably larger and winged; thorax depressed, pronotum broadly exposed.

MALE with triangular clypeus furnished near its anterior border with a small conical tubercle; its posterior portion not prolonged backward between the antennal insertions. Antennae long, scape much shorter than the second funicular joint.



Map 8. Distribution of *Paltothyreus tarsatus* (Fabricius).

Pronotum above largely exposed; mesonotum with traces of Mayrian furrows. Petiole surmounted by a thick node, its ventral surface convex, but not toothed. Postpetiole anteriorly with a strong tooth. Pygidium acutely pointed but not prolonged into a spine.

This genus is monotypic, the single species *P. tarsatus* ranging over the whole of the Ethiopian Region (Map 8) as one of its most conspicuous and characteristic ants.

***Paltothyreus tarsatus* (Fabricius)**

Text Figure 6

Of this species, which has been repeatedly described by previous authors, Lang and Chapin collected a number of single specimens from the following localities: Yakuluku, ♀; Stanleyville, ♀, ♂; Medje, ♀; Risimu, ♀; Leopoldville, ♀; Bafwasende, ♀; Bafwabaka, ♀; Faradje, ♀; Niangara, ♀, ♂.

In addition to these, 135 workers and 5 dealated females were taken from the stomachs of four species of toads (*Bufo funereus*, *tuberosus*,

superciliaris, and *polycercus*) captured by Lang and Chapin in the following localities: Niapu, ♂; Niangara, ♂; Ngayu, ♂; Medje, ♂, ♀, ♂; Avakubi, ♂; Akenge, ♂, ♀; Garamba, ♂; Gamangui, ♂; also a single worker from Faradje taken from the stomach of a frog (*Rana occipitalis*).

It is surprising to find that this large ant is represented by a greater number of specimens than any other species in the toad stomachs examined, for the insect is provided with a very formidable sting, is swallowed without mutilation, and can hardly be killed very quickly by the weak gastric fluids of the amphibians.



Fig. 6. *Paltothyreus tarsatus* (Fabricius).
Head of worker.

Concerning the habits of *P. tarsatus*, Arnold writes: "This species is widely but locally distributed. Generally the worker and female go about singly, but occasionally forage in short columns, in single file. The food is varied but consists largely of termites. The nests have several entrances, which are sometimes surrounded by large heaps of finely divided earth. The species has a most powerful and offensive smell, which appears to me to resemble that of the juice in a

foul tobacco pipe." According to Santschi this species "répand une abominable odeur de charogne."

One of the worker specimens from Medje and one from Niangara had a long *Cordyceps* growing out of the side of the thorax. These ants were attached to sticks with their mandibles, a common condition in ants that die from the attacks of these and other fungi. Dr. Bequaert says that "dead specimens of *Paltothyreus tarsatus* thus parasitized are sometimes found, fixed with the mandibles to a leaf or grass-stalk. The fungus has been referred to *Cordyceps myrmecophila* (Cesati), of the family Hypocreaceæ. Its fructification usually grows out between the coxal articulations, on a slender stalk about 2 cm. long and ending in a club-shaped organ which bears the ascocarps" (See part IV).

MEGAPONERA Mayr

WORKER.—Rather large black ants with distinctly dimorphic workers, the minor forms having the antennae shorter and with more transverse funicular joints and the surface of the head and thorax usually smoother and less pubescent. Clypeus rounded in front and extending backward in a point between the frontal carinae, which are rather long, continued posteriorly to a level with the eyes and moderately dilated and lobular anteriorly. Cheeks carinate. Mandibles, long, deflected, triangular, with multidentate apical border. Antennal scapes flattened. Eyes a little



Map 9. Distribution of *Megaponera fatens* (Fabricius).

in front of the middle of the sides of the head. Pronotum long; mesonotum surrounded by a strong suture. Petiole surmounted by a subcuboidal node, its ventral lamella with a blunt, backwardly directed tooth. Constriction between postpetiole and gaster rather feeble. Middle and hind tibiae with two well-developed spurs, one of which is pectinated; claws with a tooth near the base.

FEMALE wingless and ergatomorphic, larger and somewhat more coarsely sculptured than the worker major, with much more voluminous gaster and the petiole almost squariform and inclined forward.

MALE nearly as large as the worker major, with convex clypeus, not prolonged backward between the frontal carinæ. Mandibles very short, blunt and edentate. Antennal insertions farther from each other than from the sides of the head; scape longer than the second funicular joint. Eyes occupying less than half the sides of the head, their inner orbits slightly emarginate. Posterior border of head strongly marginate, somewhat colliform. Mesonotum prominent, twice as long as the pronotum, without Mayrian furrows. Ventral lamella of petiole with an acute posteriorly directed tooth behind the middle. Pygidium not spined. Claws with three or four minute basal teeth. Wings short, with a discoidal cell, two cubital cells and a closed radial cell.

This genus, like *Paltothyreus*, is monotypic and has much the same distribution, the single species, *M. fœtens* (Fabricius), ranging over a large part of the Ethiopian Region (Map 9).

***Megaponera fœtens* (Fabricius)**

Plate VI, Figure 2

Zambi, ♀; Niangara, ♀, ♀; Rungu, ♀; Avakubi, ♀; Faradje, ♀; Panga to Banalia, ♂; Boyulu, ♀; Niapu, ♀; Garamba, ♀; Akenge, ♀; Gamangui, ♀ (Lang and Chapin); Malela, ♀ (J. Bequaert).

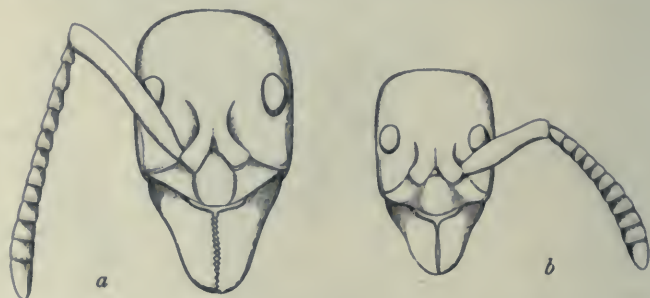


Fig. 7. *Megaponera fœtens* (Fabricius). a, head of large worker; b, head of small worker; both drawn to the same scale.

Seventeen of the specimens from Boyulu, Niapu, Garamba, Akenge, and Gamangui were taken from the stomachs of four species of toads (*Bufo funereus*, *superciliaris*, *regularis*, and *polycercus*) and a male from Faradje was taken from the stomach of a frog (*Rana occipitalis*).

The smaller individuals have the vertex and pronotum very shining, the mandibles toothless, and the funicular joints of the antennæ much shorter and more transverse than in the larger workers (Fig. 7a and b) and were therefore formerly regarded as a distinct species (*M. crassicornis* Gerstæcker). A worker media was also described by Emery as a distinct species, *M. dohrni*. At one time he interpreted the smaller

individuals as the true workers and the larger as ergatomorphic females. Arnold, who found this view improbable for the reason that the large are about four times as numerous as the small individuals in the colony, has recently discovered the true female.¹ It is of the ergatomorphic type, with a slender wingless thorax like the large worker and measures 18.5 mm. The petiole, however, is squamiform and not cuboidal as in the worker and the gaster is much more voluminous. It therefore resembles the females of *Leptogenys* (subgen. *Lobopelta*) and *Onychomyrme* which I have described in former papers.

Armies of *Megaponera* were frequently observed by Mr. Lang preying on termites or carrying the larvæ and pupæ in files, sometimes of 300 or more individuals. In the literature there are some interesting accounts of the habits of this ant.² Wellman observed it in Benguela and informed Forel of its habit of marching in populous columns.³ In a later paper⁴ Forel published some observations of Prell on the same ant in German East Africa. He found it running in single file on the road. Most of the larger individuals were carrying worker and soldier termites in their jaws and Prell was struck both by the sonorous stridulation of the army and by its strong odor, which resembled that of oil of bitter almonds and was imparted to the alcohol of the vial in which the specimens were preserved. Similar observations were made by Bequaert in the Katanga.⁵

A more detailed, though incomplete, account of a raid on termites is given by Alluaud and Jeannel in Santschi's paper on the ants they collected in East Africa:

When they are disturbed and run away the *Megaponera fatens* stridulate, and the noise made by a troop of them can be heard at a distance of several meters. We noticed this on several occasions, particularly at Fort Hall and New Moschi. At the latter station on the morning of April 10, 1912, in a corner of the forest at the edge of the Rau River, we encountered a troop of several hundred *Megaponera* marching in a column several abreast, apparently moving with decision to a predetermined goal. They descended the bank of the stream, stridulating loudly. We were unfortunately busily occupied at this spot collecting a lot of large *Papilio* which came down to the river to drink, so that we did not think of following the *Megaponera* army. An hour later these ants returned in good order in the reverse direction, each of them carrying

¹1915, Ann. South African Mus., XIV, p. 48, footnote, fig.

²Livingstone in his celebrated 'Missionary travels and researches in South Africa,' 1859, pp. 576-577, has given what is apparently the earliest account of the termite hunting Ponerine of Central Africa. His description of their foraging parties is remarkably accurate; he even mentions that "when disturbed, they utter a distinct hissing or chirping sound."

³1909, Ann. Soc. Ent. Belgique, LIII, p. 64. In Entomological News, XIX, 1908, p. 33, F. C. Wellman gives an account of what is evidently a raiding party of *Megaponera fatens*, but unfortunately calls the ant "*Polyrhachis militaria cupreopubescent*."

⁴1911, Bull. Soc. Vaudoise Sc. Nat., (5) XLVII, p. 361. See also Prell, H., 1911, 'Biologische Beobachtungen an Termiten und Ameisen,' Zool. Anzeiger, XXXVIII, pp. 243-253.

⁵1913, Rev. Zool. Afr., II, p. 422.

in its mandibles a whitish pellet consisting of dead termites glued together with saliva. Some of them carried as many as ten to twelve termite workers thus agglutinated, others only two or three soldiers; one carried a deilated male, possibly the king of the plundered termitarium. The number of termites in a pellet varied with its size, but not an ant returned without something. While collecting a number of these *Megaponera fatus* with their booty we experienced the effect of their sting, which is lancinating and very painful but very transitory.

In his monograph of the Formicidæ of South Africa (*loco citato*, p. 47) Arnold says:

It is a common ant in Rhodesia and lives almost exclusively on termites, which are carried off by means of carefully arranged raids in which the ants march in double file. This is the species which is popularly called the "Matabele" ant, and like its cousin *Pallothyreus*, it is also endowed with a very offensive odor. They stridulate very loudly when disturbed, and their sting is exceedingly painful. The entrance to the nest consists of one or more simple holes without any mounds of earth around them.

In the Proceedings of the Rhodesian Scientific Association, XIII, 1914, p. 26 et seq., Arnold has recently published a fascinating description of the extraordinary way in which the Matabele ant changes its nesting site and is followed by its numerous guests. I quote the greater part of his account, as the journal in which it appeared may not be accessible to my readers:

This is eminently a termitophagous species, and it is likely that it changes the site of its nest more often than is the case with the majority of our ants. When we bear in mind how continuous their assaults are on the colonies of termites, it seems very probable that the supply of the latter insects may be so diminished within the practical range of the camp of the raiders that the latter may find it advantageous to move their quarters from time to time to new and more fruitful country. The migration of this ant which I am about to describe is of particular interest, apart from the behavior of the guest insects, because it was the occasion of the discovery of the true queen of the species. * * *

My attention was attracted to this migration by seeing a mass of these ants assembled together with their larvæ and pupæ, in the open. On one side, many workers were to be seen bringing along the larvæ in their jaws, on the other side of this mass a few workers were moving in the other direction, in a somewhat hesitating manner. Following the track backwards, I came to the site of the old nest, situated about 15 feet away. Returning to the camp, it was seen that some workers had started to pick up the larvæ again, and were carrying them yet further away from the original nest, only to be laid down again at about another 15 feet further away. Subsequent observations showed that the migration was carried out in three stages, three temporary camps being formed between the old and the new nests, which were about 60 feet apart. The method adopted by the insects was as follows. First of all, the eggs, larvæ, pupæ and males were taken from the old nest and put down at the first camp, from which many workers were to be seen hurrying back to fetch away the rest of their charges. In the meantime, a few workers were to be seen pacing up and down on the other side of the camp. They did not carry any larvæ and it would almost

seem as though they had some idea of the numerical composition of the colony, and of what the volume of the first camp should be, before the old nest could be considered to have been emptied by its inhabitants, and the proper moment to have arrived for another start to be made. However, after about six or seven minutes, the march recommenced; and within a short time the second camp had been made at a distance of about 15 feet from the first. Similarly a third and last camp was formed further on. It was while the first camp was about to break up that I saw an insect then much larger than the largest worker, and which, when captured in the third camp, proved, to my surprise, to be the queen.

The entrance to the old nest was a hole about 1 inch across, which ran down vertically for about 5 inches and then branched off at an angle. Looking down this hole, the various guests and parasites could be seen climbing up the walls in an almost continuous stream, hastening to join their hosts in their new home. These insects comprised a *Lepisma*, two species of staphylinid beetles, a histerid beetle and an onthophagous beetle; there was also a spider. The *Lepismas* as usual were very plentiful; of the larger staphylinid I saw only one specimen, but of the smaller sort and of the other beetles very many examples occurred, and during the half hour or so through which I watched the procession, about two dozen specimens of the spider were counted. Had it been possible to have cinematographed the scene, it would have furnished us with a film of surpassing interest. Here, as in the case of *Myrmecaria*, the myrmecophiles were able to follow the tracks of their hosts without any delay or uncertainty. Occasionally one of the smaller staphylinids would leave the beaten track for a short distance and then return to it again a little further on, but to the majority of these commensals, the odour of their hosts had laid down a path as clearly marked as a macadamized road would be to our eyes, so that with the above exception, it was rare to see any of these insects swerve from the line of march by as much as an inch.

This motley crew of cringers, thieves, murderers and body-snatchers did not appear to attract the slightest attention from their victims the ants, which were too busy with the work in hand to waste any time on the rabble following in their wake. Of all this crowd, the spiders alone were able to keep pace all the time with the ants, but the slowest, the very small histerid, even at its most feverish pace, did not succeed in covering more than 2 inches per minute, so that it would have arrived at the new nest about six hours after leaving the old. Those beetles which managed to reach the different camps, while these were still intact, buried themselves in the heap of larvæ and cocoons, where they remained until the gradual depletion of the mass made it clear that they had not arrived at the site of the real nest and that another wearisome journey had to be made to attain their goal.

The spiders moved about in the camps in a very easy and unconcerned manner, making no attempts to hide under the piles of cocoons. They ran over the backs of the ants, mingling in a friendly way with the crowd; yet even in the hurry and bustle of this march, it was not possible for these animals to conceal entirely their method of earning a living. A worker ant, carrying a larva in its jaws, was seen just about to pass a spider standing on the edge of the camp. The spider ran up to the worker, stroked it with its front pair of legs for a second or two, and then plunged its fangs into the larva. The latter was released by the ant after a little hesitation, and within five minutes had been sucked dry by the spider. We know that there are many ant parasites which live chiefly on the young of their hosts; but usually these insects

offer, on various parts of their bodies, those bribes in the shape of trichomes which make the ants careless of, or oblivious to the true nature of their guests. On the other hand, there are the synœketes, or indifferently tolerated guests, with which perhaps the histeoid and onthophagous beetles found on this occasion should be classed, which do not usually bear trichomes. They owe their immunity from attack on the part of the ants, either to their insignificant size, or to their awkward shape, which prevents the ants from seizing hold of them. But it is difficult to understand how the spiders can live unmolested in the nests of such a powerful and vicious ant as *Megaponera fatens* and be allowed to feed on the larvæ, without apparently the mildest protest. They do not possess trichomes, nor are they so constructed, by smoothness or hardness of texture, as to prevent the ants from seizing hold of them.

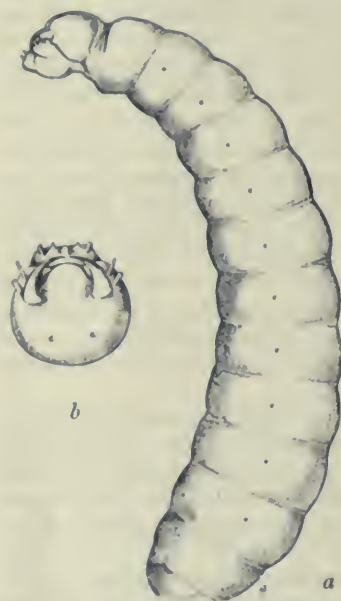


Fig. 8. *Megaponera fatens* (Fabricius).
a, nearly adult larva, lateral view; b, head
of same, dorsal view.

The staphylinids are probably to be placed in the category of synœchthrans, or inimically persecuted intruders, which includes a number of insects which skulk about ants' nests, and get a living by rummaging about in the refuse heaps or kitchen-middens, or by attacking solitary workers in the lonely corners and by-ways of the settlement. * * *

In conclusion, it should be pointed out that in these latitudes, migrations of ants can be expected to take place only after sunset, or if earlier, only on dull and cloudy days, as was the case with *Megaponera*, since the delicate larvæ cannot bear a lengthy exposure to the rays of the sun.

Two of the vials of *Megaponera* collected by Mr. Lang contained a number of cocoons and larvæ in various stages, so that, on reading Arnold's account, it seemed probable that the brood might show adaptations to being carried about and exposed to the sunlight. A study of the material shows that such adaptations can be detected.

The larvæ (Fig. 8a and b) are grayish white, long and subcylindrical, and only slightly curved, with strongly marked segments and with smooth, remarkably tough integument, which is quite hairless in all stages, a condition I have never observed in any other ant larva. The head is very large, rounded, strongly chitinized, and terminal, with long, acute, falcate, edentate mandibles, minute vestiges of antennæ, and very prominent tactile sensillæ on the maxillæ and labium. The size of the head and mandibles shows that the larvæ are fed on pieces of termites and not with

regurgitated liquid food, and the strong integument is evidently an adaptation to exposure to the air and light and to the exigencies of frequent and protracted transportation in the powerful denticulate jaws of the workers. The nudity of the integument indicates that even the very young larvæ are carried singly and not in bunches held together by interlocking hairs as in most other species of ants. The cocoons are black and remarkably tough, characters which I have observed in certain Australian Ponerinæ of the genera *Diacamma* and *Rhytidoponera* as adaptations to exposure to sunlight.¹ This interpretation is confirmed by Mr. Lang, who, without knowing of my observations, informed me that he was surprised to find *Megaponera* often exposing its dark cocoons in heaps to the sunlight.

Recently, in a letter to Prof. Poulton,² G. D. H. Carpenter records some additional observations which he was able to make on *M. fæiens* southwest of Lake Victoria:

I see a good deal of the ant *Megaponera fæiens* here: one is always coming across their long, solemn, slowly marching, black processions—of any number from 50 to 500 or so. I have never seen them carrying any other booty but the species of termite which abounds here—the one I have alluded to before. It lives underground and makes no hills—coming out of little holes and running about, uncovered, in the open, to get bits of live or dead grass which it carries down the holes. Presumably in correlation with its open-air habits, its color is much darker than the large termite whose hills I used to destroy on the islands, and which devoured my house. This one does not attack wooden posts nor does it make covered runs. Curiously enough, I have never seen any soldiers, which is perhaps why *Megaponera* wages such ceaseless war against it. This ant, when it goes out in column, wanders about looking for the termite holes. Immediately one is found there is great excitement. The little bits of grass which sometimes plug the entrance are dragged out, and the ants scramble down the hole very shortly reappearing with termites, feebly struggling in their jaws. Sometimes there seems evidence of an underground barricade, as ants come up to the surface with bits of dead grass, etc., as if they were breaking down hastily erected barricades! One can almost picture the termites hastily throwing up partitions of grass and earth to keep back the invaders. It would be interesting to know if the reason why *Megaponera* is absent from some parts, is because this particularly defenceless termite is absent also.

BOTHRAPONERA Mayr

WORKER.—Small, medium-sized or large, opaque or subopaque, usually strongly sculptured black or dark brown ants. Workers monomorphic. Head subrectangular, with the eyes usually well developed, rarely vestigial, placed at or in front of the posterior third of the head. Mandibles subtriangular, with coarsely dentate apical margin. Cheeks without a carina. Clypeus with rounded, obtusely angular or feebly

¹1915, Ann. Ent. Soc. America, VIII, pp. 335-337.

²1917, Trans. Ent. Soc. London, (1916) Proc., p. cxxix.

and sinuately marginate anterior border, prolonged backward as a narrow point between the frontal carinae, which are broadly and lobularly expanded, incrassated and covering the insertions of the antennae. Frontal groove distinct. Antennae stout, 12-jointed. Thorax with distinct promesonotal suture, but with the mesoepinotal suture and that between the mesosternum and mesepisternum absent or obsolescent. Pronotum not marginate on the sides; epinotum usually unarmed. Petiole with a thick, more or less transverse node, in a few species somewhat compressed and dentate above or behind. Gaster subcylindrical, with pronounced constriction between the postpetiole and succeeding segment, the postpetiole truncated in front; sting rather short and blunt. Middle and hind tibiae each with a large pectinated and a simple lateral spur; claws simple.

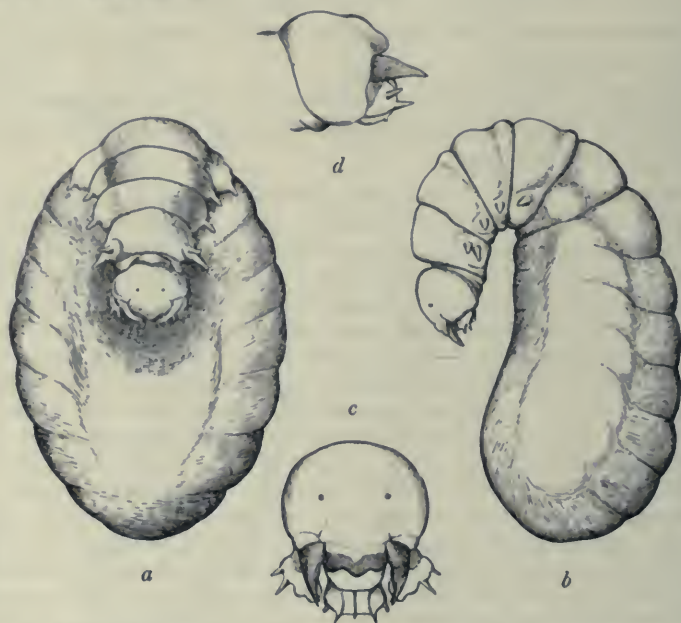


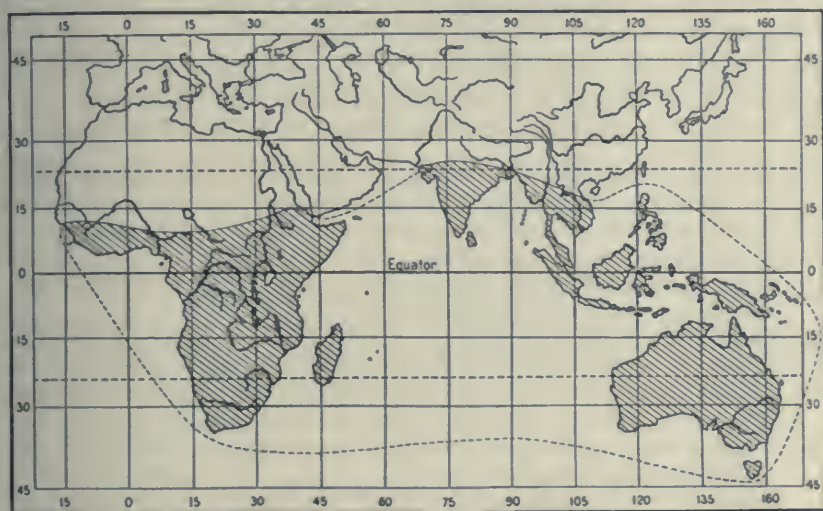
Fig. 9. *Bothroponera sublaevis* Emery. Australia. Adult larva. a, ventral view; b, lateral view; c, head, dorsal view; d, head in profile.

FEMALE only slightly larger than the worker; winged; in other respects very similar to the worker; ocelli small; pronotum broad and exposed; mesonotum small, flattened, broader than long. Wings rather broad; with a discoidal cell, two cubital cells and a closed radial cell.

MALE nearly the same size as the worker. Head short, rounded behind; eyes and ocelli very large; mandibles small, flat, edentate. Palpi long, the labial pair 3-jointed, the maxillary pair 5-jointed. Frontal carinae short. Antennae very long, filiform, 13-jointed; the scape short, scarcely twice as long as broad; the first funicular joint not longer than broad, the remaining joints long and cylindrical. Pronotum transverse, truncated in front; mesonotum without Mayrian furrows; scutellum very

convex. Abdomen strongly constricted behind the postpetiole; pygidium terminating in a downwardly directed spine. In some species the penultimate sternite of the gaster is notched and prolonged on each side as a prominent lobe. Genitalia retracted.

Mayr described *Bothroponera* as a genus; but Emery, Forel, and Santschi have been treating it as a subgenus of *Pachycondyla*. I return to Mayr's conception for the following reasons: First, the larvæ of *Bothroponera* (Fig. 9a-d) are quite different from those of *Pachycondyla*, as I have shown in a former paper.¹ Second, *Bothroponera*, being a strictly paleotropical group may be advantageously separated as a



Map 10. Distribution of the genus *Bothroponera*.

distinct genus from the purely neotropical *Pachycondyla*. *Ectomomyrmex* may be regarded either as a subgenus of *Bothroponera* or as an independent genus. I prefer to adopt the latter course. I also separate out a small group of species of *Bothroponera* (*gabonensis* Ern. André and *sveni* Forel) as a distinct genus *Phrynoponera* (*vide infra*). Third, there are certain peculiarities in the habits of *Bothroponera* which indicate that the species are generically distinct. Like *Pachycondyla*, they form small colonies under stones in rather moist, clayey soil, but are more sluggish and do not sting readily when captured and instead emit from the posterior end of the body a peculiar mass of frothy substance. I have observed this in some of the Australian species, and Bingham and Taylor have seen similar behavior in the Indian *B. rufipes* (Jerdon), according to Wrought-

¹1918, 'A study of some ant larvæ, etc.' Proc. Amer. Phil. Soc., LVII, p. 209.

on.¹ Bingham says that this ant "blows a whitish, acrid smelling, rather gelatinous froth when seized" and according to Taylor it exudes when seized "a milky substance of a frothy nature which hardens on exposure to the air and resembles fine cotton; it is called 'domona chunti' or 'gendu,' the 'domonas' being the weaver caste in Orissa." *B. tridentata* (F. Smith) of Borneo seems to have the same habit, according to Beccari.²

The genus *Bothroponera* is widely distributed over the Ethiopian, Indomalayan, Papuan, and Australian Regions (Map 10). Africa is very rich in species but Australia possesses almost as many.

The following table may be of some assistance in identifying the workers and females of the Ethiopian species of *Bothroponera*.

1. Head, thorax, petiole and postpetiole coarsely punctate, punctate-rugulose or striated.....2.
These regions finely and densely punctate, sometimes with superimposed, larger but shallow punctures.....9.
2. Mandibles striate.....3.
Mandibles smooth, sparsely punctate.....7.
3. Petiolar node broadly excised posteriorly.....*cariosa* Emery.
Petiolar node sharply truncated posteriorly.....4.
4. Length 8 mm.; testaceous yellow.....*cribrata* (Santschi).
Length not less than 9 mm.; black or brownish black.....5.
5. Antennal scapes reaching to occiput.....*cavernosa* (Roger).
Antennal scapes not reaching to occiput; eyes small.....6.
6. Length 9 mm.; golden pubescence on body, especially on head, abundant; sculpture less pronounced.....*talpa* Ern. André.
Length 12 to 15 mm.; golden pubescence less pronounced; sculpture coarser.
pachyderma (Emery).
7. Petiolar node broadly excised posteriorly; body covered with golden pubescence.
granosa (Roger).
Petiolar node truncated behind; body without golden pubescence.....8.
8. Gaster opaque, finely striated.....*strigulosa* Emery.
Gaster more or less shining.....*pumicosa* (Roger).
9. Eyes well developed in the workers.....10.
Eyes vestigial in the workers.....15.
10. Length 5.5 mm.....11.
Length at least 7 mm.....12.
11. Mandibles 7-toothed; petiole as long as broad.....*picardi* (Forel).
Mandibles 6-toothed; petiole nearly twice as broad as long.....*silvestrii* (Santschi).
12. Mandibles shining, sparsely punctate.....*soror* (Emery).
Mandibles finely striate.....13.
13. Opaque; head ovoid.....*krügeri* (Forel).
Subopaque or shining; head subrectangular.....14.

¹1891. 'Our Ants,' Journ. Bombay Nat. Hist. Soc., VII, p. 54.

²'Nelle foreste di Borneo,' Firenze, 1902, p. 237; *teste* Emery, 1911, 'Genera Insectorum, Poncinæ,' p. 75.

14. Very shining; length 12 mm.; clypeus angularly produced in middle; eyes small.....*lævissima* (Arnold).
Subopaque; length 7 to 7.5 mm.; clypeus feebly sinuate in middle; eyes larger.
crassa Emery.
15. Length only 4.5 to 5.5 mm.; mandibles smooth, sparsely punctate; eyes very small, with less than a dozen facets.....*sjöstedti* (Mayr).
Length 6.5 to 7 mm.; mandibles striate at the tip; eyes larger, with about 45 facets.....*fugax* (Forel).

***Bothroponera pachyderma* (Emery)**

Manamana, ♂; Bafwasende, ♂; Medje, ♂; Ngayu, ♂; Niapu, ♂, ♀; Niangara, ♂; Akenge, ♂, ♀ (Lang and Chapin). The specimens from Manamana, fourteen in number, are accompanied by the note: "Found under a log. When it was lifted the ants feigned death." The specimen from Bafwasende is very small. The specimens from the other localities, seventy-four in number, were all taken from the stomachs of toads (*Bufo polycercus*, *superciliaris*, *funereus*, and *tuberosus*). One specimen from Akenge was taken from the stomach of a frog (*Rana albolabris*).

I believe I have identified this species correctly. All the specimens, both workers and females, have a blood-red, subtriangular spot at the middle of the posterior border of each gastric segment. I regard Sant-schi's *B. sculpturata*, described from a female, as synonymous with Emery's *pachyderma*.

***Bothroponera pachyderma* variety *funerea*, new variety**

FEMALE (deilated).—

Length more than 13 mm.

Differing from the typical form in its somewhat greater size and in color, being coal black, with only a slight brownish tinge to the legs. Even the frontal carinae and antennae are black and there is no red on the gastric segments. The erect hairs on the dorsal surface are also black, at least in certain lights, not fulvous as in the typical form, but the hairs and pubescence on the tibiae and tarsi are of the latter color. The foveolae on the gastric segments, especially behind the anterior portion of the first segment, seem to be shallower and both they and the spaces between them to be less distinctly striated than in the typical *pachyderma*.

A single specimen from Medje (Lang and Chapin) taken from the stomach of a toad (*Bufo polycercus*).

***Bothroponera talpa* Ern. André**

Niapu, ♂; Niangara, ♂; Avakubi, ♂; Medje, ♂, ♀ (Lang and Chapin). Eight specimens, all taken from the stomachs of toads (*Bufo funereus*, *polycercus*, and *superciliaris*) and agreeing well with André's description.

Bothroponera soror (Emery)

Akenge, ♂, ♀; Medje, ♂, ♀; Ngayu, ♂; Niangara, ♂; Avakubi, ♂; Niapu, ♂; Faradje, ♂ (Lang and Chapin). Forty-one workers and three deilated females. All but three of these specimens were taken from the stomachs of toads (*Bufo superciliaris*, *polycercus*, *funereus*, *tuberosus*, and *regularis*); one from Faradje was taken from the stomach of a frog (*Rana occipitalis*). Arnold records this as a rather rare species in Rhodesia. "It usually nests under stones, and has a very strong smell of cockroaches. The colonies do not usually comprise more than two dozen individuals." Two of the specimens from Medje were taken by Mr. Lang while they were crawling on tree trunks and also on the tents of the expedition. He notes that, "when crushed, they gave off a stench reminding one of a bug."

Bothroponera soror variety **ancilla** (Emery)

A single worker from Isangi (Lang and Chapin) differs from the typical *soror* in its smaller size (less than 7 mm.). It differs from Emery's description of the variety *ancilla*, however, and agrees with the typical form in having a trace of the mesoëpinotal suture.

Bothroponera sjöstedti (Mayr)

Text Figure 10

Eight workers taken by Dr. Bequaert at Malela agree very closely with Mayr's description of the types from Cameroon except in being



Fig. 10. *Bothroponera sjöstedti* (Mayr). Worker. a, lateral view of body; b, head from above.

smaller. They were nesting "under the fallen trunk of a palm in swampy ground." The type specimens were found by Sjöstedt "in a rotten palm trunk," according to Mayr. The species is peculiar in its very small size, pale coloration and in having the eyes reduced to a few ommatidia.

PHRYNOPONERA Wm. M. Wheeler

WORKER.—Allied to *Bothroponera* but distinguished by the following characters: body shorter and stouter; mandibles narrower, not triangular, their basal and external borders parallel, the apical border oblique, bluntly dentate, not forming a distinct angle with the basal border. Clypeus short, elevated in the middle, with a median furrow and a ridge on each side, the anterior border broadly rounded and entire or bluntly bidentate, posteriorly extending back between the frontal carinæ as a narrow acute point. Frontal carinæ expanded as lobes but the latter are not thickened as in *Bothroponera*, but depressed except at the edges which are smooth and slightly elevated, concealing the insertions of the antennæ as in *Bothroponera*. Eyes rather large and convex, broadly elliptical, placed just in front of the middle of the head. Antennæ stout, 12-jointed as in most *Ponerinæ*. Thorax with broad pronotum; promesonotal suture distinct, arcuate; mesoëpinotal and mesepisternal sutures obsolete. Epinotum with two stout spines. Petiole surmounted by a flattened scale which curves back over the postpetiole and terminates in a comb consisting of five acute, flattened teeth. Remainder of abdomen very short, oval, the postpetiole which forms nearly half of it, not truncate but rounded in front and not separated by a constriction from the first gastric segment, though the stridulatory surface is well developed as in *Bothroponera*. Sting very long; longer, more slender and more acute than in the latter genus. Legs rather long and stout; middle and hind tibiæ each with a long pectinated and a simple lateral spur; claws simple. Sculpture of body coarse; pilosity short, abundant, coarse and erect.

FEMALE winged, but wings unknown; in other respects very similar to the worker and scarcely larger. Ocelli small. Pronotum broad and exposed; mesonotum and scutellum flat, together nearly circular, each being broader than long.

MALE unknown.

GENOTYPE: *Bothroponera gabonensis* Ern. André.

In my opinion this is a very distinct genus and would probably long since have been recognized as such had it not been that only one or two species were known and these very imperfectly, that one species of *Bothroponera* [*B. bispinosa* (Smith) of India] has a spined epinotum, and that another Indian species [*B. rufipes* (Jerdon)] has the petiole antero-posteriorly compressed above and the border denticulate, thus suggesting the conditions in *Phrynoponera*. In reality the latter genus is distinct, not only in the structure of the petiole but also of the mandibles, frontal carinæ, and postpetiole, in the absence of any constriction between the postpetiole and the gaster, and in the abbreviation of the latter. The genus seems to be confined to a narrow region in West-Central Africa (Map 11). The species probably all live in the humus of the rain forest. The workers and females of the forms which I have seen from the Congo may be separated with the aid of the following dichotomy.

1. Clypeus with two large blunt teeth 2.
Clypeus without teeth..... 7.
2. Length 6.5 to 7.5 mm.; mandibles 4-toothed..... 3.
Length 9 mm.; mandibles 7-toothed..... *heterodus*, new species.

Map 11. Distribution of the genus *Phrynoponera*.

3. Gaster shining, feebly sculptured (*gabonensis*).....4.
- Gaster opaque or subopaque, strongly sculptured.....5.
4. Mandibles, frontal carinae, antennae and legs red. . . typical *gabonensis* (E. André).
- Mandibles, frontal carinae, antennae and legs blackish. . . . var. *esta*, new variety.
5. Mandibles smooth, sparsely punctate.....6.
- Mandibles striated and sparsely punctate..... var. *striatidens* (Santschi).
6. Mandibles, frontal carinae, antennae and legs red. . . . var. *fecunda*, new variety.
- Mandibles, frontal carinae, antennae and legs blackish. . var. *umbrosa*, new variety.
7. Small species (6 mm.); funicular joints 2 to 10 much broader than long;
mandibles and appendages black. *bequaerti*, new species.
- Large species (8 to 9 mm.); funicular joints 2 to 5 at least as long as broad; 6
to 10 slightly broader than long; mandibles and appendages red.
sveni (Forel).

***Phrynoponera gabonensis* (Ern. André)**

There are specimens of five different forms of this species in the collection. To *gabonensis*, *sensu stricto*, I refer a single worker from Bafwasende, one from Medje (from the stomach of a toad, *Bufo funereus*),

and two workers and a dealated female from Akenge (from the stomachs of *B. polycercus* and *funereus*). In these specimens (Fig. 11a-c) the antennal scapes extend somewhat beyond the posterior border of the head; the first funicular joint is as long as broad and distinctly longer than the second; joints 2 to 10 distinctly broader than long; the terminal joint pointed but not flattened. The lateral petiolar spines are nearly twice as long as the three others, the median but little longer than the intermediate pair. The gaster is distinctly shining, and the mandibles, front of head, frontal carinae, legs, and posterior borders of gastric seg-

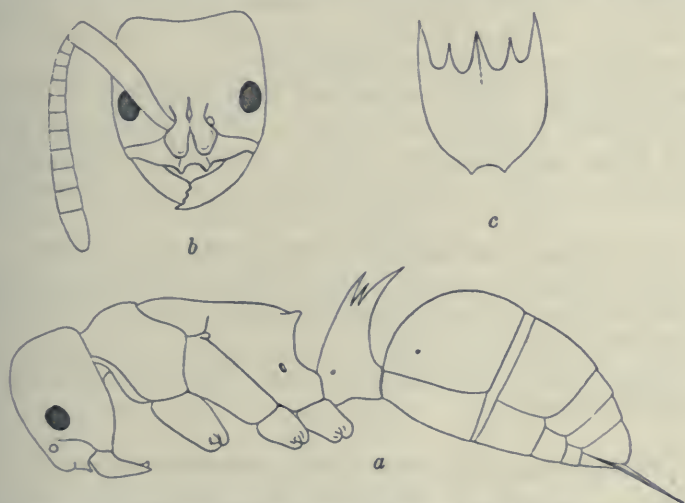


Fig. 11. *Phrynoponera gabonensis* (Ern. André). Worker. a, lateral view of body; b, head from above; c, petiole, dorsal view.

ments red, as André states. The mandibles are shining and coarsely punctate, without striae. The postpetiole has in some specimens a distinct opalescent blue reflection not mentioned by André. The specimens measure 6.5 to 7.5 mm. The female has the pronotum indistinctly and semicircularly, the mesonotum and scutellum longitudinally rugose.

***Phrynoponera gabonensis* variety *esta*, new variety**

WORKER AND FEMALE (dealated).—Differing from the preceding form in color, the mandibles being nearly black, the frontal carinae, antennae and legs blackish brown, very nearly as dark as the remainder of the body, the posterior borders of the abdominal segments slightly paler and more reddish. The mandibles and gaster are shining as in the typical form.

Described from eight workers and a female from Medje (type locality), two workers from Ngayu, and a female from Gamangui (Lang and Chapin), all found in the stomachs of toads (*Bufo superciliaris*, *polycercus*, *funereus*, and *tuberosus*).

***Phrynoponera gabonensis* variety *fecunda*, new variety**

WORKER and FEMALE (deŕlated).—Having the coloration of the typical form, i. e., with the mandibles, frontal carinæ, antennæ, legs, and posterior borders of the abdominal segments red, but with the postpetiole and gaster opaque, densely and finely punctate, and with superadded coarser longitudinal punctures, or aciculations, having sharp anterior edges. The legs are somewhat more opaque and more coarsely coriaceous than in the typical *gabonensis*. The mandibles are shining and sparsely and coarsely punctate, as in the two preceding forms.

Described from eleven workers and one female from Akenge (type locality), eighteen workers from Medje, two from Ngayu, and one from Avakubi (Lang and Chapin). All the specimens were found in the stomachs of toads (*Bufo superciliaris*, *polycercus*, *funereus*, and *tuberosus*).

***Phrynoponera gabonensis* variety *umbrosa*, new variety**

WORKER.—Coloration like that of the variety *esta*, black throughout, the postpetiole and gastric segments with narrow brown posterior border. The sculpture of the gaster is that of the variety *fecunda*.

Two specimens from Medje (Lang and Chapin) from the stomach of a toad (*Bufo polycercus*).

***Phrynoponera gabonensis* variety *striatidens* (Santschi)**

Medje, ♂; Akenge, ♂; Ngayu, ♂ (Lang and Chapin). Four specimens, all from the stomachs of toads (*Bufo polycercus*, *funereus*, and *tuberosus*). These specimens have the coloration of the typical *gabonensis* and variety *fecunda* and the abdominal sculpture of the latter, but the mandibles are subopaque and finely striated, except at the base, in addition to having the coarse, sparse punctures of the other varieties. The epinotal spines seem to be a little longer and more acute than in any of these forms.

***Phrynoponera heterodus*, new species**

FEMALE (deŕlated).—

Length 9 mm.

Very closely related to *gabonensis* but differing in its larger size and in the following particulars: the apical borders of the mandibles are 7-toothed and, in addition to the coarse punctures, are finely striated on their apical halves. The antennæ are somewhat longer, the funicular joints 2 to 7 being as long as broad. The rugæ on the front and vertex are distinctly coarser and more divergent, the eyes somewhat

smaller, the posterior corners of the head more acute, the clypeus bluntly bidentate as in *gabonensis*. The sculpture of the thorax and petiole is also very similar, the postpetiole and gaster sculptured as in the variety *striatidens* but even more sharply, so that the whole surface is opaque. The epinotal spines are broad and flat as in *gabonensis* but the median petiolar tooth is nearly twice as long as the intermediate teeth. The pilosity is, if anything, a little more abundant than in *gabonensis* and its varieties. The color is black, with the mandibles, legs, and posterior borders of the abdominal segments dark castaneous brown.

A single specimen from Stanleyville (Lang and Chapin), without further data. This form might be regarded as a large subspecies of *gabonensis* but its precise status can hardly be determined without worker specimens.

***Phrynoponera bequaerti*, new species**

Text Figure 12

FEMALE (deâlated).—

Length 6 mm.

Resembling *gabonensis* and *heterodus* but much smaller. Head, excluding the mandibles, fully as broad as long, the posterior border nearly straight; the sides very feebly and evenly convex; the eyes large, moderately convex, with their posterior orbits at the middle of the sides. Mandibles shaped as in *gabonensis*, with obliquely, bluntly 4-toothed apical borders. Clypeus short, with broadly rounded, entire anterior border, the elevated central portion somewhat concave behind in the middle, with a ridge on each side. Antennæ short and thick, the scapes scarcely extending beyond the posterior border of the head; first funicular joint nearly as long as broad, remaining joints, except the last, decidedly broader than long. Thorax as broad as the head, short, shaped much as in *gabonensis* but the epinotal teeth are proportionally longer, being longer than broad at their bases and as long as the distance between the latter, flattened dorsoventrally, with round lobe-like tips. Petiole with longer spines than in *gabonensis*, the lateral spines being as long as the remainder of the segment and the median spine as long as the lateral.

Mandibles smooth and shining with very coarse, sparse punctures, most numerous near the inner border. Remainder of body subopaque except the borders of the frontal carinae which are smooth and shining. Head reticulate-rugose, rather coarsely on the sides, on the front and vertex more finely, the rugæ scarcely longitudinal. Thorax covered with coarse umbilicate foveolæ, which are largest on the mesonotum but everywhere so close together that the surface may be described as reticulate-rugose. Anterior surface of petiole with similar sculpture, but the meshes of the

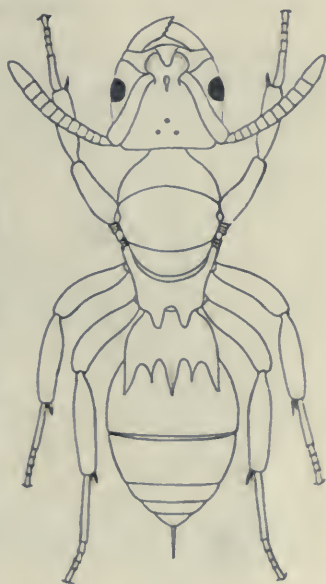


Fig. 12. *Phrynoponera bequaerti*, new species. Deâlated female.

reticulum elongate. Postpetiole and gaster appearing longitudinally striate owing to their having a sculpture like that of *P. heterodus* and several of the varieties of *gabonensis*. Legs and antennal scapes nearly opaque, closely coriaceous.

Pilosity and pubescence much as in *gabonensis* and *heterodus* but the former more reclinate on the head, thorax, and abdomen.

Black; mandibles, frontal carinae, and legs dark brown.

Described from a single specimen taken from the stomach of a toad (*Bufo superciliaris*) from Ngayu (Lang and Chapin). This is a very distinct species, easily characterized by its small size, edentate clypeus, long median petiolar spine and peculiar cephalic and thoracic sculpture.

Phrynoponera sveni (Forel)

Three workers from Medje (Lang and Chapin), agree perfectly with Forel's description. They all show, however, a beautiful blue opalescence, like that of *Lobopelta iridescens*, on the smooth declivity of the

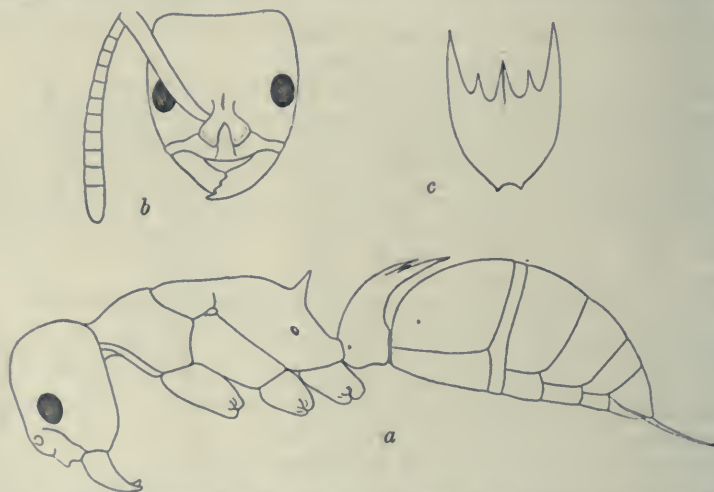


Fig. 13. *Phrynoponera sveni* (Forel). Worker. a, lateral view of body; b, head from above; c, petiole, dorsal view.

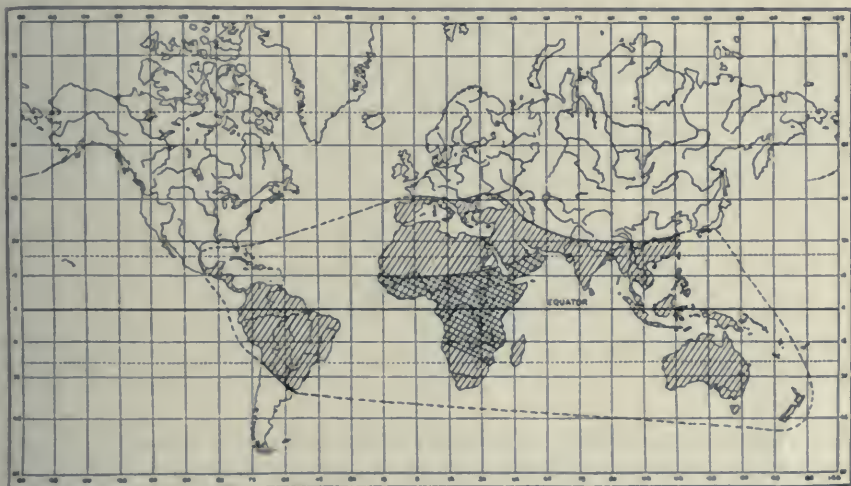
epinotum, the sides of the petiole, and the whole surface of the postpetiole. This may have been overlooked by Forel, as the surfaces of these ants are often covered with a layer of dirt. It was only after my specimens had been thoroughly washed in caustic potash that the blue coloration of the parts above mentioned was revealed. *P. sveni* is a strongly marked species, characterized by the long antennae, toothless clypeus, and slender, pointed and upwardly directed epinotal spines (Fig. 13a-c).

EUPONERA Forel

Resembling *Bothroponera* but smaller and much more finely sculptured.

WORKER monomorphic, with subtriangular mandibles the apical margins of which are dentate. Cheeks not carinate. Frontal carinae closely approximated, expanded and lobular in front and concealing the insertions of the antennae. Eyes placed near or in front of the anterior third of the head, sometimes vestigial or even absent. Clypeus rounded and obtusely pointed in front, usually carinate. Antennae slender, 12-jointed, the scapes slightly thickened apically but not clavate. Thorax shaped somewhat as in *Bothroponera* but with distinct mesoepinotal suture and usually with distinct mesoepinotal constriction. Petiole surmounted by a thick transverse scale. Middle and hind tibiae with two spurs; claws simple.

FEMALE winged; in some of the subgenera scarcely larger, in one (*Brachyponera*) considerably larger than the worker; in other respects similar.



Map 12. Distribution of the genus *Euponera* (simple crossing) and of *Euponera* (*Brachyponera*) *senaarensis* (Mayr) (double crossing).

MALE much like the males of *Pachycondyla* and *Bothroponera* but differing somewhat in the various subgenera.

Emery has divided this genus into four subgenera: *Euponera*, *sensu stricto*; *Mesoponera*; *Brachyponera*; and *Trachymesopus*. *Euponera*, with a single species, is confined to Madagascar; the other subgenera have a wide distribution over the tropical and subtropical portions of both hemispheres (Map 12). The species live in the ground, either in crater nests or under stones, logs, etc. *Eu. (Mesoponera) castanea* (Mayr) of New Zealand lives, as a rule, in rotten logs and stumps. The colonies of *Brachyponera* are rather large and populous, those of the other sub-

genera much smaller. In the subgenus *Trachymesopus* there is a pronounced tendency to hypogaëic habits and also, therefore, to a degeneration of the eyes in the worker.

***Euponera (Mesoponera) ingesta*, new species**

Text Figure 14

WORKER.—

Length 5.5 to 6 mm.

Head somewhat longer than broad and about as broad in front as behind, with evenly convex sides and feebly excavated posterior border. Eyes small, flat, broadly elliptical, placed at the anterior fifth of the sides of the head. Clypeus carinate, its anterior border entire, rounded and projecting in the middle, sinuate at the sides.

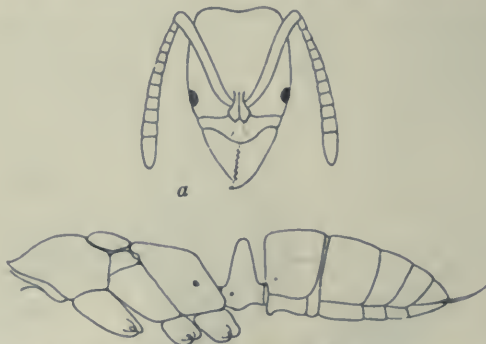


Fig. 14. *Euponera (Mesoponera) ingesta*, new species. Worker. a, head from above; b, thorax and abdomen in profile.

Mandibles moderately long, convex, their apical borders with 8 or 9 subequal teeth. Antennal scapes extending slightly beyond the posterior border of the head; first and second funicular joints subequal, about one and one-half times as long as broad, joints 4 to 6 somewhat shorter, remaining joints, except the last, as broad as long. Pronotum as long as broad, somewhat depressed above and very bluntly submarginate on the sides. Mesonotum convex, transversely elliptical, nearly twice as broad as long, completely surrounded by a strong suture; mesoëpinotal constriction distinct. Epinotum nearly as long as the pro- and mesonotum together, but somewhat lower, the base and declivity straight, subequal, forming an obtuse angle with each other, the former horizontal in profile, the latter flat; marginate on the sides. Petiolar scale in profile high and cuneate, its anterior surface feebly convex from side to side, its posterior surface flat, with a shallow longitudinal impression in the middle; the border evenly rounded, semicircular from behind, slightly narrowed ventrally. Gaster short, postpetiole sharply truncated in front, the constriction between it and the gaster feeble. Legs moderately long.

Mandibles shining, finely and rather indistinctly punctate; remainder of body subopaque; clypeal carina and legs more shining; very finely and densely punctate, especially the head, scapes and thorax.

Hairs almost lacking on the head, thorax, and appendages; on the gaster pale yellow, sparse, erect, slender, and rather uniformly distributed; pubescence very fine, yellowish, moderately abundant, investing the whole body, including the appendages.

Castaneous; legs somewhat paler; mandibles deep red, with black teeth; in some specimens the extensor surfaces of the tibiae are yellowish.

Described from six specimens taken from the stomachs of toads (*Bufo funereus* and *polycercus*) from Akenge (type locality), one from Niapu, also from a toad's stomach (*B. polycercus*), a single specimen from Faradje, and another from Lubila (Lang and Chapin).

***Euponera* (*Mesoponera*) *subiridescens*, new species**

Text Figure 15

WORKER.—

Length 6.5 to 7 mm.

Head longer than broad, as broad in front as behind, with feebly and broadly excised posterior border and feebly convex sides. Eyes rather large, feebly convex, placed with their posterior orbits just in front of the middle of the sides. Mandibles very long, narrow, with feebly concave external borders, the apical border very long, toothless except at the tip where there are four small, blunt, oblique teeth. Clypeus

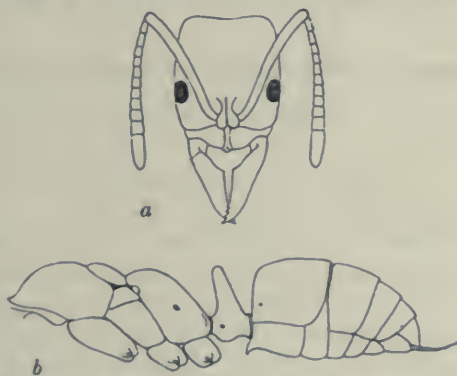


Fig. 15. *Euponera* (*Mesoponera*) *subiridescens*, new species. Worker. a, head from above; b, thorax and abdomen in profile.

carinate, its anterior border broadly projecting, sinuate on each side of the middle and also more deeply at each mandibular insertion. Frontal carinae short, their upper surfaces rather concave. Antennae slender, the scapes extending beyond the posterior border of the head a distance nearly equal to twice their greatest diameter; funicular joints 1 and 2 subequal, almost twice as long as broad; joints 3 to 5 somewhat shorter; remaining joints, except the last, little, if at all longer than broad. Pronotum rather convex and rounded, as long as broad; mesonotum transverse, semicircular, surrounded by an impressed suture. Mesoepinotal constriction distinct. Epinotum as long as the pro- and mesonotum together, the base rounded and convex, somewhat

lower than the mesonotum, passing gradually into the somewhat longer, sloping declivity, which is flat, bluntly marginate on the sides. Petiolar scale shaped as in *ingesta*, but not so thick, with the anterior surface more flattened and the posterior not impressed in the middle. Gaster short and stout, convex above, the postpetiole truncated in front, the constriction between it and the succeeding segment very feeble. Legs moderately long.

Shining; mandibles more so than the remainder of the body, smooth, with only a few large punctures along the apical margin. Remainder of body very finely but not deeply punctate and less densely than in *ingesta*.

Hairs lacking, except on the mandibles, clypeus, pygidium, and hypopygium, where they are pale yellow and rather long; the pubescence, too, is yellowish and rather long and abundant on the body and appendages, longest on the gaster.

Deep castaneous, almost black; the head and thorax with a more or less distinct blue iridescence as in some species of *Lobopelta* (*iridescens*, *chinensis*); inner borders of mandibles, the legs, antennæ, and tip of gaster somewhat paler and more reddish.

Described from six specimens, all from the stomachs of toads; four from Akenge (type locality) from the stomach of *Bufo polycercus*, one from Medje from the stomach of *B. superciliaris*, and one from Ngayu from the stomach of *B. tuberosus* (Lang and Chapin).

Both this and the preceding species seem to be very distinct from any of the previously described African species of *Mesoponera*.

***Euponera* (*Brachyponera*) *sennaarensis* (Mayr)**

Thysville, ♀, ♂, ♀ (Lang and Bequaert); Avakubi, ♀; Leopoldville, ♀, ♂; Faradje, ♀, ♂; Medje, ♀; Zambi, ♂; Stanleyville ♀, ♂; Niapu, ♀ (Lang and Chapin). One of the specimens from Medje was taken from the stomach of a toad (*Bufo funereus*).

This is a well-known ant which seems to be common throughout a large part of the Ethiopian Region and even ranges into Asia (Arabia). Concerning its habits Arnold writes that it is "the commonest ponerine ant around Bulawayo (Rhodesia). A crateriform mound of fine earth surrounds the entrance to the nest, which is as often situated in the open as it is under stones. The economic value of this little species can hardly be overestimated, since it is exceedingly plentiful and preys unceasingly on termites. It is, however, omnivorous, since it will eagerly collect bread-crumbs, insects of all sorts, and seeds of grass. Heaps of the latter are often found in the nests." Escherich, in Abyssinia, and Bequaert, in the Katanga, had previously noted its fondness for collecting grass seeds, a very unusual habit in the Ponerinae.

The following note by Mr. Lang accompanies the specimens from Avakubi: "I have generally seen this ant, which the natives call 'tussisomee,' singly or two or three together, running swiftly over the sandy

ground, from which they throw up tiny craters about one inch wide and two-thirds of an inch high. These consist of excavated particles of ground loosely put together. From the crater slender channels, two to three millimeters wide, run laterally or vertically into the hard soil. When a knife is stuck into the ground near the crater, one or even three ants may be seen hurrying away. I never saw any of the larvæ. The craters are often quite numerous. Today I counted about 60 over an area of 500 square yards. The natives say that these ants bite (sting?) and fear them even more than the 'siafu' (army ants), though they never occur in masses. They build their craters in cleared ground, chiefly after rainy nights, and are seldom seen during the day time." These accounts indicate that the habits of *sennaarensis* are very similar to those of the Australian *E. (B.) lutea*, which I have studied in New South Wales and Queensland. The latter species, however, prefers to nest under stones and logs and is, if anything, even more abundant than its African cousin.

***Euponera (Trachymesopus) darwini* (Forel) variety *africana* Forel**

A single dealated female from Stanleyville (Lang and Chapin). This species has an extraordinary range, from Northern Australia and the Philippines through India to Nigeria. It is very probably hypogæic in habit as the worker of most of the varieties, including the African, is still unknown.

PLECTROCTENA F. Smith

Large or medium-sized black or castaneous ants, with shining surface, sparsely punctate.

WORKER monomorphic, with large, rectangular and rather flat head, with small, flat, anteriorly situated eyes. Clypeus very short, its anterior border straight in the middle, emarginate on each side at the mandibular insertion, apparently not extending back between the frontal carinæ, the latter overhanging the clypeus and forming with the front an elevated lobe, longitudinally sulcate in the middle. Mandibles long, linear, feebly curved, with a deep narrow furrow running nearly their full length on the dorsal surface, their tips blunt, the inner margin armed with a strong tooth at the basal third and another obtuse tooth, sometimes indistinct, between the latter and the tip. Antennæ 12-jointed, the funiculi somewhat thickened towards their tips, the first joint shorter than the second. Thorax large and depressed, promesonotal suture distinct, mesoepinotal suture obsolete, epinotal declivity marginate on the sides. Petiole with a laterally compressed node, with the anterior and posterior surfaces vertical in profile, the dorsal surface horizontal. Constriction between the postpetiole and gaster pronounced, with well-developed stridulatory surface. Gaster short, formed largely by the first segment. Median spurs of middle and hind tibiae large and pectinated, lateral spurs lacking.

FEMALE winged, apterous or ergatomorphic, larger than the worker but otherwise similar. Eyes and ocelli small. Anterior wings with a discoidal cell, two cubital cells and the radial cell closed.

MALE about the size of the worker. Frontal carinae short, erect, closely approximated, bringing the insertions of the antennae close together. Antennal funiculi filiform, their first joint very short; scapes stout, shorter than the second funicular joint. Mandibles small, linear, parallel-sided, edentate, with rounded tips. Mesonotum with distinct Mayrian furrows; scutellum longitudinally grooved in the middle. Genitalia retracted; pygidium terminating in a blunt or truncated point. Wings short.



Map 13. Distribution of the genus *Plectroctena*.

This singular genus is confined to the Ethiopian Region (Map 13). Arnold has observed the habits of the type species, *P. mandibularis*, in South Africa. "The entrances to the nest are generally indicated by large heaps of earth. The chambers are placed deep below the surface, seldom less than 2 feet, and the number of individuals seldom exceeds 50. It is a sluggish and timid ant, the workers foraging singly. The food includes termites, but consists chiefly of millipeds and beetles." Another

South African species described by Arnold as *P. subterranea* is castaneous red, measures only 7.5 to 10 mm., and has exceedingly small eyes. It, in all probability, belongs to a different genus. In the generic key it runs down to *Myopias* and is provisionally referred to that genus.

The character of the females in the four described species of *Plectroctena* has not been adequately ascertained. Winged females of *P. minor* and *subterranea* are known, but no winged females of *mandibularis*. According to Arnold, this species has ergatoid females differing "from the worker chiefly in size, but the head and abdomen are proportionally wider and longer. The longitudinal impression on the pronotum is shallower, while that of the dorsum of the epinotum is deeper and wider. In a nest of three dozen or so individuals, not more than two or three of these forms are to be found, and usually only one." It seems that Forel saw one of these ergatoid females and described it as a subspecies (*major*) of *mandibularis*. There is, however, still another type of female, at least in *P. minor*, of which I describe a specimen below, with ocelli and slightly larger eyes than the worker and with the thorax essentially like that of the winged female, but without the slightest indications of ever having borne wings.

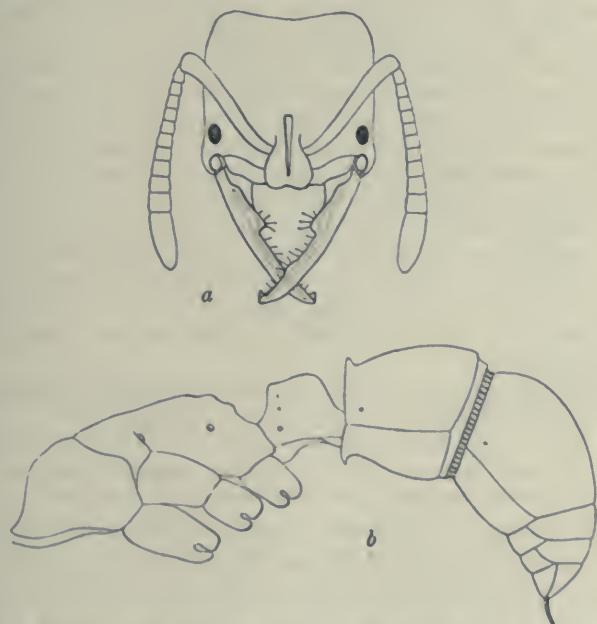


Fig. 16. *Plectroctena cristata* Emery. Worker. a, head from above; b, thorax and abdomen in profile.

Plectroctena cristata Emery

Text Figure 16

Medje, ♀; Akenge, ♀ (Lang and Chapin). Eight specimens, all taken from the stomachs of toads (*Bufo superciliaris*, *polycercus*, and *funereus*).

Plectroctena minor Emery

A single apterous female from Akenge from the stomach of a toad (*Bufo polycercus*); a single worker from Niapu from the stomach of a frog (*Xenopus tropicalis*); Stanleyville, ♀, ♀, ♂ (Lang and Chapin).

FEMALE (apterous).—

Length about 12 mm.

Smaller than the winged female and with slightly smaller eyes. Ocelli present. The thorax of the same shape as in the winged female but without wing insertions. The tint of the body is a little more reddish than in the winged female.

MALE (hitherto undescribed).—

Head broader than long, broadly rounded behind, the eyes large, moderately convex, about half as long as the sides of the head. Mandibles very small, blunt, edentate. Clypeus rather convex, with feebly and broadly excised anterior border. Antennæ long, filiform; scape about two-thirds as long as the second funicular joint, first funicular joint broader than long. Thorax broader through the wing insertions than the head, narrowed in front; promesonotal suture very deeply impressed. Mesonotum rather flat, with a median pit in front and well-developed Mayrian furrows. Scutellum convex, with a median sulcus so that it appears bi-tuberculate. Base of epinotum somewhat longer than the declivity which is concave and strongly marginate on the sides and above. Petiole narrower, higher than long, the node truncated anteriorly and posteriorly and rounded above and on the sides; its ventral tooth triangular, short and rather acute. Postpetiole broader than long, convex above and sharply constricted off from the gaster, its anterior ventral border projecting as a transverse welt. Gaster of the usual shape, pygidium bluntly pointed at the tip. Legs moderately long and slender. Wings rather short (7.8 mm.).

Shining, finely punctate; thorax more or less rugulose, the pronotum finely, the pleuræ more coarsely, the scutellum and upper portion of the base of the epinotum reticulately rugose, the latter very coarsely. Upper portion of petiolar node very smooth and shining.

Hairs yellowish, present only along the posterior borders of the gastric segments. Pubescence grayish, very fine, covering the gaster, head, and legs.

Black; mouth, mandibles, tibial spurs, and articulations of the legs, ventral portion of petiole, posterior and especially lateral, margins of the gastric segments, red. Wings uniformly brownish, veins and pterostigma dark brown.

The series from Stanleyville consists of a single worker, three females, and two males, all from the same colony. Another male from the same locality and with a different number is considerably larger (13 mm.) and evidently belongs to the same species but probably represents a distinct variety which cannot be named without the worker or female.

PSALIDOMYRMEX Ern. André

Rather large, dark reddish brown or black ants with the surface of the body covered with scattered umbilicate foveolæ, the spaces between which are in part at least densely striolate.

In the **WORKER** and **FEMALE** the clypeus is short and broad, its anterior border arcuate and entire. The frontal carinæ are approximated, dilated and lobular and concealing the antennal insertions. The mandibles have a very peculiar shape, being long, falcate, and toothless, ending in a long acute point and broadest just beyond their basal third where the basal and apical borders meet without forming a sharp angle as in most other ants. The antennal funiculi are slightly thickened



Map 14. Distribution of the genus *Psalidomyrmex*.

apically, with the second joint conspicuously longer than the first. Eyes small and flat, placed near the anterior quarter or third of the sides of the head. Base of epinotum with a narrow longitudinal sulcus in the middle. Promesonotal suture very distinct, impressed. Mesoepinotal suture indistinct or obsolete. Petiole with high rounded node, subtruncate in front and behind. Constriction between postpetiole and gaster pronounced and provided with well-developed stridulatory surfaces. Gaster small. Middle and hind tibiae without lateral spurs, with a large pectinated median spur. The female is winged but in other respects closely resembles the worker.

The MALE resembles the male of *Plectroctena* but has smaller eyes and the mesonotum is without Mayrian furrows, the scutellum with a deep longitudinal sulcus.

Only four species of this interesting genus have been described. The Lang-Chapin collection contains a fifth, which is described below. They are all rare ants, inhabiting the virgin forest and apparently restricted to Western Equatorial Africa, from French Guinea to the Northeastern Congo (Map 14).

The workers of four species of *Psalidomyrmex*¹ can be readily identified by means of the following table.

1. Mandibles narrow, without distinct basal and apical borders, broadest near the middle, where they are scarcely more than one-eighth as broad as long; scapes not reaching to the posterior corners of the head; petiole longer than broad; dorsal surface of body smooth and shining between the foveolae.
reichenspergeri Santschi.
- Mandibles much broader, with distinct basal and apical margins meeting at a right angle, broadest at their basal third and about one-third as broad as long; scapes reaching or surpassing the posterior corners of the head; petiole broader than long; interfoveolar surface of head, thorax and gaster, at least, finely striate. 2.
2. Length 9 to 10 mm. Reddish castaneous; lobes of frontal carinae smooth and shining; striæ on the postpetiole longitudinal. *foveolatus* Em. André.
- Length about 12 mm. Brown-black or black, with brown antennae, mandibles, clypeus, and legs; striæ on postpetiole arcuate. 3.
3. Head longer than broad; antennal scapes reaching beyond posterior corners of head; striæ on the head, thorax, and abdomen sharp; pronotum without a median longitudinal groove; mesoepinotal suture obsolete; petiole slightly broader than long. *procerus* Emery.
- Head as broad as long, antennal scapes shorter; striæ on head and thorax less distinct, foveolae smaller; pronotum with a median longitudinal groove; mesoepinotal suture distinct; petiole broader. *obesus*, new species.

Psalidomyrmex procerus Emery

Text Figure 17

Medje, ♀; Akenge, ♀; Niapu, ♀ (Lang and Chapin). Nine specimens, all taken from the stomachs of toads (*Bufo superciliaris*, *funereus*, and *polycercus*).

Psalidomyrmex reichenspergeri Santschi

Text Figure 18

A single worker from the stomach of a toad (*Bufo polycercus*) taken at Akenge (Lang and Chapin).

This species is easily distinguished from *procerus* Emery and *foveolatus* André by its more slender form, smoother surface between the

¹*P. longiscapus* Santschi is only known in the female sex.

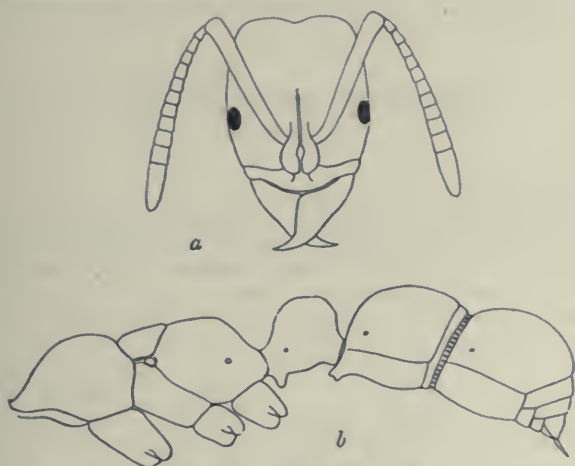


Fig. 17. *Psalidomyrmex procerus* Emery. Worker. a, head from above; b, thorax and abdomen in profile.

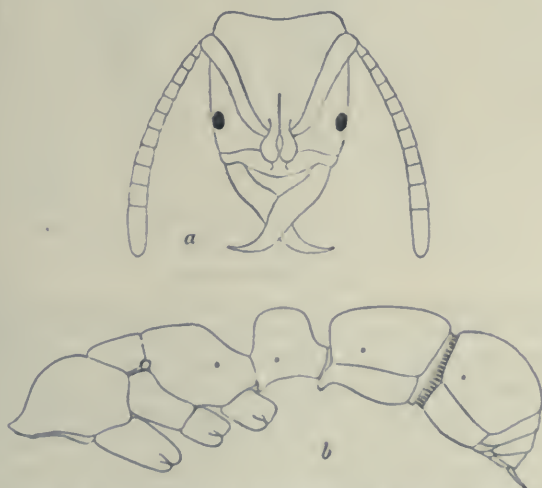


Fig. 18. *Psalidomyrmex reichenspergeri* Santschi. Worker. a, head from above; b, thorax and abdomen in profile.

foveolæ, the more rectangular head, more elongated and narrower mandibles, longer funiculi, longer petiole, and more distinct mesoëpinotal suture:

***Psalidomyrmex obesus*, new species**

Text Figure 19

WORKER.—

Length nearly 12 mm.

Very similar to *procerus* but differing in the following characters: the body is distinctly more robust, the head being rectangular, and without the mandibles as broad as long, the thorax with more rounded surfaces and a swollen appearance. The mandibles are like those of *procerus* but slightly broader at the angle between the basal and apical borders and the tips are less curved. The antennal scapes reach the

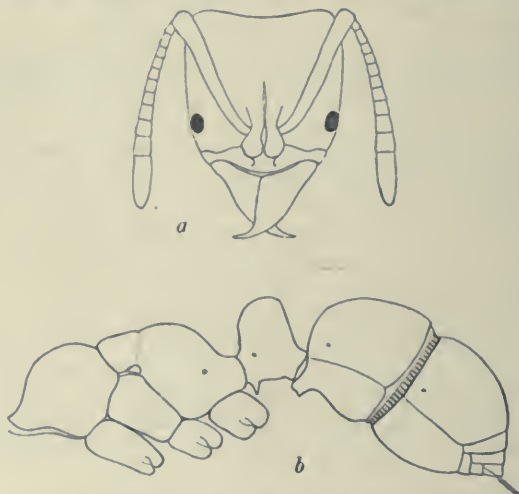


Fig. 19. *Psalidomyrmex obesus*, new species. Worker.
a, head from above; b, thorax and abdomen in profile.

posterior corners of the head; funicular joints 3 to 8 as long as broad, 9 and 10 slightly longer than broad. On the thorax the mesoëpinotal suture is more distinct than in *procerus* and there is a narrow median longitudinal furrow on the posterior half of the pronotum as well as on the base of the epinotum. The petiole in profile is much shorter and higher and, seen from above, much broader in proportion to its length than in *procerus*, being very distinctly broader than long, flat and truncated posteriorly, more rounded in front, with the anteroventral tooth long and rather acute.

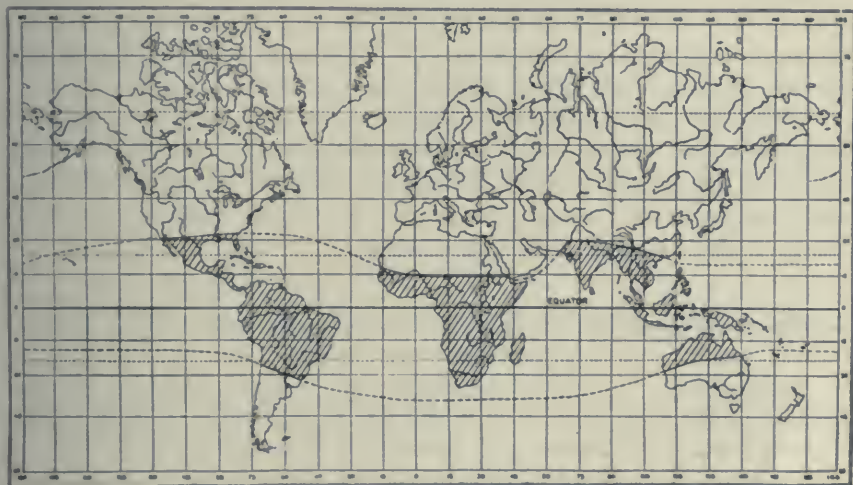
The sculpture differs from that of *procerus* as follows: the longitudinal rugæ covering the mandibles are distinctly coarser, the surface of the head and thorax is more opaque, the foveolæ being somewhat smaller, shallower and less shining, though about as numerous and the striolæ of the interfoveolar surface less sharp. The petiole and postpetiole are smoother and more shining than the head and thorax

and the interfoveolar sculpture is so feeble as to appear more or less coriaceous or alutaceous. The first gastric segment is longitudinally, not arcuately striolate. The femora are transversely, the scapes and tibiae longitudinally striolate as in *procerus*.

Erect hairs somewhat more numerous on the dorsal surface of the head and pronotum and on the antennal scapes.

Nearly coal black, darker than *procerus*, legs, excluding the coxae, mandibles, clypeus, frontal carinae, antennae, and terminal gastric segments castaneous as in *procerus*.

Described from two specimens from Medje from the stomach of a toad (*Bufo superciliaris*) collected by Lang and Chapin. This form is certainly distinct and is, in my opinion, more than a subspecies of *procerus*.



Map 15. Distribution of the genus *Leptogenys*. This genus also occurs in Georgia.

LEPTOGENYS Roger

Slender black or reddish ants, of small or medium size, sometimes with bluish iridescence.

The WORKERS are monomorphic and vary little in size. Mandibles articulated at the anterior corners of the head, almost or quite toothless and either long and linear or broader and subtriangular, usually with the angle between the basal and apical margin rounded or absent. Clypeus usually carinate and projecting in the middle in the form of a lobe or angle. Antennae long and slender, the funiculi not enlarged or clubbed apically. Thorax usually with the mesoepinotal suture distinct. Petiole either laterally or, in a few species, anteroposteriorly compressed. Abdomen small and slender, the constriction between the postpetiole and gaster not very pronounced. Legs slender, claws pectinated.

The FEMALE is wingless and scarcely larger than the worker, either highly ergatomorphic, without ocelli, with the thoracic structure as in the worker but with more voluminous abdomen, or ergatogynous, as in the case of *L. ergatogyna* described below, with ocelli and the thorax more like that of the winged females of other genera, but with the mesonotum and scutellum small and depressed.

The MALE is somewhat smaller than the worker and in some species much paler in color and nocturnal, with very large eyes and ocelli, very long antennae, small mandibles, and pronounced Mayrian furrows on the mesonotum. The claws are pectinated as in the other phases.

Emery has divided the genus into four subgenera: *Leptogenys sensu stricto*; *Lobopelta*; *Odontopelta*; and *Machærogenys*. The species of *Leptogenys sensu stricto*, are generally distributed in the tropics of both hemispheres. One *Lobopelta*, *L. elongata* (Buckley), occurs in the Gulf States from Central Texas eastward to Florida. *Odontopelta* is monotypic and confined to Queensland. Of *Machærogenys*, three species are known, all from Madagascar (Map 15).

Most species of *Leptogenys* form small colonies, each with a single female, and nest in the ground, usually under stones or logs. The workers are timid and extremely quick in their movements. Some species make organized raids on termites; others, like our North American *elongata*, forage singly and apparently only at night.

***Leptogenys stuhlmanni* Mayr subspecies *camerunensis* (Stitz) variety *opalescens*, new variety**

WORKER.—Agreeing with the variety *angusticeps* Forel in all respects, except that the head, thorax, petiole, and to some extent also the gaster, have a peculiar opalescent blue reflection like that seen in *L. iridescens* (F. Smith) and *chinensis* (Mayr).

Thirteen workers taken from the stomachs of toads (*Bufo funereus* and *polycercus*) from Akenge (Lang and Chapin). Forel drew his description of *angusticeps* from a single specimen taken at St. Gabriel, near Stanleyville. He says nothing about the blue reflection, which is very striking, so that I am unable to refer the specimens to his variety.

The habits of the typical *stuhlmanni* have been studied by Arnold.¹ He says:

I have met with this species only in Natal, where it appears to feed exclusively on woodlice; the entrance to the nest can be plainly distinguished by the accumulation of the remains of their prey, bleached a dead white, scattered around it. The nest is not indicated by any mound or other accumulation of earth; but in the neighborhood of Durban at least, it is very frequently found in, or immediately adjacent to, the nests of *Myrmicaria eumenoides* Gerst. I am inclined to think that this *Lepto-*

¹1915, Ann. South African Mus., XIV, p. 93.

genys dispossesses the latter species of a part of their large nest, rather than take the trouble of excavating one for itself. It also has a very noticeable smell, resembling essence of pears.

In 1904¹ I recorded the fact that our North American species feeds very largely on slaters (*Oniscus* and *Armadillidium*) and that "the earth surrounding the entrances to the nests is invariably white with innumerable bleaching limbs and segments of the crustaceans." The use of the same food by two species of *Leptogenys* in such remote regions as Natal and Texas would seem to indicate that the habit must be rather general in the genus.

***Leptogenys (Lobopelta) ergatogyna*, new species**

Text Figure 20

FEMALE.—

Length 7.3 mm.

Head longer than broad, narrower behind than in front, with feebly convex and rather large eyes, placed a little in front of the middle, and three small ocelli, the posterior distinctly smaller than the anterior. Mandibles rather broad, their basal and apical borders subequal, not forming an angle with each other. Clypeus carinate,



Fig. 20. *Leptogenys (Lobopelta) ergatogyna*, new species. Female. *a*, insect in profile; *b*, head from above.

produced as a sharp point or angle in the middle. Frontal carinae erect, closely approximated; frontal groove distinct. Antennae long and slender, scapes extending nearly half their length beyond the posterior border of the head; funicular joints long and slender, the second twice as long as the first, the third and fourth each nearly two-thirds as long as the second. Thorax long and narrow, elongate elliptical, scarcely broader than the head through the eyes, laterally compressed; pronotum large, as long as broad, depressed in profile; mesonotum, tegulae, paraptera, and scutellum developed as distinct but small sclerites, without traces of wings. Mesonotum scarcely longer than the pronotum, somewhat longer than broad, with distinct parapteral furrows. Epinotum long and sloping, without base or declivity. Petiole as high as long, in profile shaped like the quadrant of a circle, its anterior surface evenly arcuate,

¹ 'A crustacean-eating ant (*Leptogenys elongata* Buckley).' Biol. Bull., VI, pp. 251-259.

its posterior surface sharply and vertically truncated, its ventral surface anteriorly with a coarse tooth. Seen from above, the petiole is only one and one-fourth times as long as broad, slightly broader behind than in front, with straight, subparallel sides. Abdomen slender, like that of a normal worker, not enlarged as in the ergatomorphic females of other species. Sting long. Legs long and slender.

Subopaque; mandibles somewhat more shining, finely shagreened and coarsely and sparsely punctate. Clypeus finely longitudinally rugulose; head, pronotum, mesonotum, paraptera, and scutellum densely and finely punctate; postpetiole and gaster more shining, even more finely but a little less densely punctate; pleuræ finely and longitudinally, epinotum transversely and somewhat more coarsely rugulose. Petiole finely and rather irregularly rugulose.

Hairs and pubescence whitish, the former very sparse, erect, delicate, confined to the head, fore coxæ, and tip of gaster, short on the last; the pubescence rather short and abundant on the head, postpetiole, gaster, and appendages.

Black; mandibles, antennæ, and legs, including the coxæ, dark brown; tarsi and funiculi scarcely paler.

Described from a single specimen taken from the stomach of a toad (*Bufo polycercus*) from Medje (Lang and Chapin).

This remarkable insect I regard as the normal female of a species which must be very closely related to *L. havilandi* Forel, known only from the worker. In all the species of *Leptogenys* [*elongata* (Buckley), *diminuta* (Smith), *fallax* (Mayr), *arnoldi* Forel] of which the female is known, this phase is like the worker in the structure of the thorax and in lacking ocelli, but has a more voluminous abdomen. Of the female *arnoldi*, Arnold says that "the mesonotum is also larger and longer than in the worker," and I have found the same to be true of the Australian *fallax*. It would seem, therefore, if I am correct in my interpretation of the specimen above described, that it must be regarded as representing a stage in the degeneration of the formicid female intermediate between the common winged and the extremely ergatomorphic form, the only form of fertile female that has been seen hitherto in the genus *Leptogenys*.

ANOCHETUS Mayr

WORKER.—Small ants with monomorphic workers. Head irregularly hexagonal. Mandibles inserted close together at the middle of its anterior border, linear, flattened, with three large terminal teeth bent inward at a right angle and with the inner border toothless or furnished with a row of minute denticles. Eyes usually well developed, rarely vestigial, in front of the middle of the sides of the head. Clypeus small, subtriangular, anteriorly projecting over the insertions of the mandibles and extending backward as a narrow process between the short frontal carinæ, which are lobularly expended in front and more or less convergent posteriorly. Antennal foveæ not confluent behind; head without an oblique welt or swelling on each side starting from the eye and bounding the antennal fovea; sides of head without a marked impression behind the antennal fovea. Antennæ slender, 12-jointed; funiculi long, filiform, not enlarged apically. Thorax long and narrow, with distinct promesonotal and some-

times also mesoepinotal sutures; epinotum usually dentate. Petiole with a node or scale which may be conical and may terminate in a spine, or in two teeth or spines. Gaster oval, convex above, without a constriction between the postpetiole and the succeeding segment. Legs slender; middle and hind tibiae each with a single pectinated spur; claws simple.

FEMALE very similar to the worker; usually winged, but in some species wingless and ergatoid.

MALE with the head of the usual shape, large eyes and ocelli and very small mandibles; antennae very long; scape short, first funicular joint broader than long. Petiole above, more or less pointed or bidentate. No constriction between the postpetiole and the succeeding segment. Pygidium usually not terminating in a spine.



Map 16. Distribution of the genus *Anochetus*.

The genus comprises numerous species which form small colonies that nest in the ground under stones or in vegetable mould. Little is known of their habits. They range over the tropics of both hemispheres (Map 16), one species, *A. ghilianii* (Spinola), even entering Spain from Morocco. The subgenus *Stenomyrmex*, of which only two species are known, is confined to the Neotropical Region.

***Anochetus africanus* (Mayr)**

A worker and a dealated female from Medje (Lang and Chapin) without further data.

Anochetus estus, new species

WORKER.—

Length about 4.5 mm.

Closely related to *A. africanus*. Head, excluding the mandibles, a little longer than broad, the posterior margin deeply and arcuately excised. Eyes small, like those of *africanus*. Clypeus deeply emarginate in the middle, its posterior portion long and cuneate. Frontal groove distinct between the clypeus and the middle of the head. Mandibles about half as long as the head, shaped much as in *africanus* but with the terminal teeth shorter and the bases somewhat narrower. Antennal scapes not reaching to the posterior corners of the head; second funicular joint not longer than broad, third scarcely longer, joints 4 to 7 not twice as long as broad. In *africanus* all the funicular joints are much longer. Thorax shaped as in *africanus*, the pronotum rounded but not convex above, the mesoepinotum long, narrower and subcylindrical, with broad blunt epinotal teeth. The petiolar scale is high and compressed anteroposteriorly as in *africanus*, with feebly excised superior border, but the latter is more acute and the sides are nearly straight and subparallel (in *africanus* rounded). Gaster and legs of the usual type.

Shining; the upper surface of the head, except the impressions, sides and posterior corners subopaque and longitudinally rugulose, the rugules being regular and spreading fanwise from the frontal carinae. Thorax subopaque, the pronotum longitudinally and arcuately rugulose, except in front where the rugules are transverse, the meso- and epinotum transversely rugulose. The sculpture is distinctly finer than in *africanus*. Petiole and gaster very smooth and shining. Mandibles very indistinctly and finely punctate, smoother than in *africanus*.

Hairs slender, yellowish, erect, sparse on the body, absent on the appendages, which are very finely pubescent.

Deep castaneous brown, almost black, with the appendages, sides and posterior corners of head, mandibles, clypeus, and tip of gaster paler brown.

A single specimen from Akenge (Lang and Chapin) taken from the stomach of a toad (*Bufo funereus*).

Anochetus opaciventris, new species

WORKER.—

Length 6.5 to 7 mm.

Allied to *africanus*. Head longer than broad, deeply and arcuately excised behind, with small eyes as in *africanus*, clypeus, frontal groove, and antennae much as in that species, the scapes extending beyond the middle of the occipital border a distance equal to the length of the first funicular joint, the funicular joints even longer and more slender than in *africanus*, the third fully twice as long as broad, the second somewhat shorter. Mandibles fully three-fifths as long as the head, narrowed at the base, broadened apically as in *africanus* and *estus*, with straight internal border, the apical and preapical teeth long and slender, the subapical very short, triangular, not longer than broad, arising from the base of the apical. Thorax and petiole similar to those of *africanus* but the teeth in the former longer, more acute and erect, the latter narrower, with more deeply excised superior border so that it terminates on each side in a larger and sharper tooth, and with more nearly straight, subparallel sides. In profile the anterior and posterior surfaces of the petiole are distinctly convex, the ventral surface without a tooth.

Mandibles shining, smooth; head subopaque, finely and regularly longitudinally rugulose, the rugules spreading fanwise from the frontal carinae; clypeus, antennal foveae, sides, and posterior corners of head smooth and shining. Thorax opaque, coarsely rugose, the rugae irregular but with a feebly longitudinal trend on the pronotum, transverse on the mesonotum, more vermiculate on the epinotum. Petiole rather shining, coarsely coriaceous; gaster subopaque, densely punctate, the posterior margins of the segments more shining.

Hairs delicate, white, rather short and abundant, erect on the body; scapes and legs with dense oblique, short hairs which are also very fine and might be described as long pubescence.

Black; mandibles, clypeus, cheeks, gular surface of head, antennae, and legs, including the coxae, dark brown, the middle portions of the femora darker. Posterior margins of gastric segments golden yellow.

Described from three specimens taken from the stomachs of toads (*Bufo funereus* and *polycercus*) from Akenge (Lang and Chapin).

***Anochetus bequaerti* Forel**

A single specimen taken from the stomach of a toad (*Bufo regularis*) from Garamba (Lang and Chapin).

***Anochetus punctaticeps* Mayr**

Eighteen workers from Babeyru, forming part of a colony "found under bark on a large tree" (Lang and Chapin).

ODONTOMACHUS Latreille

Medium-sized or large ants closely resembling *Anochetus*.

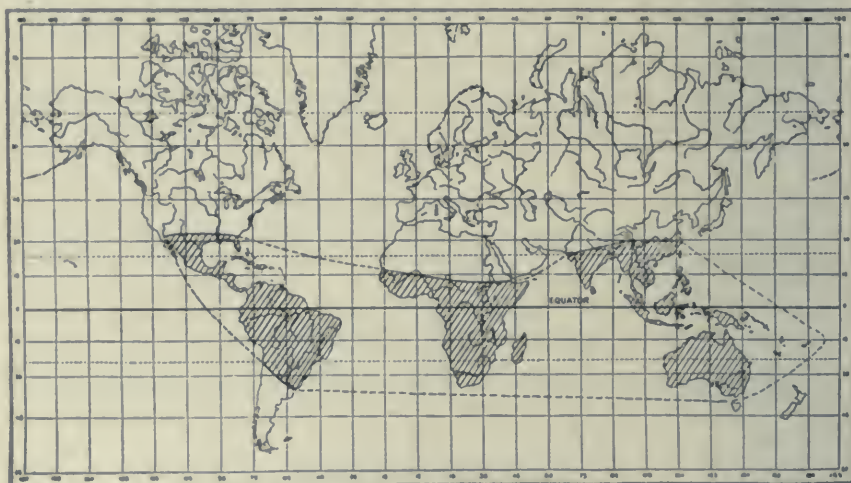
In the WORKER, however, the antennal foveae are confluent, being united by a depression of the front behind the frontal carinae, and there is a welt or swelling which extends out obliquely from the eye and separates the antennal fossa from a depression, equally oblique and very pronounced on the side of the head. Both the apical and subapical teeth of the mandibles acute, the preapical truncated or acute, according to the species; the inner border of the mandibles usually minutely and serrately toothed. Maxillary palpi 4-jointed, labial palpi 3-jointed. Eyes always well developed. Petiole surmounted by a conical node usually terminating in a spine which is inclined backward.

FEMALE winged, with large eyes and ocelli, but in other respects like the worker.

MALE with the head of the ordinary shape and with very large eyes and ocelli; mandibles very small; maxillary palpi 6-jointed. Antennae as in *Anochetus*. Petiole ordinarily with a pointed or conical node, but without terminal spine. Postpetiole separated from the succeeding segment by a rather pronounced constriction. Pygidium terminating in a spine. Claws simple.

Odontomachus is a tropicopolitan genus with apparently two centers of distribution, one in the Neotropical, the other in the Indonesian and Australian Regions (Map 17). One species, *O. haematoda*, represented by

numerous subspecies and varieties, is found in all the warmer regions of the globe, even in the Southern United States, though not in the Mediterranean Region. The species all nest in small colonies in the ground or in rotten wood and the workers of some of the species are very aggressive and sting severely. They are able to leap backward a distance of several inches by suddenly closing their divaricated mandibles against any hard body that happens to be in the environment. The genus is poorly represented in Africa.



Map 17. Distribution of the genus *Odontomachus*.

Odontomachus assiniensis Emery

Text Figure 21

Akenge, ♂; Medje, ♂; Ngayu, ♂; Niangara, ♂; Niapu, ♂. Eighty-six specimens, all taken from the stomachs of four species of toads (*Bufo polycercus*, *superciliaris*, *funereus*, and *tuberosus*) collected by Lang and Chapin.

Stitz has described an *O. intermedius* which differs from the typical *assiniensis* only in having the striae on the pronotum of the worker more arcuately concentric and therefore more as in *O. haematoda* and not simply transverse. A study of the long series of specimens before me shows that there is great variation in the pronotal striation, many specimens agreeing with Stitz's description; others having the striae in an asymmetrical whorl like that exhibited by the ridges on the tips of the fingers, and in a considerable number the striae are simply transverse, as described by

Emery for the typical *assiniensis*. I do not regard these differences as more than nest variations and have therefore relegated Stitz's *intermedius*, which Santschi is willing to regard as a subspecies of *assiniensis*, to the synonymy.

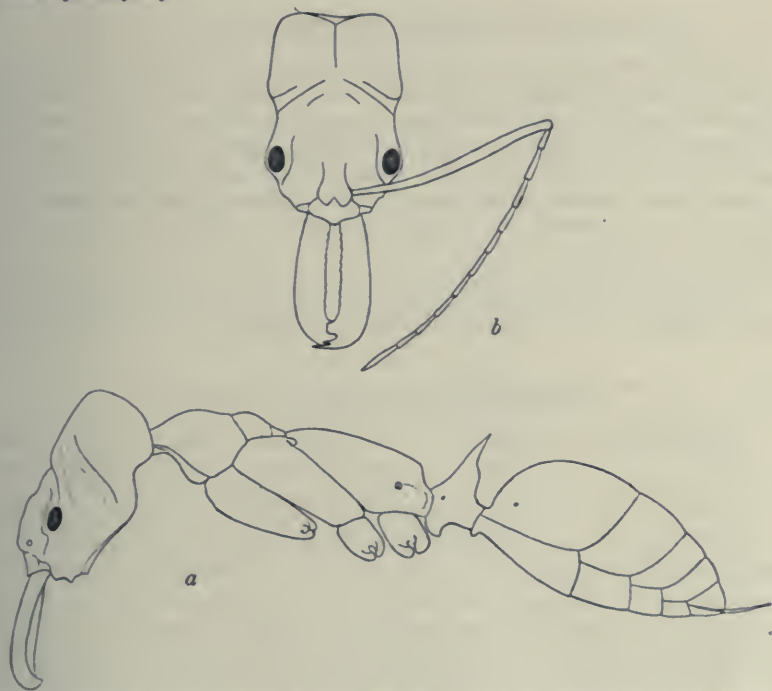


Fig. 21. *Odontomachus assiniensis* Emery. Worker. a, body in profile; b, head from above.

Odontomachus assiniensis variety *furvior*, new variety

WORKER.—Length 9 to 12 mm. Differing from the typical form in its darker color. The abdomen is black, the head and thorax deep castaneous, almost black, with the bases of the mandibles, lower surface of the head and concavities of its upper surface, mesopleuræ, legs, and antennæ somewhat paler and more reddish; in some specimens the tibiæ are still paler.

FEMALE (deâlated).—Length nearly 15 mm. Darker than the worker, black, with the legs and antennæ dark brown. Mandibles smoother and more shining than in the worker. The transverse rugæ on the pronotum and the longitudinal rugæ on the mesonotum much coarser than in *O. hæmatoda* and the whole thorax more shining. The pubescence is lacking, even on the gaster, which is very shining.

Described from nine workers from Faradje (type locality) and numerous others from Yakuluku, Stanleyville, Bafwasende (Lang and Chapin), and Thysville (J. Bequaert). In addition to these, there are thirty

workers and one female (the one described above) taken from the stomachs of toads (*Bufo polycercus*, *funereus*, and *superciliaris*) from Medje, Ngayu, Akenge, Boyulu, and Niangara.

***Odontomachus assiniensis* variety *aterrimus*, new variety**

WORKER.—Length about 10 mm. Differing from the variety *furrior* in being entirely jet black, including the appendages. The sculpture of the head and thorax is distinctly finer than in any of the other forms of the species, so that the surface is more shining. The legs are smoother and also more shining, especially the femora, than in any of the other forms. The unsculptured surfaces of the body, viz., the antennal foveæ, the mesopleuræ, lower portion of epinotum, and the gaster have a distinct blue opalescence. The longitudinal groove on the dorsal surface of the epinotum is continuous.

Described from a single specimen found in the stomach of a frog (*Rana albolabris*) from Niapu (Lang and Chapin).

***Odontomachus hæmatoda* (Linnaeus)**

Stanleyville, ♂; Malela, ♂, ♀ (Lang and J. Bequaert); Faradje, ♂; Zambi, ♂, ♀; Avakubi, ♂; Leopoldville, ♂; Vankerekhovenille, ♂; Garamba, ♂; Akenge, ♂ (Lang and Chapin); Matadi, ♂; Katala, ♀ (J. Bequaert). All this material belongs to the typical tropicopolitan form, distributed apparently throughout the Ethiopian Region. The specimen from Akenge was taken from the stomach of a toad (*Bufo funereus*) and a specimen from Faradje was taken from the stomach of a frog (*Rana occipitalis*). In connection with the well-known leaping habit of this ant, Mr. Lang makes the following remark: "This leaping may be of some practical use to the ants when scaly ant-eaters (*Manis*) open their nests. Those jumping out of the immediate range of its glutinous tongue would be fairly safe, since the *Manis* feeds only where the ants and their larvæ are thickest and seldom looks for single individuals."

***Odontomachus hæmatoda* variety *stanleyi*, new variety**

WORKER.—Length 7 to 8 mm. Distinctly smaller than the typical *hæmatoda*, with a distinctly narrower head and the mandibles, antennæ, thorax, legs, and gaster paler and reddish castaneous brown. In many specimens the cheeks, clypeus, antennal foveæ, gula, and borders of the mandibles are yellowish. Petiole with longer and more uniformly slender spine. Sculpture of the head and thorax as in the typical *hæmatoda*, but with the gray pubescence on the gaster distinctly longer and more conspicuous. The sides of the head are much less smooth and shining than in the Neotropical subspecies *insularis* (Guérin), which is of the same size though paler in color.

Described from numerous specimens from two colonies taken at Stanleyville (Lang and Chapin). The cocoons are also distinctly paler than those of the typical *haematoda*.

Pseudomyrminae

WORKER monomorphic, very rarely slightly dimorphic. Body elongate, often very slender. Clypeus with rounded posterior margin, not prolonged back between the frontal carinae; in certain species of *Pseudomyrma* there is an apparent posterior prolongation which, however, is the equivalent of the frontal area and is often separated from the clypeus. Antennae 12-jointed, short. Ocelli usually developed. Pedicel usually long, formed by the petiole and the postpetiole. Gaster with well-developed sting. Middle and hind tibiae with pectinate median spurs. The proventriculus or "gizzard" is much more specialized than in the Myrmicinae, being anteriorly developed as an apple- or quince-shaped ball, covered with longitudinal and circular muscles and with four distinct, connate sepals, bluntly rounded and finely hairy at their tips, and posteriorly as a very short, tubular, constricted portion which projects as a button into the cavity of the ventriculus.

FEMALE very similar to the worker, also with 12-jointed antennae; either winged, or ergatoid and wingless, or subapterous. All three forms of females occur together in the same nest of *Viticicola*. Wings with a discoidal and a closed radial cell; two closed cubital cells, rarely one (*Viticicola*).

MALE also rather similar to the worker; the antennae 12-jointed. External genitalia well developed, exerted; cerci present.

"The adult LARVAE of all four genera of Pseudomyrminae are much alike. The body is long, straight and cylindrical, not broader posteriorly as in nearly all other ant larvae. The anterior and posterior extremities are blunt and rounded and the segments are all sharply defined. The integument is uniformly thin and perfectly transparent, though tough, only the mandibles, as a rule, being strongly chitinized and the lining of the buccal cavity somewhat pigmented. The prothoracic segment is large and hood-shaped, and in certain species can be drawn down over the head; the meso- and metathoracic segments are narrowed ventrally, the head is large, somewhat flattened, usually subrectangular, about as broad as long and embedded in the ventral portions of the thoracic segments. The antennal rudiments are always distinct as small, rounded papillae, each bearing three sensillae. The mandibles are small, stout and bidentate, sometimes with a vestige of a third tooth, their upper surfaces covered with regular rows of subimbricate papillae. The maxillae are large, swollen and rounded, lobuliform, the labium short and broad, with the transverse, slit-shaped opening of the salivary duct in the middle. The sensory organs which in many other ants have the form of papillae or pegs on the maxillae and labium are in the Pseudomyrminae usually reduced to small areas or feeble eminences, bearing the groups of sensillae. The anterior maxillary organ has five, the posterior two and each labial organ has five of these sensillae. The buccal cavity is broad and transverse, its dorsal and ventral walls being in contact and both furnished with fine, regular transverse ridges (*trophorhinium*). Each thoracic segment bears a rounded papilliform exudatorium ventrally on each side next to the head. The sternal portion of the first abdominal segment is transversely elliptical, swollen, protuberant and furnished with a food-pouch, the *trophothylax*, opening forward, i. e., towards the mouth-parts. The

hairs on the body of the larva are of three kinds: first, short, stiff, very acute hairs, generally and rather evenly distributed over the whole surface (*microchaetae*); second, much longer, stouter, more gradually tapering, lash-like and somewhat curved hairs of unequal length, singly or in a row or loose cluster on each ventrolateral surface of each abdominal segment (*acrochaetae*); and third, long hairs, of uniform length, only slightly tapering, with hooked tips (*oncochaetae*). These are normally present in transverse rows of four to eight on the dorsal surfaces of the three thoracic and first three to eight abdominal segments. On the more posterior segments they are often represented by simple, i. e., pointed hairs."¹

Nymphs not enclosed in a cocoon.

In 1899 Emery,² after a comparative study of the larvæ of several formicid genera, proposed to separate *Tetraponera* and *Pseudomyrma* from the remainder of the Myrmicinae to form the new subfamily of the Pseudomyrmicinae. His arguments, however, based on fragmentary material, seemed not convincing at that time; long since Emery himself has reunited these genera with the Myrmicinae and in this he has been followed by all other myrmecologists up to the present. A recent study of numerous larvæ of this group, belonging to the four known genera, has convinced me that we must return to Emery's conception of 1899. I have endeavored to show in a recent paper³ that neither the larval nor the imaginal Metaponini can be regarded as at all closely related to the Pseudomyrmicinae; consequently that tribe should be retained among the Myrmicinae.

Like the Dorylinae and Cerapachyinae, the Pseudomyrmicinae are typically inhabitants of the warmer parts of the world; a small number of forms enter the southernmost portions of the Nearetic and Palearctic Regions.

TETRAPONERA F. Smith

WORKER.—Small, monomorphic or very rarely (in one South African species, *T. ambigua* Emery, according to Arnold) with the head dimorphic. Body long and slender. Head subrectangular, with large or very large, moderately convex eyes, one-third to two-fifths as long as the head; ocelli vestigial, often absent. Mandibles short and stout, with distinct basal and apical border, the latter with a small number of subequal teeth. Clypeus extremely short, steep, elevated in the middle but not extending back between the frontal carinae, the anterior border emarginate, dentate or crenulate. Frontal carinae small, short, closely approximated, lobular anteriorly, often slightly diverging behind. Maxillary palpi 5-jointed; labial palpi 4-jointed. Antennae short, 12-jointed, the funiculi somewhat thickened at their tips, without distinct clava. Thorax narrow, with well-developed promesonotal and mesoepinotal

¹Wheeler, W. M. and Bailey, I. W., 1920. 'The feeding habits of pseudomyrmecine and other ants.' *Trans. Amer. Phil. Soc. Philadelphia*, N. S., XXII, pt. 4, pp. 235-279, Pls. I-V.

²1899, 'Intorno alle larve di alcune formiche.' *Mem. Accad. Sc. Bologna*, (5) VIII, pp. 3-10, 2 Pls.

³Wheeler, W. M., 1919. 'The ants of the genus *Metapone* Forel.' *Ann. Ent. Soc. America*, XII, pp. 173-191, 7 figs.

sutures and a distinct metanotal selerite, often constricted in the mesoepinotal region. Epinotum large and rather high, always unarmed. Petiole and often also the post-petiole pedunculate, rather long and slender, both with low, rounded nodes, their ventral portions not swollen or with stout teeth. Gaster narrow and elongate oval, with well-developed, exerted sting. Middle and hind tibiae with pectinated median spurs; claws toothed.

FEMALE very similar to the worker and scarcely larger, winged; the wings short, the anterior pair with a discoidal, two closed cubital cells and a rather narrow, closed radial.

MALE scarcely smaller than the worker and very similar except for the wings. Head shorter. Eyes and ocelli well developed, convex. Mandibles well developed, with dentate apical borders. Antennae 12-jointed, the scape but little longer than the second funicular joint, the first joint much shorter than the second, not swollen. Mesonotum depressed, not overarching the pronotum, without Mayrian furrows and with very feeble parapsidal furrows. There is, at least in some species, a concavity in the pro- and mesosterna, extending dorsally nearly to the mesonotal scutum. External genitalia well developed, exerted. Cerci present. Wings as in the female.

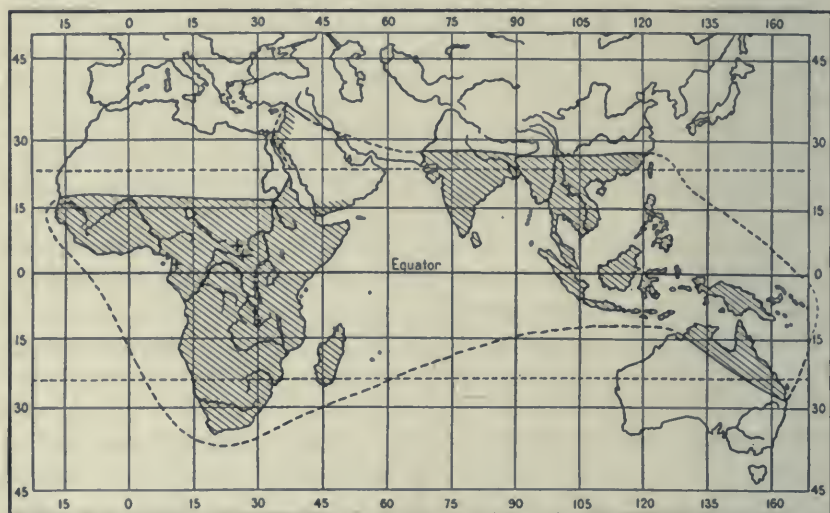
LARVA hypocephalic, with papillary exudatoria on the three thoracic and first abdominal segments. Dorsal surface with long straight hairs, hooked at their tips.

Donisthorpe (1916, Ent. Record, XXVIII, pp. 242-244) has shown that *Sima* Roger, the name used by most authors for this genus, must be sunk as an isonym of *Tetraponera* F. Smith, contrary to Emery's contention (1915, Zool. Anzeiger, XLV, p. 265). The case seems to be very clear, as Smith founded his genus *Tetraponera* (1852) on two species, *atrata* (= *Eciton nigrum* Jerdon) and *testacea*. The latter he afterwards (1855) placed in the genus *Pseudomyrma*. Roger founded his genus *Sima* in 1863 on *S. compressa* Roger (= *Pseudomyrma? allaborans* Walker). Later (1900) Emery separated the genus *Sima* into two subgenera, *Sima*, *sensu stricto*, and *Tetraponera*, the former with, the latter without ocelli in the worker and selected *Eciton rufonigrum* Jerdon as the type of *Sima*, *sensu stricto*. This was an improper procedure, since the worker of Roger's type species, *S. allaborans* has no ocelli.

Examination of the males of several of the Indomalayan species of *Tetraponera* shows that they all have 12-jointed antennae. This is also true of the males of *Pachysima*, *Viticicola*, and even of *Pseudomyrma* and, hence, of the whole tribe Pseudomyrmini of Emery. Nevertheless, in his recent classification of the Myrmicinae (1914, Rend. Accad. Sc. Bologna, p. 34) he cites the males of this tribe as having 13-jointed antennae. Bingham and Arnold also give the same number for *Tetraponera*, and Santschi, who was the first to describe the male of *Pachysima athiops*, failed to notice that it has 12-jointed antennae.

The genus *Tetraponera* is distributed over the Ethiopian, Malagasy, Indomalayan, Papuan, and Australian Regions (Map 18), being best represented in the Ethiopian and Indomalayan. One species, *T. bifoveo-*

lata (Mayr), was taken by Dr. W. M. Mann as far north as Palestine. The species all nest in plant cavities (dead wood, twigs, stems of lianas, acacia spines, etc.) and are very quick in their movements. Their habits throughout are very similar to those of the allied Neotropical genus *Pseudomyrma*. The species of the latter, however, are much more numerous and constitute an abundant and conspicuous part of the Neotropical ant-fauna, whereas the species of *Tetraponera* are comparatively rare ants.



Map 18. Distribution of the genera *Tetraponera* (crossed area) and *Viticicola* (known localities indicated by crosses).

***Tetraponera anthracina* (Santschi)**

Stanleyville, ♀ (Lang and Chapin); Lubutu, ♀; Thysville, ♀ (J. Bequaert). Five specimens which agree perfectly with Santschi's description of the types from the French Congo. Kohl found this species nesting in the hollow twigs of *Barteria fistulosa* and Bequaert's specimens from Thysville bear the note, "running on leaves and twigs of *Barteria fistulosa* whose cavities were apparently not inhabited by ants. Forest gallery in savannah. I have not seen their nest."

***Tetraponera mocquerysi* (Ern. André) variety *lepida*, new variety**

WORKER.—Length 6.5 to 7 mm. Differing from the typical form of the species in color, the thorax, petiole, gaster, and coxæ being very dark brown or black; the head, mandibles, antennæ, legs, anterior and posterior ends and ventral surface of the petiole, brownish yellow. Vertex with a large, transversely elliptical black spot

reaching on each side nearly to the orbit. In one specimen the posterior portion of the pronotum is red. Shape of head and thorax, sculpture and pilosity of the body very much as in the typical form.

FEMALE.—Length 6.5 mm. Very similar to the worker. Posterior borders of gastric segments brownish. Wings grayish hyaline, with pale brown veins and dark brown pterostigma.

Described from two workers from Faradje (type locality) and one from Yakuluku and a single female from Garamba (Lang and Chapin).

***Tetraponera mocquerysi* subspecies *emacerata* (Santschi)**

Stanleyville, ♂; Faradje, ♀ (Lang and Chapin); Lubutu, ♀; Kasonsero on the Semliki River, ♀ (J. Bequaert). In the narrow head and in coloration, the workers agree with Santschi's figure and description. The females, two in number, are dealated and have the head narrow as in the workers, but with the cheeks more concave, the anterior border more dilated, and the posterior corners more rectangular and less rounded. They measure 7 to 7.5 mm.; the workers about 5 to 6 mm.

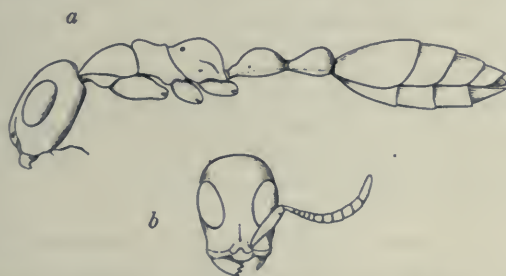


Fig. 22. *Tetraponera ophthalmica* (Emery). Worker. a, body in profile; b, head from above.

***Tetraponera ophthalmica* (Emery)**

Text Figure 22

Nine workers taken by Dr. Bequaert at Thysville agree perfectly with Emery's description. The species is very easily recognized by its huge eyes. The specimens were found "running on limbs of *Barteria fistulosa*, whose cavities were not inhabited by ants."

VITICICOLA Wm. M. Wheeler

WORKER.—Closely related to *Tetraponera*. Head convex, and rounded behind, with the clypeus and mandibles shaped as in some species of *Tetraponera*, the external border of the mandibles deeply emarginate at the base. Eyes much smaller, only about one-sixth as long as the sides of the head, flat; ocelli usually absent, sometimes the anterior present. Frontal carinae short, farther apart than in *Tetraponera* but shorter and closer together than in *Pachysima*. Frontal area and frontal groove

obsolete. Antennæ short, 12-jointed; the funiculi with distinct 3-jointed club, the first funicular joint very long, joints 2 to 7 very short and transverse. Both maxillary and labial palpi 3-jointed. Thorax much as in *Tetraponera* but more thickset, the pronotum convex and rounded, not marginate or submarginate on the sides, the epinotum very high and convex, hemispherical, with the epinotal gland on each side very long and narrow, extending obliquely upward and forward to the middle of the lateral surface of the segment. Petiole and postpetiole stout, without peduncles, the nodes from above not longer than broad, their ventral portions swollen, without teeth. Gaster and tibial spurs as in *Tetraponera* but the tarsal claws are simple, not toothed.

FEMALE winged, or ergatoid and wingless, exhibiting also subapterous forms. Even the winged form is much like the worker, but has well-developed ocelli, though the eyes are small and flat. Pronotum large and well developed; mesonotum depressed, flat. Petiole and postpetiole even broader and stouter than in the worker; both broader than long.

MALE.—Clypeus longer than in the worker and female; mandibles similar with dentate apical borders. Antennæ short, 12-jointed, the second funicular joint much shorter than the scape, not longer than the first, which is slightly swollen. Eyes and ocelli rather large and convex. Mesonotum flattened or depressed, without Mayrian furrows and with very indistinct parapsidal furrows, not overarched the pronotum. There is a very deep and wide excision, separating the pro- and mesosterna and extending dorsally nearly to the mesonotal scutum. Petiole and postpetiole much as in the worker and female, but with their ventral portions even more swollen and convex. Genitalia extruded, less robust than those of *Pachysima* and *Tetraponera*. Wings with a discoidal cell, a rather broad, closed radial cell and only one cubital cell.

LARVA hypocephalic as in *Pachysima* and *Tetraponera* and like that of the latter genus in the development of the exudatoria and dorsal hairs.

GENOTYPE.—*Sima tessmanni* Stütz.

This monotypic genus seems to me to be sufficiently distinct from *Tetraponera*. The single species is highly specialized in adaptation to life in the stem cavities of a peculiar liana, *Vitex Staudtii* (*vide infra*). The eyes have dwindled and the ocelli have disappeared; the venation of the wings has become more simple and there is a pronounced tendency for the production of wingless and subapterous females—a condition unknown in any species of *Tetraponera*. This peculiarity, the pale color, and the small eyes indicate that the ants never leave the cavities of their host plant, except when the latter is disturbed or during the marriage flight, and the very pale color of the males indicates that this flight must occur at night. The conspicuous development of the epinotum and of its glands suggests conditions like those in some species of *Crematogaster* of the subgenus *Physocrema* (*inflata*, *difformis*, *vacca*, *stethogompha*, etc.) of the Indomalayan Region, the workers of which are supposed to feed on the secretions of one another's epinota (Bingham). As at present known, the distribution of the new genus is restricted to Spanish Guinea and the Ituri Basin of the Belgian Congo (Map 18). It probably also occurs in Cameroon.

Viticicola tessmanni (Stitz)

Text Figures 23 and 24

WORKER.—

Length 3 to 3.5 mm.

Head longer than broad, a little broader behind than in front, with feebly concave cheeks, rounded posterior corners and nearly straight posterior border, and, on the vertex, with a short longitudinal impression at one end of which the anterior ocellus is sometimes distinctly developed. Posterior ocelli absent. Eyes very small, flat, shorter than half their distance from the mandibular insertions, placed a little in front of the middle of the head. Mandibles short, rather strongly angulate at the base externally, their apical margins oblique, with 5 or 6 denticles, those at the base often indistinct. Clypeus convex and evenly rounded in the middle, its anterior border projecting, entire, strongly emarginate on the sides. Frontal groove absent. Antennæ short, scapes not reaching to the middle of the head, first funicular joint much longer than broad, joints 2 to 8 much broader than long, crowded together, joints 9 to 11 forming a three-jointed club, the last joint being as long as both the others, which are subequal and somewhat broader than long. Thorax narrower than the head, constricted in the mesonotal region. Pronotum from above a little broader than long, evenly rounded and convex; mesonotum transversely subelliptical, feebly convex, surrounded by impressed sutures. Metanotum nearly as long as the mesonotum, concave, with uneven surface. Epinotum very convex and rounded, egg-shaped from above, semiglobose in profile, as high as the pronotum or slightly higher, with the slit-shaped epinotal glands shining through the integument and conspicuously enlarged. Petiole short, scarcely longer than broad, broader behind than in front, convex and rounded above. In profile, its ventral surface is also convex and protuberant, with a small, compressed, blunt, translucent tooth anteriorly. Postpetiole a little broader than the petiole, scarcely broader than long and scarcely broader behind than in front, convex and rounded above and below. Legs and gaster of the usual shape, the latter with well-developed sting.

Very smooth and shining, including the mandibles; impunctate under a magnification of 20 diameters.

Hairs golden yellow, erect, of uneven length, sparse, most numerous on the gaster, especially along its sides. These regions also have more numerous short hairs or suberect pubescence. Antennæ and legs with shorter, more appressed hairs. Cheeks and clypeus densely and conspicuously pubescent, the latter without a fringe of cilia-like bristles.

Clear brownish yellow, with the borders of the mandibles, clypeus and frontal carinae brown.

FEMALE (deflated).—

Length 4.5 to 5 mm.

Very similar to the worker. Thorax elongate elliptical, somewhat flattened above. Mesonotum as long as broad; epinotum subeuboidal, with subequal base and declivity meeting at a rounded right angle in profile, rather sharply marked off by impressed sutures from the more anterior portion of the thorax. Petiole and postpetiole from above subequal and of similar shape, broader than long. Gaster proportionally larger than in the worker.

Sculpture, pilosity and color as in the worker but the hairs and pubescence longer and more abundant. The pubescence is very conspicuous, extending back over the

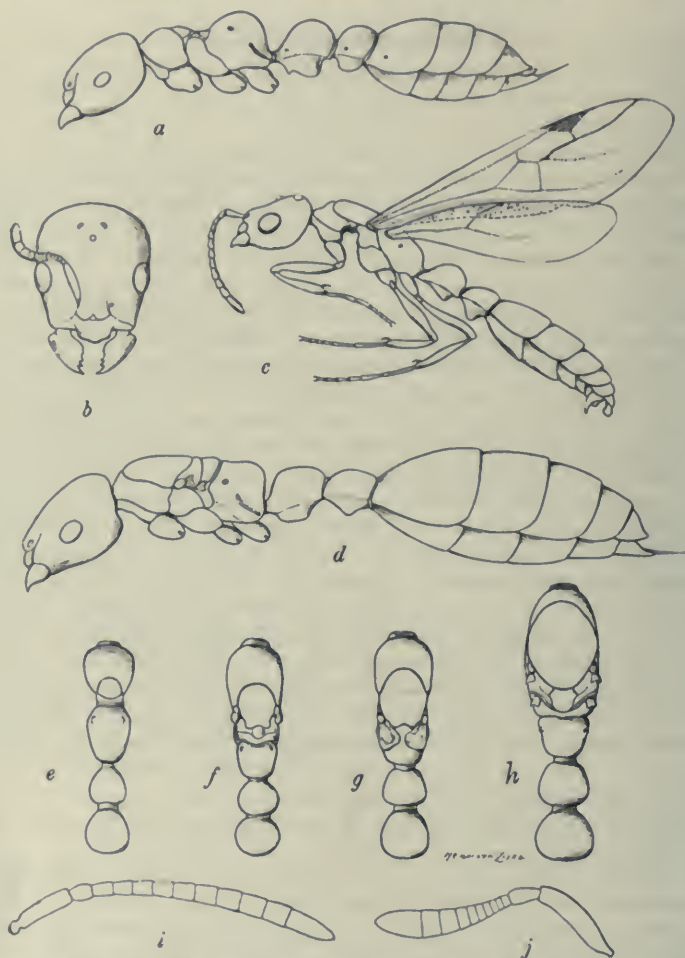


Fig. 23. *Vitilicicola tessmanni* (Stitz). *a*, body of worker in profile; *b*, head of worker from above; *c*, male in profile; *d*, body of deälated female in profile; *e*, thorax and peduncle of worker from above; *f* and *g*, thorax and peduncle of two subapterous females from above; *h*, thorax and peduncle of deälated female from above; *i*, antenna of male; *j*, antenna of worker.

sides and front of the head and especially on the pleuræ, epinotum, and nodes of the pedicel. As in the worker, the hairs and pubescence are longest on the sides of the gaster.

FEMALE (ergatoid).—

Length 3.5 to 4.5 mm.

Intermediate in the structure of the thorax, head, and abdomen between the worker and true female, possessing ocelli and with the mesonotum varying in size, as shown in the figures (Fig. 23*f-g*), as the specimen approaches the worker or female type more closely. The wings are represented by minute brownish or blackish tubercles, the anterior pair with vestigial tegulæ at their bases. Some specimens

(Fig. 23g) have the fore wings more developed as a pair of triangular pads with indistinct, contorted veins, and folded back over the anterior corners of the epinotum. The pilosity and pubescence are also intermediate between the worker and female; the color the same.

MALE.—

Length 2.6 to 3 mm.

Head, including the eyes, distinctly longer than broad, rounded behind and impressed in front of the anterior ocellus. Cheeks short. Eyes and ocelli rather large, convex. Mandibles small but with distinct, denticulate borders. Clypeus convex, its anterior border rounded and somewhat projecting. Frontal carinæ very short. Antennal scapes about three times as long as broad, funicular joints all distinctly longer than broad, cylindrical, very gradually increasing in length to the tip. Thorax narrow and long, flattened above, peculiarly and deeply excavated on the ventral side behind the insertions of the fore coxæ; mesosterna swollen. Epinotum resembling that of the female. Petiole and postpetiole much as in the worker, but the former subpedunculate, merging more gradually into the node, without a tooth on its ventral surface. Gaster long and slender. Fore wing with a single cubital cell.

Smooth and shining; hairs and pubescence much as in the worker but less abundant and more delicate.

Color pale yellow of a distinctly lighter tint than in the worker and female. Wings grayish hyaline, with pale brown veins and pterostigma.

Described from numerous specimens of all the phases belonging to a series of several hundred specimens taken at Medje from the hollow stems of *Vitex Staudtii* Guerke. The relations of the ant to the plant are described in Dr. Bequaert's notes in Part IV, and Prof. Bailey has described the woody structure of the plant and its modification by the ants in Part V.

Stitz described and figured only the worker of this species from specimens taken by Tessmann in Spanish Guinea. He gives the native Pangwe name as "odschigeso" and says that the insect stings more severely than *Pachysima æthiops*, which is a much larger and more powerful ant. He also describes one of the ergatoid females but seems to regard it as an unusual worker. In my material about 4 to 5 per cent of the specimens are ergatoid females, so that they must form a normal constituent of the colony. They probably function as egg-laying individuals and thus supplement the reproductive activities of the true females, which, judging from my material, are much less numerous.

The adult specimens of *V. tessmanni* collected by Mr. Lang are accompanied by numerous eggs, larvæ, and pupæ in all stages. I have figured the adult larva (Fig. 24) because it is interesting in connection with the extraordinary larvæ of the two species of *Pachysima* described below. It resembles the larva of *Tetraponera natalensis* figured by Emery,¹ but is longer and more slender and two of the postcephalic

¹1899, Mem. Accad. Sc. Bologna, (5) VIII, Pl. 11, fig. 7.

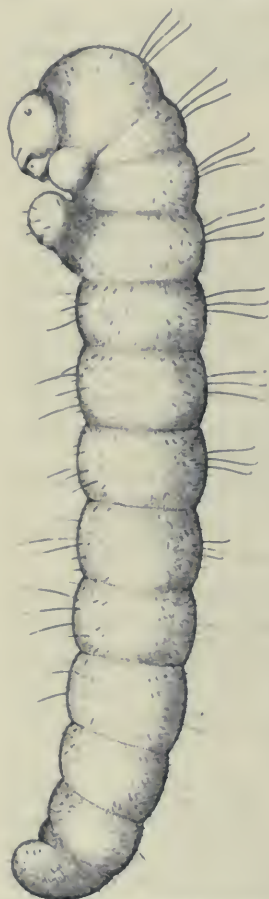


Fig. 24. *Viticicola tessmanni* (Stitz). Adult larva in profile.

segments bear appendages, the significance of which is more fully explained in my remarks on *Pachysima*. The prothoracic segment bears a rounded appendage on each side and applied to the side of the head, which, as in the *Tetraponera* larvæ, is overarched by the protuberant, cowl-like prothoracic segment. The first abdominal segment bears ventrally two large and very protuberant appendages which are fused with each other in the middle line. The anterior segments of the body have on their dorsal surfaces clusters of long hooked hairs, as in *T. natalensis*, and the more posterior segments have simple stiff hairs of very unequal length on their ventral surfaces. There are also numerous short, sparse hairs, scattered over the whole body. The young larvæ are essentially like the oldest in form and pilosity. The mandibles are well chitinated and minutely bidentate at the tip as in *natalensis*, and the head bears minute rudiments of antennæ on its dorsal surface. I find also that the larvæ of certain East Indian *Tetraponeræ*, e. g., *T. allaborans* (Walker), have a similar structure.

***Viticicola tessmanni* variety *castanea*,
new variety**

WORKER and FEMALE (deâlated).—In all respects like the typical form except in the color of the body and legs, which are pale chestnut brown, with the antennæ paler and more yellowish.

Of this variety Mr. Lang took numerous workers and females from two colonies at Avakubi. They were nesting in the same species of liana as the typical form.

PACHYSIMA Emery

WORKER.—Closely related to *Tetraponera* but larger and more robust, with smaller eyes but distinct ocelli and the frontal carinæ decidedly longer and farther apart. Maxillary palpi 5-jointed; labial palpi 4-jointed. Both the petiole and post-petiole armed beneath with stout teeth. Claws toothed as in *Tetraponera*.

FEMALE.—Much like the worker. Wings very long, with venation like that of *Tetraponera*; radial cell long and narrow.

MALE.—Resembling the female and with very similar wings. Antennæ 12-jointed; scapes only a little longer than the second funicular joint; first funicular joint not swollen, much shorter than the second. Mesonotum without Mayrian furrows. Pro- and mesosterna not separated by a deep concavity. Petiole and post-petiole not dentate beneath. External genital valves large and stout, strongly geniculate, with inturned points.

LARVA without hooked dorsal hairs; the exudatoria on the three thoracic segments and first abdominal segment in the youngest stage (trophidium) long and digitiform.



Map 19. Distribution of the genus *Pachysima* and its host plant *Barteria*: cross-hatched area, distribution of *P. xthiops* (F. Smith); crosses, known localities of *P. latifrons* (Emery); heavy interrupted line, limits of the range of the genus *Barteria*.

This genus comprises only two known species and was originally described by Emery as a subgenus. It is confined to West Central Africa (Map 19), its limited range being due to the fact that it lives in the hollow stems of *Barteria*, a genus of plants confined to the area marked on the accompanying map.

***Pachysima æthiops* (Smith)**

Text Figures 25, 26, and 27

Avakubi, ♂, ♂; Stanleyville, ♀; Ambelokudi, ♀; Isangi, ♀; Panga, ♀; Medje, ♀, ♀, ♂; Bafwabaka, ♀ (Lang and Chapin).

This shining, jet-black ant, the worker of which measures 9 to 10 mm., the male and female 13 to 14 mm., is the largest, most widely distributed, and therefore best known to taxonomists of all the Ethiopian species formerly included in the genus *Sima*. It is represented in the

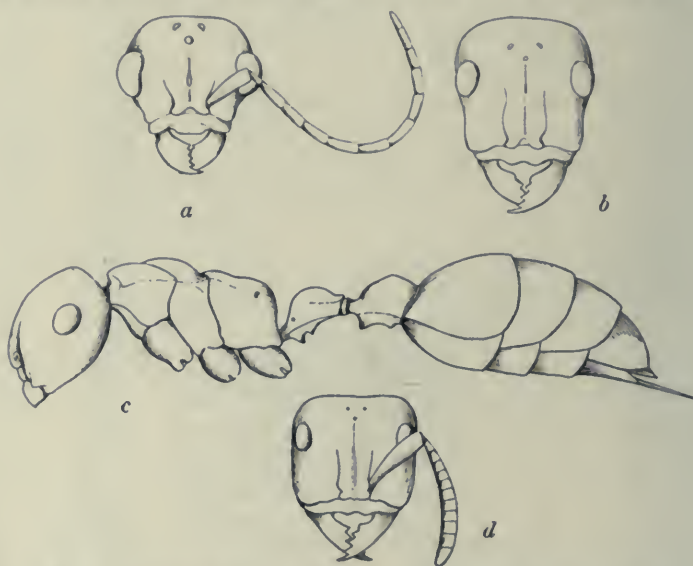


Fig. 25. *Pachysima æthiops* (F. Smith). a, head of male; b, head of female; c, body of worker in profile; d, head of same from above.

collection by numerous adults and larvæ and pupæ in all stages. The specimens from Medje and Ambelokudi were living in the twigs of *Barteria fistulosa* (Plates XXVIII and XXIX). "When disturbed the workers came out in great numbers. The natives, who call them 'gumaguma,' fear them on account of their sting."

Referring to specimens taken by Tessmann in Spanish Guinea and the Cameroon, Stitz says that "this ant is often found on the trunks of *Epitaberna myrmæcia* K. Schum., the thickened twigs of which it inhabits. It is called 'engunkun' by the natives and its sting is greatly feared as it is supposed to cause fever."

Father Kohl (1909, *Natur u. Offenbarung*, LV, p. 97, *et seq.*) gives a much more extensive account of the habits of *P. æthiops* and especially

of the plant *Barteria fistulosa* which it inhabits. According to his observations in the Congo, it is restricted to this plant and an allied species, *B. Dewevrei* De Wildeman and Th. Durand. It inhabits the peculiarly swollen, lateral branches and keeps large coccids in their cavities. The openings to the cavities are not made at definite points predetermined by a peculiar histological structure, as in the case of the Neotropical *Cecropiæ* associated with species of *Azteca*. After the marriage flight the *æthiops* queen gnaws its way into an already hollow twig and while she is establishing her colony the orifice, as in *Cecropia*, closes by growth

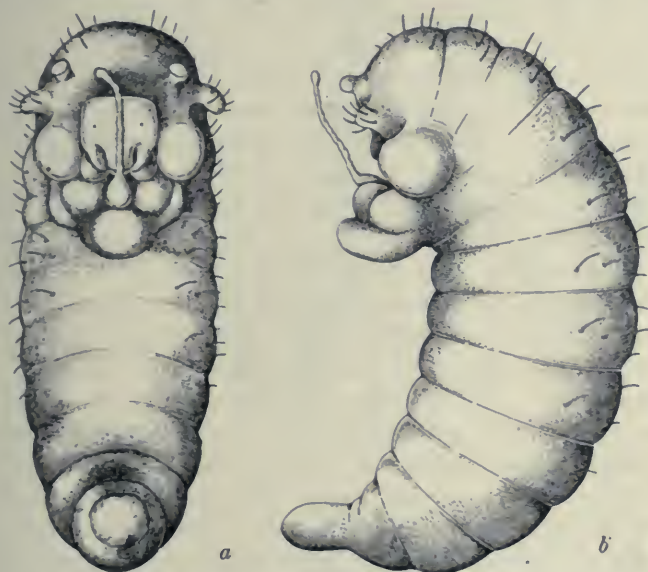


Fig. 26. *Pachysima æthiops* (F. Smith). First stage larva or trophidium. a, ventral; b, lateral view.

of the plant tissue, so that it has to be reopened from within by the workers of the young colony. As several queens enter different internodes of the same plant, their various colonies probably eventually unite to form a single huge colony possessing all the cavities in common, as in the case of *Cecropiæ* tenanted by *Azteca*. Concerning the behavior of *æthiops*, Kohl writes as follow:

The *Simæ* are extremely pugnacious and always ready for a fight as they are equipped with excellent weapons, their stings and mandibles. If a *Barteria* tree is roughly handled or even shaken, innumerable hosts of the ants rush out of all the openings and woe to him who approaches them too closely! I have had many sore experiences with their pointed stings while studying or amputating the branches.

The pain spreads instantly over the whole affected limb and continues for a long time and on the following morning returns with full intensity during one's ablutions. One day my black servant told me that it was customary in his part of the country to punish unfaithful wives by tying them to plants inhabited by the *Sima*.

On examining the series of *æthiops* larvæ, I was struck with their extraordinary appearance. A further study of them and of the larvæ of the only other known species of *Pachysima* (*P. latifrons*) throws considerable light on the *raison d'être* of the peculiar ethological relations of larval ants to their nurses, as I have shown in a recent paper.¹

Four distinct stages, probably separated by moults or ecdyses, may be recognized in the *æthiops* larva. The first stage larva, just after hatching, is represented in Fig. 26a-b as it appears in ventral and lateral view. The body is curved, convex dorsally and concave ventrally, and terminates behind in a cylindrical projection, with the anus shifted to the ventral surface near its base. The creature is strongly hypocephalic like the larvæ of *Tetraponera*, *Viticicola*, and *Pseudomyrma*, i. e., with the head on the ventral side. The head is surrounded by a cluster of prominent, tubercle-like appendages. On the prothorax, which is large and forms a hood over the head, there are three pairs of these appendages, an anterior truncate pair, a median pointed pair and a large posterior pair, which are swollen and rounded and embrace the sides of the head. These correspond to the single prothoracic pair figured in the larva of *Viticicola tessmanni*. The mesothoracic segment has a pair of smaller appendages nearer the midventral line. Between them arises a very peculiar organ, with a swollen, pear-shaped base prolonged into a slender, apparently erectile, tentacle-like process which extends up in front of the head and terminates in a small ampulla. The first abdominal segment bears a pair of large swollen appendages, which lie at the lateral bases of the mesothoracic pair and are united with a large and very prominent midventral tubercle. This tubercle and its lateral appendages are represented in the larva of *V. tessmanni* but the others, with the exception of the third thoracic pair, are absent. Sections and stained, cleared preparations of the whole larva show that the various tubercles contain portions of the fat-body, at least in the basal portions of their cavities, and next to the hypodermis a dense, granular substance, evidently a coagulated liquid produced by the adipocytes or trophocytes. The liquid also fills the impaired tentacle, except its pear-shaped base, which contains fat-cells. Around the bases of the tubercles are muscles so arranged that their contraction increases the pressure of the fat and granular

¹1918. 'A study of some ant larvæ, with a consideration of the origin and meaning of the social habit among insects.' *Proc. Amer. Phil. Soc.*, LVII, pp. 293-243, 12 figs.

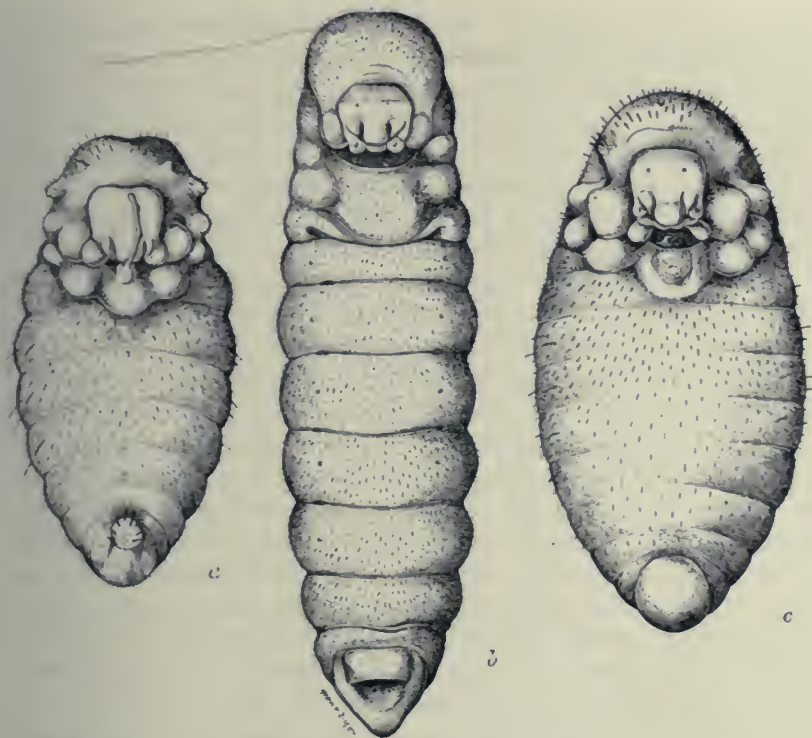


Fig. 27. *Pachysima aethiops* (F. Smith). a, second stage larva; b, third stage larva; c, fourth stage or adult larva.

liquid on the appendages and in all probability causes the liquid to exude through the hypodermis and delicate chitinous cuticle onto the surface. The whole arrangement of the tubercles, in fact, constitutes a system of exudate organs or "exudatoria," as I shall call them, adapted to produce a substance that can be licked up by the ants when they are feeding and caring for the larvæ. In this stage the mandibles are small, soft, and unchitinized, so that the ants must feed the larva by regurgitation on liquid food. The labium of the larva has a peculiar pair of swollen appendages, shown just beneath the mandibles in the figure. The body is naked, except for a few sparse, pointed bristles on the dorsal surface and the median pair of prothoracic appendages. As nothing like this larval stage is known among ants or indeed among the Hymenoptera, I propose to call it the "trophidium."

The second stage larva is shown in Fig. 27a. The various exudatoria are small in proportion to the remainder of the body but are still much

like those of the trophidium. The body is more elliptical, the mandibles are more pointed and distinctly falcate but, even in this stage, they are unchitinized and therefore nonfunctional. The coarse hairs are visible on the dorsal surface but a more uniform investment of small hairs has made its appearance. They are blunt or even clavate, especially on the prothoracic segment. In this and the trophidium stage, I am unable to find any salivary glands in cleared preparations, though rudiments of these organs may, perhaps, be present.

The third stage larva (Fig. 27*b*) is larger and very regularly elliptical. The exudatoria can all be recognized, except the impaired tentacle. It is, however, present in some of the younger individuals but in a greatly reduced and vestigial condition at the bottom of the deep depression which now forms a definite pocket just back of the mouth and under the midventral swelling of the first abdominal segment. In many larvæ I found in this pocket a small rounded, dark-colored pellet which puzzled me at first. In sections it was at once seen to consist of triturated and compacted bodies and parts of small insects. It is, in fact, a food-pellet placed by the worker ants in the pocket just behind the larva's mouth and proves to be merely the pellet which is originally formed in the infrabuccal pocket of the adult ants. In this stage, therefore, the larva is fed on solid food and the strongly chitinized, acute, and bidentate mandibles corroborate this statement. Slender salivary glands may also be detected in this stage indicating that the substance of the food-pellet is subjected to extra-intestinal digestion. The longer hairs on the dorsal integument have almost completely disappeared. The first pair of appendages on the prothorax have disappeared and the second pair is smaller or obsolescent.

In the fourth or adult stage (Fig. 27*c*) the larva is more elongate and cylindrical and much more hypocephalic, the prothorax forming a great protuberance in front of the head. The exudatoria are still recognizable, with the exception of the first and second prothoracic pairs, which have disappeared completely. The labial appendages are reduced. A food-pellet was found in the postcephalic pocket in several of the larvæ of this stage but is not represented in the figure. The coarse hairs have disappeared from the integument, which is now uniformly covered with very short, delicate hairs and the structure of the posterior end of the body is very different from that of the preceding stages.

The conclusions which I draw from the study of these larvæ and from those of *P. latifrons* and *Pædalagus infimus* (*vide infra*) are that the young larvæ are fed by regurgitation, the older larvæ with pellets of

crushed insects, and that, especially during their younger stages, the larvæ are so assiduously fed and cared for because they furnish liquid exudates, small in quantity, to be sure, but of such a quality as to excite the appetite of their nurses and induce regurgitation. I believe that the salivary glands, as soon as they develop, take on the function of supplying exudates and at the same time aid in the extra-intestinal digestion of the food placed in the postcephalic pocket. That the salivary glands may be important as exudate organs throughout life is indicated by certain genera of Myrmicinae (e. g., *Pædalagus*), the larvæ of which have no exudatoria but greatly developed salivary glands, though the latter are never used for spinning cocoons in the prepupal stage. Thus in ants very much the same "œcotrophobiotic" relations exist between the adults and young as Roubaud¹ has so beautifully described for the wasps of the genera *Belonogaster*, *Ropalidia* (= *Icaria*), and *Polistes*. To these relations, established by a mutual exchange of food-substances and which I have called "trophallactic," the social life of ants in all probability owes its origin, development, and maintenance. Moreover, the exudates of larval ants are strictly comparable with those of various castes of termites among themselves, of the queens of parasitic ants and even of workers (e. g., *Crematogaster inflata* of the East Indies), with the excrement of coecids and aphids, the secretions of lycænid larvæ and the nectar of the extrafloral nectaries of plants. Thus trophallaxis, myrmecophily, termitophily, trophobiosis, and the relations of ants with certain plants (myrmecophytes) are all seen to be merely so many particular manifestations of the same fundamental instinct of ants to foster and defend and, if possible, to feed and transport any small living object which can furnish droplets of agreeable secretion or exudates.

The only account of the *æthiops* larva in the literature is by Emery.² He describes the adult larva very briefly and figures its anterior end with some of the exudatoria but erroneously interprets the large prothoracic pair as "ébauches de pattes," or rudiments of the anterior pair of imaginal legs.

In the same paper Emery created the subgenus *Pachysima* for the accommodation of *æthiops* and *latifrons*, because those species have the frontal carinæ of the worker and female much more widely separated than the numerous other species of *Tetraponera* (= *Sima*). I have raised *Pachysima* to generic rank, because the larvæ of the two species are so very different from those of *Tetraponera*.

¹1916. 'Recherches biologiques sur les guêpes solitaires et sociales d'Afrique.' Ann. Sc. Nat. Zool., (10) I, pp. 1-160.

²1912, Ann. Soc. Ent. Belgique, LVI, p. 97.

***Pachysima latifrons* (Emery)**

Text Figures 28, 29, 30, and 31

WORKER.—Length 7 to 8.5 mm. Similar to the worker of *P. aethiops* but smaller, smoother and more shining, and much more finely punctate, with the frontal carinae somewhat farther apart and more nearly parallel. The mandibles have less oblique apical borders and are smooth and shining and sparsely punctate, not coarsely striated as in *aethiops*; the mesonotum is shorter and semicircular; the epinotum in profile somewhat lower and more rounded; the petiole bears on its ventral surface a single large acute, backwardly directed spine, instead of two spines, and the postpetiole has in the same relative position a smaller spine of similar shape, representing the larger, blunter projection of *aethiops*. The erect hairs and pubescence on the body are distinctly more abundant in *latifrons*, and the clypeus has a conspicuous fringe of yellow ciliary bristles, which are not developed in *aethiops*, and the antennal scapes have a row of long scattered hairs on their anterior surfaces. There is no difference in coloration.

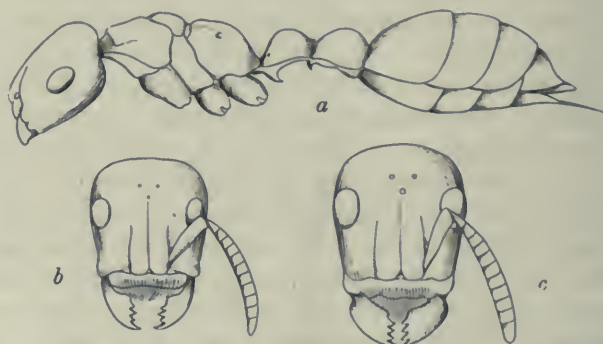


FIG. 28. *Pachysima latifrons* (Emery). a, body of worker in profile; b, head of worker from above; c, head of female.

FEMALE.—Length nearly 12 mm. Closely resembling the worker and differing by the same characters from the female of *aethiops*. The head and thorax are more slender than in the latter species and the petiolar and postpetiolar nodes are narrower and less submarginate on the sides. The pilosity and pubescence are much less developed on the body than in the worker, though the clypeus has conspicuous yellow ciliary bristles and the antennal scapes have a few long hairs along their anterior surfaces. The wings are blackened like those of *aethiops*.

Described from numerous workers and a single female taken from a colony at Niangara (Lang and Chapin), also in hollow twigs of a *Barteria*, presumably *B. fistulosa*. This species appears to be confined to western Africa; its distribution is still imperfectly known.

The larval stages are quite as remarkable as those of *P. aethiops* and exhibit four stages as follows.

The trophidium, or first stage larva, shown in Fig. 29a-b, is very hypoecephalic, the prothoracic segment being greatly enlarged and projecting anteriorly. Stained preparations *in toto* and sections show that the portion of the fat-body in this segment is heavily charged with urate crystals, so that it undoubtedly functions as a storage kidney till the Malpighian vessels are sufficiently developed to excrete. The first and second pairs of prothoracic appendages of the *æthiops* larva are absent, but the third pair is very large and embraces the sides of the head. The meso- and metathoracic segments each bear a pair of slender, pointed appendages, the first abdominal segment a huge leg-like pair which are

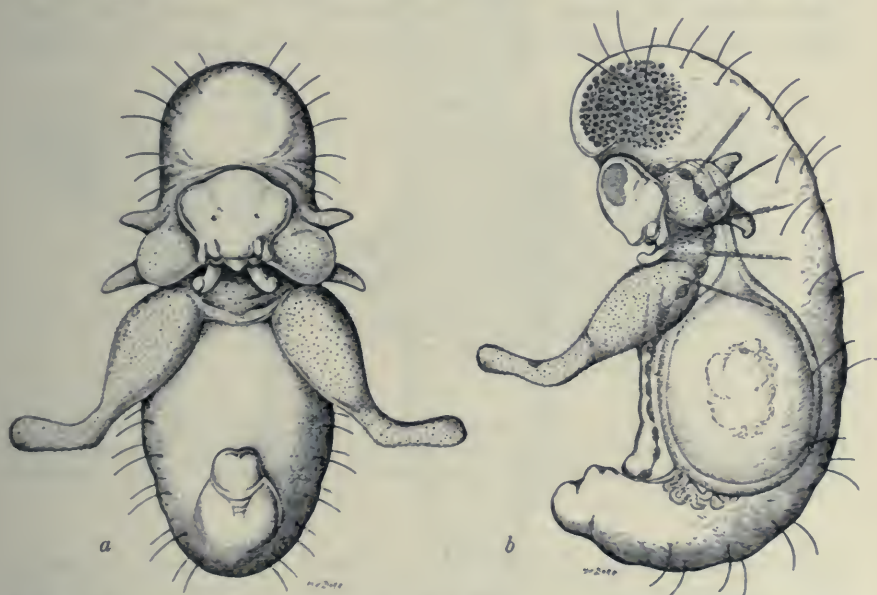


Fig. 29. *Pachysima latifrons* (Emery). First larval stage or trophidium. a, ventral; b, lateral view.

swollen and fusiform at the base and running out into a slender process which forms an obtuse angle with the basal portion. The sternal region between these appendages is protuberant and its cuticular covering, like that of the four pairs of appendages, is minutely prickly, unlike the smooth cuticle of the remainder of the body. Sections show that both the four pairs of appendages and the sternal swelling are exudate organs, though the prothoracic and abdominal pairs are evidently much more important than the others. The prothoracic appendages are filled with blood and very little fat-tissue, but their hypodermis is much thickened

and consists of crowded cells arranged in peculiar clusters. In section, the abdominal appendages appear as in Fig. 30. The fusiform base is filled with large, clear trophocytes, or fat-cells, some of which in the middle of the swelling may be filled with urate crystals, like those in the prothoracic storage kidney, but the slender, tubular distal portion contains a granular liquid which can only be regarded as an exudate derived from the trophocytes in the basal enlargement. This exudate is evidently filtered through the thin cuticle covering the appendage by pressure, for there is a rather elaborate system of museles, as in the *æthiops* larva, surrounding the bases of the appendages and capable of subjecting their contents to pressure. The head is small and has soft, blunt, rudimentary and unchitinized mandibles and the labium bears a pair of long,



Fig. 30. Longitudinal section through exudatorium of first abdominal segment of trophidium of *Pachysima latifrons* (Emery): *t*, trophocytes or fat-cells of the fusiform base, some of them in the middle with urate crystals (*u*); *x*, granular liquid or exudate filling the distal portion; *d*, dermis; *e*, epidermis; *h*, hypodermis.

palp-like appendages, which project forward in the deep depression between the head and the swollen sternal portion of the first abdominal segment. These are probably also exudatoria and seem roughly to correspond to the unpaired tentacle of the *æthiops* larva. The structure of the mouth-parts shows that the larva in this stage is fed with liquid food regurgitated by the workers. The convex dorsal surface is beset with sparse, curved bristles of uniform thickness, with blunt tips. The segmentation of the body is indistinct and its posterior end curves forward and terminates in a large tubercle with the anal orifice just anterior to its base. The Malpighian vessels have only just begun to develop at the blind end of the proctenteron where it abuts on the posterior end of the large, elliptical mesenteron, or stomach, but no salivary glands can be detected.

In the second stage larva (Fig. 31a) the body is more elongate and cylindrical and the four pairs of appendages can still be recognized though considerably smaller in proportion to the remainder of the body. The mandibles are becoming chitinized. Many of the long hairs on the dorsal surface are still present, but a general covering of short, sparse hairs has made its appearance.

The third stage larva (Fig. 31b) is larger and still more elongate and cylindrical and shows a further regressive development of the exudatoria. Those on the meso- and metathoracic segments have disappeared and

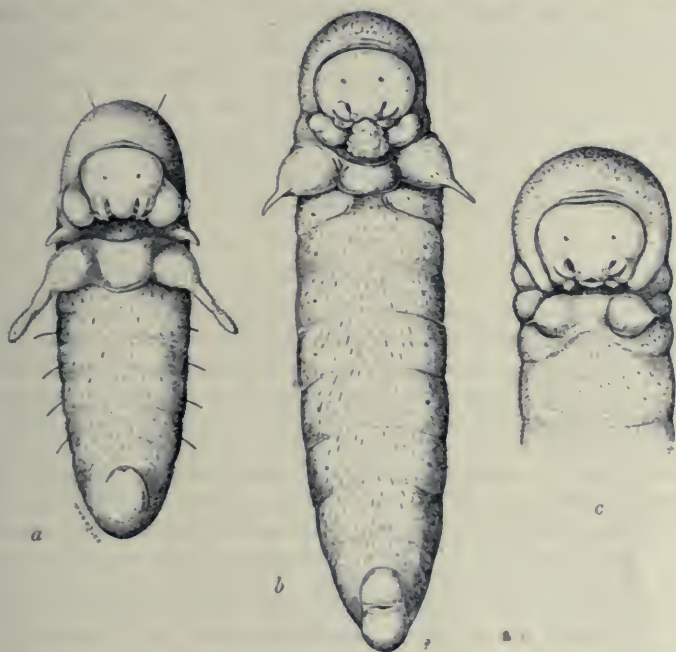


Fig. 31. *Pachyeima latifrons* (Emery). a, second stage larva; b, third stage larva; c, anterior half of fourth, or adult, larval stage.

the abdominal pair has short broad bases with the distal portions attenuated to slender points. The labial appendages have also disappeared. The mandibles are well developed and chitinized, and the larva is now fed with pellets of crushed insects, like the *aethiops* larva in the corresponding stage. These pellets were found still *in situ* in several of the alcoholic specimens as represented in the figure (Fig. 31b). The pellet lies in the deep pocket between the head and the sternal protuberance of the first abdominal segment and is, therefore, within easy reach of the

mandibles and labium of the larva. Cleared preparations show that the salivary glands have made their appearance, though they are small and slender.

The anterior end of a fourth stage or adult larva is shown in Fig. 31c. The exudatoria of the prothoracic segment now appear merely as a pair of welts or folds embracing the sides of the head and continuous with the more dorsal portions of their segment, which is relatively smaller and less projecting than in the preceding stages. The appendages of the first abdominal segment are still distinct but their distal portions are reduced to mere points, sometimes absent in larvæ just before pupation, and the sternal swelling is much less prominent. In this stage the larva resembles that of *Tetraponera* throughout its various stages. In the third and fourth stages of the *latifrons* larva, as in the corresponding stages of *æthiops*, the salivary glands probably furnish secretions which are useful both in the extra-intestinal digestion of the food-pellet and as exudates that can be imbibed by the workers.

Myrmicinæ

WORKER monomorphic, dimorphic, or polymorphic, often very strongly so; the soldier form having a very large head and strong mandibles. Frontal carinae nearly always separated, rarely close together; divergent or slightly convergent behind and rarely lobed anteriorly; usually the clypeus is wedged in between the frontal carinae; in the Metaponini and a few other forms the clypeus is not prolonged back, its posterior margin being rounded. Antennæ from 4- to 12-jointed, often with a distinct club. Ocelli frequently absent in the ordinary worker, though in strongly dimorphic species they may still be more or less distinct in the soldier. Pedicel formed by the petiole and the postpetiole; very rarely (*Melissotarsus*) the postpetiole is nearly as wide as the basal segment of the gaster. Stridulatory organ usually present at the base of the gaster. Sting developed. Spurs of the middle and hind tibiae in the majority of cases simple or absent; pectinate in the Metaponini and Myrmicini only. Gizzard simple and tubular in most genera and of a very primitive type compared with the conditions in the Dolichoderinæ, Camponotinæ, and Pseudomyminæ.

FEMALE usually winged and larger than the worker; in a few cases ergatoid; true dichthadiiform queens are not known, but in some parasitic genera (*Anergates*, *Anergatides*) the gaster of the fertile female becomes enormously distended.

MALE usually with the copulatory armature partly exerted; entirely retractile in a few genera of the Solenopsidini only. Anal segment with cerci. In a few cases (as in certain species of *Cardiocondyla*) ergatoid, wingless males are known, sometimes together with winged individuals. Antennæ almost always 13-jointed, even when the worker and female have very few antennal joints (11-jointed in *Stereomyrmex* and *Cataulacus*; 12-jointed in *Metapone*, certain Attini, Meranoplini, etc.).

The venation of the fore wing offers much diversity. In some genera the more primitive type is still retained, with a closed radial, two closed cubital cells, and a closed discoidal cell, but all degrees of reduction are met with. When there is only

one cubital cell, the cubitus may be united with the radius by means of a long intercubitus (type of *Solenopsis*) or the intercubitus may disappear, the cubitus and radius being fused in a spot or for some distance (type of *Formica*).

LARVA thick-bodied, orthocephalic, without exudatory papillæ around the mouth. The body is, as a rule, abundantly covered with chitinous hairs of very different kinds; dorsal oncochaetæ often present.

NYMPHS never enclosed in a cocoon.

The Myrmicinae is the largest subfamily of ants, containing over 120 genera and many thousands of described species, races, and varieties, nearly as many as the other six subfamilies together. As would be expected, the taxonomic arrangement of this maze is exceedingly difficult and it is no wonder that such keen myrmecologists as Forel and Emery have not yet succeeded in reaching satisfactory results and are obliged to modify their views at every turn of the road. For practical and other reasons, have felt at liberty to change somewhat the classification proposed by Emery,¹ though have followed him in the main. Have united the two tribes Solenopsidini and Pheidologetini, which pass repeatedly into each other and are merely separated by the shape of the radial cell (closed in the Pheidologetini; open in the Solenopsidini), a character the value of which seems to have been overrated by Emery. Have also accepted Forel's tribe Proattini and, furthermore, separated *Stegomyrmex* from the Dacetini as an independent tribe. The very peculiar genus *Archæomyrmex*, recently discovered by Mann in the Fiji Islands, must also constitute a distinct tribe, which I have provisionally placed between the Myrmecini and Meranoplini.

The habits in this subfamily offer no less diversity than the structure. The majority of the species are carnivorous or partly so; but many others are granivorous, the most prominent in this respect being the members of *Messor* and allied genera (*Novomessor*, *Veromessor*, *Oxyopomyrmex*, *Pogonomyrmex*, many species of *Pheidole*, etc.). In these ants the nest often contains spacious granaries full of seeds. Many myrmecine ants are attracted by sugary substances such as are furnished by the nectaries of flowers or various extrafloral plant organs. Often, also, they attend aphids, coccids, psyllids, or leafhoppers for the sake of the honeydew they excrete. The New World "leaf-cutting" or "fungus-growing" ants of the tribe Attini feed exclusively on the food-bodies ("bromatia") produced by fungi cultivated in their nests. There are also many cases of social parasitism which, in its most extreme form, has

¹Emery, C. 'Intorno alla classificazione dei Myrmecinae,' Rend. Accad. Sc. Bologna, 1914, pp. 29-42.
'Noms de sous-genres et de genres proposés pour la sous-famille des Myrmecinae; modifications à la classification de ce groupe,' Bull. Soc. Ent. France, 1915, pp. 189-192.

lead to the disappearance of the worker caste (*Wheeleriella*, *Epixenus*, *Epipheidole*, *Sympheidole*, *Epæcus*, *Anergates*, *Anergatides*, and probably several other genera of which only males and females are known). Temporary social parasitism is probably the rule in some species of *Aphænogaster* and in the Malagasy and Indomalayan subgenus *Oxygyne* of *Crematogaster*.

PHEIDOLE Westwood

Small ants with the worker strongly dimorphic, the two forms being designated as the worker and soldier. In a few species these phases are connected by intermediates (*mediæ*).

SOLDIER with very large head, subrectangular or subcordate, more or less deeply notched or excised behind and with a distinct occipital furrow, on each side of which the occipital region is convex. Clypeus short, depressed, carinate or ecarinate but not elevated in the middle, the anterior border entire or notched in the middle, the posterior border extending back between the frontal carinae, which vary in length, being short in some species and in others greatly prolonged backward and forming the inner borders of more or less distinct scrobes for the antennae. Frontal area usually distinct, deeply impressed. Mandibles large, convex, usually with two apical and two basal teeth, separated by a toothless diastema. Antennae 12-jointed; the funiculus with long first joint; joints 2 to 8 small and narrow; the three terminal joints forming a well-developed club. Thorax small, usually with distinct promesonotal and mesoëpinotal sutures and pronounced mesoëpinotal constriction; the pro- and mesonotum raised, more or less convex, the humeri sometimes prominent, the mesonotum often with a transverse welt or torus; the metanotum sometimes represented by a distinct sclerite; the epinotum armed with spines or teeth, in profile with distinct basal and declivous outline. Petiole small and narrow, pedunculate anteriorly, the node posterior, compressed anteroposteriorly, its superior border sometimes emarginate, the ventral surface unarmed. Postpetiole broader than the petiole, convex and rounded above, contracted behind, the sides often produced as angles or conules, more rarely as spines. Gaster rather small, broadly elliptical or subcircular. Femora more or less thickened in the middle; middle and hind tibia without spurs; tarsal claws simple.

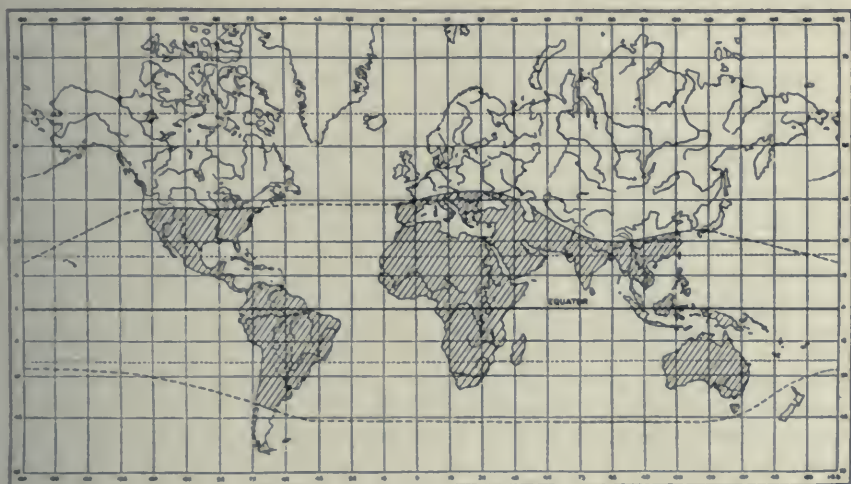
WORKER smaller than the soldier but very similar in the structure of the thorax, pedicel, and gaster; the head, however, much smaller, not grooved nor deeply excised posteriorly; the antennae longer; the mandibles less convex, with evenly denticulate apical borders. The pro- and mesonotum are proportionally less convex, and the petiole and postpetiole are more slender.

FEMALE resembling the soldier but larger; the head proportionally smaller and shorter, usually not longer than broad and not broader than the thorax; the occiput only broadly and feebly excised. Thorax broad and massive; the mesonotum flat, overarched the pronotum in front. Epinotal spines shorter and stouter; petiole and postpetiole more massive; gaster much larger and more elongate than in the soldier. Wings long, with a discoidal cell, two closed cubital cells, and an open radial cell.

MALE decidedly smaller and more slender than the female, the head small, with large, convex eyes and ocelli; mandibles small but dentate. Clypeus longer than in

the soldier. Antennæ 13-jointed; the scapes very short, scarcely longer than the second funicular joint, first joint subglobular. Thorax broad; the mesonotum flattened, without Mayrian furrows, anteriorly overarching the small pronotum; epinotum unarmed. Petiole and postpetiole slender, with low nodes. Gaster slender, elongate. Genital appendages small. Cerci present. Legs long and slender. Wing venation as in the female.

The species of this very large and difficult genus are distributed over the tropics and warmer temperate areas of both hemispheres (Map 20). In the Nearctic Region the northernmost range is southern New England



Map 20. Distribution of the genus *Pheidole*.

and Oregon; in the Palearctic, Japan and northern Italy; in the southern hemisphere it reaches Argentina and Tasmania. Emery has divided the genus into a number of subgenera and has rejected a couple of subgenera, *Allopheidole* and *Cardiopheidole*, described by Forel and myself. The various groups have been characterized by Emery in a recently published portion of the 'Genera Insectorum' on the Myrmicinae.

Nearly all the species of *Pheidole* nest in the ground, either under stones and logs or in crater or small mound nests. Many species feed exclusively on insects and often have a peculiar fecal odor precisely like that of the Dorylinae, which also have an insect diet; but many species are harvesters and store the chambers of their nests with the seeds of small herbaceous plants. This is especially true of the desert species of *Pheidole*. In some species in Australia and the southern United States, the soldiers take on the function of repletes and store in their crops sweet

liquid for the use of the colony during periods of food and water scarcity. One species, *Pheidole megacephala*, has been carried to all parts of the tropics and has become a great pest in and about dwellings and plantations as it assiduously cultivates coccids on many economic plants and ruthlessly destroys and replaces the native ant-faunas. This has been observed in the Madeira Islands, Hawaii, Australia, and the West Indies. In all probability *P. megacephala* is of Ethiopian or Malagasy origin, as it shows a great development of subspecies and varieties in these two regions and nowhere else.

***Pheidole batrachorum*, new species**

SOLDIER.—

Length 4.5 to 5 mm.

Allied to *P. caffra* Emery. Head a little longer than broad, scarcely narrowed in front, with straight sides and deeply excised posterior border, the vertex convex, the occipital region distinctly depressed, the occipital and frontal groove shallow. Eyes small, broadly elliptical, rather flat, at the anterior third of the sides of the head. Mandibles convex with bluntly bidentate tips. Clypeus flat, carinate, its anterior border notched in the middle. Frontal area small, subtriangular, deeply impressed, without median carinula. Frontal carinae not strongly diverging behind, prolonged backward as a pair of rugæ to the posterior fifth of the head and forming the inner borders of flat, scrobe-like impressions for the antennæ. The latter slender, their scapes distinctly flattened but not dilated at the base, extending to nearly half the distance between the eyes and the posterior corners of the head; club shorter than the remainder of the funiculus; joints 2 to 8 distinctly longer than broad. Pro- and mesonotum not separated by a suture, convex; humeri prominent; mesonotum with strong transverse torus; mesoepinotal constriction very sharp and deep; epinotum broader than long, its base straight and horizontal, as long as the declivity, dorsally with a broad longitudinal groove; the spines acute, stout at the base, as long as the base of the epinotum and as long as their distance apart, directed upward and somewhat backward and distinctly curved downward. Petiole twice as long as broad, scarcely broader behind than in front, with nearly straight sides; in profile with long, feebly concave anterior and short, vertical posterior surface to the node, the superior border transverse, sharp and feebly emarginate. Postpetiole nearly three times as broad as the petiole, broader than long, very convex and rounded above, the sides bluntly angular in the middle. Gaster smaller than the head, subcircular, its anterior border slightly truncated, the dorsal surface somewhat depressed. Legs long, femora thickened in the middle.

Subopaque; mandibles, clypeus, frontal area, and posterior half of gaster smooth and shining. Mandibles coarsely and sparsely punctate; coarsely rugose at the base. Clypeus very finely rugulose, especially on the sides. Head densely and finely, but not deeply punctate, longitudinally rugose, the rugæ being rather widely separated and subsiding on the posterior fifth of the head; the posterior fourth also with a few large, shallow, elongate foveolæ. Thorax, pedicel, and anterior half of gaster more opaque than the head, finely and densely punctate; the pronotum also finely and rather asymmetrically transversely rugulose. Mesoepinotal constriction with sharp

longitudinal carinulae or rugae; declivity of epinotum transversely rugose above. Basal half of gaster with sparse, elongate, piligerous elevations. Legs smooth and shining.

Hairs coarse, pointed, fulvous, long, and erect, lacking on the thorax and sides of head, sparse on the pedicel and gaster and front of head; short and closely appressed on the legs and antennae.

Deep piceous, almost black; mandibles, clypeus, cheeks, and appendages castaneous; the funiculi, tips of scapes, tibiae, tarsi, and articulations of the legs paler and more reddish.

WORKER.—

Length 3 to 3.5 mm.

Head (without the mandibles) nearly circular, the occipital border strongly marginate. Eyes rather small but convex, just in front of the middle of the sides of the head. Mandibles long, deflected, their external borders concave, their tips with two prominent teeth, the remainder of the apical border finely denticulate. Antennae long and slender, the scapes extending fully one-third their length beyond the occipital border of the head. Clypeus rather flat in the middle, eecarinate, its anterior border entire and broadly rounded. Thorax resembling that of the soldier, but the humeri not prominent, the torus of the mesonotum is feebler, the epinotal spines are more slender, and distinctly shorter than the base of the epinotum and more curved than in the soldier. Petiole more slender, the node lower, more conical, its superior border not emarginate, scarcely more than twice as long as broad. Postpetiole campanulate, as long as broad, broader behind than in front. Gaster elongate elliptical, with truncated anterior border, its dorsal surface convex. Legs long and slender.

Shining; mandibles very finely and densely striolate. Clypeus, head, thorax, and pedicel densely punctate or reticulate; the head somewhat smoother and more shining in the middle anteriorly; the sides of the pronotum smooth and polished; cheeks and sides of front with a few longitudinal rugules. Base of first gastric segment sculptured much as in the soldier.

Hairs less coarse than in the soldier, present also on the thorax; hairs on the legs and antennae longer and more abundant, on the scapes abundant and oblique.

Color very much like that of the soldier.

Described from four soldiers and twenty-one workers from Akenge (Lang and Chapin), all taken from the stomachs of toads (*Bufo polycercus* and *funereus*) and frogs (*Arthroleptis variabilis*).

This species is certainly distinct from *caffra* in the greater size and different shape of the head of the soldier, the long acute and curved epinotal spines and different shape of the thorax. It is evidently a Rain Forest insect, whereas *caffra* seems to be confined to dry country.

Pheidole aurivillii Mayr variety *attenuata* Santschi

Medje, ♂, ♀; Bafwabaka, ♂, ♀ (Lang and Chapin); Walikale to Lubutu, ♂, ♀, ♀, "taken from a colony under bark of a fallen tree trunk" (J. Bequaert). I refer numerous specimens from these localities to Santschi's variety, because they are of very small size and dark color, the soldiers measuring only 3.5 to 4 mm., the workers 2 to 2.5 mm.

The type of the species is considerably larger (soldier, 4.6 to 5 mm.; worker, 3 mm.). According to Santachi, the species varies much in stature and color. The females from Walikale measure 7 mm. and are dark brown, like the soldiers and workers, with dull yellowish brown wings. If I am correct in my interpretation, *attenuata* would more properly constitute a distinct subspecies.

***Pheidole caffra* Emery subspecies *bayeri* Forel variety *thysvillensis*,
new variety**

SOLDIER.—Length 4 to 4.5 mm. Smaller than the typical *bayeri*, with the head of the same shape, but subopaque and with only the front and occiput somewhat shining. The occipital depression is less distinct than in the subspecies *abyssinica* Forel, and the rugæ are anteriorly less numerous, coarser, and farther apart, but very fine and distinctly transverse on the occiput. The antennal scapes are shorter than in the typical *bayeri*, reaching only a little beyond the middle of the head. The suberect epinotal spines are not pointed as in *abyssinica* and *bayeri* but somewhat longer, of uniform thickness or even slightly enlarged at the tips, which are blunt. The base of the epinotum is not longer than broad. The postpetiole is somewhat narrower than in *bayeri* and *abyssinica*, with blunter lateral angles. Thorax, petiole, and postpetiole more finely rugulose-punctate than in *abyssinica*; gaster shining, with the base of the first segment subopaque and alutaceous. Color as in *abyssinica*, with the head and thorax ferruginous brown but varying in some specimens to pale ferruginous red, with the gaster black or brown and the base of the first segment and posterior borders of all the segments paler and more reddish or yellowish.

WORKER.—Length 2 mm. Smaller than the worker of *bayeri*. Head elliptical, without posterior corners, longer than broad. Antennal scapes extending two-fifths their length beyond the occipital border, which is rather sharply marginate. Shining; head and thorax finely reticulate; mesonotum, epinotum, petiole, and ventral and lateral portions of the postpetiole opaque and densely punctate. Ferruginous brown; head castaneous; mandibles except their teeth, yellowish.

Described from numerous specimens taken both by Lang and Bequaert at Thysville, apparently from the same colony, "nesting in sandy soil in the savannah."

***Pheidole caffra* subspecies *senillifrons*, new subspecies**

Text Figure 32

SOLDIER.—Length 4 mm. Differing from the typical form and the subspecies *bayeri* in the sculpture of the head, the sharp longitudinal rugæ between the prolonged frontal carinae being surrounded by the rugæ from the sides of the head, which run up to the posterior corners, then turn at a right angle and run transversely on the occipital lobes to the occipital furrow. These rugæ are quite as strong as those on the front, but denser. The head is a little longer and a little more depressed posteriorly than in the variety *thysvillensis*, the transverse welt of the mesonotum less pronounced; the blunt epinotal spines distinctly shorter. The sculpture of the thorax and pedicel and the color and pilosity are much as in that variety.



Fig. 32. *Pheidole caffra* subspecies *senilifrons*, new subspecies. Soldier. a, body in profile; b, head from above.

WORKER.—Length 1.8 mm. Very similar to the worker *thysvillensis* but the pronotum is smooth and shining and the epinotal spines are shorter, less obtuse, and more erect.

Four soldiers and a single worker from Yakuluku, where they were found “nesting in a small mushroom-shaped termitarium” (Lang and Chapin).

***Pheidole kohli* Mayr**

A single soldier from Medje (Lang and Chapin), without further data, agrees very closely with Mayr's description of this species.

***Pheidole kohli* Mayr, variety**

A single imperfect soldier and five females, three of them winged, taken from the stomachs of a toad (*Bufo regularis*) and a frog (*Rana ornatissima*) from Garamba (Lang and Chapin), appear to represent an undescribed variety or subspecies of *kohli*, the soldier being darker and having a distinctly narrower head. The pedicel, gaster and funiculi are, however, lacking in the single specimen of the soldier. It seems to be undesirable to base a new name on such defective material.

***Pheidole megacephala* (Fabricius)**

Niangara, ♂; Akenge, ♀; Stanleyville, ♀; Banana, ♂, ♂ (Lang and Chapin); Zambi, ♂, ♀, ♀ (Bequaert and Lang); Matadi, ♂, ♂; Thysville, ♂; Boma, ♂, ♂, ♀; Malela, ♂, ♂, ♀ (J. Bequaert). All these specimens belong to the typical form of this well-known tropicopolitan pest. I have been unable to recognize among it Forel's subspecies *nkomoana*, originally described from the vicinity of Stanleyville. In the

colony taken at Zambezi by Lang and Bequaert there are several specimens of an interesting *Microdon* larva, which is figured and described in Part VI. The female specimens from Akenge and Stanleyville, five in number, were taken from the stomach of a toad (*Bufo polycercus*) and a frog (*Rana mascareniensis*).

***Pheidole megacephala* subspecies *ilgi* (Forel)**

A soldier and several workers taken by Dr. Bequaert at Lesse from a colony nesting at the base of a papaya. It was on the head of one of the soldiers in this colony that he found a singular phorid fly, *Plastophora aculeipes* (Collin), subsequently referred to by H. Schmitz.¹

***Pheidole megacephala* subspecies *melancholica* (Santschi)**

Six soldiers, five workers, and seven females, mostly winged, taken at Garamba (Lang and Chapin) from the stomachs of a toad (*Bufo regularis*) and two frogs (*Rana ornatissima* and *Kassina senegalensis*). The female is a little larger than the female of the typical *megacephala*, with the head and thorax more sharply sculptured and the color of the body, including the clypeus and mandibles, darker, almost black; the legs more yellowish, as in the worker.

This is the host of the singular workerless parasitic ant, *Anergatides kohli*, recently described and figured by Wasmann from the vicinity of Stanleyville.²

***Pheidole megacephala* subspecies *punctulata* (Mayr)**

Boma, 2, 3, ♀; Ngayu, 2, 3; Avakubi, 2, 3; Stanleyville, 2, 3, ♀, ♂; Bolobo, 2, 3; Faradje, 2, 3; Zambezi, 2, 3, ♀; Niapu, 2, 3; Garamba, 2, 3; Banana 2, 3 (Lang and Chapin).

A well-known and widely distributed Ethiopian form, apparently more abundant in the Belgian Congo than the typical *P. megacephala*. The specimens from various colonies show considerable variation in color, some being dark brown, others pale and more yellowish or reddish, especially those from Stanleyville and Banana. Mr. Lang gives the native name of the species as "tuegeke" and his notes give the nesting sites as "under heaps of decomposed, moist grass," "in fallen stems of *Hyphæne*," "in mushroom-shaped termitaria in swamps," and "in the tops of termite mounds."

¹1910, Zoolog. Meded. Mus. Leiden, II, p. 28.

²1915, Ent. Mitt. Deutsch. Ent. Mus. Berlin, IV, p. 281.

Phisidole minima* Mayr subspecies *malelana*, new subspecies*SOLDIER.—**

Length 2.3 mm.

Head shaped much as in *P. megacephala*, without the mandibles a little longer than broad, distinctly but not broadly depressed in the occipital region. Eyes small, flat, at the anterior third of the head. Clypeus flat, eearinate. Frontal area small, impressed; frontal carinae diverging, reaching to the posterior third of the head, bounding distinct scrobes for the antennal scapes, which are half as long as the head. Funicular joints 2 to 8 distinctly broader than long, club longer than the remainder of the funiculus. Mandibles large and convex, coarsely bidentate at the tip. Thorax robust, pronotum very convex, with small but distinct humeral tubercles. Mesonotum falling almost vertically to the pronounced mesoepinotal constriction, with a slight transverse convexity in the middle. Epinotum broader than long, concave and sloping in the middle, its spines rather erect, shorter than the interval between their bases, with pointed tips. Petiole with rather high, anteroposteriorly compressed, distinctly emarginate node. Postpetiole only one and one-half times as broad as the petiole, broader than long, with the sides angularly produced. Gaster much smaller than the head, elliptical, convex, with subtruncate anterior border. Legs stout, femora thickened in the middle.

Shining; mandibles sparsely punctate; clypeus rather smooth in the middle, indistinctly rugulose on the sides; anterior two-thirds of head with sharp, but not coarse, longitudinal rugae; occipital lobes with small, sparse, piligerous punctures. Pronotum and gaster very smooth and shining; pedicel smooth but less polished; meso- and epinotum opaque, densely punctate.

Hairs yellow, sparse, suberect on the body, short and appressed on the legs and antennal scapes.

Castaneous; pronotum, first gastric segment, borders of clypeus, and mandibles blackish; remainder of mandibles and clypeus, cheeks and anterior portion of front, petiole and postpetiole yellowish red; legs brownish yellow; terminal gastric segments pale brown; posterior borders of all the gastric segments broadly yellowish.

WORKER.—

Length 1.5 mm.

Head subrectangular, as broad as long and as broad in front as behind, with very feebly convex sides and nearly straight posterior border. Eyes just in front of the middle. Mandibles with the entire apical border finely denticulate. Clypeus convex, with rounded, entire anterior border. Antennal scapes reaching beyond the posterior corners of the head to a distance equal to twice their diameter. Thorax shaped much as in the soldier, but the pronotum narrower and longer. Epinotal spines reduced to minute slender teeth scarcely longer than broad at their bases. Superior border of petiolar node straight and entire; postpetiole small, a little broader than the petiole, subglobular.

Pilosity, sculpture, and color as in the soldier, but the head smooth and shining, with only the cheeks delicately longitudinally rugulose.

Described from a single soldier and three workers taken by Lang from a colony nesting in a stem of *Hyphæne* at Malela.

This form agrees with the typical *minima* in size and in most of its characters but the color is very different, the postpetiole is much nar-

rower in proportion to the petiole in both soldier and worker, and the antennal scapes of the latter are decidedly longer. Santschi has described a variety, *catella*, from Nigeria and the Gold Coast, which is evidently colored like *malelana* but his description is too brief to enable me to judge of its other characters. He has also described a subspecies, *corticicola*, from the French Congo. The soldier of this form measures 3 mm., the worker 2.3 mm. Both are red or yellow and in the soldier the frontal carinae extend to the posterior quarter of the head.

***Pheidole mylognatha*, new species**

Text Figure 33

SOLDIER.—

Length 6 mm.

Head large, subrectangular, 2 mm. broad and 2.3 mm. long, as broad in front as behind, with straight, parallel sides, deeply and angularly excised posterior border, with depressed occipital surface and faint depressions on the sides of the front for the antennal scapes. Occipital and frontal groove deep. Eyes small, flat, at the anterior third of the head. Mandibles very convex, probably bluntly bidentate at apex but



Fig. 33. *Pheidole mylognatha*, new species. Soldier; head from above.

the apical borders are worn away in the specimen. Clypeus very short, concave and indistinctly carinate in the middle, swollen and convex on the sides; the anterior border rather deeply emarginate in the middle and sinuate on each side. Frontal carinae short, diverging; frontal area indistinct. Antennae small and slender; scapes when bent outward not reaching to the eyes, terete and slightly curved at the base; joints 2 to 8 only slightly longer than broad; club distinctly shorter than the remainder of the funiculus. Thorax small, much shorter than the head and less than half as wide through the pronotum, which is bluntly tuberculate on the sides both above and below. Mesonotum short, rapidly

sloping to the pronounced mesoepinotal constriction, anteriorly with a feeble transverse impression and a small, sharp transverse ridge behind it. Epinotum distinctly broader than long, broadly concave and sloping in the middle, the base shorter than the declivity, marginate on the sides, the marginations continued into the spines which are short, acute, and erect, a little longer than broad at their bases, less than half as long as their interval. Petiole small and short, less than twice as long as broad, broader behind than in front, the node blunt, transverse, and emarginate in the middle. Postpetiole broader than long, its sides produced as short, acute, backwardly directed spines, the distance between the tips of which is about three times the width of the petiole. Gaster smaller than the head, elliptical, flattened dorsoventrally. Femora only moderately thickened in the middle.

Shining; mandibles sparsely punctate in the middle, coarsely striated at the base and along the apical margins. Clypeus rugulose, irregularly in the middle, longitudinally on the sides. Anterior half of head longitudinally rugose, with punctate interrugal spaces, the punctures becoming more numerous on the very feeble scrobe-like depressions; posterior half of head very smooth and shining, with a few

sparse, piligerous punctures. Thorax loosely rugose and somewhat reticulate-punctate on the sides, concavity of epinotum finely transversely striated. Petiole and postpetiole indistinctly punctate-rugulose, the latter smoother and shining above. Gaster and legs smooth and shining, with sparse, piligerous punctures.

Hairs whitish, delicate, sparse, erect or suberect on the body, shorter, more abundant and appressed on the legs; almost absent on the scapes.

Rich castaneous brown; gaster, except the base of the first segment, darker, almost black; legs and funiculi a little more reddish, the femora infuscated in the middle.

WORKER.—

Length 2 mm.

Head a little longer than broad, as broad in front as behind, with feebly convex sides and feebly concave posterior border. Eyes rather convex, just in front of the middle of the sides. Mandibles with the whole apical border very finely denticulate. Clypeus convex, its anterior border entire, broadly rounded. Antennal scapes extending fully one-fourth their length beyond the posterior border of the head. Thorax and petiole very similar to those of the soldier but the mesonotum more sloping and with much feebler transverse convexity. Postpetiole only one and one-half times as broad as the petiole, its sides produced as short angles or conules.

Shining; mandibles finely and indistinctly striate; clypeus and cheeks longitudinally rugulose; area between the frontal carinae and the eyes reticulate, remainder of head very smooth and shining. Pronotum smooth and shining above, reticulate on the sides; meso- and epinotum subopaque, densely punctate; petiole and postpetiole more finely punctate, the nodes above smooth and shining like the gaster and legs.

Pilosity and color much as in the soldier, but the fine appressed hairs on the scapes as abundant as on the legs.

Described from a single soldier and two workers taken at Banana by Lang and Chapin.

This species is related to *P. schultzei* Forel from the Kalahari Desert, as I find by comparison with cotypes received from Prof. Forel. The head of the *schultzei* soldier, however, has more convex sides, more rounded posterior corners, a less deeply excised posterior margin, less deeply impressed occipital groove, longer antennae, and a very different color, being yellowish red, with the legs and base of gaster yellow. The worker *schultzei* departs further from that of *mylognatha* in being more slender, with decidedly longer legs and antennae, in lacking spines on the epinotum and in having a longer postpetiole, which is scarcely angular on the sides. It is sordid or brownish yellow, with the head darker behind and on the sides.

***Pheidole niapuana*, new species**

Text Figure 34

SOLDIER.—

Length 5 to 5.5 mm.

Head, excluding the mandibles, as broad as long (2.3 mm.), cordate, considerably broader behind than in front, and with the occipital border very deeply and arcuately excised. Behind the eyes the sides are convex but in front feebly concave. Eyes small, moderately convex, situated just in front of the anterior third of the head. In profile the head is most convex in the middle both above and below, but depressed in the occipital region. Frontal and occipital groove distinct but rather shallow anteriorly. Mandibles large and convex, with two blunt teeth at the apex. Clypeus flat, carinate, its anterior border emarginate in the middle, bluntly bidentate, sinuate on

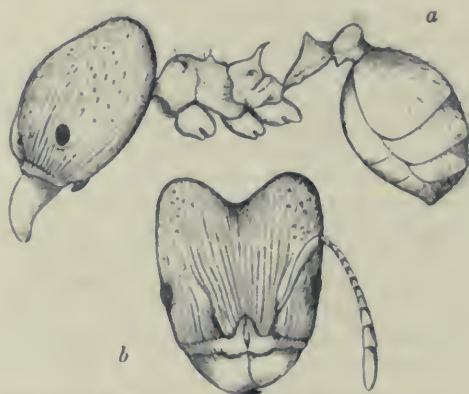


Fig. 34. *Pheidole niapuana*, new species. Soldier. a, body in profile; b, head from above.

the sides. Frontal area large, subtriangular, without a median carinula; frontal carinae short, diverging, continued back as delicate rugae bordering an indistinct scrobe-like depression for the antennal scapes. Antennae slender; scapes terete, curved at the base, reaching to the middle of the sides of the head; all the funicular joints longer than broad, club somewhat shorter than the remainder of the funiculus. Gula with a pair of very large, blunt teeth at the anterior margin. Thorax short and robust, shorter than the head without the mandibles. Pronotum with very distinct and moderately acute humeral tubercles, mesonotum sloping to a deep mesoepinotal constriction, with a sharp transverse welt or ridge; epinotum broader than long, concave and sloping in the middle; spines acute, somewhat shorter than the base, a little longer than their interval, directed upward and slightly outward and backward, with their tips distinctly curved backward. Petiole very small, narrow, fully twice as long as broad, with subparallel sides, the node short, with acute transverse superior border, distinctly notched in the middle. Postpetiole three times as broad as the petiole, subtriangular, broader than long and broader behind than in front, with prominent, bluntly angular sides, its ventral surface with a distinct tooth, its dorsal surface convex and rounded. Gaster broadly elliptical, smaller than the head. Legs rather slender, femora only moderately thickened in the middle.

Shining; mandibles sparsely punctate, striated at their bases. Head longitudinally rugose, the rugæ sharp, widely separated and not very strong, the interrugal spaces with dense shallow punctures, most distinct on the space between two rugæ representing a very feeble scrobe-like area. The rugæ on the front diverge, passing to the summits of the occipital lobes. Sides of head with finer, denser rugæ. Occipital lobes with large, scattered foveolæ. Thorax, petiole and postpetiole covered with fine shallow punctures, more pronounced on the mesopleuræ and extremely fine and dense on the petiole and postpetiole which are opaque. Pronotum transversely rugulose. Basal half of first gastric segment finely reticulate-punctate and less shining than the remainder of the gaster.

Hairs reddish yellow, glistening, coarse, uneven, erect, and rather sparse on the body; short, sparse, and appressed on the scapes and legs.

Rich ferruginous red; clypeus and borders of mandibles black; legs and antennæ paler and more yellowish red; gaster infuscated on the sides and behind the first segment.

WORKER.—

Length 3 to 3.5 mm.

Head nearly circular, scarcely longer than broad, without posterior corners, occipital border strongly marginate. Mandibles large, their apical borders long and finely denticulate, with two larger terminal teeth. Clypeus convex, with rounded, entire anterior border. Eyes just in front of the middle of the head, moderately large and convex. Antennæ slender, scapes extending about two-fifths their length beyond the occipital border. Thorax slender, the pronotum rather depressed above, bluntly tuberculate on the sides near the middle. Mesonotum long and sloping, with a broad transverse impression in front and a transverse swelling behind it. Mesoëpinal constriction deep and broad. Epinotum as broad as long, with subequal base and declivity, not concave in the middle as in the soldier. Spines longer, as long as the base and more strongly curved backward. Petiole similar to that of the soldier, but with a lower, blunter node. Postpetiole scarcely twice as broad as the petiole, longer than broad, rounded above and on the sides. Gaster distinctly smaller than the head. Legs slender.

Shining; finely reticulate; mandibles finely and densely striate, lustrous; gaster more shining than the head and thorax; meso- and epinotum and ventral and lateral portions of the petiole and postpetiole subopaque, densely punctate.

Pilosity much like that of the soldier, sparser on the body but more abundant on the legs. Color much paler, of a more yellowish red, or reddish yellow, with paler legs and brown gaster, the latter in most specimens yellowish at the base.

Described from numerous specimens of both phases taken by Lang and Chapin at Niapu "from nests in the rotten wood of fallen trees or in old roots."

This species is evidently related to *P. areniphila* Forel of the Kalahari Desert but is certainly distinct, being larger and differing in many details of structure and sculpture.

***Pheidole saxicola*, new species**

Plate VII; Text Figure 35

SOLDIER.—

Length 5.5 to 6 mm.

Head subrectangular, nearly 3 mm. long and very nearly as broad, scarcely broader behind than in front, with straight subparallel sides, rectangular anterior corners, deeply and angularly excised posterior border, and deep occipital and frontal groove. In profile the occipital region is very feebly depressed and the eyes are small, feebly convex, and at the anterior third of the sides. Gula anteriorly with prominent, blunt teeth. Mandibles convex, with two large apical and two basal teeth and a few denticles along the intermediate border. Clypeus convex and carinate in the middle, its anterior border broadly and feebly excised in the middle and sinuate on each side. Frontal carinae very short, diverging; frontal area distinct, with a median carinula. Antennae slender, scapes reaching the middle of the head; funicular joints all longer

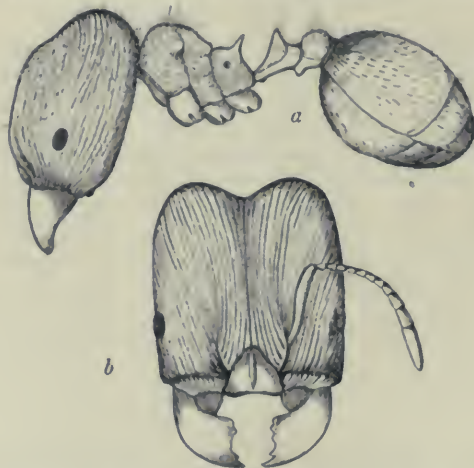


Fig. 35. *Pheidole saxicola*, new species. Soldier. a, body in profile; b, head from above.

than broad; club shorter than the remainder of the funiculus. Thorax shorter than the head, robust, through the pronotum nearly half as broad as the head, with very blunt humeri, convex and rounded in profile. Mesonotum sloping to the deep meso-epinotal constriction with merely a trace of a transverse convexity in the middle. Epinotum broader than long, concave and sloping in the middle, in profile with the base distinctly shorter than the declivity; spines short, suberect, acute, less than half as long as the base and about half as long as their interval. Petiole about one and one-half times as long as broad, broader behind than in front, with concave sides; node transverse, its superior border sharp, feebly excised in the middle. Postpetiole broader than long, about two and one-half times as broad as the petiole, its sides produced as short, acute, slightly backwardly directed spines, its ventral surface with a small, acute tooth. Gaster smaller than the head, subcircular or very broadly elliptical, somewhat flattened above. Legs with moderately thickened femora.

Shining throughout; mandibles coarsely striate, smooth and coarsely punctate in the middle. Clypeus longitudinally rugulose, less distinctly in the middle than on the sides. Head rather finely and sharply longitudinally rugose, the rugæ diverging on the front and continued to the posterior corners, where they meet the also slightly divergent rugæ between the frontal carinæ and the eyes. The interrugal spaces are loosely reticulate. There are no transverse rugæ on the occiput but only a finer continuation of the more anterior sculpture. Thorax, petiole, and postpetiole indistinctly and loosely punctate rugulose, the prothorax transversely; epinotum with fine, dense but shallow punctures, so that the surface is more opaque. Gaster with fine, sparse, piligerous punctures.

Hairs yellowish, partly coarse, sparse, uneven and suberect and partly short, much more abundant, softer and appressed or subappressed like long, coarse pubescence. Legs with numerous short, oblique hairs; scapes with a few longer scattered and coarser hairs.

Dark ferruginous red; mandibles, sides and border of clypeus, and frontal carinæ, blackish; petiole, postpetiole, and gaster, except more or less of the base of the first segment, dark brown or blackish. Legs a little paler than the thorax.

WORKER.—

Length 2.7 to 3 mm.

Head subrectangular, as broad in front as behind, with straight, subparallel sides, rounded posterior corners and nearly straight posterior border. Eyes convex, at the middle of the sides. Mandibles rather large, deflected at the tip, with denticulate apical borders and two larger terminal teeth. Clypeus distinctly carinate, with the anterior border very feebly sinuate in the middle. Antennal scapes extending one-third their length beyond the posterior corners of the head. Thorax similar to that of the soldier, but more slender, especially through the pronotum. Base of epinotum a little longer than the declivity; spines slender, acute, erect, about half as long as their interval. Petiole slender, twice as long as broad, scarcely broader behind than in front, with the sides only very faintly concave; node transverse, its border distinctly notched in the middle. Postpetiole twice as broad as the petiole, as long as broad, subglobose, not toothed on the ventral side. Gaster about as large as the head.

Shining; mandibles subopaque, finely striatopunctate. Sides of head delicately longitudinally rugulose and reticulate. Thorax, petiole, and postpetiole finely and densely punctate, opaque; upper surface of pronotum and postpetiole smooth and shining. Gaster and legs shining, sparsely punctate.

Pilosity like that of the soldier but less abundant. Antennal scapes, like the legs, with numerous oblique hairs.

Brown; head darker above and behind; gaster, except the edges of the segments, middle portions of legs, fore coxæ, and usually also the pronotum and upper surfaces of the petiolar nodes, darker than the posterior portion of the thorax.

Described from numerous specimens taken by Lang, Chapin, and Bequaert at Zambi (type locality) and by the latter at Boma.

This ant is certainly very closely related to *P. sculpturata* Mayr and might be regarded as a subspecies, but it will fit neither Mayr's description of the typical form from South Africa nor Santschi's and Forel's descriptions of the various subspecies from East and West Africa. Mr. Lang's note shows that it is a harvester. "The nests were found on a

dry hill at the Post of Zambi in rocky soil. One of the entrances, the largest of three, can be distinctly seen in the photograph (Plate VII). The ants excavate their nests in the small amount of soil between the rocks and all or nearly all of them remain under ground during the day. They work during the night up to about 8 A.M. Then the workers may be seen moving along in files, accompanied by the soldiers, and the latter carry seeds for a distance of some fifteen yards. They come and go in different directions indicated by runways left between the accumulated masses of débris and distinctly visible in the photograph. The débris, consisting of seeds and chaff, lies about the nest to a depth of four centimeters and over an area of some sixty centimeters. It is very difficult to obtain a view of the interior of the nest on account of the rocky soil. Some of the kitchen-middens about the nest entrances contained the dried remains of various ants and Coleoptera. In another locality the same species of ant was seen to have collected seeds of entirely different plants but of about the same size."

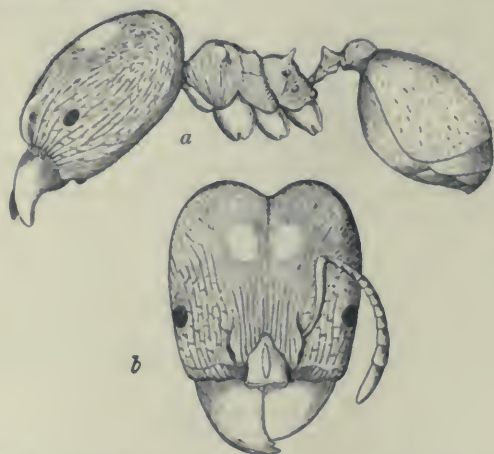


Fig. 36. *Pheidole speculifera* Emery. Soldier. a, body in profile; b, head from above.

***Pheidole speculifera* Emery**

Four soldiers from Faradje, without further data, and five workers from the stomach of a frog (*Rana ornatissima*) from Garamba agree very closely with Emery's description of the types from Abyssinia, but the workers are darker. Forel has described a variety, *cubangensis*, from Mossamedes and records it also from the Belgian Congo, but this form seems to be very close to the type. My specimens are not as large, since none of the soldiers measures more than 6 mm., whereas Forel

gives the length of *cubangensis* as 7 mm. He describes the whole head as opaque, whereas my specimens have a pair of elliptical, very smooth, and shining areas on the vertex in the midst of the opaque and finely punctate sculpture (Fig. 36a and b).

MYRMICARIA W. Saunders

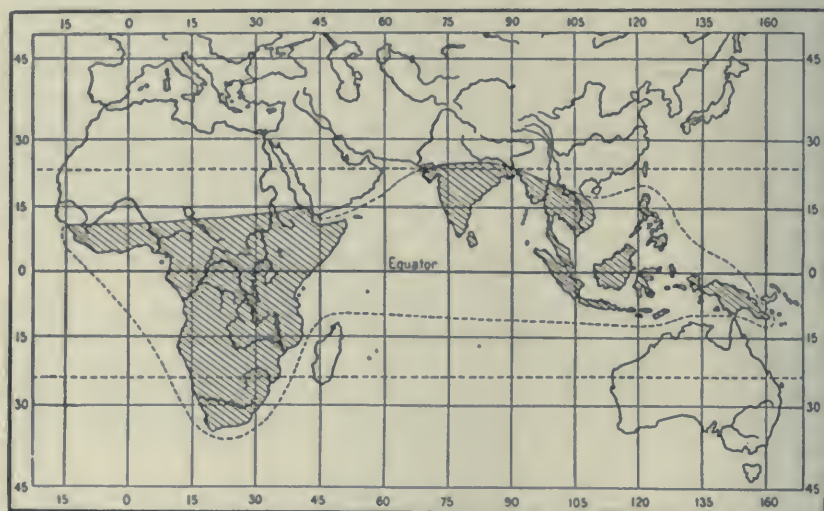
Small or medium-sized, coarsely hairy, brown or black ants, with monomorphic WORKERS, which have 7-jointed antennæ, the funiculus enlarged toward the tip but not clavate and all the joints, except the first, considerably longer than wide. Mandibles moderately large, subtriangular, with coarsely dentate apical border. Clypeus broad and convex. Frontal area indistinct behind. Frontal carinæ short, rather far apart, not strongly diverging posteriorly. Eyes not very large, convex, behind the middle of the head; ocelli absent. Thorax with indistinct or obsolete promesonotal suture; mesoepinotal suture deep, the mesoepinotal constriction pronounced; the sides of the mesonotum raised and subauriculate behind. Epinotum armed with a pair of long, acute spines, which are often lobate or expanded at the base; inferior corners of pronotum dentate or spined. Petiole with a long peduncle sharply marked off from the abrupt node, which is high and rounded, subconical, sometimes laterally compressed. Postpetiole shaped like the node of the petiole, strongly contracted posteriorly. Gaster subglobose, its basal segment somewhat truncate in front. Legs long; median and hind tibiæ with simple spurs; tarsal claws simple.

FEMALE considerably larger than the worker. Head and antennæ of very similar structure, the latter being 7-jointed. Thorax robust; mesonotum and scutellum very convex, the pronotum vertical in front though well developed, the epinotum with stouter and broader spines than in the worker. Pedicel as in the worker. Gaster much more voluminous, longer than wide, convex above; the basal segment truncate anteriorly. Wings long, with strongly marked veins, the anterior pair with an open radial cell, a single cubital and a discoidal cell.

MALE nearly as large as the female but more slender. Antennæ 13-jointed, filiform, the scape short, about as long as the second funicular joint, the first joint very short, not swollen, the remaining joints all much longer than broad. Eyes large but not very convex; ocelli rather small. Mandibles small and vestigial, sublinear, with rounded edentate tips, which do not meet. Frontal carinæ short. Mesonotum with Mayrian furrows; epinotum without spines. Petiole very long, its node low; that of the postpetiole of a similar shape, decidedly longer than broad. Gaster cordate, scarcely longer than broad, convex above, concave below. External genital appendages long and narrow, blade-like. Cerei present, but minute. Legs slender. Wings rather short, venation as in the female.

This extraordinary genus may be recognized at once by the 7-jointed antennæ of the worker and female and the unique structure of the abdomen in the male. The species are distributed over the Ethiopian, Indomalayan, and Papuan Regions but do not enter Australia (Map 21). The majority of the species and the largest are Ethiopian. The large species form crater nests in the soil; some of the smaller, both in Africa and in the Orient, make small carton nests on the under sides of leaves.

One of Mr. Lang's photographs (Pl. VIII, fig. 1) of crater nests of *M. eumenoides* is very suggestive in connection with some observations of Petch¹ on the Indian and Ceylonese *M. brunnea* Saunders. This ant, he says, "brings up from its nest underground grains of sand and particles of earth through a small hole about a centimeter in diameter; it is generally observed on footpaths. These particles are at first arranged on one side of the hole in a crescentic mound about 3 centimeters high which curves round and slopes away to nothing on either side of the hole, the distance between the vanishing horns on the crescent being about 12



Map 21. Distribution of the genus *Myrmecaria*.

centimeters. The ants run up the slope from the hole with their burden and drop it over the ridge down the steeper outer side. The most striking feature of this is that when the hole is situated in the middle of a path, away from any bank, the ridge is always on the windward side of the hole. A smaller ridge of the same shape and in the same position is constructed by *Pheidole* (? *nietneri* Emery). If undisturbed *Myrmecaria* eventually constructs a complete funnel around the hole." It would seem that the craters of *M. eumenoides* photographed by Mr. Lang were constructed in a spot protected from the wind or during a calm since they show no definite orientation of their steeper slopes.

¹1906, Ann. Roy. Bot. Gard. Peradeniya, III, p. 196.

***Myrmicaria eumenoides* (Gerstæcker) subspecies *opaciventris* (Emery)**

Plate VIII, Figures 1 and 2

Malela, ♂; Thysville, ♂; Stanleyville, ♀, ♂; Avakubi, ♂, ♀; Medje, ♂, ♀, ♂; Akenge, ♂; Bafwabaka, ♂; Ngayu, ♂; Faradje, ♂, ♀ (Lang and Chapin); Walikale to Lubutu, ♂, ♀ (J. Bequaert); Yakuluku, ♀ (J. Rodhain). Seventy-five workers and one female from Bafwabaka, Ngayu, Medje, Akenge, and Stanleyville were taken from the stomachs of toads (*Bufo regularis*, *B. funereus*, and *B. superciliaris*); a single worker from Faradje was taken from the stomach of a frog (*Rana occipitalis*).

Neither Forel nor Santschi seems to me to have recognized this form very explicitly. Several years ago I received from the former six workers labelled "Benguela (Buchner)" and, as Emery's ergatotypes bore the same label and were also received from Forel and as my specimens agree perfectly with Emery's description, I feel confident that they are cotypes. Later I received a worker and three dealated females from Gaboon (Staudinger) and, as Emery mentions specimens from the same locality, I believe that I have before me also the female of the true *opaciventris*. The workers measure about 5 to 6 mm. and are pale ferruginous brown, with the antennæ, legs, and gaster more fuscous. The mandibles have oblique 5-toothed blades; the clypeus is carinate. The epinotal spines are rather slender and very slightly bent downward, the base of the epinotum is less concave than in the typical *eumenoides*, the peduncle of the petiole is distinctly shorter and not longer than the node. The petiolar and postpetiolar nodes are laterally compressed and of the same height, the ventral surface of the postpetiole, unlike that of *eumenoides*, is swollen, and projecting and angular in front. The surface of the head and thorax is somewhat less shining than in *eumenoides*, the rugæ on the front, pleuræ, pro-, meso- and base of epinotum more sharply and regularly longitudinal and not reticulate. The gaster has the basal half or, in some specimens, the whole surface opaque and densely punctate, whereas it is smooth and shining in typical *eumenoides*. The nodes of the petiole and postpetiole have shining summits and in some specimens the sides of the petiole are also smooth and shining, in others like those of the postpetiole, finely punctate and even feebly longitudinally rugulose. In the female, which measures 13 mm., the petiole and postpetiole are sharply longitudinally rugose, the summit of the former concentrically rugose, the scutellum vermiculately rugose. Emery's description of the male, which I have not seen, includes no mention of characters that would distinguish it from the male of the typical *eumenoides*.

Numerous specimens from the various Congo localities cited above seem to me to be referable to Emery's subspecies, though they differ more or less in the sculpture of the petiole, postpetiole, and gaster and in being mostly of a darker color. They average larger than the specimens of variety *congolensis* and variety *crucheti*, the workers being 5 to 6.5 mm. The petiole and postpetiole, especially the latter, are nearly always more or less longitudinally rugulose on the sides, though sometimes merely punctate, as Emery remarks in the original description. The specimens from Walikale have the entire gaster opaque and punctate, whereas in others it is punctate usually only on the anterior half of the first segment. This character, however, varies in individuals from the same colony. Santschi says that the gaster of the worker is "entièrment sculpté, mat, brun clair," but Emery describes the gaster as fuscous, with the anterior half of the first segment opaque.

Trägårdh¹ and Arnold² have described the nests of the typical *eumenoides* of East and South Africa. The latter's account runs as follows.

The colonies of this species are usually very large, often comprising 1000 or more workers. The latter bite and sting fiercely, but the sting is rather blunt, and does not easily pierce the human skin. Although their gait is slow, they are nevertheless active insects, travelling over large areas in search of food, which seems to consist chiefly of other insects. They do not appear to be aphidicolous, nor to attend membracid or lepidopterous larvæ for their secretions, yet they are known to harbour in their nests many myrmecophilous insects. A nest examined by me contained the following species of beetles: *Allodinarda myrmicariz* Brauns; *Ogmocerus raffrayanus* Brauns and *Batrissus myrmecariophilus* Brauns. The Botanical Gardens in Durban are infested with this species, but the examination of a large number of nests revealed only one species of myrmecophile, *Allodinarda kohli* Wasm.; which, however, was plentiful, as many as three dozen being taken in one nest. The nest has numerous entrances, and is surrounded by large heaps of excavated material, often covering an area of several square feet.

Arnold³ has also described and figured the puparium of a fly (possibly a form allied to *Microdon*?), with a peculiar tray covered with trichomes at the posterior end of the body, as occurring in the nest of *M. eumenoides* with the myrmecophilous beetles cited in the foregoing quotation. The following is his account of the migration of the colony and its guests to a new nest.

I left this nest without filling up the hole, so that in about a week's time it was filled with rain after a heavy shower. The water must have filtered through the soil and almost saturated the nest, for it took nearly half an hour for all the water to dis-

¹1914, Med. Göteborgs Mus. Zool. Afd., III, p. 45.

²1916, Ann. South African Mus., XIV, p. 266.

³1914, Proc. Rhodesia Sc. Assoc., XIII, p. 25.

appear from the hole. This state of affairs had evidently made the nest so uncomfortable that the ants decided to move to new quarters about 9 feet away. They began to do this about seven o'clock that evening, or perhaps a little earlier, for the migration was in full swing when I came on the scene again at that hour. Remembering the reputation which this ant has for harboring guests, and also the observations made by various entomologists on some European ants which, when moving to a new nest, are in the habit of carrying their guests with them, I decided to watch this migration carefully. At first I could see no guests at all; the workers were carrying in their mandibles only their own larvæ, pupæ or males. In fact I was looking at the workers so attentively that I failed to notice their smaller companions on the road, to which my attention was directed by suddenly catching sight of a Lepismid running by. Going back then to the old nest, I saw at intervals various myrmecophiles crawling out of the pit made by my former excavation, and following the tracks of their hosts, to which they were guided, of course, by the sense of smell. These parasites included three different species of beetles, viz. a staphylinid, and two species of pselaphids, together with the common lepismid found in the nests of nearly all our ants. No time was wasted by any of these insects, for once over the brow of the pit, they continued straight along the narrow path leading to the new quarters. While on the march they were utterly ignored by their hosts, but on arriving at the entrance of the new nest, it was noticed that some of the pselaphids were seized by the ants dawdling around, and taken down into the nest. This change of dwelling took some hours to complete, for at midnight it was still in progress.

Mr. Lang contributes the following note on the habits of the sub-species *opaciventris* at Avakubi: "These ants, called 'dufluguntu' by the natives, are very common and noticeable because they tend to congregate in great numbers about any piece of meat or a dead insect. On one occasion I saw them tear up and carry off a butterfly two inches in diameter in exactly two minutes and a half. They are harmless and therefore not feared by the natives. A young *Manis*, which I kept in captivity, enjoyed making a meal of them. The nests, as a rule built at the bases of trees or bushes, can be easily recognized by the mound of loose earth thrown up while the chambers are being excavated. The walls of the chambers are not hardened or smoothed as in the nests of some other ants. One nest which I examined extended seventeen inches below the surface. It had many ramifications, though most of the brood was found around the roots of the tree. The whole nest, when exposed, covered an area less than two feet in diameter. These ants build long tunnels open above or with small openings (one-eighth inch), surrounded by a heap of loose particles. One of these, more than an inch wide, crossed a certain road in several places. I have seen a number of these tunnels superimposed one above another so that I could drop a stick down thirteen inches. In these tunnels the ants travel back and forth in great numbers."

Myrmicaria eumenoides* subspecies *opaciventris* variety *congolensis
(Forel)

This form is not represented among the material collected by Lang, Chapin, and Bequaert. Santschi regards it as an independent subspecies, but it seems to me to be merely a variety of *opaciventris*. Three cotypes of *congolensis* were given me by Forel. Comparison of these specimens, which were taken from the stomach of a scaly ant-eater (*Manis temminckii*) captured by Solon in the Lower Congo, with *opaciventris* show relatively slight differences. They are somewhat smaller, of a more sordid yellowish brown color (possibly due to the action of the gastric juices of the *Manis*), and with much the same sculpture and lower portion of the postpetiole. The epinotal spines, however, are decidedly more slender and more strongly deflected, a character not mentioned in Forel's original description, though noted by Santschi; the head is proportionally smaller and narrower, with straight cheeks, and the gaster is opaque only at the base of the first segment, the remainder being rather shining.

Myrmicaria eumenoides* subspecies *opaciventris* variety *crucheti
(Santschi)

Stanleyville, ♂; Leopoldville, ♂; Ngayu, ♂; Avakubi, ♀ (Lang and Chapin). The workers from Avakubi, 22 in number, were taken from the stomachs of toads (*Bufo regularis* and *B. funereus*). I refer numerous specimens from these localities to the variety *crucheti* since they agree with Santschi's very brief description in size (5 to 5.5 mm.) and in having slender but straight epinotal spines. The petiolar node in my specimens is distinctly broader and less compressed laterally than in the typical *eumenoides* and not shorter than the peduncle. The surface of the petiole is not so smooth, though it is not longitudinally rugulose. I have received this same form in all three phases from Rev. Geo. Schwab, who took it at Metit, Cameroon. The female is very similar to that of the typical *eumenoides*, but the head is somewhat smaller, with slightly more prominent posterior corners and the gaster is entirely opaque and punctate, except the bases of the second and following segments. I am unable to detect any differences between the males of the two forms. Arnold describes the wings of the male *eumenoides* as paler than those of the female. This is certainly not the case in *crucheti*.

***Myrmicaria salambo*, new species**

Plate IX, Figures 1 and 2; Text Figure 37

WORKER.—

Length 6 to 7 mm.

Of rather uniform stature and closely resembling *eumenoides* but a little more elongate. Head relatively smaller, as broad as long, excavated behind, convex above, flattened below. Mandibles 5-toothed. Clypeus eecarinate, with entire anterior border. Eyes somewhat larger and more convex than in *eumenoides*. Thorax very similar but promesonotal suture very distinct, impressed, the mesonotal lobes less compressed, their posterior outline in profile less abrupt, more sloping so that the mesoepinotal impression, though deep, is shallower and less acute than in *eumenoides* and appears longer. Epinotal spines longer, slightly sinuous, with very feebly up-turned points, directed backward and slightly outward. Base of epinotum longitudi-

Fig. 37. *Myrmicaria salambo*, new species. Worker in profile.

nally concave. Peduncle of the petiole longer than the node, which is thick and evenly rounded, not compressed laterally above. The ventral surface of the petiole armed below with two long, delicate hyaline spines, which curve towards each other and enclose an elliptical space. Postpetiolar node of the same size and shape as that of the petiole, its ventral surface straight in profile, not bulging nor angulate in front. Gaster and legs of the usual shape, the former with a straight, anterior border.

Shining; mandibles coarsely longitudinally striated; clypeus smooth in the middle, with a few rugules on the sides. Rugosity of head, thorax, and pedicel much as in *eumenoides*, but the rugæ on the dorsal surface of the head and thorax less numerous and less pronounced, without distinct anastomoses; sides of the head with finer and less distinct rugules, so that the surface is more shining. Gaster opaque and very finely punctate only at the extreme base above, otherwise shining. Legs and scapes shining, finely striate.

Hairs dark brown, in length and arrangement much like those of *eumenoides*.

Reddish brown; gaster brownish yellow; legs, including the coxæ and lower pleuræ, darker than the thorax. Mandibular teeth and antennæ blackish.

Described from numerous specimens taken at Garamba (Lang and Chapin) attending scale insects on the buds of a *Protea* which is shown in Plate IX.

This form is so closely related to *eumenoides* that it might, perhaps, be regarded as a subspecies. It is easily recognized by the unique ventral appendages of the petiole. These are so brittle that they are easily broken off, but their basal insertions on the low hyaline lamella in the midventral line of the petiole are usually discernible. Evidently *salambo* is also related to *M. striata* Stitz, specimens of which I have not seen.

***Myrmicaria exigua* Ern. André subspecies *kisangani*, new subspecies**

WORKER.—

Length 3 to 3.5 mm.

Head through the eyes scarcely longer than broad, evenly rounded behind. Mandibles 4-toothed. Clypeus carinate, convex, with entire, rounded anterior border. Frontal carinae subparallel. Eyes convex, just behind the middle of the head. Antennal scapes extending about two-fifths their length beyond the posterior border of the head; apical funicular joint fusiform, enlarged as in the typical *exigua*. Pronotum more flattened above, though bluntly angular on the sides and without inferior teeth. Promesonotal suture distinct. Mesonotum with a small but distinct tooth on each side in front and the posterior lobes larger, erect, and rather acute. Mesoepinotal impression very distinct and rather long. Epinotum not longer than broad, scarcely narrowed in front, its base longitudinally grooved in the middle, marginate on each side and not longer than the declivity, which is also marginate laterally; spines not longer than their distance apart at the base, straight, directed backward, upward, and outward, their tips not bent inward as in the typical *exigua*. Petiolar peduncle as long as the node, swollen at the spiracles; node longer than broad, as high as long, laterally compressed, constricted behind. Postpetiole longer than broad, broader and higher behind than in front, its node distinctly lower than that of the petiole. Anterior border of gaster straight or even slightly concave, with prominent anterior corners.

Shining; mandibles subopaque, longitudinally striate. Clypeus smooth in the middle, delicately rugulose on the sides. Head smooth in the middle of the front, delicately and irregularly longitudinally rugulose on the sides, posteriorly reticulaterugose, but much less sharply than in the typical *exigua*. Pronotum with a few longitudinal rugae, sometimes absent in the middle line; in some specimens reticulaterugose over the whole surface, with very large meshes as in *exigua*. Sides of pronotum smooth and shining; meso- and metapleuræ subopaque, longitudinally rugulose. Base of epinotum transversely rugulose, declivity smooth and shining. Pedicel, gaster, and legs smooth and shining, with very sparse and minute, piligerous punctures.

Pilosity like that of the typical *exigua*, gray or whitish.

Piceous, nearly black; tips of mandibles, peduncle of petiole, declivity of epinotum, base of postpetiole and in some specimens the whole gaster or only the base of the first segment brown.

Described from numerous specimens taken at Stanleyville (Lang and Chapin) "crawling about the base of an orange tree."

I have compared this form with two cotypes from Sierra Leone (Mocquerys), received many years ago from André, and a worker from

Gaboon (Staudinger). The new subspecies differs in its much darker color, feebler sculpture, laterally more compressed petiolar node and in the shape of the mesonotum, which in the typical form of the species lacks the anterior tooth on each side and has only feeble indications of the posterior lobes. Forel has described a variety, *rufiventris*, from carton nests 3 to 4 cm. in diameter on leaves at St. Gabriel, Lumaliza, and Bati-amponde (Kohl), all localities near Stanleyville. This form is larger (3.8 to 4.6 mm.) and, according to Forel, "differs from the type of André only in its paler, reddish abdomen and in having the head more elongate and narrower behind." What Stitz has described as a distinct species, *gracilis*, is evidently nothing more than a subspecies of *exigua*, as is shown by a comparison of his and Forel's descriptions with the cotypes. André failed to mention the enlarged apical antennal joint, but it is very conspicuous in his specimens. Stitz says of the petiole: "Hinten schnürt sich von seiner Basis ein kleines, sekundäres Knötchen ab." This seems to refer to the swelling of the peduncle at the spiracles, a swelling which is visible, though less accentuated in other species of the genus, when the peduncle is viewed directly from above. Forel, however, interprets Stitz's "secondary node" to mean the constricted portion of the segment behind the node. As neither Stitz nor Forel compared their specimens with André's cotypes, they were led to regard *gracilis* as a species.

CARDIOCONDYLA Emery

WORKER minute, smooth, almost hairless. Clypeus projecting over the bases of the mandibles, steep in front, with rounded anterior border. Frontal area strongly impressed. Frontal carinae short and straight. Eyes well developed; ocelli lacking. Mandibles broad, triangular, dentate. Antennae 12-jointed, with long first funicular joint and 3-jointed club, the last joint very large. Promesonotal suture indistinct; mesoepinotal constriction well developed. Epinotum armed with spines or teeth. Petiole with long peduncle and small, rounded node. Postpetiole conspicuously large, cordate or transversely elliptical. Gaster formed in large part by the first segment.

FEMALE winged (except in *C. emeryi* Forel), somewhat larger than the worker; head of the same shape but with ocelli. Pronotum not covered by the mesoscutum in front. Petiole and postpetiole usually broader than in the worker. Wings with reduced venation; pterostigma near the middle of the costal border; one closed cubital cell; distal portions of radius and cubitus obsolete; brachius not developed beyond the nervulus but bending up into the submedius. According to Emery, the female of *C. emeryi* is wingless and has the posterior ocelli vestigial.

MALE usually ergatomorphic but winged in *C. emeryi*. In this form the antennae are 13-jointed but in ergatomorphic males they are 10- to 12-jointed; with long scape and more indistinct club. Petiole and postpetiole resembling the corresponding segments of the female, in the male of *emeryi* much as in the worker.

Cardiocondyla emeryi Forel

A single worker taken at Thysville by Bequaert. This minute ant is very widely distributed through the tropics of both hemispheres. It was originally described from the island of St. Thomas in the West Indies, but was later recorded from Syria, Madeira, Madagascar, and the East Indies. Arnold records it from South Africa and my collection contains specimens from the Bahamas, Cuba, Porto Rico, Jamaica, Bermuda, Tepic in Western Mexico, and Miami, Florida. According to Arnold it "is usually found nesting in grassy soil; the entrance to the nest is a minute hole, not surrounded by earth or other substances."

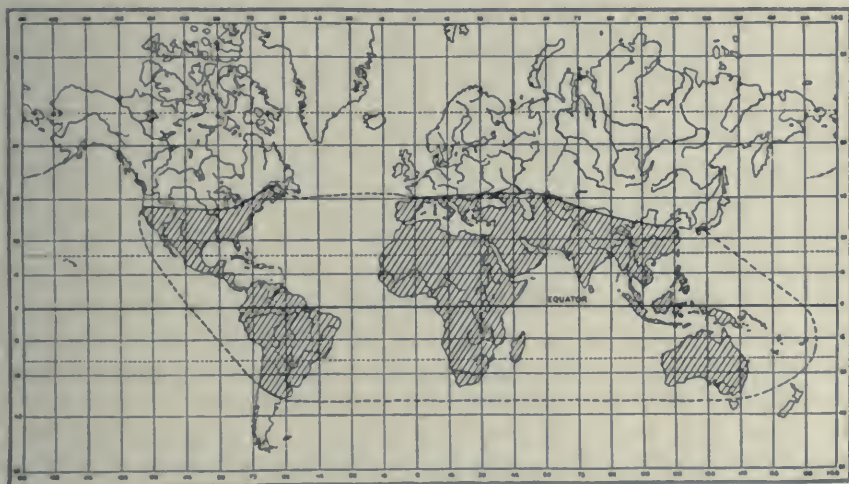
CREMATOGASTER Lund

Crematogaster is one of the largest and most sharply defined genera in the family Formicidae. The species are all small, with monomorphic worker, decidedly larger female, and the male usually as small as the worker. The worker and female have 10- or 11-jointed antennae, those of the male are usually 12-jointed. All the phases can be readily recognized by the peculiar structure and articulation of the petiole and postpetiole. The former does not bear a node but is more or less flattened above, the latter is short and articulated to the anterodorsal surface of the gaster, instead of to its anterior end as in other ants. The gaster, moreover, is in the worker and male subtriangular or subcordate, with pointed tip, and its upper surface is concave or more or less flattened, its ventral surface more convex and protuberant. These peculiarities in the structure of the abdomen enable the workers of many species to turn the gaster forward over the thorax and head, so that they are sometimes called "acrobat ants." As a rule, the sting is feebly developed. The anterior wings of the male and female have a discoidal and a single closed cubital cell.

The species of *Crematogaster* all form populous colonies which nest in the ground, under stones, in logs, the cavities of living plants, or in peculiar carton nests attached to the branches or trunks of trees. This habit of making carton nests is best seen in the tropical species, but traces of it survive even in the species inhabiting temperate regions, such as the North American *C. lineolata* (Say). Many of the species have rank and disagreeable odors.

The genus is cosmopolitan (Map 22), though the species scarcely enter the colder portions of the north and south temperate zones. Our common *C. lineolata* (Say) of North America occurs, however, as far north as Nova Scotia. The vast majority of species are confined to the tropics, being particularly numerous in the Neotropical and Ethiopian Regions. The African forms are so numerous and so variable that they constitute a veritable welter of subspecies and varieties. Mayr, Forel, Arnold, and Santschi have all dispaired of reducing this chaos to order. Unfortunately the portion of Arnold's work dealing with the South

African species has been postponed by the war. He has, however, kindly written me concerning certain necessary changes in the synonymy of several of the species and I have adopted his interpretations in the list of Ethiopian species (Part VIII). Dr. Santschi, who has given more attention to the African species of *Crematogaster* than any previous author, has generously examined and identified a series of all the Congo forms collected by Lang, Chapin, and Bequaert and has written the descriptions of several new forms. In the meantime he has published a



Map 22. Distribution of the genus *Crematogaster*.

revision of the subgenera of *Crematogaster*.¹ Forel was the first to begin the splitting of the genus, but Santschi has added several new subgenera. A translation of his table has been included in the key to the genera and subgenera of Myrmicinae. Santschi has arranged these various subgenera according to their natural affinities in the following sequence:

- | | | |
|----------------------|--|------------------------|
| 1. <i>Decacrema</i> | 5. <i>Sphaerocrema</i> | 9. <i>Xiphocrema</i> |
| 2. <i>Orthocrema</i> | 6. <i>Crematogaster, sensu stricto</i> | 10. <i>Physocrema</i> |
| 3. <i>Eucrema</i> | 7. <i>Atopogyne</i> | 11. <i>Oxygyne</i> |
| 4. <i>Necocrema</i> | 8. <i>Paracrema</i> | 12. <i>Nematocrema</i> |

Of these, at least seven, *Decacrema*, *Orthocrema*, *Sphaerocrema*, *Crematogaster*, *Atopogyne*, *Oxygyne*, and *Nematocrema* occur in the Ethiopian Region. In the Congo material before me only *Sphaerocrema*, *Crematogaster*, *Atopogyne*, and *Nematocrema* are represented.

¹1918, Bull. Soc. Ent. France, pp. 183-184.

Crematogaster brunneipennis (Ern. André) subspecies **acaciæ** (Forel)
variety **victoriosa** (Santschi)

Numerous workers from Zambi (Bequaert), "nesting in a tree trunk." The typical *C. acaciæ* was originally taken by Keller in Somaliland in the swollen spines of acacias. Concerning one of the other varieties (*generosa* Santschi), Santschi writes me as follows: "I received from Mr. G. Arnold of the Rhodesian Museum under the name of *C. brunneipennis* Ern. André variety *omniparens* Forel some workers which differ only in their deeper color from what I have called *acaciæ* variety *generosa*. The female of the latter form is very close to that of *brunneipennis* Ern. André, but the wings are even darker. I believe that *brunneipennis* should be regarded as a subspecies of *C. acaciæ*." That Santschi is correct in regarding both forms as conspecific is proved by a comparison of two cotype workers of *brunneipennis* from Sierra Leone (Mocquerys), sent me by André many years ago, with a cotype of *acaciæ* received from Forel. André's workers are smaller, with longer antennal scapes, smoother and more polished thorax, with somewhat more circular and less cordate petiole, smaller and more slender and more pointed epinotal spines, and darker gaster and head, but the resemblances are so close in other respects that I cannot regard the differences as more than subspecific. As *brunneipennis* has priority of publication, *acaciæ* must be reduced in rank and not *brunneipennis*, as Santschi supposes. Whether *omniparens* is to be retained as a distinct subspecies or is to be attached as a variety to *acaciæ*, I am unable to determine.

Crematogaster castanea F. Smith subspecies **inversa** (Forel) variety
analís (Santschi)

Bafwasende to Avakubi, ♀ (Lang and Chapin); Thysville, ♀ (J. Bequaert). The specimens from the former locality were collected on the road, without further data; those from Thysville were found "nesting in dry, dead wood, on the soil in the rocky savannah." This and the following are merely color varieties of an extremely variable and widely distributed African and Malagasy species formerly known as *C. tricolor* Gerstaecker.

Crematogaster castanea subspecies **inversa** variety **flaviventris**
(Santschi)

Many workers from Garamba (Lang and Chapin), without further data. Both this and the variety *analís* were originally described from the Belgian Congo. The variety *flaviventris* has also been taken in Uganda (C. Alluaud).

Crematogaster excisa (Mayr)

Zambi and Thysville, ♀ (J. Bequaert); near Lie, ♀; Faradje, ♀ (Lang and Chapin). The specimens from Thysville were taken "from a nest in a tree-trunk in the rocky savannah;" those from Faradje "in a hollow tree." The single specimen from near Lie was taken from the stomach of a toad (*Bufo regularis*).

Crematogaster excisa subspecies **andrei** (Forel)

Numerous workers from the Oso River and Sitaweza (between Walikale and Lubutu) (J. Bequaert). Dr. Bequaert took this subspecies at the former locality in the hollow stalks of a myrmecophytic creeper (*Uncaria africana* variety *myrmecophyta*) growing along the shore of the Oso River between Walikale and Lubutu (Part IV), in the latter locality in the hollow stalks of another myrmecophyte (*Cuviera angolensis*) in the Rain Forest (Part IV).

The following new variety of the subspecies *impressa*, though not from the Belgian Congo, was described by Santschi in connection with the forms of *excisa* which I sent him.

Crematogaster excisa subspecies **impressa** (Emery) variety **aglæa** Santschi, new variety

"WORKER.—Black; mandibles, funiculi and tarsi reddish brown. Dorsum of pronotum very densely punctate as in the typical *impressa* (Emery), the longitudinal rugæ being feebly or not at all indicated. Head and thorax narrower. Promesonotal impression feebler as in *euphrosyne*, with a small carina on the front of the mesonotum, which is sharply marginate, less concave than in *andrei* (Forel) and more so than in *impressa* (Emery). Basal surface of the epinotum scarcely broader than the petiole. Spines almost as long as the interval between their bases. Anterior angles of petiole truncated as in *andrei*. Otherwise like *impressa* (Emery).

"Dinbroko, Ivory Coast (Le Mout).

"In *impressa* the funiculi are brownish black and in *andrei* the mesonotal carina is lacking." (Santschi)

Crematogaster excisa subspecies **impressa** variety **euphrosyne** Santschi, new variety

"WORKER.—Length 3.5 mm. More or less pale chestnut brown. Thorax narrow. Pronotum reticulate-punctate in the spaces between the fine longitudinal rugæ. Mesonotum feebly carinate in front. Resembles the variety *brazzai* Santschi,¹ but the latter has a broader thorax, without carina and the sculpture of the thorax is merely reticulate." (Santschi)

¹Originally described as a subspecies of *C. impressa* and given in our catalogue (Part VIII) as *C. menilekti* subspecies *occidentalis* variety *brazzai*.

Faradje (type locality) and Thysville (Lang and Chapin). The specimens at Faradje were found "nesting in hollow twigs. Snails (*Pachnodus herbigradus* Pilsbry) were found estivating in the same twigs inhabited by the ants and often in such numbers as to clog the passages." *Camponotus foraminosus* was found in similar hollow branches together with the same snails (see p. 248).

***Crematogaster excisa* subspecies *impressa* variety *sapora* (Forel)**

Numerous workers from Yakuluku (Lang and Chapin) "found nesting in the cavities of small mushroom-shaped termitaria."

***Crematogaster impressiceps* (Mayr)**

Panga and Faradje, ♀ (Lang and Chapin). The specimens from Panga were found inhabiting the hollow twigs of *Barteria fistulosa* (see Part IV), those from Faradje were associated with aphids.

***Crematogaster impressiceps* variety *frontalis* Santschi, new variety**

"WORKER.—Length 3 to 3.5 mm. Pale brown; thorax less sculptured than in the typical *impressiceps*. Frontal groove deeply impressed. Stature less variable and smaller than in the typical form of the species and larger than in the variety *longiscapa* Stitz, but the scape also extends beyond the occiput as in that variety." (Santschi)

Numerous specimens from Malela (type locality) and Kunga (Lang, Chapin, and J. Bequaert); those at Kunga found nesting in the hollow internodes of the myrmecophyte *Cuviera* species (Part IV); the specimens from Malela "living in a small carton nest, about 9 cm. long, fixed upon a stalk of *Raphia*."

***Crematogaster menilekii* (Forel) subspecies *proserpina* Santschi, new subspecies**

"WORKER.—Length 3.2 to 4 mm. Pale brownish yellow; head, gaster, and appendages shining; thorax and petiole nearly opaque. Front and sides of head finely striate, the remainder with a few punctures. Anterior border of head and the corners obliquely truncated. Postpetiole narrower than in the typical *menilekii*, completely sulcate in the middle, forming two ovoidal eminences. Gaster broader than the head. Allied to *C. alulai* Emery and *C. menilekii* subspecies *satan* (Forel)." (Santschi)

Numerous workers from Malela (Lang, Chapin, and J. Bequaert), with the following note: "Ants living in the stalks of *Papyrus* and making carton nests in their crowns. The workers swarm out in great masses and let themselves drop on the intruder. They bite furiously and it is

difficult to get rid of them, as they work themselves upward on the body, attacking by preference the softer parts of the skin."¹

***Crematogaster (Sphaerocrema) bequaerti* (Forel) variety *atraplex*
Santschi, new variety**

"WORKER.—Length 4 mm. Rather dull yellow; gaster, postpetiole and femora yellowish brown; tips of the epinotal spines brownish black. In other respects like the type of the species and the var. *mutabilis* (Santschi), but the median impression of the pronotum is feebler. The dark tips of the spines contrast with the pale color of the thorax." (Santschi)

A dozen workers from Yakuluku (Lang and Chapin).

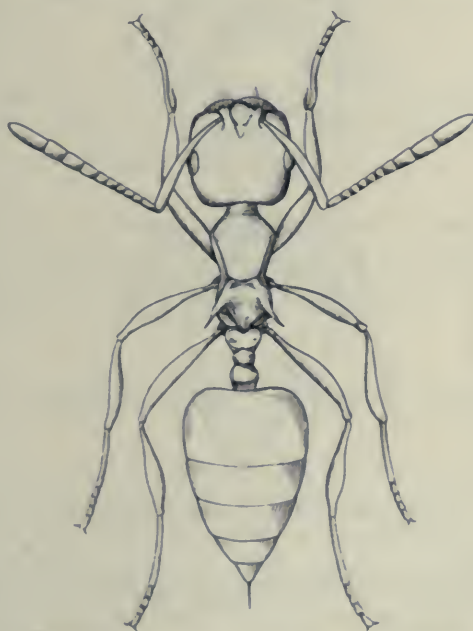


Fig. 38. *Crematogaster (Sphaerocrema) concata* Emery. Worker from above.

***Crematogaster (Sphaerocrema) concava* Emery**

Text Figure 38

Akenge, ♀; Stanleyville, ♀; Lukolela to Basoko, ♀ (Lang and Chapin). The specimens from Stanleyville were taken in twigs of *Barteria fistulosa* (Part IV); those from Lukolela were found running

¹Santschi has recently described a variety *pluton* of this race, collected by Dr. Bequaert from similar carton nests in the crowns of *Papyrus*, at Zambi.

over fire-wood. Three specimens from Akenge were taken from the stomach of a toad (*Bufo polycercus*).

***Crematogaster* (*Sphærocrema*) *pronotalis* Santschi variety *liebknehti* (Forel)**

Text Figure 39

Numerous workers from Yakuluku and Garamba (Lang and Chapin). According to a note accompanying the specimens from the

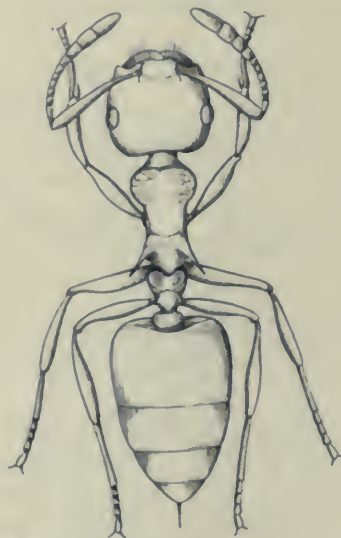


Fig. 39. *Crematogaster* (*Sphærocrema*) *pronotalis* variety *liebknehti* (Forel). Worker from above.

latter locality, this ant "builds small carton nests on the blades of grass. It is common in swamps, from three to five feet above water level."

***Crematogaster* (*Sphærocrema*) *rugosior* (Santschi)**

"FEMALE (undescribed).—Length 8 mm. Thorax smooth and shining like the posterior half of the head and that of the worker, except its upper surface and the sides of the epinotum which have rugæ as in the worker. Head rectangular, a little longer than broad, scarcely arcuate laterally. The eyes occupy nearly the middle third of the sides and the scapes barely extend beyond its posterior fourth. Clypeus with a strong median impression near its anterior border. Thorax as broad as the head. Epinotum nearly vertical, but the insertion of the spines is marked by an angular ridge which occupies nearly the upper half of the sides of the segment. Petiole

as in the worker, with a tooth beneath. Wings 7 mm. long, hyaline, with brownish veins. Otherwise like the worker." (Santschi)

Numerous workers and a few females from Stanleyville (Lang, Chapin, and J. Bequaert), without further data.

***Crematogaster (Sphærocrema) striatula* Emery variety *obstinata* (Santschi)**

Numerous workers taken by Dr. Bequaert at Leopoldville in the peculiarly inflated stipules of a species of *Uragoga*, a rubiaceous plant (Part IV). The spaces inhabited by the ants are not true nests but merely kraals or stables for Coccidæ, as no larvæ or pupæ were found in the structures.

***Crematogaster (Atopogyne) africana* (Mayr) variety *schumanni* (Mayr)**

A number of workers taken by Dr. Bequaert at Leopoldville in the hollow stems of a *Barteria Dewerrei* (Part IV).

***Crematogaster (Atopogyne) africana* subspecies *laurenti* (Forel)**

Numerous workers taken by Dr. Bequaert in the Rain Forest on the Tshopo River, near Stanleyville, in the hollow stems of *Plectronia Laurentii* (Part IV).

***Crematogaster (Atopogyne) africana* subspecies *laurenti* variety *zeta* (Forel)**

Many workers and a few females taken by Dr. Bequaert at Pale (Niembo, between Walikale and Lubutu) from the myrmecodomatia of *Plectronia Laurentii* (Part IV) and at Leopoldville in the rudimentary leaf pouches of *Randia physophylla* (Part IV); also by Lang and Chapin at Stanleyville in the stem cavities of *Cuviera angolensis* (Part IV.)

The female of this form is black and striated as in the typical *C. africana*.

***Crematogaster (Atopogyne) africana* subspecies *tibialis* Santschi, new subspecies**

"WORKER.—

"Length 3.5 mm.

"Pale castaneous. Epinotum, postpetiole, and posterior half of gaster of a deeper castaneous tint, passing to reddish brown. A spot on the vertex and the appendages dark brown, the tibiæ and metatarsi blackish, the tarsi and the ex-

tremity of the thorax reticulate, the epinotum more finely, with some fine longitudinal rugæ on the whole basal surface. Sides of the mesonotum regularly reticulate-punctate. Sides of the pronotum more shining and of the epinotum longitudinally striate. Petiole finely reticulate; gaster finely shagreened, almost smooth. The pubescence is rather well developed on the head, the gaster, and the appendages, sparse on the thorax. The hairs are very sparse, except around the mouth and at the tip of the gaster. Head square, with rather convex sides and straight posterior border. Eyes at the middle of the sides. Frontal area short, feebly impressed behind. Frontal carinae developed. Clypeus slightly convex, with rather arched anterior border. Mandibles striate-punctate, with four blackish teeth. The pronotum forms with the basal surface of the mesonotum a plane surface with a contour like that of *C. castanea* Smith. Sides of the basal surface of the mesonotum blunt, not marginate, with the anterior eminence scarcely indicated. Promesonotal suture little or not at all impressed. Sides of the pronotum marginate. Declivity of mesonotum oblique, feebly concave from right to left, above with marginate sides. Mesoëpinotal furrow moderately deep. Basal surface of epinotum trapezoidal, its length equal to its width anteriorly in the small worker. It is convex in front, more feebly behind. The spines are as short as a fifth of the interval between their bases, which is concave. They are directed backward and slightly outward. Declivity as long as two-thirds of the basal surface and forming with it an angle of about 145° . Petiole trapezoidal, as broad as long, and as broad as the epinotum. Last antennal joint reddish. A fine and dense striation disposed as in *africana* (Mayr) but more or less effaced on the front, vertex and occiput, where the reflection is more shining than silky. Epinotum transversely striate-rugose. Petiole smooth, postpetiole and gaster very finely shagreened, almost shining. The head is, moreover, punctate as in *africana* and much less smooth in the individuals with large head.

"The head, which varies in size independently of the rest of the body, which is almost invariable, is sometimes longer than broad and scarcely emarginate behind, sometimes broader than long, strongly concave behind and with convex sides. Eyes more posterior than in *africana*. Frontal area narrow, strongly impressed and shining. Mandibles punctate, feebly striate. Mesoëpinotal impression stronger than in *africana*, the pronotum less marginate anteriorly. Mesonotum carinate, more elongate and with the declivous surface much less abrupt than in *africana*, with longer epinotal spines, even longer than in the variety *variegata* (Mayr) and a little farther apart. Petiole and postpetiole as in *africana*." (Santschi)

Numerous workers taken at the village of Mosekowa between Walikale and Lubutu by Dr. Bequaert from the peculiar pouches of *Macaranga saccifera* (Part IV) growing in the Rain Forest. As only adult ants and no brood were found in the pouches, Dr. Bequaert does not regard them as true nests. The openings of the pouches were not closed with fibrous carton.

Crematogaster (Atopogyne) africana subspecies **winkleri** (Forel) variety **fickendeyi** (Forel)

Numerous workers taken by Dr. Bequaert at Masongo, between Walikale and Lubutu, in the cavities of the branches of a species of *Sarcocephalus* related to *S. sambucinus* (Part IV).

Crematogaster (Atopogyne) depressa (Latreille) variety **fuscipennis**
Emery

Plate X

Stanleyville, ♀; Medje, ♂, ♀; Niapu, ♂; Ambelokudi, ♂, ♀; Niangara, ♂ (Lang and Chapin); Leopoldville, ♂ (J. Bequaert).

The beautiful carton nest of this ant is shown in Plate X, from a fine photograph taken by Mr. Lang at Ambelokudi. "It was built along the trunk of a tree near the ground. The ants, especially when squeezed, gave off a stench like certain bugs. They came out of the nest in great numbers and let themselves drop to the ground."

The female *C. depressa* is very aberrant in the form of the head, which is large, flat, and rectangular, with peculiar mandibles. It has long been known and has been repeatedly renamed, but only recently has it been correlated with the cospecific worker.

Crematogaster (Atopogyne) theta (Forel)

Plate XI, Figures 1 and 2; Plate XII, Figures 1 and 2; Plate XIII, Figure 1

Medje, ♂; Avakubi, ♂; Stanleyville, ♂, ♀, ♂ (Lang and Chapin).

According to Santschi (*in litt.*), "this form represents the extreme limit of the subgenus *Atopogyne*. The worker has a feeble groove on the postpetiole, and the promesonotal impression is feeble. Moreover, the female is brown, smooth, and shining, with spined epinotum, very different from the female of *C. africana* (Mayr) and the variety *zeta* (Forel)."

The specimens from Avakubi were collected by the natives, who call this ant "lona." The carton nests are shown in Plate XI and XII. Concerning the specimens from Stanleyville, Mr. Lang writes: "These small black ants are very common. They build carton nests in trees, on the trunks of which they travel up and down in uninterrupted columns. At the slightest disturbance the nest is covered with workers. They appear and move so rapidly that it is very difficult to study them, especially as they sting disagreeably. Large numbers of nests may be found in the same tree, sometimes as low as ten feet from the ground, or even in bushes as well as in the tops of the tallest trees, living or dead. They have almost any shape, depending on their position, whether in forks of the branches or about twigs. In the latter situations they resemble mere lumps. The more regular nests, however, are somewhat conical, like the tops of termite hills and are placed upright on the boughs. In color, the carton is grayish or dark brown. In size, the structures are rarely more than two feet in height and about a foot in diameter. Their cells are irregular,

the walls of the chambers being from 1 to 3 mm. thick, and there are many entrances and exits. Though very light, the nests are so tough that slices can be chopped off with a hatchet without breaking the remainder. The carton seems to be made from the fibres of rotten leaves worked up with secretions from the oral glands of the workers. The chambers are often full of brood, which is not confined to any particular part of the nest. The rufous females were present in such numbers that twenty or more could be lifted at a time clinging to one another on the points of the tweezers."

***Crematogaster* (*Atopogyne*) *transiens* (Forel)**

A few workers from Avakubi and a female from Stanleyville (Lang and Chapin).

***Crematogaster* (*Nematocrema*) *stadelmanni* (Mayr)**

A single female from Stanleyville (Lang and Chapin), apparently taken at light, seems to be referable to this, the typical form of the species.

***Crematogaster* (*Nematocrema*) *stadelmanni* variety *dolichocephala* (Santschi)**

Plate XIII, Figure 2 and Plate XIV

Bengamisa, ♂, ♀; Manamana, ♂, ♀; Kwamouth, ♂; Ngayu, ♂, ♀ (Lang and Chapin). Numerous specimens from all these localities. The specimens from Bengamisa were accompanied by the photograph of the nest shown in Plate XIV, and the following note: "Ants from a pendent nest in very hard, woody carton. These nests are very common in the Rain Forest. They often fall to the ground but, in spite of the great moisture, resist disintegration fairly well. The ants leave as soon as the nest has dropped. The nests are precisely like those of some termites in shape and material, so that it is often impossible to decide from their external appearance which insect inhabits them. The internal cellular structure is very irregular and seems to follow no particular plan. The larvæ and pupæ are found in any of the cavities. The nest represented in the photograph was fixed to several creepers and was practically swaying in the wind about twenty-five feet above the ground. Size and shape vary much according to the situation of the structure." The following note accompanies the specimens from Kwamouth, together with the photograph shown in Plate XIII, fig. 2: "Black ants taken from a

nest hanging on a tree about nine feet from the ground. This nest was cone-shaped and was fastened to several small branches in such a manner as to sway when it was struck with a stick. The ants raise their abdomens and sting quite furiously when annoyed. The nest is rough on the outside and very irregular, with a great many exits. The internal cellular structure resembles crumpled leaves overlapping one another like the shingles covering a roof. The walls separating the chambers are very thin, only one-eighth to one-sixteenth of an inch in thickness. The whole of the nest that was photographed was about eighteen inches long and eleven inches broad on top. The brood was abundant in the lowermost chambers. The ants dropped by hundreds to the ground when the nest was hit."

MONOMORIUM Mayr

The numerous species of this large and difficult genus are all small but form populous colonies, commonly with several fertile females.

The WORKER is usually monomorphic, in the subgenera *Parholcomyrme* and *Holcomyrme* tending more or less to dimorphism. Clypeus abrupt, not sharply marked off from the frontal area, with two longitudinal welts or ridges often bordering an impressed median area and terminating anteriorly in projections or teeth. (These welts are fused in the subgenus *Syllophopsis*). Mandibles narrow, with few teeth. Maxillary palpi 1- to 2-jointed, labial palpi 2-jointed. Antennæ 12-jointed, in a few subgenera 11-jointed, in one species (*M. decamerum*) 10-jointed, the club typically 3-jointed, but sometimes 4-jointed or indistinct. Promesonotal suture obsolete, the mesonotum more or less impressed at the mesoepinotal suture, the epinotum nearly always unarmed. Petiole pedunculate, with high node; postpetiole lower, rounded. Tibial spurs simple or lacking.

The FEMALE is always much larger than the worker, in some species wingless; in one Australian form (*subapterum*) with vestigial wings. Venation like that of *Formica*, with a discoidal cell, rarely without.

The MALE is smaller than the female, always winged, with 13-jointed antennæ. Mesonotum usually without Mayrian furrows, genital appendages completely retractile.

The division of the genus was begun by Forel when he established the subgenus *Martia*. Emery¹ has recently revised the grouping of species and has established several additional subgenera. Viehmeyer has also proposed a subgenus *Corynomyrme*, and Santschi has since added the subgenera *Syllophopsis* and *Isolcomyrme*. In a more recent paper,² Santschi proposes to give *Syllophopsis* generic rank.

¹1913, Ann. Soc. Ent. Belgique, LVIII, p. 261; and Bull. Soc. Ent. France, 1915, p. 100.

²1921, Ann. Soc. Ent. Belgique, LXI, p. 120.

These subgenera (see the key, Part VII) may be arranged more or less according to their natural affinities in the following sequence:

- | | |
|---|---|
| 1. <i>Anillomyrma</i> Emery | 7. <i>Monomorium</i> , <i>sensu stricto</i> |
| 2. <i>Martia</i> Forel | 8. <i>Notomyrmex</i> Emery |
| 3. <i>Lampromyrmex</i> Mayr (= <i>Mitara</i> Emery) | 9. <i>Xeromyrmex</i> Emery |
| 4. <i>Chelaner</i> Emery | 10. <i>Parholcomyrmex</i> Emery |
| 5. <i>Adlerzia</i> Emery | 11. <i>Isolcomyrmex</i> Santschi |
| 6. <i>Syllophopsis</i> Santschi | 12. <i>Holcomyrmex</i> Mayr |
| | 13. <i>Corynomyrmex</i> Viehmeyer |

The genus *Monomorium*, though cosmopolitan and of even wider distribution than *Crematogaster* since it occurs even in New Zealand and Patagonia, is represented by the great majority of species in the Old World. The Neotropical Region possesses only a few species of the typical subgenus *Monomorium* and the species of *Martia*, which are not known to occur elsewhere. The subgenera *Notomyrmex*, *Adlerzia*, and *Chelaner* are exclusively Australian. *Anillomyrma* is monotypic and known only from Ceylon. *Isolcomyrmex* and *Syllophopsis* are exclusively Ethiopian. *Xeromyrmex* is properly African but spreads into the Palearctic and Indian Regions. *Holcomyrmex*, *Parholcomyrmex*, and especially *Monomorium*, *sensu stricto*, are more widely distributed. Several of the species of *Monomorium*, *sensu stricto*, (*minutum*, *floricola*, *pharaonis*), *Xeromyrmex* (*salomonis*), and *Parholcomyrmex* (*gracillimum*, *destructor*) have been widely disseminated by commerce. The species of *Holcomyrmex* are harvesting ants of dry regions and this is true of certain Australian species which are allied to *Parholcomyrmex*, though I assign them to a new subgenus ***Protholcomyrmex*** (with the type *Monomorium rothsteini* Forel) to be described in a later paper.

***Monomorium pharaonis* (Linnaeus)**

Numerous workers and females from Stanleyville and Thysville (Lang and Chapin). This is the well-known, little, red house ant, spread by commerce throughout the world.

***Monomorium* (*Xeromyrmex*) *bicolor* Emery**

Several workers from Leopoldville (Lang and Chapin), found "living beneath a log," and two from Garamba, taken from the stomach of a toad (*Bufo regularis*). This species is apparently widely distributed in the Ethiopian Region.

Monomorium (Xeromyrmex) afrum Ern. André variety **fultor** Forel

Many workers from Niapu and Garamba (Lang and Chapin). Those from Niapu "came in thousands to the body of a dead bird. They had their nest in a cleared place about thirty yards away. The following day they had moved their nest to the base of a decomposed root but towards evening had returned to their original nest. This extended about two feet below the surface of the soil." At Garamba the species was found "making crater nests about three inches high about the stalks of grasses in a dry plain (savannah) with few trees." Thirteen specimens from this locality were taken from the stomach of a toad (*Bufo regularis*).

Monomorium (Parholcomyrmex) gracillimum (F. Smith) subspecies **robustus** Forel

Several workers from Yakuluku (Lang and Chapin); found living in small mushroom-shaped termitaria. The typical form of the species is widely distributed in Asia Minor, Arabia, Central Asia, India, etc., and is evidently spreading to other parts of the Old World tropics (Africa, Java, Laysan, etc.). According to Emery, it occurs in the desert of Algiers, nesting under stones. The subspecies *robustus* was originally described from Somaliland. Yakuluku is in the dry portion of the Belgian Congo towards the type locality.

SOLENOPSIS Westwood

A large and difficult genus of mostly hypogæic ants; usually with very small, pale workers and much larger and dark-colored females and males.

The WORKERS are usually monomorphic but in a few species, such as *puncticeps* Mayr, *savissima* (Smith) and *geminata* (Fabricius), distinctly polymorphic. Antennæ 10-jointed, first funicular joint large, club large, distinctly 2-jointed, the last joint very long. Mandibles narrow, with few (usually 4) teeth. Clypeus raised in the middle and projecting anteriorly, with two diverging ridges, or carinæ, each in all but a few species terminating anteriorly in a strong tooth flanked by a smaller tooth on the side. Frontal carinæ short, somewhat diverging behind. Eyes small, often minute or vestigial; ocelli very rarely present. Promesonotal suture indistinct, mesoepinotal suture well developed. Thorax more or less impressed at the latter. Epinotum always unarmed. Petiole with short peduncle and high, rounded node; postpetiole rounded, much lower than the petiolar node.

The FEMALE has 11-jointed (rarely 10-jointed) antennæ and moderately large eyes and ocelli. Fore wings with one cubital and one discoidal cell; radial cell open.

The MALE is somewhat smaller than the female, with 12-jointed antennæ. Scape very short, first funicular joint globular. Eyes and ocelli very large and prominent. Mesonotum without Mayrian furrows. Postpetiole campanulate; first gastric segment large; legs slender.

The genus *Solenopsis* is cosmopolitan, but represented by the greatest number of species in the Neotropical Region. There are a few forms even in Australia. The species with small, nearly blind, yellow workers, like *S. fugax* (Latreille) of Eurasia and *S. molesta* (Say) of North America, are hypogæic and usually live in the nests of other ants and termites, feeding on their brood (cleptobiosis). Some species, however, (*punctaticeps*, *sævis*, *geminata*, *gayi*, etc.) live in large independent colonies. *S. sævis* and *geminata*, the well-known "fire-ants" of the tropics, sting very severely. They have well-developed eyes and lead an epigæic life, not only feeding on insects and other animal food but also harvesting seeds or destroying the tender shoots or fruits of plants.

***Solenopsis punctaticeps* Mayr subspecies *kibaliensis*, new subspecies**

WORKER.—

Length 2 to 2.8 mm.

Apparently less polymorphic than the typical *punctaticeps* and the subspecies *caffa* Forel and therefore more like the subspecies *erythra* Emery. Head in all the individuals rectangular, with straight sides, as broad in front as behind, not longer than broad in the largest, distinctly longer in the smallest individuals. Median teeth of the clypeus long and slender, lateral teeth obsolete or indicated only by feeble projections. Petiolar node broader than the petiole, its upper border straight and transverse.

Sculpture much as in typical *punctaticeps* and the hairs almost as abundant as in that form, but much shorter and less erect, especially on the head. Color yellowish brown, legs and antennæ yellow; mandibular teeth dark brown. Small workers scarcely paler.

MALE.—

Length 4.3 mm.

Head with very large eyes and ocelli, the latter extremely prominent; without the mandibles broader than long. Mandibles with 3 denticles. Antennal scapes nearly as long as the first two funicular joints together. Thorax broadly elliptical, slightly flattened above, only slightly longer than broad, much broader than the head. Epinotum bluntly subangular in profile, the base distinctly longer than the declivity. Nodes of petiole very low, rounded. Wings rather long; legs very slender.

Smooth and shining; head subopaque and finely longitudinally striate behind.

Hairs sparser and more reclinate than in the worker.

Brown; head black around the ocelli; mandibles, antennæ and legs yellowish. Wings rather opaque brownish hyaline, with very distinct brown veins and pterostigma.

Described from twenty workers and a single male from Vankerekhovenville (Lang and Chapin), on the Kibali River or Upper Uele. The specimens were living in small craters in the soil and were seen feeding on dead insects.

Emery¹ has recently revised the various subspecies and varieties of *S. punctaticeps*. The form described above is certainly distinct. I am not sure that I have seen the largest workers, although the series of specimens is rather large. The single male is smaller and much paler than that of the typical *punctaticeps*, which is described by Arnold as "black" and as measuring 5 mm. He found that the typical form of the species lives in large colonies, independent of other ants or termites, though it is hypogaeic, "rarely coming to the surface except in dull weather."

AËROMYRMA Forel

In this genus the WORKER phase is strongly dimorphic, being represented by a minute worker proper and a much larger soldier, both with 10-jointed antennæ and distinctly 2-jointed antennal club. The head of the soldier is large, suboblong and, in some species, furnished with a ridge with a slight tooth-like projection on each side near the occipital border. Maxillary and labial palpi 2-jointed. Mandibles 5- or 6-toothed. Clypeus without teeth and usually without carinæ. Eyes reduced to a few facets, the anterior ocellus well developed, the lateral ocelli absent. Pro- and mesonotum high and convex; epinotum short, unarmed or with small teeth. Promeso- and mesoepinotal sutures distinct. Petiole with a short peduncle, its node rather low and transverse; postpetiole also transverse, somewhat broader than the petiole. Gaster large, elongate, as long as the remainder of the body. Legs short. In the worker the head is small, scarcely longer than broad, without ocelli and with the eyes even more reduced than in the soldier, the gaster smaller, not elongate.

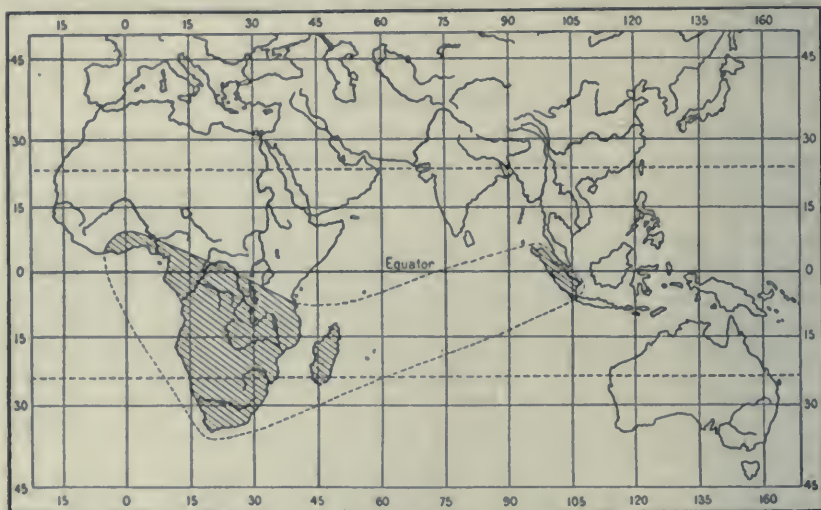
FEMALE larger than the soldier, but with shorter head. Antennæ 11-jointed, but also with a 2-jointed club. Thorax elongate elliptical, mesonotum seen from above covering the pronotum. Wings long, with a closed radial cell, a discoidal and one cubital cell.

MALE smaller than the female, not larger than the soldier, with long, filiform, 13-jointed antennæ, the scape very short, the first funicular joint not swollen, not broader than the succeeding joints. Outer genital valve long, narrow, acuminate rounded at the tip; middle valve with a short, hollow, subtriangular, external ramus, and an extremely narrow, rather long internal ramus terminating in a hook; inner valve with three ridges, the mesial of which is strongly dentate and with its point directed obliquely to the base of the valve.

The genotype, *A. nossindambo* Forel, was described from males and females taken in Madagascar many years ago. Sikora later found the soldiers and workers in a termitarium at Amparafaravantsiv in the same island. Forel therefore expressed the opinion that the species of *Aëromyrma* must be cleptobiotic. The fact that Emery found a worker attached to the tarsus of a female is suggestive in connection with conditions in *Carebara* (*vide infra*, p. 171).

¹1915, Rend. Accad. Sc. Bologna, N. S., XIX, pp. 60-65.

For many years the genus was supposed to be monotypic and peculiar to Madagascar, but within recent years eight species and a variety have been described from the Ethiopian Region; Forel has also described a species from Sumatra (Map 23). A single soldier in the collection made by Lang and Chapin is certainly different from any of the species known in that phase. I describe it as new, although it may prove to be the soldier of one of the species based on workers.



Map 23. Distribution of the genus *Aëromyrma*.

Aëromyrma petulca, new species

Text Figure 40

SOLDIER.—

Length 2.5 mm.

Head suboblong, nearly one and one-half times as long as broad, with feebly convex sides and rather deeply and angularly excised posterior border. Anterior ocellus well developed; eyes very small, consisting of about six ommatidia, situated at the anterior third of the head. Posterior corners of the latter with a low but distinct ridge produced on each side into a minute tooth. Mandibles convex, with 4 small, subequal, rather acute apical teeth, and a large blunt and flattened basal tooth. Clypeus flat, ecarinate, its anterior border feebly and sinuately excised in the middle, its posterior portion narrow, rectangular, extending back between the diverging frontal carinae. Frontal groove distinct. Antennae 10-jointed; scapes rather slender and curved at the base, reaching to the middle of the sides of the head; joints 2 to 7 of the funiculus minute, subequal, nearly as broad as long (somewhat too long in the figure); club a little shorter than the remainder of the funiculus, with the basal joint longer than broad and about one-third as long as the terminal joint. Thorax decidedly

shorter and narrower than the head; pro- and mesonotum convex, steep in front, rounded above; promesonotal suture distinct; mesonotum subcircular; metanotal sclerite distinct. In profile the dorsal outline of the mesonotum slopes backward continuously with the base of the epinotum without a distinct impression at the meso-epinotal suture. Epinotum with a small tooth on each side, its declivity longer than its base, rather steeply sloping. Petiolar node compressed anteroposteriorly, in profile with a rather angular summit, from above transverse; postpetiole transversely elliptical and somewhat broader than the petiole, with a blunt ventral tooth. Gaster voluminous, distended with a transparent liquid, elongate elliptical, longer than the remainder of the body, its anterior border straight in the middle. Legs short.

Subopaque; mandibles, posterior portion of clypeus, frontal area, mesonotum, and gaster shining; mandibles sparsely and indistinctly punctate; head finely and regularly longitudinally rugulose; sparsely and rather coarsely punctate posteriorly; gaster with fine, scattered, piligerous punctures.

Hairs yellowish, moderately abundant, suberect, of uneven length, most conspicuous on the dorsal surface; very short, dense and appressed on the appendages.

Ferruginous red; legs and antennæ paler and more yellowish; gaster dark brown above, with the venter and bases and apical borders of the segments broadly yellowish.

Described from a single specimen taken by Lang and Chapin at Malela "from a small mushroom-shaped termitarium," probably belonging to a colony of *Eutermes fungifaber* Sjöstedt.

A. petulca differs from *africana* Forel from the Kalahari in its slightly smaller size, darker color, in having the postpetiole only slightly broader than the petiole (nearly twice as broad in *africana*), in possessing epinotal teeth and longitudinal rugæ on the head. In *africana* the head is finely reticulate and the remainder of the body is evidently more shining than in *petulca*. In *nossindambo* the head is broader and less sharply rugulose, the thorax is more deeply impressed at the meso-epinotal suture, the antennal scapes are much shorter, the anterior ocellus is smaller and the color is paler.

Forel states that the gaster of the *africana* soldier is "transparent yellow," which indicates that it was full of a clear liquid as in *petulca*. This condition is seen also in the soldiers of many species of *Pheidole* in Australia and in our Southern States and seems to indicate that this caste in the two genera mentioned often functions as replete or food-storage individuals as in the honey ants (*Myrmecocystus*, *Leptomyrmex*, *Melophorus*, *Plagiolepis*, and *Prenolepis*).

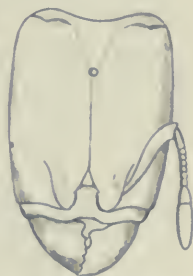


Fig. 4. *Aetomyrma petulca*, new species. Head of soldier from above.

Emery¹ believes that *Aëromyrma* should be reduced to the rank of a subgenus under *Oligomyrmex* "because in *O. debilis* Santschi the worker has 9-jointed, whereas the soldier (and probably also the female) has 10-jointed antennæ, so that if one wished to distinguish the groups as heretofore, the worker of *O. debilis* would be classified in the genus *Oligomyrmex*, the soldier in the genus *Aëromyrma*." While admitting that the two genera are very closely related, I prefer to retain *Aëromyrma* as an independent genus until the species are better known. Probably there are important differences in habit between the species of the two groups. At any rate, *A. nossindambo* and *petulca* are epletobiotic with termites, whereas two or three species of *Oligomyrmex* which I collected in Australia were always found nesting in small cavities in rotten logs quite apart from termites.

Aëromyrma species

A single winged female from Akenge, taken from the stomach of a frog (*Arthroleptis variabilis*), cannot at the present time be referred to any of the described species, mostly known from soldiers and workers.

CAREBARA F. Smith

WORKER minute, monomorphic, yellow, without eyes or ocelli; antennæ 9-jointed, joints 2 to 6 very small, the two terminal joints forming a large and distinct club, with very long last joint. Mandibles with oblique 3- or 4-toothed apical margins. Frontal carinæ short; frontal groove and frontal area absent. Clypeus simple, unarmed, without carinæ. Epinotum unarmed. Petiole with a short peduncle, its node higher and larger than that of the postpetiole; both nodes from above transverse, subelliptical.

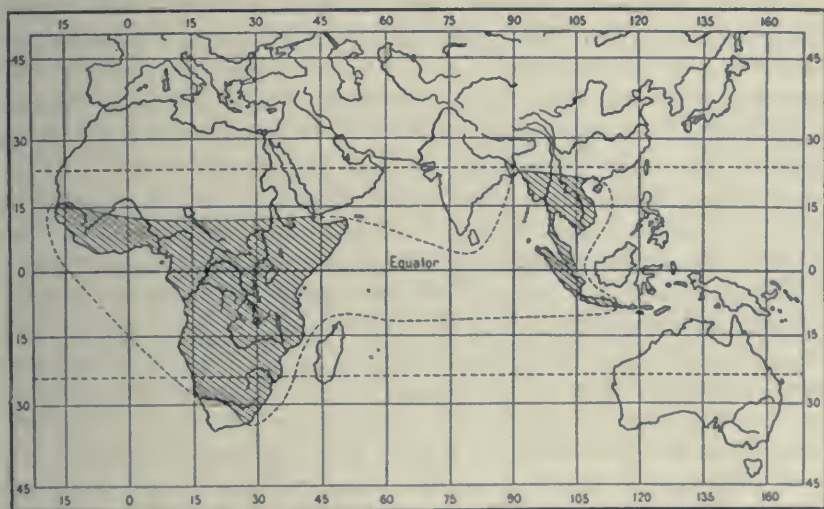
FEMALE enormously larger than the worker, dark-colored, with well-developed eyes and ocelli. Antennæ short, 10-jointed, the funiculi without a distinct club, their joints 2 to 5 not much narrower than the remaining joints. Thorax large and robust, convex above, higher than the head, the mesonotum anteriorly more or less over-arching the small pronotum, with well-developed parapsidal furrows. Epinotum unarmed, or with low flattened lobes or protuberances on the sides. Tarsi densely clothed with short, stiff bristles. Wings large, the anterior pair rather pointed, with one cubital, a discoidal, and a closed radial cell and a well-developed pterostigma.

MALE somewhat smaller than the female, but similarly colored, with long, 13-jointed antennæ, scapes short, first funicular joint not swollen nor globular, remaining joints long and cylindrical. Mesonotum large, without Mayrian furrows. Nodes of petiole and postpetiole only feebly developed.

The genus *Carebara* (Map 24) is represented by seven species in the Ethiopian and two in the Indochinese Region (*C. lignata* Westwood and *C. castanea* F. Smith). Santschi described some females and males

¹1915, Rend. Accad. Sc. Bologna, N. S., XIX, p. 59, footnote.

taken in French Guiana as *Carebara carinata*.¹ The former measure 12 to 12.8 mm., the latter 9.3 mm. He is of the opinion that the species hitherto referred to the Neotropical genus *Tranopelta*, originally founded by Mayr on male specimens, are also to be referred to *Carebara*. Forel, however, in his description of the workers of *T. gilva* Mayr variety *brunnea* shows that Mayr's genus is perfectly distinct. These workers are somewhat dimorphic, have eyes, and both the workers and females have 11-jointed antennæ, with a 3-jointed clava. The male alone is very similar to *Carebara*, especially to the male of *C. osborni* described below. These characters are all evident in a series of worker, male and female



Map 24. Distribution of the genus *Carebara* in the Old World. This genus also occurs in South America.

cotypes of *brunnea* in my collection. Emery² had previously based another Neotropical genus, *Carebarella*, on females and males of a species (*C. bicolor*) from Brazil and Peru. He also described a worker from Ega, Brazil, under the name *Oligomyrmex anophthalmus*.

At first sight the occurrence of species of *Carebara* and *Oligomyrmex* in South America seems very doubtful. During a recent trip to British Guiana I was able to secure all three phases of a new subspecies of Santschi's *C. carinata* and of the typical form of *Tranopelta gilva*. The worker of the former shows that it is without a doubt a true *Carebara*,

¹1912, Bull. Soc. Ent. France, p. 139.

²1905, Bull. Soc. Ent. Italiana, XXXVII, p. 137.

and Prof. Emery, to whom I sent specimens for comparison with his *Oligomyrmex anophthalmus*, writes me that the latter, though specifically distinct, belongs to the same genus. It should therefore be known as *Carebara anophthalma*. The new subspecies of *carinata* was taken in a large termitarium of *Syntermes dirus* Klug, and it is interesting to note that of all the Neotropical termites this is most like the large *Termes* species with which the Ethiopian *Carebaræ* live (*vide infra*). I took *Tranopelta gilva*, however, in the deeper parts of the nest of the large ponerine, *Paraponera clavata* (Fabricius), and also living independently with coccids under bark.

Emery has placed *Tranopelta* and *Carebarella* with *Diplomorium* and *Solenopsis* in the tribe Solenopsidini and has made a tribe Pheidologetini for the genera *Pheidologeton*, *Aneleus*, *Lecanomyrma*, *Oligomyrmex* (including the subgenera *Aëromyrma* and *Octella*), *Erebomyrma*, *Pædalagus*, and *Carebara*. It would seem to be more natural to include all these forms in the single tribe Solenopsidini. Evidently *Carebara*, in the diminution of the antennal joints and the loss of the eyes in the worker, in the secondary reduction of this caste to monomorphism, and the secondary enormous enlargement of the females and males, represents the most extreme development of the whole series of genera, which probably started from forms like the existing species of *Pheidologeton*. Since the volumes of bodies of the same shape vary as the cubes of their diameter, a female *Carebara vidua* measuring 24 mm. would be 4096 times as large as the conspecific worker, which measures only 1.5 mm., if the two insects were of the same shape. But the female is a much stouter insect in proportion to her length than the worker, so that she must be nearly 5000 times as large. And this disproportion occurs not only among individuals of the same species but of the same sex and among the offspring of the same mother! The only other insects which exhibit a like disproportion are the workers and physogastric queens of the very termites with which *Carebara* lives as a predatory parasite. The extraordinary differences in stature between the workers and sexual phases of *Carebara* are undoubtedly correlated with interesting habits of the species. Haviland¹ was the first to show that *C. vidua* lives in the masonry of the large nests of *Termes natalensis* in Natal. He discovered the minute workers but was unable to elucidate the relations of the ants to the termites. Forel (*loco citato*), inferring from analogy with our northern cleptobiotic species of *Solenopsis* (*S. fugax*, *molestus*, etc.) advanced the hypothesis that the *Carebara* colonies live in cavities of their

¹In Forel, 1901, Ann. Soc. Ent. Belgique, XLV, p. 392.

own in the masonry of the termitaria and that these cavities are connected with the galleries of the termites by means of very tenuous passages through which the *Carebara* workers, but not the termites, can pass. The *Carebara* workers, probably remaining unnoticed on account of their small size, prey on the termites with impunity and are therefore able to rear such huge sexual forms. The larvæ of these are so voluminous that they could not be moved by the workers and are so soft and vulnerable that they would have to be reared in chambers inaccessible to the termites. Although no detailed observations on the relations of the two species have been published, the subsequent accounts of observers in the field go to confirm Forel's inferences.

Bequaert¹ has witnessed the marriage flight of *Carebara junodi* Forel. He says:

This species is remarkable on account of the extraordinary disproportion between the female and the workers. In the Katanga it lives in the mound-shaped nests of *Acanthotermes spiniger*. October 6, 1911, I witnessed at Sankisia a nuptial flight of this ant. It was at the very beginning of the rainy season and on the two preceding days it had rained abundantly. Toward noon numerous winged females were flying about everywhere in the savannah; they came from a certain number of termitaria, the sides of which were covered with fabulous numbers of the very small workers of the same species. I did not see copulation but, in the evening, I captured several males at light but no females. The following days the phenomenon was not repeated.

The huge *Carebara* females are, among the aborigines of the Congo, a much-sought-for delicacy. Hence they take advantage of the nuptial flight to collect a great number of individuals. The swollen portion of the abdomen alone is utilized. They eat it either roasted or raw.

Dr. Bequaert informs me that his attention was directed to the marriage flight described above by the excitement of the congregated natives who were actually filling pails with the torn-off gasters of the females. Each *Carebara* colony gave off hundreds of females and the number of workers that covered a termitarium during the flight must have run into the millions. The workers of *Carebara*, like those of other hypogæic ants (*Erebomyrma*, *Acanthomyops*, etc.), apparently come to the surface of the soil only while the nuptial flight is in progress.

Arnold² adds the following interesting note to his description of *Carebara vidua*.

It is probable that the dense tufts of hairs on the tarsi of the female serve an important purpose—that of enabling some of the minute workers to attach themselves to the body of the female when the latter is about to leave the parental nest. Several specimens of the female have been taken by me with one or more workers biting into

¹1913, *Rev. Zool. Afr.*, II, p. 428.

²1916, *Ann. South African Mus.*, XIV, p. 252.

the dorsal fimbriæ. I am inclined to suspect that the young queen cannot start a new nest without the help of one or more of the workers from the old nest, on account of the size of her mouth-parts, which would probably be too large and clumsy to tend the tiny larvæ of her first brood, and that it is therefore essential that she should have with her some workers which are able to feed the larvæ by conveying to them the nourishment from the mouth of the queen.

I find that the workers also attach themselves to the tarsi of the males. Two specimens of this sex referable to *C. vidua*, evidently taken at light and sent me by Mr. C. C. Gowdey from Kampala, Uganda, each bear two workers firmly attached by their mandibles to the tarsal hairs. Such workers must, of course, perish with their carriers, unless they can manage to pass over to the legs of the females during copulation.

The workers and females of the African *Carebaræ* can be separated by means of the following keys.

FEMALES

1. Large species, more than 20 mm. long.....2.
Small species, not more than 15 mm. long.....4.
2. Mandibles with only 2 teeth and the remainder of their apical borders undulated, not properly dentate.....*ampla* Santschi.
Mandibles with more than 2 teeth, entire apical border dentate.....3.
3. Black; the gaster sometimes red; mesonotum about as broad as long; clypeal border not emarginate in the middle; hind metatarsi much shorter than hind tibiæ.....*vidua* F. Smith.
Dull rusty red; mesonotum with three dark brown longitudinal stripes; thorax narrower; clypeal border broadly emarginate in the middle; hind metatarsi but little shorter than the hind tibiæ.....*junodi* Forel.
4. Length 13 to 15 mm.; dark brown or castaneous.....5.
Length only 8 mm.; paler and more reddish brown.....*osborni*, new species.
5. Body covered with short hairs; clypeus merely coarsely punctate..*sicheli* Mayr.
Body almost hairless; clypeus transversely rugulose in the middle.
langi, new species.

WORKERS

1. Mandibles 3-toothed. Length 1.7 to 1.9 mm.....*arnoldi* (Forel).
Mandibles 4-toothed.....2.
2. Base of epinotum longer than the declivity, marginate on the sides. Length 1.6 to 2 mm.....*vidua* F. Smith.
Base of epinotum shorter.....3.
3. Petiolar node one-fourth narrower than the postpetiole. Length 1.5 to 1.8 mm.
silvestrii Santschi.....4.
Petiolar node as broad as the postpetiole.....4.
4. Thorax not impressed at the mesoepinotal suture; promesonotum but slightly longer than broad; epinotum subcuboidal with subequal base and declivity. Length 0.8 to 1 mm.....*osborni*, new species.
Thorax distinctly impressed at the mesoepinotal suture; promesonotum much longer than broad; epinotum not subcuboidal, its base very short, its declivity long and sloping. Length 1.7 to 1.9 mm.....*junodi* Forel.

Carebara langi, new species

FEMALE.—

Length 13 mm.; wings 14 mm.

Head broader than long, narrower in front, with straight posterior border and rounded posterior corners. Eyes rather large, on the sides, twice as long as the straight cheeks; ocelli large, in deep impressions. Mandibles with 6 graduated teeth, the apical tooth large. Clypeus rather evenly convex, slightly depressed in the middle behind; its anterior border entire and broadly rounded. Frontal area large, semicircular, convex; frontal groove deeply impressed; frontal carinae slightly lobed, diverging behind. Antennae short, 10-jointed; scapes reaching only to the posterior orbits; funicular joints 2 to 4 a little broader than long, fifth joint as long as broad, remaining joints longer than broad, the three terminal joints forming an indistinct clava as long as the remainder of the funiculus. Thorax long and narrow, elliptical from above; mesonotum distinctly longer than broad, distinctly overarched the pronotum in front, with sharply marked parapsidal furrows. Epinotum in profile rectangular, with the declivity longer than the base, abruptly sloping, somewhat concave in the middle, on each side with a marginate projection which forms the bluntly rectangular outline of the epinotum in profile. Petiole from above a little longer than broad, in profile with straight ventral outline and rather low, rounded node, the anterior slope of which is feebly concave. Postpetiole twice as broad as the petiole, nearly twice as broad as long, very slightly flattened above and on the sides, with a distinct transverse impression anteriorly on the ventral surface. Gaster broadly and regularly elliptical, slightly flattened above and below. Legs rather short, hind metatarsi about three-fifths as long as the hind tibiae.

Shining; sides of epinotum, petiole and postpetiole more opaque; mandibles very coarsely rugose-punctate; remainder of body with umbilicate punctures, which are smaller and sparser on the thorax and gaster than on the clypeus and head. Between these punctures there are more numerous, very minute but sharp punctures. Clypeus transversely rugulose, especially behind; front of head very finely longitudinally striate. Base and declivity of epinotum very finely transversely striate. Antennal scapes and legs finely punctate.

Almost hairless; only a few short, yellowish hairs towards the tips of the antennae, on the mandibles, mouth-parts, border of clypeus and a patch of more numerous hairs at the tip of the gaster.

Deep castaneous; gaster, scutellum, pedicel and sides of epinotum blackish. Wings uniformly infusate, with dark brown veins and pterostigma, the veins narrowly bordered with blackish.

A single specimen taken at light at Stanleyville (Lang and Chapin).

The species is evidently very different from all the described African species, except *sicheli* Mayr, but this form, judging from Mayr's description, is less shining, of a paler color, with small but distinct hairs arising from the coarse punctures on the body, the clypeus has a shallow longitudinal impression and is merely punctate and the sides of the epinotum are finely longitudinally striate. The study of more material of both forms may show that *langi* is to be regarded as a subspecies of *sicheli*.

Carebara osborni, new species

Plate XV; Text Figure 41

WORKER.—

Length 0.8 to 1 mm.

Head subrectangular, slightly longer than broad, as broad in front as behind, with nearly straight posterior and very feebly and evenly rounded lateral borders. Eyes absent. Mandibles convex, with oblique 4-toothed apical borders. Antennae 9-jointed, the scapes reaching to the middle of the sides of the head; funicular joints 2 to 6 very small, slightly broader than long (too long in the figure), terminal joint longer than the remainder of the funiculus (too short in the figure). Thorax narrower than the head; pro- and mesonotum flattened above, suboctagonal, a little longer than broad; epinotum subcuboidal, of the same height as the promesonotum but narrower, as long as broad, the base and declivity subequal in profile, meeting at a right angle, the base not marginate on the sides, the declivity in the middle sloping and longer than the base. Mesoepinotal suture very distinct but not impressed. Petiolar node as long as broad, subglobular, peduncle short; postpetiole not broader than the petiole, with much smaller node. Gaster and legs of the usual shape.

Shining; mandibles finely and sparsely punctate; head and thorax above coarsely punctate, the latter more sparsely; punctures on the remainder of the body finer and sparser.

Hairs pale yellow, short, subappressed, not very abundant, most distinct on the gaster.

Pale brownish yellow, mandibular teeth and anterior border of clypeus darker brown.

FEMALE (deâlated).—

Length 8 mm.

Head, including the mandibles, as long as broad, broader behind than in front, with feebly convex posterior border, rounded posterior corners and straight cheeks. Eyes not very convex, on the sides of the head. Ocelli large, in deep impressions. Mandibles large, with oblique, 4-toothed apical borders. Clypeus with a broad longitudinal median impression, its anterior border broadly and sinuately emarginate in the middle. Frontal area absent, represented only by the impressed anterior end of the rather deep frontal groove. Frontal carinae slightly flattened, scarcely diverging behind. Antennae short, 10-jointed, scapes reaching to the posterior orbits; funicular joints 2 to 5 broader than long; joint 6 as long as broad, joint 7 somewhat more than half as long as joint 8, the terminal joint equal to joints 7 and 8 together. Thorax robust, longer than broad, broader than the head; the mesonotum convex, longer than broad, in front scarcely overarched the vertical pronotum, parapsidal furrows very distinct. Epinotum longitudinally grooved in the middle, with short base and a much longer, abrupt, rather flat declivity, bordered on each side by a large, flat, rounded and marginate lobe or crest. Petiolar node from above broadly oval, nearly as long as broad, evenly convex and rounded above, its anterior slope with a median blunt convexity, its ventral border in profile slightly concave in the middle. Postpetiole from above a little broader than the petiole, about one and two-thirds times as broad as long, convex above in front. Gaster broadly elliptical, somewhat flattened dorsally and ventrally. Legs rather short.

Shining; mandibles, head, epinotum, and sides and ventral portions of petiole and postpetiole more opaque. Mandibles very coarsely striatopunctate. Clypeus

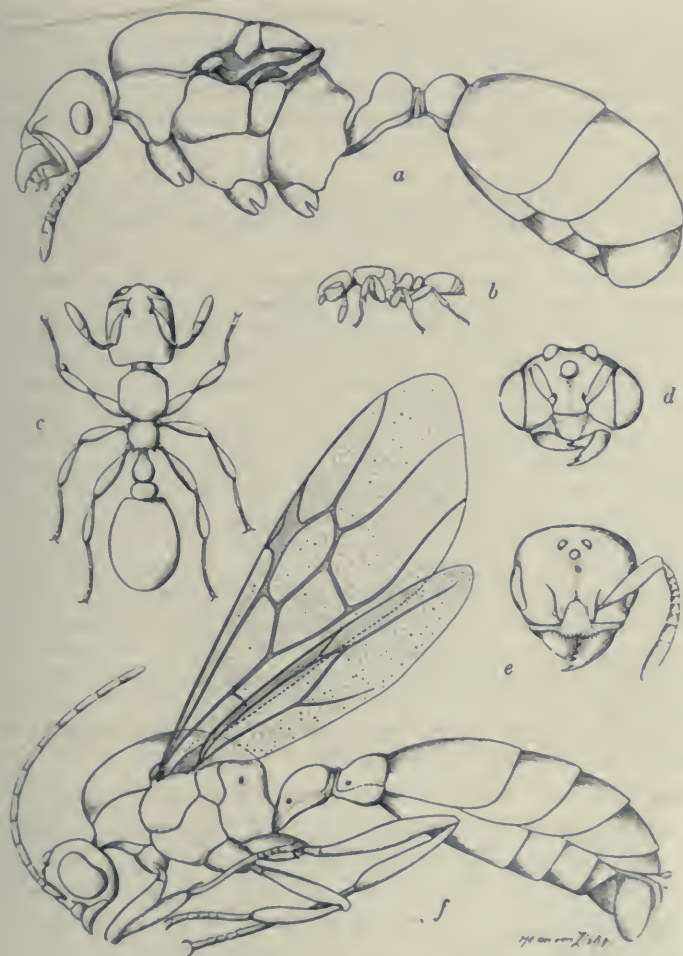


FIG. 41. *Carebara osborni*, new species. a, deellated female; b, worker in profile; c, same more enlarged; d, head of male; e, head of female; f, male in profile.

irregularly and indistinctly rugulose, somewhat transversely in the middle. Head coarsely and umbilicately punctate, finely striate in the spaces between the punctures. Mesonotum, scutellum, mesopleura, gaster, and nodes of petiole and postpetiole covered with umbilicate punctures of the same size as those on the head but sparser and with the shining interspaces very minutely and sparsely punctate. Opaque portions of epinotum and pedicel very finely striate. Legs with larger and minute punctures like the gaster, but the larger punctures are smaller and denser. Antennal scapes finely and densely punctate.

Hairs yellow, short, bristly, suberect, rather uniformly distributed over the body, arising from the large unilobate punctures, longer on the gula and tip of the gaster, more abundant on the latter; very short, delicate and appressed on the legs and scapes.

Reddish brown; gaster and legs somewhat paler; mesonotum with indistinct traces of castaneous stripes, especially posteriorly. Mandibular teeth blackish.

MALE.—

Length 7 to 7.5 mm.

Head through the eyes much broader than long, broadest at the median transverse diameter, short and rounded behind. Eyes very large; ocelli large and prominent. Mandibles narrow, 3-toothed. Clypeus very convex and rounded in the middle with projecting, entire anterior border. Antennae 13-jointed, long, filiform, of uniform thickness; scapes about three times as long as the first funicular joint, which is as broad as long but not swollen; remaining joints cylindrical, fully three times as long as broad, the terminal joint longer. Thorax robust, nearly as broad as long, through the wing insertions slightly broader than the head, convex above, in front somewhat overarched the pronotum. Epinotum short, shaped like that of the female, but without the marginate projections on the sides. Petiole resembling that of the female but with node scarcely developed; postpetiole much less convex, longer in proportion to its length. Gaster rather slender, scarcely flattened above; external genitalia voluminous, more or less exerted, the outer valves large, rounded at their tips. Legs slender.

Subopaque; scutellum, gaster, and upper surfaces of petiolar and postpetiolar nodes shining. Mandibles, head, thorax, and pedicel very finely and densely punctate; gaster also with fine but sparser punctures, those on the scutellum coarser but not so dense as on the remainder of the thorax.

Hairs finer, much shorter, and denser and more appressed on all parts of the body than in the female.

Brown; ocellar region black. Wings brownish, rather opaque, with the veins and pterostigma of the same color as the body.

Described from four workers, one female, and numerous males taken from a single colony at Niangara (Lang and Chapin) in the mound of a termite (*Termes natalensis* Haviland). According to Mr. Lang, the specimens were found "south of Niangara in one of the grass-covered termite hills which give the treeless landscape of the savannah its characteristic appearance (Plate XV). These hills extend as far as the eye can reach. They are never very high—rarely more than twelve feet—though they may attain a diameter of fifty feet at the base. Usually they appear as mere undulations of the ground, covered with grass which may be as much as ten feet high. The *Carebara* queen, males and workers were living in a flattened chamber about three feet above the general level of the soil near the center of a medium-sized termitarium."

C. osborni, though a true *Carebara*, is entirely unlike any of the known species in the small size of all the phases. In this respect and in the color of the male and female it approaches the species of the genus *Oligomyrmex*.

Carebara vidua F. Smith

Niangara, ♀; Faradje, ♀ (Lang and Chapin); Yakuluku, ♂ (J. Rodhain). The specimens from Niangara have the gaster black and therefore belong to the variety *dux* of Forel; one specimen from Faradje has the gaster castaneous and is therefore transitional to Santschi's variety *abdominalis*. Arnold has shown that these color differences are merely nest variations, so that they may be relegated to the synonymy of *vidua*.

PÆDALGUS Forel

The WORKER of this peculiar genus which is closely related to *Carebara* and *Oligomyrmex*, is monomorphic, minute, brownish yellow, with the eyes reduced to one or two ommatidia placed near the anterior third of the sides of the head. Ocelli absent. Maxillary and labial palpi each 2-jointed. Mandibles rather narrow, with oblique 4-toothed apical borders. Clypeus convex and projecting in the middle, extending back between the frontal carinæ, with a pair of longitudinal carinæ, which converge somewhat behind but do not terminate in teeth anteriorly. Antennæ rather stout, resembling those of *Carebara*, 9-jointed, with joints 2 to 6 of the funiculus small and transverse, the club large and distinct, 2-jointed. Thorax short and broad; the pronotum with rather angular humeri. Promesonotal suture lacking and, in the African species, with the mesoepinotal suture scarcely indicated. Epinotum sloping, the declivity on each side with a low vesiculate lamina resembling in structure the epinotal laminae of certain species of *Strumigenys*.

The FEMALE is considerably larger than the worker, with well-developed eyes and ocelli and 10-jointed antennæ, the club of the latter being 3-jointed and longer than the remainder of the funiculus. Mandibles 5-toothed. Clypeus convex, eecarinate. Thorax short, high, and arched, much broader than the head. Wings unknown.

The MALE has not been seen.

Forel founded this genus on *P. escherichi*, a species discovered by Escherich in a small cavity in a mound of *Termes obscuriceps* at Peradenya, Ceylon. The minute workers were "running about on the back of their huge queen, like lice." Santschi in 1913 described as *Oligomyrmex infimus* from French Guinea the worker of a second species, which he later (1914) recognized as a *Pædalagus*. The following species is very similar.

Pædalagus termitolestes, new species

Plate XVI; Text Figures 42 and 43

WORKER.—

Length 1 mm.

Head subrectangular, a little longer than broad, nearly as broad in front as behind, with feebly rounded sides and feebly excavated posterior border. Eyes very small, situated at the anterior third of the head. Mandibles rather narrow, with four subequal teeth. Clypeus convex in the middle, bicarinate, with the anterior border

projecting and truncated in the middle, narrow on the sides. Antennae robust, scapes reaching to the second third of the sides of the head; funicular joints 2 to 6 subequal, much broader than long, together but little longer than the first joint; basal joint of club slightly longer than broad, less than one-third as long as the apical, which is nearly as long as the remainder of the funiculus. Thorax narrower and somewhat shorter than the head, broad in front, narrowed in the epinotal region, with subangular humeri; its dorsal surface in profile straight and horizontal to the base of the sloping, very bluntly angular epinotum, without promesonotal and mesoepinotal sutures; the epinotal declivity on each side with a low, subtriangular, vesiculate lamina. Petiole with a short, stout peduncle, its node high, rounded, about one and one-half times as broad as long, transversely elliptical from above. Postpetiole smaller than the petiole, its node much lower, only a little broader, a little less than twice as broad as long. Gaster elliptical, its anterior border concave in the middle. Legs rather short.



Fig. 42. *Padalagus termitolestes*, new species. Worker. a, from above; b, in profile.

Head, thorax, petiole, and postpetiole opaque, covered with shallow, saucer-shaped punctures, arranged in regular rows on the head and each bearing in its center a short hair. Upper surfaces of petiolar and postpetiolar nodes smoother and somewhat shining. Gaster and legs very smooth and shining, with minute, sparse, piligerous punctures. Mandibles and antennae subopaque, the former sparsely and coarsely punctate.

Hairs yellow, short, bristly, suberect, longer on the clypeus and gaster. There is a long bristle at each humeral angle, one on each side of the mesonotum near the base of the epinotum and one on each side of the petiolar and postpetiolar nodes.

Brownish yellow; legs and antennae a little paler; mandibles and clypeus a little darker.

Described from numerous specimens taken from a single colony at Malela by Lang, Chapin, and Bequaert in a mound-shaped termitarium

of *Acanthotermes militaris* (Hagen). The latter contained beautiful fungus-gardens, which are shown in Plate XVI. The cavities inhabited by the *Pædalagus* colony were in the walls of the fungus chambers at a spot corresponding to the upper right hand corner of the figure.

P. termitolestes is certainly very close to Santschi's *infirmus* but differs in its somewhat larger size (*infirmus* measures only 0.8 mm.) and in having the head longer than broad, with shorter and stouter scapes, a somewhat longer thorax, less transverse petiolar and postpetiolar nodes, and in having the promesonotum opaque.

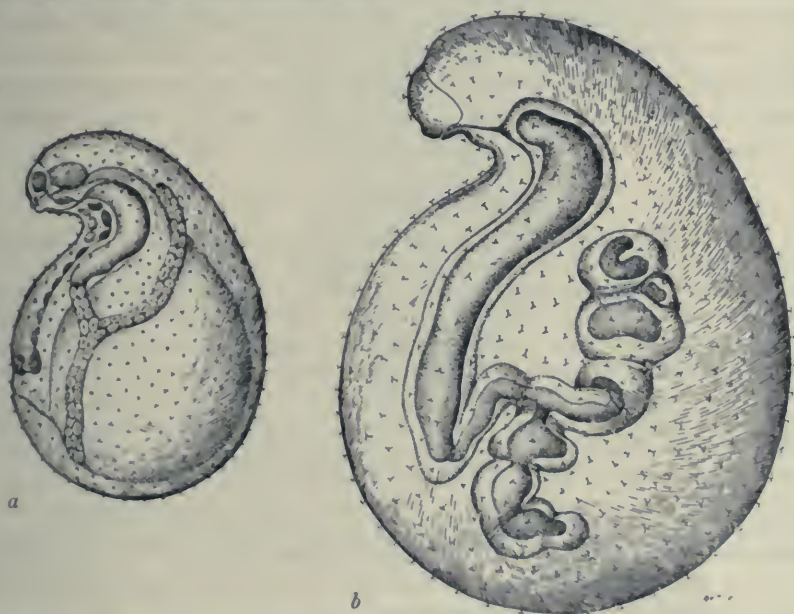


Fig. 43. *Pædalagus termitolestes*, new species. a, very young larva; b, nearly adult larva; lateral views to show the development of the salivary glands.

The specimens of the new species were accompanied by great numbers of worker larvæ and pupæ and nearly adult female larvæ. They are white, nearly spherical, with short neck, small head, and very feebly developed mouth-parts, indicating that they are fed by the tiny workers with regurgitated liquid food. They are not "glabres," as Santschi describes the larvæ of *P. infirmus*, but covered uniformly with short, stiff, sparse hairs, each of which has two recurved branches (Fig. 43a and b). Even in alcohol, the larvæ cling compactly together in masses by means of these hooks. When stained and cleared, the larvæ are seen

to possess unusually voluminous salivary glands. The youngest individuals, scarcely 0.2 mm. long, have the receptacle full of clear secretion (Fig. 43a). In older larvæ (Fig. 43b), the secretion after dehydration forms great masses in the receptacles and lumen of the glands. As these organs are not used in spinning a cocoon, it is very probable that the secretion, like the exudate of *Viticicola* and *Pachysima* larvæ described above, is elaborated and used as a food for the workers (trophallaxis).

The observations of Lang, Chapin, and Bequaert show that the African species of *Pædalagus* have the same habits as the Ceylonese *P. escherichi* and as the species of *Carebara*. Since, however, the majority of African termites cultivate fungus-gardens, the interesting question as to whether the minute workers of *Pædalagus* feed on the termites, on the fungus mycelium, or on both can be answered only by future observations on artificial compound nests of the ants and their hosts.

ATOPOMYRMEX Ern. André

WORKER variable in size, but only feebly polymorphic, with 12-jointed antennæ and 3-jointed antennal club. Clypeus subtriangular; moderately and evenly convex, its anterior border feebly notched in the middle and on the sides. Frontal area and groove distinct. Frontal carinæ far apart, in the large workers continued back some distance as diverging ridges bordering scrobe-like impressions for the antennal scapes. Mandibles triangular, convex, with toothed apical margins. Eyes small, flat, nearly circular, placed near the middle of the sides of the head. Ocelli absent. Pronotum flattened above with rectangular humeri. Promesonotal suture indistinct. Mesonotum bituberculate; separated from the epinotum by a wide and deep constriction. Epinotum armed with two long diverging spines; its base bituberculate anteriorly. Petiole and postpetiole very small, the node of the former bispinose above; postpetiole transverse with distinct anterior angles. Legs long and stout, femora inerassated in the middle; middle and hind tibiæ without spurs. Gaster broadly elliptical, somewhat compressed dorsoventrally. Body without erect hairs; pubescence extremely short and sparse, appressed.

FEMALE considerably larger than the worker. Scrobe-like impressions of the head more distinct. Antennæ 12-jointed. Eyes small, but larger than in the worker; ocelli very small, close together. Thorax short, through the wing insertions slightly narrower than the head. Pronotum visible from above as the mesonotum is rather small and flat. Epinotum abrupt, without distinct base and without spines. Petiolar spines reduced to two blunt tubercles. Gaster large, elongate, convex above and below, nearly as long as the remainder of the body. Anterior wings with a discoidal, a single cubital and a closed radial cell, with a distinct intercubitus (*Solenopsis*-type).

MALE with short, stout, denticulate mandibles. Head broad and long, much broader than the thorax and with marginate occipital border. Clypeus carinate. Frontal carinæ strongly diverging. Eyes rather small, occupying only about one-fifth of the sides of the head. Antennæ 13-jointed; scapes very short, scarcely two and one-half times as long as broad; first funicular joint as broad as long, not swollen; remaining joints cylindrical. Epinotum and petiole unarmed. External genital valves long, triangular, pointed at the tip. Wings as in the female.



Map 25. Distribution of *Atopomyrmex mocquersyi* Ern. André.

This remarkable genus contains only a single species, which is widely distributed over the Ethiopian Region though not occurring elsewhere (Map 25).

***Atopomyrmex mocquersyi* Ern. André**

Faradje, ♂, ♀; Lukolela to Basoko, ♂; Akenge, ♂; Medje, ♂ (Lang and Chapin); Matadi, ♂ (J. Bequaert).

This species is so variable that it is doubtful whether Forel's variety *curispina* and Santschi's variety *australis* can be retained. The small workers among all the specimens before me have the epinotal spines more or less curved and directed backward, whereas in the large workers they are straight, more erect and more diverging. Besides the material from the localities cited above, I have specimens from the Congo, received from Ern. André, Delagoa Bay (P. Berthoud), Mwangwa, North West Rhodesia (H. Dollman), and Xalasi (C. W. Howard). There are also noticeable differences in the length and tenuity of the petiolar spines and

in the strength of the cephalic and thoracic sculpture. The latter is noticeably strong in the specimens from Akenge, so that the head is scarcely shining in the occipital region.

The specimens taken by Lang and Chapin were nesting in cavities in dead wood. Those taken by Dr. Bequaert were "sucking nectar from the flowers of a tree (Anacardiaceae) in the rocky savannah." Arnold says of the variety *curvipina* that "it is a slow ant, living in trees and mainly carnivorous in its diet. The nest is usually situated in a hollow stem, some distance above the ground. Like *Crematogaster*, these ants, when disturbed, exude a whitish and rather sticky secretion from the anal glands. It has not been found by me except in districts containing large trees." Bequaert found the nest of the typical *mocquerysi* "in a cavity in the wood at the base of a fig-tree (River Lovoi, near Kikondja, October 18, 1911)." He writes further: "I captured the male and female of this species in copula, flying in bright daylight (at noon) at the beginning of October (beginning of the rainy season)." The male and female of the species was first described by Forel from these specimens taken by Bequaert in the Katanga.

***Atopomyrmex mocquerysi* subspecies *cryptoceroides* (Emery)**

Thirteen specimens from Malela (J. Bequaert) are referable to this form, which, I believe with Forel, is to be regarded merely as a subspecies of *mocquerysi* and not as an independent species. It is easily distinguished by its more shining head, coarser thoracic sculpture, and longer, stouter and, in the large workers, basally more flattened epinotal spines. The small workers have the spines slender, more curved, and more backwardly directed, just as in the small individuals of the true *mocquerysi*.

The habits of *cryptoceroides* are evidently the same as those of the typical form, as it had been previously taken by Bequaert at Elisabethville in the Katanga "nesting in the rotten wood of a felled tree."

***Atopomyrmex mocquerysi* subspecies *cryptoceroides* variety *melanoticus*,
new variety
Text Figure 44**

WORKER.—Length 4.2 to 8 mm. Differing from the typical form of the subspecies in color. The small workers are entirely black instead of brown; the large ones black, with the head blood red, darkened on the vertex, the antennal scapes black, the funiculi dark brown, especially towards their tips, and the thorax in some apparently less mature individuals, deep castaneous. The medium and large workers have the flattened bases of the epinotal spines distinctly and often sharply angulate externally.

Numerous specimens collected between Lukolela and Basoko "on fire-wood" by Lang and Chapin.

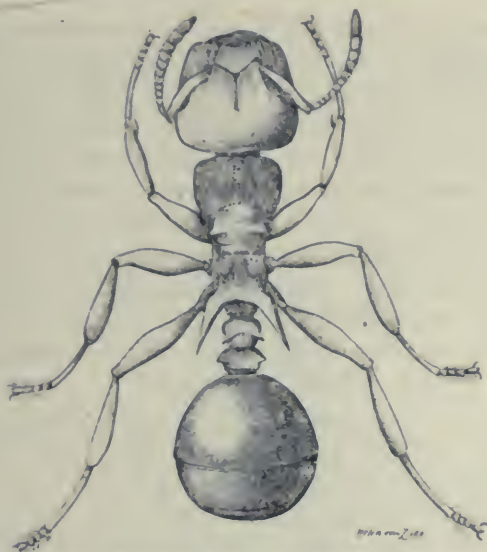


Fig. 44. *Atopomyrmer mocquerysi* subspecies *cryptoceroideus* variety *melanoticus*, new variety. Worker from above.

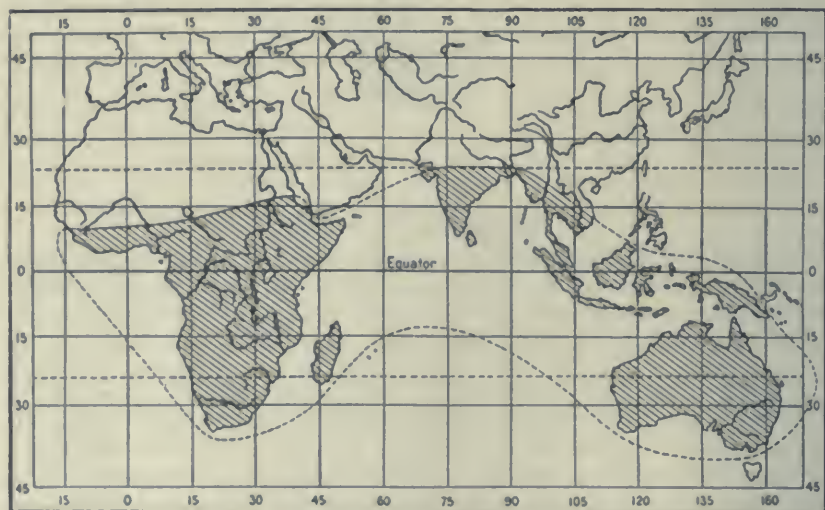
MERANOPLUS F. Smith

WORKER.—Body short and stout, somewhat flattened. Head broader behind than in front, convex above with frontal carinae far apart, diverging behind and prolonged backwards as the upper margins of deep scrobes above the eyes for the accommodation of the whole folded antennae. Eyes prominent, placed near the posterior corners of the head; ocelli absent. Clypeus short and steep. Mandibles small and stout, with a few subequal teeth. Antennae 9-jointed, with a large 3-jointed club; the scapes thickened distally. Thorax short and broad, flattened above, the pro- and mesonotum marginate or lamellately expanded on the sides and behind, forming a disc with spined or toothed anterior corners and with the posterior margin lobed or toothed and overhanging the epinotum, which is very steep or vertical and usually armed with spines. Petiole squamiform, cuneate in profile. Postpetiole with a cuboidal, globose or squamiform node. Gaster large, oval or cordate, emarginate anteriorly at the articulation of the postpetiole. Body usually more or less opaque or subopaque and sculptured, covered with long, abundant and soft or flexuous hairs.

FEMALE decidedly larger than the worker, with 9-jointed antennae. Thorax stout; pronotum large and exposed above; mesonotum large and convex, rounded on the sides; epinotum unarmed. Fore wings with large pterostigma, a cubital, a discoidal and a closed radial cell.

MALE only slightly larger than the worker, rather slender, with 13-jointed antennae; the scape very short; the first funicular joint globose, the second not much longer than the scape. Head produced behind, with very prominent eyes and ocelli. Antennal scrobes absent. Mesonotum with Mayrian furrows, rounded and unarmed on the sides or behind. Epinotum abrupt, unarmed. Nodes of petiole low. Legs slender. Wings as in the female.

This genus is confined to the Old World tropics and ranges over the Ethiopian, Malagasy, Indomalayan, and Australian Regions (Map 26), being represented by the greatest number of species in Australia. The species form moderately populous colonies which nest in the ground, either under stones or in small crater nests. Many of the Australian species which I have observed in the field are true harvesters, storing their nests with seeds. The same habit has been recorded for an Indian species, *M. bicolor* (Guérin). Arnold, however, says that the species he has observed in Rhodesia "appear to be mainly carnivorous in their diet, but are also fond of sugary substance and attend aphids and coccids on plants." The workers move very slowly and readily curl up and "feign death" when handled.



Map 26. Distribution of the genus *Meranoplus*.

***Meranoplus nanus* Ern. André subspecies *soriculus*, new subspecies**

Text Figure 45

WORKER.—

Length 1.8 to 2 mm.

Head subtrapezoidal, as broad as long, rather convex and rounded above, truncated behind. Mandibles with oblique, 4-toothed apical borders. Clypeus rather flat, with a short median carina posteriorly. Frontal area transverse, crescentic. Scrobes deep, extending to the posterior corners of the head. Eyes rather large, convex. Antennae robust; club distinctly longer than the remainder of the funiculus. Pro- and mesonotum transversely rectangular, slightly broader than the head without the eyes, about one and one-half times as broad as long (somewhat too long in the

figure), with sharply dentate anterior corners, the sides distinctly emarginate at the mesoöpinotal suture, which is straight and very distinct. Mesonotum rounded on the sides and narrowed to the posterior border, which bears four short, blunt, flattened teeth, the median pair being smaller and more approximated. Epinotum vertical, unarmed, somewhat concave in the middle, with a longitudinal welt on each side representing the spines. Petiole cuneate in profile, the node much compressed anteroposteriorly, much higher than the length of the segment, narrowed and bluntly

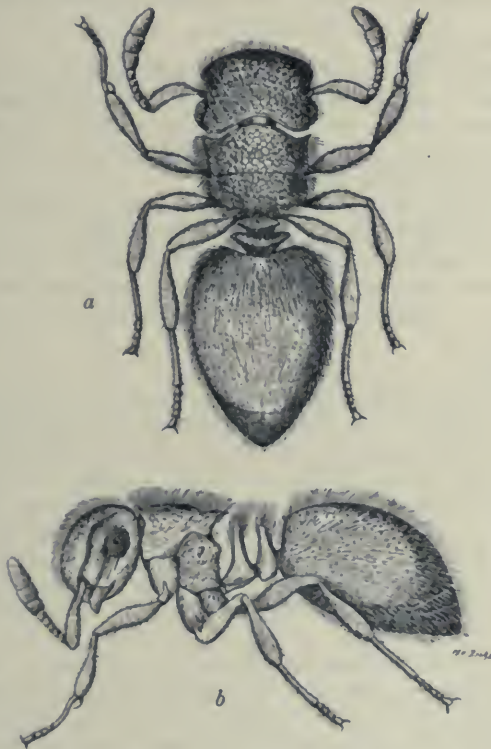


Fig. 45. *Meranoplus nanus* subspecies *soriculus*, new subspecies. Worker. a, from above; b, in profile.

pointed above, higher than the postpetiolar node, which has a similar shape but is less compressed above and with broader, transverse border. Gaster large, convex above, pointed posteriorly, its anterior border excised in the middle. Legs rather stout.

Shining; mandibles opaque, finely and indistinctly striatopunctate. Clypeus and upper surface of head longitudinally but not strongly rugulose, with indistinctly punctate-reticulate interrugal spaces. Cheeks longitudinally rugose. Truncated posterior surface of head rather regularly reticulate rugose. Pro- and mesonotum with similar sculpture but the rugae are feebler, so that the surface is more shining;

sides of thorax and epinotum nearly smooth, as are also the petiole and postpetiole. First gastric segment evenly covered with shallow punctures interspersed with extremely minute punctures.

Hairs white, delicate, soft, and abundant, forming a uniform erect fleece on the upper surface of the body, more oblique on the appendages, on the legs interspersed with a few exceptionally long hairs.

Brown; upper surface of head and first gastric segment, except at the base, dark brown; mandibles, except the teeth, legs, and antennae brownish yellow.

FEMALE.—

Length 4.5 to 4.8 mm.

Head like that of the worker. Thorax broader than the head, about one and three-fourths times as long as broad; broadest through the pronotum, the sides of which are somewhat swollen, but have blunt, though distinct, teeth. Mesonotum somewhat broader than long. Petiole and postpetiole much as in the worker, but the postpetiolar node is thicker above in profile.

Sculpture like that of the worker, but the mandibles coarsely striate and the sides of the thorax coarsely and irregularly reticulate rugose.

Hairs yellow, coarser, and shorter, especially on the gaster, than in the worker.

Color like that of the worker, but the mesonotum with three large, poorly defined, dark brown patches. Wings yellowish hyaline, with pale yellow veins and pterostigma.

MALE.—

Length 2.5 mm.

Head, including the eyes, as broad as long, very convex behind. Eyes and ocelli large and convex; cheeks very short. Clypeus convex in the middle. Antennal scapes scarcely more than twice as long as broad; first funicular joint globose, second somewhat longer than the scape but distinctly more slender than the third joint. Thorax short, broader than the head including the eyes. Mesonotum convex, with distinct Mayrian furrows. Epinotum like that of the worker, but more sloping. Petiole longer than high or broad, the node low, angular in profile, with subequal anterior and posterior slopes, the former straight, the latter slightly concave. Postpetiole as long as high, somewhat depressed above, transverse, broader than the petiole.

Clypeus smooth and shining in the middle. Head subopaque, reticulate-rugulose. Pronotum and epinotum indistinctly punctate-rugulose, subopaque; mesopleurae smooth and shining; mesonotum and scutellum less smooth but shining, indistinctly punctate. Petiole longitudinally rugulose-punctate; postpetiole smoother. Gaster as in the worker but the large punctures are less distinct.

Pilosity much as in the female, but the hairs on the body are even less even and on the legs are shorter and more appressed.

Colored like the worker, but the antennae and legs are yellow. The veins and pterostigma of the wings are distinctly paler than in the female.

Described from numerous workers, five females, and six males taken at Avakubi (type locality) and a number of workers from Medje (Lang and Chapin). According to Mr. Lang, these ants "build small crater nests in the plantations. One crater was one and one-half inches high and four inches in diameter. The whole nest, three inches wide, extended beneath the surface to a depth of only six inches. The workers

move very slowly. The native name is 'tungangele.' Eight workers from Medje were taken from the stomach of a toad (*Bufo funereus*).

I have described this form at length because it belongs to *nanus* Ern. André and is very closely related to Forel's subspecies *nanior* and its variety *kiboshanus* and to *inermis* Emery. The last I regard as a subspecies of André's species. All of these are known only from the worker. *M. nanus* measures 2.75 to 3.25 mm. and has two small, acute, spiniform teeth on the epinotum. The subspecies *nanior*, though of the same size as *soriculus* (1.9 mm.), is described as having the promesonotum one and three-fourths times as broad as long, the variety *kiboshanus* as being as large as the typical *nanus*, and *inermis* has the posterolateral corners of the mesonotum rectangular and, judging from Emery's figure, lacks the mesoepinotal suture. The various forms mentioned are from widely separated localities, *nanus* from Gaboon, *inermis* from Transvaal and Eritrea, *nanior* and *kiboshanus* from East Africa.

MACROMISCHOIDES Wm. M. Wheeler

WORKER small, monomorphic. Head subrectangular, with rounded posterior corners, rather convex lateral borders, and convex, moderately large eyes at the middle of the sides. Ocelli absent. Mandibles triangular, their apical margins with numerous unequal teeth. Maxillary palpi 3-jointed; labial palpi 2-jointed. Clypeus convex; its anterior border entire or feebly notched in the middle; its posterior portion extending back between the frontal carinae; its sides not greatly narrowed and without a trenchant ridge in front of the antennal fovea. Frontal carinae short, rather far apart, diverging behind, not prolonged as borders of scrobe-like depressions. Antennae long and slender, 12-jointed, with a 3-jointed club, which is shorter than the remainder of the funiculus, terminal joint somewhat enlarged, as long as the two preceding joints together. Thorax rather long and slender, distinctly constricted in the mesoepinotal region, with very long straight epinotal spines, but without metasternal spines. Pronotum on each side above with a bluntly angular elevation, the inferior border broadly rounded. Peduncle of petiole long and slender, the node compressed anteroposteriorly, very slightly squamiform. Postpetiole small, scarcely broader than the petiole, constricted behind. Gaster ovate, rather small. Legs long and slender; middle and hind tibiae without spurs.

FEMALE similar to the worker, but larger. Thorax not broader than the head including the eyes; pronotum not covered by the anterior portion of the mesonotum, which is short and convex. Epinotum sloping, with stout spines. Abdomen shaped much as in the worker. Fore wings with a single cubital, a discoidal and a closed radial cell.

MALE nearly as large as the female. Head small, with prominent eyes and ocelli. Mandibles well developed, with several teeth. Antennae 11-jointed, the second funicular joint representing three fused joints. Mesonotum without distinct Mayrian furrows. Petiolar node very low. Cerci distinct; hypopygium with a bluntly rounded point; external genital valves short and stout, obtusely pointed. Legs very slender. Wings as in the female.

GENOTYPE.—*Macromischa aculeata* Mayr.

Map 27. Distribution of the genus *Macromischoides*.

I include in this genus also Mayr's *M. africana*, which is hardly more than a subspecies of *aculeata*. Emery placed both of these forms in *Tetramorium*. Their habitus is certainly that of certain forms of *Macromischa*, as Mayr observed, but Emery was right in excluding them from that Neotropical genus. Both species are confined to the rain forests of West Africa (Map 27) and do not nest in the ground like the species of *Tetramorium* but build loose carton nests between leaves or on their under surfaces. Mayr claimed that the male *aculeata* has 11-jointed antennæ, but Emery, after examination of six specimens, maintained that these appendages are 10-jointed and that Mayr's specimens must have been abnormal. There are four males in the Congo collection from two different localities and all of them have 11-jointed antennæ. Emery probably overlooked the third funicular joint, which is rather rigidly articulated with the second joint so that the suture can be distinctly seen only in a favorable light. The number of joints in the male antennæ, the shape of the clypeus in the worker and female, the absence of spurs

on the middle and hind tibiae, the long slender legs and antennae, the absence of the Mayrian furrows in the male, and the reduced number of palpal joints are all characters which seem to me to justify a new generic name. The peculiar habits, too, are important in this connection, although alone they would hardly justify a change in Emery's allocation of the species, since in a well-marked genus like *Myrmicaria* we have seen that some of the smaller species build carton nests on leaves whereas the larger species nest in the ground. The genus *Tetramorium* certainly becomes more homogeneous by the removal of the two Mayrian species.

Macromischoides aculeatus (Mayr)

Plate XVII, Figure 1

Stanleyville, ♂; Avakubi, ♂, ♀; Bafuka, ♂; Medje, ♂, ♀, ♂; Isangi, ♀; Leopoldville, ♂ (Lang and Chapin); Bumba, ♂ (J. Bequaert). Many workers and females and four males.

The following note by Mr. Lang accompanies the specimens from Medje: "These ants build their nests by filling out interstices between neighboring leaves with a rough-looking, light mass of decomposed vegetable matter. They prefer densely leaved trees and there are sometimes several hundred nests on the same plant. If one touches the tree, the ants at once rush out of their nests in great numbers and hurry along the branches to reach the intruder. They cling to the human skin and double themselves up while biting and stinging. The result is rather painful and very annoying. There is no swelling but the pain endures for several minutes. All of the ants climb towards the head. The nests are often empty and contain only a few workers, but sometimes they are filled with brood and winged individuals. These ants have a strong odor, especially when rubbed between the fingers." In the plate (Pl. XVII, fig. 1) two of the nests are shown, one *in situ*, the other with one of the two thick leaves between which it was built removed.

M. aculeatus is so common in the Congo that its nests have been seen by several previous observers. Santschi¹ says of these structures: "Their nest consists of the leaf of a tree or shrub rolled up and lined with a felt-work of very fine vegetable debris and of a mycelium bearing fructifications. It would be interesting to study this fungus where it grows and to ascertain whether or not it is used habitually by the ants as food and is cultivated for this purpose." Commenting on the variety *rubroflava*, Forel² remarks that it was "found in nests woven of silk, fixed to

¹1909, Ann. Soc. Ent. France, LXXVIII, p. 385.

²1916, Rev. Suisse Zool., XXIV, p. 421.

leaves, and, according to Mr. Kohl, similar to those of *Ecophylla* and *Polyrhachis*. From this fact I conclude that the nest of *T. aculeatus* is probably only superposed on a woven tissue, i.e., it is a combination of carton and tissue, as I have proved to be the case in many species of *Polyrhachis*."

Examination of a nest of *aculeatus* preserved in alcohol by Mr. Lang and conversation with Dr. Bequaert, who is well acquainted with the habits of the ant in the Congo, have convinced me that both Santschi and Forel labor under a misapprehension in regard to the structure of the nest. It consists of particles of the most diverse vegetable substances, bits of bark, dead leaves, trichomes, etc., loosely felted together and invaded by fungus mycelium, but the latter bears nothing resembling fructifications or ambrosial bodies such as are found in the gardens of fungus-eating ants. Dr. Bequaert informs me that *aculeatus* often nests in forests that are inundated during the rainy season and, as fungus hyphæ in such situations in the tropics grow readily on any dead vegetable matter, it is not surprising that we should find them invading the loose carton of the *aculeatus* nests. These hyphæ were interpreted as silk by Forel and suggested to Santschi the possibility of the ant being mycetophagous.

Macromischoides aculeatus variety wasmanni Forel

Numerous workers from Zambi (Lang and Chapin); one female from Stanleyville. This variety is smaller than the typical *aculeatus*, with somewhat shorter epinotal spines, less regularly sculptured and somewhat paler.

TETRAMORIUM Mayr

WORKER small, monomorphic. Antennæ 12-jointed, with a 3-jointed club. Clypeus narrowed on the sides where its posterior margin is raised in the form of a short trenchant ridge or carina as the anterior border of the antennal socket. Frontal carinae rather far apart, usually continued back some distance and often the full length of the head as subparallel ridges forming the inner borders of scrobes or demiscrobes for the accommodation of the antennal scapes. Maxillary palpi 4-jointed; labial palpi 3-jointed. Eyes well developed; ocelli absent. Mandibles rather large, triangular, their apical border with a few large and several small teeth. Promesonotal suture indistinct, mesoepinotal suture more or less distinct; mesoepinotal constriction usually feeble; epinotum with two spines or teeth and episterna usually spined or dentate. Petiole with a short but distinct peduncle and the node large, subcuboidal, rounded above, rarely squamiform; the postpetiole usually broader than the petiole. Legs rather short, middle and hind tibiae with small, simple spurs. Head, thorax, and petiole sculptured, usually rugose or reticulate rugose.

FEMALE resembling the worker, but somewhat larger. Pronotum usually very little exposed above; mesonotum and scutellum raised above the level of the pronotum and epinotum, the latter with stouter and shorter spines than in the worker. Fore wing with one cubital, one discoidal, and a closed radial cell.

MALE slightly smaller than the female, with 10-jointed, very exceptionally with 12- or 13-jointed antennæ. Second funicular joint very long, representing a fusion of 4 joints. Head small, ocelli and eyes large. Mandibles small but dentate. Pronotum overarched by the mesonotum, which has distinct Mayrian furrows. Epinotum truncate and dentate. Wings as in the female.

This genus might be described as peculiar to the Old World, because nearly all the few species occurring in America (*T. cæspitum*, *similimum*, and *guineense*) are known to have been introduced by commerce. The group reaches its greatest development in the Ethiopian Region so far as the number of species, subspecies, and varieties is concerned. Arnold has included *Triglyphothrix*, *Xiphomyrmex*, and *Decamorium* as subgenera, but I have treated them as genera, though a few species with simple hairs may be assigned indifferently either to *Tetramorium* or *Triglyphothrix*. I have still further reduced the size of the genus *Tetramorium* by establishing a new genus, *Macromischoides*, for *T. africanum* and *aculeatum* (*vide supra*). The species of *Tetramorium* form moderately large colonies and nest in the ground, usually under stones or logs. One of the species, *T. cæspitum*, has a remarkable distribution, ranging from Britain to Japan, around the shores of the Mediterranean, and reappearing at higher elevations on Mt. Kilimanjaro.

***Tetramorium sericeiventris* Emery**

Two workers from Thysville (J. Bequaert) and two others from Garamba, taken from the stomach of a toad (*Bufo regularis*) by Lang and Chapin, are referable to this species, which is distributed over the whole African continent.

***Tetramorium sericeiventris* Emery subspecies *continentis* (Forel)**

Plate XVII, Figure 2

Numerous workers from Zambi (Lang, Chapin, and Bequaert), found making small nests in sand (Pl. XVII, fig. 2). According to Mr. Lang's notes, "the craters were often very regular, perfectly circular and composed of the excavated particles of white sand. The colony photographed shows three entrances close together. The nest extended about 50 cm. below the surface to just above a moist layer of sand. The territory in which the ants nest is evidently inundated during the rainy season (at high water), but now (during the dry season) the water is about four feet below the surface. One colony was seen covering small

areas about as large as the hand; the nest entrance was oblique, running under an overlapping thin layer of sand. The ants were working at noon in fairly bright sunshine. When disturbed, they all disappeared inside the nest. The craters consisted entirely of fine white sand-grains, without admixture of food particles."

***Tetramorium guineense* (Fabricius)**

Two workers from Ngayu, taken by Lang and Chapin from the stomach of a toad (*Bufo superciliaris*).

***Tetramorium guineense* subspecies *medje*, new subspecies**

WORKER.—Length nearly 4 mm. Decidedly larger than the typical *guineense* but of the same color, except that the head, thorax, petiole, and legs are concolorous and somewhat more brownish. Clypeal border distinctly emarginate in the middle; funicular joints 2 to 4 small, strongly transverse. There is a very distinct transverse crest to the pronotum like that described by Stitz for the subspecies *cristatum*. The epinotal spines are long, and stout, and curved forward as in the subspecies *peutli* Forel. The episternal spines are strongly curved upward and fully half as long as the epinotal spines. Petiolar node of the same shape in profile as in *cristatum*, with its anterior and posterior surfaces subequal, abrupt, distinctly concave and marginate above, but the node is much longer than in the typical *guineense*, broader behind than in front and with its dorsal surface roof-shaped as in *peutli*. Postpetiole robust, nearly as long as broad. Mandibles smooth and shining, with minute, scattered, indistinct punctures. Sculpture much coarser than in the typical *guineense*; clypeus with three prominent longitudinal carinae or rugae; the rugae on the head and thorax longitudinal but connected by reticulations; the sculpture of both nodes equally coarse and as coarse as that of the thorax. Anterior fourth of first gastric segment sharply longitudinally striate. Pilosity yellow, decidedly longer and coarser than in the typical *guineense*.

Described from two specimens, one taken from the stomach of a toad (*Bufo regularis*), from Medje (Lang and Chapin). This form is so strongly marked that it might be called a species, but, as many of its characters are those of described subspecies of *guineense* and as I have seen only two specimens, I prefer to attach it provisionally to that species.

***Tetramorium meressei* Forel**

A single worker taken by Dr. Bequaert at Masaki (between Masisi and Walikale) agrees very closely with Forel's description, except that the erect hairs on the body are coarser and not "wooly" and the gaster is not darker in the middle but uniformly yellowish brown like the remainder of the body. Dr. Bequaert took his specimen from one of the domatia of a *Cuviera* (probably *C. angolensis*), the other swellings of which were occupied by *Engramma denticulatum* Wheeler.

***Tetramorium pusillum* Emery variety *hemisi*, new variety**

WORKER.—Length 2.5 to 2.8 mm. Agreeing closely with Emery's description of the typical *pusillum* in size, sculpture, and coloration, but with the basal third or fourth of the first gastric segment densely punctate and nearly opaque, and with the epinotal teeth acute. The latter are distinctly larger than the metasternal teeth.

Described from fourteen workers taken from the stomach of a frog (*Hemissus marmoratum*) from Niangara (Lang and Chapin). The Abyssinian subspecies *ghindanum* Forel is slightly larger than this variety (at least this is true of several cotypes sent me by Prof. K. Escherich many years ago) and the opaque basal portion of the gaster is more extensive and finely striolate-punctate.

***Tetramorium setigerum* Mayr subspecies *quærens* Forel**

Plate XVIII, Figures 1 and 2

Numerous workers from Niapu (Lang and Chapin). The note accompanying the specimens states that they "form a ring of loose particles of soil about the entrance of their nests during the rainy season, each ant carrying the particle to a certain distance and then letting it drop and returning at once to the entrance. During the dry season they carry out the particles and food-remnants without attempting to construct a crater. The photographs (Pl. XVIII) show the difference in the appearance of the nest during the wet and dry seasons. These ants are very common, as about a dozen colonies were observed about the village of Niapu. They were usually situated along the paths or in clearings and seem to prefer dry soil."

***Tetramorium simillimum* (F. Smith)**

A single worker from Stanleyville (Lang and Chapin). This is a common tropicopolitan ant, now widely distributed by commerce.

***Tetramorium simillimum* subspecies *isipingense* Forel variety *dumezi* Forel**

A single worker taken by Dr. Bequaert at Thysville.

XIPHOMYRMEX Forel

This genus is very closely related to *Tetramorium*, differing only in having the antennæ of the worker and female 11- instead of 12-jointed. The scrobes of the antennæ are well developed in all the species known to me.

The genus is widely distributed, being represented by a number of species in tropical Africa, Madagascar, the Indomalayan and Australian Regions and by one species, *X. spinosus* (Pergande), with several subspecies, in the Sonoran Province of North America. The various species nest in the ground, like *Tetramorium*, often in very populous colonies.

Xiphomyrmex angulinodis Santschi

Medje, ♂, ♀, ♂; Irumu, ♀ (Lang and Chapin).

Santschi has described all three phases of this species from the French Congo and has figured the worker and male. The specimens before me agree perfectly with his account. They bear no data beyond the localities.

Xiphomyrmex occidentalis Santschi subspecies **akengensis**, new subspecies

WORKER.—Length 1.8 to 2 mm. Smaller than the typical form, which measures 3.5 mm., with the mandibles red, the tarsi, middle and hind coxæ and tips of fore coxæ brownish yellow, and the remainder of the legs and the antennæ reddish brown. The seventh funicular joint is as long as broad; the eyes smaller and more flattened than in the type, scarcely more than one-sixth as long as the side of the head, with the anterior orbits somewhat narrowed and bluntly pointed. The postpetiole is twice as broad as long, its node somewhat transverse and compressed anteroposteriorly, the petiolar node also somewhat broader and more squamiform than in the type. In other respects agreeing very closely with Santschi's figure and description.

Described from numerous specimens taken at Akenge (Lang and Chapin) from a single colony in "a dark brown paper nest." There is nothing to show that these specimens were not inhabiting the abandoned nest of some other ant. A single dealated female from Liberia in my collection belongs, in all probability, to this subspecies. It measures nearly 2.5 mm. and is very much like the worker. The larger eyes are not bluntly pointed in front, though rather flat. The thorax is small, with small mesonotum, bluntly pointed in front and not covering the pronotum, the epinotal spines are much stouter and further apart than in the worker, the petiolar node is broader, more squamiform and more transverse above, more sharply separated from the peduncle, and with its anterior surface decidedly concave. The color is the same as that of the worker, the body being brownish black with the appendages paler.

RHOPTROMYRMEX Mayr

WORKER small, allied to *Tetramorium*. Antennæ 12-jointed, with 3-jointed club, as long as or slightly longer than the remainder of the funiculus. Maxillary palpi 3-jointed; labial palpi 2-jointed. Head broader behind than in front, with convex sides and small, moderately convex eyes at the middle of its transverse diameter. Ocelli absent. Clypeus flattened or moderately convex, ecarinate, its anterior border entire, a little produced, narrowed on the sides and bluntly ridged in front of the small antennal foveæ. Frontal carinae short and more or less diverging; frontal area large but not impressed. Scrobes absent. Thorax short and stout, convex and rounded above, with feeble or obsolete promesonotal suture, somewhat constricted or impressed at the mesoepinotal suture, the epinotum unarmed. Petiole pedunculate, the node

Map 28. Distribution of the genus *Rhyptomyrmex*.

rounded, narrower than the postpetiole, which is transversely elliptical and rounded above. Gaster oval, formed very largely by the first segment. Legs moderately long, femora not incrassate in the middle, the middle and hind tibiae with or without short simple spurs.

FEMALE somewhat larger than the worker, with 12-jointed antennae, but differing considerably in structural details in the various species. Fore wings with a cubital, a discoidal and an open radial cell.

MALE with 10-jointed antennae and elongate second funicular joint, as in *Tetramorium*, and closely resembling the males of this genus also in other respects. Wings as in the female.

The species of this genus are confined to the Ethiopian Region (Map 28). A few Indian forms formerly referred to the genus have been recently placed by Emery in a new genus, *Acidomyrmex*, characterized by having very long, straight and diverging epinotal spines.

***Rhyptomyrmex opacus* Forel**

Numerous workers taken at Thysville by Bequaert. These were found nesting in sandy soil in the savannah.

TRIGLYPHOTHRIX Forel

Small ants closely allied to *Tetramorium*.

The WORKER has 12-jointed antennae, the funiculus terminating in a 3-jointed club. Mandibles and clypeus as in *Tetramorium*. Head with distinct scrobes, often divided by a longitudinal carina for the reception of the folded scape and funiculus. Thorax short and stout, the promesonotal and mesoepinotal sutures nearly or quite obsolete. Epinotum and episterna armed with spines much as in *Tetramorium*. Petiole pedunculate, its node and especially that of the postpetiole decidedly broader than long. Hairs on the body abundant, soft, erect, trifold or many-branched, covering the surface like a delicate white mould.

FEMALE similar to the worker but larger; anterior wings with one closed cubital cell and an open radial cell.



Map 29. Distribution of the genus *Triglyphothrix*. The crosses indicate the localities where *T. striatidens* (Emery) has been found outside of its range.

MALE with 10-jointed antennae, the second funicular joint very long, the third shorter than the first. Mesonotum with Mayrian furrows. Petiolar and postpetiolar nodes narrower than in the worker and female, the petiole subpedunculate.

This genus is paleotropical, ranging over the Ethiopian, Indomalayan, and Papuan Regions (Map 29). One Indian species, *T. striatidens* (Emery), is rapidly spreading to other parts of the world and has been taken in such widely separated localities as Queensland, Formosa, Tunis, Sierra Leone, Seychelles, Barbados, Mexico, Louisiana, and England. In the locality last mentioned it occurs in the hothouses of Kew Gardens.

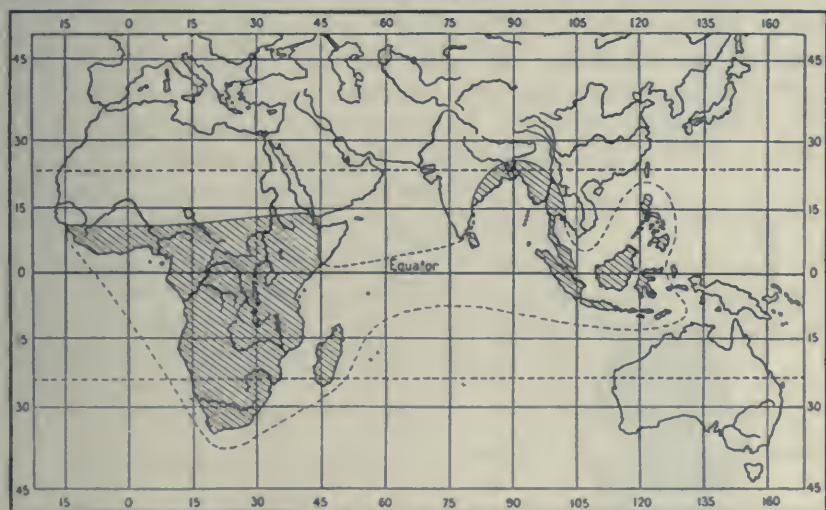
The species of *Triglyphothrix* are all very timid, usually curling up and feigning death when touched. They live in the ground. One South African species, *T. arnoldi* Forel,¹ according to Arnold, "is most fre-

¹According to Emery, this species is a typical *Tetramorium*, in which genus I have placed it in the catalogue of Ethiopian ants.

quently found in the nests of other ants, apparently in plesiobiotic or cleptobiotic association." He mentions its occurrence in the galleries of two large Ponerinae, *Platythyrea lamellosa* subspecies *longinoda* variety *rhodesiana* Forel and *Ophthalmopone berthoudi* Forel.

Triglyphothrix gabonensis Ern. André

Akenge, ♂, ♀; Niapu, ♂; Ngayu, ♂; Medje, ♀ (Lang and Chapin). Seventeen workers and two deãlated females, all taken from the stomachs of toads (*Bufo funereus*, *tuberosus*, and *polycercus*).



Map 30. Distribution of the genus *Cataulacus*

Triglyphothrix mucidus Forel

Medje, ♂; Ngayu, ♂; Boyulu, ♂ (Lang and Chapin). Four specimens from the stomachs of toads (*Bufo funereus*).

CATAULACUS F. Smith

WORKER.—Small or medium-sized, rather flat, opaque or subopaque, black ants, with coarse sculpture and the head and thorax often dentate or spinulate on the sides. Antennae in all three phases 11-jointed with 3-jointed club and apically flattened or dilated scape. Head on each side with a deep scrobe situated beneath and external to the eye and capable of accommodating the whole of the folded antenna. The frontal carinae are far apart and diverge, but border the scrobes only at the base. The clypeus is wedged in between the frontal carinae and is not sharply delimited posteriorly. Thoracic sutures often indistinct or obsolete. Epinotum armed with spines. Petiole and postpetiole stout, the former usually more or less cuboidal, with a

lamine process below, the latter subglobular. Gaster elliptical or suboblong, flattened, the first segment forming its whole dorsal surface. Legs rather short, the femora and tibiae incrassated.

The FEMALE, though larger, closely resembles the worker. The pronotum is large and forms a considerable portion of the thoracic dersum. Wings without a discoidal cell, with a single cubital and a narrowly open radial cell.

The MALE resembles the female and worker in the shape of the head but has larger and longer petiole and postpetiole. The mesonotum has well-developed Mayrian furrows.

The ants of the genus *Cataulacus* bear a strange superficial resemblance, both in structure and habits, to those of the Neotropical genus *Cryptocerus*. The genus ranges over tropical Africa and eastward over Madagascar, India, Indonesia, and the Philippines, but is represented by the greatest number of species in the Ethiopian Region (Map 30). Concerning the habits, Arnold says that "all the species of this genus are tree-ants, usually forming medium-sized nests in hollow twigs and stems, or more rarely under the bark. They are timid and slow-moving insects, often feigning death or dropping rapidly to the ground when disturbed." He has seen them breaking open the earthen tunnels constructed by termites on the trunks of trees and attacking the inmates.



Fig. 46. *Cataulacus erinaceus* Stitz.
Worker from above.

Cataulacus erinaceus Stitz

Text Figure 46

Stanleyville, ♂; Risimu, ♂ (Lang and Chapin). The collection contains many workers of this large and beautiful species, originally described and figured by Stitz from the Cameroon and Spanish Guinea. Forel many years ago gave me a specimen labelled "*Cataulacus princeps* Emery" and has himself referred to it under that name, which seems to exist only in manuscript. Lang and Chapin found this ant running up and down large trees.

Cataulacus guineensis F. Smith

Text Figure 47

Stanleyville, ♂; Bolobo, ♂; Leopoldville to Yumbi, ♂, ♀; Lukolela to Basoko, ♂; Isangi, ♂; Medje, ♂, ♀; Akenge, ♂ (Lang and Chapin). Numerous specimens, all apparently belonging to the typical form of the species. Many were taken on fire-wood. Nine workers from Medje and twelve males from Akenge were taken from the stomachs of toads (*Bufo polycercus*, *funereus*, and *tuberosus*).

Cataulacus egenus Santschi

Medje, ♂, ♀ (Lang and Chapin).

Numerous specimens. The hitherto undescribed female measures 4 to 4.5 mm., and is very similar to the worker except in the structure of the thorax. The mesonotum and sides of the pronotum are longitudinally rugulose. The wings are whitish hyaline, with the anterior border suffused with yellow, the veins pale yellow, the pterostigma dark brown.

Cataulacus pygmæus Ern. André subspecies *lujæ* (Forel)

Five workers from Garamba (Lang and Chapin) without further data.

Cataulacus trægaordhi Santschi variety *plectroniæ*, new variety

WORKER.—Length 2.8 to 3.2 mm. Smaller than the typical form of the species and the variety *ugandensis* Santschi. The rugæ of the head have no longitudinal trend, those on the pronotum are very coarse and somewhat transverse and those on the mesonotum and base of the epinotum fine and indistinctly longitudinal. The portions of the antennæ and legs, which in the typical form are red or yellowish red, are whitish yellow or white, the scapes, and tibiæ being paler than the tips of the femora, the tarsi brownish yellow, the funiculi reddish brown.

Described from two dozen specimens taken at Stanleyville by Lang and Chapin from the cavities of a species of *Plectronia* (*Plectronia* A, see Part IV).

Dolichoderinæ

A very homogeneous subfamily, comprising comparatively few genera. WORKER monomorphic, very exceptionally (certain species of *Azteca*) more or less dimorphic. Clypeus protruding between the insertions of the antennæ. Antennæ 12-jointed (except in *Semonius*). The metanotum contributes to the dorsal face of the thorax, being wedged in between the epinotum and mesonotum, and its stigmata are often



Fig. 47. *Cataulacus guineensis* F. Smith. Worker from above.

protuberant. Pedicel formed by the petiole alone, the postpetiole forming the basal segment of the gaster; the following segment without stridulating surface. Sting vestigial, except in *Ancuretus*, where it is well developed and can be protruded. Usually there is one pectinate spur on the middle and hind tibiae, homologous with the median spur of the Ponerinae; sometimes with a second, lateral spur which is much smaller and simple. FEMALE always winged; similar to the worker. Some genera still retain a more generalized wing venation with two closed cubital cells and one discoidal cell; but frequently the venation is more or less reduced, often considerably so in the MALE. Antennae of the male 13-jointed, even in *Semonius*.

The Dolichoderinae males with two closed cubital cells can usually be separated by the well-developed mandibles from such Ponerinae as have no constriction behind the postpetiole. The clypeus protruding between the frontal carinae is a good character by which to separate them from the male Formicineae with a similar venation.

NYPHUS never enclosed in a cocoon.

The anatomy of the gizzard or proventriculus is very important for the taxonomy of this subfamily; for a description of this organ the student is referred to the writings of Forel¹ and Emery.²

The larvæ are fed with liquid food, almost always of vegetable origin, regurgitated by the workers; the *Aztecae* are mostly insectivorous. All the workers possess anal glands, the secretion of which hardens on exposure to the air, becomes sticky, and has a peculiar, often unpleasant odor like that of rotten cocoanuts or rancid butter; it is used as a means of protection against other insects. The habits are rather varied; many species are inconspicuous, shy, and live in small colonies under bark of trees or in dead wood. In the Australian *Leptomyrmex* the worker can store vegetable liquids in its much inflated crop (honey ants). Several species of *Iridomyrmex*, *Azteca*, and *Engramma* inhabit the cavities of various myrmecophytic plants, and are undoubtedly adapted to this peculiar form of symbiosis. Other species of *Aztecae* build carton nests, often of large size, which may be free, attached to branches or trunks of trees, or may be placed inside cavities; certain species are associated with epiphytes which cover their carton nests; according to Ule, these "gardening ants" carry soil and seeds of these epiphytes in the branches of the trees.

The Argentine ant, *Iridomyrmex humilis* (Mayr), is one of the most troublesome pests of tropical and subtropical countries. Its original home was South America, whence it has recently spread through a large part of the globe. It is sometimes found in hothouses of temperate regions. In the Ethiopian Region it has thus far been recorded from

¹Forel, 1878, 'Anatomie du gésier des fourmis,' Bull. Soc. Vaudoise Sc. Nat., XV, pp. 339-362, Pl. XXIII.

²Emery, 1888, 'Ueber den sogenannten Kaumagen einiger Ameisen,' Zeitschr. Wiss. Zool., XLVI, pp. 378-412, Pls. XXVII-XXIX; 1912, 'Genera Insectorum, Dolichoderinae,' pp. 4-5. See also Wm. M. Wheeler, 1910, 'Ants,' pp. 33-35.

South Africa only, where its appearance is said to date from the time of the last Boer War, when it was probably introduced with forage (Arnold). It is now a great pest in houses near Cape Town; it is also very injurious to fruit-trees.¹



Map 31. Distribution of the genus *Engramma*.

ENGRAMMA Forel

Closely related to *Tapinoma*.

WORKER small, monomorphic, with the head more or less excised behind and the anterior border of the clypeus semicircularly notched in the middle and posteriorly extending back between the short but widely separated frontal carinae. Maxillary palpi 4-jointed; labial palpi 3-jointed. Antennae 12-jointed, with long first and last funicular joints. Gizzard with narrow, separated, anchor-like sepals. Gaster large, its first segment overlying the petiole; anus terminal or subterminal.

FEMALE larger than the worker; its fore wings with a discoidal, one cubital and a closed radial cell.

¹See the references given under this species in the catalogue of Ethiopian ants.

MALE as small as the worker, with 4-jointed labial and 5-jointed maxillary palpi. Antennae long, filiform, 13-jointed, the scape as long as the first and second funicular joints together. Mandibles large, denticulate, decussating. Mesonotum not over-arching the pronotum. Wings as in the female.

This genus has been known only since 1910 and comprises six described species. It has a very narrow range, being confined to equatorial Africa and in all probability to the forest regions (Map 31). Most of the species evidently live in the cavities of myrmecophytes. At least one, however, lives in the ground (*wolffi*) and another, *zimmeri* subspecies *okiavoënsis* of the Congo, is said to inhabit "a large pale gray nest, soft, woven and mixed with fine vegetable matter and applied to the trunk of a tree."

The workers of the previously known and of three new species described below may be separated by means of the following table.

1. Mesoëpinotal constriction very deep and long, so that the thorax is halteriform; epinotum with a pair of denticles above.....*denticulatum*, new species.
Mesoëpinotal constriction only moderately deep, acute; epinotum without denticles.....2.
2. Body long and slender; head and thorax opaque; antennal scapes extending at least one-fifth their length beyond the occipital border.....3.
Body more thickset; head and thorax shining; antennal scapes shorter.....4.
3. Scapes surpassing the occiput by one-fifth their length; clypeal notch very large and deep and the median border behind it with a small triangular impression; all the funicular joints twice as long as broad; color black, with brown appendages.....*wolffi* Forel.
Scapes surpassing the occiput by about one-fourth their length; clypeal notch broad and shallow, the median border without an impression; funicular joints shorter; color yellowish* red, gaster black, its segments narrowly bordered with yellow.....*zimmeri* Forel.
4. Eyes very large, nearly one-third as long as the sides of the head...*ilgi* Forel.
Eyes much smaller.....5.
5. Head, without the mandibles, as broad as long, deeply excavated behind.....6.
Head longer than broad, feebly excavated behind.....8.
6. Antennal scapes slightly surpassing the occipital border; funicular joints 2 to 7 slightly longer than broad; base of epinotum nearly as long as the declivity, horizontal; pilosity well developed.....*lujæ* Forel.
Antennal scapes not reaching the occipital border; funicular joints 2 to 7 broader than long; base of epinotum much shorter than the declivity, sloping forward; pilosity less abundant.....7.
7. Brown; length 2.25 to 3 mm.....*laurenti* Emery.
Dull yellow, with brown gaster; smaller, length 1.8 to 2.2 mm....*kohli* Forel.
8. Antennal scapes reaching the occipital border; funicular joints 2 to 7 broader than long; epinotum evenly rounded, without distinct base and declivity.
griseopubens, new species.

Antennal scapes extending about one-sixth their length beyond the occipital border; funicular joints all distinctly longer than broad; epinotum with short base sloping forward and long, flat declivity, sloping backward.
goudeyi, new species.

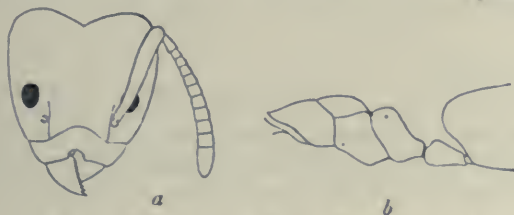


Fig. 48. *Engramma kohli* Forel. Worker. a, head from above; b, thorax and petiole in profile.

***Engramma kohli* Forel**

Text Figure 48

Niapu, ♂, ♀ (Lang and Chapin); Lubutu to Kirundu, ♂; Tshopo River near Stanleyville, ♂ (J. Bequaert). The specimens from Niapu were taken in the leaf ascidiæ of *Scaphopetalum Thonneri* De Wildeman and Durand (see Part IV); those from Lubutu to Kirundu in the similar structures of *Cola Laurentii* De Wildeman (see Part IV); and those from the Tshopo River were found nesting in the stem swellings of a hairy *Plectronia* (species A, see Part IV). The type specimens of the species were also taken by Father Kohl "in myrmecophilous plants" at St. Gabriel, near Stanleyville.

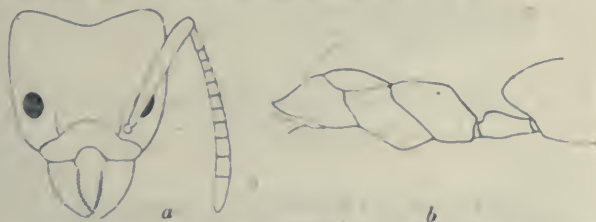


Fig. 49. *Engramma lujæ* Forel. Worker. a, head from above; b, thorax and petiole in profile.

***Engramma lujæ* Forel**

Text Figure 49

A single worker of this species was found among the numerous specimens of the preceding species and was taken in the leaf-pouches of *Scaphopetalum Thonneri* at Niapu. I have compared it with a cotype of *lujæ* received from Prof. Forel and represented in the accompanying figure.

Engramma wolff Forel

Text Figure 50

Akenge, ♂, ♀; Ngayu, ♂; Medje, ♂ (Lang and Chapin); Walikale to Lubutu, ♀, ♂ (J. Bequaert).

FEMALE (undescribed).—

Length 4.6 to 5 mm.

Very similar to the worker. Head scarcely excavated behind. Eyes about two-fifths as long as the sides of the head. Clypeal border each side of the notch flattened and angularly projecting. Head and thorax a little more finely punctate and therefore a little more shining than in the worker. Epinotum feebly convex, sloping, without

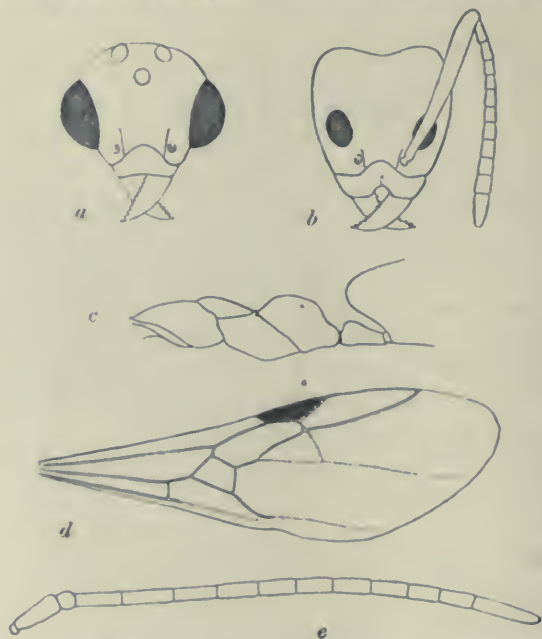


Fig. 50. *Engramma wolff* Forel. a, head of male; b, head of worker; c, thorax and petiole of worker in profile; d, fore wing of female; e, antenna of male.

distinct base and declivity. Dark brown; mandibles, antennæ and wing-insertions pale brown; legs, including the coxæ, white, with a dark brown band around each femur and the tips of the hind coxæ of the same color. Wings grayish hyaline, with pale brown veins and pterostigma.

MALE (undescribed).—

Length nearly 3 mm.

Head through the eyes as broad as long. Eyes and ocelli large. Mandibles well developed, decussating, with long, very finely and evenly denticulate apical borders. Clypeus short, with nearly straight, entire anterior border. Antennæ long and slender;

scape and all joints, except the first funicular, cylindrical; the latter as broad as long but not broader than the succeeding joints. Thorax short, not broader than the head; the mesonotum broader than long, not overhanging the pronotum. Epinotum sloping, without distinct base and declivity. Petiole with more distinct trace of the node at the anterior end than in the worker. Genitalia moderately large, exerted. Legs slender. Wing venation as in the female.

Sculpture and pilosity much as in the female, the hairs and pubescence being very sparse and short, the former apparent only on the mouth-parts and tip of the gaster.

Dark brown; front of head and three large spots on the mesonotum pale rusty brown; mandibles pale yellowish; scapes, first funicular joint, and legs, including the coxæ, sordid white; the femora without brown bands. Wings and their veins a little paler than in the female.

The specimens from Akenge, Ngayu, and Medje (a female and four workers) were taken from the stomachs of toads (*Bufo polyercus*, *super-ciliaris*, and *funereus*), those from Walikale at lights. Kohl took the workers from which Forel described the species in the virgin forest in the ground among rotten leaves. This habit accounts for the occurrence of specimens in the toads' stomachs.



Fig. 51. *Engramma denticulatum*, new species. Worker. a, head from above; b, thorax and petiole in profile.

***Engramma denticulatum*, new species**

Text Figure 51

WORKER.—

Length 2.6 mm.

Head subhexagonal, a little longer than broad and slightly broader behind than in front, with the sides subangulate in the middle and the posterior border feebly concave. Eyes moderately large, near the middle of the sides. Mandibles rather small, convex, with three large apical and several small basal teeth. Clypeal notch small, semicircular, less than one-fifth as long as the anterior border, with sharp corners. Frontal area indistinct; frontal groove obsolete. Antennal scapes extending somewhat farther than their greatest diameter beyond the posterior corners of the head; first funicular joint as long as the two succeeding joints together; joints 2 to 7 about one and one-half times as long as broad, joints 8 to 10 slightly longer than broad. Thorax long, with very deep and broad mesoepinotal constriction so that it is dumb-bell-shaped, the pronotum and mesonotum convex and hemispherical above, the impression bearing the prominent metathoracic spiracles, the epinotum high and

convex like the promesonotum, with two blunt denticles and prominent spiracles. Petiole stout, through the distinct node-like thickening at its anterior end nearly half as high as long. Gaster shaped as in the other species of the genus, with the first segment overlying the petiole; anus terminal.

Shining; head and clypeus finely but distinctly longitudinally aciculate; mandibles smooth, with coarse, scattered punctures; pronotum finely and indistinctly punctate; meso- and epinotum opaque, densely and rather coarsely punctate; gaster finely reticulate.

Pilosity and pubescence very sparse, the latter distinct only on the appendages.

Deep castaneous, nearly black; apical portions of mandibles, bases of scapes, terminal tarsal joints and petiole yellowish.

Described from two specimens taken by Lang and Chapin between Lukolela and Basoko on fire-wood. Two imperfectly preserved specimens were taken by Bequaert at Masaki, between Masisi and Walikale, from the caulinary swellings of a *Cuviera* (probably *C. angolensis*; Part IV).

This is a very strongly marked species on account of the peculiar shape of the thorax, the two denticles of the epinotum, and the peculiar sculpture of the head and thorax.

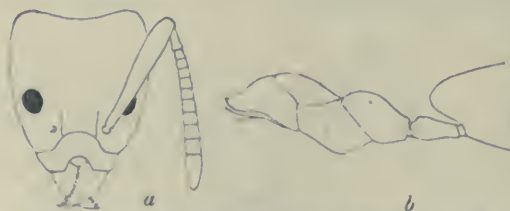


Fig. 52. *Engramma griseopubens*, new species. Worker. *a*, head from above; *b* thorax and petiole in profile.

***Engramma griseopubens*, new species**

Text Figure 52

WORKER.—

Length 2.7 mm.

Head without the mandibles slightly longer than broad, much broader behind than in front, with somewhat angularly excised posterior border and feebly convex sides. Eyes small and flat, in front of the middle of the head. Mandibles rather large, convex, their long apical margins with numerous crowded denticles. Clypeal notch semicircular, about one-fifth as broad as the anterior margin. Frontal carinae somewhat closer together than to the lateral margins of the head. Frontal area and groove obsolete. Antennæ rather slender, scapes not reaching to the posterior corners of the head; first funicular joint twice as long as broad, remaining joints except the last, as broad as long. Thorax with sharply marked promesonotal and mesoepinotal sutures, the pro- and mesonotum forming a hemispherical mass, the latter circular, the humeri rounded; the mesoepinotal constriction moderately deep, acute; the epinotum lower than the promesonotum, only a little longer than the mesonotum, broader than long, in profile rather convex, sloping, without distinct base and declivity.

Petiole of the usual shape, elliptical, with its anterior border thickened above as the vestige of the node. First gastric segment overlying the petiole as in the other species of the genus; anus nearly terminal. Legs rather slender.

Shining; whole body very finely and uniformly punctate.

Hairs absent, except on the mandibles and tip of the gaster, where they are very short. Pubescence gray, short and fine, rather abundant, uniformly covering the whole body, but not concealing the surface.

Black; mandibles, sides of clypeus, cheeks and gula brown.

Described from a single specimen taken by Lang and Chapin on fire-wood between Lukolela and Basoko. This species is quite distinct in the shape of the thorax, in sculpture, and in pilosity.

The following species, though not from the Congo, may be most conveniently described in this place.

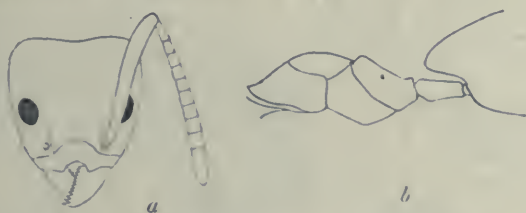


FIG. 53. *Engramma gowdeyi*, new species. Worker. a, head from above; b, thorax and petiole in profile.

***Engramma gowdeyi*, new species**

Text Figure 53

WORKER.—

Length 2.4 to 2.7 mm.

Head without the mandibles distinctly longer than broad, broader behind than in front, with feebly concave posterior border and feebly convex sides. Eyes flat, in front of the middle of the head, about one-fifth as long as its sides. Mandibles convex, with about a dozen even, crowded teeth. Clypeal notch about one-fourth the length of the anterior border, broader than deep, with sharp, slightly produced corners. Posterior clypeal border distinct; frontal area and groove obsolete; frontal carinae nearer to the sides of the head than to each other. Antennal scapes extending about one-sixth their length beyond the occipital border; funicular joints 2 to 10 perceptibly longer than broad. Thorax short, seen from above with distinctly angular humeri; promesonotal and mesoepinotal sutures distinct; pro- and mesonotum moderately convex, the latter broadly elliptical, slightly broader than long; mesoepinotal constriction rather deep, acute; epinotum as long as broad, broader behind than in front, in profile with a short base, rising rather steeply from the mesoepinotal suture, one-fourth as long as the flat, backwardly sloping declivity. Petiole elliptical, flat, its node obsolete. Gaster rather voluminous, its first segment overlying the petiole; anus terminal. Legs rather slender.

Shining; very finely and uniformly punctate.

Hairs sparse, blackish, erect, rather coarse, present on the clypeus, vertex, pro-, meso-, and epinotum, and all the segments of the gaster. Pubescence grayish, short and fine, rather abundant, covering the whole body but not concealing the shining surface.

Castaneous brown; thorax and anterior portion of head paler; mandibles, insertions of antennæ, funiculi, tarsi, and articulations of legs yellowish brown.

Described from numerous specimens taken by Mr. C. C. Gowdey at Kampala, Uganda. I at first supposed this form to be *E. ilgi* subspecies *stygium* Santschi, described from British East Africa, but careful perusal of the description shows that it is quite distinct.



Map 32. Distribution of the genus *Tapinoma*.

TAPINOMA Förster

WORKER small, monomorphic, with 4-jointed labial and 6-jointed maxillary palpi, multidenticulate mandibles, 12-jointed antennæ and entire or medially more or less emarginate clypeus. The node is reduced to an anterior thickening of the depressed or flattened petiole which is overlain by the first gastric segment; anus usually inferior. Gizzard short, calyx usually not divided into distinct sepals, feebly convex, covered with fine hairs, with the bulb almost exposed when viewed from the side.

The FEMALE is usually considerably larger than the male. The anterior wings have a single cubital cell, rarely two, and the discoidal cell is often lacking.

The MALE is commonly as small as the worker and has well-developed denticulate mandibles. Antennæ filiform, with long scape, usually surpassing the posterior border of the head and as long as the three first funicular joints together. Thorax stout; mesonotum not overhanging the pronotum. Genital appendages voluminous, the stipes with a large squamula and its free portion of variable shape. Wings as in the female, but the discoidal cell is often lacking in the smaller species.

Colonies of *Tapinoma* are usually populous and live in the ground or in the cavities of plants. The workers are timid and emit from their anal glands a strong odor like that of rancid butter ("*Tapinoma-odor*"). The genus is cosmopolitan and in the Nearctic Region reaches to rather high latitudes and altitudes (Map 32). One of the species, *Tapinoma melanocephalum*, has been widely distributed by commerce throughout the tropics of both hemispheres. It is often a pest in shops and is known in Cuba as the "hormiga bottegaria."

***Tapinoma luridum* Emery subspecies *longiceps*, new subspecies**

WORKER.—2.5 to 3 mm. Larger than the typical form and the subspecies *connexum* Santschi and differing also in the following characters. The head is longer, narrower behind and the posterior border is straight, not convex, as figured by Santschi for *connexum*, nor concave, as described by Emery for the type. The anterior clypeal border is straight in the middle, not feebly notched, and the scapes surpass the occipital border by nearly a third of their length. The eyes are decidedly smaller than in either of the other forms of the species. The thorax and petiole agree with Santschi's figure of *connexum*. The body is uniformly lustrous or moderately shining, the pilosity as described by Emery for the type, the pubescence exceedingly fine so that it somewhat dims the shining surface. The color is uniformly brown, except the tarsi, which are pale brownish yellow.

Described from numerous specimens found by Lang, Chapin, and Bequaert nesting in a deserted carton termitarium on a tree on the forested bank of the Congo River at Zambi. This form is so distinct that it may prove to be an independent species.

TECHNOMYRMEX Mayr

Allied to *Tapinoma* and distinguished by the peculiar structure of the gizzard, the calyx of which is covered with small clear spots apparently representing thin areas in the chitin. The anus is terminal in the WORKER and FEMALE. The former is small and monomorphic, the latter but little larger. The anterior wings have two closed cubital cells and a discoidal cell.

The MALE has a short antennal scape, not longer than the two first joints of the funiculus. Wings like those of the female, but with the cubital vein more or less interrupted near the second cubital cell. In one species, *T. albipes*, both apterous and winged males are known to occur.

The genus is confined to the Old World tropics, ranging over the Ethiopian, Indomalayan, Papuan, and Australian Regions (Map 33). Some of the species nest in the ground, others make small carton nests on the bark of trees. *T. albipes* is being rapidly disseminated in the tropics by commerce and sometimes occurs in hothouses in temperate regions.

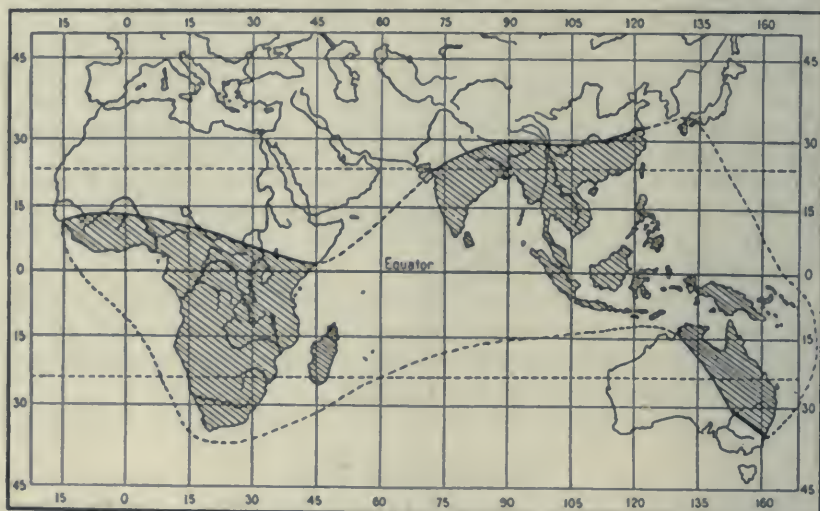
Technomyrmex nigriventris Santschi

Two workers taken by J. Bequaert at Thysville "beneath decaying leaves on the soil of a patch of forest."

Formicinæ

(Camponotinæ of authors)

WORKER monomorphic or more or less polymorphic, only in a few cases with pronounced dimorphism (*Dimorphomyrmex*). Frontal carinæ often feebly developed and the clypeus is only exceptionally produced between them (*Dimorphomyrmex*, *Gesomyrmex*); even then, it is not properly wedged in. Antennæ 8- to 12-jointed, usually long and filiform; the funiculus rarely with a feeble 4- or 5-jointed club. Abdominal pedicel always formed by one segment, the petiole, which is usually



Map 33. Distribution of the genus *Technomyrmex*.

scute-like; there is never a trace of constriction between the second and third abdominal segments and the stridulatory organ is also lacking at the base of the third segment. Sting vestigial; the poison-glands are converted into a cushion of convolutions (Forel's pulviniferous vesicle); the sting forms merely the sustentacular apparatus for the orifice of this poison vesicle. The ejaculation of the poison can in certain genera (*Formica*) be effected with great force. Orifice of the cloaca always circular and terminal, ciliated round the margin.

FEMALE always winged and similar to the worker, though of much larger size.

MALE winged, with the genitalia always exerted.

The venation of the wings is more or less reduced, often considerably so. In its most primitive stage there is still one cubital, a closed radial, and a closed discoidal cell; but there is no intercubitus, the radius and cubitus being confluent over a part of their course (*Formica*-type). Reduction has usually started by the disappearance of

the recurrent vein, there being no discoidal cell (*Camponotus*, *Ecophylla*). An intercubitus is only rarely present and then very short (*Myrmoteras*, which has the most primitive venation of this subfamily).

NYMPHS usually enclosed in cocoons; but there are some exceptions (*Ecophylla*, *Prenolepis*).

The members of this subfamily are morphologically the most highly developed of all ants; this is also true for their ethological peculiarities. Not only are their habits very diverse, but they show the most specialized form of mental and social behavior. The diet is in large part vegetarian and these ants show great predilection for sugary substances, which are sometimes stored in a special, replete form of worker (honey ants: *Melophorus*, *Myrmecocystus*, certain *Plagiolepis*, etc.). The species of *Ecophylla* and certain *Polyrhachis* and *Camponotus* build silk nests in leaves, using their larvæ as silk-producing shuttles. Moreover, the nesting habits in this subfamily are very varied. Certain species of *Formica* and *Polyergus* are slave-makers; the species of *Polyergus* are true social parasites of *Formica*, entirely dependent upon their slaves, but the worker caste is still present.

PLAGIOLEPIS Mayr

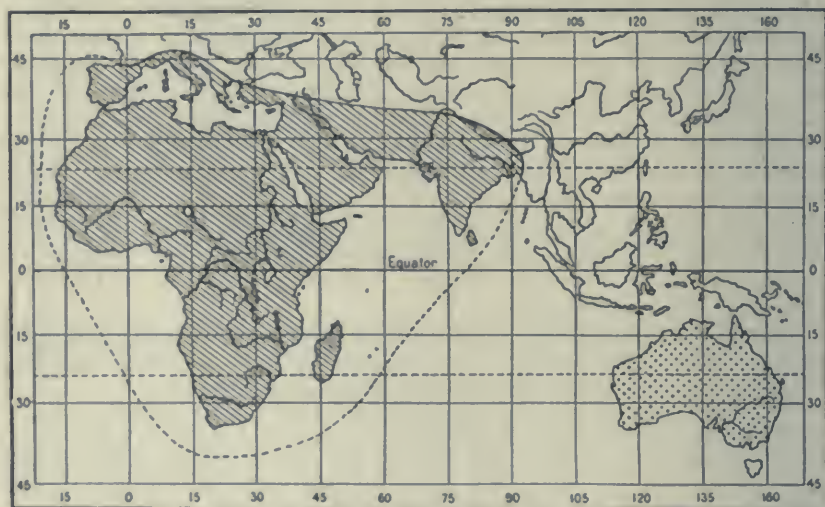
WORKER medium-sized to very small, monomorphic or feebly polymorphic. Mandibles rather narrow, with oblique, usually 5-toothed, apical borders. Clypeus large, convex, carinate or subcarinate, lozenge-shaped, its anterior border arched and projecting somewhat over the bases of the mandibles. Maxillary palpi 6-jointed, labial palpi 4-jointed. Frontal carinæ short, subparallel, rather far apart. Frontal area poorly defined. Antennæ 11-jointed, inserted very near the clypeal suture, the funiculi slender, gradually thickened towards their tips, the first joint long, the remaining joints gradually lengthening distally, the terminal joint elongate. Eyes moderately large and flat, placed in front of the middle of the head. Ocelli usually absent. Thorax short, more or less constricted in the mesonotal region, the epinotum simple and unarmed. Petiole with its scale anteriorly inclined, its superior border entire. Gaster rather voluminous, elliptical. Legs slender. Gizzard with the calyx strongly reflexed, parasol-shaped.

FEMALE much larger than the worker. Head small, thorax and gaster massive, the mesonotum somewhat flattened above, the gaster elliptical. Antennæ 11-jointed. Wings long, with one cubital cell and usually without a discoidal cell.

MALE somewhat smaller than the female. Mandibles acutely toothed. Frontal area large. Antennæ 12-jointed, with long scapes; funiculi with elongate first joint. Thorax voluminous, mesonotum large, flattened above, covering the small pronotum. Petiole as in the female. External genital valves large, rounded. Wings as in the female.

PUPÆ enclosed in cocoons.

This genus is peculiar to the warmer parts of the Old World (Maps 34 and 35) and is represented by the largest and most numerous species in the Ethiopian Region. Two of the latter, *P. custodiens* and *stein-*

Map 34. Distribution of the genus *Plagiolipsis*Map 35. Distribution of the subgenus *Anacantholepis* (crossed area) of *Plagiolipsis* and of the allied genus *Stigmacerus* (dotted area).

gröveri, resemble our northern species of *Formica* in stature and structure. A single medium-sized species, *P. longipes* (Jerdon), has been widely distributed by commerce in the Old World tropics and has also gained a footing in Mexico. Another species, *P. nuptialis* Santschi, recently discovered by Dr. Hans Brauns in the Cape Province, is parasitic on *P. custodiens* (*vide infra*). So far as known, the species of *Plagiolepis* nest in the ground, making crater nests or tunneling under stones, with the single exception of *P. mediorufa*, which inhabits plant-cavities.

Santschi has recently separated the genus into three subgenera: *Plagiolepis*, *sensu stricto*, *Anacantholepis*, and *Anoplolepis*, on the structure of the mesonotum.

***Plagiolepis mediorufa* (Forel)**

Numerous workers from Stanleyville (Lang and Chapin), taken from the leaf-pouches of *Cola Laurentii*. This form was originally described as a simple variety of the Palearctic *P. pygmaea* (Latreille), from specimens taken by Kohl "dans une plante myrmécophile," near Stanleyville. It should, in my opinion, be regarded as a distinct species on account of its peculiar habitat, for *pygmaea* nests in the soil under stones. Moreover, the worker *mediorufa* is decidedly smaller, with much shorter antennæ, the median funicular joints especially being distinctly shorter than long, whereas in *pygmaea* they are longer than broad. The head is proportionally smaller and narrower, with more rounded sides and with the occipital border straight or slightly convex, not concave as in *pygmaea*.

***Plagiolepis* (*Anoplolepis*) *custodiens* (F. Smith)**

Plate XIX, Figures 1 and 2

Banana, ♂, ♀, ♂; San Antonio, ♂ (Lang and Chapin).

At Banana this species was found nesting in flat craters in the pure sand of the sea-beach (Pl. XIX, figs. 1 and 2). According to a note by Mr. Lang, "the ants were found very near the water, where the sand was moved by the wind or even inundated by the breakers. Only a slight excavation, marking the entrance of the nest, was visible, and it was difficult to trace out the galleries. These ants carry particles of sand considerable distances, sometimes two or three feet from the nest-entrances. They work during the day-time and retreat into their nests when disturbed."

P. custodiens has been previously taken in Banana by Busschodts and in Angola by Silvestri, and is well known from other parts of the Ethiopian Region as far north as Abyssinia and as far south as the Cape.

It is the host of *P. nuptialis* Santschi, which was discovered by Dr. Brauns at Willowmore, Cape Province. Up to the present time only males of this ant have been taken. Dr. Brauns, who sent me a series of them, writes me March 24, 1920, as follows: "I am well aware of the interest attaching to the parasitic habits of *P. nuptialis*. Hitherto I have been unable to discover the female, but hope to unearth it eventually. The males always come out of the nests of *P. custodiens* and most years are not uncommon at Willowmore. I also found the male flying in numerous swarms over the Keurbooms River on the coast, near Plettenberg Bay, during a rain-storm, but could nowhere find them in copula with females. Perhaps the female is unable to fly! The males often remain for months at a time in the *custodiens* nests before swarming, which occurs only during a shower. The nests of *P. custodiens* and *steingröveri* are frequently close together, but the latter does not harbor *nuptialis*, though both species usually have the same myrmecophiles. At Willowmore *steingröveri* is showing a tendency to displace *custodiens*." It would seem from Dr. Brauns' observations that *nuptialis*, like the North American species of *Epacrus*, *Sympheidole*, and *Epipheidole*, must be a workerless parasite.

Plagiolepis (Anoplolepis) tenella Santschi

Niapu, ♀; Bafwasende, ♀; Garamba, ♀, ♂; Akenge, ♀; Medje, ♀ (Lang and Chapin). The specimens from Akenge and Medje were taken from the stomachs of toads (*Bufo funereus* and *polycercus*) and two males from Garamba from the stomach of a *Bufo regularis*. The Niapu specimens were found running about on the ground in the clearing of a native village.

The female of this species was mentioned by Forel from specimens found in the stomach of a pangolin (*Manis temmincki*) from the Lower Congo, but was not described. The hitherto undescribed male measures about 5 mm. The wings are long (6 mm.). The head is only about half as broad as the thorax, broader through the eyes than long, with small, acutely 5-toothed mandibles. Color, sculpture and pilosity as in the worker, but the head is dark brown behind and the thorax is more shining, with three obscure, brownish, longitudinal blotches on the mesonotum.

ACANTHOLEPIS Mayr

WORKER small, monomorphic. Head subquadrate, rounded laterally and posteriorly. Mandibles with oblique, dentate apical borders. Clypeus broad and high, carinate or subcarinate. Clypeal and antennary foveae confluent. Frontal area small but distinct, triangular. Frontal carinae subparallel, short, rather far apart. Maxillary palpi 6-jointed, labial palpi 4-jointed. Antennae 11-jointed, inserted close

to the clypeal suture; scapes long, funiculi slender, not thickened distally. Eyes moderately large, ocelli distinct, rather far apart. Thorax constricted at the mesonotum, the pronotum broad and usually convex anteriorly, somewhat compressed posteriorly; promesonotal and mesoepinotal sutures distinct; epinotum more or less swollen and obtusely dentate on each side. Petiolar scale bidentate or more or less excised above. Gaster broadly oval, with rather pointed tip. Legs slender. Gizzard much like that of *Plagiolepis*.

FEMALE larger than the worker. Head resembling that of the worker but broadened behind. Thorax robust, mesonotum large, gibbous in front where it overhangs the pronotum, obscurely longitudinally carinate in the middle as is also the scutellum. Epinotum unarmed or bluntly dentate. Wings with a single cubital cell and usually without a discoidal cell.

MALE scarcely larger than the worker and resembling that caste in the shape of the head. Eyes large, cheeks very short. Antennæ 12-jointed; scapes long and slender; funiculi filiform, all the joints elongate, the first shorter than the two following together. Thorax massive, about as broad as high; epinotum oblique, unarmed; mesonotum slightly convex but not subcarinate. Petiolar scale inclined forward, its upper border entire. External genital valves small, elongate, triangular. Wings long and broad.

PUPE enclosed in cocoons.

Like *Plagiolepis*, the genus *Acantholepis* is confined to the warm parts of the Old World, one species, *A. frauenfeldi* (Mayr), occurring as far north as southern Europe, Syria, and Persia. In Australia the genus is represented by a peculiar group of species, *Stigmacros*, which Forel regards as a subgenus but which, I am inclined to believe, should be raised to generic rank. The colonies of *Acantholepis* are moderately populous and usually nest in the ground, under stones, or in the fissures of rocks, rarely in the cavities of plants.

***Acantholepis capensis* Mayr variety *anceps* Forel**

Stanleyville, ♀; Medje, ♀ (Lang and Chapin). Numerous specimens. This variety is close to the subspecies *depilis*, having sparse, short, whitish pilosity. In shape the epinotum and scale, as Forel remarks, approach those of the subspecies *simplex* Forel. The variety was originally described from specimens taken by Kohl in the Belgian Congo, probably near Stanleyville. According to a note by Mr. Lang, this ant makes tiny craters in the soil after the rain. The colonies seem to be rather small, judging from the few workers seen outside the nests.

***Acantholepis capensis* variety *guineensis* Mayr**

A single worker from Thysville (Lang and Chapin) appears to belong to this variety, which is not black, like the other forms of the species, but reddish brown. The hairs are yellowish. It was originally described from the Gold Coast.

Acantholepis capensis variety validiuscula Emery

Thysville, ♀ (J. Bequaert, Lang and Chapin). Five specimens. This variety is decidedly larger and more robust than the typical *capensis*, with abundant, erect, dark brown pilosity. It seems to have a wide distribution, since it is known from Abyssinia, the Congo, Rhodesia, and Cape Province.

Acantholepis capensis subspecies canescens (Emery)

Thysville, ♀ (J. Bequaert); Avakubi, ♀ (Lang and Chapin). A form with long, white pilosity and abundant pubescence, distributed throughout the Ethiopian Region. A note by Mr. Lang states that "these small ants had their nest in the dirt which had accumulated at the bases of the cut leaves on the stem of an oil palm. They were numerous and travelled continually up and down, one by one, without forming a regular file. There were numerous nests along the trunk of the palm, but all of them were situated in the higher portion of the hollowed, partly decomposed stumps of the leaf-stalks, which had been cut off for some time. These hollows had evidently been made by the ants themselves."

Acantholepis capensis subspecies canescens variety cacozela Santschi

Faradje, ♀ (Lang and Chapin). Four workers taken from the hollow stems of an unidentified plant belonging to the family Melastomaceæ (*Dissotis*). This variety has longer hairs than the typical *canescens* and the petiolar scale is thickened at the summit, with scarcely excised border.

Acantholepis carbonaria Emery

Two workers from Banana (Lang and Chapin), without further data. This opaque species, originally described from Somaliland, has also been previously taken in the Belgian Congo.

PRENOLEPIS Mayr

WORKER small to very small, monomorphic, the body, legs, and scapes usually beset with sparse, coarse, erect, blunt hairs. Head rounded subrectangular or subelliptical, with rather narrow, dentate mandibles, their apical borders oblique. Clypeus large, convex, its anterior border entire or sinuately emarginate in the middle, not or scarcely produced over the bases of the mandibles. Frontal carinae very short and straight; frontal area poorly defined. Antennary and clypeal fossæ not confluent. Maxillary palpi 6-jointed; labial palpi 4-jointed. Antennæ 12-jointed, inserted near the posterior angles of the clypeus; scapes elongate, funiculi filiform or slightly thickened distally. Eyes moderately large; ocelli absent. Thorax short, more or less constricted in the mesonotal region. In some species the mesonotum is elongate and subcylindrical. Promesonotal and mesoepinotal sutures distinct. Epinotum more or

less convex above, unarmed. Petiole with an anteroposteriorly compressed scale, which is inclined forward. Gaster oval, convex in front, where the first segment covers the petiole, the tip pointed. Legs slender. Gizzard long and narrow, its calyx straight at the base, with the sepals reflected at their anterior tips.

FEMALE decidedly larger than the worker. Head proportionally small; thorax and gaster massive; pronotum short, vertical; mesonotum broad, flattened, with distinct parapsidal furrows; scutellum convex, often longitudinally impressed in the middle. Wings with a single cubital cell; discoidal cell present or lacking.

MALE scarcely larger than the worker. Head resembling that of the worker and female. Mandibles usually edentate. Antennæ 13-jointed; scapes rather long; funiculi filiform. Petiolar node thick. Genital valves rather small and narrow, varying considerably in the details of their structure in different species. Wings as in the female.

The PUPÆ are not enclosed in cocoons.

This genus is cosmopolitan, but most abundantly represented in the Indomalayan and Neotropical Regions. There are few species in Africa. Two, *P. longicornis* and *vividula*, have been widely distributed by commerce and, though originally tropical, often manage to live permanently in northern hothouses or even in apartment houses that are heated throughout the winter. Nearly all the members of the genus nest in the ground in small craters or under stones and usually form only moderately populous colonies. They are timid, harmless ants of little or no economic importance. Emery has divided the genus into three subgenera: *Prenolepis*, *sensu stricto*, *Euprenolepis*, and *Nylanderia*, the last containing the great majority of the species.

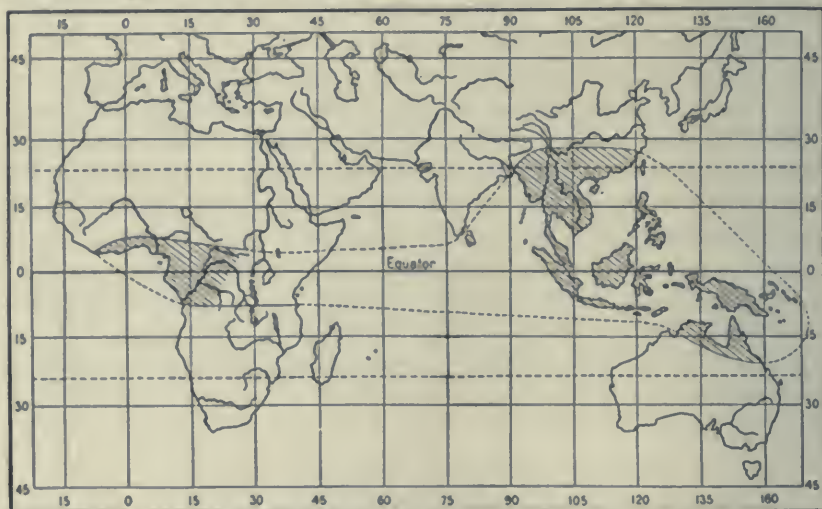
***Prenolepis* (*Nylanderia*) *longicornis* (Latreille)**

Stanleyville, ♂, ♀; Zambi, ♂, ♀ (Lang and Chapin). Numerous specimens showing some variation in color. The forms with paler workers might be assigned to Forel's variety *hagemanni*, originally described from Boma, in the Belgian Congo, but of the few distinguishing characters mentioned by the Swiss myrmecologist, the whiteness of the hairs is noticeable in all the *longicornis* workers I have seen from various parts of the world and the body color varies even in the same colony. These facts and a study of a cotype of *hagemanni* received from Prof. Forel convince me that the name should be relegated to the synonymy. Forel believed that his *hagemanni* might be the worker of Emery's *P. waelbroeckii*, described from female and male specimens, but the females accompanying pale *longicornis* workers from Stanleyville and Zambi are the same as those accompanying darker workers from other localities in the East Indies and tropical America and do not agree with Emery's description of the *waelbroeckii* female, which is larger, ferruginous instead

of dark brown, more hairy, with a much broader head, larger eyes and shorter antennal scapes.

***Prenolepis (Nylanderia) vividula* (Nylander)**

Niapu, ♂, ♀ (Lang and Chapin). Although this species is being rapidly disseminated by commerce throughout the tropics of both hemispheres and has long been known to occur in northern hothouses, it has not before been recorded from the Ethiopian Region. The workers before me are a little darker than typical specimens, but the differences are too insignificant to justify a new varietal name.



Map 36. Distribution of the genus *Pseudolasius*.

PSEUDOLASIUS Emery

WORKER small, polymorphic, the head of the major being large and differently shaped from that of the minor. Mandibles well developed, with oblique apical borders furnished with 5 to 6, more rarely with 7 to 8 teeth of different sizes. Clypeus large, convex, and more or less carinate in the middle, its anterior border projecting somewhat over the bases of the mandibles. Frontal area indistinct, triangular; frontal carinae short, subparallel, rather widely separated; frontal groove indicated. Clypeal and antennary fossae confluent. Head of major worker cordate or subrectangular, deeply emarginate posteriorly; in the minor worker much less deeply concave behind. Eyes small to very small, rarely completely lacking; ocelli absent. Antennae 12-jointed, inserted near the clypeal suture; funiculi filiform, slightly thickened towards their tips. Thorax short, stout; promesonotal and mesoepinotal sutures distinct; pro- and mesonotum convex above, mesonotum impressed; epinotum short, unarmed, with short base and long sloping declivity. Petiolar scale suberect or inclined forward, its apical border emarginate or entire. Gaster short, elliptical. Legs moderately long and stout.

FEMALE considerably larger than the worker. Head similar to that of the worker major but broader behind, with well-developed eyes and antennæ. Thorax broader than the head, the mesonotum flattened above, the pronotum short and vertical. Wings long and ample, with a single large cubital and no discoidal cell.

MALE as small as the worker and of a similar color. Mandibles dentate. Eyes and ocelli large. Antennæ 13-jointed; scapes long, funiculi filiform, all their joints longer than broad. Thorax similar to that of the female; gaster more slender; external genital appendages rather narrow, hairy. Wings long and broad; venation as in the female.

Until recently these ants were supposed to be peculiar to the Indo-malayan Region, but Forel has described a species from Australia and Santschi has described one from the French Congo (Map 36). Emery¹ has keyed all the species known up to 1911, but several Indonesian forms have since been described. The African material before me comprises four species, one of which I refer to *P. weissii* Santschi, the other three being undescribed. Two of the latter were taken by Lang and Chapin in the Belgian Congo, one by Mr. Gowdey in Uganda. All these forms have very poorly developed eyes, compared with the majority of Indo-malayan species. Further search will probably reveal many additional species in the Ethiopian Region. The workers are hypogæic or nocturnal and are therefore rarely seen; the males and females, however, are not infrequently taken at lights.

***Pseudolasius weissii* Santschi variety *sordidus* Santschi**

Text Figure 54

To this variety I refer a major and six minor workers and two partly deâlated females taken from the stomachs of toads captured by Lang and Chapin at Akenge. Owing to the fact that both females were taken from a *Bufo polycercus*, while the workers were taken from a *B. funereus*, I cannot be certain that the specimens belong to the same species. The females are of the same size as those of the typical *weissii* (6.5 mm., the fore wings nearly 7.5 mm.). The eyes are elliptical and obliquely placed, but distinctly smaller than indicated in Santschi's description; the wings are paler, being rather uniformly brown, with dark brown veins and pterostigma.

I have figured the head of the worker major and minor. The eyes, as Santschi says, are present only in the former and are very small and slightly elongate. In one of the mediæ I find them reduced to a single ommatidium. The apical border of the petiole is slightly concave in larger, entire in smaller workers. The color seems to be somewhat darker than described by Santschi for his variety *sordidus*, but this may be due to the action of the gastric juices of the toads.

¹1911, Ann. Soc. Ent. Belgique, LV, p. 214.

***Pseudolasius bufonum*, new species**

Text Figure 55

WORKER MAJOR.—

Length 2.8 to 3 mm.

Head scarcely longer than broad, subrectangular, with nearly straight, subparallel sides and sinuately excised posterior border. Mandibles 5-toothed, the median tooth small, the apical long and pointed, the others shorter and subequal. Clypeus convex, subcarinate in the middle, its anterior border entire, only slightly projecting over the bases of the mandibles. Eyes very small, consisting of only three or four ommatidia, situated a little in front of the median transverse diameter of the head. Antennal scapes not reaching to the posterior corners of the head; first funicular joint longer

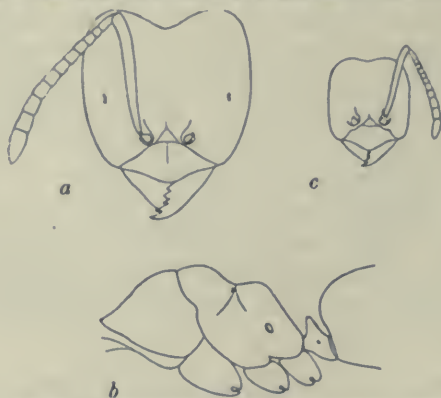


Fig. 54. *Pseudolasius weissi* variety *sordidus* Santschi.
a, head of worker major; b, thorax and petiole of same in profile; c, head of worker minor.

than the two succeeding joints together; second joint as broad as long, joints 3 to 7 slightly longer than broad. Thorax short, stout; pronotum large and broad, longer than the mesonotum, which is as long as broad; epinotum broader than long. In profile the pro- and mesonotum form a large convexity with rather uneven outline, interrupted by the strong promesonotal suture. Mesoëpinotal impression short and not very deep, the stigmata prominent. Epinotum decidedly lower than the mesonotum, in profile rounded and sloping, with very short base and long sloping declivity. Petiole small, rather strongly compressed antero-posteriorly, with entire superior border. Gaster elongate elliptical. Legs rather stout.

Mandibles opaque, very finely and longitudinally striated. Remainder of body shining, very finely and rather densely punctate, but not more coarsely on the head and thorax than on the gaster. Clypeus smoother and more shining than the remainder of the head.

Hairs and pubescence yellowish, abundant; the former erect, longest on the thoracic dorsum, sparser and shorter on the scapes and legs; pubescence rather long and dense over the whole body but only slightly obscuring the shining surface.

Yellowish brown; gaster and appendages paler and more yellow; mandibles castaneous, their teeth and a blotch on the vertex blackish.

WORKER MINOR.—

Length 2.5 to 3 mm.

Differing from the major worker in the shape of the head, which is decidedly smaller, distinctly longer than broad, with straight sides and only feebly excised posterior border. Eyes reduced to a single ommatidium or absent. Antennal scapes reaching to the posterior corners of the head; first funicular joint broader than long, joints 3 to 7 not longer than broad.

Sculpture, pilosity, and color as in the major worker, but the black spot on the vertex fainter or altogether absent.

FEMALE.—

Length 5.5 to 6 mm.

Head, excluding the mandibles, broader than long, slightly broader behind than in front, with feebly convex sides and broadly and feebly excised posterior border. Eyes slightly convex, very broadly elliptical, occupying the median third of the sides

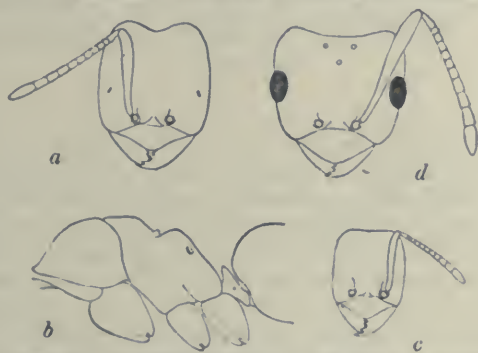


Fig. 55. *Pseudolasius bufonum*, new species. a, head of worker major; b, thorax and petiole of same in profile; c, head of worker minor; d, head of female.

of the head. Antennal scapes extending nearly one-third their length beyond the posterior corners of the head; all the funicular joints longer than broad. Thorax broader than the head; the mesonotum and scutellum flattened. Apical border of petiole blunt, straight, and transverse. Gaster large, elliptical. Wings long.

Sculpture, pilosity, and color much as in the worker, but the body darker brown, the gaster not paler than the thorax. Anterior border of clypeus blackish. Hairs lacking (possibly rubbed off), pubescence shorter and more delicate, and the surface, especially of the head and thorax, somewhat more opaque than in the worker. Wings blackish, with dark brown veins and pterostigma.

MALE.—

Length 2.5 mm.

Head as broad as long, somewhat narrowed behind and in front. Eyes convex, hemispherical, somewhat in front of the middle of the sides, the posterior border nearly straight. Mandibles denticulate, overlapping. Clypeus convex. Antennal scapes extending about one-fourth their length beyond the posterior border of the head; all the funicular joints distinctly longer than broad, the first nearly as long as the two succeeding joints together. Thorax and petiole shaped somewhat as in the female. Gaster and legs slender, external genital valves rather long and pointed.

Sculpture and pilosity much as in the worker. Color yellowish brown above, with brownish yellow appendages, genitalia, venter, and anterior portion of head. Ocellar triangle dark brown. Wings paler than in the female.

Described from four major and eleven minor workers, three females, and eight males, all taken from the stomachs of toads (*Bufo superciliaris* and *polycercus*) captured at Medje (Lang and Chapin).

This species differs from *weissi* in the shape of the head of the major worker, the slightly larger eyes, more strongly striated and more opaque mandibles, shorter antennae, and much more abundant pilosity and pubescence, and especially in having erect hairs on the scapes and legs. The female is smaller than that of *weissi*, with a differently shaped head, less excised behind, larger and more nearly circular eyes and longer antennae.

***Pseudolasius bucculentus*, new species**

Text Figure 56

WORKER MAJOR.—

Length 3.2 mm.

Head large, as broad as long, broader behind than in front, with convexly inflated sides and front and deeply and angularly excised posterior border, the posterior corners being somewhat conical. Mandibles apparently 5-toothed, folded under the clypeus, which is short and in the middle convex and obtusely carinate; its anterior border in the middle with a shallow excision. Eyes very small and indistinct, situated a little in front of the median transverse diameter of the head. Frontal groove rather distinct; frontal carinae very short; frontal area transverse, triangular, not impressed. Antennae rather slender, the scapes not reaching to the posterior corners of the head; first funicular joint as long as the two succeeding joints together; joints 2 to 7 of subequal length, all slightly longer than broad. Thorax robust, pronotum broad, in profile only feebly convex above, the mesonotum rising higher than the pronotum to its middle and then sloping and concave to the mesoepinotal suture. Epinotum with distinct base and declivity, the former short, sloping upward but not reaching the height of the mesonotum, the declivity flat and gradually sloping backward, more than twice as long as the base. Petiole small, with sharp, compressed, very distinctly notched superior border. Gaster voluminous, subelliptical, its anterior segment flattened in front and overlying the petiole. Legs long and stout.

Whole body, including the mandibles, shining and very finely and uniformly punctate, except the mandibles, which are longitudinally striate.

Pilosity and pubescence yellow, the former short, very sparse, absent except about the mouth and on the thoracic dorsum and as a single row of hairs along the posterior border of each gastric segment. Pubescence short and delicate but very dense, more conspicuous on the head and gaster than on the thorax, very fine and short on the appendages, the latter without erect hairs as in *bufonum*.

Uniformly brownish yellow; mandibular teeth and eyes blackish.

WORKER MINOR.—

Length 2.2 to 2.5 mm.

Differing from the major in the shape of the head, which is distinctly longer than broad, as broad in front as behind, with less convex, subparallel sides and less deeply

excised posterior border. Eyes extremely small, reduced to one or two ommatidia, pigmentless. Scares extending a short distance beyond the posterior corners of the head. In other respects like the major worker.

MALE.—

Length 3 mm.

Closely resembling the male of *bufonum* but with the head broader than long and especially broader and more swollen behind. Body and wings much paler, brownish yellow, the posterior portion of the head dark brown. Wings opaque, grayish, with pale brown veins and pterostigma. The pilosity is also very different, the hairs being very few and confined to the mouth-parts and genital appendages.

Described from a single major worker, two minor workers, and a male taken at Medje (Lang and Chapin), without further data. This species is quite distinct in the peculiar shape of the head and mesonotum of the worker major, the strongly notched petiolar border and the very feebly developed pilosity.

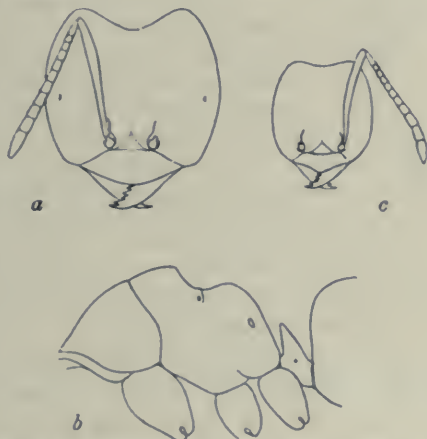


Fig. 56. *Pseudolasius bucculentus*, new species. a, head of worker major; b, thorax and petiole of same in profile; c, head of worker minor.

***Pseudolasius gowdeyi*, new species**

Text Figure 57

WORKER MAJOR.—

Length 2.5 mm.

Head as broad as long, subrectangular, as broad in front as behind, with straight sides and feebly but distinctly excised posterior border. Eyes absent. Mandibles with five acute teeth on their oblique apical borders, the median tooth small, the apical twice as long as the other three. Clypeus convex but not carinate, its anterior border nearly straight. Antennae slender, the scapes extending about one-fifth their length beyond the posterior corners of the head; the second funicular joint not longer than broad, the succeeding joints slightly longer than broad. Thorax short and robust,

the pro- and mesonotum forming together an evenly rounded convexity; mesopleuræ somewhat compressed; epinotum short, nearly horizontal, lower than the mesonotum, passing through a curve into the sloping, flat declivity. Petiolar scale narrowed above, its sides curved, its superior border rather blunt, truncated, entire. Gaster elliptical. Legs rather short.

Whole body smooth and shining, except the mandibles, which are opaque and very finely and densely striated. Integument of the body and appendages apparently microscopically but not densely punctate.

Hairs and pubescence white, the former sparse, conspicuous only on the clypeus, thorax, and gaster, the appendages being without erect hairs. Pubescence short, rather dense on the head and gaster, longer on the latter, slightly oblique on the scapes and legs.

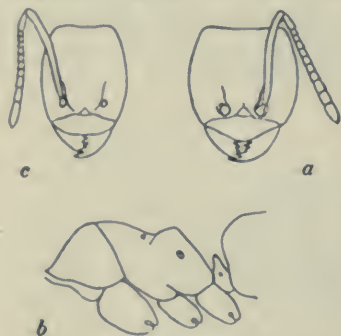


Fig. 57. *Pseudolasius gowdeyi*, new species. a, head of worker major; b, thorax and petiole of same in profile; c head of worker minor.

Pale yellow, the head and thorax a little darker, mandibular teeth dark brown.

WORKER MINOR.—

Length 1.8 to 2 mm.

Differing from the major worker in its smaller head, which is elongate and with very feeble occipital excision. Antennal scapes reaching nearly one-fourth their length beyond the posterior corners of the head; joints 2 to 6 of the funiculus as broad as long.

Described from two major and sixteen minor workers taken by Mr. C. C. Gowdey at Entebbe, Uganda. They were found attending subterranean coccids (*Pseudococcus citri* Risso) about the roots of coffee.

This is readily distinguished from all the preceding species by its smaller size, paler color, the complete absence of eyes even in the major workers, the shape of the head and thorax, and the pilosity.

ŒCOPHYLLA F. Smith

WORKER medium-sized, slender, slightly polymorphic. Head rather large, broader behind than in front, with rounded sides and posterior corners and semi-circularly excised occipital border, very convex above. Eyes large, convex, broadly elliptical, situated in front of the middle of the head. Ocelli absent. Palpi very short, maxillary pair 5-jointed, labial pair 4-jointed. Mandibles long and large, triangular, with nearly straight lateral borders, a very long curved apical tooth and numerous short denticles along the straight apical border. Clypeus very large and convex, but not distinctly carinate, its anterior border entire or very feebly sinuate in the middle, depressed and projecting over the bases of the mandibles. Frontal area rather large, subtriangular; frontal carinae moderately long, subparallel. Antennæ very long, 12-jointed, the scapes inserted some distance from the posterior corners of the clypeus, rather abruptly incrassated at their tips; the first funicular joint very long and slender, longer than the second and third together, joints 2 to 5 much shorter, subequal,

slender, the remaining joints, except the last, shorter and distinctly thicker. Thorax long and narrow; pronotum longer than broad, evenly convex above, narrowed and colliform anteriorly; mesonotum anteriorly long and constricted, subcylindrical, suddenly broadened behind where it joins the small, short, unarined epinotum, which is rounded and convex above and without distinct base and declivity. Petiole long and slender, much longer than broad, subcylindrical, with a very low rounded node near its posterior end, its ventral surface near the middle more or less convex, its posterior border on each side with a small rounded, projecting lamella, appearing like an acute tooth when the segment is viewed from above. Gaster short, broadly elliptical, its first segment suddenly contracted to the petiole, the tip rather pointed. Legs very long and slender; claws, pulvilli, and last tarsal joint enlarged. Gizzard with long slender sepals, which are not reflected at their anterior ends.

FEMALE much larger than the worker. Head broad, subtriangular; eyes not much larger than in the worker; ocelli well developed. Thorax and gaster very broad and massive, flattened above; thorax nearly as broad as long, pronotum small and vertical, overhung by the large depressed mesonotum; epinotum nearly vertical. Petiole short and stout, broader than long, its node low and rounded, more or less impressed in the middle, obliquely truncated or concave behind. Gaster short, nearly as broad as long. Wings very long and ample, decidedly longer than the body, heavily veined, with a narrow closed radial, a large single cubital, and no discoidal cell.

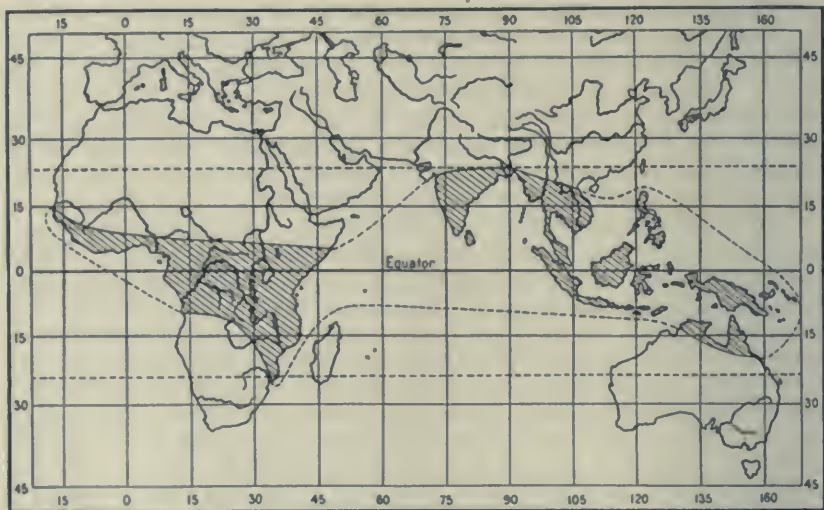
MALE somewhat smaller than the largest workers. Head small, broader than long, with very prominent, hemispherical eyes and moderately large ocelli. Mandibles very small, spatulate, with a few minute denticles. Antennæ slender and rather short, 13-jointed; scapes elongate, their apical halves somewhat abruptly incrassated; first funicular joint clavate, enlarged at tip, slender at base; remaining joints much shorter, except the last, and slender. Thorax short and massive, the mesonotum broader than the head, very convex and gibbous in front where it overhangs the small mesonotum. Petiole and gaster similar to those in the worker, but the former more flattened above and without a node. Genital appendages very small, narrow, linear; legs long and slender, tarsal claws obsolete, but pulvilli well-developed. Wings ample, distinctly paler than in the female. Head, thorax and gaster much more pilose than in the worker and female.

PUPÆ not enclosed in cocoons.

This interesting genus is confined to the Old World tropics and ranges over the Indomalayan, Papuan, and Ethiopian Regions, but does not occur in Madagascar (Map 37). It comprises the famous and vicious "tree-ants," or "tailor ants," which make peculiar globular or elliptical nests of leaves on living trees. The leaves are spun together with films of white silk, which is supplied by the larvæ. Numerous observers, notably Holland and Green, Wroughton, Rothney, Dodd, Saville Kent, Doflein, Bugnion, the Sarasin Brothers, Jacobson, Kohl, and myself, have described the extraordinary manner in which the workers use the young larvæ as animated shuttles.

According to the majority of myrmecologists, the genus *Ecophylla* comprises only a single species, *smaragdina* (Fabricius), with several geographical races and varieties. A study of the materials that have been

accumulating in my collection for the past twenty years, together with the fine series of specimens taken by Lang and Chapin in the Congo, has convinced me that there are really two distinct species: *E. smaragdina* (Fabricius) of the Indomalayan and Papuan Regions, with the varieties *selebensis* Emery, *gracilior* Forel, and *gracillima* Emery and the subspecies *subnitida* Emery and *virescens* (Fabricius); and *E. longinoda* (Latreille) of the Ethiopian Region, with the varieties *textor* Santschi, *rubriceps* Forel, *annectans*, new variety, and *fusca* Emery. Ern. André described a form *brevinodis*, from Sierra Leone, as a distinct species, and Stitz has recently cited it from Spanish Guinea, remarking that *longinoda*



Map 37. Distribution of the genus (*Ecophylla*).

occurs on the coast, *brevinodis* in the hinterland, and that there are no transitions between the two. He implies also that *brevinodis* does not make silken nests like *longinoda*. The abundant Congo series from various nests shows, however, without the slightest doubt, that *brevinodis* is nothing but the worker minima of *longinoda* (see Fig. 58c), as Emery maintained as long ago as 1886, and the localities of the material before me show that this species is not confined to the west coastal region. It occurs also in East Africa, Santschi's variety *textor* being from Zanzibar. Several authors have cited the true *smaragdina* from East Africa. Unfortunately I have little material from that region and what I have is certainly *longinoda*, presumably belonging to *textor*, though this variety seems to me to be poorly characterized and possibly not distinct from

the typical form of the species. I am unable to say, therefore, whether *E. smaragdina* actually occurs on the African continent.

According to Emery, *longinoda* is the most primitive of the existing forms of *Ecophylla*, because most closely allied to *Ec. sicula*, which he described from the Miocene amber of Sicily. In the Baltic amber I have recognized two species of the genus, *Ec. brischkei* Mayr and *brevinodis* Wheeler. As the latter name is preoccupied by *brevinodis* André, which was based, as I have shown, on the minima worker of *longinoda*, I suggest that the fossil species be called **crassinoda** (new name). In the shape of the petiole both of the Baltic amber forms, being of Lower Oligocene age and therefore older than *sicula*, are also more like *longinoda*, and especially its smaller workers, than the Oriental *smaragdina*.

***Ecophylla longinoda* (Latreille)**

Plate XX, Figures 1 and 2; Text Figures 5S and 59

Faradje, ♀, ♀, ♂; Malela, ♀; San Antonio, ♀ (Lang and Chapin); Katala, ♀; Leopoldville, ♀ (J. Bequaert).

The following differences between this species and *smaragdina* may be noted. In the worker the polymorphism is greater, for not only do the individuals of the same colony show a greater range in size (from 3 to 9 mm.) but the minimæ differ more from the mediæ and maximæ in the shape of the thorax and petiole. The head of the worker *longinoda* is distinctly more triangular than that of *smaragdina*, being broader behind, with less convex sides; the eyes are distinctly larger, the mandibles shorter, the clypeus more nearly subcarinate behind, its anterior border sometimes feebly and sinuately emarginate in the middle, the pronotum less convex, the petiole decidedly stouter, more thickened behind, with the stigmata much less prominent when the segment is viewed from above and its ventral surface much more convex anteriorly on the ventral side, when viewed in profile. The sculpture, pilosity, and color are very similar in the two species, but in *longinoda* the integument is more decidedly opaque, the mandibles are somewhat more coarsely striated, always darker, being concolorous with the posterior portion of the head, at least in the large workers and especially in the dark varieties. The transverse furrow on the second and succeeding gastric segments just behind the anterior border is more pronounced in *longinoda*.

The female of this species measures 12 to 14 mm. (wings 16 mm.) and is, therefore, distinctly smaller than the corresponding sex of *smaragdina*, which measures 15 to 17 mm. (wings 18 to 19 mm.). The body of the African species is much more opaque throughout, the wing-veins more

heavily bordered with dark brown, and the transverse bands at the bases of the second and following gastric segments are broader, darker, and more sharply marked off from the remainder of the segments. The green portions of the typical *longinoda* female are slightly more olivaceous and less pea-green, and the basal bands of the gaster are more exposed and brownish; the appendages are more brownish.

The male *longinoda* is scarcely smaller than that of *smaragdina* and measures 6 to 6.5 mm., but the head, thorax, and petiole are darker and

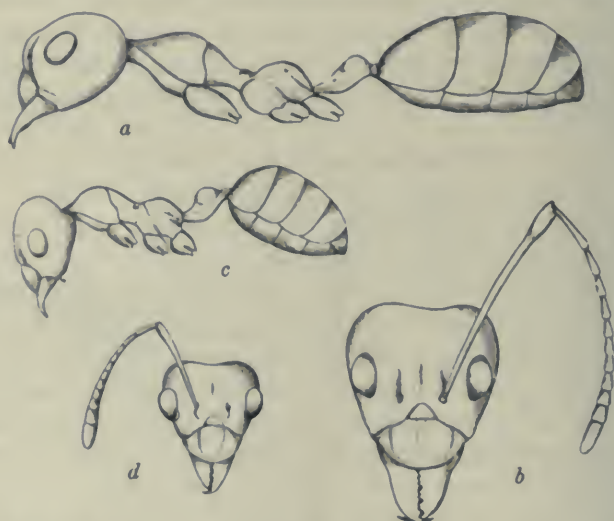


Fig. 58. *Ecophylla longinoda* (Latreille): a, body of worker major in profile; b, head of same; c, body of worker minima in profile; d, head of same.

more blackish; the head is decidedly broader, especially behind, the mandibles, petiole, antennal scapes, and wings are decidedly shorter and the integument is less shining.

The workers of the various subspecies and varieties of the two species may be separated by means of the following key.

1. Petiole very slender, its stigmata seen from above very prominent, its ventral surface nearly straight or very feebly convex in profile (*smaragdina*) 2.
- Petiole stouter and higher, its stigmata seen from above not prominent, its ventral surface strongly convex in profile (*longinoda*) 7.
2. Body ferruginous or testaceous 3.
- Gaster and sometimes the head pea-green, head more rounded and less truncated behind; size smaller, petiole somewhat shorter (Queensland, New Guinea, Islands Aru and Key) subspecies *virescens* (Fabricius).

3. Integument opaque or subopaque.....4.
Integument more or less distinctly shining.....5.
4. Color ferruginous (India, Ceylon, Cochin China, Indonesia).
smaragdina (typical).
Smaller and more testaceous, mesonotum and petiole a little narrower (Java).
variety *gracilior* Forel.
5. Large forms, integument slightly shining (Papua, Philippines, Melanesia).
subspecies *subnitida* Emery.
Smaller forms, integument more shining.....6.
6. Body very shining and slender, color testaceous, head rather elongate (Island of
Batjan).....variety *gracillima* Emery.
Less shining and less slender, head shorter (Celebes).
variety *selebensis* Emery.
7. Ferruginous or testaceous throughout.....8.
Brown or black.....9.
8. Color ferruginous (West Africa).....*longinoda* (typical).
Color paler, more testaceous, petiole shorter, head slightly broader, apical tooth
of mandibles shorter (Zanzibar).....variety *textor* (Santschi).
9. At least the thorax and mandibles black.....10.
Body rather uniformly brown (Belgian Congo). variety *annectens*, new variety.
10. Head dull red, gaster often brownish (Belgian Congo) . . variety *rubriceps* (Forel).
Head and gaster black or dark brown (Belgian Congo, Nigeria, Liberia,
Cameroon, Spanish Guinea).....variety *fusca* (Emery).

(E. fusca was originally described by Emery as an independent species, but Forel reduced it to subspecific rank on finding the variety *rubriceps*, which shows some color variation in the direction of the typical *longinoda*. The discovery of another variety, *annectens* described below, connecting *rubriceps* and *longinoda* is additional evidence that *fusca* cannot be maintained as a species. In my opinion it is merely an extreme melanic variety, for I am unable to detect in it any morphological characters of even subspecific value. All of the varieties of *longinoda* are equally polymorphic in the worker caste and the smallest individuals all agree with the description of André's *brevinodis*, except in color.

The ethological observations of Chun¹ and Father Kohl² refer to this species.

Mr. Lang's photographs reproduced on Pl. XX, figs. 1 and 2, show two of the nests of the typical *longinoda* from Malela, consisting of the leaflets of a bush skillfully folded and united with the white silk spun by the young larvæ. He found that the nests of *longinoda* and its varieties are most often constructed on bushes and are sometimes only a few feet

¹1903, 'Aus den Tiefen des Weltmeeres, II, p. 129.

²1900, 'Zur Biologie der spinnenden Ameisen,' Natur und Offenbarung, I, 11, pp. 166-169.



Fig. 59. Nest of *Ecophylla longinoda* (Latreille) at Avakubi, October 27, 1909. This nest, 16 cm. long, was placed about four feet from the ground in one of the coffee trees of a deserted plantation. Photograph by H. Lang.

from the ground. Text Fig. 59 shows a nest of this ant placed in a coffee tree at Avakubi. The habits seem to be the same in all essential particulars as those of *smaragdina*.

***Ecophylla longinoda* variety *annectens*, new variety**

WORKER very similar to the typical form but brown instead of ferruginous, the gaster sometimes slightly darker than the remainder of the body. Mandibles, except in the small workers, darker brown than the front, cheeks, and clypeus. Incrassated tips of antennal scapes with a dark brown spot; funiculi, knees, tarsi, and tips of tibiae pale yellow; pulvilli black.

FEMALE brown, instead of green and brown like the typical *longinoda*, with darker brown markings on the thorax. Second and following gastric segments with the basal bands velvety black, so that the gaster is distinctly fasciate. Funiculi, tips of scapes, tibiae, tarsi, and vertex paler, more reddish brown. Wings slightly darker than in the typical form, with deeper brown margins to the veins.

MALE darker brown than the worker. Mandibles, antennae, tarsi, and articulations of legs brownish yellow; last tarsal joint black. Wings distinctly paler than in the female.

Described from long series of specimens from the following places: Avakubi (type locality), ♂, ♀, ♂; Stanleyville, ♂; Niangara, ♂ (Lang and Chapin); Malela, ♂ (J. Bequaert).

***Ecophylla longinoda* variety *rubriceps* (Forel)**

WORKER black or dark brown, the head dull, blood red, often darker laterally and posteriorly, tips of antennal funiculi and second to fourth tarsal joints pale brownish yellow. Gaster in specimens from some colonies brown, the posterior margins of the segments paler.

FEMALE dark brown, almost black, the gaster very little paler, the bands at the bases of the segments velvety black; tarsi and tips of funiculi pale brown. Wings even darker than in the variety *annectens*.

MALE black; mandibles, legs, and funiculi piceous; wings paler than in the female but darker than in the male *annectens*.

Described from many specimens from two colonies taken at Stanleyville (Lang and Chapin). The workers of one colony agree closely with Forel's description of the types from the Belgian Congo in having the gaster nearly or quite concolorous with the thorax, and some of the larger specimens are scarcely distinguishable from the variety *fusca*; the workers of the other colony have the gaster rather pale brown and, therefore, connect the variety with *annectens*, which seems to be a more stable form than *rubriceps*.

***Ecophylla longinoda* variety *fusca* (Emery)**

WORKER differing from *rubriceps* only in having the head entirely black or dark brown, though sometimes with a reddish tinge above. Mandibles black, with dark brown teeth. Large workers have the clypeal border very feebly sinuate in the middle and the surface just behind it with a faint longitudinal impression. The smallest workers are a little paler, with paler mandibles, but in the structure of the thorax and petiole precisely like the corresponding phase of the other forms of the species.

FEMALE like that of *rubriceps*, but perhaps a shade darker.

MALE indistinguishable from the male of *rubriceps*, except that the erect white hairs on the dorsal surface of the head, thorax, and gaster are distinctly longer and more abundant.

Redescribed from specimens taken at Stanleyville and Garamba (Lang and Chapin). There is also a worker of this variety from Monrovia, Liberia, (J. Morris) in my collection.

CAMPONOTUS Mayr

WORKER medium-sized to very large, polymorphic, rarely dimorphic, the worker maxima having a large, broad head, the minima a much smaller head and more slender body, the media being intermediate in structure. Head differing considerably in form in different species, usually broad and more or less excised behind, narrower in front, very convex above and flattened beneath. Mandibles powerful, short, triangular, with coarse teeth on their broad apical borders; external border and upper surface convex in large individuals. Palpi moderately long, the maxillary pair 6-, the labial pair 4-jointed. Clypeus large, trapezoidal or subrectangular, usually carinate or subcarinate, often divided into a large, median, subhexagonal and two small, triangular, lateral divisions, which do not reach the lateral border of the cheeks, the anterior border entire or emarginate, often excised on each side, with a broad, more or less projecting median lobe. Frontal area small, triangular or lozenge-shaped; frontal groove distinct; frontal carinae long, prominent, marginate, and sinuate or S-shaped, rising from the posterior border of the clypeus. Eyes moderately large, broadly elliptical, not very prominent, situated behind the middle of the head; ocelli absent, the anterior ocellus sometimes indicated. Antennae 12-jointed; scapes sometimes thickened distally, inserted some distance behind the posterior border of the clypeus; funiculi long, filiform, not enlarged at their tips, all the joints longer than broad. Thorax differing greatly in shape in the various species, typically broadly and more or less evenly arcuate in profile, broad in front, laterally compressed behind, the epinotum usually simple and unarmed. Rarely the mesonotum is impressed or sellate. Petiole surmounted by an erect scale, the upper border of which may be blunt or anteroposteriorly compressed, entire, subacuminate or more or less emarginate. Gaster rather large, broadly elliptical, its first segment forming less than half its surface. Legs long and well developed. Gizzard with a long slender calyx, the sepals of which are not reflected at their anterior ends.

FEMALE larger than the worker maxima but usually with smaller head. The latter and the petiole much as in the worker. Ocelli present. Thorax elongate elliptical; pronotum short, its posterior margin arched, its posterior angles reaching back to the insertions of the wings, mesonotum and scutellum long, convex; metanotum depressed below the scutellum. Gaster elongate elliptical, massive. Wings long and ample, the anterior pair with a radial, one cubital, and no discoidal cell.

MALE small and slender; head small, with very prominent eyes and ocelli. Mandibles small and narrow. Antennae 13-jointed, slender, scapes long. Petiolar node thick and blunt; gaster elongate, with small slender genital appendages. Legs very slender. Wing venation as in the female.

PUPE nearly always enclosed in cocoons.

This huge cosmopolitan genus, comprising more than 1000 described forms, has become so unmanageable that Forel and Emery have recently split it up into some thirty-six subgenera. The frequent occurrence of species of *Camponotus* in all countries, except Great Britain and New Zealand, and the extraordinary variability of many of the species in response to slight differences of environment make the genus one of considerable interest to the student of geographical distribution. In the Ethiopian Region, it is represented by numerous species assignable to no

less than eleven of the thirty-six subgenera recognized by Emery and myself, namely, *Myrmoturba*, *Dinomyrmex* (Map 41), *Myrmosericus*, *Myrmothrix* (one species, probably introduced), *Orthonotomyrmex*, *Myrmotrema* (Map 38), *Myrmopiromis*, *Myrmorhachis*, *Myrmopsamma*, *Myrmamblys*, and *Colobopsis*, and species of six others, *Camponotus*, *sensu stricto*, *Myrmosaulus*, *Myrmosaga*, *Mayria*, *Myrmonesites*, and



Map 38. Distribution of *Myrmotrema*, a subgenus of *Camponotus* of the Ethiopian and Malagasy Regions. According to Emery (1920) one species occurs in India

Myrmopytia, occur in the Malagasy Region. A few of these subgenera, *Myrmopsamma* and *Myrmopiromis*, are peculiarly African, while others, *Myrmosaga*, *Mayria*, *Myrmonesites*, and *Myrmopytia*, are only found in Madagascar. The development of the subgenus *Myrmoturba* and especially of the species *maculatus* (Fabricius), the typical form of which is West African, is extraordinary, as will be seen by consulting the catalogue (Part VIII). *C. (Myrmoturba) maculatus* (Map 39) and two other species, *C. (Myrmosericus) rufoglaucus* (Map 42) and *C. (Orthonotomyrmex) sericeus* (Map 43), have a singular distribution. Forms of *maculatus*

occur in all the continents; *rufoglaucus*, with many varieties, ranges from southern China across India and equatorial and South Africa to the Gulf of Guinea; and *sericeus* occupies a similar range, though showing little tendency to produce subspecies and varieties.

The species of *Camponotus* often form very populous colonies and exhibit a great diversity of nesting habits. Many live in the ground, either under stones or in crater nests, others under bark, in dead wood, hollow twigs, and galls, and a few construct carton nests or employ their larvæ, after the manner of *Æcophylla*, in spinning together particles of vegetable detritus with silk (*C. senex* and *formiciformis*). The food of the various species consists of miscellaneous insects, the excreta of aphids (honeydew), and nectar. Many of the smaller forms are stolid, apathetic, or timid, but the maxima workers of the large species belonging to the subgenera *Dinomyrmex*, *Myrmoturba*, *Myrmothrix*, and *Myrmopiromis* are very pugnacious and capable of inflicting painful wounds with their powerful mandibles.

***Camponotus (Myrmoturba) maculatus* (Fabricius)**

Medje, ♂, ♀; Yakuluku, ♂, ♀; Garamba, ♂, ♀; Vankerekhovenville, ♀; Faradje, ♂ (Lang and Chapin). Six of the workers from Garamba, all minors, were taken from the stomach of a toad (*Bufo regularis*). The major workers agree perfectly with Donisthorpe's re-description¹ of the Fabrician type of this ant in the Banks Collection, presumably from Sierra Leone, except that they have a few short, erect hairs on the gular surface of the head.

The distribution of *C. maculatus* and its various forms is shown on Map 39.

***Camponotus (Myrmoturba) maculatus* subspecies *guttatus* Emery**

I refer fourteen minor workers from Zambi (Lang, Chapin, and J. Bequaert) to this pale subspecies. The specimens were taken "only at night-fall, visiting the tables in the camp. They are shy and fast runners."

***Camponotus (Myrmoturba) maculatus* subspecies *melanocnemis* (Santschi)**

Faradje, ♂, ♀; Yakuluku, ♀ (Lang and Chapin). Numerous specimens from several colonies.

¹1915, Ent. Record, XXVII, p. 221.

Camponotus (Myrmoturba) maculatus subspecies congolensis Emery

Yakuluku, ♂, ♀; Faradje, ♂, ♀; Medje, ♀; Niangara, ♀, ♀; Garamba, ♂, ♀, ♀ (Lang and Chapin). Numerous specimens. A major and two minor workers from Faradje are from the stomach of a frog (*Rana occipitalis*), one of the major workers from Garamba from the stomach of a toad (*Bufo regularis*).



Map 39. Distribution of *Camponotus (Myrmoturba) maculatus* (Fabricius) and its forms.

Camponotus (Myrmoturba) maculatus subspecies miserabilis Santschi
 variety *pessimus*, new variety

The major worker measures only 6 to 6.5 mm., the minor 5 to 5.5 mm. Both agree closely with Santschi's description and figure of *miserabilis*, except in their considerably smaller size. The head of the major is distinctly narrower anteriorly, the cheeks being less convex and the frontal carinae are less approximated. Sculpture, pilosity, and color very much as in *miserabilis*.

Four major and five minor workers from Yakuluku (Lang and Chapin), without further data.

Camponotus (Myrmoturba) maculatus subspecies solon Forel

Bafwabaka, ♂ ♀; Niangara, ♂; Akenge, ♂; Medje, ♂ (Lang and Chapin). All the specimens from the three former localities, twenty in number, were taken from the stomachs of toads (*Bufo regularis*, *funereus*, and *polycercus*), the single specimen from Medje from the stomach of a frog (*Rana albolabris*).

Camponotus (Myrmoturba) maculatus subspecies **solon** variety **jugurtha**,
new variety

WORKER MAXIMA.—Differing from the typical *solon* in its much paler color, the antennæ, head, and thorax being red; the mandibles, front, and a streak down the middle of the clypeus castaneous; the posterior corners of the head, the legs including the coxæ, the petiole, and the three basal gastric segments brownish yellow; the tip of the gaster more brownish. The mandibles are very finely striated and the petiolar scale is much compressed and prolonged above as in the typical *solon* and not blunt as in *brutus*. In the feebler punctuation of the head this variety is also like the typical *solon*.

A single specimen from Batama (Lang and Chapin), without further data.

Camponotus (Myrmoturba) maculatus subspecies **brutus** (Forel)

Avakubi, ♂, ♀; Medje, ♂, ♀; Faradje, ♂, ♀, ♀; Bafwasende, ♂, ♀; Stanleyville, ♂, ♀, ♀; Batama, ♀; Lukolela, ♀; Malela, ♂, ♀; Isangi, ♂, ♀; Nouvelle Anvers, ♂, ♀; Zambi, ♀; Poko, ♂; Akenge, ♂, ♀; Niangara, ♂, ♀ (Lang and Chapin); Malela, ♂, ♀ (J. Bequaert). The workers from Akenge and Niangara, ten in number, are from the stomachs of toads (*Bufo funereus*, *polycercus*, and *regularis*). To judge from the many series of specimens, this large red ant must be very common in the Congo. Its native name, according to Mr. Lang, is "maola." It nests in rotten wood. The specimens from Nouvelle Anvers were found nesting in an old oil palm trunk.

Camponotus (Myrmoturba) maculatus subspecies **brutus** variety
lycurgus Emery

Two major and four minor workers, taken at Leopoldville (Lang and Chapin), may be referred to this variety, which has the dark head and thorax of the typical subspecies *solon*.

Camponotus (Myrmoturba) acvapimensis Mayr

Faradje, ♂, ♀; Garamba, ♂, ♀; Bolengi, near Coquilhatville, ♂, ♀; Stanleyville, ♀; Thysville, ♀; Vankerekhovenville, ♂, ♀; Niangara, ♂, ♀; Akenge, ♂, ♀ (Lang and Chapin); Zambi, ♂, ♀; Thysville, ♀ (J. Bequaert). Of the numerous specimens of this small black species, thirty from Garamba and Niangara are from the stomachs of toads (*Bufo regularis* and *funereus*). A single major worker from Faradje is from the stomach of a frog (*Rana occipitalis*). The specimens from Bolengi were found nesting in the trunk of an oil-palm; some of those from Faradje were captured while attending plant lice on the young leaves of orange trees. The distribution of this species is shown on Map 40.



Map 40. Distribution of *Camponotus (Myrmoturba) acrapimensis* Mayr.

***Camponotus (Myrmoturba) maguassa*, new species**

MAJOR WORKER.—

Length 9 to 10 mm.

Head rather small, subrectangular, as long (1.3 mm. without the mandibles) as broad, a little narrower in front than behind, with straight posterior and very feebly convex lateral borders. Eyes rather large and convex, situated about their length from the posterior border when the head is seen from the front. Mandibles moderately convex, coarsely 6-toothed. Clypeus sharply carinate behind, rather deeply emarginate on each side of the median lobe, which is short, with straight border, distinctly dentate at the corners. Frontal area subtriangular, indistinct behind; frontal groove pronounced; frontal carinae approximated anteriorly. Antennae slender, the scapes straight, terete, not enlarged at the tips, reaching about two-fifths their length beyond the posterior border of the head. Pronotum flattened above, its sides distinctly marginate anteriorly; mesonotum evenly arched in profile; metanotum indistinct; epinotum with subequal base and declivity, both surfaces straight and sloping, meeting at a rounded obtuse angle. Petiole rather high, oval when seen from behind, in profile with flattened anterior and posterior surfaces, its superior border rather sharp and entire. Gaster and legs as usual, hind tibiae nearly cylindrical, only very slightly compressed, without a row of bristles along their flexor surfaces.

Body subopaque, the petiole, gaster and legs more shining. Mandibles coarsely and sparsely punctate, their tips striated, their bases sharply shagreened. Head very densely, evenly and finely punctate, so that it appears granular; the clypeus, cheeks, front, and vertex also with large, scattered, irregular, piligerous punctures. Sculpture of the thorax like that of the head but finer, especially on the pleuræ; the dorsal surface with coarse, sparse, piligerous punctures. Gaster finely, sharply and transversely shagreened, with coarse, sparse, transverse piligerous punctures. These have minutely papillate anterior borders so that the coarse hairs seem to rise from small projections. Legs finely shagreened or coriaceous.

Hairs fulvous red, coarse, erect, rather abundant, long on the dorsal surface of the head, thorax, and gaster, somewhat shorter on the gula and petiolar border, still shorter but suberect on the cheeks, scapes and legs. Pleuræ, anterior and posterior surfaces of petiole hairless. Pubescence rather coarse, very sparse, visible on the cheeks and gaster.

Brownish black; funiculi, tips of scapes, legs, including the coxæ, petiole, and gaster rich castaneous, the legs and funiculi slightly paler.

WORKER MINOR.—

Length 5 to 7.5 mm.

Differing from the major worker in the shape of the head, which is longer than broad, with straight, parallel sides and broadly convex posterior border. The eyes are more convex, the antennal scapes longer, extending somewhat more than half their length beyond the posterior corners of the head. The clypeal lobe has more rounded corners.

Described from numerous specimens from two colonies taken at Avakubi (Lang and Chapin). According to a note accompanying one lot, "these ants are said to be common in the forest in the decayed wood of large trees. Native name 'maguassa.'"

This species bears a striking resemblance to *C. festai* Emery from Asia Minor. The single worker major cotype of this insect in my collection lacks the head, so that in making comparisons of this part of the body I have to rely entirely on Emery's description. The head of the worker major of *festai* is evidently larger (3.5×3.5 mm.), more narrowed in front, with the posterior border slightly concave; the mandibles are 7-toothed, the scape is somewhat flattened, the declivity of the epinotum much shorter than the base, the petiole much broader above, with sharper border; the hind tibiæ are prismatic, with dorsal groove and their flexor border has a row of bristles; the hairs and pubescence are yellow, the latter much longer and more conspicuous on the gaster than in *maguassa*, and the hairs on the legs are distinctly longer; the head and gaster are black, the thorax, legs, and petiole deep brownish red.

Camponotus (Dinomyrmex) pompeius Forel subspecies **cassius**, new subspecies

Text Figures 60 and 61

WORKER MAXIMA.—Differing from the maxima of the typical *pompeius* in having the head distinctly smoother, more shining, and more superficially shagreened, the apical tooth of the mandibles much longer, the corners of the clypeal lobe much more acute, the superior border of the petiole somewhat more obtuse, the petiole and thorax brownish red, except the pronotum and dorsum of the mesonotum, which are dark brown. The thorax and coxæ are covered with much longer, denser, and more conspicuous yellowish pubescence than in typical *pompeius*.

WORKER MINIMA.—Very similar to the typical form but the thorax and legs paler, and the head and thorax with longer pubescence.

Described from a single maxima and seven minimæ from Yakuluku (Lang and Chapin). There is also a single mermithergate from Medje which I have figured (Fig. 61). It is 15 mm. long, the gaster measures 8 mm. and is enormously distended with nematode worms of the genus *Mermis*, which are visible through the thinner portions of the lateral and ventral integument. The head and thorax are like the corresponding parts of the minima or small media and there are no traces of ocelli. The petiole, however, has a somewhat more pointed node and therefore approaches slightly the condition in the female.

Four males from Medje and Faradje and three females from Stanleyville are probably referable to this or to one of the other forms of *pompeius*. They have the epinotum and legs more reddish than in the typical form. The wings of both females and males are slightly yellowish, with resin-colored veins and dark brown pterostigma.

Camponotus (Dinomyrmex)^rpompeius subspecies **marius** Emery

Medje, ♂, ♀; Akenge, ♂, ♀; Niapu, ♀ (Lang and Chapin). Two maxima and twenty-nine minima workers all from the stomachs of toads (*Bufo polycercus*, *funereus*, and *superciliaris*) and one small worker from Niapu from the stomach of a frog (*Xenopus tropicalis*) seem to belong to this form. Though from different localities, the two maximæ both have the head much smaller and narrower (without the mandibles, 4.5 × 3.9 mm.) than in the typical *pompeius* or the preceding subspecies and agree very closely with Emery's description. He believed that the specimen he examined was not a maxima, but the two specimens from Medje and Akenge seem to indicate that the small narrow head may be characteristic of the largest worker of the subspecies. The petiolar scale in my specimens is also high and pointed, precisely as in Emery's figure, the scapes are long (4.5 mm.), and the coloration and sculpture agree with his description.

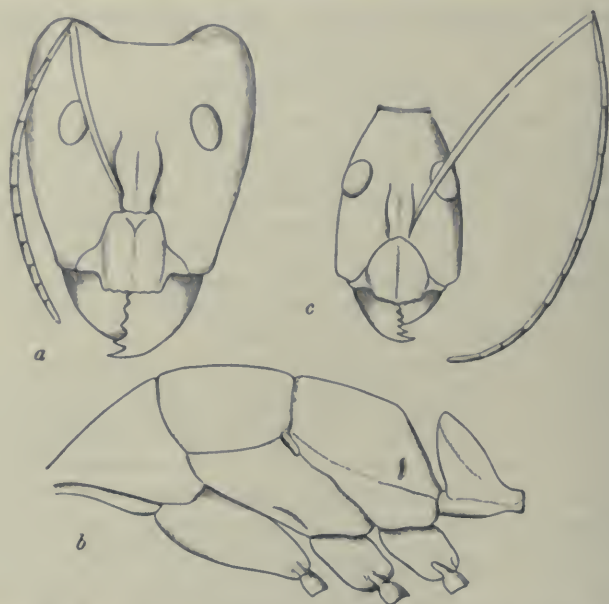


Fig. 60. *Camponotus (Dinomyrmex) pompeius* subspecies *cassius*, new subspecies. a, head of worker maxima; b, thorax and petiole of same in profile; c, head of worker minima.

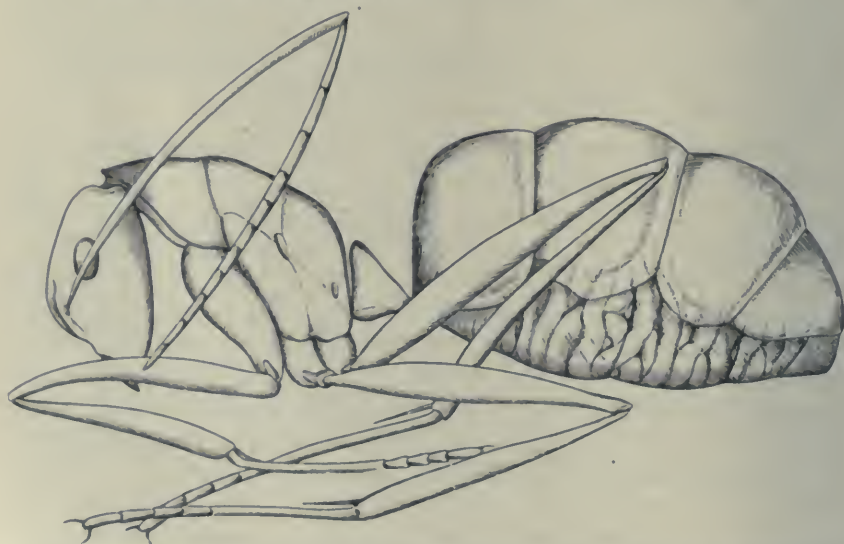


Fig. 61. *Camponotus (Dinomyrmex) pompeius* subspecies *cassius*, new subspecies. Mermithergate from Medje.

Camponotus (Dinomyrmex) langi, new species

Text Figure 62

WORKER MAXIMA.—

Length 12.5 to 14 mm.

Head unusually small, decidedly longer than broad (4.1×3 mm., without the mandibles), slightly narrower in front than behind, with broadly and not deeply excised posterior border and evenly, feebly convex sides. Eyes rather small and elongate, situated twice their length from the posterior border of the head. Mandibles rather small, convex, with 7 short teeth. Clypeus carinate, its anterior border emarginate on each side, the median lobe very short, its border coarsely crenulate, its corners obtuse. Frontal area small, subtriangular; frontal carinae closely approximated, especially in front. Antennae long (4.5 mm.) and slender, not enlarged distally, their bases distinctly flattened but not dilated, reaching nearly half their length beyond the posterior border of the head; funiculi long, filiform. Thorax low and narrow; mesonotum distinct; epinotum long, its base nearly four times the length of the declivity, with a distinct, transverse impression in the middle. Petiole very low, subquadrate, and as broad as long when seen from above, in profile scarcely higher than long, obliquely truncated anteriorly and posteriorly, with very blunt superior border. Gaster long and narrow. Legs very long and thin; tibiae triangular in cross-section, deeply channelled on all three surfaces, their flexor borders without row of bristles.

Mandibles, clypeus, legs, sides of thorax, and sides and venter of gaster somewhat shining, remainder of the body opaque. Mandibles more opaque at the base, where they are densely shagreened, smooth and coarsely punctate in the middle, coarsely striated towards the tip. Clypeus, head, and thorax very densely shagreened, the head more distinctly; clypeus, cheeks, and sides of head with small, scattered shallow, piligerous punctures. Gaster very finely and transversely shagreened, with very sparse piligerous punctures.

Hairs and pubescence golden yellow, very sparse and short, more abundant on the gula and top of the head, very short, sparse, and appressed on the appendages. Sides of head with short, sparse, stiff hairs. Pubescence very dilute, distinct on the gaster and all parts of the head, longest on the gula.

Head and gaster deep castaneous; mandibles dark red, with black borders; clypeus and adjacent portions of cheeks often reddish; tips and insertions of antennal scapes, palpi, thorax, petiole, trochanters, and femora dull brownish yellow; upper surface of pronotum, mesonotum, and base of epinotum dark brown with paler sutures; tibiae, femora, and tarsi dark brown, the latter somewhat paler at their tips; posterior borders of gastric segments rather broadly yellowish and shining.

WORKER MINIMA.—

Length 11 to 12 mm.

Head very long (3.4 mm., without the mandibles) compared with its width (1.9 mm.), the portion in front of the eyes nearly as broad as long, a little broader in front, with straight sides; behind the eyes it narrows rapidly into a neck with concave sides, the occipital border being somewhat less than one-third of the anterior border. Eyes prominent, situated more than twice their length from the occipital border. Clypeus resembling that of the maxima. Antennae longer, the scapes not flattened, straight, reaching fully three-fifths of their length beyond the occipital border. Thorax and petiole as in the maxima but lower, and the transverse impression on the base of the epinotum scarcely indicated.

Sculpture much finer, pilosity and pubescence even sparser than in the maxima. Color paler; clypeus, cheeks, funiculi, petiole, ventral portions of thorax, coxæ, and femora yellow; mandibles, scapes, posterior portion of head, tibiae, and dorsal surface of thorax and gaster brown.

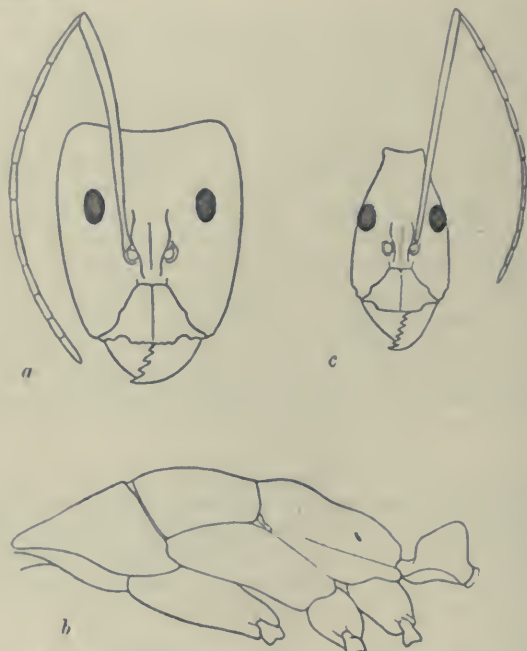


Fig. 62. *Camponotus (Dinomyrmex) langi*, new species. *a*, head of worker maxima; *b*, thorax and petiole of same in profile; *c*, head of worker minima.

FEMALE (deãlnted).—

Length 21 mm.

Head large, slightly longer than broad, broader behind than in front, with straight sides and feebly and broadly excised posterior border. Mandibles more convex than in the maxima, clypeus very similar. Antennal scapes very slightly flattened at the base, extending nearly one-third their length beyond the posterior corners of the head. Thorax through the wing-insertions not broader than the head; mesonotum as long as broad. Petiole much higher than in the worker, nearly twice as high as long, elliptical from behind, its anterior and posterior surfaces convex, its border narrowed above and slightly notched in the middle, in profile rather acute.

Mandibles shining, coarsely punctate, their bases opaque. Head and body more shining than in the maxima, but similarly sculptured.

Pilosity like that of the maxima but the pubescence very long and abundant on the prosterna, fore coxæ, and lower portions of the metapleuræ; as long but sparser on the gula and posterior surfaces of the head; short on the scapes, but longer and oblique towards their tips. Tibiæ and tarsi with short, stiff, oblique hairs.

Head black; mandibles, sutures of thorax, upper portions of mesopleuræ, and pro- and mesonotum, scutellum, and gaster castaneous; remainder of thorax, petiole, middle and hind coxæ, and trochanters yellowish red. Legs castaneous, tips of tarsi paler.

MALE.—

Length 13 mm.

Head twice as long as broad, the portion in front of the eyes long, with subparallel, slightly concave cheeks, the posterior portion rapidly narrowed to the occiput, the sides and occipital border nearly straight. Eyes convex, at the middle of the sides of the head. Mandibles spatulate, bluntly pointed, edentate but with overlapping tips. Clypeus carinate, without an anterior lobe, its border broadly rounded. Antennæ very long and slender. Thorax and gaster long and narrow; epinotum elongate, evenly convex, sloping, without distinct base and declivity. Petiole much as in the worker minima. Legs very long.

Mandibles, head, thorax, and legs rather opaque; epinotum, petiole, and gaster shining, punctuation feeble and inconspicuous.

Hairs yellow, short, and sparse as in the worker minima.

Brownish yellow; head, mesonotum, scutellum, tibiæ, and tarsi brown; mandibles darker. Wings distinctly yellow, with yellowish brown veins and dark brown pterostigma.

Described from forty-one workers from Faradje (type locality), a female and worker minima from Garamba, and two males from Faradje (Lang and Chapin). The following note accompanies the specimens from Faradje: "These long-legged ants are very fond of sugar or anything sweet, such as fruits, etc. They are seldom seen during the daytime. The colony had made its nest between boxes that were piled up on the verandah of a house, and the ants were assembled in a hollow space about half an inch wide. A few fibrous particles of detritus were used in the construction of the nest." There are no data accompanying the two specimens from Garamba, so that I am not certain that the female is conspecific with the worker.

C. langi is very peculiar in the small, narrow head of the maxima and the long neck-like occipital region of the minima. There can be no doubt that what I have described as the maxima is really the largest worker form. Fifteen specimens of the series all agree in the shape and size of the head as represented in the figure; the remaining specimens are all minimæ. Mediæ, apparently, do not exist.

***Camponotus (Dinomyrmex) cæsar* Forel**

A single imperfect worker minima from the stomach of a frog (*Rana occipitalis*) taken at Faradje (Lang and Chapin) seems to belong to this light-colored species.

***Camponotus* (*Dinomyrmex*) *cæsar* subspecies *imperator* Emery**

A single media from Isangi (Lang and Chapin), without further data.

***Camponotus* (*Dinomyrmex*) *massinissa*, new species**

FEMALE.—

Length nearly 21 mm.

Head as broad as long (4.5 mm., without the mandibles), subrectangular, slightly broader behind than in front, with straight sides, feebly but broadly concave posterior border, and rather acute posterior corners. Mandibles large and convex, with 6 flattened, acuminate teeth, the apical tooth very long and broad at the base. Clypeus carinate only at the base, its anterior border emarginate on each side, the median lobe



Map 41. Distribution of the subgenus *Dinomyrmex* of *Camponotus*.

indistinct, somewhat crenate, without pronounced corners, with a small notch in the middle. Frontal area small, subtriangular, impressed. Frontal carinae closely approximated. Antennae long; scapes measuring 6.2 mm., extending half their length beyond the posterior corners of the head, not flattened at the base nor enlarged distally. Thorax robust, through the wing-insertions broader than the head. Mesonotum broader than long, with a narrow, shining, median, longitudinal groove on its anterior half. Epinotum sloping, evenly convex. Petiole higher than long, rather pointed above, its anterior surface made of two subequal planes which meet at a very blunt obtuse angle when seen in profile; the posterior surface flat, the superior border blunt. Hind tibiae and metatarsi distinctly flattened and channelled, the flexor border of the former with a row of strong bristles, except on their basal fourth.

Mandibles shining, coarsely punctate, striate near their apical borders, opaque, finely shagreened and less coarsely punctate at the base. Head and clypeus nearly opaque, densely and finely punctate, with coarser, sparse, piligerous punctures over the whole surface. Thorax and petiole with similar sculpture, but the piligerous

punctures less pronounced. Gaster more shining, densely, coarsely and transversely shagreened, with coarse, scattered, transverse, piligerous punctures. Antennal scapes and legs shining, rather strongly and unevenly punctate.

Hairs fulvous, coarse, erect or suberect, long and abundant, especially on the head, gula, dorsal portion of the pronotum, mesonotum, epinotum, and fore coxæ. Antennal scapes also with long erect hairs; those on the tibiae stiffer, much shorter and more oblique.

Black; mandibles except their bases and teeth, deep red; insertions of antennæ, funiculi beyond the tip of the first joint, thoracic articulations, trochanters, and tips of coxæ yellowish; gaster and legs castaneous. Wings heavily infuscated, blackish, with dark brown veins.



Map 42. Distribution of *Camponotus (Myrmosericus) rufoglaucus* (Jerdon).

A single specimen from Medje (Lang and Chapin), without further data.

This female is so easily recognized and so peculiar in its characters that I do not hesitate to describe it as new. It certainly does not belong to any of the workers in the collection and I am unable to regard it as the female of any of the Ethiopian species of *Dinomyrmex* that have been described from workers only.

***Camponotus (Dinomyrmex) wellmani* Forel variety *rufipartis* Forel**

Stanleyville, ♀, ♂; Niangara, ♀; Faradje, ♀; Ngayu, ♀ (Lang and Chapin). The specimens agree very closely with Forel's description. Two workers from Ngayu were taken from the stomachs of toads (*Bufo superciliaris* and *funereus*) and one from Faradje from the stomach of a frog (*Rana occipitalis*).

Camponotus (Myrmosericus) rufoglaucus (Jerdon) subspecies **cinctellus** (Gerstæcker)

Five workers from Zambezi (J. Bequaert).

The distribution of *C. rufoglaucus* and its various forms is shown on Map 42.

Camponotus (Myrmosericus) rufoglaucus subspecies **cinctellus** variety **rufigenis** Forel

Faradje, ♂; Niangara, ♀; Garamba, ♂; Stanleyville, ♂; Medje, ♂; Poko, ♂; Akenge, ♂ (Lang and Chapin). Six of the workers from Garamba are from the stomach of a *Bufo regularis* and a single worker from Akenge is from the stomach of a *B. funereus*. The specimens from Faradje were taken while they were attending plant-lice on young orange trees.

Camponotus (Myrmosericus) rufoglaucus subspecies **syphax**, new subspecies

Plate XXII, Figure 1

WORKER very similar to the subspecies *zulu* Emery from Natal and quite as large, the largest specimens measuring fully 9 mm., but not more slender than other forms of the species. The scapes and tibiae are distinctly compressed, the former as in *C. eugenix* Forel, but not so broad. Epinotum evenly arcuate in profile, without distinct base and declivity. Pubescence dull yellowish, not very long, slightly golden on the gaster of large individuals, only feebly converging at the mid-dorsal line on the posterior portions of the second and third segments. Color brownish black, the legs a little paler, the funiculi, cheeks, clypeus, mandibles, and tarsi castaneous. Gastric segments with very narrow, dull-yellowish posterior margins.

Numerous specimens from Zambezi (type locality) and Boma (Lang, Chapin, and J. Bequaert).

The Zambezi specimens are from three colonies, two of which bear the following notes. "Ants forming numerous small craters in the white sand (Pl. XXII, fig. 1). Only a few individuals were seen outside the nest before noon. The nest extended to a depth of 50 cm. below the surface." "Nest in the rotten base of a *Hyphæne*. No larvæ nor pupæ could be seen, though there were certainly as many as 1000 workers in the colony. The nest was loosely arranged in the soft, decomposing mass." Bequaert says of the specimens from Boma that they "run very swiftly and were nesting in the road."

Workers of this ant were sent to Prof. Emery, who compared them with his cotypes of the subspecies *zulu*. He pronounced them to belong to a new subspecies "with the pubescence on the gaster much more parallel and less sinuous."

***Camponotus (Myrmosericus) rufoglaucus* subspecies *flavomarginatus*
(Mayr)**

Akenge, ♀; Vankereckhovenville, ♀; Garamba, ♀; Faradje, ♀ (Lang and Chapin); Thysville, ♀ (J. Bequaert). A small number of specimens from each locality, without further data.

***Camponotus (Orthonotomymex) vividus* (F. Smith)**

Plate XXI, Figures 1 and 2; Text Figure 63

Numerous workers of this shining black ant taken at Malela (Lang, Chapin, and J. Bequaert) and a single dealated female from Lukolela (Lang and Chapin). At Malela, the ants had occupied the large nest of an arboreal termite (Pl. XXI, figs. 1 and 2). "This consisted of strong,



Fig. 63. *Camponotus (Orthonotomymex) vividus* (F. Smith).
Worker major. a, body in profile; b, head, dorsal view.

woody carton and was built around the stem of a sapling, which grew in a mangrove swamp among raphia palms. When the nest was disturbed the worker ants swarmed out and covered the nest in great numbers and then ran up on our bodies and attacked us furiously. Only after we had cut the nest open did we notice that it had been originally built by termites. Some dead specimens of these were found in one corner. As shown in the photograph, the ants themselves had excavated the strong carton, making more spacious and more irregular cells. There were several large and many small entrances on the surface of the nest."

Camponotus (Orthonotomyrmex) vividus variety semidepilis,
new variety

WORKER.—Exactly like the typical form, except that the erect hairs on the dorsal surface of the head and body are distinctly paler and only about half as numerous. The pubescence, too, is more dilute and shorter, especially on the gaster.

Described from numerous workers from Medje (type locality) and Leopoldville (Lang and Chapin). The following note relates to the specimens from the former locality: "These ants were taken out of their nest in the rather rotten portions of a tree. Their galleries were often large enough to admit one's finger. The workers, when disturbed, ran out and bit viciously. The specimens were taken about five miles south of the Nepoko while we were collecting accessories for the Museum group of okapis."



Fig. 64. *Camponotus (Orthonotomyrmex) vividus* subspecies *cato* (Forel). Worker major. a, body in profile; b, head, dorsal view.

Camponotus (Orthonotomyrmex) vividus subspecies cato (Forel)

Text Figure 64

Stanleyville, ♂, ♀, ♀; Garamba, ♂, ♀; Medje, ♂, ♀, ♀; Avakubi, ♂, ♀; Akenge, ♀; Thysville, ♀; Bengamisa, ♀, ♂; Niangara, ♀, ♂ (Lang and Chapin). The workers from Akenge, two in number, were taken from the stomach of a *Bufo polycercus*, a female from Medje was from the stomach of a *B. funereus*, and one from Stanleyville from the stomach of a frog (*Rana mascareniensis*).

Under separate numbers two different native names, "suma" and "likulu," are given for this ant. The specimens from Stanleyville were

found "running up and down the trunks of big trees near the Tshopo River in great numbers;" those from Medje were found in similar situations and also crawling over the tents. "When crushed, they gave off a stench like bugs."

***Camponotus (Orthonotomyrmex) sericeus* (Fabricius)**

Text Figure 65

Faradje, ♀; Poko, ♀; Medje, ♀ (Lang and Chapin); Kabare, ♀ (J. Bequaert). Numerous specimens, without further data. Map 43 shows the distribution of this species.

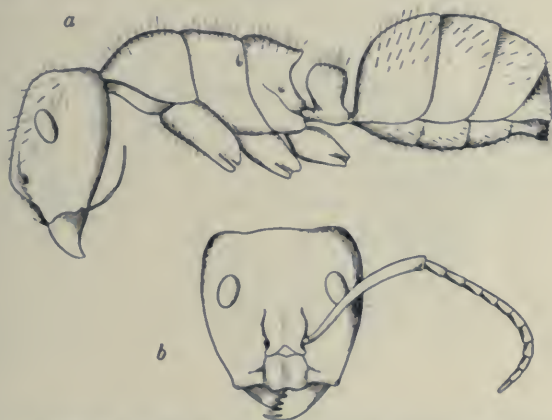


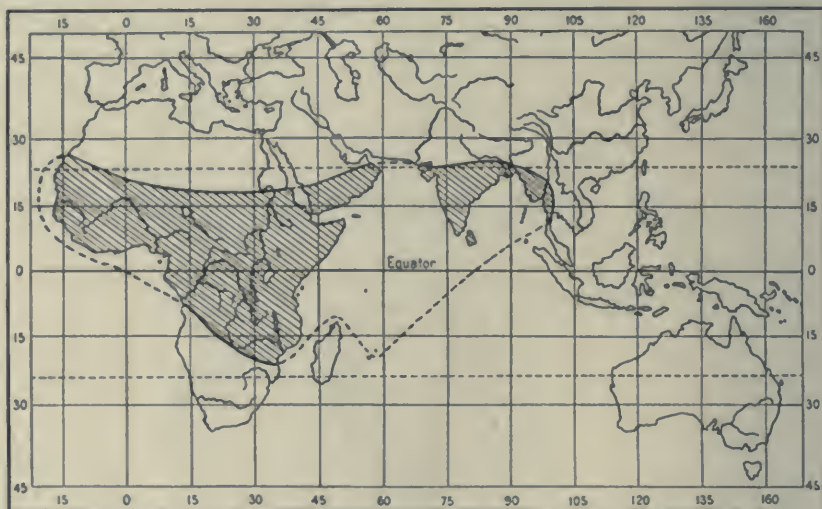
Fig. 65. *Camponotus (Orthonotomyrmex) sericeus* (Fabricius). Worker. a, body in profile; b, head, dorsal view.

***Camponotus (Myrmotrema) foraminosus* Forel, variety**

Numerous workers and four males from Faradje and Avakubi, and probably several females from Stanleyville and Bengamisa (Lang and Chapin), belong to a variety of this species, which I refrain from naming, owing to the small amount of material of this extremely variable species in my collection. Prof. Emery, to whom specimens were submitted, writes that "the pubescence is more abundant and more golden than in Congo specimens sent by Forel as corresponding to the type of the species. The true type is a unique and is in the collection of the Museum of Geneva."

The specimens from Faradje were found "living in the hollow cavities of twigs and branches which they probably bored themselves. The cavities also contained numerous estivating snails, which were evi-

dently not molested by the ants. The snails were so tightly attached to the surface that they were often broken when an attempt was made to remove them. About this time (the latter half of December and beginning of February) the grass is burned all over the country. The flames leap high and the heat is incredible, many of the branches of the trees being killed by the fire. This may be a reason for the snails' seeking refuge in the cavities made by the ants." The snails belonged to *Pachnodus herbigradus* Pilsbry.¹ (See p. 154).



Map 43. Distribution of *Camponotus* (*Orthonotomyrmex*) *sericeus* (Fabricius).

***Camponotus* (*Myrmotrema*) *foraminosus* subspecies *hæreticus* Santschi**

A single worker major from Lukolela (Lang and Chapin) seems to be referable to this subspecies.

***Camponotus* (*Myrmotrema*) *foraminosus* subspecies *auropubens* Forel'
variety**

A single minor worker from Stanleyville (Lang and Chapin), which I am unable to assign with certainty to any of the described forms of this subspecies.

¹Pilsbry, 1919, Bull. American Mus. Nat. Hist., XL, p. 308.

Camponotus (Myrmotrema) perrisii Forel subspecies **jucundus** Santschi

Text Figure 66

Kwamouth, ♂, ♀, ♀, ♂; Niangara, ♂, ♀; Faradje, ♂, ♀, ♀; Garamba, ♂, ♀ (Lang and Chapin). Many specimens, some of which were identified by Prof. Emery as belonging to this subspecies. Those from Kwamouth were found with their pupæ nesting in the galleries of a large, conical termitarium; those from Faradje were taken in small mushroom-shaped termitaria. Those from Niangara, however were nesting "in the hollow of a tree."

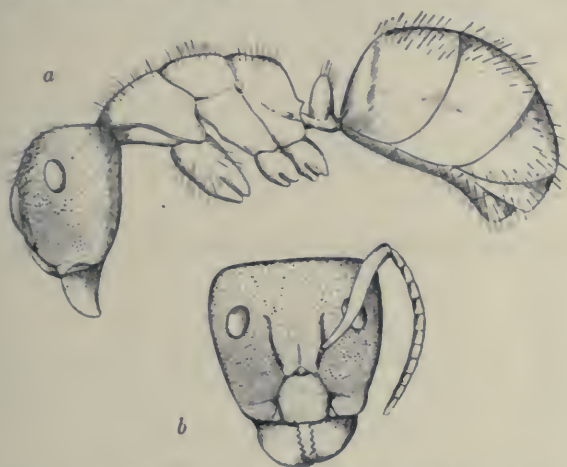


Fig. 66. *Camponotus (Myrmotrema) perrisii* subspecies *jucundus* Santschi. Worker major. a, body in profile; b, head, dorsal view.

The female of this subspecies measures 11 to 11.5 mm. (wings 12.5 mm.) and resembles the major worker very closely in sculpture, pilosity, and color, except that the erect whitish hairs are shorter and less numerous on the upper surface of the head and thorax. The antennal scapes are not so pale at their base. The wings are suffused with brown and have dark brown veins and pterostigma. The male measures 7 to 8 mm., is black throughout, with wings colored like those of the female, but paler. The scapes and hind tibiae are distinctly flattened, though much less so than in the worker and female, and the upper border of the petiole is straight and transverse, with a small elevation or tooth on each corner. The body is rather shining; the thorax without erect hairs above.

Camponotus (Myrmotrema) perrisii subspecies **jucundus**
variety **grandior** (Forel)

Yakuluku, 2, 8; Garamba, 2, 8 (Lang and Chapin). Numerous specimens. Those from Yakuluku were found "nesting in small mushroom-shaped termitaria, which were only about five yards apart."

Camponotus (Myrmotrema) olivieri (Forel) variety **sorptus** (Forel)

Seven minor workers taken at Kwamouth, Leopoldville, Lukolela, and Stanleyville (Lang and Chapin). The types were taken by Forel from the stomach of a pangolin (*Manis temmincki*).

Camponotus (Myrmotrema) bayeri Forel

Thirteen workers from Faradje (Lang and Chapin), without further data.

Camponotus (Myrmotrema) micipsa, new species

Text Figure 67

WORKER MAJOR.—

Length 9 to 10 mm.

Head large, longer than broad (without the mandibles, 3.8×3 mm.), broader behind than in front, with excised posterior border and evenly and very feebly convex sides. Mandibles very convex, with 6 short, subequal teeth. Clypeus rather flat, longer than broad, ecarinate and feebly longitudinally grooved in the middle, subhexagonal, narrower in front than behind, its anterior border somewhat truncated, straight. Frontal area impressed, lozenge-shaped; frontal carinae widely separated, as far apart as their distance from the sides of the head. Antennal scapes distinctly flattened but not dilated, somewhat narrower at their tips than in *perrisii*, extending a little beyond the posterior corners of the head. Eyes rather small and flat. Pronotum and mesoepinotal sutures more impressed than in *perrisii*; the epinotum somewhat cuboidal, as long as broad, the base and declivity subequal, nearly rectangular in profile, the former flattened, the latter very feebly concave, both slightly submarginate on the sides. Petiole similar to that of *perrisii* but broader above, the upper margin feebly notched in the middle. Hind tibiae somewhat flattened but neither prismatic nor channelled, their flexor borders without a row of bristles.

Mandibles, clypeus, upper surface of head, thorax, and gaster opaque; mandibular teeth, frontal area, antennal scapes, gula, sides of thorax, posterior surface of petiole, legs, and venter shining. Mandibles finely punctate on a very finely and evenly shagreened ground. Head very finely, densely and evenly punctate; the clypeus and cheeks with coarse, shallow, rather sparse, piligerous foveolae, which are elongate and oblique, with their posterior edges more pronounced. Front and sides of head with similar but more scattered and less pronounced foveolae. Antennal scapes covered with round punctures of very unequal size. Thorax and gaster very finely and densely punctate like the head, with small, rather sparse, piligerous punctures.

Hairs pale, yellow, coarse, erect, rather long and abundant on the upper surface of the head, thorax, and gaster and on the venter, absent on sides of thorax, petiole and gaster. On the cheeks and clypeus each foveole bears a short, stiff, blunt, sub-erect hair. Pubescence dull yellow, very short, dilute and inconspicuous on the head and thorax, but very long and dense on the dorsal surface of the gaster, where it forms a shining golden pelage nearly concealing the surface.

Coal black throughout, only the apical portions of the funiculi and the ends of the tarsi dark brown.

WORKER MEDIA.—

Length 7.5 mm.

Differing from the worker major only in the smaller and shorter head, which is not longer than wide behind. The foveolæ of the cheeks and clypeus are less distinct, but the stubby, erect golden hairs arising from them are as striking as in the major.

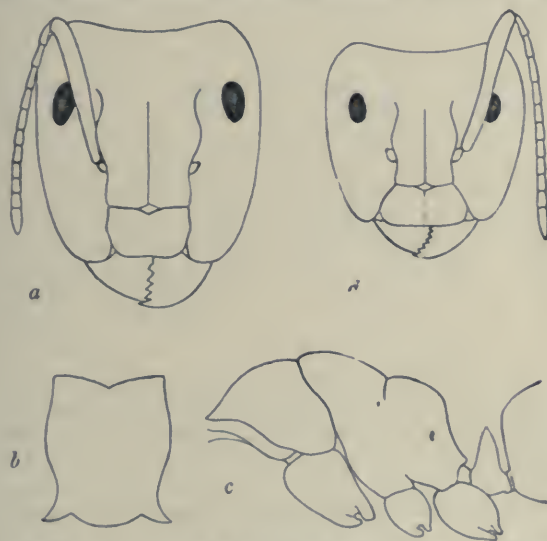


Fig. 67. *Camponotus (Myrmotrema) micipsa*, new species. a, head of worker maxima; b, clypeus of same; c, thorax and petiole of same in profile; d, head of worker media.

Described from three major workers and a single media "collected on the fire-wood taken aboard the boat between Leopoldville and Yumbi" (Lang and Chapin). This species is evidently allied to *perrisii*, *olivieri*, *bayeri*, and *maynei* Forel, but distinct from all of them in the structure of the head, sculpture, pilosity, etc., though apparently most closely related to *maynei*.

Camponotus (Myrmorhachis) polyrhachioides Emery

Lukolela, ♂, ♀; Lie, ♂ (Lang and Chapin). The workers from the latter locality, two in number, were taken from the stomach of a toad (*Bufo regularis*); the specimens from Lukolela, comprising two workers and three winged females, were found running on fire-wood.

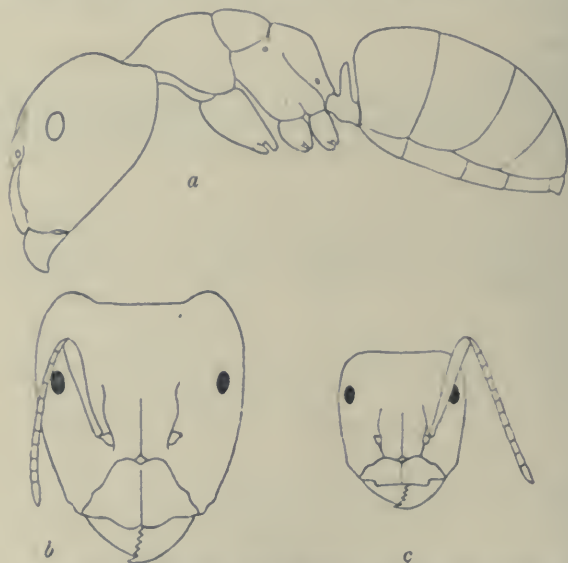


Fig. 68. *Camponotus (Myrmamblys) chapini*, new species. a, worker major, body in profile; b, head of same, dorsal view; c, head of worker minor.

Camponotus (Myrmamblys) chapini, new species

Text Figure 68

WORKER MAJOR.—

Length 5.5 to 6.5 mm.

Head very large in proportion to the remainder of the body, longer than broad (without the mandibles, 2.4×2.2 mm.), broader behind than in front, with deeply excised posterior, rather convex lateral borders and prominent, rounded posterior corners. Mandibles stout, convex, coarsely 6-toothed. Clypeus flattened, strongly carinate, its anterior border notched on each side, with a short median lobe, angularly emarginate in the middle and rounded at the corners. Frontal area obsolete; frontal groove distinct; frontal carinae approximated in front, subparallel and widely separated behind, nearly as far apart as their distance from the lateral borders of the head. Eyes small and flat. Antennae short, scapes (1.2 mm.) curved, somewhat flattened basally and thickened at their tips, which extend only about three times their greatest diameter beyond the eyes. Thorax small, short, and robust, not longer than the head, very broad through the pronotum, which is as broad as long, very rapidly narrowed

to the laterally compressed epinotum; the meso- and epinotum together not longer than the pronotum. Promesonotal suture strongly impressed, metanotum very small and short, but distinct. In profile the general dorsal outline of the thorax is arcuate, but the mesonotum is somewhat raised in front at the suture above the pronotum; the epinotum sloping, rounded, with indistinct, subequal base and declivity. Petiole small, its scale elliptical from behind, evenly rounded above, with a slight angular projection in the middle of the superior border; in profile scarcely thicker below than above, much compressed anteroposteriorly, about three times as high as thick, with blunt superior border. Gaster much smaller than the head, the first segment anteriorly truncated, the dorsal surface convex. Legs rather stout, tibiae slightly flattened, tarsal claws rather long.

Shining throughout; mandibles coarsely punctate, at their bases shagreened and subopaque. Clypeus and head sharply shagreened and covered with coarse, sparse punctures, which are very uniform on the clypeus and cheeks, somewhat shallower and more scattered on the front and vertex. Posterior corners of head with a few elongate foveolae. Thorax and gaster more finely shagreened than the head, the gaster transversely, and both with scattered piligerous punctures.

Hairs yellow, sparse, coarse, erect, and rather short. Petiolar border with four setae; gula with only a few short hairs; cheeks hairless. Scapes naked; tibiae with numerous, very short subappressed hairs. Pubescence sparse, appressed, distinct, short on the mandibles, clypeus, and cheeks, longer on the gaster.

Head deep castaneous, almost black; mandibles and anterior portion of clypeus deep red; antennae, pronotum, coxae, and legs brownish yellow or testaceous; remainder of thorax, petiole, gaster, and an inverted V-shaped spot on the dorsal surface of the pronotum, pale castaneous.

WORKER MINOR.—

Length 3 to 4.5 mm.

Differing from the major in its much smaller size and the shape of the head, which is as broad as long, a little broader behind than in front, with straight sides and feebly convex posterior border. Clypeus strongly carinate as in the major, but its anterior lobe with straight entire anterior border and subdentate angles. Mandibles smoother than in the major, much less distinctly punctate. Antennal scapes extending about one-fifth their length beyond the posterior corners of the head.

Sculpture, pilosity, and color much as in the major worker, but the thorax uniformly brown throughout, and the head paler, though darker than the thorax and gaster.

Described from five major and eleven minor workers from Garamba (type locality), a major from Medje, and a minor from Faradje (Lang and Chapin). The specimen from the locality last mentioned is from the stomach of a frog (*Rana occipitalis*) and three of the workers from Garamba are from the stomach of a toad (*Bufo regularis*). According to a note accompanying the Garamba specimens, "these ants nest in small conical termitaria." And the further remark is added: "There are few of these termitaria without ants, which sometimes run about in the same galleries as the termites but seem more often to have no dealings with these insects."

PHASMOMYRMEX Stitz

WORKER.—Rather large, elongate, monomorphic, varying little in size. Head rectangular, with rounded posterior corners. Clypeus rather flat, indistinctly carinate, without an anterior lobe, its anterior border broadly and angularly excised. Thorax long, flattened above, obtusely marginate on the sides; anterior corners of pronotum angular; metanotum distinct, bounded by well-defined sutures anteriorly and posteriorly, its stigmata situated below its lateral marginations; mesometanotal suture impressed; epinotum subcuboidal, truncated behind. Petiolar node thick, with a distinct angle at the sides of its dorsal margin. Gaster small. Legs long, hind tibiae three-sided.

FEMALE.—Head as in the worker. Thorax depressed, pronotum seen from above nearly as long as the mesonotum and overarched by the latter only very slightly. Scutellum not projecting over the postscutellum or epinotum. Wings as in *Camponotus*.

MALE unknown.

A single species, originally described by Forel as *Camponotus buchneri* and known only from the West African region, from Cameroon to Angola (Malange) and eastward to the Ituri forest.

Phasmomyrmex buchneri (Forel)

Lukolela, ♀; Avakubi, ♀; Medje, ♀ (Lang and Chapin); Lubutu, ♀ (J. Bequaert). Single specimens. Those from Avakubi and Lukolela were taken on fire-wood brought in from the forest.

POLYRHACHIS F. Smith

Large or medium-sized ants closely allied to *Camponotus*.

WORKER monomorphic. Head orbicular, oval or rounded subrectangular, very convex above, with very prominent, long and sinuate frontal carinae. Palpi long, the maxillary pair 6-jointed, with the basal about half as long as the second joint, the labial pair 4-jointed. Clypeus well developed, usually convex or more or less carinate. Antennae long, 12-jointed, the scapes inserted some distance behind the posterior border of the clypeus, as in *Camponotus*; funicular joints considerably longer than broad. Thorax more or less arcuate above, often more or less carinate on the sides, and more or less dentate or spinose, but exhibiting great differences in conformation in different species. Usually either the pronotum or the epinotum or both are armed with teeth or spines, rarely the mesonotum. The petiole has a large scale, the superior border of which is nearly always armed with pairs of spines or teeth, more rarely also with a median, unpaired spine or tooth. Gaster large, broadly elliptical or subglobular, very convex above, the first segment forming more than half of its surface and often more or less truncated or concave in front. Legs long and well developed, the tibiae often constricted at the base. Gizzard much as in *Camponotus*.

FEMALE decidedly larger than the worker, with massive thorax. Spines and teeth on the thorax and petiole smaller. Wings long, the anterior pair with a radial and a single cubital cell; discoidal cell lacking and cubital vein usually reaching the outer margin of the wing. Gaster massive, its first segment often proportionally shorter than in the worker.

MALE closely resembling the male of *Camponotus*, small and slender; the thorax and petiole quite unarmed, the latter with a low, thick scale. Frontal carinae more approximated, front more convex, pronotum overarched by the mesonotum. External genital valves small and slender. Cerei distinct.

PUPÆ enclosed in cocoons.

A large genus comprising several hundred species, many of which are among the most beautiful of ants, confined to the tropics of the Old World, though, like *Æcophylla*, absent from Madagascar (Map 44). The species of *Polyrhachis*, however, have a wider range, since a small number of forms occur as far north as Syria in Asia and as far south as the eastern Cape Colony and Tasmania. The majority of the species are aggregated in the Indomalayan, Papuan, and Australian Regions. Forel and I have divided the genus into subgenera, eleven of which, based



Map 44. Distribution of the genus *Polyrhachis*.

on peculiarities in the structure of the thorax and petiole, have been recognized up to the present time, namely, *Polyrhachis*, *sensu stricto*, *Campomyrma* Wheeler, *Hagiomyrma* Wheeler, *Myrma* Billberg, *Hedomyrma* Forel, *Myrmhopla* Forel, *Chariomyrma* Forel, *Myrmatopa* Forel, *Cyrtomyrma* Forel, *Myrmothrinax* Forel, and *Dolichorhachis* Mann. In the Ethiopian Region only two of these, *Cyrtomyrma* and *Myrma*, are known to occur, the former represented by a very few aberrant species, the latter by a number of forms which show much greater diversity of structure than do the species of the same subgenus in the Indomalayan and Papuan Regions. This fact, together with that of the wide distribu-

tion of *Myrma*, would seem to indicate that it is the most archaic of all the subgenera of *Polyrhachis*.

The species of *Polyrhachis* form only moderately large colonies and none of them is sufficiently common to be of economic importance. Many of them are, in fact, rare and sporadic. They are very timid or pacific insects and are most frequently found singly walking up or down tree-trunks or on the foliage of trees or bushes. Their nesting habits are very diverse. According to my observations in Australia, the species of *Campomyrma* nest in the ground, under stones, or more rarely in crater nests. The same is true of the species of *Hagiomyrma* and *Chariomyrma*, though I have always found *P. (Hagiomyrma) semiaurala* Mayr in large logs and certain species of *Chariomyrma* in earthen termitaria. So far as known, none of the species of these three subgenera employs silk in the construction of the nest. The species of *Hedomyrma*, as Mann and I have observed, live in high trees, but we have been unable to find the nests. Several of the larger species of *Myrma* nest in the ground or in logs and some of them line their nests with silk spun by the larvæ. Many of the smaller species of this subgenus make carton and silken nests on or between the living leaves of trees, and this is the general habit also of many species of the subgenera *Myrmhopla*, *Myrmothrinax*, *Myrmatopa*, and *Cyrtomyrma*. A few species of *Myrma* and *Myrmhopla* live in hollow stems or in old galls. Jacobson and Mann have described the beautiful carton and silk nests built by various *Myrmatopa* species on the under sides of leaves in Java and the Solomon Islands. *P. (Myrmhopla) armata* of the Indomalayan Region sometimes builds its nest in houses. *P. (M.) dives* and some of the allied species construct small globular nests of nearly pure silk, somewhat like those of tent-caterpillars, on low bushes. The nest of one of the few species of the subgenus *Polyrhachis*, *sensu stricto*, the East Indian *P. bihamata*, was found by Bingham. "It was of silky, yellowish brown material, placed close to the ground in the center of a clump of bamboos, and measured about a foot in diameter." Some species of *Polyrhachis*, when irritated, emit a strong, pleasant smell. According to Bingham, the odor of *P. (Myrmhopla) venus* Forel is like that of the tuberose.

***Polyrhachis (Myrma) laboriosa* F. Smith**

Plate XXII, Figure 2; Text Figure 69

Six workers from Stanleyville and Bafwasende, without further data and a number of workers, larvæ, and cocoons from a nest at Niangara (Lang and Chapin).

This species is easily distinguished from all the other African members of the genus by the peculiar petiole, which bears a single pair of long, hook-shaped spines. The nest (Pl. XXII, fig. 2) seen by Mr. Lang is described as follows. "It was found on a small tree about three meters from the ground and was 16 centimeters wide, built in a fork between a cluster of finer twigs and consisted of old vegetable fibres and leaves fastened together. It was naturally extremely light, as no soil had been used in its construction. The general color outside was dark gray. Its walls were very thin, scarcely one millimeter in thickness. As far as I could see, there were many entrances, though they were somewhat

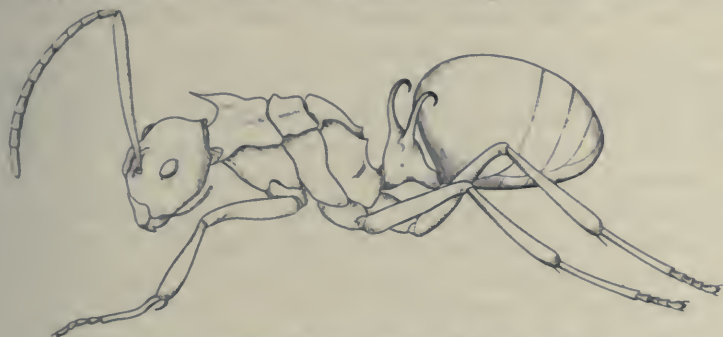


Fig. 69. *Polyrhachis (Myrma) laboriosa* F. Smith. Worker.

damaged. Still, a great many intact openings were visible. The fine hairs on the abdomen of this ant are conspicuously bronzy. When disturbed, the workers make a rattling noise by striking the nest with their abdomens. They bend the abdomen forward between their legs and discharge from its tip a copious spray of formic acid, which is quickly diffused through the air."

A nest of this ant, described and figured many years ago by Mayr and Aurivillius,¹ was 17 cm. long, 7.7 cm. broad, and 5 cm. thick. It was rather triangular in outline, with a large opening at one end and several small openings scattered over the surface. It was attached to some thin, leafy twigs and consisted of brown, fibrous vegetable detritus resembling decomposing cowdung, agglutinated "by means of a glue-like substance." The interior contained partitions of a similar structure.

Examination of the nest fragments contained in the vial with the workers from Niangara shows that the coarse vegetable particles are bound together by a small quantity of silk. This was also noticed by

¹1896, Ent. Tidskr., XVII, p. 255, Pl. IV, fig. 3.

Santschi in two nests which he examined.¹ Concerning one of them, containing only the mother queen and her first brood of larvæ and still in process of construction, he remarks: "The walls of the nest already contain silk, which seems to show that the female is able to use the larvæ as shuttles, or perhaps the young larvæ spin the silk spontaneously around themselves on vegetable detritus placed at their disposal." That the latter supposition is probably erroneous is evident from what is known concerning the behavior of the female *Ecophylla* when founding her nest.

***Polyrhachis (Myrma) militaris* (Fabricius)**

Stanleyville, ♀; Panga, ♀; Lukolela, ♀; Avakubi, ♀; Leopoldville, ♀; Medje, ♀; Lubila, ♀; Ngayu, ♀; Boyulu, ♀; Lic, ♀ (Lang and Chapin). Numerous specimens. Those from Ngayu, Boyulu, and Lic, four in number, were taken from the stomachs of toads (*Bufo funereus* and *regularis*). The only specimen from Lubila is "from a nest in a mushroom-shaped termitarium." Many of the specimens from the other localities were captured on fire-wood. Some of the workers have the pubescence on the gaster rather golden and therefore approach the subspecies *cupreopubescens* Forel.

The large Ethiopian species *Myrma*, comprising *militaris*, *schistacea*, *gagates*, *schlüteri*, and *nigriseta*, are so variable and exhibit so many annectant subspecies and varieties that one is tempted to regard the whole complex as a single, extraordinarily unstable species. Santschi, however, believes that there are several species with a pronounced tendency to hybridize. The materials in collections at the present time are quite insufficient to substantiate either of these views, and the matter must be left to some future myrmecologist, resident in equatorial Africa, who can study these ants intensively both in the field and in the laboratory.

***Polyrhachis (Myrma) militaris* subspecies *cupreopubescens* Forel**

A fine series of workers and females taken at Avakubi from "a nest built in an upright rotten stump, about four feet from the ground" and a single female from Medje (Lang and Chapin).

¹1909, Ann. Soc. Ent. France, LXXVIII, p. 393.

Polyrhachis (Myrma) militaris subspecies **cupreopubescens** variety **nkomoënsis** Forel

A single worker from Akenge, taken from the stomach of a toad (*Bufo polycercus*). As Forel states, the epinotal teeth of this variety are very long, erect, and strongly recurved. The middle pair of petiolar spines are more erect and less inclined backward than in the typical *cupreopubescens*, and the lateral spines are much longer, more slender, and farther from the median pair. The pubescence seems to be dimmer and less golden, but this may be due to the action of the toad's gastric juices.

Polyrhachis (Myrma) militaris subspecies **cupreopubescens** variety **dido**, new name

This name is suggested to replace *argentatus* Stitz, which is pre-occupied by *P. argentatus* F. Smith [= *Formica argentata* Fabricius = *P. sexspinosa* (Latreille)].

I possess two workers of this beautiful variety from Mt. Coffee, Liberia, collected by R. P. Currie. The thorax, petiole, coxæ, and ventral portions of the gaster are covered with dense, brilliant, silver pubescence, the upper surface of the gaster with brilliant golden pubescence as in *cupreopubescens*. The lateral spines of the petiole are very short.

Polyrhachis (Myrma) schistacea (Gerstæcker) variety **divina** Forel

Thysville, ♀; Poko, ♀; Boma, ♀; Zambi, ♀ (Lang and Chapin); Zambi, ♀, ♀ (J. Bequaert). The specimens from Zambi were found climbing on grass-stalks in the savannah; the others bear no data except the localities. The nesting habits of this ant are very probably the same as those of the closely allied *gagates* (*vide infra*), also taken in the savannah and in the same locality.

Polyrhachis (Myrma) schistacea subspecies **rugulosa** (Mayr) variety **divinoides** Forel

A single worker from Banana (Lang and Chapin) seems to be referable to this variety.

Polyrhachis (Myrma) schistacea subspecies **atrociliata** Santschi variety **benguelensis** Santschi

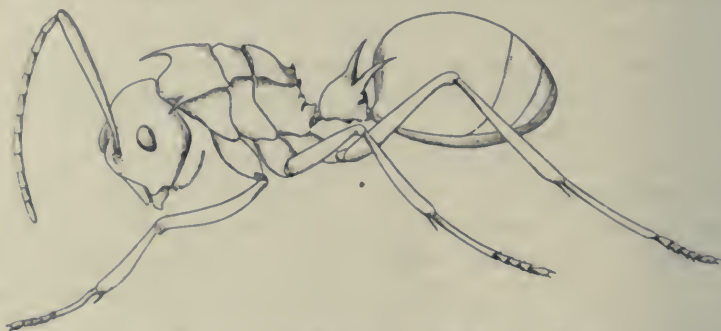
Six workers from Yakuluku and one from Garamba (Lang and Chapin) run to this variety in Santschi's table.¹ The hairs on the body are black, short and sparse, whereas in the typical *atrociliata* they are long and abundant.

¹1914, 'Voy Alluaud et Jeannel Afr. Orient., Formicidæ', p. 142.

***Polyrhachis (Myrma) gagates* F. Smith**

Plate XXIII, Figures 1 and 2; Text Figure 70

Numerous workers and females from Zambi (Lang and Chapin). The interesting nest of this species is represented on Pl. XXIII, figs. 1 and 2, from two of several photographs taken by Mr. Lang and accompanied by the following note. "These ants nest in the ground. The entrances to the nest are surrounded by an irregularly circular mound of white, loose sand, which measures about 40 cm. in diameter, the sand being heaped up to a height of 13 to 15 cm. In the center of the mound there is a tuft of grass (in one of the photos the stalks of the grasses have

Fig. 70. *Polyrhachis (Myrma) gagates* F. Smith. Worker.

been cut off near the base, in order to show the entrances). In between the root-stocks of the tuft of grass, and leading into the nest there are numerous irregular entrances which are continued outside along the stalks, the sand being agglomerated with a sort of paper-like material so as to form a solid wall in strong contrast to the loose sand. The ground below the crater contains numerous galleries simply excavated in the sand. When the nest is disturbed, great numbers of ants run out and, when directly molested, discharge much formic acid. The chambers containing the larvæ, etc., were immediately beneath the surface. No more ants were encountered at a depth of 20 cm. so that the nest is rather shallow. A few individuals were seen outside at 11 A. M., in the fairly strong sunlight. We saw a great many more of these nests, but no other as large as the one photographed. All the nests were found on a sandy island in the Congo River near Zambi, June 30, 1915, at a short distance from the shore. They were scattered over a plain which is evidently inundated during the rainy season, but which was dry at the time of our visit." Mr. Lang's description suggests that a certain amount

of silk may have been employed by the ants in the confection of the paper-like entrances, as in the nests of some other earth- or wood-inhabiting species of *Myrma*.

***Polyrhachis (Myrma) atalanta*, new species**

Text Figure 71

FEMALE.

Length somewhat less than 8 mm.; anterior wing 12 mm.

Head distinctly longer than broad, a little broader behind than in front, only moderately convex above, the portion behind the eyes short, with straight, scarcely marginate occipital border, the posterior corners rounded but distinct, the cheeks very feebly convex. Eyes large, prominent, somewhat less than hemispherical. Mandibles rather convex, with six coarse teeth. Clypeus convex, only moderately carinate, about twice as broad as long, its anterior border entire, nearly straight. Frontal area large, triangular; frontal carinae approximated in front, very strongly sinuate and widely separated behind, the greatest distance between them being equal to their distance from the lateral borders of the head. Antennae long, the scapes distinctly enlarged and slightly deflected at their tip, reaching about half their length beyond the posterior border of the head. Pronotum with two rather large, acute, diverging teeth, which are triangular, as long as broad at their base, and somewhat flattened. Mesonotum evenly convex, as broad as the head through the eyes, and as long as broad. Scutellum rather flat. Epinotum with rounded, convex base, which is about three-fifths as long as broad, measured along the sides, where it is bluntly marginate, its posterior corners with two recurved teeth, which are somewhat smaller and more slender than those of the pronotum, about twice as long as the width of their bases, directed outward, backward, and slightly upward. They are connected by a strong transverse carina, strongly curved forward in the middle and separating the base from the declivity, which is very much shorter than the base and very concave. Petiole as broad as high, very thick and strongly convex anteriorly and posteriorly, its anterior surface somewhat truncated below, its superior border bearing four broad, flat spines, very slightly incurved, and more strongly curved backwards especially at their tips. The inner pair is somewhat longer and broader than the outer. Gaster oval, the first segment not marginate on the sides and not very strongly truncated anteriorly. Legs rather stout, tibiae distinctly constricted at their bases.

Rather shining throughout and strongly sculptured as follows: Mandibles sharply and rather coarsely striatopunctate; front and posterior portion of the head sharply longitudinally rugose; the rugae on the clypeus, cheeks and sides of the head, however, irregular and more or less vermiculate. Upper surface of pronotum, mesonotum, scutellum, and base of epinotum sharply longitudinally rugose like the back of the head, the base of the epinotum more strongly. On the pronotum the rugae

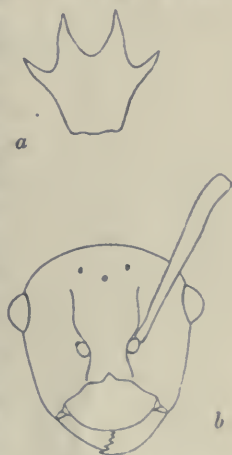


Fig. 71. *Polyrhachis (Myrma) atalanta*, new species. Female. a, petiole, anterior view; b, head from above.

diverge from the middle of the anterior border and there is also a similar, though less pronounced, tendency in the mesonotal rugae; those on the epinotum are strongly arcuate on the sides. Sides of the thorax punctate-rugulose; anterior and posterior surfaces of the petiole transversely and rather vermiculately rugulose, except the tips of the spines, which are smooth and shining, as is also the declivity of the epinotum. Gaster very finely and densely punctate; the anterior two-thirds of the first segment longitudinally rugulose, the rugules being sharp and occasionally anastomosing. Scapes and tibiae coarsely rugulose, with large, elongate piligerous punctures.

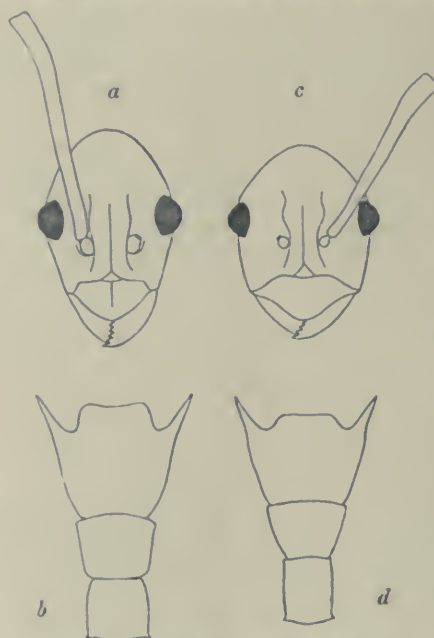


Fig. 72. *a*, *Polyrhachis (Myrma) concava* Ern André, head of worker; *b*, thorax of same, dorsal view; *c*, *Polyrhachis (Myrma) aërape*, new species, head of worker; *d*, thorax of same, dorsal view.

Hairs silvery white, long, erect, abundant, covering the whole body, except the apical half of the funiculi; as conspicuous on the scapes, cheeks, and legs as on the thorax and gaster. Pubescence grayish, very fine, short, and appressed, distinct only on the gaster, where it is sufficiently abundant to dim the surface but not to conceal the sculpture.

Black; palpi, tibial spurs, and terminal joint of tarsi testaceous; tips of funiculi and wings brownish, the latter with pale brown veins and dark brown pterostigma.

A single specimen from Stanleyville (Lang and Chapin), without further data. This species is evidently very closely related to Ern André's *P. sulcata*, which is also known only from the female. This form,

however, according to the description, is slightly larger (9 mm.), has the mandibles very superficially and almost indistinctly rugose, the eyes are more than hemispherical; the rugæ on the epinotum are described as "transversalement arquées"; the petiole is higher than broad and the pilosity is duller. *P. atalanta* may eventually prove to be merely a subspecies of *sulcata*.

***Polyrhachis (Myrma) concava* Ern. André**

Text Figure 72a and b

A single worker from Akenge, taken from the stomach of a toad (*Bufo funereus*), and a dealated female from Stanleyville (Lang and Chapin). Forel took several workers of this species from the stomach of a pangolin (*Manis temmincki*). Two of these specimens are in my collection.

***Polyrhachis (Myrma) aërope*, new species**

Text Figure 72c and d

WORKER.—

Length somewhat less than 6 mm.

Head longer than broad, subelliptical, not broader behind than in front, narrowed behind the eyes to the occipital border, which is indistinctly marginate, very convex in the middle above through the frontal carinæ, the cheeks rather straight, the gular margin bluntly submarginate. Eyes at the middle of the sides of the head, large, prominent, broadly elliptical, their external orbits slightly sinuate. Mandibles narrow, their apical borders rather oblique, with five subequal teeth. Clypeus convex, bluntly carinate in the middle, its anterior border broadly rounded, entire. Frontal area broadly triangular, indistinct; frontal carinae high, rather closely approximated, moderately sinuate, somewhat farther apart and subparallel behind. Antennæ long, scapes slightly enlarged and deflected at their tips, extending fully one-half their length beyond the posterior border of the head. Thorax much like that of *P. concava* Ern. André, long and narrow, the dorsal surface concave with strong, upturned lateral carinae, notched at the pronounced, transverse promesonotal and mesoepinotal sutures. Pronotum as long as broad, narrowed behind, its anterior spines straight, acute, slightly divergent, flattened, more than twice as long as their width at the base. Mesonotum trapezoidal like the pronotum, but smaller and broader than long; base of epinotum regularly rectangular, one and one-third times as long as broad, its posterior corners with two small, erect, slightly recurved teeth, which are as long as broad at their bases, its posterior border not marginate but, as in *concava*, passing over into the sloping declivity, which is slightly longer than the base and feebly convex in profile. Petiole and gaster shaped as in *concava*, but with the median pair of spines of the former straight, when seen from the front, and not slightly curved inward. Tibiæ distinctly constricted at their bases.

Shining; gaster smooth and polished. Mandibles finely striated and sparsely and finely punctate; head, thorax, and petiole finely coriaceous or shagreened; the clypeus somewhat smoother. Gaster very minutely and superficially punctate.

Hairs and pubescence whitish, the former erect, very sparse, present only on the tip of the gaster and posterior portion of venter; the pubescence very short and dilute, delicate, and appressed, visible only on the sides of the thorax and on the clypeus and appendages.

Black; only the palpi and insertions of the antennæ reddish.

Described from a single specimen from the stomach of a frog (*Xenopus mülleri*) taken at Niangara (Lang and Chapin).

This form is so close to *conca* André that it might be regarded as a subspecies. It differs, however, very decidedly in the proportions of the head and thorax, as shown in the accompanying figures, and is also smaller (*conca* measures nearly 7 mm); the pubescence on the body is much less developed and the legs are darker.



Fig. 73. *Polyrhachis (Myrma) alluaudi* Emery. Head, thorax, and petiole of worker; after Emery (1891).

***Polyrhachis (Myrma) alluaudi* Emery variety *anteplana* Forel**

Text Figures 73 and 74

A single worker taken from the stomach of a frog (*Phrynobatrachus perpalmaris*) captured at Stanleyville (Lang and Chapin).

This variety, originally described from the same locality, differs from the typical *alluaudi* by "the epinotum and its teeth being longer, the pronotum flatter. The transverse mesoepinotal fissure is vertical, very narrow and deep. The teeth of the epinotum are triangular, slightly curved forward; the spines of the pronotum are less than twice as long as their width at the base."

The worker and nest of the typical form were described and figured by Emery in 1892 from specimens taken by Alluaud in Assinie. I reproduce the figures (Figs. 73 and 74) because of the peculiar and interesting structure of the nest, which Emery describes in the following words: "The nest was found on a bush, 1.70 m. from the ground, attached to the lower surface of a leaf. It consists of a single low-vaulted chamber, with the entrance prolonged as a kind of chimney. Its walls are made of rather coarse vegetable particles loosely glued together."

***Polyrhachis (Myrma) nigrita* Mayr**

A single worker from Akenge (Lang and Chapin), taken from the stomach of a toad (*Bufo polycercus*).

***Polyrhachis (Myrma) decemdentata* Ern. André**

Text Figure 75

A winged female from Stanleyville (Lang and Chapin) and a single worker from Malela (J. Bequaert).



Fig. 74. *Polyrhachis (Myrma) alluaudi* Emery. Nest; after Emery (1891).

***Polyrhachis (Myrma) viscosa* F. Smith?**

The thoraces of five workers taken from the stomach of a toad (*Bufo tuberosus*) captured at Ngayu (Lang and Chapin) seem to belong to this species.

***Polyrhachis (Myrma) revoili* Ern. André**

Five dealated females taken by Bequaert at Malela are doubtfully referred to this species.

***Polyrhachis (Myrma) bequaerti*, new species**

Text Figure 76

WORKER.—

Length 4 to 4.5 mm.

Head, without the mandibles, scarcely longer than broad, broader behind than in front, with feebly convex posterior border and nearly straight, anteriorly converging sides, in profile nearly as high as long. Eyes moderately large and convex, broadly

elliptical, their anterior orbits at the median transverse diameter of the head. Mandibles feebly convex, with five acute, subequal teeth. Clypeus convex, carinate, especially behind, the anterior border evenly rounded, entire. Frontal area very indistinct; frontal carinae very long and rather far apart, feebly sinuate, subparallel behind. Antennae stout, the scapes only slightly enlarged and scarcely deflected at their tips, extending about one third their length beyond the posterior border of the head. Thorax short, as high as long, the dorsal surface strongly carinate laterally, the border deeply notched at the pronounced promesonotal and mesoepinotal sutures, especially at the latter. Pronotum very broad, without the neck nearly twice as broad as long, decidedly broader in front than behind, at the anterior angles with rather large, acute, triangular spines, which are flattened, diverging, and fully as long as broad at their bases. The surface of the pronotum is feebly convex. Mesonotum short and rather flat, more than twice as broad as long, narrower behind than in front, where it is almost as broad as the posterior border of the pronotum; its sides straight, but rounded at the corners. Epinotum extremely short, abruptly sloping, the base and declivity being in the same plane, the former strongly convex in



Fig. 75. *Polyrhachis (Myrma) decemdentata* Ern. André. Worker.

front just behind the mesoepinotal suture, or fissure, which is much more deeply impressed than the promesonotal suture. The posterior corners of the base bear acute, slender, erect, recurved spines, which are fully twice as long as the diameter of their insertions. The surface of the base is bluntly and longitudinally carinate in the middle, the declivity feebly concave. Seen from behind, the base is distinctly broader than long, a little broader behind than in front, with convex, arcuate sides; the declivity, however, has concave and more feebly marginate lateral borders. Petiole thick, very convex anteriorly and posteriorly, especially anteriorly, as broad as high, its blunt upper border with four long, slender, acute, equidistant spines, the outer pair distinctly longer than the inner and all directed upward and somewhat backward, with their tips somewhat more strongly curved than their bases. Gaster subglobular, very slightly broader than long, very convex above, the first segment concave anteriorly for the accommodation of the convex posterior surface of the petiole. Legs rather stout, tibiae distinctly constricted at the base.

Shining; mandibles smooth, with rather coarse scattered punctures; clypeus, cheeks, and anterior portion of front very smooth and shining; remainder of head regularly and rather finely longitudinally rugose, with punctate interrugal spaces. Pronotum and mesonotum above sharply and regularly longitudinally rugose, the rugae on the former coarser than on the head, on the latter radiating backward from a point in the middle of the anterior border. Base of epinotum with very regular trans-

verse rugæ, which are even sharper than those on the pronotum, giving the surface the appearance of a washboard. Lower pleuræ finely punctate-rugulose, passing above into parallel rugæ, which are longitudinal on the sides of the pro- and mesonotum and nearly perpendicular on the epinotum. Epinotal declivity rugulose-punctate, the rugules in the middle distinctly transverse. Anterior and posterior surfaces of petiole with similar sculpture, but the rugules somewhat less clearly transverse. Gaster smooth and shining, very finely and regularly reticulate. Legs finely and transversely shagreened.

Hairs whitish, delicate, erect, sparse, conspicuous only on the thoracic dorsum, tip of gaster, venter, and dorsal surface of head. Pubescence pale, short, fine, and appressed; rather dilute, longer, and sparser on the gaster; denser on the appendages.



Fig. 76. *Polyrhachis (Myrma) bequaerti*, new species. Worker.

Black; mandibles, funiculi, tibiae, and insertions and tips of scapes castaneous; palpi somewhat paler; femora and tarsi a little darker.

Described from fifteen specimens collected by Dr. Bequaert in the virgin forest at Utiasiki, between Lubutu and Kirundu. They were taken, together with their larvæ and pupæ, from a nest consisting of two leaves united by a soft tissue composed of fibrous, gnawed vegetable particles and silk.

This exquisite ant clearly belongs to the group comprising *fissa* Mayr and *monista* Santschi, but is quite distinct from any of the described species.

970

PLATE II

Temporary nest of the driver ant *Dorylus* (*Anomma*) *wilverthi* Emery. at Akenge October 17, 1913. This nest extended over 3.50 m. and could not be shown entirely in the picture.



PLATE III

Army of driver ants, *Dorylus* (*Anomma*) *wilverthi* Emery, on the march near
Avakubi, October 22, 1909.



PLATE IV

Dorylus (Anomma) wilverthi Emery, at Avakubi, October 30, 1909.

Fig. 1. Worker ants covering in dense masses the larvæ and pupæ among leaves of pineapple and grass, on a temporary halt of the column.

Fig. 2. Part of an army with workers swarming over the low vegetation. The mounds cover a portion of the temporary nest and consist of particles of earth dug out by the ants and loosely connected. There are a great number of openings to such a nest.



1



2

PLATE V

Dorylus (Anomma) nigricans Illiger, at Amani, Usambara, East Africa

Fig. 1. Army of driver ants crossing a ditch.

Fig. 2. Army overwhelming a white rabbit.

Photographs by Dr. J. Vosseler



1



2

PLATE VI

Fig. 1. *Dorylus (Anomma) nigricans* Illiger, at Amani, Usambara, East Africa. Army crossing a path. The workers carrying the brood pass between solid walls of soldiers which, with their mandibles lifted and wide open, protect the main body of the army.

Photograph by Dr. J. Vosseler

Fig. 2. *Megaponera jalens* (Fabricius), at Avakubi, October 22, 1909. Entrance to a nest, surrounded by a small mound of excavated earth, situated in a deserted plantation. When dug up, five galleries were found to open into the single aperture. On two occasions Mr. Lang observed from 30 to 40 pupa cases lying outside in the sun, near the entrance, with a few ants in steady attendance. There are no true chambers in the nest, but the galleries for the pupae and larvae are rather wide. When touched, these insects sting before using the mandibles, which can even pierce the thick skin of the hand. The columns of these ants contain relatively few individuals and, when closely approached, break up at once, the members scurrying nervously in all directions and making a stridulating noise. After a minute or so they reform the ranks and continue their march. They are great termite robbers, and Mr. Lang counted as many as eight such insects held between the mandibles of a single ant. They never opened the jaws to drop their prey, even when taken up with the forceps.



1



2

PLATE VII

Pheidole saricola Wheeler, at Zambi, June 1915. This seed-storing ant works chiefly during the night and early morning, forming columns in various directions to forage. Near the entrances to the nests heaps of refuse are shown, consisting of seeds and chaff, and often also of dead ants and other insects.



PLATE VIII

Myrmicaria cumenoides subspecies *opaciventris* (Emery).

Fig. 1. Crescent-shaped craters of excavated earth at the entrances to nests in level, hardened soil at Rungu, July 7, 1913. The ants usually burrow their galleries after a heavy rain, either by day or night. The workers then busily carry out particles of soil which they drop near the edge of the crater. Often the moist earth does not roll down but sticks to the upper margin which thus becomes an overhanging crest. The mounds in the photograph are of typical form, but some of the best are often twice as high (5 to 6 cm.). It is said that these craters suggested the shape of the famous hairdresses of the Mangbetu tribe.

Fig. 2. Crescent-shaped crater at the entrance to a nest at Avakubi, October 22, 1909. In this case it was not as true to form as those shown in Fig. 1 because the entrances were placed near the base of a bush. The galleries showed many ramifications and extended 17 inches below the surface; but the whole nest, when exposed, did not cover an area more than two feet in diameter. Most of the pupæ were found about the roots of the bush. These harmless and common ants also build subterranean tunnels in various directions from their nest and make themselves noticeable by their immediate appearance in great numbers around a piece of meat or dead insect.



1



2

PLATE IX

Myrmicaria salambo Wheeler. Low tree of the genus *Prolea* from the Savannah at Garamba, September 1912, on the buds of which this ant attends scale insects.

Fig. 1. A flowering branch of the tree.

Fig. 2. The entire tree in its typical surroundings. This plant is a characteristic element of the extreme northeastern Congo Savannah, on the divide between the Congo and the Nile. It does not extend southwest of Faradje.



1



2

PLATE XI

Crematogaster (Atopogyne) theta (Forel).

Fig. 1. Carton nest at Stanleyville, August 10, 1909, built on the trunk of a tree, about 5 feet from the ground.

Fig. 2. Another nest of this species in the same locality, but of different shape



1



2

PLATE XII

Crematogaster (Atopogyne) theta (Forel), at Medje, June 15, 1914.

Fig. 1. Outside view of a carton nest made of vegetable matter of very light gray or brownish color. The caterpillar shown on Plate XIII, fig. 1 was crawling over the surface of this nest.

Fig. 2. Inside, cross-section view of the same nest. The white masses are the brood (eggs, larvæ, and pupæ). The structure was 10.4 cm. broad and 9.8 cm. long and attached to a small tree in the forest, about 8 feet from the ground. When disturbed, the ants stream outside and let themselves drop upon the intruder. Their sting is painful and can be felt for many minutes afterwards.



1



2

PLATE XIII

Fig. 1. Portion of the outer surface of the nest of *Crematogaster* (*Atopogyne*) *theta* (Forel) shown on Plate XII. In the upper right corner is seen a caterpillar that was found crawling over the surface, its segmentation being visible at the time; but when the creature stops and tightly adheres to the nest, its body becomes quite unnoticeable as it then resembles one of the numerous protuberances of the formicary.

Fig. 2. Nest of *Crematogaster* (*Nematocrema*) *stadelmanni* variety *dolichocephala* (Santschi), at Kwamouth, July 14, 1914. This cone-shaped carton nest was hanging in a tree, about nine feet from the ground. It was fastened to several small branches in such a way that it moved about when the boughs were tapped with a stick. The outside surface was quite rough and simulated crumpled up leaves that cover one another like the shingles of a roof. The cellular structure inside was irregular, with very thin walls, and a great many exits; larvæ were especially abundant in the lower portion. It measured about 18 inches in length and 11 inches in width at the top.



1



2

PLATE XIV

Crematogaster (*Nematocrema*) *stadelmanni* variety *dolichocephala* (Santschi), at Bengamisa, September 27, 1914. Pensile nest of very hard, woody carton, resembling that of certain termites in shape as well as in material, a fact usually making it impossible to tell from the outside appearance which insect inhabits it. The example photographed was so fixed to several creepers that it swayed in the wind about twenty-five feet from the ground. It was approximately two feet long. The shape and size of these carton nests vary greatly according to the location. Their inner structure is irregular, the galleries and cells seemingly arranged without plan: larvæ and pupæ may be found anywhere throughout the formicary.



PLATE XV

Landscape in the Savannah near Niangara, May 10, 1913, showing numerous hillocks of *Termes natalensis* Haviland scattered over an almost treeless grass plain. The ant *Carebara osborni* Wheeler lives in cleptobiosis with these termites.



PLATE XVI

Mushroom garden of *Acanthotermes militaris* (Hagen) from a nest at Madela, July 6, 1915. The minute ant, *Padalpus termitolestes* Wheeler, had established its nest close to the surface in the upper part of the termitarium (upper right hand corner).



PLATE XVII

Fig. 1. *Macromischoides aculeatus* (Mayr), at Medje, May 1914. Two nests of these small ants, built with loosely connected vegetable fibres between leaves.

Fig. 2. *Tetramorium sericeiventris* subspecies *continentis* (Forel), at Zambi, June 30, 1915. Craters of white sand at the entrances to the nest of these ants.



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PLATE XVIII

Tetramorium setigerum subspecies *quarrens* Forel, at Niapu.

Fig. 1. Regular ring-shaped craters of loose particles of soil constructed about the entrance of the nest during the rainy season. These ants are very common in open places.

Fig. 2. Aspect of the entrance to the nest of the same ant during the dry season. At that time the insects merely carry out débris and particles of soil without attempting to construct a crater.



1



2

PLATE XIX

Plagiolepis (Anoplolepis) custodiens (F. Smith).

Fig. 1. Shore of the Atlantic Ocean a short distance north of Banana, showing the narrow beach of white sand in the upper part of which the nests of *P. custodiens* are excavated.

Photograph by J. Bequaert

Fig. 2. Nest of *P. custodiens* in the sandy beach of the Atlantic near Banana, August 1915.



1



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PLATE XX

Ecophylla longinoda (Latreille), at Malela, July 5, 1915. The nests of this ant consist of leaflets closely woven together with white silk. These were found in a thorny bush about three feet from the ground. In order to photograph them the compound leaves of the plant were cut off and laid on the ground.

Fig. 1. Six leaflets have been united into one nest.

Fig. 2. A closer view of another formicary of the same species.



1



2

PLATE XXI

Fig. 1. Carton nest of a termite about five feet from the ground; deserted by its builder and now occupied by a colony of *Camponotus* (*Orthonotomyrmex*) *vividus* (F. Smith); near Malela, July 7, 1915. The structure was established around the stem of a sapling in swampy woods.

Fig. 2. Interior of the same nest, showing the chambers excavated by the ants in the termitarium.



1



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PLATE XXII

Fig. 1. Craters of white sand at the entrances to the subterranean nest of *Camponotus* (*Myrmosericus*) *rufoglaucus* subspecies *syphax* Wheeler, at Zambi, June 30, 1915.

Fig. 2. Nest of *Polyrhachis* (*Myrma*) *laboriosa* F. Smith, at Niagara, November 1910. It was built in a fork of a bush in a cluster of fine twigs, and consisted of old vegetable fibres and leaves fastened together. It was extremely light since no soil entered into its construction; dark gray outside, brown inside. Though the nest was somewhat damaged there were apparently many exits. When disturbed, the ants made a rattling noise by striking the nest with their gaster; at the same time they emitted considerable quantities of formic acid, bending their gaster forward between the legs.



1



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PLATE XXIII

Nests of *Polyrhachis* (*Myrma*) *gagates* F. Smith, excavated in sandy soil at Zambi.
June 30, 1915.

Fig. 1. Craters of white sand surrounding the entrances from which the grass-stalks have been cut away.

Fig. 2. As the nest appeared before the vegetation was removed.



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