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Reprinted from BIOLOGICAL BULLETIN, Vol. XLIX, No. 3, September, 1925

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A NEW GUEST-ANT AND OTHER NEW FORMICIDÆ
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WILLIAM MORTON WHEELER.

The researches of the past twenty-five years have shown that the number of ants which regularly live in more or less intimate symbiotic or parasitic relations with other ants is considerable, and that the behavior exhibited under these conditions is remarkably diverse. Until recently, however, such social parasites were known only from north temperate and subtropical regions. Several very interesting forms have now been discovered in the tropics and even in the south temperate zone. The following is a list of the workerless parasites (permanent social parasites) resembling the European *Anergates atratulus* Schenck and the North American *Epæcus pergandei* Emery that have been described from paleotropical and neotropical localities:

(1) *Wheeleriella wroughtoni* Forel (1910, 1911), described from female and male specimens found living in the nests of *Monomorium solomonis indicum* Forel at Poona, India.

(2) *Parapheidole oculata* Emery (1900, 1914-15), described from a female specimen from Madagascar and supposed to be a workerless parasite of some species of *Pheidole*.

(3) *Anergatides kohli* Wasmann (1915). Males and females taken in nests of *Pheidole megacephala melancholica* Santschi in the Belgian Congo.

(4) *Plagiolepis (Anoplolepis) nuptialis* Santschi (1917). Males taken in Cape Province by Dr. H. Brauns in nests of *P. (A.) custodiens* Sm.

(5) *Pseudoatta argentina* Gallardo (1916). Female and male described from specimens taken in Argentina and supposed to be parasitic in the nests of some fungus-growing ant of the genus *Moellerius*, probably *M. balzani* Emery.

(6) *Xenometa monilicornis* Emery (1917, 1921), described

¹ Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 241.

from female specimens taken on the island of St. Thomas, W. I., in a nest of *Cardiocondyla emeryi* Forel.

(7) *Bruchomyrma acutidens* Santschi (1923), described from female specimens taken by Carlos Bruch in Argentina in the nest of *Pheidole strobili richteri* Forel:

Besides the accounts of these extreme, workerless, permanent parasites numerous scattered and more or less incomplete notes have been published on other types of social parasites within the tropics. No slave-making ants have been recorded, but certain African and Malagasy species of *Crematogaster* of the subgenera *Oxygyne* and *Atopogyne* are probably temporary parasites in the nests of species of the typical subgenus *Crematogaster*, and the phenomenon known as "parabiosis," as Forel (1898), Mann (1912), and I (1913, 1921a) have shown, is well-developed among certain neotropical ants belonging to several genera (*Dolichoderus*, *Crematogaster*, *Odontomachus*, *Camponotus*). There is, moreover, in the tropics of both hemispheres a long series of tiny "thief," or lestobiotic ants, which belong to the Myrmicine genera *Solenopsis*, *Oligomyrma*, *Aëromyrma*, *Pædalgus*, *Carebara*, *Erebomyrma*, *Tranopelta*, *Liomyrma*, *Pheidole*, *Xenomyrma*, *Monomorium*, etc. and live in or very near the nests of other ants or of termites.

During late July and early August, 1924, while studying the exuberant ant-fauna about the new tropical laboratory on Barro Colorado Island, in the Panama Canal Zone, I repeatedly came upon a small and peculiar *Megalomyrma* living in the fungus gardens of a *Sericomyrma*. Since the behavior of these insects represents a new type of symbiosis or xenobiosis, I here describe them, prefacing my account of each with a few historical notes. The taxonomic descriptions of the two ants and of some small lestobiotic species associated with the *Sericomyrma* colonies are placed at the end of the paper.

Our knowledge of the habits of the Attine ants of the genus *Sericomyrma* is rather meager. The earliest and best account is that of Urich published as early as 1895. It refers to a Trinidad species, later described as *S. urichi* Forel, but at the time of Urich's writing supposed to be *opacus* Mayr. "The nests of these ants," he says, "are found commonly about Port of Spain, in gardens, in the grass as a rule, but sometimes in the flower beds,

and from their peculiar raised entrance can readily be recognized. They are always excavated in clayey soil, and the raised entrances, which are more or less cylindrical, are constructed with the particles of earth resulting from their mining operations and are about an inch in height. In young colonies this entrance leads into a small chamber, about six inches below the surface of the ground, situated, not at the end of the gallery but either to the left or right of it. As the colony increases the ants do not enlarge this original chamber, but, piercing its side, form another chamber near it with a small entrance hole. In large colonies, which never consist of more than about 200 individuals, a nest consists of two or three chambers which open on the original excavation. This is no longer used for growing the fungus in, but forms a sort of antechamber which generally contains material brought in by the ants to grow their mushrooms on, which is deposited here and gradually made use of. The chambers adjoining are more or less round, with a diameter of about 2-3 inches, and any small roots of plants growing through them are not cut away but used by the ants to hang their mushroom gardens on. These fill the interior of the chamber and consist of a gray spongy mass consisting of a great number of little irregular cells and resembling a coarse sponge, amongst which are scattered larvæ, pupæ, and ants. The walls of the cells consist of small round pellets resembling dust shot and are penetrated by and enveloped in white fungus hyphæ, which hold the mass together. Strewn thickly upon the surface of the garden are to be seen round white bodies about a quarter of a millimeter in diameter. These are what Möller terms "Kohl-rabi" clumps, and consist of an aggregation of hyphæ with spherical swellings on their ends. It is on this that the ants feed. The fungus found by Möller in the nests of the Brazilian fungus growers (*Acromyrmex*) is the *Rozites gongylophora* Möller, and if it is not the same species cultivated by *S. opacus* it is, at any rate, very nearly related to it. As material to grow their mushrooms on the ants make use of particles of fruit, flowers, and leaves, but prefer the fruit. They do well in artificial nests and are easy to watch. I have tried them with all kinds of vegetable products; they have taken orange, banana, rose petals and leaves, and once they even made use of the dried glue from the back of an old book

lying near their nest, but that day they had nothing else; if the choice be left to them they invariably take fruit and seem to prefer the orange among these. Very small particles of the white skin of the oranges are torn off, and, after undergoing a slight kneading process in the ants' mandibles, are placed in the nest. The neutres are all of the same size, varying but slightly and never exceed 4 mm. in length. They are more diurnal in their habits than other species of fungus growers, but also work a little at night. I have found winged forms in the nests in the month of July."

The following year Forel, while recording his observations on the Attini of Colombia, published the following remark (1896, p. 406): "The fungus gardens of the large *Atta* species, of the subgenera *Trachymyrmex* For. and *Mycocepurus* For., as well as of the genus *Sericomyrmex* were previously unknown and were discovered by me. The gardens of the three latter groups seem to resemble those of *Apterostigma*, and these small ants are never seen on the trees in the act of cutting leaves. They bring into their nests small, desiccated vegetable particles; their fungus garden lies very deep in the earth and is very imperfect." The Colombian species of *Sericomyrmex* (*S. diego* Forel) observed by Forel was not described till 1912 (p. 193). He then added the following note: "Don Diego, at the foot of the Sierra Madre de Santa Marta, Colombia, the third of March, 1896, in the forest; nest in the humus, with a crater of coarse granules. A beautiful fungus garden at a depth of 2 decimeters in the earth. The worker feigns death like the species of *Cyphomyrmex*. They collect little green vegetable particles resembling an alga and make their fungus garden of them and other débris." Essentially the same account was published by Forel in the "Biologia Centrali-Americana" (1899-1900, p. 37).

It will be noticed that Urich and not Forel was the first to observe the fungus gardens of *Sericomyrmex* and that the latter's various accounts contain some glaring discrepancies. In one account the garden is described as "very imperfect," in another as "beautiful." Furthermore, he could not have seen the fungus garden of *Mycocepurus*, which cultivates a peculiar fungus very similar to if not the same as the *Tyridiomyces formicarum* cultivated by *Cyphomyrmex rimosus* (Wheeler, 1907, p. 771).

For many years *Sericomyrmex* has been the one genus of Attine ants which I have not had an adequate opportunity to study. These insects are local or sporadic in their occurrence and very unobtrusive and timid in their behavior. Even on the few occasions when I have encountered them I could make but a superficial examination of their nests. My note-books contain only the following jottings:



FIG. 1. Laboratory of the Institute for Tropical Research on Barro Colorado Island, in Gatun Lake, Panama Canal Zone. Photograph by Mr. James Zetek.

Dec. 15, 1911, I happened on a number of nests of a small *Sericomyrmex*, which I have since described as *S. zacapanus* (1924) on the clay banks of a small irrigating ditch in an orchard at Zacapa, a very arid locality in Guatemala. The nests had small craters 2-3 inches in diameter, which were either single or in rows, like those of *Solenopsis geminata* nests, and were covered with the ejected fragments of exhausted fungus substratum. The soil was so hard that I could not reach the chambers and gardens which must have been some distance beneath the surface. The few workers that were abroad were bringing in small vegetable

particles. During the summer of 1920 I examined some of the colonies of *S. urichi*, which were nesting in the lawn near Mr. Urich's laboratory in Port of Spain, but time to make a careful investigation was lacking. During the same summer I took in the sandy area adjoining the Tropical Laboratory of the New York Zoölogical Society at Kartabo, British Guiana, a few workers of a *Sericomyrmex* which I have recently described as *impexus* (1924), but I failed to reach the chambers in the very few nests that were excavated.

My sojourn on Barro Colorado Island finally yielded the desired opportunity to study not only *Sericomyrmex* but also several other Attini. During the height of the rainy season this locality is a veritable myrmecological and mycological paradise. Within a few hundred yards of the laboratory (Fig. 1) numerous colonies of at least 14 species of fungus-growing ants could be found, all with their gardens close to the surface of the ground and easily accessible. I recognized two species of *Atta*, one of *Acromyrmex*, three of *Trachymyrmex*, three of *Apterostigma*, three of *Cyphomyrmex*, one of *Myrmecocrypta* and one of *Sericomyrmex*. Thus nearly all the known genera of Attini were represented. Further search will probably reveal the presence of *Mycocepurus* on the island. Nor were the ants the only fungus-cultivating insects. The trunks of the trees that had been felled during the dry season (spring of 1924), when the small clearing was made around the laboratory, had reached a stage when they attracted thousands of ambrosia beetles of the family Platypodidæ. During June and July these insects were everywhere making their long tubular fungus-lined galleries in the dead wood and covering the logs with their frass. It would, indeed, be difficult to find a more favorable locality for mycological investigations, not only on account of the interesting fungi cultivated by so many ants and beetles but also of the extraordinary number and variety of other fungi, which during the rainy season flourish in all parts of the jungle.

Leaving an account of the other Attini for consideration at some future time, I will here confine my remarks to the *Sericomyrmex* which harbors the *Megalomyrmex* in its gardens. This *Sericomyrmex* seems to represent an undescribed species, which I

shall call *amabilis*. It is very closely related to *S. impexus* Wheeler of British Guiana, but the worker is somewhat larger, the external borders of the mandibles are less convex, the mesothoracic tubercles are more acute and the silky hairs and pubescence, especially on the upper surface of the body, are longer and more conspicuous. The worker averages a little over 3 mm. in length, the female somewhat more than 5 mm., the male about 3 mm. All the phases are ferruginous brown, the female being decidedly darker and less reddish than the worker. Like most of the smaller Attini, the workers are very timid and inoffensive. When rudely touched they at once curl up and feign death. Owing to their gentle disposition and graceful and deliberate movements they are among the most fascinating ants to observe in artificial nests.

S. amabilis is probably common in many parts of the jungle on Barro Colorado Island but I was able to detect its nests only in the recently made clearing and trails, where the red clay, which gives its name to the island, is exposed to the sunlight, and there only some hours after one of the almost daily, heavy showers. As soon as the rain ceased the silky, mouse-like workers began to bring up small pellets of earth and carefully deposit them in the form of a loose crater around the entrance, which was about 3 mm. in diameter. These craters, which are completely obliterated by each rain, are probably large and noticeable during the dry season. As soon as one approaches the nest, the excavating workers, like those of *Trachymyrmex*, either feign death and become indistinguishable from the soil or hastily withdraw within the nest entrance, so that the observer must remain motionless for several minutes before they resume their labors.

Most of the nests observed had a single crater and entrance, with a slender gallery descending more or less obliquely to a chamber about 4 to 6 inches beneath the surface, but a few large nests resembled *Atta* nests, on a very diminutive scale in having several entrances and craters and as many as 3 to 5 chambers, scattered over an area of about a quarter of a square yard. The chambers varied in size from that of a pigeon's to that of a hen's egg, and were each filled with a fungus garden which was either entirely built up on the floor and walls or partly suspended from

rootlets left intact by the ants during their excavations. The substratum of the gardens consisted of small, dull-yellow pellets of uniform size, held together and covered by a dense white mycelium, bearing minute clusters (bromatia) of spherical

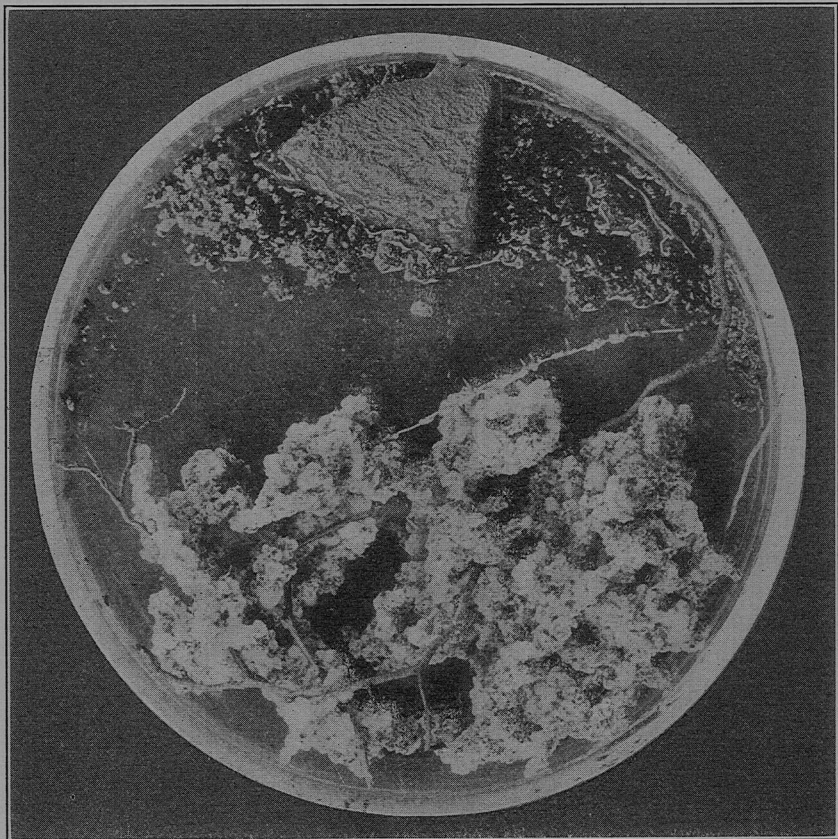


FIG. 2. Fungus garden of *Sericomyrmex amabilis* sp. nov. built in a Petri dish. $\times 1\frac{1}{2}$. Photograph by Dr. David Fairchild.

swellings ("kohlrabi") like those of *Atta*, *Acromyrmex* and *Trachymyrmex*. Urich's description of the gardens of *S. urichi* applies accurately to those of *amabilis*. The pellets of the substratum are undoubtedly particles of soft, chlorophyllless vegetable matter collected by the workers in the immediate vicinity of the nest but I was unable to identify them more closely or to observe the ants in the act of gathering them.

In order to study the ants I placed them with their brood and fungus gardens in large Petri dishes. These made excellent artificial nests in which the insects could be kept in perfect health for two to three weeks and conveniently observed under a strong pocket-lens. Within 24 to 36 hours the frail fungus gardens, which inevitably fell to pieces when extracted from the earthen chambers, were completely reconstructed by the workers as an elaborate and rather regular sponge-work with polygonal crypts a quarter to half an inch in diameter. Of course, the flat space, less than half an inch in thickness, to which the ants were confined, compelled them to rebuild their garden in the form of a disc instead of a sphere or ovoid, but this was very advantageous, since it permitted the observer to scrutinize all parts of the structure through the glass cover. (See figures 2 and 3 from photographs by my friend Dr. David Fairchild.) The ants placed their eggs, larvæ and pupæ on the fungus-covered surfaces and in the crypts. The queen is a very sluggish insect and remained for long hours in a somnolent attitude near the center of the garden, or moved about very slowly and scattered her eggs in the immediate vicinity. These were rather large and broadly elliptical and were permitted to lie where they were laid till sometime after the larvæ had hatched. The workers then carried them to other parts of the garden and placed them in contact with fresh hyphæ. Since I never saw the workers administering hyphæ or "kohlrabi" to the larvæ as described for *Atta cephalotes* by Tanner (1892), I infer that the latter, when hungry, merely reach out and crop the fungus.

The larvæ are short, thickset and beset with sparse, long, flagellum-like hairs. The head is large and subrectangular, bearing small, acute mandibles covered with acute points. This type of mandible, which I find to be peculiar to the Attini, seems to be adapted to puncturing the delicate fungus hyphæ and expressing their juices. Worker pupæ were common in the nests, but pupal males and females were much less numerous. A few of the winged adult sexual forms emerged during the last week of July and the first ten days of August.

The workers were frequently observed in the act of building and rearranging the particles of the substratum of the garden and

feeding on the "kohlrabi." They cropped the delicate hyphæ with their maxillæ, and not with their mandibles, without disturbing or shaking the substratum. On several occasions I saw

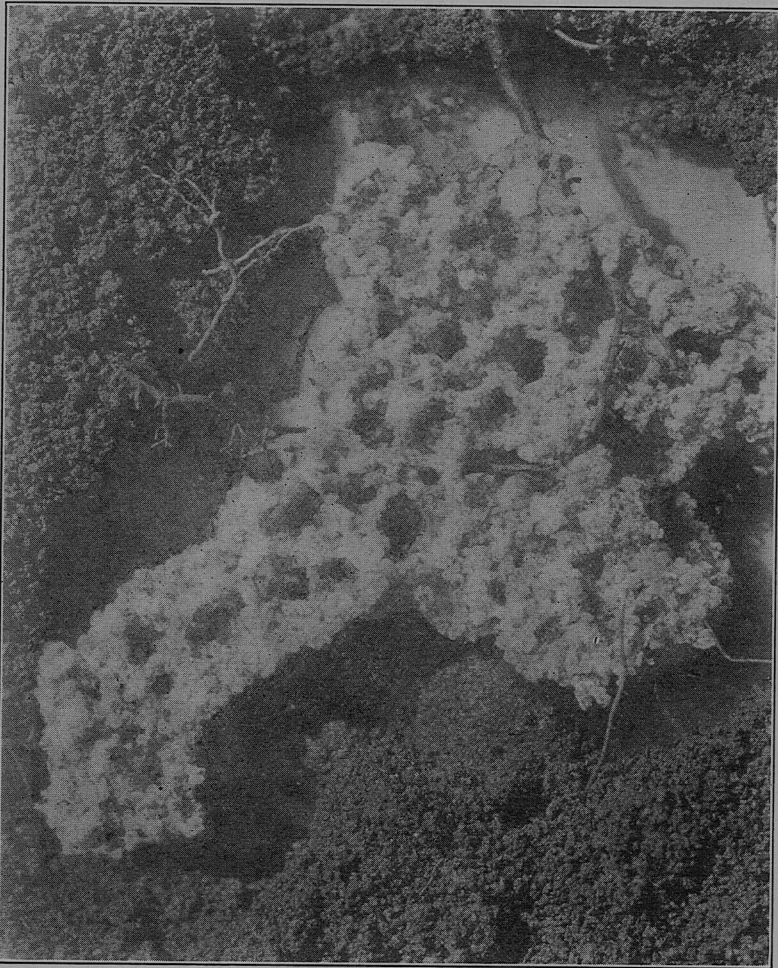


FIG. 3. Fungus garden of *Sericomymex amabilis* sp. nov. built in a Petri dish
× 2. Photograph by Dr. David Fairchild.

them devouring injured larvæ or pupæ, and they greedily fed on the pulp of various fruits, such as mangos and bananas. They also tore off small bits of the inner rind of oranges and bananas and incorporated them in the garden. When such materials

were not available, they manured the garden with numerous golden yellow droplets of their own feces. In two of my nests the gardens, were suddenly blasted in a peculiar and unexpected manner. Bits of mango had been left in the Petri dishes and had decomposed during the night. This decomposition seemed to be due to some bacterium which was accidentally transferred to the gardens, probably on the feet and mouthparts of the ants, and at once overwhelmed the fungus, so that within a few hours it shrivelled up and turned black. The ants, apparently quite unable to prevent the inroads of the lethal microörganism or to restore their fungus to its normal condition, became demoralized and eventually wandered away from it to other parts of the dishes.

The population of the *Sericomyrmex* colonies which I examined, resembled that of *Trachymyrmex* colonies, the smaller nests containing between 100 and 200, the largest (a single nest) about 300 ants. No incipient colonies were seen, but there can be no doubt that the recently fecundated queens establish their colonies and gardens in the manner described by von Ihering, Huber, Gøeldi and Bruch for various South American species of *Atta* and *Acromyrmex*.

The guest-ant, which I found in ten out of the twelve *Sericomyrmex* nests excavated in the immediate vicinity of the laboratory on Barro Colorado Island, is obviously a species of *Megalomyrmex*, a peculiar neotropical genus established by Forel in 1884 for a Colombian ant, *M. leoninus* and now known to comprise some 15 species which range from Bolivia to Mexico. While the generic name was appropriate to the type and several other species, which measure nearly a centimeter in length, it is a misnomer for several much smaller species—*gøeldii* Forel, *pusillus* Forel, *wallacei* Mann, *silvestrii* Wheeler and *sjøstedti* Wheeler—which have been recently described. The known species of the genus are divisible into two groups, one of which, including the type, has convex, coarsely 5- or 6-toothed mandibles, with a sharp angle between their apical and basal borders, whereas in the other group, comprising only two species, *silvestrii* and *sjøstedti*, the mandibles are narrower and more flattened, with a rounded angle between the basal and apical borders and the latter with two large terminal teeth and a series of very minute basal denticles. This

group is regarded by Mann as a distinct subgenus, for which he has proposed the name *Wheelerimyrmex*. I find that there is also a difference in the number of palpal joints in these two groups. In *Megalomyrmex sens. str.* (*M. bituberculatus* Fabr.) the maxillary palpi are 4-jointed, the labial palpi 3-jointed.¹ In *Wheelerimyrmex* I find the maxillary palpi to be 3-jointed, the labial palpi 2-jointed. The guest ant, which really represents a new subgenus and species and is described in the sequel as *Cepobroticus symmetochus*, has the same number of palpal joints as *Wheelerimyrmex*, but the mandibles are intermediate between the two other subgenera, having a sharp angle between the basal and apical border, and the latter with a large terminal and five or six small basal teeth. The antennæ, moreover, are short, all the funicular joints, except the last being decidedly broader than long and the clava absent. The promesonotal suture is obsolete but this character occurs also in one species of *Wheelerimyrmex* (*silvestrii*). In *sjöstedti* the suture is as distinct as it is in the species of *Megalomyrmex sens. str.* The eyes of the worker *Cepobroticus* are rather small.

It is, perhaps, significant that Emery (1921) has placed the genus *Megalomyrmex* in his tribe Monomorii, in the midst of a series of Old World genera—*Hagioxenus*, *Wheeleriella*, *Phacota*, *Xenomyrmex* and *Liomyrmex*—which are known to have xenobiotic or parasitic habits. Unfortunately very little is known concerning the habits of the described species of *Megalomyrmex*. The only data I have been able to secure are a few notes by Mann on *M. tuberculatus* and *M. (W.) silvestrii*. Of the former he says (1916, p. 445): "This form, which is confined to the upper Amazonian region, attends Membracidæ and the workers were generally found in company with these on shrubs in the dense forest. The nest is subterranean, the entrance nearly always at the base of a tree. The living insect is slow in its movements." Concerning *silvestrii*, which he observed in Honduras, he says: "A good series of workers were taken at Ceiba and San Juan Pueblo, nesting in the ground and in rotten logs. It is a timid species and very active when disturbed." These notes indicate that the species of *Megalomyrmex sens. str.* and the subgenus

¹ Forel and Emery give 3 joints for each palpus.

Wheelerimyrmex are nonparasitic and epigæic. The occurrence of *Cepobroticus* only as a hypogæic inquiline, or guest in the fungus gardens of *Sericomyrmex* may be regarded as an ethological character which still further emphasizes its subgeneric status.

The *Cepobroticus symmetochus* worker measures only 3-3.5 mm., the female 3.8 mm., the male 3 mm. It is therefore the smallest known species of its genus. The body is very smooth and shining in all three phases and in the worker and female yellowish red, with the appendages scarcely paler and the dorsal median third of the gaster dark brown or blackish. The male is paler and more yellow throughout. All the castes, and especially the worker and female, are covered with rather coarse, long, golden yellow hairs. For other characters the taxonomic description and figures may be consulted.

The colonies of the *Cepobroticus* so frequently found living with *Sericomyrmex amabilis* were decidedly less populous than those of their host. The largest comprised less than 75 individuals, and often the number did not exceed 40 or 50. In every nest a deãlated mother queen was present. She usually took up her station, surrounded by a group of her workers, in one of the crypts of the fungus garden a short distance—half to three quarters of an inch—from the *Sericomyrmex* queen. The guest ants kept their brood in small clusters scattered through the garden and each cluster was cared for by a few workers. Although the ants and their brood were thus intermingled, the workers of each species lavished their attention exclusively on their own eggs, larvæ and pupæ and were never seen even to transport the progeny of the other species from one part of the garden to another.

The workers and queens of *Cepobroticus* are rather alert and move about more rapidly than their hosts. They devote so much time to licking and fondling one another that the observer is somewhat astonished to find them paying little or no attention to the fungus-growers. As a rule the two species are indifferent to one another. One may watch them for hours without observing anything more than rather distant, mutual antennal salutations. On rare occasions a worker *Cepobroticus* may be seen licking the gaster of a *Sericomyrmex* worker or of the sluggish queen. More

frequently one of the host workers may be observed in the act of lavishing similar but more elaborate attentions on a *Cepobroticus* worker. The fungus-grower begins by licking the feet or tarsi, the tibiæ and femora, then the thorax or abdomen and finally the head and even the mandibles of the guest. During this operation the latter remains motionless and inclines its body somewhat to one side.

The *Sericomyrmex* never feed their guests by regurgitation. This is not surprising because they never feed one another thus, but resort individually to the growing fungus bromatia. When hungry the *Cepobroticus* workers and queen also crop the fungus mycelium, but they do this rather roughly, using their mandibles and even shaking or disturbing the substratum. The guests very rarely transport or rearrange the particles of the substratum or take the slightest interest in the garden, except as a source of nourishment. Only on one occasion did I see a *Cepobroticus* carry a particle of the substratum to another spot, insert it and pat it down with her fore feet. When fresh fruit was introduced into the nest, it was much less frequently visited and eaten by the guests than by their hosts.

The larvæ and pupæ of the *Cepobroticus* can be readily distinguished from the *Sericomyrmex* brood. The larvæ are more slender and more cylindrical and have smaller heads, with flat, 3-toothed mandibles. The hairs on the body are more numerous, shorter and stouter, though rapidly tapering at their tips. I was unable to determine whether the larvæ are nourished by regurgitation or feed directly on the fungus hyphæ. The fact that they usually lie in the crypts in small clusters and in less intimate contact with the fungus than the *Sericomyrmex* larvæ would seem to indicate that they are fed by their nurses with regurgitated liquids.

Theinquilines evidently lead a purely hypogæic life. Only the males and winged females leave the fungus chambers and come to the surface to mate. I took a few of the sexual forms which had thus escaped, and Prof. W. C. Allee, who collected on Barro Colorado Island during the spring of 1924, sent me among a number of miscellaneous ants a few winged females and several males of *Cepobroticus* which he had evidently taken on the ground

or vegetation. The small size of the eyes in the worker as compared with other species of *Megalomyrmex* indicates that this hypogæic mode of life is beginning to affect the visual organs. Other obvious adaptive characters are the dentition of the mandibles, which is well suited to cropping the fungus hyphæ, and the investment of long, golden yellow hairs, which suggest a trichomal function like the golden tufts of many symphilic myrmecophiles.

Some experiments were conducted in mingling the personnel from different *Sericomyrmex* and *Cepobroticus* colonies. The former were so gentle and tolerant that when workers and queens belonging to different colonies were placed in the same Petri dish little animosity and that of very short duration was exhibited. Similarly, when inquilines from an alien colony were introduced, they were adopted at once without hostility, but the members of different colonies of the inquilines were much more hostile to one another. Frequently workers or queens would be dragged about for days and eventually mutilated or even killed by workers of their own species. This behavior was, perhaps, to be expected from what is known of the mutual animosity of parasites of the same species when confined with a single host.

The foregoing observations make it seem probable that the *Sericomyrmex-Cepobroticus* colonies are not established by a consociation of fecundated queens of the two species immediately after their nuptial flight, but that the *Cepobroticus* queen enters a well-established *Sericomyrmex* nest in which the fungus garden is already large and flourishing and being cultivated by a lot of workers. The development of the garden by the recently fecundated *Sericomyrmex* queen, as already suggested, evidently takes place in the same manner as in *Atta*, *Acromyrmex*, *Møllerius*, *Apterostigma* and other Attini, and is such a slow and delicate operation that the presence of a fungus-devouring inquiline at the inception of colony formation would, to say the least, seriously interfere with the welfare of both queens. On the other hand, the intrusion of the *Cepobroticus* queen at a later stage, when the garden is well established, would not seriously affect the life and development of both colonies, especially as the inquiline is by no means a very fecund ant. This is shown by the small size of her

own colony, her diminutive stature, and the small size of her gaster, which scarcely exceeds that of the worker. The fact that the workers show only a beginning in the reduction of the eyes would seem to indicate that the hypogæic and inquilinous habit is of rather recent phylogenetic origin. This supposition is also supported by the consideration that the Attini themselves constitute a young, or recent tribe of Myrmicine ants.

It is evident that *Cepobroticus* is merely a single aberrant species of *Megalomyrmex* which has abandoned an independent life, has associated itself permanently with *Sericomyrmex* and has taken to feeding on the fungus which it cultivates. The association thus established is a type of "compound nest," as defined by Wasmann, but differs from all the known types in certain important particulars. The relationship between the two species is somewhat like that obtaining between the xenobiotic *Leptothorax emersoni* and *Myrmica canadensis* in the mountains of our northern states and British America, but is in certain respects much less intimate. Although the *Cepobrotici* look after their own brood, they do not, like the *Leptothorax*, construct special chambers communicating with those of the host. Mutual feeding by regurgitation has not been developed, because both species feed on a delicate plant which is carefully provided and cultivated by one of them. We may, therefore, regard the relations of the *Cepobroticus* to the *Sericomyrmex* as a case of what the Germans call "Futterparasitismus," a case to which we might, perhaps, apply the term "mycetometochy." With the possible exception of the *Pseudoatta* described by Gallardo, we know of no other example of this relation among ants, but further investigation may reveal its occurrence among the termites of Africa and Southern Asia.

In the soil immediately surrounding the fungus chambers of some of the *Sericomyrmex* nests I found five minute species of ants which are described below as *Pheidole (Hendecapheidole) mendicula* sp. nov.; *Oligomyrmex panamensis* sp. nov.; *Solenopsis conjurata* sp. nov.; *Tranopelta gilva* Mayr var. *columbica* Forel and *Rhizomyrma* sp. With the exception of the last these seem all to be "thief," or lestopibiotic ants, but further observations will be required to establish their precise relations to the fungus

growers. The most interesting species is the *Oligomyrmex*, because no representative of this genus, which is widely distributed over the warmer portions of the Old World—Southern Europe, Asia Minor, Africa, Madagascar, India, Indonesia, Papua, Australia—has been taken hitherto in any part of the New World. The new Hendecapheidole is also of interest, because only two species of the subgenus have been described, *tachigaliae* Wheeler and *emersoni* Wheeler (1922), both from British Guiana.

TAXONOMIC DESCRIPTIONS.

Sericomyrmex amabilis sp. nov. (Fig. 4.)

Worker.—Length 3–3.5 mm.

Very close to *S. impexus* Wheeler but differing in its somewhat larger size and darker color and in the following structural details: The head is more deeply excised posteriorly, the eyes are distinctly larger and more convex, the posterior angles of the frontal lobes

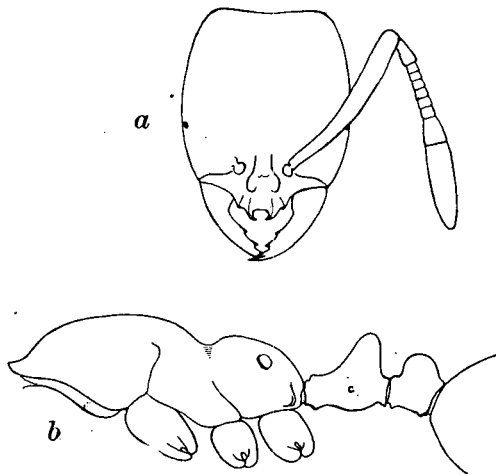


FIG. 4. (*Sericomyrmex amabilis* sp. nov. a, head of worker, dorsal aspect; b, thorax and pedicel of same in profile.

more acute, the continuations of the frontal carinae which form the inner boundaries of the scrobe-like depressions for the antennae, more pronounced, the mandibles with less convex external borders and more pronounced striae. Their surfaces are at the same time more shining. The median joints of the antennal

Legend of Fig. 4

funiculi are distinctly more transverse. The thorax, abdomen and legs are very similar to those of *impexus*, but the inferior angles of the pronotum, the pair of tubercles on this segment and the two pairs of tubercles on the mesonotum are somewhat larger and more acute and the lateral marginations of the gaster are more pronounced, as are also the three broad longitudinal depressions near its base on the dorsal side.

The pilosity and pubescence are decidedly more abundant than in *impexus*. The former is longer and more completely covers the integument, the latter is also longer and more conspicuous, especially on the dorsal surface of the body. The hairs are blackish at the base, with long, slender, flexuous, pale grayish or yellowish tips. The color of the body and appendages in mature specimens is rich ferruginous brown, with somewhat darker mandibles.

Female.—Length 5–5.5 mm.; wings 6.3 mm.

Similar to the worker. Backward extensions of the frontal carinæ and of the carinæ of the cheeks more acute, so that the antennal scrobes are more strongly developed. Mandibles coarsely striatopunctate. Pronotum with a blunt tubercle on each side, the inferior angles not very distinct. Mesonotum subrectangular, slightly longer than broad, flattened above, with a feeble Y-shaped impression. Scutellum less than twice as broad as long, bluntly bidentate behind. Epinotum declivous, with a pair of blunt longitudinal ridges terminating in blunt teeth. Petiole and postpetiole each with a pair of blunt longitudinal ridges above. The large first gastric segment is broader behind than in front, with straight sides, which are marginate; the three longitudinal impressions on the dorsal surface somewhat more distinct than in the worker.

Pilosity and especially the pubescence even longer than in the worker. Color darker, more brown and less reddish. Wings rather strongly and uniformly infuscated; veins and pterostigma pale, but very narrowly outlined with blackish.

Male.—Length nearly 3 mm.

Head, including the eyes, as long as broad, somewhat narrowed behind, with straight posterior border and rounded posterior corners. Eyes rather large and convex, the ocelli small and

widely separated. Mandibles well-developed but narrow, their long apical borders finely denticulate. Antennæ slender, the scapes extending well beyond the posterior border of the head. Thorax large, the mesonotum convex anteriorly, with distinct Mayrian furrows. Scutellum trapezoidal, nearly as long as broad, feebly impressed in the middle, with entire posterior border. Petiole and postpetiole similar to those of the worker but the former more pedunculate anteriorly. Gaster small, oval; legs long and slender, the femora feebly bent.

Surface of the body smoother than in the worker and female, the mandibles and gaster somewhat shining, the remainder of the body subopaque.

Pilosity and pubescence very short and meager, only the sides of the petiole and postpetiole with tufts of hairs like those of the worker and female. Antennæ and legs destitute of hairs, with fine, indistinct pubescence.

Brownish yellow, head, a spot on the posterior portion of the mesonotum and a line on each side of it, brown. Wings colored as in the female.

Described from numerous workers, five females and a male taken on Barro Colorado Island, C. Z. during late July and early August.

This form is so close to *S. impexus* of British Guiana that it might be regarded as a subspecies. I have given it specific rank, however, because it now appears that there are several forms—*impexus* Wheeler, *urichi* Forel, *diego* Forel, *morierai* Santschi, *lutzi* Wheeler, *zacapanus* Wheeler, *opacus* Mayr, *pusillus* Forel and *aztecus* Forel—which are so closely related that they may be merely geographical races, or subspecies of one or a few highly variable species. At present our knowledge of these various forms and of their phases is so meager that it seems best to regard them as specifically distinct.

Megalomyrmex (*Cepobroticus* Subgen. nov) *symmetochus* sp. nov.

(Fig. 5.)

Worker.—Length 3–3.5 mm.

Head subrectangular, very slightly narrower behind than in front, with straight posterior and very feebly convex lateral

borders; the posterior corners rounded. Eyes small, feebly convex, at the middle of the sides. Minute ocelli sometimes present in large workers. Clypeus convex, its anterior border broadly and evenly rounded. Frontal carinæ short, parallel; frontal area indistinct, convex in the middle. Mandibles rather narrow and not very convex, 7-8 toothed, the apical tooth longer

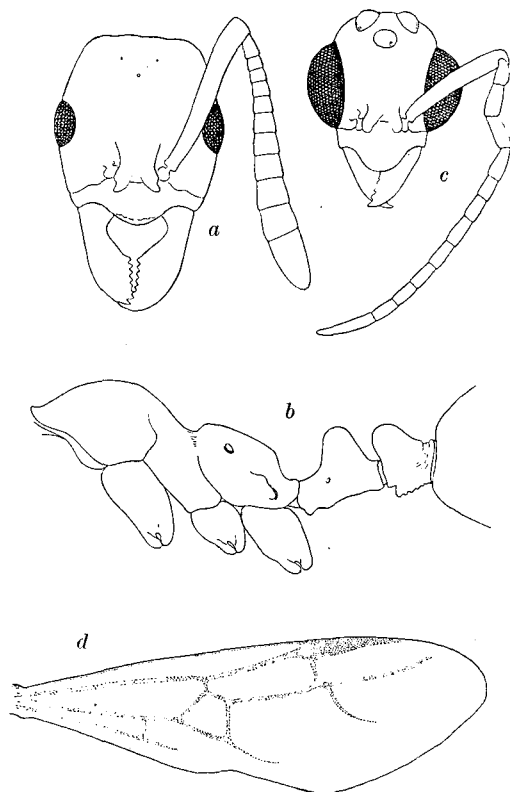


FIG. 5. *Megalomyrmex (Cepobroticus) symmetochus* sp. nov. a, head of worker, dorsal aspect; b, thorax and pedicel of same, lateral aspect; c, head of male, dorsal aspect; d, fore wing of female.

than the others which are subequal, the most basal forming the angle between the basal and apical borders. Maxillary palpi 3-jointed; labial palpi 2-jointed. Antennæ robust, the scapes extending less than one third their length beyond the posterior corners of the head; funiculi thickened apically, but not forming

a distinct club; all the joints except the first and last broader than long; joints 2-4 transverse, nearly twice as broad as long. Thorax slender, narrower than the head; the pro- and mesonotum forming an even convexity above, without promesonotal suture; the mesoëpinotal impression distinct but shallow; the epinotum in profile rising steeply for a short distance in front, then becoming straight and horizontal in the middle and gradually passing into the short sloping declivity; the metasternal angles rather large, lamellate and rounded. Seen from above the epinotum has a ridge on each side, bounding a large median longitudinal impression for the accomodation of the petiole. The latter is nearly as high as long, the peduncle shorter than the node, which rises rather abruptly in front and is rounded above, with a posterior slope like the anterior. Seen from above the node is somewhat broader than long. The ventral surface of the peduncle bears a small, blunt tooth anteriorly. Postpetiole lower than the petiole and about half again as broad, with bluntly subangular sides, the node very convex above and inclined somewhat forward. There is a small acute tooth at the anterior end on the ventral side. Gaster elliptical, its anterior border feebly excavated. Legs rather slender.

Mandibles subopaque, densely striated; remainder of body very smooth and shining, with minute, sparse, piligerous punctures. Cheeks, mesopleuræ and sides of epinotum longitudinally rugulose.

Hairs long, erect or suberect, golden yellow, somewhat bristly and rather abundant on the body, legs and antennæ; pubescence absent, except on the funiculi.

Yellowish red; mandibles, funiculi, the posterior half of the first segment of the gaster and the sutures of the thorax and pedicel, brown; tip of gaster yellowish.

Female.—Length nearly 4 mm.

Very similar to the worker, with larger eyes and distinct ocelli. Thorax as broad as the head through the eyes, the mesonotum convex and rounded above, subhexagonal, as broad as long. Epinotum sloping, without distinct base and declivity. Gaster as in the worker. Wings with a distinct discoidal cell, a single elongate cubital cell and the submarginal cell open at the tip.

Sculpture, pilosity and color as in the worker. Each ocellus with a black margin internally. Wings yellowish hyaline, iridescent, with pale yellow veins and pterostigma; their membranes distinctly pubescent.

Male.—Length nearly 3 mm.

Head without the eyes longer than broad, with rounded posterior corners and somewhat convex posterior border. Eyes and ocelli very large. Anterior border of clypeus produced and rounded. Mandibles well-developed, with triangular denticulate blades. Antennæ slender; scapes nearly as long as in the worker; first funicular joint small, as broad as long, remaining joints, except the last, subequal, twice as long as broad, terminal joint somewhat longer. Thorax resembling that of the female. Petiolar node much lower than in the worker and female. Gaster elliptical, not excavated at the base. Legs very slender.

Sculpture very similar to that of the worker and female, but the sides of the thorax are smooth.

Pilosity also similar, but the wings with longer pubescence than in the female.

Brownish yellow, gaster a little darker, antennæ and legs slightly paler; eyes and a spot along the inner border of each ocellus black.

Described from numerous workers and females and two males taken from several colonies living in the fungus gardens of *Sericomyrmex amabilis* on Barro Colorado Island, C. Z.

I have made this ant the type of a new subgenus largely on account of the dentition of the mandibles and structure of the antennal funiculus. One unfamiliar with the smaller species of *Megalomyrmex*, especially those of the subgenus *Wheelerimyrmex* would be inclined to regard the new species as a *Monomorium*, mainly because the stature is so small, the mesoëpinotal constriction so feeble and the lateral ridges of the epinotum are so poorly developed as compared with other species of *Megalomyrmex*, but I believe that there can be no doubt concerning the natural affinities of the insect. Emery states (1921) that there is no discoidal cell in the fore wing of *Megalomyrmex*, but I have found it present in all the species I have examined. Apparently this cell may be either present or absent in the species of *Monomorium*.

Pheidole (Hendecapheidole) mendicula sp. nov. (Fig. 6.)

Soldier.—Length 1.3 mm.

Head very large, subrectangular, rather convex above, about $\frac{1}{5}$ longer than broad, as broad in front as behind, with nearly straight, subparallel sides and the posterior border rather deeply and semicircularly excised in the middle. The occipital and frontal grooves are rather shallow. Eyes small, convex, sub-

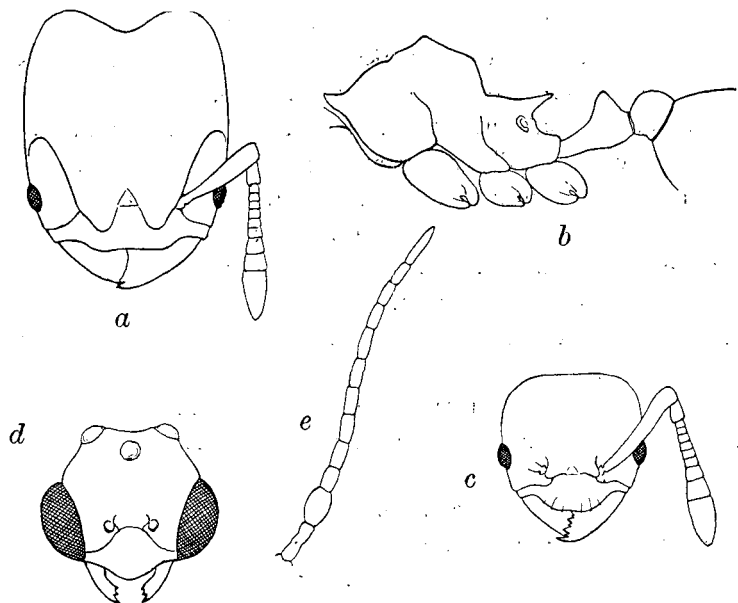


FIG. 6. *Pheidole (Hendecapheidole) mendicula* sp. nov. a, head of soldier, dorsal aspect; b, thorax and pedicel of same, in profile; c, head of worker, dorsal aspect; d, head of male; e, antenna of same.

triangular. Mandibles not very convex, with rather straight external borders and two large apical teeth. Clypeus somewhat flattened, its anterior border straight and entire in the middle, sinuate on each side. Frontal area small and indistinct; frontal carinae rapidly diverging, half as long as the head and forming sharp inner borders to rather deep scrobes for the accommodation of the antennae, which are small. Scapes reaching to the middle of the sides of the head, the club as long as the remainder of the funiculus; joints 2-7 of the latter small and transverse. Thorax

short and robust, the pro- and mesonotum forming a mass which is very convex and subangulate above in profile, the posterior surface of the mesonotum descending perpendicularly to the pronounced mesoëpinotal constriction. From above the mesonotum is semicircular in front, with rather prominent humeri, behind which the sides are straight and converge to the mesoëpinotal constriction. Epinotum as long as broad, much lower than the promesonotum, with subequal base and declivity and two backwardly directed spines which are slightly longer than the width of their bases and nearly as long as the base of the epinotum. Petiole small, about $1\frac{1}{2}$ times as long as broad, the peduncle distinct and parallel-sided, the node strongly compressed antero-posteriorly, with abrupt anterior and more sloping posterior surface and entire, distinctly transverse superior border. Postpetiole nearly half again as broad as the petiole; transversely elliptical, convex and rounded above and on the sides. Gaster smaller than the head, elongate-elliptical, with slightly concave anterior border. Femora and tibiæ distinctly thickened and clavate.

Shining; mandibles and clypeus smooth and very sparsely and finely punctate. Remainder of head densely punctate and transversely rugulose, the rugules most distinct on the front. Thorax and petiole densely and finely punctate, somewhat more coarsely on the promesonotum. Postpetiole and gaster very smooth and shining, the latter with a small punctate area near the insertion of the postpetiole.

Hairs yellowish, rather long and coarse, erect or suberect, moderately numerous, longest on the abdomen, sparser and somewhat shorter on the legs.

Brownish black, mandibles, sides of clypeus, antennæ and legs piceous; tarsi brownish yellow.

Worker.—Length 1 mm.

Head as broad as long, subrectangular, with distinct but rounded posterior corners, nearly straight posterior border and feebly convex sides. Mandibles with 7 small teeth, the second, fourth and sixth from the apex very minute. Clypeal border with four or five minute denticles which are the anterior terminations of longitudinal rugules. Eyes moderately convex, as long

as their distance from the anterior border of the head. Frontal carinae very short. There are no scrobes. Antennal scapes reaching to the posterior corners of the head. Thorax shaped much as in the soldier but the promesonotal mass is smaller and the humeral angles are less prominent, though the mesonotum is distinctly angular, with perpendicularly descending posterior surface. The epinotal spines are well developed but more erect than in the soldier. Postpetiole transversely rectangular, nearly $1\frac{1}{2}$ times as broad as long and less than half again as broad as the petiole, which is similar to that of the soldier. Gaster truncated anteriorly. Legs as in the soldier.

In sculpture, pilosity and color very similar to the soldier, except that the head is merely densely and evenly punctate. The tips of the mandibles and the funiculi are paler and more brownish yellow in some specimens.

Male.—Length nearly 2 mm.

Slender; head, including the eyes, as long as broad, narrowed behind, with straight sides and concave posterior border. Eyes and ocelli large. Mandibles and clypeus small, the former tridentate, the latter convex in the middle, with rounded anterior border. Antennæ 12-jointed; scape very small and slender, scarcely longer than the swollen, ovoidal first funicular joint; joints 2-6 about twice as long as broad; 7-10 somewhat longer, the terminal joint slender and elongate. The funiculus tapers gradually to its tip. Thorax broader than the head, the mesonotum large, convex in front, as broad as long. Epinotum convex, with subequal base and declivity, rounding into each other. Petiole slender, parallel-sided, with very low and indistinct node; postpetiole somewhat broader, campanulate, as long as broad. Gaster and legs slender.

Shining; head subopaque and very finely and densely punctate; pronotum also finely punctate but more shining.

Pilosity yellowish, similar to that of the soldier and worker but shorter, especially on the legs, where the hairs are also more reclinate.

Yellowish brown; dorsal surface of body darker; head black; mandibles, mouthparts, antennæ, legs, insertions of wings and genitalia, pale yellow. Wings hyaline, with colorless veins and pterostigma.

Described from two soldiers, numerous workers and two males taken from a colony that was nesting in the soil immediately around the fungus chamber of a *Sericomyrmex amabilis* nest on Barro Colorado Island, C. Z.

This is quite distinct from the two other known species of *Hendecapheidole*, *tachigaliæ* Wheeler and *emersoni* Wheeler. The soldier of *mendicula* can be at once distinguished from that of *tachigaliæ* by its dark color and the very different sculpture of the head, the worker by its color and much stouter epinotal spines. The soldier *emersoni* is unknown, but the worker is paler than that of *mendicula*, much less pilose, with less developed epinotal spines. The male *emersoni* has a broader and differently shaped head, stouter petiole; coarser sculpture, darker wings and 11- instead of 12-jointed antennæ. The types of *tachigaliæ* were found inhabiting the petiolar swellings of a myrmecophyte (*Tachigalia paniculata* Aublet), those of *emersoni* a small cell within a termite nest (see Wheeler, 1921, p. 148, and 1922, p. 4).

Oligomyrmex panamensis sp. nov. (Fig. 7.)

Soldier.—Length 1.3 mm.

Head large, rather flat, fully $1\frac{1}{3}$ times as long as broad, very slightly broader in front than behind, with straight, subparallel sides and deeply, semicircularly excised posterior border. A well-developed anterior ocellus is present. Eyes very small, situated about $\frac{1}{3}$ the distance from the anterior to the posterior corners of the head. In the specimen the right eye is larger and pigmented, the left very minute and colorless. Mandibles short and convex, with about five blunt teeth. Clypeus very short and abrupt, its anterior border bluntly bidentate, sinuately emarginate in the middle and on the sides. Frontal carinæ short but well-developed, rapidly diverging. Antennæ small and slender, 9-jointed; the scapes reaching the lateral border of the head at points two fifths the distance from its anterior to its posterior corners. The 2-jointed club is as long as the remainder of the funiculus, the terminal joint large and swollen, fully three times as long as the penultimate, which is distinctly longer than broad; joints 2-4 subequal, broader than long; 5-6 nearly as long as broad, the basal joint as long as 2-5 together. Thorax narrower

than the head, elongate, broadest through the pronotum, which in profile is rounded in front and straight and horizontal behind, where its outline is continued into the straight, horizontal outline of the mesonotum. There is no mesoepinotal constriction but there are very small though distinct scutellar and metanotal

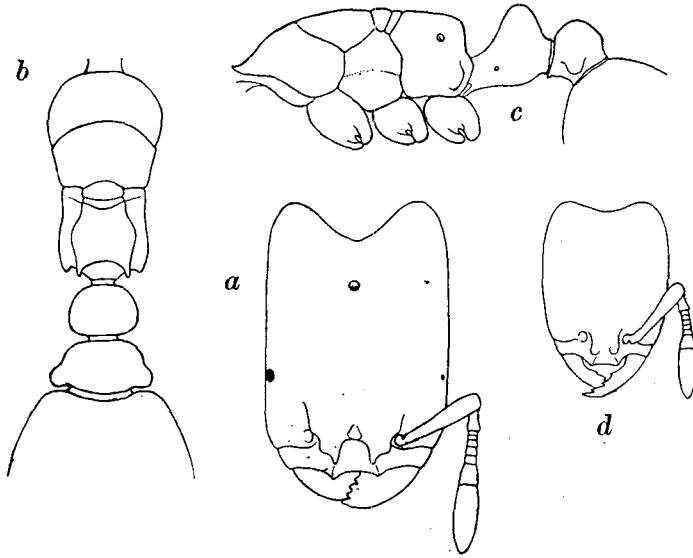


FIG. 7. *Oligomyrmex panamensis* sp. nov. *a*, head of soldier (or ergatoid?), dorsal aspect; *b*, thorax and pedicel of same, dorsal aspect; *c*, same, in profile; *d*, head of worker, dorsal aspect.

sclerites. The epinotum is subrectangular in profile, with an abrupt declivity shorter than the straight horizontal base. The angle on each side is formed by a ridge which is most distinct on the declivity. The surface between the two ridges is slightly concave. Petiole with a very short peduncle, which bears a strong, forwardly directed anteroventral tooth. The node is large and rounded, with rather steep, straight anterior and more abrupt, rounded posterior slope; from above it is transversely elliptical and nearly as long as broad. Postpetiole lower than the petiole, convex above; with a large, rounded tubercle on each side below and a minute anteroventral denticle. From above this segment is nearly $1\frac{1}{3}$ times as broad as the petiolar node and of a similar shape. Gaster about the size of the head, elliptical,

somewhat flattened, its basal border rather straight. Legs short and slender.

Mandibles somewhat shining, finely punctate. Head subopaque, densely, finely and evenly longitudinally rugulose, the rugules straight and feebly diverging from between the frontal carinæ to the posterior corners. Thorax, petiole and postpetiole also subopaque but the pro- and mesonotum, and especially the scutellum, more shining; the pronotum indistinctly and very finely longitudinally striate. Gaster shining, with rather numerous, minute, piligerous punctures.

Hairs yellowish, suberect, sparse, more numerous on the gaster, fine and subappressed on the appendages.

Ferruginous red; legs, funiculi, except the articulations, and gaster paler and more yellowish; borders of mandibles and clypeus brown or blackish.

Worker.—Length 0.9 mm.

Head shaped somewhat as in the soldier, but much smaller, with evenly convex sides and more feebly excised posterior border. Eyes and ocelli absent. Mandibles less convex, with oblique blades, bearing three large apical teeth and a small basal tooth. Clypeus resembling that of the soldier. Frontal carinæ very short. Antennæ 9-jointed, the scapes reaching to the middle of the sides of the head; the terminal joint of the club proportionally longer than in the soldier, joints 2–6 of the funiculus decidedly shorter and more transverse, fully twice as broad as long. The thorax lacks the scutellar and metanotal sclerites and has a small but distinct mesoëpinotal constriction. Epinotum small, with subequal base and declivity, the former slightly convex, the latter sloping, the angle between the two obtuse and rounded. Petiolar and postpetiolar nodes subequal, the latter nearly as long as broad, rounded on the sides, without tubercles. Gaster much smaller than the head, with somewhat concave anterior border.

Smooth and shining, with scattered piligerous punctures, which are most distinct on the head, especially on its sides.

Pilosity much as in the soldier but the hairs are decidedly shorter and of more uniform length. Clypeus with four stout bristles. Hairs on the front directed transversely, on the sides of the head forward.

Yellow; legs and antennal funiculi somewhat paler.

Described from single soldier and worker specimens found in the soil surrounding a fungus chamber of *Sericomyrmex amabilis* on Barro Colorado Island, C. Z.

This minute ant, the first *Oligomyrmex* to come to light in the New World, closely resembles its Old World cousins, except in the shape of the thorax in the soldier. The fact that the eyes on the two sides of the head are differently developed indicates that it is somewhat abnormal, and since the thorax is somewhat like that of a female in possessing scutellar and metanotal sclerites the specimen may prove to be an incomplete ergatoid or pseudogyne.

Tranopelta gilva Mayr var. *columbica* Forel.

A small colony of workers with larvæ of what I take to be this form, originally described as a variety of *T. heyeri* Forel, was found in the earth immediately surrounding a fungus-chamber of *Sericomyrmex amabilis* on Barro Colorado Island. It is obviously very close to the var. *albida* Mann of Matto Grosso, Brazil, but the eyes are even smaller. The mesoëpinotal impression is a trifle less pronounced, the color is whitish as in *albida* and the pilosity is the same. It is interesting to note that Forel found the types of *columbica* at the bottom of the nest of a fungus-grower *Mycocepurus smithi* Forel. Another colony, however, was taken by him "in a subterranean nest, beneath dried cow-dung."

Solenopsis conjurata sp. nov. (Fig. 8.)

Worker.—Length 1.4–1.5 mm.

Head subrectangular, distinctly longer than broad, with feebly convex sides and slightly concave posterior border. Eyes minute, consisting of 5 or 6 abortive but pigmented ommatidia, placed one-third the distance from the anterior to the posterior corners of the head. Mandibles narrow, with oblique 4-toothed apical borders. Clypeus with the two median teeth stout, acuminate and turned inward, the lateral teeth short, broad and blunt. Antennæ rather slender; scapes reaching the posterior fifth of the head; basal funicular joint as long as the three succeeding joints together; joints 2–7 subequal, distinctly broader than long; the 2-jointed club somewhat longer than the remainder of the

funiculus; the terminal joint fully three times as long as the penultimate, which is distinctly longer than broad. Thorax rather slender, the promesonotum longer than broad, somewhat depressed above, its outline in profile rather straight in the middle; mesoëpinotal constriction distinct but not very deep; epinotum small, as long as broad, in profile convex, rounded and sloping,

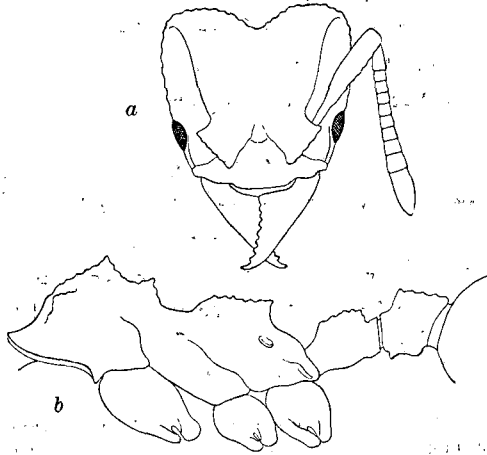


FIG. 8. *Solenopsis conjurata* sp. nov. a, head of worker, dorsal aspect; b, thorax and pedicel of same in profile.

without distinct base and declivity. Petiole small, the peduncle short, with a blunt anteroventral tooth, the node rather conical, rounded, as long as broad when seen from above. Postpetiole globular, a little broader than the petiolar node, somewhat broader than long. Gaster as large as the head, elliptical, with straight anterior border. Legs rather slender.

Smooth and shining throughout, with very fine, sparse, piligerous punctures.

Pilosity whitish, moderately long and abundant, erect on the body, more reclinate on the legs and scapes.

Uniformly pale yellow throughout, only the teeth of the mandibles reddish and the minute eyes black.

Described from numerous specimens belonging to a populous colony which was living in the earth surrounding a fungus chamber of *Sericomyrmex amabilis* on Barro Colorado Island, C. Z. These minute ants were kept for several days in an artificial

nest with the *Sericomyrmex* and their guest ants but though they mingled freely with the large ants remained quite unnoticed. It would seem therefore that *S. conjurata* may be a true thief-ant like many other species of the genus (*S. molesta* Say, *fugax* Latr., etc.).

I have described this Panamanian ant as new because it does not agree with any of the neotropical species of which I have seen specimens or descriptions. In Emery's key it runs down to *S. helena* Emery, but this species, judging from his figures, has a much more rectangular head and very different teeth on the clypeus.

Rhizomyrma sp.

A single pale yellow, dealated female, clearly referable to this difficult genus and measuring only 2.3 mm. was found in the same situation as the preceding species. It is very probably undescribed but it seems best not to give it a name till the conspecific worker comes to light.

Bibliography.

Emery, C.

- '15 Definizione del Genere *Aphænogaster* e partizione di esso in Sottogeneri. Parapheidole e Novomessor nm. gg. Rend. Accad. Sc. Ist. Bologna, 1915, 11 pp., 2 figs.
- '21 Myrmicinae in Wytsman's "Genera Insectorum," 1921, 397 pp., 7 pls.

Forel, A.

- '96 Zur Fauna und Lebensweise der Ameisen im columbischen Urwald. Mitth. schweiz. Ent. Gesell., 9, 1896, p. 401-410.
- '98 La Parabiose chez les Fourmis. Bull. Soc. Vaud Sc. Nat., 34, 1898, p. 380-384.
- '99-'00 Formicidæ in "Biologia Centrali-Americana." Hymen., 3, 1899-1900, 169 pp., 4 pls.
- '10 Glanures Myrmécologiques. Ann. Soc. Ent. Belg. 54, 1910, pp. 6-32.
- '11 Ameisen aus Ceylon. In Escherich's "Termitenleben auf Ceylon," 1911, pp. 215-228.
- '12 Formicides Néotropiques. Part 2. Mém. Soc. Ent. Belg., 19, 1912, pp. 179-209.

Gallardo, A.

- '16 Notes Systematiques et Éthologiques sur les Fourmis Attines de la République Argentine. Anal. Mus. Nac. Hist. Nat. Buenos Aires, 28, 1916, pp. 317-344, 3 figs.

Mann, W. M.

- '12 Parabiosis in Brazilian Ants. Psyche, 19, 1912, pp. 36-41.

Mann, W. M.

- '16 The Ants of Brazil. The Stanford Expedition to Brazil, 1911, John C. Branner, Director. Bull. Mus. Comp. Zool., 60, 1916, pp. 399-490, 7 pls.
- '22 Ants from Honduras and Guatemala. Proc. U. S. Nat. Mus., 61, 1922, p. 1-54, 22 figs.

Santschi, F.

- '17 Fourmis Nouvelles de la Colonie du Cap, du Natal et de Rhodesia. Ann. Soc. Ent. France, 85, (1916) 1917, pp. 279-296.
- '22 Description de Nouvelles Fourmis de L'Argentine et Pays Limitrophes. Anal. Soc. Cient. Argentina, 94, 1922, pp. 241-262, 1 fig.

Tanner, J. E.

- '92 *Oecodoma cephalotes*. The Parasol or Leaf-cutting Ant. Trinidad Field Naturalists' Club, 1, 1892, pp. 68, 69, 123, 127.

Urich, F. W.

- '95 Notes on the Fungus growing and eating habit of *Sericomyrmex opacus* Mayr. Trans. Ent. Soc. London, 1895, pp. 77-78.

Wasmann, E.

- '15 *Anergatides Kohli*, eine neue arbeiterlose Schmarotzerameise vom oberen Congo. Ent. Mitteil. Deutsch. Ent. Mus. Berlin, 4, 1915, pp. 279-288, 2 pls.

Wheeler, W. M.

- '07 The Fungus-Growing Ants of North America. Bull. Amer. Mus. Nat. Hist., 23, 1907, pp. 669-807, 5 pls., 31 text-figs.
- '13 Observations on the Central American Acacia Ants. Trans. 2d Ent. Congr. Oxford, (1912) 1913, pp. 109-139.
- '21a A New Case of Parabiosis and the "Ant Gardens" of British Guiana. Ecology, 2, 1921, pp. 89-103, 3 figs.
- '21b A Study of Some Social Beetles in British Guiana and of Their Relations to the Ant-plant *Tachigalia*. Zoologica, 3, 1921, pp. 35-183, 4 pls., 16 text-figs.

Wheeler, W. M.

- '22a A New Genus and Subgenus of Myrmicinae from Tropical America. Amer. Mus. Novitates, No. 46, 1922, pp. 1-6, 2 figs.
- '22b Neotropical Ants of the Genera *Carebara*, *Tranopelta* and *Tranopelloides*, new genus. Amer. Mus. Novitates, No. 48, 1922, pp. 1-14, 3 figs.
- '25(?) Neotropical Ants in the Collection of the Royal Museum of Stockholm. Part 1. Ark. Zool. (in press).