

the literature another account may seem entirely superfluous. However aside from the fact that its absence would occasion a rather conspicuous hiatus in a monograph of the genus, there are additional considerations which make its inclusion advisable. Chief among these is the fact that *geminata* is undergoing a rapid dissemination to new localities through the agency of modern commerce. There is always the temptation to give such immigrants varietal status and already two forms of questionable validity have been described from tropical Africa. This practice is in any case to be deplored, particularly when the species in question is as variable as *geminata*. It is hoped that the inclusion of a full description of the typical form may lead investigators to a more conservative view in the establishment of new varieties on the basis of "tramp" specimens.

Solenopsis (Solenopsis) geminata (Fabr.)

- S. geminata* (Fabricius), Syst. Piez., p. 423 (1804). ♀ (*Atta*).
Formica geminata, Roger, Berl. Ent. Zeitschr., Vol. 6, p. 289 (1862). ♀
 ♀ ♂
S. geminata, Forel, Mitt. Munchen, Ent. Ver., Vol. 5, p. 10 (1881). ♀ ♂
 Wheeler, Bull. Amer. Mus. Nat. Hist., Vol. 24, p. 424
 (1908). ♀
 Forel, Deutsche Ent. Zeitschr., p. 268 (1909).
S. geminata var. *nigra*, Forel, Bull. Soc. Vaud. Sci. Nat., Vol. 44, p. 45,
 (1908) ♀
 Forel, Deutsche Ent. Zeitschr., p. 268 (1909).
 Forel, Bull. Soc. Vaud. Sci. Nat., Vol. 49, p. 23
 (1913). ♀
S. mandibularis, Westwood, Ann. Mag. Nat. Hist., Vol. 6, p. 87 (1841). ♀
S. saevissima, Mayr, Verh. Zool.-bot. Ges. Wien., Vol. 12, p. 751 (1862). ♀
Myrmica virulens, Fred. Smith, Cat. Hym. Brit. Mus., Vol. 6, p. 132
 (1858).
Atta clypeata, Fred. Smith, *Ibid.*, Vol. 6, p. 169 (1858). ♀ ♂.
Diplorhoptum drewseini, Mayr, Europ. Formicid., p. 71 (1861). ♀
S. drewseini, Ern. Andre, Rev. Mag. Zool. (3), Vol. 2, p. 200 (1874). ♀
Myrmica glaber, Fred. Smith, Trans. Ent. Soc. Lond. (3), Vol. 1, p. 34
 (1862). ♀
Myrmica polita, Fred. Smith, *Ibid.*, Vol. 1, p. 34 (1862). ♀
Myrmica (Monomorium) saxicola, Buckley, Proc. Ent. Soc. Phil., Vol. 6,
 p. 341 (1866). ♀
Atta lincecumii, Buckley, *Ibid.*, Vol. 6, p. 344 (1866). ♀ ♂
Atta brazoënsis, Buckley, *Ibid.*, Vol. 6, p. 345, (1866). ♀
Atta coloradensis (part), Buckley, *Ibid.*, Vol. 6, p. 346, (1866). ♀

Worker major: Length 6 mm. (Plate I, fig. 1, 11.)

Head, exclusive of the mandibles, very slightly broader than long, the sides parallel from the insertion of the mandibles to the point where the occipital angles begin except for a slight impression just in front of the eyes. (Occiput divided into two lobes by a profound median impression.) At the bottom of this impression lies a prominent groove which extends across the frontal area to a point just behind the frontal lobes. Clypeus not projecting, its anterior edge slightly concave with a shallow, concave, impression between the carinal teeth. Carinal teeth very stout and moderately divergent. Lateral denticles much smaller and set close to the side of the carinal teeth. (Mandibles very thick and abruptly bent so that the apical half lies at right angles to the basal.) In some specimens the apex of the mandible is pointed and the inner margin bears two poorly defined teeth. Usually, however, the mandibles are toothless and in many cases the inner ends are rounded off to such an extent that the mandibles fail to meet when closed. The antennal scapes in repose reach two-thirds of the distance to the occiput; first funicular joint as long as the following two together, second funicular joint twice as long as broad, the remaining joints all longer than broad but gradually decreasing in length and increasing in thickness; club slender, about three-fourths as long as the remainder of the funiculus, the terminal joint very slightly less than twice as long as the penultimate. Eyes rather flat, composed of one hundred or more facets, their outline irregularly oval, their border delimited by a shallow groove. They are separated from the insertion of the mandibles by a distance twice as great as their maximum diameter.

Thorax with a well-defined pro-mesonotal suture. In profile the pronotum slopes sharply forward from the suture in a straight line, the mesonotum is much longer and feebly convex throughout except at the posterior end where it passes by means of a short, rather steep declivity to the deep, slot-like mesoepinotal suture. The epinotum in profile is very angular with basal face somewhat longer than the declivious.

Node of the petiole in profile high and thin, the summit narrow, the posterior face virtually perpendicular, the anterior face sharply sloping forward and meeting the peduncle at a marked angle, the peduncle as long or slightly longer than the base of the node, rather thick with a ventral lamella but no ventral tooth. Post petiole in profile approximately four-fifths as high as the node of the petiole;

as long as high with the summit evenly convex and the anterior and posterior faces perpendicular. Seen from above both petiole and postpetiole are strongly transverse. The postpetiole is slightly wider and irregularly oval in outline. The base of the abdomen is truncate and bears a concave impression at its point of junction with the postpetiole.

Punctures coarse and numerous, those on the head, particularly on the occiput and mandibles, often elongate. Hairs golden, stout and erect; short on the frontal area, occiput and antennal scapes, longer on the mandibles, thorax, petiolar nodes and abdomen, very long on the anterior edge of the clypeus. Mandibles and summits of the petiolar nodes with a few coarse, scattered striae. Area between the eye and the insertion of the mandibles, pleurae and the entire epinotum with numerous fine irregular striae. Base of the petiolar nodes rugulose. Other parts of the insect strongly shining.

The color is highly variable. The only constant feature is the piceous coloration of the mandibles and the anterior border of the head. In other regards the insect shows a range of color which extends from brownish yellow specimens in which the gastric segments are bordered with light brown bands to individuals having a sooty, brownish coloration with the abdomen and occiput piceous.

Worker minor: Length 2.4 mm. (Plate I, figs. 6, 10, 12.)

Head, exclusive of the mandibles, slightly longer than broad, the sides feebly convex and gradually narrowing from the eyes to the occiput, the latter flat. Clypeus moderately projecting, the carinal teeth relatively longer and thinner than the major worker, the lateral denticles relatively larger and less closely approximated to the carinal teeth. Mandibles gradually curved, their masticatory border with four large teeth. The antennal scape in repose surpasses the occipital border by less than its own thickness. First funicular joint as long as the following two together, second joint slightly less than twice as long as broad, the remaining joints gradually increasing in thickness but not decreasing in length; club relatively stouter than in the major worker, the terminal joint a trifle more than twice as long as the penultimate. Eyes oval, of about thirty facets, separated from the insertion of the mandible by a distance one and one-half times as great as their maximum diameter.

Promesonotal suture absent. Promesonotum in profile evenly convex throughout, descending to the mesoepinotal suture through a

short and abrupt declivity. Mesoepinotal impression relatively feebler than in the major worker but still strong. Basal and declivious faces of the epinotum not sharply separated, the profile appearing as a somewhat irregular curve.

Node of the petiole in profile relatively lower, thicker and blunter than the major worker, the posterior face slightly inclined forward, the angle at which the anterior face meets the peduncle less clearly defined, the peduncle relatively longer and thinner and without ventral lamella or tooth. Postpetiole in profile approximately three-fourths as high as the node of the petiole, its anterior face slightly inclined backwards, the summit strongly convex, the posterior face strongly inclined forward. Seen from above the nodes are much less transverse than in the major worker. The postpetiole is scarcely wider than the node of the petiole and oval in outline. The first gastric segment is truncate at the base but lacks the concave impression at the base of the postpetiole.

Punctures fine and rather sparse, the long, erect, yellow hairs which they bear of equal length on head, thorax and abdomen, those on the appendages shorter and somewhat more appressed. Mandibles longitudinally striate, pleurae and base of the epinotum striato-rugulose, base of the petiolar nodes rugulose, for the rest smooth and shining. The color varies from a clear yellowish brown with the abdomen and often the petiolar nodes piceous brown to a uniform piceous brown. The appendages and mandibles are in all cases of a lighter color than the rest of the insect.

Female: Length 7.5–8 mm. (Plate I, fig. 5.)

Head, exclusive of the mandibles, one-sixth broader than long, quadrate, a little wider behind the eyes than in front of them, the sides very feebly convex from the eyes to the occipital angles, straight or nearly straight in front of the eyes and meeting the anterior border of the head at a sharp angle. Occipital angles well-marked, the occiput flat with a narrow and shallow median impression, occipital furrow clearly defined, frontal furrow short, clearly marked only for about half the distance from the median ocellus to the base of the frontal lobes, thereafter becoming shallow and indistinct. Ocelli large and prominent. Clypeus feebly projecting, carinal teeth very stout and rather blunt, the edge of the clypeus between them with a shallow concave impression; lateral denticles small, often poorly defined and in some cases represented only by a sinuosity in the

edge of the clypeus. Mandibles strongly bent but less so than in the major worker, the masticatory border with three large teeth and usually the rudiment of a fourth. Eyes large, strongly convex, irregularly oval in outline, their posterior border reaching a point half way between the occiput and the anterior border of the head. The antennal scape in repose just reaches the lateral ocellus. Funicular joints and club as in the major worker.

Thorax robust, elliptical, its maximum width three-fifths of its length, only slightly narrower than the head (the eyes excluded). Seen in profile the mesonotum shows a straight posterior half and a convex anterior portion which overhangs the pronotum. Scutellum as high as the mesonotum, slightly convex with a short, perpendicular posterior face. Angle of the epinotum well-defined but very obtuse, the basal and declivous faces of about equal length. Mesosternum large and subglobose beneath.

Petiolar nodes very similar to those of the major worker except that the peduncle is thicker, the node of the petiole slightly lower and the postpetiole bears on either side an obtuse, somewhat conical, ventral projection with a small opening at its summit (this condition is sometimes found in the major worker but in that caste the conical projection is usually absent and the opening occurs as a small tubercle on the side of the node). Seen from above the nodes are very strongly transverse and of approximately equal width. Abdomen as in the major worker. Wings hyaline with yellow veins.

Punctures smaller and less numerous than in the major worker. Somewhat larger on the head than on the thorax and abdomen. Body hairs long, golden and erect, somewhat longer on the head than elsewhere, longest on the anterior edge of the clypeus. Mandibles with a few coarse, indistinct striae, epinotum almost completely covered with fine wavy striae, petiolar nodes, except their summits which are shining, striato-rugulose. For the rest smooth and shining. The color varies from a clear yellowish brown with the front of the head, the mesosternum and the appendages paler and the mandibles and the posterior half of the abdomen castaneous, to a deep castaneous brown with only the extreme anterior portion of the head yellowish brown.

Male: Length 5.8 mm. (Plate I, fig. 4.)

Head trapezoidal, its maximum width (including the eyes) approximately one-fourth greater than its length. Eyes very large, strongly

convex and oval in outline, occupying more than one-half the side of the head, their anterior border reaching the insertion of the mandible. Ocelli very large and prominent, the lateral ocelli which mark the boundary of the occiput with a shallow concave impression between them. Anterior edge of the clypeus approximately straight; seen from the side the clypeus shows a blunt, beak-like central lobe. Mandibles small, linear, bidentate. Antennal scape about one and one-half times as long as broad, roughly cylindrical; first funicular joint subglobose, broader than the scape or the following joint; second funicular joint more than twice as long as broad, third joint one and one-half times as long as broad, the remaining joints all more than twice as long as broad and progressively decreasing in width.

Thorax bulky, elliptical, its greatest width two-thirds of its length, only slightly less than twice as wide as the head (eyes included). Seen from the side the anterior part of the mesonotum is greatly swollen and overhangs the pronotum which is so much displaced that the head of the insect appears to be attached to the ventral surface of the thorax. Epinotum rather rounded, the basal face strongly convex transversely and slightly convex longitudinally, declivious face flat and virtually perpendicular. Node of the petiole in profile low but with an acute summit, the anterior face not sharply separated from the thick peduncle, the posterior face perpendicular. Seen from behind the summit of the node shows a broad, shallow median impression. Postpetiole in profile as high as the node of the petiole, about one and one-half times as high as long with a long, backward-sloping anterior face, a rounded summit and a very declivious posterior face. The conical lateral projections are even stronger than in the female. Seen from above both nodes are very transverse, the postpetiole is approximately three times as broad as long and one-sixth wider than the node of the petiole. First gastric segment truncate at the base but not impressed. Wings hyaline, the veins clear yellow.

Punctures fine and fairly numerous, the hairs which they bear long, thin, golden, erect or suberect and of uniform length over the body, those on the legs shorter and stiffer; antennae without long hairs but clothed with a dense short pubescence. Base of the epinotum, area between the eye and the insertion of the antenna and the area between the ocelli striato-granulate. Base of the petiolar nodes granulate. For the rest smooth and shining. Color yellowish brown to piceous brown, the antennae and legs pale yellow.

To present a list of the localities in which *geminata* has been taken

would require several pages. Its distribution may be summarized as uniform throughout the West Indies and on the Continent from Florida to Costa Rica. In the eastern Gulf States its range extends inland only about a hundred to a hundred and fifty miles and this also appears to be true for the greater part of Texas. From Mexico southward, however, the distribution is from coast to coast.

The habits of this species have been so often described that only the briefest comment is necessary here. In general *geminata* prefers to nest in open fields or sunny glades, avoiding the shade of deep woods. The nests are usually irregular, sandy craters of loose construction but sometimes rotten stumps are utilized as nesting sites. The ferocity of this ant is proverbial, for the activity of the workers when disturbed never fails to attract attention, however callous the observer. For a good description of the habits of *geminata* the reader is referred to Forel's account published in 1881 (see synonymy) or to the observations of H. H. Smith quoted by Forel in his *Formicides de l'Antille St. Vincent* (Trans. Ent. Soc. Lond. p. 396, 1893).

***Solenopsis (Solenopsis) geminata* subsp. *galapageia* Wheeler.**

S. geminata var. *galapageia*, Wheeler, Proc. Cal. Acad. of Sci., Vol. II, p. 272 (1919). ♂ ♀

Aside from its smaller size there is little to distinguish the worker of *galapageia* from that of the typical *geminata*. Such a distinction in the case of a polymorphic ant is quite valueless unless it is accompanied by a similar difference in the female. Not only is the female of *galapageia* decidedly smaller (6–6.5 mm.) but it also shows certain structural variations which lead me to believe that this form should have subspecific rank. The frontal furrow is much more prominent and is clearly marked to the base of the frontal lobes. In the typical *geminata* this furrow is poorly defined, in some specimens virtually absent, in the anterior half of the head. The summit of the petiole in *galapageia*, when seen from behind, shows a very distinct, obtuse, median notch. I have been able to find a transition to this condition in two *geminata* females from Jamaica but in both of these the notch is poorly indicated. In all other females which I examined, both of the typical form and also of the subspecies *medusa* and *rufa*, the summit of the petiolar node is entire and slightly convex. The color of the female of *galapageia* is a clear castaneous brown with the front of the head, the antennae, tibiae and tarsi yellow. The mandibles are castaneous with piceous teeth and the femora are castaneous with

their bases and apices tipped with yellow. Male unknown. The subspecies is known only from type material. Type locality: Charles Island, Galapagos Is. (F. X. Williams.)

Solenopsis (Solenopsis) geminata subsp. **rufa** (Jerdon.)

(Plate I, figs. 7, 8.)

- S. geminata* subsp. *rufa* (Jerdon) Madras, Jour. Litt. Sci., Vol. 17, p. 106 (1851). ♀ (Atta.)
S. geminata, Mayr, Tijdschr. v. Ent. Vol. 10, p. 109 (1867). ♀ ♀ ♂
S. geminata, Emery, Bull. Soc. Ent. Ital., Vol. 23, p. 166 (1892).
S. geminata st. *rufa*, Forel, Jour. Bombay Nat. Hist. Soc., Vol. 14, p. 689 (1902). ♀
S. geminata var. *rufa*, Wheeler, Bull. Amer. Mus. Nat. Hist., Vol. 23, p. 272 (1907). ♀
S. geminata var. *rufa*, Forel, Deutsche Ent. Zeitschr., p. 268 (1909).
S. geminata var. *rufa*, Bingham, Fauna Brit. India, Hym, Vol. 2, p. 158 (1903). ♀ ♀ ♂
S. geminata var. *diabola*, Wheeler, Bull. Amer. Nat. Hist. Vol. 24, p. 424 (1908). ♀
S. geminata var. *diabola*, Forel, Deutsche Ent. Zeitschr. p. 268 (1909).
S. cephalotes, F. Smith, Jour. Proc. Linn. Soc. Lond. Zool., Vol. 3, p. 149, (1858). ♀
Crematogaster laboriosus, F. Smith, *ibid.*, Vol. 4, suppl., p. 109, (1860). ♀

As has been pointed out in the introduction the worker of the subspecies *rufa* is characterized by the presence of a mesosternal spine or projection. In addition they can generally be distinguished by their lighter color which is a clear, reddish yellow with the abdominal segments cleanly and narrowly bordered with brown. The mandibles are usually darker, particularly in the major workers, where they are often piceous red. In some specimens the occiput and pronotum are tinged with brown.

Aside from its lighter coloration, which is like that of the worker, I can see no difference between the female of *rufa* and that of the typical *geminata*. The males are indistinguishable.

In view of the close similarity of the sexual forms it would seem that *rufa* is scarcely more than a variety of *geminata*. However, in order to eliminate the possibility of confusion and to reduce taxonomic juggling to a minimum it seems preferable to let matters stand as they are. My reasons for synonymizing *diabola* with *rufa* have been fully discussed in the introduction and need not be repeated here. The following list comprises the New World locality records of *rufa*.

- United States: Florida, Miami. (W. M. Wheeler.)
 Biscayne Bay. (No collector.)
 Alabama, Mobile. (H. P. Löding.)
 Georgia, Spring Creek. (Bradley.)
 Okeefinokee Swamp. (Bradley.)
 Mississippi, Tupelo. (M. R. Smith.)
 Louisiana, Lake Charles. (La. Exp. Sta.)
 Cameron, (La. Exp. Sta.)
 Texas, Huntsville. (W. M. Wheeler.)
 Austin. (W. M. Wheeler.)
 Dallas. (W. D. Hunter.)
 Granite Mts. (W. H. Long.)
 Montopolis. (W. M. Wheeler.)
 Langtry. (W. M. Wheeler.)
 Paris. (Rucker.)
 New Mexico, Almagordo. (von Krockow.)
 Mexico: Vera Cruz, San Francisco. (Petrunkevitch.)
 Jalapa. (No collector.)
 Cordoba. (Mann & Skewes.)
 Morelos, Cuernavaca. (No collector.)
 Jalisco, Guadalajara. (Mc. Clendon.)
 Yucatan, Merida. (W. M. Mann.)
 British Honduras: Manatee, (J. D. Johnson.)
 Guatemala: Quirigua. (W. M. Wheeler.)
 Puertos Barrios. (W. M. Wheeler.)
 Zacapa. (W. M. Wheeler.)

***Solenopsis (Solenopsis) geminata* subsp. *eduardi* (Forel.)**

(Pl. I, figs. 2, 9.)

S. eduardi, Forel, Mem. Soc. Ent. Belg., Vol. 20, p. 12 (1912).

Santschi, Ann. Soc. Ent. Belg., Vol. 64, p. 13, (1924).

S. eduardi var. *perversa*, Santschi, Ann. Soc. Ent. Belg., Vol. 64, p. 13 (1924).

The subspecies *eduardi* may readily be distinguished from all the other forms of *geminata* by the longitudinally grooved and bordered epinotum of the minor worker. The sculpture of the sides of the epinotum and mesonotum is unusually strong, rugose and densely reticulate. The transverse rugae are well marked on both basal and declivous faces. The bordering is rather thick and, when seen from above, appears to diverge posteriorly. In the majors the epinotum

is deeply grooved and densely sculptured but as this is also true to a lesser degree in the majors of the typical *geminata* the difference is not particularly striking in this caste. The shape of the head in the largest workers of *eduardi* is intermediate between that of the typical *geminata* and the subspecies *medusa*. The sides are only slightly narrowed toward the occiput and the genae, while considerably more expanded than in the typical *geminata*, are less so than in the subspecies *medusa*. The color of *eduardi* is extraordinarily variable. A number of the specimens collected by Dr. Salt have a coloration as light as that of *rufa*, while another series from a locality only a few miles distant are deep piceous brown. It is because of this fluctuation in color that I cannot see the justification for Santschi's variety *perversa*, which was established principally because of the black color of the head of the worker. I have not seen the female of *eduardi* but the insect described by Santschi seems very similar to that of the subspecies *medusa*. The antennal scapes are shorter than in the female of the typical *geminata*. The thorax is said to be higher than that of *geminata* with the mesonotum overhanging the pronotum, a character not shown by the other forms. The male of *eduardi* is unknown.

There is no need to repeat here my reasons for reducing *eduardi* to a subspecies of *geminata*. A full explanation may be found on page 57 of the introduction to *geminata*.

Localities: Colombia, Magdalena, Rio Frio. (Type loc.) (A. Forel, George Salt, P. J. Darlington.)
 Venezuela, Frines. (No collector.)
 Brazil, Pernambuco, Tapera. (R. P. Wassermann.)

***Solenopsis (Solenopsis) geminata* subsp. *medusa* Mann.**

(Plate I, fig. 3.)

S. geminata subsp. *medusa*, Mann, Bull. Mus. Comp. Zool. Harvard, Vol. 60, p. 447, pl. 4, fig. 31 (1916). ♀

S. eduardi var. *bahiaensis*, Santschi, Bull. Soc. Ent. Belg., Vol. 65, p. 236 (1925). ♀

In the major worker of the subspecies *medusa* the narrowing of the posterior portion of the head and the expansion of the genae reach extreme conditions. The head is one and one-third times as wide at the genae as at the occiput. This permits an easy separation from the typical *geminata* and there is usually little difficulty in distinguishing the majors of *medusa* from those of the subspecies *eduardi* al-

though in this case the difference is less pronounced. However since the minor worker of *medusa* does not have the grooved and sculptured epinotum characteristic of *eduardi* the two forms may be separated more readily by this character.

The female of *medusa* is very similar in structure to that of the typical *geminata*. It does not have the expanded genae or narrowed occiput of the major worker. There are, however, two characters which permit accurate identification. The antennal scape of the female of *medusa* is shorter than that of *geminata*, failing to reach the lateral ocellus by a distance equal to its greatest thickness. The transverse rugae on the basal face of the epinotum are very strong. In the typical *geminata* they are feeble and often entirely obliterated in the anterior half of the basal face. The male of *medusa* is unknown.

The color of *medusa* is less variable than in some of the other forms of *geminata*. As yet I have seen no completely light colored individuals although some of the specimens in the type series have a reddish brown area on the front of the head, the pronotum and the base of the gaster. The majority of the specimens I have examined are uniform piceous black in color. As has already been noted Santschi's *eduardi* var. *bahiaensis* must be synonymized with *medusa*. A comparison of the cotypes of this variety with those of *medusa* failed to show any differences by which the two could be separated.

Localities: Brazil, Ceara, Maranguape Mts. (Type loc.) (W. M. Mann.)

Bahia. (Bondar.)