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**TWO COMMON PONERINE ANTS OF POSSIBLE ECONOMIC
SIGNIFICANCE, *ECTATOMMA TUBERCULATUM* (OLIVIER)
AND *E. RUIDUM* ROGER**

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Generally speaking, ants of the subfamily Ponerinae are of little or no direct economic importance the world over, this rôle being furnished chiefly by members of the subfamilies Myrmicinae, Dolichoderinae and Formicinae. The worst stinging ants are ponerines and some have other interesting habits but most are inconspicuous and of neutral significance.

Over 40 years ago, however, the United States Department of Agriculture became concerned in a ponerine ant for introduction into the United States to combat pests of cotton. This ant, *Ectatomma tuberculatum* (Olivier), called the "kelep" by the Indians of Guatemala to whom it was well known, became the subject of an unfortunate controversy which has apparently caused it to be largely forgotten. The Department of Agriculture reports by O. F. Cook (1904-1905) were bitinglly criticized by W. M. Wheeler (1904-1905) and the resulting controversy in SCIENCE did not further continued investigation.

A closely related but smaller and darker species of *Ectatomma*, *ruidum* Roger, appears to have been completely ignored for its relations to cultivated plants, or even its general biology, but the records here given suggest that both species should be considered of possible significance to agriculture. The rôle is difficult to evaluate precisely but they often tend homopterous insects. Since they so commonly are found on plants, such as cotton and citrus, in the act of tending membracids or other harmful insects the ants are able to transport fungal and other pests as they go from plant to plant.

The present paper brings together the known citations of these two species and gives many additional locality records. The biology of both is described, including the hitherto unpublished biology of *ruidum*. These ants are far from uninteresting ponerines. They have dark brown to blackish eggs compared with the usual white of ant eggs and in *ruidum* the locomotion of the larvae was an unexpected habit. Both species

feed on extra-floral nectaries and both are carnivorous as well as membracid-tenders. They carry droplets of nectar in their mandibles and *ruidum* workers boldly robbed fungus-growing ants of papaya fruit. The first mermithergate of *ruidum* and the presence of *Microdon* in a nest are also described.

***Ectatomma tuberculatum* (Oliv.) (Figs. 8, 9)**

- 1791 *Formica tuberculata*, Olivier, Encycl. Méthod., Ins. 6:498 (w.)
 1802 *Formica tuberculata*, Latreille, Hist. Nat. des Fourmis, p. 210, t.8 figs. 46a, c (w. ♀)
 1804 *Formica tridentata*, Fabricius, Syst. Piez., p. 42 (w.)
 1836 *Ponera tuberculata*, Lepeletier, Hist. Nat. Ins. Hymén, 1:192 (w. ♀)
 1858 *Ectatomma tuberculatum*, Smith, Cat. Hymen., 6:102 (♀ ♂), t.7, figs. 10-13
 1860 *Ponera (Ectatomma) tuberculata*, Roger, Berl. ent. Zeitschr. p. 306
 1862 *Ectatomma tuberculatum*, Mayr, Verh. Zool-bot. Ges. Wien, 12:732
 1868 *Ectatomma ferrugiens*, Norton, Proc. Essex Institute, 6:5 (w. ♂), fig.; Amer. Nat., 2:61, t.2, fig. 4
 1890 *Ectatomma tuberculatum*, Emery, Bull. Soc. Ent. Ital., 22:40; Dalla Torre, Cat. Hymen. 7:26
 1890 *Ectatomma tuberculatum*, var. *punctigerum*, Emery, Mem. Ann. Soc. Ent. France, 10:55
 1896 *Ectatomma eruberculatum* (Sic), Emery, Boll. Mus. Zool. Anat. Univ. Torino, 11:1
 1899 *Ectatomma tuberculatum*, Forel, Biol. Centr.-Amer., Hymen. 3:5
 1904 Kelep ant, Cook, Science, 19:862-864 (♀), *loc. cit.*, 20:666-670 (w.)
 1904 Kelep ant, Cook, U.S. Dept. Agric., Bur. Ent., Bull. 49, pp. 1-15, (w. ♀)
 1904 *Ectatomma tuberculatum*, Cook, Science, 20:310-312 (w.), *loc. cit.*, 20:611-612 (w.); Wheeler, *loc. cit.*, 20:437-440, 20:766-768
 1905 Kelep ant, Cook, Science, 21:552-554
 1905 *Ectatomma tuberculatum*, Cook, U.S. Dept. Agric. Tech. Ser. 10, pp. 1-55 (w. ♀ ♂)
 1905 *Ectatomma tuberculatum*, Wheeler, Science, 21:706-710, *loc. cit.*, 23:348-350
 1906 *Ectatomma tuberculatum*, Cook, Science, 23:187-189; Wheeler, *loc. cit.*, 23:348-350
 1909 *Ectatomma tuberculatum*, ssp. *acrista*, Forel, Deutsche Ent. Zeitschr., p. 254 (w. ♀)
 1912 *Ectatomma tuberculatum*, Forel, Mém. Soc. neuchât. Sc. Nat., 5:9
 1916 *Ectatomma tuberculatum*, Wheeler, Bull. Amer. Mus. Nat. Hist., 35:2 (♀)
 1921 *Ectatomma tuberculatum*, v. *irregularis*, Santschi, Bull. Soc. Vaud. Sc. Nat. 54:83 (w.)
 1922 *Ectatomma tuberculatum*, Mann, Proc. U. S. Nat. Mus., 61:6 (w.)
 1924 *Ectatomma tuberculatum*, Wheeler, Jour. Hered., 15:147-165
 1925 *Ectatomma tuberculatum*, Wheeler, Ark. for Zool., 17:4 (w.)
 1929 *Ectatomma tuberculatum*, Forel, The Social World of the Ants Compared with that of Man. A. and C. Boni, New York, 2 vols.

w. = worker.

- 1930 *Ectatomma tuberculatum*, Wheeler, Psyche. 37:48-54, Fig. 1 (w.)
 1935 *Ectatomma tuberculatum*, Menozzi, Redia, 21:4 (w.)
 1936 *Ectatomma tuberculatum*, Wheeler, Proc. Amer. Acad. Arts Sc. 71:189
 1938 *Ectatomma tuberculatum*, Haskins, Ann. New York Acad. Sc., 37:97-162
 1942 *Ectatomma tuberculatum*, Wheeler, Bull. Mus. Comp. Zool., 90:24

DISTRIBUTION. Southern Mexico to Paraguay and Southern Brazil. Unpublished records from author's collection:

HONDURAS: Corocito, 3.iv.24 (J. Bequaert).

GUATEMALA: Pto. Barrios, 24.iv.24 (J. Bequaert).

PANAMA: Barro Colorado I., C.Z., 12,26.vi., 13.viii.38 (N. A. Weber).

COLOMBIA: Restrepo. Dept. Méta, 500 m., viii.36 (J. Bequaert).

VENEZUELA: Surukum, iii.42; Selvade de San Camilo, x.44 (P. Anduze); Orinoco Delta, Caño Orocaima of Caño Toro, 6.ii.35 (N. A. Weber).

TRINIDAD: Fyzabad, 12.i.24 (F. W. Urich); Botanical Gardens, Port of Spain, 10.v.35, Sta. Cruz, tending aphids on herb, 29.ix.34, Northern Range, 1500-1700 ft., 2.xii.34, Maracas Valley under cacao, 26,31.v.36, Spring Hill Est., 1200 ft. 6.iv.35, Aripo Valley, 1000-2500 ft., 19.iv.35, Morne La Croix, 750 ft., 7.iv.35, Piarco Savannah, 24.iii.35, Anandale Est., Cumana Bay, 18, 19.v.35, Tacarigua R., 18.xii.34, Turure R., 200-300 ft., 9.iv.35, by *Atta cephalotes* nest, Matura Bay, Mora forest. 26.xii.34, Mayaro Bay, 24.xi.34, Nariva Swamp, 5.xii.34, 10.iii.35, by *Atta cephalotes* nest, Guayaguare Bay, carrying a pupa, 22.xii.34, Galeota Pt., 23.xii.34, Rio Claro, under cacao, 11.iii.35, Guapo Bay, about buildings, 4.iv.35, Basin Hill For. Res., 700 ft., 1.iv.35, (N. A. Weber).

BRITISH GUIANA: Upper Essequibo R., 20.xi.35 (J. G. Myers 5733); Cuyuwini R., 15.xi.35 (J.G.M. 5631); Kamakusa (H. Lang); Kartabo Pt., 15.vi.36, Forest Settlement, Mazaruni R., virgin Greenheart forest, 23.viii.35, Oko R., Cuyuni trib., 20,23,25,26.vi.36, Courantyne R., Waricabra Falls, 10.vii.36, Courantyne R., above Wonotobo Falls, 14.vii.36, Oronoque R., 2°42', 25.vii., 2.viii.36 (N. A. Weber).

TAXONOMY. *E. tuberculatum* is a large, reddish brown ant with coarse sculpture, the latter being subject to considerable variation particularly on the gaster. For this reason several varieties have been established, *acrista* from Paraguay, *punctigerum* from Venezuela and *irregularis* from Colombia. Wheeler referred Trinidad and Northern Colombia specimens to the variety *punctigerum*. These forms are not separated here since there is a question on their validity.

In British Guiana I was impressed by the similarity in nests, ecology and habits between *tuberculatum* and *Paraponera clavata* Fabr., a large and fierce ponerine in a genus and tribe by itself. This similarity would suggest that the two tribes are closely related and is substantiated also by their morphology.¹ Both species here had a chimney entrance to the nest at the base of a tree. Workers of each would run up the tree when the nest was distributed, would scatter over the ground and would pursue one for a short distance. They also had similar habits in Panama. *Paraponera*, however, differs in being restricted to the probable primitive habitat, tropical rain forest, while the *Ectatomma* has become more versatile, being found in savannah, cultivations, etc.

Description of a worker from Barro Colorado Island, Canal Zone (Weber No. 865):

Length 11 mm., of head 3.4 mm., of thorax 4 mm. Head in front view with subparallel, feebly convex sides, occipital margin nearly straight, feebly convex, ending in tuberculate corners; anterior clypeal margin strongly convex; eyes large, 0.5 mm. in diameter, situated closer to the occipital margins than their diameters; antennal scapes 2.3 mm. long, exceeding occipital tubercles by nearly half their diameters; antennal segments longer than broad; mandibles slender, falcate, outer margin feebly sinuate. Thorax with three prominent tubercles anteriorly of which the lateral are slender and acute, the median lower and more a gibbosity; mesonotum evenly convex, meso-epinotal suture marked; epinotum evenly convex and with two teeth smaller than the pronotal tubercles. Node of petiole large, in side view anterior margin concave, posterior margin convex, the junction a rounded acute angle. Postpetiole feebly convex above, first gastric segment more strongly convex, the junction a deep suture on all sides.

Strongly sculptured, shining. Frons of head reticulate-striate, becoming longitudinally striate between antennal insertions and on the sides and under surface; mandibles finely striate. Thorax with concentric striations continuous on sides, front and dorsal surface of mesonotum, irregular between anterior tubercles. Basal surface of epinotum transversely vermiculate, striate on sides but running vertically or posteriorly. Anterior face of petiole mostly smooth, crest vermiculate-reticulate, posterior face striate. Upper surface of postpetiole striate, forming a whorl posteriorly as in the friction ridges of human finger, sides striate. Upper surface of the first gastric segment similar to postpetiole but more finely striate. Anterior coxae finely and regularly striate, median and hind coxae smoother.

Moderately pilose, the hairs attaining lengths up to a half-millimeter, a scanty pubescence on the appendages distally and on the tip of gaster. Light ferruginous brown, the dorsal surface somewhat darker.

¹The general habitus of the workers is similar, one of the most striking differences being that of the petiolar shape. The venation of the males is also essentially similar (Fig. 2 and 5). The male genitalia follow generally the same pattern although much larger in *Paraponera* than in *E. ruidum* or *tuberculatum* (Figs. 4, 7, 8, and 10). All have a prominent tooth to the volsellae.

This species is subject to considerable variation as indicated above and several varieties have been established. The tubercles vary in prominence and the sculpturing in depth. Some workers may have piligerous punctations on the gaster. Others may lack the whorl on the postpetiole and may be evenly striate transversely here. Some may vary in size, one worker being 4.4 mm. in thoracic length (the single best length for comparison). The validity of naming these is questionable.

BIOLOGY. Cook (1904-1905) was the first to make known the habits of *tuberculatum* and met a skeptical response for years because some of the habits differed from those known for other ponerines. He also mistakenly considered this insect to be unique and to represent a group with only superficial resemblances to the ant family. On a trip to eastern Guatemala in 1902 to study the culture of coffee and rubber for the United States Department of Agriculture the ants were commonly found to be associated with cotton. The association was apparently long known to the Indians who called the ant the "kelep." Where the ants were abundant the cotton was free from weevils. The ants were predatory on the weevil larvae and also visited the extra-floral nectaries of the cotton. Cook proposed to introduce colonies of these ants into the cotton fields of Texas and later did so.

Cook stated that the ants excavated a nest in the form of a tunnel one to three feet in the ground with three to six small chambers. A chimney extends up from the ground along the under side of the cotton plant stem from one to six inches. This is fibrous in nature. Wheeler overlooked this description when he figured the chimney in 1924 and stated that Cook "failed to mention" it. The queen with some of the eggs and younger larvae usually was in the lowest chamber while the pupae were in the upper and the remainder of the brood were in the intermediate chambers. The ants used one or more chambers for insect remains and other debris in which scavengers lived. The population of colonies was given as usually "between 200 and 300 individuals...., seldom less than 100, and sometimes 400 or more." Several queens were found in nests, fifteen occurring in one. Males may be present at all times of the year. Eggs laid by the queens turned deep gray or blackish, those laid by workers remained white. The eggs were elliptical in form. The slender larvae "have long flexible necks which enable them to reach inside and clean out the sections of boll weevils laid by the workers carefully on the fat stomachs of their baby sisters." The workers covered the larvae with dirt when the latter were ready to pupate, pupation in colonies introduced into Texas taking one and one-half hours. The cocoons changed with age from a light gray to a pale reddish brown. The pupal stage in Texas nests lasted 35½ days for

queens and 39–40½ days for workers. He found the ants to prey on insects of every order as well as centipedes. A habit he described which was particularly criticized was that the ants carry droplets of nectar or other liquid in their opened mandibles but this was later admitted to be true by Wheeler and I have often confirmed the habit. About 4,000 ants in 89 colonies were taken to Texas in 1904 and “scarcely more than a dozen died during the voyage.” These colonies averaged between 40 and 50 individuals and were later believed to represent only portions of colonies. The ants were gathered in Guatemala some time after late April 1904 and were “planted” in Texas after the middle of July. In Cook’s last article on the colonies dated in March 1905, he did not expect them to survive much beyond the month and nothing further was heard of the experiment.

Cook found the sting of the worker to be too small to penetrate the skin of the palm but elsewhere it might penetrate and produce a smarting effect for a few minutes. He stated that the Indians believed that the keleps were able to combat also the dreaded *teken* or leaf-cutting ants (probably *Atta cephalotes*—N.A.W.). The *Ectatomma* “may prevent the growth of new colonies by killing the workers as fast as they appear above ground.” This appears to be most unlikely.

After the bitter controversy with Wheeler (1904–1905) the ant was largely ignored until Wheeler in 1921 in a study of *Tachigalia* ants referred briefly to this ant feeding on the honey dew of membracids and extra-floral nectaries of *Inga*. In 1925 he published an article briefly describing a few of its habits but mostly devoted to a mimic, *Cardiacephala myrmex* Schiner. The chimney entrance to the nest and extra-floral nectaries of *Inga*, to which the insects were attracted, were figured. In 1930 a mermithergate was described and in 1936 the termite, *Nasutitermes* (*N.*) *acajutlae* (Holmgr.) was given as prey.

The ants have frequently been cited in species lists as may be seen above but without adding to a knowledge of the biology.

On Barro Colorado Island, Panama Canal Zone, I found the ants in rain forest and at the edge of the small savannah below the laboratory. The workers were seen to carry both winged sexes, dead or alive. The ants ascended trees for several feet.

In Venezuela the ants were also seen in high rain forests of the Orinoco Delta.

They occurred in Trinidad in various types of vegetation: rain forest of the Nariva Swamp and Northern Range, “lastro” or scrub forest in numerous places, Mora forest, the Piarco Savannah with thin, scattered trees and in cacao plantations. They were sometimes taken in sweepings over grass, herbs and shrubs. In altitudinal range they varied from sea level to 1500–1700 feet. In Colombia, Forel (1912) recorded the

species from about 6000 feet but, if not an error, the record is unusually high by probably 500 feet or more. The workers were often nocturnal, being found stalking slowly on the leaves or ground or at nectaries of flowers. In addition to tending membracids they were found with aphids on herbs. While taken several times by *Atta cephalotes* nests, the association was doubtless fortuitous.

My records in British Guiana are also from various types of forest: rain forest of several kinds including a virgin greenheart forest and one including Brazil nut (*Bertholletia*). One nest was surmounted by a chimney of clay quite unlike the fibrous or felted type described in Panama and Guatemala. A worker was taken carrying a dead *Pheidole* soldier.

The similarity between this species and *Paraponera clavata* in ecology and habits is described above under TAXONOMY.

***Ectatomma ruidum* Roger (Figs. 1-4)**

- 1860 *Ponera (Ectatomma) ruida*, Roger, Berl. ent. Zeitschr., 4:306 (♀ ♀)
 1862 *Ectatomma ruidum*, Mayr, Verh. Zool.-Bot. Ges. Wien, 12:732; 37:539
 1862 *Ectatomma scabrosa*, Smith, Trans. Ent. Soc. Lond. (3), 1:31 (♀); Roger, Berl. ent. Zeitschr. p. 292
 1890 *Ectatomma ruidum*, Emery, Bull. Soc. Ent. Ital., 22:14; Dalla Torre, Cat. Hymen, 7:26
 1896 *Ectatomma ruidum*, Emery, Boll. Mus. Zool. Anat. Univ. Torino, 11:1
 1899 *Ectatomma ruidum*, Forel, Biol. Centr.-Amer., Hymen, 3:6, t.1, figs. 3, 3a (w.)
 1907 *Ectatomma ruidum*, Forel, Mitt. Nat. Mus. Hamburg, p.1
 1912 *Ectatomma ruidum*, Forel, Mém. Soc. Neuchât. Sc. Nat., 5:9
 1922 *Ectatomma ruidum*, Mann, Proc. U.S. Nat. Mus., 61:6 (♀)
 1924 *Ectatomma ruidum*, Wheeler, Jour. Hered., 15:147-165
 1931 *Ectatomma ruidum*, Santschi, Rev. Ent., 1:265 (♀)
 1934 *Ectatomma ruidum*, Borgmeier, Arq. Inst. Biol. Veget., 1:95 (♀ ♂)
 1938 *Ectatomma ruidum*, Weber, Ann. Ent. Soc. Amer., 31:499-503
 1941 *Ectatomma ruidum*, Williams, Bull. Chicago Acad. Sc., 6:79
 1942 *Ectatomma ruidum*, Wheeler, Bull. Mus. Comp. Zool., 90:24

DISTRIBUTION. Southern Mexico to Brazil. Unpublished records from the author's collection:

HONDURAS: Corocito, 3.iv.24 (J. Bequaert).

COSTA RICA: Sta. Clara, iv.37 (A. Alfaro).

PANAMA: Panama City, across bay, 16.vi.38 (N. A. Weber).

Canal Zone: Barro Colorado I. 14-19.vii.38 (E. C. Williams), 12-25.vi.38 (N. A. Weber); Gatun, 17.vi.38 (N. A. Weber).

COLOMBIA: No locality (Sr. Murillo, Sr. Armero, via Bequaert); Puerto Colombia, 1936, Los Flores, Sta. Marta,

w. = worker.

24.xii.22 (J. Bequaert); Rio Porce, Cauca trib., 17-21.vii.38, 2.viii.38, Porcecito, 21.vii.38, Buenaventura, 7-9.viii.38 (N. A. Weber).

VENEZUELA: San Esteban, 30.xi.39, Caño del Tigre, ix.43 (P. Anduze); Puerto Cabello, 10.v.36, Caracas, 11.v.36, Cumana, 12.v.36, Barrancas, Orinoco R., 15-16.ii.35, junction of Orinoco and Caroni, 31.i.35, s. of Isla Paloma, Orinoco Delta, 6.ii.35, Patos I. nr. Trinidad, 12.vii.35 (N. A. Weber).

ECUADOR: Guayas, Prov. Balao, vii-ix.20 (W. Buthn).

TRINIDAD: St. Augustine, 1935-1936 (E. R. Leonard, W. R. McCreary); Mt. St. Benedict, 1936 (D. Vesey-Fitz-Gerald); Patos I. (see Venezuela), Gasparée I., 1.vii.35. Port of Spain, Botanical Gardens, 10.v.35, Maracas Valley, 900 ft., 23.iii.35, 1000 ft., 18.xi.34, 19.iii.35, 28.v.36, Aripo Valley, 700 ft., 9.iv.35, Tucuragua R., 5.v.35, Tacarigua R., 18.xi.34, Sangre Grande, rubber est., 21.xi.34, Cumana Bay, Anandale Est., 18.v.35, Arena Forest Res. nr. Arima, 12.xii.34, Arima, Mason's Est., 28.iv.35, Foot-hills north of Tunapuna, 200 ft., 14-25.v.35, St. Augustine, numerous times, 1934-36, Mt. St. Benedict, 850 ft., 27-xi.34, 1.i.35, Nariva Swamp, 5.xii.34, 22.iv.35, Mayaro Bay, 25.xi.34, 6.xii.34, 13.i.35, 10.iii.35, 2.vi.36, Galeota Pt., Ortoire R., Rio Claro, 3.i.35, San Fernando Hill, 500 ft., 3.iv.35, Basin Hill Forest Res., 700 ft., 1.iv.35 (N. A. Weber).

BRITISH GUIANA: Waikarabi Creek, Barama R., 28.iii.35, S. Rupununi Savannahs, 11.xi.35, (J. G. Myers 5023, 5606); Oronoque R., 2°42' N. Lat., 21, 31.vii.36, (N. A. Weber).

TAXONOMY. *E. ruidum* may in a sense be considered a junior edition of *tuberculatum*. In coarseness of sculpture and general arrangement of tubercles it is similar. It lacks, however, the occipital tubercles, the head being more rounded behind, and the thoracic tubercles may be much lower. The mesonotum is more strongly delimited here and the thoracic sculpture more reticulate. There is even more contrast between the postpetiole and first gastric segments dorsally, the former being coarsely reticulate-punctate, the latter being finely striate-punctate. *Ruidum* is always much darker, the body being dark brown to blackish brown, the appendages, especially legs and funiculi, being a much paler ferruginous.

Roger's original description is as follows:

P. (Ectatomma) ruida n. sp.

w. Castanea, nitida, pilosa, valde rugosa, mandibulis, antennis pedibusque rufescentibus, pro- et metathorace bidentatis.

8 Millm. long.

w. = worker.

♀ 11-12 Millm. long.

Diese Art hat mit dunkleren Stücken der *tuberculata* Latr. die meiste Ähnlichkeit, ist aber kleiner als diese, namentlich ♀. Arbeiter und Weib sind dunkel kastanienbraun, aber mit etwas Bronzeschimmer; Mandibeln, Fühler und Beine sind rötlich-braun. Die abstehende Behaarung ist nicht reichlich. Der Kopf ist auf dem Scheitel grob unregelmässig-, auf der Stirne und dem Clypeus längsgerunzelt. Der Prothorax hat stumpf gezähnte Vorderecken und ist grob, vorn etwas quer gerunzelt; die abschüssige Fläche des Metathorax ist ebenfalls quer-, der übrige Thorax aber unregelmässig gerunzelt. Der Metathorax hat 2 spitze Zähnen. Die Schuppe hat unten und vorn nur einen kleinen zahnartigen Vorsprung. Das erste Hinterleibssegment ist sehr grob, unregelmässig gerunzelt (bei) (einem Stück ist die Sculptur etwas weniger grob als bei den andern Exemplaren); das zweite Segment ist fein, aber scharf, theils längs, theils schräg gestreift.

Die 3 ♀, die mir volagen, sind sehr dunkel braun und viel kleiner als die von *tuberculata*; der Prothorax hat die Vorderecken ungezähnt, und ist quer-, der Mesothorax mit dem Schildchen längs-, der Metathorax sammt der Schuppe stark quergestreift. Der glänzende bronzeschimmernde Hinterleib ist auf dem ersten Segment an der Basis mehr quer-, gegen die Spitze hin längsgestreift; das zweite Segment ist in verschiedener Richtung feiner und schärfer gestrichelt. Die Vorderflügel, die bräunlich sind, haben nur die Länge von $9\frac{1}{2}$ Millm., bei *tuberculata* 12 Millm. und darüber.

BIOLOGY. *E. ruidum* is more terrestrial than *tuberculatum* and is commonly found about cultivations and savannahs as well as in scrub and luxuriant rain forest. I have found it from sea level to 1000 feet in Trinidad although doubtless it ascends higher here. In Columbia, however, while it occurred at sea level on the Pacific side and at 3500 feet along the Cauca River system (Rio Porce), I did not find it at Medellín (5500-5800 feet) so that it would appear to be limited to the warm tropical regions. Forel (1912) recorded it from about 5100 feet here but not higher. Similarly at comparable latitudes in the Anglo-Egyptian Sudan (Weber, 1943, Bull. Mus. Comp. Zool. Harvard, 93:263-389) few species of ponerine ants reached 6000 feet on the mountains.

It may be exceedingly common locally. In 1934-1935 the workers were always to be found on the savannah of the Imperial College of Tropical Agriculture, Trinidad and during rains in May and November-December the winged forms were also common. It was the most common ponerine on Gasparee I., Trinidad, July, 1935. *E. ruidum* was the most common or conspicuous ant in an old clearing on a promontory of Barro Colorado Island, Panama Canal Zone, when I visited it with Professor A. Petrunkevitch, who captured here, in a single sweep of his net, a worker ant and two spiders of different families which resembled the *ruidum*.

The nests differ markedly from those of *tuberculatum* in

naturally smaller size but especially in lacking the peculiar chimney of clay or fibrous material, the entrance being a simple hole. The observation colony described below came from a nest whose entrance in a sub-vertical road cut was a circular hole three millimeters in diameter rimmed by neatly agglutinated clay particles. In the entrance a worker stood with antennae extended. A tunnel led from the hole about 10 centimeters diagonally into the bank and connected with a discoidal chamber about 15 mm. high by 40 mm. lateral diameter. Larvae, pupae and winged sexes were present here. The males were timid and did not attempt flight. A second discoidal chamber was slightly lower and the ants retreated to this. It also contained refuse in the form of other ant and insect remains with unidentifiable debris. Several sowbugs (*Oniscus* type) were here.

A nest in the El Hormiguero Creek bottom of the Rio Porco, Colombia was in a hummock 22 cm. high at the side of the little valley. The hummock also contained a nest of the fungus-grower, *Trachymyrmex cornetzi brevispinosa* Weber. The *Ectatomma* nest was 2-12 cm. below the fungus-grower which itself was about 20 cm. deep and consisted of a series of small, horizontal chambers. Brood was arranged according to size, eggs and small larvae in one chamber, large larvae in another, etc. The number of larvae was unusually large and may be accounted for by the large number of dealate females present, 13 being collected. The workers collected amounted to 24 in number but some escaped. The eggs were brown in color after preservation in alcohol seven years and the cocoons pale yellow to brownish yellow.

The nesting habits probably vary somewhat according to the available sites. The ants which were found on dry soil of the arid to semi-arid coast of Venezuela at Cumaná must have been nesting more deeply to maintain the requisite humidity for the brood. Others found in towns and villages (as Porcecito, Colombia and Gatun, Canal Zone) may also modify their habits.

The chief importance of this species lies in its habit of tending homopterous insects on economic crops. The Ecuador record listed above was accompanied by numerous membracids which the ants were tending. At St. Augustine, Trinidad McCreary found them tending *Saissetia oleae* on citrus and I have often found them tending unidentified membracids here, including nymphs and adults on various trees. The habit is much more widespread than the above specific records indicate.

The ants are also predatory and were taken in Trinidad while capturing live earthworms and while carrying locustids, mantids and miscellaneous insects. By the Oronoque River, British Guiana a worker was observed to take a mole cricket (*Scapteriscus*) away from a heavy-set sphecid which was a

little shorter than the common *Sceliphron*. A worker in the Canal Zone carried a wing of *Atta cephalotes*, an obvious inedible structure. A worker at Puerto Cabello, Venezuela carried a tiny male ant. Trinidad workers were taken in an old *Nasutitermes* nest.

Like *tuberculatum*, these ants frequent extra-floral nectaries, such as of *Inga* trees, for the sweetish fluid. At Cumana Bay, Trinidad they and *tuberculatum* workers were both at nectaries of flowers from 9 to 10 p.m. Since they were on vegetation at sunrise the next morning the ants may well be active all night.

The ants are commonly found in sweepings with *tuberculatum*. They may also ascend tree trunks. Several times they have been taken in Trinidad in the immediate vicinity of *Atta cephalotes*, *Apterostigma* and other Attini nests but are certainly not likely to prey on the larger workers though the slow-moving smaller ants might readily fall victim. Workers beside an unusually large *Cyphomyrmex rimosus* nest on the beach in Panama (Weber, Rev., Ent., 12:101-103, 1941) probably ignored the deliberate, minute and thick-skinned attines.

A colony of the leaf-cutting ant, *Acromyrmex octospinosus* Reich, was intimidated by *ruidum* workers one day in Trinidad. The workers of *Acromyrmex* were climbing papaya trees and cutting off pieces of the ripe fruit and flowers. They took these back to their fungus gardens in long files over their own paths. The entrances to the nests were in the form of simple holes in the weedy ground. At one entrance numbers of *ruidum* workers were standing about. The *Acromyrmex* were filing in continually, each bearing a piece of fruit or flower. Every now and then a *ruidum* would jump at a leaf-cutter laden with fruit and would sometimes startle the ant into dropping its load. The ponerine would then snatch it up and dash off. One *Acromyrmex*, however, refused to let go and I watched a tug-of-war between it and a *ruidum* over an elongate piece of fruit. For a moment they tugged back and forth, the ponerine gradually drawing the leaf-cutter away from the path, though both ants were of about the same size. Finally the *Acromyrmex* let go and the ponerine made off. At other nest entrances there were similar hold-ups by the predatory ants.

Workers commonly carry females and males about, both dead and alive.

OBSERVATION NEST. A colony of *ruidum* which I was able to keep in an observation nest in Trinidad, B.W.I., revealed several unusual habits, particularly in the locomotion of the larvae and the dark color of the eggs.

It was collected May 5, 1935, in a clay bank beside the Tucuragua River, Northern Range. Females, males and workers with brood were taken. The pupae were in white cocoons. The next day the males attempted flight when the

nest was disturbed. The ants killed termites (*Nasutitermes*) that were placed in the nest for food. Two workers were watched removing the cocoon from a pupa and the inner larval skin. Two larvae were feeding on the callow inside. Later the larvae were watched under a binocular microscope. They rasped the integument of the callow of everything removable. The lower mouth parts were used with the aid of the sharp mandibles above. One larva pierced a femur and, when fluid exuded, the clear liquid was drawn into the mouth, presumably by capillarity. A white mite was also feeding on the callow inside its cocoon but kept out of range of the larvae. Two other larvae were feeding steadily on a termite, one larva being on its side, the other resting on its dorsal surface.

About May 21 cylindrical dark brown shiny objects, later proving to be eggs, were noticed stuck together by their long axes. They were beside several small larvae. Larvae had also apparently been feeding on sugar. May 23 they were given a wood-boring insect larva on which the ants fed. May 25 the eggs were still beside the larvae. The long hairs of the larvae were clearly of service in keeping them off the wet floor. The larvae were seen to progress slowly forward by an undulating motion and could also raise the anterior half of the body in the air at times. May 26 three larvae had their heads inside the carcass of a fly given them the previous day.

June 5 there were 25 larvae, including some of very small size, and 13 eggs. The queen died about the middle of May and in the interval a worker had developed a swollen gaster. There were six males. June 11 there were 23 larvae, 18 workers, 6 males and 23 eggs. The additional eggs had had to have been laid by the worker caste and the worker with swollen gaster was present. The workers fed greedily on ripe papaya fruit. June 21 three males and one larva were feeding intently on the anterior end of another larva. Two Collembola were running about the nest and even feeding on the juices on the male mandibles.

July 8 a packet of 15 eggs was present and 6 males, 13 larvae and 15 workers. Two males, a Collembola and a larva were all feeding on one piece of a fly. The larvae and eggs were all preserved. By July 15, 17 eggs had been laid by the worker but no larvae or pupae had appeared. July 31 the ants were given a small piece of a snake, a green tree boa, and the ants shortly were seen to feed upon it. By August 3, 35 eggs had been laid by the worker and these were a lighter brown than formerly. A worker was carrying a male by grasping its antennal scapes in the mandibles and holding it at right angles to the worker's body. There were 16 workers and 6 males. The colony was preserved August 7 with the same population as before.

During the latter part of the period few observations could be made and at this time three larvae, apparently *Microdon*, appeared.² They were not at any time observed to feed on

A MERMITHERGATE OF *ECTATOMMA RUIDUM*

This common ponerine ant has not been recorded before as infested with the parasitic nematode worm, *Mermis*. Few ponerines, indeed, of any genus have been found to contain these worms compared with the numbers of individuals of *Pheidole* and other genera found to be infested. It was not until 1930 that Wheeler recorded *Mermis* in *Ectatomma tuberculatum* from two specimens sent to him from Panama and Trinidad.

March 28, 1935, I found a worker of *ruidum* with considerably swollen gaster walking beside a path at an elevation of 1800 feet on the slopes of Morne Bleu, Trinidad and, suspecting its nature, put it in a container to keep alive. It was given water and sugar. The next day it was actively running about but could not climb glass, presumably because of the weight and bulk of the gaster. It continued to be active on succeeding days and finally on April 6 a live *Mermis* one millimeter in diameter and 128 mm. long emerged.

As described below, the ant shows peculiar combinations of female and worker characters. The sculpturing, particularly on the frons of head, dorsum of thorax, and gaster is that of the female while the more fundamental anatomy is that of the worker caste. The rounded occipital region and thorax is clearly worker. The eyes are intermediate between female and worker while there are traces of ocelli which workers lack. The antennal scapes are longer than in either caste. The petiole and gaster are greatly inflated as the presence of a worm 128 mm. long would necessitate.

To produce these changes the parasite would seem to have entered the ant while in the larval stage. The pupa is protected by a tough cocoon and the adult would seem to be hardly plastic enough, even while callow, to be altered so greatly.

larvae or infrabuccal pellets as they are known to do in other ant nests.

² The myrmecophilous larvae (Fig. 6) are of the *Microdon* type and are as large or slightly larger than the worker ant larvae. One preserved larva is 2.5 mm. x 6.6 mm. The integument under the microscope appears finely punctate and is scantily covered with hairs. In outline each segment may show one or two large, coarse hairs which are densely and finely plumose as well as shorter and much finer hairs. These two types cover the surface generally. In addition each of the median segments ventrally bears a row of nearly a score of short, truncate setae which may be important in locomotion. Dorsally the segments bear about six of the coarser type of hairs which are directed medially. One might speculate that these hairs function as trichomes or as protection from the mandibles of the ants.

Length with gastric segments distended 14 mm., of head with mandibles 2.8 mm., of thorax 3.4 mm. Length of normal worker from same locality 9 mm., of head with mandibles 2.6 mm., of thorax 3.2 mm. Length of normal worker from Cumaná, Venezuela with gastric segments distended 9.6 mm., of head with mandibles 2.5 mm., of thorax 3.1 mm. Width of mermithergate head back of eyes 1.55 mm., of same Trinidad normal worker 1.42 mm., the eyes themselves being 0.50 and 0.40 mm., respectively. In addition to being larger the mermithergate eyes are more protuberant and more impressed posteriorly than the normal worker.

The corresponding measurements of a normal winged female with contracted gaster from St. Augustine, Trinidad are as follows: total length 11 mm., of head 2.85 mm., of thorax 3.7 mm., eyes 0.60 mm. in diameter though less protuberant than in the mermithergate, width back of eyes 1.74 mm.

The configuration and sculpture of the head of the mermithergate exhibits both worker and female characters. At the site of the median ocellus present in the female is an infuscated depression in the mermithergate and the site of the lateral ocelli are also suggested. The longitudinal striae of the frons is continued farther back than in the worker though less than in the female. The occipital margin, however, is more like the worker than the female, being convex and without occipital angles. The antennal scapes are longer (2.1 mm.) than in the Trinidad worker (2.0 mm.) and much longer than in the female (1.7 mm.). The mandibles appear narrower, more correct and less finely striate than in either.

The thorax from above is generally of the worker type although the three anterior tubercles are much better developed in the mermithergate than in the Trinidad worker or the female. These tubercles, however, vary considerably in the worker caste. The coarse reticulation of the normal worker is replaced by longitudinal rugae as in the female. The transverse vermiculations of the epinotal basal surface in the normal worker are also replaced by a more regular transverse rugulation as in the female.

The thorax in side view is also generally of the worker type. The mesonotum, however, is more convex and the sculpturing more regular. The epinotal spiracle is larger and more conspicuous than in either caste and the epinotal tubercle is smaller.

The petiole is distinctly inflated and thicker than in either caste. The sculpturing of the gaster (including the postpetiole) dorsally and laterally is similar to the female and entirely different from that of the worker. It consists, on segments 1-4, of concentric whorls and lines resembling the pressure ridges of the human finger. The distended gaster of the Venezuelan worker alluded to above also shows segments 1-4 clearly but segments 2-4 are smooth and shining. The pilosity is normal but for slightly longer hairs than in the worker. Coloration dark ferruginous as in both worker and female though appearing shinier as in the female due to more regular sculpturing and lack of punctuation.

EXPLANATION OF PLATE

- Fig. 1—Outline of worker of *Ectatomma ruidum* (after Forel).
 Fig. 2—Wing of male *Ectatomma ruidum*—Trinidad.
 Fig. 3—Outline of larva of *Ectatomma ruidum*—Trinidad.

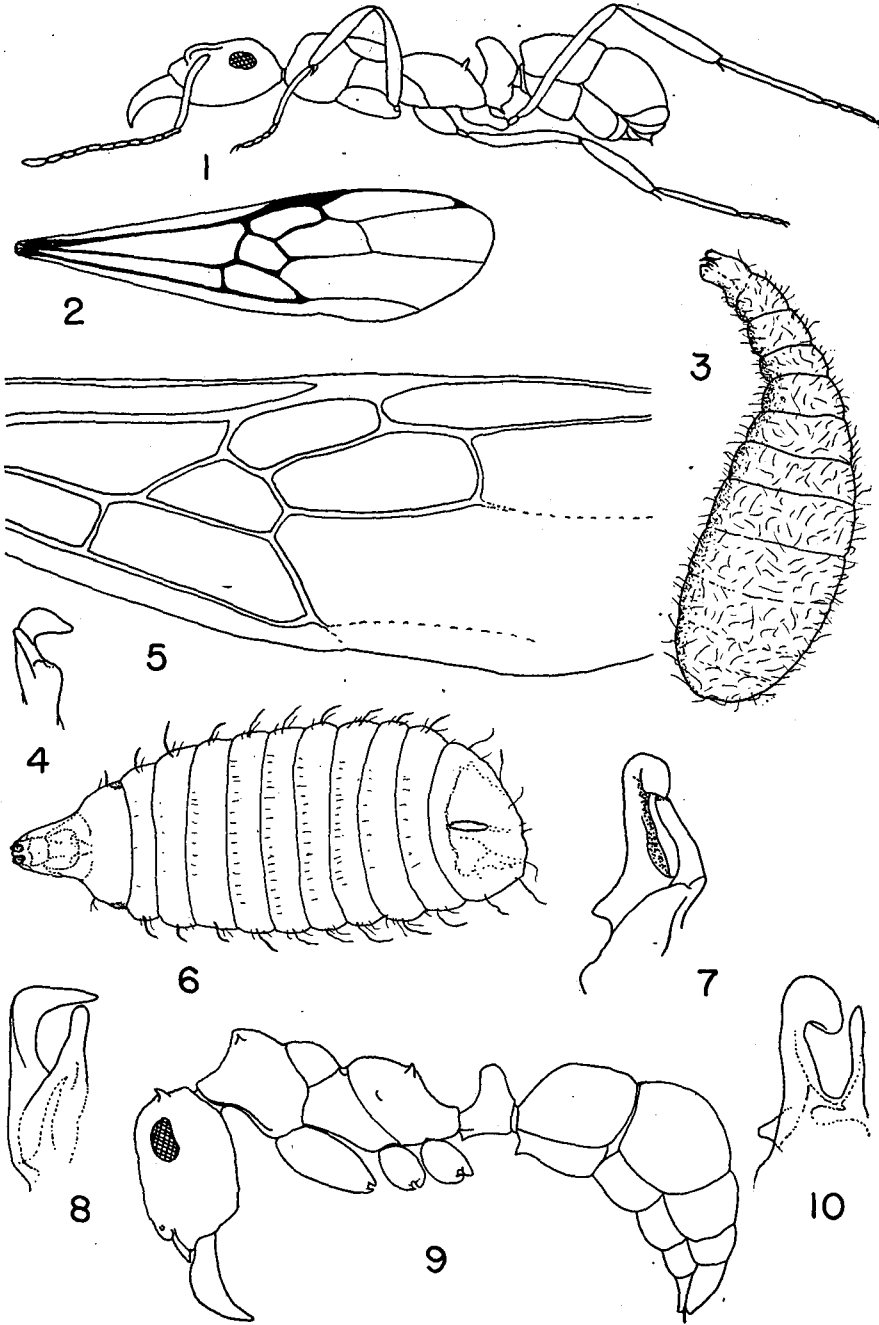


Fig. 4.—Volsella of male *Ectatomma ruidum* to same scale as Figs. 7, 8, and 10.—Trinidad.

Fig. 5.—Median portion of wing of male *Paraponera clavata* to same scale as Fig. 2, showing similarity in venation to *Ectatomma*—British Guiana.

Fig. 6.—Microdon type of larva from *Ectatomma ruidum* nest showing outline of body and ventral rows of short setae.—Trinidad.

Fig. 7.—Volsella of male *Paraponera clavata* showing long tooth as in *Ectatomma ruidum* and *tuberculatum*.—British Guiana.

Fig. 8.—Volsella of male *Ectatomma tuberculatum*.—Brazil.

Fig. 9.—Outline of worker of *Ectatomma tuberculatum* (after Wheeler).

Fig. 10.—Opposite member of pair of volsellae of *Paraponera clavata* from that shown in Fig. 7 and from another angle.
