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## THE MALES OF SOME TEXAN ECITONS.<sup>1</sup>

WILLIAM MORTON WHEELER AND WILLIAM HENRY LONG.

SINCE the observations on *Eciton* published in the June number of the *American Naturalist* for 1900 were undertaken, the recognition of the sexual forms of the Doryline ants has made some progress. European myrmecologists, notably Professor Forel and Professor Emery, have thrown considerable light on several of the species belonging both to the Old World (*Dorylii*) and American branches (*Ecitonii*) of the subfamily.

The doubts entertained in the senior author's former paper concerning the identity of André's *Pseudodichthadia incerta* have been dissipated. It now appears that this insect is really the female of *Eciton cæcum* Latr. In a note at the very end of his splendid work on the ants of Central America and Mexico<sup>2</sup> Forel quotes the following admission from a letter from M. André: "Je tiens à vous dire que je suis depuis longtemps convaincu que ma *Pseudodichthadia incerta* est bien

<sup>1</sup> Contributions from the Zoölogical Laboratory of the University of Texas, No. 11.

<sup>2</sup> Biol. Cent. Am. Hymenoptera Formicidæ, vol. iii (1899-1900), p. 160.

la femelle de l'*Eciton cæcum* Latr. J'ai été trop prudent en n'affirmant pas tout de suite cette assimilation, mais la présence d'une ♀ dans le tube contenant la ♀ et la connaissance plus étendue qu'on a aujourd'hui des Dorylides ne laissent plus aucun doute à cet égard."

Professor Emery has just published a revision of the genus *Eciton*.<sup>1</sup> For some time past he has recognized in the insect known as *Labidus latreillei* Jurine, and a number of other forms which seem to have merely varietal or synonymic value (*Labidus sayi* Hald.; *L. atriceps* F. Smith; *L. jurinei* Shuck; *L. Servillei* Westwood; *L. smithi* D. T.; *L. pilosus* F. M.; and *L. fulvescens* Blanch), the male of *Eciton cæcum*. We are, therefore, acquainted with the three phases of the commonest and most widely distributed of the ecitons, a species which ranges from Utah and Texas to southern Brazil and has been very generally known in the worker phase to entomologists for more than a century.<sup>2</sup>

#### ECITON (ECITON) CÆCUM LATREILLE.

- ♀? *Formica omnivora* Oliv. *Encycl. Method. Ins.*, vol. v (1791), No. 6, p. 496.  
 ♀ *Formica cæca* Latr. *Hist. Nat. des Fourmis*, tome ix (1802), p. 270, fig. 56.  
 ♀ *Eciton vastator* Smith. *Journ. Ent.*, vol. i (1860), p. 71.  
 ♀ *Eciton erratica* Smith. *Loc. cit.*, p. 71. Bates. *Natur. Amazons*, vol. ii (1863), p. 358.  
 ♀ *Nycteresia cæca* Roger. *Berl. Ent. Zeitschr.* (1861), p. 22.  
 ♀ *Myrmica rubra* Buckley. *Proc. Ent. Soc. Phil.* (1866), p. 335.  
 ♀ *Eciton omnivorum* Emery. *Bull. Soc. Ital.*, vol. xxiii (1891), p. 163; *ibid.*, vol. xxvi (1894), p. 179, T. II, Figs. 9 a-d; *Zool. Jahrb.*, Abth. f. Syst., Bd. viii (1894), p. 258.  
 ♀ *Eciton cæcum* Mayr. *Wien. Ent. Zeitschr.* (1886), p. 119; *Verh. zool. bot. Ges. Wien.*, Bd. xxxvi (1886), p. 440.  
 ♀ *Pseudodichthadia incerta* André. *Suppl. aux Fourmis* (1885), p. 8, Fig. 1-5; *Spéc. Hymen. Europ. II* (1886), p. 840, fig.  
 ♂ *Labidus latreillei* Jurine (1807); Emery, *Nuovi Studi sul Genere Eciton*, *Mem. R. Accad. Sci. Ist. Bologna* (1900), p. 9.

<sup>1</sup> Nuovi Studi sul Genere *Eciton*, *Mem. letta alla R. Accad. delle Sci. dell'Istituto di Bologna*, 25 marzo, 1900, 18 pp., 1 tav.

<sup>2</sup> The remarkable sexual trimorphism of this insect, together with its variability, at least in the worker and male phases, is largely responsible for the following interesting synonymy compiled from the contributions of Forcl and Emery. For further mention of the literature the reader is referred to Dalla Torre's *Catalogus Hymenopterorum*, vol. vii, *Formicidae*, 1893, pp. 1-7.

- ♂ *Labidus sayi* Hald. Stansbury's *Explor. of Utah* (1852), p. 367, Pl. IX, Figs. 1-3. Emery, *loc. cit.* (1900), p. 9.  
♂ *Labidus servillei* Westw. *Arcana. Ent.*, vol. i (1842), p. 75, tome xx, Figs. 2, 2 a; Emery, *Bull. Soc. Ent. Ital.*, vol. xxii (1890), p. 39; Emery, *Nuovi Studi*, etc., *loc. cit.* (1900), p. 9.  
♂ *Labidus jurinei* Shuck. Emery, *loc. cit.* (1900), p. 9.  
♂ *Labidus smithi* Dalla Torre. Emery, *loc. cit.* (1900), p. 10.  
♂ *Labidus pilosus* F. Sm. Emery, *loc. cit.* (1900), p. 10.  
♂ *Labidus fulvescens* Blanch. Emery, *loc. cit.* (1900), p. 10.  
♂ *Labidus atriceps* F. Smith. Emery, *loc. cit.* (1900), p. 16.

Both before and since learning of André's conclusion we have sought diligently but in vain for the female of *Eciton cæcum* in the vicinity of Austin, notwithstanding the species is so common that we rarely spend a few hours collecting and observing ants without happening on two or three of its colonies. These are found, as a rule, under clusters of stones which lie with their edges in mutual contact. But as the species is entirely subterranean it is not an easy matter to find the breeding chambers. The narrow burrows run along under the stones for some distance and then dip down into the soil. Frequently the galleries are found under large stones that have fallen from stone walls, and in these cases the burrows almost invariably extend under the wall where they are inaccessible to the observer. For several days after a rain *E. cæcum* may often be found under the stones in open fields, but during dry weather it seems to prefer the more sheltered and therefore moister localities. The males of *E. cæcum*, which may be readily identified by the aid of the table in Emery's latest paper, are common about the electric lights at certain times of the year. Messrs. Melander and Brues took them in considerable numbers on March 27, less frequently on April 10 and 20 of the past year. All of these specimens are referable to *Labidus sayi*, although somewhat exceeding the dimensions of the specimens described by Haldemann.

*Eciton cæcum*, which may be regarded as the typical species of the genus *sensu. stricto* (workers with denticulate claws), is, as we have said, the only *Eciton* of which the male, female, and worker phases are all described. In the present paper

we wish to call attention to the discovery of the males of *E. opacithorax*<sup>1</sup> Emery and of *E. schmitti* Emery.<sup>2</sup> The male of the latter species, together with the female described in the senior author's former paper, completes the series of sexual phases of a species belonging to another natural group of ecitons (subgenus *Acamatus* Emery), the workers of which have smooth claws.

A male Eciton found dead in a spider's web, Oct. 3, 1899, by Mr. C. T. Brues was referred by the senior author to *E. schmitti*, mainly on account of its coloration, but it was not till October 13 of this year that it was possible to obtain positive proof of the truth of this conjecture. Late in the afternoon of the latter date Mr. A. L. Melander, Mr. C. T. Brues, and the senior author were collecting insects near Mt. Bonnel, a few miles from Austin, when Mr. Brues saw a winged ant perched on a large flat stone beneath a shrub (*Eisenhardtia amorphoides*). It was at once recognized as the Eciton of the spider's web. On drawing near, two or three other specimens were seen moving about among a lot of workers of *E. schmitti* which were issuing from a hole in the soil about the roots of the *Eisenhardtia* and appeared to be on the point of starting on one of the *sorties* so characteristic of these ants and their congeners. We raised the stone and found beneath it a flourishing colony of *E. schmitti*, comprising no less than a hundred of the huge (*i.e.*, when compared with the workers) winged males. Many of these were literally covered with workers and

<sup>1</sup> Emery (Nuovi Studi, etc., *loc. cit.*, p. 15) is now inclined to regard the former species, originally described by him as a subspecies of *E. californicum* Mayr, as a distinct species.

<sup>2</sup> Specimens of the species designated as *E. sumichrasti* in the senior author's former paper have been examined by Professor Emery, who pronounces the species to be the closely allied *E. schmitti* Emery. The senior author has since taken the true *E. sumichrasti* in Mexico (Cuernavaca, Morelos) and is satisfied that Professor Emery's identification is correct. On seeing the males of *E. schmitti*, Professor Emery was inclined to regard them as belonging to *Labidus nigrescens* Cresson. If this is true Emery's name of the species must be relegated to the synonymy. But some of these males were sent to Mr. Fox for comparison with Cresson's types and were pronounced to be different, being "too hairy for *nigrescens*, which is entirely brownish. The first segment of *nigrescens* is shorter and the wings light fuscous." This has induced us to retain Emery's name of the species for the present.

were being hurried by them into some deep water-worn cavities on the under surface of the stone and into the galleries which the ants had excavated in the hard soil. We succeeded, nevertheless, in capturing a large portion of the colony and in transferring it, together with some of the soil of the nest, to a strong canvas bag. The colony, first established in a large glass jar, was later placed in a Lubbock nest. The material of the original nest was searched on the spot for the pupæ of the males and for the female, but without success.<sup>1</sup> The following is a description of the male of *E. schmitti* drawn from fresh specimens.

*Eciton schmitti* Emery (Figs. 1 and 2, *b*), male. Length of body, 11–13 mm.; length of fore wing, 10–11 mm. Head, thorax, petiole, extreme base of first abdominal segment, venter, antennæ and legs, except the tarsi, black; abdomen, tarsi, hypopygium, tips of mandibles, and, in some specimens, the flagellum of the antennæ, the knees and the tips of the tibiæ fulvous red. Wings blackened, with black veins and stigma, the costa and some of the veins yellowish red at the extreme base; maxillæ and labium yellow.

Head shining, clothed with long fulvous hairs arising from coarse punctures. These hairs are longest on the vertex, posterior orbit, mandibles, first antennal joint and clypeus. Mandibles rather long, curved at the base only, slightly broadened in the middle, with convex inner edge ending in short, rather blunt points. Antennæ longer than the head and thorax; tip of the somewhat incrassated scape scarcely reaching the lateral ocellus; second joint small, remainder of the cylindrical flagellum opaque, its basal somewhat thicker than

<sup>1</sup> The nest contained two species of ecitophiles, *viz.*, some small trichopterygid beetles and more than a dozen specimens of a small active staphylinid with pale pronotum and elytra (*Ecitopora tenella* Wasm. *n. sp. in litt.*). Some of the latter lived for nearly a month in the artificial nest. They sought the dry portions of the nest and seemed to elude the ants by their rapid movements. They usually lurked near the entrance in cracks in the soil. When, during the morning hours, the ants were dormant in a compact cluster in the center of the nest, the beetles crept from their hiding places and moved about the galleries with less trepidation. When the ants left the nest towards evening to move about in files on the platform, the staphylinids sometimes accompanied them and then often ran off into the moat and were drowned.

its apical half; joints of approximately equal length, except at the tip, where they are somewhat longer but not compressed. Clypeus without teeth below, frontal carinæ not very prominent, separated by a distinct facial furrow. Eyes and ocelli small and not protruding. The distance between the two lateral ocelli is about the same as the distance between the lateral ocellus and the eye. Thorax gibbous in front, flattened

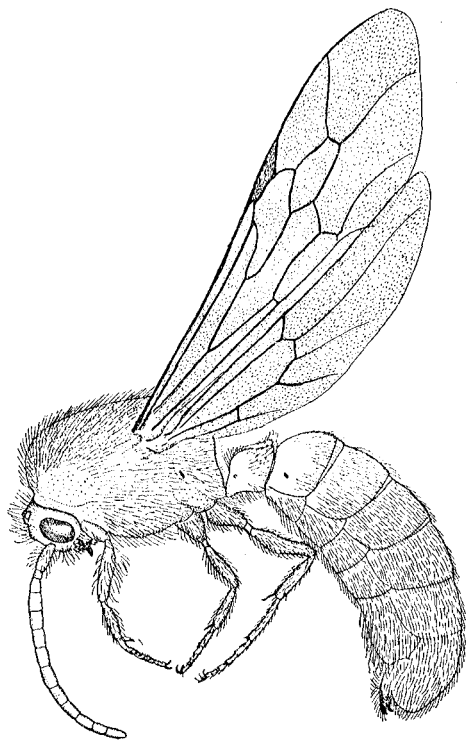


FIG. 1. — *Eciton schmitti* Emery. Male.

on the dorsal surface, which is subopaque; pleuræ and pectus shining. Dorsum with fine and rather dense pleuræ, with scattered and larger piligerous punctures. Whole thorax covered with long fulvous pile, somewhat shorter and more appressed on the mesonotum and scutellum; long and erect on the pleuræ and pectus. Anterior half of mesonotum traversed by a longitudinal smooth line which seems to lie in a shallow groove at its anterior end. A somewhat similar line is found on either side, extending over the posterior two-thirds of the

mesonotum, as far back as the scutellum, and another indistinct line traverses the posterior third of the scutellum, which is flat on its dorsal and convex on its posterior surface. Metanotum declivous and slightly concave on its posterior surface. Petiole subopaque above, shining below, nearly twice as broad as long, flattened transversely across the middle of its dorsal surface, but distinctly concave in front of and behind

this region; posterior angles only moderately projecting; anterior portion with sparse pile, posterior edges, and especially the posterior angles, with rather long, dense, and appressed fulvous pile; ventrally the pile is thin and more erect. Abdomen cylindrical, subopaque above (except at the subconstricted posterior edges of the segments which, like the venter, are glabrous), covered with minute piligerous punctures; pile on the dorsal surface of the segments short and appressed, especially towards the base of the abdomen, posteriorly and on the venter, especially in the region of the hypopygium, it is longer and more erect. Hypopygial plate shining with two short, slightly recurved teeth at its tip. Legs rather small and feeble, posterior pair not reaching to the end of the abdomen. Middle metatarsus a little more than half as long as the middle tibia. Coxæ, femora, and tibiæ shining, with rather erect fulvous pile, pile on the tarsi short and appressed. Tibial spurs red, claws with extremely rudimental denticles. Wings clothed with minute black pile, anterior pair reaching to the tip of the abdomen. For venation see Fig. 1.

On October 27 the junior author was so fortunate as to discover a flourishing colony of *E. opacithorax* Emery under a large stone in a dilapidated wall at the edge of some woods, on the sloping banks of Shoal Creek at Austin. This colony also contained a great number of males but was ransacked in vain for a queen. The workers had stored their nest with a considerable number of small carabid beetles that had evidently been captured on one of their marauding expeditions. *E. opacithorax* is considerably smaller and appears to be somewhat rarer in this locality than *E. schmitti*. We insert a description of the male, which, like the male of *schmitti*, appears to have escaped description as a species of *Labidus*.

*Eciton opacithorax* Emery (Fig. 2, *e*) male. Length of body, 10-11 mm.; length of fore-wing, 8-9 mm.

Body glabrous throughout; head, thorax, petiole, first abdominal segment, venter, femora, and tibiæ, black; lateral and dorsal regions of abdomen, including the posterior edge of the first abdominal segment, hypopygium, inner edges of mandibles, knees, and tarsi, dull red. Antennæ usually black, but

the flagellum in some specimens more or less reddish. Wings slightly blackish, covered with minute black pile; stigma reddish, veins dirty yellow. Pile covering the body grayish fulvous, long and erect on the mandibles, antennal scape, head, thorax; pleuræ, pectus, scutellum, base of petiole, and femora, elsewhere very short and appressed.

Mandibles short, covered with small piligerous punctures, curved only at the base, thence becoming broad and flat, with distinctly convex inner margin and terminating in abrupt rather blunt tips. Head covered with punctures like those on the mandibles. Eyes and ocelli very small, not projecting; cheeks and posterior orbital region broad. Lateral ocelli separated by a space about equal to that which separates each lateral ocellus from the eye. Frontal carinæ prominent, arcuate below the lateral ocelli, and separated by a rather broad longitudinal furrow. Anterior half of mesonotum with a distinct smooth longitudinal line and distinct lateral furrows extending to the insertion of the scutellum. Scutellum without a furrow on its posterior surface. The piligerous punctures covering the mesonotum and scutellum are small and evenly distributed, those on the pleuræ a little larger and more scattered. Metanotum declivous, slightly concave, finely punctate, and bearing little pile. Petiole twice as broad as long, convex above and behind, more concave anteriorly; posterior angles not projecting and covered with very short appressed pile, contrasting with the long and often dense erect pile on the basal ventral and basal dorsal surfaces of the same segment. Abdomen short, cylindrical, and laterally compressed, its surface minutely punctate; pile everywhere, even at the tip, and on the hypopygium, very short and appressed. Hypopygium armed with the usual short, slightly recurved teeth. In some specimens the red of the abdomen even on the dorsal surface is more or less suffused with black, especially near the middle of the different segments. Fore-wings reaching to the tip of the abdomen or even a little beyond. Venation very similar to that of *E. schmitti* (vide Fig. 1). Legs short, posterior pair not reaching the tip of the abdomen. Middle metatarsus a little more than half the length of the middle tibia. Denticles of claws vestigial.



At first sight the male of *E. opacithorax* is very similar to the male of *E. schmitti*, but comparison discloses a number of constant differences. Apart from its distinctly smaller size, the thorax and scutellum of the former species are more glabrous and therefore appear to be of a deeper black color. The pile is shorter on the abdomen and posterior portion of the petiole, the wings are distinctly smaller, less blackened, and have paler nervures.

The junior author has also taken the males of two other forms of Eciton at Austin, but hitherto only about the lights in the evening. One of these, taken October 29, agrees very closely with the description of *E. (Labidus) harrisi* Hald. The other, which was flying in considerable numbers August 1, is smaller and more reddish, with very pale wings. Professor Forel pronounces it to be *E. harrisi*, but as the color is not that of the type, it must be regarded as a variety. The heads of both forms, drawn to the same scale, are represented in Fig. 2, *a* and *d*. Besides the various species already mentioned we have recently taken at Austin the workers of *E. californicum* Mayr. and *E. pilosum* F. Sm. The latter species has not before been recorded from the United States. With the single exception of *E. carolinense*, all the species of Eciton known to occur north of Mexico have been found in Texas, and it is very probable that *E. carolinense* will be found in the eastern portion of the state. The species of the genus occurring north of Mexico may be tabulated as follows, according as they are known from the male or worker phase alone or from both :

WORKERS.	MALES.
1. <i>Eciton cæcum</i> Latr.	<i>Labidus sayi</i> Hald.
2. <i>E. sumichrasti</i> Norton.	Unknown.
3. <i>E. schmitti</i> Emery.	<i>E. schmitti</i> Em.
4. <i>E. californicum</i> Mayr.	Unknown.
5. <i>E. opacithorax</i> Emery.	<i>E. opacithorax</i> Em.
6. <i>E. carolinense</i> Emery.	Unknown.
7. Unknown.	<i>L. harrisi</i> Hald.
8. Unknown.	<i>L. mexicanum</i> F. Sm.
9. Unknown.	<i>L. nigrescens</i> Cress.
10. Unknown.	<i>L. minus</i> Cress.
11. Unknown.	<i>E. spoliator</i> Forel.
12. Unknown.	<i>L. melshæmeri</i> Hald.
13. <i>E. pilosum</i> F. Sm.	Unknown.

The males of *E. schmitti*, after living in good condition in the artificial nest for a few days, began to die off, at first a few each day, then more, till by the evening of October 22, nine days after their capture, they were all dead. During this period, however, it was possible to make a few observations on their habits.

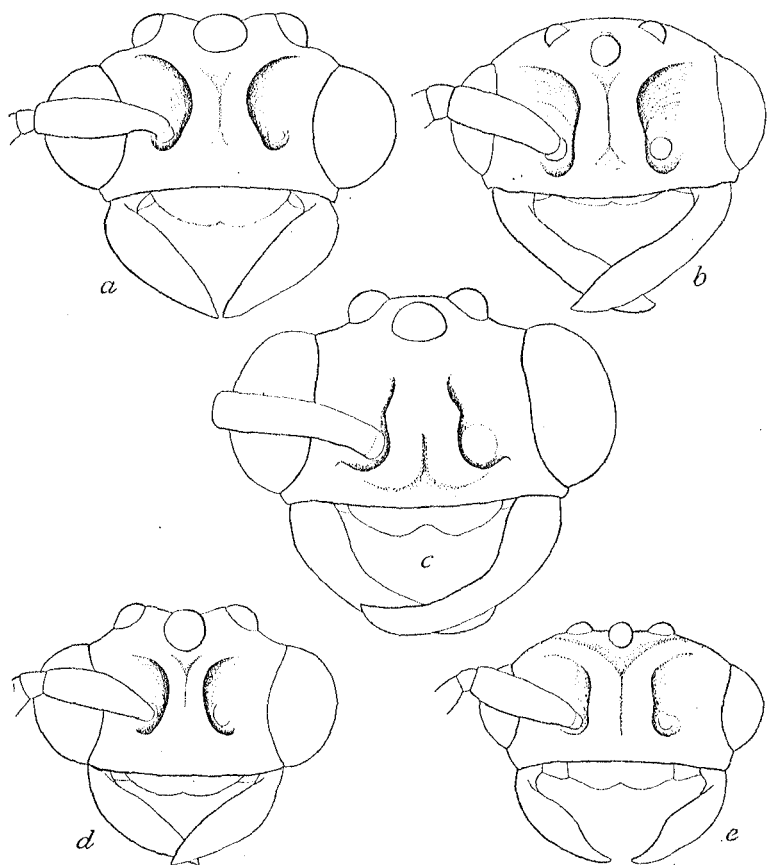


FIG. 2.—Heads of male ecitons. *a*, *E. harrisi*; *b*, *E. schmitti*; *c*, *E. caecum*; *d*, *E. harrisi*, var.; *e*, *E. opacithorax*.

In his former paper the senior author recorded the fact that the odor of the workers of *E. schmitti*, like that of other species of the genus, is rank and disagreeable, whereas the odor of the queens is mild and pleasant.<sup>1</sup>

<sup>1</sup> The peculiar odor of Eciton workers was noticed by Sumichrast (Notes on the Habits of Certain Species of Mexican Hymenoptera, etc. Note 1, On the

It was interesting, therefore, to find that the males have the same pleasant odor as the females. We believe that this peculiar property acts as a powerful attraction to the workers, causing them to cling in great numbers to the bodies of the fertile sexes. Certainly no other ants with which we are familiar appear to be so fond of their queens and males. The workers seem never to tire of fondling and licking the latter. They lick even their large mandibles and the broad membranes of their wings, and when the males move about in the nest the workers ride on their backs and sides. Sometimes the males are loaded down so heavily with workers that they can neither walk nor fly. On such occasions they are often seen to relieve themselves of their too affectionate attendants by suddenly flitting their wings and tossing the workers to a distance. Even dead males are often fondled for hours. Although the males have beautifully developed strigils on their fore-tibiae, they do not appear to use them while in the nest, probably because the continual grooming which they receive from the workers makes attention to their own persons unnecessary. In this respect the behavior of these male ants is in marked contrast with the behavior of the male Ponerinae (*Pachycondyla harpax*, for example).

So far as could be observed the males made no use of their huge mandibles, structures which cannot fail to excite interest, because the mandibles of male ants are usually so small or even rudimental as compared with the mandibles of the workers and queens. The male ecitons were never seen to fight with one another or with the workers, nor did they take food of any form during their captivity. Since the female Eciton is wingless and sluggish, the mandibles of the males can hardly function as clasping organs. We are inclined, therefore, to regard them as secondary sexual characters belonging to the same category as the much larger mandibles of the male stag-beetles (Lucanidae) or the cephalic and pronotal horns of many male chafers (Scarabaeidae). It is not improbable, however,

Habits of the Mexican Species of the Genus Eciton Latr., *Trans. Am. Ent. Soc.* (June, 1868), pp. 39-44), but erroneously attributed to the ants' living in rotten wood.

that when the mystery which still envelops the origin of the female Eciton and the time and place of her impregnation has been dispelled, the mandibles of the male may be found to have some as yet unsuspected function.

During the morning hours the ecitons remained very quiet, hanging in clusters in an angle formed by the soil and the glass of the jar, or between the glass and the earth of the Lubbock nest after being removed to the latter. The males, concealed beneath the mass of workers, were usually huddled together, with their heads hidden in holes in the earth and their abdomens and the tips of their wings projecting. They appeared to be sleeping. Between one and two o'clock in the afternoon the whole colony awoke. The males would begin to climb the glass sides of the jar in perfectly perpendicular paths, falling to the bottom from time to time but again persistently ascending. The workers would often file up the sides of the jar with the males walking at the same rate of speed in their ranks. The activity of the colony appeared to reach its height between five and seven o'clock, and then to subside as the night came on, when the colony again clustered with the males in its midst. Even a lamp kept in the room with the nest, if not too near it, failed to interrupt their slumbers. This striking rhythm of alternating activity and rest was observed on each of the nine days during which the males lived, and was continued by the workers alone for some weeks afterwards.

The numerous males of *E. schmitti* and *E. opacithorax* taken in the two nests above described showed relatively little variation in size and coloration. They were all equally fresh and active and had evidently all hatched but a short time before the nests were discovered. This induces us to add some remarks concerning the supposed dimorphism of the males of Eciton, if only for the purpose of corroborating Emery's statements on this subject. For the sake of bringing the matter clearly before the reader, we translate most of Emery's remarks.<sup>1</sup>

"In my memoir on the larvæ of ants<sup>2</sup> I omitted a discussion

<sup>1</sup> Nuovi Studi sul Genere Eciton, *loc. cit.*, pp. 4, 5.

<sup>2</sup> Intorno alle larve di alcune Formiche.

of the singular observations published by W. Müller,<sup>1</sup> which, as recorded, tend to show that the larvæ of Eciton are of two forms, one like those subsequently described by myself, the other furnished with setigerous tubercles, like the larvæ of the Ponerinæ. When, during the past autumn at the Munich meeting of German naturalists, I presented the results of my observations, Forel took exception to them, on the ground that the dimorphism observed by W. Müller in Eciton went to prove that the cutaneous tubercles could not be peculiar to the larvæ of the Ponerinæ. I was thus compelled to examine Müller's observations, for the purpose of ascertaining whether or not Forel's conclusion and those of the author himself were legitimate.

"Among many thousand typical larvæ of Eciton, Müller observed a very few much smaller larvæ, covered with tubercles and some dark-colored cocoons containing similar larvæ and pupæ and differing from those of the ecitons. The tuberculate larvæ were of different sizes and forms, and most of the dark-colored cocoons woven by these larvæ measured 8 mm., but some of them only 6 mm., in length. As it was not known at that time that the larvæ of the Ponerinæ are of this structure, he could not suppose that he was dealing with larvæ stolen from the nest of other ants. Müller and Forel, who examined the material collected, thought there was an evident connection between the two observations to be discussed, a fallacious connection which, nevertheless, as an element of suggestion, has dominated the whole thought of these authors.

"In the midst of the mass of worker ecitons Müller found a dealated and damaged specimen of the insect then known as *Labidus burchelli*, the male of the Eciton which was the subject of his observations. On examining a pupa taken from one of the dark-colored cocoons and hence derived from a tuberculate larva, Forel observed that, whereas the form of the head and thorax was that of a worker ant, the tip of the abdomen presented appendages, which, though poorly preserved in the specimen studied, recalled by their position and configuration

<sup>1</sup> Beobachtungen an Wanderameisen (*Eciton hamatum*) in *Kosmos*, 10. Jahrg., Bd. xviii (1886), pp. 81-93.

the copulatory appendages of the male sex. This pupa must, therefore, be a male, though very different from the *Labidus*, as shown in the figures which I reproduce in the plate accompanying this memoir (Fig. 30, *a*, *b*, *c*). Believing the determination of the sex to be correct and desiring an explanation of the facts, the specimen was supposed to be a heteromorphic male of *Eciton*, and the tuberculate larvæ were therefore regarded as male larvæ, the smooth ones as belonging to ants of the female sex. Thus arose the strange doctrine of the dimorphism of the males in the genus *Eciton*. The new heteromorphic male was, from analogy with the termites, designated as a supplementary male."

From an examination of W. Müller's figures, Emery concludes that the pupa which gave rise to the above view was a normal worker pupa of some ponerine ant, presumably a species of *Pachycondyla* which had been appropriated by the ecitons. That Emery has drawn the correct inference from Müller's data is very clear from the following observations made on *E. schmitti* during the past spring. These observations are transcribed from the notebook of the senior author.

May 25 we came upon a colony of *E. schmitti* under a large flat stone. The ants had dug their galleries to a depth of several inches in the moist black soil and had literally packed them with larvæ and pupæ. The latter were more abundant and were at once seen to be the slender, naked worker pupæ of the *Eciton*. The relatively small number of larvæ were nearly mature and closely resembled the figures of *Eciton* larvæ published by Emery.<sup>1</sup> There were, however, many naked pupæ and larvæ of very different shapes and sizes. Some of the former had wing-cases, and for a few days the senior author lived in the pleasant anticipation of being able to hatch the male ecitons, since much of the nest had been captured and placed in a large glass jar. The ecitons at once set to work and collected the slender larvæ and pupæ and then turned their attention to the others, which were finally brought together in the same place. Some of the winged pupæ and

<sup>1</sup> Intorno alle Larve di Alcune Formiche, *Mem. della Accad. delle Scienze dell'Istituto di Bologna*, 7 maggio, 1899, 2 tav.

the obese larvæ from which they were evidently derived were examined more carefully, and it was found that many of them were queen larvæ and pupæ of some one of three species of Pheidole whose nests had been noticed a short distance from the Eciton nest. Other larvæ and pupæ appeared to belong to another common ant, *Solenopsis geminata*. There could be no doubt that the ecitons had stolen all these myrmicine progeny, which they proceeded to devour a few days later till all had disappeared.

That this habit of pillaging the nests of other ants is shared also by the tropical ecitons is shown by the following observation recorded by Sumichrast<sup>1</sup>: "It is probable that the Eciton attacks the larvæ and pupæ of other ants to make them serve as food for the nourishment of their own larvæ or for sustaining themselves. I surprised one day, in the first hours of a somber and rainy morning, a considerable assemblage of *tepeguas* (No. 36), fastened one upon another like a swarm of bees, and entirely still. Having dispersed them, I perceived in the place which they covered with their bodies a quantity of little white larvæ, brought away, doubtless, from the nests of some Myrmicidæ. At another time I witnessed the pillage of a nursery of other ants by a quite numerous band of workers minores of No. 68; alarmed by the reprisals which I made on their account, they took to flight, some of them carrying between their mandibles as many as three larvæ at once."<sup>2</sup>

The habit of seizing the larvæ and pupæ of other ants and of storing them in their nests for several days till required for food is only a special phase of a more general habit of the ecitons and probably also of some other ants, for the ecitons do the same with the other portable insect booty which they

<sup>1</sup> *Loc. cit.*, p. 42.

<sup>2</sup> Recently at Querétaro in Mexico the senior author surprised a troop of *Eciton crassicornis* Sm. pillaging a large nest of the agricultural ant (*Pogonomyrmex barbatus*). The temporary nest of this powerful Eciton was found under a large stone only a few yards away. It contained a number of dead agriculturals. At Cuernavaca the same species of Eciton was seen pillaging some small Pheidole nests and dragging away carabid beetles from under the stones.

capture on their marauding expeditions. When they migrate to a new nest they carry this booty with them, as shown by the following observation made in the city of Galveston during the past June. A large colony of *E. schmitti*, which had been living under the front doorstep of the house in which the senior author was stopping, decided to change their quarters. In the early twilight the entire colony moved out in regular file through the garden and entered a new nest which was being dug only a few yards from the old one about the roots of some violets. While carefully scrutinizing the file of ants for the purpose of detecting any ecitophiles which might be marching with them, the ecitons were seen to carry considerable numbers of dead carabid beetles (small species of *Harpalus* and *Pterostichus*). These evidently represented their store of food for the time being. Since this observation was made, the senior author has had frequent opportunity to feed the ecitons in artificial nests with termites and the larvæ of ants (*Camponotus* and *Pachycondyla*!). In all cases many of these larvæ and termites were carried about or stored in one corner of the nest for several days before they were eaten.

#### *Postscript.*

The first female Eciton known to have been taken in the United States was discovered by Rev. P. Jerome Schmitt in April, 1894, on the grounds of St. Mary's College, Belmont, Gaston County, N. C. The insect was found under the bark of a tree and concealed under a large mass of workers half rigid with the cold. Eighty to one hundred specimens of an ecitophilous beetle (*Ecitonusa schmitti* Wasm.) were found scattered through the cluster of workers. The latter were identified by Wasmann and Emery as belonging to *E. opacithorax* Emery. The description of the female has been delayed till the present time, as Rev. Mr. Schmitt happened to be more interested in other fields of entomology. At our request he has most generously sent us the insect for examination and description, and has also permitted us to use the accompanying cut, prepared for him some years ago under the direction of Messrs. Schwarz and



Pergande. Through this kindness Rev. Mr. Schmitt has enabled us to complete our description of the sexual forms of *E. opacithorax*, the male of which is described above. Comparison of the female of this species with the female of *E. schmitti* shows such striking similarity that unless the specimens had been taken with workers of two very different species, one would scarcely regard them as specifically distinct. The following slight differences can be noticed: The female *E. opacithorax* has the head somewhat more shining, with smaller punctures, which are not confluent as in *E. schmitti*; the eyes are smaller, the hairs on the dorso-lateral portions of the head are shorter, the occiput is distinctly less depressed in the middle line, and the pronotum is somewhat rounder and more convex above. The thorax is less confluent punctate, more evenly hairy, and the petiole is less concave in the middle. The size and color of the two species are very nearly identical; even the large dark blotches on either side of the metanotum are present in *E. opacithorax*.

If we may be permitted to generalize from the study of the two species of Eciton, of which we have seen all three phases, it may be said that the fertile forms of the different species of this genus are even more difficult to distinguish from one another than the workers. For this reason, and also on account of the much greater rarity of the males and females, myrmecologists will probably continue to regard the worker ecitons as of greater taxonomic importance.

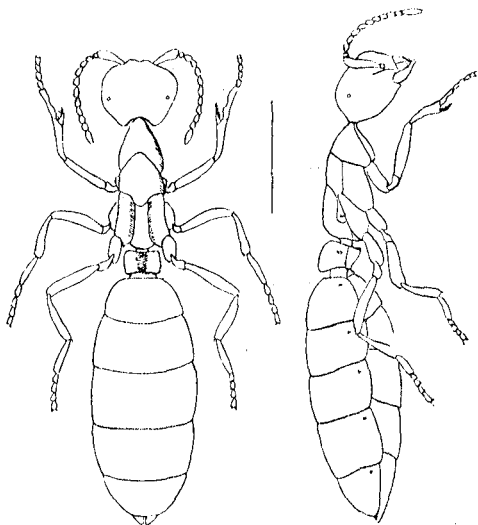


FIG. 3. — *Eciton opacithorax* Emery.