

Article X. — THE AMERICAN ANTS OF THE SUBGENUS COLOBOPSIS.

By WILLIAM MORTON WHEELER.

I. HISTORICAL NOTES ON THE TAXONOMY AND HABITS OF COLOBOPSIS.

Colobopsis was established by Mayr in 1861 as a genus for the reception of the European *Formica truncata* Spinola.¹ At the same time Mayr described the worker of *C. truncata*, of which Spinola had seen only the soldier, as a separate species under the name *C. fuscipes*. It was reserved for Emery to discover that *C. truncata* and *C. fuscipes* are really the soldier and worker phases respectively of the same species.² Twenty years later the same author showed that *Colobopsis* must be reduced to a subgenus under *Camponotus*, owing to the existence of forms intermediate between these two groups and the relatively unimportant distinguishing characters of *Colobopsis*.³ Since 1889 *Colobopsis* has been used to include those species of *Camponotus* which have sharply truncated heads in the soldier caste. A number of species, especially from southern Asia, Polynesia, and Australia have from time to time been assigned to the group.

In his admirable systematic catalogue of the genera *Camponotus*, *Polyrhachis*, and their allies,⁴ Emery defines the subgenus *Colobopsis* more concisely (p. 764). "I deem it advisable," he says, "to confine the maniple No. 14, representing the subgenus *Colobopsis*, exclusively to those species in which the anterior truncated surface of the head in the major workers and the females is distinctly marginate and in which even the mandibles have a sharp external ridge separating an anterior from a latero-ventral face. In these species the head presents a peculiar sculpture consisting of umbilicate punc-

¹ Die Europäischen Formiciden. Wien, Carl Gerold's Sohn., 1861, p. 38.

² Enumerazione dei Formicidi che rinvenngonsi nei contorni di Napoli, etc. Ann. Accad. Asp. Nat. Napoli (2), II, 1869, p. 5, No. 6.

³ Ann. Mus. Civ. Genova, XLVII, 1889, p. 517.

⁴ Saggio di un Catalogo Sistematico dei Generi *Camponotus*, *Polyrhachis* e Affini. Mem. R. Accad. delle Sci. Ist. di Bologna. Sess. 8, Marzo, 1896, pp. 761-780.

tures. The type of the group is *C. truncatus* of southern Europe. It is customary to ascribe to the subgenus *Colobopsis*—in my opinion, incorrectly—many other species, which I have assigned to my maniples 7, 9, 10, and 13. I maintain that the subcylindrical and truncated form of the head is an extreme adaptation to living in wood, and must have arisen by convergence in diverse groups which are phylogenetically independent of each other.”

We may accept Emery's strictures with the addition of two negative characters that seem to separate the species of *Colobopsis* from *Camponotus* proper, namely, the rarity or total absence of intermediates (*mediæ*) connecting the soldier (major) and worker (minor) castes, and the absence of a cocoon in the pupal stages of all the phases. As thus restricted, and apart from a few imperfectly known and therefore dubious species from Australia and Java, the subgenus *Colobopsis* is known to include only the following: *truncatus* Spin. (Europe); *rothneyi* Forel (India); *impressus* Roger (southern United States); *riehlii* Roger (Cuba); and *abditus* Forel (Guatemala). In the present paper I add two new forms from Texas, a new species allied to *impressus* and a new variety of *abditus*. The latter may prove to be really a new species when all the phases of the true *abditus*, originally described from a single female specimen, have been brought to light. Roger's description of *riehlii* is also based on a single female specimen.

For our knowledge of the peculiar habits of *Colobopsis* we are indebted to Forel, who has repeatedly studied *C. truncatus* in Switzerland.¹ I quote the following account from his paper on 'Ants' Nests' and reproduce the two figures to which he refers:

“The best wood-cutters are those species of the genus *Camponotus* Mayr, which have a short, broad head, rounded off in front, especially the subgenus *Colobopsis* Mayr.

“These ants frequently bore with their short powerful jaws

¹ Les Fourmis de la Suisse: 1874, p. 43, 386-388; Ants' Nests. Smith. Report, 1894 pp. 486, 487; pl. Iv., Figs. 11, 13, and 19; Faune Myrmécologique des Noyers dans le Canton de Vaud. Bull. Soc. Vaud. Sc. Nat. 4 ser., Vol. XXXIX, No. 146. Lausanne, 1903, pp. 83-94.

into the very hardest wood, and construct secure and elegant labyrinths for themselves in it. This is the case with *Camponotus pubescens* in Wallis and Tessin, and *Camponotus marginatus*. The latter bores into the softer layers of the wood when they are somewhat decayed and lets the harder part remain, so that its nests are more concentric around the center of the bough or trunk in their arrangement. I have noticed them in cherry trees and Paulownias.

"The smaller and very timid species of *Colobopsis* build themselves nests in the hardest wood. These nests open outward by only a very few small apertures, which are concealed by the irregularities of the bark of the tree. These apertures are kept closed by the head of a 'soldier' sentinel who permits only friends to enter. The soldier's head is broadened and rounded off in front, evidently for this very use. The rounded surface is rough, of a dull brown color; the feelers are planted back of the rounded surface, so that the latter present no hold and block up the entrance to the nest like a living stopper. I first observed this fact among our *Colobopsis truncata* Spin. at Vaux, Canton Vaux (Fig. 13, drawn four-thirds of the natural size), but the similar structure of the head and the habit of living in trees, which characterize the other species of *Colobopsis*, lead us to infer that they live in the same way.

"Fig. 13 [Fig. 1] represents a portion of the original piece of a nest of *Colobopsis truncata* discovered by me in a very hard, dead bough of a pear tree. *B* is the bark of the pear tree; *Ch* is the chambers and passages of the nest; *O* is the exterior opening of the nest; behind it, on the gallery of egress of the nest, stands a *Colobopsis* 'soldier' as a sentinel, keeping the door closed with his head. At *W* are seen two *Colobopsis* workers, one hastening toward the door from the outside, the other standing in the nest. The soldier will go back into the nest for a moment in order to let the first worker come in (I have noticed this among the living ants). That the part played by the *Colobopsis* 'soldier' is that of a living stopper is further proved by the fact that there are comparatively few of them, and that in contrast to the workers they hardly

ever go out. Fig. 19 [Fig. 2] represents a 'soldier,' still more magnified, standing at the door of egress.

"Those species of *Camponotus* which live in a similar way, such as *Camponotus marginatus* Latr., display the beginning of a similar rounded surface on the front part of the head, and always have a large-headed sentry at the door."

Recently Forel has published several interesting ethological observations on *C. truncatus* in his study of the ant-fauna

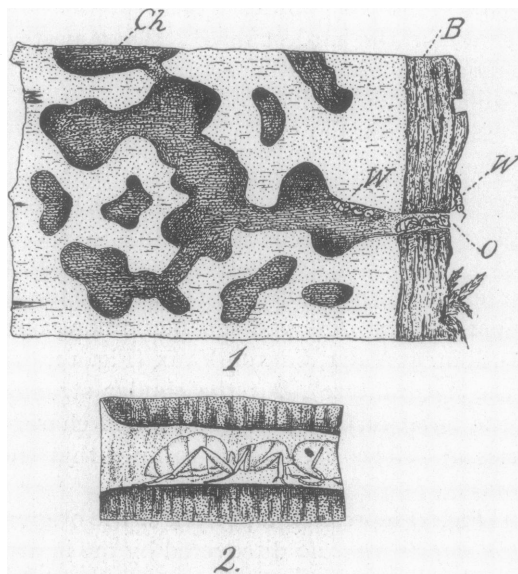


Fig. 1. Section of nest of *Camponotus (Colobopsis) truncatus* Spin. in wood. See explanation in the text. (After Forel.)

Fig. 2. Soldier of *C. truncatus* occluding the nest entrance with its head. (After Forel.)

of the nut-trees. In addition to *truncatus*, this fauna comprises *Dolichoderus 4-punctatus* L., *Leptothorax affinis* Mayr, and *Camponotus marginatus* Latr. He has repeatedly called attention to the close resemblances in form and color between the workers of *D. 4-punctatus* and *C. truncatus*. This resemblance is regarded as a case of mimicry. When both species have their nests in the same tree, there seems to be a mutual toleration which Forel interprets as a tendency toward para-

biosis. He finds, moreover, that a single colony of *truncatus* may occupy several different nests in the same tree. It is polydomous, to use Forel's expression. The gist of his observations is contained in the following passage:

"Having blown the whole contents of 12 *Colobopsis truncata* nests into a glass tube, I found it to comprise 400 workers, 77 soldiers, 2 females (one winged and one isolated), 5 males (from 2 nests).

"These numbers seem to prove two things: First, that the proportion of soldiers is about one to five or six workers; second, that the formicaries are polydomous as in *Dolichoderus 4-punctatus*, since none of the nests contained a fertile female. The only fertile female detected was isolated (*i. e.*, founding a colony in one of the branches).

"The average population of each nest (40 ants) thus gives no measure of that of a colony, which in the same nut-tree probably comprises in the mean from 10 to 20 nests.

"This fact recalls the polydomous formicaries of the tropical American *Dolichoderus bidens*, each nest of which is constructed of paper beneath a green leaf and forms a large chamber.

"Every nut-tree therefore comprises a formicary of *C. truncatus*, living in incomplete parabiosis with a colony of *Dolichoderus 4-punctatus* (it would be complete if the two species were to inhabit the same hollow limbs), whereas the *Leptothorax affinis* forms monodomous formicaries, the inhabitants of which are hostile to one another and to the two other species. . . ."

"We see therefore that *Colobopsis truncata* profits by the use of preëxisting cavities, the entrances to which are undoubtedly guarded by soldiers, as in the case of the nests excavated by the same species. But this species is also able to excavate in hard wood. Moreover, as other authors have shown, it also utilizes the cavities of galls.

"In exploring myrmecological faunas in future, it would be advisable to examine twigs and dry branches. They have many surprises in store for us."

As I shall show in the sequel, the hitherto undescribed

habits of our American species of *Colobopsis* agree very closely with Forel's account of the European form. I have had frequent opportunity to study the habits of one of the new forms from Texas (*C. abditus* var. *etiolatus*), and have seen enough of the nesting habits of the other to affirm that these too agree very closely with Forel's description of *C. truncatus*.

II. DESCRIPTIONS OF AMERICAN SPECIES OF COLOBOPSIS.

1. *Camponotus (Colobopsis) impressus* Roger.

Colobopsis impressa ROGER, Berl. Ent. Zeitg., 1863, p. 160 ♂.

Colobopsis impressa MAYR, Verh. zool. bot. Ges. Wien, 1886, pp. 423, 424. ♀.

Camponotus (Colobopsis) impressus EMERY, Ann. Mus. Civ. Genova, XXVII, 1889, p. 517.

Camponotus (Colobopsis) impressus EMERY, Zool. Jahrb. Abth. f. Syst., VII, 1893, p. 681 ♂.

Soldier. (Fig. 3, *a*, *b*, and *c*.) Length, 4.3–4.6 mm.

Head subcylindrical, from above rectangular, but little longer than broad, sides parallel, occipital border convex, anterior truncated surface concave, its edge distinctly carinate along the sides, but rounded above in the clypeal and adjacent regions. Mandibles small, with flattened lower surfaces, 4-toothed, with a short toothless proximal portion to the blade. Clypeus on the truncated surface twice as long as broad, slightly broader above, extending onto the dorsal surface of the head as a transversely oblong piece about three times as broad as long. There is a distinct median keel running the full length of the clypeus. Frontal carinae far apart, distinctly converging in front, somewhat convex externally. Eyes moderate, flattened, their anterior orbits about a third the distance from the posterior border of the head to the tips of the mandibles. Antennal scapes curved, slender at the base, gradually enlarging towards their tips, which extend beyond the posterior corners of the head to a distance about equal to their transverse diameter. All the funicular joints except the first, subequal, a little longer than broad, first joint nearly as long as the second and third together. Thorax robust, pronotum broader than long, very convex and rounded, and forming a sphere with the mesonotum. Mesopinotal constriction broad and pronounced. Epinotum with short convex basal, and longer, somewhat concave declivous surfaces, the angle between the two being rather blunt. Petiole low, convex and rounded in front and above, flattened behind, the posterior dorsal edge of the node being distinctly impressed in the middle, but not excised

or emarginate. Gaster rather broad, flattened dorso-ventrally. Legs short, femora compressed, anterior pair distinctly dilated.

Mandibles opaque, finely punctate, longitudinally and obscurely rugose. Anterior two-fifths of head subopaque, coarsely and rather regularly reticulate-rugose, the spaces enclosed by the rugæ being densely punctate. On the front and cheeks the sculpture passes over into shallow umbilicately punctate foveolæ. Behind this region there is a narrow uniformly punctate zone both on the cheeks and front. Posterior portion of head and remainder of body shining, delicately but distinctly shagreened.

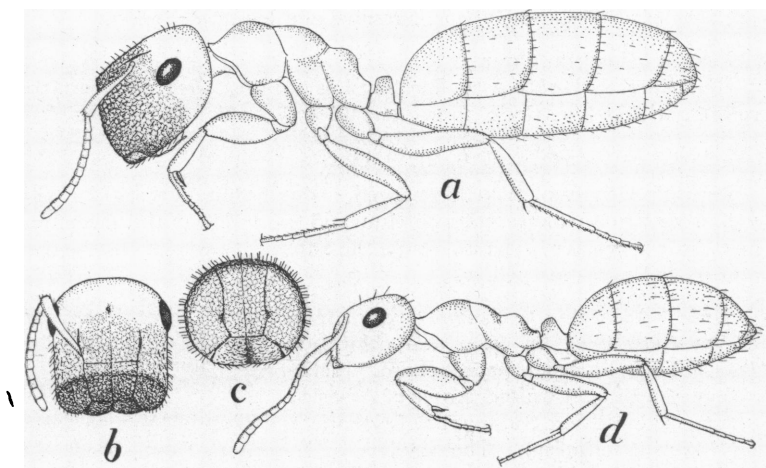


Fig. 3. *Camponotus (Colobopsis) impressus* Roger. *a*, Soldier; *b*, head of same from above; *c*, head of same from the front; *d*, worker.

Cheeks and anterior dorsal surface of head with short, erect, obtuse, brown hairs. There are a few erect hairs on the vertex and on the gastric segments, especially along their posterior edges, and a few at the tips of the antennal scapes and femora. The legs are sparsely covered with minute, appressed white hairs.

Thorax and appendages dark brown, the former with yellowish sutures, gaster and posterior two-thirds of head black; anterior third of head light yellowish brown. Mandibular teeth black.

Worker. (Fig. 3, *d*.) Length, 3.5–4.5 mm.

Head but little longer than broad, a little broader behind than in front, cheeks convex. Mandibles small, 4- to 5-toothed, when closed their external margins form a straight line at right angles to the long axis of the head. Clypeus nearly square, obscurely keeled. Frontal carinæ converging in front. Antennæ more slender and pro-
[April, 1904.]

portionally longer than in the soldier, surpassing the posterior corners of the head by about one third their length. Thorax and petiole resembling the corresponding parts of the soldier. Gaster proportionally smaller and more pointed.

Body and appendages shining, distinctly shagreened, the head and thorax more coarsely than the gaster; the cheeks and upper surface of the head also with scattered punctures.

Cheeks and legs covered with delicate, appressed, white hairs. Clypeus, front, vertex, tips of antennæ and femora and the gastric segments with a few scattered and longer brown hairs.

Dark brown, head and gaster black, mandibles yellow, anterior portions of cheeks and clypeus, antennæ and legs, pale brown.

Female. Length, 6 mm.

Head like that of the soldier but less robust. Petiole as in the soldier, with a low, thick, four-cornered node, which is broader than high.

Sculpture and pilosity as in the soldier.

Ferruginous, in part yellowish red. Mesonotum, except for two yellow longitudinal lines, the scutellum and the middle of the epinotum, light brown; gaster brownish black, the anterior two-thirds of the first and second segments yellow.

Male. According to Emery "very similar to the South European *C. truncatus* Spin. in form and coloration, but somewhat smaller (4-4.5 mm.); in other respects hardly distinguishable."

Type locality: "United States of America."

Specific localities: Savannahs of Georgia and Florida (Mayr); Texas and Florida (Emery). The soldiers and workers from which the above descriptions were taken, came from Lake Worth, Florida (Rev. P. J. Schmitt, O.S.B.)

2. *Camponotus (Colobopsis) riehlII Roger.*

Colobopsis riehlII ROGER, Berl. Ent. Zeitg., VII, 1863, p. 159, No. 40 ♀.

Camponotus (Colobopsis) riehlII EMERY, Ann. Mus. Civ., Genova, XXVII, 1889, p. 517.

"*Female.* Length, 6.5 mm. Pale reddish brown, shining. Thorax paler than the head; gaster dark brown, head and gaster sparsely (thorax apparently not at all) provided with short, erect hairs. Head throughout as in *truncata*. The sculpture is not so irregular as in this species, but consists of large, foveolate, shallow, somewhat shining punctures, each of which has a small puncture in its center; similar punctures are seen in *truncata* on the sides of the head. The frontal carinæ are almost parallel, in *truncata* they converge distinctly in front. There are three large ocelli. In front and behind the thorax is delicately striolate-reticulate, but very sparsely punctulate on the mesono-

tal disc. Petiole rounded above. Gaster transversely rugulose. Wings hyaline, somewhat iridescent, with pale yellow veins and stigma. The neurulation is exactly as in *Camponotus*.

"This species is very similar to *truncata*, but the more regular sculpture of the head, the finely punctulate thorax, the non-emarginate petiole and the parallel frontal carinae are sufficiently distinctive characters.

"Cuba." (Roger.)

3. *Camponotus (Colobopsis) pylartes* sp. nov.

Soldier. (Fig. 4, *a*, *b*, and *c*.) Length, 4.5–5 mm.

Head subcylindrical, somewhat longer than broad, decidedly wider in front than behind, with inflated cheeks; occipital border straight or slightly concave. Anterior truncated surface oblique, in profile distinctly concave, with a sharp border only on the sides of the face and mandibles; on the clypeal and adjacent regions the truncated surface passes into the dorsal surface through a rounder angle than in *impressus*. Mandibles larger than those of *impressus*, with more convex ventral margins; blade with four distinct apical teeth and a toothless basal portion. Eyes, clypeus, frontal carinae and antennae as in *impressus*. Thorax distinctly narrower and less robust, the pronotum being fully as long as broad and forming an ellipsoid with the mesonotum when seen from above; dorso-ventral diameter of the pro- and mesonotum much shorter than in *impressus*. The mesoepinotal constriction is shallower, though pronounced, the angle formed by the basal and declivous surfaces of the epinotum is more acute, and the former surface is longer and flatter. Petiole low, robust, as broad above as below, its anterior and posterior surfaces straight and parallel, the former passing over roundly into the flat top of the node when seen in profile; from above the node is convex in front and flattened behind. From behind it is somewhat more distinctly impressed in the middle above than in *impressus*. Gaster and legs as in that species.

Mandibles and anterior third of head subopaque, the former obscurely longitudinally rugose-punctate, the latter regularly and coarsely reticulate-rugose, with punctate interrugal spaces. Posteriorly this sculpture passes gradually into shallow and more scattered, umbilicately punctate foveolae on the front and cheeks. Posterior half of head and remainder of body shining, finely shagreened.

Hairs yellowish, short, erect and obtuse on the anterior half of the head, except its truncated surface, longer and tapering on the front and vertex. Gaster with scattered tapering hairs which are most abundant on the terminal segments. There are a few hairs at the tips of the antennal scapes and femora, and minute, appressed white hairs on the femora and tibiae.

Thorax and appendages yellowish brown; posterior two-thirds of

head dark brown, gaster black, with the basal fourth of the first and second and sometimes of the third segment, yellow. Femora, tibiae and upper surface of the thorax sometimes darker than the lower portions of the thorax. Mandibular teeth black.

Worker. (Fig. 4, *d*.) Length 3-4 mm.

Mandibles when closed more projecting than in *impressus*. Clypeus and anterior portion of head less convex. Antennal scape surpassing the posterior angle of the head by nearly half its length. Thorax resembling that of the soldier, low through the pro- and mesonotum, which are also narrower than in the worker *impressus*. Basal epinotal

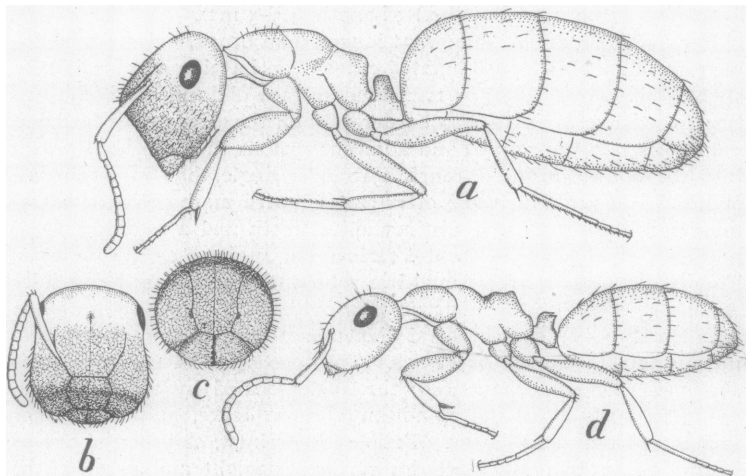


Fig. 4. *Camponotus (Colobopsis) pylartes* sp. nov. *a*, Soldier; *b*, head of same from above; *c*, head of same from the front; *d*, worker.

surface long and flattened, the declivity shorter and concave, the two surfaces meeting at a right angle. Petiole and legs as in the soldier. Gaster proportionally shorter and more pointed.

Shining throughout and finely shagreened, the front and cheeks also faintly and sparsely punctate, the sculpture throughout being somewhat fainter than in the worker *impressus*.

Hairs white, sparse; long and erect on the clypeus, front and gaster, minute and appressed on the cheeks and legs.

Yellowish brown; head, gaster, apical third of funiculus, femora and tibiae, dark brown or black; base of first and second gastric segments, mandibles, anterior portions of cheeks and clypeus, yellow.

Female. Length 5.5 mm.

Head resembling that of the soldier, but somewhat more slender, with ocelli, slightly larger eyes and less inflated cheeks. Thorax

hardly two and one half times as long as broad, mesonotum about as broad as long. There is a close resemblance to the soldier in the sculpture and pilosity. Anterior half of head brownish yellow with dark brown clypeal sutures and external mandibular borders. Teeth of mandibles black. Posterior half of head dark brown. Thorax and petiole yellow, pro- and mesonotum, scutellum and pleuræ clouded with pale brown. Gaster black, basal and dorsal half of first and second segments, basal fourth of third segment and entire ventral portions of first and second segments, pale yellow. Coxæ yellow, remainder of legs and antennæ brown. Wings whitish hyaline, with pale yellow veins and stigma.

Described from seven soldiers, numerous workers and a single female taken June 26 from a nest in a dead hickory branch (*Hicorea myristicæformis*) at Delvalle, near Austin, Texas. I have also taken single workers running on the leaves and twigs of walnut trees near Austin and at New Braunfels, Texas. Among the specimens captured at Delvalle are two individuals that are clearly intermediate in structure of head and size of body between the soldier and worker; in other words, they are true mediæ.

Although closely related to *C. impressus*, *C. pylartes* is very distinct in the shape of the thorax in the soldier and worker, and in the coloration of the gaster which is not banded with yellow in these phases of the latter species.

4. *Camponotus (Colobopsis) additus* Forel.

Biol. Centrali-Am., Hymenoptera, Vol. III, p. 158, No. 58. ♀.

"*Female*. Length, 7.5 mm. The truncation of the face is much more concave than in *C. truncatus*, and bordered by a distinct ridge, as in *C. rothneyi*; but the portion of the clypeus situated behind the truncated surface is short, as in *C. truncatus*. The truncated surface forms rather accurately a semicircle, the diameter of which is in front. Borders of the clypeus feebly diverging behind. Frontal carinæ very far apart, slightly sinuous. Head behind the truncation in the form of a short rectangle, a little broader in front than behind, much shorter than in *C. truncatus* and *C. rothneyi*, a little longer than broad. Eyes large, placed a little in front of the posterior third. Scapes hardly incrassated at the tip, rather slender, extending a little beyond the occiput. Joints of funiculus altogether cylindrical, not separated by constrictions. Thorax and petiole as in *C. truncatus*. Body narrow, elongated. Legs rather short; femora compressed.

"Truncated surface of the head finely and rather irregularly reticulate, subopaque; the portion of the head immediately behind this region is finely and densely reticulate-punctate, rather opaque, with large and very abundant, scattered punctures. Occiput, vertex, and the remainder of the body shining, feebly shagreened. Pilosity and pubescence very sparse. Tibiæ and tarsi without erect hairs.

"Pale reddish yellow; legs and antennæ yellow. Middle portions of the gastric segments largely clouded with brownish. Wings subhyaline; veins and stigma pale yellow.

"Hab. Guatemala, Capetillo (Champion). Allied to *C. impressus*, but the border of the truncation is more acute and the sculpturing less pronounced" (Forel).

Var. *etiolatus* var. nov.

Soldier. (Fig. 5, *a*, *b*, and *c*.) Length, 5-6 mm.

Head subcylindrical, from above suboblong, about one and one half times as long as broad, a little broader in front than behind; sides and occipital border straight; anterior truncated surface circular, concave, marked off on all sides from the remainder of the head by a sharp ridge. The clypeal portion of this surface is a little broader above than below, its borders somewhat concave on either side below the middle; it extends beyond the ridge onto the upper surface of the head for a much shorter distance than in *C. impressus* and *pylartes*. Frontal carinæ far apart, distinctly converging in front. Eyes large, their anterior orbits two fifths the distance from the occiput to the truncated surface. Antennal scapes curved, slender at the base, incrassated towards the tip, which extends to a distance somewhat greater than its transverse diameter beyond the posterior angle of the head. First funicular but little longer than the succeeding joints. Mandibles much larger and more projecting than in *impressus*, with convex ventral borders, four apical teeth, and a straight, toothless basal border. Thorax in profile evenly and gently arcuate above, with very faint promesonotal and mesoëpinotal incisures. Pronotum rounded, hardly broader than long; mesonotum as long as broad, somewhat narrower behind than in front. Epinotum much compressed laterally, with a pronounced angle between its basal and declivous surfaces, the latter only slightly concave and of about the same length as the former. Petiole low and thick, convex in front and above, flattened behind, its upper posterior margin entire and not transversely indented as in *impressus* and *pylartes*. Gaster elongate, suboblong, depressed. Legs rather short, femora flattened, anterior pair considerably dilated.

Mandibles and anterior two-fifths of head subopaque, the former irregularly rugose-punctate, the latter more coarsely and reticulately rugose, with densely punctate interrugal spaces. On the cheeks and

front the sculpture gradually passes over into umbilicately punctate, shallow and scattered foveolæ. Posterior half of the head and remainder of the body shining, minutely shagreened.

Hairs yellow; short, clavate, and erect on the anterior half of the head, except its truncated surface; longer and tapering on the front. On the gastric segments there are a few scattered hairs, more abundant on the terminal segments. The tips of the antennal scapes and femora are furnished with a few hairs, and there are some very inconspicuous hairs on the legs.

Pale yellow. Mandibular teeth black. Anterior half of the head

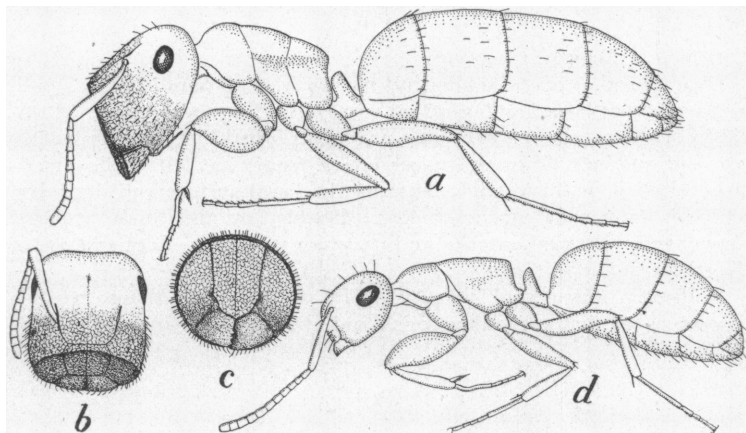


Fig. 5. *Camponotus (Colobopsis) abditus* Forel var. *etiolatus* var. nov. a, Soldier; b, head of same from above; c, head of same from the front; d, worker.

ferruginous red, gradually shading into the yellow color of the posterior portion. In soldiers from some nests the whole head is ferruginous, but always somewhat darker on the sculptured anterior portion. Segments of gaster each with a transverse brown band of variable breadth, but usually broadest on the terminal segments.

Worker. (Fig. 5, d.) Length, 3.5-4.5 mm.

Head longer than broad, not very convex in front, and with much more prominent mandibles than in the workers of *impressus* and *pylartes*. Clypeus nearly square, a little broader in front than behind, with a distinct median keel. Eyes large and flattened. Antennæ slender, scape surpassing the posterior angle of the head by about two-fifths of its length, but slightly enlarged towards its tip. Thorax shaped like that of the soldier, but more slender and more compressed in the meso- and metapleural regions. Petiole in profile acute above, with convex anterior and flat or even slightly concave posterior sur-

faces; upper border very sharp, in some specimens broadly but faintly excised in the middle when seen from behind. Legs like those of the soldier. Gaster proportionally smaller and more pointed.

Shining throughout and very finely shagreened; clypeus, front, and cheeks with faint, scattered punctures.

Hairs yellow; sparse and erect, on the clypeus, upper surface of the head and gaster; on the cheeks and legs appressed and so minute as to be almost imperceptible.

Pale yellow. Mandibular teeth black. Head and antennæ reddish; two or three terminal segments of gaster and in some specimens also the posterior portions of the preceding segments, infuscated.

Female. Length, 5.5–6 mm.

Head like that of the soldier but narrower, with parallel sides, ocelli and somewhat larger and more convex eyes. Thorax elongate, elliptical from above, about three times as long as broad; mesonotum nearly one and one half times as long as broad, somewhat flattened; epinotum rounded, with no angle between the basal surface and declivity, which is somewhat concave below. Petiole low and thick, rounded above, with flattened anterior and posterior surfaces. Legs and gaster like those of the soldier.

Sculpture, color, and pilosity as in the soldier. Wings whitish hyaline, with distinct yellow veins and stigma; wing-insertions dark brown.

Male. Length, 3.7–4.5 mm.

Head, including eyes, about as broad as long, with moderately prominent eyes and ocelli; cheeks subparallel, about as long as the convex posterior borders which pass gradually into the nearly straight occipital border. Mandibles narrow, toothless, pointed, when closed overlapping with the tips. Clypeus sharply keeled. Antennæ slender, scape half as long as the funiculus, which is filiform and of uniform thickness, except for the distinctly incrassated first joint. Thorax rather robust, mesonotum distinctly longer than wide, forming with the scutellum a regular ellipse. Basal surface of epinotum broadly rounded, declivity much shorter, obscurely concave below. Petiole small, anterior and posterior surfaces both somewhat convex, meeting above in a sharp transverse edge. Gaster and legs slender.

Shining throughout, minutely and obscurely shagreened.

Hairs pale and scattered, with about the same distribution as in the worker.

Yellowish brown; head behind, thoracic dorsum and gaster darker. There is a small deep black spot on the wing-insertions. Mandibles, mouth-parts, antennæ, legs, thoracic sutures, genitalia, and extreme basal portion of each of the gastric segments, pale yellow. Wings

whitish hyaline; veins and stigma pale yellow, less distinct than in the female.

Described from numerous specimens of all four phases taken at Austin, Texas, in the woody galls of *Holcaspis cinerosus* on the live-oaks (*Quercus virginiana*). The species is readily distinguished from *impressus* and *pylartes* by its pale color, the sharp borders of the truncated surface of the head and the shape of the thorax in the soldier and worker. In the latter character it resembles the European *truncatus*.

Professor Forel kindly compared some *etiolatus* females which I sent him, with the type of *abditus*, and called my attention to several slight differences in the proportions of the head, clypeus, etc., that would justify the description of the Texan form as a variety. Unfortunately the postal card on which Prof. Forel sometime ago indicated these differences has been mislaid among my papers, and I find myself unable to cite them from memory.

III. THE HABITS OF *Camponotus (Colobopsis) pylartes* AND *C. etiolatus*.

As stated above, the workers of *C. pylartes* were occasionally seen running about singly on walnut leaves and twigs near Austin and New Braunfels. I was, however, unable to discover the nests in these localities. One day, while examining the dead limb of a hickory (*Hicorea myristicæformis*) in the sandy post-oak woods at Delvalle, a few miles from Austin, I saw a worker run along the bark and enter a small round hole which a moment before had been closed by the circular head of a soldier. As soon as the worker had entered, the soldier moved forward and again closed the opening. Other workers were soon seen returning and anon disappearing into the nest after gently knocking at the living portal with their delicate antennæ. This is an interesting demonstration of the existence of a purely tactile communication between ants, since the soldier's eyes and antennæ are in such a position when the head is in the opening that sight and smell cannot

be employed for the perception of workers approaching either from without or within the nest. Inasmuch as the soldier steps aside only when the tactile signal is given, that is, when the flat, truncated forehead is titillated by an incoming, or the tip of the gaster by an outgoing worker, and not when these surfaces are touched with a pin or a straw, we must suppose that some very simple form of tactile communication has been developed in these insects *pari passu* with the extraordinary adaptation of the soldier as sentinel and animated front door in one.¹

When the hickory limb was broken in two, the nest was found to consist of a number of irregular galleries, apparently in great part the abandoned tunnels of some beetle larva, immediately under the bark. The galleries contained larvæ and nude pupæ, besides a few dozen workers and soldiers and a single virgin female. I was unable to ascertain whether this nest was merely one of several belonging to a single colony spread over different parts of the tree, but on still further breaking the limb, which was only about two feet long and one and one half inches in diameter, I found it to contain also a fine nest of *C. etiolatus* of essentially the same structure as the *pylartes* nest, except that the galleries extended into the hard wood, and a populous nest of *Campopnotus marginatus* Latr. (var. near *discolor* Buckl.) also excavated in the hard wood. Certainly these three species must have been very tolerant to excavate their nests in such close proximity to one another. In the bark of the same and surrounding trees I found nests of *Macromischa subditiua* Wheeler, much like the nests of *Leptothorax canadensis* Prov. in our northern trees, and of *L. affinis* in Europe.

The ant-fauna of *Hicorea myristicæformis* may therefore be compared with that described by Forel as occurring in the Swiss nut-trees, both in respect of its composition (save for the absence of *Dolichoderus*), and in the tendency towards

¹ I would emphasize the exclusion of sight and smell in this peculiar reaction, because Sharp's statement (Cambridge Natural History, Vol. VI, p. 138) that the *C. truncatus* soldier "sees a nest-fellow desirous of entering the nest" conveys an erroneous impression. The soldier merely feels the titillation of the worker's antennæ and at once responds with the appropriate, inherited reaction.

parabiosis among the component species. The same may also be said of the similar ant-fauna of the live-oaks of Central Texas. This fauna comprises the following species:

1. *Crematogaster lineolata* Say subsp. *læviuscula* Mayr and its var. *clara* Mayr.
2. *Leptothorax obturator* Wheeler,
3. *Leptothorax fortinodis* Mayr,
4. *Camponotus marginatus* Latr., two varieties near *discolor* Buckley,
5. *Camponotus* (*Colobopsis*) *abditus* Forel var. *etiolatus* var. nov.



Fig. 6. Gall of *Holcaspis cinerosus* in section, showing colony of *C. (Colobopsis) etiolatus*, with soldier guarding entrance.

All of these ants except *L. fortinodis*, are of common occurrence in the spherical, woody galls produced by the cynipid *Holcaspis cinerosus* Bassett on the twigs of the live-oaks; all of them prefer to establish their colonies in these galls, and with the exception of the *Crematogaster*, each of the above species is able to bring its males and virgin females, as well as numerous workers, to maturity within these narrow confines. This is accomplished either in a single gall, as in the

case of the small colonies of *Leptothorax*, or by extending the colony over several galls. Nevertheless all of these species may be found nesting in other places. *Crematogaster clara* and *Camponotus marginatus* often nest in the dead wood of the live-oaks, the former also in lager walnut and pecan logs. *Leptothorax obturator* is very fond of taking possession of the abandoned nests of two species of tiny, steel-blue carpenter bees (*Ceratina nanula* Cockerell and *C. arizonensis* Cockerell) in the hollow twigs of the wafer-ash (*Ptelea trifoliata*) so common in the Texas creek-bottoms. *L. fortinodis* is sometimes found nesting in oak-bark, at least in the northern States, and *C. etiolatus*, as I have shown, may inhabit galleries of its own excavation in hard wood. This ant is, however, so common and regular a tenant of the *Holcaspis* galls that I have always been able to find a few colonies of it whenever I visited any large clump of live-oaks in or about Austin. I have therefore been able to study this species more closely than the rarer *C. pylartes*.

C. etiolatus, unlike *C. pylartes*, is nocturnal in its habits. This is indicated, first by the fact that I have never seen the workers abroad in the day-time, even when the galls containing the ants were kept for some weeks in a jar in the laboratory, and, second, by their pale yellow coloration. In this respect they resemble an exclusively nocturnal ant of the same genus; *Camponotus fumidus* Roger var. *festinatus* Buckley, which forms rather large colonies under stones on dry hill-slopes in Central and Trans-Pecos Texas.

The colonies of *C. etiolatus* seem to be polydomous, as in *C. truncatus* of Europe. I infer this from the fact that galls on the same tree or even limb are found to contain workers, soldiers, and larvæ, but no queens. Moreover, when confined in the same jar, the workers from the different nests are quite friendly towards one another. The fertilized queen starts her colony in a single gall, and when her progeny become too numerous for these circumscribed quarters some of them emigrate with a portion of the brood to other galls on the same tree. The irregular central chamber made by the *Holcaspis* larva is enlarged by the ants and extended as a number

of short galleries into the hard, ligneous substance of the gall. The heads of the soldiers are just large enough to fit into the round hole through which the *Holcaspis* fly escaped (Figs. 6 and 7). In one gall four of these round holes were found and each was occluded by a soldier. In this case three of the holes must have been made by the ants. The *etiolatus* soldiers behave in the same manner as those of *pylartes* and

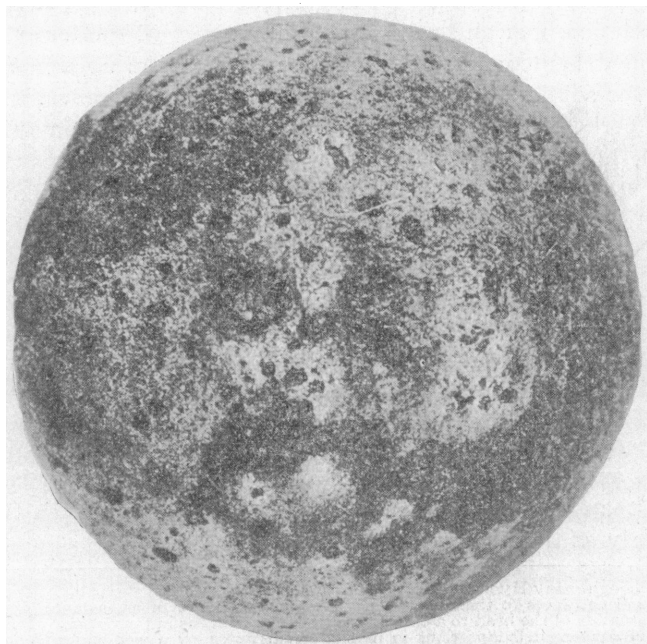


Fig. 7. Gall of *Holcaspis cinerosus* with head of a *C. (Colobopsis) etiolatus* soldier occluding the entrance to the nest.

truncatus towards workers entering or leaving the gall. When the activity of the workers is suspended during the day-time or during spells of cold weather, the soldiers remain at their post, carefully occluding the entrance for hours at a time. It is probable that they relieve one another at long and irregular intervals. This may perhaps be inferred from the fact that although there is commonly but a single entrance, the nest always contains more than one soldier. A census of 15

galls, collected from different trees in different localities, gave about 24.4 as the average number of ants in a gall, with an average of 4.9 soldiers and 19.5 workers. In other words, there are about four workers to one soldier. This approaches the ratio recorded by Forel for *C. truncatus* (see p. 143).

On one occasion I found a young queen that had just started her colony and was raising a small packet of larvæ. By replacing the slice of the gall cut away in exposing the central chamber and waiting for some time till the insect had regained her composure, she was seen to take up a position like the soldier, with her head occluding the entrance. This was perhaps to be expected from the configuration of her head, but it is an interesting fact, nevertheless, because it indicates that the isolated *Colobopsis* queen does not, like the isolated queens of many other ants, close the nest opening with earth or wood-filings till it is reopened by the first-born workers.¹

The pupæ of *C. etiolatus* are always nude, as in the other species of the subgenus. The workers and soldiers are sharply separated from each other morphologically; at least I have never been able to find any mediæ, although I have examined the personnel of many nests for this particular purpose. The males and virgin females make their appearance earlier in the year than the fertile sexes of *C. pylartes*. I have taken them as early as the first week in May.

¹ Although many Hymenoptera (bees, Bembecidæ, etc.) are in the habit of stopping the round entrances to their nests with their heads, I know of no instance in which the adaptation of the head to a circular orifice is so perfect as in *Colobopsis*. The wide range of convergent adaptations in insects is illustrated by a well-known American moth (*Cicinnna melshameri* Harris), the larva of which stops the round posterior opening of its case with the truncated, toughly chitinized hind end of the body. Another convergent adaptation is seen in the cephalic plates of certain tubicolous marine Annelids, like the Maldanidæ.