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A Taxonomic Study on the Ant Tribe Cephalotini (Hymenoptera: Formicidae)

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(With 157 figures)

Introduction

Biological taxonomy is essentially the science of distributing into a system in an orderly fashion all the different kinds of living organisms of the present and the past according to a recognized principle of classification. The naming and describing of new forms is nothing but a preliminary, yet indispensable operation. Nowadays, there are a few sectors in the immeasurable field of taxonomy where these preliminaries have nearly come to a close, and very little descriptive work is left to be done. Myrmecologists, in general, are not so fortunate. Despite the imposing wealth of validly named and diagnosed forms, — the figure of 8000 known species and subspecies representing a very conservative estimate, — a great many unknown species of ants still wait to be discovered, especially in the so-called exotic regions.

This fact, however, does not imply that the most urgent task of ant taxonomists consists in turning out as many new species as possible, until the last member of the Formicid family will be made known. The mere description of new forms, without a concomitant critical review of the work already accomplished in the respective section, threatens to reduce Formicid classification to an unextricable maze. On the other hand, the real progress of ant taxonomy depends largely on the production of monographs of single systematic groups.

Fortunately enough, such a trend is unmistakable in the recent ant literature, where the number of revisionary studies is on a steady increase. Nevertheless, in order to avoid any misunderstanding, it must be pointed out that the necessity of constructive overhauling applies much more to the specific and infraspecific, than to the generic and suprageneric classification. Wheeler was fully aware of the importance of this task, when

[1]) Revised from an unpublished thesis submitted to the faculty of the Graduate School of Cornell University, Ithaca, N. Y., for the degree of Doctor of Philosophy.

he said: "What we need for the present is not a new arrangement, the erection of a lot of new genera on superficially aberrant species and the raising of every subgenus to generic rank, but a painstaking study of all the species in the existing groups. Until such studies have made appreciable headway, the existing avowedly imperfect classification should not be discarded without at least as much thought as has been devoted to its construction".[2] Although these statements were made forty years ago, they are still applicable to the present conditions of myrmecology. The fact that even now a great many species and subspecies of ants are insufficiently diagnosed, poorly understood and often not identifiable without recourse to the types, constitutes, without any doubt, one of the sorest spots in ant taxonomy and requires urgent correction.

The present study deals with the taxonomic organization of the Neotropical ant tribe Cephalotini (olim: Cryptocerini). It is primarily intended to contribute toward a better understanding of all known forms of this group and to facilitate their identification. For this reason special attention has been given to the keys, the illustrations and the assembling of more closely related forms into species groups. The classification is based upon the worker caste. A synthetic treatment of the sexual forms, especially the males, proved to be impracticable at the present time. The comparatively rare occurrance of the reproductive castes in ants, and the fragmentary knowledge thereof, constitute a strong and factual argument against the claim of those taxonomists who insist on founding the classification upon males and females, instead of upon workers.

This writer's original intention was to offer a complete revision of the entire Cephalotine tribe. However, due to the lack of adequate material for study, the revision of the subgenera *Harnedia* and *Cyathomyrmex* of the genus *Paracryptocerus* had to be postponed until a later date.

Acknowledgments

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[2]) W. M. Wheeler, 1910. Ants. Columbia University Press, p. 133.

[3]) This and the following abbreviations will be used throughout the

Zoological Park, Washington, D. C. [CWMM]; Dr. A. Reichensperger, Professor in the Entomological Institute of the University of Bonn, Germany [CAR]. I am also greatly indebted for the loan of a large number of specimens to Dr. J. Bequaert, Curator of Insects in the Museum of Comparative Zoology at Harvard University [MCZ]; Dr. H. Dietrich, Curator in the Department of Entomology, Cornell University [CU]; Dr. C. Ferrière, of the Muséum d'Histoire Naturelle, Geneva, Switzerland [MHNG], who not only sent me a number of Forel's types, but also very kindly exerted himself to furnish detailed information on forms which could not be forwarded to me; Dr. N. Kusnezov, of the Instituto Miguel Lillo, Tucumán, Argentina [CML]; Dr. F. Maidl, Director of the Naturhistorisches Museum, Vienna, Austria [NHMW], who lent me the Mayrian types; Dr. V. S. L. Pate, who arranged for the loan of specimens from the Academy of Natural Sciences in Philadelphia [ANSP]; Dr. M. R. Smith, at whose request I was forwarded the corresponding material of the U. S. National Museum in Washington [USNM].

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Taxonomic History of the Cephalotini

Both modern systematics and the taxonomy of the Cephalotini have their origin in Linné's *Systema Naturae* (1758: 10th edition) which contains the diagnosis of *Formica atrata* [= *Cephalotes atratus*], the first known member of the tribe. After this timid start a period of almost fifty eventless years elapsed until the turn of the century brought about a noticeable progress in the knowledge of these ants. Five new species were described by Fabricius and Latreille. The latter author is also responsible for their generic separation from the heterogeneous *Formica*-complex of Linné. In 1853 the total number of valid species had been raised to 13 through the efforts of Klug, Guérin and Spinola. The same period yielded also six synonyms, now definitely recognized as such.

During the following 22 years, from 1854 to 1876, the ill-inspired genius of Frederick Smith completely dominated the field. This author produced several extensive and richly illustrated monographs on the ants of the present group and other somewhat related forms, all of which he included in his own and newly

monograph, to indicate the collections in which the respective specimens are presently deposited.

erected family Cryptoceridae.[4] However, due to his lack of taxonomic judgement, the amazing inadequacy of his figures and descriptions and his remarkable talent for mixing up locality records, — to mention just a few of his deplorable shortcomings, — F. Smith succeeded only in setting up a major stumbling block in the systematics of the Cephalotini, as well as in other groups of ants and divers hymenopterous families, which had the misfortune of receiving his attention. Instead of prolonging this diatribe, already a common-place topic in contemporary ant literature, it may suffice to point out that of 35 new specific entities created by F. Smith, only eight can now be recognized with a reasonable degree of certainty. Nine other species have to be relegated to the synonymy of species described either by Smith himself or by the preceding authors. A total of eighteen forms must be left as practically unknown until a redescription of the types, still extant in the British Museum or at Oxford, will be available. It certainly was an unhappy coincidence that most of the Neotropical material collected at that time reached the hands of F. Smith, and not those of G. Mayr, a much better taxonomist, whose excellent contributions to this particular field were forced to remain very limited.

Things took a turn to the better when Emery, in 1890, began to work on the Cephalotini. In an introductory note to his first paper dealing with the tribe, he pointed out that, on account of their bizarre structures, these ants are more readily diagnosed by means of accurate illustrations than by lengthy descriptions. Emery therefore devoted a great part of his critical study to the production of more than 60 well executed line drawings of all the known castes of 33 species, including 18 species already described by his predecessors. He likewise cleared up a considerable amount of synonymy and established the major limits of the genera within the tribe. Throughout his work Emery presents himself as a cautious taxonomist, more interested in pointing out morphological relationships than in describing new species. Perhaps one may hold this against him: his descriptive notes are often all too scanty, and in setting up polytypic species he was not always very successful.

Whereas in Emery the preoccupation for taking stock of,

[4]) Aside from the Cephalotini F. Smith's family Cryptoceridae contained several other groups, such as the Dacetini, the Cataulacini, the Meranoplini and others. This classification was abandoned by the subsequent workers, even though Ashmead, in 1905, attempted in vain to reinstate this family.

and revising, the contemporary taxonomic knowledge of ants is very pronounced, it is very secondary in Forel and nearly absent in Santschi. Forel and Santschi, especially in their later work, showed very little interest in the organizational phase of taxonomy; instead they concentrated upon publishing, often at random, the descriptions of new species, subspecies and varieties. In their work on the Cephalotini, the erection of infraspecific forms came to predominate more and more. A superficial glance over their contribution may even leave the impression that both authors already anticipated the favorite trend of the "New Systematics". In reality, however, population studies, distributional and ecological data had very little to do with the races and varieties of Forel and Santschi. The degree of morphological difference, often based upon a single specimen, was their only criterion. Forel is the taxonomic author of the tribe, which he established in 1892. In the following three decades he alone described more forms of Cephalotine ants than any other worker before or after him. Also Santschi increased remarkably the roster of Cephalotine species, although his contribution does not quite attain the proportions of that of his master. Moreover he is definitely a "splitter", especially as regards the *Paracryptocerus*-fauna of Argentina, in which he created several specific entities that are hardly distinguishable.

Finally there have to be mentioned two North American workers who exerted a rather important role in the taxonomy of this complex. The first is Wheeler, who is credited with the descriptions of several new forms and as well as a few very good suggestions concerning the generic classification of the group. Very recently Dr. M. R. Smith revised the three North American species of the tribe, and also settled the old dispute concerning the names of *Cephalotes* and *Cryptocerus,* which resulted in the definite elimination of the latter.

In conclusion, almost two hundred years of systematic work on the Cephalotine ants have yielded a total of 166 hitherto recognized forms, distributed in five genera. The chief taxonomic difficulties of this tribe lie mainly in the unrecognized species of F. Smith, and in the polytypic species and species complexes, especially those created by Santschi and Forel. Little is known concerning the distribution, the ecology, or the biology of these ants. With the exception of a few rather common forms, most of the species and subspecies have been very infrequently collected, and many are known only from the types. About a

third of the actually recognized specific and infraspecific entities are subject to some doubt, and a high percentage of these are practically unidentifiable. Taxonomists of the western hemisphere find still another difficulty in the fact, that most of the work in the past has been done by Europeans, and therefore the greatest number of types is deposited in Museums of the Old World.

Taxonomy and Nomenclature

Emery's system of quadrinomial nomenclature still prevails in the taxonomy of the present group, as well as in most other assemblies of ants not recently revised. In addition to the genus and species it recognizes also two infraspecific categories: the subspecies and, subordinated to it, the variety. In recent years the usefulness and validity of this system has often been challenged; it has been qualified as old-fashioned, retrogressive and unmanageable. Even though there is a great deal of truth in these accusations, it should be noted, — as Creighton [5] just recently pointed out, — that the original formicid subspecies was not so far removed from the homonymous category of modern systematists, as often has been claimed. The concept of geographically and morphologically differentiated races of the same species, intergrading along the border line of their continuous ranges, is no novelty to ant taxonomy. On the other hand it is true, that in applying this principle to exotic groups, such as the tribe Cephalotini, Emery, Forel and Santschi did not, and could not, take advantage of the same criteria which they so successfully used when classifying the array of European ants. Due to the lack of geographical data, personal field observation and detailed collecting records, subspecies and varieties have been erected upon the degree of morphological similarity alone. Obviously such an exclusive criterion opens the way to subjectivity; and in fact, the objective relationship of different forms has not been correctly apprehended in many cases.

The concept of variety as infrasubspecific category is at present the object of very great opposition from many modern taxonomists, myrmecologists and non-myrmecologists alike, although, from a speculative viewpoint, such a category is perfectly reconcilable with the principle of speciation. Thus it is entirely possible that geographically widespread races may again be differentiated into "subraces", both upon a morphological

[5]) W. S. Creighton, 1950. The Ants of North America. Bull. Mus. Comp. Zool. Harvard, vol. 104, p. 13.

and distributional basis. In fact, the existence of such a condition has been demonstrated in some groups of animals, where the degree of difference can be expressed quantitatively rather than qualitatively as, for instance, in fishes.

The International Rules on Zoological Nomenclature, however, at present [6] do not recognize infrasubspecific categories. Hence all the quadrinomial names, be they called forms, varieties or subraces, are neither protected by, nor subjected to, these very rules. Yet Richter [7], in his recent commentary on the Rules, states that the binary principle of our present system does not intrinsically reject the establishment of a fourth category. Whether or not such a category should be elevated to nomenclatorial rank, is a question of expediency, and may be decided upon in a very near future.

The state of our present knowledge of the forms of the Cephalotini, by no means justifies so specialized a taxonomic system. In this writer's estimation the subspecies alone should prove sufficient. For this reason I propose to abandon the varietal category, and by doing this, to follow the trend adopted by most of our modern myrmecologists.

This procedure, simple as it may appear, does not settle implicitly the problem arising from the already existing varieties. The easiest solution would consist in dropping them altogether without any further investigation, since, at the moment, they do not possess any obligatory standing. Others have suggested to raise them automatically to higher nomenclatorially valid rank. Both solutions, however, appear to be arbitrary, and certainly do not represent a real progress in the understanding of the systematics of the group. The tedious way of investigating each individual case is still the most commendable method and it should be up to each reviser to find out the true and exact status of each form, that has been originally proposed as a mere variety.

E. Mayr [8], one of the more outstanding theorists on systematics in recent years, ventured the opinion that most of the infraspecific entities in Formicidae represent the so-called sibling species. This statement may hold true in individual cases,

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[6]) The revised rules, to be published very soon, will most probably contain provisions for infrasubspecific categories.

[7]) R. Richter, 1948. Einfuehrung in die Zoologische Nomenklatur. Frankfurt, p. 104-105.

[8]) E. Mayr, 1942. Systematics and the Origin of Species. Columbia University Press, p. 203.

but cannot be generalized, as appears from Creighton's recent review of the North American ants and is shown occasionally in the present account. As a rule, it may be said, that the varieties are more often than not only individual variants, not deserving under any circumstance to be named. But even this principle is not applicable to each case, and again it must be emphasized that no general solution is possible.

Terminology and Definitions

Throughout the present study effort has been made to employ a terminology that both agrees with the traditional glossary of myrmecologists and, on the other hand, satisfies the just demands of comparative morphology. It is hoped that most of the terms used in the descriptions and keys will be self-explanatory. The meaning of others will be readily found in the glossaries of Torre Bueno [9] and M. R. Smith. [10] In the following I limit myself to discuss briefly the measurements and certain more unfamiliar morphological concepts.

Measurements. — I have adopted three standard measurements, regarding the total length of the insect, the median length of the head and the maximum length of the thorax. The last two measurements can be ascertained and expressed in a high degree of accuracy, since the sclerites of both head and thorax are firmly ankylosed, or even completely fused, excluding any possible expansion or compression. The length of the head is the median length from the anterior border of the clypeus to the posterior border of the head, in dorsal view. The length of the thorax is the so-called Weber's lenght of thorax, and consists in the maximum straight-line distance, in lateral aspect, from the antero-dorsal border of the prothorax to the postero-ventral ("metasternal") angle of the thorax, above and behind the hind coxae.

Due to the fact that the arthropod metamerism gives rise to a variable telescoping effect between succeeding somites, and, furthermore, the tagmata of the body are moveable upon one another and do not necessarily lie all in the same plane, the obtaining of a significant total length of the insect is rather difficult. More recently myrmecologists have been trying to

[9]) J. R. de la Torre Bueno, 1937. A Glossary of Entomology. Brooklyn Entomological Society. Pp. IX+336, 9 Pls.

[10]) M. R. Smith, 1947. A Generic and Subgeneric Synopsis of the United States Ants. Am. Midl. Nat. vol. 37, pp. 626-629.

overcome this obstacle by offering a synthetic measurement made up of the sum of the length of the following individual parts: maximum length of head (the closed mandibles included) + Weber's length of thorax + length of petiole + length of postpetiole and gaster combined.

There can be no doubt that the total length value thus obtained is much more objective than the result of the traditional simple procedure. Nevertheless I can see no point in overstressing the accuracy by giving the total length measurements in terms of the micrometer scale. At least in the present group of ants, the gaster of many species may be variously expanded and it is extremely difficult, if not entirely impossible, to ascertain the normal length of the gaster, i. e. the normal amount of overlapping of the successive tergal and sternal plates, with such a degree of accuracy that justifies the use of so precise a measurement. This fact alone seems to indicate that the synthetic measurement of the total length should be kept within a reasonable amount of accuracy, and not be extended to insignificant trivia. At any rate, in the present study, the total length given for any insect indicates only the maximum reasonable approximation to the objective total length.

I also have occasionally made use of the interocular width, which stands for the straight-line distance across the head, between the inner (upper) borders of the eyes.

Morphological terms. — In order to facilitate the use of the keys and the descriptions contained in this review, I present an explanation of the following terms:

The *frontal carinae* are the longitudinal ridges, lying on the inner side of the antennae. They are very conspicuous in the Cephalotine tribe, being more or less expanded and plate-like, covering the antennal scrobe from above and extending back to, or beyond, the eyes.

The prothoracic tergite, a collar-like sclerite in most aculeate Hymenoptera, presents in the present group, especially in the females and workers, the dorsal and lateral faces more or less differentiated from one another. I call the dorsal portion the *pronotum* proper, whereas the lateral pieces, covering the propleura to a great extent, are termed the *laterotergites* of the pronotum.

The *mesonotum* is a single dorsal sclerite in the worker caste. In the sexual forms it is broken up into the large, pentagonal anterior *scutum,* and the smaller, transverse posterior

scutellum, which has a wing-like projection on each side (axillae). The scutum may bear more or less distinct sutures or grooves. A pair of longitudinal grooves that arise from the anterior border and fuse mesally behind, generally known as notauli, are traditionally called the *Mayrian furrows* by myrmecologists. These grooves are very conspicuous in the males. The sutures arising from the posterior border, laterad of the Mayrian furrows, and extending forward, are the *parapsidal sutures*. They are usually distinct in the females.

The tergal portion of the metathorax, the *metanotum*, visible in sexual forms as a narrow transverse band behind the scutellum, is absent in the worker caste.

The proximal segment of the tarsi is usually much longer and somewhat differentiated from the remaining four apical segments, and is termed the *metatarsus*.

In the male, the posterior end of the gaster bears a retractile copulatory apparatus, generally known as the *genitalia*. The apparatus is attached to the ninth sternite, which for that reason is often called the *subgenital plate*. The gentialia consist of the *basal ring*, an anular sclerite, which in turn bears two sets of copulatory appendages. The dorso-lateral external claspers, known as the *parameres* or stipites, are longest. The smaller internal pair of pincers, the *volsellae*, are ventro-mesad in position and their distal end is bifid, having a median hook-shaped *digitus* and a lateral, more or less blunt *cuspis*. The genital opening is on the distal tip of two closely united and sclerotized *penial valves*, which together form the *penis* or *aedoeagus*, and lie between the paired outer and intermediate claspers.

The venation of the fore wing is of some importance in the classification of the sexual forms. The terminology accepted here is the one elaborated by Jurine, with the modifications by Cresson. Although this system is avowedly artificial, it is very useful for practical purposes due to its simplicity. Fig. 111 represents a wing, on which the most important features are labelled for reference. Following are the cells of the fore wing: costal, median, submedian, anal, marginal, first submarginal, first discoidal, second discoidal; the longitudinal veins: costal [C], subcostal [Sc], median [M], submedian [Sm], radial [R], cubital [Cu], discoidal [D], subdiscoidal [Sd]; the transverse veins: basal [B], first recurrent [1 Rc], transverse median [Tm]. The transverse cubital vein is absent in this particular wing,

since the cubital touches directly the radial vein, but can be seen on other wings, such as in figs. 86 and 92.

Tribe Cephalotini (Forel) M. R. Smith

Cryptoceridae [in part] F. Smith, 1854, Trans. Ent. Soc. London, (2) vol. 2, pt. 7, p. 214.
Cryptocerini Forel, 1892, Mitt. Schweiz. Ent. Ges. vol. 8, p. 345. — Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 299. — Wheeler, 1922, Bull. Am. Mus. Nat. Hist. vol. 45, p. 665.
Cryptocerii Forel, 1893, Ann. Soc. Ent. Belg. vol. 37, p. 164. — Emery, 1895, Zool. Jahrb. Syst. vol. 8, p. 771.
Cryptocerinae Ashmead, 1905, Canad. Ent. vol. 37, p. 384.
Rhagomyrmicinae [in part] Forel, 1917, Bull. Soc. Vaud. Sc. Nat. vol. 51, p. 231.
Cephalotini M. R. Smith, 1949, Psyche, vol. 56, pp. 18-21.

The tribe, as presently accepted, was proposed in 1892 by A. Forel who first recognized it as a systematic entity. As Dr. Smith has recently shown, the name of *Cryptocerini,* selected by Forel, cannot be maintained any longer, since it is based upon *Cryptocerus,* an isogenotypic synonym of *Cephalotes.* The tribal name, consequently, must be *Cephalotini,* with the genus *Cephalotes* as its type.

Characters of the Tribe

Amid the monotonous uniformity shown in the rest of the subfamily of Myrmicinae, the proventricular valves exhibit a high degree of specialization in the Cephalotine tribe. In all castes of these ants the posterior end of the crop possesses an object like a perfectly rounded mushroom-head, which represents the four valves of the proventriculus. This structure is rather irregular, sclerotized, ramified in its intravalvular spaces and filled with solidified folds of star-like appearance. [11] The purpose of this strangely modified proventriculus or gizzard is entirely unknown, although from a taxonomic viewpoint it offers a clear-cut distinction between the Cephalotini and all other ants.

Worker. — Monomorphic or dimorphic, if the latter, transitional stages may be present. Clypeus narrow, flat or concave. Frontal carinae widely separated from one another, either greatly expanded and covering the cheeks from above, or strongly divergent behind and reaching the occipital corner. Antennal scrobe deeply excavated, its upper wall formed by the frontal carinae, extending to or beyond the eye. Antennae 11-segmented, with the terminal segments of the funiculus not forming a distinct club. Basal face of epinotum usually very

[11]) See: Emery, 1922. Gen. Insect. Subf. Myrmicinae, fasc. 174, Pl. 6, figs. 3, 3b, 3c.

distinct and well developed. Middle and hind tibiae without an apical spur. Postpetiole articulated at the anterior end of the gaster. First gastric tergite covering almost completely the gaster from above.

Female. — Head similar to that of the worker, or the soldier, if such a caste is present. Eyes large. Ocelli always present, small, sunken in pits. Pronotum exposed. Mesonotum (scutum and scutellum) weakly convex, rather flat. Fore wing with a single marginal and submarginal cell. The marginal cell always elongate, usually closed and appendiculate. Transverse cubital vein usually present, sometimes lacking in larger forms. Pterostigma normal.

Male. — Head subcircular or transverse, not resembling that of the worker. Mandibles strong, the masticatory edge usually distinctly toothed. Clypeus short. Frontal carinae short to obsolete. Antennal scrobe vestigial to absent. Antennae 13-segmented. The scape usually, not always, shorter than the second funicular segment. The first funicular segment shorter than the second segment and the scape. Thorax somewhat similar to that of the female. Mayrian furrows of scutum Y-shaped, deeply impressed. Hind tibiae usually without an apical spur. Petiole cylindrical or nodiform, sessile. Postpetiole articulated with the anterior end of the gaster. Wings as in female.

To date 166 recognized species, subspecies and varieties have been described; these are divided into five genera: *Procryptocerus, Cephalotes, Zacryptocerus, Hypocryptocerus* and *Paracryptocerus*. To these a new genus, *Eucryptocerus,* is added in order to accommodate a few closely related species that diverge in several important features from *Cephalotes* with which they have been associated so far. The characters differentiating the various generic entities and the modifications introduced into the arrangement of the species will be discussed further on.

The phylogeny of the tribe as a whole, as well as the origin of the component groups are still hypothetical. There is no doubt, however, that the tribe as such constitutes one single natural complex, which Emery derives from hypothetical and primitive Myrmicinini. The singular specialization of the proventriculus sets them apart very distinctly from all other living groups. Unfortunately there is no known fossil record to project any light upon the problem of their origin.

Distribution and Ethology. — The entire tribe of Cephalotine ants is strictly Neotropical in distribution, occurring

in all subregions of the Neogaeic Realm, with the exception of the Chilean subregion and the portion South of the 35th parallel of Argentina. Three species have invaded the southernmost portion of the Nearctic region, at three different places in the United States: Arizona, Texas and Florida.

The climatic requirements and restrictions of the Cephalotini are not very well understood, but one may safely assume that they are confined by nature to tropical and subtropical climates. The fragmentary information concerning their life habits will be more fully discussed under each group. All species, however, seem to agree in being more or less arboreal and lignicolous. From an economic viewpoint these ants are insignificant, being neither harmful nor noticeably beneficial.

The following key serves for the generic identification of the worker caste.

Key to the genera for workers

1. Frontal carinae very little expanded, not covering the cheeks from above, strongly divergent behind; scape, when lodged in the scrobe, extending much beyond the posterior border of the eye..... I. *Procryptocerus* Emery
— Frontal carinae greatly expanded, covering the cheeks from above, subparallel to slightly divergent caudad; scape, when lodged in the scrobe, not extending beyond the posterior border of the eye..... 2
2. Eyes situated beneath the antennal scrobe, which extends above it to the occipital corner..... II. *Cephalotes* Latreille
— Eyes situated, at least in part, behind, or slightly above the scrobe, which terminates in front of the eye, never reaching the occipital corner 3
3. Occipital angle bispinose; eyes globose; sides of peduncular segments unarmed..... III. *Eucryptocerus*, n. gen.
— Occipital angle never bispinose, but either rounded, or unispinose, or dentate, or laminate; eyes never globose; the sides of the peduncular segments always armed 4
4. Gaster completely surrounded by a translucid, laminate border; prothorax with a similar border, containing a solid, raised and recurved scapular spine..... IV. *Zacryptocerus* Wheeler
— Gaster not completely surrounded by a translucid, laminate border, or, if a border is present around the posterior half, the prothoracic border is horizontal and flat, not containing a solid scapular spine.. 5
5. Epinotum with a pair of long, sharp spines, arising from the posterior corner of the basal face, the sides of which are unarmed; pronotum with a lateral flat, blunt scapular spine. Workers monomorphic.... V. *Hypocryptocerus* Wheeler
— Posterior corners of basal face of epinotum without a pair of long, sharp spines, or, if spines are present, the sides of the pronotum are continuously expanded, or the sides of the basal face of the epinotum are armed. Workers dimorphic.. VI. *Paracryptocerus* Emery

I. Genus PROCRYPTOCERUS Emery

Frederick Smith, in the sixth volume of his "Catalogue of Hymenopterous Insects in the Collection of the British Museum", published in 1858, presented the description of *Meranoplus gracilis,* a new Brazilian ant, which is the first known member of a closely related and distinctive assembly of neotropical ants, presently known as the genus *Procryptocerus*. The same author subsequently (1860, 1876) described four more South American forms of the same group, which he likewise added to the roster of *Meranoplus,* not being aware of their generic distinctness.

In 1866 G. Mayr pointed out that all the typical forms of this genus, restricted to the Ethiopian, Oriental and Australian regions, exhibit 9 antennal segments in the worker and female caste, whereas the Neotropical representatives possess 11-segmented antennae in the same caste. Hence the latter cannot be considered congeneric with the former. Nevertheless, Mayr, who himself enriched the New World group with 5 additional new species, refrained from creating a new genus, but merely transferred this assembly to the genus *Cataulacus,* with which, indeed, it agrees in the number of antennal segments and also in general habitus, although this resemblance is only superficial.

Mayr's solution, however, proved to be ephemeral. In 1887 Emery disclosed convincing facts, which showed that the nearest relatives of the present group are not to be found among the Old World Cataulacine ants, but that they are very closely allied to the Cephalotine complex; for they share with the latter group the striking and exclusive feature of the mushroomhead-shaped proventricular valves. Consequently, Emery established the genus *Procryptocerus* for the South American *Cataulaci,* and associated them with the tribe Cryptocerini [= Cephalotini].

To date *Procryptocerus* comprises 23 species, 13 subspecies, 7 varieties and 1 subjective synonym. The comparatively large number of infraspecific forms established for several species suggests that the systematic organization of the group already has reached an advanced stage. Unfortunately, however, most of the species and their subordinate forms are very imperfectly known; their limits, diagnostic characters, relationship and distribution are often not fully understood. A single revisionary study dates back to 1894, when Emery presented a critical, but brief, comment on all the forms known to him. Since then the taxonomy of the genus has become more complex, not only

due to the increase of the number of forms, but also due to the untimely introduction of infraspecific categories, begun by Emery and continued by Forel, Santschi and others.

Through the generosity of the individuals and institutions, mentioned in the introductory part, I have been able to gather over 600 specimens of *Procryptocerus* ants, among which were the types of 15 species and specimens of additional 11 forms of the genus. Although this number does not cover completely all the known members of the group, it provided a sufficient foundation for introducing several major changes in the systematic arrangement of the genus. The total number of recognized forms has been reduced from 43 to 36, whereas the number of species was raised from 23 to 28. These and other minor changes will be explained and justified at their respective places in the following pages.

Procryptocerus Emery

Meranoplus [in part] F. Smith, 1858, Cat. Hym. Brit. Mus. vol. 6, p. 194.
Cataulacus [in part] Mayr, 1866, Verh. Zool.-bot. Ges. Wien, vol. 16, p. 908.
Procryptocerus Emery, 1887, Ann. Mus. Stor. Nat. Genova, vol. 25, p. 470 nota. — Wheeler, 1911, Ann. N. Y. Acad. Sci. vol. 21, p. 171. — Emery, 1922, Gen. Insect. Hym. fasc. 174c, pp. 301-302. — Borgmeier, 1927, Arch. Mus. Nac. Rio de Janeiro, vol. 29, p. 110 (Catalog of Brazilian Ants). — Eidmann, 1936, Arb. phys. angew. Ent. Berlin-Dahlem, vol. 3 (2), pp. 81-83, 103.

Type of the Genus: *Meranoplus striatus* F. Smith, 1860 [= *Procryptocerus striatus* (F. Smith)]. Designation of Wheeler, 1911.

The following characters differentiate the worker and female of *Procryptocerus* from all other Cephalotine ants: Antennal scrobe extending almost to occipital angle. Eyes situated below the scrobe. Frontal carinae moderately and equally expanded throughout, not completely covering the cheeks from above. Occiput distinctly truncate. Pronotum without spines or teeth. Metatarsus not compressed. Petiole and postpetiole without projecting spines, teeth or tubercles.

The comparatively long scape, subequal to, or longer than, the second funicular segment; the postpetiole, which is longer than high; the greatly curved mandibles; the subcircular, not transverse, head; and the spines or teeth on the posterior corner of the basal face of epinotum, separate the males of *Procryptocerus* from all other males of the tribe.

The Old World genera, with which these ants have been temporarily associated, differ from *Procryptocerus,* also in external features. Thus workers and females of *Cataulacus* have the antennal scrobe beneath the eyes, and the same castes of *Meranoplus* exhibit only 9 antennal segments and a short, almost obsolete, basal face of epinotum.

Generic Features

Worker. — Strictly monomorphic. Moderately small to very small forms, ranging from 3.5-8.5 mm. Basic color black; tip of terminal funicular segment orange-brown. Head subrectangular to subcircular in anterior aspect, broadened behind; sides arcuate. Mandibles greatly curved, longitudinally striolated or rugulose, with distinct apical and preapical tooth, and several, more or less vestigial, proximal teeth. Clypeus transverse, rectangular, convex; anterior border shallowly emarginate or notched mesad; posterior border vestigial to obsolete. Frontal area vestigial to obsolete. Frontal carinae divergent caudad, as long as the scape, attaining the lateral border in front of the occipital angle, moderately but uniformly projecting, not covering the cheeks and the mandibular insertion in anterior aspect. Antennal scrobe situated above eyes, excavated, extending almost to occipital angle. Scape longer than half the median head length, not completely covered by frontal carinae, when lodged in the scrobe. Occiput truncate, usually distinctly marginate above. Occipital angle with or without a small tooth. Funiculus of ten segments, the second segment shorter than the first or the third. Thorax not depressed, trunk-shaped. Pronotum without excrescences. Promesonotal suture vestigial to obsolete. Mesonotum usually with postero-lateral, subrectangular, projecting lobe or tooth. Thorax more or less constricted laterad between mesonotum and epinotum. Mesoepinotal suture distinct to obsolete, often deeply impressed. Basal face of epinotum usually expanded baso-laterally into a somewhat projecting lobe; posterior corners with conspicuous, subhorizontal spines, pointing caudad. Sides of thorax longitudinally striated. Femora fusiform. Metatarsus cylindrical, not compressed. Petiole nodiform, not pedunculate, without dorsal or lateral excrescences or projections; its anterior face more or less truncate. Postpetiole always broader than petiole, upper face convex, without dorsally or laterally projecting spines, teeth or tubercles. Gaster elliptical to ovate, slightly depressed dorso-ventrally; the first tergite covering more than three fourth of the total length of the gaster. Pilosity and sculpture variable.

Female. — Slightly larger than the worker, but very similar. Ocelli minute, not conspicuously raised above the upper surface of head. Promesonotal suture distinct. Scutum flat, with lateral, vestigial parapsidal sutures. Axillae of scutellum often separated from the scutellum proper by an arcuate, dense row

of large and deep punctures. Epinotal spines shorter than half of their interbasal distance. Mesopleura divided by a transverse suture. Wings hyaline or infumated. Fore wings with distinct stigma. Marginal cell generally open, cubital and subdiscoidal veins usually more or less vestigial in the apical field. One closed submarginal and discoidal cell present. Second abscissa of cubital vein always shorter than first.

M a l e. — Larger than worker and female. Body elongate, slender. Head rounded, never transverse. Interocular distance shorter than, or subequal to, the median head length. Mandibles greatly curved, not broadened apically. Clypeus convex, anterior border faintly notched mesad, posterior border indicated by a transverse furrow in front of the antennal insertion. Frontal carinae short, divergent caudad; vestigial to obsolete behind the eyes. Antennal scrobe little excavated above eyes, vestigial to obsolete behind. Occiput not distinctly truncate. Occipital corners distinct to obsolete. Ocelli conspicuous, raised above the upper surface of head. Antennae 13-segmented and filiform. Scape subequal to, or longer than, the second funicular segment. Eyes large and prominent. Scutum of thorax with deeply impressed Y-shaped furrows; the anterior arms longer than the posterior median stem. Posterior corners of basal face of epinotum with a small tooth. Femora very moderately incrassate medially. All segments of the legs comparatively long and slender. Claws simple. Middle and hind tibiae usually without an apical spur. Petiole elongate, subcylindrical, not pedunculate. Postpetiole similar to petiole, somewhat shorter, more incrassate caudad. Gaster elongate, often cylindrical. The first gastric tergite covering less than two thirds of the gaster. Apex of parameres with a rounded projection. Subgenital plate triangular to subtrapeziform. Digitus of volsellae hook-shaped, apices bent ventrad. Wings similar to those of female. Pilosity dense, sericeous, long, especially beneath head and on gastric sternites.

E t h o l o g y. — Scarcely anything is known regarding the habits of the species of *Procryptocerus*. Most, if not all of them, seem to be xyloecetes, and often have been found nesting within cavities of plant material. According to Eidmann (1936) the South Brazilian species prefer to mine their nests within rotten wood. In Trinidad the nest of *spiniperdus* was discovered within the base of the spines of *Erythrina umbrosa,* which had been hollowed out by these inquiline ants. A nest of *coriarius* was detected in withered branches of coffee trees. Father Borgmeier found the

nest of *schmalzi,* consisting of two elongated, narrow, and parallel galleries, inside a rotten board of a wooden fence. Several times U. S. Plant Quarantine inspectors have taken specimens of *scabriusculus* and *goeldii* in dried bulbs of orchids, imported from South America.

Component Species. — I have divided the 28 species and 8 subspecies of Procryptocerus into 9 groups. Four of these, namely the complexes of *rudis, hirsutus, coriarius* and *paleatus,* constitute well defined natural groups. The polytypic species *subpilosus,* and the groups of *striatus* and *sulcatus* are most certainly heterogeneous entities, which nevertheless have here been classified together, for practical purposes, as they seem to agree in a few superficial features. The remaining two groups contain either isolated or transitional forms, the exact position of which could not be ascertained. As all the species are very similar, it does not seem feasible to recognize subgenera.

Distribution. — All the members of *Procryptocerus* are exclusively Neogaeic in their present-day distribution, and no fossil evidence exists to indicate that they were ever found outside of the Neotropical Realm.

The northern limit of the genus, so far as is known, roughly coincides with the Isthmus of Tehuantepec in southern Mexico. The southern limit of its territory runs along the 32d parallel. No specimens have been recorded from any Caribbean island, with the exception of Trinidad, the fauna of which is strictly continental in character. Likewise a positive record of the genus is lacking for British Honduras, Nicaragua, French Guiana, Surinam, Ecuador, Peru, Chile and Paraguay. One or a few species of *Procryptocerus* should occur in all the states of Brazil, but they have not as yet been collected in 9 states and all 4 territories, comprising more than half of the area of that country. Specimens of *regularis,* however, have been taken in the provinces of Misiones and Corrientes in Argentina.

Considering that only 20 of 36 forms are known from specimens other than the type series, it is obvious that the distribution of most species is imperfectly understood. It is certainly premature to distinguish between typical southern and northern, eastern and western forms, as any future collecting is liable to overthrow completely our present concept. In fact, I recently received a single specimen of *regularis* from Trinidad, a species which, until then, had to be considered as the

southernmost form of the group, the range of which did not extend north of Rio de Janeiro.

The subjoined key will serve to separate the workers, with the exception of *gracilis, striatus, subpilosus* and its subspecies *attenuatus* and *impressus*. These had to be omitted because of the lack of knowledge of their structural detail. Moreover, as only 15 females and 7 males have been described to date, no keys are given for the sexual forms. Nevertheless the key for workers should prove helpful, to a certain extent, for the identification of the females of the group.

Key to species and subspecies for workers

1. Laterotergite of pronotum excavated; pronotum distinctly constricted anteriorly towards shoulders (Figs. 17, 20, 21)..... 2
— Laterotergite of pronotum not excavated; pronotum not or only scarcely constricted anteriorly towards shoulders..... 4
2. Basal face of epinotum as long as wide at the base of the spines; epinotal spines less than half as long as the basal face (Fig. 20).. 15. *paleatus* Emery
— Basal face of epinotum distinctly shorter than wide at the base of the spines; epinotal spines more than half as long as the basal face 3
3. Longitudinal rugulae on upper surface of head converging mesad to a single point in front of the occipital crest; epinotal spines broad at base, triangular, their outer borders distinctly converging caudad (Fig. 17)..... 17. *marginatus* Borgmeier
— Longitudinal rugulae on upper surface of head subparallel, not converging mesad; epinotal spines not broad at base, slender, their outer borders distinctly subparallel (Fig. 21)..... 16. *spiniperdus* Forel
4. Base of scape with a prominent triangular lobe (Fig. 41); frontal carinae straight, anterior end bent mesad, greatly projecting above the antennal socket (Figs. 9, 15); long hair on gaster never decumbent 5
— Base of scape without a prominent triangular lobe; frontal carinae more or less sinuate, anterior end not projecting above the antennal socket; or, if so, the long hair on the gastric tergite is decumbent. 8
5. Upper surface of first gastric tergite smooth and fulgid..... 1. *batesi* Forel
— Upper surface of first gastric tergite conspicuously sculptured, at least basad 6
6. First gastric tergite striated discally for its entire length; shoulders almost rounded (Figs. 18, 19); hind femora distinctly longer than maximum width of thorax..... 4. *rudis* (Mayr)
— First gastric tergite striated discally only on basal half or less, and smooth apically; shoulders angulate (Fig. 23); length of hind femora subequal to maximum width of thorax..... 7
7. Seventh funicular segment more than 1.5 times as broad as long; size less than 4.5 mm. (Colombia and Central America)..... 2. *carbonarius* (Mayr)

— Seventh funicular segment scarcely broader than long; size more than 5.0 mm. (Santa Catarina, Southern Brazil)..... 3. *clathratus* Emery

8. First gastric tergite smooth and fulgid; sides of basal face of epinotum parallel, without a baso-lateral lobe (Fig. 28)..... 9
— First gastric tergite sculptured, at least basally, or, if not so, the basal face of the epinotum possesses a distinct baso-lateral lobe on each side 10

9. Legs reddish-brown; epinotal spines as long as the basal face of epinotum; declivous face of epinotum perpendicularly striated..... *mayri* Forel
— Legs fuscous black; epinotal spines shorter than basal face of epinotum; declivous face transversely striated..... 24. *mayri reichenspergeri* (Santschi)

10. Long hair of first gastric tergite decumbent, dense; first gastric tergite never striated 11
— Long hair of first gastric tergite erect, sparse; first gastric tergite striated, or, if not distinctly so, the fine punctures are arranged in longitudinal rows 15

11. Head subcircular in front view (Fig. 4); upper surface of head sparsely foveolate, but not reticulate-rugose, almost devoid of hair 12
— Head subrectangular in front view (Fig. 8); upper surface of head reticulate-rugose, with large, impressed areoles, abundantly covered with erect hairs 13

12. Mesoepinotal suture deeply impressed, interrupting the profile of the thorax; foveolae on upper surface of head obsolescent discally in front of the occipital crest..... 8. *coriarius* (Mayr)
— Mesoepinotal suture scarcely impressed to obsolescent, never conspicuously interrupting the profile of the thorax; foveolae equally numerous discally, in front of the occipital crest.. 9. *schmitti* Forel

13. Mesonotum longitudinally rugose, flat; middle and hind tibiae fuscous 14
— Mesonotum reticulate-foveolate, convex; middle and hind tibiae ochraceous..... 5. *belti* Forel

14. Epinotal spines shorter than length of the basal face; upper face of tibiae rugose and opaque; size more than 4 mm..... 6. *hirsutus* Emery
— Epinotal spines longer than length of basal face; upper face of tibiae smooth and fulgid; size less than 3.8 mm..... 7. *hirsutus convexus* Forel

15. Exposed portion of second to fourth gastric tergites longitudinally striated; upper surface of head striated..... 16
— Exposed portion of second to fourth gastric tergites not longitudinally striated, or, if so, then the upper surface of head is not striated at all. 18

16. Mesonotum without a laterally projecting tooth or lobe (Fig. 31); upper surface of head strictly longitudinally striated..... 25. *gibbosus* Kempf
— Mesonotum with a strong, laterally projecting tooth or lobe (Figs. 29, 30); striae on upper surface of head more or less converging behind 17

17. Petiole short, globose (Fig. 62); posterior face of hind femora completely and heavily striated; sculpture of mesonotum usually irregular, broken up or transverse..... 36. *schmalzi* Emery
— Petiole elongate, cylindrical (Fig. 42, 61); posterior face of hind

femora striated only above, smooth below; mesonotum longitudinally striated..... 35. *convergens* (Mayr)

18. Upper surface of head distinctly longitudinally striated; anterior portion of pronotum without punctures..... 19
— Upper surface of head not striated, or if so, the striation is obsolete or obscured by larger, interspersed punctures, and the anterior portion of the pronotum bears coarse punctures..... 26
19. Sixteen or fewer striae on pronotum, 12 or fewer striae on mesonotum 20
— Eighteen or more striae on pronotum, 16 or more striae on mesonotum 21
20. Striae on head subparallel, straight, regular; upper half of surface of eye deeply pushed in, concave..... 27. *sampaioi* Forel
— Striae on head converging behind, wavy; surface of eye evenly convex ..... 26. *ferreri* Forel
21. Striae on first gastric tergite fading out before reaching the posterior margin; apical third smooth; small species, 3 mm. long..... 22. *elegans* Santschi
— Striae on first gastric tergite always reaching the posterior margin; larger species, at least 4 mm. long..... 22
22. Upper surface of head and first gastric tergite very finely and superficially striated; minute decumbent setulae visible among the long, suberect hair of the first gastric tergite..... 23
— Upper surface of head and first gastric tergite deeply and coarsely striated; no minute, decumbent setulae visible among the longer erect hairs on first gastric tergite..... 24
23. Baso-lateral lobes of epinotum little projecting and rounded (Fig. 33); occipital truncation mostly transversely striated..... 31. *adlerzi* (Mayr)
— Baso-lateral lobes of epinotum distinctly projecting and angulate behind (Fig. 36); occipital truncation perpendicularly striated..... 32. *balzani* Emery
24. Striae on upper surface of head converging behind; mesoepinotal suture distinct and impressed, apparent in profile..... 30. *regularis* Emery
— Striae on upper surface of head subparallel, not converging behind; mesoepinotal suture obsolete, not impressed, invisible in profile.. 25
25. Striae on upper surface of thorax strictly longitudinal throughout.. 28. *sulcatus* Emery
— Striae on upper surface of thorax concentrically converging on mesonotum, transverse on epinotum (Fig. 32)..... 29. *sulcatus curvistriatus* Kempf
26. Upper surface of head sparsely foveolate, without traces of striation or rugosities in the intervals; diameter of foveolae not larger than the intervening spaces; mesonotum with foveolae..... 27
— Upper surface of head rugulose, without sparse foveolae, or, if foveolae are present, these are either elongate, more or less connected with one another by longitudinal furrows, or very large in the form of shallowly impressed areoles, the bottom of which is reticulate; mesonotum without foveolae, regularly striated..... 28
27. Declivous face of epinotum and anterior face of petiole without transverse striae; petiole longer than wide; erect setae extremely scarce on first gastric tergite..... 11. *goeldii* Forel
— Declivous face of epinotum and anterior face of petiole with strong transverse striae; petiole short, subquadrate; erect setae more abundant on first gastric tergite..... 12. *goeldii hylaeus*, n. subsp.

28. Dorsum of postpetiole divided into two distinct surfaces (Figs. 52, 64): the anterior surface longer, descending cephalad, with longitudinal striae; the posterior surface shorter, with a few vestigial transverse striae, continuing the lateral striae; upper surface of head with large, shallowly impressed, reticulate areoles.... 10. *pictipes* Emery
— Upper surface of postpetiole not distinctly divided into two surfaces, without transverse striae behind; upper surface of head without large, reticulate, impressed areoles.....29
29. First gastric tergite finely, densely, superficially striated; dorsum of thorax longitudinally striated, including the anterior portion of pronotum; size 4.0 mm..... 21. *subpilosus lepidus* Forel
— First gastric tergite strongly longitudinally striated; anterior portion of pronotum reticulate-rugose and foveolate; size more than 4.5 mm. 32. *scabriusculus* Emery

A. Group of Procryptocerus rudis

The Colombian species, *batesi, carbonarius, rudis* and the Southern Brazilian *clathratus*, constitute a closely related group, characterized by the following common features:

Frontal carinae straight, anterior and posterior ends rounded mesad; the anterior end prominently projecting above the antennal socket; cheeks, in front view, little arcuate, almost straight; occipital truncation imperfectly separated from vertex, without a distinct, entire, transverse crest or margination; each corner of occiput with a conspicuous denticule; eyes prominent, very convex; base of scape with a tooth or triangular lobe; upper surface of head and thorax coarsely reticulate-rugose to clathrate; the areolate depressions fulgid; mesoepinotal suture weak to obliterated; length of hind femur surpassing maximum width of thorax; thorax, as measured from anterior border of pronotum to tip of epinotal spines, twice as long as maximum width; petiole short; postpetiole not much wider than petiole; pilosity long, fine, sparse, suberect, uniform.

All these species are known only from the type series; females, except of *clathratus*, and males, are unknown.

1. *Procryptocerus batesi* Forel

(Fig. 22)

Procryptocerus batesi Forel, 1899, Biol. Centr.-Amer. Hym. vol. 3, p. 43, nota [worker; Colombia].

The smooth and fulgid gaster, the rounded shoulders, the strongly convex lateral border of the pronotum differentiate this species from all other members of the *rudis*-group. Furthermore, *batesi* differs from *carbonarius* and *clathratus* by having the postpetiole prominently convex above, and epinotal spines divergent; from *rudis* by having a strong, upturned, lateral mesonotal tooth.

Type. — Worker; Colombia (Landolt) (No other data) [Muséum d'Histoire Naturelle, Geneva, Switzerland (Coll. Forel)].

Worker (Lectotype). — Length 5.8 mm. Median head length 1.57 mm., Weber's length of thorax 1.95 mm. Black; the following fuscous brown: apices of mandibles, fore tarsi, funiculus and tibiae.

Head subopaque. Mandibles distinctly striated. Clypeus perpendicular to upper surface of head, longitudinally striolate, upper half strongly convex, with a faint, median longitudinal carinule, fading out on vertex; posterior border indistinct. Frontal area obsolete. Frontal carinae straight, anterior and posterior ends curved mesad, the anterior end somewhat produced over the antennal socket, the posterior end meeting the prominent, acute occipital tooth, which is obliquely recurved outward. Occipital truncation not set off by a distinct transverse margination of vertex. Cheeks, in front view, very little convex, almost straight; reticulate-rugose in front of, and behind, the eye, striato-rugose beneath. Eyes prominent, evenly convex. Upper surface of head longitudinally rugose anteriorly and with very few transverse connecting rugulae, becoming coarsely reticulate-rugose posteriorly, the bottom of the impressed areoles fulgid. Scape with a prominent triangular lobe at base, subcylindrical proximad, scarcely curved, slightly flattened and broadened distad; finely and sharply reticulate-punctate, its length surpassing two thirds of median head length. Lower surface of head longitudinally striato-rugose. Sculpture of occipital truncation similar to that of upper surface of head.

Thorax [Fig. 22] subopaque; its length, as measured from the anterior border of pronotum to tip of epinotal spines, almost twice as long as the maximum width (80:43). Promesonotum slightly longer than broad (45:43). Anterior and lateral borders of pronotum rounded, shoulders not angulate, lateral border not distinctly marginate. Promesonotal suture vestigial. Mesonotum projecting laterally in a strong, acute, and slightly upturned tooth. Sides of thorax greatly constricted between meso- and epinotum. Mesoepinotal suture obsolete. Dorsum of thorax, in profile, continuous, without indentation. Basal face of epinotum less than twice as broad as long (32:17), flat, with a narrow, entirely rounded (baso-lateral) lobe on each side. Epinotal spines subequal to length of basal face, slender, straight, acute, divergent; their interapical distance subequal to maximum width of basal face. Dorsum of thorax sculptured as upper surface of head, the reticulations being somewhat more elongate on the posterior portion of pronotum, tending to form longitudinal striae

mesad on meso- and epinotum. Sides of thorax reticulate-rugose to longitudinally rugose. Declivity of epinotum with irregular ridges and rugae on upper half, smooth on lower half. Fore femora more inflated than middle and hind femora, all smooth and fulgid. Hind femora longer than maximum width of thorax (54:45). Tibiae rimose on outer (upper) face.

Petiole, from above, about as long as wide, not abruptly truncate anteriorly, sides moderately convex, coarsely reticulate-rugose above and laterally; anterior face finely punctured with a few transverse striae. Ventral face anteriorly with a minute, blunt tooth. Postpetiole slightly wider than long (24:20), extremely convex above, in profile subangulate, the posterior declivity of the upper face being almost at right angles to the anterior declivity; longitudinally rugose anteriorly above, reticulate rugose laterally and behind.

Gaster perfulgid, elliptical, short, tergites and sternites smooth, with obsolescent microsculpture, consisting of extremely fine, shallow reticulations.

Upper surface of head and thorax, peduncle above and laterally, appendages and gaster with uniform, sparse, yellowish-white, suberect, rather long and flexible pile. Mandibles and funiculus with shorter suberect hairs.

Female and male. Unknown.

This distinctive species is known only from the type series, collected by Landolt in Colombia.

Specimens examined: 1 worker (lectotype), from the Museum of Natural History, Geneva, Switzerland.

2. *Procryptocerus carbonarius* (Mayr)

(Figs. 9, 23, 53, 71)

Cataulacus carbonarius Mayr, 1870, Sitz.-ber. Akad. Wiss. Wien, vol. 61, p. 413-414 [worker; Colombia: Bogotá].
Procryptocerus carbonarius, Emery, 1887, Ann. Mus. Stor. Nat. Genova, vol 25, p. 470, nota.
Procryptocerus carbonarius var. *laeviventris* Forel, 1899, Biol. Centr.-Amer. Hym. vol. 3, p. 47; [worker; Panamá, Vulcano de Chiriquí].

This species differs from *batesi* and *rudis* by the sculpture of the first abdominal tergite, the upper surface of head and thorax, the subdenticulate and angulate shoulders, the comparatively short hind femora, and the profile of the postpetiole. It also appears to be discrete from *clathratus*, on the basis of characters mentioned under that species.

Type. — Worker; Colombia: Bogotá (Lindig) [Naturhist. Museum, Wien (Coll. G. Mayr)].

Worker (holotype). — Length 4.2 mm. Median length of head 1.04 mm., Weber's length of thorax 1.49 mm. Black, subopaque. The following dark ferruginous: apical third of mandibles, 2d to 10th funicular segments, apical tips of femora, tibiae and metatarsi. Ligth ferruginous: 1st funicular segment, apical tip of scape and remaining tarsal segments. Fuscous: scapes and tibiae.

Head [Fig. 9] subopaque. Mandibles with distinct, approximated longitudinal rugulae, somewhat confined to the base and internal border. Clypeus subperpendicular to upper surface of head, transverse, posterior half longitudinally convex, its posterior border indicated by the triangular, impressed frontal area. From each side of the anterior excision of the clypeus arise two fine ridges, which unite posteriorly, setting off an anterior median triangular area, and forming posteriorly a conspicuous longitudinal carinule, which bisects the posterior half of the clypeus and the frontal area. About three fine longitudinal ridges at each side of the median crest; the intervals very finely reticulate-punctate. Frontal carinae straight, anterior and posterior ends curved mesad, the anterior end covering the antennal sockets from above, the posterior end meeting a small occipital tooth on each side. When seen from above, the frontal carinae do not reach the inner (upper) border of eyes. Eyes prominent, evenly convex, situated halfway between the tip of closed mandibles and occiput. Lateral and occipital border of head convex, the latter slightly impressed in the center. Occiput truncate, but not excavated, transverse occipital crest absent mesally, vestigial laterad. Upper surface of head coarsely clathrate, covered with longitudinal rugae, connected by transverse rugulae, forming elongated meshes which become more rounded, crowded and irregular towards the occiput. The impressed areoles contained in the meshes have the bottom finely reticulate and fulgid. Cheeks, in front view, little curved, almost straight, and irregularly and coarsely reticulate rugose. A distinct tubercle on cheeks beneath the posterior corner of antennal insertion. Lower surface of head longitudinally striated. Occipital truncation with distant longitudinal ridges, and finely reticulate-punctate intervals. Scape opaque, moderately curved, with a triangular lobe at base, depressed distad, finely, but sharply punctured, with a few rugosities on the anterior border. First and last funicular

segment longer than broad, all remaining segments distinctly broader than long.

Thorax [Fig. 23] measured from anterior border of pronotum to tip of epinotal spines, almost twice as long as broad. Promesonotum scarcely longer than broad (34:32). Anterior and lateral borders of pronotum moderately arcuate, humeral angles distinct, subdenticulate. Promesonotal suture obsolete. Mesonotum with a lateral triangular tooth on each side, which is slightly upturned. Between meso- and epinotum the thorax is greatly constricted laterally, and impressed dorsally, without a distinct mesoepinotal suture. Dorsal surface of epinotum exactly twice as broad as long; antero-laterally, for half os its length, expanded into small, narrow, rounded lobes. Epinotal spines almost as long as basal face of epinotum (11:13), slightly bent outward at base, parallel apically, horizontal. Pronotum antero-laterally coarsely reticulate-rugose, as the upper surface of head; from its postero-median portion, across mesonotum and epinotum, the ridges tend to become more regular, the longitudinal ones prevailing. About five striae run down the declivous face for a short distance, the remaining portion being smooth and fulgid. Sides of thorax longitudinally striated. Coxae and femora smooth, tibiae rimose on outer face. Femora moderately inflated, the hind femur slightly longer than maximum width of thorax (35:32).

Petiole [Figs. 53, 71], from above, subquadrate, sides and dorsum moderately convex, the median ventral ridge terminating anteriorly in a very blunt, inconspicuous tooth. Coarsely reticulate-rugose laterally and above, anterior face very finely punctured with transverse striae. Postpetiole broader than long (20:16), anterior border straight, anterior corners subangulate, lateral border moderately convex, posterior border prominently arcuate, dorsum, in profile, moderately convex. Sculpture as on petiole, except for the anterior portion of the upper face on which longitudinal rugae prevail.

Abdomen ovate, longer than broad (52:43), shallowly emarginate at the postpetiolar articulation. First tergite with fine, dense longitudinal striolation discally fading out on the apical third, which is microscopically reticulate, and smooth and fulgid, as are the sides. First sternite striolate basally. Remaining tergites sculptured as apex of first.

Dorsum of head and thorax, dorsum and sides of peduncle, dorsum of abdomen, with sparse, long, cream-colored, suberect sericeous pile. Somewhat oblique, but not appressed on antennae

and appendages. Short decumbent setae between the longer hairs on the disc of the first abdominal tergite. Gula, propleura, coxae and sternites of abdomen with silky, appressed pubescence.

Female and male: Unknown.

This species is still known only from the single worker taken by Lindig at Bogotá, Colombia.

Specimens examined: 1 worker (holotype).

Synonymical Notes. — I have not seen the type or any other specimen of *Procryptocerus carbonarius* var. *laeviventris* Forel, which, according to the original description, differs from the typical *carbonarius* by its larger size (4.5 mm.), the slightly curved and sinuate epinotal spines, the sculpture of the first abdominal tergite, which is striolated only at base, not reaching the half. However, in view of the fact that both the distribution and range of individual and colonial variation of the typical *carbonarius* are, at present, unknown, these minute discrepancies of *laeviventris* do not warrant Forel's variety being recognized as a category of taxonomical standing. I therefore propose to consider the variety *laeviventris* Forel as a synonym of *carbonarius* (Mayr).

3. *Procryptocerus clathratus* Emery

Procryptocerus clathratus Emery, 1896, Bull. Soc. Ent. Ital. vol. 28, p. 94 [worker, female; Brazil: State of Santa Catarina].
Procryptocerus carbonarius, Emery (nec Mayr), 1894, Bull. Soc. Ent. Ital. vol 26, p. 200.

Types. — Worker, female; Brazil: State of Santa Catarina (Schmalz) [(Coll. Emery) in the Museo Civico di Storia Naturale di Genova, Italy; 1 worker in the Coll. A. Forel, Muséum d'Histoire Naturelle, Genève, Switzerland].

I have been unable to examine this species, which is known only from the type series. By comparing the holotype of *carbonarius* with the description of *clathratus* I have not found any noticeable differences, besides those already mentioned by Emery. At the present state of our knowledge, the considerably larger size (5.6 mm.), the thinner funiculus — segments 2-7 being scarcely broader than long — and the sculpture of the first gastric tergite, which is striated only on the basal third, the extent of the striation being shorter discally, than laterad (2/3 in *carbonarius*, only discally), and the slightly sinuate epinotal spines are the only characters that distinguish this Southern Brazilian species from the Colombian *carbonarius*. The head sculpture, against Emery's statement (who never had seen the typical *carbonarius*, thus basing his judgment exclusively on the somewhat misleading description of Mayr) is clathrate in both species, *i. e.* in this regard the differential diagnosis for *clathratus* applies exactly to the type of *carbonarius*.

Hence, until further material will be turned up, the status of the present species remains subject to some doubt.

4. *Procryptocerus rudis* (Mayr)

(Figs. 15, 18, 19, 41, 48, 70)

Cataulacus rudis Mayr, 1870, Sitz.-ber. Akad. Wiss. Wien, vol. 61, p. 414 [worker; Colombia: Bogotá].
Procryptocerus rudis Emery, 1887, Ann. Mus. Stor. Nat. Genova, vol. 25, p. 470, nota.

The first gastric tergite, striated discally for its entire length, the bluntly rounded postero-lateral lobe of the mesonotum, and the subangulate shoulders distinguish *rudis* from *batesi*, its closest relative.

Type. — Worker; Colombia: Bogotá (no other data) [Naturhistorisches Museum, Wien (Coll. G. Mayr)].

Worker (lectotype). — Length 5.4 mm. Median head length 1.29 mm., Weber's length of thorax 1.73 mm. Black; the following dark ferruginous: tip of mandibles, upper (external) face of tibiae and tips of tarsi. Fuscous: antennae, femora, remaining part of tibiae and tarsi.

Head [Fig. 15] subopaque. Mandibles with fine, widely separated striae. Clypeus perpendicular to upper surface of head, posterior portion strongly convex, continuous with the upper surface of head, limited posteriorly by a faint transverse furrow, and a median, small, triangular depression, representing the frontal area. Frontal carinae straight, anterior and posterior ends curved mesad, anterior end largely covering antennal socket from above, posterior end meeting a prominent, pointed, occipital tooth, which points obliquely backwards. Occipital border straight, truncation not distinctly set off from vertex, transverse crest vestigial laterad, absent mesad. Cheeks in front view, very little convex, almost straight, longitudinally rugose, reticulate-rugose around eyes. Eyes prominent, evenly convex, situated at half of the distance between anterior border of the closed mandibles and occipital border. Upper surface of head coarsely reticulate-rugose, the meshes being elongate anteriorly, the longitudinal rugae prevailing; more irregular, rounded, crowded, without distinct longitudinal rugae, posteriorly, towards occiput. Impressed areoles within meshes fulgid. Scape [Fig. 41] with a triangular lobe at base, subcylindrical proximad, slightly flattened and depressed distad; scarcely curved, sharply shagreened, its length about two thirds of median head length. Flagellar segments 2-7 about as long as wide. Lower surface of head regularly and

coarsely longitudinally striated. Sculpture of occipital truncation similar to that of vertex, consisting of a single transverse row of longitudinal meshes.

Thorax [Fig. 19], as measured from the anterior border of pronotum to tip of epinotal spines about twice as long as maximum width. Promesonotum distinctly longer than broad (43:38). Anterior and lateral borders of pronotum scarcely arcuate, shoulder subangulate, almost rounded; posterior portion of lateral border submarginate. Promesonotal suture indicated by lateral furrows and differentiated sculpture, consisting of an arcuate transverse row of elongate meshes. Mesonotum on each side with a small, bluntly rounded lobe. Mesoepinotal suture marked by a transverse depression, visible in profile. Basal face of epinotum about 1.5 times as broad as long (27:19), flat, with narrow, rounded baso-lateral lobe on each side. Epinotal spines subequal in length to basal face, acute, divergent, slender, straight, interapical distance exceeding maximum width of basal face of epinotum. Dorsum of thorax coarsely reticulate-rugose, basal face of epinotum longitudinally rugose. Sides of thorax longitudinally striato-rugose. Declivity of epinotum with a few transverse striae above, smooth below. Coxae sculptured ventro-laterally. Femora inflated, smooth and fulgid. Tibiae rimose. Hind femur longer than maximum width of thorax (46:40).

Petiole [Figs. 48, 70], from above, as long as wide, sides convex, coarsely reticulate-rugose above and laterally, anterior face not abruptly truncate, with fine, dense punctures and a few transverse striae; ventral face without an antero-median tooth. Postpetiole wider than long (25:19), anterior corners subangulate, anterior border straight, lateral and posterior borders arcuate. Dorsal face divided into two slanting faces by post-median transverse elevation, forming almost a right angle in profile, the posterior face only half as long as the anterior face. Sculpture as on thorax and petiole, except for the anterior dorsal face, where longitudinal rugae prevail.

Abdomen subcircular in dorsal view (61:58). Disc of first gastric tergite longitudinally striated for its entire length, smooth laterad. First gastric sternite smooth discad, longitudinally striated laterad.

Upper surface of head, thorax, peduncle, upper and lower surface of gaster with fine, rather long, somewhat more sparse, yellowish-white setae, which are suberect, and closer to each other, than their own length. Short, decumbent setae between

the longer erect hairs on gastric tergites. Gula, coxae, venter of petiole with shorter setae. Gastric sternites with long, dense, decumbent sericeous pile.

The only record of *rudis* is from the type series taken at Bogotá, Colombia.

Specimens examined: 2 workers (lectotype and paratype).

Variation: The paratype (probably from the same nest, as both specimens received from Vienna bear the label «Type») disagrees remarkably from the above described lectotype. It is of greater size, over 5.5 mm., the head less reticulate rugose above, the longitudinal ridges more distinct, especially towards the clypeus, the same being true for the sculpture on mesonotum and epinotum. The humeral angles [Fig. 18] are slightly more evident. The epinotal spines scarcely divergent, subparallel, and the baso-lateral lobes of the epinotum obsolescent. Femora with longitudinal striations on the posterior face. Petiole still shorter, shorter than wide. Postpetiole in profile more angulate above. Gaster somewhat longer, the 1st tergite longer than wide, completely striated, also laterad. Sternites completely smooth. Otherwise much the same as the lectotype.

Most of the figures are made from the paratype, as the lectotype is partly damaged. Nevertheless this specimen has been selected as lectotype, as Mayr expressly states in the original description, that the epinotal spines are divergent, which applies only to the smaller specimen.

B. Group of Procryptocerus hirsutus

The few ants belonging to this group form a rather sharply circumscribed assembly, which differs from all other species of the genus by the ensemble of the following characters:

Head more subrectangular than subcircular; cheeks, in front view, almost straight, scarcely convex; clypeus subperpendicular to upper surface of head; frontal carinae reaching the inner (upper) border of eyes, rather straight, never largely covering the antennal socket from above; upper surface of head coarsely areolate-foveolate; occipital truncation sharply marginate above; epinotal spines somewhat raised distad; sides of petiole subparallel, the anterior face laterally sharply marginate, the petiole distinctly longer than wide, when seen from above; postpetiole transverse, almost twice as wide as long; gaster finely and densely reticulate-punctate, the punctures never forming longitudinal rows; pile on head and thorax stiff, erect, abundant, in brush-like fashion; pile on peduncle and gaster longer, curved, more os less decumbent on gaster.

Hitherto, but two species and one subspecies have been made known that are to be included in this group. Chronologically the first is Emery's *hirsutus* of 1896, from Pará, Brazil. The diagnosis is rather short and summary, but was sufficient for that time. Then in 1899 Forel presented a more detailed description of his *belti* from Costa Rica and Panamá, not realizing, however, that this new form is closely akin to *hirsutus*. Strangely enough in 1904 Forel published a somewhat confused diagnosis of a new form, *convexus* from Pará, which he attached to *hirsutus* as a subspecies, this time not remembering to differentiate it from his own *belti*.

This peculiar procedure gave the impression that *belti* and *hirsutus*

were very distinct entities. Wheeler was completely mislead when he identified a number of these ants from British Guiana as *belti*. Only after receiving a type specimen of *belti* was I able to refer these South American forms to *hirsutus*, and to establish for the first time the present species group.

5. *Procryptocerus belti* Forel

(Figs. 24, 39, 55)

Procryptocerus belti Forel, 1899, Biol. Centr.-Amer. vol. 3, p. 46, pl. 3, fig 6; [worker, female, male; Costa Rica: Nicoya; Panama: Bugaba].

The strongly convex mesonotum, which is completely reticulate-rugose and coarsely punctured, the light ferruginous funiculus, yellowish-brown middle and hind tibiae, which are scarcely sculptured on the upper (external) face, and the ferruginous femora, distinguish *belti* from the typical *hirsutus* and its subspecies *convexus*.

Types. — Worker, female, male; Costa Rica: Nicoya (R. Alfaro) [Muséum d'Histoire Naturelle, Genève, Switzerland (Coll. A. Forel)].

Worker (lectotype). — Length 3.9 mm. Median head length 0.96 mm.; Weber's length of thorax 1.19 mm. Black; the following orange-brown; scape, inflated portion of femora, tibiae. Ferruginous: tip of mandibles, basal and apical tips of femora, tarsi. Brunneous: metatarsi.

Head subopaque, moderately convex above. Mandibles finely and densely striolated. Clypeus perpendicular to upper surface of head, with a few faint, distant, longitudinal striae, upper portion strongly convex, anterior border excised mesad, posterior border vestigial. A median longitudinal crest on upper half, and through the small vestigial, weakly impressed frontal area. Frontal carinae almost straight, slightly convex above eyes, anterior end not covering completely the antennal sockets from above, posterior end curved mesad towards a minute occipital tooth. Occipital border slightly convex, somewhat impressed mesad, the truncation scarcely excavate laterad, set off by a distinct and complete transverse margination of vertex. Upper surface of head coarsely areolate, with deeply impressed, more or less rounded, smooth and perfulgid areoles. Cheeks little curved, almost straight, irregularly reticulate-rugose. Gular surface longitudinally striato-rugose. Occipital truncation smooth and fulgid, with distant, perpendicular ridges, radiating from the occipital foramen, only a few of the median ones attaining the transverse crest above. Eyes moderately convex, situated at

the half of the total head length. Scape scarcely curved, with a small triangular lobe at base, subcylindrical proximad, somewhat depressed and flattened distad, finely but sharply shagreened, opaque, about two thirds of median head length. Funicular segments 2-7 about as long as wide.

Thorax [Fig. 24] from anterior border of pronotum to tips of epinotal spines slightly shorter than twice the maximum width. Promesonotum slightly shorter than wide (27:29), greatly convex in profile [Fig. 39]. Anterior and lateral borders of pronotum moderately arcuate, shoulders angulate, marginate laterally. Promesonotal suture obsolete. Mesonotum with small triangular tooth laterally. Thorax greatly constricted between meso- and epinotum, mesoepinotal groove deeply impressed. Basal face of epinotum about twice as broad as long, the lateral lobes little projecting, but extending over half of the total length of the basal face, subangulate anteriorly and posteriorly. Epinotal spines subequal to the length of basal face, stout and divergent at base, slender, subparallel apically, somewhat raised. Promesonotum coarsely reticulate-rugose, impressed areoles slightly elongate towards posterior portion of mesonotum. Basal face of epinotum longitudinally striato-rugose. Sides of thorax longitudinally striated. Declivity of epinotum smooth and fulgid. Femora smooth and fulgid, moderately inflated. Hind femur slightly longer than maximum width of thorax. Tibiae smooth.

Petiole [Fig. 55] distinctly longer than wide (14:12), anterior face truncate, subperpendicular, smooth, fulgid, the antero-lateral border carinate, dorsum flat, sides subparallel, striato-rugose above and laterally. Postpetiole almost twice as wide as long (17:10), transverse, upper face two-slanted in profile, the anterior declivity longitudinally rugose, the posterior declivity transversely striate, continous with the lateral longitudinal striation.

Gaster short, oval; finely, sharply and densely reticulate punctate, opaque.

Upper surface of head, cheeks, and upper surface of thorax, with rather thick, whitish, abundant, erect, short setae, slightly longer on thorax, still longer, and curved, on peduncle and gaster, quite decumbent on the latter. Appendages with oblique, stiff, whitish setae.

Female[12] (paratype). — "Length 4.5 mm. Thorax

[12]) The following diagnoses of the female and the male are translated from Forel's original publication (1899).

narrower than head. Mesonotum and scutellum coarsely and densely reticulate, partly reticulate-punctate in longitudinal direction. Epinotal spines a little shorter and blunter than those of worker. Abdomen more elongate than in worker. Otherwise as the worker. Wings infuscated; marginal spot [stigma?] large, brown; radial (= marginal) cell short".

Male (paratype). — "Length 5-5.5 mm. Mandibles large, triangular, external border convex, internal border straight, trenchant, slightly transparent, with a small, pointed apical tooth. Clypeus strongly excised on the middle on anterior border, little convex. Eyes rather small, a little in front of the half of the sides. On their internal border a groove, somewhat marked, not completely rounded. Scapes short. Funicular segments thick, inflated in the middle portion, at least twice as long as wide. Thorax narrow. Epinotum with two small, weak spines, subparallel, much shorter than their interval at base. Petiole cylindrical, twice as long as wide. Postpetiole subrectangular, 1 1/3 times as long as wide. Abdomen less narrow and less elongate than in *spiniperdus*. Coarsely punctate, with the punctures densely crowded on head, and more separate on thorax. Abdomen, peduncle and sides of thorax smooth and fulgid. Basal face of epinotum longitudinally ridged. Head, subopaque, finely reticulate-punctate between the larger punctures. Body rather abundantly covered by fine, pointed, reddish-yellow pile. Tibiae and antennae with only appressed pubescence and a few oblique hairs. Black. Antennae, mandibles, and extremity of abdomen brown. Legs yellowish-brown. Wings as in female".

Distribution. This species is, apparently, confined to Central America and has been collected at Bugaba, Panama by Champion, *teste* Forel (1899), Nicoya, Costa Rica and La Ceiba, Honduras.

Specimens examined: 21 workers, as follows: *Costa Rica*: Nicoya (A. Alfaro): 1 worker (lectotype) [MHNG]. "Costa Rica" (no other data, but possibly syntypes: 2 workers [USNM]. — *Honduras*: La Ceiba (Wm. M. Mann): 1 worker [CWMM]. — *Panama Canal Zone*: Barro Colorado Island, June 27, 1924 (W. M. Wheeler): 3 workers [MCZ]. Marajal, near Colon, July 11, 1924 (W. M. Wheeler): 9 workers [MCZ]. Mt. Hope, near Colon, July 8, 1924 (W. M. Wheeler): 5 workers [MCZ].

The specimen from Honduras is slightly longer than the Costa Rican ants (4.3 mm.). The individuals from the Canal Zone are not distinctly foveolate on the mesonotum, but the profile of the thorax is as in the type. The specimens from Barro Colorado Island have their legs slightly darker.

6. *Procryptocerus hirsutus* Emery

(Figs. 8, 40)

Procryptocerus hirsutus Emery, 1896, Bull. Soc. Ent. Ital. vol. 28, p. 95; [worker; Brazil: State of Pará].

Type. — Worker; Brazil: State of Pará (A. Schulz). [In the Museo Civico di Storia Naturale di Genoa, Italy (Coll. Emery)].

This species has been characterized by Emery as follows:

Worker. "Black; scape ferruginous (one immature specimen is yellowish brown with fuscous head). The head is beset with numerous rigid, short, obtuse, and whitish setulae; on the thorax, these setulae become longer and thinner, more so on the abdomen, where they are distinctly inclined backwards. The head, as usual, is strongly narrowed in front, with arcuate sides; the posterior angles have a blunt external projection and an internal, acute and dentiform projection; the upper surface of the head is densely covered with shallow foveolae, with somewhat fulgid bottom, the intervals between them constituting a coarse reticule. The clypeus is longitudinally and somewhat irregularly striated. The thorax is longitudinally rugose, coarsely reticulate on the anterior part of pronotum, the angles of which are acute and almost dentiform; the posterior margin of the mesonotum forms on both sides, an acute tooth; the epinotum is dilated on base in an angulate lateral lobe, and ends in straight spines, almost parallel, much shorter than the basal face. The two segments of the peduncle are covered with longitudinal irregular rugae; the first segment is visibly longer than broad; the second is transverse, as broad as the first is long, with rounded sides. The remainder of the abdomen is opaque, densely punctate, covered with sparser and larger punctures, from which arise the hairs. Legs opaque with rigid whitish setae. Length 4.5 mm.".

Female and male unknown.

Only the following features of *hirsutus*, according to Emery's description, do not apply to the type of *belti:* Thorax longitudinally rugose, the coarse reticulation confined to the anterior part of the pronotum; epinotal spines much shorter than the basal face; legs opaque; size 4.5 mm. They do, however, apply to several specimens from British Guiana and Trinidad, which differ from *belti*, as follows:

Size 4.5-5.0 mm. Head [Fig. 8] above, in profile, more flattened. Median crest of clypeus obsolete. The first segment of the funiculus orange-brown, segments 2-10 fuscous-brown or black. Promesonotum, in profile [Fig. 40], especially the

mesonotum, not prominently convex; longitudinally rugose, except for the anterior portion of the pronotum, which is coarsely reticulate-rugose and coarsely punctured. The series from Kartabo, British Guiana, possesses a crest-like raised promesonotal suture. Epinotum longer, basal face distinctly less than twice as broad as long. Epinotal spines distinctly shorter than length of basal face; slightly upturned as in *belti*. Coxae and femora fuscous or black. Middle and hind tibiae mostly fuscous; upper face distinctly rugose and opaque. Front tibiae yellowish brown as in *belti*. Sculpture of gaster as in *belti*, but much shallower and not so sharp.

The blunt external and acute, dentiform internal projection of the occipital angle, mentioned by Emery, refer to the posterior end of the frontal carinae and the occipital tooth. The latter, however, in most specimens which I have examined, is minute, almost vestigial, hardly different from occasional crenulations of the occipital border. Likewise, Emery states that the legs are opaque. This evidently applies strictly only to tibiae and tarsi since the femora are rather fulgid, notwithstanding the fine but feeble reticulation of the integument.

Distribution. Despite the poor record of the species, it appears to be safe to state that the range of *hirsutus* extends from the lower Amazon River, along the Atlantic coast, over the Guianas to Trinidad and Venezuela.

Specimens examined: 19 workers as follows: *British Guiana*: Kartabo; July-Aug. 1920 (Wm. M. Wheeler): 18 workers [15 workers: MCZ; 3 workers: CTB]. — *Trinidad*: Mt. Tucuche; April 1929 (Darlington): 1 worker [MCZ].

7. *Procryptocerus hirsutus convexus* Forel

Procryptocerus hirsutus convexus Forel, 1904, Rev. Suisse Zool. vol. 12, p. 34-35; [worker; Brazil: State of Pará (Goeldi)].

Types in the Coll. A. Forel; Muséum d'Histoire Naturelle, Genève, Switzerland.

This subspecies, founded upon a very few (one or two) specimens is of a very doubtful status. It is characterized by a short, subcircular abdomen; long, subparallel, subhorizontal epinotal spines, which are as long as their interapical distance, and longer than the basal face; short petiole, hardly longer than wide; fulgid legs; size 3.4 mm.

According to Dr. Ferrière, of the Muséum de Genève, who kindly examined the types for me, *convexus* differs from *belti* in

the following details: Head not so closely reticulate, areoles larger and less in number, about 14-15 are counted across the head, whereas *belti* possesses at least 17-18 in a transverse direction; gaster finely shagreened; legs black.

I have not come across any specimen that corresponds with this description. But most of the aforesaid characters, except the epinotal spines, seem to associate it with *hirsutus*.

C. Group of Procryptocerus coriarius

This group includes species with the following distinguishing features:

Small in size, not over 4.5 mm.; head convex in profile; with scapes lodged in scrobes, circular in front view; occipital border semicircular; upper surface of head finely coriaceous (finely reticulate), with larger, scattered punctures or foveolate; occipital truncation distinct, but not sharply marginate above, low, only a narrow transverse band; occipital corners completely rounded, occipital tooth absent; posterior end of frontal carinae not projecting; scapes greatly curved; frontal carinae sinuate; eyes situated before half of median head length; cheeks greatly convex; mesonotum with short, blunt, scarcely projecting, lateral lobes; gaster somewhat sculptured basad, smooth caudad, covered with dense, sericeous, decumbent setae.

Two species are assigned to this group, *coriarius* (Mayr) and *schmitti* Forel, the former restricted to Colombia, the latter ranging from Venezuela to northeastern Brazil. As both species are extremely similar it may be expected that future collections in the area intervening between their presently known ranges, will possibly turn up intergrading forms, thus reducing *schmitti* to subspecific rank.

8. *Procryptocerus coriarius* (Mayr)

(Figs. 4, 25, 54, 69, 93)

Cataulacus coriarius Mayr, 1870, Sitz.-ber. Akad. Wiss. Wien, vol. 61, p. 413-414 [worker; Colombia: Bogotá].
Procryptocerus coriarius Emery, 1887, Ann. Mus. Stor. Nat. Genova, vol. 25, p. 470 nota.

The scattered foveolae on the upper surface of head of worker and female of *coriarius* somewhat resemble *goeldii*, but both *coriarius* and *schmitti* may be readily identified by the sculpture of the first gastric tergite, which is weakly and irregularly longitudinally rugulose basad, smooth and fulgid caudad, never finely striated or covered with longitudinal rows of fine microscopical punctures. The differences from *schmitti* will be given under that species.

Types. — Worker; Colombia: Bogotá (Lindig) [Naturhistorisches Museum, Wien (Coll. G. Mayr)].

Worker (holotype). — Length 4.1 mm. Median head length 0.98 mm.; Weber's length of thorax 1.22 mm. Black; the

following rufous brown: apices of mandibles, antennae, tibiae, tarsi; fuscous: apical anulus of funicular segments; base of tibiae, basal two thirds of metatarsi, femora.

Head [Fig. 4] subopaque; with appressed scapes, circular in front view. Mandibles finely reticulate-punctate, finely longitudinally striolated. Clypeus strongly longitudinally convex; its anterior border shallowly excised mesad; the posterior border indistinct, marked by a shallow depression, which indicates the position of the almost obsolete frontal area. Integument of clypeus finely reticulate-punctate, with a few longitudinal striae towards both margins. Frontal carinae sinuate, S-curved, not expanded above the antennal insertions. Eyes moderately convex, situated somewhat in front of the middle of the median head length. Upper face of head very convex; occipital border greatly arcuate, semicircular, without corners or teeth laterally. Upper surface of head finely reticulate-punctate (coriaceous), with larger, sparse, deeply impressed, fulgid foveolae, which are reduced in numbers to completely absent mesad, just in front of the occipital truncation. Occiput narrowly truncate, upper border marginate, not crested; covered with distant and somewhat irregular wrinkles, radially around the occipital foramen. Cheeks prominently convex, finely reticulate-punctate, and sparsely foveolate, in front of the eyes. Lower surface of head longitudinally striated. Scape distinctly curved, almost smooth, microscopically reticulate-rugulose; depressed dorso-ventrally; slightly longer than half the maximum width of head (25:40). Funicular segments 2 and 3 distinctly broader than long, the remaining segments, except the apical segment, only slightly longer than broad, or subequal in length, apical segment longer than broad.

Thorax [Fig. 25] subopaque. Promesonotal disc scarcely longer than broad (30:29). Anterior border of pronotum with a median and a lateral emargination on each side, separated by blunt angles. Shoulders angulate, subdenticulate. Lateral borders of pronotum subparallel, immarginate. Promesonotal suture obsolete, laterally indicated by short furrow. Sides of mesonotum subparallel, with a blunt, small, subrectangular lobe on posterior corner. Dorsum of promesonotum moderately convex. Mesoepinotal groove distinct and deeply impressed, sculpture interrupted. A deep lateral constriction between the mesonotum and epinotum. Basal face of epinotum more than twice as broad as long (28:12) with conspicuously rounded and projecting baso-lateral lobes, occupying more than two thirds of its length. Epinotal spines

much shorter than basal face (6:12), subparallel, stout at base, tapering toward apex, straight, horizontal. Declivity marginate laterally by sharp, fine carinule, arising from beneath the epinotal spines. Promesonotum with deeply impressed, rounded, large foveolae, the intervals having the appearance of a coarse, irregular reticulation. Basal face of epinotum mostly longitudinally striated, rather regularly discally, more rugose and reticulate laterad. Declivous face smooth. Sides of thorax longitudinally striated. Legs smooth, except for the rimose outer face of tibiae. Hind femur shorter than maximum width of thorax.

Petiole [Figs. 54, 69], from above, longer than wide (15:13); sides slightly arcuate; reticulate-rugose and foveolate above and laterally. Postpetiole wider than long (18:14), lateral and posterior borders moderately rounded. Dorsum moderately convex; in profile, highest behind its middle. Sculpture as on petiole.

Gaster eliptical, longer than wide (50:39), sublaevigate, with a few slightly raised and anastomosing rugulae discally on the anterior half of the first gastric tergite, somewhat shorter on the sides. Remaining part smooth, with minute pits from which arise the hairs.

Disc of head almost devoid of pile, except for the margins, antennae, appendages with long oblique fine setae. Dorsum of thorax, dorsum and sides of peduncle, with subdecumbent, long, fine pile. Gaster with completely decumbent, sericeous fine hairs, some shorter ones interspersed with the longer pile. Terminal tergites and sternites of gaster with sparse, erect setae. Lower surface of head, propleura, antero-ventral face of coxae, venter of abdomen with shorter, more appressed and silky pilosity.

Female (undescribed); Colombia: La Esperanza, May 11, 1935 (René P. Roba) [U. S. National Museum, Washington]. — Length 5.1 mm. Median head length 1.09 mm.; Weber's length of thorax 1.53 mm. Similar to the worker (holotype) except for the characters of the caste and the following details:

Ocelli present, minute, not raised above surface of head; hind ocelli widely separated by distance subequal to distance of each from lateral border of head. Shoulders sharply angulate, subdenticulate. Anterior border of pronotum moderately arcuate, lateral borders straight, immarginate. Pronotum, scutum and scutellum, densely, coarsely and sharply foveolate, some of the foveolae in more or less spindle-shaped, oblong, shallow furrows. Basal face of epinotum striated; lateral border straight with

a small baso-lateral projection. Epinotal spines short, triangular. Wings infuscated, veins brunneous. In the fore wing [Fig. 93] vestiges of cubitus and subdiscoidal almost attain the apical margin. Transverse median vein subequal to second abscissa of median vein. The transverse cubital vein angulate, with a distinct recurved stub projecting into the submarginal cell.

Male unknown.

This species is known only from Colombia.

Specimens examined: 4; 3 workers and 1 female, as follows: *Colombia*: Bogotá; (no date); (Lindig): 1 worker (holotype) [NHMW]. La Esperanza; May 11, 1935; (René P. Roba): 2 workers, 1 female [USNM n. 157651].

The two workers from La Esperanza have the promesonotal disc a little longer; the last funicular segments, base of tibiae and metatarsi more infuscated; basal face of epinotum more convex transversely, and epinotal spines more separated. They and the above described female were found nesting in withered branches of coffee shrubs.

9. *Procryptocerus schmitti* Forel

(Figs. 76, 85, 90, 91)

Procryptocerus schmitti Forel, 1901, Ann. Soc. Ent. Belg. vol. 45, p. 338-339 [worker; Brazil: State of Ceará, Baturité].

In the original description Forel differentiated this species from *belti*, with which, however, it does not have any close relationship, being quite different not only in structural trivia, but also in general habitus. On the other hand *schmitti* is strikingly similar to the Colombian *coriarius* from which it differs only in minor details, yet enough to maintain it, at least for the present, as a discrete species. This may be due to the fact that the extent of morphological variation of *coriarius* is not known, because, to my knowledge, only 4 specimens, 3 workers and 1 female, have been recorded so far.

I have been unable to secure the type of *schmitti*, but copious material of several nest series, from Pernambuco, Brazil, doubtlessly belong to this species.

Since there is a great resemblance between both species, and Forel's description of *schmitti* is rather detailed, it may suffice to point out here the characters which help to distinguish the worker of *schmitti* from that of *coriarius*.

Type. — Worker; Brazil: State of Ceará, Baturité (M. J. Schmitt) [Muséum d'Histoire Naturelle, Genève, (Coll. A. Forel)].

Worker. — This species differs from *coriarius* by the following features: Size averages smaller, around 3.7 mm., although a few specimens occur that attain, or exceed 4 mm., when completely outstretched. Coxae rufous, remaining segments of appendages lighter, all with rufous hues that are lacking in *coriarius*. Foveolae of upper surface of head equally abundant, also on the posterior portion of vertex in front of the occiput. Segments 4-9 of funiculus scarcely broader than long. Lateral border of pronotum straight, slightly converging caudad, posterior corners less pronounced, which gives the impression that the promesonotal disc is much longer than broad (as stated in the original description), but in reality, the length only slightly surpasses the width, sometimes even not at all. Sculpture of promesonotum not as coarse as in *coriarius*, the raised intervals between the foveolae not forming distinct rugae. Promesonotal suture obsolete. Meso-epinotal suture usually obsolete, never forming a deeply impressed transverse furrow. The basal face of epinotum distinctly shorter than width at the base of the spines. Lower mesopleura, behind the fore coxae, with a smooth, fulgid patch, devoid of any coarse sculpture. Epinotal spines somewhat longer than half the length of the basal face. Gaster mostly smooth and perfulgid, only weakly and shortly rugulose at base. Appressed pile on gaster shorter than in *coriarius*.

Female (undescribed); Brazil: State of Pernambuco, Caruaru (Pickel, O. S. B.) [Coll. T. Borgmeier, n. 3347]. — Length 4.7 mm. Median head length 0.98 mm., Weber's length of thorax 1.49 mm. Very similar to the female of *coriarius*, except for the following peculiarities:

Coxae, femora rufous; foveolae on vertex, in front of occiput and between the ocelli, not reduced in numbers; lower mesopleura smooth, fulgid, without striation; wings [Fig. 90] hyaline, veins pale brown, 2d abscissa of median vein sligtly longer than transverse median vein; no projecting stub arising from transverse cubital vein. Color and pilosity as in worker.

Male (undescribed); Brazil: State of Pernambuco, Recife, 1938 (L. Lima Castro) [Coll. T. Borgmeier, n. 5926]. — Length 5.6 mm.; median head length 0.76 mm.; Weber's length of thorax 1.63 mm. Head and thorax reddish-brown, more or less infuscated, first gastric segment fulgid, ferruginous; remaining segments and legs yellowish-brown; scape and first funicular segment orange-brown, the remaining funicular segments rufous, with an apical yellowish ring.

Head [Fig. 76] subopaque. Mandibles finely rugulose-punctate. Clypeus longitudinally and transversely convex, limited posteriorly by a transverse furrow. Frontal carinae notched behind the antennal socket, then strongly divergent, becoming obsolete behind the eyes. Cheeks extremely short. Eyes huge, subhemispherical, their maximum diameter more than half of the median head length. Occipital border continuously rounded, without forming lateral corners or angles. Ocelli large, colorless, their diameter exceeding the diameter of scape, situated on distinctly raised prominences on top of the vertex. Integument of head finely reticulate-punctate, with distant more conspicuous, more or less longitudinal rugulae. Scape somewhat tapering toward apex, cylindrical, subequal to, or slightly exceeding, length of 1st and 2d funicular segments combined.

Thorax twice as long as maximum width, in profile subcontinuously arcuate above. Shoulders minutely denticulate, followed by a minute longitudinal carinule, the rest of the lateral border of pronotum immarginate; anterior border greatly arcuate. Scutum with deeply impressed Y-shaped Mayrian furrows, the anterior arms of which are longer than the posterior common stem. Basal face of epinotum oblique in profile, terminated laterally by a small tooth, on each side, the interval between which, in front of the posterior border of basal face, is slightly, but distinctly, excavate. Declivous face vertical, much shorter than basal face. Sculpture of thorax similar to that of head. Pleura almost smooth, rugulae vestigial to obsolete, basal face of epinotum longitudinally, not quite regularly, striated. Femora long, not inflated. No apical spurs on middle and hind tibiae.

Petiole [Fig. 85] cylindrical, twice as long as high, the sides slightly divergent caudad; convex above, in dorsal view widest shortly in front of the posterior border. Postpetiole shorter and broader than petiole, sides distinctly divergent caudad, in profile highest shortly in front of the posterior border. Both petiole and postpetiole are smooth.

Gaster smooth, subcylindrical. First tergite fulgid. Genitalia retracted.

Wings [Fig. 91] hyaline, veins pale-yellowish, stigma pale-ochraceous. Cubital and discoidal veins mostly obsolete except for basal stubs. Otherwise as in female.

Hairs thin, long, pointed, flexible; very long, dense on mandibles and gular face, slightly less dense on lower mesopleura and apical margin of 2d to last tergite of gaster and sternites;

rather sparse on upper surface of head, thorax and 1st gastric tergite. Scape and 1st funicular segment subglabrous, remaining funicular segment densely pubescent.

The male may at once be recognized by the large eyes and ocelli.

Distribution. The present data indicate that this species ranges from eastern Venezuela along the Atlantic Coast, south to northeastern Brazil.

Specimens examined: 158; 138 workers, 18 females, 2 males as follows: *Venezuela*: Los Caobos, Caracas; June 21, 1938 (G. Vivas Berthier): 2 workers [CU]. — *Brazil*: State of Pernambuco, Recife, 1938 (Dr. L. Lima Castro): 64 workers, 4 females, 1 male [CTB, n. 5926-5929]. Caruaru; (B. Pickel, O. S. B.): 72 workers, 14 females, 1 male [CTB, n. 3186, 3344, 3347, 3348].

D. Group of Procryptocerus goeldii

The members of this division, which includes *pictipes*, the *goeldii*-complex, and, tentatively, *gracilis*, probably do not constitute a so-called natural group. Nevertheless, for practical purposes, they are here considered together because of the following morphological peculiarities they have in common:

Frontal carinae sinuate; the upper surface of head foveolate, or covered with larger, shallowly impressed, reticulate areoles; occipital corners angulate; occipital border moderately arcuate; occipital truncation distinctly marginate above, of normal height; lateral border of pronotum marginate; upper surface of thorax longitudinally striated to striato-rugose, sculpture more irregular towards anterior portion of pronotum; the first gastric tergite finely, superficially, longitudinally striato-rugose in its entire length, the striae containing a longitudinal row of fine punctures, sometimes more evident than the striae themselves; first gastric tergite with sparse, short, suberect setae, interspersed with minute, decumbent setulae.

The true systematic position of these forms is not quite clear. To a certain extent, *pictipes* is intermediate between *goeldii* and the *hirsutus*-group; *goeldii* itself bears a superficial resemblance with the assembly of *coriarius*, whereas the identity of *gracilis* cannot be established, before the single type, extant in the British Museum, is re-examined. The records available at present indicate that both *goeldii* and *pictipes* are widespread and not uncommon species.

10. *Procryptocerus pictipes* Emery

(Figs. 10, 26, 52, 64)

Procryptocerus pictipes Emery, 1896, Bull. Soc. Ent. Ital. vol. 28, p. 97 [worker; Costa Rica: Suerre, near Jimenez].
Procryptocerus striatus scabriusculus var. *parva*, Menozzi, 1935, Redia, vol. 21, p. 196 [worker; British Guiana, Kuruduni River].

As already mentioned in the introduction to the group,

pictipes is somewhat intermediate between the *hirsutus*-complex and *goeldii*. It differs from *hirsutus* by having the frontal carinae more sinuate, the upper surface of head without deeply impressed, fulgid areoles; the thorax, in profile, very little convex; the first gastric tergite longitudinally rugose-punctate; and by lacking the dense, curved, long, decumbent hairs on gaster. It may be readily recognized from *goeldii* by the sculpture of the upper surface of head; the flattened eyes, the regularly striated upper surface of thorax; the sculpture of the peduncular segments; and the shape of the postpetiole, which is close to the type found in the *hirsutus*-group.

Type. — Worker; Costa Rica: Suerre, near Jimenez (no other data) [(Coll. Emery) in the Museo Civico di Storia Naturale di Genova].

Worker; British Guiana: Kartabo; July-Aug. 1920 (Wm. M. Wheeler) [CTB]. — Length 3.6 mm. Median head length 0.88 mm.; Weber's length of thorax 1.05 mm. Black, the following dark ferruginous: funicular segments 2-10, apices of mandibles, apices of tarsal segments 1-4 of middle and hind legs. Yellowish-brown: scape, first funicular segment, tibiae, tarsi of fore legs, last tarsal segment of middle and hind leg. Femora fuscous.

Head [Fig. 10] subopaque. Mandibles finely, densely, longitudinally striolated. Clypeus strongly longitudinally convex; longitudinally striated, with a faint median longitudinal carinule; anterior border shallowly excised mesad, posterior border marked by a vestigial suture. Frontal carinae moderately sinuate, not expanded above the antennal socket, attaining, when seen from above, the inner (upper) border of eye; posterior end bent mesad towards the base of a minute occipital tooth on each side. Upper surface of head with very slightly impressed, subcircular areoles, separated by somewhat raised intervals, narrower than the diameter of areoles; both areoles and intervals finely, but sharply reticulate-punctate. The areoles more obsolescent discally and caudad. Occipital border arcuate, distinctly marginate. Cheeks, from above, moderately arcuate, coarsely reticulate-rugose. Eyes large, very little convex. Lower surface of head longitudinally striated. Occipital truncation almost smooth, fulgid, with a few vestigial, distant, perpendicular ridges. Scape slightly lobed at base, subcylindrical proximad, somewhat depressed and broadened distad, its length about two thirds of median head length. Funicular segments 3-10 as long as, or slightly longer than wide.

Thorax [Fig. 26] subopaque. Anterior border of pronotum

moderately arcuate, slightly impressed mesad; shoulders sharply angulate, subdenticulate; lateral border of pronotum marginate, slightly convex, somewhat converging caudad. Promesonotal suture marked by a faint, somewhat raised, not quite continuous, carinule, which forms a distinct angle mesad. Mesonotum with a postero-lateral acute, projecting tooth. Thorax greatly constricted laterad between mesonotum and epinotum, meso-epinotal groove impressed dorsally. Basal face of epinotum less than twice as broad as long, baso-lateral lobe narrow, rounded anteriorly, emarginate laterad, dentate behind. Epinotal spines as long as basal face, straight, subparallel, slender, subhorizontal. Upper surface of thorax longitudinally striated, except on anterior portion of pronotum, which is coarsely reticulate-rugose. Declivous face of epinotum finely, shallowly, reticulate-punctate, almost smooth, fulgid. Sides of thorax longitudinally striated. Fore femora more inflated than middle and hind femora. Hind femur not longer than maximum width of thorax. External (upper) surface of tibiae scarcely rugose, almost smooth.

Petiole [Figs. 52, 64] scarcely longer than wide; anterior face obliquely truncated, laterally marginate; finely reticulate-punctate. Sides slightly convex, somewhat constricted behind; longitudinally striato-rugose above and laterally, antero-median ventral tooth blunt and vestigial. Postpetiole 1.5 times as broad as long; anterior face of dorsum slanted forward, flat, not transversely convex, longitudinally striated. Sides with a few vestigial longitudinal striae which unite mesad above and behind the anterior dorsal face.

Gaster subopaque, short, oval. All tergites longitudinally striato-rugulose, with a very evident row of fine punctures within the striae, the latter, often, more evident. First sternite similarly sculptured laterad, almost smooth discad.

Mandibles, cheeks, upper surface of head and thorax, with sparse, short, stiff, obtuse, suberect whitish setae; slightly longer, curved, apically pointed on peduncle and gaster, never decumbent. Gular surface and sternites with shorter, appressed, rather dense, sericeous pubescence. Minute decumbent, sparse setulae on first gastric tergite.

Female, dealate (undescribed); British Guiana: Kartabo, July-Aug. 1920 (Wm. M. Wheeler) [Coll. T. Borgmeier]. — Length 4.8 mm. Median head length 0.95 mm.; Weber's length of thorax 1.41 mm. Similar to the worker, except fo the characters peculiar to the caste and the following details: Ocelli minute,

not raised above surface of head, widely separated, the distance between the posterior ocelli greater than the distance of each from the lateral border. Upper surface of head with more distinctly impressed foveola-like areoles, the bottoms of which are vestigially reticulate. Shoulders angulate and denticulate. Pronotum above coarsely reticulate-foveolate, lateral borders submarginate. Scutum and scutellum with sparse foveolae, situated in longitudinal more or less elongated, fusiform shallow furrows. Lateral lobes of scutellum not set off by transverse rows of deeply impressed foveolae. Basal face of epinotum longitudinally striated, not expanded in lobes baso-laterally, one or more transverse striae between the short, tooth-like spines. Petiole distinctly longer than broad, anterior face with vestigial transverse striae. Extremely similar to *goeldii*, from which it differs by the larger, reticulate foveolae on the upper surface of head, the more widely separated ocelli, the sculpture of the occipital truncation and the peduncle; the shape of the postpetiole (as in worker); the sculpture of the exposed portion of the gastric tergites 2-4; the color of scape and tibiae.

Male unknown.

Distribution. — This rather widespread and interesting species is known from Costa Rica southward, along the Atlantic Coast, lower Amazon Valley, to the State of Pernambuco, Brazil.

Specimens examined: 64; 58 workers and 6 females as follows: *British Guiana*: Kartabo; July-Aug. 1920; (Wm. M. Wheeler): 50 workers, 3 females (dealate) [MCZ & CTB]. — Demerara River, 1 mile from Georgetown; September 22, 1918 (H. Morrison): 1 worker [USNM]. — *Brazil*: State of Pará, Cachoeira do Breu; Oct. 1928 (Sampaio): 1 worker [CTB]. State of Pernambuco, Tapera; (Pickel, O. S. B.): 6 workers, 3 females (dealate) [CTB, n. 5814].

All the specimens examined agree with the above description in all essential features of livery and sculpture.

Synonymical note. — Although I have been unable to secure and to examine the types of Menozzi's *striatus scabriusculus*, var. *parva*, I am convinced that this variety has no relationship with *scabriusculus*. Instead the small size (3.5 mm.), the coloration, the sculpture of the upper surface of head, the elevated, crest-like promesonotal suture, the somewhat elongate and subcylindrical petiole, the sculpture of the gastric tergite, indicate that it is probably the present species. Since *pictipes* is now known to occur both in British Guiana and Northeastern Brazil, I do not hesitate to synonymize var. *parva* Menozzi with this form.

11. *Procryptocerus goeldii* Forel

(Figs. 16, 27, 57, 72, 74, 79, 80, 84, 89, 92)

Procryptocerus goeldii Forel, 1899, Biol. Centr.-Amer. Hym. vol. 3, p. 45, nota; [worker; Brazil; State of Santa Catarina, Blumenau; Federal District, Rio de Janeiro, Foot of Mt. Corcovado]. — Forel, 1907, Ann. Mus. Nat. Hung. vol. 5, p. 12; [female; Brazil: State of Amazonas, Fonteboa].

The differential characters for the worker and female have been presented in the introductory note to the group and under *pictipes* on a foregoing page. The male differs from *adlerzi*, its closest known relative, by the subhyaline wings, the coarsely reticulate-rugose and punctate occiput, the short antennal scape, which is subequal to the 2d funicular segment.

Type. — Worker; Brazil: State of Santa Catarina, Blumenau (Dr. Moeller). [Muséum d'Histoire Naturelle, Genève (Coll. A. Forel)].

Worker. — Brazil: State of Rio Grande do Sul, Pareci Novo; August 11, 1926 (Rambo, S. J.) [Coll. T. Borgmeier, n. 1255]. — Length 5.1 mm. Median head length 1.12 mm. Weber's length of thorax 1.41 mm. Black: the following fuscous-ferruginous: apices of mandibles, tip of scape; basal and apical tips of femora, fore tibiae; tarsi slightly lighter.

Head [Fig. 16] subopaque; evenly convex above. Mandibles finely reticulate-punctate and longitudinally striolated. Lower portion of clypeus subperpendicular to upper surface of head, upper portion prominently longitudinally convex; finely reticulate-punctate and vestigially and distantly striated, anterior border broadly, but shallowly excised mesad, posterior border obsolete. Frontal area invisible. Frontal carinae sinuate, sigmoid not expanded above the antennal socket; posterior end bent mesad toward occipital angle, which bears a minute tooth. Upper surface of head very finely, densely, shallowly reticulate (coriaceous), with sparse, larger, impressed foveolae, the bottoms of which are subfulgid. Foveolae more crowded and numerous in front of the occiput. Occipital border moderately arcuate, slightly impressed mesad, marginate, but not crenulate, above the truncation. Cheeks moderately convex, coarsely reticulate-rugose, in front of eye, longitudinally striated behind eye. Eyes prominent, evenly convex, situated somewhat before the middle of the head. Lower surface of head longitudinally striated. Occipital truncation obliquely to subtransversely striated; opaque. Scape less than two thirds of median head length (28:46), not lobed at base; moderately curved; somewhat flattened and depressed distad; finely, but sharply reticulate-punctate; outer border rugulose.

Thorax [Fig. 27] subopaque. Promesonotal disc about as long as wide. Anterior border of pronotum moderately arcuate; shoulders angulate and subdenticulate. Lateral border marginate, very little arcuate. Promesonotal suture obsolete mesad, indicated laterad by slightly raised lateral border of mesonotum. Mesonotum postero-laterally with a projecting, subrectangular lobe or tooth. Thorax strongly constricted laterad between mesonotum and epinotum; mesoepinotal groove impressed dorsally. Basal face flat, expanded baso-laterally in an anteriorly rounded, posteriorly subangulate lobe, occupying about one-half of the length of the basal face. Epinotal spines somewhat stout, shorter than the basal face, their apices slightly curved inward. Promesonotum coarsely reticulate, with interspersed large punctures or foveolae; more or less longitudinally striated mesad on mesonotum and epinotum. Declivous face with longitudinal striae on upper fifth, remaining part smooth, bordered laterally by a descending fine carinule. Sides of thorax regularly and rather coarsely longitudinally striated. Coxae distinctly striated on outer face. Femora inflated, finely reticulate-punctate, with a few fine longitudinal rugulae apically. Hind femora not longer than maximum width of thorax. Tibiae rimose.

Petiole [Figs. 57, 72] somewhat longer than wide, sides gently convex, anterior face oblique, finely reticulate-punctate, almost smooth. Dorsal and lateral faces coarsely reticulate-rugose, dorsum convex in profile. Postpetiole slightly wider than long, anterior corners subangulate, profile convex, higher than long, sculptured as petiole.

Gaster subopaque, somewhat elongate, sides almost parallel in middle portion. First gastric tergite finely and superficially longitudinally striato-rugulose, with a row of minute punctures within the striae. The first gastric sternite striolated basad and laterad. Exposed portion of 2d to 4th tergites finely and irregularly rugulose.

Pilosity very scarce. A few stiff, erect, straight, short, setae on upper surface of head and thorax. Slightly longer on peduncle, very scarce on the first gastric tergite, on which are also very small, appressed, scattered setulae. Sternites with more abundant, sericeous, appressed pile. Mandibles and funiculus with the usual pilosity.

F e m a l e ; Brazil: State of Rio Grande do Sul, Pareci Novo; December 22, 1926 (Rambo, S. J.) [Coll. T. Borgmeier, n. 1372]. — Length 5.7 mm. Median head length 1.17 mm.

Weber's length of thorax 1.63 mm. Similar to the worker, except for the peculiarities of the caste and the following details:

Ocelli minute, situated in pits, not raised above the level of head. Distance between the posterior pair shorter than the distance from each to the lateral border. Occipital tooth obsolete. Pronotum foveolate mesad to coarsely reticulate-rugose laterad. Scutum and scutellum somewhat fulgid, finely reticulate-punctate, coarsely foveolate, some of the foveolae contained in longitudinal spindle-shaped, shallow furrows, which occasionally connect several foveolae. Basal face of epinotum coarsely longitudinally striated, slightly divergent caudad. Epinotal spines short, tooth-like, shorter than half of their interbasal distance, apices slightly curved mesad. Petiole longer than wide, rectangular from above, sides parallel. Wings [Fig. 92] subhyaline, stigma and veins light brown; marginal cell open; transverse cubital vein not curved nor angulate; transverse median vein much shorter than second abscissa of median vein.

Male (undescribed); Brazil: State of Rio Grande do Sul, Pareci Novo; December 22, 1926 (Rambo, S. J.) [Coll. T. Borgmeier, n. 1372]. — Length 5.9 mm. Median head length 0.90 mm. Weber's length of thorax 1.95 mm. Black; the following dark ferruginous: antennae, coxae, femora, tarsi. Yellowish brown: tibiae, genital armature. Brunneus: gastric segments 2-5.

Head [Fig. 80] subcircular; subopaque. Mandibles finely reticulate-rugose, with very fine punctures in the intervals. Clypeus moderately convex, finely reticulate-punctate, sparsely, longitudinally rugulose; anterior border shallowly emarginate, posterior border vestigial; sides subparallel. Antennal scrobe and frontal carinae diverging caudad; both distinct anteriorly, gradually fading out posteriorly before reaching occiput. Vertex and occiput continuous, the latter not truncate, greatly rounded, lateral corners almost obsolete. Eyes large, greatly convex, their diameter, when viewed from above, slightly shorter than half of the median head length. Ocelli small, but conspicuous, well separated from one another; the antero-median ocellus facing forward, the postero-lateral ones obliquely backwards; vertex slightly excavated in front of each ocellus, raised behind it. Head finely reticulate-punctate; with super-imposed, more conspicuous, widely separated rugosities, which become coarsely reticulate-rugose on vertex and on occiput. Antennal scrobes faintly longitudinally striated, space in front of median ocellus rather smooth. Scape more than 3 times as long as wide, subequal

to the second funicular segment; first funicular segment very short, 3-9 funicular segments shorter than second, apical segment slightly longer than scape.

Thorax subopaque. Anterior border of pronotum straight, lateral border marginate; shoulders sharply angulate; sides diverging caudad; finely reticulate and sparsely foveolate mesad, coarsely reticulate-rugose laterad. Scutum with deeply impressed Y-shaped Mayrian furrows, the common stem shorter than the arms, finely reticulate-punctate, with a few longitudinal rugulae and faint, vestigial foveolae. Scutellum moderately convex, its sides converging caudad straight, without distinct baso-lateral lobe. Basal face of epinotum coarsely longitudinally striated. Sides converging caudad. Epinotal spines stout, flat, plate-like, concave above, the short tips slightly bent mesad. Declivity transversely striato-rugose above. Laterally limited by vertical carinule, descending from beneath the epinotal spines. Laterotergite of pronotum longitudinally striated. Mesopleura faintly striato-rugose, almost smooth. Remainder of sides irregularly rugose. Appendages smooth. Femora scarcely inflated in the middle.

Petiole [Fig. 84] 1.5 times as long as high, moderately convex above and on the sides, equally constricted anteriorly and posteriorly. Anterior and upper face continuous, smooth with a few fine, widely separated, straight, longitudinal ridges. Antero-laterally coarsely reticulate-rugose. Postpetiole distinctly shorter and slightly broader than petiole, sides and dorsum moderately convex, highest behind its middle; when viewed from above, not distinctly dilated behind on posterior half; finely reticulate-punctate, with a few faint longitudinal rugulae.

Gaster subcylindrical, almost smooth and fulgid; finely reticulate-punctate. Genitalia [Figs. 74, 79] very similar to those of *adlerzi,* subgenital plate pointed at apex.

Pile golden brown, thin, long, flexible, abundant on mandibles and lower surface of head; sparser on upper surface of head, thorax, lower mesopleura, peduncle; shorter and equally sparse, oblique on first gastric tergite and sternite; remaining tergites and sternites with somewhat longer hairs confined to the apical margin. Scape and first funicular segment glabrous, remaining segments densely pubescent. Appendages with shorter, oblique pile.

Wings [Fig. 89] as in female.

Distribution. — This species, as understood here, appears to be confined to southern Brazil, ranging from Rio Grande

do Sul north to Rio de Janeiro. The female from Fonteboa on the Amazon River, mentioned by Forel, may possibly belong to the new subspecies *hylaeus*. I have not seen this specimen.

Specimens examined: 64; 47 workers, 8 females, 9 males, as follows: *Brazil*: State of Rio Grande do Sul, S. Leopoldo; November 10, 1928 (Buck, S. J.): 2 workers [CTB, n. 5682]. — State of Rio Grande do Sul, Pareci Novo; August 11, 1926 and December 22, 1926 (Rambo, S. J.): 30 workers, 6 females, 9 males [CTB, n. 1255, 1372]. — State of Rio de Janeiro, Teresópolis; November 1935 (H. Souza Lopes): 1 worker [CTB]. — Petrópolis, 1918 (T. Borgmeier); November 1929 (A. Wiltuschnig); September 4, 1944 (W. Kempf): 7 workers, 1 female [CTB, n. 18a, 5149b]. — State of S. Paulo, Pedreiras; April 9, 1926 (E. Schwebel): 4 workers [CTB, n. 4458]. — "Brazil" (no other data); on *Cattleya* (orchid), taken at U. S. seaport by plant quarantine officers; October 5, 1939: 3 workers, 1 female [USNM, n. 39-15916].

Variation. — Although all the specimens examined agree in all essential morphological features, there are some minor variations which deserve to be mentioned.

In the worker, the observed size range is from 4.2-5.7 mm. The occipital truncation is usually transversely striated, but may in some instances be radially striated around the occipital foramen, especially distinct mesad. Length and width proportion of basal face are extremely variable, as is the length, distance and shape of epinotal spines. The petiole is usually longer than wide, but in a few cases the petiole may appear subquadrate, when viewed from above.

The females, other than those from Santa Catarina, have the spines straight, not curved mesad.

In the males examined, all from the same nest, the variation concerns the apical field of the wing, which in some specimens contains the distinct vestiges of cubital and subdiscoidal vein, in others only the basal stubs.

Three workers, other than the South Brazilian specimens, mentioned above, disagree more noticeably with the foregoing description, and at the same time, although being from distinct and distant locality, bear great resemblance to one another, so as to suggest that they belong to a northwestern race, differentiated from the typical *goeldii*. For this reason I propose to raise them to subspecific rank:

12. *Procryptocerus goeldii hylaeus*[13], n. subsp.

Procryptocerus goeldii Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 207; [worker; Colombia: Naranjo, foot of Sierra Nevada de Santa Marta].

Worker (holotype); Colombia: Naranjo, foot of Sierra Nevada de Santa Marta (Forel) [Muséum d'Histoire Naturelle,

[13]) Named after the tropical rain forests, which were called Hylaea by A. von Humboldt.

Genève (Coll. A. Forel)]. — Length 4.6 mm. Median head length 1.14 mm. Weber's length of thorax 1.36 mm. Similar to the typical *goeldii,* from which it differs by the following morphological details:

General habitus not as slender as in *goeldii.* Foveolae of upper surface of head very distinct, rather deeply impressed. Occipital truncation finely reticulate, almost smooth and fulgid, with short, widely separated ridges radiating mesad and laterad from the occipital foramen. Promesonotum strongly convex, anterior corners very low. Basal face of epinotum twice as wide as long, with a deeply impressed antero-median furrow, separating the slightly convex lateral portions. Declivous face with several coarse transverse striae above, smooth and fulgid below. Petiole short, subquadrate, with strong transverse striae on anterior face. Postpetiole prominently convex above. Erect setae on thorax and gaster longer and more abundant than in the typical *goeldii.*

Distribution. — This subspecies is recorded from Northern Colombia, Trinidad and northwestern Bolivia, and presumably occurs in the Amazon Valley.

Specimens examined: 3 workers, as follows: *Colombia*: Naranjo, foot of Sierra Nevada de Santa Marta (Forel): 1 worker [MHNG]. — *Trinidad*: Mt. Tucuche; April 1929 (Darlington): 1 worker [MCZ]. — *Bolivia*: Rurrenabaque, Rio Beni; October 1922 (Wm. M. Mann): 1 worker [CWMM].

The specimen from Bolivia has the foveolae on the upper surface of head not very deeply impressed, in the usual fashion, as in the typical *goeldii.*

13. *Procryptocerus goeldii guianensis* Weber

Procryptocerus goeldii guianensis Weber, 1938, Ann. Ent. Soc. Am. vol. 31 (2), p. 208; [female; British Guiana, Forest Settlement, Mazaruni River].

Type. — Female; British Guiana: Forest Settlement, Mazaruni River; from stomach of a single *Bufo marinus* L.; August 30, 1935 (N. A. Weber). [Presumably in the collection of Dr. Weber].

The single (holotype) female has been diagnosed as follows: "Length 4.6 mm. Differing from the typical form in more rounded head, less sinuate frontal carinae, epinotal spines shorter, anterior surface of petiole not transversely rugose, postpetiole dorsum more longitudinally rugulose. Head with closed mandibles, slightly longer than wide. Color and size similar. One alate female".

I have not seen the type, nor have I seen a specimen from that locality. Nevertheless the status of this subspecies is subject to doubt. Very probably it is not the female of the preceding subspecies, the worker of which is characterized by having the anterior face of petiole very coarsely transversely striated. It is quite possible that this subspecies may prove to be identical with *pictipes*, the female of which is very similar to *goeldii*.

Since all females are very little differentiated, it is hardly advisable to base a new subspecies on females alone.

14. *Procryptocerus gracilis* (F. Smith)

Meranoplus gracilis F. Smith, 1858, Cat. Hym. Brit. Mus. vol. 6, p. 194; pl. 12, fig. 7; [worker; Brazil: State of Amazonas, Egas (= Tefé)]. — F. Smith, 1862, Trans. Ent. Soc. London, Vol. 3 (1) p. 412.
Cataulacus gracilis Mayr, 1886, Verh. Zool.-bot. Ges. Wien, vol. 36, p. 361.
Procryptocerus gracilis Emery, 1887, Ann. Mus. Stor. Nat. Genova, vol. 25, p. 470 nota.

Type. — Worker; Brazil: State of Amazonas, Egas (=Tefé). [British Museum of Natural History (Coll. H. W. Bates)].

Chronologically this is the first species of the genus and has been described by Frederick Smith as follows:

"Worker. Length 2 1/4 lines. Black: head convex, subopake, and finely punctured; eyes large, prominent, placed forwards on the sides of the head, the posterior angles rounded; the clypeus concave, or depressed in the middle, its anterior margin widely but slightly emarginate. Thorax longitudinally emarginate. Thorax longitudinally rugose, intermixed with deep punctures, elongate and narrowed to the base of the mesothorax; the anterior margin of the prothorax arched, with the lateral angles subacute; the posterior lateral angles of the mesothorax tuberculate; the metathorax with the basal lateral angles rounded, and the apical ones produced into long stout acute spines: Abdomen ovate; the first node of the peduncle rugose, much narrower than the second, which is truncate at the base, rounded at the sides and behind".

Unfortunately the foregoing description is insufficient to reveal the identity of *gracilis*, nor does the accompanying figure (if it can be considered trustworthy at all) give any helpful clue. It seems to be related to the *goeldii*-group, or perhaps even to the *coriarius*-group, but nothing can be said, before the extant type in the British Museum can be examined. Thus for the time being, *gracilis* is best left aside as a *species inquirenda*.

E. Group of Procryptocerus paleatus

The next three species, *paleatus, spiniperdus* and *marginatus* exhibit a great many strikingly similar structural features and certainly constitute a natural group, which may be characterized as follows:

Species of large size; frontal carinae sinuate; occipital crest crenulate; occipital truncation slightly excavated, smooth and fulgid; pronotum somewhat to greatly expanded laterally, overhanging the distinctly excavated laterotergites; anterior angle of expanded portion more or less distinct, always separated from the corner of the shoulders; mesoepinotal suture very sharply impressed, interrupting the sculpture; upper surface of thorax longitudinally striato-rugose; tibiae strongly rugose; petiole longer than wide; postpetiole almost as long as wide; pilosity whitish, stiff, stout, abundant, decumbent on gaster.

The sexual forms, as far as known, possess the unique feature of having a distinctly closed and appendiculate marginal cell on the fore wing.

15. *Procryptocerus paleatus* Emery

(Figs. 1, 20, 50, 67)

Procryptocerus paleatus Emery, 1896, Bull. Soc. Ent. Ital. vol. 28, p. 96; [worker; Costa Rica: Atirro, near Jimenez].

The long, subquadrate basal face of epinotum, as long as wide at the base of the epinotal spines, the extremely short, triangular epinotal spines, shorter than half the length of the basal face, the minute occipital tooth, the less expanded pro-mesonotal disc, and the distinctive sculpture of the upper surface of head and gaster, separate at once *paleatus* from the other two members of the group.

Type. — Worker (holotype); Costa Rica: Atirro, near Jimenez. [(Coll. Emery) in the Museo Civico di Storia Naturale di Genova].

Worker; Costa Rica (exact locality unknown); March 1924 (Wm. M. Mann) [USNM]. — Length 6.0 mm. Median head length 1.43 mm.; Weber's length of thorax 1.78 mm. Black: the tip of mandibles and the tibiae fuscous.

Head [Fig. 1] subopaque; greatly convex above. Mandibles longitudinally striated. Clypeus longitudinally convex, finely longitudinally striated, and finely reticulate-punctate. Anterior border shallowly emarginate mesad, posterior border indicated by faint, arcuate suture. Frontal carinae very little sinuate; anterior end not projecting above the antennal socket, posterior end bent mesad towards occipital angle, which is slightly denticulate. Upper surface of head finely reticulate-punctate, with larger, shallow foveolae between which run longer or shorter longitudinal fine rugulae. Occipital border moderately arcuate, distinctly crenulate, sharply marginate, projecting slightly over

the somewhat excavate, fulgid, mostly smooth occipital truncation. Cheeks, in front view, moderately curved, longitudinally striated. Eyes moderately convex. Lower surface of head longitudinally striated. Scape slightly curved, somewhat depressed, distad, finely reticulate-rugulose on outer (anterior) face.

Thorax [Fig. 20] subopaque. Anterior border of pronotum moderately arcuate, shoulders angulate; lateral border of pronotum strongly convex, strongly marginate, overhanging the somewhat excavated latero-tergites at the side. Promesonotum slightly wider than long, moderately longitudinally convex; promesonotal suture vestigial. Mesonotum with laterally projecting, acute, triangular, somewhat upturned tooth. Mesoepinotal suture deeply impressed, thorax greatly constricted between mesonotum and epinotum. Basal face of epinotum as long as wide at the base of the spines, with little projecting, anteriorly rounded, posteriorly acutely angulate, long, baso-lateral lobes. Epinotal spines shorter than half of the length of the basal face, parallel, straight. Upper surface of thorax longitudinally striato-rugose, somewhat irregular and forming meshes on anterior portion of pronotum. Sides of thorax longitudinally striated, striae rather coarse anteriorly, finer to obsolete posteriorly; upper portion, contiguous with dorsum, smooth. Declivous face finely reticulate, submarginate above, smooth, fulgid. Coxae striated above. Fore femora more inflated than middle and hind femora, a few striae on upper half of posterior face. Tibiae coarsely rugose.

Petiole [Figs. 50, 67] distinctly longer than wide, sides slightly divergent caudad, constricted behind. Anterior surface finely reticulate-punctate, oblique, continuous with upper surface. Dorsum convex coarsely striato-rugose above and laterally. Anterior ventral tooth vestigial. Postpetiole slightly wider than long, upper face oblique, flat, longitudinally striated, abruptly bent downwards behind, shortly in front of the posterior margin. Coarsely rugose laterally and behind. Anterior corners subangulate, sides somewhat convex.

Gaster ovate, short, subopaque. Tergites finely, but sharply reticulate-punctate, with vestigial, short, longitudinal rugulae, especially apically on the first tergite. First sternite similarly sculptured laterad, smooth discally.

Mandibles, clypeus, cheeks, upper surface of head with short, suberect, yellowish white, setae which are slightly longer, stouter, denser, oblique to subdecumbent on thorax and appendages, and still longer on peduncle and gaster, on the

latter mostly decumbent, especially discad. Oblique setae on tergites and sternites 2-4 of gaster.

Female and male unknown.

Distribution. — This species is known from Central America, ranging from Costa Rica to Mexico.

Specimens examined: 13 workers as follows: *Costa Rica*: "Zentr. Costa Rica" (no other data); March 1924; (Wm. M. Mann): 12 workers [USNM]. — *Mexico*: Vera Cruz Province, S. Lucrecia; April 1923 (Wm. M. Mann): 1 worker [USNM].

The above described worker agrees perfectly with the original description of the single type (holotype) except that the latter has the first gastric tergite more distinctly striated, whereas the Costa Rican specimens, which I examined, exhibited only a few, rudimentary short rugulae, more distinct towards the apical margin.

The single worker from Mexico, however, has the sculpture of the first gastric tergite as in the type, but it differs otherwise by the short, subquadrate petiole, the sparse, suberect pilosity of the gaster.

16. *Procryptocerus spiniperdus* Forel

(Figs. 2, 21, 49, 66)

Procryptocerus spiniperdus Forel, 1899, Biol. Centr.-Amer. Hym. vol. 3, p. 43, nota. Pl. 2, fig. 8 [♀ ♂; Trinidad]. — Forel, 1930, The Social World of the Ants (English by C. K. Ogden), vol. 1, p. 254, 360; Pl. 7, fig. C.

This species from Trinidad is closely related to the Brazilian *marginatus*, from which it is readily differentiated by the sculpture of the upper surface of head, the smaller size, the slender epinotal spines, and the sharp mesonotal tooth.

Types. — Worker, male; Island of Trinidad (Urich) [Muséum d'Histoire Naturelle, Genève (Coll. A. Forel); Naturhistorisches Museum Wien (Coll. G. Mayr)].

Worker (lectotype) [Nat.-hist. Mus. Wien]. — Length 6.2 mm. Median head length 1.63 mm. Weber's length of thorax 1.80 mm. Black; the following fuscous reddish-brown: apices of mandibles, apical anulus of tarsi.

Head [Fig. 2] subopaque. Mandibles longitudinally rugulose, finely reticulate-punctate. Clypeus broadly and shallowly emarginate mesally; posterior border marked by a faint transverse suture; a fine transverse ridge parallel to the anterior border, the rest rather finely, distantly longitudinally striolated, and very finely reticulate-punctate. Frontal area obsolete. Frontal carinae sinuate, not projecting above the antennal socket; posterior end evenly rounded mesad to meet small, but conspicuous, recurved occipital tooth on each side. Upper surface of head with widely

separated longitudinal rugae which rarely anastomose; intervals finely reticulate-punctate, about 3 rows of punctures between the ridges. Cheeks, in front view, slightly arcuate, longitudinally rugose. Eyes moderately, evenly convex, situated completely before the half of the median head length. Lower surface of head longitudinally striato-rugose. Occipital border moderately arcuate, sharply marginate and crenulate, slightly impressed mesad; slightly overhanging the occipital truncation, which is scarcely excavated, smooth, fulgid, finely, superficially reticulate, with a few short, perpendicular ridges around the occipital foramen. Scape somewhat depressed, not expanded, nor lobed at base; its length slightly less than 2/3 of median head length; finely, but sharply reticulate-punctate.

Thorax [Fig. 21] subopaque; about 1 1/3 times as long as maximum width. Anterior border of pronotum slightly arcuate; shoulders angulate. Pronotum projecting laterally a considerable distance above the sides; lateral border, between shoulders and anterior angle of expansion rectangularly excised, between anterior rounded and posterior acute subacute angle of projection, slightly concave, and sharply marginate. Promesonotal suture vestigial. Mesonotum postero-laterally, with a large, projecting, somewhat flattened and upturned, projecting tooth. Thorax greatly constricted laterally between mesonotum and epinotum; mesoepinotal suture distinct, sharply impressed. Basal face of epinotum, in profile, at somewhat lower level than promesonotum; flat, slightly more than 1.5 times as wide as long, with baso-lateral lobes, projecting somewhat, rounded anteriorly, slightly emarginate laterally, subdentate posteriorly and occupying about one-half of length of basal face. Epinotal spines rather slender, straight, slightly raised, subparallel, somewhat shorter than basal face. Upper surface of thorax longitudinally striato-rugose. Sides of thorax, including laterotergites of pronotum, distinctly excavated, lower half longitudinally striated, upper half almost smooth, finely reticulate-punctate. Declivous face smooth, finely reticulate. Femora completely smooth, to shallowly punctured; fore femora with a few, longitudinal striae on upper half of posterior face. Hind femora distinctly shorter than maximum width of thorax.

Petiole [Figs. 49, 66] longer than wide (20:15), sides and dorsum scarcely convex, coarsely and longitudinally rugose; anterior face finely reticulate-punctate, almost smooth. Postpetiole broader than long (25:21); anterior corners, from above, sub-

angulate, sides and dorsum moderately convex, longitudinally rugose.

Gaster subopaque, elliptical. The first tergite and exposed portion of remaining tergites, finely, densely longitudinally striato-rugose, with a noticeable row of fine punctures within the striae. Sternites similarly sculptured laterad.

Upper surface of head with stout, stiff, blunt, abundant suberect whitish setae. Upper surface of thorax and upper surface and sides of peduncle with similar, but somewhat longer, more pointed, suberect to oblique setae. On gaster, above similar to peduncle, but denser, decumbent. Oblique setae on appendages. Short pile beneath head and peduncle. A few erect hairs on 2-4 gastric tergites and sternites.

Female unknown.

Male (after Forel's original description). — "Length 8 mm. Narrow and elongate. Antennae filiform. Scapes as long as 2nd funicular segment. First funicular segment very short, almost globulose. Mandibles perpendicularly truncate at apex, bent at right angle at the half, as wide on apex as on base, terminal border scarcely denticulate. Clypeus convex, subcarinate. Head wider than long, rounded behind. Pronotum with angulate shoulders. Epinotum with two stout teeth. The two nodes of the peduncle very much elongate, slightly incrassate behind, the first three times as long as wide. Gaster very much elongate, almost cylindrical, attenuate at base. Femora a little inflated at the middle. External genital valves large, long, depressed, forming, when seen from above, two large triangular lobes, rounded in form of a flap and beset with long, curved hairs. Head and thorax irregularly striato-rugose and subopaque. Peduncle and gaster smooth and fulgid. Pilosity pale yellowish, much finer and longer than in the worker, curved and somewhat lanuginose. Black; legs, antennae and genital valves brunneous; tibiae reddish. Wings tinged with brown. Radial [= marginal] cell closed, very narrow. The transverse vein unites with the branch of the external cubitus. Only one cubital cell".

This distinctive species is known only from the type series, taken by Urich at Trinidad Island, in a spine of *Erythrina umbrosa,* the woody base of which had been excavated by the ants. The nest is pictured on Plate 2, fig. 8, in the third volume of Hymenoptera of "Biologia Centrali-Americana".

The single cotype worker (lectotype), which I was able to examine, does not agree entirely with Forel's description. Thus, against the diagnosis, the promesonotal suture is scarcely visible; the funicular segments are scarcely longer than broad; the petiole is only 1 1/4 times

as long as broad; and the sculpture of the upper surface of head does not present conspicuous, large meshes.

17. *Procryptocerus marginatus* Borgmeier

(Figs. 17, 73, 83, 86, 87)

Procryptocerus marginatus Borgmeier, 1948, Rev. de Ent. vol. 19, p. 201-202, fig. 26 [worker, female, male; Brazil: State of Bahia, Uruçuca].

This Brazilian species resembles very closely *spiniperdus* from Trinidad, and Father Borgmeier himself, when loaning me his types, called my attention to this fact, suggesting, at the same time, that I reduce his species to subspecific rank under *spiniperdus*. Although this may eventually prove to be the true situation, the available factual evidence does not seem to warrant such a procedure. Both species are known only from the type series; their distribution and variational range are completely unknown, and, notwithstanding the striking similarity, there are, at present, a few characters, that help to establish a clear-cut division between both species.

As Borgmeiers's recent diagnosis of all three castes of the species are sufficiently detailed, I limit myself to point out the differential characteristics and to present more accurate measurements.

Types. — Worker, female, male; Brazil: State of Bahia, Uruçuca; 1947 (Pedrito Silva) [Coll. T. Borgmeier].

Worker (lectotype). — Length 8.0 mm. Median head length 1.90 mm. Weber's length of thorax 2.29 mm. Quite distinct from *spiniperdus* by its conspicuously larger size (all specimens well over 7.5 mm.), deeper head (depth: length proportion, 56:80=0.70, whereas in *spiniperdus* this proportion is 42:65=0.65). The sculpture of the upper surface of head is coarsely reticulate-rugose, all the longitudinal rugae converging mesad to a point, just a little in front of the occipital crest; the meshes broad, containing occasionally large, shallow, circular depressions; the rugae more separate from one another than in *spiniperdus*. Humeral [Fig. 17] angle with somewhat less pronounced rectangular excision (not stated in original description, nor represented in Borgmeier's figure of the thorax). Promesonotal disc less convex, the mesonotum almost flat. Lateral border of expanded portion of pronotum sharply marginate, straight, not emarginate. Mesonotal tooth rounded at apex, lobe-like. Lateral border of basal face of epinotum, behind the baso-lateral lobes, continuous with the outer border of spines, distinctly converging

caudad. Epinotal spines broad at base, not upturned. Pilosity similar, somewhat more abundant than in *spiniperdus,* about 40 setae on basal face of epinotum (less than 30 in *spiniperdus*).

F e m a l e (paratype). — Length 8.5 mm. Median head length 1.85 mm. Weber's length of thorax 2.58 mm. Extremely resembling the worker, except for the characters of the caste, and the following details: Ocelli minute, not raised above the upper surface of head. Distance between posterior ocelli much less than distance of each from the lateral border of head. Reticulation and foveolate depressions of head still more conspicuous than in worker. Pronotum coarsely reticulate-rugose above, lateral borders sharply marginate; latero-tergite excavated. Scutum and scutellum coarsely rugose. Basal face of epinotum coarsely striated. Epinotal spines short, acute, tooth-like. Wings infumated, veins dark brunneous. Fore wing [Fig. 87] with marginal cell closed and appendiculate. Cubital and subdiscoidal veins almost extending to apical border. Transverse median vein much longer than second abscissa of median vein, almost intersticial with basal vein.

M a l e (paratype). — Length 9.5 mm. Median head length 1.29 mm. Weber's length of thorax 3.02 mm. As described by Borgmeier, with the following additional characters: Scape subequal in length to second funicular segment. Greatest diameter of eye less than half the median head length. Distance between inner (upper) border of eyes subequal to the median head length [Fig. 73]. Sculpture of head and thorax not strictly striated, but striato-rugose. Laterotergite of pronotum impressed, excavated, marginate above. Epinotum with short posterior teeth. Declivous face smooth, fulgid. Petiole [Fig. 83] antero-laterally rugulose, rest smooth, slightly more than twice as long as wide. Postpetiole mostly smooth, shorter than petiole, distinctly less than twice as long as wide. Gaster comparatively short, not subcylindrical. Genitalia retracted. Wings [Fig. 86] similar to those of female.

This giant species is still known only from the type locality.

Specimens examined: 32; 19 workers, 11 females, 2 males (lectotype and paratypes).

If Forel's description of the male of *spiniperdus* is accurate, *marginatus* differs from it not only by its larger size, but also by the prominent occipital teeth, the distinctly shorter petiole and gaster. The occipital teeth, the small eyes, situated on top of the strikingly bulging sides of the head, the excavated laterotergite of pronotum, and the closed marginal cell of forewing distinguish this from all other known males of the genus.

F. Procryptocerus subpilosus and related Forms

The present section deals with *P. subpilosus* and several related forms traditionally treated as subspecies of *subpilosus*. The taxonomy of this group is very unsatisfactory. The majority of the "races" that constitute the *subpilosus*-complex are very little known. The fact that they were grouped together under a single species is not the result of careful distributional and variational studies, but rests upon the assumption that the close, yet often not fully understood, morphological resemblance of the forms concerned is indicative of their intimate systematic relationship.

The beginning of this complex dates back to 1899 when Forel described a new form, *impressus*, from Panama, which he attached as a subspecies to *puncticeps* F. Smith. The latter, as already mentioned by F. Smith (1876), is most probably the worker of *attenuatus*, a female, from the same locality, and originally proposed in the same paper. In 1908 Forel enriched *subpilosus* with a new race from São Paulo, Brazil, which he called *lepidus*. Then in 1911, the same author discovered a cotype of Smith's *subpilosus* in the collection of the Zoological Museum of Munich (prior to this date, no one had ever examined Smith's types of *subpilosus* and *attenuatus*). The examination of this type led him to reshuffle the classification of the group, *attenuatus* (+ *puncticeps*), *impressus, lepidus* being ranked as subspecies of *subpilosus*. This arrangement was adopted by Emery in 1922, in the section on Myrmicinae, of the Genera Insectorum.

Although during the preceding period abundant references have been made to the various forms of the group, most of them are of nomenclatorial nature, and very little light, if any, has been shed upon Smith's *subpilosus* and *attenuatus*. Nor have the relationship and the common characteristics of the so-called races been thoroughly documented. It is true, that at least Forel's description of both *impressus* and *lepidus* appear to be sufficient for the purpose of identification and recognition. But the fact that all of them are subspecies of *subpilosus* has to be accepted more or less by trusting Forel's authority and taxonomic sense.

I am unable to justify or to disprove this arrangement because I have not seen the types, except several cotypes of *lepidus*, nor any other specimen referable to this complex. Consequently, the situation must remain insolved for the present, and, in the following pages, I limit myself to a brief digest of what is known about these forms.

18. *Procryptocerus subpilosus* (F. Smith)

Meranoplus subpilosus F. Smith, 1860, Journ. Ent. vol. 1, p. 78; pl. 4, fig. 2 [worker; Brazil: State of Amazonas, Egas (= Tefé)]. — F. Smith, 1862, Trans. Ent. Soc. London, (3). vol. 1, p. 143, p. 13, f. 7 [worker].
Catulacus subpilosus Mayr, 1886, Verh. Zool.-bot. Ges. Wien, vol. 36, p. 361.
Procryptocerus subpilosus Emery, 1887, Ann. Mus. Stor. Nat. Genova, vol. 25, p. 470, nota. — Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, p. 211 [worker; Brazil, Rio Grande do Sul]. — Emery, 1894, Berl. Ent. Zs. vol. 39, p. 384; [worker; Brazil: Rio Grande do Sul]. — Forel, 1911, Sitz.-ber. Bayer. Akad. Wiss. p. 262; [worker]. — Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 302.

Type. — Worker; Brazil: Amazon R., Egas (Tefé) (H. W. Bates) [British Museum (Natural History)].

The original diagnosis by Frederick Smith is as follows:

"Worker: Length 2 1/4 lines. Black: the head subovate, narrowed anteriorly, delicately and rather distantly punctured, very finely and indistinctly aciculate, with a little strong abbreviated

striation at the posterior margin of the vertex. The thorax deeply striated; the transverse impressed line at the base of the metathorax profound; the metathorax with two straight, stout, acute spines directed backwards. Abdomen ovate, finely striated; the nodes of the peduncle, with an irregular coarse rugose, longitudinal striation; the body, as well as the legs, with a scattered, glittering, pale pubescence".

Female and male unknown.

The type locality, according to the description, is S. Paulo, Brazil. But Mr. Donisthorpe, of the British Museum, in a recent letter to Fr. Borgmeier states that the label on the type specimen says: "Ega, Amazon R., Brazil". The same locality has been indicated by Forel (1911), who presumably drew this information from the cotype specimen of the Zoological Museum of Munich, which he was able to examine. Egas (=Tefé), consequently, seems to be the correct type locality.

Emery (1894) states that Smith's description appears to be accurate and to fit exactly to a single specimen from Rio Grande do Sul, Southern Brazil. Forel (1911), after examining the already mentioned cotype, confirms this statement and furnishes the following additional diagnostic features:

The upper surface of head is somewhat more coarsely (but more finely than thorax) striated caudad and laterad, very finely and densely striated discad. The sparse punctures are very shallow and indistinct. The basal face of the epinotum is much longer than in lepidus, without the rounded, projecting antero-lateral lobes of that subspecies.

19. *Procryptocerus subpilosus attenuatus* (F. Smith)

Meranoplus attenuatus F. Smith, 1876, Trans. Ent. Soc. London, p. 609, pl. 11, fig. 9; [female; Brazil: Pará].
Meranoplus puncticeps F. Smith, 1876, Trans. Ent. Soc. London, p. 609, pl. 11, fig. 10; [worker; Brazil: Pará].
Cataulacus attenuatus Mayr, 1886, Verh. Zool. bot. Ges. Wien, vol. 36, p. 364.
Cataulacus puncticeps Mayr, 1886, Verh. Zool. bot. Ges. Wien, vol. 36, p. 364.
Procryptocerus attenuatus Emery, 1887, Ann. Mus. Stor. Nat. Genova, vol. 25, p. 470, nota.
Procryptocerus puncticeps Emery, 1887, Ann. Mus. Stor. Nat. Genova, vol. 25, p. 470, nota. — Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, p. 11; [worker; Brazil: State of Pará].
Procryptocerus subpilosus attenuatus Forel, 1911, Sitz.-ber. Bayer. Akad. Wiss. p. 262. — Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 302.

Types. — Female, worker; Brazil: State of Pará (Belém do Pará) [British Museum (Natural History)].

The female is diagnosed by Fred. Smith as follows:

"F e m a l e. Length 2 1/2 lines. Black and shining; the head

rather strongly punctured; the ocelli distinct, placed in a triangle on the vertex; the apical joint of the antennae rufo-testaceous. Thorax oblong, longitudinally roughly striated; the metathorax deeply emarginate, forming two lateral stout teeth; wings wanting; femora much attenuated at the base, and swollen in the middle; the anterior tibiae and tarsi, and the apical joints of the two posterior pairs, rufo-testaceous. Abdomen oblong-ovate, striated at the base, the apex with scattered pale hairs; the first node of the peduncle with large punctures, and much narrower than the second, which is longitudinally striated".

The worker, described as *puncticeps* has been characterized by the same author, as follows:

"Worker. Length 2 lines. Black and shining, the head subovate, punctured; antennae pubescent, the apex testaceous; the mandibles and a small space between the antennae striated. Thorax oblong, deeply constricted at the base of the metathorax, which is longitudinally striated, deeply emarginate and with two longish acute spines, the anterior portion of the thorax strongly longitudinally punctate-striate; the femora much attenuated at their base and swollen in the middle; the apical joints of the tarsi testaceous. Abdomen ovate, longitudinally striated at the base; the nodes of the peduncle deeply striated, the first narrower than the second, both subovate... This is very probably the worker of *Meranoplus attenuatus;* both are from the same locality, and were received at the same time".

Male unknown.

The types have not been reexamined by any modern myrmecologist. Emery (1894) expresses the belief that several specimens from Pará, collected by A. Schulz, belong to this form, because they agree rather perfectly with the original description, less perfectly with the figure, in which, according to the same author, the remarkably slender habitus of the specimen and the width of the epinotum (represented broader than mesonotum) have been greatly exaggerated.

20. *Procryptocerus subpilosus impressus* Forel

Procryptocerus puncticeps impressus Forel, 1899, Biol. Centr. Amer. Hym. vol. 3, pp. 47-48 [worker, female; Panama: Bugaba].
Procryptocerus subpilosus impressus Forel, 1911, Sitz. ber. Bayer, Akad. Wiss, p. 263.

Types. — Worker, female; Panama: Bugaba (Champion). [Place [14] where the types are presently kept unknown to me].

Worker (translated from Forel, 1911): "Length 5.5 mm. Larger than the typical form from Pará [*puncticeps=attenuatus!*] The head is more fulgid and has the ridges much more accentuated on the entire upper face, between the punctures, which are somewhat less apparent, but still sparse and very distinct. The mesonotum is strongly impressed in saucer-like fashion, on the entire median portion unto the mesoepinotal suture. The postpetiole is wider, much wider than long. The abdomen is densely reticulate-punctate and only feebly striated besides, whereas in *Procryptocerus puncticeps* [=*attenuatus*] it is above all, densely striated. The coarse and long setiform and golden pubescence that covers the abdomen, the peduncle and the epinotum is more abundant. Finally the posterior border of head is distinctly crenulate, which is not the case in *Procryptocerus puncticeps*. The habitat of the two forms being also distinct, I believe that the establishment of this race is justified".

Female (translated from Forel, 1911). — "Length 6.8 mm. Head almost without ridges, as in the typical *Procryptocerus puncticeps,* crenulated on the posterior border. The peduncle has sparse, larger punctures, and few rugosities. Wings infumated. Otherwise as worker, with the differences of the sex".

Male unknown.

I have not seen the types, nor any other corresponding specimen. However, after reading carefully the above description, one cannot help but suspect that *impressus* is not very remote from *paleatus* Emery. The larger size, sculpture of head and gaster, the pilosity of the gaster and the crenulated occipital crest are characters which *paleatus* shares with *impressus,* which nevertheless differs from the former by the very broad postpetiole and the saucer-like impression of the mesonotum.

This subspecies is known only from the type locality.

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[14]) Since the specimens were collected by Champion and their description published in the Biologia Centrali-Americana I would expect them to be in the British Museum.

21. *Procryptocerus subpilosus lepidus* Forel

(Figs. 35, 47)

Procryptocerus subpilosus lepidus Forel, 1908, Verh. Zool. bot. Ges. Wien, p. 355-356 [worker; Brazil: State of S. Paulo, S. Paulo]. — Forel, 1911, Sitz.-ber. Bayer. Akad. Wiss. p. 263.

As stated by Forel (1911) *lepidus* differs from all members of the group by the prominently projecting baso-lateral lobes of the epinotum. It may be readily separated from the *striatus*-group by the much smaller size, the sculpture of the upper surface of the head, and other features.

Type. — Worker; Brazil: State of S. Paulo, S. Paulo (H. von Ihering). [Muséum d'Histoire Naturelle, Genève (Coll. A. Forel); Coll. T. Borgmeier, Rio de Janeiro, n. 2096 and 2690].

Worker (lectotype) [Coll. T. Borgmeier]. — Length 4.0 mm. Median head length 1.10 mm. Weber's length of thorax 1.17 mm. Black; the following fuscous-ferruginous: apices of mandibles, terminal funicular segments, tips of scapes and tibiae, fore metatarsus; tarsi 2-5 lighter.

Head subopaque. Mandibles longitudinally striolated. Clypeus longitudinally convex, finely longitudinally striated; anterior border broadly emarginate; posterior border indicated by arcuate, transverse, somewhat faint suture. Frontal area vestigial. Frontal carinae conspicuously sinuate, not expanded above the antennal socket; posterior end bent mesad towards faintly dentate occipital corner. Upper surface of head very finely reticulate-punctate, with superimposed macrosculpture consisting of fine longitudinal rugulae which occasionally form meshes and reticulations, especially antero-laterally, around the somewhat impressed and slightly more shining larger punctures. Occipital border slightly carinate, greatly arcuate laterad, impressed mesad, marginate above the truncation. Cheeks moderately convex, reticulate rugose. Eyes moderately and evenly convex, situated before the half of the median head length. Occipital truncation distinctly set off, with a few median longitudinal striae separated from a few lateral transverse ridges by a rather smooth, finely reticulate area. Scape less than two thirds of the median head length, finely reticulate-punctate and opaque. Lower surface of head longitudinally striated.

Thorax [Fig. 35] subopaque. Promesonotum slightly wider than long (29:31). Anterior border of pronotum moderately arcuate laterad, somewhat impressed mesad; shoulders angulate, subdentate; lateral borders gently convex, marginate. Pro-

mesonotal suture vestigial. Mesonotum with small, little projecting postero-lateral rectangular lobe or tooth. Mesoepinotal suture impressed dorsally, distinctly visible in profile. Basal face of epinotum almost twice as broad as long, with greatly projecting, anteriorly rounded, posteriorly subangulate baso-lateral lobes, occupying less than one half of total length of basal face. Epinotal spines somewhat shorter than basal face, stout and slightly divergent at base, slender and subparallel distad. Dorsum of thorax longitudinally striated, about 25 striae on pronotum. Declivous face mostly smooth and somewhat fulgid. Sides of thorax longitudinally striated. Femora with a few striations on the upper half of the posterior face. Tibiae rugulose.

Petiole [Fig. 47] not longer than wide, sides and dorsum very little convex. Anterior face finely reticulate-punctate; sides and dorsum longitudinally striato-rugose. Postpetiole more than 1 1/2 times as wide as long, anterior corners subangulate, sides and dorsum convex; in profile, highest behind the half. Longitudinally striato-rugose.

Gaster subopaque, subovate, short. First gastric tergite finely, densely, superficially, longitudinally striated, each stria containing a visible row of minute punctures. Remaining tergites irregularly, mostly transversely and superficially, finely rugose.

Pilosity sparse to scarce, short, suberect to oblique on upper surface of head and thorax, peduncle and gaster. No decumbent pile visible in dorsal view.

Female and male unknown.

The range of the present subspecies is not well known, but it seems to be restricted to Southern Brazil.

Specimens examined: 9 workers as follows: *Brazil*: State of S. Paulo, S. Paulo; (H. V. Ihering): 7 workers (lectotype and paratype) [CTB, n. 2096, 2690]. S. Paulo; Oct. 28, 1906; (H. Luederwaldt): 1 worker [CTB]. State of Rio de Janeiro, Petrópolis, Nov. 1928: 1 worker [CTB].

G. Group of Procryptocerus sulcatus

The present section contains three distinctive species, *ferreri sampaioi, sulcatus* and the subspecies *sulcatus curvistriatus,* all of which are characterized by the heavy, coarse, generally regular striation of head, thorax, peduncle and gaster and the vestigial to obsolete meso-epinotal groove, which never interrupts the sculpture and scarcely the dorsal profile of the thorax. All these species are well differentiated from one another and so it is hard to say whether they form a phylogenetic group or not.

22. *Procryptocerus ferreri* Forel

(Figs. 6, 37, 65)

Procryptocerus ferreri Forel, 1912, Mem. Soc. Ent. Belg., vol. 19, p. 208-209 [worker; Colombia: San Antonio, Sierra Nevada de Santa Marta].

This interesting Colombian species differs from the Brazilian *sampaioi,* its closest relative, by the more irregular and converging striation of the upper surface of the head, the evenly convex eyes, the sculpture of the occipital truncation, the shape of the epinotum and the short gaster.

Type. — Worker; Colombia: San Antonio, Sierra Nevada de Santa Marta; elev. 1000 m. (Forel) [Muséum d'Histoire Naturelle, Genève (Coll. A. Forel)].

Worker (lectotype). — Length 4.4 mm.; median head length 1.07 mm.; Weber's length of thorax 1.32 mm. Black; the following reddish-brown: apices of mandibles, proximal and distal end of femora, scapes, tibiae; proximal funicular segments slightly lighter, distal segments darker, with infuscated apical band, excepting the last segment, which has a yellowish tip. Fore tarsi light brown. Middle and hind tarsi fuscous with red-brown apical band.

Head [Fig. 6] subopaque; subcircular in anterior aspect, slightly truncate anteriorly and distinctly truncate posteriorly. Mandibles finely striated and reticulate-punctate. Clypeus perpendicular to upper surface of head, longitudinally striated; a few transverse striae along the anterior border, which is slightly emarginate mesad. Posterior border of clypeus and frontal area obsolete. Frontal carinae sinuate, not projecting above the antennal socket, not attaining the internal (upper) border of eye. Upper surface of head very coarsely and longitudinally ridged or sulcate, the elevated ridges broader than the deepened intervals, the ridges subparallel anteriorly, converging mesad posteriorly, not as straight as in *sampaioi* but more or less undulated due to interspersed punctures and occasional cross-connections. Sculpture pattern especially indistinct and irregular toward the vertex, where one may count about 22 striae, ending at the transverse occipital crest. Occipital border not sharply marginate, prominently arcuate laterad, somewhat impressed mesad. Occipital truncation distinctly set off, with about 4 transverse coarse ridges. Occipital corner without a distinct tooth, bluntly angulate. Cheeks irregularly and coarsely foveolate-rugose. Lower surface of head coarsely longitudinally striate. Scape more than half as long as median head length (27:44). Second and third funicular segments

shorter than broad, the rest as long as, or slightly longer than, broad.

Thorax [Fig. 37] subopaque. Promesonotum convex in profile and continuous with the epinotum. Shoulders sharply angulate, sides of pronotum marginate, subparallel, scarcely convex. Mesonotum marginate laterally, ending posteriorly in a small, bluntly rounded, little projecting lobe. Thorax not much constricted laterally between meso- and epinotum, no distinct mesoepinotal groove dorsally. Basal face of epinotum transversely convex, with very narrow, little projecting but rather long baso-lateral lobes, the sides of which are subparallel. Epinotal spines pointing slightly upwards and somewhat diverging caudad, shorter than basal face. Dorsal surface of entire thorax continuously, coarsely, longitudinally striato-sulcate, 15-16 on pronotum, 12 on mesonotum, 11 on epinotum. Declivity of epinotum striated above, smooth below. Sides of thorax rather regularly and coarsely striated. Coxae with oblique striae. Fore and mid femora with a few striae on upper half to posterior face. Middle and hind femora only moderately inflated, less than fore femora. Tibiae slightly rimose on upper surface.

Petiole [Fig. 65] slightly longer than wide (17:15), rectangular from above, coarsely and not quite regularly striato-rugose, the anterior face finely punctured, almost smooth, the lower half perpendicular, the upper half oblique. Antero-median ventral tooth absent. Postpetiole wider than long (23:16) with angulate antero-lateral corners, moderately convex above in profile, rather regularly striated, with about 11 striae above.

Gaster subopaque, suboval, very short. First gastric tergite regularly but coarsely sulcate, scarcely longer than wide (49:48). First sternite almost concentrically striated laterad, almost smooth discally. Remaining tergites *i. e.* exposed parts thereof, finely, irregularly, mostly transversely; rugulose.

Pile mostly stiff, somewhat stout, whitish-creamy, much more robust than in *sampaioi*. Short erect sparse on head, denser, more inclined and longer on thorax. Still longer on peduncle; gaster with both long and short setae, which are more or less inclined, but not strictly decumbent.

Female and male unknown.

This species is still known only from its type locality.

Specimens examined: 1 worker (lectotype).

23. *Procryptocerus sampaioi* Forel

(Fig. 38)

Procryptocerus sampaioi Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 207-208 [worker; Brazil: State of Rio de Janeiro, "Itaucana"; State of Minas Gerais, "Veisenia Soares"].

Of all the species of *Procryptocerus* the present form possesses the coarsest, deepest and most regular striation. It may be recognized at once by the peculiar shape of the eyes: the upper half of its surface is deeply pushed in and concave, thus producing a transverse ridge across the eyes.

Type. — Worker; Brazil: State of Rio de Janeiro, "Itaucana" (Itaipava?) (Goeldi) [Muséum d'Histoire Naturelle, Genève (Coll. A. Forel)].

Worker; Brazil: State of S. Paulo, S. Paulo; 1949 (Burla) [CTB]. — Length 4.2 mm. Median head length 1.05 mm. Weber's length of thorax 1.19 mm. Black; the following ferruginous: apices of mandibles, antennae, legs; funiculus and basal two-thirds of middle and hind tarsi infuscated.

Head subopaque. Mandibles finely longitudinally striated. Clypeus longitudinally convex, finely striated, the median stria forming a slightly stronger carinule on the upper half. Anterior border of clypeus narrowly excised mesad, posterior border marked by transverse, arcuate furrow. Frontal area obsolete. Frontal carinae sinuate, not expanded above the antennal sockets, posterior end slightly bent mesad to meet sharply angulate, not denticulate occipital corner. Occipital border marginate, scarcely arcuate, somewhat impressed mesad. Upper surface of head coarsely and deeply longitudinally sulcate about 24 striae reaching the occipital border. Two median ridges fuse mesad at an acute angle, the remaining subparallel, hardly converging. Cheeks greatly convex, bulging, longitudinally striated, reticulate-foveolate in front of the eyes. Eyes situated before the half of the median head length, projecting, unevenly convex, the upper half deeply impressed, concave, the lower half convex, forming at the point of juncture a transverse ridge across the eye. Lower surface of head longitudinally striated. Occipital truncation radially striated around the occipital foramen, striae between the center and the lateral corners do not reach the occipital crest above. Scape short, curved, slightly longer than half of the median head length (24:41).

Thorax [Fig. 38] subopaque. Shoulders angulate, subdenticulate. Lateral border of pronotum marginate, scarcely arcuate,

subparallel. Promesonotum slightly wider than long (32:30); promesonotal suture obsolete. Mesonotum with a postero-lateral, somewhat projecting rectangular tooth. Thorax greatly constricted between mesonotum and epinotum; mesoepinotal suture or groove absent, dorsal profile of thorax continuous. Basal face of epinotum with greatly projecting, anteriorly rounded, posteriorly angulate baso-lateral lobe. Epinotal spines slightly divergent proximad, subparallel distad, slender, shorter than basal face. Upper surface of thorax continuously longitudinally sulcate, 13 ridges on pronotum, 10 on mesonotum, 10 on epinotum. Sides of thorax strongly longitudinally striated, mesopleura and metapleura excavated. Declivous face of epinotum with ends of striae of basal face above, smooth and fulgid below. Coxae finely transversely striated. Tibiae scarcely rugulose.

Petiole slightly longer than broad, sides and dorsum slightly convex, anterior face perpendicularly truncate, finely punctate. Dorsum and sides longitudinally sulcate, about 6 striae seen from above. Anterior mid-ventral tooth small and blunt. Postpetiole broader than long, sides and dorsum convex, coarsely and regularly sulcate, about 10 striae seen from above.

Gaster subopaque. First tergite sculptered as thorax, equally regularly sulcate, about 25 striae seen from above. Exposed portion of remaining tergites finely rugulose. First sternite sulcate laterad.

Pilosity uniform, short, sparse, fine, yellowish-white; somewhat longer on peduncle, almost twice as long as on the remaining part of body.

Female and male unknown.

Distribution. This rarely collected species is known to occur in several states of Southern Brazil.

Specimens examined: 2 workers, as follows: *Brazil*: State of S. Paulo, S. Paulo; 1949 (Burla): 1 worker [CTB]. State of Santa Catarina, Hammonia; July 1910 (Luederwaldt); 1 worker [CTB].

Both specimens agree in all essential features of structural detail.

24. *Procryptocerus sulcatus* Emery

Procryptocerus sulcatus Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, p. 200 [worker; Brazil: State of Rio de Janeiro, Nova Friburgo]. — Kempf, 1949, Rev. de Ent. vol. 20, p. 426.

The very regular and coarse (sulcate) sculpture of head, thorax and first gastric tergite associates the present species with

sampaioi and *ferreri,* although *sulcatus* appears equally close to *regularis.* In *sampaioi* the striation is coarser than in *sulcatus,* the latter exhibiting 28 striae that attain the occipital border on the upper surface of head, and at least 30 on the first gastric tergite when seen from above. On the contrary the sculpture of *regularis* is finer, especially on the gaster, where at least 40 striae can be seen from above, and the striae of the head are distinctly converging behind.

Type. — Worker; Brazil: State of Rio de Janeiro, Nova Friburgo (Germain) [(Coll. Emery) Museo Civico di Storia Naturale di Genova].

This species is known from a single specimen, probably a callow, as the color is said to be fuscous-testaceous. Unfortunately, Emery's description is very summary and may possibly apply to several distinct species, although, to date, it is sufficient to separate it from all known related species, including the form which I described as a subspecies of *sulcatus.* Emery's description contains the following diagnostic features:

Worker. — Length 4 mm. Fuscous-testaceous; subopaque. Uniformly longitudinally sulcate, the sulcations deep, parallel, perfectly regular. Both the bottom of the striae and the elevated ridges covered with fine, dense punctures. Occipital angle without a small tooth. Basolateral lobes of epinotum angulose. Epinotal spines rather short, obtuse, divergent. Twenty eight striae on upper surface of head, in front of the occipital truncation; about 30 striae visible on gastric tergite in superior aspect.

I have not had the opportunity to examine the unique type specimen. But, as I already mentioned in 1949, several workers and a female, taken near Teresópolis, State of Rio de Janeiro, not far from the type locality, are referable to this species, and I still, at least tentatively, maintain this association. The just mentioned specimens are characterized, as follows:

Worker; Brazil: State of Rio de Janeiro, Teresópolis; November 1935; (H. Souza Lopes [CTB, n. 5749]. — Length 5.0 mm. Median head length 1.22 mm. Weber's length of thorax 1.53 mm. Black; the following fuscous-brown: apex of scape, funiculus. Light ferruginous: tarsal segments 2-5.

Head subopaque. Mandibles finely, longitudinally striated. Clypeus longitudinally convex; anterior border notched mesad, posterior border obsolete. Clypeus longitudinally and rather coarsely striated (10 striae) upper half with a somewhat stronger median longitudinal carinule. Frontal carinae sinuate, not projecting above the antennal socket. Posterior end slightly bent

mesad towards the angulate occipital corner. Upper surface of head prominently convex, deeply and coarsely longitudinally sulcate, the elevated portions wider than the depressions, bearing several parallel rows of fine punctures. Striae subparallel, except for 2-4 median ones that fuse at an acute angle; all others reach the transverse occipital margination, where one counts about 26 striae. Occipital border sharply marginate and crested, and somewhat subcrenulate, ending laterally in a minute occipital tooth. Cheeks conspicuously converging mesad anteriorly, arcuate, anterior upper portion without any coarse sculpture, remaining portion and lower surface of head longitudinally striated. Occipital truncation obliquely to transversely striated, striae radiating from the median third of the occipital crest. Eyes not quite evenly convex, but not pushed in on upper half.

Thorax subopaque. Shoulders angulate, subdentate. Promesonotal suture obsolete. Lateral border of pronotum marginate, very little convex. Promesonotal disc greatly convex transversely. Mesonotum with rather sharp, acute tooth laterally. Epinotum continuous with the mesonotum dorsally, without a visible mesoepinotal suture or impression. Basal face of epinotum about twice as broad as long, with projecting anteriorly rounded, posteriorly angulate baso-lateral lobes, occupying less than 1/2 of length of basal face. Epinotal spines shorter than basal face, slightly divergent, slender, apex bluntly rounded, not acuminate. Sculpture of upper surface of thorax similar to that of head, equally coarse and regular, 18-19 striae on pronotum, 16 on mesonotum, 15 on epinotum, all continuous and uninterrupted. Sides of thorax longitudinally striated. Declivity mostly smooth. Fore femora transversely to obliquely striated on posterior face. Tibiae striato-rugose.

Petiole subquadrate from above, somewhat constricted behind; anterior face truncate, subperpendicular, finely and densely punctured. Sides and dorsum sculptured as thorax, 8-9 striae seen from above. Antero-median ventral tooth minute and blunt. Postpetiole wider than long, greatly convex, almost angulate above, the posterior part of dorsal surface abruptly bent downward to posterior border. Sculpture regular as on petiole, about 12-13 striae seen from above.

Gaster subopaque, suboval, slightly depressed. First tergite sculptured as thorax, equally coarse and regular, about 30-35 striae seen from above. Exposed portion of remaining tergites finely irregularly rugulose. First sternite striated laterally.

Pile pale yellowish, stiff; short and blunt on head; oblique and somewhat longer on thorax; more or less pointed, inclined on peduncle and appendages.

Female (from the same nest as worker). — Length 5.6 mm. Median head length 1.24 mm. Weber's length of thorax 1.80 mm. Extremely similar to the worker except for the characters of the caste and the following details: Ocelli very small, not raised above the upper surface of head. The distance between the hind ocelli less than the distance of each from the lateral border. Shoulders subangulate. Pronotum longitudinally striated without foveolae or large punctures. Gaster as coarsely striated as in worker. The female is very similar to the female of *regularis*, from which it differs by the longitudinal striation of the head and the pronotum, the extremely coarse striation of the gaster and peduncular segments. In *sulcatus* the fore wing has an open marginal cell, the subdiscoidal vein is vestigial, the cubital vein partly vestigial, both somewhat apparent throughout the apical field. Transverse median vein longer than the 2d abscissa of the median vein. Wings subhyaline and veins light brunneous.

At present the species is known only from the Serra dos Orgãos near Friburgo and Teresópolis, State of Rio de Janeiro, Brazil.

Specimens examined: 4, 3 workers and 1 female, from the aforesaid locality.

25. *Procryptocerus sulcatus curvistriatus* Kempf

(Fig. 32)

Procryptocerus sulcatus curvistriatus Kempf, 1949, Rev. de Ent. vol. 20, p. 425-426, fig. 5 [worker; Brazil: State of Espirito Santo, S. Teresa].

The peculiar sculpture of the promesonotum, consisting of longitudinal striae anteriorly which converge semicircularly and fuse on the mesonotum, and the strictly transverse striation of the basal face of the epinotum distinguish *curvistriatus* from the specimens which I consider to be *sulcatus*.

Type. — Worker; Brazil: State of Espirito Santo, Santa Teresa, 1928 (O. Conde) [Coll. T. Borgmeier].

When I described this form I gave it the rank of a subspecies of *sulcatus*, although I had only a single specimen at hand and had no direct knowledge of the typical *sulcatus*. The

choice of the exact systematic category was partly based upon guess work. In the meantime, as far as this complex is concerned, the situation has not essentially changed and thus I cannot help but retain the status-quo, no matter how doubtful and unsatisfactory it may appear.

To my original diagnosis I want to add here the following additional information:

Length 5.2 mm. Median head length 1.21 mm. Weber's length of thorax 1.56 mm. Upper surface of head with about 26 (not 20 as originally stated) striae reaching the occipital border. Eyes normal. Pronotum [Fig. 32] with 19-20 striae. Occiput transversely striated. No distinct occipital tooth on occipital corners. Mesonotal tooth obtuse. Petiole with 8-9 striae above. About 35 striae visible from above on first gastric tergite. The median striae of postpetiole end before the posterior border, where the dorsal surface abruptly bends down, forming a distinct angle. The lateral striae extend behind them, and converge mesad at the inclined posterior portion, where they become transverse and fuse mesad.

This subspecies is known only from the unique type specimen from S. Teresa, State of Espírito Santo, Brazil.

H. The Procryptocerus striatus-complex

In 1894 Emery reduced *adlerzi* and *convergens* to the rank of subspecies under *striatus* and added to the complex thus formed another subspecies and three varieties described by himself. During the following half century a few more new forms have been associated with the complex, while some of the older ones were raised from the varietal to the subspecific rank. At the present moment the arrangement of the supposedly polytypical species *striatus* is as follows:

P. striatus striatus (Fred. Smith) 1860
P. str. striatus var. *odiosa* Forel 1912
P. str. adlerzi (Mayr) 1887
P. str. convergens (Mayr) 1887
P. str. convergens var. *loretensis* Santachi 1933
P. str. latitans Forel 1912
P. str. latitans var. *muelleri* Forel 1912
P. str. regularis Emery
P. str. regularis var. *concentrica*
P. str. regularis var. *rotundiceps* Forel 1908
P. str. scabriusculus Emery 1894
P. str. scabriusculus var. *parva* Menozzi 1935
P. str. schmalzi Emery 1894

All these forms, with the exception of *striatus scabriusculus,* which is confined to Central and northern South America, inhabit southern Brazil and adjacent territories of Argentina, and perhaps Paraguay.

This system of classification, however, presents several serious difficulties. First, the ranges of four of the most outstanding "races" of the group, namely *adlerzi, convergens, regularis* and *schmalzi,* overlap completely, or almost so. Secondly, no known ecological specialization or restriction can be invoked as a factor for the supposed subspeciation. Finally, after having examined a great number of specimens from different localities and also the types of the Mayrian species, I have been unable to detect the intergrading forms, which induced Emery to unite them all and to establish the polytypical species *striatus.* Quite to the contrary, all the recognizable forms are separated from one another by clear-cut distinctions.

These facts suggest that several good species have been lumped together under *striatus,* which, although very similar morphologically, are nevertheless separable into clear-cut units. This is true for *adlerzi, convergens, regularis, scabriusculus* and *schmalzi;* whereas *latitans* is a synonym of *adlerzi,* and *scabriusculus,* var. *parva,* of *picticeps* Emery. None of the varietal names, except perhaps var. *odiosa* Forel, has taxonomical standing for reasons that will be pointed out below. The present group includes also *balzani,* a closely related form, even though it has never been definitely associated with the *striatus*-group.

The distinctive feature of all species of the present complex, with the exception of *regularis* and *scabriusculus,* is the rather fine, superficial and longitudinal striation of head, thorax and gaster. *P. regularis* exhibits some affinities with *sulcatus* of the preceding group, because of the coarse, regular and deep striation of the integument; but by the shape of the eyes and the distinctly impressed mesoepinotal suture it again disagrees with that form. On the other hand, *scabriusculus* possesses a more or less irregular and reticulate sculpture on the upper surface of head and the anterior portion of the pronotum.

Not only do the members of the present group not constitute races of the same species, but it is even doubtful that they form one single natural group of closely related species. Although none of them appears to belong to any other recognized species group, nevertheless the *striatus*-complex itself contains at least three distinct subdivisions: 1. *regularis,* a form of doubtful position, on account of the characters mentioned above; 2. the *adlerzi*-subgroup, including *balzani, scabriusculus* and *striatus,* a variable assembly, from which 3. the *convergens*-subgroup, including *schmalzi,* differs by the longitudinal striae on the 2d -4th gastric tergite and the shape of the epinotum. In the following the species are arranged in that order, even though the *striatus*-complex has been provisorily maintained, chiefly for historical reasons.

26. *Procryptocerus regularis* Emery

(Figs. 3, 34, 51, 58)

Procryptocerus convergens regularis Emery, 1887, Bull. Soc. Ent. Ital. vol. 19, p. 361 [worker; Brazil: State of Rio Grande do Sul].

P. striatus convergens var. *regularis* Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, p. 197. — Emery, 1894, *in*: H. von Ihering, Berl. Ent. Zeitschr. vol. 39, p. 384 [Brazil: State of Rio Grande do Sul; State of Santa Catarina; Federal District, Rio de Janeiro; Argentina: Province of Corrientes].

P. striatus regularis Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 302.

P. striatus convergens var. *concentrica* Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, p. 197-198 [worker; Brazil: State of Rio de Janeiro, Paraíba do Sul].

P. striatus regularis var. *concentricus* Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 207 [worker; Brazil: Federal District, Mt. Corcovado near Rio de Janeiro].

P. striatus regularis var. *rotundiceps* Forel, 1908, Verh. Zool.-bot. Ges. Wien, p. 356 [worker; Brazil: State of Rio Grande do Sul]. — Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 207 [worker; Brazil: Federal District, Mt. Corcovado, near Rio de Janeiro].

P. striatus convergens var. *loretensis* Santschi, 1933, An. Soc. cient. Argent. vol. 116, p. 117 [worker; Argentina: Province of Misiones, Loreto].

The present species is very distinct from all other *striatus*-like forms by its heavy, coarse, dense and regular sculpture, resembling that of *sulcatus*. It may be distinguished from the latter species by the impressed transverse mesoepinotal suture, the unevenly rounded and somewhat pushed in upper half of the eyes and the finer striation of the gastric tergite.

Type. — Worker; Brazil: State of Rio Grande do Sul (H. von Ihering) [(Coll. Emery) in the Museo Civico di Storia Naturale di Genova].

Worker; Brazil: State of Rio Grande do Sul, Porto Alegre; Nov. 29, 1928 (Buck, S. J.) [CTB]. Length 5.2 mm. Median head length 1.24 mm. Weber's length of thorax 1.54 mm. Black; the following fuscous: apices of mandibles, apices of femora, base of middle and hind tarsi, tibiae. Brown: fore tarsi, apex of tibiae and middle and hind tarsi, tip of scape.

Head [Fig. 3] subcircular, subopaque. Clypeus longitudinally convex, finely longitudinally striated, with a few, rather indistinct transverse, curved ridges along the anterior border, which is shallowly emarginate mesad; posterior border marked by a faint transverse depression; a short, longitudinal median carinule on posterior half. Frontal area obsolete. Frontal carinae sinuate, not projecting above the antennal sockets, the posterior end bent mesad, but not notched in front of the occipital corner, which has a minute tooth. Occipital border arcuate laterad, rather straight, but gently impressed, mesad, distinctly crested throughout. Cheeks reticulate-rugose in front of, striato-rugose behind the eyes. Eyes moderately, but unevenly, convex, upper half slightly flattened, or pushed in; situated in front of the half of the median head length. Upper surface of head coarsely and very regularly striated, the furrows being narrow and deep, the intervening elevated ridges broad, their upper surface bearing generally several parallel rows of fine microscopical punctures. The striae are longitudinal and subparallel anteriorly, converging behind the posterior border of eyes, the median striae fusing mesad at an acute angle. The lateral striae, arising from the border of the frontal carinae also converge, do not fuse mesad, but reach the transverse occipital crest, where one counts about 28-30 striae. Scape depressed, microscopically reticulate-punctate, subopaque. Lower surface of head very coarsely longitudinally striated. Occipital truncation slightly concave, striated, the striae

radiating from the occipital foramen, the median ones perpendicularly upward to the occipital crest, the lateral ones mostly transverse, toward the occipital angle.

Thorax [Fig. 34] subopaque, about 1.5 times as long as maximum width (63:43). Promesonotum shorter than broad (43:38), anterior border of pronotum rounded, shoulders sharply angulate, lateral border strongly marginate, gently arcuate, slightly converging caudad. Promesonotal suture faint, but visible. Mesonotum, on each side, with a plate-like, subrectangular, somewhat upturned tooth, pointing obliquely backwards. Meso-epinotal suture distinct and impressed. Basal face of epinotum about twice as broad as long (16:31), moderately, transversely convex, baso-laterally expanded into projecting lobe, on each side, which is rounded anteriorly, subdentate posteriorly, occupying a little more than half of the total length of the basal face, excluding the spines. Epinotal spines shorter than the basal face, subparallel, horizontal, straight. Dorsum of thorax as coarsely and regularly striated as head. Mesonotum with about 18 striae. Sides of thorax with less coarse and more widely separated striae. Declivity of epinotum smooth, excepting the upper portion where the striae of the basal face curve downwards for a short distance. Lower half fulgid, finely microscopically reticulate. Fore femora much more inflated than the middle and hind femora, posterior face of fore femora striated. Anterior face of fore femora and both faces of middle and hind femora microscopically reticulate, almost smooth and fulgid. Tibiae rimose.

Petiole [Figs. 51, 58] shorter than wide (15:16), sides and dorsum gently convex, with somewhat irregular, coarse, longitudinal ridges above. Upper part of anterior face with faint ridges, the rest mostly smooth, finely punctate, not marginate above. Ventral surface anteriorly with a blunt, but conspicuous tooth. Postpetiole wider than long (18:22), sides rounded; antero-lateral corners subangulate. In profile highest behind its middle, abruptly descending caudad, in front of the posterior border. About 12 striae on dorsum of postpetiole.

Abdomen eliptical, longer than broad (67:52). The first tergite coarsely and deeply longitudinally striated, almost as coarse as head and thorax. Exposed portion of second to fourth tergites with irregular and minute sculpture, which is mostly transverse in the middle. Sternites shallowly, microscopically reticulate, almost smooth, with somewhat more conspicuous

setigerous punctures; a few lateral striae basally on the first sternite.

Entire body, except ventrally and on the sides of thorax, with whitish, sparse, stiff setae; shorter and erect on head, longer, more or less oblique, but not decumbent, on appendages thorax, peduncle and gaster. The first sternite with fine more flexible, sericeous pile, mostly appressed. Mandibles with shorter, sparse, erect hairs. The short appressed decumbent setae between the longer suberect hairs on the first gastric tergite not very evident, concealed deep down in the furrows.

Female (undescribed); Brazil: State of Rio Grande do Sul, S. Leopoldo; Feb. 10, 1928 (Hansen) [CTB]. — Length 5.9 mm. Median head length 1.28 mm. Weber's length of thorax 1.85 mm. Extremely similar to the worker, except for the characters of the caste and the following details:

Ocelli small, almost vestigial, not raised above the surface of the vertex; the posterior ones being more approximate, forming almost a right angle with the antero-median ocellus. Shoulders sharply angulate. Anterior border of pronotum moderately rounded, slightly impressed mesad. Lateral borders straight, slightly divergent caudad; dorsal face coarsely, mostly longitudinally, rugose, lateral face striated. Scutum rather regularly longitudinally striato-rugose, with rare, interspersed larger punctures. Scutellum similarly sculptured. Basal face of epinotum coarsely and deeply striated, with about 16, somewhat divergent striae, one or two transverse striae between the bases of the epinotal spines. Baso-lateral lobe not distinctly set off. Epinotal spines hort and stout, half as long as basal face. Sides of thorax longitudinally striated. Posterior face of fore femora strongly striate. Petiole elongate, sides straight and subparallel; striato-rugose above and laterally; anterior face finely reticulate, almost smooth. Postpetiole slightly shorter than wide, sides arcuate, striated above. Striation of first gastric tergite as coarse and regular as in worker. Wings infumated, veins brunneous. Marginal cell of fore wing open, transverse median vein slightly shorter than second abscissa of median vein. First transverse cubital vein a little sinuous at the base of the cubital vein. Submarginal cell twice as long as the single discoidal cell.

Male unknown.

Distribution. — Among all the Southern Brazilian forms of the *striatus*-complex, this species is one of the commoner forms, and occupies doubtless the largest territory. It has been

recorded from the states of Rio de Janeiro, S. Paulo, southern Paraná, Santa Catarina, Rio Grande do Sul, and from the Provinces of Misiones and Corrientes in Argentina. A single specimen of the same species has been taken on the Island of Trinidad.

Specimens examined: 88; 81 workers and 7 females, as follows: *Brazil*: Federal District, Mt. Corcovado near Rio de Janeiro; Sept. 7, 1891 ("var. *rotundiceps*", Forel det.): 1 worker [MHNG]. — State of Rio de Janeiro, Petrópolis; Sept. 14, 1944 (W. W. Kempf): 2 workers [CTB]. Itatiaia; Oct. 30, 1932 (J. F. Zikán): 1 worker [CTB]. — State of S. Paulo, Campos do Jordão; Oct. 6, 1949 (T. Borgmeier): 3 workers [CTB]. Mato do Governo; Oct. 29, 1929 (T. Borgmeier): 1 worker [CTB]. — State of Paraná, Rio Negro; Jan. 1929 (M. Witte): 2 workers [CTB]. — State of Santa Catarina ("*convergens*, type"); (no locality nor date) (Hetschko): 3 workers [NHMW]. "*convergens*" (no locality, nor date, probably the same as preceding): 1 worker [USNM]. Gaspar, 1928 (Fontes): 1 worker [CTB]. Nova Teutônia (F. Plaumann): 1 worker, 1 female [CTB]. — State of Rio Grande do Sul, S. Leopoldo; Feb. 10, 1928 (Hansen): 4 workers [CTB]. Porto Alegre; November 29, 1928 (Buck, S. J.): 5 workers, 1 female [CTB]. Pareci Novo; Feb. 10, 11; March 3, 18; Oct. 13, 17; Dec. 21, 1926 (Rambo, S. J.): 47 workers, 3 females [CTB]. Pareci Novo; Oct. 1927 (Hansen): 4 workers [CTB]. — *Argentina*: Province of Misiones, Loreto; 1931 (A. Oglobin): 1 worker [CTB]. — *Trinidad*: Mt. Tucuche; April 1929 (Darlington): 1 worker [MCZ].

Variation. — None of the material studied exhibits any essential deviation from the specimens described above. Among certain minor variations the following may be mentioned here: The direction of the striae on the upper surface of head is variable among individuals of the same colony. Some may have them in the usual converging arrangement, whereas in others they are almost straight and subparallel, hardly converging at all. Still others, although rarely, have the lateral striae fusing behind on the vertex in a continuously rounded fashion, not forming a conspicuous angle at the point of fusion. This is the condition which has been given the varietal name of *concentricus*, but unjustly so, as it is strictly an individual variant. Furthermore, as Emery pointed out (1894a), the sculpture of the occipital truncation is noticeably changeable, but never completely transverse nor perpendicular. Finally the degree of coarseness of the striation of the first gastric tergite, and the sculpture of the anterior face of the petiole, which may be either smooth, or transversely or longitudinally striated, are subject to a great deal of variation. The specimens from S. Leopoldo, Rio Grande do Sul, have the epinotal spines curved and the tips slightly turned

mesad. The specimen from Mato do Governo, S. Paulo, is remarkable by the transverse rows of rather densely arranged and thick setae, on the apical border of the first gastric tergite. The striation on the upper surface of the head in the single worker from Trinidad is of the concentric type.

Synonymic notes. — Although *regularis* has been raised to full specific rank, its former varieties may not be thus elevated. I have examined a specimen of *rotundiceps* (Forel det.) and have found several individuals in Borgmeier's Collection, that present the peculiarities assigned by Emery to his *concentricus*. The characters peculiar to both these entities do not characterize colonies or populations, but only individuals of certain colonies. Consequently I propose to regard them as synonyms.

Santschi's variety *loretensis*, originally attached to *convergens*, belongs evidently to *regularis*, as shown by Santschi's description and a topotype (perhaps a cotype) in the collection of Father Borgmeier. I have not as yet seen sufficient material from the Argentine to permit me to decide whether or not the somewhat finer striation of the first gastric tergite warrants *loretensis* being accorded racial status.

27. *Procryptocerus adlerzi* (Mayr)

(Figs. 13, 33, 45, 59, 75, 78, 82)

Cataulacus adlerzi Mayr, 1887, Verh. Zool. bot. Ges. Wien, vol. 37, p. 562 [worker, female, male; Brazil: State of Santa Catarina].
Procryptocerus adlerzi Emery, 1893, *in*: Dalla Torre, Cat. Hymen. vol. 7, p. 139.
Procryptocerus striatus adlerzi Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, p. 199 [Brazil: State of Santa Catarina; Federal District, Rio de Janeiro]. — Forel, 1908, Verh. Zool.-bot. Ges. Wien, p. 356 [worker; Brazil: State of S. Paulo, S. Paulo].
Procryptocerus striatus latitans Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 206 [worker; Brazil: Federal District, Copacabana (Rio de Janeiro)].
Procryptocerus striatus latitans var. *Muelleri* Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 207 [worker; Brazil: Federal District, Mt. Corcovado, Rio de Janeiro].

The worker of this southern Brazilian species is very closely related to the Bolivian *balzani*, but the more rounded occipital border, the predominantly transversely striated occipital truncation, the unevenly convex surface of the eyes, the little projecting and entirely rounded baso-lateral lobes of the epinotum, and the distinctly elongate petiole stamp it as a discret species. The female resembles that of the same Bolivian form, from which it may be distinguished by the same characters of the head, as assigned the worker. The male is closest to *convergens* (the only other male known of the present group) and to *goeldii*. It is distinct from the former by not having apical spurs on middle and hind tibiae, and from the latter by having infuscated wings and by the second abscissa of the median vein being not longer than the transverse median vein.

Types. — Worker, female, male; Brazil: State of Santa Catarina (Hetschko) [Naturhistorisches Museum, Wien (Coll. G. Mayr)].

Worker (lectotype). — Length 5.2 mm. Median head

length 1.32 mm. Weber's length of thorax 1.49 mm. Black, subopaque; the following ferruginous: apices of mandibles, the antennae, the fore tarsi, apices of middle and hind tarsi, apices of femora. Fusco-ferruginous: second — fourth abdominal tergites and apical border of first sternite. Fuscous: femora and basal portion of middle and hind tarsi.

Head [Fig. 13] subcircular. Mandibles finely longitudinally striated and very finely punctured. Clypeus longitudinally convex, longitudinally striated, with a few transverse curved ridges along the anterior border, which is notched mesad; posterior border slightly marked by a faint transverse depression. Frontal area vestigial. Frontal carinae sinuate, not projecting above the exposed antennal sockets, posterior end bent mesad and ventrad, where it intersects with the likewise deflected lateral end of the occipital crest, both forming together a small occipital tooth, which is distinctly beneath the level of the upper surface of head, and not well visible from above. The occipital border, above the truncation, sharply crested, its median portion faintly impressed, the lateral portions being conspicuously convex. Cheeks striato-rugose, coarsely reticulate and foveolate around the eyes. Eyes moderately but unevenly convex, the upper half being somewhat pushed in. Upper surface of head regularly longitudinally striated, about 50 striae touching the occipital crest; all striae subparallel and straight. Behind the vestigial frontal area the median striae diverge slightly from one another, but converge again before reaching the posterior half of the vertex without anastomosing mesad. Antennal scape depressed, slightly tapering basad, very finely but sharply reticulate, outer face rugose, about 3/5 of median head length (30:50). Lower surface of head very regularly and more coarsely longitudinally striated. Occipital truncation striated, the striae arising from the median impressed portion of the occipital crest, the lateral ones run more or less parallel to it laterad, the median ones run perpendicularly or obliquely to the lower border of the truncation.

Thorax [Fig. 33] about 1.5 times as long as maximum breadth (62:43). Promesonotum shorter than broad (36:43), anterior border of pronotum moderately rounded, shoulders sharply angulate; lateral border strongly marginate, and gently convex; a little converging caudad; posterior corners of pronotum visible, rounded. Promesonotal suture very faint, almost obsolete. Mesonotum with exposed lateral portions subparallel, posterior

corners forming a rectangular tooth. Meso-epinotal groove impressed, distinct. Basal face of epinotum about twice as broad as long, flat, with slightly projecting and completely rounded baso-lateral lobes, occupying about two-thirds of the length of the basal face. Epinotal spines shorter than the basal face, stout, subhorizontal, pointing caudad, the apical end a little set off and curved inward. Dorsum of thorax more coarsely and densely longitudinally striated, than head; about 22 striae on mesonotum. Sides of thorax less coarsely striated. All striae contain a row of very fine punctures. Declivity smooth, but microscopically and shallowly reticulate. Coxae, especially the fore coxae, with some oblique striae. Fore femora much more inflated than the middle and hind femora, their posterior face striated. Middle and hind femora microscopically reticulate, fulgid. Tibiae rugose.

Petiole [Figs. 45, 59] longer than broad (18:16), sides subparallel, a little constricted behind, rather coarsely longitudinally rugose; anterior face smooth, microscopically punctate, not marginate above, oblique. Ventral face anteriorly with a small, blunt tooth. Postpetiole wider than long (24:19), sides convex, diverging caudad; anterior corners subangulate; in profile highest behind its middle, almost forming an angle above; posterior border moderately rounded; striated above, about 16 striae dorsally.

Gaster oval, but short, longer than broad (68:56); first tergite finely longitudinally striated, striae being much finer and denser than those of thorax and head, becoming very shallow and subobsolete caudad and the row of fine punctures in the striae more evident. Exposed part of remaining tergites with a few vestigial longitudinal striae laterad, but irregular or transverse striae discad. Sternites shallowly microscopically reticulate, almost smooth, with somewhat more conspicuous setigerous punctures and a few lateral striae based on the first sternite.

Body and appendages, except the sides of thorax, with yellowish-white, sparse, stiff setae, suberect and short on head and thorax, more or less oblique, but not decumbent, on legs, peduncle and gaster. First sternite of gaster with fine more flexible and sericeous but erect hairs. Appressed, short setae between the longer oblique ones on first gastric tergite.

Paratype workers differ slightly in size (4.9-5.3 mm.). Epinotal spines variable in length, with their apices more or less inwardly directed, in some specimens as long as basal face of epinotum. The rounded lateral lobes are likewise somewhat

variable, as are also the proportions of the basal face of the epinotum and the coloration of body and appendages.

Female (paratype). — 6.2 mm. long. Median head length 1.27 mm. Weber's length of thorax 1.78 mm. Similar to the worker, except for the peculiarities of the caste and the following details: Head as in worker, except for the dorsal striation, which is definitely coarser and more irregular due to occasional large, shallow, sparse punctures and transverse rugulae anastomosing with the longitudinal ones. About 34 striae reach the occipital crest. Upper half of the surface of eyes slightly pushed in, flattened to excavate, as in worker. Ocelli small, almost vestigial, the lateral ones forming an obtuse angle with the antero-median ocellus. Shoulders sharply angulate, anterior border of pronotum moderately rounded; lateral borders subparallel; roughly foveolate-reticulate above, striated laterally. Scutum longitudinally furrowed, with sparse and large foveolae. Scutellum similarly sculptured, foveolae larger and more conspicuous. Basal face of epinotum longitudinally striated, with about 13 striae that diverge caudad; no transverse striae between the bases of the epinotal spines. Epinotal spines short, less than half the length of the basal face, their apices slightly curved mesad and ventrad. Lateral border of basal face slightly concave. Declivity mostly smooth, microscopically reticulate, fulgid. Sides of thorax longitudinally striated. Fore femora without conspicuous sculpture on posterior face, except for a few very faint apical striations. Petiole elongate, 6-7 striae above, anterior face smooth, coarsely striated above and laterad. Gaster very finely and less regularly striated than in worker. Wings infuscated. The marginal cell of fore wing open, the transverse median vein is shorter than the second abscissa of the median vein. Submarginal cell twice as long as discoidal cell. Veins brunneous.

Male (paratype). — Length 6.4 mm. Median head length 0.93 mm. Weber's length of thorax 1.90 mm. Head and thorax subopaque, gaster fulgid; the following black: mandibles, head, thorax and postpetiole. Fuscous brown: scape and base of first gastric segment. Brown: funiculus, coxae, femora, remaining gastric segments, including subgenital plate, tip of parameres, volsellae and the sclerotized portion of the aedoeagus; the tarsi ferruginous. Tibiae, base of parameres, and the soft part of the aedeagus, yellowish. Eyes purplish-brown. (Coloration slightly faded since the days when Mayr first described it). Head without mandibles longer than interocular distance (38:34). Mandibles

finely rugulose-punctate, and also somewhat longitudinally striated. Clypeus finely, distinctly and longitudinally striated, its anterior border slightly notched mesad. Front discally almost without sculpture, laterad with parallel longitudinal striation. Remaining part of head irregularly rugose. Behind the frontal carinae the antennal scrobe is scarcely indicated and impressed. Maximum diameter of eyes less than one half of the median head length. Ocelli relatively small, well separated from each other, somewhat raised above the surface of the head. Antennal scape [Fig. 78] shorter than first and second funicular segments combined. Occiput rounded, without distinct corners. Thorax in profile not evenly curved above, scutellum bulging and projecting, not continuous with the postnotum and epinotum. Shoulders angulate and subdentate, sides of pronotum diverging caudad, submarginate. Pronotum obliquely or irregularly rugose dorsally, the laterotergites longitudinally striated. Scutum with deeply impressed Y-shaped Mayrian furrows. Scutellum longitudinally striated. Mesopleura partly smooth, partly striated. Base of epinotum with a short triangular tooth on each posterior corner, its surface more coarsely and longitudinally striato-rugose; declivous face transversely striated above, perpendicularly below. Wings infuscated. Marginal cell of fore-wing open. Petiole 1.5 times longer than wide, its sides somewhat convex; above and laterally very finely and longitudinally striated. Postpetiole incrassate caudad, only slightly longer than wide, sculptured as petiole. Abdomen subcylindrical. First gastric tergite covering less than 2/3 of gaster, finely and longitudinally striated at base. Following segments smooth and fulgid, with fine microscopical subsculpture, which is mostly transverse. Genitalia [Fig. 75] with the digitus of the volsellae in the form of a slender, rectangular hook. Subgenital plate [Fig. 82] subtriangular, with pointed tip. Body covered with long, flexible yellowish-brown pile; erect and dense on head, but shorter than scape; much denser beneath head. Somewhat sparser and inclined on petiole, distinctly oblique on first gastric tergite. Remaining tergites with a row of shorter pile at the apical margin. Legs with rather long and subdecumbent hair.

Distribution. This species is apparently not very common and rather poorly represented in collections. The present records indicate that it ranges from the State of Santa Catarina north to the State of Rio de Janeiro and Southern Minas Gerais, along the eastern and western slopes of the Serra do Mar. Nothing is

known about its ethology except for the fact that, like most species of the genus, it nests in cavities of dead branches and in hollow twigs.

Specimens examined: 14; 10 workers, 3 females and 1 male, as follows: *Brazil*: State of Santa Catarina: Bom Retiro; Jan. 1929: 1 worker [CTB]. Gaspar; 1928 (Fontes): 1 worker [CTB]. "Santa Catarina" (Hetschko) (no other data): 4 workers, 1 female, 1 male (lectotype and paratypes [NHMW]. — State of S. Paulo, Ipiranga; (Lima): 1 worker, 2 females [CTB]. — Federal District, Rio de Janeiro; Nov. 22, 1948 (Borgmeier): 2 workers [CTB]. — Minas Gerais, Cambuquira; (Marques): 1 worker [CTB].

The material examined agrees with the types in all essential features of livery and structural detail, except for the length of the epinotal spines, the proportions of the basal face of the epinotum, and the sculpture of the anterior face of the petiole, which in some specimens presents longitudinal or vertical striation. All these variations appear to be on an individual basis, rather than on a geographical or ecological one.

Both the original description and additional information furnished by Dr. Charles Ferrière, who kindly examined the type, at my request, convince me that *latitans* Forel must be regarded as a synonymum of *adlerzi*. The Forelian sub-species disagrees with the type of *adlerzi* in presenting perpendicular or longitudinal striations on the anterior face of the petiole. This character, however, as already mentioned above, occurs also in specimens that evidently belong to *adlerzi*. Furthermore, I cannot recognize the variety *muelleri* Forel, since it has been founded upon features that differentiate individuals of the same colony.

According to Dr. Ferrière, a second specimen of *latitans* (= *adlerzi*) mounted on the same pin, with the type, exhibits a strikingly aberrant sculpture on head and epinotum. The striation of the upper surface of the head approaches the condition obtained in *convergens*, and the basal face of the epinotum, presenting the typical *adlerzi*-shape, bears a peculiar sculpture consisting of concentric irregular quadrangles on each side. If this specimen came from the same nest series, it represents a rather unusual variant of *adlerzi*.

Emery (1922, Gen. Insect. l. c.) has pictured the worker in dorsal aspect. However the sculpture patterns of the head are incorrectly presented. The striae do not diverge caudad but are strictly parallel and longitudinal.

28. *Procryptocerus balzani* Emery

(Figs. 5, 36, 43, 60)

Procryptocerus balzani Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, p. 199 [worker, female; Bolivia: Provinces of Coroico and Chilumano-Yungas].

When Emery, in 1894, reduced all forms of the genus with fine, more or less longitudinal striation on head, thorax and gaster, to races of *striatus*, he for once admitted an exception to

that rule and presented in the same paper *balzani* as a new and independent species. In this particular case the choice of the systematic category was determined by the two following characters:

First, the sculpture of the first gastric tergite, consisting of fine, longitudinal and rather superficial striae basad, diverges from the customary patterns on the apical half, where the striae suddenly converge mesad, fuse with the corresponding ones of the opposite side, forming a system of concentric arches around the median striae, which thus are prevented from reaching the posterior margin.

The second discriminating feature of this form, in the opinion of Emery, consists of the finely and transversely rugulose sculpture of the exposed portion of the remaining gastric tergites. However, the same condition applies to *adlerzi, regularis* and *scabriusculus,* a fact which has been completely overlooked by Emery.

Several Bolivian specimens, collected by Dr. Mann, agree in all essential characters with the original description of *balzani,* with the exception of the sculpture patterns of the first gastric tergite, which in these individuals does not differ from *adlerzi.* This suggests the possibility that the peculiar sculpture of the types of *balzani* may not represent a specific character but rather a variable condition of the species. A somewhat similar case occurs in *gibbosus,* the holotype of which has the first gastric tergite strictly longitudinally striated, whereas the single paratype presents on the left half of the tergite the condition that occurs on both sides of the tergite of the typical *balzani.* Only more abundant material from the same region can help to decide this problem. Since it is not at present available, I present here the diagnosis of the types and the other Bolivian forms separately, instead of precipitating the conclusion.

The description of the types has been drawn up from the original publication and from notes and sketches furnished by Dr. Charles Ferrière, who, at the writer's request, kindly examined the cotype worker existing in the collection of A. Forel.

The typical form resembles *adlerzi* in the strictly longitudinal striation of the upper surface of head, but differes from it by having the occipital truncation perpendicularly striated, the petiole subquadrate, the epinotum with projecting and subangulate baso-lateral lobes.

The specimens from Canamina, and perhaps the type series

also, are in many respects very close to the northern *scabriusculus*. However, the sharp, very weakly arcuate occipital border, the lightly colored legs, the regular striation of head, thorax and peduncle, the absence of any larger foveolae on vertex and pronotum are characters which help to differentiate them from *scabriusculus*. The very fine, almost inconspicuous ocelli and the very fine superficial striation of the gaster distinguish the female of *balzani* from that of *scabriusculus*.

Types. — Worker, female; Bolivia, Provinces of Coroico and Chilomano-Yungas (L. Balzan) [(Coll. Emery) Museo Civico di Storia Naturale, Genova; a cotype worker in the Coll. A. Forel, Muséum d'Histoire Naturelle, Genève].

Worker (cotype). Length 4.0-4.5 mm. Black moderately fulgid. The tibiae mostly rufous.

Head above longitudinally striato-rugose; the striae being parallel, about 40 reach the occipital border. Occipital crest rather sharply marked; the truncate part forming with the upper surface about a right angle. The occipital angles inconspicuously denticulate. Occipital truncation with about 30 vertical striae.

Thorax above longitudinally striato-rugose. Baso-lateral lobes of epinotum projecting, angulate behind, somewhat similar to those of convergens. Epinotal spines rather long, subparallel.

Petiole, from above, about as long as broad, longitudinally striated, narrower than postpetiole. The postpetiole longitudinally striated, about 8 striae can be seen from above; convex and subangulate above, in lateral aspect.

Abdomen with the first gastric tergite very finely striated, the striae being longitudinal anteriorly, arcuate and concentric posteriorly. The exposed portions of the apical tergites transversely striated.

Female (paratype). — "Very similar to the worker, but the striation of head is coarser, the furrows impressed with sparse series of foveolae. Dorsum of thorax less distinctly rugose; foveolate. Length 5.0-5.5 mm." (after Emery's description).

Male unknown.

The series of 9 workers and 5 females from Bolivia, Canamina; (Wm. M. Mann) [Coll. Wm. M. Mann, Washington] is characterized as follows:

Worker. Length 4.5-4.7 mm. Median head length 1.10-1.12 mm. Weber's length of thorax 1.32-1.41 mm. Black, the following ferruginous: Apices of mandibles, antennae, tibiae, fore

tarsi, apices of middle and hind tarsi, apices of femora. Femora and basal portion of middle and hind tarsi fuscous.

Head [Fig. 5] subopaque. Mandibles finely longitudinally striated and punctured. Clypeus longitudinally convex, longitudinally striated with a few transverse, curved ridges along the emarginate anterior border. Posterior border of clypeus vestigial, marked by a faint transverse depression. Frontal area vestigial. Frontal carinae sinuate, not projecting above the exposed antennal sockets, posterior end bent mesad in front of the small occipital tooth. Occipital border above the truncation marginate and slightly crested, rather straight, gently impressed mesad, slightly rounded laterad. Cheeks swollen, striato-rugose, coarsely reticulate in front of eyes. Eyes prominently but evenly convex. Front and vertex longitudinally striated, striae parallel, about 36 touching the occipital crest. A few median striae may converge mesad and fuse at an acute angle. Lower surface of head very regularly and more coarsely striated. Occipital truncation perpendicularly striated, the striae arising from the occipital crest, running down to the occipital foramen.

Thorax [Fig. 36] subopaque. Promesonotal disc shorter than broad. Anterior border of pronotum slightly arcuate, shoulders angulate, lateral borders strongly marginate, gently convex and little converging caudad. Promesonotal suture impressed laterad, obsolete discad. Posterior corners of mesonotum with a rectangular, projecting tooth on each side. Transverse meso-epinotal groove impressed. Basal face of epinotum about twice as broad as long, flat, with projecting, but narrow baso-lateral lobes, which are rounded anteriorly, angulate and subdentate posteriorly, occupying not more than half of the total length of the basal face. Epinotal spines straight, slender, subparallel, shorter than the basal face. Dorsum of thorax more coarsely and less densely longitudinally striated than head, about 21 striae on mesonotum. Sides of thorax longitudinally striated. Fore femora somewhat more inflated than middle and hind femora, all microscopically reticulate, very fulgid. Tibiae rugose.

Petiole [Figs. 43, 60] scarcely broader than long, sides moderately convex; longitudinally rugose above and laterally. Anterior face smooth, finely punctate, not marginate above. Ventral face anteriorly with a small, blunt tooth. Postpetiole wider than long, in profile highest behind its middle, forming almost an angle above, abruptly descending caudad; antero-lateral corners subangulate, with about 14 striae seen from above.

Gaster subopaque, oval, but short, longer than broad. First gastric tergite finely longitudinally striated, striae being much finer and denser and more superficial than those of thorax and head. The rows of fine punctures within the striae more conspicuous. Exposed part of second to fourth gastric tergite finely transversely or irregularly, but never longitudinally, rugose. Sternites microscopically reticulate, almost smooth, with somewhat more conspicuous setiferous punctures, a few lateral striae basally on the first sternite.

Body and legs with yellowish-white, sparse, stiff setae, suberect on head, thorax; more or less oblique, but not decumbent, on peduncle, gaster and legs. Basal face of epinotum with 16 setae at most. Gastric sternites with fine, more flexible, and usually appressed sericeous pile. Short and decumbent setae between the longer, suberect ones on the first gastric tergite.

Female (dealate). — Similar to the worker except for the peculiarities of the caste and the following details of structure and vestiture.

Length 6.5 mm. Median head length 1.27 mm. Weber's length of thorax 1.95 mm. Striation of head obsolescent with interspersed, larger foveolae, almost as in the worker of *scabriusculus*. Ocelli minute, almost vestigial, not projecting, the posterior ones forming an obtuse angle with the antero-median ocellus. Occiput perpendicularly striated. Shoulders sharply angulate, subdentate. Anterior and lateral border of pronotum moderately rounded; roughly reticulate-rugose, laterad, smooth and coarsely foveolate discad. Laterotergite of pronotum longitudinally striated. Scutum longitudinally rugose, with larger and sparser foveolae discad, the furrows more or less obsolescent laterad. Scutellum foveolate. Basal face of epinotum coarsely striated, as in *adlerzi*. No transverse striae between the bases of the epinotal spines. Epinotal spines stout, short, about half as long as the basal face. Sides of thorax longitudinally striated. Posterior face of fore femora vestigially striated distad. Petiole elongate, with 7-8 striae dorsally; anterior face finely shagreened, almost smooth with a few vestigial transverse striae. Postpetiole almost as long as wide. Sculpture of first gastric tergite as worker, the striae still more obsolescent and finer and the rows of fine punctures more evident. Wings unknown.

Male unknown.

The habits and distribution of *balzani* are unknown.

29. *Procryptocerus scabriusculus* Emery

(Fig. 88)

Procryptocerus striatus schmalzi var. *scabriusculus* Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, p. 198.
Procryptocerus adlerzi Emery, 1890 (nec Mayr), Bull. Soc. Ent. Ital. vol. 22, p. 55 [worker; Costa Rica: Palmares].
Procryptocerus striatus scabriusculus Forel, 1899, Biol. Centr. Amer. Hymen. vol. 3, p. 45 [Mexico: Orizaba; Guatemala: Mirandilla, Pantaleon; Panama: Volcano de Chiriqui]. — Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 207 [worker; Colombia: Sierra Nevada de Santa Marta, near St. Antonio]. — Skwarra, 1934, Oekol. Studien, Koenigsberg, p. 302 [Mexico: Mirador].

The usually strongly striated first gastric tergite, which is always clothed with sparse, but relatively abundant, erect setae, interspersed with shorter decumbent ones, help to discriminate the worker of *scabriusculus* from *goeldii* and *paleatus* within its own range. The short and broad basal face of the epinotum and the long and slender epinotal spines also distinguish it from *paleatus*. However, its closest relative is the Bolivian *balzani*, from which it differs by the obsolescent striation of front and vertex, the presence of foveolae on the anterior margin of the pronotum, the more arcuate occipital border, and the fuscous appendages. The female of *scabriusculus* may be recognized by the comparatively large, greenish-brown and somewhat raised ocelli, the diameter of which approaches the smallest width of the first funicular segment.

Type. — Worker; Costa Rica: Palmares (Alfaro) [(Coll. Emery) Museo Civico di Storia Naturale, Genova].

Worker; Costa Rica: San José; Nov. 27, 1911 (Wm. M. Wheeler) [MCZ]. — Length 5.0 mm. Median head length 1.20 mm. Weber's length of thorax 1.51 mm. Black; the following more or less fuscous brown: apices of mandibles, fore tibiae apices of middle and hind tarsal segments, fore tarsi, apices of femora. Second to fifth segments of fore tarsi lighter, tip of last funicular segment orange-brown.

Head subopaque. Mandibles finely, longitudinally striated and punctured. Clypeus longitudinally convex, finely but shallowly, longitudinally striated; anterior border broadly notched mesad; posterior border marked by faint, transverse depression. Frontal area obsolete. Frontal carinae sinuate, slightly concave above the exposed antennal sockets, posterior end bent mesad, toward the vestigially denticulate occipital angle. Occipital border marginate, somewhat crested, lateral portions distinctly arcuate and convex. Cheeks coarsely reticulate-foveolate in front of, and behind, the eyes; longitudinally striated above and beneath the eyes. Eyes moderately and evenly convex. Upper surface of head very finely

and sharply reticulate-punctate, with superimposed macrosculpture, which forms a coarse reticulation, the meshes forming more or less longitudinal rows, which tend to become longitudinal striations toward the occipital border. Lower surface of head very regularly and more coarsely striated. Occipital truncation microscopically reticulate, appearing smooth and shiny, with a few perpendicular striae arising from the occipital foramen in the middle and a few oblique ones at the sides.

Thorax, in general, similar to *balzani*; subopaque. Promesonotal disc slightly shorter than broad, moderately convex in profile. Anterior border of pronotum convex, mesad, straight or somewhat concave laterad. Lateral border of pronotum rather sharply marginate, gently convex, distinctly converging caudad. Promesonotal suture vestigial. Mesonotum with small, rather acute, laterally projecting tooth. Mesoepinotal groove impressed. Basal face of epinotum about twice as broad as long, flat, baso-laterally expanded into conspicuously projecting lobes, rounded anteriorly and subdentate posteriorly, occupying about half the length of the basal face. Epinotal spines straight, slender, subparallel, subhorizontal, somewhat shorter than basal face. Dorsum of thorax more coarsely and conspicuously longitudinally striated, about 18 striae on mesonotum. Large and rounded foveolae on anterior portion of pronotum, where the striation is obsolete. All striae contain a row of fine punctures, exhibiting occasionally transverse connections, and rarely a few larger punctures. Declivity above perpendicularly striated, microscopically reticulate but fulgid below. Coxae with a few shallow and oblique striae. Fore femora more inflated than the middle and hind femora, shallowly and vestigially striated distad. All femora very finely and shallowly reticulate and very fulgid. Tibiae rugose.

Petiole slightly broader than long, subquadrate in dorsal aspect, convex above in profile. Sides subparallel, a little constricted behind; rather coarsely reticulate-rugose laterally and above, on the anterior half dorsally, longitudinally rugose behind. Anterior face transversely striated, not marginate above. Ventral face with small antero-mesal blunt tooth. Postpetiole wider than long, in profile highest behind its middle. Sides convex, anterior border almost straight, lateral corners subangulate; longitudinally striated above anteriorly, about 15 striae seen from dorsal aspect; reticulate-foveolate behind and laterally.

Gaster subopaque, oval, but short; longer than broad. The first gastric tergite finely longitudinally striated, the striae being

finer, more regular, than those of thorax, but not quite continuous; row of fine punctures within the striae very conspicuous. Exposed portions of second to fourth tergite very finely and rather irregularly rugulose, not distinctly longitudinally striated. Sternites microscopically reticulate, almost smooth, with somewhat more conspicuous setiferous punctures; a few lateral striae basally on the first sternite.

Body except sides of thorax and ventrally, with yellowish-white, sparse, somewhat stiff setae; very short and suberect on head, thorax and gaster; more or less oblique on legs, and somewhat longer and oblique on peduncle. In general the pilosity is sparser than in *adlerzi* and *convergens*. First sternite of abdomen with fine, more flexible, sericeous, appressed pile. Mandibles with shorter, fine and erect hairs. The short appressed setae between the longer suberect ones on the first gastric tergite very distinct and conspicuous.

F e m a l e (undescribed); Venezuela: (from unknown locality, taken on imported *Cattleya,* sp., at Hoboken, N. J., May 27, 1941, by U. S. Plant Quarantine inspectors) [USNM]. Length 6.8 mm. Median head length 1.44 mm. Weber's length of thorax 2.06 mm. Similar to the worker except for the characters of the caste and the following details: Front and vertex of head very finely, but sharply reticulate, coarsely and sparsely foveolate, the foveolae eliptical, most of them connected by longitudinal furrows; bottom of foveolae fulgid, but finely reticulate. Eyes large, prominent, greatly convex. Ocelli comparatively large, their diameter approaching the smallest width of the first funicular segment; somewhat raised above the surface of the head; greenish-brown in color; the posterior ones more approximate, forming almost a right angle with the antero-median ocellus. Shoulders sharply angulate. Anterior border of pronotum moderately arcuate, and convex, lateral borders almost straight, slightly diverging caudad; its dorsal face foveolate discad, reticulate-rugose and foveolate laterad; laterotergite of pronotum regularly longitudinally striated. Scutum foveolate with a few connecting longitudinal furrows discad; very sparsely foveolate and very little rugose laterad. Scutellum densely foveolate antero-laterally, more sparsely caudad. Basal face of epinotum without projecting baso-lateral lobes, its sides almost straight; heavily striated above. Epinotal spines stout, short, straight, about half as long as basal face. Sides of thorax longitudinally and regularly striated. Posterior face of fore femora finely striated

distad. Petiole oblong, reticulate-rugose and foveolate above and laterally; anterior face transversely striated. Postpetiole slightly shorter than wide, striated above, reticulate-rugose laterally and behind. Striation of gaster rather coarse and regular. Wings [Fig. 88] infuscated, veins brunneous. Marginal cell of fore wing open. Transverse median vein subequal to second abscissa of median vein. First transverse cubital vein sinuate. Submarginal cell about twice as long as the single discoidal cell.

Male unknown.

Distribution. This very common species, so far as known, ranges from north of the Isthmus of Tehuantepec in southern Mexico southward to Venezuela and Colombia. It is the northernmost species of the genus.

Specimens examined: 107; 90 workers and 17 females, as follows: *Mexico*: Vera Cruz Province: Santa Lucia (Jesus Carranza); April 1923 (Wm. M. Mann): 8 workers, 1 female [USNM]. — *Guatemala*: Guatemala City (collected March 27, 1946, by U. S. Plant Quarantine Inspectors, on *Oncidium splendidum*): 2 workers [USNM]. "Guatemala" (no data; taken on April 23, 1938, by U. S. Plant Quarantine Inspectors on *Oncidium cavendishianum*): 6 workers, 4 females [USNM]. — *Costa Rica*: San José; Dec. 1, 1911 (Wm. M. Wheeler): 9 workers [MCZ, CU]. San José; 1940 (H. Schmidt): 9 workers [CTB]. Hamburg Farm (F. Nevermann): 1 female [CTB]. — *Colombia*: Cundinamarca Province, La Esperanza; elev. 1250 m.; Oct. 1935 (René P. Roba): 8 workers [USNM]. "Colombia" (Collected at Hoboken, U. J. by U. S. Plant Quarantine Inspectors, Sept. 4, 1945): 3 workers [USNM]. "Colombia" (collected by U. S. P. Q. Inspectors in Seattle, Washington, on orchids and roots): 2 workers [USNM]. — *Venezuela*: Carret. Filas de Maridres; June 16, 1938 (G. Vivas Berthier): 2 workers [CU]. "Venezuela" (from unknown locality, 12 lots, collected by U. S. Plant Quarantine Inspectors, at Seattle, Washington and Hoboken, N. J., 1939-1945, on orchids, especially *Cattleya*): 38 workers, 11 females [USNM]. Caracas (on *Cattleya* sp. collected by U. S. P. Q. Insp. at Hoboken, N. J., March 28, 1941): 2 workers [USNM].

Little is known of the biology of the species, except for the fact that workers and females of *scabriusculus* have been taken at U. S. seaports, by Plant Quarantine Inspectors on imported orchids, especially *Oncidium* and *Cattleya*. E. Skwarra (1934, l. c.) reports ecological data of 5 colonies from Mexico, 3 of

which were found nesting in decaying wood, 1 in hollow twigs, and 1 in reed.

Variation. — The sculpture of the present species is rather variable, as far as minor details are concerned. Except for the specimens from Costa Rica, the striation of the first gastric tergites is usually heavy and quite regular. The occipital truncation is completely and radially striated in all specimens from Venezuela, Colombia and Mexico, and in some individuals from Guatemala, whereas the sculpture of the upper surface of the head tends to be rather coarsely foveolate in larger individuals from the southern section of the range. The sides of the prothorax are slightly more converging caudad in specimens from Guatemala and Mexico. The epinotal spines occasionally may be diverging caudad, and the minute occipital tooth on the posterior corners of the head may be lacking. The striation of the anterior face of the petiole is, likewise, very inconstant, and may be longitudinal in some specimens, irregular and obsolescent in others.

A single dealate female, from Hamburg Farm, Costa Rica, collected without workers, is relatively small in size (6.0 mm.), with the dorsal sculpture of thorax and gaster much smoother and more superficial, very similar to *balzani*, from which it differs essentially only by the sculpture of the occipital truncation, which is as in the workers from Costa Rica, the larger ocelli and the dark, infuscated appendages.

Two worker specimens, one from S. José, Costa Rica, [MCZ], the other from Venezuela [CU] exhibit female-like features on the thorax, and should, perhaps, be regarded as pseudogynes. The former specimen has the dorsal face of the pronotum coarsely reticulate-rugose, the promesonotal suture distinct and deeply impressed, the mesonotum rounded laterally, the epinotum without the baso-lateral lobes; its size, however, is hardly different from that of the normal worker. The specimen from Venezuela has the dorsal face of the thorax sculptured as in the true worker, but the mesonotum is rounded laterally, and from beneath it, there projects, on each side, a minute membranous stub, which certainly represents a wing rudiment. The baso-lateral lobes of the epinotum are less reduced, but the size is close to that of the female.

At present there is no valid reason for regarding *scabriusculus* as a subspecies of *striatus* or any other species of the group. When the extent of morphological variation and the range of *balzani* will be better known, *scabriusculus* may possibly have to be associated with that form. But according to the present data, it is still morphologically distinct from all other species of the complex, and geographically separated from its closest relative by more than 2000 km.

30. *Procryptocerus striatus* (F. Smith)

Meranoplus striatus F. Smith, 1860, Journ. Ent. vol. 1, p. 77, Pl. 4, fig. 1 [worker; Brazil: State of S. Paulo, S. Paulo]. — F. Smith, 1862, Trans. Ent. Soc. London (3) vol. 1, p. 413.
Cataulacus striatus, Mayr, 1886 (nec Mayr 1866), Verh. Zool. bot. Ges. Wien, vol. 36, p. 361.
Procryptocerus striatus, Emery, 1887, Ann. Mus. Stor. Nat. Genova, vol. 25, p. 470 nota. — Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, p. 196 (exclusive of subspecies and varieties). — Forel, 1912, Mém. Soc. Ent. Belg. vol. 19, p. 206 [worker; Brazil: Federal District, Rio de Janeiro].

The exact identity of this species must remain uncertain until a detailed description of the holotype in the British Museum is

available. According to Fred. Smith (1860) the worker is characterized as follows:

Type. — Worker; Brazil: State of S. Paulo, S. Paulo (H. W. Bates), British Museum (Natural History).

Worker (holotype). "Length 2 3/4 lines. Black and slightly shining; the head strongly striated longitudinally, the striae diverging from the centre; the palpi and extreme tip of the flagellum rufo-testaceous. The thorax strongly striated, widest in front, with an obtuse tooth on each side at the margin near the deep strangulation at the base of the metathorax, the latter terminating posteriorly in two long, stout spines; the legs rugose and slightly pubescent, the claws of the tarsi rufo-testaceous. Abdomen ovate, and very finely striated or aciculate longitudinally; the first node of the peduncle oblong and subovate; the second subquadrate, with the lateral margins rounded; both coarsely rugose".

Female and male unknown.

There is a possibility that *striatus* be identical with one of the southern Brazilian species, treated in this group, although it is more probable, that it is a distinct species. W. F. Kirby, at Mayr's request, compared the types of *adlerzi* and *convergens* with the type of *striatus* and reported that *striatus* is a larger species with a very short epinotum and very long epinotal spines, exactly as indicated by Smith's figure. It is certainly not identical with *regularis,* which has the first tergite of the gaster rather coarsely striated, and comparatively short epinotal spines. Also *schmalzi* seems to be quite different, on account of the shape of the epinotum and the typically irregular sculpture of the promesonotal disc. If Smith's figure can be trusted, the epinotum of *striatus* possesses the outline peculiar to *adlerzi.*

Emery (1894) and Forel (1912) have given their opinion of what they considered to be the typical *striatus.* Inasmuch as neither of them had seen the type, their diagnoses are of little value. According to Forel, for instance, *striatus* has a short petiole, almost broader than long, which certainly does not agree Smith's description and figure of the type.

31. *Procryptocerus convergens* (Mayr)

(Figs. 14, 30, 42, 61, 77, 81)

Cataulacus convergens Mayr, 1887, Verh. Zool. bot. Ges. Wien, vol. 37, p. 584 [worker, female (?), male; Brazil: State of Santa Catarina].
Cataulacus striatus Mayr, 1866, (nec Fred. Smith, neve Mayr 1886), Verh. Zool. bot. Ges. Wien, vol. 16, p. 908 [worker; Brazil: Federal District, Rio de Janeiro]. — Mayr, 1870, Sitz.-ber. Akad, Wiss, Wien, vol. 61, p. 413.
Procryptocerus convergens, Emery, 1893, *in*: Dalla Torre, Cat. Hymen., vol. 7, p. 139.
Procryptocerus striatus convergens, Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, p. 197. — (?) Wheeler, 1925, Ark. Zool. vol. 17A (8), p. 36 [worker; Brazil: State of Rio Grande do Sul, S. Leopoldo; Federal District, Rio de Janeiro]. — (?) Eidmann, 1936, Arb. phys. angew. Ent. Berlin-Dahlem, vol. 3 (2), p. 81.
?*Procryptocerus striatus* var. *odiosa* Forel, 1912, Mém. Soc. Ent. Belg. vol. 19, p. 206 [worker; Brazil: Federal District, Serra Vermelha, near Rio de Janeiro].

The elongate subrectangular petiole, the regular longitudinal sculpture of the mesonotum, the incompletely striated posterior face of the hind femora, the weakly convex dorsum of the petiole and the evenly rounded dorsum of the postpetiole will at once distinguish this from from *schmalzi*, which is its closest relative. Both *schmalzi* and *convergens* differ from all other forms of the group by having the exposed part of the second to fourth tergite completely longitudinally striated, by the wavy pattern of the head striation, by the conspicuous occipital denticules, by the shape of the epinotum, which is constricted behind the narrow, tooth-like basolateral lobes, and by the somewhat divergent epinotal spines. The male differs from all other known males of the genus by having an apical spur on middle and hind tibiae.

Types. — Worker, male; Brazil: State of Santa Catarina, Blumenau. [Naturhistorisches Museum, Wien (Coll. G. Mayr)].

Worker (lectotype). — Length 5.1 mm. Median head length 1.23 mm. Weber's length of thorax 1.56 mm. Black, the following fuscous: apices of mandibles, tibiae and funiculus. Brown: fore tarsi, apex of middle and hind tarsi.

Head [Fig. 14] subopaque, subcircular in anterior aspect. Mandibles finely and longitudinally striated and punctured. Clypeus longitudinally convex, finely longitudinally striated, with a few transverse curved ridges along the anterior border, which is broadly notched mesad; posterior border slightly marked by a faint transverse depression. Frontal area vestigial. Frontal carinae sinuate, not projecting above the exposed antennal sockets, posterior end bent inward and notched in front of the rather conspicuous occipital tooth. Occipital border, above the truncation, completely marginate, slightly crested, rather straight in the median portions, very gently impressed in the center, the lateral portions being somewhat rounded and convex, but much less than in *adlerzi* or regularis. Cheeks reticulate-rugose in front of

and around the eyes; striato-rugose behind them. Eyes moderately and evenly convex. Upper surface of head striated, the striae being strictly longitudinal and parallel at the anterior half, becoming rather wavy at the posterior half, where they converge mesad and fuse at an acute angle. The lateral striae which arise from the border of the frontal carinae also converge, but do not fuse mesad, except for a very few median ones, and reach the transverse occipital crest, where one counts about 26 striae. Length of scape almost two thirds of the median head length (33:50). Gular surface very regularly and more coarsely longitudinally striated. Occipital truncation transversely striated, with about 4 ridges, parallel to the occipital crest.

Thorax [Fig. 30] subopaque. Promesonotal disc shorter than broad (38:48), anterior border of pronotum somewhat rounded, shoulders sharply angulate and denticulate, lateral borders strongly marginate, gently convex and scarcely converging caudad. Promesonotal suture very faint, almost obsolete. Mesonotum on each side with a strongly projecting slightly upturned, acute tooth. Transverse mesoepinotal groove somewhat impressed, distinct. Basal face of epinotum less than twice as broad as long (33:18), flat, with a narrow, but conspicuously projecting, tooth-like, baso-lateral lobe on each side, the base of which occupies less than half of the length of the basal face. Epinotal spines somewhat shorter than the basal face, slightly raised and divergent, straight. Dorsum of thorax as coarsely and densely striated as the upper surface of head, not quite regularly laterad, about 24 striae on mesonotum. Sides of thorax less coarsely and more distantly striated. At least one transverse stria between the base of the epinotal spines. All striae containing a row of extremely fine punctures. Declivous face smooth, microscopically reticulate and fulgid. Coxae, especially fore coxae, with some oblique striae. Fore femora much more inflated than the middle and hind femora. Posterior face of all femora with a few dorsal striations. Tibiae rugose.

Petiole [Figs. 42, 61] longer than broad (18:15), with about 6 coarse and distant longitudinal ridges above; anterior face subperpendicular, smooth, finely shagreened, but not marginate above; sides scarcely convex; ventral face anteriorly with a small blunt tooth. Postpetiole wider than long (24:17), in profile highest behind its middle, but evenly rounded above, lateral corners subangulate, about 15 longitudinal striae seen, when viewed from above.

Gaster subopaque, eliptical, but short, longer than broad (61:52). The first tergite finely longitudinally striated, the striae being much finer and denser than those of thorax and head. Exposed portion of second to fourth tergite distinctly longitudinally striated. Sternites shallowly, microscopically reticulate, almost smooth, with somewhat more conspicuous setiferous punctures; a few lateral striae basally on the first sternite.

Body dorsally and the appendages with white, sparse, rather stiff setae, suberect and shorter on head, more or less oblique and longer, but not decumbent, on peduncle and gaster. First sternite of gaster with fine, more flexible, sericeous pile, usually appressed. Mandibles with shorter, sericeous, fine, but erect hairs. The short appressed setae between the longer ones on the first gastric tergite are visible only on the sides.

Female not known. G. Mayr described a female of this species, but the three females received from his collection bearing the label: *"convergens,* Type", are evidently the so far undescribed females of *regularis* Emery. It is possible that Mayr did confuse both species, especially because two workers of *regularis* originally from Mayr's collection, now in the collection of the U. S. National Museum, were labeled: *convergens* Mayr.

Male (paratype). — Length 6.6 mm. Median head length 1.04 mm. Weber's length of thorax 2.12 mm. Very similar to *adlerzi,* with the exception of the following discrepancies: Slightly darker than *adlerzi;* the scape black; the funiculus dark brown, with ferruginous apex; tibiae more brownish than yellowish. The long pile is also more reddish-brown than yellowish. Mandibles only rugulose and punctate, without distinct striae. Front sculptured throughout, without free, sculptureless median area. Striation of front becomes oblique on vertex and converges towards the lateral ocelli. Scape [Fig. 77] longer than first and second funicular segments combined. Pile above and beneath the head denser, longer than scape. Pronotum above mesad almost smooth. Scutellum not bulging, dorsum continuously curved in profile. Middle and hind tibiae with an apical spur, both tibiae and tarsi with very long and rather dense pile, which is subdecumbent, and longer than the thickness of femora. Gastric tergites smooth, perfulgid, with microscopical reticulation. Subgenital plate [Fig. 81] rounded at apex, subtruncate. Wings infumated, as in *adlerzi.*

Distribution. The present species is definitely rare, and thus far has been recorded from the State of Santa Catarina and

from the Federal District, Rio de Janeiro, Brazil; both localities within the ranges of *adlerzi, schmalzi* and *regularis.*

Specimens examined: 6; 5 workers and 1 male as follows: Brazil: State of Santa Catarina, Blumenau: 2 workers, 1 male (lectotype and paratypes) [NHMW]. (No data, but presumably from the same locality and possibly cotypes): 2 workers [USNM]. — Federal District, Rio de Janeiro; Dec. 21, 1927 (O. Conde): 1 worker [CTB].

Variation. The specimens from Santa Catarina are essentially alike, but the individual from Rio de Janeiro offers a few minor deviations, chiefly in the sculpture patterns of the head. The median striae of the upper surface of head form concentric semicircles, the lateral ones are as in the type. Likewise the occipital truncation has a coarse, perpendicular median carinule, and some vestigial perpendicular striae mesad, the lateral portions being transversely striated. The basal face of the epinotum, excluding the baso-lateral teeth, is narrower, subquadrate.

I suspect that Forel's variety *odiosa* is a synonym of the present species, inasmuch the differential diagnosis presents characters which are typical for *convergens:* a rather narrow basal face of the epinotum, with large, plate-like, baso-lateral tooth on each side; occipital corners with a small, but comparatively conspicuous denticule; transverse striation of the occipital truncation. Forel easily could have made this error since he, like many other workers on the group, did not possess a clear concept of *convergens.*

Santschi's *convergens* var. *loretensis* is a synonym of *regularis* Emery, as already has been pointed out on a foregoing page.

32. *Procryptocerus schmalzi* Emery

(Figs. 12, 29, 44, 62)

Procryptocerus striatus schmalzi Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, p. 198 [worker; Brazil: State of Santa Catarina, Joinville; Federal District: Rio de Janeiro]. — Forel, 1911, Deutsche Ent. Zeitschr. p. 297 [female (no diagnosis); Brazil: State of S. Paulo, Alto da Serra]. — Eidmann, 1936, Arb. phys. angew. Ent. Berlin-Dahlem, vol. 3 (2), p. 81.

The short, subglobose petiole, the completely and rather heavily striated posterior face of all femora, the broken up or transverse striation of the mesonotum, the profile of petiole and postpetiole, separate the worker of *schmalzi* from that of *convergens,* with which, however, it is very closely related. The female differs from all other known females of the present group by having the exposed portion of the second to fourth gastric tergites longitudinally striated, and the posterior face of all the femora completely and heavily striated.

Type. — Worker; Brazil: State of Santa Catarina, Joinville (Schmalz) [(Coll. Emery) in the Museo Civico di Storia Naturale, Genova, Italy].

Worker; Brazil: State of Paraná, Taquara; Dec. 20,

1930 (M. Witte, O. F. M.) [Coll. T. Borgmeier, n. 5708]. — Length 5.3 mm. Median head length 1.29 mm. Weber's length of thorax 1.66 mm. Black: the following fuscous-brown: apices of mandibles, basal two thirds of middle and hind tarsi, tip of femora and funiculus. Brown: fore tarsi, tibiae, apices of middle and hind tarsi.

Head [Fig. 12] subopaque, subcircular in anterior aspect. Mandibles longitudinally striated. Clypeus longitudinally convex, rather finely and shallowly longitudinally striated; its anterior border narrowly notched mesad, posterior border marked by faint transverse depression; a longitudinal median carinule on the posterior half. Frontal area obsolete; frontal carinae sinuate, not projecting above the exposed antennal sockets, posterior ends slightly lobate, then roundly bent mesad in front of the small occipital tooth. Occipital border little arcuate laterad, marginate above the truncation, not distinctly crested. Cheeks reticulate-rugose around the eyes, striato-rugose in front of and behind them. Surface of eyes moderately, but evenly convex. Upper surface of head striato-rugose, striae longitudinal and parallel anteriorly, rather wavy, irregular, frequently anastomosing, posteriorly where the striae converge mesad (less than in *convergens*); about four median striae fuse at an acute angle and do not reach the occiput. The lateral striae, part of which arise from the border of the frontal carinae, also converge but do not fuse mesad, and reach the transverse occipital margination, where one counts about 26-28 striae. Lower surface of head very regularly and more coarsely striated. Occipital truncation microscopically reticulate, with a few distant striae, arising perpendicularly from the occipital foramen, a few of the median ones reaching the occipital margination above.

Thorax [Fig. 29], in general, similar to that of *convergens*. Promesonotal disc shorter than broad, convex above in profile. Anterior border of pronotum rounded, shoulders angulate, lateral borders marginate, subparallel. Promesonotal suture very faint, almost obsolete. Mesonotum on each side with a strong, projecting, acute, slightly upturned tooth. Transverse epinotal groove impressed. Basal face of epinotum transversely convex above, with a narrow and strongly projecting baso-lateral lobe on each side, the lobe being rounded anteriorly and subangulate posteriorly, occupying less than half of the total length of the basal face, spines not included. Epinotal spines slightly shorter than the basal face, divergent proximad, their apices subparallel. Dorsum

of thorax as coarsely sculptured as upper surface of head. The striae mostly longitudinal on pronotum, slightly reticulate discad, and a few transverse striae on the mesal portion of the anterior border. Mesonotum with more irregular, broken up or transverse striation, especially toward the epinotum. The basal face of epinotum longitudinally striated. Declivity transversely striated above, microscopically reticulate and rather smooth below. Coxae obliquely striated. Fore femora more inflated than middle and hind femora, all with the anterior face partly, the posterior face completely and rather heavily striated. Tibiae rugose.

Petiole [Figs. 44, 62] subglobose to subhexagonal from above, wider than long, striato-rugose above (about 8 ridges visible) and laterally; dorsum convex in profile. Anterior face oblique, not marginate above. Ventral face with a small antero-median, blunt tooth. Postpetiole wider than long, in profile convex above, highest behind its middle, suddenly descending caudad, in front of the posterior border. Sides slightly arcuate, anterior corners subangulate. About 15 striae seen from above.

Gaster subopaque, short, oval, longer than broad, first tergite finely and densely longitudinally striated; striae much finer than those of thorax and head. Exposed portion of second to fourth tergite distinctly and completely longitudinally striated. Sternites shallowly and microscopically reticulate, almost smooth; with somewhat more conspicuous setiferous punctures, a few lateral striae basally on the first sternite.

Entire body, except sides of thorax, with yellowish-white, sparse, stiff setae; shorter and erect on head, longer, more or less oblique, not decumbent, on thorax, peduncle, gaster and legs. First sternite of gaster clothed with fine, flexible, and sericeous pile, which is mostly appressed. Mandibles with short, erect pile. The short appressed setae between the longer erect ones on the first gastric tergite visible only on the sides.

Female (undescribed) Brazil: State of S. Paulo, Cantareira; 1912 (Luederwaldt) [Coll. T. Borgmeier]. — Length 6.2 mm. Median head length 1.36 mm. Weber's length of thorax 2.0 mm. Similar to the worker except for the characters of the caste and the following details:

Perpendicular striae discad on occipital truncation slightly more abundant than on worker. Ocelli small, vestigial, not raised above the surface of the head. Shoulders sharply angulate. Anterior border of pronotum moderately arcuate, lateral borders subparallel. Dorsal face foveolae in the meshes. Latero-tergite

longitudinally striated. Scutum longitudinally reticulate-rugose discad with large foveolae in the meshes, less distinctly furrowed laterad. Scutellum similarly sculptured, except for the antero-lateral lobes which are densely foveolate. Basal face of epinotum with baso-lateral lobes, slightly set off, sides somewhat concave in front of the stout, short epinotal spines, which diverge strongly basad, converging again distad, their apices being subparallel, their length subequal to half of their apical distance. Basal face coarsely and somewhat irregularly striato-rugose, sculpture diverging obliquely caudad. Declivity transversely striated above, rather smooth, but finely reticulate below. Sides of thorax longitudinally striated. Posterior face of all femora strongly striated. Petiole stout, slightly longer than wide, anterior face transversely striated; sides somewhat arcuate, upper face coarsely striato-rugose, about 6-7 striae seen from above. Postpetiole slightly longer than in worker, but broader than long, with 15 regular striae visible from above. Striation of gaster as fine and dense as in worker, much finer than sculpture of head or thorax. No small decumbent intersticial setae visible between the longer, erect hairs on the first gastric tergite. Wings infuscated, veins brunneous. Marginal cell of fore wing open; the transverse median vein subequal to second abscissa of medial vein. Submarginal cell about twice as long as the single discoidal cell.

Male unknown.

Distribution. This rather common South Brazilian species possesses the same range as *adlerzi,* extending from the State of Santa Catarina north to Rio de Janeiro.

Specimens examined: 82; 78 workers and 4 females as follows: *Brazil*: State of Minas Gerais, Cambuquira (Azevedo Marques): 1 worker [CTB]. State of Rio de Janeiro, Petrópolis; 1918 (Borgmeier): 16 workers [CTB]. Mendes; Oct. 23, 1933 (Eidmann): 3 workers [USNM]. State of S. Paulo, Mato do Governo; Nov. 24, 1929 (Borgmeier): 2 workers [CTB]. Cantareira; (Luederwaldt): 3 workers, 3 females [CTB]. State of Paraná, Taquara; Dec. 20, 1930 (M. Witte, O. F. M.): 49 workers, 1 female [CTB]. Rio Negro; Jan. 7, 1929 (M. Witte, O. F. M.): 3 workers [CTB].

Variation. This species does not exhibit any conspicuous change of livery or structure throughout its range. The individual variation within a single nest, however, is remarkable. The main features, subject to variability, are size (4.9-5.6 mm.) and sculpture of the integument. The hind femora, too, are of variable length, approaching or even equalling in some specimens the maximum width of the thorax, which

represents an uncommon, but unfortunately inconstant, feature for an ant of this group. Greatest variability is shown by the sculpture patterns of the dorsum of the thorax. In some, usually small, individuals, the striation is almost perfectly longitudinal, hardly differing in this regard from *convergens*. But in most specimens a dissolution of the regular patterns takes place, first on the mesonotum, where the striae become irregular, broken up until in some specimens they become transverse. In more extreme cases both pronotum and epinotum may be affected by this disturbance of the regular longitudinal striation, and in a few specimens the whole thoracic dorsum is more or less transversely, though irregularly, striato-rugose. In this latter case, the promesonotal suture is usually well differentiated, and it is possible that these individuals may already represent a step towards pseudogynism. Furthermore, in small specimens the declivous face of the epinotum may be devoid of any transverse striation. On the other hand, the anterior face of the petiole is transversely striated in many specimens.

In the present revision, for the first time, *schmalzi* is ranked as an independent species. But, since it is morphologically very remote from both *regularis* and *adlerzi* and equally distinct from *convergens*, at the extreme limits of their common range, it must be considered as a good species.

I. Species of Uncertain Relationship

This section comprises several distinctive species, which apparently do not exhibit any close relationship with the members of the other groups, nor any affinity among themselves.

33. *Procryptocerus elegans* Santschi

Procryptocerus elegans Santschi, 1921, Bull. Soc. Vaud. Sci. Nat. vol. 54, p. 98-99 [worker; Brazil: State of S. Paulo, Ipiranga (S. Paulo)].

This small species presents some superficial resemblance with *convergens* and *schmalzi*, from which, however, it may be readily distinguished by the diminutive size, the sculpture of the first gastric tergite, which is finely longitudinally striated basally, and smooth apically, the perpendicular striation of the occipital truncation, and the obtuse mesonotal tooth.

Type. — Worker; Brazil: State of S. Paulo, Ipiranga, near S. Paulo City [Santschi misspells "Ypurango"] (Luederwaldt). [Museum of N. H., Basle, Switzerland].

I have not seen any representatives of this species, which is known only from the type. But it should not be difficult to identify any further specimens as Santschi's description appears to be complete and sufficiently detailed.

A single specimen in the U. S. National Museum, from Rio de Janeiro, incorrectly identified as *convergens*, may possibly have to be referred to this species, although it differs from the original description in the following features:

Occipital truncation mostly transversely striated, the declivity of the epinotum indistinctly sculptured, the posterior angle of the baso-lateral lobes of the epinotum blunt, and the strong carinae and the intervening concave furrow of the clypeus are lacking.

32. *Procryptocerus mayri* Forel

(Figs. 11, 28, 56, 68)

Procryptocerus mayri Forel, 1899, *in*: Biol. Centr. Amer. Hymen. vol. 3, p. 43 [worker; Colombia].

Procryptocerus mayri shares with *marginatus* the distinctive feature of being the largest species of the genus. Moreover, the smooth and fulgid first gastric tergite, the absence of baso-lateral epinotal lobes separate *mayri* from all other species of the genus.

Type. — Worker; Colombia (no other data) (Landolt) [Muséum d'Histoire Naturelle, Genève (Coll. A. Forel)].

Worker (lectotype). — Length 8.0 mm. Median head length 1.85 mm. Weber's length of thorax 2.58 mm. Black; the following light reddish-brown: femora, except basal constricted portion, tibiae, scapes. Brunneous: funiculus and tarsi.

Head [Fig. 11] subopaque; strongly convex above. Mandibles fulgid, finely and shallowly reticulate-punctate, with a few longitudinal rugulae. Clypeus longitudinally convex, longitudinally striated, with the median ridge slightly stronger than the lateral ones, extending caudad across the distinctly impressed frontal area. Anterior border of clypeus shallowly emarginate mesad, posterior border distinct. Frontal carinae sinuate, not projecting above the antennal socket, posterior end slightly upturned, evenly curved mesad towards the angulate and subdentate occipital corner. Upper surface of head longitudinally striato-rugose, striae occasionally anastomosing, and finely reticulate-punctate. The median striae continue uninterruptedly, perpendicularly or obliquely across the occipital truncation. The lateral striae end on the lateral upper margination of the occiput. Median portion of vertex, in front of the occiput, shallowly longitudinally impressed, continuous with occiput. Occipital truncation set off only laterally, by distinct margination. Cheeks slightly curved, longitudinally striato-rugose. Eyes rather flat, very slightly convex. Lower surface of head longitudinally striated. Length of scape about two thirds of median head length (76:50), very finely reticulate-punctate, slightly curved, somewhat depressed.

Thorax [Fig. 28] subopaque: about 1.5 times as long (as measured from the anterior border of pronotum to tips of epinotal spines) as maximum width. Anterior border of pronotum moderately arcuate; shoulders low, sharply angulate; lateral borders gently convex, posterior half marginate. Promesonotal suture vestigial. Mesonotum with posterolaterally projecting, bluntly rounded, subdentiform lobes. Thorax constricted laterally between mesonotum and epinotum. Transverse mesoepinotal groove deeply impressed dorsally, interrupting the sculpture. Basal face of epinotum slightly more than 1.5 times as broad as long (37:23), without expanded baso-lateral lobes, anterior corners slightly impressed from above. Epinotal spines subequal in length to basal face, slender, slightly sinuate, subparallel. Upper surface of thorax longitudinally, not quite regularly, striato-rugose. Anterior portion of pronotum more or less coarsely reticulate-rugose, mesoepinotum regularly striated. Sides of thorax longitudinally striated. Declivous face of epinotum perpendicularly striated above, smooth and fulgid below. Femora equally inflated, smooth, tibiae rugose. Hind femur longer than maximum width of thorax.

Petiole [Figs. 56, 68] longer than wide (27:22); anterior face smooth, with a few longitudinal striae, oblique, grading into dorsal face at the half of the total length. Sides subparallel, slightly constricted caudad; ventral face with antero-median tooth. Coarsely reticulate-rugose above and laterally. Postpetiole about as long as wide, sides slightly diverging caudad; higher than long, the dorsum presents two slanting faces, in profile almost at right angles, the anterior face almost twice as long as the posterior face. Coarsely reticulate-rugose laterally and behind, longitudinally striated anteriorly above.

Gaster oval, very little depressed, smooth perfulgid, shallowly and very finely reticulate.

Upper surface of head, thorax dorsum and sides of peduncle, gaster, appendages with long, fine, yellowish white, sericeous, abundant setae. Short hair on funiculus, mandibles and beneath postpetiole.

Female and male unknown.

This interesting species is known only from the type locality. The lectotype differs from the original diagnosis in the proportions of the petiole and the details of the sculpture of the occipital truncation.

24. *Procryptocerus mayri reichenspergeri* (Santschi)

Paracryptocerus mayri reichenspergeri Santschi, 1921, Bull. Soc. Vaud. Sci. Nat. vol. 54, p. 98-99 (lapsus for *Procryptocerus*) [worker; Brazil: no other data]. *Procryptocerus mayri reichenspergeri*, Borgmeier, 1927, Arch. Mus. Nac. Rio, vol. 29, p. 112.

The present subspecies, of which I have not seen any specimen, is said to differ from the typical mayri in the following morphological details:

Worker: Size 7 mm. Entirely black, including appendages. Epinotal spines parallel, shorter than the basal face. Declivous face transversely striated.

Female and male unknown.

All other characters, mentioned by Santschi, do not offer any difference from the typical *mayri*.

Type. — Worker; Brazil (no other data) (from Coll. Reichensperger). [Coll. Santschi, Museum of Natural History, Basle].

25. *Procryptocerus gibbosus* Kempf

(Figs. 7, 31, 46, 63)

Procryptocerus gibbosus Kempf, 1949, Rev. de Ent. vol. 20, p. 423-425, fig. 1-4 [worker; Brazil: State of Espírito Santo, Santa Teresa].

The longitudinally and somewhat superficially striated *gibbosus* may be recognized from all other species of the genus by the hump-backed promesothorax, the unarmed sides of the mesonotum, the posteriorly lobate frontal carinae, and the shape of the epinotum.

Type. — Worker (holotype and a single paratype); Brazil: State of Espírito Santo, Santa Teresa, July 8, 1928 (O. Conde) [CTB, n. 4293].

To the original description I add the following measurements: Length 5.1 mm. Median head length 1.11 mm. Weber's length of thorax 1.58 mm. [Figs. 7, 31, 46, 63].

Male and female unknown.

This species is known only from the type locality.

II. Genus CEPHALOTES Latreille

From a chronological viewpoint *Cephalotes* is second only to *Formica* in ant nomenclature. It dates back to 1802, when

Latreille [15] separated a single South American species, *F. atrata* Linnaeus, from the genus *Formica* and created for it the new and monobasic *Cephalotes*. However in the following year, Latreille decided to reject this name and to adopt the more descriptive *Cryptocerus* as a substitute. In this he was followed, without any contradiction, by Fabricius (1804), and the cohort of myrmecologists for more than a century. In 1905, with the general acceptance of the law of priority and its retroactive effects, Latreille's procedure became untenable, and in 1913 Wheeler [16] pointed out that the older *Cephalotes* had to replace *Cryptocerus* which, at that time, already applied to a sizeable number of species. But in the subsequent years Emery (1914, 1915) recognized several generically distinct groups in this complex, and, consequently, the resuscitated genus *Cephalotes* became restricted to only four species, including aside from *atratus*, also *alfaroi, oculatus* and *placidus*. This last form, described as a *Cryptocerus* by Frederick Smith, in 1862, upon a single male specimen, was associated with *Cephalotes* by Emery in 1922. Its status, however, remains subject to doubt, since the characters contained in the original description do not permit a definitive placement. Without forcing the unpleasant situation, it is best to consider it, as a cephalotine ant *incertae sedis*.

In the decade between 1919 and 1929 Santschi not only presented a revisionary study on this genus, but also brought the number of recognized forms up to 13. This increase was largely effected through burdening *atratus* with a number of newly erected infraspecific forms. Both Wheeler (1925) and Stärcke (1945) have manifested their skepticism as regards this intricate system of classification and the more conservative viewpoint of these authors is largely justified, as will be shown below. On the other hand, Stärcke is certainly going too far when he extends his doubts even upon the legitimacy of *C. oculatus* (Spinola) and related forms. For this particular group, to which belong also *abdominalis* and *opacus*, presents a great many distinctive features, which, in my opinion, form a sufficient foundation for according them distinct generic rank. Hence I have created for this group the new genus *Eucryptocerus*.

With this further reduction *Cephalotes* now contains only the following species: *alfaroi, atratus, decemspinosus*, and tentatively *placidus*. The problem of the races of *atratus* will be dealt with

[15]) Hist. Nat. Crust. Ins. vol. 3, p. 357.
[16]) Ann. N. Y. Acad. Sc. vol. 23, p. 78.

further on. It suffices to point out here that I recognize only a single form as valid, namely *erectus* Santschi, which is raised from the varietal to subspecific rank.

Genus *Cephalotes* Latreille

Cephalotes Latreille, 1802, Hist. Nat. Crust. Ins. vol. 3, p. 357. Monobasic. — Wheeler, 1913, Ann. N. Y. Acad. Sc. vol. 23, p. 78. — Emery, 1914, Ann. Soc. Ent. Belg. vol. 58, pp. 37-39. — Santschi, 1920, Bull. Soc. Ent. France, p. 149. — Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 303. — Stärcke, 1945, Ent. Ber. (264-266) vol. 11, p. 263.
Cryptocerus Latreille, 1803, Hist. Nat. Crust. Ins. vol. 5, p. 311. Monobasic. — Fabricius, 1804, Syst. Piez. p. 148. — Latreille, 1810, Consid. Gen. Crust. Arachn. Ins. p. 347. Designation of genotype: *Formica atrata* Linnaeus [= *Cephalotes atratus* (L.)].

Type of the genus: *Formica atrata* Linnaeus, 1758 [=*Cephalotes atratus* (L.)]. Monobasic.

Generic features

The broadly expanded frontal carinae, covering completely the cheeks from above and projecting in front well beyond the clypeus, distinguish at once the worker and the female of *Cephalotes* from those of *Procryptocerus*. The position of the eyes, situated beneath the long antennal scrobe, separates them from all the other genera of the tribe. The male differs from that of *Procryptocerus* by the short scape, much shorter than the second funicular segment, and from all remaining genera by the short, stout, yet conspicuous scapular spine on the pronotum and the very small, sometimes even open, discoidal cell of the fore wing.

The present group, though small in numbers of species, contains the largest species of the tribe. The worker caste is more or less monomorphic. The genus is nearest to *Zacryptocerus* Wheeler and *Eucryptocerus*, n. gen. Due to the peculiar position of the eyes and the length of the antennal scrobe, it is best placed immediately following *Procryptocerus*, even though *Eucryptocerus* appears to be more primitive as regards the completely unarmed peduncular segments.

Worker. Monomorphic to slightly dimorphic. Size from 8 to 14 mm. Black. Frontal carinae broadly expanded laterally, covering the sides of the head from above, rounded and protracted in front above the bases of the mandibles, well beyond the retracted clypeus. Clypeus emarginate in front, with a row of long setae projecting from the anterior border over the mandibles. Lateral border of the frontal carinae scarcely to conspicuously upturned, more or less distinctly crenulated, without a laterally

projecting tooth in front of the eye. Antennal scrobe deeply excavate beneath the frontal carinae, extending almost unto the occipital corner. Eyes large, moderately convex, never globose, situated beneath the antennal scrobe. Each occipital corner with two spines, one of which may be obsolete in the largest workers of *alfaroi*. Terminal segment of the maxillary palpi subequal to, or slightly longer than, the preceding segment. Thorax distinctly constricted between the mesonotum and the epinotum. Shoulders distinctly angulate and dentate. Pronotum on each side with a stout, usually subacuminate, scapular spine, bent obliquely laterad and denticulate anteriorly halfway between base and apex. Between the scapular spines usually a pair of more or less developed, median spines or teeth, always much shorter than the scapulars. Promesonotal suture vestigial to distinct. Dorsum of thorax usually immarginate laterad. Mesonotum without a lateral projection. Mesoepinotal suture distinct and impressed. Epinotum with a pair of long, more or less oblique and suberect, divergent, subacuminate spines. A carinule descending from the base of each epinotal spine downward separates the declivous face from the sides of the thorax. Tibiae prismatic. Middle and hind metatarsus plate-like, extremely flattened and expanded. Remaining tarsal segments subtriangular. Petiole subcuboidal, slightly longer and narrower than the postpetiole, with a dorso-lateral spine or tubercle on each side, and a midventral carina, terminating in front in a small, blunt tooth. Postpetiole, when seen from above, tapering caudad with a pair of small spines, tubercles or ridges above. Gaster oval, provided with a narrow, lamelliform border on the antero-lateral portions of the first tergite, fading out in front of the spiracles. The first gastric tergite, not completely covering the remaining tergites from above, its lateral border separated from the posterior border by a distinct angle. Integument subopaque to fulgid. Microsculpture consisting of very fine and shallow punctures, with superimposed larger, sparse, more or less rounded setuliferous foveolae on head disc and thorax. Pile usually thickened and appressed within the foveolae, suberect, longer, and pointed elsewhere. No fine pubescence present.

F e m a l e. Somewhat similar to the worker, with the exception of all projections, spines and teeth being conspicuously shortened, and the thorax highly modified according to the usual patterns of the caste. Gaster elongate. Size about 20 mm. Integument black, finely shagreened, subopaque to fulgid. Eyes beneath the antennal scrobe, as in worker. Occipital spines reduced to a pair

of blunt tubercles on each corner. Scapular spines short, tooth-like. Pronotum immarginate laterad, without a distinct transverse crest, but with two small median teeth. Epinotum narrowed, the posterior corners of the basal face with a short spine. Mesopleura with a small tooth below, above the middle coxae. Middle and hind metatarsi flattened and broadened, but not as thin as in worker. Peduncular segments much broader than long. Gaster marginate and bordered at the antero-lateral corners. Wings infumated. Front wing with a fuscous stigma, a closed and appendiculate marginal cell. The transverse cubital vein absent, the cubital vein touching the marginal cell. Discoidal cell closed, very small.

Male. Length up to 14 mm. Head, thorax and peduncle black. Gaster and appendages testaceous to dark ferruginous. Head without mandibles shorter than the interocular distance. Mandibles without longitudinal ridges basad, the apical end not bent downward. Scape shorter than half the length of the second funicular segment. Frontal carinae short, not extending beyond the anterior half of the eye. Antennal scrobe obsolete. Sides of pronotum with a small, short scapular tooth. Postpetiole in profile, scarcely convex, almost flat above. Wings as in female, except for the fact that the transverse cubital vein of the fore wing is usually present, although shortened. Discoidal cell very small, sometimes open.

Ethology. Very little is known regarding the life history and habits of these ants. All the available information concerns *C. atratus,* but it is very probable that *C. alfaroi* and *C. decem-spinosus* have a similar biology.

C. atratus is usually found on large trees, running up and down within the crevices of the bark. I have once caught a few individuals on the bulbs of an orchid of the genus *Cattleya,* in Petrópolis, near Rio de Janeiro. The species is xyloecete, establishing the nest within the cavities of dead or living trees. Forel (1899, 1912) relates how he himself discovered an immense nest of these ants within a large dead tree on the island of Trinidad. Through repeated knocking on the trunk, he was able to arouse them. As a consequence, the ants left the nest in great numbers and destroyed in a few moments the nest of a small polybiine wasp, not sparing its inhabitants. Prof. Bugnion and Santschi (Forel, 1912; Santschi, 1929) found a nest of the same species in a cavity of a living tree, of 40 cm. in diameter, not much above the ground, which was being attacked by a

considerable number of *Eciton (Nomamyrmex) crassicorne,* a species of army ants. The majority of the *Cephalotes atratus* were inside the nest, some of them engaged in closing the entrance by placing their heads side on side, whereas a few others on the outside, were struggling with the invaders. Most probably the army ants were longing for the eggs and larvae of *Cephalotes,* since the heavy armor of the adults were invulnerable to their attacks.

According to Mann (1916) "the species nests generally in hollowed branches of high trees, though one nest was in the hollowed trunk of a small tree. It is omnivorous in habit, frequenting garbage and eating even carrion. Some dead macaws which I placed in the woods as bait for carrion-feeding insects were continually covered by *C. atratus,* to the exclusion of other insects. It is diurnal, and a striking form as it walks slowly about on tree trunks and logs. The hard spiny armor is sufficient to protect it from any ordinary enemy".

Eidmann (1936) gives a detailed description of the nest of a young colony of *C. atratus,* found near Mendes, State of Rio de Janeiro, Brazil. Wheeler (1942) reports that he discovered the same species nesting in a large branch of a *Cecropia sciadophylla* var. *decurrens Sn.*

L. Richter (1945), in a paper on Colombian Membracidae, presents an interesting account of the relationship between this ant and *Tragopa peruviana* Funkhouser, a neotropical membracid. According to this writer's observations, *C. atratus* is always found in company with *Tragopa peruviana,* which lives on the large leaves of *Isertia haenkeana* and, less frequently, on *Vismia angusta.* It is suggested that the ants take advantage of the sugary secretions of *Tragopa.* The interesting fact, however, consists both in the constant association of the two insects, and also in a certain "convergent adaptation" of the membracid which in its general habitus resembles the color and the shape of the gaster of *C. atratus.* Richter states, that only once he was able to find *Tragopa* without its guest, and that was on a *Vismia* growing exceptionally inside the woods. Strangely enough, all the individuals of *Tragopa peruviana* taken there possessed whites spots of variable size and shape, a fact never observed among individuals living with the ants, which are invariably black all over. Whether or not the ants exert a selective influence upon the color of the host, as Richter believes, is a fact which can not be decided upon on such little evidence. A further statement of the same

author, propounding that the gaster of *C. atratus,* with the large first tergite covering in a shield-like fashion the remaining segments, is an "intentional" adaptation to the host, is merely a product of his own imagination; for this same condition holds true for more than 100 different species of the Cephalotine tribe, most of which, most certainly, are not exclusively the guest of this black *Tragopa peruviana.* This and other similar statements concerning an "intentional" influence of ant symbionts upon the phaenotypical variation of diverse membracid host of the genus *Tragopa* have to be accepted with utmost caution.

Distribution. The genus *Cephalotes* is strictly Neotropical in its dispersal. It ranges from Honduras in Central America south over most of Brazil, northern Argentina, Paraguay, Bolivia and cisandean Peru and Ecuador. The occurrence of *C. atratus* in Trinidad and the Island of St. Thomas (Virgin Islands) appears to be the result of immigration from the continent, easily explainable in the case of Trinidad, but definitely more problematic in the case of the Virgin Islands, where it may have been introduced through human agency. Sexual forms are known only of *C. atratus.* The workers may be separated on hand of the subjoined key:

Key to the species and subspecies

1. The entire border of the frontal carinae distinctly crenulated, with short, thick, somewhat clubbed setae projecting from the notches; the first (outer) occipital spine, if present, with a laterally projecting denticule from its base, or without a distinct first occipital spine, and with the lateral denticule projecting from the sides of the head. Somewhat dimorphic..... 1. *alfaroi* Emery
— Frontal carinae never distinctly crenulated, especially not on the posterior half, without short clubbed setae along the entire lateral margin; two occipital spines always present on each corner of the head, without a lateral denticule projecting from the base of the first spine. Monomorphic 2
2. Median pronotal teeth greatly developed, stout, spine-like, higher than half of the distance between their bases; promesonotum densely and confluently foveolate; gaster with unusually dense, oblique setae beneath..... 4. *decemspinosus* Santschi
— Median pronotal teeth usually very little developed or absent, especially in small individuals, never stout and never as high as the half of their interbasal distance; promesonotum more sparsely foveolate; gaster beneath with sparse oblique setae..... *(atratus)* 3
3. Integument of first gastric tergite finely but distinctly reticulate-punctate, opaque to subfulgid; epinotal spines obliquely inclined, of variable size and thickness. (South America)..... 2. *atratus* (L.)
— Integument of first gastric tergite smooth and perfulgid, the microsculpture absent or only vestigial discally; epinotal spines suberect, never longer than the basal face of the epinotum, never greatly inflated proximad. (Panama and Northern Colombia)..... 3. *atratus erectus* Santschi

1. *Cephalotes alfaroi* (Emery)

(Figs. 98, 99, 101, 102)

Cryptocerus alfaroi Emery, 1890, Bull. Soc. Ent. Ital. vol. 22, p. 76-77 [worker, soldier; Costa Rica: Alajuela]. — Forel, 1899, Biol. Centr.-Amer. Hym. vol. 3, p. 48. Pl. 3, fig. 7, 8 [worker, soldier; Panama: Bugaba].
Cephalotes alfaroi Emery, 1914, Ann. Soc. Ent. Belg. vol. 58, pp. 38-39. — Santschi, 1920, Bull. Soc. Ent. France, p. 149.

The present species differs from both *atratus* and *decemspinosus* by the more pronounced dimorphism of the worker caste. The major worker presents a distinctly truncate, yet immarginate, occiput behind the paired blunt tuberculate swellings of the vertex, more or less arcuate lateral borders of the frontal carinae, only a single distinct tooth on each occipital corner, and a much finer and smoother sculpture of the integument. The erect, recurved pair of spines on the anterior border of the postpetiole, the rim of projecting, clubbed setae along the entirely crenulate border of the frontal carinae, the accessory tooth projecting either from the anterior occipital spine, or from the side of the head, behind the eyes, stamp it as a discrete species.

Types. — Worker, soldier; Costa Rica: Alajuela (Alfaro) [Coll. Emery, in the Museo Civico di Storia Naturale di Genova, Italy].

Major worker; Costa Rica: Santa Clara Province, Limón planes, Hamburg Farm (A. Nevermann) [Coll. A. Reichensperger]. Length 13 mm. Median head length 2.97 mm. Weber's length of thorax 4.15 mm. Black; the following dark ferruginous: tip of last funicular segment, apices of last tarsal segments, claws.

Head [Fig. 98] subfulgid, subquadrate, microscopically punctate, coarsely and sparsely foveolate. Mandibles reticulate-rugose, with a distinct apical and preapical tooth. Clypeus and frontal area vestigially set off. Frontal carinae crenulated, their sides moderately arcuate and slightly upturned. Vertex with a transversely located pair of blunt swellings. Occiput subtruncate mesad. Occipital corners with a rather large and obtuse posterior tooth, the anterior tooth scarcely distinct from the crenulated border of the frontal carinae. In lateral view three minute denticules project ventrad from the frontal carinae, in front of the eye. Eyes beneath the antennal scrobe. Maxillary palpi 5-segmented, segments 2-5 subequal in length. Labial palpi 3-segmented. A small but distinct tooth projecting from the sides of the head, somewhat above and behind the eyes. Scape incrassated distad, attenuate and subcylindrical proximad.

Thorax [Fig. 99] subopaque. Shoulders obtusely angulate. Dorsal face of pronotum inclined cephalad, with two stout, rather acute median spines and a lateral, stout, more or less apically truncate scapular spine on each side, above and behind the shoulder. A minute tooth projecting distad from the anterior side of the scapular spine. Promesonotal suture distinct. Mesonotum moderately inclined caudad, flat, marginate laterad, its posterior corners marked by somewhat raised, blunt swellings. Mesoepinotal suture distinctly impressed. Basal face of epinotum somewhat inclined cephalad; about as long as wide, its sides immarginate, subequal in length to the declivous face. Lower mesopleura with an anterior tooth. Epinotal spines longer than basal face, divergent, somewhat upturned, subacuminate. Integument microscopically and densely punctate, sparsely foveolate. Middle portion of femora moderately incrassate, the upper face strongly marginate on the distal end. Tibiae prismatic. Middle and hind metatarsus compressed and greatly flattened.

Petiole [Fig. 102] subopaque; subquadrate from above, its sides subparallel. Anterior face obliquely truncate. Anterior corner of dorsal face with a laterally projecting minute tooth. Integument finely and densely punctate, and sparsely foveolate. Postpetiole wider than long, with a pair of conspicuous recurved teeth above, on the anterior border. Ventral face with a distinctly ventrally projecting lobe. Sculpture as on petiole. Densely foveolate-rugose.

Gaster subfulgid. First tergite and first sternite microscopically and very shallowly punctate, almost smooth, fulgid, except the narrow posterior margin, which, as also the exposed portion of the remaining tergites and sternites, are more sharply punctured and transversely rugulose.

Most of the foveolae contain a thin, short, decumbent seta. Margin of frontal carinae with a row of somewhat clubbed setae within the crenulations, along their entire length. Mandibles, lower surface of head, spines of thorax, postpetiole appendages and gaster above and below, with sparse, erect setae.

Minor worker (of the same nest series). Length 10.0 mm. Median head length 2.24 mm. Weber's length of thorax 3.17 mm. Similar to the major worker, from which it differs in the following features: Frontal carinae [Fig. 101] partly semi-transparent, fuscous-ferruginous, converging in front, lateral border straight, preatly upturned. Each occipital angle with a pair of triangular spines, the anterior spine with a minute tooth

arising from the base, projecting outward. Occiput continuous with vertex, not truncated, the pair of teeth on vertex obsolete. Integument subopaque, more sharply punctured and finely longitudinally rugulose caudad. Thorax subopaque, longitudinally areolate-rugulose above and laterally. Scapular spines more slender, longer, acuminate, median teeth small, their bases transverse in the form of a crest. Spines of petiole more conspicuous. Sculpture of gaster sharper and coarser, distinctly longitudinally rugulose.

Female and male unknown.

Distribution. This interesting species is known from Costa Rica and Panama.

Specimens examined: 11; 5 soldiers and 7 workers, as follows: *Costa Rica*: Santa Clara Province, San José; Aug. 8, 1936 (A. Alfaro): 1 worker [ANSP]. Limón Planes, Hamburg Farm (F. Nevermann): 1 worker, 4 soldiers [CAR; USNM]. Rio Parrita, vicinity of Pacific Ocean; Feb. 8, 1937 (A. Alfaro): 1 worker [ANSP]. — *Panama*: Bugaba, elev. 800-1500 ft (Champion): 4 workers, 1 soldier [MCZ; USNM; MHNG].

The major worker, as described by Emery, is a small soldier, inasmuch as its head still possesses two distinct occipital spines on each corner and the sides are subparallel. It corresponds to my figure based on a soldier from Panama. The pair of vertical teeth occurs only in major workers and in the larger minor workers, and are absent in the smaller individuals. The transverse carina of the pronotum practically exists only in the minor worker, whereas the stout, large median pronotal teeth of the major worker can hardly be termed a crest. The specimens from Panama differ by a slightly coarser sculpture. The appended figures regarding the present species were made upon the Panamanian individuals.

2. *Cephalotes atratus* (Linnaeus)

(Figs. 95, 96, 97, 100, 104)

Formica atrata Linnaeus, 1758, Syst. Nat. edit. 10, vol. 1, p. 581 [worker; South America]. — Fabricius, 1775, Syst. Ent. p. 395. — Fabricius, 1781, Spec. Insect. vol. 1, p. 493, n. 33. — Fabricius, 1787, Mant. Insect. vol. 1, p. 310, n. 40. — Olivier, 1791, Encycl. méth. Hist. Nat. vol. 6, p. 500. — Fabricius, 1798, Entom. Syst. emend. vol. 2, p. 363, n. 54. — Latreille, 1802 (a), Fourmis, p. 272, Pl. 12, fig. A & B [worker, female; South America].

Cephalotes atratus Latreille, 1802 (b), Hist. Nat. Crust. Ins. vol. 3, p. 358. — Wheeler, 1913, Ann. N. Y. Acad. Sc. vol. 23, p. 78. — Emery, 1914, Ann. Soc. Ent. Belg. vol. 58, p. 38. — Wheeler, 1916, Bull. Mus. Comp. Zool. Harvard, vol. 60 (8), p. 326 [Trinidad: Port of Spain]. — Santschi, 1916, Physis, vol. 2, p. 281 [Paraguay: Santa Trinidad]. — Wheeler, 1925, Ark. Zool. vol. 17A, (n. 8), p. 36 [Peru: Llinguipata; Brazil: State of Amazonas, Manaus]. — Santschi, 1929, An. Soc. ci. Argent. vol. 107, pp. 301-302. — Forel, 1930, The Social World of the Ants, New York, vol. 2, pp. 66, 204-205, 295. — Menozzi, 1935, Redia, vol. 21, p. 197 [Brit. Guiana: Canister Falls, Kurupuka, Canake]. — Eidmann, 1936, Arb. phys. angew. Ent. Berlin-Dahlem, vol. 3 (2), pp. 81-83, 103, 110, Pl. 1, figs. VIII, 1-3 [Brazil: State of Rio de Janeiro, Mendes]. — Wheeler, 1942, Bull. Mus. Comp. Zool. Harvard, vol. 90, p. 207 [British Guiana: Kartabo]. — Stärcke, 1945, Ent. Ber. (264-266), vol. 11, p. 263 [Surinam: Paramaribo]. — Richter, 1945, Rev. Acad. Colomb. Cien. Ex. Fis. Nat., Bogotá, vol. 6, (22-23), p. 347-349.

Cryptocerus atratus Latreille, 1803, Hist. Nat. Crust. Ins. vol. 13, p. 280, Pl. 102,

fig. 1. — Fabricius, 1804, Syst. Piez. p. 418 [worker]. — Latreille, 1810, Consid. Gen. Crust. Arachn. Ins. p. 437. — Klug, 1824, Ent. Monogr. p. 200 [Brazil]. — Spinola, 1853, Mem. R. Acad. Sc. Torino, (2) vol. 13, pp. 63-64 [female; Brazil: State of Pará, Belém]. — F. Smith, 1854, Trans. Ent. Soc. London (2) vol. 2, p. 215, Pl. 19, fig. 1 & 2 [worker, female]. — F. Smith, 1858, Cat. Hym. Brit. Mus. vol. 6, Pl. 11, figs. 4, 5, 6. — F. Smith, 1862, Trans. Ent. Soc. London, (3) vol. 1, p. 408. — Mayr, 1863, Verh. Zool. bot. Ges. Wien, vol. 13, p. 405. — Emery, 1896, Zool. Jahrb. Syst. vol. 9, p. 637. — Forel, 1899, Biol. Centr. Amer. Hymen. vol. 3, p. 48. — Forel, 1901, Mitth. Naturhist. Mus. Hamburg, vol. 18, p. 50 [St. Thomas, Virgin Islands]. — Emery, 1905, Bull. Soc. Ent. Ital. vol. 37, p. 170 [Brazil: State of Mato Grosso, Coxipó, Urucum]. — Forel, 1906, Ann. Soc. Ent. Belg. vol. 50, p. 235 [Paraguay: San Bernardino]. — Wheeler, 1908, Bull. Am. Mus. Nat. Hist. vol. 24, p. 144. — Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 199 [Trinidad].

Cryptocerus (*Cephalotes*) *atratus* Wheeler, 1916, Bull. Am. Mus. Nat. Hist. vol. 35, p. 12 [British Guiana: Georgetown, Rockstone]. — *Mann*, 1916, Bull. Mus. Comp. Zool. Harvard, vol. 60, pp. 448-449 [Brazil: State of Pará, Belém; State of Amazonas, Manaus, Itacoatiara, Upper Rio Madeira].

Cryptocerus atratus ab. *rufiventris* Emery, 1894, Boll. Mus. Zool. Anat. Comp. Torino, vol. 91 (186), p. 4 [worker; Argentina: *Tucumán*].

Cephalotes atratus var. *nitidiventris* Santschi, 1920, Bull. Soc. Ent. France, p. 148 [worker; French Guiana: Cayenne, *Lumier River*].

Formica quadridens De Geer, 1773, Mem. Hist. Ins. vol. 3, p. 609, Pl. 31, figs. 17-20 [worker; Surinam].

Cephalotes quadridens Santschi, 1919, (nec De Geer), An. Soc. Cient. Argent. vol. 87, pp. 44-45 [Paraguay: *Santa Trinidad*; Argentina: Laishi, Formosa; French Guiana].

Cephalotes atratus quadridens Santschi, 1920, Bull. Soc. Ent. France, p. 148 [worker; French Guiana: Cayenne, St. Jean du Maroni, Camopi; Trinidad]. — Santschi, 1929, An. Soc. Cient. Argent. vol. 107, pp. 301-302.

Cryptocerus marginatus Fabricius, 1804, Syst. Piez. p. 419 [female].

Cryptocerus dubitatus F. Smith, 1854, Trans. Ent. Soc. London, (2), vol. 2, p. 216, Pl. 20, fig. 1 [male; Brazil].

Cephalotes atratus crassispinus Santschi, 1920, Bull. Soc. Ent. France, p. 148 [worker; Brazil: Mato Grosso; Argentina: Misiones, Formosa; Paraguay: Santa Trinidad].

Cephalotes atratus quadridens var. *dehnowi* Forel, 1922, Rev. Suisse Zool. vol. 30, p. 97 [worker; South America].

The differential features of this common and widespread species have already been given in the key on a foregoing page. There is hardly a fair-sized ant collection that does not contain specimens of it and the number of bibliographical references is appreciably large, as substantiated by the preceding, yet not exhaustive, list of synonymy. Among those, the following papers contain more extensively diagnostic data: DeGeer (1773: worker); Latreille (1802a: worker, female); Fabricius (1804: female); Klug (1824: female); Spinola (1853: female); Fred. Smith (1854: male); Santschi (1919, 1920, 1929). This is the only Linnaean species of the tribe.

Worker. Monomorphic. Length 8-14 mm. Black; the following fuscous-ferruginous: two semitranslucid spots on each frontal carinae, tips of tarsi.

Head subopaque; finely reticulate-punctate. Mandibles densely and finely rugose and punctured. Frontal carinae slightly diverging caudad, scarcely upturned laterad, vestigially crenulate anteriorly with only a few projecting setae, remaining part not crenulate and without setae. Occiput continuous with upper surface of head, inclined ventrad; its angles with a pair of spines. Vertex without spines nor swellings. Lower occipital border straight, carinulate. Upper surface of head and cheeks covered

with sparse oval foveolae, containing a short, scale-like, silvery, decumbent hair. Lower surface of head more coarsely reticulate-rugose and foveolate. Apical segment of maxillary palpi somewhat longer than the preceding.

Thorax subopaque. Shoulders obtusely dentate. Scapular spines strong, obliquely inclined backward, and laterad, subacuminate, the apical half more or less recurved, with a small tooth projecting from the anterior face at the bent. Median pronotal spines usually minute, vestigial or absent. Promesonotum moderately longitudinally convex, immarginate laterad. Promesonotal suture distinct. Mesonotum flat, with a minute tubercle laterally toward the posterior corner. Mesoepinotal suture distinct and impressed. The basal face of the epinotum slightly inclined forward, immarginate laterad, slightly constricted in front of the oblique, more or less divergent, straight to slightly curved epinotal spines. Entire thorax finely reticulate-punctate, with sparse setigerous foveolae, crowded and more deeply impressed on pronotum, very sparse on the pleura, leaving free spaces, which are mostly longitudinally rugose. Mesopleura with a small tooth above the anterior corner of the mid coxae. Declivous face mostly without coarse sculpture. Outer surface of fore coxae transversely striated. Legs without foveolae, but with appressed setae. Oblique setae on apical end of femora, tibiae and on tarsi.

Petiole shorter than broad, subcuboidal, densely foveolate above and on the sides, with a small sidewards projecting tubercle or tooth on each anterior corner. Ventral face strongly keeled, ending anteriorly in an obtuse tooth. Postpetiole more than 1.5 times as broad as long. Sides with a conspicuous, anteriorly angulate, posteriorly rounded swelling, the sides converging caudad. Upper face flat, with a pair of small tubercles on the anterior border. Ventral face with a large, truncate, rounded or bifid lobe, projecting ventrad and somewhat cephaled. Sculpture as on petiole.

Gaster eliptical, subopaque to subfulgid, finely reticulate-punctate, covered with larger, elongate, shallow grooves, containing a decumbent hair. Posterior half of first sternites and the exposed portion of the tergites and sternites 2-4 with sparse, suberect, pale-brownish hairs.

Female. Length up to 23 mm. Somewhat similar to the worker. Black, subopaque. Head somewhat broader than long. Mandibles strongly rugose. Clypeus much broader than long, subtriangular. Frontal carinae distinctly converging anteriorly,

not parallel not upturned laterally, slightly crenulate on anterior third, with a few projecting setae. Vertex with a pair of obtuse swellings, just in front of the subtruncate occiput. Occipital corners bituberculate. Cheeks immarginate below. Sculpture as in worker. Thorax subopaque. Pronotum immarginate cephalad and laterad. Shoulders low, bluntly angulate. Scapular spines short, stout, acute. Transverse crest of pronotum vestigial, not carinate, two median pronotal spines short, obtuse. Mesopleura with a small tooth above the mid coxa. Epinotum narrow, immarginate, laterad, spines short, incrassate at base, apices slightly diverging, their interapical distance less than 1/2 of the maximum width of thorax. Declivous face twice as long as basal face of epinotum. Sculpture as on head. Metatarsus of middle face of epinotum. Sculpture as on head. Metatarsus of middle and hind leg flattened and broadened, not as thin as in worker. Petiole short, about twice as broad as long, the upper face presenting a transverse keel. Postpetiole longitudinally, greatly convex, with a large, blunt, rounded swelling laterad, about twice as broad as long. Ventral lobe less conspicuous than in worker. Both peduncular segments coarsely and rather densely foveolate. Gaster as in worker, more elongate, sides subparallel, the microsculpture less prominent; first tergite rather fulgid discad, sparsely foveolate, the foveolae smaller than on thorax and on head. Wings infumated. Fore wing with fuscous stigma and a dark streak along the subcostal vein. Marginal cell closed and appendiculate. Submarginal cell shorter than in *Zacryptocerus clypeatus*. Transverse cubital vein absent, the cubital vein touching the marginal cell. Second abscissa of subcostal vein shorter than the section of basal vein that encloses the submarginal cell. Occasionally stubs projecting from the cubital vein into the submarginal cell and the apical field.

The male of this species has been very poorly described by F. Smith and therefore I present the following more detailed description:

Male; Brazil: State of S. Paulo, Itatiaia (J. F. Zikán) [Coll. T. Borgmeier]. — Length 13.2 mm. Median head length 1.53 mm. Weber's length of thorax 4.05 mm. Black: the following brunneous: antennae, coxae, trochanters, base of femora. Orange-brown: gaster, femora, tibiae, tarsi.

Head, without mandibles much broader than long (103:63). Mandibles finely rugulose and punctate; chewing border with distinct apical and preapical tooth. Clypeus transverse, anterior

face truncate, subperpendicular to upper surface of head, posterior half at right angles to it; horizontal. Anterior border straight, posterior border marked by a deep transverse depression in front of the antennal sockets. Entire clypeus finely shagreened. Frontal carinae scarcely expanded, divergent caudad, fading out before the posterior border of eye. Antennal scrobe indistinct. Ocelli on vertex, conspicuous, subequal to diameter of 2d funicular segment, somewhat raised above the upper surface of head. Eyes large, their maximum diameter subequal to half the median head length. Occiput subtruncate behind ocelli, immarginate above, occipital angles bearing on each side two small teeth, the anterior tooth above, somewhat behind the eye, the posterior one below, and somewhat mesad, connected by a carinule with the margination of the occipital foramen. Cheeks, occiput, lower surface of head coarsely reticulate-rugose and foveolate, the bottom of the foveolae shining. Scape shorter than half the length of the 2d funicular segment. First funicular segment shorter than broad. Second funicular segment longer than the following, except the apical segment.

Thorax subopaque, almost twice as long as maximum width (83:47). Pronotum immarginate laterad, with a minute tooth on the anterior angle, and a longer blunt tooth somewhat behind; rugose-reticulate and foveolate. Scutum convex, with deeply impressed Y-shaped Mayrian furrows, antero-mesal part deeply and densely foveolate, postero-lateral portion more sparsely and shallowly foveolate. Scutellum similarly sculptured with antero-lateral lobes almost constricted off by a deep transverse furrow immediately behind the anterior border. Basal face of epinotum shorter than declivous face, transversely convex, immarginate laterall, posterior corners with a sharp carinule, reticulate-rugose and foveolate. Declivous face finely reticulate, subfulgid, with a few faint, distinct rugulae. Sides of mesothorax finely shagreened anteriorly, sparsely, shallowly foveolate and rugose posteriorly. Metatarsi elongate, compressed.

Petiole subopaque, slightly broader than long, anterior face truncate, excavated, the sides somewhat converging behind, finely shagreened above, finely longitudinally rugose laterad, and reticulate-rugose antero-laterad. Postpetiole broader than long, sides greatly convex, subtuberculate, sculptured as petiole.

Gaster subopaque, short, fusiform, finely shagreened. Subgenital plate transverse, apical border rounded. Genitalia as represented in figures 95, 96, 97, 100, 104.

Wings leathery, infumated. Veins brunneous. Fore wings with fuscous stigma, and fuscous streak along the subcostal vein. Marginal cell closed and appendiculate. Discoidal cell extremely small. Transverse cubital vein present, cubital vein not touching the marginal cell.

Pilosity gold-brown. Antennae with dense fine pubescence. Long dense hair on head and thorax; sparse, appressed on first gastric tergite, erect on apical border of the gastric tergites and sternites.

Certain features are higly variable, even among males of the same nest. Among those are the occipital spines, which may form mere perpendicular carinule on each side, or even be quite obsolete. The same is true for the carinules on the posterior corner of the epinotum, which may occasionally be tooth-like. The sculpture in some instances is coarser than in the specimen described above. The following variability occurs in the fore wing: discoidal cell always small, sometimes minute, open or even completely absent. Stubs projecting into submarginal cell from various places of the recurrent and the cubital veins. The variability of the worker will be discussed below.

Morphological data on the larva of the worker are given in Eidmann's paper of 1936.

Distribution. The typical *atratus* occupies nearly the total range of the genus but is replaced in Panama and northern Colombia by the subspecies *erectus.* Strangely enough, I have received a single specimen taken in Honduras, Central America, which belongs to the typical form rather than to the Central American race. This species is also reported from the Island of St. Thomas, Virgin Islands. The occurrence of the present form in Honduras and on the Virgin Islands may be due to accidental introduction by man who is always upsetting the balance of nature.

Specimens examined: 489; 463 workers, 8 females, 18 males, as follows: *British Honduras*: Benque Viejo (Father Stanton): 1 worker [MCZ]. — *Colombia*: Rio Uaupés; Nov. 6, 1906 (Wm. M. Wheeler): 1 worker [MCZ]. Sasaima; (Bro. Apolinar Maria) 1 worker [CTB]. Vilavicencio; Dec. 1928 (Bro. Apolinar Maria): 1 worker [CTB]. — *Ecuador*: Cachabi (Rosenberg) 5 workers [USNM]. — *Venezuela*: State of Barinas; Jan. 1943 (D. R. Iriate) 1 worker [USNM]. Caracas; March 8, 1929: 3 workers [USNM]. Caricara, Rio Orinoco: 5 workers [USNM]. Caripito; Aug. 25, 1937 (L. F. Martorel) 3 workers [USNM]. Orinoco

Delta; Jan. 1935 (N. A. Weber); 4 workers [MCZ]. Quaicara, Rio Orinoco (Wm. M. Wheeler) 1 worker [MCZ]. San Esteban, Carabobo; Sept. 27, 1937 (G. Vivas-Berthier) 5 workers [CTB]. Yaracuy River, E. of S. Felipe de Yaracuy; Oct. 23, 1943 (McCluve) 6 workers [USNM]. — *Trinidad*: (no data); (N. A. Weber) 1 worker [MCZ]. (No data): 1 worker [USNM]. 1907 (O. W. Barret) 10 workers [USNM]. Arera Forest Reserve, S. of Arima, Dec. 12, 1934 (N. A. Weber) 3 workers [MCZ]. Brasso; Oct. 10, 1942 (E. McCallan) 9 workers [USNM]. Mopcas Valley; May 3, 1925 (F. W. Rosenberg) 6 workers [USNM]. Montserrat; June 1929 (Aug. Busck) 1 worker [USNM]. Port of Spain; June 11, 1929 (Aug. Busck) 1 worker [USNM]. Port of Spain; 1913 (R. Thaxter) 2 workers, 1 female [MCZ]. Mt. Tucuche; April 1929 (Darlington) 1 worker [MCZ]. — *British Guiana*: (locality unknown): April 4, 1901 (R. J. Creco) 4 workers [USNM]. Barakara; July 15, 1920 (Wm. M. Wheeler) 2 workers [MCZ]. Bartica; Sept. 20, 1917 (Wm. Beebe) 2 workers [MCZ]. Georgetown; July 4, 1920 (Wm. M. Wheeler) 3 workers [MCZ]. Georgetown, Botanical Garden; Sept. 26, 1918 (H. Morrison) 31 workers [USNM]. Kartabo; July-Aug. 1920 (Wm. M. Wheeler) 29 workers, 3 males [MCZ]. Kamakura (H. O. Lang) 3 workers [MCZ]. Mackenzie, Demerara River; June 22, 1927: 1 worker, 1 male [CU]. Rockstone, Potaro Landing (Lutz) 2 workers [MCZ]. — *Surinam*: Moenjo Boven, Coltica River; May 16, 1927: 1 worker [CU]. Paramaribo (Alkeyne) 3 workers, 1 female [USNM]. Paramaribo (Buenzli) 4 workers [CTB]. Zanderij I. Boven; April 27, 1927: 1 worker [CU]. — *Peru*: Azupizu, Cam. del Pechis; July 8, 1920: 1 worker [MCZ]. El Campamiento, Col. Perene; June 21, 1920 (J. C. Bradley) 2 workers [CU]. Chanchamayo; Sept. 1928 (C. N. Wolcott) 1 worker [USNM]. La Chorrera, Putumayo Distr.; Aug. 25, 1920 (J. C. Bradley) 8 workers [CU]. El Encanto, Putumayo Distr.; Aug. 25, 1920 (J. C. Bradley) 1 worker [CU]. Hda. San Juan, Col. Perene; June 23, 1920 (J. C. Bradley) 1 worker [CU]. Llinguipata (N. Holmgren) 2 workers [MCZ]. La Merced, Rio Chanchamayo; June 17, 1920 (J. C. Bradley) 2 workers [CU]. La Merced (P. Soukup) 1 worker [CTB]. Pueblo Pardo, Col. Perene; June 17, 1920 (J. C. Bradley) 10 workers [CU]. Satipo; Feb. 1945 (P. Puprzycki) 2 workers [USNM]. Rio Toara Parana, Putumayo Distr.; July 15, 1920 (J. C. Bradley) 1 worker [CU]. — *Brazil*: *State of Amazonas*: Rio Madeira, Abunã Br. (Mann & Baker) 6 workers [CWMM]. Madeira-Mamoré R. R. Co. Camp

39: 6 workers [CWMM]. S. Gabriel, Rio Negro; Aug. 1927 (J. F. Zikán) 4 workers [CTB]. Manaus (Braga) 3 workers [CTB]. Alto Purus; Nov. 1928 (Sampaio) 3 workers [CTB]. Porto Velho, Rio Madeira (Mann & Baker) 3 workers [CWMM]. Rio Purus; April 1929: 1 worker [CTB]. Rio Putumayo, Pto. America; Aug. 30, 1920 (J. C. Bradley) 82 workers [CU]. — *State of Pará*: Belém (G. Frank) 2 workers [MCZ]. Belém (W. M. Mann) 9 workers [CWMM]. Belém; May 1927: 3 workers [CTB]. Belém; Sept. 1928 (Sampaio) 2 workers [CTB]. Óbidos; Dec. 1920 (Garbe) 2 workers [CTB]. Santarém; June 1920 (Garbe) 2 workers [CTB]; Cachoeira Tronco, Rio Cuminá; Sept. 5, 1936 (Almeida) 1 worker [CTB]. — *State of Mato Grosso*: Chapada; Nov. 1 male [MCZ]. Descalvados, R. Paraguay; July 8, 1931 (J. A. G. Rehn) 1 worker [MCZ]. S. Luiz de Cáceres; 1917 (Garbe) 3 workers [CTB]. Faz. Murtinho; Nov. 1929 (Spitz) 12 workers [CTB]. — *State of Goiás*: Campinas (Schwarzmaier) 1 worker, 1 female [CTB]. Sta. Rita de Paranaíba; Aug. 10, 1926 (Schwarzmaier) 2 workers [CTB]. — *State of Pernambuco*: Tapera (Pickel, O. S. B.) 5 workers [CTB]. — *State of Bahia*: Água Preta; July 28, 1943 (Pedrito Silva) 9 males [CTB]. Ilhéus; 1909 (Garbe) 4 workers, 1 female [CTB]. — *State of Minas Gerais*: Arassuaí; April 1927 (Thieman, O. F. M.) 7 workers, 2 females [CTB]. Barro Alto; Nov. 1931 (J. Blaser) 5 workers [MCZ]. Lassance; Nov. 19, 1919: 1 male [CU]. Monlevade (Lujan) 8 workers [CTB]. Teófilo Otoni (Fonseca, Zeidler) 5 worjers [CTB]. — *State of Espírito Santo*: S. Teresa (O. Conde) 1 worker [CTB]. (locality unknown) 1906 (Garbe) 3 workers [CTB]. — *Federal District*: Rio de Janeiro, Jardim Botanico; July 1935 (H. S. Lopes) 1 worker [CTB]. — *State of Rio de Janeiro*: Niterói; Aug. 1928 (Borgmeier, O. F. M.) 1 worker [CTB]. Petrópolis (T. Barbour) 1 worker [MCZ]. Petrópolis; Oct. 1944 (W. W. Kempf) 2 workers [CTB]. Porto das Caixas; March 1925 (O. Conde) 3 workers [CTB]. — *State of S. Paulo*: Jaboticabal; 1914 (R. von Ihering) 3 workers [CTB]. Juquiá; Nov. 1929 (J. Lane) 10 workers [CTB]. Pirapora; 1912 (Garbe) 3 workers [CTB]. S. Paulo; Dec. 1929 (J. Lane) 2 workers [CTB]. Itatiaia (J. F. Zikán) 2 males [CTB]. — *Bolívia*: Cavinas, Beni; Feb. 1922 (W. M. Mann) 3 workers [CWMM]. Cachuela Esperanza, Beni; March 1922 (W. M. Mann) 6 workers [CWMM]. Rio Colorado; Sept. 1921 (W. M. Mann) 6 workers [CWMM]. Ixiamas; Dec. 1921 (W. M. Mann) 3 workers [CWMM]. Reyes; 1921-1922

(W. M. Mann) 12 workers [CWMM]. Rosario L. Rocagua; Nov. 1921 (W. M. Mann) 9 workers [CWMM]. Rurrenabaque, R. Beni; Nov. 1921 (W. M. Mann) 9 workers, 2 females [CWMM]. "Between P. Suarez & Cerrito" (Wittmer) 4 workers [CTB]. Tuiche (N. Holmgren) 3 workers [USNM]. — *Paraguay*: Paraná River (K. Fiebrig) 2 workers [MCZ]. — *Argentina*: Salta, Guemes: 2 workers [USNM].

Despite the availability of abundant material and the vast range of the present species, both Emery and Forel refrained from changing its monotypic status. Only in 1920 Santschi decided to split it up into infraspecific categories, subspecies and varieties. However, far from clarifying the classification of *atratus*, Santschi only succeeded in producing one of the most intricate systematic tangles in the Cephalotine tribe. In order to explain the changes, which in my opinion, have to be made, I wish to comment briefly on Santschi's procedure.

His first step consisted in reviving, in 1919, *Formica quadridens* DeGeer as an independent species; although DeGeer himself, as well as all the subsequent workers, had always considered this form to be identical with *atratus* (L.). Santschi, however, maintained that the typical *quadridens* lacks the small median pronotal teeth, between the large scapular spines, which, to the contrary, are always more or less well developed in the typical *atratus*. It is very improbable that he had seen the specimens, upon which DeGeer had based his diagnosis, but at any rate he did not read carefully DeGeer's description, where it is expressly stated that "... entre ces deux longues épines le corcelet en a encore deux autres petites et très courtes..." DeGeer's figures do not exhibit these median spines, and it is possible, that Santschi drew his information from the figures alone. Whatever may have been the reasons for this mistake, it is evident that *quadridens*, as defined by Santschi, is by no means identical with *quadridens* DeGeer, and the former falls as a homonym of the latter.

In the next year Santschi changed his ideas to some extent, and he began to divide *atratus* into a number of races and varieties. His own *quadridens* was reduced to subspecific rank, and aside from *atratus* s. str. another subspecies, *crassispinus* and two varieties, one *nitidiventris*, subordinated under *atratus* s. str., the other var. *erecta* under *quadridens*, were established. In the same paper Santschi presented a brief diagnosis of these 5 forms and also appended a key for all known members of *Cephalotes*. Finally in 1922 Forel, encouraged by the former author's bad example, added another variety, var. *dehnowi*, which he associated with *quadridens* Santschi.

Although Santschi insisted upon the workability of his system, practical taxonomic experience, to the contrary, proves that it is far from being satisfactory. It may appear serviceable to some extent in the case of identification of single isolated individuals. But as soon as larger series of the same next are examined, in most cases it becomes evident that the diagnostic characters worked out by Santschi do not separate true races but various more or less common phaenotypes of the same form. Yet it must be admitted that not all the aforesaid infraspecific forms are equally affected by the same difficulties.

The strongest objection, in my opinion, is against the subspecies *quadridens* and the variety *nitidiventris*. First of all, they do not agree with distributional data, since, even according to Santschi himself, *atratus*

s. str., *quadridens,* and var. *nitidiventris* may occur in the same locality. Furthermore, during my studies I have examined a large series of 80 workers of the same nest of all sizes, which according to Santschi's keys and descriptions, had to be associated with the var. *nitidiventris.* But, at the same time, even among the larger individuals, some did occur which lacked the median pronotal spines completely and thus keyed out at *quadridens.* Wheeler in 1925, already had pointed out this fact. But still in 1929, Santschi maintained that the character of the median spines was absolutely invulnerable in the case of distinguishing between larger specimens of *atratus* var. *nitidiventris* and *atratus quadridens.* But even this does not hold true, as I have convinced myself by examining several hundred specimens. Consequently *atratus quadridens* cannot be distinguished from the var. *nitidiventris,* and falls as a synonym. The variety *nitidiventris* again is just a sporadically occuring colony-bound variant, which differs from the typical *atratus* exclusively by a slightly more shiny integument, due to a somewhat less pronounced microsculpture. It cannot be elevated to subspecific rank since it is impossible to bring it in accordance with distributional and ecological data.

The other two forms, *crassispinus* and *quadridens* var. *erecta* at least do not offer conflicts from a geographical and distributional viewpoint. As far as *crassispinus* is concerned, I have indeed seen specimens from Mato Grosso and Argentina which agree with the characters assigned by Santschi to this race. This, however, applies only to very large workers. In more than 50 per cent of all cases, the separation cannot be made and for this reason I see no advantage in maintaining this subspecies. The variety *erecta,* to the contrary, may be circumscribed both morphologically and geographically and deserves subspecific status. It will be treated further on.

Forel's variety *dehnowi* is based upon a single specimen from an unknown locality somewhere in South America. I have not seen the type nor can I find an elucidating clue in the description. Unless it represents a different species, it should be dropped since it will be extremely difficult to base a race on it.

The present species is quite variable, especially as far as the projections of the exoskeleton and the degree of sculpture are concerned. Some variants are strictly individual, correlated with differential growth and heterogony; others affect the entire population of a nest, not yet attaining the distinctiveness required for establishing systematic categories.

It is even possible to discover certain relationship in, and interdependence of, morphological characters. Thus, small individuals, as a rule, do not develop the median small pronotal teeth. Large individuals seldom lack them. The habitus of the epinotal spines is somewhat indicative of the condition found on the pronotum. Individuals with well developed median-pronotal spines have the epinotal spines incrassate basad, sometimes approaching one another; whereas in specimens that lack the median pronotal teeth, the epinotal spines are slender and well separated from one another. The antero-lateral, rather sharp denticule of the scapular spines is more distinct in small specimens and tends to become obsolete in specimens in which both scapular and epinotal spines are incrassated. Furthermore, also the other characters used by Santschi, such as the direction of the sides of the head, the inclination of the epinotal and scapular spines, the more or less confluent foveolae are signs of individual, *resp.* nest variability, and by no means can be used as taxonomic characters. Another quite variable feature is the ventral lobe of the postpetiole, the apex of which may be rounded, pointed, bifid or truncate in members of the same nest. Finally, the

degree of opaqueness and fulgidness is a problem all by itself. Generally it seems to be restricted to the entire population of the nest, and is perhaps caused by ecological factors, on account of its highly irregular distribution. It should be noted, however, that none of the specimens south of the range of the here recognized subspecies *erectus* possesses the high degree of smoothness and fulgidness of that race. Only a few individual, from Ecuador, 5 workers, make an exception in this respect, having a perfulgid and smooth first gastric tergite. They also lack the median pronotal tubercles, possess very long, slender, accuminate epinotal spines, and the foveolae on mesopleura and laterotergites of the pronotum are extremely sparse. As a matter of fact, these specimens are not quite either one of the recognized forms; but, since all are from the same nest, and other material from that region was unavailable to me, for the time being I do not want to separate them from the typical *atratus*.

The possible relationship of the present species with *decemspinosus* will be discussed under that species. The ecology has been discussed in the introduction to the genus.

3. *Cephalotes atratus erectus* Santschi

Cephalotes atratus quadridens var. *erecta* Santschi, 1920, Bull. Soc. Ent. France, p. 149 [worker; Panama: Darien].

The members of this race are characterized by the perfulgid first gastric tergite, the microsculpture of which is practically obsolete discad. The epinotal spines, even in larger specimens, are always shorter than the basal face, and much more erect than in the typical *atratus*. Moreover there is little tendency for incrassation of the spines basad, and the denticules of the scapular spines are always distinct. A single female from Panama, the exact locality being unknown, appears to belong to the same race and it is characterized by the less tumid epinotal spines, and, above all, by the very smooth and fulgid surface of the first gastric tergite, the smoothness not being restricted to the discal portions.

Type. — Worker; Panama (Canal Zone?) Darien (F. Geay) [Muséum de Paris].

Although the differences between this form, described as variety, and the typical *atratus*, are very slight, especially when considering the extreme variational range of that form, I have, nevertheless, recognized this category, since rather abundant material from Panama, the Canal Zone and Northern Colombia form a rather homogeneous group, agreeing with Santschi's description except that the fact of the absence and presence of the median pronotal spines is of no importance. The Colombian specimens are somewhat intermediate between this race and the typical form, as far as the sculpture of the gaster is concerned,

i. e. is slightly more distinct than in the Panamanian *erectus,* but the habitus of the epinotal spines seems to associate them with this subspecies.

Specimens examined: 61; 60 workers and 1 female, as follows: *Panama*: Bella Vista; April 3, 1923 (Shannon): 1 worker [USNM]. Bella Vista; Feb. 21, 1923 (Wm. M. Wheeler): 3 workers [MCZ]. Cano Saddle, Gatun Lake; May 8, 1923 (R. C. Shannon): 1 worker [USNM]. Colon; 1907 (Aug. Busck): 1 worker [USNM]. Chilitre R.; Feb. 26, 1923 (Wm. M. Wheeler): 3 workers [MCZ]. Porto Belo; Feb. 17, 1911; March 6, 1911 (E. A. Schwarz): 2 workers [USNM]. Porto Belo; April 4, and March 3, 1912 (A. Busck): 2 workers [USNM]. Punta Paitea; Feb. 7, 1924 (Wm. M. Wheeler): 3 workers [USNM]. (no locality given) "Panama": 1 female [USNM]. — *Canal Zone*: Alhajuelo; March 7, 1912 (A. Busck): 3 workers [USNM]. Ancon (H. F. Dietz & Molino): 10 workers [USNM]. Near Balboa; Aug. 29, 1946 (N. L. H. Kraus): 1 worker [USNM]. Barro Colorado Island; April 7, 1911 (E. A. Schwarz); July 24, 1924 (Wm. M. Wheeler); Jan. 1947 (N. L. H. Kraus): 8 workers [USNM & MCZ]. Indio Hydrographic Station; Oct. 1946 (N. L. H. Kraus): 1 worker [USNM]. Tabernilla (Aug. Busck: 1 worker [USNM]. — *Colombia*: Rio Frio (H. W. Atkinson): 9 workers [USNM]. Santa Anna; Feb. 1924 (Wm. M. Mann): 11 workers [USNM].

4. *Cephalotes decemspinosus* Santschi

(Figs. 94, 103)

Cephalotes decemspinosus Santschi, 1920, Bull. Soc. Ent. France, p. 148 [worker; French Guiana: St. Jean du Maroni].
Cephalotes decemspinosus var. *spissus* Santschi, 1929, An. Soc. Cient. Argent. vol. 107, p. 302 [worker; Dutch Guiana: Surinam, Lucie Rio Gebrid].

This species differs from *atratus* by the dense pile covering the entire lower surface of the gaster, the crowded, more or less confluent foveolae of pronotum and mesonotum, the long median pronotal spines, which are longer than the half of their interbasal distance.

Type. — Worker; French Guiana: St. Jean du Maroni (E. le Moult). [Coll. Santschi; Coll. T. Borgmeier].

Worker (lectotype) [Coll. T. Borgmeier]. Length 14 mm. Median head length 3.17 mm. Weber's length of thorax 4.58 mm.

Santschi's description not only exhausts the possibility of

bringing out the difference between the present species and *atratus* but even is likely to encover the extremely close similarity between them. Aside from the characters mentioned above, only the long, suberect epinotal spines may be used as diagnostic features. The single syntype (lectotype) specimen differs from the description by not having the petiole slightly longer than broad (16:19!); although it is indeed a little more slender, less pronouncedly tuberculate laterad than in *atratus,* but equally distinctly tuberculate above as in *atratus.* The dorsal outline of the thorax is definitely stronger angulate. I have presented a figure of the thorax.

I have relegated to synonymy the variety *spissus* Santschi even though I have not seen the types nor any other specimens corresponding with it. But the differential diagnosis presents only and exclusively characters which in *atratus* discriminate individuals of the same colony, and are insufficient to establish a valid systematic category. For this reason I do not recognize this variety.

Furthermore, as already mentioned under *atratus,* the taxonomic status of *decemspinosus* itself is not without doubt and may eventually have to be modified. Among the large number of specimens of *atratus* I have come across several individuals which, in one or more details, come very close to the condition obtained in *decemspinosus.*

Thus in a series of 9 workers of *atratus* from Pará, Brazil (Coll. Wm. M. Mann) one individual shows rather large, but slender, median pronotal spines, denser pile beneath the gaster, the foveolae on mesothorax rather crowded, the upper profile of the thorax more angulate; in short, reaching a condition which is strictly in between the typical *atratus* and *decemspinosus.* The remaining 8 individuals have the same characters, but in a lesser degree, definitely more on the *atratus*-side.

A single worker from Rio Uaupés, Colombia (Coll. Wheeler) possesses similar characteristics, as the preceding worker from Pará, and also greatly erect epinotal spines of *decemspinosus.* The gaster, however, is peculiar, in being almost completely smooth, infuscated, yet appearing cherry-red under the microscope. It is probably a callow specimen.

To be sure, none of the aforesaid specimens attains exactly the features of *decemspinosus,* but it is possible that further collecting will turn up more intermediate specimens, and definitely

establish the fact that even this form is nothing but a heterogonic variant of *atratus*.

5. *Cephalotes placidus* (F. Smith)

Cryptocerus placidus F. Smith, 1860, Journ. Ent. vol. 1, p. 76 [male; Brazil: State of S. Paulo, S. Paulo]. — F. Smith, 1862, Trans. Ent. Soc. London, 3, vol. 1, Pl. 12, fig. 4 [male].
Cephalotes placidus Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 304.

Type. — Male; Brazil: State of S. Paulo, S. Paulo. [Presumably in the British Museum (Natural History)].

The status of the present form already has been discussed in the introduction to the genus.

III. Genus EUCRYPTOCERUS, n. g.

Eucryptocerus, n. gen.

Cryptocerus [in part] Spinola, 1853, Mem. R. Acad. Sc. Torino, (2) vol. 13, p. 48.
Cephalotes [in part] Emery, 1914, Ann. Soc. Ent. Belg. vol. 58, pp. 37-39.

Type of the genus: *Cryptocerus oculatus* Spinola, 1853 [= *Eucryptocerus oculatus* (Spinola)].

Generic diagnosis

The members of the present group, hitherto assigned to *Cephalotes*, differ from that genus by the following characters:

General body size less variable, averaging smaller, between 7.5-9.0 mm. Eyes globose, strongly projecting, situated behind the antennal scrobe. Frontal carinae with a small laterally projecting tooth in front of the eyes. Last segment of the maxillary palpi elongate, almost twice as long as the preceding segment. Thorax compact; mesonotum transverse, usually distinctly shorter than wide. Middle and hind metatarsi prismatic, never plate-like, nor foliaceous. Petiole cylindrical, usually shorter than wide, without dorsal or lateral projections, teeth, or spines; its anterior face perpendicularly truncate; the ventral face with a distinct antero-median, blunt, small tooth. Postpetiole transverse, its sides converging behind without dorsal or lateral teeth, nor projections. First gastric tergite completely covering the gaster from above, its posterior border hardly set off from the lateral border, in lateral aspect both are subcontinuous. Integument opaque, finely but rather sharply and densely punctured throughout.

They agree with *Cephalotes* by having strictly monomorphic

workers, the head of which has greatly expanded frontal carinae, covering the cheeks from above. Occipital corners with a pair of spines, vertex usually with a pair of small teeth. Prothorax with large scapular spines and usually with a pair of intermediate small teeth. Mesonotum without any lateral projections. Epinotum with usually long, divergent and slightly raised spines. Femora and tibiae long.

The sexual forms of all three known species of the genus are still unknown. However, it is very probable that *Cryptocerus serraticeps*, described upon a female specimen by F. Smith in 1858, belongs to the present genus, and may even represent the female caste of any of the three other species, known only in the worker caste.

Component species. Eucryptocerus includes the following species:

1. *E. abdominalis* (Santschi), 1929.
2. *E. oculatus* (Spinola), 1853.
3. *E. opacus* (Santschi), 1920.
4. *E. serraticeps* (F. Smith), 1858.

All these species, which form a rather homogeneous group, have been taken only in small numbers and their respective ranges of distribution are imperfectly known and the extent of their morphological variability is poorly understood. I have not seen any type specimens but all the 10 specimens which I have examined were divisible into three diverse groups corresponding with the three already described forms. Unfortunately Santschi's species are very poorly diagnosed; and moreover, some of the differential characters presented by that author most certainly coincide with features that are subject to heterogonic growth and individual variability.

Distribution. According to the presently known record, the genus ranges from the Amazon basin in Brazil and the adjacent regions of Bolivia and Peru as far north as the coastal French Guiana. The subjoined key will serve to separate the workers.

Key to Species

1. Interocular width larger than maximum length of head (as measured from the most anterior portion of the frontal carinae to the apex of the posterior, internal occipital spine); mesonotum and epinotum slightly bordered laterally..... 2. *oculatus* (Spinola)
— Interocular width smaller than maximum length of head; mesonotum and epinotum not distinctly bordered laterally..... 2

2. Gaster distinctly emarginate anteriorly, the emargination receiving the postpetiole..... 3. *opacus* (Santschi)
— Gaster not emarginate anteriorly, its anterior borders not protracted in front, at the sides of the postpetiole.... 1. *abdominalis* (Santschi)

1. *Eucryptocerus abdominalis* (Santschi)

(Fig. 115)

Cephalotes abdominalis Santschi, 1929, An. Soc. Cien. Argent. vol. 107, p. 302 [worker; French Guiana: St. Jean du Maroni].
Cephalotes oculatus [in part] Borgmeier (nec Spinola) 1937, Arch. Inst. Biol. Veget. vol. 3 (2), pp. 242-243 [Brazil: State of Pará, Rio Cuminá].

This species may be readily distinguished from *opacus* and *oculatus* by the shape of the gaster, which lacks the baso-lateral lobes and the antero-median emargination to receive the postpetiole.

Type. — Worker; French Guiana: St. Jean du Maroni; 1914 (Benoit). [Coll. Santchi (?)].

Two workers, one from Rio Cuminá, State of Pará, Brazil, 1928 (A. Sampaio leg.) [CTB], the other from Rurrenabaque, Rio Beni, Bolívia, 1921 (Wm. M. Mann leg.) [CWMM], seem to belong to this species, inasmuch as both present the distinctive features of the gaster, which are absent in the other two species of the genus.

Length 7.8-8.3 mm. Head subquadrate. Distance between the most anterior portion of the frontal carinae and the apex of the internal occipital spine subequal to, or slightly longer than, the interocular width of the head. Vertex with a paired swelling representing the vestiges of the vertical teeth. Upper surface of head finely shagreened, rather sparsely and shallowly foveolate. Pronotum [Fig. 115] above similarly sculptured. Pair of median pronotal teeth absent, or, at most vestigial. Mesonotum submarginate laterad. Basal face of epinotum immarginate laterad. Epinotal spines much shorter than basal face. Metatarsus of middle and hind legs somewhat broader than deep. Petiole subcylindrical, slightly broader than long. The median antero-ventral tooth small, inconspicuous. Gaster rounded in front without a median emargination and antero-lateral crests or lobes.

Both specimens disagree with Santschi's description by the proportions of the head and the peduncular segments, and the sculpture of the upper surface of the head. However, as far as the measurements are concerned, I believe that Santschi's data are based upon mere estimates, since, if strictly interpreted, they

would indicate an unusual condition for an ant of the present group.

2. *Eucryptocerus oculatus* (Spinola)

(Figs. 108, 112, 113, 114)

Cryptocerus oculatus Spinola, 1853, Mem. R. Acad. Sc. Torino (2) vol. 13, p. 48 [worker; Brazil: State of Pará, Belém]. — F. Smith, 1862, Trans. Ent. Soc. London (3) vol. 1, p. 408. — Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 199 [worker; Brazil: State of Pará, Belém]. — Wheeler, 1916, Bull. Am. Mus. Nat. Hist. vol. 35, p. 11 [worker; British Guiana: Kaieteur].
Cryptocerus (Cephalotes) oculatus Mann, 1916, Bull. Mus. Comp. Zool. Harvard, vol. 60, p. 409 [worker; Brazil: State of Pará, Belém].
Cephalotes oculatus Emery, 1914, Ann. Soc. Ent. Belg. vol. 58, p. 39. — Santschi, 1920, Bull. Soc. Ent. France, p. 149. — Borgmeier, 1937, Arch. Inst. Biol. Veget. vol. 3 (2), pp. 242-243 [worker; Brazil: State of Pará, Belém].
Cryptocerus aethiops F. Smith, 1854, Trans. Ent. Soc. London, (2) vol. 2, p. 216, Pl. 20, fig. 9 [worker; Brazil].

The distinctly transverse head and the narrow prismatic metatarsi of the middle and hind legs stamp *oculatus* as a discrete species.

Type. — Worker; Brazil: State of Pará, Belém; 1846 (M. Ghiliani). [Coll. Spinola, Turin Museum, Italy, if still extant].

Worker. Length 7.7-8.9 mm. Distance between the most anterior projection of the frontal carinae [Fig. 108] and the apex of the internal occipital spine somewhat shorter than the interocular width. The pair of teeth on the vertex well developed. The internal occipital spines sometimes obliquely truncate or bidenticulate at apex. Upper surface of head foveolate only on posterior half, the foveolae, rather deeply impressed behind the vertical teeth. Lower surface of head with large and deeply impressed areoles. Thorax [Fig. 112] more sparsely and shallowly foveolate. Scapular spines strong. Median pronotal spines well developed. Mesonotum submarginate laterad. Basal face of epinotum rather flat, its sides marginate in front. Epinotal spines strong, usually as long as the basal face, somewhat divergent and raised upward. Metatarsus of middle and hind legs prismatic, almost as deep as broad. Petiole [Figs. 113, 114] broader than long, antero-midventral tooth distinct. Postpetiole much broader than long; its sides converging caudad. Gaster emarginate in front, the first tergite subfulgid discad, antero-laterally with projecting, large angulate lobes [Fig. 114]. Erect setae confined to femora, mandibles, lower surface of head and gaster.

Spinola states in his otherwise very good description of the type, that the epinotal spines are very little divergent. This condition does not exactly obtain in all the specimens which I have examined; in most of them the spines are very distinctly divergent.

Distribution. Presently this species is still known only from its type locality.

Specimens examined: 5 workers, all taken at, or near to, Belém do Pará, Brazil, as follows: 1 worker (Spitz) [CTB]. 1 worker (Arnold) [MCZ]. 3 workers (Wm. M. Mann) [CWMM].

3. *Eucryptocerus opacus* (Santschi)

(Fig. 107)

Cephalotes opacus Santschi, 1920, Bull. Soc. Ent. France, pp. 147-148 [worker; French Guiana: St. Jean du Maroni].

The present species differs essentially from the preceding *oculatus* only by the different proportions of the head, the lack of lateral margination on mesonotum and epinotum, and the rather broad metatarsi of the middle and hind legs.

Holotype. — Worker; French Guiana: St. Jean du Maroni (E. le Moult). [Coll. Santschi (?)].

Dr. J. C. Bradley, during the Cornell University expedition in South America (1920) collected 2 specimens at La Sombra, Peru, and a single worker at Rio Toara Parana, Putumayo, Brazil, which have to be referred to this species.

Length 7.8-8.7 mm. The specimen from Rio Toara and the smaller individual from La Sombra agree with one another in the following features: The pair of teeth on vertex well developed. The upper surface of head [Fig. 107], thorax and peduncle very strongly foveolate, the pits deeply impressed. Epinotal spines longer than basal face, somewhat raised and divergent. Metatarsus of middle and hind legs almost twice as broad as deep.

The other specimen from La Sombra, taken at the same time, and possibly from the same nest, lacks the pair of small teeth on vertex, the coarse sculpture of head, thorax, and peduncle. Furthermore, the epinotal spines are much shorter than the basal face and the general appearance of the thorax approaches the condition described under *abdominalis*. The metatarsi are slightly narrower.

Only the single specimen from Rio Toara possesses strong scapular spines and a well developed median pair of pronotal teeth.

All specimens agree by having the same head proportions as *abdominalis,* and the gaster as in *oculatus,* and by lacking any visible lateral margination on mesonotum and epinotum, which are the essential characters assigned to this species by Santschi.

4. *Eucryptocerus serraticeps* (F. Smith)

Cryptocerus serraticeps F. Smith, 1858, Cat. Hym. Brit. Mus. vol. 6, p. 188; Pl. 11, fig. 7 [female; Brazil: State of Amazonas, Egas (=Tefé)].
Cryptocerus (*Cryptocerus*) *serraticeps* Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 310.

Type. — Female; Brazil: State of Amazonas, Egas (=Tefé). (H. W. Bates) [British Museum (Natural History)].

Smith's original diagnosis is as follows:

Female. — "Length 6 lines. — Jet-black: head depressed, slightly convex at the vertex; ocelli distinct; strongly punctured and slightly shining; the lateral margins elevated and finely serrated; deeply emarginate anteriorly; antennae short, thick and clavate, the extreme apex ferruginous. Thorax shorter than the abdomen, the disk shining, with large scattered punctures; the lateral angles of the prothorax with a short, stout, acute spine; the metathorax with two short, straight, thick spines; wings hyaline, the nervures thick, and of a blackish-brown; a fuscous cloud occupying the marginal cell, and passing beyond to the apex of the wings; a narrow fuscous stain traverses all the nervures of the wings, the stigma black; the femora and tibiae with their sides flattened, four-sided, with a few scattered pale setae. Abdomen oblong-ovate very smooth and shining, with scattered delicate punctures; the apical segments roughened, with their margins smooth and shining".

Worker and male unknown.

This insect appears to be known only from the single type specimen in the British Museum. The only author, beside F. Smith, to make mention of it, is Carlo Emery who, in 1922, placed *serraticeps* in the *angustus*-group of *Cryptocerus*, s. str. [=*Paracryptocerus (Harnedia)*]. It is very improbable that Emery did see the type. In placing this species he must have been led by the description and figure of F. Smith alone. Although I do not possess any other evidence aside from the information available to Emery I cannot agree with his interpretation of the data. The shape of the head disc, the flattened "four-sided" femora and tibiae, and the wing venation are in absolute discord with the features found in the species of the *angustus*-group. Moreover the subglobose, unarmed peduncular segments are strikingly similar to those of the workers of *Eucryptocerus*. This character, in combination with all the other features mentioned in the original diagnosis, seems to furnish enough evidence for associating *serraticeps* with the present genus, and, as already mentioned above, it may even prove to be the female of either *oculatus*, or *abdominalis* or *opacus*.

I also like to mention that, according to Smith's figure, the venation of the fore wing of *serraticeps* offers a few outstanding peculiarities: A transverse cubital vein is absent, as in *Zacryptocerus*, and usually in *Cephalotes*. Instead the cubital vein fuses directly with the marginal vein, for a distance that exceeds the length of the first abscissa of the marginal vein, and then, distad, recovers its independence in the

apical field. This feature is rather unique for a member of the Cephalotine tribe, and may possibly constitute a good generic character for the present group.

IV. Genus ZACRYPTOCERUS Wheeler

In "A Skeleton of a New Arrangement of the Families, Subfamilies, Tribes and Genera of the Ants, or the Superfamily Formicoidea" Wm. A. Ashmead [17] erected in his subfamily Cryptocerinae (equivalent to the actual tribe Cephalotini) a new genus, *Zacryptocerus,* with *Cryptocerus multistrigus* F. Smith as its type. Wheeler, in "A List of the Type Species of the Genera and Subgenera of Formicidae" [18] points out that such a species does not exist and remarks, in a footnote, that he regards this name as a clerical error for *Cryptocerus clypeatus* Fabricius, because some years before, he had received from Ashmead a specimen of the latter, labeled *"Zacryptocerus"*. A few years later Emery [19] declares that he recognizes the genus *Zacryptocerus* Ashmead, the type species of which "according to Mr. Wheeler" is *Cr. clypeatus* Fabricius. Finally, in 1922, in the Myrmicinae section of the Genera Insectorum [20] Emery introduces Wheeler as the nomenclatorial author of the genus, presenting it in the following manner: *Zacryptocerus* (Ashmead) Wheeler.

There can be no doubt that, according to article 25 a of the International Rules on Zoological Nomenclature, *Zacryptocerus* Ashmead must be considered as a *nomen nudum,* since it is not accompanied by a definition, diagnosis or bibliographical reference. Nor can the type designation contribute toward its validity, since it is based upon a non-existant species. Hence *Zacryptocerus* becomes a name of nomenclatorial standing only through Wheeler's publication of 1911, when this author, for the first time, associated it with a legitimate species, *Cr. clypeatus* Fabricius. Consequently Wheeler, not Ashmead, is the author of the genus, which is monobasic, due to the fact, that, when firstly proposed, only a single species, the aforesaid *Cr. clypeatus*, was expressly referred to it.

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[17]) Ashmead, 1905. Canad. Entom. vol. 27, p. 384.
[18]) Wheeler, 1911. Ann. N. Y. Acad. Sc. vol. 21, p. 175.
[19]) Emery, 1915. Bull. Soc. Ent. France, p. 192.
[20]) Gen. Insect. Formicidae, Subf. Myrmicinae, fasc. 174c, p. 304.

Zacryptocerus Wheeler

Cryptocerus [in part] Fabricius, 1804, Syst. Piez. p. 420.
Cephalotes [in part] Emery, 1914, Ann. Soc. Ent. Belg. vol. 58, p. 39.
Zacryptocerus (Ashmead, 1905, Canad. Entom. vol. 27, p. 384). Wheeler, 1911, Ann. N. Y. Acad. Sc. Vol. 21, p. 175 and footnote. — Emery, 1915, Bull. Soc. Ent. France, p. 192. — Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 304.

Type of the genus: *Cryptocerus clypeatus* Fabricius, 1804 [=*Zacryptocerus clypeatus* (Fabricius)]. Monobasic.

Generic Characters

The translucid laminate border around the first gastric tergite of the worker serves as the most obvious differential feature, distinguishing *Zacryptocerus* from all other cephalotine ants, with the exception of *Paracryptocerus* (*H.*) *foliaceus* (Emery). However, it differs from the latter by the absence of pronounced dimorphism in the worker caste, the presence of conspicuous, upturned pronotal and epinotal spines, contained within the translucid laminate border of the thorax, and the sharp, spine-like occipital corners of the head. The general color, which is ochraceous, and the pale yellowish maculae, surrounded by a fuscous ring, on the basal and apical corners of the first gastric tergite are sufficient for recognizing the female. The male may be readily identified by the infuscated head and thorax, the testaceous, polished gaster, and the venation of the forewing, lacking a transverse cubital vein, the cubital vein touching the closed and appendiculate marginal cell.

Worker. — Scarcely dimorphic. Medium to large forms, ranging from 5.5-10.5 mm. Ochraceous to dark yellowish brown. Head transverse, broader than long. Apices of mandibles obliquely bent ventrad and mesad, the line of curvature marked by an oblique carinule above. Clypeus retracted between the anterior extension of the greatly expanded frontal carinae, which are subparallel to moderately divergent caudad and somewhat upturned laterad. Eyes small, situated behind the antennal scrobe, on a stalk, which is dorsally united with the frontal carinae. Head disc moderately convex. Occipital border with a semitransparent crest. Occipital corners forming an acute, spine-like angle on each side. Cheeks marginate beneath. Occiput not truncate. Scape short, cylindrical at base, thickened distad. Last three funicular segments longer than the remaining ones. Thorax with lateral expanded, more or less upturned translucid laminate border. Border of pronotum containing a large recurved lateral spine. Border of mesonotum separate, small, tooth-like. Laminate border

of epinotum larger, margins rounded, containing, at least in larger specimens, a distinct epinotal spine. Mesoepinotal suture vestigial. Basal face of epinotum not distinctly set off from declivous face. Petiole and postpetiole short, transverse, with lateral, membranaceous spines. Gaster subcircular to eliptical. First gastric tergite covering the remaining segments from above, completely surrounded by a translucid laminate border, which is slightly notched mesally, behind. Larger workers with an entire or partial transverse crest on pronotum.

Female (known only from *clypeatus*). — Clypeus triangular, about as long as broad. Clypeal emargination narrow. Frontal carinae broader anteriorly, subhyaline, sides subparallel, somewhat upturned. Eyes behind the antennal scrobe, not stalked, close to the occipital corners. Ocelli situated on the lateral wall of large, deeply impressed pits. Behind the ocelli, two short, stout acute spines. Occipital angles spinose. Lower border of cheeks marginate and carinulate. Thorax compact, less than 1.5 times as long as broad. Pronotum marginate and crested anteriorly and laterally, with a transverse pronotal crest; without scapular or median spines. Lower mesopleura without a small tooth. Epinotum not constricted, marginate laterad, the basal face extremely short, with crested, subacute, posterior corners. Petiole and postpetiole about three times as broad as long. Gaster elongate, without an antero-lateral plate-like border, but with a blunt, rounded immarginate lobe, on each side of the postpetiole. Erect pile absent, except on mandibles, and a very short setal brush projecting from the anterior border of the clypeus. Wings subhyaline, with an infuscated marginal cell. No transverse cubital vein in fore wing.

Male. About 8 mm. long. Head, thorax, peduncle black and finely reticulate-punctate and opaque; gaster yellow, smooth and fulgid. Mandibles with a longitudinal ridge, apical end strongly bent and twisted. Anterior face of clypeus not truncate, evenly and moderately convex. Head transverse, shorter than wide. Lateral ocelli larger than the median ocellus. Frontal carinae forming a sharp triangular tooth between the antennal sockets. Occipital corners not angulate, without a spine or tooth. Thorax, short, compact and bulging. Sides of pronotum form without a scapular tooth on each side. Peduncle fulgid. Postpetiole distinctly convex above in profile. Claws stout. Wing venation as in female; no transverse cubital vein present in fore wing, the cubital vein touching the marginal cell.

The genus *Zacryptocerus* contains only two species, which are, however, the most exquisite and bizarre representatives of the tribe. The group, due to the reduced number and the distinctiveness of its members does not offer any systematic problem at the present time.

These ants are strictly Neotropical in their distribution and are entirely confined to South America, ranging from Venezuela south to Paraguay and northern Argentina. Nevertheless only *clypeatus* is to be found over most of this vast territory, whereas *membranaceus* seems to be restricted to the coastal belt of southeastern Brazil, from Espírito Santo to Rio de Janeiro, where it apparently replaces the former species. The following key will serve for the identification of the workers:

Key to the species for workers

1. Head, thorax and gaster smooth, fulgid, more or less transparent; gaster eliptical with upturned subhyaline border; eye-stalk completely attached to the lower surface of the frontal carinae..... 1. *clypeatus* (Fabricius)

— Head, thorax and gaster finely, densely and sharply punctured, opaque; gaster subcircular, with broad, sculptured, horizontal border; apical end of eye-stalk free from the frontal carinae... 2. *membranaceus* (Klug)

1. *Zacryptocerus clypeatus* (Fabricius)

(Figs. 105, 109, 111)

Cryptocerus clypeatus Fabricius, 1804, Syst. Piez.. P. 420 [worker; South America]. — Klug, 1824, Ent. Monogr. pp. 207-208 [worker; Brazil: State of Pará, Belém]. — Smith, 1854, Trans. Ent. Soc. London, (2) vol. 2, p. 217, Pl. 21, figs. 1, 2, 5, 6 [female; male; Brazil: State of Pará, Santarém]. — F. Smith, 1862, Trans. Ent. Soc. London, (3) vol. 1, p. 408, pl. 12, fig. 3 [worker]. — Emery, 1905, Bull. Soc. Ent. Ital. vol. 37, p. 170 [Brazil: State of Mato Grosso: Coxipó; Paraguay: Puerto Bertoni; Argentina: Chaco, Formoso]. — Forel, 1906, Ann. Soc. Ent. Belg. vol. 50, p. 235 [worker, soldier, female, male; Paraguay: San Bernardino]. — Forel, 1908, Verh. Zool.-bot. Ges. Wien, vol. 58, p. 354 [worker; Brazil: State of S. Paulo, S. Paulo].

Zacryptocerus clypeatus Wheeler, 1911, Ann. N. Y. Acad. Sc. vol. 21, p. 175. — Emery, 1915, Bull. Soc. Ent. France, p. 192. — Santschi, 1916, Physis, vol. 2, p. 283 [Paraguay: Santa Trinidad]. — Emery, 1922, Gen. Insect. Hym. fasc. 174c, pl. 6, fig. 4 [worker]. — Forel, 1930, The Social World of the Ants, New York, vol. 1, p. 51; vol. 2, p. 293, 295. Pl. 16, fig. a-c. [worker, female, male].

Cephalotes clypeatus Emery, 1914, Ann. Soc. Ent. Belg. vol. 58, p. 39.

Cryptocerus (Zacryptocerus) clypeatus Wheeler, 1916, Bull. Mus. Comp. Zool. Harvard, vol. 60, (8), p. 326 [Trinidad: Port of Spain]. — Mann, 1916, Bull. Mus. Comp. Zool. Harvard, vol. 60, p. 449 [Brazil: State of Pará, Santarém; State of Amazonas: Itacoatiara, along the Rio Madeira].

This distinctive species differs from *membranaceus* by the features already pointed out in the key.

Type. — Worker; South America. [Mus. Dom. de Sjoestedt, if still extant].

Worker [Fig. 105]. — Length 6.5-10.0 mm. Ochraceous to yellowish brown. Head, thorax and gaster fulgid, sparsely covered with small, shallow foveolae, each containing a minute decumbent, scale-like hair. Head transverse, broader than long. Mandibles densely punctate-rugulose, fulgid. Clypeus triangular, its anterior border emarginate, the sides converging behind, the sutures visible. Frontal area small, vestigial. Frontal carinae

diverging behind, somewhat upturned laterad, subtranslucid, slightly more pigmented, sculptured and subopaque along the margin. Occipital corners subspinose, acute. Occipital border crested, more or less sinuate. Eye-stalk fused above with the frontal carinae; eyes small. Cheeks immarginate below. Upper surface of thorax, except the expanded laminate and translucid border, more or less flat. Anterior border of pronotum more or less straight, with a narrow subhyaline crest. Scapular spine long, upturned, and recurved distad, contained within a broadly expanded subhyaline border. Transverse pronotal crest absent, except a median single denticule. Promesonotal suture absent. Mesonotum with a lateral membranaceous, slightly upturned subhyaline tooth. Mesoepinotal suture present. Epinotum not distinctly divided into a basal and declivous face, moderately convex, its sides expanded into a broad, rounded somewhat upturned subhyaline border, containing a few pigmented strands representing the vestiges of the epinotal spines. Femora [Fig. 109] moderately incrassated at the proximal third, attenuate distad. Metatarsi of middle and hind legs compressed, yet not as thin as in *Cephalotes*. Both the tibiae and the metatarsi have elongate, dense grooves, containing a decumbent hair. Petiole more than twice as broad as long, with an antero-lateral, slightly recurved tooth, the anterior border marginate, the ventral face with a hyaline median tooth. Postpetiole broader, with a lateral, plate-like, apically rounded lobe, curving foreward. Gaster oval, depressed, surrounded by a narrow, hyaline, upturned, translucid border, interrupted mesally in front for the reception of the postpetiole.

The larger individuals exhibit a little pronounced, yet distinct dimorphism, which affects the following features: Head slightly longer, sides subparallel. Vertex with a pair of short spines. Occipital angles sharply angulate, but not forming a spine. Eyes less conspicuously stalked. Cheeks marginate below. A transverse crest across the pronotum. Epinotum with a distinct spine, somewhat projecting beyond and raised above the hyaline laminate border. Basal and declivous face differentiated.

F e m a l e. — Brazil: State of Goiás, Campinas, Nov. 1928 (Schwarzmaier) [Coll. T. Borgmeier].

Length 13 mm. Median head length 2.53 mm.; Weber's length of thorax 4.05 mm. Ochraceous; the following ferruginous: Antennae, tarsi, mandibles. First gastric tergite with a pale yellowish macula, surrounded by a fuscous ring, open towards

the outer margin, on each corner. Parts of the frontal carinae and crests of the pronotum are subhyaline and semitranslucid.

Head subfulgid above, subopaque below; subquadrate. Mandibles visible from above, finely rugulose, sparsely punctured, the apices curved obliquely downward. Clypeus retracted, subtriangular, anterior border emarginate. Frontal area vestigial. Frontal carinae greatly expanded, covering the sides of the head from above, extending backwards to the occipital corner; semitransparent, laterally straight, upturned, rounded anteriorly. Upper surface of head slightly concave discad, microscopically and rather sparsely punctured, covered with large, sparse, rounded foveolae, each containing a small. whitish, decumbent scale. Ocelli forming an equilateral triangle, situated in large pits, on the side walls. Behind the posterior ocelli two short, stout, acute spines. Occipital angles with a similar spines, its base continuous with frontal carinae and sending out a crest, downwards and mesad toward the occipital foramen, fading out shortly before reaching it. A sharp crest separating the cheek from the lower surface of the head. Scape attenuate at base, incrassated discad. Eyes situated behind the antennal scrobe.

Thorax fulgid, one and a half times as long as broad (83:64); sparsely foveolate, each foveola containing a decumbent seta. Anterior border of pronotum scarcely emarginate mesad, slightly crested. Shoulders with a large, angular, protruding crest, marginating the sides until it gives off, on each side, the transverse pronotal crest, the remaining part of the lateral border of the pronotum immarginate. Laterotergite of pronotum flat. Mesonotal sclerites flat. Parapsidal furrows of scutum vestigial. Scutum almost twice as broad as long. Mesopleura convex, the lower half without an antero-ventral tooth. Basal face of epinotum extremely short, mesad, marginate and crested laterad, forming an acute, crested angle caudad, where the crest turns mesad, for one fourth of the width. Declivous face almost three times as long as basal face, somewhat excavated. Middle and hind metatarsus broadened and flattened, almost as in the female *Cephalotes*. Femora, tibiae and tarsi with elongate, decumbent long hair.

Petiole twice as broad as long, impressed above, mesad, its anterior border slightly emarginate. Densely foveolate above and laterad, sides slightly converging caudad. Anterior half of the ventral face with a median crest, ending in an acute tooth anteriorly. Postpetiole more than twice as broad as long, with

an antero-lateral, projecting blunt, marginate and crested lobe, the dorsal face greatly convex above longitudinally and transversely, sculptured as petiole.

Gaster fulgid, elongate, suboval, sides subparallel. Anterior corners not crested, but lobate, immarginate. Both the tergites and sternites are very finely and shallowly foveolate except on the posterior border of the sclerites where the foveolae become crowded and the integument rugulose.

Wings subhyaline. Veins dark brunneous. Fore wing with a black stigma. Marginal cell infuscated, closed, appendiculate, narrow, and elongate. Submarginal cell elongate, its apical half infuscated. A fuscous streak along the veins in the apical field and the costal margin. No transverse cubital vein. Discoidal cell small.

Male; Brazil: State of Goiás, Ilha do Bananal (Himmelreich). [Coll. T. Borgmeier].

Length 8.4 mm. Median head length 1.26 mm.; Weber's length of thorax 2.80 mm. Black; the following stramineous: mandibles, antennae, legs, excluding the coxae, gaster. Brunneous: clypeus, a central patch discad on each of the three parts of the scutum, metanotum, edges of lateral sclerites of thorax, fore coxae, peduncle; the postpetiole ferruginous.

Head subopaque, transverse, median head length shorter than distance between the eyes (52:58). Mandibles finely rugulose-punctate, with a longitudinal crest basad. Chewing border finely crenulate with a distinct apical and a minute preapical tooth. Clypeus transverse, evenly convex, not forming two faces, anterior and posterior border arcuate. Frontal carinae raised to a conspicuous triangular acute tooth between the antennal sockets, diverging behind, fading out before the posterior half of the eyes. Front finely punctate-rugulose. Antennal scrobe obsolete. Cheeks, vertex, occiput and lower surface of head more coarsely reticulate-rugose, interspersed with larger setigerous foveolae. Ocelli on vertex, large, raised above the surface of the head, the lateral ones larger than the antero-median ocellus. Occiput perpendicular to the upper surface of head, immarginate above, slightly excavated beneath mesad, occipital angles obsolete. Cheeks, in anterior aspect, diverging caudad, subcontinuous with the anterior border of the mandibles, scarcely emarginate. Eyes large, slightly shorter than half the median head length. Scape shorter than half the length of the 2nd funicular segment. Segments 2-12 of funiculus more than twice as long as broad.

Thorax subfulgid; 1.5 times as long as maximum width. Anterior border of pronotum moderately arcuate, with bluntly angulate, projecting shoulder. Median portion of the dorsal face and the laterotergite of the pronotum mostly smooth and fulgid, the postero-lateral portions above rather coarsely foveolate-rugose. Scutum smooth and fulgid, sparsely and shallowly foveolate, the Mayrian furrows not fusing mesad behind. Scutellum similarly sculptured, the antero-lateral lobes separated from the body by a very deep transverse furrow. Metanotum subopaque. Upper and lower portion of metapleura greatly convex and bulging. Epinotum unarmed, densely foveolate above, rather smooth and fulgid laterad and on the declivous face. Middle and hind metatarsus flattened basad. Legs fulgid. Claws stout, with a blunt basal tooth.

Petiole subquadrate from above. Upper surface smooth and fulgid, sides scarcely converging caudad, with a few scattered foveolae below. Postpetiole slightly broader than long, with a blunt tubercle projecting from each side. Upper face convex in profile. Sculpture as petiole.

Gaster oval, perfulgid. Exposed portion of tergites 2-6 with very fine, inconspicuous microsculpture. (The genitalia were lost).

Pilosity long, pale creamy, sparser than in *Cephalotes*. Erect on head and thorax, appressed on appendages.

Wings [Fig. 111] as in female.

Distribution. The range of *Z. clypeatus* extends from Trinidad over British Guiana and most of Brazil south to Northern Argentina, Paraguay, west to subandean Bolivia. I have collected several workers running between the crevices of the bark of a native hardwood tree "Peroba" in Rolândia, northern Paraná, Brazil. Mann records a colony nesting in a hollow parasitic vine.

Specimens examined: 146; 142 workers, 3 females, 1 male, as follows: *Argentina*: Salta Province, Urundel (N. Kusnezov): 2 workers [CTB]. — *Paraguay*: S. Bernardino (K. Fiebrig): 2 workers [USNM]. — *Bolivia*: Rurrenabaque, Rio Beni (Wm. M. Mann): 2 workers [CWMM]. Cavinas, Rio Beni (M. R. Lopes): 2 workers [CWMM]. Ivon, Rio Beni (Wm. M. Mann): 4 workers [CWMM]. Yaguacua; March 1924 (G. L. Harrington): 1 worker [USNM]. Rio Guaporé (Lizer): 1 worker [CTB]. — *Brazil*: *State of Paraná,* Rolândia; Dec. 1945 (W. W. Kempf): 6 workers [CTB]. *State of S. Paulo,* Bauru, Rio Ferro, 1905 (H. von Ihering): 5 workers [USNM]. Porto Epitácio; Oct.

1926 (Lima): 2 workers [CTB]. Juquiá; Nov. 1929 (J. Lane): 2 workers [CTB]. Lençóis; July 1928 (D. Mendes): 5 workers [CTB]. Ribeirão Preto, Col. Sta. Amália; June 12, 1929 (O. Conde): 4 workers [CTB]. *State of Goiás*: Sta. Rita de Paranaíba; July 1926 (Schwarzmaier): 2 workers [CTB]. Ilha do Bananal (Himmelreich): 1 worker, 1 male [CTB]. Campinas; Nov. 1927, July 1928 (Schwarzmaier): 4 workers, 1 female [CTB]. *State of Mato Grosso*: Abunã, Rio Madeira (Wm. M. Mann): 15 workers [CWMM]. Murtinho; Nov. 1927 (Melzer): 1 worker [CTB]. Faz. Murtinho; Jan. 1930 (Spitz): 4 workers [CTB]. *State of Bahia*: Camisão (G. Bondar): 3 workers [CTB]. Tapera (Pickel, O. S. B.): 6 workers [CTB]. *State of Amazonas*: Itacoatiara (Mann & Baker): 10 workers, 2 females [CWMM]. Manáus; July 13, 1935 (A. T. Paes Filho): 2 workers [CTB]. Pto. América; Aug. 30, 1921 (J. C. Bradley): 12 workers [CU]. Porto Velho, Rio Madeira (Mann & Baker): 30 workers [CWMM]. — *British Guiana*: Georgetown, Botanical Garden; Sept. 26, 1918 (H. Morrison): 1 worker [USNM]. — *Trinidad*: Port of Spain; Dec. 1902; 7 workers [USNM]. Mayaro; April 28, 1929 (Darlington): 2 workers [MCZ].

2. *Zacryptocerus membranaceus* (Klug)

(Figs. 106, 110)

Cryptocerus membranaceus Klug, 1824, Ent. Monogr. pp. 208-210 [worker; Brazil]. — F. Smith, 1854, Trans. Ent. Soc. London, (2) vol. 2, p. 227, Pl. 21, fig. 4 [worker]. — F. Smith, 1862, Trans. Ent. Soc. London, (3) vol. 1, p. 410, Pl. 12, fig. 9 [worker]. — Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 199 [worker; Brazil: Federal District, Mt. Corcovado near Rio de Janeiro].
Cephalotes membranaceus Emery, 1914, Ann. Soc. Ent. Belg. vol. 58, p. 39.
Zacryptocerus membranaceus Emery, 1915, Bull. Soc. Ent. France, p. 192. — Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 305. — Borgmeier, 1937, Arch. Inst. Biol. Veget. vol. 3 (2), p. 244 [worker; Brazil: State of Rio de Janeiro, Niterói (Horto); State of Espírito Santo, Santa Teresa].

Zacryptocerus membranaceus differs from the preceding species by the opaque, densely sculptured integument of the body; the circular gaster surrounded by a broad, horizontal, coarsely sculptured, translucid, laminate border; and the obtuse lateral tooth projecting from the occipital spine on the head.

Type. — Worker; Brazil (Dr. de Olfers). [Coll. Klug (Mus. Berlin?)].

Worker; Brazil: State of Espírito Santo, Sta. Teresa (O. Conde). [Coll. T. Borgmeier].

Length 5.6 mm. Median head length 1.46 mm. Weber's length of thorax 1.58 mm. Ochraceous, darker than the preceding species, subopaque, strongly shagreened.

Head [Fig. 106] transverse. Frontal carinae not hyaline, semiopaque, due to strong sculpture; rounded anteriorly, sinuate laterally and strongly upturned, vertical and lobate above the eyes. Occipital angle dentate with a broad, blunt, stout tooth projecting from beneath. Eye stalk not completely united with frontal carinae, the apical end free.

Thorax similar to that of clypeatus, except the sculpture. Scapular spines more recurved. No trace of transverse pronotal crest. Mesonotal tooth slender, cylindrical, and pigmented. Meso-epinotal suture more or less distinct. Epinotal spine developed, projecting beyond the enveloping border. Legs lacking foveolae. Femora [Fig. 110] angulate above, greatly inflated, upper face marginate distad, beginning from the angle. Metatarsus not quite as broad as in *clypeatus*.

Petiole transverse, slightly narrower than in clypeatus, lateral spines slender, blunt at apex, very little upturned. Ventral face with a small midventral hyaline tooth. Postpetiole slightly longer than petiole, the lateral teeth about half as long as the total width of the body.

Gaster circular, broadly surrounded by a horizontal, coarsely sculptured, laminate border which is notched mesally behind.

Foveolae indistinct to obsolete; pilosity consisting of long, silvery, appressed, and scale-like hair.

The specimen from Rio de Janeiro is somewhat larger and possesses a transverse pronotal crest; the color is darker, fuscous-ferruginous on dorsum of the thorax; more distinctly foveolate on vertex and thorax. The faces of the epinotum more distinct, the spines of the petiole more recurved. It is a major worker, and seems to indicate that this species possesses the same kind of rudimentary dimorphism as *clypeatus*.

Female and male unknown.

Specimens examined: 2 workers, as follows: *Brazil*: *State of Rio de Janeiro,* Niterói (Horto), Nov. 28, 1932 (Agas): 1 worker [CTB]. — *State of Espirito Santo*: S. Teresa: Mav 1928 (O. Conde): 1 worker [CTB].

V. Notes on the Genus HYPOCRYPTOCERUS Wheeler [21]

Hypocryptocerus was originally proposed by Wheeler, in 1920, as a subgenus of *Cryptocerus* [=*Paracryptocerus*]. In 1936, in a comprehensive treatment of this group, the same author raised it to full generic rank. Even though this genus contains only a single species, *Formica haemorrhoidalis* Latreille (1802), it seems sufficiently differentiated from all other forms of *Paracryptocerus* by the mere fact that it lacks the pronounced dimorphism of the worker caste as peculiar to that group.

At the present time *haemorrhoidalis* has the status of a polytypic species, including six described races, all of them established, or reestablished by Wheeler's monograph of 1936. The taxonomy of the variable species, however, is far from being definitively settled. So far the distinction and the systematic position of the great majority of the races rests exclusively upon strictly morphological evidence, which, in turn, is derived in most cases, from isolated specimens or single nest series. The distribution, ecological preferences, and the extent of individual and nest variability are poorly understood. Moreover, the identity of the typical *haemorrhoidalis* is still questionable.

In the following pages I confine myself to comment briefly on Wheeler's revisionary study and to establish a new case of synonymy concerning the race *steinheili* Forel.

Hypocryptocerus Wheeler

Formica [in part] Latreille, 1802, Fourmis, pp. 276-277.
Cryptocerus [in part] Lepeletier, 1836, Hist. Nat. Hym. vol. 1, p. 172.
Cryptocerus (*Paracryptocerus*) [in part] Emery, 1915, Bull. Soc. Ent. France, p. 192. — Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 307.
Cryptocerus (*Hypocryptocerus*) Wheeler, 1920, Psyche, vol. 27, p. 53. — Mann, 1920, Bull. Am. Mus. Nat. Hist. vol. 42, p. 430. — Wheeler, 1922, Bull. Am. Mus. Nat. Hist. vol. 45, p. 665.
Hypocryptocerus Wheeler, 1936, Bull. Mus. Comp. Zool. Harvard, vol. 80, p. 200.
Cryptocerus (*Procryptocerus*) [22] [in part] Menozzi & Russo, 1930, Bull. Lab. Zool. Gen. Agr. Portici, vol. 24, p. 162.

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[21]) In his monograph of 1936, Wheeler quotes Mann as the author of the genus. As Dr. Mann himself has brought to my attention, this is incorrect. Wheeler's formal proposition of *Hypocryptocerus*, subgen. nov. was published in the April-June issue of Psyche, vol. 27, 1920. This issue was in circulation even before June 15, 1920, as I could verify on a copy in the N. Y. State Library in Albany. Mann, in an article on the ants of the West Indies, by listing *Cryptocerus (Hypocryptocerus) haemorrhoidalis* Latreille, likewise makes use of this subgeneric name. However, Mann's paper, published in vol. 42 of the Bull. Am. Mus. Nat. Hist. (1920), was issued separately only on December 20, 1920 and the entire volume of the Bulletin was made public in 1921. Consequently, Wheeler, not Mann, is the author of *Hypocryptocerus*.

[22]) The paper of Menozzi and Russo is solely a faunistic study on the ants of the Dominican Republic. The curious presentation of *haemorrhoidalis* as a *Cryptocerus (Procryptocerus)* is very likely a

Type of the genus: *Formica haemorrhoidalis* Latreille, 1802 [=*Hypocryptocerus haemorrhoidalis* (Latreille)]. Monobasic.

The workers of *Hypocrytocerus* are medium-sized forms which combine the characters of several genera of the tribe. The structure of the occiput, thorax and petiole superficially resembles that of *Procryptocerus,* from which they may be separated at once by the broadly expanded frontal carinae, the lateral spines on the pronotum and the peduncular segments, and the flat, compressed metatarsi. On the other hand the lack of pronounced dimorphism, *i. e.* the absence of a soldier caste, the peculiar shape of the occiput, the position and length of the antennal scrobe in relation to the eye, the structure of the epinotum, readily distinguish them from *Paracryptocerus.*

Diagnostic Features

Worker. — Length 6.0-7.5 mm. Black; the frontal carinae, tip of mandibles, antennae, four apical tarsal segments more or less brown to ferruginous. Mandibles longitudinally rugulose. Head subquadrate in anterior aspect, its maximum length slightly longer than the distance between the eyes. Frontal carinae greatly expanded, slightly raised in front somewhat divergent behind, their lateral borders straight. Antennal scrobe terminating above the middle of the large, flat eyes. Cheeks immarginate below. Upper surface of head rather flat, scarcely convex, coarsely foveolate-rugose behind. Vertex with a vestigial, crenate, transverse crest, often containing a pair of more prominent median denticules. Occipital angles rounded. Occipital border sharply crested, straight, scarcely emarginate mesally. Occiput truncate, continuous with the lower surface of the head, more or less regularly, coarsely and transversely striato-rugose. Lower surface of head longitudinally striato-rugose.

Thorax not depressed, trunk-shaped; the dorsal face and the sides rather coarsely striato-rugose. Shoulders more or less distinctly angulate. Sides of pronotum with a short, flattened, usually blunt or obliquely truncate spine. Posterior corner of pronotum projecting as a rectangular tooth. Sides of mesonotum

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lapsus calami, resulting from mistaking *Procryptocerus* for *Hypocryptocerus.* It is hardly conceivable that these authors intended to introduce such a sweeping rearrangement of the generic classification of the tribe, without, at least briefly, discussing this change. At any rate, the association of *haemorrhoidalis* with *Procryptocerus* and the inclusion of the latter as a subgenus in the genus *Cryptocerus* [=*Paracryptocerus*] are unacceptable.

slightly rounded, often denticulate. Mesoepinotal suture impressed. Basal face of epinotum somewhat shorter than long, its sides marginate, rather straight, sometimes slightly convex; each of the posterior corners bearing a long, diverging, strong spine, subequal in length to the length of the basal face. Declivous face subperpendicular to, longer than, the basal face. Femora terete, inflated in the middle. Tibiae subterete, their outer face longitudinally and distantly rugulose. Metatarsi broadened and flattened.

Petiole somewhat broader than long, its anterior face truncate, its sides converging behind, with a small, acute tooth at the half, its upper face flat. Postpetiole broader than the petiole, with strong, greatly curved, and subacuminate lateral spines; its upper face strongly convex. Both peduncular segments strongly striato-rugose.

Gaster suboval, without any coarse sculpture, except on the base of the first gastric tergite. Anterior border scarcely emarginate mesad, strongly marginate to crested laterad.

Pilosity abundant, consisting of both erect, whitish, and long hair, and flat, shiny, and more or less appressed scales.

Female unknown.

Male. — Only a single male specimen has been collected so far. Presumably it belongs to the subspecies *hamulus*, under which it will be discussed.

Ethology. — These ants, like all other members of the tribe, are arboreal and xyloecetes. Mann (Wheeler & Mann, 1914) has found them nesting in hollow twigs and also occasionally in fence posts. According to Menozzi and Russo (1930), specimens have been taken on cacao plants (*Theobroma cacao*), where they were feeding on the secretion of aphids (*Toxoptera aurentiae*) which, in turn, infested the floral peduncles of the same plant. The type series of the subspecies *vinosus* inhabited cavities of a beech tree, and proved to be rather pugnacious.

Distribution. — All forms of the present genus are strictly insular and apparently confined to the island of Haiti, occurring both in the Dominican Republic and in Haiti. The locality records indicating a different territory for the subspecies *steinheili*, are extremely doubtful, as already pointed out by Wheeler in 1936. The six races, except the typical form, may be identified by means of the subjoined key:

Key to the Subspecies of *H. haemorrhoidalis* for workers

1. First gastric tergite entirely black, its base more or less distinctly longitudinally rugulose 2
— First gastric tergite never entirely black, its base without conspicuous longitudinal rugulae 4
2. Basal face of epinotum densely covered with golden scales, completely concealing the underlying integument; first gastric tergite with distinctly visible appressed golden scales. . 3. *H. h. auricomus* Wheeler
— Basal face of epinotum with sparse scales, not completely concealing the underlying integument; first gastric tergite without visible appressed scales 3
3. Declivous face of epinotum coarsely longitudinally striato-rugose; sides of mesonotum rounded, edentate. . . . . 2. *H. h. affinis* Wheeler
— Declivous face of epinotum densely punctate, the longitudinal rugae faint or absent; sides of mesonotum denticulate. . . . . 4. *H. h. hamulus* (Roger)
4. First gastric tergite purplish-maroon, without a black postero-median macula. . . . . 7. *H. h. vinosus* Wheeler
— First gastric tergite reddish-yellow, usually with a black postero-median macula 5
5. Postero-median black spot of first gastric tergite much broader in front than behind, having the shape of an inverted triangle; epinotal spines strongly divergent, long and slender. . . . . 5. *H. h. signatus* Wheeler
— Postero-median black spot of first gastric tergite elongate, with subparallel sides, not conspicuously broadened in front; epinotal spines stout, shorter, little diverging. . . . 6. *H. h. unimaculatus* (F. Smith)

1. *Hypocryptocerus haemorrhoidalis* (Latreille)

Formica haemorrhoidalis Latreille, 1802, Fourmis, pp. 276-277 [worker; Dominican Republic: Santo Domingo (Ciudad Trujillo?)].
Cryptocerus haemorrhoidalis Lepeletier, 1836, Hist. Nat. Hym. vol. 1, p. 172. — F. Smith, 1854, Trans. Ent. Soc. London, (2) vol. 2, p. 223. — Emery, 1896, Zool. Jahrb. Syst. vol. 9, p. 637.
Cryptocerus (Paracryptocerus) haemorrhoidalis Emery, 1915, Bull. Soc. Ent. France, p. 192. — Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 307.
?*Cryptocerus (Hypocryptocerus) haemorrhoidalis* Mann, 1920, Bull. Am. Mus. Nat. Hist. vol. 42, p. 430 [Dominican Republic: Blanton Mine, north of San Cristobal]. [23]
?*Cryptocerus (Procryptocerus) haemorrhoidalis* Menozzi & Russo, 1930, Bull. Lab. Zool. Gen. Agr. Portici, vol. 24, p. 162 [worker; Dominican Republic: Sonador (Puerto Plata)]. [24]
Hypocryptocerus haemorrhoidalis Wheeler, 1936, Bull. Mus. Comp. Zool. Harvard, vol. 80, p. 200.

Latreille's diagnosis is sufficiently detailed so that it is possible to discriminate *haemorrhoidalis* from all other genera and species of the Cephalotine tribe. On the other hand, it is almost entirely applicable to all the already erected races, with the exception of a single character, viz. the coloration of the

[23-24]) The records of Mann (1920) and Menozzi & Russo (1930) may possibly be of specimens that belong to one of the subsequent races rather than to the typical form.

gaster. I wish to transcribe the following paragraph of Wheeler's monograph, which, in my opinion, contains everything that can be said at the present about this species.

"His (Latreille's) description of the type, which was taken by Geoffroy de Villeneuve at Santo Domingo, is in part peculiarly disconcerting. In his diagnosis the specimen is said to have the "tête mutique, ses bords latéraux et l'anus rougeâtres (capite mutico, lateribus anoque rubescentibus)" but in the more detailed French description we have the statement "l'anus a une grande tâche rougeâtre separée au milieu par un trait longitudinal, formé l'empiétement du noir en cette partie". In our paper on the ants of Haiti (1914), Mann and I conjectured that Latreille's description might have been based on an immature specimen with red anal region, but belonging to the form later (1863) described by Roger as *Cryptocerus hamulus* and by Forel (1901) as *C. haytianus.*[25] We therefore regarded these forms as synonymous with *haemorrhoidalis.* But two of the forms described below, namely the subspecies *steinheili* Forel and *signatus* subsp. nov., have the dorsal surface of the first gastric segment reddish-yellow, with a very conspicuous black postero-median spot or stripe, so that if we suppose Latreille to have employed the term "anus" in a quite unjustifiable sense, it is conceivable, that he may have had before him a similar form but one with less of the first gastric segment reddish-yellow. It is clear, at any rate, that, unless his type specimen still exists or unless specimens turn up that agree more closely with his description than any since collected in Haiti or the Dominican Republic, we shall have to regard the identity of the true *haemorrhoidalis* as questionable".

2. *Hypocryptocerus haemorrhoidalis affinis* Wheeler

H. haemorrhoidalis affinis Wheeler, 1936, Bull. Mus. Comp. Zool. Harvard, vol. 80, p. 203 [worker; Haiti: Poste Terre Rouge].

Types. — 2 workers; Haiti: Poste Terre Rouge. Elevation 2000 ft. (Dr. Darlington). [Museum of Comparative Zoology, Harvard (Coll. W. M. Wheeler)].

The present subspecies is a very close ally of *hamulus,* from which it may be distinguished by the following characters: Sides of mesonotum edentate, rounded. Epinotal spines distinctly longer and more tapering. Declivous face of epinotum regularly and strongly longitudinally striato-rugose. Anterior corners of petiole sharply dentate. Base of first gastric tergite with finer and more numerous longitudinal rugulae.

These characters, however, apply fully only to one of the syntypes, whereas the other approaches to some extent the condition obtained in *hamulus,* especially with regard to the sculpture of the declivous face of the epinotum and the base

[25]) In reality Forel described it as a variety of *hamulus* (W. K.).

of the first gastric tergite. Furthermore the sides of the mesonotum are vestigially denticulate. The rather slender and tapering epinotal spines and the denticulate anterior corners of the postpetiole, seem, at least for the time being, to separate this race from *hamulus*. However, I would not be surprised, if more abundant material should eventually prove that both races are identical. *Affinis* is without any doubt the least differentiated subspecies of the *haemorrhoidalis*-complex.

I have examined both syntypes.

3. *Hypocryptocerus haemorrhoidalis auricomus* Wheeler

H. haemorrhoidalis auricomus Wheeler, 1936, Bull. Mus. Comp. Zool. Harvard, vol. 80, p. 203 [worker; Dominican Republic; Sanchez].

Types. — Worker; Dominican Republic: Sanchez. May 11-16, 1915 (Watson). [Museum of Comparative Zoology, Harvard. (Coll. W. M. Wheeler)].

Worker (paratype). — Similar to the preceding subspecies and to *hamulus*, with the following differences: Epinotal spines stouter, straight, shorter than the length of the basal face. The longitudinal rugae on the declivous face of the epinotum are intermediate between *affinis* and *hamulus*. The anterior corners of the petiole angulate, but not denticulate. The base of the first gastric tergite with very fine, short, more or less vestigial rugulae. This race is very distinctive by its conspicuous abundant and golden pilosity. The squamiform hairs are rather dense on the thorax, the posterior portion of the vertex and the peduncle. They are very dense and crowded on the basal face of the epinotum, where they completely conceal the underlying integument. The scales of the first gastric tergite are fine, more slender and appressed.

The collection of W. M. Wheeler, aside from the numerous type specimens, contains also another series of the same race, improperly labelled "cotype", from San Lorenzo, Dominican Republic; June 27-29, 1915 (Watson). These specimens are outstanding by the more abundant pilosity of intense golden coloration. Their gaster is more elongate and the scales of the first gastric tergite are broader, denser, than in the type, nearly concealing the surface of the integument. The rugulae on the declivity of the epinotum are somewhat irregular.

Another lot, received from the U. S. National Museum, consisting of three worker specimens, collected on June 14, 1940, on *Pinus occidentalis* at Jarabacoa, Dominican Republic by D. de Leon, belongs evidently to this subspecies. These individuals are robust, have rather stout and short epinotal spines, and the scales of the gaster are minute, but still clearly visible. However the pilosity of the basal face of the epinotum is exactly as in the type.

4. *Hypocryptocerus haemorrhoidalis hamulus* (Roger)

Cryptocerus hamulus Roger, 1863, Berl. Ent. Zs. vol. 7, pp. 209-210 [worker; Dominican Republic: Santo Domingo (Ciudad Trujillo?)].
Hypocryptocerus haemorrhoidalis hamulus Wheeler, 1936, Bull. Mus. Comp. Zool. Harvard, vol. 80, pp. 201-202.
Cryptocerus haemorrhoidalis Wheeler & Mann, (nec Latreille), 1914, Bull. Am. Mus. Nat. Hist. vol. 33, pp. 38-39; fig. 16 [worker, male; Haiti: Port au Prince, Manneville, Diquini, Ennery, mountains North of Jacmel].
Cryptocerus hamulus var. *haytianus* Forel, 1901, Ann. Soc. Ent. Belg. vol. 45, pp. 337-338 [worker; Haiti].

Type. — Worker; Dominican Republic: Santo Domingo (Ciudad Trujillo?) [Presumably in the Museum of Berlin, if still extant].

Worker. — Following are the characters that, as stated by Wheeler, differentiate *hamulus* from the preceding and following races: Sides of mesonotum distinctly denticulate. Epinotal spines as long as the basal face, suberect, diverging behind, the tips slightly curved foreward. Declivous face densely punctate with a few very fine, distant, longitudinal rugulae. Base of first gastric tergite rather conspicuously longitudinally rugose. Pilosity as in *affinis*. First gastric tergite without visible decumbent, shiny squamiform hairs. Scales on basal face of epinotum not dense, not concealing the underlying integument.

Roger mentions the presence of a crenulate, transverse carina across the pronotum of his type, a character which occasionally occurs both in this as well as in other races, and seems to indicate a slight degree of dimorphism in the worker caste.

Male: Port au Prince. (W. M. Mann) [MCZ]. — This is the only known male specimen of the genus, and was described by Wheeler and Mann in 1914. Since their diagnosis is rather poor, being limited almost exclusively to color and pilosity, I wish to add the following diagnostic features: Head, thorax, coxae, peduncle fuscous brown. Legs, tips of mandibles, scape and gaster yellowish brown. Funiculus light brown. Mandibles with a distinct apical and preapical tooth; the following teeth vestigial. Head transverse; the median head length shorter than the interocular width. Frontal carinae divergent, fading out above the eyes. Antennal scrobe obsolescent. Eyes large, their maximum diameter subequal to half of the median head length. Occiput evenly rounded transversely without forming distinct lateral corners. Integument finely reticulate-punctate. Transverse rugae between the upper border of the eyes and the front. Scape about half as long as the second funicular segment. Sides of pronotum diverging behind, with a distinct scapular tooth. A vestigial

transverse carina across the pronotum. Laterotergite excavated beneath just above the fore coxae. Scutum and scutellum considerably convex. Mayrian furrows deeply impressed. Upper mesopleura strongly convex. Epinotum transverse, the posterior corners of the basal face dentate. Integument finely reticulate-punctate, irregularly rugulose. Petiole about as long as wide, with a vestigial tooth on each side. Postpetiole flat above, subquadrate, with a tubercular tooth on each side. Gaster finely reticulate, subfulgid. The genitalia have been lost. Pile fulvous and erect, abundant and conspicuous on head and thorax; sparser and appressed on gaster and legs. Wings slightly infumated; veins brunneous. Fore wing with a closed and appendiculate marginal cell, and a transverse cubital vein. Submarginal cell short. Transverse median vein about half as long as the second abscissa of the median vein.

Specimens examined: 18; 17 workers and 1 male, as follows: *Haiti*: Diquini (W. M. Mann): 3 workers [CWMM]. Manneville (W. M. Mann): 1 worker [CWMM]. Mountains North of Jacmel (W. M. Mann): 7 workers [CWMM]. Petionville (W. M. Mann): 2 workers [CWMM]. Port au Prince (W. M. Mann): 1 male [MCZ]; Dec. 6, 1901 (G. Kettel): 1 worker [CWMM]. "Haiti" (exact locality unknown; syntypes of var. *haytianus* Forel): 2 workers [MHNG, NHMW].

The two specimens from Petionville, which belong to the lot expressly referred to the present subspecies by Wheeler, have several divergent features, which make their association with *hamulus* rather doubtful. The dorsal striae of the thorax are very regular and straight. The epinotal spines are straight, their apices not recurved. The anterior corner of the petiole sharply angulate. The rugulae on the base of the first gastric tergite are faint and less conspicuous. The color of the first gastric tergite is peculiar. The sides are purplish maroon, as in *vinosus* separated by a broad, not well delimited, median longitudinal black stripe.

5. *Hypocryptocerus haemorrhoidalis signatus* Wheeler

H. haemorrhoidalis signatus Wheeler, 1936, Bull. Mus. Comp. Zool. Harvard, vol. 80, pp. 203-204 [worker; Haiti: Mt. Basil].

Holotype. — Worker; Haiti: Mt. Basil. Elevation 4500 ft. (Dr. Darlington). [Museum of Comparative Zoology, Harvard (Coll. W. M. Wheeler)].

The holotype worker, the only known specimen of this race, is very similar to the following subspecies *unimaculatus*, — perhaps a mere variant, — from which it differs only by slightly longer pronotal spines, the subdenticulate sides of the mesonotum,

the very long, slender, raised and extremely divergent epinotal spines, the coarsely and transversely rugose declivous face of the epinotum, the acutely denticulate anterior corners of the petiole, and the minute squamiform hairs on the first gastric tergite. The most obvious distinguishing feature consists in the broad postero-median black spot of the otherwise reddish-yellow first gastric tergite. This black stripe is very broad and expanded in front and has the shape of an inverted triangle.

6. *Hypocryptocerus haemorrhoidalis unimaculatus* (F. Smith)

Cryptocerus unimaculatus F. Smith, 1854, Trans. Ent. Soc. London, (2) vol. 2, p. 221; Pl. 19, fig. 9 [worker; "Brazil" (*sic!*)]. — Emery, 1896, Zool. Jahrb. Syst. vol. 9, p. 637.
Cryptocerus (*Paracryptocerus*) *unimaculatus* Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 308.
Cryptocerus hamulus steinheili Forel, 1908, Verh. Zool. Bot. Ges. Wien, p. 355 [worker; "Antille St. Thomas"].
Cryptocerus (*Paracryptocerus*) *haemorrhoidalis steinheili* Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 308.
Hypocryptocerus haemorrhoidalis steinheili Wheeler, 1936, Bull. Mus. Comp. Zool. Harvard, vol. 80, p. 203 [worker; Dominican Republic: Samana].

Dr. Donisthorpe of the British Museum, to whom I sent both a figure and a description of the lectotype specimen of Forel's *steinheili* with the request to compare them with the type of F. Smith's *unimaculatus*, very kindly confirmed my suspicion that both forms are identical. Consequently *steinheili* falls as a synonym of the older *unimaculatus*. Unfortunately this change does not dispel the doubts concerning the type locality of this form, since Smith's diagnosis and the label on the type of *unimaculatus* indicate the most certainly incorrect locality of "Brazil". According to Wheeler (1936), the type locality of *steinheili* as given by Forel, namely the "Antille St. Thomas", is likewise highly improbable. As far as is known at the present time the *haemorrhoidalis*-complex is confined to the island of Haiti. Furthermore Wheeler has described a specimen of this race, which was taken by Watson in the Dominican Republic.

Type. — Worker; "Brazil". [British Museum (Natural History)].

The differential characters for the worker of this race have already been given by Wheeler in 1936. It should be noted, however, that the lectotype of *steinheili* differs from Wheeler's specimen by having the epinotal spines very stout and somewhat curved. Moreover the first gastric tergite possesses rather abundant, erect pile. The postpetiolar spines are not quite as broad as in *vinosus* and their recurved tips are long and acuminate.

The black median stripe is likewise better developed and the anterior border forms an angle mesally. The rugulae on the declivous face of the epinotum are weak, forming transversely and concentrically arranged semicircles, the concavity of which faces upward. Gaster with vestigial rugulae on the base of the first tergite.

Specimens examined: 2 workers, as follows: "Antille St. Thomas" (?!) (Saussure): 1 worker (lectotype of *steinheili* Forel [MHNG]. — Dominican Republic: Samana (Watson): 1 worker [MCZ].

In this connection I wish to mention two specimens from Bizoton, Haiti, collected by Hoffmann on February 12, 1925, which are at present deposited in the collections of the U. S. National Museum. These individuals possess a reddish-yellow first gastric tergite. One has a vestigial black median stripe, somewhat similar to *unimaculatus* whereas in the other specimen some ill-defined purplish-maroon spots cover partially the first gastric tergite. In both specimens, the declivous face is strongly longitudinally rugose and the pronotal spines are longer than in *unimaculatus*. The postpetiole is very narrow, much narrower than the distance between the tips of the straight epinotal spines. The erect pile on the gaster is almost absent. These specimens are perhaps intergrades between the present race and the following *vinosus*, although nothing can be stated with certainty at the moment.

7. *Hypocryptocerus haemorrhoidalis vinosus* Wheeler

H. haemorrhoidalis vinosus Wheeler, 1936, Bull. Mus. Comp. Zool. Harvard, vol. 80, pp. 202-203 [worker; Haiti: Mt. Rochelois].

Type. — Worker; Haiti: Mt. Rochelois; in a beech tree (Eyerdamm). [Museum of Comparative Zoology, Harvard (Coll. W. M. Wheeler)].

This race is known only from numerous workers of the type series. They possess the following distinguishing characters: Pronotal spines longer than in *unimaculatus*, more flattened and blunt at apex. Sides of the mesonotum rounded. Epinotal spines shorter than the basal face, slender, tapering, directed backward and outward as in *auricomus*. Declivous face of epinotum strongly longitudinally rugose. Anterior corners of petiole angulate, not dentate. Lateral spines of postpetiole rather flat and broad. Base of the first gastric tergite indistinctly rugulose. Erect pile almost absent on the purplish-maroon colored first gastric tergite.

VI. Genus PARACRYPTOCERUS Emery

A Revisionary Study of the Subgenus Paracryptocerus s. str.

The genus *Paracryptocerus* is one of the major groups resulting from the division of the heterogeneous and unwieldy *Cryptocerus*-complex *sensu* Latreille into several genera. Unfortunately Emery, who is justly praised for the establishment of very satisfactory generic delimitations within the Cephalotine tribe, committed one serious mistake in nomenclature by retaining *Cryptocerus* as the name of the present genus and designating *umbraculatus* Fabricius (1804) as its type. Dr. M. R. Smith has shown in his recent paper [26] that Latreille already in 1810 [27] selected *atratus* Fabricius [=*Cephalotes atratus* (L.)] as the type species of *Cryptocerus,* which thus became an isogenotypic synonym of *Cephalotes* Latreille and, consequently unavailable for the present genus. The necessary substitutions already have been made by Dr. Smith. The oldest subgeneric name, *Paracryptocerus* Emery (1915), now applies to the entire genus, whereas the former subgenus *Cryptocerus* s. str. received the new name of *Harnedia* M. R. Smith (1949).

In the present section I restrict myself to a critique of the subgenus *Paracryptocerus* s. str. However I have transferred into this subgenus eight forms, hitherto associated with *Harnedia.* On account of the lack of sufficiently representative material for study I do not, at the moment, feel qualified to give a similar treatment to the other two subgenera. Furthermore very little emphasis has been given to the sexual forms, since our present knowledge of the females, and more so, of the males, is too poor and fragmentary to permit a proper synthesis of these castes.

Genus *Paracryptocerus* Emery

Cryptocerus Emery (*nec* Latreille) 1914, Ann. Soc. Ent. Belg. vol. 58, pp. 37-39.
Cryptocerus (*Paracryptocerus*) Emery, 1915, Bull. Soc. Ent. France, p. 192.
Paracryptocerus M. R. Smith, 1949, Psyche, vol. 56, pp. 18-21.

Type of the genus: *Cryptocerus spinosus* Mayr, 1862 [=*Paracryptocerus* (*Paracryptocerus*) *spinosus* (Mayr)]. By original designation of Emery, 1915.

The most outstanding distinguishing feature of *Paracryptocerus* lies in the prominent dimorphism of the worker caste. All

[26]) M. R. Smith, 1949. On the Status of *Cryptocerus* Latreille and *Cephalotes* Latreille. Psyche, vol. 56, pp. 18-21.
[27]) Latreille, 1810. Consid. Gen. Crust. Arachn. Ins. p. 437 (Table des genres avec l'indication de l'espèce qui leur sert de type).

the species of this genus possess not only the costumary (minor) workers but also dinergates or soldiers, characterized by a huge, peculiarly shaped head, and thoracic structures approaching that of the female in size and shape.

Generic Features

Worker. — Head depressed, somewhat narrower in front than behind. Frontal carinae greatly expanded, covering the cheeks in anterior aspect. Eyes situated entirely behind the posterior end of the antennal scrobe. Upper surface of head slightly convex. Cheeks strongly marginate or carinulate below. Occiput not truncate. Occipital corners rounded, dentate, laminate or obliquely truncate, never spinose. Thorax depressed; the dorsal surface rather flat. Dorsal sutures more or less obsolete. Lateral borders marginate, dentate or crested. Petiole and post-petiole short and broad, with lateral spines or teeth. Gaster somewhat depressed; its anterior border more or less emarginate mesad, carinate or crested laterad. Body usually covered with bright, shiny, squamiform and decumbent hairs.

Soldier. — Differing from the worker by the larger size, the larger and thicker head which is distinctly truncate behind. Upper surface of head with different sculpture, more convex or surmounted by a more or less differentiated disc, the sides of which are distinctly crested or carinate. Thorax rather thickset; the lateral projections shorter, more obtuse. Pronotum more expanded sidewise, usually with a distinct transverse carina, separating the posterior, subhorizontal part from the anterior inclined portion, on which the head rests when fully extended. Promesonotum convex in profile. Dorsal sutures of thorax distinct.[28]

Female. — Head, prothorax, pilosity and sculpture similar to those of the soldier. The mesothorax with the usual sclerites of the caste. Basal face of epinotum very short and transverse, the posterior corners without prominent teeth or spines. Peduncular segments more thickset. Gaster more elongate; the first tergite usually longer than the maximum length of the thorax. Degree of transparency and venation of the wings variable. Fore wings always with a closed and appendiculate marginal cell, a single closed submarginal and discoidal cell. Transverse cubital vein

[28]) Although strictly dimorphic, most of the species present in each colony a few specimens that are intermediate between the worker and soldier caste, and combine the characters of both.

generally present, except in a few cases, where the cubital vein touches the marginal cell.

Male. — Head transverse. Eyes large. Scape only half as long as the second funicular segment. Epinotum generally unarmed. Wings as in female. Outer valves (parameres or stipites) of the genitalia with a rounded apical lobe. Digitus of volsellae slender and hook-shaped. Apex of aedoeagal valves (sagittae) with a lateral small tooth.

Distribution and *Ethology*. This is the only genus of the otherwise strictly Neotropical tribe, that penetrates into the southernmost parts of the Nearctic region. Three species occur in the United States, *viz.* in Arizona, Texas and Florida. A few forms inhabit the Caribbean islands. The bulk of the genus is confined to Central America, the Magdalena River basin in Colombia, Cisandean South America, south to about the 35th parallel. All forms, as far as known, are arboreal and lignicolous. For that reason they are not all too frequently collected. Several species have been taken on imported orchids and other plants in U. S. seaports by Plant Quarantine inspectors.

Component species, species groups, subgenera. — *Paracryptocerus* is by far the largest genus of the Cephalotine tribe, containing almost twice as many described forms, as all other genera combined. Of 166 species, subspecies and varieties, hitherto recognized as valid, 101 are included in this genus. Even though the present study has changed these numbers to some extent, the proportions remain essentially the same.

The genus is divisible into a great number of natural groups, some of which already have been pointed out by Emery in 1922. However, the three subgenera introduced by the same author, namely *Paracryptocerus, Cryptocerus* s. str. [=*Harnedia* M. R. Smith] and *Cyathocephalus* [=*Cyathomyrmex* Creighton], are not founded upon these species groups, but upon the threefold differentiation of the head in the soldier and female caste. Emery's classification is, at least to some degree, artificial, since the selected differential character is probably the result of convergence. This is very evident in the case of the subgenus *Cyathomyrmex*. The Central American species *setulifer* agrees with the other two species, *pallens* and *varians* exclusively by having the head of the soldier and the female surmounted by a completely closed disc, *i. e.* the disc is not emarginate in front, above the mandibles. On the other hand the shape of the head, including the disc, in *setulifer* is quite distinctive.

Moreover the worker of the same species is definitely much more closely related with the *angustus*-group of the subgenus *Harnedia,* than with the *Cyathomyrmex* species *pallens* and *varians*. Nevertheless, as long as the sexual forms of the majority of the species are not known and fully understood, I consider it more advisable to accept on a provisory base the subgenera of Emery. The immediate elevation of each of the species group to subgeneric rank involves too many difficulties, on account of such intergrading forms as *manni, duckei, emeryi, patei* and *setulifer*.

Key to the subgenera of *Paracryptocerus*

a. *Key to the workers.*

1. Lateral border of head with a deep, rounded excision near the occipital corner, for lodging the eye.....
Cyathomyrmex Creighton [in part]
— Lateral border of head without a deep, rounded incision near the occipital corner, straight or convex and upturned above the eye.. 2
2. Upper face of hind femora distinctly angulate or denticulate at the middle, or, if not distinctly so, the apical half bears a longitudinal crest 3
— Upper face of hind femora rather evenly curved, never forming a distinct angle at the half nor a longitudinal crest..... 4
3. Sides of epinotum with a continuous, only exceptionally denticulate, crest, beginning at the anterior angle of the basal face.....
Harnedia M. R. Smith [in part]
— Sides of epinotum not crested, or, if so, the crest begins at some distance behind the anterior angle of the basal face.....
Paracryptocerus, s. str. Emery [in part]
4. Basal face of epinotum with a pair of spines on each side, the posterior spine being as long as, or longer than, the length of the petiole; declivous face of epinotum well differentiated, more or less perpendicular to the basal face.....
Paracryptocerus, s. str. Emery [in part]
— Basal face of epinotum with a variable number of denticules on each side, the longest of which is always shorter than the length of the postpetiole; declivous face of epinotum continuous with the basal face, forming a rather even curvature in profile.....
Harnedia M. R. Smith [in part] [29]

b. *Key to the soldiers*

1. Head flat to excavate above, surmounted by a marginate disc, or, if not completely marginate laterally behind, the integument of the upper surface of head is subopaque and coarsely foveolate, the foveolae being much larger than the diameter of the raised intervals 2

[29]) The workers of *Paracryptocerus (Cyathomyrmex) setulifer* Emery and the subspecies *orbis* Forel will key out at this place and have to be separated from the workers of the *angustus*-group in the specific key for *Harnedia*.

— Head convex, occasionally somewhat flattened above, never excavate nor surmounted by a marginate disc, or, if the upper surface is somewhat disc-like, the foveolae are small and the integument is shiny ..... *Paracryptocerus* s. str. Emery

2. Head disc excised in front, above the mandibles..... *Harnedia* M. R. Smith

— Head disc not excised in front, above the mandibles..... *Cyathomyrmex* Creighton

Subgenus *Paracryptocerus* Emery

Cryptocerus (*Paracryptocerus*) Emery, 1915, Bull. Soc. Ent. France, p. 192. — Emery, 1922, Gen. Insect. Hym. fasc. 174c, pp. 306-308. — Wheeler, 1922, Bull. Am. Mus. Nat. Hist. vol. 45, p. 665.
Paracryptocerus (*Paracryptocerus*) M. R. Smith, 1949, Psyche, vol. 56, pp. 18-21.

Type of the subgenus: *Cryptocerus spinosus* Mayr, 1862 [=*Paracryptocerus* (*Paracryptocerus*) *spinosus* (Mayr)]. By original designation of Emery, 1915.

This subgenus includes three well differentiated species groups, and several isolated species, the exact placement of which is still problematical. All species agree in having the head of the soldier and female not surmounted by a flat or excavate disc, as stated in the preceding key. All other characters given in Emery's diagnosis of the subgenus never had any absolute distinguishing value, and are now practically useless, on account of the inclusion of the *pavonii-group* in the present subgenus. The justification of this step and also the discussion of each species group will be discussed further on. The workers and soldiers can be identified on hand of the subjoined key.

aa. *Key to the workers* [30]

1. Epinotum with distinctly differentiated basal and declivous face; petiole with a perpendicular, often truncate anterior face above the insertion 2

— Epinotum evenly curved, without a differentiated basal and declivous face; petiole without a perpendicular anterior face above the insertion (*pavonii*-group) 15

2. Anterior half of outer border of frontal carinae with projecting clubbed setulae (Fig. 128)..... 24. *manni*, n. sp.

— Anterior half of outer border of frontal carinae without such setulae 3

3. Hind femora incrassate and distinctly angulate above at the half; hind metatarsi broadened and flattened basad, narrowed distad; sides of pronotum continuous, not denticulate nor spinose; spines of petiole slightly upturned distad..... (*complanatus*-group) 4

— Hind femora not conspicuously incrassate nor angulate above at the half; hind metatarsi slender, not greatly flattened, sides parallel; sides of pronotum denticulate or spinose; spines of petiole horizontal (*spinosus*-group) 9

[30]) The following species have not been included: *conspersus* (F. Smith), *exiguus* (F. Smith) and *laminatus* (F. Smith).

4. Basal face of epinotum with only a posterior spine, the sides being unarmed; occipital border ecarinate, rounded (Fig. 132)..... 12. *cordiae* (Stitz)
— Basal face of epinotum with at least one lateral and one posterior spine or tooth; occipital border carinate or crested laterad..... 5
5. Frontal carinae ferruginous; first gastric tergite without conspicuous glittering scales, the posterior half rather coarsely striato-rugose. (Fig. 129)..... 13. *femoralis* (F. Smith)
— Frontal carinae fuscous to black, concolorous with the rest of the head; first gastric tergite with conspicuous glittering scales, the posterior half not striato-rugose, or, if so, the striae are very faint and covered with large glittering scales..... 6
6. Lateral border of head scarcely sinuate, little or not at all upturned above the eyes; posterior epinotal spine not longer than the lateral mesonotal spine (Figs. 130, 131)..... *(complanatus)* 7
— Lateral border of head conspicuously sinuate, distinctly upturned above the eyes; posterior epinotal spine much longer than the lateral mesonotal spine (Figs. 133, 134)..... *(multispinus)* 8
7. Occipital corner and anterior corner of the pronotal expansion sharply angulate; petiole and postpetiole with a faint longitudinal median carinule above (Fig. 131)..... 10. *complanatus* (Guérin)
— Occipital corner and anterior corner of the pronotal expansion rounded; petiole and postpetiole without a trace of a median longitudinal carinule above (Fig. 130)..... 11. *complanatus ramiphilus* (Forel)
8. Posterior epinotal spines much shorter than their distance at base; distance between the apices of the petiolar spines not much longer than the distance between the apices of the postpetiolar spines Fig. 133)..... 14. *multispinus* (Emery)
— Posterior epinotal spines as long as their distance at base; distance between the apices of the petiolar spines much longer than the distance between the apices of the postpetiolar spines (Fig. 134).. 15. *multispinus inca* (Santschi)
9. Lateral border of mesonotum without a projecting spine or tooth; posterior corners of pronotum not projecting, continuous with the mesonotum (Fig. 117)..... 8. *spinosus* (Mayr)
— Lateral border of mesonotum with a projecting spine, tooth or rectangular lobe; posterior corners of pronotum projecting beyond the anterior corner of mesonotum..... 10
10. Head transverse, visibly broader than long; epinotal spines triangular, depressed and flattened (Fig. 124)..... 1. *inaequalis* (Mann)
— Head subquadrate, or if slightly broader than long, the epinotal spines are long, cylindrical and subacuminate..... 11
11. Second pronotal tooth spine-like, subequal to, or longer than the first epinotal spine (Fig. 119).. 3. *laminatus christopherseni* (Forel)
— Second pronotal tooth never spine-like, usually small or obsolete, always shorter than the first epinotal spine..... 12
12. Eyes large, their greatest diameter longer than one third of the median head length; petiole with a long lateral spine; tibiae yellowish-brown above 13
— Eyes small, their greatest diameter shorter than one third of the median head length; petiole with a small lateral tooth, often obsolete, seldom spine-like; tibiae fuscous to black above..... *(pusillus)* 14

13. Posterior border of second epinotal spine expanded, forming a sharp crest, delimiting the declivous face caudad, when seen from above; declivous face smooth and excavated (Fig. 126)..... 7. *simillimus*, n. sp.
— Posterior border of second epinotal spine not expanded, not forming a sharp crest nor delimiting the declivous face caudad; declivous face longitudinally striated, not excavated (Fig. 123)..... 4. *minutus* (Fabricius)
14. Outer face of fore coxae not striated; glittering, scale-like hair on upper surface of head conspicuous; petiole often with a small lateral tooth (Fig. 121)..... 5. *pusillus* (Klug)
— Outer face of fore coxae conspicuously striated; glittering scale-like hair on upper surface of head minute, scarcely visible; petiole without lateral tooth; posterior epinotal spines very long and slender..... 6. *pusillus columbicus* (Forel)
15. Shoulders angulate, separated from the lateral pronotal expansions; sides of epinotum bispinose or bidentate; occipital border greatly emarginate 16
— Shoulders concealed, not separated from the lateral pronotal expansions; sides of epinotum crested, never bispinose or bidentate; occipital border scarcely emarginate..... 21
16. Lateral lamella of pronotum broader than length of petiole..... 17
— Lateral lamella of pronotum narrower than length of petiole.... 19
17. Pronotal lamellae in the form of a continuously rounded lobe, their outer margin scarcely convex and distinctly converging caudad (Fig. 146)..... 17. *cordatus* (F. Smith)
— Pronotal lamellae in the form of a broad subquadrangular lobes, their anterior, outer and posterior borders sinuate..... 18
18. Frontal carinae concolorous with the rest of the head; the second epinotal spine situated at the posterior corner of the epinotum, its posterior border crested, continuous with the posterior margin of the epinotum (Fig. 147)..... 16. *borgmeieri*, n. sp.
— Frontal carinae ferruginous to testaceous; the second epinotal spine situated at the side of the epinotum, its posterior border not continuous with the posterior margin of the epinotum (Fig. 145).. 21. *pavonii* (Latreille)
19. Anterior border of petiolar spines not continuous with the anterior border of the petiole, the spines arising from the middle of the side; pronotal lamellae short, subquadrate (Fig. 148)..... 19. *depressus* (Klug)
— Anterior border of petiolar spines continuous with the anterior border of petiole, the spines arising from the anterior corner; pronotal lamellae elongate, subrectangular 20
20. Antero-lateral border of gaster marginate and crested (Central America) (Fig. 149)..... 18. *cristatus* (Emery)
— Antero-lateral border of gaster marginate but not crested (Central South America)..... 20. *eduarduli* (Forel)
21. Laterotergite of pronotum longitudinally striated; sides of declivous face without a testaceous crest at the posterior half (Fig. 150).... 22. *multispinosus* (Norton)
— Laterotergite of pronotum finely reticulate-punctate, not striated; sides of declivous face of epinotum with a testaceous crest along its entire length (Fig. 152).... 23. *multispinosus biguttatus* (Emery)

bb. *Key to the soldiers*[31]

1. Occiput not distinctly truncate; promesonotum flat (Fig. 127)..... 24. *manni*, n. sp.
— Occiput truncate; promesonotum arched and convex..... 2
2. Hind femora angulate above at the half, or, if not distinctly angulate, the apical half of the upper face is densely covered with glittering scale-like hairs 3
— Hind femora not angulate above at the half, apical half of upper face not densely covered with glittering scale-like hairs..... (*spinosus*-group) 4
3. Posterior margin of basal face of epinotum marginate or submarginate; the declivous face perpendicular to the basal face..... (*complanatus*-group) 9
— Posterior margin of basal face of epinotum not marginate, not distinctly separated from the declivous face; the latter not perpendicular to the basal face..... (*pavonii*-group)
4. Frontal carinae prolonged as a distinct, slightly upturned carina above and beyond the eyes; maximum length of head distinctly shorter than interocular width; occipital border more or less concave.... 5
— Frontal carinae not prolonged as a distinct, upturned carina above the eyes; maximum length of head greater than interocular width; occipital border convex 8
5. Lamellate antero-lateral border of first gastric tergite distinctly set off, excavate above, as broad as the length of the postpetiole; mesonotum and epinotum forming a distinct angle in profile (Fig. 116)..... 8. *spinosus* (Mayr)
— Lamellate antero-lateral border of first gastric tergite flat, not excavated above, narrower than length of the postpetiole, often not differentiated; mesonotum and epinotum subcontinuous in profile.. 6
6. Occiput distinctly marginate above between the tubercles on vertex; lateral lobe of postpetiole curved forward, rounded at apex (Fig. 120)..... 3. *laminatus christopherseni* (Forel)
— Occiput immarginate above, pair of tubercles on vertex absent or obsolete; lateral lobes os postpetiole projecting sidewards, angulate behind on apex..... (*pusillus*) 7
7. Upper surface of head subfulgid, rather densely and deeply foveolate; mesonotum with elongate foveolae; each foveola containing a visible scale (Fig. 118)..... 5. *pusillus* (Klug)
— Upper surface of head opaque, more sparsely and shallowly foveolate, hairs in foveolae hardly visible; mesonotum with round foveolae, scales obsolete..... 6. *pusillus columbicus* (Forel)
8. Declivous face of epinotum crested laterally below; promesonotum subfulgid (Fig. 125)..... 7. *simillimus*, n. sp.
— Declivous face of epinotum not crested laterally below; promesonotum subopaque (Fig. 122)..... 4. *minutus* (Fabricius)
9. Occipital corners dentate; vertex with a pair of small teeth (Fig. 137) 14. *multispinus* (Emery)
— Occipital corners rounded, without teeth; vertex without a pair of small teeth 10

[31]) The following have been omitted: *duckei* (Forel), *spinosus peruvianus* (Forel). Of the following I have seen no specimens and the key is based upon the description alone: *borgmeieri*, n. sp., *cristatus* (Emery), *eduarduli* (Forel).

10. Pronotum, in profile, strongly convex, its lateral borders ecarinate, converging caudad; occiput subtruncate, immarginate, rounded above; epinotal spines slender, as long as petiole..... 12. *cordiae* (Stitz)
11. Occipital corner and lateral portion of occipital border above the truncation ecarinate (Fig. 136)..... 10. *complanatus* (Guérin)
— Occipital corner and lateral portion of occipital border above the truncation carinate (Fig. 135).. 11. *complanatus ramiphilus* (Forel)
12. Anterior half of frontal carinae not crenulate; anterior corners of gaster with a light, large, yellowish macula..... 18
— Anterior half of frontal carinae distinctly crenulate; anterior corners of gaster without a light, yellowish-brown macula..... 13
13. Petiole with a very short lateral spine, arising from the side, not continuous with the anterior border of the petiole, or, petiole only one and a half times as broad as long..... 14
— Petiole at least three times as broad as long, the lateral spines long, continuous with the anterior border..... 15
14. Postero-lateral projection of basal face of epinotum with a dorsal tooth distad, prolonged mesad in the form of a carinule separating the declivous and basal face laterad, vertex with a distinct transverse bidentate crest..... 20. *eduarduli* (Forel)
— Postero-lateral projection of basal face without a dorsal tooth or carinule, transverse bidentate crest of vertex vestigial to obsolete (Fig. 141)..... 19. *depressus* (Klug)
15. Transverse pronotal crest sharply crenulated.. 18. *cristatus* (Emery)
— Transverse pronotal crest not sharply crenulated..... 16
16. Occiput marginate and crested above only mesad between the pair of teeth on vertex..... 16. *borgmeieri*, n. sp.
— Occiput marginate and crested above also laterad between each tooth on vertex and the sides of the head..... 17
17. Anterior border os petiole from the middle to the tip of the spine evenly convex; posterior corner of basal face of epinotum with an upturned, blunt tooth (Figs. 142, 144)..... 17. *cordatus* (F. Smith)
— Anterior border of petiole from the middle to the tip of the spine sinuate, the median portion emarginate; posterior corner of basal face without a conspicuous upturned blunt tooth (Fig. 139)..... 21. *pavonii* (Latreille)
18. Vertex delimited behind and laterad by a distinct carinule, extending from each of the median teeth to the lateral border; sides of mesonotum projecting as a blunt, rounded lobe (Fig. 143)..... 22. *multispinosus* (Norton)
— Vertex without a carinule laterally behind; sides of mesonotum without a rounded lobe (Fig. 138)..... 23. *multispinosus biguttatus* (Emery)

A. Group of Paracryptocerus (P.) spinosus (Mayr)

The workers of the present group possess the following common characteristics: Frontal carinae lighter than front, semi-translucid, never concolorous, without a rim of projecting setulae; occipital corners with a more or less obliquely truncate lobe; occipital border emarginate; shoulders angulate, separate from the pronotal expansions; sides of pronotum spinose or dentate; epinotum with two spines or teeth on each side, the posterior

spine usually the longest, never shorter than the anterior spine; femora rounded in cross section, not compressed, not angulate above, distal half of upper face never densely scaled; metatarsi of middle and hind legs elongate, not broadened nor flattened basad, nor attenuate distad, their sides parallel; declivous face differentiated from basal face of epinotum, but not marginate above; anterior face of petiole truncate above the insertion; gaster with more or less distinct antero-lateral lamellate border; scales on upper surface of head and gaster simple, usually thinner than those of the thorax, which are generally canaliculate.

The soldiers have the head not surmounted by a disc; upper surface of head distinctly convex, posterior border not marginate nor crested; frontal carinae usually concolorous with the front; eyes flat; mandibles not angulate above at the half; transverse keel on pronotum more or less distinct, always interrupted mesad; sides of pronotum with one or two denticules; basal face of epinotum with a lateral tooth and a longer divergent posterior spine on each side; declivous face of epinotum more or less perpendicular to the basal face, usually not sharply marginate above; femora not angulate above, nor compressed, apical half above without dense, glistening scales; metatarsi of middle and hind legs not considerably flattened nor broadened proximad.

The females exhibit the same head characteristics as the soldier, the upper surface being still more conspicuously convex. The gaster is appreciably elongate, and the median length of the first gastric tergite exceeds the length of the thorax.

Following is a list of the species and subspecies included in the present group:

1. *P. (P.) inaequalis* (Mann)
2. *P. (P.) laminatus* (F. Smith)
3. *P. (P.) laminatus christopherseni* (Forel)
4. *P. (P.) minutus* (Fabricius)
5. *P. (P.) pusillus* (Klug)
6. *P. (P.) pusillus columbicus* (Forel)
7. *P. (P.) simillimus,* n. sp.
8. *P. (P.) spinosus* (Mayr)
9. *P. (P.) spinosus peruvianus* (Forel)

This complex includes the type species of the genus and the subgenus: *P. (P.) spinosus* (Mayr).

1. *Paracryptocerus (P.) inaequalis* (Mann)

(Fig. 124)

Cryptocerus (Cryptocerus) inaequalis Mann, 1916, Bull. Mus. Comp. Zool. Harvard, vol. 60, pp. 449-450 [worker; Brazil: Guaporé territory, Abunã, Madeira-Mamoré RR. Camp 41].
Cryptocerus (Paracryptocerus) inaequalis Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 307.

This very distinctive species bears some resemblance to *spinosus*, from which it differs by the presence of a lateral mesonotal tooth, the shape of the thoracic spines, and the flat, not excavated foliaceous border of the first gastric tergite. It disagrees from *laminatus christopherseni* by the very broad head, the broad lamellate border of the first gastric tergite and the shape of the pronotal and epinotal spines.

Type. — Worker; Brazil: Guaporé territory, Abunã, Madeira-Mamoré RR. Camp. 41 (Mann & Baker). [Coll. Wm. M. Mann].

Worker (lectotype). — Length 5.6 mm. Median head length 1.39 mm.; Weber's length of thorax 1.73 mm. Black; the following pale yellowish-brown and semitranslucid: Frontal carinae, occipital lamellae, thoracic and peduncular spines; lamellate border of the first gastric tergite. Ferruginous: tibiae, tarsi, apices of mandibles. Fuscous: femora and base of middle and hind metatarsi.

Head [Fig. 124] subopaque; broader than long, broadest behind the eyes, narrowed in front; interocular distance longer than maximum length of head (78:74). Posterior margin between the lobes, scarcely concave, almost straight, the occipital angles with prominently projecting, obliquely truncate lamellae, the apical border of which is distinctly sinuate. Cheeks strongly marginate beneath, covered with dense, large, canaliculate, golden scales. Integument very finely reticulate-punctate, sparsely covered with slender, simple, short, appressed, scale-like hairs which, near the occipital border, are situated in grooves.

Thorax subopaque. Pronotum angulate at the shoulders; broadly expanded behind the shoulders with two broad, flat, triangular teeth on each side; posterior corners of pronotum more or less rounded and projecting. Promesonotal suture obsolete. Mesonotum with a small, acute, lateral tooth. Mesoepinotal suture impressed. Basal face of epinotum with two large, broad, flat, triangular teeth on each side, the anterior tooth slightly smaller than the posterior. The posterior border of the second tooth forms a sharp crest and delimits the distinctly excavated declivous

face laterad. Sculpture as on head, but sparsely foveolate above, with very short, broad scales, some of which are distinctly canaliculate, becoming slightly longer on the basal face of the epinotum. Laterotergite of pronotum and mesopleura longitudinally striated. Excavated portion of declivous face without distinct macrosculpture and without scales.

Petiole subopaque, transverse, with set off, slender, long, lateral spines, arising from the anterior corner, gently curved backwards, rounded at apex. Postpetiole with somewhat shorter, broader lateral spines, bluntly rounded at apex, curving obliquely foreward. Sculpture as on thorax, less distinctly foveolate, scales slightly longer.

Gaster subopaque; broadly cordiform, very convex above. First gastric tergite with antero-lateral, flat, lamellate border, almost as broad as the length of petiole. Tergites and sternites finely, densely and rather sharply reticulate-punctate. Scales of gaster sparser, simple, short, not situated in distinct foveolae. Erect pile limited to the 2d-4th gastric tergites and the sternites.

Soldier, female, male unknown.

This very characteristic form is still known only from the type series, of which I have examined 2 specimens (lectotype and paratype).

2. *Paracryptocerus* (*P.*) *laminatus* (F. Smith)

Cryptocerus laminatus F. Smith, 1860, Journ. Ent. vol. 1, p. 76; Pl. 4, fig. 3 [worker; Brazil: State of Amazonas, Egas (=Tefé)]. — (?) Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, p. 213; Pl. 3, fig. 4 [soldier; Brazil: State of Pará]. — Forel, 1911, Sitz.-ber. Akad. Wiss. p. 261 [worker]. — Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, pp. 204-205.
Cryptocerus (*Paracryptocerus*) *laminatus* Emery, 1915, Bull. Soc. Ent. France, p. 192.

Type. — Worker; Brazil: Amazon River, Egas (H. W. Bates). [British Museum (Natural History)].

The present species is known only from the type series and has been characterized by Frederick Smith as follows:

"Worker: Length 2-2 1/2 lines. Black, and sprinkled over with silvery white glittering setae; the sides of the head, before the eyes broad, pale testaceous yellow; the eyes prominent, situated at the posterior angles of the head, which has the margin curved behind the eyes and emarginate in the middle; the antennae pale beneath and fuscous above. The thorax with five pale spines on each side, the posterior pair longest; a deep strangulation at the base of the metathorax; the tips of the femora, the tibiae, and apical joints of the tarsi pale ferruginous, the tibiae with a dark stain beneath. The abdomen subcordate, the margins

at the base pale and membranaceous; the nodes of the peduncle transverse; the anterior one subquadrate, with a pale acute spine on each side curved backwards toward the abdomen; the second node somewhat cup-shaped, terminating laterally in a pale, acute spine, which is directed outwards".

In 1911 Forel was able to examine a presumable syntype of this species, contained in the Bates Collection, at the Museum of Munich. According to his account (1911, 1912), the typical *laminatus* differs from the subspecies *christopherseni* as follows:

Head much wider behind the eyes than long; occipital lamellae very broad, each one occupying more than 1/3 of the occipital border; declivous face of epinotum excavate, marginate above, finely reticulate-punctate without striae nor rugosities; epinotal spines stouter and shorter than the length of the basal face; frontal carinae, occipital lamellae, lamellate border of first gastric tergite, tips of thoracic spines, tibiae, tarsi, reddish-yellow; spines of petiole slender; scale-like hairs longer, less distinctly canaliculate; sculpture less dense. [32]

Among these diagnostic features the broadness of the head and especially the broadness of the occipital lamellae are the most striking ones, and seem to differentiate sufficiently the typical *laminatus* from the race *christopherseni.* Emery, in 1894, has given a picture and a short description of what he believed to represent the soldier of the present form. Comparing this figure with the soldier of *laminatus christopherseni,* I could not detect any noticeable difference between the two forms, except, perhaps, the rather slender acute spines of the thorax of Emery's specimen, which character however may be due to the small size of the soldier. All the soldiers of *laminatus christopherseni,* which I have examined are appreciably larger than Emery's specimen from Pará.

The relationship between both forms remains dubious. I have not seen the type, nor other specimens referable to it.

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[32]) *P. laminatus* (F. Smith) may possibly be identical with *inaequalis* (Mann) or *spinosus* (Mayr). If this should be the case, then one of the latter species falls as a synonym and *laminatus christopherseni* (Forel) must be accorded full specific rank.

3. *Paracryptocerus (P.) laminatus christopherseni* (Forel)

(Figs. 119, 120)

Cryptocerus laminatus christopherseni Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, pp. 204-205 [worker, soldier; Colombia: Santa Marta, Dibulla, Ourlheka, Bonda, Naranjo; Panama].
Cryptocerus (Paracryptocerus) laminatus christopherseni Emery, 1922, Gen. Insect. Hym., fasc. 174c, p. 307.

This rather common subspecies already has been differentiated from the practically unknown typical species. The worker may be separated from the somewhat similar *pusillus* by the second pronotal spine, which is as long as, or longer than, the first epinotal spine; the extremely divergent epinotal spines, shorter than their interbasal distance; the long lateral spine of the petiole; and the subopaque, cordiform gaster, with a light, distinctly set off, antero-lateral lamellate border. The soldier differs from that of *pusillus* by the presence of two distinct tubercles on the occipital border, which is sharply marginate between them.

Types. — Worker, soldier; Colombia: Santa Marta (Forel) [Muséum d'Histoire Naturelle, Genève (Coll. A. Forel)].

Worker (lectotype) [Fig. 119]. — Length 5.4 mm. Median head length 1.36 mm. Weber's length of thorax 1.57 mm. Black; the following light ferruginous: frontal carinae, occipital lamellae, tip of last funicular segment, lamellate border of first gastric tergite. The following slightly darker: 1st funicular segment, apices of thoracic spines, peduncular teeth, apices of tarsal segments.

Head subopaque; slightly broader than long, broadest behind the eyes, narrowed in front, interocular distance slightly longer than maximum length of head (71:69). Posterior margin straight, the occipital angles with projecting obliquely truncate lamellae, the apical border of which is scarcely sinuate. Cheeks strongly marginate beneath, densely scaled. Eyes small, their maximum diameter distinctly less than one third of the median head length. Integument very finely reticulate-punctate, sparsely covered with silvery, slender, simple, appressed scale-like hairs, longer than in *inaequalis*, larger, canaliculate, situated in grooves in front of the occipital border.

Thorax opaque. Anterior border moderately arcuate, shoulders sharply angulate. Pronotum somewhat expanded laterally behind the shoulders, with two short, unequal and slightly upturned spines on each side, the posterior spine being shorter

than the anterior. Posterior corner of pronotum projecting, as a more or less rectangular tooth. Promesonotal suture vestigial. Mesonotum with a small and acute lateral tooth. Mesoepinotal suture more or less distinct. Basal face of epinotum in the same plane as mesonotum, transverse, with a short and straight antero-lateral spine, as long as the second pronotal spine and a much longer, slender spine projecting laterad and somewhat caudad from the posterior corner. Microsculpture as on head, but the very sparse, mostly canaliculate, decumbent, silvery, long scales lie in elongate grooves. Declivous face of epinotum not excavated mesally nor crested laterad, without scales finely longitudinally rugose above and laterad. Laterotergite of pronotum and meso-pleura longitudinally striated.

Petiole opaque, transverse, with distinctly set off, slender, long, subacute lateral spines, arising from the anterior corner. Postpetiole slightly longer than petiole, transverse, with shorter, broader, apically rounded, lateral spine, curving slightly forward. Both segments sculptured as thorax, the scales somewhat shorter and simple, not lying in distinct grooves.

Gaster subfulgid, elongate cordiform, very convex above. First gastric tergite with rather narrow, distinctly set off antero-lateral lamellate border. Tergites and sternites finely and rather sharply reticulate-punctate. Scales of gaster sparser, simple, short, not lying in foveolae. Erect pilosity confined to 2d to 4th tergites and the sternites.

Soldier [Fig. 120]; Panama Canal Zone: Monte Lirio. Nov. 18, 1911 (Wm. M. Wheeler) [Museum of Comparative Zoology, Harvard]. Length 7.0 mm. Median head length 1.83 mm.; Weber's length of thorax 2.00 mm. Black; the following ferruginous: frontal carinae in part (partly translucid), tip of last antennal segment, outer face of tibiae, tip of femora, three apical segments of tarsi. Fuscous: remaining part of appendages. Lamellate border of first gastric tergite semitranslucid.

Head subopaque; shorter than wide in front of the eyes (86:93). Frontal carinae greatly rounded anteriorly, prolonged and slightly upturned above the eyes in the form of a raised carinule, fading out before reaching the subangulate and projecting occipital corner. Upper surface of head very little convex. Eyes scarcely convex. Vertex with a pair of dentiform projections, occipital border between these teeth distinctly and sharply marginate. Occiput truncate mesad. Cheeks immarginate beneath. A distinct carinule below the eyes, extending to the

occipital corners. Integument finely and shallowly reticulate-punctate. Upper surface of head with sparse, small foveolae, containing no distinctly visible hair. Foveolae somewhat more crowded on occiput. Sparser but larger on lower surface of head, containing a distinctly visible decumbent seta.

Thorax subopaque above. Anterior border arcuate, shoulders subangulate, not visible from above. Pronotum expanded laterally with two small, rather blunt teeth on each side; between the posterior pair of teeth a transverse crest, broadly interrupted mesad, vestigial laterad, the inner end raised, almost tooth-like. Sides of pronotum converging mesad behind the crest, the posterior corners subrectangular and projecting. Promesonotal suture vestigial. Mesonotum with a small, more or less rectangular lateral tooth. Mesoepinotal suture impressed. Epinotum opaque, transverse; the basal face with a short, triangular tooth antero-laterally and a much larger, stout, strongly diverging tooth at the posterior corner, having a ventral lobe near its tip. Microsculpture as on head. Dorsum of thorax and laterotergite of pronotum covered with rather dense, deeply impressed setiferous foveolae, much larger than on upper surface of head, rounded on mesonotum, elongate on epinotum. Declivous face and posterior portion of the sides of the thorax without conspicuous macrosculpture; declivous face not crested on the sides.

Petiole opaque, transverse, anterior corners rounded; with a rather short, acute, scarcely recurved tooth on each side. Postpetiole with a plate-like lateral tooth, curving slightly foreward. Both segments finely reticulate-punctate, opaque, covered with vestigial foveolae and rugosities.

Gaster subopaque, subcordiform, about as long as wide. First gastric tergite with a narrow, semitranslucid lamellate antero-lateral border; finely reticulate.

All foveolae, except on upper surface of head, contain a decumbent seta, which is flattened, shiny, and scale-like on thorax and peduncle. Erect pilosity on the terminal tergites of the gaster and the sternites. First gastric tergite beset with minute appressed setulae. Scales canaliculate on dorsum of thorax.

Female and male unknown.

Distribution. — This form appears to be confined to Northern Colombia and Panama.

Specimens examined: 27; 21 workers, 6 soldiers, as follows: *Colombia*: Bonda (Forel): 2 workers ("Cotypes") [CWMM]. Rio Frio; March 1924 (Wm. M. Mann): 9 workers, 3 soldiers

[USNM]. Santa Marta (Forel): 2 workers (lectotype and paratype) [MHNG]. — *Panama*: Porto Belo; Feb. 26, 1911 (E. A. Schwarz): 1 worker [USNM]. Matias Hernandez; Nov. 1946 (N. L. H. Kraus) 1 worker [USNM]. — *Canal Zone*: Barro Colorado Island; June 25, 1924 (N. Banks): 1 worker [MCZ]. Gatun; Nov. 18, 1911 (Wm. M. Wheeler): 3 workers [MCZ]. Monte Lirio; Nov. 18, 1911 (Wm. M. Wheeler): 2 workers, 3 soldiers [MCZ]. Red Tank (Wheeler): 3 workers [MCZ].

Variation. — The worker specimens from Gatun and Barro Colorado Island, Panama Canal Zone, and from Porto Belo, Panama, possess completely infuscated, extremely short lateral petiolar teeth. The individuals from Rio Frio, Colombia, are distinctive by the light frontal carinae and the dark ferruginous upper face of the tibiae. The above described soldier disagrees to some extent from Forel's description. The frontal carinae are less converging anteriorly than in *pusillus*, and their posterior prolongation, although longer than in *pusillus*, fades out before reaching the occipital corner. Smaller soldiers have the occipital crest less sharply defined and no distinct apico-ventral tooth on the posterior epinotal spine.

The status of the present subspecies and its relationship with the typical *laminatus* already have been discussed under that species, on a foregoing page.

4. *Paracryptocerus* (*P.*) *minutus* (Fabricius)

(Figs. 122, 123)

Cryptocerus minutus Fabricius, 1804, Syst. Piez. p. 420 [worker; South America]. — Klug, 1824, Ent. Monogr. p. 203 [worker; Brazil: Rio de Janeiro]. — F. Smith, 1854, Trans. Ent. Soc. London, (2) vol. 2, p. 221. — F. Smith, 1858, Cat. Hym. Brit. Mus. vol. 6, p. 190; Pl. 11, fig. 8 [worker]; Pl. 12, fig. 3 [soldier]. — F. Smith, 1862, Trans. Ent. Soc. London, (3) vol. 1, p. 409, Pl. 12, fig. 6 [soldier]. — Mayr, 1862, Verh. Zool.-bot. Ges. Wien, vol. 12, p. 116 [St. Thomas, Virgin Island]. — Emery, 1890, Bull. Soc. Ent. Ital. vol. 22, p. 74, Pl. 9, fig. 7 a-d [worker, soldier, female]. — Emery, 1893, *in*: Dalla Torre, Cat. Hym. vol. 7, p. 143. — Forel, 1899, Biol. Centr.-Amer. Hym. vol. 3, p. 50 [Mexico: Guerrero Province, Amula; Vera Cruz Province, Atoyac; Tabasco Province, Teapa. Guatemala: Chacoj en Vera Paz, El Reposo, Pantaleon, Mirandilla, San José. Nicaragua: Chontales. Costa Rica: Alajuela, Jimenez. Panama: Volcan de Chiriqui, David, Caldera]. — Forel, 1905, Ann. Soc. Ent. Belg. vol. 49, p. 158 [Venezuela: Las Trincheras]. — Forel, 1906, Ann. Soc. Ent. Belg. vol. 50, p. 234 [worker; Costa Rica: El Hiquito, nr. San Mateo (Pacific Coast); Colombia: Sierra Nevada de Santa Marta, between Dibulla and S. Antonio]. — Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 201 [worker, female; Colombia: Santa Marta, Bonda. Guatemala. Venezuela. Brazil: State of Pará, Belém; State of Bahia, Salvador; Federal District, Rio de Janeiro; State of S. Paulo, Santos]. — Mann, 1922, Proc. U. S. Nat. Museum, vol. 61, p. 34 [Honduras: Ceiba, Monte Cristo, Tela].

Cryptocerus (*Paracryptocerus*) *minutus* Emery, 1915, Bull. Soc. Ent. France, p. 192. — Skwarra, 1934, Oekol. Stud. Koenigsberg, p. 128 [Mexico]. — Wheeler, 1942, Bull. Mus. Comp. Zool. Harvard, vol. 90, p. 209 [Panama: Tumba Muerta Road, near Las Sabanas; Canal Zone: Miraflores].

Cryptocerus quadrimaculatus Klug, 1824 (*nec* F. Smith, 1854), Ent. Monogr. p. 215 [female; Brazil: State of Pará]. — Guérin, 1845, Iconogr. Regne Animal, Insect. vol. 7, p. 426.

Cryptocerus volxemi Emery, 1878, C. R. Ann. Soc. Ent. Belg. vol. 21, p. 9 [worker; South America].

Cryptocerus (*Paracryptocerus*) *minutus* var. *cognatus* Santschi 1931, (*nec* F. Smith, 1862), Rev. de Ent., Rio de Janeiro, vol. 1, p. 275 [worker, soldier; Panama, Costa Rica, French Guiana; Amazon River].

This species may possibly be confused with *pusillus*, from which, however, it is very distinct. The minor worker differs by

the smaller size (3.4-3.9 mm.), the large eyes, the flat dorsum of the thorax, the comparatively long and recurved first epinotal spine, about half as long as the second; the long lateral petiolar spine. The soldier and the female are immediately recognized by the distinctive shape of the head. The closest relative of *minutus* is the new species *simillimus*, from which it will be differentiated on a following page, under that species.

Type. — Worker; South America. [Mus. Dom. de Sehestadt, or Mus. Regii Havniensis (sec. Klug, 1824)].

Worker [Fig. 123]; British Guiana: Kartabo; July-Aug. 1920 (Wm. M. Wheeler). [Mus. Comp. Zool. Harvard]. Length 3.4 mm. Median head length 0.88 mm.; Weber's length of thorax 0.95 mm. Black; the following light reddish-brown: antennae, tips of mandibles, tips of femora, tibiae, tarsi, apical half of metatarsus, apices of first prothoracic tooth, epinotal and peduncular spines, antero-lateral border of gaster, distal border of gastric tergites and sternites. Frontal carinae and upper face of tibiae pale yellowish.

Head opaque; slightly longer than broad, broadest behind the eyes; interocular distance somewhat shorter than the maximum length of the head (43:40). Lateral margins of head scarcely sinuate above the eyes. Posterior margin straight mesally, the occipital angles with slightly projecting, subtransversely truncate, partly infuscated, lamellae, the apical border of which is more or less straight. Cheeks strongly marginate beneath, densely covered with flat, appressed, silvery hairs. Eyes large, their longest diameter more than 1/3 of median head length. Upper and lower surface of head finely reticulate-punctate, sparsely covered with silvery, slender, simple, flat, scale-like, appressed hairs; slightly larger, denser, and somewhat canaliculate, lying in grooves, in front of the occipital border.

Thorax opaque. Anterior border moderately arcuate; shoulders sharply angulate. Pronotum somewhat expanded laterally behind the shoulders, with two short teeth on each side, the posterior tooth slightly shorter than the anterior. Posterior corners of pronotum projecting, forming a rectangular tooth. Promesonotal suture vestigial laterad, obsolete mesad. Mesonotum on each side with a small, acute, projecting tooth. Mesoepinotal suture not deeply impressed, more or less vestigial. Basal face of epinotum with an antero-lateral, smaller recurved spine and a posterior long, slender spine, twice as long as the first, greatly divergent, more than 45° from the longitudinal axis. Declivity not excavated,

its sides not conspicuously crested, but finely longitudinally striated, without scales. The entire thorax finely reticulate-punctate, the upper face very little convex longitudinally and transversely, with rather dense, more or less longitudinal, elongate grooves, each containing a flat, canaliculate, appressed silvery scale. Laterotergite of pronotum and mesopleura longitudinally striated, sparsely scaled.

Petiole opaque, transverse, with a long, subacute spine on each side. Postpetiole slightly longer than petiole, transverse, with a somewhat shorter, broader, spine, on each side, more or less rounded apically curving obliquely forward. Sculpture as on thorax, the sparse scales not lying in foveolae.

Gaster subopaque, somewhat elongate, depressed. First gastric tergite with rather narrow, not distinctly set off antero-lateral lamellate border, emarginate mesad. Tergites and sternites finely reticulate-punctate. Scale-like silvery hair appressed, sparse and simple, not lying in deep foveolae. Erect pile confined to apical half of first sternite and the exposed portion of the tergites 2-4 and the sternites.

Soldier [Fig. 122]; Guatemala: Zacapa; Dec. 13, 1911 (Wm. M. Wheeler). [Museum of Comparative Zoology, Harvard]. — Length 7 mm. Median head length 1.90 mm.; Weber's length of thorax 2.02 mm. Black; the following ferruginous: antennae, tip of femora, tibiae, tarsi. First gastric tergite with a large yellowish-brown spot on each corner.

Head subfulgid; slightly longer than wide (83:82). Frontal carinae arcuate, diverging caudad to above the posterior end of the antennal scrobe, where they form a distinct, very obtuse angle, and are prolonged in the form of a conspicuous, not raised margination above the eyes, fading out before reaching the posterior border of the eyes. Upper surface of head scarcely convex. Occiput sharply truncate, distinctly marginate on vertex. Occipital corners indicated by faint tubercular swellings on each side. Occipital border slightly convex. Cheeks immarginate below. Eyes flat. A distinct margination extends from beneath the eyes back to the occipital corner. Upper surface of head very finely punctate, with sparse, small foveolae, in which no distinct hair is visible. Foveolae slightly larger and more crowded on occiput, still larger, containing a distinctly visible, decumbent seta, on the lower surface of the head.

Thorax subfulgid above. Anterior border arcuate, shoulders subangulate. Sides of pronotum, with a strong lateral tooth,

pointing obliquely forward. Transverse pronotal keel distinct, not sharply crested. Posterior corner of pronotum projecting in the form of a small rectangular tooth. In profile the promesonotum is strongly convex. Promesonotal suture vestigial. Mesonotum with a stout, bluntly rounded, slightly upturned, marginate, lateral lobe. Thorax greatly constricted laterad between mesonotum and epinotum. Mesoepinotal suture impressed. Epinotum opaque. Basal face transverse with an antero-lateral, broad, obtuse tooth, and a much stronger, greatly diverging posterior spine, with blunt apex, and a postero-ventral lamella, which does not border the declivity laterad. Declivous face longitudinally striato-rugose. Microsculpture of promesonotum as on head, epinotum and sides subopaque, finely reticulate-punctate. Upper surface of thorax foveolate, sparsely on the anterior portion of the pronotum, densely and deeply behind, the foveolae being much larger than those of the upper surface of head. Laterotergite of pronotum with sparse and more shallow foveolae.

Petiole opaque; transverse with a stout, short, subacute, somewhat recurved lateral tooth. Posterior half shallowly transversely concave. Postpetiole slightly longer than petiole, as wide as petiole, with a plate-like, apically subtruncate lateral tooth on each side. Both segments finely reticulate-punctate.

Gaster subopaque; elongate, the anterior border emarginate mesad, antero-laterally strongly marginate, without a distinct lamellate border. Sides subparallel, scarcely convex. Tergites and sternites finely reticulate-punctate, without foveolae.

All foveolae, except the ones on the upper surface of head and promesonotum, bear a decumbent, flattened seta. Setae rather shiny on epinotum. Gaster with minute, shiny, scale-like scattered hairs. Erect pile confined to the terminal tergites and sternites of gaster and the posterior half of the first sternite.

Female; British Guiana: Kartabo. July-Aug. 1920 (Wm. M. Wheeler). [Coll. T. Borgmeier, Rio de Janeiro]. — Length 8.6 mm. Median head length 1.75 mm:; interocular width 1.73 mm.; Weber's length of thorax 2.40 mm. Black; the following ferruginous: apices of mandibles, tibiae, tarsi. Funiculus fuscous ferruginous. First gastric tergite with a large yellowish spot close to each corner.

Head, as in soldier, frontal carinae slightly less projecting laterad, upper surface of head appreciably more convex above. Ocelli small, dark, situated in pits.

Thorax subopaque, finely shagreened, slightly more fulgid

on scutum. Pronotum without a marked transverse keel, obliquely inclined cephalad, its sides marginate, with a stout scapular tooth, pointing forward. Epinotum short, transverse, the posterior border of the basal face emarginate, immarginate, with a stout, short tooth on each corner. Declivous face perpendicular to, three times longer than, the basal face. Upper surface of thorax and upper portion of the sides and the declivity rather densely and coarsely foveolate. Lower mesopleura with a tooth, the portion behind the tooth rather smooth without foveolae. Lower half of declivous face not foveolate, vestigially rugulose. Femora rounded in cross section, not angulate above. Metatarsi of middle and hind legs not conspicuously compressed nor broadened proximad, their sides parallel.

Petiole obliquely truncate anteriorly, its sides somewhat constricted behind with a minute denticule. Postpetiole greatly convex above in profile, with a short stout antero-lateral tooth. Both peduncular segments finely shagreened and coarsely and densely foveolate above.

Gaster elongate, subopaque. The first gastric tergite longer than the maximum length of thorax, its sides subparallel broadest behind the half. All segments finely shagreened, with a few vestigial foveolae.

Erect pile on legs, mandibles, and gastric segments, very sparse on scutum and postpetiole.

Wings infumated. Veins dark brunneous. Stigma fuscous. Marginal cell closed and appendiculate. Cubital and discoidal veins distinct almost to apical margin. Transverse cubital vein present.

Distribution. — This very widespread species is found throughout Central America, the Magdalena and Amazon basin and along the eastern coast of South America down to Santos, State of S. Paulo, Brazil.

Specimens examined: 430; 271 workers, 119 soldiers, 31 females, 9 males, as follows: *Mexico*: "on orchid plants"; May 3, 1943 (taken at Brownsville, Texas, by U. S. Plant Quarantine Inspectors): 3 workers, 3 soldiers [USNM]. Guerrero (Province or town in Coahuila Province, near the Rio Grande ?), "on orchids"; 1946 (U. S. Plant Quar. Insp.): 5 workers [USNM]. Chilpancingo, Guerrero Province; on orchids; Feb. 11, 1946 (U. S. Plant Quar. Insp.): 3 workers [USNM]. Tampico, Vera Cruz Province; July 1912 (E. A. Schwarz): 2 workers [USNM]. Tapachula, Chiapas Province; May 1923 (Wm. M. Mann): 1

worker, 9 soldiers, 2 females [USNM]. Tomazunchale, S. Luís de Potosi Province; on orchids; Oct. 7, 1946 (U. S. Plant Quar. Insp.): 1 worker [USNM]. Remudadero, April 9, 1929; on *Hypone arborescens* Don.: (E. Skwarra): 4 soldiers [MCZ]. — *Guatemala*: Livingston, Bahia de Amatique, Atl. Coast; April 4 (Barber & Schwarz): 1 worker [USNM]. Patalul; Jan. 8, 1912 (Wm. M. Wheeler): 3 soldiers [MCZ]. Samarata (Kellerman): 1 worker [MCZ]. Trece Aguas, Alta Vera Paz; on Cacao; March 1926 (Schwarz & Barbar): 1 worker [USNM]. Zacapa; Dec. 13, 1911 (Wm. M. Wheeler): 3 workers, 6 soldiers [MCZ]. — *Honduras*: "on *Cattleya,* sp."; May 18, 1941 (taken by U. S. Plant Quar. Insp.): 4 workers, 2 soldiers [USNM]. La Ceiba; Aug.-Oct. 1916 (F. J. Dyers): 9 workers [USNM]. La Ceiba (Wm. M. Mann): 9 workers, 2 soldiers, 1 female [CWMM]. — *Costa Rica*: Circuelas; Sept. 22, 1929 (A. Alfaro); 19 workers, 2 soldiers [ANSP]. Hamburg Farm, Limon Planes, Santa Clara Province (F. Nevermann): 5 workers, 1 soldier [CTB]; same locality, same collector; May-Aug. 1925, Jan. 1926; in dead twigs of Balsa: 12 workers, 10 soldiers, 2 females; in anteater stomach: 10 workers, 2 soldiers [USNM]. S. José; 1940 (H. Schmidt): 3 workers, 1 soldier [CTB]. S. José; Nov. 1911 (Wm. M. Wheeler): 3 workers, 1 soldier [MCZ]. Liberia; Jan. 14-16, 1930 (A. Alfaro): 66 workers, 22 soldiers [ANSP, MCZ]. Orotina; Dec. 7, 1929 (A. Alfaro): 18 workers, 7 soldiers [ANSP]. — *Panama*: Monte Oscuro; April 13, 1935: 1 worker [MCZ]. Tumba Muerta; April 5, 1923; in *Acacia spadicigera* (Wm. M. Wheeler): 12 soldiers [MCZ]. — *Canal Zone:* Barro Colorado Island; Aug. 6, 1924 (Wm. M. Wheeler): 3 workers, 5 soldiers [MCZ]. Corozal; July 12, 1924 (Wm. M. Wheeler): 2 workers, 3 soldiers [MCZ]. Corozal; Dec. 2, 1911 (E. A. Schwarz): 1 worker [USNM]. Ft. Amador; July 18, 1924 (Wm. M. Wheeler): 4 soldiers [MCZ]. Gamboa; 1924 (N. Banks): 1 worker [MCZ]. Marajal, near Colon; July 11, 1924 (Wm. M. Wheeler): 3 workers [MCZ]. Paraiso; Nov. 6 (E. A. Schwarz): 2 workers, 1 soldier [USNM]. Rio Aina Salud; March 6, 1923 (Wm. M. Wheeler): 8 workers [MCZ]. Trijoles (Wm. M. Wheeler): 8 workers [MCZ]. — *Colombia*: Aracatara, Magdalena River; May 3, 1929 (Darlington): 1 worker [MCZ]. Las Mercedes; June 6, 1936 (René Paul Roba): 2 workers [USNM]. Rio Frio; March 1924 (Wm. M. Mann): 6 workers, 3 soldiers [USNM]. Rio Frio, Magdalena River; March 7, 1928 (Darlington): 1 worker [MCZ]. Venecia; F. C. June 1936 (René P. Roba): 4 workers

[MCZ]. — *British Guiana*: Georgetown; July 14, 1920 (Wm. M. Wheeler): 1 worker [MCZ]. Georgetown, Botanical Garden; Sept. 26, 1918 (Harold Morrison): 2 workers [USNM]. Georgetown, near Peter's Hall, Sept. 22, 1918 (H. Morrison): 3 workers [USNM]. Georgetown, Demerara River Bank; Sept. 22, 1918 (H. Morrison): 1 worker, 1 soldier [USNM]. Georgetown; swept along the seashore, 4 miles east of G'town; Sept. 30, 1918 (H. Morrison): 1 worker [USNM]. Kartabo, July-Aug. 1920 (Wm. M. Wheeler): 5 workers, 4 soldiers, 6 females [MCZ]. — *Peru*: Iquitos Amazon River; July 29, 1920 (J. C. Bradley): 1 worker [CU]. — *Bolivia*: Covendo; 1921-22 (Wm. M. Mann): 13 workers, 11 soldiers [CWMM]. Reyes; Oct. 1921 (Wm. M. Mann): 11 workers, 1 soldier [CWMM]. Riberalta; Jan. 1922 (Wm. M. Mann): 16 workers, 7 soldiers [CWMM]. Rio Negro; Jan. 1922 (Wm. M. Mann): 1 worker [CWMM]. Rurrenabaque, Beni R.; Oct. 1921 (Wm. M. Mann): 33 workers, 7 soldiers, 15 females, 6 males [CWMM]. — *Brazil*: *State of Amazonas*: Manaus (Mann & Baker): 6 workers [CWMM]. *State of Pará*: Alto Purus; Sept. 1928 (Sampaio): 2 workers [CTB]. *State of Rio Grande do Norte*: Ceará Mirim (Wm. M. Mann): 1 female [MCZ]. Natal (Wm. M. Mann): 9 workers, 6 soldiers [CWMM]. *State of Pernambuco*: Caruaru (Pickel, O. S. B.): 4 workers, 2 soldiers, 4 females, 3 males [CTB]. Recife; 1938 (L. Lima Castro): 2 workers, 2 soldiers [CTB]. *State of Minas Gerais*: Matosinhos; July 1926 (Padtberg): 2 workers [CTB]. *State of Rio de Janeiro*: Niterói; Oct. 15, 1919 (J. C. Bradley): 1 worker [CU].

Variation. — In the worker caste the scales and grooves on the upper surface of thorax are not always regularly arranged, and not infrequently the occipital lamellae and the lamellate border of the first gastric tergite are completely fuscous. Similarly the striation of the declivous face may be obsolete in some individuals.

The soldiers are more variable, especially due to the fact, that there is no distinct line between this and the preceding caste. The observed size range is from 4.6-7.0 mm. The yellow spots on the gaster are present only in very large soldiers, absent to obsolete in smaller ones, where also the gaster is much shorter, the scales more visible and the antero-lateral border somewhat lamellate. The transverse pronotal keel is obtuse and vestigial in small workers, more pronounced in larger ones. The ventral lobe on the posterior epinotal spine is present only in larger soldiers. A second pronotal tooth may be found in some small individuals, which have likewise a subacute lateral denticule on the mesonotum.

The following features are subject to variation in the females: the length of the epinotal spines, the presence or absence of a well defined transverse pronotal keel.

All these characters are subject to heterogonic growth, and their variability is the result of it.

Synonymical notes. — A female, described as *Cryptocerus cognatus* by F. Smith (1862), has been associated with this species by Emery (1922), who gave it the rank of a variety. However, in my estimation, *cognatus* has no relationship with *minutus*, being of much smaller size (5.2 mm.), and having an oblong, rather coarsely punctured (foveolate) head. The exact identity of this form depends from the reexamination of the type, presumably still extant in the British Museum. Santschi, in 1931, described the worker and soldier under the same varietal name, giving as main differential characters the larger size. Now, it is not quite plausible, how the female *cognatus*, distinguished by a very small size, could have workers and soldiers which are far larger in size than the usual *minutus*. I do not hesitate to brand Santschi's procedure in this particular case as a careless and unwarranted interpretation. On the other hand the size difference as given by that author is not significant and therefore the var. *cognatus* Santschi (not of F. Smith) is a mere synonym of the present species.

Ethology. — The only fact known about the habits of this ant is the circumstance that it is customarily found nesting in the dead twigs and branches of various trees, and, according to Wheeler, (1942), also in the culms of coarse grasses. A variety of "host" plants have been discovered, and there is little indication of any kind of specialization or preference. Wheeler has given a resume of what is known in his paper on "neotropical Ant-plants and their Ants", and it may suffice to point out here, that *minutus* has also been taken upon orchids by U. S. Plant Quarantine Inspectors.

5. *Paracryptocerus* (*P.*) *pusillus* (Klug)

(Figs. 118, 121)

Cryptocerus pusillus Klug, 1824, Ent. Monogr. p. 201 [worker; Brazil: State of Pará and Rio de Janeiro; "Demerary" (Brit. Guiana?)]. — F. Smith, 1854, Trans. Ent. Soc. London, (2) vol. 2, p. 220. Pl. 20, fig. 8 [worker]. — F. Smith, 1858, Cat. Hym. Brit. Mus. Pl. 12, fig. 9 [worker]. — Mayr, 1863, Verh. Zool.-bot. Ges. Wien, vol. 13, p. 406. — Emery, 1890, Bull. Soc. Ent. Ital. vol. 22, p. 75, Pl. 9, fig. 8 a-d [worker, soldier, female]. — Emery, 1896, Zool. Jahrb. Syst. vol. 9, p. 636 [male]. — Emery, 1905, Bull. Soc. Ent. Ital. vol. 37, p. 170 [Brazil: State of Mato Grosso, Coxipó, Corumbá; Paraguay: Tacuru Pucu]. — Forel, 1906, Ann. Soc. Ent. Belg. vol. 50, p. 234 [Colombia; Costa Rica; Brazil: State of Pará; Paraguay: San Bernardino]. — Forel, 1911, Sitz.-ber. Bayer. Akad. Wiss. p. 262. — Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 201 [Brazil; Colombia]. — Wheeler, 1916, Bull. Am. Mus. Nat. Hist. vol. 35, p. 12 [Brit. Guiana: Georgetown]. — Santschi, 1921, An. Soc. cient. Argent. vol. 92, p. 127; Fig. 2B [worker; Argentina: Corrientes Province, San Roque. Brazil: State of Mato Grosso. Bolivia: between Bayova to Guagua. Paraguay: Asunción Vila Morá].

Cryptocerus (*Paracryptocerus*) *pusillus* Emery, 1915, Bull. Soc. Ent. France, p. 192. — Wheeler, 1925, Ark. Zool. vol. 17A (8), p. 36 [worker, soldier; Brazil; Peru: Rio Perene]. — Menozzi, 1935, Redia, vol. 21, p. 197 [British Guiana: Alto Demerara R., Kuruduni R.; Baboo camp]. — Eidmann, 1936, Arb. phys. angew. Ent. Berlin-Dahlem, vol. 3 (2), pp. 83-84, 101, 109 [Biology, ecology and symbionts]. — Wheeler, 1942, Bull. Mus. Comp. Zool. Harvard, vol. 90, p. 209.

Cryptocerus (*Cryptocerus*) *pusillus* Mann, 1916, Bull. Mus. Comp. Zool. Harvard, vol. 60, p. 450 [Brazil: State of Ceará; State of Amazonas, Manaus].

Cryptocerus elongatus Klug, 1824, Ent. Monogr. p. 214 [female; Brazil: State of Pará and Rio de Janeiro; Demerary (Brit. Guiana)]. — F. Smith, 1860, Journ. Ent. vol. 1, p. 75. — F. Smith, 1862, Trans. Ent. Soc. London (3), vol. 1, p. 409. Pl. 12, fig. 8 [soldier]. Pl. 13, fig. 6 [female].

Formica caustica Kollar, 1832, Reise in Brasilien, vol. 1, p. 115. Pl. fig. 12 [worker].

Cryptocerus causticus F. Smith, 1854, Trans. Ent. Soc. London (2), vol. 2, p. 222.

Cryptocerus obtusus F. Smith, 1858, Cat. Hym. Brit. Mus. vol. 6, p. 191, Pl. 12, fig. 12 [soldier; Brazil: State of Pará, Santarém].

Cryptocerus pusillus var. Forel, 1905, Ann. Soc. Ent. Belg. vol. 49, p. 148 [Venezuela: St. Esteban].

Cryptocerus pusillus var. *brevispinosa* Santschi, 1921, An. Soc. Cient. Argent. vol. 92, p. 127; fig. 2C [worker; Argentina: Misiones, nr. S. Ignacio; Vila Lutecia; Cerro Cora; Cordoba; Paraguay; Brazil: Rio de Janeiro, Alto da Boa Vista].

Cryptocerus pusillus var. *brevispinosa* ab. *rufescens* Santschi, 1921, An. Soc. Cient. Argent. vol. 92, p. 128 [Argentina: Chaco].

This very common species is a near relative of both *minutus* and *laminatus christopherseni,* from which it already has been differentiated in the key and under these respective forms, on several foregoing pages.

Type. — Worker; Brazil: State of Pará. [Coll. Klug, Museum of Berlin, if still extant].

Worker [Fig. 121]; Brazil: State of S. Paulo, Itanhaem. May 1928 (Spitz) [Coll. T. Borgmeier, Rio de Janeiro]. — Length 4.4 mm. Median head length 1.14 mm.; Weber's length of thorax 1.29 mm. Black; the following ferruginous: apex of mandibles, anterior portion of frontal carinae, apex of last funicular segment, apex of femora and metatarsi, distal half of the following tarsal segments, antero-lateral border of first gastric tergite, apex of lateral projections of peduncular segments.

Head subopaque, about as long as broad; interocular distance subequal to maximum length of head (57:58). Sides of head subparallel, posterior margin between the internal corners of the short, obliquely truncate, infuscated occipital lamellae evenly curved and emarginate. Apical border of occipital lamellae straight. Cheeks strongly marginate beneath, densely covered with flat, silvery hairs. Upper and lower surface of head very finely reticulate-punctate, sparsely covered with silvery, slender, simple, scale-like hairs, which lie in grooves on the posterior portion of the vertex. Eyes small, their maximum diameter less than 1/3 of the median head length.

Thorax opaque. Anterior border arcuate, shoulders angulate. Pronotum somewhat expanded laterally behind into a narrow, denticulate crest, with two short teeth on each side, the posterior tooth distinctly shorter than the anterior; posterior corner of pronotum rectangular and projecting. Promesonotal suture distinct. Mesonotum on each side with a very small, subrectangular tooth. Mesoepinotal suture vestigial, obsolete mesad. Basal face of epinotum in the same plane as mesonotum, transverse, very short, with a short lateral tooth, longer than the second pronotal tooth, and a very long, subcylindrical posterior spine arising from the posterior corner, diverging about 45º degrees from the longitudinal axis. Dorsum of thorax moderately both longitudinally and transversely convex. Declivous face not excavate mesad, nor crested laterad. The entire thorax finely reticulate-punctate, with rather dense, sharply impressed, more

or less elongate foveolae, each containing an appressed silvery, elongate glistening scale. Declivous face without macrosculpture and without scales. Laterotergite of pronotum and mesopleura more or less regularly rugose and sparsely scaled.

Petiole opaque, transverse, with a very small somewhat recurved lateral denticule. Postpetiole opaque, as broad as petiole, with a broad, apically truncate, posteriorly subdentate projection on each side, curving slightly forward. Both peduncular segments finely reticulate-punctate with sparse, glistening appressed hairs.

Gaster opaque, eliptical, emarginate anteriorly mesad. First gastric tergite with a very narrow, not distinctly set off nor crested antero-lateral border. Tergites and sternites finely and rather sharply reticulate-punctate. Scales of gaster sparser, more slender than on head and thorax, not lying in distinctly excavated foveolae. Erect pile confined to mandibles and to the 2-4th tergites and the sternites of the gaster.

Soldier [Fig. 118]; Argentina: Formosa Province, Puerto Pilcomayo (N. Kusnezov) [Coll. Inst. Miguel Lillo, Tucuman]. — Length 7.5 mm. Median head length 1.95 mm.; Weber's length of thorax 2.12 mm. Black; the following ferruginous: the four apical tarsal segments of the fore legs, and the two apical segments of the middle and hind legs. Tips of last funicular segments orange-brown.

Head subopaque, somewhat shorter than wide. Frontal carinae strongly converging anteriorly, prolonged behind above the eyes in the form of a raised carinule, fading out before reaching the occipital corner. Upper surface of head distinctly convex, vertex with a pair of faint, not tuberculate median swellings on the posterior border. Occiput truncate, immarginate above; occipital angles form a scarcely projecting blunt, strong tubercle. Cheeks not marginate beneath in front; a vestigial margination beneath the eye is present. Eyes very little convex. Upper and lower surface of head finely and shallowly reticulate, the upper surface with rather dense, small foveolae in which a minute, not shiny, scale is visible. Foveolae slightly more crowded, longer on occiput. Still larger and more deeply impressed on occiput and lower surface of head, containing a short decumbent, somewhat glistening seta.

Thorax subopaque. Anterior border arcuate, shoulder subangulate. Sides of pronotum diverging until reaching the lateral end of the transverse crest, having before the crest a stout,

apically rounded tooth, projecting obliquely forward and laterad. Transverse pronotal crest broadly interrupted mesad, and obsolescent towards the sides. Lateral border of pronotum angulate at the crest, and converging posteriorly behind the crest. Promesonotum, in profile, greatly convex. Promesonotal suture more or less distinct laterad, vestigial mesad. Sides of mesonotum subparallel with a small posterior, acute, lateral tooth. Mesoepinotal suture impressed and distinct. Basal face of epinotum transversely convex, with a small, blunt tooth antero-laterad, and a much longer and stronger, blunt spine on the posterior corner, slightly more divergent than in the worker. Entire thorax finely and sharply reticulate-punctate. Dorsum of thorax and laterotergite of pronotum covered with rather dense, elongate deeply impressed setiferous foveolae. Declivous face and posterior portion of the sides of the thorax with more or less vestigial, irregular, fine rugosities.

Petiole opaque, transverse, its sides subparallel, with a minute denticule. Postpetiole opaque, slightly broader than petiole, with a tapering, plate-like lateral projection, the apex of which is rounded in front, subdentate behind, curving slightly forward. Both segments finely reticulate-punctate, covered with vestigial foveolae and rugosities.

Gaster subopaque, eliptical, finely reticulate-punctate, not foveolate, deeply emarginate in front mesad. First gastric tergite antero-laterally sharply marginate, not forming a lamellate border.

All foveolae bear a decumbent setae, which is slightly flattened and glistening on thorax and peduncle. Erect setae on the terminal tergites and on the sternites of the gaster. First gastric tergite covered with minute, decumbent setulae laterad, almost scaleless discad.

F e m a l e ; Brazil: State of S. Paulo, Itatiaia; Oct. 24, 1930 (W. C. Zikán) [Coll. T. Borgmeier, Rio de Janeiro]. — Length 10.5 mm. Median head length 2.13 mm.; interocular width 2.27 mm.; Weber's length of thorax 3.17 mm. Black; tip of last funicular segment fuscous ferruginous. In general resembling *minutus,* from which it differs by the appreciably larger size, the black coloration of the appendages, the lack of the yellow maculae on the first gastric tergite. The head is shorter than wide, the upper face subopaque, greatly convex, with a distinct carinule laterad, below the eyes. Occiput subtruncate, immarginate above. Pronotum with a distinct transverse crest. Sides of petiole

without a spine, or tooth; subparallel. Sides of thorax more extensively foveolate.

Male, as described by Emery (1896).

Distribution. — The present species is very common and widespread in cisandean South America. The southern boundary line of its range roughly coincides with the 28th parallel. Forel (1906) reports it from Costa Rica, which is a rather doubtful record, unless it has to be referred to the subspecies *columbicus*. Miss Skwarra (1934) reports the same species from Cuernavaca, Mexico, where she collected it on *Tillandsia circinnata*. Since this record appears highly questionable, I searched the collection of Wheeler, who was responsible for the identifications of the specimens taken by Miss Skwarra, and indeed I found among the lot of *pusillus* three specimens of *aztecus*, taken by the same collector on the same locality and host plant. However, since Miss Skwarra states that also *aztecus* was taken by her on that plant, at the same locality, the doubt cannot be completely removed. Nevertheless, it appears to me highly improbable, that *pusillus* ranges so far north, especially because its occurence in southern Central America is a fact which has not as yet been conclusively established.

Specimens examined: 501; 342 workers, 134 soldiers, 14 females, 11 males, as follows: *Argentina*: Misiones Province: Eldorado (N. Kusnezov): 3 workers [CML]. Esperanza (N. Kusnezov): 3 workers [CML]. Iguazu (N. Kusnezov): 1 worker, 1 soldier [CML]. Loreto (N. Kusnezov): 7 workers, 3 soldiers [CML]. Manoel Belgrano (N. Kusnezov): 6 workers, 2 soldiers [CML]. Chaco Province: Roque Saenz Peña (N. Kusnezov): 2 workers [CML]. Formosa Province: Las Lomitas (N. Kusnezov): 14 workers, 2 soldiers [CML]. Puerto Pilcomayo (N. Kusnezov): 9 workers, 1 soldier [CML]. Salta Province: Aguas Blancas (N. Kusnezov): 15 workers, 1 soldier [CML]. Anta (N. Kusnezov): 3 soldiers [CML]. Lumbreras (N. Kusnezov): 3 workers [CML]. Malan: 1 worker [USNM]. Rio Segundo (N. Kusnezov): 2 workers [CML]. Yuto (N. Kusnezov): 2 workers, 3 soldiers [CML]. Jujuy Province: Calilegua (N. Kusnezov): 1 worker [CML]. Ledesma (N. Kusnezov): 1 worker [CML]. San Pedro (G. J. Harrington): 1 soldier [USNM]. Yuto (N. Kusnezov): 2 workers [CML]. — *Paraguay*: San Bernardino; Nov. 6 (K. Fiebrig): 2 workers, 2 females [USNM]. — *Bolivia*: Canamina; July 1922 (Wm. M. Mann); 19 workers, 12 soldiers, 1 pseudogyne, with wing stubs [CWMM]. Cavinas, Beni; Feb.

1922 (Wm. M. Mann): 1 worker [CWMM]. Espia, Rio Beni; 1921 (Wm. M. Mann): 22 workers, 12 soldiers [CWMM]. Huachi, Rio Beni; Sept. 1921 (Wm. M. Mann): 28 workers, 7 soldiers, 1 female [CWMM]. Ixiamas; Dec. 1921 (Wm. M. Mann): 24 workers, 13 soldiers [CWMM]. Reyes; Oct. 1921 (Wm. M. Mann): 6 workers, 3 soldiers [CWMM]. Rosario, Lake Rocagua; Nov. 1921 (Wm. M. Mann): 26 workers, 18 soldiers, 5 males [CWMM]. Rurrenabaque, Rio Beni; Oct. 1921 (Wm. M. Mann): 12 workers, 3 soldiers, 2 females, 3 males [CWMM]. San Gregorio; Oct. 1921 (Wm. M. Mann): 1 worker [CWMM]. — *Brazil*: locality unknown, on wild *Cattleya*, sp., intercepted at Hoboken, N. J.; Sept. 9, 1941 (U. S. Plant Quarantine Inspectors): 1 worker [USNM]. *State of Paraná*: Palmas, Mangueirinha; Dec. 1928 (F. Schroer, O. F. M.): 1 soldier [CTB]. *State of S. Paulo*: Amparo; Oct. 4, 1928 (T. Borgmeier, O. F. M.): 2 workers [CTB]. Campinas (A. Ferreira): 1 worker, 2 soldiers [CTB]. Campinas (O. Filho): 2 workers, 1 soldier, 1 female, 2 males [CTB]. Franca; 1919 (Garbe): 3 workers, 2 soldiers, 1 female [CTB]. Itanhaem; May 1928 (Spitz): 3 workers [CTB]. Itararé (O. Filho): 2 workers [CTB]. Itatiaia; Oct. 24, 1930 (W. C. & J. F. Zikán): 4 workers, 4 soldiers, 1 female [CTB]. Itaquaquecetuba; in reed; 1943 (H. L. Parker): 5 workers, 1 soldier [USNM, MCZ]. Lindóia; April 1926 (C. Wirth, O. F. M.): 3 workers [CTB]. Pedreiras; April 1926 (Schwebel): 4 workers, 1 soldier [CTB]. Pindamonhangaba (Schwarzmaier): 1 worker [CTB]. Pirapora; June 1922 (Garbe): 2 workers [CTB]. Ribeirão Preto, Fazenda Dumont; July 9, 1927 (O. Conde): 1 worker, 1 soldier [CTB]. Vila Frontim; Dec. 7, 1905 (H. von Ihering): 4 workers [USNM]. *State of Rio de Janeiro*: Barão de Inhomirim (Raiz da Serra); Nov. 7, 1921 (T. Borgmeier, O. F. M.): 2 workers [CTB]. Guaratiba; Oct. 1929 (T. Borgmeier, O. F. M.): 4 workers [CTB]. Mendes (Eidmann): 1 worker, 2 soldiers [CTB]. Petrópolis; 1918 (T. Borgmeier, O. F. M.): 3 workers [CTB]. Porto das Caixas; March 1928 (O. Conde): 1 worker [CTB]. Quissamã; Jan. 14, 1922 (T. Borgmeier, O. F. M.): 3 workers [CTB]. Rio Manso; April 1919 (T. Borgmeier, O. F. M.): 2 workers, 1 soldier [CTB]. *State of Minas Gerais*: locality unknown (from coll. Reichensperger): 2 workers [CTB]. Arassuaí; Sept. 1926, April 1927 (P. Thiemen, O. F. M.): 3 workers, 3 soldiers [CTB]. Belo Horizonte; Nov. 1-6, 1919 (J. C. Bradley): 10 workers, 1 soldier [CU]. Jacutinga; Oct. 10,

1928 (O. Monte): 1 worker, 1 soldier [CTB]. Lassance; Nov. 9-19, 1919 (J. C. Bradley): 1 worker [CU]. Monlevade (E. Luja): 4 workers [CTB]. *State of Goiás*: Campinas; April 1927, July 23, 1928 (Schwarzmaier): 3 workers, 2 soldiers [CTB]. *State of Mato Grosso*: Poconé: 2 workers [CTB]. *State of Pernambuco*: Caruaru (Pickel, O. S. B.): 7 workers, 1 soldier [CTB]. Recife (L. Lima Castro): 1 soldier [CTB]. Tapera (Pickel, O. S. B.): 12 workers, 7 soldiers, 2 females, 1 male [CTB]. *State of Pará*: Campo das Colinas; Nov. 30, 1938 (Sampaio): 1 worker, 2 soldiers [CTB]. Rio Purus; Nov. 1928 (Sampaio): 1 worker [CTB]. Rio Tupucuru; Aug. 1928 (Sampaio): 1 worker [CTB]. Santarém; Aug. 1920 (Garbe): 2 workers [CTB]. *State of Amazonas*: Manaus (Mann & Baker): 8 workers, 9 soldiers [CWMM, MCZ]. Manaus; July 1927 (J. F. Zikán): 1 worker [CTB]. — *Peru*: Chanchamayo; Sept. 10, 1935: 1 soldier [USNM]. El Campamiento, Colonia del Perene; June 20, 1920 (J. C. Bradley): 7 workers, 1 soldier [CU]. — *British Guiana*: Georgetown, Botanical Garden; Sept. 26, 1918 (Harold Morrison): 1 worker [USNM]. Kartabo; July-Aug. 1920 (Wm. M. Wheeler): 8 workers, 4 soldiers [MCZ]. — *Venezuela*: Caicara, Rio Orinoco (G. K. Cherrie): 1 worker [MCZ].

Variation. — The present species exhibits all forms of intergrades between the typical worker and the typical soldier. In the worker caste the lateral teeth of the petiole are variable in members of the same colony: they may be small, long, or even absent. The scales on the first gastric tergite are occasionally very small, and some specimens exhibit a distinctly lamellate antero-lateral border on the first gastric tergite. Worker specimens from El Campamiento, Peru, possess rather conspicuous large, canaliculate scales on the basal face of the epinotum, and lack completely the lateral petiolar teeth. A few soldier specimens, generally the smaller ones, have a second lateral spine on the pronotum, at the point of intersection of the transverse crest, others have the sides of the mesonotum rounded, lobe-like, lacking the lateral denticule. All soldiers lack a distinct lateral tooth on the petiole.

Synonymical notes. — I accept the synonymy as proposed in Emery's Myrmicinae section in *Genera Insectorum*. In addition I relegate to synonymy the var. *brevispinosa* Santschi, and the ab. *rufescens* Santschi, since both represent mere individual variants. As far as var. *brevispinosa* is concerned, I have seen specimens thus identified by Santschi himself, and they are a common phase in most every colony of the typical *pusillus*.

6. *Paracryptocerus (P.) pusillus columbicus* (Forel)

Cryptocerus pusillus var. *columbica* Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 201 [worker, soldier; Colombia: Santa Marta].
Cryptocerus (Paracryptocerus) pusillus var. *columbica* Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 307.

The present form may be separated from the typical *pusillus* by the strongly striated outer face of the fore coxae and the intense black, opaque integument.

Types. — Worker, soldier; Colombia: Santa Marta (Forel). [Muséum d'Histoire Naturelle, Genève (Coll. A. Forel)].

Worker (lectotype). — Length 5.5 mm. Median head length 1.36 mm.; interocular width 1.68 mm.; Weber's length of thorax 1.58 mm. Black; the following dark reddish-brown: frontal carinae, apical three tarsal segments, apex of posterior epinotal spines; antero-lateral lamellate border of gaster. Very similar to the typical *pusillus,* from which it differs by the following peculiarities:

Scales on upper surface of head minute to obsolete, especially on the anterior half. Foveolae limited to narrow band in front of the occipital border. Outer face of fore coxae distinctly striated. Foveolae on upper surface of thorax well separated by finely reticulate-punctate, flat, opaque interstices. First pronotal tooth spine-like and prominent, the second tooth rather obsolete. First epinotal tooth comparatively small, the posterior spine very long and slender; as measured from the posterior rim of the spiracle to the tip, longer than 1/3 of the maximum length of the thorax. Petiole without a lateral tooth. Scales of gaster minute, obsolete above discad. Integument opaque.

Soldier. — According to Forel, the soldier exhibits similar differential features, and may be distinguished by the greater opaqueness and stronger foveolation of the upper surface of head.

Female and male unknown.

Distribution. — According to our present knowledge, the present race is confined to northern Colombia.

Specimens examined: 9; 8 workers and 1 small soldier, as follows: *Colombia*: Santa Marta (Forel): 3 workers (lectotype and 2 paratypes) [MHNG]. Rio Frio, Magdalena; Oct. 16, 1928 (Darlington): 1 worker [MCZ]. Rio Frio; Feb. 1924 (Wm. M. Mann): 5 workers, 1 soldier [USNM].

The present form is sufficiently differentiated from the typical *pusillus*, both geographically and morphologically, that, in my estimation, the raising from the varietal to subspecific status is warranted.

However, I have found, that the type specimens do not agree completely with the description given by Forel. First of all the size difference does not seem all too important, due to the fact that the type specimens of the worker caste which I have seen are somewhat intermediate between this and the soldier caste. One worker from Rio Frio, Colombia is much smaller, having the following measurements: Length 4.6 mm. Median head length 1.12 mm.; interocular width 1.31 mm.; Weber's length of thorax 1.31 mm. The head is distinctly subquadrate and the sides are subparallel. Furthermore it is not true, that generally speaking the foveolation on the head is more pronounced in this race, to the contrary, the opposite is true, especially on the anterior half. Likewise the epinotal spines, although considerably longer than in *pusillus* s. str., are not as long as their greatest interval. I have not seen any full-sized soldier, but the small one examined has the upper surface of head more sparsely and shallowly foveolate, with the scales hardly visible, likewise the integument is appreciably more opaque than in the typical form.

7. *Paracryptocerus* (*P.*) *simillimus*, n. sp.

(Figs. 125, 126)

This interesting form exhibits a striking similarity with *minutus*, from which, however, it may be readily distinguished by the shape of the epinotum both in the worker and the soldier caste.

Types. — Worker, soldier; British Guiana: Kartabo. July-Aug. 1920 (Wm. M. Wheeler). [Museum of Comparative Zoology, Harvard; Coll. T. Borgmeier, Rio de Janeiro].

Worker (holotype, MCZ). — Length 3.9 mm. Median head length 1.00 mm.; Weber's length of thorax 1.12 mm. Black; the following ferruginous: apex of mandibles, antennae, tip of femora, tibiae, tarsi, apical gastric segments, epinotal and petiolar spines. Frontal carinae yellowish-brown.

Head [Fig. 126] opaque; longer than broad, broadest behind the eyes; interocular distance distinctly shorter than maximum length of head (45:50). Lateral margins somewhat sinuate above the eyes, posterior margin straight mesad; the occipital angles with slightly projecting subtransversely truncate entirely infuscated lamellae, the apical border of which is nearly straight. Cheeks strongly marginate beneath, densely covered with silvery, appressed, scale-like hairs. Eyes large, their longest diameter more than 1/3 of median head length. Upper and lower surface of head finely reticulate-punctate, sparsely covered with slender, flattened, simple, appressed, silvery scale-like hairs; slightly

larger, denser and somewhat canaliculate, in grooves, in front of the occipital border.

Thorax subopaque. Anterior border moderately arcuate, shoulders acutely angulate. Pronotum somewhat expanded behind laterally with small triangular teeth on each side, coaslesced at their base, the posterior being smaller than the anterior tooth. Posterior corners of pronotum in the form of a subrectangular tooth, projecting. Promesonotal suture vestigial. Mesonotum comparatively broader and shorter than in *minutus,* each side with a small, acute tooth. Mesoepinotal suture distinct and impressed. Basal face of epinotum in the same plane as mesonotum, transverse, with two broad, flat, triangular teeth on each side, the posterior being somewhat longer. The posterior border of the second tooth forms a sharp crest which delimits the declivity laterad and behind. Dorsum of thorax flat, scarcely convex. Declivous face excavated mesad, not striated longitudinally. The entire thorax finely reticulate-punctate, dorsum with dense, elongated grooves, harboring more or less canaliculate, silvery appressed scales, denser than on head. Declivity without scales below. Laterotergites of pronotum and mesopleura indistinctly longitudinally rugose, not striated.

Petiole opaque, transverse, with distinctly set off, slender, long, lateral spine, arising from the anterior corner, pointing slightly backwards. Postpetiole as long as petiole, transverse, with shorter, broader, apically subtruncate lateral spines, curving obliquely forward. Both peduncular segments finely reticulate-punctate with scattered glistening scales.

Gaster subopaque, subcordiform, depressed, moderately convex above. First gastric tergite emarginate antero-mesally, sharply crested antero-laterad, not forming a distinctly set off lamellate border. Tergites and sternites finely reticulate-punctate. Scale-like silvery hair appressed, simple, rather dense. Erect pile confined to 2d-4th tergites and the sternites.

Soldier (paratype, MCZ). — Length 5.9 mm. Median head length 1.65 mm.; Weber's length of thorax 1.73 mm. Black; the following ferruginous: outer border of frontal carinae, antennae, tibiae, tarsi, tips of femora, apical border of gastric tergites and sternites.

Head subfulgid, scarcely longer than wide. Frontal carinae arcuate, diverging caudad to above the posterior end of the antennal scrobe, where they form a distinct yet very obtuse angle, prolonged above the eyes, but more or less obsolete, never

forming a raised crest. Occiput distinctly truncate, the upper border not sharply marginate above. Occipital corners rounded. Occipital border blunt, slightly convex. Upper surface of head moderately convex above, slightly impressed mesad, cheeks immarginate below. Eyes flat. Upper surface of head very finely punctate, with sparse, small foveolae, in which no distinct hair is visible. Foveolae slightly larger on occiput, still larger containing a visible, decumbent seta, on lower surface of head.

Thorax subfulgid above. Anterior border arcuate, shoulders rounded, sides of pronotum diverging posteriorly with a short, stout and acute, lateral tooth, pointing obliquely forward, then parallel and straight until reaching the lateral corner of the bluntly rounded more or less vestigial and mesally interrupted transverse pronotal keel, then converging towards the mesonotum. Posterior corners rounded. Promesonotum in profile greatly convex. Promesonotal suture vestigial. Mesonotum with a stout and bluntly rounded lateral tooth. Mesoepinotal suture impressed and distinct. Epinotum subopaque. Basal face of epinotum [Fig. 125] transverse, the posterior border concave and submarginate. Sides with an antero-lateral broad, short, triangular tooth and a somewhat longer and more acute, posterior spine which is greatly diverging, having beneath a crest which delimits the entire side of the declivous face, and with a small tooth projecting from the crest beneath the posterior epinotal spine. Declivous face without macrosculpture. Microsculpture of promesonotum as on head, epinotum and sides of thorax finely reticulate-punctate. Upper surface of thorax with sparse, deeply impressed foveolae, rounded on promesonotum, elongate and not as deep on epinotum. Sides of thorax without macrosculpture; declivous face with transversely arcuate, more or less vestigial rugosities.

Petiole opaque, transverse, with a short, stout, subacute and recurved lateral tooth. Posterior half shallowly transversely concave. Postpetiole slightly longer than petiole, as wide as petiole, with very broad, plate-like, apically truncate, lateral projections.

Gaster subopaque, elongate; anterior border deeply emarginate; antero-laterally strongly marginate, without forming a distinct lamellate border. Sides of gaster moderately convex. Tergites and sternites finely reticulate-punctate, without foveolae.

All foveolae, except the ones on the upper surface of head and promesonotum have a distinct, decumbent, flattened seta, which is shiny and scale-like on the epinotum. Sides sparsely

scaled. Gaster with small, decumbent, shiny scales. Erect pile confined to the tergites 2-4, the sternites and the posterior half of the first tergite of the gaster.

Female and male unknown.

Distribution. — At present this rather rare species is known from British Guiana, and the upper Amazon Valley in Peru and the Beni valley in Bolivia.

Specimens examined: 21; 15 workers and 6 soldiers, as follows: *British Guiana*: Kamakura (H. O. Lang): 1 worker [MCZ]. Kartabo; July-Aug. 1920 (Wm. M. Wheeler): 11 workers, 6 soldiers (holotype and 16 paratypes) [MCZ, CTB]. — *Peru*: Rio Cotuhe; Aug. 12, 1920 (J. C. Bradley): 1 worker [CU]. — *Bolivia*: Ivon, Beni; Jan. 1922 (Wm. M. Mann): 1 worker [CWMM]. Rurrenabaque, Beni; Oct. 1921 (Wm. M. Mann): 1 worker [CWMM].

So far this species has been confused with *minutus*, and for some time I did not regard it as but an aberrant form of this species. However, discovering other specimens from various South American localities with the same strikingly different epinotal characteristics, I have decided to propose it as a new species.

8. *Paracryptocerus* (*P.*) *spinosus* (Mayr)

(Figs. 116, 117)

Cryptocerus spinosus Mayr, 1862, Verh. Zool.-bot. Ges. Wien, vol. 12, p. 761-762 [worker; Brazil: Amazon River]. — Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, p. 202, Pl. 3, fig. 5 [worker; Peru: Huambra]. — Forel, 1901, Mitth. Naturhist. Mus. Hamburg, vol. 18, p. 150 [Bolivia: Tipuani]. — Forel, 1911, Sitz.-ber. Bayer. Akad. Wiss. p. 260. — Wheeler, 1916, Bull. Amer. Mus. Nat. Hist. vol. 35, p. 11 [worker; British Guiana: Rockstone, Potaro Landing].
Cryptocerus (*Paracryptocerus*) *spinosus* Emery, 1915, Bull. Soc. Ent. France, p. 192.
Cryptocerus (*Cryptocerus*) *spinosus* Mann, 1916, Bull. Mus. Comp. Zool. Harvard, vol. 60, p. 450 [Brazil: Guaporé territory, Porto Velho, Rio Madeira].
Cryptocerus quadrimaculatus F. Smith, 1854 (*nec* Klug, 1824), Trans. Ent. Soc. London (2) vol. 2, p. 219. Pl. 19, fig. 8 [female]. — F. Smith, 1860, Journ. Ent. vol. 1, pp. 74-75 [soldier]. — F. Smith, 1862, Trans. Ent. Soc. Ent. London (3), vol. 1, p. 409. Pl. 12, fig. 2 [soldier, female].
Cryptocerus punctatus Mayr, 1862, Verh. Zool.-bot. Ges. Wien, vol. 12, p. 761 [soldier; Brazil: Amazon River].

Paracryptocerus spinosus is readily recognized by the lack of a lateral mesonotal tooth in the worker, and the broad, distinctly set off, translucid and excavate antero-lateral border of the first gastric tergite in the worker and soldier.

Types. — Worker, soldier; Brazil: Amazon River [Naturhistorisches Museum Wien (Coll. G. Mayr)].

Worker (lectotype) [Fig. 117]. — Length 5.2 mm. Median head length 1.29 mm.; Weber's length of thorax 1.68 mm. Black; the following yellowish-brown: frontal carinae, occipital lamellae, lamellate border of the first gastric tergite. Ferruginous: first and tip of terminal funicular segments, spines

of thorax and peduncular segments, tips of femora, tibiae, fore tarsi, distal half of middle and hind tarsi.

Head subopaque, slightly broader than long, broadest behind the eyes, narrowed in front. Interocular distance subequal to maximum length of head (64:65). Posterior margin scarcely concave. Occipital angles with projecting, obliquely truncate lamellae, the apical border of which is sinuate. Cheeks strongly marginate beneath, densely covered with appressed, scale-like hairs. Upper and lower surface of head microscopically reticulate-punctate, sparsely covered with golden, slender, appressed scales. A few broader and canaliculate scales towards the occipital border.

Thorax subopaque. Anterior border moderately arcuate, shoulders angulate. Lateral border of pronotum with two subequal, strong, scarcely recurved and somewhat raised spines. Posterior corners of pronotum not projecting, confluent with the lateral border of the mesonotum. Promesonotal suture vestigial. Mesonotum unarmed at the sides. Thorax scarcely constricted laterad between mesonotum and epinotum. Mesoepinotal suture distinct and impressed. Basal face of epinotum, excluding the spines, about twice as broad as long, with two spines arising from its lateral border on each side. The anterior spine subequal to the prothoracic spines, the posterior spine very strong, twice as long, pointing sidewards and only slightly backwards. Microsculpture sharper, with superimposed, mostly longitudinal and rather dense rugosities on the dorsal face, between which lie rather dense, golden, canaliculate, appressed scales. Sides of thorax with longitudinal striae and sparse canaliculate scales. Declivity not excavated. Legs finely reticulate-punctate with simple, flattened hairs as on head.

Petiole subopaque, transverse, with distinctly set off, long, slender, apically recurved and rounded lateral spines, arising from the anterior corner. Postpetiole as long as, narrower than, the petiole, with shorter, broader and apically rounded lateral spines, curving obliquely forward. Sculpture of peduncle similar to head and gaster.

Gaster subopaque, cordiform, longer than broad. First gastric tergite with broad, antero-lateral, transparent lamellae, the outer margin of which is slightly upturned; as broad as length of postpetiole. Tergites and sternites finely and rather sharply reticulate-punctate. Scales of gaster simple, sparse, becoming

slightly denser towards the apex of the first tergite. Erect pile limited to 2d to 4th tergites and the sternites.

Soldier [Fig. 116]; British Guiana: Kartabo; July-Aug. 1920 (Wm. M. Wheeler). [Museum of Comparative Zoology, Harvard]. — Length 7.6 mm. Median head length 1.85 mm.; Weber's length of thorax 2.22 mm. Black; the following ferruginous: frontal carinae, first funicular segment, tip of femora, tibiae, apices of metatarsi, tarsi, apices of thoracic spines, peduncular spines. Lamellate border of gaster pale-yellowish. Tip of last funicular segment orange.

Head subfulgid; subquadrangular; shorter than wide; anterior corners rounded; posterior corners slightly projecting in a short, stout, bluntly rounded tooth. Frontal carinae prolonged above the eyes in the form of a distinctly raised, carinule, fading out before reaching the occipital corner. Upper surface of head moderately convex. Cheeks not distinctly marginate beneath. Eyes little convex. A distinct carina extends from beneath the eyes back to the occipital corner. Vertex with a pair of tuberculate swellings on the immarginate occipital border. Upper and lower surface of head finely punctate, more sparsely foveolate, foveolae on upper surface of head rounded, without conspicuous hair. Occiput smooth, fulgid, sparsely foveolate.

Thorax smooth and fulgid above, sides and declivous face of epinotum opaque, finely reticulate-punctate. Anterior border arcuate, shoulders subangulate, not well visible from above. Pronotum with a transverse crest, broadly interrupted mesad, ending laterad in a stout, apically rounded, short spine, projecting outward, another spine in front of this. Sides distinctly converging cephalad and caudad from the second spine. Promesonotum, in profile, greatly convex. Promesonotal suture distinct. Mesonotum on each side with a minute, inconspicuous denticule. Thorax greatly constricted between mesonotum and epinotum. Basal face of epinotum with a small triangular tooth laterad, and a large, stout, apically bluntly rounded spine, arising from the posterior corner, projecting outward and upward. Dorsum of thorax covered with rather dense, deeply impressed rounded setiferous foveolae; somewhat denser on basal face and upper third of declivous face of epinotum. Remainder of declivous face and sides of thorax without any conspicuous macrosculpture.

Petiole transverse, with a long, very slender, apically obtuse, slightly recurved spine on each side. Postpetiole with plate-like

broad, rounded, lateral projection on each side. Both segments finely reticulate-punctate, opaque.

Gaster subfulgid, subcordiform, finely and densely punctured with sparse, very shallow, vestigial foveolae. Antero-lateral border of first gastric tergite with a subtranslucid, excavated broad lamellate crest, as in worker.

Pilosity scarcer than in worker. All foveolae except the ones on the upper surface of head, contain a small, distinctly visible, decumbent, flat seta, which is more or less glistening on epinotum. Gaster with minute appressed setulae. Erect pile confined to the apical portion of the gaster as in the other species.

Female. — Pictured, but insufficiently diagnosed by F. Smith, due to the fact that this author wrongly identified it as *quadrimaculatus* Klug [=*minutus* Fabricius]. It possesses a quadrimaculate first gastric tergite, as *minutus*. Other details are unknown, as Smith's figure is definitely too generalized to disclose diagnostic features.

Male unknown.

Distribution. — This distinctive species is known to occur in the Amazon Basin and in the Guianas.

Specimens examined: 49; 46 workers, 3 soldiers, as follows: *Brazil*: Amazon River (M. C. Vienn.): 1 worker (lectotype) [NHMW]. State of Amazonas: Esperança; August 9, 1920 (J. C. Bradley): 2 workers [CU]. Guaporé Territory: Rio Madeira, Porto Velho (Mann & Baker): 21 workers [CWMM, MCZ]. — *Bolivia*: La Paz Province, Tumupasa, Cerro de Bala; Dec. 1921 (Wm. M. Mann): 1 worker [CWMM]. Beni Province, Rurrenabaque; Oct. 1921 (Wm. M. Mann): 9 workers [CWMM]. Locality and date unknown) (Staudinger): 1 worker [CTB]. — *British Guiana*: Kartabo; July-Aug. 1920 (Wm. M. Wheeler): 11 workers, 3 soldiers [MCZ]. — *Peru*: Upper Rio Pachitea; July 21, 1920 (J. C. Bradley): 1 worker [CU].

All the specimens examined agree perfectly with the type, and with Mayr's excellent description. A smaller soldier, somewhat intermediate between this and the worker caste, has distinct, short golden scales in the foveolae of head, and, in general, the pilosity is more apparent. The integument, however, is slightly less shiny. Only the above mentioned specimen from Upper Rio Pachitea, Peru is somewhat aberrant, by having the head much broader than long, the occipital lamellae very short, the frontal carinae darker, the scales on thoraz less crowded, the lamellate border of the gaster little excavated and narrower, and although of small size, it represents an intermediate between the soldier and worker caste.

The synonymy is that accepted by Emery and Forel. The synonymizing of *quadrimaculatus* F. Smith resulted from the examination of a cotype by Forel, in 1911.

9. *Paracryptocerus (P.) spinosus peruvianus* (Forel)

Cryptocerus laminatus peruvianus Forel, 1911, Deutsche Ent. Zeitschr. p. 297 [soldier; Peru: Chanchamayo, elev. 1200 m.].
Cryptocerus spinosus peruvianus Forel, 1911, Sitz.-ber. Bayer. Akad. Wiss. p. 260.
Cryptocerus (Paracryptocerus) spinosus peruvianus Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 308.

In the original publication this form was erroneously ranked under *laminatus,* as subspecifically distinct, on account of the lack of a lateral mesonotal tooth. Still in the same year Forel transferred and placed it under *spinosus,* but retaining it as a subspecies. While this race is based upon a few (perhaps a single) specimens from the same nest, its systematic status is rather doubtful, but for the time being it seems sufficiently characterized by combining the general *spinosus* features with an extremely short, conical lateral petiolar spine.

Type. — Soldier; Peru: Chanchamayo; elev. 1200 m. (Forel?). [Muséum d'Histoire Naturelle, Genève (Coll. A. Forel)].

Since I have not seen the type, I limit myself to paraphrase briefly the data furnished in several papers by its author, A. Forel:

Soldier. — Length 6.2 mm. Head very little narrowed in front. Eyes flat. Vertex with two swellings on the occipital border, which is emarginate between the two tubercular swellings. Thorax with the fine punctation almost obsolete. Transverse pronotal crest interrupted mesad, not as high as in *spinosus.* Lateral spines of pronotum and epinotum not transparent, fuscous, thick. Mesonotum without a lateral spine or tooth. Lateral spine of petiole short, opaque, fuscous, in the form of a conical recurved tooth. Lateral process of postpetiole ferruginous, transparent, curved anteriorly. Head and thorax fulgid, not densely punctured. Gaster more distinctly punctate, and subfulgid. Pilosity decumbent, flat, scale-like, yellowish, sparse. Head and thorax regularly foveolate, the foveolae being very shallow on the gaster. Erect pilosity absent.

Worker, female and male unknown.

B. Group of Paracryptocerus (P.) complanatus (Guérin)

The workers of the *complanatus*-complex are characterized as follows: Frontal carinae generally concolorous with the rest of the head; occipital corners angulate or rounded, never with truncate lobes; occipital border straight or slightly emarginate; shoulders concealed, not set off from the lateral pronotal expansions; lateral border of pronotum with more or less distinct lamelliform plates, the outer margin of which is always continuous, never denticulate or notched; mesonotum always with a strong lateral spine or tooth; epinotum with 1-3 teeth or spines, the posterior always the longest; declivous face distinctly differentiated from the basal face of epinotum, more or less perpendicular to the latter; femora compressed, prismatic, inflated, angulate above at the half; metatarsus, especially of hind legs, flattened and broadened proximad, more attenuate and less compressed distad; anterior face of petiole distinctly truncate above the insertion, perpendicular to the dorsal face; lateral spines of petiole stout and long, upturned apically, not set off from the body of the segment.

The following features distinguish the soldier caste: head not surmounted by a disc, distinctly convex above; frontal carinae concolorous; upper surface of head subfulgid to fulgid, sparsely covered with rather small, often vestigial foveolae; eyes flat; mandibles angulate at the half of the upper (outer) face; occipital border straight or slightly convex; shoulders concealed, not separate from the lateral pronotal expansions; transverse keel or crest of pronotum usually present, always interrupted mesad; mesonotum with a more or less rounded lateral lobe; posterior tooth or spine of epinotum always the longest; lateral tooth often more or less obsolete; posterior border of basal face of epinotum marginate; declivous face perpendicular to basal face of epinotum; femora as in worker, compressed, angulate above, at the half; metatarsus flattened and broadened proximad, attenuate distad; petiolar spines as in worker.

The female, as far as is known, reproduces many of the peculiarities of the soldier, and is distinctive by having the first gastric tergite not longer than the maximum length of the thorax.

The roster of the component species of the present group is as follows:

10. *P. (P.) complanatus* (Guérin)
11. *P. (P.) complanatus ramiphilus* (Forel)
12. *P. (P.) cordiae* (Stitz)

13. *P. (P.) femoralis* (Fred. Smith)
14. *P. (P.) multispinus* (Emery)
15. *P. (P.) multispinus inca* (Santschi)

10. *Paracryptocerus (P.) complanatus* (Guérin)

(Figs. 131, 136)

Cryptocerus complanatus Guérin, 1845, Iconogr. Règne Anim. Insect. vol. 7, p. 424 [worker; French Guiana: Cayenne]. — F. Smith, 1854, Trans. Ent. Soc. London, (2), vol. 2, p. 221. — Mayr, 1863, (excl. synonyms), Verh. Zool.-bot. Ges. Wien, vol. 13, pp. 405-406. — (?) Emery, 1890, Bull. Soc. Ent. Ital. vol. 22, p. 75. Pl. 9, fig. 6 [worker; Peru].
Cryptocerus (Paracryptocerus) complanatus Emery, 1915, Bull. Soc. Ent. France, p. 192. — Emery, 1922, (excl. *femoralis*), Gen. Insect. Hym. fasc. 174c, p. 307.
Cryptocerus angulatus F. Smith, 1858, Cat. Hym. Brit. Mus. vol. 6, p, p. 219. Pl. 12, fig. 4 [soldier; Brazil: State of Amazonas, Tunantins]. — F. Smith, 1862, Trans. Ent. Soc. London, (3), vol. 1, p. 409. Pl. 12, fig. 1 [soldier].
Cryptocerus multispinus var. *amazonensis* Forel, 1911, Sitz.-ber. Bayer. Akad. Wissen. p. 261 [worker; Brazil: Amazon River].
?*Cryptocerus multispinus* Wheeler, 1925, Ark. Zool. vol. 17A (8), p. 36 [worker; Bolivia: Puna].

This species is intermediate between *multispinus* and *cordiae*. The worker may be distinguished from the former by having the lateral border of the head very little sinuate, scarcely upturned above the eyes, whereas the laterally carinate occipital border and the presence of a lateral tooth on the basal face of the epinotum distinguish it from *cordiae*. The soldier is at once recognized by the distinctive shape of the epinotum.

Type. — Worker; French Guiana: Cayenne. [Place where the type is presently deposited, if still extant, unknown to me].

Worker [Fig. 131]; Dutch Guiana: Paramaribo (A. Reying). [U. S. National Museum]. — Length 6.9 mm. Median head length 1.68 mm.; Weber's length of thorax 2.04 mm. Black; the following fuscous ferruginous: apex of mandibles, three apical tarsal segments. Tips of last funicular segment yellowish-brown.

Head subopaque, subquadrate. Mandibles finely reticulate-punctate, finely longitudinally rugulose. Sides of head very little sinuate, somewhat converging anteriorly, frontal carinae curved mesad, forming a blunt, small tooth in front of the eye, prolonged behind as a distinct carina, reaching the occipital corner, very scarcely upturned above the eye. Occipital corner forming a distinct angle. Occipital border emarginate mesally, sharply crested laterad. Upper surface of head very little convex, finely reticulate-punctate, more sparsely covered with shallow, oval grooves, each containing a conspicuous, usually canaliculate, silvery, appressed scale. Cheeks strongly carinate below, densely covered with large, canaliculate, silvery scales. Lower surface of head more fulgid, with sparser scales.

Thorax subopaque. Sides of lateral pronotal plates somewhat

converging behind, anterior corner angulate, posterior corner rounded. Promesonotal suture obsolete. Mesonotum with a strong lateral spine. Mesoepinotal suture vestigial. Basal face of epinotum with a large, broad triangular, plate-like tooth on each side and a posterior rather short, slender, acuminate spine, projecting obliquely backward, much shorter than the length of the basal face. Promesonotum, in profile, somewhat convex. Posterior border of basal face of epinotum submarginate. Sides of declivous face carinate. Dorsum of thorax finely reticulate-punctate, with sparse, squamiferous foveolae, the scales being appressed and canaliculate. Laterotergite of pronotum longitudinally striated. Declivous face very finely, superficially reticulate. Tibiae prismatic.

Petiole and postpetiole subopaque, with a vestigial longitudinal median carinule above, beginning behind the anterior border on the postpetiole. Spines of petiole upturned and slightly recurved.

Gaster subopaque, elongate, cordiform, shallowly emarginate anteriorly mesad; with an antero-lateral foliaceous border. Sculpture as on dorsum of thorax, foveolae only vestigial, scales slender, simple. Erect hair confined to the terminal tergites and the sternites.

Soldier [Fig. 136]; Bolivia: Ixiamas. Dec. 1921 (Wm. M. Mann). [Coll. Wm. M. Mann, Washington]. — Length 8.2 mm. Median head length 2.06 mm.; Weber's length of thorax 2.44 mm. Black.

Head fulgid, subquadrate; anterior and posterior corners rounded. Mandibles reticulate-rugose. Frontal carinae slightly raised, continued behind the scrobe as a distinct carina, above the eyes, fading out before reaching the occipital corner. Upper surface of head moderately convex. Vertex without a pair of teeth above the distinctly truncate and submarginate occiput. Cheeks submarginate beneath, the lower border continuing behind, below the eye, as a vestigial carina, reaching the occipital corner. Upper surface of head smooth, sparsely and rather finely foveolate, the foveolae containing a minute, but visible hair. Lower surface of head more sparsely foveolate, the foveolae containing a conspicuous decumbent hair.

Thorax fulgid above, subfulgid at the sides. Pronotum moderately expanded laterad, the anterior border greatly arcuate, the anterior corner angulate and subdentate, the sides crested, parallel, until reaching the transverse, mesally broadly interrupted, more or less blunt, pronotal crest. Promesonotal suture vestigial. Mesonotum with a strong rounded lateral lobe. Mesoepinotal

suture impressed, scarcely arcuate. Basal face of epinotum with arcuate, crested sides and a short, obliquely divergent tooth on each posterior corner. Posterior border of basal face straight, and sharply marginate. Dorsum of thorax and laterotergite of pronotum microscopically punctate, sparsely foveolate, each foveola containing a decumbent scale. Scales and foveolae larger and more conspicuous on the basal face. Mesopleura and metapleura mostly smooth, finely and superficially reticulate, each with a patch of silvery, appressed hairs. Declivous face of epinotum somewhat excavate, superficially and microscopically reticulate. Upper face of apical half of the femora, and the upper face of tibiae densely scaled. Scales slender, simple and sparser on the anterior and posterior face of the femora and tibiae.

Petiole with a smooth, truncate anterior face, marginate above. The upper face scaled and somewhat foveolate. The spines greatly upturned, obtuse apically. Postpetiole similarly sculptured, the spines not upturned.

Gaster subopaque, finely reticulate-punctate, cordiform. The first gastric tergite shallowly emarginate anteriorly mesad, with a sharply marginate anterio-lateral border, covered with minute, scattered, appressed, glistening scales. Sternites subfulgid, microscopically reticulate, more sparsely scales. Erect, sparse setae on the apical third of gaster.

Female and male unknown.

Distribution. — This very little known species is known to occur in the Amazon Basin and the Guianas.

Specimens examined: 4; 3 workers and 1 soldier, as follows: *Dutch Guiana*: Paramaribo (A. Reying): 1 worker [USNM]. — *Bolivia*: Cavinas, Beni; Jan. 1922 (Wm. M. Mann): 2 workers [CWMM]. Ixiamas; Dec. 1921 (Wm. M. Mann): 1 soldier [CWMM].

Synonymical Notes. — In the past, *complanatus,* has been subject to a great deal of confusion. This is partly due to the fact, that its identity had to be established upon Guerin's very scanty description. But the confusion with *femoralis* F. Smith, introduced by Mayr, and accepted by Emery, was perhaps more responsible of this happening. As will be shown below, *femoralis* is identical with, and has priority over, *silvae* Forel. Smith's description alone is sufficient to bring out the fact that *femoralis* is quite distinct from the present form. On the other hand Guerin's diagnosis is sufficiently detailed to avoid confusion with *multispinus, femoralis* and *ramiphilus* and fits perfectly the worker specimens examined by myself. The soldier, on the contrary, was described as *angulatus* by F. Smith in 1858, and only in 1922 it was synonymized with *complanatus* by Emery. This appears to be correct, although the soldier described above, agreeing perfectly with Smith's description and

picture, was not accompanied by workers, and thus the association of the two forms cannot be corroborated at the present. Finally, even though not having seen the type, I consider *multispinus* var. *amazonensis* Forel as a synonym of *complanatus,* because Forel's description presents features characteristic of this latter species. Forel's mistake is easily understandable, since he accepted *femoralis* F. Smith as a synonym of *complanatus.* The worker and soldier of *complanatus,* as diagnosed by Mann, 1916, however, belong to the following form, the subspecies *ramiphilus* Forel. The worker specimen from Bolivia, listed by Wheeler, in 1925, as *multispinus,* very likely belongs to the present species, since *multispinus,* as accepted here, is not known to occur in that region.

11. *Paracryptocerus (P.) complanatus ramiphilus* (Forel)

(Figs. 130, 135)

Cryptocerus complanatus ramiphilus Forel, 1904, Zool. Jahrb. Syst. vol. 20, p. 678 [worker, soldier; Brazil: State of Amazonas, Bom Fim do Juruá].
Cryptocerus (Paracryptocerus) complanatus ramiphilus Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 307.
Cryptocerus (Cryptocerus) complanatus Mann, 1916, Bull. Mus. Comp. Zool. Harvard, vol. 60, p. 451. Pl. 4, fig. 35 [soldier]; [worker, soldier; Brazil: State of Amazonas, Itacoatiara].

This interesting form, proposed as a race of the preceding *complanatus,* is characterized by significantly smaller size. The worker has the occipital and anterior pronotal corners rounded, the sides of the head subparallel behind, not upturned above the eye. The soldier differs from the typical species by a stronger margination of the lateral upper border of the occiput and the occipital corner, and also by having the posterior epinotal teeth still shorter and not divergent.

Types. — Worker, soldier; Brazil: State of Amazonas, Bom Fim do Juruá, Nov. 1900 (E. Ule). [Muséum d'Histoire Naturelle, Genève (Coll. A. Forel)].

Worker (lectotype) [Fig. 130]. — Length 5.4 mm. Median head length 1.27 mm.; Weber's length of thorax 1.51 mm. Black; the following fuscous ferruginous: apex of mandibles, apical three tarsal segments. Tip of last funicular segment yellowish.

Head subopaque, subquadrate. Mandibles finely reticulate-punctate and rugulose. Sides of head very little sinuate, not upturned above the eye. Frontal carinae prolonged behind the scrobe as a distinct carina, not reaching the occipital corner. Occipital corners rounded, occipital border straight, scarcely emarginate mesad, sharply carinate laterad. Upper surface of head moderately convex, finely reticulate-punctate, sparsely covered with very shallow elongate grooves, each containing a large, usually canaliculate, appressed, silvery, scale-like hair.

Cheeks strongly carinate below, densely covered with silvery, appressed scales. Lower surface of head more fulgid, scales sparser.

Thorax subopaque. Sides of lateral pronotal plates more or less subparallel, anterior and posterior corners rounded. Promesonotal suture obsolete. Mesonotum with a strong lateral spine. Mesoepinotal suture obsolete. Basal face of epinotum with a broad, plate-like, triangular tooth on each side, having on its anterior border a minute, rather blunt, denticule, and a posterior, rather short, slender, acuminate spine, projecting obliquely backwards, about as long as half the length of the basal face. Pronotum convex in profile. Mesoepinotum flat longitudinally, slightly convex transversely. Posterior border of basal face of epinotum submarginate. Sides of declivous face carinate. Dorsum of thorax finely reticulate-punctate, with sparse, squamiferous foveolae, scales conspicuous, appressed, silvery and canaliculate. Sides of thorax and declivous face very finely and distantly longitudinally striated, and very finely reticulate. Tibiae prismatic. Petiole and postpetiole subopaque, petiolar spines upturned and somewhat recurved. Both segments without a dorsal median longitudinal carinule.

Gaster subopaque, elongate, cordiform. First gastric tergite conspicuously emarginate anteriorly mesad, broadly crested antero-laterad, sculptured as upper surface of the thorax, foveolae vestigial, scales more slender, and simple. Erect hair on the following tergites and the sternites.

Soldier [Fig. 135]; Brazil: State of Amazonas, Itacoatiara (Mann & Baker). [Coll. Wm. M. Mann, Washington]. — Length 7 mm. Median head length 1.87 mm.; Weber's length of thorax 2.09 mm. Black.

Head fulgid, subquadrate; rounded anteriorly and posteriorly. Mandibles finely reticulate-rugulose. Frontal carinae scarcely raised, continued behind the scrobe as a distinct carina, above the eyes, fading out before reaching the occipital corner. Upper surface of head moderately convex, vertex without teeth. Occiput distinctly truncate, submarginate above mesad, marginate laterad. Cheeks submarginate beneath, the lower border continuing behind below the eye as a distinct carina, reaching the occipital corner. Upper surface of head smoot, sparsely and rather finely foveolate, the foveolae containing a minute yet visible hair. Lower surface of head more sparsely foveolate, the foveolate with a more conspicuous hair.

Thorax subfulgid. Pronotum expanded laterad, the anterior border conspicuously arcuate, the anterior corner angulate, the sides parallel and crested onto the transverse pronotal crest, then abruptly bent mesad, towards the mesonotum. Transverse pronotal crest distinct laterad, somewhat obsolescent mesally. Promesonotal suture vestigial. Mesonotum with a strong apically rounded lateral tooth. Mesoepinotal suture impressed, scarcely arcuate. Basal face of epinotum without a lateral spine, sides arcuate and crested, the posterior corner with a small, not divergent, tooth, the posterior border sharply marginate. Declivous face smooth, slightly excavate, superficially and very finely reticulate. Promesonotum finely punctate, basal face of epinotum and sides of thorax very finely, shallowly reticulate-punctate. Dorsum of thorax, laterotergite of pronotum sparsely foveolate, with rather large, golden, always visible scales within the foveolae. Scales very conspicuous on basal face of epinotum. Upper face of tibiae and apical half of upper face of femora rather densely scaled.

Petiole with smooth anterior truncate face, marginate above. The upper face scaled and foveolate. The spines not greatly upturned, stouter than in worker. Postpetiole similarly sculptured, the spines not upturned.

Gaster subopaque, finely reticulate-punctate, elongate, subcordiform. The first gastric tergite moderately emarginate anteriorly mesad, narrowly crested antero-laterad, with scattered, minute, glistening, appressed setulae. Sternites subfulgid, shallowly and very finely reticulate, more sparsely scaled. Erect, sparse setae on the apical third of the gaster.

Female and male unknown.

Distribution. — According to our present record this form is confined to the upper Amazon valley.

Specimens examined: 4; 3 workers and 1 soldier, as follows: *Brazil*: State of Amazonas, Bom Fim do Juruá; Nov. 1910; in perforated twigs of *Platymiscium ulei* Harms (E. Ule): 1 worker (lectotype) [MHNG]. Itacoatiara; from a twig (Mann & Baker): 2 workers, 1 soldier [CWMM].

The specimens from Itacoatiara, described by Mann (1916) as *complanatus* s. str. agree perfectly with the lectotype worker of *ramiphilus*, except the slightly less rounded anterior corner of the pronotal lamella, and the more obsolescent accessory denticule of the lateral epinotal tooth. Mann based his identification on Emery's figure of a worker specimen of *complanatus* from Peru. However also Emery's *complanatus*

most likely has to be associated with the present form, since it exhibits rounded corners of the occipital angle and the anterior angle of the pronotal lamellae.

12. *Paracryptocerus* (*P.*) *cordiae* (Stitz)

(Figs. 132, 140)

Cryptocerus cordiae Stitz, 1913, Deutsche Ent. Zeitschr. pp. 207-208, fig. 1 [soldier]; [worker, soldier; Brazil: Alto Acre].
Cryptocerus (*Paracryptocerus*) *cordiae* Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 307.

The rounded, immarginate occipital border and the single spine on the posterior corner of the epinotum stamp *cordiae* as a species distinct from all other members of the present group.

Types. — Worker, soldier; Brazil: Alto Acre (E. Ule): [Two cotypes in the Naturhistorisches Museum, Wien].

Worker [Fig. 131]; Bolivia: Rurrenabaque, Beni, Oct. 1921 (Wm. M. Mann). [Coll. Wm. M. Mann, Washington]. — Length 6.4 mm. Median head length 1.45 mm.; Weber's length of thorax 1.83 mm. Black; the following fuscous ferruginous: apex of mandibles, anterior corner of frontal carinae, three apical tarsal segments. Tip of last funicular segment orange-brown.

Head subopaque, subquadrate. Mandibles very finely reticulate-punctate, not rugulose. Sides of head not sinuate, not upturned above the eyes. Frontal carinae greatly curved mesad in front, prolonged behind the scrobe, fading out above the eyes. Occipital corner obtusely angulate, more or less rounded. Occipital border almost straight, scarcely emarginate mesad, not crested nor marginate laterad. Upper surface conspicuously convex, finely reticulate-punctate, more sparsely and somewhat vestigially foveolate, each foveola containing a small, usually simple, bright, shiny and appressed scale. Cheeks weakly to indistinctly carinate below, rather densely covered with large, silvery, appressed, canaliculate scales. Lower surface of head more fulgid, with sparser scales.

Thorax subopaque. Sides of lateral pronotal plates strongly converging caudad, their lateral border crested, the anterior corner subspinose, the posterior corner rounded. Promesonotal suture obsolete mesad. Mesonotum with a lateral, apically rounded, lobe-like tooth. Mesoepinotal suture impressed. Basal face of epinotum without a lateral tooth, sides moderately arcuate, immarginate, the posterior corner with a longer, somewhat divergent and upturned spine, shorter than the length of the basal face. Promesonotum in profile, conspicuously convex. Posterior border of

basal face submarginate. Declivous face longer than basal face, the sides marginate. Dorsum of thorax finely reticulate-punctate, without distinctly impressed foveolae, scales sparse, short and simple. Sides of thorax and declivous face finely reticulate. Tibiae prismatic.

Petiole and postpetiole subequal in width, subopaque, without a median logitudinal carinule above. Spines of petiole upturned and slightly recurved.

Gaster subopaque, elongate, finely reticulate-punctate. First gastric tergite scarcely emarginate mesad, narrowly crested antero-laterad, with simple, minute scattered, appressed scales. Erect hair confined to the following tergites and the sternites.

Soldier (from the same nest series as worker). Length 7.3 mm. Median head length 1.78 mm.; Weber's length of thorax 2.19 mm. Black.

Head subfulgid; subquadrate. Mandibles smooth, subfulgid, sparsely punctate. Frontal carinae greatly curved mesad in front, scarcely raised, continued behind the scrobe as a faint carina, fading out above the eyes, not reaching the rounded occipital corner. Clypeus obliquely inclined, not perpendicular to the conspicuously convex upper surface of head. Vertex without a pair of median teeth. Occiput distinctly truncate, immarginate above. Cheeks submarginate with a vestigial carina below the eyes reaching back to the occipital corner. Upper surface of head smooth, very finely punctate, sparsely covered with very small, vestigial foveolae, not containing a distinctly visible hair. Hair more apparent on lower surface of head.

Thorax subfulgid to subopaque. Pronotum greatly expanded laterad, the anterior border conspicuously arcuate, the anterior corner angulate and subspinose, the lateral border not crested, the sides converging caudad. Promesonotum, in profile, greatly convex, pronotum without a distinct transverse crest or margination. Promesonotal suture vestigial. Mesonotum with a strong, apically rounded, lateral, lobe-like tooth. Mesoepinotal suture impressed, scarcely arcuate caudad. Basal face of epinotum rounded anteriorly the sides immarginate, subparallel, without a tooth, the posterior corner with a strong, rather short, slightly divergent and slightly upturned spine, the basal face being somewhat impressed above, in front of the base of each spine. Posterior border of basal face scarcely emarginate, but marginate. Dorsum of thorax and laterotergite of pronotum microscopically punctate, with sparse, more or less obsolete foveolae. Mesopleura

and metapleura very finely, superficially reticulate with a few scattered scale-like hairs. Declivous face smooth, fulgid, superficially and very finely reticulate.

Petiole with smooth anterior truncate face, immarginate above mesad, submarginate laterad. The upper face rather vestigially scaled and foveolate. The spines greatly upturned and recurved. Postpetiole as wide as petiole, the spines not upturned, rather stout, blunt at apex.

Gaster subopaque, finely reticulate-punctate, broadly subcordiform. The first gastric tergite scarcely emarginate anteriorly mesad, not distinctly crested, but marginate antero-laterad, with rather dense, scattered, minute appressed shiny setulae. Sternites subfulgid, shallowly and finely reticulate, more sparsely scaled. Erect sparse setae on the following tergites and the sternites of the gaster.

F e m a l e (dealate; undescribed) [Fig. 140]; Bolivia: C. Esperanza, Beni, March 1922 (Wm. M. Mann). [Coll. Wm. M. Mann, Washington]. — Length 10 mm. Median head length 2.12 mm.; interocular width 2.17 mm.; Weber's length of thorax 3.07 mm. Black; the anterior corner of the frontal carinae, the tibiae, tarsi, sides and apical border of the gastric sclerites with rufous hues.

Head, as in soldier, fulgid, finely and shallowly punctate. Median head length subequal to interocular width. Mandibles fulgid, finely and sparsely punctured, with a projecting angle above, near the base. Frontal carinae not upturned, not prolonged above beyond the eyes. Upper surface of head greatly convex, with very sparse, larger punctures. Cheeks immarginate above and below; no carinule beneath the eyes. Ocelli light and colorless. Occiput truncate, immarginate above and below. Occipital corners bluntly rounded. Lower surface of head sparsely and more coarsely punctate-foveolate.

Thorax fulgid, its maximum length subequal to the length of the first gastric tergite. Pronotum above with a transverse blunt keel, not interrupted mesad. Sides immarginate, with a stout, short, conical scapular tooth, pointing obliquely forward. Part of pronotum in front of the keel subvertical. Basal face of epinotum very short, transverse, its posterior border emarginate and submarginate, having a stout conical tooth on each posterior corner. Declivous face perpendicular, much longer than the basal face. Upper mesopleura greatly convex, lower mesopleura with a tooth. Upper surface of thorax very finely punctate, very sparsely

and vestigially foveolae. Sides and declivous face finely and shallowly reticulate. Femora incrassated, somewhat compressed, angulate above. Tibiae twice as broad as thick. Middle and hind metatarsi greatly broadened and flattened proximad, narrower and less compressed distad, less than twice as long as broad.

Petiole with a stout conical tooth on each side. The anterior face obliquely truncate, marginate above, twice as long as the dorsal face. Postpetiole with a stout conical tooth on each side, its dorsal face greatly convex. Both peduncular segments fulgid and smooth, the microsculpture vestigial.

Gaster elongate oval, sides moderately convex, scarcely emarginate anteriorly, the anterior corners not producted, immarginate. Subfulgid, finely but distinctly reticulate, and sparsely and more or less vestigially foveolate.

Erect pile on mandibles, and apical segments of gaster; minute decumbent setulae on legs and the first gastric tergites and sternites.

Male unknown.

Distribution. — This apparently rare, yet interesting species is known only from the type locality and the Beni valley in Bolivia.

Specimens examined: 20; 15 workers, 4 soldiers and 1 dealate female, as follows: *Brazil*: Alto Acre; in Cordia sp. (E. Ule): 1 worker (syntype) [NHMW]. — *Bolivia*: C. Esperanza, Beni; March 1922 (Wm. M. Mann); 1 female [CWMM]. Rurrenabaque, Beni; Oct. 1921 (Wm. M. Mann): 14 workers, 4 soldiers [CWMM].

The "cotype" specimen received from Vienna, Austria, lacked the head, and also the pleural and sternal portions of the prothorax, and thus was not used in the diagnosis of the worker. The Bolivian specimens differ by a slightly larger size, by lacking a pair of swellings on the occiput and a distinct transverse crest on the pronotum of the soldier, and by having the epinotal spines slightly shorter and less divergent than in the type. Otherwise they agree perfectly with the typical specimen, and with the figure and excellent description of Stitz.

13. *Paracryptocerus* (*P.*) *femoralis* (F. Smith)

(Fig. 129)

Cryptocerus femoralis F. Smith, 1854, Trans. Ent. Soc. London, (2), vol. 2, p. 219, Pl. 20, fig. 3 [worker; Colombia].
Cryptocerus silvae Forel, 1906, Ann. Soc. Ent. Belg. vol. 50, pp. 223-224 [worker; Colombia: Santa Marta, Sabanilla, Cienaga, Calabasio, Ouriheka].
Cryptocerus (*Paracryptocerus*) *silvae* Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 307.

This species is very close to *multispinus*, from which it may be readily differentiated by the ferruginous frontal carinae, the

subparallel, ferruginous, lateral lamellae of the pronotum, the anterior and posterior corners of which are more or less rounded, the coarsely longitudinally rugose first gastric tergite, which does not bear glittering scales.

Type. — Worker; Colombia. [Coll. Westwood].

Worker (lectotype of *silvae* Forel) [Fig. 129]; Colombia: Santa Marta (Forel & Santschi). [Muséum d'Histoire Naturelle, Genève (Coll. A. Forel)]. — Length 6.6 mm. Median head length 1.56 mm.; Weber's length of thorax 2.07 mm. Black; the following ferruginous: tip of mandibles, frontal carinae, lateral border of pronotal plates. Tip of last funicular segment orange.

Head subopaque, subtrapezoid. Mandibles finely reticulate-punctate, finely reticulate-rugose. Sides of head greatly sinuate, distinctly converging in front, conspicuously expanded above the eyes. Frontal carinae prolonged behind the scrobe, upturned above the eyes, reaching the angulate occipital corner. Occipital border concave, sharply crested laterad, the middle piece slightly convex. Upper surface of head very little convex, finely reticulate-punctate, densely foveolate discally, reticulate-rugose and foveolate laterad and caudad, each foveola containing a broad, appressed, short, canaliculate, silvery scale. Cheeks strongly marginate beneath, densely covered with large silvery appressed scales. Lower surface of head reticulate-rugose and foveolate, rather densely scaled.

Thorax subopaque. Sides of lateral pronotal plates subparallel, the anterior angle subrectangular, the posterior corner rounded. Promesonotal suture obsolete. Mesonotum with a strong lateral spine. Mesoepinotal suture obsolete.

Basal face of epinotum with a broad, plate-like triangular tooth, having on its anterior border a smaller accessory denticule, on each side, and a posterior, short, acuminate spine, projecting obliquely backward and upward, shorter than the length of the basal face. Promesonotum somewhat convex in profile. Declivous face coarsely longitudinally striated, its sides submarginate. Dorsum of thorax finely reticulate-punctate, coarsely reticulate-rugose, and foveolate, each foveola containing a conspicuous canaliculate scale, as on head. Laterotergite of pronotum longitudinally striated. Sides of thorax reticulate-rugose, densely scaled below, smooth above. Femora, even the fore femora, greatly incrassated and compressed, angulate above the lateral faces rather densely reticulate-punctate longitudinally rugulose

and subopaque. Tibiae prismatic. Hind metatarsus broader and shorter than in *multispinus*.

Petiole and postpetiole subopaque. The petiolar spines less upturned than in *multispinus*. Both segments above with a median longitudinal carinule, which in the postpetiole arises from a median tooth on the anterior border.

Gaster subopaque; broadly subcordiform; very convex above. First gastric tergite scarcely emarginate in front mesad, narrowly crested antero-laterad, rather conspicuously longitudinally areolate-rugulose, not foveolate, without distinctly visible scales. Longitudinal rugulae very distinct on base and apical third of the tergite. First sternite with coarse longitudinal striae laterad. Sparse, erect hair on the apical third of the gaster.

Soldier, female, and male unknown.

Distribution. — This very distinctive species is known only from Northern Colombia.

Specimens examined: 6 workers, as follows: Colombia: Santa Marta (Forel & Santschi): 3 workers (lectotype and paratypes of *silvae*, n. syn.) [MHNG, CWMM]. Rio Frio, March 1924 (Wm. M. Mann): 3 workers [USNM].

In the past, beginning with Mayr, *femoralis* has been accepted as a synonym of *complanatus*, but Smith's diagnosis and figure are clear enough to point out that this species is not only discrete from *complanatus* but is also identical with what has been described later as *Cr. silvae* by Forel. In order to substantiate this argument, I like to quote from Smith's description:

"... the lateral margins of the head expanded before the eyes, the margin testaceous, the hinder angles acute; ... the sides of the thorax in front testaceous, the anterior portion transverse... the posterior angles produced into a sharp spine... abdomen... longitudinally and finely rugulose, most strongly so at the base. Hab. Colombia..." Furthermore it is stated there that "glittering scales" occur on head, thorax and legs, the gaster, consequently being excluded. In my opinion, these features are so characteristic of *silvae* that I consider this synonymy securily established although I have not seen the type of *femoralis*.

14. *Paracryptocerus* (*P.*) *multispinus* (Emery)

(Figs. 133, 137)

Cryptocerus cordatus multispinus Emery, 1890, Bull. Soc. Ent. Ital. vol. 22, p. 75, Pl. 9, fig. 5 [worker; Costa Rica].

Cryptocerus multispinus Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, pp. 211-212. Pl. 3, fig. 1 [soldier; Costa Rica]. — Forel, 1899, Biol. Centr.-Amer. Hym. vol. 3, p. 49. Pl. 3, fig. 9-11 [worker, soldier, female; Guatemala: Las Mercedes, Pantaleon, Rio Maria Linda, Zapote; Nicaragua: Chontales; Costa Rica: Alajuela, Jimenez; Panama: Bugaba]. — Forel, 1906, Ann. Soc. Ent. Belg. vol. 50, p. 234 [Colombia: Ouriheka]. — Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 201 [Guatemala: Retaluleu]. — Mann, 1922, Proc. U. S. Nat. Mus. vol. 61, p. 33 [Honduras: La Ceiba, Lombardia].

Cryptocerus (*Paracryptocerus*) *multispinus* Emery, 1915, Bull. Soc. Ent. France, p. 192.

Cryptocerus (*Paracryptocerus*) *multispinus* var. *cordiventris* Santschi, 1931, Rev. de Ent. vol. 1, pp. 274-275 [worker, soldier; Panama Canal Zone].

The fuscous black frontal carinae, the anteriorly acutely angulate and pointed fuscous pronotal lamellae, the distinctly scaled first gastric tergite separate the worker of the present species from *femoralis,* its closest relative. The soldier may at once be recognized by the broadly expanded pronotum and the pair of teeth on the vertex.

Type. — Worker; Costa Rica (Alfaro?). [Coll. Emery].

Worker [Fig. 133]; Costa Rica: Santa Clara Province, Hamburg Farm (F. Nevermann). [Coll. T. Borgmeier, Rio de Janeiro]. — Length 7.1 mm. Median head length 1.75 mm.; Weber's length of thorax 2.34 mm. Black.

Head subopaque, subquadrate. Mandibles finely reticulate-punctate, finely retciulate-rugose. Sides of head sinuate, conspicuously converging in front, concave in front of, convex and visibly upturned above, the eyes. Frontal carinae prolonged behind the scrobe, as a visible carina, which reaches the sharply angulate, subspinose occipital corner. Occipital border concave, sharply crested laterad, the middle piece slightly convex. Upper surface of head little convex, finely reticulate-punctate, densely foveolate, each foveola containing a broad, appressed, short, canaliculate, silvery scale. Cheeks strongly marginate beneath, densely covered with large silvery scales. Lower surface of head more fulgid, sparsely scaled.

Thorax subopaque. Sides of lateral pronotal plates converging behind, the anterior angle acute, subspinose, the posterior angle subrectangular. Promesonotal suture obsolete. Mesonotum with a strong, lateral spine. Mesoepinotal suture vestigial. Basal face of epinotum with a broad, plate-like, triangular, lateral tooth, with an accessory smaller tooth arising from its anterior border, and a longer, subacuminate, posterior spine, projecting obliquely backward and slightly upward, subequal to the length of the basal face. Promesonotum somewhat convex in profile. Dorsum of thorax finely reticulate-punctate and foveolate, each foveola containing an appressed canaliculate scale, as on head. Latero-tergite of pronotum longitudinally striated. Sides of thorax densely scaled below, smooth above. Declivous face of epinotum finely reticulate, very finely and distantly longitudinally rugulose, its sides marginate. Femora slightly less inflated than in *femoralis,* the posterior side only finely reticulate, and subfulgid. Hind metatarsus elongate, broadened and flattened proximad.

Petiole and postpetiole subopaque, sculptured as upper surface of thorax, with a median longitudinal carinule above,

arising on the postpetiole distinctly behind the anterior border which is slightly impressed mesad. Petiole with very long, slightly raised, lateral spines.

Gaster subopaque, broadly cordiform, very convex above. First gastric tergite slightly emarginate in front mesad, crested antero-laterad, sculptured as dorsal surface of thorax, foveolae more or less obsolete, but similarly scaled; scales large, canaliculate. First sternite with a few longitudinal rugosities on the sides. Erect hair confined to the terminal tergites and the sternites of the gaster, and few erect setulae on the internal curvature of the frontal carinae.

Soldier [Fig. 137]; (from the same locality and the same nest series as the preceding worker). — Length 10 mm. Median head length 2.73 mm.; Weber's length of thorax 2.93 mm. Black.

Head subfulgid, subquadrate. Mandibles finely reticulate, almost smooth, sparsely foveolate. Frontal carinae rounded anteriorly, slightly raised laterally, continued behind the scrobe as a distinct carina, reaching the occipital corner. Upper surface of head little convex, vertex with two short teeth above the truncate occiput, which is submarginate above mesad and laterad. Cheeks marginate beneath, with a strong carina extending back to the occipital corner, densely foveolate and scaled. Upper and lower surface of head smooth, covered with small foveolae. Lower surface of head superficially reticulate, the foveolae sparser containing a distinctly visible hair.

Thorax fulgid. Pronotum greatly expanded laterad, the anterior border scarcely arcuate, the lateral borders subparallel, sharply crested, converging mesad, behind the conspicuous, medially interrupted, transverse pronotal crest. Promesonotal suture distinct. Mesonotum with a strong lateral apically rounded tooth. Mesoepinotal suture impressed, greatly arcuate caudad. Basal face of epinotum with a strong, broad triangular tooth on each side, and a posterior strongly divergent, somewhat upturned apically, stout spine the posterior border of which is continuous with the marginate posterior border of the basal face. Dorsum of thorax and laterotergite of pronotum mostly smooth, vestigially and very finely reticulate, sparsely foveolate, the foveolae larger, rather dense, containing visible scales on epinotum. Sides of thorax mostly smooth, with a patch of very dense silvery scales on mesopleura and metapleura. Declivous face perpendicular to basal basal face, smooth and fulgid.

Petiole with smooth anterior truncate face, which is marginate above. Lateral spines greatly upturned, upper face densely scaled and foveolate. Postpetiole narrower than petiole, lateral spines not upturned. Sculpture as on petiole.

Gaster fulgid above, subfulgid below. Broadly cordiform, slightly emarginate in front mesad, narrowly crested antero-laterad. First gastric tergite with dense large canaliculate scales on the anterior corners and on the apical third, scales and foveolae more or less obsolete discad. Sternites finely reticulate, more sparsely scaled. Erect hair confined to apical third of gaster.

The f e m a l e, yet undescribed, was pictured by Forel (1899). This caste is conspicuous by the rather coarse foveolae on the dorsal face of the body, and the lack of a transverse cubital vein in the fore wing.

Male unknown.

Distribution. — The typical *multispinus* ranges from Guatemala in Central America south to Colombia.

Specimens examined: 67; 54 workers and 13 soldiers as follows: *Guatemala*: Escuintla; Dec. 24, 1911 (Wm. M. Wheeler): 3 workers [MCZ]. S. Sebastian, Retaluleu; 1925 (L. Thiel): 2 workers, 1 soldier [USNM]. — *Honduras*: La Ceiba; Aug. 22, 1911 (F. J. Dyer): 1 worker [USNM]. La Ceiba (Wm. M. Mann): 3 workers [USNM]. Lombardia (Wm. M. Mann): 1 worker [USNM]. San Juan Pueblo (Wm. M. Mann): 2 workers [USNM]. — *Costa Rica*: Desmonte (A. Bierig): 1 worker [CTB]. Hamburg Farm, Santa Clara Province; Aug. 1925 (F. Nevermann): 8 workers, 5 soldiers [USNM, CTB]. Tempisque, Jan. 22, 1937 (A. Alfaro): 6 workers [ANSP]. Turrialba: 1 worker [MCZ]. — *Panama*: Bugaba, 800-1500 ft. (Champion): 1 worker [CWMM]. Matias Hernandez; Nov. 1946 (N. L. Kraus): 1 worker [USNM]. Porto Belo; Feb. 2, March 1, 1911 (E. A. Schwarz): 2 workers [USNM]. — *Canal Zone*: Barro Colorado Island, June 21, 1924 (N. Banks): 3 workers, 5 soldiers [MCZ]. Barro Colorado Island, June 6, 1925 (Wm. M. Wheeler): 19 workers, 2 soldiers [MCZ]. — *Colombia*: Bogotá: 1 worker [NHMW]. Santa Anna; Feb. 1924 (Wm. M. Mann): 3 workers [USNM].

V a r i a t i o n. — Worker specimens from Tempisque, Costa Rica, and Bogotá, Colombia, and one individual from Porto Bello, Panama, correspond with what has been described by Santschi as the variety *cordiventris*. The most outstanding feature of this variant is the more or less complete lack of the accessory denticule on the first lateral

epinotal tooth. However, since this variant occurs very sporadically within the territory of the typical form, often even coexisting in the same habitat, it does not appear proper to raise it to subspecific level. I therefore propose to relegate this variety to mere synonomy.

The extent of scale-covered areas in the soldier, especially on the gaster, and, in general, the development of the scales, regarding size and density is likewise quite variable in the present form.

15. *Paracryptocerus (P.) multispinus inca* (Santschi)

(Fig. 134)

Cryptocerus multispinus inca Santschi, 1911, Ann. Soc. Ent. Belg. vol. 55, p. 278 [worker; Peru: La Massa].
Cryptocerus (Paracryptocerus) multispinus inca Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 307.

The huge spines on the posterior corner of the epinotum and the petiole distinguish at once this form from the typical *multispinus*.

Type. — Worker; Peru: La Massa (Rivet). [Muséum de Paris].

Worker [Fig. 134]; Peru: Piura, 1910 (Townsend). [Museum of Comparative Zoology, Harvard]. — Length 7 mm. Median head length 1.80 mm.; Weber's length of thorax 2.17 mm. Black; the following fuscous ferruginous: four apical tarsal segments; tip of mandibles. Tip of last funicular segment light orange-brown.

In general similar to the typical *multispinus*, with the following differences:

Bronzeous canaliculate squamiform hair comparatively denser and more abundant. Posterior epinotal spines and lateral petiolar spines extremely elongate and acuminate. Lateral tooth of epinotum without an accessory denticule on the anterior border. First gastric tergite scarcely emarginate antero-mesad. The general outline of the thorax and peduncle can be seen from the appended figure.

I have seen only the single worker specimen mentioned above.

Soldier, female and male unknown.

Group of Paracryptocerus (P.) pavonii (Latreille)

This assembly of closely related forms was established as a species group within the subgenus *Cryptocerus*, s. str. (=*Harnedia*) by Emery, in 1922. Although the complex very definitely constitutes a natural group, its association with the

subgenus *Harnedia* is rather doubtful and Emery himself, recognized its transitional character between *Paracryptocerus* s. str. and *Harnedia*. As has already been pointed out, the only valid reason for maintaining the subgenera introduced by Emery in their present form lies in the threefold differentiation of the head of the soldier. Hence, in my estimation, it is more adequate to place the *pavonii*-complex in the subgenus *Paracryptocerus*, because none of the soldiers of this group exhibits a perfectly disc-shaped upper surface of head, and in some of them, the upper surface is rather convex and not limited behind.

By making this shift, however, one species, *viz. emeryi* Forel, must be removed from the *pavonii*-group. This species is still known only in the worker caste. The general configuration of the thorax resembles that of *multispinosus*, yet it disagrees with the latter from in the completely simple, not angulate femora and the narrow metatarsi. Recently I have received all 4 castes of a new species from Colombia, which doubtless is a very near relative to *emeryi*, and, strikingly enough, the soldier's head is surmounted by a flat, subcircular, completely differentiated disc and quite different from the soldiers of the *pavonii*-group. It is thus very probable that also *emeryi* has a similar soldier, and both forms, must be transferred to the *angustus*-group of *Harnedia*.

The worker caste of the *pavonii*-group may be briefly characterized as follows: Frontal carinae usually lighter than the rest of the head; pronotum with lateral foliaceous plates or lamellae; basal face of epinotum very short, not distinctly separated from the declivous face; hind femora distinctly angulate above, or if not distinctly so, then the apical portion of the upper face of the femora contrasts by a rather dense covering of large scales; metatarsi broadened and flattened proximad, attenuate distad; petiole without a truncate, perpendicular anterior face above the insertion.

The soldiers possess the following distinctive features: Upper surface of head slightly convex, not surmounted by a distinctly differentiated disc. Vertex with a pair of tubercles often connected by a transverse median carinule; transverse pronotal crest interrupted mesad; pronotum four times as broad as long in the middle; declivous face of epinotum oblique, immarginate above; petiole without a truncate anterior face above the insertion.

The females have the head as in the soldier, and the first gastric tergite is longer than the maximum length of the thorax.

All these species have the peculiar habit of very frequently

raising the gaster to the vertical plane, a movement which is made possible by the characteristic shape of the petiole that lacks an anterior truncate face, and the shape of the declivous face, which is greatly inclined and subcontinuous with the basal face.

Following is a list of the component species:

16. *P. (P.) borgmeieri,* n. sp.
17. *P. (P.) cordatus* (Fred. Smith)
18. *P. (P.) cristatus* (Emery)
19. *P. (P.) depressus* (Klug)
20. *P. (P.) eduarduli* (Forel)
21. *P. (P.) pavonii* (Latreille)
22. *P. (P.) multispinosus* (Norton)
23. *P. (P.) multispinosus biguttatus* (Emery)

Of all these forms, *multispinosus* and its race *biguttatus* form a rather distinct subgroup apart from the *pavonii*-group in a restricted sense. The latter constitutes a very closely related assembly, differing mostly in the outline and shape of the thorax and the peduncular segments.

The workers of the *pavonii*-subgroup share the following features in common: frontal carinae rather distinctly crenulate, with a small, clubbed, setula projecting from the notches; sides of head convex and upturned above the eyes; occipital corner with a bidentate, obliquely truncate lobe; occipital border strongly emarginate; shoulders separate from the lateral pronotal lamella; lateral mesonotal tooth strong; sides of epinotum bidentate or bispinose, the anterior spine the longest; gaster more or less cordate; dorsum of head, thorax, peduncle and gaster rather densely covered with canaliculate, oval, silvery, appressed scales.

The soldiers have the frontal carinae crenulated and beset with a rim of setulae, as in the worker; the upper surface of head subfulgid; the occiput truncate mesad; the shoulders separate from the expanded portion of the pronotum; the declivous face of the epinotum without a lateral crest, or crest-like tooth. In *cordatus, cristatus, eduarduli* and *pavonii* the soldier possesses a sharp bidentate median transverse crest above the occiput, and another, oblique carina connecting the median crest with the lateral border of the head. On these species the upper surface of head is completely marginate and somewhat disc-like, rather flat. This condition, most probably, is responsible for Emery considering them as belonging to *Harnedia* instead of *Paracryptocerus* s. str. However, in the aforesaid species, the integument of the upper surface of head is fulgid, the foveolae rather small, smaller than the separating intervals, and, on the other hand

borgmeieri and *depressus* have the upper surface of head distinctly convex, with only a faint median bidentate crest above the occiput, which is not connected with the sides by a lateral carina.

The species of the *pavonii*-complex, s. str. are extremely similar. They differ more in body outline than in small structural detail, and should be easily recognized on hand of the accompanying figures and the differential diagnosis. The descriptions have been held to a minimum.

16. *Paracryptocerus* (*P.*) *borgmeieri*, n. sp.

(Fig. 147)

Cryptocerus pavonii Emery (nec Latreille), 1890, (excl. synonyms), Bull. Soc. Ent. Ital. vol. 22, p. 73. Pl. 8, fig. 7-10 [worker, soldier, female; Brazil: State of Mato Grosso]. — Emery, 1896, Zool. Jahr. Syst. vol. 9, p. 636 [male]. — Emery, 1905, Bull. Soc. Ent. Ital. vol. 37, p. 170 [Brazil: State of Mato Grosso, Cuiabá]. — Forel, 1911, Sitz.-ber. Akad. Wiss. p. 258 [Paraguay: San Bernardino]. — Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 200-201 [Paraguay]. *Cryptocerus* (*Paracryptocerus*) *pavonii* Emery [in part], 1922, Gen. Insect. Hym. fasc. 174c, p. 309.

This new species comprises all the specimens from South-western Brazil, Argentina and Paraguay, which up to the present have been considered as identical with *pavonii* Latreille. Two characters contained in Latreille's scanty description, referring to the crenulate border and the pale ferruginous color of the frontal carinae of *pavonii*, are sufficient to establish the diversity of *borgmeieri* from that species.

I take great pleasure in naming this interesting form after my confrere and colleague Father Thomas Borgmeier, O. F. M., D. Sc. as a token of gratitude for the help and suggestion received during the present work.

Type. — Worker; Argentina: Misiones Province, Iguazu (N. Kusnezov). [Coll. Inst. Miguel Lillo, Tucumán; Coll. T. Borgmeier, Rio de Janeiro].

Worker (holotype) [Fig. 147]. — Length 5.7 mm. Median head length 1.34 mm.; Weber's length of thorax 1.58 mm. Fuscous reddish-brown; appendages more or less rufous-brown; gaster almost black.

Head subopaque, greatly depressed; subquadrate. Interocular distance exceeding maximum length of head. Mandibles very finely reticulate-punctate, vestigially rugulose. Frontal carinae rounded in front, slightly sinuate and subparallel at the sides, somewhat upturned above the eye, reaching the occipital corner. Sides vestigially crenulate, the projecting setulae in the notches minute to obsolete. Upper surface of head very little convex, very finely reticulate-punctate, somewhat more coarsely reticulate-

rugulose, rather densely covered with large, oval, appressed, canaliculate, pale yellowish, glittering, scale-like hairs. Vertical teeth vestigial. Occipital border emarginate, occipital corners obliquely truncate, with an outer blunt and an inner more acute denticule. Cheeks strongly marginate beneath, very densely covered with minute scales as on upper surface. Lower surface with distant, longitudinal rugulae, and sparse, scattered, simple, appressed hairs.

Thorax subopaque; much broader across the pronotum than long. Upper surface of thorax including the declivous face of epinotum continuously and conspicuously convex in profile. Sculptured and scaled as the upper surface of head. Anterior border arcuate, shoulders angulate, separate from the broad, long, lateral lamellae of the pronotum, the anterior border of which is arcuate, the outer border sinuate, the posterior border concave. Promesonotal suture obsolete. Mesonotum with a blunt lateral spine. Mesoepinotal suture obsolete. Sides of epinotum with a long, plate-like depressed spine in front, and a shorter, triangular, plate-like tooth behind, close to the posterior corner, the posterior border of which forming a crest, delimiting the declivity behind. Sides of thorax finely reticulate-punctate, distinctly longitudinally rugose, with sparser, canaliculate scales, longer than those on the upper face. Middle and hind femora distinctly angulate above. Middle and hind metatarsi flattened and broadened proximad, attenuate distad.

Petiole subopaque; anterior border, including the long recurved spines, evenly curved. Postpetiole subopaque, narrower and shorter than petiole, lateral spines slightly curved forward at base, vestigially recurved at apex. Sculpture and scales as on thorax.

Gaster subopaque, cordiform, about as broad as long. First gastric tergite moderately emarginate anteriorly mesad, narrowly crested antero-laterad, sculpture and scales as on thorax.

Soldier. — The soldier has never been described, but a figure drawn and published by Emery (1890), as the soldier of *pavonii,* represents this caste of *borgmeieri.* According to this picture it seems to be nearest to *depressus,* by lacking the postero-lateral crests connecting the pair of small teeth on vertex, with the sides of the head, and by having the upper surface of head more convex. The rather distinct median bidentate crest on the vertex, the shape of the peduncular segments, similar to those of the worker, distinguish it from *depressus.*

An overgrown worker from Puerto Bertoni, Paraguay, exhibits certain features of the soldier caste. It is distinct by larger size (6.3 mm.), the truncate occiput, the shallow emargination of the sides of the head above the eyes, the distinct pair of teeth on the vertex presenting a vestigial transverse margination between them. The pronotum has a transverse crest, ending laterad at the half of the posterior side of the pronotal lamella, rather strong laterad, interrupted mesad. Mesoepinotal suture impressed laterad, vestigial discad. Sculpture slightly smoother. The epinotum as in the worker, with two teeth on each side.

F e m a l e. — Likewise known only through Emery's picture, seems to differ from *depressus* by the less distinctly crenulate frontal carinae, somewhat shorter head, the lack of the transverse pronotal crest, with the teeth on epinotum and postpetiole less distinct and less acute.

M a l e, probable identical with the male of *"pavonii"* mentioned incidentally by Emery (1896). The only characters known are as follows: Antennae, except the scape, yellow. Volsellae of genital apparatus covered, invisible from the side. Parameres narrow and flat.

Distribution. — This form inhabits the upper Paraguay River basin, having been taken in Mato Grosso, Brazil, in Paraguay and Northern Argentina.

Specimens examined: 8 workers, as follows: *Argentina*: Misiones Province, Iguazu (N. Kusnezov): 4 workers (holotype and paratypes) [CML, CTB]. — *Paraguay*: locality unknown: 1 worker [MHNG]. Puerto Bertoni (Stremikov): 3 workers [MCZ].

The specimens from Paraguay have a slightly shorter but broader head. In some individuals there is a minute tooth set off behind the posterior border of the lateral lamella of the pronotum, in front of the mesonotum. Others have the apex of the same lamellae ferruginous, and vestigial, lighter, semitransparent spots on the frontal carinae.

17. *Paracryptocerus* (*P.*) *cordatus* (F. Smith)

(Figs. 142, 144, 146)

Cryptocerus cordatus F. Smith, 1854, Trans. Ent. Soc. London, (2), vol. 2, p. 220. Pl. 21, fig. 3 [worker; Brazil: State of Pará, Santarém]. — Emery, 1894, Bull. Soc. Ent. Ital. vol. 26, p. 212; Pl. 3, fig. 2, 3 [worker, soldier; Brazil: State of Pará, Belém]. — Wheeler, 1925, Ark. Zool. vol. 17A (8), p. 36 [worker; Bolivia: Butura].

Cryptocerus (*Cryptocerus*) *cordatus* Mann, 1916, Bull. Mus. Comp. Zool. Harvard, vol. 60, p. 450 [Brazil: State of Amazonas, Porto Velho]. — Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 308.

Cryptocerus cordatus var. *boliviensis* Santschi, 1921, An. Soc. Cient. Argent. vol. 92, p. 126; fig. 2A [worker, female; Bolivia: Rio Guapay].

The nearest relative of this distinctive species is *pavonii*, the worker of which, however, differs by the shape of the lateral pronotal lamellae, the apically acute postpetiolar spines, and the shorter gaster. The chief difference between the soldier of both species lies in the shape of the peduncular segments.

Type. — Worker; Brazil: State of Pará, Santarém (H. W. Bates). [British Museum (Natural History)].

Worker [Fig. 146]. — Length 5.5 mm. Black; the following ferruginous: frontal carinae, occipital lobes, lateral border of pronotal lamellae, tip of epinotal and peduncular spines.

Head broader than long, sides slightly diverging caudad. Frontal carinae distinctly crenulate, expanded and somewhat upturned above the eyes, the anterior half with projecting setulae within the notches. Lateral pronotal lamellae broad, broadest in front, anterior corner subangulate, sides scarcely convex, broadest in front, anterior corner subangulate, sides scarcely convex, distinctly converging caudad. Mesonotum with an acute lateral tooth. Sides of epinotum with an anterior plate-like, recurved spine and a posterior, shorter, triangular tooth, usually somewhat removed foreward from the posterior corner of the declivous face. Anterior border of petiole evenly rounded, including the spines, which are truncate at apex. Postpetiolar spines curving foreward at base, recurved at apex, truncate. Gaster slightly elongate, cordiform.

Soldier [Figs. 142, 144]. — Length 7.2 mm. Black; the tibiae and tarsi fuscous-ferruginous. Head subquadrate. Anterior corners rounded, posterior corners obliquely truncate and crested. Frontal carinae crenulate, slightly upturned in front of, somewhat emarginate above, the eyes. Upper surface of head scarcely convex, very finely punctate, coarsely foveolate, subfulgid. Vertex with a median transverse bidentate crest, and a lateral oblique carina between each denticule and the sides of the head. Occiput truncate. Lower border of occiput scarcely emarginate mesally. Thorax subfulgid, finely reticulate. Shoulders vestigial. Pronotum greatly expanded at the sides, with a strong transverse crest above, notched, but scarcely interrupted mesally. Mesonotum finely, but sharply reticulate-punctate, with a blunt lateral lobe. Mesoepinotal suture impressed, slightly arcuate caudad. Basal face of epinotum with a conspicuous postero-lateral lobe, which bears an upturned tubercular tooth above on the posterior corner. Upper surface and sides of thorax rather densely foveolate. Upper half of declivous face scaled and foveolate. Petiole [Fig.

144] and postpetiole as in worker, slightly stouter. All foveolae contain a golden, scale-like hair.

Female. — Santschi (1921) described a female of a variety named *boliviensis,* which I consider a mere synonym of the typical *cordatus.* According to this diagnosis, individuals of this caste are 8 mm. long, black, with the extreme apices of the tibiae and the terminal tarsal segments more or less reddish-brown. The integument is opaque and presents the same sculpture as the worker. Head somewhat similar to *pusillus* (!) but distinctly quadrangular, with the frontal carinae more expanded. Occipital corners subdentate. Mesonotum more triangular, narrowed in front. Epinotum and peduncular segments much wider than in *pusillus.* Sides of the basal face of the epinotum bidentate and marginate. Declivous face similarly marginate laterad, distinctly set off from the basal face, excavated from the top to the base. Petiole about twice as broad as long, its sides more expanded than in *pusillus* with a tooth directed backward, and slightly laterad. Postpetiole about three times as wide as long, similar to that of worker. Gaster very long, with parallel sides, slightly emarginate antero-mesad.

Unfortunately Santschi has not differentiated this species from a more closely related from than the very remote *pusillus.* The most striking detail of the preceding description is the fact that no mention is made of a transverse crest on the vertex and on the pronotum nor of the outline of the peduncular segments, which are the most essential characters in differentiating the females of the group. The preceding description will not be sufficient to discriminate the female of *cordatus* from all the other females of the group.

Male unknown.

Distribution. — The range of *cordatus* appears to coincide with the basin of the Amazon River and its tributaries. Emery, quoting Mayr, asserts that it occurs in French Guiana.

Specimens examined: 7; 5 workers and 2 soldiers, as follows: Brazil: State of Amazonas, R. Iça (Putumaio), Porto América; Aug. 30, Sept. 2, 1920 (J. C. Bradley): 1 worker [CU]. Guaporé Territory, Madeira-Mamoré RR. Camp 41 (Mann & Baker): 3 workers, 1 soldier [MCZ]. — *Peru*: Chanchamayo; Sept. 1928 (G. N. Wolcott): 1 soldier [USNM]. — *Bolivia*: Cavinas, Beni (Wm. M. Mann): 1 worker [CWMM].

As mentioned above, Santschi's variety *boliviensis,* which differs only by somewhat longer peduncular spines cannot be regarded as a

race of *cordatus*, and is consequently relegated to synonymy. The differences mentioned by Santschi are not significant, in my opinion.

The present species seems to have been confused quite frequently with *multispinus* Emery, at least several specimens of the latter species, which I have examined, had the identification label saying: *cordatus*. Fortunately enough this error has apparently not been brought into the literature.

18. *Paracryptocerus* (*P.*) *cristatus* (Emery)

(Fig. 149)

Cryptocerus cristatus Emery, 1890, Bull. Soc. Ent. Ital. vol. 22, p. 72-73. Pl. 9, fig. 2a-d [worker, soldier, female; Costa Rica: Alajuela, Jimenez]. — Forel, 1899, Biol. Centr.-Amer. Hym. vol. 3, p. 49. — Wheeler, 1907, Bull. Am. Mus. Nat. Hist. vol. 23, p. 272 [British Honduras]. — Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 200 [worker, soldier; Costa Rica: San José, La Caja]. — Wheeler, 1925, Ark. Zool. vol. 17A (8), p. 36 [worker; Colombia: Antioquia]. *Cryptocerus* (*Cryptocerus*) *cristatus* Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 308. ?*Cryptocerus* (*Cryptocerus*) *cristatus* var. *ruficeps* Santschi, An. Soc. Cient. Argent. vol. 102, p. 301 [soldier; Brazil].

This interesting Central American species has as its nearest relatives the South American forms *depressus* and *eduarduli*. The worker is readily differentiated from *depressus* by the shape of the petiole, the longer pronotal lamella on each side, and the longer, more slender, posterior epinotal spine, whereas the vestigial pair of denticules on the vertex and the distinctly crested antero-lateral border of the first gastric tergite distinguish it from *eduarduli*. The soldier and the female are at once recognized by the conspicuously crenulated transverse pronotal crest.

Types. — Worker, soldier, female; Costa Rica: Alajuela, Jimenez (Alfaro) [Coll. Emery].

Worker [Fig. 149]. — Length about 5 mm. Black; the following ferruginous: frontal carinae and usually the crest on the antero-lateral border of the first gastric tergite. Head slightly broader than long, the sides little diverging caudad. Frontal carinae very indistinctly crenulate, the minute projecting setulae limited to less than the anterior third. Vertex with a pair of more or less vestigial minute denticules. Occipital lobes bidentate. Thorax moderately and more or less continuously longitudinally convex. Pronotal lamellae narrower than postpetiole, longer than wide, rectangular. Behind the lamellae another short, triangular, plate-like lateral tooth, in front of the mesonotum, subequal to the lateral tooth of the mesonotum. Second epinotal spine slender, much longer than in depressus. Petiole with a long, recurved lateral spine, arising from the anterior corner; the anterior border, including the spines, not continuously arcuate. Lateral spines of postpetiole curved foreward at base, recurved and denticulate

behind at apex. Gaster narrowly crested antero-laterad, longer than wide, its length subequal to the interocular width.

Soldier. — Similar to *cordatus*. Length 6.5-7.5 mm. Black. Upper surface of head and thorax subfulgid. Head subquadrate from above. Frontal carinae only slightly crenulate. Vertex with a bidentate transverse crest, and an oblique lateral carina between the sides of the head and each denticule. Transverse pronotal crest convex in front view, distinctly crenulate. Posterior corner of basal face of epinotum with a bidentate projection. Petiole similar to that of *pavonii*, anterior border not evenly rounded. Postpetiolar spines not recurved at apex.

Female. — Length 10 mm. Black. Head as in soldier, frontal carinae slightly less expanded, more distinctly crenulate. Vertex with a median bidentate transverse crest, the lateral carina more or less vestigial. Sides of pronotum with an acute scapular spine, pointing obliquely foreward. Dorsum of pronotum with a serrated transverse crest, the median portion touching the posterior margin of the pronotum. Basal face of epinotum with a small lateral and a somewhat longer posterior tooth. Lower mesopleura with a strong tooth. Petiole less than twice as long as broad, the sides forming an obtuse stout tooth or angle, when seen from above. Postpetiole with a short conical, stout spine on each side, curving forward and recurved apically. Gaster elongate, slightly emarginate antero-mesad, distinctly marginate, not crested antero-laterad. Wings infumated, veins dark brunneous. Fore wing with a transverse cubital vein. Marginal cell closed and appendiculate.

Male unknown.

Distribution. — *P. cristatus* is essentially a Central American form in its dispersal, ranging from Mexico south to Northern Colombia.

Specimens examined: 52; 35 workers and 17 females, as follows: *Mexico*: locality unknown; Feb. 10, 1945; in bamboo (captured at El Paso, Texas by U. S. Plant Quarantine Inspectors): 7 workers, 3 females [USNM]. Huachinango Pueblo; Feb. 7, 1945; on bamboo pales, Taurez RR. yards (U. S. Plant Quar. Insp.): 3 workers, 4 females [USNM]. Sta. Lucrecia, Teh.: April, 1923 (Wm. M. Mann): 2 workers [USNM]. — *Guatemala*: Trece Aguas, Alta V. Paz; April 13; in cacao (Barbor & Schwarz): 3 workers [USNM, CU]. — *Honduras*: Carmelina (Wm. M. Mann): 6 workers [CWMM]. — *Costa Rica*: locality unknown; 2 workers ("Emery det." = Syntypes?) [MHNG]. Belize: 1

worker [CU]. Hamburg Farm; S. Clara Province (F. Nevermann): 4 workers, 1 female [CTB, USNM]. Parismina, S. Clara Province; July 28, 1925 (F. Nevermann): 3 workers [USNM]. S. José; 1940 (H. Schmidt): 3 workers, 9 females [CTB]. — *Colombia*: La Esperanza, July 20, 1936 (René P. Roba): 1 worker [MCZ].

The full-grown soldier appears to be very rare, since I have not seen any specimen of that caste, although a few workers examined were slightly intermediate, exhibiting some of the characters of the soldiers, the description of which has been drawn up from Emery's description and figure.

Santschi's *cristatus* var. *ruficeps* is doubtfully placed under this species. It was based upon a callow soldier from Brazil, the exact locality being unknown. It may be identical with any member of the group, since the soldiers are very much alike, and their differences very little known. The association with *cristatus* may eventually prove to be a very poor device since, according to our present knowledge, this species does not occur in Brazil. In order to settle the problem it would be necessary to know the exact features of the transverse pronotal crest, and the outlines of the epinotum and the peduncular segments. Santschi's very poor description does not enable us to reach a decision.

19. *Paracryptocerus* (*P.*) *depressus* (Klug)

(Figs. 141, 148)

Cryptocerus depressus Klug, 1824, Ent. Monogr. pp. 204-206 [worker; Brazil: Rio de Janeiro]. — Emery, 1894, Bull. Mus. Zool. Torino, vol. 9 (186), p. 4 [Paraguay: S. Pedro]. — Emery, 1905, Bull. Soc. Ent. Ital. vol. 37, p. 170; fig. 30 [soldier; Brazil: Mato Grosso, Coxipó; Paraguay: Villa Rica]. — Forel, 1906, Ann. Soc. Ent. Belg. vol. 50, p. 235 [female, male; Paraguay:- San Bernardino]. — Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, pp. 199-200 [worker, soldier, female, male; Brazil: State of S. Paulo, Sorocaba; Rio de Janeiro, Mt. Corcovado; Paraguay: San Bernardino]. — Santschi, 1916, Physis, vol. 2, p. 283 [Paraguay].

Cryptocerus (*Cryptocerus*) *depressus* Mann, 1916, Bull. Mus. Comp. Zool. Harvard, vol. 60, p. 450 [Brazil: State of Amazonas, Manaus]. — Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 309.

Cryptocerus depressus var. *sorocabensis* Forel, 1912, Mem. Soc. Ent. Belg. vol. 19, p. 200 [soldier; Brazil: State of S. Paulo, Sorocaba].

This is one of the more common and widespread species of the *pavonii*-group. The worker, soldier and female are at once recognized by the distinctive shape of the petiole.

Type. — Worker; Brazil: Federal District, Rio de Janeiro (Dr. de Olfers & Sello). [Coll. Klug (Museum of Berlin?)].

Worker [Fig. 148]. — Length 4.5-6 mm. Black; the following ferruginous to testaceous: frontal carinae, occipital lobes, tips of lateral spines on thorax and peduncle, and antero-lateral border of gaster. Reddish-brown to fuscous-brown: mandibles, antennae, tibiae, and tarsi.

Head subquadrate, slightly broader than long. Frontal carinae distinctly crenulate and beset with small projecting setulae on the anterior half; very little diverging caudad. Occipital lobes

bidenticulate, the inner tooth subacute, the outer tooth blunt. Pronotal lamellae short, not longer than broad, the second tooth of the pronotum, behind the lamella small, smaller than the lateral mesonotal tooth. First lateral epinotal spine not recurved, the second spine very short, in the form of a triangular tooth, removed from the posterior corner of the declivous face. Petiole with a lateral slender spine, arising from the side, its base removed backward from the often subangulate anterior corner of the segment. Postpetiole with an anterior lateral stout spine, recurved at apex. Gaster subcordiform, longer than wide, longer than the interocular width. The antero-lateral border of the first tergite distinctly but narrowly crested.

Soldier [Fig. 141]. — 7 mm. Black; the following lighter, more or less ferruginous: anterior portion of frontal carinae, tips of femora, tibiae and tarsi, tips of lateral pronotal and epinotal lobes, peduncular spines.

Head subquadrate, the upper surface of head rather convex. Frontal carinae sharply crenulated, with small setulae projecting from the notches. Vertex with a vestigial transverse median carinule, the small teeth more or less vestigial; occiput subtruncate. Upper surface of head finely punctate and subfulgid. Shoulders distinct, pronotum greatly expanded laterad, the posterior portion, of the sides strongly converging and somewhat emarginate. Transverse pronotal crest vestigial mesad. Mesonotum with a rounded lateral lobe. Basal face of epinotum very short mesad, with a postero-lateral bituberculate on each side, the base of which forms a faint carinule separating the declivous face from the basal face, fading out towards the middle. Petiole and postpetiole as in worker, the petiole still narrower, the lateral spines shorter. The postpetiole with stouter, more recurved lateral spines.

Female. — Length 10 mm. In general similar to that of *cristatus*. Frontal carinae regularly and very sharply crenulate. Vertex without a distinct median bicarinate crest. Occipital angle simple, not bidenticulate. Transverse pronotal crest not serrated, with a more or less continuous edge. Scapular spine short, directed sideward, not foreward. Lower mesopleura without a conspicuously projecting tooth, usually more or less obsolete. Epinotal teeth shorter. Petiole about as long as wide, sides subparallel, constricted behind, the sides forming a small, rectangular denticule in front of the constriction. Postpetiole somewhat broader than long, much narrower than in *cristatus*. Wings

infuscated, the veins dark brunneous. Fore wing with a closed and appendiculate marginal cell, the transverse cubital vein present.

Male. — This caste has been briefly diagnosed by Forel in 1906 and 1912.

Distribution. — The present species ranges from the Amazon River to southeastern Brazil, northern Argentina, Paraguay and Bolivia.

Specimens examined: 118; 78 workers, 19 soldiers, 13 females, 8 males, as follows: *Argentina*: Misiones Province, Loreto (N. Kusnezov): 16 workers, 1 soldier, 1 female, 2 males [CML]. Posadas; Jan. 15-24, 1920: 1 worker [CU]. Formosa Province, Clorinda (N. Kusnezov): 3 workers, 1 soldier [CML]. Las Lomitas (N. Kusnezov): 1 worker [CML]. — *Bolivia*: Rosario, Rocagua Lake; Nov. 1921 (Wm. M. Mann): 17 workers, 8 soldiers, 8 females, 3 males [CWMM]. — *Brazil*: State of S. Paulo, Franca (Garbe): 9 workers, 1 soldier, 1 male [CTB]. Pindamonhangaba, Feb. 1949 (Schwarzmaier, C. SS. R.): 1 worker [CTB]. Sorocaba (Goeldi): 2 workers ("Var. sorocabensis" types) [MHNG]. State of Goiás: Campinas: 1 worker, 1 soldier [CTB]. State of Mato Grosso: Várzea Alegre; 1 worker [CTB]. State of Pernambuco: Tapera (B. Pickel, O. S. B.): 1 worker, 2 soldiers [CTB]. State of Pará; Rio Cunimã; 1928 (Sampaio): 3 workers, 2 soldiers [CTB]. Alto Cuminá, Nov. 27, 1928 (Sampaio): 2 workers [CTB]. State of Amazonas: Manáus (Mann & Baker): 22 workers, 4 soldiers, 2 females, 2 males [CWMM]. — *Paraguay*: (locality unknown): 1 worker [USNM].

This species has been temporarily confused by Mayr and Emery with what they considered to be *pavonii*. The latter form, however, as pointed out on a foregoing page, is a new distinct species, *borgmeieri*. In 1894, after having reexamined the type, then extant in the Museum of Berlin, Emery was able to reestablish the independence of the present species.

I have examined two syntype workers of the var. *sorocabensis* Forel, which was, strangely enough, proposed solely upon the soldier. Yet both Forel's description of the soldier and the two worker specimens, which I was able to see do not present any feature that would permit me to accord them subspecific rank.

20. *Paracryptocerus* (*P.*) *eduarduli* (Forel)

Cryptocerus eduarduli Forel, 1920, Bull. Soc. Bot. Genève, (2), vol. 12, pp. 204-206 [worker, soldier, female; Paraguay, near Concepción]. — Wheeler, 1942, Bull. Mus. Comp. Zool. Harvard, vol. 90, p. 207.

Types. — Worker, soldier, female; Paraguay, near Concepción; in *Agonandra brasiliensis* (R. Chodat & W. Vischer). [Muséum d'Histoire Naturelle, Genève (Coll. A. Forel)].

Paracryptocerus eduarduli is a near relative of *cristatus* and may eventually prove to be a subspecies of the latter. In the following I limit myself to point out the characters which appear to differentiate the very similar forms from one another.

The worker of *eduarduli* differs from *cristatus* solely by the absence of even a vestigial pair of teeth on the vertex, the strongly and longitudinally convex thorax, the reddish extremities of the lateral projections of the thorax and the peduncle, the reddish fore tibiae, and the lack of a crest on the antero-lateral border of the gaster. Forel mentions in his diagnosis a pair of mesonotal spines on each side. This is most certainly a misinterpretation, since the anterior tooth belongs to the pronotum, as is evident from other similar species. The mistake is easily explainable due to the lack of a distinct promesonotal suture, which prevente the exact determination of the limits of each somite. Otherwise the worker is much the same as *cristatus*, but should not be confused with it, since the ranges, at least at the present appear to be very separate.

I have not seen a soldier of either *cristatus* or *eduarduli*, but comparing the descriptions of each I cannot agree with Forel, that the major difference between both species consists in the much more pronounced dimorphism of *eduarduli* as regards the difference between soldier and worker. From this viewpoint alone, there is very little distinction, and, if any, it is *cristatus* that possesses a more discrepant soldier. However, from descriptional data alone, it appears that the soldier of *eduarduli* diverges from *cristatus* by a much broader head, with the median bidentate crest of the vertex not connected with the sides by an oblique lateral carinule, by the strong, acute external tooth of the occipital corner, the transverse pronotal crest, which is not crenulated nor serrated, the postero-lateral lamella of the basal face of epinotum, not being bifid apically, and having a visible dorsal denticule at the tip, which sends out mesad a carinule, separating the declivous face from the basal face (somewhat similar to that of the soldier of *depressus*?), the rather narrow peduncular

segments, only one and a half times as broad as long. The shape of the epinotum and the peduncular segments differentiate *eduarduli* from *cordatus* and *pavonii*.

The female seems to be distinctive by the lack of a transverse crest on the vertex, the transverse crest of the pronotum which is not serrated, the single triangular short spine on the basal face of the epinotum and the dimensions of the peduncular segments, the petiole being twice as broad as long, the postpetiole one and a half times as broad as long.

The male is unknown.

Distribution. — The species is known to occur in Paraguay, northern Argentina and Bolivia.

Specimens examined: 2 workers, as follows: *Argentina*: Formosa Province, Las Lomitas (N. Kusnezov): 1 worker [CML]. — *Bolivia*: locality unknown; 1921-1922 (Wm. M. Mann): 1 worker [CWMM].

In the type locality the species proved to be a rather constant guest in cavities of the trunk of *Agonandra brasiliensis*, nesting in medullary galleries of that plant.

21. *Paracryptocerus* (*P.*) *pavonii* (Latreille)

(Figs. 139, 145)

Cryptocerus pavonii Latreille, 1809, Gen. Crust. Insect. vol. 4, p. 132 [worker; Peru?]. — Mayr, 1863, (Excl. synonyms), Verh. Zool.-bot. Ges. Wien, vol. 13, pp. 405-406.

Cryptocerus (*Cryptocerus*) *pavonii* Emery, 1922, (in part), Gen. Insect. Hym. fasc. 174c, p. 309. — Menozzi, 1935, Redia, vol. 21, p. 197 [worker; British Guiana: Canister Falls].

The determination of the identity of the present species is hampered by considerable difficulties. Latreille's description fits nearly any species of the *pavonii*-group in the strict sense. Only the species, which traditionally has been considered to represent the typical *pavonii* seems to be definitely excluded since it is the only one that has the frontal carinae concolorous with the rest of the head, and scarcely crenulated. The fact that *pavonii* is "*... thorace... ad angulos anticos producto, subcrenato...*, seems to set it apart from *cristatus, depressus* and *eduarduli*, which are characterized by a rather, almost tooth or spine-like lateral pronotal lamella, for which Latreille would have used different terms. Finally the word *subcrenato* segregates *cordatus*, since this species has the lateral border of the pronotum continuously expanded, the rim not having even a vestige of a crenulation. Thus, by way of exclusion we have to arrive at another species, which must satisfy all the demands of the

diagnosis. This solution, which admittedly is hypothetical, seems to agree more closely with all the available facts, and should be retained until the type of *pavonii,* if still extant, can be reexamined.

The type locality is also open to question. All we know, is that it came from South America, and was sent to Latreille by Mr. Pavon, the author of "Flora Peruviana". This suggests that this ant came from Peru.

The specimens, which in my estimation, fit best the description of *pavonii* are from British Guiana and were determined as such by the late Dr. Wheeler. Following are the main diagnostic features, that distinguish the worker and the soldier:

Worker [Fig. 145]; British Guiana: Kartabo. July-August 1920 (Wm. M. Wheeler). [Museum of Comparative Zoology, Harvard]. Length 5.4 mm. Median head length 1.36 mm.; Weber's length of thorax 1.58 mm. Black; the following ferruginous and subtransparent: Frontal carinae, occipital lobes, lateral projections of thorax and peduncle. Ferruginous and opaque: first funicular segment, tibiae and tarsi, except the metatarsus. Fuscous rufous: tip of mandibles, and femora. Tip of last funicular segment orange-brown.

Head broader than long. The frontal carinae distinctly crenulate and beset with projecting setulae along the anterior half. Upper surface of head rather flat anteriorly and laterad, conspicuously convex discad and caudad. Sides of head upturned above the eyes. Occipital corners with a bidenticulate lobe.

Pronotum with a broadly expanded lateral lamella, about as long as broad, broader than the length of the postpetiole, and a broad, plate-like, more or less rounded lobe, separated from the anterior lamella by a deep notch. Anterior border of the lamella convex, lateral border crenulate, posterior border concave. Mesonotum with a conspicuous spine on each side. Sides of epinotum with a large, plate-like anterior spine, and a shorter, rather slender and acute triangular tooth, arising well in front of the posterior corner of the declivous face.

Petiole broader than postpetiole, the spines plate-like, truncate at apex; the anterior border, including the spines, evenly rounded. Postpetiole with acute, apically recurved lateral spines.

Gaster emarginate antero-mesad, crested antero-laterad. About as long as broad. Sculpture and pilosity similar to that of the other species of the group.

Soldier (from the same nest as the worker). — Length 7.7 mm. Median head length 2.00 mm.; Weber's length of thorax 2.17 mm. Black; the following fuscous ferruginous: anterior portion of frontal carinae, tibiae and metatarsi. Tarsi lighter.

Extremely similar to *cordatus*, from which it differs by the following characters: Pronotum without macrosculpture, smooth and fulgid. Mesonotum finely reticulate, smooth and fulgid. Basal face of epinotum with a broad triangular tooth on the side, the posterior border of which forms the outer border of a subequal posterior tooth; which is not upturned, nor sends out a median carinule. Declivous face finely but sharply reticulate, scales and foveolae confined to narrow band near the upper border. Anterior border of petiole [Fig. 139] not evenly curved, the slender lateral spines, pointing obliquely backward, are more or less distinctly set off from the body of the segment.

Female and male unknown.

This species, as understood here, occurs in British Guiana and in Peru. I have examined three workers and one soldier, of a single series, provenient from British Guiana: Kartabo. July-Aug. 1920 (Wm. M. Wheeler).

22. *Paracryptocerus* (*P.*) *multispinosus* (Norton)

(Figs. 143, 150)

Cryptocerus multispinosus Norton, 1868, Amer. Nat. vol. 2, p. 72; Pl. 1, fig. 11 [soldier; Mexico: Cordova]. — Norton, (1868) 1871, Proc. Essex. Inst. vol. 6, Comm. p. 6; fig. 6 [soldier]; [soldier, worker]. — Forel, 1899, Biol. Centr.-Amer. Hym. vol. 3, p. 50 [Mexico: Orizaba, Cordova]. — Skwarra, 1934, Oekol. Stud. Koenigsberg, p. 129 [Mexico: Nayarit, El Llanos; Mirador].
Cryptocerus gibbosus F. Smith, 1876, Trans. Ent. Soc. London, p. 605. Pl. 2, fig. 3 (not 2!) [soldier; Mexico]. — Emery, 1890, Bull. Soc. Ent. Ital. vol. 22, p. 73, Pl. 11, fig. 3 [soldier; Mexico].
Cryptocerus (*Cryptocerus*) *multispinosus* Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 309.

This and the following form are quite distinct from all the preceding species of the *pavonii*-group. The workers and soldiers lack the crenulations and the projecting setae on the frontal carinae, and the obliquely truncate lobe on the occipital corner. The angles of the shoulders are obsolete, incorporated in the lateral expansion of the pronotum, the sides of the epinotum are not spinose but crested and the anterior corners of the gaster possess a conspicuous yellow spot. The much coarser sculpture on head and thorax distinguishes the typical *multispinosus* from the race *biguttatus*.

Type. — Soldier; Mexico: Cordova. [Coll. Norton?]

Worker [Fig. 150]; Mexico: Nayarit Province, Compostela. April 22, 1933 (Wm. M. Wheeler). [Museum of

Comparative Zoology, Harvard]. — Length 6 mm. Median head length 1.41 mm.; Weber's length of thorax 1.63. Black; the following ferruginous: Frontal carinae, tip of last funicular segment, tips of femora and tibiae. Pale yellowish: crests of thorax and peduncular spines. Yellow: a single spot on each anterior corner of the gaster.

Head subquadrate, subopaque. The anterior corners greatly rounded, the posterior corners subangulate, the sides parallel. Occipital border shallowly emarginate mesad, almost straight, with a very narrow light crest on each side. Frontal carinae not crenulate, without projecting setae from the border. Eyes very small, the maximum diameter less than 1/4 of the median head length. Vertex with a pair of small denticules. Upper surface of head densely foveolate, each foveola containing a short, broad, appressed, silvery, flat hair.

Thorax subopaque. Anterior border rounded, shoulders not separate from the lateral projections of pronotum. Sides of pronotum crested; the anterior half of the crest greatly projecting and bidenticulate, the posterior half constricted and narrow. Promesonotal suture vestigial. Mesonotum with a small lateral denticule. Mesoepinotal suture more or less distinct. Epinotum not differentiated into distinct basal and declivous faces, with a broad, large, flattened triangular tooth projecting from the anterior half of the lateral border, the posterior half carinate. Upper surface of thorax, except a small area mesally in front of the petiolar insertion, very finely shagreened, densely and coarsely foveolate, as the upper surface of head. Laterotergite of pronotum and sides of thorax finely reticulate-punctate, the laterotergite longitudinally striated, the remaining parts rugulose. Outer face of fore coxae finely longitudinally striated. Hind femora sharply angulate and denticulate above at the half.

Petiole and postpetiole flattened above, the sides with a distinctly set off spine, the petiolar spine recurved, the postpetiolar spine pointing forward at base, recurved backward at apex.

Gaster subopaque, emarginate in front mesally, narrowly crested antero-laterad. All scales golden.

Soldier [Fig. 143]; Mexico: Nayarit, near Compostela. May 28, 1933 (Wm. M. Wheeler). [Museum of Comparative Zoology, Harvard]. — Length 7.7 mm. Median head length 1.78 mm. Weber's length of thorax 2.07 mm. Color as in worker. Quite similar to the worker, with the following differences: Upper surface of head subfulgid, not as shiny as in the race biguttatus,

rather coarsely and densely foveolate. Each of the teeth on vertex sends out an oblique carina towards the sides, fading out shortly before reaching the lateral border of the head. Occipital angle rounded and crested. Pronotum with a bidenticulate lateral expansion, the sides converging obliquely towards the mesonotum behind the second denticule. Mesonotum with a blunt lateral lobe. Sculpture of thorax as coarse as on upper surface of head. Epinotum with a flat, triangular, large tooth, without a transparent crest behind. The basal and declivous faces slightly differentiated. Declivous face not excavated below. Spines of the peduncular segments shorter, less acute than in worker.

Female and male unknown.

Distribution. — The typical *multispinosus* is apparently confined to the northern half of Mexico.

Specimens examined: I have seen only the single worker and soldier described above. All the other specimens, even those from Mexico had to be referred to the race *biguttatus*.

Ethology. — According to Norton (1868), "this is the most common species of *Cryptocerus* in the environs of Cordova, where it lives in the trunk of certain trees, especially those of *Croton sanguiferum, Cedrela odorata, Spondias chilias.* These ants show little vivacity, remaining stationary a good part of the day at the entrance of the holes which conduct to their nest. In the middle of the day one sees them running about fallen trunks, without apparent order or aim. When one attempts to seize them, they elevate the abdomen while running, after the manner ascribed to another kind of ant, the *Crematogaster montezumia*".

23. *Paracryptocerus* (*P.*) *multispinosus biguttatus* (Emery)

(Figs. 138, 152)

Cryptocerus gibbosus biguttatus Emery, 1890, Bull. Soc. Ent. Ital. vol. 22, pp. 73-74; Pl. 9, fig. 3a-c [worker, soldier, female: Costa Rica: Jiménez].
Cryptocerus multispinosus biguttatus Forel, 1899, Biol. Centr.-Amer. Hym. vol. 3, pp. 50-51 [Mexico: Yucatan, Temax; Guatemala: Vera Paz, Cubilguitz, Chacoj, Rio Maria Linda; Costa Rica: Jiménez].
Cryptocerus (*Cryptocerus*) *multispinosus biguttatus* Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 309. — Borgmeier, 1937, Arch. Inst. Biol. Veget. vol. 3 (2), p. 244 [Costa Rica: San José].
Cryptocerus gibbosus Mann, 1922, (*nec* F. Smith), Proc. U. S. Nat. Museum, vol. 61, p. 33 [Honduras: La Ceiba, San Juan Pueblo].

Types. — Worker, soldier, female; Costa Rica: Jiménez [Coll. Emery].

The worker [Fig. 152] differs from the typical form by the more sparsely foveolate upper surface of head, and thorax. The sides of head are somewhat converging anteriorly,

not quite parallel. Mesoepinotal suture distinct. Epinotum bordered in its entire length by a continuous, converging caudad, semi-transparent crest, the lower portion of the declivous face slightly impressed mesad. Laterotergite of pronotum finely reticulate-punctate, without longitudinal striae. Scales within the foveolae on head thorax and gaster more slender, longer, and silvery. Some worker specimens from Costa Rica, have the lateral crest of the epinotum slightly produced anteriorly in the form of a triangular tooth, similar to that in the typical form, and this character alone is not sufficient to discriminate the two forms. The specimens mentioned by Emery, to occur in Costa Rica, having this condition, seem to belong to the present subspecies.

The soldier [Fig. 138] may be recognized by the finer sculpture on head and thorax, the foveolae are as sparse as in the worker. The teeth on the vertex have no lateral crest between the sides of the head. The occipital angles are slightly upturned in very large soldiers. Sides of mesonotum without a conspicuous, projecting, rounded lobe. Epinotum as in the worker.

Female. — Length 11 mm. General color as in soldier and worker. Head longer, about as long as wide, the sides somewhat converging anteriorly. Vertex with two blunt teeth, connected by a blunt transverse crest. Occipital corners crested, subrectangular. Occiput truncate mesad and slightly excavated. Upper surface of head rather smooth, sparsely covered with small foveolae, containing a simple appressed hair. Anterior corner of thorax rectangular, slightly notched behind the corner. Pronotum and mesonotum subfulgid, sparsely foveolate. Epinotum sharply marginate laterad, the basal face subopaque and densely foveolate, the declivous face subopaque, somewhat excavated, not foveolate. Upper mesopleura bulging, densely foveolate, the intervals rather fulgid. Lower mesopleura with a blunt tooth. Posterior portion of the sides of the thorax finely shagreened and subopaque. Femora not angulate above. Sides of petiole slightly diverging caudad until the last third, where it is suddenly constricted, forming a small tooth. Postpetiole with a short, slightly recurved, stout lateral tooth. Both peduncular segments densely but rather shallowly foveolate above. Gaster not crested antero-laterad, emarginate antero-mesad, with a large yellow spot on each anterior corner. Integument finely shagreened. Appressed hair minute. Wings infumated, veins brunneous. Fore wing with a closed appendiculate marginal cell, the transverse cubital vein short to obsolete, the transverse median vein bisects

the median vein into to two subequal halves, the 2nd abscissa more than three times as long as the transverse median vein.

Male undescribed.

Distribution. — This is a Central American form, ranging from Costa Rica to southern Mexico. Specimens from San José, Costa Rica, were found in a branch of *Ficus,* sp. (Borgmeier, 1937).

Specimens examined: 62; 39 workers, 19 soldiers, 3 females, 1 male, as follows: *Mexico*: Mendoza; June 16, 1906 (O. F. Cook): 2 workers [USNM]. Yucatan Province, Temax: 1 worker [CWMM]. — *Honduras*: San Juan Pueblo (Wm. M. Mann): 4 workers [CWMM]. — *Costa Rica*: Guapiles (F. Nevermann): 6 soldiers, 1 female [CTB]. Escobal S. W. of Atenas, Prov. of Alajuela, elev. 411 mm.; Sept. 15, 1936 (A. Alfaro) 2 workers [ANSP]. Hamburg Farm, S. Clara Province, Aug. 1925 (F. Nevermann): 16 workers, 12 soldiers, 2 females, 1 male [CAR, USNM]. Port Limón; Sept. 29, 1908 (Fred. Knab): 1 worker [MCZ]. Tempisque, June 22, 1937 (A. Alfaro): 13 workers, 2 soldiers [ANSP].

D. Isolated species

24. *Paracryptocerus (P.) manni, n. sp.*

(Figs. 127, 128)

Although superficially resembling *simillimus* the present species does not fit into any of the preceding groups. The frontal carinae, upturned above the eyes, and beset with projecting setulae, the more or less obsolete shoulders, the tridentate sides of the epinotum, the angulate femora, and the strong petiolar spines separate the worker of *manni* from the *minutus*-group. The ferruginous frontal carinae with the projecting setulae, the obliquely subtruncate occipital corners, the denticulate sides of the pronotum, and the narrow, prismatic metatarsi, not broadened nor flattened basad, distinguish it from the *complanatus*-complex. The presence of a distinct anterior truncate face of the petiole, above the insertion, the differentiated basal and declivous faces of the epinotum, and the lack of projecting lateral pronotal lamellae remove it from the *pavonii*-group.

Type. — Worker; Brazil: State of Pará, Cachoeira Breu, Oct. 1928 (Sampaio). [Coll. T. Borgmeier, Rio de Janeiro].

Worker (holotype) [Fig. 128]. — Length 4.0 mm. Median head length 1.05 mm.; Weber's length of thorax 1.22 mm. Black; the following ferruginous: tip of mandibles, frontal

carinae, tip of scape, first funicular segment, apex of last funicular segment, tip of femora, tibiae, fore tarsi, 2-4 middle and hind tarsi, antero-lateral crest of gaster. Tip of thoracic and peduncular spines rufous-brown.

Head subopaque. Mandibles finely reticulate-punctate and rugulose. Frontal carinae without crenulate border, beset with projecting setulae on the anterior half, the setulae arising from above. Posterior portion of frontal carinae slightly diverging caudad, and strongly sinuate, emarginate in front of, convex and upturned above, the eyes, a few erect setae above the eyes. Eyes prominent, their maximum diameter longer than 1/3 of median head length. Occipital corners obliquely subtruncate, the occipital border evenly concave. Cheeks strongly marginate beneath, very densely scaled. Upper surface of head scarcely convex, very finely and densely reticulate-punctate, sparsely covered with simple, appressed, flattened, appressed, silvery hairs, which become canaliculate and situated in more or less excavated grooves in front of the occipital border.

Thorax subopaque. Pronotum with a tridenticulate crest on each side. Mesonotum with an acute lateral tooth. Promesonotal and mesoepinotal sutures obsolete. Basal face of epinotum with a pair of small teeth near the anterior corner and a third tooth on the posterior corner, the posterior border of which is prolonged behind in a crest, delimiting the declivous face laterad and behind, as in *simillimus*. Upper surface of thorax finely reticulate-punctate, with scattered longitudinal grooves, each containing a decumbent, silvery canaliculate scale. Laterotergite of pronotum longitudinally striated. Sides of thorax finely reticulate with sparse, simple, appressed setae. Femora incrassated, somewhat compressed, angulate above at the half. Metatarsi slender, not conspicuously flattened and broadened at base.

Petiole subopaque, the anterior face truncate, with a strong lateral somewhat recurved spine. Postpetiole as long as petiole, with a slightly shorter, lateral spine, curved forward at base, slightly recurved at apex. Sculpture of both peduncular segments as on upper surface of thorax.

Gaster subopaque, oval. Greatly emarginate mesad in front, distinctly crested antero-laterad, the crest extending backward over more than half of the sides of the first gastric tergite, fading out shortly in front of the apical third. Upper surface of gaster finely reticulate-punctate, rather densely covered with mostly simple, silvery appressed scales, lying in shallow grooves.

Erect pile confined to tergites 2-4 and the apical border of sternite I and the following sternites.

Soldier [Fig. 127]. — A single specimen, on the same pin with a worker of the present species, and another worker of *simillimus* is presumably the soldier of *manni,* although it is very peculiar in lacking a distinctly truncate occiput and by having the upper surface of pronotum and mesonotum almost flat, without a transverse pronotal crest.

British Guiana: Kartabo. July-Aug. 1920 (Wm. M. Wheeler). [Museum of Comparative Zoology, Harvard]. — Length 6 mm. Median head length 1.41 mm. Weber's length of thorax 1.66 mm. Black; the following ferruginous: tip of mandibles, outer portion of frontal carinae, tip of femora, tibiae and tarsi. The first funicular segment and the tip of the last segment lighter.

Head subfulgid; subquadrate, anterior corners greatly rounded, posterior corners subrectangular. Mandibles angular, reticulate rugose. Frontal carinae extending to the occipital corner, upturned, crenulate, with a rim of projecting clubbed setulae. Upper surface of head slightly convex discad. Occipital border straight, crested, with a median depression. Occiput not truncate beneath the crest, confluent with the lower surface of the head. Eyes elongate, ovoid. A distinct carina extending from beneath the eye to the occipital corner. Upper surface of head finely reticulate, coarsely and rather densely foveolate with a simple, decumbent, glittering hair in each foveola. Lower surface of head with the microsculpture partly obsolete, more fulgid, reticulate-foveolate.

Thorax subfulgid above. Pronotum greatly expanded; anterior border arcuate, shoulders obsolete, not set off, the sides greatly expanded, anterior corners acutely angulate, sides straight, converging towards the mesonotum, the posterior corners rounded, and slightly depressed. Pronotum without a transverse crest, flat, continuous with the mesonotum, in the same plane. Promesonotal suture vestigial. Sides of mesonotum with an obliquely truncate, lateral lobe, the posterior corner of which is slightly upturned. Mesoepinotal suture impressed laterad, obsolete discad. Basal face of epinotum with a basal rectangular tooth, and, following, a larger similar plate-like tooth, and a broad, more or less rounded lobe on the posterior corner, the posterior, (internal), border of which is continuous with the emarginate posterior border of the basal face. Upper surface of thorax sculptured as on head, foveolae more crowded. Laterotergite vestigially longitudinally

striated. Sides and declivous face subopaque, finely reticulate-punctate. Femora incrassated, somewhat compressed, indistinctly angulate above at the half.

Petiole and postpetiole as in worker, the spines shorter and stouter, and somewhat blunt at apex.

Gaster subopaque, elongate, broadest behind the half. First gastric tergite conspicuously emarginate anteriorly mesad, submarginate, not crested, antero-laterad. Upper surface finely reticulate-punctate, with scattered, minute silvery, simple appressed hairs. Erect pilosity as in worker.

Female and male unknown.

Distribution. — The range of this peculiar form seems to extend from the Amazon River north to British Guiana.

Specimens examined: 5; 4 workers and 1 soldier, as follows: *Brazil*: State of Pará, Cachoeira Breu; Oct. 1928 (Sampaio): 2 workers (holotype and paratype [CTB]. — *British Guiana*: Kartabo; July-Aug. 1920 (Wm. M. Wheeler): 2 workers, 1 soldier [MCZ].

I take very great pleasure in naming this interesting species after Dr. W. M. Mann, Director of the U. S. Zoological Park in Washington, D. C.

25. *Paracryptocerus* (*P.*) *duckei* (Forel)

Cryptocerus duckei Forel, 1906, Ann. Soc. Ent. Belg. vol. 50, p. 233; fig. [worker (?); Brazil: State of Amazonas, Barcelos, Rio Negro].
Cryptocerus (*Paracryptocerus*) *duckei* Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 307.

Type. — Worker (?); Brazil: State of Amazonas, Barcelos, Rio Negro (Dr. Ducke). [Museum d'Histoire Naturelle, Genève (Coll. A. Forel)].

I have not seen the type of this curious species, which, most probably, represents a soldier or an aborted soldier. Forel's diagnosis, although sufficient for the purpose of identification, does not contain the necessary information to permit the exact placement of this form. The very small size of this soldier, with a bidenticulate transverse crest on the occiput and a transverse crest on the pronotum, the peculiar shape of the thoracic projections, the excavated and perpendicular declivous face of the epinotum, the broad anterio-lateral crest of the gaster, seem to constitute the most striking features of this species, which is one of the few species, Forel cared for to represent it by a figure.

No other specimens have come to my attention that resemble *duckei*.

E. Species inquirendae of the subgenus Paracryptocerus.

Following is a list of species established by F. Smith, which seem to belong to this subgenus. Their identity, however, has not been fully established as yet.

a) *Species based on workers:*

26. *Paracryptocerus (P.) conspersus* (F. Smith)

Cryptocerus conspersus F. Smith, 1867, Trans. Ent. Soc. London, (3), vol. 5, p. 523, Pl. 26, fig. 1 [worker; Brazil: Amazon River].

Coll. W. Wilson Saunders.

27. *Paracryptocerus (P.) exiguus* (F. Smith)

Cryptocerus exiguus F. Smith, Trans. Ent. Soc. London, (3), vol. 5, p. 524. Pl. 26, fig. 4 [worker; Mexico].

Coll. W. Wilson Saunders.

b) *Species based upon females:*

28. *Paracryptocerus (P.) argentatus* (F. Smith)

Cryptocerus argentatus F. Smith, 1854, Trans. Ent. Soc. London, (2), vol. 2, p. 218. Pl. 19, fig. 7 [female; Columbia].

Coll. F. Smith. — This species is probably the female of either *femoralis* or *multispinus*.

30. *Paracryptocerus (P.) basalis* (F. Smith)

Cryptocerus basalis F. Smith, 1876, Trans. Ent. Soc. London, p. 608 [worker; Nicaragua: Chontales].

Coll. British Museum (Natural History). Possibly the female of *multispinosus biguttatus*.

31. *Paracryptocerus (P.) d'orbignyianus* (F. Smith)

Cryptocerus d'orbignyianus F. Smith, 1854, Trans. Ent. Soc. London, (2), vol. 2, p. 218; Pl. 19, fig. 5 [female; South America].

Coll. Westwood.

31. *Paracryptocerus (P.) fenestralis* (F. Smith)

Cryptocerus fenestralis F. Smith, 1876, Trans. Ent. Soc. London, p. 607 [female; Brazil: S. Paulo].

Coll. British Museum (Natural History).

Appendix: Subgenus HARNEDIA M. R. Smith

Species properly excluded from the pavonii-group and the subgenus Paracryptocerus

In his treatment of the tribe Cephalotini in fascicle 174c of the Genera Insectorum (1922), Emery included *Cryptocerus emeryi* Forel, known only in the worker caste, in the newly established *pavonii*-group, then a component of the subgenus *Cryptocerus* s. str. (=*Harnedia*). Even though *emeryi* does bear a superficial resemblance to forms such as *depressus, cristatus* and *eduarduli,* especially on account of the lateral pronotal lamellae, it disagrees with these species in several important features: The femora are not angulate above in the middle; the sides of the epinotum bear only a single tooth and no crest; the differentiation between the basal and declivous face of the epinotum is more conspicuous; and the petiole possesses a distinct, obliquely truncate, anterior face, above the insertion.

A new species from Colombia, represented by all four castes, described as *patei,* n. sp. on a following page, is a very close relative of *emeryi,* and furnishes the necessary clue for the correct placement of both these forms. In *patei* both soldiers and females have the head surmounted by a completely marginate, circular disc, as it is characteristic for members of the subgenus *Harnedia,* and it is very probable that *emeryi* has similar soldiers and females. Consequently both these forms must be retained in the subgenus *Harnedia,* whereas all other members of the *pavonii*-group have been ranked under *Paracryptocerus* s. str. for reasons already discussed on a foregoing page. Within the *Harnedia*-complex both *emeryi* and *patei* agree most closely with the *angustus*-group, with which I propose to associate them. Both species, however, may at once be distinguished from all other forms of this particular assembly by the lateral pronotal lamellae in the worker, and the circular, flat disc on the head of the soldier and the female.

1. *Paracryptocerus* (*Harnedia*) *emeryi* (Forel)

(Figs. 156, 157)

Cryptocerus emeryi Forel, 1912, Mém. Soc. Ent. Belg. vol. 19, pp. 203-204 [worker; Curaçao Island].
Cryptocerus (*Cryptocerus*) *emeryi* Emery, 1922, Gen. Insect. Hym. fasc. 174c, p. 310.

The slightly more elongate head and the shape of the peduncular segments, the gaster and the scale-like, decumbent pile, distinguish *emeryi* from *patei,* its nearest relative.

Type. — Worker; Island of Curaçao. [Muséum d'Histoire Naturelle, Genève (Coll. A. Forel)].

Worker (lectotype) [Fig. 157]. — Length 5.3 mm. Median head length 1.24 mm.; Weber's length of thorax 1.51 mm. Black; tip of last funicular segment and apical tarsal segments dark ferruginous. Tips of mandibles rufous-brown.

Head subopaque, subquadrate; its maximum length slightly longer than the interocular width (61:58). Mandibles rugulose. Frontal carinae not transparent nor membranous, their lateral border vestigially crenulate in front, slightly diverging behind, sinuate, scarcely upturned above the eyes. Occipital corners obliquely truncate, not serrated nor notched. Eyes small, greatly convex, their greatest diameter less than 1/4 of the median head length. Upper surface of head somewhat convex discad, flatter towards the sides, finely reticulate-punctate, sparsely covered with squamiferous foveolae, which are slightly denser and encircled by a raised network of rugae towards the sides and the occiput. Vertex with a more or less vestigial pair of small denticules.

Thorax subopaque. Anterior border moderately arcuate. Shoulders angulate. Sides of pronotum with a flat, narrow, rectangular projecting lamella, the posterior border of which is emarginate and converges obliquely toward the posterior, rectangular corner of the pronotum. Promesonotal suture vestigial. Mesonotum with a faint denticule on each side. Mesoepinotal suture deeply impressed laterad, obsolescent mesad. Anterior corner of basal face of epinotum sharply rectangular, the sides with a strongly projecting triangular tooth. Declivous face more or less differentiated from the basal face. Dorsum of thorax finely reticulate-punctate, coarsely areolate-rugose, each areole containing a squamiferous foveola. Basal face of epinotum longitudinally striato-rugose. Declivous face without distinct macrosculpture and pilosity. Sides of thorax rather coarsely and more or less longitudinally rugose. Femora not angulate above at the half. Hind metatarsus little compressed and broadened.

Peduncular segments [Fig. 156] subopaque, dorso-lateral sculpture as on dorsum of thorax. Petiole narrower than the postpetiole, its anterior face obliquely truncate, finely reticulate-punctate, without macrosculpture nor pilosity. Anterior corners rounded, the sides with a small tooth, constricted and converging behind the tooth. Postpetiole with a stout, thick, lateral, triangular tooth, arising from the anterior corner, pointing obliquely

backwards and sidewards. Dorsal face with a pair of vestigial longitudinal ridges.

Gaster short, eliptical, subopaque, slightly emarginate in front mesad, not extremely convex above, the length: depth proportion being more than 1.5 (69:43). The antero-lateral border sharply marginate, not crested. First gastric tergite finely reticulate-punctate, longitudinally rugulose. Sculpture evanescent discally, where the integument is almost smooth and subfulgid.

Sides of head, including the truncate occipital corners, sparsely beset with short, thick, whitish, projecting setulae. Upper surface of head, thorax, peduncle, and gaster with long, flat, decumbent, light, aureate, scale-like hairs, which are longitudinally canaliculate. Scales very dense on the basal face of the epinotum and the peripheral portions of the first gastric tergite. Scales sparser on the sides of the thorax. Small and sparse on the appendages.

Soldier, female and male unknown.

This distinctive species is known only from the type specimens. The single lectotype examined disagrees with the original description, where it is stated that the angle of the shoulder is absent, i. e. the shoulders are completely rounded.

2. *Paracryptocerus* (*Harnedia*) *patei*, n. sp.

(Figs. 151, 153, 154, 155)

The worker of this new Colombian species disagrees with *emeryi* by the broader, evenly flattened head, the longitudinal striae on the laterotergite of the pronotum and the declivous face of the epinotum, the shape of the peduncle, gaster and the scales. The soldier and the female are distinctive among all other forms of the *angustus*-complex by the flat, circular cephalic disc and the peculiar type of pilosity. The transverse incision on the clypeus, the plate-like projection of the sides of the prothorax, and the highly elevated undulating ridges on the posterior portion of the thorax, are the main diagnostic characters for the male.

Types. — Worker, soldier; Colombia (locality unknown; taken from imported orchids of the genus *Cattleya,* in Hoboken, N. J., USA). April 10, 1946 [U. S. National Museum, n. 46-8631; paratypes in the collection of T. Borgmeier, Rio de Janeiro].

Worker (holotype) [Fig. 155]. — Length 5.7 mm. Median head length 1.41 mm.; Weber's length of thorax 1.63 mm. Black;

the apex of the funicular segment and the three apical tarsal segments ferruginous. Tips of mandibles fuscous-ferruginous.

Head subopaque, subquadrate; its maximum length distinctly shorter than the interocular width (65:72). Mandibles rugulose. Frontal carinae with semitransparent, more or less infuscated maculae; the lateral border vestigially crenulate, slightly sinuate and diverging behind, scarcely upturned above the eyes. Occipital corners obliquely truncate, the edges serrated or notched. Eyes small, their greatest diameter less than one fourth of the median head length. Upper surface of head scarcely but evenly convex, finely reticulate-punctate, more sparsely covered with squamiferous foveolae, which are somewhat denser and larger towards the occiput. Vertex without a pair of small denticules. Lower surface of head rather coarsely reticulate-rugose.

Thorax subopaque. Anterior border moderately arcuate. Shoulers subrectangular. Sides of pronotum with a flat, narrow rectangular projecting lamella, the apical border of which is emarginate and bidentate, the posterior border emarginate and converging towards the rectangular, subdentate posterior corner of the pronotum. Promesonotal suture vestigial. Mesonotum with a small denticule on each side. Mesoepinotal suture distinct, slightly impressed. Anterior corner of basal face of epinotum rather obtuse, not sharply rectangular, the sides with a triangular tooth. Declivous face more or less differentiated from the basal face. Dorsum of thorax finely reticulate-punctate, rather densely covered with squamiferous foveolae, the slightly raised intervals between which form a coarse reticule. A few longitudinal rugae mesad on basal face of epinotum. Declivous face of epinotum, the laterotergite of pronotum and the greater portion of the thoracic pleura coarsely longitudinally striated. Femora not angulate above at the half. Hind metatarsi compressed and somewhat broadened basad.

Peduncular segments [Fig. 153] subopaque, the dorso-lateral sculpture as on dorsum of thorax. Petiole narrower than postpetiole, its anterior face obliquely truncate, finely reticulate-punctate, subfulgid, without macrosculpture and pilosity. Anterior corners subangulate, the sides with a small, acute tooth, constricted and converging behind the tooth. Postpetiole with a slender, acute tooth, arising from the anterior corner. Upper face flat, not bordered by longitudinal ridges.

Gaster short, suboval, subopaque. Strongly convex above. Scarcely emarginate in front mesad, the antero-lateral border

sharply marginate and crested. Length: depth proportion less than 1.5 (75:55). First gastric tergite finely reticulate-punctate, more coarsely areolate-rugose, each areole containing a shallow squamiferous groove. Sculpture not evanescent discally.

Sides of head, excluding the truncate occipital corners, sparsely beset with short, whitish, thick, projecting setulae, which are somewhat longer than those of *emeryi*. Upper surface of head, thorax, peduncle and gaster with oval, canaliculate scales, shorter than those of *emeryi* and not as aureate. Strictly silvery on the appendages and the densely scaled areas of the thoracic pleura. Apical borders of gastric tergites and sternites with common, sparse, erect pile.

Soldier (paratype) [Fig. 151]. — Length 7.3 mm. Median head length 1.97 mm.; Weber's length of thorax 2.10 mm. Black; the frontal carinae dark rufous brown; tip of last funicular segment and three apical tarsal segments ferruginous.

Head subopaque; surmounted by a circular, flat, completely marginate disc, with an antero-median emargination, exposing the strongly rugose mandibles from above. Antero-lateral border of disc crenulate, the median portion of the posterior border slightly truncate, forming a bidentate crest above the perpendicularly truncate occiput. Floor of disc very slightly raised in the middle, just behind the vestigially outlined clypeus, and again less prominently farther behind on the vertex, very shallowly excavate laterad of the anterior convexity where the margins are slightly upturned. Occipital corners blunt, rounded, carinulate. Eyes moderately convex. Lower border of cheeks carinate. Upper surface and sides of head finely reticulate-punctate, coarsely, densely and deeply foveolate. Lower surface of head fulgid, areolate-foveolate.

Thorax subopaque. Shoulder angle scarcely visible from above. Pronotum greatly expanded on each side, the anterior angle acute and subdentate, the posterior angle bluntly rounded. Transverse pronotal crest strong and greatly raised, narrowly interrupted in the middle by a cut-like longitudinal incision. Promesonotal suture distinct. Sides of mesonotum bluntly rounded, the posterior border bisinuate, followed by a deeply impressed metanotal groove. Basal face of epinotum conspicuously transversely convex, with a short broad tooth on the sides and another similar tooth on the posterior corners. Declivous face more than twice as long as the basal face, immarginate laterad. Sculpture as on upper surface of head, the squamiferous foveolae

more crowded and smaller. Sides of the thorax coarsely rugose. Legs as in worker. Peduncular segments and gaster similar to those of the worker; the postpetiole and petiole narrower.

Rim of projecting setulae extending around the dic to the posterior border of the eyes. Scales within the foveolae oval, canaliculate, as in worker.

Female [Fig. 154]; Colombia (taken in the U. S. on imported *Cattleya gigas*). April 19, 1946. [U. S. National Museum, n. 46-4656]. — Length 8.2 mm. Median head length 1.97 mm.; Weber's length of thorax 2.39 mm. Resembling the soldier in color, sculpture pilosity and general structure, with the exception of the peculiarities of the caste and the following details:

Head disc still flatter, the postero-lateral border only faintly marginate, the posterior portion behind the deeply sunken ocelli slightly curved downwards. The posterior border crested as in the soldier. Shoulders obsolete. Transverse pronotal crest distinct, not as strong nor as highly raised as in the soldier, the median interruption broader, not slit-like. The anterior tip of the lateral expansion of the pronotum forming an acute large, triangular tooth. Scutellum longitudinally convex. Basal face of epinotum very short, the lateral and posterior teeth more obtuse. Lower mesopleura with a strong tooth. First gastric tergite longer than the maximum length of the thorax (118:98). Gaster somewhat longer than in soldier. Wings hyaline, the veins brunneous, the stigma fuscous. Fore wing with a closed and appendiculate marginal cell and a transverse cubital vein. The second abscissa of the median vein not much longer than the transverse median vein.

Male: Colombia: Bogotá. (Taken from *Cattleya,* sp.). [U. S. National Museum]. (The specimen is partly damaged, lacking more than half of the funiculi, the terminal segments of the legs, etc. The genitalia were not visible, and no effort has been made to extract them, since this is the only available specimen). — Length 6.4 mm. Median head length 0.9 mm.; Weber's length of thorax 2.19 mm. Black; the tip of mandibles, antennae, legs and gaster brunneous.

Head subopaque; transverse. Distance between the eyes longer than the median head length (49:39). Mandibles finely and densely punctate, somewhat rugulose at apex. Chewing border with a strong apical and a postapical tooth, and three following minute teeth. Clypeus convex, with a transverse incision, near the posterior border. Front slightly impressed in front of

the anterior ocellus. Eyes large, their maximum diameter slightly less than half of the median head length (18:39). Ocelli raised on short sockets. A vestigial crest extending from behind the eye to the bluntly rounded, yet visible occipital corner. Integument finely reticulate-punctate and rugose, the rugae being transverse between the eyes and the rather smooth front, forming a network on the cheeks, the occiput and the lower surface of the head. Scape and first antennal segment glabrous. Length of scape about one half of the second funicular segment.

Thorax subopaque, somewhat similar to that of the female. Pronotum with similarly projecting antero-lateral, apically pointed, lobes on each side. Transverse crest inconspicuous, obsolescent towards the sides, ininterrupted mesad. Mayrian furrows deeply impressed in scutum. Epinotum unarmed. Sculpture as on head. The posterior portion of the sides and the epinotum with highly raised, undulating ridges, longitudinal on the sides, more or less transverse on the basal face of the epinotum.

Petiole about as long as wide, anterior face obliquely truncate, sides unarmed. Dorsal and lateral face covered with a network of raised ridges. Postpetiole slightly broader than petiole, with a tubercular tooth on each side, somewhat in front of the half. Sculpture as on petiole, ridges less conspicuous and predominantly longitudinal in direction.

Gaster subfulgid, very finely reticulate. First gastric tergite without erect pile. Head and thorax with abundant, long, flexuose, whitish and erect pile. A thin brush of similar hairs arising from beneath the postpetiole. Setae shorter, stiffer sparser and suberect on the remaining tergites of the gaster and on the sternites. Legs with similar pile, which is sparse and subdecumbent.

Wings short, scarcely projecting beyond the tip of gaster when folded, hyaline, the veins pale brunneous, the stigma darker. Venation similar to that of female. Second abscissa of median vein subequal in length to the transverse median vein.

Strikingly enough, this very peculiar species has never been caught in its native Colombia, but has been taken time and again on imported orchids in the United States, by Plant Quarantine Inspectors. According to collecting data, the species nests in the pseudobulbs of orchids of the genus *Cattleya*. Perhaps it is even to be looked upon as a specialized guest of *Cattleya gigas*.

Specimens examined: 70; 40 workers, 20 soldiers, 9 females and 1 male, provenient from 10 different nests series: *Colombia*: Jan. 17, 1940 (San Francisco, Cal.; on *Cattleya*, sp.): 10 workers,

5 soldiers [USNM, n. 40-2190]. July 1, 1938 (San Francisco, Cal.; on *Cattleya gigas*): 2 workers, 3 soldiers, 5 females [USNM]. April 10, 1946 (Hoboken, N. J.; on *Cattleya,* sp.): 16 workers, 5 females (holotype and paratypes) [USNM, CTB]. Bogotá (on *Cattleya,* sp.): 3 workers, 3 soldiers, 1 female, 1 male [USNM]. April 19, 1946 (Brownsville, Tex.; on *Cattleya gigas*, pseudobulb): 1 worker, 1 soldier, 3 females [USNM, n. 46-4656]. May 16, 1946 (Hoboken, N. J.; on *Cattleya,* sp. pseudobulb): 4 workers [USNM, n. 46-8292]. Jan. 24, 1941 (San Francisco, Cal.; on *Catleya,* sp.): 2 workers [USNM, n. 41-1735]. Sept. 20, 1945 (Hoboken, N. J.; on *Cattleya,* sp.): 1 worker [USNM, n. 45-17532]. July 31, 1946 (Hoboken, N. J.; on *Cattleya,* sp.): 1 worker [USNM, n. 46-13079]. Oct. 3, 1945 (Hoboken, N. J.; on pseudobulb of orchid): 2 soldiers, 1 female [USNM, n. 45-18003].

All the specimens agree with the preceding descriptions and the types in all essential features of livery and structural detail.

The present species is named for Dr. V. S. L. Pate, Professor of Entomology in Cornell University, who not only suggested and encouraged the present revisionary study, but also followed it through all its steps with constant interest, aid and constructive criticism.

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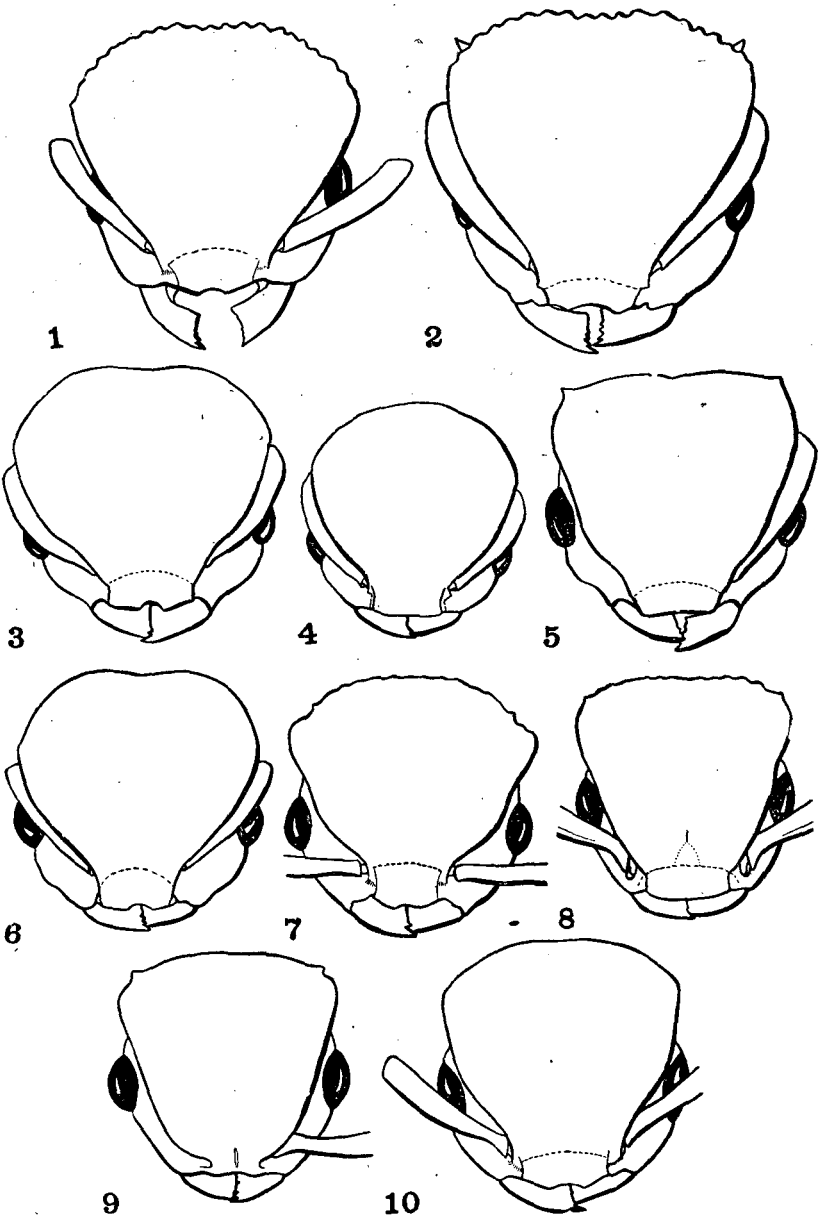
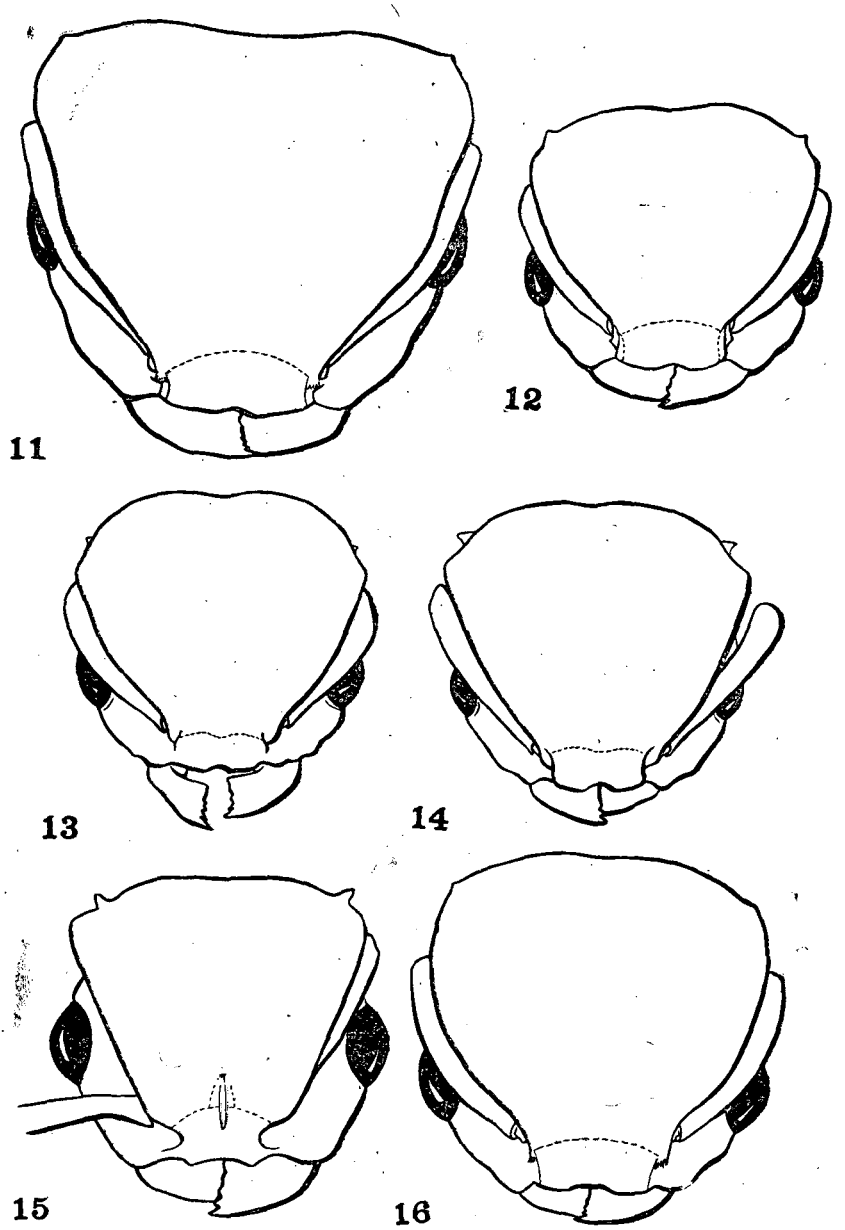
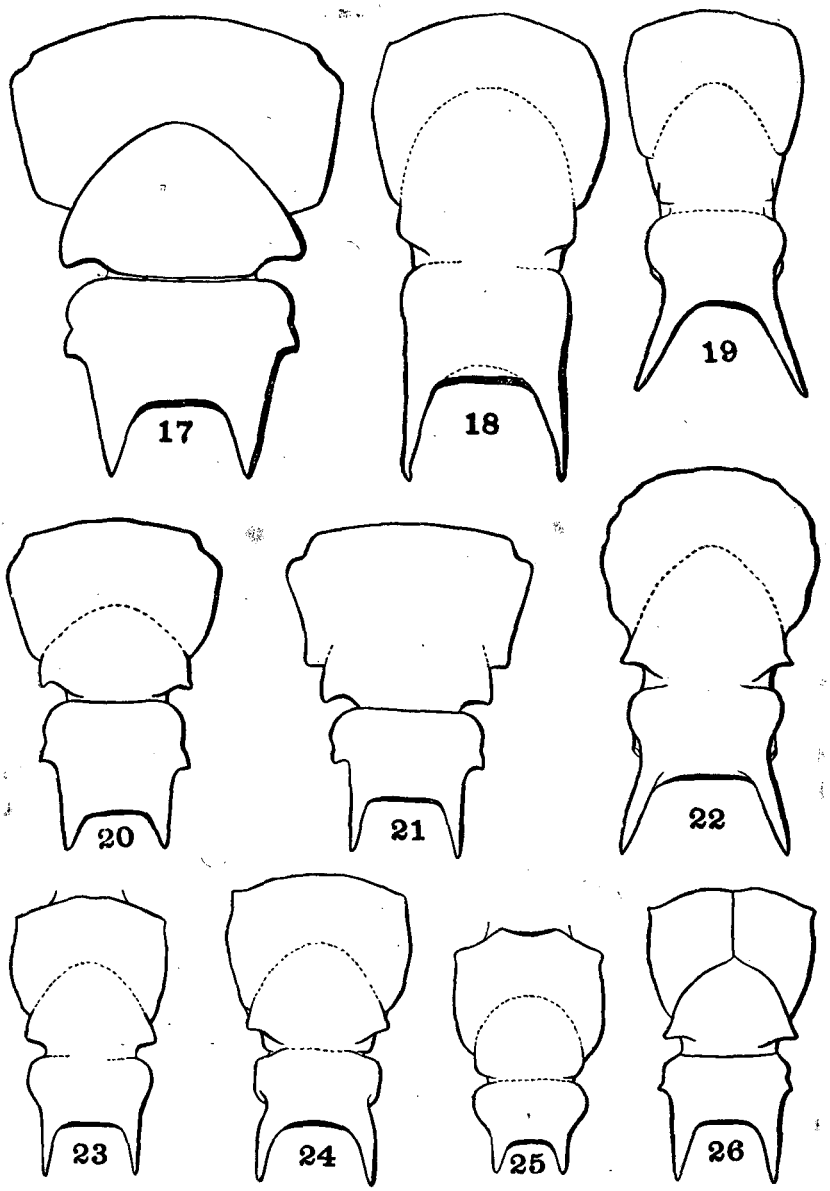


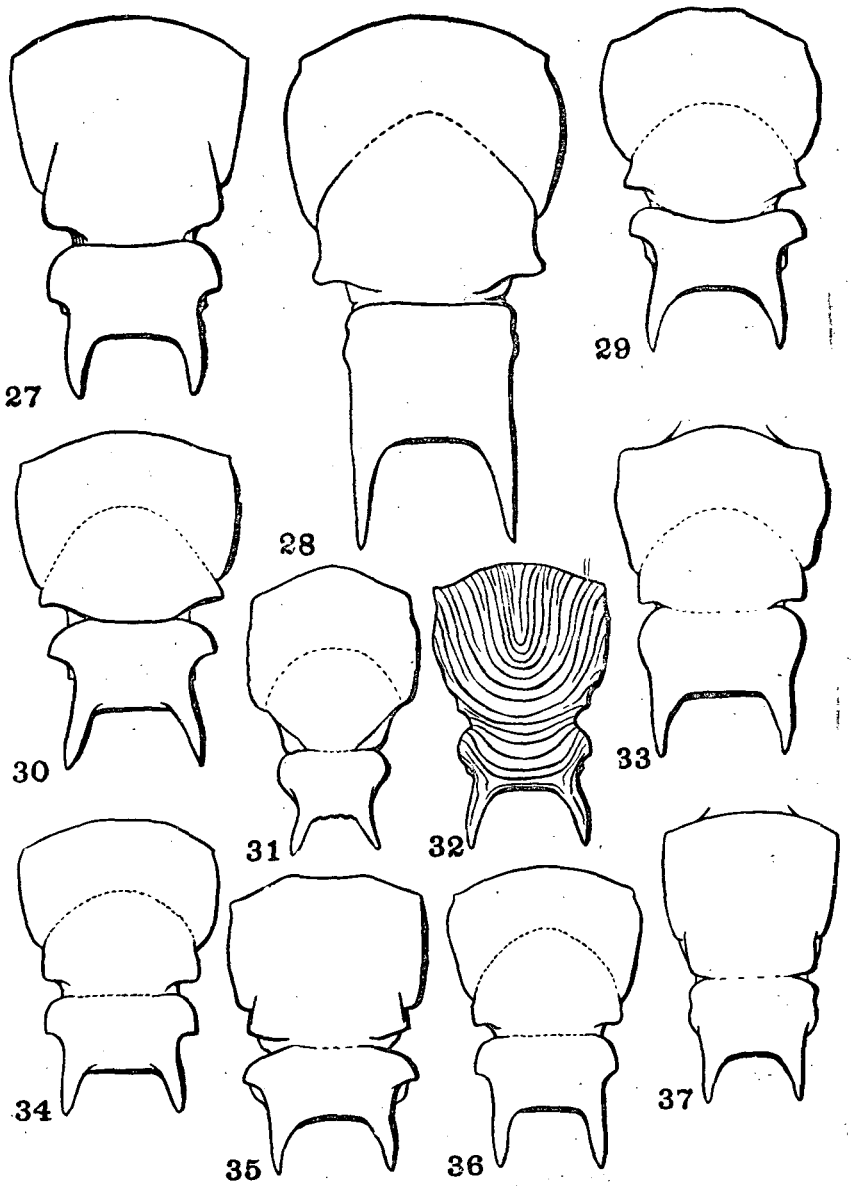
Genus *Procryptocerus* (workers)
Cephalic aspect of the head
Fig. 1. *P. paleatus* Emery. — Fig. 2. *P. spiniperdus* Forel (lectotype). — Fig. 3. *P. regularis* Emery. — Fig. 4. *P. coriarius* (Mayr) (holotype). — Fig. 5. *P. balzani* Emery. — Fig. 6. *P. ferreri* (Forel) (lectotype). — Fig. 7. *P. gibbosus* Kempf (holotype). — Fig. 8. *P. hirsutus* Emery. — Fig. 9. *P. carbonarius* (Mayr) (holotype). Fig. 10. *P. pictipes* Emery. — (Kempf del.)



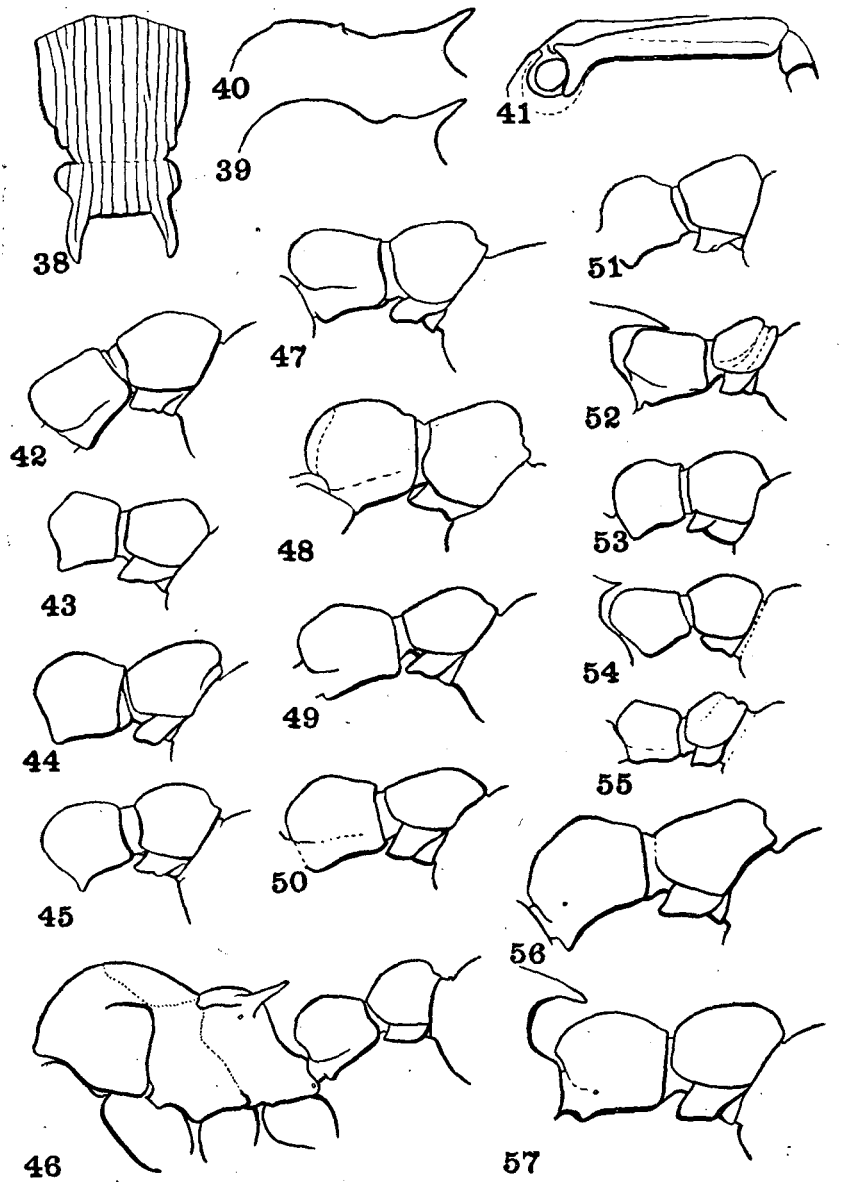
Genus *Procryptocerus* (workers)
Cephalic aspect of the head
Fig. 11. *P. mayri* Forel (lectotype). — Fig. 12. *P. schmalzi* Emery. — Fig. 13. *P. adlerzi* (Mayr) (lectotype). — Fig. 14. *P. convergens* (Mayr) (lectotype). — Fig. 15. *P. rudis* (Mayr) (lectotype). — Fig. 16. *P. goëldii* Forel (not drawn to the same scale). — (Kempf del.)



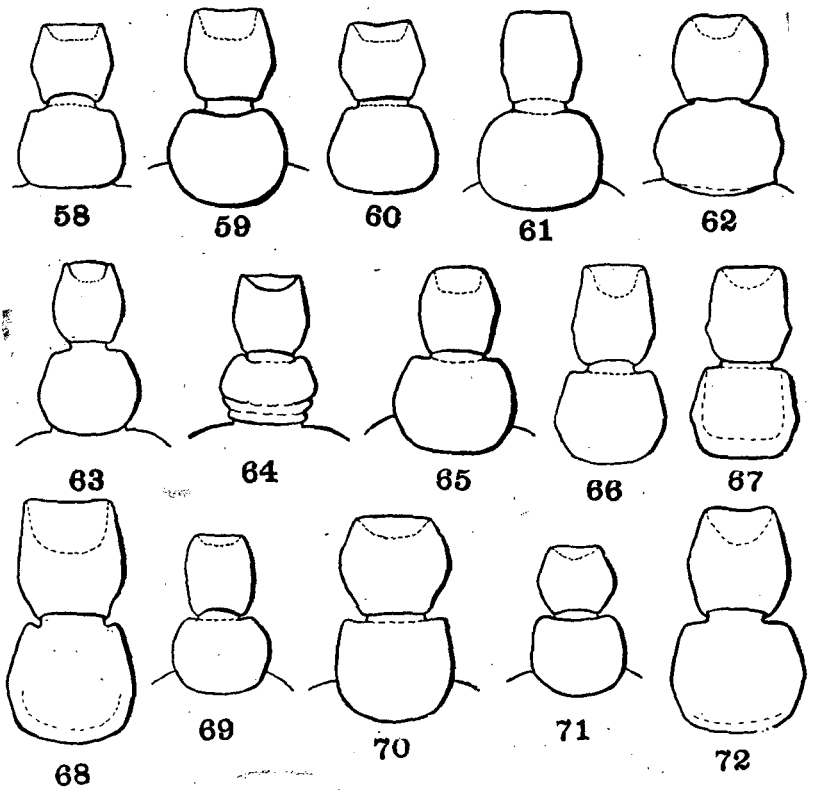
Genus *Procryptocerus* (workers)
Dorsal aspect of the thorax (not drawn to the same scale)
Fig. 17. *P. marginatus* Borgmeier (lectotype). — Fig. 18. *P. rudis* (Mayr) (paratype). — Fig. 19. *P. rudis* (Mayr) (lectotype). — Fig. 20. *P. paleatus* Emery. — Fig. 21. *P. spiniperdus* Forel (lectotype). — Fig. 22. *P. batesi* Forel (lectotype). — Fig. 23. *P. carbonarius* (Mayr) (holotype). — Fig. 24. *P. belti* Forel (lectotype). — Fig. 25. *P. coriarius* (Mayr) (holotype). — Fig. 26. *P. pictipes* Emery. — (Kempf del.)



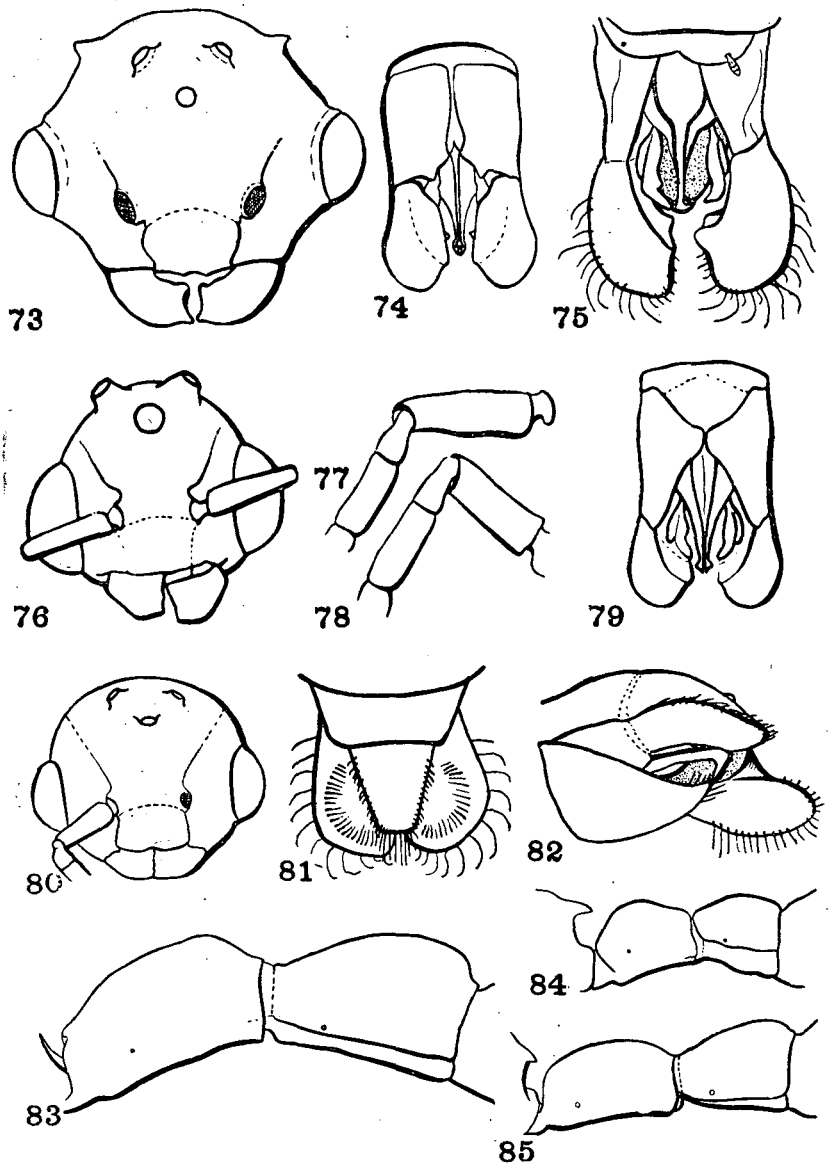
Genus *Procryptocerus* (workers)
Dorsal aspect of the thorax (not drawn to the same scale)
Fig. 27. *P. goeldii* Forel. — Fig. 28. *P. mayri* Forel (lectotype). — Fig. 29. *P. schmalzi* Emery. — Fig. 30. *P. convergens* (Mayr) (lectotype). — Fig. 31. *P. gibbosus* Kempf (holotype). — Fig. 32. *P. sulcatus curvistriatus* Kempf (holotype). — Fig. 33. *P. adlerzi* (Mayr) (lectotype). — Fig. 34. *P. regularis* Emery. — Fig. 35. *P. subpilosus lepidus* Forel (lectotype). — Fig. 36. *P. balzani* Emery. — Fig. 37. *P. ferreri* Forel (lectotype). — (Kempf del.)



Genus *Procryptocerus* (workers) (figures not drawn to the same scale)
Fig. 38. *P. sampaioi* Forel: thorax, dorsal aspect. — Fig. 39. *P. belti* Forel: thorax, profile. — Fig. 40. *P. hirsutus* Emery: thorax, profile. — Fig. 41. *P. rudis* (Mayr): scape. — Fig. 42. *P. convergens* (Mayr): peduncle, lateral aspect. — Fig. 43. *P. balzani* Emery: peduncle, lateral aspect. — Fig. 44. *P. schmalzi* Emery: peduncle, lateral aspect. — Fig. 45. *P. adlerzi* (Mayr): peduncle, lateral aspect. — Fig. 46. *P. gibbosus* Kempf: thorax and peduncle, lateral aspect. — Fig. 47. *P. subpilosus lepidus* Forel: peduncle, lateral aspect. — Fig. 48. *P. rudis* (Mayr): peduncle, lateral aspect. — Fig. 49. *P. spiniperdus* Forel: peduncle, lateral aspect. — Fig. 50. *P. paleatus* Emery: peduncle, lateral aspect. — Fig. 51. *P. regularis* Emery: peduncle, lateral aspect. — Fig. 52. *P. pictipes* Emery: peduncle, lateral aspect. — Fig. 53. *P. carbonarius* (Mayr): peduncle, lateral aspect. — Fig. 54. *P. coriarius* (Mayr): peduncle, lateral aspect. — Fig. 55. *P. belti* Forel: peduncle, lateral aspect. — Fig. 56. *P. mayri* Forel: peduncle, lateral aspect. — Fig. 57. *P. goeldii* Forel: peduncle, lateral aspect. — (Kempf del.)

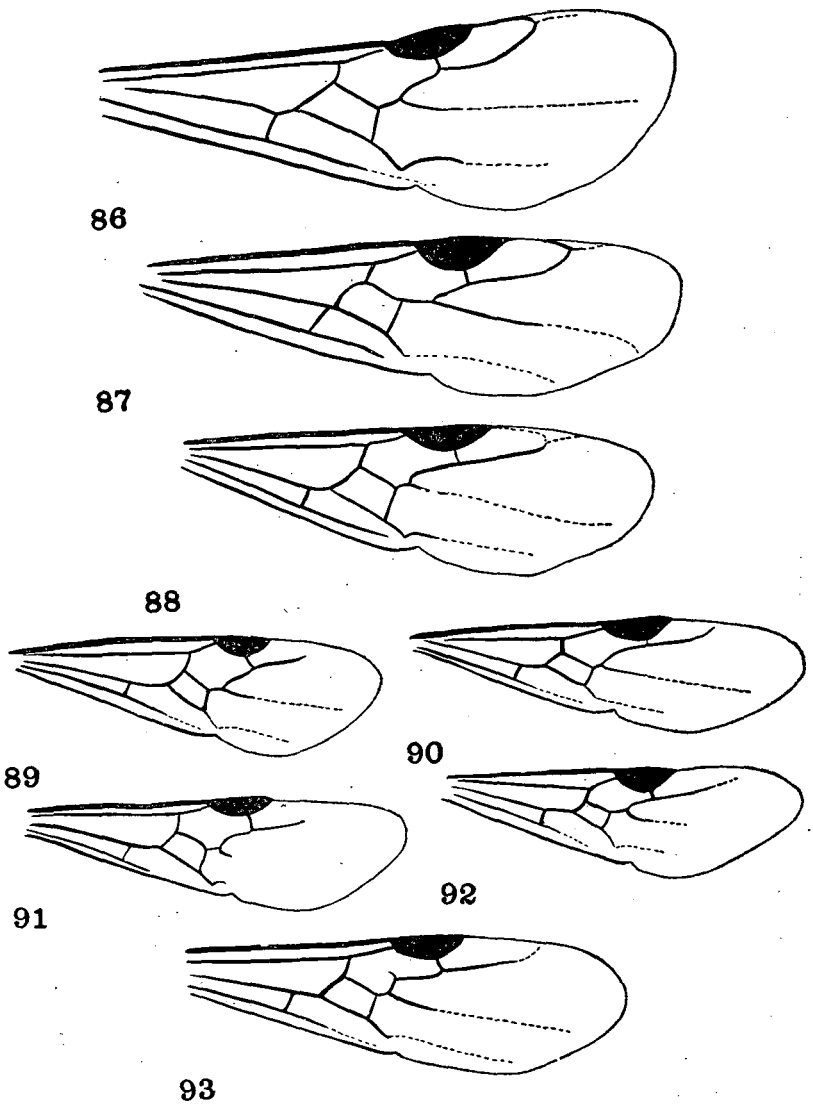


Genus *Procryptocerus* (workers)
Peduncle in dorsal aspect (not drawn to the same scale)
Fig. 58. *P. regularis* Emery. — Fig. 59. *P. adlerzi* (Mayr). — Fig. 60. *P. balzani* Emery. — Fig. 61. *P. convergens* (Mayr). — Fig. 62. *P. schmalzi* Emery. — Fig. 63. *P. gibbosus* Kempf. — Fig. 64. *P. pictipes* Emery. — Fig. 65. *P. ferreri* Forel. — Fig. 66. *P. spiniperdus* Forel. — Fig. 67. *P. paleatus* Emery. — Fig. 68. *P. mayri* Forel. — Fig. 69. *P. coriarius* (Mayr). — Fig. 70. *P. rudis* (Mayr). — Fig. 71. *P. carbonarius* (Mayr). — Fig. 72. *P. goeldii* Forel. — (Kempf del.)

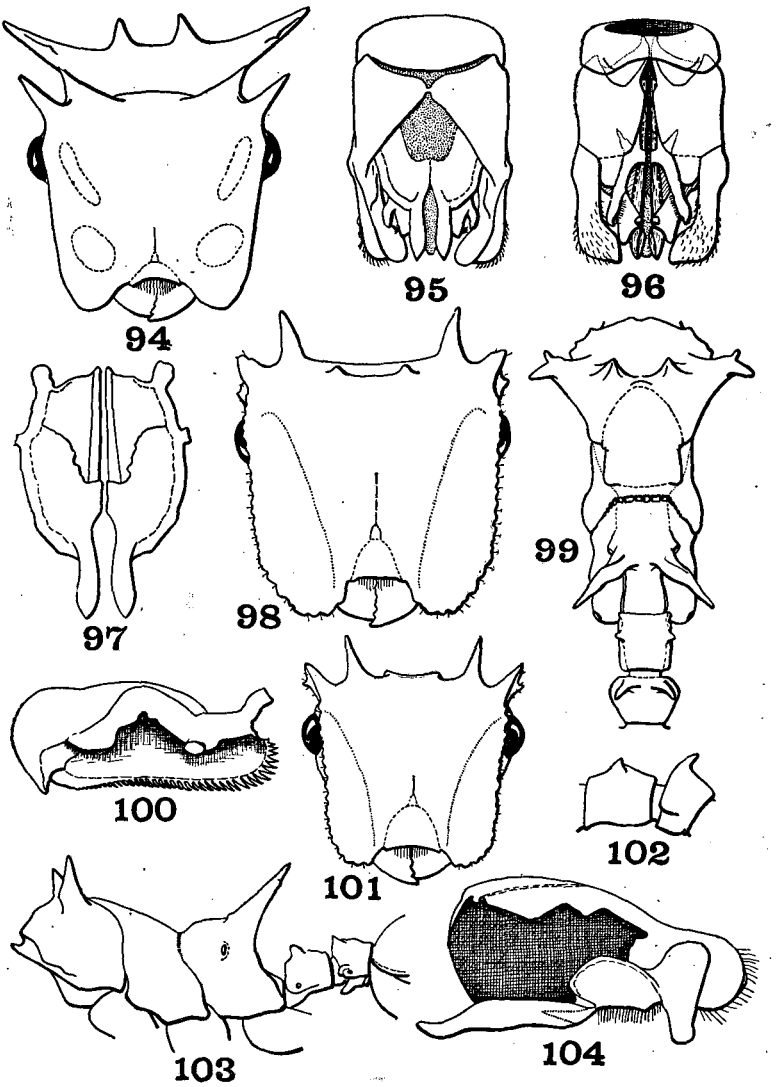


Genus *Procryptocerus* (males)

Fig. 73. *P. marginatus* Borgmeier: head, anterior aspect. — Fig. 74. *P. goeldii* Forel: genitalia, ventral aspect. — Fig. 75. *P. adlerzi* (Mayr): genitalia, dorsal aspect. — Fig. 76. *P. schmitti* Forel: head, anterior aspect. — Fig. 77. *P. convergens* (Mayr): scape. — Fig. 78. *P. adlerzi* (Mayr): scape. — Fig. 79. *P. goeldii* Forel: genitalia, dorsal aspect. — Fig. 80. *P. goeldii* Forel: head, anterior aspect. — Fig. 81. *P. convergens* (Mayr): subgenital plate. — Fig. 82. *P. adlerzi* (Mayr): subgenital plate. — Fig. 83. *P. marginatus* Borgmeier: peduncle, lateral aspect. — Fig. 84. *P. goeldii* Forel: peduncle, lateral aspect. — Fig. 85. *P. schmitti* Forel: peduncle, lateral aspect. — (Kempf del.)

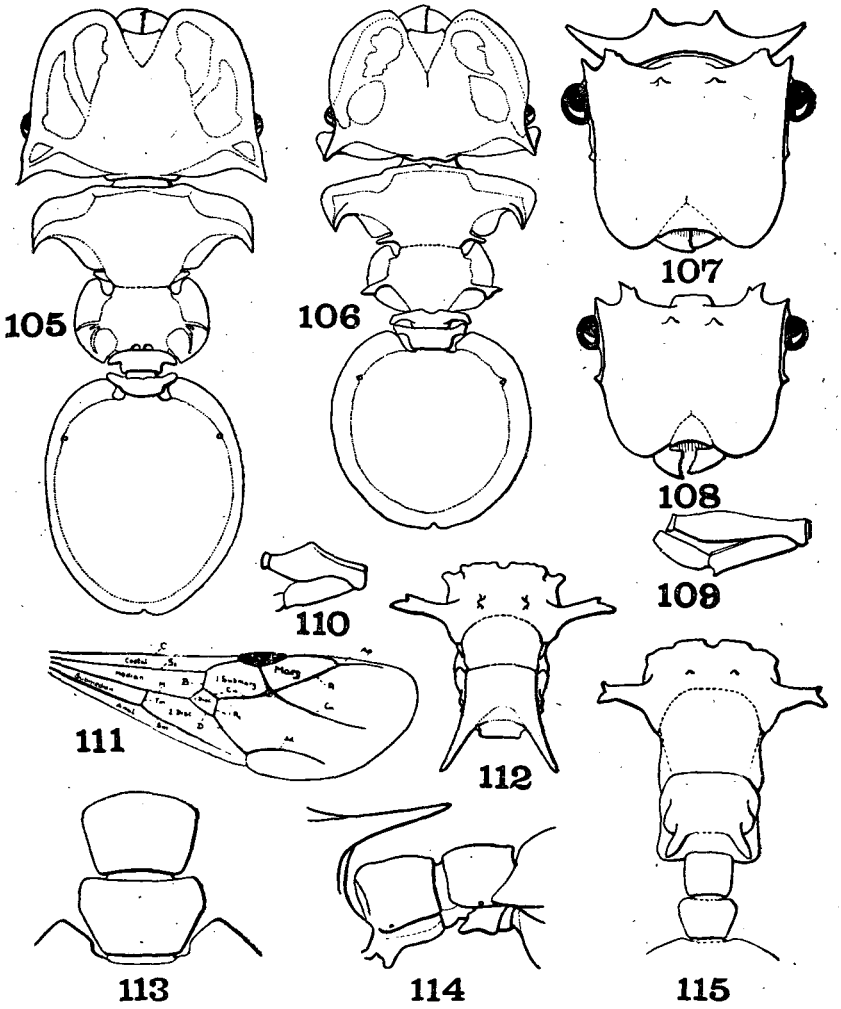


Genus *Procryptocerus*: fore wings
Fig. 86. *P. marginatus* Borgmeier, male. — Fig. 87. *P. marginatus* Borgmeier, female. — Fig. 88. *P. scabriusculus* Emery, female. — Fig. 89. *P. goeldii* Forel, male. — Fig. 90. *P. schmitti* Forel, female. — Fig. 91. *P. schmitti* Forel, male. — Fig. 92. *P. goeldii* Forel, female. — Fig. 93. *P. coriarius* (Mayr), female. — (Kempf del.)



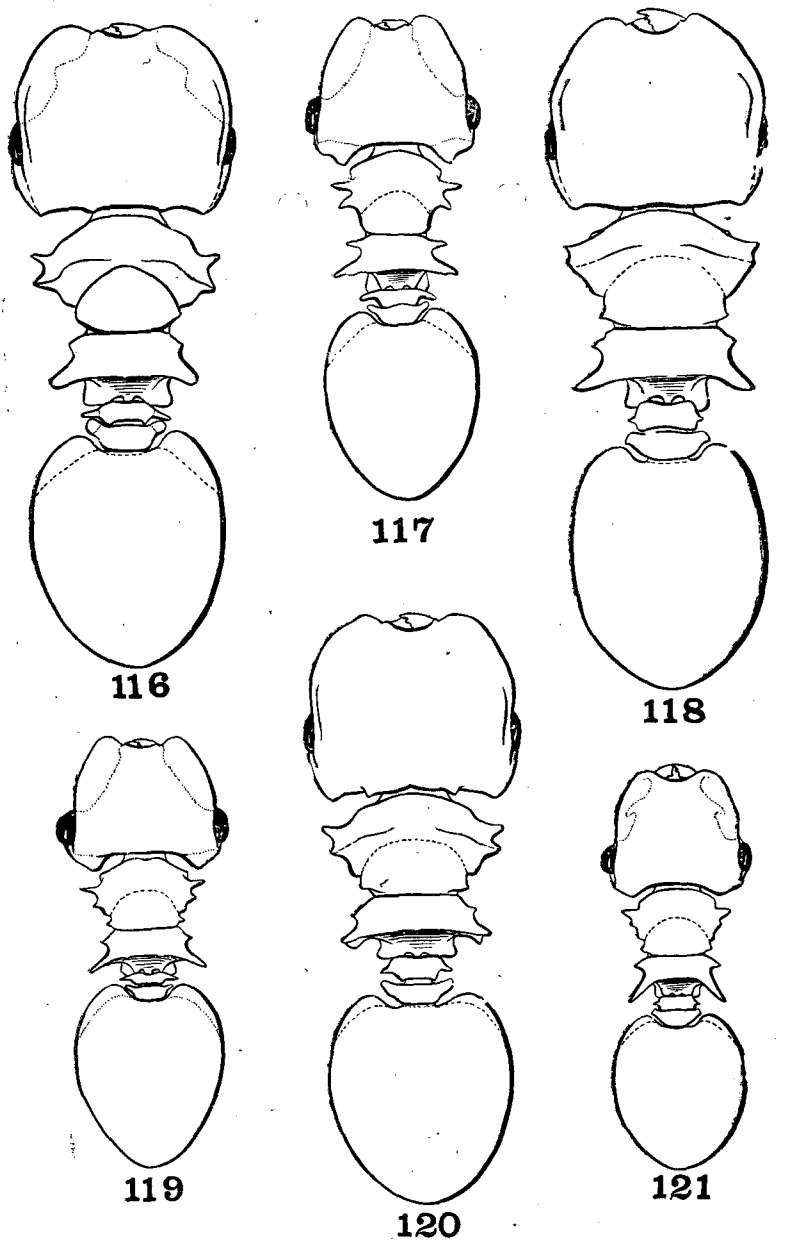
Genus *Cephalotes* Latreille

Fig. 94. *C. decemspinosus*: worker, head in cephalic aspect. — Fig. 95. *C. atratus*: male genitalia, dorsal aspect. — Fig. 96. *C. atratus*: male genitalia, ventral aspect. — Fig. 97. *C. atratus*: male, aedoeagus, dorsal aspect. — Fig. 98. *C. alfaroi*: major worker, head in cephalic aspect. — Fig. 99. *C. alfaroi*: major worker, thorax in dorsal aspect. — Fig. 100. *C. atratus*: male, aedoeagus in lateral aspect. — Fig. 101. *C. alfaroi*: minor worker, head in cephalic aspect. — Fig. 102. *C. alfaroi*: major worker, peduncle in lateral aspect. — Fig. 103. *C. decemspinosus*: worker, thorax in lateral aspect. — Fig. 104. *C. atratus*: male, paramere and volsella from the inside. — (Kempf del.)

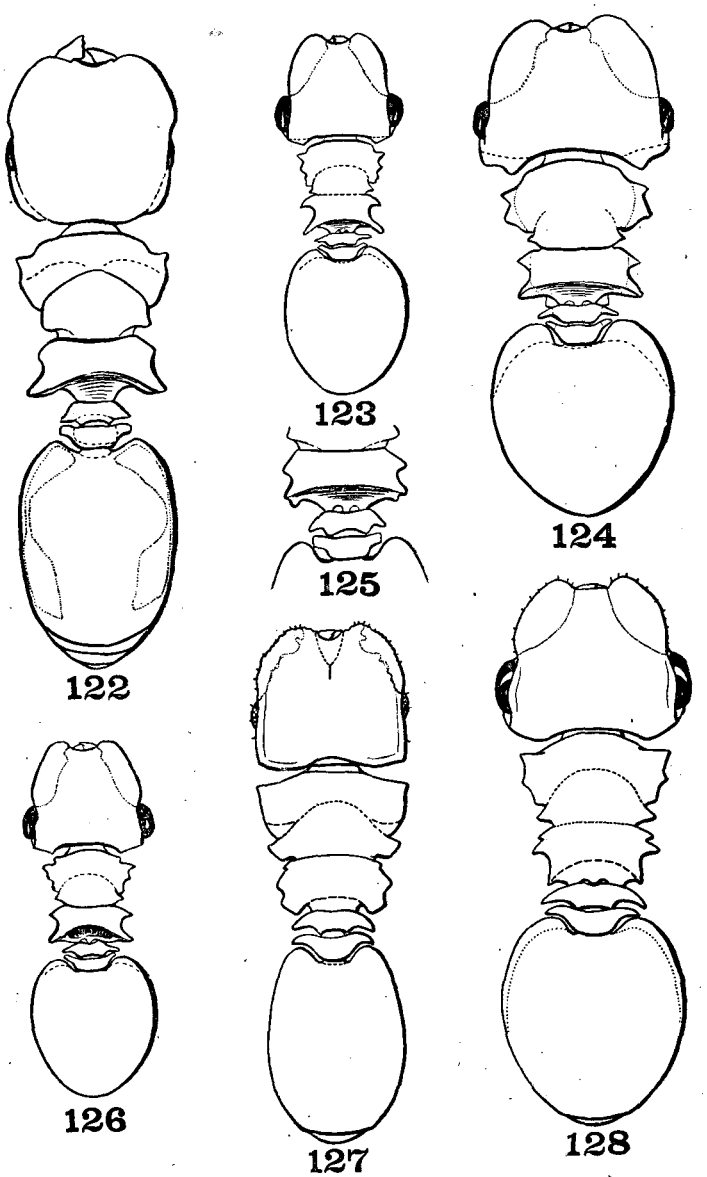


Zacryptocerus and *Eucryptocerus*

Fig. 105. *Z. clypeatus*: worker, dorsal aspect. — Fig. 106. *Z. membranaceus*: worker, dorsal aspect. — Fig. 107. *E. opacus*: worker, head in cephalic aspect. — Fig. 108. *E. oculatus*: worker, head in cephalic aspect. — Fig. 109. *Z. clypeatus*: worker, femur and tibia of middle leg. — Fig. 110. *Z. membranaceus*: worker, femur and tibia of middle leg. — Fig. 111. *Z. clypeatus*: male, right fore wing. — Fig. 112. *E. oculatus*: worker, thorax in dorsal aspect. — Fig. 113. *E. oculatus*: worker, peduncle in dorsal aspect. — Fig. 114. *E. oculatus*: worker, peduncle in lateral aspect. — Fig. 115. *E. abdominalis*: worker, thorax and peduncle in dorsal aspect. — (Kempf del.)



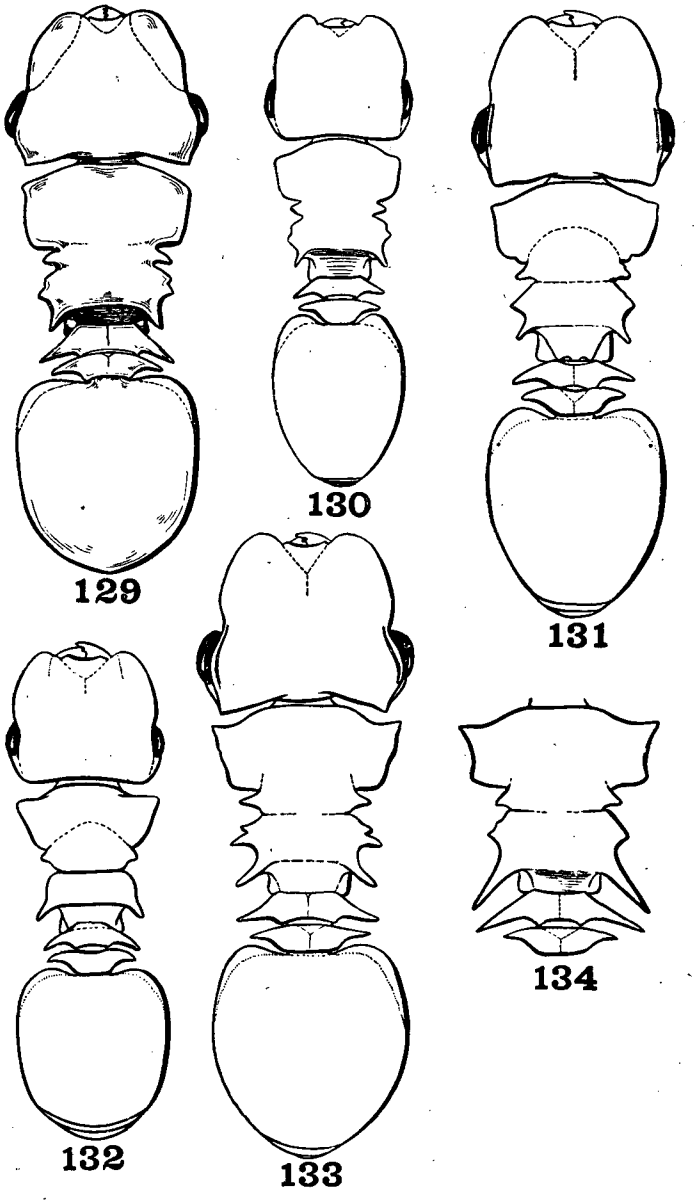
Genus *Paracryptocerus* subg. *Paracryptocerus*
Fig. 116. *P.* (*P.*) *spinosus*: soldier, dorsal aspect. — Fig. 117. *P.* (*P.*) *spinosus*: worker, dorsal aspect. — Fig. 118. *P.* (*P.*) *pusillus*: soldier, dorsal aspect. — Fig. 119. *P.* (*P.*) *laminatus christopherseni*: worker, dorsal aspect. — Fig. 120. *P.* (*P.*) *laminatus christopherseni*: soldier, dorsal aspect. — Fig. 121. *P.* (*P.*) *pusillus*: worker, dorsal aspect. — (Kempf del.)



Paracryptocerus subg. *Paracryptocerus*

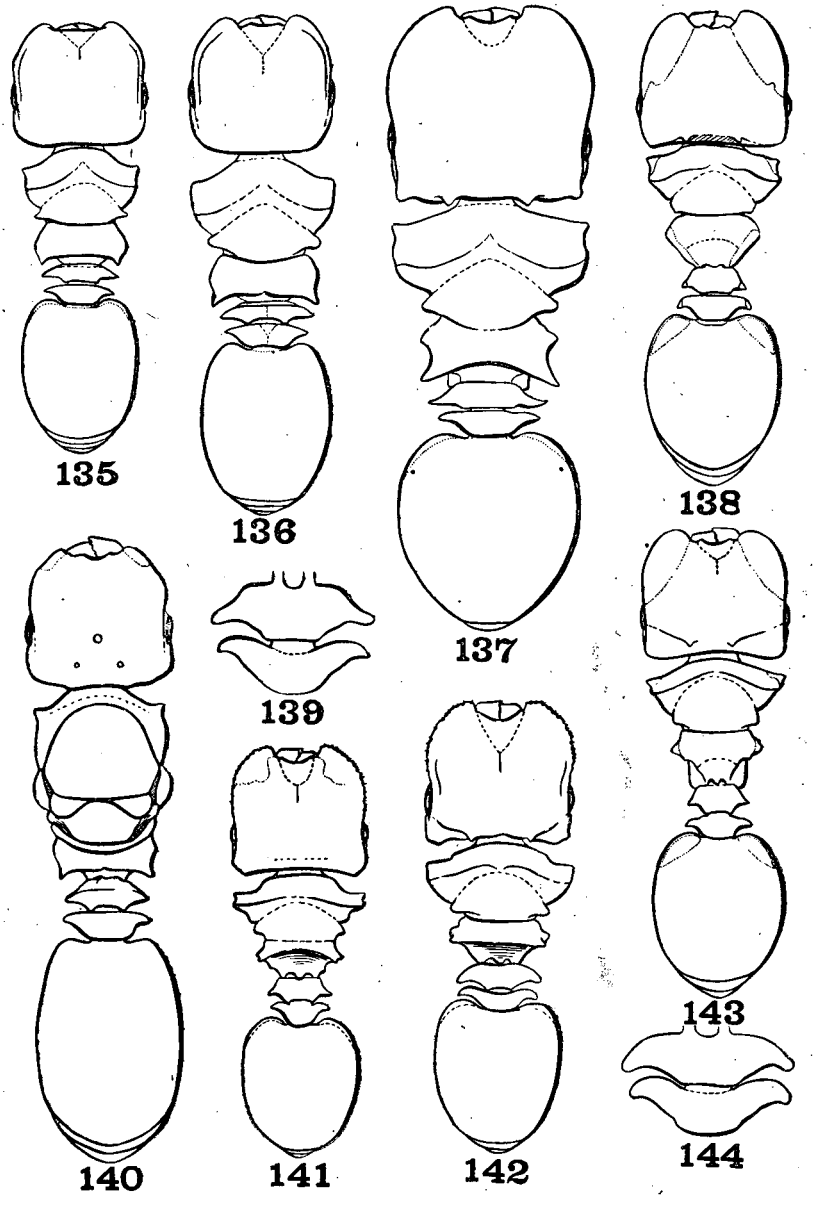
Fig. 122. *P.* (*P.*) *minutus*: soldier, dorsal aspect. — Fig. 123. *P.* (*P.*) *minutus*: worker, dorsal aspect. — Fig. 124. *P.* (*P.*) *inaequalis*: worker, dorsal aspect. — Fig. 125. *P.* (*P.*) *simillimus*: soldier, epinotum and peduncle in dorsal aspect. — Fig. 126. *P.* (*P.*) *simillimus*: worker, dorsal aspect. — Fig. 127. *P.* (*P.*) *manni*: soldier, dorsal aspect. — Fig. 128. *P.* (*P.*) *manni*: worker, dorsal aspect. — (Note: Figs. 127 and 128 are not drawn to the same scale). — (Kempf del.)

Rev. de Entomologia, vol. 22, fasc. 1-3
Plate XIII

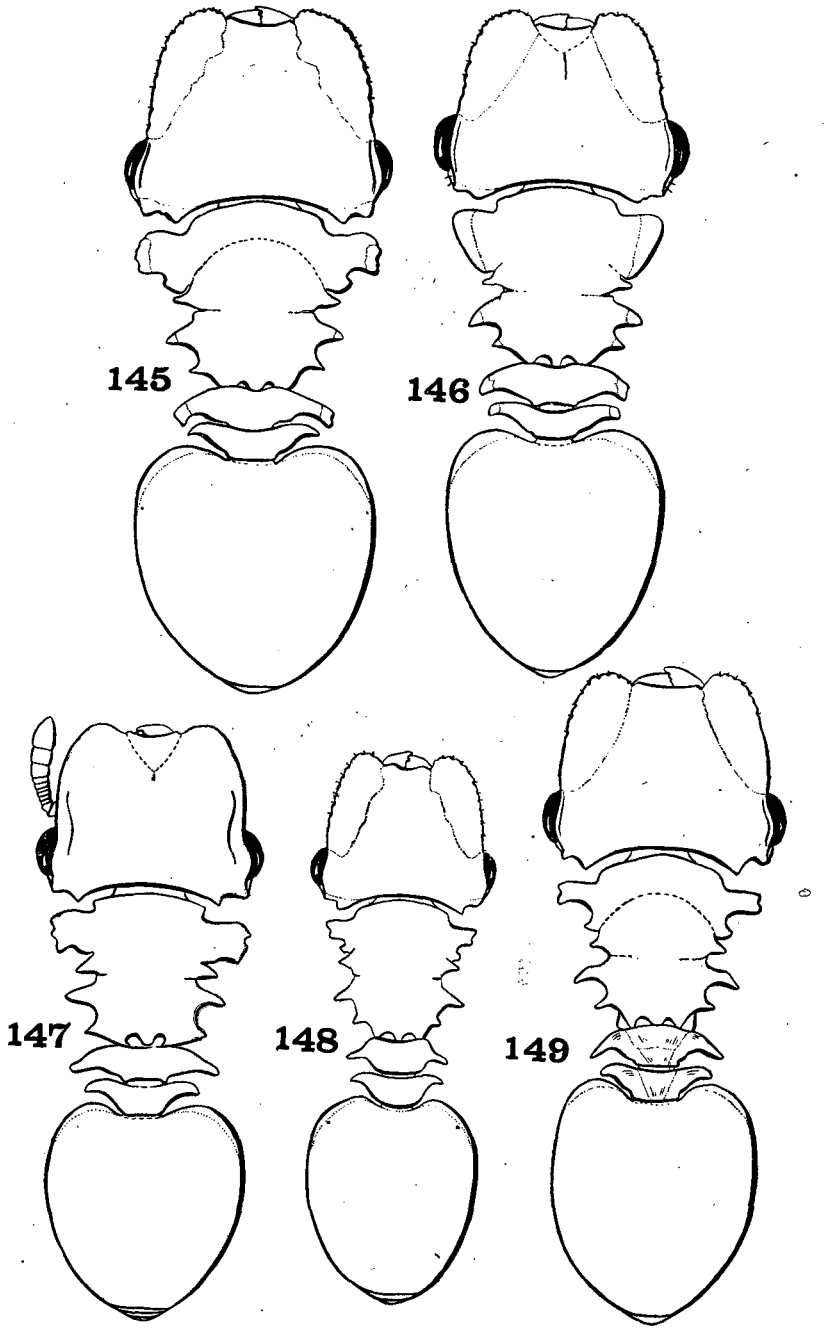


Paracryptocerus subg. *Paracryptocerus*
Worker in dorsal aspect

Fig. 129. *P.* (*P.*) *femoralis*. — Fig. 130. *P.* (*P.*) *complanatus ramiphilus*. — Fig. 131. *P.* (*P.*) *complanatus*. — Fig. 132. *P.* (*P.*) *cordiae*. — Fig. 133. *P.* (*P.*) *multispinus*. — Fig. 134. *P.* (*P.*) *multispinus inca*: thorax and peduncle. — (Kempf del.)

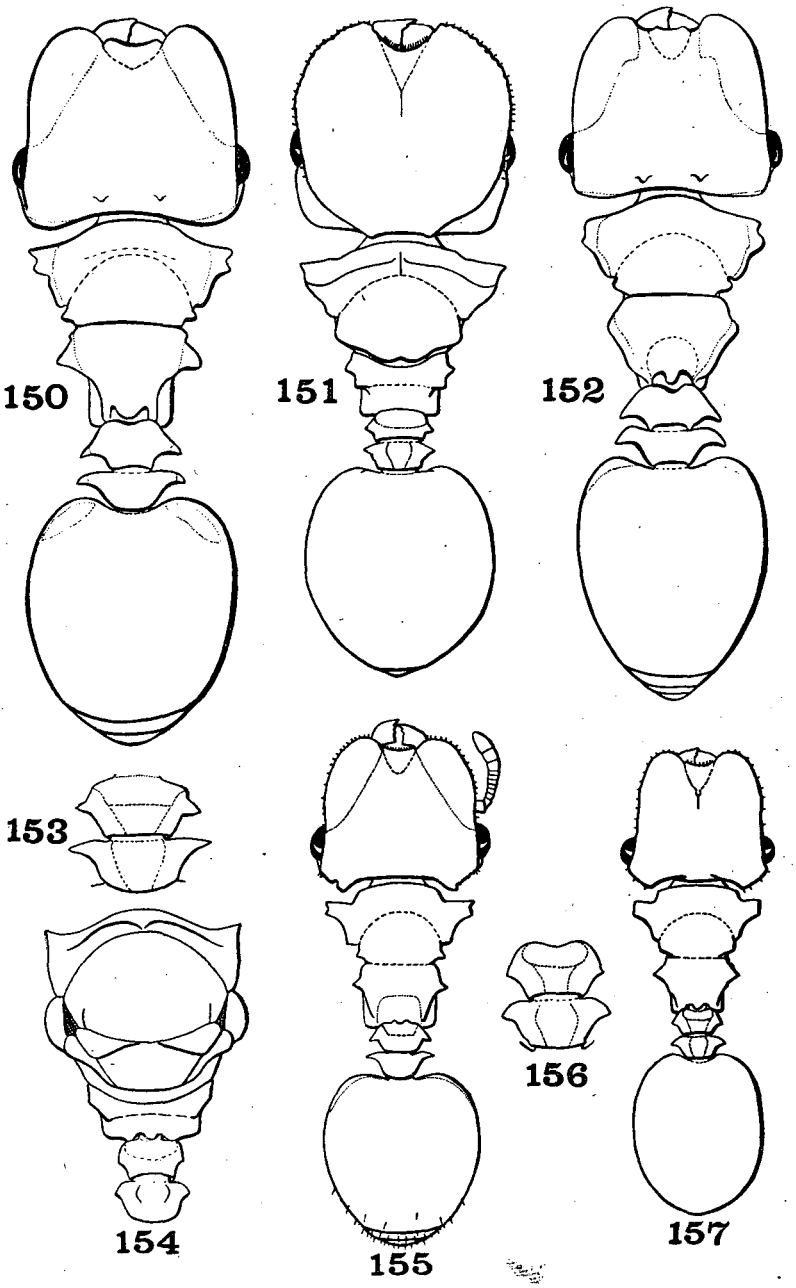


Paracryptocerus subg. *Paracryptocerus* (soldiers)
Fig. 135. *P.* (*P.*) *complanatus ramiphilus*: dorsal aspect. — Fig. 136. *P.* (*P.*) *complanatus*: dorsal aspect. — Fig. 137. *P.* (*P.*) *multispinus*: dorsal aspect. — Fig. 138. *P.* (*P.*) *multispinosus biguttatus*: dorsal aspect. — Fig. 139. *P.* (*P.*) *pavonii*: peduncle in dorsal aspect. — Fig. 140. *P.* (*P.*) *cordiae*: female, dorsal aspect. — Fig. 141. *P.* (*P.*) *depressus*: dorsal aspect. — Fig. 142. *P.* (*P.*) *cordatus*: dorsal aspect. — Fig. 143. *P.* (*P.*) *multispinosus*: dorsal aspect. — Fig. 144. *P.* (*P.*) *cordatus*: peduncle in dorsal aspect. — (Kempf del.)



Paracryptocerus subg. *Paracryptocerus*
Workers in dorsal aspect
Fig. 145. *P.* (*P.*) *pavonii*. — Fig. 146. *P.* (*P.*) *cordatus*. — Fig. 147. *P.* (*P.*) *borgmeieri*. — Fig. 148. *P.* (*P.*) *depressus*. — Fig. 149. *P.* (*P.*) *cristatus*. — (Kempf del.)

Rev. de Entomologia, vol. 22, fasc. 1-3
Plate XVI



Paracryptocerus: Subgenera *Paracryptocerus* and *Harnedia*
Fig. 150. *P.* (*P.*) *multispinosus*: worker, dorsal aspect. — Fig. 151. *P.* (*H.*) *patei*: soldier, dorsal aspect. — Fig. 152. *P.* (*P.*) *multispinosus biguttatus*: worker, dorsal aspect. — Fig. 153. *P.* (*H.*) *patei*: worker, peduncle in dorsal aspect. — Fig. 154. *P.* (*H.*) *patei*: female, thorax and peduncle in dorsal aspect. — Fig. 155. *P.* (*H.*) *patei*: worker, dorsal aspect. — Fig. 156. *P.* (*H.*) *emeryi*: worker, peduncle in dorsal aspect. — Fig. 157. *P.* (*H.*) *emeryi*: worker, dorsal aspect. — (Kempf del.)

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