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THE TRUE ARMY ANTS OF THE INDO-AUSTRALIAN AREA
(Hymenoptera: Formicidae: Dorylinae)

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Abstract: All of the known Indo-Australian species of Dorylinae, 4 in *Dorylus* and 34 in *Aenictus*, are included in this revision. Eight of the *Aenictus* species are described as new: *artipus*, *chapmani*, *doryloides*, *exilis*, *huonicus*, *nganduensis*, *philiporum* and *schneirlai*. Phylogenetic and numerical analyses resulted in the discarding of two extant subgenera of *Aenictus* (*Typhlatta* and *Paraenictus*) and the loose clustering of the species into 5 informal "groups" within the unified genus *Aenictus*. A consistency test for phylogenetic characters is discussed. The African and Indo-Australian doryline species are compared, and available information in the biology of the Indo-Australian species is summarized.

The "true" army ants are defined here as equivalent to the subfamily Dorylinae. Not included are species of Ponerinae which have developed legionary behavior independently (see Wilson, E. O., 1958, *Evolution* **12**: 24-31) or the subfamily Leptanillinae, which is very distinct and may be independent in origin. The Dorylinae are not as well developed in the Indo-Australian area as in Africa and the New World tropics. *Dorylus* itself, which includes the famous driver ants, is centered in Africa and sends only four species into tropical Asia. Of these, the most widespread reaches only to Java and the Celebes. *Aenictus*, on the other hand, is at least as strongly developed in tropical Asia and New Guinea as it is in Africa, with 34 species being known from the former regions and only about 15 from Africa. *Aenictus* is nevertheless notably poor in dispersal ability, as one might expect in army ants. No species is known from east of New Guinea, while only three species have reached eastern and northern Australia. Dorylines are unknown from the rich fossil ant deposits of the Eocene and Miocene of Europe and North America. This fact is consistent with the apparently youthful character of the distribution of the subfamily in the Indo-Australian area.

The Asian *Dorylus* form very large colonies as do the African species, and the one species on which we have any information (*D. orientalis*) appears to be a general predator. The studied species of *Aenictus* also form large colonies, consisting of tens of even hundreds of thousands of workers. They are apparently specialized predators of other ant species.

This monograph is a continuation of my revisionary studies of the Indo-Australian ant fauna. I have been stimulated and encouraged in this work by Dr T. C. Schneirla's field studies of the behavior of *Aenictus* colonies in Thailand and the Philippines. Both Dr Schneirla and Dr James W. Chapman, before the latter's recent death, contributed gen-

erously from their collections and field notes to supply a fuller biological background to what otherwise would have been a much more purely taxonomic treatment. The work has been supported by grant no. GB1634 from the National Science Foundation.

GLOSSARY OF SPECIAL TERMS AND MEASUREMENTS

The following terms, which are useful in the description of Dorylinae, either are not found in the ordinary entomological glossary or else require special definition with reference to ants.

Basal face (of propodeum). The dorsal surface of the propodeum.

Basal tooth. The posteriormost tooth of the masticatory border of the mandible. In Indo-Australian dorylines it is usually as well developed as the apical and preapical teeth.

CI. Cephalic index. (HW×100)/HL.

Declivitous face (of propodeum). The posterior face of the propodeum, extending to the petiolar junction.

15/16 level. The set of species that share at least 15 of the 16 binary characters used (*q. v.*) with the species under consideration.

HL. Head length. As conventionally used in myrmecology, the maximum distance, taken along the midline between the points of intersection of the midline with the lines, drawn perpendicular to the midline, that touch the anteriormost and posteriormost parts of the head exclusive of the mandibles (the posteriormost and anteriormost points need not be on or near the midline).

HW. Head width. When the head is viewed in full face, the maximum width taken perpendicular to the midline. This measurement is made across the eyes in the ♂ but above or below the eyes (if these break the profile) in the queen and worker.

Mesosoma. The alitrunk, or middle tagma, including the thorax and propodeum together.

Microreticulum. A very fine reticulum, where the reticular diameters are of the order of 0.01 mm. For most cases in *Aenictus*, this is one particular form of the microsculpture generically referred to as "shagreening" by many authors.

Parafrontal ridges. Thin, low, bilaterally placed ridges running (in some *Aenictus*) from the posterior margin of the clypeus longitudinally just laterad to the antennal sockets.

Propodeal junction. Line of junction of the basal and declivitous faces (*q. v.*).

SI. Scape index (SL×100)/HW.

SL. Scape length. The maximum length of this appendage that can be taken.

Subopaque. Four arbitrary degrees in the spectrum of "shininess" are recognized: shining, feebly shining, subopaque, opaque. The first and last are self-explanatory, and the middle two are meant to be (subjectively) two equidistant intermediate steps. Thus subopaque means mostly opaque but with a few points of reflection under ordinary reflected light.

Typhlatta spot. The two, symmetrically placed patches of yellow located on the occipital corners or upper genae or overlapping both. They usually contrast with a much darker pigment in surrounding areas and characterize certain species of *Aenictus*.

Typical mandible. In *Aenictus*, the triangular mandible with more than four teeth on the masticatory border, characterizing species such as *pachycerus* and *peguensis* (*q. v.*); contrasted with the thin, 3- or 4-toothed mandible of *brevicornis*, *ceylonicus*, etc. The designation as "typical" is arbitrary.

ANALYSIS OF RELATIONSHIPS

In the case of *Dorylus*, the Indo-Australian and African species together are few enough and the characters clear enough to make firm subjective comparisons. In *Aenictus*, however, there are many more species to be considered: 34 from the Indo-Australian area and at least 12 from Africa. There are moreover about 20 more or less independent characters available to separate these entities. Thus in evaluating the relationships of the *Aenictus* species, one has to handle over 900 pieces of information. Subjective evaluation becomes exceedingly difficult unless certain characters are chosen in advance as " more important " than others and used exclusively. The latter crude weighting method is in common usage and is justified provided these characters can be assumed to be the ones that do not show convergence in their evolution. However, in *Aenictus*, I chose initially to use a " numerical " method consisting simply of matching species according to a list of binary characters, *i. e.*, characters that exist in two states. Sixteen such characters were found convenient in the classification of the genus. I used them, together with a smaller number of continuously varying characters, both in the key and routine verbal descriptions. Most involve the simple presence or absence of structures; several involve a 2-state condition of a structure always present; and a single one, ground coloration, is continuous but still allows a sharp partition of the species. The 16 binary characters are as follows:

1. Antenna 9- or 10- segmented.
2. Mandible thin, with 3 or 4 teeth; vs. mandible broad, subtriangular, with more than 4 teeth.
3. A gap remaining between the mandibles and clypeus when the mandibles are closed; or not.
4. Clypeus entire vs. emarginate.
5. Clypeus armed with teeth; or not.
6. Parafrontal ridge present vs. absent.
7. Occiput tumulose (as in *gracilis*); or not.
8. Occiput bearing a well-developed collar (as in *dentatus*); or not.
9. Head mostly smooth and shining vs. head mostly microreticulate and opaque.
10. Propodeum mostly smooth and shining vs. propodeum mostly microreticulate and opaque.
11. Pronotum armed (as in *cornutus*); or not.
12. Mesonotum and mesopleuron separated by a ridge; or not.
13. Propodeal junction angulate vs. smoothly rounded.
14. Subpetiolar process large and angulate vs. low and rounded or absent.
15. Typhlatta spots present vs. absent.
16. Ground color yellow vs. light reddish brown or darker.

The results are shown in Table 1. These data should be very useful for making a rapid assessment of the purely morphological affinities of any given species, and I have used them as a measure of " relationships " in individual taxonomic descriptions.

Can the binary-character counts be used to set up an objective subdivision of the genus? Applying the methods of numerical taxonomy (R. R. Sokal & R. H. A. Sneath, 1963, *Principles of numerical taxonomy*, Freeman and Co.) it should be possible to set up objective groupings reproducible on the basis of " phenons. " For instance, an 80-phenon connotes a group affiliated at no lower than 80% of the similarity scale used in the analysis. Den-

Table I. The number of binary characters, out of a maximum possible total of 16, held in
Twelve African species, their names preceded by a star (★), are then added. All of the species
Two of those from Africa are apparently undescribed and are indicated here by code numbers

	alticolus	*aratus*	*artipus*	*binghami*	*brevicornis*	*biroi*	*camposi*	*ceylonicus*	*chapmani*	*cornutus*	*currax*	*dentatus*	*doryloides*	*exilis*	*fergusoni*	*gracilis*	*huonicus*	*javanus*	*laeviceps*	*luzoni*
alticolus	16																			
aratus	10	16																		
artipus	12	10	16																	
binghami	13	11	9	16																
brevicornis	11	7	13	10	16															
biroi	10	12	14	9	11	16														
camposi	13	11	15	10	12	13	16													
ceylonicus	9	9	9	10	12	11	10	16												
chapmani	10	14	10	13	9	12	11	11	16											
cornutus	12	10	8	11	7	10	9	9	10	16										
currax	12	12	12	11	9	14	13	11	12	12	16									
dentatus	9	15	9	10	6	11	10	8	13	11	11	16								
doryloides	10	8	10	9	13	10	9	13	10	8	8	7	16							
exilis	9	9	9	10	12	11	10	16	11	9	11	8	13	16						
fergusoni	13	11	11	14	10	11	12	10	13	11	13	10	9	10	16					
gracilis	11	11	9	10	6	11	10	10	11	11	13	10	9	10	12	16				
huonicus	14	12	12	11	9	12	13	9	12	12	14	11	10	9	13	13	16			
javanus	8	8	10	9	13	12	9	15	10	8	10	7	14	15	9	9	8	16		
laeviceps	15	9	11	14	12	9	12	10	11	11	11	8	11	10	14	10	13	9	16	
luzoni	15	11	11	14	10	11	8	10	11	13	13	10	9	10	14	12	13	9	14	16
nganduensis	7	11	9	8	10	11	12	12	11	7	9	10	13	12	10	10	9	13	8	8
pachycerus	11	15	11	10	8	13	13	10	13	11	13	14	9	10	12	12	13	9	10	12
powersi	10	10	14	9	13	14	11	11	12	8	12	9	12	11	11	9	12	12	11	9
peguensis	10	10	12	11	13	14	12	13	12	10	12	9	12	13	11	9	10	14	11	11
philiporum	11	15	11	10	8	13	10	10	13	11	13	14	9	10	12	12	13	9	10	12
philippinensis	9	13	11	8	8	13	11	8	11	9	11	12	9	8	10	10	11	9	8	10
piercei	10	8	12	9	15	12	14	13	10	8	10	7	14	13	9	7	10	14	11	9
punensis	11	13	13	10	10	15	11	12	13	11	15	12	9	12	12	12	13	11	10	12
rabori	10	12	12	9	9	14	14	9	12	10	12	11	10	9	11	11	12	10	9	11
reyesi	13	13	13	10	10	13	14	10	13	11	13	12	11	10	12	12	15	9	12	12
sagei	13	9	15	10	14	13	7	10	9	9	11	8	11	10	10	8	11	11	12	12
schneirlai	8	12	6	11	9	8	10	13	12	8	8	11	12	13	9	9	8	12	9	9
silvestrii	9	15	9	10	6	11	14	8	13	9	11	14	7	8	10	10	11	7	8	10
wroughtoni	13	9	15	10	14	13	12	10	9	9	11	8	11	10	10	8	11	11	12	12
★ *asperivalvus*	11	11	13	10	12	15	12	12	11	11	13	10	11	12	10	10	11	13	10	12
★ *bidentatus*	9	11	13	8	12	15	12	12	11	9	13	10	11	12	10	10	11	13	8	10
★ *congolensis*	9	11	13	12	12	13	10	10	13	7	11	10	9	10	12	8	9	11	10	10
★ *eugenii*	9	9	11	10	12	13	13	14	11	9	11	8	13	14	10	10	9	15	10	10
★ *furibundus*	12	8	14	11	15	12	13	11	10	8	10	7	12	11	11	7	10	12	13	11
★ *mariae*	12	10	14	9	13	14	13	11	10	10	12	9	12	11	9	9	12	12	11	11
★ *mentu*	12	10	14	9	13	14	13	11	10	10	12	9	12	11	9	9	12	12	11	11
★ *rotundatus*	12	10	14	9	13	14	13	11	10	10	12	9	12	11	9	9	12	12	11	11
★ *steindachneri*	12	10	14	9	13	14	13	11	10	10	12	9	12	11	9	9	12	12	11	11
★ *weissi*	11	11	13	10	12	15	12	12	11	11	13	10	11	12	10	10	11	13	10	12
★ *1*	11	11	13	8	10	13	12	10	11	9	11	10	13	10	10	12	13	11	10	10
★ *2*	12	12	14	11	11	14	13	9	12	10	12	11	10	9	13	11	12	10	11	13

common by species of *Aenictus*. All of the known 34 Indo-Australian species are listed first. are represented in the collections of the Museum of Comparative Zoology, Harvard University. (1 & 2).

nganduensis	*pachycerus*	*powersi*	*peguensis*	*philiporum*	*philippinensis*	*piercei*	*punensis*	*rabori*	*reyesi*	*sagei*	*schneirlai*	*silvestrii*	*wroughtoni*	★ *asperivalvus*	★ *bidentatus*	★ *congolensis*	★ *eugenii*	★ *furibundus*	★ *mariae*	★ *mentu*	★ *rotundatus*	★ *steindachneri*	★ *weissi*	★ *1*	★ *2*
16																									
12	16																								
11	11	16																							
11	11	14	16																						
12	16	11	11	16																					
12	14	11	11	14	16																				
11	9	14	14	9	9	16																			
10	14	13	13	14	12	11	16																		
11	13	12	12	13	15	10	13	16																	
10	14	13	11	14	12	11	14	13	16																
8	10	13	13	10	10	13	12	11	12	16															
13	11	8	10	11	9	10	9	8	9	7	16														
10	14	9	9	14	12	7	12	11	12	8	11	16													
8	10	13	13	10	10	13	12	11	12	16	7	8	16												
10	12	13	15	12	12	13	14	13	12	14	9	10	14	16											
12	12	13	13	12	12	13	14	13	12	12	9	10	12	14	16										
10	10	13	13	10	10	11	12	11	10	12	9	10	12	12	12	16									
12	10	13	15	10	10	13	12	11	10	12	11	8	12	14	12	12	16								
9	9	14	14	9	9	14	11	10	11	15	8	7	15	13	11	13	13	16							
9	11	14	14	11	11	14	13	12	13	15	8	9	15	15	13	11	13	14	16						
9	11	14	14	11	11	14	13	12	13	15	8	9	15	15	13	11	13	14	16	16					
9	11	14	14	11	11	14	13	12	13	15	8	9	15	15	13	11	13	14	16	16	16				
9	11	14	14	11	11	14	13	12	13	15	8	9	15	15	13	11	13	14	16	16	16	16			
10	12	13	15	12	12	13	14	13	12	14	9	10	14	16	14	12	14	13	15	15	15	15	16		
12	12	13	11	12	12	11	12	13	14	12	9	10	12	12	12	10	12	11	13	13	13	13	12	16	
11	13	12	12	13	13	10	13	14	13	13	8	11	13	13	13	13	11	12	12	12	12	12	13	13	16

drograms can be drawn with partitions at the 55%, 65%, 75%, etc. phenon lines. Unfortunately, I have not been able to make this procedure work very satisfactorily on the basis of binary characters in *Aenictus*. The source of the difficulty is the following. If we have all members (species) of the "phenon set" related to all others in the set by the same criterion, that is if each pair has at least some given percentage of character states in common, we find that for any phenon line chosen, many species will belong to several phenon sets. For example, *alticolus* shares 15 of 16 characters with *laeviceps* and *luzoni* respectively, but *laeviceps* and *luzoni* share only 14 with each other. *Alticolus* and *currax* share 14 characters with *huonicus* but only 12 with each other. The result is a confusing replication and interlocking of resemblance sets throughout the genus, at all phenon levels.

The reason that this simple numerical technique does not work well is that the characters are poorly correlated among species. Thus, species *a* and *b* in *Aenictus* may relate at the 14/16 level, and *b* and *c* at the same level; but it is obvious that if different characters are involved in the discrimination of the two pairs, *a* and *c* will associate at a lower level. The hypothetical example used by Sokal and Sneath (1963: 178) evidently assumes a high degree of concordance, a situation unlikely to occur in nature where more than several characters are used.

The same considerations apply if we try to define phenons as chain-connected sets. That is, if we define a member of a set as having a given percentage of characters in common with at least one other member of the set, we find that any set defined below the 15 or 16 level expands to include all members of the genus.

No doubt more elaborate (and time-consuming) clustering procedures could be applied which would result in a more satisfactory result. But there is at least one method by which the complexity of *Aenictus* can be somewhat simplified in a biologically meaningful way: by weighting characters and basing phylogenetic hypotheses on the basis of the several most important characters. I have undertaken to do this by weighting characters according to their phylogenetic significance. Specifically, I attempted to choose those character states which are most likely to be *unique*, or *unreversed*, or both, and to make partitions of the species accordingly. The great advantage of this method is that it classifies the species in terms of a series of falsifiable hypotheses. It can be determined with increasing confidence, as taxonomic and paleontological knowledge grows, whether given character states are really unique and unreversed. Four classes of character states can of course be recognized: unique and unreversed, unique and reversed, non-unique and unreversed, and non-unique and reversed. The first class is the one of greatest interest in phylogenetic classification. By unique is meant that the particular state does not resemble any other state found in the group of related taxa and is otherwise of such a peculiar nature as to justify hypothesizing that it arose only once. By unreversed is meant that it is of such a nature that once acquired it would be unlikely to be lost without leaving a vestige. It follows that an assemblage of species sharing such a character state is monophyletic. It is also true that if such states cannot be identified and a fossil record is lacking a phylogenetic classification is impossible. Therefore it is important to seek characters containing such states. Continuing this reasoning, if within such an equivalence set defined by one character state there exists a subset of species containing a second unique, unreversed state belonging to a second character, the subset is a second monophyletic assemblage. Also, the second character state occurred after the first in time. A genuine phylogeny can then be drawn containing two successive nodes. Suppose we hypothesized that two given states (belonging to different characters) are unique and unreversed, defining two sets of species A and B. The hypothesis can be falsified if we find that there exist species which are in both A and B and others that are in A separately and B separately. In short, where A is the smaller set $A \subseteq B$ is a necessary (but not sufficient) condition for the hypothesis to be true. The statement $A \subseteq B \subseteq \ldots$ for a sequence of taxa defined by the postulated sequence of unique, unreversed character states is a consistency test, the failure of which falsifies the hypothesis

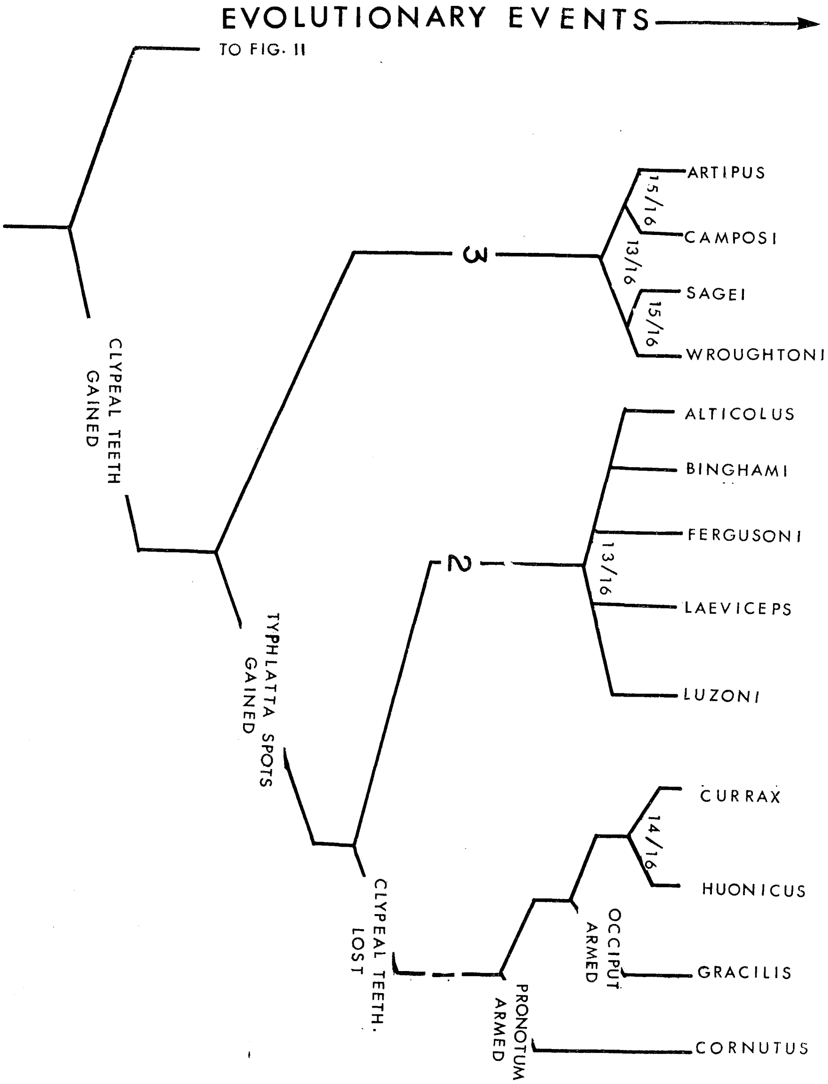


Fig. I. Phylogeny based on certain hypothesized "unique, unreversed" characters in *Aenictus*. The divisions are purely cladistic and are not intended to convey degrees of overall relationship. However, it is noteworthy that the divisions obtained by the cladistic hypotheses do produce groups that show a high level of correspondence in the binary characters on which Table I is based.

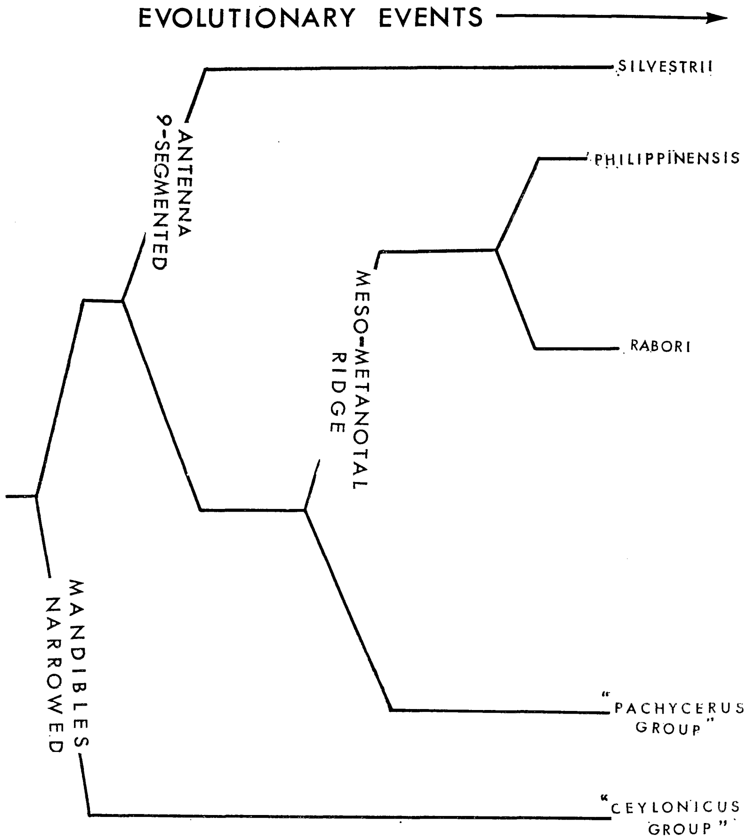


Fig. II. A continuation of fig. I. The "*pachycerus* group" includes *aratus*, *chapmani*, *dentatus*, *pachycerus*, *philiporum*, *powersi*, *punensis* and *reyesi*. The "*ceylonicus* group" is much more diverse, and as arbitrarily defined here includes *biroi*, *brevicornis*, *ceylonicus*, *doryloides*, *exilis*, *javanus*, *nganduensis*, *piercei* and *schneirlai*.

of uniqueness and unreversed condition.

In *Aenictus* I selected, on the basis of overall knowledge of the Formicidae, the following character states as possibly unique and unreversed: reduction of antennal segmentation, development of clypeal teeth, development of pronotal horns, development of mesonotal-metanotal ridge, and the development of "Typhlatta spots." On applying the consistency test just mentioned, I found that it was not possible for both clypeal teeth and Typhlatta spots to be unique and unreversed. The next simplest hypothesis was that *Aenictus* phylogeny followed one of the four schemes shown in fig. III. Now, a choice had to be made. I reasoned that the character states were so peculiar within the Formicidae as to be more likely to be reversed in evolution than duplicated, so that the lower two phylogenies were tentatively eliminated. Next, it was noted that there are two species in the set with Typhlatta spots but lacking clypeal teeth: *currax* and *huonicus* of New Guinea. Closer inspection then revealed that *currax* has a clypeal structure which can be interpreted as vestigial

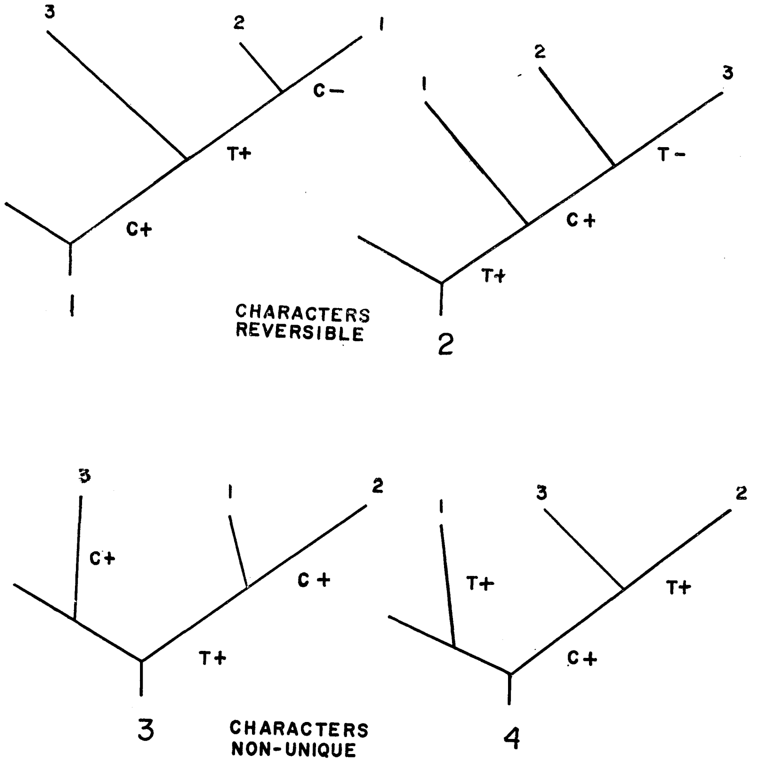


Fig. III. When the 2 characters, possession of clypeal teeth (C+) and possession of Typhlatta spots (T+) failed the consistency test, 4 alternative explanations were available. Explanation no. 1 was accepted for reasons given in the text.

clypeal teeth! This unexpected new information, plus the consideration that *currax* and *huonicus* occupy a range typical of derivative species in Asia-centered ant groups, led to the selection of the upper left phylogeny in fig. III. The other "unique, unreversed" states postulated above define sets which do pass the consistency test. Accepting them leads to the provisional phylogeny of figs. I and II. It is claimed that this phylogenetic scheme is (1) non-arbitrary; (2) subject to constant checking and revision as new information is made available from fossil or living material; and (3), perhaps most importantly, heuristic in that it is predictive and prompts further questioning and research on the characters and species enumerated.

A cladistic arrangement of this kind, relying heavily on several characters selected by subjective taxonomic judgment, is at least of some intrinsic interest simply because of the biological questions it raises. Yet any given partitioning procedure will not necessarily produce sets of species otherwise bound together by overall similarities. In other words the sets defined by the "unique, unreversed" character states may not be the same sets that would be defined by a large number of other states averaged together without weighting. Even so, in *Aenictus* such a correlation does fortunately exist. The final "branches" produced in the cladistic arrangement do hold groups of species that are reasonably close to one another in the 16 binary characters. A comparison of the numbers in Table I and the arrangements in figs. I–II will confirm that whereas objective clustering is not feasible by numerical criteria alone, numerical resemblances do tend to support the phylogenetic arrangement. There is some justification in referring, for convenience, to the *wroughtoni* group, the *laeviceps* group, the *currax* group, the *pachycerus* group, and the *ceylonicus* group. *Silvestrii*, *philippinensis*, and *rabori* can be conveniently placed in the *pachycerus* group. The relatively good correspondence of the lower-level groupings of the *Aenictus* species produced by the binary numerical method and phylogenetic method suggests that both have some validity at this level of classification. Since each addresses itself to a different question, one may conclude that both should be employed in routine taxonomic studies.

Relation of the Indo-Australian fauna to the African fauna: Both Africa and the Indo-Australian area contain many very distinctive endemic elements. For example, the "typical" driver ants comprising the genus *Anomma* are peculiar to Africa. *Dorylus* (*Dichthadia*) *laevigatus*, which possesses the primitive antennal segment number (12) and has been placed in a separate subgenus by itself, is known only from Asia. Both Africa and the Indo-Australian area are inhabited by endemic species of *Aenictus* that are among the most divergent elements in the genus. Presumably this faunal differentiation has occurred largely or entirely since Miocene times, since dorylines are unknown in the rich ant fossil deposits of the Miocene and early Tertiary. On the other hand, some faunal exchange could have taken place until at least the late Pleistocene, when savannas and forests through the Middle East and northern Africa provided a potential bridge for the more adaptable doryline species. Dorylines are evidently not adept at jumping true barriers such as water gaps and deserts, but they are capable of living in a remarkable variety of marginal habitats that might serve as bridges in times of climatic amelioration. In central Africa, for example, species of *Anomma* are dominant elements in several habitats up to 2700 m (Weber, N. A., 1943, *Bull. Mus. Comp. Zool.* **93**: 263–389). In Asia *Dorylus orientalis* and *Aenictus laeviceps* occur both in native rain forests and in cultivated land. Carlos Menozzi (1936, *Boll. Lab. Zool. Ist. Agrar. Portici* **39**: 262–311) has described a remarkable relict species, *Aenictus rhodiensis*, from near the village of Cattavia on Rhodes, in the eastern Mediterranean.

Although there are highly peculiar endemics in Africa and Asia respectively, other species groups are so poorly differentiated as to suggest dispersal between Africa and Asia within relatively recent times, probably no farther back than the Pleistocene. *Dorylus labiatus* of India is very close to and probably conspecific with *D. fulvus* of N. Africa and the Middle East, while *D. orientalis* is close to the widespread African species *D. atriceps*. On examining the numerical data on African *Aenictus* given in Table I, it can be seen that the following form a closely knit group: *asperivalvus*, *mariae*, *mentu*, *rotundatus*, *steindachneri*, and *weissi*. These in turn are allied to the *ceylonicus* group of species in Asia, especially *peguensis* of Burma. It would be most interesting to know whether a given species or species groups dispersed from Asia to Africa or in the reverse direction. However, the data are not adequate to permit such an evaluation.

KEY TO THE INDO-AUSTRALIAN DORYLINE SPECIES BASED ON THE WORKER CASTE

1. Pygidium toothed and bearing a median impression; postpetiole not separated from the succeeding abdominal segment by a distinct impression; antenna variously 8- to 12-segmented; workers distinctly polymorphic (genus *Dorylus*)...2

Pygidium simple; postpetiole demarcated posteriorly by a strong (myrmicine-like) constriction; antenna 10-segmented except in 1 species (*silvestrii*) where it is 9-segmented; workers strictly monomorphic (genus *Aenictus*)................. 5

2 (1). Antenna 8- or 9-segmented (subg. *Alaopone*)... 3

Antenna 10- to 12-segmented.. 4

3 (2). Subpetiolar process a simple, low lobe; frontal lobes of minor worker (whose head width is about 0.6 mm) seen in full face just reach the anterior clypeal border, which is approximately straight; head of major worker (whose head width is about 1.3 mm) distinctly broader than long (*i. e.*, $HW > HL$); abundant from Ceylon to Nepal and Burma .... **orientalis** Westwood

Subpetiolar process rectangular to triangular; frontal lobes of minor worker seen in full face do not approach the anterior clypeal border, which is strongly convex; head of major worker distinctly longer than broad ($HW < HL$); known only from type series from lower Burma .... **vishnui** Wheeler

4 (2). Seen in full-face view, the frontal lobes do not reach the anterior clypeal border, which is emarginate; antenna 10- to 12-segmented; HW 0.64–1.76 mm; Burma to Java and Celebes......................................**laevigatus** (Fr. Smith)

Seen in full face view, the frontal lobes extend well beyond the anterior clypeal border, which is entire; antenna invariably 11-segmented; apparently limited to India.. **labiatus** Schuckard

5 (1). Antenna 9-segmented .... **silvestrii** Wheeler

Antenna 10-segmented 6

6 (5). Mandibles narrow, 3- or 4-toothed, and in closed position their inner borders are often (but not always) separated from the anterior clypeal border by a large gap 7

Mandibles broad and triangular; bearing a distinct apical tooth and a preapical tooth, followed by at least 4 or 5 smaller teeth or denticles, the posteriormost of which are much smaller than the apical tooth; mandibular gap lacking... 14

7 (6). Anterior clypeal border entire and convex and bearing approximately 6 small but distinct teeth; a small (HW 0.51–0.53 mm), shining, very hairy, brownish yellow species with very short scapes (scape index 66–69) from India... .... **brevicornis** (Mayr)

Anterior clypeal border lacking teeth, and emarginate 8

8 (7). Scapes very short (scape index only 58–61); junction of propodeal faces an even convex curve 9

Scapes longer (scape index at least 70); junction of propodeal faces angulate...10

9 (8). Clypeus strongly emarginate; mandibles thick, strongly curved inward; in closure the inner mandibular borders are separated from the anterior clypeal border by a gap as wide as the maximum width of the scape .... **doryloides** Wilson

Clypeus straight or slightly convex; mandibles neither conspicuously thickened or curved inward; in closure the inner mandibular borders either reach the anterior clypeal border or are separated from it by a gap much narrower than in *doryloides*...**piercei** Wheeler & Chapman

10 (8). At least the sides of the mesosoma longitudinally rugulose, interstices feebly to strongly microreticulate.. 11

Mesosoma at least in part microreticulate, but lacking longitudinal rugulae...... 13

11 (10). Larger species (HW over 0.65 mm); head microreticulate and mostly opaque; in closure the inner border of the mandibles are separated from the anterior clypeal border by a gap about 2× as wide as the maximum width of the scape; known only from New Guinea.................................. **schneirlai** Wilson

Smaller species (HW 0.37–0.61 mm); head shining; in closure the inner boarders of the mandibles are separated from the anterior clypeal border by a gap only about as wide as the maximum width of the scape; widespread in Indo-Australian area.. 12

12 (11). A very small species (HW 0.37–0.42 mm); dorsum of petiole smooth and shining; head and mesosoma light yellowish brown; New Guinea...... **exilis** Wilson

HW 0.43–0.60 mm; New Guinea samples (but not all others) with dorsum of petiole microreticulate and subopaque and head and mesosoma medium to dark yellowish brown; Ceylon to Taiwan, Philippine Is., and E. Australia... .... **ceylonicus** (Mayr)

13 (10). Scape index about 90; head, mesosoma, and pedicel medium reddish brown, contrasting with the light reddish brown gaster and appendages; New Guinea .... **nganduensis** Wilson

Scape index less than 80; concolorous clear to light brownish yellow; Java .... **javanus** Emery

14 (6). Humeri produced into horn-like protuberances; Borneo............... **cornutus** Emery

Humeri unarmed.. 15

15 (14). "Typhlatta spots" present; these are a pair of large, pale, circular areas covering most of the posterolateral portions of the head and contrasting sharply with the much darker remainder of the head.............................. 16

"Typhlatta spots" absent.. 23

16 (15). Subpetiolar process prominent and angular.. 17

Subpetiolar process absent or at most very low and rounded 19

17 (16). Seen from the side, the propodeal faces join through a smooth curve .... **laeviceps** (Fr. Smith)

Seen from the side, the propodeal faces join in a sharp angle....................... 18

18 (17). Pronotal dorsum microreticulate and opaque; a somewhat larger species, HW 0.79–0.92 mm... **binghami** Forel

Pronotal dorsum smooth and shining; HW 0.63–0.78 mm..............**fergusoni** Forel

19 (16). Parafrontal ridges present; clypeal teeth absent... 20

Parafrontal ridges absent; clypeal teeth present but inconspicuous 22

20 (19). Small but distinct, obtusely angulate elevations present on each side of occiput; center of clypeus feebly concave; Ceylon to Philippine Is. ....**gracilis** Emery

Occiput smoothly rounded in typical *Aenictus* form; center of clypeus straight or convex; New Guinea..21

21 (20). Concolorous brownish yellow, except for dark brown area in middle of occiput; petiole microreticulate and subopaque; a smaller species; HW 0.64–0.69 mm .... **currax** Emery

Concolorous dark reddish brown; petiole mostly smooth and shining; larger species; HW 0.70–0.82 mm .... **huonicus** Wilson

22 (19). Depth of subpetiolar lobe several times maximum width of petiolar spiracle; scape index about 110.....................................**alticolus** Wheeler & Chapman

Subpetiolar lobe rudimentary, its depth only about as great as the maximum width of petiolar spiracle; scape index about 100... **luzoni** Wheeler & Chapman

23 (15). Subpetiolar process large and angulate.. 24

Subpetiolar process either absent or else merely a low, evenly round lobe.........26

24 (23). Parafrontal ridges absent; Burma.. **peguensis** Emery

Parafrontal ridges present; Philippine Is., New Guinea 25

25 (24). Junction of propodeal faces forming a smooth, convex curve; most of pronotal dorsum shining; medium yellow; Philippine Is. ......**powersi** Wheeler & Chapman

Junction of propodeal faces surmounted by an angulate ridge; pronotal dorsum microreticulate and opaque; medium reddish brown; New Guinea .... **chapmani** Wilson

26 (23). Mesonotum demarcated from mesopleuron by a conspicuous ridge; Philippine Is. ...27

Mesonotum not visibly demarcated from mesopleuron.................................... 28

27 (26). Metanotum concave, dipping well below level of basal face of propodeum; parafrontal ridge about 0.3 mm long............................**philippinensis** Chapman

Metanotum flat and level with basal face of propodeum; parafrontal ridge about 0.2 mm long .... **rabori** Chapman

28 (26). Anterior clypeal border dentate; small species, HW 0.43–0.53 mm; scapes long, scape index at least 102 and usually much more; body clear yellow........... 29

Anterior clypeal border not dentate; larger species, HW at least 0.57 mm; scapes shorter, scape index not exceeding 102 and usually much less; body clear yellow or (in most cases) reddish brown 32

29 (28). Junction of propodeal faces angulate and bearing a series of short rugulae; Philippine Is. .... **camposi** Wheeler & Chapman

Junction of propodeal faces forming a smooth, convex curve and lacking rugulae; India to Thailand 30

30 (29). Scape index 141–142; mesosomal pilosity sparse: only about 15 standing hairs breaking the dorsal profile; Thailand...................................... **artipus** Wilson

Scape index 102–119; at least 25 hairs breaking the dorsal profile of mesosoma; India 31

31 (30). Head width 0.43–0.44 mm; scape index 116–119 .... **wroughtoni** Forel

Head width 0.46–0.53 mm; scape index 102–108 .... **sagei** Forel

32 (28). Occiput constricted behind into a narrow but distinct "collar"; propodeal angle (junction of basal and declivitous faces) longer in profile than maximum length of propodeal spiracle, very thin, acute, and far overhanging the declivitous face; a large species (HW 0.78–0.81 mm) with long scapes (scape index about 137)...**dentatus** Forel

Occiput not constricted behind into a large collar; propodeal angle no longer than maximum spiracle width and not overhanging the declivitous face 33

33 (32). Pronotum densely microreticulate and opaque .... **aratus** Forel

Pronotum mostly smooth and shining... 34

34 (33). Junction of propodeal faces forming an even, convex curve; wholly smooth and shining; Philippine Is. ....**reyesi** Chapman

Junction of propodeal faces forming an angle of 90° or less, or at least marked with a thin angular transverse ridge... 35

35 (34). Cephalic index (of single syntype examined) 84; longitudinal rugulae present

on propodeal dorsum; propodeal junction lower and more rounded (see fig. 79); differing from the sympatric species *pachycerus* in having microreticulate band of occiput only 0.1 mm wide; India .... **punensis** Forel

Cephalic index 87–92; longitudinal rugulae lacking on propodeal dorsum......... 36

36 (35). Parafrontal ridges indistinct and only about 0.15 mm in length; occiput wholly shining; yellow; Ceylon... **biroi** Forel

Parafrontal ridges prominent and at least 0.30 mm long or about 1/2 length of head; posterior margin of occiput microreticulate and opaque; reddish brown to blackish brown 37

37 (36). Smaller, HW 0.57–0.63 mm; blackish brown; New Guinea and N. Queensland .... **philiporum** Wilson

Larger, HW 0.66–0.71 mm; light to medium reddish brown, India .... **pachycerus** (Fr. Smith)

Genus **Dorylus** Fabricius

Dorylus (Typhlopone) labiatus Schuckard Figs. 12–14.

Dorylus labiatus Schuck., 1840, Ann. Mag. Nat. Hist. **5**: 319, ♂. Type locality: India.—Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 464, variation, dist.—Mukerji, 1962, J. Proc. Asiatic Soc. Bengal **22**: 87, ♂ anatomy.

Dorylus fulvus subsp. *labiatus*: Emery, 1895, Zool. Jahrb. Syst. **8**: 728.

Dorylus hindostanus Fr. Smith, 1859, Cat. Hym. Brit. Mus. **7**: 3, pl. 1, figs. 1, 16, ♂.

Typhlopone laeviceps Fr. Smith, 1878, Sci. Res. Second Yarkand Miss., p. 13, fig. 2, worker.

DISTRIBUTION: India, NC portion (vicinity of Dehra Dun and Dharmsala) south to the vicinity of Bombay and east to Calcutta.

Worker: HW 1.13–2.30 mm. A large, polymorphic species. Antenna always 11-segmented. Concolorous brownish yellow.

MATERIAL EXAMINED. INDIA: Calcutta; Ahmedabad, Bombay Prov., "in bathroom of house", X. 1912 (A. N. Meldrum); Delhi (Lindner).

Related species: *Labiatus* is so similar to *fulvus* Westwood, of N. Africa and the middle East, that it can be given separate status only with misgiving. The only worker characters I have found are minor, possibly non-significant, differences in the proportions of the petiolar node and shape of the subpetiolar process. The other castes have not been studied.

Dorylus (Dichthadia) laevigatus (Fr. Smith) Figs. 7–11.

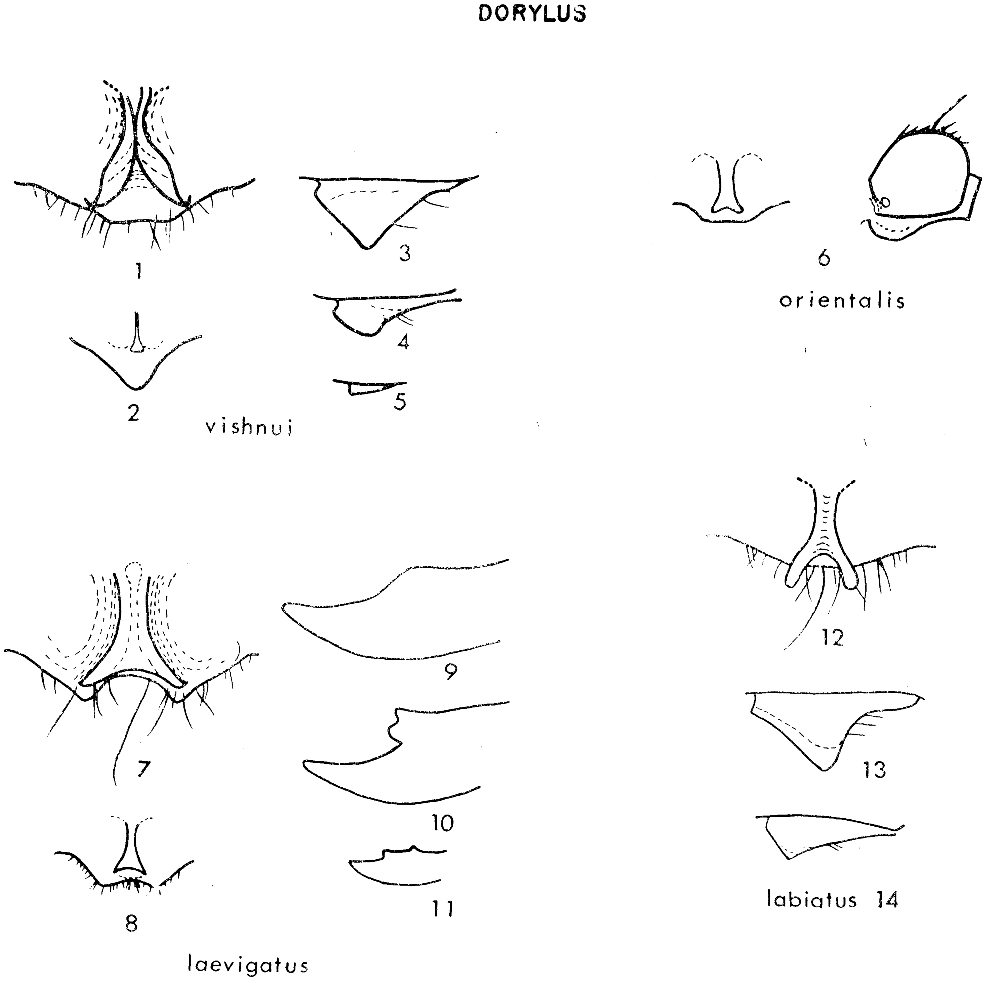
Typlopone laevigata Fr. Smith, 1857, J. Proc. Linn. Soc. Lond. **2**: 70, worker. Type locality: Sarawak, Borneo.—Emery, 1901, Zool. Jahrb. Syst. **40**: 566, dist.—Bingham, 1903, Fauna Brit. Ind. Hym. **2**: 3, dist.—Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 464, dist; 1909, Notes Leyden Mus. **31**: 221, dist; 1912, *Ibid.* **34**: 104, dist; 1913, Zool. Jahrb. Syst. **36**: 53, dist.

Dorylus levigatus: Emery, 1895, Zool. Jahrb. Syst. **8**: 729.

Dichthadia glaberrima Gerstacker, 1863, Stett. Ent. Ztg. **24**: 93, pl. 1, fig. 2, dichthadiigyne.

Dichthadia klugi Emery, 1887, Ann. Mus. Stor. Nat. Genova **25**: 448, pl. 1, fig. 10, worker.

Dorylus (*Typhlopone*) *breviceps* Emery, 1889, Ann. Mus. Stor. Nat. Genova **7**: 488, worker.



Figs. 1-14. Genus *Dorylus*. 1-2, *D. vishnui*, clypei and frontal lobes of syntype major worker (HW 1.55 mm) and syntype minor worker (HW 0.68 mm); 3-5, same, subpetiolar processes of workers with HW 1.55, 1.12, and 0.68 mm (top to bottom); 6, *D. orientalis*, clypeus and frontal lobes of media (HW 0.71 mm) from Kandy, Ceylon; 7, *D. laevigatus* from Semarang, Java, clypeus and frontal lobes of major (HW 1.58 mm); 8, same, media (HW 0.72); 9-11, same, mandibles of workers of 3 sizes (HW 1.65, 1.50, and 0.61); 12, *D. labiatus*, clypeus and frontal lobes of worker from Bombay; 13, same species, subpetiolar process, worker from Ahmedabad, India; 14, same, worker from Delhi.

Type locality: Kawkareet, Tenasserim, Burma. **New Synonomy.**

DISTRIBUTION: Burma to Sumatra, Java, Borneo, and Celebes.

Worker: HW in a single nest series from Semarang, Java, 0.64–1.55 mm. Highly polymorphic, as illustrated in figs. 7–11. Number of antennal segments varying allometrically from 10 to 12. Concolorous brownish yellow.

MATERIAL EXAMINED: MALAYA: Penang I. BORNEO: Kuching, Sarawak (J. Hewitt);

Sandakan, N. Borneo, ♂ only (Baker). JAVA: Semarang, teak forest (L. G. E. Kalshoven); Buitenzorg (Bogor) (K. W. Dammerman); Garoet, 1000 m (Kalshoven); Idjen, 950 m, ♂ only, VI. 1924 (Dammerman); Sebesi I., workers, IX. 1921 (Dammerman). The Sebesi and Penang workers have fewer mandibular teeth than those from Semarang. In fact, the single Penang worker I was able to examine was quite edentate. The great variation in mandible form within the Semarang series, which is partly allometric in nature, is shown in figs. 9–11.

Relationships: This is the only known member of the subgenus. Since the large workers have the primitive number of antennal segments for ants (12) and are not severely modified in other ways, *laevigatus* is probably best interpreted as a relatively primitive relict. Otherwise its affinities seem to be with *Typhlopone.*

Dorylus (Alaopone) orientalis Westwood Fig. 6.

Dorylus orientalis Westw., 1835, Proc. Zool. Soc. Lond. **3**: 72, ♂. Type locality: India.—Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 463, worker, ♂, dist.—Green, 1900–1903, Ind. Mus. Notes. **5**: 39, ecology.—Mukerji, 1953, Zool. Anz. **105**: 97, morphology, ecology, dist.

Typhlopone curtisi Schuckard, 1840, Ann. Mag. Nat. Hist. **5**: 265, worker.

Dorylus longicornis Schuck., 1840, *Ibid.*, p. 321, ♂. **New Synonymy.**

Alaopone oberthueri Emery, 1881, Ann. Mus. Stor. Nat. Genova **16**: 274, nota, worker.

Dorylus fuscus Emery, 1889, *Ibid.* **27**: 487, ♂. Type locality: Rangoon, Burma. **New Synonymy.**

DISTRIBUTION: S. China, Nepal, and NC India (region of Dehra Dun and Darjeeling) south to Ceylon, then SW as far as lower Burma (Tenasserim).

Worker: A single series from Kandy, Ceylon varied in HW 0.55–1.37 mm, or as much as all the other series together. Antenna always 9-segmented. The species is only moderately polymorphic. As in other Oriental *Dorylus*, the mandibular dentition shows great variation which is in part allometric. Concolorous yellowish brown.

MATERIAL EXAMINED: CHINA: Meitan, Kweichow (G. Liu). NEPAL: Amlekhganj, 520 m, meadow, 18. X. 1956 (E. I. Coher). INDIA: Sibpur, nr Calcutta; Orissa; Madras; Poona (Wroughton). CEYLON: Kandy, 600–700 m (Wilson, acc. no. 1250). BURMA: Kabo, 120 m (Abor Exp.).

Related species: Of 2 African species of *Alaopone* whose worker caste I have seen (*atriceps* Schuckard, *conradti* Emery), both are much closer in cephalic and petiolar structure to *orientalis* than to *vishnui*. *Atriceps*, in fact, one of the most widespread African dorylines, resembles *orientalis* closely. It can be easily separated, however, by its much longer head.

Biology: My Ceylon collection was made in disturbed rain forest in the Udawaddatekele Sanctuary (Garden of the Kandy kings), at Kandy. Workers were found dispersed in the soil to a depth of at least 12.5 cm. None were found above ground. Our limited records indicate that the species is generally subterranean and occurs in a wide range of habitats, including cultivated land.

Green (1903) claimed that *orientalis* is vegetarian, attacking potatoes, dahlias, and roots of the common sunflower. But Mukerji (1933) doubted this. He studied the worker mouthparts in detail and found them "better adapted for feeding on animal food than on plants. The mandible is similar to that of the species *Dorylus* (*Typhlopone*) *labiatus* Schuck., which is carnivorous in habit. The sharp-pointed bristles, spines, and setae on the 1st and 2nd maxillae, can well pierce the skin of the victim, and draw out the nutritive fluid from the body of their prey, which they suck by their mobile tongue." This conclusion is supported by certain limited observations. "Examples of this species were found within the college compound at Ballygunge, Calcutta, engaged in feeding on a dead earthworm, underneath an earthern seedling pot. On digging the adjoining turf a large number of these blind ants were found below the surface of the earth, a few being busy in attacking a live grub of a beetle. Evidently they reached the bottom of the seedling pot by tunneling through the ground to hunt the prey, as none of them were seen on the surface of the lawn. These specimens were then collected in live condition, and were kept in an earthern vessel half filled with moist earth. They settled down there, and made nests in the earth. I fed them with small live earthworms, but they did not partake of any vegetable food which was given to them."

Dorylus (Alaopone) vishnui Wheeler Figs. 1–5.

Dorylus (*Alaopone*) *vishnui* Wh., 1913, Rec. Ind. Mus. **8**: 233, worker. Type locality: Mulmein, lower Burma.

DISTRIBUTION: Burma, known only from the type series.

Syntypes: 3 workers showed HW variation 0.68–1.55 mm. The smallest worker had 8 antennal segments, the largest 9. Other strong allometric variation occurred in the form of the clypeus and subpetiolar process. Concolorous yellowish brown.

Relationships: As noted under the description of *orientalis*, *vishnui* stands far apart from *orientalis* and the 2 somewhat similar African *Alaopone* studied. It may represent a relict of an early invasion of *Alaopone* into Asia.

A SPECIES OF ANOMMA NOW EXCLUDED FROM THE INDO-AUSTRALIAN FAUNA

Anomma erratica Fr. Smith, 1865, J. Proc. Linn. Soc., Lond. **8**: 71, worker. Type locality: "New Guinea" (in error).

Frederick Smith's unique record of the tribe Dorylini from New Guinea and a member of the genus *Anomma* from the Indo-Australian area have been among the outstanding anomalies of ant zoogeography during the past century. I am now able to state with some confidence that Smith's generic placement is correct [as affirmed by H. Donisthorpe, 1932, Ann. Mag. Nat. Hist. ser. 10, **10**: 473] but that the locality label is in error. The holotype of *Anomma erratica*, loaned me by Mr Ernest Taylor, was compared with the collection of *Anomma* in the Museum of Comparative Zoology. It was found to be nearly identical to workers of similar size of a species determined as *Anomma emeryi* Mayr from "Burunga," Africa. Since the types of *emeryi* have not been examined, synonymy of that species cannot be established. But it does seem highly probable that the origin of the *erratica* type is African, not Indo-Australian.

Genus **Aenictus** Schuckard

Aenictus Schuck., 1840, Ann. Mag. Nat. Hist. **5**: 268 (type-species: *A. ambiguus* Schuck., by monotypy).

Typhlatta F. Smith, 1858, J. Proc. Linn. Soc. **2** (zool.) : 79 (type-species: *T. laeviceps* F. Sm., by monotypy). **New Synonymy.**

Aenictus subgen. *Paraenictus* Wheeler, 1929. Boll. Lab. Gen. Agrar. Portici **24**: 27 (type-species: *A.* (*P.*) *silvestrii* Wheeler, by monotypy). **New Synonymy.**

In the most recent review of the subgenera of *Aenictus*, Wheeler (1930, J. New York Ent. Soc. **38**: 193–212) emphasized the "Typhlatta spots" as nicely demarcating the subgenus *Typhlatta*. This partition seemed to be reinforced by limited data on the queen caste then at his disposal. The queens of the 2 *Typhlatta* species in which this caste was known, *gracilis* (=*martini*) and *laeviceps*, are distinguished by a stout body form and enlarged heads with high cephalic indices. These characters were contrasted with the more slender body and head of queens of the 2 known African members of *Aenictus s. s.*: *abeillei* and *congolensis*. The worker caste of *Aenictus s. s.* was admitted to be "decidedly heterogeneous." *Paraenictus* was considered to be an aberrant offshoot of the latter assemblage.

In the light of new information uncovered in the present (1964) study, these simple subgeneric distinctions are seen to be no longer tenable and the usefulness of any kind of subgeneric division is rendered dubious. The reasons have already been brought out in the discussion of worker characters in the section on "Analysis of Relationships." The characters, including those judged to be unique and unreversed and hence of superior classificatory value, are too numerous and too poorly correlated with one another to allow simple nomenclatural divisions. The queen caste, now known from *binghami* and *ceylonicus* in addition to the species just named, shows similarly complex variation. Relationships are best represented in a more detailed manner, as in the matrix of Table I and dendrograms of figs. I and II. By combining the information in both analyses it is possible to distinguish the following 5 rough groups of species: the *wroughtoni* group, the *laeviceps* group, the *currax* group, the *pachycerus* group, and the *ceylonicus* group. *Silvestrii*, *philippinensis*, and *rabori* are placed in the *pachycerus* group for convenience. The majority of African species studied would, under this arrangement, fall in the *ceylonicus* group.

Aenictus ambiguus Schuckard Fig. 90.

Aenictus ambiguus Schuck., 1840, Ann. Mag. Nat. Hist. **5**: 268, ♂. Type locality: N. W. Prov., India.—Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 469, dist.—Bingham, 1903, Fauna Brit. Ind. Hym. **2**: 9, fig. 8, ♂ redescribed; dist.

DISTRIBUTION: From Sikkim (Rungit Valley) west to Agra Presidency (N. W. provinces) south to Gujarat and Poona.

Holotype: Since this species is the type species of *Aenictus*, a special effort has been made to locate and identify the ♂ type. In the publication of W. Horn and I. Kahle on insect collections (1936, Ent. Beihefte in Berlin-Dahlem **3**: 161–296) the collection of William Edward Schuckard is stated to have been auctioned in 1868 via J. C. Stevens from London. Mr G. E. J. Nixon (per. comm. 1963) informs me that no specimen referable to the type can be found in the British Museum, one likely repository in England. Mr Ernest Taylor, on the other hand, has located a single ♂ labeled "Aenictus schuck...

ambiguus...Ind " on what appears to be a very old label, in the Oxford University Museum. I am indebted to Mr Taylor for the loan of this specimen. Unfortunately, Horn and Kahle did not publish a sample of Schuckard's handwriting, so that the Oxford specimen cannot be readily authenticated in this manner. However, it does fit the concept of *A. ambiguus* of past ant taxonomists, especially Bingham, Forel and Wheeler, and it would seem to be usefully regarded as the type specimen. Three ♂♂ in the collection at the Museum of Comparative Zoology have been compared in detail to it and are available for future reference when the exact worker-male association can be made. Meanwhile, it can be confirmed that the Oxford specimen is indeed an *Aenictus*, and it is further possible to trace it with some confidence to the *pachycerus* group. Beyond this, placement is less easy. It is certainly not *aratus*. The Walajanagar ♂♂ belonging to *aratus* have medium brown pedicel and gaster, only slightly lighter in shade than that of the mesosoma and head, whereas in the *ambiguus* type the pedicel and abdomen are dark yellow, contrasting to the medium brown mesosoma and head; the mandibles of the *aratus* ♂♂ are shorter and broader; the median impression of the petiole is also distinctly less deep in the *aratus* ♂♂. If our conclusion is correct that *ambiguus* is a member of the *pachycerus* species group, and if it is the ♂ of a species also known from the worker, there remain 8 species in the group after we have eliminated *aratus*: *biroi*, *dentatus*, *pachycerus*, *philippinensis*, *philiporum*, *punensis*, *rabori*, *reyesi*. All but *pachycerus* and *punensis* can be eliminated on the basis of their distribution. Of the remaining 2, *punensis* is the less likely, since it appears to be relatively rare and possibly also local in distribution. On the other hand, the distribution of *pachycerus* encompasses that of *ambiguus*. Both *pachycerus* (known only from workers) and *ambiguus* (known only from ♂♂) are abundant within their broadly overlapping ranges. When worker-♂ associations are made, *ambiguus* should be readily recognizable by fig. 90 and the more detailed figures of Bingham (1903), and the identification can be made definite by comparison with either the Oxford type or the closely compared specimens in the Museum of Comparative Zoology. The HW of the Oxford type, across and including the eyes, is 1.66 mm. Besides the characters implicit in fig. 90 and the distinctive coloration already mentioned, it may be important that the entire body of this specimen is covered with dense, appressed, pale yellow hairs.

Aenictus alticolus Wheeler and Chapman Fig. 18.

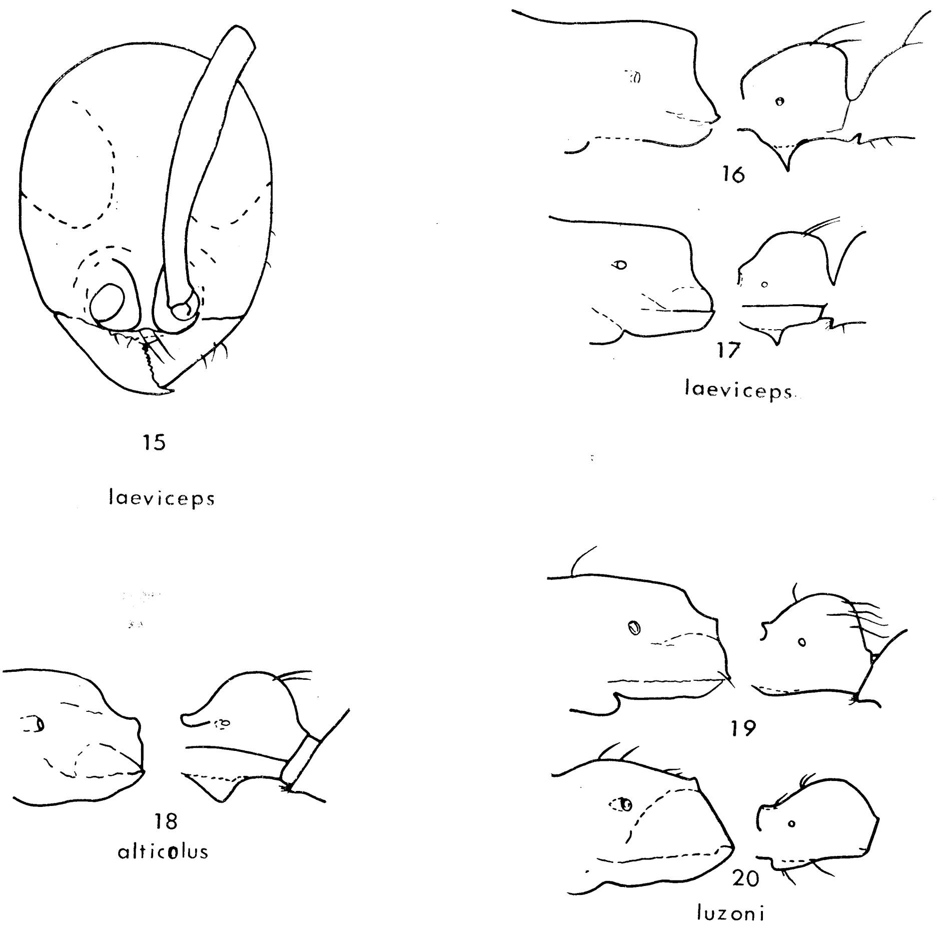
Aenictus (Typhlatta) alticola Wh. & Ch., *In* Wheeler, 1930, J. New York Ent. Soc. **38**: 205, fig. 5a-d, worker. Type locality: Polis, Bontoc, 1800 m, Luzon, P. I.

DISTRIBUTION: Luzon, Philippine Is. Known only from the type series. This series seems best interpreted as a local derivative of the *laeviceps* stock.

Syntypes: Worker chosen at random: HW 0.81 mm, HL 0.95 mm, SL 0.88 mm. HW of 36 other syntypes 0.76–0.81 mm. Parafrontal ridge absent. Clypeal teeth present, resembling those of *laeviceps* (*q.v.*). Clypeus and mandibles as in *laeviceps*. Occiput convex, lacking collar. Propodeal junction evenly rounded. Subpetiolar process large and angular, the apex directed downward. Pilosity sparse; about 10 hairs breaking the dorsal profile of the mesosoma, the longest on the pronotum being only about 0.15 mm.

Head entirely smooth and shining, mesosoma smooth and shining with about 10 longitudinal, irregular rugulae on mesopleuron and sides of propodeum. Petiole entirely smooth and shiny. " Typhlatta " spots present; remainder of body mostly uniformly light to medium

AENICTUS



Figs. 15–20, *Aenictus* workers. 15, 16, *A. laeviceps*, syntype workers; 17, *A. laeviceps*, showing deviation from syntype (based on syntype worker of synonymous *A. breviceps*); 18, *A. alticolus*, syntype; 19, *A. luzoni* syntype from Ilocos Norte, Luzon; 20, *A. luzoni* worker from Horns of Negros, Los Negros.

reddish brown.

Related species: 14/15 level: *huonicus*, *laeviceps*, *luzoni*.

Aenictus aratus Forel Figs. 72, 73, 87.

Aenictus aratus Forel, 1900, Ann. Soc. Ent. Belg. **44**: 74, worker. Type locality: Mackay, Queensland, Australia.

Aenictus aitkenii Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 475, worker. Original localities: Kanara; Thana; Travancore; (all India). **New Synonymy.**

Aenictus (*Ae.*) *aratus* var. *asiatica* Forel, 1911, Rev. Suisse Zool. **19**: 453, worker. Type locality: Peradeniya, Ceylon. **New Synonymy.**

Eciton (*Aenictus*) *impressus* var. *levior* Karawajew, 1926, Treubia **8**: 425, worker. Type locality: Tifu, Buru, Moluccas. **New Synonymy.**

Eciton (*Aenictus*) *pachycerus impressus* var. *levior*: Karawajew, 1927, Mem. Acad. Sci. Ukraine **7**: 6, worker redescribed.

Aenictus (*Ae.*) *aratus* subsp. *nesiotus* Wheeler & Chapman, *In* Wheeler, 1930, J. New York Ent. Soc. **38**: 208, fig. 7a-d, worker. Type loc.: Dumaguete, Negroes, P. I. **New Synonymy.**

Aenictus (*Ae.*) *aratus nesiotus* var. *fraterculus* Wh. & Ch., 1930, J. New York Ent. Soc. **38**: 209, worker. Type locality: Dumaguete, Negros, P. I. **New Synonymy.**

DISTRIBUTION: W and NC India to Queensland, Australia.

Syntype: HW 0.74 mm, HL 0.83 mm, SL 0.74 mm. HW of 2 other syntypes examined 0.72–0.74 mm. Antenna 10-segmented. Mandibles typical, closely resembling those of *pachycerus* (*q. v.*). Clypeal teeth lacking, anterior clypeal border rounded and entire. Parafrontal ridges well developed, extending back about 0.3 mm or 1/2 length of head exclusive of mandibles; shape of ridges as in *pachycerus* and in *dentatus* (*q. v.*). Propodeum acutely angulate, but the angle points upward and does not strongly overhang the declivitous face. Pilosity everywhere abundant, hairs on pronotum up to 0.30 mm long.

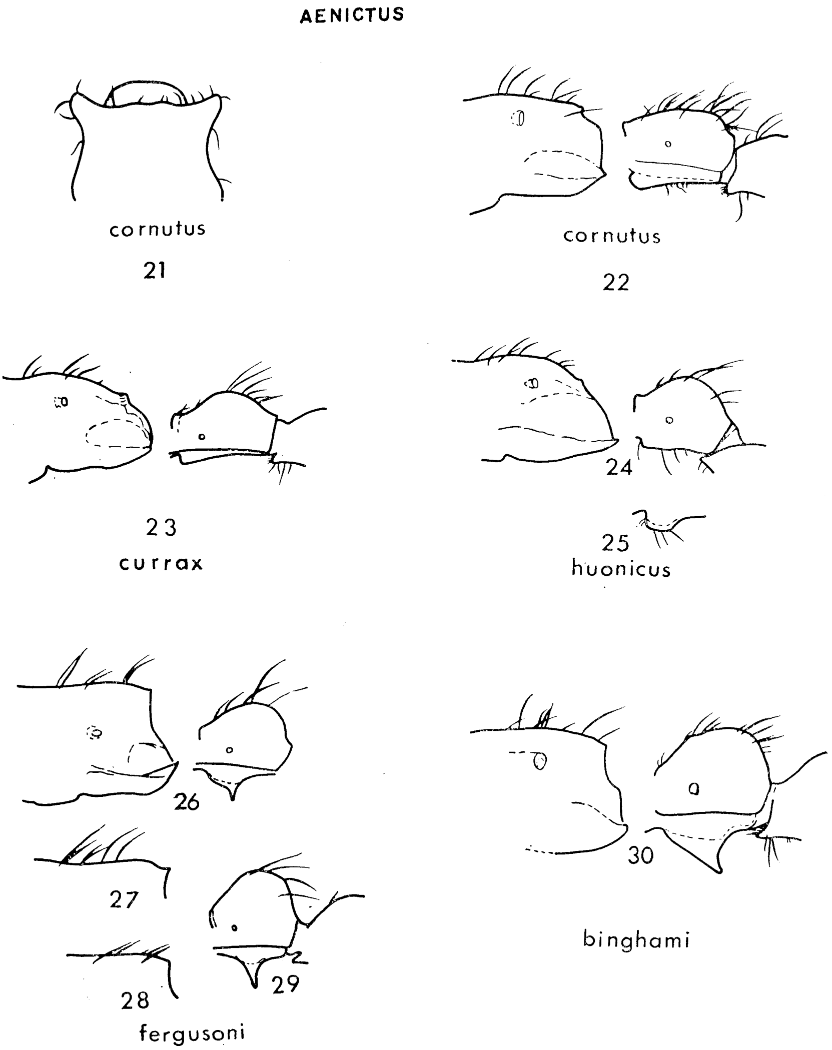
Head entirely microreticulate with reticular diameters about 0.01 mm, and opaque, except for anterior part of genae where the microreticulation is feeble and surface is feebly shiny. Mesosoma and pedicel similarly entirely microreticulate and opaque. In addition, entire mesosoma covered with low, broad, longitudinal rugae spaced 0.06–0.10 mm apart. Occiput, mesothorax and propodeum dark reddish brown; remainder of body medium reddish brown.

OTHER MATERIAL EXAMINED: INDIA: Kanara, 11 syntype workers of *aitkenii* Forel; Walajanagar, S. India, workers and ♂♂ associated (A. P. Nathan); Solon, 1400 m, nr Simla, Himachal Prad. (L. Weatherill). CEYLON: Peradeniya; 10 syntype workers of *aratus* var. *asiatica* Forel. PHILIPPINES: Horns of Negros, 450 m, Negros, syntypes of *aratus* subsp. *nesiotus* Wheeler & Chapman; Dumaguete City, 390–900 m, Negros, several colonies (T. C. Schneirla); Zamboanga Peninsula 600–1350 m, Mindanao (D. Empeso); Los Baños, Luzon (F. Williams); Laguna, 240–360 m, Los Baños Forest, Luzon (T. C. Schneirla). NEW GUINEA: Laulaunung-to-Kua River, 1000–1300 m, NE New Guinea (Wilson, acc. no. 797). QUEENSLAND: Mackay, 3 syntype workers of *aratus*. Considerable variation is shown in several characters which may or may not be geographic in nature. The propodeal angle ranges from an approximation of a simple right angle, as seen in the *aratus* syntypes, to thinly acute and sharply upturned as seen in the *aitkenii* syntypes. The subpetiolar lobe varies from prominent, as seen in both the *aratus* and *aitkenii* syntypes, to obsolescent, a condition characterizing the series from Walajanagar, India. The *aitkenii* types, from India, are larger in size than material from the remainder of the range, including other parts of India. Head width in this series varies between 0.87 and 0.93 mm. In other series it is consistently between 0.62 and 0.74 mm. The trend is for a gradual decrease in size from Queensland through New Guinea and the Philippines to Ceylon, with the Ceylon series (*asiatica* syntypes) having HW only 0.62–0.67 mm. The trend is then reversed in India, with the Walajanagar series measuring 0.80–0.82 mm and the Solon series measuring 0.71–

0.78 mm, *i. e.*, intermediate to the *aitkenii* types. Other, minor variation occurs in sculpturing, especially that of the head and mesosoma. The queen is represented in 2 series collected at Dumaguete, Philippine Is., by J. W. Chapman and Glicerio Alido respectively. Its distinctive morphological features are illustrated in fig. 87.

Related species: 14/15 level: *chapmani*, *dentatus*, *pachycerus*, *philiporum*, *silvestrii*.

Biology: My New Guinea series was collected in a shaded portion of midmountain rain forest, where workers were found running in files 1–3 workers wide during the early after-



Figs. 21–30, *Aenictus* workers. 21, 22, *A. cornutus*, Kuching, Borneo; 23, *A. currax*, Karema, SE New Guinea; 24, *A. huonicus* holotype; 25, *A. huonicus*, variant worker from holotype colony; 26–29, *A. fergusoni* syntypes, all from Travancore series; 30, *A. binghami* syntype.

noon. In the Philippines Chapman collected this species in forested areas under a brush pile and from an earthworm burrow.

T. C. Schneirla (*in litt.*) has provided the following biological notes gleaned from studies on Philippine *aratus* conducted in collaboration with A. Reyes and G. Alido:

"Dumaguete, 1100 ft., 3/23/61. 2 : 30 p.m, sunny, found colony just behind cottage under light cover. Clustered with a nearly mature worker larval brood below the humus 5 cm. below surface under an old log. A single raiding column was followed out 8 m., under cover of leaves all the way, then branched and was lost. Booty was mainly small ant brood. At 4 : 30 p. m. an emigration was under way, in a 1 cm.—wide column carrying larvae, following the raiding route and altogether under surface cover. Queen taken from widened column— [her abdomen was] contracted. Emigration then continued for two hours. A large colony comparing in size with *A. gracilis*. From the circumstances, in late nomadic phase.

" Los Baños forest, 800–1000 ft., 4/19/61., 9 : 30 a. m., sunny day but [colony in a well shaded area] on creek bank under medium cover. Clustered in chambers from 20 cm. down in humus between two buttressed roots of hardwood, with prepupal worker brood. Most of colony under rocks below 30 cm., hence got no trace of the main mass and the queen. No indications of raiding. When disturbed, the colony started a small column, brood-carrying mainly, downhill under the humus. From the circumstances, in early statary phase. "

On the basis of his extensive comparative work with other doryline species, including other *Aenictus*, Dr Schneirla concludes: " This species is more hypogaeic than surface—adapted, raiding and emigrating on the surface only under cover of leaves and rubble, raiding columns exposed only during the main development of the foray and then hardly ever except in dim light. Colonies judged at least as large as those of *A. gracilis*, as are the all-worker broods. The nomadic bivouacs are far more secluded than those of *A. gracilis.*" Dr Schneirla (still *in litt.*) also infers that the *aratus* life cycle is divided into alternating nomadic and statary phases in a fashion similar to that revealed in his well-known studies of the New World army ant genera *Eciton* and *Neivamyrmex.*

Aenictus artipus Wilson, n. sp. Fig. 60.

DISTRIBUTION: Type locality: Chiengmai, Thailand.

Holotype: HW 0.46 mm, HL 0.55 mm, SL 0.63 mm, SI 137. Closely resembling the syntypes of *wroughtoni* Forel (*q. v.*), but differing in the strikingly longer scapes. Also, the diameter of the propodeal spiracle is greater (about 0.06 mm maximum diameter); pedicel somewhat more elongate; pilosity somewhat sparser, especially on mesosoma; and certain areas of mesosoma weakly microreticulate (albeit still feebly shining), namely the dorsal 1/4 of mesopleuron, a narrow strip embracing propodeal-mesopleural junction and posterior 1/2 of the sides of propodeum.

Paratypes: 8 workers, evidently from the same colony as the holotype. HW 0.45–0.47 mm. Two workers chosen at random have the following measurements: HW 0.46 mm, HL 0.57 mm, SL 0.65 mm, SI 141; HW 0.45 mm, HL 0.58 mm, SL 0.64 mm, SI 142.

Related species: 14/16 level: ***biroi***, ***camposi***, ***powersi***, ***sagei***, ***wroughtoni***, (****furibundus***), (**mariae*), (**mentu*), (**rotundatus*), (**steindachneri*), (*2). African species indicated with an asterisk (*).

Aenictus binghami Forel Figs. 30, 84.

Aenictus Binghaniri [!] Forel, 1900, Ann. Soc. Ent. Belg. **44**: 76, worker. Original localities: Burma, Assam.—Bingham, 1903, Fauna Brit. Ind. Hym. **2**: 19, dist.

Aenictus (*Typhlatta*) *binghami* var. *gatesi* Wheeler, 1927, Psyche **34**: 42, worker. Type locality: Rangoon, Burma. **New Synonymy.**

DISTRIBUTION: Assam south to lower Burma (Tenasserim) and W. Thailand. Bingham (1903) records the species from Borneo, but this is doubtful.

Syntypes: Assam: HW 0.90 mm, HL 1.04 mm, SL 0.93 mm; a 2nd worker has HW 0.92 mm. Antenna 10-segmented. Mandibles typical in form, as illustrated by the related species *laeviceps* (*q.v.*). Clypeus convex, entire, and bearing distinct serial teeth. Parafrontal ridge lacking. Occiput nearly straight, lacking a well developed collar. Propodeum obtusely angulate. Subpetiolar process large, acute and directed posteriorly. Pilosity relatively sparse and short; maximum length of pronotal hairs only about 0.10 mm.

Head shining. Mesosoma entirely microreticulate, and opaque, except for 2 small symmetrically placed areas on pronotum which are feebly shining; reticular diameters on pronotum about 0.015 mm, elsewhere about 0.010 mm. In addition, mesosoma bearing a few longitudinal rugae. Petiole microreticulate (reticular diameters about 0.01 mm) and opaque; postpetiole mostly shining. Dark reddish brown; head bearing pale "Typhlatta spots."

OTHER MATERIAL EXAMINED. BURMA: Rangoon, syntypes of var. *gatesi* Wheeler. THAILAND: Pak Chong, nr Bangkok, tropical evergreen forest, workers with queen, 21.V.1961 (T. C. Schneirla). Worker in these 2 series differ from the *binghami* syntypes in having the pronotum entirely opaque. They are also somewhat smaller: Burma, HW 0.79–0.88 mm; Thailand: HW 0.81–0.85 mm. Certain distinguishing features of the Pak Chong queen are shown in fig. 84. This individual is remarkably large, with HW 2.4 mm. Body and antennal scapes concolorous blackish brown. Legs uniquely bicolorous: coxae and trochanters brownish yellow; basal halves of femora brownish yellow; tibiae blackish brown, changing to light reddish brown just at distal ends; and tarsi light reddish brown.

Related species: 14/16 level: *fergusoni*, *laeviceps*, *luzoni*.

Biology: Dr Schneirla (*in litt.*) described the colony he discovered at Pak Chong, Thailand, in his notes as follows: "In dry tropical evergreen forest with moderate sub-humus moisture, under moderate cover. A long column of *Aenictus* returns with booty (mainly brood and adults of various ant species) from two well separated caches on the south side of a forest trail, junction with another peripheral raiding 20 m. to the north. At 9 : 30 a. m., traffic is mainly outward on the latter branch. At 10 : 10 a. m. the entire north-south route has reversed its direction outward (to the south), with brood-carrying throughout its first half (and a minority of booty-carriers) from a large surface cluster under roots and dry leaves at the north-terminus. At 10 : 25 a. m. the entire line mainly carries brood, ending at one of the caches to the south, forming a cluster under leaves and rubble. At 10 : 50 a. m. the queen passed, contracted and running under her own power, near the head of a 2.5 m.—long entourage of workers, brood-laden except for the few cm. just behind her. Worker larvae plentiful, estimated to be 1/4 developed. Brood-carrying ended at 11 : 15 a. m., the emigration itself at 11 : 50 a. m."

" General behavior and circumstances very similar to those of a colony of *A. laeviceps* in the nomadic phase. "

Aenictus biroi Forel Fig. 75.

Aenictus Birõi Forel, 1907, Ann. Mus. Nat. Hung. **5**: 10, worker. Type locality: Pattipola, 2000 m, Ceylon.

DISTRIBUTION: Ceylon.

Syntype: HW 0.59 mm, HL 0.70 mm, SL 0.67 mm. Antenna 10-segmented. Mandible typical. Clypeus convex, entire, unarmed. Parafrontal ridge indistinct, only 0.15 mm long. Basal face of propodeum seen from side strongly convex. Propodeal junction right-angular. Subpetiolar process a low lobe located beneath anterior 1/2 of node. Pilosity relatively sparse and short; length of longest pronotal hairs only 0.10 mm.

Head shining. Mesopleuron and propodeum microreticulate and opaque; remainder of mesosoma shining. Pedicel shining.

Related species: 15/16 level: *punensis*, (**asperivalvus*), (*bidentatus*), (**weissi*). 14/16 level: *artipus*, *currax*, *powersi*, *peguensis*, *rabori*, (**asperivalvus*), (**bidentatus*), (**mariae*), (**mentu*), (**rotundatus*), (**steindachneri*), (**weissi*), (*2). African species marked with an asterisk (*).

Biology: The type colony was "in a bare area, [from] a very populous nest excavated in hard clay soil. "

Aenictus brevicornis (Mayr) Figs. 51–53.

Typhlatta brevicornis Mayr, 1878, Verh. Zool.—Bot. Ges. Wien **28**: 668, worker. Type locality: Calcutta, India.

Aenictus brevicornis: Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 466.

DISTRIBUTION: India: Assam and Agra south to Calcutta in the east and Calicut and Bangalore on the peninsula.

Lectotype (herein designated from a syntype in the collection of the Naturhistorisches Museum, Vienna). HW 0.53 mm, HL 0.60 mm, SL 0.35 mm, SI 66. Antenna 10-segmented. Mandible very narrow, bearing 3 large teeth; in closure, leaving a gap between its posterior border and the anterior clypeal border. Anterior clypeal border flat in the center, entire, armed with 7 well-developed teeth. Parafrontal ridge absent. Occiput convex, lacking collar. Propodeal faces seen in side view straight, approaching one another at an angle of about 100°; but their junction evenly rounded. Subpetiolar process a flat, forward-directed lobe surmounted by a subtriangular flange whose apex is posteriorly directed. Pilosity extremely abundant overall, more than in any other Indo-Australian member of the genus; length of the longest pronotal hairs about 0.20 mm.

Head shining. Mesopleuron, metapleuron, and propodeum microreticulate, opaque; remainder shining. Pedicel microreticulate overall; dorsa feebly shining, remainder opaque. Brownish yellow; head and alitrunk a shade darker than the rest.

Paratype: HW 0.51 mm, HL 0.60 mm, SL 0.35 mm, SI 69. Very similar to the lectotype, but differing greatly in the shape of the subpetiolar process: this structure is much smaller, and the ventral flange is directed anteriorly (fig. 53). This difference between the 2 syntypes examined induced me to designate a lectotype, on the chance that 2 species are represented in the original Mayr series.

Related species: 14/16 level: *piercei*, *sagei*, *wroughtoni*, (**furibundus*).

Aenictus camposi Wheeler and Chapman Fig. 63.

Aenictus camposi Wh. & Chap. 1925, Philippine J. Sci. **28**: 48, pl. 1, figs. 3, 4, worker. Type locality: Horns of Negros, 1200 m, Negros, P.I.—Wheeler, 1930, J. New York Ent. Soc. **38**: 209, fig. 6 a–d, redescr. of worker.

DISTRIBUTION: Negros and Luzon, Philippine Is.

Syntype: HW 0.43 mm, HL 0.58 mm, SL 0.59 mm. Antenna 10-segmented. Mandible typical in form. Clypeus feebly convex, entire, dentate. Parafrontal ridge distinct but only 0.1 mm long. Propodeal junction acutely angulate. Subpetiolar process a low, right-angular lobe projecting anteriorly. Pilosity overall sparse, longest pronotal hairs only about 0.10 mm long.

Head smooth and shining. Mesosoma smooth and shining except for mesopleuron and propodeum, which are microreticulate and feebly shining. Also, there are short longitudinal rugae distributed along the propodeal junction. Concolorous clear yellow.

OTHER MATERIAL EXAMINED. PHILIPPINES: Horns of Negros, 450–1080 m, Negros (J. C. Chapman); Mt Makiling, Luzon (Chapman). Chapman (*in litt.*) also records workers from the Manapla Mts, 180 m, Negros; and Los Baños, Luzon. HW varies 0.42–0.44 mm; and there is little variation in other characters.

Related species: 14/16 level: *artipus*, *piercei*, *rabori*, *reyesi*, *silvestrii*.

Biology: The type series was collected from a bivouac beneath the bark of a fallen tree.

Aenictus ceylonicus (Mayr) Figs. 31, 32, 37–44, 85.

Typhlatta ceylonica Mayr, 1866, Sitzungsb. K. Akad. Wien **53**: 22, worker. Type locality: Ceylon.—Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 477, dist.—Bingham, 1903, Fauna Brit. Ind. Hym. **2**: 22, dist.

Aenictus ceylonicus var. *latro* Forel, 1900, J. Bombay Nat. Hist. **13**: 466 (key), worker. Type locality: Poona, India. **New Synonymy.**

Aenictus Turneri Forel, 1900, Ann. Soc. Ent. Belg. **44**: 75, worker. Type locality: Mackay, Queensland, Australia. **New Synonymy.**

Aenictus Ceylonicus var. *formosensis* Forel, 1913, Arch. Naturg. (A) **6**: 188, worker. Type locality: Taihorin, Taiwan. **New Synonymy.**

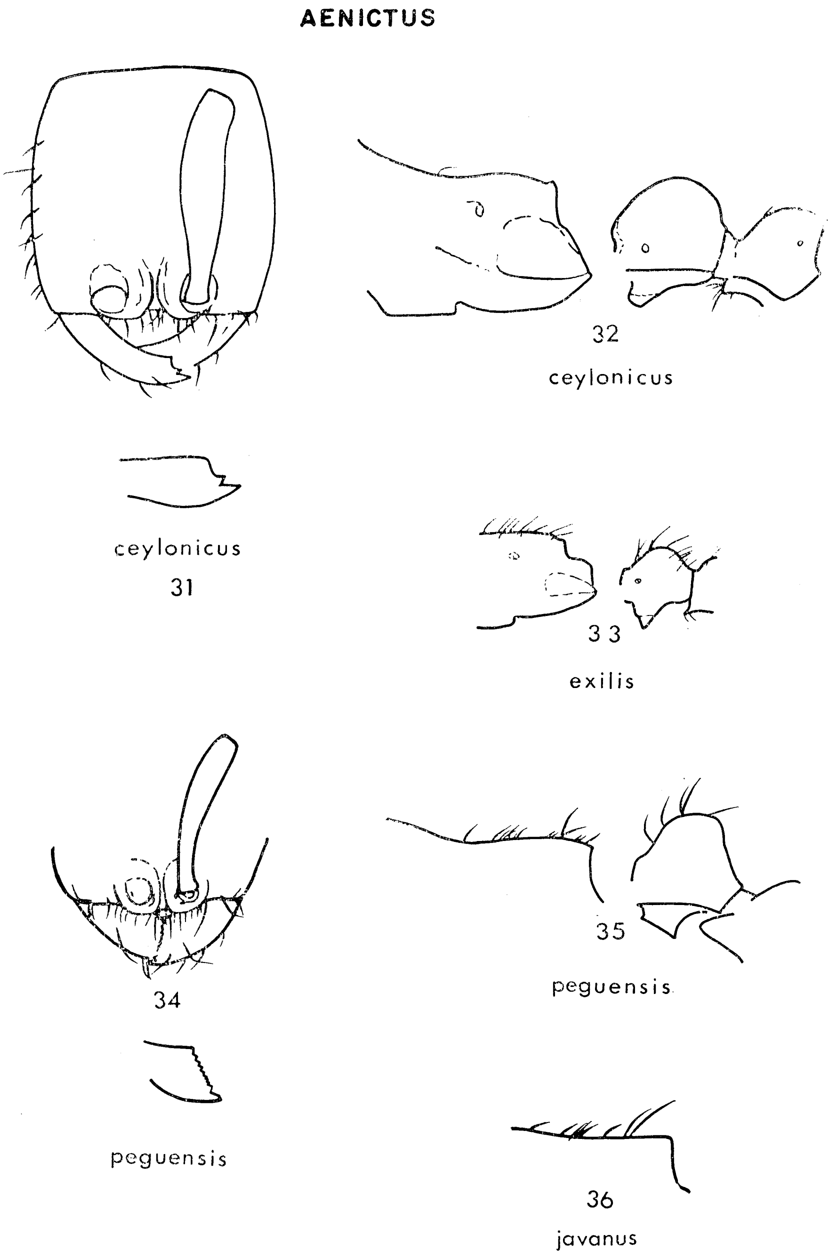
Eciton (*Aenictus*) *ceylonicus* subsp. *orientalis* Karawajew, 1926, Treubia **8**: 423, fig. 2, worker. Type locality: Wammar I., Aru. **New Synonymy.**

Aenictus exiguus Clark, 1934, Mem. Nat. Mus. Victoria **8**: 21, pl. II, fig. 1, worker. Type locality: Cairns Dist., N. Queensland, Australia. Synonymy under *A. turneri* Forel by Brown, 1957, Psyche **64**: 5.

Aenictus papuanus Donisthorpe, 1941, Ann. Mag. Nat. Hist. ser. 11, **7**: 129, worker. Type locality: Mafulu, 1220 m, Wharton Range, Papua. **New Synonymy.**

Aenictus similis Don., 1948, Ann. Mag. Nat. Hist. ser. 12, **1**: 131, worker. Type locality: West New Guinea. **New Synonymy.**

DISTRIBUTION: Ceylon and India, as far north as Agra; Taiwan; Borneo; Philippine Is.; New Guinea and Aru; Australia as far south as northern New South Wales. This is



Figs. 31–36, *Aenictus* workers. 31, 32, *A. ceylonicus* syntype; 33, *A. exilis* holotype; 34, 35, *A. peguensis*, Pegu, Burma (possibly from type colony); 36, *A. javanus*, Bogor (Buitenzorg), Java.

the most widely dispersed army ant in the Indo-Australian area. On Java it is replaced by the related *A. javanus*, which may prove (if and when geographically intermediate series are collected) to be a geographical variant.

Syntypes: HW 0.62 mm, HL 0.62 mm, SL 0.50 mm; HW 0.54 mm, HL 0.60 mm, SL 0.44 mm. Antenna 10-segmented. Mandible narrow, bearing 1 large apical and 1 large preapical tooth; the basal portion right-angulate, which can be interpreted as a 3rd "basal" tooth. When mandibles are closed there remains a gap between their posterior borders and center of anterior clypeal border almost as wide as maximum width of mandible. Clypeus emarginate, not armed. Parafrontal ridge rudimentary. Occiput very feebly convex, lacking a collar. Propodeal junction surmounted by low, rounded, transverse ridge, which in side view appears as a "rounded" right angle. Subpetiolar process a long, thin, evenly rounded lobe which projects anteriorly. Pilosity abundant and relatively long; length of longest hairs on pronotum about 0.16 mm.

Head entirely shining. Pronotum shining. Mesothorax and propodeum bearing 15–20 longitudinal rugae, their interspaces weakly microreticulate and feebly shining. Sides of petiole and postpetiole microreticulate and subopaque, their tops shining. Concolorous clear yellow.

OTHER MATERIAL EXAMINED: INDIA: Kanara (Bell); Poona, syntypes of var. *latro* Forel; Solon, 1430 m, nr Simla (L. Weatherill). TAIWAN: Taihoku (R. Takahashi). N. BORNEO: (E. Mjöberg). PHILIPPINES: Horns of Negros, 450 and 1080 m (J. W. Chapman); Manapla Mts, Occidental Negros, Chapman *in litt.* NW NEW GUINEA: Maffin Bay, syntypes of *similis* Donisthorpe. NE NEW GUINEA: lower Busu River, Huon Pen. (Wilson, acc. no. 1030); Gemeheng, 1200–1300 m, Mongi Watershed, Huon Pen. (Wilson acc. no. 774); Nganduo, 1000 m, Mongi Watershed (Wilson, acc. no. 800); Boana to Bandong, 800–1300 m, Bunbok Valley (Wilson, acc. no. 1123). SE NEW GUINEA: Mafulu, 1220 m, syntypes of *papuanus* Donisthorpe. ARU: Wammar, syntypes of *orientalis* Karawajew. QUEENSLAND: Mackay, syntypes of *turneri*; vicinity of Cardwell, 600–900 m, Kirrama Range, eucalypt forest (P. F. Darlington); Ravenshoe, 900 m, Atherton Tableland (P. J. Darlington); Kuranda, Atherton Tableland (W. M. Wheeler); Cedar Creek, Tamborine Mt, eucalypt forest, workers and queen (W. L. Brown); Babinda, Boulders Park, disturbed rain forest (R. W. Taylor, acc. no. 1551). NEW SOUTH WALES: Lismore, syntypes of *deuqueti* Crawley. A single ♂ collected at Darwin, Northern Territory, by W. L. Brown on 9. VII. 1951, has been tentatively identified as this species. At the least, it represents a most significant westward extension of the range of the genus (and subfamily Dorylinae) in Australia.

Geographic variation is extensive and complicated. Workers from India and Ceylon have the meso- and metapleura and propodeum densely longitudinally rugose, with interspaces feebly microreticulate and feebly shining to subopaque. Bornean specimens are closely similar but with somewhat fewer rugae overall. Those from Taiwan have only 1 or 2 rugae, located on the metapleuron. In Philippine, Papuan, and Australian specimens, the rugae are sparse or lacking on the propodeal dorsum. Thus in the character there is a more or less gradual reduction along the India-Australia axis but a radical reduction in the isolated Taiwan population.

A second geographically variable character is the extent of microreticulation on the pedicel. Material from India, Borneo, Philippines and mainland New Guinea have the dorsal surface smooth and shining. Taiwan specimens are again divergent, being wholly opaque. Aru workers have the petiolar dorsum opaque and the postpetiolar dorsum shining. Australian series vary irregularly among themselves from the Indian to the Aru condition. Thus, overall, there is a tendency for increased microreticulation in the peripheral populations on Taiwan, Aru, and Australia.

As shown in figs. 37–44, the shapes of the propodeum and petiole, including especially the subpetiolar process, show striking geographic variation, as well as a considerable but lesser degree of intrademe and intranidal variation. This is "chaotic" geographic variation, showing no overall strong trend as is the case in sculpturing.

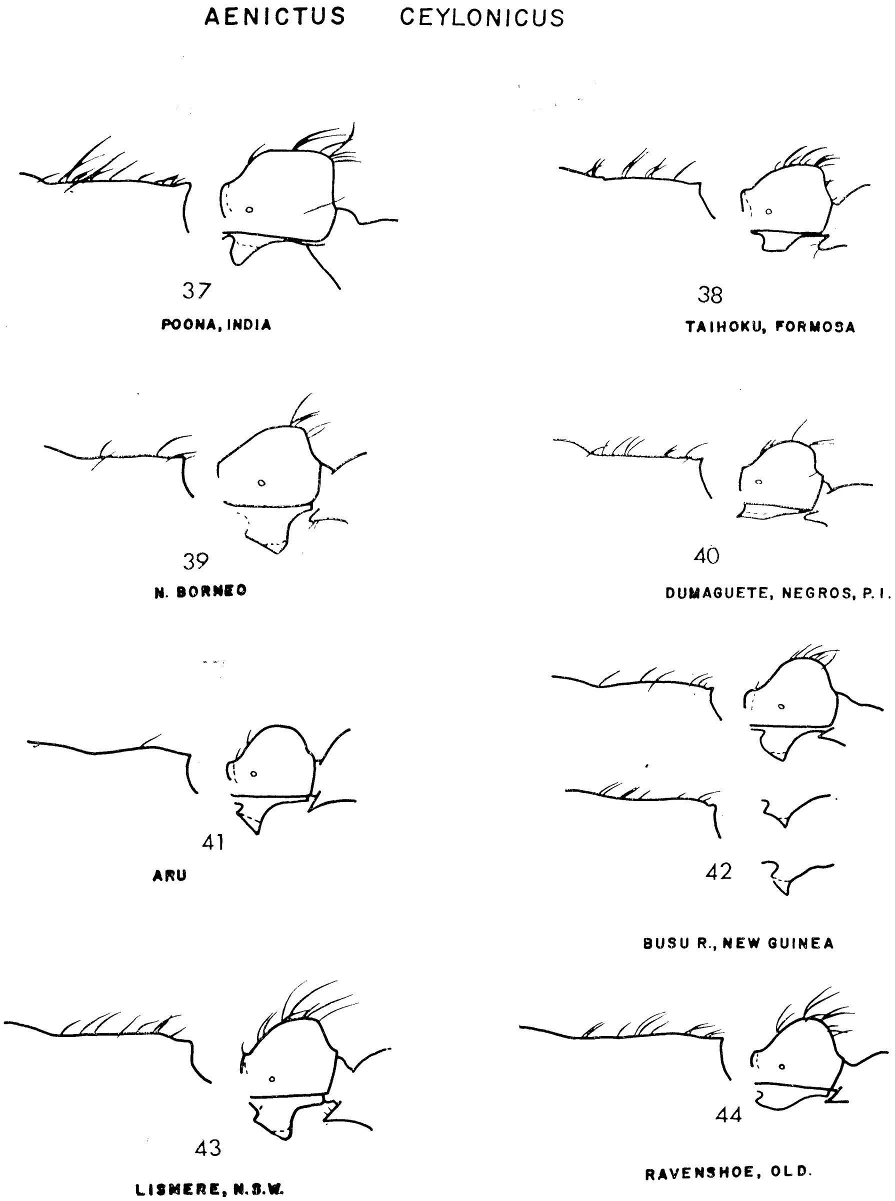
The queen associated with the Tambourine Mountain series is morphologically very distinct from the same caste known from other species, as shown in fig. 85. The HW is only 1.3 mm. The color pattern is also noteworthy. Most of the body is clear yellow, as in the worker. But the gaster is strikingly marked: the 1st segment has a uniform median band 0.3 mm in width and dark brown in color; the next 3 segments have patches of the same color, triangular in shape; each triangular patch has its base, which is about 0.8 mm wide, positioned on the anterior scleritic margin and its apex touching the posterior margin.

Related species: 14/16 level: *exilis*, *javanus*, (**eugenii*).

Biology: *Ceylonicus* occurs in a variety of habitats over a wide range of elevation. In Australia it has been found in both eucalyptus forest and disturbed rain forest. On Aru Karawajew (1926) collected it in lowland rain forest. On New Guinea I found it in both intact and disturbed midmountain rain forest on the Huon Peninsula. It is clearly a relatively abundant ant in the mountain forests of New Guinea.

At 3 localties in New Guinea (Boana, Busu, Gemeheng) workers were found running in files over the ground. All were encountered on sunny days, 9–11 a.m. My subjective impression was that the files, although coursing both over and beneath leaf litter, tended to remain under cover more than other New Guinea species encountered. Of course, my experience is too limited to allow a firm generalization. R. W. Taylor's Queensland series was taken from columns running under a log. My Boana colony was carrying brood consisting apparently entirely of mature larvae. Thus, the brood cycle is probably well marked, as T. C. Schneirla has shown for *A. binghami*, *A. gracilis*, and *A. laeviceps*.

Dr W. L. Brown has supplied me with the following note on his Australian collection: "A flourishing bivouac was found in a rotten log in open second-growth forest below Joalah National Park, along Cedar Creek on Tambourine Mountain, southeastern Queensland. The nest contained many thousands of workers and second or third instar larvae, the latter all of about the same size. The single queen found was damaged slightly in opening the nest, but she seemed quite clearly to have her gaster in the contracted state. These conditions ... would seem to apply to a colony during the middle of the nomadic phase. This collection was made during an interval of light rain between heavy downpours, the rainy season having begun somewhat early on Tambourine Mountain in this year (November 14, 1950). Although the collection was made in the early afternoon of a day, no workers were seen outside the nest..." Dr Brown goes on to suggest that the last observation might indicate nocturnal foraging habit. However, my own notes on foraging in New Guinea colonies (*vide supra*) suggest that it was either too late in the day or else the rain inhibited the Tambourine Mountain colony. R. H. Crozier (*in litt.*) observed *ceylonicus* workers raiding a colony of *Pheidole concinna* Wheeler at Saigon, Vietnam.



Figs. 37-44. Geographic variation in propodeal and petiolar outlines in *Aenictus ceylonicus* workers.

Aenictus chapmani Wilson, n. sp. Figs. 45, 46.

DISTRIBUTION: Known only from the type series: Zingzingu, 1200 m, Mongi Watershed, Huon Peninsula, NE New Guinea. This species is named for the late Dr J. W. Chapman, in recognition of his pioneering taxonomic and ecological studies of Philippine army ants.

Holotype: HW 0.72 mm, HL 0.76 mm, SL 0.70 mm. Antenna 10-segmented. Mandible somewhat narrower with reference to the head than in the "typical" form (e. g., in *laeviceps* and *pachycerus*), its maximum width 0.16 mm; indistinctly 3-toothed. In closure the mandibles leave a gap between their posterior margins and the clypeus of about 0.02 mm. Anterior clypeal border very feebly concave, unarmed. Parafrontal ridge 0.10 mm long, in side view prosalient as a narrow, irregular lobe. Occiput almost perfectly straight, lacking a collar. Posterior surface of petiolar node drawn into a low, obtuse angle. Main portion of subpetiolar process large, lobose, anteriorly directed; surmounted by a thin, acute flange which is posteriorly directed. Pilosity abundant; pronotal hairs up to 0.20 mm in length.

Head shining. Mesosoma almost entirely microreticulate (reticular diameter 0.01 mm) and opaque. Microreticulum on mesonotum weakly developed, the surface only subopaque. In addition the meso-, metathorax, and propodeum bear about 25 longitudinal rugae. Pedicel wholly microreticulate and opaque. Head, alitrunk, and pedicel rich medium reddish brown; gaster and appendages a contrasting light reddish brown.

Paratypes: 7 workers from same nest series show little deviation from holotype. HW 0.70–0.77 mm. One paratype chosen at random: HW 0.73 mm, HL 0.76 mm, SL 0.71 mm. Mandibles range from distinctly 3-toothed to distinctly 4-toothed, with intermediate development of the 4th tooth as 1 or 2 denticles between the preapical basal teeth.

Related species: 14/16 level: *aratus*. 13/16 level: *binghami*, *dentatus*, *fergusoni*, *pachycerus*, *philiporum*, *punensis*, *reyesi*, *silvestrii*, (**congolensis*).

Biology: Several scattered files of workers were found crossing a native trail in second-growth forest during the early part of the night.

Aenictus cornutus Forel Figs. 21, 22.

Aenictus cornutus Forel, 1900, Ann. Soc. Ent. Belg. **44**: 75, worker. Type locality: Sarawak, Borneo.

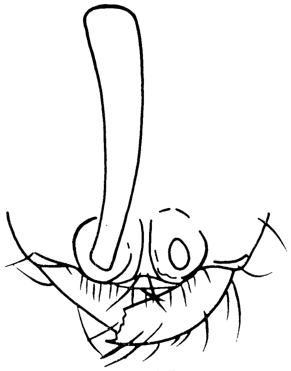
DISTRIBUTION: Borneo.

Worker: HW 0.74 mm, HL 0.81 mm, SL 0.84 mm. Antenna 10-segmented. Mandible typical. Clypeus convex, unarmed. Parafrontal ridge distinct but only 0.18 mm long. Cephalic collar well developed, as shown in *dentatus* Forel (*q. v.*). Pronotum armed with large bilateral horn-like protuberances, a unique character within the genus. Propodeal junction right-angulate. Petiolar node exceptionally low; subpetiolar process a low, evenly rounded lobe that projects forward. Pilosity abundant and long; mesosomal hairs mostly 0.15–0.20 mm long, a few on pronotum as long as 0.35 mm.

Head shining. Pronotum and mesonotum shining, except for a 0.3 mm-wide strip posterior to anterior pronotal margin and pronotal horns which is microreticulate (reticular diameters 0.01 mm) and opaque. Remainder of mesosoma longitudinally rugose, interspaces microreticulate and subopaque. Pedicel similarly microreticulate and opaque. Concolorous dark reddish brown, with reduced yellowish " Typhlatta " spots on occipital corners; diameters of spots only about 0.07 mm.

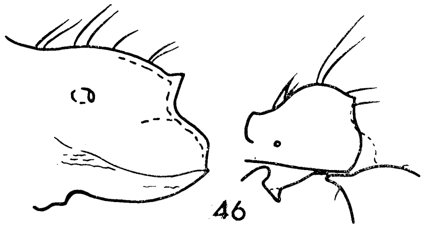
MATERIAL EXAMINED: SARAWAK: Kuching (J. Hewitt).

AENICTUS



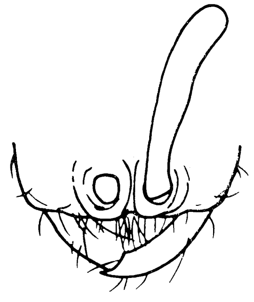
45

chapmani



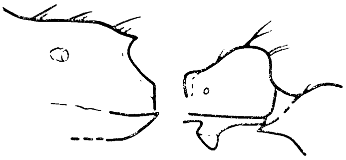
46

chapmani



47

nganduensis



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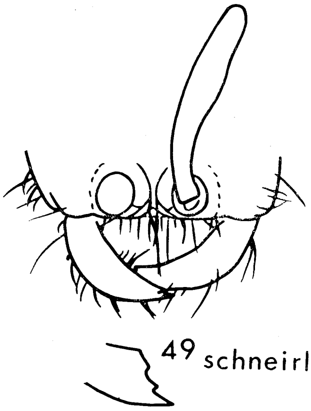
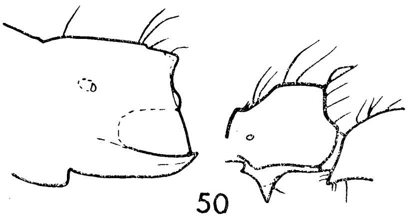


49 schneirlai



50

schneirlai

Figs. 45–50, *Aenictus* workers. 45, 46, *A. chapmani* holotype; 47, 48, *A. nganduensis* holotype; 49, 50, *A. schneirlai* holotype.

Related species: 14/16 level: none. 13/16 level: *luzoni*. 12/16 level: *alticolus, currax, huonicus.*

Aenictus currax Emery Figs. 23, 86.

Aenictus currax Emery, 1900, Természetr. Füz. **13**: 310, worker. Type locality: Erima, Astrolabe Bay, NE New Guinea.

DISTRIBUTION: E New Guinea.

Worker: A worker from Karema, compared earlier with a syntype, measured HW 0.67 mm, HL 0.81 mm, SL 0.67 mm. Other workers in this series had HW 0.64–0.69 mm. Antenna 10-segmented. Mandibles approaching typical form but slightly modified: the apical, preapical, and basal teeth are well developed, but the teeth intervening between the preapical and basal are reduced to 2–4 denticles. Thus, *currax* exhibits a condition intermediate between the "typical" and 3- or 4-toothed condition. The mandibles are noticeably narrowed. Clypeus convex and unarmed, but the dorsal surface of the anterior margin (not the anterior border itself) is crenulate, suggesting an approach to (or regression from) the dentate condition. Parafrontal ridge indistinct but about 0.25 mm long. Occiput feebly convex, lacking well-marked collar. Propodeal junction obtusely angulate. Subpetiolar process reduced to a low, right-angular projection that is directed forward. Pilosity moderately abundant; hairs on pronotum 0.10–0.15 mm long.

Head shining. Pronotum and mesonotum shining; mesopleuron irregularly microreticulate (reticular diameters mostly 0.01 mm); propodeum bearing scattered, thin, straight rugae, whose interspaces are shining. Petiole microreticulate and subopaque; postpetiole shining. Brownish yellow overall; except for dark brown median occipital spot flanked by large, light yellow "Typhlatta" spots occupying the occipital corners.

MATERIAL EXAMINED. NE NEW GUINEA: Erima, Astrolabe Bay, syntype. SE NEW GUINEA: Karema, Brown R., nr Port Moresby, workers and queen (Wilson, acc. no. 562). Like other known *Aenictus* queens, the *currax* queen is very distinctive morphologically, as shown in fig. 86. Her head width is 2.05 mm. Her color is light reddish brown (hence, a shade darker than the workers), with narrow, yellow Typhlatta spots and the median strip of the 1st gastric segment and most of the dorsal surface of the rest of the gaster blackish brown.

Related species: 14/16 level: *camposi, huonicus, punensis.*

Biology: The Karema colony was found on the morning of March 9 or 10, 1955, on the open floor of virgin lowland rain forest. It consisted of a packed mass of workers, which must have numbered at least 100,000, collected around the base of a small spiny palm tree. The mass extended up the trunk to about 1 m. The colony was apparently entirely above ground. When it was knocked onto a ground cloth and scattered, the queen and brood were easily collected. The colony was evidently in the nomadic phase. The queen's abdomen was not enlarged, *i. e.*, the gastric sclerites overlapped; and the brood consisted mostly of mature larvae, nearly as long as a worker, together with a few smaller larvae and prepupae. Although no raids were being conducted at time, the workers were carrying bodies of adult workers and ♂♂ of an unidentified species of *Crematogaster*. The *currax* workers were not at all aggressive when disturbed. They dispersed rapidly over the forest floor and rarely attempted to sting my hands as I handled them.

Aenictus dentatus Forel, new status Figs. 69–71.

Aenictus Aitkeni var. *dentata* Forel, 1911, Bull. Soc. Vaud. Sci. Nat. (Lausanne) **47**: 383, worker. Original localities: Berhentian Tingi and Nigri Sembilan, Malacca, Malaya; 1913, Zool. Jahrb. **36**: 20, dist.

DISTRIBUTION: India, Malaya, Borneo.

Worker: Kuching: HW 0.76 mm, HL 0.92 mm, SL 1.09 mm. Other workers in this series have HW 0.78–0.81 mm. Bombay: HW 0.87 mm, HL 1.03 mm, SL 1.09 mm. Other workers in this series have HW 0.87–0.88 mm. Antenna 10-segmented. Mandibles typical. Clypeus convex, entire, unarmed. Parafrontal ridge prominent, about 0.5 mm long; prosalient and acutely angular in side view. Occiput convex, with a large, well demarcated collar. Propodeal junction developed into a high, thin transverse ridge which in side view appears as a large, acute "tooth" overhanging the declivitous face. Subpetiolar process a low, irregularly shaped lobe directed downward. Pilosity abundant and long; hairs on pronotum as long as 0.30 mm.

Head, mesosoma, and pedicel entirely microreticulate (reticular diameters about 0.01 mm) and opaque in Kuching series; in the Bombay series, a small area on the gena is feebly shining. In addition, lateral mesosomal surface bearing several longitudinal rugae, 5–6 in the Kuching series and about 10 in the Bombay series. Medium reddish brown overall, except for occiput, which is a somewhat contrasting dark reddish brown.

MATERIAL EXAMINED: INDIA: Bombay. SARAWAK: Kuching (Harrison Smith).

Related species: 14/16 level: *aratus*, *pachycerus*, *philiporum*, *silvestrii*.

Aenictus doryloides Wilson, n. sp. Figs. 54, 55.

DISTRIBUTION: Type locality: Solon, 1400 m, nr Simla, NC India, 8. VIII. 1944 (L. Weatherill, acc. no. 9).

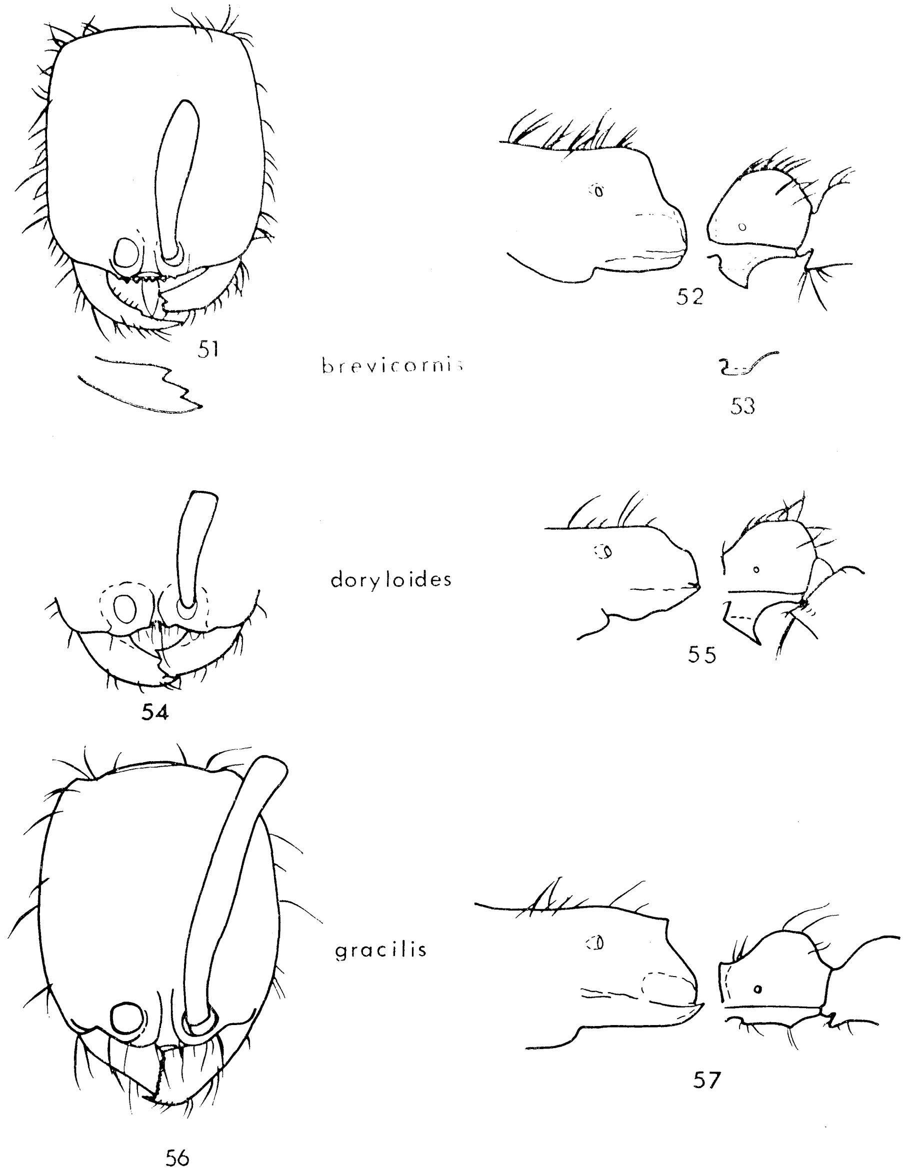
Holotype: HW 0.57 mm, HL 0.59 mm, SL 0.35 mm. Antenna 10-segmented, its scape both very short and incrassate. Mandibles narrow, strongly incurved, 3-toothed; in closure leaving a gap between their posterior borders and anterior clypeal border nearly as wide as their maximum width. Clypeus strongly emarginate, unarmed. The conformation of the anterior part of the head is, in fact, strongly reminiscent of some species of *Dorylus*, hence the name proposed here. Parafrontal ridge absent. Occiput straight, lacking a collar. Propodeal junction smoothly rounded. Subpetiolar process large, consisting of a rectangular base, which is forward-projecting, surmounted by a thin, acute, posteriorly directed flange. Pilosity moderately abundant, the length of the longest pronotal hairs about 0.15 mm.

Head shining. Dorsa of pronotum and mesonotum shining. Sides of pronotum feebly microreticulate (reticular diameters about 0.01 mm) and feebly shining. Remainder of mesosoma more strongly microreticulate (*i. e.*, reticulum more raised) and opaque. Dorsum of postpetiole shining; remainder of pedicel microreticulate and opaque. Concolorous light reddish brown.

Paratypes: 2 workers, HW 0.54 and 0.56 mm, differing little from holotype.

Related species: 14/16 level: *javanus*, *piercei*.

AENICTUS



Figs. 51–57, *Aenictus* workers. 51, 52, *A. brevicornis* lectotype; 53, *A. brevicornis* paratype, subpetiolar process; 54, 55, *A. doryloides* holotype; 56, 57, *A. gracilis*, drawn from syntype of the synonymous *A. martini.*

Aenictus exilis Wilson, n. sp. Fig. 33.

DISTRIBUTION: E. New Guinea. Type locality: Karema, Brown, R., nr Port Moresby, SE New Guinea, 8.III.1955 (Wilson, acc. no. 569).

Holotype: HW 0.40 mm, HL 0.48 mm, SL 0.31 mm. Antenna 10-segmented. Very similar to workers from sympatric series of *ceylonicus* (Mayr), differing chiefly in its smaller size, lighter coloration, and weaker sculpturing. (The name *exilis* means weak or feeble and refers to these characteristics). Mandibles thin and 4-toothed, as in *ceylonicus*. Cephalic structure as in *ceylonicus*. Propodeum angulate. Subpetiolar process large, consisting of a forward-directed lobe surmounted by a thin, acutely angulate flange which is directed straight downward. Pilosity moderately abundant; the length of the longest pronotal hairs only about 0.10 mm.

Head shining. Pronotum shining. Propodeal dorsum very weakly microreticulate, feebly shining. Meso-, metapleuron, and sides of propodeum longitudinally rugose, the interspaces weakly microreticulate and subopaque to feebly shining. Dorsa and most of sides of pedicel shining, the remainder weakly microreticulate and subopaque. Concolorus light brownish yellow.

Paratypes: 9 workers from same colony as holotype. Also, 2 workers from lower Busu River, Huon Peninsula, NE New Guinea, 14.V.1955 (Wilson, acc. no. 1052). HW of Karema workers 0.38–0.41 mm, of Busu River workers 0.37, 0.42 mm. The Busu River workers differ from holotype nest series in having propodeal dorsum strongly shining.

Related species: 14/16 level: *ceylonicus*, *javanus*, (**eugenii*).

Biology: The Karema workers were found running in a very diffuse single file over the top of the ground and under leaf litter in a small, recently made clearing at the edge of virgin lowland rain forest. The time was noon of a sunny day (note that 3 colonies of the closely related *ceylonicus* were found foraging in New Guinea between 9 and 11 in sunny mornings, or, in other words, at nearly the same time and under similar condition). The file was very inconspicuous and could not be traced more than a few feet. The Busu River workers were collected in a soil-litter berlesate from the floor of virgin lowland rain forest, in close company with such distinctive Papuan ant species as *Dacetinops cibdela*, *Strumigenys mayri*, *Eurhopalothrix biroi*, and *E. brevicornis*.

Aenictus fergusoni Forel Figs. 26–29.

Aenictus fergusoni Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 473, worker. Type locality: Tranvancore, India; 1903, Rev. Suisse Zool. **11**: 401, dist.; 1913, Zool. Jahrb. **36**: 20, dist.

Aenictus fergusoni var. *piltzi* Forel, 1900, *l. c.*, 474, worker. Original localities: Kanara and Surat Dist., India. **New Synonymy.**

Aenictus fergusoni var *hodgsoni* Forel, 1900, *l.c.*, worker. Type locality: Moulmain, Burma. **New Synonymy.**

Aenictus fergusoni var. *montanus* Forel, 1900, *l.c.*, worker. Type locality. Darjeeling, 900–2400 m, India. **New Synonymy.**

Aenictus fergusoni var. *karawajewi* Wheeler & Chapman, *In* Wheeler, 1930, J. New York Ent. Soc. **38**: 199, key, worker. (No further data). **New Synonymy.**

DISTRIBUTION: India, from the extreme south north to Darjeeling and Assam, thence

SE to Burma and Java. This species is also most unusual in that it has been recorded from Great Nicobar I., which is over 160 km from the nearest large land mass (Sumatra).

Syntypes: HW 0.67 mm, HL 0.76 mm, SL 0.72 mm; other HW's in this series 0.63–0.72 mm. Antenna 10-segmented. Mandibles typical. Clypeus feebly convex, entire, armed with about 12 teeth. Parafrontal ridge very short, only 0.08 mm. Occiput convex, lacking distinct collar. Propodeal junction approximately right-angulate. Subpetiolar process a rounded lobe surmounted by a thin, downward-projecting flange. Pilosity moderately abundant, long; length of longest pronotal hairs 0.25 mm.

Head shining. Pronotum shining; remainder of mesosoma microreticulate and opaque, with traces of a few longitudinal rugae. Pedicel wholly shining except for the shagreened and subopaque peduncles. Head bearing yellow "Typhlatta spots"; otherwise head and mesosoma dark reddish brown. Pedicel and gaster somewhat lighter, medium reddish brown.

OTHER MATERIAL EXAMINED: INDIA: Kanara, var. *piltzi* syntypes; Nedungadu, Tanjore, Madras (P. S. Nathan); Darjeeling, 900–2400 m, var. *montanus* syntypes; Misamari, Assam (A. C. Cole). BURMA: var. *hodgsoni* syntypes. The syntypes of var. *piltzi* were stated by Forel to be smaller than those of *fergusoni s. s.*; this is not true, since their HW ranges 0.65–0.69 mm. The syntypes of var. *hodgsoni* are also closely similar in size: HW 0.63–0.67 mm. But those of var. *montanus* are somewhat larger: HW 0.74–0.78 mm. The var. *hodgsoni* syntypes differ from the other series, as pointed out by Forel, by having the propodeal junction more rounded (although the condition is approached by some of the *fergusoni* syntypes) and the anterior 1/2 of the metapleura and sides of propodeum shining. I have considered these differences most likely to be geographical variation rather than real specific characters. The forms of the propodeal junction of subpetiolar process vary greatly within and between nest series, as shown in figs. 26–29.

Related species: 14/16 level: *binghami*, *laeviceps*, *luzoni*.

Aenictus gracilis Emery Figs. 56, 57, 89.

Aenictus (*Typhlatta*) *gracilis* Emery, 1893, Rev. Suisse Zool. **1**: 187, pl. 8, fig. 1, worker. Type locality: Sarawak.—Bingham, 1903, Fauna Brit. Ind. Hym. **2**: 17, dist.—Forel, 1913, Zool. Jahrb. **36**: 20, dist.—Wheeler, 1930, J. New York Ent. Soc. **38**: 203, fig. 4, worker, queen, biology, dist.

Aenictus martini Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 473, worker. Original localities: Pahang and Perak, Malacca, Malaya; Moulmein, Burma. **New Synonymy.**

Aenictus martini var. *boelianensis* Forel, 1913, Zool. Jahrb. (Syst.) **36**: 20, worker. Original localities: Bah Boelian and Bah Soemboe, Sumatra. **New Synonymy.**

Eciton (*Aenictus*) *fergussoni* [!] subsp. *elongata* [!] Karawajew, 1926, Treubia **8**: 424, fig. 3, worker. Type locality: Ramboda, Ceylon. **New Synonymy.**

DISTRIBUTION: Ceylon; (not yet recorded from India); upper Burma south to Sumatra, Borneo, and Philippines.

Syntype: HW 0.64 mm, HL 0.75 mm, SL 0.78 mm. Antenna 10-segmented. Mandible typical. Clypeus convex, entire, unarmed. Parafrontal ridge about 0.15 mm long. Occiput convex, lacking well developed collar, bearing on each corner a low, rounded, but distinct protuberance which gives the head a unique "horned" appearance. Propodeal junction bearing a right-angulate ridge. Subpetiolar process a very low, flattened lobe barely distinguishable from main body of petiole. Pilosity moderately abundant, long. Several hairs on the pronotum as much as 0.40 mm long.

Head shining. Pronotum and mesonotum shining. Mesopleuron and propodeum microreticulate (reticular diameters about 0.01 mm) and opaque. In addition, the propodeum bears several thin, straight, longitudinal rugae. Peduncles of pedicel and sides of petiole irregularly microreticulate, subopaque; remainder of pedicel shining. Medium to dark reddish brown with small "Typhlatta spots" on occiput.

OTHER MATERIAL EXAMINED: MALAYA: Malacca, syntypes of *martini* Forel. SUMATRA: Bah Boelian, syntypes of *martini* var. *boelianensis* Forel. PHILIPPINES: Dumaguete City, 390–900 m, Negros, tropical evergreen forest, numerous series from colonies studied in the field by T. C. Schneirla & A. Reyes; Horns of Negros, 300–1350 m, numerous collections (Chapman, Del Rosario, & Empeso); Lake Region, Occ. Negros, 300–1140 m, (Chapman); Fabrica, Occ. Negros (Chapman & Del Rosario); Davao, Mindanao (A. Reyes); Ginoog, Misamis, Mindanao (Reyes); Malibalay, Bukidon, Mindanao (Empeso). Chapman (*in litt.*) has also recorded *gracilis* from Los Baños, Luzon. Syntypes of *martini* Forel gave the following measurements: HW 0.62 mm, HL 0.79 mm, SL 0.76 mm; HW 0.62 mm, HL 0.78 mm, SL 0.75 mm; HW of 5 other workers in series 0.61–0.63 mm. Syntypes of *martini* var. *boelianensis* Forel: HW 0.61 mm, HL 0.71 mm, SL 0.73 mm; HW 0.62 mm, HL 0.78 mm, SL 0.71 mm; HW 0.51 mm, HL 0.65 mm, SL 0.49 mm; HW of 3 others in series 0.60–0.61 mm. A worker from Horns of Negros, P. I.: HW 0.59 mm, HL 0.72 mm, SL 0.66 mm; HW of all Philippine series varied greatly, 0.50–0.64 mm. Thus, considerable variation exists in relative scape length, but it appears to be of a graded, geographical kind. The occipital horns are best developed in the syntypes of *martini*, as illustrated in fig. 56. They are somewhat reduced in the other material examined. In a few Philippine specimens and 1 syntype of *martini* var. *boelianensis* they are rudimentary to absent. Four queens collected by J. W. Chapman in the vicinity of Dumaguete, Negros, were examined; their most distinguishing features are shown in fig. 89. Their head widths were 1.5, 1.5, 1.6, and 1.6 mm respectively. Their color is almost uniformly blackish brown, with the posterior margins of the 2nd and 3rd gastric sclerites a slightly contrasting medium to light reddish brown.

Related species: 14/16 level: none. 13/16 level: *currax*, *huonicus*. Thus, a very distinct species with its closest affinities to 2 endemic New Guinea forms.

Biology: Dr J. W. Chapman (*in litt.*) has found this species to feed primarily on other ants in the Philippines. The prey species are listed below. Unless otherwise indicated, the species were represented by adult workers. It is possible, and very likely, that brood was included among the booty more often than indicated but could not readily be distinguished by Dr Chapman from the *Aenictus*' own brood.

- Ponerinae
  - *Leptogenys* sp. (♂♂)
- Myrmicinae
  - *Crematogaster* sp.
  - *Pheidole* sp.
- Formicinae
  - *Anoplolepis longipes* (Jerdon)
  - *Camponotus* sp.
  - *Camponotus* (*Colobopsis*) *leonardi* Emery

Paratrechina longicornis (Latreille)
Polyrhachis (*Myrmhopla*) *dives* Fr. Smith
Polyrhachis sp. (larvae, pupae, workers)

These prey species are mostly but not all intermediate to large in size. Their great variation in size, armament, and habitat and nest site preference suggests that *gracilis* workers are general ant predators. A colony of *A. gracilis* was also found raiding a colony of the social wasp *Ropalidia flavopicta* Smith. "They had captured larvae, pupae, and callows; the latter so large it took several *Aenictus* workers to drag them along."

Chapman found winged ♂♂ at Dumaguete on 29. V. 1934, "from a foray leaving a statary phase of their life cycle. They lay coiled up motionless as they were carried by the workers." Twelve ♂♂, lacking wings, were taken in a column of workers from another colony on 6. VI. 1947. The wingless condition is most noteworthy. It would be interesting to know whether the workers chew the wings off, and whether the wings are lost only after the ♂♂ have flown and penetrated alien colonies.

In 1961 Dr Schneirla and Mr Reyes studied many colonies of *gracilis* in open tropical evergreen forest between 300 and 900 m above Dumaguete, Philippines. The following generalizations are based on Schneirla's extensive notes to be published at a future date:

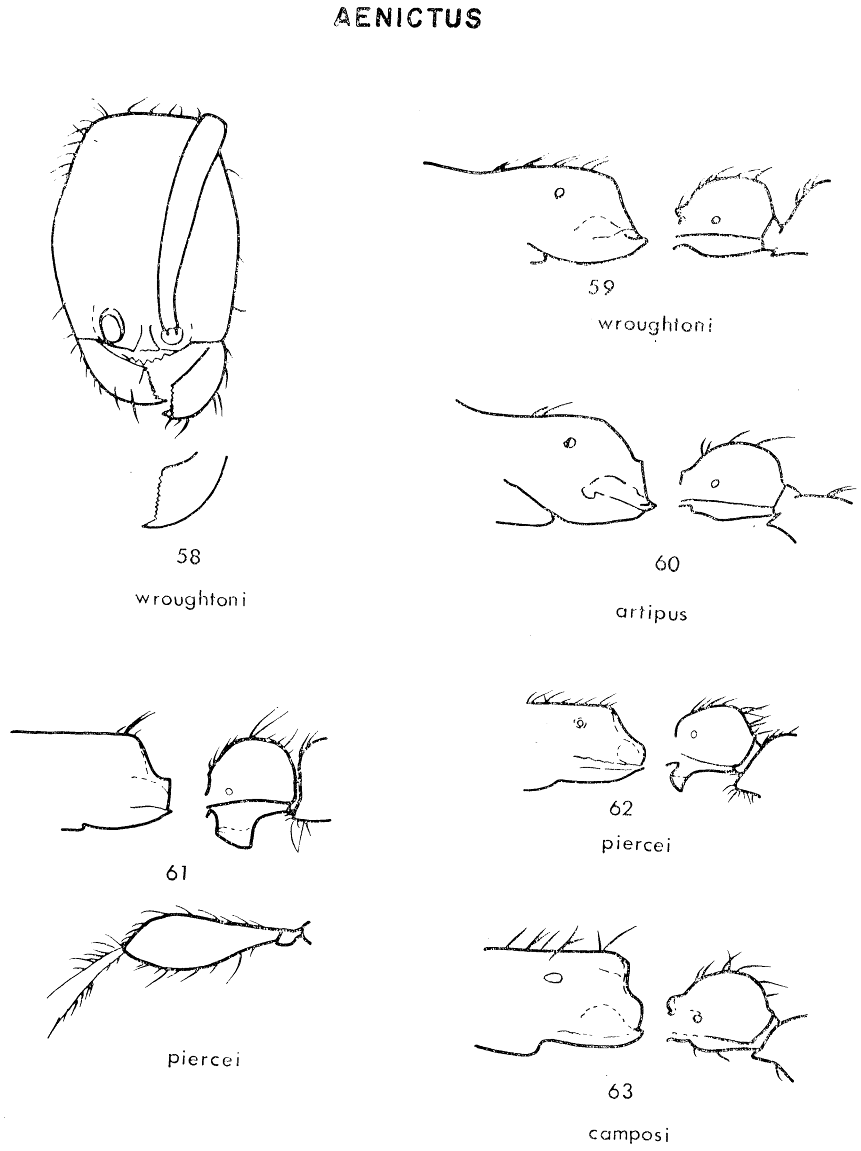
"Bivouacs of *gracilis* in the nomadic phase are typically on the surface (except in very dry weather), as are those of *A. laeviceps.* Both of these species carry out their raids and emigrations on the surface in highly varied situations from open terrain and light cover to deep forest. The statary bivouacs, in contrast to the nomadic bivouacs, are always secluded, typically in pre-empted subterranean insect nests reaching the surface only by narrow galleries. During the statary phase raiding is minimal.

"[*Gracilis* and *laeviceps*] are the two surface-adapted species prominent in the Dumaguete area, the branch columns of whose raids are typically fully exposed on the surface, both often raiding in lower vegetation and high in the trees. As Chapman reported, the booty of both species is dominated by the brood and adults of other ants, both large and small species (perhaps ranging somewhat smaller in size for *A. gracilis*), together with a scattered catch of other arthropods, including beetle larvae and frequently wasps. *A. gracilis*, at least, occasionally diverges from the insectivorous diet. For example, Mr Reyes observed one colony engaged for hours in carrying quantities of corn grits from a hut into its bivouac.

"Our evidence, from a great many colony studies including some lengthy continuous ones, shows that both of these species have well-marked, regularly alternating nomadic and statary phases, in a pattern closely comparable to that I described for surface-adapted *Eciton* species. Secondary differences include a definitely longer statary phase in *Aenictus* species than in *Eciton* species. The relationship of brood stages to colony functional phases are on the whole similar to those I have reported for *Eciton.*"

Aenictus huonicus Wilson, n. sp. Figs. 24, 25.

DISTRIBUTION: New Guinea. Type locality: Wamuki, 800 m, Mongi-Mape Watershed, Huon Peninsula, 19–20. IV. 1955 (Wilson, acc. no. 859). Additional series have been seen from Lae (N. Krauss) and from Bomberi, 700–900 m, SW Vogelkop, NW New Guinea (T. C. Maa).



Figs. 58–63. *Aenictus* workers. 58, 59, *A. wroughtoni* syntype; 60, *A. artipus* holotype; 61, *A. piercei* syntype, propodeum, petiole, and fore femur; 62, *A. camposi*, Solan, India; 63, *A. camposi* syntype.

Holotype: HW 0.73 mm, HL 0.90 mm, SL 0.74 mm. Antenna 10-segmented. Mandibles typical. Clypeus convex, entire, unarmed; lacking even the crenulations of dorsal surface of anterior clypeal border found in the related *currax* Emery (*q. v.*). Parafrontal ridge thin, about 0.25 mm long. Propodeal junction marked by a very low, obtusely angular transverse ridge. Subpetiolar process a low, forward-projecting lobe. Pilosity moderately abundant, relatively long; some hairs on pronotum are as long as 0.40 mm.

Head shining. Mesosoma as in *currax* (*q. v.*). Pedicel mostly shining; peduncles shagreened, subopaque. Very dark reddish brown, with relatively small yellow "Typhlatta spots."

Paratypes: 7 workers from holotype nest series measured HW 0.72–0.82 mm. 19 workers from Lae measured HW 0.70–0.80 mm. Considerable intranidal variation in the shape of the subpetiolar process occurs in the Wamuki series, as shown in figs 24–25.

Biology: The Wamuki workers were found on a bright sunny morning, running in file over a log at the edge of a native trail in open secondary rain forest.

Related species: 14/16 level: *alticolus*, *currax*, *reyesi*.

Aenictus javanus Emery Fig. 36.

Aenictus javanus Emery, 1897, Ann. Soc. Ent. Belg. **40**: 245, fig. 2, ♂. Type locality: Buitenzorg (Bogor), Java.—Forel, 1909, Notes Leyden Mus. **31**: 222, worker descr.

DISTRIBUTION: Java.

Worker: HW 0.50 mm, HL 0.55 mm, SL 0.36 mm. Antenna 10-segmented. Mandible narrow, 4-toothed. Clypeal structure as in *ceylonicus* (*q. v.*). Parafrontal ridge absent. Occiput feebly convex, lacking a collar. Basal face of propodeum seen from side straight; propodeal junction forming an almost exact right angle. Subpetiolar process an acute tooth which curves posteriorly. Pilosity abundant; length of longest pronotal hairs 0.25 mm.

Head shining. Pronotum mostly shining. Remainder of mesosoma weakly microreticulate and subopaque; but, unlike the condition in *ceylonicus*, rugae are completely absent. Petiolar dorsum feebly microreticulate and feebly shining; remainder of petiolar more densely reticulate and subopaque to opaque. Postpetiole mostly shining. Color as in *ceylonicus*.

MATERIAL EXAMINED: JAVA: Bogor (Buitenzorg), workers and ♂♂ associated, 30. III. 1921 (K. W. Dammerman); same locality, ♂ only, 18. X. 1944 (F. C. Drescher); Semarang, ♂ only, VIII. 1910 (E. Jacobson).

Related species: 14/16 level: *ceylonicus*, *exilis*, *peguensis*, *piercei*, (**eugenii*).

Aenictus laeviceps (Fr. Smith) Figs. 15–17, 88.

Typhlatta laeviceps Fr. Smith, 1858, J. Proc. Linn. Soc. Lond. **2** (Zool): 79, worker. Type locality: Sarawak.

Aenictus laeviceps var. *smythiesii* Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 465 (key), worker. Original localities: Assam; Mount Tapah, Perak, Malaya. **New Synonymy.**

Aenictus Fergusoni var. *breviceps* Forel, 1912, Notes Leyden Mus. **34**: 105, worker. Type locality: Gunung Gedeh, Java. **New Synonymy.**

Eciton (*Aenictus*) *fergusoni* var. *sundaica* Karawajew, 1927, Mem. Acad. Sci. Ukraine **7**: 7, worker. Type locality: Prinsen I., Sunda Strait, nr Java. **New Synonymy.**

DISTRIBUTION: Southern China to Assam (absent from the rest of India) south to Java and east to Borneo and the Philippines. Emery (1901) records it doubtfully from Celebes.

Syntypes: HW 0.73 mm, HL 0.88 mm, SL 0.86 mm; HW 0.74 mm, HL 0.88 mm, SL 0.85

mm. Antenna 10-segmented. Mandibles typical. Clypeus convex, entire, bearing about 6 distinct teeth on its anterior border. Occiput strongly convex, lacking a distinct collar. Propodeal junction smoothly rounded, although the basal and declivitous faces approach each other at right angles. Subpetiolar process a low symmetrical lobe surmounted by a thin, acute flange which is directed downward. Mesosoma and dorsal surface of head devoid of pilosity.

Head shining. Pronotum shining. Mesonotum, propodeum and metapleura covered with about 40 densely packed, nearly straight, fine rugae, which become irregular feeble on mesopleuron; interrugal spaces irregularly microreticulate and opaque to feebly shining. Peduncles of pedicel weakly microreticulate and subopaque; remainder of pedicel shining. Nearly concolorous dark reddish brown, with broad yellow "Typhlatta spots" on occiput (fig 15).

OTHER MATERIAL EXAMINED: CHINA: Mokanshan (N. G. Gee); Soochow (Gee); Baeh Liang (S. F. Light); Hsinching, Szechwan (W. L. Brown). ASSAM: Chabua (A. C. Cole). THAILAND: Chantaburi, SE Thailand, 240–360 m (T. C. Schneirla). BORNEO: Bongo, Mt Sarawak (J. Hewitt). JAVA: Goenoeng Gedeh, syntypes of *fergusoni* var. *breviceps* Forel; Prinsen I. (Panaitan), syntypes of *fergusoni* var. *sundaica* Karawajew; Pemalang (L. G. E. Kalshovan); Kendeng, Idjen, 1400 m (K. W. Dammerman). PHILIPPINES: Dumaguete City, 390–900 m, tropical evergreen forest, numerous collections (T. C. Schneirla & A. Reyes); Horns of Negros, 300–1100 m (Chapman & Empeso); Laguna, Los Baños Forest, 240–360 m, Luzon, rain forest, 2 collections (Schneirla). Chapman (*in litt.*) has also recorded *laeviceps* from several localities in Mindanao: Ginoog; Davao; Mt Apo, 1500 m; Zamboanga Prov., 1200 m.

Pilosity varies in density along a cline extending from the Asian continent south to Java and SE to the Philippines. Series from China, Assam, and Thailand have numerous hairs over the dorsal surface of the mesosoma. Those listed above from Borneo and Java mostly have dorsal mesosomal pilosity limited to a single pair of hairs on the pronotum. The *laeviceps* syntypes, from Sarawak, and Philippine series completely lack pilosity on the mesosomal dorsum.

The Bornean workers are slightly larger than those from elsewhere: HW 0.79–0.81 mm. The HW of other series, from areas peripheral to Borneo, range as follows: China, 0.70–0.75 mm; Thailand, 0.65–0.66 mm; Java, 0.69–0.75 mm; P. I., 0.71–0.76 mm.

Great intranidal variation is shown in the shape of the subpetiolar process. In a single series from Los Baños, for instance, the outline ranges from an approach to an isosceles triangle to a long, thin spine. Similar extreme variation is shown by the Chantaburi series.

Two queens, collected by J. W. Chapman at Horns of Negros, were examined and are illustrated in fig 88. The HW of both is 2.0 mm. They are unique among *Aenictus* queens in totally lacking pilosity on the dorsa of the mesosoma and pedicel. The coloration is also remarkable. The ground color is blackish brown. In sharp contrast are clear yellow areas covering various parts of the body as follows: the "Typhlatta spots," which are located midway on the genae instead of on the occiput; the entire pronotal dorsum; the entire basal and declivitous faces of the propodeum (but not the lateral face); the dorsal surface of the petiolar node; 2 small bilaterally located areas on the 1st gastric sclerite (=postpetiole); 2 bilaterally located pairs of spots on the 2nd gastric sclerite.

Related species: 14/16 level: *alticolus*, *binghami*, *fergusoni*, *luzoni*.

Biology: *Laeviceps* occurs in a variety of habitats over a wide range of elevation. Dr W. L. Brown (pers. comm.) found it foraging in cultivated fields in Szechwan Province, China. Elsewhere it has been collected mostly in forests. Judging from the Philippine prey records made by Dr J. W. Chapman (see under *gracilis* Emery) it feeds mostly on ant species, in a variety of genera, and to a lesser extent on other arthropods. The following list of prey ant species compiled by Chapman is based on workers recovered from the foraging *Aenictus*. It is probable that the *Aenictus* also collected the immature stages of these species, but the brood could not be readily distinguished by Chapman from that of the *Aenictus* and hence were not listed.

- Ponerinae
  - *Ponera* (*s. lat.*) sp.
  - *Diacamma* sp.
- Myrmicinae
  - *Myrmicaria* sp.
  - *Pristomyrmex* sp.
  - *Vollenhovia* sp. (worker, queen).
- Dolichoderinae
  - *Hypoclinea* sp.
- Formicinae
  - *Paratrechina longicornis* (Latreille)
  - *Echinopla* sp.
  - *Camponotus* (*Tanaemyrmex*) *carin* Emery
  - *Polyrhachis* (*P.*) *bellicosa* Fr. Smith
  - *P.* (*Myrmhopla*) sp.
  - *P.* (*Myrma*) sp.

This list indicates that *laeviceps* can be characterized as a *general* ant predator. Included are prey species of the most diverse phylogenetic origin, size, defensive physiology, behavior, and ecology. Chapman (*in litt.*) records a colony found by Mr Domingo Empeso which was raiding a colony of the social wasp *Ropalidia flavopicta* Smith in the interior of Negros Island.

Dr W. L. Brown has supplied the following notes on his Chinese collections of this species. " Szechwan Province, West China: near the base of Mou Man Shan, near Hsin Ching, September, 1944, a single foraging file along a dike path near the river. The file, completely unshaded, stretched for about 40 meters along the path, and consisted of workers of the common Chinese representative of the *Formica fusca* group, *F. japonica* Motschoulsky. The bivouac was established at the roots of a large clump of bamboo, and could not be dug out. Observations were made at 3 : 00 P. M.; sky overcast but bright.

" Mountains immediately west of Kuan Hsien City: several raiding columns crossing the trails in shady broad-leaved forest and in bamboo at altitudes of 300–1500 meters. September, 1945, daylight hours.

" Mount Omei: columns seen crossing the main trail to the summit in circumstances similar to those of the Kuan Hsien district, and at the same altitudes. October, 1945."

The results of extensive studies performed on *laeviceps* ecology by Dr T. C. Schneirla and his colleagues in the Philippines in 1961, have already been cited in the earlier section on *gracilis*. Schneirla estimates (*in litt.*) the typical colony size for *laeviceps* to be somewhat more than 100,000 workers. An additional colony examined by Schneirla at Chantaburi, Thailand, was described as follows:

"5/15/61. Mountain slope near 1200 feet, generally rocky, in light hardwood forest. 10 : 15 A. M., sunny, slightly overcast. Two widely branched columns, mainly outgoing downhill, one terminating in a loose mass of foragers about 1 m. across, the entire raid exposed. In another column 1 cm. wide and at right angles to these, ants returned uphill, the majority laden (mainly with ant brood and a few beetle larvae). Bivouacked in several interconnected cavities of an old stump, the brood of larvae (ca. 1/3 grown) heaped in chambers which had clearly been vacated recently by a fungus-growing termite. In raiding, bivouacking and all general circumstances, this colony resembled many of *A. laeviceps* colonies studied in the Dumaguete area."

Aenictus luzoni Wheeler and Chapman Figs. 19, 20.

Aenictus luzoni Wh. & Ch., 1925, Philippine J. Sci. **28**: 48, pl. 1, figs. 1, 2, worker. Type locality: Bangui, Ilocos Norte Prov., Luzon, P. I.—Wheeler, 1930, J. New York Ent. Soc. **38**: 206, fig. 5e-h, redescr. of worker.

DISTRIBUTION: Luzon and Negros, Philippine Is.

Syntypes: HW 0.76 mm, HL 0.88 mm, SL 0.78 mm; HW 0.79 mm, HL 0.88 mm, SL 0.78 mm. Antenna 10-segmented. Mandible typical. Clypeus convex, entire, bearing several rudimentary but distinct teeth on its anterior border. Parafrontal ridge absent. Occiput nearly straight, lacking a distinct collar. Pilosity present but limited to only 5–10 hairs on mesosomal dorsum; length of the longest pronotal hairs about 0.20 mm; some of the pilosity appears to have been rubbed off.

Head shining. Entire mesosoma shining, the surface broken only by scattered, irregularly shaped, longitudinal rugae limited to mesopleuron and propodeum. Pedicel shining. Medium to dark reddish brown with large, yellow "Typhlatta spots."

OTHER MATERIAL EXAMINED: Horns of Negros, 450 m, Negros (Chapman). This series differs rather markedly from the syntypes in the conformation of the propodeum, as illustrated in fig 20. Also, the metanotum, mesopleuron, anterior 1/3 of the metapleura and sides of the propodeum are microreticulate and opaque. Finally, the pilosity is more abundant and longer: up to 0.40 mm on the pronotum. There is good reason to consider this series as belonging to a distinct species but I have hesitated to do so because of the limited quantity of the available material and the allopatric nature of the distribution.

Related species: 14/16 level: *alticolus*, *binghami*, *fergusoni*, *laeviceps.*

Aenictus nganduensis Wilson, n. sp. Figs. 47, 48.

DISTRIBUTION: Type locality: Nganduo, 1000 m, Mongi-Mape Watershed, Huon Peninsula, NE New Guinea, midmountain rain forest (Wilson, acc. no. 738).

Holotype: HW 0.58 mm, HL 0.61 mm, SL 0.53 mm. Antenna 10-segmented. Mandibles narrow, 3-toothed; in closure a gap remains between their posterior border and the anterior clypeal border nearly as wide as the maximum mandibular width. Clypeus shallowly concave, unarmed. Parafrontal ridge absent. Occiput convex, lacking collar. Propodeal junction acutely angulate. Subpetiolar process large, consisting of an acutely angular, forward-directed flange. Pilosity moderately abundant; length of longest pronotal hairs about 0.20 mm.

Head shining. Pronotum and mesonotum shining. Remainder of mesosoma microreticulate (reticular diameters about 0.01 mm) and opaque. Mesopleuron in addition bearing 3 coarse longitudinal rugae. Dorsum of postpetiole shining; remainder of pedicel microreticulate and opaque.

Paratype: HW 0.56 mm, HL 0.61 mm, SL 0.51 mm. Nearly identical to holotype.

Related species: A very distinct species. 14/16 level: none. 13/16 level: *doryloides, javanus, schneirlai.*

Aenictus pachycerus (Fr. Smith) Figs. 64–68.

Eciton pachycerus F. Smith, 1858, Cat. Hym. Brit. Mus. **6**: 153, worker. Type loc.: "South America ?"—Bingham, 1903, Fauna Brit. India Hym. **2**: 21, correction of type locality to "India."

Typhlatta bengalensis Mayr, 1878, Verh. Zool. Bot. Ges. Wien **28**: 668, worker. Type locality: Calcutta, India. Synonymy by Bingham, 1903, Fauna Brit. Ind. Hym. **2**: 20; confirmed in present study.

Aenictus bengalensis var. *continuus* Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 476, worker. Original localities: Ceylon; Calcutta, India. **New Synonymy.**

DISTRIBUTION: India, from vicinity of Simla and Dehra Dun in Himalayan foothills south to Travancore.

Syntypes: HW 0.71 mm, HL 0.82 mm, SL 0.63 mm; HW 0.71 mm, HL 0.83 mm, SL 0.65 mm. Antenna 10-segmented. Mandible typical. Clypeus strongly convex, entire, unarmed. Parafrontal ridge very distinct, 0.3 mm in length, in side view forming a prosalient lobe. Occiput weakly convex, lacking collar. Propodeal junction acutely angulate. Subpetiolar process a large, evenly rounded lobe which projects slightly forward. Pilosity moderately abundant and relatively long; length of longest pronotal hairs 0.28 mm.

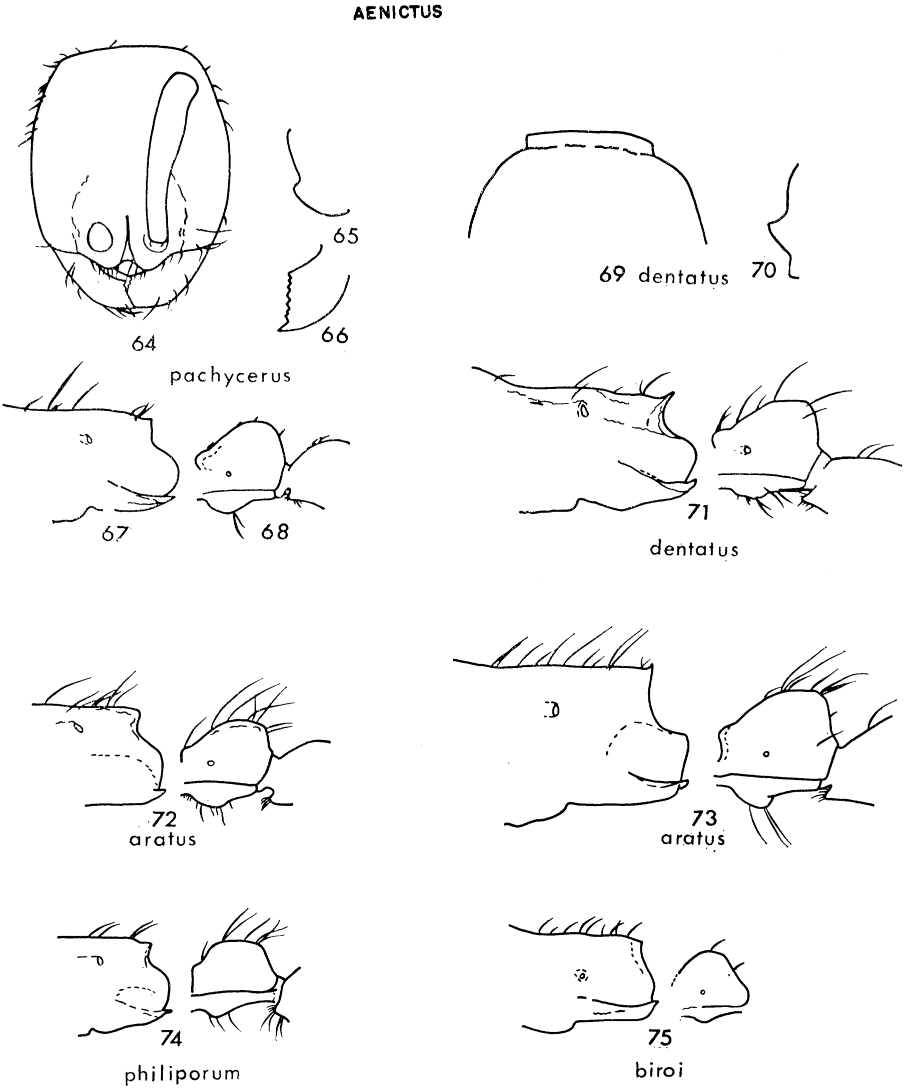
Head everywhere weakly microreticulate, the reticular diameters about 0.01 mm; vertex, area immediately surrounding parafrontal ridges, and clypeus subopaque; remainder of head feebly shining; mesosoma and pedicel entirely microreticulate, with reticular diameter about 0.01 mm; body everywhere opaque, except over most of pronotal dorsum, which is feebly shining. Concolorous medium reddish brown.

MATERIAL EXAMINED: INDIA: Bombay (G. B. King); Calcutta, syntypes of *bengalensis* Mayr; Solon, nr Simla, 1400 m (L. Weatherill, no. 7). The *bengalensis* syntype examined was found to be almost identical to the *pachycerus* syntypes; its measurements were HW 0.70 mm, HL 0.84 mm, SL 0.63 mm. Workers from Solon and Bombay differed in having the microreticulum of most of the dorsum of the head obsolescent and the surface feebly shining; HW of the Bombay series ranged 0.66–0.70 mm, of the Solon series 0.68–0.72 mm.

Related species: 14/16 level: *aratus, dentatus, philiporum, philippinensis, punensis, reyesi, silvestrii.*

Aenictus peguensis Emery Figs. 34, 35.

Aenictus peguensis Emery, 1894, Ann. Mus. Stor. Nat. Genova **14**: 452, worker. Type



Figs. 64-75, *Aenictus* workers. 64-68, *A. pachycerus* syntype; 69-71, *A. dentatus*, Bombay; 72, *A. aratus* syntype; 73, *A. aratus* (drawing of syntype of synonymous *A. aitkenii*); 74, *A. philiporum* holotype; 75, *A. biroi* syntype.

loc.: Palon, at Pegu, Burma.
Aenictus ceylonicus r. *peguensis*: Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 477.

DISTRIBUTION: Burma: Palon, at Pegu, nr Rangoon.

Worker: (Based on workers in Musem of Comparative Zoology, collected at Pegu by E. André and believed to be part of type nest series). HW 0.62 mm, HL 0.69 mm, SL 0.50 mm, in a worker chosen at random; HW of 4 others ranged 0.55-0.59 mm. Antenna

10-segmented. Mandible typical, *i. e.*, broad, triangular, with well developed apical, preapical, and basal teeth, together with about 3 smaller intermediate teeth. Clypeus feebly emarginate, unarmed. Parafrontal ridge absent. Occiput feebly concave, lacking collar. Seen in side view, basal face of propodeum feebly convex; propodeal junction almost exactly right-angular. Subpetiolar process large, trapezoidal, with anterior and posterior faces concave, and ventral face straight; ventral face longer than posterior face, which in turn is longer than anterior face. Pilosity abundant; length of longest pronotal hairs 0.15 mm.

Head shining. Pronotum shining; remainder of mesosoma and pedicel microreticulate (reticular diameters about 0.01 mm) and opaque. Alitrunk, head, and pedicel reddish yellow; remainder of body clear yellow.

Related species: 15/16 level: (**asperivalvus*), (**eugenii*), (**weissi*). 14/16 level: *biroi*, *javanus*, *powersi*, *piercei*, (**furibundus*), (**mariae*), (**mentu*), (**rotundatus*), (**steindachneri*). African species indicated by an asterisk (*). The principal interest in this species is its close similarity to African members of the *steindachneri* group.

Aenictus philiporum Wilson, n. sp. Fig. 74.

DISTRIBUTION: New Guinea and Cape York, Queensland.

Holotype: HW 0.63 mm, HL 0.70 mm, SL 0.55 mm. Closely resembling the syntypes of *aratus*, which are also from Queensland (*q. v.*). But smaller in size and with much weaker sculpturing: the microreticulate and opaque occipital strip is only about 0.15 mm wide, and the microreticulum is obsolescent and the surface shining over most of the dorsal surface of the mesosoma and pedicel. Named after the collectors in recognition of the important ant collections made during their 1957–58 expedition in eastern Australia.

MATERIAL EXAMINED: Type series: Iron Range, Cape York, Queensland, I. 1958, holotype and 5 paratype workers (Philip F. & Philip J. Darlington). A paratype chosen at random: HW 0.60 mm, HL 0.69 mm, SL 0.5 mm; others, HW 0.57–0.63 mm. A series from Bandong, 1300 m, Bunbok Valley, NE New Guinea, 26. V. 1955 by Wilson (acc. no. 1127) is very similar. A worker chosen at random: HW 0.63 mm, HL 0.73 mm, SL 0.54 mm; HW of 11 other workers in this series ranged 0.59–0.62 mm.

Related species: 14/16 level: *aratus*, *dentatus*, *pachycerus*, *philippinensis*, *punensis*, *reyesi*, *silvestrii*.

Biology: The Bandong colony was found running in file during the late afternoon in midmountain rain forest. The workers were carrying brood consisting of half-grown larvae; thus the colony is interpreted as being in the nomadic phase. Also, 3 *Pheidole* soldiers, representing at least 2 species, were retrieved from the mandibles of the workers.

Aenictus philippinensis Chapman Fig. 83.

Aenictus (*Ae.*) *philippinensis* Chap., 1963, Philippine J. Sci. **92**: 247, fig. 2 (*not* fig. 1 as printed), worker. Type locality: Horns of Negros, 450 and 1080 m, Negros, Philippines.

DISTRIBUTION: Philippines: Negros.

Syntypes: Worker chosen at random: HW 0.78 mm, HL 0.83 mm, SL 0.61 mm; HW of long series of additional workers, 0.79–0.84 mm. Antenna 10-segmented. Mandibles typical.

Clypeus rounded, entire, unarmed. Parafrontal ridge indistinct but 0.28 mm long. Occiput straight, lacking collar. Mesonotum demarcated from mesopleuron by a conspicuous ridge; a striking character shared within the genus only by the Philippine species *rabori* Chapman. Metanotum strongly impressed. Basal face of propodeum convex. Propodeal junction right-angular. Subpetiolar process a low, inconspicuous, forward-directed lobe. Pilosity less abundant and shorter than in the related *pachycerus*; length of longest pronotal hairs only 0.25 mm.

Cephalic and mesosomal sculpturing similar to that of *pachycerus* (*q. v.*). Postpetiolar dorsum feebly shining; remainder of pedicel microreticulate and opaque. Concolorous medium reddish brown.

Related species: 14/16 level: *pachycerus*, *philiporum*, *rabori*.

Biology: Chapman: "[The workers discovered at 3600 feet] came from a hole in the ground, climbed up a nearby stump, and spent the next hour in which they were observed building a living pyramid in the center of the stump. Some tried to build out from the edge of the stump in a horizontal direction. Time 5 to 6 P. M. or until dark [note by E. O. W.: this was on July 29, 1942, while Dr. Chapman was in the Horns of Negros hiding from the Japanese occupation troops; see his account of this remarkable adventure in the book *Escape to the hills*, by James and Ethel Chapman; published by the Jaques Cattell Press, Lancaster, Pennsylvania]. The next morning I dug around the hole from which they had come, but I found no trace of their bivouac."

Aenictus piercei Wheeler and Chapman Figs. 61, 62.

Aenictus (*Ae.*) *piercei* Wh. & Chap., *In* Wheeler, 1930, J. New York Ent. Soc. **38**: 209, fig. 7e-g, worker. Type loc.: Cadiz, Negros, P. I.

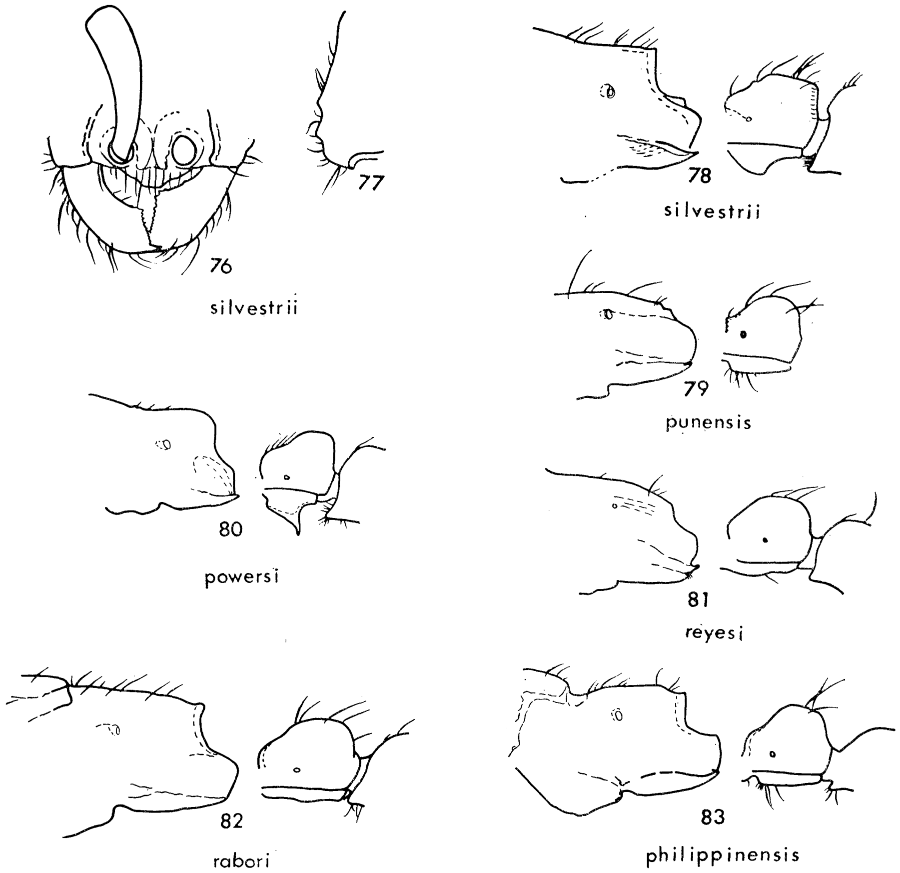
DISTRIBUTION: India, Philippines.

Worker: Dumaguete: HW 0.46 mm, HL 0.51 mm, SL 0.27 mm. (Syntype: HW 0.44 mm; only HW could be measured in this specimen). Antenna 10-segmented; scape exceptionally short and incrassate. Mandibles narrow, 3- or 4-toothed; on closure, not separated by a gap from the anterior clypeal border. Clypeus convex, entire, unarmed. Parafrontal ridge lacking. Occiput very feebly convex. Basal face of propodeum straight. Propodeal junction evenly rounded. Femora incrassate, a distinctive character. Subpetiolar process proportionately very large, consisting of a symmetrical, downward directed lobe surmounted by a flange whose major angle is about 80° and projects posteriorly. Pilosity moderately abundant; length of longest pronotal hairs about 0.10 mm.

Head shining. Pronotum shining; remainder of mesosoma microreticulate (reticular diameters about 0.008 mm), dorsum feebly shining and sides microreticulate and subopaque. Concolorous medium yellow.

OTHER MATERIAL EXAMINED. INDIA: Solon, 1400 m, nr Simla (L. Weatherill). PHILIPPINES: Dumaguete City, 15 m, Negros (F. del Rosario). Chapman (*in litt.*) also records this species from Ginoog, 600 m, and Misamis, Mindanao (A. Reyes). The Indian workers are practically identical to those from the Philippines. One chosen at random measured HW 0.40 mm, HL 0.47 mm, SL 0.23 mm. The subpetiolar process is similarly shaped but thinner.

AENICTUS



Figs. 76–83, *Aenictus* workers. 76–78, *A. silvestrii* syntype; 79, *A. punensis* syntype; 80, *A. powersi* syntype; 81, *A. reyesi* syntype; 82, *A. rabori* syntype; 83, *A. philippinensis* syntype.

Related species: 14/16 level: *brevicornis*, *ceylonicus*, *doryloides*, *javanus*, *peguensis*, *powersi*, (**furibundus*), (**mariae*), (**mentu*), (**rotundatus*), (**steindachneri*). African species indicated by an asterisk (*).

Biology: Mr Weatherill retrieved a worker of an unidentified species of the ant genus *Triglyphothrix* (HW 0.68 mm) from the workers of the Solon colony.

Aenictus powersi Wheeler and Chapman Fig. 80.

Aenictus (*Ae.*) *powersi* Wh. & Chap., *In* Wheeler, 1930, J. New York Ent. Soc. **38**: 210, fig. 6 e-h, worker. Type loc.: Dumaguete, 540 m, Negros, P. I.

DISTRIBUTION: Philippines: Negros.

Syntypes: Worker selected at random: HW 0.78 mm, HL 0.74 mm, SL 0.45 mm. HW of 29 other syntypes 0.68–0.80 mm. Antenna 10-segmented. Mandible typical in form; in closure leaving a small gap between its posterior border and anterior clypeal border. Clypeus convex, entire, unarmed. Parafrontal ridge weakly defined, only 0.12 mm long. Occiput straight, lacking collar. Basal face of propodeum straight. Propodeal junction smoothly rounded, with no trace of a ridge. Subpetiolar process very large, consisting of a subretangular lobe surmounted by a large, ventrally curving, acute flange. Pilosity sparse; only 10–25 hairs breaking the mesosomal profile. Length of longest pronotal hairs only about 0.25 mm.

Head shining, except for mandibles, which are microreticulate and opaque. Anterior face of pronotum, metanotum, mesopleuron, metapleuron, and sides of propodeum microreticulate and subopaque; remainder shining. Dorsum of pedicel shining; the rest microreticulate and opaque. Mostly clear medium yellow; parts of alitrunk with a brownish tinge.

Related species: 14/16 level: *artipus*, *biroi*, *peguensis*, *piercei*, (**furibundus*), (**mariae*), (**mentu*), (**rotundatus*), (**steindachneri*).

Biology: The type series was collected from beneath a piece of wood in a garden.

Aenictus punensis Forel Fig. 79.

Aenictus punensis Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 476, worker. Type locality: Poona, India.

DISTRIBUTION: India, known only from type collection.

Syntype: HW 0.73 mm, HL 0.87 mm, SL 0.69 mm. Antenna 10-segmented. Mandible typical. Clypeus convex, entire, unarmed. Parafrontal ridge well developed, about 0.33 mm long. Occiput weakly convex, without a distinct collar as shown in *dentatus* (*q. v.*). Basal face of propodeum weakly convex, descending abruptly through a short, even curve to a secondary basal face just anterior to the true propodeal junction, which in turn is obtusely angulate. Subpetiolar process a low, forward-directed lobe whose ventral border is straight. Pilosity abundant; length of longest pronotal hairs 0.20 mm.

Occiput microreticulate and subopaque; mandibles finely striated and subopaque; remainder of head shining. Pronotal dorsum shining; remainder of mesosoma microreticulate and subopaque to opaque. In addition, the mesopleura and metanotum bearing about 20 longitudinal rugae, only several of which extend posteriorly to metapleuron and propodeum. Petiole microreticulate; dorsum feebly shining and remainder opaque. (Postpetiole and gaster missing in specimen at hand). Mesosoma, petiole, and antenna brownish yellow; head and legs mostly clear medium yellow.

Related species: 14/16 level: *biroi*, *currax*, *pachycerus*, *philiporum*, *reyesi*, (**asperivalvus*), (**bidentatus*), (**weissi*). African species indicated by an asterisk (*).

Aenictus rabori Chapman Fig. 82.

Aenictus (*Ae.*) *rabori* Chap., 1963, Philippine J. Sci. **92**: 249, fig. 1 (*not* fig. 2 as printed), worker. Type locality: Horns of Negros, 1080 m, Negros, Philippines.

DISTRIBUTION: Philippines: Negros.

Syntypes: Worker selected at random: HW 0.78 mm, HL 0.83 mm, SL 0.62 mm; HW of remainder of long syntype series 0.82–0.84 mm. Antenna 10-segmented. Mandibles typical. Clypeus convex, entire unarmed. Parafrontal ridge about 0.17 mm. Occiput very feebly convex, lacking distinct collar. Mesonotum demarcated from mesopleuron by a conspicuous ridge; a striking character shared within the genus only by the sympatric *philippinensis*. In addition, mesonotum drops to metanotum through a short vertical face; this character is peculiar to *rabori*. Unlike *rabori*, metanotum is level with basal face of propodeum. Femora and tibiae distinctly thicker than in *philippinensis*. Propodeal junction acutely angulate. Subpetiolar process almost non-existent, consisting at most of a very low central convexity. Pilosity moderately abundant; length of longest pronotal hairs 0.15 mm.

Entire head shining. Pronotal dorsum shining; remainder of mesosoma microreticulate and opaque. Pedicel microreticulate, its dorsum shining; remainder subopaque. Color as in *philippinensis*.

Biology: The type colony was found foraging in a garden.

Related species: 14/16 level: *biroi*, *camposi*, *philippinensis*, (*2).

Aenictus reyesi Chapman Fig. 81.

Aenictus (*Ae.*) *reyesi* Chap., 1963, Philippine J. Sci. **92**: 250, fig. 3, worker. Type locality: Horns of Negros, 450 m, Negros, Philippines.

Syntypes: Worker selected at random: HW 0.73 mm, HL 0.82 mm, SL 0.62 mm. Antenna 10-segmented. Mandibles typical. Clypeus convex, entire, unarmed. Parafrontal ridge about 0.30 mm long. Occiput weakly convex. Basal face of propodeum convex, gently descending to the obtusely angulate junction with the declivitous face. The junction is not surmounted by a ridge and approaches the "evenly rounded" condition of some other members of the genus, e. g. *powersi*. Subpetiolar process a low lobe lying beneath anterior 1/2 of node. Pilosity sparse; less than 10 hairs break the mesosomal profile. Length of longest pronotal hairs only 0.15 mm.

Antennal "fossae" (the circular, sunken regions median to the parafrontal ridges) microreticulate and subopaque; rest of head shining. Entire mesosomal dorsum shining; entire sides microreticulate and subopaque to opaque. In addition, the mesopleuron is longitudinally rugose. Dorsum of pedicel shining; remainder microreticulate and opaque. Body concolorous dark (almost blackish), rich reddish brown; appendages medium reddish brown.

Related species: 14/16 level: *camposi*, *huonicus*, *pachycerus*, *philiporum*, *punensis*, (*1).

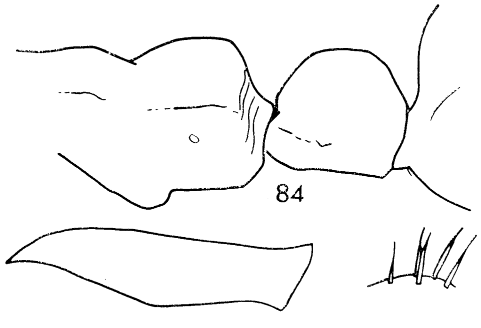
Aenictus sagei Forel, new status

Aenictus wroughtonii var. *sagei* Forel, 1900, J. Bombay Nat. Soc. **13**: 469, worker. Type locality: Dharmsala, India.

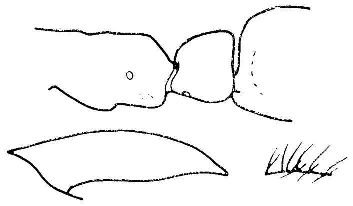
DISTRIBUTION: NC India (allopatric to the related, more southerly *wroughtoni* Forel).

Syntypes: HW 0.51 mm, HL 0.62 mm, SL 0.54 mm, SI 106; HW 0.46 mm, HL 0.60 mm, SL 0.47 mm, SI 102. HW of 7 other syntypes measured 0.46–0.53 mm. Close to *wroughtoni*, differing as follows: larger; with much shorter scapes; the petiolar node a little higher; a broad triangular area covering most of central occiput and vertex infuscate, contrasting with the yellow coloration of the remainder of head (*wroughtoni* is concolorous yellow).

AENICTUS


84

binghami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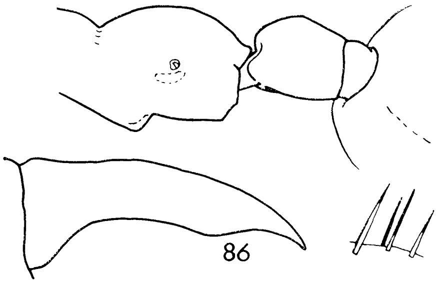
ceylonicus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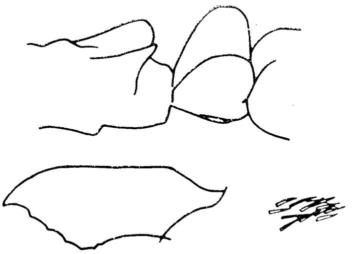
currax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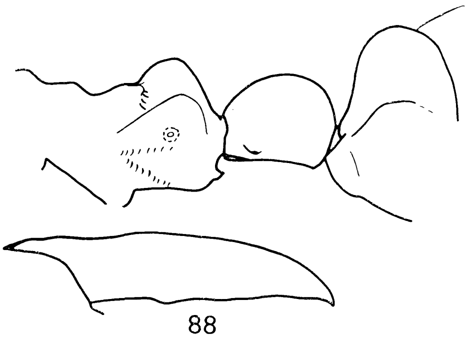
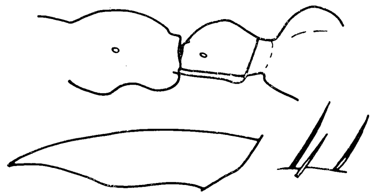
aratus


88

laeviceps


89

gracilis

Figs. 84-89, *Aenictus* "queens" (dichthadiigynes). 84, *A. binghami*, Pak Chong, Thailand; 85, *ceylonicus*, Tamborine Mt, Queensland; 86, *currax*, Karema, SE New Guinea; 87, *aratus*, Dumaguete, P.I.; 88,*laeviceps*, Dumaguete, P.I.; 89, *gracilis*, Dumaguete, P.I.

While *sagei* may in time prove to be a northern geographic variant of *wroughtoni*, I have considered the characters listed here adequate to justify provisional species rank for a form already bearing a name.

OTHER MATERIAL EXAMINED: INDIA: Solon, 1380–1400 m, nr Simla (L. Weatherill, acc. nos. 8, 15, 20). Worker from acc. no. 20: HW 0.53 mm, HL 0.63 mm, SL 0.56 mm, SI 106.

Related species: 14/16 level: *artipus*, *brevicornis*, *wroughtoni*, (**asperivalvus*), (**mariae*), (**mentu*), (**rotundatus*), (**steindachneri*) (**weissi*), (**furibundus*).

Biology: Mr Weatherill found a worker of a small (HW 0.56 mm) species of *Paratrechina* (*Nylanderia*) and 1 of a *Plagiolepis* (HW 0.64 mm) being preyed on by workers of accession no. 15.

Aenictus schneirlai Wilson, n. sp. Figs. 49, 50.

DISTRIBUTION: Type locality: Bubia, 13 km NW of Lae, NE New Guinea (Wilson, acc. no. 1079). This species is named after Dr T. C. Schneirla, the leading student of doryline biology.

Holotype: HW 0.63 mm, HL 0.67 mm, SL 0.56 mm. Antenna 10-segmented. Mandible falciform, 3-toothed; in closure its posterior border separated from anterior clypeal border by a gap about 2× as wide as maximum width of scape. Clypeus convex, deeply emarginate, and unarmed. Parafrontal ridge absent. Occiput convex, lacking a distinct collar. Basal face of propodeum evenly and gently convex. Propodeal junction acutely (80°) angulate. Subpetiolar process distinctive, consisting of a downward projecting lobe with a secondary anterior tooth and surmounted ventrally by a thin, tooth-like flange which is directed downward. Pilosity abundant; length of longest pronotal hairs 0.25 mm.

Head and mesosoma entirely microreticulate (reticular diameters about 0.01 mm) and subopaque. In addition mesopleuron, metapleuron, and propodeum bear about 16 longitudinal rugae. Pedicel microreticulate and opaque, except for postpetiolar dorsum, which is nearly smooth and feebly shining. Head, mesosoma, and pedicel rich medium reddish brown; gaster and appendages a contrasting light reddish brown.

Paratypes: Worker chosen at random: HW 0.68 mm, HL 0.69 mm, SL 0.60 mm. HW of remaining seven paratypes 0.62–0.68 mm. This series shows little variation in any character.

Related species: A very distinctive species. 14/16 level: none. 13/16 level: *ceylonicus*, *exilis*, *nganduensis*.

Biology: The colony was found in rather open, somewhat disturbed lowland rain forest, bivouacked in the soil on the top of a low ridge. The bivouac cavities apparently had a single small entrance hole, and there was no evidence of recent excavation. The brood consisted entirely of pupae and packets of eggs. Hence, I interpret it as having been in the statary phase. When discovered, during the afternoon, there were no foraging columns leading from the nest.

Aenictus silvestrii Wheeler Figs. 76–78.

Aenictus (*Paraenictus*) *silvestrii* Wh., 1929, Boll. Lab. Gen. Agrar. Portici **24**: 28, fig. 1, worker. The locality: Penang I., Malaya.

DISTRIBUTION: Malaya: Penang I.

Syntype: HW 0.83 mm, HL 0.92 mm, SL 0.59 mm. HW of 2nd syntype 0.80 mm. Antenna 9-segmented, a unique character within the genus. Mandibles typical, except that the blade is unusually large and thick, the intercalary teeth are numerous, and several teeth occur on inner border of mandibles, basad to basal tooth of masticating border. Clypeus strongly convex, entire, unarmed. Parafrontal ridge 0.27 mm long, strongly prosalient in the form of a double lobe. Lower part of gena marginate. Occiput straight, without collar. Scapes, femora, and tibiae incrassate. Basal face of propodeum in side view almost straight. Junction of propodeal faces forming about an 80° angle. Subpetiolar process subtriangular, apex directed ventro-posteriorly. Pilosity moderately abundant; length of longest pronotal hairs only 0.20 mm.

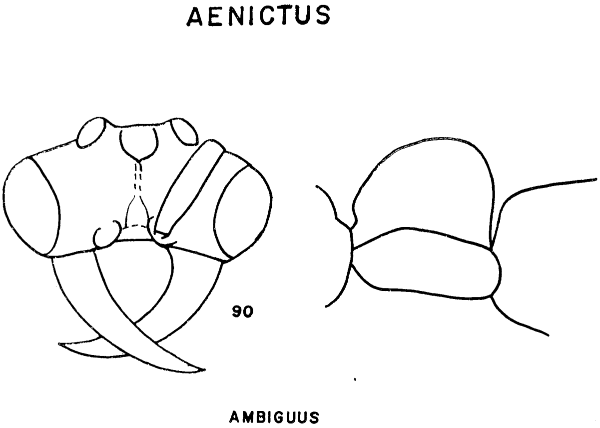


Fig. 90. *Aenictus ambiguus*, holotype (?) ♂.

Sculpturing very distinctive. Mandibles microreticulate and opaque. Entire head and mesosoma evenly and deeply costate; costal crests 0.05 mm apart; costae longitudinally oriented except on occiput, where they curve to a transverse alignment. In addition the cephalic and mesosomal surface microreticulate (reticular diameters a little less than 0.01 mm) and opaque. Pedicel microreticulate and opaque. Head, antennae, mesosoma, and pedicel light reddish brown. Gaster and legs a contrasting yellow.

Related species: 14/16 level: *aratus*, *camposi*, *dentatus*.

Aenictus wroughtoni Forel Figs. 58, 59.

Aenictus Wroughtonii Forel, 1890, C. R. Soc. Ent. Belg., pp. 104, worker, ♂. Type locality: Thana, nr Poona, India; 1900, J. Bombay Nat. Hist. Soc. **13**: 469, dist.—Bingham, 1903, Fauna Brit. Ind. Hym. **2**: 17, dist.

DISTRIBUTION: India, from the vicinity of Bombay south to Travancore.

Syntypes: 2 workers selected at random: HW 0.43 mm, HL 0.56 mm, SL 0.51 mm, SI 119; HW 0.43 mm, HL 0.56 mm, SL 0.50 mm, SI 116. HW of 10 other syntypes 0.43–0.44 mm. Antenna 10-segmented. Mandible typical. Clypeus convex, entire, bearing about 7 prominent teeth on its anterior border. Parafrontal ridge absent. Occiput straight. Propodeal junction evenly rounded. Subpetiolar process virtually absent, consisting of no more than a very low lobe situated under anterior 1/2 of node. Pilosity abundant; length of longest pronotal hairs 0.10 mm.

Entirely shining. Concolorous clear yellow.

Related species: 14/15 level: *artipus*, *brevicornis*, (**asperivalvus*), (**furibundus*), (**mariae*), (**mentu*), (**rotundatus*), (**steindachneri*), (**weissi*). African species indicated with an asterisk (*).

SPECIES NAMES IN AENICTUS BASED ON THE MALE

There are really two classifications of *Aenictus.* One is based on the worker caste and the other on the male. Forty-three names have been applied to isolated worker series and 41 to isolated males, the latter usually collected at light. In the original descriptions prior to the present study only a single worker-male association (*wroughtoni* Forel) was made. It did not seem to bother the older workers at all, especially the onomatorrheic Auguste Forel, that this dual classification was both increasingly unstable and biologically unsound. Even now, as I finish the first revision of the Indo-Australian species, I have succeeded in making male-worker associations in only the following four species: *aratus*, *gracilis*, *javanus*, and *wroughtoni.* Since the males appear in the nests only during brief periods each year, it will take many more decades before associated males and workers of a majority of the species are collected.

The result is a Gordian knot of nomenclature that would take a lifetime to unravel. The set of worker names and the set of male names must largely intersect. Future synonymy would be appallingly complex and extensive, and the nomenclature would remain unstable. Is there any reasonable way to sever this knot so that we may proceed unhindered with the study of *Aenictus* biology? I believe there is, and I have in effect chosen it for this revision. One simply has to decide to use one system of nomenclature and ignore the other. The worker-based nomenclature has been chosen because the worker caste is by far the better known and has been the object of almost all biological research conducted on the genus. A separate male-based classification would be of too little zoogeographic or biological interest to justify the nomenclatural confusion attendant on cultivating it. This is not to say, however, that males should be omitted when they are associated with workers. They possess many distinctive characters that would aid in measuring species-level relationships. But too few are associated at present to make their description of much use. Hence, I have left a complete collection of the associated males in the Museum of Comparative Zoology to await the day when enough additional associations are made to justify extensive description. The species names based on males alone are listed below. It is hoped, quite frankly, that future workers will use this list only for purposes of avoiding homonymy and will ignore it with reference to questions of synonymy. Here we should let these useless names come to permanent rest. Admittedly, to do so is to fail to apply Article 23 of the International Code of Zoological Nomenclature to the letter, but it will result in a stable, useful taxonomy of *Aenictus.* To possible future dissenters from this frankly unorthodox suggestion, I can only pose the question: is nomenclature an end in itself, or is it a communication system designed to serve the needs of biology?

Aenictus ambiguus var. *westwoodi* Forel, 1900, J. Bombay Soc. **13**: 469, ♂. Type locality: southern India. Raised to specific rank and redescribed by Bingham, 1903, Fauna Brit. Ind. Hym. **2**: 10.

Aenictus Annae Forel, 1911, Notes Leyden Mus. **33**: 194, ♂. Type locality: Semarang, Java.

Aenictus arya Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 472, ♂. Type locality: Kanara, India.

Aenictus bakeri Menozzi, 1925, Philippine J. Sci. **28**: 439, pl. 1, fig. 1, ♂. Type locality: Iligan, Mindanao, P. I.

Aenictus buttel-reepeni Forel, 1913, Zool. Jahrb. **36**: 20, fig. F, ♂. Original localities: Bahsoemboe and Tandjung Slamat, Sumatra.

Aenictus clavatus Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 471, ♂. Original localities: Poona and Guzerath, India; also southern India.—Bingham, Fauna Brit. India Hym. **2**: 12, fig. 11, ♂ redescribed.

Aenictus clavatus r. *atripennis* Forel, 1913, Zool. Jahrb. **36**: 24, ♂. Type locality: Bahsoemboe, Sumatra.

Aenictus clavatus var. *kanariensis* Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 467 (key), ♂. Type locality: Kanara, India.

Aenictus clavatus subsp. *sundaicus* Forel, 1909, Notes Leyden Mus. **31**: 223, ♂. Type locality: Batavia, Java.

Aenictus clavitibia Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 472, ♂. Type locality: Barrackpore, India.—Bingham, 1903, Fauna Brit. Ind. Hym. **2**: 15, fig. 14, ♂ redescribed, dist.

Aenictus clavitibia subsp. *facetus* Forel, 1911, Notes Leyden Mus. **33**: 196, ♂. Type locality: Semarang, Java.

Aenictus Feae Emery, 1889, Ann. Mus. Stor. Nat. Genova **7**: 486. Original localities: Teinzo and Rangoon, Burma.—Bingham, 1903, Fauna Brit. Ind. Hym. **2**: 14, fig. 13, ♂ redescribed, dist.

Aenictus fuscipennis Forel, 1913, Zool. Jahrb. **36**: 24, ♂. Type locality: Bahsoemboe, Sumatra.

Aenictus gibbosus Dalla-Torre, 1893, Cat. Hym. **7**: 7, nom. nov. pro *Aenictus certus* Emery.

Aenictus gibbosus r. *ashaverus* Forel, 1913, Zool. Jahrb. **36**: 22, ♂. Type locality: Bahsoemboe, Sumatra.

Aenictus gleadowii Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 468, ♂. Type locality: Kanara, India.

Aenictus grandis Bingham, 1903, Fauna Brit. Ind. Hym. **2**: 11, fig. 9, ♂. Type locality: Toungoo, lower Burma.

Aenictus greeni Bingham, 1903, Fauna Brit. Ind. Hym. **2**: 11, ♂. Type locality: Ceylon.

Aenictus hilli Clark, 1928, J. Roy. Soc. W. Australia **14**: 38, pl. 1, figs. 32–36, ♂. Type locality: Malanda, N. Queensland, Australia.

Aenictus Icarus Forel, 1911, Notes Leyden Mus. **33**: 197, ♂. Type locality: Semarang, Java.

Aenictus Icarus var. *incauta* Forel, 1911, Notes Leyden Mus. **33**: 198, ♂. Type locality: Semarang, Java.

Aenictus idoneus Menozzi, 1928, Misc. Zool. Sumatrana **30**: 1, fig. 142, ♂. Type locality: Medan, Sumatra.

Aenictus Jacobsoni Forel, 1909, Notes Leyden Mus. **31**: 222, ♂. Type locality: Semarang, Java.

Aenictus latiscapus Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 471, ♂. Type locality: Poona, India.—Bingham, 1903, Fauna Brit. Ind. **2**: 15, fig. 15, ♂ redescribed.

Aenictus latiscapus var. *fumatus* Wheeler, 1926, Amer. Mus. Novitates **255**: 1, ♂. Type locality: Amoy, China.

Aenictus latiscapus r. *Sauteri* Forel, 1913, Arch. Naturg. (A) **6**: 188, ♂. Original localities: Taihorin, Kankau, and Anping, Taiwan.

Aenictus latiscapus st. *sauteri* var. *satoi* Santschi, 1937, Ann. Ent. Soc. Belg. **77**: 367, ♂. Type locality: Hokuto, Taiwan.

Aenictus longi Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 470, ♂. Type locality: Garo Hills, India.—Bingham, 1903, Fauna Brit. Ind. Hym. **2**: 13, fig. 12, ♂ redescribed, dist.

Aenictus Longi r. *Taivanae* Forel, 1913, Arch. Naturg. (A) **6**: 189, ♂. Type locality: Suisharyo, Taiwan.

Aenictus Mocsaryi Emery, 1902, Természet. Füz. **25**: 152, fig., ♂. Type locality: Stephensort, Astrolabe Bay, NE New Guinea.

Enictus [!] *obscurus* Fr. Smith, 1865, J. Linn. Soc. Lond. Zool. **8**: 79, ♂. Type locality: New Guinea.

Aenictus pubescens Fr. Smith, 1859, Cat. Hym. Brit. Mus. **7**: 10, pl. 2, fig. 17, ♂. Type locality: "Hindustan."

Aenictus punctiventris Emery, 1901, Bull. Ent. Soc. Ital. **33**: 47, ♂. Pulo, Laut, Borneo.

Aenictus punctiventris var. *scutellaris* Forel, 1913, Zool. Jahb. **36**: 53, ♂. Type locality: Indrapura, Sumatra.

Aenictus schuckardi Forel, 1900, J. Bombay Nat. Hist. Soc. **13**: 471, ♂. Type locality; Barrackpore, India.

Aenictus spathifer Santschi, 1928, Tidjschr. v. Ent. **71**: 119, fig. 1, ♂. Type locality: "Crastaji", Sumatra.

Aenictus sumatrensis Forel, 1913, Zool. Jahrb. **36**: 23, ♂. Type locality: Tandjung Slamat, Sumatra.

Aenictus sumatrensis var. *maxillosa* Forel, 1913, Zool. Jahrb. **36**: 24, ♂. Type locality: Tandjung Slamat, Sumatra.

Aenictus trigonus Forel, 1911, Notes Leyden Mus. **33**: 195, ♂. Type locality: Semarang, Java.

Pacific Insects 6 (3): 483-488 **November 10, 1964**

A NEW AQUATIC ORIBATID MITE FROM KAUAI ISLAND

By Jun-ichi Aoki

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Abstract: Taxonomic and ecological notes on an aquatic species of oribatid mite are presented. This species, found in a taro patch on Kauai, is regarded as a new species representing a new genus.

It is well-known that most of the members of Oribatei are terrestrial animals living mainly in moss as well as in surface layers of soil. A very few members of Oribatei, however,