

Classification, Phylogeny, and
Zoogeography of the Genus *Perilypus*
(Coleoptera: Cleridae)

GINTER EKIS

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 227

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ABSTRACT

Ekis, Ginter. Classification, Phylogeny, and Zoogeography of the Genus *Perilypus* (Coleoptera: Cleridae). *Smithsonian Contributions to Zoology*, number 227, 138 pages, 386 figures, 2 tables, 1977.—New World Genus *Perilypus* is redefined, and its natural history summarized. Species occur in at least three macrohabitats defined as oak, liana, and herbaceous assemblages. Beetles with rectangular bodies inhabit oak and liana assemblages whereas oval-bodied beetles are found among herbaceous plants; mimetic interactions are thought to be the basis for these habitat-body form correlations. *Perilypus* mimics are regarded as generalists having evolved in appearance and/or behavior characteristics that simulate more than one distasteful model. Altitudinally the genus ranges from sea level to 3400 meters; however, most specimens were collected between 1000 and 2000 meters. Laboratory observations indicate that *Perilypus* beetles are highly predatory, with size and rigidity of victims being important limiting factors in prey acceptability. The criteria used for recognition of species and of infra- and suprageneric groupings are discussed and techniques for dissections, illustrations, and measurements are described, a morphological analysis of the major external and internal organs is presented, and a key to the species groups and species based on adult characteristics is provided. Larval and pupal stages of *Perilypus* are described for the first time. The species groups are characterized, and given for each species are, as appropriate, synonymic list, diagnostic combination, description, discussion of structural and chromatic variation, discussion of natural history, geographic distribution, etymological derivation, locality records, general notes, and illustrations. Distribution maps with symbols visually convey the geographic range of species and species groups.

There are 49 species presently recognized in *Perilypus* and 30 of these are described for the first time. Twelve new synonymies are established. A phylogeny of *Perilypus* is postulated using the Hennigian method of phylogenetic analysis. The zoogeography of the genus is discussed in terms of faunal limits and vicariance. Concepts of historical zoogeography ("faunal tracks", "center of origin and dispersal", and "forest refugia") are briefly discussed and two of them are used to explain distributions of extant *Perilypus* taxa. Relationship discussions within the species groups vary in completeness according to availability of data. A fairly complete treatise is presented for the larger *limbatus*, *quadrilineatus*, and *ornaticollis* groups, but the treatment of the *reventazon* group, the largest group in the genus, is very fragmentary. Ancestral *Perilypus* probably evolved in northern Central America, during mid-Tertiary, and ultimately evolved into eight species groups. Progenitors of the *frontalis*, *criocerides*, *chaletoides*, and *quadrilineatus* groups remained in northern Central America as did all of their descendants. Ancestors of the *limbatus* and *viridipennis* groups dispersed to southern Central America; some members of both groups ultimately penetrated South America. The *ornaticollis* group, the most derived species group in the genus, and the *reventazon* group are especially widespread geographically.

[Abstract in Spanish on p. 135]

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Classification, Phylogeny, and Zoogeography of the Genus *Perilypus* (Coleoptera: Cleridae)

Ginter Ekis

Introduction

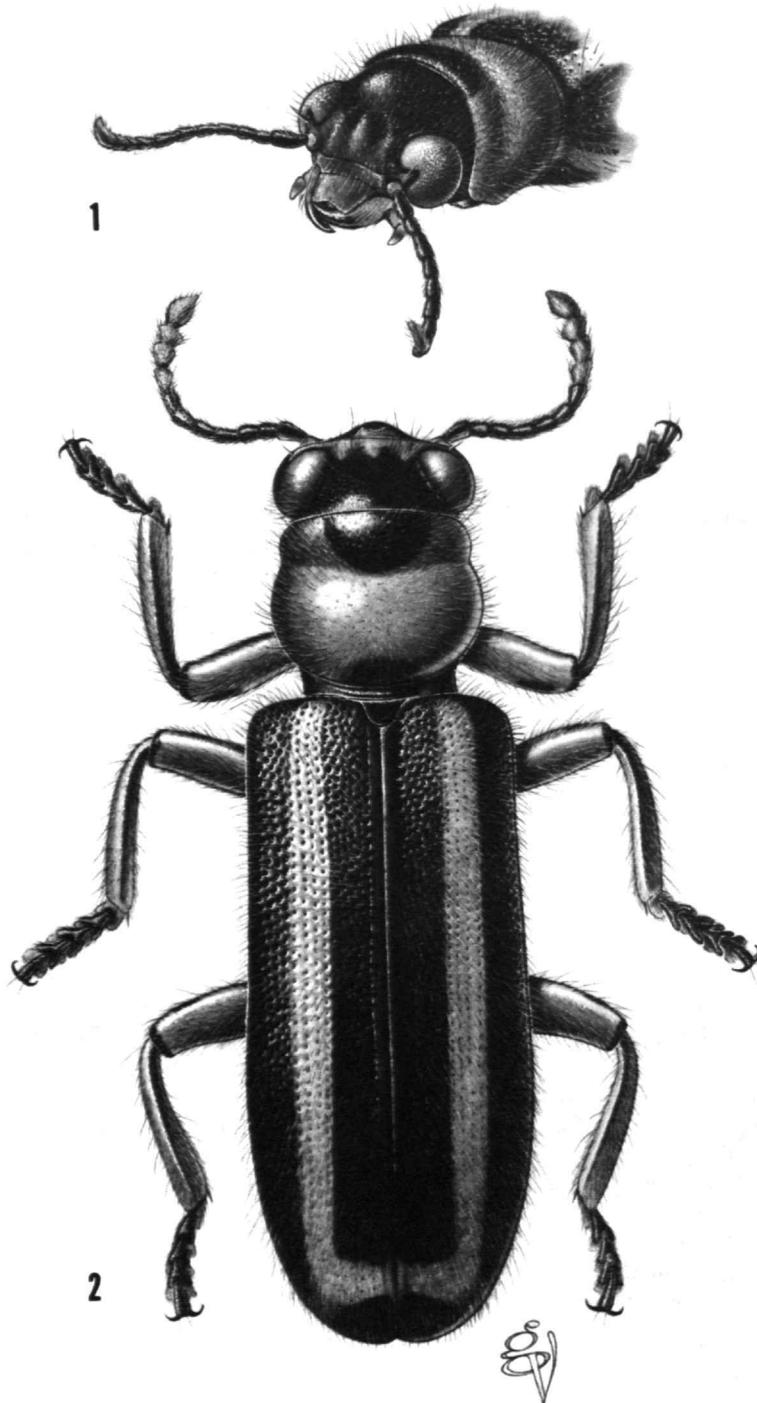
Checkered beetles of the genus *Perilypus* are exclusively New World and predominantly tropical; they are predaceous surface dwellers with great agility in gait and flight. Structurally, the beetles are either rectangular or oval in body form and their integumental color ranges from dull black to floricolorous patterns of yellow, red, and blue. Woody vegetation in dry montane forests seems to be the macrohabitat for many of the species, but lampyroid mimics occur on herbaceous plants located in the more open highland habitats. Intra- and interpopulation color polymorphism (often correlated with sex) and mimetic life styles are some interesting traits of most of the species.

I first acquired an interest for these beetles in 1970 when William F. Barr of the University of Idaho conveyed the following notes about specimens of *Perilypus* (heretofore in the genus *Colyphus* Spinola) sent to him for identification: "I'm at a loss as to what to call these *Colyphus* specimens. The names available in the literature really are meaningless until we can establish what constitutes a species in this group. The possibility of a considerable amount of variation within a species including sexual dimorphism should not be overlooked." From this reply evolved my objectives for

the beginning stages of this work; to resolve the species concept in *Perilypus*, clarify nomenclatural problems, and provide diagnostic aids for species recognition. At first there was little more to be done with this group because only a handful of specimens were available for study. *Perilypus* specimens are not abundantly collected in nature, as is the case with most mimics; consequently, the beetles were unfamiliar to most keepers of collections and essentially unavailable for loan shipments. In time, additional specimens became available, particularly during my tenure as a research fellow of the Smithsonian Institution. During that period (June 1973 to June 1974) two research grants provided financial support for an extensive field expedition to Central and South America and a visit to various museums in Europe. These expeditions nearly doubled the available study material. Particularly important was the trip to Latin America, during which I obtained data about the natural history of the group, collected specimens of several species in fluid for analyses of internal anatomy, and discovered the larval and pupal stages of the genus.

The procurement of additional specimens and biological data prompted an expansion of the scope of this study to include generalizations about *Perilypus* natural history, and analyses of internal and external anatomy, and of phylogeny and zoogeography. The reader may find some of these sections less than complete; for example, in the sections of phylogeny and zoogeography, relationships

Ginter Ekis, Research Fellow, Department of Entomology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560.



FIGURES 1-2.—*Perilypus decoris*: 1, forebody; 2, habitus.

within the largest species group, the *reventazon* group, remain undeciphered. Even a terse and/or provisional treatment of some of the aforementioned subjects, however, may positively influence a group's systematic progress. The purpose of this paper is twofold. First, it is offered as a unit of information consisting of all the current knowledge about the genus *Perilypus*, including a resynthesis of the data in sections of morphology, practical taxonomy, and evolutionary relationships. Second, this work is intended to establish a ground plan for revisions involving genera of the subfamily Clerinae.

LITERATURE REVIEW.—*Perilypus* was validated by Spinola in 1841; he included the name in a diagnostic key of the clerid genera of the world. The genus was subsequently more fully described by Spinola in 1844a on the basis of *P. carbonarius* which until recently was classified under the subfamily Tillinae. In a previous paper, I (1975:25) discussed the classification of the genus and transferred two other Spinola species to *Perilypus* from *Colyphus*. In this work, the majority of *Colyphus* species described by other authors are also transferred to *Perilypus*. There is little else to say about the history of the group, except that the species were never studied collectively, and that species descriptions are scattered throughout the literature, are very brief, and rarely include illustrations. Besides Spinola, the following authors published one or more names of species now considered valid and currently placed in *Perilypus*: Chevrolat (1843, 1874), Gorham (1878, 1882, 1886), LeConte (1880), Pic (1941), Thomson (1860), and Wolcott (1927a).

ACKNOWLEDGMENTS.—During the course of this study, I was very fortunate to work at the National Museum of Natural History, Smithsonian Institution, with many competent persons who were always willing to discuss concepts or assist in material needs. For practical reasons, only a few can be mentioned herein. I am particularly indebted to Terry L. Erwin, who provided among other things, museum space, equipment, travel funds for fieldwork in Latin America, a review of the manuscript, and, most important, guidance and encouragement during a research fellowship at the Smithsonian Institution. This manuscript was also reviewed by Donald R. Whitehead of the University of Michigan and Lee H. Herman, Jr., of the American Museum of Natural History, with whom I also enjoyed occasional discussions about systematics

theory. John M. Kingsolver kindly made available a microscope during the initial stages of this work. I also must acknowledge his patience during repeated visits to his office, the first point of inquiry whenever I needed equipment relevant to taxonomic work. As usual, William F. Barr of the University of Idaho was very helpful in making available his notes and photographic transparencies of type specimens, and George C. Steyskal rendered guidance on matters relevant to nomenclature. I am indebted to George L. Venable for drawing the habitus and forebody illustrations of *P. decoris*, new species (Figures 1, 2) and to Michael W. Druckenbrod for illustrating *P. limbatus* larva and pupa (Figures 370, 380, 381).

I extend my gratitude to the museum curators and private collectors (see "Materials") who entrusted me with their specimens. For lending type specimens I am grateful to Christine M. F. von Hayek (British Museum of Natural History), Mme. A. Bons (Museum d'Histoire Naturelle de Paris), F. Heike (Museum für Naturkunde on der Humboldt-Universität zu Berlin), Marco Spinola (Tassarolo Castle in Novi Ligure, Italy), Henry Dybas (Field Museum of Natural History), and John F. Lawrence (Museum of Comparative Zoology).

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Natural History

Although little is known about the natural history of *Perilypus* beetles, some general comments can be made about their macrohabitats, approximate seasonal and altitudinal distribution, and apparent involvement in several mimetic complexes. More specific notes relevant to mating behavior and prey acceptance are based on laboratory observations. In addition, on page 47 I briefly allude to the larval and pupal microhabitat of *P. limbatus*.

MACROHABITATS

Field observations (June, July) in Mexico, Guatemala, Costa Rica, and Venezuela indicate that species of *Perilypus* frequent at least three kinds of vegetation assemblages, here broadly defined as the oak assemblage, the liana assemblage, and the herbaceous assemblage. Specimens were collected from the oak assemblage, essentially a montane oak-pine forest, by beating low hanging branches of *Quercus*.

The liana assemblage consists of an assortment of lianas intertwined with branches, twigs, and low canopy shrubby vegetation. A substantial part of the woody vegetation is dead. The most productive method of collecting specimens from the liana assemblage is by beating between 10:00 AM and 1:00 PM. This macrohabitat, usually found in the drier regions of montane forests (about 1500 m), also is frequented by wood-boring beetles. This suggests, at least superficially, a potential biological relationship between the wood borers and the species of *Perilypus* found among them; under laboratory conditions, bark beetles were the preferred food of *P. limbatus*.

The herbaceous assemblage involves broad-leaf herbaceous plants (including such members of Compositae as *Vernonia deppeana* Lessing), which were particularly evident along hedgerows adjacent to cultivated fields and near roadsides. Adult *Perilypus* on these plants were collected easily by hand during late afternoon hours.

There is an interesting correlation between the body shape of the beetles and two of the vegetation types on which they were collected. Beetles with rectangular bodies were found in liana assemblages, whereas those with oval bodies were found on broadleaf herbaceous plants. Consequently, unlike the slender beetles from the liana plants, the more ovate beetles always were exposed and conspicuously visible on broad-surface foliage. This is not surprising, however, as oval *Perilypus* are lampyrid mimics whose success is dependent on their "inconspicuous" exposure among models.

MIMICRY

Even a cursory survey of Neotropical clerids reveals how extensively mimicry and warning coloration have influenced clerid evolution. These traits certainly are conspicuous in *Perilypus* whose mem-

bers may simulate lampyrids, cantharids, lycids, or chrysolids. Characteristics of the mimetic pattern in the perfection of the mimetic pattern may involve body form, integumental color, and behavior, or a combination of all three as in *P. ventralis*. The mimetic relationships within *Perilypus* will be discussed in more detail. For the present suffice to say that there is a tendency among some species of *Perilypus* to simulate more than one distasteful model; that is, the mimic has evolved a generalized appearance and/or behavior that simulates members of several model species with more or less similar color patterns. Membership in such a generalized mimetic complex requires phenotypic plasticity on the part of the mimic. Perhaps the extensive color polymorphism present in this genus is a manifestation of that requirement.

SEASONAL AND ALTITUDINAL DISTRIBUTION

Seasonal and altitudinal distribution records were taken from collector labels and from data recorded by me during field work. Most adult specimens were collected from June to August; very few were obtained before June or after August, and none during December or January. Three immatures (two larvae and one pupa) were captured in June. The composite altitudinal range of the members of *Perilypus* extends from sea level to about 3400 meters, most specimens being collected between 1000 to 2000 meters.

LABORATORY OBSERVATIONS

Specimens of *P. limbatus* were collected alive, sexed, and maintained in petri dishes for general observation. Longevity of captive specimens ranged from five to ten days after capture; males perished first and became a meal for survivors if not quickly removed from the enclosures (dried specimens were not eaten).

Interphenon matings occurred between members of all phenotypes (pp. 5, 47). The mating position is dorsoventral. The male lifts his forebody onto the female while maintaining his hind legs in contact with the substrate; copulation lasts approximately 45 seconds. Precopulation events are rapid and uncomplicated. The male overtakes the female from behind and with his hind legs on the substrate clasps the female epipleural margin with his pro-

and mesotarsal claws. I suspect that the convex female epipleuron and the conspicuously asymmetrical male protarsal claws function as copulatory anchorage structures.

Field and laboratory observations suggest that only one egg is released during each oviposition. The habit of depositing a single egg at each oviposition site is possibly a safeguard against larval cannibalism. One captive female devoured her singly laid egg immediately after it was deposited on the surface of a small twig.

My observations pertinent to prey acceptability, admittedly based on superficial tests, show that specimens of *P. limbatus* feed on a wide array of insects as most checkered beetles probably do. Apparently two important limiting factors in prey acceptance are size and rigidity of the exoskeleton of the potential victim. Smaller prey, such as scolytid beetles, are held with the middle legs (usually around the abdomen) and simultaneously oriented with the front legs. The predator follows a distinct sequence when devouring its catch: first eaten are the contents of the cervical membranes, followed by the soft tissues at the promesothoracic junction, and finally the contents of the abdominal cavity. Some larger beetles such as elaterids, chrysomelids, and cerambycids also were eaten, but these were acceptable only when freshly killed and with some exposure of internal tissue.

Criteria for Species and for Intra- and Supraspecific Groupings

I accept the biological species concept (Mayr, 1969:26) as the theoretical premise for recognition of species despite the fact that conjectures about reproductive isolation are usually based on indirect evidence (in part indicative of our inability to determine extent of gene flow). No species concept alternative to Mayr's is more consistent with evolutionary theory.

The nominal species included in this work represent my best estimates (hypotheses) of what the biological species of *Perilypus* are. Each estimate is based largely on anatomical criteria, but structural, distributional, and biological characteristics are integrated in species delimitations whenever possible. In *Perilypus* the genital organs, and particularly the aedeagus, provide the most consistent characteristics for species recognition. Aedeagal

characteristics are exceptionally homogeneous at the infraspecific level but otherwise they are highly variable. Characteristics of the ovipositor are specifically distinct within some species groups.

I consider stable gaps (morphological or otherwise) not correlated with sex between sympatric forms to indicate nonconspecificity; I assume such gaps are manifestations of disrupted gene flow. Allopatric samples are regarded as conspecific if they show no appreciable morphological or biological differences. Within this definition, minor variations are interpreted as due to geographic variation. When allopatric samples are notably different, however, the magnitude of their difference is compared with that observed between sympatric species. In absence of contrary evidence and when such differences between the allopatric samples approximate those between the sympatric species, I judged allopatric forms not conspecific.

I generally oppose formal naming of species subunits, particularly in the absence of nonanatomical information. Even when such information is available, it usually consists of gross approximations of environmental limits and of distribution, and therefore is deficient for in-depth assessments of population dynamics. The recent work of Ehrlich, et al. (1975) and of authors cited therein demonstrates the level of experimentation necessary to gain meaningful information about interpopulation gene flow.

In addition to avoiding the introduction of ambiguous trivial names into the literature, nonusage of the subspecific category necessitates a more thorough discussion of interpopulation differences. Too often, and after minimal assessments, taxonomic entities are named with justifications for their formal recognition ill-defined or hidden under the cloak of theory.

I believe that most differences among infraspecific populations can be conveyed effectively and emphasized through discussions, and if necessary, variant populations may be identified by informal designations such as "morph" and "phenon." In this work, noteworthy infraspecific variations are discussed under "Variation" in the species descriptions. When variation is noted at the interpopulation level, specimens exhibiting the atypical characteristics are assigned under a "morph" name (e.g., red-legged morph). I assigned groups of specimens exhibiting a common intrapopulation color varia-

tion to a "phenon"; observed color polymorphism is often sex dependent.

I do not formally recognize supraspecific taxa within *Perilypus*. Until relationships among the various New World clerine groups (of dubious generic rank) closely related to *Perilypus* are better understood, I will recognize the "species group" category and, when necessary, the "species subgroup" category. Informal species groups and species subgroups will identify adequately the respective major and minor monophyletic lineages of these genera until such time when a balanced generic classification in the Clerinae is established. Lindroth (1969:xxiv) and Whitehead (1972:140) also have alluded to the pitfalls of indiscriminate use of the subgenus category.

Materials, Methods, and Terminology

I examined more than 1200 adult specimens, one pupa, and two larvae of North, Central, and South American *Perilypus*, and approximately 300 adults and 12 larvae of other genera of Clerinae. The majority of these specimens were loaned to me by museums but material from private collectors is also well represented. I collected these insects from Mexico southward to Venezuela and Charles W. O'Brien, Terry L. Erwin, and Henry P. Stockwell made special efforts to collect material in Pampel's fluid especially for this study.

DISSECTING TECHNIQUES

Fluid-preserved specimens were killed and fixed in Pampel's fluid (glacial acetic acid, 4 parts; 40% formaldehyde, 6 parts; 95% alcohol, 15 parts; water, 30 parts). I found this preservative superior to any other that I have used to date (Ekis and Gupta, 1971:52); the beetles are not discolored, do not become brittle internally, and can remain in fluid for several years without notable damage. Several structures described under "Morphological Analysis" would not have been noticed had I only studied dried-preserved specimens. Indeed, I found that by examining fluid-preserved specimens in fluid (usually water) integumental regions, and particularly the soft membranous structures, were more clearly visible and easier to maneuver for detailed study. Another advantage to collecting specimens in Pampel's fluid is that specimens collected in that fluid

may be dry mounted and subsequently rehydrated to an extent that delicate internal tissue can be easily dissected. The quality of these dissections was often equivalent to those made with specimens retained in fluid.

Fluid-preserved specimens were dissected in water as follows: First, the hind pair of wings was removed with microscissors, submerged in absolute ethanol, unfolded between two glass slides, dried, removed from the slide, mounted on paper point, and pinned beneath the specimen and at right angles to it. The second step involved removal of the abdominal contents including the copulatory organs. With an eye knife the abdomen was incised from the third spiracle to the anus; with a watchmaker's forceps the digesting tract was severed at the base of the abdomen; and the intact mass of internal organs was lifted out of the abdominal cavity. The organs were subsequently separated and reintroduced into Pampel's fluid until they could be studied and illustrated. Once dissected, beetles were rinsed in water, dried on tissue paper, and pointed. Whenever possible, at least four fluid-preserved specimens (two males and two females) were dissected as described above, but the genital organs were extracted from all male specimens irrespective of preservation technique used.

To remove membranous wings from a dry specimen, it was boiled for five minutes in water containing five drops of 409 detergent. After dissection the beetle was washed in an ultrasonic cleaner, dried, and pinned. Extraction of genital organs from dry-preserved beetles involved severing the abdomen from the specimen, boiling in 10 percent KOH, and dissection procedures as described in the previous paragraph. Occasionally internal reproductive organs from dry-preserved beetles were sufficiently rehydrated so that a detail study of them was possible. Genitalia and portions of internal organs were stored in glycerine and introduced into plastic genitalia vials, which were sealed with polyethylene stoppers and pinned below appropriate specimens.

ILLUSTRATIONS

All drawings were prepared with a camera lucida mounted on a Wild stereoscopic microscope. Sometimes line drawings of small organs (e.g., mouthparts) had to be optically magnified so that

structural details, examined through a compound microscope, could be presented in adequate scale. In the drawings of the male internal reproductive organs only one-half of the accessory glands, testes and associated tubes were drawn. The posterior accessory glands are stippled for contrast. Unless indicated otherwise the scale line accompanying a drawing equals 1 mm. The scales for electron micrograph figures are presented in the legends.

Distribution maps, usually by species groups, are provided; dots and various other symbols represent locality records. I used a question-mark symbol whenever the locality records referred to a country only. All illustrated morphological structures discussed in the text are indicated by italics at first mention.

MEASUREMENTS

The meristic data provide a close approximation of the size and proportions of the beetles and of some of their parts. They also provide a quantitative basis for substantiating descriptive terms, such as "feebly transverse," "boldly transverse." When available, I measured at least 10 males and 10 females of each species. All measurements were made with an ocular micrometer through a Spencer stereoscopic microscope. Measurements and their abbreviations (when relevant) found in the descriptions are: length = body length, sum of lengths of head, pronotum, and elytron (head length is the linear distance from the antennal carina to the most posterolateral limit of the eye; lengths of pronotum and elytron are explained below); width = body width, maximum width across elytra; AL = antennal length, sum of lengths of all articles; EL = elytral length, linear distance from the humeral margin, proximal to the suture, to the elytral apex; EW = maximum width across the elytron; HW = maximum width of the head across eyes; IOW = maximum width between ocular sutures; PL = maximum dorsal pronotal length; PLS = maximum lateral pronotal length; PW = maximum dorsal pronotal width.

TYPES

I examined the primary type-specimen (holotype or lectotype) of each *Perilypus* species except *Derestenus columbicus* var. *reynoldsi* Wolcott and

Colyphus melanopterus Dury. Because male genital characteristics provide the most reliable criteria for diagnosing species, whenever possible I selected male specimens to establish holotypes or designate lectotypes. Procedures pertinent to selection of primary or secondary types were carried out in accordance with the International Rules of Zoological Nomenclature (1964).

Data relevant to type-specimens and to type-localities are noted at the beginning of each species description.

LIST OF ABBREVIATIONS

The following abbreviations are used in the text. They indicate the repository of specimens and collections from which material was borrowed. Addresses and the names of curators within the institution, and private collectors are supplied to facilitate inquiries regarding the collections.

AMNH	American Museum of Natural History, New York, New York 10024; L. H. Herman, Jr.
BMNH	British Museum (Natural History), Entomology, SW7 5BD, London, England; Christine M. F. von Hayek
CASC	California Academy of Sciences, San Francisco, California 94118; D. H. Kavanaugh
CBAZ	C. Bordon Azzali, Avenida Lima, Edificio Taormina, Apt. 8, Los Caobos, Venezuela; private collection
CISC	California Insect Survey, Entomology, University of California, Berkeley, California 94720; J. A. Chemsak
CMPP	Carnegie Museum, Insects and Spiders, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15212; G. E. Wallace
CMNH	Cincinnati Museum of Natural History, 1720 Gilbert Ave., Cincinnati, Ohio 45202; C. Oehler
CNCC	Canadian National Collection of Insects, Entomology Research Institute, Ottawa, Ontario, Canada; D. Bright, E. C. Becker
CUNY	Cornell University, Entomology, Ithaca, New York 14850; L. L. Pechuman
DEIE	Deutsches Entomologisches Institute, 13 Eberswalde, D. D. R.; H. Morge
FMNH	Field Museum of Natural History, Chicago, Illinois 60605; H. Dybas
GEKI	G. Ekis, c/o National Museum of Natural History, Smithsonian Institution, Entomology, Washington, D.C. 20560; private collection
GHNE	G. H. Nelson, Kansas City College of Osteopathy and Surgery, Anatomy, 2105 Independence Avenue, Kansas City, Missouri 64124; private collection
HFHO	H. F. Howden, Carleton University, Biology, Ottawa, Ontario, Canada; private collection

HPST	H. P. Stockwell, Gorgas Memorial Hospital, Canal Zone; private collection
ISNB	Institute Royal des Sciences Naturelles de Belgique, Bruxelles
LACM	Los Angeles County Museum of Natural History, 900 Exposition Boulevard, Los Angeles, California 90007; J. P. Donahue
LMDR	L. M. Drukenbrod, 5519 Decatur St., Bladensburg, Maryland 20710; private collection
MCZC	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138; J. F. Lawrence
MHNM	Museo de Historia Natural de la ciudad de México, Apartado 18-845, México, D.F. 18; D.F.A. Barrera
MNHB	Museum für Naturkunde on der Humboldt-Universität zu Berlin, 104 Berlin, Invalidenstrasse 43, DDR; F. Hieke
MNHP	Muséum National d'histoire Naturelle, Entomologie, 45 bis, Rue de Buffon, Paris (Ve), France; A. Bons, M. Villiers, J. J. Menier
MSPI	Massimiliano Spinola Collection, Tassarolo Castle, Novi Ligure, Italy; M. Spinola
MZSP	Museu de Zoologia da Universidade de São Paulo, Caixa Postal 7172, 04263, São Paulo, Brazil; H. Reichardt
MZSI	Museo ed Instituto di Zoologia Sistemica della Università di Torino, 10123 Torino, Via Giovanni Giolitti, 34 Italy; M. Zunino
NMNH	National Museum of Natural History, Smithsonian Institution, Entomology, Washington, D.C. 20560; R. E. White, P. J. Spangler
RNHN	Rijksmuseum van Natuurlijke Historie, Raamsteeg 2, Leiden, Netherlands; J. Krikken
SEMK	Snow Entomological Museum, University of Kansas, Lawrence, Kansas 66044; G. W. Byers
TAMT	Texas A & M University, Entomology, College Station, Texas 77843; H. R. Burke
TTUT	Texas Tech University, Entomology, P. O. Box 4169, Lubbock, Texas 79409; D. Foster
UCMV	Universidad Central de Venezuela, Instituto de Zoología, Facultad de Agronomía, Agrícola, Maracay, Venezuela; G. Yepes T.
UZMD	Universitets Zoologiske Museum, Universitetsparken 15, Copenhagen, Denmark; Sv. G. Larsson
WBIV	W. Bivin, Box 1854 Balboa, Canal Zone; private collection
WFBA	W. F. Barr, University of Idaho, Entomology, Moscow, Idaho 83843; private collection
ZMAN	Zoologisch Museum der Universiteit van Amsterdam, Entomologie, Plantage Middenlaan 64, Amsterdam 1004, Netherlands; J. P. Duffels

Morphological Analysis

In studies of insect systematics, anatomy often provides most if not all of the data accessible for relationship discussions, hence the importance of

comprehensive morphological analyses in revisionary works. By investigating more than the convenient integumental and internal characteristics, the basis for evolutionary inferences is maximized. With this in mind I decided to present a reasonably thorough morphological analysis of *Perilypus* and to accomplish this I chose *P. reventazon* since its members exhibit the "typical" exoskeletal characteristics of most *Perilypus* species. Herein, I treat most of these characteristics and those of the alimentary canal, ventral nerve cord, and internal reproductive organs of both sexes. The characters and their states are defined and illustrated, not only to facilitate the descriptions and discussion included in this work, but also to provide a foundation of terminology for future works.

EXTERNAL MORPHOLOGY

Head

CRANIUM.—Snodgrass (1935:111) used head sutures to delimit six major areas of the generalized insect cranium. Unfortunately, comparable areas cannot always be so rigidly defined; in beetle adults some of the sutures described by Snodgrass are obscured or absent. An alternative used herein is to subdivide the cranial surface on a more general basis.

The major structures and areas on the front of the head are illustrated in Figure 3. The frontoclypeal region is bounded laterally by the *antennal carina* and interocular portion of the *ocular suture*, anteriorly by the labral base, and posteriorly by the hind limit of the *interocular depressions*. The *epistomal suture* traverses the frontoclypeal area, dividing it into the *clypeus* and the broader *frons*. The latter is marked by a pair of interocular depressions that partially encircle the *frontal umbo*. The region from the posterior limit of the *frons* to the postoccipital suture (Figure 7) is the *epicranium* (Figure 3) which extends from the most dorsal aspect of the ocular suture to the base of the *epicranial acumination* (Figure 4).

The *gena* (Figure 5) is the postocular region of the cranial wall, bounded posteriorly by the postoccipital suture, dorsally by the epicranium, and ventrally by the *gular suture* and obscured lateral borders of the submentum. The *gena* is conspicuously sculptured with shallow wrinkles at the sides

proximal to the ocular suture. The transverse *gula* (Figure 5) is prolonged posteriorly into an oblong, feebly elongate *gular process* that is microsetiferous on the hind margin. The free borders of the process unite with the ventral portion of the inflexed *postocciput*. The latter borders the *occipital foramen* and is widely splayed proximal to the epicranial acumination. The *compound eyes* are setose, boldly convex, have a well-developed *ocular notch* (Figure 6) in front, and consist of ommatidia that are about as wide as the ocular suture.

ANTENNA.—The antenna (Figure 8) consists of 11 articles, is serrate along the anterior border, and via the articulatory process of the *scape* pivots on the *antennifer* (Figure 6) of the antennal sclerite. The scape is feebly arcuate and slightly concave ventrally, and is about twice as long as the subspherical *pedicel*. The articles of the flagellum are compressed dorsoventrally but as a group become progressively more subcylindrical toward the antennal apex. The distal margins of articles 1 through 10 are truncate whereas article 11 is acuminate; all articles are densely setose, particularly the distal five. The macrosetae (Figure 19) are long, acuminate, and grooved longitudinally, whereas the microsetae are short, smooth, and blunt apically. Microsetae occur only on the last five articles, being concentrated on the dorsodistal region of articles 7 to 10, and are particularly prominent on the dorsal surface of article 11. The ventral surface of the antenna is more sparsely setaceous, particularly at the distal third where microtubercles are present. These tubercles are most abundant on the venter of article 11, and are very similar to the sensilla basiconica of *Tenebrio molitor* Linnaeus reported by Doyen (1966:110).

MOUTHPARTS.—The labrum (Figure 9) is a transverse, strongly emarginated preoral flap attached to the frontoclypeal inflexion. The labrum is vested dorsally with long setae and has an anterior fringe of short setae. The torus projects from the hind angles of the labrum and bifurcates distally into a *medial toral process* and a *lateral toral process*. The toral sclerite is similarly bifurcated in other clerids (Solervicens, 1973a:165; 1973b:235, 238) and in other beetles (Evans, 1961:307; Doyen, 1966:111). Anteroventrally, the labrum has a U-shaped ridge that partially outlines a thin, feebly concave sclerotized region.

The mandible (Figures 10, 11) is subfalciform

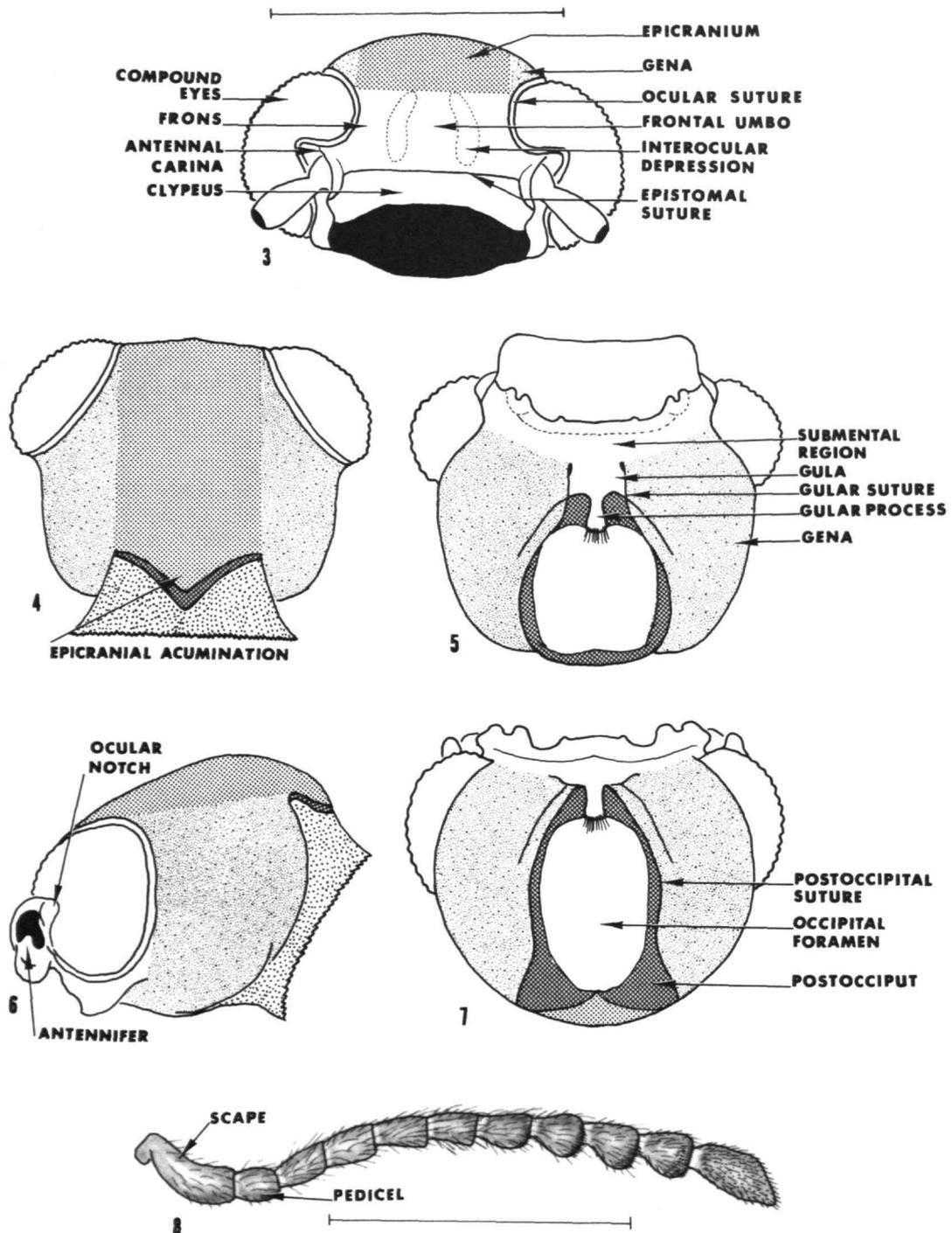
and prominently visible in repose. Its outer facies is broadly depressed and setose in the basal two-thirds. Three dentes occupy most of the masticatory surface; the *anterior dens* is broadly arcuate and acuminate; the *medial dens* is short, truncate, and feebly arcuate; the *posterior dens* is broad, shallow, and projects an asperate profile. Behind the posterior dens is a small transparent lobe, which appears continuous with the mandibular *penicillus*; the latter extends anteriorly along the inner base of the medial and posterior dentes. The condyle and fossa of the mandibular base articulate with the ventrolateral edge of the cranium.

The maxilla (Figure 12) connects to the cranium behind the mandibular fossa. Its triangular base, the *cardo*, is bifurcated into a posterior *inner* and *outer cardal process*. Anteriorly the cardo connects to the *basistipes*, a triangular sclerite flanked by the *palpifer* and *mediostipes*. The latter is continuous with the *lacinia*, whose base is distinguishable in maxillary dorsal view only. Distally the lacinia is divided into a triangular medial lobe (the *mediolacinia*) and smaller basolateral lobe (the *laterolacinia*). A short, transverse inflexion divides the galea into a small *basigalea* and vastly larger *distigalea*. The *maxillary palpus* consists of four setose articles; the first (the basal) is the shortest, the second and third together are slightly longer than the fourth, and the fourth is cylindrical and membranous apically.

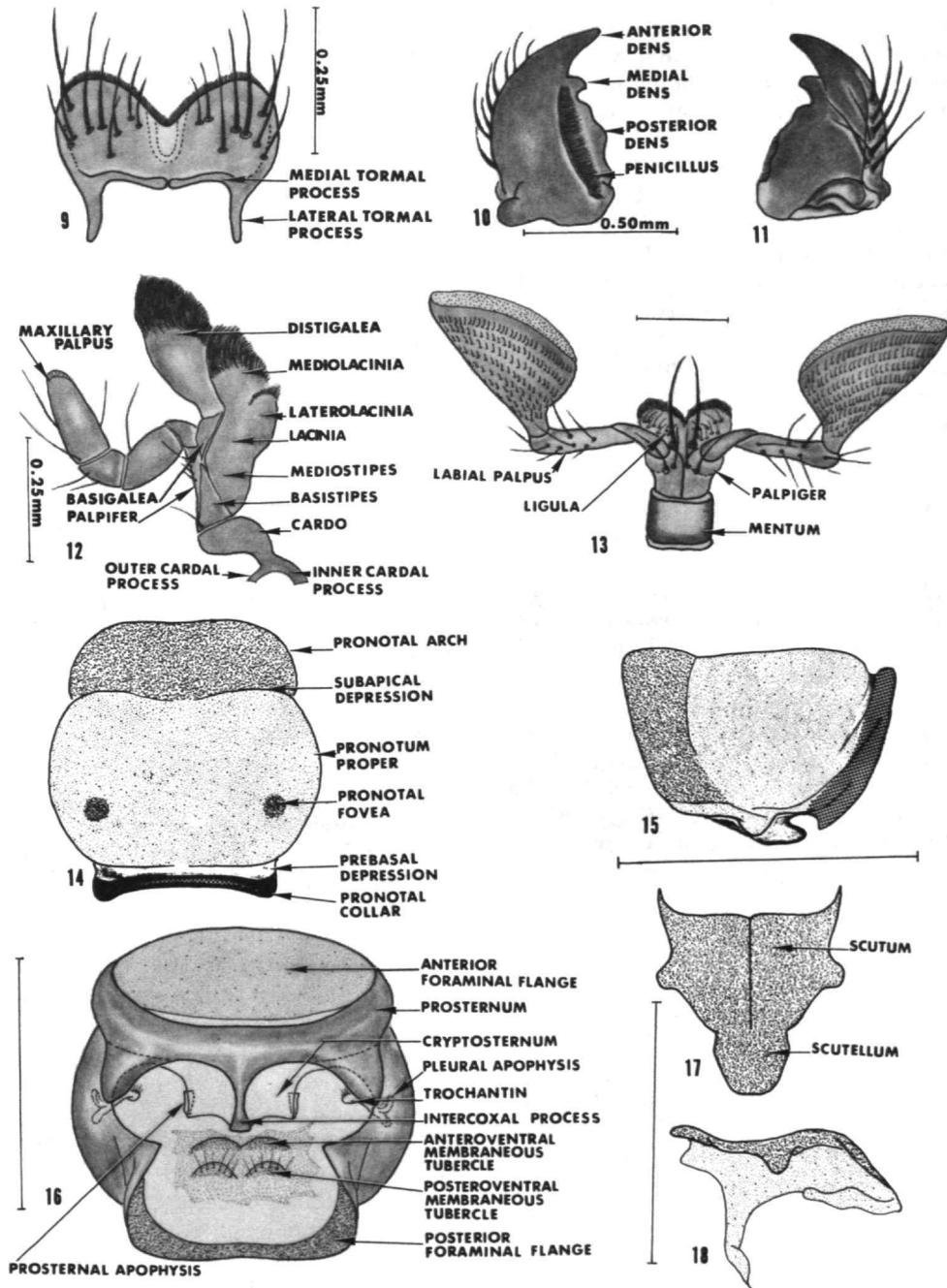
The labium (Figure 13) connects to the *submental region* of the cranium (Figure 5). Its *mentum* is predominantly membranous, feebly sclerotized basally and laterally. The *palpifers* also are feebly sclerotized, subcylindrical, and partially underlie the mentum. The *ligula* has a setose submarginal fringe anteriorly, some scattered setae medially, and one exceptionally long setae proximal to each bisetose palpifer. The *labial palpus* consists of three articles; the first is conical; the second slightly swollen apically and nearly twice as long as the first; and the third, the largest, is securiform, membranous along its distal border, and densely vested with short recumbent setae.

Prothorax

The prothorax (Figures 14–16) is a squat moderately transverse cylinder flexibly connected to the cranium by the cervical membrane. The cervical



FIGURES 3-8.—*Perilypus reventazon*: 3, head, anterior; 4, head, dorsal; 5, head, ventral; 6, head, lateral; 7, head, posterior; 8, antenna. (Scales = 1 mm)



FIGURES 9-18.—*Perilypus reventazon*: 9, labium; 10-11, mandible; 12, maxilla; 13, labium; 14, prothorax, dorsal view; 15, prothorax, lateral view; 16, prothorax, ventral view; 17, mesoscutellum, dorsal view; 18, mesoscutellum, lateral view. (Scale = 1 mm)

sclerites are slender, feebly pigmented plates that do not articulate with the head or prothorax. The dorsal and lateral wall of the prothorax comprise the pronotum; the ventral wall, or prosternum, is greatly reduced externally but substantially inflected.

The pronotum (Figures 14, 15) is traversed by anterior and posterior depressions that delimit three regions, the *pronotal arch*, the *pronotum proper*, and the *pronotal collar*. At about the anterior fourth, the *subapical depression* marks the hind limit of the convex pronotal arch that extends over most of the epicranial region when the head is reposed. To minimize the potential friction between the epicranial surface and the inner wall of the pronotal arch, the latter is lined with a transparent inflection, the *anterior foraminal flange* (Figure 16). This thin, almost membranous flange extends posteriorly to the inner ridge of the subapical depression where it connects to the cervical membrane.

In dorsal view the pronotum proper is subspherical, boldly convex laterally, sinuous anteriorly, and truncate posteriorly. Near each hind angle there is a spheroid muscle-attachment depression, the *pronotal fovea* (Figure 14). Behind this fovea, the *prebasal depression* precedes the narrow pronotal collar, which widens at the sides and is broadly inflected along its posterior margin. This inflection, the *posterior foraminal flange* (Figure 16), is a broad, rigid lining that combines with the pronotal collar to provide additional rigidity to the posterior region of prothorax. Anteriorly, the flange connects to the ensuing intersegmental membrane.

The *prosternum* (Figure 16) is a narrow transverse plate adjoined to the anterior half of the pronotal deflection. Posteriorly, the plate is broadly inflected, particularly so laterad to the prosternal *intercoxal process*. The prosternal inflection, the *cryptosternum* of Hlavac (1972:126), supports the *prosternal apophysis* and extends laterally to the *pleural apophysis*. The latter is short, broadly bilobed distally, and continuous with the *trochantin*. (In the prothorax of the clerid *Necrobia rufipes* DeGeer, the distal end of the pleural apophysis is also broad but not bilobed (Tremblay, 1958:98).)

The pronotum is densely clothed by short vertical setae; such setae line the posterior margin of the pronotal postcoxal process. The prosternum is pre-

dominantly glabrous; setae are present on the anterior margin and on the feebly expanded distal region of the intercoxal prosternal process.

Mesothorax

The pro-mesothoracic intersegmental membrane contains one dorsal and two ventral pairs of transverse *membranous tubercles* (Figure 16). The dorsal pair is similar in form and vestiture to the anteroventral pair. The posteroventral tubercles differ from the others by being more conical and by bearing stout vertical setae; they are probably sensory organs as suggested by their connection with a mesothoracic nerve.

The mesothorax (Figures 21, 22) is approximately one-half the size of the metathorax. Its thick, strongly sclerotized notal plate (Figures 17, 18) may be divided conveniently into *scutum* and *scutellum*; the former is transverse, the latter subquadrate. A longitudinal mesonotal suture divides equally the rugose scutum, which partially projects into the pronotum. Side margins of the mesonotum are broadly inflexed, particularly so below the scutellum where the inflection serves as a shelf on which rests the mesobasal angle of the elytron.

The mesopleuron (Figures 21, 22) is divided into a large triangular *mesepisternum* and a smaller, tapering *mesepimeron*. The first is coarsely rugose in the dorsal half, conspicuously ridged at the anterior margin, and is copiously vested with recumbent setae, as are most of the metathoracic pleural and sternal plates. The substantially narrower mesepimeron is finely rugose and emarginated at the pleurocoxal articulation.

The mesosternum is sagittal in outline and prolonged medially. The anterior prolongation is short and tumid. The posterior one, the *mesothoracic intercoxal process*, is long and slender, and is invaginated apically to accommodate the apex of the *metathoracic intercoxal process* with which it forms a strong but flexible connection. Posteriorly, the mesosternum is deeply inflexed, particularly beneath its intercoxal process where it forms a nearly imperforated septum. Posteroventrally, the mesosterneal inflection adjoins a feebly sclerotized plate located anteriorly to a metasternal transverse ridge. (A comparable area in the cantharid *Chanlognatus pennsylvanicus* (DeGeer) was interpreted

by Matsuda (1970:213) to consist of "mesospinas-ter-nal" and "metapresternal" elements.)

Metathorax

The metathorax (Figures 21, 22, 24) is feebly sclerotized dorsally, strongly sclerotized and boldly convex ventrally. The metanotum is typically complex, being partitioned into various sclerites, sutures, and/or other structures correlated with the development of flight. A lengthy description of the metanotal components is not necessary because they have no immediate relevance to the taxonomic data herein; but an illustration (Figure 24) of some of the more important regions might be useful for subsequent comparative studies. The metapleuron (Figures 21, 22) consists primarily of the slender *metepisternum*; the *metepimeron* is largely membranous, being feebly sclerotized along the *mesopleural suture* and at the pleural wing processes.

The *metasternum* is trapezoidal, about half as long as wide, and is divided into two halves by a midlongitudinal suture (the *discriminal line* of Ferris, 1940:37). Ferris apparently was also the first to suggest that the beetle metathoracic venter, commonly called the "metasternum," consists of subcoxal elements. The discriminal line is also well-defined in the clerids *Enoclerus spegeus* Fabricius and *Necrobia rufipes* DeGeer (Campau, 1940:78).

Internally, the discriminal line is expressed by a bold inflection referred to as the *discrimen* by Ferris (1940:36) and the median ridge by Doyen (1966:123). The inflection is a keel-like structure that nearly spans the length of the metasternum and increases in depth posteriorly where it becomes continuous with the internal ridge of the *antecoxal suture*. Posterior to this suture is a narrow tapered *antecoxal piece* ("Katepisternum 3" of Campau, 1940:78) whose ventral extremity forms the ventral coxal condyle.

To my knowledge a metafurcal sclerite, or meta-sternellum, is not distinguishable in the Cleridae; however, a well-formed Hylecoetoid metendosternite (Crowson, 1944:274) does not vary appreciably in *Perilypus*. The metendosternite (Figure 25) of *P. reventazon* consists of a broad laterally arcuate *stalk*, oval *lamina*, and feebly arcuate *furcal arms* that project anterolaterally. Solervicens (1973a, fig. 5b; 1973b, figs. 4a,b) studied the metendosternites

of the clerid genera *Epiclines* Blanchard and *Natalis* Laporte. He noted a substantial difference between the metendosternites of *N. laplacii* Laporte and *N. impressus* (Spinola).

Wings

MESOTHORACIC WINGS.—The elytron (Figures 26, 28, 29) is an oblong protective cover that overlays the thorax and all abdominal segments; its posterior deflection, the *apical slope* (Figure 29), is acute. The dorsal surface is copiously indented with coarse *favus* (or honeycombed-shaped) punctations and has a sparsely microrugose microsculpture (note arrow in Figure 307). The latter gives the punctate and interpunctate surface a glittering arenose appearance that becomes particularly apparent under intensive light. The elytral disc also has a dense vesture of short *reclinate* and longer *vertical setae*.

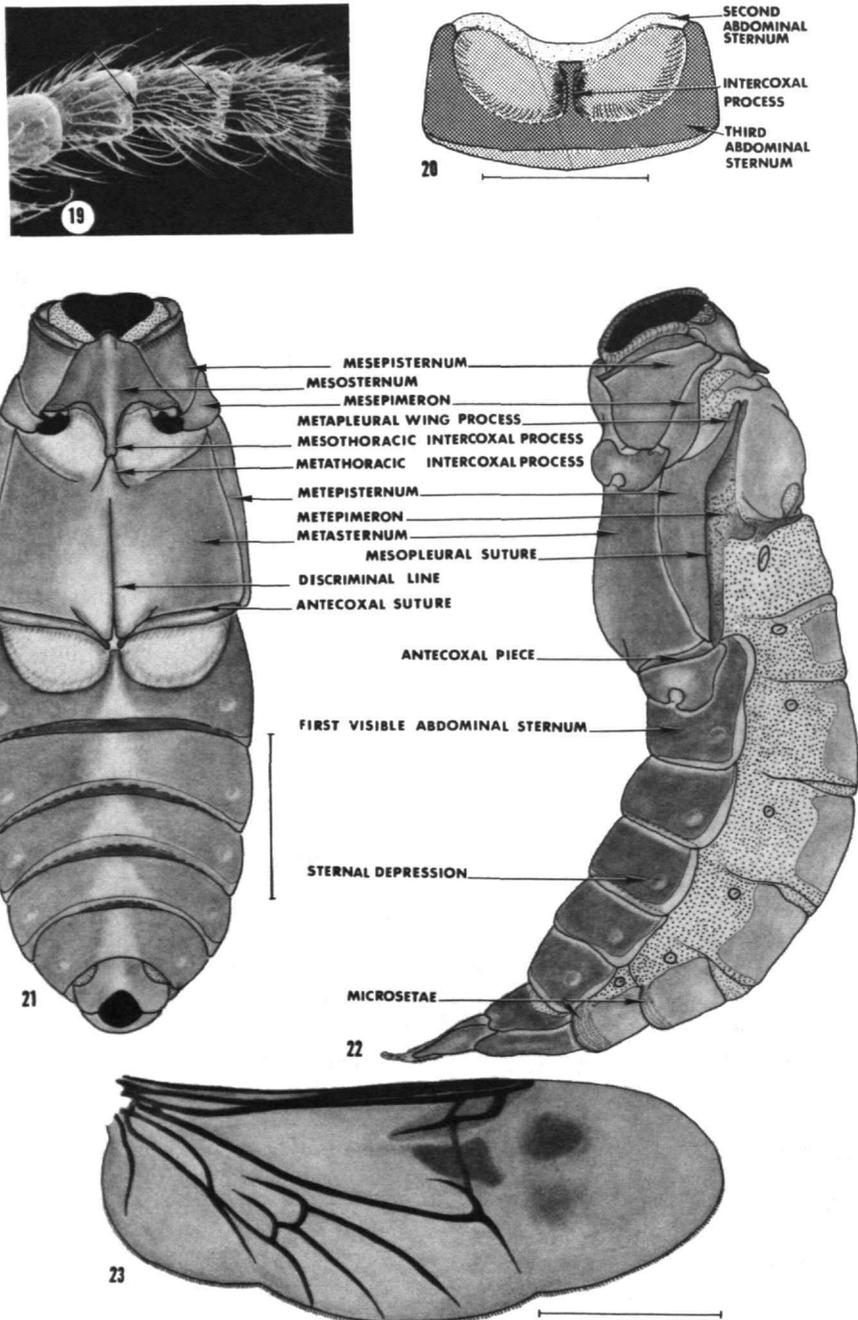
In dorsal view, the elytron is outlined by three margins (Figure 26). Two of these, the *humeral* and *sutural*, are defined according to their morphological origin. The third, the *posthumeral*, is defined in accord with its position and/or function. Below the posthumeral margin is the epipleural margin (Figure 28) that consists of lateral *epipleural fold* and ventral *epipleuron*.

The humeral margin is feebly sinuous, the post-humeral margin is linear in basal two-thirds and acutely arcuate in apical third. The sutural margin is linear and has a prominent *sutural ridge* that extends from the sutural cleft (as in Figure 27) to the elytral apex. The sutural margin has a sutural groove and sutural flange that interlock the reposed elytra.

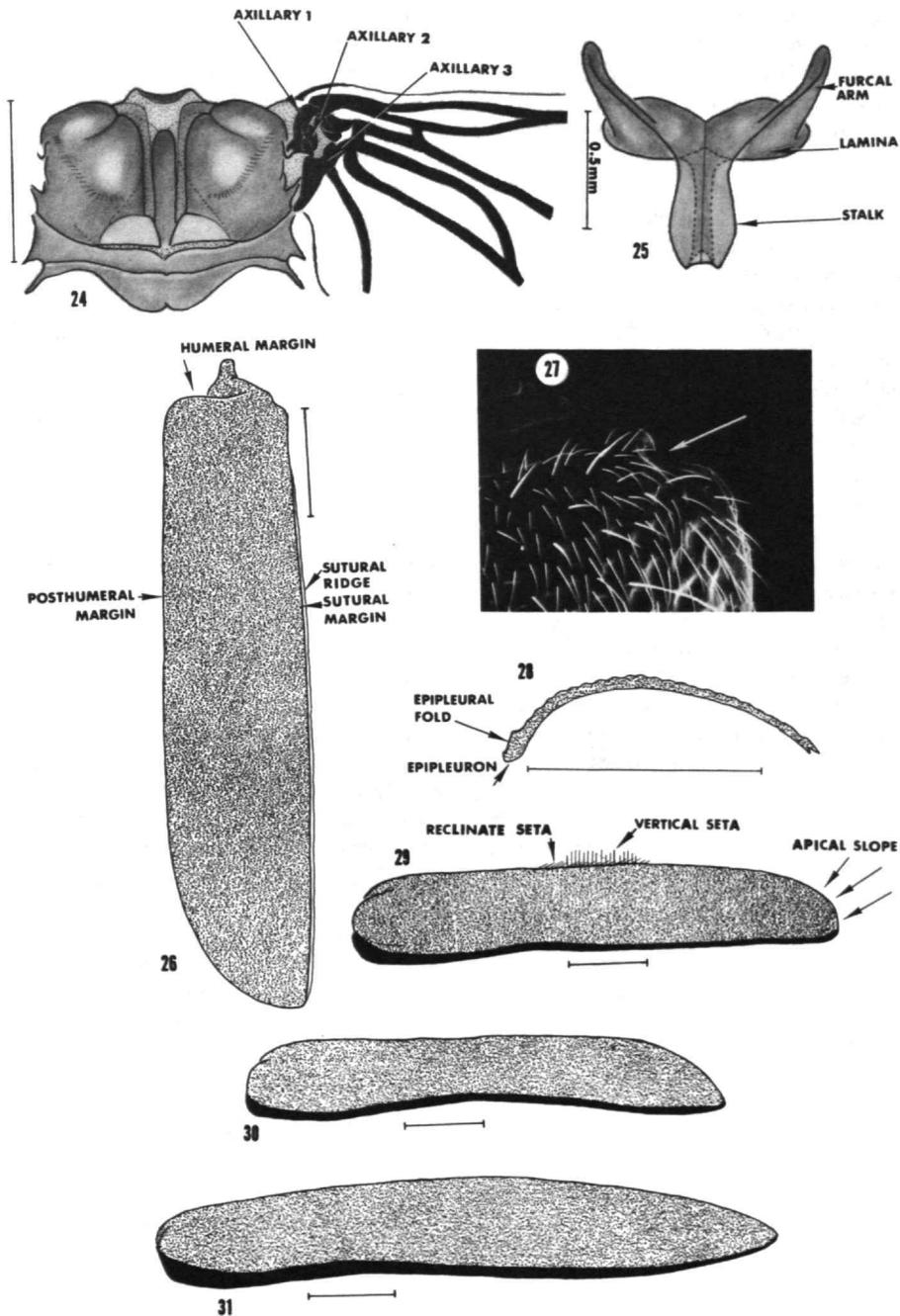
METATHORACIC WINGS.—A membranous wing is illustrated in Figure 23. Wing venation characteristics of *P. reventazon* are not described because they are of no consequence in delimitation of perilypine species and because terminology of clerid wing venation is currently being reevaluated by other workers.

Legs

Close apposition of the intrasegmental leg bases, as found in the more successful surface predatory beetles, is a primary structural adaptation for an efficient mechanism of cursorial locomotion. Of



FIGURES 19-23.—*Perilypus reventazon*: 19, antennal articles 5 to 8 (arrows indicate microsetae); 20, abdominal sterna II, III, ventral view; 21, mesothorax, metathorax, and abdomen, ventral view; 22, mesothorax, metathorax, and abdomen, lateral view; 23, metathoracic wing. (Scale = 1 mm)



FIGURES 24-31.—*Perilypus reventazon*: 24, metanotum and axillary sclerites; 25, metendosternite; 26, elytron, dorsal view; 28, elytron, cross section; 29, elytron, lateral view. *P. orthopleuridus*: 27, mesobasal region (arrow indicates sutural cleft). *P. limbatus*: 30, elytron, lateral view. *P. quadrilineatus*: 31, elytron, lateral view. (Scales = 1 mm)

secondary importance in this scheme are modifications of structures and/or proportions of the leg components, particularly those of the tarsal articles. All of these considerations are to some degree pertinent to a discussion of the leg structure of clerid beetles which, as a group, are almost exclusively cursorial predators.

In *P. reventazon* the intrasegmental coxae are separated by a thin intercoxal process, which in the meso- and metathorax communicate with a midlongitudinal extension of the subsequent segmental venter. The procoxa (Figure 32) is conical and more protrusive than the pyriform mesocoxa (Figure 33) and transverse metacoxa (Figure 35). The pro- and mesotrochanter are triangular and the metatrochanter is oblong. In general, the femora are very similar but the front femur is shorter and slightly more robust than the rest. The tibiae are also very similar, but protibia differs by having one *tibial spur*, not two (Figure 32). All tibiae are conspicuously carinate (the *tibial carina*) on their anterior and posterior facies, and each is particularly densely setose at its inner apical third.

The tarsus, the most variable leg region, consists of five conspicuous *tarsomeres*, which differ with respect to length and pulvillar shape on each leg (Figure 34). The *basitarsus* (Figure 33) is always the shortest; the second and fifth tarsomere are about equal in length; and the third is slightly longer than the fourth. The emargination of the distal border of the pulvillus of each tarsus becomes more pronounced from basitarsus to tarsomere four. Another structural progression involves abridgement of the first two pulvilli from pro- to metatarsus. The basitarsal pulvillus, which along with pulvillus 2 is conspicuously asymmetrical on the metatarsus (note left arrow in Figure 36), is reduced and obscured by a narrow setal cluster (note right arrow in Figure 36).

Protarsal claws are sexually dimorphic with respect to symmetry. In male specimens the inner claw is conspicuously longer than the outer claw (Figure 34). In female specimens the protarsal claws are symmetrical as are the claws of the middle and hind legs of both sexes.

Abdomen

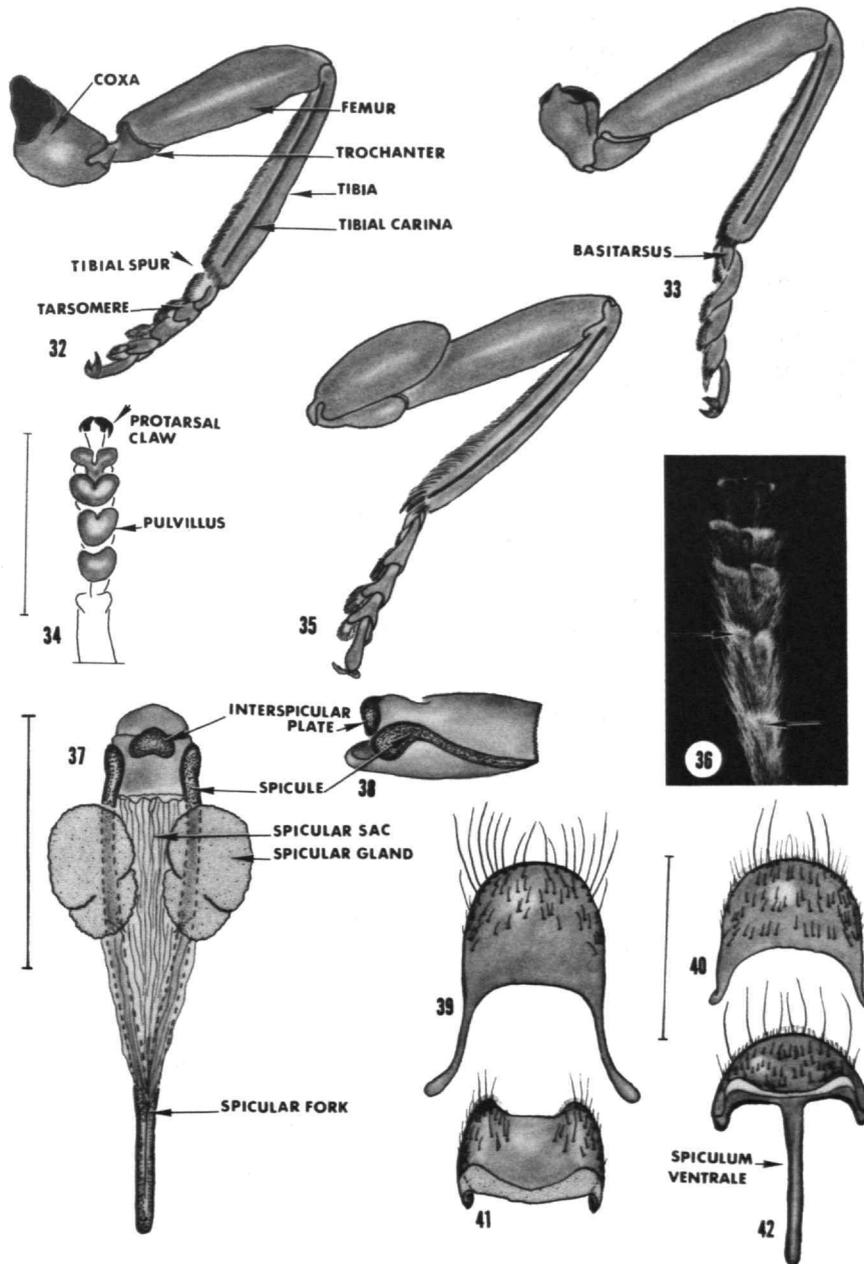
The abdomen (Figures 21, 22) is soft, flexible, with eight apparent segments. In males, rudiments

of a ninth segment may be present in the form of a feebly sclerotized crescentic plate (the *interspicular plate*) located beneath the aedeagus and between the posterior explanation of the *spiculi* (Figures 37, 38). Doyen (1966:138) found a dorsal interspicular plate in *Tenebrio* and considered it the tenth tergum. Tanner (1927, pl. 6: figs. 56, 57), in his coverage of female genitalia of Tillinae clerids, identified the membrane between segment 8 and the ovipositor as the ninth segment.

In general the abdominal dorsum (Figure 22) is feebly sclerotized. However, tergal sclerotization becomes more intense from tergum 1, which is entirely membranous, to tergum 8; the sclerotization of sterna 3 to 8 is about equivalent. The first five terga are glabrous, whereas the sixth and seventh have bands of microsetae at their posterior margins, which are probably instrumental in the folding mechanism of the membranous wings. Tergum 8, the pygidium, is vested with long reclinate setae, and is subquadrate in males (Figure 39) and transverse in females (Figure 40). The lateral area of the abdomen is broadly membranous.

In more advanced coleopterans it is often difficult to identify components of the anteroventral region of the abdomen. This region was modified substantially during the posterior extension of the metathoracic ventral plate, an adaptation yielding greater surface area for attachment of flight muscles. In general, sternum I is considered absent in most polyphagan beetles but a vestige of this plate is present in *Tenebrio* (Doyen, 1966:135). In *Perilypus*, sternum I appears to be entirely suppressed. The *second abdominal sternum* (Figure 20) is narrow and feebly sclerotized and is fused with an anterior depression of the *third abdominal sternum* to form the metacoxal cavity. Medially however, the two sterna form a keel-like *intercoxal process* (Figure 20). Forbes (1925:290) described a similar development of the abdominal venter in the anobiid *Trypopytys sericeus* (Say) (now in the genus *Priobium*).

The posterior six sterna, which comprise the visible abdominal venter, are well-sclerotized, transverse plates, the lateral and posterior margins of which are narrowly and palely indicated. Sterna III to VII each have a pair of *sternal depressions* (Figure 22). To the inner surface of these are attached short longitudinal muscles that connect to the antecostal ridge. Doyen (1966:136) found similar



FIGURES 32-42.—*Perilypus reventazon*: 32, front leg; 33 middle leg; 34, front tarsus; 35, hind leg; 36, hind tarsus (top arrow indicates pulvillus 2, bottom arrow indicates basitarsal pulvillus); 37, spicular fork, ventral view; 38, spicular fork, lateral view; 39, male pygidium; 40, female pygidium; 41, male abdominal sternum VIII; 42, female abdominal sternum VIII. (Scales = 1 mm)

muscle attachment regions on exposed sterna of *Tenebrio molitor*. The posterior margin of sternum VII (Figure 21) is broadly emarginated in both sexes, whereas that of sternum VIII is sexually dimorphic, being emarginated in males (Figure 41) and arcuate in females (Figure 42). The exposed sterna are vested with long, reclinate setae.

Reproductive Organs

MALE.—The aedeagus (sensu Lindroth, 1957:242) consists of two major structures, the tegmen (Figure 43) and the phallus (Figure 46). The tegmen is a dorsoventrally compressed cylinder that consists of a pair of parameres, the phallobase, two phallobasic struts, and the phallobasic apodeme. Each paramere has a basolateral depression, is hollow, and has two mesal margins (the mesodorsal and the mesoventral margins). Together, the parameres enclose a dorsal and ventral sinus (Figure 44). Anteriorly, the parameres are continuous with the phallobase, whose anterior limit projects as the mesoventral phallobasic apodeme and the lateral phallobasic struts.

The phallus, which when reposed lies in the tegmen, consists of one dorsal and one ventral phallic plate (Figure 46) and two lateral membranes. Each phallic plate is set with a row of marginal denticles aligned along the margin proximal to the phallic plicae. Also, the posterior ends of these plates fuse to form the phallic apex; anteriorly each plate projects as a phallic strut. The phallic plicae are distended during copulation (as in Figure 47). Their numerous phallic papillae (as in Figure 155; top arrow) may be stimulatory organs or anchorage structures; the latter function is unlikely because the inner lining of the bursa copulatrix does not have structures that might be construed as elements of an interlocking mechanism.

When reposed the aedeagus rests on the spicular fork (Figure 37), which provides an attachment surface for the aedeagal protractor and retractor muscles, and guides aedeagal movements. The spicular fork consists of two slender spicules that are broadened posteriorly and fused at the anterior third. Between the spicules and attached to them is the spicular sac, which is opened proximal to the interspicular plate. To the ventrolateral walls of this sac connects a spheroid gland (the spicular gland), whose function has not been determined. Cholodkovsky (1913:530) described and figured

similar glands in the clerid *Necrobia ruficollis* Latreille and indicated that the duct of each gland opened on either side of the anus. Scott (1919:108, footnote) suggested that the glands reported by Cholodkovsky might be neotenic structures that in mature larvae produce secretions important to construction of the pupal cocoon. During studies of clerid internal anatomy I found the spicular gland present in both sexes of species from all suprageneric taxa. In females, the spicular gland connects to the membranous sac of the *spiculum ventrale* (Figure 42).

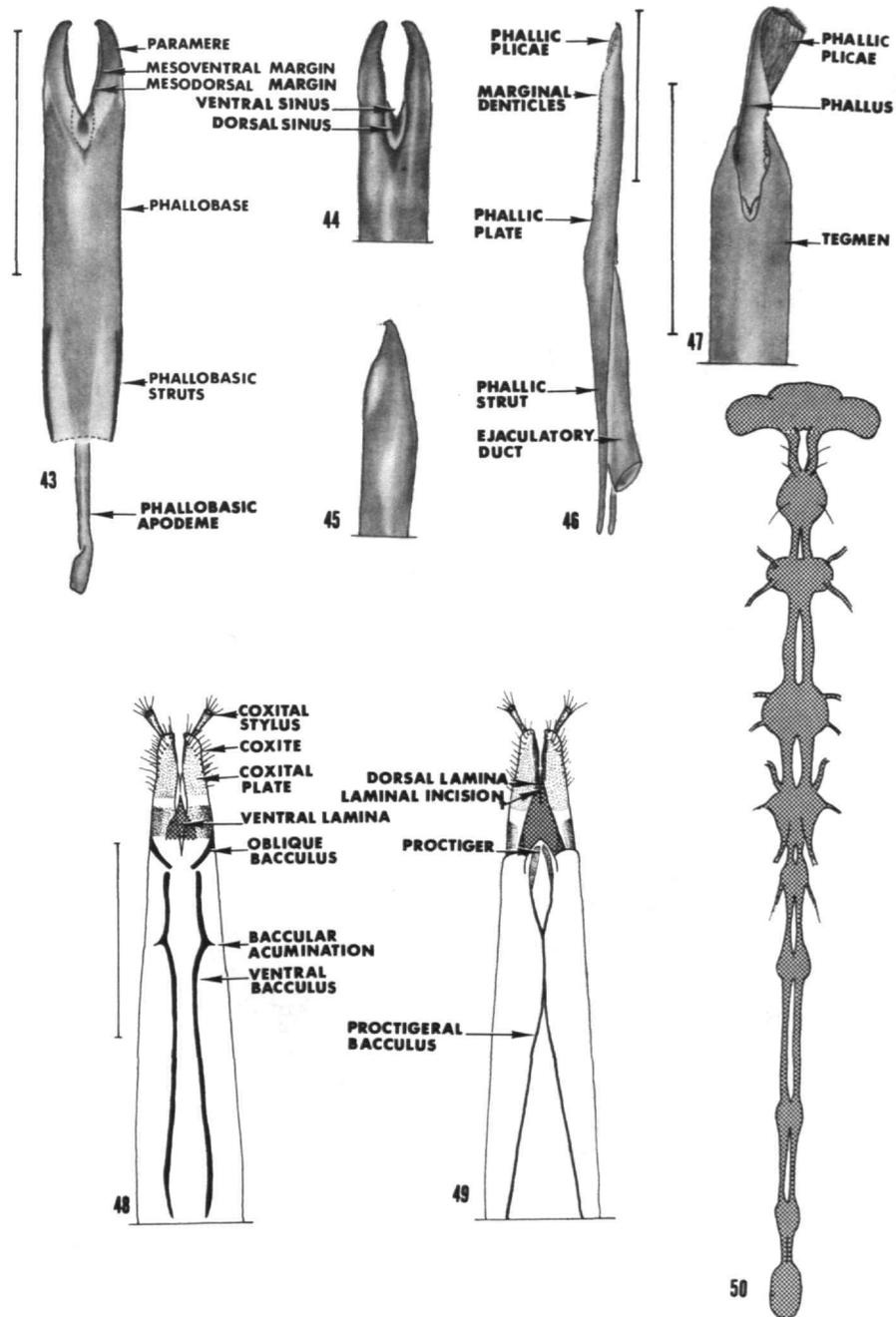
FEMALE.—The ovipositor (Figures 48, 49), a predominantly membranous tube, connects to the eighth segment via an expansive connecting membrane (the ninth segment of Tanner, 1927, figs. 56, 57); three pairs of slender sclerites provide structural rigidity to the genital tube. Two pairs of these sclerites, the oblique and ventral bacculi (Figure 48) are remnants of the first and second valvifers, respectively (Tanner, 1927:23). The mesoventral extremity of the oblique bacculus articulates with the posterior limit of the ventral bacculus, which at the posterior fourth projects as a short lateral extension (the *baccular acumination*). The third pair of supportive sclerites, *proctigeral bacculi* (Figure 49) widen on the *proctiger*, are fused at posterior third, and are strongly divergent anteriorly.

The *coxites* (the hemisternites of Lindroth, 1957:250) are lobate structures that show sclerotized vestiges (the *coxital plates*) of valvifer two. The outer margin of the coxite is broadly vested with setae and the inner margin is asetose and strongly sclerotized in the posterior half. Between the dorsal and ventral bases of the coxites extend membranous and acuminate laminae. The dorsal *laminal incision* divides the posterior half of the *dorsal lamina* (Figure 49) into two equal lobes; this lamina is substantially larger than the unlobed *ventral lamina* (Figure 48). Posteriorly, the coxite projects as a well-developed *coxital stylus* that is multisetose distally.

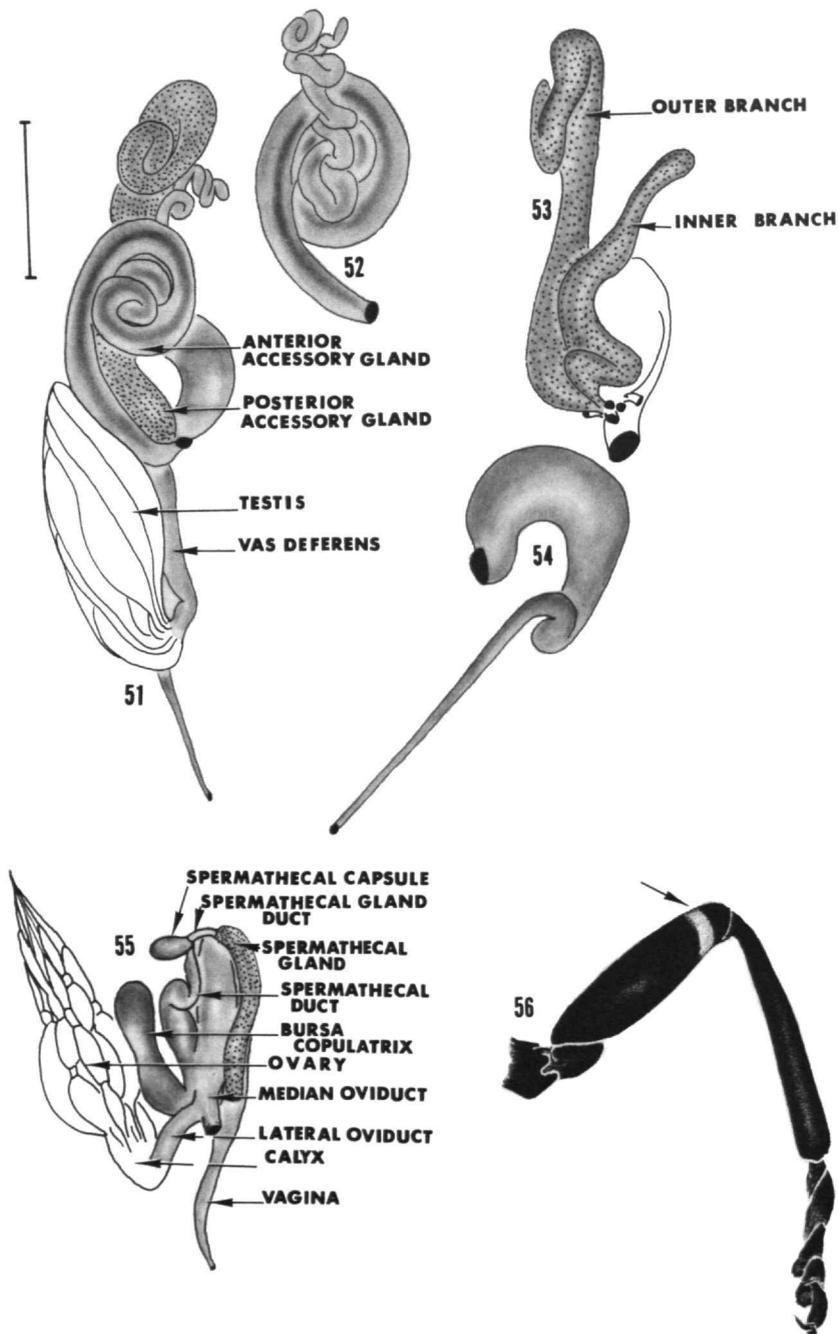
INTERNAL MORPHOLOGY

Digestive System

The male and female alimentary canal of *P. reventazon* were described by Ekis and Gupta (1971:56, figs. 28, 29, 76, 77) under *C. signaticollis*



FIGURES 43-50.—*Perilypus reventazon*: 43, tegmen, ventral view, 44, tegmen, dorsal view, 45, tegmen, lateral view, 46, phallus. *P. chaletoides*: 47, aedeagus, dorsal view; 48, ovipositor, ventral view; 49, ovipositor, dorsal view; 50, brain and ventral nerve cord, dorsal view. (Scales = 1 mm)



FIGURES 51-56.—*Perilypus reventazon*: 51, male internal reproductive organs; 52, anterior accessory gland; 53, posterior accessory gland; 54, ejaculatory duct; 55, female internal reproductive organs. *P. ventralis*: 56, hind leg. (Scales = 1 mm)

Spinola and *C. bilineatus* Gorham, respectively. The descriptions and illustrations in that work adequately characterize perilypine digestive organs, which have no appreciable intrageneric variation.

Nervous System

An illustration of the ventral nerve cord (Figure 50) is provided to establish a frame of reference for subsequent intergeneric comparisons. The nerve cord was not notably varied among the species in which it was studied.

Reproductive Systems

MALE.—The more important male organs (Figures 51–54) are the testes, vas deferens, accessory glands, and ejaculatory duct.

Each of two oblong testes consists of 12 tubular testicular follicles that are encapsulated by the peritoneal membrane. The follicles unite with the tubular vas deferens via the vasa efferentia, which join the ejaculatory duct. An oblong swelling on the vas deferens proximal to the ejaculatory duct is the seminal vesicle. To the anterior limit of the ejaculatory duct there also are attached two pairs of accessory glands which according to their position of insertion are designated as the posterior accessory glands and the anterior accessory glands.

The anterior accessory gland (Figures 51, 52) is very long, undivided, and coiled; its narrower distal third is tightly convoluted. The inner walls of this gland has two shallow, longitudinal ridges that delimit at least two different secretional regions. The products of one of these regions are externally visible as a dark band along the inner half of the gland. The posterior accessory gland (Figures 51, 53) divides near the base into two variously convoluted branches. The outer branch is about one-third longer than the inner branch; the texture and other visible properties of the secretions of both branches are identical. The ejaculatory duct (Figure 54) is bulbous and sinuous in its anterior half, slender and linear in the remainder.

FEMALE.—The major female organs (Figure 55) are the ovaries, lateral and median oviducts, bursa copulatrix, spermathecal capsule, spermathecal gland, and vagina. The shape and external appearance of these organs are generally homogeneous at infra- or interspecific level. However, the shape of

the bursa copulatrix is correlated with the amount of semen in its lumen.

The ovaries consist of 12 acrotrophic ovarioles that stem from a well-developed calyx. The latter connects to short, lateral oviducts that communicate with a narrower more elongate median oviduct. The bursa copulatrix, a saccular extension of the anterior region of the vagina, is recurved basally. The bursa copulatrix is usually spatulate, but in gravid females it is swollen substantially by seminal fluid. Near the base of the bursa copulatrix the spermathecal capsule, a sclerotized ovoid structure, communicates with the vagina via the spermathecal duct; the latter is distended basally, narrowed and convoluted distally. The spermathecal gland connects to the spermathecal capsule via a short brunneous spermathecal gland duct. The vagina is flexed near the middle and is tapered.

Genus *Perilypus*

Perilypus Spinola, 1841:72 [type-species: *Perilypus carbonarius* Spinola, 1844a:105, by monotypy].—Spinola, 1844a:103.—Lacordaire, 1857:430.—Desmarest, [1860]:235.—Schenkling, 1903:13.—Ekis, 1975:26.

Derestenus Chevrolat, 1843:13 [type-species: *Derestenus quadrilineatus* Chevrolat, 1843:13, by monotypy].—Desmarest, 1860:238.—Lacordaire, 1857:443.—Gorham, 1878:162.—Corpsaal, 1948:243.

DIAGNOSIS.—The combination of serrate antenna (Figure 8) and intricate elytral punctation (Figure 2; punctations are usually honeycomb-shaped) distinguish specimens of most species of *Perilypus* from those of other New World genera of Clerinae (sensu Crowson, 1964). Specimens of the *frontalis* and *criocerides* groups (involving four species) have clubbed antenna. Members of the first group are superficially similar to some specimens of the genus *Placopterus*, but are separated easily from them (p. 26). Specimens of *P. criocerides* (Gorham) might be confused with those of *Systemoderes amaenus* Spinola, which differ by having the elytron boldly convex, sparsely setose, and impunctate.

DESCRIPTION.—*Form*: Variable, commonly rectangular (Figure 2) with elytron plane in basal two-thirds and deflexed in apical third. Members of the *quadrilineatus* and *ornaticollis* groups are variously oval (Figures 279, 293) and usually compressed dorsoventrally, whereas those of the *chaletoides* and *viridipennis* groups are respectively conspicuously robust, and short and variously convex.

Size: Length 5.4 to 14.4 mm, width 1.6 to 5.2 mm. Females usually more robust than males.

Color: Head (including antennae), thoracic venter, elytron, legs, and abdomen usually flavotestaceous or black, or both. Pronotum concolorous, or lateral regions flavotestaceous to rufous and disc with black vitta; latter percurrent or interrupted at middle; sometimes pronotum predominantly flavotestaceous with dark brown or black midapical macula. Abdomen usually entirely black in males, black and flavotestaceous in females. Elytron concolorous, fasciate, or vittate (usually vittate or fasciate in females only).

Integumental Setae: Head, pronotum, elytron, and legs densely setose; setae particularly long and copious on antenna and tibia. Antennal setal length inversely related to elytral setal length; in lampyri-form specimens (where antenna most serrate) antennal setae exceptionally long, elytral setae exceptionally short.

Head: Interocular depressions deeply impressed or shallow, confluent posteriorly or not. Eyes usually boldly convex; ommatidia fine, as wide as ocular suture. Mouthparts, see pages 9, 11. Antenna serrate (Figure 8); rarely clubbed (Figure 67); articles usually increasing in width from scape to article 11; funicular articles filiform (Figure 67) to boldly serrate (Figure 284).

Thorax: For discussion of prothoracic venter, metathorax, and metathoracic wings and legs, see pp. 9–16. Pronotum usually conspicuously transverse, length rarely equals width; subapical depression deeply impressed throughout, or deeply impressed laterally and shallow medially, sinuous or linear; pronotal foveae shallow or deeply impressed, punctiform or elongate; side margins of pronotum proper variously convex; prebasal depression and pronotal collar usually well developed. Mesoscutellum subquadrate, transverse (Figure 312), or triangular (Figure 300); rarely stalked (Figure 310). Elytron variable; outer margins (epipleural or posthumeral) broadly arcuate, or straight in basal two-thirds (or more); arcuate in apical third (or more); surface microsculptured (see arrow in Figure 307) or not; punctation usually favus, deeply impressed or shallow, and profusely distributed throughout elytral surface, or punctations small and round and restricted to posthumeral region. Epipleural fold plane or convex; apical slope

deflection gradual (Figure 30), very gradual (Figure 31), or acute (Figure 29). Front tarsal claws boldly (Figure 69) or feebly (Figure 34) asymmetrical, or symmetrical.

Abdomen: The structures of the abdomen are discussed on page 16. Male pygidium varied in size and shape, particularly robust in some species (Figure 217); posterior margin usually entire, rarely emarginated (Figure 94).

Male Genitalia: For a general description, see page 18. Usually strongly pigmented throughout; in members of the *ornaticollis* group phallobase marked with two dorsal and two ventral longitudinal bands. Combined length of phallobase and phallobasic apodeme 1.5 to 10 times longer than paramere. Combined length of paramere and phallobase 1.0 to 4.8 times longer than phallobasic apodeme. Paramere: well developed; dorsum usually convex, explanate medially or not; mesodorsal margin denticulated or not; venter usually concave; dorsal and ventral sinuses well defined. Phallus: marginal denticles present or not; phallic plicae usually well developed.

Female Genitalia: For a general description see page 18. Dorsal lamina bilobed (Figure 101), or trilobed (Figure 71), rarely heptalobed (Figure 318); ventral lamina usually trilobed (Figure 85), rarely unilobed (Figure 48), or pentalobed (Figure 70); laminae often deeply incised; proctigeral bacculi fused (Figure 49) or not (Figure 71); ventral bacculi never fused, acuminate at posterior two-thirds or near middle; coxital plates present or absent.

Internal Organs: The treatise of the alimentary canal, ventral nerve cord, and the reproductive organs of *P. reventazon*, (p. 18) adequately serves as a generic characterization of the internal organs considered. The accessory glands of the male reproductive organs, however, are somewhat variable interspecifically. The most notable variation involves the anterior glands, which are feebly coiled in *P. ventralis* (Figure 316), and the posterior glands which are exceptionally long in *P. chaletoides* (Figure 277).

DISTRIBUTION.—The species of this genus occur in the New World only. Except for *P. ornaticollis*, whose northern limit is recorded as Ohio (USA), the genus is exclusively Neotropical and ranges from Mexico to central Brazil. Most of the species occur in Central America, from Mexico to Panama.

Key to the Species of *Perilypus*

1. Antenna (Figure 67) loosely clubbed, funicular articles usually filiform, rarely serrate 2
 Antenna (Figure 8) not clubbed, serrate 3
- 2.(1) Elytron copiously punctate (Mexico to Nicaragua) (*frontalis* group) 8
 Elytral punctations absent, or few punctations in posthumeral region (Mexico) (*criocerides* group) 9
- 3.(1) Elytra (Figures 279, 293) ovate, and/or elytral surface copiously impressed with small shallow punctations; punctate and interpunctate elytral surfaces arenose, rarely smooth and shiny; pronotum (Figure 279) boldly transverse; antenna (Figure 284) usually boldly serrate 4
 Elytra (Figure 2) rectangular; elytral surface impressed with large deeply impressed punctations (Figure 2), punctations profusely distributed (Figure 2), or concentrated in posthumeral region (Figure 99); punctate and interpunctate elytral surface usually smooth and shiny; pronotum (Figure 110) feebly transverse, length rarely equals width; antenna rarely boldly serrate 6
- 4.(3) Mesoscutellum (Figure 312) transverse; femora usually dark brown or black and with subapical annulus (Figure 56), rarely entirely dark brown or flavotestaceous (USA to Venezuela) (*ornaticollis* group) 10
 Mesoscutellum subquadrate or trigonal; femora predominantly flavotestaceous or entirely dark brown or black, rarely annulated subapically 5
- 5.(4) Dorsal facies entirely stramineous or predominantly castaneous (Mexico) (*chaletoides* group) 17
 Dorsal facies not as above; elytral surface entirely black, rarely predominantly piceous and vittate discally (Mexico to Guatemala) (*quadriineatus* group) 18
- 6.(3) Epipleural fold convex, and/or elytral surface impunctate at apical fourth or more 7
 Epipleural fold plane, concave or grooved longitudinally; elytral surface coarsely punctate throughout (Mexico to Peru) (*reventazon* group) 22
- 7.(6) Elytral apical fourth impunctate or with few very small punctations (but see variation under *P. levis*) (Panama to Brazil) (*viridipennis* group) 56
 Elytral surface coarsely punctate throughout (Coast Rica to Peru) (*limbatus* group) 58
- 8.(2) Front tarsal claws asymmetric; epipleural fold grooved longitudinally (males), or shifted dorsally (females) by boldly convex epipleuron at elytral middle half (Figure 61) (Mexico to El Salvador) 1. *P. frontalis* (Gorham), new combination
 Front tarsal claws symmetric; epipleural fold convex from elytral base to elytral apex (El Salvador to Nicaragua) 2. *P. sensilis*, new species
- 9.(2) Antennal club compact (Figure 80), funicular articles filiform; elytron predominantly flavotestaceous; posterior margin of pygidium feebly emarginated in males (Figure 86), entire in females (Mexico) 3. *P. criocerides* (Gorham), new combination
 Antennal club lax (Figure 96), funicular articles serrate; posterior margin of pygidium deeply emarginated in males (Figure 94), feebly emarginated in females (Figure 95); elytron dark blue or purpurescent (Mexico) 4. *P. insectus*, new species
- 10.(4) Femora entirely dark brown or entirely flavotestaceous, not annulated 11
 Femora predominantly black, annulated (Figure 56) 12
- 11.(10) Pronotal discal vitta furcate (Figures 322-324); elytral discal vitta (when present) not strongly diverged from elytral suture at elytral apical fifth; femora entirely dark brown (USA to Mexico) 43. *P. ornaticollis* (LeConte), new combination
 Pronotal discal vitta reduced to a midbasal macula (Figure 342); elytral discal vitta strongly diverged from elytral suture at elytral apical fifth (Figure 342); femora entirely flavotestaceous (Panama) 49. *P. floralis* (Gorham), new combination
- 12.(10) Fourth and fifth visible abdominal sternum flavous; mesoscutellar disc concave; average size about 13 mm (Mexico to Guatemala)
 42. *P. ventralis* (Gorham), new combination
 Fourth and fifth visible sternum black; mesoscutellar disc plane; average size from 6 to 8 mm 13
- 13.(12) Epipleural fold plane 14
 Epipleural fold obliquely convex 16

14.(13)	Elytron sinuate apically (Figure 354), surface with stout vertical setae, sutural margin diverged at apical fifth (Figure 354) (Panama)	46. <i>P. pilatus</i> , new species
	Elytron truncate apically, vertical setae and sutural margin normal	15
15.(14)	Antennal article 11 as long as preceding three combined (Figure 331) (Mexico)	45. <i>P. prolixicornis</i> , new species
	Antennal article 11 as long as preceding two combined (Figure 332) (Mexico to Guatemala)	44. <i>P. galbeus</i> , new species
16.(12)	Elytral apex uplifted (Figure 353), surface dull, epipleural fold obliquely convex (Costa Rica)	47. <i>P. antarius</i> , new species
	Elytral apex not uplifted but sinuatotruncate, surface shiny, epipleural fold evenly convex (Venezuela)	48. <i>P. sinuapicis</i> , new species
17.(5)	Elytral surface entirely stramineous (Mexico)	36. <i>P. bicolor</i> (Chevrolat), new combination
	Elytral surface predominantly rufous, apex and sutural margin usually black (Figure 266), rarely only faintly infuscated at suture (Mexico) ..	35. <i>P. chaletoides</i> , new species
18.(5)	Epipleural fold obliquely convex, visible in specimen dorsal view; elytral vitta as in Figure 279 (Mexico to Guatemala)	37. <i>P. quadrilineatus</i> (Chevrolat), new combination
	Epipleural fold not obliquely convex and not visible in specimen dorsal view; elytral disc avittate	19
19.(18)	Elytral surface undulated longitudinally (Figure 305); pronotum not coarsely macrosculptured	20
	Elytral surface not undulated; pronotum coarsely macrosculptured	21
20.(19)	Pronotal vitta exceptionally broad, with oblong roseous macula at center; femur testaceous ventroapically (Mexico)	39. <i>P. coroniformis</i> , new species
	Pronotal vitta constricted medially, not maculated centrally, femora annulated subapically (Guatemala)	40. <i>P. fuctus</i> , new species
21.(19)	Elytral disc bicarinate (Figure 300); pronotum concave centrally and paraterally, coarsely punctate (Mexico)	41. <i>P. bicristatus</i> , new species
	Elytral disc not carinate; pronotum plane, transversely wrinkled; posthumeral margin briefly vittate (Figure 287) (Mexico to Guatemala)	38. <i>P. telephoroides</i> (Gorham), new combination
22.(6)	Posterior margin of sixth visible sternum emarginated (Figure 41) (males)	23
	Posterior margin of sixth visible sternum not emarginated (Figure 42) (females)	39
23.(22)	Front tarsal claws boldly asymmetrical	24
	Front tarsal claws feebly asymmetrical, or symmetrical	28
24.(23)	Length about 6 mm; elytron olive green or blue green, apex usually testaceous (Mexico)	32. <i>P. immitis</i> , new species
	Length more than 8 mm; elytral coloration not as above	25
25.(24)	Antenna testaceous (Mexico to Costa Rica)	27. <i>P. orthopleuridus</i> (Thomson), new combination
	Antenna entirely black or dark brown	26
26.(25)	Pygidium transverse (Mexico)	29. <i>P. latilobus</i> , new species
	Pygidium oblong	27
27.(26)	Antennal articles 3-5 moderately serrate (Figure 8); procoxae infuscated (Guatemala) ..	26. <i>P. calcaris</i> , new species
	Antennal articles 3-5 feebly serrate, nearly filiform; procoxae immaculate (Mexico) ..	28. <i>P. exilis</i> , new species
28.(23)	Elytral apex testaceous (Panama)	23. <i>P. bilineatus</i> (Gorham)
	Elytral apex not testaceous	29
29.(28)	Antenna boldly serrated (Figure 244)	30
	Antenna moderately serrated	31
30.(20)	Femora infuscated at apex only; elytra not truncated (Panama)	24. <i>P. cerroazul</i> , new species
	Femora infuscated at distal third or more; elytra truncated (Peru)	31. <i>P. crassus</i> , new species
31.(29)	Specimens north of Nicaragua	32
	Specimens south of Nicaragua	35

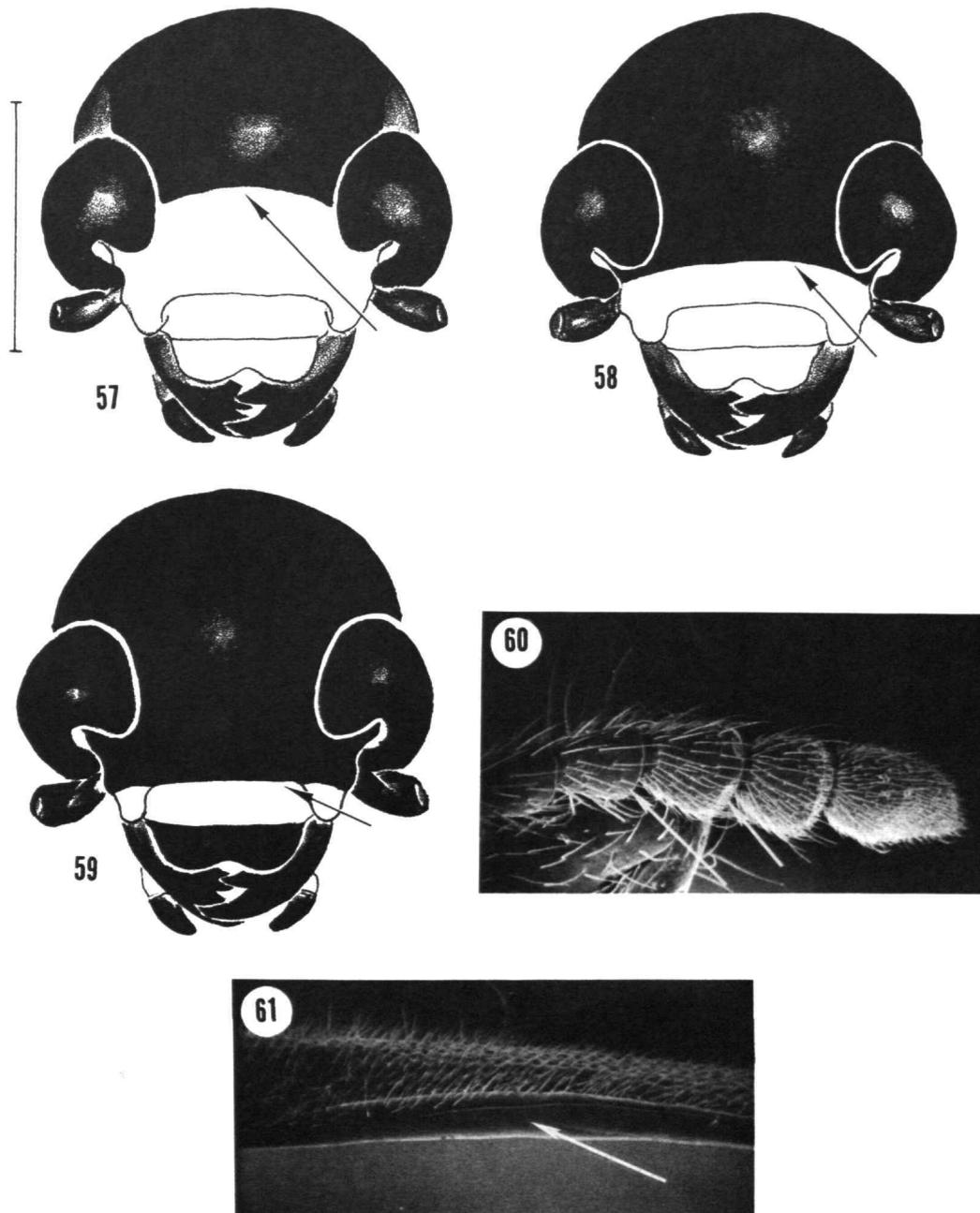
- 32.(31) Body form slender (Figure 239); elytra feebly convex; elytral vertical setae about one-third longer than elytral reclinate setae; pronotal vitta constricted at subapical depression (Mexico to Guatemala) 30. *P. distinctus* (Chevrolat), new combination
 Body form squat; elytra plane; elytral vertical setae about one-half longer than elytral reclinate setae; pronotal vitta not as above 33
- 33.(32) Pronotal subapical depression shallow at middle; pronotal arch feebly convex, approaching plane (Guatemala) 19. *P. nigriventris* (Gorham)
 Pronotal subapical depression deeply impressed throughout; pronotal arch boldly convex 34
- 34.(33) Parameres short, strongly arcuate (Figure 255); parameres with combined venter deeply concave (Figure 255) (Mexico) 33. *P. caliculus*, new species
 Parameres not as above, but as in Figure 258 (Mexico) 34. *P. carbonarius* Spinola
- 35.(31) Profemur black in ventroapical third or entirely flavotestaceous (Costa Rica) 21. *P. claudus* (Wolcott)
 Profemur flavotestaceous in ventroapical third 36
- 36.(35) Metafemur entirely flavotestaceous or infuscated dorsoapically 37
 Metafemur black in apical half or less (Costa Rica) 20. *P. sapientis*, new species
- 37.(36) Antenna more serrate than in Figure 8; metafemur flavotestaceous (Costa Rica) 22. *P. cultratus*, new species
 Antennal serration as in Figure 8 38
- 38.(37) Metafemur infuscated dorsopreapically (infuscation narrowed to femoral apex dorso-laterally or not narrowed) (Costa Rica) 18. *P. reventazon*, new species
 Metafemur infuscated dorsoapically (Panama) 25. *P. ordinatus*, new species
- 39.(22) Epipleuron broadly explanate in elytral middle third (Figure 230) (Mexico) 27. *P. orthopleuridus* (Thomson)
 Epipleuron not broadly explanate 40
- 40.(39) Sixth visible abdominal sternum conspicuously arenose and with broad shallow depressions; fourth and fifth visible sternum flavous (Guatemala) 26. *P. calcaris*, new species
 Abdominal sterna not as above 41
- 41.(40) Elytral disc vittate (sometimes vitta only faintly visible) 42
 Elytral disc avittate 51
- 42.(41) Elytral discal vitta closer to posthumeral margin than to sutural margin (Figure 186) 43
 Elytral discal vitta about equidistant from side margins (Figure 193) 46
- 43.(42) Elytral discal vitta gradually incurved posteriorly, terminating at elytral apex 44
 Elytral discal vitta acutely incurved posteriorly, terminating at sutural margin before elytral apex 45
- 44.(43) Elytral sutural margin flavotestaceous at basal third or more (Mexico) 34. *P. carbonarius* Spinola
 Elytral sutural margin piceous (Panama) 23. *P. bilineatus* (Gorham), new combination
- 45.(43) Femora black in distal half or more, not flavotestaceous ventroapically (Costa Rica) 21. *P. claudus* (Wolcott)
 Femora infuscated in dorsodistal half, flavotestaceous ventroapically (Costa Rica) 18. *P. reventazon*, new species
- 46.(42) Anterior limit of elytral discal vitta before humeral margin (Figure 239); first five visible abdominal sterna flavotestaceous 47
 Anterior limit of elytral discal vitta at humeral margin (Figure 186); abdominal sternum not as above 48
- 47.(46) Elytron feebly convex; metafemur infuscated at dorsoapical third (Mexico) 30. *P. distinctus* (Chevrolat)
 Elytron plane; metafemur infuscated at apex only (Costa Rica) 22. *P. cultratus*, new species
- 48.(46) Femora predominantly black (Mexico) 29. *P. latilobus*, new species
 Femora predominantly flavotestaceous 49
- 49.(48) Antenna flavotestaceous (Costa Rica) 21. *P. claudus* (Wolcott)
 Antenna black 50
- 50.(49) Meso- and metafemur black in apical third or more (Costa Rica) 20. *P. sapientis*, new species

	Meso- and metafemur black at apex only (Guatemala)	19. <i>P. nigriventris</i> (Gorham), new combination
51.(41)	Elytron broadly flavotestaceous at or near margin, fasciate (Figures 262-265), or entirely flavotestaceous (Mexico)	34. <i>P. carbonarius</i> Spinola
	Elytron not as above, disc entirely black	52
52.(51)	Antenna boldly serrate (Figure 244); elytra feebly convex (Peru)	31. <i>P. crassus</i> , new species
	Antenna moderately serrate (Figure 8); elytra plane	53
53.(52)	Elytral apex testaceous and/or elytra olive green or blue green (Mexico)	32. <i>P. immitis</i> , new species
	Elytral apex not testaceous	54
54.(53)	Femora flavotestaceous in basal third; pronotal vitta abruptly narrowed at subapical depression (Mexico)	29. <i>P. latilobus</i> , new species
	Femora entirely black; pronotal vitta not as above	55
55.(54)	Pronotum boldly transverse (Mexico)	34. <i>P. carbonarius</i> Spinola
	Pronotum feebly transverse (Mexico)	33. <i>P. caliculus</i> , new species
56.(7)	Antenna boldly serrate (Figure 244) and densely setose (Canal Zone to Brazil)	7. <i>P. levis</i> , new species
	Antenna only moderately serrate and moderately setose	57
57.(56)	Antenna uniformly black; elytral apical fourth impunctate or with very small punctations; epipleural fold more collapsed than convex (Panama to Colombia)	6. <i>P. velucens</i> (Gorham), new combination
	Antenna predominantly dark brown, flavotestaceous apically; elytral apical half impunctate; epipleural fold convex (Panama to Venezuela)	5. <i>P. viridipennis</i> (Spinola), new combination
58.(7)	Legs testaceous, except hind femur black in distal half (Panama)	16. <i>P. testaceicornis</i> (Pic), new combination
	Combination of leg colors not as above	59
59.(58)	Epipleural fold wider than antennal pedicel (north of Colombia)	60
	Epipleural fold not wider than antennal pedicel (South America)	62
60.(59)	Elytral apex black; elytral discal vitta sharply incurved and broadly outcurved posteriorly (Figure 2) (Panama)	17. <i>P. decoris</i> , new species
	Elytral apex flavotestaceous; elytral disc avittate, or vitta not curvate posteriorly	61
61.(60)	Specimens from north of Panama; male genitalia as in Figures 172-174	15. <i>P. prolixipennis</i> , new species
	Specimens from Panama; male genitalia as in Figures 167-169	14. <i>P. latilira</i> , new species
62.(59)	Distal half of hind femur predominantly or entirely black; frons partially or totally black (Figures 58, 59)	63
	Distal half of hind femur predominantly flavotestaceous, only apex infuscated; frons flavotestaceous (Figure 57)	66
63.(62)	Inner margins and venter of antennal articles 9 to 11 testaceous (Colombia)	10. <i>P. apocopatus</i> , new species
	Inner margins and venter of antennal articles 9 to 11 black	64
64.(63)	Femur entirely black	11. <i>P. iris</i> , new species
	Femur flavotestaceous basally	65
65.(64)	Labrum and frons black (Figure 59) (Colombia)	9. <i>P. columbicus</i> (Spinola), new combination
	Labrum testaceous; frons testaceous anteriorly, black posteriorly (Figure 58) (Colombia)	13. <i>P. buga</i> , new species
66.(62)	Antennal articles 9 to 11 testaceous ventrally (Venezuela to Bolivia)	8. <i>P. limbatus</i> (Gorham), new combination
	Antennal articles 9 to 11 black ventrally (Peru)	12. <i>P. acus</i> , new species

The *frontalis* Group

The members of this group have clubbed antennae, a characteristic that separates them from all

other species of *Perilypus* except the two species that constitute the *criocerides* group. Specimens of the *frontalis* group differ from those of the *criocerides* group by having the elytral surface conspicuously



FIGURES 57-61.—Anterior limit of black color of frons: 57, *Perilypus limbatus*, 58, *P. buga*, 59, *P. columbicus*. *P. frontalis*: 60, antenna, dorsal view, $\times 60$ (arrows indicate apical border of antennal articles); 61, female elytron, lateral view, $\times 27$ (arrow indicates convex epipleuron). (Scale = 1 mm)

and deeply punctated; the paramere (Figures 73, 78) long, feebly pigmented, and without lateral depression; and the phallic plate (Figures 74, 79) devoid of marginal denticles.

Specimens of the *frontalis* group superficially resemble those of the genus *Placopterus* (Wolcott, 1910b:363) from which they can easily be distinguished as follows: in *frontalis* group specimens the antenna extends beyond the pronotal collar, antennal article 11 is oblong, body form is rectangular, and pronotal subapical depression is sinuous. In *Placopterus* species the antenna does not reach the pronotal collar, antennal article 11 is quadrate or transverse, body form is more oval, and the pronotal subapical depression is broadly arcuate.

The distribution of this group extends from Chiapas, Mexico, to Rivas, Nicaragua.

1. *Perilypus frontalis* (Gorham), new combination

FIGURES 60-76, 356

Poecilochroa frontalis Gorham, 1886:338 [holotype: female, deposited in BMNH; type-locality: Ciudad Guatemala, Departamento de Guatemala, Guatemala].

Derestenus apicalis Pic, 1941:10 [lectotype: female, deposited in MNHP, here designated; type-locality: Guatemala; new synonymy].

Pic's type-specimen does not differ significantly from Gorham's type-specimen.

DIAGNOSIS.—The extraordinary degree of asymmetry between the inner and outer front tarsal claws (Figure 68) will distinguish males of this species from those of any other congeneric species. Female specimens are easily recognized by the boldly convex epipleuron, which is most developed in elytral middle half. The modification of the female epipleuron causes the epipleural fold to be shifted upward and the confluence of both structures gives the epipleural margin a tubular appearance (Figure 61).

DESCRIPTION.—*Form:* As in Figure 62.

Size: Length: males, average about 6.3 mm, range 5.2-7.4 mm; females, average about 6.7 mm, range 5.7-7.8 mm. Width: males, average about 1.9 mm, range 1.8-2.3 mm; females, average about 2.2 mm, range 1.8-2.7 mm. Ten males and 10 females measured.

Color: Cranium either flavotestaceous, pale orange, flavotestaceous with midpicranial black

macula, or clypeus, frons, and cranial venter flavotestaceous and epicranium and gena black; antenna black; prothorax either flavotestaceous at sides and with percurrent or medially interrupted black discal vitta, or flavotestaceous or pale orange and with or without dark brown midapical macula and dark brown collar; femur either flavotestaceous in basal four-fifths and black in apical fifth, flavotestaceous in basal fifth and black in apical four-fifths, or entirely flavotestaceous; tibia black or yellow; meso- and metasternum piceous; elytron either shiny black but apex flavotestaceous (Figure 62), black with sutural and marginal flavotestaceous vitta (Figure 63), as in Figure 64, or stramineous and infuscated subapically (Figure 66); abdomen black.

Head: Interocular depressions broad and shallow; eyes shallow; frons (Figure 65) conspicuously broad (HW/IOW, average about 1.9, range 1.8-2-1; 10 males and 10 females measured); antenna clubbed (Figures 60, 67); funicular articles feebly serrate; apical border and disc of antennal articles 7 and 8 not microsetiferous; AL/PLS, about 1.7; length/width ratio of each male antennal article 2.5:1.4:2.0:2.0:2.0:1.7:1.8:1.7:1.3:1.1:1.7.

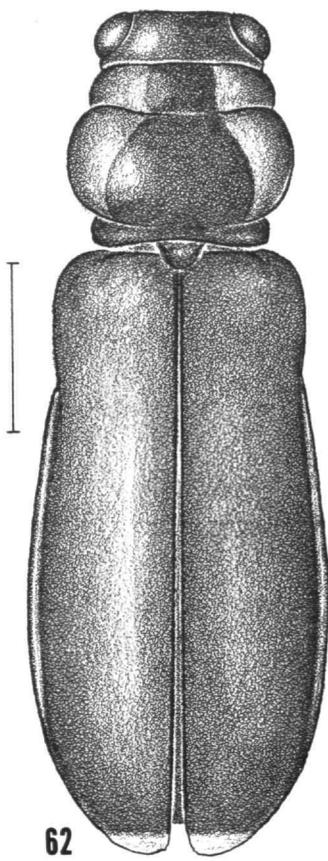
Pronotum: PL/PW, average about 0.86, range 7.9-9.2 (10 males and 10 females measured); subapical and prebasal depressions deeply impressed; side margin of pronotal proper boldly convex.

Mesoscutellum: Subquadrate.

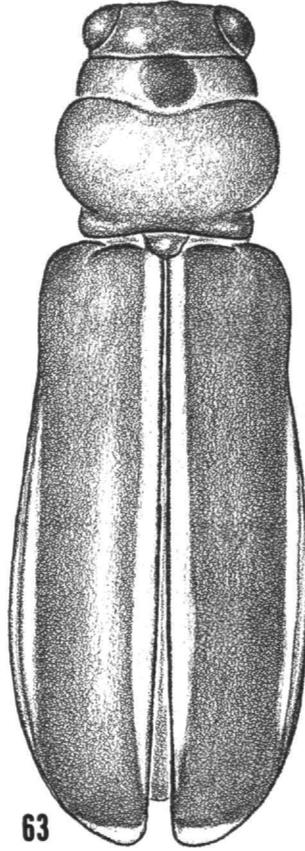
Elytron: Epipleural margin straight in basal three-fourths, broadly arcuate in apical fourth; slope of apical deflection gradual; discal punctations well impressed and evenly distributed; punctate and interpunctate surfaces smooth, shiny, and densely covered with pale reclinate setae; vertical setae piceous; epipleuron and epipleural fold variable (see "Variation"); EL/EW, average about 4.3, range 3.9-4.9 (10 males and 10 females measured).

Front Tarsal Claws: Strongly asymmetrical in both sexes; inner claw about ^{three} times longer than outer claw in males (Figure 69), and about one and a half times longer in females (Figure 68).

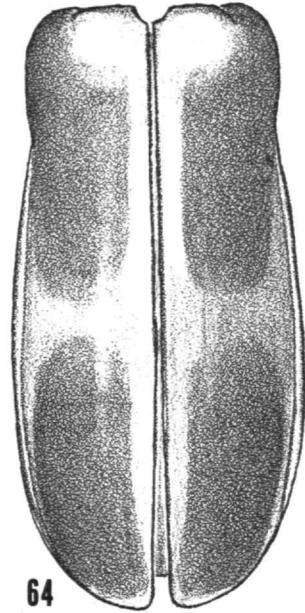
Male Genitalia (Figures 72-74): Feebly pigmented. Phallobase very broad. Combined length of phallobase and phallobasic apodeme 1.5 times longer than paramere. Combined length of paramere and phallobase 3.0 times longer than phallobasic apodeme. Paramere: apex obtuse, feebly declinate in lateral view; lateral depression absent; dorsum convex, explanate medially; venter narrow,



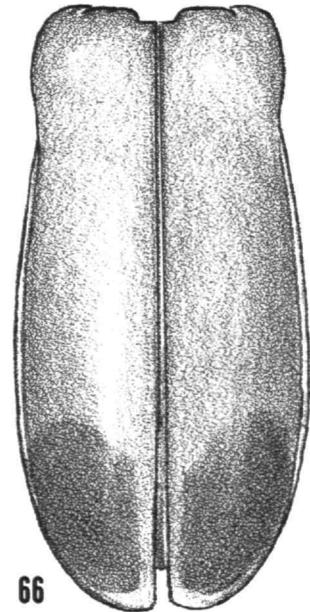
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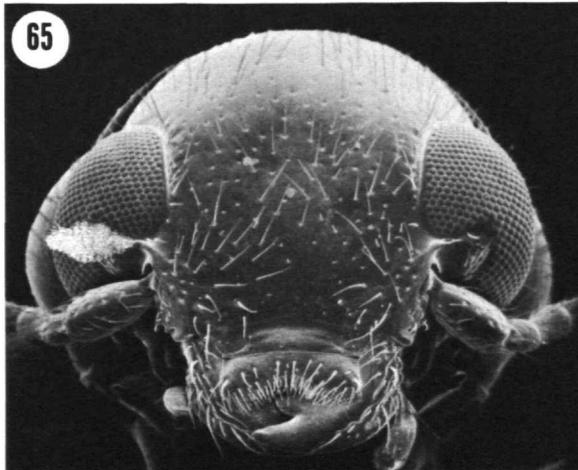
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64



66



65

FIGURES 62-66.—*Perilypus frontalis*: 62-63, habitus; 64, elytra; 65, head, front view, $\times 30$; 66, elytra. (Scale = 1 mm)

mesoventral margin broadly arcuate; mesodorsal margin sinuous. Sinus: dorsal narrow, lanceolate; ventral elliptical. Phallus: marginal denticles absent; phallic plicae well developed (47 specimens examined).

Female Genitalia (Figures 70, 71): Laminae very short; dorsal lamina trilobed, lobes equal in length; ventral lamina pentalobed, paralateral pair of lobes shorter than medial lobe; proctigeral bacculi widely separated; ventral bacculus acuminate at posterior two-thirds; coxital plates absent (2 specimens examined).

Internal Reproductive Organs: Male (Figures 75, 76); anterior accessory gland uniramous, tightly coiled; posterior accessory gland biramous, outer branch little less than twice as long as inner branch; testis composed of 12 follicles. Female, as in Figure 55 (5 males and 2 females examined).

VARIATION.—Structural: The degree of asymmetry of the front tarsal claws varies with sex (see "Front Tarsal Claws") as does development of the epipleuron and the epipleural fold. In the female elytron the epipleuron and epipleural fold are boldly convex (Figure 61); in males the epipleuron is not convex and the epipleural fold is grooved longitudinally.

The degree of asymmetry of the front tarsal claws also varies slightly independent of sex. The epipleuron and epipleural fold is collapsed in some female specimens; however, this variation is probably due to incomplete cuticular expansion.

Color: Variation in color, not correlated with sex or geography, is extreme (Figures 62–66). In general, color of various parts of the integument not normally black or brown ranges from stramineous to fulgidus.

NATURAL HISTORY.—In June, in Sumpango, Guatemala, I collected four specimens at 2012 meters and in Zinacatán, Mexico, three specimens at 1830 meters. The Guatemalan sample was collected by beating roadside shrubs while those from Mexico were collected by beating oak branches (*Quercus* sp.). In May, on Cerro Verde, El Salvador, H. F. Howden collected 13 specimens at 2000 meters. Adult specimens were also collected in July, in Mexico.

DISTRIBUTION (Figure 356).—The known range of this species extends from southern Mexico to southern El Salvador and southwestern Guatemala.

LOCALITY RECORDS (Figure 356).—I examined 110 adult specimens from Central America. MEXICO: Estado de Chiapas: Chiapas (ZMAN, 1 female); 2 miles [3.2 km] northwest of Pueblo Nuevo (GHNE, 1 female); 20 miles [32 km] north of Bochil, Yerba Buena (CNCC, 1 female; GEKI, 2 females); San Cristóbal de las Casas (GEKI, 1 male and 1 female); Huistán area, 27 miles [43 km] northeast of San Cristóbal de las Casas (GEKI, 1 male); 11 miles [18 km] northeast of San Cristóbal de las Casas (GEKI, 1 female); 7 miles [11 km] southeast of San Cristóbal de las Casas (HFHO, 1 male); Teopisca (MNHB, 1 male and 5 females; GEKI, 2 males and 5 females); Highway 24, 8 to 10 miles [13 to 16 km] southeast of Teopisca (CNCC, 4 males and 3 females; GEKI, 2 males and 2 females; HFHO, 1 male and 3 females); Comitán (GEKI, 7 males and 5 females; MNHB, 7 males and 13 females); El Rincón, route 17 (HFHO, 1 female); Chincultic, near El Rincón (GEKI, 1 female); Zinacatán (GEKI, 1 male and 2 females; MNH, 1 female). GUATEMALA: Departamento de Guatemala: Ciudad Guatemala (BMNH, 1 female, holotype); Departamento de Sacatepequez: Dueñas (BMNH, 1 male and 1 female; GEKI, 1 female); Capetillo (BMNH, 2 males and 1 female; GEKI, 4 males and 1 female; MNHB, 1 male; MNHP, 2 females; MNH, 1 male). Departamento de Chimaltenango: Calderas (BMNH, 1 female; GEKI, 1 female). "Guatemala" (MNHP, 1 female). EL SALVADOR: Departamento de Santa Ana: 23 kilometers north of Metapán (GEKI, 1 female). Departamento de San Miguel: Cerro Verde (CASC, 1 male; GEKI, 4 males and 2 females; HFHO, 6 males and 2 females).

2. *Perilypus sensilis*, new species

FIGURES 77–79, 356

TYPE-LOCALITY.—Cerro San Jerónimo, Departamento de La Paz, El Salvador.

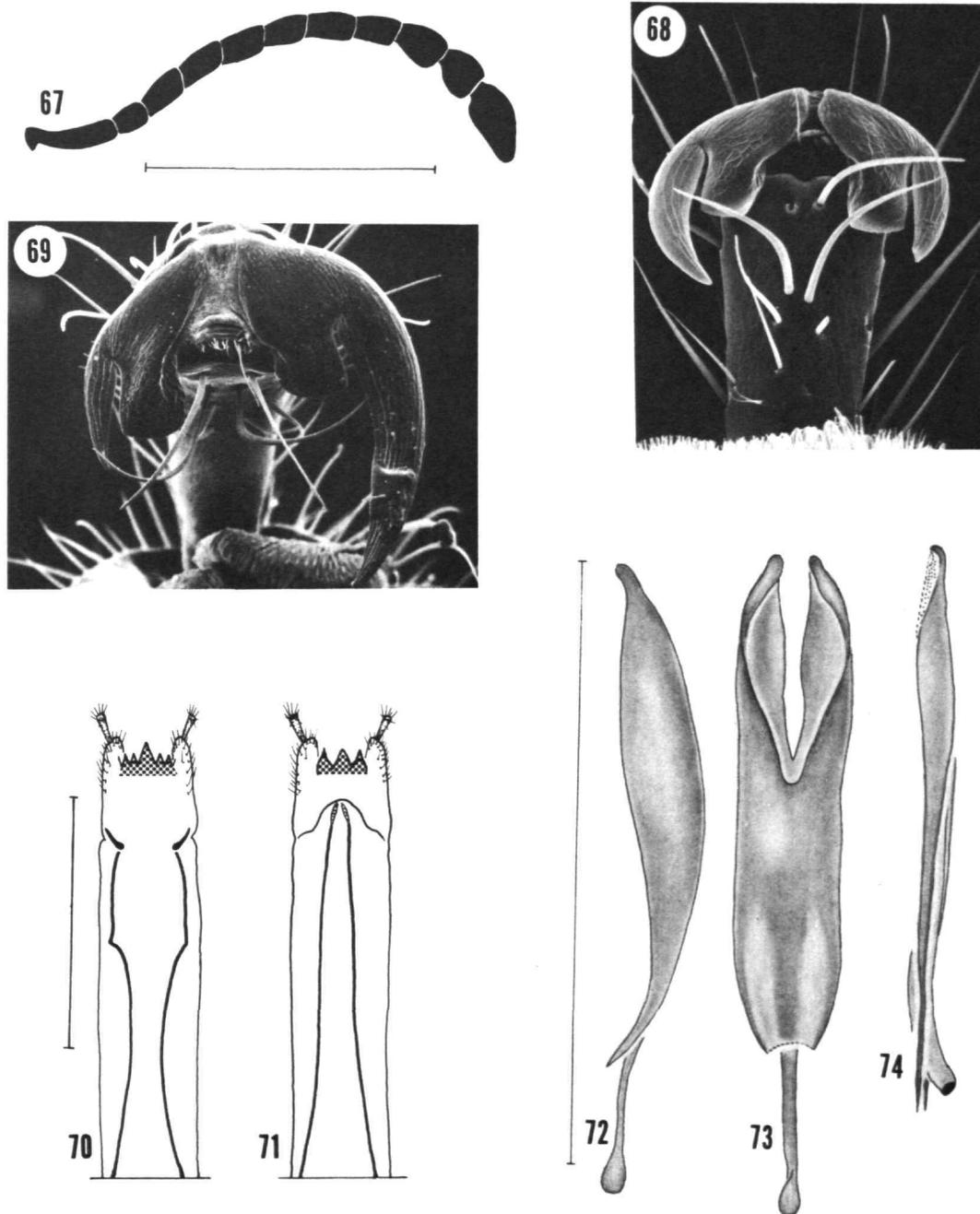
TYPE-SPECIMENS.—The holotype male is deposited in MNHP, the allotype in BMNH. Both specimens were collected by G. C. Champion. Two paratypes: GEKI, 1 male; HFHO, 1 male.

DIAGNOSIS.—Distinguishable from *P. frontalis*, the only other member of the *frontalis* group, by symmetry of the front tarsal claws, by the evenly convex epipleural fold (male and female), and by the less convex side margins of the pronotum proper.

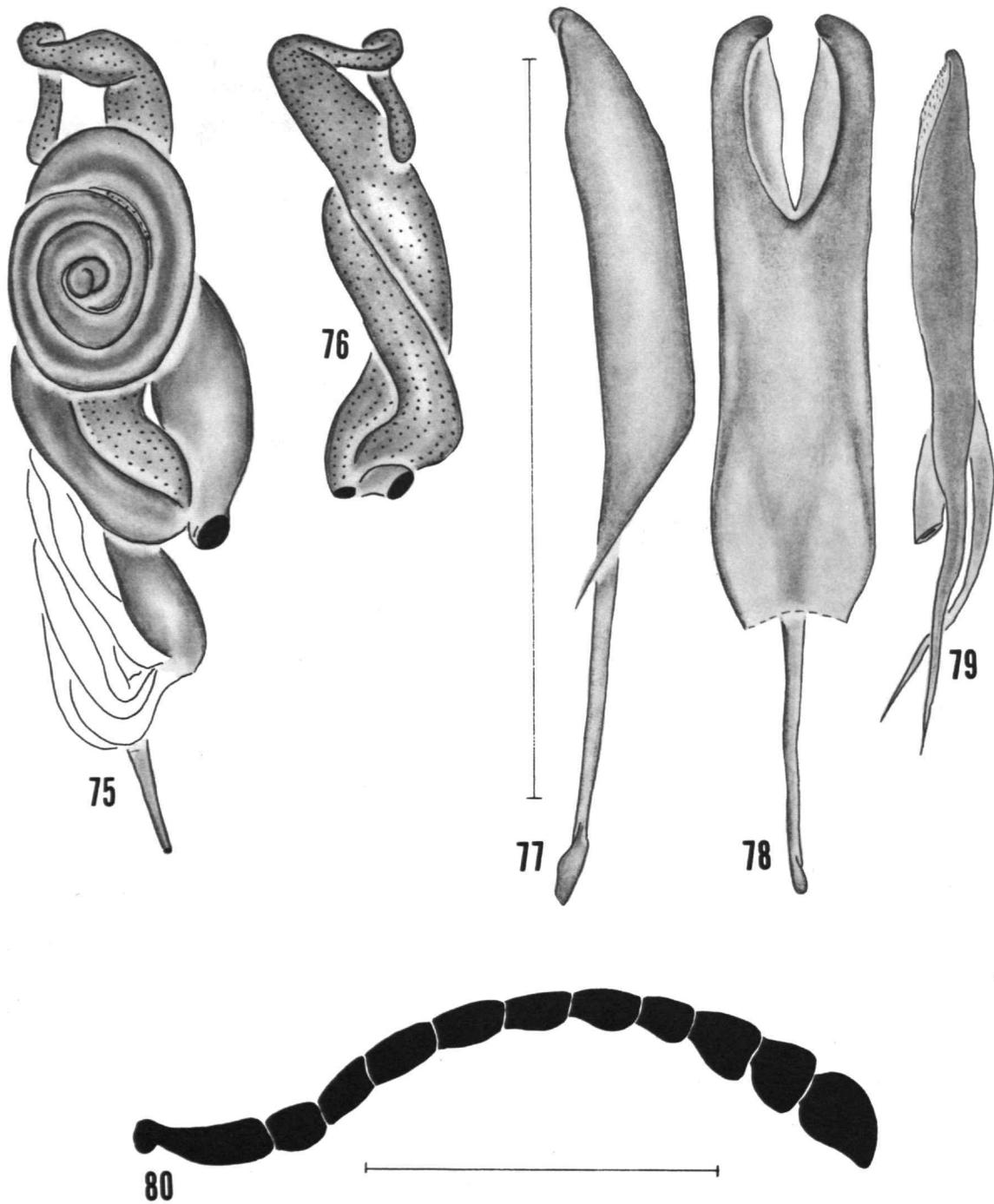
DESCRIPTION.—*Form*: As in *P. frontalis* (Figure 62).

Size: Length: males, average about 6.8 mm, range 5.6–8.0 mm; females 7.6 mm. Width: males, average about 2.2 mm, range 1.8–2.9 mm; females 2.2 mm. Three males and 1 female measured.

Color: Clypeus, frons, and cranial venter flavo-testaceous, epicranium and gena black; antenna



FIGURES 67-74.—*Perilypus frontalis*: 67, antenna; 68, female front tarsal claw, $\times 140$; 69, male front tarsal claw, $\times 140$; 70, ovipositor, ventral view; 71, ovipositor, dorsal view; 72, tegmen, lateral view; 73, tegmen, ventral view; 74, phallus. (Scale = 1 mm)



FIGURES 75-80.—*Perilypus frontalis*: 75, male internal reproductive organs; 76, posterior accessory glands. *P. sensilis*: 77, tegmen, lateral view; 78, tegmen, ventral view; 79, phallus. *P. crioerides*: 80, antenna. (Scales = 1 mm)

black; prosternum and side margin of pronotum flavotestaceous; pronotal disc broadly vittate; femora flavotestaceous in basal four-fifths, dark brown in apical fifth; tibia and tarsus dark brown; meso- and metasternum black; elytron flavotestaceous along epipleural margin and at apex, black in remainder; abdomen black.

Head: Cranium and antenna as in *P. frontalis* except eyes more convex and AL/PLS 1.9.

Pronotum: As in *P. frontalis* except less transverse (PL/PW, average about 0.93, range 0.87–0.98; 4 specimens measured) and side margin of pronotum proper less convex.

Elytron: As in *P. frontalis* except surface less shiny, punctations more conspicuous, and epipleural fold (of both sexes) evenly convex from elytral base to elytral apex.

Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 77–79): Feebly pigmented. Phallobase very broad. Combined length of phallobase and phallobasic apodeme 3 times longer than paramere. Combined length of paramere and phallobase 2.8 times longer than phallobasic apodeme. Paramere: apex broadly incurved and obtuse; apical third declinate in lateral view; lateral depressions absent; dorsum convex, broadly explanate medially; venter narrow and feebly concave; mesoventral margin broadly concave; mesodorsal margin sinuous. Sinus: dorsal narrowly lanceolate; ventral elliptical. Phallus: as in *P. frontalis* except phallic plates broader (3 specimens examined).

Female Genitalia: Not studied.

VARIATION.—**Structural:** No structural variation was noted.

Color: The only noticeable variation is in the intensity of the vitta on the elytral epipleural margin; the vitta is most pronounced in specimens from Guatemala.

NATURAL HISTORY.—G. C. Champion collected the holotype from Cerro San Jerónimo, Guatemala, at 914 meters. In May, in Boquerón, El Salvador, H. F. Howden collected one specimen at 1800 meters.

DISTRIBUTION (Figure 356).—The known range extends from Alta Verapaz, Guatemala, to San Juan del Sur, Nicaragua.

ETYMOLOGY.—Latin, adjective *sensilis* (sensitive), with reference to the inferred sensory function of the microsetae on antennal articles 9 to 11.

LOCALITY RECORDS (Figure 356).—I examined 4 adult specimens from Central America. GUATEMALA: Departamento de Alta Verapaz: Purulhá (BMNH, 1 female). EL SALVADOR: Departamento de San Salvador: Boquerón, near Santa Tecla (HFHO, 1 male); Departamento de La Paz: Cerro San Jerónimo (MNHP, 1 male, holotype). NICARAGUA: Departamento de Rivas: San Juan del Sur (GEKI, 1 male).

The *criocerides* Group

The group consists of two rather dissimilar species. In both of these the antenna is clubbed, elytral surface smooth and shiny and only sparsely vested with small punctations behind the humerus, and the male pygidium is conspicuously emarginated posteriorly (Figures 89, 94). Components of the male genitalia are strongly pigmented and phallic marginal denticles are present. In *P. criocerides* the phallic plates are denticulated on both margins (Figure 84), a characteristic not present elsewhere in *Perilypus*.

Members of this group are known only from southern Mexico.

3. *Perilypus criocerides* (Gorham), new combination

FIGURES 80–87, 356

Colyphus criocerides Gorham, 1882:144 [holotype: male, deposited in BMNH; type-locality: Cerro de Plumas, Estado de Veracruz, Mexico].

DIAGNOSIS.—The compact yellow antennal club (Figure 80) and nearly impunctate and predominantly flavotestaceous elytron (Figure 81) will distinguish members of this species from other species occurring in Mexico.

DESCRIPTION.—**Form:** As in Figure 81.

Size: Length: male, 8.0 mm; females, average about 7.7 mm, range 7.4–8.1 mm. Width: male 2.2 mm; females, average about 4.4 mm, range 4.3–4.5 mm. One male and 3 females measured.

Color: Cranium flavotestaceous; first 8 antennal articles dark brown, article 9 to 11 flavotestaceous; prothorax flavotestaceous, pronotum with or without midapical macula or percurrent discal vitta; meso- and metasternum black; femur predominantly flavotestaceous, infuscated apically; tibia and tarsus dark brown; elytron entirely flavotestaceous, or predominantly flavotestaceous and with one

basosutural and one discal black macula (Figure 81); abdomen dark brown.

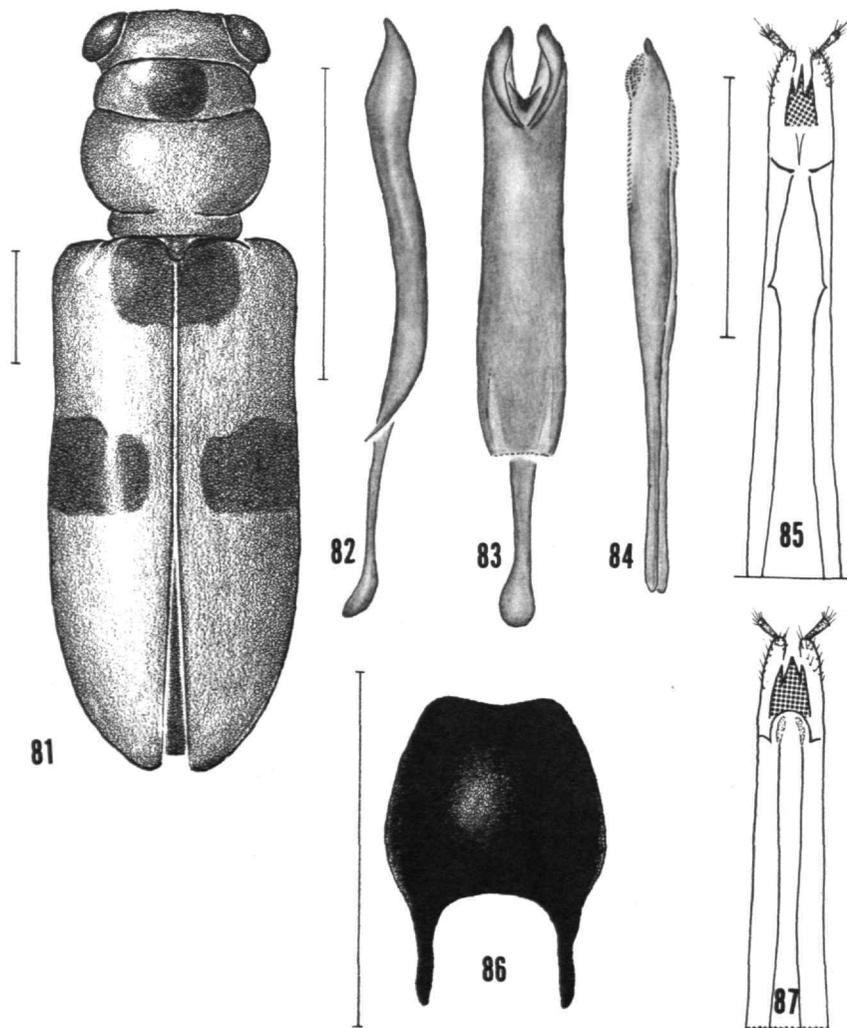
Head: Frons broad (HW/IOW, 1.9; 4 specimens measured); interocular depressions broad, deeply impressed; eyes boldly convex; antenna (Figure 80) distinctly clubbed, funicular articles filiform, articles 7 and 8 without microsetae; length/width ratio of each male antennal article 2.0:1.0:2.2:2.2:2.2:2.0:1.6:1.4:0.85:0.60:1.1.

Pronotum: Feebly transverse (PL/PW, average about 0.91, range 0.88–0.93; 4 specimens measured),

subapical depression deeply impressed and strongly sinuous, side margin of pronotum proper boldly convex.

Mesoscutellum: Subquadrate.

Elytron: Posthumeral margin straight in basal half, broadly arcuate in apical half; slope of apical deflection gradual; surface punctations faintly visible posthumerally and near epipleural margin; punctate and interpunctate surfaces smooth and shiny; epipleural fold grooved longitudinally proximal to epipleural margin, feebly convex more dor-



FIGURES 81–87.—*Perilypus criocerides*: 81, habitus; 82, tegmen, lateral view; 83, tegmen, ventral view; 84, phallus; 85, ovipositor, ventral view; 86, male pygidium; 87, ovipositor, dorsal view. (Scales = 1 mm)

sad; EL/EW, average about 4.4, range 4.3–4.5 (4 specimens measured).

Abdomen: Posterior margin of pygidium emarginated in males (Figure 86), arcuate in females.

Front Tarsal Claws: Asymmetrical in both sexes.

Male Genitalia (Figures 82–84): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 5 times longer than paramere. Combined length of paramere and phallobase 2.7 times longer than phallobasic apodeme. Paramere: lateral depression present; dorsum feebly convex; venter feebly concave; mesoventral margin concave; mesodorsal margin irregular, feebly explanate medially, and boldly braced basally. Sinus: dorsal lanceolate; ventral broadly elliptical. Phallus: Phallic plates denticulated on both margins; phallic plicae well developed (1 specimen examined).

Female Genitalia (Figures 85, 87): Dorsal and ventral lamina trilobed, lateral lobes shorter than median lobe; proctigeral bacculi widely separated; ventral bacculus acuminate near posterior two-thirds; coxital plates absent (1 specimen examined).

VARIATION.—Structural: The available specimens are structurally homogeneous.

Color: The dorsum of one female is entirely flavotestaceous. The black markings on the pronotum and the elytron vary in size.

NATURAL HISTORY.—J. M. Campbell collected three adults during July, in Chiapas, Mexico.

DISTRIBUTION (Figure 356).—Known only from Veracruz and Chiapas, Mexico.

LOCALITY RECORDS (Figure 356).—I examined 4 adult specimens from Central America. MEXICO: Estado de Chiapas: 17 kilometers north of Tuxtla Gutierrez (GEKI, 3 females). Estado de Veracruz: Cerro de Plumas (BMNH, 1 male, holotype).

4. *Perilypus insectus*, new species

FIGURES 88–96, 356

TYPE LOCALITY.—Mexico.

TYPE-SPECIMENS.—The holotype male and the allotype, deposited in MNHB, were collected by J. Flohr G. One paratype: GEKI, 1 male.

DIAGNOSIS.—The extent of emargination of the pygidial posterior margin (Figure 94) distinguishes male specimens. In female specimens the pygidium is feebly emarginated (Figure 95). Small size and metallic luster of the elytron are diagnostic characteristics for both sexes.

DESCRIPTION.—Form: As in Figure 88.

Size: Length: male, average about 6.0 mm, range 5.8–6.2 mm; female, 6.0 mm. Width: male, average about 1.8 mm, range 1.7–1.9 mm; female 1.8 mm. Two males and 1 female measured.

Color: Cranium flavotestaceous; antenna flavotestaceous to light brown; prothorax flavotestaceous, except pronotum with brown midapical macula; mesoscutellum flavotestaceous; pro- and mesofemur flavotestaceous, except infuscated dorsoapically; metafemur flavotestaceous in basal half, brown in apical half; tibia and tarsus brown; mesosternum flavotestaceous, metasternum brown; elytron shiny, metallic dark blue or purple; abdomen black.

Head: As in *P. criocerides* except frons broader; HW/IOW, 1.7 (3 specimens measured); antennal club less compact, funicular articles serrate (Figure 96); and length/width ratio of each male antennal article 2.1:1.3:1.4:1.7:1.3:1.7:1.4:1.4:1.4:1.2:2.0.

Pronotum: As in *P. criocerides* except side margins of pronotum proper less convex.

Elytron: As in *P. criocerides* except basal half behind humerus finely punctate and distal half impunctate.

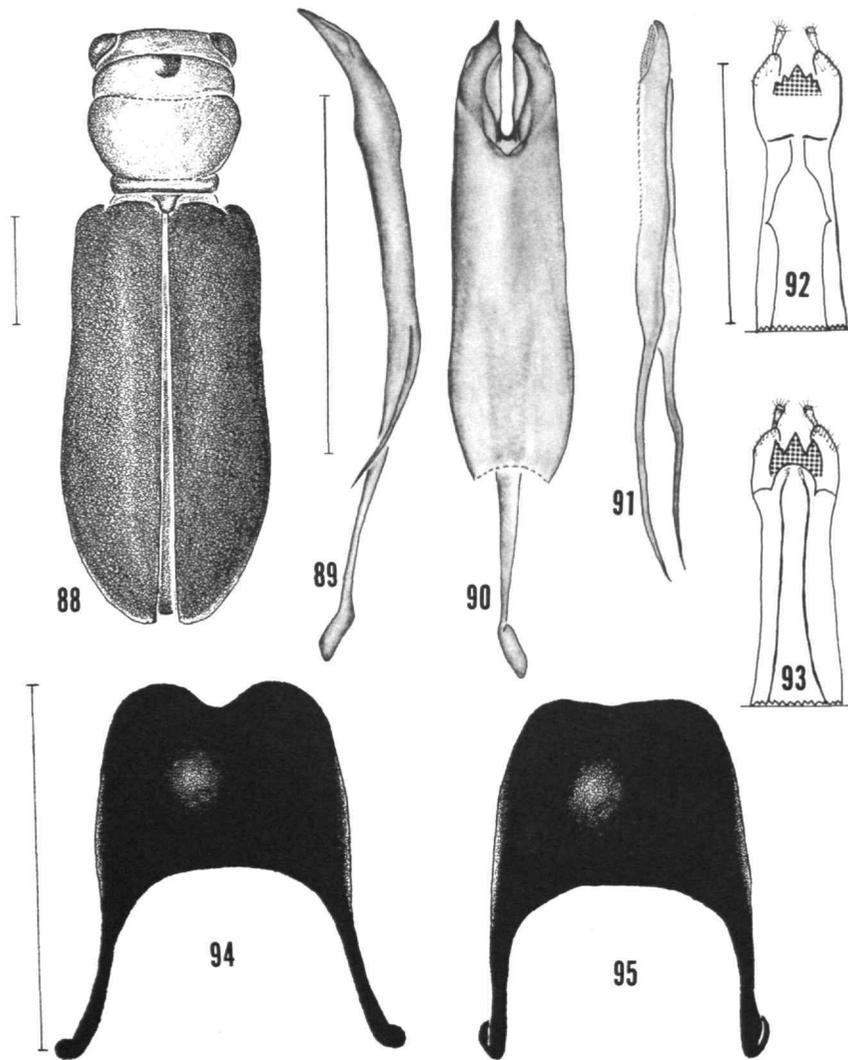
Abdomen: Posterior margin of pygidium deeply emarginated in male (Figure 94), feebly emarginated in female (Figure 95).

Front Tarsal Claws: Asymmetrical in both sexes.

Male Genitalia (Figures 89–91): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 3.5 times longer than paramere. Combined length of paramere and phallobase 2.6 times longer than phallobasic apodeme. Paramere: carinate lateroapically; attenuate; lateral depression well impressed and localized medially; dorsum feebly convex; venter concave; mesoventral margin strongly sinuous; mesodorsal margin feebly sinuous and boldly braced basally. Sinus: dorsal subparallel, ventral broadly elliptical. Phallus: phallic plate broad to phallic plicae; marginal denticles extended from basal third to phallic plicae (2 specimens examined).

Female Genitalia (Figures 92, 93): Laminae and coxites very short; dorsal lamina trilobed, lobes about equal in length; ventral lamina pentalobed, paralateral pair of lobes shorter than medial lobe; proctigeral bacculi widely separated; coxital plates absent.

VARIATION.—Structural: Emargination of the py-



FIGURES 88-95.—*Perilypus insectus*: 88, habitus; 89, tegmen, lateral view; 90, tegmen, ventral view; 91, phallus; 92, ovipositor, ventral view; 93, ovipositor, dorsal view; 94, male pygidium; 95, female pygidium. (Scales = 1 mm)

gidium is sex dimorphic (Figures 94, 95) as is the degree of asymmetry of the front tarsal claws; the claws are more asymmetrical in males than in the female.

Color: Elytron may be dark blue or purple. The antenna varies in extent of paleness.

ETYMOLOGY.—Latin, *insectus* (to cut into; masculine past participle of *inseco*). I refer to the emargination of the pygidial posterior margin.

DISTRIBUTION (Figure 356).—Known only from "México."

LOCALITY RECORDS (Figure 356).—I examined 3 adult specimens from Central America. "México" (GEKI, 1 male; MNHB, 1 male, holotype, and 1 female).

The *viridipennis* Group

The conspicuous absence of deeply impressed punctations from the apical third (or more) of the

elytron is the major diagnostic characteristic for the group. Others are antenna pronouncely serrate, and elytral punctate and interpunctate surface smooth and shiny. Elytral coloration (Figures 103, 110) is unique in *Perilypus*.

Geographically, the members of this group are distributed from northern Panama to northeastern Brazil with distribution records from northern Colombia and Venezuela.

5. *Perilypus viridipennis* (Spinola), new combination

FIGURES 97–108, 357, 358

Systemoderes viridipennis Spinola 1844a:132 [holotype: sex not determined, deposited in MSPI; type-locality: Colombia].—Desmarest, [1860]:239.—Ekis, 1975:27.

Cleronomus amaeus Schenkling, 1906:263 [lectotype: male, deposited in DEIE, and 1 paralectotype, female, deposited in ZMAN, here designated; type-locality: "Magdalenström" = Rio Magdalena, Colombia; new synonymy].

Schenkling's type-specimen does not differ significantly from the type of *P. viridipennis*.

DIAGNOSIS.—The gradual increase of flavotestaceous color in the distal half of the antenna, and the lack of deeply impressed punctations at the elytral apical half easily distinguishes specimens of this species from those of the other two species in the *viridipennis* group.

DESCRIPTION.—*Form:* As in Figure 98.

Size: Length: males, average about 5.8 mm, range 5.7–7.0 mm; females, average about 6.5 mm, range 5.9–7.6 mm. Width: males, average about 1.8 mm, range 1.6–2.1 mm; females, average about 2.2 mm, range 1.8–2.4 mm. Ten males and 10 females measured.

Color: Cranium rufescent; antenna bicolorous, basal half dark brown, distal half increases in paleness; thorax rufescent except female pronotum (and usually of males) with dark brown midapical macula; mesoscutellum rufescent; femora flavotestaceous, usually infuscated dorsally; elytron variable (see "Variation"); abdominal venter rufescent.

Head: Interocular depressions shallow; frontal umbo shallow; eyes moderately convex; HW/IOW, average about 2.2, range 2.0–2.3 (10 males and 10 females measured); antenna (Figure 97) serrate; AL/PLS, 1.4; length/width ratio of each male antennal article 2.4:1.4:1.8:1.8:1.5:1.3:1.2:1.1:1.0:0.93:1.5.

Pronotum: Only slightly transverse, rarely length

equals width (PL/PW, average about 0.95, range 0.90–1.0; 10 males and 10 females measured); sub-apical and prebasal depressions deeply impressed; side margin of pronotum proper moderately arcuate.

Elytron: Epipleural margin straight in basal half, broadly arcuate in apical half; elytral convexity varied (see "Variation"); large punctations localized behind humerus (Figure 99); punctate and interpunctate surfaces smooth and shiny, not arenose; epipleural fold feebly convex, but lower region slightly collapsed; slope of apical deflection gradual; EL/EW, average about 4.2, range 3.8–5.0 (20 specimens measured).

Front Tarsal Claws: Male, feebly asymmetrical. Female, symmetrical.

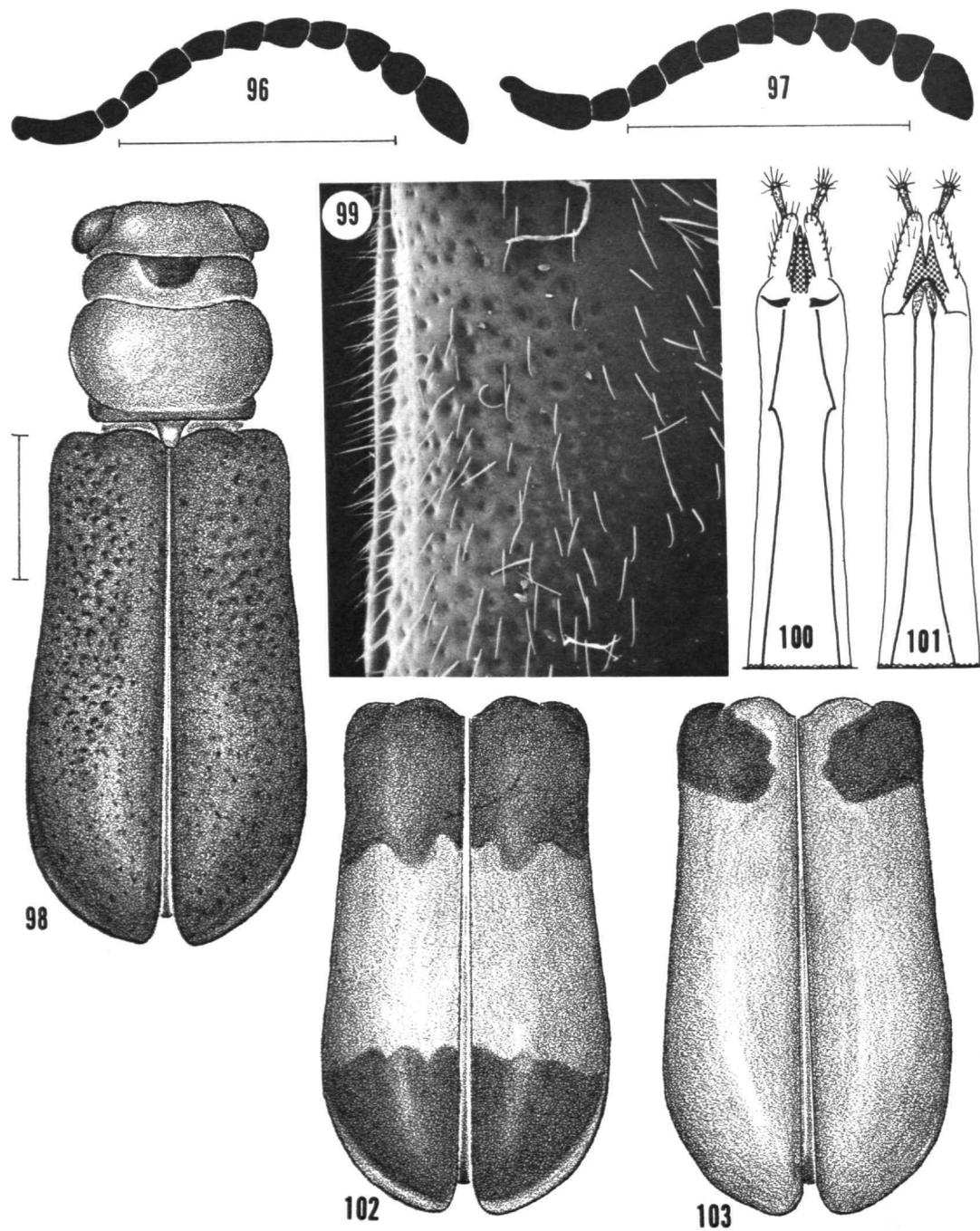
Male Genitalia (Figures 104–106): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 6 times longer than paramere. Combined length of paramere and phallobase 4.0 times longer than phallobasic apodeme. Paramere: apical region papilliform in lateral view; lateral depression broad and well depressed, clearly visible in ventral view; dorsum convex and explanate medially; venter concave; mesoventral margin concave; mesodorsal margin sinuous and denticulate. Sinus: dorsal constricted at basal third, spheroid behind constriction, narrowly elliptical in front of constriction. Phallus: marginal denticles of phallic plate broad, shallow, and extended to phallic plicae (9 specimens examined).

Female genitalia (Figures 100, 101): Dorsal lamina bilobed, deeply incised; ventral lamina trilobed, lateral lobes slightly shorter than medial lobe; proctiger robust; proctigeral bacculi not fused; ventral bacculi acuminate at posterior third; coxital plates absent (1 specimen examined).

Internal Reproductive Organs: Male (Figures 107, 108); anterior accessory gland uniramous, tightly coiled; posterior accessory gland biramous, outer branch one-third longer than inner branch; testis composed of 12 follicles; basal third of ejaculatory duct exceptionally bulbous. Female as in Figure 55 (2 males and 1 female examined).

VARIATION.—*Structural:* The convexity of the elytron seems to correlate geographically, the elytra being more convex in specimens from Panama than in those from Venezuela.

Color: In some Panamanian specimens the mid-apical macula of the pronotum extends posteriorly



FIGURES 96-103.—*Perilypus insectus*: 96, antenna. *P. viridipennis*: 97, antenna; 98, habitus; 99, elytral posthumeral region; 100, ovipositor, ventral view; 101, ovipositor, dorsal view; 102-103, elytra. (Scale = 1 mm)

to form a narrow discal streak. Variation of elytral coloration suggests an east to west cline, but it may also correlate with altitude as the few elevation records indicate. The lighter specimens were collected at low elevations in Panama, the darker ones at higher Andean elevations in Colombia and Venezuela. Panamanian specimens are predominantly rufescent and have a black to violaceous basal macula on the elytron (Figure 103). This macula may be confined to the humeral angle or extend from the post humeral margin to the sutured margin. In specimens from Colombia the elytron may be entirely blue, or blue in basal and apical thirds and rufescent in middle third (Figure 102). Venezuelan specimens have the elytron shiny blue or shiny blue-green.

NATURAL HISTORY.—In May, on Cerro Campana, Panama, I collected a female by beating woody shrubs and lianas at an altitude of 460 meters. At the same site and by the same collecting method, H. Stockwell collected two male adults in January. Other specimens were collected in Panama in February, March, May, June, July, and November, and in Colombia in May. The specimens from Venezuela were collected in June by J. and B. Bechyné, one at 850 meters, the other at 1000 meters.

DISTRIBUTION (Figures 357, 358).—Specimens were collected in central Panama, northern Colombia, and northern Venezuela.

LOCALITY RECORDS (Figures 357, 358).—I examined 21 adult specimens from Central and South America. PANAMA: Provincia de Coclé: El Valle (NMNH, 1 male and 1 female). Provincia de Panamá: Rio Diablo (GEKI, 1 male); Cerro Campana (GEKI, 1 male and 1 female; HPST, 1 male). Cahualito (CMPP, 1 male). Provincia de Colon: Portobelo (GEKI, 1 male). Canal Zone: Summit (GEKI, 1 female); 3 miles [4.8 km] west of Paraiso (GEKI, 1 female); Barro Colorado Island (WBIV, 1 male). COLOMBIA: Departamento de Magdalena: Sevilla (MCZC, 1 male and 1 female); Aracataca (GEKI, 2 females; MCZC, 1 female); Rio Magdalena (DEIE, 1 male; ZMAN, 1 female). Colombia (MSPI, 1 specimen, sex not known). VENEZUELA: Estado de Carabobo: Las Trincheras, Hacienda El Palmar (CMPP, 1 female); Cerro Aquirre (GEKI, 1 male).

6. *Perilypus relucens* (Gorham), new combination

FIGURES 109–114, 357

Colyphus relucens Gorham, 1886:336 [lectotype: female, deposited in BMNH, and 4 paralectotypes, females, 2 de-

posited in BMNH, 1 in GEKI, and 1 in MNHP, here designated; type-locality: Volcán de Chiriquí, Provincia de Chiriquí, Panama].

DIAGNOSIS.—Specimens of this species can be easily confused with Panamanian specimens of *P. viridipennis*, primarily because their elytral coloration is very similar (compare Figures 103, 110). Anatomically, however, the two species are quite distinct. Specimens of *P. relucens* are generally broader, their elytra less convex posteriorly and feebly depressed at middle third. The convexity of their epipleural fold is almost obliterated; the fold is collapsed and appears grooved longitudinally. Also their elytral punctations are slightly smaller, extend to the suture, and terminate at elytral posterior fourth.

DESCRIPTION.—*Form:* As in Figure 110.

Size: Length: males, average about 6.9 mm, range 5.9–7.7 mm; females, average about 7.4 mm, range 6.1–8.0 mm. Width: males, average about 2.2 mm, range 2.0–2.4 mm; females, average about 2.5 mm, range 2.2–2.8 mm. Ten males and 10 females measured.

Color: Cranium rufescent; antenna rufescent or brown; prothorax rufescent, with or without dark brown midapical macula; scutellum, meso- and metasternum, legs, and abdomen rufescent or dark brown; elytron either blue in basal fourth and rufescent in apical three-fourths, or entirely blue and with a violaceous or virescent tinge.

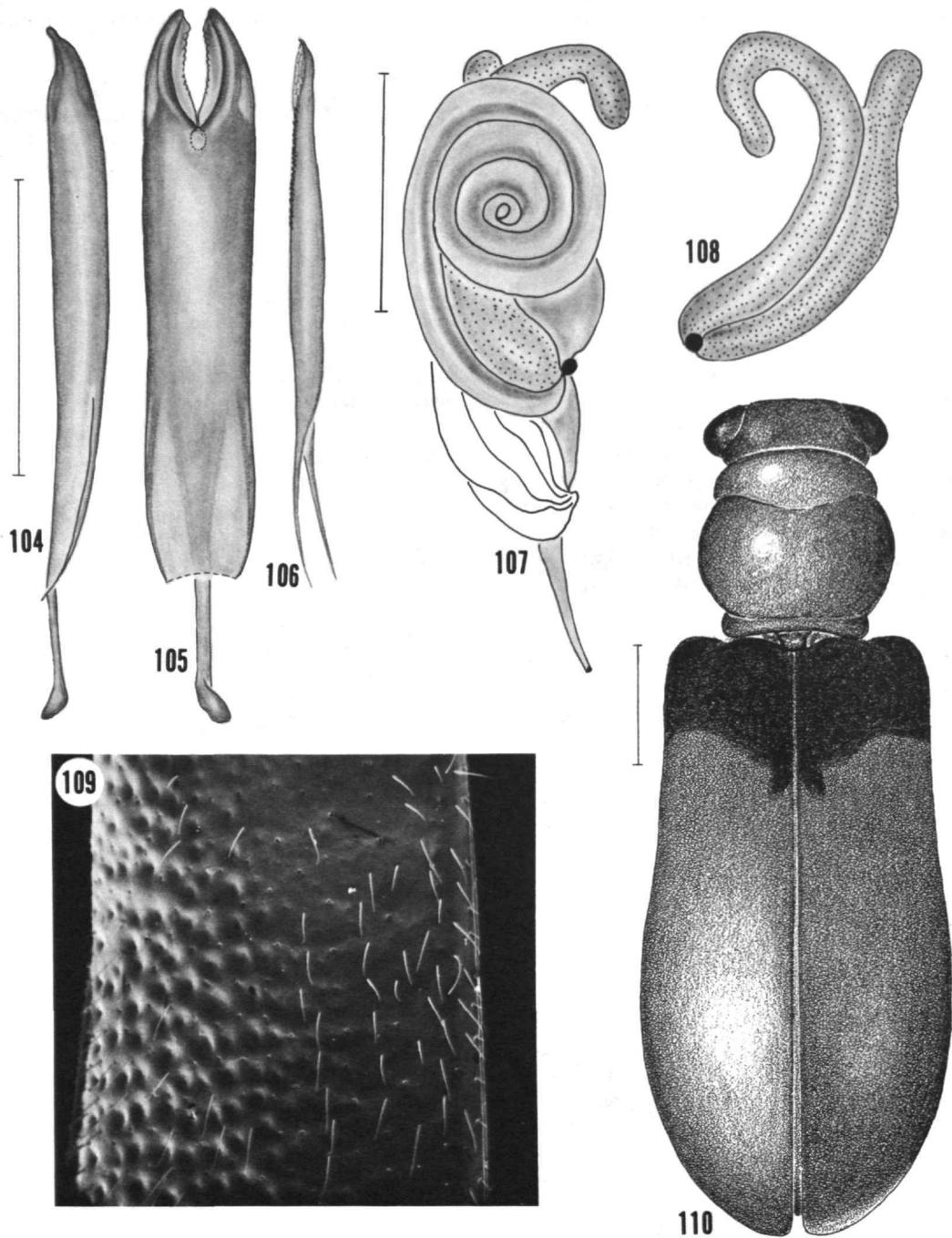
Head: As in *P. viridipennis* except interocular width proportionally wider (HW/IOW, average about 1.9, range 1.9–2.1; 20 specimens measured); eyes shallower; antenna (Figure 111) proportionally longer (AL/PLS, 1.6); and length/width ratio of each male antennal article 2.0:1.2:1.8:1.6:1.4:1.4:1.4:1.4:1.3:1.2:1.8.

Pronotum: As in *P. viridipennis* except more transverse (PL/PW, average about 0.87, range 0.77–0.98; 20 specimens measured), less convex, and subapical depression more sinuous.

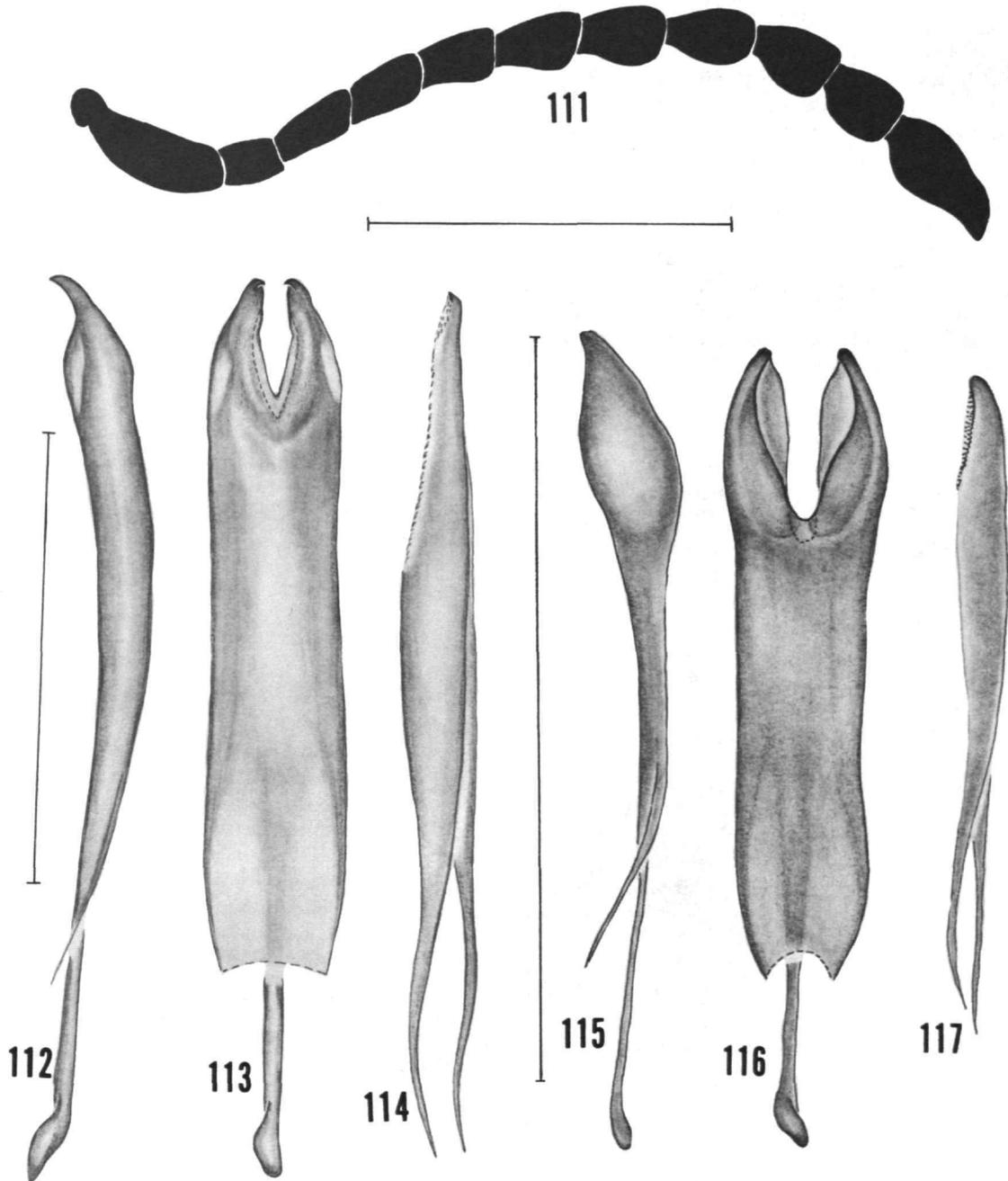
Elytron: As in *P. viridipennis* except less convex, feebly depressed at middle third, punctations larger (Figure 109) and extended to posterior three-fourths, epipleural fold collapsed, and epipleural margin less convex at posterior third.

Front Tarsal Claws: As in *P. viridipennis*.

Male Genitalia (Figures 112–114): Strongly pigmented. Combined length phallobase and phal-



FIGURES 104-110.—*Perilypus viridipennis*: 104, tegmen, lateral view; 105, tegmen, ventral view; 106, phallus; 107, male internal reproductive organs; 108, posterior accessory glands. *P. relucens*: 109, clytral posthumeral region; 110, habitus. (Scale = 1 mm)



FIGURES 111-117.—*Perilypus relucens*: 111, antenna; 112, tegmen, lateral view; 113, tegmen, ventral view; 114, phallus. *P. levis*: 115, tegmen, lateral view; 116, tegmen, ventral view; 117, phallus. (Scale = 1 mm)

lobasic apodeme 7 times longer than paramere. Combined length of paramere and phallobase 3.6 times longer than phallobasic apodeme. Paramere: apex uncinately in ventral view; lateral depression broad, more basoventral than basolateral; dorsum feebly convex and not explanate medially; venter narrowly concave; mesoventral margin straight in basal two-thirds, slightly arcuate in apical third; mesodorsal margin sinuous. Sinus: dorsal and ventral sagittate, ventral slightly narrower than dorsal. Phallus: phallic plate narrowing from middle half; marginal denticles restricted to apical half of phallic plate (10 specimens examined).

Female Genitalia: As in *P. viridipennis* except proctiger broader and posterior margin more arcuate (1 specimen examined).

Internal Reproductive Organs: Female, as in Figure 55 (1 specimen examined).

VARIATION.—Structural: No conspicuous structural variation was noted, except that the epipleural fold is more collapsed in some specimens than in others.

Color: Specimens from the type-locality are partially sex dimorphic in elytral and abdominal coloration. In male specimens, the elytron is entirely blue and may have a purpurescent or viriscent tinge, and the abdomen is dark brown. In females the elytron is blue in the basal fourth and rufescent in the apical three-fourths, and the abdomen is rufescent. In one female the elytron is entirely blue and the abdomen predominantly brown.

In one of two other females from Panama (exact locality not known) the elytron is entirely blue and has a purpurescent tinge, and the abdomen is entirely brown. In the second specimen the elytron is entirely rufescent except for a small blue macula on the humeral angle. The abdomen is entirely rufescent.

NATURAL HISTORY.—In May, in lakeside forest at Las Lagunas, Panama, I collected one female specimen by beating tree foliage. G. E. Champion collected adults on Volcán de Chiriquí at elevations from 610 to 1829 meters.

DISTRIBUTION (Figure 358).—The known range extends from northern Panama to western Colombia.

LOCALITY RECORDS (Figure 358).—I examined 21 adult specimens from Central and South America. PANAMA: Provincia de Chiriquí: Volcán de Chiriquí (BMNH, 4 males and 3 females, lectotype; GEKI, 5 males and 2 females;

MNHP, 2 males and 1 female); Las Lagunas (GEKI, 1 female). "Panamá" (ZMAN, 2 females). COLOMBIA: Departamento de Valle del Cauca (GEKI, 1 male).

REMARKS.—Gorham (1886:336), unaware of this species' sex linked color polymorphism, identified the males as *Colyphus signaticollis* Spinola. He did, however, note the anatomical similarity between the two sexes. In discussing the females he states, "Allied to the blue variety [= *P. relucens* males] of *C. signaticollis* figured in the earlier part of this volume."

7. *Perilypus levis*, new species

FIGURES 115–123, 358

TYPE-LOCALITY—Santarem, Estado de Brasil.

TYPE-SPECIMENS.—The male holotype and allotype are deposited in CMPP. Five paratypes: GEKI, 2 males and 1 female; CMPP, 1 male and 1 female.

DIAGNOSIS.—Within the *viridipennis* group specimens of this species are easily recognized by their boldly serrate antenna (Figure 123).

DESCRIPTION.—Form: As in Figure 120.

Size: Length: Males, average about 6.7 mm, range 6.1–7.1 mm; females, average about 6.8 mm, range 6.5–7.8 mm. Width: males, average about 1.9 mm, range 1.8–2.2 mm; females, average about 1.9 mm, range 1.8–2.0 mm. Eight males and 9 females measured.

Color: Cranium usually flavotestaceous, sometimes dark brown or black; antenna dark brown or black, rarely flavous apically; pronotum ranging from predominantly flavotestaceous to predominantly black (see "Variation" and Figures 118–122); femur flavotestaceous, infuscated apically; tibia and tarsus dark brown; elytron violaceous, cupreus, or blue-black, and with or without broad flavotestaceous vitta on epipleural margin, rarely with faint discal vitta (epipleural-margin vitta extended to apex or not); abdominal venter dark brown or black.

Head: As in *P. viridipennis* except antenna (Figure 123) broader, more serrate (see "Variation"), more setose, and proportionally longer (AL/PLS, 1.6); and length/width ratio of each male antennal article 2.0:1.3:1.4:1.5:1.0:1.0:1.0:0.9:0.8:0.8:1.3.

Pronotum: As in *P. viridipennis* except length equals width (7 specimens measured).

Elytron: As in *P. viridipennis* except more slender (EL/EW, average about 4.7, range 4.4–5.2; 17 specimens measured), less convex, and punctuation extended to sutural margin and to elytral apical third (but see "Variation").

Front Tarsal Claws: As in *P. viridipennis*.

Male Genitalia (Figures 115–117): Feebly pigmented; tegmen spatulate. Combined length of phallobase and phallobasic apodeme 4.7 times longer than paramere. Combined length of paramere and phallobase 2.5 times longer than phallobasic apodeme. Paramere: very broad in lateral view; dorsum boldly convex, explanate medially; venter convex broad at base and tapered to apex; mesoventral margin sinuous; mesodorsal margin arcuate. Sinus: dorsal digitiform but widened between paramere apices; ventral abconic, slightly shorter than dorsal, and feebly constricted basally. Phallus: phallic plates without marginal denticles (8 specimens examined).

Female Genitalia: As in *P. viridipennis* except lobes of ventral lamina equal in length (1 specimen examined).

Internal Reproductive Organs: Female, as in Figure 55 (1 specimen examined).

VARIATION.—*Structural*: Degree of antennal serration, and apportionment of elytral punctations vary substantially. Antennal serration varies geographically, which is particularly evident among male specimens; serration of the clavola is more prominent in eastern than in western South American specimens.

There is some indication that development and distribution of elytral punctations is also correlated with geography; the punctations are notably reduced or absent at elytral apical third in specimens from Santarem (Brazil), Colombia, or Venezuela. Elytral punctuation is conspicuously coarser and more densely distributed among the geographically disjunct specimens from the Canal Zone and Amapa, Brazil (the two specimens from Amapa are particularly coarsely punctated). I assign these specimens to a deep-punctated morph.

Color: Color polymorphism appears to correlate geographically and possibly altitudinally. Specimens from lower elevations (Canal Zone and Santarem, in Brazil) have a lighter pronotum than those collected from the more mountainous regions of Colombia and Venezuela.

The pronotum is predominantly flavotestaceous

in specimens from Santarem, Brazil, and in females from Colombia and the Canal Zone (Figure 122). The pronotum (Figures 118–120) is predominantly black in specimens from Amapa, Brazil, and in males from Venezuela and Colombia.

The male from Bogota, Colombia, has a short and narrow flavotestaceous vitta on the elytral disc and one on the epipleural margin. In specimens from Colombia, and in one of three females from the Canal Zone, the epipleural vitta is broader than the epipleural fold and extends to the elytral apex; in other specimens the marginal vitta is as broad or narrower than the epipleural fold and terminates before the elytral apex. The antennae are uniformly dark brown or black except in three females from the Canal Zone, in which they are increasingly flavotestaceous towards the apex.

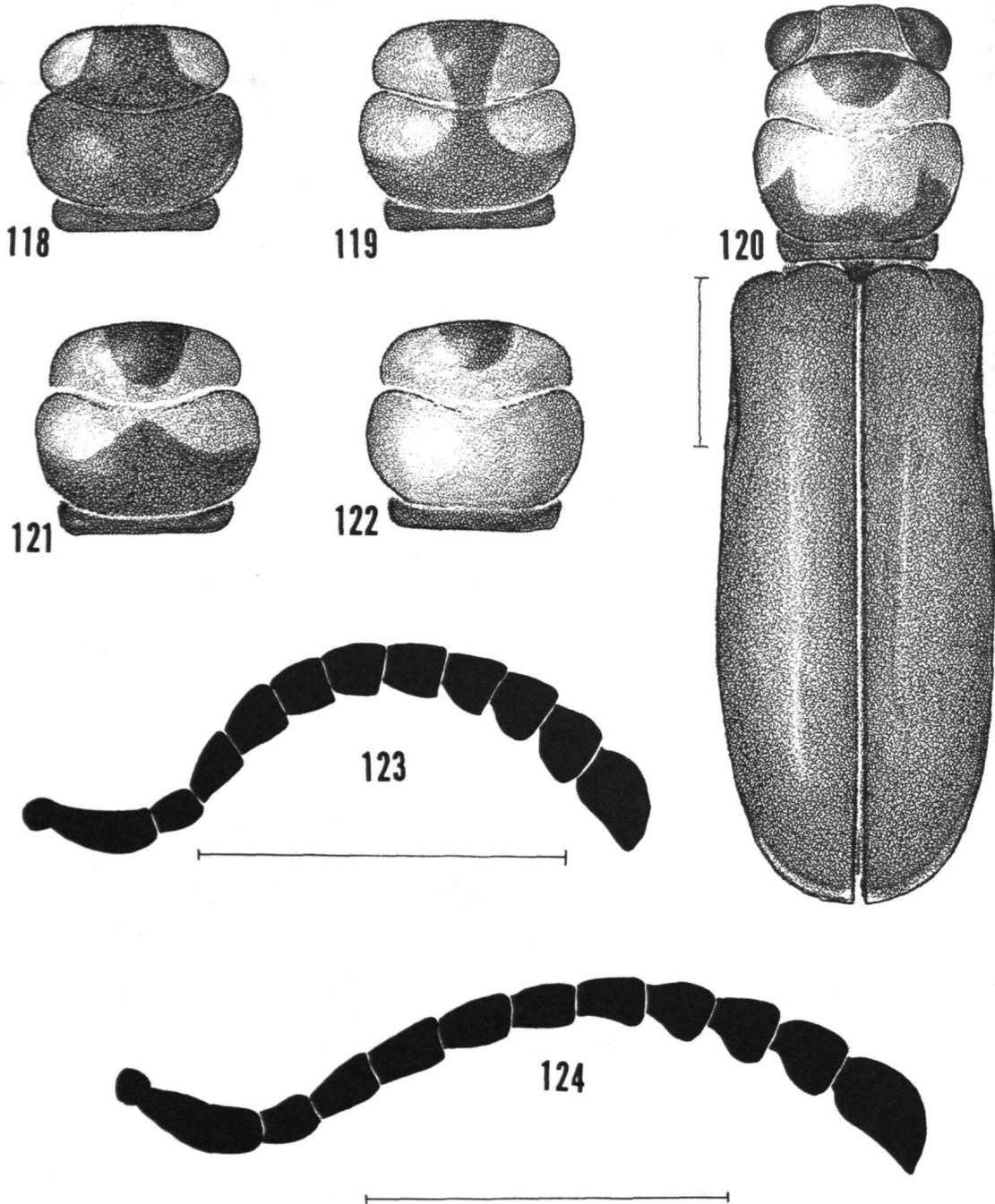
NATURAL HISTORY.—From Barro Colorado Island, Canal Zone, T. L. Erwin collected one adult specimen in June. P. J. Darlington collected two additional adults from the same locality in May. Other specimens were collected from Colombia in September by M. deMathan, from Brazil between October and November by Thieme, and from Venezuela in August by J. and B. Bechyné, and between September and October by E. A. Klages.

DISTRIBUTION (Figure 358).—This widely distributed species ranges from the Canal Zone to Brazil and is recorded from highlands of Colombia and Venezuela.

ETYMOLOGY.—Latin, the adjective *levis* (smooth). I refer to the smooth surface at the sutural and apical region of the elytron.

LOCALITY RECORDS (Figure 358).—I examined 17 adult specimens from Central and South America. **CANAL ZONE**: Barro Colorado Island (GEKI, 1 female; MCZC, 1 female; NMNH, 1 female). **COLOMBIA**: Departamento de Cundinamarca; Bogotá (GEKI, 1 male); Conanche (NMNH, 1 female). Departamento de Boyaca; Muzco (GEKI, 1 male and 1 female). **VENEZUELA**: Distrito Bolivar: Suapure, Rio Cauca (CUNY, 1 male). **BRAZIL**: Territorio de Amapá: Serra Lombarda (USMV, 1 female); Rio Calcoene (GEKI, 1 male). Estado de Para: Santarem (GEKI, 2 males and 1 female; CMPP, 2 males, holotype, and 2 females).

REMARKS.—The magnitude of infraspecific variation involving elytral punctuation is quite exceptional. Perhaps the specimens from the Canal Zone and Amapa, Brazil, are not conspecific with the other specimens examined, but the genitalic char-



FIGURES 118-124.—*Perilypus levis*: 118-119, 121-122, pronotum; 120, habitus; 123, antenna. *P. limbatus*: 124, antenna. (Scale = 1 mm)

acteristics in the male from Amapa are identical with males whose elytral punctation is typical. I assume that within the *viridipennis* group homogeneity of genitalic characteristics indicates conspecificity, as they do in other species groups of the genus; perhaps the observed differences are early indications of peripheral isolation.

Although I did not study male specimens from the Canal Zone, I tentatively consider the three female specimens from that region as conspecific. I labeled them "*Perilypus levis* Ekis?"

The *limbatus* Group

The following combination of characteristics distinguish members of the *limbatus* group from other *Perilypus*: body form rectangular; antenna moderately serrate (flagellar articles subfiliform in males); elytron with convex epipleural fold, deeply impressed and widely distributed punctations, punctate and interpunctate surfaces smooth and shiny, and with a gradual apical slope.

The composite distribution of the 10 species of this group extends from Chiapas, Mexico, to San Martin, Peru; the range north of Panama is attributed only to locality records of *P. prolixipennis*.

8. *Perilypus limbatus* (Gorham), new combination

FIGURES 124–132, 136, 137, 362

Colyphus limbatus Gorham, 1878:161 [lectotype: male, here designated, deposited in MNHP; type-locality: Caracas, Venezuela]; 1886:336.

Derestenus limbatus var. *latesuturalis* Pic, 1941:11 [lectotype: female, here designated, deposited in MNHP; type-locality: Bolivia; new synonymy].

Derestenus limbatus var. *notaticollis* Pic, 1941:11 [lectotype: female, here designated, deposited in MNHP; type-locality: Venezuela; new synonymy].

Derestenus limbatus var. *suturalis* Pic, 1941:11 [lectotype: male, here designated, deposited in MNHP; type-locality: Venezuela; new synonymy].

Derestenus columbicus var. *reynoldsi* Wolcott, 1927b:106 [holotype not studied; see "Remarks," one paratype in FMNH; type-locality: El Valle, Venezuela; new synonymy].

Derestenus latefasciatus Pic, 1941:10 [lectotype: female, here designated, deposited in MNHP; type-locality: Bolivia; new synonymy].

The names in synonymy represent intrapopulation color variants.

DIAGNOSIS.—Within the *limbatus* group only specimens of *P. limbatus*, *P. apocopatus*, and *P.*

decoris, have the anterior margin of antennal article 9 to 11 flavotestaceous. *Perilypus limbatus* differs from *P. apocopatus* by having the femora predominantly flavotestaceous, and from *P. decoris* by the narrower epipleural fold and absence of the elytral discal vitta.

DESCRIPTION.—*Form*: As in Figure 125.

Size: Length: males, average about 6.9 mm, range 6.3–7.6 mm; females, average about 8.2 mm, range 7.2–9.2 mm. Width: males, average about 1.9 mm, range 1.8–2.0 mm; females, average about 2.4 mm, range 2.1–2.8 mm. Ten males and 10 females measured.

Color: Clypeus, frons (Figure 57), and venter of cranium flavotestaceous; epicranium and gena shiny black; antenna predominantly black, anterior margin of articles 9 to 11 flavotestaceous, pronotum variable (see "Variation"); legs bicolorous; femur flavotestaceous, with dorsoapical infuscation diminishing from front to hind femur; tibia and tarsus black to brown; prosternum flavotestaceous, meso- and metasternum black to brown; elytron variable (see "Variation"); abdomen black.

Head: Interocular depressions shallow; frontal umbo indistinct; eyes boldly convex (HW/IOW, average about 2.2, range 2.1–2.4; 20 specimens measured); antenna (Figure 124) moderately serrate; AL/PLS, 1.7; length/width ratio of each male antennal article 2.5:1.4–1.7:1.7:2.0:1.5:1.4:1.3:1.1:1.0 1.9.

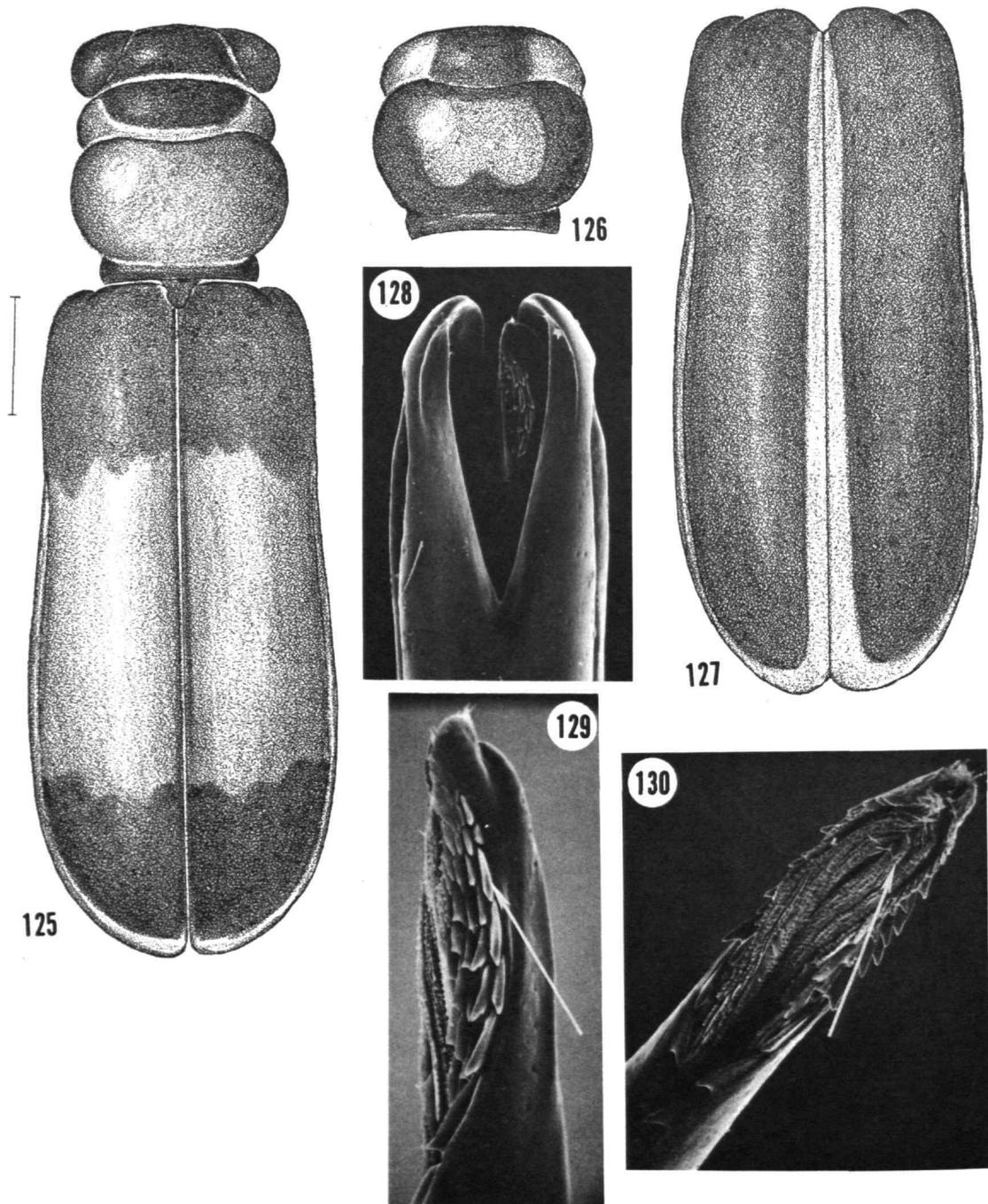
Pronotum: Only slightly transverse; PL/PW, average about 0.93, range 0.89–0.96 (20 specimens measured); subapical depression deeply impressed and strongly sinuous; pronotal arch impressed with few shallow punctations; side margin of pronotum proper moderately arcuate.

Mesoscutellum: Subquadrate.

Elytron: Epipleural margin straight in basal three-fourths, arcuate in apical fourth; apical slope gradual; disc impressed with large punctations at basal two-thirds, punctations are smaller at apical third; punctate and interpunctate surfaces smooth and shiny; epipleural fold convex; EL/EW, average about 5.1 range 4.6–5.7 (20 specimens measured).

Front Tarsal Claws: Male, strongly asymmetrical. Female, feebly asymmetrical.

Male Genitalia (Figures 128–130): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 4 times longer than paramere. Combined length of paramere and phallobase 4.8



FIGURES 125-130.—*Perilypus limbatus*: 125, habitus; 126, pronotum; 127, elytra; 128, aedeagus, ventral view; 129, phallus, ventral view, $\times 130$ (arrow indicates marginal denticles); 130, phallus, lateral view, $\times 130$ (arrow indicates phallic plicae). (Scale = 1 mm)

times longer than phallobasic apodeme. Paramere: Apex obtuse; lateral depression present; dorsum convex, explanate medially; venter concave; mesoventral margin straight in basal half, faintly sinuous in distal half; mesodorsal margin sinuous. Sinus: dorsal lanceolate, constricted subapically; ventral obconic. Phallus: apex papilliform; phallic plates contiguous dorsally; marginal denticles stout and extended beyond limit of phallic plicae (20 specimens examined).

Female Genitalia (Figures 131, 132): Dorsal lamina bilobed; ventral lamina trilobed, lateral lobes shorter than medial lobe; proctiger reduced; proctigeral bacculi not fused; ventral bacculus acuminate at posterior fourth; coxital plates prominent; coxital stylus bulbous distally (2 specimens examined).

Internal Reproductive Organs: Male (Figures 136, 137), anterior accessory gland uniramous, tightly coiled; posterior accessory gland biramous, outer branch about one-fourth longer than inner branch; testis composed of 12 follicles. Female, as in Figure 55; ovary composed of 12 ovarioles (5 males and 3 females examined).

VARIATION.—Structural: The degree of concavity of the elytral epipleural margin is notably variable. Females from El Valle, Venezuela, have the epipleural margin conspicuously more concave than do females from other localities; El Valle females are also more robust in body form.

Color: The available specimens, although generally homogeneous in external structure, are chromatically polymorphic. Pronotal and elytral pigmentation segregate specimens into four color phena: the bimaculate phenon (with reference to pronotal lateroapical maculae), the bivittate phenon (with reference to bivittate elytron), the punctate phenon (with reference to pronotal and apical macula), and the fasciate phenon (with reference to fasciate elytron). Both sexes are represented by the first two phenon, the last two only by females.

To the bimaculate phenon I assign individuals that have a flavotestaceous lateroapical macula on each anterior angle of the pronotum (as in Figure 157) and whose elytron is vittate at the epipleural margin. In two female specimens of this phenon the pronotal disk is flavotestaceous. Specimens of the bivittate phenon have a bimaculate pronotum, and each elytron (Figure 127) has a yellow vitta on

the epipleural margin and one on the sutural margin. In some specimens of the bimaculate and bivittate phenon the pronotum has a fuscous testaceous macula anterior to the fovea. In one specimen of the bivittate phenon, the marginal vitta extends only to the elytral basal half. In specimens of the punctate phenon, the pronotum is fulvous to fulvescent and has a black midapical macula and black collar (Figure 125); the pronotal macula varies in width. Members of the fasciate phenon have a punctate pronotum and a broad flavous discal fascia on the midelytron (Figure 125). The entire spectrum of color polymorphism described above is present in one population sample from Rancho Grande, Venezuela.

Seven specimens from El Limón, Venezuela, are more melanistic than the other specimens examined. They exhibit the following characteristics: posterior region of clypeus black, femur black distally, and elytral vitta absent or indistinct.

NATURAL HISTORY.—In May, in the vicinity of the Rancho Grande Biological Station in Aragua, Venezuela, I collected 53 adults, 2 larvae, and 1 pupa. The macrohabitat of the site can be described briefly as a predominantly deciduous, subtropical montane forest. The topographical location of this Andean region, generally considered a cloud forest, affords some protection from the nubilous conditions generated by the Caribbean Ocean. Consequently the collection site (at about 1100 meters) is considerably drier than adjacent mountainous areas, particularly those at higher elevations. I did not find *P. limbatus* specimens at 1200 meters where clouds maintained moisture level at constant saturation.

Woody lianas and low canopy verdure are two of the site's most characteristic types of vegetation. Adults and one larva were collected by beating vegetation assemblages rich in lianas of about 7–13 cm in diameter. I found a second larva and one pupa after examining numerous sections of dead lianas that housed the immatures in a shallow cavity beneath thin bark. On the same kind of liana I observed a female oviposit into a crevice in which I subsequently found one egg. Although I failed to rear the aforementioned immatures to imago stage I am confident that they are members of *P. limbatus*. The pupa (Figures 380, 381) albeit not mature, clearly exhibits typical characteristics of adult *Perilypus*. The color markings of the

pupal abdomen are identical to that found in the larvae; and I do not know of any other species of *Perilypus* collected from Rancho Grande vicinity. At Rancho Grande I also collected adults of this species by black light; however, the species apparently is only mildly phototropic since only three specimens were collected.

The altitudinal range of *P. limbatus*, as indicated by label data, is from 900 to 1500 meters.

DISTRIBUTION (Figure 362).—I studied specimens from northern Venezuela and Bolivia. The seemingly disjunct distribution is probably a consequence of coincidental collecting. The affinity of this species for subtropical montane forests suggests that they occur along the Atlantic slopes of the Andes, which would make a transamazonian distribution unlikely.

LOCALITY RECORDS (Figure 362).—I examined 122 adults, 2 larvae, and 1 pupa from South America. VENEZUELA: Distrito Federal: Caracas (ZMAN, 1 male and 1 female; FMNH, 1 male and 1 female; GEKI, 2 males; MNHP, 1 male, lectotype; NMNH, 1 male); Quebrada Avila (CBAZ, 1 male); Rio Gurimare (GEKI, 1 female); El Limón, Cordillera Del Litoral (CBAZ, 2 males and 1 female; GEKI, 2 males and 2 females); El Valle (FMNH, 2 females; GEKI, 1 female). Estado de Carabobo: Cerro de Caffé (GEKI, 1 female); Santa Clara (UCMV, 1 male); Trincheras (GEKI, 1 female). Estado de Aragua: Maracay, Rancho Grande (AMNH, 2 males and 1 female; ZMAN, 3 males; BMNH, 3 males and 1 female; CBAZ, 3 males and 1 female; FMNH, 4 males; GEKI, 18 males, 19 females, 1 larva and 1 pupa; CMPP, 2 males; UCMV, 2 males and 2 females; MNHP, 2 males and 1 female; MCZC, 2 males and 1 female; MZSP, 2 males; NMNH, 13 males, 4 females and 1 larva). "Venezuela" (FMNH, 1 female, MNHP, 5 females). BOLIVIA: Departamento de Cochabamba: Cochabamba (GEKI, 1 female). "Bolivia" (GEKI, 1 male; MNHP, 3 males and 1 female).

REMARKS.—The new synonymies are based on comparisons of the appropriate type-specimens and on available biological data; I did not study the type of Wolcott's variety. The color variants, herein assigned to phenas, were given varietal or species status by previous authors. The varietal names of Pic (1941), *latesuturalis*, *notaticollis*, *suturalis*, and that of Wolcott (1927b), *reynoldsi*, correspond to the bimaculate, bivittate, punctate, and fasciate phenon, respectively. Further, *Derestenus latefasciatus* Pic, corresponds to my fasciate phenon and to Wolcott's *reynoldsi* variety. I did not study the holotype specimen of *D. columbicus* var. *reynoldsi* Wolcott although a paratype and

Wolcott's description leaves little doubt that the synonymy is correct; the holotype of this variety is assumed lost (Henry H. Dybas, of the Field Museum of Natural History, pers. comm.).

9. *Perilypus columbicus* (Spinola), new combination

FIGURES 133–135, 138, 139, 362

Thanasimus columbicus Spinola, 1844a:195 [lectotype: female, and one paralectotype, male, subsequent designation by Ekis, 1975:27, lectotype deposited in MNHP, paralectotype in MSPI; type-locality: Bogotá, Colombia].—Chevrolat, 1876:46.—Schenkling, 1906:263.—Ekis, 1975:27. *Clerus colombiae* Spinola, 1844b:135 [lectotype: female, here designated, deposited in MNHP; type-locality: Colombia; new synonymy].—Gemminger and Harold, 1869:1735.—Chevrolat, 1876:46.

Spinola's (1844b:135) lectotype represents a color phenon of *P. columbicus*.

DIAGNOSIS.—In addition to the characteristics given in the key, specimens of this species are distinguished from other members of the *limbatus* group by the proportionally shorter antenna (AL/PLS, 1.5) and by the length/width ratio of pronotum (0.99). Also, the lateral explanation of the phallobase and the basal region of the lateral lobes (Figure 134) is a modification of the male genitalia unique in *Perilypus*.

DESCRIPTION.—*Form:* As in *P. limbatus* (Figure 125).

Size: Length: male, average about 7.6 mm, range 7.4–7.9 mm; female, average about 7.7 mm, range 7.1–8.3 mm. Width: male, average about 2.2 mm, range 2.1–2.4 mm; female, average about 2.4 mm, range 2.0–2.6 mm. Seven specimens measured.

Color: Clypeus, gula, prosternum, and basal half of femur flavotestaceous; labrum, frons, cranium, distal half of femur, tibia, tarsus, meso- and metasternum, and abdomen black; pronotum and elytron variable (see "Variation").

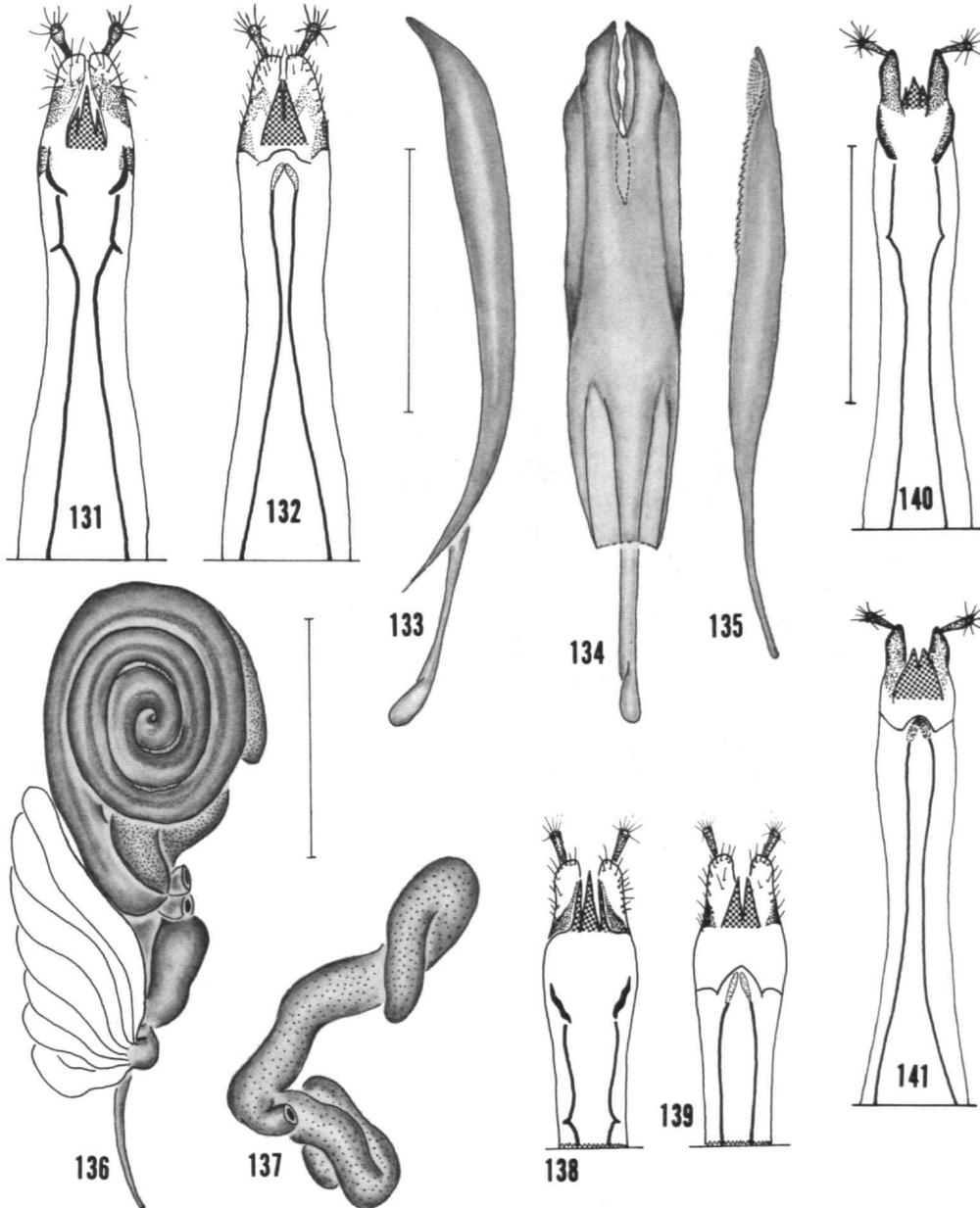
Head: As in *P. limbatus*.

Pronotum: As in *P. limbatus* except feebly transverse (PL/PW, average about 0.99, range 0.95–1.0 (7 specimens measured)).

Elytron: As in *P. limbatus* except EL/EW, average about 4.5, range 4.3–4.9 (7 specimens measured).

Front Tarsal Claws: As in *P. limbatus*.

Male Genitalia (Figures 133–135): Strongly pigmented. Combined length of phallobase and phallosome



FIGURES 131-141.—*Perilypus limbatus*: 131, ovipositor, ventral view; 132, ovipositor, dorsal view. 136, male internal reproductive organs; 137, posterior accessory glands. *P. columbicus*: 133, tegmen, lateral view; 134, tegmen, ventral view; 135, phallus; 138, ovipositor, ventral view; 139, ovipositor, dorsal view. *P. iris*: 140, ovipositor, ventral view; 141, ovipositor, dorsal view. (Scale = 1 mm)

basic apodeme 4 times longer than paramere. Combined length of paramere and phallobase 3.1 times longer than phallobasic apodeme. Paramere: explanate basally; apical region feebly arcuate in lateral view; lateral depression small but well impressed; dorsum convex, explanate medially; venter concave; mesoventral margin concave; mesodorsal margin sinuous. Sinus: dorsal narrow and almost twice as long as ventral, ventral elliptical. Phallobase: explanate in apical half. Phallus: acuminate; marginal denticles as in *P. limbatus* (3 specimens examined).

Female Genitalia (Figures 138, 139): As in *P. limbatus* except lateral lobes of ventral lamina as long as medial lobe and proctiger more prominent.

VARIATION.—*Structural*: The beetles examined are structurally homogeneous externally.

Color: The male pronotum and elytron are black, except the former is fuscous lateroapically, the latter feebly vittate on the epipleural margin. Two color patterns of the female elytron distinguish a vittate phenon and a fasciate phenon. Vittate females have the elytron black; a faint vitta on the epipleural margin may be present. In fasciate females, the elytron has a broad rufescent fascia at the midelytron which extends to the sutural margin, and a broad rufescent macula is present on the elytral apex.

NATURAL HISTORY.—Unknown, except that two specimens were collected from Bogota, a locality at about 4000 meters on the Cordillera Oriental of the Colombian Andes.

DISTRIBUTION (Figure 362).—Known only from Colombia.

LOCALITY RECORDS (Figure 362).—I examined 6 adult specimens from South America. **COLOMBIA**: Departamento de Cundinamarca: Bogotá (MNHP, 2 females, lectotype; MSPI, 1 male). "Colombia" (GEKI, 2 males and 1 female).

REMARKS.—I (Ekis, 1975:25) erroneously concluded that the specimen in MSPI was the holotype. With regard to *Clerus colombiae* Spinola, Chevrolat (1876:46) poses the question "C'est un *Colyphus*?" He was quite correct in doubting the placement of this species under *Clerus* (now *Enoclerus*). The width of the distal articles of *colombiae* antennae is exaggerated in the habitus illustration published by Spinola (1844b, pl. 6; fig. 6).

10. *Perilypus apocopatus*, new species

Figures 143–148, 362

TYPE-LOCALITY.—Ocaña, Departamento de Norte de Santander, Colombia.

TYPE-SPECIMENS.—The holotype male is deposited in MNHP, the allotype in GEKI.

DIAGNOSIS.—Distal half of hind femur predominantly black; inner margins and venter of antennal articles 9 to 11 testaceous. Elytral coloration of the *P. apocopatus* female specimen is similar to that of fasciate females of *P. limbatus* and *P. columbicus*, except that the elytral fascia of *P. apocopatus* does not reach the sutural margin.

DESCRIPTION.—*Form*: As in *P. limbatus* (Figure 125).

Size: Length: male, 7.4 mm; female, 7.0 mm. Width: male, 2.2 mm; female, 2.2 mm. One male and one female measured.

Color: As in *P. limbatus* except posterior half of frons black; antennal articles 9 to 11 predominantly flavotestaceous; and hind femur black in distal half. Pronotal and elytral coloration varies with sex (see "Variation").

Head: As in *P. limbatus*.

Pronotum: As in *P. limbatus*.

Elytron: As in *P. limbatus* except EL/EW, average about 4.5, range 4.4–4.6 (2 specimens measured).

Front Tarsal Claws: As in *P. limbatus*.

Male Genitalia (Figures 146–148): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 3 times longer than paramere. Combined length of paramere and phallobase 4.0 times longer than phallobasic apodeme. Paramere: apical region arcuate and acuminate in lateral view; lateral depression feebly developed; dorsum convex, broadly explanate medially; venter concave; mesoventral and mesodorsal margin concave. Sinus: dorsal narrow, digitiform; ventral exceptionally long and elliptical. Phallus: apical region acutely narrowed; phallic plates narrowed in apical half; marginal denticles as in *P. limbatus*.

Female Genitalia (Figures 143, 144): Dorsal lamina broadly incised; ventral lamina reduced, lateral lobes longer than very shallow medial lobe; oblique bacculus incorporated into large anterior coxital plate; proctiger short; proctigeral and ventral bacculi as in *P. limbatus*.

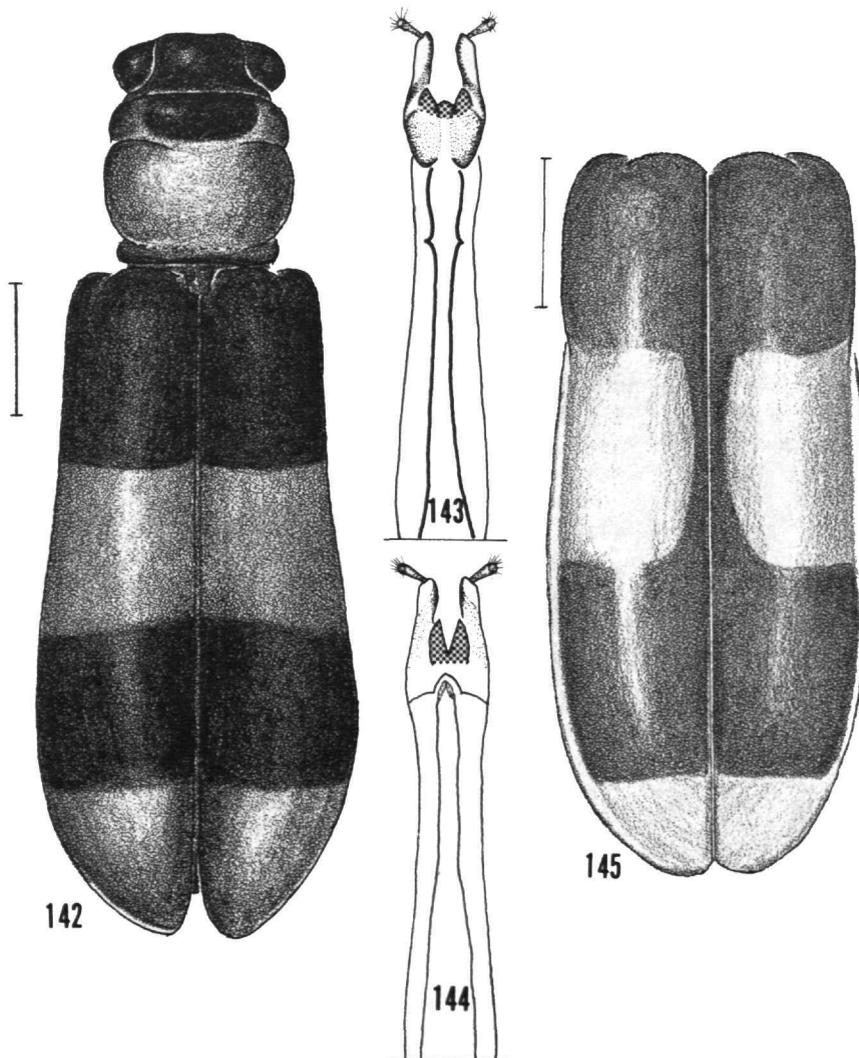
VARIATION.—*Structural*: The specimens examined are structurally homogeneous externally.

Color: The two specimens studied differ in pronotal and elytral coloration. In the male pronotum is predominantly black and fuscous lateroapically; the elytron is black, with a purpurescent tinge, and is broadly flavotestaceous apically. In the female the pronotum is predominantly flavotestaceous and has a black midapical macula and black pronotal collar; the elytron has a broad flavotestaceous fascia at the middle and an epipleural vitta that expands

apically (Figure 145); and the nonflavotestaceous portions of the elytron are more purpurescent than black.

DISTRIBUTION (Figure 362).—Known only from Ocaña, located on the northern latitude of the Colombian Cordillera Oriental.

ETYMOLOGY.—A Latin derived adjective from the noun *apocope* (a cutting off) + the suffix *-atus* (cut off). The name refers to the abbreviated length of the dorsal sinus of the male genitalia.



FIGURES 142-145.—*Perilypus iris*: 142, habitus. *P. apocopatus*: 143, ovipositor, ventral view; 144, ovipositor, dorsal view; 145, elytra. (Scale = 1 mm)

LOCALITY RECORDS (Figure 362).—I examined 2 adult specimens from South America. COLOMBIA: Departamento de Norte de Santander: Ocaña (GEKI, 1 female; MNHP, 1 male, holotype).

11. *Perilypus iris*, new species

FIGURES 140–142, 362

TYPE-LOCALITY.—Tocotá, Departamento de Valle del Cauca, Colombia.

TYPE-SPECIMENS.—The holotype female is deposited in ZMAN.

DIAGNOSIS.—Within the *limbatus* group specimens belong to this species if their femora are entirely black.

DESCRIPTION.—*Form*: As in Figure 142; forebody narrow; elytra convex.

Size: Female: length, 8.3 mm; width, 2.5 mm.

Color: Head, meso- and metasternum, legs, and abdominal venter black; prothorax flavotestaceous, except pronotal arch with transverse black macula; elytron with broad sharply outlined fascia at middle, and at apex.

Head: As in *P. limbatus*.

Pronotum: As in *P. limbatus* except feebly transverse (PL/PW, 0.99).

Elytron: As in *P. limbatus* except more convex and with more depth.

Front Tarsal Claws: Female, feebly asymmetrical.

Female Genitalia (Figures 140, 141): Ventral lamina with lateral lobes shorter than medial lobe; oblique bacculus incorporated into small anterior coxital plate; coxite well sclerotized throughout; dorsal lamina and proctigeral and ventral bacculi as in *P. limbatus*.

ETYMOLOGY.—Latin, the noun *iris* (rainbow); with reference to the dorsal coloration of this beetle.

LOCALITY RECORDS (Figure 362).—I examined 1 adult specimen from South America. COLOMBIA: Departamento de Valle del Cauca: Tocotá (ZMAN, 1 female, holotype).

12. *Perilypus acus*, new species

FIGURES 149–151, 154, 155, 362

TYPE-LOCALITY.—Callanga, Provincia de Cusco, Peru.

TYPE-SPECIMENS.—The holotype male is deposited in MNHB, the allotype in FMNH. Fourteen

paratypes are deposited in repositories as noted under "Locality Records."

DIAGNOSIS.—Distinguishable from the very similar specimens of *P. limbatus* by the following combination of characteristics: front tarsal claws symmetrical, antennal articles 9 to 11 not testaceous, lateroapical maculae of pronotum (when present) extended posteriorly beyond subapical depression.

DESCRIPTION.—*Form*: As in *P. limbatus* (Figure 125).

Size: Length: males, average about 7.2 mm, range 6.1–7.9 mm; females, average about 7.5 mm, range 6.4–8.4 mm. Width: males, average about 2.0 mm, range 1.8–2.1 mm; females, average about 2.2 mm, range 2.0–2.3 mm. Twelve males and 5 females measured.

Color: Head, thoracic sterna, legs, and abdomen as in *P. limbatus*, or postocular region of cranium flavotestaceous; antennal articles 9 to 11 entirely black; pronotum predominantly black, lateroapical flavotestaceous maculae (when present) extended beyond subapical depression, and discal vitta percurrent or not (Figure 149); and vitta on epipleural margin broader.

Head: As in *P. limbatus*.

Pronotum: As in *P. limbatus*.

Elytron: As in *P. limbatus*.

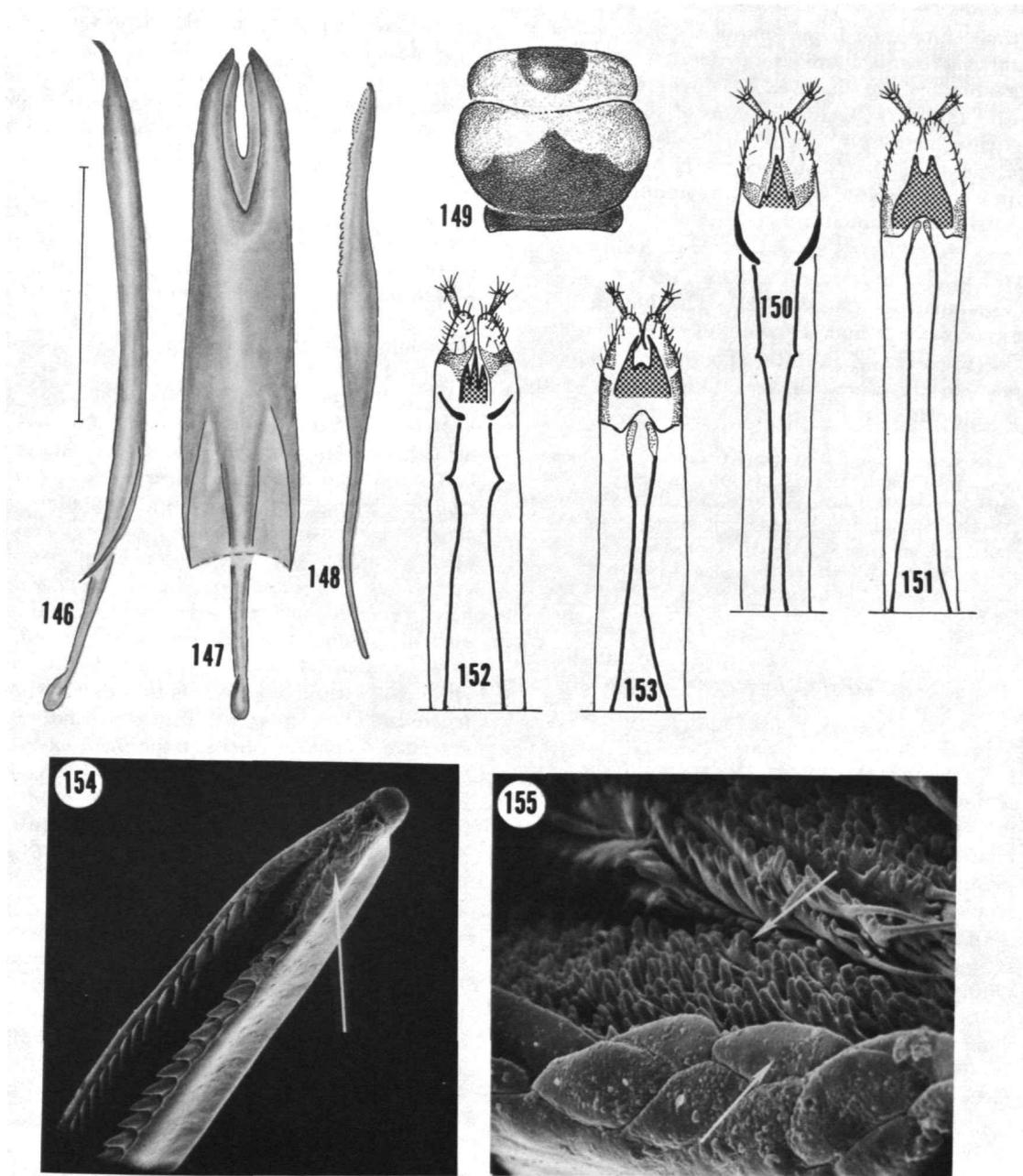
Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 154, 155): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 5.5 times longer than paramere. Combined length of paramere and phallobase 4.5 times longer than phallobasic apodeme. Paramere: acuminate; dorsum plane, explanate medially; venter concave; mesoventral margin arcuate; mesodorsal margin feebly convex and denticulate. Sinus: dorsal narrowly obconic; ventral broadly elliptical. Phallus: apex lobiform; phallic plates widely separated dorsally with marginal scales near apex (note arrow in Figures 154, 155) (12 specimens examined).

Female Genitalia (Figures 150, 151): As in *P. limbatus*; except coxites more robust; dorsal lamina deltoid, with short broad incision; lateral lobes of ventral lamina very short; and proctiger more prominent (2 specimens examined).

VARIATION.—*Structural*: The specimens examined are structurally homogeneous externally.

Color: Pronotal coloration is sex dimorphic. The



FIGURES 146-155.—*Perilypus apocopatus*: 146, tegmen, lateral view; 147, tegmen, ventral view; 148, phallus. *P. acus*: 149, pronotum; 150, ovipositor, ventral view; 151, ovipositor, dorsal view; 154, phallus, lateral views, $\times 130$ (arrow indicates phallic scales); 155, phallus, lateral view, $\times 1000$ (upper arrow indicates phallic papillae; lower arrow indicates phallic scale). *P. buga*: 152, ovipositor, ventral view; 153, ovipositor, dorsal view. (Scale = 1 mm)

female pronotum is predominantly flavotestaceous and has a black midapical macula and black pronotal collar. However, in three female specimens the black basal coloration of the pronotum extends anteriorly (Figure 149). In males, the pronotum is always predominantly black and the vitta on the elytral epipleural margin is narrower than in female specimens.

NATURAL HISTORY.—Adults were collected in Peru in May and August.

DISTRIBUTION (Figure 362).—The known distribution extends from Tarapoto to Marcapata, Peru.

ETYMOLOGY.—Latin, the noun *acus* (husk). I refer to the scales on the apical region of the phallic plates.

LOCALITY RECORDS (Figure 362).—I examined 16 adult specimens from South America. PERU: Provincia de Cusco: Callanga (FMNH, 1 male and 1 female; GEKI, 2 males and 1 female; MNHB, 1 male, holotype); Marcapata (ZMAN, 1 male). Provincia de San Martín: Tarapoto (GEKI, 1 male and 1 female; MNHP, 2 males and 1 female). "Perú" (BMNH, 1 male; GEKI, 2 males; MNHP, 1 female; ZMAN, 1 male).

13. *Perilypus buga*, new species

FIGURES 152, 153, 156–162, 362

TYPE-LOCALITY.—Buga, Valle del Cauca, Departamento de Valle del Cauca, Colombia.

TYPE-SPECIMENS.—The holotype male and allotype are deposited in NMNH. These and three paratypes were collected by me in 1973. Three paratypes: GEKI, 3 females.

DIAGNOSIS.—In addition to characteristics given in the key, specimens of this species are distinguished from specimens of other species in the *limbatus* group by the longer antenna (AL/PL, 1.9), more conspicuous elytral costae, and by the preponderance of pale erect setae on the elytral surface.

DESCRIPTION.—*Form*: As in Figure 156.

Size: Length: male, 5.9 mm; female, average about 7.6 mm, range 7.3–7.8 mm. Width: male 1.5 mm; female, average about 2.2 mm, range 2.0–2.3 mm. One male and 4 females measured.

Color: As in *P. limbatus* except venter of antennal articles 9 to 11 black, venter of cranium and posterior region of frons totally or predominantly black (Figure 58), and femur black in apical half or

more. Color of pronotum and elytron variable (see "Variation").

Head: As in *P. limbatus* except frontal umbo more prominent; antenna proportionally longer (AL/PL, 1.9); and length/width ratio of each male antennal article, 2.5:1.1:1.7:1.6:1.7:1.7:1.5:1.6:1.6:1.3:2.0.

Pronotum: As in *P. limbatus* except PL/PW, average about 0.91, range 0.88–0.95 (5 specimens measured).

Elytron: As in *P. limbatus* except elytral costae prominent; vertical setae pale; and EL/EW, average about 5.0, range 4.7 to 5.4 (5 specimens measured).

Front Tarsal Claws: As in *P. limbatus*.

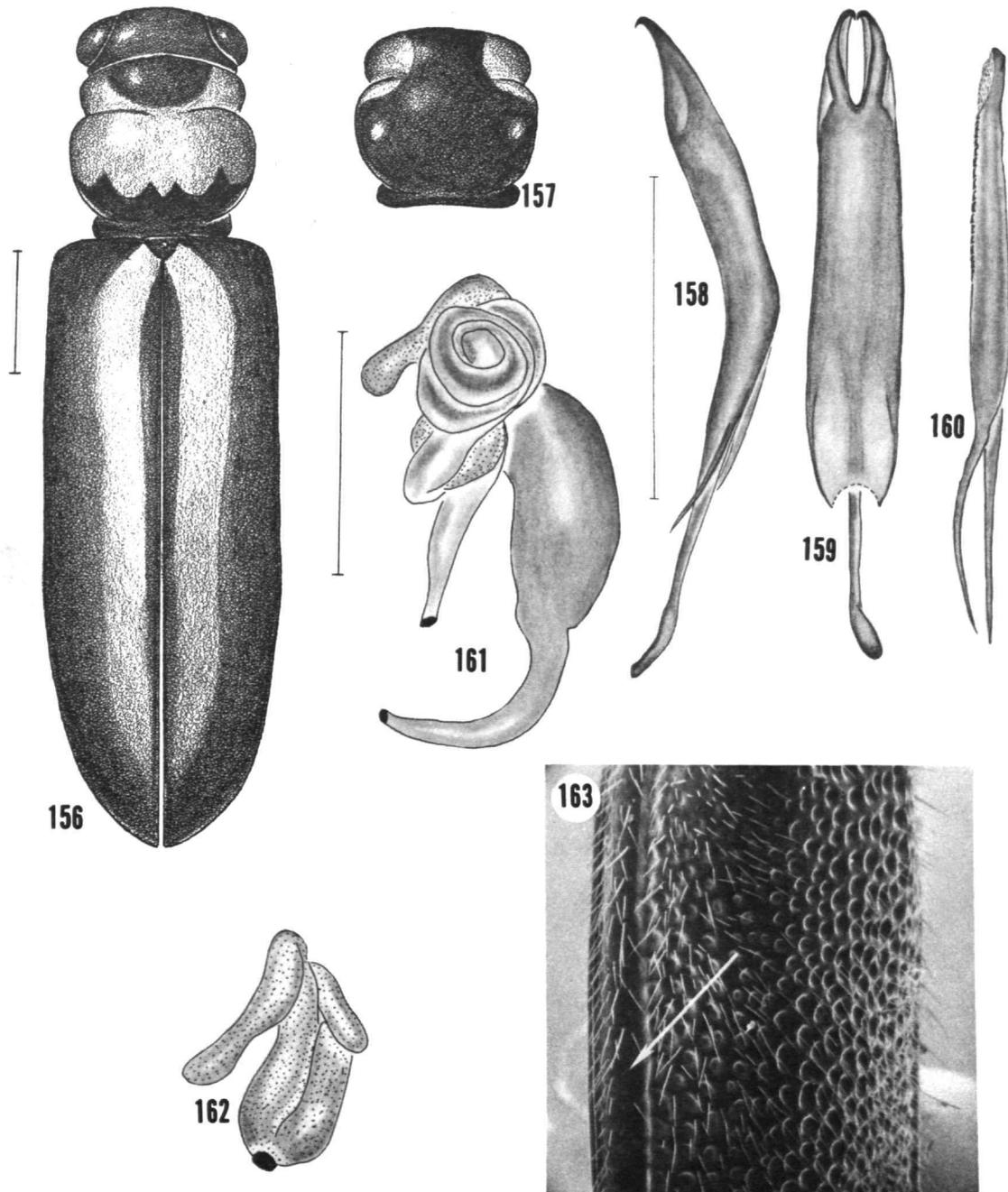
Male Genitalia (Figures 158–160): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 6 times longer than paramere. Combined length of paramere and phallobase 3.4 times longer than phallobasic apodeme. Paramere: apex uncinately; lateral depression broad, conspicuously long and most prominent near parameral base; dorsum plane, only slightly explanate medially; venter concave; mesoventral margin concave; mesodorsal margin straight. Sinus: dorsal elliptical; ventral abovate; both sinuses equal in length. Phallus: marginal denticles small, barely extended to phallic plicae (1 specimen examined).

Female Genitalia (Figures 152, 153): As in *P. limbatus* except coxites shorter, coxital stylus not bulbous distally; proctiger more prominent; and dorsal lamina with very short medial lobe (2 specimens examined).

Internal Reproductive Organs: Male (Figures 161, 162); anterior accessory gland uniramous, tightly coiled; posterior accessory gland biramous, outer branch only slightly longer than inner branch; testis composed of 12 follicles; ejaculatory duct conspicuously bulbous in proximal half. Female as in Figure 55; ovary composed of 12 ovarioles (1 male and 4 females examined).

VARIATION.—*Structural*: Conspicuous structural variation appears to be restricted to convexity of the epipleural fold, which is most developed in the vittate female.

Color: Sexual dimorphism with respect to pronotal and elytral color is present. Color variation groups females into a punctate or bivittate phenon. These phenon are generally similar to their *P. limbatus* counterparts, but in this species the pronotum



FIGURES 156-163.—*Perilypus buga*: 156, habitus; 157, pronotum; 158, tegmen, lateral view; 159, tegmen, ventral view; 160, phallus; 161, male internal reproductive organs; 162, posterior accessory gland. *P. latilira*: 163, elytron (arrow indicates epipleural fold). (Scale = 1 mm)

of punctate specimens (Figure 156) is black along the lower sides and at the base anterior to the pronotal collar. The posthumeral elytral vitta is faintly visible or absent in punctate females. The elytron of the bivittate phenon (Figure 156) has a broad discal vitta that does not join the marginal vitta at the elytral apex. In the male, color of the pronotum is similar to Figure 157; the elytron is black and avittate.

NATURAL HISTORY.—In May, in Buga, Colombia, at an altitude of 1700 meters, I collected 5 specimens of this species by beating tree branches intertwined with small woody lianas.

DISTRIBUTION (Figure 362).—Specimens were collected from Buga, a location between Cordillera Occidental and Cordillera Central of the Colombian Andes.

ETYMOLOGY.—"Buga" is the name of the locality from which these beetles were collected. The epithet is a noun in apposition.

LOCALITY RECORDS (Figure 362).—I examined 5 adult specimens from South America. COLOMBIA: Departamento de Valle del Cauca: Valle del Cauca, Buga (GEKI, 3 females; NMNH, 1 male, holotype, and 1 female).

REMARKS.—The avittate females are superficially very similar to the darker *P. limbatus* specimens from El Limón, Venezuela. However, in *P. buga* specimens the elytral vertical setae are pale, not black as in El Limón specimens. The black coloration on the pronotal lower sides and at the base beyond the pronotal collar (Figure 156) further distinguish *P. buga* specimens from the more melanistic specimens of *P. limbatus*.

14. *Perilypus latilira*, new species

FIGURES 164–171, 361

TYPE-LOCALITY.—Bugaba, Provincia de Chiriquí, Panama.

TYPE-SPECIMENS.—The holotype male and the allotype are deposited in BMNH. These and 14 paratypes were collected from the type-locality by G. C. Champion. The 14 paratypes are deposited in repositories as noted under "Locality Records."

DIAGNOSIS.—The combination of robust body, epipleural fold wider than pedicel, and epicranium with black subquadrate macula separate specimens of this species from those of other species in the *limbatus* group except *P. prolixipenis*. Specimens of

P. latilira are distinguished from specimens of *P. prolixipenis* by male genitalic characteristics (compare Figures 168, 173) and probably by geographic distribution.

DESCRIPTION.—*Form* (Figure 165): A broad and deep-bodied species.

Size: Length: males, average about 7.6 mm, range 6.4–8.9 mm; females, average about 8.6 mm, range 6.5–9.8 mm. Width: males, average about 2.0 mm; range 1.9–2.5 mm; females, average about 2.6 mm, range 1.9–3.0 mm. Ten males and 3 females measured.

Color: Frons and venter of cranium flavotestaceous; gena black; epicranium with black subquadrate macula; antenna black; pronotal disc usually with black vitta that extends to hind angles of pronotum proper; lower sides of pronotum black; femur flavotestaceous but black or infuscated dorsoapically; tibia and tarsus dark brown; prosternum flavotestaceous; meso- and metasternum black; elytron piceous, with purpurescent tinge and with broad flavotestaceous marginal vitta that expands apically; elytron in male with or without short and narrow flavotestaceous discal vitta, in female vitta (Figure 166) is broad and long and not confluent with vitta on epipleural margin; abdominal venter in male black, in female flavotestaceous except visible sterna 5 and 6 black.

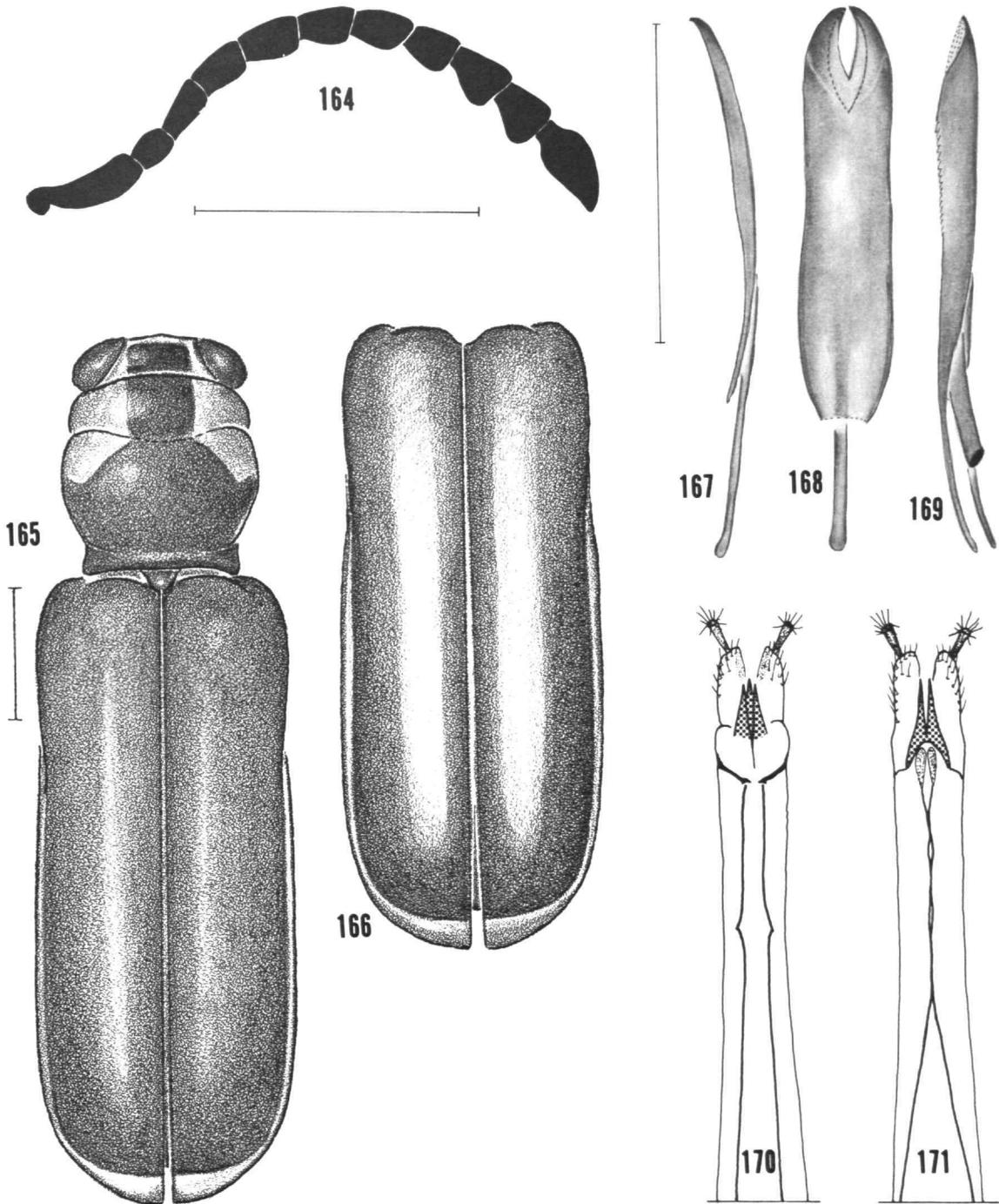
Head: As in *P. limbatus* except eyes less convex (HW/IOW, average about 2.2, range 1.8–2.4, 13 specimens measured) and antenna (Figure 164) proportionally shorter (AL/PL, 1.4).

Pronotum: As in *P. limbatus* except more convex, subapical depression more sinuous, and pronotal arch shallower and more prolonged medially.

Elytron: As in *P. limbatus*, except broader and deeper (EL/EW, average about 4.9 range 4.5–5.4; 13 specimens measured) and epipleural fold (Figure 163) wider.

Front Tarsal Claws: As in *P. limbatus*.

Male Genitalia (Figures 167–169): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 6 times longer than paramere. Combined length of paramere and phallobase 3.4 times longer than phallobasic apodeme. Paramere; feebly arcuate in lateral view; dorsum narrow and feebly convex; venter conspicuously broader than dorsum, feebly concave; mesoventral and mesodorsal margin concave. Sinus: dorsal and ventral elliptical, former broader. Phallus: acuminate;



FIGURES 164-171.—*Perilypus latilira*: 164, antenna; 165, habitus; 166, elytra; 167, tegmen, lateral view; 168, tegmen, ventral view; 169, phallus; 170, ovipositor, ventral view; 171, ovipositor, dorsal view. (Scales = 1 mm)

marginal denticles broad, shallow, and restricted in middle region of phallic plate (13 specimens examined).

Female Genitalia (Figures 170, 171): Dorsal lamina deeply incised and acuminate; lateral lobes of ventral lamina only slightly shorter than medial lobe; proctigeral bacculi fused as in Figure 171; inner margin of coxite well sclerotized; coxital plates not visible (1 specimen examined).

VARIATION.—*Structural*: The epipleural fold is conspicuously broader and more convex in females (Figure 163) than in males. The terminal article of the male antenna varies in length and in extent of acumination.

Color: Color variation is evident in both males and females. One male specimen from Bugaba, Panama, is particularly atypical; its cranium, antenna, prothorax, and mesosternum, and legs are entirely flavotestaceous. Definition of the elytral discal vitta is correlated with sex. Two of three females examined have broad, clearly defined vittae on the elytral disc (Figure 166). The elytral discs of the other female and some males show a faint abbreviated streak (Figure 165).

DISTRIBUTION (Figure 361).—Known only from northern Panama.

ETYMOLOGY.—The trivial name is a Latin compound noun formed from the adjective *latus* (wide) + the noun *lira* (slide). I refer to the width of the epipleural fold.

LOCALITY RECORDS (Figure 361).—I examined 16 specimens from Central America. PANAMA: Provincia de Chiriquí: Bugaba (BMNH, 3 males, holotype, and 1 female; GEKI, 5 males and 1 female; MNHP, 4 males and 1 female). Corrigimiento de Caldera (GEKI, 1 male).

REMARKS.—Specimens of this species were mistaken for the superficially similar *P. distinctus* (Figure 239), and *P. nigriventris*. Elytral color characteristics of female *P. latilira* accentuate the similarity between that species and the aforementioned congeners, but the broad and convex epipleural fold easily segregates *P. latilira* females from females outside the *limbatus* group.

15. *Perilypus prolixipenis*, new species

FIGURES 172–174, 360, 361

TYPE-LOCALITY.—Turrialba, Provincia de Cartago, Costa Rica.

TYPE-SPECIMENS.—The holotype male, deposited in FMNH, was collected by A. Hayne in 1922. Four paratypes: deposited in repositories as noted under "Locality Records."

DIAGNOSIS.—Within the *limbatus* group specimens of this species are reliably separated from the externally similar specimens of *P. latilira*, by male genital characteristics (compare Figures 168 and 174).

DESCRIPTION.—*Form*: As in *P. latilira* (Figure 165).

Size: Length: males, average about 8.0 mm, range 7.4–8.9 mm; female, 9.8 mm. Width: males, average about 2.2 mm, range 2.0–2.5 mm; female, 3.0 mm. Four males and 1 female measured.

Color: As in *P. latilira*.

Head: As in *P. latilira*.

Pronotum: As in *P. latilira*.

Elytron: As in *P. latilira*.

Front Tarsal Claws: As in *P. latilira*.

Male Genitalia (Figures 172–174): As in *P. latilira* except combined length of phallobase and phallobasic apodeme 7 times longer than paramere; ventral sinus inversely acuminate; and marginal denticles less conspicuous (4 specimens examined).

Female Genitalia: As in *P. latilira*.

VARIATION.—There is no conspicuous variation other than that noted for *P. latilira*.

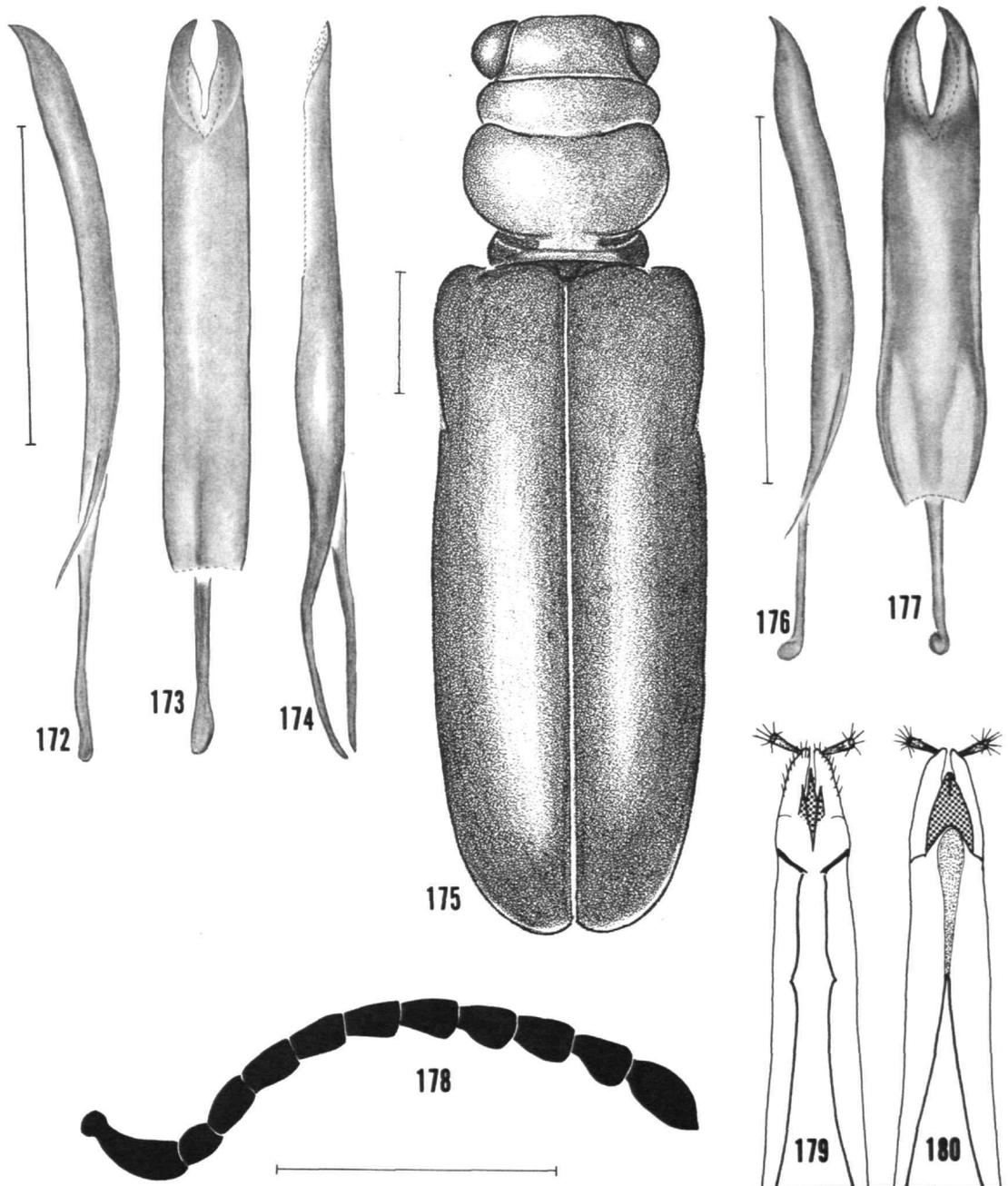
DISTRIBUTION (Figures 360, 361).—The known range extends from Chiapas, Mexico, to Cartago, Costa Rica.

ETYMOLOGY.—The epithet is a Latin compound noun formed from the adjective *prolixus* (long) + the noun *penis* (penis). I refer to the length of the aedeagus.

LOCALITY RECORDS (Figures 360, 361).—I examined 5 adult specimens from Central America. MEXICO: Estado de Chiapas (GEKI, 1 male). COSTA RICA: Provincia de Cartago: Turrialba (FMNH, 2 males, holotype, and 1 female; GEKI, 1 female; ZMAN, 1 male).

REMARKS.—As mentioned in the diagnosis, only the differences in male genitalia reliably distinguish *P. prolixipenis* from *P. latilira*. I am confident that the noted differences reflect reproductive isolation. If the differences were geographic, one would expect a less than identical appearance of genital characteristics between the *P. prolixipenis* specimen from Mexico and those from Costa Rica.

Three locality labels have the abbreviation



FIGURES 172-180.—*Perilypus proluxipennis*: 172, tegmen, lateral view; 173, tegmen, ventral view; 174, phallus. *P. testaceicornis*: 175, habitus; 176, tegmen, lateral view; 177, tegmen, ventral view; 178, antenna; 179, ovipositor, ventral view; 180, ovipositor, dorsal view. (Scale = 1 mm)

"acq," which, I suspect, refers to the Latin word *acquisitus* (to add to, to obtain). I suspect that Hayne used this abbreviation to identify the collector in the same way that one would use "leg" (abbreviation for *legulus* meaning a gatherer, a collector). One specimen has two different locality records. One of these indicates that the specimen originates from "Guatemala, Chiapas," the other label confines the locality to "Chiapas," which was once part of Guatemala.

**16. *Perilypus testaceicornis* (Pic),
new combination**

FIGURES 175-180, 361

Colyphus testaceicornis Pic, 1941:11 [holotype: female, deposited in MNHP; type-locality: Panama].

DIAGNOSIS.—Specimens of this species are easily recognized by the following combination of femoral color; front and middle femora testaceous, hind femur black in distal half, testaceous in proximal half.

DESCRIPTION.—*Form* (Figure 175): Shallow bodied; elytra feebly concave postmedially.

Size: Length: males, average about 7.5 mm, range 6.6-8.2 mm; females, average about 7.3 mm, range 6.0-8.7 mm. Width: males, average about 2.0 mm, range 1.8-2.1 mm; females, average about 2.1 mm, range 1.8-2.5 mm. Three males and 10 females measured.

Color: Cranium, antenna, and prothorax flavotestaceous, except pronotum sometimes dusky mid-apically and pronotal collar black at sides; legs flavotestaceous, except hind femur black in distal half; meso- and metasternum mostly black, former fulvous medially; elytron and abdominal sterna variable (see "Variation").

Head: As in *P. limbatus* except antenna (Figure 178) proportionately longer (AL/PL, 1.9); antennal articles 9 and 10 not as wide as long; and length/width ratio of each male antennal article 2.2:1.4:1.9:1.9:1.8:1.9:1.7:1.5:1.4:1.3:1.9.

Pronotum: As in *P. limbatus* except less convex, subapical depression more sinuous and feebly impressed medially, and side margins of pronotum proper less arcuate.

Elytron: Posthumeral margin, surface, and epipleural fold as in *P. limbatus*; otherwise shallower, feebly concave postmedially, and generally more slender.

Front Tarsal Claws: Feebly asymmetrical in both sexes.

Male Genitalia (Figures 176, 177): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 6.5 times longer than paramere. Combined length of paramere and phallobase 3.4 times longer than phallobasic apodeme. Paramere: apex slightly declinate; dorsum narrow, feebly convex; venter feebly concave; mesoventral margin sinuous; mesodorsal margin concave. Sinus: elliptical dorsal narrower than lanceolate ventral. Phallus: phallic plates acuminate; marginal denticles shallow, broad, and restricted to middle region of phallic plates (3 specimens examined).

Female Genitalia (Figures 179, 180): Dorsal lamina convex laterally, incision short; lateral lobes of ventral lamina shorter than medial lobe; proctigeral bacculi fused as in Figure 180, coxite with small coxital plate (1 specimen examined).

VARIATION.—*Structural:* The specimens examined do not vary appreciably in external characteristics.

Color: The sutural, apical, and epipleural regions of the elytron may be dark brown or black. The paler, nearly fulvous coloration of the elytral disc suggests a dimly defined vitta that varies in width. In general, lighter elytra are reddish, darker ones purpurescent.

NATURAL HISTORY.—In May, near Las Lagunas, Panama, at an altitude of 1400 meters, I collected one female specimen by beating tree foliage. G. C. Champion collected 23 adult specimens on Volcán de Chiriquí at elevations of from 920 to 1227 meters.

DISTRIBUTION (Figure 361).—To my knowledge these beetles have only been collected on the Pacific slope of the Cordillera de Talamanca, in northern Panama.

LOCALITY RECORDS (Figure 361).—I examined 25 adult specimens from Central America. PANAMA: Provincia de Chiriquí: Volcán de Chiriquí (AMNH, 1 female; BMNH, 1 male and 6 females; GEKI, 1 male and 6 females; ISNB, 1 female; MNHP, 3 females; MNHB, 1 female; RNHN, 1 female; NMNH, 1 male and 1 female); Las Lagunas (GEKI, 1 female). "Panamá" (MNHP, 1 female, holotype).

17. *Perilypus decoris*, new species

FIGURES 1, 2, 181-185, 187, 188, 361

TYPE-LOCALITY.—Cerro Campana, Provincia de Panamá, Panama.

TYPE-SPECIMENS.—The holotype male, deposited in NMNH, was collected by T. L. Erwin in 1974. The allotype is deposited in GEKI. Three paratypes deposited in repositories noted under "Locality Records."

DIAGNOSIS.—The right-angled incurvature of the elytral discal vitta (Figure 2), near the elytral apex, easily distinguishes members of this species from congeners. The general shape of the elytral discal vittae in *P. decoris* is roughly similar in specimens of *P. floralis* (Figure 342) of the *ornaticollis* group, but in *P. floralis* specimens the vitta is not acutely incurved and the elytra is more oval than rectangular.

DESCRIPTION.—*Form:* As in Figure 2.

Size: Length: males, 7.6; females, average about 8.8, range 8.3–9.3 mm. Width: males, 2.2; females, average about 2.3, range 2.5–2.8 mm. Two males and 3 females measured.

Color: Labrum, clypeus, frons, and cranial venter flavotestaceous, remainder of cranium black; antenna black, except articles 9 to 11 flavotestaceous; prothorax predominantly flavotestaceous, with mid-apical, midbasal, and basolateral black maculae; femur predominantly flavotestaceous, dark brown at dorsopreapical half; tibia flavotestaceous or dark brown; meso- and metasternum black; elytron predominantly black, with two white vittae that converge near elytral apex; discal vitta acutely incurved to sutural margin apically; abdominal venter black in male, predominantly black in female (first five visible sterna yellow along posterior margin).

Head: As in *P. limbatus* except interocular impressions (Figure 1) broader and more deeply impressed, frontal umbo more prominent, antenna as in Figure 181.

Pronotum: As in *P. limbatus* except more transverse (PL/PW, average about 0.86, range 0.88–0.90; 5 specimens measured).

Elytron: As in *P. limbatus* except epipleural fold broader and more convex, and EL/EW 4.6 (5 specimens measured).

Abdomen: Male pygidium as in Figure 185.

Front Tarsal Claws: As in *P. limbatus*.

Male Genitalia (Figures 181–184): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 5.1 times longer than paramere. Combined length of paramere and phallobase 2.3 times longer than phallobasic apodeme. Paramere:

apex uncinata; lateral depression shallow and elongate; dorsum feebly convex, explanate mesally; venter narrow and concave; mesoventral margin feebly arcuate except apically where strongly recurved; mesodorsal margin feebly sinuous and more sclerotized at base. Sinus: dorsal narrow, slightly expanded at basal half and longer than lanceolate ventral sinus. Phallus: phallic plate feebly sinuous; marginal denticles conspicuous, not extended beyond anterior limit of phallic plicae (1 male examined).

Female Genitalia (Figures 189, 190): Dorsal lamina deeply incised; ventral lamina reduced to one very short triangular lobe; proctigeral bacculi fused as in Figure 190; baccular acumination arcuate and projecting anteriorly; coxites slender; coxital plates prominent (2 specimens examined).

Internal Reproductive Organs: Male (Figures 187, 188), anterior accessory glands uniramous, tightly coiled; posterior accessory glands biramous, outer branch almost twice as long as inner branch; testis composed of 12 follicles. Female as in Figure 55 (1 male and 2 females examined).

VARIATION.—*Structural:* The specimens studied showed no noteworthy structural variation.

Color: The posterior junction between the elytral vittae is less distinct in male specimens.

NATURAL HISTORY.—Specimens were collected from the type-locality (850 meters) in May, June, and July. Three adults were collected during night by beating "slash and burn" vegetation; T. L. Erwin, C. W. O'Brien, and B. Marshall.

DISTRIBUTION.—Known only from the type-locality.

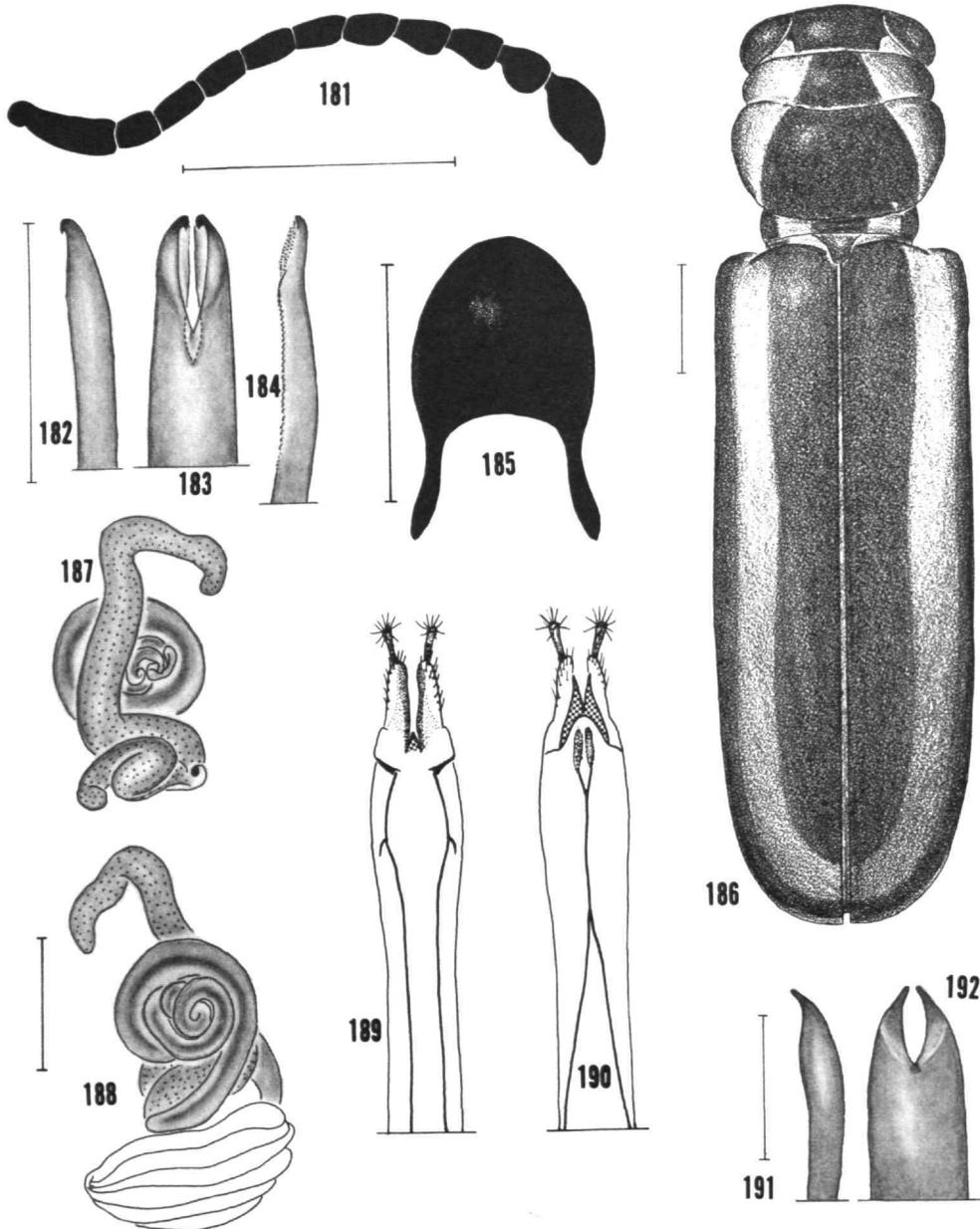
ETYMOLOGY.—Latin, the adjective *decoris* (ornamented); with regard to the striking coloration of the elytra.

LOCALITY RECORDS (Figure 361).—I examined 5 adult specimens from Central America. PANAMA: Provincia de Panamá: Cerro Campana (GEKI, 1 male and 2 females; NMNH, 1 male, holotype; WBIV, 1 female).

REMARK.—The male paratype is without abdomen.

The *reventazon* Group

Specimens of the *reventazon* group are characterized by having the elytral apical slope acute (Figures 29–31) and the curvature of the epipleural



FIGURES 181-192.—*Perilypus decoris*: 181, antenna; 182, tegmen, lateral view; 183, tegmen, ventral view; 184, phallus; 185, male pygidium; 187, male internal reproductive organs, inner lateral view; 188, male internal reproductive organs, outer lateral view; 189, ovipositor, ventral view; 190, ovipositor, dorsal view. *P. reventazon*: 186, habitus. *P. nigriventris*: 191, tegmen, lateral view; 192, tegmen, ventral view. (Scale = 1 mm)

margin at elytral apical fourth acutely arcuate (except in *P. orthopleurides* where both characteristics are secondarily lost). Within the group there is little nongenital structural variation, but color polymorphism is abundant at intraspecific level. Color differences usually pertain to the elytral surface and are most often correlated with sex.

The composite distribution of the 17 species that currently comprise this group extends from Mexico to Peru.

18. *Perilypus reventazon*, new species

FIGURES 3–26, 28, 29, 32–46, 48–55, 186, 363

TYPE-LOCALITY.—Rio Reventazón, Turrialba, Estado de Cartago, Costa Rica.

TYPE-SPECIMENS.—The holotype male and the allotype, deposited in NMNH, were collected by me in 1973. Sixty-eight paratypes deposited in repositories as noted under "Locality Records."

DIAGNOSIS.—Similar to *P. claudus*, *P. sapientis*, and *P. cultratus*. Specimens of *P. reventazon* are substantially larger than members of *P. claudus* and *P. sapientis*. From *P. cultratus*, *P. reventazon* differs by the less-developed antennal serration, more convex pronotum, and shallower interocular depressions.

DESCRIPTION.—*Form*: As in Figure 186.

Size: Length: males, average about 8.4 mm, range 7.2–10.0 mm; females, average about 9.0 mm, range 8.0–10.5 mm. Width: males, average about 2.3 mm, range 2.0–2.7 mm; females, average about 2.4 mm, range 1.6–3.0 mm. Ten males and 10 females measured.

Color: Cranium, pronotum, elytron, and abdomen variable (see "Variation"); antenna black; meso- and metasternum dark brown; femur predominantly flavotestaceous, infuscated dorsoapically; tibia and tarsus brown.

Head: Interocular depressions deeply impressed, feebly oblique, and not confluent posteriorly; frontal umbo prominent; eyes boldly convex; HW/IOW, average about 2.2, range 2.1–2.3 (20 specimens measured); antenna (Figure 8) serrate; AL/PLS about 1.9; length/width ratio of each male antennal article 2.2:1.1:1.6:1.8:1.7:1.3:1.5:1.3:1.1:1.2:1.7.

Pronotum: Moderately transverse (PL/PW, average about 0.88, range 0.83–0.93; 20 specimens meas-

ured); subapical and prebasal depressions deeply impressed, former strongly sinuous; pronotal arch with few coarse punctations; side margins of pronotum proper boldly convex; fovea small, spheroid, and deeply impressed; collar prominent.

Mesoscutellum: Subquadrate.

Elytron: Epipleural margin straight in basal three-fourths, acutely arcuate in apical fourth; apical slope acute; surface arenose; disc deeply impressed with large punctations; epipleural fold plane; EL/EW, average about 4.8, range 4.4–5.3 (20 specimens measured).

Front Tarsal Claws: Males, distinctly asymmetrical. Female, feebly asymmetrical.

Male Genitalia (Figures 43–46): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 5.5 times longer than paramere. Combined length of paramere and phallobase 2.4 times longer than phallobasic apodeme. Paramere: apex feebly uncinat; lateral depression feebly impressed; dorsum plane; venter slightly concave; mesoventral margin concave; mesodorsal margin sinuous and conspicuously more sclerotized in basal third than in apical two-thirds. Sinus: dorsal digitiform; ventral lanceolate. Phallus: marginal denticles extended from basal half to plicae (30 specimens examined).

Female Genitalia: See page 18.

Internal Reproductive Organs: See page 20.

VARIATION.—**Structural:** Except for the sex dimorphism present in the front tarsal claws, the specimens studied are structurally homogeneous externally.

Color: There is substantial color variation and except for the elytral and abdominal coloration, color polymorphism is not sex correlated. The entire spectrum of color variation presented below is evident in a series of 45 specimens collected from the type-locality.

The cranium may be variously bicolored, but usually is predominantly black. If predominantly black the cranium is flavotestaceous in the postocular epicranial region. When the flavotestaceous macula of this region is prolonged anteriorly (along the interocular margin of the eyes) it marks the epicranium with a subquadrate black macula; the latter combination of cranial color is most often found in males with vittate pronotum. In some males, the black epicranial macula is reduced to the extent that the cranium is predominantly flavotestaceous to rufescent.

The pronotum is either flavotestaceous or refuscated, and vittate or avittate; its lower sides may be infuscated or entirely black. The pronotal disc is either marked by a midapical black macula or by a black vitta.

Elytral coloration distinguishes an avittate phenon, a univittate phenon, and a bivittate phenon. In an avittate beetle the elytron is entirely black, except for a small pale macula at the base. This macula corresponds, in position, to the basal limit of a fully developed vitta. In beetles of the univittate phenon the elytron has a discal vitta that begins at the base, gradually obliques toward the suture, and incurves sharply at its apical limit; the incurved portion may or may not reach the sutural margin. In members of the bivittate phenon the elytron has two vitta, one on the epipleural margin and one on the disc. The marginal vitta, which is narrower than the discal one, usually terminates at the elytral apical eight. Of 32 male specimens examined only three have avittate elytra; in one of these the discal vitta diminishes in the basal half. Female specimens whose pronotum is vittate have univittate elytra whereas those that have the pronotum maculated have bivittate elytra; in one female specimen the elytron is entirely flavotestaceous.

The male abdomen is black. In females, visible abdominal sterna I to V are either entirely flavotestaceous or predominantly brown (when mostly brown their middle and posterior margin is pale), and VI is entirely brown.

NATURAL HISTORY.—I collected 45 specimens of this species, from May to July, in Turrialba, Costa Rica. Thirty-eight of these were collected by beating tree branches intertwined with lianas, seven by sweeping herbaceous hedge growth. All specimens were collected from a forested ravine adjacent to Rio Reventazón; the altitude of the site is 610 meters. A. Hayne collected two specimens from Turrialba at 900 meters.

In-captivity feeding behavior of adult specimens is similar to that observed in *P. limbatus* (Gorham).

DISTRIBUTION (Figure 363).—Known only from the type-locality.

ETYMOLOGY.—The trivial name, *reventazon*, constitutes a noun in apposition and refers to the type-locality.

LOCALITY RECORDS (Figure 363).—I examined 71 adult specimens from Central America. COSTA RICA: Estado de Cartago: Turrialba, at Rio Reventazón (AMNH, 1 male

and 1 female; BMNH, 1 male and 1 female; CASC, 1 male and 1 female; CISC, 1 male; CNCC, 1 male; FMNH, 1 male; GEKI, 18 males and 14 females; CMPP, 1 male and 1 female; UCMV, 1 male; MCZC, 1 male and 1 female; MNHB, 1 male; MNHP, 1 male and 1 female; MZSP, 1 male and 1 female; NMNH, 2 males, holotype, and 1 female; ZMAN, 1 male); Turrialba (CNCC, 1 female; FMNH, 8 females; MNHB, 1 female; NMNH, 1 male and 1 female; ZMAN, 1 female. Locality not known: FMNH, 1 male and 1 female.

19. *Perilypus nigriventris* (Gorham), new combination

FIGURES 191, 192, 198, 199, 364

Colyphus nigriventris Gorham, 1886:336 [lectotype: male, deposited in BMNH, here designated; type-locality: El Zapote, Departamento de Escuintla, Guatemala].—Wolcott, 1927a: 33.

DIAGNOSIS.—Within the *reventazon* group male specimens of *P. nigriventris* are superficially very similar to those of *P. latilobus*, *P. calcaris*, and *P. exilis*. Among the four species, however, only *P. nigriventris* has symmetrical male front tarsal claws. Females of these species are more difficult to separate.

DESCRIPTION.—*Form*: As in *P. reventazon* (Figure 186) except more robust.

Size: Length: males, average about 7.5 mm, range 6.6–8.5 mm; females, average about 8.3 mm, range 7.6–9.4 mm. Width: males, average about 2.0 mm, range 1.8–2.2 mm; females, average about 2.3 mm, range 2.2–2.6 mm. Four males and five females measured.

Color: Clypeus, frons, cranium venter, and postocular region of epicranium flavotestaceous; remainder of epicranium and gena black; antenna black; pronotum broadly flavotestaceous dorsolaterally, piceous ventrolaterally and discally; pronotal collar piceous; prosternum flavotestaceous, meso- and metasternum piceous; femora flavotestaceous, except distal region infuscated; tibia and tarsus piceous; elytron piceous, with or without testaceous discal vitta; abdomen entirely black, or partially dark brown and partially flavotestaceous.

Head: As in *P. reventazon* except antenna sex dimorphic in length (AL/PLS, male 2.1; female 1.8) and in proportion of length/width ratio of each antennal article, male 2.0:1.0:1.5:1.7:1.6:1.7:1.7:1.7:1.6:1.3:1.9; female 2.0:1.0:1.0:1.0:1.0:1.0:1.0:1.0:1.2:1.0:1.7.

Pronotum: As in *P. reventazon* except subapical depression shallower, pronotal arch less convex, and pronotum proper side margins less arcuate.

Elytron: As in *P. reventazon*.

Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 191, 192): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 6 times longer than paramere. Combined length of paramere and phallobase 2.8 times longer than phallobasic apodeme. Paramere: arcuate and acuminate; lateral depression shallow and elongate; dorsum plane; venter feebly concave; mesoventral and mesodorsal margin concave. Sinus: dorsal and ventral equal in length and lanceolate. Phallus: feebly sinuous; marginal denticles distributed from basal fourth to apical fourth of phallic plate (18 specimens examined).

Female Genitalia (Figures 198, 199): Dorsal lamina bilobed, outer margins arcuate, ventral lamina trilobed, lateral lobes about equal to median lobe; dorsal bacculus not fused; ventral bacculus acuminate at about posterior third; coxite robust; coxital plates absent (1 specimen examined).

VARIATION.—*Structural*: The male antenna is more slender and proportionally shorter than the female antenna (see "Head"). Also, in one female the side margin of the pronotum proper is more conspicuously convex and the elytral apical curvature is less arcuate than in other specimens.

Color: The female elytron has a testaceous discal vitta that is closer to the posthumeral margin than to the sutural margin. The discal vitta begins posteriorly to the humeral margin, ends anteriorly to the apex, and varies in width. The male elytron is avittate. Also in males, the flavotestaceous postocular macula of the epicranium extends anteriorly, marking the epicranium with a black subquadrate macula; in females, the epicranial postocular macula is reduced or absent. Color of abdominal venter is also correlated with sex, being entirely black in males and predominantly flavotestaceous in females.

DISTRIBUTION (Figure 364).—The single locality record from Costa Rica extends the known range of this species from southwestern Guatemala to central Costa Rica.

LOCALITY RECORDS (Figure 364).—I examined 9 adult specimens from Central America. GUATEMALA: Departamento de Escuintla: El Zapote (BMNH, 1 male, lectotype, and 2 females; GEKI, 2 males and 2 females; MNHP, 1 male and

1 female). COSTA RICA: Provincia de Cartago: Turrialba (GEKI, 1 male).

REMARKS.—Two *P. nigriventris* females formed part of the syntype series of *P. bilineatus*, a third was identified as *P. distinctus*. Wolcott's (1927a:33) treatise of this species refers to specimens of *P. reventazon* and *P. acus*.

20. *Perilypus sapientis*, new species

FIGURES 193–196, 363

TYPE-LOCALITY.—Montes de Oca, San Pedro, Provincia de San José, Costa Rica.

TYPE-SPECIMENS.—The holotype male and the allotype are deposited in NMNH. These and 11 paratypes were collected by C. H. Ballou, 10 in 1936 and one in 1937. Twenty-six paratypes deposited in repositories as noted under "Locality Records."

DIAGNOSIS.—Within the *reventazon* group specimens of this species are superficially most similar to specimens of *P. claudus* Wolcott. No one external characteristic will easily separate all members of these two species, but males are separable by genital differences (compare Figures 195, 201), females by elytral form; female specimens of *P. claudus* have shorter and more quadrate elytra.

DESCRIPTION.—*Form*: As in Figure 193.

Size: Length: males, average about 6.8 mm, range 6.0–7.8 mm; females, average about 7.2 mm, range 6.7–7.9 mm. Width: males, average about 2.0 mm, range 1.8–2.3 mm; females, average about 2.2 mm, range 2.0–2.4 mm. Ten males and 10 females measured.

Color: Cranium entirely testaceous, or clypeus frons and cranium venter testaceous and epicranium and gena black; antenna black; venter and sides of pronotum testaceous; pronotal disc testaceous, with or without midapical infuscation or with broad piceous vitta that narrows abruptly at subapical depression (Figure 193); pronotal collar black; prosternum testaceous; meso- and metasternum black or piceous; femur flavotestaceous in basal half, piceous in distal half; tibia piceous, distal region pale or not; tarsus piceous; elytron piceous, with or without discal vitta; elytral discal vitta begins at midbase extends posteriorly equally distant from suture and posthumeral margin and ends at elytral apical eighth, where feebly explanate (Figure 193)

or not; abdominal venter entirely black, or predominantly dark brown having middle region of visible sternum I to IV flavotestaceous.

Head: As in *P. reventazon* except antenna proportionally shorter (AL/PLS, 1.7) and length/width ratio of each antennal article 2.0:1.2:1.3:1.2:1.3:1.0:1.3:1.3:1.0:1.0:1.8.

Pronotum: As in *P. reventazon*.

Elytron: As in *P. reventazon* except proportionally shorter (EL/EW, average about 4.2, range 4.1–5.2; 20 specimens measured) and apical curvature more acute.

Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 194–196): As in *P. nigri-ventris* except dorsal and ventral sinus broader and paramere more acutely arcuate in apical region (3 specimens examined).

Female Genitalia: As in *P. nigri-ventris*.

Internal Reproductive Organs: Male and female as in *P. reventazon* (1 male and 1 female examined).

VARIATION.—**Structural:** A male specimen from Turrialba, Costa Rica, is more robust and has a larger more convex pronotal arch; the side margins of the pronotum proper are broadly arcuate and the body form is generally more robust. Female specimens are shorter; their elytral apical curvature is more acute than it is in males. Depth of the pronotal subapical depression varies independent of sex.

Color: All males examined have the cranium testaceous. Partial sex-linked color variation is apparent in coloration of the pronotal disc: vittate in 8 of 11 females studied, avittate in all males examined. Color of elytron and abdominal venter is invariably sex linked: always vittate discally in females (in one female, from the type-locality, this vitta is faintly visible), avittate in males. Male abdominal sterna are black; those of females are part piceous and part testaceous, except for the last visible sternum, which is totally black.

NATURAL HISTORY.—Adult specimens were collected in Costa Rica from February to July. I collected one female specimen in May by beating tree foliage in Alajuela. In June, in Montes de Oca, once a forested environ of San José and now occupied by the campus of the University of Costa Rica, C. H. Ballou collected 10 specimens on *Hamelia erecta* Jacquin (probably equals *H. patens* Jacquin), one specimen on *Trichilia havanensis* Jacquin, and one on *Mirabilis jalapa* Linnaeus. Ballou collected

one other specimen in July on *Veronica brachiata* Benth. C. Fernandez collected one specimen from San José, in May, between 1000 to 2000 meters.

DISTRIBUTION (Figure 363).—The known range of this species extends from central Guatemala to central Costa Rica.

ETYMOLOGY.—The epithet represents a genitive case of the latin adjective *sapiens* (wise). I dedicate the name of this species to my learned friend George C. Steyskal.

LOCALITY RECORDS (Figure 363).—I examined 28 adult specimens from Central America. GUATEMALA: Departamento de Guatemala: northwestern outskirts of Guatemala City (GEKI, 1 male). COSTA RICA: Provincia de Alajuela: Alajuela (GEKI, 1 female); Provincia de San José: San Ignacio (GEKI, 1 male); Farm La Caja, 8 kilometers, west of San José (ZMAN, 1 male); San Pedro, Montes de Oca (GEKI, 5 males and 2 females; MHNH, 2 males; NMNH, 2 males, holotype, and 2 females); San José (FMNH, 1 male and 1 female; GEKI, 1 male; NMNH, 2 males and 1 female). Provincia de Cartago: Turrialba (GEKI, 1 male; NMNH, 1 female; ZMAN, 1 male and 2 females). "Cost Rica" (MNHP, 1 female).

REMARKS.—The more robust male specimen from Turrialba, heretofore identified as *Colyphus nigri-ventris*, may not be conspecific; but without additional data I cannot justify its specific distinction from other specimens of *P. sapientes* or its conspecificity with *P. nigri-ventris*.

21. *Perilypus claudus* (Wolcott)

FIGURES 197, 200–203, 364

Derestenus claudus Wolcott, 1927a:32 [holotype: male, deposited in FMNH; type-locality: Turrialba, Estado de Cartago, Costa Rica].

Cleronomus nigrifrons Chevrolat var. *flavicornis* Wolcott, 1927a:36 [holotype: female, deposited in FMNH; new synonymy].

Chevrolat's type-specimen is a color variant of *P. claudus*.

DIAGNOSIS.—Males of this species can be reliably distinguished from males of other species of *Perilypus* only by genitalic characteristics as described (see "Male Genitalia") and depicted in Figures 200–202. No one characteristic will diagnose *P. claudus* females but the combination of small size, slender body, and distal confluence of the elytral discal vittae will generally separate them from females of other Costa Rican congeners.

The shape and position of the discal vitta in *P. claudus* specimens from Volcán Turrialba is very similar to that in females of *P. sapientis*. However, female *P. sapientis* is more robust and more quadrate in body form than female *P. claudus*. The configuration of the discal elytral vitta in *P. claudus* females from Monteverde is the same as in females of *P. reventazon* (Figure 186), but specimens of the latter species are considerably larger than those of the former.

DESCRIPTION.—*Form:* As in *P. sapientis* (Figure 193) except more slender.

Size: Length: males, average about 6.2 mm, range 5.3–7.3 mm; females, average about 6.8 mm, range 5.7–8.0 mm. Width: males, average about 1.7 mm, range 1.4–1.9 mm; females, average about 1.8, range 1.7–2.3 mm. Ten males and 10 females measured.

Color: Color characteristics are exceptionally variable and because of this a composite description of this species' integumental color is not provided. Instead, the general color patterns and the deviations from them are described under "Variation."

Head: As in *P. reventazon* except antenna proportionally longer (AL/PLS, 2.0) and length/width ratio of each male antennal article 2.8:1.4:1.8:1.8:1.6:1.6:1.4:1.4:1.2:1.0:2.3.

Pronotum: As in *P. reventazon*.

Elytron: As in *P. reventazon*.

Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 200–202): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 5 times longer than paramere. Combined length of paramere and phallobase 3 times longer than phallobasic apodeme. Paramere: feebly arcuate in lateral view; parameral septum prominent (note arrow in Figure 201); lateral depression indistinct; dorsum tumid midbasally, feebly convex medially; venter narrow and feebly convex; mesoventral margin concave; mesodorsal margin sinuous. Sinus: dorsal irregular; ventral broadly elliptical. Phallus: as in Figure 202 (29 specimens examined).

Female Genitalia: As in *P. nigriventris* (2 specimens examined).

Internal Reproductive Organs: Male (Figures 197–203), anterior accessory gland uniramous, tightly coiled; posterior accessory gland biramous, outer branch one-fourth longer than inner branch;

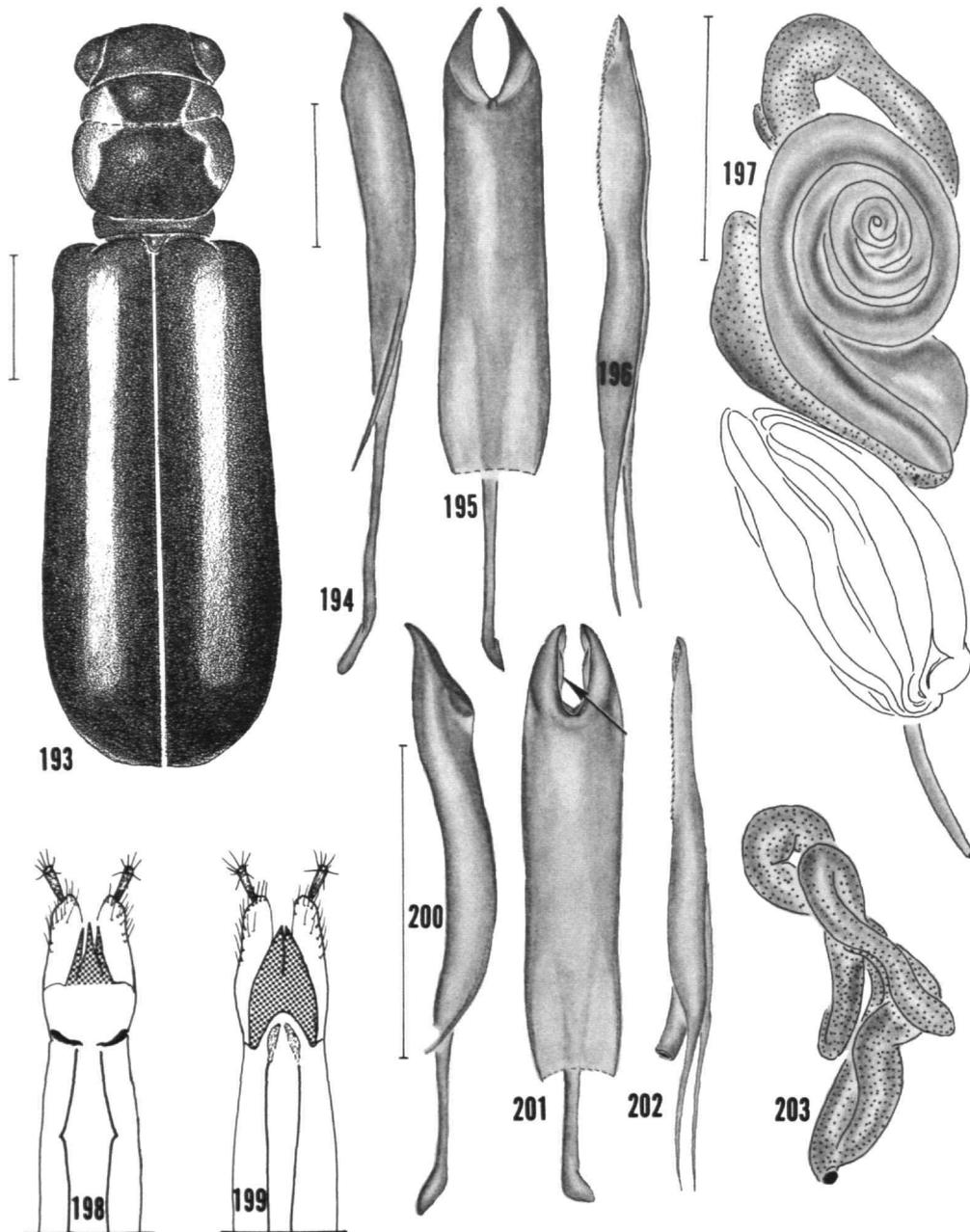
testis composed of 12 follicles. Female (Figure 55), ovary composed of 12 ovarioles (3 males and 2 females examined).

VARIATION.—*Structural:* Elytral punctations are slightly shallower in specimen from Volcán Irazú and in those from Quebrada Florida.

Color: On the basis of leg color, specimens from Volcán Irazú and those from Quebrada Florida are assigned to a brown-legged morph. These specimens are considerably homogeneous in color unlike in other population samples of this species. Color characteristics of specimens of the dark-legged phenon are as follows: Head: cranium testaceous, immaculate; antenna piceous with articles 9 to 11 not testaceous beneath. Thorax: prothorax predominantly testaceous; pronotum with midapical macula, or with or without discal vitta, latter interrupted at middle or not; pronotal collar piceous; meso- and metasternum piceous; legs piceous; elytron piceous, with cupreous or purpurescent luster. Abdomen: sternum piceous in both sexes.

Leg color can also be used to distinguish a yellow-legged morph. In specimens of this morph the head, antenna, pronotum, mesoscutellum and legs are entirely flavotestaceous, and the elytra purpurescent and avittate.

All other specimens examined exhibit the following possible color characteristics: Head: cranium flavotestaceous, with or without midpicranial macula, or clypeus and frons flavotestaceous, epicranium black (except postocular region flavotestaceous), gena piceous, and venter piceous or flavotestaceous; antenna flavotestaceous or black, when piceous articles 9 to 11 testaceous or dark brown. Thorax: pronotum predominantly black or predominantly flavotestaceous; when predominantly black vittate discally and flavotestaceous laterally; when predominantly flavotestaceous discal vitta reduced; pronotal discal vitta (when present) may be entire or interrupted at middle; when pronotum predominantly flavotestaceous midapical macula present; pronotal collar piceous; prosternum flavotestaceous; meso- and metasternum piceous; profemur flavotestaceous in basal half, piceous in apical half, meso- and metafemur flavotestaceous in basal two-thirds and piceous in apical third, or all femora flavotestaceous in basal half and piceous in apical half; tibia entirely piceous, or piceous in basal half and testaceous in apical half (usually only hind tibia testaceous in apical half); tarsus piceous;



FIGURES 193-203.—*Perilypus sapientis*: 193, habitus; 194, tegmen, lateral view; 195, tegmen, ventral view; 196, phallus. *P. claudus*: 197, male internal reproductive organs; 200, tegmen, lateral view; 201, tegmen, ventral view (arrow indicates parameral septum); 202, phallus; 203, posterior accessory gland. *P. nigriventris*: 198, ovipositor, ventral view; 199, ovipositor, dorsal view. (Scale = 1 mm)

elytron piceous, with or without purpurescent luster and vittate or avittate discally. Abdomen: venter entirely black, or visible sternum I to V flavotestaceous infuscated discally and laterally, sternum VI piceous.

Specimens from Monte Verde are sex dimorphic with respect to cranial, pronotal, and possibly elytral color. Male specimens have the cranium entirely flavotestaceous, pronotal vitta absent, and elytron avittate. Female specimens have the cranium predominantly piceous, the pronotal vitta is always entire, and of 14 specimens eight have vittate elytra. The elytral discal vitta, which is nearer to the posthumeral margin than to the sutural margin, is incurved apically; the incurvature reaches the sutural margin.

I studied too few specimens from Volcán Turrialba to determine relationships between color and sex. The following color characteristics are present, however. The legs are entirely flavotestaceous in 5 of 11 males; in the other males the legs are partly piceous and partly flavotestaceous. Among all specimens studied, 2 males and the only female from this locality have univittate elytra while in another male the elytral vitta is reduced to a short basal streak.

NATURAL HISTORY.—In June, on the northeastern slope of Volcán Turrialba, Costa Rica, at an altitude of 1450 meters, I collected a series of 12 specimens by beating live branches of *Psidium guajava* Linnaeus.

I collected 26 additional specimens, in June, from Monte Verde, Costa Rica, by beating dense understorey composed mostly of live and dead tree branches and liana vines. The macrohabitat of the locality may be described as a dry section of montane forest situated at 1600 meters on the Pacific slope of the Cordillera de Tilarán. Holdridge, et al. (1971), classified this region as "lower montane rain forest."

In April and May, F. Nevermann collected four specimens of the brown-legged phenon from the western slope of Volcán Irazú (at 1500 meters); four others were collected during May near Quebrada Florida (at 1400 meters). A single specimen, with an F. Nevermann label but apparently collected by "Schild" (the writing is not clear), was collected in October from Turrialba.

DISTRIBUTION (Figure 364).—The single specimen

from Mexico extends the known range of this species from Mexico to Costa Rica.

LOCALITY RECORDS (Figure 364).—I examined 52 adult specimens of this species from Central America. **MEXICO:** Estado de Morelos: Yautepec (GEKI, 1 male). **COSTA RICA:** Provincia de Puntarenas: Monteverde (AMNH, 1 male and 1 female; BMNH, 1 male and 1 female; CASC, 1 male and 1 female; FMNH, 1 male and 1 female; GEKI, 3 males and 6 females; CMPP, 1 male; MNHB, 1 female; MNHP, 1 male; NMNH, 2 males and 2 females; ZMAN, 1 male and 1 female). Provincia de Cartago: Turrialba (FMNH, 2 males, holotype, and 2 females; GEKI, 1 male); Volcán Turrialba (GEKI, 10 males and 1 female); Volcán Irazú (FMNH, 1 female; GEKI, 1 female; NMNH, 3 females). Provincia de Limón: Quebrada Florida (GEKI, 2 males; NMNH, 1 male and 1 female).

REMARKS.—The vast color variability present in the available samples is evident at intra- and inter-population levels. Diversity of integumental color is particularly evident in coloration of the elytron. The elytral discal vitta may be linear or incurved at the apex. Elytra are avittate in the beetles from Volcán Irazú and Quebrada Florida.

While intrapopulation color polymorphism is not extraordinary in *Perilypus* the extent reported here is more than usual. Accordingly, one might suspect that the beetles from Monteverde, Volcán Turrialba, Volcán Irazú, and Quebrada Florida are not conspecific, as indeed they may not be. However, for the present I assume them conspecific in view of their structural similarity including characteristics of the genital organs of both sexes.

Wolcott's (1927a:36) description of *Derestenus nigrifrons* Chevrolat var. *flavicornis* is based on one female specimen from Turrialba. Integumental color (Wolcott's criteria for recognizing var. *flavicornis*) of a male specimen from Monte Verde, Costa Rica, is identical to that of Wolcott's holotype. There is no noticeable anatomical difference between these two specimens except for size and structures related to sex. I believe the specimens under consideration are conspecific, not only to each other, but also with the other specimens included herein. I assign two male specimens and Wolcott's var. *flavicornis* to a yellow-legged phenon (see "Variation.")

22. *Perilypus cultratus*, new species

FIGURES 204–206, 211, 216, 363

TYPE-LOCALITY.—Rio Reventazón, Turrialba,

Estado de Cartago, Costa Rica.

TYPE-SPECIMENS.—The holotype male is deposited in NMNH, the allotype in GEKI; both were collected by me in 1971. Five paratypes are deposited in the repositories noted under "Locality Records."

DIAGNOSIS.—Within the *reventazon* group, specimens from Costa Rica belong to this species if their pronotal disc is faintly tumid behind the subapical depression and in front of the prebasal depression, if the pronotal foveae are deeply impressed and not particularly spheroid (sometimes they approach a crescentic shape), and if their antenna is more serrate than in *P. reventazon* (Figure 8). Specimens of this species also can be easily separated from the very similar sympatric specimens of *P. reventazon* by differences in the male pygidium (compare Figures 211, 39) and by the lineate female elytral vitta.

DESCRIPTION.—*Form:* As in *P. reventazon* (Figure 186) except pronotum less convex.

Size: Length: males, average about 7.6 mm, range 8.0–6.6 mm; females, average 8.0 mm. Width: males, average about 2.2 mm; range 2.0–2.6 mm; females: 2.4 mm. Five males and 2 females examined.

Color: Clypeus, frons, postocular region of epicranium, and cranial venter testaceous; gena and remainder of epicranium black; antenna black; side margin of pronotum proper flavotestaceous; pronotal disc broadly vittate; pro-, meso-, and metasternum dark brown; femora predominantly flavotestaceous, infuscated dorsoapically; elytron piceous, with or without short flavotestaceous discal vitta; abdomen entirely black or predominantly flavotestaceous.

Head: As in *P. reventazon* except: interocular depressions more deeply impressed, rugose or not; antenna more serrate; and length/width ratio of each male antennal article 2.4:1.2:1.4:1.3:1.3:1.3:1.2:1.0:1.2:1.1:2.2.

Pronotum: As in *P. reventazon* except foveae more deeply impressed, more elongate than spheroid; and disc behind subapical depression and before prebasal depression feebly tumid.

Elytron: As in *P. reventazon*.

Front Tarsal Claws: Male and female feebly asymmetrical.

Abdomen: Male pygideal apodeme as long as pygidial plate (Figure 211).

Male Genitalia (Figures 204–206, 216): Strongly

pigmented. Combined length of phallobase and phallobasic apodeme 7 times longer than paramere. Combined length of paramere and phallobase 3 times longer than phallobasic apodeme. Paramere: acuminate in lateral view; lateral depression not conspicuous; dorsum feebly convex; venter concave; mesoventral and mesodorsal margin sinuous, margins confluent in apical half, not in distal half. Sinus: dorsal narrow, as long as inversely acuminate ventral. Phallus: attenuate; marginal denticles prominent (4 specimens examined).

Female Genitalia: As in *P. nigriventris*.

Internal Reproductive Organs: Male and female as in *P. reventazon* (1 male and 2 females examined).

VARIATION.—*Structural:* The interocular depressions are less depressed and abbreviated in the female specimen from Hamburg Farm; they are conspicuously rugose in the male from Tuis and in one female from Turrialba.

Color: The pronotal vitta is deltoid in the female specimen from Hamburg Farm, and in one from Turrialba. Except for the male from Hamburg Farm, male elytra are avittate; female elytra are vittate discally.

NATURAL HISTORY.—In June and July, within a forested ravine adjacent to Rio Reventazón, I collected a male and two females by sweeping herbaceous hedge growth.

In June, within the Rio Reventazón drainage system, in Limón, F. Nevermann collected one female in "troknem holz" (probably translated as fallen timber, or from a wood pile). He also collected a male in August from Hamburg Farm.

DISTRIBUTION (Figure 363).—The few locality records suggest that this species is primarily distributed along the Costa Rican Atlantic drainage system.

ETYMOLOGY.—Latin, the adjective *cultratus* (knife-shaped); the trivial name refers to the knife-shaped phallus.

LOCALITY RECORDS (Figure 363).—I examined 7 adult specimens from Central America: COSTA RICA: Provincia de Cartago: Turrialba at Rio Reventazón (GEKI, 2 females; NMNH, 1 male, holotype); Tuis (GMNH, 1 male). Provincia de Limón: Hamburg Farm at Rio Reventazón (GEKI 1 male; NMNH, 1 female). Locality not known (FMNH, 1 male).

REMARKS.—Females of this species have been confused with females of *P. bilineatus*; however, the conspicuous convexity of the elytron and the

distinct confluence of the epipleural and discal vittae at the elytral apex in *P. bilineatus* should easily separate specimens of that species from those of *P. cultratus*.

**23. *Perilyphus bilineatus* (Gorham),
new combination**

FIGURES 207–209, 364

Colyphus bilineatus Gorham, 1886:335 [lectotype: female, deposited in BMNH, two paralectotypes, females, one deposited in BMNH and one in ZMAN, here designated; type-locality: Volcán de Chiriquí, Provincia de Chiriquí, Panama].—Wolcott, 1927a:37.

DIAGNOSIS.—The slender, shallow body combined with the following characteristics will distinguish specimens of this species within the *reventazon* group; elytral apex testaceous, elytral disc vittate or not, pronotum as long as wide, and pronotal subapical depression shallow and wrinkled transversely midbasally.

DESCRIPTION.—*Form:* As in *P. reventazon* (Figure 186) except shallower and more slender.

Size: Length: male, average 6.7 mm; females, average about 7.3 mm, range 6.4–8.5 mm. Width: males 2.0; females, average about 2.1 mm, range 2.0–2.4 mm. One male and 5 females measured.

Color: Cranium entirely testaceous, or clypeus frons and postocular region of epicranium testaceous and remainder of cranium black; antenna black; pronotum predominantly testaceous and infuscated midapically, or predominantly black and pronotum proper with side margins and anterior angles testaceous; prosternum testaceous; meso- and metasternum black; femur predominantly testaceous, infuscated apically; tibia and tarsus dark brown; elytron predominantly piceous, epipleuron and apex faintly testaceous and flavotestaceous discal vitta closer to posthumeral margin than to sutural margin (as in Figure 264); discal vitta may or may not be confluent with testaceous epipleural vitta; abdominal venter black, or visible sterna I to IV testaceous and infuscated anteriorly, V predominantly testaceous or predominantly dark brown, and VI black.

Head: As in *P. reventazon* except cranium sometimes conspicuously macrosculptured; antenna less serrate; and length/width ratio of each male anten-

nal article 2.5:1.0:1.1:1.4:1.2:1.1:1.1:1.1:1.0:1.0:1.8.

Pronotum: As in *P. reventazon* except as long as wide, subapical depression more sinuous, and pronotal arch transversely wrinkled midapically.

Elytron: As in *P. reventazon* except shallower and more convex.

Front Tarsal Claws: Male, damaged. Female, symmetrical.

Male Genitalia (Figures 207–209): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 6 times longer than paramere. Combined length of paramere and phallobase 2.5 times longer than phallobasic apodeme. Paramere: feebly uncinata in ventral view; lateral depression deeply impressed; dorsum convex; venter concave; mesoventral margin concave; mesodorsal margin sinuous. Sinus: dorsal ovate; ventral lanceolate. Phallus: phallic plates tapered; marginal denticles stout (1 specimen examined).

Female Genitalia: As in *P. nigriventris*.

VARIATION.—*Structural:* Antenna is proportionally shorter and more cylindrical in one female specimen, particularly articles 8 to 10.

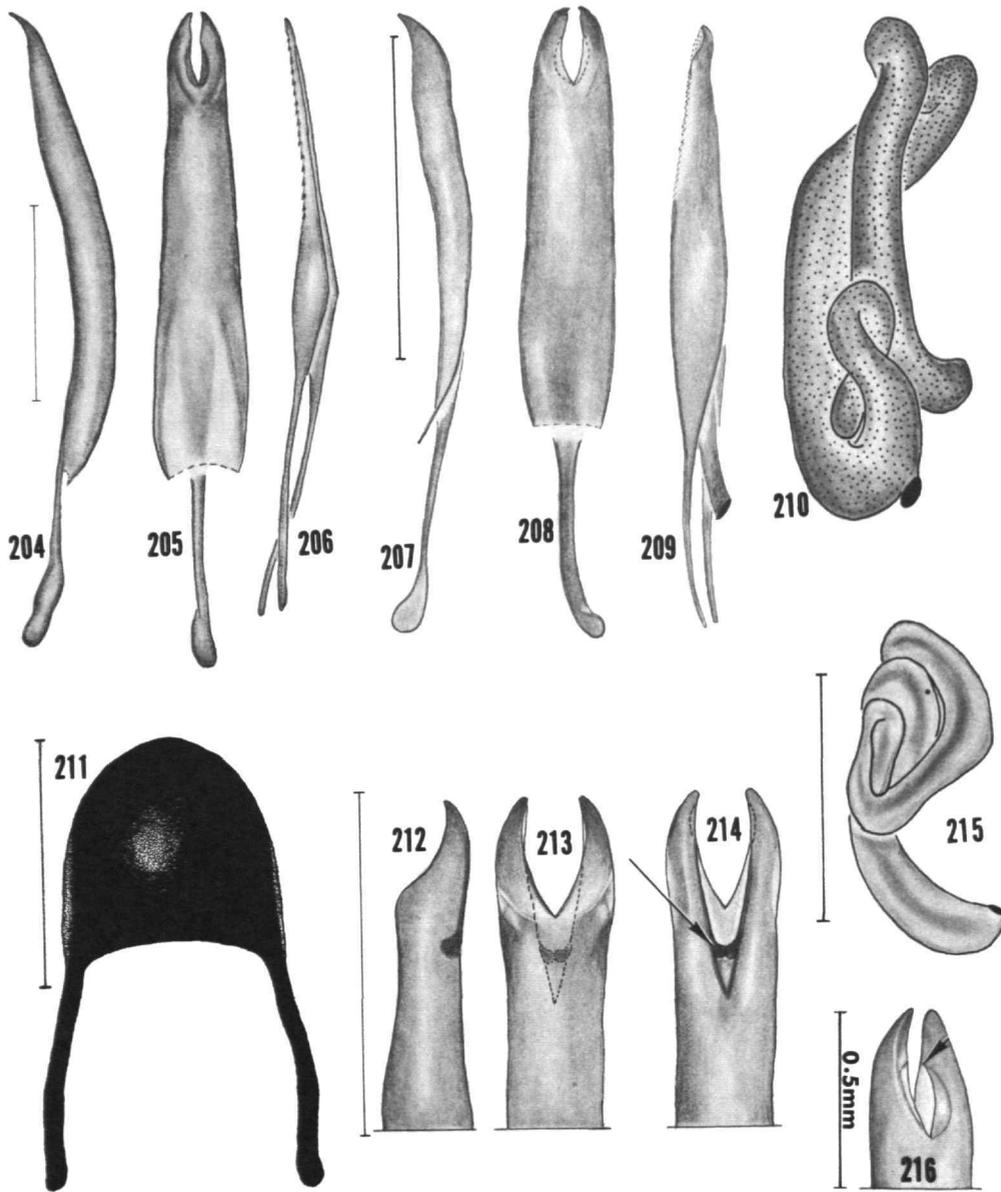
Color: In the male specimen the pronotum is predominantly testaceous, the abdomen black, and the elytral disc avittate. Females have the pronotum predominantly black, abdomen part black and part testaceous, and the elytral disc distinctly vittate. The elytral epipleural vitta varies in extent of expression, and is absent in the female specimen in which antennal articles 8 to 10 are more cylindrical.

NATURAL HISTORY.—G. C. Champion collected the available specimens from Volcán de Chiriquí at various altitudes ranging from 610 to 1829 meters.

DISTRIBUTION.—Presently known only from the type-locality.

LOCALITY RECORDS (Figure 364).—I examined 6 adult specimens from Central America. PANAMA: Provincia de Chiriquí: Volcán de Chiriquí (BMNH, 1 male and 2 females, lectotype; GEKI, 1 female; MNHP, 1 female; ZMAN, 1 female).

REMARKS.—The name of this species has been applied to members of *P. nigriventris*, *P. reventazon*, and *P. copiscolis*. In view of the substantial similarity in elytral color among females of these species, particularly with regard to the form of elytral vittae, it is not surprising that the aforementioned misidentifications involved only female specimens.



FIGURES 204-216.—*Perilypus cultratus*: 204, tegmen, lateral view; 205, tegmen, ventral view; 206, phallus; 211, male pygidium; 216, tegmen (arrow indicates confluency between mesoventral and mesodorsal margins). *P. bilineatus*: 207, tegmen, lateral view; 208, tegmen, ventral view; 209, phallus. *P. cerroazul*: 210, posterior accessory gland; 212, tegmen, lateral view; 213, tegmen, ventral view; 214, tegmen, dorsal view (arrow indicates dorsal brace); 215, anterior accessory gland. (Scale = 1 mm)

24. *Perilypus cerroazul*, new species

FIGURES 210, 212–215, 217, 364

TYPE-LOCALITY.—Cerro Azul, Provincia de Panamá, Panama.

TYPE-SPECIMENS.—The holotype male, deposited in NMNH, was collected by W. Bivin in 1971.

DIAGNOSIS.—The only specimen studied is superficially very similar to the sympatric specimens of *P. ordinatus*. However, the antenna is more distinctly serrate and the pygidium more robust (compare Figures 217, 245) in male specimens of *P. cerroazul*.

DESCRIPTION.—*Form:* As in *P. reventazon* (Figure 186) except proportionally longer.

Size: Length: 9.2 mm. Width: 2.4 mm.

Color: As in *P. reventazon* except postocular region of epicranium broadly flavotestaceous, femur black at apex only, and elytron with faint discal vitta visible only at elytral basal half.

Head: As in *P. reventazon* except antenna more serrate.

Pronotum: As in *P. reventazon* except more convex and side margins of pronotum proper less arcuate.

Elytron: As in *P. reventazon* except proportionally longer (EL/EW, 5.2) and more densely pubescent.

Abdomen: Male pygidium (Figure 217) particularly robust.

Front Tarsal Claws: Feebly asymmetrical.

Male Genitalia (Figures 212–214): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 9 times longer than paramere. Combined length of paramere and phallobase 4 times longer than phallobasic apodeme. Paramere: acuminate and arcuate in lateral view; lateral depression indistinct; dorsum narrow and feebly convex; venter broadly concave; mesodorsal margin feebly concave, strongly braced, and margins contiguous at basal fifth (note arrow in Figure 214). Sinus: dorsal and ventral broadly lanceolate. Phallus: acuminate.

Internal Reproductive Organs: Male (Figures 210, 215), anterior accessory gland uniramous, coiled; posterior accessory gland biramous, outer branch about twice as long as inner branch; testis composed of 12 follicles.

NATURAL HISTORY.—In June, on Cerro Azul,

Panama, W. Bivin collected the holotype specimen by beating vegetation at 700 meters.

ETYMOLOGY.—The epithet is a noun in apposition and refers to the type-locality.

LOCALITY RECORDS (Figure 364).—I examined 1 adult specimen from Central America. PANAMA: Provincia de Panamá: Cerro Azul (NMNH, 1 male, holotype).

25. *Perilypus ordinatus*, new species

FIGURES 218–221, 245, 364

TYPE-LOCALITY.—Cerro Campana, Provincia de Panamá, Panama.

TYPE-SPECIMENS.—The holotype male, deposited in NMNH, was collected by W. Bivin in 1971. Five paratypes deposited in the repositories noted under "Locality Records."

DIAGNOSIS.—See *P. cerroazul*.

DESCRIPTION.—*Form:* As in *P. reventazon* (Figure 186).

Size: Length: Average about 7.5 mm, range 6.8–8.5 mm. Width: Average about 2.1 mm, range 1.8–2.4 mm. Three males measured.

Color: Clypeus, frons, cranium venter, and postocular region of epicranium flavotestaceous; remainder of epicranium and gena black (see "Variation"); antenna black; pronotum with side margin broadly flavotestaceous, lower sides and disc black; pronotal collar black (see "Variation"); prosternum testaceous; meso- and metasternum black; profemur black dorsally, flavotestaceous ventrally; meso- and metafemur black in dorso-apical fourth, flavotestaceous in remainder; pro- and mesotibia black, metatibia at least partially testaceous; elytron piceous; abdomen black.

Head: As in *P. reventazon* except antenna more serrate, proportionally shorter (AL/PL, 1.7) and frontal umbo more prominent.

Pronotum: As in *P. reventazon* except less transverse (PL/PW, average about 0.94, range 0.92–0.96; 3 specimens measured), more convex, and side margins of pronotum proper less arcuate.

Elytron: As in *P. reventazon* except more densely pubescent.

Abdomen: Male pygidium as in Figure 245.

Front Tarsal Claws: Feebly asymmetrical.

Male Genitalia (Figures 218–220): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 3.5 times longer than para-

mere. Combined length of paramere and phallobase 3.6 times longer than phallobasic apodeme. Paramere: lateral depression broad, extended beyond basal limit of paramere; dorsum narrow and convex; venter narrow and concave; mesodorsal margin concave, strongly incised at basal third, mesoventral margin strongly sinuous, feebly incised at basal third and uncinately preapically (note arrow in Figure 219). Sinus: as in Figure 219. Phallus: as in Figure 220 (5 specimens examined).

Internal Reproductive Organs: Male (Figure 221); anterior accessory gland uniramous, tightly coiled; posterior accessory gland biramous, outer branch longer than inner branch; testis composed of 12 follicles (5 specimens examined).

VARIATION.—*Structural:* I found no noteworthy structural variation among the specimens studied.

Color: In one specimen the head, pronotum, and mesoscutellum is entirely flavotestaceous.

NATURAL HISTORY.—On Cerro Campana (850 meters) W. Bivin collected two specimens by beating, one during March and one during May. From the same locality additional specimens were collected by S. S. and W. D. Duckworth (in April by sweeping) and by H. P. Stockwell (in May by beating).

ETYMOLOGY.—Latin, the adjective *ordinatus* (well ordered). I dedicate the name of this species to my colleague and friend Terry L. Erwin.

LOCALITY RECORDS (Figure 364).—I examined 6 adult specimens from Central America. PANAMA: Provincia de Panamá: Cerro Campana (GEKI, 2 males; HPST, 1 male; NMNH, 2 males, holotype; WBIV, 1 male).

26. *Perilypus calcaris*, new species

FIGURES 222–226, 363

TYPE-LOCALITY.—Finca Recreo, Municipio de Yepocapa, Departamento de Chimaltenango, Guatemala.

TYPE-SPECIMENS.—The holotype male and the allotype, deposited in FMNH, were collected by R. D. Mitchell in 1948. Two paratypes: BMNH, 1 male; GEKI, 1 male.

DIAGNOSIS.—Specimens of *P. calcaris* are superficially very similar to specimens of *P. nigriventris* and of *P. lobulatus*. The pygidium, however, is substantially larger in males of *P. calcaris*, being about equal in size to the one illustrated in Figure

185 (compare with Figure 245). Female specimens of these three species are difficult to separate, but color of the abdominal venter seems to provide some basis for distinguishing them. The abdominal venter is dark brown in the anterior half and flavotestaceous in the posterior half (except the fifth visible sternum is infuscated) in females of *P. calcaris*, entirely dark brown in females of *P. lobulatus*, and predominantly flavotestaceous (sternum VI is dark brown) in females of *P. nigriventris*.

DESCRIPTION.—*Form:* As in *P. reventazon* (Figure 186).

Size: Length: males, average about 7.6 mm, range 7.2–7.8 mm; female 7.9 mm. Width: males, average about 2.3 mm, range 2.0–2.4 mm; female, 2.2 mm. Three males and one female measured.

Color: As in *P. nigriventris* except female elytron faintly pale along posthumeral margin, femora dark brown in apical half (except testaceous ventroapically), coxae strongly infuscated, and female abdominal venter not predominantly flavotestaceous.

Head: As in *P. reventazon* except antenna more slender.

Pronotum: As in *P. reventazon* except pronotal arch and pronotum proper with shallow rugosities.

Elytron: As in *P. reventazon* except punctations smaller and shallower and surface more arenose.

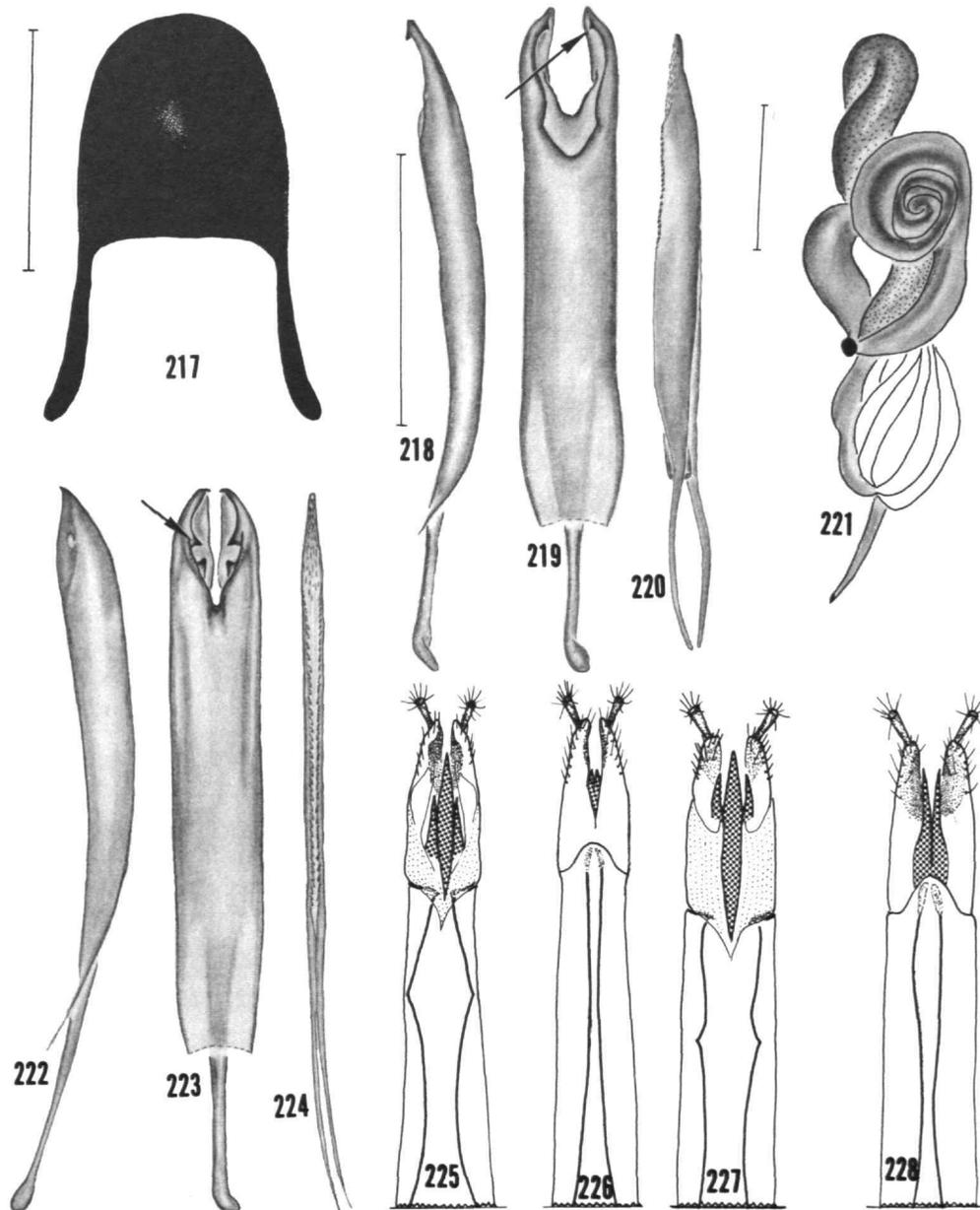
Front Tarsal Claws: Male, distinctly asymmetrical; female, feebly asymmetrical.

Male Genitalia (Figures 222–224): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 5.3 times longer than paramere. Combined length of paramere and phallobase 4 times longer than phallobasic apodeme. Paramere: apex feebly uncinately in ventral view; lateral depression narrow, more dorsad than ventrad; dorsum convex and broadly explanate medially; venter narrow and feebly concave; mesoventral margin emarginated and biacuminate; mesodorsal margin sinuous, with stout brace at base. Sinus: dorsal much narrower than elliptical ventral. Phallus: acuminate; outer margin inflexed; stout marginal denticles centralized at middle half of phallic plate (3 specimens examined).

Female Genitalia (Figures 225, 226): As in *P. orthopleuridus* except dorsal lamina reduced.

VARIATION.—*Structural:* The pronotal rugosities vary in extent of expression.

Color: Color of the abdominal venter varies with



FIGURES 217-228.—*Perilypus cerroazul*: 217, male pygidium. *P. ordinatus*: 218, tegmen, lateral view; 219, tegmen, ventral view (arrow indicates preapical uncination of mesoventral margin); 220, phallus; 221, male internal reproductive organs. *P. calcaris*: 222, tegmen, lateral view; 223, tegmen, ventral view (arrow indicates acumination of mesoventral margin); 224, phallus; 225, ovipositor, ventral view; 226, ovipositor, dorsal view. *P. orthopleuridus*: 227, ovipositor, ventral view; 228, ovipositor, dorsal view. (Scale = 1 mm)

sex; in male specimens entirely dark brown, in females dark brown in basal half and mostly flavotestaceous in apical half.

NATURAL HISTORY.—R. D. Mitchell collected three adult specimens (at 1341 meters) in May from Finca Recreo, Guatemala, by beating "dead branches." G. C. Champion collected one specimen from Cerro Zunil, Guatemala, at an elevation between 1219 and 1832 meters.

DISTRIBUTION (Figure 363).—Known only from the southwestern highlands of Guatemala.

ETYMOLOGY.—The trivial name is the genitive case of *calcar* (a spur) and refers to the spur-like acumination on the mesoventral margin of parameres.

LOCALITY RECORDS (Figure 363).—I examined 4 adult specimens from Central America. **GUATEMALA:** Departamento de Quetzaltenango: Cerro Zunil (BMNH, 1 male). Departamento de Chimaltenango: Finca Recreo (GEKI, 1 male; FMNH, 1 male holotype, and 1 female).

27. *Perilypus orthopleuridus* (Thomson), new combination

FIGURES 27, 227–234, 364

Derestenus orthopleuridus Thomson, 1860:57 [holotype, female, deposited in MNHP; type-locality: Mexico].—Gorham, 1882:144.—Schenkling, 1906:263.

Derestenus vittipennis Chevrolat, 1874:290 [lectotype: male, deposited in BMNH, here designated; type-locality: Mexico; new synonymy].—Gorham, 1882:143.

Derestenus collaris Chevrolat, 1876:12 [lectotype: female, deposited in MNHP, here designated; type-locality: Mexico].—Schenkling, 1906:263.

The new synonymy is based on the discovery that *D. vittipennis* Chevrolat is the heretofore undescribed male of *P. orthopleuridus*.

DIAGNOSIS.—The combination of front tarsal claws boldly asymmetrical, and antenna partially or totally flavotestaceous will easily separate males of this species from other males within the *reventazon* group. The epipleuron (Figure 230) is explanate and plane ventrally in *P. orthopleuridus* females only.

DESCRIPTION.—*Form:* As in *P. reventazon* (Figure 186) except elytral apical slope gradual.

Size: Length: males, average about 8.2 mm, range 5.8–9.9 mm; females, average about 8.9 mm, range 7.6–10.4 mm. Width: males, average about 2.1 mm,

range 2.0–2.8 mm; females average about 2.3 mm, range 2.0–3.4 mm. Ten males and 10 females measured.

Color: Cranium unicolorous or bicolorous; unicolorous cranium is flavotestaceous; bicolorous cranium has clypeus, frons, and cranial venter flavotestaceous, and epicranium and gena piceous; antenna entirely flavotestaceous, or articles 1 to 8 brunneous and 9 to 11 flavotestaceous; pronotum predominantly flavotestaceous and with midapical piceous macula, or flavotestaceous at sides and piceous discally; pronotal collar piceous or predominantly flavotestaceous; prosternum flavotestaceous; mesoscutellum and meso- and metasternum flavotestaceous or piceous; femur entirely flavotestaceous, flavotestaceous in basal half and ventro-apical half and piceous in dorsoapical half, or predominantly flavotestaceous and infuscated dorso-apically; tibia and tarsus testaceous or piceous; elytron piceous, with or without flavous discal vitta; visible abdominal sterna I to V entirely flavotestaceous, predominantly flavotestaceous and infuscated basally or laterally, or piceous; sixth visible abdominal sternum piceous.

Head: As in *P. reventazon* except antenna less serrate.

Pronotum: As in *P. reventazon* except more convex.

Elytron: As in *P. reventazon*, except apical slope gradual, punctations shallower, surface not arenose, and female epipleuron explanate and plane ventrally (Figures 230, 231).

Abdomen: Male pygidium (Figure 229) conspicuously large and feebly convex.

Front Tarsal Claws: Male, boldly asymmetrical; female, feebly asymmetrical.

Male Genitalia (Figures 232–234): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 4.7 times longer than paramere. Combined length of paramere and phallobase 3.0 times longer than phallobasic apodeme. Paramere: apex uncinately; lateral depressions extended beyond base of ventral sinus; dorsum particularly narrow and broadly braced basally; venter narrow, concave; mesoventral margin emarginated (note arrow in Figure 233); mesodorsal margin sinuous. Sinus: dorsal about twice as broad as ventral. Phallus: acuminate; outer margin inflexed in basal half and denticulated from middle to basal three-

fourths; plicae feebly developed (45 specimens examined).

Female Genitalia (Figures 227, 228): Dorsal and ventral lamina and coxites very long; dorsal lamina

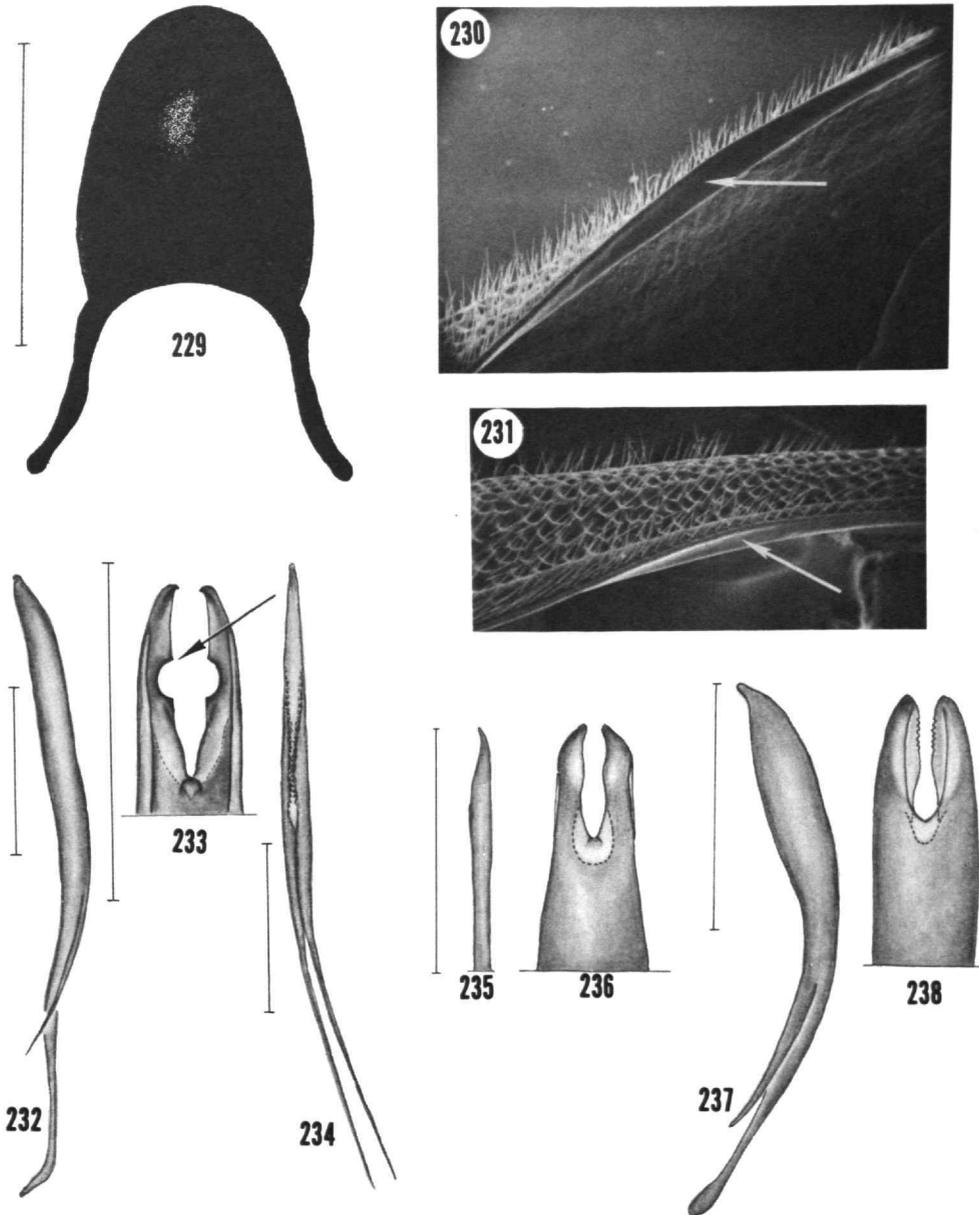


FIGURE 229-238.—*Perilypus orthopleuridus*: 229, male pygidium, 230, female elytron, ventral view, $\times 25$ (arrow indicates epipleuron); 231, female elytron, lateral view, $\times 25$ (arrow indicates epipleuron); 232, tegmen, lateral view; 233, tegmen, ventral view (arrow indicates acumination of mesoventral margin); 234, phallus, lateral view. *P. exilis*: 235, tegmen, lateral view; 236, tegmen, ventral view. *P. latilobus*: 237, tegmen, lateral view; 238, tegmen, ventral view. (Scale = 1 mm)

slender, deeply incised; lateral lobes of ventral lamina shorter than medial lobe; inner margin of coxites well sclerotized; remainder as in *P. reventazon* (2 specimens examined).

Internal Reproductive Organs: Male, anterior accessory gland uniramous tightly coiled, posterior accessory gland biramous (3 specimens examined).

VARIATION.—Structural: The epipleuron is explanate in female elytra only; epipleural explanation varies but is always prominent. The cranium, femora, pronotum, and abdominal sterna are conspicuously rugose and the elytral surface is more arenose in the female specimen from Temascal, Mexico.

Color: Coloration of cranium, pronotum, femur, meso- and metasternum, and of abdominal sterna is correlated with sex.

Pronotal color distinguishes 2 male phena, a maculate phenon and a vittate phenon. Among the 45 male specimens studied, 35 belong to the maculate phenon (the pronotum is predominantly flavotestaceous and has a piceous midapical macula) and 10 to the vittate phenon (the pronotal disc has a piceous vitta that is narrowly percurrent or interrupted at the middle).

Among the maculate males, 11 have the elytron distinctly vittate, in the remaining specimens the elytral vitta is faintly visible or absent. In all maculate males the cranium, femur, and meso- and metasternum are entirely flavotestaceous. In two of the 10 vittate males the elytra are distinctly vittate, while in the remaining 8 the elytral discal vitta are either faintly visible or absent. Vittate males have the cranium and the femur bicolorous, and the meso- and metasternum piceous. In all males the abdomen is entirely piceous.

The female pronotum is vittate, the elytron either avittate, faintly vittate, or distinctly vittate. The female cranium, femur, and the first five visible abdominal sterna are partly testaceous and dark brown; sternum vi is always black.

DISTRIBUTION (Figure 364).—The known range extends from Mexico to Costa Rica with locality records from Guatemala and Honduras.

LOCALITY RECORDS (Figure 364).—I examined 98 adult specimens from Central America. MEXICO: Estado de Nayarit: Tepic (MNHB, 1 male); Estado de México: Toluca (ZMAN, 1 female). Estado de Veracruz: Atoyac (BMNH, 1 female); 49 miles [78 km] south of Acayucan (GEKI, 1 female); Orizaba (BMNH, 1 male; CASC, 4 males and 4 females; GEKI, 3

males and 3 females; GEKI, 2 males; MNHB, 1 female, LACM, 1 male; MNHP, 3 females, holotype; ZMAN, 1 male); 1 mile [1.6 km] west of Fortín de las Flores (CISC, 1 male); Cordoba (BMNH, 2 males; CASC, 4 males and 2 females; FMNH, 1 male; GEKI, 4 males and 2 females; NMNH, 2 males); Jalapa (CASC, 1 male; FMNH 1 male); Mirador (MNHB, 1 male); Lago de Catemaco (CNCC, 1 male; GEKI, 2 males and 1 female); San Andres Tuxtla (GEKI, 1 male); Playa Vicente (BMNH, 1 female); Cerro de Palmas (BMNH, 1 female). Estado de Oaxaca: Oaxaca (BMNH, 1 female, GEKI, 1 female); Temascal (GEKI, 1 female; GHNE, 1 female). Estado de Chiapas: 8 miles [13 km] south of Simojovel (CNCC, 1 male); 27 kilometers southwest of Simojovel (GEKI, 1 female); 2 miles [3 km] northeast of Bochil (GEKI, 1 male); 2 kilometers north of Bochil (GEKI, 1 female); 12 miles [19 km] north of Tuxtla Gutierrez (GEKI, 1 male); 11 miles [18 km] north of Ocozacoautla (GEKI, 1 female; TAMT, 1 female); 22 kilometers north of Ocozacoautla (CNCC, 1 female); El Suspiro, Berriozabal (GEKI, 1 male). "México" (BMNH, 1 male and 2 females; FMNH, 1 male; GEKI, 3 males and 7 females; MNHB, 1 female; MNHP, 1 male and 7 females; ZMAN, 2 females). GUATEMALA: Departamento de Alta Verapaz: San Juan (BMNH, 1 male). Tamahú (AMNH, 1 female); Senahú (BMNH, 1 female). HONDURAS: Departamento de Choluteca: Cantarranas, Rio Choluteca (GEKI, 1 female.) COSTA RICA: Provincia de Cartago: Turrialba (GEKI, 1 male).

REMARKS.—Specimens of this species were identified as *P. quadrilineatus*, *P. distinctus*, *P. nigrifrons*, and *Colyphus signaticollis* Spinola.

28. *Perilypus exilis*, new species

FIGURES 235, 236, 363

TYPE-LOCALITY.—Thirty-two kilometers north of Huixtla, Estado de Chiapas, Mexico.

TYPE-SPECIMENS.—The holotype male, deposited in CNCC, was collected by W. R. M. Mason in 1969.

DIAGNOSIS.—The combination of conspicuously slender antenna (with article 11 strongly acuminate), front tarsal claws conspicuously asymmetrical, and pygidium exceptionally robust and truncate will distinguish males of this species from other males within the *reventazon* group.

DESCRIPTION.—*Form:* As in *P. reventazon* (Figure 186) except more slender.

Size: Length: male, 8.0 mm. Width: male, 2.4 mm.

Color: As in males of *P. calcaris* except coxae not infuscated.

Head: As in *P. reventazon* except frons proportionally narrower (HW/IOW, 2.5), antenna more slender, antennal article 11 more acuminate, and

length/width ratio of each antennal article 2.0: 1.3:1.7:1.7:1.7:1.9:1.9:1.9:1.6:1.4:2.1.

Pronotum: As in *P. reventazon* except less transverse (PW/PLS, 0.91).

Elytron: As in *P. reventazon*.

Abdomen: Male pygidium conspicuously robust and truncate.

Front Tarsal Claws: Boldly asymmetrical.

Male Genitalia (Figures 235, 256): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 6.3 times longer than paramere. Combined length of paramere and pallobase 3 times longer than phallobasic epodeme. Paramere: outer margin compressed at middle; feebly curvate in apical fourth in lateral view; lateral depressions well depressed; dorsum convex and venter concave at their respective apical half, basal half dorsum and venter plane; mesoventral and mesodorsal margin sinuous. Sinus: dorsal narrow in apical half, broad at basal half; ventral narrow, constricted medially. Phallus: as in *P. claudus* except more slender.

NATURAL HISTORY.—W. R. M. Mason collected the only available specimen of this species in June, in Chiapas, Mexico, at an altitude of 914 meters.

ETYMOLOGY.—Latin, the adjective *exilis* (thin). I refer to the slender form of the antenna.

LOCALITY RECORDS (Figure 363).—I examined 1 adult specimen from Central America. MEXICO: Estado de Chiapas: 20 miles [32 km] north of Huixtla (CNCC, 1 male, holotype).

29. *Perilypus latilobus*, new species

FIGURES 237, 238, 363

TYPE-LOCALITY.—Six kilometers northwest of Pueblo Nuevo, Rio Bahada, Estado de Chiapas, Mexico.

TYPE-SPECIMENS.—The holotype male is deposited in NMNH, the allotype in CNCC. The first of these specimens was collected by G. H. Nelson in 1965, the second by J. M. Campbell in 1969. One paratype: GEKI, 1 female.

DIAGNOSIS.—The combination of femora predominantly black to dark brown and pronotal discal vitta abruptly constricted at subapical depression will generally distinguish members of this species from the very similar specimens of *P. nigri-ventris*, *P. calcaris*, and *P. exilis*.

DESCRIPTION.—*Form*: As in *P. reventazon* (Figure 186).

Size: Length: male, 8.0 mm; females, average about 8.5 mm, range 7.9–9.2 mm. Width: Male, 2.2 mm; females, average about 2.4 mm, range 2.0–2.8 mm. One male and 2 females measured.

Color: As in *P. calcaris*.

Head: As in *P. reventazon* except antenna proportionally shorter (AL/PLS, 1.7).

Pronotum: As in *P. reventazon* except disc more convex and side margin of pronotum proper less arcuate.

Elytron: As in *P. reventazon*.

Abdomen: Male pygidium subquadrate; pygidial apodeme as long as pygidial plate.

Front Tarsal Claws: Male, boldly asymmetrical; female, feebly asymmetrical.

Male Genitalia (Figures 237, 238): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 4.3 times longer than paramere. Combined length of paramere and phallobase 5 times longer than phallobasic apodeme. Paramere: conspicuously broad in basal four-fifths, abruptly narrow apical fifth, lateral depression inconspicuous in lateral view; dorsum broadly convex, explanate medially; venter broadly concave; mesoventral margin concave; mesodorsal margin feebly sinuous and briefly denticulated preapically. Sinus: dorsal narrow in apical half, slightly expanded in studied (1 specimen examined).

Female Genitalia: As in *P. nigri-ventris*.

Internal Reproductive Organs: Female, as in Figure 55; ovary composed of 12 ovarioles (2 sub-basal half; ventral subelliptical. Phallus: not mens examined).

VARIATION.—*Structural*: The female specimen from Tuxtla Gutierrez is more robust than the one from Pueblo Nuevo.

Color: The specimen from Tuxtla Gutierrez has a short narrow vitta on the elytral, disc which is not the case in the other two specimens studied.

NATURAL HISTORY.—In June in Tuxtla Gutierrez, Mexico, at 1280 meters, I collected one adult specimen by beating roadside vegetation. G. H. Nelson collected the holotype in July, by sweeping roadside vegetation near Rio Bahada, in Pueblo Nuevo, Mexico.

DISTRIBUTION (Figure 363).—Known only from southern Mexico.

ETYMOLOGY.—The trivial name is a Latin com-

pound noun formed from the adjective *latus* (wide) + the noun *lobus* (lobe). I refer to the lobe-like appearance of the paramere.

LOCALITY RECORDS (Figure 363).—I examined 3 adult specimens from Central America. MEXICO: Estado de Chiapas: four miles [6 km] northwest of Pueblo Nuevo, Rio Bahada (NMNH, 1 male, holotype); Tuxtla Gutierrez (GEKI, 1 female); junction between routes 190 and 195 (CNCC, 1 female).

30. *Perilypus distinctus* (Chevrolat), new combination

FIGURES 239–242, 363

Derestenus distinctus Chevrolat, 1874:289 [lectotype: female, deposited in MNHP, here designated; type-locality: Yucatán, Estado de Yucatán, Mexico].—Gorham, 1882:143.—Schenkling, 1906:262.

DIAGNOSIS.—Within the *reventazon* group specimens from between the southern half of Mexico and north of Honduras belong to this species if they are particularly densely pubescent, have the pronotal sides broadly flavotestaceous and often roseate, and have a short but robust body form.

DESCRIPTION.—*Form*: As in Figure 239.

Size: Length: males, average about 8.5 mm, range 6.3–9.4 mm; females, average about 8.1 mm, range 6.5–9.8 mm. Width: males, average about 2.0 mm, range 1.8–2.6 mm; females, average about 2.5 mm, range 2.0–2.8 mm. Ten males and 10 females measured.

Color: Clypeus, frons, and venter of cranium flavotestaceous; epicranium predominantly black or predominantly flavotestaceous, often marked by subquadrate black macula; gena black or flavotestaceous; antenna black; pronotum with black discal vitta that narrows at middle; pronotal sides broadly flavotestaceous or roseate; pronotal collar black; prosternum flavotestaceous; meso- and metasternum dark brown or black; femora predominantly flavotestaceous, infuscated dorso-apically; tibia and tarsus dark brown or black; elytral disc with or without narrow flavotestaceous vitta that when present begins at midbase, gradually oblique toward suture, and usually not incurved apically; abdominal venter entirely black, or first five visible sterna flavotestaceous, sixth black.

Head: As in *P. reventazon* except antenna more serrate and proportionally shorter (AL/PLS, 1.6).

Pronotum: As in *P. reventazon* except more con-

vex, subapical depression more sinuous, and side margins less arcuate.

Elytron: As in *P. reventazon* except elytron proportionally shorter (EL/EW, average about 4.4, range 4.3–5.6; 20 specimens measured).

Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 240–242): Strongly pigmented. Combined length of phallobase and phallobasic apodeme variable in relation to length of paramere (see "Variation"). Combined length of paramere and phallobase 3.0 times longer than phallobasic apodeme. Paramere: apex boldly uncinat; lateral depression broad and deeply impressed; dorsum convex, strongly braced at base; venter narrow, concave; mesoventral and mesodorsal margins sinuous. Sinus: dorsal broadly lanceolate; ventral elliptical, constricted basally. Phallus: abruptly narrowed near apex; marginal denticles prominent (18 specimens examined).

Female Genitalia: As in *P. nigriventris*.

Internal Reproductive Organs: Male, anterior accessory gland uniramous; coiled posterior accessory gland biramous, divided into inner and outer branch (3 specimens examined).

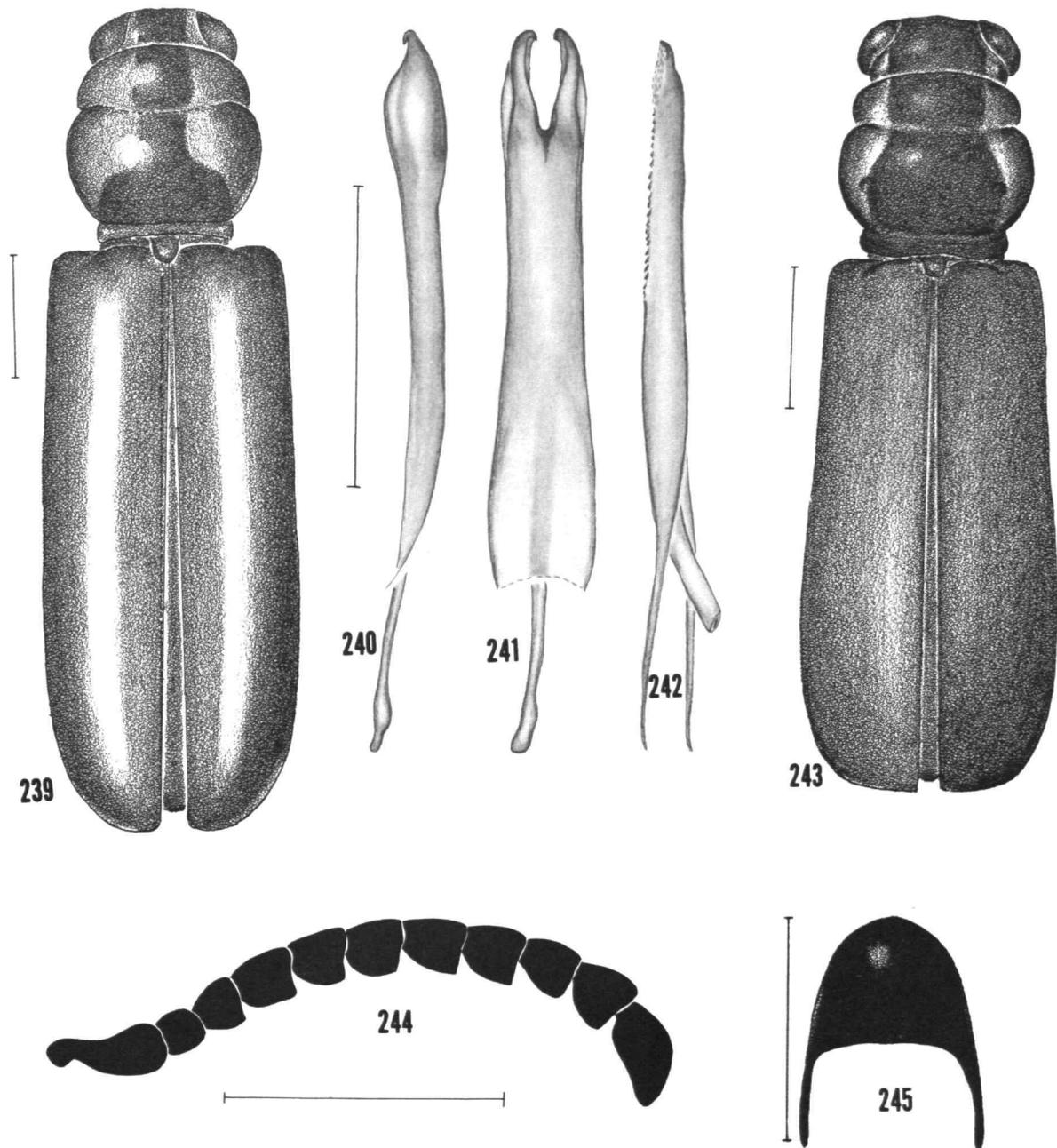
VARIATION.—**Structural**: The ratio between the combined length of the phallobase and the phallobasic apodeme over the length of the paramere is highly variable (6.5 to 9.0). The variation may be geographic but the available data are inconclusive. In general, the aforementioned ratio is lower in males from Oaxaca than in those from Veracruz.

Color: Sex dimorphism is evident in the coloration of the abdominal venter and in the elytron. In females, the abdominal venter is bicolorous and the elytron vittate. In males, the abdominal venter is concolorous and the elytron avittate. Of 17 females examined 2 have the elytral vitta feebly incurved apically.

NATURAL HISTORY.—Adult specimens were collected in Mexico from May to August. H. F. Howden collected 9 specimens at 609 meters by beating tree foliage in Oaxaca, Mexico.

DISTRIBUTION (Figure 363).—The known range of this species extends from Veracruz, Mexico, to Alta Verapaz, Guatemala.

LOCALITY RECORDS (Figure 363).—I examined 45 adult specimens from Central America. MEXICO: Estado de Veracruz: Cordoba (BMNH, 1 female, CASC, 1 male; GEKI, 1 male and 1 female; FMNH, 1 female); Montepio, 8 miles [13 km] north of Sontecomapán (GEKI, 1 female); Lago de Catemaco



FIGURES 239-245.—*Perilypus distinctus*: 239, habitus; 240, tegmen, lateral view; 241, tegmen, ventral view; 242, phallus. *P. crassus*: 243, habitus; 244, antenna. *P. ordinatus*: 245, male pygidium. (Scale = 1 mm)

(CNCC, 5 males and 1 female; GEKI, 2 males and 2 females); Cerro de Palma (BMNH, 1 female). Estado de Oaxaca: 6 miles [10 km] south of Valle Nacional (CNCC, 1 male; GEKI, 4 males and 1 female; HFHO, 4 males and 1 female). Estado de Chiapas: 20 to 25 miles [32 to 40 km] north of Huixtla (CNCC, 1 female); Rio de Salvador, 4 kilometers northwest of Ixhauté (GHNE, 1 female). Estado de Yucatán: Yucatán (MNHP, 1 female, lectotype). "México" (MNHP, 1 male and 3 females; MNHB, 1 female; ZMAN, 1 male). GUATEMALA: Departamento de Alta Verapaz: Telemán (BMNH, 2 males). "Guatemala" (GEKI, 1 male). BELIZE: Distrito de Corozal: Rio Hondo (GEKI, 1 male). Distrito de Belize: Belize (GEKI, 1 male). "M-tee Dist" (GEKI, 1 female; MCZC, 1 male and 1 female).

REMARKS.—A male specimen formed part of the syntype series of *P. nigriventris*. Other specimens were identified as *P. quadrilineatus*, *P. orthopleuridus*, *P. nigrifrons*, and *Colyphus signaticollis* Spinola.

31. *Perilypus crassus*, new species

FIGURES 243, 244, 246–248, 365

TYPE-LOCALITY.—Rio Huallaga, Yurimaguas, Chambireyacu, Provincia de Huallaga, Peru.

TYPE-SPECIMENS.—The holotype male and the allotype, deposited in MNHP, were collected by M. de Mathan in 1885. One paratype: GEKI, 1 male.

DIAGNOSIS.—The combination of robust body that is densely pubescent and truncated, boldly serrate antenna (Figure 244), and South American distribution will easily identify members of this species within the *reventazon* group.

DESCRIPTION.—*Form*: As in Figure 243.

Size: Length: males, 7.4 mm; female, 7.3 mm. Width: males, 4.6 mm; female, 4.3 mm. Two males and 1 female measured.

Color: Clypeus, anterior half of frons, and venter of cranium flavotestaceous; posterior half of frons black; epicranium predominantly black, fulvous in postocular region; prosternum flavotestaceous; pronotum flavotestaceous dorsolaterally, black ventrolaterally and discally; pronotal collar black; front femur flavotestaceous in proximal half, dark brown in distal half; middle and hind femur flavotestaceous in basal two-thirds, dark brown in distal third; elytron piceous but epipleural fold slightly paler; abdominal venter black.

Head: As in *P. reventazon* except antennal ridge more prominent; antenna (Figure 244) more ser-

rate, flattened, and profusely pubescent; scrape shorter than article 11; and length/width ratio of each male antennal article 2.0:1.0:1.0:1.1:1.1:1.0:1.0:1.0:1.0:1.8.

Pronotum: As in *P. reventazon* except only feebly transverse (PL/PW, average about 0.93, range 0.91–0.95; 3 specimens measured), integumental setae more numerous and longer, disc more convex, subapical depression more sinuous, and side margins of pronotum proper more arcuate.

Elytron: As in *P. reventazon* except with more depth, prominently convex and truncated, surface more arenose and more densely pubescent, epipleural fold explanate dorsally, EL/EW, average about 4.4, range 4.3–4.6 (3 specimens measured).

Front Tarsal Claws: Feebly asymmetrical in both sexes.

Male Genitalia: Strongly pigmented. Combined length of phallobase and phallobasic apodeme 5.7 times longer than paramere. Combined length of paramere and phallobase 3.4 times longer than phallobasic apodeme. Paramere: apex feebly upcurved; lateral depression particularly prominent; dorsum convex; explanate medially; venter concave; mesoventral margin arcuate; mesodorsal margin feebly arcuate in most of posterior two-thirds, strongly arcuate in anterior third. Sinus: dorsal feebly elliptical at middle, oval basally; ventral elliptical. Phallus: apex feebly digitiform; marginal denticles prominent (2 specimens examined).

Female Genitalia: As in *P. nigriventris*.

VARIATION.—*Structural*: The female antenna is slightly more serrate than male antenna.

Color: The pronotal discal vitta is narrow medially in the females and broad throughout in males.

NATURAL HISTORY.—Unknown except M. de Mathan collected two specimens near Rio Huallaga, Peru, one in June and one in August.

DISTRIBUTION (Figure 365).—Known only from Huallaga to Loreto, Peru.

ETYMOLOGY.—Latin, the adjective *crassus* (stout), with reference to the short stout body of this insect.

LOCALITY RECORDS (Figure 365).—I examined 3 adult specimens from South America. PERU: Provincia de Huallaga: Chambireyacu, Yurimaguas, Rio Huallaga (MNHP, 1 male, holotype, and 1 female). Provincia de Loreto: Rio Amazonas (GEKI, 1 male).

32. *Perilypus immitis*, new species

FIGURES 249-253, 364

TYPE-LOCALITY.—Atlixco, Estado de Puebla, Mexico.

TYPE-SPECIMENS.—The holotype male and allotype are deposited in CASC. Five paratypes deposited in repositories as noted under "Locality Records."

DIAGNOSIS.—Within the *reventazon* group, specimens from Mexico belong to this species if their elytra are predominantly or entirely blue-green or olive green (the elytral apex is usually testaceous), and if their elytral surface is densely vested with gray reclinate setae.

DESCRIPTION.—*Form:* rectangulate; these beetles are exceptionally small and shallow-bodied.

Size: Length: males, average about 6.2 mm, range 5.4–6.9 mm; females, average about 6.9 mm, range 5.9–8.0 mm. Width: males, average about 2.2 mm, range 1.6–3.0 mm; females, average about 2.3 mm, range 2.0–2.6 mm. Five males and 2 females measured.

Color: Cranium entirely testaceous, or clypeus frons and venter of cranium testaceous and epicranium and gena black; antenna dark brown; prothorax testaceous, except pronotum with mid-apical dark brown macula; mesosternum predominantly testaceous; metasternum black; femora becoming more dark brown from front to middle femur; elytron olive green or blue-green; abdomen testaceous or dark brown.

Head: As in *P. reventazon* except eyes less convex and cranium more coarsely punctated (particularly in males).

Pronotum: As in *P. reventazon*.

Elytron: As in *P. reventazon* except elytron proportionally shorter (EL/EW, average about 4.2, range 3.2–4.7; 11 specimens measured) and more densely vested with reclinate setae.

Front Tarsal Claws: Male, boldly asymmetrical; female, feebly symmetrical.

Male Genitalia (Figures 249–251): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 5 times longer than paramere. Combined length of paramere and phallobase 2.7 times longer than phallobasic apodeme. Paramere: very broad basally; lateral depression deeply impressed at middle third; dorsum convex, explanate medially

to extent that mesodorsal margins overlap; venter concave; mesoventral margin and mesodorsal margin sinuous, latter denticulated in apical half only. Sinus: dorsal indistinct, ventral obovate and acuminate basally. Phallus: phallic plate abruptly narrowed in apical fourth; marginal denticles localized at middle third of plate (5 specimens examined).

Female Genitalia (Figures 252, 253): Dorsal and ventral lamina short; proctiger particularly broad; remainder as in *P. nigriventris* (1 specimen examined).

VARIATION.—*Structural:* The epicranium and frons are more coarsely punctated in males than in females.

Color: The male specimen from Yecora does not have the elytral apex testaceous. Also, in this beetle the elytron has a more bluish tinge; in most other specimens, the elytron is olive green.

NATURAL HISTORY.—In May, in Yecora, Mexico, H. F. Howden collected one adult specimen at 2134 meters by beating oak foliage (*Quercus* sp.). Specimens were also collected in June and July.

ETYMOLOGY.—Latin, the adjective *immitis* (rough). The name refers to the coarse dentitions along the mesodorsal margin of the parameres.

DISTRIBUTION (Figure 364).—From Sonora to Puebla, in Mexico.

LOCALITY RECORDS (Figure 364).—I examined 7 adult specimens from Central America. MEXICO: Estado de Sonora: Yecora (GEKI, 1 male). Estado de Queretaro: San Juan del Rio (GEKI, 1 female; MNHB, 1 male). Estado de Puebla: Atlixco (CASC, 1 male, holotype, and 1 female; GEKI, 1 male). Estado de Morelos: Tepoztlán (MHNM, 1 male).

33. *Perilypus caliculus*, new species

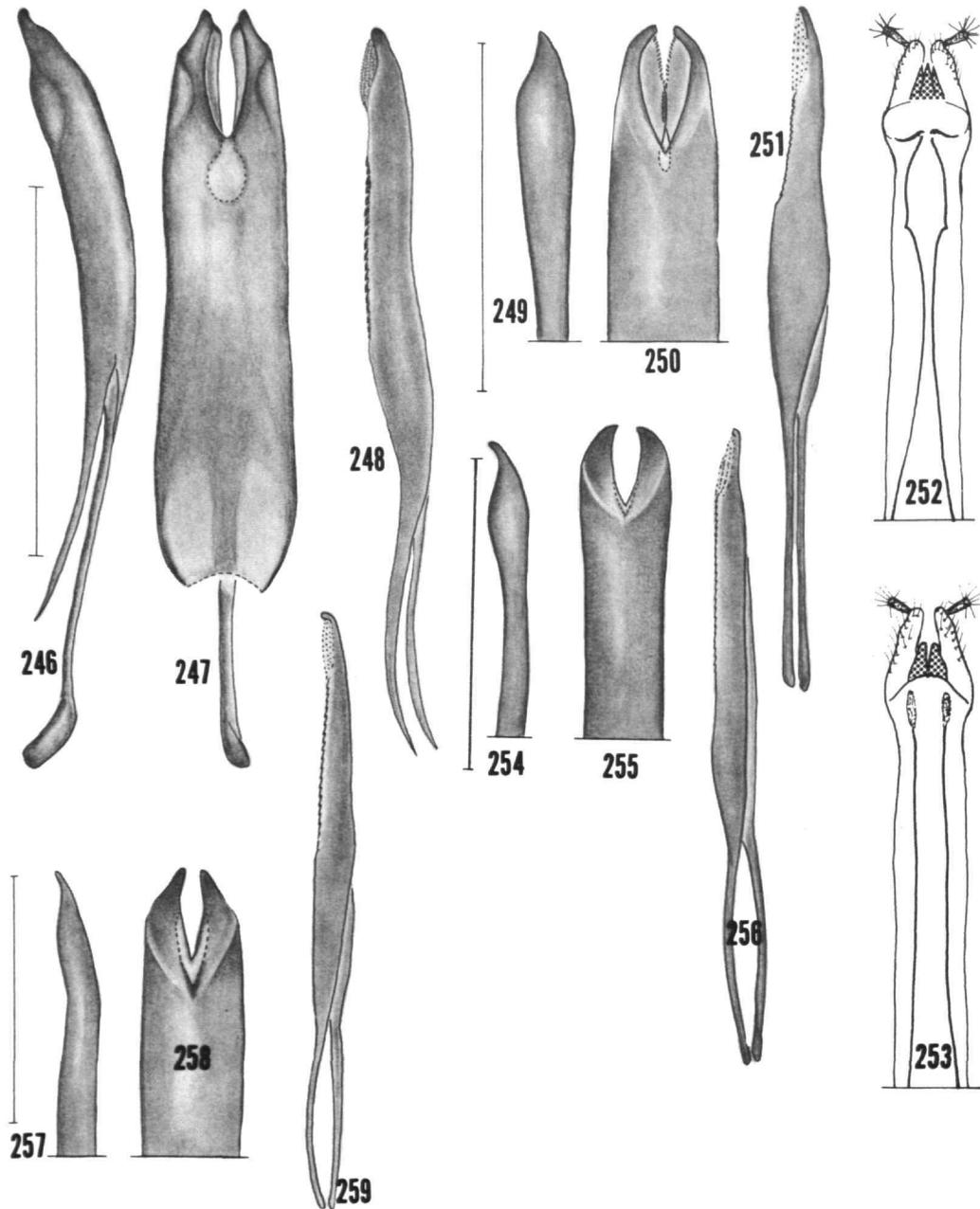
FIGURES 254-256, 363

TYPE-LOCALITY.—Tejupilco, Estado de México, Mexico.

TYPE-SPECIMENS.—The holotype male, deposited in FMNH, and 73 paratypes were collected by H. E. Hinton and R. L. Usinger in 1933. Paratypes are deposited in repositories as noted under "Locality Records."

DIAGNOSIS.—The male genitalia (Figures 254–256) provides the only reliable characteristics for diagnosing members of this species.

DESCRIPTION.—*Form:* As in *P. reventazon* (Figure 186).



FIGURES 246-259.—*Perilypus crassus*: 246, tegmen, lateral view; 247, tegmen, ventral view; 248, phallus. *P. immitis*: 249, tegmen, lateral view; 250, tegmen, ventral view; 251, phallus; 252, ovipositor, ventral view; 253, ovipositor, dorsal view. *P. caliculus*: 254, tegmen, lateral view; 255, tegmen, ventral view; 256, phallus. *P. carbonarius*: 257, tegmen, lateral view; 258, tegmen, ventral view; 259, phallus. (Scale = 1 mm)

Size: Length: males, average about 7.8 mm, range 5.9–9.0 mm; females, average about 7.6 mm, range 6.4–9.2 mm. Width: males, average about 2.3 mm, range 2.1–2.6 mm; females, average about 2.5 mm, range 2.3–3.0 mm. Ten males and 10 females measured.

Color: Cranium entirely flavotestaceous, or clypeus postocular region of epicranium and cranial venter flavotestaceous and frons and epicranium black; prothorax flavotestaceous, with or without piceous macula at pronotal midapex, or prosternum and upper sides of pronotum and pronotal disc black; mesoscutellum flavotestaceous or black; meso- and metasternum from flavotestaceous to black; legs predominantly flavotestaceous or predominantly black; elytron usually piceous or black and avittate, rarely flavotestaceous or vittate; vittate elytron with flavotestaceous vitta on epipleural margin, disc, and sutural margin.

Head: As in *P. reventazon* except setiferous punctations on frons and epicranium larger and antenna more serrate.

Pronotum: As in *P. reventazon* except subapical depression more deeply impressed.

Elytron: As in *P. reventazon* except elytral surface more arenose.

Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 254–256): Strongly pigmented. Combined length of phallobase and phallobasic apodeme about 7 times longer than paramere. Combined length of paramere and phallobase about 3.0 times longer than phallobasic apodeme. Paramere: arcuate in lateral view; dorsum convex; venter broadly concave; mesoventral and mesodorsal margin concave. Sinus: dorsal and ventral elliptical. Phallus: phallic plates broad, with marginal denticles faintly visible (74 males examined).

Female Genitalia: As in *P. nigriventris* except lateral lobes of ventral lamina proportionally shorter.

Internal Reproductive Organs: Male, anterior accessory gland uniramous, coiled; posterior accessory gland biramous (5 specimens examined).

VARIATION.—**Structural:** The female pronotum is usually more transverse than the male pronotum. The setiferous punctations on the head and pronotum are particularly robust in some specimens from Valle De Bravo, Mexico; also in some of these specimens the interocular depressions are coarsely rugose.

Color: Among the males studied 60 have the cranium entirely flavotestaceous and the prothorax predominantly flavotestaceous; in other specimens the cranium and prothorax is predominantly black. In females, the cranium is always mostly black; the pronotum either predominantly flavotestaceous and maculated midapically or predominantly black, in which case it has a black discal vitta.

I assign 14 specimens from Tejupilco, Mexico, to a trivittate phenon. These have the elytron trivittate; the vitta on the epipleural margin extends from the elytral base to the elytral apical half or more; the discal vitta begins at the elytral base (nearer the posthumeral margin than to the sutural margin) curves inward at the basal fifth and gradually outcurves to the elytral apical fifth where it curves inwards towards the elytral apex; the sutural vitta is faintly developed and extends from the elytral base to the elytral basal third.

NATURAL HISTORY.—Adult specimens were collected from Mexico in May; in June by H. E. Evans from Morelos at 1829 meters and by G. H. Nelson on *Mimosa* sp. in Valle de Bravo; in July by H. E. Hinton from Tejupilco at 1164 meters; in August by G. H. Dieke from Michoacán at 1378 meters; and in October by H. H. Smith from Chilpancingo at 378 and 914 meters.

DISTRIBUTION (Figure 363).—A specimen from Turrialba, Costa Rica, extends the known range of this species from Mexico to Costa Rica.

ETYMOLOGY.—Latin, a masculine diminutive noun *caliculus* (cup). I refer to the cup-shaped contour of the combined venter of the parameres.

LOCALITY RECORDS (Figure 363).—I examined 168 adult specimens from Central America. MEXICO: Estado de Hidalgo: Metamoros (CASC, 2 males and 2 females; GEKI, 1 male). Estado de México: Tejupilco (FMNH, 36 males, holotype, and 41 females; GEKI, 6 males and 6 females); Real de Arriba (FMNH, 1 male and 4 females; GEKI, 1 male and 1 female); Valle de Bravo (GEKI, 3 males and 2 females; GHNE, 10 males and 8 females); Cuernavaca (CASC, 2 males and 3 females; CNCC, 2 males and 1 female; CUNY, 1 male and 1 female; GEKI, 2 males and 2 females). Estado de Morelos: Yautepec (BMNH, 1 male and 1 female). Estado de Guerrero: Tepetlapa (BMNH, 1 male and 1 female; GEKI, 1 male); Chilpancingo (AMNH, 1 female; BMNH, 5 males and 8 females; CNCC, 1 female; GEKI, 1 male; Iguala (CNCC, 1 male and 1 female); Soledad (BMNH, 1 male); Tasco (BMNH, 1 female; NMNH, 1 male and 1 female). "México" (BMNH, 1 male). "Guatemala" (GEKI, 1 male). COSTA RICA: Provincia de Cartago: Turrialba (GEKI, 1 male).

REMARKS.—At first glance specimens of the trivittate phenon are very different from the others included herein, but they do not differ appreciably in any structural characteristic studied.

34. *Perilypus carbonarius* Spinola

FIGURES 257-265, 363

Perilypus carbonarius Spinola, 1844a:105 [holotype: male, deposited in MSPI; type-locality: "México"].—Ekis, 1975:26.
Derestenus lateralis Chevrolat, 1874:289 [lectotype: female, and 1 female paralectotype, here designated, deposited in BMNH; type-locality: "México"; new synonymy].—Gorham, 1882:142.

Derestenus mutabilis Chevrolat, 1874:289 [lectotype: female, and 3 female paralectotypes, here designated, deposited in MNHP; type-locality: "México"; new synonymy].—Gorham, 1882:142.

Derestenus nigrifrons Chevrolat, 1874:289 [lectotype: male, here designated, deposited in MNHP; type-locality: Oaxaca, Estado de Oaxaca, Mexico; new synonymy].—Gorham, 1882:142.—Wolcott, 1927a:35.

Colyphus flammeus Gorham, 1878:162 [lectotype, female, here designated, deposited in BMNH; type-locality: "México"; Gorham, 1882:142, placed this nominal species in synonymy with *Derestenus mutabilis* Chevrolat].

Colyphus marginatus Gorham, 1878:162 [lectotype: female, here designated, deposited in MNHP; type-locality: "México"; Gorham, 1882:142, placed this nominal species in synonymy with *Derestenus lateralis* Chevrolat].

See "Remarks" for the justification of the new synonymies.

DIAGNOSIS.—Although somewhat variable, genital characteristics provide the most reliable clues for identifying male members of this species (Figures 257-259). In most cases Mexican specimens belong to this species if they possess the following combination of characteristics: body deep, pronotum boldly transverse, elytral surface densely arenose, frons rugose, and cranium and pronotum impressed with large setiferous punctations. Color patterns of the elytron are also diagnostic in some individuals (Figures 262-265), particularly females.

DESCRIPTION.—*Form*: As in Figures 260, 261.

Size: Length: males, average about 8.0 mm, range 6.8-10.0 mm; females, average about 8.6 mm, range 6.8-10.3 mm. Width: males, average about 2.3 mm, range 2.0-3.2 mm; females, average about 2.7 mm, range 2.4-3.3 mm. Ten males and 10 females measured.

Color: Cranium entirely flavotestaceous or entirely black, or clypeus, cranial venter, and post-

ocular region of epicranium flavotestaceous and remainder of cranium black; prothorax entirely flavotestaceous except for midapical piceous macula, or predominantly piceous and pronotal disc vittate; meso- and metasternum flavotestaceous, or from dark brown to black; legs flavotestaceous or black, or both; elytron variable (see "Variation"); abdomen from dark brown to black.

Head: As in *P. reventazon* except antenna (Figure 260) more serrate; epicranial setiferous punctations larger; frons often rugose; and length/width ratio of each male antennal article 2.0:1.0:1.4:1.3:1.3:1.2:1.1:1.1:1.1:1.9.

Pronotum: As in *P. reventazon* except more transverse in females, subapical depression more deeply impressed, setiferous punctations larger, and side margin of pronotum proper more boldly arcuate.

Elytron: As in *P. reventazon* except surface more arenose.

Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 257-259): Strongly pigmented. Combined length of phallobase and phallobasic apodeme about 5 times longer than paramere. Combined length of paramere and phallobasic apodeme about 3.6 times longer than phallobasic apodeme. Paramere: feebly arcuate in lateral view; dorsum feebly convex, boldly braced basally; venter concave; mesodorsal and mesoventral margin concave. Sinus: dorsal and ventral lanceolate; dorsal slightly broader and longer than ventral. Phallus: as in Figure 259 (38 specimens examined).

Female Genitalia: As in *P. nigriventris*.

Internal Reproductive Organs: Male; anterior accessory glands uniramous, coiled; posterior accessory glands biramous, divided into an inner and outer branch (1 specimen examined).

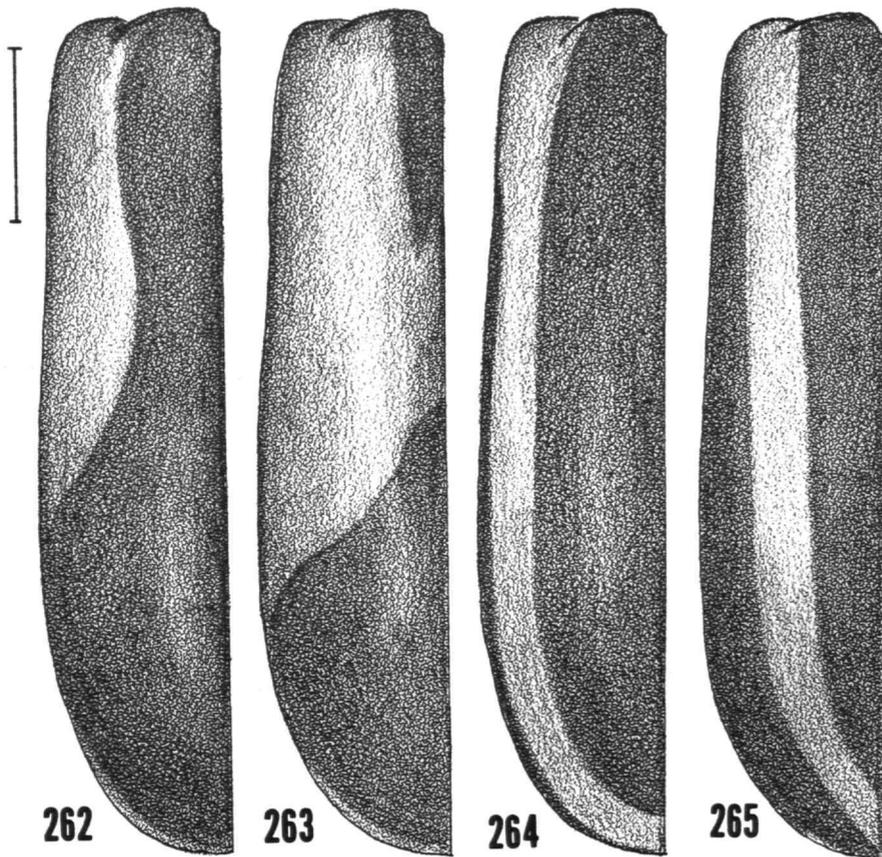
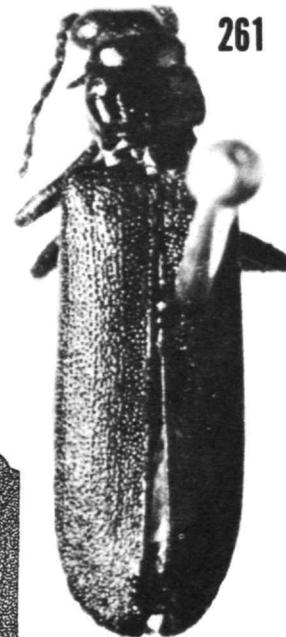
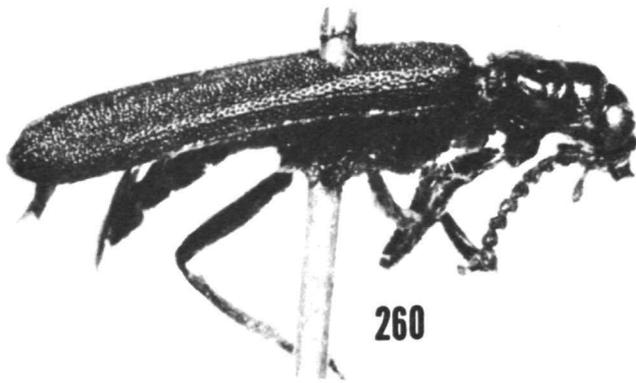
VARIATION.—*Structural*: There is considerable variation in the degree of concavity of the parameral mesodorsal margin, and in width of the paramere and parameral dorsobasal brace. The elytral apex is sometimes acuminate at the suture as is the case in all females from El Palmito. The pronotum is generally more transverse in females than in males.

Color: Elytra are mostly concolorous, usually black, rarely testaceous. When bicolorous the elytron may have one of three color patterns, corresponding to the marginate phenon, the trivittate phenon, or the subfasciate phenon.

In specimens of the marginate phenon the ely-

tron is broadly vittate at the posthumeral margin; the vitta extends from the humeral angle to the

elytral apex. In males, the same vitta may extend from the humeral angle to the elytral apex, ter-



FIGURES 260-265.—*Perilypus carbonarius*: 260, habitus, lateral view; 261, habitus, dorsal view; 262-265, elytra. (Scale = 1 mm)

minate at midelytron, or be faintly visible at the elytral middle half. In one female specimen the posthumeral vitta gradually extends towards the elytral apex (Figure 265). I studied 5 males and 11 females of this phenon.

The elytral color pattern of trivittate specimens is as described for the trivittate phenon of *P. caliculus* (see "Variation"). However, in specimens of this species the discal vitta is less incurved at the elytral basal fifth and is closer to the posthumeral margin; in two male specimens the vittae are only faintly visible at the elytral base. I studied 5 males and 2 females of this phenon.

The elytra of subfasciate specimens are illustrated in Figures 262 and 263. The nonpiceous portion of the elytral disc ranges from stramineous to rufotestaceous. I studied 1 male and 7 females of this phenon.

NATURAL HISTORY.—Specimens were collected from Mexico in June, July, and August. H. F. Howden collected 8 adult specimens, by beating, from El Palmito at 1251 meters. J. Laue collected 1 adult from Volcán Colima at 1000 meters.

DISTRIBUTION (Figure 363).—From Sinaloa to Oaxaca, Mexico.

LOCALITY RECORDS (Figure 363).—I examined 91 adult specimens from Central America. **MEXICO:** Estado de Sonora: Arroyo del Juchujaqui, Alamos (GEKI, 1 male); Guirocoba (GEKI, 1 male). Estado de Sinaloa: 15 miles [24 km] west of El Palmito (CNCC, 4 males and 2 females; GEKI, 1 male and 2 females); about 38 miles [61 km] east of Villa Union (CNCC, 1 female; GEKI, 1 male and 1 female). Estado de Durango: Ventanas (GEKI, 1 male). Estado de Nayarit: El Pichón (CISC, 1 female; GEKI, 1 male); Tepic (MNHB, 1 female). Estado de Jalisco: Guadalajara (CMPP, 3 males and 1 female; GEKI, 1 male and 1 female). Estado de Colima: Volcán Colima (GEKI, 1 male). Estado de Morelos: Yautepec (MNHB, 1 male). Estado de Veracruz: Cerro de Palmas (MNHB, 1 female); Playa Vicente (BMNH, 1 male and 1 female). Estado de México: Bejuco (FMNH, 1 male); Temascaltepec (BMNH, 1 female). Estado de Guerrero: Acapulco (WFBA, 1 female); 8 miles [13 km] north of Iguala (GEKI, 1 male); 5 miles [8 km] south and 2.5 miles [4 km] east of Chilpancingo (GEKI, 1 female). Estado de Oaxaca: Jugila (BMNH, 5 males and 7 females; GEKI, 3 males and 3 females; MNHP, 5 females; MNHB, 1 male and 4 females); Panixtlahuaca (BMNH, 3 males and 2 females); GEKI, 3 males); Oaxaca (MNHP, 2 males and 1 female). "México" (BMNH, 2 females; GEKI, 4 males and 3 females; MNHP, 3 males and 5 females; MNHB, 1 female; MSPI, 1 male, holotype).

REMARKS.—Some specimens, here assigned to the subfasciate phenon, were described as *Derestenus*

mutabilis Chevrolat or *Colyphus flammeus* Gorham, while some of the marginate phenon were described as *Derestenus lateralis* Chevrolat or *Colyphus marginatus* Gorham. I believe the specimens representing these phenon are conspecific primarily because their elytral color characteristics intergrade to some extent as do characteristics of the male genitalia.

As a group, specimens of *P. carbonarius* are variable in color and in male genitalia, but the variation is unequal to interspecific variations within *Perilypus*. Perhaps *P. carbonarius* is undergoing more rapid differentiation than congeneric species and perhaps the observed interpopulation variations are manifestations of restricted gene flow and possibly of incipient speciation. Alternatively, *P. carbonarius*, as defined herein, may consist of several biological species in which stable external gaps have not yet materialized.

The nominal species placed in synonymy by me (see above) were considered "good" species by other authors, primarily on the basis of color characteristics. I found such characteristics unsuitable for inferring reproductive isolation within *Perilypus*.

The *chaletoides* Group

The members of this group are characterized by their stout body; small, shallow, and profusely distributed elytral punctations; very arenose elytral surface; light coloration (predominantly castaneous or stramineous); and by the unusually long male posterior accessory glands.

The two species that comprise the group occur in Mexico from Durango to Chiapas.

35. *Perilypus chaletoides*, new species

FIGURES 266-271, 274, 277, 278, 359

TYPE-LOCALITY.—Twenty-four kilometers north of LaVentosa, at junction with highway 185, Estado de Oaxaca, Mexico.

TYPE-SPECIMENS.—The holotype male is deposited in NMNH, the allotype in GHNE. Both specimens were collected by G. H. Nelson in 1965.

DIAGNOSIS.—The color pattern of the elytron as described and figured (Figure 266), will distinguish members of this species from congeneric species.

DESCRIPTION.—*Form* (Figure 266): The specimens

are broad and deep bodied, and conspicuously convex in lateral view.

Size: Length: males, average about 8.6 mm, range 7.6–9.9 mm; females, average about 9.7 mm, range 8.0–10.6 mm. Width: males, average about 2.7 mm, range 2.4–3.2 mm; females, average about 3.2 mm, range 2.6–3.6 mm. Nine males and 6 females measured.

Color: Cranium castaneous, with or without mid-epicranial black macula; antenna black; prothorax castaneous, except lower sides of pronotum and pronotal discal vitta black; mesoscutellum castaneous, black, or castaneous but infuscated distally; meso- and metasternum entirely black, or middle region castaneous and lateral regions black; femur variable (see "Variation"); tibia and tarsus black; elytron narrowly black along sutural margin, black at apical fifth, castaneous in remainder; abdomen black.

Head: Interocular depressions shallow; frontal umbo prominent; eyes moderately convex; HW/IOW, average about 2.3, range 2.0–2.3 (15 specimens measured); antenna (Figure 274) short; AL/PLS, 1.4, boldly serrate; length/width of each antennal article sex dimorphic, male 2.7:1.4:1.6:1.5:1.2:1.2:1.2:1.0:0.88:0.72:1.6, female 1.8:1.2:1.3:1.1:1.1:1.0:1.0:0.89:0.72:0.67:1.5.

Pronotum: Boldly convex and only slightly transverse (PL/PW, average about 0.96, range 0.92–1.0; 15 specimens measured); subapical and prebasal depressions deeply impressed; pronotal arch coarsely punctate; side margins of pronotum proper boldly convex.

Mesoscutellum: Subquadrate.

Elytron: Conspicuously convex and with exceptional depth; epipleural margin straight in basal half, arcuate in apical half; punctations very small and profusely distributed; punctate and interpunctate surfaces conspicuously arenose; setal densely distributed; EL/EW, average about 4.2, range 3.3–4.7 (15 specimens measured); slope of apical deflexion gradual.

Front Tarsal Claws: Male and female feebly asymmetrical.

Male Genitalia (Figures 269–271): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 5.4 times longer than paramere. Combined length of paramere and phallobase 3.0 times longer than phallobasic apodeme. Paramere: apical

fourth abruptly narrowed in dorsal or ventral view, feebly declinate in lateral view; lateral depression feebly impressed; dorsum plane, with narrow brace at basal third (Figure 271); venter feebly concave; mesoventral margin faintly arcuate; mesodorsal margin sinuous in basal half, linear in apical half. Sinus: dorsal and ventral lanceolate. Phallus: acuminate; marginal denticles on middle half of phallic plate (12 specimens examined).

Female Genitalia (Figures 267, 268): Dorsal lamina bilobed, incision short; ventral lamina trilobed, lateral lobes shorter than medial lobe; dorsal baculi not fused; ventral bacculus acuminate near middle; coxital plates absent (2 specimens examined).

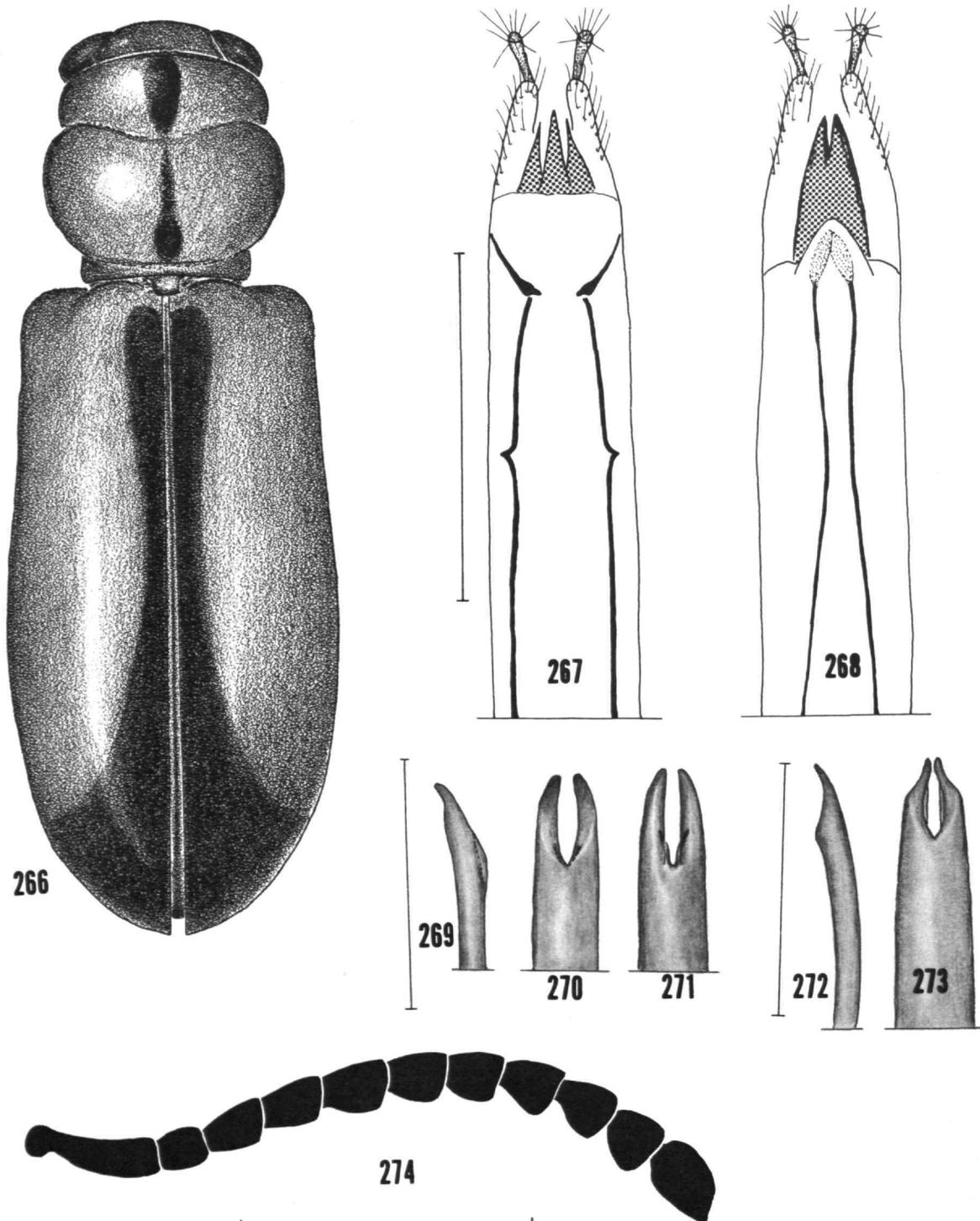
Internal Reproductive Organs: Male (Figures 277, 278); anterior accessory glands uniramous, coiled throughout; posterior accessory glands biramous, outer branch about 1.5 longer than inner branch, both branches exceptionally long and extensively convoluted; testis composed of 12 follicles. Female; spermathecal capsule bulbous distally and spermathecal gland duct exceptionally long (2 males and 2 females examined).

VARIATION.—Structural: The front tarsal claws are particularly asymmetrical in the male specimen from El Camerón, Oaxaca, Mexico. The interocular depressions and disc of the pronotal arch are more coarsely punctated in male specimens than in female specimens. Also correlated with sex is the degree of concavity of the epipleural margin (best seen in the elytral lateral view), which is conspicuously more concave in males than in females.

Color: The pronotal vitta may be percurrent, interrupted at the middle, or reduced to a midapical macula. In three male specimens the dark regions of the elytron are confined to an elongate sutural infuscation. The elytron of some specimens is predominantly flavocastaneous.

NATURAL HISTORY.—In August in Chiapas, Mexico, C. W. O'Brien collected three specimens, by beating, at 885 meters. G. H. Nelson collected specimens in July by sweeping roadside vegetation in Oaxaca, Mexico. One specimen was collected at light in July by Mastro and Schaffner. Other specimens were collected from Mexico in June.

DISTRIBUTION (Figure 359).—Known only from southwestern Mexico.



FIGURES 266-274.—*Perilypus chaletoides*: 266, habitus; 267, ovipositor, ventral view; 268, ovipositor, dorsal view; 269, tegmen, lateral view; 270, tegmen, ventral view; 271, tegmen, dorsal view; 274, antenna. *P. bicolor*: 272, tegmen, lateral view; 273, tegmen, ventral view. (Scale = 1 mm)

ETYMOLOGY.—Latin compound adjective formed from *Chaletus* (a chrysomelid generic name) + the suffix *-oides* (like). I refer to the similarity in the elytral color pattern between members of this species and those of *Chaletus*.

LOCALITY RECORDS (Figure 359).—I examined 34 adult specimens from Central America. MEXICO: Estado de Oaxaca: 9 miles [15 km] east of El Cameron (TTUT, 1 male); 15 miles [24 km] north of La Ventosa, at junction with highway 185 (NMNH, 1 male, holotype; GEKI, 1 male and 1 female; GHNE, 2 females); 8 miles [13 km] north of La Ventosa (TAMT, 1 female); 14 miles [23 km] south of Matias Romero (GEKI, 1 female; TAMT, 2 females); Almoloya (NMNH, 1 male). Isthmus of Tehuantepec (MCZC, 1 female). Estado de Chiapas: 4 miles [7 km] northwest of Pueblo Nuevo, Rio Bajada (GHNE, 1 male); At junction between highways 190 and 195 (HFHO, 1 male); Tuxtla Gutierrez (CNCC, 1 female); Suchiapa (CISC, 1 male); Los Amates (AMNH, 1 male); 21 miles [34 km] west of Lazaro Cardenas (CNCC, 1 female); 2.3 miles [4 km] west of Las Cruces (GEKI, 2 males); 31 miles [50 km] southeast of Comitán (GEKI, 1 male and 1 female; TAMT, 3 males and 1 female); 7 miles [11 km] southeast of Chiapa de Corzo (GEKI, 1 male); 19 miles [31 km] west of Ocozacoatlá (TAMT, 1 female); 7 miles [11 km] southwest of Ocozacoatlá (GEKI, 1 male and 1 female); 13 miles [21 km] northeast Cintalapa (GEKI, 2 males and 1 female); 2 miles [3 km] east Rizo de Oro (GEKI, 1 male).

36. *Perilypus bicolor* (Chevrolat), new combination

FIGURES 272, 273, 275, 359

Sallea bicolor Chevrolat, 1874:287 [lectotype, female, deposited in MNHP, here designated; type-locality: Veracruz, Estado de Veracruz, Mexico].—Gorham, 1882:144.—Schenkling, 1898:364.

DIAGNOSIS.—The dorsal fascies of these specimens is entirely testaceous.

DESCRIPTION.—*Form:* As in *P. chaletoides* (Figure 266).

Size: Length: males, average about 8.2 mm, range 7.1–8.9 mm; females, average about 8.6 mm, range 7.3–10.2 mm. Width: males, average about 2.7 mm, range 2.4–3.0 mm; females, average about 2.8 mm, range 2.3–3.2 mm. Six males and 10 females measured.

Color: Cranium, prothorax, and elytron testaceous; antenna, meso- and metasternum, tibia, tarsus, and abdomen dark brown; femora variable (see "Variation").

Head: As in *P. chaletoides* except antenna (Figure 275) slightly less serrate, and length/width ra-

tio of each male antennal article 2.3:1.2:1.3:1.3:1.5:1.3:1.1:1.0:1.0:1.0:1.5.

Pronotum: As in *P. chaletoides*.

Elytron: As in *P. chaletoides*.

Front Tarsal Claws: As in *P. chaletoides*.

Male Genitalia (Figures 272, 273): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 5.7 times longer than paramere. Combined length of paramere and phallobase 3.2 times longer than phallobasic apodeme. Paramere: acuminate, abruptly narrowed at apical third; lateral depression narrow, deep, and projecting beyond basal limit of ventral sinus; dorsum plane; venter feebly convex; mesoventral margin concave; mesodorsal margin feebly convex in basal third, linear in apical two-thirds. Sinus: dorsal and ventral lanceolate, dorsal slightly longer than ventral. Phallus: phallic plates broad in basal three-fourths, gradually narrowed to apex in apical fourth; marginal denticles small, extended from basal fourth to apical three-fourths of phallic plate (7 specimens examined).

Female Genitalia: As in *P. chaletoides*.

VARIATION.—*Structural:* No appreciable structural variation was noted.

Color: The dorsal fascies is concolorous in the specimens studied, but femoral coloration is variable and not correlated geographically or with regard to sex. In four specimens, the front and middle femora are entirely testaceous, the hindfemur is predominantly testaceous and infuscated apically. In 6 specimens, the front and middle femur is testaceous and infuscated apically, the hind femur entirely dark brown; in 14 specimens the front femur is testaceous and infuscated apically, the middle and hind femur entirely dark brown.

Additional color variation involves the mesosternum which is lighter, as dark, or paler than the metasternum. Also, in one female specimen the epipleural fold is faintly infuscated at the mid-elytron.

NATURAL HISTORY.—Specimens were collected in southern Mexico from June through August.

DISTRIBUTION (Figure 359).—This Mexican species ranges from Durango to Oaxaca.

LOCALITY RECORDS (Figure 359).—I examined 24 adult specimens from Central America. MEXICO: Estado de Veracruz: Veracruz (MNHP, 1 female, lectotype); Cotaxtla Experiment Station, Cotaxtla (CISC, 1 female; GEKI, 1 male); Puente Nacional (CISC, 1 male); Motzorongo (MNHB, 1

female). Estado de Durango: Canelas (GEKI, 1 male). Estado de Guerrero: Taxco (GEKI, 1 female); Almolonga (GEKI, 1 male). Estado de Oaxaca: Oaxaca (BMNH, 1 female; GEKI, 1 male and 1 female; MNHP, 1 female). "México" (FMNH, 1 male and 1 female; GEKI, 1 male; MNHB, 1 male and 2 females; RNHN, 1 male; UZMD, 1 female; ZMAN, 2 females).

The *quadrilineatus* Group

The most striking characteristic of the species included herein is their lampyroid body. Members of this group are also characterized by antenna boldly serrate; elytron with arenose surface, small punctations, very gradual apical slope, and deflexed posthumeral region deeply concave; and mesodorsal margin of paramere denticulated.

The *quadrilineatus* group exhibits more interspecific structural variation than the other species groups do. *Perilypus bicristatus*, for example, has some particularly discordant characteristics including, elytron bicarinate, mesoscutellum triangular, and pronotum concave medially and paraterally.

The combined distribution of the five species included in this group extends from northeastern Mexico to central Guatemala. However, only *P. quadrilineatus* extends north of the Isthmus of Tehuantepec where it occurs primarily along the Atlantic drainage systems.

37. *Perilypus quadrilineatus* (Chevrolat), new combination

FIGURES 276, 279–283, 285, 286, 366

Derestenus quadrilineatus Chevrolat, 1843:14 [holotype: female, deposited in MNHP; type-locality: Veracruz, Estado de Veracruz, Mexico].—Lacordaire, 1857:443.—Gorham, 1882:141.

Derestenus similis Thomson, 1860:57 [lectotype: male, here designated, deposited in MNHP; type-locality: Mexico].

DIAGNOSIS.—The bold, obliquely convex epipleural fold and the narrow vitta of the elytral disc (Figure 279) easily separate specimens of this species from congeners within the *quadrilineatus* group.

DESCRIPTION.—*Form:* As in Figure 279.

Size: Length: males, average about 10.1 mm, range 9.0–10.9 mm; females, average about 10.6 mm, range 8.2–13.2 mm. Width: males, average about 3.5 mm, range 3.0–4.4 mm; females, average about 3.5 mm, range 2.6–4.6 mm. Ten males and 10 females measured.

Color: Clypeus, frons, and postocular region of epicranium flavotestaceous; remainder of cranium dark brown; pronotal sides flavotestaceous, sometimes roseous; pronotal disc with piceous vitta; thoracic sterna brown; legs variable (see "Variation"); elytron predominantly dark brown, with marginal and discal flavotestaceous vittae; abdominal sternum variable (see "Variation").

Head: Interocular depression broad, shallow, not crescentic; eyes boldly convex (HW/IOW, average about 2.2, range 2.0–2.4; 10 males and 10 females measured); antenna (Figure 276) serrate, not particularly flattened, length/width ratio of each male antennal article 1.7:1.4:1.5:1.7:1.4:1.5:1.4:1.4:1.4:1.4:2.3; AL/PLS, 1.7.

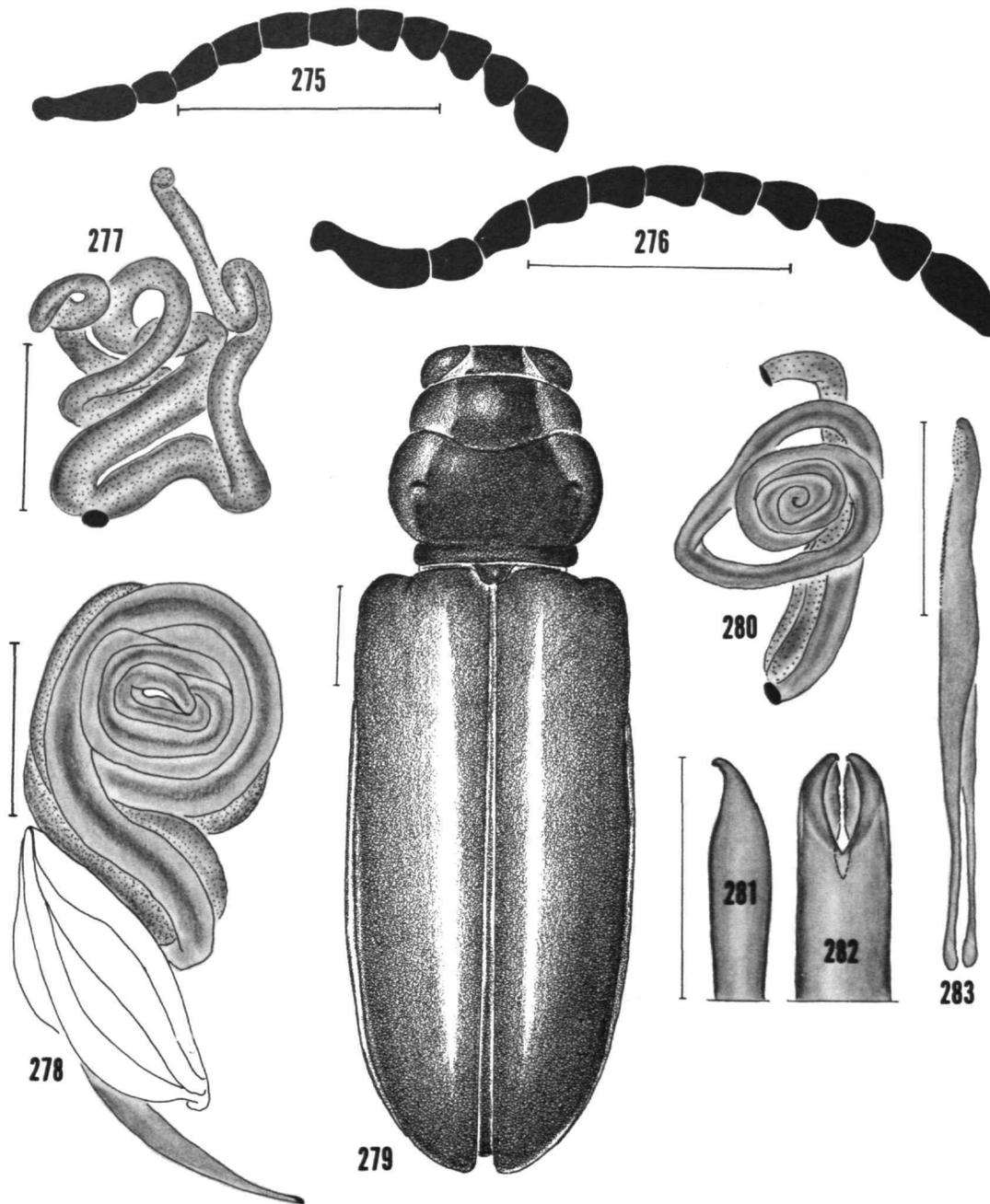
Pronotum: Boldly transverse (PL/PW, average about 0.90, range 0.82–0.96; 20 specimens measured); sides of pronotum proper boldly arcuate; dorsum feebly convex; pronotal arch coarsely punctate; subapical depression well impressed at sides, shallow at middle; pronotal foveae and prebasal depression deeply impressed; pronotal collar normal, not particularly narrow.

Mesoscutellum: Subquadrate.

Elytron: Posthumeral margin arcuate in outline and contour; narrow longitudinal region proximal to epipleural fold gradually deflected, deflected region concave; punctations small, shallow, and evenly distributed throughout elytral disc although diminished near suture; surface arenose and profusely vested with short reclinate setae; epipleural fold obliquely convex; epipleuron convex, explanate internally; apical slope very gradual; EL/EW, average about 4.4 range 3.2–4.9 (20 specimens measured).

Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 281–283): Strongly sclerotized. Combined length of phallobase and phallobasic apodeme 5 times longer than paramere. Combined length of paramere and phallobase 2.3 times longer than phallobasic apodeme. Paramere: outer margin acutely inflected at apical third; apex incurved; lateral depression elongate and deeply impressed; dorsum convex, strongly explanate medially; venter narrow and concave; mesoventral margin concave; mesodorsal margin sinuous and denticulated at middle third. Sinus: dorsal narrow in apical half, expanded in basal half; ventral elliptical. Phallus: phallic plates broad, feebly sclerotized subapically; marginal denticles extended from



FIGURES 275-283.—*Perilypus bicolor*: 275, antenna. *P. chaletoides*: 277, posterior accessory gland; 278, male internal reproductive organs. *P. quadrilineatus*: 276, antenna; 279, habitus; 280, male internal reproductive organs; 281, tegmen, lateral view; 282, tegmen, ventral view; 283, phallus. (Scale = 1 mm)

middle of phallic plate to phallic plicae (17 specimens examined).

Female Genitalia (Figure 285, 286): Dorsal lamina bilobed; ventral lamina trilobed; proctiger short, acute; proctigeral bacculus acuminate at posterior fifth; coxital plates absent (2 specimens examined).

Internal Reproductive Organs: Male (Figure 280); anterior accessory gland uniramous, coiled throughout; posterior accessory gland biramous, outer branch nearly twice as long as inner branch (1 specimen studied).

VARIATION.—*Structural*: The angularity of the convex epipleural fold is more pronounced in some specimens; in others it is the extent of its inner and outer explanation that is striking. In general, female antennae are more serrate than male antennae.

The geographically disjunct female specimen from Volcán Colima, Mexico, differs from all other specimens studied as follows: pronotum more transverse (PL/PW, 0.81), with subapical depression more deeply impressed, and with arch narrower and more convex; elytral form more rectangular elytral disc avittate; and legs entirely dark brown. Whether these differences can be inferred to represent genetic discontinuity or geographic variation will depend on study of additional material from Colima and its environs. Should this specimen (which I labeled *P. quadrilineatus* (Chevrolat)) be judged distinct from *P. quadrilineatus* it would undoubtedly be a member of the sister of that species.

Color: The flavous femoral annulus varies in width, its definition is obliterated when the femur is predominantly flavous. Coloration of the abdominal venter varies with sex and is dark brown in males. In females, visible sterna I, II, and VI are brown, sterna III to V are flavotestaceous. Sometimes the female sternum III is partially flavotestaceous and partially brown.

NATURAL HISTORY.—Specimens were collected in Mexico in June by G. H. Nelson (by beating roadside vegetation in Oaxaca) and by H. S. Dybas from Veracruz at 920 meters. A female specimen was intercepted in New Orleans (U.S.A.) on banana debris apparently transported from Mexico. Other adult specimens were collected in Mexico in May, June, and August.

DISTRIBUTION (Figure 366).—The center of distribution of this Mexican species appears to be the Isthmus of Tehuantepec: most of the specimens

studied were collected from the Atlantic side of the Isthmus. Two specimens were collected from northern Guatemala.

LOCALITY RECORDS (Figure 366).—I examined 68 adult specimens from Central America. MEXICO: Estado de Tamaulipas: 5 miles [8 km] west of Gomez Farias (GEKI, 1 female). Estado de San Luis Potosi: El Salto de Agua (GEKI, 1 female; 25 miles [40 km] north of Tamazunchale (CNCC, 2 females; GEKI, 2 females). Estado de Puebla: 15 miles [24 km] east of Teziutlán (CNCC, 1 male and 1 female; GEKI, 1 female). Estado de Colima: Volcán Colima (GEKI, 1 female). Estado de Veracruz: Jalapa (GEKI, 1 female); Fortín (FMNH, 2 males and 1 female); Los Amates (CNCC, 1 female); Tezonapa (FMNH, 1 female); Veracruz (BMNH, 1 female; FMNH, 1 male; GEKI, 1 male; MNHP, 1 female, holotype); Cordoba (CASC, 3 males; GEKI, 1 male and 1 female; MNHP, 1 female); San Rafael, Jicaltepec (MCZC, 2 females; GEKI, 1 female); Cotaxtla Experiment Station, Cotaxtla (CISC, 1 male and 1 female); Puente Nacional (GEKI, 1 female); Lago de Catemaco (CISC, 1 female; NMNH, 1 female); 2 miles [3 km] north of Santiago Tuxtla (GEKI, 1 female); Cerro de Palmas (BMNH, 2 females; GEKI, 2 females); Santiago Tuxtla (BMNH, 2 females); Playa Vicente (BMNH, 2 males); Cosamaloapán (BMNH, 1 female); Atoyac (MNHB, 1 female). Estado de Oaxaca: Oaxaca (GEKI, 1 female); Temescal (GEKI, 1 female; GHNE, 2 males). Estado de Chiapas: Portugal, 7 miles [11 km] southeast of Simojovel (GEKI, 1 female); 8 miles [13 km] south of Simojovel (GEKI, 1 female); Santo Domingo, 15 miles [24 km] southeast of Simojovel (CISC, 1 female); Simojovel (CISC, 1 female); 10 miles [16 km] south of Malpaso (GEKI, 1 female). "México" (BMNH, 1 female; GEKI, 3 females; MNHP, 2 males and 1 female; MNHB, 4 females; MZST, 1 female; NMNH, 2 females; ZMAN, 1 female). GUATEMALA: Departamento de Alta Verapaz: Telemán (BMNH, 1 female).

38. *Perilypus telephoroides* (Gorham), new combination

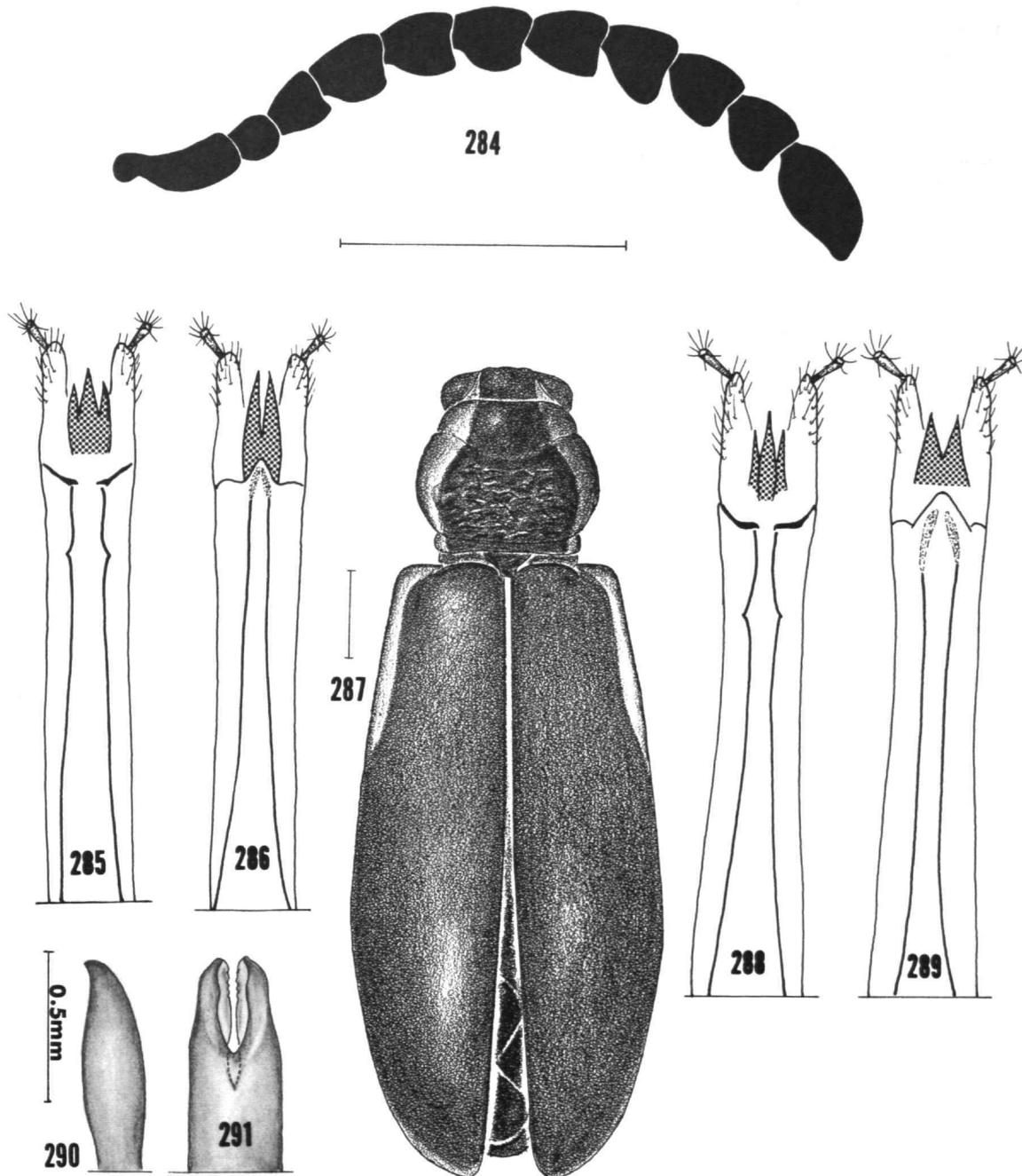
FIGURES 284, 287–291, 366

Colyphus telephoroides Gorham, 1882:142 [lectotype; male, and two paralectotypes, male and female, here designated, deposited in BMNH; type-locality: Capetillo, Departamento de Sacatepequez, Guatemala].—Gorham, 1886:335.—Schenkling, 1906:262.

DIAGNOSIS.—The short testaceous vitta on the elytral humeral angle (Figure 287) identifies specimens of this species.

DESCRIPTION.—*Form*: As in Figure 287.

Size: Length: males, average about 8.6 mm, range 6.2–10.4 mm; females, average about 9.4 mm, range 7.9–10.1 mm. Width: males, average about 2.9 mm, range 1.9–3.6 mm; females average about 3.2, range 2.6–3.6 mm. Eight males and 9 females measured.



FIGURES 284-291.—*Perilypus telephoroides*: 284, antenna; 287, habitus; 288, ovipositor, ventral view; 289, ovipositor, dorsal view; 290, tegmen, lateral view; 291, tegmen, ventral view. *P. quadrilineatus*: 285, ovipositor, ventral view, 286, ovipositor, dorsal view. (Scale = 1 mm)

Color: Clypeus and postocular region of epicranium testaceous, remainder of cranium black; antenna black; pronotum testaceous dorsolaterally, black ventrolaterally and discally; pro-, meso-, and metasternum black; legs black; elytron black except with short testaceous vitta at basal third of post-humeral margin (Figure 287); abdominal venter color variable (see "Variation").

Head: Interocular depressions broad and well impressed; interocular surface coarsely rugose; epicranium densely punctate; eyes boldly convex; HW/IOW, average about 2.4, range 2.1–2.7 (20 specimens measured); antenna (Figure 284) conspicuously serrate and sex dimorphic with respect to length (AL/PLS, male 2.0, female 2.3); length/width ratio of each male antennal article 2.5:1.0:1.1:1.4:1.2:1.1:1.1:1.1:1.0:1.0:1.8.

Pronotum: Distinctly transverse and feebly trapezoidal; subapical depression shallow; pronotal arch feebly convex and coarsely punctate; disc of pronotum proper transversely wrinkled; PL/PW, average about 0.83, range 0.79–0.90 (17 specimens measured).

Elytron: Posthumeral margin straight in basal two-thirds, arcuate in apical third; narrow longitudinal region proximal to epipleural fold acutely deflexed; concavity of deflexed posthumeral region elongate and deeply impressed; apical slope very gradual; surface copiously impressed with small shallow punctations; punctate and interpunctate surfaces arenose and profusely vested with short reclinate setae; epipleural fold unusually narrow; EL/EW, average about 4.1, range 3.9–4.9 (17 specimens measured).

Front Tarsal Claws: Male, feebly asymmetrical; female, symmetrical.

Male Genitalia (Figures 290, 291): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 5 times longer than paramere. Combined length of paramere and phallobase 3.4 times longer than phallobasic apodeme. Paramere: apex obtuse; outer margin depressed at middle; lateral depression deep, extended from paramere base to paramere apical fourth; dorsum convex, strongly explanate medially; venter narrow and concave; mesoventral margin concave in basal two-thirds, sinuous in apical third; mesodorsal margin sinuous, denticulated in apical third only, and with conspicuous brace at base. Sinus: dorsal narrowly lanceolate; ventral elliptical and feebly constricted

apically. Phallus: as in *P. quadrilineatus* (10 specimens examined).

Female Genitalia (Figures 288, 289): As in *P. quadrilineatus* except dorsal lamina and its incision broader and proctiger more robust (1 specimen examined).

Internal Reproductive Organs: Male, anterior accessory gland uniramous, coiled throughout.

VARIATION.—Structural: Notable structural variation is evident in the length and degree of antennal serration. Male antennae are proportionally longer and less serrate than female antennae.

Color: The size of the postocular epicranial macula varies as does the length of the testaceous vitta on the elytral humeral angle; in one specimen the vitta is broadened and extends from the humeral angle to the elytral apex. Coloration of abdominal venter is sex dimorphic being black in males; in females, visible sterna I–III are black, sterna IV–VI testaceous.

NATURAL HISTORY.—In October in the interior valley of Sierra de las Minas, Guatemala, R. D. Mitchell collected one adult specimen at 1550 meters. Other adult specimens were collected from Mexico in May and June.

DISTRIBUTION (Figure 366).—The known range extends from southern Mexico to southern Guatemala.

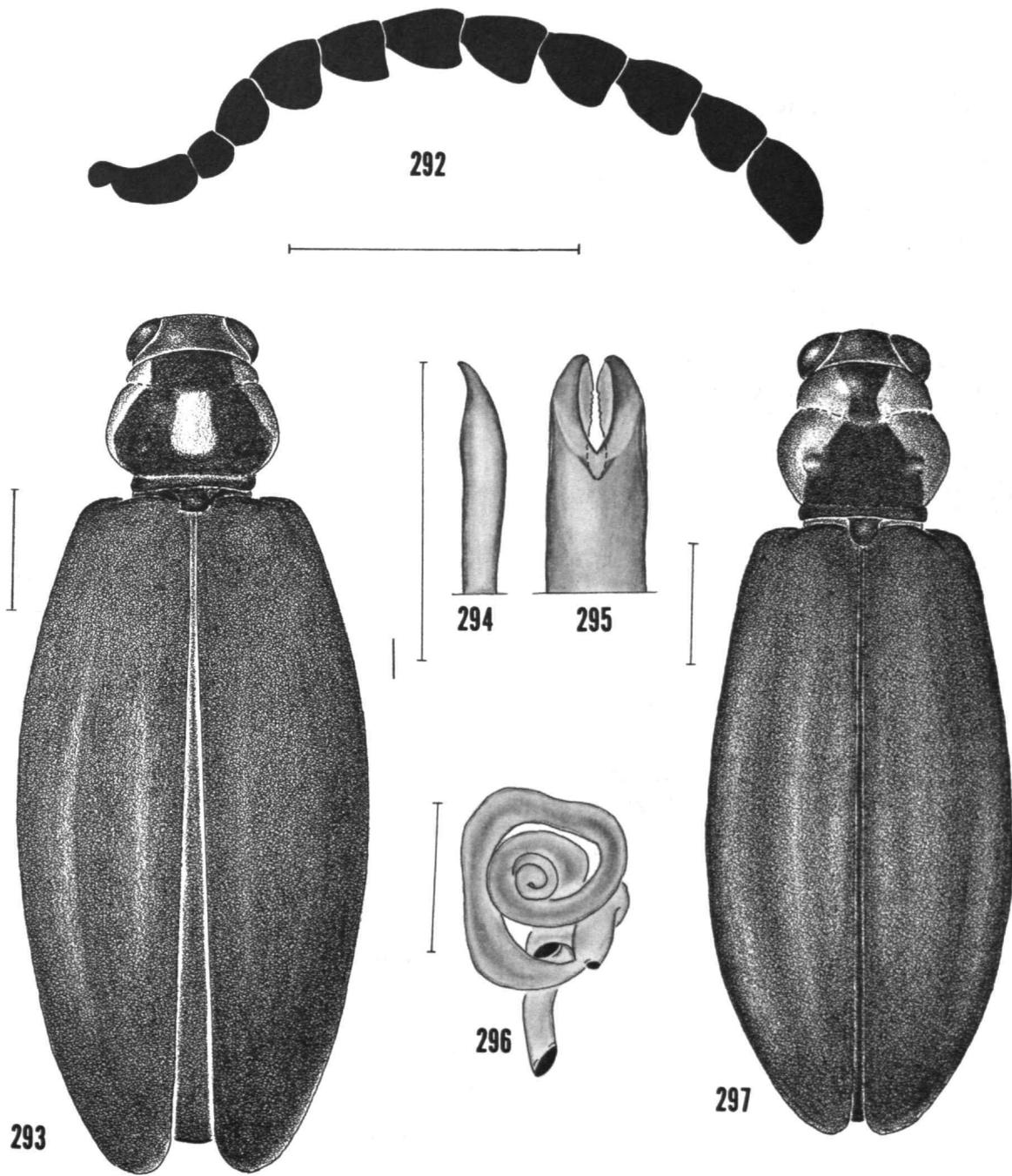
LOCALITY RECORDS (Figure 366).—I examined 20 adult specimens from Central America. MEXICO: Estado de Chiapas: Chilcultic, near El Rincón (CNCC, 1 male; GEKI, 1 male); Lagos des Calores, route 17 (HFHO, 1 male); El Rincón, route 7 (GEKI, 2 females); 17 miles [27 km] southeast of Teopisca, route 24 (CNCC, 1 female). "México" (MNHP, 1 male, ZMAN, 1 female). GUATEMALA: Departamento de Sacatepequez: Capetillo (BMNH, 1 male, lectotype, and 2 females; GEKI, 1 male and 1 female; MNHP, 1 female). Departamento de Zacapa: Santa Clara, north of Cabañas (FMNH, 1 female).

39. *Perilypus coroniformis*, new species

FIGURES 292–296, 366

TYPE-LOCALITY.—Eight kilometers west of San Cristóbal de las Casas, Estado de Chiapas, Mexico.

TYPE-SPECIMENS.—The holotype male and the allotype are deposited in HFHO. These and 4 paratypes were collected by H. F. Howden in 1969. Four paratypes: GEKI, 1 male and 1 female; HFHO, 2 females.



FIGURES 292-297.—*Perilypus coroniformis*: 292, antenna; 293, habitus; 294, tegmen, lateral view; 295, tegmen, ventral view; 296, posterior accessory glands. *P. fluctus*: 297, habitus. (Scales = 1 mm)

DIAGNOSIS.—The configuration of the pronotal discal vitta, as illustrated (Figure 293) and described is unique in *Perilypus*.

DESCRIPTION.—*Form*: As in Figure 293.

Size: Length: males, average about 8.1 mm, range 8.5–10.7 mm; females, 10.0 mm. Width: males, average about 3.8 mm, range 3.6–4.0 mm; females, 3.6 mm. Two males and 2 females measured.

Color: Clypeus testaceous, remainder of cranium, and antenna black; prosternum and pronotal sides roseous; pronotal disc broadly vittate, vitta with oblong roseous macula at center; meso- and metathorax, legs, elytron, and abdomen black, except femora testaceous ventroapically.

Head: As in *P. telephoroides* except HW/IOW, average about 2.4, range 2.3–2.5 (4 specimens measured); antenna (Figure 292) boldly serrate; AL/PLS, sex dimorphic, male 2.7, female 2.3; and length/width ratio of each antennal article sex dimorphic, male 2.3:1.4:1.2:1.4:1.4:1.3:1.4:1.4:1.4:1.4:1.9, female 2.4:1.0:1.2:1.3:1.2:1.2:1.1:1.0:1.0:1.0:1.5.

Pronotum: As in *P. telephoroides* except more transverse (PL/PW, average about 0.80, range 0.77–0.84; 4 specimens measured), more trapezoidal, and disc smooth.

Elytron: As in *P. telephoroides* except posthumeral margin arcuate, disc undulated longitudinally, and EL/EW, average about 4.0, range 3.8–4.2 (4 specimens measured).

Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 294, 295): Strongly pigmented. Combined length of phallobase and phallobasic apodeme 5 times longer than paramere. Combined length of paramere and phallobase 3 times longer than phallobasic apodeme. Paramere: outer margin broadly arcuate; apex subacute; lateral depression well impressed, extended from parameral base to parameral apical two-thirds; dorsum convex, strongly explanate mesally; venter concave; mesoventral margin concave; mesodorsal margin convex and finely denticulated at middle third. Sinus: dorsal indistinct; ventral elliptical. Phallus: as in *P. telephoroides* (2 males examined).

Female Genitalia: As in *P. telephoroides*.

Internal Reproductive Organs: Male; as in Figure 296 (1 specimen examined).

VARIATION.—*Structural*: Antennal length varies with sex; the male antenna is proportionally longer

than the female antenna. In general, the antennal articles are more transverse in females.

Color: There is no conspicuous color variation among the 4 specimens examined.

NATURAL HISTORY.—During June near San Cristóbal de las Casas, Mexico, H. F. Howden collected 6 adult specimens by beating oak (*Quercus* sp.) foliage.

DISTRIBUTION (Figure 366).—Known only from the type-locality.

ETYMOLOGY.—Latin noun *corona* (crown) + noun *forma* (shape), and adjectival ending *-is*. The name refers to the peculiar shape of the pronotal discal vitta.

LOCALITY RECORDS (Figure 366).—I examined 6 adult specimens from Central America. MEXICO: Estado de Chiapas: 5 miles [8 km] west of San Cristóbal de las Casas (GEKI, 1 male and 1 female; HFHO, 1 male, holotype, and 3 females).

40. *Perilypus fluctus*, new species

FIGURES 297, 301–303, 366

TYPE-LOCALITY.—Sinanja, Departamento de Baja Verapaz, Guatemala.

TYPE-SPECIMENS.—The holotype male and allotype, deposited in BMNH, were collected by G. C. Champion.

DIAGNOSIS.—Distinguishable from *P. coroniformis*, the only other species in the *quadrilineatus* group with elytral surface undulated longitudinally, by the testaceous annulation of the femora and by the sagittate pronotal vitta.

DESCRIPTION.—*Form*: As in Figure 297.

Size: Length: male, 8.7 mm; female, 9.0 mm. Width: male, 3.2 mm; female 3.5 mm. One male and 1 female measured.

Color: As in *P. telephoroides*, except posthumeral margin avittate, pronotal vitta strongly constricted at subapical depression, and femora annulated.

Head: As in *P. telephoroides*.

Pronotum: As in *P. telephoroides*, except not transversely wrinkled, margins of pronotum proper boldly arcuate, and foveae more spheroid.

Elytron: As in *P. telephoroides* except posthumeral margin arcuate from base to apex, surface distinctly undulated longitudinally, and EL/EW 3.9 (2 specimens measured).

Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 301–303): Strongly pig-

mented. Combined length of phallobase and phallobasic apodeme 9 times longer than paramere. Combined length of paramere and phallobase 3.2 times longer than phallobasic apodeme. Paramere: apical region broadly uncinat in lateral view; lateral depression shallow and localized at middle third; dorsum boldly explanate in apical half, feebly explanate in basal half; venter narrowly concave; mesoventral margin sinuous; mesodorsal margin convex and coarsely denticulated in middle half. Sinus: dorsal indistinct; ventral broadly lanceolate. Phallus: as in Figure 303.

Female Genitalia: Not studied.

VARIATION.—*Structural*: The two specimens are structurally homogeneous.

Color: The male abdominal venter is black; in female specimens visible sterna I–III are black and IV–VI testaceous.

DISTRIBUTION (Figure 366).—Known only from Baja Verapaz, Guatemala.

ETYMOLOGY.—Latin noun *fluctus* (wave), referring to the longitudinal undulation of the elytral disc.

LOCALITY RECORDS (Figure 366).—I examined 2 adult specimens from Central America. GUATEMALA: Departamento de Baja Verapaz: Sinanja (BMNH, 1 male, holotype); San Jeronimo (BMNH, 1 female).

REMARKS.—The holotype was part of the syntype series of *P. telephoroides* and can be easily distinguished from members of that species by the more convex margins of the pronotum and the elytron, undulation of the elytral surface, testaceous annulus of femur, and by the absence of an elytral humeral vitta.

The allotype was part of the syntype series of *P. ventralis*. While there is considerable habitus similarity between female members of the two species, orientation of the epipleural fold easily separates them. In specimens of *P. ventralis* the epipleural fold is in the ventral position while in specimens of the *quadrilineatus* group the fold is lateral.

41. *Perilyptus bicristatus*, new species

FIGURES 298–300, 366

TYPE-LOCALITY.—Twenty-four kilometers west of El Palmito, Estado de Sinaloa, Mexico.

TYPE-SPECIMENS.—The holotype female, depos-

ited in CNCC, was collected by H. F. Howden in 1964.

DIAGNOSIS.—Elytron bicristate (Figure 300), pronotum concave medially and paralaterally and with paramedial longitudinal elevations, mesoscutellum triangular, and frontal umbo particularly prominent (Figure 299). The frontal umbo is the only region of body not black.

DESCRIPTION.—*Form*: As in Figure 300.

Size: Length 9.4 mm; width 2.3 mm.

Color: Frontal umbo flavous, remainder of body black.

Head: Cranium coarsely punctate; interocular depressions deeply impressed and rugose posteriorly; frontal umbo prominent, conspicuously convex, and narrowly prolonged posteriorly; antenna (Figure 298) boldly serrate and very flat, article 1 and 11 oblong, 2 to 9 transverse, 10 as long as broad; length/width ratio of each antennal article 1.2:0.8:0.9:0.8:0.7:0.8:0.9:0.9:0.8:1.0:1.9; AL/PLS, 2.4.

Pronotum: Transverse (PL/PW, 0.83), coarsely punctate; surface concave centrally and paralaterally, and with paramedial longitudinal elevations; subapical depression deeply impressed at side margins, feebly impressed discally.

Mesoscutellum: Triangular.

Elytron: Posthumeral margin arcuate; narrow longitudinal region proximal to epipleural fold acutely deflexed; concavity of deflexed posthumeral region long and deeply impressed; apical slope very gradual; surface with small coarse punctations, prominently arenose; disc bicarinate (Figure 300); epipleural fold conspicuously narrow; EL/EW, 3.7.

Front Tarsal Claws: Symmetrical.

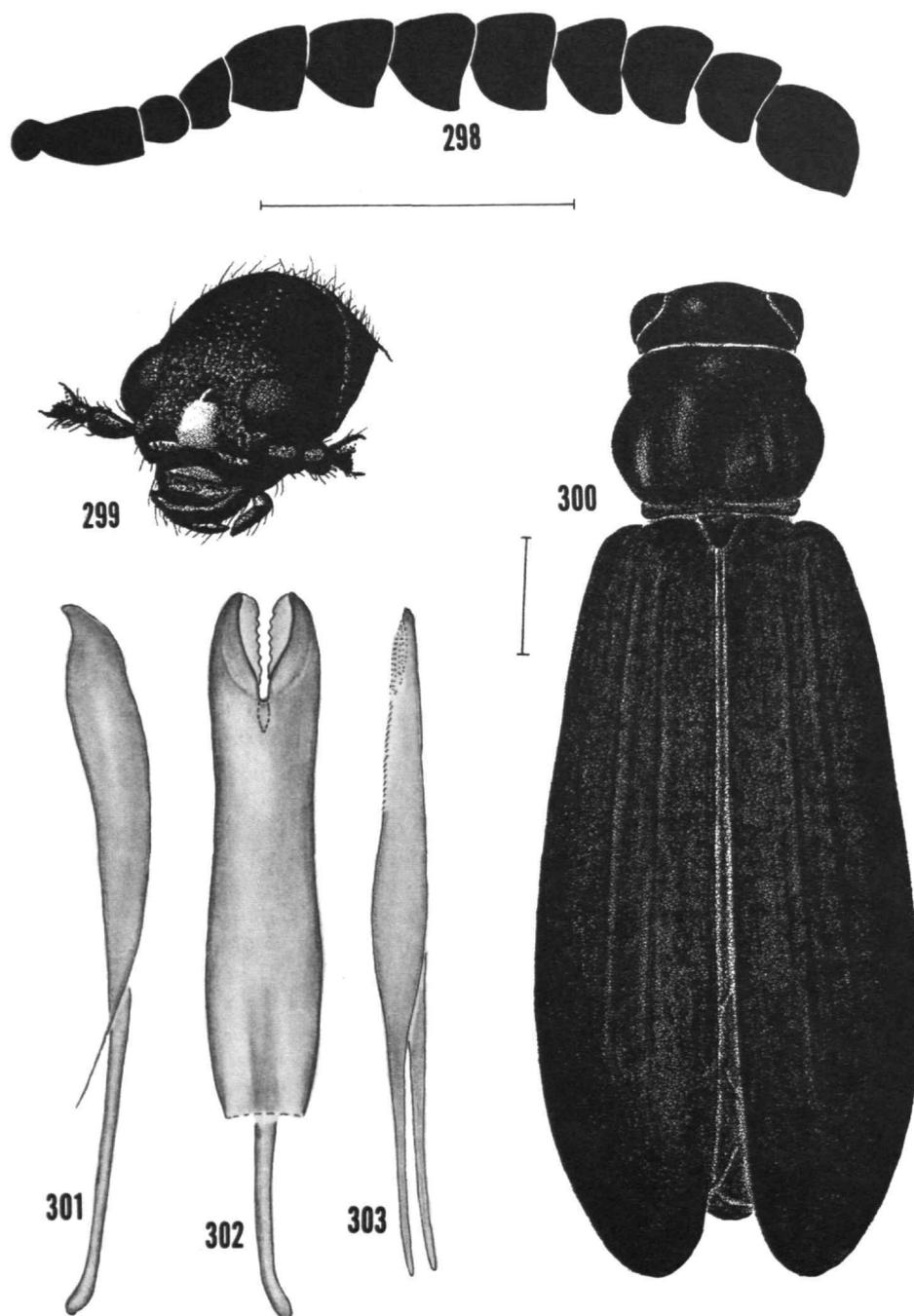
NATURAL HISTORY.—The holotype was collected from El Palmito, Mexico in July.

ETYMOLOGY.—Latin compound noun formed from the prefix *bi-* (two) + noun *crista* (ridge), referring to the two conspicuous longitudinal ridges on the elytral disc.

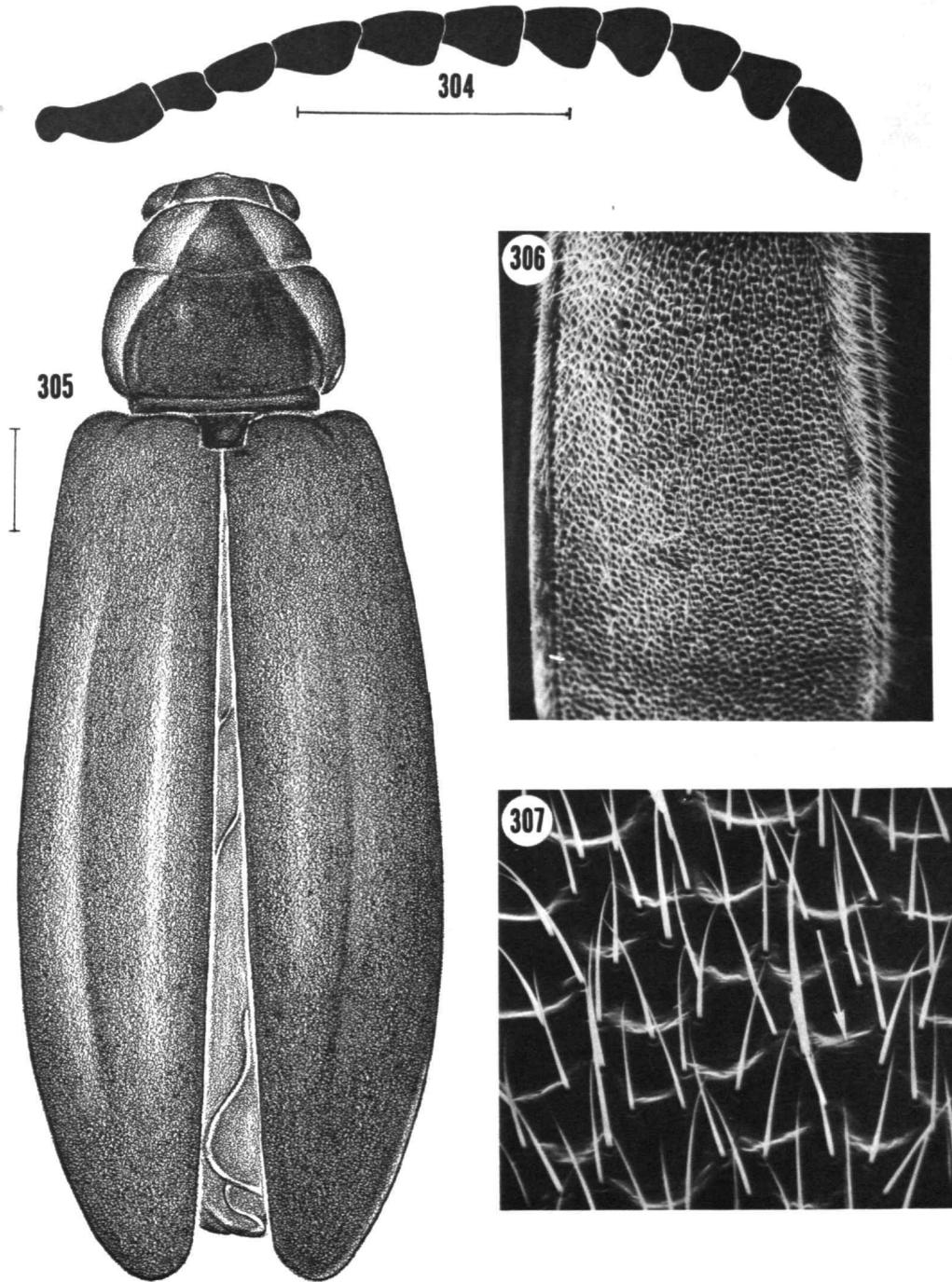
LOCALITY RECORDS (Figure 366).—I examined 1 adult specimen from Central America. MEXICO: Estado de Sinaloa: 15 miles [24 km] west of El Palmito (CNCC, 1 female, holotype).

The *ornaticollis* Group

The species included herein are substantially diverse anatomically, but as a group are charac-



FIGURES 298-303.—*Perilypus bicristatus*: 298, antenna; 299, head; 300, habitus. *P. fluctus*: 301, tegmen, lateral view; 302, tegmen; ventral view; 303, phallus. (Scale = 1 mm)



FIGURES 304-307.—*Perilypus ventralis*: 304, antenna; 305, habitus; 306, elytron, $\times 16$; 307, elytron, $\times 65$ (arrow indicates microsculpture). (Scale = 1 mm)

terized by mesoscutellum transverse, body form moderately to strongly oval, interocular depressions crescentic, elytral sutural notch right angle, elytral punctations small, and elytral surface usually conspicuously arenose. Male genital characteristics include, combined length of paramere and phallobase less than twice as long as phallobasic apodeme, phallobase marked with two dorsal and two ventral longitudinal bands, and first connecting membrane vested with serrulated scales.

Perilypus ventralis is a particularly aberrant member in the group. Only specimens of that species have the mesoscutellum stalked, postscutellar disc concave, epipleural fold in ventral position, elytron undulated longitudinally, and anterior accessory gland of male reproductive organs not completely coiled. In general, there is more habitus concordance between specimens of *P. ventralis* and lampyrid members of the *quadrilineatus* group than with the other members of the *ornaticollis* group. The similarity, however, is due to convergence and is not an expression of immediate common ancestry.

The composite distribution of the eight species in this group extends from Ohio, U.S.A., to Distrito Puerto Caballo, Venezuela.

42. *Perilypus ventralis* (Gorham), new combination

FIGURES 304–319, 368

Colyphus ventralis Gorham, 1882:141 [lectotype: female, and 3 paralectotypes, 2 males and 1 female, here designated, deposited in BMNH; type-locality: Dueñas, Departamento de Sacatepequez, Guatemala].

DIAGNOSIS.—In addition to the characteristics given in the key, specimens of this species are easily diagnosed by their large size (average length about 13 mm), concave mesoscutellar disc (Figure 312), and by the narrow and longitudinal pronotal foveae.

DESCRIPTIONS.—*Form:* As in Figure 305.

Size: Length: males, average about 12.9 mm, range 10.4–14.1 mm; females, average about 13.0 mm, range 10.0–14.4 mm. Width: males, average 4.6 mm, range 4.0–5.0 mm; females, average about 4.4 mm, range 3.6–5.2 mm. Eight males and 10 females measured.

Color: Head including antenna black; pronotum flavous at sides, with black triangular discal vitta

(Figure 305); prosternum black; legs black except femur with testaceous annulus (Figure 56); meso- and metasternum black; elytron color variable (see "Variation"); abdomen bicolorous, visible sterna I–III and VI black, IV–V flavous.

Head: Gular process (Figure 308) filiform; interocular depressions broad, shallow, conspicuously rugose and only feebly crescentic; frontal umbo prominent, narrowed from clypeus to epicranium; antennal carina coarsely punctate; frons broad; eyes not particularly convex; HW/IOW, average about 2.2, range 2.0–2.3 (18 specimens measured); antenna (Figure 304) serrate; length/width ratio of antennal articles sex dimorphic, male 2.2:1.5:1.5:1.7:1.3:1.2:1.2:1.2:1.2:1.0:1.9, female 2.3:1.5:1.7:2.0:1.9:1.8:1.6:1.5:1.3:1.3:2.0; AL/PLS, 2.2.

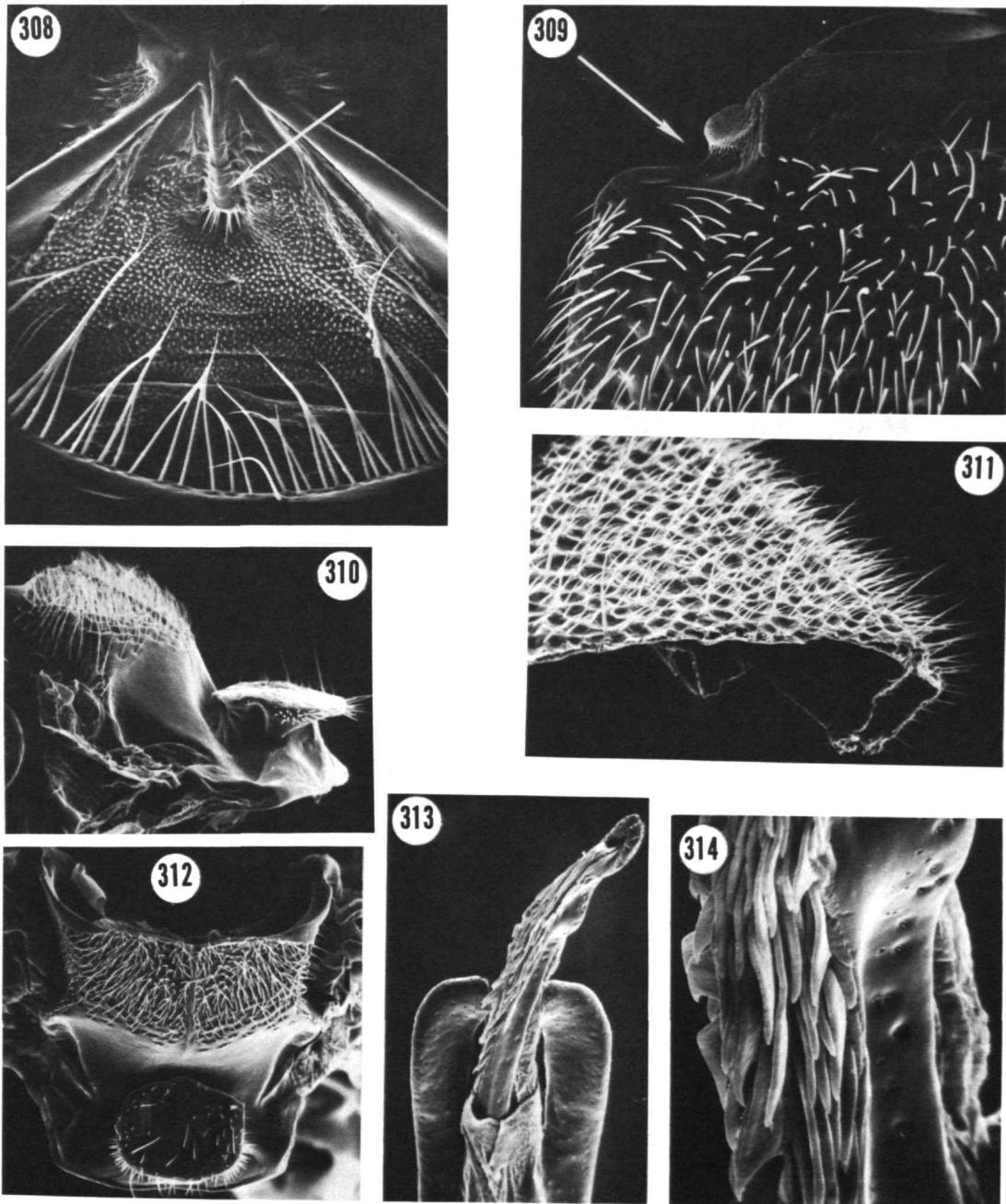
Pronotum (Figures 305): Transverse (PL/PW, average about 0.88, range 0.84–0.93; 18 specimens measured); densely setose; pronotal arch poorly defined; subapical depression feebly impressed at sides, nearly obliterated medially; pronotal foveae longitudinal and transversely rugose; prebasal depression shallow; pronotal collar narrow.

Mesoscutellum (Figures 310, 312): Transverse, stalked, and concave discally.

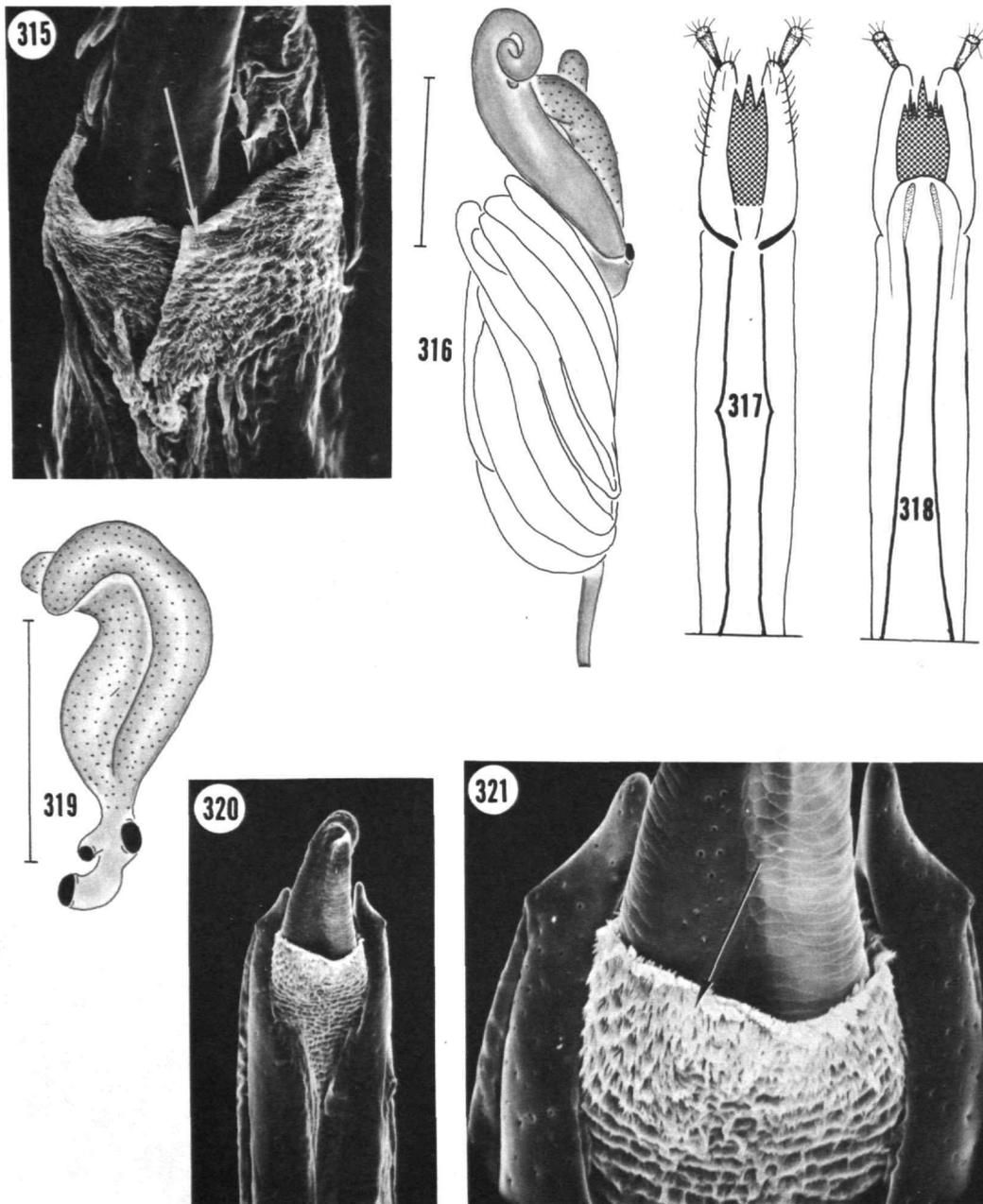
Elytron: Shallow, undulated longitudinally and copiously vested with short setae; posthumeral margin arcuate; slope of apical deflection very gradual; punctations small and profusely distributed throughout surface (Figure 306); punctate and interpunctate surface arenose (Fig. 307); epipleural fold broad, concave, and deflected internally; epipleural fold (Fig. 311) as wide as antennal article 11; sutural notch right angle; apical slope gradual; EL/EW, average about 4.5, range 4.3–5.0 (18 specimens measured).

Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 313, 314): Feebly sclerotized; phallobase with 2 dorsal and 2 ventral longitudinal bands, latter more sclerotized than remainder of phallobase. Combined length of phallobase and phallobasic apodeme 8 times longer than paramere. Combined length of paramere and phallobase 1.4 times longer than phallobasic apodeme. Paramere: apex truncate; lateral depression absent; dorsum and venter plane; mesoventral and mesodorsal margin broadly concave. Sinus: dorsal indistinct, half as long as lanceolate ventral. First connecting membrane with serrulate scales (Figure 315). Phallus: phallic plate very slender and



FIGURES 308-314.—*Perilypus ventralis*: 308, head venter and cervical membrane, $\times 90$ (arrow indicates gular process); 309, elytron, $\times 41$ (arrow indicates sutural cleft); 310, mesoscutellum, lateral view, $\times 45$; 311, elytron, $\times 41$; 312, mesoscutellum, dorsal view, $\times 45$; 313, aedeagus, ventral view, $\times 60$; 314, phallus, $\times 290$.



FIGURES 315-321.—*Perilypus ventralis*: 315, aedeagus, $\times 350$ (arrow indicates first connecting membrane); 316, male internal reproductive organs; 317, ovipositor, ventral view; 318, ovipositor, dorsal view; 319, posterior accessory gland. *P. ormaticollis*: 320, aedeagus, ventral view, $\times 117$; 321, aedeagus, ventral view, $\times 325$ (arrow indicates first connecting membrane). (Scale = 1 mm)

strongly sclerotized; marginal denticles absent; phallic plicae prolonged and set with very large spines (Figure 314) (18 specimens examined).

Female Genitalia (Figures 317, 318): Dorsal lamina heptalobed; ventral lamina trilobed, laminal incisions very short; proctiger semicircular; proctigeral bacculi not fused; ventral bacculus acuminate near middle; coxital plates absent (2 specimens examined).

Internal Reproductive Organs: Male (Figures 316, 319): anterior accessory gland uniramous, coiled distally, posterior accessory gland biramous, outer branch slightly longer than inner branch, both branches broadly arcuate; ejaculatory duct not bulbous anteriorly; testis composed of 12 follicles. Female: as in Figure 55 (4 males and 2 females examined).

VARIATION.—Structural: A female specimen from El Fortín, Mexico, is more oval in body form.

Color: Intrapopulation variation of elytral color not correlated with sex distinguishes a light phenon and a dark phenon. Beetles of the light phenon have flavous vitta on the sutural and epipleural margins. The epipleural vittae may be slightly expanded at midelytron. The elytron is entirely black in beetles of the dark phenon. In general, the elytral disc varies from brown to black.

*NATURAL HISTORY.—*In June Henry Dybas collected a female specimen from El Fortín, Mexico, at 1000 meters. From Sumpango, Guatemala, at 2012 meters, I collected 15 adult specimens on the compositae *Vernonia deppeana* Lessing. Fourteen of these were of the dark phenon, one of the light phenon. On the same plant I also collected specimens of the lampyrid genus *Photinus*. The striking similarity between these beetles was first noted by Gorham (1882:141), “. . . this, together with the color, gives this insect a singularly close resemblance to some Lampyridae which the two or three pale segments beneath heightens. The variety from Oaxaca [my light phenon] equally resembles those varieties of species of *Photinus* in which the margins are pale.”

DISTRIBUTION (Figure 368).—The known distribution of this species extends from Veracruz, Mexico, to Sacatepequez, Guatemala. Most of the specimens were collected at elevations from 1000 to 2012 meters.

LOCALITY RECORDS (Figure 368).—I have examined 28 adult

specimens from Central America: MEXICO: Estado de Veracruz: Fortín (FMNH, 1 female). Jesus Carranza (NMNH, 1 female). Estado de Guerrero: Jalapa (BMNH, 2 males). Estado de Oaxaca: Oaxaca (BMNH, 1 male). “México” (MNHP, 1 female). GUATEMALA: Departamento de Baja Verapaz: San Jeronimo (GEKI, 1 female). Departamento de Sacatepequez: Antigua (GEKI, 1 female; NMNH, 1 female); Sumpango (AMNH, 1 female; GEKI, 5 males and 4 females; FMNH, 1 female; NMNH, 1 male and 3 females); Dueñas (BMNH, 4 females, lectotype; GEKI, 1 female).

43. *Perilypus ornaticollis* (LeConte), new combination

FIGURES 320–330, 367

Cleronomus ornaticollis LeConte, 1880:194 [holotype: female, deposited in MCZC; type-locality: Ohio, U.S.A.].

Colyphus melanopterus Dury, 1906:251 [type deposited in CMNH; type-locality: Cincinnati, Ohio, U.S.A.; Synonymy by Wolcott (1910a:851)].

Colyphus furcatus Schaeffer, 1904:218 [lectotype: male, and 7 paralectotypes, 1 male and 6 females, here designated, deposited in NMNH; type-locality: San Tomas, Esperanza Ranch, Brownsville, Texas, U.S.A.; new synonymy].

According to Dury (1906:251) the type-specimen of *Colyphus melanopterus* Dury (*Cleronomus ornaticollis* LeConte) is “longer, much less hairy, the elytra are more shining and immaculate jet black” than representatives of *Colyphus furcatus* Schaeffer. Although I did not see the type-specimen of *C. melanopterus*, two other specimens from Ohio were studied. The characteristics mentioned by Dury fall within the range of variation of this species.

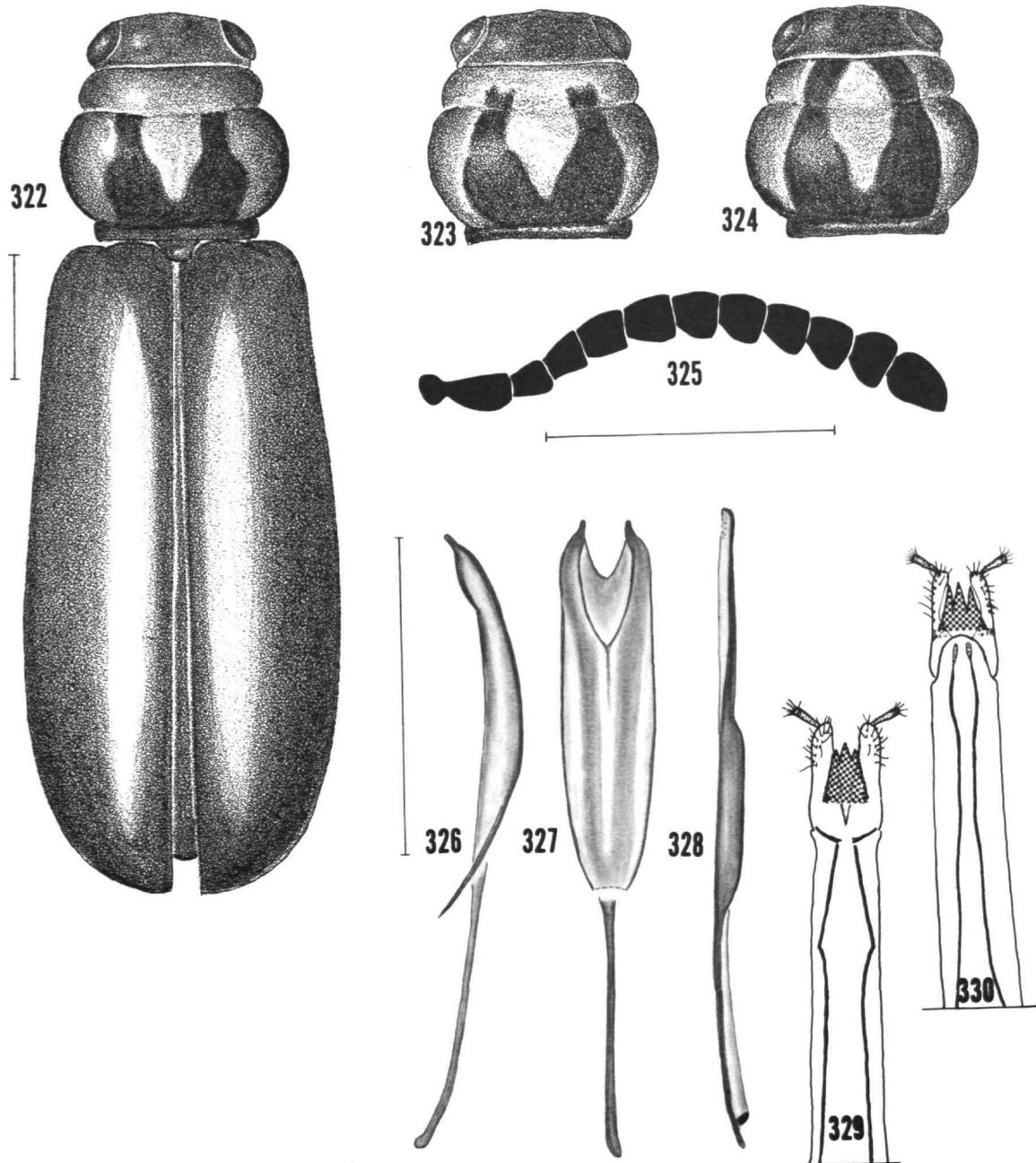
*DIAGNOSIS.—*Distinguishable by the bifurcate configuration of the pronotal discal vitta (Figures 322–324).

DESCRIPTION.—Form: As in Figure 322.

Size: Length: males, average about 6.7 mm, range 6.3–7.2 mm; females average about 7.9 mm, range 6.0–8.4 mm. Width: males, average about 2.0 mm, range 1.6–2.4 mm; females, average about 2.3 mm, range 1.5–2.8 mm. Six males and 15 females measured.

Color: Clypeus and frons flavotestaceous; epicranium, gena, antenna, and legs dark brown; pronotum and elytron variable (see “Variation”); prosternum flavotestaceous; legs, meso- and metasternum, and abdomen brown to black.

Head: Interocular depressions broad, well impressed, and crescentic; frontal umbo prominent; frons broad; eyes moderately convex; HW/IOW,



FIGURES 322-330.—*Perilypus ornaticollis*: 322, habitus; 323-324, pronota; 325, antenna; 326, tegmen, lateral view; 327, tegmen, ventral view; 328, phallus; 329, ovipositor, ventral view; 330, ovipositor, dorsal view. (Scale = 1 mm)

average about 1.8, range 1.3–1.9 (21 specimens measured); antenna (Figure 325) boldly serrate; length/width ratio of antennal articles sex dimorphic, male 2.0:1.1:1.3:1.2:1.1:1.1:1.2:0.9:0.9:0.7:1.3, female 2.0:1.1:1.3:1.2:1.2:1.2:1.0:1.0:0.8:0.7:1.2; AL/PLS, 1.7.

Pronotum: Strongly transverse (PL/PW, average about 0.81, range 7.4–8.7; 21 specimens measured); side margin of pronotum proper boldly convex; subapical depression parallel with anterior margin, pronotal arch narrow, feebly convex; prebasal depression shallow; pronotal collar narrow.

Mesoscutellum: Transverse.

Elytron: Posthumeral margin straight in basal third, arcuate in apical two-thirds; slope of apical deflection gradual; punctations broad and shallow; punctate and interpunctate surfaces with rugose microsculpture, latter makes elytral surface appear areose; densely setose; EL/EW, average about 4.5, range 4.1–5.6 (21 specimens measured).

Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 320, 321, 326–328): Feebly sclerotized; phallobase with 2 dorsal and 2 ventral longitudinal bands, latter more sclerotized than remainder of phallobase. Combined length of phallobase and phallobasic apodeme 7 times longer than paramere. Combined length of paramere and phallobase 1.4 times longer than pallobasic apodeme. Paramere: acuminate; inner walls of paramere densely setose. Sinus: dorsal, half as long as ventral. First connecting membrane set with serrulate scales (Figure 321). Phallus: apex lobiform; phallic plate abruptly narrowed at middle and at junction with phallic apodeme; marginal denticles absent; phallic plicae inconspicuous (6 specimens examined).

Female Genitalia (Figures 329, 330): Dorsal and ventral lamina trilobed, latter with very short incisions; proctiger broad, nearly semicircular; proctigeral bacculi not fused; ventral bacculus acuminate near middle; coxital plates absent (2 specimens examined).

Internal Reproductive Organs: Male: lateral accessory gland uniramous, coiled throughout (1 specimen examined).

VARIATION.—*Structural*: The antenna is more serrate and body form more oval in three female specimens from southeastern Mexico; two of these

also differ by their more transverse pronotum (PL/PW, 0.76).

Color: In general, southern specimens are lighter than northern ones. Beetles from the southern part of the range (south of Louisiana) have an incomplete pronotal vitta (Figure 322), and the elytron is broadly vittate (Figure 322). The pronotal vitta is percurrent and the elytral disc avittate and more shiny in specimens north of Louisiana (Figure 324).

Two specimens, one from Tennessee and one from Arkansas, have the pronotal vitta prolonged unto the basal half of the pronotal arch (Figure 323).

NATURAL HISTORY.—Adult specimens were collected in March, May, June, and July. R. Kirkton collected one specimen in Arkansas in June within a "cotton alfalfa strip." Dury (1906:251) collected "one specimen while sweeping low vegetation in river bottom, July 5, 1905."

DISTRIBUTION (Figure 367).—This is the only species of *Perilypus* prominently distributed north of Mexico. The known range extends from Ohio, U.S.A., to Cordoba, Mexico.

LOCALITY RECORDS (Figure 367).—I examined 46 adult specimens from North and Central America. UNITED STATES: Ohio: Hamilton County (FMNH, 1 male); "Ohio" (MCZC, 1 female, holotype). Indiana: Tippecanoe County (GEKI, 1 female). Tennessee: Memphis (GEKI, 1 female). Louisiana: Alexandria (GEKI, 1 female). Arkansas: Mississippi County (WFBA, 1 female). Texas: Saint Thomas, Brownsville (GEKI, 1 female); Brownsville, Esperanza Ranch (AMNH, 1 female; CASC, 1 female; BMNH, 1 female; FMNH, 3 females; GEKI, 2 males and 8 females; GHNE, 1 female; LMDR, 2 females; MCZC, 1 male and 1 female; SEMK, 2 females; NMNH, 2 males and 7 females; UZMD, 1 female). MEXICO: Estado de Veracruz: San Rafael, Jicaltepec (GEKI, 1 female; MCZC, 2 females); Cordoba (GEKI, 1 female); Orizaba (GEKI, 1 female); 17 miles [27 km] north of Nautla (GEKI, 1 female).

REMARKS.—The three female specimens discussed under "Variation" are probably not conspecific, but I cannot decide on the basis of the available information. I labeled these *P. ornaticollis* (LeConte)?.

44. *Perilypus galbeus*, new species

FIGURES 332, 337–339, 355, 368

TYPE-LOCALITY.—Guatemala.

TYPE-SPECIMENS.—The holotype male is depos-

ited in MNHP and was collected by L. Conradt. The allotype is in BMNH.

DIAGNOSIS.—There is considerable habitus similarity between specimens of this species and those of *P. prolixicornis* and of *P. pilatus*. From the first of these, *P. galbeus* differs by its shorter antennal article 11 (compare Figures 331, 332), and from *P. pilatus* by the more oval and more convex elytron. Also, the elytral surface of *P. pilatus* is vested with exceptionally long vertical setae.

DESCRIPTION.—*Form:* As in Figure 355.

Size: Length: male 7.5 mm, female 8.8 mm. Width: male 2.4 mm, female 3.4 mm.

Color: Head black, except clypeus and mid-anterior region of frons flavotestaceous; antenna black; prothorax predominantly flavotestaceous, pronotal disc with tapering black vitta; legs black except femur annulated distally; meso- and metathorax, elytron, and abdomen black.

Head: Interocular depressions and frontal umbo as in *P. ornatcollis*; frons broad, eyes moderately convex; antenna (Figure 332) boldly serrate; antennal length sex dimorphic (AL/PLS, male 2.5, female 2.1) and article 11 as long as preceding two; length/width ratio of each antennal article, male 2.2:1.4:1.5:1.3:1.2:1.2:1.0:1.0:1.0:2.0.

Pronotum: Strongly transverse (PL/PW, average about 0.77, range 0.76–0.78; 2 specimens measured); subapical depression feebly sinuous, shallow at middle; pronotal arch narrow and shallow; foveae more transverse than punctiform; pronotum proper margin feebly arcuate; prebasal depression very shallow; pronotal collar very narrow medially.

Mesoscutellum: Transverse.

Elytron: More convex and more arenose than in *P. ornatcollis*; posthumeral margin arcuate throughout; slope of apical deflection gradual; epipleural fold feebly concave, as broad as antennal article 11; apex truncate; EL/EW, average about 4.2, range 3.8–4.5 (2 specimens measured).

Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 337–339): As in *P. ornatcollis* except paramere apex more gradually acuminate; dorsal and ventral sinus very narrow, latter sinus only slightly longer than dorsal sinus; and phallic plates uniformly slender.

Female Genitalia: Not studied.

VARIATION.—*Structural:* Antennal length is sex dimorphic; the male antenna is the longer. The two

specimens examined differ in shape of interocular depression which is more crescentic in the male.

Color: The two specimens do not vary appreciably in color.

DISTRIBUTION (Figure 368).—The known range extends from Veracruz, Mexico, to Guatemala.

ETYMOLOGY.—Latin noun *galbeus* (arm band), in allusion to the testaceous annulus on the femora.

LOCALITY RECORDS (Figure 368).—I examined 2 adult specimens from Central America. MEXICO: Estado de Veracruz, Cordoba (BMNH, 1 female). GUATEMALA (MNHP, 1 male, holotype).

45. *Perilypus prolixicornis*, new species

FIGURES 331, 334–336, 368

TYPE-LOCALITY.—Cordoba, Estado de Veracruz, Mexico.

TYPE-SPECIMENS.—The holotype male, deposited in CASC, was collected by A. Feyes.

DIAGNOSIS.—The only specimen studied can be distinguished from congeners by the length of antennal article 11 (Figure 331), which is as long as the preceding three.

DESCRIPTION.—*Form:* As in *P. galbeus* (Figure 355).

Size: Length, 7.5 mm; width, 2.4 mm.

Color: As in *P. galbeus*.

Head: As in *P. galbeus* except antennal article 11 (Figure 331) proportionally longer; length/width ratio of each antennal article, 2.0:1.1:1.0:1.3:1.3:1.1:1.0:0.9:0.8:0.9:3.5; and AL/PLS, 4.9.

Pronotum: As in *P. galbeus* except foveae broader and shallower.

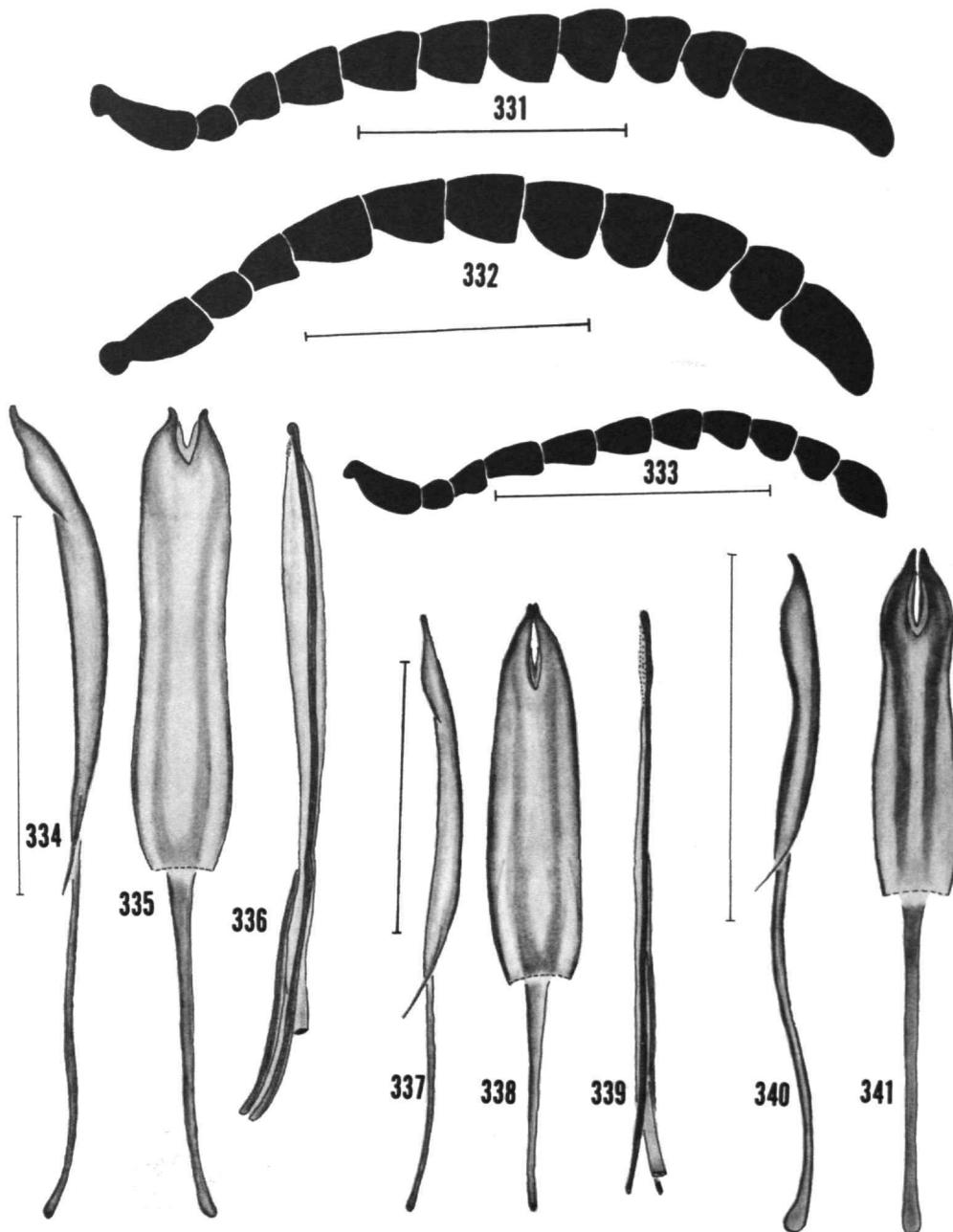
Elytron: As in *P. galbeus*.

Front Tarsal Claws: Symmetrical.

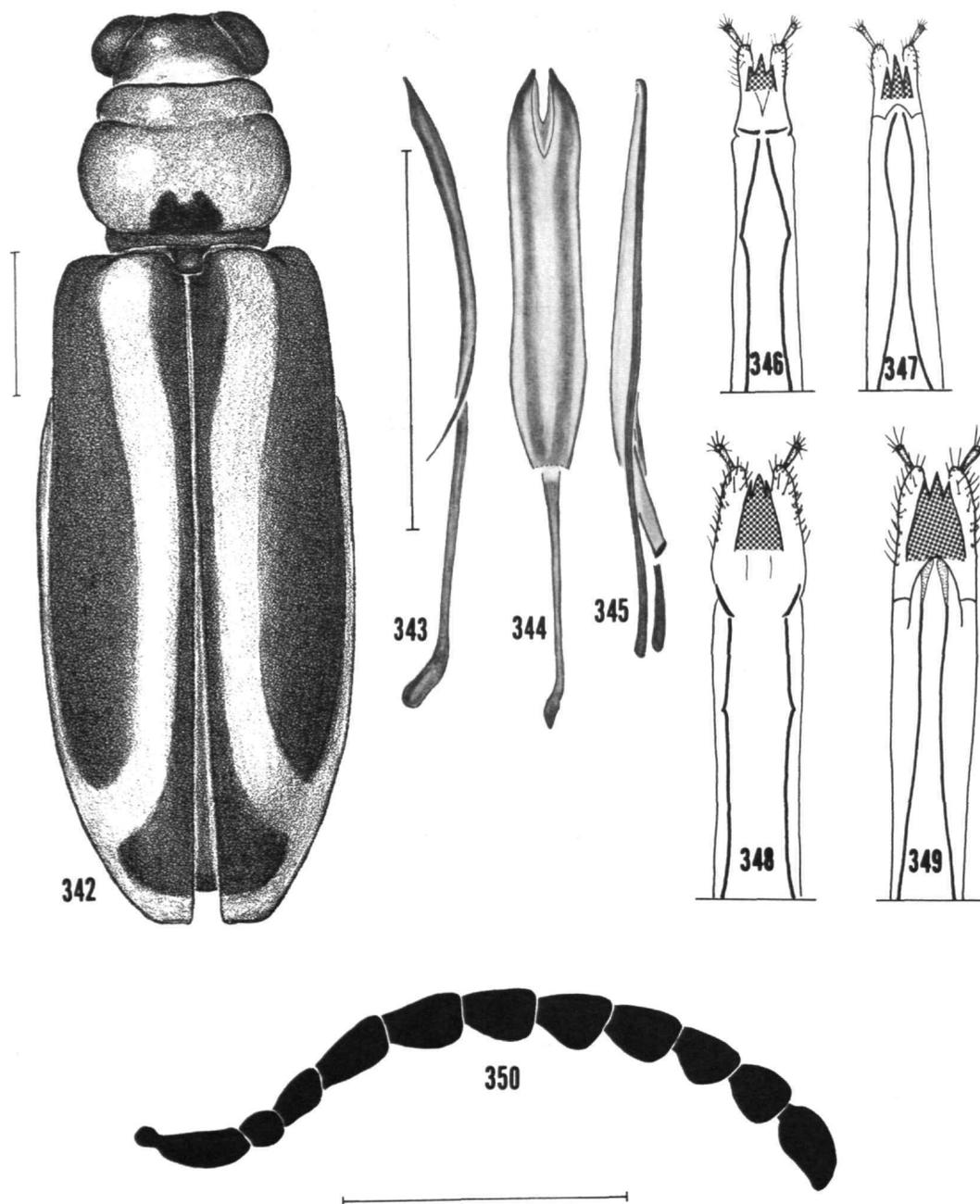
Mesoscutellum: Transverse.

Male Genitalia (Figures 334–336): Generally as in *P. ornatcollis* (LeConte) but differs from that species as follows: combined length of phallobase and phallobasic apodeme 10 times longer than paramere; paramere apices excurved, ventral sinus only slightly longer and broader than dorsal sinus, and phallic plate uniformly narrow.

ETYMOLOGY.—Latin adjective *prolixus* (stretched out) + the noun *cornu* (horn) + 1 adjectival ending *-is*; referring to the long antennal article 11.



FIGURES 331-341.—*Perilypus prolixicornis*: 331, antenna; 334, tegmen, lateral view; 335, tegmen, ventral view; 336, phallus. *P. galbeus*: 332, antenna; 337, tegmen, lateral view; 338, tegmen, ventral view; 339, phallus. *P. floralis*: 333, antenna; 340, tegmen, lateral view; 341, tegmen, ventral view. (Scale = 1 mm)



FIGURES 342-350.—*Perilypus floralis*: 342, habitus; 343, tegmen, lateral view; 344, tegmen, ventral view; 345, phallus; 346, ovipositor, ventral view; 347, ovipositor, dorsal view. *P. pilatus*: 348, ovipositor, ventral view; 349, ovipositor, dorsal view. *P. antarius*: 350, antenna. (Scale = 1 mm)

LOCALITY RECORD (Figure 368).—I examined 1 adult specimen from Central America. MEXICO: Estado de Veracruz: Cordoba (CASC, 1 male, holotype).

46. *Perilypus pilatus*, new species

FIGURES 348, 349, 351, 354, 368

TYPE-LOCALITY.—Cerro Campana, Provincia de Panamá, Panama.

TYPE-SPECIMENS.—The holotype female, deposited in NMNH, was collected by H. P. Stockwell in 1970.

DIAGNOSIS.—The stout black setae on the elytral surface and the conspicuous divergence of sutural margins at the elytral apical fifth are diagnostic characteristics of this species.

DESCRIPTION.—*Form*: As in Figure 354.

Size: Length: 8.4 mm. Width: 2.9 mm.

Color: As in *P. ornatcollis* except pronotal vitta not furcate; pronotal sides roseate; apex and suture of elytron black; and femora with subapical testaceous annulus.

Head: As in *P. ornatcollis* except eyes more convex (HW/IOW, 2.1); antenna (Figure 350) more compressed, more distinctly serrate, and proportionally longer (AL/PLS, 2.0); and length/width of each antennal article 2.0:1.0:1.1:1.3:1.2:1.2:1.0:0.9:0.8:1.3.

Pronotum: As in *P. ornatcollis* except subapical depression more sinuous and foveae more deeply impressed.

Mesoscutellum: Transverse.

Elytron: Posthumeral margin arcuate; punctations particularly small and shallow; punctate and interpunctate surfaces densely arenose; surface copiously vested with short pale reclinate setae and with stout black vertical setae; sutural hinge abruptly narrowed at apical fifth; elytral sutural margin diverging in apical fifth; apex sinuato-truncate (Figure 354); EL/EW, 3.9.

Front Tarsal Claws: Symmetrical.

Female Genitalia (Figures 348, 349): As in *P. ornatcollis* except dorsal laminal incisions shorter and proctiger more slender.

NATURAL HISTORY.—In July H. P. Stockwell collected the holotype from the type-locality (800 meters) by beating.

ETYMOLOGY.—Latin adjective *pilatus* (thick), referring to the stout elytral vertical setae.

LOCALITY RECORDS (Figure 368).—I examined 1 adult specimen from Central America. PANAMA: Provincia de Panamá, Cerro Campana (NMNH, 1 female, holotype).

47. *Perilypus antarius*, new species

FIGURES 350, 352, 353, 368

TYPE-LOCALITY.—San Pedro, Montes de Oca, Provincia de San José, Costa Rica.

TYPE-SPECIMEN.—The holotype female, deposited in NMNH, was collected by C. H. Ballou in 1936.

DIAGNOSIS.—Elytral apex strongly upcurved (Figure 353).

DESCRIPTION.—*Form*: As in Figure 352.

Size: Length 7.8 mm. Width 2.5 mm.

Color: As in *P. ornatcollis* except epipleural fold flavotestaceous, pronotal vitta not furcate, elytral disc avittate, femora annulated subapically, and posterior margin of abdominal sterna flavotestaceous.

Head: As in *P. ornatcollis* except antenna (Figure 350) proportionally longer (AL/PLS, 2.5); length/width ratio of each antennal article 2.2: 1.1:1.2:1.9:1.7:1.5:1.5:1.3:1.3:1.1:1.9; and HW/IOW, 2.2.

Pronotum: As in *P. ornatcollis* except subapical depression more impressed and PL/PW, 0.73.

Mesoscutellum: Transverse.

Elytron: As in *P. ornatcollis* except apex uplifted epipleural fold obliquely convex; and EL/EW, 4.8.

Front Tarsal Claws: Symmetrical.

NATURAL HISTORY.—In June, from the type-locality, G. H. Ballou collected the holotype on *Hemalia erecta* Linnaeus.

ETYMOLOGY.—Latin adjective *antarius* (hoisting), referring to the uplifted elytral apex.

LOCALITY RECORDS (Figure 368).—I examined 1 adult specimen from Central America. COSTA RICA: Provincia de San José: San Pedro, Montes de Oca (NMNH, 1 female, holotype).

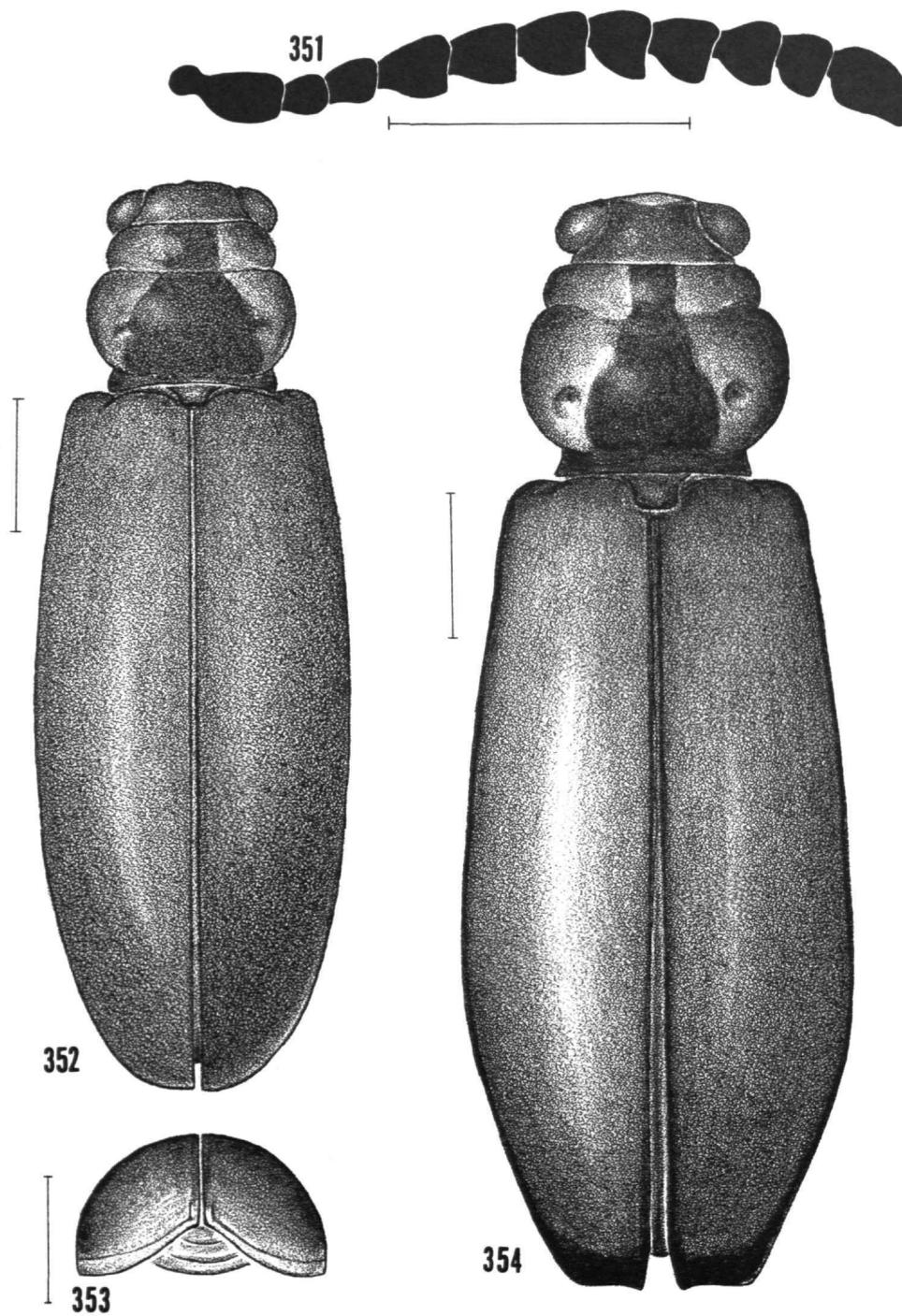
48. *Perilypus sinuapicis*, new species

FIGURES 343–345, 369

TYPE-LOCALITY.—San Esteban, Estado de Carabobo, Venezuela.

TYPE-SPECIMENS.—The male holotype, deposited in FMNH, was collected by P. J. Anduze in 1939.

DIAGNOSIS.—Easily distinguishable from speci-



FIGURES 351-354.—*Perilypus pilatus*: 351, antenna; 354, habitus. *P. antarius*: 352, habitus; 353, hind body. (Scale = 1 mm)

mens of *P. floralis*, the only other member of the *ornaticollis* group whose specimens have the elytral surface very shiny, by differences in elytral color (elytron is avittate in specimens of *P. sinuapicis*). Also, in specimens of *P. sinuapicis* the antenna is black and femora predominantly dark brown whereas in those of *P. floralis* the antenna and the abdomen is entirely flavotestaceous.

DESCRIPTION.—*Form*: As in *P. floralis* except epipleural margin less convex.

Size: Length: 6.2 mm. Width: 1.9 mm.

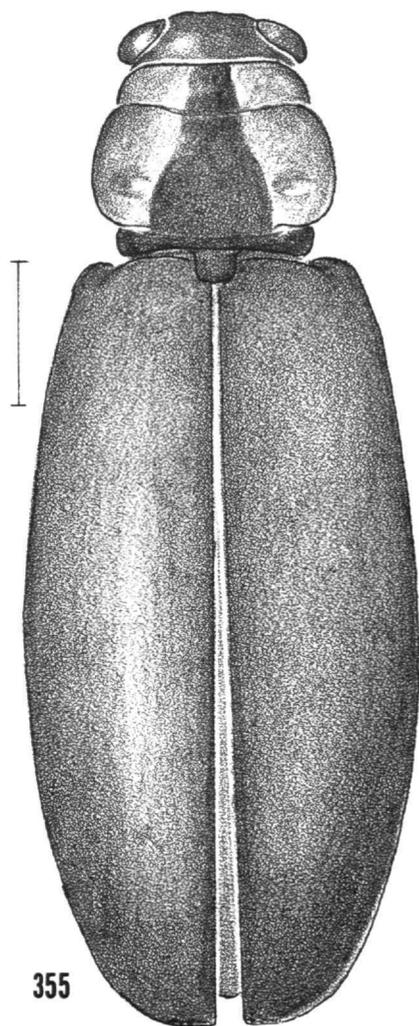


FIGURE 355.—*Perilypus galbeus*, habitus. (Scale = 1 mm)

Color: As in *P. ornaticollis* except pronotal vitta not furcate and femur with testaceous annulus.

Head: As in *P. ornaticollis* except eyes more convex (HW/IOW, 2.2), antenna proportionally longer (AL/PLS, 2.1), and length/width ratio of each antennal article 2.0:1.1:1.4:1.5:1.5:1.3:1.2:1.1:1.2:1.5.

Pronotum: As in *P. ornaticollis* except less transverse and subapical depression more deeply impressed.

Mesoscutellum: Transverse.

Elytron: As in *P. ornaticollis* except punctate and interpunctate surfaces shiny, only feebly arenose, epipleural fold convex, and apex sinuatotruncate.

Front Tarsal Claws: Symmetrical.

Male Genitalia (Figures 343–345): As in *P. ornaticollis* except combined length of paramere and phallobase 1.6 times longer than phallobasic apodeme, paramere apex more acuminate, dorsal and ventral sinus narrower, and phallic plates not abruptly widened at middle.

NATURAL HISTORY.—Unknown except the holotype was collected in December.

ETYMOLOGY.—Latin noun *sinus* (pocket) + noun *apex* (tip) + adjectival ending *-is*, referring to the emargination of elytral apex.

LOCALITY RECORDS (Figure 369).—I examined 1 adult specimen from South America. VENEZUELA: Estado de Carabobo: San Esteban (FMNH, 1 male, holotype).

49. *Perilypus floralis* (Gorham), new combination

FIGURES 333, 340–342, 346, 347, 368

Colyphus floralis Gorham, 1882:142 [holotype: male, deposited in BMNH; type-locality: Volcán de Chiriquí, Provincia de Chiriquí, Panama].

DIAGNOSIS.—Distinguishable from all other congeneric species by the unique configuration of the elytral vittae. The flavous discal vitta begins at the elytral midbase and arches to join the epipleural margin vitta at the elytral apical fifth (Figure 342).

DESCRIPTION.—*Form*: As in Figure 342.

Size: Length: males, average about 6.8 mm, range 6.6–6.9 mm; females, average about 6.7 mm, range 6.0–7.4 mm. Width: males, 2.3 mm; females, average about 2.1 mm, range 1.9–2.4 mm. Two males and 3 females measured.

Color: Clypeus, frons, posterior epicranial region, venter of head, and antenna flavotestaceous; an-

terior epicranial region and gena black; prothorax flavotestaceous, except pronotum with black mid-basal macula; legs flavotestaceous; meso- and metasternum black; elytron predominantly black, with sinuous discal and linear marginal vitta converging at apical fifth; abdomen black.

Head: Interocular depression, frontal umbo, and eye convexity as in *P. ornatcollis*; frons broad (HW/IOW, average about 2.0, range 1.8–2.1; 5 specimens measured); antenna (Figure 333) distinctly serrate; length/width ratio of each male antennal article 1.8:1.3:1.3:1.8:1.7:1.5:1.5:1.7:1.7:1.2:2.0; AL/PLS sex dimorphic, male 2.6, female 2.3.

Pronotum: Boldly transverse (PL/PW, average about 0.78, range 0.71–0.80; 5 specimens measured); subapical depression deeply impressed; side margin of pronotum proper boldly convex; fovea prominent, broad and shallow; prebasal depression shallow; pronotal collar narrow.

Mesoscutellum: Transverse.

Elytron: Elytral surface as in *P. ornatcollis* except surface smooth, shiny, less setose, and punctations reduced near suture and apex; epipleural fold very broad and convex (as wide as antennal article 11); apex feebly sinuatotruncate.

Front Tarsal Claws: Symmetrical in both sexes.

Male Genitalia (Figures 340, 341): As in *P. ornatcollis* except phallobasic apodeme as long as phallobase and paramere combined; dorsal and ventral sinus broader, latter only slightly shorter than ventral; and phallus uniformly slender (2 specimens examined).

Female Genitalia (Figures 346, 347): As in *P. ornatcollis* except ventral lobes more prominent and proctiger reduced (1 specimen examined).

Internal Reproductive Organs: Male, anterior accessory gland uniramous, coiled throughout (1 specimen examined).

VARIATION.—Antennal length is sex dimorphic, being longer in males than in females (AL/PL, male 2.6, females 2.3). The elytral vitta varies in width.

NATURAL HISTORY.—In August, at 915 meters on Cerro Campana, H. and A. Howden collected 1 adult specimen by beating. G. C. Champion collected 4 specimens from Volcán de Chiriquí at elevations from 915 and 1220 meters.

DISTRIBUTION (Figure 368).—The known distri-

bution extends from Provincia de Chiriquí, to Provincia de Panamá, Panama.

LOCALITY RECORDS (Figure 368).—I examined 5 adult specimens from Central America. PANAMA: Provincia de Chiriquí: Volcán de Chiriquí (BMNH, 2 males, holotype; GEKI, 1 female; MNHP, 1 female). Provincia de Panamá: Cerro Campana (HFHO, 1 female).

Immature Specimens

I studied two larvae and one pupa of *P. limbatus* (Gorham), the only known immature specimens of *Perilypus*. Although the larval description is based on one species, I tentatively consider the description generic even though the specimens studied probably do not present adequately the full complement of generic character states. Fortunately, the comprehensive publication of clerid larvae by Böving and Champlain (1920) provides some basis for making tentative decisions about generic characterizations, even when only a few larval specimens are available.

Lack of sufficient data and specimens precludes a precise age determination of the two larvae examined. On the basis of size, the larger specimen probably belongs to at least the penultimate larval instar.

I do not provide a description of the pupa at this time because the only available specimen exhibits most of the *Perilypus* imaginal characteristics. The small uncinata urogomphi, and chaetotaxy, may be taxonomically important, but I cannot decide without comparative information. In lieu of a written description, habitus figures of the pupa (Figures 380, 381) are provided as preliminary diagnostic aids.

DIAGNOSIS.—Larval *Perilypus* are distinguished from larval specimens of most other genera of Clerinae studied to date by having only one seta on the outer surface of the mandible. The only known exceptions are *Trichodes bicinctus* Green and *T. nutalli* (Kirby) (Foster, 1976); the conspicuously concave hypostomal margin in *Trichodes* distinguish members of that genus from the available larvae of *Perilypus* in which the hypostomal margin is feebly oblique. Foster (1976) provided detailed characterizations of *Trichodes* larvae in his revision of North American *Trichodes*. The mandible of other known clerine larvae has at least two mandibular setae. Also, the anterior margin of the labrum

is emarginated deeply in larvae of *Perilypus*; the anterior labral margin in other known clerine larvae is more transverse, and shallowly emarginated or feebly arcuate.

DESCRIPTION.—*Form* (Figure 370): Digitiform, and cylindrical except head capsule flattened dorsoventrally; forebody more tapered than hindbody; densely vested with pale setae.

Size: Length 8.8 mm, width 1.6 mm.

Color: Mandible, cranium, pronotal plate, and ninth abdominal segment dark brown; remainder of mouthparts, antennae, legs, prosternal plate, and meso- and metanotal plates light brown; abdominal terga with pair of transverse purpurescent maculae; remainder of body white.

Head (Figures 371, 372): Prognathus and protruding. Head capsule transverse (length 0.9 mm, width 1.0 mm) plane, venter feebly tumescent; epicranial suture absent; frontal sutures feebly arcuate at anterior third; frons triangular, with shallow longitudinal rugosities; epicranium smooth; maxillary *hypostomal margin* (Figure 371) feebly oblique; gular sutures feebly sinuous; gular plate narrow, tapering posteriorly. Five stemmata (Figure 372) present; stemmata aligned in two parallel vertical rows, three in anterior row and two in posterior row. Antenna (Figure 376) composed of three articles and broad transparent basal membrane; article 1 largest, about twice as long as wide; article 2 quadrate, ventroapical region projecting a conical antennal appendix; article 3 about three times as long as wide and with long stout apical seta. Mandible (Figure 373) falciform, with one seta on posterior outer surface; mandibular groove deeply invaginated; apex unidentate; retinaculum shallow, present on middle of masticatory surface; lacinia mandibulae present, setiform, and only feebly bifid apically. Maxilla (Figure 377) with cardo and stipes trapezoidal, each with oblique transverse plate at base, plate of former asetose, of latter bisetose near outer margin; palpiger feebly sclerotized, bisetose at inner margin; palpus with three articles successively narrowing from basal article, article 1 transverse, article 2 quadrate, article 3 elongate; *pedunculate seta* well developed. Labium (Figure 371) with rudimentary ligula; submentum and mentum faintly sclerotized, former elongate, latter transverse; palpiger strongly sclerotized, with one stout seta on inner apical margin; palpus with two articles, article 1 subquadrate,

article 2 elongate and feebly arcuate. Labrum (Figure 375) transparent and well developed; side margins serrulated; anterior margin strongly emarginated; aboral surface bearing eight large setae arranged into two anterolateral groups of four. Epipharynx (Figure 375) with anterior row of 12 *truncate epipharyngeal seta*, and four *epipharyngeal sensilla*; latter dorsad to tormal sclerite, which extends into elongate processes posterolaterally.

Thorax (Figures 370, 378): Prothorax with notal plate strongly sclerotized, scutiform, and divided by a light midlongitudinal line; prosternum (Figure 378) with elliptical *midlongitudinal prosternal plate* (the sternal plate of Böving and Champlain, 1920:581) that adjoins two transverse *lateral prosternal plates* (the presternal area of same authors). Meso- and metathorax with pair of feebly sclerotized notal sclerotizations; sternomedial sclerotization elliptical in mesothorax and subovate in metathorax, plates feebly sclerotized in both segments. Legs well sclerotized, composed of five segments that taper to claw; coxa rectangular; femur as long as longitudinal diameter of coxa; tibia narrow, about as long as femur; tarsus unguiform.

Abdomen (Figure 370): Segments 1 to 8 without ampullae or sclerotizations; segment 9 (Figure 379) with strongly sclerotized notal plate, which projects as pair of widely separated uncinuate urogomphi; segment 10 reduced, entirely covered by segment 9.

VARIATION.—In addition to size, the smaller larva (length 8.0 mm, width 1.9 mm) differs from the larger one most conspicuously by the bluntness of the mandibular apex (Figure 374), shallower mandibular groove, equilateral head capsule, and by having shorter integumental setae.

DISCUSSION.—In addition to the immature specimens of *Perilypus* described in this paper, I studied larvae of the genera *Placopterus*, *Enoclerus*, *Thanasimus*, *Trichodes*, *Opilo*, and *Tillicera*. Because larvae of only a few genera of Clerinae are available, any discussion of relationships based on larval character states is obviously tentative. Nevertheless, such a discussion is presented to stimulate resyntheses as additional data become available.

The relative apotypy and plesiotypy of Clerinae larval characters is beyond surmise at present, because few clerine larvae are available for study. However, the presence of the lacinia mandibulae in the larvae of *Perilypus* (Figure 373) and *Placopterus*

(Figure 382) suggest a potentially close relationship. The lacinia mandibulae has heretofore not been reported in Cleridae although Crowson (1964:277) noted its occurrence in other families of the superfamily Cleroidea. Unfortunately, I have not been able to substantiate the possible close relationship between *Perilypus* and *Placopterus* on the basis of adult synapotypy, but earlier (p. 20) I alluded to the superficial similarities between some of their members. Should the lacinia mandibulae be judged a synapotypic characteristic, then it would be quite legitimate to infer sister group relationship between the aforementioned two genera since it is not unusual for taxa to lose indicators of "immediate" ancestry in the imago stage while retaining them in the immature stages. This is precisely why Hennig (1966:32) stressed the importance of the holomorphological approach in phylogenetic systematics.

The second item of interest regarding the aforementioned larvae is that they provide some hints of relationships at suprageneric level. The configuration of the hypostomal margin separates all the larvae examined into two groups. In *Perilypus*, *Placopterus*, and *Enoclerus* the margin is feebly oblique (as in Figure 371), whereas in the remaining genera the hypostomal margin is distinctly concave (Böving and Champlain, 1920, fig. 36). When the closely related genera of each group are brought into alignment an interesting pattern emerges, one that may have considerable heuristic value. The dichotomy, based on hypostomal margin configuration, essentially separates the more recently evolved genera (*Perilypus*, *Placopterus*, *Enoclerus*) from the aforementioned older generic groups (*Trichodes*, etc). The former group of genera are exclusively New World whereas the latter group is predominantly Old World except for *Priocera*, a New World genus with apparent Old World affinities.

Phylogeny and Zoogeography

PHYLOGENETIC METHODS

The postulated phylogenetic relationships within *Perilypus* are illustrated in Figures 383-386 and are based on Hennigian principles (Hennig, 1965, 1966). Hennig's tenets for reconstructing phylogeny were copiously reviewed elsewhere and I think it

unnecessary to rediscuss them or to restate their logic as justification for their use herein. However, I want to emphasize, an aspect of Hennig's approach apparently not fully appreciated; that is, systematic studies in which Hennigian methods are applied result in a more comprehensive presentation of available data about the organisms under study. The reason for this should become evident in the following paragraphs.

Fundamental to Hennig's methods of phylogenetic analysis are the breakdown of phenotypic resemblance into symplesiomorphy, synapomorphy, and convergence (for definitions see Hennig, 1965: 102), and the establishment of monophyletic groups only on the basis of shared apomorphic character states; that is, a taxon is monophyletic when it includes all the known descendants of that taxon's ancestor; the descendants are recognized by the concept of synapomorphy.

Hennig's approach to phylogenetic analysis has an inherent prerequisite for in-depth investigations of characters from as many aspects of an animal's gestalt as is available for study; hence, the possibility of discovering synapomorphies is maximized. How readily such similarities are detected is, of course, largely dependent on a group's evolutionary history. Often it is dependent on a specialist's willingness to conduct comprehensive analysis of more than just the readily observable characters.

In-depth studies of phenotype (morphological or otherwise) are essential to the holomorphological approach of character analysis forwarded by Hennig (1966:180). Results from such an approach are presented in phylogenetic systems in which relationships are recognized by definable criteria (autapomorphies or synapomorphies), which theoretically best approximate evolutionary history. The concept of monophyly by autapomorphy only is one of the crucial differences between the theory of phylogenetic systematics advocated by Hennig and that championed by Mayr (1969), or Sokal and Sneath (1963). Works not mentioned elsewhere in this paper that discuss some of Hennig's phylogenetic principles include Brundin (1966, 1968, 1972), Tuomikoski (1967), Darlington (1970), Schlee (1971), Kavanaugh (1972), and Mayr (1974).

CHARACTER PHYLOGENY.—The phylogenetic status of character states, whether apotypic (derived) or plesiotypic (primitive), must be resolved before

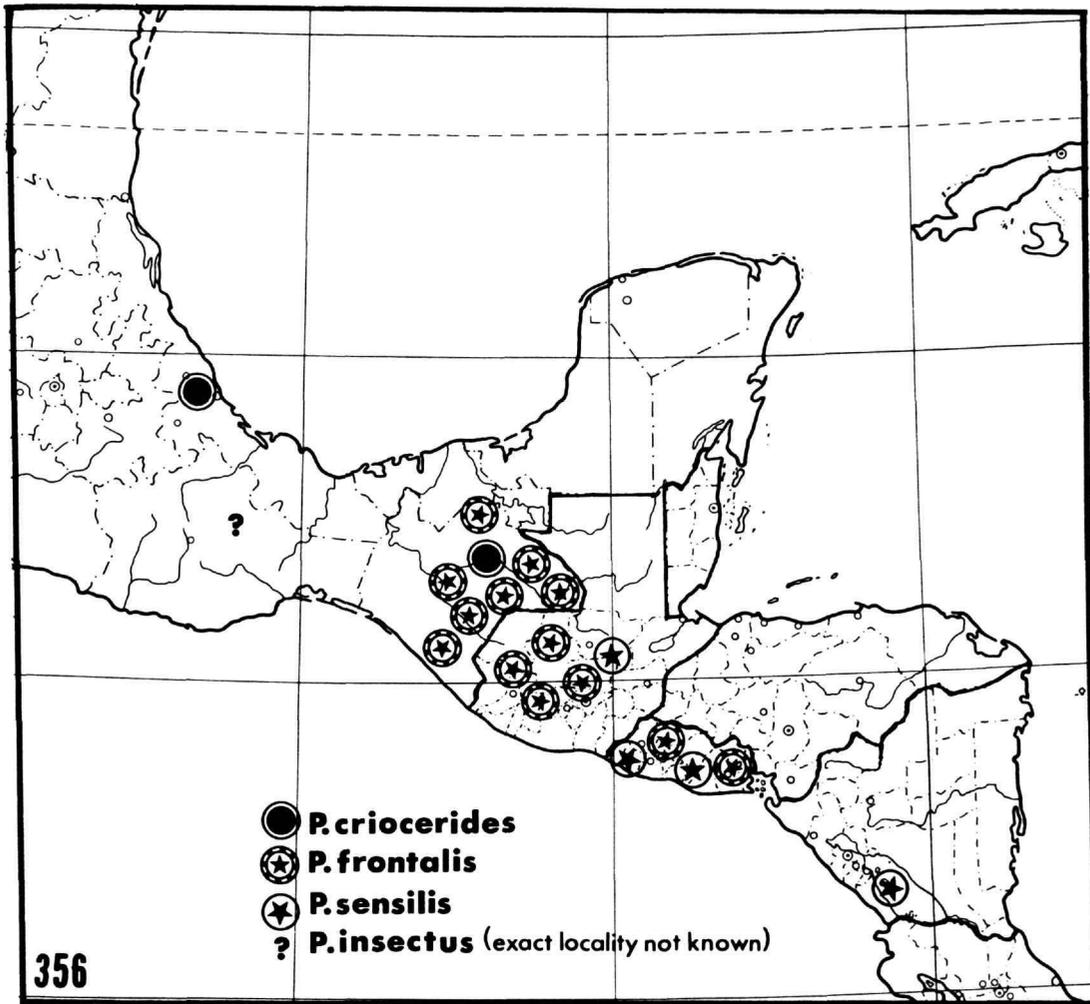
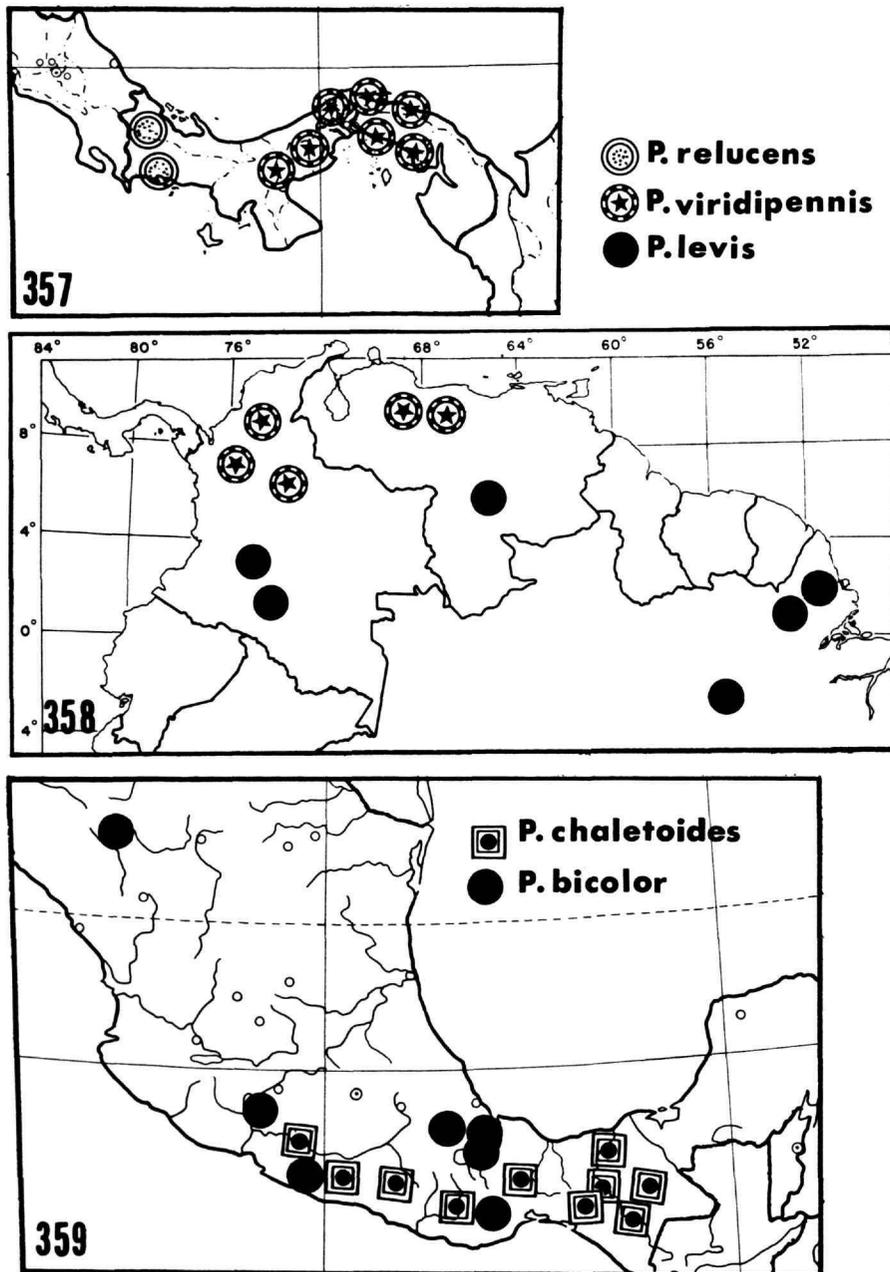


FIGURE 356.—Distribution map of the *frontalis* and *criocerides* groups.

sister-group relationships can be established (the prefixes apo- and plesio- are combined with the neutral suffix -typic (cf. Ball, 1975), not with -morphic which has strictly morphological implications). Criteria for inferring character phylogenies were proposed and/or reviewed in detail by Hennig (1965, 1966), Maslin (1952), Schlee (1969), Kluge and Faris (1969), Marx and Rabb (1970, 1972), Crowson (1970), Munroe (1974), Ross (1974), and by Ball (1975). Of the criteria mentioned by these authors those most relevant to this study are briefly discussed below. The application of most of these

criteria require of the specialist a broad understanding of character states (particularly their distribution) among diverse groups relevant to the taxa under investigation.

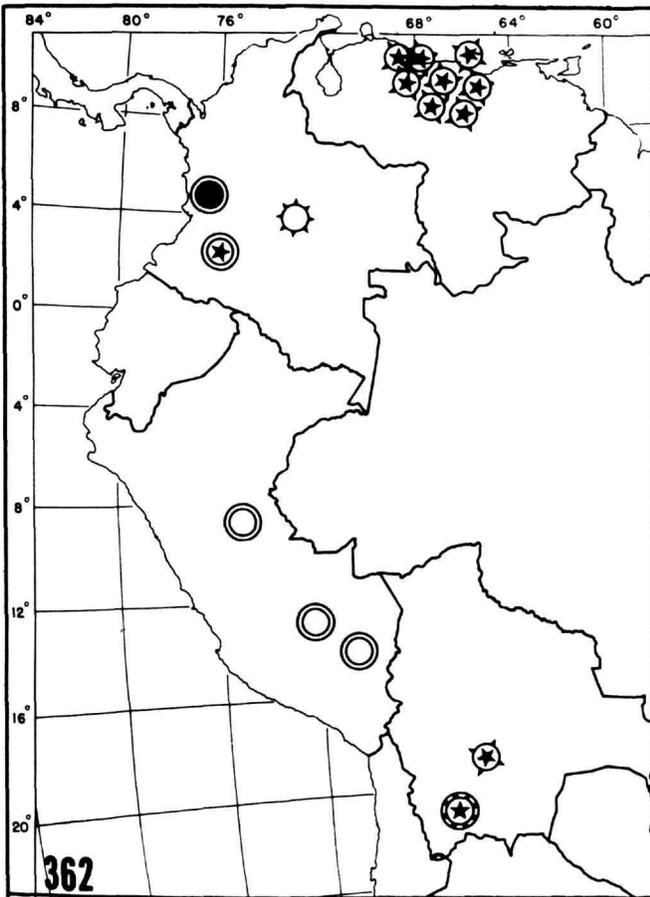
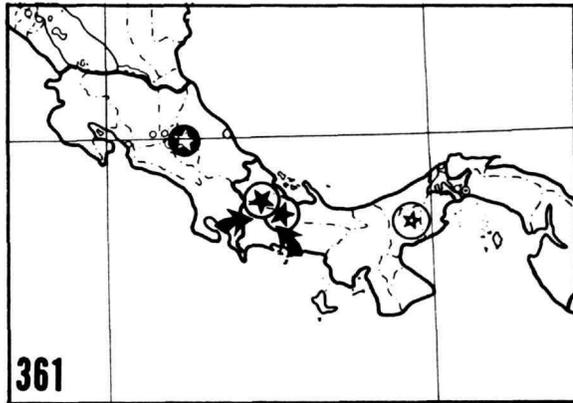
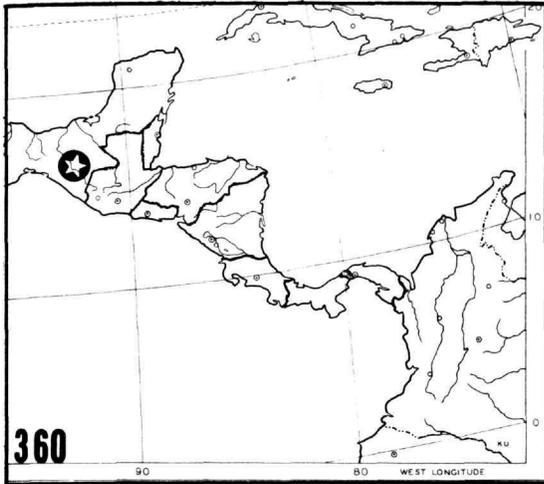
CRITERION OF FREQUENCY OF OCCURRENCE.—This is the most conventional method of predicting a characteristic's phylogenetic status, particularly when two-state characters are involved. The objective is to determine how extensively a character state is distributed within the taxon under study (e.g., genus) and among taxa of at least the next highest category (e.g., subtribe). Needless to say,



FIGURES 357-359.—Distribution maps: 357-358, the *viridipennis* group; 359, the *chaletoides* group.

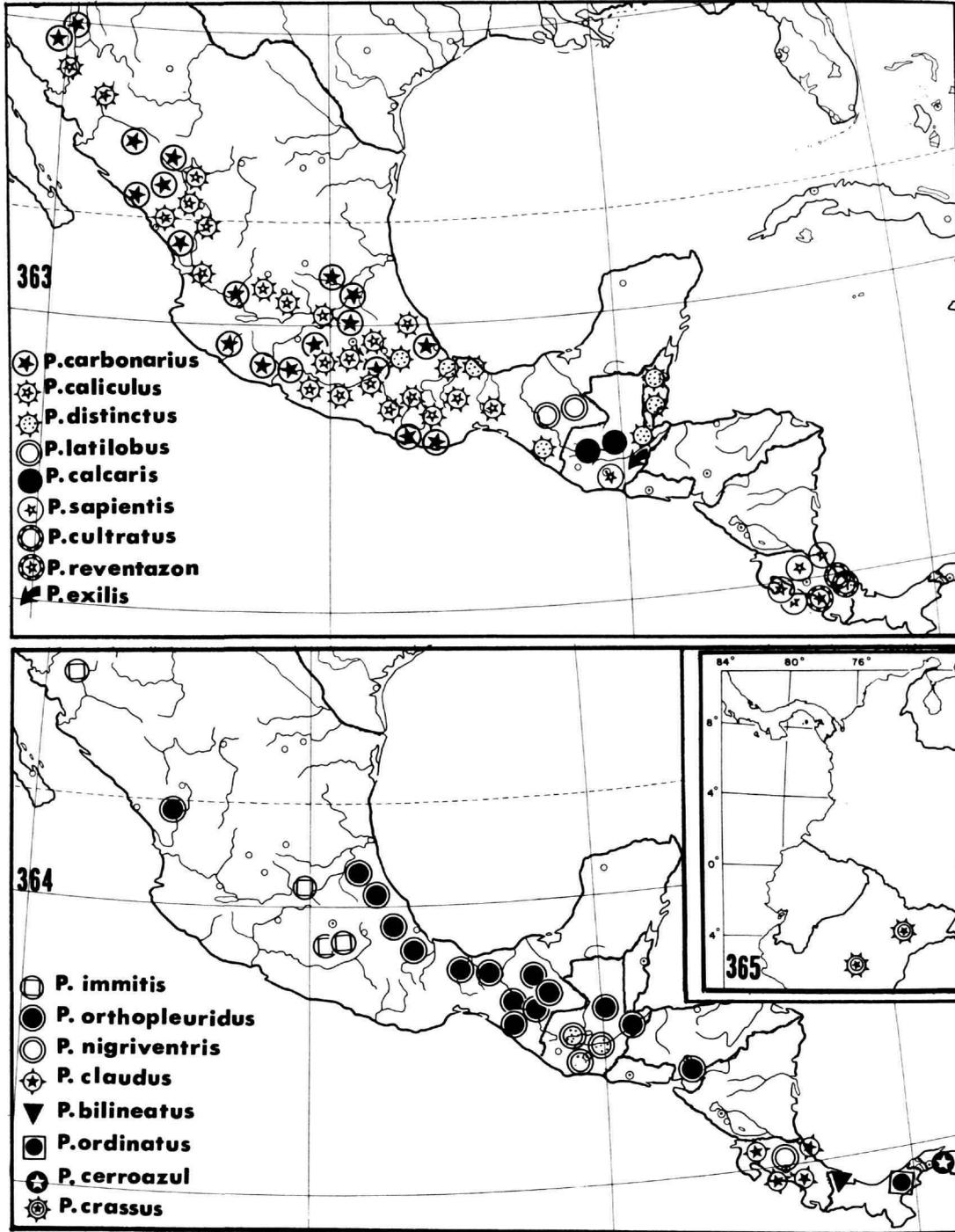
the more inclusive the survey of taxa the more credible becomes the assessment of character phylogeny. Character states widespread among diverse groups are classified as plesiotypic on the assump-

tion their extensive distribution is a result of inheritance, not due to independent evolution. Conversely, character states with limited distributions are interpreted apotypic because their re-

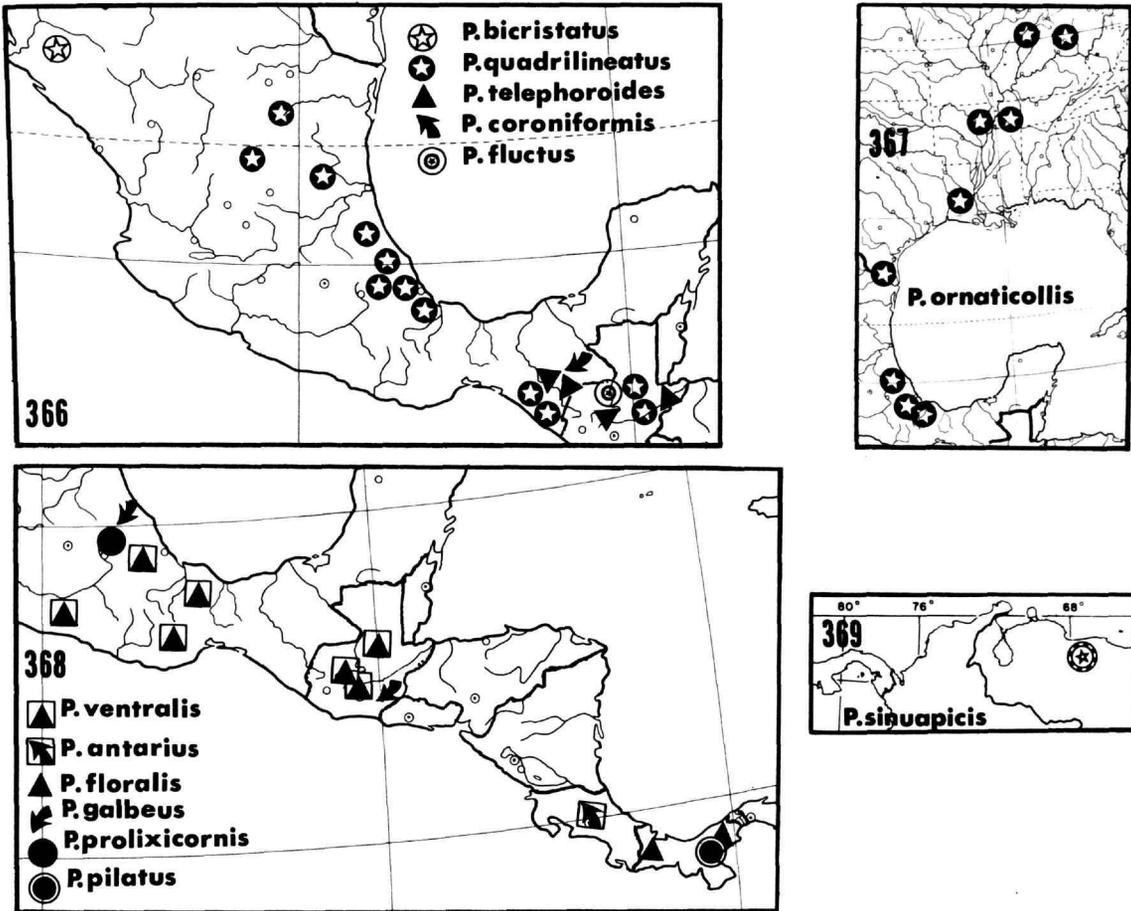


- ★ **P. proluxipenis**
- ★ **P. testaceicornis**
- ★ **P. decoris**
- ▲ **P. latilira**
- ★ **P. limbatus**
- **P. buga**
- ★ **P. iris**
- ★ **P. apocopatus**
- ☼ **P. columbicus**
- **P. acus**

FIGURES 360-362.—Distribution maps of the *limbatus* group.



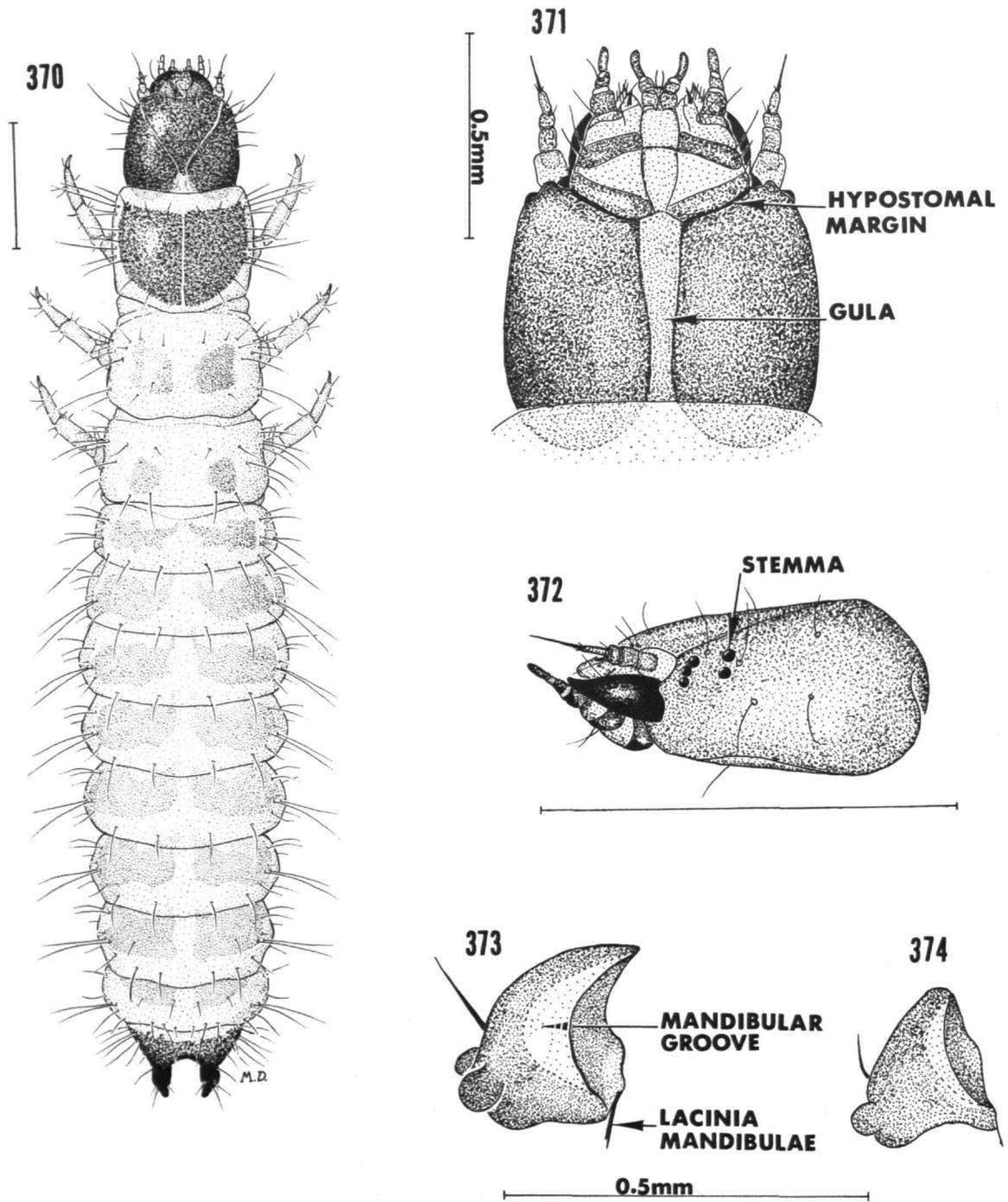
FIGURES 363-365.—Distribution maps of the *reventazon* group.



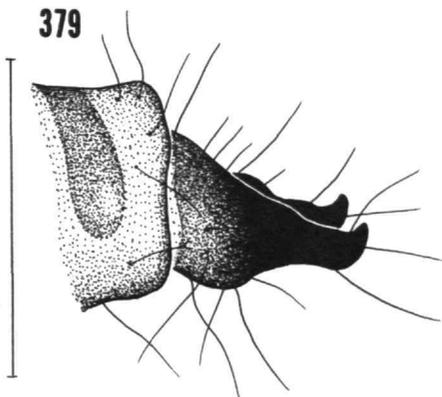
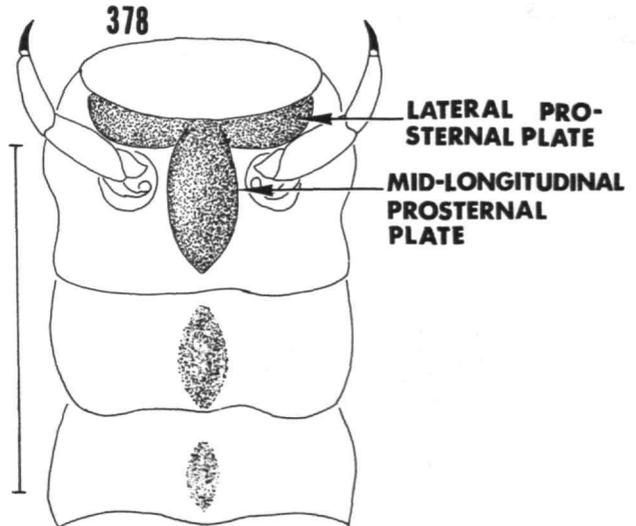
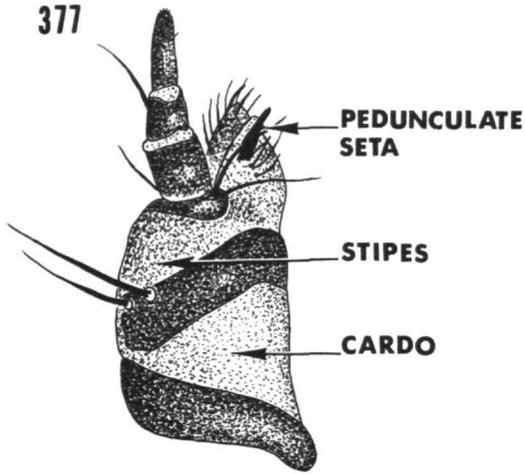
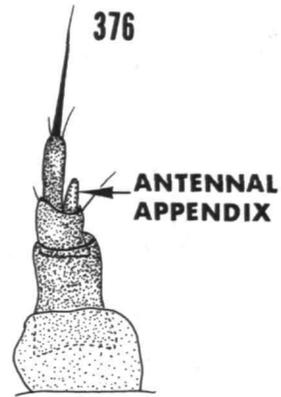
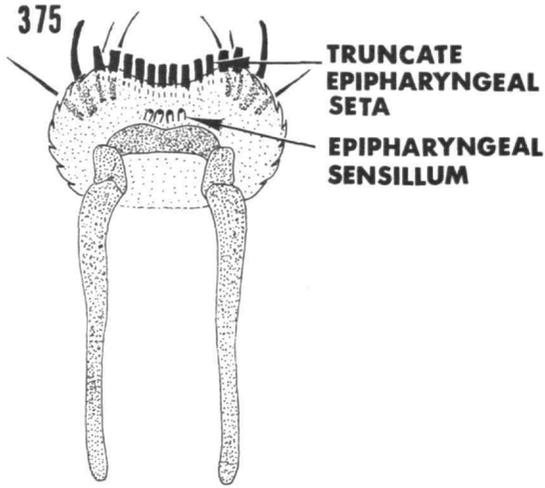
FIGURES 366-369.—Distribution maps: 366, the *quadrilineatus* group; 367-369, the *ornaticollis* group.

stricted occurrence is an assumed manifestation of recent evolution. However, limited distribution of characteristics may also indicate massive extinctions in lineages once rich in taxa. Should the majority of taxa of such a lineage become extinct, the few survivors would exhibit sparsely distributed, relictual characteristics; these could be mistaken as recently evolved on the basis of the criterion under consideration. While relictual characteristics, among extant taxa, are generally considered the exception, their potential presence must be carefully considered when the criterion of frequency of occurrence is used. The application of this criterion, and of some that follow, requires the assumption that in evolutionary progression character diver-

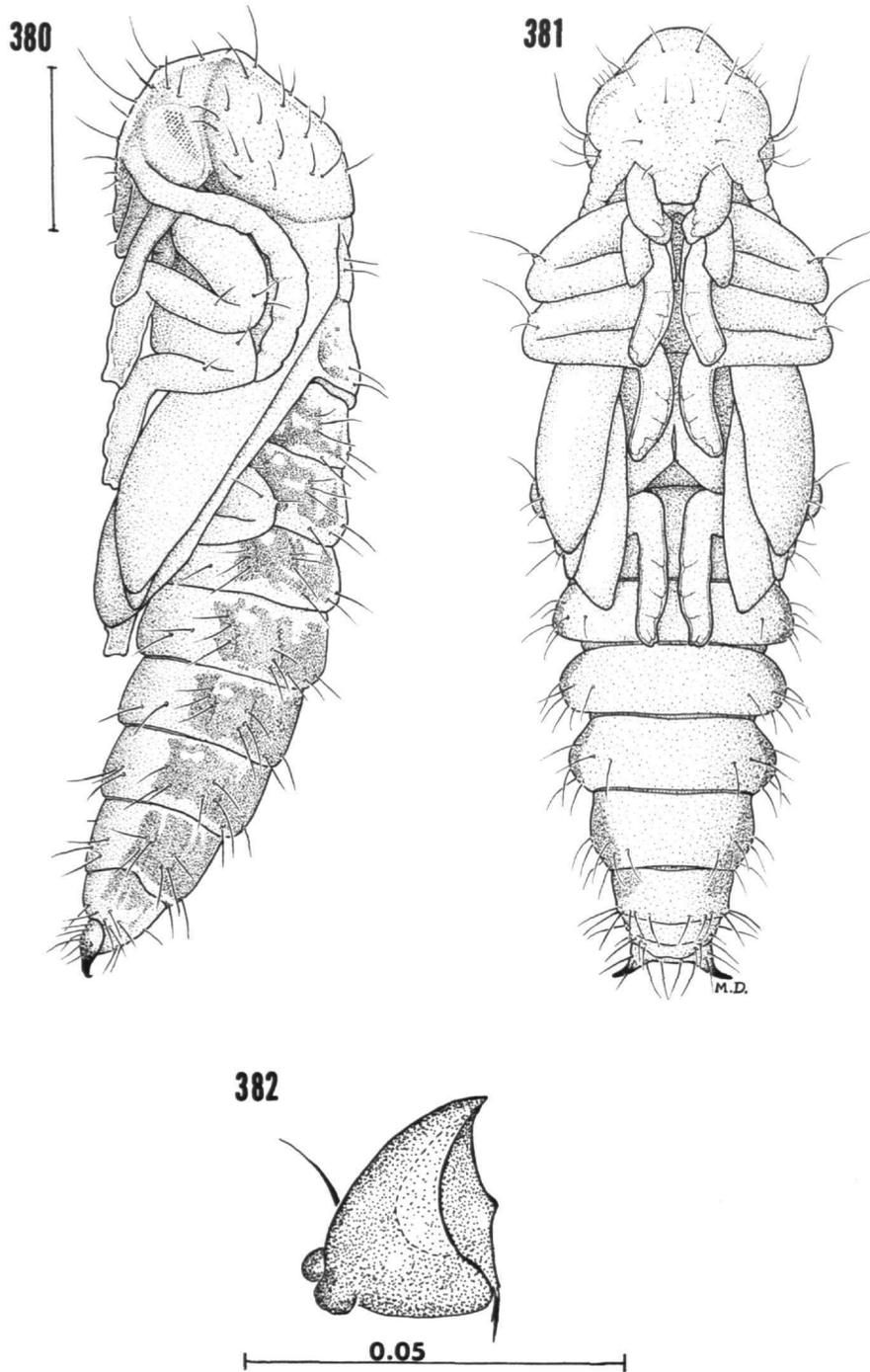
gence is more common than character convergence. **CRITERION OF CORRELATION TO TRANSFORMATION SERIES.**—Morphoclines, or morphological transformation series, in which the order and direction of change is known, provide a means of predicting character phylogeny of less understood morphoclines, or of states of two-state character systems whose phylogenetic value is unpredictable by the criterion of frequency of occurrence. Maslin (1952) and Hennig (1966) discussed various ways by which the relative apotypic and plesiotypic extremes of transformation series can be inferred. In general, the most practical way is to establish the most plesiotypic extreme by the criterion of frequency of occurrence and infer the opposite extreme to be



FIGURES 370-374.—*Perilypus limbatus* larva: 370, habitus; 371, head, ventral view; 372, head, lateral view; 373, mandible, older larva (see p. 114); 374, mandible, younger larva. (Scales = 1 mm)



FIGURES 375-379.—*Perilypus limbatus* larvae: 375, epipharynx; 376, antenna; 377, maxilla; 378, thorax, ventral view; abdominal segments VIII-IX, lateral view; 379, abdominal segment IX. (Scale = 1 mm)



FIGURES 380-382.—*Perilypus limbatus* pupae: 380, lateral view; 381, ventral view.
Placopterus thoracicus: 382, mandible. (Scales = 1 mm)

apotypic. The state, or states, between the apotypic and plesiotypic extremes are considered phylogenetic intermediates. In Hennig's phylogenetic system, intermediate (or transitional) character states sometimes provide the only clue for inferring sister-group relationships (Erwin 1974, fig. 161).

CRITERION OF CHOROLOGICAL PROGRESSION.—Chorology may be used as an index of character state classification only after the spatial origin of a taxon has been postulated. When this has been done structural character states may be correlated with distributional character states. In general, and in the absence of contrary evidence, one assumes that characteristics of relictual taxa are plesiotypic and that those of taxa from derivative geographical regions are apotypic. Hennig (1966:95) provided the terms apochory and plesiochory to express, respectively, the relative derived and primitive distributional states in chorological transformation series.

CRITERION OF CORRELATION WITH ADAPTIVE SIGNIFICANCE.—As noted by Munroe (1974:76), "inferred adaptive significance is usually present, but hidden, in discussions of the distribution of character states in taxa." While it is often difficult to postulate, much less demonstrate, the adaptive significance of a substantial number of character states, most groups of organisms evolved some character complexes whose adaptive function is fairly obvious. Character states judged apotypic on the basis of adaptive significance can be correlated with characteristics whose adaptive significance is cryptic, or whose phenotypic expression may not directly reflect adaptation. The latter kind of characteristic may represent manifestations of genetic mechanisms not related to "immediate" adaptive needs. For example, their expression may be due to genetic pleiotropy or based on genetic recombination generated by drift.

The substantial number of mimetic patterns (obviously adaptive) present in Cleridae will make the criterion of correlation with adaptive significance particularly useful for inferring character phylogeny. Munroe (1974:76) has commented about the credibility of such inferences involving characters pertinent to mimicry and to warning coloration.

CRITERION OF DEVIATION FROM A BASIC PLAN.—Schlee (1969) and Munroe (1974) discussed this criterion in considerable detail. According to my

interpretation, the basic tenet involves a search for plesiotypic states (particularly of transformation series) of structurally rich characters that in aggregate are considered the basic or ancestral plan. It is assumed that the relatively apotypic states of extant descendants ultimately evolved from that plan. The basic plan (or aggregate of plesiotypic characteristics) is usually established by the plesiotypic extreme of transformation series or by the criterion of frequency of occurrence. The taxonomic level at which the ancestral plan is established is, of course, dependent on the taxonomic level of the group under study and on the categorical level at which such a plan can be credibly established.

It may be particularly difficult to recognize the basic plan in recently evolved groups or in those where the higher classification is not well understood, because in such cases recognition and interpretation of transformation series may be particularly difficult. Concordant transformation series involving complex organ systems are particularly important in this method of establishing character phylogeny; mainly because it is the plesiotypic extreme of such series that lends credibility to postulations of what the basic plan is.

ZOOGEOGRAPHIC METHODS

While hypotheses about speciation and phylogeny have been organized into comprehensive theoretical models (of species by Mayr [1942], of phylogeny by Hennig [1966]), those about historical zoogeography remain unconsolidated. The Darwinian concepts of center of origin and of dispersal of species remain the most practical tools for predicting ancestral distributions. Croizat, et. al. (1974), recently criticized these concepts and provided alternative guidelines for historical biogeography at biotal level.

According to Croizat, et al. (1974:265), "the general features of modern biotic distributions have been determined by subdivisions of ancestral biotas in response to changing geography." I do not reject the concepts discussed by these authors; indeed the idea that contemporary macrobiotic distributions resulted from fragmentations of ancestral biotas is quite consistent with past geologic and climatic events, such as continental drift and the less catastrophic events leading to continental refugia. On

the other hand, I cannot accept their total rejection of the concept of center of origin and its corollary, dispersal of species, primarily because faunal fragmentation predicates faunal expansion (expansion accomplished by various possible mechanisms of dispersal). It seems to me that a highly vagile species is capable of at least fortuitous dispersal during its history, particularly in regions such as Central America where vicissitudinous climates have undoubtedly affected dispersal potentials. The question that remains, therefore, is this: Which of the aforementioned approaches to historical zoogeography is most useful? I submit that both have merit, but generally at different biotic and/or taxonomic levels. Irrespective of biotic or taxonomic level, it is the nature of the available data that usually determines the approach to historical zoogeography.

In general, zoogeographic relationships within *Perilypus* are discussed in terms of faunal limits and vicariance, and because the distributions of most of the species remain poorly documented the treatise is brief and fragmentary. Postulations about historical zoogeography are based on the concept of center of origin and I assume that vicariance reflects dispersal. Distributions of the South American species are correlated with Quaternary refugia postulated by Haffer (1969), and Williams (1970), and Brown (1975).

Phylogenetics and Zoogeography of *Perilypus*

INTERGENERIC RELATIONSHIPS

Earlier in this paper (p. 115), I suggested the possible sister group relationship between the genera *Placopterus* and *Perilypus*, based primarily on the presence of the lacinia mandibulae in the larvae. I cannot offer additional statements regarding intergeneric kinships based on potential synapotypic similarity. Otherwise, I can comment that there are at least three Central American genera (*Colyphus*, *Clerosoma*, and *Blaxina*) whose phylogenetic placement probably belongs close to *Perilypus* and *Placopterus*. Perhaps it will be necessary to first study the larval stages and adult internal anatomy before these genera are placed into credible phylogenetic perspective.

RELATIONSHIPS AMONG THE SPECIES GROUPS

Figure 383 illustrates the proposed phylogeny of the species groups and Table 1 lists the character states on which the reconstruction is based. The scheme is provisional, as all proposed phylogenies must be, and is weakened by several convergences and reversals. Nevertheless, I feel that the analysis broadly reflects what might have transpired during the early history of *Perilypus*; at the very least a foundation of relationships is presented, one that is open to the challenge of subsequent discoveries and resynthesis.

The *Placopterus-Perilypus* stock probably differentiated in northern Central America perhaps during mid-Tertiary time when northern Central America was discontinuous with a series of volcanic islands (now southern Central America) and isolated by a wide sea gap from South America (Malfait and Dinkelman, 1972, fig. 3; Ball, 1975,

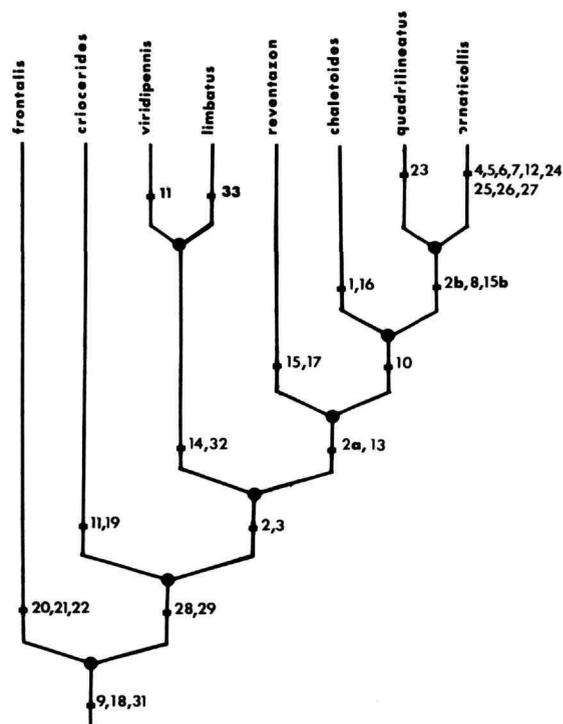


FIGURE 383.—Proposed phylogeny of the *Perilypus* species groups (numbers refer to apotypic character states listed in Table 1).

TABLE 1.—Plesiotypic and apotypic character states used in Figure 383 (references indicate the criteria by which the character states are judged apotypic)

Number	Character	Character state	
		Plesiotypic	Apotypic
1	Body depth	shallow (Fig. 260)	deep ¹
	Head		
2	antenna	clubbed (Fig. 80)	serrate ² (Fig. 96)
2a			moderately serrate ³ (Fig. 8)
2b			boldy serrate ³ (Fig. 284)
3	articles 7-8	without microsetae (Fig. 60)	with microsetae ^{2, 4} (Fig. 19)
4	interocular depression	not crescentic	crescentic ¹
	Thorax		
5	subapical depression depth	strongly impressed	feebly impressed ¹
6	subapical depression shape	strongly sinuous (Fig. 110)	feebly sinuous ¹ (Fig. 342)
7	mesoscutellum	subquadrate	transverse ¹
	Elytra		
8	form	rectangulate (Fig. 2)	ovate ¹ (Fig. 300)
9	puncture shape	not favous	favous ²
10	puncture depth	deep	shallow ¹
11	puncture distribution	throughout disc (Fig. 2)	absent from apical third or more ¹
12	sutural cleft	not right angle (Fig. 27)	right angle ¹ (Fig. 309)
13	microsculpture	absent	present ¹ (Fig. 307)
14	epipleural fold	not convex	convex ¹ (Fig. 163)
15	apical slope	gradual (Fig. 30)	acute ¹ (Fig. 29)
15b			very gradual ^{2, 4} (Fig. 31)
16	disc color	predominantly black or piceous	predominantly castaneous or testaceous ¹
17	discal vitta	absent	present ² (Fig. 2)
	Legs		
18	front trasal claws	symmetrical	asymmetrical ^{2, 4}
19	Pygidium	entire (Fig. 39)	emarginate ¹ (Fig. 94)
	Male genitalia		
	Tegmen		
20	pigmentation	strongly pigmented	feebly pigmented ^{1, 5}
21	phallobase width	normal (Fig. 82)	very broad ¹ (Fig. 72)
22	parameral lateral depression	present	absent ^{1, 5}
23	parameral mesodorsal margin	not denticulated	denticulated ^{2, 5} (Fig. 282)
24	phallobasic pigmental bands	absent	present ^{2, 5} (Fig. 344)
25	combined length of paramere and phallobasic apodeme	more than 2	less than 2 ^{1, 5}
26	First connecting membrane	serrulated scales absent	serrulated scales present ¹
	Phallus		
27	phallic plate shape	normal (Fig. 46)	uniformly slender ^{1, 5} (Fig. 296)
28	marginal denticles	absent	present ^{2, 5} (Fig. 46)
	Female genitalia		
29	dorsal lamina	trilobed (Fig. 71)	bilobed ^{2, 5} (Fig. 49)

TABLE 1.—Continued

Number	Character	Character state	
		Plesiotypic	Apotypic
30	coxital plates	absent (Fig. 198)	present ¹ (Fig. 48)
	Male internal reproductive organs		
31	anterior accessory gland	not coiled	coiled ² (Fig. 51)
32	Distribution	northern Central America	southern Central America ²
32a			South America ²

¹ Frequency of occurrence within *Perilypus*.

² Frequency of occurrence within Clerinae.

³ Correlation with transformation series.

⁴ Correlation with adaptive significance.

⁵ Deviation from a basic plan.

⁶ Chorological progression.

fig. 119). In that region (north of Nicaragua) occur the more primitive species of *Perilypus*, all the species of *Placopterus*, and most species of the other genera closely related to *Perilypus*. The hypothesis of a Central American origin of *Perilypus* requires the assumption of three independent southern dispersals, and the penetration into South America by at least one species during each southern movement.

Ancestral *Perilypus* evolved autapotypic favous elytral punctations, asymmetrical front tarsal claws, and coiled male anterior accessory glands. The second character state was subsequently lost in several lineages, that is, assuming its genotype is relatively uncomplicated and easily reversed; otherwise one would have to make the unlikely assumption that asymmetry of the front tarsal claws evolved independently in five out of eight major lineages. Ancestral *Perilypus* differentiated into two lineages, one giving rise to the *frontalis* stock and the other to the basic stock of the remaining species. The stem species of the *frontalis* group apparently remained in northern Central America, evolved an apotypic feebly pigmented tegmen, and very broad phallobase, and lost the parameral lateral depression. The first and third of these characteristics are also present in specimens of *P. levis* (*viridipennis* group) that differ most conspicuously from members of the *frontalis* group by having apotypic boldly serrate antennae. In this scheme, I assume that genital characteristics of *P. levis* evolved independently from those of the *frontalis* group, and that antennal serration is more likely to reveal patristic kinships than the afore-

mentioned genital characteristics. Antennal serration undoubtedly developed to maximize surface area for forebody sensory organs and thus is a highly adaptive character, one that is probably genetically complex and less likely lost or evolved in parallel than genital-phallobasic characteristics (the reverse would have to be assumed if *P. levis* were to be placed in the *frontalis* group). The diverging sister lineage of the *frontalis* stock evolved apotypic phallic marginal denticles and female genital bilobed dorsal lamina. The marginal denticles were secondarily lost in *P. levis* and in the progenitor of the *ornaticollis* group.

The ancestor of the *criocerides* lineage also remained in northern Central America, retained an antennal club, and acquired a nearly impunctate elytron and apotypic pygidium emarginate. Some reduction of elytron punctation occurred independently in the *viridipennis* group, although in that taxon the loss of deeply impressed punctations involved only the elytral apical third. The complementary stem species evolved apotypic serrate antenna and microsetigerous antennal articles 7 and 8, and differentiated into the progenitor of the *limbatus-viridipennis* stock and the one for the remainder of the species.

An ancestor of the *limbatus-viridipennis* line dispersed to southern Central America (exemplifying apochory; page 125) and subsequently penetrated South America. It evolved a convex epipleural fold, a characteristic retained by all descendants except *P. relucens*; in that species the epipleural fold became grooved longitudinally. A

slightly different convex epipleural fold is also present in both species of the *frontalis* group and in one species of each of the *quadrilineatus* and *ornaticollis* groups. Therefore, convexity of the epipleural fold may not be a strong indicator of patristic affinities, but, in the absence of additional evidence contrary to the proposed grouping, I tentatively consider the presence of that characteristic in the *limbatus-viridipennis* assemblage an expression of monophyly. The monophyly of the *limbatus* group is based on the presence of autapotypic female coxital plates; the plates are only feebly developed in the more primitive Central American species. From the stock of the *limbatus* group evolved the *viridipennis* group whose members share apotypic impunctate elytral apical third (or less). Although I found only one autapotypic characteristic for each of the *limbatus* and *viridipennis* groups, the two lineages probably have been separated for a long time as the considerable habitus differences between their extant members suggest.

The progenitor of the remaining species groups, a vicariant with the ancestor of the *limbatus-viridipennis* lineage, acquired apotypic moderately serrate antenna, the second of two intermediate states of a transformation series that begins with a plesiotypic clubbed antenna and ends with an apotypic boldly serrate antenna. The ancestor of this lineage also evolved elytral microsculpture and subsequently differentiated, producing the *reventazon* lineage and the stock ancestral to the *chaleoides*, *quadrilineatus*, and *ornaticollis* groups.

The evidence that the *reventazon* lineage is monophyletic is that its members share the apotypic characteristics of an acute elytral-apical slope and an elytral discal vitta. Exceptions involving character reversals involve *P. orthopleuridus* whose elytral apical slope is gradual, and *P. immitis* and *P. crassus* in which the elytral disc is apparently avittate (I studied only a few specimens of the last two species). The lineage complementary to ancestral *reventazon* evolved shallow elytral punctations and subsequently differentiated into the basic stock of the *chaleoides* lineage and the *quadrilineatus-ornaticollis* lineage.

Ancestral *chaleoides* developed a deep body and predominantly castaneous elytral color. The progenitor of the complementary stock established two diverse lines of mimetic species. The most obvious anatomical reconstructions that materialized during

the evolution of these species were (1) transformation of a moderately deep and rectangular body form to one that is conspicuously shallow and oval, and (2) progression of antennal serration from moderately serrate to boldly serrate. Perfection of a Batesian mimetic interaction (probably applicable to most of the mimetic species under consideration) often requires that the incipient mimic species evolve toward a model species morphologically and ecologically. Thus the imitator and the model usually look alike and occur together in places where both are maximally exposed to the selection agent (predator). These requirements invite the assumption that ancestral *quadrilineatus-ornaticollis* negotiated a generalized ecological shift from a relatively compact vegetation assemblage to a more open one. Once the shift to a lampyroid-type habitat was initiated genetically pliant species of *Perilypus* converged towards the lampyroid models and concomitantly differentiated. In this paper, under "Natural History" (p. 4), I provide some evidence that an ecological shift did indeed occur during the history of *Perilypus*.

The monophyletic status of the *quadrilineatus* stock is based on apotypic parameral mesodorsal denticulated margin, a characteristic independently evolved in one species of the *limbatus*, *viridipennis*, and *reventazon* groups. From the correlative ancestral species evolved the geographically widespread *ornaticollis* group, the most derived species group in the genus. The species of that group share the following apotypic characteristics not duplicated elsewhere in *Perilypus*: crescentic interocular depression; feebly sinuous pronotal subapical depression; transverse mesoscutellum; right angled elytral sutural cleft; presence of phallobasic pigmental bands; combined length of paramere and phallobase over length of phallobasic apodeme less than 2; first connecting membrane with serrulated scales; and a uniformly slender phallic-plate shape. The extent of derivitiveness and the widespread distribution of the *ornaticollis* group gives the impression that the group is much older than its phylogenetic placement suggests. But the derivitiveness of the *ornaticollis* group may also be interpreted as a manifestation of accelerated diversification, particularly when considering the positive influence that ecological shifts might have on evolutionary rate. The extensive geographic range of the group is probably a reflection of the general

mimetic interaction between *ornaticollis* species and a variety of lampyroid models. A generalized mimic is not restricted to the range of only one model species as a more specialized mimic might be. Therefore, the generalist can overlap the geographical range (become widespread) of several model species without losing the protective benefits of the mimetic interaction.

RELATIONSHIPS WITHIN THE SPECIES GROUPS

Patristic and geographic relationships within each of the species groups are discussed and/or illustrated to whatever extent the data allow (Table 2). A fairly complete treatise is possible for

three of the larger species groups, namely the *limbatus*, *quadrilineatus*, and *ornaticollis* groups. The *reventazon*, *frontalis*, *criocerides*, *viridipennis*, and *chaletoides* groups are treated briefly and in discussion form only.

The two species of the *frontalis* group are very similar anatomically, and probably are recently derived: the species are sympatric in Guatemala and in El Salvador, but *P. frontalis* extends northward into southern Mexico and *P. sensilis* southward into western Nicaragua; the two species may be partial latitudinal complements. *Perilypus frontalis* evolved an apotypic boldly convex female epipleuron and boldly asymmetrical male front tarsal claws. *Perilypus sensilis* lost the asymmetry of the front

TABLE 2.—Plesiotypic and apotypic character states used in Figures 384–386 (references indicate the criteria by which the character states are judged apotypic)

Number	Character	Character state	
		Plesiotypic	Apotypic
	Head		
33	gular process	rectangulate	filiform ¹ (Fig. 308)
34	antennal article 11	not as long as articles 9 and 10 combined	as long or longer than articles 9 and 10 combined ¹
	Pronotum		
35	discal vitta	not maculated	maculated ¹ (Fig. 293)
35a		not furcate	furcate ¹ (Fig. 322)
36	discal concavities	absent	present ¹ (Fig. 300)
37	macrosculpture	absent	present ¹
38	transverse wrinkles	absent	present ¹
39	Mesoscutellum	not stalked	stalked ¹ (Fig. 310)
39a		subquadrate	triangular ¹
40	Leg color	femora concolorous or bicolorous	front and middle femur concolorous, hind femur bicolorous ^{1, 4}
	Elytra		
	Disc		
41	contour	plane or feebly convex	undulated ^{1, 4} (Fig. 293)
41a		not bicristate	bicristate ¹ (Fig. 300)
42	fascia	absent	present ¹
	Margins		
43	base or posthumeral	avittate	with short vitta ¹ (Fig. 287)
44	apical	arcuate	truncate ^{1, 2}
44a		not sinuatotruncate	sinuatotruncate ^{1, 2}
44b		not upcurved	upcurved ¹
	Epipleural fold		
45	contour	plane	obliquely convex ¹
46	position	lateral	ventrolateral ¹
47	dorsal margin	not explanate	explanate ¹
48	narrow longitudinal region proximal to epipleural fold	not acutely deflexed	acutely deflexed ^{1, 4}

TABLE 2.—Continued

Number	Character	Character state	
		Plesiotypic	Apotypic
49	Vertical seta	normal	exceptionally stout ¹
	Male genitalia		
50	phallic plate	not abruptly broadened medially	abruptly broadened medially ² (Fig. 328)
51	phallic plate marginal denticles	far removed from phallic apex	proximal to phallic apex ¹ (Fig. 130)
52	phallic apex	normal	acute
53	dorsal sinus	normal	reduced ^{1, 5} (Fig. 338)
54	phallobase	not explanate	explanate ² (Fig. 134)
	Female genitalia		
	Ventral lamina		
55	length	normal (Fig. 131)	short ² (Fig. 140)
56	size	normal (Fig. 152)	minute ¹ (Fig. 150)
57	number of lobes	three	one ²
	Dorsal lamina		
58	median lobe	absent	present ¹
59	number of lobes	three	seven ²
	Bacculi		
60	dorsal bacculus	not contiguous (Fig. 151)	contiguous ² (Fig. 171)
61	contiguous dorsal bacculus	narrow	expanded ² (Fig. 180)
62	oblique bacculus	not fused with coxital plate	fused with coxital plate ¹ (Fig. 140)

- ¹ Frequency of occurrence within *Perilypus*.
- ² Frequency of occurrence within Clerinae.
- ³ Correlation with transformation series.
- ⁴ Correlation with adaptive significance.
- ⁵ Deviation from a basic plan.
- ⁶ Chorological progression.

tarsal claws and acquired, in convergence, an apotypic convex epipleural fold.

In the *criocerides* group, *P. criocerides* probably ranges into southeastern Mexico; no exact locality in Mexico is available for its sister species, *P. insectus*. Except for the autapotypic characteristics that define the group, the two species do not show a close relationship to each other. The substantial habitus differences between them probably reflects the mimetic interaction between *P. criocerides* and an unidentified species of leaf beetle. *Perilypus criocerides* evolved apotypic denticulatad outer margin of phallic plate.

My views of the relationships within the *limbatus* group are illustrated in Figure 284. In the group, a monophyletic group of four Central American species is vicarious with its South American sister group. The progenitor of the Central American vicariant evolved apotypic contiguous dorsal bacculi, a characteristic convergent in *P. reventazon*.

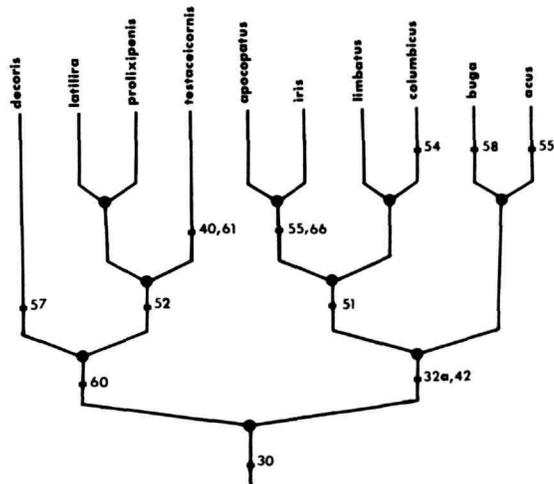


FIGURE 384.—Proposed phylogeny of the *limbatus* species group (numbers refer to apotypic character states listed in Tables 1 and 2).

Further differentiation of the lineage established the basic stock of *P. decoris* characterized by an apotypic unilobed ventral lamina (also found in *P. reventazon*), and the sister stock characterized by an apotypic acute phallic apex. The latter stock subsequently gave rise to the *latilira-prolixipenis* stock and the *testaceicornis* stock, which evolved specializations relevant to leg color. Also in *P. testaceicornis* the fused dorsal bacculi of the female genitalia became expanded in the posterior half. I did not find a synapotypic characteristic to substantiate the sister group relationship between *P. latilira* and *P. prolixipenis*, but their anatomical similarity suggest close relationship; the two species have probably not been reproductively isolated for very long.

The South American species of the *limbatus* group are known only from the Andes ranging from Venezuela to Peru; *P. apocopatus* is vicarious with *P. iris*, and *P. buga* with *P. acus*. *Perilypus limbatus* is particularly widely distributed extending from northern Venezuela to southern Peru. The known distributions of these species roughly coincide with Quaternary Andean forest refugia postulated by Haffer (1969) and Vanzolini and Williams (1970). Assuming that the coincidental distributions between *limbatus* group species and refugia have some historical significance, we might assume that the species in question arose in the Pleistocene epoch when Andean forest refugia were presumably established. The paucity of external differences among the species, suggesting Recent origin, lends support to that hypothesis. Ancient refugial systems, probably also forestal, might also have influenced the evolution of the Central American members of the *limbatus* group. The known geographic occurrence of these species similarly coincides with montane forests, such as those found on the Panamanian Chiriquí range and Cerro Campana, which contain more or less coherent biotas. It seems likely that Pleistocene climatic changes (Vuilleumier, 1971) which profoundly influenced South American forests also markedly affected forest development in southern Central America.

The South American species of the *limbatus* group are more structurally homogeneous externally than their Central American relatives. The basic stock evolved elytral fascia, an apotypic characteristic independently evolved in *P. carbonarius*

of the *reventazon* group and in *P. viridipennis* of the *viridipennis* group. In specimens of these species, however, the fascia are very variable in shape and may be poorly defined. This lineage subsequently evolved from an ancestral stock, in which the phallic marginal denticles (of the male genitalia) became more proximal to the phallic apex, and a basic stock that later differentiated into the *apocopatus-iris* and *limbatus-columbicus* lineages. I did not find an autapotypic character state for the latter lineage which subsequently differentiated into two species. One of these, *P. columbicus*, acquired an apotypic explanate phallobase. The *apocopatus-iris* lineage is inferred to be monophyletic because the member species share the following synapotypic characteristics of the female genitalia: an oblique bacculus fused with coxital plate and short ventral lamina. The remaining two taxa, *P. buga* and *P. acus*, are probably sister species, but this needs corroboration by synapotypy. An apotypic characteristic of the female genitalia present in specimens of *P. buga* is a dorsal lamina with median lobe, and in those of *P. acus* a lateral lobe of minute ventral lamina.

The sister taxon of the *limbatus* group is the *viridipennis* group; in the group, *P. viridipennis* and *P. relucens* are vicariants. The other known species of this group, *P. levis*, ranges widely, occurring in southwestern Colombia, across southern Venezuela, and eastward into the Guiana Highlands of Brazil. The progenitor of the group diverged, producing the *levis* and *viridipennis-relucens* lineages. This differentiation probably took place early in the history of the group; the extant taxa of the two lineages are very different structurally. The *levis* lineage lost the phallic marginal denticles but evolved in convergence the boldly serrate antenna, feebly pigmented male genitalia, and the absence of the lateral depression of the paramere, as well as the nonconvergent characteristic spatulate tegmen. I found no unequivocal autapotypic characteristic for the *viridipennis-relucens* stock, except perhaps the predominantly refescent color that is present in most specimens of the two extant species.

In the *reventazon* group several species range widely in northern Central America: *P. carbonarius* and *P. caliculus* occur in Mexico from Sonora to Oaxaca and apparently are quite abundant in the Transvolcanic Sierra; *P. orthopleuridus* is most prevalent in southeastern Mexico and extends into

southern Honduras. Most of the other species appear to be localized in highlands of either central or southern Mexico, central Guatemala, central Costa Rica, or northern Panama; *P. crassus* is the only species of the group indigenous to South America.

In aggregate the species of the *reventazon* group are very similar externally; consequently, little can be stated about their patristic relationships. The species differ substantially in characteristics of the genitalia, however, but because aedeagal differences are so pronounced genital character states are generally unsuitable for establishing sister groups; thus no phylogeny is postulated. Despite these shortcomings some brief statements about relationships can be made.

The robustness of the male pygidium may be used to roughly distinguish two clusters of species. In specimens of *P. orthopleuridus*, *P. calcaris*, *P. exilis*, and *P. cerroazul* the pygidium is quite robust (Figure 229) while in the remainder of the species it ranges from small (Figure 245) to moderately large (Figure 39). I cannot decide to what extent these groupings reflect phyletic relationships, primarily because the pygidium of some of the species, such as *P. reventazon*, is difficult to group according to size. Also difficult to interpret are the various degrees of asymmetry of the front tarsal claws, despite meristic comparisons. The front tarsal claws are exceptionally asymmetrical in *P. orthopleuridus*, *P. calcaris*, *P. exilis*, and *P. immitis*.

There are two particularly discordant species in the *reventazon* group, *P. orthopleuridus* and *P. crassus*. Specimens of the first species differ most conspicuously from members of the other species of the *reventazon* group by the following character state reversals: gradual apical slope of the elytron and the nonarenose elytral surface. The sister species of *P. orthopleuridus* is probably *P. calcaris*; specimens of these species share an apotypic mesoventral margin of the emarginate paramere, an acuminate phallus, inflexed outer margin of the phallic plate and a very long female genital coxite. *P. crassus*, the only South American species of the group, is notably different because its specimens have the antenna exceptionally serrate and the elytron truncate.

The species of the *chaletoides* group are known only from Mexico; *P. chaletoides* are mostly from

the southwest and *P. bicolor* extends northward to Durango. The ancestors of the *chaletoides* group produced two structurally similar species that are markedly different in elytral color. *Perilypus chaletoides* acquired a dark streak along the suture of an otherwise castaneous elytron while *P. bicolor* evolved totally stramineous elytral coloration.

In the *quadrilineatus* group, *P. quadrilineatus* ranges widely in eastern Mexico, but the species also extends into southern Guatemala; *P. telephoroides* is vicarious with *P. bicristatus*. Figure 385 illustrates my views of the phylogenetics of the *quadrilineatus* group. *Perilypus quadrilineatus*, characterized by an apotypic dorsal margin of the explanate epipleural fold, was apparently the first offshoot of the ancestral stock. The rest of the species are derivatives of an ancestor that acquired a flatter, more oval body and one that evolved the apotypic characteristic, narrow longitudinal region proximal to the acutely deflexed elytral posthumeral margin. This ancestor subsequently differentiated into the *bicristatus*-*telephoroides* and *coroniformis*-*fluctus* lineages. The progenitor of the first lineage attained a coarsely macrosculptured pronotum and subsequently diverged, producing *P. telephoroides* and the highly derivative *P. bicristatus*. Apotypic character states present in *P. bicristatus* include a bicristate elytral disc, triangular scutellum, and pronotal discal concavities. *Perilypus telephoroides*

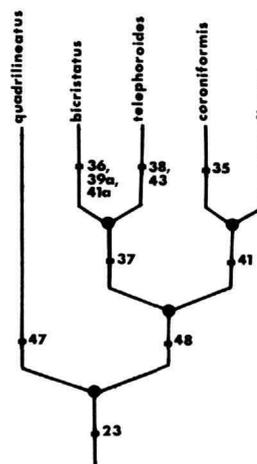


FIGURE 385.—Proposed phylogeny of the *quadrilineatus* species group (numbers refer to apotypic character states listed in Table 2).

acquired the derivatives, the vittate base of the posthumeral margin, and the transversely wrinkled pronotum. The elytral surface became undulated in the complementary progenitor which later diverged into *P. fluctus* and *P. coroniformis*; the latter acquired an apotypic maculated pronotal vitta. Elytral undulations evolved secondarily in *P. ventralis* of the *ornaticollis* group.

In the *ornaticollis* group two species range widely. *Perilypus ornaticollis* occurs in southeastern Mexico, extends northward along the Mexican east

coast, and follows a northern track that spans the Mississippi and Ohio River drainage systems. *Perilypus ventralis* extends from north of the Isthmus of Tehuantepec to central Guatemala; *P. floralis* is vicarious with the South American *P. sinuapicis*. The hypothetical phylogenetic reconstruction of the *ornaticollis* group is illustrated in Figure 386. The most specialized species in the group, and perhaps in the genus, is *P. ventralis*, which anatomically stands far apart from other members of the *ornaticollis* group. The apotypic character states that define this early derivative are: a filiform gular process, stalked mesoscutellum, heptalobed dorsal lamina, plus various modifications of the elytra including a ventrolateral epipleural fold and the convergent characteristic undulated elytral surface. Some of these character states of *P. ventralis* are undoubtedly anatomical specializations relevant to the mimetic existence of that species, particularly those of the elytra.

The complementary stock of the *P. ventralis* lineage acquired a reduction of the dorsal sinus of the male genitalia and subsequently diverged producing the *ornaticollis* and the progenitor of the remaining species. The *ornaticollis* lineage evolved at least two apotypic characteristics, furcate pronotal vitta and an abruptly medially broadened phallic plate. Its sister stem species evolved a truncated elytral apex and subsequently differentiated into the *prolixicornis-galbeus* stock and a line in which the elytral apex became sinuatotruncate. Article 11 of the antenna became prolonged in the *prolixicornis-galbeus* line, which then differentiated into *P. prolixicornis* and *P. galbeus*. The first offshoot of the remaining stock was *P. pilatus*, which is characterized by apotypic robust elytral vertical setae. The remaining three species are derivatives from a progenitor that acquired an obliquely convex epipleural fold and one that later differentiated into the *antarius* and *floralis-sinuapicis* lineages. *Perilypus antarius* acquired an apotypic upcurved elytral apex. I did not find an autapotypic character state that may have been present in the ancestor of *P. floralis* and *P. sinuapicis*.

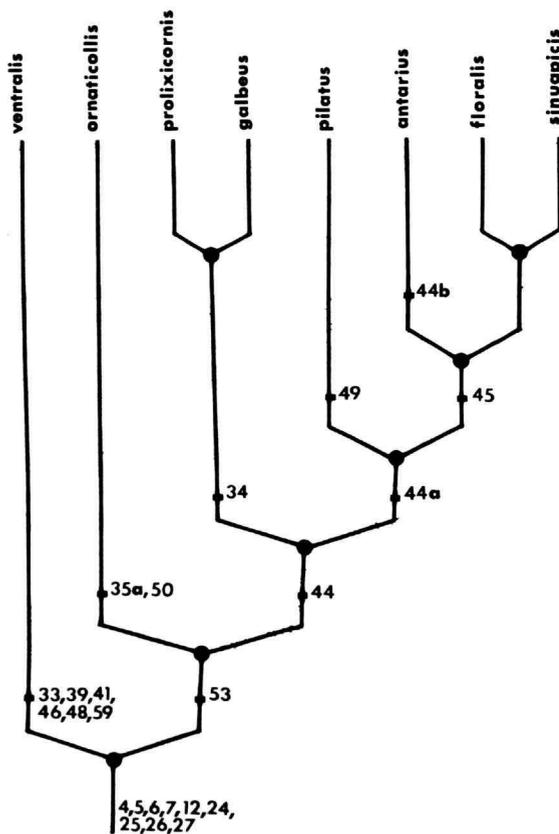


FIGURE 386.—Proposed phylogeny of the *ornaticollis* species group (numbers refer to apotypic character states listed in Table 2).

Abstract in Spanish

Se redefine, reclasifica e ilustra el género americano *Perilypus*. Se resume la historia natural del grupo. Las especies prosperan, por lo menos, en tres tipos de macrohábitat, que son los relativos al roble, a lianas y a plantas herbáceas. Los escarabajos de cuerpo rectangular habitan en robles y lianas, mientras que los de cuerpo ovalado viven en hierbas. Se asume que la correlación hábitat-perfil del cuerpo se debe a interacciones miméticas. Los *Perilypus* miméticos se consideran generalistas que en cuanto a características de aspecto y hábitos han evolucionado simulando más de un modelo repugnante.

Las especies de *Perilypus* se encuentran desde el nivel del mar hasta los 3400 metros de altitud, pero la mayoría de ejemplares conocidos se colectaron entre 1000 y 2000 metros. Observaciones de laboratorio prueban que los escarabajos de *Perilypus* son extremadamente predadores, siendo factores importantes en la limitación de su agresividad el tamaño y la rigidez de las presuntas víctimas.

Se discuten los criterios usados en el reconocimiento de las especies y de los grupos infra y supra-genéricos; se describen las técnicas seguidas para las disecciones, ilustraciones y mediciones; se dan análisis morfológicos de los principales órganos externos e internos, y se ofrece una clave de las especies y de sus grupos basada en caracteres de adultos. Las fases de larva y ninfa del género se describen por vez primera. Se dan los caracteres para cada grupo de especies. Para cada especie se dan sinonimia, combinación diagnóstica, descripción, discusión de la variación estructural y cromática, se dan sinonimia, combinación diagnóstica, descripción, discusión de la variación estructural y cromática, discusión de su historia natural, distribución geográfica, derivación etimológica, localidades, notas generales e ilustraciones. Mapas de distribución con símbolos facilitan la visualización de las áreas geográficas de especies y sus grupos.

En total se reconocen 49 especies en *Perilypus* y 30 de estas se describen como nuevas. Se establecen 12 nuevas sinonimias.

Se postula una filogénesis de *Perilypus* usando el método Hennigiano de análisis filogenético. Se expone la zoogeografía del género en términos de límites faunísticos y vicarismo. Se discuten sumariamente conceptos de zoogeografía histórica ("rutas faunísticas", "centro de origen y dispersión" y "refugios forestales") y dos de ellos se utilizan para explicar la distribución de los taxa de *Perilypus* existentes. Las consideraciones sobre las afinidades entre diversos grupos varía según los datos asequibles. Se presenta un estudio bastante completo de los grupos mayores de *limbatus*, *quadri-lineatus* y *ornaticollis*, en cambio el tratamiento del grupo *reventazon*, el mayor del género, es muy fragmentario.

Es probable que el *Perilypus* ancestral se desarrolló en el norte de América Central durante el Terciario medio evolucionado al fin en ocho grupos específicos. Los progenitores de los grupos *frontalis*, *criocerides*, *chaletoides* y *quadri-lineatus* permanecieron en norte de Centro América así como también sus descendientes. Los ancestros de los grupos *limbatus* y *viridipennis* se dispersaron hacia el sur de América Central; algunos miembros de ambos grupos penetraron últimamente en Sur América. El grupo *ornaticollis*, el más evolucionado en el género, y el grupo *reventazon*, especialmente, son de gran dispersión geográfica.

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