

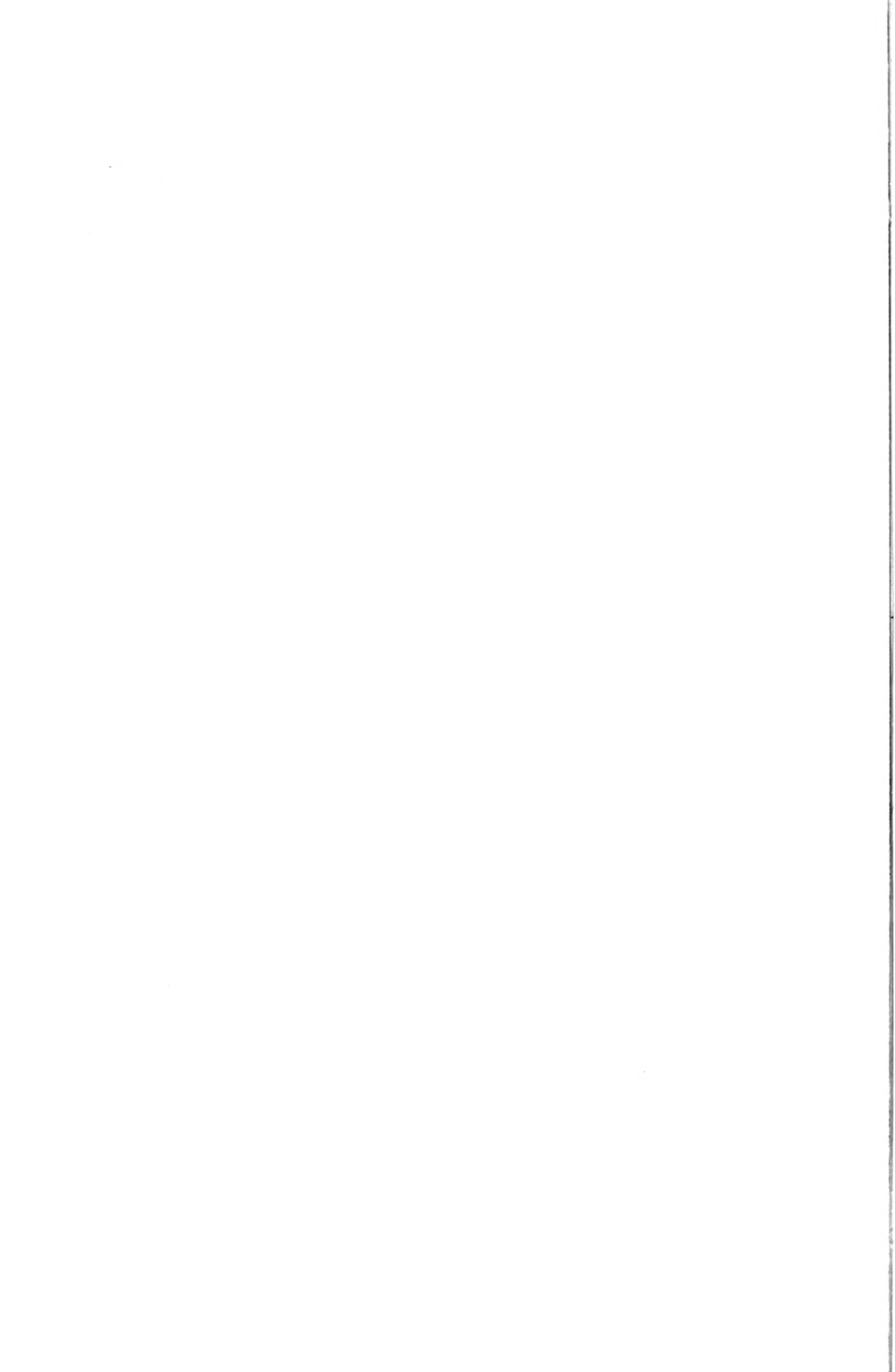


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**A TAXONOMIC STUDY OF THE NEARCTIC SPIDER  
WASPS BELONGING TO THE TRIBE POMPILINI  
(HYMENOPTERA: POMPILIDAE).  
PART I**

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(Plates X to XVI)

INTRODUCTION AND ACKNOWLEDGMENTS

The wasps which constitute the tribe Pompilini of the family Pompilidae have long been poorly understood and notoriously difficult to identify. This is partly the result of a great deal of uncritical analysis of the group with no attempt at a critical synthesis. But perhaps part of the blame may be laid to Nature itself, for in few groups of wasps do the genera and species seem so difficult of definition, and the insects themselves so variable intraspecifically. Furthermore, we have only one set of criteria on which to base a classification of the group: the external anatomy of the adult. The internal anatomy of the adult, and the total anatomy of the egg, larva, and pupa, remain almost wholly uninvestigated, and of the life histories and behavior-patterns of these wasps we have only a smattering of information.

Members of the tribe Pompilini are common elements in the fauna of all of North America except the extreme Arctic, and are constantly being met with by field and museum workers. For this reason it has seemed desirable to attempt at this time to bring together all possible information on the morphology and biology of these wasps, and to construct a classification, well supplied with keys, illustrations, descriptions, and distributional data, which may serve as a basis for future studies of this most interesting group of insects. Because of the magnitude of this task, this revisionary study will be presented in three parts, of which this is the first. Included in this section are the introductory material, a definition

of the tribe and a key to the Nearctic genera, and a systematic treatment of the first eight genera. Part II will cover the single large genus *Anoplius*, and part III will include the remaining four genera, certain conclusions regarding the phylogeny and distribution of the Nearctic forms, a check list of genera and species, and an index to the entire work.

The greater part of this study was undertaken in the Department of Entomology at Cornell University, Ithaca, New York, under the guidance of Professors J. C. Bradley and V. S. L. Pate, who first suggested the study and who have advised and encouraged me constantly to its completion. Only a few of the many other entomologists who have helped me in a great many different ways can be mentioned here. Professor Nathan Banks, of Holliston, Mass., Dr. George Arnold, of Bulawayo, Southern Rhodesia, and Dr. J. Wilcke, of Wageningen, Netherlands, have sent me copies of their valuable papers on the Pompilidae; Dr. Wilcke and Dr. P. M. F. Verhoëff, of den Dolder, Netherlands, have sent me specimens of certain species from the Palaearctic fauna which I especially needed; Dr. Kjell Ander, of the University of Lund, Lund, Sweden, has compared certain specimens for me with types at that institution; Dr. B. J. Kaston, of the Teachers College of Connecticut, New Britain, Connecticut, has determined many spiders for me. To these and to the many other entomologists who have co-operated with me, I express my sincerest gratitude.

Some 17,000 specimens have been studied in the preparation of this work. The great majority of these are in the collections of various museums and private individuals. The following list indicates the sources of this material and the abbreviations used in the text in referring to each. It is also intended as an acknowledgement of the co-operation of these individuals and institutions in providing material for these studies.

Academy of Natural Sciences of Philadelphia, Pa. [ANSP]; American Museum of Natural History, New York, N. Y. [AMNH]; University of Alberta, Edmonton, Alta. [Alta.]; California Academy of Sciences, San Francisco, Calif. [CAS]; California Insect Survey, Berkeley, Calif. [CIS]; Canadian National Collections, Ottawa, Ontario [CNC]; Carnegie Museum,

Pittsburgh, Pa. [CM]; Cornell University, Ithaca, N. Y. [CU]; Emory University, Atlanta, Georgia [EU]; Howard E. Evans, East Hartford, Conn. [HEE]; James E. Gillaspay, Taylor, Texas [JEG]; Kansas State College, Manhattan, Kansas [KSC]; Karl V. Krombein, Arlington, Va. [KVK]; University of Massachusetts, Amherst, Mass. [Mass.]; University of Minnesota, St. Paul, Minn. [Minn.]; Morton S. Vogel, Washington, D. C. [MSV]; Museum of Comparative Zoology, Cambridge, Mass. [MCZ]; Oregon State College, Corvallis, Oregon [OSC]; Pennsylvania State College, State College, Pa. [PSC]; Quebec Provincial Museum, Quebec, Quebec [QPM]; R. W. Strandtmann, Lubbock, Texas [RWS]; South Dakota State College, Brookings, South Dakota [SDS]; Utah Agricultural College, Logan, Utah [UAC]; University of Kansas, Lawrence, Kansas [UK]; and United States National Museum, Washington, D. C. [USNM].

#### HISTORICAL RESUMÉ

Up to the year 1865 a few miscellaneous North American Pompilidae had been described by Linnaeus, Fabricius, Say, Smith, and a few others. In that year appeared the first of several papers by E. T. Cresson, in which he greatly increased our knowledge of these wasps. Of particular note is Cresson's "Notes on the Pompilidae of North America," which was the first attempt at an organized treatment of the members of the family on this continent.<sup>1</sup> Although without keys, it is a most valuable descriptive work and a necessary source of reference for all subsequent workers.

Up until the turn of the century, the classification of the family was simplicity itself. In Dalla Torre's "Catalogus Hymenopterorum" (1897) all the species of the world were placed in thirteen genera, and practically all the Pompilini in the genus *Pompilus*. In 1900 an era of splitting was ushered in by the publication of Dr. W. H. Ashmead's "Classification of the fossorial, predaceous, and parasitic wasps, or the superfamily Vespoidea: Family XXVII—Pompilidae."<sup>2</sup> The work consisted entirely of a long,

<sup>1</sup> Cresson, E. T., 1867, Trans. Amer. Ent. Soc., 1: 85-150.

<sup>2</sup> Ashmead, W. H., 1900-1902, Canad. Ent., 32: 149-155, 185-188, and 295-296, and 34: 79-88 and 131-137.

and in large part unworkable, key to the genera, many of which were newly described. Fortunately he designated genotypes, and many of his genera hold today through a knowledge of the genotypes. But only recently have we begun to recover fully from the confusion created by Ashmead's "Classification."

In 1910 appeared the first of a long series of papers by Nathan Banks on the Pompilidae (or, as he renamed them, the Psammocharidae) of North America and many other parts of the globe. His 1911 paper, "Psammocharidae: classification and descriptions," established a far sounder classification of the family, with workable keys.<sup>3</sup> In subsequent papers he has described many new genera and species, and elaborated upon and modified his ideas about the family. Perhaps at times he has been prone to describe genera on the basis of very insignificant characters, and to describe, as species, forms which are only variants of others; his classification is, furthermore, based almost exclusively on the females. Nevertheless, Professor Banks' contributions to our knowledge of the Nearctic Pompilidae have been very great, and his tireless research on these wasps deserves the respect of all modern students of the family.

Within the past few decades several European workers have made very important contributions to the taxonomy of the Pompilidae. It is not possible to review these here, but mention must surely be made of Haupt's monumental "Monographie der Psammocharidae Mittel-, Nord-, and Osteuropas."<sup>4</sup> This remarkably careful study of the European Pompilidae has been a constant source-book throughout the preparation of the present work, for the faunas of Europe and North America are closely related. Haupt has also published a number of subsequent papers of considerable value.

Two recent papers in this country have paved the way for a sounder classification of the family than has hitherto been possible. The first of these is Dr. J. C. Bradley's "Preliminary Revision of the Pompilinae of the Americas, exclusive of the tribe Pompilini."<sup>5</sup>

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<sup>3</sup> Banks, Nathan, 1911, Jour. N. Y. Ent. Soc., 19: 219-237.

<sup>4</sup> Haupt, H., 1927, Deutsch. Ent. Zeitschr., Beiheft. 367 pp.

<sup>5</sup> Bradley, J. C., 1944, Trans. Amer. Ent. Soc., 70: 23-157.

In this paper the American forms were subjected for the first time to a thorough and modern analysis. In many ways the present work is an attempt to supplement Dr. Bradley's revision by covering the tribe which he omitted. Secondly, Dr. V. S. L. Pate has recently published a most valuable and much-needed paper: "The Generic Names of the Spider Wasps and their Type Species."<sup>6</sup> With this as a basis it may be possible to achieve in the future a more correct application of generic names, and to go on from this to a better understanding of the limits of the genera, and their relationships and phylogeny.

#### MORPHOLOGY AND TERMINOLOGY

Throughout the present study I have attempted to use the terminology in most common use among hymenopterists. A few special terms have, however, been resorted to. For this reason a brief consideration of the terms used in describing the morphological features of a pompilid wasp is necessary at this point. For a more general discussion of external morphology, the reader is referred to Salman's paper on the morphology of *Pepsis elegans*.<sup>7</sup>

The *head* of a pompiline wasp is the source of many useful but often subtle characters (Fig. 1). The *mandibles* bear either one or two teeth along the inner margin, and are called respectively *unidentate* or *bidentate*. (Some authors consider the apex of the mandible a "tooth," and hence use the terms differently than I have done.) The *labrum* varies in size and shape, and in many forms is concealed, or almost so, by the clypeus. The *clypeus* also exhibits variations in size and shape which are of use taxonomically; the breadth of the clypeus divided by its length gives a figure which is frequently of use in separating species. The *eyes*, *ocelli*, *front*, and *vertex* all are sources of useful characters, and certain terms have been used to describe these features. The distance between the eyes at their point of closest convergence below, just above the clypeus, is termed the *lower interocular distance* (LID in fig. 1). The distance between the eyes at the greatest emargination of the orbits, near or slightly above the middle of the eyes, is called the *middle interocular distance* (MID). The distance

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<sup>6</sup> Pate, V. S. L., 1946, Trans. Amer. Ent. Soc., 72: 65-137.

<sup>7</sup> Salman, K. A., 1929, Trans. Amer. Ent. Soc., 55: 119-153.

between the eyes at their tops is called the *upper interocular distance* (UID). The greatest breadth of the head, including the eyes, is called the *transfacial distance* (TFD), while the height of the head, measured from the apical margin of the clypeus to the crest of the vertex, is called the *facial distance* (FD). The distance of the posterior ocelli from one another is called the *post-ocellar line* (POL), while the distance of one posterior ocellus from the nearest point on the compound eye is called the *ocello-ocular line* (OOL). By the use of these terms the features of the head may be described with some accuracy; in the females it is sometimes necessary to rely upon the proportions between these various distances for species determination.<sup>8</sup>

The *antennae* of Pompilini are not highly modified; the relative lengths of the various segments are sometimes of use in separating species. The length of the third antennal segment as compared with that of the upper interocular distance is sometimes a useful character. This is particularly difficult to judge, and one must rely upon accurate measurements. The space between the base of the mandibles and the bottoms of the eyes is called the *malar space*; the lateral portions of the head behind the eyes are called the *temples*.

The *thorax* is relatively uniform in structure throughout the tribe, but such differences as do occur are often of much taxonomic significance. The *pronotum* consists of three parts: a small anterior projection into the foramen magnum, called the *neck*, a transverse, slightly elevated piece behind this, the *collar*, and the main portion of the pronotum posterior to this, separated from the collar by an impressed line, the *streptaulus*. The ventral portion of the prothorax is directed forward, facing the temples;

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<sup>8</sup> Measurements of these and all other features of the morphology, where such are required, should be made with great care, using an ocular micrometer; judgment alone will often result in erroneous decisions. Since relative and not absolute measurements are important, it is convenient to have by one's side a slide rule. By reading the figures directly onto the slide rule, one may arrive at relative lengths very quickly. For example, if the upper interocular distance measures 22 and the lower interocular distance 29, one may calculate easily that UID is  $.76 \times$  LID, an accurate expression of the degree of convergence of the eyes above. Such characters as these are used frequently in the keys. With a little skill in the use of a micrometer and a slide rule, nothing is lost in the way of speed in the use of the keys, and a great deal is gained in precision.

this is composed chiefly of the *propleura*, since the *prosternum* is reduced to a minute sclerite between the bases of the front coxae. The dorsal portion of the mesothorax is composed of the large *mesonotum* and behind it the *scutellum*, the latter consisting of a flat or convex median *disc*, and the declivous *side-pieces*. The *mesopleura* are large and are continued underneath to meet on the median line ventrally; this ventral part is here called the *mesosternum*, although it is not separated by a suture from the pleura, and morphologically is undoubtedly a continuation of the pleura, the true sternum being lost. The *metanotum* is a transverse, elevated piece, followed by a depressed, very short sclerite, the *metapostnotum*, or *postnotum*. The metanotum terminates laterally at the bases of the hind wings, but the postnotum is continuous with the *metapleura*.

The *propodeum* is not strictly part of the thorax, but is best discussed here because of its close association with the metathorax. The propodeum is slightly to strongly convex in profile; posteriorly there may be a steepened portion which is nearly flat or even a bit concave, which is called the *declivity*. The laminate rim along the posterior margin of the propodeum is called simply the *posterior rim*.

The *legs* are long and vary from extremely spiny to almost spineless. In many females the front tarsus bears a series of articulated spines used in digging in the earth, called a *tarsal comb*. This varies greatly in development and is a source of generic and specific characters; unfortunately the spines are subject to wear, so that their length cannot be depended upon absolutely to represent the true length. As Banks has pointed out, the way to recognize whether a tarsal comb is present or absent is to examine the second tarsal segment: if there is a spine at the middle of this segment about as long as that at the apex, the tarsal comb is said to be present. (In Fig. 9 the tarsal comb is absent; in Fig. 3 it is present.) The *claws* are slender and bear a single tooth on the inner margin: this tooth may be short and erect, in which case the claws are said to be *dentate*, or it may be longer and sloping outward, parallel to the main shaft of the claw, in which case the claws are said to be *bifid*. The *pulvillus* is covered by a small pad, the *pulvillar pad*, from which arise a variable number of small setulae

which constitute the *pulvillar comb*. There are often useful taxonomic characters in the pulvillar pad and comb.

The *veins* are well developed in all the Nearctic Pompilini. In the naming of the veins and cells of the wing I have used the system in common use among aculeate hymenopterists, the Jurine-Cresson system, and it seems unnecessary to describe this in detail. The uninitiated will find a figure in Matheson's "Entomology for Introductory Courses," p. 448, illustrating this system of wing venation. In most Pompilidae the anal and transverse median veins of the hind wing are completely confluent, and the entire vein in this case is merely called the *anal vein*.

The *abdomen* of the *female* is composed of six evident segments, each consisting of a tergite and a sternite. The tergites are called tergite 1, tergite 2, . . . tergite 6, proceeding from front to rear, and the sternites similarly sternite 1, sternite 2, . . . sternite 6. The apical tergite, tergite 6, is also called the *pygidium*; there is no distinct pygidial area set off on this tergite as in many aculeates, but the whole tergite is so called. Similarly the apical sternite may be called the *hypopygium*. It should be remembered, of course, that morphologically tergite 1 is that of the second true abdominal segment, but to call it the second in the text would lead to confusion and be contrary to the usual practice among hymenopterists.

The *abdomen* of the *male* is composed of seven visible segments. The tergites cause no difficulty and are numbered simply tergite 1 through 7. The first six sternites are similarly numbered sternite 1 through 6. Sternite 6 always possesses a median emargination along its posterior margin, on each side of which is a small chitinized process, somewhat hook-shaped. The seventh sternite is modified to form a somewhat tongue-shaped flap which closes the genital orifice, and is called the *subgenital plate*. This represents the true ninth sternite, true sternite eight being entirely internal and forming a usually V-shaped sclerite at the base of the subgenital plate; in the text this is called the *basal sclerite* of the subgenital plate.

The *male genitalia* (Fig. 2) are much used for separating species, and to a limited extent in defining genera. In the naming of the parts of the genitalia, I have in general followed Snodgrass'



"The Male Genitalia of Hymenoptera",<sup>9</sup> although a number of structures were not named by Snodgrass, and in these cases the terms of certain other authors have been employed. At the extreme base is a short, hollow cylinder called the *cardo* or basal ring (*co* in Fig. 2). In the phallus itself the central structure is the *aedocagus* (*ae*), an elongate, lightly sclerotized structure with two basal apodemes (*ap*) which attach it to the phallobase. On each side of the aedocagus and quite closely supporting it are the *paramucial lobes* (*pl*), which arise from a broad base on the dorsal side of the genitalia and are usually quite slender and elongate; these never bear setae of any kind. The next structures are those of the  *volsella*; these are chiefly ventral and consist of a *basal plate* or *basis volsellaris* (*ba*), which may bear one or several setae, and distad of this a more or less elongate appendage, the *digitus* or *digitus volsellaris* (*di*), which is the source of many excellent specific characters because of differences in shape and the nature of the setae it bears. In addition there are structures lying between the basal plates which in shape suggest a bird's-head; these are called the *basal hooklets* (*bh*). These have never been noted with more than passing interest by previous workers, but actually are of considerable generic value. Where they consist of a single sclerotized point (as in Fig. 2) they are said to be *single*; in some genera there is a second pointed process below this, and in such case they are said to be *double* (as in Fig. 42); they are sometimes wanting altogether. The outermost appendages of the genitalia are the *paramercs* (*pr*), which are generally elongate and more or less setose; near the base, or part way out on the ventral side, there may be a slightly elevated and more heavily pigmented area for which it is convenient to have a name, and for which the term *squama* is used (*sq*). Illustrations of the male genitalia of most of the Nearctic Pompilini are included in this work. In all these figures, the ventral view is shown on the left side, the dorsal on the right.

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<sup>9</sup> Snodgrass, R. E., 1941, Smithsonian Misc. Coll., vol. 99, no. 14.

## BIOLOGY

The Pompilini are relatively generalized Pompilidae in behavior as well as in structure. Nevertheless there is considerable diversity in habits within the tribe, so much so that the taxonomist is able to learn much about the relationships of the various genera and species from a study of their biology. Instinctive behavior patterns are inherited just as strictly as morphological features, and there can be no doubt of their genetic basis, or that biological criteria are any less important than morphological criteria in the study of the relationships of wasps. Unfortunately our knowledge of the life histories and behavior patterns of the Pompilini consists in general of little more than fragments, for only a very few workers have had the infinite patience required to study these interesting wasps in the field.

Under the various genera and species on the pages which follow, I have attempted to describe briefly whatever is known of their biology, and to indicate the sources of this knowledge. At this point it may be well to outline briefly the behavior of a "typical" pompiline wasp, in order that the variations on this theme exhibited by the different genera and species may become more apparent. Only the behavior of the adult female is noteworthy; that of the male consists merely of the fertilization of the female, and that of the larva consists merely of devouring the spider placed before it by the female parent.

There are four phases in the behavior of the pompiline wasp associated with the laying of a single egg; since normally a considerable number of eggs are laid by a female, these are repeated a number of times in the life of the wasp. (1) *The Search*. The wasp, usually walking over the ground or foliage with the wings vibrating and the antennae in constant motion, combined with short flights, undertakes a more or less random search for a suitable spider in an appropriate habitat. Some Pompilini appear to take any spider of sufficient size which presents itself, while others attack only spiders of a certain family or genus, rarely a single species of spider. (2) *Paralysis*. Once a desired spider is found, both wasp and spider exhibit a high degree of nervousness, the spider apparently showing fear and attempting to escape, the wasp pursuing it in a frenzy until it is able to sting it. The sting is normally inflicted on the ventral side of the cephalothorax, but is

not always so precisely placed as earlier entomologists believed; frequently the spider is stung several times. Paralysis is immediate, but the duration of paralysis very variable. (3) *Transportation*. The best hunting-grounds for spiders are not often the best nesting-sites for fossorial wasps; the wasp therefore usually finds it necessary to transport its prey some distance. The common method among the Pompilini is for the wasp to walk backward, carrying or dragging the spider, which it holds in its mandibles by the base of the posterior legs. During transport frequent stops are made for exploratory purposes. A few species fly with their prey. (4) *Nidification*. The majority of Pompilini are fossorial, that is, they construct their nests by digging in sand or loose earth. By means of the tarsal comb, the other spines on the legs, and sometimes the mandibles, the wasp constructs a gallery in the earth with an enlarged terminal cell. In this cell the spider is placed and an egg laid upon it, usually ventrally on the abdomen; the tunnel is then refilled with earth. The nature of the soil in which a pompilid is accustomed to nest often determines its habitat. Many species are rather strict psammophiles, rarely being taken far from sandy places; others choose soft, loamy earth; still others in gravel or among rocks. Some forms show a preference for ledges, stone walls, and niches in buildings; still others use beetle galleries or other niches in wood. Such species as have lost the fossorial habit have also lost the tarsal comb. So far as known, all Nearctic Pompilini construct a separate nest for each spider captured, though some exotic species are reputed to build multicellular nests in the earth.

The many variations on this fundamental pattern of behavior cannot be reviewed here, but will become apparent in the pages which follow. The most striking thing will be, however, the incompleteness of our knowledge of the habits of even some of our commonest spider wasps. Of several genera of taxonomic importance, nothing whatever is known. The patient field observer may yet learn a wealth of facts about these wasps, and his efforts will be rewarded not only by the thanks of taxonomists and students of animal behavior, but by his acquaintance with the wasps themselves, for few insects are so fascinating in their activities as these intrepid hunters of spiders.

## TAXONOMY

There exists little agreement among students of the Pompilidae, past and present, as to the broader aspects of the classification of the family. Banks, in his 1911 classification,<sup>10</sup> divided the family into four subfamilies, the Pepsinae, Psammocharinae, Ceropalinae, and Notocyphinae. Haupt<sup>11</sup> later increased the number of subfamilies to eight, adding the Macromerinae, Clavelinae, Homonotinae, and Pedinaspinae. If we include the Cryptocheilinae and Aporinae, which also have sometimes been ranked as subfamilies, we have a maximum of ten. Undoubtedly the number of subfamilies recognized by future workers will be much fewer than this. As yet no single student, with sufficient material from all parts of the globe before him, has set himself to the task of critically reconsidering the classification of the family. Pending such a study, a conservative point of view seems desirable.

In any event, there has been general agreement among authors as to the validity of the Pompilinae (or Psammocharinae) as a discrete subfamily, and as to its approximate limits. Haupt, it is true, divides it into three subfamilies, the Psammocharinae, Pedinaspinae, and Homonotinae; however, he groups these together in what he calls the Psammocharidae trachyscelides, as opposed to the remainder of the family, which he calls the Psammocharidae lissoscelides. Arnold<sup>12</sup> has pointed out the impossibility of dividing this part of the family into more than a single clearly defined subfamily. This subfamily seems to represent a single broad phyletic line, and its characters are described briefly below.

Bradley<sup>13</sup> has recently placed the trachyscelid genus *Psorthaspis* in the Ctenoceratini, a group which Haupt and Arnold consider to belong to the lissoscelides. Although it is true that the females of *Psorthaspis* show remarkable resemblances to those of *Ctenocerus*, *Dromopompilus*, and certain other Ctenoceratini, particularly with regard to the shape of the head and prothorax, in certain other

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<sup>10</sup> Banks, Nathan. 1911, Jour. N. Y. Ent. Soc., 19: 219-237.

<sup>11</sup> Haupt, H., 1929, Mitt. Zool. Mus. Berlin, 15: 108-197.

<sup>12</sup> Arnold, George, 1935, Ann. Transvaal Mus., 15: 413-416.

<sup>13</sup> Bradley, J. C., 1944, Trans. Amer. Ent. Soc., 70: 30-36.

perhaps more fundamental characters, such as the nature of the spines at the apex of the hind tibiae, the spine-pits on the femora, and the male genitalia, the difference is great. It seems likely to me that these resemblances, however striking, may be due to convergence, these genera probably all being predators on subterranean spiders. That *Psorthaspis* and the Ctenoceratini might belong to entirely different stocks has already been suggested by Arlé.<sup>14</sup> While the matter cannot be considered closed, I prefer to place the tribe Ctenoceratini in the Pepsinae, and the American genus *Psorthaspis* in the Pompilinae, tentatively in the tribe Aporini.

The division of the subfamily Pompilinae into tribes is not an easy matter, particularly in the light of our limited knowledge of certain faunas. Arnold,<sup>15</sup> after stating reasons for abandoning Haupt's division of the group into three subfamilies, divided the Ethiopian Pompilinae (Psaumocharinae) into ten tribes. Working on the American fauna, Bradley<sup>16</sup> a few years later divided the subfamily into seven tribes. The only tribe these two classifications have in common is the Pompilini (Psaumocharini)! Clearly if one were to extend these classifications into still other faunal regions, the result would be a prodigious number of tribes, separated often on very tenuous characters, and many of them monogeneric. A diametrically opposite point of view is presented by Banks,<sup>17</sup> who doubts if the subfamily can be divided into tribes at all.

I expect these points of view will eventually be reconciled, and the Pompilinae of the world divided into several tribes, representing natural phyletic lines; this must, however, await a general reclassification of the family, as noted above. In the meantime, I prefer to recognize two tribes among the Nearctic Pompilinae: (1) those genera specialized in the structure of the head and prothorax for entering the tunnels of subterranean spiders, i.e., Bradley's tribe Aporini, plus the genus *Psorthaspis*, and (2) those genera not specialized in this manner, i.e., Bradley's tribes

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<sup>14</sup> Arlé, Roger, 1947, *Revista de Entomología*, 18: 418.

<sup>15</sup> Arnold, George, 1937, *Ann. Transvaal Mus.*, 19: 75-81.

<sup>16</sup> Bradley, J. C., 1944, *Trans. Amer. Ent. Soc.*, 70: 28-30.

<sup>17</sup> Banks, Nathan, 1947, *Bull. Mus. Comp. Zool.*, 99: 371-372.

Pompilini, Allocyphonychini, and Allocharini. Admittedly (1) is derived from (2), probably polyphyletically; nevertheless, this arrangement seems to me to express most clearly the relationships of the Nearctic genera, at least in the light of our present knowledge of the world fauna.

Following a short analysis of the characters of the subfamily Pompilinae, I have presented a key which will separate the two tribes in the Nearctic fauna. This is followed by a summary of the characters of the tribe Pompilini and a key to the Nearctic genera; subsequent pages treat these genera and their contained species and subspecies.

#### *Summary of Characters of the Subfamily Pompilinae*

Apex of hind tibia with a number of spines which are of unequal length, irregularly spaced, and more or less radiating. Hind femur usually with several small spines or spine-pits on the upper surface near the apex. Hind tibiae never serrate. Second abdominal sternite without a transverse groove. Subdiscoidal vein of the fore wing usually deflected downward at its base, forming a small pocket at the lower inner corner of the third discoidal cell.

#### *Key to Tribes of Nearctic Pompilinae*

- Pronotum very long, usually longer than the mesonotum, its posterior margin nearly transverse, sometimes with a slight median notch; pronotal collar of female not much if any depressed, in almost the same plane as the vertex and the thoracic dorsum as seen in lateral view; propodeum never produced postero-laterally into pointed processes; either with two submarginal cells in the fore wing, or if with three, the scape of the female is compressed and the front grooved to receive it, and in the male the propodeum is excavated behind, the sides of the concavity projecting backward as short, vertical ridges, and the parameres of the genitalia are very short, truncate apically; antennae of males short, the third segment always less than twice as long as thick . . . . . APORINI
- Pronotum rarely slightly longer than the mesonotum, usually distinctly shorter, its posterior margin angulate, arcuate, or sometimes nearly straight; pronotal collar in the female always depressed, on a much lower plane than the vertex or the thoracic dorsum; fore wing with three submarginal cells, or if with two, the propodeum is produced postero-laterally into sharp, conical processes; scape rarely slightly compressed, the front without distinct antennal scrobes; propodeum of variable shape, but never with the postero-lateral angles produced backward as vertical ridges; antennae of males variable . . . . . POMPILINI

## Tribe POMPILINI Fox

- Pompilini Fox, 1894, Proc. Acad. Nat. Sci. Phila., 1894, p. 296. [Described as a tribe, but having the rank of a subfamily.] [In part.]—Bradley, 1944, Trans. Amer. Ent. Soc., 70: 28-30. [Plus the tribes Allocharini (p. 147) and Allocyphonychini (p. 105).]
- Anopliini Ashmead, 1902, Canad. Ent., 34: 80. [Tribe of subfamily Aporinae.] [In part.]
- Psammocharinae Haupt, 1927, Deutsch. Ent. Zeitschr., Beiheft, p. 24. [Subfamily, but with about the same limits as the tribe Pompilini as here defined.]
- Psammocharini Dreisbach, 1949, Ent. Amer., 29 (n. s.): 1-58.

The tribe Pompilini consists, in brief, of a number of genera centering around the genus *Pompilus*, either quite generalized or representing a low degree of specialization. The single most characteristic feature of these wasps is the tarsal comb of the female, but this is not possessed by all of the members of the tribe.

*Tribal characters.*—Small to fairly large wasps (3-30 mm.) of variable color, but the dominant color black; wings hyaline to fuscous, only rarely yellowish. Body clothed wholly with a close, fine pubescence, which may be blackish, brownish, cinereous, silvery, or more or less refulgent of dark metallic colors. Body usually with a certain amount of erect hair, sometimes very densely hairy, or, at the other extreme, practically devoid of hair.

Head inserted rather high on the prothorax, the eyes prominent, bare or with only minute, scarcely evident setulae. Palpi slender, simple. Each mandible with a groove below, which terminates some distance from the apex, and from which arise several bristles (except in *Allocharcs*). Clypeus a transverse sclerite about as wide as the lower front, or a little more or less, usually somewhat convex, never elevated and plate-like. Antennal bases somewhat removed from the margin of the clypeus. Front not or scarcely grooved or depressed to receive the antennae; scape somewhat barrel-shaped, not compressed (slightly compressed in *Chalcocharcs*). Vertex rounded, never acute, always on a higher plane than that of the pronotal collar.

Pronotum not especially long, its median dorsal length rarely greater than that of the mesonotum, usually much shorter; streptaulus impressed dorsally and dorso-laterally, delimiting an anterior collar which is on a much lower plane than that of the vertex or the remainder of the pronotum; pronotum behind the collar arched upward to the level of the mesonotum, never with a vertical anterior surface perpendicular to the dorsum. Front tarsus of female with or without a tarsal comb; front femora never incrassate; apical tarsal segments with or without a median row of spines beneath, occasionally with a few lateral spines; claws dentate or bifid. Wings fully developed;

fore wing usually with three submarginal cells, but if with only two, it is the second transverse cubital vein which is lacking, never the third.

Male genitalia with the parameres normally elongate, never abruptly truncate apically. Basal hooklets present or absent. Parapenial lobes elongate, usually flattened dorsoventrally, but sometimes triangular in cross-section or rarely flattened from side to side. Aedoeagus elongate, occasionally bearing short spines along the shaft.

*Biology.*—The members of this tribe are primarily predators on errant or web-spinning spiders belonging to the suborder Labidognatha of the order Araneae. The prey is placed singly in a ready-made niche or more commonly in a burrow constructed in the ground and having an enlarged terminal cell. A single egg is laid upon it and the nest is covered; the larva consumes the spider and pupates in the nest.

*Distribution.*—Cosmopolitan. There are a number of genera not represented in the Nearctic fauna, where, according to my interpretation, there are thirteen genera.

#### *Key to the Genera of Nearctic Pompilini*

1. Propodeum not produced postero-laterally into sharp, conical processes; legs more or less spinose; postnotum a transverse band of variable width, never broadly concealed dorsally .....2
- Propodeum bearing sharp, conical processes postero-laterally; basal hooklets of male genitalia wanting; either (a) the legs smooth and almost devoid of spines, or (b) the postnotum concealed dorsally, the metanotum and propodeum in broad contact .....12
2. Anal vein of hind wing straight, paralleling the preaxillary furrow for its entire length, the transverse median vein leaving it at an angle; cubitus of hind wing extending beyond the transverse cubital vein only as a short stub (Fig. 11); posterior rim of propodeum virtually absent, represented merely by a narrow ridge.
  - I. **Tastiotenia** new genus
  - Anal and transverse median veins of hind wing confluent and forming an arch (Figs. 10 and 13); cubitus of hind wing extending considerably beyond the transverse cubital vein; posterior rim of propodeum well developed .....3
  3. Anal lobe of hind wing very large, about three-fourths the length of the submedian cell (Fig. 10); spines beneath the apical tarsal segments of the female in an irregular double row; males very densely hairy, even on the abdominal dorsum .....II. **Chalcochares** Banks



- Anal lobe smaller, at most a little over half the length of the submedian cell (Figs. 12 and 60); spines beneath the apical tarsal segments, when present, in a single median row (occasionally also with one or two lateral spines); males never as densely hairy, the abdominal dorsum not at all hairy .....4
4. Malar space well developed, about as long as, or longer than, the antennal pedicel; labrum fully exposed; claws bifid in both sexes; antennae of male beyond the third segment subserrate; hypopygium of female strongly compressed, hirsute .....XIII. **Paracyphononyx** Gribodo
- Malar space shorter than the pedicel, usually very short or practically absent; antennae of males slender, at most with very feeble serrations on the apical few segments; hypopygium of female at most moderately compressed .....5
5. Anal vein of hind wing meeting the media beyond the origin of the cubitus (Figs. 59 and 60), except occasionally in *Episyron*, which has a scale-like pubescence on the first abdominal tergite; postnotum considerably arcuately broadened on each side between the median line and a point just above the spiracles, where it is constricted (Figs. 69 and 70) .....6
- Anal vein of hind wing meeting the media before or at the origin of the cubitus (Figs. 12 and 58), or sometimes a little beyond, in which case the postnotum is very short, transversely linear; in any case the postnotum is not as above, but with nearly parallel margins; never with scale-like pubescence .....8
6. Apical tarsal segments without spines beneath; all the claws of both sexes dentate; wings very long, never folded longitudinally in repose; body without scale-like pubescence .....V. **Sericopompilus** Howard
- Female: apical tarsal segments with a row of spines beneath. Male: claws bifid .....7
7. First abdominal tergite, and more or less of the propodeum and parts of the thorax, with appressed, scale-like pubescence; claws of both sexes bifid .....VI. **Episyron** Schiödte
- Without such scale-like pubescence; at least the middle and hind claws of the female dentate; eyes of female strongly converging above.
- VII. **Poecilopompilus** Howard
8. Front with a distinct blunt tubercle between and slightly above the antennal orbits, present in both sexes but less pronounced in the male (Figs. 54 and 55); pronotum with a slight median impression; mostly ferruginous species .....VIII. **Tachypompilus** Ashmead
- Front without such a tubercle; frontal elevation of male, if present, ill-defined and sloping gradually to the face below; Nearctic species never mostly ferruginous .....9

9. Female: pygidium with numerous setae, at least a few of which are stout, brittle, and bristly, directed caudad; pulvillar comb strong, of from 12 to 26 subparallel setulae. Male: claws bifid.

IX. **Anoplius** Dufour

Female: pygidium with a few slender, flexible setae or none at all, never with bristles. Male: claws of middle and hind legs, at least, dentate ... 10

10. Antennae relatively short and thick, the third segment in the female not more than 2.8 times as long as its greatest thickness, and never equal to more than six-tenths the upper interocular distance, the vertex always being very broad (Figs. 25 and 26); third segment in the male not more than twice as long as thick (Figs. 29, 30, 31, and 35); pulvillar comb of not more than seven weak setulae (Fig. 7).

III. **Evagetes** Lepeletier

Antennae more elongate, the third segment in the female at least three times as long as thick, and usually equal to more than six-tenths the upper interocular distance; third segment in the male more than twice as long as thick; if the pulvillar comb is greatly reduced (in the female) the antennae are very long and slender ..... 11

11. Subdiscoidal vein of the fore wing reaching the wing margin or nearly so, the second recurrent vein arising more than half-way out on it (Fig. 58); pulvillar comb of not more than seven weak setulae (Fig. 36); species of delicate build and very slender appendages.

IV. **Agenioideus** Ashmead

Subdiscoidal vein not reaching the wing margin; second recurrent vein arising half-way or less of the distance from the base of the subdiscoidal vein to the wing margin (as in Fig. 12).

X. **Pompilus** Fabricius

12. Legs spinose, the female with a tarsal comb; postnotum concealed dorsally, the metanotum and propodeum in broad contact; fore wing frequently with only two submarginal cells; head not notably concave behind ..... XI. **Aporinellus** Banks

Legs virtually devoid of spines; postnotum complete; always with three submarginal cells in the fore wing; head rather strongly concave behind and convex in front, more markedly so in the male; malar space fairly long ..... XII. **Allochares** Banks

I. Genus **TASTIOTENIA** new genus<sup>18</sup>

GENOTYPE: *Tastiotenina festiva* new species.

This curious new genus, known at present from only two specimens, possesses a strange mixture of characteristics. The propodeum is practically without a posterior rim, suggesting *Cero-*

<sup>18</sup> Named for the Tastioteño, an ancient Indian tribe of Seri stock, which formerly inhabited a portion of the west coast of Sonora, Mexico.

*pales*; the broad, finely punctate head, with relatively small eyes and broad temples, suggests *Priocnemis* and certain other pepsines; the unusual venation of the hind wing is approached only by the obviously unrelated *Allaporus* in our fauna, and by certain Old World forms usually placed in the Idopompilini. Yet for all this it seems to be a pompilinae, albeit a very primitive one. The hind femora possess minute spines above, near the apex; the spines on the tibiae are arranged as in the Pompilinae, those at the apex being of variable length and irregularly spaced; the second abdominal tergite is without a transverse furrow; there is a slight indication of a pocket at the lower inner corner of the third discoidal cell of the fore wing. It would seem to be a relic of the stock of very early Pompilinae, before certain features of these wasps became fully fixed.

*Generic characters.*—(Female only; male unknown.) Small wasps, 5 to 6.5 mm. in length, the only known species in large part ferrugino-castaneous, marked with black and pale yellow. Body clothed with a fine, silvery pubescence, and entirely devoid of erect hairs.

Head much broader than high, the temples strongly developed, especially above; integument of head finely and evenly punctate. Palpi slender, short; apical segment of maxillary palpus about as long as the antennal pedicel. Mandible with a single tooth on the inner margin, the outer margin with a number of bristles arising from a groove, as in nearly all Pompilini. Labrum mostly concealed by the clypeus, its apical margin bristly, slightly emarginate. Clypeus very broad, its apical margin broadly truncate. Malar space very short. Front very broad, moderately convex, without prominences, and with only a faint median groove just above the antennal orbits. Antennae slender, of moderate length, the third segment equal to much less than half the upper interocular distance. Vertex raised slightly and in an even arc above the tops of the eyes.

Pronotum with the streptaulus complete, the collar much depressed below the level of the thoracic dorsum and of the vertex, the slope of the pronotum behind the collar gradual and even. Postnotum a transverse band nearly the length of the metanotum, with a median linear impression, without striations. Propodeum short, with an oblique posterior declivity nearly as long as the anterior, horizontal part; posterior rim indicated by only a very small ridge. Mesopleuron rather strongly convex across its short axis.

Legs with numerous short, dark spines; hind femora with some minute spines on the upper side near the apex; all the tibiae with a few unequal, irregularly spaced, splayed-out spines at their apices. Front tibiae without other spines except for two or three on the outer side; middle and hind tibiae sparsely spinose on the sides and above. Tarsal segments, except the last, with a sparse median ventral row of short spines. Front basi-

tarsus with three short spines along the outer side, one at the apex, and the second segment with one at the apex; no true tarsal comb. Claws dentate; pulvillar pad small, the comb very weak.

Fore wing with the transverse median vein meeting the media basad of the basal vein. Stigma small; radial vein nearly evenly arcuate; marginal cell removed from the wing-tip by a little more than its own length; 2d and 3d submarginal cells both 4-sided. Third discoidal cell removed from the outer wing margin by slightly more than its own length, and with a very slight pocket at its lower basal corner; second recurrent vein nearly vertical, meeting the subdiscoidal vein less than half-way from its base to the outer wing margin. Hind wing with the anal lobe small; anal vein straight, paralleling the preaxillary furrow, terminating at the transverse median vein, which it meets at an angle, the latter vein joining the media much before the origin of the cubitus. Cubitus terminating a very short distance beyond the transverse cubital vein. (Wings shown in Fig. 11.)

Abdomen short, rather stout, the apical segment only very slightly compressed; sting well developed.

*Distribution.*—Lower Sonoran fauna of the western United States and Mexico.

1. *Tastiotenia festiva* new species

(Plate XI, fig. 11.)

FEMALE.—Length 6.5 mm.; fore wing 4.2 mm. Head black, except that the clypeus is castaneous, the mandibles castaneous tipped with ferruginous, the antennae dusky-castaneous, the apical segments darker, almost black. Propleura dark brown; pronotum ferrugino-castaneous, the posterior margin with a broad stripe of pale yellow. Mesonotum, tegulae, scutellum, metanotum, postnotum, mesopleura, and mesosternum dark brown varying to black. Metapleura, propodeum, all the legs, and the entire abdomen ferrugino-castaneous. Entire body clothed with a light silvery pubescence. Wings hyaline, the apical fourth of the fore wing lightly banded with brownish.

Clypeus 3.5 times as broad as high, about as broad as the lower front. Front very broad, middle interocular distance  $.67 \times$  transfacial distance. Inner orbits converging above, middle interocular distance about equal to lower interocular distance, upper interocular distance  $.87 \times$  lower. Ocelli in a large triangle on a broad vertex, forming a right angle in front; post-ocellar line is to ocello-ocular line about as 7:6. First 4 antennal segments in a ratio of 20:8:19:18, segment 3 equal to  $.46 \times$  upper interocular distance.

Posterior pronotal margin angulate. Median line of propodeum lightly impressed in front. Fore wing with the marginal cell  $1.3 \times$  its own length from the wing-tip; 2d submarginal cell nearly twice as broad as high, narrowed by about half above; 3d submarginal cell much smaller, higher than broad, as wide above as below. (Fig. 11.)

The single paratype is 5 mm. long, the fore wing 3.8 mm. The color is the same as that of the type except that the clypeus is dark brown and

the anterior portion of the propodeum is suffused with blackish for a short distance. Middle interocular distance is  $.66 \times$  transfacial distance; upper interocular distance is  $.91 \times$  lower interocular distance; antennal segment 3 equals  $.42 \times$  upper interocular distance. The 3d submarginal cell of the fore wing is a little wider than in the type, approximately square.

The type lacks the right antenna. The paratype lacks the apical four segments of the right antenna, and parts of the tarsi on all but two legs; this specimen is abnormal in that the 3d transverse cubital vein is lacking from the right fore wing.

MALE.—Unknown.

*Distribution*.—Known only from the Colorado Valley of southern California and the west coast of Sonora, Mexico.

*Holotype*.—MEXICO: Sonora: ♀, Guaymas, 29 Sept. 1923 (W. M. Mann) [USNM]. *Paratype*.—UNITED STATES: California: San Bernardino Co., ♀, Needles, 1-6 April 1918, on mesquite [CU].

## II. Genus **CHALCOCHARES** Banks

*Chalcochares* Banks, 1917. Bull. Mus. Comp. Zool., 61: 107. [Type: *Psammochares hirsutifemur* Banks, 1914; monobasic.] [Proposed as a subgenus of *Psammochares*.]—Dreischach, 1949, Ent. Amer. (n. s.) 29: 6.

*Anotochares* Banks, 1939, Canad. Ent., 71: 225, 228. [Type: *Anotochares cnygheharti* Banks, 1939; monobasic.] New synonymy.—Dreischach, 1949, Ent. Amer. (n. s.) 29: 6, 7, 9.

This genus is not closely allied to the preceding, but is placed here because, like *Tastiotenia*, it possesses a number of curious and probably primitive characters. The hind wings are unusually broad and full, the anal lobe very large; the anal and transverse median veins of the hind wing are confluent, but the tip of the anal vein is usually preserved as a small stub; the abdomen has a tendency to be somewhat constricted between the basal segments; the pronotum of the female is flattened above; the pubescence is bluish or purplish, and the body unusually hairy, at least in the males. These and other characters suggest a primitive condition, and also suggest a possible relationship to such genera as *Psorthaspis* and *Aporus*, which are not usually placed in this tribe. On the other hand, there are certain resemblances to the following genus, *Eragetes*. Unfortunately nothing is known of the biology of *Chalcochares*; perhaps a knowledge of its biology will someday shed light on its true position and relationships.

*Generic characters.*—Medium-sized to fairly large wasps, 10 to 30 mm. in length. Color black, rendered conspicuously bluish or purplish by the pubescence. Body unusually hairy; propodeum densely, and femora to some extent hairy in both sexes; male densely hairy all over, including even the abdominal dorsum, the hair on the clypeus and lower front extremely dense.

Mandibles bidentate in both sexes. Clypeus not quite as wide as the lower front, slightly elevated, the apical margin in the male evenly rounded, in the female truncate. Labrum mostly or wholly concealed, its apical margin feebly emarginate, the apical fringe of bristles not especially long. Malar space present, shorter than the antennal pedicel. Scape of antenna rather long, in both sexes at least as long as the third antennal segment, in the female slightly compressed toward the base; length and thickness of the flagellum not differing noticeably in the two sexes. Front in the female slightly depressed below and to the sides of the antennal orbits; front in both sexes very broad, middle interocular distance at least  $.65 \times$  transfacial distance. Vertex very broad, elevated slightly to very strongly above the tops of the eyes.

Pronotum rather long, its posterior margin arcuate; slope abrupt just behind the collar, the surface thereafter nearly flat, in the same plane as the mesonotum, broad, the shoulders rather prominent, especially in the female; sides of the dorsum rather sharp, at least in the female, the sides of the pronotum nearly vertical. Postnotum a very narrow transverse band, more or less overhung medially by the strongly convex metanotum. Mesopleura convex, prominent. Propodeum relatively short and broad, very abruptly declivous behind, the declivity rather sharply defined, oblique but approaching vertical; posterolateral angles prominent, humped, in the females obscurely rugulose; females with a rounded elevation just behind the spiracles, faintly indicated in the males. Legs spinose; female without a tarsal comb, but the front tarsus rather strongly spinose, the front tibia with some stout, curved spines at its apex (Fig. 9); apical tarsal segments spined beneath in the female, the spines forming two irregular rows rather than a single row; last segment of front tarsus of male unmodified; all the claws dentate in both sexes; tibial spurs rather short. Pulvillar pad small, the comb not well developed, of not over 12 setulae. Front legs of male, especially the coxae, rather disproportionately small.

Hind wing unusually broad, the anal lobe large, at least three-fourths the length of the submedian cell; preaxillary excision not well defined, but located slightly beyond the end of the submedian cell. Anal vein well rounded out or somewhat angulate below its junction with the media, usually with a short stub vein at this point. Fore wing with the basal and transverse median veins interstitial on the media, or the latter slightly basad of the former. Stigma of moderate size; marginal cell about or slightly more or less than its own length from the wing-tip, the radial vein somewhat angled at the 3d transverse cubital vein; 2d submarginal cell quadrate, 3d 4-sided but slightly to strongly narrowed above. (Wings shown in Fig. 10.)

Abdomen of the female stout, the apex hirsute but without bristles; tergite I with the anterior surface nearly perpendicular to the dorsal. Abdomen of the male rather stout, showing feeble constrictions between the basal segments, especially the first and second; tergite I with the anterior surface vertical, fitting closely to the propodeal declivity; entire abdomen densely hairy above and below. Sternite 6 with the emargination very large, U-shaped. Subgenital plate tongue-shaped, flat, compared to the other sternites weakly pilose. Genitalia (Figs. 16 and 17) with the aedocagus slender, deeply cleft apically, more or less folded longitudinally; parapenials stout, subtriangular in cross-section, in lateral view very wide; basal hooklets single; parameres densely bristly along their lower inner margin.

*Biology*.—Nothing fundamental is known of the biology of members of this genus; a few habitat notes are included under each of the species.

*Distribution*.—Lower Sonoran fauna; Mexico and the four states of the United States bordering it. Only two species are known.

*Key to Species*

Females

Vertex elevated far above the tops of the eyes, in anterior view nearly straight across and with a slight median impression; ocelli far removed from the crest of the vertex; length 19-30 mm.

1. **engleharti** (Banks)

Vertex elevated slightly and in an even arc above the tops of the eyes; ocelli not unusually far from the crest of the vertex; size 12-19 mm.

2. **hirsutifemur** (Banks)

Males

Vertex extended a considerable distance above and behind the eyes (Fig. 15); parameres of genitalia very strongly curved (Fig. 16); size 14-23 mm. . . . . 1. **engleharti** (Banks)

Vertex rounded off only a little above and behind the eyes (Fig. 14); parameres in ventral view but slightly curved (Fig. 17); size 10-15 mm. . . . . 2. **hirsutifemur** (Banks)

1. **Chaicochares engleharti** (Banks) new combination<sup>19</sup>  
(Plate X, fig. 9; plate XI, figs. 15 and 16.)

*Anotochares engleharti* Banks, 1939, *Canad. Ent.*, 71: 228. [Type: ♀; Fredericksburg, Texas, 10 Oct. 1939 (G. Englehart); M. C. Z. no. 23,481.]

<sup>19</sup>This species was presumably named after its collector, who is said by Banks to be G. Englehart; this in fact is the name as it appears on the label of the type. It seems likely that the collector was George P. Engelhardt. There may be some who would prefer to emend the specific name to *englehardtii*, but I prefer to retain the original orthography.

This is a striking species because of its large size, bluish coloration, very hairy body, and curious morphological features. The female is readily recognized by the strongly produced vertex; this character is less well-developed in the male, and it is sometimes necessary to examine the genitalia to separate males of this and the following species. The ranges of the two species do not appear to overlap in this country, but may do so in Mexico.

FEMALE.—Length 24 (19-30) mm. Color black, the pubescence refulgent of deep bluish, purplish, or blue-green; wings wholly deep fuliginous, violaceous, the pubescence on the wing, especially toward the base, reflecting the same color as that on the body. Scape slightly hairy; clypeus, front, vertex, and occiput clothed with short hairs; temples, propleura, and front coxae with dense, longer hair; thoracic dorsum with very short hair; pleurites and propodeum with dense, longer hair; all the coxae and femora hairy, often also the tibiae and tarsi to some extent; first abdominal tergite densely hairy in front, all the sternites and the apical tergites sparsely setose.

Transfacial distance about  $1.05 \times$  facial distance. Clypeus .8 the width of the lower front, a little over twice as broad as high. Antennae inserted low, on a prominence just above the clypeus, the front obliquely depressed on each side of the antennal bases. Front with a short but deep median furrow just above the antennal bases. Middle interocular distance about  $.7 \times$  transfacial distance; upper interocular distance and lower interocular distance about equal; the former at least as great as the height of the eye. Vertex extended above the tops of the eyes a distance about equal to the width of an eye, its top nearly straight across, but with a slight median impression. Ocelli on a level with the eye-tops, far removed from vertex crest, the lateral ocelli being about as close to the eyes as to the crest of the vertex; ocello-ocular line much greater than post-ocellar line, the ocellar triangle rather flat. Temples strongly developed, especially above, wider than the eye. Scape long and the flagellum relatively short; first four antennal segments in a ratio of roughly 4:1:3.5:3.3, segment 3 equal to much less than half the upper interocular distance.

Propodeal declivity nearly vertical and actually longer than the anterior, horizontal part; median line of propodeum well impressed in front. Front tarsus and apex of tibia as shown in Fig. 9; the apex of the tibia is actually slightly emarginate between the stout, claw-like spines. Wings as described under the generic heading. Abdomen stout, the vertical portion of tergite 1 fitting closely against the propodeal declivity; sting very long when exerted.

MALE.—Length 19 (14-23) mm. Color of body and wings as in the female, the body much more hairy than in this sex. Scape densely hairy, the hairs short above, long below; clypeus and front densely hairy, the front especially so just above the antennal bases; vertex, occiput, and temples very hairy; thoracic dorsum densely short-haired; propodeum



densely long-haired; pleura, coxae, and femora densely hairy, the tibiae slightly so; entire abdominal dorsum densely short-pilose, the venter similarly pilose except on the basal and apical sternites.

Clypeus about  $1.7 \times$  as broad as high, somewhat convex. Front broad, middle interocular distance about  $.65 \times$  transfacial distance; inner orbits slightly divergent above. Vertex raised considerably above the tops of the eyes, but not so strongly as in the female, and more arcuately, without the median impression; seen in side view the upper temples and vertex are produced considerably above and behind the eyes (Fig. 15). Ocelli in a very flat triangle and much below the vertex crest, post-ocellar line much less than ocello-ocular line. First 4 antennal segments in a ratio of about 4:1:4:4; flagellum rather thick, its profile slightly crenulate.

Median line of propodeum well impressed; spiracles not their own length from the front margin of the propodeum. Abdomen with a well-defined constriction between the first two segments, and a very slight one between the next two. Subgenital plate slender, the apex narrowly rounded, the surface with only pubescence and a few weak hairs. Genitalia (Fig. 16) with the parameres strongly curved for their entire length, the lower inner margin thickened and densely clothed with short, stout setae. Digitus volsellaris strongly twisted, narrowly spatulate, the disc with scattered short setae and a number of longer ones on the upper, outer margin.

*Biology*.—Mr. James E. Gillaspay, who to my knowledge is the only person to have collected this species in any series, has taken both sexes on the thorny shrub *Condalia obtusifolia* (Rhamnaceae). "They were taken," he says (*in litt.*), "in the mesquite country in Llano Co. [Texas] . . . females were taken flying in gladelike openings among mixed mesquite and oak at the brow of a rise some four or five hundred feet away from a tank or earthen reservoir. [Others] were taken several miles away, on the shrub which was growing in a broad, shallow stream bed among the mesquites." The species has also been taken "on Euphorbiaceae."

*Distribution*.—This is a Lower Sonoran form, ranging from central Texas southward and westward well into the Mexican states of Coahuila and Durango.

*Specimens seen*: 24 (13 ♀♀, 11 ♂♂). TEXAS: 1 ♀, 1 ♂ (no further data) [CU, ANSP]; Bastrop Co., 1 ♂ [JEG]; Blanco Co., 1 ♀, Round Mt. [ANSP]; Culberson Co., 1 ♀, Boracho, 22 June (Michener) [AMNH]; Dimmit Co., 1 ♀, Carrizo Springs, 11 June (Strandtmann) [RWS]; Gillespie Co., 1 ♀, Fredericksburg, 10 Oct. (Englehart) [MCZ]; Llano Co., 4 ♀♀, 3 ♂♂, 10–11 June (Gillaspay) [JEG]; Reeves Co., 2 ♀♀, Pecos, 19 June (A. T. McClay) [JEG]; Travis Co., 1 ♂, Austin [MCZ];

Uvalde Co., 2 ♂♂, Uvalde, 19 May (Bradley) [CU]; Valverde Co., 1 ♀, Devil's River, 6 May (Bishopp) [USNM]; Webb Co., 1 ♂, Laredo, 16 May [USNM]; Williamson Co., 1 ♀, Liberty Hill, 20 June (Strandtmann) [RWS]. MEXICO: Coahuila: 1 ♂, Buena Vista, 7000 feet, Sierra del Carmen, 12 July (R. H. Baker) [CIS]. Durango: 1 ♂, San Isidro, 6700 feet, 8 Aug. (Michener) [AMNH].

2. **Chalcochares hirsutifemur** (Banks) (Plate XI, figs. 10, 14, 17.)

*Psammochares hirsutifemur* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 304. [Type: ♀; Lemon Grove, Calif., 16 May (Van Duzee); Mus. Comp. Zool., no. 13,691.]

*Psammochares (Chalcochares) hirsutifemur* Banks, 1917, Bull. Mus. Comp. Zool., 61: 107.

*Chalcochares hirsutipennis* M. Smith, 1943, Zool. Record, v. 79, sect. 13, p. 134. [*Lapsus calami* for *hirsutifemur* Banks.]

This is a smaller species than *engleharti* and occurs farther west. It is very similar in appearance, but the vertex is only slightly produced above the tops of the eyes.

FEMALE.—Length 15.5 (12–19) mm. Color black, rendered by the pubescence more or less bluish or violaceous; wings deep fuliginous, violaceous. Clypeus, front, vertex, and thoracic dorsum with abundant short hairs; temples, pro- and mesopleura, and propodeum with dense, longer hair; all the coxae and femora hairy, the tibiae slightly so; first abdominal tergite hairy in front, all the sternites and the apical tergites sparsely setose.

Transfacial distance about  $1.12 \times$  facial distance, the head therefore noticeably broader than high. Clypeus slightly more than twice as broad as high, about .9 as wide as the lower front. Front rather convex above the antennal bases, its median line faintly impressed below. Middle interocular distance about  $.67 \times$  transfacial distance; lower interocular distance and upper interocular distance subequal, the latter about equal to the height of the eye. Vertex elevated in an even arc above the tops of the eyes. Ocelli in a flat triangle about on a level with the eye-tops; post-ocellar line: ocello-ocular line about as 3:4. Temples moderately developed, in lateral view not as wide as the eyes. First four antennal segments in a ratio of about 3:1:3:2.8, segment 3 equal to about half the upper interocular distance, or a little less.

Propodeal declivity oblique, approaching vertical, the declivous part about as long as the anterior, horizontal part; median line noticeably impressed at the top of the declivity. Tarsal characters about as in the preceding species; apical tarsal segments only weakly spined beneath. Vertical portion of first abdominal tergite fitting closely against the propodeal declivity; sting long when exerted.

MALE.—Length 13.5 (10–15) mm. Color of body and wings as in the female, the body much more densely hairy than in that sex, the distribution and abundance of hair exactly as described under the preceding species.

Clypeus somewhat less than twice as broad as high. Middle interocular distance about  $.67 \times$  transfacial distance; upper and lower interocular distance nearly equal. Vertex raised in an arc above the eye-tops, but not as strongly as in *engleharti*, and the upper temples not as wide as in this species (Fig. 14). Ocelli in a very flat triangle, post-ocellar line considerably less than ocello-ocular line. Scape slender; first four antennal segments in a ratio of about 3.5:1:3:3.3, segment 3 usually shorter than 4 and not much more than twice as long as thick.

Median line of propodeum weakly impressed in front, more strongly toward the edge of the declivity. Abdomen faintly constricted between the first and second segments. Subgenital plate and genitalia very similar to those of *engleharti*; the parameres, however, are somewhat less strongly curved, and the inner margin is densely bristly for a greater proportion of its length (Fig. 17).

*Biology*.—I have taken this species on the flowers of *Tamarix gallica* in the New Mexico desert. It has also been taken on *Acacia*.

*Distribution*.—Lower Sonoran fauna, southern New Mexico to California.

*Specimens seen*: 24 (14 ♀♀, 10 ♂♂). NEW MEXICO: Hidalgo Co., 1 ♂, Steins, 14 July (Bradley) [CU]; Otero Co., 1 ♀, 1 ♂, 12 mi. SW of Alamogordo, 27 July (Evans) [HEE]; 1 ♂, White Sands, 30 June (R. H. Beamer) [UK]; ARIZONA: 1 ♀ (no further data) [ANSP]; Cochise Co., 1 ♀, Portal, Chiricahua Mts., Aug. [CAS]; 1 ♀, San Bernardino Valley, 2 mi. SW of Chiricahua, 4650 feet, July (Pate) [ANSP]; 3 ♀♀, Douglas, 22 Aug. (W. W. Jones) [USNM]; Santa Cruz Co., 1 ♀, Washington Mts., near Nogales, 7 Sept. [CAS]; CALIFORNIA: Inyo Co., 1 ♀, 2 ♂♂, Big Pine Creek, 8–11,000 feet, Aug. (I. McCracken) [CAS, CIS]; Los Angeles Co., 1 ♂, Pasadena, 17 July (Bridwell) [USNM]; Marin Co., 1 ♂, Manor, 28 July (Williams) [CIS]; Orange Co., 1 ♀, Newport Bay, 6 Aug. (P. D. Hurd) [CIS]; Riverside Co., 1 ♂, Idyllwild, 14 July [CIS]; San Bernardino Co., 1 ♂, Colton [MCZ]; 1 ♀, Redlands, 3 July [CU]; San Diego Co., 1 ♀, Lemon Grove, 16 May (VanDuzee) [MCZ]; 1 ♀, San Diego [MCZ]; 1 ♀, San Felipe Valley, 6 June [CIS]; Santa Barbara Co., 1 ♂, Santa Barbara, 27 June [MCZ].

### III. Genus **EVAGETES** Lepelletier

*Evagetes* Lepelletier, 1845, Hist. Nat. Ins. Hymen., III, p. 390. [Type: *Aporus bicolor* Lepelletier, 1845 (= *dubius* Van der Linden, 1827); monobasic.]

- Eyagates* Lucas, 1852, Ann. Soc. Ent. France, (2) 10: 418. [Typographical error for *Evagetes* Lepeletier.]
- Evagethes* Smith, 1858, Cat. Brit. Foss. Hymen. Brit. Mus., pp. 53, 79. [Emendation for *Evagetes* Lepeletier.]
- Pompilus* Groups 3, 4, & 5 Kohl, 1884, Verh. zool.-bot. Ges. Wien, 34: 39-55.
- Sophropompilus* Howard, 1901, The Insect Book, p. VII, fig. 13. [Type: *Pompilus inachus* Cresson, 1867; monobasic.] New synonymy.—Ashmead, 1902, Canad. Ent., 34: 84. [Proposed as a new genus.]—Banks, 1911, Jour. N. Y. Ent. Soc., 19: 224.—Dreisbach, 1949, Ent. Amer., (n.s.) 29: 8, 12.
- Nannopompilus* Ashmead, 1902, Canad. Ent., 34: 82. [Type: *Nannopompilus argenteus* Ashmead MS (nomen nudum);<sup>20</sup> monobasic.] New synonymy.—Banks, 1919, Bull. Mus. Comp. Zool., 63: 230.—Dreisbach, 1949, Ent. Amer. (n.s.) 29: 8, 9.
- Nanopompilus* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 301. [Emendation or *lapsus calami* for *Nannopompilus* Ashmead.]
- Psammochares crassicornis*-group Haupt, 1927, Deutsch. Ent. Zeitschr., Beiheft, pp. 154, 210.
- Psammochares (Evagetes)* Haupt, 1927, Deutsch. Ent. Zeitschr., Beiheft, pp. 158, 166, 227.

The generic name *Evagetes* has always been used for certain Old World Pompilini which are structurally somewhat diverse but resemble one another in the loss of the 2d transverse cubital vein, thus having but 2 submarginal cells. A number of European authors have noted the resemblance of *dubius*, the genotype, to *Pompilus crassicornis* and its allies (*Sophropompilus* Howard). All the other species of *Evagetes* have now been removed to other genera. When, however, we remove *dubius* to *Sophropompilus*, an inevitable step, we find that the name *Evagetes* has priority and must be used for this group. I have studied specimens of both sexes of *Evagetes dubius*, and found them extremely similar

<sup>20</sup> It has usually been considered that *Nannopompilus argenteus* Ashmead MS was in reality *Pompilus argenteus* Cresson, 1867 (= *parvus* Cresson, 1865). Ashmead, in characterizing the new genus in his key, states, however that the cubitus in the hind wing originates "before the transverse median nervule" and the "claws in the ♀ [are] cleft." These characters certainly do not fit Cresson's *argenteus*, although certain other characters presented do. It seems best to credit this confusion to Ashmead's lack of care in the preparation of his keys, and to continue to consider *argenteus* Cresson the genotype of *Nannopompilus*. See also Pate, 1946, Trans. Amer. Ent. Soc. 72: 96, footnote.

to European and American species formerly placed in *Sophropompilus*. The male genitalia and subgenital plate of *dubius* (Figs. 18 and 34) conform closely to the pattern of the American species. Specimens of several species are not rare in which there are but two submarginal cells in one wing and three in the other (this was noted by Shuckard in *crassicornis* as early as 1835); I have seen one specimen of *padrinus* Viereck with but two submarginal cells in each wing. Not a single character of any significance can be found which will save the genus *Sophropompilus* (along with *Nannopompilus*) from synonymy with *Evagetes*.

The most characteristic feature of this genus is the short antenna; in the female the flagellum is thickened toward the middle and the segments somewhat flattened on one side, the flattened area highly sensory. As the female walks over the sand the antennae are applied constantly to the surface; by this means she is apparently able to perceive the nests of certain species of Pompilini beneath the sand, for the members of this genus appear to be social parasites of other Pompilini (see further discussion under *Biology*). This, incidentally, is another reason for considering this group of generic rank, rather than a subgenus or species-group of *Pompilus*. Further morphological characters are in the much reduced pulvillar pad and comb, and the very broad front and vertex.

The species of *Evagetes* are in most cases extremely variable, not only in size and vestiture, but in almost every structural character that is customarily used in separating the species. The shape of the pronotum, length of the comb spines, length of the antennal segments, venation, hairiness of the body, and even to some extent the male genitalia, are all subject to so much variation that they can be used only with reservation. It is possible that this variability is explainable from their biology, for we would expect a large range in size, at least, in forms which are social parasites of a number of different species of spider wasps. A great deal of careful work needs to be done on this genus, particularly with respect to the habits and life-histories of its various members, some of which are among our most common Pompilidae.

*Generic characters*.—Small to medium-sized wasps, 4 to 18 mm. in length. Color black or with the base of the abdomen marked with rufous. Pubes-

cence variable, but frequently obscurely to brilliantly dark metallic-refulgent, sometimes rendering the insect strongly bluish in appearance; pubescence sometimes very extensively silvery, at other times brownish and inconspicuous.

Labrum exerted slightly or not at all, its apical margin truncate or feebly emarginate. Mandibles in both sexes with but a single distinct tooth on the inner margin. Clypeus broad, but never broader than the front, its apical margin truncate or very slightly arcuately concave. Malar space present, not greater than the length of the antennal pedicel. Front and vertex very broad; middle interocular distance at least .6 the trans-facial distance. Antennae short, never capable of reaching the abdomen, in the female with a tendency to be thickened toward the middle of the flagellum, the segments flattened somewhat on one side. Third segment of antenna in the female not more than  $2.8 \times$  as long as its greatest thickness, never more than very slightly longer than the 1st or 4th segments, and never equal to more than .6 the upper interocular distance. Antenna of male with the 3d segment distinctly shorter than the fourth and not over twice as long as thick, usually less. (See Figs. 25, 26, 29-31.)

Pronotum shorter than the mesonotum, never sharply angulate behind, either arcuate or broadly subangulate (Figs. 25, 26 and 27). Postnotum very short, depressed medially. Propodeum without protuberances or striations, but in the female with a rather well-defined oblique declivity behind. Legs moderately spinose; female with a few median spines beneath the apical tarsal segments, the male usually without. Front tarsus of female with a well-developed comb, the spines at least as long as the tarsus is wide, usually much longer (Figs. 3-6). Last segment of front tarsus of male (Fig. 8) barely to rather strongly asymmetrical, the inner margin more or less produced, the claw on the inner side strongly curved, the rays widely separated, the outer claw more like those of the other tarsi, either dentate or bifid. Middle and hind tarsal claws of the male, and all the claws of the female, dentate. Pulvillar comb (Fig. 7) very weak, of at most about seven weak, diverging setulae arising from a small pad.

Hind wings with the anal lobe small, less than half the length of the submedian cell; anal vein meeting the media usually slightly before the origin of the cubitus. Transverse median vein of the fore wing meeting the media beyond or at the origin of the basal. Stigma short; marginal cell more than its own length from the wing-tip, the radial vein usually somewhat angled at the 3d transverse cubital vein. The 1st and 3d transverse cubital veins arcuately approaching above; 2d erect, nearly straight, occasionally absent; 3d submarginal cell always much narrowed above, sometimes triangular. (See Figs. 12 and 13.)

Abdomen of female stout, the pygidium without bristles. Abdomen of male much more slender. Male subgenital plate simple, the median line usually slightly elevated; near the base are usually a pair of raised, sclerotized points or a pair of carinae (as in Figs. 33, 34 or 32). Genitalia with the parameres slender and moderately long, the squamae fairly prominent.

Digitus of variable shape, more or less expanded apically, clothed ventrally with short setae. Basal hooklets single or feebly doubled. Parapentials simple and slender. Acdoeagus of moderate breadth, the shaft often bearing small setae. The genitalia of the genotype are shown in Fig. 18.

*Biology.*—From what is at present known of the biology of the species of this genus, it appears that they are all social parasites of other Pompilini. Our knowledge of their habits is traceable, as is so often the case, to the observations of Ferton<sup>21</sup> and Adlerz<sup>22</sup> in Europe, and the Peckhams<sup>23</sup> in America. Richards and Hamm<sup>24</sup> present an excellent summary in English of what is known of the European species.

According to Ferton, the female *E. crassicornis*, walking with her antennae in rapid motion over the surface of the sand, is able to perceive the whereabouts of the filled nest of a Pompilid in the sand. When one is located, the wasp digs a hole in the sand until the cell is found which contains the paralyzed spider, on which an egg has been laid by the host species. Thereupon the *crassicornis* proceeds to destroy the host egg and lay her own, and then refill the burrow. The form of parasitism is very different from that of *Ceropales*, and is much more like that of the sphecid *Stizus uncinatus*, as described by the Raus,<sup>25</sup> which behaves in a similar manner toward *Priononyx*. Adlerz confirmed Ferton's observations on *crassicornis*, and observed this species in a glass tube, actually devouring the egg of *Pompilus unguicularis*. The known hosts of *E. crassicornis* are *Episyron* spp. and *Pompilus unguicularis* Thomson. *E. pectinipes* (L.) is known to parasitize *Pompilus sceleratus rufus* (Haupt) and *Episyron rufipes* (L.) in a similar fashion.

The North American *E. parvus* (Cresson) has been observed by the Peckhams (under the name *subviolaceus* Cresson) to lurk in the background while *Pompilus sceleratus* Cresson completed her

<sup>21</sup> Ferton, C., 1901-1905, Ann. Soc. Ent. France, 70: 116, 71: 519, and 74: 73.

<sup>22</sup> Adlerz, G., 1910, K. Svensk. Vet.-Akad. Handl., 45: 13.

<sup>23</sup> Peckham, G. W. and E. G., 1905, Wasps Social and Solitary, pp. 236, 240.

<sup>24</sup> Richards, O. W. and A. H. Hamm, 1939, Trans. Soc. Brit. Ent., 6: 88-89.

<sup>25</sup> Rau, Phil & Nellie, 1918, Wasp Studies Afield, pp. 180-193.

nesting in a garden. When *scelestus* had left, *parvus* suddenly appeared on the scene and began to dig, in this case unsuccessfully, where the former had filled her burrow. I have observed this same species on two occasions entering the burrows of *Anoplius marginatus* (Say), in one case while the *marginatus* female was still in it. I have also noticed *E. padrinus minusculus* (Banks) haunting the nesting-site of *Anoplius relativus* (Fox). The most detailed observations on the habits of an American species are those recently made by the author on *Ecagetes hyacinthinus* (Cresson), which is a social parasite of *Anoplius americanus* (Beauvois); these are discussed under that species.

The habits of the genotype, the European *dubius* (Van der Linden), have apparently not been observed. Ferton<sup>26</sup> has published certain notes on a spider-hunting wasp which he called *dubius*, but he later<sup>27</sup> discovered that these were based on mis-determined specimens. He suggests, in fact, that the real *dubius* may be a parasite of other Pompilidae, quoting Wesmael, who as early as 1851 noted the resemblance of *dubius* to *pectinipes* L. and suggested that both were probably parasites. And yet for exactly one century no one has had the courage to place *dubius* and the *pectinipes-crassicornis* group together in the same genus, and to state unequivocally that this genus is parasitic in habit—all because a single very small vein is lacking in the fore wing of *Ecagetes dubius*!

*Distribution*.—Palearctic, Nearctic, and Neotropical Regions. It is possible that the African *argenteodecoratus* Cameron belongs here, although I have not seen specimens and hence cannot assign it definitely. This species is the genotype of *Asthenoctenus* Arnold. I recognize six species of *Ecagetes* in our fauna, two of them polytypic.

### Key to Species

#### Females

1. Posterior margin of pronotum broadly arcuate, at most with a very small angulate notch at the middle (Figs. 25 and 27); body rendered by the pubescence more or less brilliantly bluish, violet or blue-green .....2

<sup>26</sup> Ferton, C., 1897, Actes Soc. Linn. Bordeaux, 52: 19, 33.

<sup>27</sup> Ferton, C., 1921, Ann. Soc. Ent. France, 89: 352-353.



- Posterior margin of pronotum angulate or subangulate, rarely nearly arcuate (Fig. 26, though the angulation not always this distinct); pubescence at most obscurely reflecting metallic colors .....6
2. Front and hind wings wholly and uniformly deep fuliginous; body wholly without silvery pubescence, even on the lower front; submedian cell of hind wing usually broadly rounded or somewhat truncate apically, sometimes appendiculate (Fig. 12); size 10.5 to 18 mm.
1. **ingenuus** (Cresson)
- Wings not wholly fuliginous (when nearly so, the lower front, at least, silvery-sericeous); submedian cell of hind wing pointed or narrowly rounded apically, never appendiculate (Fig. 13) .....3
3. Front basitarsus with three short comb-spines, the apical one not equal to more than .8 the second tarsal segment (Fig. 3); color dark bluish or purplish, not very brilliant, at most in small part silvery-sericeous
2. **parvus** (Cresson)
- Front basitarsus more strongly spined, either with three comb-spines, the apical one subequal to or longer than the second segment, or with four or five comb-spines; body rather brilliantly metallic-refulgent and or extensively silvery .....4
4. Front basitarsus with from 3 to 5 (usually 4) comb-spines, the spines somewhat broad and flat, the apical one on the basitarsus subequal to or a little longer than the 2d tarsal segment (Fig. 4); propodeum at least slightly hairy; 3d submarginal cell usually as wide below as the 2d, or wider .....4. **hyacinthinus** (Cresson)
- Front basitarsus with 3 very long, slender comb-spines, the apical one considerably longer than the 2d tarsal segment (Fig. 6); propodeum without erect hair; 3d submarginal cell small, usually shorter above and below than the 2d, often triangular .....5
5. Body brilliantly bluish or blue-green (fading to violet in older specimens); head and thorax sometimes more or less silvery-sericeous, the abdomen, at least the dorsum, never so
- 3a. **padrinus padrinus** (Viereck)
- General appearance paler, the silvery pubescence very extensive, involving most of the head and thorax and part or all of the abdomen
- 3b. **padrinus minusculus** (Banks)
6. Propodeum with numerous erect hairs; color black, the pubescence deep blue-black; front basitarsus with 3 or 4 very long comb-spines, the apical one usually longer than the 2d tarsal segment (Fig. 5)
5. **subangulatus** (Banks)
- Propodeum very slightly or not at all hairy; color black or black and rufous; pubescence not at all reflecting bluish; front basitarsus with 3 (rarely 4) comb-spines, the apical one slightly if at all longer than the 2d tarsal segment .....7

7. Base of the abdomen with at least a small amount of rufous, usually with the greater part of the basal 2 or 3 segments above and below rufous; length 8.5 (6-11) mm.

6a. **crassicornis crassicornis** (Shuckard)

Wholly black; length averaging slightly less, 7.5 (5-9) mm.; 3d submarginal cell usually triangular, sometimes petiolate

6b. **crassicornis consimilis** (Banks)

### Males

(Certain species of *Pompilus* and *Agenioideus* with short antennae will occasionally key out to this genus, and are therefore included in the following key.)

- a. Apical margin of clypeus convexly rounded, the clypeus less than twice as broad as high; posterior pronotal margin with a pale stripe; subgenital plate with a pair of basal palpus-like processes (visible only upon dissection) ..... **Pompilus (Hesperopompilus)**, 2 spp.

Apical margin of clypeus truncate, the clypeus at least twice as broad as high; pronotum without a pale stripe; subgenital plate without such processes ..... b

- b. Marginal cell very long, less than its own length from the apex of the wing; stigma very large; apex of abdomen compressed, the subgenital plate strongly so, though the apical abdominal segments are usually telescoped into the basal ones

**Agenioideus (Gymnochaeres) birkmanni** (Banks)

Marginal cell at least its own length from the wing-tip; stigma small or of moderate size; subgenital plate not strongly compressed ..... c

- c. Abdominal tergites 2-4 each with a sharply defined band of coarse silvery pubescence along the apical margin, the remainder of the tergite with much finer, brownish pubescence; 3d submarginal cell very much smaller than the 2d, usually petiolate; sternite 6 with a specialized median area set off by a carina

**Pompilus (Ammosphex) phoenix** Evans

Abdominal tergites not banded with silvery pubescence, or if so, the pubescence is all very fine, and the bands are basal, not apical; sternite 6 without a specialized area set off by a carina ..... 1

1. Subgenital plate with a pair of prominent carinae near the base (Fig. 32); digitus of genitalia with an apical nasutiform lobe (Fig. 22); color black or black and rufous, the pubescence not reflecting bluish .. 2

Subgenital plate with a single median carina for its entire length or none at all; digiti without such a lobe apically; color black, the pubescence variable ..... 3

2. Basal abdominal tergites marked with at least a small amount of rufous

6a. **crassicornis crassicornis** (Shuckard)

- Wholly black .....6b. **crassicornis consimilis** (Banks)
3. Subgenital plate with the median line elevated in the form of a ridge which is arcuate in profile (Fig. 28); 3d submarginal cell small, shorter above and below than the 2d, sometimes petiolate .....4
- Median line of subgenital plate only feebly elevated (Fig. 33); 3d submarginal cell usually at least as wide below as the 2d .....5
4. Body often extensively silvery-sericeous, but noticeably reflecting bluish at least on the thoracic dorsum and part of the abdomen
- 3a. **padrinus padrinus** (Viereck)
- Body almost entirely silvery, a small part of the thoracic dorsum and abdomen brownish-pubescent or brownish-violaceous, but never noticeably bluish .....3b. **padrinus minusculus** (Banks)
5. Front and hind wings wholly and almost uniformly deep fuliginous; submedian cell of hind wing usually broadly rounded or somewhat truncate apically, sometimes appendiculate (Fig. 12); 3d antennal segment about twice the length of the 2d, which is very short (Fig. 29)
1. **ingenuus** (Cresson)
- Wings not wholly fuliginous; submedian cell of hind wing pointed or narrowly rounded apically, never appendiculate (Fig. 13); 3d antennal segment not twice the 2d .....6
6. Posterior margin of pronotum subangulate; vestiture deep blue-black, nowhere silvery; digiti of genitalia subclavate, the apex scarcely extended inward (Fig. 23) .....5. **subangulatus** (Banks)
- Posterior pronotal margin arcuate, at most with a slight median notch; pubescence markedly bluish and/or silvery; digiti to some extent produced inward at the apex .....7
7. Propodeum without more than a very few inconspicuous erect hairs on the sides apparent above the coarse silvery pubescence; front barely to moderately hairy; digiti less strongly extended inward apically, sparsely and rather uniformly setose (Fig. 20) .....2. **parvus** (Cresson)
- Propodeum usually with noticeable dark erect hairs; front with abundant erect hairs just above the antennal bases; digiti slightly more strongly extended inward apically, clothed with numerous short setae which tend to be crowded toward the upper, outer angles (Fig. 21)
4. **hyacinthinus** (Cresson)

1. **Evagetes ingenuus** (Cresson) new combination  
 (Plate X, fig. 7; plate XI, fig. 12; plate XII, fig. 19; plate XIII, fig. 29.)

*Pompilus ingenuus* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 89. [Lectotype: ♀; Dakota Territory (no further data); A.N.S.P. no. 419.]— [?] Cresson, 1872, Trans. Amer. Ent. Soc., 4: 202. [TEXAS.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 296.

- Sophropompilus ingenuus* Howard, 1901, The Insect Book, pl. VII, fig. 13.—Ashmead, 1902, Canad. Ent., 34: 84.—Strickland, 1947, Canad. Ent., 79: 124. [Medicine Hat, Alta.]
- Anoplus (Ferrocola) ingenuus* Viereck, 1906, Trans. Amer. Ent. Soc., 32: 241. [Colorado Springs, Colo.]
- Anoplus ingenuus* Smith, 1910, Ann. Rpt. N. J. State Mus., 1909, p. 674. [N. J.]
- Psammochares (Sophropompilus) ingenuus* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 224.—Banks, 1917, Bull. Mus. Comp. Zool., 61: 107.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 988. [N. Y., several localities.]—Johnson, 1930, List Ins. Fauna Nantucket, p. 111.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 126. [N. C., several localities.]—Brimley, 1938, Insects N. Carolina, p. 434.

This species is placed first in the genus because of certain resemblances to members of the preceding genus, *Chalcochares*. For example, the anal vein of the hind wing is often much the same as in that genus, the flagellum of the male is moderately long, not notably shorter than that of the female, the wings are wholly fuliginous and the pubescence of the body deep bluish or purplish, and some specimens even show faint constrictions between the basal abdominal segments. However, the tarsal comb is well developed as in all the species of *Etagetes*, and there are numerous other generic differences. *E. ingenuus* is the largest species of the genus; it is widely distributed but not at all common.

FEMALE.—Length 14 (10.5–18) mm. Color black, the body rendered by the pubescence a deep glossy blue, blue-violet, or purplish; pubescence never even in small part silvery. Wings wholly and uniformly fuliginous, violaceous. Scape below, clypeus, front, vertex, temples, entire thorax and propodeum, coxae, and often to some extent the femora, with rather abundant short black erect hair.

Head considerably broader than high, transfacial distance about  $1.2 \times$  facial distance. Clypeus about  $3 \times$  as broad as high. Front strongly convex, especially just above the antennal orbits, and very broad, middle interocular distance  $.62-.66 \times$  transfacial distance. Inner orbits converging slightly above, upper interocular distance  $.85-.95 \times$  the lower. Post-ocellar line is to ocello-ocular line about as 3:4, the ocelli forming an obtuse angle in front. First 4 antennal segments in a ratio of about 3:1:2.8:2.8, segment 3 about twice as long as its greatest thickness, and equal to from  $.35$  to  $.45 \times$  upper interocular distance, segment 6 a little over twice as long as thick; flagellum somewhat thickened toward the middle and the segments a bit flattened on one side. Temples very narrow; vertex elevated very slightly above the tops of the eyes.

Posterior margin of pronotum broadly arcuate, with or without a slight median notch. Propodeum short, with a well-defined slightly concave declivity. Front tarsus with a comb of slender or moderately stout, sometimes brown-tipped, spines; the basitarsus bears 3, occasionally 4, comb-spines, the apical one usually a little shorter than the 2d tarsal segment. Wings as shown in Fig. 12; the submedian cell of the hind wing is usually broadly rounded or somewhat truncate apically and sometimes appendiculate, but there is considerable variation in this character.

MALE.—Length 13.5 (10.5–17) mm. Color of integument, pubescence, and wings as in female; never with even a trace of silvery pubescence. Scape hairy below; front rather densely hairy; remainder of head, thorax, and propodeum with moderately abundant short hairs; coxae slightly hairy; first abdominal tergite and sternites 2–6 slightly hairy.

Clypeus from 2.3 to 2.6  $\times$  as broad as high. Front broad, middle interocular distance from .61 to .66  $\times$  transfacial distance; inner orbits subparallel or diverging very slightly above. Ocelli small, in a broad, flat triangle, post-ocular line slightly less than ocello-ocular line. First 4 antennal segments (Fig. 29) in a ratio of about 3:1:2.2:2.8, segment 2 relatively shorter than in other species of this genus, segment 3 only slightly less than twice as long as thick.

Posterior pronotal margin arcuate or subarcuate. Propodeum with the median line impressed in front, the declivity well-defined, short. Last segment of front tarsus distinctly asymmetrical; inner claw of this tarsus strongly curved, the outer like those of the middle and hind tarsi. Wing venation as in the female.

Emargination of sternite 6 large, V-shaped. Subgenital plate weakly elevated medially, the apex rounded, the margin spinose (not differing noticeably from that of *parvus*, shown in Fig. 33). Genitalia (Fig. 19) with the basal hooklets distinctly double, the lower pointed processes, well-defined; digitus broadened and strongly curved apically, the disc clothed with short setae; aedoeagus rather broad, with a submarginal row of setae on the apical half and a few setae at the apex.

*Biology*.—This species is characteristic of sand dunes and other open, sandy areas. It is attracted to honeydew and to flowers, particularly to *Solidago* spp., but also to *Daucus carota*. It is essentially a mid-summer species, and there appears to be a single generation a year.

*Distribution*.—This form occurs transcontinentally in the Upper Austral Zone and the lower fringes of the Transition Zone, but is nowhere common.

*Specimens seen*: 110 (61 ♀♀, 49 ♂♂). The following are marginal records: QUEBEC: 1 ♂, Norway Bay, 2 July [CNC]; ONTARIO: 1 ♀, St. Thomas, 23 Aug. [CNC]; MICHIGAN: Newaygo Co., 1 ♂, 31 July [MCZ];

MINNESOTA: Big Stone Co., 1 ♀, Ortonville, 5 Aug. [Minn.]; DAKOTA TERRITORY: 1 ♀ [type, ANSP]; ALBERTA: 1 ♀, Medicine Hat [Alta.]; BRITISH COLUMBIA: 1 ♀, Okanagan, 30 July [CNC]; CALIFORNIA: Orange Co., 1 ♀, Newport Bay, July [CIS]; ARIZONA: Cochise Co., 1 ♀, Huachuca Mts., June [CAS]; COLORADO: Yuma Co., 1 ♀, Wray, 17 Aug., 3700 feet [AMNH]; KANSAS: Meade Co., 1 ♂, 10 July [UK]; IOWA: Dickinson Co., 1 ♀, 23 June [CU]; GEORGIA: Dade Co., 1 ♀, Sitton's Gulch, July [EU].

2. *Evagetes parvus* (Cresson) new combination (Plate X, fig. 3; plate XI, fig. 13; plate XII, fig. 20; plate XIII, figs. 27, 31, 33.)

*Pompilus parvus* Cresson, 1865, Proc. Ent. Soc. Phila., 4: 453. [Type: ♀; Colorado (no further data); A.N.S.P. no. 549.]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 91.—Provancher, 1889, Faune Ent. Canad., Hymen., Add. and Corr., p. 260–261.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 309.

*Pompilus subziolaccus* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 91. [Lectotype: ♀; Delaware (no further data); A.N.S.P. no. 551.] New synonymy.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 325.—Peckham and Peckham, 1905, Wasps Social and Solitary, pp. 236 and 240. [Biology.]

*Pompilus argenteus* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 93. [Lectotype: ♂; Virginia (no further data); A.N.S.P. no. 556.] New synonymy.—Provancher, 1883, Nat. Canad., 14: 35. [Quebec.]—Provancher, 1889, Faune Ent. Canad., Hymen., Add. and Corr., p. 260.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 274.

*Nanopompilus argenteus* Ashmead, 1902, Canad. Ent., 34: 82. [See footnote under generic synonymy.]—Strickland, 1947, Canad. Ent., 79: 124. [Alberta.]—Dreisbach, 1949, Ent. Amer. (n.s.) 29: 40, pl. IV, fig. 19.

*Anoplus (Ferrocola) subziolaccus* Viereck, 1906, Trans. Amer. Ent. Soc., 32: 232, 245. [Williams, Ariz., and Lusk, Wyo.]

*Anoplus argenteus* Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674. [N. J.]

*Anoplus subziolaccus* Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.

*Pompiloides minor* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 227. [Type: ♀; Falls Church, Va., 2 Aug. (Banks); Mus. Comp. Zool., no. 13,671.] New synonymy.

*Pompiloides (Nanopompilus) argenteus* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 301.

*Pompiloides (Nanopompilus) parvus* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 301.

*Pompiloides (Pompiloides) subziolaccus* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 301.

- Pompiloides argenteus* Rohwer, 1916, *Conn. Geol. Nat. Hist. Survey Bull.* 22, pp. 631-632. [Conn.]—Robertson, 1928, *Trans. Acad. Sci. St. Louis*, 25: 308, 317.
- Pompiloides subviolaceus* Rohwer, 1916, *Conn. Geol. Nat. Hist. Survey Bull.* 22, pp. 631-632.—Robertson, 1928, *Trans. Acad. Sci. St. Louis*, 25: 308, 317.
- Psammochares (Nannopompilus) argenteus* Banks, 1917, *Bull. Mus. Comp. Zool.*, 61: 107.—Leonard, 1926, *Cornell Agri. Exp. Sta. Memoir* 101, p. 988. [N. Y.]—Brimley, 1938, *Insects N. Carolina*, p. 434. [N. C.]
- Psammochares (Nannopompilus) parvus* Banks, 1917, *Bull. Mus. Comp. Zool.*, 61: 107.
- Psammochares (Pompiloides) minora* Banks, 1917, *Bull. Mus. Comp. Zool.*, 61: 107.—Brimley, 1936, *J. Elisha Mitchell Sci. Soc.*, 52: 124-125.—Brimley, 1938, *Insects N. Carolina*, p. 433.
- Sophropompilus parvus* Banks, 1919, *Bull. Mus. Comp. Zool.*, 63: 237-238. [Calif., Wash., B. C.]—Strickland, 1947, *Canad. Ent.*, 79: 124.
- Psammochares (Sophropompilus) subviolaceus* Leonard, 1926, *Cornell Agri. Exp. Sta. Memoir* 101, p. 988.
- Psammochares (Pompiloides) argenteus* Brimley, 1936, *J. Elisha Mitchell Sci. Soc.*, 52: 124-125.

As the long synonymy suggests, *parvus* is a widely distributed and relatively common species, and also highly variable. In general it suggests a diminutive *ingenuus*, but is separable from this species by the much paler wings and more pointed submedian cell of the hind wing (Fig. 13 as compared with 12). From *padrinus* the female is separable by the much shorter comb-spines, the male by the lack of a high, arched carina on the subgenital plate. Separation from *hyacinthinus* is a more difficult matter, for the latter is also a highly variable species. *Parvus* averages smaller than *hyacinthinus*; the females are less extensively silvery-pubescent, often not at all so, and both sexes are less brilliantly metallic-pubescent; *parvus* tends to be somewhat more northern in its distribution. Individuals can scarcely be placed accurately by these generalities; however, the characters as expressed in the keys should serve to separate them in most cases. Here the crucial character in the female is the length of the spines of the tarsal comb. In *parvus* the spines are shorter, tapering, and usually wholly black, and there are but 3 on the basitarsus. In *hyacinthinus* the spines are longer and generally somewhat broad and flattened, often with pale tips, and there are usually 4 on the

basitarsus, though there may be 3 or 5. Figures 3 and 4 illustrate typical specimens, but since the spines are subject not only to much individual variation but also to considerable wear, not every specimen should be expected to agree closely with the figures.

FEMALE.—Length 8 (5–11.5) mm. Color black, rendered by the pubescence a dull to rather intense deep blue, fading to violet in older specimens; there may or may not be a small amount of silvery pubescence on the front, rarely on parts of the thorax. Front wings lightly to rather heavily infuscated, with a darker outer marginal band; hind wings subhyaline, darker apically. Clypeus, front, vertex, prothorax, and sometimes the coxae and mesopleura with sparse short, dark hair; propodeum very slightly or not at all hairy.

Features of the head exactly as described under *ingenuus*; middle interocular distance varies from .62 to  $.7 \times$  transfacial distance; post-ocellar line is usually somewhat less than ocello-ocular line; the first 4 antennal segments are in a ratio of 2:1:2.8:2.8, segment 3 equal to from .33 to  $.45 \times$  upper interocular distance. Posterior margin of pronotum (Fig. 27) arcuate or almost straight, rarely with a slight median notch. Propodeum with a fairly well-defined posterior declivity. Tarsal comb (Fig. 3) of short, tapering spines, usually black but occasionally pale tipped; there are 3 comb-spines on the basitarsus, the apical one varying from .4 to .8 the length of the second tarsal segment. Hind wing (Fig. 13) with the submedian cell more or less pointed apically, or narrowly rounded, never appendiculate. Front wing much as in *ingenuus*; marginal cell usually about  $1.3 \times$  its own length from the wing tip; 3d submarginal cell much narrowed above, sometimes nearly triangular; 2d and 3d subequal in maximum breadth, or the 3d slightly broader than the 2d.

MALE.—Length 6.5 (4.5–9) mm. Color black; pubescence conspicuously silvery over the greater part of the head and thorax, including the coxae and sometimes more of the legs, very coarse on the propodeum, and often forming basal silvery bands on some of the abdominal tergites; elsewhere the pubescence is brownish or somewhat bluish or purplish, but rarely conspicuously so; in some specimens from the Far West only the clypeus, front, metanotum, and propodeum are silvery. Wings hyaline, the outer margin of the fore wing and apex of the hind wing narrowly infuscated. Scape often slightly hairy below; clypeus, front, and vertex with sparse to fairly abundant short hairs; pronotum and front coxae slightly hairy; propodeum without erect hairs or with a very few dark hairs visible above the coarse silvery pile.

Clypeus about  $2.5 \times$  as broad as high. Middle interocular distance varying from .62 to  $.67 \times$  transfacial distance; inner orbits diverging slightly above. Front convex, the line from the antennal bases to the anterior ocellus well-impressed. Ocelli forming a right or obtuse angle in front; post-ocellar line subequal to or less than ocello-ocular line. First 4 antennal segments (Fig. 31) in a ratio of about 2.5:1:1.5:1.8; segment 3 only



slightly longer than thick. Posterior pronotal margin arcuate. Median line of propodeum impressed. Last segment of front tarsus modified as in the preceding species. Venation as in the female; the 3d submarginal cell varies from wide above to actually petiolate.

Abdomen slender; sternite 6 with the emargination broad and deep. Subgenital plate (Fig. 33) slightly variable in shape, the sides tapering to a narrowly rounded apex, the margin set with stout bristles, the median line weakly elevated; near the base are a pair of small, darkly pigmented raised points. Genitalia (Fig. 20) differing but slightly from those of *ingenuus*. Parameres slender, slightly curved; digiti broadened and curved apically, the disc clothed with scattered setae of moderate length; the portion of the digitus beyond the curvature is generally a little shorter than in *ingenuus* and *hyacinthinus*, longer than in *padrinus* and *subangulatus*. Basal hooklets essentially double, but the lower sclerotized points small or obsolete. Parapenials and aedeagus as in *ingenuus*, except the setae along the shaft of the latter, if at all visible, are very minute.

*Gynandromorph*.—A specimen from Kings Co., Nova Scotia [CNC], is a mosaic of male and female characters. The abdomen and the meso- and metathorax and their appendages are entirely female. The prothorax is female except for the legs; the coxae are small, the legs slender and weakly spinose; the tarsal comb is partially developed on the left leg, absent on the right; the apical tarsal segment is produced on the inner margin very slightly; the inner claws of the front tarsus are modified as in the male. The head is a blending of male and female characters: the shape is more that of the female, but the clypeus is only  $2.5 \times$  as broad as high; the right antenna is male, the left intermediate between the two sexes. The lower front, clypeus, and temples are silvery-sericeous, also parts of the thoracic pleura, but the propodeum is wholly without silvery pubescence.

*Biology*.—This species frequents sand pits, waste places, gardens, and occasionally clearings in woodlands, where the females may often be found running along the ground with their wings and antennae in constant motion. There is no definite information, but considerable circumstantial evidence, that the species is a social parasite of other Pompilini. (See discussion under the generic heading.) The species visits honeydew, and is a frequent visitor to flowers, having been taken on *Daucus carota*, *Pastinaca sativa*, *Solidago*, *Angelica*, and *Cleome serrulata*. It occurs throughout the summer months, and possibly has several generations during this time.

*Distribution*.—Transcontinental in the Canadian, Transition, and Upper Austral Zones, but less common southward and westward; it is one of the commonest Pompilini in the northeastern

and north central United States and eastern Canada; there are but few records from west of the Rocky Mountains.

*Specimens seen*: 503 (382 ♀♀, 120 ♂♂, 1 gynandromorph). The following are marginal records: NOVA SCOTIA: 1 ♀, Baddeck, Cape Breton Island, Aug. [MCZ]; PRINCE EDWARD ISLAND: 1 ♀, Brackley Beach, Canad. Nat. Park., 29 July [CNC]; QUEBEC: 1 ♀, Hemmingford, 27 June [CNC]; ONTARIO: 1 ♀, Constance Bay, 24 Aug. [CNC]; 6 ♀♀, 2 ♂♂, Ottawa, July-Sept. [CNC]; MICHIGAN: Midland Co., 3 ♀♀, Aug. [MCZ]; WISCONSIN: Wood Co., 1 ♀, Cranmoor, 16 Aug. [USNM]; MANITOBA: 4 ♀♀, Aweme, June-Sept. [CNC]; SASKATCHEWAN: 1 ♀, Waskesiu Lake, 22 July [CNC]; YUKON: 1 ♀, 1 ♂, Watson Lake, 25 June [CNC]; BRITISH COLUMBIA: 2 ♂♂, Carbonate, Columbia R., July [CU]; CALIFORNIA: Riverside Co., 1 ♀, San Jacinto, May [CAS]; ARIZONA: Cochise Co., 2 ♀♀, Rustler's Park, 9000 feet, Chiricahua Mts., 8 Aug. [HEE]; NEW MEXICO: San Miguel Co., 1 ♀, Pecos, 23 June [ANSP]; TEXAS: Brazos Co., 1 ♀, 25 Oct. [JEG]; MISSOURI: 1 ♀, St. Louis [USNM]; GEORGIA: Stephens Co., 1 ♀, Toccoa, 18 Aug. [CU].

3a. *Evagetes padrinus padrinus* (Viereck) new combination

(Plate X, fig. 6; plate XII, fig. 24; plate XIII, figs. 28, 30.)

*Anoplius (Pompilinus) padrinus* Viereck, 1902, Proc. Acad. Nat. Sci. Phila., 54: 734. [Type: ♂; San Pedro, Calif., 27 July, on *Euphorbia*; (not seen by author).]<sup>28</sup>

*Pompiloides (Nanopompilus) padrinus* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 301.

*Psammochares (Nannopompilus) padrinus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 107.

*Nannopompilus padrinus* Banks, 1919, Bull. Mus. Comp. Zool., 63: 237.

*Sophropompilus padrinus* Strickland, 1947, Canad. Ent., 79: 124. [Medicine Hat, Alta.]

This beautiful little wasp can be confused with no other. The spines of the tarsal comb of the female are very long and slender; the 3d submarginal cell is very small, often triangular or petiolate; the propodeum is without erect hairs or practically so; the subgenital plate of the male possesses a strong carina which is arched in profile; the pubescence is brilliantly refulgent of metallic colors.

FEMALE.—Length 7 (4.5-9) mm. Color black, the body rendered by the pubescence an intense blue, violet, or blue-green. Pubescence of the lower front and clypeus silvery, also sometimes parts of the thorax, legs, and propodeum, but the abdomen never silvery, at least dorsally. Wings lightly

<sup>28</sup> Viereck states following his description that his type is in the A.N.S.P. However, I have been unable to find the type in the collection of this institution, and assume it has been lost or destroyed.

to moderately infuscated, usually with an evident darker marginal band, somewhat iridescent or violaceous. Front and vertex with sparse, short, dark hairs; temples and propleura with pale hairs; apex of abdomen slightly setose; remainder of body practically devoid of erect hairs.

Head not quite as broad as in the two preceding species, transfacial distance about  $1.15 \times$  facial distance. Clypeus  $2.4-2.7 \times$  as wide as high, not quite as wide as the lower interocular distance. Front not especially broad for the genus, middle interocular distance varying from  $.59$  to  $.63 \times$  transfacial distance, the average  $.61$ . Front rather convex, with a strongly impressed line from the antennal bases to the front ocellus. Inner orbits slightly convergent above, upper interocular distance about  $.9 \times$  the lower. Ocelli forming a right or acute angle in front; post-ocellar line subequal to or greater than ocello-ocular line. Antennae of moderate length for the genus; first 4 segments in a ratio of about  $5:2:5:5$ , segment 3 sometimes slightly longer than 1 or 4, generally about  $2.5 \times$  as long as its maximum thickness, and equal to approximately half the upper interocular distance.

Posterior pronotal margin slightly arched, but almost straight across. Propodeum with a fairly well-defined oblique declivity; median line impressed in front. Front tarsus with a comb of unusually long and slender spines (Fig. 6), the third and apical one on the basitarsus distinctly longer than the 2d tarsal segment. Transverse median vein of fore wing meeting the media well beyond the origin of the basal. Stigma very small; marginal cell small, from  $1.5$  to  $2 \times$  its length from the wing-tip. 3d submarginal cell narrower than the 2d, much narrowed above by the arcuation of the 3d transverse cubital vein, usually triangular, not infrequently petiolate. Hind wing as in *parvus*.

MALE.—Length  $5.5$  ( $4-7$ ) mm. Color of integument black; wings hyaline, the outer margins with a fuscous band. Pubescence conspicuously silvery and bluish-refulgent; some specimens are entirely bluish except on the front, temples, and clypeus, which are silvery (California specimens especially); at the other extreme are specimens almost entirely silvery-sericeous, except on the vertex, parts of the thoracic dorsum, and the greater part of the abdomen, which are bluish. Temples and propleura with considerable pale erect hair; clypeus, front, vertex, and pronotum usually with sparse, short, dark hair; abdominal sternites sparsely short-haired.

Clypeus  $2.2$  to  $2.6 \times$  as broad as high. Eyes diverging noticeably above, upper interocular distance  $1.1$  to  $1.2 \times$  the lower; front of moderate breadth, with a well-defined line from the antennal bases to the front ocellus. Ocelli in a rather large triangle, post-ocellar line equal to or greater than ocello-ocular line. First 4 antennal segments in a ratio of about  $2.2:1:1.8:2$ , the third segment  $1.5-1.8 \times$  as long as thick (Fig. 30).

Posterior pronotal margin arcuate or very feebly angulate. Propodeum sloping rather evenly, its median line well impressed. Last segment of front tarsus slightly asymmetrical, the inner margin weakly produced, the inner claw strongly modified, the outer sub-bifid, the tooth a little stronger

than that of the middle and hind tarsal claws and sloping outward somewhat. Venation as in the female.

Abdomen very slender. Sternite 6 with the emargination large, broadly V-shaped. Subgenital plate similar to that of *parvus* except that the median line is sharply elevated, forming a carina which is arched in profile, highest near the base (Fig. 28). Genitalia (Fig. 24) with the parameres slender, rather long-setose apically; basal hooklets double or the lower pair obsolete; digiti much expanded beyond the base, the disc subtriangular, clothed with short setae; aedeagus weakly spinose apically.

*Biology*.—This form occurs in small or large open sandy areas. It is frequently attracted to the ground beneath trees which are dripping honeydew. Males have been taken on the flowers of *Euphorbia* and *Tamarix*. It is on the wing throughout the summer season, and at the southern extremities of its range, throughout the year.

*Distribution*.—Lower and Upper Sonoran faunas and lower fringes of the Transition fauna; east of western Texas, Colorado, and Manitoba it is replaced by subspecies *minusculus*.

*Specimens seen*: 126 (80 ♀♀, 46 ♂♂). The marginal records are as follows: MANITOBA: 1 ♀, Aweme, 11 Sept. [CNC]; SASKATCHEWAN: 1 ♀, Great Sand Hills, W. of Swift Current, 29 May [CNC]; ALBERTA: 2 ♀♀, 1 ♂, Medicine Hat, June [Alta.]; BRITISH COLUMBIA: 1 ♀, Creston, 13 Sept. [CNC]; CALIFORNIA: San Diego Co., 1 ♀, Coronado, June [CAS]; ARIZONA: Pima Co., 1 ♀, Bear Canyon, Santa Catalina Mts., 7000 feet, Aug. [HEE]; NEW MEXICO: Sandoval Co., 1 ♀, Jemez Springs, 7500 feet, Oct. [ANSP]; TEXAS: Brewster Co., 1 ♀, 3 ♂♂, The Basin, 5400 feet, Chisos Mts., 8–11 July [HEE]; COLORADO: Larimer Co., 27 ♀♀, 31 ♂♂, Poudre Canyon, 5200 feet, beneath honeydewed willow, 19–22 Aug. [HEE]; MONTANA: Dawson Co., 3 ♀♀, Glendive [USNM].

3b. *Evagetes padrinus minusculus* (Banks) new combination

*Psammochares minusculus* Banks, 1910, Jour. N. Y. Ent. Soc., 18: 118.  
[Type: ♀; Fedor, Lee Co., Texas, 21 June 1909 (G. Birkman); Mus. Comp. Zool., no. 13,701.]

*Pompiloides* (*Nanopompilus*) *minusculus* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 301.

*Psammochares* (*Nanopompilus*) *minusculus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 107.

This form is often misdetermined as *argenteus* Cresson, and it is possible that some of the references cited under that name (*cf.* *parvus* Cresson) really pertain to this form.

FEMALE.—Length 7 (4.5–9) mm. Black, pubescence silvery over the greater part of the head, thorax, and propodeum, and the abdomen with at least a little silvery pubescence on the basal tergites and sternites, elsewhere more or less bluish or blue-green; some specimens are almost entirely silvery, while an occasional specimen from within the range of this form is no more extensively silvery than typical *padrinus*. Middle interocular distance varies from .60 to .66  $\times$  transfacial distance, averaging about .63; antennal segment 3 usually equal to slightly less than half the upper interocular distance. In all other features very similar to the nominate subspecies.

MALE.—Length 5.5 (4.5–6.5) mm. Color black; pubescence over most of the head and thorax silvery and a little coarse; first 3 or 4 abdominal segments with basal silvery fasciae; pubescence of the vertex, parts of the thoracic dorsum, and the remainder of the abdomen brownish-violaceous, at most obscurely bluish. Morphological features as in typical *padrinus*.

*Distribution*.—Austro-riparian and Carolinian faunas; like the typical subspecies, partial to sandy places.

*Specimens seen*: 100 (89 ♀♀, 11 ♂♂). The following are marginal records: NEW HAMPSHIRE: Hillsborough Co., 1 ♀, Pelham, 11 Sept. [USNM]; ONTARIO: 1 ♀, Ottawa, 3 Aug. [CNC]; MICHIGAN: Cheboygan Co., 1 ♀, Aug. [UK]; MINNESOTA: Polk Co., 1 ♀, 6 Sept. [Minn.]; SOUTH DAKOTA: Stanley Co., 1 ♀, White River, 15 Sept. [USNM]; KANSAS: 1 ♀, central part, Aug. [USNM]; TEXAS: Bexar Co., 1 ♀, San Antonio, 13 June [JEG]; LOUISIANA: St. Landry Co., 1 ♀, Opelousas [USNM]; ALABAMA: 1 ♀, Tuscaloosa, 22 May [HEE]; GEORGIA: Decatur Co., 1 ♂, Spring Creek, 16–29 July [CU].

#### 4. *Evagetes hyacinthinus* (Cresson) new combination

Plate X, fig. 4; plate XII, fig. 21; plate XIII, fig. 25.)

*Pompilus hyacinthinus* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 90. [Type: ♀; Connecticut (no further data); formerly in the collection of Edward Norton.]<sup>29</sup>—Provancher, 1882, Nat. Canad., 13: 35, 37. [Quebec.]—Provancher, 1889, Faune Ent. Canad., Hymen., Add. and Corr., p. 260. —Dalla Torre, 1897, Cat. Hymen., viii, p. 294.

*Pompilus brevicornis* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 90. [Lectotype: ♂; Pennsylvania (no further data); A.N.S.P. no. 550.] New synonymy.—Dalla Torre, 1897, Cat. Hymen., viii, p. 277.

<sup>29</sup> I have not seen the type of this species, which is in all probability no longer extant. Parts of the Norton collection are now at the Peabody Museum, New Haven, Conn., but this specimen is not contained in the material there. My interpretation of the species is based wholly on the original description. A neotype selected by Nathan Banks [Colebrook, Conn., Aug. 1918 (W. M. Wheeler)] [MCZ] is in my estimation a specimen of *parvus* Cresson.

- Pompilus castaneus* Provancher, 1882, Nat. Canad., 13: 35, 39. [Lectotype: ♂; St. Hyacinthe, Quebec; Q.P.M. no. 774 (yellow label).] [Nec Klug, 1834.] New synonymy.—Provancher, 1883, Nat. Canad., 14: 35. [Said to be synonym of *argenteus* Cresson.]
- Anoplius hyacinthinus* Smith, 1910, Ann. Rpt. N. J. State Mus. 1910, p. 674. [N. J.]
- Pompiloides* (*Nanopompilus*) *hyacinthinus* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 301.
- Pompiloides castaneus* Rohwer, 1916, Canad. Ent., 48: 372. [Stated to be synonym of *argenteus* Cresson.]
- Psammochares* (*Arachnophila*) *scudderi* Banks, 1917, Bull. Mus. Comp. Zool., 61: 104, 107. [Type: ♀; Winnipeg, Manitoba (Scudder); M.C.Z. no. 10,918.] New synonymy.
- Psammochares* (*Sophropompilus*) *hyacinthinus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 107.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 988.—Johnson, 1930, List Insect Fauna Nantucket, p. 111.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 127.—Brimley, 1938, Insects N. Carolina, p. 434.
- Psammochares* (*Sophropompilus*) *brevicornis* Banks, 1917, Bull. Mus. Comp. Zool., 61: 107.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 988.
- Sophropompilus quadrispinosus* Banks, 1919, Canad. Ent., 51: 82. [Type: ♀; Long Beach, L. I., N. Y., Aug. (Shannon); M.C.Z. no. 13,703.] [Nec Klug, 1886.] New synonymy.
- Sophropompilus bradleyi* Banks, 1919, Bull. Mus. Comp. Zool., 63: 237–238. [Type: ♀; Giant Forest, Sequoia Nat. Park, Calif., 21–26 July 1907, 6000–7000 feet (J. C. Bradley); C. U. no. 688.] New synonymy.
- Psammochares* (*Sophropompilus*) *quadrispinosus* Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 988.
- Sophropompilus mohave* Banks, 1933, Psyche, 40: 6. [Type: ♀; Tempe, Arizona, 1 Aug. (J. Bequaert); M.C.Z. no. 17,034.] New synonymy.
- Sophropompilus hyacinthinus* Procter, 1938, Biol. Survey Mt. Desert Reg., vi, Insecta, p. 430. [Mt. Desert, Me.]
- Nanopompilus texanus* Banks, 1944, Bull. Mus. Comp. Zool., 94: 170. [Type: ♀; Richmond, Fort Bend Co., Texas, 22 June 1917; M.C.Z. no. 25,895.] New synonymy.
- Sophropompilus parvus* Dreisbach, 1949, Ent. Amer., (n.s.)29: 38, pl. III, fig. 15. [Nec Cresson; misidentification.]

This is the most widely distributed and, at least southwardly, the most common species of the genus. In the female there are 4 (sometimes 3 or 5) comb-spines on the basitarsus; these spines are somewhat broadened and blade-like, and the apical one on the

basitarsus is typically subequal in length to the 2d tarsal segment, although it may be somewhat longer or shorter. The head of the female is relatively broad and thin, the lower front and clypeus usually silvery-sericeous (and sometimes much more of the body).

This is an exceedingly variable species. The several new synonymies indicated above have been made only after a detailed study of several hundred specimens from many parts of this country and Canada. Certainly an examination of the types alone would convince one that several of them are good species. However, all possible intergrades between these various extremes occur; furthermore, I can find no evidence in the males for recognizing more than a single species. Efforts to retain certain of these names for geographical races have failed, because of the at most very rough correlation of variation with geography, and the lack of characters in the males. Those who believe in the naming of "forms," based on one sex and having no well-defined range, may wish to resurrect the following: *scudderi*, a very hairy form occurring along the northern fringe of the range of the species; *bradleyi*, also very hairy, but without silvery pubescence, occurring in parts of California, Oregon, and Utah; *mohave*, a bright bluish or greenish form almost devoid of erect hairs on the thorax or propodeum, more or less southwestern in distribution; and *texanus*, likewise scarcely hairy, but with almost the entire body silvery-sericeous, occurring in parts of the south and southeast. It is possible that future workers may be able to find some basis for splitting this species, but they will need more evidence than is now available. For the present I choose to consider the great variability of this species as due to variations in host, as presumably this species is a social parasite of a number of different pompilid wasps.

FEMALE.—Length 10 (6.5–14) mm. Color black, the middle inner, and upper outer orbits sometimes with a very small pale spot; body rendered by the pubescence an intense deep blue, blue-violet, purplish, or blue-green; lower front and clypeus usually silvery, and sometimes more of the body; occasionally practically the entire body silvery-sericeous. Fore wings lightly to rather heavily infuscated, with a more or less evident darker marginal band; hind wings varying from hyaline with only the apex infuscated to wholly infuscated except at the extreme base. Scape hairy or not; clypeus, front, vertex, temples, and propleura with abundant dark hairs; thorax and propodeum with at least a few scattered hairs, sometimes very conspicuously

hairy; front coxae and femora, at least, slightly hairy, sometimes all the coxae and femora and occasionally the tibiae and even the tarsi somewhat hairy; abdomen slightly to moderately hairy below, scarcely to moderately hairy above.

Head much broader than high, transfacial distance about  $1.2 \times$  facial distance; temples very narrow, the front not strongly convex, the head in general somewhat thinner than in the preceding 3 species. (See Fig. 25.) Clypeus about  $3 \times$  as broad as high. Front very broad, middle interocular distance varying from .60 to  $.65 \times$  transfacial distance; eyes converging very slightly above. Ocelli forming a right or obtuse angle in front, post-ocellar line subequal to or slightly less than ocello-ocular line. Antennae short, the first 4 segments in a ratio of about 2.5:1:2:2.2, though somewhat variable in this respect; segment 3 not much if any more than twice as long as its greatest thickness, equal to from .3 to  $.45 \times$  upper interocular distance.

Pronotum broadly arcuate behind, often, but not always, with a small angulate notch medially (Fig. 25). Propodeum with a well-defined slightly concave declivity; median line impressed in front. Front tarsus (Fig. 4) with a strong comb, the spines somewhat flattened and blade-like, often pale tipped; basitarsus with from 3 to 5 comb-spines, most often 4, the apical one about as long as the 2d tarsal segment, sometimes slightly longer or shorter.

Anal vein of hind wing sloping gradually into the media, which it reaches near the origin of the cubitus (as in *parvus*, Fig. 13). Fore wing with the marginal cell about or slightly more than its own length from the wing-tip; 2d and 3d submarginal cells subequal in breadth, or either slightly the broader; the 3d narrowed by at least two-thirds above, often nearly or quite triangular.

MALE.—Length 8 (5–11) mm. Color black, the vestiture bluish, purplish, or blue-green, on the lower front and posterior slope of the propodeum almost always conspicuously silvery, the body often more extensively silvery than this. Wings hyaline or nearly so, with a narrow fuscous outer marginal band. Scape usually hairy; clypeus, front, vertex, temples, and propleura with rather dense short hairs, the front in particular more densely hairy than in *parvus*; front coxae and pronotum slightly hairy; femora and middle and hind coxae hairy or not; propodeum with at least a few black erect hairs toward the sides.

Clypeus  $2.2\text{--}2.5 \times$  as broad as high. Front broad, middle interocular distance from .60 to  $.64 \times$  transfacial distance; inner orbits diverging above. Ocelli as in female. Antennae short, the first 4 segments in a ratio of about 2.5:1:1.5:2, segment 3 from 1 to  $1.5 \times$  as long as thick. Posterior pronotal margin arcuate or with a feeble median angulation. Slope of the propodeum low, somewhat steepened behind. Last segment of front tarsus only very slightly modified, asymmetrical, the inner claw modified as usual, the outer claw dentate. Venation as in the female.



Sternite 6 with a large, V-shaped emargination; subgenital plate not differing noticeably from that of *parvus* (Fig. 33). Genitalia (Fig. 21) with the parameres very slender; basal hooklets single, the lower sclerotized points obsolete or nearly so; digiti strongly curved apically, the portion beyond the curvature generally longer than in *parvus*, the disc clothed with numerous short setae which tend to be crowded toward the upper, outer angles; aedoeagus with numerous setae along the shaft and at the apex.

*Biology.*—This species has been taken on the flowers of *Pastinaca sativa*, *Solidago*, *Asclepias*, *Sphaeralcea angustifolia*, *Tamarix gallica*, and *Cleome serrulata*. It occurs especially in sandy places and clay banks along water-courses.

Recently, while studying the biology of *Anoplius americanus* (Beauvois) along the banks of the Kansas River at Manhattan, Kansas, I have been able to learn something of the manner of parasitism of *E. hyacinthinus*. One morning, over a two hour period, an *americanus* was observed constructing a tunnel in a clay bank, the spider having been deposited on the earth about a foot from the excavations. During this time a female *hyacinthinus* was observed circling about the area, seemingly rather haphazardly, but occasionally approaching the tunnel long enough, I suppose, to observe that it had not yet been completed. Finally the *americanus* returned to its spider, dragged it to the nest, and then seized it by the end of the abdomen and pulled it into the nest. Several minutes elapsed, when the *americanus* was seen down in the tunnel at some depth working the soil with her legs and apparently beginning filling operations. At this moment the *hyacinthinus* appeared suddenly on the scene, and entered the tunnel without hesitation. I expected to see it driven out immediately, but nothing of the sort occurred. Rather I observed a rapid movement of the two wasps in the tunnel, and a moment later saw the *americanus* resume her activities of filling the burrow. These actions puzzled me, and after about 5 more minutes I captured the *americanus* with my forceps, and began to dig out the nest. I discovered the tunnel to be about three inches deep, and at that time about half filled by the *americanus*. In the cell at the end, buried under an inch and a half of soil, I found the *hyacinthinus*. She was resting on top of the spider (which was ventral-side up) and was very reluctant to move, even when prodded with the forceps. Finally she was taken, and the spider carefully removed from the cell. No evidence of an

egg was found on the spider, but the mouthparts of the wasp were moist with an albuminous substance which may have been the remains of the egg of the *americanus* which she destroyed. Presumably the *hyacinthinus* was about to lay an egg herself when taken, and would have dug her way out through the filled tunnel when this was completed. The surprising point to me was the fact that the *americanus* permitted the *hyacinthinus* to pass her in the tunnel, and then went on with her filling of the burrow. It would be interesting to know if this particular mode of entry is always used by *hyacinthinus*; I suspect it is not.

*Distribution*.—This species occurs in a broad band across the continent, from the Transition to the Lower Austral Zones of Canada, the United States, and Mexico.

*Specimens seen*: 490 (335 ♀♀, 155 ♂♂). The following records define the periphery of the range so far as present knowledge goes: NEW BRUNSWICK: 2 ♀♀, 1 ♂, St. Stephen, 16 July [CNC]; PRINCE EDWARD ISLAND: 2 ♀♀, 1 ♂, Canad. Nat. Park, 19 July [CNC]; QUEBEC: 1 ♂, St. Hyacinthe [QPM]; ONTARIO: 1 ♀, Sudbury [CNC]; WISCONSIN: 1 ♀, Rib Mt. State Park, 27 Aug. [Minn.]; MANITOBA: 1 ♀, Aweme, 12 July [CNC]; ALBERTA: 1 ♂, Edgerton, 20 June [Alta.]; BRITISH COLUMBIA: 1 ♂, Creston, 1924 [CNC]; BAJA CALIFORNIA: 1 ♀, La Paz, June [CAS]; ARIZONA: Cochise Co., 1 ♂, Huachuca Mts., June [CAS]; NEW MEXICO: Otero Co., 1 ♀, 12 mi. SW. of Alamogordo, 27 July [HEE]; TEXAS: Presidio Co., 1 ♀, Marfa, 27 July [HEE]; Dimmit Co., 1 ♀, Carrizo Springs, 17 June [OSC]; LOUISIANA: St. Landry Co., 1 ♂, Opelousas [USNM]; FLORIDA: Hendry Co., 1 ♀, LaBelle, 8 April [CU].

##### 5. *Evagetes subangulatus* (Banks) new combination

*Sophropompilus subangulatus* Banks, 1919, Bull. Mus. Comp. Zool., 63: 237-239. [Type: ♀; Ingleside, San Francisco, Calif., 25 Aug. 1908 (J. C. Bradley); C.U. no. 689.]<sup>30</sup>—Strickland, 1947, Canad. Ent., 79: 124. [Edmonton, Alta.]

*Psammochares (Sophropompilus) tchemi* Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 127. [Type: ♀; Smokemont, N. C., 30 June 1934 (T. B. Mitchell); No. Carolina Dept. Agri., Raleigh (not seen by author).] New synonymy.—Brimley, 1938, Insects N. Carolina, p. 434.

This species is in many respects intermediate between the preceding four and the next species, *crassicornis*. The pubescence is deep metallic, almost black, by no means as brilliant as in any of

<sup>30</sup> A male paratype with the same data as the type [MCZ] does not belong to this genus, but is an *Anoplus (Pompilinus) clystera* (Banks).

the preceding forms. The pronotum is usually distinctly, though very broadly, angulate behind; the antennae are long for the genus. The male subgenital plate resembles that of *parvus* and its allies; this fact and the more hairy body and longer comb-spines of the female separate it readily from *crassicornis*. *Subangulatus* is much more widely distributed than has usually been realized.

FEMALE.—Length 10.5 (7.5–13) mm. Color black, upper outer orbits often with a very small pale spot; pubescence very dark, rather obscurely reflecting deep bluish or purplish, nowhere silvery. Fore wings lightly to heavily infuscated, with a darker marginal band; hind wings subhyaline, the apex infuscated. Scape slightly hairy; clypeus, front, vertex, temples, and propleura with considerable short, dark hair; front coxae, pronotum, propodeum, and first abdominal tergite very noticeably hairy; mesonotum, scutellum, mesopleura, middle and hind coxae usually slightly hairy, sometimes also the femora.

Head broad, transfacial distance about  $1.2 \times$  facial distance. Clypeus  $3 \times$  as broad as high. Front broad, middle interocular distance varying from .60 to .64  $\times$  transfacial distance; inner orbits converging slightly above. Ocelli forming a right or obtuse angle in front, post-ocellar line is to ocello-ocular line about as 4:5. Antennae of moderate length, and more slender than in the preceding four species, the flagellum only a little thickened toward the middle; first 4 segments in a ratio of about 5:2:5:5, the 3d segment sometimes slightly longer than 1 or 4, equal to slightly less than half the upper interocular distance. Temples very narrow; front not strongly convex.

Pronotum rather long, the slope abrupt in front, nearly flat behind; posterior margin broadly angulate or subangulate. Propodeum with the median line strongly impressed, the declivity oblique and slightly concave. Front tarsus with a comb of long, slender, slightly flattened spines, sometimes pale-tipped; basitarsus with either 3 or 4 comb-spines, the apical one as long as, often longer than, the 2d tarsal segment (Fig. 5). Venation not differing notably from that of *hyacinthinus*, except that the 3d submarginal cell is rarely triangular.

MALE.—Length 9 (5.5–12) mm. Black, pubescence as in the female, never even in small part silvery. Wings varying from hyaline to moderately infuscated, with a darker marginal band. Scape hairy below; clypeus, front, vertex, temples, and propleura rather densely hairy; front coxae, pronotum, propodeum, and anterior slope of tergite 1 with rather abundant erect hairs; remainder of thorax, coxae, and venter with sparse, short hairs.

Clypeus about  $2.5 \times$  as broad as high. Middle interocular distance varying from .60 to .67  $\times$  transfacial distance; eyes diverging very slightly above. Post-ocellar line subequal to or slightly less than ocello-ocular line. First 4 antennal segments in a ratio of about 2.2:1:1.8:2, segment 3 about  $1.5 \times$  as long as thick (Fig. 35). Pronotum as in female. Propodeum

with the median line impressed in front, the declivity short and abrupt. Last segment of front tarsus rather strongly produced on the inner margin; outer claw of front tarsus bifid.

Sternite 6 with the emargination large, V-shaped. Subgenital plate virtually the same as in *parvus*, shown in Fig. 33. Genitalia (Fig. 23) quite distinctive: parameres straight, tapering to an acute apex, not strongly setose; digiti subclavate, sparsely clothed with setae; basal hooklets double; aedocagus usually the longest of the appendages, the shaft with a few small setae, the apex feebly bilobed.

*Biology*.—This species occurs either in open country or in clearings in woodlands, and like its congeners is partial to sandy soil. There are several records of its having been taken on *Solidago* blossoms, and one on *Spiraea*.

*Distribution*.—This species occurs transcontinentally from the Hudsonian to the Transition Zones, from Labrador and Yukon to Georgia in the Appalachians and to New Mexico, Arizona, and California in the mountains of the West.

*Specimens seen*: 159 (85 ♀♀, 74 ♂♂). The following records are marginal: NOVA SCOTIA: 1 ♀, Kings Co., 21 June [CNC]; LABRADOR: 1 ♀, Goose Bay, 14 Aug. [CNC]; ONTARIO: 1 ♀, Sudbury [CNC]; MICHIGAN: Midland Co., 1 ♀, 1 ♂, May, Sept. [MCZ]; MINNESOTA: Clearwater Co., 1 ♀, 2 ♂♂, Itasca Park, July–Sept. [Minn.]; MANITOBA: 3 ♀♀, Aweme, June, Aug. [CNC]; ALBERTA: 1 ♂, Edmonton, June [Alta.]; YUKON: 2 ♀♀, Whitehorse, June, July [CNC, CAS]; BRITISH COLUMBIA: 2 ♂♂, Victoria, 14 July [CNC]; CALIFORNIA: Tulare Co., 1 ♂, Giant Forest, Sequoia Nat. Park, 21 July [MCZ]; ARIZONA: Cochise Co., 1 ♀, Rustler's Park, Chiricahua Mts., 9000 ft., 7–8 Aug. [HEE]; NEW MEXICO: Otero Co., 3 ♀♀, 1 ♂, Cloudcroft, 18 June, 26 July [HEE, ANSP]; COLORADO: Boulder Co., 1 ♂, Boulder, Aug. [MCZ]; SOUTH DAKOTA: Scully Co., 1 ♀, Onida, 21 June [SDS]; MINNESOTA: Hennepin Co., 1 ♀, Lake Minnetonka, 26 June [Minn.]; OHIO: Franklin Co., 1 ♀, Columbus [USNM]; GEORGIA: Dawson Co., 1 ♀, July [EU]; NORTH CAROLINA: Buncombe Co., 5 ♂♂, Black Mt., 14–28 Aug. [AMNH]; NEW JERSEY: Gloucester Co., 1 ♂, Wenonah, 14 May [ANSP].

6a. *Evagetes crassicornis crassicornis* (Shuckard) new combination<sup>31</sup>

(Plate X, fig. 8; plate XII, fig. 22; plate XIII, figs. 26, 32.)

*Pompilus crassicornis* Shuckard, 1835, Essay Indig. Fossor. Hymen., p. 63.

[Described from ♀♀ from several places in England; location of types, if extant, not known to me.]—Richards and Hamm, 1939, Trans. Soc. Brit. Ent., 6: 88. [Biology.]

<sup>31</sup>I have not attempted to present a complete list of synonyms and references for this Holarctic species pertaining to the European fauna. The reader is referred to Haupt (1927) and Wilcke (1943) for synonymy, and to Richards and Hamm (1939) for references on the biology of the species.

- Pompilus pectinipes* var. 2 ♀ *campestris* Wesmael, 1851, Bull. Acad. Belg., 18: 466. [Described from a ♀ from Belgium; location of type unknown to me.]
- Pompiloides rufibasis* Banks, 1911, Jour. N. Y. Ent. Soc. 19: 226. [Type: ♀; Ithaca, N. Y., 1-7 July (Banks); Mus. Comp. Zool., no. 13,702.] New synonymy.
- Pompiloides (Nanopompilus) rufibasis* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 301.
- Psammochares (Nanopompilus) rufibasis* Banks, 1917, Bull. Mus. Comp. Zool., 61: 107.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 988.
- Nanopompilus rufibasis* Banks, 1919, Bull. Mus. Comp. Zool., 63: 237. [Olympia, Wash.]
- Psammochares (Psammochares) campestris* Haupt, 1927, Deutsch. Ent. Zeitschr., Beiheit, p. 218.
- Sophropompilus crassicornis* Wilcke, 1943, Med. van de Landbouwhoogeschool Wageningen, 47: 62, 68.
- Sophropompilus rufibasis* Strickland, 1947, Canad. Ent., 79: 124. [Edmonton, Alta.]

This easily recognizable form is the most northerly in distribution of the American *Evagetes*. The Nearctic *rufibasis* Banks has been placed in synonymy with the Palaearctic *crassicornis* Shuckard after a careful study of Wilcke's (1943) description and figures, and of a series of specimens from Holland sent to me by Dr. P. M. F. Verhoeff and determined by him as this species. In all respects, including the male genitalia, the American and European specimens resemble each other very closely.

FEMALE.—Length 8.5 (6-11) mm. Color black, the abdomen marked with at least a little rufous near the base, usually with the greater part of the basal 2 or 3 segments rufous above and below. Wings hyaline or lightly infuscated, the outer margin with a fuscous band. Pubescence brownish, usually varied with silvery on at least the lower front, coxae, and base of abdomen, sometimes extensively silvery. Clypeus, front, and vertex with short hairs in moderate abundance; temples and propleura rather hairy; front coxae slightly setose in front and behind; remainder of thorax, and the propodeum, with at most a few scattered, inconspicuous short hairs.

Clypeus about  $3\times$  as broad as high. Front broad, middle interocular distance varying from .60 to .67  $\times$  transfacial distance; inner orbits converging slightly above, upper interocular distance from .8 to .9  $\times$  the lower. Antennae rather long for the genus, the flagellum only slightly thickened and flattened toward the middle; first 4 segments in a ratio of about

2.5:1:2.7:2.5, segment 3 about  $2.5 \times$  as long as thick and equal to from .45 to .6  $\times$  upper interocular distance. Ocelli in approximately a right triangle, post-ocellar line and ocello-ocular line subequal, or either may be slightly the greater. (Dorsal view of head and pronotum shown in Fig. 26.)

Posterior margin of pronotum more or less broadly angulate, though not always as distinctly so as the specimen figured (Fig. 26). Propodeum with the median line impressed in front, the declivity rather well defined, oblique. Front tarsus with a comb of slender, fairly long spines; basitarsus with 3, rarely 4, comb-spines, the one at the apex of the segment equal to from three-fourths to one and one-fourth  $\times$  the 2d tarsal segment.

Fore wing with the marginal cell rather small, from 1.2 to 1.6  $\times$  its own length from the wing-tip, the radial vein arcuate or slightly angled at the 3d transverse cubital vein. Submarginal cells rather variable in shape; 2d submarginal cell narrowed somewhat above; 3d narrowed strongly above, sometimes triangular, occasionally petiolate. 2d transverse cubital vein somewhat oblique.

MALE.—Length 7 (5–9) mm. Color black, with at least a small amount of rufous on tergite 2, at most with the basal two abdominal segments and the base of tergite 3 wholly rufous. Wings hyaline or nearly so, with a narrow fuscous band along the outer margin. Pubescence over a considerable part of the head, thorax, propodeum, and usually the base of the abdomen silvery, elsewhere brownish. Scape slightly hairy or not; clypeus, front, vertex, temples, and propleura with considerable short, dark hair; front coxae, pronotum, abdominal venter, and sometimes the sides of the propodeum sparsely short-haired.

Clypeus 2.3–2.6  $\times$  as broad as high. Front rather broad; inner orbits subparallel or diverging slightly above. Post-ocellar line subequal to or slightly greater or less than ocello-ocular line; ocelli in about a right triangle. First 4 antennal segments in a ratio of about 2:1:1.7:1.9, segment 3 from 1.5 to 2  $\times$  as long as thick. Posterior pronotal margin broadly angulate. Median line of propodeum strongly impressed. Last segment of front tarsus rather strongly produced on the inner margin, the inner claw strongly modified, the outer claw bifid (Fig. 8). Venation as in the female.

Sternite 6 with a broad, shallow emargination. Subgenital plate (Fig. 32) distinctive, provided with two strong but short, subparallel carinae near the base, visible without dissection unless the abdomen is strongly telescoped. Genitalia (Fig. 22) also very distinctive: aedoeagus very slender, parallel-sided, with only some very minute spines at the apex; basal hooklets single; digitus apically terminating in a large nasutiform lobe; disc of digitus clothed with short hairs which are longer and directed mesad along the inner margin.

*Biology*.—This species is known to be a social parasite of several Pompilini. Its habits are discussed under the generic heading;

the reader is also referred to Richards and Hamm (1939) and to the references cited in that paper. In North America its habits have not been observed. The species inhabits sandy or gravelly areas, often in the vicinity of woods.

*Distribution.*—Holarctic. In Europe the species is widely distributed throughout the northern part of the continent; in North America it occurs across the continent in the Hudsonian and Canadian Zones, and to a limited extent the Transition Zone, although it appears to extend no farther south in the Appalachians than Pennsylvania, and no farther south in the mountains of the West than Washington and Alberta.

*Specimens seen* (Nearctic): 110 (99 ♀♀, 11 ♂♂). Marginal records are as follows: NOVA SCOTIA: 1 ♂, Kentville, 21 July [CNC]; NEW BRUNSWICK: 1 ♀, Fredericton, 15 June [CNC]; QUEBEC: 1 ♀, Kazabazua, 9 Aug. [CNC]; ONTARIO: 2 ♀♀, Sudbury [CNC]; MANITOBA: 1 ♀, Aweme, 24 Aug. [CNC]; NORTHWEST TERRITORIES: 9 ♀♀, 1 ♂, Reindeer Depot, McKenzie Delta, 13 Aug. [CNC]; YUKON: 3 ♀♀, 1 ♂, Whitehorse, 3-4 July [CNC]; 2 ♀♀, Snag, 24 July [CNC]; BRITISH COLUMBIA: 1 ♂, Fort Nelson, 10 June [CNC]; WASHINGTON: Jefferson Co., 1 ♀, Olympus Nat. Park, 5000 feet, Aug. [CIS]; ALBERTA: 2 ♀♀, Billy, July, Aug. [Alta.]; MINNESOTA: Scott Co., 1 ♀, 6 June [Minn.]; WISCONSIN: 1 ♀, Rib Mt. State Park, 27 Aug. [Minn.]; MICHIGAN: Baraga Co., 1 ♀, 5 Sept. [ANSP]; NEW YORK: Chautauqua Co., 1 ♀, Bemus Point, 12 Aug. [CU]; PENNSYLVANIA: Sullivan Co., 1 ♀, Lopez, 4-15 Aug. [ANSP]; CONNECTICUT: Litchfield Co., 2 ♀♀, Colebrook, 24 Aug. [MCZ].

6b. ***Evagetes crassicornis consimilis*** (Banks) new combination

*Pomphiloides consimilis* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 228. [Type: ♀; Florissant, Colo., on sand, 12 June 1908 (S. A. Rohwer); U.S.N.M. no. 20,120.]<sup>32</sup>

*Pomphiloides (Nanopompilus) consimilis* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 301.

*Psammochares (Nannopompilus) consimilis* Banks, 1917, Bull. Mus. Comp. Zool., 61: 107.

*Nannopompilus consimilis* Banks, 1919, Bull. Mus. Comp. Zool., 63: 237. [Wash., Ore.]

*Sophropompilus consimilis* Strickland, 1947, Canad. Ent., 79: 124. [Medicine Hat, Alta.]

This subspecies differs from typical *crassicornis* only in being wholly black and of a slightly smaller average size. In general it

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<sup>32</sup> Ten paratypes [USNM and MCZ] are in part this form and in part two species of *Pompilus*.

occurs farther south or at lower altitudes than typical *crassicornis*, although there is a considerable area where both may occur. It is interesting to note that this species parallels almost exactly the case of *Pompilus fumipennis* Zetterstedt, which is also Holarctic and which also has a subspecies occupying about the same range as *consimilis* and differing in the same characters from the typical form.

FEMALE.—Length 7.5 (5–9) mm. Color black; wings hyaline or lightly infuscated, with a fuscous band along the outer margin. Pubescence brownish, usually varied with silvery on the lower front, clypeus, and more or less of the coxae and lower thoracic pleura and propodeum. Posterior pronotal margin broadly angulate or occasionally practically arcuate. Marginal cell of fore wing small, nearly twice its own length from the wing-tip; 2d and 3d submarginal cells small, the 3d usually nearly or quite triangular, sometimes petiolate.

MALE.—Length 6.5 (5–8) mm. Color black, without a trace of rufous on the abdomen; wings hyaline, with a rather broad, lightly infuscated band along the outer margin. Pubescence brownish and silvery in varying proportions; head and prothorax with a small amount of short hair, the remainder of the body practically devoid of hair. Posterior pronotal margin broadly angulate or nearly arcuate; venation as in female. Terminalia as described under the typical subspecies. The male of this form is very similar to several species of *Pompilus*, subgenus *Ammosphex*, but the subgenital plate is so characteristic as to identify it at once.

*Biology*.—This form has been collected on sand and on the flowers of *Cleome serrulata*.

*Distribution*.—Canadian and Transition faunas of western United States and Canada. In general occurs south of the range of typical *crassicornis*, but there is considerable overlap in range.

*Specimens seen*: 40 (28 ♀♀, 12 ♂♂). MANITOBA: 1 ♀, Aweme, 5 June [CNC]; SASKATCHEWAN: 1 ♂, Cut Knife, 7 June [CNC]; ALBERTA: 4 ♀♀, Medicine Hat, June–Aug. [Alta., CNC]; 1 ♂, Waterton Lake, 19 June [CNC]; 1 ♂, Strathmore, July [Alta.]; 1 ♀, Edmonton, 16 Aug. [MCZ]; 1 ♀, Wabamun, 28 June [MCZ]; YUKON: 2 ♀♀, Whitehorse, 4–5 July [CNC]; BRITISH COLUMBIA: 1 ♀, Chilcotin, 16 June [CNC]; OREGON: Grant Co., 1 ♂, Onion Creek, 7700 feet, 18 July [OSC]; Hood River Co., 1 ♂, Mt. Hood [CU]; CALIFORNIA: Eldorado Co., 1 ♀, Fallen Leaf Lake, July [CAS]; Sierra Co., 1 ♀, 1 ♂, Gold Lake, July [CAS]; NEVADA: Washoe Co., 1 ♀, Reno, May [CIS]; UTAH: Kane Co., 1 ♀, 10 mi. N. of Orderville, 14 Aug. [HEE]; NEW MEXICO: Otero Co., 2 ♀♀, 1 ♂, Cloudcroft, June–July, 9000 feet [HEE, UK]; COLORADO: 2 ♀♀ [USNM]; Boulder Co., 1 ♂, Boulder, 1 June [USNM]; Teller



Co., 4 ♀♀, 2 ♂♂. Florissant, June [USNM, MCZ]; WYOMING: 1 ♀, Mt. Adams, 3 Aug. [USNM]; Laramie Co., 4 ♀♀, 28 mi. E. of Laramie, 7700 feet, 6 Aug. [OSC, MCZ]; Yellowstone Nat. Park, 1 ♀, Sylvan Pass, 21 Aug. [Mim.]; NORTH DAKOTA: Cass Co., 1 ♂, Tower City, 19 June [USNM]; Golden Valley Co., 1 ♂, Beach [USNM].

IV. Genus **AGENIOIDEUS** Ashmead<sup>33</sup>

*Agenioideus* Ashmead, 1902, *Canad. Ent.*, 34: 85. [Type: *Pompilus humilis* Cresson, 1857; monobasic.]

*Aporoideus* Ashmead, 1902, *Canad. Ent.*, 34: 86. [Type: *Pompilus sericeus* Van der Linden, 1827; monobasic.] New synonymy.

*Sericopompilus* Banks, 1911, *Jour. N. Y. Ent. Soc.*, 19: 229. [In part.]—Sustera, 1913, *Verh. zool.-bot. Ges. Wien*, 62: 182, 208. [Type stated to be *Pompilus sericeus* Van der Linden; *nec Sericopompilus* Howard, 1901.]

*Agenioideus* Banks, 1917, *Bull. Mus. Comp. Zool.*, 61: 107. [*Lapsus calami* for *Agenioideus* Ashmead.]

This genus shows certain structural similarities to the preceding, such as the greatly reduced pulvillar comb and the presence of setae (sometimes) on the male aedoeagus. It is appropriately named *Agenia*-like, for its members suggest in many ways the species of the old genus *Agenia* (tribe Auplopodini) in the Pepsinae. It is possible that there is a fundamental linkage of the two major subfamilies of the Pompilidae at this point; however, a great deal more work must yet be done on the classification of the family before such phylogenetic speculations are truly in order.

Some of the facts which suggest the possible primitive nature of this genus and its affinities with the Pepsinae are as follows: (1) the delicate build of the body and long, slender, not strongly spinose legs, suggesting certain Auplopodini; (2) the pulvillar comb consists of only a few weak setulae, the common condition in the Pepsinae, but characteristic of only a few somewhat primitive Pompilinae; (3) the "pocket" at the base of the third discoidal cell is often scarcely evident; (4) here alone among the Pompilini is the propodeum often transversely rugulose, a common condition in the Pepsinae; (5) in some species there is present in the female a slight transverse concavity on the second abdominal sternite, vaguely suggesting the transverse groove of the Pepsinae; (6) there is much variation in the development of the tarsal comb,

<sup>33</sup> For full synonymy, see also the several subgenera.

and in one subgenus it is lacking, suggesting a possible origin in this genus of this typically pompilid character; (7) the members of this genus are typical hunters of spiders, those without the tarsal comb utilizing any convenient niche as a nest, much as in *Priocnemis*, for example; (8) the genus is protean and cosmopolitan, being represented in every zoogeographic region of the world by a highly variable assemblage of forms.

*Generic characters.*—Small wasps, 4 to 17 mm. in length. Color generally black, but with a tendency toward pale markings; our species all with the apical abdominal tergite of the male white; exotic species sometimes in part ferruginous. Pubescence variable, never more than obscurely bluish-refulgent. Body almost devoid of erect hairs, though there may be some fine hair on the head, prothorax, propodeum, and apical abdominal segments.

Mandibles unidentate, in some females bidentate. Labrum notched apically, but usually completely covered by the clypeus. Front without prominences, narrow or of moderate breadth, the eyes in the female distinctly converging above. Antennae of female very slender, segment 3 considerably longer than 1 or 4, and in our species always longer than upper interocular distance.

Pronotum short, in the female somewhat swollen dorsolaterally, sometimes with a faint median impression. Postnotum at least one-third the length of the metanotum, more or less pitted and constricted opposite the spiracles, finely transversely striate. Propodeum sloping gradually, never with a well-defined declivity, often with a shallow groove running caudad from the spiracles; propodeum usually either transversely rugulose or with coarse, suberect, silvery pubescence. Legs very slender, not strongly spinose; tarsi very slender, becoming increasingly so apically. Claws of female and all but the inner front claws of the male dentate; the latter are strongly curved and bifid. Last segment of front tarsus of male parallel-sided, not produced on the inner margin. Pulvillar pad very small, the comb of about 7 weak, diverging setulae (Fig. 36).

Hind wing with the anal lobe small; cubitus arising beyond the apex of the submedian cell. Fore wing with the stigma large, at least  $2.5\times$  as long as high, longer than the first abscissa of the radius, generally rather heavily pigmented. Marginal cell long, acute apically, usually less than its own length from the wing-tip. 2d and 3d submarginal cells both 4-sided. 3d discoidal cell long; 2d recurrent vein arising considerably more than half way from the base of the subdiscoidal vein to the margin of the wing, the latter vein nearly or quite attaining the margin of the wing. (Wing of genotype shown in Fig. 58.)

Apical abdominal segments showing considerable tendency to telescope in both sexes, but especially in the males, so that the abdomen appears rather short in resting position. Male genitalia with the basal hooklets single; parameres long, not much if any widened apically; digiti more or less expanded apically, the disc clothed sparsely with minute, simple hairs;

parapenials simple, slender; aedoeagus sometimes with minute setae along the shaft.

*Biology.*—The meager information available regarding the biology of these forms is summarized under the several subgenera. In general, they are hunters of spiders, and apparently not highly selective of their prey. They nest in the ground or in niches of various sorts, and seem especially attracted to walls, cliffs, and buildings. All three of our species have occasionally been taken inside buildings. They appear to visit flowers only occasionally.

*Distribution.*—Cosmopolitan; poorly represented in the New World. The genus is here divided into three subgenera, each containing a single species; many of the exotic species can be placed in these subgenera, but by no means all of them.

*Key to Subgenera*

1. Female: Apical tarsal segments with several median spines in a row beneath; tarsal comb well developed; propodeum transversely rugulose (sometimes only feebly). ♂: subgenital plate not compressed or keeled, nearly flat; parameres of genitalia very slender, slightly curved, short-setose .....A. **Ridestus** Banks

Female: Apical tarsal segments not or very feebly spinose beneath; tarsal comb present or absent; propodeum smooth or slightly rugulose. ♂: subgenital plate compressed, strongly keeled; parameres somewhat elbowed about midway .....2

2. Legs moderately spinose, the longer spines of the hind tibia about half as long as the thickness of the tibia at their base. ♀: Tarsal comb well developed. ♂: Aedocagus constricted just before the apex, which is in the form of two slender lobes. (♂♂ of our species, and often the ♀♀, with a white spot on the hind tibia.)

B. **Agenioideus** Ashmead

Legs weakly spinose, the spines on the hind tibia not half as long as the width of the tibia at their base. ♀: Tarsal comb wanting. ♂: Aedocagus simple, not constricted subapically. (Our species without a white spot on the hind tibia.) .....C. **Gymnochares** Banks

A. Subgenus **RIDESTUS** Banks

*Ridestus* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 223. [Type: *Psammochares transversalis* Banks, 1916 (= *biedermani* Banks, 1910); original designation.]—Dreisbach, 1949, Ent. Amer., (n.s.)29: 5.

*Rhidestus* Gussakovskij, 1929, Rev. Russe Ent., 23: 5. [*Lapsus calami* for *Ridestus* Banks.]

*Subgeneric characters.*—Apical margin of clypeus of male truncate or rounded, of female slightly notched medially. Malar space very narrow. Head slightly thicker than in the typical subgenus, the temples in the female somewhat more strongly developed. Propodeum in the female obscurely to rather strongly transversely rugulose, and without erect hairs or silvery pubescence; propodeum of male covered with coarse silvery pubescence which diverges from the median line. Front tarsus of female with a comb of long, slender spines; apical tarsal segments in this sex with a row of small spines beneath, sometimes present but very minute in the male. Legs very slender, especially apically; claws rather long and bent only slightly. Apical abdominal segments of the male tending to telescope into the first three; apex of abdomen not noticeably compressed. Subgenital plate of moderate breadth, nearly flat. Genitalia with the parameres very slender, curved only slightly; aedeagus simple, without spines or setae.

*Biology.*—Available evidence indicates that the species of this subgenus nest in crevices among rocks or in walls, including the foundations of houses. There are no host records.

*Distribution.*—This subgenus is represented in this hemisphere only by the genotype. Certain Old World species, such as *clivus* Kohl and *arcisus* Morawitz, appear to go here on the basis of the females, but I have not seen males of these species and hence cannot assign them definitely.

1. **Agenioideus (Ridestus) biedermani** (Banks) new combination  
(Plate XIII, fig. 36; plate XIV, fig. 40.)
- Psammochares biedermani* Banks, 1910 (June), Jour. N. Y. Ent. Soc., 18: 116. [Type: ♂; Palmerlee, Ariz., July (Biederman); M.C.Z. no. 13,706.]
- Psammochares striatulus* Banks, 1910 (June), Jour. N. Y. Ent. Soc., 18: 119. [Type: ♀; Palmerlee, Ariz., Aug. (Biederman); M.C.Z. no. 13,662.] New synonymy.
- Psammochares transversalis* Banks, 1910 (Dec.), Psyche, 17: 248. [Type: ♀; Palmerlee, Ariz., Aug. (Biederman); M.C.Z. no. 13,661.] New synonymy.
- Ridestus transversalis* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 223. [Made genotype of n. gen. *Ridestus*.]
- Sericopompilus biedermani* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 229.
- Psammochares (Gymnochoares) biedermani* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.
- Gymnochoares biedermani* Banks, 1919, Bull. Mus. Comp. Zool., 63: 239. [Claremont, Calif.]
- Gymnochoares biedermani* [sic] Dreisbach, 1949, Ent. Amer., (n.s.)29: 40, pl. IV, fig. 18.

The males of this species are easily confused with those of *A. (Gymnochaeres) birkmanni* Banks, since in both the abdomen is usually more or less telescoped and the apical segments difficult to observe. A convenient character for separating them is the fact that the third antennal segment in *biedermanni* is about  $3 \times$  as long as thick and as long as the fourth; in *birkmanni* it is about twice as long as thick and slightly shorter than the fourth. The females of these two species have considerable superficial resemblance, although the subgeneric differences readily separate them on close inspection.

FEMALE.—Length 12 (7–17) mm. Color black, the middle inner and upper outer orbits each with a small pale spot; fore wings lightly to rather heavily infuscated, a little darker along the outer margin; hind wings hyaline, the apex infuscated. Body clothed with a fine brownish pubescence, except on the sides of the lower front, where it is silvery. Front, vertex, and front coxae with a few erect hairs; temples and propleura with dense, fine hair; apical abdominal segments with a few setae; remainder of body virtually devoid of hair.

Mandibles with two strong teeth on the inner margin. Clypeus about  $2.5 \times$  as broad as high, a little broader than the lower front, its apical margin with a distinct but shallow median notch. Base of mandibles practically touching the bottoms of the eyes. Front narrow, middle interocular distance from  $.52$  to  $.58 \times$  transfacial distance; inner orbits nearly parallel below, distinctly convergent above, upper interocular distance from  $.75$  to  $.8 \times$  lower interocular distance. Ocelli forming about a right triangle, post-ocellar line is to ocello-ocular line usually about as 3:2. Antennae very long and slender, the first 4 segments in a ratio of about 3:1:6:4, segment 3 equal to from 1.2 to  $1.7 \times$  upper interocular distance. Temples slightly developed, the head arcuately contracted almost immediately behind the eyes.

Pronotum short, somewhat impressed medially, rather full in the shoulders, the posterior margin subarcuate. Postnotum about half the length of the metanotum. Posterior slope of the propodeum with a series of transverse rugae, varying from barely perceptible to fairly strong. Front basitarsus with 3 very slender comb-spines, the apical one about as long as the 2d tarsal segment. Fore wing with the marginal cell about two-thirds its own length from the wing-tip, the radial vein arcuate. Second submarginal cell narrowed by usually about one-third above, the 3d submarginal cell narrowed by about half above, this cell generally somewhat larger than in *humilis*. Stigma very large, longer than the transverse median vein. Subdiscoidal vein ending a short distance from the wing margin. Abdomen with sternite 2 slightly concave in profile.

MALE.—Length 7.5 (5.5–11) mm.; fore wing longer than the body length when the abdomen is telescoped, as it normally is in resting position. Color black, the inner and outer orbits usually with a small, inconspicuous pale spot, the apical abdominal tergite mostly white. Wings clear hyaline, the apical margin of the fore wing and sometimes the tip of the hind wing narrowly infuscated. Practically the entire body silvery-sericeous, the pubescence on the propodeum rather coarse, diverging from the median line. Front and vertex very slightly hairy; temples and propleura with considerable white erect hair, the pronotum and front coxae with a little.

Clypeus about  $1.5\text{--}1.7\times$  as broad as high, the apical margin subtruncate or somewhat rounded, the disc rather convex. Front not very broad, middle interocular distance  $.57$  to  $.6\times$  transfacial distance; inner orbits nearly parallel. Ocelli large, in approximately a right triangle; post-ocellar line is to ocello-ocular line about as  $3:2$ . Antennae slender, of moderate length, the first 4 segments in a ratio of about  $5:2:5:5$ , segment 3 about  $3\times$  as long as thick, or slightly more.

Pronotum short, its posterior margin subarcuate. Postnotum slightly shorter than the metanotum. Propodeum without rugae, the slope low and even, the median line faintly indicated. Longer spur of hind tibia slightly over half the length of the basitarsus. Legs but weakly spinose. Venation as in the female.

Abdomen with the first 3 segments rather long, forming a slight arch, in resting position the remaining segments more or less telescoped into these three. Apical segments scarcely compressed. Subgenital plate broadly subpatulate, the apex rounded, its margin short-setose; median line of plate only very slightly elevated. Genitalia (Fig. 40) with the parameres very slender, more slender than the parapenials, slightly curved, short-setose; digiti rather slender, clothed with sparse hairs of moderate length; parapenials and aedocagus about as long as the parameres, simple.

*Biology.*—This species is frequently taken in and around houses, and probably nests in niches in the foundations, and probably also, in the wild, in crevices in cliffs and among rocks. One specimen, a female, has been taken on goldenrod, *Solidago*. Judging from the records, there may well be two generations a year, one in late spring and early summer, another in late summer and autumn.

*Distribution.*—Lower Sonoran fauna, entering the Upper Sonoran to a limited extent, from Kansas, Utah, and California south into Mexico. A single specimen labeled "Montana" may represent a stray or mislabeled specimen; at least its occurrence in this state needs confirmation.

*Specimens seen:* 66 (43 ♀♀, 23 ♂♂). The following records are marginal so far as present records indicate: TEXAS: Brazos Co., 5 ♀♀, College Station, May, Oct. [JEG, RWS]; Dallas Co., 1 ♀, Dallas, 13 June,

on porch [HEE]; KANSAS: Riley Co., 6 ♀♀, 3 ♂♂, Manhattan, June, Sept., on porch [KSC, coll. J. B. Kring]; MONTANA: 1 ♀ (no further data) [ANSP]; NEW MEXICO: San Miguel Co., 1 ♂, Beulah, 2 June [ANSP]; UTAH: Davis Co., 1 ♂, Farmington, June [UAC]; Tooele Co., 1 ♂, Skull Valley, 4 Aug. 1931 [UAC]; NEVADA: Lincoln Co., 1 ♂, Oak Springs, 25 May [UAC]; Lyon Co., 1 ♂, Yerington, 24 July [CU]; CALIFORNIA: Los Angeles Co., 1 ♀, Los Angeles [USNM]; MEXICO: Baja California: 1 ♀, La Paz, 5 June [CAS]; Chihuahua: 1 ♀, Tinaja [USNM]; Nuevo Leon: 1 ♀, Galeana, 5-6000 feet, 3 Aug. [USNM].

B. Subgenus **AGENIOIDEUS** Ashmead

*Agenioideus* Ashmead, 1902, Canad. Ent., 34: 85. [Type: *Pompilus humilis* Cresson, 1867; monobasic.]—Dreisbach, 1949, Ent. Amer., (n.s.)29: 9, 38, pl. III, fig. 13.

*Aporoideus* Ashmead, 1902, Canad. Ent., 34: 86. [Type: *Pompilus sericeus* Van der Linden, 1827; monobasic.]

*Agenioideus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 107. [*Lapsus calami* for *Agenioideus* Ashmead.]

*Subgeneric characters*.—Clypeus about as wide as the lower front, not emarginate apically. Malar space of variable length, in our species about half as long as the antennal pedicel. Head thin, flattened immediately behind the eyes. Propodeum with the slope low and even, with a suggestion of grooves running caudad from the spiracles; disc somewhat shining, clothed with conspicuous silvery pubescence in both sexes, without more than a faint trace of transverse rugae. Tarsal comb consisting of 6 very slender spines, 3 on the basitarsus. Apical tarsal segments not spined beneath, or with one or two very minute, scarcely evident spines. Legs moderately spinose, the longer spines on the upper side of the hind tibia in both sexes at least half as long as the thickness of the tibia at their base. Abdomen of male small, but all the segments usually evident, the apical segments not or barely telescoped into the basal ones. Apical segments of male slightly compressed; subgenital plate strongly compressed, keel-shaped. Genitalia, at least in the genotype, with the aedoeagus constricted just before the apex, which is in the form of two slender lobes, and with a few minute setae along the shaft; parameres somewhat elbowed about mid-way.

*Biology*.—The species of this subgenus nest in sand, gravel, or in loose earth amongst the stones of walls or cliffs, probably also in the walls of buildings. The prey is caught before the nest is constructed, and consists of small spiders of the families Epeiridae, Salticidae, and Thomisidae.

*Distribution*.—Holarctic, and probably more widely distributed. The European *sericeus* and our *humilis* are the only species I have seen.

1. *Agenioideus (Agenioideus) humilis* (Cresson)

(Plate XIII, fig. 37; plate XIV, fig. 39; plate XVI, fig. 58.)

*Pompilus humilis* Cresson, 1867. Trans. Amer. Ent. Soc., 1: 91. [Type: ♀; New York (no further data); A.N.S.P. no. 552.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 294.

*Agenioideus humilis* Ashmead, 1902, Canad. Ent., 34: 85. [Selected genotype of n. gen. *Agenioideus*.]—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 985.—Hurd, 1947, Pan-Pac. Ent., 23: 132. [Mt. Diablo, Calif.; biology.]—Dreisbach, 1949, Ent. Amer., (n.s.)29: 38, pl. III, fig. 13.

*Anoplus humilis* Viereck, 1906, Ent. News, 17: 304. [New Haven, Conn.]

*Sericopompilus humilis* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 229.—Rohwer, 1916, Conn. Geol. Nat. Hist. Survey Bull. 22, p. 632.

*Psammochares (Agenioideus) humilis* Banks, 1917, Bull. Mus. Comp. Zool., 61: 107.

*Agenioideus humilis* Banks, 1919, Bull. Mus. Comp. Zool., 63: 239. [Revelstoke, B. C.]

*Psammochares (Sericopompilus) humilis* Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 987.

The bifasciate wings at once separate *humilis* from all other native Pompilini, except the males of some species of *Sericopompilus*, which are easily separable on a number of other characters. This is one of the most widely distributed of all North American spider wasps, but does not seem to be common anywhere.

FEMALE.—Length 8 (5.5–10.5) mm. Color black, the inner orbits usually with a small pale spot, the hind tibia usually with a pale spot near the base on the outer side. Wings hyaline, the fore wings with a submarginal light fuscous band and a separate broader band extending from the marginal cell through the third discoidal, sometimes with a light cloud over the basal vein; hind wings with a pale band along the margin. Pubescence of at least the front, temples, lower sides of the thorax, coxae, and propodeum silvery, sometimes practically the whole body silvery-sericeous. Clypeus, front, and vertex weakly setose; temples and propleura with considerable pale hair; propodeum with a small amount of inconspicuous pale, erect hair in addition to the pubescence.

Clypeus about  $2.5 \times$  as broad as high, its apical margin subtruncate or very slightly rounded. Malar space about half the length of the antennal pedicel. Front of moderate breadth, middle interocular distance from  $.57$  to  $.62 \times$  transfacial distance. Eyes converging considerably above, upper interocular distance about  $.7 \times$  the lower. Ocelli large and rather close together on the narrow vertex; post-ocellar line is to ocello-ocular line about as 3:2. Antennae very slender, the first 4 segments in a ratio of about 5:2:10:8, segment 3 equal to from 1.0 to  $1.6 \times$  upper interocular distance.



Pronotum very short, its posterior margin subarcuate, with a slight median angulation. Postnotum about as long as the metanotum. Propodeum with the median line not or but faintly impressed; in an occasional specimen very faint transverse rugae may be observed on the posterior slope. Tarsal comb-spines long and slender, the apical one on the basitarsus about as long as the 2d tarsal segment. Venation as shown in Fig. 58. Stigma very large, nearly or quite as long as the 2d submarginal cell, heavily pigmented. Marginal cell about three-fourths its own length from the wing-tip, pointed apically. Third submarginal cell nearly always shorter than the 2d, and usually narrowed by more than half above.

MALE.—Length 6.5 (4–9.5) mm. Color black, the apical abdominal tergite whitish, the hind tibia with a whitish spot or streak on the outer side near the base, the inner orbits usually with a very small pale spot. Wings hyaline and bifasciate as in the female, but the bands often rather faint. Body clothed in great part with a coarse silvery pubescence, especially conspicuous on the propodeum. Vertex, temples, prothorax, and sometimes the sides of the propodeum with some very fine, light hair.

Clypeus about twice as broad as high, its apical margin truncate. Front rather broad, middle interocular distance over  $.6 \times$  transfacial distance; eyes converging slightly above, upper interocular distance about  $.9 \times$  the lower. Ocelli large and prominent, in about a right triangle; post-ocellar line is to ocello-ocular line about as 3:2. Antennae slender, the first 4 segments in a ratio of about 2:1:2:1.8, segment 3 about  $2.5 \times$  as long as thick. Posterior pronotal margin arcuate or subangulate. Postnotum about as long as the metanotum. Slope of propodeum very low, the median line not well impressed. Venation as in the female; 3d transverse cubital vein often rather strongly bent about mid-way.

Abdomen slender, slightly compressed toward the apex. Subgenital plate, in ventral aspect, narrowly spatulate, the apical margin fringed with short hairs; in lateral aspect (Fig. 37) with the median line very strongly raised, its profile arched. Genitalia (Fig. 39) with the parameres slender, but broader than the parapenial lobes, more or less elbowed about mid-way (usually more so than shown in figure), the apical half with long, sinuous hairs. Digits rather broad, the outer margins arcuate, the apex abruptly truncate, the disc clothed with very minute setae. Aedoeagus with several small setae along the shaft, the apex in the form of two slender lobes.

*Biology*.—Hurd (1947) reports rearing this species from cocoons found at the base of a cliff in pulverized sandstone; two of eleven cocoons were parasitized, one by a bombyliid and one by a mutillid (species not stated). Not infrequently specimens are taken inside buildings, probably having nested in the walls. A specimen from Niagara Falls, N. Y. [CM] is pinned with a young epeirid spider, possibly genus *Epeira* [det. B. J. Kaston]. A specimen from Sinai Bay, Long Island, N. Y. [AMNH] bears the

note: "This wasp had captured a specimen of *Aranca pegnia* Walck. [Epeiridae] (identified by W. J. Gertsch)." The species appears to have but one generation a year, most of the records being for spring or early summer in the southern part of the range, mid-summer farther north.

*Distribution*.—New Brunswick, Minnesota, and British Columbia south to Florida and Guatemala, chiefly in the Transition and Upper Austral Zones. The species appears to be absent from the more arid, treeless parts of the West, but is otherwise quite generally distributed throughout its range.

*Specimens seen*: 113 (60 ♀♀, 53 ♂♂). The following records are marginal: NEW BRUNSWICK: 1 ♀, Fredericton [CNC]; QUEBEC: 1 ♂, Aylmer, 5 Aug. [CNC]; ONTARIO: 1 ♀, Marmora, 26 July [CNC]; WISCONSIN: Columbia Co., 1 ♀, Columbus, 12 Aug. [USNM]; MINNESOTA: Blue Earth Co., 1 ♀, 28 July [Minn.]; COLORADO: Larimer Co., 1 ♀, Estes Park, 11 Aug. [CU]; BRITISH COLUMBIA: 1 ♀, Revelstoke, Selkirk Mts., 13 July [CU]; 2 ♂♂, Vancouver, July [CNC, MCZ]; CALIFORNIA: Santa Clara Co., 1 ♀, Morgan Hill, 6 Sept. [Minn.]; MEXICO: Morelos, 1 ♀, Cuernavaca, May [USNM]; GUATEMALA: 2 ♂♂, Moca Gualalon, 1000 m., Mch.–Apr. [MCZ]; TEXAS: Williamson Co., 1 ♀, 1 ♂, Liberty Hill, 17–21 June 1936 [RWS]; FLORIDA: 1 ♀ (no further data) [USNM].

#### C. Subgenus **GYMNOCHARES** Banks

*Gymnocharcs* Banks, 1917, Bull. Mus. Comp. Zool., 61: 107, 108. [Type: *Psammochares birkmanni* Banks, 1910; designated by Pate, 1946.] [Described as subgenus of *Psammochares*.]—Banks, 1934, Proc. Amer. Acad. Arts and Sci., 69: 99. [Philippine species.]—Pate, 1946, Trans. Amer. Ent. Soc., 72: 88.—Dreisbach, 1949, Ent. Amer., (n.s.)29: 6, 9 [not page 40, figure 18.]

This is a widely distributed and protean subgenus, in which the legs are very weakly spinose and the tarsal comb absent. Our single species superficially resembles *A. (Ridestus) biedermani* Banks.

*Subgeneric characters*.—Small wasps, 3.5–11 mm. in length. Mandibles of female bidentate, or the inner tooth so much reduced that they appear unidentate. Malar space very short; temples very narrow. Propodeum either smooth and silvery-sericeous, as in *Aqcnioideus* in the strict sense, or transversely rugulose, as in *Ridestus*. Legs weakly spinose; spines of the hind tibia small, not half as long as the width of the tibia at their base; front tarsus of female without a comb. Apical tarsal segments without spines beneath. Abdomen of male small, the apical segments compressed and more or less telescoped into the first three. Subgenital plate strongly compressed;

sternite 6 also slightly compressed, and deeply emarginate apically. Genitalia with the aedeagus simple, not setose, the digiti slender, the parameres more or less elbowed about mid-way and somewhat setose.

*Biology*.—Little is known of the biology of our species. A summary of the habits of the European *cinctellus*, a member of this group, has been given by Richards and Hamm.<sup>34</sup> This species nests in sandy places, in niches in walls, in rotten wood, in abandoned burrows of other wasps, and is even reported as having nested in a snail-shell. It does little digging of its own, using ready-made cavities which it afterward closes with bits of earth and debris. The list of recorded hosts consists mostly of Salticidae, with a few records of Thomisidae.

*Distribution*.—Very widely distributed. The European *cinctellus* Spinola and *apicalis* Van der Linden belong here. The Philippine species assigned by Banks (1934) to this group appear to belong here.

1. **Agenioideus (Gymnochaeres) birkmanni** (Banks) new combination  
(Plate XIII, fig. 38; plate XIV, fig. 41.)

*Psammochares birkmanni* Banks, 1910, Jour. N. Y. Ent. Soc., 18: 116.  
[Type: ♂; Lee Co., Texas, 16 Sept. 1905 (Birkmann); M.C.Z. no. 13,707.]

*Sericopompilus birkmanni* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 228.

*Psammochares (Gymnochaeres) birkmanni* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.

*Ridestus striatulus* Banks, 1919, Bull. Mus. Comp. Zool., 63: 241. [Calif.]  
[Misidentification; *nec* Banks, 1910.]

*Gymnochaeres texana* Banks, 1944, Bull. Mus. Comp. Zool., 94: 170. [Type: ♀; Austin, Texas, 5 June 1900 (A. L. Melander); M.C.Z. no. 25,704.]  
New synonymy.

*Gymnochaeres birkmanni* Pate, 1946, Trans. Amer. Ent. Soc., 72: 88.  
[Selected genotype.]

This is a widely distributed and rather variable species. Both sexes are easily confused with *biedermanni* unless care is taken in observing the subgeneric distinctions (see also notes under that species).

<sup>34</sup> Richards, O. W. and Hamm, A. H., 1939, Trans. Soc. Brit. Ent., 6: 78-79.

FEMALE.—Length 7.5 (5–11) mm. Color black; wings varying from hyaline with the outer margin infuscated, to wholly infuscated and somewhat violaceous. Pubescence very fine, silvery at least on the sides of the front, sometimes with practically the whole body silvery-sericeous; pubescence otherwise brownish, obscurely violaceous. Temples and propleura with fine hair; vertex slightly hairy; apical abdominal segments with a few dark setae.

Clypeus  $2.3$  to  $2.6 \times$  as broad as high, the apical margin truncate and with a narrow, shining marginal rim. Front of rather variable breadth, middle interocular distance varying from  $.53$  to  $.6 \times$  transfacial distance; front with a well-defined median line from the antennal bases to the front ocellus. Inner orbits convergent above, middle interocular distance subequal to the lower, upper interocular distance  $.67$ – $.77 \times$  the lower. Vertex narrow; ocelli forming an angle in front which is distinctly less than a right angle; post-ocellar line is to ocello-ocular line about as  $3:2$ . Antennae very slender, the first 4 segments in a ratio of about  $5:2:8:6$ , segment 3 equal to from  $1.1$  to  $1.6 \times$  upper interocular distance.

Pronotum short, the shoulders rather full, the median line somewhat impressed behind; posterior margin subarcuate. Postnotum from one-third to two-thirds the length of the metanotum. Propodeum with the median line usually slightly impressed in front, the posterior slope with a series of transverse rugae, sometimes weak and difficult to observe. Front tarsus with spines of moderate length at the outer apices of segments 1–3, elsewhere with only a few very short spines. Venation of the usual pattern in the genus, but the stigma smaller than usual, only about  $2.5 \times$  as long as high, but longer than the transverse median vein. Marginal cell about or a little less than its own length from the wing-tip, the radial vein evenly arcuate. Second and 3d submarginal cells subequal in size, or the 3d slightly broader; 3d narrowed by from one-third to one-half above.

MALE.—Length 5 (3.5–6.5) mm. Black, the apical abdominal tergite mostly whitish. Wings generally clear hyaline, the outer margin of the fore wing and tip of the hind wing narrowly infuscated, or they may be wholly lightly infuscated. Body in large part silvery-sericeous, the pubescence coarse and suberect on the propodeum. Body practically without erect hairs, except fine, inconspicuous hairs on the head and prothorax.

Clypeus about or slightly less than twice as broad as high, the apical margin truncate. Front of variable breadth, middle interocular distance from  $.54$  to  $.62 \times$  transfacial distance. Inner orbits subparallel or diverging slightly above, somewhat emarginate near the middle. Ocelli forming a right or somewhat acute angle in front, post-ocellar line usually greater than ocello-ocular line. Antennae with the first 4 segments in a ratio of about  $2:1:1.8:2$ , segment 3 about twice as long as thick, always a bit shorter than 4. Pronotum as in female; postnotum nearly as long as the metanotum. Propodeum with the slope very low, clothed with coarse silvery pubescence which diverges from the median line. Legs weakly

spinose; longer spur of hind tibia about .7 the basitarsus. Venation about as in the female, the stigma usually larger, the marginal cell pointed apically and less than its own length from the wing-tip.

Abdomen small, the basal 3 segments fairly large, slightly arched, the remaining segments more or less telescoped into these in resting position. Sternite 6 deeply emarginate. Subgenital plate strongly compressed, the sides folded against one another; in profile, the lower margin is nearly straight, the upper margin abruptly declivous subapically, the extreme apex attenuate (Fig. 38). Genitalia (Fig. 41) with the parameres elbowed, with rather long, somewhat sinuous hairs on the apical half ventrally. Basal hooklets produced into slender processes. Digits slender, curved, with a few scattered setae of moderate length on the disc. Parapenials straight, rather thick, slightly expanded apically. Aedocagus simple, of moderate breadth.

*Biology.*—This species is often taken in the vicinity of rocks, and may nest in niches in these. The single record of its prey is a female taken by the author at New Braunfels, Texas, with a ♀ *Herpyllus vasifer* (Walck.) (Gnaphosidae) [det. B. J. Kaston]. The spider is carried in flight by the wasp. Males of this species are known to visit the flowers of *Asclepias*.

*Distribution.*—This form occurs across the continent, but there are only two records from east of the Mississippi. It is principally a Lower Austral form, but enters the Upper Austral in the West.

*Specimens seen:* 48 (27 ♀♀, 21 ♂♂). GEORGIA: Charlton Co., 1 ♀, Okefenokee Swamp, July [CU]; Dekalb Co., 1 ♀, Stone Mt., 3 Aug. [MCZ]; MISSOURI: 1 ♀, St. Louis [USNM]; KANSAS: Douglas Co., 1 ♂, Lawrence, 15 June [CM]; TEXAS: 6 ♂♂ (no further data) [ANSP, USNM]; Brazos Co., 1 ♀, 1 ♂, 30 May, 28 July [JEG]; Cameron Co., 1 ♀, 1 ♂, Brownsville [USNM]; Comal Co., 1 ♀, New Braunfels, 29 June [HEE]; Lee Co., 1 ♀, 3 ♂♂, March, Sept. [MCZ]; McLennan Co., 1 ♀, 22 July [JEG]; Travis Co., 1 ♀, Austin, 5 June [MCZ]; Webb Co., 3 ♂♂, Laredo, Sept. [JEG]; Williamson Co., 1 ♀, 29 Sept. [JEG]; 1 ♀, Liberty Hill, 23 Aug. [RWS]; Grimes Co., 1 ♀, Navasota, 22 Aug. [KVK]; ARIZONA: Pima Co., 1 ♀, Tucson, June [Univ. Ariz.]; COLORADO: Larimer Co., 2 ♀♀, Poudre Canyon, 5200 feet, 21 Aug. [HEE]; WYOMING: Sweetwater Co., 1 ♀, Green River, 2 July [AMNH]; OREGON: Wasco Co., 1 ♂, Biggs Jet., 12 July [OSC]; CALIFORNIA: 1 ♀ (no further data) [CU]; Alameda Co., 1 ♀, Niles Canyon, 9 June [CAS]; Marin Co., 1 ♂, Baltimore, 2 July [CAS]; Riverside Co., 1 ♂, Blythe, 3 Aug. [CIS]; San Diego Co., 1 ♂, La Jolla, Aug. [USNM]; Tulare Co., 1 ♂, Lindsay [USNM]; MEXICO: Baja California: 1 ♀, Mouth of Rio Santelmo, 21 Sept. [CAS]; Coahuila: 1 ♀, Fuente, 12 June [CIS]; Revillagigedo Islands: 7 ♀♀, 1 ♂, Clarion Isl., 26–30 Apr. [CAS, CIS].

V. Genus **SERICOPOMPILUS** Howard

*Sericopompilus* Howard, 1901, The Insect Book, pl. XI, fig. 17. [Type: *Pompilus cinctipes* Cresson, 1867 (= *apicalis* Say, 1837); monobasic.]—Ashmead, 1902, Canad. Ent., 34: 82. [Proposed as a new genus.]—Banks, 1911, Jour. N. Y. Ent. Soc., 19: 223, 228.—Banks, 1917, Bull. Mus. Comp. Zool., 61: 107, 108. [Subgenus of *Psammochares*.]—Dreisbach, 1949, Ent. Amer., (n.s.)29: 6, 11, 36, pl. II, fig. 6.

This distinctive genus is related to the preceding in the slender body and appendages and in the wing venation. It is closely allied to the two following genera, with which it forms a compact and well-defined generic complex, characterized by having the cubitus of the hind wing arising before the apex of the submedian cell, the postnotum arcuately expanded on each side of the median line, and with tendencies for the front tibiae to be more spinose than usual, for the eyes of the female to be rather strongly convergent above, and for the male to be patterned with pale yellow; the male genitalia are also similar in these three genera, and the subgenital plate of the same pattern throughout. The species of *Sericopompilus* are handsome insects, with slender bodies and long appendages, and often variously colored with red and pale yellow.

The genus *Sericopompilus* is represented in the Americas by three species inhabiting the Lower and Upper Austral Zones of North America. In addition I have seen an Australian species which differs in essential characters only in the presence of a median row of spines beneath the apical tarsal segments, and is thus probably no more than subgenerically distinct from the American species. Such a discontinuous distribution suggests a primitive condition, and there is morphological evidence to support such a belief. *Sericopompilus* may well represent a remnant of the ancestral stock which split off from early Pompilini and culminated in such highly successful genera as the cosmopolitan *Episyron* and *Pocillopompilus*. While sharing the general characteristics of these genera, it lacks their specializations, and in outward appearance remains much like a *Pompilus* or an *Agenioides*.

*Generic characters*.—Medium-sized wasps (7–17 mm. in length) of slender build. Color predominantly black, but often marked with rufous; males with the head, thorax, legs, and apical abdominal tergite more or less marked with pale yellow. Head, prothorax, propodeum and sometimes the mesopleura and first abdominal tergite, with a considerable amount of short, fine pile.

Head rather thin, disc-like, not wider than the thorax at its widest. Apical margin of labrum with a median notch. Mandibles of the female with two teeth along the inner margin, sometimes a weak third; those of the male with a single tooth, sometimes a weak second. Malar space extremely short. Clypeus large, its upper margin feebly sinuate. Front rather broad; inner orbits slightly to strongly convergent above in the female. Antennae elongate, segment 3 in the female at least  $4\times$  as long as thick, in the male at least twice as long as thick. Ocelli prominent, in a rather broad triangle, the front angle greater than a right angle.

Pronotum short, steeply declivous in front. Mesonotum large, in the female strongly convex; scutellum convex, prominent. Postnotum fairly long, constricted and depressed on the median line, on each side arcuately expanded, and constricted once again in front of the spiracles (Fig. 69). Propodeum with smooth contours, its slope even, never with a distinct posterior declivity. Legs long and slender, rather strongly spinose. Front tarsus of female with a comb of rather short spines, from 1 to  $2\times$  as long as the width of the tarsus; basitarsus always with four comb-spines. Apical tarsal segments without spines beneath in both sexes. Pulvillar pad small, the comb poorly developed, of not more than 9 weak, diverging setulae. All the claws of both sexes dentate. Last segment of front tarsus of male not modified. Anterior tibia with or without some indication of several rows of spines, some of which are on the upper surface.

Wings long and slender, exceeding the abdomen, never folded longitudinally. Veins and cells extending relatively close to the wing-margin; marginal cell long and slender, less than its own length from the wing-tip; radial vein evenly arched. Stigma very large, darkly pigmented. Second and 3d submarginal cells both large and wide above. Basal and transverse median veins of fore wing interstitial or the latter meeting the media slightly beyond the basal. Anal vein of hind wing meeting the media considerably beyond the origin of the cubitus. (Wings of the genotype shown in Fig. 59.)

Abdomen of female slender, subfusiform, with a few strong but non-bristly setae toward the apex. Male abdomen variable in shape even within a single species; in some males the first one or two segments are very slender, giving the abdomen an almost petiolate appearance; in others the first segment is expanded behind, and the abdomen of the usual shape in the tribe, although very slender throughout. Sternite 6 of male deeply emarginate; subgenital plate with the median line strongly elevated, the sides sloping from it, the apex obtusely pointed or somewhat rounded. Male genitalia with the aedoeagus simple, much exceeded by the slender parapenial lobes; basal hooklets double; digiti much broadened apically, spatulate; parameres long and slender, the squamae not prominent. Our three closely allied species show no constant differences in the male genitalia. (See Fig. 42.)

*Biology.*—The wasps of this genus are most frequently taken at flowers; occasionally they may be found flying over the ground in sandy or waste places. What little is known of their habits is chiefly accreditable to the Peckhams,<sup>35</sup> who vividly describe the behavior of *Pompilus fuscipennis* (i.e., *Scricopompilus apicalis*), which preys upon thomisid and lycosid spiders and nests in soft earth. Hartman<sup>36</sup> found a wasp preying upon *Dolomedes* sp. (Pisauridae) which he called *Pompilogaster fuscipennis*, and which possibly was *Scricopompilus apicalis* or *neotropicalis*. It was nesting in a hole in the side of the burrow of a small rodent.

*Distribution.*—Sonoran subregion of the Nearctic region. As mentioned earlier, certain Australian forms appear to be only subgenerically distinct from the American species. The species from South America and the Philippines placed by Banks in *Scricopompilus* do not belong here, but to several other genera.

#### Key to Species

##### Females

1. Eyes only moderately convergent above, upper interocular distance about .85  $\times$  the lower; 3d antennal segment equal to about .7 to .8  $\times$  upper interocular distance (Fig. 47); wholly black

##### 1. **angustatus** (Cresson)

Eyes strongly convergent above, upper interocular distance about .75  $\times$  the lower; 3d antennal segment equal to at least .9  $\times$  upper interocular distance (Figs. 45 and 46); abdomen at least in part rufo-ferruginous . . . . 2

2. Clypeus evenly arcuate below; ocelli of average size, post-ocellar line usually slightly greater than ocello-ocular line (Fig. 46); apical 3 or 4 segments of abdomen black; legs wholly black . . . . . 2. **apicalis** (Say)

Extreme lower margin of clypeus truncate; ocelli large, post-ocellar line distinctly greater than ocello-ocular line (Fig. 45); abdomen entirely rufo-ferruginous, the legs usually in part so

##### 3. **neotropicalis** (Cameron)

##### Males

1. Upper interocular distance equal to or greater than the lower; neck usually not marked with yellowish; abdomen never marked with rufous; wings often wholly fuscous . . . . . 1. **angustatus** (Cresson)

<sup>35</sup> Peckham, G. W. and E. G., 1898, Bull. Wis. Geol. Nat. Hist. Survey, no. 2, p. 140.

<sup>36</sup> Hartman, C., 1905, Bull. Univ. Texas, no. 65, p. 54.



Upper interocular distance less than lower (though sometimes only very slightly so); neck with a yellowish spot on each side; abdomen usually marked with rufous; wings in large part hyaline .....2

2. Ocelli of moderate size, post-ocellar line slightly greater than ocello-ocular line (Fig. 48); middle basitarsus not ringed with pale yellow

2. **apicalis** (Say)

Ocelli unusually large and prominent, post-ocellar line much greater than ocello-ocular line (Fig. 49); middle basitarsus with a broad ring of pale yellow .....3. **neotropicalis** (Cameron)

1. **Sericopompilus angustatus** (Cresson) (Plate XV, fig. 47.)

*Pompilus angustatus* Cresson, 1865, Proc. Ent. Soc. Phila., 4: 452. [Type: ♀; Colorado (no further data); A.N.S.P. no. 418.]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 89.—[not] Provancher, 1882, Nat. Canad., 13: 35, 38.—[not] Provancher, 1883, Nat. Canad., 14: 35.—Dalla Torre, 1897, Cat. Hymen., viii, p. 272.

*Psammocharcs fulvoapicalis* Banks, 1910, Jour. N. Y. Ent. Soc., 18: 117. [Type: ♀; Lee Co., Texas, 2 Sept. 1905 (Birkmann); M.C.Z. no. 13,712.] New synonymy.

*Psammocharcs (Sericopompilus) angustatus [sic]* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.

*Psammocharcs (Sericopompilus) fulvoapicalis* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.

*Sericopompilus fumosus* Banks, 1933, Psyche, 40: 5. [Type: ♂; Fountain Valley School, Colorado Springs, Colo., 12–19 July 1932; M.C.Z. no. 17,050.] New synonymy.

The female of this species is easily recognized by the all-black coloration and the rather broad vertex. The males may have wholly fuscous wings or hyaline wings with the outer margins broadly fuscous, or they may be intermediate between these two strikingly different extremes. A series of nine males from Victoria, Texas [USNM], exhibits the two extremes and every gradation between them.

FEMALE.—Length 11.5 (9–14) mm. Color black, upper outer and sometimes the middle inner orbits with a very small pale spot, apex of the abdomen, when fully extended, somewhat fulvous. Wings wholly fuliginous, somewhat iridescent. Body clothed with a fine brownish or obscurely brownish-violaceous pubescence, which is sometimes silvery on the lower front. Head, thorax, and propodeum with abundant short, fine, dark hair.

Clypeus from 2 to 2.2 × as broad as high, its apical margin rounded or very feebly truncate. Segments of the maxillary palpi somewhat shorter than in the following two species. Front broad, middle interocular distance .62–.67 × transfacial distance. Middle interocular distance from 1.05 to 1.1

$\times$  the lower, upper interocular distance from .8 to .9  $\times$  the lower, the eyes thus only moderately convergent above. Antennae of moderate length, the first 4 segments in a ratio of about 3:1:4.2:3, segment 3 approximately .75  $\times$  upper interocular distance. Vertex slightly, arcuately raised above the tops of the eyes; post-ocellar line usually slightly greater than ocello-ocular line. (Head shown in Fig. 47.)

Posterior pronotal margin subarcuate, with a slight median angulation. Propodeum with a rather well-defined median line. Spines of the tarsal comb nearly twice as long as the width of the tarsus. Other features, including the venation, as described under the generic heading.

MALE.—Length 9.5 (7–12) mm. Color black, the following pale yellowish: middle inner and upper outer orbits narrowly and briefly; posterior margin of pronotum rather broadly; a small spot on the axillary sclerites of the fore wing, just behind the tegulae, and sometimes a spot on the mesonotum adjacent to it; sides of the posterior rim of the propodeum; apical abdominal tergite; middle tibial spurs; broad basal rings on segments 1, 2, 3, and 4 of the middle tarsi, and on segments 2, 3, and 4 of the hind tarsi (sometimes 1 and the spurs to some extent); hind tibia with a streak on the outer side for the basal two-thirds. Wings wholly brownish, or hyaline with the outer margin broadly banded with brownish, or intermediate. Pubescence brownish-cinereous, more or less silvery on the lower front and clypeus, coxae, sides of the thorax, and propodeum, sometimes more extensively so. Head, thorax, and propodeum with a moderate amount of short, rather pale and inconspicuous, erect pile; apical abdominal segments with a few short, dark setae.

Clypeus a little more than twice as broad as high, the apical margin arcuate or feebly truncate. Front broad, middle interocular distance usually about .65  $\times$  transfacial distance; inner orbits somewhat emarginate just above the middle; upper interocular distance about equal to the lower, or slightly greater. First 4 antennal segments in a ratio of about 5:2:5:5, segment 3 slightly more than twice as long as thick. Ocellar triangle prominent, post-ocellar line slightly greater than ocello-ocular line.

Posterior pronotal margin subarcuate or very feebly angulate. Median line of propodeum somewhat impressed. Abdomen subfusiform, the first segment gradually expanded posteriorly, never as slender as it sometimes is in the following two species. Apical segments as described under the generic heading.

*Biology.*—This wasp has been taken on the flowers of *Melilotus alba*, *Stillingia squiraria*, and *Petalostemon oligophyllum*; it occurs throughout the warmer months of the year, from May to October.

*Distribution.*—This species occurs throughout the Lower and Upper Austral zones of the Great Plains region, from New Mexico, Chihuahua, and eastern Texas to Colorado, South Dakota, and Michigan. A single specimen labeled "Fla." [USNM] may be mislabeled.

*Specimens seen*: 51 (34 ♀♀, 17 ♂♂). MEXICO: Chihuahua, 1 ♀, Samalayuca, 24 June [AMNH]; NEW MEXICO: Eddy Co., 1 ♀, Carlsbad, 11 July [OSC]; COLORADO: 2 ♀♀ (no further data) [ANSP]; El Paso Co., 1 ♂, Colorado Springs, 12-19 July [MCZ]; Weld Co., 1 ♀, Roggen, 8 July [MCZ]; KANSAS: Cheyenne Co., 1 ♂, 1 July [UK]; Wallace Co., 1 ♂, Sharon Springs, 17 June [MCZ]; NEBRASKA: Thomas Co., 2 ♀♀, 1 ♂, Halsey, June, Aug. [USNM, Mimm.]; SOUTH DAKOTA: Fall River Co., 1 ♂, Hot Springs, 9 July [MCZ]; IOWA: Woodbury Co., 4 ♀♀, Sergeant's Bluff, July-Aug. [USNM]; 5 ♀♀, 2 ♂♂, Sioux City, July-Aug. [USNM]; MICHIGAN: Midland Co., 1 ♀, 7 Sept. [MCZ]; FLORIDA: 1 ♀ (no further data) [USNM]; TEXAS: Bexar Co., 2 ♀♀, June, July [JEG]; Dimmit Co., 1 ♂, Carrizo Springs, 20 June [OSC]; Hudspeth Co., 1 ♀, McNary, 24 June [OSC]; Lee Co., 8 ♀♀, Sept.-Oct. [MCZ]; Presidio Co., 1 ♀, Marfa, 27 July [HEE]; Valverde Co., 1 ♀, Del Rio, 17 July [HEE]; Victoria Co., 3 ♀♀, 9 ♂♂, Victoria, 13-16 May [USNM].

## 2. *Sericopompilus apicalis* (Say)

(Plate XV, figs. 46, 48; plate XVI, figs. 59, 69.)

*Ceropales apicalis* Say, 1835, Boston Jour. Nat. Hist., 1: 366. [Type: ♂; Indiana (no further data); (no longer extant).]

*Pompilus fuscipennis* Lepeletier, 1845, Hist. Nat. Ins., Hymen., III, p. 434. [Type: ♀; Philadelphia, Pa.; (location of type not known to author).] [Nec Van der Linden, 1827.]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 102.—Peckham and Peckham, 1898, Bull. Wisc. Geol. Nat. Hist. Survey, no. 2, pp. 140-144. [Biology.]—Birkmann, 1899, Ent. News, 10: 244. [Lee Co., Texas.]

*Pompilus sordidus* F. Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 160. [New name for *fuscipennis* Lepeletier, preoccupied.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 324.

*Pompilus cinctipes* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 102. [New name for *apicalis* Say, preoccupied in the genus *Pompilus*.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 280.—Birkmann, 1899, Ent. News, 10: 244. [Lee Co., Texas.]

*Sericopompilus cinctipes* Howard, 1901, The Insect Book, pl. XI, fig. 17.—Ashmead, 1902, Canad. Ent., 34: 82.—Banks, 1911, Jour. N. Y. Ent. Soc., 19: 229.—Dreisbach, 1949, Ent. Amer., (n.s.) 29: 3, pl. II, fig. 6. [?] *Pompilogaster fuscipennis* Hartman, 1905, Bull. Univ. Texas, no. 65, p. 54. [Biology.]

*Anoplus cinctipes* J. Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674. [N. J.]

*Anoplus fuscipennis* J. Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.

*Psammochares fuscipennis* Banks, 1911, Proc. Ent. Soc. Wash., 13: 238.

*Psammochares (Sericopompilus) cinctipes* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Brimley, 1936, J. Elisha Mitchell Sci. Soc., 52: 126.

[N. Carolina, several localities.]—Brimley, 1938, *Insects N. Carolina*, p. 433.

*Psammocharcus (Scricopompilus) fuscipennis* Banks, 1917, *Bull. Mus. Comp. Zool.*, 61: 108.—Brimley, 1936, *J. Elisha Mitchell Sci. Soc.*, 52: 126.—Brimley, 1938, *Insects N. Carolina*, p. 433.

*Scricopompilus apicalis* Pate, 1946, *Trans. Amer. Ent. Soc.*, 72: 107, 130.

This species has seldom been called by its correct name. When Cresson in 1867 referred the species to *Pompilus*, it became necessary to rename it; his name, *cinctipes*, has generally been used for males of the species. However, I consider this species and its allies generically distinct from *Pompilus*, and that Say's name is therefore available. The females have generally gone by the name of *fuscipennis*, although *sordidus* would have been the correct name, as *fuscipennis* is a homonym. In any case there is now much evidence that *sordidus* and *apicalis* are two sexes of the same species, a possibility first suggested by Cresson in 1867.

This is the best known species of the genus and the most common in collections. Although colors are rather variable in this genus, two color characters seem to hold well for *apicalis*: the basal two or three segments of the abdomen of the female are rufous, the remainder black; the middle basitarsus of the male is wholly black or brownish.

FEMALE.—Length 13.5 (11–16) mm. Color black; basal two abdominal segments, except the extreme base of the first and often a narrow apical margin of the second, rufo-ferruginous, the coloration sometimes extending to the basal part of tergite 3; middle inner and upper outer orbits each with a very small pale spot; neck marked with pale yellow. Wings fuliginous, iridescent or somewhat violaceous, the fore wing usually with a slightly paler crescentic streak just beyond the 3d submarginal cell and 3d discoidal cell. Pubescence very fine, brownish, usually silvery on the sides of the lower front. Head and thorax clothed rather densely with fine brownish pile.

Clypeus from 2 to 2.2 × as broad as high, the apical margin evenly arcuate. Front broad, though somewhat less so than in *angustatus*, middle interocular distance from .59 to .64 × transfacial distance. Inner orbits subparallel below, converging rather strongly above the middle, upper interocular distance approximately .75 × lower interocular distance. Ocelli of moderate size, post-ocellar line usually slightly greater than ocello-ocular line. Antennae long and slender, the first 4 segments in a ratio of about 3:1:4.5:3.5, segment 3 about .9 to 1.0 × upper interocular distance. (Head shown in Fig. 46.)

Posterior pronotal margin subarcuate or very feebly angulate. Propodeum with the median line well impressed. Spines of the tarsal comb slender, from 1.5 to  $2\times$  as long as the width of the tarsus. Venation as described under the generic heading and shown in Fig. 59.

MALE.—Length 10 (7–13) mm. Color black, the abdomen usually but not always marked with rufous on part or all of the basal three segments, the body marked with pale yellowish as follows: anterior and posterior orbits narrowly; a pair of spots on the neck, sometimes connected; posterior margin of pronotum with a stripe, interrupted medially; a small spot on the axillary sclerites of the fore wing, close to the tegulae; sides of the posterior rim of the propodeum; apical abdominal tergite; a streak on the basal half of the hind tibia on the outer side; and broad basal rings on segments 2, 3, and 4 of the middle and hind tarsi. Wings clear hyaline, the hind wings infuscated at the tip, the fore wings broadly fuscous beyond the stigma and the middle of the third discoidal cell, with a paler crescentic streak just beyond the 3d submarginal cell and 3d discoidal cell. Pubescence brownish-cinereous, grading into silvery on the lower front, sides of the thorax, and propodeum; sometimes very extensively silvery. Head and prothorax, including the coxae, with a considerable amount of short, brownish hair; remainder of thorax and propodeum with a smaller amount of usually paler hair; tergite 1 with some pale hair; apical abdominal segments somewhat dark-setose, especially ventrally.

Clypeus about or a little more than twice as broad as high, its apical margin rounded or subtruncate. Front of moderate breadth, middle interocular distance from .59 to  $.64\times$  transfacial distance. Inner orbits slightly convergent above, upper interocular distance from .85 to  $.97\times$  the lower. Ocelli of moderate size; post-ocellar line is to the ocello-ocular line about as 5:4. First 4 antennal segments in a ratio of about 3:1:3:3, segment 3 about  $2.5\times$  as long as thick.

Posterior pronotal margin subarcuate or subangulate. Propodeum with the median line vaguely impressed, the brilliant silvery pubescence diverging from the median line. Abdomen rather variable in shape, even in males from the same locality. In some specimens the first segment is extremely slender, the sides nearly parallel in dorsal aspect, the segment barely expanded in lateral aspect, the abdomen having a stalked appearance and attaining its full diameter at the 3d segment. In others the first segment is considerably expanded posteriorly and the abdomen attains its full diameter at the 2d segment. The subpetiolate abdomen, the red and yellow maculations, and the long, conspicuously banded hyaline wings make the males of this species one of the most bizarre and attractive of native Pompilidae.

*Biology.*—The Peckhams (1898) found this species nesting in the soft earth of their potato field. Of ten spiders captured, nine were a single species of *Thomisus*, and one an immature male

lycosid. The species has the curious habit of mutilating the legs of its victims. This instinct is not so well developed as in some *Auplopodini*, for example, which cut off all the legs neatly at the base. Nor is it apparently for feeding purposes. The Peckhams believed it to be related to the fact that the wasp makes a small nest in comparison to the size of the prey; in the cases observed there was always some difficulty in getting the spider into the nest, and a particular tendency to bite at the legs at this time. Once the prey is in place and the egg laid, the tunnel is filled by use of the mandibles and the tarsal comb, with the tip of the abdomen used to pound or rub down the earth, or even to sweep with. Once the nest is filled, bits of sticks, dead leaves, pebbles, and other debris are placed over the entrance for concealment.

This species is occasionally attracted to honeydew, and has also been taken on the flowers of *Daucus carota*, *Cicuta maculata*, and *Ampelopsis arborea*. In the northern parts of its range, it appears to have but one generation per year, appearing on the wing in July and August; farther south its flight season extends from May until October, and it probably has two generations a year here.

*Distribution*.—Austro-riparian and Carolinian faunas of central and eastern United States.

*Specimens seen*: 241 (167 ♀♀, 74 ♂♂). The following records are marginal: CONNECTICUT: Hartford Co., 19 ♀♀, 12 ♂♂, East Hartford, 13 July–24 Aug. [HEE, CU]; NEW YORK: Long Island, 1 ♀, Cold Spring Harbor [MCZ]; NEW JERSEY: Camden Co., 1 ♀, 1 ♂, 26–28 July [USNM]; MARYLAND: Montgomery Co., 1 ♂, Plummers Island, 29 June [USNM]; WEST VIRGINIA: Monongalia Co., 1 ♀, 18 July [CU]; OHIO: Lucas Co., 1 ♂, 9 July [JEG]; MICHIGAN: Newaygo Co., 1 ♀, White Cloud, 16 July [USNM]; ILLINOIS: Cook Co., 3 ♀♀, Chicago, July–Aug. [MCZ]; MINNESOTA: Anoka Co., 1 ♀, Fridley sand dunes, 19 July [Minn.]; NEBRASKA: Thomas Co., 2 ♀♀, Halsey, 12–15 Aug. [Minn.]; KANSAS: Finney Co., 1 ♂, 11 Aug. [coll. R. L. Fischer]; TEXAS: Bexar Co., 5 ♀♀, 1 ♂, Apr.–July [JEG]; ALABAMA: Mobile Co., 1 ♂, Oak Grove, 19 July [MCZ]; FLORIDA: Dade Co., 2 ♂♂, Biscayne Bay [ANSP, AMNH] (and many other records from Florida).

### 3. *Sericopompilus neotropicalis* (Cameron) new combination

(Plate XIV, fig. 42; plate XV, figs. 45, 49.)

*Pompilus neotropicalis* Cameron, 1893, Biol. Centr.-Amer., Hymen., II, p. 203. [Type: ♀; San Geronimo, Guatemala (Champion); British Museum (not seen by author).]

- Pompilus guatemalensis* Cameron, 1893, Biol. Centr.-Amer., Hymen., II, p. 206. [Type: ♂; San Geronimo, Guatemala (Champion); British Museum (not seen by author).] New synonymy.
- Psammochares posticatus* Banks, 1910, Jour. N. Y. Ent. Soc., 18: 119. [Type: ♂; Lee Co., Texas, 2 Oct. 1905 (Birkmann); M.C.Z. no. 13,709.] New synonymy.
- Psammochares fuscipennis* var. *georgiana* Banks, 1911, Proc. Ent. Soc. Wash., 13: 238. [Type: ♀; Bainbridge, Ga., 17 Sept.-19 Oct. 1910 (J. C. Bradley); M.C.Z. no. 13,711.] New synonymy.
- Scricopompilus posticatus* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 229.
- Psammochares georgiana* Banks, 1912, Canad. Ent., 44: 198.
- Psammochares (Scricopompilus) georgiana* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Brimley, 1936, J. Elisha Mitchell Sci. Soc., 52: 126. [N. C., several localities].—Brimley, 1938, Insects N. Carolina, p. 433.
- Psammochares (Scricopompilus) posticatus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.

Despite a considerable amount of variation in color, this species may be easily separated from its relatives by the characters given in the key to species. There seems to be no correlation between color variation and geographic distribution except for a general tendency for specimens from the southern parts of the range to be more extensively marked with red and yellow.

FEMALE.—Length 14 (10.5–17) mm. Color black, the entire abdomen rufo-ferruginous, the legs varying from wholly black to wholly rufous, most commonly with the hind legs partly or mostly rufous, the remaining legs black; the following are marked with pale yellowish: middle inner and upper outer orbits with small spots, a spot on each side of the neck, a band along the posterior margin of the pronotum (in U. S. specimens often obsolescent), and a small spot on the axillary sclerites of the fore wing, close to the tegulae. Wings wholly fuliginous, with a slightly darker area along the outer margin. Pubescence brownish or cinereous, grading into silvery (usually) on the front and clypeus, and sometimes on the hind coxae and propodeum. Head, thorax, and propodeum with considerable short, inconspicuous hair.

Clypeus from 2.2 to 2.4 × as broad as high, its apical margin arcuate on the sides, truncate medially. Front broad, middle interocular distance .61 to .65 × transfacial distance. Inner orbits subparallel below, middle and lower interocular distance nearly equal, rather strongly convergent above, upper interocular distance from .7 to .8 × the lower. Ocelli large and prominent; post-ocellar line is to ocello-ocular line about as 3:2. Antennae long and slender, the first 4 segments in a ratio of about 3:1:5:3.5, segment 3 from .9 to 1.2 × upper interocular distance. (Head shown in Fig. 45.)

Posterior margin of pronotum subarcuate or feebly angled. Propodeum with a distinct median linear groove. Spines of the tarsal comb from 1.5 to  $2 \times$  as long as the width of the tarsus; front tibiae rather spinose above. Venation as described under the generic heading.

MALE.—Length 9.5 (7.5-12) mm. Color black, the 2d and sometimes the adjacent abdominal segments rufous, or the abdomen occasionally without rufous markings; the following are pale yellow: inner and outer orbits with small spots (usually), a spot on each side of the neck, a broad band along the posterior margin of the pronotum, a spot on the axillary sclerites of the fore wing and usually one on the tegulae and on the mesonotum adjacent to it, lateral corners of the posterior rim of the propodeum, apical abdominal tergite, hind tibia with a streak on the outer side for the basal two-thirds, and broad basal rings on segments 1, 2, 3, and 4 of the middle tarsi and segments 2, 3, and 4 of the third tarsi. Wings clear hyaline, the tips of the hind wings fuscous or not, the fore wings broadly brownish-fuscous beyond the stigma and the middle of the 3d discoidal cell, and usually with a paler, crescentic streak within this fuscous area, just beyond the cells; in a few specimens there is a fuscous blotch over the basal vein, and occasionally the wing is lightly infuscated between this and the outer marginal band; many specimens show a whitish bloom on the hyaline part of the wings. Pubescence brownish-cinereous, more or less silvery over a considerable part of the head, thorax, and propodeum, and sometimes the base of the abdomen.

Clypeus about  $2.3 \times$  as broad as high, its apical margin truncate. Front broad; eyes distinctly converging above, upper interocular distance about  $.9 \times$  the lower. Ocellar triangle somewhat elevated, the ocelli large; post-ocellar line much greater than ocello-ocular line (Fig. 49). First 4 antennal segments in a ratio of about 3:1:3:3, segment 3 about  $2.5 \times$  as long as thick. Pronotum subarcuate or feebly angulate behind. Propodeum with the median line lightly impressed, the silvery pubescence diverging from it. Abdomen variable in shape as in *apicalis*, although the basal segments are never quite as slender as they sometimes are in that species. Apical segments as described under the generic heading; genitalia as shown in Fig. 42.

*Biology*.—This species inhabits open country, more particularly in arid regions. It is a frequent visitor to flowers, having been taken on *Asclepias*, *Baccharis glutinosus*, *Tamarix gallica*, and *Sphaeralcea angustifolia*.

*Distribution*.—This is primarily a Mexican species, which is not uncommon throughout the Lower Austral Zone of the United States, though it seems to be more prevalent in desert or semi-desert areas.



*Specimens seen:* 131 (62 ♀♀, 69 ♂♂). The following records are marginal: NORTH CAROLINA: Moore Co., 3 ♀♀. Southern Pines, June, Aug., Sept. [MCZ]; GEORGIA: Fulton Co., 2 ♀♀, Atlanta, June–July [USNM, EU]; ILLINOIS: Morgan Co., 1 ♂, Meredosia, 19 Aug. [AMNH]; TEXAS: Lee Co., 1 ♂, 2 Oct. [MCZ]; El Paso Co., 1 ♀, Canutillo, 24 July [HEE]; ARIZONA: Maricopa Co., 1 ♂, Phoenix, 17 July [CIS]; CALIFORNIA: Contra Costa Co., 2 ♀♀, Antioch, 10–24 Oct. [CIS, CAS]; MEXICO: Baja California, 1 ♀, La Paz, 5 June [CAS]; Yucatan, 1 ♀, Chichen Itza, 29 June [MCZ]; LOUISIANA: St. Landry Co., 6 ♂♂, Opelousas [USNM]; ALABAMA: Mobile Co., 1 ♀, Mobile [MCZ]; FLORIDA: 1 ♂ (no further data) [USNM].

#### VI. Genus **EPISYRON** Schiödte

*Episyron* Schiödte, 1837, Krøyer's Naturhist. Tidsskr., 1: 341. [Type: *Sphex rufipes* Linnaeus, 1758; monobasic.]—Banks, 1911, Jour. N. Y. Ent. Soc., 19: 223, 229.—Sustera, 1913, Verh. zool.-bot. Ges. Wien, 62: 181, 204.—Dreisbach, 1949, Ent. Amer., (n.s.)29: 5, 38, pl. III, fig. 11.

*Spilopompilus* Ashmead, 1902, Canad. Ent., 34: 81. [Type: *Pompilus biguttulatus* [sic] Fabricius, 1798; monobasic.]

*Epizuron* Ashmead, 1902, Canad. Ent., 34: 82. [*Lapsus calami* for *Episyron* Schiödte.]

In our fauna a single character will readily separate members of the genus *Episyron* from all other Pompilidae: the presence of scales on the first abdominal tergite, propodeum, and parts of the thorax. Elsewhere, however, certain species belonging to other genera also possess this character. The species of *Episyron* are very similar and often not easily separated. The male genitalia are all very similar. Arnold<sup>37</sup> and Yasumatsu<sup>38</sup> profess to have found subtle differences in the genitalia of the African and Japanese species respectively; I have failed, however, to find any constant specific characters in those of the American forms. This homogeneity, along with the existence of certain specialized characters in the genus, suggests that *Episyron* may have evolved rather recently, probably from stock resembling *Sericopompilus*. Judging from its wide distribution and the relative abundance of some of the species, it appears to be a very successful genus.

<sup>37</sup> Arnold, G., 1936, Ann. Transvaal Mus., 18: 446.

<sup>38</sup> Yasumatsu, K., 1937, Mushi, 10: 42.

*Generic characters.*—Small or medium-sized wasps, 5 to 17 mm. in length. Ground color black, many species exhibiting whitish markings on the pronotum, abdomen, and legs, and some having the legs partly or wholly rufous. Body with the usual fine, close pubescence, and in addition to this with a coarse, squamiform pubescence covering much of the first abdominal tergite, and generally portions of the propodeum, postnotum, metanotum, and pronotum, occasionally parts of the mesopleura, coxae, scutellum, and the other abdominal tergites. Body with a variable amount of erect hair; female pygidium without bristles.

Palpi long and slender. Mandibles bidentate in the female, unidentate in the male. Labrum protruding slightly from beneath the clypeus, its apical margin bristly, with a median notch. Clypeus large, slightly convex, its upper margin somewhat sinuous. Malar space short or practically absent. Eyes in the female converging above, sometimes strongly. Antennae in general rather elongate, but in some males rather short.

Pronotum sloping evenly in front. Postnotum strongly developed, constricted on the median line, where it may or may not be concealed by the overhanging metanotum, constricted again just in front of the spiracles; between the constrictions the posterior margin is arcuately expanded. Propodeum often with a well-defined posterior declivity in the female, otherwise with even contours. Front tibia with a number of spines above, at least on the distal half; front tarsus of female with a strong comb. All the claws in both sexes bifid, the inner ray obliquely truncate; the claws of the front pair in the male are nearly alike, and the apical tarsal segment is unmodified. Pulvillar pad small, the comb weak, of not more than nine weak setulae. Apical tarsal segments spined beneath in the female, often not strongly, in the male not or but weakly spined.

Fore wings with a vena spuria just above the media, along which the wings fold longitudinally in repose; this vena spuria is indicated as a line along which the setulae of the wing are densely concentrated. Basal and transverse median veins of fore wing interstitial or nearly so; stigma rather small; 2d and 3d submarginal cells in our species both 4-sided, the 1st and 3d transverse cubital veins oblique in opposite directions, the 2d suberect; subdiscoidal vein not reaching the wing margin. Anal lobe of hind wing fairly large, about half the length of the submedian cell; cubitus of this wing arising usually before the tip of the submedian cell, but sometimes at or a little beyond. (See fig. 60.)

Abdomen subfusiform, stouter in the female than in the male. Sternite 6 of male strongly emarginate; subgenital plate strongly elevated medially, the apex broadly rounded or subtruncate. Genitalia (Fig. 61) with the basal hooklets strong, double. Aedoeagus and parapenials simple; digiti subspatulate, with numerous short setae on the disc and outer margins, and a few at the base. Parameres with strong squamae about half-way out, setose here and at the tip. There is considerable individual variation in the male genitalia but, so far as I have been able to determine, no constant

specific characters in the American forms. The genitalia are therefore not discussed further in this genus.

*Biology.*—The members of this genus occur usually in sandy or gravelly areas, where they nest in the earth. They are unusually swift in their actions, not only in flight but in the process of nesting. Their prey seems always to consist of orb-weavers (Epeiridae). The egg is not firmly fastened to the spider as in most Pompilidae, but is placed on the wall of the cell. The biology of the American species, so far as known, is discussed under the various species. A resumé of that of the genotype, *rufipes* L., may be found in Richards and Hamm.<sup>39</sup>

*Distribution.*—Members of this genus occur in all the zoogeographic regions of the world except, so far as I know, the Australian. Twelve species have been described or recorded from the Nearctic region, of which I consider but four valid, and describe a fifth.

*Key to Species*

Females

1. Front basitarsus with 4 (rarely 5) comb-spines of considerable length, the basal one often smaller than the others; eyes not strongly convergent above, upper interocular distance approximately .85 × lower interocular distance; vertex not strongly raised above the tops of the eyes .....2
- Front basitarsus with only 3 comb-spines; eyes more strongly convergent above, upper interocular distance less than .78 × the lower, or the front very broad and the vertex arcuately raised above the tops of the eyes ...3
2. Apical abdominal tergite with a white spot (sometimes concealed by the overlapping of the preceding tergite) and the abdomen with from 2 to 6 paired spots, sometimes united into bands, on tergites 2 to 4; pubescence of head and thorax usually extensively silvery; fore wings subhyaline, the outer margin with a fuscous band
  - 1a. **quinquenotatus quinquenotatus** (Say)
  - Abdomen wholly black, or rarely with from 1 to 3 small or faintly indicated spots; pubescence dark, at most silvery on the lower front; fore wings more or less infuscated, only slightly darker along the outer margin ..... 1b. **quinquenotatus hurdi** new subspecies

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<sup>39</sup> Richards, O. W., and Hamm, A. H., 1939. Trans. Soc. Brit. Ent., 6: 101.

3. Third antennal segment subequal to or greater than upper interocular distance; vertex less broad than below, and scarcely raised above the tops of the eyes; ocelli in a more compact triangle, the front angle of which is about or slightly greater than a right angle (fig. 52) .....4  
 Third antennal segment equal to .9 or less  $\times$  upper interocular distance; ocelli forming a very flat triangle, the front angle distinctly greater than a right angle; vertex very broad, more or less arcuately raised above the tops of the eyes (fig. 53) .....6
4. Legs partly or wholly rufo-ferruginous; head and thorax with moderately abundant pale hair; tarsal comb very strong, the apical basitarsal spine about 1.5  $\times$  the length of the 2d tarsal segment

2. **posterus** (Fox)

Legs black; head and thorax with abundant black hair; apical basitarsal comb-spine slightly if any longer than the 2d tarsal segment ...5

5. Body dull black, the pubescence rather vaguely reflecting bluish or purplish, on the lower front often silvery; abdomen often with 2 whitish spots, but sometimes with 4 or 6, or none at all; wings subhyaline or lightly infuscated, with a darker marginal band, not or but slightly violaceous .....3a. **biguttatus biguttatus** (Fabricius)

Body black, rendered by the pubescence rather brilliantly deep bluish or purplish; abdomen not spotted; fore wings fuscous, with a less contrastingly darker marginal band, usually rather strongly violaceous

3b. **biguttatus californicus** (Banks)

6. Scape, pronotum, propodeum, tergite 1, and in fact almost the entire head and thorax rather conspicuously hairy; pronotum shorter, its posterior margin feebly angulate; temples well developed

4. **oregon** new species

Body unusually free of erect hair, the scape, pronotum, propodeum, and tergite 1 at most very slightly hairy; pronotum rather long, nearly or quite as long as the mesonotum, its posterior margin arcuate; head very thin, lenticular, the temples reduced .....5. **snowi** (Viereck)

### Males

1. Outer flagellar segments (except the last) not more than about 1.5  $\times$  as long as their greatest thickness (Figs. 65 and 66); middle and hind tibial spurs almost pure white; mandibles tricolored, black at the base, whitish in the middle, and ferruginous at the apex; head and pronotum with mostly pale hairs .. . . . .2

Outer flagellar segments from 1.5 to 2.5  $\times$  as long as thick (figs. 63 and 64); spurs varying from dirty white to black; mandibles bicolored, black tipped with dark ferruginous; head and pronotum with mostly dark hairs .....3

2. Pronotum short, shorter than the mesonotum; antennae slightly longer, the segments not noticeably imbricate (fig. 65); wings largely hyaline, but without a whitish bloom; hind margin of pronotum with a broad pale yellowish stripe, mesonotum often marked with yellowish; legs often reddish .....2. **posterus** (Fox)

Pronotum rather long, almost or quite as long as the mesonotum; antennae short, with a slight constriction between each of the outer flagellar segments, and each segment somewhat produced over the next (fig. 66); wings with a whitish bloom; pronotum occasionally with a pale band, the mesonotum never marked with pale.

5. **snowi** (Viereck)

3. Vertex raised rather strongly and evenly above the tops of the eyes, and the temples moderately developed (fig. 50); vertex very broad, the ocelli in a broad, flat triangle; apical abdominal tergite black or slightly suffused with pale. ....4. **oregon** new species

Vertex not strongly arcuately raised above the tops of the eyes; temples not well developed, the head in general considerably thinner (fig. 51); apical tergite with a large whitish spot .....4

4. Hind margin of pronotum usually more or less angulate; apex of front tibia and base of hind tibia marked with pale on the outer side, or both these parts without pale markings; somewhat smaller: 8 (5.5-12) mm. ....5

Hind margin of pronotum arcuate or very feebly angulate; front tibiae never marked with pale, but the hind tibia always with a pale spot or stripe on the outer side basally; size generally larger: 9 (6.5-13) mm. ....6

5. Head and thorax extensively silvery-sericeous; tergite 3 usually with paired white spots or a white band, sometimes also tergite 2

1a. **quinquenotatus quinquenotatus** (Say)

Body silvery-sericeous at most on the lower front, elsewhere dark-pubescent (exclusive of the scales); abdomen rarely with more than the apical tergite white ....1b. **quinquenotatus hurdi** new subspecies

6. Pubescence in large part silvery, nowhere more than vaguely reflecting bluish; spurs usually pale; tergite 3 usually with paired white spots or a band, sometimes also tergite 2 and/or tergite 4

3a. **biguttatus biguttatus** (Fabricius)

Pubescence silvery at most on the lower front, elsewhere dark and more or less evidently reflecting deep blue or purplish; spurs black; abdomen rarely with more than the apical tergite white

3b. **biguttatus californicus** (Banks)

- 1a. **Episyron quinquenotatus quinquenotatus** (Say)

(Plate XVI, fig. 61.)

*Pompilus quinquenotatus* Say, 1835, Boston Jour. Nat. Hist., 1: 304. [Type: ♀; "Indiana"; (no longer extant).]—Smith, 1855, Cat. Hymen. Brit.

- Mus., III, p. 160.—Provancher, 1882, Nat. Canad., 13: 40. [Considered synonym of *biguttatus* Fabr.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 276. [Listed as synonym of *biguttatus* Fabr.]—Peckham and Peckham, 1898, Wisc. Geol. Nat. Hist. Survey Bull. no. 2, pp. 126-138. [Biology.]

*Pompilus biguttatus* var. *5-notatus* Cresson, 187, Trans. Amer. Ent. Soc., 1: 97.

*Pompilus griscus* Provancher, 1882, Nat. Canad., 35, 36. [Lectotype: ♂ (not ♀ as described); Chicoutimi, Quebec; QPM yellow label no. 1011.] New synonymy.—Provancher, 1883, Nat. Canad., 14: 35.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 293.

*Episyron quinquenotatus* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 229.—Rohwer, 1916, Conn. Geol. Nat. Hist. Survey Bull. 22, p. 631.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 896.—Johnson, 1930, Ins. Fauna Nantucket, p. 110.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 121. [N. C., several localities.]—Brimley, 1938, Insects N. Carolina, p. 433.—Procter, 1938, Biol. Survey Mt. Desert Reg., VI, Insecta, p. 429. [Mt. Desert, Me.]—Strickland, 1947, Canad. Ent., 79: 125. [Alta., several localities.]

*Episyron griscus* Rohwer, 1916, Canad. Ent., 48: 371.

As the long list of references suggests, this is a common wasp in the eastern United States and Canada. Some authors have doubted its distinctness from *biguttatus*; however, a number of good characters, as indicated in the key, will separate the females. The males are another matter. The Peckhams (1898) state that the males of *biguttatus* "may be seen attempting to mate not only with females of their own kind but also with those of *quinquenotatus*"—a reflection of the difficulty of separating the two species in this sex. Even today really precise characters for separating the males of *quinquenotatus* and *biguttatus* are not known. The couplet for separating them in the key was arrived at after considerable trial and error; it is hoped that in most cases it will work satisfactorily.

FEMALE.—Length 10 (6.5-13) mm. Ground color black, the body marked with a variable amount of pale buff, as follows: inner and outer orbits with narrow stripes; posterior pronotal margin with or without a stripe; apical abdominal tergite with a spot, which may be concealed when the abdomen is telescoped; tergite 3 with a pair of transverse spots which are sometimes confluent medially, forming a band; tergites 2 and 4 either with or without spots, which when present may or may not be united to form bands; tip of front tibia and base of hind tibia occasionally with small spots. Wings subhyaline, the outer margin of the fore wing and apex

of the hind wing broadly fuscous. Body with a fine brownish pubescence which varies to silvery on the clypeus and front, and usually also on the coxae and much of the thorax, especially the pleura, and occasionally on the bases of several of the abdominal tergites. Squamiform pubescence covering most of tergite 1, where it is usually dingy or somewhat coppery, the propodeum, especially the posterior slope and anterior margin, postnotum, metanotum medially, sides of the scutellum, pronotum anteriorly, upper mesopleura, and hind coxae above; on the thorax and propodeum it is generally whitish, sometimes slightly greenish. Body with rather abundant short dark hair, as follows: scape, clypeus, front, vertex, temples, pronotum, propleura, front coxae, mesopleura, metanotum, propodeum, and tergite 1 all rather conspicuously; middle and hind coxae slightly hairy; apical abdominal segments slightly setose.

Clypeus from  $2.2$  to  $2.5 \times$  as broad as high, its apical margin truncate, slightly raised. Front broad, middle interocular distance from  $.60$  to  $.63 \times$  transfacial distance. Inner orbits emarginate near the middle, middle interocular distance from  $1.0$  to  $1.1 \times$  lower interocular distance, somewhat convergent above, upper interocular distance from  $.80$  to  $.88 \times$  lower interocular distance. Front in profile rather strongly convex; vertex scarcely elevated above the tops of the eyes. Ocelli in a right triangle or slightly greater; post-ocellar line is to ocello-ocular line about as  $9:8$ . Antennae elongate, the first 4 segments in a ratio of about  $6:2:10:7$ , segment 3 from  $.82$  to  $.91 \times$  upper interocular distance. Temples not well developed, the head contracted immediately behind the eyes.

Pronotum short, its posterior margin subarcuate. Propodeum with the slope even, the declivity defined only by a heavy band of scales. Tarsal comb strong, the spines slightly flattened; basitarsus with 4 or rarely 5 comb-spines, the basal one smaller than the others, the apical one considerably longer than the 2d tarsal segment. Venation as described under the generic heading; marginal cell about its own length from the wing-tip; 3d submarginal cell usually shorter both above and below than the 2d.

MALE.—Length 8 (5.5–12) mm. Color black, marked with pale buff as follows: inner and outer orbits narrowly, posterior pronotal margin with or without a stripe which is interrupted medially, a spot at the apex of the front tibia, sometimes a spot at the apex of the front femur, usually a spot or stripe on the base of the hind tibia, entire apical tergite, a pair of transverse spots on tergite 3 which may be united to form a band, and sometimes paired spots on tergite 2 and/or tergite 4; spurs occasionally pale. Some or all of the abdominal markings may be concealed if the segments are telescoped. Wings hyaline, the outer margin of the fore wing and apex of the hind wing broadly fuscous. Pubescence silvery over much of the head and thorax, on the abdomen brownish, but the basal tergites silvery at the base. Scales distributed about as in the female, and colored similarly; head, thorax, and propodeum with abundant dark hairs about as in the female.

Clypeus about twice as broad as high, its apical margin truncate. Middle interocular distance from .60 to  $.64 \times$  transfacial distance; middle interocular distance about  $1.2 \times$  the lower; upper interocular distance about  $1.1 \times$  the lower, the inner orbits thus distinctly convergent above. Ocelli in a flat triangle, post-ocellar line and ocello-ocular line subequal, or either slightly the greater. Scape short; first 4 antennal segments in a ratio of about 5:2:6:6; antennal segments 9 to 12 from 1.6 to  $2.2 \times$  as long as their greatest thickness. Temples not at all developed. Pronotum short, its posterior margin varying from feebly to distinctly angulate. Longer spur of hind tibia about .8 the basitarsus. Venation as in the female. Abdominal features as described under the generic heading; genitalia shown in fig. 61.

*Biology.*—This wasp has been dubbed the "Tornado Wasp" by the Peckhams (1898) because of the furious pace of its activities. The Peckhams found it nesting in their garden. The prey, in more than 50 examples, was always *Epeira strix* Emerton (i.e., *E. foliata* Fourcroy). The spider is stung severely and often killed; it is carried either by dragging it by one leg and running backward, or in flight. Once a nesting site is found, the spider may be hung in the crotch of a low plant or merely left on the ground during excavations, which take only about 20 minutes. Then the spider is hastily dragged into the nest, usually an oblique burrow about three inches deep, and an egg laid in the cell, the burrow finally being filled quickly with sand. The whole operation is performed with a great deal more speed than is usual among spider wasps.

My own observations essentially confirm those of the Peckhams, except that in the vicinity of Ithaca, N. Y., it preys upon *Eustala anastera* (Walck.) [det. B. J. Kaston] (and probably other epeirids). It is not an uncommon wasp, preferring open sand, and being on the wing from June until September. It visits flowers rather frequently, and is recorded from *Daucus carota*, *Pastinaca sativa*, *Anaphalis margaritacea*, *Solidago rigida*, and *Baccharis salicina*; the species also visits honeydew.

*Distribution.*—This species occurs throughout the Canadian, Alleghanian, and Carolinian faunas of eastern United States and Canada, being more common northward; westward it ranges sparingly to Texas, Colorado, Montana, and British Columbia.

*Specimens seen:* 382 (191 ♀♀, 191 ♂♂). The following records are marginal as far as present available data indicate: NOVA SCOTIA: 1 ♀, Petite Riviere, July [CNC]; PRINCE EDWARD ISLAND: 1 ♀, 1 ♂, Canad.



Nat. Park, 21 July [CNC]; QUEBEC: 1 ♂, Chicoutimi [QPM]; 1 ♂, Kazabazua, Aug. [CNC]; ONTARIO: 1 ♀, Haileybury, July [CNC]; MINNESOTA: Cook Co., 2 ♂♂, 21 Aug. [Mim.]; MANITOBA: 1 ♀, 2 ♂♂, Aweme, July-Aug. [CNC]; SASKATCHEWAN: 1 ♂, Prince Albert, Aug. [CNC]; ALBERTA: 2 ♂♂, Wabamun, July [Alta.]; BRITISH COLUMBIA: Vancouver Isl., 1 ♀, Goldstream, 27 July [USNM]; MONTANA: Glacier Nat. Park, 1 ♂, 3 Aug. [MCZ]; WYOMING: Teton Co., 1 ♂, Jackson, 6300 feet, 13 July [AMNH]; COLORADO: Moffat Co., 1 ♂, Sunbeam, 12 July [CU]; KANSAS: Rooks Co., 1 ♀, Stockton [UK]; TEXAS: Williamson Co., 1 ♀, 4 Oct. [JEG]; ARKANSAS: 1 ♂, White River, 9 Aug. [CU]; ALABAMA: Morgan Co., 1 ♀, Decatur, 6 July [UK]; NORTH CAROLINA: (recorded by Brimley, 1936); VIRGINIA: Fairfax Co., 3 ♀♀, 1 ♂, Great Falls, 11 Sept. [MCZ].

1b. *Episyron quinquenotatus hurdi* new subspecies<sup>40</sup>

This form has sometimes been misdetermined as *californicus* Banks, but the latter was described from a small male of what Banks later described in the female sex as *arizonicus*. True *californicus* is a subspecies of *biguttatus* Fabricius, while *hurdi* represents a parallel case of subspeciation in *quinquenotatus*. The female *hurdi* is wholly black except at the orbits, although an occasional specimen will have a small pale spot on the apical tergite and/or a pair of small spots on the third abdominal tergite; these are usually from the northern part of the range and represent intergrades with typical *quinquenotatus*. The male *hurdi* lacks the pale spot on the hind tibia present in both subspecies of *biguttatus*; in this sex intergrades with the typical subspecies also occur, chiefly in Washington, Montana, and British Columbia.

FEMALE (Holotype).—Length 12 mm. Color black, the middle inner orbits with a small pale yellowish spot, and the outer orbits with a thin yellowish line. Wings wholly moderately infuscated, somewhat darker along the outer margin. Pubescence wholly dark, obscurely violaceous. Squamiform pubescence as in the typical subspecies, but generally darker in color. Clypeus  $2.2 \times$  as broad as high. Middle interocular distance  $.62 \times$  transfacial distance; the former equal to lower interocular distance; the upper  $.82 \times$  the lower. First 4 antennal segments in a ratio of 3:1:6:4, segment 3 equal to  $.93 \times$  upper interocular distance. Front basitarsus with 4 comb-spines, the apical one  $1.3 \times$  the length of the 2d tarsal segment.

<sup>40</sup> This subspecies, a not uncommon element in the fauna of the western United States, is named for Mr. Paul D. Hurd, Jr., of Berkeley, Calif., who collected the types, in recognition of the value of his studies of the tarantula hawks (genus *Pepsis*) and in appreciation of his assistance to me in obtaining Pompilini from the western United States.

Sixty-three female paratypes vary in size from 7 to 14 mm., the average 10 mm. A few specimens (B. C. and Ore.) show small pale spots on the 3d and/or apical tergite of the abdomen. Some specimens have a small amount of silvery pubescence on the lower front and clypeus. Upper interocular distance varies from .75 to .85  $\times$  the lower (the average degree of convergence somewhat greater than in typical *quinquenotatus*). Antennal segment 3 varies from .8 to 1.0  $\times$  upper interocular distance.

MALE (Allotype).—Length 8.5 mm. Color black, the inner and outer orbits narrowly pale, the apical abdominal tergite mostly whitish. Fore wings lightly infuscated, with a darker outer marginal band; hind wings subhyaline, the apex clouded. Pubescence fuscous, obscurely violaceous, a bit silvery on the lower front and the clypeus; squamiform pubescence largely pale gray, slightly iridescent. Clypeus 1.9  $\times$  as broad as high. Middle interocular distance .62  $\times$  transfacial distance; the middle interocular distance 1.2  $\times$  the lower; the upper 1.05  $\times$  the lower. Posterior margin of pronotum broadly but distinctly angulate.

Forty-five male paratypes vary in size from 5.5 to 10 mm., the average 8 mm. A few specimens (Mont., Wash., B. C., Calif.) have paired whitish spots on tergite 3; some specimens, chiefly from the northern part of the range, have a pale spot at the apex of the front tibia, and a few have pale markings on the hind tibia.

*Biology*.—There are many records of this form having been taken on flowers. The list includes *Daucus carota*, *Cicuta*, *Cleome scrrulata*, *Cirsium*, *Eriogonum*, *Solidago*, and *Asclepias*. A male from Hermiston, Ore., is pinned with a juvenile *Epcira* sp. [det. B. J. Kaston].

*Distribution*.—The form inhabits the Transition and Upper Sonoran faunas of western United States and (sparingly) Canada, from southern British Columbia and Alberta to Utah and California. Its range is somewhat more limited than that of the sibling *biguttatus californicus*.

*Holotype*.—CALIFORNIA: Contra Costa Co., ♀, Antioch, 24 Oct. 1948, on *Eriogonum* (P. D. Hurd) [CAS]. *Allotype*.—Eldorado Co., Calif., ♂, Chile Bar, 5 July 1948 (P. D. Hurd) [CAS].

*Paratypes*.—CALIFORNIA: Alameda Co., 2 ♀♀, 1 ♂, Niles Canyon, 9 Sept. [CAS]; Contra Costa Co., 13 ♀♀, Antioch, Aug.-Oct. [CAS, CIS, USNM, ANSP]; Eldorado Co., 1 ♂, Chile Bar, 5 July [CIS]; Imperial Co., 1 ♀, 1 ♂, June [USNM]; Inyo Co., 1 ♂, Independence, 14 June [CIS]; 1 ♂, Lone Pine, June [UK]; 1 ♀, Owen's Lake, 2 June [CIS]; Kern Co., 1 ♂, Shafter, 25 June [CIS]; Kings Co., 1 ♂, Lemoore, 500 ft., 6 Aug. [CU]; Monterey Co., 1 ♂, Delmonte, 8 May [CAS]; Riverside Co., 1 ♂, Taquitz Canyon, 16 Apr. [CIS]; 1 ♀, Gilman Hot Springs, 14 May

[CAS]; 1 ♀, Blythe, 7 May [CIS]; 1 ♀, Pinon Flat, 18 June [CAS]; 1 ♀, 1 ♂, Hemet Res., San Jacinto Mts., 22 May [CIS]; San Benito Co., 1 ♀, Pinnacles Mon., 3 May [CIS]; San Bernardino Co., 1 ♂, Redlands [USNM]; San Diego Co., 1 ♀, 1 ♂ [UK, CAS]; San Francisco Co., 6 ♀♀, 5 ♂♂, May-Aug. [CAS, CU, ANSP]; Santa Barbara Co., 2 ♂♂, Solomon Canyon, 12 Aug. [ANSP]; Tulare Co., 1 ♀, Lemon Cove, 9 July [CU]; Yolo Co., 1 ♂, Davis, 1 Oct. [CIS]; OREGON: Baker Co., 3 ♀♀, 5 mi. No. of Huntington, 23 Aug. [OSC]; Benton Co., 6 ♀♀, Corvallis, July-Aug. [OSC, USNM, CU]; Crook Co., 1 ♀, 1 ♂, Powell Butte, 10 July 1941 [OSC]; Deschutes Co., 1 ♀, 1 ♂, Redmond, 27 June, 19 July [OSC]; Harney Co., 1 ♂, Harney Lake, 15 July [OSC]; Klamath Co., 2 ♀♀, 7 ♂♂, 20 May-9 July [OSC, CAS]; Linn Co., 1 ♂, High Cascades, 20 July [USNM]; Marion Co., 1 ♂, Wheatland Ferry, 6 Aug. [OSC]; Umatilla Co., 1 ♀, Hermiston, Sept. [OSC]; WASHINGTON: 1 ♀, 3 ♂♂ (no further data) [ANSP]; Spokane Co., 1 ♂, 20 July [CAS]; BRITISH COLUMBIA: 1 ♂, Agassiz, 18 May [CNC]; 1 ♂, Crescent, 14 Aug. [CNC]; 1 ♂, Dog Lake, July [CNC]; 1 ♀, Penticton, 7 Aug. [CNC]; 1 ♀, Summerland, 10 Aug. [CNC]; ALBERTA: 1 ♂, Manyberries, 1 Aug. [Alta.]; MONTANA: 4 ♂♂ (no further data) [ANSP]; IDAHO: 1 ♀, Idaho Falls, 5 Aug. [UAC]; UTAH: Cache Co., 1 ♂, Logan Canyon, 12 July [UAC]; Utah Co., 14 ♀♀, Utah Lake, 16 Aug. [HEE, UAC, CU, ANSP].

2. *Epsyron posterus* (Fox) (Plate XVI, fig. 65.)

*Pompilus posterus* Fox, 1893 (May), *Canad. Ent.*, 25: 115. [Type: ♀; Southern Florida (Robertson); A.N.S.P. no. 4717.]—Dalla Torre, 1897, *Cat. Hymen.*, VIII, p. 313.

*Pompilus exactus* Cameron, 1893 (Sept.), *Biol. Centr.-Amer.*, Hymen., II, p. 202, pl. XI, figs. 23 and 23a. [Type: ♀; Temax, Yucatan, Mexico; British Museum (not seen by author).] New synonymy.

*Pompilus porus* Fox, 1894, *Proc. Calif. Acad. Sci.*, (2)4: 98. [Lectotype: ♀; San José del Cabo, Baja Calif., Mexico; C.A.S. no. 240].<sup>41</sup> New synonymy.—Dalla Torre, 1897, *Cat. Hymen.*, VIII, p. 313.

*Anoplius posterus* Smith, 1910, *Ann. Rpt. N. J. State Mus.*, 1909, p. 674. [Camden Co., N. J.]

*Epsyron porus* Banks, 1911, *Jour. N. Y. Ent. Soc.*, 19: 229.

*Epsyron posterus* Banks, 1911, *Jour. N. Y. Ent. Soc.*, 19: 229.—Banks, 1911, *Proc. Ent. Soc. Wash.*, 13: 238.—Robertson, 1928, *Trans. Acad. Sci. St. Louis*, 25: 307, 308. [Flower records, Florida.]—Brimley, 1936, *Jour. Elisha Mitchell Sci. Soc.*, 52: 121. [Beaufort, N. C.]—Brimley, 1938, *Insects N. Carolina*, p. 432.

<sup>41</sup>This specimen was selected by E. P. VanDuzee from specimens labeled in Fox's hand, likewise a lectallotype bearing the same data (E. S. Ross *in litt.*). I have not seen these specimens.

The rufous legs readily separate this species from the other members of the genus; in an occasional male, the legs are wholly black, but the pure white spurs, pale hair, short antennae, and short pronotum will identify these. Some females have the legs wholly rufous (*cractus* Cameron); these are chiefly from the deep Southwest and from Mexico. Others, from many parts of the range, have only the hind legs rufous; I have also seen a few specimens with the middle and hind legs rufous, the front pair black.

Female:—Length 10 (6.5–13) mm. Color black, marked with pale yellow and rufous. The following are pale yellow: inner and outer orbits always, but with a variable amount; the neck; often a band along the posterior pronotal margin; small spots on the bases of the front wings, just behind the tegulae; rarely a rectangular spot on the mesonotum; sometimes two spots on the base of tergite 3. At least the greater part of the hind tibiae and femora are bright rufo-ferruginous; occasionally all the legs except the coxae and trochanters are rufous, and intermediates occur between these two extremes. Wings hyaline or lightly infuscated, the outer margin of the fore wing and apex of the hind wing with a fuscous band. Pubescence brownish, varying to silvery at least on the front and clypeus, often over a large part of the head and thorax and sometimes forming bands at the bases of some of the abdominal tergites. Squamiform pubescence present on tergite 1, the propodeum, postnotum, metanotum, pronotum, and often the upper part of the mesopleura, the sides of the scutellum, and the upper part of the hind coxae; the coloration of the scales varies from coppery through silvery to a distinct pale greenish. Head, thorax, propodeum, and tergite 1 with abundant erect hairs which are for the most part pale; apex of abdomen with a few black setae.

Clypeus from 2.2 to 2.4  $\times$  as broad as high, its apical margin truncate. Front of moderate breadth, middle interocular distance usually about .61  $\times$  transfacial distance; middle interocular distance about 1.05  $\times$  the lower; upper interocular distance from .7 to .8  $\times$  the lower, the eyes thus distinctly convergent above. Vertex scarcely raised above the eye-tops. Ocelli forming a right angle or slightly greater in front; post-ocellar line is to ocello-ocular line about as 5:4. Antennae slender, the first 4 segments in a ratio of about 3:1:5:4, segment 3 subequal to upper interocular distance.

Pronotum short, its posterior margin arcuate. Propodeum with even contours, a little steeper behind. Front tarsus with a strong comb; there are 3 comb-spines on the basitarsus, the apical one about 1.5  $\times$  the length of the 2d tarsal segment. Fore wing with the stigma short, the marginal cell long, about its own length from the wing-tip. Third submarginal cell smaller than the 2d; 1st transverse cubital vein strongly oblique, starting well basad of a line drawn perpendicular to the costa at the base of the

stigma; 2d transverse cubital vein erect, nearly straight; 3d oblique, straight or slightly arched.

MALE.—Length 8.5 (6–9.5) mm. Color black, marked with pale yellow as follows: inner and outer orbits narrowly; a spot on each side of the neck; a band on the posterior margin of the pronotum; a spot on the base of the fore wing, just behind the tegulae; sometimes a spot on the tegulae; sometimes a spot on the mesonotum; sometimes a pair of spots on tergite 3; apical tergite; a stripe on the basal part of the outside of the hind tibia; usually a small spot at the tip of the front femur and one at the tip of the front tibia. All the spurs are white; there may also be a small white spot on the scape; a white spot is usually present on the mandibles and renders these tricolored, the base being black and the apex ferruginous. The legs vary from wholly black (except for the pale markings indicated above) to wholly rufo-ferruginous beyond the trochanters; often only the hind legs are rufous. Wings hyaline, the outer margin of the fore wing and apex of the hind wing banded with fuscous. Pubescence in large part silvery, on the abdomen mostly brownish, with basal silvery bands on the first 3 segments, and the last 3 tergites mostly silvery. Squamiiform pubescence about as in the female. Head, thorax, propodeum, and tergite 1 with considerable pale erect hair.

Clypeus about  $1.8 \times$  as broad as high, its apical margin truncate. Front of moderate breadth, middle interocular distance varying from .58 to .61  $\times$  trans-facial distance. Middle interocular distance about  $1.2 \times$  the lower; upper interocular distance about  $1.05 \times$  the lower. Ocelli rather large, post-ocellar line usually slightly greater than ocello-ocular line. Antennae relatively short and thick; first 4 segments in a ratio of about 3:1:2.5:2.7; segment 3 about  $1.7 \times$  as long as its greatest thickness; segments 8 through 12 each about  $1.5 \times$  as long as their greatest thickness (fig. 65). Temples not well developed.

Pronotum very short, its posterior margin arcuate. Mesonotum very wide, making the thorax unusually broad between the wing bases. Longer spur of hind tibia about  $.8 \times$  the basitarsus. Venation as in the female. Abdomen somewhat flattened above; characters of the terminal segments as described under the generic heading.

*Biology*.—Like its congeners, this species is partial to sandy places and preys on epeirid spiders. A female from Farmingdale, Long Island, N. Y., was taken with the spider *Eustala anastera* (Walck.) [det. H. Blauvelt]. There are many records of this species having been taken on flowers; the list includes *Thysanella fimbriata*, *Ceanothus microphyllus*, *Chilopsis*, *Helianthus*, *Baccharis glutinosus*, and alfalfa.

*Distribution*.—This is a Tropical and Lower Austral species, ranging from Central America north to California, Texas, Illinois, and Long Island, N. Y.

*Specimens seen*: 106 (68 ♀♀, 38 ♂♂). The following records appear to be marginal: NEW YORK: Long Island, 1 ♀, Farmingdale, 4 July [KVK]; NEW JERSEY: Burlington Co., 1 ♀, Brown's Mills, 11 June [AMNH]; Camden Co., 1 ♀ [ANSP]; VIRGINIA: 1 ♂, Cape Henry, 24 Sept. [USNM]; NORTH CAROLINA: 1 ♀, Beaufort [USNM]; Dare Co., 2 ♀♀, 1 ♂, Kill Devil Hills, 2-5 June [KVK]; SOUTH CAROLINA: 1 ♀, Dewees Island, 29 May [MCZ]; GEORGIA: Glynn Co., 1 ♀, St. Simon's Island [CU]; FLORIDA: (many records from all parts); ALABAMA: Clarke Co., 1 ♂, 11 June [MCZ]; MISSISSIPPI: Lafayette Co., 1 ♀, Oxford, July [MCZ]; ILLINOIS: Morgan Co., 1 ♂, Meredosia, 21 Aug. [AMNH]; TEXAS: Lee Co., 2 ♀♀, Fedor, Aug., Oct. [MCZ]; Jeff Davis Co., 1 ♀, Limpia Canyon, 5000 feet, 24 July [HEE]; NEW MEXICO: Dona Ana Co., 1 ♀, Las Cruces, 5 June [ANSP]; ARIZONA: Graham Co., 1 ♂, Fort Thomas, 2700 feet, 7 Aug. [OSC]; CALIFORNIA: Lake Co., 2 ♀♀, Seda Bay, Clear Lake, 29 Sept. [CAS]; MEXICO: Baja California, 1 ♀, 1 ♂, Angeles Bay, 26-27 June [CAS]; Yucatan, 7 ♀♀, Chichen Itza, 29 June [MCZ]; GUATEMALA: 3 ♀♀, 1 ♂, Moca Guatalon, Mch.-Apr. [MCZ]; COSTA RICA: 1 ♂, San José [CU].

### 3. *Episyron biguttatus biguttatus* (Fabricius)

(Plate XV, figs. 51, 52; plate XVI, figs. 60, 63.)

*Pompilus biguttatus* Fabricius, 1798, Suppl. Ent. Syst., p. 249. [Type: ♀; "America septentrionali"; (not seen by author).]—Fabricius, 1804, Syst. Piezatorum, p. 193.—Say, 1835, Boston Jour. Nat. Hist., 1: 303.—Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 158.—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 96.—Provancher, 1882, Nat. Canad., 13: 35, 40.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 276.—Peckham and Peckham, 1898, Wisc. Geol. Nat. Hist. Survey Bull., 2, pp. 138-140. [Biology.]

*Spilopompilus biguttulatus* [sic] Ashmead, 1902, Canad. Ent., 34: 81. [Made genotype of n. gen. *Spilopompilus*.]

*Episyron atrytone* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 229. [Type: ♀; Lee Co., Texas, Apr. 1912 (Birkmann); M.C.Z. no. 13,665.] New synonymy.—Banks, 1911, Proc. Ent. Soc. Wash., 13: 238.

*Episyron snowi* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 229. [Based on misdetermination; *nec snowi* Viereck.]—Banks, 1912, Ent. News, 23: 108.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 986.—[?]Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 121-122.—[?]Brimley, 1938, Insects N. Carolina, p. 433.

*Episyron biguttatus* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 230.—Banks, 1912, Ent. News, 23: 108.—Rohwer, 1916, Conn. Geol. Nat. Hist. Survey Bull., 22, p. 631.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 986.—Robertson, 1928, Trans. Acad. Sci. St. Louis, 25: 308.—Johnson, 1930, Ins. Fauna Nantucket, p. 110.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 121.—Brimley, 1938, Insects N. Carolina,

p. 432.—Procter, 1938, Biol. Survey Mt. Desert Reg., vi, Insecta, p. 429.  
—Strickland, 1947, Canad. Ent., 79: 125. [Alta.]—Dreisbach, 1949,  
Ent. Amer., (n.s.) 29: 38, pl. 111, fig. 11.

*Psammochares biguttata* Bromley, 1914, Psyche, 21: 192. [Preyed upon by  
the asilid *Proctacanthus philadelphicus*.]

This is one of the best known of American spider wasps, being very widely distributed and common over much of its range. *Biguttatus biguttatus* may be readily told from the sympatric *quincunotatus quincunotatus* by the lack of a pale spot on the apical abdominal tergite of the female, and by the lack of a pale spot at the apex of the front tibia of the male, in addition to the morphological differences mentioned in the keys. Males of this form have often been misdetermined as *snoövi* Viereck.

FEMALE.—Length 12.5 (9–18) mm., thus very variable but averaging the largest of our native *Episyron*. Body black, marked with pale buff as follows: inner and outer orbits very narrowly, rarely a pale stripe on the posterior margin of the pronotum, usually with a pair of round or transverse spots on tergite 3, not infrequently also with paired spots on tergite 2 and/or tergite 4; outer side of hind tibia sometimes with a spot or stripe. Wings subhyaline to moderately infuscated, the outer margins contrastingly darker. Body clothed with dark pubescence which vaguely reflects deep bluish or purplish in certain lights, often silvery on the lower front, sometimes also on the temples, coxae, and lower thoracic pleura. Coarse squami-form pubescence, brownish or somewhat silvery or coppery, is present on tergite 1, the propodeum, postnotum, metanotum, pronotum, and often to some extent on the scutellum, mesopleura, and hind coxae. Head, thorax, and propodeum with a considerable amount of erect black hair; tergite 1 rather hairy, the apical abdominal segments with a few thin setae.

Clypeus about  $2.4 \times$  as broad as high, the apical margin nearly straight, the edge narrowly raised. Front broad, middle interocular distance from  $.57$  to  $.63 \times$  transfacial distance. Inner orbits subparallel below, converging rather strongly above, upper interocular distance from  $.65$  to  $.78 \times$  lower interocular distance. Ocelli forming a right angle or slightly greater in front; post-ocellar line subequal to or slightly greater than ocello-ocular line. Antennae slender, the first 4 segments in a ratio of about 4:1:6:5, segment 3 equal to from  $.92$  to  $1.3 \times$  upper interocular distance. Head in general rather broad, transfacial distance about  $1.15 \times$  facial distance; vertex raised at most very slightly above the eye-tops; temples not strongly developed. (Fig. 52.)

Pronotum short, its posterior margin arcuate, sometimes with a slight angulation on the median line. Propodeum sloping more steeply behind, the declivity marked off by a heavy band of scales. Tarsal comb well developed, but the spines shorter than in the other native members of the

genus; basitarsus with 3 comb-spines, the apical one subequal in length to the 2d tarsal segment. Wing venation as shown in fig. 60, and not differing notably from that of other members of the genus; the 1st transverse cubital vein is generally less strongly oblique than in the preceding species.

MALE.—Length 9.5 (6–13) mm. Body black, marked with pale buff as follows: inner and outer orbits narrowly; posterior margin of pronotum usually with a band which is interrupted medially; usually a pair of transverse spots on the base of tergite 3, sometimes confluent medially, sometimes concealed when the segments are telescoped; rarely there are paired spots on tergite 2 or tergite 4; apical tergite usually wholly pale; hind tibia always with a pale stripe on the outer side basally or for most of its length; spurs usually pale, but always somewhat dusky or “dirty,” at least at the tips, never pure whitish as in *snowi* or *posterus*. Wings hyaline, outer margin of fore wing and apex of hind wing conspicuously banded with brownish. Body silvery-sericeous over much of the head and thorax, and usually with basal silvery bands on tergites 2 and 3. Squamiform pubescence as in the female. Head, including the scape, and the prothorax, rather densely clothed with short dark hairs; remainder of thorax and propodeum with a moderate amount of dark hair.

Clypeus slightly more than twice as broad as high, its apical margin truncate. Front of moderate breadth, middle interocular distance from .57 to .64  $\times$  transfacial distance. Middle interocular distance from 1.05 to 1.15  $\times$  lower interocular distance; upper interocular distance from .95 to 1.1  $\times$  the lower. Ocelli forming a right angle or slightly greater in front, post-ocellar line and ocello-ocular line subequal, or either somewhat the greater. First 4 antennal segments in a ratio of about 3:1:3:3.2; scape less than twice as long as its greatest thickness; segment 3 about twice as long as its greatest thickness; segments 9 to 12 each about twice as long as thick (fig. 63). Temples not strongly developed, the head contracted almost immediately behind the eyes. (Fig. 51, dorsal view.)

Pronotum varying from arcuate to feebly angulate behind. Propodeum slightly more declivous behind, without a median groove. Longer spurs of hind tibiae about .8 the length of the hind basitarsi. Venation as in the female. Abdomen cylindrical, slightly flattened dorsally, the apical segments as described under the generic heading.

*Biology*.—This species is active in the northeastern United States from May until September (farther south from April to October) but is most common in mid-summer; there are probably two or more generations a year. It occurs in sand or gravel banks, gardens, or sometimes even in open woodland where the soil is light. The nest is a burrow in the ground, and is provisioned with at least two species of epeirid spiders (*Metepeira labyrinthea* Hentz and *Epeira foliata* Fourcroy). The only account of its prey



and habits is that of the Peckhams (1898).<sup>42</sup> Both sexes come frequently to many kinds of flowers, but especially to Umbelliferae; the following flowers are known to be visited: *Pastinaca sativa*, *Daucus carota*, *Cicuta maculata*, *Ceanothus* spp., *Polygonum cuspidatum*, *Solidago* spp., *Angelica*, *Melilotus alba*, *Baccharis salicina*, *Ptelea trifoliata*, and *Chaerophyllum teinturierii*.

*Distribution*.—This form occurs throughout North America east of the Rockies, from Texas and Florida to Northwest Territories and Labrador; west of the eastern slopes of the Rockies, and also in the Black Hills of South Dakota and places in Alberta, it is replaced by subspecies *californicus* Banks.

*Specimens seen*: 503 (312 ♀♀, 191 ♂♂). The following records are marginal: NOVA SCOTIA: 3 ♀♀, 2 ♂♂, Baddeck, Cape Breton Isl., 5 Aug. [MCZ]; PRINCE EDWARD ISLAND: 2 ♀♀ 1 ♂, Canad. Nat. Park, July-Aug. [CNC]; LABRADOR: 2 ♀♀, Goose Bay, 23-29 Aug. [CNC]; QUEBEC: 1 ♂, Kazabazua, 30 June [CNC]; ONTARIO: 1 ♂, Norway Point, Lake of Bays, June [CNC]; MICHIGAN: Cheboygan Co., 1 ♀, Mullet Lake, 10 Aug. [Minn.]; MINNESOTA: Cook Co., 5 ♀♀, 1 ♂, June-Aug. [Minn.]; MANITOBA: 1 ♂, Cormorant Lake, July [CNC]; SASKATCHEWAN: 1 ♂, Prince Albert, July [CNC]; NORTHWEST TERRITORIES: 1 ♀, Fort Norman, McKenzie River, 6 Aug. [CNC]; ALBERTA: 2 ♀♀, White Mud R., Peace River Dist., 22 July [CNC]; MONTANA: 1 ♀ (no further data) [ANSP]; COLORADO: 1 ♀ (no further data) [USNM]; TEXAS: Brewster Co., 1 ♂, Chisos Mts., 5 July [OSC]; Brazos Co., 1 ♀, 5 ♂♂, May-Oct. [JEG]; FLORIDA: Pasco Co., 1 ♀, Elfers, 4 Apr. [KVK]; Orange Co., 1 ♀, Orlando, 8 Mch. [Mass.]

### 3b. *Epišyron biguttatus californicus* (Banks)

*Psammochares californica* Banks, 1910, Jour. N. Y. Ent. Soc. 18: 117.  
[Type: ♂; Claremont, Calif. (Baker); M.C.Z. no. 13,664.]

*Epišyron californicus* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 230.—Banks, 1919, Bull. Mus. Comp. Zool., 63: 241.

*Epišyron arizonica* Banks, 1933, Psyche, 40: 5. [Type: ♀; Apache Camp, Santa Catalina Mts., Ariz., 5500 feet, 25 July 1917 (J. Bequaert); M.C.Z. no. 17,033.] New synonymy.

<sup>42</sup> Since the above was written I have, however, discovered a short account of the behavior of this wasp by Phil Rau (1922, Trans. Acad. Sci. St. Louis, v. 24, no. 7, pp. 9-10). The host in this case was *Epeira prompta* Hentz (= *Eustala anastera* Walck.). In two instances, Rau found the egg of the wasp to be attached firmly to the abdomen of the spider. This is contrary to other observations on wasps of this genus, and to the statement made by the present author on an earlier page that the egg is attached to the wall of the cell in this genus, and not directly to the spider.

This is an all black or somewhat blue-black western subspecies of *biguttatus*, paralleling the case of *quinquenotatus* and its subspecies *hurdi*. However, this is a wider-ranging form than *hurdi*, occurring east to New Mexico and the Black Hills of South Dakota. The males retain the whitish streak on the hind tibia and the white apical tergite.

FEMALE.—Length 13 (10–17) mm. Color black, the outer orbits very narrowly pale, the inner orbits sometimes with a very small pale spot; rarely there are a pair of pale spots on the 3d abdominal tergite. Wings wholly infuscated, somewhat deeper along the outer margin, distinctly violaceous. Body rendered rather conspicuously deep blue-black by the pubescence. Squamiform pubescence rather dark. Morphologically very similar to typical *biguttatus*. Eyes converging strongly above, upper interocular distance from .6 to .75  $\times$  lower interocular distance. Tarsal comb strong, the apical spine on the basitarsus usually slightly longer than the 2d tarsal segment.

MALE.—Length 9.5 (7–13) mm. Color black, the inner and outer orbits with small pale markings; apical abdominal tergite mostly whitish; hind tibia with a spot or usually a stripe of whitish on the outer side near the base. Pubescence dark blue-black as in the female, occasionally silvery on the lower front and parts of the thorax. Squamiform pubescence varying from dark to silvery. Wings subhyaline or lightly infuscated, the outer margin of the fore wing and apex of the hind wing with a darker band. Structurally not differing noticeably from the nominate subspecies.

*Biology*.—Like other members of the genus, this subspecies is a frequent visitor to flowers; it has been taken on *Cicuta*, *Eriogonum*, *Cleome*, and *Solidago*.

*Distribution*.—Upper Sonoran to Canadian faunas, from New Mexico, Arizona, and California to British Columbia, Alberta, and the Black Hills of South Dakota.

*Specimens seen*: 134 (87 ♀♀, 47 ♂♂). Marginal records are as follows: SOUTH DAKOTA: Custer Co., 13 ♀♀, 2 mi. So. of Custer, 24 Aug. [HEE, CU]; MONTANA: Lake Co., 1 ♀, Flathead Lake [USNM]; ALBERTA: 1 ♀, Waterton, 13 July [Alta.]; BRITISH COLUMBIA: 1 ♀, Revelstoke, Selkirk Mts., July [CU]; 1 ♀, Maple Bay, Vancouver Island, July [CNC]; CALIFORNIA: San Diego Co., 1 ♂, Warner Springs [UK]; ARIZONA: Pima Co., 1 ♀, Baboquivari Mts., 8 Aug. [CAS]; NEW MEXICO: Otero Co., 1 ♀, Alamogordo, 13 May [ANSP]; Santa Fe Co., 1 ♀, 9200 feet. Aug. [MCZ]; UTAH: Davis Co., 1 ♀, Bountiful, 8 Aug. [UAC].

4. *Episyron oregon* new species

(Plate XV, figs. 50, 53; plate XVI, fig. 64.)

This species is closely allied to the preceding, with which it has previously been confused; the males also closely resemble those of *quinquenotatus hurdi*. The diagnostic morphological features are the very broad front and vertex, the rather wide temples, the broad ocellar triangle, the front angle of which is much greater than a right angle, and the elevation of the vertex in an arc above the tops of the eyes. (Figs. 50 and 53.) The apical abdominal tergite of the male is black or only slightly suffused with pale. The females suggest *snowi*, but the body is much more hairy than in this species, and the pronotum shorter. *E. oregon* is an inhabitant of the northwestern United States and western Canada.

FEMALE (Holotype).—Length 9.5 mm.; fore wing 8.5 mm. Color black, the upper outer orbits with a very narrow pale yellowish stripe, the 3d abdominal tergite with a very small pale spot on each side. Wings lightly infuscated, the outer margins with a darker band, not violaceous. Entire body with a close brownish pubescence. Tergite 1, posterior slope of propodeum, postnotum, middle of metanotum, pronotum, and the mesopleura just below the tegulae with a dingy squamiform pubescence. Body with considerable dark, erect hair of moderate length: scape, clypeus, front, vertex, temples, propleura, front coxae, pronotum, mesopleura, metanotum, propodeum, and tergite 1 all with abundant hairs; remaining coxae and remainder of thoracic dorsum somewhat hairy, the femora barely so; apical abdominal segments with a few strong setae.

Head in anterior view (fig. 53) subcircular; transfacial distance  $1.08 \times$  facial distance. Clypeus  $2.3 \times$  as broad as high, its apical margin truncate, narrowly reflexed. Front very broad, middle interocular distance  $.67 \times$  transfacial distance. Inner orbits subparallel below, distinctly converging above, upper interocular distance  $.75 \times$  lower interocular distance. Vertex raised slightly, evenly and arcuately, above the tops of the eyes. Ocelli in a broad triangle, the front angle greater than a right angle; post-ocellar line and ocello-ocular line about equal. Antennae moderately long and slender, the first 4 segments in a ratio of 3:1:4.5:3.5, segment 3 equal to  $.82 \times$  upper interocular distance. Temples strongly developed, in dorsal view nearly as thick as the eyes.

Pronotum shorter than the mesonotum, its posterior margin arcuate, with a faint median angulation. Postnotum strongly expanded on each side of the median line. Propodeum sloping more steeply behind, the declivity flat and somewhat polished; median line not impressed. Comb of front tarsus strongly developed, the spines slightly flattened and curved; basitarsus with 3 comb-spines, the apical one  $1.3 \times$  the length of the 2d tarsal segment.

Longer spur of hind tibia .7 the basitarsus. Venation as in *biquittatus* and in no way distinctive.

Nineteen female paratypes vary in length from 6.5 to 12 mm., the average being 9.5 mm. The usual color of the abdomen is wholly black; only occasionally are there small spots on tergite 3, and one specimen has paired spots on tergites 2 and 3. Middle interocular distance varies from .63 to .67  $\times$  transfacial distance; upper interocular distance varies from .75 to .81  $\times$  the lower; antennal segment 3 varies from .75 to .9  $\times$  upper interocular distance. The length of the comb-spines varies from 1 to 1.5  $\times$  the 2d tarsal segment.

MALE (Allotype).—Length 8.5 mm.; fore wing 8 mm. Color black, the upper outer orbits with a slender pale yellowish streak; body and legs wholly without other pale markings. Front wings lightly infuscated, darker along the outer margin; hind wings subhyaline, slightly darker apically. Entire body with a fine brownish pubescence; squamiform pubescence dingy, distributed as in the female. Scape hairy above and below; head, thorax, propodeum, and tergite 1 with abundant black pile of moderate length.

Head in anterior view subcircular, a little broader than high, transfacial distance 1.1  $\times$  facial distance. Vertex raised rather strongly, arcuately, above the tops of the eyes. Temples rather strong, in dorsal view (fig. 50) nearly as wide as the eyes. Clypeus twice as broad as high, its apical margin truncate. Front broad, middle interocular distance .65  $\times$  transfacial distance. Eyes diverging above, middle interocular distance 1.15  $\times$  the lower, upper interocular distance 1.05  $\times$  the lower. Antennae of moderate length, the first 4 segments in a ratio of 5:2:5:6, segment 3 about 1.5  $\times$  as long as thick; segments 9 to 12 each about 1.5  $\times$  as long as thick (fig. 64). Ocelli in a broad, flat triangle, post-ocellar line and ocello-ocular line about equal.

Pronotum short, its posterior margin distinctly angulate. Propodeum short, its median line lightly impressed. Apical tarsal segments not spined beneath. Longer spur of hind tibia .8 the basitarsus. Abdomen subfusiform, the dorsum slightly flattened; apical segments as described under the generic heading.

Fifteen male paratypes vary in length from 5.5 to 10.5 mm., the average being 7.5 mm. The apical abdominal tergite may be black or suffused with whitish; in none of the members of the type series is it as conspicuously whitish as in the other members of the genus. Middle interocular distance varies from .62 to .68  $\times$  transfacial distance. In other features they compare closely with the allotype.

*Distribution*.—Western United States and Canada, from Yukon and Alberta to Wyoming and California; principally a Transition Zone species.

*Holotype*.—OREGON: Klamath Co. ♀, Lamis Mill, Eagle Ridge, Klamath Lake, 24 May 1924 (C. L. Fox) [CAS]. *Allotype*.—CALIFORNIA: San

Benito Co. ♂, Pinnacles National Monument, 24 April 1948 (J. W. McSwain) [CAS].

*Paratypes*.—CALIFORNIA: 1 ♀ (no further data) [ANSP]; San Luis Obispo Co., 1 ♀, Pismo, 25 Apr. 1919 (E. P. VanDuzee) [CAS]; Santa Cruz Co., 1 ♀, Felton, Santa Cruz Mts., 15–19 May 1907 (J. C. Bradley) [CU]; Los Angeles Co., 1 ♂, Santa Monica (F. C. Clark) [CAS]; WASHINGTON: 2 ♀♀, 2 ♂♂ (labeled "W. T."; no further data) [ANSP]; WYOMING: 3 ♀♀, 1 ♂, Summit, 8835 feet, 16 Aug. 1940 (H. E. Milliron) [Mim.]; MONTANA: 6 ♀♀, 7 ♂♂ (no further data) [ANSP, USNM, CU]; ALBERTA: 1 ♀, 1 ♂, Medicine Hat, 17 July 1917 (F. W. L. Sladen) [CNC]; 1 ♀, Tilley, 7 June 1941 (J. L. Carr) [Alta.]; 1 ♂, Gull Lake, 24 June 1929 (E. H. Strickland) [Alta.]; 1 ♂, Lethbridge, 30 May 1929 (J. H. Pepper) [CNC]; BRITISH COLUMBIA: 1 ♀, 1 ♂, Vernon, 25 July 1917 (F. W. L. Sladen) [CNC]; 1 ♀, Vernon, 19 Aug. 1917 (M. H. Ruhmann) [CNC]; YUKON: 1 ♀, Whitehorse, 2 July 1948 (W. R. M. Mason) [CNC].

5. *Episyron snowi* (Viereck) (Plate XVI, fig. 66.)

*Anoplus (Pompilinus) snowi* Viereck, 1906, Trans. Amer. Ent. Soc., 32: 202. [Type: ♂; Morton Co., Kansas, 3200 feet (F. H. Snow); Univ. Kansas.]

*Psammochores mancei* Banks, 1910, Jour. N. Y. Ent. Soc., 18: 117. [Type: ♀; Southern Pines, N. C., 26 June 1909 (A. H. Mance); M.C.Z. no. 13,663.] New synonymy.

*Episyron mancei* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 230.—Rau, 1922, Trans. Acad. Sci. St. Louis, v. 24, no. 7, p. 10. [Biology.]—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 121.—Brimley, 1938, Insects No. Carolina, p. 432.

*Episyron laevis* Banks, 1933, Psyche, 40: 4. [Type: ♀; Fedor, Lee Co., Texas, 27 Mch. 1909 (Birkmann); M.C.Z. no. 17,032.] New synonymy.

[?] *Episyron snowi* Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 121. —[?] Brimley, 1938, Insects No. Carolina, p. 433.

The name *snowi* has seldom been used in its correct sense. The type, which I have examined, is in good condition, and there can be no doubt of its association with Banks' *mancei*. This is the most highly evolved of our native species of the genus, as evidenced by the loss of erect hair in the female, the rather long pronotum, the short antennae, the segments of which are somewhat imbricate in the male, and the often very extensive squamiform pubescence.

FEMALE.—Length 10.5 (8–13) mm.; color black, the upper outer orbits usually with a very small pale spot or stripe. Pubescence brownish or obscurely metallic, often silvery on the lower front and clypeus. Squamiform pubescence brownish-silvery or somewhat coppery in color, usually

more extensive than in other members of the genus, covering not only the first abdominal tergite, but usually parts of the 2d, and sometimes extending onto the 3d, 4th, and even the 5th tergites; pronotum and propodeum extensively clothed with scales, and to a lesser extent the meso- and metapleura, hind coxae, sides of the scutellum, postnotum, and metanotum. In specimens which have flown for some time, much of this squamiform pubescence may be lost. Scape not or very barely hairy; front and vertex with only some inconspicuous hair; pronotum, mesopleura, propodeum, and base of tergite 1 with only some very inconspicuous, short, pale hairs; apical abdominal segments with a few dark setae. Fore wings nearly hyaline basally, becoming gradually more infuscated apically, the outer margin with a dark band; hind wings subhyaline, infuscated apically.

Head in anterior view subcircular, the vertex raised rather noticeably above the tops of the eyes. Clypeus about  $2.4 \times$  as broad as high, its apical margin truncate, narrowly reflexed. Front broad, middle interocular distance from .61 to .65  $\times$  transfacial distance. Inner orbits subparallel below, distinctly converging above the middle, upper interocular distance varying from .75 to .8  $\times$  lower interocular distance. Ocelli in a flat triangle well below the crest of the vertex, the front angle greater than a right angle; post-ocellar line is to ocello-ocular line about as 5:3. Antennae relatively short for the genus, the first 4 segments in a ratio of about 3:1:5:3.5, segment 3 from .8 to .9  $\times$  upper interocular distance. Head thin, contracted immediately behind the eyes, the temples not well developed.

Pronotum rather long, subequal in length to the mesonotum, its posterior margin arcuate. Propodeum sloping gradually in front, with a rather abrupt, oblique, slightly concave declivity on the posterior third. Front tarsus with a comb of long, slender spines; there are 3 comb-spines on the basitarsus, the apical one from 1.2 to 1.5  $\times$  the length of the 2d tarsal segment. Legs strongly spinose; middle and hind femora compressed. Wing venation of the usual type in the genus; marginal cell slightly more than its own length from the wing-tip.

MALE.—Length 8 (6–10.5) mm. Color black, or very deep blue-black, more or less marked with white or very pale buff; mandibles tricolored, the base black, the middle white, the apex reddish; upper outer orbits and often the middle inner orbits very narrowly pale; pronotum occasionally with a band of pale along its posterior margin; apical abdominal tergite, a streak along the outer side of the hind tibia, and the spurs of the middle and hind tibia, whitish; front tibial spurs dusky white or yellowish; apex of front tibiae with a pale spot; scape often with a small pale spot apically. Wings hyaline, with a conspicuous whitish bloom, the outer margins banded with fuscous. Body clothed with a somewhat coarse pubescence, silvery at least on the clypeus, front, and lower sides of the thorax, often more extensively silvery. Squamiform pubescence very coarse, dense, whitish, distributed much as in the female though because of its color and density it is much more conspicuous than in that sex. Scape, clypeus, front, vertex, temples, and prothorax with considerable erect, short, mostly whitish hair;

remainder of thorax, propodeum, and tergite 1 with a variable amount of inconspicuous pale hair.

Clypeus about twice as broad as high, truncate below. Front of variable breadth, middle interocular distance from .6 to .67  $\times$  transfacial distance. Eyes diverging above, middle interocular distance about 1.25  $\times$  the lower, the upper about 1.15  $\times$  the lower. Ocelli in a broad triangle, post-ocellar line is to ocello-ocular line about as 5:4. Head flat behind the eyes, the temples reduced; malar space fairly long, nearly as long as the antennal pedicel. Antennae relatively short and thick; first 4 segments in a ratio of about 6:2:5:6; segment 3 less than 1.5  $\times$  as long as thick; segments 9 through 12 each less than 1.5  $\times$  as long as thick; there is a slight constriction between each of the flagellar segments, and on the outside each segment may be seen to be somewhat produced dorsally so as to overlap part of the next segment (fig. 66).

Pronotum rather long, almost or quite as long as the mesonotum, its posterior margin arcuate or very feebly angulate. Middle and hind legs very long, slender, and strongly spinose; longer spur of hind tibia nearly as long as the basitarsus. Abdominal characters of the usual form in the genus.

*Biology*.—This species is usually taken on flowers, and has been taken on *Stillingia*, *Gossypium*, *Solidago*, *Baccharis*, *Tamarix*, and *Polytaenia nuttallii*.

Rau (1922) discovered a female of this species walking across a road and into a woods dragging the epeirid spider *Cyclosa conica* (Pallas).

*Distribution*.—This species occurs transcontinentally in the Lower and Upper Austral Zones, north to New Jersey, Illinois, South Dakota, Montana, and Oregon. It appears to be somewhat less uncommon westward, and is sometimes taken in series on flowers in desert areas.

*Specimens seen*: 102 (42 ♀♀, 60 ♂♂). The following records are marginal or from areas where the species is local in occurrence, or where its distribution may be discontinuous: NEW JERSEY: Camden Co., 1 ♀ [USNM]; NORTH CAROLINA: Dare Co., 3 ♀♀, Kill Devil Hills, 28–30 May [KVK]; Moore Co., 3 ♀♀, 1 ♂, Southern Pines, June–Nov. [MCZ, CU]; GEORGIA: Schley Co., 1 ♂, Ellaville, 28 Apr. [USNM]; ILLINOIS: Morgan Co., 1 ♂, Meredosia, 22 Aug. [OSC]; IOWA: Woodbury Co., 1 ♀, 1 ♂, Sioux City, June [USNM]; SOUTH DAKOTA: Harding Co., 1 ♂, Buffalo, 31 July [SDS]; Custer Co., 1 ♀, Custer, 24 July [Minn.]; MONTANA: 1 ♀, 1 ♂ (no further data) [ANSP]; IDAHO: Gooding Co., 1 ♀, Hagerman, 9 Sept. [USNM]; WASHINGTON: Yakima Co., 3 ♂♂, Yakima R., June [MCZ]; CALIFORNIA: Contra Costa Co., 1 ♀, 1 ♂, Antioch, Apr., Aug. [CIS, CAS]; San Diego Co., 1 ♂, 23 Aug. [CAS]; ARIZONA: Cochise Co., 2 ♂♂, Douglas, 16 June [OSC, CAS]; NEW MEXICO: Otero Co., 1 ♂,

White Sands, 30 June [UK]; TEXAS: El Paso Co., 1 ♀, 6 ♂♂, June [OSC]; Cameron Co., 1 ♀, 6 ♂♂, Brownsville, May [USNM]; LOUISIANA: 1 ♂ (no further data) [USNM]; ALABAMA: 1 ♂ (no further data) [USNM]; FLORIDA: Hillsborough Co., 1 ♂, Lutz, 20 Mch. [CM].

#### VII. Genus **POECILOPOMPILUS** Howard

*Pocilopompilus* Howard, 1901, The Insect Book, pl. V, fig. 1, and pl. XI, fig. 18. [Type: *Pompilus narus* Cresson, 1867 (= *interruptus interruptus* Say, 1835); designated by Ashmead, 1902.]—Ashmead, 1902, Canad. Ent., 34: 82. [Proposed as new genus.]

*Batozonus* Howard, 1901, The Insect Book, pl. XI, fig. 24. [Type: *Pompilus algidus* Smith, 1855; monobasic.] New synonymy.—Ashmead, 1902, Canad. Ent., 34: 81. [Proposed as new genus.]

*Agenioxenus* Ashmead, 1902, Canad. Ent., 34: 137. [Type: *Ceropales rufiventris* Ashmead, *nce* Walsh (misidentification) (= *interruptus interruptus* Say, 1835); monobasic.]<sup>43</sup>

*Batozonus* Banks, 1911, Jour. N. Y. Ent. Soc., 19: 221, 224. [*Lapsus calami* for *Batozonus* Howard, 1901.]—Dreisbach, 1949, Ent. Amer. (n.s.)29: 5, 8, 38, pl. 111, fig. 12.

This is one of the most distinctive genera of Pompilini. The upper margin of the clypeus is strongly sinuate; the eyes of the female are strongly convergent above; the postnotum is much expanded on each side of the median line, where it is often concealed; the front tibiae are spinose above; the anal vein of the hind wing meets the media well beyond the origin of the cubitus. Most of the species are brightly colored, some of them suggesting species of *Polistes*.

*Generic characters*.—Small to fairly large wasps (8–28 mm.); color black and/or ferruginous, often marked with yellow. Body with a variable amount of erect hair; apical abdominal segment of female with numerous strong setae, but none of them bristly.

Maxillary palpi relatively short, segments 4 through 6 each considerably shorter than 3. Labrum semicircular, its apical margin bristly, with a slender median incision; labrum protruding slightly from beneath the clypeus, in the male sometimes a considerable distance. Mandibles bidentate in the female, unidentate in the male. Disc of clypeus somewhat

<sup>43</sup> For an amusing sidelight on the question of the identity of *Agenioxenus* Ashmead, see Ashmead's paper "*Ceropales* vs. *Agenioxenus*" (1902, Ent. News, 13: 318). Dr. Ashmead's specimen of *Ceropales rufiventris* Walsh (= *robinsoni* Cresson) was a misidentified male *Pocilopompilus interruptus* (Say). This is apparent from his description and remarks, and is confirmed by Rohwer (see Banks, 1911, Jour. N. Y. Ent. Soc., 19: 220). The invective leveled by Ashmead against Viereck in the above paper is certainly out of order!



convex; fronto-clypeal suture with a strong sinuation on each side. Malar space very short or practically absent. Inner orbits converging above, in the female rather strongly so. Antennae of moderate length; scape of male short, not twice as long as its greatest thickness; outer flagellar segments of the male somewhat convex below, concave above, the profile thus slightly crenulate.

Pronotum short, expanded gradually from front to rear, the slope smooth and even, the median line usually faintly impressed. Postnotum of variable length, but always strongly constricted medially, where it may be concealed by the overhanging metanotum, and constricted again just above the spiracles, the hind margin arcuately expanded on each side of the median line, between the constrictions (fig. 70). Propodeum either with even contours, or somewhat protuberant postero-laterally. Legs long and spinose; femora with numerous minute spines; front tibiae spinose above for most of their length, and unusually spinose on the sides; front tarsus of female with a tarsal comb. Apical tarsal segments spined beneath in the female, often weakly so in the male. Pulvillar pad small; pulvillar comb consisting of 6 to 8 weak, diverging setulae. Claws of the female dentate, except that in some species those of the front tarsus are bifid; claws of the male all bifid, the inner ray truncate; front claws of male alike, the apical segment of this tarsus unmodified.

Wings long; fore wings with a vena spuria above the media along which the wings sometimes fold longitudinally, although this tendency is less strong than in *Episyron*. Stigma small or of moderate size; marginal cell long and slender, its apex acute; 2d and 3d submarginal cells both 4-sided, wide above; 3d discoidal cell less than its own length from the wing margin. Hind wing with the submedian cell very long and slender, the anal vein meeting the media well beyond the origin of the cubitus. The venation does not differ greatly from that of *Episyron*.

Abdomen of female rather stout, subfusiform, in some species rather slender basally. Abdomen of male slender, in cross-section subtrigonal, the dorsum flattened. Sternite 6 with a U-shaped emargination. Subgenital plate strongly elevated medially, the apex rounded, the plate shaped much as in *Episyron*. Genitalia (figs. 43 and 44) with the aedeagus somewhat bilobed apically, sometimes with a few weak setae along the shaft; parapenials slender, simple; basal hooklets double; digiti subspatulate, the disc with numerous short, downward-directed setae; parameres slender and simple.

*Biology*.—Wasps of this genus, as in the closely related *Episyron*, appear to prey entirely upon orb-weavers (Epeiridae). The habits of a Central American species in capturing and transporting its prey are described by Thomas Belt as follows:

"I one day saw a small black and yellow banded wasp (*Pompilus polistoides*) [i.e., *Pocillopompilus polistoides* (Smith)] hunting

for spiders; it approached a web where a spider was stationed in the centre, made a dart towards it—apparently a feint to frighten the spider clear of its web; at any rate it had that effect, for it fell to the ground, and was immediately seized by the wasp, who stung it, then ran quickly backwards, dragging the spider after it, up a branch reaching to the ground until it got high enough, when it flew heavily off with it. It was so small, and the spider so heavy, that it probably could not have raised it from the ground by flight . . . .”<sup>44</sup>

Whether these same behavior patterns occur throughout the genus remains to be determined; quite likely they do. A few notes are available concerning the habits of our native *interruptus*, and these are summarized under that species. Members of this genus are very frequent visitors to flowers of many kinds.

*Distribution.*—This genus is characteristic of the American tropics, but ranges as far south as Argentina and Bolivia, and as far north as California, North Dakota, southern Ontario, and New England. Old World species placed in the past in the genus *Batozonus* all belong (to the best of my knowledge) to the very closely related genus *Batozonellus* Arnold. Many species belonging to this genus have been described from the Americas, but in actuality there are but a few widely distributed, polytypic species. In our fauna there are two polytypic species.

### Key to Species

#### Females

1. Claws of front tarsus bifid, the inner ray truncate; front basitarsus with 3 rather strong comb-spines; eyes strongly convergent above, upper interocular distance not much more than half lower interocular distance; antennal segment 3 about  $1.3 \times$  upper interocular distance (*algidus*) . . . . .2
- All the claws dentate, the tooth erect, acute; front basitarsus with 4 shorter comb-spines; eyes less strongly convergent above, upper interocular distance from  $.65$  to  $.75 \times$  the lower; antennal segment 3 subequal to or a little greater than upper interocular distance (*interruptus*) . . . . .4

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<sup>44</sup> Belt, Thomas, 1874, *The Naturalist in Nicaragua*, pp. 133–134.

2. Posterolateral corners of propodeum roundly protuberant; wings wholly dark fuliginous, strongly violaceous; general body color varying from deep castaneous to black, the 3d abdominal tergite with contrasting orange markings; body wholly without yellow markings; flagellum blackish .....1a. **algidus algidus** (Smith)

Propodeum with nearly even contours, not or barely protuberant posteriorly; wings varying from brownish tinged with yellowish in the costal or marginal cells to almost wholly flavous; body color lighter, and always marked with at least a little yellow along the posterior margin of the pronotum; postero-lateral corners of the propodeal rim usually yellow; metanotum often marked with yellow; basal 3 or 4 segments of flagellum ferruginous or yellowish .....3

3. Wings rather uniformly brownish or yellow-brown, somewhat luteous along the costal or marginal cell, slightly violaceous; body generally rich ferrugino-castaneous, tergite 3 and sometimes tergites 4-6 more or less marked with yellow .....1b. **algidus marcidus** (Smith)

Wings bright flavous, the outer margins with a distinct narrow fuscous band, not at all violaceous; at least the thoracic pleural sutures blackish, more often a large part of the thorax and tergite 1 suffused with blackish; abdomen beyond the basal segment more or less yellowish

1c. **algidus coquilletti** (Provancher)

4. Head and thorax liberally marked with yellow and usually with ferruginous or castaneous; mesonotum rarely wholly black; posterior slope of propodeum almost always with a transverse yellow band, or the propodeum mostly yellow; coxae never wholly black; abdomen variously colored, usually conspicuously banded

2a. **interruptus interruptus** (Say)

Head, thorax, and propodeum mainly black, with limited yellow markings; mesonotum black; propodeum rarely with more than the lateral corners of the rim yellow; coxae black; abdomen blackish or dusky ferrugino-castaneous, not usually noticeably banded

2b. **interruptus cressoni** (Banks)

### Males

1. Clypeus about  $2.3 \times$  as broad as high, its apical margin broadly rounded; eyes very broad, only about  $1.5 \times$  as high as their greatest breadth; middle interocular distance about  $.56 \times$  transfacial distance; aedeagus broadly bilobed apically (*algidus*) .....2

Clypeus about twice as broad as high, its apical margin truncate; eyes less broad, about  $1.8 \times$  as high as their greatest breadth; front proportionally broader, middle interocular distance about  $.61 \times$  transfacial distance; aedeagus narrowly bilobed apically (*interruptus*)

See couplet 4 of key to females

2. Propodeum steeply declivous behind, the sides of the declivity roundly protuberant; wings wholly deep fuliginous, violaceous; body color varying from dark castaneous to black, tergite 3 more or less marked with orange at the base; body without yellow markings

1a. *algidus algidus* (Smith)

Propodeum less steeply declivous behind, the sides scarcely protuberant; wings with at least a little yellowish along the costal margin, sometimes in large part yellowish; colors, at least in part, paler; lateral corners of propodeal rim, posterior margin of pronotum, and usually spots on the metanotum and scutellum, yellow

3. Wings darker, varying shades of yellow-brown, brownish-hyaline, or fuscous, somewhat luteous along the costal margin; thorax mostly pale, the mesonotum at most in small part blackish; abdomen wholly more or less pale, the tergites usually with darker posterior margins

1b. *algidus marcidus* (Smith)

Wings flavous or bright yellow-brown, the outer margins with a fuscous band; thorax, propodeum, and basal one or two abdominal segments more or less suffused with blackish; mesonotum almost wholly blackish; abdominal segments 3-7 more or less yellowish, contrasting with the darker basal segments

1c. *algidus coquilletti* (Provancher)

1a. *Poecilopompilus algidus algidus* (Smith) new combination

(Plate XIV, fig. 43; plate XVI, fig. 70.)

*Pompilus algidus* F. Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 158. [Type: ♀; "North America"; British Museum (not seen by author).]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 101. [W. Va., Ga.]—Cresson, 1872, Trans. Amer. Ent. Soc., 4: 203. [Texas.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 271.—Birkmann, 1899, Ent. News, 10: 244. [Lee Co., Texas.]

*Batozonus algidus* Howard, 1901, The Insect Book, pl. XI, fig. 24.—Ashmead, 1902, Canad. Ent. 34: 81.—Regan, 1923, Ann. Ent. Soc. Amer., 16: 183, 191.

*Anoplius algidus* J. Smith, 1910, Ann. Rpt. N. J. State Mus., 1909, p. 674.

*Batozonus algidus* Banks, 1911, Proc. Ent. Soc. Wash., 13: 238.

*Arachnophroctonus ferruginus* Dreisbach, 1949, Ent. Amer., (n.s.) 29: 40, pl. IV, fig. 17. [Nec Say; misidentification.]

This large spider wasp is not easily confused with any other, as its generic, specific, and subspecific characteristics are all very distinctive. *Algidus* and its subspecies are far less commonly met with than *interruptus*, though nearly as widely distributed.

FEMALE.—Length 22 (17-28) mm.; color somewhat variable, the ground color generally very deep ferruginous or mahogany-brown, sometimes practically black over the greater part of the body; tergite 3 at base with two

semicircular orange spots, which may be united to form a band which is emarginate behind. Antennae black beyond the 3d segment, the first 3 segments black or dark brown; head varying from mostly brownish, but blackish around the ocelli and antennal bases, to wholly blackish with brownish blotches on the upper inner orbits; legs varying from castaneo-ferruginous through brown to black; tegulae usually brownish, contrasting with the darker mesonotum. Wings deep fuliginous, strongly violaceous. Body clothed with a somewhat velvety pubescence, brownish or more or less violaceous; lighter if and wherever the integument is lighter. Front with dense short hair just above the antennal bases, its color depending upon that of the integument; temples and propleura with dense, fine hair; vertex, pronotum, front coxae, mesopleura, metanotum, and propodeum all with considerable rather fine hair.

Clypeus large, about  $2.3 \times$  as broad as high, almost touching the eyes on each side, the apical margin truncate, the basal margin strongly sinuate. Front broad below, greatly narrowed above by the convergence of the eyes; middle interocular distance about  $.9 \times$  the lower; upper interocular distance about  $.55 \times$  the lower; middle interocular distance about  $.53 \times$  transfacial distance; lower interocular distance about  $.6 \times$  transfacial distance. Eyes broad, their height about  $1.8 \times$  their greatest width. Vertex raised arcuately above the tops of the eyes. Ocelli below the vertex crest, and just below a line drawn between the eyes at their point of nearest proximity; ocelli in a close, flat triangle; post-ocellar line is to ocello-ocular line about as 5:4. There is a faint groove from the hind ocelli to the eye margins. Antennae of moderate length, the first 4 segments in a ratio of about 4:1:8:5, segment 3 equal to about  $1.3 \times$  upper interocular distance.

Pronotum very short, its posterior margin broadly angulate. Postnotum without striations, overhung medially by the very convex metanotum (fig. 70). Propodeum short, its median line weakly impressed above; slope, in profile, somewhat steepened behind; postero-laterally the propodeum is roundly protuberant on each side; posterior rim sharply rectangular postero-laterally. Front tarsus with a comb of blade-like spines; there are 3 comb-spines on the basitarsus, the apical one subequal in length to the 2d tarsal segment. Apical tarsal segments with a row of from 5 to 8 small spines beneath. Claws of the front tarsus bifid, the inner ray truncate; remaining claws dentate, the tooth short, erect, acute. Fore wing with the marginal cell long, the radial vein evenly arched; 1st transverse cubital vein strongly arched; the 2d nearly straight; the 3d straight or slightly arched.

MALE.—Length 16 (13–21) mm. Color varying from dark castaneous to black, with an area of pale castaneous or orange on the 3d abdominal segment, which may consist of paired semicircular spots near the base of the tergite, or a band, which may in some cases encircle the entire segment; this is, of course, less conspicuous when the entire insect is brownish, but very evident when it is black. The legs and antennae vary like the body from castaneous to black; the tegulae and inner and outer orbits are always

brownish; there is no yellow on the body except sometimes a faint indication of it on the posterior pronotal margin. Wings uniformly fuliginous, strongly violaceous. Pubescence pale or dark, depending on the color of the integument, rather iridescent; erect hair of the body much as in the female.

Head much broader than high, transfacial distance  $1.3 \times$  facial distance (this is measured exclusive of the labrum, which is normally well exerted). Clypeus separated from the eyes on each side by a very narrow strip; clypeus  $2.3 \times$  as broad as high, its apical margin rounded. Front broad, but because of the width of the eyes, middle interocular distance is only about  $.56 \times$  transfacial distance. Middle interocular distance about equal to the lower; the upper about  $.85$  to  $.9 \times$  the lower. Ocelli located below the vertex crest, in a small, flat triangle; post-ocellar line is to ocello-ocular line about as 2:3. Scape small, the flagellum long and heavy, the segments except the first and last concave above and convex below; first 4 antennal segments in a ratio of about 7:2:13:11, segment 3 about  $2.3 \times$  as long as thick and this segment alone equal to slightly over half the upper interocular distance. Eyes very broad, each about  $1.5 \times$  as high as broad.

Pronotum short, much broadened behind, its posterior margin angulate. Scutellum and metanotum very convex, the latter overhanging the pronotum on the median line. Propodeum short, steeply and broadly declivous behind, the posterolateral angles somewhat protuberant; propodeum also with small humps in front of the spiracles. Legs long, spinose; longer spur of hind tibia about  $.6$  the basitarsus. Venation as in the female.

Abdomen stout, decidedly flattened dorsally; first and second tergites very broad, the abdomen tapering thereafter. Sternite 6 with a broad, rather shallow emargination; subgenital plate in profile with the median elevation very slightly arcuate. Genitalia (fig. 43) with the aedoeagus slender, the apex broadly flabellate; parapenials rather stout, a little shorter than the aedoeagus; basal hooklets double, often with some indication of a third tooth between the usual two; digiti rather variable in shape, subspatulate, clothed only with some very small, inconspicuous setae, which are absent from the inner margin; parameres slender, the outer side with numerous small setae, the inner side with a few setae near the base.

*Biology.*—This form is usually taken on flowers; it is known to visit *Cicuta maculata*, *Polytacia nuttallii* (Umbelliferae), *Ampelopsis arborea* (Vitaceae), and *Euphorbia marginata* (Euphorbiaceae). No information is available regarding the host spiders of this species; I assume it preys upon large orb-weavers.

*Distribution.*—Typical *algidus* occurs throughout the Austroriparian and Carolinian faunas of the eastern United States, from eastern Texas and Florida to North Dakota, Michigan, and Massachusetts.

*Specimens seen*: 88 (55 ♀♀, 33 ♂♂). The following records are marginal: MASSACHUSETTS: Bristol Co., 1 ♂, Taunton [MCZ]; CONNECTICUT: Litchfield Co., 1 ♀, Colebrook [MCZ]; New London Co., 2 ♀♀, Lyme, Aug. [USNM]; NEW YORK: New York City, 1 ♀ [ANSP]; NEW JERSEY: Burlington Co., 1 ♀, Browns Mills, 28 June [ANSP]; MARYLAND: Charles Co., 4 ♀♀, Indian Head, Aug. [USNM]; VIRGINIA: Nelson Co., 1 ♀, 21 Aug. [USNM]; WEST VIRGINIA: 1 ♀ [ANSP]; MICHIGAN: Midland Co., 1 ♂, 23 July [MCZ]; MINNESOTA: Chisago Co., 1 ♀, 10 ♂♂ [Minn.]; NORTH DAKOTA: Traill Co., 1 ♀, 19 July [Minn.]; SOUTH DAKOTA: Lincoln Co., 1 ♀, Canton, 27 Aug. [SDS]; IOWA: Woodbury Co., 2 ♂♂, Sioux City [USNM]; TEXAS: Denton Co., 2 ♀♀, Shiloh, 4-8 Oct. [JEG]; Bexar Co., 1 ♀, 18 June [JEG]; Harris Co., 1 ♀, Houston, 11 Aug. [KVK]; LOUISIANA: Cameron Co., 1 ♀, Johnsons Bayou, 27 July [USNM]; ALABAMA: 1 ♀, Mobile, Aug. [CU]; FLORIDA: Pinellas Co., 1 ♀, Gulfport, Sept. [MCZ].

1b. *Poecilopompilus algidus marcidus* (Smith) new combination

*Pompilus marcidus* Smith, 1862, Journal Ent., 1: 395-396. [Type: ♀; Orizaba, Mexico; British Museum (not seen by author).]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 110.—Cresson, 1869, Proc. Boston Soc. Nat. Hist., 12: 371.—Cameron, 1893, Biol. Centr.-Amer., Hymen. II, p. 211.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 300.

*Pompilus willistoni* Patton, 1879, Bull. U. S. Geol. Survey, 5: 352. [Type: ♀; Northwestern Kansas, 8 Sept. 1877 (S. W. Williston); location of type unknown, possibly no longer extant.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 336.

*Batozonus marcidus* Banks, 1925, Bull. Mus. Comp. Zool., 67: 338. [Panama].

*Batozonus marcidus* Bradley, 1944, Notulae Naturae, Acad. Nat. Sci. Phila., no. 145, p. 10.

*Batozonus willistoni* Banks, 1944, Bull. Mus. Comp. Zool., 94: 168.

The much paler coloration at once separates this subspecies from typical *algidus*; the propodeum is smooth, at most very slightly protuberant posterolaterally; the wings are brownish tinged with luteous toward the costal margin, never deep fuliginous or bright yellowish as in the preceding and following subspecies. I have relatively little material of this subspecies before me, but specimens from western Kansas and Colorado appear to differ little from specimens from Arizona, and from Mexico and Guatemala. For this reason I have placed Patton's *willistoni* in synonymy with the Mexican and Central American *marcidus* Smith. Judging from the description, Patton's type may have been

an intermediate between this form and typical *algidus*; it is clear, however, that it is an *algidus*, and not an *interruptus*, as suggested by Banks (1944).

FEMALE.—Length 19 (17–22) mm., averaging slightly smaller than the nominate subspecies. Head castaneous, except the tips of the mandibles black, some black in the ocellar triangle, and usually some black near the antennal bases or base of the clypeus; lower front often suffused with yellowish; antennae castaneous or yellowish, except the apical 4 to 6 segments, which are black. Thorax, propodeum, and legs mostly castaneous, often somewhat blackish on the anterior part of the mesonotum, the postnotum, and along the pleural sutures; posterior margin of pronotum and lateral corners of propodeal rim yellowish; tibiae and tarsi sometimes suffused with yellowish. Basal two segments of abdomen castaneous, somewhat blackish along their posterior margins; tergite 3 with basal yellowish markings, the abdomen caudad of this either yellowish or pale castaneous, or a mixture of the two. Wings wholly brownish-fuscous, slightly violaceous, suffused with yellowish along the costal margin, often somewhat paler in the vicinity of the 3d discoidal cell; outer margins of wings banded with fuscous. Pubescence of body very light, silvery or somewhat golden, inconspicuous; erect hair also pale.

Features of the head much as in typical *algidus*; eyes about twice as high as their greatest breadth; 3d antennal segment from 1.3 to 1.5  $\times$  upper interocular distance. Thorax, including the legs and the venation, as in the typical subspecies. Propodeum with the slope low and even, scarcely or not at all protuberant on the sides of the posterior slope; surface not or very slightly elevated in front of the spiracles.

MALE.—Length 15 (13–17) mm. Head castaneous, often suffused with yellowish below; tips of mandibles black, front with a large black median blotch above, separated from the eyes on each side, extending from the ocellar triangle nearly to the antennal bases, with a pale spot in the center, just in front of the anterior ocellus; antennae castaneous, except segments 8 to 13, which are infuscated, the tip of segment 13 reddish-brown. Thorax, legs, and propodeum mostly castaneous; posterior margin of pronotum, metanotum, usually the scutellum, and spots on the corners of the propodeal rim, yellow; tegulae and sometimes a small part of the mesonotum yellowish; there is a variable amount of black on the front part of the mesonotum, the postnotum, the pleura, especially along the sutures, and sometimes also on the propodeum, the scutellum, and bases of the legs. Basal one or two segments of abdomen castaneous, the tergites darker behind; remainder of abdomen varying from pale castaneous to yellow, or a mixture of the two. Wings brownish-fuscous to brownish-hyaline, the outer margins narrowly fuscous, the costal margin tinged with yellowish, the wing somewhat paler in the vicinity of the 3d discoidal cell. Pubescence as in female. Front with a patch of short, pale hairs just above the antennal bases, and another on the vertex; pronotum and mesopleura with considerable short, pale hair;



propodeum with considerable longer hair. Morphological features as in the nominate subspecies, except for the propodeum, which has much more even contours, being very barely protuberant at the sides of the posterior slope.

*Biology*.—I have taken this subspecies on the flowers of *Cleome serrulata* (Capparidaceae), *Clematis* (Ranunculaceae), and *Azicennia nitida* (Verbenaceae); it has also been taken on *Ptelea trifoliata* (Rutaceae), and pollenia on the tarsi of several specimens indicate that it also visits *Asclepias*.

*Distribution*.—This form occurs from Central America north to southern and western Texas, the western parts of Kansas, Nebraska, and South Dakota, eastern Colorado, New Mexico, and southern Arizona.

*Specimens seen*: 26 (14 ♀♀, 12 ♂♂). TEXAS: Bexar Co., 3 ♀♀, 2 ♂♂, Sept.-Oct. [JEG]; Bastrop Co., 1 ♀, 1 ♂, Apr., Sept. [JEG]; Cameron Co., 1 ♂, Port Isabel, 23 June [HEE]; KANSAS: 1 ♀ (no further data) [UK]; NEBRASKA: 2 ♀♀ (no further data) [MCZ]; Thomas Co., 1 ♂, Halsey, 3 Sept. [Minn.]; SOUTH DAKOTA: Beadle Co., 1 ♀, Huron, 20 Aug. [SDS]; Brule Co., 1 ♂, Chamberlain, 31 Aug. [SDS]; COLORADO: Larimer Co., 2 ♂♂, Poudre Canyon, 5200 feet, 21 Aug. [HEE]; NEW MEXICO: McKinley Co., 1 ♂, Fort Wingate, 8 Aug. [ANSP]; ARIZONA: Southern part, 2 ♂♂ [MCZ, UK]; Cochise Co., 1 ♀, Carr Canyon, Huachuca Mts., 7 Aug. [CIS]; 1 ♀, 8 mi. No. of Douglas, 30 July [OSC]; Pima Co., 1 ♀, Baboquivari Mts., Oct. [CAS]; 1 ♂, Santa Rita Mts., 11 Aug. [JEG]; 1 ♀, Sabino Canyon, Santa Catalina Mts., 23 Aug. [CU]; MEXICO: 1 ♀ (no further data) [ANSP]; NICARAGUA: 1 ♀, Coseguina, 6 July [CAS].

1c. *Poecilopompilus algidus coquilletti* (Provancher) new combination

*Pompilus coquilletti* Provancher, 1889, Faune Ent. Canad., Hymen., Add. & Corr., p. 261. [Type: ♂; Anaheim, Calif. (Coquillett); Q.P.M. white label no. 27, yellow label no. 1422.]<sup>45</sup>

*Anoplius (Batozonus) algidus* "Race?" Viereck, 1906, Trans. Amer. Ent. Soc., 32: 232. [Oak Creek Canyon, Ariz.]

*Batozonus coquilletti* Rohwer, 1916, Canad. Ent., 48: 372.

*Batozonus flavipennis* Banks, 1921, Ann. Ent. Soc. Amer., 14: 20. [Type: ♀; Salt Lake City, Utah; M.C.Z. no. 13,660.] New synonymy.

<sup>45</sup> There is a second "type" of this species in the U.S.N.M., no. 1989, a ♂ from Los Angeles Co., Calif. (Coquillett). Provancher does not state exactly the type locality of his species, but does make the following statement: "M. D. W. Coquillett, d'Anaheim, Californie... no is ayant fait un envoi d'hyménoptères de sa localité, nous y avons trouvé ce bel insecte...." On this basis I accept the Anaheim specimen as type. In any case, the two specimens are extremely similar, and there can be no doubt that they represent the same form.

In this far western subspecies of *algidus* the wings are for the greater part yellowish, with a narrow band of fuscous along the outer margins; another striking character is the color of the abdomen: the basal two segments are dark, castaneous or sometimes in part blackish, while the segments beyond the second are contrastingly paler, more or less yellowish.

FEMALE.—Length 18 (15–20) mm.; color rather variable, chiefly pale castaneous marked with yellow and fuscous. Antennae yellow-brown or reddish-brown, the apical 6 segments blackish. Head castaneous, the lower front and orbits suffused with yellowish; tips of mandibles black, upper margin of clypeus often marked with black, ocellar triangle marked with at least a little black, the front often with a large black median spot extending from the ocelli to the antennal bases in the middle of which is a pale spot in front of the anterior ocellus; vertex and occiput either pale or marked with black. Ground color of thorax and propodeum varying from almost wholly fuscous to almost wholly castaneous; yellow markings are always present on the lateral corners of the propodeal rim, the metanotum, and the posterior margin of the pronotum. Legs wholly castaneous, somewhat tinged with yellowish, or with the coxae, trochanters, and basal half of the femora blackish. First abdominal segment varying from castaneous to blackish; tergite 2 yellowish at base, at the posterior margin castaneous or infuscated; sternite 2 wholly castaneous or fuscous; remainder of tergites yellowish, with a darker band of castaneous or fusco-ferruginous along the posterior margin; remaining sternites varying from castaneous to yellowish. Wings bright flavo-hyaline, the setulae reflecting golden; outer margins of both pairs of wings with a narrow band of light fuscous. In other features this subspecies does not differ from *marcidus*; the propodeum has smooth contours as in that form.

MALE.—Length 15 (13–17) mm.; color in general not unlike that of the darker females. Antennae castaneo-ferruginous, the apical segments more or less infuscated, the tip of the last segment reddish. Head castaneous, more or less suffused with yellowish on the lower front and outer orbits; tips of mandibles black; sometimes a spot on the base of the mandibles and a streak along the upper margin of the clypeus black; front with a large median black area, extending from the antennal bases to the vertex, within which is a pale spot in front of the anterior ocellus; occiput black, this black either connected with that on the front and vertex or separated by a narrow band of pale. Thorax and propodeum mostly blackish; slope of pronotum more or less castaneous followed by a yellow band along the posterior margin; tegulae yellowish or pale castaneous; mesonotum marked with brownish posteriorly; scutellum with a spot of castaneous or yellowish; metanotum conspicuously marked with yellow; lateral corners of propodeal rim yellow; legs black at base, yellowish-brown beyond the basal two-thirds of the femora. Abdomen colored as in the female, always con-

trastingly paler beyond the basal two segments. Wings flavo-hyaline or pale yellowish-brown, the outer margins narrowly banded with pale fuscous. Other features as in typical *algidus*, except for the propodeum, which has much more even contours, the sides of the posterior slope being barely if at all protuberant.

*Distribution*.—This apparently uncommon form occurs in the Upper Sonoran fauna from southern California and the northern parts of Arizona and New Mexico to Salt Lake, Utah, and Butte Co., California.

*Specimens seen*: 15 (6 ♀♀, 9 ♂♂). NEW MEXICO: Sandoval Co., 2 ♂♂, Jemez Springs, July (J. Woodgate) [MCZ, CU]; ARIZONA: Coconino Co., 2 ♂♂, Oak Creek Canyon, 6000 feet, July (F. H. Snow) [UK]; UTAH: Juab Co., 1 ♀, Trout Creek, Irapah Mts., 9 Aug. (T. Spalding) [AMNH]; Salt Lake City, 1 ♀ [MCZ]; CALIFORNIA: Butte Co., 1 ♀, Feather River, 15 Oct. [CU]; Los Angeles Co., 1 ♂ (Coquillett) [USNM]; Orange Co., 1 ♂, Anaheim (Coquillett) [QPM]; 3 ♀♀, 3 ♂♂, Newport Bay, May-Aug., 2 ♀♀ on *Eriogonum* (P. D. Hurd) [CIS].

2a. ***Poecilopompilus interruptus interruptus*** (Say)

(Plate XIV, fig. 44.)

*Ceropales interrupta* Say, 1835, Boston Jour. Nat. Hist., 1: 365. [Type: ♂; Indiana (no further data); (no longer extant).]—Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 180.

*Pompilus naxus* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 105. [Type: ♀; Georgia (no further data); A.N.S.P. no. 426.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 304.

*Pompilus interruptus* Cresson, 1872, Trans. Amer. Ent. Soc., 4: 203. [Texas.]—Fox, 1894, Proc. Calif. Acad. Sci., (2)4: 99. [Baja Calif.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 296.—Peckham and Peckham, 1898, Wise. Geol. Nat. Hist. Survey Bull. no. 2, p. 152. [Biology.]—Birkmann, 1899, Ent. News, 10: 244. [Lee Co., Texas.]

*Pompilus ichneumoniformis* Patton, 1879, Bull. U. S. Geol. Survey, 5: 351. [Type: ♀; Northwestern Kansas, 8 Sept. 1877 (S. W. Williston); (location of type, if still extant, not known to author).] [Nec Smith, 1864.]

*Pompilus ichneumonoides* Dalla Torre, 1897, Cat. Hymen., VIII, p. 295. [New name for *ichneumoniformis* Patton.]

*Poecilopompilus naxus* Howard, 1901, The Insect Book, pl. XI, fig. 18.—Ashmead, 1902, Canad. Ent., 34: 82. [Selected genotype.]

*Agenioxenus rufiventris* Ashmead, 1902, Canad. Ent., 34: 137. [Nec *Ceropales rufiventris* Walsh; misidentification.]

*Batazonus interruptus* Banks, 1912, Ent. News, 23: 108. [At flowers of *Ceanothus* in Virginia.]—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc.,

52: 130. [N. C.]—Brimley, 1938, Insects No. Carolina, p. 434.—Banks, 1944, Bull. Mus. Comp. Zool., 94: 167.—Dreisbach, 1949, Ent. Amer., (n.s.) 29: 38, pl. III, fig. 12.

*Batazonus nazus* Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 130.—Brimley, 1938, Insects No. Carolina, p. 434.

*Batazonus ichneumonoides* Banks, 1944, Bull. Mus. Comp. Zool., 94: 168. [Considered synonym of *nazus* Cresson.]

There can be no doubt from the description, that Say had before him one of the darker males when he described this species; this has led Cresson and others to use Say's name for the melanic northeastern form which Banks has named *cressoni*. Nevertheless certain statements in the description make it clear that Say's type would have to be assigned to the subspecies which Cresson called *nazus*; for example: "posterior band [of yellow on the propodeum] clavate each side on the pleura," and "coxae varied with yellow." *Interruptus interruptus* is so exceedingly variable a form in coloration as to almost defy description; it is probably the most brightly colored of our native Pompilidae, often suggesting certain species of *Polistes*, particularly *cxrelamans* Viereck, *bellicosus* Cresson, and *apachus* Saussure. Specimens from the Far West are often much paler than those from the East, but not constantly so.

FEMALE.—Length 14 (11–18) mm.; color very variable, consisting of liberal yellow markings on a background of castaneo-ferruginous which is often suffused with a certain amount of black. Antennae castaneous at base, the apical 6 to 8 segments more or less infuscated. Mandibles castaneous or yellowish, the apices blackish, sometimes with a black spot at base. Clypeus castaneous, often a little yellow on the sides, rarely wholly yellow, sometimes the upper margin and rarely a central spot blackish. Lower front, inner orbits broadly, and outer orbits narrowly, yellow; upper front with a large median blotch extending from the antennal bases to the vertex, and connected at the vertex with the tops of the eyes by short laterally extending bands, and with the occiput by a short backward extending band; in color this blotch varies from castaneous to black, and is often a composite of both colors. Occiput and bases of maxillae and labium castaneous and/or blackish. Greater part of pronotum castaneous and/or black, marked with yellow as follows: the neck; a broad band along the posterior margin, extended along the sides to the anterior lateral margin or nearly so, then usually extended mesad along the anterior margin almost to the markings on the neck, but never connected with these. Tegulae yellow or castaneous. Mesonotum castaneous and/or black, almost always marked with yellow posteriorly, the yellow often extended forward as two diverging rami from the middle posterior margin. Scutellum castaneous and/or black, the sides and

sometimes the entire posterior half yellow. Metanotum wholly yellow, or the extreme sides castaneous or black; postnotum castaneous or black. Propodeum castaneous and/or black, the posterior slope nearly always with a transverse yellow band or mostly yellow; posterior rim dark medially, otherwise yellow, the yellow commonly more or less extended onto the lower metapleura. Upper metapleuron also usually with a yellow spot, the sclerite otherwise castaneous and/or black, as is also the mesopleuron; the latter has a large subtriangular area at the lower posterior corner yellow, also rarely a spot just beneath the tegulae yellow. Coxae castaneous and/or black, always variegated with at least a small amount of yellow. Trochanters and greater part of femora castaneous and/or black; apex of femora and remainder of legs pale castaneous more or less suffused with yellowish, or mostly yellowish. Abdomen occasionally wholly castaneo-ferruginous, but usually with narrow to broad basal yellow bands on some or all of the tergites; posterior margin of some or all of the tergites sometimes narrowly to broadly infuscated. Front wings subhyaline to rather heavily infuscated, always suffused with yellowish at least along the costal margin, often over much of the wing; usually with a noticeable pale area in the vicinity of the 3d discoidal cell; outer margins with a pale fuscous band, often extended through the submarginal cells to the first discoidal cell; hind wings flavo-hyaline, the outer margin lightly infuscated.

Body clothed with a very fine pubescence, varying from pale brownish to silvery. Scape without erect hairs; short, pale erect hairs are present on the clypeus, front, vertex, temples, propleura, front coxae, pronotum, pleura, metanotum, propodeum, and first abdominal tergite.

Clypeus slightly over twice as broad as high, its apical margin slightly arcuately concave, its basal margin sinuate. Front broad, middle interocular distance about  $.62 \times$  transfacial distance. Eyes converging above, though less strongly than in *algidus*; middle interocular distance subequal to lower interocular distance; upper interocular distance  $.65$  to  $.72 \times$  the lower. Vertex raised very slightly above the tops of the eyes, arcuate or nearly straight. Ocelli well below the vertex crest and about on a line drawn between the eyes at their point of greatest proximity; lateral ocelli connected with the eyes by a very faint depression; ocelli forming a flat triangle, post-ocellar line is to ocello-ocular line about as 4:3. Antennae long, the first 4 segments in a ratio of about 4:1:9:6, segment 3 subequal to or slightly greater than upper interocular distance.

Pronotum broadly angulate or subangulate behind. Postnotum short, concealed medially by the overhanging metanotum. Propodeum with very even contours, the median line not impressed; posterior rim prominent, its lateral corners obtusely angulate. Front tarsus with a comb of short spines, 4 of which are on the basitarsus, the apical one from half to three-fourths the length of the 2d tarsal segment. All the claws with  $\tau$  short erect tooth about half-way out. Fore wing with the marginal cell long and narrow, the radial vein evenly arched; 2d submarginal cell generally wider but not so high as the 3d.

MALE.—Length 11.5 (8–15) mm.; color not dissimilar to that of the female, but generally more liberally marked with yellow. Scape yellowish; flagellum reddish- or yellowish-brown, at most slightly infuscated apically. Palpi yellowish; mandibles yellowish, the tips and sometimes the base blackish. Clypeus yellow, usually with a median spot or band castaneous or black. Front and temples yellow; upper front with a large blotch of castaneous and/or black extending from the antennal bases to the vertex and connected to the tops of the eyes by a broad band, sometimes connected to the castaneous and/or black of the occiput by a band. Ground color of thorax varying from pale castaneous to black, often partly each, marked with yellow as in the female, except that the markings are frequently more ample. Coxae marked with a variable amount of yellow; trochanters and bases of femora castaneous or blackish; remainder of legs pale castaneous varied with yellow. Abdomen marked much as in the female, the alternate yellow and castaneous-and/or-black bands usually pronounced; sometimes, however, the abdomen is almost uniformly yellowish, dull ferruginous, or fuscous. Wings colored as in the female. Pubescence pale, reflecting silvery. Head and thorax with short, pale, erect hairs as in the female.

Head broader than high, transfacial distance about  $1.25 \times$  facial distance. Clypeus not as wide as the lower front, separated from the eye on each side by a space at least as great as the minimum malar space; clypeus about twice as broad as high, lower margin broadly truncate, upper margin strongly sinuate. Front broad, middle interocular distance about  $.61 \times$  transfacial distance; eyes less broad than in *algidus*, each eye about  $1.8 \times$  as high as broad. Middle interocular distance about  $1.1 \times$  lower interocular distance; upper interocular distance from  $.95$  to  $1.0 \times$  the lower, the eyes thus scarcely converging above. Ocelli in a flat triangle; post-ocellar line subequal to or slightly less than ocello-ocular line. Scape very short, hardly longer than thick; flagellum long and rather heavy; first 4 antennal segments in a ratio of about 10:3:18:17; segment 3 about  $2.3 \times$  as long as thick, alone equal to a little over half the upper interocular distance.

Pronotum very short, its posterior margin angulate. Propodeum short, with even contours; slope slightly more steep behind; posterior rim prominent, its lateral angles obtuse. Legs long, spinose; longer spur of hind tibia about three-fourths the length of the basitarsus. Venation as in female.

Abdomen less markedly flattened dorsally than in *algidus*. Sternite 6 with a shallow U-shaped emargination; subgenital plate more tapering behind than in *algidus*, the apex narrowly rounded. Genitalia (fig. 44) with the aedeagus slender, the apex narrowly bilobed, the shaft with a few minute setulae; parapenials simple, slender; basal hooklets double, the upper hook prolonged upward; basis volsellaris with a few long setae; digiti elongate-spatulate, with scattered small setae toward the outer sides; parameres slender, slightly curved, with a group of long setae near the base on the inner margin.

*Biology.*—This species was studied by the Peckhams (1898), who found it preying upon *Epeira strix* (i.e., *Epeira foliata* Fourcroy), and nesting in a short gallery in the earth, only a little over an inch in length. A specimen from Baldwin, Kansas [USNM] is pinned with an *Argiope aurantia* Lucas [det. B. J. Kaston]. The species appears to have but one generation a year in the North, being on the wing from July to early September; farther south it occurs throughout the warmer months of the year and undoubtedly has at least two generations. It has been collected on a wide variety of flowers, among which are *Daucus carota*, *Pastinaca sativa*, *Cicuta maculata*, *Polytaenia nuttallii*, *Ampelopsis arborca*, *Artemisia nitida*, *Tamarix gallica*, *Cleome serrulata*, *Polygonum* sp., *Solidago* spp., *Baccharis glutinosus*, *Helianthus annuus*, *Asclepias* spp., and *Melilotus alba*.

*Distribution.*—This form occurs throughout the Lower Austral Zone transcontinentally, and through much of the Upper Austral except in the Far West, occurring from the southern limits of the United States north to central California, Utah, South Dakota, Michigan, southern Ontario, and southern New Jersey. In the northeastern states it is replaced by subspecies *cressoni* Banks.

*Specimens seen:* 352 (172 ♀♀, 180 ♂♂). There are many records from Florida, the Gulf States, and the states bordering Mexico; the species undoubtedly occurs in parts of Mexico, though I have seen no Mexican specimens. The following records define the northern periphery of its range as far as present data indicate: NEW JERSEY: Cape May Co., 3 ♀♀, 8 July [ANSP]; DELAWARE: 1 ♂ [ANSP]; VIRGINIA: Fairfax Co., 1 ♀, Dunn Loring, 26 July [KVK]; OHIO: Delaware Co., 1 ♀, 2 Aug. [RWS]; ONTARIO: 1 ♀, Pt. Pelee, 8 July [CNC]; MICHIGAN: Kalkaska Co., 1 ♂, Aug. [MCZ]; WISCONSIN: 1 ♂, Milwaukee, 18 Aug. [MCZ]; ILLINOIS: 3 ♀♀, 2 ♂♂, Chicago, July [MCZ]; IOWA: Woodbury Co., 3 ♀♀, 1 ♂, Sioux City, July-Sept. [USNM]; SOUTH DAKOTA: Brule Co., 1 ♀, Chamberlain, 22 July [SDS]; WYOMING: Weston Co., 1 ♂, Clifton, 15 Aug. [Minn.]; UTAH: Utah Co., 1 ♀, 1 ♂, Utah Lake, 16 Aug. [HEE]; CALIFORNIA: Yolo Co., 1 ♂, Davis, July [CIS].

2b. *Poecilopompilus interruptus cressoni* (Banks)

*Pompilus interruptus* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 104. [*Nec* Say, 1835; misidentification.] [Mass., Conn., Pa., Del.!—Cresson, 1887, Synopsis Hymen., Suppl. Vol., Trans. Amer. Ent. Soc., p. 271.]

*Poecilopompilus interruptus* Howard, 1901, The Insect Book, pl. V, fig. 1.

*Anoplus interruptus* Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.

*Arachnoproctonus interruptus* Rohwer, Conn. Geol. Nat. Hist. Survey Bull. 22, p. 632.—Britton, 1920, Conn. Geol. Nat. Hist. Survey Bull. 31, p. 336.

*Batazonus interruptus* Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 985. [N. Y., many localities.]

*Batazonus interruptus* var. *cressoni* Banks, 1944, Bull. Mus. Comp. Zool., 94: 167. [Type: ♀; Holliston, Mass., July (Banks); M.C.Z. no. 25,729.]

This form differs from typical *interruptus* only in the consistently darker coloration; it inhabits the northeastern United States, north and east of the range of the typical subspecies.

FEMALE.—Length 13.5 (10.5–16.5) mm.; color black, with limited markings of yellow and ferruginous. Basal 3 or 4 segments of antennae castaneous, the remaining segments blackish above, castaneous below. Mandibles black at base and apex, in the middle ferrugino-castaneous. Clypeus ferrugino-castaneous, a large black blotch in the center connected with the black upper margin. Front, vertex, and occiput black; inner and outer orbits bordered with yellowish and/or castaneous. Thorax and propodeum black; tegulae castaneous; the following are yellow: posterior margin of pronotum, usually a spot on each side of the scutellum, a spot at the center of the metanotum, the lateral corners of the propodeal rim, and sometimes a spot on the lower mesopleura. Coxae black, except that the apex of the front pair may be brownish; trochanters black; basal one-third to four-fifths of the femora black; remainder of legs pale castaneous, the apices of the tarsal segments darker; hind tibiae usually somewhat infuscated apically. Abdomen for the greater part blackish or dusty-ferruginous, the apices of most of the segments and sometimes all of the last three segments paler, dusky ferrugino-castaneous; occasionally there is a poorly developed yellowish band or pair of spots on the 2d and/or 3d tergite. Fore wings flavo-hyaline or light yellowish-brown, with a fuscous band along the margin, the fuscous extending across the submarginal cells and first discoidal cell to the basal vein; hind wings flavo-hyaline, the outer margin broadly, lightly infuscated. Pubescence of body light brownish to silvery; erect hairs pale, distributed as in the nominate subspecies.

MALE.—Length 11.5 (8–15) mm.; color much like that of the female. Scape yellowish below; flagellum wholly ferruginous or somewhat castaneous, the upper half of the segments sometimes infuscated. Mandibles black at base, yellowish in the middle, reddish at apex. Clypeus usually in greater part black, bordered with yellow below and on the sides. Front, vertex, and occiput black; inner and outer orbits yellowish and/or castaneous, the pale coloration of the inner orbits wider below, sometimes meeting beneath the antennal bases. Thorax and propodeum black; tegulae and wing-bases castaneous; yellow are: the neck, the posterior pronotal margin, often a spot on each side of the scutellum, a conspicuous spot on the metanotum medially.



the lateral corners of the propodeal rim, a spot of variable size and shape on the lower mesopleuron, rarely a spot on the upper metapleuron, rarely spots or a feeble band on the slope of the propodeum. Coxae black, the apex of the front coxae castaneous or yellowish, the hind coxae rarely marked with a little yellow above; trochanters and greater part of the femora black; apices of femora, and the tibiae, pale castaneous, except the apex of the hind tibiae somewhat infuscated, and the bases of the middle and hind tibiae on the outside yellowish; spurs yellowish; tarsi yellowish, the apices of the segments, and the entire apical segment, darker. Abdomen varying from wholly blackish to wholly dusky castaneo-ferruginous, occasionally obscurely banded, often with a narrow band or paired spots of yellow on tergite 2 and/or tergite 3. Wings subhyaline, suffused with yellowish at least along the costal margin of the fore wing, the outer margins with a band of pale fuscous which is extended across the submarginal cells and first discoidal cell of the fore wing as in the female.

*Biology*.—A female from Boston, Mass. [CAS] is pinned with the spider *Epcira trifolium* Hentz, ♀ [det. B. J. Kaston]. This form is often taken in sandy places, or in open areas on the blossoms of flowers; it has been taken on *Pastinaca sativa*, *Solidago*, and *Spiraea*. Males appear in the field in mid-June, the females a week or two later; the latest records are for mid-September. I presume there is but one generation a year.

*Distribution*.—This form inhabits the Carolinian fauna and portions of the Alleghanian fauna of the northeastern United States, from eastern Ohio and northern Virginia to Massachusetts; a single female from East Sister Island, Ontario, Canada, also appears to belong here.

*Specimens seen*: 86 (35 ♀♀, 51 ♂♂). The following records are marginal: MASSACHUSETTS: Suffolk Co., 2 ♀♀, Boston, Aug. [CAS]; Hampshire Co., 1 ♀, 1 ♂, Cummington, 26-31 Aug. [HEE]; NEW YORK: Putnam Co., 5 ♀♀, Putnam Valley, 5-12 Sept. [CU, HEE]; Tompkins Co., 3 ♀♀, 5 ♂♂, Ithaca, July [HEE, CU, USNM]; Monroe Co., 1 ♂, Rochester Jct., 7 July [CU]; ONTARIO: 1 ♀, E. Sister Isl., July [MCZ]; OHIO: Lawrence Co., 1 ♂, 6 Sept. [RWS]; PENNSYLVANIA: Huntingdon Co., 1 ♂, Charter Oak, 11 July [MCZ]; DISTRICT OF COLUMBIA: 2 ♂♂, Washington, July-Aug. [USNM, Minn.]; VIRGINIA: Fairfax Co., 1 ♀, 1 ♂, Falls Church, June-July (Banks) [MCZ]; DELAWARE: 1 ♀ [ANSP]; NEW JERSEY: Cape May Co., 2 ♂♂, Cape May, 5 Aug. [ANSP].

#### VIII. Genus **TACHYPOMPILUS** Ashmead

*Tachypompilus* Ashmead, 1902, *Canad. Ent.*, 34: 83. [Type: *Tachypompilus abbotti* Ashmead, 1902 (=  *analis* Fabricius, 1781); monobasic].—Haupt,

1930. Mitt. Zool. Mus. Berlin, 15: 606.—Banks, 1934, Proc. Amer. Acad. Arts and Sci., 69: 84, 86. [Philippine species.]
- Arachnoproctonus* Ashmead, 1902, Canad. Ent., 34: 83. [Type: *Ceropales ferruginca* Say, 1824; monobasic.] [Nec Howard, 1901.] New synonymy.—Banks, 1911, Jour. N. Y. Ent. Soc., 19: 224.—Dreisbach, 1949, Ent. Amer., (n.s.) 29: 6, 8 (but not pl. IV, fig. 17).
- Arachnoproctonus* Rau and Rau, 1918, Wasp Studies Afield, p. 78. [Typographical error for *Arachnoproctonus* Ashmead.]
- Balanoderes* Haupt, 1929, Mitt. Zool. Mus. Berlin, 15: 119, 155. [Type: *Sphex analis* Fabricius, 1781; designated by Haupt, 1929.] [Placed in synonymy with *Tachypompilus* by Haupt, 1930.]
- Afropompilus* Arnold, 1956, Ann. Transvaal Mus., 18: 107. [Type: *Pompilus ignitus* Smith, 1855; original designation.] New synonymy.
- Arachnoproctonus* Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 129. [Typographical error for *Arachnoproctonus* Ashmead.]
- Zarachnoproctonus* Pate, 1946, Trans. Amer. Ent. Soc., 72: 130. [New name for *Arachnoproctonus* Ashmead, 1902, nec Howard, 1901.] New synonymy.

This distinctive and showy genus has been given tribal rank by Arnold.<sup>46</sup> I consider it closely related to *Anoplius* and *Pompilus*, and unworthy of such rank. In many parts of the world species of *Tachypompilus* form a conspicuous element among the Pompilini. The genus is not, however, a large one, nor do any of the species seem to be abundant. Unfortunately the North American forms have always been incorrectly placed in the genus *Arachnoproctonus*.

In the American fauna, the species of *Tachypompilus* are apt to be confused only with those of *Poecilopompilus*, which are also brightly colored. There are, however, many structural differences between the genera, and I do not consider them closely related, as does Banks.<sup>47</sup> The postnotum of *Tachypompilus* is very short, and not expanded on the sides; the front tibiae are not spinose above. The blunt tubercle just above the bases of the antennae (figs. 54 and 55) forms the best single character for identifying the genus. The American species are predominantly castaneous or ferruginous, with variable amounts of black.

<sup>46</sup> Arnold, George, 1937, Ann. Transvaal Mus., 19: 76.

<sup>47</sup> Banks, Nathan, 1947, Bull. Mus. Comp. Zool., 99: 381.

*Generic characters.*—Species of moderate or rather large size, 7 to 30 mm. in length. Color in small or large part castaneo-ferruginous, the only other color which may be present being black. Body smooth, the pubescence very fine, erect hair sparse to moderately abundant; pygidium of female setose, but none of the setae bristly.

Mandibles with a single strong tooth on the inner margin, some females with a weak second tooth basad of this. Clypeal disc convex, the apical margin truncate or emarginate. Labrum usually protruding slightly from beneath the clypeus, its apex deeply cleft. Malar space short or of moderate length. Front distinctly tuberculate just above the bases of the antennae on the median line (figs. 54 and 55), the convexity occasionally with a carina which extends downward to the clypeus. Front of the male, when not distinctly tuberculate, at least with a convexity which slopes abruptly to the face below the antennal orbits. Antennae elongate, segment 3 in the female always much longer than 4. Front of moderate breadth, the eyes converging at most moderately above.

Pronotum short, the posterior margin arcuate or subarcuate, the median line slightly impressed. Postnotum a narrow, nearly linear transverse band, which may be somewhat concealed on the median line by the overhanging metanotum. Propodeum rarely with even contours, but with the declivity usually well-defined, flat or more often concave, and the sides of the declivity humped or ridged, sometimes with one or more pairs of tubercles; there are also tubercles in front of the spiracles in some species. Legs long and slender, particularly the front coxae and femora of the female. Front tibiae with a few spines on the sides, none above. Front tarsus of female with a strong comb, the spines of which are considerably longer than the width of the tarsus. Apical tarsal segments with several median spines beneath, at least in the female. Pulvillar comb weak, of at most 12 slender, somewhat diverging setulae. Claws of the female dentate, those of the male bifid or subbifid. Last segment of front tarsus of male modified slightly, the segment a bit asymmetrical, the inner claws more abruptly curved than the outer, and with the rays more widely separated.

Wings large, never folded in repose. Anal vein of hind wing meeting the media near or at the fork of the cubital vein. Basal and transverse median veins of fore wing interstitial or nearly so on the media. Stigma large, pigmented; marginal cell large, always notably less than its own length from the wing-tip. 2d and 3d submarginal cells both rather large, 4-sided. 3d discoidal cell much less than its own length from the wing margin.

Abdomen of both sexes relatively stout, the first 3 segments large, the first tergite strongly convex in front. Male subgenital plate strongly keeled; basally, within the body, with a wing-like expansion on each side. Male genitalia (figs. 67 and 68) with the parameres long, slender, with a membranous area of variable breadth on the inner margin near the apex. Basal hooklets single or feebly doubled. Volsella with several strong hairs at the base; about midway on the digitus there is a transverse fold, beyond which

the digitus is rather densely setose. Parapenial lobes supporting the aedeagus closely; aedeagus always bearing a number of setae along the shaft. The genitalia of the genotype,  *analis* (fig. 68), resemble very closely those of the American *ferrugineus* (fig. 67). In fact, the genitalia are fairly uniform throughout the genus, most of the specific characters being in the aedeagus.

*Biology.*—The species of *Tachypompilus* prey upon large lycosid or pisaurid spiders which, like most Pompilinae, they drag backward over the ground. Their nesting habits seem to be variable. The North American *ferrugineus* nests in walls and crevices, often in buildings. The habits of the genotype,  *analis* Fabricius, are somewhat different; this species has been studied by Williams.<sup>48</sup> *Analis* nests in shallow pits in the ground, a number of such pits being made and stocked in the same small area, usually at the base of a tree. The abdomen is used to pound down the soil over the nest, and debris is placed over the spot to conceal it.

*Distribution.*—Widespread in the tropical and subtropical parts of the globe. *T. analis* Fabricius is widely distributed in the Orient, and *T. praepotens* Kohl in Africa. A considerable number of species have been described from the American tropics, but further study may reduce these to a few polytypic species. In our fauna there are two species, each with several subspecies.

### Key to Species

#### Females and Males

1. Female: Antennal segment 3 from 1.3 to 1.8  $\times$  upper interocular distance; eyes rather strongly convergent above, upper interocular distance about .8 (.72–.86)  $\times$  lower interocular distance; vertex not raised above the eye-tops; temples not at all developed. Male: Eyes not diverging above, upper interocular distance from .9 to 1.0  $\times$  the lower; antennal segment 3 more than twice as long as its greatest thickness; aedeagus beset with rather long spines along the shaft (*ferrugineus*) .....2
- Female: Antennal segment 3 shorter, from .9 to 1.2  $\times$  upper interocular distance; eyes more widely separated at the top, upper interocular distance .9 (.85–1)  $\times$  the lower; vertex very slightly arcuately raised above the level of the tops of the eyes. Male: Eyes slightly diverging above, upper interocular distance from 1.05 to 1.15  $\times$  the lower; antennal segment 3 not more than twice as long as its greatest thickness; spines of aedeagus somewhat shorter (*torridus*) .....5

<sup>48</sup> Williams, F. X., 1919, Bull. Hawaiian Sugar Planters' Assoc., Ent. Ser., no. 14, pp. 108–110.

2. Thorax extensively marked with black; meso- and metapleura and propodeum mostly blackish; basal abdominal tergites strongly banded with black at their apices; wings more or less fuscous, violaceous .....3

Body almost entirely ferruginous; thoracic pleura and propodeum at most in small part blackish; abdominal tergites banded with black or not; wings variable .....4

3. Head and thorax almost entirely black; mesonotum black, usually also the pronotum and coxae; femora often partly black; antennae mostly black, at least in the female, the basal 1 to 3 segments ferruginous

1b. **ferrugineus nigrescens** (Banks)

Head and thorax in large part ferruginous; pro- and mesonota mostly or wholly ferruginous, femora entirely so; antennae of females gradually infuscated distad, the apical few segments blackish

1a. **ferrugineus ferrugineus** (Say)

4. First abdominal tergite with a narrow dark band along its posterior margin, the following tergites usually with less well-defined bands. Female: Apex of mesosternum, in front of the middle coxae, not produced into lobes. Male: Wings rather heavily infuscated

1c. **ferrugineus burrus** (Cresson)

Abdominal tergites much less distinctly banded apically, the abdomen nearly uniformly ferruginous. Female: Apex of mesosternum, in front of the middle coxae, produced into small, acute lobes. Male: Wings subhyaline or very lightly infuscated, the apices darker

1d. **ferrugineus yavapai** new name

5. Wings flavo-hyaline or nearly clear hyaline, the apices of both pairs of wings distinctly narrowly infuscated; body color usually nearly uniformly ferrugino-testaceous .....2. **torridus torridus** (Smith)

Wings brownish in varying degrees, usually somewhat violaceous, the apices darker, but less contrastingly so; body wholly ferruginous or more or less marked with black, especially in the males

2b. **torridus unicolor** (Banks)

- 1a. **Tachypompilus ferrugineus ferrugineus** (Say) new combination

(Plate XV, figs. 54, 55, 57; plate XVI, figs. 67, 71.)

*Ceropaltes ferruginca* Say, 1824, Narr. Exp. St. Peter's River, II, p. 334. [Type: ♂; "United States"; (no longer extant).]

*Pompilus ferrugineus* Dahlbom, 1844, Hymen. Europ., I, p. 63.—Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 159.—Cresson, 1867, Trans. Amer. Ent. Soc., I, 107. [Del., Ill., La.]—Cresson, 1872, Trans. Amer. Ent. Soc., 4: 203. [Texas.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 288.—Birkmann, 1899, Ent. News, 10: 244. [Lee Co., Texas.]—Howard, 1901, The Insect Book, pl. VI, fig. 11.

*Priocnemis nuperus* Howard, 1901, The Insect Book, pl. VI, fig. 3. [Mis-identification.]

- Arachnophroctonus ferrugineus* Ashmead, 1902, *Canad. Ent.*, 34: 83. [Selected genotype of *Arachnophroctonus* Ashmead, 1902,  *nec* Howard, 1901.]—Rau and Rau, 1918, *Wasp Studies Afield*, pp. 78–83. [Biology.]—Brimley, 1936, *Jour. Elisha Mitchell Sci. Soc.*, 52: 129. [N. C., many localities.]—Brimley, 1938, *Insects No. Carolina*, p. 434.—Banks, 1944, *Bull. Mus. Comp. Zool.*, 94: 168. [Selects neotype from Falls Church, Va.]—[not] Dreisbach, 1949, *Ent. Amer.*, (n.s.)29: 40, pl. IV, fig. 17. [Misidentification.]
- Anoplus (Arachnophroctonus) ferrugineus* Viereck, 1906, *Trans. Amer. Ent. Soc.*, 32: 223. [Galveston, Texas.]

This well-known form, which occurs over much of the United States east of the Rockies, is at once recognized by its black meso- and metapleura and propodeum against a general castaneo-ferruginous body color; the apices of the abdominal tergites are also banded with black.

FEMALE.—Length 18 (15–22) mm. Body bright castaneo-ferruginous, except as follows: tips of mandibles black; antennae infuscated beyond the basal few segments; front coxae usually in small part black, the other coxae with a larger amount of black, sometimes wholly black; anterior part of mesonotum with or without a black transverse band; sides of the metanotum infuscated; mesopleura, mesosternum, metapleura, postnotum, and propodeum wholly or in large part blackish; tergites 1 and 2 with conspicuous dark bands along their posterior margins, the remaining tergites at most slightly infuscated apically. Body clothed with a very fine pale brown pubescence, more noticeable on the front and coxae. Wings brownish-fuliginous, rather strongly reflecting violet. Body with a few short, pale hairs on the front, vertex, temples, prosternum, front coxae, sides of the propodeum, and to a lesser extent elsewhere on the thorax.

Mandibles strongly unidentate (fig. 71). Clypeus about twice as broad as high, its apical margin broadly emarginate. Front of moderate breadth, middle interocular distance from .55 to .6  $\times$  transfacial distance; middle interocular distance very slightly greater than lower interocular distance; upper interocular distance from .75 to .86  $\times$  the lower, the eyes thus noticeably convergent at the top. Ocelli prominent, post-ocellar line subequal to or slightly greater than ocello-ocular line. Supra-antennal tubercle well developed. Temples not strongly developed, in lateral view not nearly as broad as the eyes. Antennae elongate, the first 4 segments in a ratio of about 3:1:6:4.5, or the 3d segment proportionally even longer; 3d segment equal to from 1.3 to 1.8  $\times$  upper interocular distance. (Figs. 54 and 57.)

Pronotum short, the posterior margin arcuate. Propodeum rather long, somewhat humped antero-dorsally and postero-laterally, the declivity well-defined, flat or a little concave; median line impressed above; there is a slight hump in front of each spiracle. Spines of the tarsal comb about 3  $\times$

as long as the width of the very slender tarsus; there may be 4 or 5 comb-spines on the basitarsus, rarely 3 or 6. Tibial spurs short in relation to the length of the legs; longer spur of hind tibia .4 the length of the basitarsus. Fore wing with the marginal cell from half to two-thirds its own length from the wing-tip; 2d recurrent vein somewhat bent in the middle.

MALE.—Length 13 (8–17) mm. Coloration very similar to that of the female; antennal flagellum usually almost wholly infuscated; mesonotum usually with some black anteriorly; scutellum sometimes black on the sides. Wing color and pubescence as in the female. This sex is inclined to have slightly more erect, pale hair on the front and prothorax.

Clypeus about twice as broad as high, its apical margin truncate or very slightly concave. Front of moderate breadth, middle interocular distance from .59 to .66  $\times$  transfacial distance. Upper interocular distance from .9 to 1.0  $\times$  the lower, the eyes thus subparallel within. Ocelli large, post-ocellar line is to ocello-ocular line about as 4:3. Front very convex above, protuberant just above the antennal bases, below which point it slopes steeply to the face below. Temples not developed, the head contracted immediately behind the eyes. Antennae slender, the first 4 segments in a ratio of about 2.5:1:2.7:2.7, though somewhat variable in this respect; segment 3 from 2 to 3  $\times$  as long as its greatest thickness (fig. 55).

Postero-lateral angles of the propodeum distinctly protuberant, the declivity concave between; median line of propodeum clearly impressed above. Front coxae and femora much shorter than in the female. Apical tarsal segments weakly if at all spined beneath.

Abdomen in resting position short and stout, the apical segments often somewhat telescoped into the first two, which are very large. Sternite 6 with a large U-shaped emargination. Subgenital plate strongly keeled, in profile sloping convexly behind. Genitalia (Fig. 67) with the parameres slender, expanded apically, the expansions on the inner margin and mostly membranous. Aedocagus spindle-shaped, apically very acute, bearing along its shaft numerous spine-like setae of varying lengths, some of which are fairly long and extend beyond the margin of the aedocagus when pressed against it.

*Biology.*—This form is frequently taken around rock-piles, stone walls, and buildings, where it nests in crevices. When in buildings, the emerging adults sometimes find their way to the interior of the building rather than the exterior, so that they are sometimes taken on windows. The Raus (1918) are to be credited with the only detailed observations on the habits of this species. They found it nesting in the stone wall of the foundation of an abandoned building. The prey, a *Lycosa*, is dragged backward, even up the perpendicular sides of the wall. The Raus suggest that it may once have nested in the loose stone of cliffs, but now

makes use of man-made structures when these are available. The species also preys upon *Dolomedes* sp. (Pisauridae) [det. B. J. Kaston], as shown by a specimen taken at Elfers, Florida [KVK] pinned with this spider.<sup>49</sup> Flower records for this species include *Daucus carota*, *Aralia spinosa*, *Monarda punctata*, *Ampelopsis arborca*, and *Euphorbia marginata*.

*Distribution*.—This form inhabits the Lower and Upper Austral Zones east of the Rockies, from central eastern Texas and southern Florida to Colorado, Minnesota, Ohio, and New Jersey. In the northeastern states it is replaced by subspecies *nigrescens*, and in the Southwest by subspecies *burrus* and *yatapai*.

*Specimens seen*: 263 (150 ♀♀, 113 ♂♂). The following localities define the northern and western limits of its range so far as present records go: NEW JERSEY: Burlington Co., 1 ♀, Moorestown, 6 Aug. [USNM]; Cape May Co., 7 ♀♀, 10 ♂♂, 15 July-28 Aug. [ANSP]; PENNSYLVANIA: Lancaster Co., 1 ♀ [HEE]; MARYLAND: St. Marys Co., 1 ♂, Blakiston Isl., 7 Aug. [USNM]; WEST VIRGINIA: Randolph Co., 1 ♀, 1 ♂, Cheat Mt. [CM]; OHIO: Erie Co., 1 ♀, Sandusky, 21 July [ANSP]; INDIANA: Clinton Co., 1 ♂, Edna Mills, 11 July [Minn.]; ILLINOIS: 1 ♀ (no further data) [ANSP]; MINNESOTA: Hennepin Co., 1 ♂, Minneapolis, 27 June [Minn.]; KANSAS: Riley Co., 8 ♀♀, 4 ♂♂, Aug.-Sept. [KSC]; COLORADO: Boulder Co., 7 ♀♀, Boulder Canyon, 17 Aug. [Minn.]; TEXAS: Tarrant Co., 1 ♀, Arlington [USNM]; Lee Co., 2 ♀♀, 1 ♂, Fedor, May-Sept. [MCZ, CIS]; Galveston Co., 3 ♀♀, 5 ♂♂, June [MCZ, USNM]. There are abundant records from the southeastern states, especially Florida.

1b. *Tachypompilus ferrugineus nigrescens* (Banks) new combination

*Pompilus ferrugineus* Smith, 1890, Cat. Insects N. J., p. 50.

*Anoplius ferrugineus* Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.

*Arachnoproctonus ferrugineus* Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 985.—Britton, 1938, Conn. Geol. Nat. Hist. Survey Bull. 60, p. 146.

*Arachnoproctonus ferrugineus* var. *nigrescens* Banks, 1944, Bull. Mus. Comp. Zool., 94: 169. [Type: ♀; Arlington, Va., 17 Aug. (Banks); M.C.Z. no. 25,732.]

This form occurs in the northeastern United States, north and east of the range of the nominate subspecies, although there is some overlapping in range, and intermediates are not uncommon. The case parallels that of *Poecilopompilus interruptus*, which also

<sup>49</sup> A later paper by Rau (1922, Trans. Acad. Sci. St. Louis, v. 24, no. 7, p. 12), not seen by the author when the above was written, reports this wasp as preying upon *Dolomedes idoncus* Emerton (= *D. tenebrosus* Hentz).



has a melanic form in the Northeast, *cressoni*. The right of these forms to be considered subspecies is questionable; the darker coloration may be caused by the direct effect of lower temperature or other physical factors rather than genetic make-up.

**FEMALE.**—Length 16.5 (14–19) mm., averaging slightly smaller than the typical form. Color bright ferruginous, except black as follows: antennal flagellum except sometimes the first 1 or 2 segments; tips of mandibles; front, vertex, temples, and occiput variably infuscated, usually mostly blackish; entire thorax and propodeum black except usually a spot on the metanotum and scutellum, and sometimes a small part of the pro- and mesonota; coxae, trochanters, and usually the bases of the femora blackish; base and apex of tergite 1 black, also apical bands on tergites 2 and 3, and the greater part of sternites 1–3. Wings fuliginous, violaceous. Pubescence very fine, brownish varying to silvery on the front, coxae, and lower pleura. Other features as in the typical subspecies.

**MALE.**—Length 13 (11–17) mm. Coloration much as in the female; flagellum often wholly black, sometimes merely dusky-ferruginous; clypeus, inner orbits below, and outer orbits pale; front, vertex, and occiput usually dusky or black; posterior margin of pronotum narrowly pale; femora varying from wholly black to wholly pale.

*Biology.*—This form appears in the field in early July and disappears in late August, having but one generation a year. It has been taken in gravel banks and around rock piles, and also on the flowers of *Daucus carota*, *Solidago*, and *Spiraea*.

*Distribution.*—This form inhabits the Carolinian and Alleghanian faunas of the states of New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, and New Jersey. The type is from Arlington, Virginia, somewhat south of the normal range of the subspecies. There is a considerable band of overlap of this and the typical subspecies from Pennsylvania and New Jersey to northern Virginia.

*Specimens seen:* 60 (31 ♀♀, 29 ♂♂). The following records are marginal: NEW HAMPSHIRE: 2 ♂♂ (no further data) [USNM]; Hillsboro Co., 1 ♂, Pelham, 17 Aug. [USNM]; MASSACHUSETTS: Middlesex Co., 1 ♂, Holliston, Aug. [MCZ]; CONNECTICUT: Litchfield Co., 1 ♂, Colebrook [MCZ]; NEW YORK: Dutchess Co., 1 ♀, Poughkeepsie, 26 July [KVK]; Tompkins Co., 8 ♀♀, 12 ♂♂, Ithaca, 23 June–3 Aug. [HEE]; Erie Co., 1 ♀, Hamburg, 24 July [CIS]; PENNSYLVANIA: Cumberland Co., 1 ♂, West Fairview, 31 July [USNM]; NEW JERSEY: Cape May Co., 1 ♀, 2 ♂♂, Cape May, 21 July–24 Aug. [ANSP]; VIRGINIA: 1 ♀, Arlington, 17 Aug. [MCZ].

1c. *Tachypompilus ferrugineus burrus* (Cresson) new combination

*Pompilus torridus* var. *burrus* Cresson, 1869, Proc. Boston Soc. Nat. Hist., 12: 371. [Lectotype: ♀; Vera Cruz, Mexico (Charles Sartorius); A.N.S.P. no. 429.]

*Arachnoproctonus torridus* var. *burrus* Bradley, 1944, Notulae Naturae, Acad. Nat. Sci. Phila., no. 145, p. 9.

*Arachnoproctonus ferrugineus* var. *annexus* Banks, 1944, Bull. Mus. Comp. Zool., 94: 168. [Type: ♀; Fedor, Lee Co., Texas, 15 June 1909 (Birkmann); M.C.Z. no. 25,731.] New synonymy.

This form is very similar to typical *ferrugineus*, but without much if any black on the propodeum and the thoracic pleura. It is distinguishable from the following subspecies by the usually more distinct dark bands on the basal abdominal tergites, and by the absence of small projections on the mesosternum in front of the middle coxae. *Torridus torridus*, the range of which overlaps that of this form, may be told by the much paler wings and broader vertex than *ferrugineus burrus*.

FEMALE.—Length 20 (15–27) mm., averaging slightly larger than typical *ferrugineus*. Body bright castaneo-ferruginous, overlaid by a very fine silvery or light brown pubescence. Antennae infuscated apically, the last few segments black; tarsi somewhat infuscated apically; extreme base of tergite 1 black, and the posterior margin of this tergite with a narrow dusky or black border, tergites 2 and 3 usually with less well-defined dark bands. Occasionally there is a small amount of black on the thorax and on the propodeal declivity. Wings fuliginous, violaceous. Tarsal comb strong, most commonly with 5 comb-spines on the basitarsus.

MALE.—Length 15 (10–19) mm.; color in general like that of the female. Antennal flagellum usually blackish above, more or less ferruginous below for most of its length; mesosternum and hind coxae in front often marked with blackish. Wings wholly and rather heavily infuscated, more or less violaceous. Morphologically very similar to typical *ferrugineus*.

*Biology*.—I have taken this form in series in a screened porch in Dallas, Texas, and on a stone wall in Austin. It is a frequent visitor to flowers, and has been taken on *Cicuta maculata*, *Avicennia nitida*, *Ampelopsis arborea*, and *Euphorbia marginata*.

*Distribution*.—Eastern Mexico north through eastern Texas, with an occasional specimen from as far north as Kansas. There is a considerable area of overlap with the typical subspecies.

*Specimens seen*: 123 (79 ♀♀, 44 ♂♂). KANSAS: Riley Co., 2 ♀♀, Manhattan, Aug. [KSC, coll. R. L. Fischer]; TEXAS: Bexar Co., 12 ♀♀,

4 ♂♂, June-July [JEG]; Brazos Co., 12 ♀♀, 6 ♂♂, June-Aug. [RWS, JEG]; Caldwell Co., 1 ♀, Maxwell, June [RWS]; Cameron Co., 1 ♀, Brownsville, 14 July [HEE]; 20 ♀♀, 21 ♂♂, Port Isabel, 22 June [HEE, CU]; Comal Co., 1 ♀, New Braunfels, 29 June [HEE]; Dallas Co., 10 ♀♀, Dallas, June-Oct. [HEE, MCZ, USNM]; Dewitt Co., 1 ♀, Cuero, Aug. [CAS]; Galveston Co., 1 ♀, Dickinson, 26 May [KVK]; Hunt Co., 2 ♂♂, June, July [RWS]; Lee Co., 4 ♀♀, Fedor, June-Sept. [MCZ]; Nueces Co., 5 ♂♂, Robstown, 21 Apr. [JEG]; San Jacinto Co., 1 ♀, Aug. [RWS]; Titus Co., 1 ♀, Mt. Pleasant, 13 June [HEE]; Travis Co., 4 ♀♀, Austin, Apr.-July [HEE, MCZ]; Uvalde Co., 1 ♀, Uvalde, 15 June [CAS]; Victoria Co., 1 ♀, Black Bayou [CM]; 5 ♀♀, 1 ♂, Victoria [USNM]; Walker Co., 1 ♂, Huntsville [USNM]; Williamson Co., 3 ♂♂, May-June [JEG]; 1 ♀, Taylor, 20 Aug. [KVK]; MEXICO: 1 ♀, Vera Cruz [ANSP].

1d. *Tachypompilus ferrugineus yavapai* new name

*Arachnoproctonus ferrugineus* var. *unicolor* Banks, 1944, Bull. Mus. Comp. Zool., 94: 168. [Type: ♀; Oak Creek Canyon, Arizona, 6000 feet (F. H. Snow); M.C.Z. no. 25,730.] [*Nec* Banks, 1919.]

In this subspecies the body is without any black markings whatever; the wings of the female are moderately infuscated, violaceous, those of the male very lightly infuscated. This form has usually been confused with what has been called *unicolor*, but is clearly a subspecies of *ferrugineus*, as evidenced by the narrow vertex, longer third antennal segment, larger size, and strongly spined aedeagus of the male.

Female.—Length 18 (14–22) mm.; color light castaneo-ferruginous, overlaid with a fine pale brownish or somewhat silvery pubescence. Antennae and tarsi slightly infuscated apically; basal abdominal tergites often with a dusky band along the posterior margin, seldom as dark and distinct as in *burrus*; tips of mandibles and extreme base of first abdominal segment black; occasionally there is some black on the bases of the coxae, the mesosternum, and the postnotum. Wings varying from light brownish, sometimes slightly tinged with yellowish, and darker along the outer margins, to wholly dark brownish; wings always somewhat violaceous. Structurally very similar to typical *ferrugineus*, but the mesosternum produced in front of the bases of the middle coxae into small, acute processes. These are not conspicuous, but provide a handy character for separating this form from *burrus*, since the difference in color is not great.

Male.—Length 13 (12–15) mm. Color as in the female, but the wings much lighter. Wings very lightly tinged with brownish, their apices narrowly darker, and usually with a faintly darker area in the fore wing extending from the marginal cell through the submarginal cells into the 3d discoidal; vicinity of the basal vein also somewhat clouded. There is at most a very faint tinge of yellowish in the wings.

*Distribution.*—This form inhabits western Mexico and ranges north through the Lower Sonoran fauna of western Texas, New Mexico, Arizona, and southern California.

*Specimens seen:* 32 (22 ♀♀, 10 ♂♂). TEXAS: Brewster Co., 1 ♂, Chisos Mts., 5 July [OSC]; Jeff Davis Co., 7 ♀♀, Limpia Canyon, Davis Mts., some on *Baccharis glutinosus*, 20 July [HEE]; NEW MEXICO: 1 ♀ (no further data) [USNM]; ARIZONA: Cochise Co., 1 ♂, Douglas, 24 July [USNM]; Coconino Co., 1 ♀, Oak Creek Canyon, 6000 feet [MCZ]; Pima Co., 1 ♀, 1 ♂, Baboquivari Mts., July, Oct. [CAS]; 1 ♀, 1 ♂, Bear Canyon, Santa Catalina Mts., 4 Aug. [HEE]; 2 ♂♂, Tucson [MCZ, CU]; 1 ♀, Ventana Canyon, Santa Catalina Mts., 30 Aug. [USNM]; southern part, 6 ♀♀ [MCZ]; CALIFORNIA: Imperial Co., 1 ♀, Westmoreland, 15 May [CIS]; Riverside Co., 1 ♀, Palm Springs, 30 Oct. [CAS]; 1 ♂, Pinon Flat, San Jacinto Mts., 18 June [CAS]; San Bernardino Co., 1 ♂, Boyer Ranch, 29 Palms [MCZ]; 1 ♀, 1 ♂, Mill Creek Canyon, 21 Sept. [CAS]; MEXICO: Baja California, 1 ♀, Las Animas, Sierra Laguna, 12 Oct. [CAS]; 1 ♂, 15 mi. No. of San Ignacio, 29 Sept. [CAS].

2a. *Tachypompilus torridus torridus* (Smith) new combination

(Plate XV, fig. 56; plate XVI, fig. 62.)

*Pompilus torridus* Smith, 1862, Journal Ent., 1: 396. [Type: ♀: "Mexico"; British Museum (not seen by author).]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 110.—Cresson, 1869, Proc. Boston Soc. Nat. Hist., 12: 371. [Orizaba, Mex.]—Cameron, 1893, Biol. Centr.-Amer., Hymen. II, pp. 211–212, pl. XI, figs. 28 and 28a.

*Arachnophroctonus torridus* Bradley, 1944, Notulae Naturae, Acad. Nat. Sci. Phila., no. 145, p. 9.

This is a somewhat smaller species than *ferrugineus*, although individuals are often as large as an averaged-sized *ferrugineus*. The antennae are distinctly shorter, segment 3 in the female not much if any exceeding the vertex width, segment 3 in the male from 1.5 to 2.1 × as long as its greatest thickness. The vertex is broader and the temples somewhat better developed than in *ferrugineus*. There are small processes on the mesosternum in the female which overlie the bases of the middle coxae. Typical *torridus* is best told by the nearly hyaline wings which are usually distinctly suffused with yellowish; the apical margins of both pairs are narrowly, contrastingly infuscated.

FEMALE.—Length 14.5 (11–18) mm.; color bright castaneo-ferruginous, overlaid with a fine pale pubescence. Tips of the mandibles black; apical few segments of antennae more or less infuscated; occasionally there is some black on the pleura, metanotum, postnotum, coxae, and propodeal de-

clivity. Wings subhyaline, usually distinctly suffused with yellowish, especially toward the base; outer margins of both pairs of wings narrowly infuscated. Temples and propleura with some very light hair; there may also be erect hairs on the clypeus, front, vertex, front coxae, thoracic dorsum, and propodeum.

Clypeus about twice as broad as high, its apical margin broadly, shallowly emarginate. Temples moderately developed, in dorsal view not quite as thick as the eyes. Front rather broad, middle interocular distance varying from .56 to .63  $\times$  transfacial distance; frontal tubercle well-defined. Eyes converging slightly above, upper interocular distance from .85 to .95  $\times$  the lower. Ocelli in a flat triangle; post-ocellar line subequal to ocello-ocular line, or either may be slightly the greater. Antennae elongate, the first 4 segments in a ratio of about 6:2:12:9, segment 3 equal to from 1.0 to 1.2  $\times$  upper interocular distance.

Pronotum short, its posterior margin arcuate or very feebly angulate. Propodeum with a well-defined oblique declivity, flat or slightly concave, on each side of which it is more or less humped; median line distinctly impressed in front. Mesosternum bearing small acute lobes just in front of the bases of the middle coxae. Tarsal comb strong, as in *ferrugineus*, but there are usually only 3 comb-spines on the basitarsus, sometimes 4. Wing venation not differing noticeably from that of *ferrugineus*.

MALE.—Length 10 (8-12) mm.; coloration as in the female, except that the mesosternum, hind coxae in front, and sometimes the postnotum, the pleural sutures, and the posterior part of the propodeum may be blackish. Wings nearly clear hyaline, lightly suffused with yellowish or pale yellow-brown, the outer margins narrowly infuscated. Pubescence pale brownish or silvery; front, vertex, temples, propleura, and to a lesser extent the pronotum, front coxae, and propodeum, with very fine, short, pale hairs.

Clypeus about twice as broad as high, its apical margin truncate. Front broad, middle interocular distance from .6 to .65  $\times$  transfacial distance. Inner orbits diverging slightly above, upper interocular distance from 1.05 to 1.2  $\times$  lower interocular distance. Ocelli small, in a broad triangle, post-ocellar line usually slightly greater than ocello-ocular line. Front with a small but distinct tubercle just above the antennal bases, and a faint line extending from it to the front ocellus. Antennae of moderate length, the first 4 segments in a ratio of about 6:2:5:5, segment 3 from 1.7 to 2.1  $\times$  as long as its greatest thickness, the first 3 segments together about equal to upper interocular distance.

Pronotum and propodeum shaped much as in the female; postero-lateral corners of the propodeum gibbous, barely protuberant. Characters of the abdomen much as in *ferrugineus*, and the genitalia very similar to those of that species. However, the aedoeagus is somewhat broader and apically less attenuate than in this species, and the spines along the shaft are considerably shorter, not extending beyond the margins of the aedoeagus (fig. 62).

*Biology*.—This form inhabits desert and semidesert areas of the deep Southwest. I have taken it on the flowers of *Asclepias*, *Arvicennia nitida*, and *Sphaeralcea angustifolia*.

*Distribution*.—Typical *torridus* is widely distributed in Mexico, but enters the United States only in the extreme southern parts of Texas, New Mexico, Arizona, and California. North of this, and west of New Mexico, it is replaced by subspecies *unicolor* Banks.

*Specimens seen*: 25 (18 ♀♀, 7 ♂♂). TEXAS: Cameron Co., 2 ♂♂, Brownsville [USNM]; 2 ♀♀, Port Isabel, 23 June [HEE]; Culberson Co., 1 ♀, Van Horn, 24 June [CAS]; Jeff Davis Co., 2 ♂♂, 6-10 mi. W. of Fort Davis, 12-23 July [HEE]; Presidio Co., 1 ♀, Marfa, 20 July [HEE]; Taylor Co., 1 ♀, 2 Sept. [CIS]; NEW MEXICO: Dona Ana Co., 1 ♀, Las Cruces, 12 July [ANSP]; ARIZONA: Cochise Co., 1 ♀, 1 ♂, Douglas, July [HEE, USNM]; Pinal Co., 2 ♀♀, 1 ♂, Florence [ANSP]; CALIFORNIA: San Diego Co., 1 ♀, Red Mt., nr. Fall Brook, 1025 feet, 19 Aug. [ANSP]; MEXICO: Baja California, 1 ♂, Mesquital, 22 June [CAS]; 2 ♀♀, 10 mi. E. of Mesquital, 23 June [CAS]; 3 ♀♀, 20 mi. No. of Mesquital, 27 Sept. [CAS]; Chihuahua, 1 ♀, Samalayuca, 24 June [AMNH]; Mexico, 1 ♀, Teotehuacan, 24 Mch. [Minn.]; State unknown, 1 ♀, Tiahualilo, July [USNM].

2b. *Tachypompilus torridus unicolor* (Banks) new combination

*Arachnoproctonus ferruginus* Woodworth, 1913, Guide to Calif. Insects, p. 99.—Banks, 1919, Bull. Mus. Comp. Zool., 63: 239-240.

*Arachnoproctonus unicolor* Banks, 1919, Bull. Mus. Comp. Zool., 63: 239, 240. [Lectotype: ♀; Wenass Valley, Wash., 6 July 1882; M.C.Z.]<sup>50</sup>

*Arachnoproctonus latifrons* Banks, 1939, Canad. Ent., 71: 229. [Type: ♀; Wenass Valley, Wash., 6 July 1882; M.C.Z. no. 23,474.] New synonymy.

This form is very similar to typical *torridus*, but the wings are wholly brownish; the body may be wholly ferruginous or more or less marked with black; males are occasionally marked with as much black as *ferruginus ferruginus*, rarely as much as in

<sup>50</sup> Banks credits this species to Viereck, but the latter had never described it; this is therefore the first appearance of the species in print, and since Banks places it in a key, I believe it may be considered a description. Of the four specimens Banks had before him, the above mentioned is hereby designated the type; this same specimen is also the type of *latifrons* Banks. In 1944 Banks, apparently realizing that *unicolor* had never been "officially" described, published a description, based on specimens from Arizona which I consider specifically distinct from his earlier *unicolor*. On a previous page I have, therefore, proposed a new name for *unicolor* Banks 1944, *nec* Banks 1919.

*nigrescens*. This is a common wasp in the Pacific states, and is the only *Tachypompilus* known to reach Canada (Okanagan Valley, B. C.).

FEMALE.—Length 16 (10–21) mm. Color in general bright castaneo-ferruginous, overlaid with a very fine pale pubescence. The minimum amount of black which may be present is as follows: tips of mandibles, apices of the antennae, and extreme base of the first abdominal segment. The maximum amount of black on any specimen before me is as follows: tips of mandibles, cheeks and lower temples, lower front below, between, and just above the antennal orbits, a blotch covering the ocelli, occiput, propleura, base and apex of front coxa, a median blotch on the anterior part of the pronotum; anterior third of the mesonotum; sides of the scutellum and metanotum; all of the postnotum, metapleura, and propodeum; greater part of the mesopleura and middle and hind coxae and trochanters; basal fourth of first abdominal segment; apices of antennae and legs. In general, most of the darker specimens are from the northern parts of the range, though some northern specimens have very little black on them. Wings pale to dark brownish, somewhat violaceous, the outer margins very slightly darker.

Third antennal segment shorter than, equal to, or a little longer than upper interocular distance (.85 to 1.15  $\times$  the latter). Contours of the propodeum somewhat variable, but the declivity always well-defined, and the surface of the propodeum always somewhat gibbous on each side of the declivity.

MALE.—Length 11 (6.5–14) mm.; color much like that of the female, except that some specimens have even more black on them than the extremes in that sex: almost the entire head and thorax may be blackish; the abdomen, however, never possesses bands of black at the apices of the segments as in several subspecies of *ferrugineus*. Wings colored as in the female. Head, thorax, and propodeum with a considerable amount of short, pale hair, especially noticeable on the front and vertex. Pronotum rather abruptly declivous in front; postero-lateral corners of the propodeum scarcely protuberant; abdomen short, compact.

*Biology*.—This form has been taken on the flowers of *Asclepias*, *Eriogonum*, and *Cicuta*. In the northern parts of its range there is a single yearly generation, the adults occurring in July and August; in the South it occurs from April until November, and there is undoubtedly more than one generation during this time.

*Distribution*.—This subspecies occurs from southern California and Utah north to Wyoming, Idaho, and British Columbia, principally in the Upper Sonoran fauna and the upper portion of the Lower Sonoran.

*Specimens seen*: 279 (211 ♀♀, 68 ♂♂). The following records appear to be marginal: CALIFORNIA: San Diego Co., 16 ♀♀, 15 ♂♂, La Jolla, June, Aug. [USNM]; Riverside Co., 2 ♂♂, 10 mi. SW. of Hemet, 19 July [CIS]; Kern Co., 1 ♀, Kernville, 24 July [UK]; NEVADA: Washoe Co., 4 ♀♀, Reno, 4 July-10 Aug. [CIS]; UTAH: Utah Co., 2 ♀♀, July, Aug. [CIS]; Cache Co., 10 ♀♀, 1 ♂, Logan, 17 July-1 Aug. [UAC]; WYOMING: Sweetwater Co., 1 ♀, Green River, 6100 feet, 2 July [AMNH]; IDAHO: Ada Co., 1 ♀, Boise, 30 July [USNM]; WASHINGTON: Whitman Co., 2 ♀♀, Wawawai, 18 Aug. [MCZ, USNM]; Yakima Co., 1 ♀, Wenass Valley, 6 July [MCZ]; BRITISH COLUMBIA: 3 ♀♀, Okanagan Falls, 20-24 July 1917 [CNC]; 1 ♀, Oliver, 17 July [CNC]; 1 ♀, Peachland, 23 July [MCZ]. There are no records from west of the Cascades and Coast Ranges north of Sonoma Co., Calif., the dry interior being the principal home of this form.

## EXPLANATION OF FIGURES

## PLATE X

- Fig. 1.—Head of *Anoplus relativus* (Fox), showing terminology of parts: FD, facial distance; LID, lower interocular distance; MID, middle interocular distance; OOL, ocello-ocular line; POL, post-ocellar line; TFD, transfacial distance; UID, upper interocular distance.
- Fig. 2.—Male genitalia of *Anoplus relativus* (Fox), showing terminology of parts: *ac*, aedeagus; *ap*, apodeme of aedeagus; *ba*, basis volsellaris; *bh*, basal hooklets; *co*, cardo; *di*, digitus volsellaris; *pl*, parapenial lobes; *pr*, parameres; *sq*, squama.
- Fig. 3.—*Evagtes parvus* (Cresson), front tarsus of female.
- Fig. 4.—*E. hyacinthinus* (Cresson), front tarsus of female.
- Fig. 5.—*E. subangulatus* (Banks), front tarsus of female.
- Fig. 6.—*E. padrinus* (Viereck), front tarsus of female.
- Fig. 7.—*E. ingenuus* (Cresson), last segment of hind tarsus of female.
- Fig. 8.—*E. crassicornis* (Shuckard), inner lateral view of last segment of front tarsus of male.
- Fig. 9.—*Chalcochares engleharti* (Banks), front tarsus and apex of front tibia of female.

## PLATE XI

- Fig. 10.—*C. hirsutifemur* (Banks), wings.
- Fig. 11.—*Tastiotenia festiva* new species, wings.
- Fig. 12.—*Evagtes ingenuus* (Cresson), wings.
- Fig. 13.—*E. parvus* (Cresson), hind wing.
- Fig. 14.—*Chalcochares hirsutifemur* (Banks), lateral aspect of head of male.
- Fig. 15.—*C. engleharti* (Banks), lateral aspect of head of male.
- Fig. 16.—*C. engleharti* (Banks), male genitalia.
- Fig. 17.—*C. hirsutifemur* (Banks), male genitalia.
- Fig. 18.—*Evagtes dubius* (Van der Linden), male genitalia.



## PLATE XII

- Fig. 19.—*E. ingenuus* (Cresson), male genitalia.  
 Fig. 20.—*E. parvus* (Cresson), male genitalia.  
 Fig. 21.—*E. hyacinthinus* (Cresson), male genitalia.  
 Fig. 22.—*E. crassicornis* (Shuckard), male genitalia.  
 Fig. 23.—*E. subangulatus* (Banks), male genitalia.  
 Fig. 24.—*E. padrinus* (Viereck), male genitalia.

## PLATE XIII

- Fig. 25.—*E. hyacinthinus* (Cresson), dorsal aspect of head and pronotum of female.  
 Fig. 26.—*E. crassicornis* (Shuckard), dorsal aspect of head and pronotum of female.  
 Fig. 27.—*E. parvus* (Cresson), dorsal aspect of pronotum of female.  
 Fig. 28.—*E. padrinus* (Viereck), male subgenital plate.  
 Fig. 29.—*E. ingenuus* (Cresson), basal five segments of antenna of male.  
 Fig. 30.—*E. padrinus* (Viereck), basal five segments of antenna of male.  
 Fig. 31.—*E. parvus* (Cresson), basal five segments of antenna of male.  
 Fig. 32.—*E. crassicornis* (Shuckard), male subgenital plate.  
 Fig. 33.—*E. parvus* (Cresson), male subgenital plate.  
 Fig. 34.—*E. dubius* (Van der Linden), male subgenital plate.  
 Fig. 35.—*E. subangulatus* (Banks), basal five segments of male antenna.  
 Fig. 36.—*Agenioideus* (*Ridestus*) *biedermanni* (Banks), apex of hind tarsus of female.  
 Fig. 37.—*A. (Agenioideus) humilis* (Cresson), male subgenital plate, lateral view.  
 Fig. 38.—*A. (Gymnocharces) birkmanni* (Banks), male subgenital plate, lateral view.

## PLATE XIV

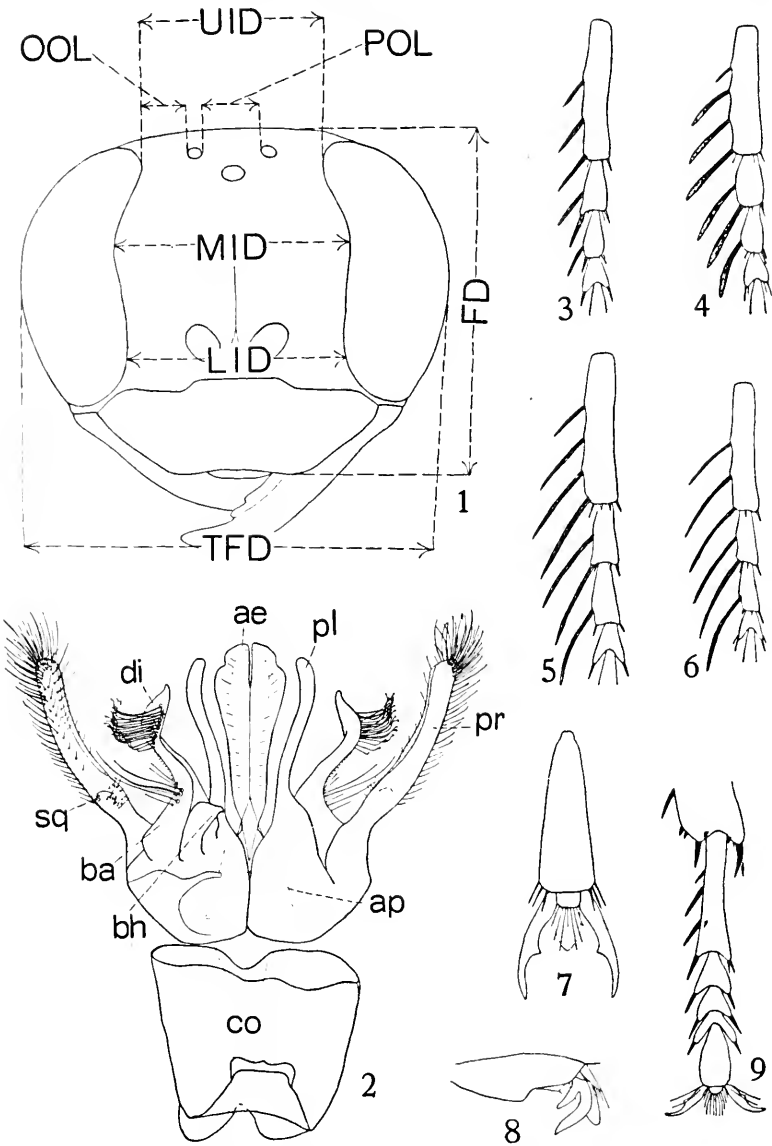
- Fig. 39.—*A. (Agenioideus) humilis* (Cresson), male genitalia.  
 Fig. 40.—*A. (Ridestus) biedermanni* (Banks), male genitalia.  
 Fig. 41.—*A. (Gymnocharces) birkmanni* (Banks), male genitalia.  
 Fig. 42.—*Sericopompilus neotropicalis* (Cameron), male genitalia.  
 Fig. 43.—*Pocillopompilus algidus* (Smith), male genitalia.  
 Fig. 44.—*P. interruptus* (Say), male genitalia.

## PLATE XV

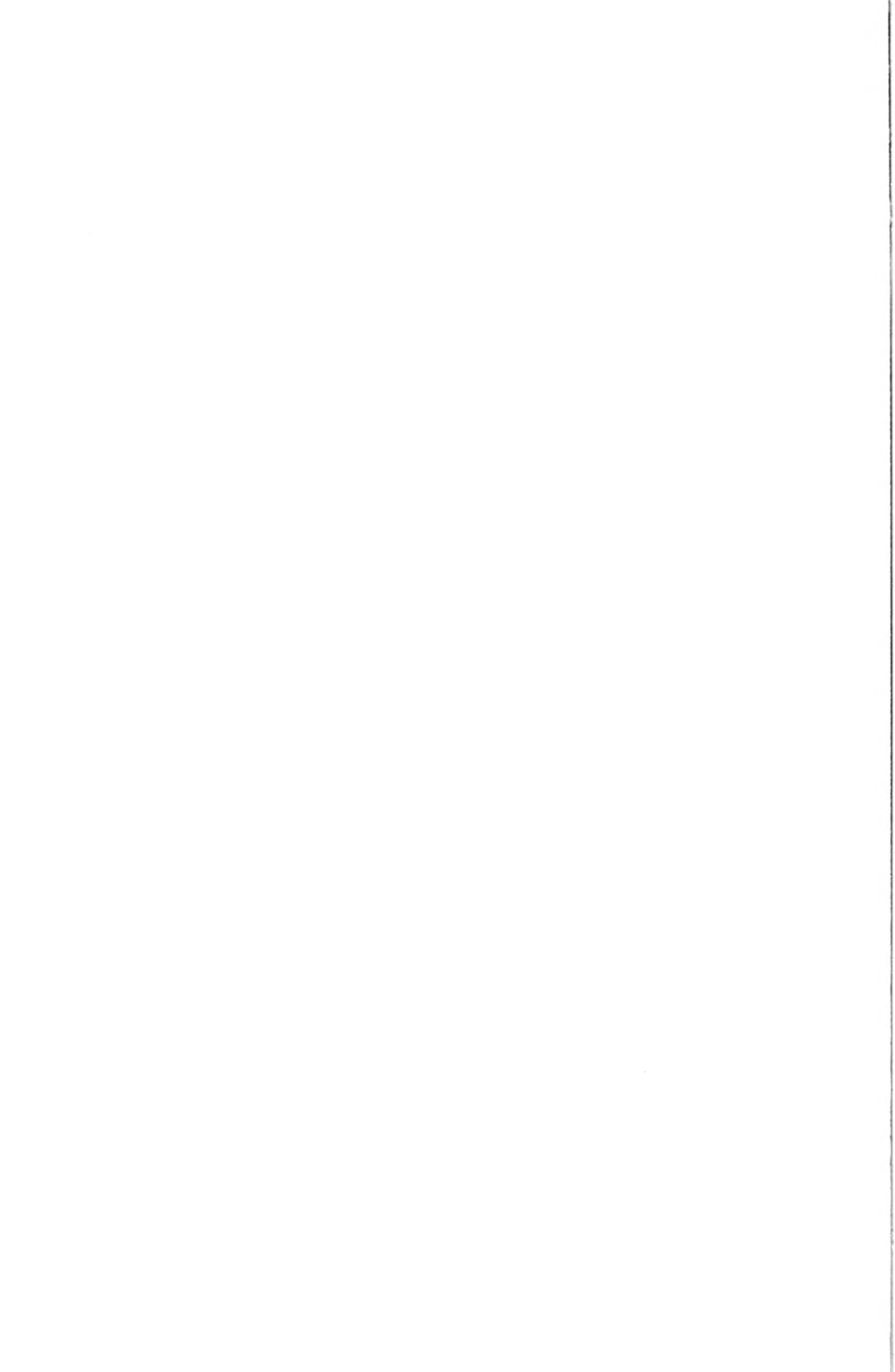
- Fig. 45.—*Sericopompilus neotropicalis* (Cameron), head of female.  
 Fig. 46.—*S. apicalis* (Say), head of female.  
 Fig. 47.—*S. angustatus* (Cresson), head of female.  
 Fig. 48.—*S. apicalis* (Say), dorsal aspect of head of male.  
 Fig. 49.—*S. neotropicalis* (Cameron), dorsal aspect of head of male.  
 Fig. 50.—*Episyron oregon* new species, dorsal aspect of head of male.  
 Fig. 51.—*E. biguttatus* (Fabricius), dorsal aspect of head of male.  
 Fig. 52.—*E. biguttatus* (Fabricius), head of female.  
 Fig. 53.—*E. oregon* new species, head of female.  
 Fig. 54.—*Tachypompilus ferrugineus* (Say), lateral aspect of head and prothorax of female.  
 Fig. 55.—*T. ferrugineus* (Say), lateral aspect of head of male.  
 Fig. 56.—*T. torridus* (Smith), basal segments of antenna of male.  
 Fig. 57.—*T. ferrugineus* (Say), antenna of female.

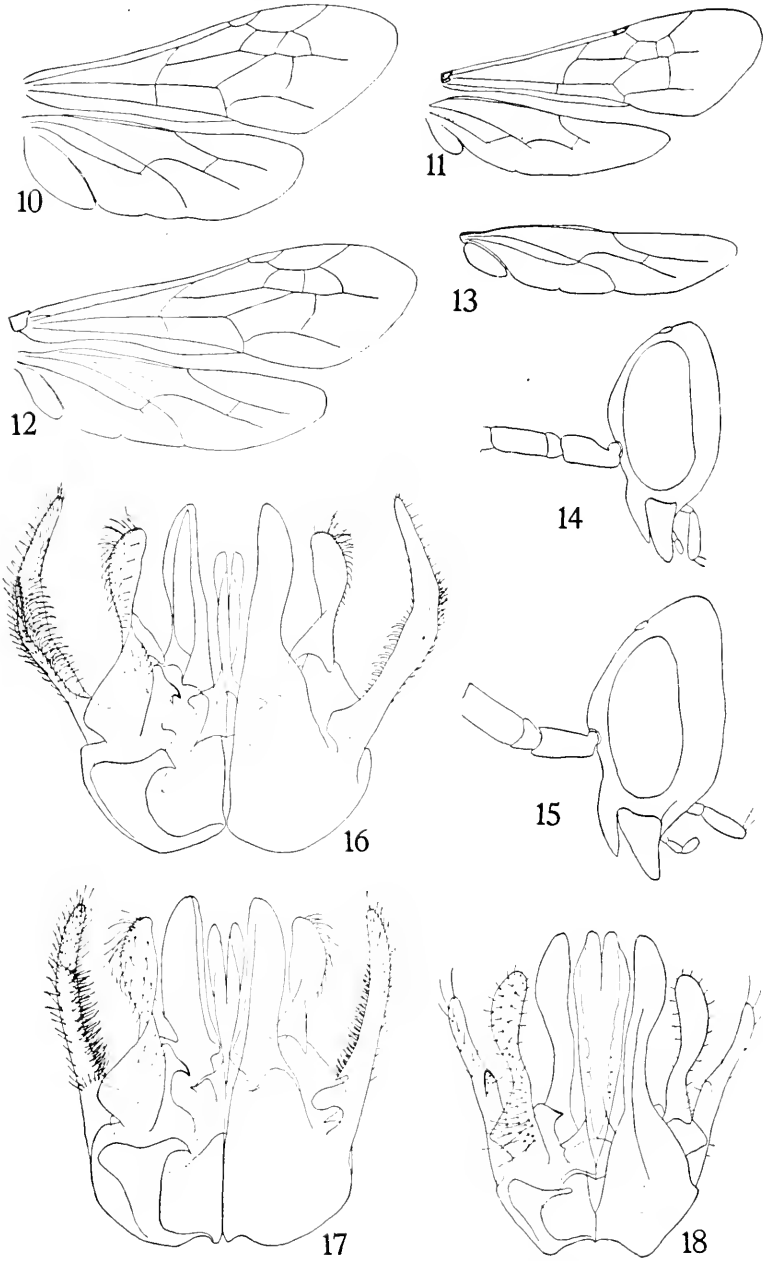
## PLATE XVI

- Fig. 58.—*Agenioideus (Agenioideus) humilis* (Cresson), wings.  
 Fig. 59.—*Sericopompilus apicalis* (Say), wings.  
 Fig. 60.—*Episyron biguttatus* (Fabricius), wings.  
 Fig. 61.—*E. quinquenotatus* (Say), male genitalia.  
 Fig. 62.—*Tachypompilus torridus* (Smith), aedeagus of male.  
 Fig. 63.—*Episyron biguttatus* (Fabricius), outer aspect of segments 8, 9, and 10 of male antenna.  
 Fig. 64.—*E. oregon* new species, outer aspect of segments 8, 9, and 10 of male antenna.  
 Fig. 65.—*E. posterus* (Fox), outer aspect of segments 8, 9, and 10 of male antenna.  
 Fig. 66.—*E. snowi* (Viereck), outer aspect of segments 8, 9, and 10 of male antenna.  
 Fig. 67.—*Tachypompilus ferrugineus* (Say), male genitalia.  
 Fig. 68.—*T. analis* (Fabricius), male genitalia.  
 Fig. 69.—*Sericopompilus apicalis* (Say), postnotum of female.  
 Fig. 70.—*Pocilopompilus algidus* (Smith), postnotum of female.  
 Fig. 71.—*Tachypompilus ferrugineus* (Say), mandible of female.



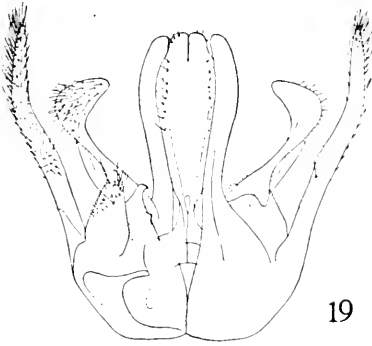
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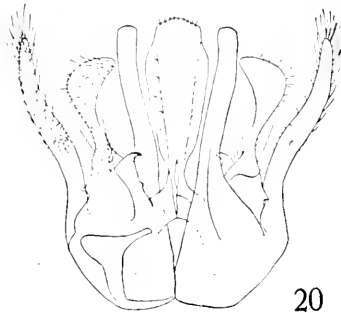


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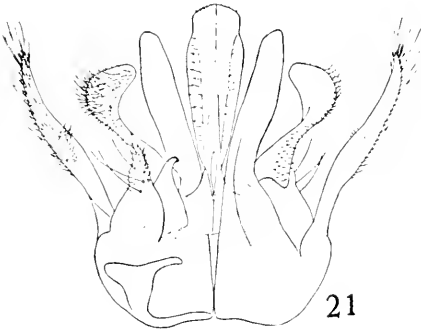




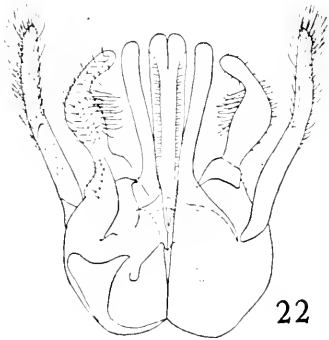
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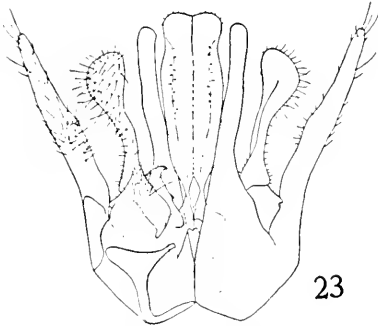
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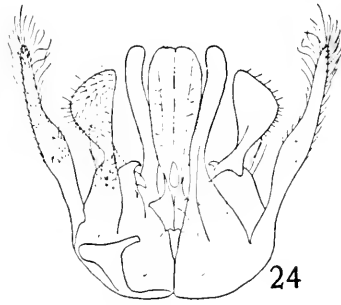
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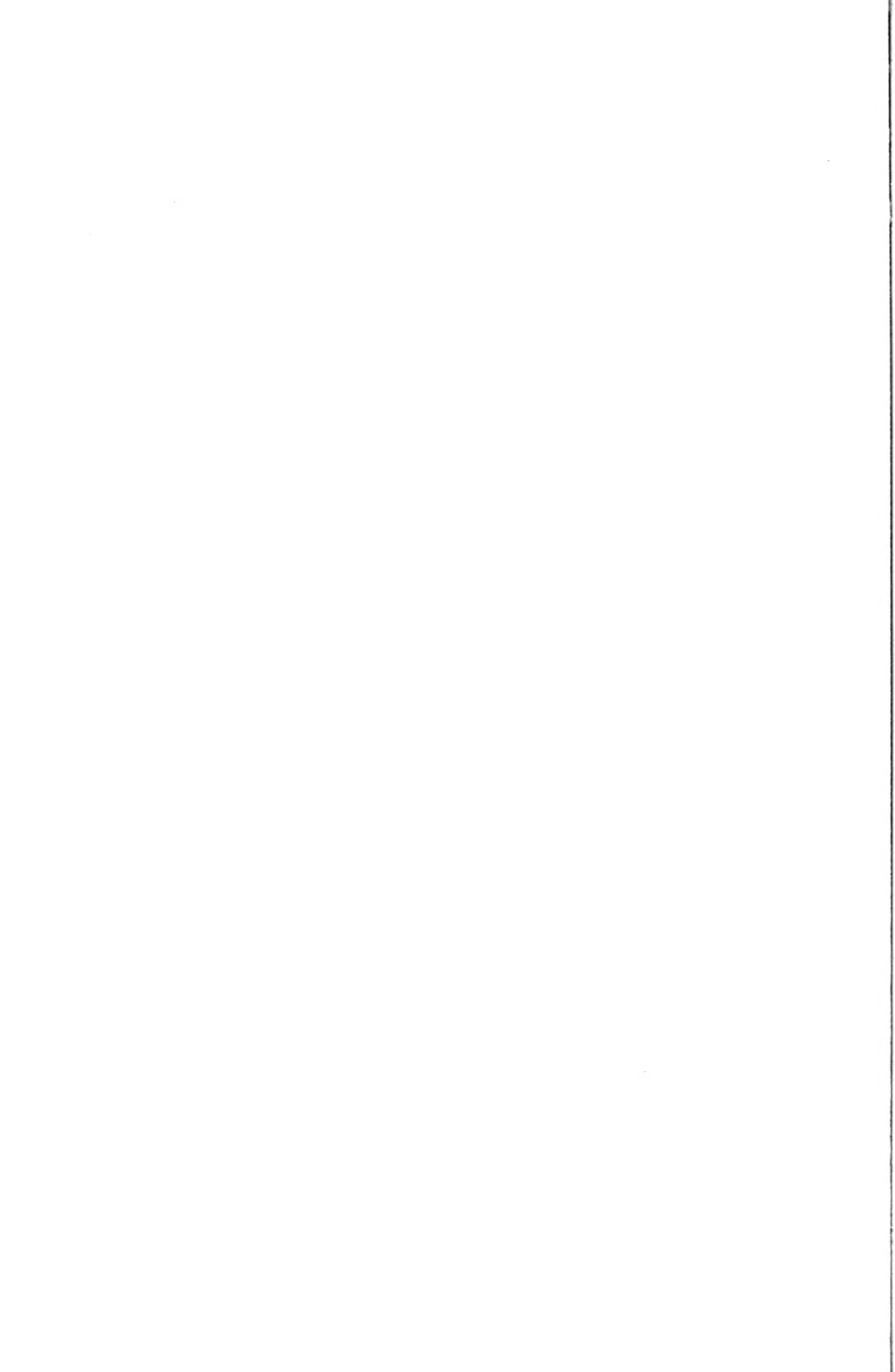


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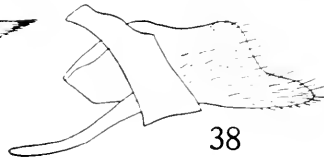
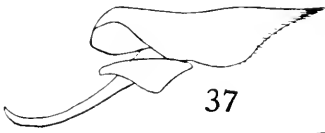
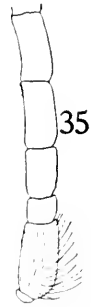
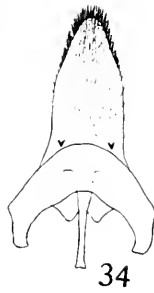
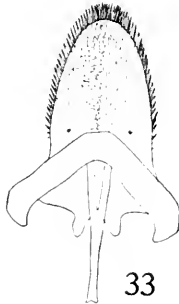
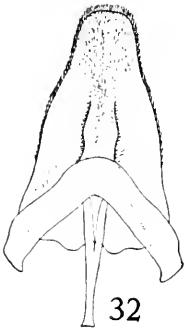
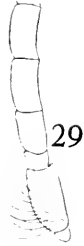
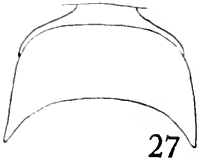
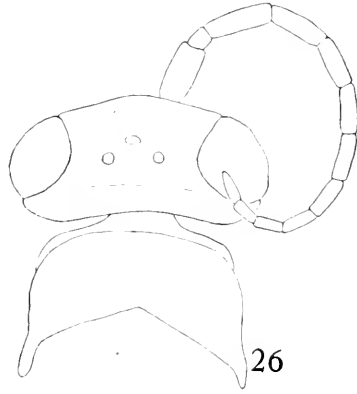
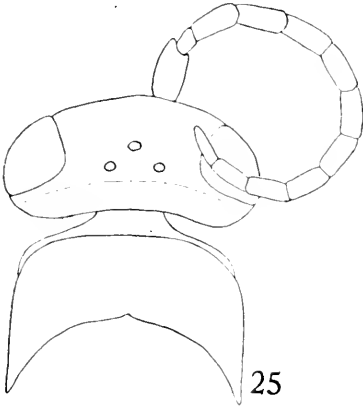


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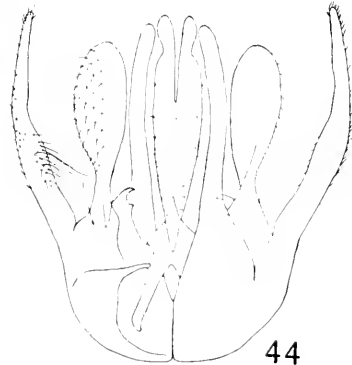
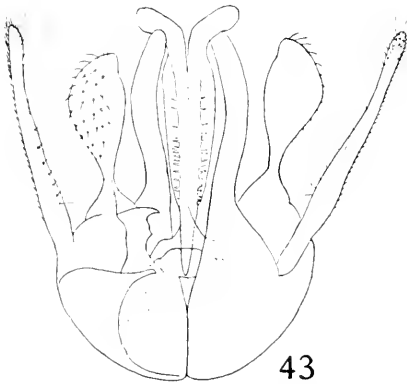
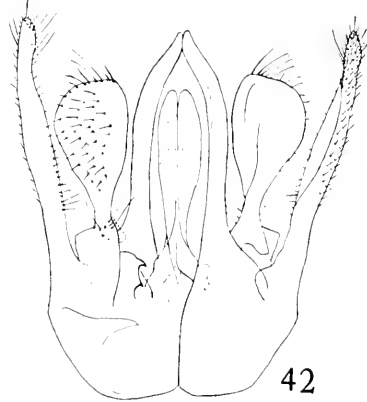
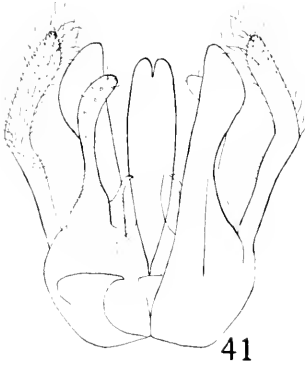
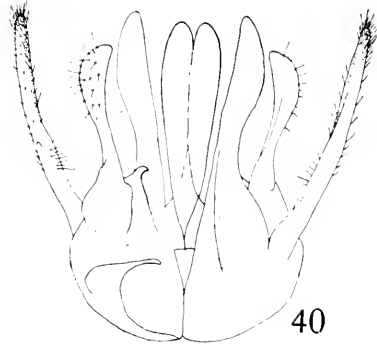
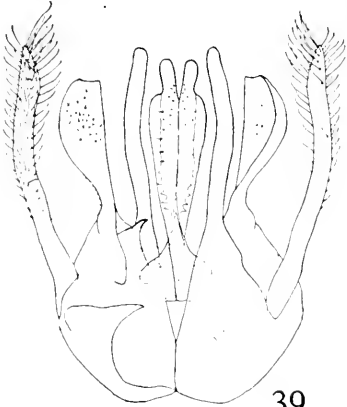




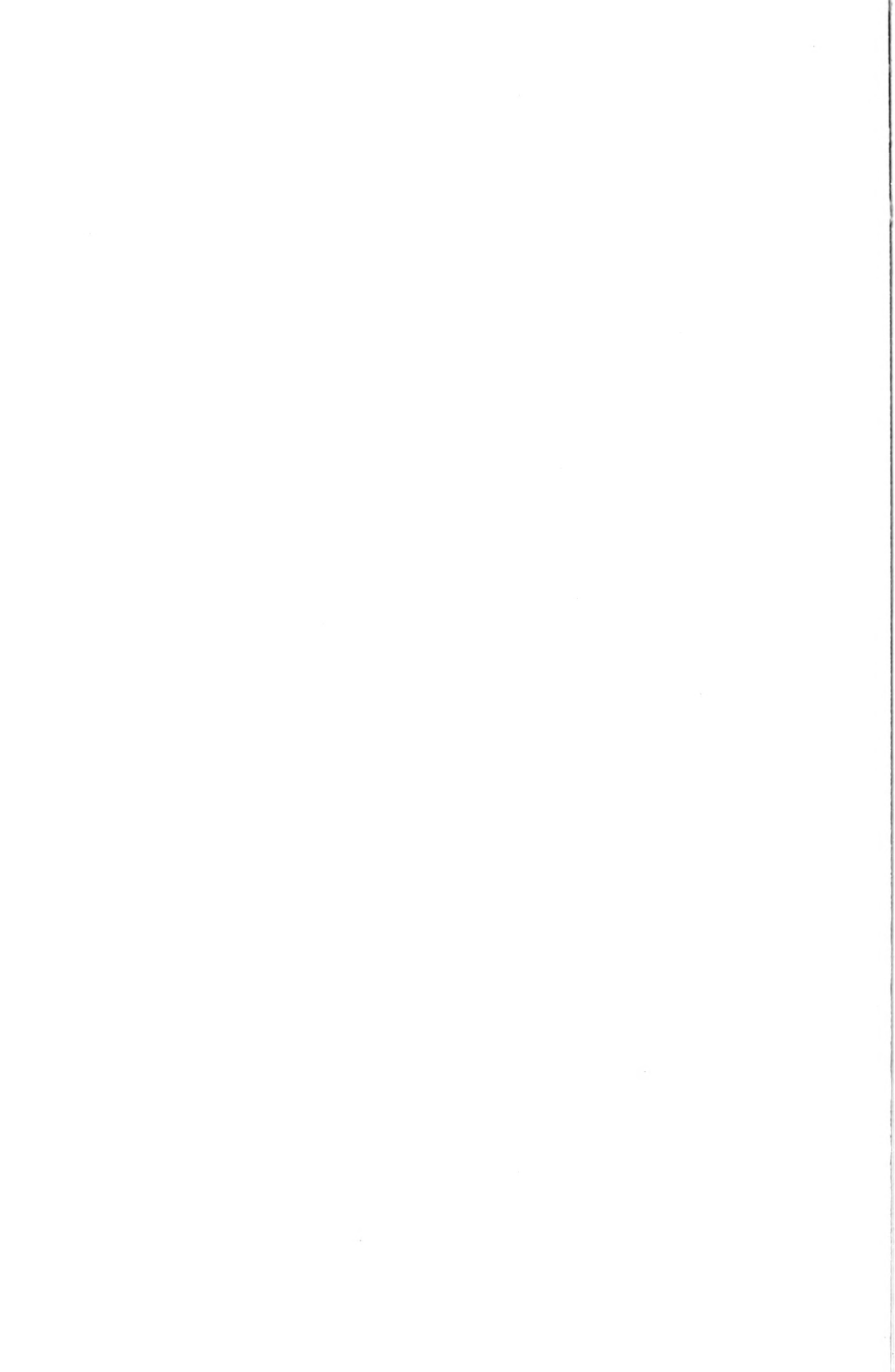


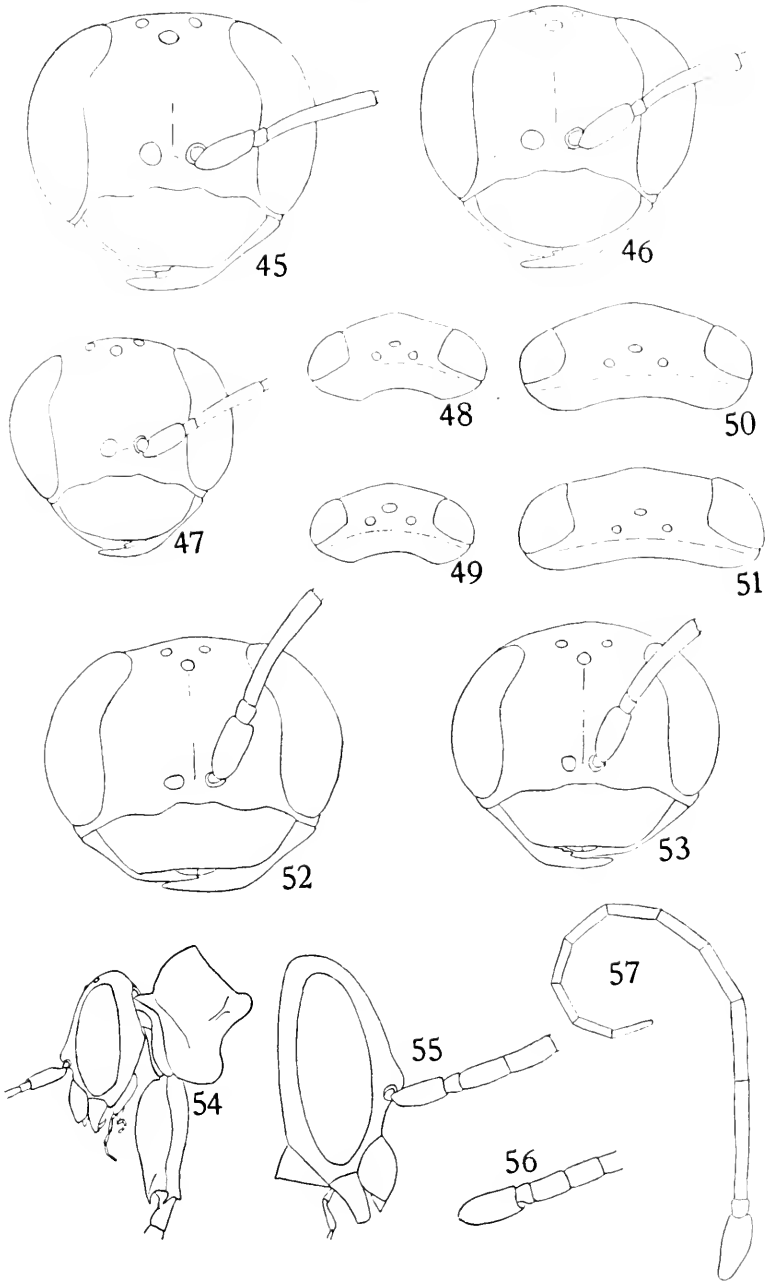
EVANS—NEARCTIC SPIDER WASPS





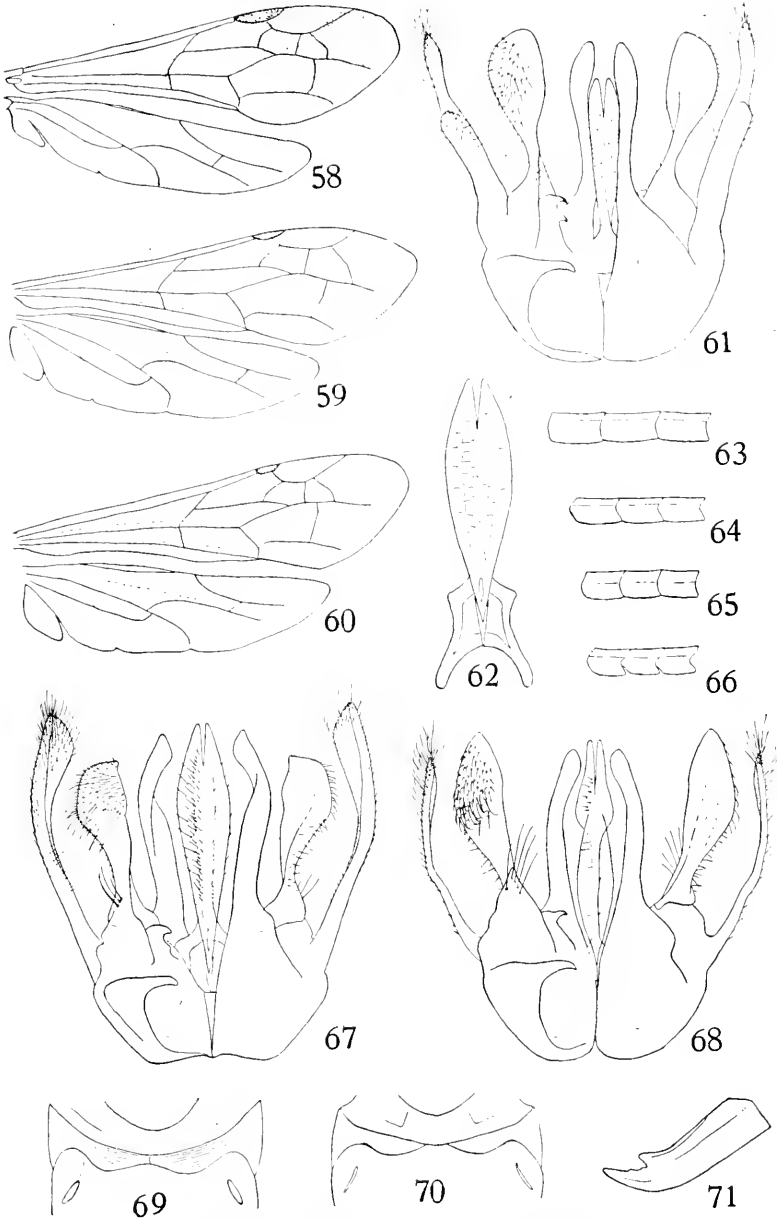
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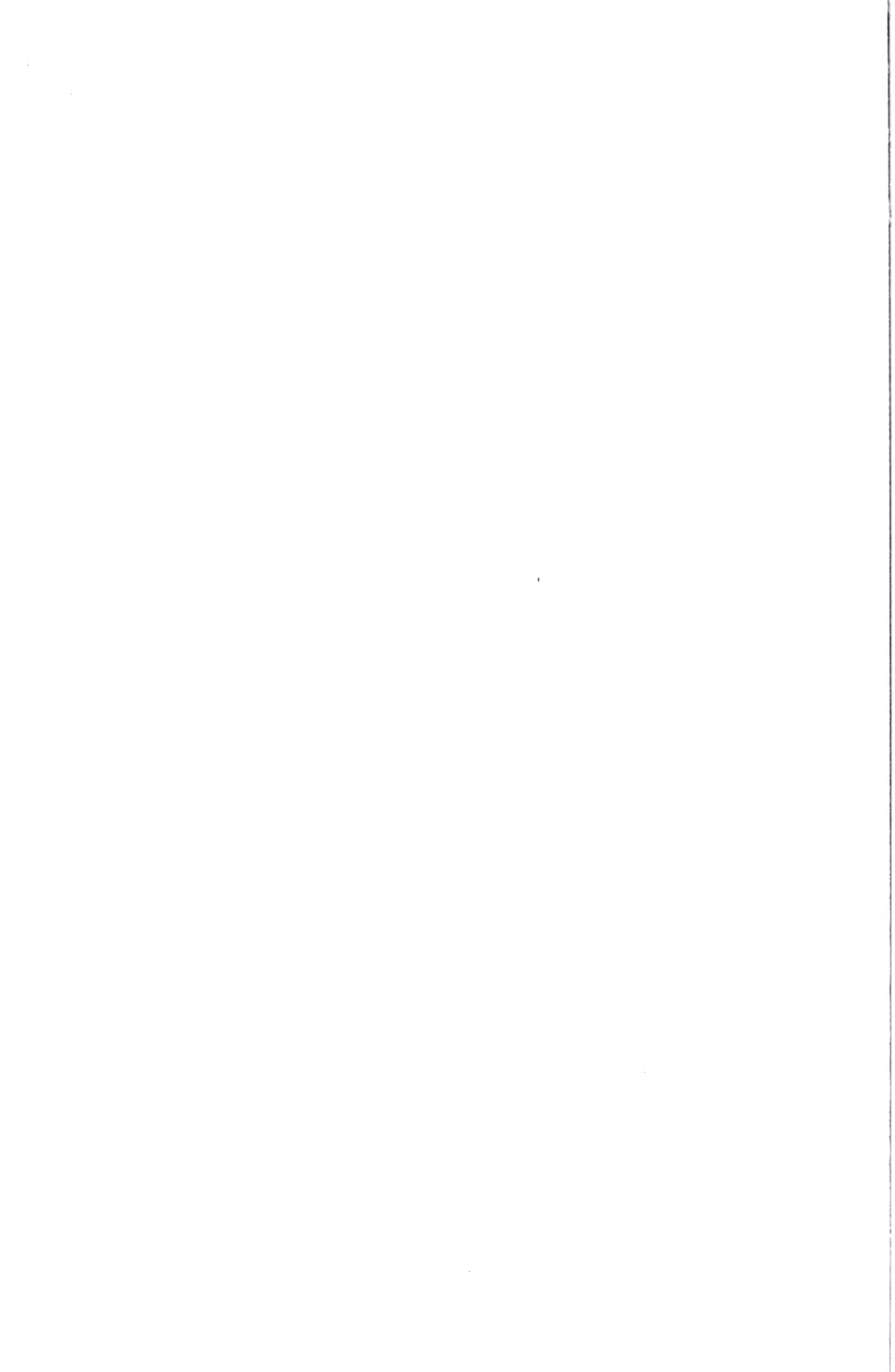


EVANS—NEARCTIC SPIDER WASPS





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**A TAXONOMIC STUDY OF THE NEARCTIC SPIDER  
WASPS BELONGING TO THE TRIBE POMPILINI  
(HYMENOPTERA: POMPILIDAE). PART II:  
GENUS ANOPLIUS DUFOUR**

BY HOWARD E. EVANS

*Kansas State College, Manhattan, Kansas*

(Plates XI to XXII)

This is the second paper of a series of three, in which it is planned to review the systematics and bionomics of the Nearctic Pompilini. In the first part of this study,<sup>1</sup> the author presented certain introductory material, a key to the genera, and a systematic treatment of eight of the thirteen genera. Part III, yet to be published, will include four of the genera, as well as a check list of the Nearctic genera and species and an index to all three parts. To this part will also be appended such additions and corrections to the first two parts as seem necessary at that time.

The present part of this study includes the single genus *Anoplus*. This is the largest genus of the entire family in our fauna, including as it does some 43 species, some of them among our commonest Pompilidae. This genus has frequently gone by the name of *Psammochares*, a name now rejected by the International Commission of Zoological Nomenclature. The generic synonymy which follows is only a partial one, the reader being referred also to the synonymies given under the several subgenera.

IX. Genus **ANOPLIUS** Dufour

*Psammochares* Latreille, 1796, Précis des Caractères générique des Insectes, p. 115. [Type: *Sphex fusca* Linnaeus, 1761; designated by Latreille, 1803.]—Banks, 1912, Jour. N. Y. Ent. Soc., 19: 223. [*E' auct.*] [Suppressed by the Internat. Comm. Zool. Nomen. in Opinion 166, 1945.]

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<sup>1</sup> Evans, H. E., 1950, Trans. Amer. Ent. Soc., 75: 133-270.

- Pompilus* Fabricius, 1798, Suppl. Ent. Syst., pp. 212 and 246-252. [Type: *Pompilus viaticus* Fabricius (? = *Sphex viatica* Linnaeus, 1758<sup>2</sup>; = *Sphex fusca* Linnaeus, 1761); designated by Latreille, 1810.]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 86. [In part.] [*Et auct.*] [*Nec Pompilus* in the sense of the Internat. Comm. Zool. Nomen., which in Opinion 166 designated *Pompilus pulcher* Fabricius as type.]
- Anoplius* Dufour, 1834, Ann. Soc. Ent. France, 2: 483. [Type: *Pompilus niger* Fabricius, 1775 (= *nigerrimus* Scopoli, 1763); designated by Fox, 1901.]—Sustera, 1913, Verh. zool.-bot. Ges. Wien, 62: 182, 206. [First used in approximately its present limits.]—Berland, 1925, Faune de France X, Hymen. vespiformes 1, pp. 248-252.—Haupt, 1927, Deutsch. Ent. Zeitschr., Beiheft, pp. 159, 166, 230-247.—Wilcke, 1943, Overdruk uit Med. van de Landbouwhoogeschool Wageningen, 47: 72-79.

The genus *Anoplius* is here used in the same sense as used by recent European authors, that is, to include those forms closely allied to *Pompilus* in which the apical tergite of the female is provided with numerous stout bristles and in which the claws of the male are bifid on all the tarsi. As thus defined it is a distinct and, I believe, natural genus. It is a very large genus in the New World, and there has been a strong temptation for American authors to split it into more convenient-sized genera. Some of these groups can be retained as subgenera, while others must be abandoned. It is possible that some of the subgenera here recognized will have to be discarded when the genus is more thoroughly studied in other parts of the world.

*Generic characters.*—Small to fairly large wasps, 3 to 30 mm. in length. American species all in large part black or blue-black, the abdomen in a number of species marked with rufous, the mandibles normally somewhat ferruginous apically. Pubescence and pilosity very variable, but the abdomen of the female always more or less setose ventrally beyond the basal sternite, and the apical tergite in this sex with at least a few stout bristles toward the posterior end which are directed caudad, often very densely bristly (Fig. 145).

Mandibles usually bidentate in the female, but in a few species unidentate, in the male usually unidentate, but in a few species bidentate. Labrum with the apical margin only slightly emarginate, protruding only slightly if at all from beneath the clypeus. Clypeus from 2 to 3 times as broad as high, its apical margin truncate, concave, or emarginate. Malar space very short. Antennae elongate, segment 3 in the female at least 3 times as long as its

<sup>2</sup> The identity of *Sphex viatica* Linnaeus has been much disputed. Cf. Pate, 1946, Trans. Amer. Ent. Soc., 72: 126, and Verhoeff, 1947, Tijdschr. voor Ent., 88: 334-336.

greatest diameter, segment 3 in the male at least twice as long as its greatest diameter.

Pronotum short, usually considerably shorter than the mesonotum, the anterior slope rather even. Postnotum a transverse band of variable width, never longer than the metanotum and usually considerably shorter, its margins nearly parallel. Propodeum with the contours even, or occasionally somewhat protuberant postero-laterally, sometimes with a steeply declivous area posteriorly. Front tarsus of the female with or without a comb. Apical tarsal segments spined beneath in the female, often so in the male. Claws of the female dentate, except in one species where they are unusually long, unsymmetrical, and bifid. All the claws of the male bifid, the inner claws of the front tarsus always strongly curved and deeply cleft, the apical segment of the front tarsus in this sex either modified or not. Pulvillar comb well developed, in the female of from 12 to 24 strong, subparallel setulae, in the male of from 8 to 24 setulae.

Hind wing with the anal lobe small, at most half the length of the submedian cell. Cubitus arising at, beyond, or slightly before the tip of the submedian cell. Fore wing with the marginal cell never removed by more than twice its own length from the wing-tip; third discoidal cell not more than  $1\frac{1}{2}$  times its own length from the wing margin. Second and third submarginal cells commonly somewhat narrowed above by the arcuation of the first and third transverse cubital veins, the third submarginal sometimes triangular or petiolate.

Abdomen of the female stout, subfusiform, the pygidium bristly as described above. Abdomen of the male more slender and elongate, the apical segments never strongly telescoped, though often slightly so. Venter of male either smooth, slightly setose, or with dense tufts of hair on some of the sternites. Subgenital plate variously developed, the basal sclerite simple, more or less V-shaped. Genitalia variously developed, showing excellent specific characters throughout the genus; aedeagus never with spines or setae on the shaft; parapenials simple and slender; basal hooklets usually strong, single, but in two subgenera wanting or reduced to small flaps.

*Biology.*—The species of this genus occupy a variety of habitats, some being rather restricted ecologically, and others very wide-ranging. The prey consists of spiders of a wide variety, but perhaps most commonly Lycosidae. Some species are rather specific in their prey-preferences, while the majority apparently are rather unselective. The nest is a simple gallery in the earth or a ready-made niche. Further generalizations can hardly be made; the biology is discussed under the various subgenera and species where it is known.

*Distribution.*—This genus occurs throughout the world except that, so far as I know, there are no endemic species in the Australian region. There are numerous species in the Palaearctic, Oriental, and Ethiopian regions, but the genus is nowhere so well represented as in the Nearctic and Neotropical regions. The 43 Nearctic species can be placed in 6 subgenera, which seem to represent natural groups; the lines between them, however, are not always clear-cut.

### Key to Subgenera

#### Females

1. Front tarsus without a comb, the second segment with only 1 to 3 very small spines on the outer side, much shorter than that at the apex of the segment; transverse median vein of fore wing usually meeting the media beyond the origin of the basal vein .....F. **Anoplius** Dufour  
Front tarsus with a true comb, that is, there is a single spine on the outer side near the middle of the second segment which is as long as that at the apex of the segment .....2
2. Anterior margin of clypeus with a distinct median emargination; posterior margin of pronotum arcuate; head, thorax, and propodeum with abundant erect hairs .....A. **Lophopompilus** Radoszkowski  
Anterior margin of clypeus with a distinct emargination only in a few species, and in these either the pronotum is angulate behind or the propodeum is without erect hairs or practically so .....3
3. Transverse median vein of fore wing meeting the media beyond the origin of the basal (Fig. 153); third submarginal cell usually petiolate; spines of the tarsal comb from one to two times as long as the thickness of the tarsus; wings never wholly deep fuliginous  
E. **Pompilinus** Ashmead  
Transverse median vein of fore wing meeting the media at or slightly before the origin of the basal (Fig. 152) (rarely slightly beyond, but in this case either the spines of the tarsal comb are more than twice as long as the thickness of the tarsus, or the wings are wholly deep fuliginous) .....4
4. Marginal cell very long, removed from the wing-tip by not more than its own length, the radial vein nearly evenly arched; third submarginal cell large, wider on the radius than the second submarginal; front narrow; spines of the tarsal comb very short ....C. **Anopliodes** Banks  
Marginal cell of variable length, the radial vein always somewhat angled at the third transverse cubital vein; third submarginal cell much narrowed above, shorter on the radius than the second, occasionally triangular or petiolate .....5

- 5. Apical margin of clypeus with a median emargination; front narrow, the middle interocular distance not over .56 times the transfacial distance

B. **Notiochaes** Banks

Apical margin of clypeus truncate or slightly concave, except in one species in which the front is very broad, the middle interocular distance varying from .57 to .60 times the transfacial

D. **Arachnoproctonus** Howard

Males

- 1. Subgenital plate with a large plumose process at its base which projects from the emargination of the preceding sternite (Fig. 116); head, thorax, and propodeum with abundant erect hairs

A. **Lophopompilus** Radoszkowski

Subgenital plate without a basal plumose process .....2

- 2. Sternite 4 of the abdomen with a semicircular area of dense, felt-like pubescence along its posterior margin; subgenital plate with a sharp, V-shaped incision apically, internally with lateral expansions which terminate in a group of stout setulae (Fig. 118)

B. **Notiochaes** Banks

Sternite 4 without such a patch of felt-like pubescence; subgenital plate without an apical V-shaped incision or basal lateral expansions .....3

- 3. Last segment of front tarsus unmodified, the sides nearly parallel, not at all produced; wings subhyaline basally, darker apically; marginal cell long, the third submarginal wide above; basal hooklets of genitalia wanting .....C. **Anopliodes** Banks

Last segment of front tarsus with the inner margin slightly to strongly produced, the segment thus asymmetrical (barely so in one species having wholly deep fuliginous wings); basal hooklets well developed ....4

- 4. Transverse median vein of fore wing meeting the media at or slightly before the origin of the basal (Fig. 152) .....5

Transverse median vein of fore wing meeting the media beyond the origin of the basal vein (Figs. 153 and 154) .....6

- 5. Either (a) the wings rather heavily infuscated, usually wholly and uniformly so; or (b) the propodeum without more than some very short, inconspicuous erect hairs; propodeum with the slope very slight in front, steepened behind .....D. **Arachnoproctonus** Howard

Wings hyaline or subhyaline, with a darker marginal band; propodeum with noticeable dark hairs; slope of propodeum low and nearly even from front to rear .....F. **Anoplius** Dufour

- 6. Propodeum, in profile, with the slope very slight in front, steepened behind (Fig. 151); third submarginal cell nearly always petiolate; parameres of genitalia long, usually broadened apically

E. **Pompilinus** Ashmead

Propodeum with the slope low and nearly even from front to rear (as in Fig. 147); third submarginal cell only occasionally petiolate; parameres slender or broad, but not broader apically than near the base, often rather short .....F. *Anoplius* Dufour

A. Subgenus **LOPHOPOMPILUS** Radoszkowski

- Lophopompilus* Radoszkowski, 1887, Hor. Soc. Ent. Ross., 21: 42. [Type: *Pompilus grandis* Eversmann, 1849 (= *samariensis* Pallas, 1771); desig. by Ashmead, 1902.]—Ashmead, 1902, Canad. Ent., 34: 81.—Banks, 1912, Jour. N. Y. Ent. Soc., 19: 224. [Subgenus of *Psammochares*.]—Banks, 1919, Bull. Mus. Comp. Zool., 63: 231. [Genus.]—Regan, 1923, Ann. Ent. Soc. Amer., 16: 177-194. [Genus; revision of Nearctic species.]—Dreisbach, 1949, Ent. Amer., (n. s.) 29: 7, 9, 34, pl. I, fig. 2. [Genus.]
- Pompilogaster* Howard, 1901, The Insect Book, pl. V, fig. 19. [Type: *Pompilus aethiops* Cresson, 1865; monobasic.]
- Pompilogastra* Ashmead, 1902, Canad. Ent., 34: 81. [Type: *Pompilus aethiops* Cresson, 1865; monobasic.]

The mostly rather large wasps of this subgenus are among the best known and most often collected of American spider wasps. The plumose process at the base of the subgenital plate of the male (Figs. 116 & 117) is unique in the family. The emargination of the clypeus of the female is a less distinctive character, as several other species of *Anoplius* belonging to other subgenera share it; two other characters, the completely arcuate posterior pronotal margin, and the very hairy pronotum and propodeum, combined with it will, however, separate the females from these species.

*Subgeneric characters.*—Medium-sized to large wasps (8-25 mm.); color black, the second abdominal tergite sometimes marked with orange. Body with conspicuous black erect hair on the following parts: scape (usually), front, vertex, temples, propleura, pronotum, coxae, femora (sometimes), mesopleura, scutellum, metanotum, propodeum, first abdominal tergite, and to some extent the sternites and the apical tergites; pygidium of female densely bristly. Mandibles with a single strong tooth on the inner margin, the females sometimes with a weak second tooth basad of this. Clypeus large, slightly elevated, the apical margin in the male truncate or very slightly concave, in the female with a well-defined median emargination beneath which the truncate, bristly apical margin of the labrum may be seen. Front broad; eyes somewhat convergent above the middle. Antennae long and slender, segment three considerably longer than four in the female, usually slightly so in the male.

Posterior margin of pronotum evenly arcuate, in some males with a faint suggestion of a median angulation. Slope of propodeum rather even, or

slightly steeper behind. Front tarsus of female with a well-developed comb, the basitarsus with from 3 to 5 comb-spines, and 3 or 4 additional, shorter spines below these. Apical tarsal segments with a median row of from 3 to 6 spines beneath in the female, weakly or not at all spined beneath in the male. Last segment of front tarsus of male not modified, more or less parallel-sided, the inner claw of this tarsus strongly curved, deeply cleft. Pulvillar comb strong, of about 24 setulae in the female, about 14 in the male. Hind wing with the cubitus arising at or a little before the tip of the submedian cell. Fore wing with the basal vein arising at or a little before the juncture of the transverse median. Marginal cell about or a little less than its own length from the wing-tip; third submarginal cell much narrowed above, occasionally triangular; third discoidal cell long, less than its own length from the wing margin.

Penultimate sternite of male with a deep emargination, from which protrudes a compressed, finger-like lamella, clothed densely with hairs, which has its origin at the base of the subgenital plate, apparently as a posterior prolongation of the basal sclerite; subgenital plate broad, nearly flat, the apex rounded or subtruncate (Figs. 116 & 117). Genitalia with the aedeagus simple and slender, feebly bilobed apically; parapenials slender and elongate, closely embracing the aedeagus. Basal hooklets strong, single; digitus slender, spindle-shaped, provided with numerous setae which are directed laterad. Parameres slender, with a distinct sub-basal squama, more or less setose.

*Biology.*—The species of *Lophopompilus* are wide-ranging, strong-flying forms; several are most often found in open fields or meadows, one (*cleora* Banks) in sand dunes, and one (*carolinus* Banks) in woodlands. Both sexes visit flowers of many kinds; there are several records of females having been taken at light at night. Despite the relative abundance of members of this group, little is known of their nesting habits, except that they prey on large spiders, chiefly Lycosidae, and nest in the ground. A patient observer in almost any part of the country could make a valuable contribution by studying the biology of *A. (L.) aethiops* Cresson, one of our commonest Pompilidae.

*Distribution.*—Holarctic Region; represented by the genotype and several other species in the Palaearctic fauna, and by five species in North America.

*Key to Species*

## Females

1. Color black, the pubescence more or less evidently reflecting deep bluish or purplish; length 13-23 mm.; third antennal segment subequal to or a little shorter than the upper interocular distance .....2  
 Color black, the second abdominal tergite marked with orange; pubescence obscurely reflecting deep blue-green; third antennal segment slightly to considerably greater than upper interocular distance, or the size under 13 mm. ....3
2. Front basitarsus with 3 rather short comb-spines, rarely with a small fourth; emargination of clypeus rather broad; eyes converging but slightly above, upper interocular distance from .82 to .88 times the lower interocular; post-ocellar line less than the ocello-ocular  
     1. **aethiops** (Cresson)  
 Front basitarsus with 4 longer comb-spines, rarely with a short fifth; emargination of clypeus more narrow and sharply-defined; eyes converging more above, upper interocular distance from .72 to .8 times the lower interocular; post-ocellar line subequal to or slightly less than the ocello-ocular .....2. **cleora** (Banks)
3. Size 9 to 13 mm.; wings rather lightly infuscated; third antennal segment equal to from .83 to .93 times the upper interocular distance; upper interocular distance from .78 to .88 times the lower interocular  
     3. **carolinus** (Banks)  
 Size 15 to 26 mm.; wings fuliginous, violaceous; third antennal segment at least as great as the upper interocular distance; eyes more strongly convergent above .....4
4. Front basitarsus usually with 3 comb-spines; upper interocular distance about .75 times the lower interocular; third antennal segment from 1.0 to 1.2 times the upper interocular distance; emargination of clypeus more narrow and sharply defined .....4. **atrox** (Dahlbom)  
 Front basitarsus usually with 4 comb-spines; upper interocular distance about .65 times the lower interocular; third antennal segment from 1.2 to 1.4 times the upper interocular distance; emargination of clypeus rather broad and shallow .....5. **bengtssoni** (Regan)

## Males

1. Wings hyaline, the outer margins with a fuscous band; pubescence of head and thorax in large part silvery; parameres of genitalia straight, rather sparsely hairy along the outer margin and the apical fourth of the ventral surface .....3. **carolinus** (Banks)  
 Wings wholly fuliginous, more or less violaceous; pubescence wholly dark; parameres sinuate or, if straight, rather bushy-haired on the outer margin and apical third of the ventral surface .....2



2. Color black, the pubescence more or less strongly reflecting deep bluish or purplish; plumose process of subgenital plate extending less than half the distance from the basal sclerite to the apex of the plate (Fig. 116) .....3
- Color black, the second abdominal tergite marked with orange, the pubescence obscurely reflecting deep blue-green; plumose process longer, generally extending more than half way from the basal sclerite to the apex of the subgenital plate (Fig. 117) .....4
3. Post-ocellar line distinctly less than ocello-ocular; eyes converging less above, upper interocular distance about .95 times the lower interocular; front convex, rather full between the eyes; parameres with a distinct subapical curvature (Fig. 72) .....1. **aethiops** (Cresson)
- Post-ocellar line subequal to ocello-ocular; eyes converging somewhat more above, the upper interocular distance about .9 times the lower interocular; front less convex, rather flat between the eyes; parameres straight (Fig. 73) .....2. **cleora** (Banks)
4. Eyes converging slightly above, upper interocular distance from .88 to .95 times lower interocular; post-ocellar line usually a little less than the ocello-ocular, the ocelli of average size; parameres linear (Fig. 76)
4. **atrox** (Dahlbom)
- Eyes more strongly convergent at the top, the upper interocular distance from .80 to .88 times the lower interocular; ocelli rather large, the post-ocellar line usually slightly greater than the ocello-ocular; parameres somewhat broadened apically (Fig. 75)
5. **bengtssoni** (Regan)

1. **Anoplius (Lophopompilus) aethiops** (Cresson)

(Pl. XI, fig. 72; pl. XVIII, fig. 116.)

*Pompilus aethiops* Cresson, 1865, Proc. Ent. Soc. Phila., 4: 451. [Lectotype: ♀; Colorado (no further data); A.N.S.P. no. 413.]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 87.—Provancher, 1882, Nat. Canad., 13: 35. [Quebec.]—Fox, 1894, Proc. Calif. Acad. Sci., (2)4: 98. [Lower Calif.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 270.

*Pompilogaaster aethiops* Howard, 1901, The Insect Book, pl. V, fig. 19.

*Pompilogastra aethiops* Ashmead, 1902, Canad. Ent., 34: 81.

*Anoplius (Sophropompilus?) aethiops* Viereck, 1906, Trans. Amer. Ent. Soc., 32: 223. [Galveston, Texas.]

*Anoplius aethiops* Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 673.

*Psammochares ilione* Banks, 1910, Psyche, 17: 249. [Type: ♀; Falls Church, Va., 12 Sept. (N. Banks); M.C.Z. no. 13,667.]—Regan, 1923, Ann. Ent. Soc. Amer., 16: 179. [Placed in synonymy with *aethiops*.]

*Psammochares (Lophopompilus) aethiops* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 224.—Rohwer, 1916, Conn. Geol. Nat. Hist. Survey Bull., 22, pp.

633, 634.—Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 986. [N. Y.]—Johnson, 1930, List Insect Fauna Nantucket, p. 111.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 123. [N. C.]

*Psammochares (Lophopompilus) ilione* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Johnson, 1930, List Insect Fauna Nantucket, p. 110.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 123.

*Lophopompilus aethiops* Banks, 1919, Bull. Mus. Comp. Zool., 63: 231.—Regan, 1923, Ann. Ent. Soc. Amer., 16: 178-191, pl. XI, fig. 3.—Dreisbach, 1949, Ent. Amer., (n. s.) 29: 34, pl. I, fig. 2.

*Lophopompilus azotus* Banks, 1929, Psyche, 36: 326. [Type: ♀; Springfield, S. D., 14 Sept. 1925 (H. C. Severin); M.C.Z. no. 16,232.] New synonymy.

This widely distributed species is easily confused only with *cleora*, but a number of characters, as indicated in the keys, serve to separate these species. In determining a mixed series of males, I have found it convenient to relax the specimens and draw out the genitalia to the extent where the parameres can be seen, rather than attempt to interpret the more subtle external characters. The parameres of *aethiops* have a distinct preapical curvature, whereas in *cleora* they are straight.

FEMALE.—Length 18 (13-23) mm. Color black; wings fuliginous, violaceous. Body clothed with a fine dark pubescence which reflects deep metallic colors, chiefly bluish. Clypeus about 2.7 times as broad as high, its apical margin with a slightly raised rim, medially with a broad, moderately deep, arcuate emargination. Front broad, the middle interocular distance from .6 to .63 times the transfacial distance. Inner orbits subparallel below, converging slightly above, the upper interocular distance equal to from .82 to .88 times the lower interocular. Ocelli in a rather close triangle on the vertex, the front angle usually a little greater than a right angle; ocello-ocular line always distinctly greater than the post-ocellar. First four antennal segments in a ratio of about 4:1:7:5, segment 3 slightly shorter than the upper interocular distance.

Propodeum strongly convex, the median line impressed on the anterior half, and with a rather flat semicircular declivity behind. Front basitarsus with three comb-spines (rarely a small fourth, basal one), the apical one about half the length of the second tarsal segment. Fore wing with the second and third submarginal cells both four-sided, the second narrowed by from .1 to .4 above, the third narrowed by from .7 to .8 above.

MALE.—Length 13.5 (9-18) mm. Color black, clothed with a dark pubescence which in proper light rather strongly reflects deep bluish, as in the female. Scape hairy above and below; head and thorax with abundant erect

hairs; abdominal sternites and basal and apical tergites all slightly hairy. Wings in color and venation as in the female.

Clypeus about 2.2 times as broad as high, its apical margin slightly arcuately concave. Front broad, middle interocular distance from .63 to .66 times the transfacial distance. Inner orbits diverging slightly to the middle, converging somewhat above, upper interocular distance about .95 times the lower interocular. Post-ocellar line usually slightly less than the ocellular. First four antennal segments in a ratio of about 3:1:3.2:3, segment 3 more than 3 times as long as thick. Pronotum arcuate behind; propodeum weakly impressed medially. Longer spur of hind tibia about .6 the basitarsus.

Emargination of sternite 6 large, V-shaped. Subgenital plate (Fig. 116) with the basal process relatively short, the hairs on it very long. Genitalia (Fig. 72) with the parameres slender, slightly arched, with a distinct pre-apical curvature; squama, outer margin, and apex of parameres setose, the ventral surface with only a few setae apically. Volsellae with several long hairs at the base, the digitus clothed with numerous rather long setae. Aedoeagus simple, slightly exceeding the parapenials, both of these somewhat shorter than the parameres.

*Biology.*—This species is an inhabitant of open areas, fields, meadows, and prairies. I have sometimes taken it in gravel pits, but never in open sand. Despite its relative abundance, nothing is known of its nesting habits; it is possible that it nests among tall grass, where it escapes notice. The only record of its prey is a female from Amherst, Mass. [Mass.] pinned with the spider *Lycosa frondicola* Emerton, ♂ [det. B. J. Kaston].

*Anoplus aethiops* is principally a late summer species in the northern part of the United States and in southern Canada, where there is a single generation a year; in the South there are at least two generations a year. The species is commonly taken on flowers, and is known to visit the following: *Daucus carota*, *Pastinaca sativa*, *Conium maculatum*, *Tecoma radicans*, *Solidago* spp., *Eupatorium perfoliatum*, *Asclepias* spp., *Sphaeralcea angustifolia*, *Tamarix gallica*, *Cleome* spp., *Melilotus* sp., and *Eriogonum* sp.

*Distribution.*—This species occurs transcontinentally from the Lower Austral to the Transition Zones. It is a rather common wasp over much of its range, but apparently much less common in the southeastern United States, perhaps through competition with a very common wasp of similar habits, *A. (Notiochares) amethystinus atramentarius* (Dahlbom).

*Specimens seen*: 630 (311 ♀♀, 319 ♂♂). The following records appear to define the periphery of its range: NOVA SCOTIA: 1 ♂, Kentville, Aug. [CNC]; QUEBEC: 1 ♀, Hemmingford, Aug. [CNC]; ONTARIO: 1 ♀, 4 ♂♂, Ottawa, Aug.-Sept. [CNC]; MICHIGAN: Ingham Co., 1 ♂, 11 Aug. [Coll. R. L. Fischer]; WISCONSIN: Wood Co., 1 ♀, Cranmoor, Aug. [USNM]; MINNESOTA: Ramsey Co., 1 ♀, 25 Aug. [Minn.]; SOUTH DAKOTA: Butte Co., 1 ♂, Newell, Aug. [SDS]; MONTANA: 1 ♀, 1 ♂ (no further data) [ANSP]; BRITISH COLUMBIA: 1 ♀, Vernon, 5 Aug. [CNC]; CALIFORNIA: Riverside Co., 1 ♀, Palm Springs, 6 July [CIS]; MEXICO: Durango, 1 ♀, 1 ♂, Coyotes, 8300 feet, 8 Aug. [AMNH]; Dist. Federal, 1 ♂, July-Aug. [USNM]; TEXAS: Dimmit Co., 2 ♀♀, Carrizo Springs, Oct.-Nov. [RWS]; ALABAMA: Mobile Co., 1 ♀, 26 Nov. [CAS]; GEORGIA: 2 ♀♀ (no further data) [ANSP]; NORTH CAROLINA: Carteret Co., 1 ♀, Cherry Point [CIS].

2. *Anoplius (Lophopompilus) cleora* (Banks) (Pl. XI, fig. 73.)

*Psammochares cleora* Banks, 1917, Bull. Mus. Comp. Zool., 61: 105. [Type: ♀; Los Angeles, Calif., 3 May 1915 (M. C. VanDuzee); M.C.Z. no. 10,020.]

*Psammochares (Lophopompilus) cleora* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 987. [Ithaca and L. I., N. Y.].—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 123. [N. C.]

*Lophopompilus cleora* Banks, 1919, Bull. Mus. Comp. Zool., 63: 231.—Regan, 1923, Ann. Ent. Soc. Amer., 16: 178-191, pl. XI, fig. 4, & pl. XII, figs. 3, 7.

*Anoplius (Lophopompilus) cleora* Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 264.

This species is distinguishable from the very similar *aethiops* by the characters mentioned in the key and under that species; it occupies quite a different ecological niche than that species, being very partial to sandy places.

FEMALE.—Length 15 (13-19) mm. Color black; pubescence very dark, in proper light reflecting deep bluish or purplish. Wings wholly fuliginous, violaceous. Body extensively hairy, including the scape, the coxae, and often the femora to some extent. Clypeus slightly shorter than in *aethiops*, about 3 times as broad as high; apical margin with a more narrow and sharply defined emargination. Front broad, the middle interocular distance about .6 to .63 times the transfacial distance. Inner orbits subparallel below, or very slightly converging to the middle; orbits distinctly converging above, the upper interocular distance from .72 to .8 times the lower interocular. Ocelli in a compact triangle, forming a right angle or a little more or less in front; post-ocellar line subequal to or a little less than the ocello-ocular.

First four antennal segments in a ratio of about 4:1:7:5, the third segment equal to or slightly shorter than the upper interocular distance, varying from .87 to 1.0 times the upper interocular.

Pronotum arcuate behind, sometimes with a faint suggestion of a median angulation. Propodeum convex, posteriorly with a rather flat declivity. Front basitarsus with four comb-spines (rarely with a small fifth, basal one); the spines are longer than in *aethiops* and, unless worn, the apical spine on the basitarsus is over half the length of the second tarsal segment, often nearly equal to it. Venation as usual in the subgenus; marginal cell usually slightly less than its own length from the wing-tip; third submarginal cell narrowed by .6 to .8 above.

MALE.—Length 13 (9.5-15) mm. Color of body, wings, and pubescence as in female. Clypeus convex, about 2.2 times as broad as high, its apical margin slightly concave. Middle interocular distance usually about .62 times the transfacial distance. Inner orbits distinctly convergent above, the upper interocular distance from .85 to .95 times the lower interocular. Front rather flat, less full between the eyes than in *aethiops*. Ocelli moderately large, in a compact triangle the front angle of which is about a right angle; post-ocellar line subequal to or very slightly greater or less than the ocello-ocular. First four antennal segments in a ratio of about 3:1:3.2:3, the third segment more than three times as long as thick.

Posterior pronotal margin arcuate, often with a vague suggestion of a median angulation. Slope of propodeum low and even, a little steeper behind; median line weakly if at all impressed. Abdomen with the emargination of the sixth sternite broadly V-shaped, at the base with a narrowly V-shaped extension. Subgenital plate much like that of *aethiops*, but the basal process slightly longer and the hairs on it usually slightly shorter. Genitalia (Fig. 73) with the parameres rather stout, straight, only slightly exceeding the parapenials; squama, outer margin, apex, and outer portion of ventral surface of parameres strongly setose; other genitalic structures much as in *aethiops*.

*Biology.*—This species is a rather strict psammophile, being partial to open sandy areas, especially along watercourses. Although local in its distribution, it is often common in its habitat. Dates of collection vary widely, and indicate two or more generations a year throughout its range. In Manhattan, Kansas, it is a common species along riverbanks in the autumn, and I have taken it as late as the 19th of November. This species only rarely visits flowers, but I have taken a few specimens on *Solidago* and on *Baccharis* (Compositae).

This insect nests in short tunnels in the sand which it provisions with Lycosid spiders. I have not observed the full nesting process,

but have found it in the evening constructing its burrows, presumably in which to spend the night. I have also taken a single female with the spider *Arctosa littoralis* (Hentz) ♂ [det. B. J. Kaston]. The wasp was walking backward over the sand dragging the spider by one of its legs. This individual was approached by several males and eventually left its spider briefly to mate, and was captured *in copula*.

*Distribution*.—This form occurs transcontinentally in the Lower and Upper Austral Zones, but, like the preceding species, is rare or absent in the Southeast. It enters the lower fringes of the Transition Zone in the East; the record from Ithaca, N. Y., given by Leonard (1926) is, however, based on a misdetermined *aethiops*.

*Specimens seen*: 200 (127 ♀♀, 73 ♂♂). Marginal records are as follows: PRINCE EDWARD ISLAND: 2 ♀♀, 2 ♂♂, Canad. Nat. Park, July [CNC]; NEW BRUNSWICK: 1 ♀, Chatham, Aug. [CNC]; VERMONT: 1 ♀, Burlington, 1 Sept. [MCZ]; NEW YORK: Nassau Co., 1 ♀, Sea Cliff [CU]; NEW JERSEY: Gloucester Co., 1 ♂, Westville, July [CU]; WEST VIRGINIA: Randolph Co., 1 ♀, Cheat Mt., 2000 feet, Aug. [CM]; NEW YORK: Wayne Co., 1 ♀, 4 Aug. [HEE]; ONTARIO: 1 ♀, Ottawa, Aug. [CNC]; MICHIGAN: Cheboygan Co., 1 ♀, Douglas Lake, 23 Aug. [Minn.]; MINNESOTA: Ramsey Co., 1 ♀, St. Anthony Park [Minn.]; NORTH DAKOTA: Ramsey Co., 1 ♀, Devil's Lake, 29 June [CU]; COLORADO: Mesa Co., 1 ♂, Grand Junction, 12 June [CAS]; BRITISH COLUMBIA: 1 ♂, Vernon, 25 Aug. [CNC]; OREGON: Josephine Co., 1 ♂, Grant's Pass, 6 July [OSC]; CALIFORNIA: Humboldt Co., 1 ♀, Fort Seward, May [CIS]; BAJA CALIFORNIA: 2 ♂♂, La Paz, June [CAS]; ARIZONA: Cochise Co., 1 ♀, Huachuca Mts., June [CAS]; TEXAS: Jeff Davis Co., 9 ♀♀, 5 ♂♂, Limpia Canyon, Davis Mts., July [HEE, ANSP]; KANSAS: Reno Co., 4 ♀♀, 7 ♂♂, 18 June [HEE, KSC]; Riley Co., 22 ♀♀, 10 ♂♂, Manhattan, 18 Sept.-19 Nov. [KSC, HEE, Coll. R. L. Fischer]; INDIANA: 1 ♀ (no further data) [USNM]; NORTH CAROLINA: Dare Co., 1 ♀, Kill Devil Hills, 4 June [KVK].

### 3. *Anoplius (Lophopompilus) carolinus* (Banks) new combination

(Pl. XI, fig. 74.)

*Lophopompilus carolina* Banks, 1921, Ann. Ent. Soc. Amer., 14: 20. [Type: ♀; Blowing Rock, N. C., Sept. 1915; M.C.Z. no. 13,668.]—Regan, 1923, Ann. Ent. Soc. Amer., 16: 179.

*Psammochares (Lophopompilus) carolina* Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 123. [N. C., several localities.]—Brimley, 1938, Insects No. Carolina, p. 433.

This is a considerably smaller *Lophopompilus* than our other native species, and unlike any of these is rather strictly a woodland species. The male has not previously been recognized; it is without the orange markings of the female, but is easily told by the mostly hyaline wings.

**FEMALE.**—Length 10.5 (9-13) mm. Color black, the second abdominal tergite with a pair of orange spots, sometimes confluent on the median line. Wings lightly infuscated, darker along the outer margins, non-violaceous. Pubescence brownish-fuscous, scarcely reflecting metallic colors. Scape slightly hairy; body in general slightly less strongly hairy than in the other species of the subgenus.

Clypeus short, transverse, about 3.2 times as broad as high; anterior margin with a broad, rather deep arcuate emargination. Front broad, middle interocular distance from .58 to .61 times the transfacial; eyes converging somewhat above, upper interocular distance from .78 to .88 times the lower interocular. Ocelli in a compact triangle, the front angle a right angle or slightly less; postocellar line less than ocello-ocular about as 4:5. First four antennal segments in a ratio of about 3.5:1:5:4, segment 3 equal to from .83 to .93 times the upper interocular distance.

Pronotum arcuate behind, often with a weak median angulation. Slope of propodeum low and rather even, the median line lightly impressed anteriorly. Tarsal comb consisting of spines scarcely longer than the width of the tarsus; basitarsus with 3 comb-spines, the apical one about a third the length of the second tarsal segment. Marginal cell of fore wing about its own length from the wing-tip, the radial vein nearly evenly arched. Third submarginal cell narrowed by at least half above, usually nearly or quite triangular, occasionally petiolate.

**MALE.**—Length 9 (8-10) mm. Color black; wings hyaline or subhyaline, the outer margins and upper half of the marginal cell with a distinct fuscous band. Posterior pronotal margin sometimes with a faint pale stripe. Pubescence over the greater part of the head and thorax silvery, that of the abdomen sometimes in part silvery. Clypeus about 2.4 times as broad as high, its apical margin slightly concave. Middle interocular distance from .62 to .66 times the transfacial. Inner orbits nearly parallel, the upper and lower interocular distances nearly equal, the orbits slightly emarginate at the middle. Ocelli about as in the female. First four antennal segments in a ratio of about 3:1:3:3, the third segment about 2.5 times as long as thick.

Posterior pronotal margin arcuate or vaguely angulate; slope of propodeum low and even, the median line weakly impressed. Longer spur of hind tibia about three-fourths the length of the basitarsus. Wing venation as in the female. Abdomen with sternite 6 broadly emarginate behind, with a narrow slit medially. Subgenital plate of the usual type in the subgenus, the basal process rather long, extending more than half way from

the basal sclerite to the apex of the plate. Genitalia (Fig. 74) with the parameres slender, straight, setose on the squama, outer margin, and apex, with a few setae on the ventral surface near the apex. Genitalia otherwise very similar to those of *cleora*.

*Biology*.—This species occurs from late June to late August in open woodlands, where it may usually be found in sunny spots, running or flying over the low foliage and debris. Its common associates are *Anoplius* (*Anoplius*) *virginiensis* (Cresson) and *Priocnemis germana* (Cresson). Both sexes occasionally visit the flowers of wild carrot along the borders of woods. There is undoubtedly but one generation a year.

The only record of the prey of this species is that of a female taken by the author at Ithaca, N. Y., with the spider *Hadotes* sp., young ♀ (Agelenidae) [det. B. J. Kaston]. The wasp was dragging the spider over the forest floor, leaving it on the ground at frequent intervals while it explored crevices under sticks and leaves, presumably for a suitable nesting site.

*Distribution*.—This form appears to be restricted to the Appalachian region of the eastern United States, ranging from southern Quebec to northern Georgia.

*Specimens seen*: 95 (60 ♀♀, 35 ♂♂). QUEBEC: 2 ♀♀, Hull, Aug. [CNC]; MASSACHUSETTS: Hampshire Co., 1 ♀, Aug. [Mass.]; CONNECTICUT: Litchfield Co., 2 ♀♀, Aug. [MCZ]; Tolland Co., 5 ♀♀, Aug. [HEE]; NEW YORK: Essex, Jefferson, Orange, and Tompkins Cos., 27 June-18 Aug. [CU, AMNH, CM, HEE]; NEW JERSEY: Bergen Co., 2 ♀♀, Aug. [MCZ]; PENNSYLVANIA: Centre, Dauphin, Lancaster, Fayette, York, and Westmoreland Cos., 20 June-22 July [PSC, CM, USNM]; MARYLAND: Cecil and Montgomery Cos., June-Aug. [USNM, MCZ, MSV]; VIRGINIA: Augusta Co., 1 ♀, 31 Aug. [USNM]; WEST VIRGINIA: Randolph Co., 5 ♀♀, June-Aug. [CM]; NORTH CAROLINA: Buncombe and Watauga Cos., Aug.-Sept. [MCZ, HEE]; GEORGIA: Fulton, Lumpkin, Rabun, and Union Cos., 27 June-31 Aug. [EU, USNM].

#### 4. *Anoplius* (*Lophopompilus*) *atrox* (Dahlbom)

(Pl. XI, fig. 76; pl. XVIII, fig. 117.)

*Pompilus atrox* Dahlbom, 1844, Hymen. Europ., I, p. 63. [Type: ♀; So. Carolina (no further data); Univ. of Lund, Sweden (not seen by present author).]—F. Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 157.—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 98.—Cresson, 1872, Trans. Amer. Ent. Soc., 4: 203.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 275.—Peckham & Peckham, 1900, Bull. Wisc. Nat. Hist. Soc., 1: 87. [Biology.]



- Arachnophroctonus atrox* Howard, 1901, The Insect Book, pl. VII, fig. 14.  
*Anoplus atrox* J. Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.  
*Psammochares (Lophopompilus) atrox* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 224.—Rohwer, 1916, Conn. Geol. Nat. Hist. Survey Bull. 22, pp. 633-634.—Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 986.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 123.  
*Lophopompilus atrox* Regan, 1923, Ann. Ent. Soc. Amer., 16: 178-191, pl. XI, fig. 2, pl. XII, figs. 4 & 6, & pl. XIII, figs. 1, 2, & 8.

Prior to Regan's work in 1923, this species and *bengtssoni* Regan were not separated; most of the earlier literature therefore actually refers to the two sibling species indiscriminately. The male genitalia differ considerably in these two species, but otherwise they are extremely similar, differing by such subtle characters as the degree of convergence of the eyes above, the depth of the clypeal emargination, the size of the ocelli, etc. The two species occur over much the same range and apparently in the same habitat.

FEMALE.—Length 20 (15-24) mm. Color black, the second abdominal tergite with a pair of large orange spots which may be confluent medially or separated by a thin black line. Wings wholly fuliginous, in fresh specimens violaceous. Pubescence dark, scarcely reflecting metallic colors; body with abundant erect hair.

Clypeus about 2.9 times as broad as high, the apical margin with a rather narrow, well-defined median emargination. Front of moderate breadth, the middle interocular distance varying from .56 to .62 times the transfacial distance; eyes converging slightly to the middle, then more strongly above, the middle interocular distance about .95 times the lower interocular, the upper interocular about .75 times the lower. Ocelli in a close triangle, the front angle about a right angle; postocellar line slightly less than ocellocular. First four antennal segments in a ratio of about 4:1:7:5, segment 3 subequal to or slightly greater than the upper interocular distance.

Pronotum arcuate behind; scutellum prominently convex; propodeum convex, with an ill-defined flattened posterior declivity. Front tarsus with a comb of spines which are about one and one-half times as long as the tarsus is thick; basitarsus with 3 comb-spines, the apical one slightly less than half as long as the second tarsal segment. Wing venation of the usual pattern in the subgenus; third submarginal cell narrowed by from half to three-fourths above.

MALE.—Length 16 (12-20) mm. Color of body and wings as in female; lower inner and upper outer orbits often with a very narrow, pale stripe. Pubescence very dark, in certain lights vaguely reflecting deep blue-green.

Body with abundant erect hair; scape hairy; coxae hairy, the femora often slightly so.

Clypeus from 2.1 to 2.4 times as broad as high, the apical margin very slightly concave. Middle interocular distance from .6 to .63 times the transfacial distance. Inner orbits converging above somewhat, the upper interocular distance from .88 to .95 times the lower interocular. Ocelli rather close together, of average size, forming a right angle or slightly greater in front; postocellar line usually slightly less than the ocello-ocular. First four antennal segments in a ratio of about 3:1:3.2:3, the third segment about 3 times as long as thick.

Pronotum moderately long, its posterior margin subarcuate or very feebly angulate. Slope of propodeum rather gradual in front, more steeply declivous behind. Abdominal sternite 6 with a large V-shaped emargination, the base of the emargination slit-like. Subgenital plate of the usual form in the subgenus, the basal process rather long, extending more than halfway from the basal sclerite to the apex of the plate (fig. 117). Genitalia (Fig. 76) with the parameres slender, with abundant strong setae on the outer margin and apex, the ventral surface setose on the outer third; digiti with the outer margins arcuate, the inner margins nearly straight, the disc covered with stout setae.

*Biology*.—The Peckhams (1900) found this species nesting in a crevice in a hillside; the prey was a large spider (not identified) which it carried backward to the nest. A female from Clifton, Va. [USNM] is pinned with a poorly preserved spider labeled as *Lycosa rabida* Walck. *A. atrox* occurs principally in fields and meadows, and has been taken on the flowers of *Daucus carota*, *Cicuta maculata*, *Pastinaca sativa*, *Conium maculatum*, *Melilotus alba*, and *Euphorbia marginata*. In the latitude of New York the flight season is during July and August, and there is but one generation a year; in the southern tier of states it occurs from May to October and undoubtedly has two or more generations a year.

*Distribution*.—This is principally an Austral species, but occurs in the lower fringes of the Transition zone, ranging from Florida, Texas, and New Mexico to Montana, Minnesota, southern Ontario, and Massachusetts.

*Specimens seen*: 137 (66 ♀♀, 71 ♂♂). The following records are marginal: MASSACHUSETTS: Hampshire Co., 1 ♀, 2 ♂♂, Amherst, July-Aug. [Mass.]; VERMONT: Windham Co., 1 ♂, Laurel Lake, Aug. [Mass.]; NEW YORK: Tompkins Co., 1 ♀, 2 ♂♂, Ithaca, 18 July-18 Aug. [CU]; ONTARIO: 2 ♂♂, Chatham, Aug. [CNC]; MICHIGAN: Ingham Co., 1 ♂, East Lansing, 30 Aug. [Coll. R. L. Fischer]; MINNESOTA: Olmstead Co., 1 ♀ [USNM]; SOUTH DAKOTA: Jackson Co., 1 ♀, Interior, 6 Aug. [SDS]; MONTANA:

(Recorded by Regan, 1923); COLORADO: Boulder Co., 1 ♀, Jim Creek, 8 July [AMNH]; NEW MEXICO: Sandoval Co., 1 ♂, Jemez Springs, 7 July [CU]; TEXAS: Montgomery Co., 1 ♀, Willis [USNM]; LOUISIANA: 1 ♀ [ANSP]; ALABAMA: Mobile Co., 1 ♂, Theodore, 12 June [CU]; FLORIDA: Marion Co., 1 ♀, Ocala, 6 Apr. [HEE].

5. *Anoplius (Lophopompilus) bengtssoni* (Regan) (Pl. XI, fig. 75.)

*Lophopompilus bengtssoni* Regan, 1923, Ann. Ent. Soc. Amer., 16: 178-191, pl. XI, fig. 1, pl. XII, fig. 5, & pl. XIII, figs. 3, 4, & 5. [Type: ♀; Dallas, Texas, "8-5" 1908, at night in lighted house (E. S. Tucker); U.S.N.M. no. 26, 691.]

*Psanmochares (Lophopompilus) bengtssoni* Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 986. [L. I., N. Y.]—Johnson, 1930, List Insect Fauna Nantucket, p. 110.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 123. [Smiths Isl., N. C.]—Brimley, 1938, Insects No. Carolina, p. 433.

*Anoplius (Lophopompilus) bengtssoni* Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 264.

This is the largest species of the subfamily Pompilinae in North America. It is easily confused with the preceding species, *atrox*, however, unless care is taken in observing the key characters.

FEMALE.—Length 22 (17-26) mm. Color black, the second abdominal tergite with a pair of large orange spots narrowly separated or confluent medially. Wings fuliginous, more or less violaceous. Pubescence fine, dark, velvety, in certain lights obscurely reflecting deep blue-green; body with abundant erect hair, the scape hairy, especially above, the femora often somewhat hairy.

Clypeus from 2.5 to 3 times as broad as high, the apical margin with a broad, shallow median emargination. Front rather narrow, the middle interocular distance about .55 times the transfacial; inner orbits converging strongly above, the middle interocular distance about .9 the lower interocular, the upper interocular only about .65 times the lower. Ocelli close together, the laterals distant from the median ocellus by less than the diameter of the latter; postocellar line nearly always slightly greater than the ocello-ocular. First four antennal segments in a ratio of about 4:1:7:5, segment 3 from 1.2 to 1.35 times the upper interocular distance.

Pronotum short, posterior margin arcuate; propodeum with the posterior slope nearly flat, obliquely declivous. Spines of tarsal comb about twice as long as the width of the tarsus; basitarsus nearly always with 4 comb-spines, the basal one usually smaller than the others. Fore wing with the third submarginal cell narrowed by usually about half above; third transverse cubital vein often with a slight sinuation or "kink".

MALE.—Length 17 (14-21) mm. Color of integument, wings, and pubescence as in the female, except that there are often thin pale lines on the

lower inner and upper outer orbits. Body with the usual abundance or long, dark, erect hairs. Clypeus a little over twice as broad as high, its apical margin truncate. Middle interocular distance varying from .57 to .63 times the transfacial distance. Inner orbits converging considerably above, upper interocular distance from .80 to .88 times the lower. Ocelli rather large, about as in the female. First four antennal segments in a ratio of about 3:1:3.2:3, the third segment about three times as long as thick.

Posterior pronotal margin arcuate, usually with a faint median angulation; propodeum with an oblique, flattened declivity behind. Abdominal sternite 6 with a deep V-shaped emargination. Subgenital plate as in the two preceding species, the plumose process rather long. Genitalia (Fig. 75) characterized by the broad parameres, which are setose on the outer margin and apical third of the ventral surface. Digits elongate-subfusiform, the inner margin straight or somewhat sinuate, the disc clothed with strong setae. Parapenials slender and elongate, subequal in length to the aedeagus, but these structures slightly shorter than the parameres.

*Biology*.—This species is most commonly taken on flowers, and has been taken on *Cicuta maculata*, *Stillingia sylvatica*, *Melilotus alba*, *Ampelopsis arborca*, and *Solidago* spp. It also visits honeydew and has been taken at light. In the North it is a late summer species (mid-July to early October) with but one yearly generation, but in the South it occurs throughout the summer months (Apr.-Nov.).

*Distribution*.—This is essentially an Austroriparian and Carolinian species, ranging from Texas and Florida to South Dakota, Michigan, and Massachusetts.

*Specimens seen*: 85 (42 ♀♀, 43 ♂♂). The following records are marginal: MASSACHUSETTS: Dukes Co., 1 ♀, Martha's Vineyard, Sept. [CU]; Hampshire Co., 1 ♀, Cummington, Aug. [HEE]; NEW YORK: Suffolk Co., 1 ♀, Riverhead, 14 Sept. [CU]; PENNSYLVANIA: Dauphin Co., 1 ♀, Rockville, 5 July [ANSP]; Erie Co., 1 ♀, Presque Isle, 23 July [CM]; MICHIGAN: Cheboygan Co., 2 ♂♂, Douglas Lake, 23 Aug. [Minn.]; MINNESOTA: Goodhue Co., 1 ♀, Red Wing, 18 July [Minn.]; SOUTH DAKOTA: Jackson Co., 3 ♀♀, Interior, 5-6 Aug. [SDS]; NEBRASKA: Thomas Co., 1 ♀, Halsey, 31 Aug. [Minn.]; KANSAS: Cheyenne Co., 2 ♂♂ [UK]; TEXAS: Williamson Co., 1 ♂, 4 June [JEG]; ALABAMA: Mobile Co., 1 ♂, June [CU]; FLORIDA: DeSoto Co., 1 ♂, Arcadia, 10 Apr. [CU].

#### B. Subgenus **NOTIOCHARES** Banks

*Notiochares* Banks, 1917, Bull. Mus. Comp. Zool., 61: 107, 108. [Type: *Pompilus philadelphicus* Lepeletier, 1845 (= *amethystinus atramentarius*

Dahlbom, 1844); monobasic.] [Proposed as subgenus of *Psammocharcs*.]—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 122-123.—Banks, 1939, Canad. Ent., 71: 225. [Genus.]—Banks, 1947, Bull. Mus. Comp. Zool., 99: 408-411. [South American species.]—Dreisbach, 1949, Ent. Amer., (n. s.) 29: 8, 9, 40, pl. IV, fig. 21.

The species assigned to this subgenus form a rather closely knit group clearly derived from stock similar to the subgenus *Arachnophroctonus*. The males have acquired a number of morphological specializations, such as the patch of velvety pubescence at the apex of the fourth abdominal sternite, the basally bilobed and apically forked subgenital plate, and the small flap-like lobes which replace the basal hooklets of the genitalia. The females, however, resemble very closely the members of the subgenus *Arachnophroctonus*, and are separable from them only by a combination of more subtle characters. The anterior margin of the clypeus is slightly to strongly emarginate; the body is never strongly hairy, the propodeum bearing at most a few weak setae; the pulvillar pad and comb are unusually well developed; the pronotum is always angulate behind; the radial vein of the fore wing is somewhat angled at the third transverse cubital, the third submarginal cell strongly narrowed above, but not triangular or petiolate.

*Subgeneric characters*.—Medium-sized or fairly large wasps (10-25 mm.); our species wholly black or blue-black, but some extralimital species marked with red and/or yellow; wings fuliginous. Scape without erect hairs; front and vertex varying from barely to moderately hairy; pronotum, scutellum, and propodeum barely or slightly hairy; metanotum with a small patch of short hairs on each side; abdominal sternites beyond the first each with some strong setae in both sexes; female pygidium densely bristly.

Mandibles with a single strong tooth on the inner margin subtended by a carina, some females with a weak second tooth basad of this. Labrum rounded or subtruncate apically, the margin bristly, usually almost wholly concealed by the clypeus. Clypeus wider than the lower front, its apical margin in the female at least arcuately concave, often distinctly emarginate, in the male truncate or slightly concave. Front relatively narrow, in the female seldom much wider than the two eyes taken together. Vertex narrow, and never raised above the tops of the eyes. Antennae elongate, segment 3 in the female never much shorter than the upper interocular distance, segment 3 in the male longer than 1 or 4.

Posterior margin of pronotum always distinctly angulate; postnotum a narrow transverse band, feebly transversely striate; propodeum with rather even contours, in the females and some males with a somewhat flattened

declivity behind. Tarsal comb of female present, consisting of short spines, from 1 to 2 times as long as the width of the tarsus; basitarsus with 3 or 4 comb-spines and 3 or 4 additional spines in a row below these. Last segment of front tarsus of male not modified, the sides expanded evenly and gradually from the base, the inner claw of this tarsus deeply cleft, the inner ray short, blunt; remaining claws bifid, the inner ray somewhat truncate. Pulvillar pad rather large, setulae of pulvillar comb in a close, even series, numbering about 24 in the female, 18 in the male. Hind wing with the cubitus arising at or a little before the tip of the submedian cell. Basal of fore wing arising at or a little beyond (rarely before) the intersection of the transverse median with the media. Stigma short; marginal cell fairly long, about or a little less than its own length from the wing-tip, the radial vein always with a more or less distinct angulation at the third transverse cubital vein. Third submarginal cell much narrowed above, often subtriangular.

Abdomen of male rather stout, subfusiform. Fourth sternite in the male with a semicircular mat of dense, short, black pile along its posterior margin. Sixth sternite with a broadly U-shaped apical emargination. Subgenital plate (Fig. 118) at the base internally with a broad expansion on each side, at the apex of which is a small group of short, thick setae; apex of the plate with a sharply defined V-shaped emargination, on each side of which it is acutely pointed. Genitalia with the cardo very long; basal hooklets replaced by small, flap-like lobes; parameres with prominent squamae, beyond which these appendages are much more slender; aedoeagus simple, slightly expanded apically (Fig. 77).

*Biology*.—These wasps are commonly taken on flowers. They are hunters of large spiders of the family Lycosidae, and nest in the ground. Little is known of their habits, but a few notes are included under our common form, *A. (N.) amethystinus atramentarius* (Dahlbom).

*Distribution*.—This subgenus is confined to the Neotropical Region except for a single species, *amethystinus*, which enters the Austral portion of the Nearctic Region. In South America this group includes such well-known species as *insularis* Holmberg, *scalaris* Taschenberg, and *triquetrus* Fox, as well as the widely distributed *amethystinus* Fabricius.

#### *Key to Subspecies*

#### Females and Males

1. Body rendered by the pubescence a brilliant deep blue or blue-green; wings strongly bluish-refulgent
  - 1a. *amethystinus amethystinus* (Fabr.)

Body rendered by the pubescence a dull deep violet or purplish, which in proper light vaguely reflects deep blue-green; wings violaceous

1b. *amethystinus atramentarius* (Dahlbom)

1a. *Anoplius (Notiochares) amethystinus amethystinus* (Fabricius)  
new combination<sup>3</sup> (Pl. XI, fig. 77; pl. XVIII, fig. 118.)

*Sphex amethystina* Fabricius, 1793, Ent. Syst. Emend. & Auct., II, p. 210.  
[Type: ♀?; St. Croix, West Indies (Dr. Pflug); (location not known to present author)].

*Pompilus amethystinus* Fabricius, 1798, Suppl. Ent. Syst., p. 247.—Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 148. [Brazil, Guiana.]—Taschenberg, 1869, Zeitschr. Ges. Naturw., 34: 50. [Antilles, Colombia, Brazil.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 272.

*Pepsis amethystina* Fabricius, 1804, Syst. Piezatorum, p. 215.—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 149.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 246.

*Pompilus anceps* Cresson, 1865, Proc. Ent. Soc. Phila., 4: 130. [Lectotype: ♂; Cuba (no further data); A.N.S.P. no. 420.] [*Nec* Smith, 1862.] New synonymy.

*Pompilus cubensis* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 93. [New name for *anceps* Cresson, preoccupied.] New synonymy.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 283.—Gowdey, 1926, Jamaica Dept. Agri. Ent. Bull. no. 4, p. 96. [Jamaica.]

*Pompilus philadelphicus* var. *cubensis* Cresson, 1869, Proc. Boston Soc. Nat. Hist., 12: 366. [Orizaba, Mex.]

*Psammochares philadelphicus* var. *floridensis* Banks, 1917, Bull. Mus. Comp. Zool., 61: 106. [Type: ♀; Gulfport, Fla., Sept. (Reynolds); M.C.Z. no. 10,021.] New synonymy.

*Notiochares philadelphicus* Banks, 1925, Bull. M.C.Z., 67: 338. [Panama.]

*Notiochares fulgidus* Banks, 1928, Harvard Biol. Lab. Cuba (Atkins Found.), Studies in Cuban Insects, I, p. 9. [Cuba, Bahamas; *nec* Cresson; misidentification.]

*Notiochares cubensis* Bradley, 1946, Mem. Soc. Cubana Hist. Nat., 18: 130.

*Notiochares amethystina* Banks, 1947, Bull. Mus. Comp. Zool., 99: 410.  
[So. America, many records.]

This distinctive and showy wasp is possibly the most widely distributed of all American Pempilidae. I have been unable to find any constant differences between Cresson's *cubensis*, Banks' *floridensis*, and Fabricius' *amethystinus*.

<sup>3</sup> This is a common wasp throughout much of the Neotropical Region; I have not attempted to present a complete list of references pertaining to extralimital records.

FEMALE.—Length 18 (14-22) mm. Integument black; pubescence dark, over most of the body brilliantly reflecting deep metallic blue or blue-green; wings fuliginous, conspicuously reflecting bluish or blue-green. Mandibles and clypeus with a few bristles; front and vertex with numerous erect hairs; propodeum very slightly, inconspicuously hairy.

Clypeus about 2.2 times as broad as high, its apical margin with a clearly defined median emargination. Front narrow, the middle interocular distance varying from .52 to .55 times the transfacial distance. Lower inner orbits subparallel; eyes converging somewhat above, the upper interocular distance varying from .75 to .88 times the lower interocular. Ocelli in a right triangle, the laterals about equidistant from each other and the nearest eye margin. First four antennal segments in a ratio of about 4:1:7:5, the third segment equal to from 1.1 to 1.25 times the upper interocular distance. Temples moderately developed, in lateral view somewhat more than half the width of the eye.

Front basitarsus with four comb-spines, the spines about 1.5 times the thickness of the tarsus, the apical one not more than half the length of the second tarsal segment, often somewhat less. Tibial spurs usually slightly curved apically. First abdominal tergite with a median linear impression at the top of the anterior slope.

MALE.—Length 14 (10-17) mm. Color of body and wings as in female; pubescence as in female, except that it is often more brownish on the legs, and often silvery or cinereous on the front. Clypeus about twice as broad as high, the apical margin slightly arcuately concave. Middle interocular distance varying from .57 to .6 times the transfacial distance. Middle interocular distance about 1.2 times the lower interocular; upper interocular distance about .9 times the lower. Ocelli about as in female. First four antennal segments in a ratio of about 8:2:9:8, the third segment more than three times as long as thick.

Slope of propodeum rather low and even, the median line lightly impressed. Apical tarsal segments with several median spines beneath. Abdomen with the subgenital plate (Fig. 118) with three carinae on the disc, one median, and a pair on the sides which diverge slightly apicad, none of them reaching the apex; basal lateral flanges of the subgenital plate prominent, acute, tipped with a small group of short setae. Genitalia (Fig. 77) rather variable; parameres very slender beyond the squamae, and bearing only a few setae here; digiti subspatulate, clothed with small setae; parapenials curved, stouter near the base than apically; aedeagus much expanded apically, the apex broadly rounded or feebly bilobed.

*Distribution.*—This form ranges from Bolivia and northern Argentina north to Mexico and the Antilles. It barely enters the United States in the southern parts of Florida, Arizona, and California.



*Specimens seen from the United States*: 22 (14 ♀♀, 8 ♂♂). FLORIDA: Calhoun Co., 1 ♀, Blountstown, 14 Aug. [CU]; Collier Co., 1 ♀, Everglade, 5 Apr. [AMNH]; 2 ♀♀, 2 ♂♂, 10-40 mi. E. of Everglade, 30 Aug. [CU]; 1 ♀, Naples, 29 Aug. [CU]; Dade Co., 1 ♀, Homestead, Aug. [UK]; 2 ♀♀, 1 ♂, Royal Palm Park, Mch., July [ANSP, CU, UK]; 1 ♀, Paradise Key, 20 Apr. [USNM]; Orange Co., 1 ♀, Orlando [CU]; Pinellas Co., 1 ♀, Gulfport, Sept. [MCZ]; ARIZONA: Santa Cruz Co., 1 ♀, Nogales, 30 Aug. [CU]; CALIFORNIA: Imperial Co., 5 ♂♂, Experiment Farm, May-June [USNM]; 1 ♀, Westmoreland, 21 May [CIS]; Riverside Co., 1 ♀, Blythe, 3 Oct. [Minn.].

Specimens also seen from the following places south of the United States: Mexico (states of Baja California, Jalisco, Morelos, Sinaloa, and Vera Cruz), Guatemala, Costa Rica, Panama, Colombia, Ecuador, Peru, Bolivia, Argentina, Paraguay, Brazil, British Guiana, Venezuela, Trinidad, Barbados, Haiti, St. Vincent, Puerto Rico, Jamaica, and Cuba.

**1b. *Anoplius (Notiochares) amethystinus atramentarius* (Dahlbom)**

*Pompilus atramentarius* Dahlbom, 1844, Hymen. Europ., I, p. 48. [Type: ♂; North America (no further data); University of Lund, Sweden (not seen by present author).]—Dahlbom, 1845, Hymen. Eur., I, p. 446.—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 90. [Not identified].—Dalla Torre, 1897, Cat. Hymen., VIII, p. 274.

*Pompilus philadelphicus* Lepelletier, 1845, Hist. Nat. des Insectes, Hymen., III, p. 423. [Type: ♀; Philadelphia, Pa.; (location of type not known to present author).] New synonymy.—F. Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 160.—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 87. [Conn., Del., La.].—Cresson, 1872, Trans. Amer. Ent. Soc., 4: 202. [Texas.].—Provancher, 1882, Nat. Canad., 13: 35, 37.—Provancher, 1883, Nat. Canad., 14: 35. [Earlier record from Canada retracted.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 310.—Birkman, 1899, Ent. News, 10: 244. [Fedor, Texas.].—Howard, 1901, The Insect Book, pl. VII, fig. 19.

*Pompilus philadelphicus* var. *scricatus* Cresson, 1872, Trans. Amer. Ent. Soc. 4: 202. [Type: ♂; Dallas, Texas (Boll); A.N.S.P. no. 411.].—Dalla Torre, 1897, Cat. Hymen., VIII, p. 310.

*Anoplius (Sophropompilus?) philadelphicus* Viereck, 1906, Trans. Amer. Ent. Soc., 32: 223. [Galveston, Tex.]

*Anoplius philadelphicus* J. Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.

*Scricopompilus plutonis* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 228. [Type: ♂; Fedor, Lee Co., Texas, 3 June 1904 (Birkmann); M.C.Z. no.

- 13,708.] New synonymy.—Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.
- Psammochares philadelphicus* Banks, 1912, Ent. News, 23: 108. [At flowers of *Ceanothus* in Va.]—Britton, 1920, Conn. Geol. Nat. Hist. Survey Bull. 31, p. 336.
- Psammochares (Lophopompilus) philadelphicus* Rohwer, 1916, Conn. Geol. Nat. Hist. Survey Bull. 22, p. 633, 634. [Conn.]
- Psammochares (Notiochares) philadelphicus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc. 52: 123. [N. C.]—Brimley, 1938, Insects No. Carolina, p. 433.
- Notiochares philadelphicus* Rau, 1922, Trans. Acad. Sci. St. Louis, v. 24, no. 7, pp. 13-15, & pl. VI, fig. 5. [Biology.]—Dreisbach, 1949, Ent. Amer., (n. s.) 29: 40, pl. IV, fig. 21.
- Notiochares angusticeps* Banks, 1939, Canad. Ent., 71: 227. [Type: ♀; Brownsville, Texas, 11-16 June 1933 (Darlington); M.C.Z. no. 23,477.] New synonymy.
- Anoplius (Notiochares) philadelphicus* Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 264.

This is one of the commonest Pompilidae in the Austroriparian fauna, and not uncommon throughout much of the Carolinian. It has, however, rarely been called by its correct name. Dahlbom's description, which antedates Lepeletier's *philadelphicus* by a year, rather clearly applies to this species. Recently I have sent specimens of this form to the University of Lund, where Dr. Kjell Ander has been kind enough to compare them with the type of *atramentarius*. After a careful comparison, Dr. Ander assures me that what has been called *philadelphicus* is conspecific with Dahlbom's *atramentarius*.

FEMALE.—Length 19 (15-24) mm. Color black; pubescence over the greater part of the body dark, reflecting deep violet or purple, in certain lights obscurely reflecting deep blue-green; pubescence on the front, clypeus, and coxae (and sometimes much more of the body) more or less brownish or cinereous. Wings wholly fuliginous, violaceous. Morphological features virtually the same as in the nominate subspecies. In both forms there is a certain amount of variation in the sharpness of limitation and in the depth of the clypeal emargination, and also in the width of the front and vertex.

MALE.—Length 15 (12-19) mm. Color of body, pubescence, and wings as in the female. Structural characters, including those of the terminalia, not differing from those of typical *amethystinus*.

*Biology.*—This is a wide-ranging species which occurs in a variety of habitats, but seems to prefer bare, clay-soil areas, especially along water-courses. It is most frequently taken on flowers, and has been taken on the following: *Cicuta curtissii*, *Cicuta maculata*, *Conium maculatum*, *Bifora americana*, *Monarda* sp., *Solidago* spp., *Melilotus alba*, *Baccharis salicina*, *Tamarix* spp., *Verbesina helianthoides*, *Arvicennia nitida*, *Ampelopsis arborea*, *Euphorbia marginata*, *Eupatorium* sp., *Polytaenia nuttallii*, and *Persicaria lapathifolia*. The flight season extends from April to October throughout most of its range.

Rau (1922) reports several observations on this species. He found it preying upon *Lycosa scutulata* Emerton (= *rabida* Walck.), and also observed it attacking an orb-weaver in its web. He noticed this species "loitering" around its nest, a hole in the earth, which contained a larva which had partially consumed its spider. One would assume from this that this wasp does not close its burrow after provisioning; this would be an unusual trait for a Pompilid wasp, and I am not sure that I understand Rau correctly. Rau also observed a female emerging from the sand, awaited by four males. One of the males succeeded in mating with the female, while two more struggled to drag him off. "The mating", says Rau, "lasted for about a minute, when the female was . . . placed in the same vial [as one of the males], where the mating continued".

I have taken one specimen of *atramentarius* with its prey, a large but immature *Lycosa* [det. B. J. Kaston], which it was dragging by the end of a leg over the ground in a shaded area near a stream. On another occasion I observed a female of this form standing astride a spider on a sand-bank. I was able to approach closely, and noticed that the wasp seemed to be feeding on the spider. In a few moments the wasp flew off to another part of the sand-bank. The spider proved to be a male *Arctosa littoralis* (Hentz) [det. B. J. Kaston]; two legs had been cut off neatly at the base and two others mutilated. The wasp was watched and finally captured only after I was convinced she did not intend to return to the spider, and was not using it to provision a nest. The spider was very small for a wasp of this size. It seems likely that either she had captured this spider merely for feeding purposes,

or had "decided" after capturing it that it was not of sufficient size for provisioning a nest, and hence was feeding upon it herself.

These few notes suggest that this may be a rather versatile wasp, and leave one with the hope that we may soon learn more of its habits.

*Distribution.*—This form ranges from western and southern Texas and central Florida north to Nebraska, Ohio, and, east of the Appalachians, southeastern New York and perhaps Connecticut.

*Specimens seen:* 641 (385 ♀♀, 256 ♂♂). The following records appear to be marginal: CONNECTICUT: (recorded by Rohwer, 1916); NEW YORK: Kings Co., 1 ♂, Brooklyn, 18 July [coll. L. Schatz]; NEW JERSEY: Burlington Co., 1 ♂, Medford Lake [ANSP]; PENNSYLVANIA: Philadelphia, 1 ♀, 5 ♂♂ [ANSP, CU]; York Co., 1 ♂, York, 1 Sept. [ANSP]; Allegheny Co., 1 ♀ [CM]; OHIO: Greene Co., 1 ♀, Clifton, 19 Aug. [RWS]; INDIANA: Knox Co., 2 ♀♀, Vincennes, 29 May [USNM]; NEBRASKA: Otoe Co., 1 ♀, Nebraska City, 23 July [CAS]; KANSAS: Meade Co., 4 ♀♀, 2 ♂♂ [UK]; OKLAHOMA: Comanche Co., 1 ♀, Lawton, 20 Mch. [USNM]; TEXAS: Reeves Co., 1 ♀, 2 ♂♂, Balmorhea Lake, 18 July [HEE]; Cameron Co., 10 ♀♀, 5 ♂♂, Port Isabel, 20-23 June [HEE, ANSP]; LOUISIANA: Cameron Co., 1 ♂, Cameron, June [UK]; ALABAMA: Mobile Co., 1 ♀, 10 Aug. [CU]; FLORIDA: Highlands Co., 1 ♀, Lake Placid, 15 Apr. [CU].

#### C. Subgenus **ANOPLIODES** Banks

*Anopliodes* Banks, 1939, *Canad. Ent.*, 71: 225-226. [Type: *Anopliodes modestus* Banks, 1939 (= *bolli* Banks, 1917); monobasic.]

*Anoplioides* Dreisbach, 1949, *Ent. Amer.*, (n. s.) 29: 7. [*Lapsus calami* for *Anopliodes* Banks.]

This is a small group of apparently uncommon species showing relationships both to *Notiochares* and to *Arachnophroctonus*. As in the former, the last segment of the front tarsus of the male is unmodified, the basal hooklets of the genitalia are wanting, and the front of the female is rather narrow. On the other hand, the fourth and seventh sternites of the male abdomen lack the modifications of *Notiochares*. The unique features of this group lie in the venation: the marginal cell is very long, the radial vein evenly arcuate, and the third submarginal cell wider above than the second, at least in the female.

*Subgeneric characters.*—Size 10-19 mm.; color black, the males sometimes marked with yellowish on the posterior pronotal margin, the scape, and the mandibles. Pubescence of females known to me more or less fuscous, not strongly reflecting metallic colors; males always with a considerable amount of silvery pubescence, sometimes highly ornamented with silvery. Front and vertex slightly to moderately hairy; thorax, propodeum, and first abdominal tergite with a variable amount of fine erect hair; female pygidium strongly bristly; propodeum of male with numerous white erect hairs; venter of male somewhat hairy, often with thin to dense brushes of hair on some of the sternites.

Mandibles with a single strong tooth on the inner margin, the female usually with some evidence of a weak second tooth basad of this. Apical margin of clypeus truncate or slightly arcuately concave. Front of female narrow, the middle interocular distance never over .55 times the transfacial distance. Temples but slightly developed in the female, scarcely at all so in the male. Antennae elongate, segment 3 in the female at least 1.2 times the upper interocular distance.

Postnotum a narrow transverse band, in the male a little wider near the mid-line than on the sides. Propodeum of female with a well-defined oblique, more or less flat declivity behind, that of the male rather long and with the slope very low. Tarsal comb of female consisting of short spines which are not or but little longer than the width of the tarsal segments; there are 3 comb-spines on the basitarsus, the apical one very short and not one third the length of the second segment; in addition there are three more, usually slightly longer spines in a row below these. Last segment of front tarsus of male not modified, the inner margin not produced, the inner claw of this tarsus strongly curved, deeply cleft, the inner ray short and blunt. Pulvillar pad of moderate size, the comb consisting of fairly long setae, numbering 16-24 in the female, about 10 in the male. Legs of male strongly spinose, the middle and hind tibiae grooved beneath each spine.

Cubitus of hind wing arising at or a little before the tip of the submedian cell. Transverse median vein of fore wing meeting the media at or a little basad of the origin of the basal vein. Stigma very short, only a little longer than high. Marginal cell long, about or less than its own length from the wing-tip, the radial vein nearly evenly arcuate, but in some males somewhat angled at the third transverse cubital vein. Second and third submarginal cells both 4-sided, the third usually larger than the second and wider on the radial vein, but not so in some males. The wings of the male show some tendency to fold longitudinally.

Abdomen of male rather slender, the dorsum slightly flattened. Subgenital plate simple, its median line elevated, the apex more or less rounded. Male genitalia with the basal hooklets wanting, replaced by very slender, flap-like sclerites; basis volsellaris with a number of strong setae, the digitus subspatulate, more or less setose; parameres, parapeuials, and aedeagus elongate. Further generalizations regarding the genitalia are scarcely possible,

as there are marked differences in the various species, the appendages sometimes being rather curiously modified.

*Distribution.*—This subgenus is principally Neotropical, a single species, *bolli* Banks, entering the Nearctic region, and another species, *parsonsi* Banks, entering the United States at the southern tip of Florida. Specimens before me from northern South America, determined by Banks as *Anoplius varius* Fabricius and *Psammochares ornamenta* Fox, belong to this group. All of the species seem to be uncommon, and nothing is known of their biology.

### Key to Species

#### Females

1. Pronotum arcuate behind, with a slight angulation on the median line; propodeum with a considerable amount of very fine hair  
1. *parsonsi* (Banks)
- Pronotum broadly angulate behind; propodeum with only a small amount of very fine, inconspicuous hair .....2. *bolli* Banks

#### Males

1. Venter with numerous erect hairs, a little more dense on sternite 4, but not forming a dense brush; parameres of genitalia slender, nearly linear  
1. *parsonsi* (Banks)
- Venter with a very dense brush of erect hairs on sternite 4; parameres very broad basally .....2. *bolli* Banks

1. **Anoplius (Anopliodes) parsonsi** (Banks) new combination

(Pl. XII, fig. 79.)

*Psammochares parsonsi* Banks, 1944, Bull. Mus. Comp. Zool., 94: 183-184.

[Type: ♀; Buenos Aires, Trinidad Mts., Cuba, 17-23 June 1923 (C. T. Parsons); M.C.Z. no. 25,742.]

This species is known to me from only twelve specimens, four from Cuba and eight from southern Florida. It closely resembles *bolli*, but may be distinguished by the characters used in the key.

FEMALE.—Length 15 mm.; color black; wings rather heavily infuscated, slightly darker along the outer margin, violaceous. Pubescence mostly brownish-fuscous, a little paler on the coxae, clypeus, lower front, and sides of the metanotum, sometimes a bit silvery in these places. Pronotum slightly hairy; propodeum with a considerable amount of rather fine erect hair, especially dorso-laterally.

Clypeus 2.3 times as broad as high, the apical margin slightly concave. Front very narrow, the middle interocular distance only about .51 times the transfacial. Inner orbits subparallel below, convergent above, upper interocular distance equal to about .7 times the lower interocular. First four antennal segments in a ratio of about 7:2:12:9, segment three equal to about 1.35 times the upper interocular distance. Ocelli in a small triangle, the laterals distant from the median ocellus by less than the diameter of the latter, the angle formed by the ocelli in front somewhat less than a right angle; postocellar line slightly greater than the ocello-ocular.

Pronotum short, its posterior margin broadly arcuate, but with an ill-defined median angulation. Median line of propodeum vaguely impressed above. Marginal cell of fore wing about three times as long as high, approximately its own length from the wing-tip; third submarginal cell wider above and below than the second, narrowed by less than half above.

MALE.—Length 10.5 (10-11) mm.: color black, the posterior margin of the pronotum with a pale yellow stripe. Wings subhyaline, the veins brown, the fore wing more or less infuscated along the outer margin and through the marginal and outer submarginal cells, the apex of the hind wing infuscated. Pubescence more or less brownish, replaced by silvery as follows: sides of clypeus, lower front, temples, coxae and sometimes more of the legs, mesopleura, pronotum, posterior border of mesonotum, scutellum on the sides, metanotum, at least the anterior margin and posterior third of the propodeum, basal bands on abdominal tergites 1 to 3, and median apical spots on tergites 5 to 7. Front and vertex with numerous dark hairs; temples and propleura with abundant whitish hair; thorax, propodeum, and first abdominal tergite with a variable amount of fine, mostly pale hair, rather prominent on the posterior slope of the propodeum; abdominal sternites 2 to 5 each with a number of rather long, dark setae, slightly more abundant on sternite 4; apical two sternites somewhat hirsute.

Clypeus about twice as broad as high, truncate apically. Middle interocular distance varying from .61 to .64 times the transfacial distance; upper interocular distance about .9 times the lower interocular. First four antennal segments in a ratio of about 3:1:3:3, segment 3 about 2.4 times as long as thick. Ocelli forming a right or obtuse angle in front; posterior ocelli close to the vertex crest, which is rather abrupt, the head rather flat behind. Posterior pronotal margin broadly subangulate or nearly arcuate. Propodeum long, narrowed behind, its median line not impressed. Pubescence on the spurs and tarsi rather coarse; longer spur of hind tibia nearly as long as the basitarsus. Venation as in the female; third submarginal cell sometimes narrowed by slightly more than half above, but in the specimens seen by the writer it is always wider both above and below than the second.

Abdomen setose below as described above, but without dense brushes of hair. Sternite 6 with the emargination shallow, broadly U-shaped. Subgenital plate with the median line strongly elevated, the apex narrowly rounded. Genitalia (Fig. 79) with the parameres only a little wider at the

base than apically, long and attenuate, strongly setose. Digits clothed with short setae except along the outer margin, where they are much longer and somewhat sinuate. Parapenials simple, slightly curved, shorter than the aedeagus, which is large, the apex bilobed. In some specimens the parameres considerably exceed the aedeagus, instead of being subequal to it as in the one figured.

*Distribution.*—This species is known only from Cuba and extreme southern Florida, and is hence not truly a member of the Nearctic fauna. Only the males have thus far been taken in Florida.

*Specimens seen:* 12 (3 ♀♀, 9 ♂♂). FLORIDA: Dade Co., 1 ♂, Larkins, June [MCZ]; 1 ♂, Miami, 14 Sept. (Graenicher) [MCZ]; 2 ♂♂, Paradise Key, on lodge veranda, 8 Sept. 1918 (C. A. Mosier) [USNM]; 2 ♂♂, Paradise Key, 1 Apr. 1919 (C. A. Mosier) [USNM]; 2 ♂♂, Royal Palm Park (Mosier, Beamer) [USNM, MCZ]; CUBA, 1 ♂, Santiago de Cuba [MCZ]; 2 ♀♀, Buenos Aires, Trinidad Mts., 17-23 June 1923 (C. T. Parsons) [MCZ]; 1 ♀, San Vicente, Punta del Rio, 7 July 1940 (J. C. Bradley) [CU].

2. *Anoplius (Anopliodes) bolli* Banks (Pl. XII, fig. 78).

*Anoplius bolli* Banks, 1917, Bull. Mus. Comp. Zool., 61: 104. [Type: ♂; Dallas, Texas (Boll); M.C.Z. no. 10,017.]

*Anopliodes modestus* Banks, 1939, Canad. Ent., 71: 226. [Type: ♀; Brownsville, Texas, 11-16 June 1933 (Darlington); M.C.Z. no. 23,476.] New synonymy.

*Anoplius dollii* [sic] Dreisbach, 1950, Amer. Midl. Nat., 43: 583.

This distinctive but uncommon species is not easily confused with any other. The male is ornamented with silvery pubescence and bears a dense brush of hairs on the fourth abdominal sternite. The female superficially resembles *A. (Arachnophroctonus) relativus* (Fox), but is readily told by the characters which separate these two subgenera.

FEMALE.—Length 15 (13-18.5) mm. Color black; wings rather heavily infuscated, with a darker marginal band, violaceous. Pubescence brownish-fuscous, a little paler on the clypeus, front, and coxae, very dark on the abdomen and often obscurely reflecting deep bluish or purplish. Pronotum slightly hairy; propodeum with very fine, short hairs, visible only on close examination.

Clypeus from 2.3 to 2.5 times as broad as high, its apical margin slightly concave. Middle interocular distance about .53 times the transfacial, the front thus very narrow. Inner orbits subparallel below, convergent above,



the upper interocular distance about .75 times the lower interocular. First four antennal segments in a ratio of about 8:2:15:10, segment 3 equal to from 1.2 to 1.4 times the upper interocular distance. Ocelli in a close triangle, the front angle a right angle or a little less, postocellar line subequal to or slightly greater than the ocello-ocular line.

Pronotum short, its posterior margin broadly angulate. Median line of propodeum weakly impressed. Marginal cell of fore wing about three times as long as high; third submarginal cell in all the specimens seen wider above and below than the second.

MALE.—Length 11.5 (11-12) mm. Color black, the posterior pronotal margin with a very narrow pale stripe, the scape sometimes with pale markings. Wings subhyaline, the outer margin of the fore wing with a fuscous band which extends over the marginal cell and to some extent the outer submarginals; apex of hind wing infuscated. Pubescence in considerable part dark, showing some tendency to reflect deep metallic colors, but replaced by silvery pubescence as follows: base of mandibles, clypeus, lower front, temples, coxae, pronotum at least in large part, posterior part of mesonotum, scutellum at least on the sides, metanotum, posterior slope and rim of propodeum, much or all of the mesopleura, often extreme top and bottom of metapleura, basal bands on abdominal tergites 1-3, and median apical spots on tergites 4-7. Head, thorax, propodeum, and basal abdominal tergite with pale erect hair, most noticeable on the front, temples, and propodeum. Abdominal sternites 2 and 3 with a few weak hairs; sternite 4 posteriorly with a very dense brush of hairs, longer in front than behind; sternite 5 slightly hirsute posteriorly.

Clypeus about twice as broad as long, its apical margin truncate. Middle interocular distance .6 to .63 times the transfacial distance; inner orbits very slightly convergent above, the upper interocular distance about .95 times the lower interocular. First 4 antennal segments in a ratio of about 3:1:3:3, segment 3 about 2.4 times as long as thick. Ocelli in approximately a right triangle, the lateral ocelli close to the vertex crest and about as close to one another as to the nearest eye-margin. Posterior pronotal margin broadly angulate or subangulate. Fore wing with the radial vein arcuate or slightly angled; third submarginal cell narrowed by half to three fourths above, sometimes narrowed above more strongly than the second submarginal.

Abdomen slender, though slightly less so than in *parsonsi*; fourth sternite with a dense brush of hairs as described above. Sternite 6 with a narrow emargination apically. Subgenital plate strongly elevated medially, the apex rounded. Genitalia (Fig. 78) characterized by having the parameres much broadened near the base, the broad portion ventrally covered with short setae; beyond this are many long setae, some of which are clubbed; the paramere then tapers to an acute apex, the shaft clothed with numerous rather long setae. Digitus subspatulate, clothed with short setae; parapenials simple, very slightly curved; aedocagus broadened apically, the margins somewhat ragged, the apex weakly bilobed.

*Biology*.—On several occasions I have taken the female of this species on riverbanks, flying over the ground. In every case the soil was clay, and not particularly sandy. Males have been taken on cotton and on the flowers of poison hemlock (*Conium maculatum*).

*Distribution*.—This species occurs locally throughout the Austroriparian and Carolinian faunas, from Texas and North Carolina to Kansas, Missouri, Pennsylvania, and New Jersey.

*Specimens seen*: 26 (19 ♀♀, 7 ♂♂). NEW JERSEY: Camden Co., 1 ♀ [USNM]; PENNSYLVANIA: Pike Co., 1 ♀, Paupack [KVK]; DISTRICT OF COLUMBIA: 1 ♀, Washington, 10 Sept. [USNM]; VIRGINIA: Fairfax Co., 1 ♀, Dunn Loring, 12 Aug. [HEE]; 1 ♀, Falls Church, 15 Sept. [HEE]; NORTH CAROLINA: Duplin Co., 2 ♂♂, Wallace, 17 June [Coll. H. K. Townes]; MISSOURI: 1 ♀, 1 ♂, St. Louis [USNM]; KANSAS: Crawford Co., 1 ♀, 5 Aug. [HEE]; Riley Co., 5 ♀♀, 1 ♂, Manhattan, 25 June, 17 Sept.-1 Oct. [HEE, KSC]; 1 ♀, Randolph, 21 Aug. [HEE]; TEXAS: Cameron Co., 1 ♀, 1 ♂, Brownsville, 11 June-2 July [MCZ, USNM]; Comal Co., 1 ♀, New Braunfels, 29 June [HEE]; Dallas Co., 1 ♂, Dallas [MCZ]; Hidalgo Co., 2 ♀♀, 23-25 June [HEE]; Jefferson Co., 1 ♀, Port Arthur, May [MCZ]; Liberty Co., 1 ♀, Dayton, 22 June [MCZ]; Victoria Co., 1 ♂, Victoria, 22 March [USNM].

#### D. Subgenus **ARACHNOPHROCTONUS** Howard

*Arachnophroctonus* Howard, 1901, The Insect Book, pl. VII, figs. 11 & 14. [Type: *Sphex tropica* Fabricius, 1775, *nec* Linnaeus, 1758 (= *marginalis* Banks, 1910); designated by Pate, 1945.]—Pate, 1946, Trans. Amer. Ent. Soc., 72: 129.

*Arachnophila* Ashmead, 1902, Canad. Ent., 34: 86. [*Nec* Salvadori, 1874, *nec* Haeckel, 1887.] [Type: *Pompilus divisus* Cresson, 1867 (= *semirufus* Cresson, 1867); monobasic.] New synonymy.

*Psammochares* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 224. [In part.]—Banks, 1917, Bull. Mus. Comp. Zool., 61: 107, 108. [In part.]—Banks, 1919, Bull. Mus. Comp. Zool., 63: 231. [In part.]—Banks, 1939, Canad. Ent., 71: 226. [In part.]—Dreisbach, 1949, Ent. Amer., (n. s.) 29: 8, 10, 36, pl. II, fig. 7.

*Arachnodaictor* Pate, 1946, Trans. Amer. Ent. Soc., 72: 74. [New name for *Arachnophila* Ashmead, preoccupied.] New synonymy.

The name *Arachnophroctonus* has unfortunately been used incorrectly by most authors. Ashmead in 1902 designated *ferugineus* Say as the type; this species properly belongs in the

genus *Tachypompilus* Ashmead, as I have indicated earlier<sup>4</sup>. The first use of the name *Arachnophroctonus* was by Howard, 1901, who included two species in the genus, *tropicus* Fabricius and *atrox* Dahlbom; the former has been designated type by Pate, 1946, thus assigning the name to the present group.

The species of this subgenus show somewhat greater variability, both interspecific and intraspecific, than is shown by the other five subgenera of *Anoplius*. They are also, by and large, more generalized. It is possible that the other subgenera arose, perhaps each separately, as developments of single lines from the more protean *Arachnophroctonus*. One invariable and very useful character in this group is the fact that the transverse median and basal veins of the fore wing are either interstitial, or the former meets the media slightly before the basal.

*Subgeneric characters*.—Small to fairly large wasps, 6 to 25 mm. in length. Nearctic forms mostly or wholly black, some species with the abdomen partly or entirely rufous, the males of some species with a pale stripe along the posterior pronotal margin. Propodeum with or without erect hairs; venter of male often with erect hairs, occasionally with dense brushes of hair on some of the sternites; pygidium of female varying from only slightly to very densely bristly.

Mandibles of male unidentate, those of the female usually bidentate, but the inner tooth sometimes weak or even wanting through wear. Apical margin of clypeus truncate, concave, or in one species emarginate. Front of very variable breadth. Antennae elongate, segment 3 in the female always longer than 1 or 4, segment 3 in the male at least twice as long as thick. Metapostnotum a narrow transverse band, at most about half the length of the metanotum. Tarsal comb of female present, the spines from 1 to 3.5 times as long as the thickness of the tarsus, the basitarsus with 3 or 4 (rarely 5) comb-spines. Last segment of front tarsus of males slightly asymmetrical, the inner margin feebly lobed, the segment widest about two-thirds the distance from the base (in some exotics apparently belonging here, this segment is unmodified); inner claw of front tarsus deeply cleft, strongly curved, the inner ray subacute, of moderate length. Pulvillar pad of moderate size, the comb fairly long, consisting of from 12 to 24 setulae in the female, 8 to 16 in the male.

Cubitus of hind wing arising at or a little beyond or before the tip of the submedian cell. Fore wing with the transverse median vein usually meeting the media at the origin of the basal, occasionally slightly before, rarely slightly beyond. Marginal cell about or somewhat more than its own length from the wing-tip; radial vein always somewhat angulate at the

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<sup>4</sup> Evans, H. E., 1950, Trans. Amer. Ent. Soc., 75: 254.

second or third transverse cubital vein. Second submarginal cell 4-sided; third submarginal cell much narrowed above, 4-sided or 3-sided, occasionally petiolate.

Abdomen of male cylindrical or somewhat flattened above, varying from circular to subtrigonal in cross-section. Subgenital plate of simple form, without any special modifications, flat or with the median line somewhat elevated. Genitalia of rather uniform character, but possessing distinct specific differences; parameres always slender, nearly linear; basal hooklets single, strong; digiti spindle-shaped, the disc clothed with setae of variable nature; parapenials and aedoeagus simple.

*Biology*.—The species of this group inhabit open country, particularly where the soil is sandy; some of the species come frequently to flowers, while others practically never do. The nest is a simple burrow in the earth, usually in sand or clay, with a single terminal cell. So far as known, the species are not selective of their prey, but take primarily spiders of the families Lycosidae, Salticidae, Agelenidae, and Thomisidae.

*Distribution*.—This subgenus is widely distributed and well represented in the warmer regions of the globe. Numerous Neotropical species belong here, and I have seen several Ethiopian and Oriental species assignable to this group. The eight species of the Nearctic fauna fall into three rather well-defined species-groups.

### *Key to Species*

#### Females

1. Wings wholly deep fuliginous, violaceous; propodeum often somewhat hairy; clypeus sometimes emarginate; propodeum with a rather well-defined flattened or slightly concave posterior declivity (*Marginalis*-group) .....2
  - Wings varying from hyaline to moderately heavily infuscated, with a darker marginal band, at least the hind wings subhyaline basally; propodeum not noticeably hairy, except when the entire body is unusually hairy; clypeus not emarginate; propodeum with the declivity not or only indistinctly defined .....5
2. Clypeus somewhat elevated, its apical margin with a distinct median emargination; propodeum practically without erect hair; posterior margin of pronotum arcuate .....1. **bellicosus** (Banks)
  - Clypeus scarcely elevated, its apical margin at most slightly arcuately concave; propodeum with at least some short hair .....3
3. Head broadly oval, the front and vertex unusually broad; inner orbits diverging above, the upper interocular distance greater than the lower:

- propodeum with a short, steep declivity, on the sides of which it is somewhat protuberant .....3. **xerophilus** Evans
- Head not of unusual breadth; inner orbits converging above, the upper interocular distance less than the lower interocular; propodeal declivity more oblique, its lateral angles not prominent .....4
4. Wholly black; antennae fairly long, segment 3 equal to from .65 to .95 times the upper interocular distance; front basitarsus with 3 comb-spines; postocellar line about equal to the ocello-ocular line  
 2. **relativus** (Fox)
- Orange markings on second abdominal tergite (and sometimes more of the abdomen); antennae short for the genus, segment 3 equal to from .55 to .70 times the upper interocular distance; front basitarsus with from 3 to 5 (usually 4) comb-spines; postocellar line shorter than the ocello-ocular .....4. **marginalis** (Banks)
5. Spines of the tarsal comb long, at least 1.5 times as long as the thickness of the tarsus, the spine at the apex of the basitarsus well over half the length of the second tarsal segment; propodeum with a strong median linear impression; first abdominal tergite with a median basal sulcus (*Apiculatus*-group) .....6
- Comb-spines very short, but little if any longer than the thickness of the tarsus, the one at the apex of the basitarsus not over one third the length of the second tarsal segment; propodeum and first abdominal tergite lightly if at all impressed (*Americanus*-group)<sup>5</sup> .....9
6. Mesosternum with small spiniform processes which project over the inner bases of the middle coxae; front broad, the middle interocular distance over .6 the transfacial distance; abdomen shining  
 6. **semirufus** (Cresson)
- Mesosternum with processes short and broad, not spiniform; front more narrow, the middle interocular distance from .53 to .58 times the transfacial distance; abdomen not strongly shining .....7
7. Abdomen wholly rufous except sometimes the apical one or two segments; Central America to the southern parts of California, Arizona, and Texas .....5a. **apiculatus apiculatus** (Smith)
- Abdomen with only the basal three (rarely four) segments rufous; eastern Texas and Florida to Minnesota and Maine .....8
8. Head and thorax extensively silvery-sericeous, the posterior margin of the pronotum with a distinct silvery band; mesopleura silvery-sericeous; Texas and Florida to Kansas, Minnesota, Ontario, and western New York .....5b. **apiculatus autumnalis** (Banks)

<sup>5</sup> Certain species belonging to the *Subcylindricus*-group of the subgenus *Pompilius* will occasionally key out to this group. These are separable by the small size and much broader front (the middle interocular distance always exceeding .6 times the transfacial). In the *Americanus*-group the front is very narrow, the middle interocular distance not exceeding .56 times the transfacial.

Silvery pubescence much reduced, and not forming a complete band on the posterior pronotal margin; mesopleura not or in small part silvery; Atlantic coastal plain, Florida to Maine

5c. **apiculatus pretiosus** (Banks)

9. Wholly black; posterior margin of pronotum very broadly angulate

8. **moestus** (Banks)

Abdomen marked with orange; angulation of pronotum somewhat more sharp . . . . .10

10. Abdominal tergites 2 and 3 with paired orange spots, separated by a thin line or more or less confluent medially, the abdomen otherwise black; eastern Texas, Tennessee, and North Carolina to South Dakota, Michigan, Ontario, and New Jersey

7a. **americanus americanus** (Beauv.)

Abdomen with a greater amount of rufous or orange coloration, the first tergite at least in part colored; Tropical and Lower Austral Zones . . . .11

11. Posterior portion of first abdominal tergite, all of the second, and the anterior part of the third orange-brown; sternites wholly black; darker insects, usually without any silvery pubescence; average size somewhat larger; Georgia and Florida . . . .7b. **americanus trifasciatus** (Beauv.)

Greater part of the first three abdominal tergites, and usually part or all of the sternites, more or less bright orange; at least the lower front usually silvery-sericeous; average size smaller; Central America and the Antilles to Alabama, Kansas, Utah, and California

7c. **americanus juxtus** (Cresson)

Males

1. Propodeum with a variable amount of dark erect hair; wings in general more heavily infuscated; hind femora strongly compressed; second and third transverse cubital veins usually not meeting above, the third submarginal cell 4-sided or subtriangular, rarely triangular or petiolate (*Marginalis*-group) . . . . .2

Propodeum without erect hairs, or with only a few pale hairs; wings hyaline or subhyaline, with a fuscous marginal band; third submarginal cell usually triangular, often petiolate . . . . .5

2. Abdominal sternites 4 and 5 with dense brushes of erect hairs (Fig. 146); digiti of genitalia with a group of very long, clubbed hairs on the disc

2. **relativus** (Fox)

Venter not more than slightly hairy; digiti without long clubbed hairs . . . . .3

3. Propodeal declivity almost vertical, its sides somewhat protuberant; vertex very broad, the upper interocular distance about 1.2 times the lower interocular; subgenital plate without long hairs along its median line or its outer margin . . . . .3. **xerophilus** Evans

- Propodeal declivity less abrupt, its sides not prominent; vertex less broad, the upper interocular distance at most 1.15 times the lower; subgenital plate with a series of erect hairs either along its median line or as an outer marginal fringe .....4
4. Second abdominal tergite, and sometimes more of the abdomen, marked with orange; subgenital plate broad and nearly flat, its outer margin fringed with curved hairs; scape hairy .....4. **marginalis** (Banks)
- Wholly black or blue-black; subgenital plate with the median line elevated and provided with a series of erect hairs, the margin not hairy; scape not hairy .....1. **bellicosus** (Banks)
5. Almost the entire body clothed with a coarse silvery or somewhat glaucous pubescence; clypeus at least  $2\frac{1}{4}$  times as broad as high; venter without erect hairs; apex of digiti devoid of setae (*Apiculatus*-group) .....6
- Pubescence of the body very fine and delicate, though often in large part silvery; clypeus about twice as broad as high; venter with at least a few erect hairs; digiti setose to the apex (*Americanus*-group) <sup>6</sup> ... ..7
6. Antennae rather heavy, segment 3 less than 2.5 times as long as its greatest thickness; subgenital plate rounded apically (Fig. 119)
5. **apiculatus** (Smith) <sup>7</sup>
- Antennae more slender, segment 3 more than 2.5 times as long as thick; subgenital plate pointed apically (Fig. 120) ...6. **semirufus** (Cresson)
7. Subgenital plate clothed with perpendicular setae of moderate length (Fig. 122); digiti clothed with hairs of moderate length which are angled at their apices (Fig. 86) .....8. **moestus** (Banks)
- Subgenital plate broadly rounded apically, clothed with fine pubescence and only a few setae if any (Fig. 121); digiti fringed with very long setae (Fig. 85) .....8
8. Abdomen black, or the second tergite with a pair of small orange spots, the segment rarely encircled with orange; venter sparsely hairy; eastern Texas, Tennessee, and North Carolina to South Dakota, Michigan, Ontario, and New Jersey .....7a. **americanus americanus** (Beauv.)
- Abdomen very rarely wholly black, the second segment usually marked with orange and usually encircled with orange, the coloration sometimes extending to adjacent segments; venter sparsely or conspicuously hairy; Tropical and Lower Austral Zones .....9

<sup>6</sup> Some members of the *Subcylindricus*-group of the subgenus *Pompilinus* will occasionally key out here. These may be recognized by their very small size, the absence of any scattered, long, erect setae on the venter, and the presence of a brush of very short hairs on the fourth sternite.

<sup>7</sup> This species is divisible into three subspecies on the basis of characters present (so far as I have been able to determine) in the female sex only. The user of the key is referred to couplets 7 and 8 of the key to females, where the ranges of the three subspecies are stated.

9. Georgia and Florida; a form averaging somewhat larger and darker than the others, but not clearly distinguishable in this sex

7b. **americanus trifasciatus** (Beauv.)

Central America and the Antilles to Alabama, Kansas, Utah, and California; abdomen conspicuously marked with bright orange; venter often conspicuously hairy .....7c. **americanus juxtus** (Cresson)

#### *Marginalis* Species-group

To this group are assigned four rather large, dark species, the pubescence in large part or wholly dark, often reflecting deep metallic colors, and the wings (except in the male *xerophilus*) wholly and rather uniformly fuliginous, violaceous. In general there is more erect hair on the body than in the other two species-groups; the tarsal comb is of moderate length, the spines between 1 and 2 times the width of the tarsus; the propodeum is rather convex and possesses a rather distinct posterior declivity; the femora of the male are strongly compressed; the abdomen of the male is somewhat flattened above; the third submarginal is only occasionally triangular, but often nearly so.

1. **Anoplius (Arachnoproctonus) bellicosus** (Banks) new combination  
(Pl. XII, fig. 80.)

*Psammochares bellicosus* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 224. [Type: ♂; Palmerlee, Ariz., Sept.; M.C.Z. no. 13,666.]—Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—[not] Banks, 1919, Bull. Mus. Comp. Zool., 63: 233. [Calif., Wash.; based on misidentification.]—Regan, 1923, Ann. Ent. Soc. Amer., 16: 179.

*Lophopompilus autilone* Banks, 1919, Canad. Ent., 51: 82. [Type: ♂; Fort Myers, Fla., 7 May 1916 (J. C. Bradley); C. U. no. 679.]

*Lophopompilus autilone* [sic] Regan, 1923, Ann. Ent. Soc. Amer., 16: 179. [Present synonymy indicated.]

The strongly emarginate clypeus of the female of this species separates it at once from the other members of the subgenus, and suggests the species of *Lophopompilus*, from which it is separable by the virtual absence of erect hair on the pleura and propodeum. The median line of the male subgenital plate is elevated and bears a series of erect hairs; this is somewhat suggestive of the plumose tuft on the subgenital plate of *Lophopompilus*, and may represent a precursor of it. Indeed, this species is probably somewhat intermediate between these two subgenera, although the balance of characters clearly places it in *Arachnoproctonus*.



FEMALE.—Length 20 (17-23) mm. Color black; wings wholly fuliginous, rather strongly violaceous or bluish-refulgent. Pubescence wholly dark, over most of the body reflecting deep bluish, violet, or blue-green, on the front, clypeus, and legs usually more or less brownish. Front and vertex with a small amount of short erect hair; pronotum very slightly hairy; metanotum with a few hairs on each side; propodeum with only some very fine, short, inconspicuous hairs; venter somewhat setose; pygidium densely bristly.

Head broader than high, the transfacial distance about 1.2 times the distance from the apical clypeal margin to the vertex crest. Clypeus convex, elevated, its apical margin with a large arcuate emargination; clypeus about 3 times as broad as high. Front broad, middle interocular distance about .57-.61 times the transfacial distance. Inner orbits subparallel below, convergent above, the upper interocular distance about .85-.90 times the lower interocular. Vertex raised considerably above the tops of the eyes; ocelli in a broad triangle, the front angle usually slightly greater than a right angle. First four antennal segments in a ratio of about 7:2:10:7, segment 3 equal to from .7 to .85 times the upper interocular distance.

Posterior margin of pronotum arcuate or with a vague median angulation. Propodeum with a well-defined oblique, flattened declivity; median line not or slightly impressed. Tarsal comb consisting of spines on the average about  $1\frac{1}{2}$  times as long as the thickness of the tarsus; basitarsus with 3 comb-spines (rarely a weak fourth), the apical one about half the length of the second tarsal segment. Fore wing with the second submarginal cell rather long, usually about twice as long as high, narrowed by not more than one-fourth above; third submarginal cell about  $1\frac{1}{2}$  times as long as high, strongly narrowed above, almost subtriangular.

MALE.—Length 16 (10-22) mm. Color black; wings fuliginous, reflecting violet or bluish. Pubescence of the lower front and clypeus often silvery; elsewhere the pubescence is dark, rather richly refulgent of deep metallic colors, chiefly violet and deep blue-green. Scape not hairy; clypeus, front, and vertex with fairly abundant short hairs; pronotum, metanotum, propodeum, and pleura a little more hairy than in the female, but the hairs rather fine and inconspicuous; abdominal sternites beyond the first each with a few erect hairs, those on the apical sternite in a line along the median ridge.

Clypeus slightly convex, about twice as broad as high, its apical margin slightly arcuately concave. Front broad, middle interocular distance about .62 times the transfacial distance. Eyes divergent to somewhat above the middle, then slightly convergent at the top, the upper interocular distance subequal to or slightly greater than the lower interocular distance. Ocelli forming an obtuse angle in front, the postocellar line subequal to or less than the ocello-ocular line. First four antennal segments in a ratio of about 7:2:8:8, segment 3 about 2.2-2.5 times as long as thick.

Pronotum arcuate or feebly subangulate behind. Propodeum sloping gradually in front, rather precipitous behind. Last segment of front tarsus very slightly asymmetrical, the inner margin inconspicuously produced a

little before the apex. Venation as in the female, the second submarginal cell usually only about  $1\frac{1}{2}$  times as broad as high.

Abdomen very slightly flattened above; venter a little hairy, without dense brushes of hair. Sternite 6 with a deep V-shaped emargination. Subgenital plate of moderate breadth, the apex broadly rounded, the median line elevated and provided with a series of suberect hairs. Genitalia (Fig. 80) with the parameres as long as or a little longer than the aedeagus, setose on the squamae, outer margin, apex, and over most of the ventral surface. Volsellae with a number of strong setae on the basis; digiti very characteristic, somewhat spindle-shaped but strongly curved, the disc wholly clothed with prominent, strongly sinuate setae.

*Biology*.—This species is often collected on flowers; it has been taken on water hemlock (*Cicuta*), milkweed (*Asclepias*), mesquite (*Prosopis*), beargrass (*Nolina*), salt cedar (*Tamarix*), pepper vine (*Ampelopsis*), and horse mint (*Monarda*).

*Distribution*.—Lower Austral Zone, Mexico to Arizona and Texas, eastward along the Gulf coast to Florida, and north along the Atlantic coast to Cape May, New Jersey.

*Specimens seen*: 83 (26 ♀♀, 57 ♂♂). NEW JERSEY: Cape May Co., 1 ♂, Cape May, 13 July [ANSP]; NORTH CAROLINA: Pitt Co., 1 ♂, Greenville, 6 July [USNM]; SOUTH CAROLINA: Horry Co., 1 ♀, 2 ♂♂, Myrtle Beach, 5 July [USNM]; GEORGIA: Charlton Co., 2 ♂♂, Okefenokee Swamp, May, June [CU, MCZ]; FLORIDA: Hendry Co., 6 ♂♂, LaBelle, 8-10 May [CU, MCZ]; ALABAMA: Mobile Co., 2 ♀♀, 1 ♂, Del Champs, 19 July [MCZ]; Tuscaloosa Co., 1 ♀, 24 June [HEE]; MISSISSIPPI: Lafayette Co., 1 ♀, Oxford, 5 May [MCZ]; TEXAS: many records, from Bastrop, Brazos, Brewster, Dallas, El Paso, Hunt, Jeff Davis, Kleburg, Kenedy, LaSalle, Llano, Presidio, Titus, and Williamson Cos.; NEW MEXICO: Otero Co., 1 ♀, 12 mi. SW of Alamogordo, 27 July [HEE]; ARIZONA: many records, from Cochise, Gila, Pima, and Santa Cruz Cos.; MEXICO: Chihuahua, 1 ♀, 92 km. N. of Chihuahua, June [AMNH].

## 2. *Anoplius (Arachnoproctonus) relativus* (Fox)

(Pl. XXI, figs. 146, 152.)

*Pompilus relativus* Fox, 1893, *Canad. Ent.*, 25: 114. [Type: ♀; Ocean Co., N. J.; A.N.S.P. no. 412.]—Dalla Torre, 1897, *Cat. Hymen.*, VIII, p. 315.

*Anoplius relativus* Viereck, 1906, *Trans. Amer. Ent. Soc.*, 32: 239, 241. [N. Mex., Colo.]—Smith, 1910, *Ann. Rpt. N. J. State Mus.* 1909, p. 674. —Evans, 1950, *Trans. Amer. Ent. Soc.*, 75: 268, pl. X, figs. 1 and 2.

*Psammochares (Allocophonyx) hesione* Banks, 1910, *Psyche*, 17: 250. [Type: ♂; Douglas Co., Kansas (Snow); M.C.Z. no. 13.694.] New synonymy.

- Psammochares (Psammochares) relativus* Rohwer, 1916, *Conn. Geol. Nat. Hist. Survey Bull.* 22, p. 633. [Branford, Conn.]—Banks, 1917, *Bull. Mus. Comp. Zool.*, 61: 108.—Leonard, 1926, *Cornell Agri. Exp. Sta. Memoir* 101, p. 986.—Johnson, 1930, *List Insect Fauna Nantucket*, p. 110.—Brimley, 1936, *Jour. Elisha Mitchell Sci. Soc.*, 52: 128, 129. [N. C.]—Brimley, 1938, *Insects No. Carolina*, p. 434.
- Psammochares difficilis* Banks, 1917, *Bull. Mus. Comp. Zool.*, 61: 105. [Type: ♀; Falls Church, Va., 8 Sept. (N. Banks); M.C.Z. no. 10,019.] [Nec Tournier, 1889.] New synonymy.
- Anoplus confraternus* Banks, 1926, *Canad. Ent.*, 58: 201. [Type: ♀; Ridgeway, Ont., 24 July 1910 (M. C. VanDuzee); M.C.Z. no. 15,802.] New synonymy.
- Psammochares henshawi* Banks, 1939, *Canad. Ent.*, 71: 226. [Type: ♀; Ainsworth, Wash., 20 July 1882; M.C.Z. no. 23,480.] New synonymy.
- Psammochares relativus* Dreisbach, 1949, *Ent. Amer.*, (n. s.) 29: 36, pl. II, fig. 7.
- Anoplus (Arachnoproctonus) relativus* Krombein, 1950, *Jour. Elisha Mitchell Sci. Soc.*, 65: 264.

This is one of the most widely distributed of North American Pompilini, and over much of its range not uncommon. It is a highly variable species, frequently misdetermined in collections; Banks has redescribed the species under four different names. The males are easily separated from other members of the subgenus by the strong brushes of hair on the venter, a character also possessed by several species of *Anoplus* s. str., however. The females closely resemble the preceding species, but the clypeus is truncate or at most slightly concave apically, and the body is somewhat more hairy.

FEMALE.—Length 16 (11-21) mm. Color black; wings fuliginous, a little darker along the outer margin, more or less violaceous. Pubescence wholly dark, obscurely to rather strongly reflecting various shades of deep bluish. Body with a variable amount of erect hair; front and vertex moderately hairy; front coxae setose, the other coxae and the femora slightly hairy or not; pronotum, mesopleura, metanotum, and other parts of the thorax somewhat hairy; propodeum with considerable rather fine erect hair; venter somewhat setose; pygidium densely bristly.

Head broader than high, the transfacial distance about 1.15 times the facial distance. Clypeus 2.6 to 3 times as broad as high, its apic. l margin truncate or slightly concave. Front of very variable breadth, the middle interocular distance varying from .55 to .64 times the transfacial distance—an unusually broad range. Eyes slightly convergent above, the upper interocular distance from .82 to .92 times the lower interocular. Vertex raised

only very slightly if at all above the eye-tops; ocelli forming about a right angle in front, or slightly greater; postocellar and ocello-ocular lines usually nearly equal. First four antennal segments in a ratio of about 7:2:11:9, segment 3 varying from .65 to .95 times the upper interocular distance. (The head of this species was figured by the author in part I of this study. [Evans, 1950, pl. X, fig. 1].)

Posterior margin of the pronotum varying from arcuate to broadly angulate. Propodeum with a well-defined oblique declivity, its sides not or barely protuberant. Front basitarsus with three comb-spines, the spines from 1.2 to 2.2 times as long as the thickness of the tarsus. Fore wing with the marginal cell large, about or slightly more or less than its own length from the wing-tip, the radial vein angled at the third transverse cubital vein. Second submarginal cell from 1 to 2 times as broad as high, narrowed somewhat above; third submarginal cell much narrowed above, often subtriangular, sometimes triangular (Fig. 152).

MALE.—Length 13 (8-18) mm. Color black; wings fuliginous, with a darker marginal band, generally somewhat violaceous. Pubescence of lower front, sides of clypeus, base of mandibles, and temples often silvery; pubescence over most of the body dark, obscurely to rather strongly reflecting deep metallic colors. Scape slightly hairy or not; front, vertex, and temples with rather copious short, dark hair; front coxae, pronotum, mesopleura, and propodeum with considerable hair; first abdominal tergite slightly hairy near the base; sternites 2 and 3 each with a few hairs, sternites 4 and 5 with dense brushes of hairs, sternite 6 with some very short hair, the subgenital plate not noticeably hairy (Fig. 146).

Clypeus about twice as broad as high, its apical margin truncate or very slightly concave. Middle interocular distance varying from .58 to .65 times the transfacial distance; upper interocular distance subequal to or slightly greater than the lower interocular. Ocelli rather small and far apart, forming an angle in front which is greater than a right angle; postocellar line equal to or greater than the ocello-ocular line. First four antennal segments in a ratio of about 3:1:3:3.

Posterior pronotal margin arcuate or feebly angulate. Propodeum sloping but very slightly to near the posterior end, where there is a short, almost vertical declivity; postero-lateral angles slightly prominent. Last segment of front tarsus distinctly asymmetrical, the inner margin produced, the segment widest about two-thirds the distance from the base. Wing venation about as in the female, the marginal cell usually a little shorter, the third submarginal sometimes triangular, rarely petiolate. (Propodeum and abdomen shown in Fig. 146.)

Abdomen distinctly flattened dorsally, especially basally. Venter with strong brushes of hair, as described above. Sternite 6 with a shallow, broad emargination. Subgenital plate simple, of moderate breadth, the apex broadly rounded (rather similar to that of *americanus*, shown in Fig. 121). Genitalia very characteristic; parameres linear, very slightly curved,

setose along the outer margin and especially at the apex; basis volsellaris with several long hairs; digiti slender, curved, the disc somewhat spindle-shaped and bearing a number of long clubbed setae which are directed outward and bent at an angle a short distance from their apices; aedocagus fairly broad, slightly exceeding the slender, slightly curved parapepials. (The genitalia of this species were illustrated by the author in Part I of this study, Fig. 2, and also by Dreisbach, 1949.)

*Biology.*—This species is especially characteristic of sandy, gravelly, or waste areas in open country or along watercourses. In the absence of any published information on the biology of this fairly common species, the following observations of the author are described in some detail.

At 2:30 P.M. on a cloudy day late in September, a female *A. relativus* was found excavating a hole in a sand bank along the Connecticut River at East Hartford, Conn. The wasp would remain in the burrow about a minute at a time, each time she reappeared raking back sand with her tarsal comb. After 10 minutes of this the wasp ran off down the bank and out of sight for several minutes. She was next seen walking backward up the bank dragging a large spider behind her. After some difficulties caused by the steepness and irregularity of the slope and size of the spider, she finally deposited the spider on the crest of a mole-hill about 14 inches from the burrow. The wasp then returned to her digging for about half an hour, during which time 3 trips were made back to inspect the spider and drive off intruders. One of these was the small socially parasitic spider wasp *Evagetes padrinus minusculus* (Banks), which was driven off with a vengeance by the *relativus*. A small fly and an ant were also sent on their way by the excited wasp.

Having finally completed the burrow, the *relativus* ran quickly to her spider, which she grasped by the base of the legs with her mandibles and carried backward to the nest. The grade was steep, and it took her two minutes to make 9 inches; the spider was then deposited while a quick visit was made to the burrow; returning, the spider was carried directly to the edge of the burrow. Now the wasp changed her grip on the spider, grasping it by the spinnerets, and backed directly into the hole; the legs of the spider flipped backward over the cephalothorax and were the last to disappear. After its disappearance 13 minutes elapsed,

when the wasp reappeared head first, raking sand behind her. For 20 minutes the process of filling went on; then for another 20 minutes there was no sign of the wasp. Since it was now 5 P.M. and very cool, it seemed possible that she intended to spend the night in the partially filled burrow. The wasp and the spider were therefore dug out. The burrow proved to be 5 inches in length, perfectly straight, and with the usual terminal cell containing the spider in an inverted position; the egg of the wasp was not found, most likely having been dislodged in the digging. The spider proved to be a ♀ *Agelenopsis naevia* (Walck.) (Agelenidae) [det. B. J. Kaston].

*A. relativus* is also a frequent visitor to flowers, and has been taken on the following: *Daucus carota*, *Cicuta maculata*, *Conium maculatum*, *Solidago*, *Baccharis glutinosus*, *Petalostemon oligophyllum*, *Vicia*, *Melilotus alba*, *Polytactnia nuttallii*, *Sphaeralcea angustifolia*, *Asclepias*, *Tamarix*, *Polygonum*, *Eriogonum*, *Angelica*, *Cleome serrulata*, *Helianthus*, *Monarda*, and *Euphorbia marginata*. Dates of collection vary widely, and indicate one generation a year in the North, and several in the South.

*Distribution*.—This is a very wide-ranging species, though principally characteristic of the Lower and Upper Austral Zones, its range extending from the Mexican states of Jalisco and Morelos north to British Columbia, Manitoba, Ontario, and Massachusetts.

*Specimens seen*: 784 (406 ♀♀, 378 ♂♂). The following records appear to define the periphery of the range of this species: MASSACHUSETTS: Norfolk Co., 2 ♀♀, Wellesley, Aug. [MCZ]; VERMONT: Windsor Co., 1 ♀, Woodstock, 13 Aug. [USNM]; NEW YORK: Essex Co., 3 ♀♀, New Russia, Aug., Sept. [CU]; ONTARIO: 3 ♀♀, 1 ♂, Ottawa, 24 July [HEE]; MICHIGAN: Cheboygan Co., 2 ♀♀, 1 ♂, Douglas Lake, July, Aug. [MCZ, CU]; MANITOBA: 1 ♀, 1 ♂, Aweme, Aug. [CNC]; ALBERTA: 1 ♀, Medicine Hat, July [CNC]; BRITISH COLUMBIA: 2 ♀♀, 2 ♂♂, Okanagan, May, July [CNC]; BAJA CALIFORNIA: 1 ♂, San Domingo, 19 July [CAS]; JALISCO: 2 ♀♀, Guadalajara [ANSP]; MORELOS: 1 ♂, Cuernavaca, Oct. [USNM]; TEXAS: Cameron Co., 1 ♀, Port Isabel, Apr. [Mass.]; LOUISIANA: 3 ♀♀, New Orleans [USNM]; FLORIDA: Lee Co., 1 ♂, Punta Rassa, May [CU].

3. *Anoplius (Arachnoproctonus) xerophilus* Evans (Pl. XII, fig. 81.)

*Anoplius xerophilus* Evans, 1947, Ent. News, 58: 10-14. [Type: ♂; Steins, N. Mex., 14 July 1917 (J. C. Bradley), on *Acacia greggii*; C. U. no. 2398.]

This apparently uncommon species is confined to desert regions of the deep Southwest. It is clearly distinguishable from other members of this species-group by the very broad vertex, the steep propodeal declivity, and the characters of the male terminalia.

FEMALE.—Length 12.5 (12-13) mm. Color black; wings fuliginous, with a slightly darker marginal band, slightly violaceous. Pubescence dark, somewhat violaceous. Scape not hairy; front and-vertex with considerable short, black hair; pronotum, scutellum, and mesonotum slightly hairy, the propodeum conspicuously so; abdominal sternites each with a few setae, the apical tergite rather densely bristly.

Head broadly oval, the transfacial distance about 1.2 times the facial distance. Clypeus about 2.6 times as broad as high, slightly broader than the lower front, its apical margin truncate. Front broad, the middle interocular distance .63 times the transfacial; eyes diverging above, the middle interocular distance from 1.2 to 1.3 times the lower interocular, the upper interocular distance about 1.1 times the lower. Ocelli in a broad, flat triangle, the front angle much greater than a right angle; postocellar line slightly less than the ocello-ocular. First four antennal segments in a ratio of about 3:1:3.8:3.3, segment 3 only very slightly more than half the upper interocular distance. Vertex scarcely raised above the tops of the eyes; head contracted immediately behind the eyes.

Pronotum rather long, its posterior margin feebly angulate. Propodeum with an abrupt, oblique, somewhat concave declivity behind, the sides of the declivity faintly protuberant. Front femur with a slight compression on the outside about one-third the way from the base, as though pinched at this point. Spines of the tarsal comb only slightly longer than the width of the tarsus; basitarsus with three comb-spines. Pulvillar comb of about 14 setulae. Fore wing with the marginal cell about its own length from the wing-tip; radial vein nearly evenly arcuate; second and third submarginal cells both four-sided, both somewhat narrowed above. First abdominal tergite somewhat swollen, the anterior surface nearly perpendicular to the dorsal; median line of this tergite slightly impressed.

MALE.—Length 10 (8-12) mm. Color black; wings lightly to rather heavily infuscated, with a darker band along the outer margin. Pubescence largely brownish-violaceous, often silvery on the lower front, clypeus, and base of the mandibles, occasionally also on parts of the pronotum and propodeum. Scape not or barely hairy; front, vertex, temples, and propleura with abundant short, dark hair; thoracic nota, pleura, and coxae barely to moderately hairy; propodeum always with considerable hair; first abdominal tergite often a little hairy near the base, but the rest of the abdomen practically devoid of erect hair.

Head very broad, the transfacial distance from 1.2-1.3 times the facial distance. Clypeus about as wide as the lower front, truncate below. Front very broad, the middle interocular distance from .63 to .67 times the transfacial distance, and about 1.3 times the lower interocular distance. Vertex very broad, the upper interocular distance about 1.2 times the lower interocular. Vertex slightly raised in the region of the ocelli, the ocelli about as in the female. First four antennal segments in a ratio of about 3:1:3:2.8, or segment 4 sometimes as long as 3; first 4 segments together a little greater than the upper interocular distance.

Posterior pronotal margin arcuate or feebly angulate. Propodeum sloping but little to near the posterior margin, where it is almost vertically declivous, the sides of the declivity faintly protuberant. Front femora pinched as in the female; middle and especially the hind femora strongly compressed throughout. Last segment of front tarsus distinctly lobed on the inner margin; inner claw of this tarsus strongly modified. Venation about as in the female; radial vein of fore wing sometimes slightly angled; third submarginal cell often narrowed above more than the second.

Abdominal dorsum flattened slightly, especially toward the base; venter not or scarcely hairy. Sternite 6 with a deep V-shaped emargination. Subgenital plate fairly broad, the sides approaching to a subacute apex; median line weakly carinate; outer sides of plate rather weakly pigmented; plate without erect hairs, only fine pubescence. Genitalia (Fig. 81) most like those of *bellicosus*; parameres straight, linear; volsellae with a few strong setae on the basis, the digitus a little curved, the disc somewhat spindle-shaped, clothed with abundant, moderately long setae which are bent at an angle near their apices; parapenials slender, slightly curved, embracing the aedeagus, which is fairly broad, the apex weakly bilobed.

*Biology*.—The type and several paratypes of this species were collected on the pods of cats-claw, which were covered with a sweet exudate. I have collected males on the blossoms of milkweed. This species occurs in desert areas, and does not seem to be common.

*Distribution*.—This is a Lower Sonoran form, the known range extending from Lower California and western New Mexico to Utah (Millard Co.) and California (Fresno Co.).

*Specimens seen*: 14 (4 ♀♀, 10 ♂♂). NEW MEXICO: Hidalgo Co., 1 ♀, 4 ♂♂, Steins, 14 July (J. C. Bradley) [CU]; 1 ♀, 15 mi. W. of Lordsburg, Aug. (Werner & Nutting) [MCZ]; ARIZONA: Cochise Co., 1 ♂, Bowie, 14 July (J. C. Bradley) [CU]; 2 ♂♂, 2 mi. E. of Pearce, 9 Aug. (H. E. Evans) [HEE, USNM]; Pima Co., 1 ♂, Apache Camp, Santa Catalina Mts., 5500 feet, 25 July (J. Bequaert) [MCZ]; UTAH: Millard Co., 1 ♀, Beaver Pass, 4000 feet, 31 July (E. R. Tinkham) [Minn.]; CALIFORNIA: Fresno Co., 1 ♂, Coalinga, 1-3 June (J. C. Bradley) [CU]; Inyo Co.,



1 ♀, Wild Rose Canyon, 24 Aug. [CIS]; BAJA CALIFORNIA: 1 ♂, 10 mi. S. of Punta Prieta, 21 June (Michelbacher & Ross) [CAS].

4. *Anoplius (Arachnoproctonus) marginalis* (Banks)

(Pl. XIII, fig. 84.)

*Sphex tropica* Fabricius, 1775, Syst. Ent., p. 350. [Type: ♀?; "America"; (location unknown to present author).] [*Nec* Linnaeus, 1758.]—Fabricius, 1793, Ent. Syst. Emend. & Aucta, II, p. 213.

*Pompilus tropicus* Fabricius, 1798, Suppl. Ent. Syst., p. 250.—Fabricius, 1804, Syst. Piezatorum, p. 194.—Jurine, 1807, Nouv. Meth. Class. Hymen. & Dipt., p. 121.—Dahlbom, 1844, Hymen. Europ., I, p. 62.—Lepeletier, 1845, Hist. Nat. Insect. Hymen., III, p. 434.—F. Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 161.—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 98. [Pa., Del., Ga., Ill.]—Cresson, 1872, Trans. Amer. Ent. Soc., 4: 203. [Texas.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 328.—Birkman, 1899, Ent. News, 10: 244. [Fedor, Lee Co., Tex.]

*Arachnoproctonus tropicus* Howard, 1901, The Insect Book, pl. VII, fig. 11.—Pate, 1946, Trans. Amer. Ent. Soc., 72: 129. [Designated genotype.]

*Psammochares marginalis* Banks, 1910 (June), Jour. N. Y. Ent. Soc. 18: 118. [Type: ♀; Southern Pines, No. Carolina, 23 May (A. H. Manee); M.C.Z. no. 13,685.]—Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 128, 129.

*Psammochares castella* Banks, 1910 (Dec.), Psyche, 17: 248. [Type: ♂; Fedor, Lee Co., Texas, 3 May 1909 (Birkmann); M.C.Z. no. 13,689.] New synonymy.—Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.

*Anoplius tropicus* J. Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.

*Psammochares tropicus* Banks, 1912, Ent. News, 23: 108. [At flowers of *Ceanothus* in Va.]—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 986. [Long and Staten Islands, N. Y.]—Johnson, 1930, List Insect Fauna Nantucket, p. 110.

*Pompiloides tropicus* Rohwer, 1916, Conn. Geol. Nat. Hist. Survey Bull. 22, pp. 631, 632. [New Haven, Conn.]—Rau and Rau, 1918, Wasp Studies Afield, pp. 45-58. [Biology.]—Robertson, 1928, Trans. Acad. Sci. St. Louis, 25: 307. [Flower records.]

*Psammochares fabricii* Banks, 1933, Psyche, 40: 6. [Proposed as a new name for *tropicus* Fabricius, preoccupied.] New synonymy.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 128, 129. [N. C., many records.]—Brimley, 1938, Insects N. Carolina, p. 434.

*Anophus (Arachnoproctonus) marginalis* Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 264.

This well-known species has long been called *tropicus* or, in the more recent literature, *fabricii*. The correct name, however, is *marginalis*, as the type of this species indubitably falls within the range of variation of *tropicus-fabricii*, and is the earliest valid name for the species. The only member of this species-group marked with orange, *marginalis* is rather readily identified. The male subgenital plate is very characteristic: it is broad and nearly flat, the very broadly rounded apical margin fringed with hairs.

FEMALE.—Length 15.5 (11-20) mm. Color black, the upper outer orbits often with a narrow streak of pale, the second abdominal tergite with a broad band of orange, emarginate behind medially; in a few specimens the orange extends to the adjacent tergites, occasionally even to the sternites. Wings wholly fuliginous, somewhat violaceous. Pubescence wholly somewhat brownish, obscurely reflecting deep metallic colors. Head and thorax with a variable amount of dark erect hair; propodeum with at least some fine, short hair, sometimes strongly hairy.

Clypeus very broad, from 2.6 to 3 times as broad as high, its apical margin broadly rounded or subtruncate. Front broad, the middle interocular distance from .57 to .65 times the transfacial distance. Inner orbits subparallel below, converging slightly above, the upper interocular distance from .85 to .95 times the lower interocular distance. Ocelli small and widely separated, in a triangle somewhat below the crest of the vertex, the front angle somewhat greater than a right angle; postocellar line less than the ocello-ocular. Antennae short for the genus, the first four segments in a ratio of about 7:2:10:8, segment 3 from .55 to .7 times the upper interocular distance. Head rather thick, the temples well developed.

Posterior margin of the pronotum broadly angulate, sometimes rather indistinctly so. Propodeum short, the median line impressed, posteriorly with a fairly well-defined flattened declivity. Front tarsus with a strong tarsal comb, the spines 1.5 to 2 times as long as the width of the tarsus; basitarsus with from 3 to 5 (most commonly 4) comb-spines. Fore wing with the marginal cell about 2.5 times as long as high, the radial vein angled at the third transverse cubital vein. Second submarginal cell rhomboidal, a little narrowed above, usually about 1.5 times as broad as high; third submarginal cell narrowed above by at least .8, typically nearly triangular, occasionally triangular.

MALE.—Length 12 (6.5-17) mm. Color of body and wings as in the female, except that the orange somewhat more frequently extends beyond the limits of the 2d abdominal tergite. Pubescence in large part brownish-violaceous, in certain lights reflecting deep blue-green; occasionally the pubescence is silvery on the sides of the lower front and clypeus. Scape hairy below; front rather densely hairy; propodeum with considerable hair; disc of subgenital plate clothed with short hairs, the outer margin fringed with longer, curved hairs.

Clypeus a little over twice as broad as high, its apical margin truncate or slightly rounded. Front of very variable width, the middle interocular distance varying from .56 to .64 times the transfacial distance. Eyes diverging slightly above, the upper interocular distance from 1.0 to 1.15 times the lower interocular. Ocelli small, forming an obtuse angle in front; post-ocellar line: ocello-ocular line about as 9:10. Posterior pronotal margin angulate or subangulate. Propodeum sloping very gradually in front, more steeply behind, the declivity short but less abrupt than in the preceding two species; median line well impressed. Last segment of front tarsus produced on the inner margin; both claws of this tarsus somewhat modified, the inner strongly so. Venation as in the female, the marginal and second submarginal cells usually slightly shorter.

Abdominal dorsum slightly flattened; venter with only a few weak setae. Sternite 6 broadly and shallowly emarginate. Subgenital plate broad, very broadly rounded apically, the surface flat or very slightly raised medially; outer margins fringed with fairly long, curved setae. Genitalia (Fig. 84) with the parameres strong, slender and attenuate apically, clothed with strong setae on the outer margin and entire ventral surface; volsella with a group of weak setae on the basis, the digitus broadened and slightly curved apically, the tip subacute, the disc clothed (except near the tip) with short setae, most of which are bent at an angle near their tip; parapeenials slender, curved; aedoeagus broadest subapically, the margins here a little ragged, the apex narrowed, weakly bilobed.

*Gynandromorph*.—There is a gynandromorph of this species in the collection of the University of Minnesota, taken by C. E. Mickel in a sand area at Jordan, Minn., 13 July 1923. The head of this specimen is thoroughly male, the abdomen thoroughly female, the left side of the thorax and propodeum male, the right, female.

*Biology*.—We are indebted to the Raus (1918) for a long and vivid account of the habits of this species. They found it nesting in bare spots in fields, and preying upon *Lycosa frondicola* Emerton, *Lycosa carolinensis* Walck. (Lycosidae), and *Pellencs coccatus* Hentz (Salticidae). The burrow (see Figs. 10 and 11 in Raus and Raus, pp. 53 and 56) is straight, either vertical or oblique, about 2 or 3 inches long, terminating in an oval chamber. They also watched this species stalking a web-spinning spider in its web without becoming entangled.

The Raus observed this species feeding upon the blood exuding from wounds made by the wasp on the spider, and they suggest that this may be the only food of the adult *marginalis*. However,

the species is now known to visit a considerable number of flowers, as follows: *Daucus carota*, *Pastinaca sativa*, *Solidago*, *Ceanothus*, *Monarda*, *Potentilla*, *Euphorbia marginata*, and *Stillingia sylvatica*.

*Distribution*.—This species occurs principally within the limits of the Lower and Upper Austral Zones, from Arizona, Texas, and Florida to Utah, Manitoba, southern Ontario, and Massachusetts.

*Specimens seen*: 410 (269 ♀♀, 140 ♂♂, 1 gynandromorph). The following records are marginal: MASSACHUSETTS: Suffolk Co., 1 ♂, Chelsea, July [MCZ]; Hampshire Co., 4 ♀♀, 3 ♂♂, Amherst, June-Aug. [Mass.]; NEW YORK: Putnam Co., 1 ♂, Patterson, 26 July [KVK]; NEW JERSEY: Burlington Co., 1 ♂, Road to Speedwell, June [ANSP]; VIRGINIA: Fairfax Co., 2 ♀♀, 1 ♂, Falls Church, June-Aug. [MCZ]; NORTH CAROLINA: Buncombe Co., 1 ♀, Swannanoa, Sept. [HEE]; PENNSYLVANIA: Erie Co., 3 ♀♀, 3 ♂♂, Presque Isle, July-Aug., on beach [CM]; ONTARIO: 2 ♀♀, 2 ♂♂, Toronto, 6 July [CNC]; 1 ♀, 1 ♂, Pt. Pelee, July [CNC]; MICHIGAN: Midland Co., 1 ♀, 21 July [MCZ]; WISCONSIN: Wood Co., 1 ♀, Cranmoor, Aug. [USNM]; MANITOBA: 2 ♀♀, Aweme, July-Aug. [CNC]; SOUTH DAKOTA: Harding Co., 1 ♀, 3 ♂♂, Buffalo, July-Sept. [SDS]; NEBRASKA: Kimball Co., 1 ♂, 5000 feet, 6 Aug. [OSC]; COLORADO: El Paso Co., 3 ♀♀, Drennan Blowout, 17 Aug. [Minn.]; Moffat Co., 2 ♂♂, Sunbeam, 12 July [CU]; UTAH: Emery Co., 2 ♀♀, 2 ♂♂, 16 July-23 Aug. [Minn.]; ARIZONA: Navajo Co., 1 ♀, 2 ♂♂, Kayenta, 16 July [CAS]; Pima Co., 1 ♀, Marsh Pass, 28 June [CU]; NEW MEXICO: Luna Co., 1 ♂, 10 mi. E. of Deming, 12 July [CU]; TEXAS: Kenedy Co., 1 ♂, Armstrong, 12 July [HEE]; ALABAMA: 1 ♀, Mobile, Oct. [CAS]; FLORIDA: Pasco Co., 2 ♀♀, Lacochee, 7 July [UK].

#### *Apiculatus* Species-group

The two species *apiculatus* Smith and *semirufus* Cresson possess numerous characters in common and represent a somewhat divergent element in the subgenus, for which the name *Arachno-daïcter* Pate is available for splitters. In these species the tarsal comb is very long, the spines from 1.5 to 3.5 times as long as the width of the tarsus, the one at the apex of the basitarsus from two-thirds to one and one-third times the length of the second tarsal segment. The wings are at most lightly infuscated basally, with a darker marginal band; the body is usually extensively clothed with silvery pubescence; the hairs on the temples and propleura are whitish; both sexes of each species are marked with orange on the basal abdominal segments; the median line of the propodeum is strongly impressed, and there is a deep median

sulcus at the base of the first abdominal tergite; the male genitalia of the two species are very similar.

The first species, *apiculatus*, is divisible into three subspecies on characters present in the female sex only. Males can be determined only by inference. It is possible that there is no genetic basis for the factors which separate the females, but that the differences are due to the direct effect of the environment. I leave this problem for future investigators.

5a. **Anoplius (Arachnoproctonus) apiculatus apiculatus** (Smith)  
(Pl. XII, fig. 82; pl. XVIII, fig. 119.)

*Pompilus apiculatus* Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 157. [Type: ♀; Vera Cruz, Mexico; British Museum (not seen by present writer).]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 103.—Cameron, 1893, Biol. Centr.-Amer., Hymen., II, p. 205 and pl. XI, fig. 25.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 273.

*Anoplius (Pompilius) apiculatus* Viereck, 1906, Trans. Amer. Ent. Soc., 32: 223, 232. [Galveston, Tex., and Williams, Ariz.]

This distinctive species is not likely to be confused with any other. The nominate subspecies is predominantly Mexican, but is not uncommon in the southern parts of the four states of the United States which border Mexico.

FEMALE.—Length 10.5 (7.5-14) mm. Head and thorax black; abdomen bright rufo-ferruginous, except that the extreme base of the first segment is black, and the last segment (and sometimes part of the penultimate segment) is suffused with blackish. Wings hyaline or lightly infuscated, the outer margin of the fore wing with a prominent fuscous band, which extends into the upper, outer part of the marginal cell; apex of the hind wing somewhat infuscated. Body patterned with pale and dark pubescence; the pubescence is conspicuously silvery or somewhat glaucous on the following parts, elsewhere dark: base of mandibles; clypeus except sometimes for a median spot; temples; at least the lower front, often the whole front and vertex except for a narrow band connecting the tops of the eyes; pronotum at least anteriorly and in a prominent band along the posterior margin; posterior and postero-lateral margins of the mesonotum, either narrowly or broadly; sides of scutellum; metanotum except sometimes a median spot; propodeum except sometimes on the sides; part or all of the meso- and metapleura; coxae in large part, and to a variable extent the remainder of the legs; abdomen except sometimes toward the apex. Front and vertex with sparse but prominent dark hairs; temples and propleura with abundant pale hairs; front coxae and pronotum slightly hairy; propodeum with at most a very

few fine, short hairs on the sides; first abdominal tergite with some light, pale hair anteriorly; sternites each with a few dark setae, more abundant caudad; apical tergite with a number of long setae anteriorly and several stout bristles posteriorly.

Mandibles very slender, with two rather weak teeth on the inner margin. Clypeus about three times as broad as high, its apical margin truncate. Front of moderate breadth, the middle interocular distance from .53 to .58 times the transfacial distance; front with a prominent impressed line from the antennal bases to the anterior ocellus. Inner orbits subparallel below, slightly converging above, the upper interocular distance from .8 to .9 times the lower interocular. Ocelli forming an acute angle in front; postocellar line: ocello-ocular line about as 7:6. Antennae a little short for the genus, the first four segments in a ratio of about 6:2:9:8, segment 3 varying from .62 to .85 times the upper interocular distance.

Posterior pronotal margin arcuate or feebly angulate. Postnotum one-third to two-thirds as long as the metanotum, with a prominent median impression from which extend on each side a number of transverse striations. Propodeum with the slope a little flat behind; median line distinctly impressed. Mesosternum produced over the inner bases of the middle coxae as small lobes, angulate apically, not slender and spiniform as in *semirufus*. Front tarsus with a strong comb, the spines rather flat, often pale at the tip, from 2.2 to 2.5 times as long as the width of the tarsal segments; basitarsus with 3 comb-spines, the apical one about as long as the second tarsal segment, or somewhat longer. Pulvillar comb of about 18 setulae. Cubitus of hind wing arising slightly beyond the tip of the submedian cell. Transverse median vein of fore wing interstitial with the basal on the media, or it may be a little before or beyond. Marginal cell about 2.5 times as long as high, the radial vein angled at the third transverse cubital vein. Second submarginal cell narrowed by less than half above; third submarginal cell triangular or nearly so, rarely short-petiolate, the third transverse cubital vein rather strongly arched. Base of the first abdominal tergite with a deep median sulcus. Apical tergite of the usual form, not unusually prominent, generally less bristly than is usual in the genus.

MALE.—Length 7 (5.8-8) mm. Color black; basal three segments of abdomen orange except for the base of the first and usually the apical margin of the third; occasionally part of the fourth segment is orange. Wings hyaline, the outer margin of the fore wing with a prominent brownish band which extends into the outer part of the marginal cell; apex of hind wing somewhat clouded. Almost the entire body is clothed with a coarse silvery or somewhat glaucous pubescence, absent from the following parts: antennae beyond the scape; a band across the vertex; a band across the pronotum just before the hind margin, interrupted medially; greater part of the mesonotum; disc of the scutellum; postnotum; underside of middle and hind tibiae; most of the tarsi; usually the basal parts of the 4th and 5th abdominal tergites, and the greater part of the sternites beyond the third. Front slightly hairy; temples and propleura with fine, pale hair; front

coxae and pronotum very slightly hairy; remainder of head and thorax devoid of erect hairs; abdomen with only a few short, inconspicuous setae on the apical segments.

Clypeus 2.2 to 2.6 times as broad as high, its apical margin truncate. Front of moderate breadth, the middle interocular distance .58 to .64 times the transfacial distance. Inner orbits diverging above, the upper interocular distance about 1.15 times the lower. Ocelli rather far apart, forming an acute angle in front. First four antennal segments in a ratio of about 5:2:4.8:5, segment 3 from 2 to 2.3 times as long as thick. Pronotum arcuate or feebly angulate behind; postnotum as in the female. Propodeum rather convex, sloping more steeply behind, its median line strongly impressed anteriorly. Last segment of front tarsus weakly produced on the inner margin, the claw on this side strongly modified. Venation as in the female.

Abdomen slender, cylindrical. Sternite 5 with a large arcuate emargination posteriorly. Sternite 6 with a more narrow, U-shaped emargination. Subgenital plate (Fig. 119) with a broad basal sclerite, the plate itself broadly rounded or obtusely angled apically. Genitalia (Fig. 82) similar to those of *marginalis* and *scmirufus*; parameres curved, the outer margins with numerous strong setae, but less densely setose than in *marginalis*; digiti clothed with numerous rather stout setae which are angled at their apices, except that the extreme apices of the digiti are bare.

*Biology*.—This species is characteristic of stream-banks where the soil is sandy or gravelly. It stays close to the ground and is a very active, excitable species; the males are very difficult to capture or even to see, because of their small size, erratic flight, and the pale pubescence which makes them blend very well with the sand. This species apparently does not visit flowers.

*Distribution*.—This is a Lower Sonoran subspecies, ranging from Central America to the southern parts of California, Arizona, and Texas.

*Specimens seen*: 98 (75 ♀♀, 23 ♂♂). TEXAS: Galveston Co., 2 ♀♀, July [USNM, RWS]; Jeff Davis Co., 19 ♀♀, 8 ♂♂, Limpia Canyon, Davis Mts., 14-25 July [HEE, CU, ANSP]; Montgomery Co., 1 ♂, Willis, Aug. [USNM]; Victoria Co., 1 ♀, 25 June [MCZ]; Wharton Co., 3 ♀♀, 24 June [CU, MCZ]; ARIZONA: 1 ♀ (no further data) [USNM]; Maricopa Co., 3 ♀♀, Phoenix, 3 Aug. [CU, MCZ]; 5 ♀♀, Tempe, 1 Aug. [CU, MCZ]; Pima Co., 1 ♂, Arivaca, 26 July [UK]; 1 ♀, Sabino Canyon, 5 Aug. [HEE]; 1 ♀, Tucson, 2 Aug. [HEE]; Gila Co., 1 ♀, Globe, 6 Aug. [KVK]; Yuma Co., 1 ♀, Dome, 21 July [CAS], 1 ♀, Yuma 14 Apr. [CAS]; CALIFORNIA: San Bernardino Co., 1 ♀, Colton, 8 Oct. [CAS]; 3 ♀♀, Mojave R., Apple Valley, 29 June [CIS]. MEXICO: 1 ♀ (no

further data) [USNM]; Baja California, 3 ♀♀ Angeles Bay, 26-27 June [CAS]; 1 ♂, La Paz, 3 Jan. [CAS]; Vera Cruz (type locality); GUATEMALA: 3 ♂♂, Concepcion [USNM]; 18 ♀♀, 6 ♂♂, El Rancho, Feb. [USNM]; 1 ♀, Lake Atitlan, Feb. [USNM]; 2 ♀♀, Guatemala City, Feb. [USNM]; 1 ♀, Santa Maria, Mch. [USNM]; HONDURAS: 4 ♀♀, 3 ♂♂, Puerto Castilla, 27 Mch. [MCZ]; 1 ♀, Tela, Mch. [USNM]; CANAL ZONE: 1 ♀, Alhajuelo, Mch. [USNM].

5b. *Anoplius (Arachnophroctonus) apiculatus autumnalis* (Banks) new combination

*Pompiloides (Nanopompilus) autumnalis* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 301. [Type: ♀: Ridgeway, Ontario, 9 Aug. 1908 (M. C. Van Duzee); M.C.Z. no. 13,686.]

*Psammochares (Psammochares) autumnalis* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 128, 129. [N. C., several localities.]—Brimley, 1938, Insects N. Carolina, p. 434.

This subspecies is very similar to the preceding, but only the basal three or four segments of the abdomen of the female are rufous; the sericeous band along the posterior margin of the pronotum is always prominent. This form occurs north and east of the range of typical *apiculatus*, and like it occurs chiefly on beaches and sand-banks along water.

FEMALE.—Length 10 (7.5-13) mm. Head and thorax black; all but the base of abdominal segment 1 rufo-ferruginous, all of segment 2, and at least the basal half of the 3d tergite also rufo-ferruginous; sometimes the entire first 4 segments are colored, only the apical two segments being black; most commonly the basal three segments are mostly rufous, the apical three black. Body patterned with silvery pubescence much as in typical *apiculatus*; sometimes the thoracic pleura, coxae, and legs are without much if any silvery pubescence, but the band along the posterior pronotal margin is always distinct and complete. Other features as in the nominate subspecies.

MALE.—Length 7.5 (6.5-8.5) mm. In all respects similar to *apiculatus apiculatus*, from which it can be told only by locality, or by association with the female.

*Distribution*.—This form is characteristic of the Austroriparian and Carolinian faunas, ranging from Texas and Florida north to southeastern North Carolina, western New York, southern Ontario, Minnesota, and Kansas.

*Specimens seen*: 58 (44 ♀♀, 14 ♂♂). The following records are marginal: NORTH CAROLINA: Brunswick Co., 1 ♀, Smith Island, Oct. [USNM];



PENNSYLVANIA: Erie Co., 3 ♀♀, 1 ♂, Presque Isle, 10-13 July [CM]; NEW YORK: Cayuga Co., 2 ♀♀, 1 ♂, No. Fairhaven, Sept. [CU]; ONTARIO: 1 ♀, Ridgeway, 9 Aug. [MCZ]; ILLINOIS: 1 ♀, Chicago, Sept. [MCZ]; MINNESOTA: Wabasha Co., 1 ♀, Lake City, 12 Sept. [Minn.]; IOWA: Woodbury Co., 1 ♀, Sioux City [USNM]; KANSAS: Riley Co., 6 ♀♀, 1 Oct.-19 Nov. [KSC]; Rooks Co., 1 ♀, 9 Aug. [UK]; TEXAS: Cooke Co., 1 ♀, 26 July [RWS]; ALABAMA: Baldwin Co., 1 ♀, Orange Beach, 13 Aug. [CU]; FLORIDA: DeSoto Co., 4 ♀♀, 5 ♂♂, Arcadia, 9-10 Apr. [CU, HEE].

5c. *Anoplius (Arachnoproctonus) apiculatus pretiosus* (Banks)

*Psammochares pretiosa* Banks, 1910, Jour. N. Y. Ent. Soc., 18: 119. [Type: ♂; "N. Y." (Banks states in the description that this specimen is from Sea Cliff, L. I., N. Y.); M.C.Z. no. 13,695.]—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 986.—Procter, 1938, Biol. Survey Mt. Desert Reg., VI, Insecta, p. 430.

*Pompiloides (Nanopompilus) pretiosa* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 301.

*Pompiloides (Nanopompilus) autumnalis* var. *atlanticus* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 301. [Type: ♀; Long Beach, L. I., N. Y., Aug.; M.C.Z. no. 13,684.] New synonymy.

*Psammochares (Arachnophila) pretiosa* Banks, 1917, Bull. Mus. Comp. Zool., 61: 107.

*Psammochares (Psammochares) atlanticus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 986.

*Psammochares (Pompiloides) pretiosa* Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 124, 126.—Brimley, 1938, Insects N. Carolina, p. 433.

*Anoplius (Arachnoproctonus) pretiosus* Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 264. [Dare Co., N. C.]

This subspecies is colored like *autumnalis*, but the silvery pubescence is much reduced, giving the insect a much darker appearance; the mesopleura are scarcely if at all silvery, and the posterior margin of the pronotum is without the sericeous band characteristic of both the other subspecies, although it may be partially developed. These remarks pertain only to the female, the male being virtually indistinguishable from the other subspecies except by range.

FEMALE.—Length 10.5 (7-14) mm. Color black, the greater part of the first three abdominal segments rufo-ferruginous above and below; sometimes the base of the fourth tergite is also rufous. Pubescence mostly dark.

somewhat brownish, sometimes silvery on the clypeus, front, anterior slope of the pronotum, sides of the scutellum and metanotum, propodeum, and the tibiae; the pubescence of the basal three abdominal segments is very fine, silvery. Body with erect hairs as in typical *apiculatus*; the numerous dark hairs on the front, and the finer, pale hairs on the temples and propleura are conspicuous. The spines of the tarsal comb tend to be slightly more slender and acute than in the typical subspecies, and they are often wholly black.

MALE.—Length 7.3 (6.5-8) mm. Very similar to *apiculatus apiculatus*; pubescence sometimes slightly less extensively silvery than described under that form.

*Distribution*.—This race occurs along the Atlantic coastal plain from Florida to Maine. From southern North Carolina southward the range overlaps that of the preceding subspecies.

*Specimens seen*: 111 (83 ♀♀, 28 ♂♂). MAINE: Hancock Co., 1 ♂ [MCZ]; Penobscot Co., 1 ♀, Bangor [MCZ]; 1 ♀, Orono [MCZ]; MASSACHUSETTS: Middlesex Co., 1 ♀, Malden [Mass.]; Norfolk Co., 1 ♂, Wellesley, 28 Aug. [MCZ]; Plymouth Co., 1 ♀, June [MCZ]; 1 ♀, Manomet, July [MCZ]; RHODE ISLAND: Block Island, 1 ♂, 28 Aug. [MCZ]; CONNECTICUT: Hartford Co., 15 ♀♀, 1 ♂, 20 June-6 Sept. [HEE, ANSP]; NEW YORK: Nassau Co., 20 ♀♀, Long Beach [MCZ, USNM, AMNH]; 1 ♂, Sea Cliff [MCZ]; Queens Co., 1 ♀, Belmont Park, 22 July [CU]; 1 ♀, Brooklyn, 9 Sept. [CU]; NEW JERSEY: 7 ♀♀, 1 ♂, Cape May, Monmouth, and Ocean Cos. [ANSP, USNM, CNC, MCZ]; VIRGINIA: Princess Anne Co., 1 ♀, 1 ♂, Cape Henry, 9 Sept. [USNM]; NORTH CAROLINA: Dare Co., 11 ♀♀, 16 ♂♂, Kill Devil Hills, 26 May-4 June [KVK]; GEORGIA: Decatur Co., 1 ♀, Spring Creek, 18-21 May [CU]; FLORIDA: 21 ♀♀, 5 ♂♂, Dade, DeSoto, Palm Beach, Sarasota and Volusia Cos. [AMNH, CU, HEE, KVK, USNM, MCZ].

#### 6. *Anoplius (Arachnoproctonus) semirufus* (Cresson)

(Pl. XII, fig. 83; pl. XVIII, fig. 120.)

*Pompilus semirufus* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 100. [Type: ♀; Georgia (no further data); A.N.S.P. no. 423.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 321.

*Pompilus divisis* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 100. [Type: ♀; Georgia (no further data); A.N.S.P. no. 424.] New synonymy. —Dalla Torre, 1897, Cat. Hymen., VIII, p. 286.

*Arachnophila divisa* Ashmead, 1902, Canad. Ent., 34: 86. [Selected genotype of n. gen. *Arachnophila*.]

*Anoplius divisis* Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.

*Psammochares (Arachnophila) divisa* Banks, 1917, Bull. Mus. Comp. Zool., 61: 107.

*Psammochares (Pompiloides) semirufus* Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 987.

*Arachnodactylus divisus* Pate, 1946, Trans. Amer. Ent. Soc., 72: 74.

*Anoplus (Arachnophroctonus) semirufus* Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 264. [Dare Co., N. C.]

The two species *semirufus* and *divisus* were described on the same page by Cresson, in that order. While the types seem rather different, it is apparent from the examination of further material that they both fall within the range of variation of a single species. Some females of this species are rather strikingly clothed with long, dark setae over much of the body, including even the propodeum, the abdominal dorsum, and the legs. In other specimens this is entirely lacking, and all possible intermediates seem to occur between the two extremes.

FEMALE.—Length 9.5 (7-13) mm. Color black, the base of the abdomen more or less orange in color, this coloration varying from pale to a rich rufo-ferruginous, covering at least the greater part of the first two tergites, and at most all of the first three segments, above and below, and the base of the fourth tergite. Integument of the head and thorax somewhat shining, that of the abdomen rather distinctly so. Wings lightly infuscated, darker along the outer margins. Pubescence silvery over the greater part of the body. Front and vertex with sparse dark hairs; temples and propleura with fine, pale hairs; scape slightly hairy or not. The amount of dark erect hair on the thorax and abdomen is very variable: in the minimum condition there is only a little on the front coxae and pronotum, none elsewhere except for the pygidium; in the maximum condition the entire thorax, including the legs even to the tarsi, the propodeum, and the entire abdomen, even dorsally, are beset with long, dark setae. Pygidium with a few bristles near its posterior margin, anteriorly with several to many long hairs; hypopygium with a number of setae.

Mandibles long, with two small teeth well back from the apex on the inner margin. Clypeus about three times as broad as high, the apical margin truncate. Front broad, the middle interocular distance from .60 to .65 times the transfacial distance. Inner orbits subparallel below, convergent above, the upper interocular distance from .7 to .82 times the lower. Ocelli forming about a right angle in front; postocellar and ocello-ocular lines usually nearly equal. Antennae slender, the first four segments in a ratio of about 15:5:21:17, segment 3 equal to from .70 to .85 times the upper interocular distance.

Posterior margin of pronotum subarcuate or subangulate. Propodeum sloping rather evenly, the median line well impressed. Mesosternum produced over the inner bases of the middle coxae in the form of a pair of small

spiniform processes. Front tarsus with a strong comb, the spines slender, from 1.5 to 3 times as long as the width of the tarsus; basitarsus with 3 comb-spines. Fore wing with the marginal cell about 1.3 times its own length from the wing-tip; 2d submarginal cell 4-sided, narrowed slightly above by the slightly arched first transverse cubital vein; third submarginal cell triangular or nearly so, sometimes short-petiolate, the third transverse cubital vein rather strongly arched. Base of the first abdominal tergite with a deep median sulcus. Apical tergite somewhat swollen and prominent, the apical sternite also slightly so.

MALE.—Length 7.5 (6-9) mm. Color black, posterior pronotal margin sometimes obscurely marked with pale, second abdominal segment and adjacent parts of the first and third always marked with orange. Wings subhyaline, the outer margins with a darker band. Practically the entire insect clothed with a coarse silvery pubescence; pubescence of the flagellum, vertex, mesonotum, and last four abdominal segments more or less brownish, but the apical margins of the last four tergites usually silvery. Front and vertex with a few dark hairs; temples and propleura with whitish hairs; remainder of the body at most very obscurely hairy.

Clypeus about 2.5 times as broad as high, its apical margin truncate. Middle interocular distance from .61 to .66 times the transfacial distance, and about 1.15 times the lower interocular distance; upper interocular distance from .9 to 1.0 times the lower interocular. Ocelli forming an acute angle in front; postocellar line: ocello-ocular line about as 5:7. Antennae slender, the first four segments in a ratio of about 3:1:3:3, segment 3 from 2.5 to 3 times as long as thick. Posterior pronotal margin subarcuate or broadly angulate. Median line of propodeum impressed. Last segment of front tarsus rather strongly produced on the inner margin. Venation as in the female; third submarginal cell varying from petiolate to rather wide above.

Abdominal sternite 5 arcuately concave behind, less strongly so than in *apiculatus*. Sternite 6 with a more narrow, U-shaped emargination. Subgenital plate (Fig. 120) with the basal sclerite rather slender, the disc of the plate slightly elevated medially, bearing short, suberect setae, the apex tapering to a subacute or very narrowly rounded tip. Genitalia (Fig. 83) nearly identical to those of *apiculatus*, but the parameres of slightly greater relative length.

*Biology*.—This species, like the preceding, is confined rather strictly to sandy places. It does not frequently come to flowers, but has been taken on *Daucus carota* and *Chaerophyllum tein-turicri*. Dates of capture vary widely, and suggest two or more generations a year through most of the range.

*Distribution*.—This species occurs throughout North America east of the Rockies, from the Lower Austral to the Transition

Zones, ranging from Texas and Florida to New Brunswick, Ontario, Manitoba, and Montana.

*Specimens seen*: 111 (76 ♀♀, 35 ♂♂). The following records are marginal: NEW BRUNSWICK: 1 ♂, Nerepis, 22 July [USNM]; QUEBEC: 1 ♂, Kazabazua, 4 Aug. [CNC]; ONTARIO: 1 ♂, Kearney, 6 July [MCZ]; MICHIGAN: Baraga Co., 1 ♀, Point Abbaye, 24 July [ANSP]; MANITOBA: 1 ♀, Aveme, 27 June [CNC]; MONTANA: 6 ♀♀, 2 ♂♂ (no further data) [ANSP]; Dawson Co., 1 ♀, Glendive, 17 June [USNM]; SOUTH DAKOTA: Bon Homme Co., 1 ♀, Springfield, 1 Sept. [SDS]; KANSAS: Logan Co., 1 ♀ [UK]; TEXAS: Hidalgo Co., 2 ♀♀, Feb., June [JEG, HEE]; LOUISIANA: 1 ♂ (no further data) [USNM]; ALABAMA: Clarke Co., 1 ♀, Thomasville, 11 June [MCZ]; FLORIDA: Orange Co., 1 ♀, Winter Garden, 12 March [Mass.].

#### *Americanus* Species-group

This group of two species bears strong resemblance to the following subgenus, *Pompilinus*. The tarsal comb of the female is reduced, the spines not being longer than the thickness of the tarsus; the propodeum is without erect hairs; the third submarginal cell is triangular, often petiolate. The pubescence is finer and less extensively silvery than in the preceding species-group. The front of the female is narrow, the middle interocular distance not more than .56 times the transfacial distance; the third antennal segment of the female is at least .9 the upper interocular distance. The male venter is at least a little hairy, and shows some tendency to form brushes of hair; in the genitalia the digiti are somewhat spindle-shaped and provided with numerous rather long hairs.

#### 7a. *Anoplius (Arachnoproctonus) americanus americanus* (Beauvois)

(Pl. XIII, fig. 85; pl. XVIII, fig. 121.)

*Pompilus americanus* Palisot de Beauvois, 1805, *Insectes Recueillis en Afrique et en Amérique*, p. 117 and pl. 111 (Hymen.), fig. 6. [Type: ♀; United States (no further data); (location of type not known to present author).]—F. Smith, 1855, *Cat. Hymen. Brit. Mus.*, III, p. 157.—Cresson, 1867, *Trans. Amer. Ent. Soc.*, 1: 99. [Pa., Del., Md., Ill.] Cresson, 1872, *Trans. Amer. Ent. Soc.*, 4: 203. [Texas.]—Dalla Torre, 1897, *Cat. Hymen.*, VIII, p. 272.—Birkmann, 1899, *Ent. News*, 10: 244. [Lee Co., Tex.]

*Pompilus plebejus* Dahlbom, 1844, *Hymen. Europ.*, I, p. 60. [Type: ♀; No. America (no further data); Univ. of Lund, Sweden (not seen by

- present author).]—F. Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 157. [Present synonymy indicated.]
- Entypus americanus* Howard, 1901, The Insect Book, pl. VII, fig. 15.
- Anoplius americanus* J. Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.
- Psammochares albomarginatus* Banks, 1910, Jour. N. Y. Ent. Soc., 18: 114. [Type: ♂; Falls Church, Va., 1 July (Banks); M.C.Z. no. 13,678.] New synonymy.
- Pompiloides americanus* Rohwer, 1916, Conn. Geol. Nat. Hist. Survey Bull. 22, p. 631.—Rau, 1922, Trans. Acad. Sci. St. Louis, 24: 10-11. [Biology.]—Rau, 1926, Trans. Acad. Sci. St. Louis, 25: 210. [Biology.]—[?] Britton, 1938, Conn. Geol. Nat. Hist. Survey Bull. 60, p. 146.—[not] Procter, 1938, Biol. Survey Mt. Desert Reg., VI, Insecta, p. 430.
- Psammochares (Pompiloides) albomarginatus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 124, 125.—Brimley, 1938, Insects N. Carolina, p. 433.
- Psammochares (Pompiloides) americanus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—[?] Johnson, 1930, List Insect Fauna Nantucket, p. 111.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 124, 125.—Brimley, 1938, Insects N. Carolina, p. 433.
- Pompiloides agnema* Brimley, 1928, Jour. Elisha Mitchell Sci. Soc., 43: 204. [Type: ♂; Raleigh, N. C., 23 July 1924 (C. S. Brimley); Coll. N. C. Dept. Agri., Raleigh.] New synonymy.
- Psammochares (Pompiloides) agnema* Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 124, 125.—Brimley, 1938, Insects N. Carolina, p. 433.
- Anoplius (Arachmophroctonus) americanus* Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 204.

The female of this well-known form may be recognized by the orange bands or paired spots on the second and third abdominal tergites; an occasional specimen is more extensively colored than this. There is almost always a certain amount of silvery pubescence on the lower front and clypeus. The male may be marked with orange or not; there is a pale stripe along the posterior pronotal margin (sometimes obsolescent); the third submarginal cell is normally petiolate, and the subgenital plate is rounded apically. The genitalia of this species are very distinctive (Fig. 85).

FEMALE.—Length 12 (9-16) mm. Color black, the second abdominal tergite with a pair of orange spots occupying most of the tergite, separated by a thin line or confluent medially, the third tergite with a similar pair of spots, but the spots smaller and confined to the anterior half or three-quarters of the segment. This is the typical coloration, but a few specimens have considerably more orange on the abdomen, much as in subspecies *jurtus*.

Wings subhyaline or lightly infuscated, with a darker outer marginal band. Pubescence very fine, somewhat brownish, on the lower front and clypeus generally silvery, sometimes also silvery on the temples, coxae, and parts of the thorax. Front and vertex with sparse hairs; as well as the pronotum and front coxae; greater part of the thorax, and the propodeum, with at most a very little inconspicuous hair; pygidium densely bristly.

Clypeus from 2.2 to 2.6 times as broad as high, its apical margin truncate. Front narrow, not much wider than the two eyes taken together, the middle interocular distance from .52 to .56 times the transfacial distance. Eyes convergent above; upper interocular distance from .75 to .86 times the lower. Ocelli forming an angle in front which is slightly less than a right angle; postocellar line: ocello-ocular line about as 5:4. First four antennal segments in a ratio of about 3:1:5:4, segment 3 nearly equal to the upper interocular distance (.9 to 1.1 times it). Vertex narrow, not at all elevated above the eye-tops.

Posterior margin of pronotum distinctly angulate. Propodeum short, rather convex, the declivity nearly flat, the median line lightly impressed in front. Front tarsus with a comb of spines which are not much if any longer than the width of the tarsus; basitarsus with 3 comb-spines, the apical one not over one-third the length of the second tarsal segment. Fore wing with the marginal cell about 1.3 times its own length from the wing-tip; third submarginal cell triangular or nearly so, not infrequently petiolate. First abdominal tergite with a median linear impression, but without the deep basal sulcus characteristic of the preceding two species; pygidium of normal shape.

MALE.—Length 9 (8-10.5) mm. Color black, posterior margin of pronotum with a pale yellowish line, interrupted medially (sometimes obsolescent), second abdominal tergite with or without a pair of orange spots, the orange occasionally extending to the sternites and adjacent tergites. Wings hyaline, the outer margins with a distinct fuscous band. Pubescence very fine, over much of the head and thorax distinctly silvery; basal abdominal tergites with some silvery sheen basally, the apical one or more tergites conspicuously silvery. Front and vertex with some very fine hair, the thorax and propodeum not or very obscurely hairy; abdominal sternites 2 through 5 each with a few dark erect hairs, 4 and 5 with somewhat more than the others.

Clypeus about twice as broad as high, truncate below. Front narrow or of moderate breadth; middle interocular distance varying from .54 to .62 times the transfacial distance. Upper interocular distance subequal to or slightly greater than the lower. Ocelli forming a right or acute angle in front, postocellar line and ocello-ocular line usually about equal. First four antennal segments in a ratio of about 17:5:15:16, segment 3 about 2.2 times as long as its greatest thickness. Posterior pronotal margin angulate. Slope of propodeum low, steeper behind; median line impressed. Last segment of front tarsus slightly produced on the inner margin. Venation as in

the female, the marginal cell sometimes as much as twice its length from the wing-tip, the third submarginal cell very often petiolate.

Abdomen slender, subcylindrical. Sternite 5 slightly emarginate posteriorly; sternite 6 with a slit-like emargination posteriorly. Subgenital plate (Fig. 121) fairly broad, its apex rather broadly rounded, the disc slightly arcuately elevated medially. Genitalia (Fig. 85) with the parameres very slightly curved, linear. Digitus volsellaris of remarkable form: the disc is elongate-fusiform, acutely pointed apically; it is fringed all around with long setae which are angled at their apices; on the outer third of the outer side, these hairs are still longer, and some of them are weakly clubbed. Aedoeagus rather broad; parapenials slender, curved near their base.

*Biology.*—This species is partial to sandy or barren areas or clay banks, but is not confined to these. Rau (1922) reports two cases in which he took *americanus* with the spider *Pardosa nigropalpis* Emerton (= *milvina* Hentz) (Lycosidae), once in wheat stubble, and once in a sand bank. In the latter case the wasp was seen to deposit her spider under bits of loose clay several times during the search for a nesting site. He also reports this wasp with *Philodromus* sp. (Thomisidae), and in a later paper (1926) remarks that he found a female *americanus* in a spider web, "victim to the prey which she was pursuing".

*A. americanus juxtus* is a common wasp along the Kansas River at Manhattan, Kansas, where I have taken three females with their prey, in every case the spider *Arctosa littoralis* (Hentz) [det. B. J. Kaston], a common lycosid occurring in the same habitat. The favorite nesting site seems to be sloping banks where the soil is intermediate in character between sand and clay. The prey is carried backward by the wasp, and when deposited during the search for a nesting-place, is sometimes (but not always) placed beneath a stick, leaf, or bit of earth, as first noted by Rau. The nest is an oblique burrow about four inches deep, and in the cases observed took the wasp between 80 and 100 minutes from the time the nest was started until the spider was dragged in. This wasp has been observed by the writer to be parasitized by the pompiline *Evaetes hyacinthinus* (Cresson) (see notes under that species in Part I of this study).

*A. americanus americanus* has been taken on the following flowers: *Daucus carota*, *Pastinaca sativa*, *Conium maculatum*, *Polygonum* spp., *Melilotus alba*, *Bifora americana*, *Tamarix gal-*



*lica*, *Ampelopsis arborea*, *Polytaenia nuttallii*, and *Solidago* sp. Flight records extend from May to October.

*Distribution*.—Carolinian and upper portion of the Austro-riparian faunas, from central eastern Texas, Mississippi, and northern Georgia to South Dakota, Michigan, southern Ontario, Pennsylvania, and southeastern New York. There is a considerable band of overlap with the range of subspecies *jurtus*, but throughout much of this area, *americanus americanus* appears to be more characteristic of uplands and tributary stream-valleys, while *americanus jurtus* is more often found along the banks of the major watercourses. Thus the overlapping of the ranges may be more apparent than real.

*Specimens seen*: 232 (148 ♀♀, 84 ♂♂). The following records more or less define the outer limits of the range of this subspecies: NEW YORK: New York City, 1 ♀, Van Cortland Park, 3 Oct. [Mass.]; PENNSYLVANIA: Bucks Co., 1 ♀, Newtown, 25 July [MSV]; Cumberland Co., 2 ♀♀, 1 ♂, Carlisle, Aug. [USNM]; Allegheny Co., 6 ♀♀, July [CM]; ONTARIO: 1 ♀, Chatham, 21 Aug. [CNC]; MICHIGAN: Monroe Co., 1 ♀, LaSalle, 14 Aug. [USNM]; MINNESOTA: Ottertail Co., 1 ♀, Parkdale, Aug. [Minn.]; SOUTH DAKOTA: Bon Homme Co., 1 ♀, 1 ♂, Springfield, June, Sept. [SDS, MCZ]; NEBRASKA: Cuming Co., 1 ♀, West Point [USNM]; KANSAS: Seward Co., 1 ♀ [UK]; TEXAS: Dallas Co., 2 ♀♀ [MCZ]; Comal Co., 2 ♀♀, New Braunfels, 29 June [HEE]; Ft. Bend Co., 4 ♀♀, Richmond [MCZ]; LOUISIANA: Madison Co., 1 ♂, Mound, 12 May [USNM]; MISSISSIPPI: Adams Co., 1 ♀, Natchez, 16 May [USNM]; ALABAMA: Tuscaloosa Co., 1 ♀, 23 May [HEE]; GEORGIA: Fulton Co., 1 ♀, 2 ♂♂, Atlanta, June-July [EU, MCZ]; NORTH CAROLINA: Brunswick Co., 1 ♂, Southport, 10 Oct. [USNM].

7b. *Anoplus (Arachnoproctonus) americanus trifasciatus* (Beauvois)  
new combination

*Pompilus trifasciatus* Palisot de Beauvois, 1805, *Insectes Recueillis en Afrique et en Amérique*, p. 118 and pl. III (Hymen.), fig. 7. [Type: ♀; United States (no further data); (location of type unknown to present author).]—Smith, 1855, *Cat. Hymen. Brit. Mus.*, III, p. 157. [Placed in synonymy with *americanus*.]—Dalla Torre, 1897, *Cat. Hymen.*, VIII, p. 272. [Listed as synonym of *americanus*.]

*Pompilus americanus* var. *trifasciatus* Cresson, 1867, *Trans. Amer. Ent. Soc.*, 1: 99.—Cresson, 1887, *Synopsis Hymen.*, Suppl. Vol. *Trans. Amer. Ent. Soc.*, p. 271.

<sup>9</sup> *Psammochares eurydice* Banks, 1921, *Ann. Ent. Soc. Amer.*, 14: 49. [Type: ♀; Spring Creek, Decatur Co., Ga., 16-29 July 1912 (J. C. Bradley);

M.C.Z. no. 13,687.] New synonymy.—[?]Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 128, 129.—[?]Brimley, 1938, Insects N. Carolina, p. 433.

This form averages somewhat larger than typical *americanus* and is somewhat darker in appearance; the orange markings, which usually extend on to the first tergite in this form, are of a darker shade, the pubescence is never at all silvery, and the wings are generally a little more heavily infuscated. These remarks pertain only to the females, as the males are not clearly distinguishable from those of the nominate subspecies.

FEMALE.—Length 13.5 (10-20) mm. Color black, the abdomen marked with orange-brown as follows: posterior two-thirds or less of the first tergite (occasionally this tergite is all black), greater part of the second tergite, and the third tergite with a pair of basal spots which may be confluent into a band which is emarginate posteriorly; rarely the coloration extends to some extent to the sternites. Wings lightly to rather heavily infuscated, with a darker marginal band, sometimes somewhat violaceous. Pubescence dark, more or less brownish-cinereous, nowhere silvery. Other features as described under the nominate subspecies.

MALE.—Length 9.5 (8.5-11) mm. Color black, the posterior margin of the pronotum with a pale line, the abdomen marked with a variable amount of orange or orange-brown: most commonly the second segment is ringed with orange, the color sometimes extending to the adjacent segments; in a few specimens the orange color is reduced or absent. Wings hyaline or lightly infuscated, the outer margins with a fuscous band. Pubescence of body generally extensively silvery, as in the typical subspecies. In all other features essentially the same as *americanus americanus*, from which this form cannot truly be distinguished in this sex except by range.

*Distribution.*—This subspecies occurs not uncommonly throughout Florida and Georgia, except in the northern part of the latter state. Quite likely it occurs in the coastal portions of the Carolinas, although I have not seen specimens from these states.

*Specimens seen:* 50 (36 ♀♀, 14 ♂♂). GEORGIA: Appling, Bryan, Charlton, Decatur, Glynn, Lanier, Macon, Mitchell, Stephens, Thomas, and Tift Cos., numerous specimens [USNM, CU, EU, ANSP, UK, MCZ]; FLORIDA: Brevard, Dade, Duval, Highlands, Orange, Polk, Seminole, and Volusia Cos., numerous specimens [AMNH, CU, CNC, USNM, JEG, MCZ, KVK, Mass.]

7c. *Anoplius (Arachnophroctonus) americanus juxtus* (Cresson) new combination

*Pompilus juxtus* Cresson, 1865, Proc. Ent. Soc. Phila., 4: 128. [Type: ♀; Cuba (no further data); A.N.S.P. no. 421.]

*Pompilus subargenteus* Cresson, 1865, Proc. Ent. Soc. Phila., 4: 129. [Type: ♂; Cuba (no further data); Coll. J. Gundlach, Instituto de Segunda Enseñanza, Havana (not seen by present writer).] New synonymy.—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 103.—Cameron, 1893, Biol. Centr.-Amer., Hymen. 11, p. 205.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 325.

*Pompilus coruscus* var. *juxtus* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 103.8—Cresson, 1869, Proc. Boston Soc. Nat. Hist., 12: 370. [Orizaba, Mex.]—Fox, 1894, Proc. Calif. Acad. Sci., (2)4: 99. [San José del Cabo, Baja Calif., Mex.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 283.

*Psammochares (Pompiloides) semirufus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108. [Nec Cresson, 1867; misidentification.]

*Pompiloides juxta* Banks, 1928, Harv. Biol. Lab. Cuba (Atkins Found.), Studies on Cuban Insects, I, p. 9. [Cuba.]

*Pompiloides subargenteus* Banks, 1928, Harv. Biol. Lab. Cuba (Atkins Found.), Studies on Cuban Insects, I, p. 9. [Bahamas.]—Banks, 1931, Bull. Brooklyn Ent. Soc., 26: 133. [Yucatan.]

*Anoplius puella* Banks, 1941, Canad. Ent., 73: 121. [Type: ♂; Galveston, Tex., June; M.C.Z. no. 25,261.] New synonymy.—Dreisbach, 1950, Amer. Midl. Nat., 43: 585, 588.

*Pompilinus coruscus* var. *juxtus* Bradley, 1946, Mem. Soc. Cubana Hist. Nat., 18: 130.

This widely distributed Tropical and Lower Austral subspecies has gone by a variety of names, as indicated above. In this form the abdomen of the female has the basal three segments almost wholly orange, above and below; the front and often other parts of the body are silvery-sericeous in most cases. Some males have an unusual amount of hair on abdominal sternites four and five,

<sup>8</sup> The identity of *Pompilus coruscus* Smith, 1855 (Cat. Hymen. Brit. Mus., III, p. 156), of which Cresson considered *juxtus* a variety, has remained something of a mystery to American authors. I have not seen the type, which is in the British Museum, but what I believe to be *coruscus*, judging from the description, belongs to the subgenus *Pompilinus*, and is thus not closely allied to *juxtus*. *Pompilus insignis* Cresson, 1865, which was also made a variety of *coruscus* by Cresson in 1867, is a discrete and very distinctive species, belonging to the *Americanus* species-group of the subgenus *Arachnophroctonus*.

sometimes forming distinct brushes. The genitalia of these specimens, however, are exactly like those of specimens with very little hair on the venter, and this character must be attributed to individual variation.

FEMALE.—Length 12.5 (9-17) mm. Color black, the basal three abdominal segments in large part orange; usually all but the extreme base of the first segment and the apical margin of the third are colored, but sometimes the sternites are partly or wholly black; the orange on the third tergite is usually emarginate behind medially. Wings lightly to rather heavily infuscated, with a darker marginal band, sometimes somewhat violaceous. Pubescence in greater part dark, frequently silvery on the front, clypeus, base of the mandibles, and outer orbits; sometimes parts of the thorax and abdomen are also silvery. Other features essentially the same as in the nominate subspecies.

MALE.—Length 8.8. (6.5-11) mm. Color black, the posterior pronotal margin with a buff stripe, the second abdominal segment circled with orange, usually wholly orange with the coloration extending to the adjacent segments. Abdominal sternites 4 and 5 with a variable amount of erect hair, occasionally dense enough to form distinct brushes, but on the other hand sometimes scarcely noticeable. Body often extensively silvery-sericeous, as in the typical subspecies, the apical abdominal tergite especially noticeably silvery. Propodeum sometimes with a few white erect hairs.

*Biology.*—This form occurs on beaches, stream-banks, and other places where the soil is predominantly sand, clay, or gravel. Males have been taken on desert broom (*Baccharis sarathroides*), desert lavender (*Hyptis emoryi*), and smartweed (*Polygonum* sp.). For notes on the prey and nesting habits, see under *americanus americanus*.

*Distribution.*—This subspecies ranges from Central America north to central California, Utah, Kansas, Tennessee, and Alabama; it also occurs in Cuba. East of central Texas and Kansas there is much apparent overlap in range with typical *americanus*; in fact, throughout the range of *americanus americanus* specimens occasionally occur which resemble *justus*, perhaps wherever ecological conditions simulate those of the usual range of *justus*.

*Specimens seen:* 168 (88 ♀♀, 80 ♂♂). The following records seem to define the northern limits of its range in the United States: ALABAMA: Tuscaloosa Co., 1 ♀, 9 May [HEE]; TENNESSEE: Shelby Co., 1 ♀, Memphis, 16 July [CU]; LOUISIANA: Madison Co., 1 ♀, 1 ♂, Tallulah, Aug. [JEG]; KANSAS: Riley Co., 14 ♀♀, 12 ♂♂, 2 July-16 Oct. [KSC, HEE]; Seward Co., 1 ♀, 18 Aug. [UK]; NEW MEXICO: Dona Ana Co.,

2 ♀♀, 5-15 Oct. [ANSP, CIS]; UTAH: Uintah Co., 1 ♀, Vernal, 28 June [UAC]; Wayne Co., 1 ♂, Hanksville, 1 Aug. [UAC]; CALIFORNIA: Calaveras Co., 1 ♀, Jenny Lind, 21 Oct. [CU]; Tulare Co., 1 ♀, 4 ♂♂, May-July [CIS, CU]. Specimens also seen from MEXICO (Baja California, Jalisco, Tamaulipas, and Yucatan), GUATEMALA, HONDURAS, COSTA RICA, PANAMA, and CUBA.

8. *Anoplius (Arachnoproctonus) moestus* (Banks) new combination  
(Pl. XIII, fig. 86; pl. XVIII, fig. 122.)

*Pompiloides moestus* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 226. [Type: ♀; Fedor, Lee Co., Tex., April (Birkmann); M.C.Z. no. 13,677.]<sup>9</sup>

*Psammochares (Pompiloides) moestus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.

*Anoplius comanche* Banks, 1941, Canad. Ent., 73: 121. [Type: ♂; Nueces River, Uvalde Co., Tex., 2 July 1917 (J. Bequaert); M.C.Z. no. 25,262.] New Synonymy.

Although probably most closely related to *americanus*, this species is little apt to be confused with it because of its all-black coloration. It is more likely to be confused with certain species of *Pompilinus*; however, the transverse median vein of the fore wing always meets the media before or at the origin of the basal, never beyond. The male genitalia and subgenital plate are very distinctive.

FEMALE.—Length 12 (9.5-16) mm. Color black; wings lightly to rather heavily infuscated, with a darker marginal band, sometimes slightly violaceous. Body clothed with a fine brownish pubescence, in certain lights obscurely reflecting deep metallic colors, on the lower front and base of the mandibles often cinereous or a bit silvery. Front and vertex with scattered short hairs; pronotum and front coxae a bit hairy; remainder of thorax and the propodeum without more than a very little inconspicuous hair; apical tergite densely bristly.

Clypeus from 2.3 to 2.5 times as broad as high, its apical margin very slightly concave. Front narrow, middle interocular distance about .55 times the transfacial. Inner orbits slightly convergent above, upper interocular distance from .8 to .9 the lower. Ocelli in a right triangle on the narrow vertex; postocellar line: ocello-ocular line about as 5:4. First four antennal segments in a ratio of about 3:1:5:4, segment 3 about equal to the upper interocular distance (.9 to 1.1 times it).

Posterior margin of pronotum distinctly but rather broadly angulate. Propodeum rather short and convex, the declivity nearly flat, the median

<sup>9</sup> A single female paratype from the type locality [MCZ] is an *A. (Pompilinus) insolens* (Banks), and not *moestus*.

line not or weakly impressed. Spines of the tarsal comb not much if any longer than the width of the tarsus; basitarsus with 3 comb-spines. Fore wing with the third submarginal cell much narrowed above, triangular or subtriangular.

MALE.—Length 9 (7-11) mm. Color black, the posterior pronotal margin occasionally with a pale stripe. Wings hyaline or lightly infuscated, the outer margins with a fuscous band. Pubescence silvery at least on the lower front, base of mandibles, clypeus, and outer orbits, often also over much of the thorax and propodeum; pubescence of the abdomen dark, obscurely reflecting deep metallic colors. Clypeus, front, and vertex with sparse short hairs; thorax and propodeum with at most only a very small amount of inconspicuous hair; abdominal sternites 2 through 6 each with a few hairs, and sternites 4 through 6 each with a patch of short, suberect hairs near the base, forming inconspicuous short brushes; subgenital plate covered rather densely with erect setae of moderate length.

Clypeus about twice as broad as high, its apical margin truncate. Front of moderate breadth, the middle interocular distance from .58 to .60 times the transfacial distance. Upper interocular distance subequal to or very slightly greater than lower interocular distance. Ocelli forming a right or acute angle in front, the postocellar line subequal to or a little greater than the ocello-ocular line. First 4 antennal segments in a ratio of about 3:1:3:3, segment 3 a little more than twice as long as thick. Posterior pronotal margin broadly angulate. Median line of propodeum weakly if at all impressed. Last segment of front tarsus slightly produced on the inner side. Venation much as in the female, the 2d submarginal cell only a little if any broader than high, the 3d submarginal often petiolate.

Abdomen slender, subcylindrical; venter hairy as described above. Sternite 6 with a median U-shaped emargination behind. Subgenital plate (Fig. 122) rather broad near the base, tapering to a subacute apex; disc nearly flat, dark-pigmented and provided with numerous perpendicular hairs along a median band, on the sides with only short setae and almost unpigmented. Genitalia (Fig. 86) much like those of *americanus*; parameres slender, with a few strong setae along the lower inner margin and most of the outer margin; volsellae with several strong setae on the base, the digiti somewhat spindle-shaped and clothed all over with rather long hairs which are angled near their apices; parameres slender, slightly curved; aedoeagus broadest subapically, simple.

*Biology*.—This species has been collected on the flowers of *Asclepias*, *Ampelopsis arborea*, *Tamarix gallica*, and *Bifora americana*. Collection dates vary from 21 April to 6 December.

*Distribution*.—This is a Lower Sonoran form, ranging from the Mexican states of Coahuila and Chihuahua north to southeastern Arizona, southern New Mexico, southern Kansas, and eastern Texas.

*Specimens seen*: 52 (30 ♀♀, 22 ♂♂). KANSAS: Reno Co., 2 ♀♀, 18 June [HEE]; TEXAS: Bexar, Brazos, Collin, Dallas, Eastland, Hunt, Jeff Davis, Lee, Mitchell, Nueces, Presidio, Travis, Uvalde, Victoria, Webb, and Williamson Cos., numerous specimens [CU, HEE, JEG, MCZ, RWS, USNM, UK]; NEW MEXICO: Dona Ana Co., 1 ♂, Las Cruces, 3 July [UK]; ARIZONA: Cochise Co., 2 ♂♂, Douglas, 7-24 July [UK, USNM]; 2 ♂♂, 2 mi. E. of Pearce, 9 Aug. [HEE]; MEXICO: Chihuahua, 1 ♀, Villa Allende, 6 Dec. [Minn.]; Coahuila, 1 ♀, Buena Vista, Sierra del Carmen, 6000 feet, 22 July [JEG].

#### E. Subgenus **POMPILINUS** Ashmead

*Psammochares* Latreille, 1796, Précis des Caractères générique des Insectes, p. 115. [Type: *Sphex fusca* Linnaeus, 1761; designated by Latreille, 1803.] (See further remarks under the generic heading.)

*Pompilus* Fabricius, 1798, Suppl. Ent. Syst., pp. 212 and 246-252. [Type: *Pompilus viaticus* Fabricius, 1798 (= *Sphex fusca* Linnaeus, 1761); designated by Latreille, 1810.] (See further remarks under the generic heading.)

*Pompilinus* Ashmead, 1902, Canad. Ent., 34: 85. [Type: *Pompilus cylindricus* Cresson, 1867; monobasic.]—Banks, 1939, Canad. Ent., 71: 225.—Dreisbach, 1949, Ent. Amer., (n. s.) 29: 1-58. [Revision of males of North American species.]

*Pompiloides* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 221, 223, 226. [*Pro Pompiloides* Radoszkowski, 1887, nec Radoszkowski.]—Banks, 1917, Bull. Mus. Comp. Zool., 61: 107, 108.—Banks, 1919, Bull. Mus. Comp. Zool., 63: 235-236.

*Anopliella* Banks, 1939, Canad. Ent., 71: 225, 227. [Type: *Pompilus tenebrosus* Cresson, 1865; original designation.]—Dreisbach, 1950, Amer. Midl. Nat., 42: 722. [Placed in synonymy with *Pompilinus*.]

This exceedingly homogeneous group may have arisen as a development of a single line within the subgenus *Arachnoproctonus*. Its members closely resemble those of the *Americanus*-group of that subgenus, the only reliable difference being that in *Pompilinus* the transverse median vein of the fore wing meets the media beyond the origin of the basal. The parameres of the male genitalia of *Pompilinus* are normally considerably broadened apically, rather than being slender throughout or broadest near the base, as in the other subgenera of *Anoplius*. However, in *subcylindricus* and its allies the parameres are slender throughout; furthermore, in these species the transverse median and basal veins are occasionally interstitial, and the male venter shows a tendency to have short brushes of hair, rather than being completely smooth as in most

*Pompilinus*. The *Subcylindricus* species-group appears to be annectant between *Pompilinus* and *Arachnophroctonus*, and might be included in the latter group by a slight shifting of the weight given the various characters used in their definition. In fact, it is not certain whether these two groups will stand as discrete subgenera, in the final analysis, unless further characters are discovered to separate them.

The most frequently used "key" character for this subgenus is the usually petiolate third submarginal cell of the fore wing. However, this character is not diagnostic by itself, as a number of other Pompilini also possess it. In most of the species the spines of the tarsal comb are very short; in many of the species the propodeum is without erect hairs. Because of the great similarity among the numerous species of *Pompilinus*, combined with a not inconsiderable amount of intraspecific variation, the group is one of the most difficult in the tribe. The male terminalia provide almost the only clear-cut characters, and for the accurate identification of most of the species a careful study of the genitalia and subgenital plate is necessary. Of course, like all other morphological features, these are subject to individual variation. Failure to recognize this fact has led to the creation of many new synonyms recently by Dreisbach (1949). The present treatment of this subgenus is, I am well aware, by no means the last word on the subject. Particularly needed in this group are careful field studies on the various species, in order to more accurately associate the sexes, and to discover facts in their biology which may enable us to more clearly define the species.

*Subgeneric characters*.—Small wasps, 3 to 15 mm. in length; color black, in some species the basal abdominal tergites marked with orange. Pubescence very fine, predominantly fuscous, in the males of most of the species extensively silvery. Body usually relatively devoid of erect hairs; propodeum at most moderately hairy, usually not at all so; male venter practically devoid of erect hairs, except that in a few species there are mats of short hair on some of the sternites; pygidium of female always conspicuously bristly.

Mandibles of male unidentate, those of the female bidentate, but the inner tooth often reduced or worn so that they seem to be unidentate. Apical margin of clypeus truncate, only in the female *fraternus* somewhat emarginate. Front and vertex of very variable breadth; antennae slender, of variable length. Tarsal comb of female present, the spines usually not



longer than the width of the tarsus, never more than twice that length. Last segment of front tarsus of male distinctly asymmetrical, with an expansion on the inner margin, the segment widest about half-way from base to apex. Inner claw of front tarsus of male strongly curved, deeply cleft, the inner ray acute; outer claw of this tarsus slightly more strongly curved than the claws of the other tarsi. Pulvillar comb of female with from 10 to 20 setulae, in the male much less well developed. Hind femora of male compressed. Propodeum of male nearly flat in front, distinctly more declivous behind (Fig. 151).

Cubitus of hind wing meeting the media at or beyond the tip of the submedian cell. Transverse median vein of fore wing meeting the media almost always distinctly beyond the origin of the basal. Stigma short; marginal cell rather small, always more than its length from the wing-tip, the radial vein always somewhat angled at the third transverse cubital vein. Second submarginal cell 4-sided, seldom much broader than high, sometimes higher than broad; third submarginal cell usually petiolate above, sometimes not so, the 2d and 3d transverse cubital veins rarely not meeting above. (Wings of one species shown in Fig. 153.)

Abdomen of the male very slender, cylindrical, elongate; venter smooth, or in a few species with mats of short or moderately long suberect setae on one or more of the sternites. Emargination of sternite 6 well defined, narrow. Subgenital plate with the basal sclerite slender, V-shaped, the plate itself variously shaped, flat or with the median line elevated. Genitalia with the parameres broader apically than near the base, except in a few species, the squamae usually evident. Basal hooklets strong, simple, the upper margin not strongly arched. Digits variously modified and showing excellent specific characters. Parameres simple, slender, embracing the simple, usually slender aedoeagus.

*Biology.*—The species of this subgenus, some of which are very common, are predominantly inhabitants of sandy areas; in most areas extensive collecting in a single sand-pit or barren area will turn up several species. Most of the species also come regularly to flowers, especially Umbelliferae.

So far as known, the species of *Pompilinus* are remarkably unselective in their spider prey. For example, *marginatus* is known to prey upon spiders belonging to seven different families and many different modes of life, as well as on Phalangids. The European *fuscus* is known to prey upon spiders of five different families. Lycosidae are most commonly taken; I have seen *marginatus*, however, actually enter the web of an orb-weaver in search of prey, and on another occasion took it with a specimen of the golden garden spider, *Argiope aurantia*. This species is

also known to enter the burrows of subterranean spiders. The nest is a simple burrow with a terminal cell constructed in sand or soft earth. Richards and Hamm<sup>10</sup> have compiled the rather considerable information available regarding the habits of the common European species *fuscus* L. What is known about the biology of our native species is summarized under the various species.

*Distribution.*—This subgenus appears to be distributed throughout the range of the genus *Anoplius*, but is nowhere so well represented as in the Nearctic region, where there are 17 species.

### Key to Species

#### Females

(The females of four species are unknown.)

1. Body entirely black or blue-black ..... 2  
    Body marked with rufous, orange-brown, or yellowish-brown on one or more of the basal abdominal tergites ..... 10
2. Head, in anterior view, with the vertex distinctly elevated in an arc above the tops of the eyes (as in Fig. 158); very small species ..... 3  
    Head, in anterior view, with the vertex extending straight across at or slightly above the eye-tops (as in Figs. 156 and 157); small or medium-sized species ..... 5
3. Posterior margin of pronotum arcuate or at most with a very feeble angulation ..... 2. **subcylindricus** (Banks)  
    Posterior margin of pronotum forming a distinct, though often broad, angulation ..... 4
4. Temples strongly developed, in lateral aspect about two-thirds the width of the eye; propodeum usually with some short erect hairs on the sides  
    8. **estellina** (Banks)  
    Temples narrow, not more than half the width of the eye; propodeum not at all hairy ..... 3. **percitus** Evans
5. Body rendered by the pubescence a rich deep blue (fading to violet in older specimens); third antennal segment equal to from .9 to 1.0 times the upper interocular distance ..... 1. **grandiflexionis** Evans  
    Body dull black, the pubescence at most rather obscurely violaceous (in doubtful cases the third antennal segment equal to less than .9 the upper interocular distance) ..... 6
6. Propodeum bearing numerous prominent erect hairs, at least dorso-laterally; head and thorax with considerable erect hair ..... 7  
    Propodeum not at all hairy or with only a few very short, fine, scarcely noticeable hairs on the sides ..... 8

<sup>10</sup> Richards, O. W., and A. H. Hamm, 1939, Trans. Soc. Brit. Ent., 6: 90-96.

7. Tarsal comb strong, the spines usually longer than the thickness of the tarsus, the basitarsus with either three or four comb-spines.  
 7. **californiae** Evans  
 Spines of the tarsal comb not or scarcely longer than the width of the tarsus, the basitarsus always with three comb-spines.  
 9. **tenebrosus** (Cresson)
8. Front of moderate breadth, distinctly wider than the eyes taken together, the middle interocular distance varying from .57 to .60 times the transfacial distance (Fig. 157) .....10. **insolens** (Banks)  
 Front narrow, only a little wider than the eyes taken together, the middle interocular distance varying from .53 to .56 times the transfacial distance (as in Fig. 156) ..... 9
9. Propodeum rather long, the slope low, the declivity not well defined; apical margin of clypeus slightly excavated; Eastern states, Florida to New Jersey .....5. **krombeini** Evans  
 Propodeum shorter, the declivity rather well defined and steeply sloping; apical margin of clypeus truncate or very slightly concave; Texas and Kansas westward .....11. **clystera** (Banks)
10. Apical margin of clypeus distinctly emarginate medially; propodeum somewhat hairy .....17. **fraternus** (Banks)  
 Apical margin of clypeus truncate or very slightly concave; propodeum hairy or not .....11
11. Propodeum rather long, in full dorsal view as long as its greatest breadth, in lateral view (Fig. 162) with the slope low, the declivity not well defined; first two abdominal tergites marked with orange; antennae long and slender, the outer segments all more than three times as long as thick .....16. **splendens** (Dreisbach)  
 Propodeum shorter, in full dorsal view not as long as broad, in lateral view (Fig. 161) with the dorsum more arched, the declivity better defined (in doubtful cases, antennal segments 7-10 each less than three times as long as thick); first abdominal tergite marked with orange or not .....12
12. Front and vertex very broad, the middle interocular distance at least .6 the transfacial distance; propodeum at least a little hirsute on the sides; tarsal comb variable, often stronger than below, the basitarsus with three or four comb-spines .....6. **cylindricus** (Cresson)  
 Front and vertex of moderate breadth, the middle interocular distance less than .6 the transfacial; propodeum not at all hairy; spines of the tarsal comb not longer than the width of the tarsus, the basitarsus with three comb-spines .....15. **marginatus** (Say)

Males

1. Abdominal sternite 4 with a dense patch of setae, visible at least under high magnification; parameres of genitalia slender throughout, except in two species in which the hair-brush on the fourth sternite is very conspicuous (*Subcylindricus*-group) .....2

- Abdominal venter without a patch of setae on any of the sternites, at most with a few scattered weak hairs, or some short setae on sternites 6 or 7; parameres usually broader distally than near the base (*Cylindricus*-group) .....6
2. Larger, over 10 mm.; posterior margin of the pronotum with a pale stripe; upper, outer margin of digitus volsellaris without very long hairs .....1. **grandiflexionis** Evans  
Smaller, 4 to 9 mm.; wholly black; upper, outer margin of digitus with a group of very long hairs .....3
3. Third antennal segment not more than 2.3 times as long as its greatest thickness, and a little shorter than the scape; digitus volsellaris with a group of small setae on the inner margin at and just below the apex ..4  
Third antennal segment very slender, at least 3 times as long as its greatest thickness, at least as long as the scape; digitus without a group of setae in this position .....5
4. Brush of hairs on the fourth sternite very short, often seen with difficulty; subgenital plate fairly broad (Fig. 125); parameres slender throughout (Fig. 88) .....2. **subcylindricus** (Banks)  
Brush of hairs on the fourth sternite prominent, long; subgenital plate very narrow (Fig. 128); parameres broadened apically (Fig. 155).  
4. **texanus** (Dreisbach)
5. Third antennal segment very slightly longer than the fourth; brush of hairs on the fourth sternite not prominent; parameres slender; digiti clothed mostly with minute setae (Fig. 89) .....3. **percitus** Evans  
Third antennal segment about as long as the fourth; brush of hairs on the fourth sternite prominent, long; parameres expanded apically; digiti of different shape than above and clothed densely with fairly long hair (Fig. 90) .....5. **krombeini** Evans
6. Subgenital plate (Fig. 135) completely flat, the disc with two feeble carinae which converge slightly behind, the apex evenly rounded; digiti (Fig. 94) rounded apically .....9. **tenebrosus** (Cresson)  
Subgenital plate of different form, generally somewhat elevated medially, the apex usually acute or subacute, the disc never with paired carinae; digiti never evenly rounded apically .....7
7. Hind basitarsus on the inner side for its entire length beset with short, erect hairs (Fig. 165); genitalia as shown in Fig. 97.  
15. **marginatus** (Say)  
Hind basitarsus with erect setae only for a short distance basally, near the spurs .....8
8. Subgenital plate (Fig. 137) unusually slender throughout; parameres (Fig. 104) attenuate apically, the apex and areas along the inner and outer margins toward the apex almost unpigmented, membranous; abdomen always marked with rufous .....17. **fraternus** (Banks)  
Subgenital plate much less slender; parameres without such membranous areas; marked with rufous or not .....9

9. Propodeum, and usually the mesopleura and middle and hind coxae, somewhat hairy; genitalia as shown in Fig. 92, the digiti elongate-fusiform, the aedoeagus rather broadly expanded apically.

7. *californiae* Evans

Propodeum, mesopleura, and middle and hind coxae not or very scarcely hairy; genitalia of different structure, the aedoeagus more narrowly expanded apically . . . . .10

10. Subgenital plate (Fig. 123) tapering gradually to a more or less acute tip, usually rather strongly hirsute ventrally; genitalia (Fig. 91) with the digiti more or less truncate apically, the parameres slender basally and with the squamae unusually prominent . . 6. *cylindricus* (Cresson)

Subgenital plate either obtusely pointed apically, or broadly rounded and with the median point acute; digiti not squarely truncate apically . . . . .11

11. Subgenital plate (Fig. 136) obtusely pointed, the disc a little convex in cross-section, but the median line not sharply elevated; parameres (Fig. 95) broad nearly to the apex, which is subtruncate.

10. *insolens* (Banks)

Subgenital plate with the median line distinctly elevated above the rest of the disc, the apex not tapered gradually to an obtuse angle; genitalia not as in Fig. 95 . . . . .12

12. Subgenital plate (Figs. 131 and 132) with broad side-pieces completely devoid of even minute setae; digiti often without long setae on the upper, outer margin . . . . .13

Subgenital plate (Figs. 130 and 134) clothed completely, at least on the apical half, with at least minute setae; digiti with some setae on the upper, outer margin, which are almost always longer than those on the remainder of this appendage . . . . .16

13. Parameres (Figs. 98 and 99) devoid of setae along their inner margins ventrally except for a few short ones just above the squamae; digiti more or less spindle-shaped, the outer margin arched gradually to the apex . . . . .14

Parameres (Figs. 100 and 101) clothed ventrally along the inner margin with prominent long setae; digiti elongate, the apex more or less obliquely truncate . . . . .15

14. Digiti not carinate subapically, the upper, outer portion with some moderately long, straight hairs; parameres a little longer along the inner margin than the outer, the apex somewhat acute (Fig. 98).

13a. *stenotus stenotus* (Banks)

Digiti with a short carina near the outer margin just below the apex, more or less devoid of setae in this area; paramere: more or less rounded apically (Fig. 99) . . . . .13b. *stenotus bequaerti* (Dreisbach)

15. Digiti tapering on their apical one-third to a somewhat acute apex; parameres nearly straight, much exceeding the other appendages (Fig. 100) . . . . .12a. *rectangularis rectangularis* (Dreisbach)

- Digiti with an oblique truncation on their apical one-sixth, the apex less acute; parameres slightly shorter and more curved than above (Fig. 101) .....12b. **rectangularis gillaspyi** new subspecies
16. Aedoeagus (Fig. 93) with a marked, abrupt apical expansion; basis volsellaris with some very long setae; digiti elongate.  
8. **estellina** (Banks)  
Aedoeagus only slightly expanded apically; basis volsellaris with only some very short, weak setae .....17
17. Parameres strongly curved, tapering to a slender, acute apex; digiti clothed sparsely with rather soft hairs, and with a number of long hairs at the upper, outer margin (Fig. 103).  
16. **splendens** (Dreisbach)  
Parameres somewhat curved, the apex much less slender and tapering; digiti clothed on the disc with close-set, rather stiff hairs which are angled at their apices .....18
18. Parameres gradually expanded nearly to the apex, which is rather abruptly, obliquely truncate; digiti broadest about half-way out, thereafter narrowed gradually to the apex (Fig. 102).  
14. **townesi** new species  
Parameres gradually widened to about the middle, thereafter narrowed to the apex; digiti gradually expanded to a point just below the apex, thereafter abruptly contracted, almost truncate (Fig. 96)  
11. **clystera** (Banks)

### *Subcylindricus* Species-group

In this group are placed five species in which the male venter bears a short to moderately long brush of hairs on the fourth abdominal sternite. The parameres of the genitalia are slender and nearly linear, except in two species in which they are somewhat expanded apically. In this group the basal and transverse median veins of the fore wing are occasionally interstitial. All of these characters suggest a linkage of this group with the *Americanus*-group of the subgenus *Arachnophroctonus*. None of the species of this group are marked with rufous.

#### 1. *Anoplus* (*Pompilinus*) **grandiflexionis** Evans

(Pl. XIII, fig. 87; pl. XIX, fig. 124.)

*Anoplus* (*Pompilinus*) *grandiflexionis* Evans, 1950, Jour. Kansas Ent. Soc., 23: 84-85, 87, figs. 1 and 2. [Type: ♂; Fort Davis, Texas, 26 July 1946, on dried leaves in an arroyo (H. E. Evans); U.S.N.M. no. 59,474.]

The rich bluish pubescence of this species sets it apart at once; the species superficially resembles *A. (Anoplius) ventralis tarsatus* Banks. Of the species of *Pompilinus* this probably stands closest to *Arachnophroctonus*, as evidenced by the pale stripe on the pronotum of the male, and particularly the genitalia, which suggest *moestus* and *americanus*. The species is known at present from only seven specimens.

FEMALE.—Length 11.5 (10-13) mm. Color black, the body rendered a rather conspicuous deep bluish (fading to violet in older specimens) by the pubescence. Wings fuscous, a little darker along the outer margin, violaceous. Front, vertex, and front coxae with numerous dark setae; pronotum, mesonotum, scutellum, mesopleura, and sides of the propodeum very slightly hairy.

Clypeus about 2.6 times as broad as high, its apical margin truncate. Front rather narrow, the middle interocular distance varying from .52 to .56 times the transfacial distance. Inner orbits converging slightly above, the upper interocular distance about .85 times the lower. Ocelli forming an acute angle in front; postocellar and ocello-ocular distances about equal. First four antennal segments in a ratio of about 6:2:9:7, segment 3 equal to from .9 to 1.0 times the upper interocular distance.

Posterior margin of the pronotum feebly angulate. Propodeum short, with a somewhat flattened declivity behind. Mesosternum acutely produced over the inner bases for the middle coxae, with a V-shaped emargination between the processes. Spines of the tarsal comb about as long as the thickness of the tarsus; basitarsus with 3 comb-spines. Fore wing with the third submarginal cell triangular, sometimes petiolate.

MALE.—Length 11.5 mm. Color black, the posterior margin of the pronotum with a buff-colored stripe, interrupted medially. Clypeus, lower front, temples, and greater part of the thorax and propodeum with fine silvery pubescence; pubescence of the dorsal parts of the head and thorax, and the entire abdomen, dark bluish. Front with considerable black erect hair; abdominal sternites four and five clothed with a mat of very short, suberect setulae. Wings hyaline, the outer margins broadly and conspicuously infuscated.

Clypeus 2.2 times as broad as high, its apical margin truncate. Middle interocular distance about .6 the transfacial; upper interocular distance very slightly greater than the lower. Ocelli rather large, in a right triangle, the postocellar and ocello-ocular lines about equal. Antennae slender, the first four segments in a ratio of about 3:1:3:3, segment 3 about 3.2 times as long as thick. Pronotum feebly angulate behind; propodeum with a faintly impressed median line. Third submarginal cell of the fore wing petiolate.

Abdomen long, cylindrical, without long erect hairs, but sternites 4 and 5 with mats of very short hairs, visible on close inspection. Sternite 6

with a broadly V-shaped emargination. Subgenital plate of moderate breadth, the apex broadly rounded, the median line not elevated (Fig. 124), very similar to that of *A. (Arachnophroctonus) americanus*. Genitalia (Fig. 87) with the parameres long, slender, slightly curved, sparsely clothed with setae. Basis volsellaris with two very long setae; digitus somewhat triangular, clothed with setae which are longest at the outer angles. Parapenials simple, slender, embracing the rather broad aedoeagus, which is weakly bilobed apically.

*Biology*.—I have taken several specimens of this species in dry stream-beds beneath trees, and one female on the flowers of *Sphaeralcea angustifolia*.

*Distribution*.—This species inhabits the Upper Sonoran fauna of New Mexico and western Texas.

*Specimens seen*: 7 (6 ♀♀, 1 ♂). TEXAS: Brewster Co., 1 ♀, Chisos Mts., 5400 feet, 8-14 July (H. E. Evans) [ANSP]; Jeff Davis Co., 2 ♀♀, 1 ♂, Fort Davis, 5000 feet, 26 July (H. E. Evans) [USNM, HEE]; 1 ♀, 6-10 mi. W. of Fort Davis, 15-23 July (H. E. Evans & G. E. Ball) [CAS]; NEW MEXICO: Sandoval Co., 2 ♀♀, Jemez Springs, 21 July, 7 Aug. (J. Woodgate) [CU, MCZ].

## 2. *Anoplius (Pompilinus) subcylindricus* (Banks)

(Pl. XIII, fig. 88; pl. XIX, fig. 125.)

*Pompiloides subcylindricus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 103. [Type: ♀; Falls Church, Va., Aug., on tulip tree honeydew (N. Banks); M.C.Z. no. 10,015.]<sup>11</sup>

*Psammochares (Pompiloides) subcylindricus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 124, 126. [Raleigh, N. C.]

*Pompilinus cylindricus* Dreisbach, 1949, Ent. Amer., (n. s.) 29: 27, 31, 36, pl. II, figs. 9 and 10. [Nec Cresson, 1867; misidentification.]

*Anoplius (Pompilinus) subcylindricus* Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 264.

This is one of the more common species of the subgenus east of the Rockies. The female may be recognized by its small size and arcuate posterior pronotal margin. The male is very similar to the species which follows, and care must be taken in observing the characters indicated in the key for separating these species. The brush of hairs on the fourth abdominal sternite of this species is very short, and in some specimens very difficult to observe.

<sup>11</sup> Banks' paratypes [MCZ] consist of this and four other species, belonging to two genera and three subgenera.



FEMALE.—Length 7.3 (5.5-9.5) mm. Color black; wings lightly to moderately infuscated, usually a bit darker along the outer margin. Pubescence wholly dark, often somewhat violaceous, sometimes rather strongly so. Clypeus, front, and vertex with fairly abundant short, dark hair; pro- and mesonota, scutellum, and coxae usually a little hairy; propodeum with not more than a very small amount of inconspicuous hair on the sides.

Clypeus 2.5 to 2.7 times as broad as high, its apical margin truncate. Front very broad, the middle interocular distance from .60 to .65 times the transfacial distance. Inner orbits somewhat convergent at the top, the upper interocular distance from .85 to .95 times the lower. Vertex arched slightly above the tops of the eyes. Ocelli forming a right or obtuse angle in front, the postocellar line often slightly greater than the ocello-ocular. Antennae rather short, the first four segments in a ratio of about 3:1:3.8:3.3, segment 3 never longer than 1 plus 2, and equal to from .54 to .7 times the upper interocular distance. Temples rather strongly developed, in lateral view roughly half the width of the eye.

Posterior margin of pronotum arcuate or at most with a very vague median angulation. Propodeum short and convex, with a well-defined slightly concave declivity behind. Spines of tarsal comb short, about as long as the thickness of the tarsus; basitarsus with 3 comb-spines. Fore wing with the transverse median and basal veins sometimes interstitial, more often slightly to rather strongly disjointed. Third submarginal cell triangular, nearly always petiolate.

MALE.—Length 7 (4.5-9) mm. Color black; wings hyaline or nearly so, the outer margins with a fuscous band. Greater part of the head and thorax conspicuously silvery-sericeous, especially the lower front, coxae, and propodeum. Front and vertex with scattered short hairs; pronotum and front coxae a bit hairy; abdominal sternite 4 with a dense mat of very short, suberect setae, and to a lesser extent usually sternite 5 (considerable magnification is needed to see this).

Clypeus about 2.2 times as broad as high, truncate below. Front broad, the middle interocular distance varying from .61 to .67 times the transfacial distance; upper interocular distance subequal to or a little greater than the lower. First four antennal segments in a ratio of about 25:10:24:25, segment 3 from 1.9 to 2.2 times as long as its greatest thickness. Pronotum moderately long, with a steep anterior slope and a nearly flat portion behind; posterior margin arcuate or with a vague median angulation. Propodeum with an impressed median line, its surface nearly flat in front, rather steeply declivous behind.

Venter with short, inconspicuous mats of hair on the 4th and 5th sternites, as described above. Sternite 6 with a narrow, U-shaped emargination. Subgenital plate rather narrow, nearly parallel-sided, the apex rounded or obtusely pointed, the median line strongly though not sharply elevated; surface of the plate clothed with very short setulae (Fig. 125, the plate

sometimes more narrow than figured). Genitalia (Fig. 88) with the parameres slender (occasionally not quite as slender as shown in figure), curved slightly, the squama fairly strong. Volsella with one or a few hairs of moderate length on the basis; digitus large, subfusiform, the inner margin nearly straight, the outer margin arched, the apex acuminate; most of the disc of the digitus is clothed with small setae which are angled near the tips, but along the inner margin near and at the apex is a series of slightly longer, straight hairs, and on the upper outer margin is a series of very long hairs which are more or less sinuate apically. Parapenials slender, nearly straight. Aedoeagus gradually and evenly broadened toward the apex, where it is abruptly truncate.

*Biology.*—This species is a characteristic inhabitant of small sandy or gravelly areas. I have taken a female with the spider *Nysticus gulosus* Keys. (Thomsidae) [det. B. J. Kaston], which it was dragging backward in a sand pit near Ithaca, N. Y. Both sexes visit flowers, especially those of umbelliferous plants such as *Pastinaca sativa*, *Daucus carota*, and *Conium maculatum*; it has also been taken on *Solidago*, *Ceanothus*, *Baccharis*, *Polytaenia nuttallii*, *Sphaeralcea angustifolia*, *Melilotus alba*, *Euphorbia marginata*, *Hymenopappus corymbosus*, *Lepidium densiflorum*, and *Bifora americana*. Collection dates range from June to September in the northern parts of the range, April to October in the South.

*Distribution.*—This species ranges from the Lower Austral to the Transition Zones, from Florida and northern Mexico to Utah, North Dakota, Michigan, and Quebec.

*Specimens seen:* 300 (22 ♀♀, 79 ♂♂). The following records appear to define the periphery of the range: NEW HAMPSHIRE: Rockingham Co., 1 ♂, Hampton, 24 June [USNM]; QUEBEC: 1 ♀, Val Morin, July [CU]; 2 ♂♂, Kazabazua, July [CNC]; ONTARIO: 4 ♀♀, Jordan, 24 Aug.-7 Sept. [CNC]; MICHIGAN: Cheboygan Co., 1 ♂ [UK]; MINNESOTA: Clearwater Co., 1 ♀, Itasca Park, 8 July [Minn.]; NORTH DAKOTA: LaMoure Co., 1 ♀, Edgeley, 23 June [Minn.]; NEBRASKA: Nance Co., 1 ♂, Genoa, 10 Sept. [CU]; KANSAS: Pratt Co., 1 ♀ [UK]; NEW MEXICO: Colfax Co., 1 ♂, Raton, 13 Aug. [HEE]; UTAH: Uintah Co., 1 ♀, Ft. Duchesne, 14 July [MCZ]; Kane Co., 1 ♀, Orderville, 14 Aug. [HEE]; MEXICO: 1 ♀, Meadow Valley [USNM]; TEXAS: Webb Co., 1 ♀, Laredo, 24 Sept. [JEG]; Victoria Co., 2 ♀♀, 16 June [HEE]; ALABAMA: Mobile Co., 3 ♀♀, 2 ♂♂, Creola, 3 Apr. [HEE]; FLORIDA: 1 ♀, St. Nicholas [USNM].

3. *Anoplius (Pompilinus) percitus* Evans

(Pl. XIII, fig. 89; pl. XIX, fig. 12; pl. XXII, fig. 158.)

*Pompilinus subcylindricus* Dreisbach, 1949, Ent. Amer., (n. s.) 29: 31, 42, pl. V, figs. 25, 26. [Nec Banks; misidentification.]*Anoplius (Pompilinus) percitus* Evans, 1950, Jour. Kansas Ent. Soc., 23: 85-88. [Type: ♂; Ithaca, N. Y., on sand, 27 July 1947 (H. E. Evans); U.S.N.M. no. 59,475.]

This species is very closely allied to the preceding. In the male the third antennal segment is more elongate, and the genitalia lack the group of small hairs at the tip of the digitus; the aedeagus is also of very different shape. In both sexes the posterior margin of the pronotum is distinctly angulate.

FEMALE.—Length 7.5 (6-9.5) mm. Color black; fore wings lightly infuscated, darker beyond the cells; hind wings nearly hyaline, darker apically. Pubescence wholly brownish-cinereous. Front and vertex with sparse short setae; pronotum and front coxae slightly hairy; remainder of thorax, and the propodeum, practically without erect hair.

Head rather broad, the vertex raised slightly, arcuately above the tops of the eyes (Fig. 158). Clypeus about 2.7 times as broad as high, truncate below. Front very broad, the middle interocular distance varying from .60 to .64 times the transfacial distance. Eyes very slightly convergent above, the upper interocular distance about .95 times the lower. Ocelli in a right triangle, the postocellar and ocello-ocular distances about equal. First four antennal segments in a ratio of about 8:3:10:9, segment 3 equal to from .55 to .8 times the upper interocular distance. Front, in lateral view, strongly convex; temples about half the width of the eyes.

Posterior margin of the pronotum broadly but distinctly angulate. Propodeum short and convex, with an oblique, slightly concave posterior declivity. Spines of the tarsal comb about as long as the width of the tarsus; basitarsus with 3 comb-spines. Marginal cell of the fore wing nearly twice its own length from the wing-tip. Second submarginal cell usually a little higher than broad; third submarginal petiolate.

MALE.—Length 6.5 (5-8.5) mm. Color black; wings hyaline, the fore wing with a broad fuscous band along the outer margin. Pubescence brownish-cinereous, grading into silvery on the front, clypeus, coxae, a large part of the thorax, and the propodeum. Front, vertex, and front coxae very slightly hairy; fourth and to a lesser extent the fifth abdominal sternites with dense mats of short, suberect setae.

Clypeus slightly more than twice as broad as high, its apical margin truncate. Front broad; upper interocular distance subequal to or slightly greater than the lower interocular. Ocelli in a right triangle, the post-ocellar line equal to or slightly greater than the ocello-ocular. Antennae slender, the first four segments in a ratio of about 9:4:10:9, the third

segment thus slightly longer than the fourth, and about three times as long as thick. Posterior pronotal margin angulate. Median line of propodeum lightly impressed. Wing venation as in the female.

Abdominal sternite 6 with a V-shaped emargination. Subgenital plate (Fig. 126) rather narrow, its median line somewhat elevated, the disc clothed with short, suberect setulae. Genitalia (Fig. 89) with the parameres slender, curved. Basis volsellaris with several setae, one of which is very long; digitus with the inner margin nearly straight, the outer margin strongly arched, the apex acute but less attenuate than in *subcylindricus*, and without the short setae on the tip as in that species; disc of the digitus clothed with small setae, the upper outer margin with several long setae which are only slightly sinuous apically. Aedoeagus with its sides arcuately expanded to a point about three-fourths the distance to the apex, then narrowed, the apex feebly bilobed.

*Biology*.—I have taken this species on sand at the same time and place as *subcylindricus*, *rectangularis*, and *marginatus*, all members of this same subgenus. It has also been taken on the flowers of *Pastinaca sativa*, *Daucus carota*, *Anaphalis margaritacea*, and *Solidago* spp., and on a tulip tree which was dripping honeydew.

*Distribution*.—This wasp ranges from Texas and Alabama to Colorado, Kansas, Michigan, New York, and Massachusetts, chiefly in the Carolinian and Alleghanian faunas.

*Specimens seen*: 109 (76 ♀♀, 33 ♂♂). The following records appear to be marginal: MASSACHUSETTS: Suffolk Co., 1 ♀, Boston, 30 Aug. [CAS]; Hampshire Co., 2 ♀♀, 1 ♂, Amherst [Mass.]; NEW YORK: Essex Co., 1 ♀, Mt. McIntyre, 27 Aug. [CU]; Tompkins Co., 2 ♀♀, 2 ♂♂, Ithaca, 5 July-10 Aug. [CU, USNM]; Chautauqua Co., 1 ♀, Bemus Point, 15 July [CU]; PENNSYLVANIA: Allegheny Co., 1 ♀, Pittsburgh, July [CM]; MICHIGAN: Midland Co., 1 ♀, 28 Aug. [Coll. R. R. Dreisbach]; KANSAS: Riley Co., 4 ♀♀, 1 ♂, Manhattan, July, Oct. [HEE, KSC]; COLORADO: Jefferson Co., 1 ♀, Plainview, 9-14 July [MCZ]; TEXAS: Brazos Co., 1 ♀, 1 ♂, 10 Oct. [JEG]; ALABAMA: Tuscaloosa Co., 1 ♀, 4 Oct. [HEE]; VIRGINIA: Fairfax Co., 2 ♀♀, 5 ♂♂, Dunn Loring, 28 Aug.-5 Sept. [KVK].

4. *Anoplius (Pompilinus) texanus* (Dreisbach) new combination  
(Pl. XIX, fig. 128; pl. XXI, fig. 155.)

*Pompilinus texanus* Dreisbach, 1949, Ent. Amer., (n. s.) 29: 14-15, 31, 46, pl. VII, fig. 37 (but *not* fig. 36). [Type: ♂; Lee Co., Texas, May 1907 (Birkmann); M.C.Z.]

This species resembles the preceding two in the shape of the digitus volsellaris, but the parameres are broadened apically much as in *krombeini*, and the brush of hair on the fourth abdominal sternite is prominent as in that species. The very slender subgenital plate sets it apart from other members of this species-group.

FEMALE.—UNKNOWN.

MALE.—Length 7 (5.5-8) mm. Color black; wings subhyaline, the outer margin of the fore wing and apex of the hind wing broadly infuscated. Greater part of the head, thorax, and propodeum conspicuously silvery-sericeous; pubescence of the vertex, mesonotum, metapleura, and legs beyond the coxae, brownish-cinereous; abdomen obscurely silvery on the basal tergites, elsewhere brownish-pubescent. Front, vertex, temples, propleura, and anterior coxae with scattered short hairs; abdominal sternite 4 with a dense brush of moderately long hairs, longest behind; subgenital plate rather hirsute.

Clypeus about 2.2 times as broad as high, truncate below. Middle interocular distance about .59 times the transfacial; upper interocular distance slightly greater than the lower. Ocelli in about a right triangle; postocellar line slightly greater than ocello-ocular. First 4 antennal segments in a ratio of about 28:10:25:25, segment 3 a little more than twice as long as its greatest thickness. Posterior pronotal margin feebly angulate. Median line of propodeum distinctly impressed. Fore wing with the marginal cell nearly twice its own length from the wing-tip; third submarginal cell petiolate.

Abdomen with a brush of hair on the fourth sternite, as described above. Sternite 6 with a slit-like emargination. Subgenital plate (Fig. 128) unusually slender, on the apical half parallel-sided, the apex obtusely angulate; disc and apex clothed with moderately long setae. Genitalia (Fig. 155) with the parameres slightly expanded apically, strongly setose; digitus shaped much as in the preceding two species, the upper, outer margin with a number of long setae, somewhat sinuate at the tip, the apex of the digitus with some shorter, diverging setae; aedoeagus gradually expanded to near the apex, which is obliquely truncate on each side.

*Distribution.*—This species is known from a very few localities in Louisiana and eastern Texas.

*Specimens seen:* 5 ♂♂. TEXAS: Lee Co., 3 ♂♂, May, June (Birkmann) [MCZ]; Williamson Co., 1 ♂, 28 May 1935 (J. E. Gillaspay) [JEG]; LOUISIANA: Madison Co., 1 ♂, Tallulah, 25 June 1948 (R. C. Gaines) [USNM].

5. *Anoplius (Pompilinus) krombeini* Evans

(Pl. XIV, fig. 90; pl. XIX, fig. 127; pl. XXII, fig. 156.)

*Anoplius (Pompilinus)* n. sp. Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 264.*Anoplius (Pompilinus) krombcini* Evans, 1950, Jour. Kansas Ent. Soc., 23: 88-89. [Type: ♂; Kill Devil Hills, N. C., 28 May 1948 (K. V. Krombein); U.S.N.M. no. 59,476.]

The male of this species possesses a brush of hair on the fourth sternite, a character which allies it with the preceding four species. However, the genitalia are more of the type characteristic of the *cylindricus*-group, with which this species may be considered annectant. In both sexes the front is rather narrow; in the female the propodeum is somewhat longer and less steeply declivous than in related species.

FEMALE.—Length 8 (6-10) mm. Color black; wings lightly infuscated, somewhat darker along the outer margin. Pubescence wholly brownish-fuscous. Front and vertex with a few weak setae; front coxae setose, the other coxae, the pronotum, mesonotum, and scutellum sometimes slightly hairy; propodeum without erect hairs.

Clypeus 2.5 times as broad as high, its apical margin slightly arcuately concave. Front rather narrow, the middle interocular distance varying from .53 to .56 times the transfacial distance. Inner orbits slightly converging above, the upper interocular distance about .9 times the lower. Vertex not at all elevated above the eye-tops; ocelli in about a right triangle, the post-ocellar line equal to or slightly greater than the ocello-ocular. First four antennal segments in a ratio of about 9:3:12:11, the third antennal segment equal to about .85 times the upper interocular distance. (Head shown in Fig. 156.)

Pronotum with the slope rather low and even, the posterior margin distinctly angulate. Propodeum relatively long, the declivity ill-defined and not steep; median line vaguely impressed. Spines of the tarsal comb about as long as the thickness of the tarsus; basitarsus with 3 comb-spines. Fore wing with the marginal cell somewhat less than twice its own length from the wing-tip; second submarginal cell usually a little broader than high; third submarginal petiolate.

MALE.—Length 6.7 (6-7.5) mm. Color black; wings nearly hyaline, with a brownish outer marginal band. Pubescence brownish, more or less silvery on the clypeus, lower front, temples, coxae, pronotum, pleura, and propodeum. Clypeus, front, and vertex with a very few short setae; abdominal sternite 4 with a brush of suberect setae of moderate length (longer than in *percitus* or *subcylindricus*); sternite 5 and the subgenital plate with shorter, suberect setae.

Clypeus a little over twice as broad as high, its apical margin slightly arcuately concave. Front rather narrow; inner orbits diverging very slightly above. Ocelli as in the female. Antennae very slender, the first four segments in a ratio of about 3:1:3:3, the third segment about 3 times as long as thick. Posterior pronotal margin angulate. Propodeum with a weakly impressed median line, its slope very low, only slightly steepened behind. Venation as in female.

Abdominal venter with a short brush of hairs as described above. Sternite 6 with a rather deep U-shaped emargination. Subgenital plate with the median line strongly elevated, the median ridge and apex clothed with short, suberect setulae; the side-pieces are unpigmented and clothed with very small setae (Fig. 127). Genitalia (Fig. 90) with the parameres broadened apically, subclavate, clothed ventrally and along the outer margin with sparse, long setae. Volsellae with a group of small setae on the basis, one of which is a little longer than the others; digiti gradually expanded to the apex, which is rounded on the outer side, acute at the inner angle; digiti clothed with fairly long setae which are angled at their apices, and on the upper, outer portion with a number of much longer, sinuate setae. Aedocagus slender, the apex with two somewhat truncate lobes, between which it is deeply cleft.

*Distribution.*—This species inhabits the Austroriparian fauna, from Florida north along the Atlantic coast to New Jersey.

*Specimens seen:* 48 (25 ♀♀, 23 ♂♂). NEW JERSEY: Atlantic Co., 1 ♂, Weymouth, 27 June [CU]; Burlington Co., 1 ♀, Brown's Mills, 3 Sept. [USNM]; NORTH CAROLINA: Dare Co., 20 ♀♀, 16 ♂♂, Kill Devil Hills, 25 May-3 June [KVK, USNM, HEE]; FLORIDA: 1 ♀ (no further data) [ANSP]; 1 ♂, Suwannee Springs, 3 July [UK]; Clay Co., 1 ♂, Hibernia, 7 Aug. [UK]; Collier Co., 1 ♀, 10-40 mi. E. of Everglade, 30 Aug. [CU]; Hendry Co., 2 ♀♀, 1 ♂, La Belle, 8 Apr.-10 May [CU]; Lee Co., 1 ♂, Sanibel Isl., 13 May [CU]; Orange Co., 1 ♂, Orlando, 4 Apr. [JEG]; Polk Co., 1 ♂, Lakeland, 10 Nov. [AMNH].

### *Cylindricus* Species-group

This group includes twelve closely related species in which the male venter is smooth or practically so, without short brushes of hair on any of the sternites. The male genitalia are all of a similar pattern; the parameres are distinctly broader apically than near the base (except sometimes in *estellina* Banks). In this group a careful examination of the male genitalia and subgenital plate is essential for identification. The characters which separate the females are for the most part exceedingly subtle. The females of three species have not been distinguished, though they doubtless

occur in collections and are being confused with other species at the present time.

6. *Anoplius (Pompilinus) cylindricus* (Cresson)

(Pl. XIV, fig. 91; pl. XIX, fig. 123.)

*Pompilus cylindricus* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 92. [Lectotype: ♂; Texas (no further data); A.N.S.P. no. 553.]—Cresson, 1872, Trans. Amer. Ent. Soc., 4: 203.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 284.—[?]Birkmann, 1899, Ent. News, 10: 244.

*Pompilinus cylindricus* Ashmead, 1902, Canad. Ent., 34: 85, 86. [Selected genotype of n. gen. *Pompilinus*.]

[?] *Anoplius cylindricus* Viereck, 1906, Trans. Amer. Ent. Soc., 32: 223.

[?] *Pompiloides cylindricus* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 301.—[?] Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.

*Arachnophila brevihirta* Banks, 1945, Psyche, 52: 105. [Type: ♀; Chicago, Ill., July (C. T. Brues); M.C.Z. no. 26,739.] New synonymy.

*Pompilinus truncatus* Dreisbach, 1949, Ent. Amer., (n. s.) 29: 15-16, 32, 48, figs. 40 and 41. [Type: ♂; Gratiot Co., Mich., 2 Aug. 1947 (R. R. Dreisbach); M.C.Z.]. New synonymy.

*Pompilinus subtruncatus* Dreisbach, 1949, Ent. Amer., (n. s.) 29: 17-18, 33, 54, figs. 58 and 59. [Type: ♂; Lincoln, Nebr., 14 June 1909 (C. H. Gable); Univ. Nebraska (not seen by present author).] New synonymy.

*Pompilinus hispidus* Dreisbach, 1949, Ent. Amer., (n. s.) 29: 23-24, 32, 50, figs. 47 and 48. [Type: ♂; Tuscola Co., Mich., 20 Aug. 1940 (R. R. Dreisbach); M.C.Z.]. New synonymy.

*Anoplius (Pompilinus) cylindricus* Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 264. [Dare Co., N. C.]

No American pompilid has been so consistently misidentified as *cylindricus*.<sup>12</sup> Indeed, it has been customary to call almost any male of this subgenus (and some males of other subgenera and genera) "*cylindricus*." Cresson's type series was a mixture of species. However, in selecting a lectotype, Cresson chose a specimen from Texas having a slender, acute, hirsute subgenital plate. I have not examined the genitalia of the type, but feel certain that the true *cylindricus* is the species here discussed under that name, as the subgenital plate is very distinctive.

This is probably the commonest member of the subgenus in the prairie regions of central North America. I have collected both

<sup>12</sup> This has recently been pointed out vehemently by Dreisbach (1949, p. 27). Yet this author not only misidentified the species, but redescribed it under three different names within ten pages!



sexes in series in several localities, and have little doubt that the association of the sexes expressed here is correct. The variation in color, size, pilosity, and certain morphological features in this species is very striking, and quite disconcerting in a subgenus so homogeneous as this. Nevertheless, after a careful study of nearly two hundred specimens, from a wide variety of localities, I have been unable to find any constant characters which will enable one to divide the species in any way. The broad front and short, convex, somewhat hairy propodeum of the female are distinctive, as are the acute, hirsute subgenital plate and truncate digiti of the male.

FEMALE.—Length 8 (4.5-12) mm. Color black, the abdomen marked with orange or yellow-brown over the greater part of the first two tergites, occasionally over part of the third tergite, sometimes over part of the basal sternites. Fore wings lightly to moderately infuscated, somewhat darker along the margin; hind wings subhyaline, darker apically. Pubescence brownish, except pale where the integument is colored, and sometimes silvery on the base of the mandibles and a small part of the clypeus and lower front. Clypeus, front, and vertex with numerous short, dark, erect hairs; thorax with a variable but often considerable amount of short, erect hair; propodeum with at least a small amount of short hair on the sides, sometimes conspicuously hairy.

Clypeus about 2.5 times as broad as high, its apical margin truncate. Front very broad, the middle interocular distance varying from .60 to .65 times the transfacial distance. Inner orbits slightly convergent above, the upper interocular distance from .8 to .9 times the lower interocular. Ocelli rather small and far apart, forming an angle in front which is usually greater than a right angle; postocellar line subequal to or sometimes greater than ocello-ocular line. Antennae relatively short, the first four segments in a ratio of about 30:10:35:32 (somewhat variable in this respect, but segment 3 always shorter than 1 plus 2), segment 3 equal to from .5 to .7 times the upper interocular distance.

Pronotum rather long, its posterior margin broadly angulate or subangulate. Propodeum short and convex, with a fairly well defined, nearly flat posterior declivity. Mesosternum usually slightly produced in the form of two small processes over the inner bases of the middle coxae, with a V-shaped emargination between. Tarsal comb with the spines a little more stout than is usual in the subgenus, varying from 1 to 2 times as long as the thickness of the tarsus; basitarsus with either 3 or 4 comb-spines. Fore wing with the marginal cell about 1.5 times its own length from the wing-tip; third submarginal cell triangular, often petiolate.

MALE.—Length 8 (3.5-12) mm. Color black, the second abdominal tergite occasionally marked with orange. Wings subhyaline, the outer

margin of the fore wing with a fuscous band. Pubescence conspicuously silvery at least on the front, sides of the clypeus, and the propodeum, often over the greater part of the head and thorax. Front and vertex a little hairy, also the pronotum, front coxae, and sometimes the sides of the propodeum very slightly; body otherwise without erect hairs, except that the subgenital plate is somewhat hirsute, and there may be some scattered, inconspicuous small hairs on the abdominal sternites.

Clypeus about twice as broad as high, or slightly broader. Middle interocular distance varying from .58 to .64 times the transfacial; upper interocular distance subequal to or slightly greater than the lower. Ocelli rather large and prominent, forming an angle in front which may be greater or less than a right angle. First four antennal segments in a ratio of about 5:2:5:5; in some specimens segment 3 is a little shorter than 4 and only a little more than twice as long as thick; in others it is slightly longer than 4 and nearly 3 times as long as thick. Pronotum rather long, angulate or subangulate behind. Propodeum sloping but slightly in front, much more steeply on the posterior fourth, its median line weakly if at all impressed. Venation like that of the female and in no way distinctive.

Abdomen slender, cylindrical; sternite 6 with a narrowly U-shaped emargination. Subgenital plate (Fig. 123) with the median line slightly to strongly raised, the disc slightly to strongly hirsute; sides of the plate converging behind to an acute or subacute tip. Genitalia (Fig. 91) with the parameres strong, basally slender and with very prominently raised squamae, apically expanded, the tip more or less acute; outer margin setose, the inner ventral border also with a row of setae; dorsal side setose along the upper, outer margin, the setae forming a row which runs basad just inside the inner margin. Volsellae with only some minute hairs on the basis; digiti large and prominent, gradually expanded from the base, the apex abruptly truncate, the inner apical angle acute, the outer angle rounded; disc of the digitus clothed with short setae of variable density, the upper, outer angles with a number of longer setae. Parapenials unusually slender, strongly curved apically; aedeagus of moderate breadth, slightly broadened apically.

*Biology.*—This species is most characteristic of inland, well-drained areas, especially sand dunes or semidesert areas. Males come frequently to flowers, and have been taken on *Solidago*, *Asclepias*, *Cleome*, *Sphaeralcea*, *Conium*, and *Melilotus*, and also at honeydew. Females rarely visit flowers, but I have taken a few on *Melilotus alba*. The species appears to have several generations a year, occurring from May to September in the latitude of Minnesota, February to October in Texas. Its nesting habits are as yet unknown.

*Distribution.*—This species is very widely distributed, occurring from Florida, Texas, and Arizona to Connecticut, New York,

Ontario, Northwest Territories, and central Oregon. It is, however, most abundant in the Great Plains, northern Mississippi Valley, and Great Lakes regions, and elsewhere apparently uncommon.

*Specimens seen*: 185 (116 ♀♀, 69 ♂♂). The following records are marginal or from areas where the distribution may be discontinuous: CONNECTICUT: Hartford Co., 7 ♀♀, 7 ♂♂, 13 June-17 Sept. [HEE]; NEW YORK: Oswego Co., 3 ♀♀, 2 July [USNM]; ONTARIO: 1 ♀, Ridgeway, 24 July [MCZ]; MICHIGAN: Chippewa Co., 1 ♀, Whitefish Point, 30 June [MCZ]; MANITOBA: 2 ♀♀, 2 ♂♂, Aweme, July-Sept. [CNC]; NORTHWEST TERRITORIES: 1 ♂, Fort Norman, 6 Aug. [CNC]; ALBERTA: 1 ♂, Ironsprings, 16 June [CNC]; MONTANA: 3 ♂♂ (no further data) [ANSP]; OREGON: Lake Co., 1 ♂, Summer Lake, 26 Aug. [OSC]; UTAH: Emery Co., 1 ♀, 16 July [Minn.]; ARIZONA: Navajo Co., 1 ♀, Kayenta, 15 July [CAS]; NEW MEXICO: Dona Ana Co., 1 ♀, Mesilla Park, 4 Aug. [USNM]; TEXAS: Jeff Davis Co., 18 ♂♂, 6-10 mi. W. of Ft. Davis, 15-23 July [HEE, ANSP]; Hidalgo Co., 1 ♀, Mercedes, Feb. [USNM]; FLORIDA: Citrus Co., 2 ♀♀, Red Level, 6 July [UK]; Orange Co., 1 ♀, Winter Park, 2 May [Mass.]; NORTH CAROLINA: Dare Co., 12 ♀♀, 1 ♂, Kill Devil Hills, 26 May-5 June [KVK].

#### 7. *Anoplus (Pompilinus) californiae* Evans

(Pl. XIV, fig. 92; pl. XIX, fig. 129.)

*Anoplus (Pompilinus) californiae* Evans, 1948, Pan-Pac. Ent., 24: 128-129, and figs. 1, 2, & 7, p. 127. [Type: ♀; La Paz, Baja Calif., Mexico, 3 June 1921 (E. P. VanDuzee); C.A.S. no. 5949.]

*Pompilinus californiae* Dreisbach, 1949, Ent. Amer., (n.s.) 29: 28, 31, 54, pl. XI, figs. 55 & 56.

The female of this species shows much resemblance to the preceding, especially in the facial configuration, the strong tarsal comb, and the hairiness of the propodeum; it is, however, wholly black, and the antennae are somewhat longer. The genitalia of the male are very distinctive, particularly the aedoeagus.

FEMALE.—Length 10.5 (8.5-12.5) mm. Color black; fore wings moderately infuscated, slightly darker along the margin, often somewhat violaceous; hind wings subhyaline, darker apically. Pubescence fuscous, on the abdomen often reflecting deep metallic colors; base of the mandibles often with a patch of silvery pubescence. Body with erect hairs as follows: clypeus, front, and vertex in moderate abundance; front coxae with strong hairs in front and finer hairs behind; remainder of thorax, and the propodeum, with a variable but usually considerable amount of short erect hair, including the middle and hind coxae and usually to some extent the front femora.

Head distinctly broader than high; vertex straight across between the tops of the eyes. Clypeus from 2.5 to 2.8 times as broad as high, its apical margin truncate. Front rather broad, the middle interocular distance from .56 to .62 times the transfacial distance. Inner orbits subparallel below, slightly convergent above, the upper interocular distance from .83 to .93 times the lower interocular. Ocelli rather far apart, forming an angle in front which is a right angle or somewhat greater; postocellar line slightly greater than ocello-ocular. Antennae elongate, the first four segments in a ratio of about 15:5:24:20, segment 3 equal to from .65 to .8 times the upper interocular distance.

Pronotum of moderate length, its slope even, its posterior margin broadly angulate. Propodeum short, convex, posteriorly with a rather well-defined declivity. Mesosternum with small angulate processes which overlie the inner bases of the middle coxae, and between which is a V-shaped emargination. Front tarsus with a well-developed comb, the spines longer than the width of the tarsus, often nearly twice as long; basitarsus with either 3 or 4 comb-spines, the one at the apex equal to from .4 to .9 times the second tarsal segment. Fore wing with the second submarginal cell somewhat broader than high, the third submarginal petiolate.

MALE.—Length 8 (6.5-9.5) mm. Color black; wings hyaline to moderately infuscated, with a darker marginal band. Pubescence largely fuscous or fusco-violaceous, conspicuously silvery at least on the lower front, clypeus, and temples, sometimes over the whole front, pronotum, coxae, propodeum, and parts of the pleurites. Clypeus, front, vertex, temples, and propleura with abundant short, dark hairs; thorax and propodeum with a variable but usually considerable amount of erect hair (for this subgenus), occasionally scarcely hairy.

Clypeus a little over twice as broad as high, its apical margin truncate. Front rather broad, the middle interocular distance about .6 the transfacial; upper interocular distance subequal to or a little greater than the lower interocular. Ocelli large and prominent, forming a right angle or somewhat greater in front. First four antennal segments in a ratio of about 5:2:5:5, segment 3 from 2 to 2.8 times as long as thick. Posterior pronotal margin broadly angulate. Propodeum short and full, its median line lightly *ii* at all impressed.

Abdomen subfusiform, a little stout for the subgenus. Sternite 6 with a U-shaped apical emargination. Subgenital plate (Fig. 129) rather broad, obtusely pointed apically, its median line slightly raised, the plate clothed with small setae, which are usually grouped to form a small tuft on each side near the base. Genitalia (Fig. 92) with the parameres strong, expanded apically, the outer margin strongly setose, the squamae somewhat prominent and provided with a group of short hairs. Volsella with a group of hairs on the basis, 1 or 2 of which are rather long; digitus long and rather narrow, strap-shaped, clothed with setae of moderate length, the upper, outer angles with several somewhat longer setae. Aedoeagus of rather

variable shape, not always as broad as in the specimen figured, sometimes nearly parallel-sided basally, but always rather broadly expanded just below the apex.

*Biology*.—This species is restricted to the arid regions of the deep Southwest. It has been taken on salt cedar (*Tamarix gallica* L.) and sunflower (*Helianthus annuus* L.). Collection dates vary from April to October.

*Distribution*.—This is a Lower Sonoran species, ranging from Lower California north to southern New Mexico, Arizona, and central California.

*Specimens seen*: 21 (13 ♀♀, 8 ♂♂). NEW MEXICO: Otero Co., 1 ♀, 12 mi. SW of Alamogordo, 27 July [HEE]; ARIZONA: 1 ♀ (no further data) [USNM]; Pima Co., 1 ♂, Tucson, 17 Oct. [CU]; Pinal Co., 1 ♀, Florence, May [ANSP]; CALIFORNIA: Fresno Co., 1 ♂, Coalinga, 14 May [CIS]; Inyo Co., 1 ♀, Owens Lake, 2 June [CU]; Kings Co., 1 ♂, Kettleman City, 23 April [CAS]; Merced Co., 1 ♂, Los Banos, 23 May [CAS]; San Bernardino Co., 5 ♀♀, Boyer Ranch, 29 Palms [MCZ]; San Diego Co., 1 ♀, 23 June [CAS]; San Joaquin Co., 2 ♂♂, Tracy, 7 June & 1 Aug. [CIS]; BAJA CALIFORNIA: 1 ♀, Angeles Bay, 7 May [USNM]; 1 ♀, 2 ♂♂, La Paz, 3-5 June [CAS]; 1 ♀, Magdalena Bay, 30 May [CAS].

8. **Anoplius (Pompilinus) estellina** (Banks) new combination  
(Pl. XIV, fig. 93; pl. XIX, fig. 130.)

*Pompiloides estellina* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 303. [Type: ♂; Fosters, San Diego Co., Calif., 29 May (E. P. VanDuzee); M.C.Z. no. 13,673.]—Banks, 1919, Bull. Mus. Comp. Zool., 63: 236.

*Psammochares (Pompiloides) estellina* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.

*Pompilinus estellina* Dreisbach, 1949, Ent. Amer., (n.s.) 29: 32, 40, pl. IV, fig. 20, pl. V, fig. 24.

The type of this species is an aberrant specimen, having the claws of the middle and hind tarsi toothed instead of bifid. The female associated with *estellina* by Banks in his original description belongs to *Pompilus phoenix* Evans. True *estellina* is a member in good standing in the subgenus *Pompilinus*, closely allied to *californiae*. The female may be recognized by its small size, very broad front, and by having the vertex slightly arcuately raised above the tops of the eyes; this sex closely resembles *subcylindricus*, with which its range in part overlaps, but there is a

small amount of hair on the sides of the propodeum and the pronotum is angulate behind. The male is best recognized by the extremely broad subgenital plate and the unusual shape of the aedoeagus, which is abruptly broadened ("hammer-headed") apically.

FEMALE.—Length 7.5 (7-8) mm. Color black; fore wings moderately infuscated, somewhat darker apically; hind wings subhyaline, darker apically. Pubescence fuscous, obscurely violaceous. Front and vertex with short dark hairs; temples and propleura with dense, fine hair; pronotum, mesonotum, scutellum, sides of the propodeum, coxae, and sometimes the front femora, with scattered short hairs.

Clypeus 2.8 times as broad as high, its anterior margin truncate or slightly concave. Front very broad, the middle interocular distance from .61 to .65 times the transfacial distance. Inner orbits slightly emarginate in the middle, somewhat convergent above, the upper interocular distance from .85 to .95 times the lower. Ocelli in a right triangle, the laterals about equidistant from the eyes and from each other. Antennae rather short, the first four segments in a ratio of about 25:10:32:28, segment 3 varying from .56 to .64 times the upper interocular distance. Temples rather wide, in lateral aspect over half the width of the eye; vertex raised slightly, arcuately above the tops of the eyes, seen in anterior aspect.

Pronotum short, its posterior margin distinctly angulate. Propodeum short and convex, the median line impressed in front, posteriorly with a well-defined flattened declivity. Front tarsus with a comb of very short spines, not longer than the width of the tarsus; basitarsus with 3 comb-spines. Fore wing with the 2d submarginal cell about as broad as high, the 3d submarginal usually long-petiolate; cells rather far removed from the wing margin.

MALE.—Length 6.5 (5.5-8) mm. Color black; wings hyaline or nearly so, the outer margin of the fore wing and apex of the hind wing broadly infuscated. Pubescence silvery at least on the lower front, clypeus, and propodeum, often over the greater part of the head and thorax, elsewhere brownish-cinereous, sometimes slightly violaceous. Front and vertex with numerous short, dark hairs; temples and propleura rather hairy; front coxae and pronotum a little hairy; remainder of body practically without erect hair.

Clypeus about 2.3 times as broad as high, truncate below. Middle interocular distance from .62 to .66 times the transfacial distance, and about 1.2 times the lower interocular distance; upper interocular distance subequal to or slightly greater than lower. First 4 antennal segments in a ratio of about 25:10:22:24, segment 3 only about twice as long as its greatest thickness. Pronotum short, its posterior margin angulate. Propodeum with the median line impressed, the slope much steepened behind. Venation in no way distinctive; third submarginal cell always petiolate; marginal cell often as much as twice its own length from the wing-tip.

Abdomen slightly less long and slender than is usual in the subgenus. Sternite 6 with a narrow, U-shaped emargination. Subgenital plate (Fig. 130) broad, its median line slightly elevated, the apex obtusely pointed, the sides broadly expanded, unpigmented but clothed with small setae. Genitalia (Fig. 93) with the parameres slender, slightly curved, the outer margin and dorsal surface somewhat setose, the ventral surface with only minute setae over most of its surface; in some specimens the parameres are slightly expanded apically, as in the figure, but in others they are slender throughout. Volsella with a small group of setae on the basis, one of which is very long, half the length of the digitus, and a second which is about half the length of this. Digitus long and rather slender, its apex acute, the disc clothed with short setae, those on the upper, outer portion a bit longer. Parapenials straight, distinctly expanded apically. Aedocagus slender, apically with an abrupt truncated expansion on each side, giving it a "hammer-headed" appearance.

*Distribution.*—This apparently rare species occurs in the Upper Sonoran and Transition faunas, from New Mexico and California to Alberta.

*Specimens seen:* 10 (3 ♀♀, 7 ♂♂). CALIFORNIA: Alameda Co., 1 ♀, Alameda, 12 May [CAS]; Inyo Co., 1 ♂, Olancha, 20 May [CIS]; San Diego Co., 1 ♂, Fosters, 29 May [MCZ]; NEW MEXICO: Guadalupe Co., 1 ♀, Santa Rosa, 23 June [UK]; Lincoln Co., 1 ♂, Alto, 24 June [CU]; UTAH: Salt Lake Co., 1 ♂, 8 June [MCZ]; 1 ♀, 2 ♂♂, Saltair, 21 May & 12 July [CAS]; ALBERTA: 1 ♂, Lethbridge, 2 July [CNC].

9. *Anoplius (Pompilius) tenebrosus* (Cresson)

(Pl. XIV, fig. 94; pl. XX, fig. 135.)

*Pompilus tenebrosus* Cresson, 1865, Proc. Ent. Soc. Phila., 4: 453. [Type: ♀; Colorado (no further data); A.N.S.P. no. 417.]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 89. [Colo., Me.]—[?] Cresson, 1872, Trans. Amer. Ent. Soc., 4: 203. [Texas.]—Provancher, 1882, Nat. Canad., 13: 35, 39.—Provancher, 1883, Nat. Canad., 14: 35.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 326.—[?] Birkman, 1899, Ent. News, 10: 244. [Texas.]

*Pompilus compactus* Provancher, 1895, Nat. Canad., 22: 111. [Type: ♀; Vancouver, B. C.; Q.P.M., white label no. 301.] New synonymy.

*Anoplius tenebrosus* Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674. [N. J., several localities.]

*Pyenopompilus tenebrosus* Woodworth, 1913, Guide to Calif. Ins., p. 100. [Calif.]

*Psammochares (Psammochares) tenebrosus* Rohwer, 1916, Conn. Geol. Nat. Hist. Survey Bull. 22, pp. 633, 634. [Conn.]

- Psammochares (Anoplius) tenebrosus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 987. [N. Y., many localities.]—Johnson, 1930, List Ins. Fauna Nantucket, p. 111.—[?] Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 127, 128. [N. C., several localities.]—[?] Brimley, 1938, Insects No. Carolina, p. 434.
- Pompiloides canadensis* Banks, 1919, Canad. Ent., 51: 82. [Type: ♂: Truro, Nova Scotia, 12 Aug. 1913 (R. Matheson): C. U. no. 680.]—Procter, 1938, Biol. Survey Mt. Desert Reg., VI, Insecta, p. 430.
- Anoplius compactus* Banks, 1919, Bull. Mus. Comp. Zool., 63: 235.
- Anopliella tenebrosa* Banks, 1939, Canad. Ent., 71: 227. [Selected genotype of n. gen. *Anopliella*.]—Procter, 1946, Biol. Survey Mt. Desert Reg., VII, Insecta, p. 491.
- Psammochares (Pompilinus) canadensis* Procter, 1945, Biol. Survey Mt. Desert Reg., VII, Insecta, p. 491.
- Pompilinus tenebrosus* Strickland, 1947, Canad. Ent., 79: 125. [Alta., several localities.]—Dreisbach, 1949, Ent. Amer., (n.s.) 29: 27-28, 31, 52, pl. X, figs. 49, 50.—Dreisbach, 1950, Amer. Midl. Nat., 42: 722-723.

This is a common wasp across the continent in the Canadian and Transition Zones. Fortunately it is rather easily separated from related species. Males may be readily recognized by the unusual subgenital plate (Fig. 135) which is completely flat, and bears two weak carinae on its disc. Females may be told by the hairiness of the body, especially the propodeum, the short tarsal comb, and the wholly black integument overlaid with a fusco-violaceous pubescence.

FEMALE.—Length 11 (7.5-15) mm. Color black; fore wings lightly to rather heavily infuscated, often somewhat violaceous; hind wings subhyaline, the outer margin infuscated. Pubescence brownish or nearly black, generally with a violaceous tinge, especially on the abdomen; base of the mandibles often with a patch of silvery pubescence. Front and vertex with numerous erect hairs; pro- and mesonota, scutellum, propodeum, and coxae all with noticeable dark, erect hair; mesopleura and front femora often a bit hairy.

Clypeus about 2.5 times as broad as high, truncate below. Front of moderate breadth, the middle interocular distance varying from .55 to .61 times the transfacial distance. Inner orbits slightly emarginate near the middle, slightly convergent above, the upper interocular distance from .78 to .88 times the lower. Ocelli forming a right or obtuse angle in front, the postocellar line equal to or greater than the ocello-ocular. Antennae fairly long, the first 4 segments in a ratio of about 9:3:12:10, segment 3 from .6 to .9 times the upper interocular distance, averaging about .75.



Posterior margin of pronotum varying from arcuate to angulate, most commonly with a broad, rather indistinct angulation. Propodeum with the median line vaguely if at all impressed, posteriorly with a not-strongly-defined flattened declivity. Front tarsus with a comb of spines not or scarcely longer than the width of the tarsus; basitarsus with 3 comb-spines. Fore wing with the marginal cell from 1.3 to 1.8 times its own length from the wing-tip; third submarginal cell triangular, nearly always petiolate.

MALE.—Length 9 (6.5-12) mm. Color black; wings hyaline or subhyaline, the outer margins with a broad fuscous band. Pubescence silvery on the scape below, clypeus, front, temples, coxae, mesopleura, front and sides of the pronotum, sides of the scutellum, metanotum, propodeum except for the sides, and to some extent the front legs; elsewhere the pubescence is fusco-violaceous. Front and vertex with a number of short erect hairs; front coxae and pronotum slightly hairy; sometimes the mesonotum, scutellum, and propodeum very slightly hairy; abdomen scarcely or not at all hairy.

Clypeus about twice as broad as high, truncate below. Front of moderate breadth, the middle interocular distance about .6 the transfacial distance. Upper and lower interocular distances subequal, or either slightly the greater. Ocelli in about a right triangle. First 4 antennal segments in a ratio of about 25:10:27:25, segment 3 about 2.8 times as long as thick. Posterior pronotal margin subangulate. Propodeum rather abruptly declivous behind, its median line usually lightly impressed.

Abdomen slender, cylindrical. Sternite 6 with the emargination narrowly U-shaped. Subgenital plate (Fig. 135) of moderate breadth, flat, with two rather weak carinae on the disc, which converge slightly caudad; apex of the plate evenly rounded. Genitalia (Fig. 94) characterized chiefly by the digiti, which are evenly rounded apically, the disc clothed with setae of moderate length, some of which are clubbed. The parameres are stout and rather heavily pigmented, with convexly raised squamae. Basis volsellaris with only some minute hairs; hooklets slender; aedocagus slender, a little wider apically, the apex subtruncate and deeply cleft medially.

*Gynandromorph*.—A specimen from Jemez Springs, N. M. [CU] is wholly female except the head, which is entirely male.

*Biology*.—This species occurs in sandy places, particularly in the vicinity of woods; the nest is a short tunnel in the earth with an enlarged terminal cell. A specimen from Rancocas Park, N. J. [USNM], is pinned with the spider *Schizocosa saltatrix* Hentz (Lycosidae); another from Pullman, Wash. [Minn.], is pinned with *Xysticus gulosus* Keys. (Thomisidae) [det. B. J. Kaston]. The species is often attracted to goldenrod, *Solidago* spp., and has also been taken on *Angelica*, *Cleome*, and *Eryngium*.

*Distribution.*—This species occurs transcontinentally from the upper extremities of the Upper Austral Zone far into the Hudsonian.

*Specimens seen:* 676 (388 ♀♀, 287 ♂♂, 1 gynandromorph). The following records appear to be marginal: NOVA SCOTIA: 1 ♀, Cape Breton Isl., June [MCZ]; NEWFOUNDLAND: 2 ♀♀; Harmon Field, 27-30 May [CNC]; LABRADOR: 4 ♀♀, 1 ♂, Goose Bay, 10 June-2 Aug. [CNC]; NORTHWEST TERRITORIES: 1 ♀, 17 ♂♂, Norman Wells, 24-28 June [CNC]; 1 ♀, Reindeer Depot, McKenzie Delta, 11 July [CNC]; YUKON: 12 ♀♀, Watson Lake, 20-25 June [CNC]; BRITISH COLUMBIA: 2 ♀♀, Vancouver [CNC, QPM]; CALIFORNIA: Riverside Co., 1 ♀, Keen Camp, San Jacinto Mts., May [CIS]; Tulare Co., 2 ♀♀, Sequoia Nat. Park, 6-7000 feet, July [CU]; NEVADA: Lander Co., 1 ♂, Austin, 12 Aug. [UK]; UTAH: Beaver Co., 1 ♀, Beaver Creek, June [OSC]; NEW MEXICO: Sandoval Co., 3 ♀♀, 1 gynandromorph, Jemez Springs, 7500 feet, Apr.-July [CU]; COLORADO: Teller Co., 3 ♀♀, Florissant, June [USNM, MCZ]; Larimer Co., 1 ♀, Fort Collins, 15 May [USNM]; SOUTH DAKOTA: Custer Co., 21 ♀♀, 3 ♂♂, 2 mi. S. of Custer, 24 Aug. [HEE]; MINNESOTA: Hennepin Co., 1 ♂, Ft. Snelling, July [Minn.]; WISCONSIN: Clark Co., 1 ♂, Worden Township, July [AMNH]; MICHIGAN: Saginaw Co., 1 ♀, June [Coll. R. L. Fischer]; ONTARIO: 1 ♀, Komoka, June [CNC]; PENNSYLVANIA: Centre Co., 2 ♀♀, State College, May [PSC]; VIRGINIA: Fairfax Co., 1 ♂, Falls Church, June [MCZ]; NEW JERSEY: Cumberland Co., 2 ♀♀, Menantico, May [CU].

10. *Anoplius (Pompilinus) insolens* (Banks) new combination

(Pl. XIV, fig. 95; pl. XX, fig. 136; pl. XXII, fig. 157.)

*Pompiloides insolens* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 226. [Type: ♂; Black Mt., N. C., May; M.C.Z. no. 13,681.]—Procter, 1938, Biol. Survey Mt. Desert Reg., VI, Insecta, p. 430. [S. W. Harbor, Me.]

*Pompiloides cylindricus* Rohwer, 1916, Conn. Geol. Nat. Hist. Survey Bull. 22, pp. 631, 632. [Nec Cresson; misidentification.]—[?] Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 124, 125.—[?] Brimley, 1938, Insects No. Carolina, p. 433.

*Psammocharis (Pompiloides) insolens* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 124, 125. [N. C., several localities.]—Brimley, 1938, Insects No. Carolina, p. 433.—Procter, 1946, Biol. Survey Mt. Desert Reg., VII, Insecta, p. 491.

*Pompilinus insolens* Strickland, 1947, Canad. Ent., 79: 124. [Medicine Hat, Alta.]—Dreisbach, 1949, Ent. Amer., (n.s.) 29: 28, 33, 50, pl. IX, fig. 43, 44.

This species is more widely distributed than has usually been realized, occurring from coast to coast, chiefly south of the range

of *tenebrosus*, to which it is closely related. The female has only a small amount of very short, fine hair on the sides of the propodeum; this sex is very similar to the following species, *clystera*, the only character for separating them known to me being the somewhat broader front of *insolens*. The male *insolens* is rather easily told by the characteristics of the terminalia: the subgenital plate is obtusely pointed, the median line not distinctly elevated, but the disc a little convex in cross-section; the parameres of the genitalia are also quite unlike those of any other species (Fig. 95).

Female.—Length 10.5 (7.5-14) mm. Color black; fore wings moderately infuscated, a little darker along the outer margin, often somewhat violaceous; hind wings subhyaline, darker apically. Pubescence wholly deep brownish-violaceous. Front and vertex with scattered erect hairs; pronotum and front coxae a little hairy, and to a lesser extent the mesonotum, scutellum, mesopleura, and middle and hind coxae; propodeum usually with some very short, fine hair on the sides of the slope.

Clypeus about 2.5 times as broad as high, its apical margin truncate or very slightly concave. Front rather broad, the middle interocular distance varying from .56 to .60 times the transfacial distance, averaging .58. Inner orbits subparallel below, convergent above, the upper interocular distance varying from .78 to .92 times the lower. Ocelli in about a right triangle, rather small and far apart, the postocellar line often slightly greater than the ocello-ocular. First four antennal segments in a ratio of about 6:2:8:7, segment 3 equal to from .68 to .84 times the upper interocular distance. Vertex, in anterior view, raised very slightly if at all above the tops of the eyes; temples, in lateral view, generally about half the width of the eye.

Posterior margin of the pronotum angulate, sometimes rather indistinctly so. Propodeum with a fairly well-defined posterior declivity. Spines of the tarsal comb short, not or but little longer than the width of the tarsus; basitarsus with 3 comb-spines. Wing venation like that of the preceding species and not in any way distinctive.

Male.—Length 9 (6.5-11) mm. Color black; wings hyaline or nearly so, with a fuscous outer marginal band; occasionally the wings are almost wholly fuscous. Pubescence fusco-violaceous, sometimes wholly so, but usually silvery over a considerable part of the head, thorax, and propodeum. Front and vertex with a few weak hairs; prothorax slightly hairy; remainder of body without noticeable erect hairs.

Clypeus about twice as broad as high, its apical margin truncate. Front moderately broad, the inner orbits subparallel, slightly emarginate near the middle. Ocelli in about a right triangle, the postocellar line equal to or a little greater than the ocello-ocular. Antennae slender, the first 4 segments in a ratio of about 3:1:3:3, segment 3 from 2.5 to 3 times as long as thick. Posterior pronotal margin angulate to nearly arcuate. Propodeum rather long, the median line somewhat impressed.

Abdomen smooth, slender, and cylindrical. Sternite 6 with a narrowly U-shaped emargination. Subgenital plate (Fig. 156) of moderate breadth, its apex obtusely angular, the disc slightly convexly raised, but the median line itself not prominent; disc and outer margin clothed with only small setae. Genitalia (Fig. 95) with the parameres gradually expanded nearly to the apex, which is subtruncate; outer margin and apex with setae of moderate length, the inner margin ventrally on the apical half with a single series of setae. Basis volsellaris with a number of very short and one very long setae; digitus much as in *clystera*, rather slender, slightly curved, and with an acute apex; the disc is clothed with small setae, most of which are clubbed; on the upper outer margin are several (6 to 14) long setae which are somewhat sinuate apically. Parameres slender, a little thickened toward the apex; aedeagus slender, slightly expanded apically, the tip obliquely truncate on each side.

*Biology*.—This species occurs principally in or around sandy areas, and doubtless nests in the sand. I have taken a single female with the spider *Maevia vittata* (Hentz) ♀ (Salticidae) [det. B. J. Kaston], which it was dragging over the ground in a sandy area at East Hartford, Conn. *Insolens* is commonly taken on flowers, and has been captured on *Pastinaca sativa*, *Daucus carota*, *Asclepias*, *Sphaeralcea angustifolia*, *Petalostemon oligophyllum*, *Achillea millefolium*, *Chrysanthemum leucanthemum*, *Cleome lutea*, *Eriogonum*, and *Chrysothamnus*.

*Distribution*.—This species occurs transcontinentally from the Lower Austral to the Transition Zones.

*Specimens seen*: 345 (242 ♀♀, 103 ♂♂). The following records are marginal: MAINE: Lincoln Co., 1 ♂, 11 Aug. [CIS]; MASSACHUSETTS: Franklin Co., 1 ♀, Warwick, 27 July [CM]; NEW YORK: Essex Co., 1 ♂, New Russia, 18 Aug. [CU]; Tompkins Co., 24 ♂♂, Ithaca, 19 June-4 Aug. [HEE, CU]; ONTARIO: 1 ♂, Toronto, 29 July [CNC]; MICHIGAN: Cheboygan Co., 1 ♂, 27 June [Coll. R. L. Fischer]; MINNESOTA: Kittson Co., 1 ♀, Lancaster, 26 Aug. [Minn.]; MANITOBA: 1 ♀, Aweme, 4 Sept. [CNC]; 1 ♂, Treesbank, 18 Aug. [CNC]; ALBERTA: 3 ♀♀, 2 ♂♂, Medicine Hat, July-Aug. [CNC]; 1 ♀, Kipp, 9 Sept. [CNC]; BRITISH COLUMBIA: 2 ♀♀, Creston, 10 Sept. [CNC]; 1 ♂, Victoria, 25 June [CNC]; CALIFORNIA: San Diego Co., 1 ♀, Coronado Beach, Apr. [CAS]; ARIZONA: Santa Cruz Co., 1 ♂, Nogales, 30 Aug. [CU]; MEXICO: Chihuahua, 1 ♀, 16 mi. SE of Chihuahua, 11 July [AMNH]; TEXAS: Presidio Co., 2 ♀♀, 2 ♂♂, Marfa, 18-27 July [HEE]; Lee Co., 1 ♀, 1 ♂, Fedor, Apr. [MCZ]; ARKANSAS: Logan Co., 1 ♀, Mt. Magazine, 10 June [HEE]; KENTUCKY: Edmonson Co., 1 ♂, 8 June [HEE]; GEORGIA: Macon Co., 1 ♂, Oglethorpe, 31 July [CU].

11. *Anoplius (Pompilinus) clystera* (Banks) new combination

(Pl. XV, fig. 96; pl. XIX, fig. 134.)

*Pompiloides clystera* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 302. [Type: ♂; Stanford Univ., Calif.; M.C.Z. no. 13,675.]—Banks, 1919, Bull. Mus. Comp. Zool., 63: 235, 236.

*Psammochares (Pompiloides) clystera* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.

*Pompilinus clystera* Dreisbach, 1949, Ent. Amer., (n. s.) 29: 27, 38, 42, pl. III, fig. 14, pl. V, fig. 22.

The female *clystera* is very similar to *insolcus*, differing principally by the narrower front. The male is clearly distinguishable from several other species only by the genitalia: the parameres are slightly curved, not wider just below the apex than about half-way out, the apex itself acute; the digiti are closely set with hairs of moderate length which are angled near their apices, except on the outer margin near the apex, where there are a number of long, straight setae (Fig. 96). The median line of the subgenital plate is strongly elevated; this is helpful in identifying California specimens, but further east a number of other species also possess this character.

FEMALE.—Length 10 (7-13) mm. Color black; fore wings moderately to heavily infuscated, usually darker along the outer margin, often violaceous; hind wings subhyaline to moderately infuscated. Pubescence fusco-violaceous, a little paler on the coxae, on the abdomen often bluish-refulgent. Erect hairs of the same abundance and distribution as in the preceding species.

Clypeus about 2.5 times as broad as high, its apical margin truncate or a little concave. Front narrow, the middle interocular distance varying from .53 to .56 (the average about .55) times the transfacial distance. Inner orbits converging slightly above, the upper interocular distance from .8 to .95 times the lower. Ocelli in about a right triangle, the postocellar line slightly greater than the ocello-ocular. Antennae elongate, the first four segments in a ratio of about 6:2:8:7, segment 3 equal to from .70 to .90 times the upper interocular distance. Vertex, in anterior view, scarcely elevated above the eye-tops.

Posterior margin of pronotum broadly angulate or subangulate. Propodeum of moderate length, its median line impressed in front, posteriorly with a rather distinct flattened, oblique declivity. Spines of the tarsal comb about as long as the width of the tarsus; basitarsus with 3 comb-spines. Wing venation in no way distinctive; second submarginal cell usually but not always broader than high; third submarginal cell nearly always petiolate.

MALE.—Length 8.5 (6-11) mm. Color black; wings varying from hyaline with a fuscous outer marginal band to almost wholly fuscous, violaceous. Pubescence varying from wholly fusco-violaceous, reflecting bluish (California specimens especially), to mostly silvery (Texas and Colorado specimens especially). Clypeus, front, vertex, temples, and prothorax with a few hairs, the body otherwise without noticeable erect hairs.

Clypeus 2 to 2.3 times as broad as high, its apical margin truncate. Front of variable breadth, the middle interocular distance from .58 to .64 times the transfacial distance. Upper interocular distance subequal to or slightly greater than the lower. Ocelli prominent, in about a right triangle, the post-ocellar line greater than the ocello-ocular as 5 is to 4. First four antennal segments in a ratio of about 5:2:5:5, segment 3 about 2.5 times as long as its greatest thickness. Posterior pronotal margin varying from subarcuate to angulate. Propodeum with the median line slightly impressed or not; slope very low in front, suddenly precipitous behind.

Abdomen slender, smooth, cylindrical. Sternite 6 with a narrow, slit-like emargination posteriorly. Subgenital plate (Fig. 134) of moderate breadth, the sides arcuately approaching to the apex, which is somewhat pointed; median line strongly elevated; sides of the plate mostly unpigmented, but covered with small setae. Genitalia (Fig. 96) with the parameres large, slightly curved, the squamae prominent; parameres broadened gradually to about the middle, then about the same width nearly to the apex, which tapers to a subacute point; the outer margin is strongly setose, and the ventral surface more or less covered with small setae, including some along the inner margin. Base of the volsella with a group of small setae; digitus gradually broadened to near the apex, where the outer margin is abruptly arched, the inner forming an angulation; disc of the digitus clothed rather heavily with short hairs which are angled at their apices, on the outer margin with several long, straight hairs. Parapenials slender, slightly curved apically; aedeagus slender, with an apical expansion which is obliquely truncate on each side.

*Biology*.—This species has been taken on *Eriogonum*, *Solidago*, *Cleome serrulata*, *Bifora americana*, *Asclepias*, *Solanum*, *Verbesina*, *Tamarix*, *Conium maculatum*, and *Chaerophyllum teinturieri*. Dates of capture cover the period from April to October.

*Distribution*.—This is an Austral species inhabiting the western United States, ranging from southern California and eastern Texas to Kansas, Colorado, and north-central California.

*Specimens seen*: 113 (70 ♀♀, 43 ♂♂). The following localities appear to be marginal: TEXAS: Kleburg Co., 1 ♂, Riviera Beach, 18 June [HEE]; Dallas Co., 2 ♀♀, Apr., Oct. [USNM, Minn.]; KANSAS: Reno Co., 4 ♀♀, Arkansas River, 18 June [HEE, KSC]; Riley Co., 1 ♂, Manhattan, 25 June [HEE]; COLORADO: Larimer Co., 4 ♀♀, Poudre Canyon, 5200

feet, 26 July [HEE]; CALIFORNIA: San Francisco, 2 ♀♀, Lone Mt., 1-4 July [CAS]; San Diego Co., 2 ♀♀ [CAS]; Riverside Co., 1 ♀, 1 ♂, Blythe, 23 June [CIS]; ARIZONA: Santa Cruz Co., 1 ♂, Ruby, 27 July [UK]; NEW MEXICO: Otero Co., 1 ♂, Alamogordo, 26 June [UK]; TEXAS: Presidio Co., 2 ♂♂, Presidio, May [USNM].

12a. *Anoplius (Pompilinus) rectangularis rectangularis* (Dreisbach)  
new combination (Pl. XV, fig. 100; pl. XIX, fig. 131.)

*Pompilinus rectangularis* Dreisbach, 1949, Ent. Amer., (n. s.) 29: 18-20, 33, 46, figs. 34 and 35. [Type: ♂: Falls Church, Va., 11 July (N. Banks); M.C.Z.]

This is the first of two species, known from males only, in which the subgenital plate is very broad, the median line elevated, the apex acute, and the broad side-pieces unpigmented and wholly devoid of even minute setulae; in both species the parameres are gradually broadened nearly to the apex, then suddenly narrowed, and the digiti are attenuate apically and for the most part lacking the long setae on the upper, outer margin characteristic of most species of this subgenus. This form is best recognized by the prominent setae along the inner margin of the parameres ventrally.

FEMALE.—Unknown, or at least not separable at present from certain other species of this subgenus.

MALE.—Length 7.5 (5.5-9.5) mm. Color black; wings subhyaline, the outer margin of the fore wing and apex of the hind wing with a broad brownish band. Pubescence very fine, over most of the head, thorax, and propodeum more or less silvery. Front, vertex, and anterior coxae with a few dark hairs, the body otherwise devoid of erect hairs.

Clypeus about 2.2 times as broad as high, its apical margin truncate. Front of moderate breadth, the middle interocular distance varying from .58 to .63 times the transfacial. Inner orbits subparallel or diverging slightly above. Ocelli forming a right or acute angle in front, the post-ocellar line equal to or slightly greater than the ocello-ocular line. Antennae very slender, the first four segments in a ratio of about 3:1:3:3, or segment 3 relatively slightly longer, this segment more than 3 times as long as its maximum thickness. Pronotum of moderate length, the posterior margin angulate, sometimes rather indistinctly so. Propodeum with the median line impressed, the surface nearly flat in front, obliquely declivous on its posterior fourth. Third submarginal cell of the fore wing petiolate.

Abdomen slender, cylindrical; sternite 6 with the emargination narrow, slit-like. Subgenital plate (Fig. 131) broad, the sides rounded to the apex, which is slightly, acutely produced; median line distinctly elevated, pigmented, and somewhat setose, but the broad side-pieces hyaline and devoid

of even minute setulae. Genitalia (Fig. 100) with the parameres gradually broadened nearly to the apex, then obliquely subtruncate, longer along the inner than the outer margin; squamae not prominent; ventral surface more or less setose, including a series of rather long setae near the inner margin. Basis volsellaris with a group of small setae; digitus gradually widened to a point about two-thirds of the way out, thereafter attenuate, the apex acute; ventral surface of the digitus clothed with short setae which are angled at their apices, these setae gradually shorter in length toward the apex. Parapenials slender, slightly curved; aedeagus rather slender, expanded apically, the expansions obliquely truncate on each side.

*Biology*.—This species occurs in sandy places, where it may be found flying rapidly and erratically over the sand, in association with such species as *A. (P.) marginatus*, *A. (P.) subcylindricus*, and *Evaetes parvus*. It is not known to visit flowers, but has been taken on honeydew.

*Distribution*.—This form is widely distributed in the Upper Austral and Transition zones, from Massachusetts, Ontario, Michigan, and Minnesota to Colorado, Kansas, Ohio, and North Carolina.

*Specimens seen*: 36 ♂♂. The following records appear to be marginal: MASSACHUSETTS: Suffolk Co., 1 ♂, Boston, Aug. [CAS]; VERMONT: Windsor Co., 1 ♂, Woodstock [MCZ]; NEW YORK: Tompkins Co., 16 ♂♂, Ithaca, 14 June-10 Aug. [HEE, CU, ANSP, USNM]; ONTARIO: 1 ♂, Toronto, 1 Aug. [CNC]; MICHIGAN: Otsego Co. (recorded by Dreisbach, 1949); MINNESOTA: Chisago Co., 1 ♂, 16 July [Minn.]; IOWA: Woodbury Co., 1 ♂, Sioux City, 26 June [USNM]; COLORADO: Yuma Co., 1 ♂, Wray, 17-19 Aug. [AMNH]; KANSAS: Atchison Co. (recorded by Dreisbach, 1949); OHIO: Franklin Co., 2 ♂♂, 3 July [RWS]; NORTH CAROLINA: Buncombe Co., 1 ♂, Black Mt., 25 Aug. [AMNH]; VIRGINIA: Fairfax Co., 1 ♂, Falls Church, 11 July [MCZ].

12b. *Anoplius (Pompilinus) rectangularis gillaspyi* new subspecies  
(Pl. XV, fig. 101.)

*Anoplius (Pompilinus) splendens* Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 264. [Based on specimens misidentified by H. E. Evans.]

This form is extremely similar to typical *rectangularis*, but exhibits minor (though constant) genitalic differences and occurs south of the range of that form.

FEMALE.—Unknown.

MALE (Holotype).—Length 7 mm.; fore wing 5 mm. Color black; wings subhyaline, darker apically; head and thorax extensively silvery-sericeous.



Postocellar line: ocello-ocular line about as 4:3. Angulation of posterior pronotal margin broad but distinct. Abdomen cylindrical; subgenital plate as described and figured under the nominate subspecies.

Genitalia (Fig. 101) with the parameres curved slightly, rather long, but not surpassing the other appendages as much as in *rectangularis rectangularis*; apex of parameres more or less truncate, the parameres about as long along the outer margin as the inner. Digits slender, elongate, clothed with setae which become shorter apically; apex obliquely truncate, the tip subacute, but less attenuate than in the typical subspecies.

Fifteen male paratypes vary in length from 6.5 to 9.5 mm. and compare very closely with the type.

*Distribution*.—Austro-riparian fauna, from eastern Texas to coastal North Carolina.

*Holotype*.—TEXAS: Bastrop Co., ♂, 27 April 1935 (J. E. Gilaspay) [ANSP].

*Paratypes*.—TEXAS: Lee Co., 1 ♂, Fedor, 7 July 1946 (H. E. Evans) [HEE]; NORTH CAROLINA: Dare Co., 14 ♂♂, Kill Devil Hills, in woods, 28 May-16 July 1948-50 (K. V. Krombein) [KVK, USNM].

13a. *Anoplius (Pompilinus) stenotus stenotus* (Banks) new combination  
(Pl. XV, fig. 98; pl. XIX, fig. 132.)

*Pompiloides stenotus* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 302. [Type: ♂: Bradentown, Fla., March (VanDuzee); M.C.Z. no. 13,674.]

*Psammochares (Pompiloides) stenotus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.

*Pompilinus stenotus* Dreisbach, 1949, Ent. Amer., (n. s.) 29: 33, 50, pl. IX, figs. 45 and 46.

This species is clearly distinguishable from the preceding only on genitalic characters. The parameres are devoid of setae over most of the ventral surface, and lack the strong setae along the inner margin characteristic of *rectangularis*; the digits are similar in shape but the upper outer margin is more arcuate.

FEMALE.—Unknown.

MALE.—Length 7 (6.5-8) mm. Color black; wings subhyaline or lightly infuscated, the outer margins with a broad fuscous band. Pubescence conspicuously silvery over the greater part of the head, thorax, coxae, and propodeum. Front and vertex with scattered dark hairs; temples and propleura with pale hair; front coxae and pronotum very slightly hairy; body otherwise practically devoid of erect hairs.

Clypeus about twice as broad as high, truncate below. Front of moderate breadth, the middle interocular distance varying from .56 to .63 times the transfacial distance. Upper interocular distance subequal to or a little greater than the lower. Ocelli prominent, in about a right triangle, the postocellar line equal to or a little greater than the ocello-ocular. Antennae slender, the first four segments in a ratio of about 14:5:14:14, segment 3 nearly three times as long as its greatest thickness. Posterior pronotal margin angulate or subangulate. Median line of propodeum lightly impressed. Third submarginal cell of the fore wing petiolate.

Abdomen smooth and slender, the 6th sternite with a slitlike posterior emargination. Subgenital plate (Fig. 132) broad, the median line somewhat elevated, pigmented, and setose (more so than in *rectangularis*), the sides hyaline and without even minute setulae. Genitalia (Fig. 98) with the parameres straight, gradually broadened to the apex, which is obliquely truncate, the inner margin of the paramere exceeding the outer; ventral surface devoid of setae except for those along the outer margin and apex, and a few along the inner margin just above the squamae. Basis volsellaris with only some minute setae. Digits elongate, spindle-shaped, clothed with setae which are angled at their apices, except for a few straight ones at the upper, outer margin. Parapenials slender, slightly curved; aedoeagus slightly expanded apically, the expansion obliquely truncate on each side.

*Distribution.*—This form is known only from a few localities in Florida and southern Alabama.

*Specimens seen:* 8 ♂♂. FLORIDA: Dade Co., 1 ♂, Biscayne Bay (Mrs. Slosson) [AMNH]; Manatee Co., 2 ♂♂, Bradentown, March (VanDuzee) [MCZ]; Dry Tortugas, 1 ♂, Loggerhead Key, Aug. 1936 (H. H. Plough) [CU]; ALABAMA: Clarke Co., 2 ♂♂, Thomasville, 11 June 1917 [MCZ]; Washington Co., 2 ♂♂, Leroy, 11 June 1917 [MCZ].

13b. *Anoplius (Pompilinus) stenotus bequaerti* (Dreisbach) new combination (Pl. XV, fig. 99.)

*Pompilinus bequaerti* Dreisbach, 1949, Ent. Amer., (n.s.) 29: 16-17, 33, 44, 48, pl. VI, fig. 32, pl. VIII, fig. 42. [Type: ♂; Meredosia, Ill., 11-19 Nov. 1913, sand pit; Ill. Nat. Hist. Survey (not seen by present author).]

This is a more widely distributed form than *stenotus stenotus*, from which it differs slightly in the shape of the parameres and in having a short but easily observed carina near the apex of the volsellar digitus. I am inclined to consider these differences of only subspecific value at present, although a final decision on such a matter can scarcely be made from so little material of only one sex.

FEMALE.—Unknown.

MALE.—Length 7 (5-10) mm. Color black; pubescence silvery over the greater part of the head, thorax, and propodeum. Body devoid of erect hairs except for a few inconspicuous ones on the front, vertex, pronotum, and front coxae. Wings nearly hyaline, the outer margins with a broad band of fuscous.

Morphological features as described under the nominate subspecies, except for the following differences in the genitalia. The parameres tend to be a little longer along the outer margin than the inner, and the apex is usually somewhat rounded; the ventral surface is without setae except for a very few on the inner margin just above the squamae. Digits spindle-shaped, clothed with setae which are angled at their apices, except on the apical one-half to one-third, where they are reduced; on the outer side just below the apex is a small carina which parallels the margin for a short distance. The straight setae which are present on the upper, outer margin of the digitus of *stenotus stenotus* are mostly absent in this subspecies. (Fig. 99.)

*Biology*.—This form occurs, like many of its congeners, in sand pits and dunes. It has been taken also on the flowers of *Solidago*, *Baccharis*, and *Bifora*.

*Distribution*.—Austro-riparian and Carolinian faunas, from Texas and Florida to Alberta, Minnesota, Michigan, and North Carolina. There are no records from east of the Appalachians north of the Carolinas.

*Specimens seen*: 20 ♂♂. TEXAS: Brazos Co., 4 ♂♂, Apr., Oct. [JEG, MCZ, USNM]; Williamson Co., 1 ♂, 5 Oct. [JEG]; KANSAS: Riley Co., 1 ♂, Manhattan, 4 June [HEE]; ALBERTA: 1 ♂, Medicine Hat, 17 July [CNC]; MINNESOTA: Anoka Co., 7 ♂♂, Fridley San Dunes, 3 June-3 Aug. [Minn., HEE]; Hennepin Co., 1 ♂, 6 June [CU]; ILLINOIS: Mason Co., 1 ♂, Devil's Hole, Havana, 18 Aug. [AMNH]; MICHIGAN: Huron Co. (recorded by Dreisbach, 1949); NORTH CAROLINA: Moore Co., 1 ♂, So. Pines, 26 June [MCZ]; FLORIDA: Hillsboro Co., 1 ♂, 8 Feb. [USNM]; Palm Beach Co., 2 ♂♂, Lake Worth [AMNH].

14. *Anoplius (Pompilinus) townesi* new species (Pl. XVI, fig. 102.)

*Pompilinus reductus* Dreisbach, 1949, Ent. Amer., (n. s.) 29: 25-27, 33, 44, pl. VI, figs. 28 and 29. [Nec Banks, 1914.]

This form was associated tentatively with Banks' *reductus* by Dreisbach (1949). I consider the latter a synonym of *marginatus* Say, and must therefore provide a name for the males considered here. It is likely that the female of *townesi* is marked with red

and is at present being confused with what is here called *margi-natus*, but there seems to be no reason at present for associating it specifically with *reductus*. The answer to this and to similar dilemmas in this subgenus will be found, I suspect, not by further ponderings over long processions of pinned specimens, but by field observations directed toward accurately associating the sexes and defining the distinctive behavior-patterns of the various species.

FEMALE.—Unknown.

MALE (Holotype).—Length 7.5 mm.; fore wing 5.5 mm. Color black, the basal two-thirds of the second abdominal tergite dorsally brownish-orange. Wings subhyaline, the veins brownish, the outer margin with a brownish band. Pubescence very fine, silvery on the clypeus, lower front, temples, pronotum, coxae, mesopleura, and propodeum, elsewhere brownish-cinereous. Front, vertex, temples, propleura, pronotum, and front coxae with a very few dark hairs, the body otherwise without noticeable erect hairs.

Clypeus twice as broad as high, its apical margin truncate. Middle interocular distance .61 times the transfacial; upper interocular distance 1.05 times the lower. Ocelli forming a right angle in front; postocellar and ocello-ocular lines about equal. First four antennal segments in a ratio of about 14:6:16:15, segment 3 about 3 times as long as thick. Pronotum broadly angulate behind. Median line of propodeum very lightly impressed. Fore wing with the second submarginal cell about as broad as high; third submarginal cell petiolate.

Abdomen smooth, slender, cylindrical. Emargination of sternite 6 narrowly U-shaped. Subgenital plate with the median line elevated rather strongly, the entire plate clothed with setulae (very similar to that of *clystera*, shown in Fig. 134). Genitalia (Fig. 102) with the parameres gradually expanded to a point about two-thirds the way out, then of about the same width nearly to the apex, where they are obliquely truncate, longer along the inner margin than the outer; ventral surface of parameres wholly covered with small setae. Volsellar basis with a group of very minute setae; digitus elongate, somewhat fusiform, the disc clothed with short hairs which are angled at their apices, the upper, outer margin with several long, straight setae. Parapenials slender, slightly curved; aedoeagus slender, slightly expanded apically.

Thirty-four male paratypes vary in length from 6.5 to 9 mm. In only one of the paratypes are there red markings on the second abdominal tergite as in the type, all the others being entirely black. In some specimens the third antennal segment is not perceptibly longer than the first or fourth; the middle interocular distance varies from .58 to .64 times the transfacial distance; the upper and lower interocular distances are in most cases about equal.

*Biology*.—I have taken this species on the flowers of *Daucus carota* and *Pastinaca sativa* (Umbelliferae). It occurs in woodlands as well as open places and does not seem to be as strictly psammophilous as many of its congeners.

*Distribution*.—This species is chiefly characteristic of the Alleghanian fauna of the eastern United States, ranging from New Hampshire, Quebec, Ontario, Michigan, and Manitoba south in the Appalachians to Georgia.

*Holotype*.—NEW YORK: Chautauqua Co., ♂, Bemus Point, 15 July 1937, on wild parsnip flowers at dusk (H. K. Townes) [ANSP].

*Paratypes*.—NEW YORK: Essex Co., 1 ♂, Keene Valley, 16 July [AMNH]; Tompkins Co., 1 ♂, Enfield Glen, 29 July [HEE]; 5 ♂♂, Ithaca, May-July [CU, HEE]; CONNECTICUT: Middlesex Co., 1 ♂, East Haddam, 25 Aug. [HEE]; MASSACHUSETTS: Middlesex Co., 1 ♂, Melrose Highlands, 28 June [CAS]; Suffolk Co., 1 ♂, Boston, 30 Aug. [CAS]; NEW HAMPSHIRE: Cheshire Co., 2 ♂♂, Nelson, 15 Aug. [USNM]; Rockingham Co., 1 ♂, Hampton [USNM]; VERMONT: Rutland Co., 1 ♂, 15 Aug. [MCZ]; QUEBEC: 1 ♂, Aylmer, 17 July [CNC]; 1 ♂, Hemmingford, 24 June [CNC]; 2 ♂♂, Kazabazua, 8 July, 4 Aug. [CNC]; 1 ♂, Knowlton, 24 July [CNC]; 5 ♂♂, Val Morin, 20-30 July [CU]; ONTARIO: 2 ♂♂, Ottawa, 26 June, 31 July [CNC]; 1 ♂, Toronto, 15 July [CNC]; MANITOBA: 1 ♂, Aweme, 3 July [CNC]; MINNESOTA: Ramsey Co., 1 ♂ [Minn.]; PENNSYLVANIA: Philadelphia, 2 ♂♂ [CU]; DISTRICT OF COLUMBIA: 1 ♂, Washington, 6 Sept. [MSV]; GEORGIA: Fulton Co., 1 ♂, Pine Park, 17 March [HEE]. No locality data: 1 ♂ [CU].

Dreisbach (1949, p. 26) gives a considerable number of Michigan records for this species (under the name *reductus*).

#### 15. *Anoplus (Pompilinus) marginatus* (Say)

(Pl. XV, fig. 97; pl. XXI, figs. 151, 153; pl. XXII, figs. 161, 165.)

*Pompilus marginatus* Say, 1824, Narr. Exp. St. Peter's River, II, p. 333. [Type: ♀; "Northwest Territory and Missouri"; (no longer extant).]—F. Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 160.—Cresson, 1865, Proc. Ent. Soc. Phila., 4: 454. [Colo.]—Cresson, 1867, Trans. Amer. Ent. Soc. 1: 98. [Many localities.]—Cresson, 1868, Trans. Amer. Ent.

- Soc., 1: 378. [N. Mex.]—Cresson, 1872, Trans. Amer. Ent. Soc., 4: 203. [Texas.]—Provancher, 1882, Nat. Canad., 13: 35, 40. [Que.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 300.—Peckham and Peckham, 1898, Wisc. Geol. Nat. Hist. Survey, Bull. 2, pp. 144-152. [Biology.]—Hancock, 1899, Ent. News, 10: 29. [Biology.]—Hartman, 1905, Bull. Univ. Texas, no. 65, pp. 52-54. [Biology.]
- Pompilus petiolatus* Say, 1835, Boston Jour. Nat. Hist., 1: 305. [Type: ♀; "Indiana"; (no longer extant).] [Vcc Van der Linden, 1827.]—F. Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 160.—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 98. [Placed in synonymy with *marginatus*.] [?] *Pompilus cylindricus* Provancher, 1882, Nat. Canad., 13: 35, 39.
- Entypus marginatus* Howard, 1901, The Insect Book, pl. XI, fig. 14.
- [not] *Anoplus (Pompilinus) marginatus* Viereck, 1902, Proc. Acad. Nat. Sci. Phila., 54: 735. [San Pedro, Calif.]
- [?] *Anoplus (Entypus) marginatus* Viereck, 1906, Trans. Amer. Ent. Soc., 32: 223, 232, 239. [Ariz., N. Mex., Texas.]
- Anoplus marginatus* J. Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.
- [?] *Anoplus cylindricus* J. Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.
- Pompiloides marginatus* Banks, 1912, Ent. News, 23: 108. [Va.]—Rohwer, 1916, Conn. Geol. Nat. Hist. Survey Bull. 22, pp. 631, 632. [Conn.]—Rau and Rau, 1918, Wasp Studies Afield, pp. 58-63. [Biology.]—Robertson, 1928, Trans. Acad. Sci. St. Louis, 25: 307, 308, 317. [Fla.]—Procter, 1938, Biol. Survey Mt. Desert Reg., VI, Insecta, p. 430. [Me.]
- Pompiloides reducta* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 302. [Type: ♀; Falls Church, Va., 23 June (N. Banks); M.C.Z. no. 13,670.] New synonymy.
- Psammochares (Pompiloides) marginatus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 987.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 124, 125. [N. C.]—Brimley, 1938, Insects No. Carolina, p. 433.
- Psammochares (Pompiloides) reducta* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 987.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 124, 126.—Brimley, 1938, Insects No. Carolina, p. 433.
- Pompiloides hageni* Banks, 1919, Bull. Mus. Comp. Zool., 63: 235. [Type: ♀; Weeksville, Mont., 2 Aug. 1882; M.C.Z. no. 10,400.] New synonymy.
- [?] *Psammochares (Pompiloides) cylindricus* Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 987.
- Pompilinus marginatus* Strickland, 1947, Canad. Ent., 79: 125. [Medicine Hat, Alta.]—Dreisbach, 1949, Ent. Amer., (n. s.) 29: 29-30, 48, pl. VIII, figs. 38 and 39.

*Anoplus (Pompilinus) marginatus* Evans, 1948, Ent. News, 59: 183-184.  
[Biology.]—Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 264.  
[Kill Devil Hills, N. C.]

As the long list of references suggests, *marginatus* is one of the commonest pompilids over much of North America east of the Rockies. However, since a number of other species have in the past been confused with *marginatus*, it is not possible to assert definitely that all the above references actually pertain to this species. Indeed, it is possible that the females of more than one species are still being confused under this name. The male is fortunately not only distinct genitally, but possesses an excellent external character which separates it at once from all its congeners: along the inside of the hind basitarsus for its entire length is a series of short erect hairs (Fig. 165).

FEMALE.—Length 10 (5.5-13) mm. Color black, the abdomen marked with orange-brown over most of the second tergite and frequently over most of the first tergite, rarely over the base of the third tergite and part of the basal sternites. Wings lightly to rather heavily infuscated, with a darker marginal band. Pubescence brownish, rarely a bit silvery on the lower front and clypeus. Front and vertex with a few erect hairs; front coxae slightly hairy, pro- and mesonota and scutellum often a bit so; propodeum without erect hairs.

Clypeus about 2.5 times as broad as high, truncate below. Front of moderate breadth, the middle interocular distance varying from .53 to .59 times the transfacial distance. Inner orbits converging somewhat above, the upper interocular distance from .78 to .88 times the lower. Ocellar triangle varying from acute to obtuse, the postocellar line often slightly greater than the ocello-ocular. Antennae of rather variable length, the first four segments in a ratio of about 7:2:9:8, segment three sometimes slightly longer than 1 plus 2, equal to from .7 to 1.0 times the upper interocular distance; outer antennal segments somewhat variable in length, sometimes as long as in *splendens*, sometimes as short as in *cylindricus*.

Pronotum with the anterior slope low and even, the posterior margin broadly angulate. Propodeum rather short (Fig. 161), the dorsum strongly arched, in full dorsal view about 1.3 times as broad as long; declivity rather large, oblique, fairly well defined. Spines of the tarsal comb not or scarcely longer than the thickness of the tarsus; basitarsus with 3 comb-spines. Fore wing with the marginal cell about 1.5 times its own length from the wing-tip; third submarginal cell usually petiolate (Fig. 153).

MALE.—Length 7.5 (4.5-10) mm. Color black, the second abdominal tergite occasionally and the adjacent tergites and sternites infrequently marked with orange. (Specimens from the southern parts of the range tend

to be more extensively marked with orange than those from the North.) Wings nearly hyaline, the outer margins with a light brownish band. Pubescence silvery over the greater part of the head, thorax, and propodeum. Front, vertex, pronotum, and front coxae a bit hairy; temples and propleura with some fine hair; body otherwise devoid of erect hair.

Clypeus from 2 to 2.2 times as broad as high. Middle interocular distance varying from .55 to .64 times the transfacial distance. Inner orbits nearly parallel; ocelli in approximately a right triangle, the postocellar line equal to or a little greater than the ocello-ocular. First four antennal segments in a ratio of about 5:2:5:5, segment 3 between 2.5 and 3 times as long as its greatest thickness. Posterior pronotal margin angulate, sometimes not distinctly so. Propodeum strongly declivous on its posterior fourth (Fig. 151), its median line feebly if at all impressed. Hind basitarsus with short erect hairs along the inner side for its entire length (Fig. 165). Venation like that of related species and in no way distinctive.

Abdomen slender and smooth; sternite 6 with a U-shaped emargination. Subgenital plate rather broad, the median line distinctly elevated, the sides broadly rounded and the apex subacute; disc entirely clothed with small setae except basally. Genitalia (Fig. 97) with the parameres of approximately the same width throughout most of their length, the ventral surface clothed with small setae, the outer margin with a series of rather long setae. Basis volsellaris with a group of minute setae; digitus subspatulate, the extreme apex somewhat pointed, the disc clothed sparsely with setae which are angled at their apices, the upper, outer margin with several long setae which are also angled at their apices. Parapenials slender, curved but slightly; aedoeagus expanded only slightly apically.

*Gyndromorph*.—A gynandromorph collected by the author in a sand-pit at Ithaca, N. Y., is 6.5 mm. long and wholly black. The head is completely female in its characters; the prothorax is essentially female, the front tarsus possessing a tarsal comb, the last tarsal segment having a row of spines beneath, and the pulvillar comb of this tarsus being well developed. The pronotum, however, is silvery-sericeous and more of the shape of the male. The remainder of the thorax is male; the middle and hind legs are weakly spinose, the apical tarsal segments are without spines beneath, and the pulvillar comb of these legs is weakly developed. The propodeum and abdomen are also wholly male, and the genitalia entirely normal in appearance.

*Biology*.—This species is probably most characteristic of small sand pits, gardens, and open, sandy woodlands, although it occurs in a wide variety of habitats. The prey consists of spiders belonging to at least seven different families and exhibiting many different modes of life, and the species is even known to take phalangids occasionally (Evans, 1948). The prey is dragged over the ground by the wasp walking backward; occasionally it will fly backward



for a few feet with its prey (Peckham and Peckham, 1898). The Raus (1918) observed it carrying its prey with ease up an overhanging earthen bank. The wasp has the habit of hiding its prey under foliage or clods of earth while the nest is being constructed. For further description of its habits, the reader is referred to the vivid accounts by the Peckhams (1898) and the Raus (1918), as well as to shorter accounts by Hancock (1899), Hartman (1905), and Evans (1948).

The male *marginatus* does not appear to visit flowers, but is usually found flying erratically close to the ground in sandy areas. The female, however, is a frequent visitor to flowers, and has been taken on *Daucus carota*, *Pastinaca sativa*, *Conium maculatum*, *Ceanothus americanus*, *Spiraea latifolia*, *Cleome serrulata*, *Melilotus alba*, *Solidago*, *Eupatorium*, and *Polytaenia*. The flight period is from June to September in the northern parts of the range, from March to November in the South.

*Distribution*.—Temperate North America east of the Rockies, from Florida, Texas, and Arizona to Nova Scotia, Quebec, Ontario, Northwest Territories, and Alberta (with a single record from British Columbia). In the northeastern United States it is probably the commonest species of Pompilidae, though farther west and south it is less abundant.

*Specimens seen*: 1078 (856 ♀♀, 221 ♂♂, 1 gynandromorph). The following records are from the margins of the range: NOVA SCOTIA: 1 ♀, Digby, 21 Aug. [CU]; PRINCE EDWARD ISLAND: 3 ♀♀, 3 ♂♂, Canad. Nat. Park, July-Aug. [CNC]; QUEBEC: 1 ♀, 1 ♂, Kazabazua, 9 Aug. [CNC]; ONTARIO: 1 ♀, Bobcaygeon, 9 July [CNC]; MICHIGAN: Emmett Co., 1 ♀, July [MCZ]; MINNESOTA: Clearwater Co., 5 ♀♀, July-Aug. [Minn.]; MANITOBA: 7 ♀♀, Aweme, June-Sept. [CNC]; SASKATCHEWAN: 1 ♂, Codette, 5 July [CNC]; NORTHWEST TERRITORIES: 1 ♀, Fort Norman, 15 Aug. [CNC]; ALBERTA: 1 ♀, Tilley, 25 Aug. [Alta.]; BRITISH COLUMBIA: 1 ♀, Buccaneer Bay, 20 July [CNC]; MONTANA: 3 ♀♀, 12 ♂♂ (no further data) [ANSP]; UTAH: Utah Co., 1 ♀, Provo Canyon, 15 Sept. [Minn.]; ARIZONA: Coconino Co., 1 ♀, Flagstaff, 27 Aug. [CAS]; NEW MEXICO: Otero Co., 1 ♀, Sixteen Springs Canyon, Sacramento Mts., 26 July [HEE]; TEXAS: Webb Co., 1 ♀, Iaredo, 24 Sept. [JEG]; Montgomery Co., 1 ♀, 1 ♂, Willis, 14 Apr., 11 June [USNM]; LOUISIANA: Cameron Co., 1 ♀, 17 June [UK]; ALABAMA: Mobile Co., 3 ♀♀, 18-19 Oct. [CAS]; FLORIDA: Lee Co., 1 ♀, Punta Rassa, 12 May [CU].

16. **Anoplius (Pompilinus) splendens** (Dreisbach) new combination  
(Pl. XVI, fig. 103; pl. XIX, fig. 133; pl. XXII, fig. 162.)

*Pompilinus splendens* Dreisbach, 1949, Ent. Amer., (n. s.) 29: 20-21, 31, 52, figs. 53 and 54. [Type: ♂; Morton Co., Kansas, 2800 feet, 5 Aug. 1911 (F. X. Williams); Univ. Kansas.]<sup>13</sup>

*Pompilinus pseudoreductus* Dreisbach, 1949, Ent. Amer., (n. s.) 29: 21-23, 31, 44, figs. 30 and 31. [Type: ♂; Muskegon, Mich., 6 Aug. 1945 (R. R. Dreisbach); M.C.Z.] New synonymy.

[?] *Pompilinus ohioensis* Dreisbach, 1949, Ent. Amer., (n. s.) 29: 24-25, 32, 44, 54, figs. 33 and 57. [Type: ♂; Pickaway Co., Ohio, 21 June 1937 (R. R. Dreisbach); M.C.Z.]<sup>14</sup>

This species is closely allied to *marginatus*, with which it has until recently been confused. The male is best recognized by the characteristic genitalia (Fig. 103); the subgenital plate (Fig. 133) is also rather characteristic, although the small tufts of hair on each side near the base (used as a specific character for *pseudoreductus* by Dreisbach) vary in a series of otherwise similar specimens before me from rather strong to entirely absent. What I believe to be the female of this species differs from *marginatus* in the long, low propodeum and the very long and slender antennae.

FEMALE.—Length 11 (7.5-14.5) mm. Color black, the first two abdominal tergites for the most part pale brownish-yellow, approaching orange. Wings lightly to rather heavily infuscated, with a darker marginal band. Pubescence brownish, occasionally silvery on parts of the head and thorax. Front and vertex with a few dark hairs; pronotum and front coxae slightly hairy; propodeum not at all hairy.

Clypeus about 2.5 times as broad as high, its apical margin truncate. Front rather narrow, the middle interocular distance varying from .51 to .56 times the transfacial distance. Inner orbits convergent above, the upper interocular distance about .85 times the lower. Ocellar triangle a little forward of a line drawn between the tops of the eyes, the front angle acute; postocellar line equal to or greater than the ocello-ocular. Antennae long and slender, the first four segments in a ratio of about 15:5:21:18, segment 3 equal to from .8 to 1.0 times the upper interocular distance; outer

<sup>13</sup> At this writing, the type of this species is still in the possession of the describer, and I have not seen it.

<sup>14</sup> This species is known from a single specimen, the genitalia of which are so badly mounted as to render many of the details invisible. Although the subgenital plate is somewhat anomalous, it seems likely that this form falls within the range of variation of *splendens*. The practice of describing a species from a single poorly mounted specimen in so difficult a group as this, is, to say the least, scarcely commendable.

flagellar segments long and slender, all more than three times as long as thick.

Anterior slope of pronotum low and even, the posterior margin angulate. Propodeum (Fig. 162) rather long and slender, in full dorsal view approximately as long as its greatest width, the slope low and gradual, a little steepened behind, but the declivity not well defined. Spines of the tarsal comb about as long as the width of the tarsus; basitarsus with 3 comb-spines. Venation as in *marginatus*.

MALE.—Length 9 (6-11.5) mm. Color black, some specimens (particularly those from the southern parts of the range) marked with orange on some of the basal abdominal segments. Wings subhyaline, with a fuscous outer marginal band. Pubescence silvery over a considerable part of the head, thorax, and propodeum. Front, vertex, and anterior coxae a bit hairy; temples and propleura with considerable fine hair; body otherwise practically devoid of erect hair.

Clypeus twice as broad as high, its apical margin truncate. Front rather narrow, the middle interocular distance varying from .54 to .61 times the transfacial distance. Inner orbits subparallel or slightly convergent above. Ocelli in a right triangle, the postocellar line equal to or slightly greater than the ocello-ocular. Antennae slender, the first four segments in a ratio of about 3:1:3:3, segment 3 about 3 times as long as its greatest thickness. Pronotum angulate behind, not always sharply so. Propodeum with the median line lightly impressed. Hind basitarsus without the fringe of hairs of the preceding species.

Abdomen slender, cylindrical; sternite 6 with a V-shaped emargination apically. Subgenital plate (Fig. 133) with its margins broadly rounded, the apex slightly produced, the median line strongly elevated; the disc is clothed, except basally, with small setae; near the base on each side there is often a small tuft of setae. Genitalia (Fig. 103) with the parameres distinctly curved and expanded on the apical half, the apex itself acute; ventral surface clothed with small setae, a little stronger along the inner margin; outer margin with a series of strong setae. Basis volsellaris with a group of minute setae; digitus elongate, the inner margin nearly straight, the outer arched, the extreme apex acutely pointed; the disc is clothed with mostly straight, rather soft hairs; on the upper, outer margin are several long hairs which are more or less sinuate at their apices. Parapenials curved slightly, a little expanded toward the apex; aedeagus somewhat expanded apically.

*Biology.*—This species inhabits sandy places, gardens, and other open places where the soil is light. I have taken a female along the edge of a corn field at Manhattan, Kansas, with a young spider of the genus *Lycosa* [det. B. J. Kaston], which it had hidden under a clod of earth while it apparently looked for a place to nest. Both sexes visit flowers, and have been taken on *Daucus*

*carota*, *Polytaenia nuttallii*, *Melilotus alba*, *Vicia*, *Solidago*, *Eupatorium*, *Euphorbia marginata*, *Cleome*, and *Lepidium*. It is on the wing during the warmer months of the year, from June to September in the northern parts of the range, April to October in the southern parts.

*Distribution*.—Lower and Upper Austral Zones, from Georgia, Texas, and Arizona to Alberta, Manitoba, Michigan, Ontario, and Maine.

*Specimens seen*: 182 (114 ♀♀, 68 ♂♂). The following records are marginal: MAINE: Penobscot Co., 1 ♀, Orono, 30 Sept. [Minn.]; VERMONT: Caledonia Co., 1 ♂ [CM]; NEW YORK: Essex Co., 1 ♀, New Russia, 18 Aug. [CU]; Nassau Co., 1 ♂, Cold Spring Harbor, 24 July [AMNH]; NEW JERSEY: Burlington Co., 1 ♂, Moorestown, Summer [Minn.]; PENNSYLVANIA: Dauphin Co., 1 ♀, Deodate, 23 Aug. [CU]; Erie Co., 1 ♀, 1 ♂, Presque Isle, 7-8 July [CM]; ONTARIO: 1 ♀, Jordan, 23 Sept. [CNC]; MICHIGAN: Ingham Co., 3 ♀♀, East Lansing, 11-26 July [Coll. R. L. Fischer]; WISCONSIN: Dane Co., 1 ♀, Madison, 11 Sept. [USNM]; MINNESOTA: Ramsey Co., 2 ♀♀, 1 ♂, June-July [Minn.]; MANITOBA: 2 ♀♀, Lyleton, Aug.-Sept. [Minn.]; ALBERTA: 1 ♀, Medicine Hat, 25 Aug. [CNC]; NORTH DAKOTA: Golden Valley Co., 1 ♂, Beach, 22 Aug. [USNM]; SOUTH DAKOTA: Custer Co., 1 ♀, 2 mi. S. of Custer, 24 Aug. [HEE]; COLORADO: Prowers Co., 1 ♂, Lamar, 4-11 June [AMNH]; ARIZONA: Santa Cruz Co., 1 ♂, Sonoita, 27 July [OSC]; Cochise Co., 1 ♀, Huachuca Mts., June [CAS]; TEXAS: Brewster Co., 1 ♀, 25 mi. E. of Marathon, 7 July [HEE]; Bexar Co., 2 ♀♀, 16 June, 1 Oct. [JEG]; Galveston Co., 1 ♂, May [UK]; ALABAMA: Tuscaloosa Co., 1 ♀, 4 Oct. [HEE]; GEORGIA: Fulton Co., 1 ♂, Atlanta, 4 Aug. [HEE]; Chatham Co., 1 ♀, Tybee Island, 26 July [CU].

17. **Anoplius (Pompilus) fraternus** (Banks) new combination

(Pl. XVI, fig. 104; pl. XX, fig. 137.)

*Lophopompilus fraternus* Banks, 1941, *Canad. Ent.*, 73: 120. [Type: ♀; Salt Plains, Cherokee, Okla., 14 June 1935 (C. T. Brues); M.C.Z. no. 25,264.]

*Pompilus doxii* Dreisbach, 1949, *Ent. Amer.*, (n.s.) 29: 12-14, 30, 52, pl. X, figs. 51 and 52. [Type: ♂; Coconut Grove, Fla., 22 May 1937 (R. Dow); M.C.Z.] New synonymy.

Although undoubtedly closely allied to the preceding several species, *fraternus* is endowed with a number of excellent specific characters in both sexes. The clypeus of the female is distinctly emarginate medially and the head, thorax, and propodeum bear numerous erect hairs. The male subgenital plate is unusually

narrow, and the parameres and digiti of the genitalia are quite unlike those of any other species of the subgenus.

**FEMALE.**—Length 10 (7-14) mm. Color black, the upper posterior orbits sometimes with a narrow pale stripe, the greater part of the first two abdominal tergites pale to dark orange-brown; the coloration on tergite 2 is often emarginate behind, that on tergite 1 (rarely absent) emarginate in front. Wings lightly to moderately infuscated, somewhat darker along the outer margin. Pubescence wholly brownish, obscurely violaceous. Clypeus, front, and vertex with scattered erect hairs; front coxae and pronotum distinctly hairy; scutellum and sides of the propodeum with noticeable erect hairs; mesonotum, mesopleura, middle and hind coxae, and first abdominal tergite usually somewhat hairy.

Clypeus from 2.5 to 2.8 times as broad as high, its apical margin distinctly though not sharply emarginate medially. Front of moderate, rather variable breadth, the middle interocular distance varying from .53 to .60 times the transfacial distance. Inner orbits convergent above, the upper interocular distance from .75 to .85 times the lower. Ocelli prominent, in about a right triangle, the postocellar line greater than the ocello-ocular about as 5:4. Antennae elongate, the first four segments in a ratio of roughly 6:2:9:8, segment 3 equal to from .75 to 1.2 times the upper interocular distance (this figure unusually variable).

Posterior margin of pronotum angulate. Propodeum with the median line impressed; slope more steep behind, the declivity not especially well defined. Spines of the tarsal comb about as long as the width of the tarsus; basitarsus with three comb-spines. Marginal cell of the fore wing about 1.3 times its own length from the wing-tip; third submarginal cell triangular, usually petiolate.

**MALE.**—Length 7.5 (5.5-10) mm. Color black, the greater part of the second abdominal tergite and usually the apex of the first tergite orange-brown. Wings subhyaline or lightly infuscated, with a darker marginal band. Pubescence varying from wholly brownish except for a little silvery on the front and clypeus, to almost wholly silvery except for parts of the abdomen and legs. Front and vertex with numerous dark hairs; front coxae and pronotum slightly hairy; remainder of thorax and the propodeum sometimes a bit hairy.

Clypeus twice as broad as high, its apical margin truncate or slightly concave. Middle interocular distance varying from .56 to .63 times the transfacial distance; upper interocular distance subequal to or a little greater or less than the lower. Ocelli prominent, in about a right triangle, the postocellar line generally somewhat greater than the ocello-ocular. Antennae slender, the first four segments in a ratio of about 15:5:16:15, segment 3 about 3 times as long as its greatest thickness. Pronotum angulate behind. Propodeum with the median line weakly impressed, the slope in profile very slight in front, suddenly declivous on the posterior fourth. Venation as in the female, the cells a bit further removed

from the wing margin.

Abdomen slender, cylindrical, sternite 6 with an apical U-shaped emargination. Subgenital plate (Fig. 137) of somewhat variable shape, but always very slender, setose both above and below, the side margins near the base with a prominent series of setae. Genitalia (Fig. 104) with the parameres long, straight, of moderate breadth, a portion along the inner margin for the outer two-thirds, and along the outer margin for the outer third, including the entire apex, lightly pigmented and almost membranous; ventral surface rather evenly and sparsely setose, more prominently along the margins; dorsal surface with an area of dense setae on the apical fourth toward the outer margin. Basis volsellaris with a group of small setae; digitus much expanded apically, subspatulate, the tip acute, the shaft of the digitus rather strongly twisted about half-way out; disc of the digitus clothed with short setae, more dense below, some of which are clubbed. Parapenials slender, nearly straight; aedeagus slightly expanded apically.

*Biology.*—This species is characteristic of, and perhaps restricted to, sea beaches and inland saline areas. In such places it is often common, though there are broad intervening areas where it does not appear to occur. Both sexes are usually found close to the ground, flying irregularly over the sand or mud, often in the vicinity of seaweed or other vegetation. I have taken a single female on the beach near Port Isabel, Texas, with a spider of the genus *Lycosa* (juvenile) [det. B. J. Kaston]. The species is not known to visit flowers.

*Distribution.*—Lower and Upper Austral zones, Texas and Florida to Colorado, Nebraska, and Long Island, New York. As noted above, this species is very local in its distribution.

*Specimens seen:* 85 (47 ♀♀, 38 ♂♂). NEW YORK: Nassau Co., 1 ♀, 2 ♂♂, Sea Cliff, July [MCZ]; NEW JERSEY: Cape May Co., 2 ♀♀, 1 ♂, 14 June, 16 Aug. [ANSP, USNM]; GEORGIA: Chatham Co., 1 ♀, Tybee Island, 26 July [CU]; FLORIDA: Collier Co., 1 ♂, Marco, 17 Apr. [AMNH]; Dade Co., 1 ♂, Coconut Grove, 22 May [MCZ]; Lee Co., 2 ♂♂, Punta Rassa, 12 May [CU]; Monroe Co., 1 ♀, Long Key, 23 July [UK]; Volusia Co., 1 ♀, Coronado Beach, 5 May [CU]; TEXAS: Brazos Co., 1 ♀, 29 Apr. [JEG]; Cameron Co., 15 ♀♀, 11 ♂♂, Port Isabel, 20-23 June [HEE]; Galveston Co., 1 ♀, 2 ♂♂, March-Aug. [USNM, Minn., RWS]; Hidalgo Co., 1 ♀, 23-25 June [HEE]; Kenedy Co., 6 ♀♀, 2 ♂♂, Los Olmos Creek, 18 June [HEE]; Kleburg Co., 4 ♀♀, Riviera Beach, 18 June [HEE]; OKLAHOMA: Alfalfa Co., 2 ♀♀, Salt Plains, Cherokee, 14 June [MCZ]; KANSAS: Stafford Co., 4 ♀♀, 15 ♂♂, Salt flats, 27 May [HEE];

NEBRASKA: Lancaster Co., 7 ♀♀, Lincoln, 29 June, 8-9 Sept. [Mim.];  
 COLORADO: Logan Co., 1 ♂, Crook, 15 June [MCZ].

F. Subgenus **ANOPLIUS** Dufour

*Anoplus* Dufour, 1834, Ann. Soc. Ent. France, 2: 483. [Type: *Pompilus niger* Fabricius, 1775 (= *nigerrimus* Scopoli; 1763); designated by Fox, 1901.]—Banks, 1912, Jour. N. Y. Ent. Soc., 19: 224.—Banks, 1917, Bull. Mus. Comp. Zool., 61: 107.—Dreischach, 1949, Ent. Amer., (n. s.) 29: 7, 11.—Dreischach, 1950, Amer. Midl. Nat., 43: 574-590. [Key to males.]

*Pompilioides* Radoszkowski, 1887, Hor. Soc. Ent. Ross., 21: 94. [Type: *Pompilioides unicolor* Radoszkowski, 1887; designated by Ashmead, 1902.]

*Aphiloctenus* Ashmead, 1902, Canad. Ent., 34: 87. [Type: *Pompilus virginicus* Cresson, 1867; monobasic.]

The females of this subgenus do not possess a tarsal comb, though in some cases the tarsi are rather spinose. Instead of the single distinct spine at the middle of the second tarsal segment on the outer side, there are two very minute spines in this position. The pygidium of the female is densely bristly, and by this character the members of this group may be told from those of the subgenus *Anoplochares* of the genus *Pompilus*, with which they are sometimes confused. Males belonging to this subgenus may be recognized by having the slope of the propodeum low and even, not steepened behind, and by having the transverse median vein of the fore wing meeting the media beyond the origin of the basal vein (rarely interstitial). The male venter is often hirsute, and some species bear dense brushes of hair on some of the sternites, much as in some species of *Arachnophroctonus* and *Anopliodes*; in the genitalia the parameres tend to be of not exceptional length, usually slender or at least not broadened apically.

*Subgeneric characters*.—Small to medium-sized wasps, length 4.5 to 20 mm.; Nearctic species with the integument wholly black or blue-black. Amount of erect hair on the body rather variable, usually greater than in *Pompilinus*; propodeum usually but not always hairy; male venter at least slightly hirsute, sometimes strongly hairy; female pygidium densely bristly. Mandibles either unidentate or bidentate. Apical margin of clypeus truncate or excised very slightly. Malar space practically absent; temples never strongly developed; vertex never raised more than very slightly above the tops of the eyes. Antennae rather long and slender.

Pronotum short, its posterior margin usually distinctly angulate, but in one species nearly arcuate. Propodeum not strongly convex longitudinally, the slope low and rather even; in the female it may be somewhat steepened behind, but the declivity is never well defined; in the male the profile is low and even from front to rear (as in Fig. 147). Tarsal comb of the female absent; basitarsus of this sex with two rows of spines (Fig. 166), those of the upper row ("U" in Fig. 166) less strong than those of the lower ("L" in Fig. 166), and sometimes scarcely visible; second tarsal segment with from one to three very small spines on the outer side (Fig. 167). Last segment of front tarsus of the male slightly to rather strongly lobed on the inner margin (Figs. 163 and 164), the inner claw of this tarsus strongly modified, the outer slightly so. Pulvillar comb well developed, in the female of from 14 to 20 setulae. Transverse median vein of fore wing meeting the media beyond the origin of the basal (occasionally they are interstitial). Stigma small to fairly large. Marginal cell rather large, sometimes less than its own length from the wing-tip. Third submarginal cell narrowed above by the arcuation of the third transverse cubital vein, but only occasionally triangular, infrequently petiolate. (Wings of one species shown in Fig. 154.)

Abdomen of the male elongate-subfusiform, less uniformly cylindrical than in *Pompilinus*, sometimes rather slender basally, almost petiolate. Subgenital plate of very variable shape. Genitalia with the parameres of most of the species rather short, frequently shorter than the aedoeagus, usually tapering beyond the prominent squamae (but not so in the genotype); digiti variously shaped, never with long hairs on the upper outer margins; basal hooklets single, the tip often somewhat bifid; aedoeagus of moderate breadth, the apex more or less rounded, with the usual median cleft.

*Biology.*—The species of *Anoplius s. str.* are rather various in their habits; none of the species seem to be strict psammophiles. Some of the species inhabit restricted ecological niches and prey only on certain genera of spiders, while others are more wide-ranging and less selective of their prey. Several species seem to use ready-made cavities of various kinds for nests, but others are apparently able to construct galleries in the earth in spite of the absence of a tarsal comb. Some of the species visit flowers frequently, others rarely or not at all. In general, not much is known of the habits of our native species, but brief accounts of the biology of a few are included in the following pages.

*Distribution.*—I have seen species belonging to this subgenus from the Nearctic, Neotropical, Palaearctic, and Oriental regions. Ten species inhabit our fauna.



Key to Species

Females

1. Either (a) the hind coxae conspicuously silvery-sericeous above, or (b) the front basitarsus weakly spined, the spines of the upper row minute, either very short or longer but setiform (Figs. 168-170), or (c) the claws of each pair unequal, the inner larger than the outer, both more or less bifid (Fig. 144) (*Nigerrimus*-group) .....2  
 None of the above conditions true; hind coxae never at all silvery; front basitarsus fairly strongly spined, the upper row of three spines which are usually half or more as long as the width of the tarsus, the lower row of three or four spines which are in part, at least, as long as the width of the tarsus (Figs. 166 and 167); claws normal, dentate and of equal size (*Illinocnisis*-group) .....8
2. Basal four segments of all the tarsi distinctly flattened on one side, the tarsus thus more or less semicircular in cross-section; front basitarsus ridged along the upper, nearly obsolete, row of spines (Fig. 169); pronotum not sharply angulate behind, nearly arcuate.
  2. **depressipes** Banks  
 Tarsi normal, circular in cross-section; front basitarsus not ridged along the upper spine-row; pronotum distinctly angulate behind .....3
  3. Claws bifid, the tooth sloping outward, the claws of each pair unequal, the inner claw much larger than the outer (Fig. 144); spines beneath the apical tarsal segments rather long; stigma rather large.
    3. **ithaca** (Banks)  
 Claws normal, the tooth short and erect, the inner claws not larger than the outer; stigma small .....4
    4. Ground color of body a brilliant metallic blue or lavender, fading to violet in older specimens; front and vertex narrow, the third antennal segment equal to or greater than the upper interocular distance; spines of the upper row on the front basitarsus fairly long, but very slender, setiform (Fig. 168) .....4. **fulgidus** (Cresson)  
 Ground color black, at most with the pubescence obscurely violaceous; spines of the upper row inconspicuous .....5
    5. Front and vertex narrow, the third antennal segment subequal to the upper interocular distance (.9 to 1.2 times it), the middle interocular distance at most .58 times the transfacial distance, usually about .55 times it; third submarginal cell always 4-sided.
      5. **virginiensis** (Cresson)  
 Front and vertex broader; third antennal segment equal to from .6 to .9 the upper interocular distance; middle interocular distance equal to from .57 to .62 times the transfacial distance; third submarginal cell often triangular or nearly so, sometimes petiolate .....6
  6. Clypeus only a little over twice as broad as high, the apical margin slightly emarginate (Fig. 159); third submarginal cell triangular, usually petiolate .....6. **hispidulus** Dreisbach

- Clypeus at least 2.5 times as broad as high, the apical margin only slightly concave (Fig. 160); third submarginal cell occasionally petiolate .....7
7. Head and thorax not strongly hairy; middle and hind coxae and propodeum only very slightly if at all hairy; spines of the upper row on the front basitarsus very minute .....1. **nigerrimus** (Scopoli)  
Head and thorax with abundant erect hair; propodeum and usually the middle and hind coxae rather strongly hairy; spines of the upper row on the front basitarsus a little longer, but very slender.  
7. **basalis** Dreisbach
8. Length 7.5 (5-10) mm.; inner orbits barely if at all convergent above; third transverse cubital vein strongly arched, the third submarginal cell varying from triangular to fairly wide above; pubescence dark, obscurely violaceous .....8. **imbellis** Banks  
Length 12 (8.5-16) mm.; inner orbits convergent above, the upper interocular distance usually about .9 the lower; third submarginal cell never completely triangular; pubescence variable, sometimes strongly bluish .....9
9. Mesopleura not hairy, propodeum slightly to moderately hairy; spines of the upper row on the front basitarsus strong, usually about as long as the width of the tarsus (Fig. 166) .....9. **illinoensis** (Robertson)  
Mesopleura with at least a few prominent erect hairs; head, thorax, and propodeum in general more hairy than above; spines of the upper row on the basitarsus shorter, at most a little more than half as long as the width of the tarsus (about as in Fig. 167) .....10
10. Pubescence fuscous or brownish, obscurely reflecting deep metallic colors; wings only slightly violaceous; head and thorax slightly less hairy than below .....10a. **ventralis ventralis** (Banks)  
Pubescence strongly reflecting deep bluish or violaceous over the entire body; wings strongly violaceous; head, thorax, and propodeum very conspicuously hairy .....10b. **ventralis tarsatus** Banks

### Males

1. Abdominal sternites without dense brushes of long hairs, either almost smooth, or with brushes of less dense, short hairs (Figs. 149 and 150); last segment of front tarsus slightly produced on the inner margin, this segment widest about two-thirds the distance from the base, more than 1.5 times as long as broad (Fig. 163) (*Nigerrimus*-group) .....2  
Sternites 4 and 5 with dense brushes of rather long hairs (Figs. 147 and 148); last segment of front tarsus more strongly produced on the inner margin, the segment widest about midway, and only about 1.5 times as long as broad (Fig. 164) (*Illinoensis*-group) .....7
2. Body entirely a brilliant deep blue, violet, or blue-green; subgenital plate very broad, the surface flat or somewhat folded medially, clothed, especially along the outer margin, with fairly long setae.  
4. **fulgidus** (Cresson)

- Ground color black; subgenital plate not of this form, either slender and acute apically, or else strongly elevated medially .....3
3. Stigma very large, at least a third as long as the marginal cell; subgenital plate very broad, folded roof-like beneath the apex of the abdomen; parameres of genitalia very short (Fig. 107).

3. *ithaca* (Banks)

- Stigma smaller, only a small fraction of the length of the marginal cell; subgenital plate not as broad, though sometimes of moderate breadth and somewhat elevated medially; parameres longer .....4
4. Subgenital plate rather broad, the apex obtusely pointed, the median line sharply elevated (Fig. 140); venter rather hirsute, but the setae showing little tendency to form brushes; parameres moderately to very broad .....5

Subgenital plate slender apically, the tip acute (Fig. 138); setae on sternites 3 to 5 fairly dense, tending to form weak brushes (Figs. 149 and 150); parameres slender .....6

5. Propodeum hairy; third submarginal cell wide above; minimum size 9 mm.; digiti broad, subspatulate (Fig. 105) ....2. **depressipes** Banks
- Propodeum not or but slightly hairy; third submarginal cell triangular or nearly so, sometimes petiolate; maximum size 9 mm.; digiti very slender (Fig. 106) .....1. **nigerrimus** (Scopoli)

6. Third submarginal cell narrowed above, rarely completely triangular, never petiolate; subgenital plate acutely pointed apically; parameres not much if any exceeding the other appendages (Fig. 108).

5. *virginiensis* (Cresson)

Third submarginal cell triangular, usually petiolate; subgenital plate extremely slender and attenuate apically; parameres very strong, much longer than the other appendages (Fig. 110).

6. *hispidulus* Dreisbach

7. Coxae at least in part silvery-sericeous; parameres of genitalia very broad near the base (Fig. 111). .....7. **basalis** Dreisbach
- Silvery pubescence, if present at all, restricted to the lower front and clypeus; parameres at most very slightly broader near the base than apically .....8

8. Subgenital plate but slightly raised medially, the sides tapering gradually, the apex narrowly rounded and fringed with a rather even row of bristles (Fig. 142); emargination of sternite 6 broadly U-shaped.

8. *imbellis* Banks

Subgenital plate more or less keeled, the apex subacute, somewhat bushy-haired (Figs. 141 and 143); emargination of sternite 6 more narrow, somewhat V-shaped .....9

9. Scape and propodeum not or only very slightly hairy; sternite 3 with at most a few setae; digitus volsellaris more or less triangular apically, the inner margin with a group of setae which are directed mesad (Fig. 113) .....9. **illinoensis** (Robertson)

- Scape and propodeum both rather hairy; sternite 3 frequently with numerous hairs, sometimes forming a brush; digiti somewhat spindle-shaped .....10
10. Pubescence fuscous or brownish, at most rather vaguely violaceous or bluish; wings not or scarcely violaceous; digitus with a strip along the inner margin which is devoid of setae (Fig. 114).
- 10a. **ventralis ventralis** (Banks)  
Pubescence over most of the body strongly reflecting dark bluish, fading to violet in older specimens; wings more or less violaceous; setae on the digitus distributed over the whole surface (Fig. 115)
- 10b. **ventralis tarsatus** Banks

### *Nigerrimus* Species-group

To this group belong several species closely resembling the Holarctic *nigerrimus* and possibly derivatives of it. In these species the front basitarsus of the female is weakly spined (except in *ithaca*), and the hind coxae are often somewhat silvery-sericeous. In the male the last segment of the front tarsus is less strongly produced on the inner margin than in the following species-group, and the venter is without the long brushes of hair characteristic of that group. One species, *basalis*, is placed here on the characters of the female, although the males agree with the *illinoensis*-group, with which this form may be annectant.

#### 1. **Anoplius (Anoplius) nigerrimus** (Scopoli)

(Pl. XVI, fig. 106; pl. XX, fig. 140; pl. XXII, fig. 163.)

*Sphex nigerrima* Scopoli, 1763, Entomologia Carniolica, p. 295. [Type: ♀; Carniola (i. e., northwestern Yugoslavia); (location of type, if extant, not known to present author).]

*Sphex nigra* Fabricius, 1775, Systema Entomologiae, p. 350. [Type: ♀?; "Europe"; (location of type not known to present author).]

*Pompilus niger* Panzer, 1804, Fauna Insectorum Germaniae, p. 71.

*Anoplius nigerrimus* Berland, 1925, Faune de France X, Hymen. Vespi-formes I, pp. 249-252.—Haupt, 1927, Deutsch. Ent. Zeitschr., Beiheft, p. 241.—Richards and Hamm, 1939, Trans. Soc. Brit. Ent., 6: 98-100. [Biology.]—Wilcke, 1943, Overdruk uit Med. van de Landbouwhoogeschool Wageningen, 47: 78. & fig. 77.—Strickland, 1947, Canad. Ent., 79: 125. [Edmonton, Alta.]

*Anoplius wheeleri* Banks, 1939, Canad. Ent., 71: 228. [Type: ♀; Colebrook, Conn. (W. M. Wheeler); M.C.Z. no. 23,482.]<sup>15</sup> New synonymy.

<sup>15</sup> Banks' paratypes [MCZ] are a mixture of this species and *Pompilus apicatus* Provancher.

*Anoplus banksi* Dreisbach, 1950, Amer. Midl. Nat., 43: 579-581, 589, figs. 13 and 14. [Type: ♂; Midland Co., Mich., 22 June 1946 (R. R. Dreisbach); M.C.Z.] New synonymy.

This is a common Palaearctic species; a complete list of references for the European fauna cannot be given here, but the reader is referred to Haupt (1927). Banks' *wheeleri* and Dreisbach's *banksi* have been placed in synonymy with *nigerrimus* after a careful study of two series of European specimens, of both sexes, determined as this species by Kohl and by Wilcke. The American and European specimens agree in all essentials, including the very distinctive male genitalia.

FEMALE.—Length 8.8 (6-11) mm. Color black, the upper outer orbits sometimes with a small pale mark. Fore wings lightly infuscated or nearly hyaline, with a darker marginal band; hind wings subhyaline, darker apically. Pubescence mostly fuscous, but silvery at least on the posterior part of the middle and hind coxae; occasionally the silvery pubescence extends over much of the head and thorax and even forms weak bands on the bases of the abdominal tergites. Clypeus, front, vertex, and front coxae slightly hairy; middle and hind coxae at most very slightly hairy, the femora not at all so; propodeum either without erect hairs or with a few scattered, rather inconspicuous hairs.

Clypeus about 2.5 times as broad as high, its apical margin slightly arcuately concave. Front broad, the middle interocular distance varying from .57 to .62 times the transfacial distance. Inner orbits converging slightly above, the upper interocular distance from .85 to .9 times the lower. Ocelli forming a right or acute angle in front, the postocellar line slightly less than the ocello-ocular. Antennae of moderate length, the first four segments in a ratio of about 3:1:4:3, segment 3 equal to from .65 to .85 times the upper interocular distance. Front, in profile, rather strongly convex; temples strong.

Posterior pronotal margin sharply angulate. Median line of propodeum impressed. Front basitarsus weakly spined, the spines of the upper row stout but short, less than half as long as the basitarsus is wide, the spines of the lower row of somewhat variable length, one or two of them sometimes as long as the width of the basitarsus. Fore wing with the stigma short; marginal cell of moderate length, usually very slightly more than its own length from the wing-tip. Second submarginal cell trapezoidal, slightly longer than high, narrowed by about a third above; third submarginal cell of about the same length as the second, much more strongly narrowed above, nearly or quite triangular, rarely short-petiolate.

MALE.—Length 7.5 (6-9) mm. Color black; wings hyaline or nearly so, the outer margins with a fuscous band. Pubescence brownish-fuscous, except silvery as follows: lower front, sides of clypeus, coxae in great

part, lower pleura, propodeum, and often a suggestion of bands on the bases of the first three abdominal tergites; occasionally almost the whole head and thorax are silvery. Clypeus, front, vertex, temples, propleura, and front coxae slightly hairy; pronotum and propodeum usually with a few inconspicuous hairs; abdominal sternites 4, 5, and 6, and the subgenital plate, with rather abundant short, suberect setae.

Clypeus about 2.3 times as broad as high; front broad, the middle interocular distance from .6 to .65 times the transfacial. Eyes diverging very slightly above; ocelli as in female. First four antennal segments in a ratio of about 3:1:3:3, segment 3 about 2.5 times as long as thick. Posterior pronotal margin sharply angulate. Median line of propodeum impressed or not. Last segment of front tarsus produced on the inner side, though not strongly. Inner claw of front tarsus strongly curved, deeply cleft, outer claw much less so, but more so than the claws of the middle and hind tarsus. Venation about as in the female; second submarginal cell usually not longer than high; third submarginal cell usually triangular.

Abdomen slender, especially toward the base; first tergite not strongly swollen, in profile sloping very slightly. Sternites without well-defined brushes of hair, but sternites 4 to 7 with abundant short setae. Emargination of sternite 6 V-shaped. Subgenital plate (Fig. 140) rather broad, the apex obtuse; median line strongly elevated for its entire length; disc, margins, and especially the median elevation with abundant hairs of moderate length. Genitalia (Fig. 106) unique in that the parameres are very broad, apically broadly rounded or subtruncate; squamae strong, protuberant; outer margin and apex clothed with long hairs, the ventral surface clothed uniformly with smaller setae. Basis volsellaris with a few small setae; digiti very slender, acuminate, clothed with short, straight setae. Parapenials straight and slender; aedocagus rather broad, its margins uniformly arched from base to apex, the apex deeply cleft medially.

*Biology.*—There are no published observations on the habits of this species in this country. In Europe its biology has been studied by a number of workers, especially Nielsen and Fertou; this information has been summarized by Richards and Hamm (1939). They state that the species "is not especially attached to sandy soils, but is often found on banks or walls in heathy or marshy places." Ready-made cavities of many sorts are used in nesting, including hollow twigs, under stones, and in the deserted tunnels of bees. These authors have compiled a considerable list of spiders known to serve as prey; these are chiefly Lycosidae, with few records of Pisauridae and Gnaphosidae.

*Distribution.*—This Holarctic species is known from almost the whole of Europe; in North America it occurs transcontinentally

in the Hudsonian and Canadian Zones, entering the Transition Zone sparingly.

*Specimens seen*: 124 (90 ♀♀, 34 ♂♂). The following records are marginal: NEWFOUNDLAND: 1 ♀, Spruce Brook, 29 July [CNC]; QUEBEC: 1 ♀, east coast of James Bay, 19 July [CNC]; NORTHWEST TERRITORIES: 1 ♀, Cameron Bay, Great Bear Lake, 1 July [CNC]; 1 ♀, Fort Norman, McKenzie R., 9 Aug. [CNC]; YUKON: 1 ♂, Marsh Lake, 10 July [CNC]; OREGON: Klamath Co., 1 ♀, Aspen Lake, 26 June [CAS]; UTAH: Kane Co., 1 ♂, 10 mi. N. of Orderville, 5500 feet, 14 Aug. [HEE]; COLORADO: Rocky Mt. Nat. Park, 2 ♀♀, Trail Ridge, 12,000 feet, Aug. [MCZ]; SASKATCHEWAN: 1 ♀, Regina, 8 Aug. [CNC]; MANITOBA: 1 ♀, Aweme, 12 July [CNC]; MINNESOTA: Itasca Co., 1 ♀, Grand Rapids, 7 July [Minn.]; Chisago Co., 1 ♀ [Minn.]; WISCONSIN: Sawyer Co., 1 ♂, 1-8 Aug. [Minn.]; MICHIGAN: Gratiot Co., 1 ♀, June [Coll. R. R. Dreisbach]; ONTARIO: 1 ♂, Ingersoll, 25 June [CNC]; PENNSYLVANIA: Allegheny Co., 1 ♀, Sample Station, 15 July [CM]; Sullivan Co., 1 ♀, Lopez, 4-15 Aug. [ANSP]; CONNECTICUT: Litchfield Co., 7 ♀♀, Colebrook [MCZ]; MASSACHUSETTS: Suffolk Co., 2 ♀♀, Forest Hills, Aug. [CAS].

## 2. *Anoplius (Anoplius) depressipes* Banks

(Pl. XVI, fig. 105; pl. XXII, fig. 169.)

*Anoplius depressipes* Banks, 1919, *Canad. Ent.*, 51: 81. [Type: ♀; Ithaca, N. Y., 12 July 1912; C. U. no. 677.]—Evans, 1949, *Proc. Ent. Soc. Wash.*, 51: 206-208. [Biology.]—Dreisbach, 1950, *Amer. Midl. Nat.*, 43: 582.

*Anoplius illinoicensis* [sic] Caudell, 1922, *Proc. Ent. Soc. Wash.*, 24: 125-126. [Nec Robertson; misidentification.] [Biology.]

*Psammochares (Anoplius) depressipes* Leonard, 1926, *Cornell Agri. Exp. Sta. Memoir* 101, p. 987.

This species is closely allied to the preceding, and may be a derivative of it. The male subgenital plate is very similar to that of *nigerrimus*, but the genitalia are very different, and the propodeum is conspicuously hairy. The female may be recognized at once by the unusual tarsi: the basal four segments of all the tarsi are distinctly flattened on one side, in cross-section thus being semicircular instead of circular; on the middle and hind tarsi there is a small fringe of setae along the edge of this flattened portion. This may well be an adaptation for the semi-aquatic habits of this wasp, possibly to permit it to walk on the surface film. (See remarks under *Biology*.)

FEMALE.—Length 14 (11-20) mm. Color black; wings fuliginous, somewhat violaceous. Pubescence fusco-violaceous, sometimes with small patches of silvery pubescence on the front coxae in front and the middle and hind coxae behind, sometimes also on the sides of the clypeus. Body in general rather hairy; scape slightly hairy or not; head, thorax, coxae, and propodeum all rather prominently hairy, but the femora not or scarcely so.

Mandibles bidentate, the two teeth strong and rather close to the apex. Clypeus about 2.4 times as broad as high, the apical margin broadly truncate. Front of moderate breadth, the middle interocular distance from .55 to .6 times the transfacial. Inner orbits converging slightly above, the upper interocular distance from .85 to .9 times the lower. Ocelli in a small triangle, the front angle right or acute; postocellar line less than the ocellular as 4:5. Antennae elongate, the first four segments in a ratio of about 4:1:7:5, segment 3 equal to or greater than the upper interocular distance. Front rather flat transversely; line from the antennal bases to front ocellus very distinct; temples narrow.

Posterior margin of the pronotum subangulate or subarcuate, never distinctly angulate as in related species. Propodeum with the slope low and even, the median line impressed. Legs weakly spined; basal four segments of the front tarsus flattened or slightly hollowed out on the lower outer side, the basitarsus ridged along the line of the upper row of spines, which are very small (Fig. 169). Middle and hind tarsi also flattened on one side (except the apical segment), in this case the inner side, the ridge on the outer side of this flattened portion bearing a small fringe of setae. Fore wing with the stigma rather short, the marginal cell long, about or less than its own length from the wing-tip. Second submarginal cell trapezoidal, wider than high; third submarginal generally wider than the second, narrowed by half to two-thirds above.

MALE.—Length 12 (9-14.5) mm. Color black; wings nearly hyaline at the extreme base, becoming gradually more infuscated toward the outer margin, the margin with a distinct fuscous band. Pubescence fusco-violaceous, silvery as follows: sides of lower front and clypeus, front of anterior coxae, middle and hind coxae above, lower portion of mesopleura, and posterior slope of propodeum. Head, thorax, and propodeum with abundant dark erect hair as in the female; first abdominal tergite rather hairy; venter with scattered short, suberect setae, showing little tendency to form brushes.

Clypeus slightly over twice as broad as high. Middle interocular distance varying from .58 to .6 times the transfacial distance; inner orbits subparallel, the upper interocular distance subequal to or slightly greater than the lower. Ocelli as in the female. First four antennal segments in a ratio of about 3:1:3.2:3, segment 3 about 3 times as long as thick. Pronotum subarcuate or indistinctly angulate behind. Propodeum rather short, the median line weakly impressed or not. Last segment of front tarsus about as in *nigerrimus*. Venation as in the female.



Abdomen subfusiform, slightly flattened dorsally. Venter somewhat hirsute, as described above. Subgenital plate and the preceding sternite practically the same as in *nigerrimus*. Genitalia (Fig. 105) with the parameres short, of moderate breadth, long-setose; basis volsellaris with a few setae; digitus much broadened apically, clothed with semierect, straight setae of moderate length. Parapenials simple, straight; aedocagus rather broad, shaped much as in *nigerrimus*.

*Biology*.—This species occurs along still or slow-moving inland waterways, where it preys upon large semiaquatic spiders of the genus *Dolomedes* (Pisauridae). Like its prey, this wasp is apparently able to walk on the surface film of the water and even to dive beneath the surface and walk on the bottom and on aquatic vegetation. The nest of the wasp is a burrow in the stream-bank, and the spider is transported to its nest by the remarkable method of flying over the surface film towing the spider behind. Several observers have noted this behavior, and these notes have recently been summarized by the author (Evans, 1949). Since the publication of this paper, my attention has been drawn to still another series of observations on the behavior of this wasp, published by Phil Rau in a paper entitled "Pompilid wasps and prey-transportation by water".<sup>16</sup> While Rau did not identify the wasp, his notes leave little doubt that he was dealing with this species. His observations were made in parts of Missouri and Kansas which are well within the known range of *depressipes*.

This species is on the wing from late May until early August, and probably has but one generation a year. I have taken an occasional specimen at honeydew and on the flowers of poison hemlock, *Conium maculatum*.

*Distribution*.—This wasp occurs over most of the eastern half of the United States, from Florida, Alabama, and Kansas north to Minnesota, Michigan, and Maine.

*Specimens seen*: 60 (29 ♀♀, 31 ♂♂). MAINE: Cumberland Co., 1 ♀, 1 ♂, Casco, 1-2 Aug. [CU]; MASSACHUSETTS: Middlesex Co., 1 ♀, Stony Brook Res. [MCZ]; Norfolk Co., 1 ♀, Wellesley, July [MCZ]; NEW YORK: Tompkins Co., 1 ♀, Ithaca, 12 July [CU]; 1 ♀, Renwick, 12 Aug. [Minn.]; Westchester Co., 1 ♀, White Plains [MCZ]; PENNSYLVANIA: 1 ♂ (no further data) [USNM]; Centre Co., 1 ♀, Tusseyville Gap, 11 July [PSC]; Butler Co., 1 ♀, Slippery Rock Creek, 13 July [CM]; NEW JERSEY:

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<sup>16</sup> Rau, Phil, 1934, *Psyche*, 41: 241-242.

Bergen Co., 1 ♀, W. Englewood. July [MCZ]; Camden Co., 1 ♂, Berlin, 1 June [CU]; Cumberland Co., 1 ♀, Vineland, 25 June [CU]; MARYLAND: Montgomery Co., 1 ♂, Cabin John, 8 June [USNM]; 1 ♀, Great Falls, 4 July [USNM]; VIRGINIA: Lee Co., 1 ♀, Stone Creek [MCZ]; WEST VIRGINIA: Randolph Co., 1 ♀, Cheat Mt., June [CM]; NORTH CAROLINA: Wake Co., 1 ♀, 2 ♂♂, Raleigh, May [USNM]; GEORGIA: 1 ♀, Burton, 21 May [CU]; Decatur Co., 1 ♀, Spring Creek, July [MCZ]; 1 ♂, Bainbridge, Sept. [MCZ]; FLORIDA: Pasco Co., 1 ♀, Lacochee, 7 July [UK]; ALABAMA: Washington Co., 1 ♀, LeRoy, June [MCZ]; KANSAS: Riley Co., 5 ♀♀, 24 ♂♂, Deep Creek, 30 May-10 June [KSC, HEE]; Marshall Co., 1 ♀, Marysville, 15 June [KSC]; MINNESOTA: Nicollet Co., 1 ♀, St. Peter, 25 July [Minn.]; Ramsey Co., 1 ♀, St. Paul, 18 July [Minn.]; WISCONSIN: Wood Co., 2 ♀♀, Cranmoor, 13-17 July [USNM]; MICHIGAN: Roscommon Co., 1 ♀, 3 Aug. [Coll. R. R. Dreisbach].

### 3. *Anoplius (Anoplius) ithaca* (Banks)

(Pl. XVI, fig. 107; pl. XX, fig. 144.)

*Psammochares ithaca* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 224. [Type: ♀; Ithaca, N. Y., 1-7 July; M.C.Z. no. 13,699.]

*Psammochares (Anoplius) ithaca* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 987.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 128. [Raleigh, N. C.]—Brimley, 1938, Insects No. Carolina, p. 434.

*Anoplius selkirkensis* Banks, 1919, Bull. Mus. Comp. Zool., 63: 234. [Type: ♀; Downie Creek, Selkirk Mts., B. C., 14 Aug. 1905 (J. C. Bradley); C. U. no. 685.] New synonymy.

*Anoplius ithaca* Strickland, 1947, Canad. Ent., 79: 125. [Medicine Hat, Alta.]

*Anoplius (Anoplius) ithaca* Evans, 1948, Ent. News, 59: 180-183. [Biology.]

*Anoplius ithica* [sic] Dreisbach, 1950, Amer. Midl. Nat., 43: 575, 583-584, 589, figs. 15 and 16.

This species, while doubtless derived from stock resembling *nigerrimus*, has become rather specialized with regard to the legs, which are unusually spinose for this species-group, and the tarsal claws, which (especially in the female) are large, bifid, and asymmetrical. These are probably adaptations for the stone-loving habits of this wasp (see notes under *Biology*). Haupt<sup>17</sup> has proposed the generic name *Paranoplius* for certain Old World species also possessing asymmetrical claws. I have not seen specimens of the genotype, *separatus* Haupt, but it is possible that it is

<sup>17</sup> Haupt, H., 1929, Mitt. Zool. Mus. Berlin, 15: 118, 144.

closely related to *ithaca*. If this proves to be true, *Paranoplius* may be regarded a synonym of *Anoplius*.

FEMALE.—Length 8 (5.5-11) mm. Color black; fore wings hyaline basally, becoming gradually somewhat infuscated toward the apex, the outer margin with a darker fuscous band, the veins and stigma brownish; hind wings hyaline, the apex infuscated. Pubescence mostly fusco-violaceous or somewhat brownish, often silvery on the hind coxae above, often much more extensively silvery, sometimes even to the extent of having silvery bands at the bases of the basal abdominal tergites. Clypeus, front, vertex, temples, prothorax, and propodeum all with rather abundant dark erect hair; mesonotum, scutellum, pleurites, coxae, and first abdominal tergite also generally somewhat hairy.

Mandibles unidentate. Clypeus about three times as broad as high, truncate below. Front broad, the middle interocular distance varying from .56 to .62 times the transfacial. Inner orbits slightly convergent above, the upper interocular distance about .9 the lower. Vertex broad, nearly straight across at the eye-tops; ocelli forming a right or acute angle in front; post-ocellar line: ocello-ocular line about as 4:5. First four antennal segments in a ratio of about 3:1:5:4, segment 3 varying from .7 to 1.0 times the upper interocular distance.

Posterior pronotal margin angulate. Propodeum with a strongly impressed median groove. Legs strongly spinose; front basitarsus with the spines of both the upper and lower rows strong, at least in part as long as the thickness of the tarsus. Apical tarsal segments (Fig. 144) with the spines of the median row 3 to 5 in number, becoming increasingly long distad; usually there are a few shorter lateral spines on these segments; claws large, bifid, the inner claw of each pair distinctly longer than the outer, and about as long as the last tarsal segment. Fore wing with the basal and transverse median veins either interstitial or disjointed. Stigma very large, dark brown, the lower margin arcuate. Marginal cell about or a little less than its own length from the wing-tip; second and third submarginal cells subequal in breadth, the second narrowed by about a third above, the third narrowed by from .4 to .8 above.

MALE.—Length 6.5 (4.5-9) mm. Color black; wings nearly hyaline, the veins and stigma brownish, the fore wings with a fuscous marginal band which extends through the upper half of the marginal cell. Head and thorax often in large part silvery-sericeous; basal four abdominal segments frequently with basal silvery bands. Clypeus, front, temples, and propleura with numerous dark erect hairs; front coxae, thoracic dorsum, and propodeum slightly hairy; venter and apical tergites with sparse sub-erect hairs.

Clypeus from 2.6 to 3 times as broad as high, broadly truncate below. Middle interocular distance from .61 to .66 times the transfacial; inner orbits diverging slightly or not at all above. Ocelli as in the female. First four antennal segments in a ratio of about 27:10:32:30, segment

3 about 3 times as long as thick. Pronotum sharply angulate behind. Postnotum nearly as long as the metanotum, somewhat striate; propodeum with a median groove. Last segment of front tarsus produced on the inner margin, less than twice as long as its maximum width. Inner claw of front tarsus very strongly curved, the inner ray short and rounded; outer claw of front tarsus moderately curved, the inner ray about half as long as the outer (measured from the split); remaining claws less strongly bent, the inner ray nearly as long as the outer; claws of each pair only slightly unequal, less so than in the female. Venation much as in the female, the stigma more than twice as long as high, and more than one third the total length of the marginal cell. In many individuals the basal and transverse median veins of the fore wing are interstitial on the media.

Abdominal sternite 6 with the emargination U-shaped, rather shallow. Subgenital plate unusually broad, strongly folded medially, forming an inverted roof-shaped closure for the genital chamber. Genitalia (Fig. 107) with the parameres very short, much exceeded by all the other appendages (though sometimes somewhat longer than shown in figure); basis volsellaris with several rather long setae in a group; digiti slender, curved almost at right-angles about midway, the apical half clothed with short setae, more dense apically; parapenials simple and slender, slightly exceeded by the aedeagus.

*Biology.*—This species is confined to stony stream-sides, where it may sometimes be found in considerable numbers flying and running over the rocks. The prey consists largely if not exclusively of small spiders of the genus *Pardosa* (Lycosidae), which are common in the same habitat. Since publishing several prey records (Evans, 1948), I have taken still another specimen, this one in Bosque Co., Texas, with a spider of this same genus. The nest is a short gallery among the stones or in gravel. It is interesting that two species closely related to and possibly derived from *nigerrimus*, a wide-ranging species showing little selection of its prey, have each come to be restricted to a distinct ecological niche and to a single genus of spiders. I refer to *depressipes*, which occurs along ponds or sluggish streams and preys on *Dolomedes*, and the present species. Both exhibit certain specializations in their tarsi which may fit them for their habits. I have on one occasion taken the two species together, along a rocky stream in which there were numerous quiet pools.

*Anoplius ithaca* appears to have several (perhaps three) generations a year throughout its range. It occasionally visits honeydew if available in its habitat, but has never been recorded as

visiting flowers. The reader is referred to Evans (1948) for further details on the behavior of this species.

*Distribution.*—Although rather local in its occurrence, this species is exceedingly widely distributed, having been taken from Georgia, Texas, and California north to Yukon, Manitoba, and Maine.

*Specimens seen:* 413 (170 ♀♀, 243 ♂♂). The following are marginal records: MAINE: Hancock Co., 1 ♂, Northeast Harbor [MCZ]; VERMONT: 1 ♀ (no further data) [MCZ]; NEW YORK: Cayuga Co., 15 ♀♀, 82 ♂♂, No. Fairhaven, 5 June-1 Sept. [CU]; ONTARIO: 1 ♀, 1 ♂, Haileybury, 7 July [CNC]; MINNESOTA: St. Louis Co., 1 ♀, 12 Oct. [Minn.]; MANITOBA: 1 ♀, Cormorant Lake, 1 July [CNC]; ALBERTA: 1 ♀, Smoky River, Peace R. Dist., 15 Sept. [CNC]; YUKON: 2 ♀♀, Kluane, 28 July [CNC]; 2 ♀♀, 2 ♂♂, Snag, 24 July [CNC]; CALIFORNIA: Calaveras Co., 1 ♀, 1 ♂, Jenny Lind, 21 Oct. [CU]; ARIZONA: Cochise Co., 1 ♀, Huachuca Mts., 11 June [CAS]; NEW MEXICO: Colfax Co., 1 ♀, 1 ♂, Raton, 12 Aug. [HEE]; TEXAS: Jeff Davis Co., 29 ♀♀, 23 ♂♂, Limpia Canyon, 14-22 July [HEE, CU, ANSP]; Gillespie Co., 2 ♀♀, 8 mi. So. of Fredericksburg, 5 July [HEE]; MISSOURI: 1 ♀, St. Louis [USNM]; GEORGIA: Thomas Co., 4 ♀♀, Ochlochnee, July [EU].

#### 4. *Anoplius (Anoplius) fulgidus* (Cresson)

(Pl. XVII, fig. 109; pl. XXII, fig. 168.)

*Pompilus fulgidus* Cresson, 1865, Proc. Ent. Soc. Phila., 4: 131. [Type: ♀; Cuba (no further data); A.N.S.P. no. 562.]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 94.—Cresson, 1869, Proc. Boston Acad. Nat. Hist., 12: 367. [Orizaba, Mexico.]—Cameron, 1893, Biol. Centr.-Amer., Hymen. II, p. 199.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 289.

*Pompilus acncopurpurus* Fox, 1891, Trans. Amer. Ent. Soc., 18: 339. [Type: ♀; Portland, Jamaica; A.N.S.P. no. 561.] New synonymy.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 270. [Erroneously reported from Indiana.]

*Anoplius (Pompilinus) fulgidus* Viereck, 1906, Trans. Amer. Ent. Soc., 32: 232. [Williams, Ariz.]

*Psammochares (Anoplius) fulgidus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108. [Florida.]

*Psammochares acncopurpurus* Gowdey, 1926, Jamaica Dept. Agri. Ent. Bull. 4, p. 96.

*Anoplius fulgidus* Bradley, 1946, Mem. Soc. Cubana Hist. Nat., 18: 129.

*Anoplius acncopurpurus* Bradley, 1946, Mem. Soc. Cubana Hist. Nat., 18: 129.

*Anoplius acnopurpureus* [sic] Dreisbach, 1950, Amer. Midl. Nat., 43: 575, 582, 588, fig. 7.

This essentially tropical form crosses our borders rather sparingly. It may be easily told by the strongly metallic-blue coloration of the integument. Structurally it is very close to the other members of the *nigerrimus*-group, particularly to *virginiensis* Cresson.

FEMALE.—Length 10 (7.5-14) mm. Integument of fresh specimens brilliant deep metallic Prussian blue, fading to violet in older specimens. Wings fuliginous, somewhat darker along the outer margin, with a violet or somewhat brassy reflection. Pubescence very fine, brownish-violaceous, often conspicuously silvery on the lower front and sides of the clypeus, sometimes also more or less so on the pronotum and coxae. Clypeus, front, vertex, front coxae, thoracic dorsum, and propodeum all with considerable black erect hair; remaining coxae and sometimes the femora slightly hairy; first abdominal tergite with numerous fine hairs anteriorly; pygidium very densely bristly.

Clypeus about 2.5 times as broad as high, its apical margin truncate. Front narrow, the middle interocular distance varying from .52 to .54 times the transfacial distance. Inner orbits converging slightly above, the upper interocular distance from .8 to .9 the lower. Ocelli in a close triangle, the front angle of which is much less than a right angle; postocellar line less than the ocello-ocular line as 3 is to 4. Antennae elongate, the first four segments in a ratio of about 3:1:5:4, segment 3 equal to or greater than the upper interocular distance.

Pronotum short, its posterior margin angulate. Median line of propodeum weakly impressed. Front tarsus weakly spined, the basitarsus with the spines of the upper row of moderate length but slender, setiform, the spines of the lower row fairly strong, sometimes about as long as the width of the tarsus (Fig. 168). Fore wing with the second and third submarginal cells of about the same width, the second narrowed by about .2 above, the third narrowed by from .5 to .9 above.

MALE.—Length 8 (6.5-9.5) mm. Integument deep but rather brilliant bluish, violet, or greenish; hind wings lightly infuscated, the fore wings moderately infuscated, darker along the margin, reflecting violet, brassy, or a play of colors. Pubescence fusco-violaceous, conspicuously silvery on the lower front and sides of the clypeus, sometimes also on the coxae, pronotum, and propodeum. Head, thoracic dorsum, front coxae, and propodeum all with moderately abundant erect, black hairs. Abdominal sternites 3 and beyond with a variable amount of short, suberect pile, never abundant or long enough to form "brushes"; subgenital plate usually with considerable short erect hair on the disc and along the outer margin.

Clypeus about twice as broad as high; front of moderate breadth, the middle interocular distance about .58 times the transfacial; eyes diverging

very slightly above. First four antennal segments in a ratio of about 3:1:3:3. Ocelli as in the female. Pronotum angulate behind; propodeum with the median line at most very weakly impressed. Tarsal characters as in *nigerrimus*. Venation about as in the female, the third submarginal cell usually subtriangular.

Abdomen subfusiform; venter slightly hairy, as described above, but without brushes. Sternite 6 with a rather deep, V-shaped emargination. Subgenital plate very broad, the apex broadly subtruncate or somewhat obtusely pointed, the disc nearly flat or somewhat folded along the median line; disc covered with short erect setae, the outer margin usually more or less fringed with setae. Genitalia as shown in Fig. 109, very similar to those of *virginiensis*. The digitus volsellaris varies considerably in breadth, the one figured representing about the maximum breadth; in some it is much more slender and more sparsely setose. The short series of males before me exhibits an unusual amount of variation in the subgenital plate and genitalia; I cannot, however, find any constant characters which will separate it into more than a single species.

*Distribution*.—This is a tropical species, ranging from the Greater Antilles and Central America north to Florida and to Texas, southern Utah, and southern California.

*Specimens seen*: 52 (23 ♀♀, 29 ♂♂), only 15 from the United States. United States records are as follows: FLORIDA: 1 ♂, Brighton, 7 Apr. [KVK]; Dade Co., 2 ♀♀, 1 ♂, Miami Beach [ANSP]; 1 ♀, 2 ♂♂, Biscayne Bay [ANSP, USNM]; 1 ♀, Royal Palm Park, May [UK]; TEXAS: Kerr Co., 1 ♀, Kerrville, 19 June [USNM]; Jeff Davis Co., 1 ♀, Limpia Canyon, Davis Mts., 24 July, on flowers of *Baccharis glutinosus* [HEE]; Williamson Co., 1 ♀, Liberty Hill, Dec. [RWS]; ARIZONA: Coconino Co., 1 ♀, Bill Williams Fork [UK]; UTAH: Washington Co., 1 ♂, Leeds, 18 Sept. [UAC]; CALIFORNIA: Los Angeles Co., 1 ♀, Pasadena, Feb. [ANSP]; Riverside Co., 1 ♀, Palm Springs, 20 Apr. [CIS]. Specimens also seen from Mexico (Baja California, Nayarit, San Luis Potosi, Sonora, and Vera Cruz), Guatemala, Honduras, Panama, Jamaica, Cuba, Puerto Rico, and Haiti.

##### 5. *Anoplius (Anoplius) virginiensis* (Cresson)

(Pl. XVII, fig. 108; pl. XXI, fig. 150; pl. XXII, fig. 170.)

*Pompilus virginiensis* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 92. [Lectotype: ♂; Virginia (no further data); A.N.S.P. no. 555.]—Provancher, 1882, Nat. Canad., 13: 35, 37.—Dalla Torre, 1897, Cac. Hymen., VIII, p. 335.

*Aphiloctenus virginiensis* Ashmead, 1902, Canad. Ent., 34: 87. [Selected genotype of new genus *Aphiloctenus*.]

- Anoplius virginicnsis* Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.  
 —Procter, 1938, Biol. Survey Mt. Desert Reg., VI, Insecta, p. 430.  
 [Mt. Desert, Me.]—Strickland, 1947, Canad. Ent., 79: 125. [Edmonton, Alta.]—Dreisbach, 1950, Amer. Midl. Nat., 43: 587-590, figs. 27 and 30.
- Psammochares (Anoplius) virginicnsis* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 224.—Banks, 1912, Ent. News, 23: 108.—Rohwer, 1916, Conn. Geol. Nat. Hist. Survey Bull. 22, p. 633. [Conn.]—Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 987.—Johnson, 1930, List Insect Fauna Nantucket, p. 111.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 128.—Brimley, 1938, Insects No. Carolina, p. 434.
- Pompiloides cylindricus* Blackman and Stage, 1924, N. Y. State Coll. Forestry, Syracuse, Tech. Publ. no. 17, p. 194. [Misidentification; bred from decaying hickory.]

The following combination of characters will separate *virginicnsis* from the several species which closely resemble it: (1) the front basitarsus of the female is weakly spined, the spines of the upper row being very small (Fig. 170); (2) the front and vertex of the female are very narrow, and the third antennal segment nearly equal to the upper interocular distance; (3) the abdomen of the male is very slender basally, is more or less annulated by bands of fine silvery pubescence, and possesses a short, loose brush of erect setae on sternites 2 to 6, strongest on 4 and 5 (Fig. 150); (4) the male subgenital plate is slender and acute apically, though less attenuate than in the following species. This is a common pompilid throughout much of the northeastern United States and southern Canada.

FEMALE.—Length 10.5 (8-13.5) mm. Color black; wings subhyaline, becoming gradually slightly more infuscated apically, the outer margins with a distinct fuscous band. Pubescence very fine, brownish, usually silvery on the middle and hind coxae above, occasionally silvery on the lower front and sides of the clypeus, sometimes also on the thoracic pleura and the bases of the basal abdominal tergites. Clypeus, front, vertex, temples, propleura, and front coxae with numerous dark erect hairs; propodeum rather strongly hairy; thoracic dorsum with scattered hairs; venter with a few setae; pygidium densely bristly.

Clypeus 2.2 to 2.5 times as broad as high, the apical margin slightly concave. Front rather narrow, the middle interocular distance varying from .53 to .58 times the transfacial distance (commonly about .55). Eyes converging slightly above, the upper interocular distance about .85 the lower. Ocelli in a close triangle, the front angle acute; postocellar line less than



the ocello-ocular as 4 is to 5. Antennae elongate, the first four segments in a ratio of about 3:1:5:3.5, segment 3 subequal to the upper interocular distance (.9 to 1.2 times it). Temples narrow; vertex not at all elevated above the eye-tops.

Pronotum distinctly angulate behind. Slope of the propodeum low and even; median line weakly impressed if at all. Front basitarsus (Fig. 170) very weakly spined, the spines of the upper row very short, often seen with difficulty, those of the lower row moderately strong, one or two of them sometimes as long as the width of the tarsus. Fore wing with the second and third submarginal cells both 4-sided, both usually a little broader than high, of about equal breadth, the second narrowed by from .2 to .5 above, the third narrowed by from .5 to .9 above.

MALE.—Length 8.5 (6.5-11) mm. Color black; wings hyaline, the outer margin of the fore wings and apex of the hind wings with a conspicuous fuscous band. Head and thorax in large part silvery-sericeous, including the scape and the coxae, and to some extent the femora and tibiae; propodeum usually wholly silvery; first abdominal tergite with a broad basal silvery band, second and third tergites with progressively narrower silvery bands. Clypeus, front, and vertex with numerous dark hairs; front coxae, pro- and mesonota, and scutellum usually slightly hairy; propodeum with numerous fine, rather pale hairs on the sides; abdominal venter beyond the base of the second sternite with considerable short, dark, suberect hair, densest on sternites 4 and 5, where it tends to form loose brushes (Fig. 150).

Clypeus slightly over twice as broad as high, truncate below. Front of moderate breadth; inner orbits subparallel or diverging very slightly above. Ocelli as in the female. First four antennal segments in a ratio of about 3:1:3:3, the first three together equalling about 1.2 times the upper interocular distance. Pronotum sharply angled behind. Slope of the propodeum very low; median line often well impressed. Last segment of front tarsus modified as in *nigerrimus*. Venation as in the female; basal and transverse median veins of the fore wing sometimes interstitial.

Abdomen (Fig. 150) rather slender, especially basally, not attaining its full diameter until the end of the second segment; first tergite sloping only very slightly in profile. Venter with a considerable amount of short, bristly hair, as described above. Sternite 6 with the emargination broadly U-shaped. Subgenital plate slender, the sides approaching evenly to a narrowly rounded apex, the median line somewhat raised; disc rather hirsute, especially apically. Genitalia (Fig. 108) with the parameres slender, straight, the outer part with sparse long setae; basis volsellaris with a single long seta; digiti slender, the apex acuminate, the disc clothed with erect setae of moderate length, all of which are straight; parapenial lobes simple, slightly curved; aedoeagus of moderate breadth, the apex feebly bilobed.

*Biology*.—The typical habitat of this species is on the ground or low foliage in sunny spots in woodlands. In the northern parts

of the range there is one yearly generation, in early summer, although females may occasionally be found as late as September. Farther south there are two distinct generations, one in spring and one in late summer. Flowers are occasionally visited, particularly in the vicinity of woods, and the species has been taken on *Ceanothus*, *Solidago*, and *Pastinaca*. Nothing is known of the prey or nesting habits of this species. I have seen females walk under loose bark of trees, possibly looking for a convenient niche to serve as a nest. Blackman and Stage (1924) have reared it from dead hickory.

*Distribution*.—This species occurs transcontinentally, chiefly in the Transition Zone, from Nova Scotia, Manitoba, and British Columbia south to Washington, Colorado, Missouri, and Georgia.

*Specimens seen*: 590 (262 ♀♀, 328 ♂♂). The following records are marginal: NOVA SCOTIA: 1 ♀, Kentville, 13 July [CNC]; NEW BRUNSWICK: 1 ♂, Nerepis [USNM]; QUEBEC: 1 ♀, 1 ♂, Hemmingford, 5 July [CNC]; ONTARIO: 3 ♀♀, 11 ♂♂, Ottawa, July-Aug. [CNC]; 1 ♂, Gravenhurst, 6 July [AMNH]; MICHIGAN: Baraga Co., 1 ♂, Pequaming, 14 July [ANSP]; MINNESOTA: Lake of the Woods Co., 1 ♀, Baudette, 10 Aug. [Minn.]; MANITOBA: 1 ♂, Emerson, 15 July [CNC]; ALBERTA: 2 ♂♂, Wabamun, June-July [Alta.]; BRITISH COLUMBIA: 9 ♂♂, Steelhead, 9-31 Aug. [CNC]; WASHINGTON: 1 ♀ (no further data) [CU]; COLORADO: 1 ♂ (no further data) [USNM]; KANSAS: Riley Co., 6 ♀♀, 3 ♂♂, Manhattan, May, Oct. [KSC]; MISSOURI: Taney Co., 1 ♂, Hollister, 12 Aug. [CU]; KENTUCKY: Harlan Co., 2 ♀♀, Pine Mt., 3 May [ANSP]; GEORGIA: Fulton Co., 1 ♂, Atlanta, 5 May [EU]; Charlton Co., 1 ♀, Okefenokee Swamp, June [CU].

6. *Anoplus (Anoplus) hispidulus* Dreisbach

(Pl. XVII, fig. 110; pl. XX, fig. 138; pl. XXI, fig. 149; pl. XXII, fig. 159.)

*Anoplus hispidulus* Dreisbach, 1950, Amer. Midl. Nat., 43: 577, 585, figs. 25 and 26. [Type: ♂; Algonquin, Ill., 10 Aug. 1895; Ill. Nat. Hist. Survey (not seen by present author).]

This apparently uncommon species is best recognized by the very narrow, somewhat emarginate clypeus of the female, and the characteristic male genitalia and subgenital plate; the third submarginal cell is triangular and often petiolate.

FEMALE.—Length 8 (7-9) mm. Color black; wings subhyaline, outer margin of the fore wing and apex of the hind wing with a fuscous band. Pubescence brownish-cinereous, shading into silvery on the middle and hind coxae above. Front and vertex sparsely hairy; front coxae, pronotum,

mesonotum, and scutellum with scattered hairs; propodeum rather hairy, especially on the sides; middle and hind coxae and first abdominal tergite usually slightly hairy.

Clypeus only a little more than twice as broad as high, its apical margin shallowly but noticeably emarginate. Front rather broad, the middle interocular distance varying from .58 to .60 times the transfacial distance; upper interocular distance very slightly shorter than the lower. Vertex broad, straight across above the eye-tops. Ocelli close together, forming an acute angle in front; postocellar line: ocello-ocular line about as 2:3. First four antennal segments in a ratio of about 5:2:8:7, segment 3 equal to from .65 to .80 times the upper interocular distance. (Head shown in Fig. 159.)

Pronotum distinctly angulate behind. Slope of the propodeum low and even; median line faintly impressed above. Front basitarsus weakly spined, the spines of the upper row (except the apical one) extremely minute, those of the lower row only about half as long as the width of the tarsus. Fore wing with the stigma short; marginal cell approximately its own length from the wing-tip; second and third submarginal cells both usually somewhat broader than high, the second quadrate, the third triangular, often petiolate.

MALE.—Length 7 (6-8) mm. Color black; wings nearly hyaline, the outer margins with a brownish band. Pubescence more or less brownish, silvery as follows: lower front, coxae, lower pleura, propodeum, and basal bands on the first two or three abdominal tergites. Front, vertex, pronotum, front coxae, and propodeum with sparse erect hairs; third abdominal sternite with numerous short, suberect setae, more abundant caudad; fourth and fifth sternites each with a rather dense brush of short setae; last two sternites somewhat hirsute (Fig. 149).

Clypeus about twice as broad as high, its apical margin slightly arcuately concave. Front rather broad, the middle interocular distance about .62 times the transfacial. Inner orbits diverging very slightly above. Ocelli about as in the female. First four antennal segments in a ratio of about 11:5:12:12, segment 3 from 2.5 to 3 times as long as its greatest thickness. Pronotum angulate behind; propodeum sloping very gradually and evenly. Last segment of front tarsus feebly produced on the inner margin. Wing venation as in the female; third submarginal cell triangular, often petiolate.

Abdomen (Fig. 149) subfusiform, the first segment rather slender. Sternites with short brushes of hair as described above and shown in the figure. Sternite 6 with a rather deep V-shaped emargination. Subgenital plate (Fig. 138) rather broad within, tapering apically to a very slender, acute point, the extreme tip very narrowly rounded. Genitalia (Fig. 110) differing notably from other members of the subgenus by virtue of the very long parameres, which much exceed the other appendages; there is a strong sub-basal squama, and the outer margin is strongly setose. The volsellar digitus is very slender, the disc provided with a number of moderately long, recurved hairs; the apex is bare and acute. Parapenial lobes slender, simple, slightly exceeded by the aedocagus, which is broadest about two-thirds of the way out, the apex deeply cleft.

*Biology*.—I have collected this species in series on the flowers of parsnip, *Pastinaca sativa*, and taken a few specimens on sand nearby.

*Distribution*.—This species is known from only five localities, in the states of Illinois, Michigan, New York, Connecticut, and Maryland.

*Specimens seen*: 16 (8 ♀♀, 8 ♂♂). CONNECTICUT: Hartford Co., 7 ♀♀, 7 ♂♂, East Hartford, 11-20 June (H. E. Evans) [HEE, ANSP, USNM]; NEW YORK: Orange Co. 1 ♂, Tuxedo, 24 June (L. L. Pechuman) [KVK]; MARYLAND: Kent Co., 1 ♀, Chestertown, 27 Aug. [ANSP]; MICHIGAN: (Oscoda Co., 10 June; recorded by Dreisbach, 1950); ILLINOIS: (McHenry Co., Algonquin, 10 Aug.; recorded by Dreisbach, 1950).

7. *Anoplius (Anoplius) basalis* Dreisbach

(Pl. XVII, fig. 111; pl. XX, fig. 139; pl. XXI, fig. 148; pl. XXII, fig. 160.)

*Anoplius basalis* Dreisbach, 1950, Amer. Midl. Nat., 43: 575, 578, 589, figs. 9 and 10. [Type: ♂; Rutland, Vt., 15 Aug. 1916 (Chittenden); M.C.Z. no. 28,388.]

This species appears to be somewhat annectant between the *Nigerrimus* and *Illinoensis* species-groups. The female closely resembles *nigerrimus*, but differs in the much more hairy head, thorax, and propodeum; from *virginiensis* it differs principally in the broader front and vertex. The male resembles *illinoensis* and *ventralis* in most of its characteristics, but is much more extensively silvery-sericeous, and the genitalia are very distinctive.

FEMALE.—Length 9.5 (8-11) mm. Color black; wings lightly infuscated, the fore wings darker along the margin, very slightly violaceous. Pubescence conspicuously silvery at least on the hind coxae above, often much more extensively so. Clypeus, front, vertex, occiput, front coxae, thoracic dorsum, and propodeum all with moderately abundant erect hairs: middle and hind coxae often somewhat hairy, the femora often slightly so.

Clypeus nearly three times as broad as high, the apical margin slightly concave. Front broad, the middle interocular distance about .6 the transfacial. Eyes converging noticeably above, the upper interocular distance about .85 times the lower. Ocelli forming an acute angle in front; post-ocellar line usually slightly shorter than the ocello-ocular line. Antennae of moderate length, the first four segments in a ratio of about 15:5:21:19, segment 3 varying from .75 to .9 times the upper interocular distance. (Head shown in Fig. 160.)

Pronotum sharply angulate behind. Slope of the propodeum low and even, the median line weakly impressed. Front basitarsus weakly spined, the spines of the upper row (except the apical one) short and slender,

setiform, those of the lower row stout but very short. Fore wing with the marginal cell slightly more than its own length from the wing-tip; second submarginal cell rhomboidal, broader than high; third submarginal cell varying from triangular to fairly wide above.

MALE.—Length 8 (6-9.5) mm. Color black; wings nearly hyaline, with a darker marginal band. Pubescence silvery on the sides of the clypeus, lower front, coxae, lower pleura, and often the propodeum and basal bands on the basal abdominal tergites. Clypeus, front, vertex, front coxae, thoracic dorsum, and propodeum with moderately abundant erect hair; middle and hind coxae and first abdominal tergite slightly hairy; abdominal venter (Fig. 148) with moderately strong brushes of hair, that of the fourth sternite strongest, that of the fifth slightly less well developed, that of the third sternite weak.

Clypeus about 2.2 times as broad as high, its apical margin slightly concave; front broad, the middle interocular distance about .64 times the transfacial distance; inner orbits diverging very slightly above. Ocelli forming an acute angle in front; postocellar line: ocello-ocular line about as 2:3. Antennae rather long and slender, the first 4 segments in a ratio of about 3:1:3:3. Pronotum sharply angulate behind. Last segment of front tarsus rather strongly produced on the inner margin (much as in *ventralis*, shown in Fig. 164). Venation like that of the female.

Abdomen subfusiform, less slender basally than in the preceding two species. Venter with brushes of hair as described above and shown in Fig. 148. Sternite 6 with a rather deep V-shaped emargination. Subgenital plate (Fig. 139) much narrowed and attenuate apically, the extreme apex somewhat truncate. (In life the subgenital plate is somewhat folded medially, and therefore appears narrower apically than shown in the figure, where it is flattened out.) Genitalia (Fig. 111) with the parameres very stout basally, much more slender on the apical half; in dorsal view the base shows an arcuate constriction on the outer margin. Volsellar digitus straight for its basal half and folded upon itself, forming a double rod; the apical half is simple and irregularly acuminate, at an angle of about 120° to the basal half; at the outer angles are a number of setae which are abruptly bent upward about midway of their length. Parapenials simple, slightly exceeded by the aedeagus.

*Distribution.*—This apparently uncommon species occurs transcontinentally in the Canadian zone, south to New Brunswick, Vermont, Manitoba, and at high altitudes to New Mexico and California.

*Specimens seen:* 15 (8 ♀♀, 7 ♂♂). NEW BRUNSWICK: (1 ♂, Nerepis, 20 Aug.) (recorded by Dreisbach, 1950);<sup>18</sup> VERMONT: 1 ♂, Rutland, 1-15

<sup>18</sup> This is the specimen stated by Dreisbach (1950, p. 578) to be from "Nerepis, Nebr., VIII-20-? A. G. Levitt". There is no such locality in Nebraska, and it is very doubtful if this species occurs in that state in any case. There is, however, a considerable amount of material in the U.S.N.M. collected by A. G. Leavitt at Nerepis, New Brunswick, and I have no doubt this specimen is from that source.

Aug. 1916 (Chittenden) [MCZ]; MANITOBA: 1 ♀, Herchner, 1 July 1949 (J. B. Wallis) [CNC]; NORTHWEST TERRITORIES: 1 ♀, 1 ♂, Norman Wells, 20-29 July 1949 (W. R. M. Mason) [CNC]; BRITISH COLUMBIA: 1 ♀, 1 ♂, Kaslo (J. M. Cockle) [CNC]; WASHINGTON: Pierce Co., 1 ♀, 3 ♂♂, Paradise Valley, Mt. Rainier, 21 July-3 Aug. (C. L. Fox, E. C. VanDyke) [CAS]; OREGON: Harney Co., 1 ♀, Fish Lake, Steens Mts., 7000 feet, 11 July 1927 (H. A. Scullen) [OSC]; CALIFORNIA: Fresno Co., 1 ♀, 60 Lake Basin, 10500 feet, 21 July 1910 (E. C. VanDyke) [CAS]; COLORADO: 1 ♀, Twin Sisters Mt., June (Cockerell) [USNM]; NEW MEXICO: Otero Co., 1 ♀, Clouderoft, 9000 feet, on forest floor, 26 July 1948 (H. E. Evans) [HEE]; San Miguel Co., 1 ♂, Beulah, 29 June 1902 [ANSP].

### *Illinoensis* Species-group

In this group the silvery pubescence, if present at all, is confined to the front and clypeus in both sexes. The front basitarsus of the female is rather strongly spined; the last segment of the front tarsus of the male is strongly produced on the inner margin, the inner claw strongly curved, deeply cleft, the inner ray acute. The male venter has prominent brushes of long hairs.

#### 8. *Anoplius* (*Anoplius*) *imbellis* Banks

(Pl. XVII, fig. 112; pl. XX, fig. 142; pl. XXII, fig. 167.)

*Anoplius imbellis* Banks, 1944, Bull. Mus. Comp. Zool., 94: 169. [Type: ♀; Corvallis, Ore. (H. A. Scullen); C. A. S. no. 5954.]—Strickland, 1947, Canad. Ent., 79: 125. [Medicine Hat, Alta.]—Dreisbach, 1950, Amer. Midl. Nat., 43: 583, 585, 590, figs. 20 and 24.

*Anoplius imbellis* var. *major* Dreisbach, 1950, Amer. Midl. Nat., 43: 581-582, 590. [Type: ♂; Falls Church, Va., 29 June (N. Banks); M.C.Z. no. 28,389.] New synonymy.

This very small species has only recently been recognized; it is, however, very widely distributed and, at least in the Pacific states, not uncommon. The male is easily recognized by the characteristic subgenital plate (Fig. 142) and genitalia (Fig. 112). The female is extremely similar to *illinoensis* and *ventralis*, but is smaller, and the eyes are not or barely convergent above. This sex also resembles *nigerrimus* in some respects, but the front tarsi are more spinose and the coxae never silvery-sericeous.

FEMALE.—Length 7.5 (5-10) mm. Color black; front wings lightly to moderately infuscated, with a darker marginal band, hind wings subhyaline or lightly infuscated, darker apically. Pubescence brownish-fuscous, obscurely violaceous, sometimes silvery on the sides of the lower front and

clypeus and base of the mandibles. Body with a variable amount of erect hair; clypeus, front, vertex, temples, propleura, front coxae, thoracic dorsum, and propodeum slightly to moderately hairy; mesopleura and middle and hind coxae often somewhat hairy.

Clypeus about 2.5 times as broad as high, the apical margin truncate. Front of moderate, rather variable breadth, the middle interocular distance from .53 to .61 times the transfacial. Inner orbits a little emarginate in the middle, barely if at all convergent above, the upper interocular distance varying from .9 to 1.05 times the lower. Antennae not especially long, the first four segments in a ratio of about 30:10:40:33, segment 3 equal to from .65 to .85 times the upper interocular distance. Ocelli forming a right or acute angle in front, the postocellar line subequal to or slightly less than the ocello-ocular.

Posterior pronotal margin angulate. Propodeum usually with a slight median impression; slope low, a little steeper behind, with a poorly defined slightly concave declivity. Front basitarsus (Fig. 167) with the spines of the upper row large enough to be readily seen, and usually about half as long as the width of the tarsus, those of the lower row, in part at least, as long as the width of the tarsus. Fore wing with the stigma small; marginal cell about or slightly more than its length from the wing-tip; second and third submarginal cells both somewhat broader than high; third submarginal narrowed by at least half above, sometimes nearly or quite triangular; third transverse cubital vein strongly arched.

MALE.—Length 7 (5-9) mm. Color black; wings subhyaline or lightly infuscated, with a slightly darker marginal band. Pubescence brownish, often silvery on the lower front and clypeus. Front and vertex with numerous erect hairs; front coxae, thoracic dorsum, and propodeum a little hairy; abdominal sternite 3 with a few long erect hairs, sternites 4 and 5 each with a rather dense brush of prominent erect hairs, which are somewhat sinuate apically, and much shorter medially than laterally.

Clypeus about 2.2 times as broad as high. Front of moderate breadth, the middle interocular distance varying from .57 to .61 times the transfacial. Inner orbits slightly divergent above, the upper interocular distance varying from 1.0 to 1.1 times the lower. Ocelli as in the female. First four antennal segments in a ratio of usually about 25:10:28:27, segment 3 from 2.5 to 3 times as long as thick. Pronotum angulate behind. Slope of the propodeum low; median line impressed or not. Last segment of front tarsus strongly lobed on the inner margin, as in other members of this species-group. Venation as in the female; third submarginal cell often triangular, rarely petiolate.

Abdomen with prominent ventral hair-tufts, as described above. Sternite 6 with a large, broadly U-shaped emargination. Subgenital plate (Fig. 142) raised but slightly along the median line, the sides tapering to a narrowly rounded apex; the disc is inconspicuously setose, the outer margin fringed with a rather even row of stiff bristles. This is in contrast to the much

more keeled, rather bushy-haired subgenital plates of the two species which follow. Genitalia (Fig. 112) with the parameres short, straight, the squamae prominent and with a number of setae, the outer margin and apex with sparse long setae. Volsellar basis with only a few tiny setae; digitus broadened and slightly curved beyond the basal half, the apex somewhat attenuate, the disc evenly clothed with short setae. Aedoeagus weakly bilobed apically, exceeding slightly the other appendages, supported by the simple, slightly curved parapenial lobes.

*Biology.*—I have taken this species along streams in much the same habitat as *A. (A.) ithaca*; it does not, however, appear to be restricted to this habitat. Males have been taken on the flowers of *Heracleum* and *Eryngium* (Umbelliferae), and females on *Solidago* (Compositae); both sexes occasionally visit honeydew.

*Distribution.*—This species occurs transcontinentally from the Hudsonian to the Upper Austral Zones, but appears to be most common in the Transition Zone. It appears to be considerably more common in the Pacific states and provinces than elsewhere.

*Specimens seen:* 220 (78 ♀♀, 142 ♂♂). The following records appear to define the limits of the range as far as present knowledge indicates: MASSACHUSETTS: Suffolk Co., 1 ♂, Forest Hills, 15 Aug. [CAS]; Franklin Co., 1 ♀, Buckland, Sept. [MCZ]; NEW YORK: Oswego Co., 1 ♀, 28 Aug. [KVK]; Erie Co., 1 ♂, Buffalo, 16 Aug. [KVK]; MANITOBA: 1 ♂, Winnipeg, July [CNC]; 1 ♀, The Pas, 11 Aug. [Minn.]; NORTHWEST TERR.: 11 ♀♀, 22 ♂♂, Norman Wells, 12 July-3 Aug. [CNC]; YUKON: 3 ♂♂, Whitehorse, 9-11 July [CNC]; 1 ♀, 2 ♂♂, Snag, 24 July [CNC]; BRITISH COLUMBIA: Vancouver Isl., 1 ♀, Nanaimo, 25 June [CAS]; CALIFORNIA: San Diego Co., 1 ♂, Lakeside, 8 May [CU]; Riverside Co., 1 ♀, Ripley, 19 Aug. [CIS]; UTAH: Washington Co., 1 ♂, Leeds, 25 Apr. [UAC]; NEW MEXICO: San Miguel Co., 1 ♂, Beulah, 24 July [USNM]; TEXAS: Jeff Davis Co., 1 ♀, 2 ♂♂, Limpia Canyon, 5000 feet, 22-24 July [HEE]; KANSAS: Riley Co., 3 ♂♂, 22 May, 2-16 Oct. [HEE, KSC]; Douglas Co., 1 ♂, Baldwin [USNM]; TENNESSEE: Great Smoky Mts. Nat. Park, 1 ♀, 1 ♂, Clingman's Dome, 6300-6600 ft., 5 Aug. [ANSP]; NORTH CAROLINA: Buncombe Co., 2 ♀♀, Asheville, Aug. [HEE]; VIRGINIA: Fairfax Co., 1 ♀, 4 ♂♂, Dunn Loring, 30 May, 14 June, 5 Sept. [KVK].

9. *Anoplius (Anoplius) illinoensis* (Robertson)

(Pl. XVII, fig. 113; pl. XX, figs. 143, 145;  
pl. XXI, fig. 154; pl. XXII, fig. 166.)

*Pompilus luctuosus* Provancher, 1882, Nat. Canad., 13: 35, 36. [*Nec* Cresson, 1865; misidentification.]—Provancher, 1889, Faune Ent. Canad., Hymen., Add. & Corr., p. 260.



- Pompilus illinoensis* Robertson, 1901, Trans. Amer. Ent. Soc., 27: 202.  
[Lectotype: ♀; Carlinville, Ill. (Robertson); A.N.S.P.]<sup>19</sup>
- Anoplus luctuosus* Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.  
[N. J.]
- Psammochares (Anoplus) illinoensis* [sic] Banks, 1912, Jour. N. Y. Ent. Soc., 19: 224.
- Psammochares (Psammochares) luctuosus* Rohwer, 1916, Conn. Geol. Nat. Hist. Survey Bull. 22, p. 633. [Conn.]
- Psammochares (Anoplus) illinoensis* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Brimley, 1938, Insects No. Carolina, p. 434. [N. C.]
- Psammochares (Anoplus) illinoensis* [sic] Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 987. [N. Y.]—Johnson, 1930, List Ins. Fauna Nantucket, p. 111.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 128.
- Psammochares (Anoplus) luctuosus* Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 987.
- Anoplus illinoensis* Dreisbach, 1950, Amer. Midl. Nat., 43: 583, 585, 590, figs. 19 and 23.

One of the commoner elements in the pompilid-fauna of the northeastern and north central United States, *illinoensis* may be told from related species by the strongly spinose anterior basitarsus of the female (Fig. 166), the absence of more than a few inconspicuous hairs on the propodeum of the male, and the very characteristic male genitalia (Fig. 113).

FEMALE.—Length 12 (9-16) mm. Color black; wings lightly to moderately infuscated, the outer margins with a darker fuscous band. Pubescence brownish-fuscous, on the abdomen obscurely violaceous. Front, vertex, pronotum, and propodeum with scattered erect hairs; mesonotum, scutellum, coxae, and first abdominal tergite also somewhat hairy; mesopleura without erect hairs.

Clypeus about 2.5 times as broad as high, the apical margin truncate or a little concave. Front of moderate breadth, the middle interocular distance varying from .52 to .58 times the transfacial distance. Inner orbits emarginate near the middle, slightly convergent above, the upper interocular distance about .9 the lower. Ocelli forming a right or acute angle in front; post-ocellar line usually slightly less than the ocello-ocular. First four antennal segments in a ratio of about 30:10:50:35, segment 3 equal to from .8 to 1.0 times the upper interocular distance.

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<sup>19</sup> Robertson described this species from four co-types, two each in the ANSP and USNM, all conspecific beyond a doubt. The female in the former collection is hereby designated the type.

Pronotum angulate behind. Propodeum slightly more declivous behind, with a moderately well-defined declivity; median line impressed or not. Front basitarsus (Fig. 166) strongly spined, more so than other members of the species-group, the spines of both rows for the most part as long as the width of the tarsus. Fore wing with the stigma short; marginal cell long, about or slightly more than its own length from the wing-tip; second and third submarginal cells of about the same width, both slightly broader than high; third submarginal cell narrowed by more than half above (Fig. 154).

MALE.—Length 9.5 (7-12.5) mm. Color black; wings hyaline or lightly infuscated, the outer margins with a fuscous band. Pubescence brownish or nearly black, obscurely violaceous, nowhere silvery. Clypeus, front, vertex, pronotum, and front coxae with a few erect hairs; propodeum without more than a few thin hairs on the sides; third abdominal sternite sometimes slightly hairy, but without a definite brush; fourth and fifth sternites with brushes of rather long hairs, longer on the sides than medially, the hairs sinuate at their tips for the most part; sternite 6 with some short bristles on each side; subgenital plate somewhat bushy-haired.

Mandibles bidentate. Clypeus a little more than twice as broad as high. Front of moderate breadth, the middle interocular distance varying from .56 to .61 times the transfacial. Inner orbits subparallel, slightly emarginate near the middle. Vertex rather broad, raised slightly above the eye-tops; ocelli as in the female. Antennae elongate, the first four segments in a ratio of about 25:10:32:30, segment 3 nearly 4 times as long as thick. Pronotum angulate behind. Last segment of front tarsus strongly produced on the inner margin, this segment about 1.7 times as long as its greatest width. Venation like that of the female; third submarginal cell often nearly or quite triangular.

Abdomen relatively stout; venter with brushes of hair as described above. Sternite 6 with the emargination large, V-shaped. Subgenital plate (Fig. 143) rather narrow, the apex attenuate, narrowly rounded, the median line strongly elevated; apical portion more or less bushy-haired. The plate is slightly more long and narrow than in *ventralis*, and is wholly pigmented, though when not exerted it appears very similar. Genitalia (Fig. 113) characterized at once by the peculiar form of the diti; these are somewhat triangular in shape, the apex acuminate, the upper outer margin slightly concave, the upper inner margin slightly convex; the disc is clothed with short, straight hairs which are rather long and dense along the upper inner margin and directed inward. The other appendages do not differ notably from those of related species.

*Biology*.—This species is chiefly characteristic of open fields and meadows. Nothing whatever is known of its nesting habits. I have taken it on the flowers of *Pastinaca sativa*, *Daucus carota*, *Eupatorium perfoliatum*, *Hymenopappus corymbosus*, *Solidago* spp., *Tamarix gallica*, and *Melilotus alba*. It is on the wing from June to September.

*Distribution.*—This species is chiefly an inhabitant of the Alleghanian and Carolinian faunas, occurring from Quebec, Michigan, and Montana to Colorado, Texas, and Georgia.

*Specimens seen:* 409 (290 ♀♀, 119 ♂♂). The following records are marginal: MAINE: Kennebec Co., 1 ♀, Winthrop, Aug. [MCZ]; QUEBEC: 1 ♂, Hemmingford, 24 June [CNC]; ONTARIO: 3 ♀♀, Ottawa [CNC]; MICHIGAN: Cheboygan Co., 1 ♀, Mullet Lake, 10 Aug. [Minn.]; MINNESOTA: Clearwater Co., 2 ♀♀, 1 ♂, Itasca, July-Aug. [Minn.]; NORTH DAKOTA: Cass Co., 1 ♀, Fargo, Aug. [MCZ]; SOUTH DAKOTA: Custer Co., 8 ♀♀, 1 ♂, Black Hills, 24 Aug. [HEE]; MONTANA: 1 ♂ (no further data) [ANSP]; COLORADO: Boulder Co., 1 ♀, July [USNM]; KANSAS: Reno Co., 1 ♀, 11 June [KSC]; TEXAS: Dallas Co., 1 ♀, Dallas, June [USNM]; MISSOURI: Taney Co., 1 ♀, Ozark Lake, 21 Sept. [CAS]; GEORGIA: Spalding Co., 1 ♀, Pomona, 15 May [CU].

10a. *Anoplius (Anoplius) ventralis ventralis* (Banks)

(Pl. XVIII, fig. 114; pl. XX, fig. 141; pl. XXI, fig. 147; pl. XXII, fig. 164.)

*Psanmochares ventralis* Banks, 1910, Jour. N. Y. Ent. Soc., 18: 120. [Type: ♂; Falls Church, Va., 22 Oct. (N. Banks); M.C.Z. no. 13,698].—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 986. [Ithaca, N. Y.]

*Anoplius ventralis* Procter, 1938, Biol. Survey Mt. Desert Reg., VI, Insecta, p. 430. [Mt. Desert, Me.]—Dreisbach, 1950, Amer. Midl. Nat., 43: 586-588, figs. 29 and 32.—Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 264. [Dare Co., N. C.]

*Anoplius elongatus* Dreisbach, 1950, Amer. Midl. Nat., 43: 575-576, figs. 11 and 12. [Type: ♂; Pelican Lake, Niswaw, Minn., 30 July 1919 (L. Brunner); Univ. Nebraska.]<sup>20</sup> New synonymy.

*Anoplius subtarsatus* Dreisbach, 1950, Amer. Midl. Nat., 43: 578-579, 585, figs. 18 and 22. [Type: ♂; Raleigh, N. C., 9 May 1940 (D. L. Wray); N. Carolina Dept. Agri.]<sup>20</sup> New synonymy.

This species resembles very closely the preceding, and the nominate subspecies occurs over much the same range, though it extends farther south. Both sexes show a greater amount of hair on the body, as expressed in the keys; the front basitarsus of the female is somewhat less strongly spined than in *illinoensis*; the male genitalia and subgenital plate show minor though constant differences from this species.

<sup>20</sup> The type specimens of *elongatus* and *subtarsatus* are, at this writing, still in the hands of the describer, and I have not seen them. Judging from the descriptions and figures, both appear to fall within the range of variation of *ventralis ventralis* as here interpreted.

FEMALE.—Length 12 (10-15) mm. Color black; fore wings lightly to moderately infuscated, with a darker marginal band, sometimes slightly violaceous; hind wings subhyaline basally, the apex infuscated. Pubescence very dark, fusco-violaceous, obscurely reflecting deep bluish, especially on the abdomen. Front and vertex with numerous erect hairs; front coxae rather hairy, the middle and hind coxae usually slightly so; pronotum, mesonotum, scutellum, and mesopleura all with at least a few rather long hairs; propodeum with abundant hairs.

Clypeus about 2.5 times as broad as high, its apical margin slightly concave. Front of moderate breadth, the middle interocular distance varying from .54 to .59 times the transfacial. Inner orbits slightly convergent above, the upper interocular distance about .9 the lower. Ocelli forming a right or acute angle in front, the postocellar line usually slightly less than the ocello-ocular. First four antennal segments in a ratio of about 3:1:5:4, segment 2 equal to from .8 to 1.0 times the upper interocular distance.

Posterior margin of pronotum angulate. Propodeum with a vaguely defined posterior declivity. Front basitarsus with the spines of the upper row of moderate size, generally about half as long as the diameter of the tarsus, those of the lower row in part at least as long as or longer than the diameter of the tarsus. (The illustration for *imbellis*, Fig. 167, serves equally well for this species.) Fore wing with the second submarginal cell usually not broader than high, because of the obliquity of the second transverse cubital vein; third submarginal wider than the second and usually wider than high, narrowed by from .6 to .9 above.

MALE.—Length 10 (7-14) mm. Color black; wings subhyaline to moderately infuscated, with a darker marginal band. Pubescence often a bit silvery on the sides of the lower front, otherwise very dark, somewhat violaceous, obscurely reflecting deep bluish. Scape, clypeus, front, vertex, temples, and propleura all with erect hairs; front coxae and pronotum somewhat hairy, the remainder of the thorax slightly so; propodeum strongly hairy; abdominal sternites 3, 4, and 5 each with a dense brush of rather long hairs, longer laterally than medially (the brush on the third sternite is often less strong than the others, and is rarely almost absent); sternites 6 and 7 somewhat hirsute. A lateral view of the propodeum and abdomen is shown in Fig. 147.

Mandibles bidentate. Clypeus slightly more than twice as broad as high. Middle interocular distance varying from .56 to .62 times the transfacial. Upper interocular distance subequal to or a little greater than the lower. Ocelli prominent, forming an angle in front which is generally slightly less than a right angle; postocellar line: ocello-ocular line about as 4:5. First four antennal segments in a ratio of roughly 30:10:32:31, segment 3 usually about 3 times as long as thick. Pronotum angulate behind. Propodeum with the slope low and even, the median line usually impressed. Last segment of front tarsus strongly produced on the inner margin (Fig. 164), as usual in this species-group. Venation about as in the female, the

cells a bit further removed from the wing margin; the strongly oblique second transverse cubital vein is characteristic.

Abdominal venter with brushes of hair as described above and shown in Fig. 147. Sternite 6 with the emargination V-shaped. Subgenital plate (Fig. 141) of somewhat variable shape, but always with an elevated, pigmented, somewhat bushy-haired median band, and on either side more or less broad unpigmented areas. Genitalia (Fig. 114) also somewhat variable; parameres slender, not exceeding the aedocagus, the squamae prominent and strongly setose; basis volsellaris with one or two setae of moderate length; digiti somewhat spindle-shaped, the apex acuminate, the disc clothed rather heavily with simple setae, except for a bare strip along the inner margin; parapenials curved slightly; aedocagus rather broad, somewhat bilobed apically.

*Biology*.—This is a wide-ranging form which does not seem to be restricted to any particular habitat. I have taken it in sandy areas, fields, and wooded swampy areas. It has been taken on honeydew, and on the flowers of *Solidago* (Compositae), *Pastinaca*, and *Bifora* (Umbelliferae). Dates of capture vary from June to September in the northern parts of the range, February to November in the South.

*Distribution*.—This subspecies ranges throughout the Austro-riparian, Carolinian, and Alleghanian faunas, from Florida and eastern Texas to Nova Scotia and Manitoba.

*Specimens seen*: 160 (90 ♀♀, 70 ♂♂). The following localities appear to be marginal: NOVA SCOTIA: 1 ♂, White Pt. Beach, Queens Co., 14 Aug. [CNC]; QUEBEC: 1 ♂, St. Hilaire, 11 July [CNC]; ONTARIO: 1 ♀, Merivale, 10 Sept. [CNC]; MICHIGAN: Cheboygan Co., 1 ♂, 4 July [UK]; MINNESOTA: Clearwater Co., 3 ♀♀, 1 ♂, Itasca Park, 3 July-10 Aug. [Minn.]; MANITOBA: 1 ♀, Winnipeg [CNC]; SOUTH DAKOTA: Pennington Co., 1 ♂, Hill City, 31 July [Minn.]; ARKANSAS: Prairie Co., 1 ♀, Hazen, 10 June [HEE]; TEXAS: Lee Co., 1 ♀, 1 ♂, Giddings, 6-10 July [HEE]; Victoria Co., 1 ♀, 2 ♂♂, Victoria, Mch., Nov. [USNM]; LOUISIANA: 1 ♀, New Orleans, 13 Mch. [USNM]; MISSISSIPPI: Harrison Co., 1 ♂, Biloxi, June [MCZ]; FLORIDA: Dade Co., 1 ♂, Paradise Key, 10 Mch. [USNM].

10b. *Anoplius* (*Anoplius*) *ventralis tarsatus* Banks

(Pl. XVIII, fig. 115.)

*Anoplius tarsatus* Banks, 1919, Bull. Mus. Comp. Zool., 63: 233, 234. [Type: ♀; Sherwood, Mendocino Co., Calif., 1 July 1907; C. U. no. 686.]—Strickland, 1947, Canad. Ent., 79: 125. [Medicine Hat, Alta.]—Dreisbach, 1950, Amer. Midl. Nat., 43: 585, 586, 590, figs. 17 and 21.

- Psammocharcs luctuosus* Williams, 1919, Bull. Hawaiian Sugar Pl. Assoc., Ent. Ser., no. 14, p. 110. [*Nec* Cresson, 1865; misidentification.] [Biology.]—Essig, 1926, Insects of Western North America, p. 882, fig. 742. [Biology.]—Essig, 1942, College Entomology, p. 697.
- Anoplius luctuosus* Williams, 1931, Handbook of Insects and Other Invert. of Hawaiian Sugar Cane Fields, pp. 240-241.
- Anoplius papago* Banks, 1941, Canad. Ent., 73: 120. [Type: ♂; Tucson, Ariz. (F. H. Snow); M.C.Z. no. 25,263.] New synonymy.—Dreisbach, 1950, Amer. Midl. Nat., 43: 584-585, 587, 590, figs. 28 and 31.

This conspicuously bluish wasp is a common element in the fauna of the western United States. It has also been introduced into the Hawaiian Islands, where it is the only representative of the family Pompilidae. Unfortunately it has usually been called *luctuosus*, but this is a very different insect belonging to the genus *Pompilus*.

FEMALE.—Length 11.5 (8.5-15) mm. Color black, rendered slightly to rather intensely bluish by the pubescence. In some individuals the pubescence is merely fusco-violaceous, rather obscurely reflecting bluish; on the other extreme are specimens in which the pubescence is wholly a rich Prussian blue. Fore wings lightly to rather heavily infuscated, with a darker marginal band, more or less violaceous; hind wings nearly hyaline basally, the apex infuscated. Scape usually hairy; entire head, thorax, and propodeum with moderately abundant erect black hairs; front coxae hairy, the middle and hind coxae and front femora somewhat so, sometimes also the remaining femora; first abdominal tergite with considerable erect hair anteriorly. Morphological features much as in *centralis centralis*. Front and vertex often a bit broader, the middle interocular distance varying from .53 to .61 times the transfacial distance; third antennal segment varying from .7 to 1.1 times the upper interocular distance.

MALE.—Length 9.5 (6.5-13.5) mm. Color black, rendered slightly to intensely bluish or blue-green by the pubescence; there is sometimes a patch of silvery pubescence on the sides of the lower front. Wings subhyaline to moderately infuscated, darker along the outer margin, more or less violaceous. Scape hairy below; front with abundant dark hairs; thorax and propodeum with considerable erect hair; venter with brushes of hair on sternites 3, 4, and 5, but that on 3 usually not as strong as the others and sometimes practically absent. Genitalia (Fig. 115) differing from those of the nominate subspecies in that the digiti are hairy along the inner margin as well as elsewhere, except at the extreme tip.

*Biology*.—Essig (1926) reports that this species nests in the ground and preys upon *Trochosa pratensis* (Emerton) (Lyco-sidae). Williams (1931) notes that the species first appeared in

Hawaii about 1910, and has since become common there. It may, he says, "often be seen dashing about the grass or low weeds". He states that it preys on a variety of spiders. Earlier (1919) Williams notes that the species "though digging a separate burrow for each of her spiders, has a tendency to bury all these close together".

This form is a not infrequent visitor to flowers, having been taken on *Asclepias*, *Heracleum lanatum*, and *Vicia*. In the northern parts of its range, it is on the wing chiefly from July to September; in the Sonoran parts of California there are records from every month of the year, suggesting a considerable number of generations a year in this area.

*Distribution*.—Lower Sonoran to Transition faunas, from western Texas, Chihuahua, and southern California to British Columbia and Alberta. As mentioned earlier, this form is now well established in the Hawaiian Islands.

*Specimens seen*: 287 (136 ♀♀, 151 ♂♂). The following records are marginal: BRITISH COLUMBIA: 1 ♀, Seton Lake, 4 Aug. [CNC]; 1 ♀, Creston, 12 Sept. [CNC]; ALBERTA: 1 ♀, Lethbridge, 21 Sept. [CNC]; 2 ♀♀, Medicine Hat, July-Aug. [Alta.]; MONTANA: Yellowstone Co., 1 ♀, Billings [USNM]; WYOMING: 1 ♂, Summit, 8835 feet, 16 Aug. [Minn.]; COLORADO: Boulder Co., 1 ♂, Boulder, July [MCZ]; El Paso Co., 1 ♀, Colorado Springs, Aug. [USNM]; NEW MEXICO: San Miguel Co., 1 ♂, Beulah, 24 July [ANSP]; TEXAS: Reeves Co., 1 ♀, Balmorhea Lake, 18 July [HEE]; Brewster Co., 1 ♀, Alpine, 1 July [OSC]; MEXICO: Chihuahua, 1 ♀, Madera, 6 July, 7200 feet [AMNH]; ARIZONA: Pima Co., 1 ♀, Baboquivari Mts. [USNM]; CALIFORNIA: San Diego Co., 1 ♀, Laguna Mt., 23 Aug. [CAS]; 1 ♂, Poway, 22 March [CAS]. I have also seen specimens from the islands of Hawaii, Maui, and Oahu in the Hawaiian Islands.

## EXPLANATION OF FIGURES

Note: In all figures of male genitalia, the ventral aspect is shown on the left half, the dorsal on the right.

## PLATE XI

- Fig. 72.—*Anoplius* (*Lophopompilus*) *acthiops* (Cresson), male genitalia.  
 Fig. 73.—*A. (L.) clcora* (Banks), male genitalia.  
 Fig. 74.—*A. (L.) carolinus* (Banks), male genitalia.  
 Fig. 75.—*A. (L.) bengtssoni* (Regan), male genitalia.  
 Fig. 76.—*A. (L.) atrox* (Dahlbom), male genitalia.  
 Fig. 77.—*A. (Notiochares) amethystinus* (Fabricius), male genitalia.

## PLATE XII

- Fig. 78.—*A. (Anopliodes) bolli* Banks, male genitalia.  
 Fig. 79.—*A. (A.) parsonsi* (Banks), male genitalia.  
 Fig. 80.—*A. (Arachnoproctonus) bellicosus* (Banks), male genitalia.  
 Fig. 81.—*A. (A.) xerophilus* Evans, male genitalia.  
 Fig. 82.—*A. (A.) apiculatus* (Smith), male genitalia.  
 Fig. 83.—*A. (A.) semirufus* (Cresson), male genitalia.

## PLATE XIII

- Fig. 84.—*A. (A.) marginalis* (Banks), male genitalia.  
 Fig. 85.—*A. (A.) americanus* (Beauvois), male genitalia.  
 Fig. 86.—*A. (A.) moestus* (Banks), male genitalia.  
 Fig. 87.—*A. (Pompilius) grandiflexionis* Evans, male genitalia.  
 Fig. 88.—*A. (P.) subcylindricus* (Banks), male genitalia.  
 Fig. 89.—*A. (P.) percitus* Evans, male genitalia.

## PLATE XIV

- Fig. 90.—*A. (P.) krombeini* Evans, male genitalia.  
 Fig. 91.—*A. (P.) cylindricus* (Cresson), male genitalia.  
 Fig. 92.—*A. (P.) californicae* Evans, male genitalia.  
 Fig. 93.—*A. (P.) estellina* (Banks), male genitalia.  
 Fig. 94.—*A. (P.) tenebrosus* (Cresson), male genitalia.  
 Fig. 95.—*A. (P.) insolens* (Banks), male genitalia.

## PLATE XV

- Fig. 96.—*A. (P.) clystera* (Banks), male genitalia.  
 Fig. 97.—*A. (P.) marginatus* (Say), male genitalia.  
 Fig. 98.—*A. (P.) stenotus stenotus* (Banks), male genitalia.  
 Fig. 99.—*A. (P.) stenotus bequaerti* (Dreisbach), male genitalia.  
 Fig. 100.—*A. (P.) rectangularis rectangularis* (Dreisbach), male genitalia.  
 Fig. 101.—*A. (P.) rectangularis gillaspyi* new subspecies, male genitalia.



## PLATE XVI

- Fig. 102.—*A. (P.) tocneci* new species, male genitalia.  
 Fig. 103.—*A. (P.) splendens* (Dreisbach), male genitalia.  
 Fig. 104.—*A. (P.) fraternus* (Banks), male genitalia.  
 Fig. 105.—*A. (Anoplius) depressipes* Banks, male genitalia.  
 Fig. 106.—*A. (A.) nigerrimus* (Scopoli), male genitalia.  
 Fig. 107.—*A. (A.) ithaca* (Banks), male genitalia.

## PLATE XVII

- Fig. 108.—*A. (A.) virginicusis* (Cresson), male genitalia.  
 Fig. 109.—*A. (A.) fulgidus* (Cresson), male genitalia.  
 Fig. 110.—*A. (A.) hispidulus* Dreisbach, male genitalia.  
 Fig. 111.—*A. (A.) basalis* Dreisbach, male genitalia.  
 Fig. 112.—*A. (A.) imbellis* Banks, male genitalia.  
 Fig. 113.—*A. (A.) illinoensis* (Robertson), male genitalia.

## PLATE XVIII

- Fig. 114.—*A. (A.) ventralis ventralis* (Banks), male genitalia.  
 Fig. 115.—*A. (A.) ventralis tarsatus* Banks, male genitalia.  
 Fig. 116.—*A. (Lophopompilus) aethiops* (Cresson), male subgenital plate.  
 Fig. 117.—*A. (L.) atrox* (Dahlbom), male subgenital plate.  
 Fig. 118.—*A. (Notiochares) amethystinus* (Fabricius), male subgenital plate.  
 Fig. 119.—*A. (Arachnophroctonus) apiculatus* (Smith), male subgenital plate.  
 Fig. 120.—*A. (A.) semirufus* (Cresson), male subgenital plate.  
 Fig. 121.—*A. (A.) americanus* (Beauvois), male subgenital plate.  
 Fig. 122.—*A. (A.) moestus* (Banks), male subgenital plate.

## PLATE XIX

- Fig. 123.—*A. (Pompilinus) cylindricus* (Cresson), male subgenital plate.  
 Fig. 124.—*A. (P.) grandiflexionis* Evans, male subgenital plate.  
 Fig. 125.—*A. (P.) subcylindricus* (Banks), male subgenital plate.  
 Fig. 126.—*A. (P.) percitus* Evans, male subgenital plate.  
 Fig. 127.—*A. (P.) krombeini* Evans, male subgenital plate.  
 Fig. 128.—*A. (P.) texanus* (Dreisbach), male subgenital plate.  
 Fig. 129.—*A. (P.) californiae* Evans, male subgenital plate.  
 Fig. 130.—*A. (P.) estellina* (Banks), male subgenital plate.  
 Fig. 131.—*A. (P.) rectangularis* (Dreisbach), male subgenital plate.  
 Fig. 132.—*A. (P.) stenotus* (Banks), male subgenital plate.  
 Fig. 133.—*A. (P.) splendens* (Dreisbach), male subgenital plate.  
 Fig. 134.—*A. (P.) clystera* (Banks), male subgenital plate.

## PLATE XX

- Fig. 135.—*A. (P.) tenebrosus* (Cresson), male subgenital plate.  
 Fig. 136.—*A. (P.) insolens* (Banks), male subgenital plate.  
 Fig. 137.—*A. (P.) fraternus* (Banks), male subgenital plate.  
 Fig. 138.—*A. (Anoplius) hispidulus* Dreisbach, male subgenital plate.  
 Fig. 139.—*A. (A.) basalis* Dreisbach, male subgenital plate.  
 Fig. 140.—*A. (A.) nigerrimus* (Scopoli), male subgenital plate.  
 Fig. 141.—*A. (A.) ventralis* (Banks), male subgenital plate.  
 Fig. 142.—*A. (A.) imbellis* Banks, male subgenital plate.  
 Fig. 143.—*A. (A.) illinoensis* (Robertson), male subgenital plate.  
 Fig. 144.—*A. (A.) ithaca* (Banks), apical tarsal segment of female.  
 Fig. 145.—*A. (A.) illinoensis* (Robertson), apex of abdomen of female.

## PLATE XXI

- Fig. 146.—*A. (Arachnoproctonus) relaticus* (Fox), side view of propodeum and abdomen of male.  
 Fig. 147.—*A. (Anoplius) ventralis* (Banks), side view of propodeum and abdomen of male.  
 Fig. 148.—*A. (A.) basalis* Dreisbach, side view of abdomen of male.  
 Fig. 149.—*A. (A.) hispidulus* Dreisbach, side view of abdomen of male.  
 Fig. 150.—*A. (A.) virginiensis* (Cresson), side view of abdomen of male.  
 Fig. 151.—*A. (Pompilinus) marginatus* (Say), side view of propodeum of male.  
 Fig. 152.—*A. (Arachnoproctonus) relaticus* (Fox), wings.  
 Fig. 153.—*A. (Pompilinus) marginatus* (Say), wings.  
 Fig. 154.—*A. (Anoplius) illinoensis* (Robertson), wings.  
 Fig. 155.—*A. (Pompilinus) texanus* (Dreisbach), male genitalia.

## PLATE XXII

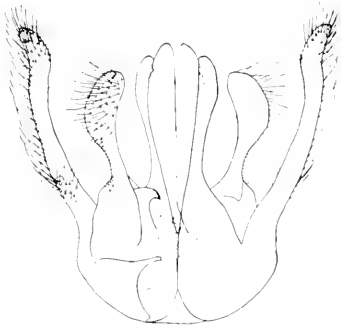
- Fig. 156.—*A. (P.) krombcini* Evans, head of female.  
 Fig. 157.—*A. (P.) insolens* (Banks), head of female.  
 Fig. 158.—*A. (P.) percitus* Evans, head of female.  
 Fig. 159.—*A. (Anoplius) hispidulus* Dreisbach, head of female.  
 Fig. 160.—*A. (A.) basalis* Dreisbach, head of female.  
 Fig. 161.—*A. (Pompilinus) marginatus* (Say), side view of propodeum of female.  
 Fig. 162.—*A. (P.) splendens* (Dreisbach), side view of propodeum of female.  
 Fig. 163.—*A. (Anoplius) nigerrimus* (Scopoli), last segment of front tarsus of male.  
 Fig. 164.—*A. (A.) ventralis* (Banks), last segment of front tarsus of male.  
 Fig. 165.—*A. (Pompilinus) marginatus* (Say), hind basitarsus of male.  
 Fig. 166.—*A. (Anoplius) illinoensis* (Robertson), front basitarsus of female.  
 U, upper row of spines; L, lower row of spines.  
 Fig. 167.—*A. (A.) imbellis* Banks, basal two segments of front tarsus of female.

Fig. 168.—*A. (A.) fulgidus* (Cresson), front basitarsus of female.

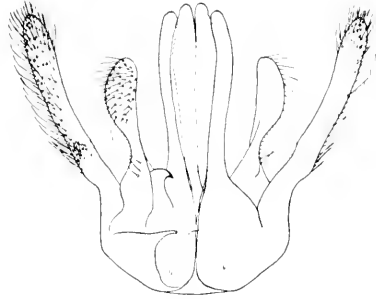
Fig. 169.—*A. (A.) depressipes* Banks, basal two segments of front tarsus of female.

Fig. 170.—*A. (A.) virginiensis* (Cresson), front basitarsus of female.

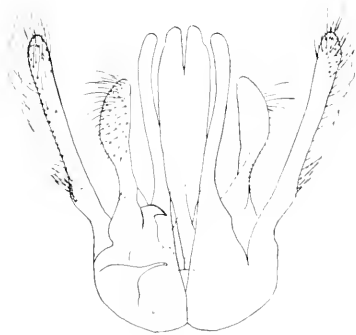




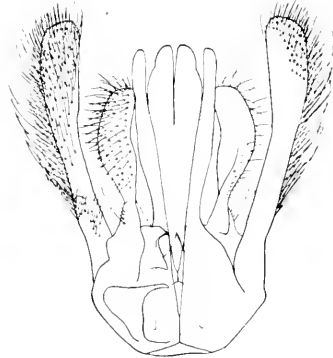
72 AETHIOPS



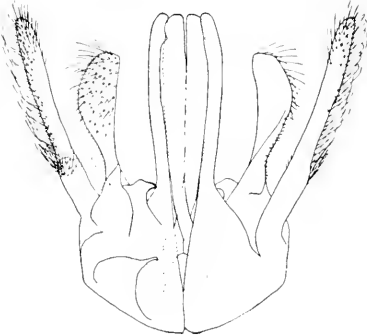
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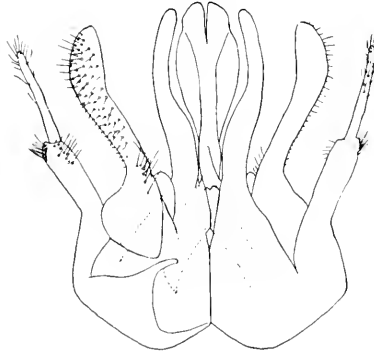
74 CAROLINUS



75 BENGTSSONI



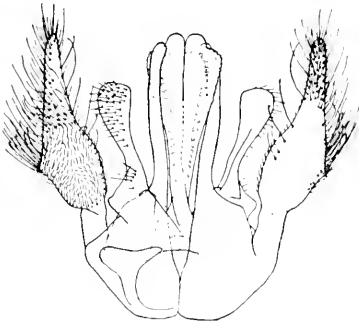
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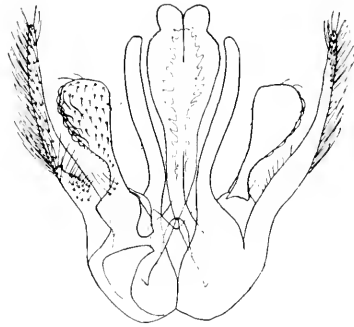
77 AMETHYSTINUS

EVANS—NEARCTIC SPIDER WASPS

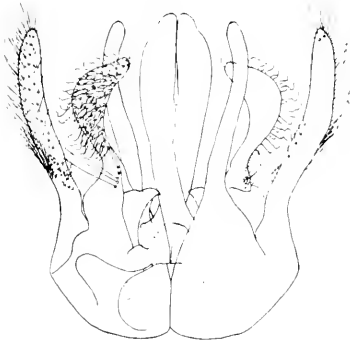




78 BOLLIA



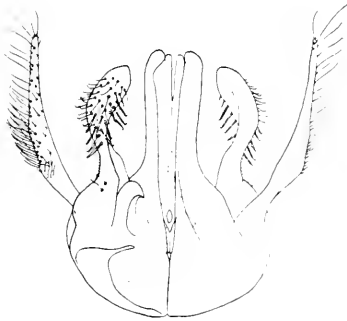
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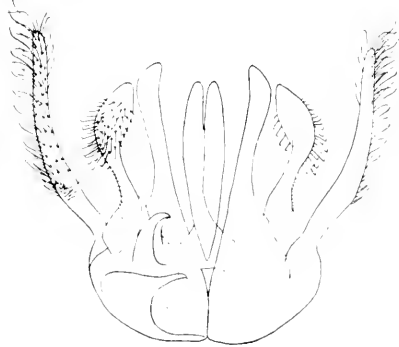
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81 XEROPHILUS



82 APICULATUS



83 SEMIRUFUS

EVANS—NEARCTIC SPIDER WASPS



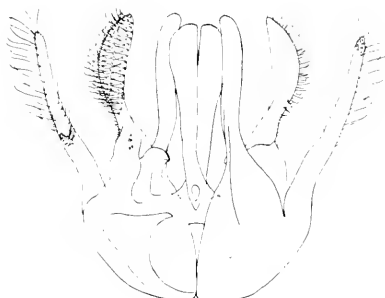




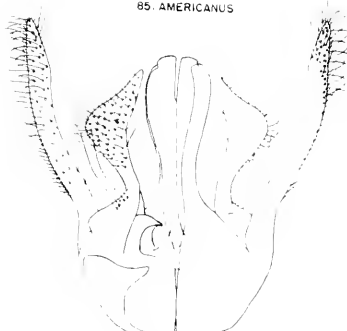
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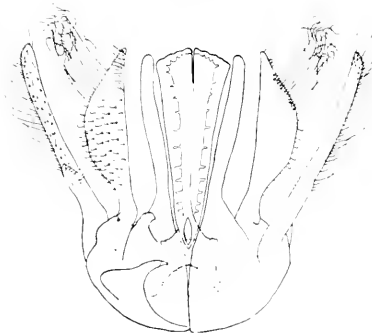
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86 MOESTUS



87 GRANDIFLEXIONIS



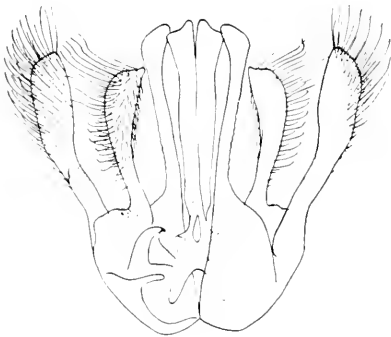
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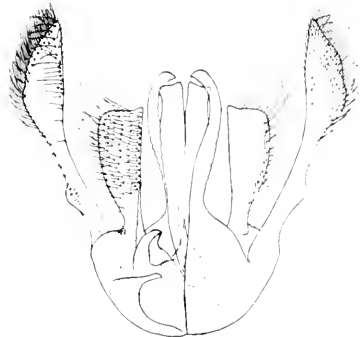
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EVANS—NEARCTIC SPIDER WASPS

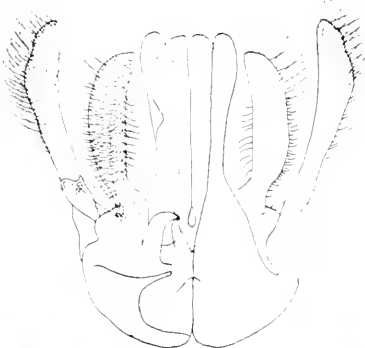




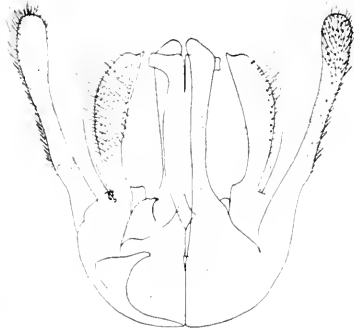
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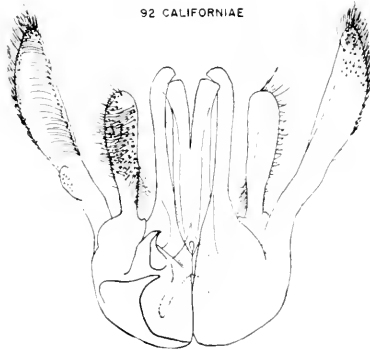
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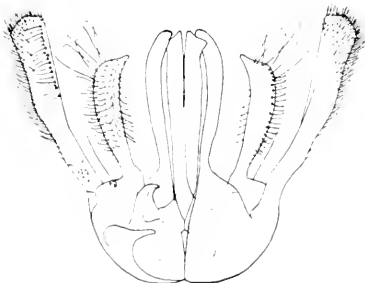
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93 ESTELLINA



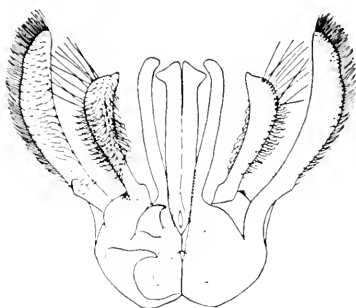
94 TENEBROSUS



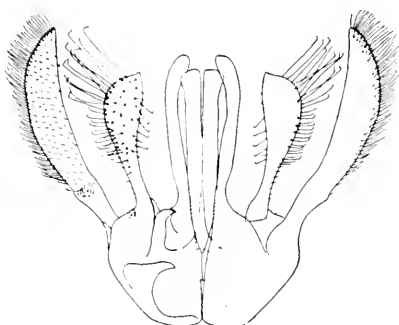
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EVANS—NEARCTIC SPIDER WASPS

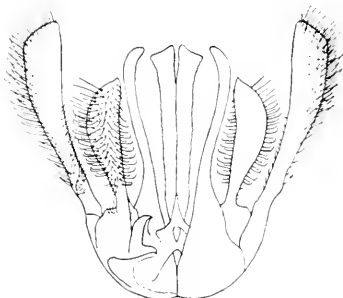




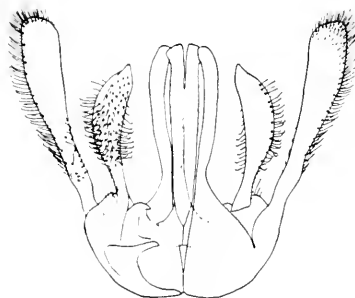
96 CLYSTERA



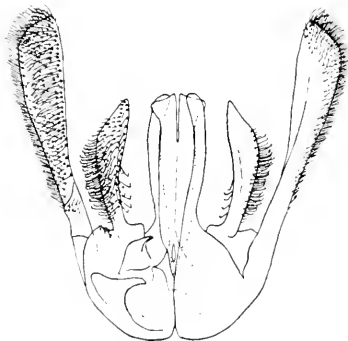
97. MARGINATUS



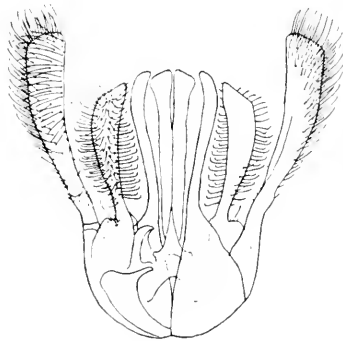
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99 BEQUARTI



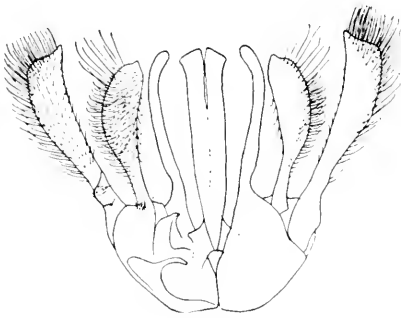
100 RECTANGULARIS



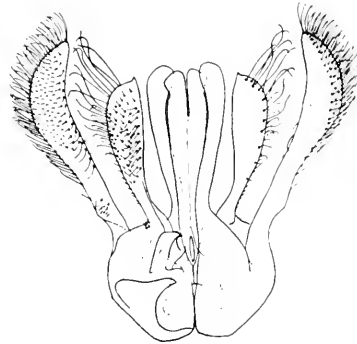
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EVANS—NEARCTIC SPIDER WASPS

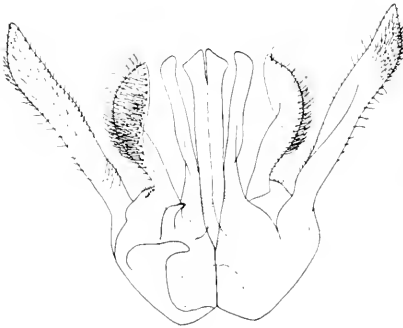




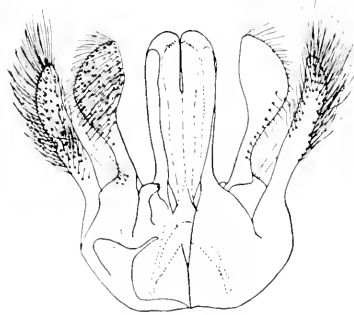
102. TOWNESI



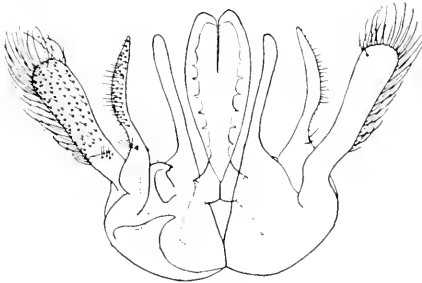
103. SPLENDENS



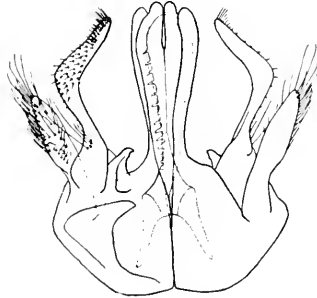
104. FRATERNUS



105. DEPRESSIPES



106. NIGERRIMUS

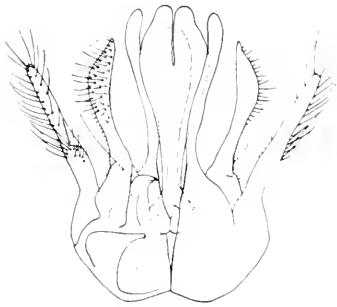


107. ITHACA

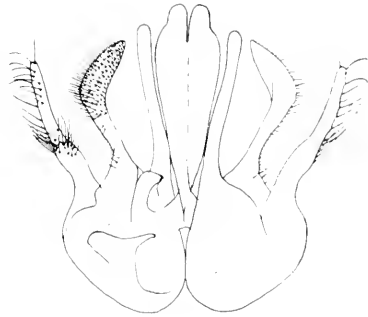
EVANS—NEARCTIC SPIDER WASPS



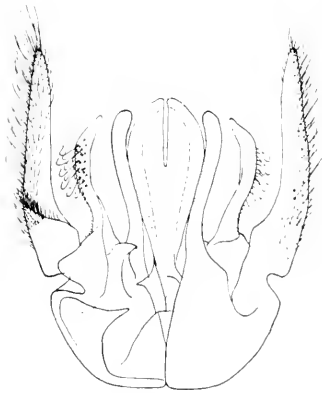




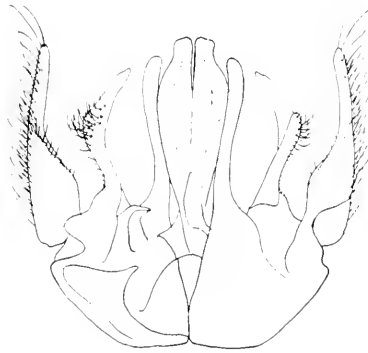
108 VIRGINIENSIS



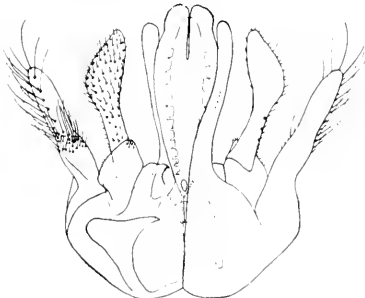
109 FULGIDUS



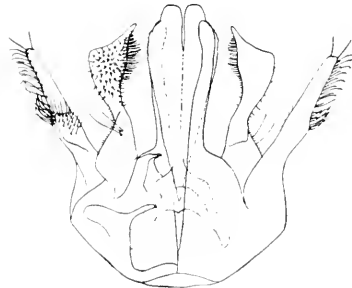
110 HISPIDULUS



111 BASALIS



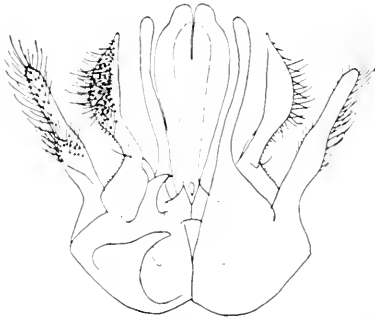
112 IMBELLIS



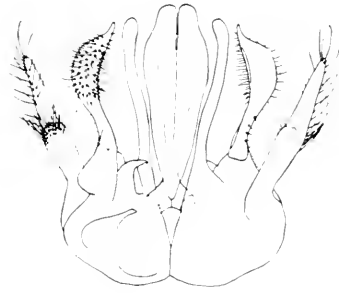
113 ILLINOENSIS

EVANS—NEARCTIC SPIDER WASPS

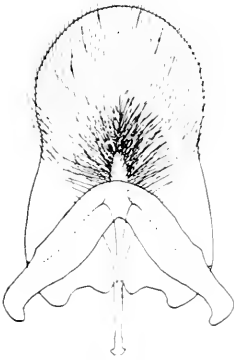




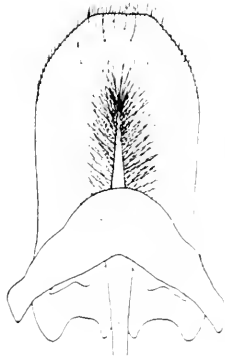
114 VENTRALIS



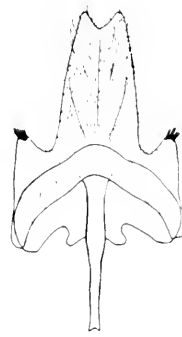
115 TARSATUS



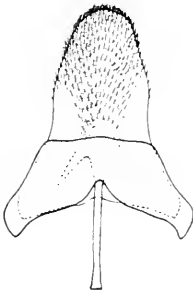
116 AETHIOPS



117. ATROX



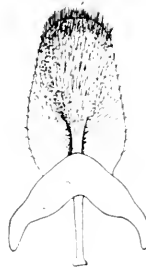
118 AMETHYSTINUS



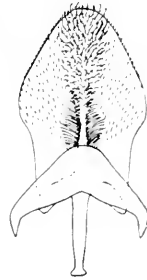
119 APICULATUS



120 SEMIRUFUS



121 AMERICANUS



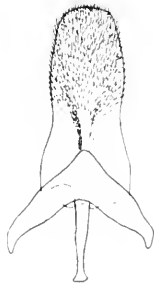
122 MOESTUS

EVANS—NEARCTIC SPIDER WASPS





123. CYLINDRICUS



124. GRANDIFLEXIONIS



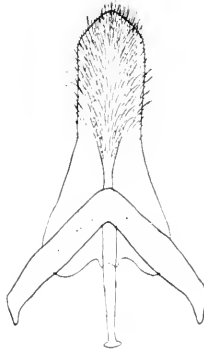
125. SUBCYLINDRICUS



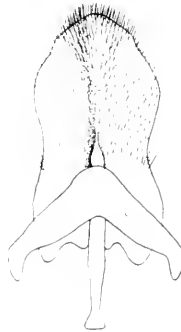
126. PERCITUS



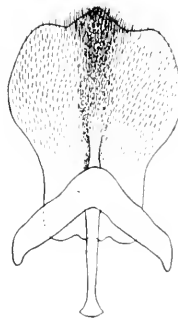
127. KROMBEINI



128. TEXANUS



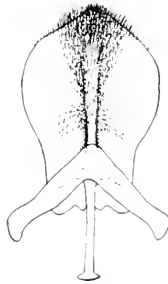
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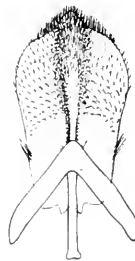
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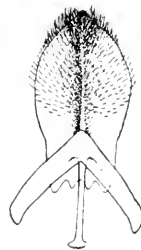
131. RECTANGULARIS



132. STENOTUS



133. SPLENDENS



134. CLYSTERA

EVANS—NEARCTIC SPIDER WASPS





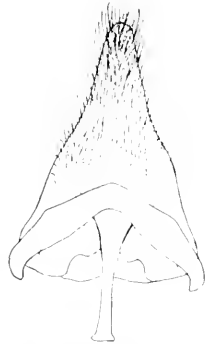
135 TENEBROSUS



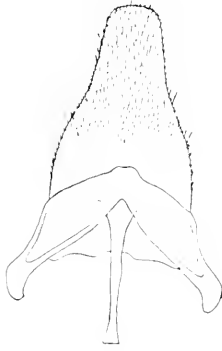
136 INSOLENS



137 FRATERNUS



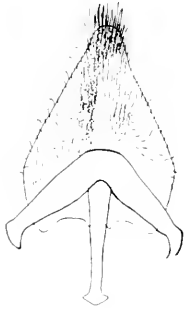
138 HISPIDULUS



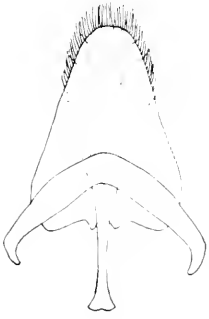
139 BASALIS



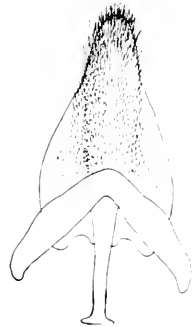
140 NIGERRIMUS



141 VENTRALIS



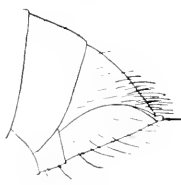
142 IMBELLIS



143 ILLINOENSIS



144 ITHACA

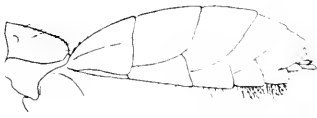


145. ILLINOENSIS

EVANS—NEARCTIC SPIDER WASPS







146 RELATIVUS



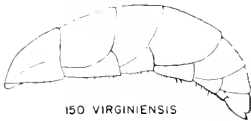
147 VENTRALIS



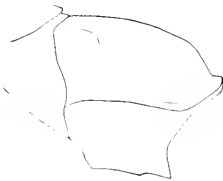
148 BASALIS



149 HISPIDULUS



150 VIRGINIENSIS



151 MARGINATUS



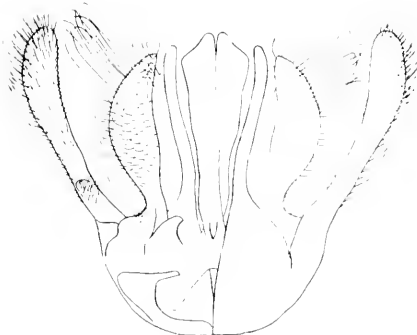
152 RELATIVUS



153 MARGINATUS



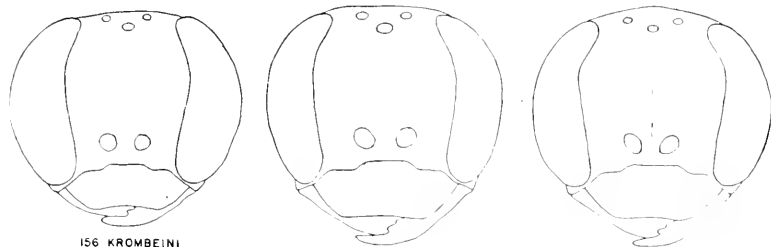
154 ILLINOENSIS



155 TEXANUS

EVANS—NEARCTIC SPIDER WASPS

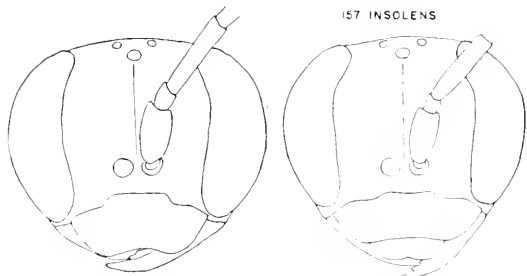




156 KROMBEINI

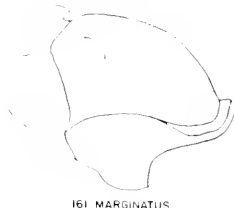
157 INSOLENS

158 PERCITUS



159 HISPIDULUS

160 BASALIS



161 MARGINATUS



163 NIGERRIMUS

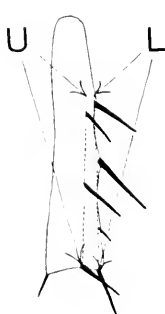
164 VENTRALIS



165 MARGINATUS



162 SPLENDENS



166 ILLINOENSIS



167 IMBELLIS



168 FULGIDUS



169 DEPRESSIPES



170 VIRGINIENSIS

EVANS—NEARCTIC SPIDER WASPS



**A TAXONOMIC STUDY OF THE NEARCTIC SPIDER  
WASPS BELONGING TO THE TRIBE POMPILINI  
(HYMENOPTERA: POMPILIDAE). PART III**

BY HOWARD E. EVANS

*Kansas State College, Manhattan, Kansas*

(Plates VI to XV)

In two earlier papers under this same title,<sup>1</sup> I have presented an introduction to the study of the Nearctic Pompilini and a systematic treatment of nine of the thirteen genera. In this, the final part, the remaining four genera (*Pompilus*, *Aporinellus*, *Allochares*, and *Paracyphononyx*) are treated. Following this, I have appended a number of supplementary sections. First, I have presented a short list of species which cannot be recognized, and which are therefore otherwise omitted from this work. Following this is a section entitled "Addenda", in which I have brought together certain additional information which has become available regarding the genera and species covered in Parts I and II. The concluding portion of the text is in the form of a general summary, in which I have attempted to analyze the composition of the Nearctic fauna and to make certain suggestions regarding the possible phylogeny of the Nearctic genera. A check list and an index covering all three parts are included at the end.

X. Genus **POMPILUS** Fabricius<sup>2</sup>

*Pompilus* Fabricius, 1798, Suppl. Ent. Syst., pp. 212, 246-252. [Type: *Pompilus pulcher* Fabricius, 1798; fixed by Opinion 166 of the Internat. Comm. Zool. Nomen., issued Aug. 1945.]—Latreille, 1802, Hist. Nat. Crust. Insect., III, pp. 334-335.—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 86. [In part.]—Cresson, 1887, Synopsis Hymen., Suppl. Vol. Trans. Amer. Ent. Soc., pp. 110, 270-271. [In part.]—Berland, 1925, Faune de

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<sup>1</sup> Evans, H. E., 1950, Trans. Amer. Ent. Soc., 75: 133-270. (Part I.)  
Evans, H. E., 1951, Trans. Amer. Ent. Soc., 76: 207-361. (Part II.)

<sup>2</sup> For full synonymy, see also the several subgenera.

France N. Hymen. vespiformes I, pp. 257-273.—Richards, 1937, Gen. Names Brit. Insects, pt. 5, p. 126.—Wilcke, 1942, Ent. Berichten, 11: 23-25.—Wilcke, 1943, Overdr. Med. Landbouwhoogeschool Wageningen, 47: 46.—Evans, 1950, Trans. Amer. Ent. Soc., 75: 150.—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 933.

*Psammochares* Susterer. 1913, Verh. zool.-bot. Ges. Wien, 62: 210. [Type: *Sphex plumbea* Fabricius, 1787.] [Nec Latreille, 1796.]—Haupt, 1927, Deutsch. Ent. Zeitschr., Beiheft, pp. 150-151. [In part.]—Arnold, 1937, Ann. Transvaal Mus., 19: 43.

*Aporoides* Banks, 1941, Proc. Acad. Nat. Sci. Phila., 92: 353. [Nec Ashmead, 1902.]

The generic name *Pompilus* has never been used in exactly the same sense as used by the present author. Previous authors have been inclined to use it as a blanket genus to include a variety of unspecialized Pompilini (for example, Berland, 1925, and many of the early authors), or in a very restricted sense to include only the genotype and perhaps a few other species (for example, Wilcke, 1943). In the present treatment I have effected something of a compromise between these two extremes. *Agenioideus*, *Sericopompilus*, *Anoplius*, and *Evagetes*, though closely related, seem to me to constitute discrete genera, which have already been treated as such. On the other hand, Wilcke's *Ammosphex*, Banks' *Anoplochares*, and several other groups, do not appear to me to be sufficiently discrete to be considered full genera, and they are here treated as subgenera of *Pompilus*. In all, six subgenera are recognized in North America, and a seventh, *Pompilus s. str.*, is treated briefly, although it does not occur in the New World.

The genus *Pompilus* is more noteworthy for the absence of any distinguishing characteristics than otherwise. The genus is a rather generalized one, derived possibly from *Agenioideus*, with which it seems to be linked via the subgenus *Hesperopompilus*. The pulvillar comb is for the most part more strongly developed than in *Agenioideus*, and the venation of a more advanced type, i.e., the veins and cells extend less close to the wing margin, the second recurrent vein arising halfway or less of the distance from the base of the subdiscoidal vein to the wing margin. Many of the other genera of Pompilini are essentially variations on the *Pompilus* theme and possibly derived from this genus or its ancestral stock.

*Generic characters.*—Small to fairly large wasps, 4 to 20 mm. in length. Ground color black, the abdomen sometimes marked with rufous, the legs occasionally so. Pygidium of female with or without setae, never with stout bristles. Mandibles of male unidentate, of female unidentate or bidentate. Malar space short or practically absent. Front flat or convex, never tuberculate; eyes in the female subparallel within or somewhat convergent above, the upper interocular distance at least .7 the lower interocular. Antennae slender, long, or of moderate length, segment 3 in the female at least three times as long as its greatest thickness, segment 3 in the male usually but not always more than twice as long as thick.

Pronotum dorsally not longer than the mesonotum, usually much shorter, its posterior margin arcuate or angulate. Postnotum a transverse band of variable breadth, never strongly expanded on each side of the median line. Propodeum evenly sloping or with a more or less well-defined oblique posterior declivity, never tuberculate or rugose. Female with or without a tarsal comb. Claws of the female dentate, those of the middle and hind tarsi of the male dentate, those of the front tarsi of the male either dentate or bifid. Apical tarsal segments with or without spines beneath. Pulvillar comb variously developed, rarely as strong as in *Anoplius*, rarely as weakly developed as in *Agcnioides*. Cubitus of hind wing arising at or more often beyond the tip of the submedian cell. Transverse median vein of the fore wing interstitial or not with the basal. Stigma small or of moderate size; marginal cell of very variable length, the radial vein arcuate or sometimes angled at the third transverse cubital vein. Usually with three submarginal cells, but a few species with only two, in which case the second receives both recurrent veins. Second recurrent vein arising on the subdiscoidal vein halfway or less of the distance from the base of the subdiscoidal to the wing margin, the latter vein not reaching the wing margin.

Abdomen of female rather stout, subfusiform, the apex not noticeably compressed, the pygidium without bristles. Abdomen of male much more slender; sixth sternite with a median apical emargination of variable depth. Male genitalia variously developed; basal hooklets double, single, or wanting; parameres usually strong, more or less setose. The genitalia for the most part exhibit excellent subgeneric and specific characters.

*Biology.*—The species of *Pompilus* are spider-hunters of a rather generalized sort, usually not highly selective of their prey, but probably most often taking Lycosidae. The nest is constructed in sand or soft earth, except in one non-fossorial subgenus, *Anoplochares*. The biology is further discussed under the various subgenera and species. Except in the subgenus *Arachnospila*, very little is known of the biology of the North American forms.

*Distribution.*—Cosmopolitan. The Nearctic forms can be placed in six more or less well-defined subgenera, separated in the following key. The subgenus *Pompilus s. str.* is also included in the

key, although it does not occur in our fauna. Certain other exotic subgenera are not included.

### *Key to Subgenera*

#### Females

1. Apical tarsal segment without a median row of spines beneath which are about the same size as those on the preceding tarsal segments, either without spines beneath, or with not more than three near the base, the apical half bare, or with a complete row of very minute spines; posterior pronotal margin varying from broadly angulate to arcuate .....2
- Apical tarsal segment with several median spines in a row beneath, which are about the same size as those on the preceding segments, and which form a row that extends at least beyond the middle of the segment; posterior pronotal margin with a distinct angulation .....5
2. Front basitarsus with two comb-spines, one at the middle and one at the apex of the segment; third submarginal cell only a small fraction of the size of the second, or actually absent; front microscopically granulo-punctate, dull .....D. **Perissopompilus** new subgenus  
Front basitarsus with three (rarely four) comb-spines; third submarginal cell well developed, at least half as large as the second; front microscopically reticulo-punctate, somewhat shining .....3
3. Apical tarsal segment with a complete row of extremely minute spines beneath; front basitarsus with three long comb-spines on the outer side, and two almost equally strong spines on the inner side, one at the apex; pulvillar comb strong, the setae rather stout ....A. **Pompilus** Fabricius  
Apical tarsal segment either without median spines beneath, or with 1 to 3 spines near the base, with apical half bare; front basitarsus with three long comb-spines, but without other spines on this segment rivalling these in length .....4
4. Apical tarsal segment without spines beneath; propodeum and mesopleura bare or with dark hairs; pulvillar comb weakly developed.  
B. **Hesperopompilus** Evans  
Apical tarsal segment with from 1 to 3 spines near the base; propodeum and mesopleura, as well as the temples, propleura, and front coxae, with abundant white hair; pulvillar comb strong, of at least 20 setulae.  
C. **Xerochaeres** new subgenus
5. Tarsal comb absent; anterior margin of clypeus slightly, evenly concave, the labrum exerted beyond the clypeus to about half the length of the latter .....G. **Anoplochaeres** Banks  
Tarsal comb present, the spines of variable length; labrum but slightly if at all visible beyond the apical margin of the clypeus .....6
6. Marginal cell of the fore wing 1.3 or more times its own length from the tip of the wing (Figs. 239 and 240); front at most moderately hairy.  
E. **Ammosphex** Wilcke



Marginal cell of the fore wing approximately its own length from the wing-tip (Fig. 241); front, in fact most of the head, thorax, and propodeum, with a considerable amount of erect hair.

F. **Arachnospila** Kincaid

Males

1. Apical segment of front tarsus nearly parallel-sided, the inner margin not at all produced (Figs. 226-228); posterior pronotal margin arcuate or broadly subangulate; either the basal hooklets of the genitalia single or absent, or the sixth sternite with a flat median area set off by a carina . . . 2
- Apical segment of front tarsus shorter and wider, with a distinct expansion on the inner margin, therefore asymmetrical (Figs. 229 and 230); posterior pronotal margin usually distinctly angulate; basal hooklets of genitalia double; sternite 6 unmodified . . . . . 5
2. Both front tarsal claws bifid (Fig. 228); propodeum and mesopleura with abundant white erect hairs; head very thin; subgenital plate without basal palpus-like structures; sternite 6 unmodified.

C. **Xerochaeres** new subgenus

Outer front tarsal claw with the inner ray very short, therefore not or scarcely bifid (Figs. 226 and 227); propodeum and mesopleura without erect hairs or with a few dark hairs; either the subgenital plate with basal palpus-like appendages, or the sixth sternite with a flat median area set off by a carina . . . . . 3

3. First four abdominal tergites with broad, complete transverse apical bands of very heavy silvery pubescence which diverges strongly from the median line; sixth abdominal sternite with a specialized, flattened median area set off by a carina (Fig. 178); basal hooklets of genitalia double (Fig. 177) . . . . . D. **Perissopompilus** new subgenus

Abdominal tergites without complete apical bands of heavy pubescence which diverge from the median line, though sometimes with a partial band of pubescence which is directed backward; sixth sternite not modified as above; basal hooklets single or wanting . . . . . 4

4. Both claws of the front tarsus toothed, and weakly so (Fig. 226); apical margin of clypeus truncate; pulvillar comb fairly well developed.

A. **Pompilus** Fabricius

Inner claw of front tarsus bifid (Fig. 227); apical margin of clypeus rounded; pulvillar comb very weak.

B. **Hesperopompilus** Evans

5. Last segment of front tarsus strongly lobed on the inner margin, the segment widest about mid-way; inner ray of inner claw of front tarsus short, rounded (Fig. 229); aedoeagus provided with a number of sclerotized tooth-like projections along the margin; marginal cell much more than its own length from the wing-tip (Figs. 239 and 240).

E. **Ammosphex** Wilcke

- Last segment of front tarsus less strongly lobed, and widest about two-thirds the distance from the base, the inner claw of this segment with the inner ray longer (Fig. 230); aedoeagus simple, the margin not armed as above .....6
6. Labrum slightly if at all visible beyond the apical margin of the clypeus; propodeum hairy; subgenital plate broader than below, of various shapes; digiti of genitalia broadly excised along the inner margin.

F. **Arachnospila** Kincaid

Labrum exerted beyond the clypeus to about half the shorter diameter of the latter, the apical margin of the clypeus evenly, arcuately concave; propodeum not or scarcely hairy; subgenital plate (at least in our species) narrow and strongly keeled apically, basally (internally) with lateral expansions (Figs. 222 and 223); digiti strap-shaped, not excised.

G. **Anoplochares** Banks

A. Subgenus **POMPILUS** Fabricius

*Pompilus* Fabricius, 1798, Suppl. Ent. Syst., pp. 212, 246-252. [Type: *Pompilus pulcher* Fabricius, 1798; fixed by Opinion 166 of the Internat. Comm. Zool. Nomen., 1945.]—Wilcke, 1943, Overdr. Med. Landbouwhoogeschool Wageningen, 47: 46.

*Psanmochares* Suster, 1913, Verh. zool.-bot. Ges. Wien, 62: 210. [Nec Latreille, 1796.] [Type: *Sphex plumbea* Fabricius, 1787.]

The subgenus *Pompilus* is here equivalent to the genus *Pompilus* as interpreted by Wilcke (1943) in his monograph of the Pompilidae of the Netherlands. As thus restricted, it includes the widely distributed Old World species *plumbeus* Fabricius and its varieties, and several closely allied species. None of the North American species can be considered consubgeneric with *plumbeus*.

*Subgeneric characters*.—Mandibles unidentate in both sexes. Clypeus large, wider than the lower front, almost completely covering the labrum. Eyes converging above somewhat in the female; front with an impressed line from the front ocellus to the antennal bases. Malar space present, short. Temples well developed, bearing numerous white hairs.

Pronotum rather short, the sides, seen from above, subparallel; posterior margin subangulate. Postnotum a very narrow band. Propodeum without a well-defined posterior declivity, and without erect hairs. Front tarsus of female with a comb of strong, flat spines; basitarsus rather short, not longer than the two following segments together, bearing three comb-spines, and in addition two long, slightly more slender spines on the inner side, one about midway and one at the apex. Apical segment of front tarsus of male unmodified, nearly parallel-sided (Fig. 226). All the claws of both sexes dentate, those of the male rather weakly so. Apical tarsal segments of female with a complete row of minute spines on the median line beneath, the

spines much smaller than those beneath the other tarsal segments and visible only under high magnification. Pulvillar comb of both sexes consisting of about 8 to 12 unusually stout setulae. Fore wing with three submarginal cells.

Male subgenital plate (Fig. 201) with a pair of short appendages on the sides near the base, visible only upon dissection. Male genitalia (Fig. 171) with the basal hooklets entirely wanting; aedeagus simple, without setae or chitinized teeth; digiti short, subspatulate, the apex with a fringe of setae; parameres long and rather broad, the squamae not prominent.

*Biology.*—*Pompilus plumbeus* is a common psammophilous species of Europe, and preys upon a variety of spiders, most commonly Lycosidae. A summary of the known facts concerning its biology is given by Richards and Hamm.<sup>3</sup>

*Distribution.*—Palearctic, Ethiopian, Oriental, and Australian Regions. There are no Nearctic species.

#### B. Subgenus **HESPEROPOMPILUS** Evans

*Hesperopompilus* Evans, 1948, Proc. Ent. Soc. Wash., 50: 141-149. [Type: *Pompilus orophilus* Evans, 1947; original designation.]. [Subgenus of *Pompilus*.]—Dreisbach, 1949, Ent. Amer., 29: 4, 6, 10, 42, fig. 23 (not fig. 22 as stated). [Genus.]-Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 933.

This is a small group, containing five known species, all western and all apparently rare. It is probably a relict group somewhat related to *Agenioideus* and *Evagetes*. The pulvillar comb is not strongly developed, though sometimes slightly more so than in those genera; the delicate build of the body and slender appendages suggest *Agenioideus*; the usually bluish vestiture and the short antennae of the male suggest *Evagetes*. The closest affinities of the group are, however, probably with *Pompilus s. str.*; the male subgenital plate has a pair of basal palpus-like structures as in that group,<sup>4</sup> and there are many other structural similarities.

*Subgeneric characters.*—Small wasps, 5 to 10 mm. in length. Color black or black and red; pubescence often extensively silvery, in some species almost entirely deep blue-violet. Front and vertex scarcely to rather densely hairy;

<sup>3</sup> Richards, O. W., and A. H. Hamm, 1939, Trans. Soc. Brit. Ent., 6: 74.

<sup>4</sup> In the original description of *Hesperopompilus*, I stated that I knew of no other Pompilini possessing these structures on the subgenital plate. However, I have since discovered their presence in *Pompilus s. str.*, and also in the genus *Aporinellus*, probably a derivative of *Pompilus s. str.*

propodeum with or without erect hairs. Mandibles of female weakly bidentate, of male unidentate. Clypeus of male convexly rounded apically, that of the female either rounded or truncate. Malar space very short; temples not strongly developed; front and vertex of moderate breadth to fairly broad. Antennae of female elongate, the third segment at least four times as long as thick, and equal to at least .75 times the upper interocular distance. Antennae of male relatively less elongate, segment three from 1.4 to 2.5 times as long as thick.

Pronotum variable, its posterior margin never sharply angulate. Propodeum of the female with a fairly well defined, slightly concave posterior declivity. Front basitarsus of female longer than the two following segments together, bearing three (rarely four) long and very slender comb-spines, and no additional long spines. Apical tarsal segments without spines beneath in both sexes. Last segment of front tarsus of male (Fig. 227) only very vaguely if at all produced on the inner margin, almost parallel-sided; inner claw of this segment bifid, the rays widely separated; outer claw of this segment and of all the remaining tarsi dentate. Pulvillar comb of at most 15 rather weak setulae. Fore wing with the second and third submarginal cells both four-sided, both somewhat narrowed above.

Abdomen of female stout, subfusiform, in resting position not exceeding in length the head and thorax together. Abdomen of the male much more slender. Male subgenital plate with two small, palpus-like structures, apparently consisting of matted setae, one on each side near the base, visible only upon dissection. Genitalia with the basal hooklets either single or absent, if present not especially hook-shaped, the apex merely rectangular; digiti shaped much as in *Pompilus s. str.*; parapenials very stout, compressed, in lateral view rather wide; aedoeagus variously developed, in one species with a few setae at the apex.

*Distribution.*—Western North America, from Lower California and New Mexico to Alberta. Only two of our five species are known from both sexes, and even with these there is no definite evidence that the sexes are correctly associated. The whole subgenus is known at present from only 17 specimens.

### Key to Species

#### Females

1. Apical margin of clypeus arcuately, convexly rounded; pronotum rather long, sloping very gradually in profile; color black, the abdomen and hind femora and tibiae rufous; pubescence in large part silvery.

#### 1. *rufopictus* Evans

- Apical margin of clypeus truncate; pronotum short and sloping steeply in front; color black, rendered rather conspicuously bluish or blue-green by the pubescence .....2

2. Front rather broad, the middle interocular distance varying from .58 to .60 times the transfacial distance; size larger, about 10 mm.; postocellar line equal to or less than the ocello-ocular; third antennal segment equal to from .80 to .9 times the upper interocular distance.

2. **jacintoensis** Evans

Front narrower, the middle interocular distance varying from .50 to .54 times the transfacial distance; size smaller, 6.5 to 8.5 mm.; postocellar line greater than ocello-ocular line; third antennal segment subequal in length to the upper interocular distance .....3. **orophilus** Evans

Males

1. Posterior pronotal margin with a narrow pale stripe; third antennal segment about twice as long as thick, or slightly longer; aedoeagus not parallel-sided, the margins somewhat sinuate .....2
- Posterior pronotal margin without a pale stripe, though sometimes with a line of pale pubescence; third antennal segment only about 1.5 times as long as its greatest thickness; aedoeagus slender, the margins parallel .....3

2. Subgenital plate moderately broad, tapering apically (Fig. 202); parameres of genitalia short, with a tuft of long hairs at the apex; parapenials strongly curved; aedoeagus with an abrupt apical expansion which bears a transverse ridge (Fig. 173); size larger, about 6.5 mm.

2. **jacintoensis** Evans

Subgenital plate very slender, nearly linear (Fig. 203); parameres longer, the apex with only short hairs; parapenials only slightly curved; aedoeagus only slightly expanded apically, without such a ridge (Fig. 174); size smaller, about 5 mm. ....3. **orophilus** Evans

3. Propodeum not hairy, the front but slightly so; subgenital plate narrow basally, broadened beyond the base, the apex tapering (Fig. 204); parameres shorter than the aedoeagus, not expanded basally (Fig. 176); size smaller, about 5 mm. ....4. **boharti** new species
- Propodeum somewhat hairy, the front densely hairy; subgenital plate broad, the apex broadly rounded (Fig. 205); parameres longer than the aedoeagus, basally somewhat expanded (Fig. 175); size larger, about 9 mm. ....5. **evagetoides** new species

1. **Pompilus (Hesperopompilus) rufopictus** Evans

*Pompilus (Hesperopompilus) rufopictus* Evans, 1948, Proc. Ent. Soc. Wash., 50: 144-146. [Type: ♀; Dos Palmas, Riverside Co., Calif., 8 May 1932 (R. M. and G. E. Bohart); C.A.S. no. 5951.]—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 934.

This tiny and attractive *Pompilus* is still known from only one specimen. It may be recognized at once by its color and by the

shape of the clypeus, the apical margin of which is convexly rounded.

FEMALE.—Length 6.5 mm. Color black; apical two-thirds of the mandibles and lower portion of the clypeus dull ferruginous; front and middle legs brownish; femora and tibiae of hind legs, except the joints, bright rufo-ferruginous; abdomen bright rufo-ferruginous except the extreme base of the first segment and apex of the last, which are somewhat infuscated. Entire body clothed with a fine, pale pubescence, which is more coarse and conspicuously silvery on the clypeus, front, anterior slope and posterior margin of the pronotum, sides of the scutellum, metanotum, posterior slope of the propodeum, and posterior half of the hind coxae. Wings nearly hyaline, the outer margin of the fore wing broadly banded with brownish. Clypeus front, and vertex with a few dark hairs; temples and propleura with some short, pale hair; body otherwise without erect hairs except for a few dark setae on the apical abdominal segment.

Clypeus 2.5 times as broad as high, its apical margin evenly, convexly rounded. Front rather narrow, the middle interocular distance .56 times the transfacial distance; inner orbits converging very slightly above. Post-ocellar line slightly greater than the ocello-ocular line. Antennae very long and slender, the first four segments in a ratio of about 2:1:4:3, segment three about equal in length to the upper interocular distance.

Pronotum rather long, its anterior slope very low and even, its posterior margin subarcuate. Slope of the propodeum low, slightly steepened behind, the declivity slightly concave; median line distinctly impressed. Front tarsus slender, with a comb of long and very slender spines, the apical basitarsal spine about as long as the second tarsal segment. Pulvillar comb of about seven weak, diverging setulae. Fore wing with the transverse median vein meeting the media slightly beyond the origin of the basal; stigma short; marginal cell rather long, about 1.2 times its own length from the wing-tip; second submarginal cell nearly twice as broad as high, narrowed by one-third above; third submarginal cell about as broad as high, narrowed by two-thirds above.

MALE.—Unknown.

*Distribution*.—Known only from the type locality.

*Specimens seen*: 1 ♀. CALIFORNIA: Riverside Co., Dos Palmas, 8 May 1932 (R. M. & G. E. Bohart) [type, CAS].

## 2. *Pompilus (Hesperopompilus) jacintoensis* Evans

*Pompilus (Hesperopompilus) jacintoensis* Evans, 1948, Proc. Ent. Soc. Wash., 50: 146-148. [Type: ♀; San Jacinto Mts., Calif., July 1912 (J. C. Bridwell); U.S.N.M. no. 58,631.]—Evans, 1951, U. S. Dept. Agr., Monogr. 2, p. 934.

This species closely resembles *orophilus*, but a number of morphological characters, as indicated in the key, readily distinguish it. The pulvillar comb is somewhat more strongly developed than in the other species of the subgenus.

FEMALE.—Length 10 (8.5-12) mm. Color black, the entire body rendered by the pubescence a deep Prussian blue, fading to blue-violet in older specimens. Wings rather heavily infuscated, slightly darker along the outer margin, somewhat violaceous. Clypeus, front, vertex, temples, and propleura with considerable short, dark hair; pronotum and front coxae somewhat hairy, the remaining coxae and the remainder of the thoracic dorsum slightly so; propodeum with numerous erect hairs; abdomen slightly setose apically.

Clypeus 2.4 to 2.7 times as broad as high, its apical margin truncate. Front rather broad, the middle interocular distance varying from .58 to .6 times the transfacial distance. Eyes converging slightly above, the upper interocular distance about .9 the lower. Postocellar line equal to or slightly less than the ocello-ocular line, the ocelli forming an angle in front which may be slightly greater or less than a right angle. Antennae long and slender, the first four segments in a ratio of about 3:1:5:4, segment 3 equal to from .8 to .9 the upper interocular distance.

Pronotum short, sloping strongly in front, its posterior margin arcuate or very feebly angulate. Postnotum reduced to a thin transverse line. Propodeum rather convex, short, the declivity well defined and slightly concave; median line lightly impressed in front. Front tarsus with a comb consisting of three long, slender spines, the apical basitarsal spine about as long as the second tarsal segment, or slightly longer. Pulvillar comb of about 15 fairly strong, subparallel setulae. Fore wing with the transverse median and basal veins interstitial or nearly so; marginal cell of moderate length, from 1.3 to 1.5 times its own length from the wing-tip, the radial vein angled at the third transverse cubital vein. Second submarginal cell much wider than high, narrowed by half or slightly less above; third submarginal cell narrowed by from .7 to .9 above.

MALE.—Length 6.5 mm. Color black, the posterior margin of the pronotum with a pale yellowish stripe, narrowly interrupted medially. Pubescence deep bluish or blue-violet as in the female, except on the lower front, lower side of the scape, posterior slope of the propodeum, and the posterior coxae behind, where it is silvery. Wings subhyaline, outer margins of the front wings broadly infuscated. Clypeus, front, vertex, temples, and propleura with numerous short pale hairs; remainder of body practically devoid of erect hairs.

Clypeus 1.7 times as broad as high, its apical margin convexly rounded. Front rather narrow, the middle interocular distance about .55 times the transfacial distance; eyes diverging slightly above. Postocellar line slightly

less than the ocello-ocular. Antennae of moderate length, the first four segments in a ratio of about 2:1:2:2, segment 3 about 2.3 times as long as thick. Posterior pronotal margin subangulate. Median line of propodeum vaguely impressed. Last segment of front tarsus shown in Fig. 227. Venation about as in the female; second submarginal cell only slightly narrowed above, the third strongly so.

Abdominal sternites 4 and 5 slightly arcuately emarginate posteriorly; sternite 6 with a broad V-shaped emargination. Subgenital plate (Fig. 202) shaped somewhat like an arrowhead; basal sclerite rather broad, partially overlying the palpus-like processes. Genitalia (Fig. 173) characterized by the very short parameres bearing several long setae at the apex; parapenials strongly curved, somewhat S-shaped; aedoeagus constricted just before the apex, which is narrowly and abruptly expanded, this expansion appearing to bear a transverse ridge.

*Distribution*.—Lower Sonoran fauna, southern California and Lower California.

*Specimens seen*: 8 (7 ♀♀, 1 ♂). CALIFORNIA: Los Angeles Co., 1 ♂, Pomona Mts., Sept. (H. C. Fall) [MCZ]; 1 ♀, Camp Baldy, 11 July 1950 [CIS]; Riverside Co., 1 ♀, San Jacinto Mts., July 1912 (J. C. Bridwell) [USNM]; San Diego Co., 4 ♀♀, 25 June-10 July [Coll. H. A. Hill, HEE]. MEXICO: Baja California, 1 ♀, Cedros Island, 3 June 1925 (H. H. Keifer) [CAS].

### 3. *Pompilus* (*Hesperopompilus*) *orophilus* Evans

*Pompilus orophilus* Evans, 1947, Ent. News, 58: 14-16. [Type: ♀; Raton, N. Mex., 7000 feet, 12 Aug. 1946 (H. E. Evans); M.C.Z.]

*Pompilus* (*Hesperopompilus*) *orophilus* Evans, 1948, Proc. Ent. Soc. Wash., 50: 148-149.—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 934.

*Hesperopompilus orophilus* Dreisbach, 1949, Ent. Amer., 29: 42, pl. V, fig. 23 (not Fig. 22 as stated).

This species is colored like the preceding, but is somewhat smaller. The front of the female is more narrow in proportion to the eyes; the pulvillar comb is weakly developed; the marginal cell is nearly twice its own length from the wing-tip; the subgenital plate of the male is extremely narrow.

FEMALE.—Length 7.5 (6.5-8.5) mm. Color black, the body rendered a deep Prussian blue or a rich blue-green by the pubescence. Wings moderately infuscated, slightly darker along the outer margin, somewhat violaceous. Clypeus, front, vertex, temples, and propleura with fairly abundant dark hairs; pronotum, front coxae, and tip of abdomen slightly hairy.

Clypeus about 2.3 times as broad as high, its apical margin truncate. Front rather narrow, the middle interocular distance varying from .50 to .54



times the transfacial distance. Inner orbits subparallel, the upper and lower interocular distances nearly equal. Postocellar line greater than the ocello-ocular as 6:5. Antennae long and slender, the first four segments in a ratio of about 6:2:9:7, the third segment subequal in length to the upper interocular distance.

Pronotum short, sloping rather steeply in front, the posterior margin arcuate. Postnotum fairly long, nearly as long as the metanotum, showing faint transverse striations, with a median impression on each side of which it is very slightly arcuately broadened. Propodeum sloping rather evenly, the declivity not clearly defined; median line distinctly impressed. Front basitarsus with 3 or 4 slender comb-spines, the apical one about as long as the second tarsal segment. Pulvillar comb of about 9 weak, diverging setulae. Fore wing with the transverse median vein meeting the media slightly before the basal; stigma very short; marginal cell short, nearly or fully twice its own length from the apex of the wing. Second submarginal cell considerably broader than high, narrowed by half or slightly more above; third submarginal cell shorter both above and below than the second, narrowed by half or slightly more above.

MALE.—Length 5 mm. Posterior margin of the pronotum with a narrow band of pale yellowish, interrupted medially; body otherwise black, rendered by the pubescence a rather brilliant blue-violet, except on the following parts, where it is silvery: clypeus, antennal scape below, front, temples, coxae, pronotum in greater part, a posterior band on the mesonotum, sides of the scutellum, metanotum, mesopleura, upper part of the metapleura, posterior slope of the propodeum (where it is very coarse), and broad basal bands on the first three abdominal segments. Wings hyaline, the fore wings with a fuscous band along the outer margin. Clypeus, front, vertex, temples, propleura, and collar with numerous short, pale hairs; remainder of body without erect hairs.

Clypeus 1.8 times as broad as high, its apical margin arcuately rounded, entirely covering the labrum. Front of moderate breadth, the middle interocular distance .6 the transfacial. Inner orbits diverging above, the upper interocular distance 1.2 times the lower. Ocelli widely separated, forming an acute angle in front; postocellar line greater than the ocello-ocular as 5:4. First four antennal segments in a ratio of about 10:5:9:10, segment 3 about twice as long as thick. Pronotum subangulate behind, much shorter than the mesonotum. Postnotum about one third the length of the metanotum. Median line of propodeum impressed. Wing venation about as in the female; radial vein nearly evenly arcuate; transverse median vein meeting the media slightly beyond the origin of the basal.

Abdominal sternite 6 broadly, rectangularly emarginate. Subgenital plate (Fig. 203) very slender apically, nearly linear, its margins fringed with setae; basal sclerite large, though less broad than in *jacintoensis*. Genitalia (Fig. 174) with the parameres long, exceeding the digiti, with only short hairs apically and along the shaft; parapenials simple, stout; aedoeagus with sinuate margins, but not abruptly expanded and ridged apically as in *jacintoensis*.

*Biology*.—The type of this species was taken by the author on the gravel bottom of a dried stream bed bordering a meadow at an altitude of about 7000 feet in Raton Pass, New Mexico.

*Distribution*.—This species appears to inhabit the Transition Zone of western North America, occurring from New Mexico and southern California to Alberta.

*Specimens seen*: 5 (4 ♀♀, 1 ♂). CALIFORNIA: Los Angeles Co., 1 ♀ (Coquillett) [USNM]; ARIZONA: Pima Co., 1 ♀, Baboquivari Mts., 19 July (H. O. Wright) [UK]; NEW MEXICO: Colfax Co., 1 ♀, Raton, 7000 feet, 12 Aug. (H. E. Evans) [MCZ]; COLORADO: Fremont Co., 1 ♀, Texas Creek, 18 Sept. (R. C. Shannon) [CU]; ALBERTA: 1 ♂, Medicine Hat, 5 July (J. L. Carr) [CNC].

#### 4. *Pompilus (Hesperopompilus) boharti* new species

This species is described from a single male which closely resembles the preceding two species, but which differs in lacking the pale stripe on the posterior pronotal margin, and in the shorter third antennal segment. The terminalia closely resemble those of *jacintocensis*, but the parapenials and aedoeagus are of very different form.

FEMALE.—UNKNOWN; may possibly be *rufopictus*, though structurally this seems unlikely.

MALE (Holotype).—Length 5 mm.; fore wing 3.7 mm. Color wholly black; wings clear hyaline, the veins brown, the fore wing with a narrow pale fuscous marginal band. Pubescence conspicuously silvery on the clypeus, lower half of the front, pronotum, meso- and metapleura, coxae, posterior corners of the mesonotum, sides of the scutellum, metanotum, propodeum, and bases of the first two abdominal segments; pubescence elsewhere brownish. Vertex, temples, and propleura each with a few short hairs, the body otherwise practically devoid of erect hair.

Clypeus convex, 1.7 times as broad as high, its apical margin rounded. Front very broad; middle interocular distance .63 times the transfacial distance. Eyes strongly diverging above; middle interocular distance 1.3 times the lower interocular distance; upper interocular distance 1.25 times the lower. Ocelli small and widely separated; postocellar line : ocello-ocular line about as 5:4. Vertex raised rather strongly in an even arc above the tops of the eyes; temples very narrow. Antennae rather short; first four segments in a ratio of 11:4:7:9, the third segment 1.5 times as long as thick.

Posterior pronotal margin arcuate. Postnotum a narrow transverse band, about a third the length of the metanotum. Propodeum rather convex, with a deeply impressed median line. Legs weakly spinose; pulvillar comb very

weakly developed. Anal vein of hind wing meeting the media well before the origin of the cubitus. Fore wing with the transverse median vein meeting the media slightly beyond the origin of the basal. Stigma short; marginal cell long and somewhat pointed apically, removed from the wing-tip by slightly less than its own length. Second submarginal cell 1.8 times as broad as high, narrowed slightly above; third submarginal cell 1.3 times as broad as high, narrowed by about half above.

Abdomen cylindrical, very slender. Emargination of sternite 6 broad and deep. Subgenital plate (Fig. 204) with the basal sclerite rather broad; basal processes slender, well developed; main portion of plate shaped somewhat like an arrowhead. Genitalia (Fig. 176) with the parameres short, subapically with a small, chitinized elevation, the apex setose; digiti slightly exceeding the parameres, with several prominent setae on the upper, outer margin; basal hooklets absent. Parapenials slender, more or less compressed, and the apical half somewhat produced ventrally; aedeagus simple, slender, parallel-sided.

*Holotype*.—CALIFORNIA: San Diego Co., ♂. Borego, 5 April 1940 (R. M. Bohart) [CAS].

##### 5. *Pompilus* (*Hesperopompilus*) *evagetooides* new species

This is a somewhat larger species of *Hesperopompilus* than any of the others; the pubescence is conspicuously bluish, ornamented with silvery. It bears considerable superficial resemblance to certain species of *Evagetes*, hence the specific name. The subgenital plate is unusually broad, and the genitalia very distinctive. The species is known from two specimens from one locality in Lower California.

FEMALE.—Unknown.

MALE (*Holotype*).—Length 8 mm.; fore wing 7 mm. Color wholly black; wings subhyaline, the outer margins with a fuscous band. Pubescence dark, conspicuously reflecting deep blue-violet, except silvery on the following parts: clypeus, lower front, temples, anterior slope and posterior margin of the pronotum, sides of the scutellum, metanotum, posterior slope of the propodeum, hind coxae in part, upper sides of the middle and hind tibiae, and median semicircular spots on the apices of the first four abdominal tergites. Clypeus, front, vertex, and temples with rather dense, short, brownish hairs; front coxae and pronotum slightly hairy; propodeum with a considerable amount of dark erect hair; venter with scattered inconspicuous setae.

Clypeus convex, 1.8 times as broad as high, its apical margin rounded. Front convex, broad, the middle interocular distance .63 times the transfacial. Eyes diverging slightly above, the upper interocular distance 1.15 times the lower. Ocelli forming an obtuse angle in front, the postocellar

and ocello-ocular lines about equal. Vertex raised slightly above the tops of the eyes; head flattened immediately behind the eyes. Antennae of moderate length, the first four segments in a ratio of 15:6:10:14, the third segment 1.4 times as long as thick; outer flagellar segments about twice as long as thick.

Posterior pronotal margin arcuate. Postnotum a mere line, almost absent. Slope of the propodeum low and even, the median line not impressed. Hind wing with the anal and cubital veins interstitial on the media. Fore wing with the transverse median vein meeting the media slightly before the origin of the basal. Stigma short; marginal cell removed from the wing-tip by approximately its own length. Second submarginal cell 1.7 times as broad as high, narrowed by about half above; third submarginal cell not quite as wide as the second, 1.5 times as wide as high, narrowed by three-fourths above.

Abdomen slender, subfusiform; sternites 4 and 5 arcuately emarginate apically. Subgenital plate (Fig. 205) broad, nearly parallel-sided, the apex broadly rounded; basal palpus-like appendages well developed. Genitalia (Fig. 175) with the parameres the longest of the appendages, with a broad expansion near the base which is clothed on the dorsal surface with setae which are angled at their apices; apical half of the parameres slender, the outer margin setose. Volsellar digitus short, subspatulate apically, the disc and upper, outer margin with numerous erect hairs; basal hooklets not hook-like, but rectangular at their apices. Parapenials stout, strongly compressed, apically strongly curved ventrally. Aedoeagus slightly surpassing the parapenials, slender and parallel-sided, the apex with several prominent setae.

The single paratype is 10 mm. in length and has a pale stripe along the upper side of the hind tibia for most of its length. The middle interocular distance is .60 times the transfacial distance; the third submarginal cell is triangular. In other respects it closely resembles the type. This specimen is lacking both antennae beyond the fifth segment. Both type and paratype are lacking the sixth abdominal segment, the apical tergite, and the basal plate of the subgenital plate, the latter not being shown in Fig. 205 for this reason.

*Holotype*.—MEXICO: Baja California, ♂, 20 miles north of Mesquital, 27 Sept. 1941 (E. S. Ross & R. M. Bohart) [CAS].

*Paratype*.—1 ♂, same data as type [ANSP].

C. Subgenus **XEROCHARES** new subgenus

GENOTYPE: *Pompilus expulsus* Schulz, 1906.

This new subgenus is proposed to accommodate a single species which cannot be placed in any of the existing subgenera. In

some respects, such as the short malar space, the long white hairs on the temples, and the stout, flat spines of the tarsal comb, it resembles *Pompilus s. str.* In other respects it differs considerably from this subgenus. The apical tarsal segment of the female has from 1 to 3 strong spines beneath, but these are near the base, leaving the apical half bare. The last segment of the front tarsus of the male is parallel sided, but both claws are bifid. The subgenital plate lacks the basal appendages of *Pompilus* and *Hesperopompilus*; the basal hooklets of the genitalia are well developed and single.

*Subgeneric characters.*—Medium-sized wasps, 9 to 17 mm. in length, of heavier build than the preceding two subgenera. Temples, propleura, front coxae, mesopleura, and propodeum with abundant white hair. The single known species is black with the abdomen wholly rufo-ferruginous, and is extensively mottled with a heavy glaucous-gray pubescence. Head thin, especially in the male, the temples not well developed; head of male triangular in outline. Mandibles of female bidentate, of male unidentate. Clypeus truncate below, almost entirely concealing the labrum. Mandibles at base not reaching the eyes, leaving a short malar space.

Pronotum short, its posterior margin arcuate; postnotum a narrow band. Front basitarsus of female with 3 long, flattened spines, the one at the apex longer than the second tarsal segment, without other long spines on this segment. Apical tarsal segment of the female with from one to three strong spines beneath near the base of the segment. Last segment of front tarsus of male parallel-sided, both claws bifid (Fig. 228). Pulvillar comb well developed, in the female of over 20 setulae, in the male of about 12, the setulae slender but rather long. Anal and cubital veins of the hind wing nearly interstitial on the media. Transverse median vein of the fore wing meeting the media slightly basad of the basal. Stigma very short; marginal cell about its own length from the wing-tip.

Male subgenital plate (Fig. 206) without basal appendages. Genitalia (Fig. 172) of simple structure; basal hooklets strong, single; parameres very slender; digiti devoid of setae on the apical fourth; aedoeagus slender and elongate, without setae or spines.

*Distribution.*—Lower Sonoran fauna of southern Arizona and western Mexico.

### 1. *Pompilus (Xerochaeres) expulsus* Schulz

*Pompilus connexus* Fox, 1893, Proc. Calif. Acad. Sci., (2)4: 23. [Lectotype: ♀; San José del Cabo, Baja California, Mexico (Gustav Eisen); C.A.S. no. 238.]<sup>5</sup> [Nec Cresson, 1869.]

<sup>5</sup> I have not seen the type of this species, but have seen a female paratype [ANSP].

- Pompilus expulsus* Schulz, 1906, Spolia Hymen., p. 170. [New name for *connexus* Fox, *nec* Cresson.]
- Psammochares arizonica* Banks, 1910, Jour. N. Y. Ent. Soc., 18: 115 [Type: ♀; Palmerlee, Arizona, May; M.C.Z. no. 13,692.]
- Psammochares (Psammochares) arizoniensis* [sic!] Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.
- Pompilus rubriventris* Bradley, 1944, Notulae Naturae, Acad. Nat. Sci. Phila., no. 145, p. 9. [New name for *connexus* Fox, *nec* Cresson.]
- Pompilus (Pompilus) expulsus* Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 933.

The wholly bright rufous abdomen and heavy grayish pubescence of this species, combined with the features which set it apart in a subgenus of its own, strikingly separate this form from all other native species of *Pompilus*. It bears considerable superficial resemblance to *Anoplius (Arachnoproctonus) apiculatus apiculatus* (Smith), and overlaps the range of that species.

FEMALE.—Length 15 (12.5-17) mm. Color black; abdomen, except the extreme base of the first segment, bright rufo-ferruginous. Wings lightly infuscated, with a distinct darker band along the outer margin. Greater part of the body and even the appendages clothed with a heavy, grayish-glaucous pubescence, replaced on the following parts with a finer, brownish pubescence: antennae beyond the first two segments; a stripe across the vertex; a stripe on the upper side of the femora; stripes on the tibiae above and below, the basitarsi below, and all the remainder of the tarsi; a broad stripe across the pronotum, interrupted medially; tegulae; anterior half of the mesonotum; disc of the scutellum; and a vaguely defined area on the anterior part of the propodeum. Pubescence of the abdomen very fine, silvery. Scape with a few short, pale hairs below, and a few dark hairs above; clypeus, front, and vertex with abundant short hairs, mixed dark and light; temples, propleura, and front coxae with abundant rather long pale hairs; pronotum with a few dark hairs near the hind margin, elsewhere above and on the sides clothed with pale hairs; mesopleura, metanotum, propodeum, and base of the first abdominal tergite with abundant, mostly whitish hairs; abdominal sternites 3 to 6 and tergite 6 each with a few strong, dark setae.

Clypeus about 2.5 times as broad as high, the apical margin very slightly concave. Front of moderate breadth, the middle interocular distance about .58 times the transfacial distance. Inner orbits convergent above, the upper interocular distance about .8 the lower. Ocelli forming an acute angle in front, the postocellar line usually slightly less than the ocello-ocular. Antennae rather long, the first four segments in a ratio of about 6 : 2 : 10 : 7, segment 3 equal to about .9 the upper interocular distance.

Propodeum sloping very gently, more steeply declivous behind, the median line usually rather vaguely impressed. Fore wing with the radial vein somewhat angled at the third transverse cubital vein; second and third submarginal cells both about 1.5 times as broad as high, the second narrowed slightly above by the arcuation of the first transverse cubital vein, the third narrowed more strongly above by the arcuation of the third transverse cubital vein.

MALE.—Length 11.5 (9-13.5) mm. Color black; abdomen, except the extreme base of the first segment, bright rufo-ferruginous; posterior margin of the pronotum with a narrow yellowish stripe. Wings colored as in the female. Pubescence as in the female, except that the pattern on the legs is more irregular. Scape with white hairs below and a few dark ones above; erect hairs on the head and thorax distributed much as in the female; abdomen with pale hairs on the base of the first tergite and a few short dark ones on the apical sternites.

Head very thin, flattened immediately behind the eyes. Malar space nearly as long as the antennal pedicel. Clypeus slightly over twice as broad as high. Middle interocular distance about .6 the transfacial distance; eyes diverging very slightly above. Ocelli rather large, forming a right or acute angle in front; postocellar line less than the ocello-ocular line as 2:3. First four antennal segments in a ratio of about 5:2:5:5. Propodeum rather long, the sides gradually converging behind; median line faintly impressed. Venation as in the female.

Abdominal sternite 6 with a shallow U-shaped emargination. Subgenital plate (Fig. 206) of moderate breadth, somewhat raised along the median line, the apex truncate. Genitalia (Fig. 172) with the appendages subequal in length, all rather slender. Parameres very slender, slightly curved, the outer margin short-setose. Digitus slender, slightly and gradually expanded toward the apex, which is subtruncate, the apical fourth bare, the remainder clothed with short setae. Parapenials simple, straight; aedoeagus narrowly fusiform, the apex deeply cleft.

*Distribution.*—This is a Lower Sonoran form, known only from southern Arizona and from Baja California. It will doubtless be found to occur in other parts of western Mexico, and perhaps in southern California.

*Specimens seen:* 12 (4 ♀♀, 8 ♂♂). ARIZONA: Cochise Co., 1 ♂, Reef, 14 Nov. (Biederman) [ANSP]; 1 ♀, Palmerlee, May [MCZ]; Maricopa Co., 2 ♂♂, Phoenix, 15 Oct. (R. H. Crandall) [CU]; Pima Co., 1 ♀, 1 ♂, Baboquivari Mts., 30 June, 18 Aug. (O. C. Poling) [CAS]; 1 ♂, Tucson (F. H. Snow) [UK]; 1 ♂, Sycamore Canyon, Santa Catalina Mts., 3800 feet, 20 Aug. [AMNH]; MEXICO: Baja California, 1 ♀, Angeles Bay, Gulf of California, 27 June (E. P. VanDuzee) [CAS]; 2 ♂♂, La Paz, 3 June (E. P. VanDuzee) [CAS]; 1 ♀ San José del Cabo (G. Eisen) [ANSP].

D. Subgenus **PERISSOPOMPILUS** new subgenus

GENOTYPE: *Pompilus* (*Ammosphex*) *phoenix* Evans, 1948.

Although I originally considered *phoenix* an aberrant member of the subgenus *Ammosphex*, it forms an exception to many of the characteristics of that group, and it now seems best to remove it to a new subgenus. This action has been precipitated by the discovery of an interesting new species closely allied to *phoenix*, yet differing still more radically from any of the other subgenera of *Pompilus*. In this new species the third submarginal cell of the fore wing is entirely wanting, the front tarsus is very short, and the body is heavily banded with silvery pubescence. The beginnings of all of these tendencies can be observed in *phoenix*. All in all, this seems to be a rather highly evolved, though probably relict, subgenus of *Pompilus*. In many of its characters it approaches *Hesperopompilus*, though the double basal hooklets of the male genitalia and perhaps the venation appear to ally it with *Ammosphex*.

*Subgeneric characters*.—Very small wasps, 3 to 11 mm. in length. Color black, except the apical half of the mandibles more or less ferruginous. Body with some fine, light hair on the temples, propleura, and sometimes the pronotum, but otherwise smooth and devoid of erect hairs, even on the apical abdominal segments of the female. Pubescence either wholly dark, or more often in considerable part silvery; abdomen with a tendency to have silvery bands at the apices of the basal tergites, in which the pubescence diverges from the median line (reduced or absent in the ♀ *phoenix*).

Mandibles unidentate in both sexes. Clypeus truncate below in both sexes, in the female somewhat wider than the lower front. Front and vertex rather dull, the surface minutely granulo-punctate; line from the antennal bases to the front ocellus deeply impressed. Ocelli widely separated, the postocellar line considerably greater than the ocello-ocular. Antennae short or of moderate length; segment 3 in the female at least three times as long as broad, and longer than the fourth; segment 3 in the male not or scarcely twice as long as thick.

Posterior margin of the pronotum varying from arcuate to rather distinctly angulate. Postnotum rather large, usually as long as the metanotum medially. Median line of propodeum deeply impressed. Legs weakly to moderately spinose; ultimate tarsal segments without spines beneath, or with not more than 3 small spines on the basal half. Front basitarsus of female short, not longer than the two following segments together, bearing only two comb-spines. Pulvillar pad of moderate size, the comb greatly reduced, of only a few very short setulae. Fore wing with the marginal cell short, at least 1.5 times its own length from the wing-tip, usually more; radial



vein somewhat angled at the second transverse cubital vein. Second submarginal cell quadrangular, somewhat wider than high, receiving the first recurrent vein not far from the middle; third submarginal cell very much smaller than the second, triangular, often petiolate, in one species wholly absent; second recurrent vein received by the third submarginal cell near the middle when this is present, or near the outer corner of the second submarginal cell when the third is absent. (Wings shown in Figs. 237 and 238.)

Abdomen of the female stout, subfusiform, the tip smooth or with some very short, inconspicuous setae. Abdomen of male short, somewhat arched, the apical segments normally somewhat telescoped into the basal four. Sternite 6 (Fig. 178) with a flat or somewhat depressed elongate median area set off by a carina, apically with a broad and shallow emargination on each side of which it is angularly produced. Subgenital plate (Fig. 207) of moderate breadth, with a pair of tooth-like protuberances near the median line at the extreme base, not visible externally. Genitalia (Fig. 177) with the basal hooklets unusually large and prominent, double; parapenials short and broad; aedeagus very slender, expanded abruptly at the apex.

*Distribution.*—This subgenus appears to be restricted to the Lower Sonoran fauna of the southwestern United States and western Mexico.

*Key to Species*

- Fore wing with a small third submarginal cell present; female: apical segment of middle and hind tarsi with two or three small spines beneath, but the legs as a whole weakly spinose; front wings of female wholly somewhat infuscated, violaceous, the body at most weakly banded with silvery pubescence; male: genitalia and subgenital plate as shown in Figs. 177 and 207 .....1. **phoenix** Evans
- Fore wing with the third submarginal cell absent; female: apical segment of all the tarsi without spines beneath, but the legs as a whole rather strongly spinose; front wings hyaline, the apical fourth contrastingly infuscated; body very conspicuously ornamented with silvery pubescence; male: not as yet known .....2. **perfasciatus** new species

1. **Pompilus (Perissopompilus) phoenix** Evans

*Pompilus (Anmosphex) phoenix* Evans, 1948, Pan-Pac. Ent., 24: 123-127. [Type: ♂; Phoenix, Arizona, 11 July 1932; C.A.S. no. 5952.]—Dreischbach, 1949, Ent. Amer., 29: 42, pl. v, fig. 22 (not fig. 23 as stated).—Evans, 1950, Trans. Amer. Ent. Soc., 75: 166.—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 934.

Despite a considerable amount of variation in size and in facial proportions, this very distinctive species can scarcely be confused with any other. Although only recently recognized, it is not a rare species within its range.

FEMALE.—Length 8.5 (5.5-10.5) mm. Color black; front wings brownish, with a darker marginal band, strongly violaceous; hind wings hyaline, the tip infuscated. Pubescence very fine, somewhat velvety, over most of the body brownish or fusco-violaceous; some specimens are without silvery pubescence, while others have a considerable amount of it, particularly on the front, temples, scutellum, metanotum, propodeum, and occasionally in the form of weak silvery bands at the apices of the basal abdominal tergites, suggesting those of the male.

Clypeus about three times as broad as high, its apical margin truncate, with a narrow raised rim. Front narrow in relation to the eyes, which are large and prominent; middle interocular distance varying from .45 to .57 times the transfacial distance. Inner orbits converging slightly above, the upper interocular distance from .8 to .9 the lower. Ocelli forming about a right angle in front; postocellar line greater than the ocello-ocular line as 4:3. Antennae of moderate length, the first four segments in a ratio of about 3:1:4:3, segment 3 equal to from .65 to 1.0 times the upper interocular distance, usually closer to the latter figure.

Pronotum rather full in the shoulders, usually with a faint median impression, its posterior margin angulate. Propodeum with the slope low in front, posteriorly with a short, oblique declivity; median line strongly impressed. Legs unusually weakly spinose. Tarsal comb with only two spines in a row on the basitarsus; the comb-spines vary in length from 1 to 2 times as long as the width of the tarsus. Apical tarsal segment with from 1 to 3 minute spines beneath near the base, the apical half bare. Cubitus of hind wing arising opposite the tip of the submedian cell or nearly so. Fore wing with the marginal cell only about twice as long as high, at least twice its own length from the wing-tip; third submarginal cell very much smaller than the second, higher than broad, often petiolate. (Wings shown in Fig. 237.)

MALE.—Length 5.5 (3.5-7) mm. Color black; wings clear hyaline, the outer margin of the fore wing with a broad brownish band. Body clothed with a dense, coarse, silvery pubescence on the following parts: lower half of scape, basal half of mandibles, clypeus, front, temples, pronotum, posterior half or more of mesonotum, sides of scutellum, metanotum, propodeum, all the pleurites, coxae, to some extent the trochanters and femora, first abdominal tergite, and sharply defined broad apical bands on tergites 2, 3, and 4; here and on the propodeum the setulae diverge strongly from the median line. Vertex, front part of mesonotum, disc of scutellum, and remainder of abdomen and appendages with a finer, brownish pubescence.

Clypeus about twice as broad as high, its apical margin truncate. Eyes very large, the front rather narrow between them, the middle interocular distance varying from .5 to .6 the transfacial distance. Eyes diverging noticeably above, the upper interocular distance about 1.2 times the lower interocular. Ocelli prominent, in a large triangle; postocellar: ocello-ocular line about as 3:2. First four antennal segments in a ratio of about 25:10:15:18, segment 3 from 1.3 to 2 times as long as thick. Posterior

pronotal margin broadly angulate or nearly arcuate. Last segment of front tarsus unmodified, parallel-sided, the inner claw strongly curved, bifid, the outer claw dentate. Legs weakly spinose, very thin apically. Venation as in the female; third submarginal cell in all the specimens seen rather long-petiolate.

Abdomen with sternite 6 and the subgenital plate as described under the subgeneric heading and as shown in Figs. 178 and 207. Genitalia (Fig. 177) with the parameres very slender, sparsely setose, not exceeding the other appendages; digiti narrowly subspatulate, clothed with short setae; parapentials rather short and stout, their inner margins excised near the base of the aedeagus. Aedeagus with a broad expansion near the base, beyond which it is much more slender, the extreme apex expanded, suggesting the tail of a fish; margins of the aedeagus somewhat irregular.

*Biology*.—I have taken males of this species on dried leaves beneath an oak tree which was dripping honeydew. Because of their small size, erratic flight, and somewhat disruptive markings, they are exceedingly difficult to see.

*Distribution*.—This species is widely distributed in the Lower Sonoran Zone, ranging from western Texas, Utah, and central California south into Mexico.

*Specimens seen*: 28 (16 ♀♀, 12 ♂♂). TEXAS: Brewster Co., 9 ♂♂, The Basin, Chisos Mts., 5400 feet, 8-14 July [HEE, CU, ANSP]; Jeff Davis Co., 1 ♀, Fort Davis, 26 July [HEE]; ARIZONA: Maricopa Co., 2 ♀♀, 1 ♂, Phoenix, July, Oct. [CAS, CU]; UTAH: San Juan Co., 1 ♀, Bluff, 7 July [MCZ]; CALIFORNIA: Alameda Co., 1 ♀, Tesla, 15 Oct. [CIS]; Calaveras Co., 1 ♀, Mokelumne Hill, Oct. [CAS]; Contra Costa Co., 1 ♀, Antioch, 10 Sept. [CAS]; Fresno Co., 1 ♀, Coalinga, 18 July [USNM]; Imperial Co., 1 ♀, El Centro, 14 June [CIS]; 1 ♀, Palo Verde, 20 Aug. [CAS]; Inyo Co., 1 ♂, Independence, 7 June [USNM]; Kern Co., 1 ♀, Red Rock Canyon, 30 Apr. [CIS]; Kings Co., 1 ♀, Lemoore, 6 Aug. [CU]; Riverside Co., 1 ♀, Indio, 1 Apr. [CIS]; San Bernardino Co., 1 ♀, 1 ♂, Yermo, 28 Apr., 23 May [CIS, UAC]; San Diego Co., 1 ♀, National City, 15 May [MCZ]; MEXICO: 1 ♀ (no further data) [USNM].

## 2. *Pompilus (Perissopompilus) perfasciatus* new species

This remarkable and highly attractive species is described from a single specimen of the female sex. Although obviously related to *phoenix*, it possesses a number of unusual characteristics: the third submarginal cell is wholly wanting; the antennae are unusually short, the third segment equal to only .46 times the upper interocular distance; the body is highly ornamented with silvery pubescence, much as in the male *phoenix*, but much more so than in the female of that species.

FEMALE (Holotype).—Length 5.3 mm.; fore wing 4.5 mm. Color black; front wings clear hyaline on the basal three-fourths, the apical fourth with a broad, contrasting brownish band; hind wings hyaline, the tip slightly clouded. Body clothed almost entirely by a brilliant silvery pubescence, absent only from the vertex, mesonotum, disc of the scutellum, metapleura, apex of the abdomen, outer portion of the legs, and antennal flagellum. This pubescence is particularly strong on the sides of the lower front and clypeus, the temples, the sides of the pro- and mesothorax, hind coxae, and the propodeum; the basal four abdominal segments are completely clothed with sericeous pubescence which is directed backward, except for apical bands on the first three tergites (and to a lesser extent the fourth), where the pubescence is more coarse and diverges strongly from the median line. The body is completely devoid of erect hairs except for a few on the occiput and propleura.

Head much broader than high, the transfacial distance 1.25 times the facial distance, and very thick, the eyes wide and the temples rather strong. Clypeus nearly four times as broad as high, its apical margin broadly truncate. Front of moderate breadth, the middle interocular distance .56 times the transfacial distance. Inner margins of eyes subparallel, the middle interocular distance subequal to the lower, the upper .9 the lower. Vertex broad, rather flat between the tops of the eyes; postocellar line greater than the ocello-ocular line as 5:3. Antennae unusually short for the genus, the first four segments in a ratio of 12:5:12:10, segment three about 3 times as long as its greatest thickness, equal to .46 times the upper interocular distance; outer flagellar segments, except the last, only about 1.5 times as long as thick.

Pronotum short, its posterior margin feebly angulate. Median line of propodeum impressed. Legs rather strongly spinose, but the ultimate tarsal segments without spines beneath. Front basitarsus short, only about 2.5 times as long as its greatest thickness, bearing two comb-spines, each about half the length of the basitarsus and about equal to the length of the second tarsal segment. Hind wing with the cubitus arising well beyond the apex of the submedian cell. Fore wing with the basal vein arising slightly basad of the transverse median vein on the media. Stigma of moderate size; marginal cell short, slightly over twice its own length from the tip of the wing. Second submarginal cell 1.25 times as broad as high, narrowed by a little more than half above by the slight arcuation of the first and second transverse cubital veins, receiving the first recurrent vein .4 of the way from the base, the second recurrent vein .9 the distance from the base; third submarginal cell wanting. (Wings shown in Fig. 238.)

Abdomen short and stout, a little flattened dorsally, heavily banded with silvery pubescence as described above; apical segment slightly depressed, with only some very fine, short, inconspicuous hair.

MALE.—Unknown.

*Holotype*.—CALIFORNIA: Riverside Co., ♀, Whitewater, 9 July 1950 (J. W. MacSwain) [CAS].

E. Subgenus **AMMOSPHEX** Wilcke

- Psammochares* (*Psammochares*) *gibbus*-group Haupt, 1927, Deutsch. Ent. Zeitschr., Beiheft, pp. 154, 162, 200.
- Ammosphex* Wilcke, 1942, Ent. Berichten, 11: 25. [Type: *Pompilus unguicularis* Thomson, 1870; original designation.]—Wilcke, 1943, Overdr. uit Med. Landbouwhoogeschool Wageningen, 47: 12, 47-61. [In part; Netherlands species.]—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 934.
- Anopompiliinus* Dreisbach, 1949, Ent. Amer., 29: 7, 10, 11, 34, pl. I, fig. 3. [Type: *Anopompiliinus michiganensis* Dreisbach, 1949; monobasic.]—Dreisbach, 1950, Amer. Midl. Nat., 42: 723-738.

This and the following two subgenera are rather closely related, and were all included by Wilcke in his genus *Ammosphex*, although there are several earlier names for the group as so defined. These three subgenera probably represent a somewhat recent development of a single line arising somewhere among the more protean subgenera *Pompilus* and *Hesperopompilus*. The two most characteristic features of the subgenus *Ammosphex*, as here defined, are (1) the tendency for the cells of the fore wing to be rather far removed from the outer wing margin, the marginal cell being from 1.3 to 3 times its own length from the wing-tip, and (2) the peculiar structure of the male aedeagus, which bears along its margin a number of small, tooth-like, pigmented projections.

Dreisbach (1950) has accurately defined the limits of this group in our fauna, and has presented a synopsis of the Nearctic species, with photographs of the male terminalia. He was, however, apparently unacquainted with the European fauna, and with the important papers of Wilcke (1942, 1943). *Pompilus unguicularis* Thomson, the type of *Ammosphex*, is very closely allied to *michiganensis* Dreisbach, and the name *Anopompiliinus* Dreisbach must therefore fall as a synonym of *Ammosphex*.

*Subgeneric characters*.—Small wasps, 3.5 to 12 mm. in length. Color black, the mandibles usually somewhat ferruginous apically, some species with the basal abdominal segments marked with rufous. Body with a variable amount of erect hair, but seldom as much as in the following subgenus; front and propodeum at most moderately hairy. Mandibles unidentate in the male, bidentate in the female. Malar space virtually absent. Labrum exerted only a short distance or not at all beyond the clypeus. Antennae fairly long, segment 3 in the male over twice as long as thick, and as long as segment 4.

Posterior margin of the pronotum distinctly angulate. Postnotum of moderate length, at least half the length of the metanotum. Front tarsus of the female with a comb of short to fairly long spines, the basitarsus always with 3 comb-spines. Apical tarsal segment of the female with a more or less complete row of spines beneath, which are about as long as those beneath the other tarsal segments. Last segment of front tarsus of male strongly asymmetrical, with a lobe on the inner margin which reaches its widest at about the middle of the segment, the outer claw of this segment bifid, the inner bifid and with the inner ray short and rounded (Fig. 229). Pulvillar comb fairly well developed, of about 12 setulae in the female, about 8 in the male. Hind wing with the cubitus arising usually slightly beyond the tip of the submedian cell. Fore wing with the basal vein arising at or slightly before the transverse median vein. Stigma very short; marginal cell short, not more than 2.5 times as long as high, at least 1.3 times its own length from the tip of the wing. Second and third submarginal cells rather small, rarely wider than high, often higher than wide, much narrowed above. (Figs. 239 and 240.)

Subgenital plate of the male variously modified, never with large lateral expansions at the base or with palpus-like processes. Genitalia with the basal hooklets double: parameres long and more or less setose; digits of rather uniform pattern throughout the group, expanded and curved apically, the disc usually with an area of feeble longitudinal striations toward the apex. Parapenials rather short, always shorter than the aedoeagus; aedoeagus bearing somewhere along its margins a number of small, pigmented, tooth-like projections, clearly visible under high magnification.

*Biology.*—Members of this subgenus occur in a variety of habitats, but seem particularly characteristic of wooded places, where they may often be found close to the ground in sunny spots. In such a place it is not uncommon to find several species flying together. They also visit honeydew and flowers to some extent. The prey consists chiefly of Lycosidae. Very little is known of the habits of our native species. Accounts of the habits of the European *unguicularis* and *trivialis* are given by Richards and Hamm.<sup>6</sup>

*Distribution.*—Holarctic Region; represented in Europe by such species as *Pompilus unguicularis* Thomson, *P. trivialis* Dahlbom, and *P. abnormis* Dahlbom. In our fauna there are eight known species, three of them polytypic.

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<sup>6</sup> Richards, O. W., and A. H. Hamm, 1939, Trans. Soc. Brit. Ent., 6: 81-83.

*Key to Species*

Females

1. Propodeum not hairy or with at most a few very short, inconspicuous hairs on the sides; apical margin of clypeus truncate or slightly arcuately concave (Figs. 233 and 234) .....2  
 Propodeum with at least a few long and rather noticeable erect hairs; clypeus arcuately emarginate apically, though often not deeply so (Figs. 235 and 236) .....8
2. Marginal cell very short, removed from the wing-tip by at least twice its own length (Fig. 239); color black or blue-black .....3  
 Marginal cell slightly longer, removed from the wing-tip by less than twice its own length, usually about 1.5 times its own length (Fig. 240); color black or black and red .....7
3. Third antennal segment equal to at least .9 the upper interocular distance, usually about equal to it; color blue-black; spines of the tarsal comb distinctly longer than the width of the tarsus .....4  
 Third antennal segment equal to from .6 to .9 the upper interocular distance; color black, the pubescence sometimes reflecting bluish or violaceous; spines of the tarsal comb at most slightly longer than the width of the tarsus .....5
4. Integument with a distinct bluish caste, the pubescence usually wholly dark, conspicuously bluish-refulgent or violaceous; Arizona and Utah to California .....4a. **solonus solonus** (Banks)  
 Integument black or only vaguely bluish, the pubescence with moderately strong bluish or violet reflections, except on the sides of the lower front, where it is silvery; occurring east of the range of the preceding, from eastern Arizona and Texas to Colorado.  
     4b. **solonus silvivagus** new subspecies
5. Front considerably broader than the two eyes taken together, the middle interocular distance varying from .55 to .61 times the transfacial distance (averaging .58); third antennal segment usually slightly shorter than the first two together; transcontinental in distribution.  
     1. **angularis** (Banks)  
 Front only a little wider than the two eyes taken together, the middle interocular distance varying from .53 to .57 times the transfacial distance (averaging .55); third antennal segment subequal to or slightly longer than the first two together; western North America .....6
6. Third antennal segment equal to from .6 to .8 the upper interocular distance; pubescence wholly dark, somewhat violaceous; wings strongly violaceous in fresh specimens .....3. **anomalus** (Dreisbach)  
 Third antennal segment equal to from .75 to .9 times the upper interocular distance; pubescence usually silvery on the sides of the lower front; wings somewhat violaceous or not .....2. **parvulus** (Banks)
7. Base of the abdomen marked with rufous.  
     5a. **michiganensis michiganensis** (Dreisbach)

- Wholly black .....5b. **michiganensis dakota** (Dreisbach)
8. Spines of the tarsal comb not or but slightly longer than the width of the tarsus; apical margin of the clypeus barely emarginate (Fig. 235); antennal segment 3 about equal to the first two together; body less hairy than below .....9
- Spines of the tarsal comb distinctly longer than the width of the tarsus, or if not so, the clypeus very distinctly emarginate, as in Fig. 236; third antennal segment slightly longer than the first two together; head, thorax, and propodeum rather strongly hairy .....10
9. Entirely black .....6a. **imbecillus imbecillus** (Banks)  
Base of the abdomen marked with rufous.
- 6b. **imbecillus ojobwae** new subspecies
10. Longer spur of hind tibia not more than two thirds the length of the hind basitarsus, the setulae on the spurs somewhat more coarse than the usual pubescence of the body (Fig. 224); emargination of the clypeus moderately deep (Fig. 236); integument black.
7. **luctuosus** Cresson  
Longer spur of hind tibia more than two thirds the length of the hind basitarsus, the setulae on the spurs small and appressed (Fig. 225); emargination of the clypeus shallow; integument reflecting deep blue, at least in fresh specimens, especially noticeable on the front.
8. **occidentalis** (Dreisbach)

### Males

1. Subgenital plate without erect hairs on the median line just before the apex (Figs. 208, 209, and 210); aedoeagus strongly modified, the sinuation of the margins delimiting three arcuately broadened portions along the shaft (*Angularis*-group) .....2
- Subgenital plate with a pencil, tuft, or series of erect hairs on the median line just before the apex (very short in *solonus*) (Figs. 213-218); aedoeagus simple, the margins not strongly sinuate (*Luctuosus*-group) .....4
2. Subgenital plate (Fig. 208) with the sides tapering evenly to a subacute apex; tips of the parameres with long, bushy hairs (Fig. 181).
1. **angularis** (Banks)  
Subgenital plate with the sides not tapering evenly to the apex, but somewhat sinuate (not usually evident without dissection); tips of the parameres short-setose .....3
3. Subgenital plate (Fig. 210) slender apically, the margins flared out and provided with some rather long hairs toward the base; genitalia (Fig. 180) with the parameres clothed with erect, bristling setae.
3. **anomalus** (Dreisbach)



- Subgenital plate (Fig. 209) of somewhat variable form, but in general less slender apically, and without a group of suberect hairs on each side toward the base; genitalia (Fig. 179) with the parameres clothed for the most part with soft, suberect setae .....2. **parvulus** (Bauks)
4. Subgenital plate with only some very short setae in a tuft or series near the apex (Figs. 217 and 218); marginal cell about twice its own length from the wing-tip (Fig. 239) .....5  
 Subgenital plate with a pencil, tuft, or series of rather long setae near the apex (occasionally worn or broken off); marginal cell usually less than twice its own length from the wing-tip (Fig. 240) .....6
5. Entire disc of the subgenital plate slightly elevated, short-setose (Fig. 217); parameres more slender and sparsely setose apically than below (Fig. 183) .....4a. **solonus solonus** (Banks)  
 Disc of the subgenital plate not wholly elevated, but only the median line narrowly raised and provided with a series of small setae (Fig. 218); parameres broader and more strongly setose than above (Fig. 184) .....4b. **solonus silvivagus** new subspecies
6. Subgenital plate with two elevated ridges which converge somewhat posteriorly and between which it is flat or slightly concave, subapically with a pencil of setae (Fig. 214) .....7  
 Subgenital plate either flat or with the median line strongly elevated ...8
7. Subgenital plate with a comb of stout setae on each side near the base (not visible externally) (Fig. 211); parameres of genitalia slender; basis volsellaris with a small group of slender setae (Fig. 185).  
 5a. **michiganensis michiganensis** (Dreisbach)  
 Subgenital plate with an interrupted series of slender setae on each side near the base (not visible externally) (Fig. 212); parameres rather broad, tapering apically; basis volsellaris with a prominent group of stout setae (Fig. 186) .....5b. **michiganensis dakota** (Dreisbach)
8. Subgenital plate more or less keeled, tectiform, near the apex with a tuft or short series of rather long hairs, beyond which the plate slopes rapidly to the apex (Fig. 213) .....9  
 Subgenital plate flat or nearly so .....10
9. Wholly black .....6a. **imbecillus imbecillus** (Banks)  
 Second abdominal tergite marked with rufous.  
 6b. **imbecillus ojibwae** new subspecies
10. Subgenital plate with a series of prominent setae along the median line (Fig. 215); hind basitarsus compressed, the inner side covered with erect setulae; aedoeagus spined only on the apical one-third (Fig. 188).  
 7. **luctuosus** Cresson  
 Subgenital plate with a pencil of setae near the apex (Fig. 216); hind basitarsus unmodified; aedoeagus armed with spines or at least the apical half (Fig. 187) .....8. **occidentalis** (Dreisbach)

*Angularis* Species-group

In this group the aedoeagus of the male is of unusual form, the sides being strongly sinuate so as to delimit three arcuately expanded lobes along the shaft. The subgenital plate is without the erect hairs so characteristic of the *Luctuosus*-group. The venation is well removed from the outer margin of the wing, the marginal cell usually being at least twice its own length from the wing-tip. The propodeum is without erect hairs, and the clypeus of the female never more than very slightly arcuately concave apically.

The three species comprising this group are very closely allied and not easily separable. The best characters lie in the parameres of the male genitalia, which are distinctly different in the three species. The subgenital plate also shows specific characters, although it is subject to considerable individual variation within each species. The characters used in the key for separating the females of this species-group are of a tentative nature, as I am not certain that they will always properly separate the species.

1 *Pompilus (Ammosphex) angularis* (Banks)

*Psammochares angularis* Banks, 1910, Jour. N. Y. Ent. Soc., 18: 115. [Type: ♂; Claremont, Calif. (Baker); M.C.Z. no. 13,676.]

*Psammochares (Pompiloides) angularis* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.

*Pompiloides angularis* Banks, 1919, Bull. Mus. Comp. Zool., 63: 235.

*Pompilus angularis* Strickland, 1947, Canad. Ent., 79: 124. [Drumheller, Alta.]

*Anopompilinus angularis* Dreisbach, 1950, Amer. Midl. Nat., 42: 734. [Placed in synonymy with *parvulus* Banks.]

*Pompilus (Ammosphex) angularis* Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 934.

This is our smallest native *Pompilus*. The front of the female averages somewhat broader than in the following two species, and the third antennal segment is usually slightly shorter than the first two combined; the wings are iridescent but rarely wholly violaceous. The male is best identified by the characteristic subgenital plate (Fig. 208) and by the long hairs at the apex of the parameres (Fig. 181). Since this is the only member of the species-group occurring in the eastern United States, eastern specimens can be assigned with little difficulty.

FEMALE.—Length 6.5 (4.5-8) mm. Color black; wings lightly infuscated, broadly darker beyond the cells, reflecting various colors, including green, rose, and violet, but the wings rarely wholly violaceous. Pubescence fusco-violaceous and/or silvery; specimens from the West tend to be mostly dark-pubescent, though usually silvery on the sides of the front, while eastern specimens usually are silvery-pubescent over a large part of the head, thorax, and propodeum. Front, pronotum, and front coxae each with a few erect hairs; remainder of thorax, and the propodeum, scarcely or not at all hairy.

Clypeus slightly over three times as broad as high, the apical margin at most very slightly arcuately concave. Front broad, the middle interocular distance varying from .55 to .61 (averaging .58) times the transfacial distance; inner orbits converging slightly above, the upper interocular distance from .8 to .85 times the lower interocular. Antennae of moderate length, the first four segments in a ratio of about 16:6:19:17, the third segment about 3.5 times as long as its greatest thickness, and equal to from .62 to .75 times the upper interocular distance. Postocellar line subequal to or slightly less than the ocello-ocular line.

Propodeum sloping very gradually in front, more steeply behind; median line impressed. Front tarsus with a comb of spines which are not or scarcely longer than the width of the tarsus, the apical spine on the basitarsus about half the length of the second tarsal segment. Marginal cell of the fore wing short, about twice as long as high, from 2.2 to 3 times its own length from the wing-tip. Second and third submarginal cells small, not wider than high, both narrowed by more than half above. Third discoidal cell at least 1.5 times its own length from the outer wing margin.

MALE.—Length 5.5 (4-6.5) mm. Color black; wings hyaline, the outer margin of the fore wing broadly infuscated. Head and thorax in large part finely silvery-sericeous, the abdomen often in part so. Temples, propleura, and front coxae with a few pale erect hairs; front with a few dark hairs; remainder of body not at all hairy.

Clypeus about 2.6 times as broad as high, the lower margin very slightly concave. Front of moderate breadth, the middle interocular distance varying from .57 to .63 times the transfacial distance; inner orbits subparallel or slightly diverging above. First four antennal segments in a ratio of about 24:10:23:24, the third segment about 2.5 times as long as thick. Postnotum expanded dorsally, where it is as long as or slightly longer than the meta-notum, depressed on the median line. Propodeum with an impressed median line, sloping more steeply behind. Venation similar to that of the female, but the veins still farther removed from the outer wing margin; marginal cell very short, at least 2.5 times its own length from the wing-tip; third submarginal cell sometimes triangular or petiolate.

Abdominal sternite 6 with a deep V-shaped emargination. Subgenital plate (Fig. 208) simple, rather slender, attenuate apically. Genitalia (Fig. 181) with the parameres considerably exceeding the other appendages, apically acutely pointed and bushy-haired. Digits subspatulate, the disc

clothed with short setae. Parapenials rather short, nearly straight. Aedoeagus with its margins sinuate, tapering apically to a deeply divided apex; margin armed with scattered short spines on the apical third.

*Biology.*—This species occurs in sheltered sandy areas and in open woodlands where the soil is light. It has been taken on honeydew and on the flowers of *Cleome*. The species is probably commoner than the records suggest; because of its small size and quick, nervous flight close to the ground, it is scarcely apt to be noticed from the height of a man's head.

*Distribution.*—This species occurs transcontinentally in the Transition and Upper Austral Zones, with an occasional record from the Canadian and Lower Austral Zones.

*Specimens seen:* 74 (41 ♀♀, 33 ♂♂). MASSACHUSETTS: Middlesex, Norfolk, and Suffolk Cos., 4 ♀♀, 3 ♂♂, Aug.-Sept. [CAS]; CONNECTICUT: Hartford Co., 4 ♀♀, 4 ♂♂, Aug.-Sept. [HEE, ANSP]; NEW JERSEY: Atlantic Co., 1 ♀, DeCosta, 25 July [CU]; Ocean Co., 1 ♀, Pt. Pleasant [USNM]; NEW YORK: Suffolk Co., 2 ♀♀, June-July [USNM, KVK]; Oswego Co., 1 ♀, 1 ♂, 1-5 Sept. [KVK]; MICHIGAN: Clare Co., 1 ♀, 28 June [Coll. R. R. Dreisbach]; MINNESOTA: Anoka Co., 1 ♀, 3 Aug. [Minn.]; Polk Co., 1 ♀, 6 Sept. [Minn.]; SOUTH DAKOTA: Brookings Co., 1 ♀ [MCZ]; NEBRASKA: Thomas Co., 1 ♀, Thedford, 4 July [Coll. R. R. Dreisbach]; TEXAS: Brewster Co., 3 ♂♂, The Basin, Chisos Mts., 5400 feet, July [HEE]; Presidio Co., 1 ♂, 30 May [USNM]; NEW MEXICO: Otero Co., 2 ♀♀, 1 ♂, Cloudcroft, 26 July [HEE]; Sandoval Co., 1 ♂, Jemez Springs, July [UK]; COLORADO: Boulder Co., 1 ♀, 5 ♂♂, Apr.-Aug. [USNM, MCZ]; Las Animas Co., 1 ♂, Trinidad, 10 Aug. [HEE]; Teller Co., 2 ♀♀, 1 ♂, Florissant, June [USNM, MCZ]; WYOMING: Laramie Co., 1 ♀, 6 Aug. [MCZ]; MONTANA: 2 ♀♀ (no further data) [ANSP]; Gallatin Co., 1 ♀, Bozeman, 15 June [Mass.]; ALBERTA: 1 ♀ (no further data) [CNC]; 1 ♀, Drumheller, 14 June [Alta.]; 1 ♀, Bow Island, 14 July [CNC]; YUKON: 1 ♂, Whitehorse, 3 July [CNC]; BRITISH COLUMBIA: 1 ♀, Chilcotin, 29 May [CNC]; OREGON: 1 ♀ (no further data) [USNM]; BENTON CO., 2 ♀♀, 1 ♂, May, Sept. [USNM, MCZ, OSC]; CALIFORNIA: Alameda, Eldorado, Los Angeles, Mariposa, Mendocino, Monterey, Riverside, San Diego, and Shasta Cos., 6 ♀♀, 10 ♂♂, Apr.-Oct. [CAS, CIS, CU, UK, USNM].

## 2. *Pompilus (Ammosphex) parvulus* (Banks)

*Pompiloides parvulus* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 227-228.  
[Type: ♀; Boulder Colo., 22 Aug. 1908 (S. A. Rohwer); U.S.N.M. no. 20,119.]

*Psammochares (Pompiloides) parvulus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.

*Anopompilinus parvulus* Dreisbach, 1950, Amer. Midl. Nat., 42: 734-735, 740, fig. 14.<sup>†</sup>

*Pompilus (Ammosphex) parvulus* Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 934.

The parameres of the male genitalia of *parvulus* distinguish it readily from *angularis* and *anomalus*; the subgenital plate is also somewhat distinctive, though subject to much individual variation. Otherwise one must rely upon more subtle characters such as the breadth of the front and the relative length of the third antennal segment as compared to the upper interocular distance. In the female there is nearly always a small amount of silvery pubescence on the lower front, and the wings are rarely as strongly violaceous as in *anomalus*.

FEMALE.—Length 8 (6-10.5) mm. Body black; wings lightly to moderately infuscated, the fore wing with a broad darker band beyond the cells; wings reflecting various colors, including violet, occasionally wholly violaceous. Pubescence very dark, rather distinctly violaceous, especially on the abdomen, on the legs often somewhat cinereous, on the sides of the lower front cinereous or somewhat silvery. Clypeus, front, vertex, temples, and prothorax with a number of erect hairs, the remainder of the body practically without erect hairs except for a few at the tip of the abdomen.

Clypeus about three times as broad as high, truncate below. Front only slightly wider than the two eyes taken together, the middle interocular distance varying from .53 to .56 (averaging .54) times the transfacial distance. Inner orbits subparallel below, converging slightly above, the upper interocular distance about .8 the lower. Postocellar line equal to or slightly greater than the ocello-ocular line. Antennae rather long and slender, the first four segments in a ratio of about 21:9:32:28, the third segment thus slightly longer than the first two together, and equal to from .75 to .92 times the upper interocular distance.

Propodeum rather long, with a short posterior declivity; median line feebly impressed. Spines of the tarsal comb about as long as the width of the tarsus, or slightly longer. Marginal cell of the fore wing short, removed from the wing-tip by from two to nearly three times its own length. Second and third submarginal cells much narrowed above by the arcuation of the first and third transverse cubital veins, the second transverse cubital vein erect and nearly straight.

MALE.—Length 6 (4.5-8) mm. Color black; wings subhyaline, the fore wings with a light fuscous band beyond the cells. Head, thorax, and propodeum in large part silvery-sericeous; legs silvery as far as the femora;

<sup>†</sup> Dreisbach designates a "lecto-holotype male" and a "lecto-allotype female" of this species, both from Boulder, Colo. [MCZ]. Banks clearly states, however, that the type of his species is in the U.S.N.M., and the female indicated above as the type is clearly marked as such.

bases of the first two or three abdominal tergites slightly silvery; pubescence of the vertex, mesonotum, scutellum, and remainder of legs and abdomen fuscous, often slightly violaceous. Temples and propleura with considerable pale erect hair; front, vertex, and pronotum with a few dark erect hairs.

Clypeus 2.5 times as broad as high, the apical margin truncate. Middle interocular distance varying from .57 to .63 times the transfacial distance; upper and lower interocular distances nearly equal. Ocelli forming an angle in front which is less than a right angle; postocellar line usually slightly greater than the ocello-ocular line. Antennae of moderate length, the first four segments in a ratio of about 11:5:12:12, the third segment about 2.4 times as long as thick. Postnotum about as long as the metanotum, depressed medially. Propodeum with the median line impressed, sloping very slightly for its anterior two-thirds, more steeply behind. Venation as in the female; third submarginal cell much narrowed above, sometimes triangular, rarely petiolate.

Abdominal sternite 6 with a deep U-shaped emargination. Subgenital plate tapering to a subacute or a somewhat blunt apex, the sides slightly sinuate about half-way out (Fig. 209); there is considerable variation in the shape of the plate, but it is usually broader and with less even margins than in *angularis*, and there are no prominent hairs near the base as in *anomalus*. Genitalia (Fig. 179) with the parameres clothed with short setae which are directed toward the apex (not bristling and perpendicular as in *anomalus*), the setae at the apex slightly longer. Digits broadened and somewhat curved apically, clothed with very tiny hairs, which are absent from the extreme apex. Basal hooklets with the lower pair more strongly developed than the upper. Aedoeagus rather broad, the margins armed with short spines on the outer two-thirds.

*Biology*.—I have taken this species on several occasions flying close to the ground in sunny spots in forests at moderate altitudes, and also beneath trees dripping honeydew. It has been taken on the flowers of *Ceanothus fendleri*, *Cleome serrulata*, and *Helianthus pumilus*.

*Distribution*.—This form is widely distributed in the Upper Sonoran and Transition faunas of the western United States and Canada.

*Specimens seen*: 47 (31 ♀♀, 16 ♂♂). ALBERTA: 1 ♂, Lethbridge, 5 June [Alta.]; 1 ♂, Tilley, 7 June [CNC]; MONTANA: 1 ♀ (no further data) [ANSP]; COLORADO: Boulder Co., 3 ♀♀, 3 ♂♂, May, Aug. [MCZ, USNM]; Larimer Co., 4 ♀♀, 2 ♂♂, Poudre Canyon, 19-22 Aug. [HEE, ANSP]; Teller Co., 4 ♀♀, Florissant, June [USNM]; TEXAS: Brewster Co., 2 ♀♀, 1 ♂, The Basin, Chisos Mts., 5400 feet, 8-14 July [HEE]; NEW MEXICO: Santa Fe Co., 1 ♀, 23 Sept. [USNM]; УТАН: 1 ♂, Penrosa,

13 July [UAC]; ARIZONA: Cochise Co., 5 ♀♀, Carr Canyon, Huachuca Mts., 29 July [HEE]; Coconino Co. 1 ♂, Red Lake, 6450 feet, 25 July [ANSP]; 1 ♀, Bright Angel, Grand Canyon, 6880 feet, 1 Aug. [ANSP]; 1 ♀, Yavapai Pt., Grand Canyon, 18 Oct. [USNM]; 1 ♀, 1 ♂, Oak Creek Canyon, 11 Aug. [HEE]; 1 ♀, 1 ♂, Flagstaff, June, Aug. [USNM]; Pima Co., 2 ♀♀, 1 ♂, Bear Canyon, St. Catalina Mts., 7000 feet, 4 Aug. [HEE]; 2 ♂♂, Madera Canyon, Santa Rita Mts., 6500 feet, 30 July [HEE]; CALIFORNIA: Eldorado Co., 1 ♂, Angora Peak, 26 July [CIS]; Inyo Co., 1 ♀, Whitney Portal, 6 Aug. [CIS]; Los Angeles Co., 1 ♀, San Pedro, July [ANSP]; Mariposa Co., 3 ♀♀, May [CIS].

### 3. *Pompilus (Ammosphex) anomalus* (Dreischbach)

*Pompilus parvulus* Strickland, 1947, *Canad. Ent.*, 79: 124. [Medicine Hat, Alta.] [Based on specimens misidentified by H. E. Evans.]

*Anopompilinus anomalus* Dreischbach, 1950, *Amer. Midl. Nat.*, 42: 725-726, 737, 739, figs. 1 and 2. [Type: ♂; Mountain Home Lake, Ft. Garland, Colo., 20-25 July 1932, 8300 feet; M.C.Z. no. 28.153.]

*Pompilus (Ammosphex) anomalus* Evans, 1951, U. S. Dept. Agri., *Monogr.* 2, p. 934. [Erroneously placed in synonymy with *parvulus* Banks.]

This species is extremely similar to the preceding, with which it has until recently been confused. The genitalia are very similar to those of *parvulus*, but the setae along the shaft of the parameres are somewhat longer and are erect, bristling (Fig. 180); the subgenital plate is also distinctive (Fig. 210). The pubescence of the female is wholly dark and the wings strongly violaceous; the third antennal segment is about as long as the first two together, and is equal to from .6 to .8 the upper interocular distance.

FEMALE.—Length 7.5 (6-9.5) mm. Color black, the integument in fresh specimens with a slight bluish caste, the pubescence fusco-violaceous. Front wings moderately heavily infuscated, with a broad darker marginal band, rather strongly violaceous; hind wings lightly infuscated, darker apically. Clypeus, front, vertex, front coxae, pronotum, and scutellum each with a few erect hairs; temples and propleura with fine hair; body otherwise devoid of erect hair except for some at the apex of the abdomen.

Clypeus about three times as broad as high, the apical margin truncate or very slightly arcuately concave (Fig. 234). Front rather narrow, the middle interocular distance varying from .53 to .57 (averaging .55) times the transfacial distance. Eyes converging slightly above, the upper interocular distance .8 to .9 the lower interocular. Antennae of moderate length, the first four segments in a ratio of about 25:10:35:30, the third segment equal to from .6 to .8 the upper interocular distance. Postocellar line equal to or slightly greater than the ocello-ocular.

Propodeum with the median line impressed. Spines of the tarsal comb from 1 to 1.5 times as long as the width of the tarsus, the one at the apex of the basitarsus about half the length of the second segment, or sometimes slightly longer. Marginal cell of the fore wing short, usually about twice as long as high, from 2.5 to 3 times its own length from the wing-tip. Second and third submarginal cells both small, much narrowed above, often nearly triangular. Third discoidal cell about 1.7 times as long as high, at least 1.5 times its own length from the outer wing margin.

MALE.—Length 6 (4.5-7) mm. Color black; wings subhyaline, broadly infuscated along the outer margin, iridescent. Pubescence of the greater part of the head, thorax, and propodeum usually silvery, basal segments of the abdomen sometimes silvery; pubescence of vertex, mesonotum, greater part of the abdomen, and sometimes much more of the body, fusco-violaceous. Front, vertex, temples, and prothorax with scattered dark hairs; remainder of body without noticeable erect hairs.

Clypeus about 2.6 times as broad as high, its apical margin slightly concave. Middle interocular distance from .56 to .62 times the transfacial distance; upper and lower interocular distances about equal. First four antennal segments in a ratio of about 11:5:10:12, the third segment 2.2 to 2.5 times as long as thick. Ocelli forming an acute angle in front, the postocellar line equal to or slightly greater than the ocello-ocular line. Venation much like that of the female; second and third submarginal cells small, either or both sometimes triangular; third discoidal cell short, about twice its own length from the wing margin.

Abdominal sternite 6 with a large U-shaped emargination. Subgenital plate (Fig. 210) very slender apically, inwardly abruptly broadened, with an area of rather long, suberect hairs near the situation of the margins. Genitalia (Fig. 180) with the parameres slightly exceeding the other appendages, the shaft with perpendicular, bristling setae of moderate length, the apex also with a few setae; disc of volsellar digitus with evenly distributed short setae; basal hooklets about equally developed; parapenials straight, short; aedeagus very similar to that of the preceding species.

*Distribution.*—This species is widely distributed in the Transition and Upper Sonoran faunas of the western United States and Canada, apparently least uncommon in the coastal states.

*Specimens seen:* 37 (25 ♀♀, 12 ♂♂). ALBERTA: 1 ♂, Medicine Hat, 5 July [Alta.]; COLORADO: Costilla Co., 1 ♂, Ft. Garland, 8300 feet, 20-25 July [MCZ]; ARIZONA: Coconino Co., 1 ♀, Williams, 4 Nov. [UK]; Yavapai Co. 1 ♀, Prescott, 8000 feet [CAS]; BAJA CALIFORNIA: 1 ♀, San Quentin, 18 July [CAS]; CALIFORNIA: Alameda Co., 2 ♀♀, Berkeley, 27 July, 15 Sept. [USNM, CIS]; Los Angeles Co., 1 ♀ [USNM]; 1 ♀, Big Dalton Dam, 25 June [CIS]; Fresno Co., 1 ♀, Oxalis, 6 Aug. [CIS]; Marin Co., 2 ♀♀, 2 ♂♂, San Rafael [CAS]; Mariposa Co., 2 ♀♀, Yosemite, June, Aug. [UK, CIS]; Monterey Co., 1 ♀, Pacific Grove, 20 Aug.



[CAS]; Riverside Co., 1 ♀, Temecula, 4 July [CIS]; San Diego Co., 1 ♀, Alpine, 9 July [UK]; 1 ♀, Laguna Mt., 6000 feet, 23 Aug. [CAS]; 1 ♂, Borego, 8 Apr. [CIS]; San Francisco Co., 3 ♀♀, San Francisco, Sept. [CAS, USNM]; 1 ♀, 2 ♂♂, Ingleside, 25 Aug. [CU]; 3 ♀♀, 2 ♂♂, Lone Mt., 25 Apr.-4 July [CAS]; Santa Cruz Co., 1 ♀, Big Basin, 29 July [CIS]; WASHINGTON: Whatcom Co., 1 ♂, Sumas, 8 Sept. [USNM]; BRITISH COLUMBIA: 1 ♂, Crescent, 14 Aug. [CNC]; 1 ♂, Minnie Lake, 26 July [CNC]; 1 ♀, Seton Lake, Lillooet, 29 June [CNC].

#### *Luctuosus* Species-group

The members of this group are characterized in the male sex by the presence of a pencil, tuft, or series of erect hairs on the median line of the subgenital plate (very short in *solonus*). The aedoeagus is not as specialized as in the preceding group, the margins being subparallel or gradually expanded at the middle or apex of the shaft. The venation is less far removed from the outer wing margin, the marginal cell nearly always being less than twice its own length from the tip of the wing. There is a tendency toward an increased amount of erect hair on the body, and toward a greater emargination of the clypeus of the female.

#### 4a. *Pompilus* (*Ammosphex*) *solonus solonus* (Banks)

*Pompiloides solonus* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 303. [Type: ♀; Garces, Ariz., Aug. (Biederman); M.C.Z. no. 13,672.]

*Psammochares* (*Pompiloides*) *solonus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.

*Anopompilinus solonus* Dreisbach, 1950, Amer. Midl. Nat., 42: 735-736, 737.

*Pompilus* (*Ammosphex*) *solonus* Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 934.

This species, although very similar to the preceding three by virtue of the venation and the absence of erect hair on the propodeum, is clearly a member of the *luctuosus*-group, as evidenced by the structure of the male aedoeagus, and the fact that there are some short erect setae near the apex of the subgenital plate. The integument of this form is a deep steel-blue; the front and vertex of the female are very narrow, and the third antennal segment in this sex is about the length of the upper interocular distance.

FEMALE.—Length 9 (7.5-10.5) mm. Color of integument deep blue-black, somewhat shining, the integument overlaid by a rather strongly bluish or violaceous pubescence, which is occasionally silvery on the lower front and

base of the mandibles. Fore wings fuscous, darker along the margin, strongly violaceous; hind wings subhyaline, the apex infuscated. Clypeus, front, vertex, temples, propleura, and front coxae with numerous erect hairs; pronotum, middle and hind coxae, scutellum, and sides of propodeum often with some short, sparse hair; abdominal venter and apical tergite sparsely setose.

Clypeus about three times as broad as high, its apical margin very slightly arcuately concave. Front narrow, the middle interocular distance varying from .53 to .55 times the transfacial distance. Eyes converging somewhat above, the upper interocular distance from .75 to .85 times the lower interocular. Antennae long and slender, the first four segments in a ratio of about 3:1:5:4, segment 3 equal to from .9 to 1.1 times the upper interocular distance. Ocelli in a right triangle on the narrow vertex; postocellar line: ocello-ocular line usually about as 5:4.

Pronotum somewhat full in the shoulders, its posterior margin angulate. Median line of propodeum impressed. Comb-spines of front tarsus slender, from 1.5 to 2 times as long as the width of the tarsus, the apical basitarsal spine about two thirds the length of the second tarsal segment. Longer spur of hind tibia a little over half the length of the basitarsus. Marginal cell short, about twice its own length from the wing-tip (sometimes somewhat more or less); radial vein nearly evenly arcuate. Second and third submarginal cells subequal in size and shape, both approximately as broad as high. (Wings shown in Fig. 239.)

MALE.—Length 8 (6-9.5) mm. Color of integument deep steel blue; pubescence conspicuously silvery on the following parts: head except the vertex; antennal scape below; greater part of the thorax and propodeum, including the legs as far as the femora; basal bands on abdominal tergites 1 through 3 or 4; part or all of sternites 1 through 3; pubescence on the vertex, mesonotum, and remainder of abdomen fusco-violaceous. Wings subhyaline, the outer margins broadly fuscous. Temples and propleura with considerable pale hair; clypeus, front, and vertex with numerous dark hairs; pronotum and sides of propodeum sometimes inconspicuously hairy; remainder of body almost devoid of erect hairs, except the subgenital plate as described below.

Clypeus from 2.2 to 2.5 times as broad as high, its apical margin slightly concave. Middle interocular distance varying from .54 to .58 times the transfacial distance; upper interocular distance equal to or slightly greater than the lower interocular. Antennae slender, the first four segments in a ratio of about 25:10:27:27, segment 3 nearly three times as long as thick. Ocelli prominent; postocellar line: ocello-ocular line about as 5:4. Postnotum about as long as the metanotum, it and the propodeum with a well-impressed median line. Longer spur of the hind tibia slightly more than two-thirds the length of the hind basitarsus, which is very slender. Venation about as in the female.

Abdominal sternite 6 with a broadly U-shaped emargination. Subgenital plate (Fig. 217) rather broad, tapering apically to a somewhat rounded

point; disc somewhat elevated and clothed with very short erect setae, subapically with a small tuft of slightly longer setae. Genitalia (Fig. 183) with the parameres long, slightly broadened apically, coarsely and sparsely setose; parapenials stout, somewhat truncate apically; aedeagus expanded somewhat apically, its apical fifth armed along the margin with short, stout spines.

*Biology*.—This species is characteristic of open, sunny spots in mountain forests. A female taken by the author at Rustlers' Park, in the Chiricahua mountains of Arizona [HEE], was walking along the ground dragging an immature spider of the genus *Lycosa* [det. B. J. Kaston].

*Distribution*.—Typical *solonus* is an inhabitant of Transition zone forests at moderate to high elevations, ranging from Arizona and Utah west to California.

*Specimens seen*: 27 (20 ♀♀, 7 ♂♂). ARIZONA: Cochise Co., 1 ♀, Garces, Aug. [MCZ]; 4 ♀♀, 4 ♂♂, Huachuca Mts., June-July [HEE, CAS]; 4 ♀♀, 2 ♂♂, Chiricahua Mts., July-Aug. [HEE, UK]; 2 ♀♀, Reef, 16 Nov. [ANSP]; Coconino Co., 1 ♀, Williams, 21 July [USNM]; 1 ♀, Oak Creek Canyon, 6000 feet, 11 Aug. [HEE]; 1 ♀, Mormon Lake, 7000 feet, 12 Aug. [HEE]; Pima Co., 1 ♀, Bear Canyon, Santa Catalina Mts., 7000 feet, 4-5 Aug. [HEE]; 1 ♀, Tucson, 22 Oct. [CU]; UTAH: Cache Co., 1 ♀, Cove Fort, 14 Aug. [UK]; CALIFORNIA: Alameda Co., 1 ♀, Oakland Hills, 21 Oct. [CIS]; Marin Co., 1 ♂, Baltimore Peak, 2 July [CAS]; 1 ♀, Mt. Tamalpais, 2 July [CAS]; San Mateo Co., 1 ♀, Redwood City, 27 June [CAS].

#### 4b. *Pompilus (Ammosphex) solonus silvivagus* new subspecies

Specimens from the eastern part of the total range of *solonus* appear to show constant differences in the male genitalia and subgenital plate, and are therefore considered to constitute a discrete subspecies. Females are more difficult to characterize, but the few specimens available to me seem to be less intensely bluish than typical *solonus*.

FEMALE (Allotype).—Length 9.5 mm.; fore wing 7 mm. Color of integument black, with vague deep metallic reflections; pubescence fuscoviolaceous, on the sides of the lower front distinctly silvery. Front wings fuscous, darker apically, violaceous; hind wings subhyaline, the tip fuscous. Middle interocular distance .54 times the transfacial distance; upper interocular distance .75 times the lower interocular distance; third antennal segment equal to .95 times the upper interocular distance. Marginal cell 1.9 times its own length from the wing-tip. Other characters essentially as described under the nominate subspecies.

Three female paratypes vary in length from 7 to 10 mm., and show only minor differences from the type. The marginal cell varies from 1.8 to 2.2 times its own length from the wing-tip.

**MALE** (Holotype).—Length 6 mm.; fore wing 4.5 mm. Color deep blue-black; pubescence conspicuously silvery over almost the entire head, thorax, and propodeum, including the legs to the femora, as well as the bases of the first three abdominal segments; pubescence on the remainder of the abdomen darker, reflecting bluish. Wings subhyaline, the veins brownish, the fore wing with a broad fuscous band along the outer margin. Middle interocular distance .59 times the transfacial distance; inner orbits subparallel. Marginal cell of fore wing short, three times its own length from the wing-tip; second and third submarginal cells higher than wide.

Subgenital plate (Fig. 218) with the median line slightly elevated for its entire length, bearing a series of small setae, and near the apex a small tuft of slightly longer setae. Genitalia (Fig. 184) with the parameres much broadened apically, the inner margin with a series of small hairs, the upper, outer margin strongly setose. Other characters as described under the nominate subspecies.

Seven male paratypes vary in length from 7 to 9 mm. In all important essentials they agree closely with the type.

*Distribution*.—This form occurs east of the range of typical *solonus*, being known from Texas, New Mexico, and Colorado, with a single record from Arizona. Like *solonus solonus*, it is especially characteristic of Transition zone forests at moderate or high elevations.

*Holotype*.—NEW MEXICO: Otero Co., ♂, Cloudcroft, 9000 feet, 26 July 1948 (H. E. Evans) [ANSP]. *Allotype*.—Sandoval Co., N. M., ♀, Jemez Springs, 24 July 1916 (John Woodgate) [ANSP].

*Paratypes*.—NEW MEXICO: Otero Co., 2 ♂♂, same data as type [HEE, MCZ]; Catron Co., 1 ♀, 9 mi. W. of Quemado, 7500 feet, 14 July 1932 (Will & McIlroy) [CM]; Socorro Co., 1 ♀, Magdalena Mts., July 1904 (F. H. Snow) [UK]; ARIZONA: Pima Co., 1 ♂, Madera Canyon, Santa Rita Mts., 6500 feet, 30 July 1948 (H. E. Evans) [HEE]; COLORADO: Larimer Co., 1 ♂, Poudre Canyon, 5200 feet, 19-22 Aug. 1948 (H. E. Evans) [HEE]; Boulder Co., 1 ♀, Boulder, Sept. 1924 (T. D. A. Cockerell) [USNM]; TEXAS, 3 ♂♂ (Belfrage)<sup>8</sup> [USNM].<sup>8</sup>

<sup>8</sup> Although most of Belfrage's collecting is supposed to have been done in Bosque Co., in east-central Texas, it seems to me unlikely that these specimens came from that locality. They were probably taken in the mountains of western Texas.

5a. *Pompilus (Ammosphex) michiganensis michiganensis* (Dreisbach)

*Anopompilinus michiganensis* Dreisbach, 1949, Ent. Amer., 29: 34, pl. 1, fig. 3. [Type: ♂; Branch Co., Michigan, 31 May 1942 (R. R. Dreisbach); M.C.Z. no. 28,147.]—Dreisbach, 1950, Amer. Midl. Nat., 42: 729-730, 738, figs. 20, 24, 29, 30.

*Anopompilinus aspinosus* Dreisbach, 1950, Amer. Midl. Nat., 42: 730-732, 736, 738, figs. 5 and 6. [Type: ♂; Alcona Co., Michigan, 31 July (R. R. Dreisbach); M.C.Z. no. 28,151.]

*Pompilus (Ammosphex) michiganensis* Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 934.

This species is most closely allied to the following species, *imbecillus*, and occurs over much the same range and in much the same type of habitat. Like *imbecillus*, it has an all-black and a red-and-black subspecies, although the ranges of the subspecies of each do not coincide. *Michiganensis* may be told from *imbecillus*, in the female sex, by the absence (or nearly so) of hairs on the propodeum, and by the at most very slightly concave apical clypeal margin. The subgenital plate, with two carinae which converge posteriorly, and a subapical pencil of long hairs, can be distinguished at once from other members of the subgenus. Dreisbach's *aspinosus* appears to have been described from a male in which this pencil of setae was broken or worn off.

FEMALE.—Length 8.5 (7-10.5) mm. Color black, the first abdominal segment, except the extreme base, rufo-ferruginous, the basal half to four-fifths of the second tergite, and usually the base of the second sternite, also rufo-ferruginous. (In one specimen from Morrin, Alberta, the red is reduced to a small band on the second tergite; this specimen is probably an intergrade with subspecies *dakota*.) Wings lightly infuscated, the outer margin with a darker band. Pubescence brownish, slightly reflecting silvery on the front, propodeum, and hind coxae. Temples and propleura with considerable fine hair; clypeus, front, vertex, pronotum, scutellum, and front coxae each with a few rather strong hairs; sides of the propodeum and middle and hind coxae often with a few short, inconspicuous hairs; abdominal sternites and apical tergite slightly setose.

Clypeus about three times as broad as high, its apical margin truncate or slightly arcuately concave (Fig. 233). Front broad, the middle interocular distance about or somewhat more than .6 the transfacial distance. Eyes converging noticeably above, the upper interocular distance about .8 the lower. Ocelli in a right triangle; postocellar line equal to or slightly less than the ocello-ocular line. First four antennal segments in a ratio of about 15:5:20:17, segment three sometimes slightly longer or shorter than 1 plus 2, and equal to from .65 to .85 times the upper interocular distance.

Median line of propodeum impressed, but usually not strongly. Spines of the tarsal comb about as long as the width of the tarsus, or slightly longer, the apical spine on the basitarsus about half as long as the second tarsal segment. Fore wing with the marginal cell about 2.5 times as long as high, about 1.5 times its own length from the apex of the wing. Second and third submarginal cells usually slightly wider than high, the second narrowed by from one third to two thirds above, the third narrowed by at least two thirds above by the arcuation of the third transverse cubital vein, often nearly or quite triangular (Fig. 240).

MALE.—Length 7 (5-9) mm. Color black, the first and/or second abdominal tergite occasionally marked with rufous or brownish; pubescence brownish, reflecting silvery in certain lights on the propodeum, hind coxae, and front. Wings subhyaline, the outer margin of the fore wing with a broad fuscous band. Temples and propleura with fine hair; clypeus and front with scattered setae; remainder of body scarcely hairy except for the pencil of hairs on the subgenital plate.

Clypeus about 2.5 times as broad as high, its apical margin truncate. Front broad, the middle interocular distance varying from .61 to .66 times the transfacial distance. Inner orbits usually converging slightly above. Antennae elongate, the first four segments in a ratio of about 10:5:11:11, the third segment about three times as long as thick. Ocelli in a right triangle, the laterals about as near to each other as to the nearest eye-margin. Postnotum as long as the metanotum, impressed medially; median line of propodeum impressed, often rather weakly. Longer spur of hind tibia about three-fourths the length of the basitarsus. Venation like that of the female.

Abdominal sternite 6 with a broadly U-shaped emargination. Subgenital plate (Figs. 211, 214) with the disc somewhat elevated, the elevation bordered by two carinae which converge somewhat behind, and between which the disc is flat or somewhat concave, clothed with small setae; subapically there is a pencil of setae longer than the distance from its base to the apex of the plate; margin of the plate fringed with short setae; at the extreme base on each side is a short comb of thick, darkly pigmented setae. Genitalia (Fig. 185) with the parameres very slender, rather sparsely setose; basis volsellaris with a small group of short, thin setae; digitus with a series of clubbed setae along the inner margin, the remainder of the disc nearly devoid of setae; aedoeagus of nearly uniform breadth to the apex, which is obliquely truncate on each side, the outer apical angles with a few minute black teeth.

*Biology*.—This species frequents woodland glades or borders, and has been taken visiting honeydew and the flowers of *Solidago*. A male from Aweme, Manitoba [CNC], is labeled "*ex* cocoon among locust eggs".

*Distribution*.—This form inhabits the Hudsonian, Canadian, and Transition zones, ranging from New Brunswick, Northwest Territories, and Yukon south to Alberta, Minnesota, New York, and at high elevations to Colorado and to Georgia.

*Specimens seen*: 58 (25 ♀♀, 33 ♂♂). NEW BRUNSWICK: 1 ♀, Fredericton, 15 June [CNC]; QUEBEC: 1 ♂, Hemmingford, 20 June [CNC]; 1 ♂, Norway Bay, 6 July [CNC]; 2 ♂♂, Aylmer, 9 July, 11 Aug. [CNC]; ONTARIO: 1 ♂, Ottawa, 13 July [HEE]; MAINE: Lincoln Co., 1 ♀, Waldoboro, Aug. [USNM]; MASSACHUSETTS: Hampshire Co., 1 ♀, Cummington, 28 Aug. [HEE]; NEW YORK: Erie, Essex, Chautauqua, Rensselaer, Sullivan, and Tompkins Cos., 8 ♀♀, 3 ♂♂, May-Sept. [CU, MCZ, HEE, KVK]; NORTH CAROLINA: Buncombe Co., 1 ♀, Black Mt., 23 July [AMNH]; GEORGIA: Rabun Co., 1 ♂, Rabun Bald, 6 June [USNM]; INDIANA: 1 ♀ (no further data) [USNM]; MICHIGAN: Alcona, Branch, Gratiot, Ingham, and Shiawassee Cos., 1 ♀, 5 ♂♂, May-Sept. [MCZ, UK, Coll. R. R. Dreisbach, Coll. R. L. Fischer]; MINNESOTA: Bigstone, Olmstead, Ramsey, Red Lake, Traverse, Wabasha, and Washington Cos., 5 ♀♀, 3 ♂♂, May-Sept. [Minn., USNM]; COLORADO: Larimer Co., 1 ♀, Poudre Canyon, 5200 feet, 20 Aug. [HEE]; 1 ♂, Longs Peak Inn, 9000 feet, 13 July [USNM]; Grand Co., 1 ♂, Elk Creek, 7-9 July [CU]; MANITOBA: 1 ♀, Winnipeg, 19 Aug. [CNC]; 1 ♂, Aweme, 19 Mch. [CNC]; SASKATCHEWAN: 1 ♂, Great Deer, 26 May [CNC]; ALBERTA: 1 ♂, Consort, 21 June [Alta.]; 1 ♂, Edmonton, 21 May [Alta.]; 1 ♀, Morrin, 6 July [CNC]; 1 ♀, St. Paul, 22 June [Alta.]; BRITISH COLUMBIA: 4 ♂♂, Fort Nelson, 10-13 June [CNC]; YUKON: 2 ♀♀, 3 ♂♂, Watson Lake, 20-25 June [CNC]; 2 ♂♂, Snag, 24 July [CNC]; NORTHWEST TERRITORIES: 1 ♂, Norman Wells, 20 July [CNC].

5b. *Pompilus (Ammosphex) michiganensis dakota* (Dreisbach) new status  
*Anopompilinus dakota* Dreisbach, 1950, Amer. Midl. Nat., 42: 728, 737, 740, figs. 9 and 10. [Type: ♂; Stump Lake, Nelson Co., No. Dak., 7 July 1920 (T. H. Hubbell); Univ. Michigan (not seen by present writer)].  
 —Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 934. [Erroneously placed in synonymy with *michiganensis* Dreisbach.]

This form is very similar to the preceding, but the female is entirely black, and the male genitalia and subgenital plate show minor though constant differences. The range of *dakota* appears to overlap that of *michiganensis* rather broadly; because of this and because of the genitalic differences, it is possible that it should be regarded as a full species. However, in the band of overlap, *dakota* appears to occur principally at lower altitudes. Furthermore, the genitalic differences do not appear to me great enough

to outweigh the overall strong resemblance of this form to *michiganensis*.

FEMALE.—Length 8 (7-9.5) mm. Color wholly black; wings lightly to moderately infuscated, somewhat darker along the outer margin. Pubescence fuscous or somewhat cinereous, sometimes obscurely violaceous, sometimes reflecting silvery on the front, coxae, and propodeum. Third antennal segment frequently slightly longer than the first two together; spines of the tarsal comb usually slightly longer than the width of the tarsus. As in the nominate subspecies, the apical margin of the clypeus is truncate or only very slightly concave, and the propodeum has at most a trace of erect hair; these features distinguish this form from *imbecillus imbecillus*, which occurs throughout its range and often in much the same habitat.

MALE.—Length 7 (6.5-7.5) mm. Color black; pubescence either wholly dark, or a bit silvery on the front, coxae, and propodeum. Other features as described under the nominate subspecies, except for the terminalia. The subgenital plate externally is very similar to typical *michiganensis*, although in the few specimens seen the pencil of hairs appears to be slightly farther removed from the apex; internally, at the base, instead of a dense comb of stout setae on each side, are two separate groups of longer and more slender setae (Fig. 212). Genitalia (Fig. 186) with the parameres of moderate breadth, widest near the middle and tapering toward the base and apex; basis volsellaris with a large group of stout, prominent setae, some of which are clubbed; digiti elongate, the disc clothed with minute setae, the inner margin with some longer ones; aedoeagus somewhat more slender than in *michiganensis michiganensis*, the spines at the apex prominent.

*Biology*.—This form occurs on or near the ground in open, sunny spots in Transition Zone forests, and has also been taken on the flowers of *Heracleum lanatum*. A female from Electra Lake, Colorado [AMNH], is pinned with the spider *Thanatus formicinus* (Olivier) (Thomisidae) [det. B. J. Kaston].

*Distribution*.—This form inhabits the Transition fauna from Montana and North Dakota south to Arizona and New Mexico.

*Specimens seen*: 21 (18 ♀♀, 3 ♂♂). MONTANA: 2 ♀♀ (no further data) [ANSP]; NORTH DAKOTA: Nelson Co. (type locality; Dreisbach, 1950); COLORADO: Larimer Co., 1 ♀, Fort Collins [USNM]; 2 ♀♀, Glen Haven, 29 July [UK]; 1 ♀, Poudre Canyon, 6 Aug [MCZ]; Teller Co., 1 ♂, Florissant, 4 July [USNM]; Co. ?, 1 ♀, Electra Lake, 8400 feet, 28 June [AMNH]; NEW MEXICO: Otero Co., 2 ♀♀, 1 ♂, Cloudcroft, 9000 feet, 26 July [HEE]; 1 ♀, Sixteen Sprgs. Canyon, Sacramento Mts., 26 July [HEE]; San Miguel Co., 3 ♀♀, Beulah, July [ANSP, CU]; 1 ♀, John's Canyon, near Beulah, 4 Aug. [USNM]; ARIZONA: Coconino Co., 4 ♀♀, 1 ♂, Oak Creek Canyon, 6000 feet, 11 Aug. [HEE].



6a. *Pompilus (Ammosphex) imbecillus imbecillus* (Banks)

- Anopliclla imbecilla* Banks, 1939, *Canad. Ent.*, 71: 227. [Type: ♀; Colebrook, Conn., Sept. (W. M. Wheeler); M.C.Z. no. 23,475.]
- Pompilus imbecillus* Strickland, 1947, *Canad. Ent.*, 79: 124. [Medicine Hat and Edmonton, Alta.]
- Anopompilinus coloradensis* Dreisbach, 1950, *Amer. Midl. Nat.*, 42: 724-725, 737, 741, figs. 16 and 17. [Type: ♂; Florissant, Colo., 28 June 1908 (S. A. Rohwer); M.C.Z. no. 28,152.]
- Anopompilinus banksi* Dreisbach, 1950, *Amer. Midl. Nat.*, 42: 728-729, 737, 740, figs. 11 and 12. [Type: ♂; Luce Co., Michigan, 5 July 1946 (R. R. Dreisbach); M.C.Z. no. 28,150.]
- Anopompilinus imbecilla* Dreisbach, 1950, *Amer. Midl. Nat.*, 42: 736, 738, 740, figs. 13 and 15.
- Pompilus (Ammosphex) imbecillus* Evans, 1951, *U. S. Dept. Agri., Monogr.* 2, p. 934.

This species is intermediate in hairiness and in the emargination of the clypeus between the preceding and the following species. The female is best recognized by the short tarsal comb and the few long hairs on the propodeum. The subgenital plate of the male provides a ready identification character: the median line is elevated, the sides sloping roof-like from it; subapically there is a short series of erect hairs, beyond which the median line slopes rapidly to the apex. The nominate subspecies is entirely black except for the mandibles and sometimes the apical margin of the clypeus.

FEMALE.—Length 8.5 (7-10.5) mm. Color black; body clothed with a brownish or somewhat cinereous pubescence which is frequently silvery on the lower front and parts of the thorax. Wings lightly infuscated, broadly darker along the outer margin. Temples and propleura with considerable fine erect hair; clypeus, front, vertex, pronotum, scutellum, propodeum, and front coxae each with a few erect hairs; abdominal sternites and apical tergite slightly setose.

Clypeus slightly more than three times as broad as its median height, its apical margin distinctly but not deeply arcuately excised (Fig. 235). Front rather broad, the middle interocular distance varying from .57 to .61 times the transfacial distance. Eyes converging slightly above, the upper interocular distance about .85 times the lower interocular. First four antennal segments in a ratio of about 30:10:40:33, the third segment equal to from .73 to .82 times the upper interocular distance. Postocellar line subequal to or slightly greater than the ocello-ocular line.

Median line of propodeum rather faintly impressed. Comb-spines of the front tarsus short, not much if any longer than the width of the tarsus, the apical basitarsal spine less than half the length of the second tarsal segment. Longer spur of the hind tibia from .55 to .67 times the length of the basitarsus; pubescence of the spurs somewhat rough, suberect, though usually less noticeably so than in *luctuosus*. Marginal cell of the fore wing usually about 1.5 times its own length from the wing-tip; second and third submarginal cells subequal in area, both about as broad as or a little broader than high, the third submarginal strongly narrowed above, often subtriangular.

MALE.—Length 7 (6-8.5) mm. Color black; wings nearly hyaline, the outer margin of the fore wing broadly infuscated. Pubescence brownish or somewhat cinereous, at least the sides of the lower front silvery, often also the clypeus, temples, and a considerable part of the thorax. Temples and propleura with considerable fine hair; front with scattered dark hairs; a few inconspicuous hairs may be present on the front coxae, pronotum, and the sides of the propodeum; abdomen without erect hairs except for a subapical tuft on the subgenital plate.

Clypeus about 2.5 times as broad as high, its apical margin slightly concave. Front rather broad, the middle interocular distance about .6 the transfacial distance. Inner orbits subparallel or diverging slightly above. First four antennal segments in a ratio of about 12:5:13:13, the third segment nearly three times as long as thick. Postocellar and ocello-ocular lines nearly equal. Median line of propodeum usually weakly impressed. Longer spur of hind tibia from two-thirds to three-fourths the length of the basitarsus, the latter slender and not modified as in the following species. Venation as in the female.

Subgenital plate (Fig. 213) tectiform, the sides sloping strongly from the elevated median line, subapically with a short series of prominent erect setae. Genitalia (Fig. 182) with the parameres rather slender, the ventral surface clothed rather uniformly with short setae, which may be longer along the inner margin. Volsellae with numerous rather long hairs on the basis; digitus somewhat striolate apically, the disc covered with short, clubbed setae, the apex obliquely truncate. Parapenials rather stout; aedoeagus gradually expanded toward the apex, the outer margin armed with short spines.

*Biology*.—The typical habitat of this species is open woodlands or woodland borders, where it may be found on the ground, logs, and low herbage. I have taken it on honeydew and on the flowers of *Ceanothus americanus*.

*Distribution*.—This form occurs across the continent in the Transition Zone, but appears to be absent from the Pacific states except British Columbia. It is replaced northward by subspecies *ojibwae*.

*Specimens seen*: 57 (41 ♀♀, 16 ♂♂). QUEBEC: 1 ♀, Aylmer, Sept. [CNC]; ONTARIO: 1 ♀, Ottawa, 20 Aug. [HEE]; MAINE: Kennebec Co., 1 ♀, Winthrop, 15 Aug. [MCZ]; NEW HAMPSHIRE: Hillsboro Co., 1 ♀, Pelham, 17 Aug. [USNM]; MASSACHUSETTS: Suffolk Co., 1 ♀, Blue Hills, Sept. [CAS]; Middlesex Co., 1 ♂, Melrose Highlands, Sept. [CAS]; CONNECTICUT: Hartford Co., 4 ♀♀, 1 ♂, 28 July-13 Sept. [HEE]; Litchfield Co., 2 ♀♀, Colebrook [MCZ]; NEW YORK: Erie, Jefferson, and Tompkins Cos., 8 ♀♀, 4 ♂♂, 19 June-4 Sept. [CU, USNM, HEE, CAS]; PENNSYLVANIA: Sullivan Co., 1 ♀, Lopez, Aug. [ANSP]; VIRGINIA: 1 ♂ (no further data) [ANSP]; MICHIGAN: Cheboygan, Huron, Lapeer, Luce, and Mecosta Cos., 4 ♀♀, 2 ♂♂, May-Aug. [MCZ, USNM, UK, coll. R. R. Dreisbach]; SOUTH DAKOTA: 1 ♀, Cedar Pass [USNM]; MONTANA: 2 ♀♀ (no further data) [ANSP]; COLORADO: 1 ♂ (no further data) [USNM]; Lake Co., 1 ♀, Leadville, 3-5 Aug. [AMNH], Larimer Co., 1 ♀, Glen Haven, Aug. [UK]; Teller Co., 1 ♀, 1 ♂, Florissant, June [MCZ, USNM]; NEW MEXICO: Otero Co., 1 ♀, 1 ♂, Clondcroft, 9000 feet, 26 July [HEE]; ALBERTA: 3 ♀♀, 2 ♂♂, Medicine Hat, June [Alta., USNM]; 1 ♀, Edmonton, June [HEE]; BRITISH COLUMBIA: 1 ♀, Revelstoke, Selkirk Mts., June [CU]; 1 ♀, Salmon Arm, June [CNC]; 1 ♀, Trinity Valley, 29 June [CNC]; 2 ♀♀, Midday Valley, Merritt, July [CNC]; 1 ♂, Hedley, July [CNC]; 1 ♀, 1 ♂, Robson, 28 Aug., 4 Sept. [CNC].

6b. *Pompilus (Ammosphex) imbecillus ojibwae* new subspecies

This form differs from typical *imbecillus* only in having the basal segments of the abdomen marked with rufous. It thus bears considerable resemblance to *michiganensis michiganensis*, but the propodeum is somewhat hairy and the apical margin of the clypeus is distinctly excised (in the female). Named for the Ojibwa Indians of the Lake Superior region, this form occurs chiefly in the Canadian Zone, north of the range of the nominate subspecies.

FEMALE (Holotype).—Length 10 mm.; fore wing 8 mm. Color black, the abdomen marked with rufo-ferruginous on the apical two-thirds of the first tergite, all of the second tergite, a basal spot on the third tergite, all of the first sternite, and the basal half of the second sternite. Pubescence wholly brownish, except where the integument is pale. Clypeus 3.2 times as broad as high, the apical margin slightly arcuately emarginate. Middle interocular distance .59 times the transfacial distance; third antennal segment equal to .75 times the upper interocular distance. Other features as described under typical *imbecillus*.

Seventeen female paratypes vary in length from 7.5 to 10.5 mm. There is some variation in the amount of red on the abdomen; specimens from Ottawa, Ontario, Aylmer, Quebec, and Erie Co., Pa., have the red on the

abdomen considerably reduced, and probably represent intergrades with *imbecillus imbecillus*.

MALE (Allotype).—Length 7.5 mm.; fore wing 6 mm. Color black, the basal half of the second abdominal tergite and basal third of the second sternite rufo-ferruginous. Pubescence of lower front, clypeus, sides of the thorax, and propodeum somewhat silvery, elsewhere brownish. Middle interocular distance .6 the transfacial distance; upper interocular distance .93 times the lower interocular; postocellar and ocello-ocular lines about equal. Other characters, including the terminalia, not differing notably from the typical subspecies.

Two male paratypes compare closely with the type, showing minor variations in head measurements and in the amount of red on the abdomen.

*Distribution*.—This subspecies occurs across the continent in the Canadian and Hudsonian Zones, from New Brunswick, Ontario, Minnesota, Alberta, and British Columbia north to Northwest Territories.

*Holotype*.—MINNESOTA: Clearwater Co., ♀, Itasca Park, 17 July 1937 (Entomology class) [Minn.]. *Allotype*.—♂, same locality, 5 July 1943 (W. D. Murray) [Minn.].

*Paratypes*.—NEW BRUNSWICK: 1 ♀, Nerepis, 22 Aug. (A. G. Leavitt) [USNM]; QUEBEC: 2 ♀♀, Aylmer, 9 Aug., 1 Sept. [CNC]; ONTARIO: 1 ♀, Ottawa, 3 Aug. 1947 (W. R. M. Mason) [HEE]; 1 ♀, Sudbury, 12 July 1889 [CNC]; 1 ♂, Waubamic, 7 June 1915 [CU]; NEW HAMPSHIRE: 1 ♀ (no further data) [ANSP]; NEW YORK: Essex Co., 1 ♀, Artist's Brook, 23 June 1940 (H. Dietrich) [CU]; PENNSYLVANIA: Erie Co., 1 ♀, Cranberry Bog Trail, Presque Isle, 27 July 1933 (G. E. Wallace) [CM]; MINNESOTA: Anoka Co., 1 ♀, Republic, 30 July 1932 (C. E. Mickel) [Minn.]; Clearwater Co., 1 ♀, Lake Itasca, 27 July 1923 (S. A. Graham) [Minn.]; 1 ♂, Itasca Park, 12 June 1931, from cocoons of spotted Jack pine sawfly (L. W. Orr) [USNM]; Beltrami Co., 1 ♀, Bemidji, 19 Aug. 1922 [Minn.]; Lake Co., 1 ♀, Kawishiwi R., 30 Aug. 1919 (H. H. Knight) [Minn.]; Nicollet Co., 1 ♀, St. Peter, 27 July 1922 [Minn.]; Rock Co., 1 ♀, Luverne, 10 Sept. [Minn.]; ALBERTA: 1 ♀, Wabamun, 2 Aug. 1936 (E. H. Strickland) [Alta.]; BRITISH COLUMBIA: 1 ♀, Peace River Bridge, Taylor, 31 Aug. 1948 (W. R. M. Mason) [CNC]; NORTHWEST TERRITORIES: 1 ♀, Reindeer Depot, McKenzie Delta, 8 July 1948 [CNC].

### 7. *Pompilus (Ammosphex) luctuosus* Cresson

*Pompilus luctuosus* Cresson, 1865, Proc. Ent. Soc. Phila., 4: 452. [Lectotype: ♀; Colorado (no further data); A.N.S.P. no. 416.]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 88.—[?]Harrington, 1896, Canad. Ent., 28: 80. [Biology.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 299.—Strickland, 1947, Canad. Ent., 79: 124. [Alta., several localities.]

- [?] *Psammochares luctuosus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—  
[?] Rohwer, 1917, Proc. U. S. Nat. Mus., 53: 239. [Tahoe, Calif.]
- [?] *Anoplus luctuosus* Banks, 1919, Bull. Mus. Comp. Zool., 63: 233, 234.  
[Calif., Wash., B. C.]—[?] Cockerell, 1937, Bull. Brooklyn Ent. Soc.,  
32: 25. [Trail Ridge, 12000 feet, Colo.]
- Anopompilinus mainensis* Dreisbach, 1950, Amer. Midl. Nat., 42: 733-734,  
737, 743, figs. 25 and 26. [Type: ♂; Bangor, Me., July (F. A. Eddy);  
M.C.Z. no. 28, 146.]
- Anopompilinus hirsutus* Dreisbach, 1950, Amer. Midl. Nat., 42: 733, 737,  
741, figs. 18 and 19. [Type: ♂; Estes Park, Colo., 14 July 1934  
(A. L. Melander); M.C.Z. no. 28,148.]
- Pompilus (Ammosphex) luctuosus* Evans, 1951, U. S. Dept. Agri., Monogr.  
2, p. 934.

A variety of species have from time to time been misidentified as *luctuosus* Cresson; unfortunately it is impossible to be sure which records are incorrect in every case, or what species was actually meant. True *luctuosus* is apparently a common species only in the Far North. The integument is dull black, not at all bluish as in the following species. In the female the clypeus is very distinctly emarginate (Fig. 236) and the longer spur of the hind tibia less than two-thirds the length of the basitarsus, the spurs rather coarsely pubescent (Fig. 224). The male is easily recognized by the modified hind basitarsus and by the characteristic subgenital plate (Fig. 215).

FEMALE.—Length 9 (7-11.5) mm. Color black, the upper outer orbits often with a very small pale spot; body clothed with a brownish, obscurely violaceous, pubescence. Fore wings moderately infuscated, darker along the outer margin, slightly violaceous; hind wings subhyaline, the apex infuscated. Body with rather abundant erect, black hairs on the mandibles, clypeus, front, vertex, temples, propleura, pronotum, front coxae, and propodeum; mesonotum, scutellum, middle and hind coxae, and usually to some extent the femora, slightly hairy; abdominal sternites and the apical tergite somewhat setose.

Clypeus about 3.3 times as broad as its median height, the anterior margin distinctly arcuately emarginate (Fig. 236). Front of moderate breadth, the middle interocular distance varying from .55 to .6 times the transfacial distance. Eyes converging slightly above, the upper interocular distance about .8 the lower. Antennae elongate, the first four segments in a ratio of about 30:10:43:35, segment 3 about .8 the upper interocular distance. Ocelli in a rather broad triangle, the postocellar line equal to or slightly greater than the ocello-ocular line. Temples rather wide, in lateral view over two-thirds the width of the eye.

Propodeum with an impressed median line and a somewhat flattened posterior declivity. Front tarsus with a comb of spines from 1 to 2.2 times as long as the thickness of the tarsus, the one at the apex of the basitarsus from one-third to two-thirds the length of the second tarsal segment. Setulae on the tibial spurs somewhat longer than the usual pubescence of the body, suberect; longer spur of the hind tibia between half and two-thirds the length of the basitarsus (Fig. 224). Marginal cell of the fore wing from 1.5 to nearly 2 times its own length from the wing-tip, the radial vein arcuate or slightly angled at the third transverse cubital vein. Second and third submarginal cells subequal in area, the second narrowed by from .3 to .6 above, the third narrowed more strongly above, often nearly triangular.

MALE.—Length 8 (5.5-10.5) mm. Color black, the upper outer orbits sometimes with a small pale spot; pubescence brownish, obscurely violaceous, conspicuously silvery on the sides of the clypeus and lower front, often also to some extent on the coxae, sides of the thorax, and propodeum. Wings lightly infuscated, darker along the outer margin. Temples, occiput, and propleura with moderately dense hair; clypeus, front, and vertex rather hairy; pronotum, disc of scutellum, sides of propodeum, and front coxae with a few erect hairs; abdomen with erect hairs only on the median line of the subgenital plate.

Clypeus about 2.5 times as broad as high, the lower margin arcuately concave. Middle interocular distance varying from .57 to .61 times the transfacial distance; inner orbits subparallel or diverging slightly above. First four antennal segments in a ratio of about 12:5:11:12, the third segment only about 2.2 times as long as its greatest thickness. Ocelli in a rather broad triangle; postocellar line subequal to or slightly greater than the ocellular line. Basal segment of the hind tarsus compressed, the inner surface with the pubescence erect, bristling. Longer spur of the hind tibia about three fourths the length of the basitarsus; spurs somewhat roughly pubescent as in the female. Venation like that of the female.

Abdominal sternite 6 broadly and shallowly emarginate. Subgenital plate (Fig. 215) nearly flat, the median line with a row of erect hairs for most of its length, these hairs longest a short distance from the apex, where they tend to form a loose tuft about as long as the distance to the apex; outer margin of the subgenital plate fringed with rather long setae. Genitalia (Fig. 188) with the parameres rather broad, fringed on the outer margin with long hairs. Digitus slightly curved, the disc clothed with short, clubbed setae. Parapenials stout, shorter than the aedoeagus, the latter rather slender, the apical fourth of the shaft with short spines along the margin.

*Distribution.*—This species occurs transcontinentally in the Hudsonian and Canadian Zones, sparingly entering the Transition Zone in the western states.

*Specimens seen*: 51 (35 ♀♀, 16 ♂♂). MAINE: 1 ♂, Bangor, July [MCZ]; QUEBEC: 2 ♂♂, Kazabazua, 9 Aug. [CNC]; MICHIGAN: Mackinaw Co., 1 ♀, 27 Aug. [Coll. R. R. Dreisbach]; MINNESOTA: 1 ♀, Itasca Park, 12 May [Coll. R. R. Dreisbach]; 1 ♀, Lake Superior shore, Rosebush Township, 9 Aug. [Minn.]; SOUTH DAKOTA: 1 ♀, Cedar Pass [USNM]; DAKOTA TERR.: 2 ♀♀ (no further data) [ANSP]; WYOMING: 1 ♂, Jackson Hole, 16 Aug. [USNM]; COLORADO: 3 ♀♀ (no further data) [ANSP]; 1 ♀, Leadville, 3-5 Aug., 10,000 feet [AMNH]; 1 ♂ Estes Park, 14 July [MCZ]; 2 ♀♀, Fort Collins [USNM]; NEW MEXICO: 1 ♀, Ft. Wingate, 8 Aug. [ANSP]; IDAHO: 1 ♂, Castleford, 17 May [USNM]; CALIFORNIA: Marin Co., 1 ♀, Dillon Beach, 19 Apr. [CIS]; BRITISH COLUMBIA: 1 ♂, Chilcotin, 29 May [CNC]; 1 ♀, Windermere, 4 Aug. [Alta.]; 1 ♀, Wavenby, 11 Sept. [USNM]; 1 ♀, Lower Post, 17 June [CNC]; 2 ♂♂, Fort Nelson, 6 June [CNC]; ALBERTA: 3 ♀♀, 1 ♂, Medicine Hat, 15 June, 20 Aug. [CNC, Alta., USNM]; 1 ♀, Lethbridge, 28 Aug. [CNC]; 1 ♂, Drumheller, 14 June [Alta.]; 1 ♂, Edmonton, 13 May [Alta.]; YUKON: 4 ♀♀, 1 ♂, Whitehorse, 3 July-1 Aug. [CNC]; 1 ♀, 1 ♂, Watson Lake, 17-24 June [CNC]; NORTHWEST TERRITORIES: 8 ♀♀, 1 ♂, Reindeer Depot, MacKenzie, Delta, 12 July-13 Aug. [CNC]; 1 ♀, 1 ♂, Norman Wells, 12-23 Aug. [CNC].

#### 8. *Pompilus (Ammosphex) occidentalis* (Dreisbach)

*Anopompilinus occidentalis* Dreisbach, 1950. Amer. Midl. Nat., 42: 726-728, 736, 738, 743, figs. 27 and 28. [Type: ♂; Pinecrest, Tuolumne Co., Calif., 29 July 1947 (P. H. Arnaud); M.C.Z. no. 28,149.]

*Pompilus (Ammosphex) occidentalis* Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 934.

This not uncommon inhabitant of the western United States and Canada has apparently escaped detection until recently because of its close similarity to *luctuosus* Cresson, from which the characters presented in the keys serve to separate it. The integument has a distinct bluish caste, particularly apparent on the front. In this species the spininess of the male aedoeagus reaches its ultimate development, this structure suggesting a machinist's file.

FEMALE.—Length 8.5 (7-10) mm. Color black, the integument faintly reflecting deep steel-blue, especially on the front, the upper, outer orbits often with a small pale spot. Wings moderately infuscated, somewhat darker apically, violaceous. Pubescence brownish-fuscous, somewhat violaceous, nowhere silvery. Body with erect black hairs as follows: mandibles, clypeus, front, vertex, pro- and mesonota, disc of scutellum, propodeum, and coxae, conspicuously though rather sparsely; temples, occiput, and propleura more densely but with finer hairs; abdominal venter and apical tergite sparsely setose.

Clypeus about three times as broad as high, its apical margin broadly and not deeply emarginate. Front of moderate breadth, the middle interocular distance varying from .54 to .6 times the transfacial distance. Eyes somewhat convergent above, the upper interocular distance about .85 times the lower interocular. Antennae rather elongate, the first four segments in a ratio of about 30:10:42:35, the third segment equal to about .8 the upper interocular distance. Ocelli in approximately a right triangle, the postocellar and ocello-ocular lines about equal. Temples moderately developed, in lateral view at least half the width of the eye.

Propodeum with an impressed median line. Comb-spines of front tarsus slender, nearly twice as long as the width of the tarsus, the one at the apex of the basitarsus about two-thirds the length of the second tarsal segment, or somewhat longer. Longer spur of the hind tibia from .67 to .8 times the length of the basitarsus, the spurs and the basitarsus more slender than in *luctuosus*, the pubescence on the spurs fine and appressed (Fig. 225). Marginal cell short, about 1.5 times its own length from the wing-tip; radial vein nearly evenly arcuate. Second and third submarginal cells each strongly narrowed above.

MALE.—Length 7 (5-9) mm. Color black, the integument faintly reflecting deep steel-blue. Pubescence fusco-violaceous, reflecting silvery on the clypeus, lower front, and often also on the greater part of the coxae, mesopleura, and propodeum. Wings lightly infuscated, the outer margin broadly darker; wings iridescent, faintly violaceous. Clypeus, front, vertex, anterior coxae, pronotum, and propodeum with numerous erect hairs; temples and propleura with denser, finer hair; venter with a few sparse, short setae, and a long pencil of hairs on the subgenital plate.

Clypeus about 2.5 times as broad as high, the lower margin slightly arcuately concave. Front of moderate breadth, the middle interocular distance about .6 the transfacial distance. Upper interocular distance subequal to or slightly greater than the lower interocular. Antennae slender, the first four segments in a ratio of about 22:10:25:25, segment 3 about 2.5 times as long as its greatest thickness. Postnotum dorsally nearly as long as the metanotum, its median line and that of the propodeum distinctly impressed. Longer spur of the hind tibia about three-fourths the length of the basitarsus, the latter unmodified. Venation like that of the female, the cells often a bit farther removed from the outer wing margin.

Abdominal sternite 6 with a broad, U-shaped emargination. Subgenital plate (Fig. 216) nearly flat, the apex rounded, the disc with a subapical pencil of long setae, at least twice as long as the distance from its base to the apex of the plate. Genitalia (Fig. 187) with very broad parameres, which much exceed the other appendages in length; digitus striolate apically, clothed with small, clubbed setae; parapenials short, slender, curved; aedoeagus somewhat broadly lanceolate, the apex truncate, the margins for the apical half or more beset with stout, dark spines of varying size.



*Distribution.*—This species is an inhabitant of mountain forests of the West, apparently chiefly in the Transition Zone, ranging from Alberta and British Columbia south at high altitudes to New Mexico, Arizona, and California.

*Specimens seen:* 44 (24 ♀♀, 20 ♂♂). ALBERTA: 1 ♂, Banff, 1 July [USNM]; 1 ♂, Medicine Hat, 3 June [Alta.]; MONTANA: 2 ♀♀, 1 ♂ (no further data) [ANSP]; Dawson Co., 1 ♀, Glendive, 11 June [USNM]; COLORADO: 3 ♀♀ (no further data) [USNM]; Adams Co., 1 ♂, Bennett, 12 Aug. [UK]; Costilla Co., 1 ♀, Ft. Garland, Mt. Home, 8300 feet, July [MCZ]; Boulder Co., 2 ♀♀ [USNM]; Mineral Co., 2 ♀♀, Creede, 8844 feet, Aug. [UK]; NEW MEXICO: Otero Co., 1 ♀, 4 ♂♂, Sacramento Mts., 8000-9000 feet, June-July [HEE, UK]; ARIZONA: Cochise Co., 1 ♂, Chiricahua Mts., Rustler's Park, July [UK]; Pima Co., 1 ♀, Mt. Lemmon, Santa Catalina Mts., Aug. [HEE]; NEVADA: Elko Co., 1 ♀, Talbot Creek, Lamoille, 23 July [MCZ]; CALIFORNIA: Inyo Co., 1 ♂, Bishop, 28 July [UK]; 1 ♂, Glacier Lodge, Big Pine Creek, 8000-11000 feet, Aug. [CAS]; Monterey Co., 4 ♀♀, 1 ♂, Carmel, May-Oct. [CAS]; San Bernardino Co., 1 ♀, Big Bear, 13 Aug. [HEE]; Tulare Co., 1 ♀, Dorst Camp, 23 July [CIS]; Tuolumne Co., 1 ♂, Pinecrest, 29 July [MCZ]; OREGON: Deschutes Co., 1 ♂, Sunshine Shelter, 16 Aug. [OSC]; Hood River Co., 1 ♂, Mt. Hood, 3000-6000 feet, 5 Aug. [CAS]; Marion Co., 1 ♀, Silver Creek Park, 10 Aug. [OSC]; Washington Co., 1 ♂, Forest Grove, 1 June [OSC]; WASHINGTON: Mt. Rainier Nat. Park, 1 ♂, Paradise Valley, July [CAS]; Pierce Co., 1 ♀, Buckley, 6 July [UK]; BRITISH COLUMBIA: 1 ♀, Keremeos, 28 June [CNC], 1 ♀, Middy Valley, Merritt, 10 July [CNC]; 1 ♂, Okanagan, Aug. [CNC]; 2 ♂♂, Robson, 19 Aug., 14 Sept. [CNC].

#### F. Subgenus **ARACHNOSPILA** Kincaid

- Arachnospila* Kincaid, 1900, Proc. Wash. Acad. Sci., 2: 509. [Type: *Arachnospila septentrionalis* Kincaid, 1900 (= *fumipennis fumipennis* Zetterstedt, 1838); monobasic.]—Pate, 1946, Trans. Amer. Ent. Soc., 72: 74.—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 934.
- Pycnopompilus* Ashmead, 1902, Canad. Ent., 34: 83. [Type: *Pompilus scelestus* Cresson, 1865; original designation.]—Pate, 1946, Trans. Amer. Ent. Soc., 72: 75, 105. [Present synonymy indicated.]—Banks, 1947, Bull. Mus. Comp. Zool., 99: 422-423. [South American species.]—Dreisbach, 1949, Ent. Amer., 29: 8, 11, 34, pl. I, fig. 4.
- Arachnophila* Ashmead, 1902, Proc. Wash. Acad. Sci., 4: 134. [*Nec* Ashmead, 1902, Canad. Ent., 34: 86.]
- Psammochares* (*Psammochares*) *Fumipennis*-group Haupt, 1927, Deutsch. Ent. Zeitschr., Beiheft, pp. 154, 162, and 195.
- Ammosphex* Wilcke, 1942, Ent. Berichten, 11: 25. [In part.]—Wilcke, 1943, Overdr. uit Med. Landbouwhoogeschool Wageningen, 47: 47-61. [In part.]

This subgenus is closely related to the preceding, but the venation extends farther toward the outer wing margin, the marginal cell being approximately its own length from the wing-tip and the third discoidal cell about or less than its own length from the outer wing margin (Fig. 241). The tarsal comb of the female is strongly developed; the body is generally more strongly hairy than in *Ammosphex*. The last segment of the front tarsus of the male (Fig. 230) is shaped as in *Anoplochaeres*, not as in *Ammosphex*; the male genitalia are very characteristic.

*Subgeneric characters*.—Small to fairly large wasps, 7 to 20 mm. in length. Color wholly black, or the basal abdominal segments marked with rufous. Front with rather dense erect, dark hair; temples and propleura with abundant dark hair; pronotum and propodeum with a considerable amount of erect hair; venter and apical segments of the female with numerous dark setae. Mandibles bidentate in the female, unidentate in the male. Labrum exerted only a short distance or not at all beyond the clypeus. Malar space wanting. Antennae elongate, the third segment in the male always well over twice as long as thick.

Pronotum strongly angulate behind. Postnotum half or more the length of the metanotum and more or less transversely striate. Front tarsus of female with a well-developed comb, the spines from one to three times as long as the width of the tarsus, the basitarsus with from 3 to 5 comb-spines. Apical tarsal segments of the female with a row of median spines beneath, and usually some lateral spines as well. Last segment of front tarsus of male produced on the inner margin, but less strongly than in *Ammosphex*, the segment widest about two-thirds the distance from the base; both claws of this segment are bifid, the inner one with the inner ray longer than in *Ammosphex* (Fig. 230). Pulvillar comb of about 13-15 setulae in the female (Fig. 232). Wing venation as shown in Fig. 241, showing little variation in the subgenus. Marginal cell long, about three times as long as high, the radial vein nearly evenly arcuate; this cell is not more than 1.2 times its own length from the wing-tip, usually about equal to it. Second and third submarginal cells both four-sided and fairly wide above. Third discoidal cell about or slightly less than its own length from the outer wing margin.

Abdomen of the male relatively stout; subgenital plate with the disc slightly to strongly elevated, not as slender as in the following subgenus, nor produced on each side internally, as in that group. Genitalia with the basal hooklets double; aedoeagus simple and unarmed. Digits more or less rounded apically and provided here with several upright setae; inner margin more or less arcuately excised toward the base, the upper end of the excision angulate. Parameres strong, setose, of variable breadth.

*Biology.*—The species of this subgenus are hunters of errant spiders and are not highly selective of their prey. The nest is a short tunnel in sand or soft earth with a single terminal cell. Our three species are all fairly common, and a few notes regarding their biology are included under each.

*Distribution.*—Holarctic; represented in the Palaearctic Region by *fumipennis* Zetterstedt and *rufus* Haupt. The former occurs in northern North America as well as in northern Eurasia; the latter, Haupt's *rufus*, appears to be no more than subspecifically distinct from the North American *scelestus* Cresson. Banks (1947) has assigned two South American species to this group. Although 14 names are available for the Nearctic species, there appear to me to be but three highly variable, widely distributed species in our fauna.

*Key to Species*  
Females

1. Scape not hairy; apical margin of clypeus somewhat arcuately excised; postocellar line less than the ocello-ocular line, the ocelli in rather a small triangle, the front angle of which is usually about a right angle.
  1. **arctus** Cresson  
Scape with a number of hairs below or on the sides which are usually about as long as the thickness of the scape; apical margin of clypeus truncate or very slightly arcuately concave; ocelli variable .....2
  2. Ocelli forming a right or obtuse angle in front, the post-ocellar line less than the ocello-ocular line; front basitarsus with from 3 to 5, most commonly 4, comb-spines; body black, usually noticeably reflecting bluish .....2. **scelestus** Cresson  
Ocelli forming an acute angle in front, the postocellar and ocello-ocular lines about equal; front basitarsus with three comb-spines; body black, slightly violaceous, or black and red .....3
  3. Base of the abdomen rufous; pubescence brownish, often somewhat silvery on the hind coxae .....3a. **fumipennis fumipennis** Zetterstedt  
Wholly black; pubescence very dark, somewhat violaceous.  
3b. **fumipennis eureka** (Banks)

Males

1. Subgenital plate merely convexly raised medially, toward the base with a pair of elevations (usually rounded, though sometimes acute, and sometimes obsolescent) (Fig. 221); parameres of genitalia slender throughout (Fig. 191) .....1. **arctus** Cresson

- Subgenital plate keeled, the median line strongly and sharply elevated; parameres much broadened apically .....2
2. Median elevation of subgenital plate sloping evenly from front to rear, the posterior slope convex or nearly straight (Fig. 219); digiti strongly spatulate (Fig. 190) .....2. **scelestus** Cresson
- Median elevation of subgenital plate abruptly declivous behind, the posterior slope concave (Fig. 220); digiti less strongly enlarged apically (Fig. 189) .....3
3. Base of the abdomen marked with rufous; pubescence brownish, often in part silvery .....3a. **fumipennis fumipennis** Zetterstedt
- Wholly black; pubescence very dark, somewhat violaceous, sometimes silvery on the lower front .....3b. **fumipennis eureka** (Banks)

### 1. *Pompilus* (*Arachnospila*) **arctus** Cresson

*Pompilus arctus* Cresson, 1865, Proc. Ent. Soc. Phila., 4: 453. [Type: ♂; Colorado (no further data); A.N.S.P. no. 554.]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 92.—Packard, 1874, Guide to the Study of Insects, p. 273.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 273.—Strickland, 1947, Canad. Ent., 79: 124. [Edmonton, Alta.]

*Psammochares anoplus* Banks, 1919, Bull. Mus. Comp. Zool., 63: 231-232. [Type: ♀; Medicine L. to Jasper, Alta., 4 July 1915 (J. C. Bradley); C.U. no. 683.]

*Pycnopompilus siouxensis* Dreisbach, 1950, Amer. Midl. Nat., 43: 592, 593, 598, figs. 46 and 47. [Type: ♂; Glen, Sioux Co., Nebr., 4000 feet, 13 Aug. 1906; Univ. Nebraska.]<sup>9</sup> New synonymy.

*Pycnopompilus sculleni* Dreisbach, 1950, Amer. Midl. Nat., 43: 587, 594, 598, figs. 33 and 37. [Type: ♂; Cornucopia, Ore., 7100 feet, 25 July 1936 (H. A. Scullen); M.C.Z. no. 28,382.] New synonymy.

*Pycnopompilus arctus* Dreisbach, 1950, Amer. Midl. Nat., 43: 593, 595, 598, fig. 45.

*Pycnopompilus eureka* Dreisbach, 1950, Amer. Midl. Nat., 43: 587, 596, 598, figs. 34 and 38. [Nec Banks, 1919; misidentification.]

*Pycnopompilus luctuosus* Dreisbach, 1950, Amer. Midl. Nat., 43: 593, 597, 598, figs. 43 and 44. [Nec Cresson, 1855; misidentification.]

*Pompilus* (*Arachnospila*) **arctus** Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 935.

The species of *Arachnospila* have been much confused in the past, and *arctus*, in particular, has rarely been correctly identified. The tarsal comb, usually a reliable diagnostic character in the Pompilini, varies in the number of spines and in their length in both *arctus* and *scelestus*, so that this cannot be used to separate

<sup>9</sup> At this writing, this type had not yet been deposited at this institution, and I have not seen it.

these species. Although all three species of this subgenus show considerable variation in the amount of erect hair on the body, the antennal scape in *arctus* is devoid of erect hairs, but not so in the other two species. This character may seem tenuous enough, but it seems perfectly reliable in identifying *arctus*. In addition certain other characters, especially the slight emargination of the clypeus of the female (not unlike that of *imbecillus*, shown in Fig. 235), and the male genitalia, serve to identify this species.

The male subgenital plate of this species (Fig. 221) is also highly characteristic, although subject to much individual variation, as described below. Dreisbach (1950) has recently applied five names to this species, based solely on very minor differences in the subgenital plate. There is nothing else to support this division of the species, and with a sufficient series of males before him one is easily convinced that intraspecific variation readily accounts for Dreisbach's five "species", and for as many other variants as one might wish to select.

FEMALE.—Length 11 (7.5-14.5) mm. Color black, the upper posterior orbits usually with a very slender pale streak. Fore wings moderately infuscated, darker along the margin, usually somewhat violaceous; hind wings lightly infuscated, darker apically. Pubescence fuscous, obscurely reflecting deep bluish or violet (specimens from the Pacific states sometimes rather strongly bluish). Antennal scape without erect hairs; clypeus, front, vertex, and temples varying from slightly to rather densely hairy; pronotum and front coxae somewhat hairy; propodeum with considerable erect hair; remainder of thoracic dorsum and pleura, front femora, and middle and hind coxae often somewhat hairy; abdominal venter and apical tergite setose.

Clypeus about 3 times as broad as high, the apical margin distinctly though shallowly concave. Front broad, the middle interocular distance about .6 the transfacial distance, or somewhat more. Inner orbits converging slightly above, the upper interocular distance about .8 the lower. Ocelli forming an angle in front which is usually less than a right angle; postocellar line less than the ocello-ocular line as 3:4, rarely approaching 1:1. Antennae elongate, the first four segments in a ratio of about 30:10:45:38, though this ratio rather variable, segment 3 sometimes not exceeding the first two together; third segment equal to from .6 to 1.0 times the upper interocular distance, this factor varying with the size of the specimen.

Propodeum with the median line impressed in front; slope rather even, slightly steepened behind. Tarsal comb variable, the basitarsus with either 3 or 4 spines, the spines varying in length from 1 to 3 times the width of the tarsal segments. Wing venation not differing notably from that of *scelestus*, shown in Fig. 241; the third submarginal cell is frequently slightly larger in area than the second.

MALE.—Length 8.5 (6.5-12) mm. Color black, the outer orbits usually with a very slender pale spot, the inner orbits sometimes also with such a spot. Wings lightly infuscated or nearly hyaline, broadly darker along the outer margin. Pubescence dark, often somewhat violaceous, that of the sides of the lower front more coarse and nearly always conspicuously silvery; silvery pubescence sometimes more extensive, especially in eastern specimens, often involving the coxae, sides of the thorax, and the propodeum. Body with a variable amount of erect hair, the scape always without erect hair, the propodeum always somewhat hairy.

Clypeus from 2.3 to 2.5 times as broad as high, the apical margin slightly concave. Front broad, the middle interocular distance varying from .6 to .64 times the transfacial distance. Inner orbits converging slightly above; ocelli forming a right or acute angle in front, the postocellar line usually less than the ocello-ocular line. First four antennal segments in a ratio of about 3:1:3:3, or the third segment proportionally slightly longer. Median line of the propodeum impressed. Longer spur of the hind tibia about .7 the length of the basitarsus. Venation as in the female.

Abdominal sternite 6 with a broad U-shaped emargination. Subgenital plate (Fig. 221) rather broad, the disc convexly elevated medially, with an elevation on each side near the base; these basal elevations are usually rounded and not prominent, as in the figure, but they are occasionally produced as sharp tubercles. Genitalia (Fig. 191) with the parameres slender throughout, somewhat setose, with a hyaline area along the inner margin. Digits somewhat variable in shape, the apex with several prominent setae, the inner margin excised below, the appendage as a whole somewhat suggesting the head of a cockatoo. Parapenials stout and straight, closely embracing the slightly longer aedoeagus.

*Biology.*—One of the more common species of *Pompilus* within its range, *arctus* is most often encountered on or near the ground in open wooded areas or in parks, where it nests in soft earth. The three records of its prey known to me are as follows: (1) a specimen from Aweme, Manitoba [CNC] taken with an immature female *Arctosa* sp. (Lycosidae); (2) a specimen taken by W. R. M. Mason at Edmonton, Alberta [CNC] with an immature *Clubiona* sp. (Clubionidae); (3) a specimen in the author's collection taken at Syracuse, New York, by Mr. Howard Miller of that city, with a female *Amaurobius ferox* Walck. (Amaurobiidae) [determinations by B. J. Kaston].

Mr. Miller has provided me with the following notes pertaining to the last of these records. The wasp was encountered in a residential part of the city, dragging the spider across the grass of a lawn. The wasp walked backward, carrying the spider head-up,

grasping it by the coxae. After it had traveled about 15 feet, the wasp reached the edge of a side-walk, where the soil was somewhat gravelly, and where it entered a previously prepared burrow in the earth. The hole was about three inches deep, straight and diagonal. The spider was taken into the laboratory, where it remained torpid but alive for 12 days. On the thirteenth day it would no longer respond to stimuli, and on the fourteenth day it showed signs of decomposition.

*Distribution.*—This species ranges transcontinentally in the Hudsonian, Canadian, and Transition Zones.

*Specimens seen:* 418 (222 ♀♀, 196 ♂♂). The following are marginal records: NOVA SCOTIA: Cape Breton Isl., 1 ♀, Baddeck, Aug. [MCZ]; QUEBEC: Anticosti Isl., 1 ♀, 6 Aug. [CNC]; LABRADOR: 1 ♂, Goose Bay, 14 Aug. [CNC]; NORTHWEST TERRITORIES: 1 ♀, Crow's Nest Pass, 1888 [CNC]; 1 ♀, Fort Norman, 6 Aug. [CNC]; YUKON: 3 ♂♂, Whitehorse, July, Aug. [CNC]; 2 ♂♂, Watson Lake, 24 June [CNC]; BRITISH COLUMBIA: Vancouver Isl., 1 ♀, Victoria [CNC]; CALIFORNIA: Riverside Co., 1 ♀, Tahquitz Valley, San Jacinto Mts., 14 June [CAS]; San Bernardino Co., 1 ♀, Oak Glen Lodge, 5000 feet, July [CAS]; ARIZONA: Cochise Co., 2 ♂♂, Chiricahua Mts., 8000 feet, 29 June [CAS]; NEW MEXICO: Otero Co., 3 ♀♀, 1 ♂, Cloudcroft, 9000 feet, 26 July [HEE]; COLORADO: Teller Co., 1 ♀ 3 ♂♂, Florissant, June-July [USNM]; NEBRASKA: Madison Co., 1 ♀, Meadow Grove, June [USNM]; IOWA: Webster Co., 1 ♀, 20 June [USNM]; OHIO: Franklin Co., 1 ♂, 12 July [RWS]; WEST VIRGINIA: Randolph Co., 1 ♀, 1 ♂, Cheat Mt., 2000 feet, June [CM]; DISTRICT OF COLUMBIA: 6 ♀♀, 5 ♂♂, Washington, 29 May-8 Sept. [MSV, USNM].

## 2. *Pompilus (Arachnospila) scelestus* Cresson

*Pompilus scelestus* Cresson, 1865, Proc. Ent. Soc. Phila., 4: 451. [Lectotype: ♀; Colorado (no further data); A.N.S.P. no. 415.]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 88. [Conn. N. J.]—Cresson, 1872, Trans. Amer. Ent. Soc., 4: 203. [Texas.]—Provancher, 1882, Nat. Canad., 13: 35-36. [Que.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 321.—Peckham and Peckham, 1898, Wisc. Geol. Nat. Hist. Survey Bull. no. 2, p. 153. [Biology.]—Peckham and Peckham, 1905, Wasps Social and Solitary, pp. 230-243. [Biology.]—Strickland, 1947, Canad. Ent., 79: 124. [Alta.]

*Pyncopompilus scelestus* Ashmead, 1902, Canad. Ent., 24: 83. [Selected genotype of n. gen. *Pyncopompilus*.]—Dreisbach, 1950, Amer. Midl. Nat., 43: 593, 597, 599, figs. 36 and 41.

*Psammocharis astur* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 225. [Type: ♀; Great Falls, Md., 12 July (N. Banks); M.C.Z. no. 13,688.]—Banks,

- 1917, Bull. Mus. Comp. Zool., 61: 108.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 986.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 128-129. [N. C.]—Procter, 1938, Biol. Survey Mt. Desert Reg., VI, Insecta, p. 430. [Me.]
- Psammochares scelestus* Rohwer, 1916, Conn. Geol. Nat. Hist. Survey, Bull. 22, p. 633.—Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Rau and Rau, 1918, Wasp Studies Afield, pp. 64-67. [Biology.]—Banks, 1919, Bull. Mus. Comp. Zool., 63: 233. [Calif., Wash.]—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 986.—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 128-129.
- Psammochares sublaevis* Banks, 1921, Ann. Ent. Soc. Amer., 14: 20. [Type: ♀; Marion Co., Ind. (H. Morrison); M.C.Z. no. 13,693.]—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 986.
- Pycnopompilus subscelestus* Dreisbach, 1950, Amer. Midl. Nat., 43: 591-593, 599, figs. 39 and 40. [Type: ♂; Ute Creek, Colo., 30 July (R. W. Dawson); Univ. Nebraska.]<sup>10</sup> New synonymy.
- Pycnopompilus astur* Dreisbach, 1950, Amer. Midl. Nat., 43: 595.
- Pycnopompilus sublaevis* Dreisbach, 1950, Amer. Midl. Nat., 43: 598.
- Pompilus (Arachnospila) scelestus* Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 935.

This is the best known and possibly the most common species of *Pompilus* in our fauna. The male is easily recognized by the characteristic subgenital plate (Fig. 219). The female closely resembles the preceding species; however, the scape is hairy, generally rather prominently so, the clypeus is scarcely concave apically, and the ocellar triangle is rather flat, the front angle generally being a right angle or greater. Like *arctus*, this is a very variable species; the range of variation in size is possibly the greatest of any of the Pompilini. The smallest female seen by the writer was 6.5 mm. long, the largest 20 mm. long!

FEMALE.—Length 13.5 (6.5-20) mm. Color black, the upper posterior orbits with a slender pale spot. Pubescence dark, more or less conspicuously reflecting deep steel blue, less apparent and fading to purplish in older specimens. Fore wings fuscous, darker in a band along the margin, in fresh specimens strongly violaceous; hind wings lightly infuscated, darker apically. Scape with at least a few hairs below or on the sides which are about as long as the thickness of the scape; clypeus, front, vertex, temples, and propleura all with considerable erect hair; propodeum hairy over its entire surface; pronotum, mesonotum, scutellum, metanotum, pleura, coxae, and to

<sup>10</sup> At this writing, this type had not been deposited at the institution stated, and I have not seen it.



some extent the femora, with a variable amount of short, erect hair; venter and apical tergite setose.

Clypeus from 2.6 to 3 times as broad as high, its apical margin truncate or very slightly incurved medially. Front broad, the middle interocular distance usually about .6 the transfacial distance. Inner orbits convergent above, the upper interocular distance equal to from .75 to .83 times the lower interocular distance. Ocelli in a somewhat flattened triangle, the front angle a right angle or somewhat greater; ocello-ocular line nearly always distinctly greater than the postocellar line. First four antennal segments in a ratio of about 3:1:5:4, though somewhat variable in this respect, the third segment equal to from .75 to 1.0 times the upper interocular distance.

Median line of the propodeum at most slightly impressed. Front tarsus with a well-developed comb, the spines varying from 1.5 to 3 times as long as the thickness of the tarsus, the basitarsus with 3 or 4 (rarely 5) comb-spines. Venation as shown in Fig. 241 and described under the subgeneric heading; second and third submarginal cells subequal in area.

MALE.—Length 11.5 (6-16) mm. Color black, the upper outer and middle inner orbits usually with a very small pale spot. Pubescence fusco-violaceous, on the sides of the lower front often silvery. Wings lightly to rather heavily infuscated, darker along the outer margin, iridescent or violaceous. Scape hairy below; clypeus, front, vertex, temples, and propleura generally rather densely hairy; thoracic dorsum and pleura, propodeum, front coxae, and base of the first abdominal tergite usually with considerable erect hair.

Clypeus about 2.5 times as broad as high, its apical margin truncate or slightly concave. Middle interocular distance about .6 the transfacial distance; upper interocular distance about .9 the lower interocular. Ocelli in a flattened triangle, the front angle usually a right angle or greater; ocello-ocular line distinctly greater than the postocellar line. Antennae elongate, the first four segments in a ratio of about 15:5:16:15. Median line of the propodeum feebly if at all impressed. Longer spur of hind tibia about two-thirds the length of the basitarsus.

Abdominal sternite 6 with a deep U-shaped emargination. Subgenital plate (Fig. 219) strongly keeled, the keel in profile rather evenly arcuate from front to rear, or the posterior slope nearly straight. Genitalia (Fig. 190) with the parameres much broadened apically, their inner margin with a rather large membranous and unpigmented area, the outer margin with numerous long setae. Digits capitate, larger apically than in the other members of this subgenus, the disc densely clothed with setae which are longest at the lower inner angles. Parapenials slender and nearly straight; aedeagus simple, somewhat expanded apically.

*Biology*.—This is a wide-ranging species, occurring in a variety of habitats, including sand dunes, fields, gardens, and open woodlands. It has been taken on the flowers of *Astragalus*, *Petalostemon*, *Sphaeralcea*, *Solidago*, and *Daucus carota*. The nesting

habits have been studied and described by the Peckhams (1898 and 1905) and the Raus (1918). The recorded hosts are as follows: (1) a Lycosid spider (Peckhams), (2) *Dolomedes* sp. (Pisauridae) (Raus). To this I am able to add the following: (3) a specimen taken at Logan, Utah [MCZ], with a young *Phidippus* sp. (Salticidae), and (4) a specimen taken by the author at East Hartford, Conn., with a male *Lycosa gulosa* Walck. (Lycosidae) [det. B. J. Kaston].

The nest of this species is constructed in sand or soft earth, and is oblique and about 3 or 4 inches deep; it is apparently prepared before the search for the spider begins, although it may be enlarged afterward to fit the size of the spider. The wide variety of spiders preyed upon by this species doubtless explains its great range in size. After the spider is placed in the cell, the egg is laid transversely beneath the abdomen. The Raus remark upon the fact that spiders taken by this wasp are often so severely stung that they show no signs of reviving for several days. My own experience has been just the opposite. The *Lycosa gulosa* mentioned above recovered completely within two hours and ran actively around the container in which I had placed it; in spite of this the egg of the wasp hatched in three days and the larva developed normally, reaching a large size in four days, when it died. In the confines of the nest this activity of the spider would of course have been impossible. *P. scelestus* is apparently parasitized by *Ccroपालes*, and in a different manner by *Evagetes parvus* (*Pompilus subviolaceus* of the Peckhams, 1905). For further details on the behavior of this species, the reader is referred to the excellent accounts by the Peckhams and the Raus.

*Distribution.*—Transcontinental in the Upper Austral and Transition Zones, entering the Canadian Zone to a limited extent, especially in the West.

*Specimens seen:* 375 (212 ♀♀, 163 ♂♂). The following records are selected from periphery of the range: NOVA SCOTIA: 1 ♂, Kentville, July [CNC]; NEW BRUNSWICK: 1 ♂, Fredericton, June [CNC]; QUEBEC: 1 ♂, Duchesney, 4 Aug. [CU]; ONTARIO: 1 ♀, Toronto, 1 July [CNC]; MICHIGAN: Cheboygan Co., 3 ♀♀, 3 ♂♂, June-July [MCZ, CIS]; MINNESOTA: Clearwater Co., 2 ♀♀, 1 ♂, Itasca Park, June-July [Minn.]; MANITOBA: 1 ♀, 1 ♂, Aweme, July-Sept. [CNC]; ALBERTA: 1 ♂, Edgerton, 20 June [Alta.]; BRITISH COLUMBIA: 2 ♂♂, Taylor, 3 June [CNC];

CALIFORNIA: Los Angeles Co., 1 ♀, Mt. San Antonio, 5 Aug. [CIS]; ARIZONA: Cochise Co., 1 ♀, Huachuca Mts., 15 June [CAS]; NEW MEXICO: Socorro Co., 1 ♀, Magdalena [UK]; TEXAS: Presidio Co., 4 ♀♀, Marfa, June-July [USNM, HEE]; KANSAS: Clark Co., 3 ♀♀, 2 ♂♂, May-June [USNM, UK]; IOWA: Kossuth Co., 1 ♂, Buffalo Creek, 16 Aug. [USNM]; INDIANA: Marion Co., 1 ♀ [MCZ]; GEORGIA: Rabun Co., 1 ♀, Clayton, 2000 feet, 18 May [CU]; NORTH CAROLINA: Chatham Co., 1 ♀, Siler City, 9 Aug. [HEE].

3a. *Pompilus (Arachnospila) fumipennis fumipennis* Zetterstedt

*Pompilus fumipennis* Zetterstedt, 1838, Insecta Lapponica I, p. 438. [Type: ♀; Lapland (no further data); (location, if still extant, not known to present writer).]

*Arachnospila septentrionalis* Kincaid, 1900, Proc. Wash. Acad. Sci., 2: 509. [Lectotype: ♀ Kukak Bay, Alaska, 4 July 1899, on flowers of *Heraclium lanatum* (T. Kincaid); U.S.N.M. no. 5313.]

*Arachnophila septentrionalis* Ashmead, 1902, Proc. Wash. Acad. Sci., 4: 134. —Banks, 1945, Psyche, 52: 105.

*Pompilus borealis* Aurivillius, 1907, Ent. Tidskr., 28: 14, 19. [Described from ♀ and ♂ from northern Sweden; whereabouts of types not known to present author.]

*Psammochares lasiophe* Banks, 1919, Canad. Ent., 51: 81. [Type: ♀; Saranac Lake, N. Y., 26 Aug. 1916; C.U. no. 676.]—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 986.—Procter, 1938, Biol. Survey Mt. Desert Reg., VI, Insecta, p. 430. [Bar Harbor, Me.]

*Psammochares (Psammochares) fumipennis* Haupt, 1927, Deutsch. Ent. Zeitschr., Beiheft, p. 195.

*Ammosphex fumipennis* Wilcke, 1943, Overdr. uit Med. van de Landbouwhoogeschool Wageningen, 47: 53.

*Pompilus septentrionalis* Strickland, 1947, Canad. Ent., 79: 124. [Alta.]

*Pompilus lasiops* [sic] Strickland, 1947, Canad. Ent., 79: 124.

*Pycnopompilus lasiophe* Dreisbach, 1950, Amer. Midl. Nat., 43: 593, 596, 598, fig. 48.

*Pompilus (Arachnospila) fumipennis fumipennis* Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 935.

This Holarctic species is the most boreal of our Pompilidae. The synonymy of *septentrionalis* Kincaid and *lasiophe* Banks with *fumipennis* Zetterstedt was established after a study of Wilcke's (1943) careful description and figures, and after study of a pair of specimens from Finland sent to me by Dr. P. M. F. Verhoeff and determined by him as *fumipennis*. These compare very closely with American specimens, even to the male terminalia.

This species, unlike the preceding two, is rather constant in its size and morphological features. The tarsal comb, the antennal formula, and the pilosity never vary greatly from the mean. The ocelli form an acute angle in front, and in the female the postocellar and ocello-ocular lines are about equal. The shape of the subgenital plate (Fig. 220) readily distinguishes the male. Typical *fumipennis* is easily recognized by its color, for it is the only member of the subgenus in our fauna which is partly red.

FEMALE.—Length 10.5 (8.5-13) mm. Color black, the upper outer and sometimes the middle inner orbits with a very small pale streak, the basal two segments of the abdomen for the greater part bright rufo-ferruginous, sometimes also part of the third segment. Pubescence brownish, usually somewhat silvery on the posterior part of the middle and hind coxae. Wings lightly infuscated, darker along the outer margin, iridescent or slight violaceous. Scape somewhat hairy below; clypeus, front, vertex, temples, and prothorax with abundant erect hair; remainder of thorax, including the coxae and to some extent the femora, barely to moderately hairy; propodeum and base of the first abdominal tergite which considerable hair; venter and apical tergite somewhat setose.

Clypeus about three times as broad as high, its apical margin very slightly arcuately concave. Front of moderate breadth, the middle interocular distance varying from .57 to .6 times the transfacial distance. Inner orbits converging noticeably above, the upper interocular distance from .72 to .82 times the lower. Ocelli forming an angle in front which is nearly always less than a right angle, the postocellar and ocello-ocular lines about equal. First four antennal segments in a ratio of about 15:5:23:20, segment 3 equal to from .8 to .95 times the upper interocular distance.

Postnotum nearly as long as the metanotum, transversely striate on the anterior half. Median line of propodeum weakly impressed. Front tarsus with a comb of slender spines which are from 1.5 to 3 times as long as the width of the tarsus; basitarsus with three comb-spines, rarely a small fourth one. Venation as in *scelestus* (Fig. 241).

MALE.—Length 9.5 (7.5-11.5) mm. Color and pubescence as in the female; sides of the lower front often silvery; wings as in the female. Scape at most very slightly hairy; clypeus, front, vertex, temples, and propleura with considerable erect hair; front coxae, thoracic dorsum, and propodeum with more sparse erect hairs; pleura, remaining coxae, and base of the first abdominal tergite usually slightly hairy.

Clypeus about 2.5 times as broad as high, its apical margin slightly concave. Front broad, the middle interocular distance usually about .63 times the transfacial distance; upper interocular distance usually slightly less than the lower interocular. Ocelli forming an acute angle in front, the postocellar line equal to or less than the ocello-ocular. First four antennal segments in a ratio of about 10:5:15:14, the third segment more than 3

times as long as thick. Thoracic features as in the female except for the usual sexual differences.

Sixth abdominal sternite with a deep V-shaped apical emargination. Subgenital plate (Fig. 220) strongly keeled on the basal part, the keel abruptly and concavely declivous on the posterior half, with a series of small setae on the median line. Genitalia (Fig. 189) with the parameres long, somewhat expanded apically, the apex a little more rounded than in *scolestus*, the outer margin fringed with long setae. Digits somewhat variable in shape, but never as broadly spatulate as in *scolestus*, and with a number of rather long setae at the apex. Parapenials somewhat broadened toward the apex, about as long as the aedoeagus, the latter simple, subtruncate apically.

*Distribution.*—This form is circumpolar in distribution; in North America it ranges transcontinentally in the Hudsonian and Canadian Zones, except from British Columbia and Alberta southward in the Rockies and Coastal Ranges, where it is replaced by subspecies *eureka* Banks.

*Specimens seen:* 43 (27 ♀♀, 16 ♂♂). LABRADOR: 1 ♀, Matamek River, 11 Aug. [MCZ]; NEW BRUNSWICK: 2 ♀♀, 1 ♂, Nerepis, Aug. [USNM]; QUEBEC: 1 ♀, Laniel, 10 June [CNC]; 1 ♂, Seven Islands, 25 Aug. [CNC]; ONTARIO: 1 ♀, Westree, 28 July [CNC]; NEW YORK: Essex Co., 1 ♀, Heart Lake, 15 Aug. [CU]; 1 ♀, Wilmington, 20 Aug. [MCZ]; Franklin Co., 1 ♀, Saranac Lake, 26 Aug. [CU]; MINNESOTA: Clearwater Co., 1 ♂, Itasca Park, 17 June [Minn.]; Itasca Co., 1 ♂, Grand Rapids, 7 July [Minn.]; Lake Co., 1 ♀, Finland, 20 Aug. [Minn.]; Cook Co., 1 ♀, Poplar Lake, 10 Aug. [CU]; NORTH DAKOTA: Bottineau Co., 1 ♂, Turtle Mts. [USNM]; SASKATCHEWAN: 1 ♀, Harlan, 10 Aug. [CNC]; 1 ♀, Pike Lake, 30 May [CNC]; 1 ♂, Great Deer, 26 May [CNC]; ALBERTA: 2 ♀♀, 1 ♂, Banff, June-Aug. [USNM, CNC]; 1 ♀, Bilby, 28 July [MCZ]; 2 ♀♀, 2 ♂♂, Edmonton, June-Aug. [MCZ]; 1 ♀, Nordegg, 26 July [Alta.]; 1 ♀, Peace River, 4 Aug. [CNC]; 2 ♀♀, 1 ♂, Wabamun, June-July [Alta.]; BRITISH COLUMBIA: 1 ♀, Glacier [ANSP]; 1 ♂, Lower Post, 17 June [CNC]; 4 ♂♂, Fort Nelson, June [CNC]; WASHINGTON: Mt. Rainier Nat. Park, 1 ♀, Paradise Valley, July [CAS]; NORTHWEST TERRITORIES: 1 ♀ [CNC]; 1 ♀, Yellowknife, 10 Aug. [CNC]; YUKON: 1 ♂, Whitehorse, 1 July [CNC]; ALASKA: 2 ♀♀ Kukak Bay, 4 July [USNM].

### 3b. *Pompilus (Arachnospila) fumipennis eureka* (Banks)

*Psammochares eureka* Banks, 1919, Bull. Mus. Comp. Zool., 63: 231-232. [Type: ♀; Ingleside, Calif., 25 Aug. 1908 (J. C. Bradley); M.C.Z. no. 10,397.<sup>11</sup>]

<sup>11</sup> Banks' male paratypes [M.C.Z. and C.U.] do not belong to this species, but to two species of *Anoplus* s. str.

*Psammochares catalinae* Banks, 1933, Psyche, 40: 7. [Type: ♀; Mt. Lemmon, Santa Catalina Mts., Ariz., 7800 feet, 29 July 1917 (J. Bequaert); M.C.Z. no. 17,039.]

*Pycnopompilus catalinae* Dreisbach, 1950, Amer. Midl. Nat., 43: 587, 593, 595, 599, figs. 35, 42 and 49.

*Pompilus (Arachnospila) fumipennis curcka* Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 935.

This wholly black subspecies of *fumipennis* closely resembles *arctus* and *scelestus* in outward appearance. The male is readily distinguished by the very different subgenital plate, the female by having the ocelli forming an acute angle in front, the lateral ocelli about as close to the eyes as to one another.

FEMALE.—Length 10.5 (7.5-13) mm. Color black, the upper outer and often the middle inner orbits with a very small pale streak. Pubescence very dark, over most of the body reflecting deep bluish or violet, usually not strongly. Front wings moderately infuscated, darker along the margin, violaceous; hind wings lightly infuscated, darker apically. Scape hairy beneath; clypeus, front, vertex, temples, and propleura rather densely hairy; entire thorax, front coxae, and propodeum with abundant hairs; middle and hind coxae and to some extent the femora, slightly hairy; base of the first abdominal tergite, the apical tergite, and the venter somewhat setose. Structural features as described under the nominate subspecies.

MALE.—Length 8.5 (6-11) mm. Color black, the upper outer and middle inner orbits each with a very small pale spot; pubescence very dark, reflecting deep bluish or violet in certain lights, on the sides of the lower front often silvery. Wings somewhat more lightly infuscated than in the female. Scape slightly or barely hairy; clypeus, front, vertex, temples, and propleura with abundant erect hair; thoracic dorsum and pleura, coxate, and propodeum with considerable erect hair. Structural characters as in typical *fumipennis*.

Biology.—This form is chiefly characteristic of open places in forests at moderate or high elevations. The prey consists, so far as known, of Lycosidae. A female taken by the author at Cloudcroft, N. M., 25 July 1948, was excavating a burrow in the side of a mound of earth thrown up by a small mammal; the site was an alpine meadow surrounded by forest at an altitude of 9000 feet. The prey, which had been deposited on the earth nearby, proved to be an immature *Lycosa* sp. A female from Jackson Hole, Wyoming [USNM] is pinned with a ♂ *Trochosa pratensis* Emerton [determinations by B. J. Kaston].

*Distribution.*—This subspecies is distributed throughout the Canadian and Transition Zones from British Columbia and Montana south at high altitudes to New Mexico, Arizona, and southern California.

*Specimens seen:* 150 (86 ♀♀, 64 ♂♂). The following records are from the periphery of the range: BRITISH COLUMBIA: 2 ♀♀, Victoria, July [CNC]; 1 ♂, Courtenay, 15 July [CNC]; 1 ♀, Merritt, 13 Sept. [CNC]; 1 ♂, Carbonate, Columbia R., 7-12 July [CU]; MONTANA: Glacier Nat. Park, 1 ♂, Swift Current, 23 July [MCZ]; Meagher Co., 2 ♂♂, Belt Mts., Sept. [CNC]; WYOMING: Lincoln Co., 2 ♀♀ Jackson, Sept. [USNM]; COLORADO: Boulder Co., 1 ♀, Apr. [USNM]; NEW MEXICO: San Miguel Co., 1 ♀, 1 ♂, Beulah, Aug. [ANSP]; Otero Co., 4 ♀♀, 10 ♂♂, Cloudcroft, May-July [ANSP, HEE, UK]; Torrance Co., 1 ♂ Tajique, 25 June [UK]; ARIZONA: Cochise Co., 2 ♀♀, 1 ♂, Rustlers' Park, Chiricahua Mts., 9000 feet, 7-8 Aug. [HEE]; Pima Co., 16 ♀♀, 17 ♂♂, Mt. Lemmon, Santa Catalina Mts., 8-9000 feet, July-Aug. [CU, MCZ, HEE]; Coconino Co., 1 ♀, Flagstaff, 9 June [MCZ]; NEVADA: Elko Co., 1 ♀, Summit Pequop Mts., 17 July [CU]; CALIFORNIA: Tuolumne Co., 1 ♀, Tuolumne Meadows, 17 July [CIS]; Mariposa Co., ♀, Yosemite, 4000 feet, 12 June [CIS]; San Bernardino Co., 1 ♂, Seven Oaks, 30 May [CIS]; Riverside Co., 2 ♀♀, 1 ♂, San Jacinto Mts., June [CIS]; Los Angeles Co., 2 ♀♀, Mts. near Claremont [CU, MCZ].

#### G. Subgenus **ANOPLOCHARES** Banks

*Psammochares* (*Psammochares*) *Spissus*-group Haupt, 1927, Deutsch. Ent. Zeitschr., Beiheft, pp. 153, 162, and 188.

*Anoplochares* Banks, 1939, Canad. Ent., 71: 225, 229. [Type: *Pompiloides rectus* Banks, 1914 (= *Pompilus apicatus* Provancher, 1882); original designation.]—Pate, 1946, Trans. Amer. Ent. Soc., 72: 72.—Dreisbach, 1949, Ent. Amer., 29: 7, 10, 38, pl. III, fig. 16.—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 935.

*Ammosphex* Wilcke, 1942, Ent. Berichten, 11: 25.—Wilcke, 1943, Overdr. uit Med. Landbouwhoogeschool Wageningen, 47: 47-61. [In part.]

This subgenus of *Pompilus* has become specialized in the loss of the tarsal comb, comparable to the subgenus *Anoplius* of the genus *Anoplius*. There are certain further specializations in the head and in the male terminalia, as described below, but in general the group seems very closely allied to the preceding subgenus, from which it may be derived.

*Subgeneric characters.*—Small to medium-sized wasps. 5.5 to 18 mm. in length. Our species wholly black. Body in general not strongly hairy;

propodeum at most very slightly hairy. Mandibles of the male unidentate, those of the female with two small, closely approximate teeth on the inner margin; apical part of the mandibles unusually smooth, flat, and shining; at the edge of the shining area is a small group of setae. Labrum exerted to about half the median length of the clypeus, the apical margin of which is distinctly concave. Malar space practically absent. Head attached unusually low on the prothorax, the vertex, in lateral view, well below the dorsal plane of the thorax.

Pronotum sharply angulate behind; postnotum a third or more the length of the metanotum. Propodeum with a strongly impressed median groove. Front tarsus of female without a comb, the basitarsus with several short spines of varying lengths, the second segment with only some very minute spines besides those at the apex. Apical tarsal segments of the female with several median spines beneath, occasionally also with one or two lateral spines. Last segment of front tarsus of male as shown in Fig. 231, not differing noticeably from the preceding subgenus. Pulvillar comb moderately well developed, as in the preceding two subgenera. Hind wing with the cubitus arising at or beyond the tip of the submedian cell. Transverse median vein of fore wing meeting the media beyond the origin of the basal. Stigma of moderate size; marginal cell rather long, from 1 to 1.5 times its own length from the wing-tip. Second and third submarginal cells both 4-sided, both somewhat narrowed above (Fig. 242).

Male subgenital plate rather narrow apically, strongly keeled (Fig. 222); basally, internally, the subgenital plate is strongly produced on each side (Fig. 223). Genitalia (Fig. 192) with the parameres slender, strongly setose; digiti strap-shaped, twisted, with dense short setae on the outer side; basal hooklets double; aedoeagus with the margins strongly sinuate, considerably broadened about two-thirds the distance from the base, then narrowed again preapically.

*Biology.*—Although one of our species of this subgenus is not uncommon, nothing is known of its habits. This is unfortunate, since the structural modifications of the subgenus indicate a somewhat different behavior from that of the preceding two subgenera. Adlerz<sup>12</sup> has studied *P. (Anoplochares) spissus* in Sweden, and found it attacking certain lycosid spiders in their burrows, and using the spider's burrow as a nest, closing over the top with debris.

*Distribution.*—Holarctic. Represented in Europe by such species as *spissus* Schiodte and *minutus* Dahlbom. In our fauna there are two closely related species.

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<sup>12</sup> Adlerz, G., 1910. Handl. K. Svensk Vet.-Akad., 45: 5.



*Key to Species*

## Females and Males

1. Fore wings subhyaline or lightly infuscated, with a darker marginal band; hind wings hyaline or subhyaline, at least basally; marginal cell usually more than its own length from the wing-tip; third discoidal cell approximately its own length from the outer wing margin; size 5.5 to 14 mm.

1. *apicatus* Provancher

Fore and hind wings wholly fuliginous, with or without a darker marginal band; marginal cell not or but slightly more than its own length from the wing-tip; third discoidal cell less than its own length from the outer wing margin; size generally larger, 11.5 to 18 mm.

2. *similaris* (Banks)1. *Pompilus (Anoplochaes) apicatus* Provancher

*Pompilus apicatus* Provancher, 1882, Nat. Canad., 13: 35, 38. [Type: ♀; St. Hyacinthe, Quebec; Q. P. M., yellow label no. 769.]—Provancher, 1883, Nat. Canad., 14: 35.—Cresson, 1887, Synopsis Hymen., Suppl. Vol. Trans. Amer. Ent. Soc., p. 270.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 273.—Strickland, 1947, Canad. Ent., 79: 124. [Alta.]

*Pompiloides rectus* Banks, 1914, Jour. N. Y. Ent. Soc., 22: 303. [Type: ♂; Great Falls, Va., 19 June (N. Banks); M.C.Z. no. 13,682.]—Procter, 1938, Biol. Survey Mt. Desert Reg., VI, Insecta, p. 430. [Mt. Desert, Me.]

*Pompiloides apicatus* Rohwer, 1916, Canad. Ent., 48: 371.

*Psammochaes (Pompiloides) rectus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 987. [N. Y.]—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 125-126. [N. C.]—Brimley, 1938, Insects No. Carolina, p. 433.

*Pompiloides elsinore* Banks, 1919, Bull. Mus. Comp. Zool., 63: 235-236. [Type: ♀; Carbonate, Columbia R., B. C., 2600 feet, 7-12 July 1908 (J. C. Bradley); C.U. no. 687.]

*Anoplochaes rectus* Banks, 1939, Canad. Ent., 71: 229. [Made genotype of n. gen. *Anoplochaes*.]—Procter, 1946, Biol. Survey Mt. Desert Reg., VII, Insecta, p. 491.—Dreisbach, 1949, Ent. Amer., 29: 38, pl. III, fig. 16.

*Pompilus rectus* Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 263.

*Pompilus (Anoplochaes) apicatus* Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 935.

This distinctive species presents few difficulties in identification. It has most commonly gone by the name *rectus*, but Provancher's type specimen of *apicatus* is in good condition, and there can be no doubt that it is conspecific with Banks' *rectus* and *elsinore*.

FEMALE.—Length 10.7 (6.5-14) mm. Color black; posterior orbits with or without a very small pale spot. Front wings subhyaline to moderately infuscated, with a darker marginal band; hind wings subhyaline, the apex infuscated; wings iridescent or slightly violaceous. Pubescence brownish, often slightly violaceous in certain lights, sometimes silvery on the lower front, coxae, pleura, and propodeum. Scape very slightly hairy; temples and propleura with abundant fine hair; clypeus, front, vertex, pronotum, and front coxae with sparse erect hairs; remainder of thorax and the propodeum with at most a few very short, fine hairs; abdominal venter and apical tergite slightly setose.

Clypeus over three times as broad as high, its apical margin concave. Front of very variable breadth, the middle interocular distance varying from .59 to .66 times the transfacial distance. Inner orbits converging slightly above, the upper interocular distance about .9 the lower. Ocelli in approximately a right triangle; postocellar line equal to or slightly greater or less than the ocello-ocular line. Antennae remarkably variable in length, the third segment sometimes not longer than the scape, and equal to but slightly more than half the upper interocular distance; at the other extreme, antennal segment 3 may be much longer than the scape and pedicel together, and equal to as much as .9 the upper interocular distance.

Propodeum with a flattened posterior declivity. Mesosternum posteriorly with a median, V-shaped emargination, on each side of which it is slightly produced. Fore wing with the marginal cell from 1.1 to 1.5 times its own length from the apex of the wing; first and third transverse cubital veins slightly to strongly arched, the second nearly straight; third discoidal cell about its own length from the outer wing margin.

MALE.—Length 9.5 (5.5-13) mm. Color black, the posterior orbits sometimes with a very slender pale spot. Fore wings hyaline or very lightly infuscated, with a darker outer marginal band; hind wings hyaline, the apex slightly infuscated. Pubescence varying from entirely fuscous to almost entirely silvery. Scape slightly hairy or not; temples and propleura with abundant fine hair; front slightly to rather densely hairy; vertex, front coxae, and usually the pronotum somewhat hairy; remainder of body without more than a few short, inconspicuous hairs.

Clypeus 2.5 times as broad as high, its apical margin slightly concave. Middle interocular distance usually approximately .6 the transfacial distance; inner orbits subparallel or diverging slightly above. Ocelli forming a right or obtuse angle in front, the postocellar and ocello-ocular lines about equal. Antennae elongate, the first four segments in a ratio of about 3:1:3:3, the first three segments together about equal to the upper interocular distance. Longer spur of hind tibia about three-fourths the length of the basitarsus. Wing venation as in the female.

Abdominal sternite 6 with a deep U-shaped emargination. Apical abdominal segments shown in lateral view in Fig. 222. Subgenital plate differing from that of *similaris*, shown in Fig. 223, only in having the total

length slightly less in relation to the width. Genitalia as shown in Fig. 192 and as described under the subgeneric heading.

*Biology.*—Although *apicatus* is a widely distributed and not uncommon species, there are no records known to me of its having been taken with a spider. It occurs chiefly in sheltered places, being particularly partial to sunny spots in woodlands, where it may often be found in association with such species as *Anoplus virginianensis* and *Pompilus arctus*. In the Great Plains, however, it often occurs in open prairie country, a very different habitat from that in which it is common farther north. The species has been taken on the flowers of wild carrot and parsnip, poison hemlock, goldenrod, *Bifora*, and *Angelica*. In the latitude of Ithaca, New York, it is an early summer species, appearing in June and disappearing in early August; in the southern extremities of the range it makes its appearance in March or April and disappears a few weeks later. There appears to be only one generation a year throughout the range.

*Distribution.*—This is a very widely distributed species, occurring most abundantly in the Transition Zone, where it is transcontinental in distribution; from the Great Plains eastward it occurs also in the Canadian and Upper and Lower Austral Zones, ranging as far north as Labrador and Newfoundland and as far south as southern Alabama and Texas, at least in limited numbers.

*Specimens seen:* 367 (176 ♀♀, 191 ♂♂). The following records appear to be marginal: NEWFOUNDLAND: 2 ♀♀, 2 ♂♂, Little River, Southwest part, July [CNC]; LABRADOR: 1 ♂, Goose Bay, 9 July [CNC]; ONTARIO: 1 ♀, Sudbury [CNC]; MANITOBA: 1 ♀, 1 ♂, Aweme, July [CNC]; SASKATCHEWAN: 1 ♀, Prince Albert, July [CNC]; ALBERTA: 1 ♂, Edmonton, June [Alta.]; BRITISH COLUMBIA: 2 ♀♀, Carbonate, 7-12 July [CU, MCZ]; WASHINGTON: Thurston Co., 1 ♂, Olympia [USNM]; CALIFORNIA: Mariposa Co., 2 ♀♀, 3 ♂♂, Yosemite, 22 May-24 June [ANSP, CAS, CIS]; UTAH: 2 ♂♂, Navajo, 17 June [UAC]; NEW MEXICO: Santa Fe Co., 2 ♀♀, 1 ♂, 9200 feet, Aug. [MCZ]; TEXAS: Cameron Co., 1 ♂, Brownsville, 20 March [USNM]; LOUISIANA: 2 ♂♂ (no further data) [USNM]; ALABAMA: Mobile Co., 1 ♀, 1 ♂, Creola, 3 A.pr. [HEE]; GEORGIA: 1 ♀, Atlanta, 22 July [EU]; NORTH CAROLINA: Dare Co., 2 ♀♀, Kill Devil Hills, 5 June [KVK].

## 2. *Pompilus (Anoplochares) similaris* (Banks)

*Anoplius similaris* Banks, 1919, *Canad. Ent.*, 51: 82. [Type: ♀; Ithaca, N. Y., 25 July 1916; C.U. no. 678.]

*Psanmochares (Anoplius) similaris* Leonard, 1926, *Cornell Agri. Exp. Sta. Memoir* 101, p. 987.

*Anoplochares similaris* Banks, 1939, *Canad. Ent.*, 71: 229.

*Pompilus (Anoplochares) similaris* Evans, 1951, *U. S. Dept. Agri., Monogr.* 2, p. 935.

This species averages considerably larger than *apicatus* and its wings are wholly brownish. Structurally there are only minor differences between the two species. *P. similaris* is much more restricted in its range than *apicatus*, and occupies a different ecological niche.

FEMALE.—Length 15.5 (12.5-18) mm. Color black, the upper posterior orbits with a very slender pale spot. Front and hind wings entirely fuliginous, usually somewhat more deeply so beyond the cells. Pubescence entirely fuscous or brownish, vaguely reflecting deep metallic colors in proper light. Clypeus, front, and vertex with moderately abundant short hair; temples and propleura with denser but finer hair; pronotum and front coxae slightly hairy; remainder of thorax, and the propodeum, with at most a small amount of very short, fine hair; venter and apical tergite somewhat setose.

Front rather narrow, the middle interocular distance varying from .54 to .57 times the transfacial distance. Inner orbits converging slightly above, the upper interocular distance about .9 the lower. Postocellar and ocellular lines equal, or either slightly the greater; ocelli in about a right triangle. Antennae long and slender, the first four segments in a ratio of about 30:10:45:42, the third segment equal to about .9 the upper interocular distance. Venation as in *apicatus*, but the marginal cell not or very slightly more than its own length from the tip of the wing. First transverse cubital vein usually rather strongly bent about mid-way, almost angulate; second and third submarginal cells both wider than high, both somewhat narrowed above (Fig. 242). Third discoidal cell long, distinctly less than its own length from the outer wing margin.

MALE.—Length 13.5 (11.5-16.5) mm. Color black, the upper outer and middle inner orbits each with a very slender pale spot, sometimes obsolescent. Wings entirely fuliginous, often slightly violaceous. Pubescence brownish-fuscous, obscurely violaceous, on the lower front coarser and paler, usually distinctly silvery; coxae and lower sides of the thorax also sometimes silvery. Clypeus, front, vertex, temples, and propleura with rather abundant erect hair; front coxae and pronotum somewhat hairy; remainder of thorax with at most a small amount of fine, short hair; propodeum usually with some fine erect hair on the sides; venter and apical two tergites with a few short erect hairs.

Front rather narrow, the middle interocular distance varying from .57 to .6 times the transfacial distance; inner orbits subparallel, the upper interocular distance subequal to or slightly less than the lower. Ocelli in a flat triangle, the front angle greater than a right angle; postocellar and ocellocular lines subequal. First four antennal segments in a ratio of about 3:1:3:3, the first three segments together equal to about 1.2 times the upper interocular distance. Venation as in the female. Characters of the abdomen very similar to those of *apicatus*. Subgenital plate (Fig. 223) of the same form as in that species, but the apical portion slightly more elongate. Genitalia showing no noticeable differences from those of *apicatus*, which are shown in Fig. 192.

*Biology*.—This species appears to frequent more open localities than *apicatus*, occurring in sandy places, gravel pits, fields, and along roadsides. I have taken a few specimens on the flowers of parsnip, *Pastinaca sativa*.

*Distribution*.—This form occurs from New England, Ontario, and Illinois south to Georgia, being an inhabitant of the Alleghanian fauna and upper fringes of the Carolinian.

*Specimens seen*: 35 (20 ♀♀, 15 ♂♂). ILLINOIS: McHenry Co., 1 ♂, Algonquin [ANSP]; INDIANA: 1 ♂ (no further data) [USNM]; OHIO: 1 ♀ (no further data) [MCZ]; Ottawa Co., 1 ♂, Put-in-bay, July [MCZ]; CANADA: 1 ♀, 1 ♂ (no further data) [USNM]; ONTARIO: 1 ♀, 2 ♂♂, Toronto, 1-12 July [CNC]; 1 ♀, Ottawa [CNC]; NEW HAMPSHIRE: Cheshire Co., 1 ♀, Silver Lake, 16 July [CU]; VERMONT: Windsor Co., 1 ♀, Woodstock, 20 Aug. [USNM]; MASSACHUSETTS: Hampshire Co., 1 ♂, Amherst, 10 Aug. [Mass.]; Middlesex Co., 1 ♀, Lexington [MCZ]; CONNECTICUT: New London Co., 1 ♂ [USNM]; NEW YORK: Essex Co., 1 ♀, Keene Valley, 16 Aug. [CU]; Tompkins Co., 9 ♀♀, 3 ♂♂, Ithaca, 28 June-3 Aug. [CU, MCZ, HEE]; NEW JERSEY: 2 ♀♀, 2 ♂♂, Cape May, 7-8 July [ANSP]; PENNSYLVANIA: Lancaster Co., 1 ♂, Pequea, 8 July [USNM]; WEST VIRGINIA: Wood Co., 1 ♂, Kanawha Station, 28 June [USNM]; GEORGIA: White Co., 1 ♀, Cleveland, 9 June [EU].

#### XI. Genus **APORINELLUS** Banks

*Pompilus* Groups 13 & 14 Kohl, 1884, Verh. zool.-bot. Ges. Wien, 34: 39, 54.  
*Aporinellus* Banks, 1911, Proc. Ent. Soc. Wash., 13: 238. [Type: *Aporus fasciatus* Smith, 1855; desig. by Banks, 1912].—Banks, 1912, Jour. N. Y. Ent. Soc., 19: 223, 230.—Bequaert, 1919, Psyche, 26: 115-123. [Review of Nearctic species.]—Banks, 1919, Bull. Mus. Comp. Zool., 63: 230, 240.—Banks, 1934, Proc. Amer. Acad. Arts & Sci., 69: 84, 106. [Philippine species.]—Banks, 1947, Bull. Mus. Comp. Zool., 99: 429. [South American species.]—Dreisbach, 1949, Ent. Amer., 29: 5, 34, pl. 1, fig. 1.—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 935.

- Pompiloides* Haupt, 1927, Deutsch. Ent. Zeitschr., Beiheft, p. 258. [Type stated to be *Pompilus albofasciatus* Radoszkovsky, 1887; *nec Pompiloides* Radoszkovsky, 1887.]—Haupt, 1929, Mitt. Zool. Mus. Berlin, 15: 149-155. —Gussakovsky, 1935, Konowia, 14: 135-150. [European species.]—Arnold, 1936, Ann. Transvaal Mus., 18: 415-421. [African species.]
- Ferreoloides* Haupt, 1929, Mitt. Zool. Mus. Berlin, 15: 150, 153. [Type: *Pompilus moestus* Klug, 1834; desig. by Bradley, 1944.]—Bradley, 1944, Eos, 20: 93-100. [List of Old World spp.]
- Eupompiloides* Gussakovsky, 1935, Konowia, 14: 141. [Type: *Pompilus moestus* Klug, 1834; monobasic.]
- Ceratopompilus* Bradley, 1944, Eos, 20: 95, 97. [Type: *Pompilus sexmaculatus* Spinola, 1805; original desig.]

This genus is one of the most easily recognized in the tribe. The conical processes at the posterolateral angles of the propodeum (Fig. 258 and 261), the absence of any visible evidence of the postnotum dorsally, and the loss of the second transverse cubital vein in the fore wing of the majority of North American specimens, leaving but two submarginal cells, all assist in its recognition. The genus is very likely derived from *Pompilus s. str.*, with which it has many characters in common, including the presence of small appendages at the extreme base of the subgenital plate of the male (Fig. 262), and the absence of basal hooklets in the genitalia.

As indicated above, I consider *sexmaculatus* and its allies in the Old World congeneric, in fact consubgeneric, with the American *fasciatus* and its allies. I have seen both sexes of *sexmaculatus*, and in all respects, including the male genitalia, this species very closely resembles *fasciatus*. Three Nearctic species may have either two or three submarginal cells in the fore wing; the remaining Nearctic species always have two, and all the Old World species three. This character, the only one by which *Ceratopompilus* and *Aporinellus* might be considered distinct, scarcely seems of generic or subgeneric value under the circumstances.<sup>13</sup> I am also inclined to regard *Ferreoloides* Haupt as a synonym of *Aporinellus*, agreeing with Arnold (1936) that the toothed or bifid condition of the claws in this genus seems of little significance. The other character cited by Bradley (1944) for separating these

<sup>13</sup> Two other genera of Pompilini, *Evagctes* and *Pompilus* (subgenus *Perissopompilus*), have already been considered in the present study as containing species both with two and with three submarginal cells.

two groups, the color of the apical tergite of the male, is of no significance, since the North American species, all possessing toothed claws in the female, may have the apical tergite black or white.

The Nearctic species of *Aporinellus* have commonly been separated on the basis of differences in the pattern of silvery pubescence in the female. In the present study this character has been found to have no significance whatever in the separation of species. On the basis of morphological characters, there appear to be six species of *Aporinellus* in our fauna, all showing wide differences in pubescence within themselves. It is a curious fact that in some localities all the species appear to show similar changes in the pubescence. For example, in some parts of California several of the species have the silvery pubescence greatly reduced, while in places in the Pacific Northwest there is a similar tendency in the opposite direction, that is, toward a very extensive silvery pubescence. This variation seems to be of a rather local nature, not involving any definite geographic areas. At the present time it does not seem wise to regard these variants as subspecies, although further study is clearly suggested.

*Generic characters.*—Small wasps, 4 to 13 mm. in length. Color predominantly black, the males always entirely so, the females sometimes in part or almost wholly rufo-ferruginous. Silvery pubescence often extensive, giving the body a banded appearance, especially on the abdomen; some females with the pubescence mostly dark. Head and prothorax usually with a few inconspicuous erect hairs; apical abdominal segments of the female with a few dark setae; body otherwise practically devoid of hair. Mandibles bidentate in the female, unidentate in the male. Labrum protruding slightly if at all from beneath the clypeus, its apical margin truncate or slightly emarginate, bristly. Clypeus wider than the lower front, its apical margin truncate. Antennae inserted rather low on the front; scape fairly long; flagellum slender, of variable length. Malar space very short.

Pronotum sloping very gradually in profile, nearly or quite as long as the mesonotum; posterior margin arcuate or nearly straight. Postnotum completely absent dorsally, or represented by a very thin line, the metanotum and propodeum in broad contact. Propodeum smooth, fairly long, in dorsal aspect with the sides nearly parallel, but converging slightly behind; posterior lateral angles produced into distinct, more or less acute conical processes (Figs. 258 and 261). Legs spinose; middle and hind tibiae sparsely but strongly spinose above; front tibiae without spines above. Front tarsus of female with a comb of long, slender spines; ultimate tarsal segments

with or without small spines beneath. Pulvillar comb moderately well developed, in the female with about 15 setulae; comb of the male much weaker, of about 8 short setulae. Claws of the female in the Nearctic species dentate, the tooth short, acute. Claws of the male dentate or subbifid, the inner claw of the front tarsus somewhat modified, bifid or subbifid; apical segment of front tarsus of male unmodified.

Fore wings slender, frequently showing a tendency to fold longitudinally along a line of weakness just above the media. Stigma very small; marginal cell small, much more than its own length from the wing-tip. Transverse median vein meeting the media before the origin of the basal; basal vein with a more or less evident arcuation between the cubitus and the subcosta. Third submarginal cell, when present, smaller than the second, sometimes petiolate; American species usually with only two submarginal cells, because of the loss of the second transverse cubital vein. Third discoidal cell with the pocket at its lower basal corner scarcely evident. Hind wings slender, the anal lobe very small; cubitus arising near the tip of the submedian cell. (Wings shown in Figs. 243-246.)

Abdomen of female stout, subfusiform, that of the male much more slender. Male subgenital plate variously shaped, but always bearing on each side basally and internally a small appendage apparently composed of closely matted long setae (Figs. 262-265), much like those of *Pompilus s. str.* and in *Hesperopompilus*. Genitalia (Figs. 195-200) with the cardo short; parapenials stout, carinate dorsally, notched near the base of the aedeagus; basal booklets wholly wanting; basis volsellaris with a few very minute setae; digiti somewhat spatulate and bearing a few setae, the disc of the digiti with an area of minute sculpturing; parameres strong, always exceeding the other appendages, more or less short-setose.

*Biology.*—The species of *Aporinellus* have habits similar to those of the genus *Pompilus*, preying upon spiders of several kinds and nesting in unicellular galleries in the earth. Observations have been made upon the European *sexmaculatus* by Ferton<sup>14</sup> and on the American *fasciatus* by the Peckhams.<sup>15</sup> All host records for American species so far are of jumping spiders (Salticidae). Ferton has found *sexmaculatus* preying upon several genera of jumping spiders, and upon two genera of crab spiders (Thomisidae). The species of this genus come frequently to honeydew, and some of the species occasionally visit flowers.

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<sup>14</sup> Ferton, C., 1897, Act. Soc. Linn. Bordeaux, 52: 114; 1901, Ann. Soc. Ent. France, 70: 124; 1908, Ann. Soc. Ent. France, 77: 571; 1911, Ann. Soc. Ent. France, 80: 371, 377.

<sup>15</sup> Peckham, G. W. and E. G., 1898, Wisc. Geol. Nat. Hist. Survey Bull. no. 2, p. 55.



*Distribution.*—This genus is widely distributed in the warmer regions of the globe, being absent, so far as I know, only from the Australian region. Bradley (1944) has presented a list of the Old World species. Banks (1947) records but one species from South America. There appear to be six species in the Nearctic fauna.

*Key to Species*

Females

- 1. Ultimate tarsal segments with two or three minute spines beneath (Fig. 255); second submarginal cell of the fore wing small, less than twice as broad as high (Fig. 245) (*Taeniatus*-group) .....2
- Ultimate tarsal segments without a trace of spines beneath; second submarginal cell (or 2d plus 3d when both are present) at least twice as broad as high (Figs. 243, 244, and 246) .....6
- 2. Abdomen entirely black; legs varying from wholly black to wholly rufous or castaneous; widely distributed in the Lower and Upper Austral Zones, and throughout the Pacific states.
  - 1a. **taeniatus taeniatus** (Kohl)  
Abdomen in part or wholly rufous; legs partly or wholly rufous; forms with more limited ranges, occurring in the Transition Zone east of the Pacific states .....3
  - 3. Thorax and propodeum entirely black .....4
  - Thorax and propodeum in part or wholly rufous .....5
  - 4. Pubescence not at all silvery; comb-spines short, the apical basitarsal spine a little more than half as long as the second tarsal segment.
    - 1b. **taeniatus wheeleri** Bequaert  
Pubescence extensively silvery, the abdomen with apical silvery bands on several of the tergites; comb-spines longer, the apical basitarsal spine about as long as the second tarsal segment.
    - 1c. **taeniatus semirufus** Banks
  - 5. Pronotum for the most part black; mesonotum, scutellum, and metanotum black; temples, in lateral view, only about half the width of the eye.
    - 1d. **taeniatus baboquivari** new subspecies  
Pronotum rufous; mesonotum, scutellum, and metanotum rufous or somewhat infuscated; temples, in lateral view, nearly as wide as the eye.
    - 1e. **taeniatus rufus** Banks
- 6. Ocelli forming a compact, nearly right triangle; vertex rather narrow, the eyes noticeably convergent above, the upper interocular distance varying from .75 to .9 the lower interocular distance (Figs. 251 and 252); second submarginal cell (or 2d plus 3d when both are present) usually between 2 and 2.5 times as broad as high (Figs. 243 and 244) (*Fasciatus*-group) .....7

- Ocelli forming a broad, flat triangle, the front angle much greater than a right angle; vertex rather broad, the eyes usually only slightly if at all convergent above, the upper interocular distance varying from .8 to 1.0 times the lower (Fig. 250); never with more than two submarginal cells, the second usually more than 2.5 times as broad as high (Fig. 246) (*Apicatus*-group) .....8
7. Head in anterior view subcircular, only slightly broader than high, the transfacial distance less than 1.15 times the facial distance, the vertex arched slightly above the tops of the eyes (Fig. 252); front in profile moderately convex .....2. **fasciatus** (Smith)  
 Head in anterior view broadly oval, distinctly broader than high, the transfacial distance usually more than 1.15 times the fascial distance, the vertex nearly flat between the tops of the eyes (Fig. 251); front in profile strongly convex .....4. **completus** Banks
8. Antennae (Fig. 257) short and compact, segment 3 about 3.5 or 4 times as long as thick, and equal to from .45 to .65 times the upper interocular distance; antennal segments 8 through 11 each about twice as long as thick .....5. **apicatus** (Banks)
- Antennae (Fig. 256) more long and slender, segment 3 about five times as long as thick, and equal to from .6 to .8 the upper interocular distance; segments 8 through 11 at least three times as long as thick.  
 6. **sinuatus** new species

### Males

1. Ocelli in a compact, nearly right triangle; vertex of moderate breadth, the crest rounded off a short distance behind the posterior ocelli; second submarginal cell of the fore wing (or 2d plus 3d when both are present) usually less than 2.5 times as broad as high (Figs. 243, 244, and 245) ...2  
 Ocelli in a very broad, flat triangle, the front angle much greater than a right angle; crest of the vertex rather sharp, the vertex very broad, the upper interocular distance at least 1.2 times lower interocular; second submarginal cell usually more than 2.5 times as broad as high (Fig. 246); never with 3 submarginal cells (*Apicatus*-group) .....5
2. Second submarginal cell less than twice as broad as high (Fig. 245); ventral surface of parameres of genitalia more or less completely covered with short setae, more setose than the dorsal surface (Fig. 195) (*Taeniatus*-group) .....1. **taeniatus** (Kohl)<sup>16</sup>  
 Second submarginal cell (or 2d plus 3d when both are present) about or somewhat more than twice as broad as high (Figs. 243 and 244); ventral surface of parameres not wholly setose, less extensively so than the dorsal surface (*Fasciatus*-group) .....3

<sup>16</sup> This species is divisible into five subspecies on characters present in the female sex only. Males can be placed in the proper subspecies only by association with the female or, to some extent, by range.

- 3. Subgenital plate narrow, tectiform, the apex more or less acute (Fig. 263); apical tergite black, dark-pubescent; digiti capitate, about three times as wide near the apex as at the stem (Fig. 198) .....4. **completus** Banks  
Subgenital plate broad, rather flat, the apical margin broadly rounded or somewhat truncate (Figs. 264 and 265); digiti more narrowly expanded apically, about twice as wide there as at the stem .....4
- 4. Subgenital plate flat except for a very short median basal elevation (Fig. 264); apical tergite with a white spot and with silvery pubescence; disc of the digitus set at an angle to the stem, clothed with prominent clubbed setae (Fig. 196) .....2. **fasciatus** (Smith)  
Subgenital plate with a very prominent median carina extending from the base about half the length of the plate (Fig. 265); apical tergite without a white spot, with or without silvery pubescence; digiti straight, the disc not clothed with clubbed setae (Fig. 197).  
3. **bridwelli** new species
- 5. Third antennal segment about 1.5 times as long as thick, considerably shorter than the fourth (Fig. 254); genitalia with numerous straight hairs of moderate length on the digitus, the aedoeagus unusually broad (Fig. 200) .....5. **apicatus** (Banks)  
Third antennal segment about 1.8 times as long as thick, only a little shorter than the fourth (Fig. 253); genitalia with a number of long, sinuate hairs at the apex of the digitus, the aedoeagus not unusually broad (Fig. 199) .....6. **sinuatus** new species

*Tacniatus* Species-group

In this group the second submarginal cell of the fore wing is smaller than in the two following species-groups, being from 1.4 to 1.9 times as broad as high (Fig. 245). In the female there are several minute spines beneath the apical tarsal segments (Fig. 255); there may be two or three comb-spines on the front basitarsus; the color varies from black to partly or wholly rufo-ferruginous.

A considerable number of specific names are available for members of this group, based principally on differences in color and pubescence in the female. However, all males belonging to the group appear to be identical, even to genitalic characters. For this reason it seems logical to consider the group as constituting a single, widely distributed, highly variable species. The described variants in the female sex may be sorted into two kinds: those which are restricted to a definite geographic area and rather constant within it (such as *rufus*, *semirufus*, and *wheeleri*), and those which appear to occur at widely scattered localities and which fail

to retain their identity in an extended series (such as *banksi*, *bequaerti*, and *californicus*). The former appear to constitute a fringe of subspecies along the northern periphery of the range of *taeniatus*, while the names in the latter group are probably best regarded as synonyms of the highly variable *taeniatus taeniatus*.

1a. **Aporinellus taeniatus taeniatus** (Kohl)

*Pompilus taeniatus* Kohl, 1886, Verh. zool.-bot. Ges. Wien, 36: 315, 336.

[Type: ♀; Orizaba, Mexico; K. K. Naturhistorische Hofmuseum, Vienna (not seen by present writer).]

*Pompilus taeniolatus* Dalla Torre, 1897, Cat. Hymen., VIII, p. 326.

*Aporus ferrugineipes* Viereck, 1906, Trans. Amer. Ent. Soc., 32: 203. [Type: ♀; Clark Co., Kansas, May, 1962 feet (F. H. Snow); Univ. Kansas.]

*Aporinellus ferrugineipes* Banks, 1911, Proc. Ent. Soc. Wash., 13: 238.—Banks, 1912, Jour. N. Y. Ent. Soc., 19: 230.—Bequaert, 1919, Psyche, 26: 117, 121, 123.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 985.

*Aporinellus californicus* Rohwer, 1917, Proc. U. S. Nat. Mus., 53: 240. [Type: ♀; Alameda Co., Calif., July 1907 (W. M. Giffard); U.S.N.M. no. 19,967.]—Banks, 1919, Bull. Mus. Comp. Zool., 63: 240.—Bequaert, 1919, Psyche, 26: 121.

*Aporinellus banksi* Bequaert, 1919, Psyche, 26: 118, 121. [Type: ♀; Lee Co., Texas, May 1907 (Birkmann); M.C.Z. no. 10,757.] New synonymy.—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 936.

*Aporinellus taeniatus* Bequaert, 1919, Psyche, 26: 123. [Suggests possible synonymy of *ferrugineipes* with this species.]—Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 263. [N. C.]—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 936.

*Aporinellus bequaerti* Banks, 1933, Psyche, 40: 3. [Type: ♀; El Paso, Texas, 11 July 1917 (J. Bequaert); M.C.Z. no. 17,030.]

The female of this widely distributed form varies in color from wholly black, except for the mandibles, to a condition where the legs are entirely rufous, including the coxae, and the clypeus and base of the antennae are also suffused with rufous. The amount of silvery pubescence is also very variable in this sex. The males, which have previously been confused with *fasciatus*, are always wholly black and conspicuously patterned with silvery pubescence.

FEMALE.—Length 6 (4.5-8) mm. Color black; mandibles mostly castaneo-ferruginous, the base and apex generally darker; anterior margin of the clypeus usually suffused with castaneo-ferruginous, the antennal scape sometimes so; legs varying from wholly black to wholly rufo- or castaneo-

ferruginous. Body often extensively clothed with silvery pubescence, with conspicuous bands at the apices of the basal abdominal tergites, but not always so; in some specimens the pubescence is almost entirely brownish. Wings nearly hyaline, the outer margin of the fore wing with a broad brownish band, the tip of the hind wing somewhat infuscated.

Head slightly broader than high, the vertex nearly straight across; front, in profile, rather strongly convex. Clypeus considerably wider than the lower front, about 3 times as broad as high. Middle interocular distance varying from .56 to .64 times the transfacial distance; upper interocular distance varying from .75 to .9 times the lower interocular distance. Ocelli forming a triangle the front angle of which is a right angle or less; postocellar line: ocello-ocular line about as 3:2. First four antennal segments in a ratio of usually about 23:10:27:26, segment 3 equal to from .6 to .9 the upper interocular distance.

Propodeal processes prominent, acutely pointed. Front basitarsus with either two or three comb-spines, the apical one equal to from .5 to 1.2 times the length of the second tarsal segment. Ultimate tarsal segments with two or three minute spines beneath (Fig. 255). Fore wing with the marginal cell very small, over twice its own length from the wing-tip; second transverse cubital vein always wanting, there thus being two submarginal cells, the outer one less than twice as broad as high, receiving the first recurrent vein about one-third the distance from the base, the second about .9 the distance from the base (Fig. 245).

MALE.—Length 5.5 (4-7) mm.; color black, except the mandibles yellowish in the middle, reddish at the apex. Greater part of the head and thorax clothed with a heavy silvery or somewhat glaucous pubescence; base and apex of the first abdominal tergite, and apical bands on tergites 2 to 4, conspicuously silvery; basal abdominal sternites more or less silvery. Wings hyaline or nearly so, the outer margin of the fore wing with a broad light brownish band.

Clypeus between 2.5 and 3 times as broad as high. Front rather broad, the middle interocular distance from .65 to .7 times the transfacial distance; upper interocular distance about 1.1 times the lower, the eyes thus diverging somewhat above. Ocelli in a right or acute triangle, the postocellar line usually slightly less than the ocello-ocular line. Antennae rather short, the first four segments in a ratio of about 7:3:5:6, the third segment about twice as long as thick; outer flagellar segments, except the last, not twice as long as thick. Posterior pronotal margin with a faint median angulation. Processes of the propodeum small, acute.

Abdominal sternite 6 with a pronounced V-shaped emargination. Subgenital plate strongly elevated medially, tectiform; when flattened out (Fig. 262) it is seen to be broadly spatulate, the apex more or less rounded. Genitalia (Fig. 195) with the parameres strong, slightly arched, broadest about mid-way, the ventral surface clothed everywhere except at the extreme base with small setae, the dorsal surface setose only on the apical fourth. Digits subspatulate, the disc only a little wider than the stem, clothed with a few

simple setae of moderate length. Parapenials stout, prominently curved apically, embracing the moderately broad aedeagus.

*Biology*.—This form occurs in sandy or gravelly places such as beaches, stream-banks, or small sand pits, and occasionally visits honeydew. A female taken by the author near Jacksonville, Florida, was walking along a sandy road dragging the spider *Habronattus calcaratus* (Banks) (Salticidae) [det. B. J. Kaston].

*Distribution*.—This is a very widely distributed form, ranging throughout the Lower and Upper Austral Zones, and the Transition Zone in the Pacific states, occurring from Guatemala to British Columbia, Minnesota, and Connecticut.

*Specimens seen*: 89 (69 ♀♀, 20 ♂♂). The following records are from the periphery of the range: CONNECTICUT: Hartford Co., 5 ♀♀, 1 ♂, East Hartford, 13 June-19 Sept. [HEE]; NEW YORK: Nassau Co., 1 ♀, 1 ♂, Bayville, 6 Sept. [MCZ]; 2 ♀♀, Farmingdale, 4 July [KVK]; NEW JERSEY: Cumberland Co., 1 ♀, Manumuskin, 27 July [CU]; NORTH CAROLINA: Dare Co., 6 ♀♀, Kill Devil Hills, 23-27 May [KVK]; GEORGIA: Dougherty Co., 1 ♀, Albany, 30 March [EU]; OHIO: Franklin Co., 1 ♂, 21 July [RWS]; MINNESOTA: Ottertail Co., 1 ♀, Wall Lake, 30 Aug. [Minn.]; KANSAS: Clark Co., 1 ♀, May [UK]; NEW MEXICO: Dona Ana Co., 1 ♂, Mesilla, Apr. [USNM]; ARIZONA: Maricopa Co., 1 ♂, Tempe, 31 July [MCZ]; CALIFORNIA: Inyo Co., 3 ♀♀, Whitney Portal, 6 Aug. [CIS]; Placer Co., 2 ♀♀, Tahoe, July [CAS]; BRITISH COLUMBIA: 1 ♂, Okanagan Falls, 21 July [CNC]; 1 ♀, Penticton, 7 Aug. [CNC]; MEXICO: Nuevo Leon, 1 ♀, 10 mi. S. of Linares, 24 Dec. [CIS]; GUATEMALA: 1 ♀, El Salto, Escuintla, 28 June [MCZ]; LOUISIANA: 1 ♂ (no further data) [USNM]; FLORIDA: Dade Co., 1 ♀, Royal Palm Park, July [UK].

1b. *Aporinellus taeniatus wheeleri* Bequaert new status

*Aporinellus wheeleri* Bequaert, 1919, Psyche, 26: 118, 122. [Type: ♀; Stony Brook Reservation, near Boston, Mass., 12 July 1919 (J. Bequaert); A.M.N.H. (not seen by present writer).]—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 936.

This form is known from a few specimens from scattered localities in the Alleghanian region of the eastern United States, and appears to represent a more northerly race of *taeniatus*. The partly or wholly ferruginous abdomen, black thorax, wholly brownish pubescence, and short tarsal comb serve to separate the female from other members of this complex.

FEMALE.—Length 6.8 (6.5-7) mm. Color black, except marked with ferruginous as follows: mandibles except at base and apex; anterior margin of clypeus; usually the antennal scape; all the legs beyond the trochanters, except that the spurs and the tarsi are more or less infuscated; at least the basal three segments of the abdomen, sometimes the entire abdomen except that the apical segment is slightly infuscated. Pubescence very fine, brownish or somewhat cinereous, nowhere silvery. Wings hyaline, the outer margin of the fore wing broadly, lightly infuscated. Middle interocular distance about .58 times the transfacial distance; upper interocular distance about .74 times the lower; third antennal segment equal to about .8 the upper interocular distance. Front basitarsus with two short comb-spines, and an additional spine of moderate length just below the basal comb-spine; apical basitarsal comb-spine a little more than half as long as the second tarsal segment. Second submarginal cell from 1.5 to 1.7 times as broad as high.

MALE.—A single male assigned tentatively to this subspecies on the basis of locality data appears indistinguishable from *taeniatus taeniatus*.

*Distribution*.—Alleghanian fauna, Massachusetts to North Carolina.

*Specimens seen*: 5 (4 ♀♀, 1 ♂). MASSACHUSETTS: Middlesex Co., 1 ♀, Stony Brook Res., 9 June 1925 (J. Bequaert) [USNM]; Suffolk Co., 1 ♀, 11 Aug. 1914 (F. X. Williams) [CIS]; NEW YORK: Tompkins Co., 1 ♂, Ithaca, in sand-pit, 24 July 1947 (H. E. Evans) [HEE]; NORTH CAROLINA: Buncombe Co., 1 ♀, Valley of Black Mts., 15 Aug. 1906 (W. Beutenmuller) [AMNH]; 1 ♀, Asheville, 28 July 1939 (H. K. Townes) [Coll. H. K. Townes].

1c. *Aporinellus taeniatus semirufus* Banks new status

*Aporinellus semirufus* Banks, 1929, Psyche, 36: 326. [Type: ♀; Martin, So. Dakota, 12 Sept. 1925 (H. C. Severin); M.C.Z. no. 16,234.]—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 936.

This subspecies is known from but four specimens. It is much like *wheeleri* in coloration, but the abundant silvery pubescence gives it an altogether different appearance.

FEMALE.—Length 5.6 (4.5-6.5) mm. Color black, marked with bright castaneo-ferruginous as follows: mandibles except at base and apex; usually the anterior margin of the clypeus narrowly; hind legs beyond the trochanters, except the spurs and tarsi more or less infuscated; middle femora and tibiae to some extent; entire abdomen, except the apical segment slightly infuscated. Greater part of the head and thorax, including the scape and most of the legs, conspicuously silvery-pubescent; first four abdominal segments more or less silvery, the pubescence tending to form bands along

the posterior margins of the segments. Wings hyaline, the outer fourth of the fore wings lightly infuscated. Middle interocular distance about .6 the transfacial; upper interocular distance about .83 times the lower; third antennal segment equal to only about .6 the upper interocular distance. Front basitarsus with three long and slender comb-spines, the apical one equal to or a little longer than the second tarsal segment. Second submarginal cell of the fore wing about 1.5 times as broad as high, nearly triangular because of the close approach of the transverse cubital veins above.

MALE.—Unknown.

*Distribution*.—This form is known only from Martin, South Dakota, and Medicine Hat, Alberta, Canada.

*Specimens seen*: 4 ♀♀. SOUTH DAKOTA: Bennett Co., 1 ♀, Martin, 12 Sept. 1925 (H. C. Severin) [MCZ]; ALBERTA: 3 ♀♀, Medicine Hat, 20 Aug. 1916, 17 July 1917 (F. W. L. Sladen) [CNC].

Id. *Aporinellus taeniatus baboquivari* new subspecies

This interesting new form represents a stage of erythrization between that of *semirufus* and that of *rufus*; the propodeum, metapleura, most of the mesopleura, and part of the sides of the pronotum are rufous, the remainder of the thorax (except the legs) black. It further differs from *rufus* in the narrower temples, and from *semirufus* in having only two basitarsal comb-spines.

FEMALE. (Holotype).—Length 5.7 mm.; fore wing 4 mm. Mandibles castaneous in the middle, black at the base and apex; apical margin of the clypeus castaneous; remainder of head black; propleura black; pronotum black, except the anterior lateral portion slightly suffused with castaneous; mesonotum, tegulae, scutellum, and metanotum black; propodeum rufo-castaneous, the posterior rim suffused with blackish; metapleura rufo-castaneous; mesopleura rufo-castaneous except along the sutures and at the top and bottom, where it is blackish; coxae, trochanters, femora, and tibiae rufo-castaneous, those of the front legs slightly infuscated; tarsi dusky-ferruginous; abdomen bright rufo-castaneous, the apex slightly infuscated. Greater part of the head, thorax, legs, and propodeum clothed with silvery pubescence; venter silvery, the first four abdominal tergites with apical silvery bands. Wings hyaline, the outer fourth of the fore wings lightly infuscated.

Clypeus three times as broad as high. Middle interocular distance .62 times the transfacial distance; upper interocular distance .82 times the lower interocular. First four antennal segments in a ratio of 17:8:20:19, the third segment equal to .7 the upper interocular distance. Head, in lateral view, with the temples less than half the width of the eye. Front basitarsus with two comb-spines, the apical one slightly longer than the second



tarsal segment. Second submarginal cell of the fore wing 1.6 times as broad as high, narrowed by .8 above.

MALE.—Unknown.

*Distribution.*—This subspecies is known from a single specimen from the Baboquivari Mts. of Arizona.

*Holotype.*—ARIZONA: Pima Co., ♀, Baboquivari Mts., over sandy wash, 26 April 1947 (G. H. & J. L. Sperry) [Univ. Kansas].

1e. *Aporinellus taeniatus rufus* Banks new status

*Aporinellus rufus* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 230. [Type: ♀; Boulder, Colo., 13 Aug. 1907, on *Helianthus pumilus* (S. A. Rohwer); U.S.N.M. no. 20,121.]—Bequaert, 1919, Psyche, 26: 117, 122.—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 936.

The preceding several subspecies exhibit a progressively increasing amount of rufous coloration; in *rufus* this is carried to its ultimate, and the insect is almost wholly rufo-ferruginous. Like the preceding three, this form appears to be very local in its distribution, and is known from only a few specimens.

FEMALE.—Length 6 (5-7) mm. Body wholly bright rufo-ferruginous, except as follows: tips of the mandibles deep ferruginous; front, vertex, temples, occiput, and antennal flagellum black; mesonotum, scutellum, and metanotum sometimes somewhat infuscated; extreme ventral portion of the mesopleura sometimes blackish; tarsi somewhat infuscated apically. Body clothed with a conspicuous pubescence which on the head and thorax varies from silvery to golden, or in part somewhat ferruginous; abdomen with apical silvery bands on the first 3 or 4 tergites. Wings hyaline, the outer margin of the fore wings broadly, lightly infuscated, the apex of the hind wing very lightly infuscated. Front very broad, the middle interocular distance varying from .62 to .65 times the transfacial distance; upper interocular distance about .8 to .9 the lower. First four antennal segments in a ratio of about 25:10:25:26, the third segment equal to from .55 to .65 times the upper interocular distance. Temples strongly developed, in lateral view nearly the width of the eye. Front basitarsus with two slender comb-spines, the apical one subequal in length to the second tarsal segment. Second submarginal cell of the fore wing about 1.5 times as broad as high.

MALE.—Several males assigned tentatively to this subspecies on the basis of locality data do not differ noticeably from *taeniatus taeniatus*.

*Distribution.*—This form is known from several localities in Colorado and in Minnesota.

*Specimens seen*: 11 (7 ♀♀, 4 ♂♂). COLORADO: 1 ♀ (W. J. Fox) (no further data) [ANSP]; 3 ♂♂ (C. F. Baker) (no further data) [USNM]; Boulder Co., 2 ♀♀, Boulder, 13 Aug. 1907 and 1 June 1908 (S. A. Rohwer) [USNM, MCZ]; 1 ♀, 1 ♂, White Rocks, near Boulder, 30 July 1922 [AMNH]; Teller Co., 1 ♀, Florissant, 19 June 1908, on sand (S. A. Rohwer) [USNM]; MINNESOTA: Norman Co., 1 ♀, 24 July 1923 (A. A. Nichol) [Minn.]; Polk Co., 1 ♀, 14 Aug. 1936 (D. G. Denning) [Minn.].

### *Fasciatus* Species-group

In this group the second transverse cubital vein of the fore wing may be preserved, resulting in three submarginal cells, though more often there are but two; the second submarginal cell (or second plus third when both are present) is generally from 2 to 2.5 times as broad as high (Figs. 243 and 244). The ultimate tarsal segments of the female are without spines beneath. The ocelli are in a fairly compact triangle, the front angle of which is a right angle or sometimes slightly greater. The conical processes of the propodeum are rather small and pointed (Fig. 258).

The three species of this group are easily separable on characters of the male terminalia, but are otherwise extremely similar. A slight difference in head shape appears to separate the females of *fasciatus* and *completus*, although this is difficult to appreciate without experience in the group. The female of *bridwelli* cannot at present be distinguished from the other two species.

#### 2. *Aporinellus fasciatus* (Smith)

*Aporus fasciatus* F. Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 175. [Type: ♀; Warm Springs, So. Carolina; British Museum (not seen by present writer).]—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 137, 149.—Cresson, 1872, Trans. Amer. Ent. Soc., 4: 207. [Texas.]—Packard, 1874, Guide to the Study of Insects, p. 174.—Peckham and Peckham, 1898, Wisc. Geol. Nat. Hist. Survey Bull. no. 2, p. 55. [Biology.]—Birkman, 1899, Ent. News, 10: 244.—J. Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.

*Pompilus unionis* Dalla Torre, 1897, Cat. Hymen., VIII, p. 330. [New name for *fasciatus*, preoccupied in the genus *Pompilus*.]

*Aporinellus fasciatus* Banks, 1911, Proc. Ent. Soc. Wash., 13: 238.—Banks, 1912, Jour. N. Y. Ent. Soc., 19: 223, 230, 231. [Selected genotype.]—Banks, 1912, Ent. News, 23: 108. [At flowers of *Ceanothus* in Va.]—Bequaert, 1919, Psyche, 26: 118, 121.—Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 985. [Long Island, N. Y.]—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 120. [N. C.]—Brimley, 1938,

- Insects No. Carolina, p. 432.—Krombein, 1950, Jour. Elisha Mitchell Sci. Soc., 65: 263.—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 936.
- Aporinellus medianus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 97. [Type: ♀; El Cajon, Calif., 1 May (E. P. VanDuzee); M.C.Z. no. 10,005.]—Banks, 1919, Bull. Mus. Comp. Zool., 63: 240.—Bequaert, 1919, Psyche, 26: 122.
- Aporinellus intermedius* Banks, 1919, Bull. Mus. Comp. Zool., 63: 240, 241. [Type: ♀; Claremont, Calif. (Baker); C.U. no. 690.]<sup>17</sup>—Bequaert, 1919, Psyche, 26: 121.

As suggested by the long list of references, *fasciatus* is one of the more common species of the genus, particularly in the southern half of the United States. The female may be told from *completus* by the more nearly circular head (Fig. 252); the male differs from all other Nearctic *Aporinellus* in having the subgenital plate almost completely flat (Fig. 264). As in several other species of this genus, females from California localities frequently have the silvery pubescence much reduced.

FEMALE.—Length 7.5 (4-13) mm. Color black, the mandibles yellowish-brown in the middle, the tips deep ferruginous. Pubescence varying from almost wholly dark, silvery only on the lower front, parts of the pronotum, and the outer portion of the tibiae, to almost wholly silvery, brownish only on the vertex, a band just before the posterior margin of the pronotum, anterior half of the mesonotum, disc of the scutellum, the bases of abdominal tergites 2, 3, and 4, and all of segments 5 and 6, the antennal flagellum, and the apices of the legs. Wings hyaline or lightly infuscated, the outer margin of the fore wing broadly banded with fuscous, the apex of the hind wing somewhat infuscated.

Head (Fig. 252) in anterior aspect subcircular, a little broader than high, the transfacial distance varying from 1.1 to 1.15 times the facial distance, the vertex elevated slightly in an arc above the tops of the eyes; front in profile somewhat less strongly convex than in *completus*. Clypeus from 2.5 to 3 times as broad as high. Front of variable breadth, the middle interocular distance varying from .58 to .67 times the transfacial distance, averaging about .61. Upper interocular distance varying from .75 to .93 times the lower interocular distance. First four antennal segments in a ratio of about 25:10:33:30, segment three equal to from .67 to .97 times the upper interocular distance, a very variable factor. Ocelli forming a right angle or slightly greater in front, the postocellar line usually slightly greater than the ocello-ocular.

<sup>17</sup> A female paratype of *intermedius* Banks, from Owen's River, Calif., 5 Aug. 1915 (C. H. Kennedy) [M.C.Z. no. 10,803] does not belong to this species, but to *sinuatus* new species.

Processes of the propodeum rather prominent, acute or narrowly rounded apically (Fig. 258). Tarsal comb consisting of long, slender spines; basitarsus with 3 comb-pines, the apical one subequal in length to the second tarsal segment, or slightly longer or shorter. Marginal cell of the fore wing from 1.5 to 2.5 times its own length from the wing-tip. About 20 percent of the specimens examined possess three submarginal cells, the second transverse cubital vein when present erect, straight. Second submarginal cell (or 2d plus 3d when both are present) varying from 2.0 to 2.7 times as broad as high, rarely over 2.5. (See Figs. 243 and 244.)

MALE.—Length 6 (4-8) mm. Color black, the apices of the mandibles more or less ferruginous, the apical abdominal tergite with a round white spot (frequently concealed by the overlapping of the preceding tergite). Body clothed with a conspicuous silvery pubescence on the following parts: scape; head except for a band across the vertex; thorax except for a band just before the posterior margin of the pronotum (usually), the anterior part of the mesonotum, and the disc of the scutellum; propodeum; legs except the extremities; first 3 or 4 abdominal sternites; first tergite, at least in large part; broad bands along the posterior margins of tergites 2, 3, and 4; and the apical tergite. Wings hyaline, the apical margin of the fore wing with a brownish band.

Clypeus from 2 to 2.5 times as broad as high. Front broad, the middle interocular distance from .65 to .7 times the transfacial distance. Inner orbits diverging considerably above, the upper interocular distance about 1.2 times the lower. Ocelli in approximately a right triangle, the postocellar line usually a little greater than the ocello-ocular line. First four antennal segments in a ratio of about 11:5:9:10, segment 3 from 1.5 to 2 times as long as thick. Longer spur of the hind tibia about as long as the basitarsus, or even a little longer. Wings as in the female; fore wing with either 2 or 3 submarginal cells.

Abdominal sternite 6 with an apical V-shaped emargination, on each side of which it is somewhat produced (Fig. 259). Subgenital plate (Fig. 264) broad, nearly flat, with at most a very short median elevation at the extreme base, the apex truncate or very broadly rounded. Genitalia (Fig. 196) with the parameres strong, somewhat pointed apically and setose on their outer margins and the apical half dorsally. Digitus narrow at the base, the disc oblong and bent at an angle to the stem, provided with numerous clubbed setae of moderate length. Parapenials stout, nearly straight, much wider than the aedoeagus, which is parallel-sided, unusually slender for this genus.

*Biology*.—This species is usually found in sandy places; it has also been taken on flowers of Queen Anne's lace, cotton, thistle, *Rudbeckia*, and *Eriogonum*, and is a frequent visitor at honeydew. The Peckmans (1898) found it nesting in their melon patch. The prey was found to be *Maevia vittata* (Hentz), a *Phidippus*, and an

*Attus* (all Salticidae). The burrow is oblique, about an inch and a half deep. Spiders stung by *fasciatus* seem to recover frequently, and the Peckhams believe the wasp depends more upon packing the spider tightly into the nest than upon paralysis. They also note the peculiar habit of this wasp of filling up partially excavated burrows which it decides to abandon.

*Distribution.*—This species occurs transcontinentally in the Lower and Upper Austral Zones, from south-central Mexico and southern Florida to southeastern New York, Michigan, Wyoming, and California.

*Specimens seen:* 252 (177 ♀♀, 75 ♂♂). The following records appear to be marginal: NEW YORK: Nassau Co., 1 ♂, Bayville, 6 Sept. [MCZ]; NEW JERSEY: Camden Co., 1 ♀, Clementon, 24 May [MCZ]; MARYLAND: Montgomery Co., 1 ♀, 27 June [MSV]; VIRGINIA: Fairfax Co., 2 ♀♀, Falls Church, July [AMNH, USNM]; NORTH CAROLINA: Dare Co., 10 ♀♀, 6 ♂♂, Kill Devil Hills, 24 May-5 June [KVK]; GEORGIA: Fulton Co., 3 ♀♀, Atlanta, July [USNM, EU]; MICHIGAN: Wayne Co., 1 ♀, Detroit, Sept. [CIS]; IOWA: Story Co., 1 ♀, Ames, 9 June [USNM]; NEBRASKA: Thomas Co., 2 ♀♀, 1 ♂, Halsey, 30 Aug.-3 Sept. [Minn.]; COLORADO: Teller Co., 1 ♀, Florissant, 12 June [MCZ]; UTAH: Duchesne Co., 1 ♀, No. fork Duchesne R., 13 July [CU]; WYOMING: Sweetwater Co., 1 ♀, Green River, 6100 feet, 2 July [AMNH]; NEVADA: Lyon Co., 2 ♀♀, Yerington, 5 July [CU]; CALIFORNIA: Tulare Co., 1 ♀, Lemon Cove, 10 July [CU]; San Joaquin Co., 1 ♀, Stockton, 20 Aug. [CAS]; Contra Costa Co., 3 ♀♀, Antioch, July, Oct. [CIS, CAS]; MEXICO: Baja California, 1 ♀, San Domingo, 23 Oct. [CAS]; Morelos, 1 ♀, Cuernavaca, Apr. [USNM]; Tamaulipas, 1 ♀, Victoria, 15 Mch. [USNM]; FLORIDA: Dade Co., 5 ♀♀, Mch., Apr., Oct. [AMNH, MCZ].

### 3. *Aporinellus bridwelli* new species

This species is closely allied to the preceding, but the male subgenital plate (Fig. 265) possesses a strong carina on its basal half, and the genitalia (Fig. 197) exhibit a number of differences.

FEMALE.—Unknown, or at least not separable at the present time from other members of this species-group.

MALE (Holotype).—Length 6 mm.; fore wing 4.5 mm. Color black, the apical half of the mandibles castaneous, tipped with ferruginous. Wings hyaline, the veins brownish, the outer margin of the fore wing with a brownish band. Head, thorax, propodeum, and legs clothed almost entirely with a heavy silvery pubescence; first 4 abdominal sternites silvery, the first tergite silvery except for a brownish spot in the middle, tergites 2, 3, and 4 with broad apical silvery bands; apical tergite dark.

Clypeus 2.2 times as broad as high. Front strongly convex, broad, the middle interocular distance .65 times the transfacial distance. Inner orbits diverging above, the upper interocular distance 1.15 times the lower interocular. Ocelli in about a right triangle; postocellar line: ocello-ocular line about as 9 : 8. First four antennal segments in a ratio of 9 : 4 : 8 : 9, segment three about twice as long as its greatest thickness.<sup>18</sup> Propodeum rather long, the posterior processes small. Longer spur of the hind tibia .9 the length of the basitarsus. Second submarginal cell of the fore wing 2.4 times as long as high; third submarginal cell wanting.

Abdominal sternite 6 with an apical V-shaped emargination, on each side of which it is slightly produced. Subgenital plate (Fig. 265) nearly flat, but the basal half with a very prominent, sharply elevated median carina; apical margin very broadly rounded. Genitalia (Fig. 197) with the parameres slightly curved, rather slender, the apex narrowly rounded. Digits short and nearly straight, the disc only about twice as wide as the stem, with only some minute setae on the ventral surface, several larger ones on the upper, outer margin. Parapenials more slender than the fairly broad aedeagus.

Five male paratypes vary in length from 5 to 7 mm. There is some variation in the pattern of silvery pubescence on the body; in one specimen there is a patch of pale pubescence on the apical tergite. In two specimens there are three submarginal cells, the third petiolate in one, sessile in the other. The genitalia are very similar in all specimens, but the subgenital plate exhibits considerable variation in shape and in the length of the median carina; the latter is often shorter than in the type, but it is always much more prominent than the small basal elevation of *fasciatus*. Two of the paratypes are lacking heads. In addition to the antennae, the holotype is also lacking the left front leg, the right hind wing, and parts of several tarsi.

*Distribution*.—The known range of this species extends from Kansas and Texas west to Oregon and California.

*Holotype*.—KANSAS: Clay Co., ♂, Aug. 1901 (J. C. Bridwell) [USNM].

*Paratypes*.—TEXAS: Victoria Co., 1 ♂, Victoria, 16 May 1913, on *Stillingia* (J. D. Mitchell) [USNM]; ARIZONA: Pima Co., 1 ♂, Arivaca, 13 July 1950 (R. H. Beamer) [UK]; CALIFORNIA: Inyo Co., 1 ♂, Lone Pine, 13 June 1937 (N. W. Frazier) [CAS]; Riverside Co., 1 ♂, Temecula, 4 July 1950 (E. G. Linsley) [CIS]; OREGON: Klamath Co., 1 ♂, Crater Lake, south rim, 7100 feet, 2 Aug. 1930 (H. A. Scullen) [OSC].

#### 4. *Aporinellus completus* Banks

*Aporinellus fasciatus* Rohwer, 1916, Conn. Geol. Nat. Hist. Survey Bull. 22, p. 631 [*Ver* Smith, 1855; misidentification.]—Britton, 1920, Conn. Geol.

<sup>18</sup> The antennae are missing in the type, and this information is taken from the paratypes.

- Nat. Hist. Survey Bull. 31, p. 335—Dreisbach, 1949, Ent. Amer., 29: 34, pl. I, fig. 1.
- Aporinellus completus* Banks, 1917, Bull. Mus. Comp. Zool., 61: 97. [Type: ♀; Yakima River, Lone Tree, Wash., 30 June 1882; M.C.Z. no. 10,004.]—Banks, 1919, Bull. Mus. Comp. Zool., 63: 240.—Bequaert, 1919, Psyche, 26: 118, 121.—Strickland, 1947, Canad. Ent., 79: 124. [Medicine Hat and Drumheller, Alta.]—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 936.
- Aporinellus basalis* Banks, 1933, Psyche, 40: 3. [Type: ♀; Tempe, Ariz. (J. Bequaert); M.C.Z. no. 17,031.]—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 936. [Erroneously placed in synonymy with *fasciatus* Smith.]

This species was separated from *fasciatus* by Banks on the basis of the complete silvery vestiture. While this is the condition in most specimens from the Pacific Northwest, eastern specimens are much less extensively silvery, and some California specimens are almost wholly dark. Hence one must rely upon morphological characters in separating these species. The male of *completus* is readily recognized by the shape of the subgenital plate, but the female is less readily separated from *fasciatus* by a subtle difference in head shape (Fig. 251 as compared with Fig. 252).

FEMALE.—Length 6.5 (5-8) mm. Color black, except that the mandibles are yellowish-brown in the middle, the apices deep ferruginous or black, and the apical margin of the clypeus sometimes pale. Wings hyaline, the outer margin of the fore wings broadly banded with pale fuscous, the apex of the hind wings lightly infuscated. Body usually extensively clothed with a heavy whitish, glaucous, or somewhat cinereous pubescence; this is replaced by a brownish, much more obscure pubescence at least on the scutellar disc, the apices of the legs, and the last two segments of the abdomen; frequently the vertex, a band just before the posterior margin of the pronotum, the mesonotum, and the bases of abdominal tergites 2, 3, and 4 are also brownish-pubescent; some California specimens have the silvery pubescence very much reduced, as in several other species of *Aporinellus*.

Head (Fig. 251) distinctly broader than high, the transfacial distance varying from 1.15 to 1.2 times the facial distance, the vertex rather flat between the eye-tops. Clypeus about three times as broad as high. Front of variable breadth, the middle interocular distance varying from .56 to .62 times the transfacial distance. Eyes converging slightly above, the upper interocular distance about .85 times the lower. First four antennal segments in a ratio of about 25 : 10 : 32 : 20, the third segment equal to from .7 to .88 times the upper interocular distance. Ocelli in about a right triangle, the postocellar line slightly greater than the ocello-ocular line. Temples

moderately developed, not wider than half the eye in lateral view; front strongly convex. Head about 1.5 times the width of the pronotum.

Propodeal processes short, acute or narrowly rounded. Spines of the tarsal comb long and slender, the one at the apex of the basitarsus about as long as the second tarsal segment. Fore wing with the second submarginal cell (or 2d plus 3d when both are present) from 2 to 2.5 times as broad as high. Third submarginal cell present in about 10% of the specimens, when present much smaller than the second.

MALE.—Length 5.5 (4-6.5) mm. Color black, the mandibles yellowish-brown apically, the tip ferruginous. Wings hyaline, the veins brownish, the apical margin of the fore wing with a brownish band. Body patterned with conspicuous silvery pubescence as in *fasciatus*, except that the apical tergite is without pale markings or pubescence.

Clypeus about 2.5 times as broad as high. Front rather broad, the middle interocular distance averaging about .67 times the transfacial distance. Inner orbits diverging above, the upper interocular distance about 1.2 times the lower. Ocelli in about a right triangle. First four antennal segments in a ratio of about 11 : 5 : 9 : 10, segment three about twice as long as its greatest thickness. Propodeum rather long, the posterolateral processes small, acute. Longer spur of the hind tibia about as long as the basitarsus. Wings as in the female.

Abdominal sternite 6 with a V-shaped apical emargination, the sides of the emargination not produced (Fig. 260). Subgenital plate narrow, strongly keeled, the apex more or less acute, the margins provided with stout setae (Fig. 263). Genitalia (Fig. 198) with the parameres long, slightly curved, setose on the outer margin and the apical third of the dorsal surface. Digitus capitate, the disc about 3 times the breadth of the stem, clothed with a few weak setae toward the upper, outer margin, one or two of which may be clubbed. Parapenials stout, slightly curved; aedeagus simple, rather slender.

*Biology*.—This species is a frequent visitor to honeydew, and has also been taken on wild carrot and on sunflower. There are two host records associated with pinned specimens: (1) a female from San Francisco, Calif., labelled "dragging attid spider backward into nest hole" (F. X. Williams) [CAS]; (2) a female from Oakland, Calif. [CAS] pinned with a specimen of an immature salticid spider, probably of the genus *Habronattus* [det. B. J. Kaston]. It is possible that the Peckhams' observations on *fasciatus* (see under that species) in reality belong to this species.

*Distribution*.—This species occurs transcontinentally, chiefly in the Transition and Upper Austral Zones, with a number of records from the Lower Austral.



*Specimens seen*: 144 (88 ♀♀, 56 ♂♂). The following are marginal records: CONNECTICUT: Hartford Co., 7 ♀♀, 3 ♂♂, East Hartford, 3 Aug.-11 Sept. [HEE]; NEW YORK: Tompkins Co., 1 ♂, Taughanick Falls, 26 July [CU]; MINNESOTA: Clearwater Co., 1 ♂, Itasca Park, 15 July [Minn.]; SOUTH DAKOTA: Fall River Co., 1 ♀, Hot Springs, 9 July [SDS]; ALBERTA: 1 ♂, Drumheller, 14 June [Alta.]; BRITISH COLUMBIA: 1 ♀, Nanaimo, 28 June [CAS]; CALIFORNIA: San Diego Co., 3 ♀♀, San Diego, June-July [Coll. H. A. Hill]; ARIZONA: Cochise Co., 2 ♀♀, Huachuca Mts., June [CAS]; NEW MEXICO: Guadalupe Co., 1 ♂, Cuervo, 23 June [UK]; TEXAS: Brewster Co., 1 ♂, Chisos Mts., 5400 feet, 8-14 July [HEE]; Hidalgo Co., 1 ♂, 28 July [UK]; KANSAS: Riley Co., 18 ♀♀, 9 ♂♂, May-Nov. [HEE, KSC]; VIRGINIA: Fairfax Co., 2 ♀♀, 1 ♂, Dunn Loring, 6 Aug., 5 Sept. [KVK].

### *Apicatus* Species-group

This group includes two more heavy-bodied species, in which in the female the head is only slightly wider than the prothorax. In these species the ocelli form a very broad, flat triangle on the broad vertex (Figs. 250 and 253). There are never more than two submarginal cells, and the second is very long, usually between 2.5 and 3 times as long as high (Fig. 246). In the female the eyes converge but little above, the upper interocular distance varying from .84 to 1.0 times the lower interocular. The propodeal processes are large, somewhat rounded (Fig. 261). The species of this group seem to visit flowers more frequently than those of the preceding two groups.

#### 5. *Aporinellus apicatus* (Banks)

*Aporus apicatus* Banks, 1910, Jour. N. Y. Ent. Soc., 18: 126. [Type: ♂; Claremont, Calif. (Baker); M.C.Z. no. 13,721.]

*Aporinellus apicatus* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 230.—Banks, 1919, Bull. Mus. Comp. Zool., 63: 240.—Bequaert, 1919, Psyche, 26: 122.—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 936.

*Aporinellus laticeps* Banks, 1912, Jour. N. Y. Ent. Soc., 19: 230, 231. [Type: ♀; Boulder, Colo., on *Helianthus pumilus* (S. A. Rohwer); U.S.N.M. no. 20,122.]—Bequaert, 1919, Psyche, 26: 118, 122.

The broad front and vertex, broad ocellar triangle, and short, compact antennae (Figs. 254 and 257) distinguish this species. As in several other species of this genus, most specimens are liberally clothed with silvery pubescence, giving the insect a banded appearance, but females from California usually show a reduction

in the amount of pale pubescence, leaving the abdomen wholly dark-pubescent or with only small patches or bands of silvery pubescence at the apices of the basal tergites.

FEMALE.—Length 7.5 (5.5-10) mm. Color black, the mandibles with a subapical ferruginous band. Wings hyaline or lightly infuscated, the outer margin of the fore wing with a fuscous band, the apex of the hind wing somewhat infuscated. Pubescence varying from almost wholly brownish, silvery only on the front, clypeus, and parts of the pronotum and tibiae, to almost wholly silvery, brownish only on the flagellum, vertex, a band before the posterior margin of the pronotum, anterior half of the mesonotum, disc of scutellum, extremities of legs, bases of abdominal tergites 2, 3, and 4, and all of segments 5 and 6. All possible intermediates between these extremes occur, those with greatly reduced silvery vestiture coming chiefly from California.

Head in anterior aspect subcircular, the transfacial distance about 1.1 times the facial distance. Clypeus about 3 times as broad as high. Front very broad, the middle interocular distance varying from .6 to .68 times the transfacial distance. Eyes converging slightly if at all above, the upper interocular distance varying from .85 to 1.0 times the lower interocular. Ocelli in a very broad, flat triangle, the front angle much greater than a right angle; ocelli small and far apart; postocellar line: ocello-ocular line about as 5 : 4. Antennae (Fig. 257) relatively short, the first four segments in a ratio of about 15 : 5 : 16 : 13, segment 3 about 3.5 or 4 times as long as its greatest thickness, and equal to from .45 to .65 times the upper interocular distance; antennal segments 8 through 11 each about twice as long as thick.

Propodeal processes large, in profile rather broadly rounded (Fig. 261). Tarsal comb strong, the basitarsus with three slender comb-spines, the apical one subequal in length to the second tarsal segment. Legs relatively short and strongly spinose. Fore wing with the marginal cell about three times as long as high; second transverse cubital vein always wanting; second submarginal cell rarely less than 2.5 times as long as high.

MALE.—Length 7 (5-9.5) mm. Color black, the mandibles somewhat castaneous or ferruginous apically. Wings hyaline, the outer margin of the fore wing with a pale fuscous band, the apex of the hind wing somewhat infuscated. Body extensively patterned with conspicuous silvery pubescence, which is distributed as described under *fasciatus*. The apical abdominal tergite is silvery-sericeous, and also possesses a round white spot on the integument, often concealed by the overlapping of the preceding tergite.

Clypeus about 2.3 times as broad as high. Front broad, the middle interocular distance varying from .66 to .74 times the transfacial distance. Inner orbits diverging strongly above, the upper interocular distance about 1.25 times the lower interocular. Ocelli small and far apart, in a broad, flat triangle, the crest of the vertex rather sharp behind the posterior ocelli; head flat behind, the temples not at all developed. First four antennal segments in a ratio of about 5 : 2 : 3 : 4, segment three only

about 1.5 times as long as thick (Fig. 254); segments 9 through 12 each about 1.5 times as long as thick. Pronotum arcuate behind, with a faint suggestion of a median angulation; propodeal processes rounded or subacute apically. Venation as in the female.

Sixth abdominal sternite with a deep V-shaped emargination. Subgenital plate strongly keeled; when flattened out the plate is somewhat rounded apically, not unlike that of *tacniatus*. Genitalia (Fig. 200) with the parameres very strong, somewhat tapering apically, the outer margin and apical fourth of the inner margin rather strongly setose. Digits short, somewhat spatulate, with numerous setae on the disc, a few of which are clubbed. Parapenials somewhat curved, rather stout, but not as wide as the aedeagus, which is of unusual breadth.

*Biology*.—This species appears to visit flowers more frequently than other members of the genus. It has been taken on *Baccharis*, *Chrysothamnus*, *Heterotheca*, *Helianthus*, *Ratibida*, *Sphaeralcea*, *Gossypium*, *Cleome*, *Eriogonum*, *Euphorbia*, and *Tephrosia*. Collection dates vary from April to November in the southern tier of states, suggesting that it may breed continually throughout the warmer months of the year.

*Distribution*.—This species occurs transcontinentally in the Lower and Upper Austral Zones, north to Oregon, southern Alberta, Illinois, and New Jersey; it appears to be much less common east of the 100th meridian.

*Specimens seen*: 117 (80 ♀♀, 37 ♂♂). The following records appear to be marginal: NEW JERSEY: Camden Co., 1 ♀, 24 Aug. [USNM]; NORTH CAROLINA: Wake Co., 1 ♀, 1 ♂, Raleigh, June, Aug. [Coll. N. C. Dept. Agri.]; GEORGIA: DeKalb Co., 1 ♀, Stone Mt., 13 June [EU]; INDIANA: 1 ♀ (no further data) [USNM]; ILLINOIS: Morgan Co., 2 ♂♂, Meredosia, 22 Aug. [OSC]; IOWA: Woodbury Co., 1 ♀, Sioux City, 22 July [USNM]; KANSAS: Riley Co., 2 ♀♀, 1 ♂, Manhattan, Aug.-Sept. [KSC]; ALBERTA: 1 ♂, Medicine Hat, 1 Aug. [CNC]; COLORADO: Boulder Co., 2 ♀♀, Aug. [MCZ, USNM]; UTAH: Tooele Co., 1 ♀, 1 ♂, Skull Valley, 12 Aug. [UAC]; IDAHO: Elmore Co., 1 ♂, Mountain Home, 3138 feet, 13 June [CIS]; OREGON: Deschutes Co., 1 ♀, Redmond, 6 Aug. [OSC]; CALIFORNIA: Lassen Co., 2 ♀♀, Hallelujah Jct., 13 July [CIS]; Contra Costa Co., 6 ♀♀, Antioch, May-Sept. [CAS, CIS]; MEXICO: Baja California, 1 ♀, 20 mi. No. of Mesquital, 27 Sept. [CAS]; Vera Cruz, 1 ♀, 29 Dec. 1940 [CIS]; TEXAS: Victoria Co., 4 ♀♀, 2 ♂♂, Victoria, Apr.-May [USNM]; FLORIDA: Orange Co., 2 ♀♀, Orlando, May, June [JEG. Mass.].

**6. *Aporinellus sinuatus* new species**

The most striking feature of this species is the presence of several long, sinuate hairs at the apex of the digitus volsellaris of the male genitalia, hence the specific name. The males may further be told from *apicatus* by the relatively longer antenna, the third segment of which is only a little shorter than the fourth, and more than 1.5 times as long as thick (Fig. 253). The female is very similar to *apicatus*, but the antennae are notably longer and more slender (Fig. 256 as compared with Fig. 257).

FEMALE (Allotype).—Length 7.2 mm.; fore wing 6 mm. Color black, the apical two-thirds of the mandibles reddish-brown, except the tip black. Wings subhyaline, the outer margin of the fore wing with a light fuscous band, the apex of the hind wing very lightly clouded. Body clothed with conspicuous silvery pubescence as follows: scape; entire head including base of mandibles, except for a streak across the vertex; pronotum except for a band just before the posterior margin; posterior third of mesonotum; sidepieces of the scutellum; metanotum; propodeum; all of the pleura, coxae, and the legs except the extremities; first abdominal tergite except for a portion of the sides; broad bands across the posterior margins of tergites 2, 3, and 4; all of the first four abdominal sternites. The pubescence is elsewhere brownish.

Head (Fig. 250) a little broader than high; clypeus 2.7 times as broad as high; front broad, the middle interocular distance .61 times the transfacial distance. Inner orbits diverging to the middle, then converging very slightly above; middle interocular distance 1.28 times the lower interocular distance; upper interocular distance .93 times the lower interocular. Vertex broad, the ocelli small and far apart, in a broad, flat triangle; postocellar line greater than the ocello-ocular line as 3:2. Antennae long and slender, the first four segments in a ratio of about 30:10:32:31, segment three nearly 5 times as long as its greatest thickness, equal to .73 times the upper interocular distance; antennal segments 9 through 11 each about 3 times as long as thick (Fig. 256).

Propodeal processes large, in lateral aspect rounded apically. Tarsal comb strong, with three comb-spines on the basitarsus, the apical one a little longer than the second tarsal segment. Ultimate tarsal segments not spined beneath. Marginal cell of the fore wing three times as long as high, 1.5 times its own length from the wing-tip. Second submarginal cell three times as broad as high, receiving the first recurrent vein about one-third the distance from the base, the second recurrent about .8 the distance from the base (Fig. 246).

Thirty-one female paratypes vary in size from 7 to 12 mm., the average being 9 mm. In several specimens from California and Lower California the pubescence is in large part dark; on the other hand, specimens from

Idaho and British Columbia have almost the entire body heavily silvery-pubescent except for the last two abdominal segments. In the paratype series, the middle interocular distance varies from .59 to .64 times the transfacial distance; the upper interocular distance varies from .80 to .98 times the lower interocular; antennal segment 3 varies from .64 to .80 times the upper interocular distance; the second submarginal cell varies from 2.4 to 3.1 times as long as high.

MALE (Holotype).—Length 6.5 mm.; fore wing 5 mm. Color black, the apex of the mandibles dull ferruginous, the seventh abdominal tergite with a round white spot. Wings hyaline, the outer margin of the fore wing and the apex of the hind wing lightly clouded. Body clothed with a heavy silvery pubescence as follows: scape; entire head except the vertex; pronotum except for a band just before the posterior margin; posterior half of mesonotum; side-pieces of scutellum; metanotum; propodeum; thoracic pleura, coxae, and legs except the extremities; first abdominal tergite at base, sides, and apex; broad bands along the posterior margins of tergites 2, 3, and 4; seventh tergite; sternites 1, 2, and 3, and a posterior band on 4. The pubescence is elsewhere brownish.

Clypeus 2.2 times as broad as high; front very broad, the middle interocular distance .69 times the transfacial distance; middle interocular distance 1.5 times the lower interocular distance; upper interocular distance 1.25 times the lower. Vertex very broad, the ocelli small and far apart, in a flat triangle; postocellar line: ocello-ocular line as 5:4; lateral ocelli nearer to the crest of the vertex, which is rather sharp, than to the anterior ocellus. First four antennal segments in a ratio of about 25:10:18:20, segment 3 about 1.8 times as long as thick; segments 9 through 11 each about 1.5 times as long as thick. (Dorsal view of head and antennae shown in Fig. 253.) Posterior pronotal margin arcuate, with a faint indication of a median angulation. Middle and hind tarsal claws dentate, but the tooth sloping forward somewhat; front tarsal claws bifid. Wing venation as described under the allotype; second submarginal cell in the type 2.9 times as broad as high.

Abdominal sternite 6 with a large, somewhat U-shaped emargination, on each side of which it is slightly produced. Subgenital plate strongly keeled, very similar to that of *completus*, shown in Fig. 263. Genitalia (Fig. 199) with the parameres rather broad, not acutely pointed apically, with an unpigmented area on the middle inner margin. Digitus volsellaris subspatulate, the disc with numerous setae along the inner margin which are short and clubbed, and on the outer side apically with several much longer, prominently sinuate setae. Parapenials rather stout, slightly curved apically; aedoeagus simple, of moderate breadth.

Twenty-four male paratypes show only very minor variations in pubescence and physical characters. This size varies from 4 to 8 mm., the average 6 mm.

*Biology*.—The type of *sinuatus* was collected by the author on the sandy banks of a small stream, the allotype on honeydew beneath an oak tree in an arroyo. Paratype males have been taken on the flowers of *Melilotus alba* and *Stillingia squiraria*.

*Distribution*.—This species appears to occur transcontinentally in the Lower and Upper Austral Zones, north to New Jersey, Kansas, Montana, and British Columbia. Its range is nearly identical with that of the sibling species *apicatus*, and like that species it is much less uncommon in the western half of the continent.

*Holotype*.—TEXAS: Jeff Davis Co., ♂, Limpia Canyon, Davis Mts., 5000 feet, 14-22 July 1948 (H. E. Evans) [ANSP]. *Allotype*.—TEXAS: Brewster Co., ♀, The Basin, Chisos Mts., 5400 feet, 8-14 July 1948 (H. E. Evans) [ANSP].

*Paratypes*.—NEW JERSEY: Camden Co., 1 ♂, Clementon, 30 May [ANSP]; GEORGIA: Decatur Co., 1 ♂, Bainbridge, 15-27 July [CU]; Gwinnett Co., 1 ♂, Lawrenceville, 10 May [MCZ]; FLORIDA: Pinellas Co., 1 ♂, Clearwater, 29 April [AMNH]; TEXAS: Bexar Co., 1 ♀, 9 May [JEG]; Culberson Co., 1 ♀, Van Horn, 5 June [CIS]; Hood Co., 1 ♀, Cresson, 1 June [USNM]; Uvalde Co., 1 ♀, Sabinal, April [USNM]; Victoria Co., 1 ♂, 16 May [USNM]; KANSAS: Meade Co., 1 ♂, 2500 feet, 10 July [UK]; Morton Co., 1 ♂, 3200 feet [UK]; Reno Co., 1 ♂, 12 Aug. [KSC]; Rooks Co., 1 ♀, 1775 feet, 9 Aug. [UK]; Scott Co., 1 ♂, 17 June [UK]; ARIZONA: Cochise Co., 1 ♀, Douglas, 29 April [USNM]; Pima Co., 1 ♂, Tucson, 14 June [HEE]; 1 ♀, 30 mi. E. of Quijotoa, 28-29 Aug. [CU]; 1 ♂, Santa Catalina Mts., 6 May [CU]; Maricopa Co., 1 ♂, Phoenix, 18 May [HEE]; 1 ♂, Marinette, 6 July [UK]; UTAH: Box Elder Co., 1 ♂, Promontory Point, 31 May [MCZ]; Tooele Co., 1 ♂, Delle, 11 Aug. [UAC]; 9 ♀♀, Skull Valley, 12 Aug. [UAC, HEE]; Uintah Co., 1 ♂, 13 July [CM]; Utah Co., 1 ♀, Lehi, 6 July [UAC]; WYOMING: Teton Co., 1 ♀, Grand Teton Park, July [CIS]; MONTANA: 2 ♀♀, 1 ♂ (no further data) [ANSP]; IDAHO: Gooding Co., 1 ♀, Tuttle, 29 July [USNM]; Twin Falls, 2 ♂♂, Hollister, 13 June, 8 Aug. [USNM]; BRITISH COLUMBIA: 1 ♀, Peachland, 22 July [CNC]; WASHINGTON: Franklin Co., 1 ♂, Pasco [USNM]; OREGON: Wasco Co., 1 ♂, The Dalles, 17 July [OSC]; CALIFORNIA: 1 ♂ (no further data) [USNM]; Kern Co., 1 ♀, Rosamond, 23 July [UK]; Lassen Co., 1 ♂, Hallelujah Jct., 13 July [CIS]; Riverside Co., 1 ♀, Pinon Flat, San Jacinto Mts., 15 June [CAS]; San Bernardino Co., 1 ♀, Cajon Pass, 27 June [CAS]; 1 ♂, 29 Palms, 14 April [CIS]; San Diego Co., 1 ♀, Jacumba, 17 July [UK]; Santa Clara Co., 1 ♀, San Antonio Valley, 14 Sept. [CIS]; Ventura Co., 1 ♀, Ventura, 15 April; MEXICO: Baja California, 2 ♀♀, Mouth of Rio Santelmo, 21 Sept. [CAS]; NO DATA: 1 ♀ [JEG].

XII. Genus **ALLOCHARES** Banks

*Allochares* Banks, 1917, Bull. Mus. Comp. Zool., 61: 98. [Type: *Allochares brucei* Banks, 1917 (= *azurcus* Cresson, 1867); monobasic.]—Bradley, 1944, Trans. Amer. Ent. Soc., 70: 148-150.—Evans, 1950, Trans. Amer. Ent. Soc., 75: 150.—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 936.

Although this genus has certain characters in common with the preceding genus, *Aporinellus*, such as the presence of pointed processes on the propodeum and the absence of basal hooklets in the male genitalia, it was probably derived independently from an early *Pompilus*-like form. It would seem to have no close relatives. However, the shape of the head and the propodeum somewhat suggest *Homonotus*, a highly evolved Old World genus, and it is possible that it is a relict of the old stock which gave rise to this genus. The absence of spines on the legs suggests that it is a non-fossorial genus, but as yet nothing definite is known of its biology.

*Generic characters.*—Small wasps, 7 to 14 mm. in length, the single known species wholly black with bluish or violet reflections. Body in both sexes devoid of all erect hair, except for a small amount on the temples and propleura. Head rather strongly convex in front and somewhat concave behind, more markedly so in the male. Maxillary palpi long and slender. Mandibles pubescent, but without setae, and without a setigerous groove beneath; inner margin with a single weak tooth. Clypeus convex; lower front, below the antennal orbits, flat; upper front strongly convex. Malar space well developed, about or more than half as long as the width of the mandibles at their base; temples not at all developed. Ocelli unusually small, situated in slight depressions.

Pronotum long, on the median line almost or quite as long as the mesonotum; streptaulus complete, the collar small, not elevated; slope of the pronotum behind the collar gradual and even. Postnotum short, transversely linear, widened on the median line. Propodeum with the spiracles removed by not more than their own length from the anterior margin; posterolaterally the propodeum is produced into a sharp, conical process on each side, between which is a strong concavity into which the basal abdominal tergite fits snugly when the abdomen is elevated; median line of propodeum strongly impressed. Legs of the female very smooth, with only a few minute spines at the apices of the tarsal segments laterally, and some barely perceptible spines on the middle and hind tibiae (even the apical tibial spines extremely minute). Legs of the male similar, but with the spines on the tibiae and basitarsi not so minute, the apices of the tibiae with a few unequal, somewhat radiating spines. Claws dentate, the tooth very weak; pulvillar pad of moderate size, but with only a fringe of very minute setulae, the pulvillar

comb thus virtually absent. Fore wing with the stigma small, the marginal cell rather large, less than its own length from the wing-tip. Second and third submarginal cells both four-sided. Basal and transverse median veins of the fore wing interstitial on the media, or nearly so; anal vein of hind wing meeting the media well before the origin of the cubitus; anal lobe small, less than one third the length of the submedian cell.

Abdomen of female stout, short, the first two segments large, the remaining segments usually telescoped rather strongly into these two; apical segment not compressed nor setose, the sting well developed. Abdomen of male also short, the apical segments in resting position telescoped into the first two, which are unusually long. Apical segments somewhat compressed, the subgenital plate strongly so, consisting of two flaps which are folded against one another. Genitalia (Fig. 193) of simple structure, without basal hooklets, the parameres slender, weakly setose.

*Distribution.*—The single known species of this genus is primarily Mexican in distribution, but enters the southern tier of states from California to Florida.

#### 1. *Allochaeres azureus* (Cresson)

*Pompilus (Agenia) azureus* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 131.

[Type: ♀; Vera Cruz, Mexico; A.N.S.P. no. 472.]—Cresson, 1869, Proc. Boston Soc. Nat. Hist., 12: 372.

*Pseudagenia azurea* Kohl, 1884, Verh. zool.-bot. Ges. Wien, 34: 42.—Cameron, 1891, Biol. Centr.-Amer., Hymen. II, p. 167.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 198.

*Pompilus sinaloa* Cameron, 1893, Biol. Centr.-Amer., Hymen. II, p. 192. [Type: ♀; Mazatlan, Mexico; British Mus. (not seen by present writer).]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 323.—Bradley, 1944, Trans. Amer. Ent. Soc., 70: 149. [Present synonymy indicated.]

*Allochaeres bruesi* Banks, 1917, Bull. Bus. Comp. Zool., 61: 98. [Type: ♀; Austin, Texas (C. T. Brues); M.C.Z. no. 10,006.]—Bradley, 1944, Trans. Amer. Ent. Soc., 70: 149. [Present synonymy indicated.]

*Allochaeres azureus* Bradley, 1944, Trans. Amer. Ent. Soc., 70: 149.—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 936.

This unusual species presents no difficulties in identification. Unfortunately we have as yet no information as to its habits.

**FEMALE.**—Length 11 (9-13.5) mm. Color black, rendered by the very fine, velvety pubescence a rather conspicuous dark blue-violet; pubescence of the legs somewhat cinereous, that of the sides of the lower front usually grayish or silvery. Front wings moderately infuscated, with a darker apical band, violaceous; hind wings lightly infuscated, darker apically.

Clypeus about twice as broad as high, its apical margin rounded or sub-truncate. Front narrow or of moderate breadth, the middle interocular



distance varying from .54 to .59 times the transfacial distance; inner orbits slightly convergent above, the upper interocular distance slightly less than the lower. Ocelli in a large triangle; postocellar line: ocello-ocular line about as 3 : 2. Antennae long and slender, the first four segments in a ratio of about 30 : 10 : 42 : 37, segment 3 equal to from .8 to 1.2 times the upper interocular distance.

Posterior pronotal margin arcuate, with a slight angulate notch on the median line. Scutellum prominent. Longer spur of hind tibia about half the length of the basitarsus.

MALE.—Length 8.5 (7-10) mm. Color black; wings hyaline or nearly so, the outer margin of the fore wing and apex of the hind wing narrowly infuscated. Pubescence in large part deep blue-violet, over much of the head and thorax more or less silvery.

Clypeus about 1.8 times as broad as high, its apical margin convexly rounded, the disc strongly convex. Front strongly gibbous above the antennal orbits. Eyes diverging above, the upper interocular distance considerably greater than the lower. Antennae of moderate length, the first four segments in a ratio of about 20 : 10 : 15 : 17, segment 3 from 1.5 to 2 times as long as thick.

Subgenital plate strongly compressed, when flattened out seen to possess an apical V-shaped emargination. Genitalia (Fig. 193) with the parameres slender, sparsely setose; volsellae with a group of strong setae on the basis, some of which are clubbed, the digitus clothed with short setae except near the inner margin.

*Biology*.—This species has been taken on flowers of *Baccharis* and *Solidago* (Compositae).

*Distribution*.—The known range of this species extends from the Mexican states of Jalisco and Vera Cruz north to southern California, Arizona, Texas, Mississippi, Alabama, and Florida.

*Specimens seen*: 46 (30 ♀♀, 16 ♂♂). FLORIDA: Alachua Co., 1 ♂, Gainesville, 7 April [USNM]; Duval Co., 1 ♂, Jacksonville [USNM]; Orange Co., 3 ♀♀, Orlando [CU, USNM]; Seminole Co., 1 ♀, 5 June [USNM]; ALABAMA: 2 ♂♂, (no further data) [USNM]; MISSISSIPPI: Jackson Co., 1 ♀, Ocean Springs, 6 Oct. [USNM]; Lafayette Co., 1 ♀, Oxford [MCZ]; TEXAS: Bexar Co., 3 ♀♀, May, July [JEG]; Brazos Co., 2 ♀♀, 2 ♂♂, Apr.-June, Oct. [JEG]; Brewster Co., 1 ♂, Chisos Mts., June [USNM]; Caldwell Co., 1 ♀, 1 ♂, Maxwell, 16 Apr. [JEG]; Cameron Co., 3 ♀♀, 2 ♂♂, Brownsville, Apr.-June [USNM]; Frio Co., 1 ♀, 28 June [HEE]; Hunt Co., 1 ♂, 8 July [RWC]; Jeff Davis Co., 1 ♀, Limpia Canyon, Davis Mts., July [HEE]; Hidalgo Co., 1 ♀, Edinburg [Minn.]; Lee Co., 1 ♂, Giddings, July [HEE]; Travis Co., 1 ♀, Austin [MCZ]; Uvalde Co., 1 ♀, Sabinal, April [USNM]; ARIZONA: Cochise Co., 1 ♀, Douglas [USNM]; Graham Co., 1 ♀, Thatcher, 8 Aug. [UAC];

Maricopa Co., 2 ♀♀, 1 ♂, Phoenix, May, Oct. [HEE]; Pima Co., 3 ♂♂, Tucson, Sept., Oct. [HEE]; CALIFORNIA: Riverside Co., 1 ♀, Blythe, 2 Aug. [CIS]; MEXICO: 2 ♀♀ (no further data) [ANSP]; Jalisco, 1 ♀, Volcans de Colima [CU]; Sonora, 1 ♀, Dec. [USNM]; Vera Cruz, 1 ♀ [ANSP].

### XIII. Genus **PARACYPHONONYX** Gribodo

*Paracyphononyx* Gribodo, 1884, Ann. Mus. Civ. Stor. Nat. Genova, (2) 1: 306 [Type: *Paracyphononyx melanicus* Gribodo, 1884 (= *ruficrus* Klug, 1834); monobasic.]—Arnold, 1936, Ann. Transvaal Mus., 18: 428-446. [African spp.]—Banks, 1941, Proc. Acad. Nat. Sci. Phila., 92: 352, 354. [Madagascar spp.]—Pate, 1946, Trans. Amer. Ent. Soc., 72: 98.—Evans, 1950, Trans. Amer. Ent. Soc., 75: 149.—Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 936.

*Schistosalius* Saussure, 1892, Grandidier's Hist. Nat. Madagascar, XX, Hymen. I, p. 313. [Type: *Salius ellioti* Saussure, 1892; designated by Ashmead, 1902.]

*Paracyphononyx* Ashmead, 1902, Canad. Ent., 34: 81. [Type: *Paracyphononyx mitchumensis* Magretti, 1884; monobasic.]—Banks, 1934, Proc. Amer. Acad. Arts & Sci., 69: 84, 86. [Philippine spp.]

*Allocyphononyx* Ashmead, 1902, Canad. Ent., 34: 136. [Type: *Pompilus maurus* Cresson, 1857 (= *funcreus* Lepeletier, 1845); monobasic.]—Banks, 1912, Jour. N. Y. Ent. Soc., 19: 222.—Bradley, 1944, Trans. Amer. Ent. Soc., 70: 150-152.—Banks, 1947, Bull. Mus. Comp. Zool., 99: 436-445. [South American spp.]

*Pompiloides* Sustera, 1913, Verh. zool.-bot. Ges. Wien, 62: 180, 203. [*Pro Pompiloides* Radoszkowski, nec Radoszkowski; type stated to be *Pompilus ruficrus* Klug, 1834.]

*Dicyrtomus* Haupt, 1927, Deutsch. Ent. Zeitschr., Beiheft, p. 150, p. 256. [Type: *Pompilus ruficrus* Klug, 1834; original designation.]

The American species of this genus have generally been placed in Ashmead's *Allocyphononyx*, although no one has ever presented valid characters for separating *Allocyphononyx* from the Old World *Paracyphononyx*. In fact, there seem to be none. Bradley considers this group a "strongly diverging element" among the Pompilinae, and has erected the tribe Allocyphonychini for it. While it does appear to have evolved in its own way and to have developed some unusual features, the genus appears to me to fit well enough in the Pompilini. The long malar space, fully exposed labrum, compressed hypopygium of the female, serrate antennae of the male, unusual male subgenital plate, and a number of other characters serve to readily identify this genus.

*Generic characters.*—Medium-sized wasps (6 to 20 mm. in length); our species wholly black, but exotic species often marked with red or yellow. Pubescence variable, but the propodeal declivity, at least in the males, with dense, upright pubescence, which may also be present on parts of the thorax. Head attached rather low on the prothorax, rather thin, the temples not well developed. Mandibles unidentate in both sexes. Labrum fully exposed, convex, semicircular, its median length at least half that of the clypeus. Clypeus convex transversely, its apical margin slightly concave. Malar space well developed, about as long as or longer than the antennal pedicel, at least a third as long as the width of the mandibles at their base. Front feebly convex; vertex not elevated above the eye-tops. Antennae of moderate length, in the female slender, in the male (Fig. 248) with the segments beyond the third produced on the lower side near the base, giving the antenna a weakly serrate profile.

Pronotum rather long, but on the median line shorter than the mesonotum; in profile the slope of the pronotum is seen to be rather steep behind the collar, nearly flat posteriorly. Scutellum prominent, the side-pieces concave. Postnotum a narrow transverse band, slightly expanded dorsally, but narrowly constricted on the mid-dorsal line. Propodeum with the spiracles well removed from the anterior margin, posteriorly with a rather well-defined oblique declivity, the sides of which are sometimes prominent. Legs strongly spinose, but the female without a tarsal comb. Ultimate tarsal segments with or without spines beneath. Claws bifid in both sexes, the inner ray rather broad, truncate; pulvillar comb of from 6 to 12 setulae. Fore wing with the stigma small; radial vein somewhat angled at the third transverse cubital vein. Third submarginal cell always much narrowed above, often triangular, sometimes petiolate. Transverse median vein meeting the media beyond the origin of the basal. Hind wing with the anal vein approximately interstitial with the cubitus. (Wings of our species shown in Fig. 247.)

Abdomen of female stout, subfusiform, apically somewhat compressed, the apical sternite in particular strongly compressed, and this sternite with numerous weak erect setae. Abdomen of male slightly flattened above. Subgenital plate generally somewhat spatulate, provided apically with numerous spines and setae; basally, internally, are located paired, flap-like lobes which are provided with long setae (Fig. 249). Genitalia with the basal hooklets present, single; aedoeagus and parapenials simple; digiti elongate-spatulate, more or less setose. The parameres are the most distinctive feature of the genitalia; these are usually much expanded apically, and the margins are frequently beset with long setae. There appear to be excellent specific characters in the parameres, although the intraspecific variation is also great in some cases. (Genitalia of our species shown in Fig. 194.)

*Biology.*—So far as I know, nothing is known of the biology of members of this genus. Since there seems to be some structural convergence toward the genus *Notocyphus*, it is possible that they

attack certain spiders in their nests and leave them there with the egg attached to the spider, as do the species of *Notocyphus*. The structure of the clypeus and labrum also suggests the subgenus *Anoplochares* of the genus *Pompilus*, which has somewhat similar habits. Since our species is not uncommon throughout most of its range, it is to be hoped that someone will eventually have an opportunity to study its habits.

*Distribution*.—This genus is widely distributed in the warmer parts of the globe; I have seen specimens from all zoogeographic regions. Banks (1947) has treated the Neotropical species, and Arnold (1936) the Ethiopian. Only one species occurs in our fauna.

1. ***Paracyphononyx funereus*** (Lepeletier)

*Anoplius funereus* Lepeletier, 1845, Hist. Nat. des Insectes, Hymen., III, p. 449. [Type: ♂; Philadelphia, Pa.; location not known to present writer.]—J. Smith, 1910, Ann. Rpt. N. J. State Mus. 1909, p. 674.

*Pompilus funereus* F. Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 159.—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 93. [Not identified.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 290.

*Pompilus maurus* Cresson, 1867, Trans. Amer. Ent. Soc., 1: 88. [Type: ♀; West Virginia (no further data); A.N.S.P. no. 414.]—[not] Provancher, 1882, Nat. Canad., 13: 35, 38.—[not] Provancher, 1883, Nat. Canad., 14: 35. [Earlier record from Canada retracted.]—Dalla Torre, 1897, Cat. Hymen., VIII, p. 300.

*Alloocyphonyx maurus* Ashmead, 1902, Canad. Ent., 34: 136. [Made genotype of n. gen. *Alloocyphonyx*.]—Banks, 1917, Bull. Mus. Comp. Zool., 61: 108.—[?] Leonard, 1926, Cornell Agri. Exp. Sta. Memoir 101, p. 985. [Saranac, N. Y.]—Brimley, 1936, Jour. Elisha Mitchell Sci. Soc., 52: 122. [N. C.]—Brimley, 1938, Insects N. Carolina, p. 433.—Bradley, 1944, Trans. Amer. Ent. Soc., 70: 152.—Dreisbach, 1946, Papers Mich. Acad. Sci., Arts. & Letters, 22: 250. [Michigan.]

*Psammochares (Alloocyphonyx) harpalyce* Banks, 1910, Psyche, 17: 250. [Type: ♀; Southern Pines, N. C., 26 July 1909 (A. H. Manee); M.C.Z. no. 13,710.]

*Paracyphononyx funereus* Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 937.

This is a highly variable species. While I have not seen the type, I have little doubt that it is a highly silvery-sericeous specimen of what has usually been called *maurus* Cresson; I have seen such specimens from the vicinity of the type locality.

FEMALE.—Length 15.5 (11-20) mm. Color black; wings wholly fuliginous, violaceous. Pubescence brownish-violaceous, on the occiput and often on the temples and lower front grayish or somewhat silvery. Front, temples, propleura, thoracic dorsum and pleura, coxae, and propodeum with a small amount of short erect hair; abdominal sternites and the apical tergite slightly setose, the hypopygium with numerous erect hairs.

Clypeus about twice as broad as high, its apical margin truncate or very slightly concave. Malar space of moderate length, half or more as long as the width of the mandibles at their base. Front narrow or of moderate breadth, the middle interocular distance varying from .54 to .58 times the transfacial distance. Inner orbits subparallel, the upper and lower interocular distances nearly equal. Antennae with the first four segments in a ratio of usually about 3 : 1 : 5 : 4, segment three equal to from .7 to .9 the upper interocular distance. Postocellar line usually slightly greater than the ocello-ocular line. Front with a short, impressed line in front of the anterior ocellus.

Posterior pronotal margin subangulate. Propodeal declivity short and steep; median line of propodeum lightly if at all impressed. All the tibiae, including the front pair, with prominent long spines; ultimate tarsal segments without spines beneath. Wings as shown in Fig. 247.

MALE.—Length 14.5 (8-19) mm. Color black, the apical abdominal tergite sometimes with a white spot; wings fuliginous, violaceous. Pubescence for the greater part fusco-violaceous, rarely entirely so, usually with at least the occiput and lower front grayish or silvery-pubescent; some specimens are extensively mottled with grayish-silvery pubescence, particularly on the head, pronotum, sides of the scutellum, posterior coxae, basal bands on the basal abdominal tergites, and the apical tergite. The pubescence of the propodeal declivity and disc of the metanotum is always coarse and erect, and varies in color from black to bright silvery.

Head thin, the temples not at all developed. Clypeus about twice as broad as high; malar space a little longer than in the female. Front somewhat swollen just above the antennal bases, rather flat above; inner orbits diverging slightly above. Ocelli forming an obtuse angle in front; postocellar and ocello-ocular lines about equal. Antennae as shown in Fig. 248; first four segments in a ratio of about 3 : 1 : 3 : 3, segment three from 2.5 to 3 times as long as thick. Propodeum with a short, abrupt declivity which is clothed with coarse pubescence.

Abdominal sternite 6 with a broad, shallow emargination. Subgenital plate (Fig. 249) somewhat variable in shape, the internal flaps with long setae, the apex of the plate with dense spines and setae. Genitalia (Fig. 194) with the parameres usually rather broad, fringed rather evenly with sparse long setae, the ventral surface with dense short setae near the base, otherwise bare, the dorsal surface wholly bare. The genitalia appear to show much intraspecific variation, and should not always be expected to agree closely with the figure.

*Biology.*—This is a mid-summer species in the northern parts of its range, but farther south occurs throughout the warmer months of the year. It is most often taken in fields and prairies, though sometimes on sand. Both sexes come frequently to flowers, and have been taken on *Asclepias*, *Ceanothus*, *Condalia*, *Eupatorium*, *Euphorbia*, *Melilotus*, *Prosopis*, *Solidago*, *Stillingia*, and *Tamarix*. Nothing further is known of the habits of this species.

*Distribution.*—This species occurs throughout the Lower and Upper Austral Zones, except in the Pacific states, ranging from Mexico to Utah, South Dakota, Michigan, New York, and Massachusetts.

*Specimens seen:* 350 (175 ♀♀, 175 ♂♂). The following are marginal records: MASSACHUSETTS: Barnstable Co., 1 ♂, Provincetown, 24 June [MCZ]; Bristol Co., 2 ♀♀, Taunton [MCZ]; CONNECTICUT: Hartford Co., 2 ♀♀, East Hartford, 6-13 Sept. [HEE]; NEW YORK: Albany Co., 1 ♀, Albany, 30 July [Mass.]; NEW JERSEY: Burlington Co., 3 ♂♂, Riverton, Aug. [ANSP]; DISTRICT OF COLUMBIA: 1 ♀, 4 ♂♂, Washington, Aug.-Sept. [USNM, MSV]; WEST VIRGINIA: 2 ♀♀ (no further data) [ANSP]; MICHIGAN: Manistee Co., 1 ♀, 24 July 1940 [Coll. R. L. Fischer]; SOUTH DAKOTA: Campbell Co., 1 ♀, Mound City, 24 Aug. [SDS]; COLORADO: 1 ♀, 1 ♂ (no further data) [ANSP]; UTAH: Cache Co., 2 ♀♀, 1 ♂, Aug. [UAC]; ARIZONA: Cochise Co., 1 ♀, 2 mi. SW of Chiricahua, 27 Aug. [ANSP]; MEXICO: Chihuahua, 1 ♀, 2 mi. W. of Matachic, 6400 feet, 7 July [AMNH]; Coahuila, 1 ♂, Buena Vista, Sierra del Carmen, 7 July [JEG]; TEXAS: Kleburg Co., 2 ♂♂, Riviera Beach, 18 June [HEE]; LOUISIANA: 1 ♀, New Orleans [USNM]; FLORIDA: 1 ♂, Key West, March [UK] (and many other Florida records).

#### SPECIES INCERTAE SEDIS

There remain several species which cannot be definitely placed at the present time because of inadequate descriptions and the unavailability of the types. It is possible that some of these are not Pompilini, or that they do not actually occur in the Nearctic region. These are listed below alphabetically, and a few notes are presented under each.

##### 1. *ambiguus* Dahlbom

*Pompilus ambiguus* Dahlbom, 1845, Hymen. Europ., I, p. 452.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 272.

This is an appropriately named species, for not only is the type locality ambiguous ("America"), but the description is of such

a nature as to apply to any of several species of *Anoplus* and *Pompilus*. It is described from a female having a short tarsal comb, triangular third submarginal cell, fusco-hyaline wings with a darker marginal band, and the first two abdominal segments and the base of the third rufous.

2. **bipartitus** Lepeletier

*Pompilus bipartitus* Lepeletier, 1845, Hist. Nat. des Insectes, Hymen., III, p. 439.—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 101.

*Pompilus semipartitus* Dalla Torre, 1897, Cat. Hymen., VIII, p. 321.

This species, described from a female from Philadelphia, is said to be black, with the abdomen entirely testaceo-ferruginous, the wings uniformly fuscous, violaceous, the posterior pronotal margin arcuate, the propodeum with a longitudinal sulcus, the third submarginal cell narrowed toward the radius, the second slightly larger.

3. **ephippiger** Smith

*Pompilus ephippiger* Smith, 1855, Cat. Hymen. Brit. Mus., III, p. 158.—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 99.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 287.

*Lophopompilus* (?) *ephippiger* Regan, 1923, Ann. Ent. Soc. Amer., 16: 179.

This species was described from a female from North America having the anterior margin of the clypeus emarginate, the posterior margin of the pronotum arcuate, the wings dark fuscous with a darker marginal band, and the second and third abdominal segments with broad yellow fasciae which are emarginate apically. I know of no North American pompilid which fits this description.

4. **fiorentinii** Dalla Torre

*Pompilus brevicornis* Taschenberg, 1869, Zeitschr. ges. Naturwis., 34: 50. [Nec Cresson, 1867.]

*Pompilus fiorentinii* Dalla Torre, 1897, Cat. Hymen., VIII, p. 289.

Described from Illinois and Mexico, this species is said to be blue-black, with the propodeum emarginate and bi-dentate posteriorly in the female, the male very similar to *amethystinus* Fabricius but with shorter antennae and the subgenital plate keeled and truncate. If the female specimen is from Mexico and is the holotype, then it is perhaps safe to regard this a synonym of *At-*

*lochaes azureus* (Cresson). Taschenberg's male is apparently something else.

5. **obscurus** Dahlbom

*Pompilus obscurus* Dahlbom, 1845. Hymen. Europ., I, p. 449.—Dalla Torre, 1897, Cat. Hymen., VIII, p. 307.

This species was described from "America"; it is stated to have violaceous wings, the base of the abdomen ferruginous, and the third submarginal cell trapezoidal. Once again one may compliment Dahlbom for the appropriateness of the name he chose, if not for his exceedingly brief description.

ADDENDA

Since the publication of Parts I and II of this study,<sup>19</sup> I have examined a considerable amount of additional material of the genera and species covered in those parts. Many of the specimens represent new locality records, and it seems desirable to make note of several range extensions at this time. A number of new host records are also reported. Since the appearance of Part I, another paper has been published by R. R. Dreisbach,<sup>20</sup> and the several new synonymies created by this paper are also indicated below. In the following outline, the genera and species are considered in the same order as in the main body of Parts I and II, and given the same numbers.

III. Genus **EVAGETES** Lepeletier

The following should be added to the generic synonymy:

*Streptosella* Dreisbach, 1950. Amer. Midl. Nat., 43: 570-574. [Type: *Streptosella steyskali* Dreisbach, 1950 (= *crassicornis crassicornis* Shuckard, 1835); by present designation.<sup>21</sup>] New synonymy.

Having before him three specimens of the widely distributed Holarctic *Evagetes crassicornis* Shuckard, Dreisbach recently

<sup>19</sup> Part I: Trans. Amer. Ent. Soc., 75: 133-270, June, 1950.

Part II: Trans. Amer. Ent. Soc., 76: 207-361, April, 1951.

<sup>20</sup> Dreisbach, R. R., 1950, *New Species in the Genera Anoplius, Pycnopompilus, and Streptosella, n. gen.* (Hymenoptera: Psammocharidae), Amer. Midl. Nat., 43: 570-599.

<sup>21</sup> Dreisbach designated *Streptosella michiganensis* as type of this genus, but failed to include such a species in the genus. Presumably he meant *steyskali*, the only species he had from Michigan.



described the new genus *Streptosella*, making each of the three specimens the type of a new species. While the male genitalia of *crassicornis* are unusually distinctive, this species is in all respects clearly an *Evagetes*. Dreisbach's three species, described on the basis of minor differences in size, in color, and in shape of certain parts of the terminalia, all fall clearly within the range of variation of *crassicornis*.

## 2. *Evagetes parvus* (Cresson)

Mr. W. R. M. Mason, of the Division of Entomology, Department of Agriculture, Ottawa, Canada, recently collected a series of 5 females and 6 males of this species at Norman Wells, Northwest Territories, 20-28 July 1949 [CNC]. This widely distributed form was previously known from Saskatchewan and Yukon, but this record extends the known range still farther north.

### 6a. *Evagetes crassicornis crassicornis* (Shuckard)

The following additions should be made to the synonymy:

*Streptosella steyskali* Dreisbach, 1950, Amer. Midl. Nat., 43: 571-572, 575, figs. 1 and 2. [Type: ♂; Deerfield Township, Lapeer Co., Mich., 4 July 1937 (G. Steyskal); Univ. Michigan (not seen by present author).] New synonymy.

*Streptosella albertensis* Dreisbach, 1950, Amer. Midl. Nat., 43: 571, 572-573, 575, figs. 3 and 4. [Type: ♂; Bilby, Alberta, 20 July 1924 (O. Bryant); M.C.Z. no. 28,390.] New synonymy.

*Streptosella stricklandi* Dreisbach, 1950, Amer. Midl. Nat., 43: 571, 574, 575, figs. 5 and 6. [Type: ♂; Tofield, Alberta,<sup>22</sup> 22 May 1923 (E. H. Strickland); M.C.Z. no. 28,393.] New synonymy.

The situation regarding these three names is discussed under the generic heading. It is possible that *stricklandi* is somewhat intermediate between typical *crassicornis* and the smaller, all-black subspecies *consimilis* (Banks).

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<sup>22</sup> Dreisbach gives "Toticut" as the type locality of this species, but the town of Tofield, Alberta, is clearly indicated on the label of the type.

IV. Genus **AGENIOIDEUS** AshmeadB. Subgenus **AGENIOIDEUS** Ashmead1. **Agenioideus (Agenioideus) humilis** (Cresson)

Two host records not previously reported in this study are as follows: (1) a record by Phil Rau<sup>23</sup> of this wasp taken at Creve Coeur Lake, Mo., with the spider *Epeira globosa* Keys., and (2) a female from Vienna, Va. (J. C. Bridwell) [USNM] pinned with the spider *Epeira pegnia* Walck. [det. B. J. Kaston]. There are now four records of the prey of this species, and in every case it is a spider of the genus *Epeira* (Epeiridae).

C. Subgenus **GYMNOCHARES** Banks1. **Agenioideus (Gymnochares) birkmanni** (Banks)

There is a male of this species in the collection of Dr. H. K. Townes, of Raleigh, N. C., taken by him at Takoma Park, Maryland, 20 June 1943. This is a considerable extension of the range of this species, which was previously known from only two places east of the Mississippi, both in Georgia.

V. Genus **SERICOPOMPILUS** Howard1. **Sericopompilus angustatus** (Cresson)

The occurrence of this species in Florida is confirmed by a specimen from Dunnellon, Fla., taken by D. E. Hardy on 12 July 1939 [UK]. Presumably this species will also be found to occur in other parts of the southeastern states. There is also a specimen in the author's collection from Goshen Co., Wyoming, which represents the first record from this state.

VI. Genus **EPISYRON** Schiødte4. **Episyron oregon** Evans

Two additional specimens of this species have been found in the University of Kansas collections, a female from North Powder, Ore., 13 July 1931 (J. Nottingham), and a female from Trout Creek Pass, Colo., 5 July 1949 (L. D. Beamer). The latter represents the first record from Colorado and the southernmost record from the Rocky Mts.

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<sup>23</sup> Rau, Phil, 1922, Trans. Acad. Sci. St. Louis, v. 24, no. 7, p. 15.

VII. Genus **POECILOPOMPILUS** Howard

The common Mexican and Central American *flavopictus* Smith is now known from a single record to occur in Cameron Co., Texas. While this scarcely qualifies it as a member of the Nearctic fauna, it seems best for the sake of completeness to include it in this study. The range of *flavopictus* overlaps that of *interruptus* Say only to a very limited extent, and it differs from that form in no important structural details. While a revisionary study of the Neotropical species of *Poecilopompilus* is much needed, I shall for the present consider *flavopictus* as a subspecies of *interruptus*.

All the females of *flavopictus* which I have seen have only three basitarsal comb-spines, while the typical number in *interruptus* is four. Except for this character, *flavopictus* will key readily to *interruptus interruptus* in the key to species of *Poecilopompilus* in Part I of this study (p. 238). The following couplet will separate both sexes of *flavopictus* from typical *interruptus*:

Body clothed entirely with a fine pale pubescence which for the most part renders the integument somewhat dull; mesonotum variously colored; propodeum and first abdominal tergite in profile each strongly arched; size: female 14 (11-18) mm., male: 11.5 (8-15) mm.

2a. *interruptus interruptus* (Say)

Body clothed with a pubescence which is very fine and hardly visible for the most part, which scarcely dulls the strongly polished integument; mesonotum black, with a pair of prominent yellow stripes which are usually complete, sometimes also yellow on the sides; propodeum and first abdominal tergite in profile sloping only very slightly; size: female 12 (10-14) mm., male: 10 (8-12) mm.

2c. *interruptus flavopictus* (Smith)2c. *Poecilopompilus interruptus flavopictus* (Smith)

*Pompilus flavopictus* Smith, 1862, Jour. Ent., 1: 396. [Type: ♀; Mexico (no further data); Brit. Mus. (not seen by present author).]—Smith, 1879, Descr. New Species Hymen., p. 158.—Cresson, 1867, Trans. Amer. Ent. Soc., 1: 97.—Cresson, 1869, Proc. Boston Soc. Nat. Hist., 12: 370. [Orizaba, Mex.]—Cameron, 1893, Biol. Centr.-Amer., Hymen. II, p. 210, pl. 11, figs. 27 and 27a. [Mexico (Guerrero, Tabasco, Yucatan), Guatemala, Nicaragua, Costa Rica, Panama.]—Dalle Torre, 1897, Cat. Hymen., VIII, p. 289.

- Batizonus flavopictus* Banks, 1925, Bull. Mus. Comp. Zool., 67: 388. [Panama.]—Banks, 1947, Bull. Mus. Comp. Zool., 99: 378. [Colombia, Surinam.]
- Pocilopompilus flavopictus* Bradley, 1944, Notulae Naturae, Acad. Nat. Sci. Phila., no. 145, p. 10.
- Pocilopompilus interruptus flavopictus* Evans, 1951, U. S. Dept. Agri., Monogr. 2, p. 927.

This distinctive form appears to be relatively constant in coloration; the head, thorax, and propodeum are conspicuously banded with yellow and black, but without ferruginous markings (except on the antennae and legs); the abdomen has alternating yellow and fusco-ferruginous bands. The integument of the head, thorax, and propodeum is strongly polished, particularly on the front and on the mesopleurum. The male terminalia appear to be identical to those of *interruptus interruptus*.

*Specimens seen* from the United States: 1 ♂. TEXAS: Cameron Co., 1 ♂, 3 July 1928 (L. D. Beamer) [UK]. Other specimens before me at this writing are from the Mexican states of Vera Cruz and Yucatan.

#### VIII. Genus **TACHYPOMPILUS** Ashmead

##### 1a. *Tachypompilus ferrugineus ferrugineus* (Say)

During the summer of 1950, two specimens of this form were taken with their prey at Manhattan, Kansas, one inside a barn and one inside a field insectary. In both cases the prey proved to be *Lycosa helluo* Walck. In addition, a specimen from Vienna, Va. [USNM] was found to be pinned with the spider *Lycosa rabida* Walck. [determinations by B. J. Kaston].

##### 2b. *Tachypompilus torridus unicolor* (Banks)

A specimen from Missoula, Montana, collected 11 July 1934 (H. T. Peters) [UK] represents the first record of this form from that state.

#### IX. Genus **ANOPLIUS** Dufour

##### B. Subgenus **NOTIOCHARES** Banks

##### 1b. *Anoplius (Notiochares) amethystinus atramentarius* (Dahlbom)

This common eastern and midwestern form is now known to occur in New Mexico, two males having been taken at Las Cruces on 12 June 1950 by L. D. Beamer [UK].

D. Subgenus **ARACHNOPHROCTONUS** Howard7c. **Anoplius (Arachnophroctonus) americanus juxtus** (Cresson)

A long series of this form has recently been collected by J. W. MacSwain of the University of California at Big Dalton Dam, Los Angeles Co., Calif. (27 ♀ ♀, 35 ♂ ♂, 25 June 1950) [CIS]. I had previously seen relatively few specimens from California. In this series the females are entirely without silvery pubescence, and the rufous coloration extends very slightly if at all to the abdominal sternites. Consequently they key out poorly to *juxtus* in my key to the species and subspecies of *Arachnophroctonus*. I confess that I am unable to present better characters for separating the subspecies of *americanus* at the present time. This is only one of many pompilids which are more or less consistently darker in the coloration of the integument and pubescence in California.

E. Subgenus **POMPILINUS** Ashmead2. **Anoplius (Pompilinus) subcylindricus** (Banks)

A new prey record and a slight range extension may be reported for this species. A female in the U. S. National Museum, from Barcroft, Va., is pinned with a young spider of the genus *Micaria* (Clubionidae) [det. B. J. Kaston]. A male from Arivaca, Arizona, 18 July 1950 (L. D. Beamer) [UK] is the first record from this state.

7. **Anoplius (Pompilinus) californiae** Evans

A specimen of this species collected at Yermo, San Bernardino Co., Calif., 28 April 1949 [CIS] is a gynandromorph. It is essentially a female except for the left front leg, which is entirely male in character; in addition there are patches of silvery pubescence on various parts of the head and thorax not ordinarily present in the female, but suggestive of the extensive silvery pubescence sometimes present in the male.

9. **Anoplius (Pompilinus) tenebrosus** (Cresson)

A specimen of this species taken by J. G. Rozen at Whiteriver, Arizona, 19 June 1950 [UK] is the first record of this widely distributed northern species from the state of Arizona.

15. *Anoplius (Pompilinus) marginatus* (Say)

The following are new host records for this species: (1) a female taken by the author at East Hartford, Conn., 18 Aug. 1950 [HEE] with a female *Habronattus decorus* (Blackwall) (Salticidae); (2) a female from Clifton, Va. (J. C. Bridwell) [USNM] taken with the spider *Trochosa pratensis* (Emerton) [determinations by B. J. Kaston].

SUMMARY AND CONCLUSIONS: THE COMPOSITION, ORIGIN, AND  
PHYLOGENY OF THE NEARCTIC FAUNA OF POMPILINI

It is not altogether customary to conclude a taxonomic paper with a summary, for the keys, descriptions, and discussions which comprise such a treatise are commonly considered to be self-sufficient. From the stand-point of identification, they perhaps are. Yet a taxonomic study ought to have meaning to a person not actually engaged in the identification of specimens, to a person, in fact, who may not even be well acquainted with the group in question. This meaning is, however, apt to be a lost needle in a vast haystack of words unless the systematist makes some effort to assist the reader in finding it. The essence of the problem will, of course, be a consideration of the evolution of the group in question, since systematics is, within the limitations of its techniques, a study of evolution. It may be argued that in many groups of insects (including, surely, the Pompilini) our knowledge is so fragmentary as to preclude the possibility of drawing valid conclusions along these lines. Yet how few insect groups are known as well as the butterflies or the pomace-flies! This need not mean that there is no hope for the taxonomist in other groups, however, for the cautious application of principles discovered in better-known groups may be a profitable way of analyzing one's data. At any rate, on the following pages I have attempted to bring together a few facts relating to the broader aspects of the problem at hand, and to present a few tentative conclusions regarding certain aspects of the evolution of the Nearctic Pompilini.

*Composition of the Nearctic fauna.*—The tribe Pompilini contains 96 known species in the Nearctic fauna, or a total of 124 species and subspecies. Undoubtedly a few species remain to be

discovered, particularly in the Southwest, and undoubtedly further analysis of the fauna will enable future workers, using more refined techniques, to recognize additional subspecies. In all, about 19,000 specimens were examined in the present study, or an average of about 200 specimens per species. As would be expected, some species are abundantly present in most collections of Pompilidae, while others are known from very few specimens. Thus, while I have seen over 1000 specimens of one species, I have seen only one specimen of each of three species. The abundance of a species in collections is, of course, only very roughly indicative of its abundance in nature; however poor a criterion it may be, it is nevertheless almost the only one readily available to the taxonomist for estimating the size of a population.

It may be of interest to note parenthetically that among these 19,000 specimens were discovered five gynandromorphs. This is a rate of 1 per 3800 specimens, or .0263%. While many hymenopterists have described gynandromorphs, there is little information available on the actual per cent of gynandromorphs in a long series of specimens of a tribe or genus. Krombein,<sup>24</sup> in a very interesting paper on gynandromorphs among the Aculeata, states that he has examined approximately 10,000 specimens of the tiphid genus *Mysinum* and seen only one gynandromorph, which would be a percentage of .01% for this genus. I do not attach any particular significance to these figures, but they may serve to illustrate more precisely the very low incidence of gynandromorphs among these insects.

It should be pointed out that the 96 species recognized by the present author represent a very considerable reduction in the number of supposed species in our fauna. A large number of specific names have been placed in synonymy in the present study, largely as a result of three factors. First, it has been recognized that each species has a certain range of variation, which in these wasps is often surprisingly great. Since many of the Pompilini are not highly selective of their prey and use only one spider to stock the nest, it seems likely that much of this variation (in size, at least) is due to differences in food available to the larva. Secondly, a genuine effort has been made to correlate the sexes properly.

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<sup>24</sup> Krombein, K. V., 1949, Proc. U. S. Nat. Mus., 100: 59.

As in many groups of Hymenoptera in which there is a marked sexual dimorphism, there has been a tendency in the past to apply different names to opposite sexes of the same species. In certain groups, particularly *Pompilinus*, considerable work still remains to be done in correlating the sexes. A third factor has been the recognition of the exceedingly broad ranges of many of our species. Some earlier authors have been much inclined to apply different names to virtually identical specimens from different parts of the country, on the assumption that they must be different species. It is now known that 44 species, or 46% of the total, are trans-continental in distribution.

An additional reason for the reduction in the number of species is that a number of them have been reduced to subspecific rank. In the present study 19 species, or 20% of the total, are regarded as polytypic, the remainder as monotypic. As I have already stated, I suspect that future workers will be able to discern additional subspecies, and thus increase the percentage of polytypic species. In the present study, a number of the "varieties" of earlier authors have been reduced to synonymy, since they do not appear to have any definite range. The subspecies now recognized vary all the way from color forms which, however, appear to have a definite geographic range, to forms which differ by morphological features which are sometimes fairly prominent. I have been criticized (*in litt.*) by some hymenopterists for regarding as subspecies certain allopatric forms which, while extremely similar, differ in some details of the male genitalia. If it is true that these slight differences in genitalic structure imply reproductive isolation, then these forms should, of course, be regarded as full species. However, the genitalia of these wasps are by no means lock-and-key devices, and I suspect that the reproductive isolating factors are more often behavioristic than morphological. It is apparent that workers in some other groups of Aculeata regard any form having constant genitalic differences from its relatives, however slight they may be, as being worthy of full specific rank. To my mind, it may in some cases better indicate the relationships involved to regard them as subspecies in spite of minor differences in the male genitalia, although in such cases the forms in question may well be approaching the specific level.



The 96 Nearctic species are regarded by the present author as falling into 13 genera, or a total of 25 genera and subgenera. The average is therefore 7.4 species per genus, or slightly less than 4 per subgenus. Three genera contain, in our fauna, but one species; three genera contain two species; two genera contain three species; one genus contains five species; two contain six species; one genus (*Pompilus*) contains 21 species; and one genus (*Anoplus*) contains 43 species. If the number of genera is plotted against the number of contained species, the hollow curve of Willis<sup>25</sup> is approached surprisingly closely for so small a group.

Again, thirteen represents a large reduction in the number of genera previously recognized in this tribe. This perhaps requires little explanation, the genus being the intangible thing that it is. It may be worth pointing out, however, that the genus is commonly conceived as a unit representing a certain level of evolutionary distinctness. It seems to me poor practice to regard the genus as merely a device for grouping species for identification's sake. Dreisbach,<sup>26</sup> for example, expresses this view, and defines a genus simply as "a group of species which can be separated in both sexes by means of external, easily discernible characters". This author, while defining the Pompilini (Psammocharini) more narrowly than I have done, and omitting several groups, recognizes 25 genera in the Nearctic fauna. To my mind, it is fallacious to give equal rank to such groups, for example, as *Episyrus* and *Pompilinus*. The former is a discrete genus by any definition, but the latter merges into *Arachnophroctonus* on one hand, and is sometimes difficult to separate from *Anoplus* on the other. If the generic category is to have any phylogenetic significance at all, an effort must be made to apply it to stocks of approximately equal value as far as apparent degree of discreteness is concerned. Groups of lesser value may then be regarded as subgenera, and those of still less value as species-groups.

*Origins of the Nearctic fauna.*—If one examines the ranges of the various genera and subgenera of Pompilini, it soon becomes

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<sup>25</sup> Willis, J. C., 1922, *Age and Area*, p. 195.

<sup>26</sup> Dreisbach, R. R., 1949, *Ent. Amer.*, 29: 4.

apparent that each presents a distinct facies with regard to distribution and relationships. In general, these distribution patterns may be classified as one of three types. First of all, there are those groups which are predominantly northern in distribution, ranging southward principally in the mountain systems; these for the most part have their closest relatives in Eurasia, and their distribution may be termed *Holarctic*. Secondly, there are those groups of essentially southern distribution, which range northward for the most part along the coasts and the major river systems, and which have their closest relatives in the tropics. These may be termed simply the *Tropical* element. The members of the third group, which may be called the *Sonoran* element, seem to have no close relatives either to the south or to the north; these forms are especially characteristic of the arid regions of the Southwest. It is logical to make certain deductions from these distribution patterns regarding the origins of these various elements in our fauna. This has been done in a number of other groups of insects, and the conclusions reached here do not differ radically from those reached by workers in several other groups.<sup>27</sup>

The largest number of Nearctic Pompilini are rather clearly *Holarctic* in their affinities. In all, nine genera or subgenera come in this category: *Evagetes*, *Agenioideus* (*s. str.*), *Episyrion*, *Lophopompilus*, *Pompilinus*, *Anoplius* (*s. str.*), *Ammosphex*, *Arachnospila*, and *Anoplochares*. These groups include a total of 57 species, or 59% of the fauna. Several of the groups have a few representatives in the Neotropical region, but in all cases the center of distribution is decidedly northern, and each of the groups is well represented in Eurasia. This similarity between the faunas of North America and Eurasia is by no means surprising, since it is believed that a Siberia-Alaska land bridge existed through a considerable part of the Coenozoic. Presumably most or all of the Holarctic elements entered our fauna by way of Siberia and Alaska.

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<sup>27</sup> See, for example, several papers published in the Proc. 6th Pacific Science Congress, v. 4, 1940, particularly E. C. VanDyke's *The Origin and Distribution of the Coleopterous Insect Fauna of North America* (pp. 255-268), and C. D. Michener's *The Distributional History of North American Bees* (pp. 297-303). While neither of these authors considers the Sonoran element of equal rank with the Holarctic and the Tropical, it is interesting to note that VanDyke considers the Sonoran fauna as derived chiefly from the neotropics, while Michener ranks it as a subregion of the Nearctic, and feels that it contains more elements of northern origin than of southern.

Three species of Pompilini, *Evagetes crassicornis crassicornis*, *Anoplius (Anoplius) nigerrimus*, and *Pompilus (Arachnospila) fumipennis fumipennis*, occur both in Eurasia and in northern North America. It seems possible that these forms may have entered our fauna postglacially. Another group of species may be singled out as differing from their nearest Eurasian relatives only in minor characters such as color, size, pilosity, and details of the genitalia; in this group would fall such forms, for example, as *Evagetes crassicornis consimilis*, *Anoplius (Anoplius) basalis*, *Pompilus (Arachnospila) fumipennis eureka*, and *Pompilus (Ammosphex) luctuosus*. These forms are for the most part somewhat less boreal than the first group, and may represent a somewhat earlier wave of migrants from Eurasia, perhaps during the last interglacial period. Still other species, of which *Evagetes parvus*, *Anoplius (Anoplius) virginianensis*, and *Pompilus (Arachnospila) arctus* might be cited as examples, differ in a larger number of characters from their nearest Eurasian relatives, and occur slightly farther south. A still further echelon of species includes such forms as *Evagetes hyacinthinus*, *Anoplius (Anoplius) ventralis*, *Pompilus (Ammosphex) solonus*, and others, which are predominantly Austral in distribution. A final group includes such forms as *Anoplius (Anoplius) fulgidus*, now predominantly tropical in distribution, although clearly of Holarctic origin.

It seems apparent, then, that the Holarctic members of our fauna have entered at various times within recent geological epochs, each wave of migrants over the Siberia-Alaska land bridge having been pushed southward progressively by successive periods of glaciation, the species of each echelon coming to differ progressively from their nearest Eurasian relatives and to become progressively adapted to a warmer climate. While these generalizations seem relatively safe, it is more difficult, if not impossible, to deduce the time at which any given species entered our fauna, or even to state which species belong to any specific wave of migration.

The remaining 41% of our species are much more southerly in their general distribution and show few if any affinities to the Eurasian fauna. This group falls readily into two components: those having few or no relatives in Central and South America,

and hence rather uniquely characteristic of the Sonoran subregion of the Nearctic region, and those groups having many representatives in the Neotropical region. The latter group, or *Tropical* element, makes up 25% of our fauna, and may be subdivided into the *tropicopolitan* element and the strictly *neotropical* element. The former includes *Ridestus*, *Gymnochaeres*, *Pocillopompilus*, *Tachypompilus*, *Arachnophroctonus*, *Aporinellus*, and *Paracyphononyx*; these are groups occurring throughout the tropics of the world, which were probably cosmopolitan during the warmer parts of the Tertiary, having later been compressed into the tropics by Pleistocene glaciation. The latter, or *neotropical* element, includes two subgenera of *Anoplius*, *Notiochaeres* and *Anopliodes*, groups which apparently developed in South America during its period of separation from North America in the Tertiary, since these groups are strictly Neotropical except for a few species which have invaded the southern parts of North America. As in the Holarctic fauna, one may perceive among the Tropical elements a number of apparent waves of migration, in this case northward. Several species range as far north as Canada, for example, *Anoplius* (*Arachnophroctonus*) *relativus* and *Aporinellus taeniatus*, while others, such as *Anoplius* (*Anopliodes*) *parsonsi*, barely reach the southern extremities of the United States. This is probably not so much an indication of the time of migration as of the degree of adaptive temperature-tolerance attained by these forms during the successive cold periods of the Pleistocene, during which they were alternately compressed into the tropics and allowed to extend their ranges northward.

In many ways the most interesting part of our fauna is the remaining 16%, the apparently endemic *Sonoran* element. To this group belong the following seven genera or subgenera: *Tastiotenia*, *Chalcochaeres*, *Sericopompilus*, *Hesperopompilus*, *Xerochaeres*, *Perissopompilus*, and *Allochaeres*. Three of these are monotypic, and all seven together contain only 15 species. It is characteristic of these forms that they have no close relatives either to the south or to the north. Apparently they represent relicts of an earlier fauna which has been able to survive recurrent periods of glaciation and the competition of more highly evolved forms by becoming somewhat localized in the desert regions of the south-

western United States and northern Mexico. The only one of these seven groups which is known to occur outside the Sonoran subregion of the Nearctic region is *Sericopompilus*, which also occurs in Australia. In our fauna the species of *Sericopompilus* are relatively widespread, but their focal point is clearly in the Southwest. The other groups are all known from a few relatively uncommon species which are mostly southwestern in distribution. Certain of these genera, particularly *Tastiotenina* and *Chalcochares*, appear to have many primitive characteristics, as described in the text. It is these relict genera which are of most interest from a phylogenetic standpoint, but unfortunately it is just these groups which are least known at the present time. Next to nothing is known regarding the biology of any of the genera composing this faunal element.

*Phylogeny of the Nearctic Genera.*—Any discussion of phylogeny based on a limited fauna and without paleontological data is unlikely to yield much in the way of valid conclusions. Nevertheless, I should like to bring together in this section a number of suggestions made in the text regarding the possible relationships of some of our genera. The accompanying chart (Plate XV) presents these suggestions in the form of a phylogenetic tree, which should be regarded as highly tentative. A full-scale consideration of the phylogeny of the Pompilini must await a more thorough understanding of the fauna of several zoogeographic regions and a comprehensive study of the classification of the family as a whole.

Certain of the Sonoran genera mentioned above suggest themselves as possibly close to the ancestral stock of the Pompilini. *Tastiotenina* is known only from the female sex, and must be regarded as of very doubtful phylogenetic position. *Chalcochares* is somewhat better known, and has a number of primitive characteristics, including a rather broad hind wing with an unusually large anal lobe. The rather short legs and antennae and the heavy, hairy body may also be primitive characters, though the reason for considering them so is not altogether clear, unless it is merely that they suggest some of the Scolioidea which may possibly be ancestral to the Pompilidae as a whole. We might envisage our ancestral pompilid ("Ancestor B" in Plate XV) as a primitive scolioid having somewhat the aspect of *Chalcochares*, giving rise

to the subfamily Pepsinae through such a genus as, for example, *Chirodamus*, and to the Pompilinae through *Chalcochaeres*. The genus *Psorthaspis* (here placed in the Aporini) appears to be related to *Chalcochaeres*, and may be derived from it. In the Pompilini, some species of *Evaetes*, especially *ingenuus*, have certain characters in common with *Chalcochaeres*, particularly the slight constrictions between the abdominal segments, the appendiculate submedian cell of the hind wing, the bluish vestiture, short antennae, etc. From *Evaetes*, which possesses a fully developed tarsal comb, the remainder of the tribe can perhaps be accounted for with less difficulty, since both *Agenioideus* and *Hesperopompilus* show some similarities to *Evaetes*, and from these genera in turn a considerable number of other groups may be derived rather logically.

Certain defects in this hypothesis must, however, be pointed out (other than the obvious one that the evidence in favor of it is extremely slim). Although the biology of *Chalcochaeres* is unknown, both *Evaetes* and *Psorthaspis* have somewhat specialized behavior-patterns, the members of the former group being parasites of other Pompilini, those of the latter group being predators on trap-door spiders. Furthermore, from our ancestral pompilid it is necessary to derive the Ceropalinae, the most distinctive group in the family, which undoubtedly split off very early from the main stock of the Pompilidae. Yet *Ceropales* and its allies appear to have almost nothing in common with *Chalcochaeres* or with our hypothetical ancestor. Rather than to elaborate upon this theory further, or to abandon it altogether, I should like to suggest an alternate possibility.

Under the discussion of *Agenioideus* in the text (Part I, p. 189), I have suggested several reasons for suspecting that this widely distributed, protean genus may have affinities with the tribe Auplododini in the Pepsinae. The species of *Agenioideus* are typical spider-hunters, nesting in the ground or in niches of various sorts, as we might imagine our ancestral pompiline did. Although many of the Auplododini build mud nests, others appear to nest in niches much as do the members of the subgenus *Gymnochaeres* of the genus *Agenioideus*. There is also the interesting Neotropical genus *Priochilus*, which uses leaf fragments

in constructing its nest, and which morphologically seems to be somewhat intermediate between the Pompilinae and the Pepsinae. The genus *Tastiotenina* might be accounted for as a relict of an early pompiline-auplopodine type. Not only might the Ceropalinae be more easily derived from such a stock, but certain genera usually placed in the Auplopodini have recently been transferred by Townes<sup>28</sup> to the Ceropalinae, indicating perhaps that there is no great morphological gulf between these two groups.

If we accept the hypothesis that *Agenioideus* is allied to the Auplopodini and more or less ancestral to the remainder of the Pompilini, it is logical to conclude that the ancestral pompilid ("Ancestor A" in Plate XV) was a slender, long-legged, smooth-bodied insect, not at all like "Ancestor B" and probably more like a rhopalosomatid than a scolioid. Indeed, Arnold<sup>29</sup> and Reid<sup>30</sup> have included in the Pompilidae certain genera which are almost certainly Rhopalosomatidae. Curiously, Reid compares one of these genera, *Olixon*, to *Homonotus*, one of the most highly evolved of the Pompilidae, when in all probability it is related to the ancestral stock of this family. The similarity of the male genitalia of *Olixon* to those of *Rhopalosoma* was noted long ago. The genitalia of *Homonotus* have almost nothing in common with those of *Olixon*, although the genitalia of *Ceropales* are in some ways more similar to those of *Olixon* than to those of most Pompilidae. To derive the Pompilidae from the Rhopalosomatidae is, however, of little help in relating the pompilids to other Aculeata, since the rhopalosomatids are themselves a decidedly isolated group, perhaps derived from some primitive bethyloid type.

In any event, it ultimately makes relatively little difference within the tribe Pompilini whether we start from ancestor A and *Agenioideus* or ancestor B and *Evagetes*. These are both

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<sup>28</sup> Townes, H. K., 1951, U. S. Dept. Agri., Monogr. 2, p. 919. Townes transfers *Minagenia* to the Ceropalinae. While I am not sure that I entirely agree with Townes in this placement of *Minagenia*, at least his action illustrates the point in question.

<sup>29</sup> Arnold, G., 1935, Ann. Transvaal Mus., 15: 471-483. [Genus *Psyllosphex* Arnold.]

<sup>30</sup> Reid, J. A., 1939, Proc. Royal Ent. Soc. London (B) 8: 95-102.

relatively unspecialized genera, and they share certain characteristics in common, such as the poorly developed pulvillar pad and comb, dentate claws throughout, etc. It seems likely that they are in some way related, and either might conceivably have been derived from the other. From *Agenioideus* probably was derived the rather similar *Sericopompilus*, and from this genus in turn the two epeirid-hunting genera *Episyron* and *Pocilopompilus*; these three genera form a closely-knit generic complex, having several characteristics in common, as described under *Sericopompilus* in the text (Part I, p. 202).

Forming another line of ascent, either by way of *Agenioideus* or *Evagetes*, is a group of genera and subgenera which may collectively be called the *Pompilus*-complex. *Hesperopompilus* appears to have a number of characters in common with both *Evagetes* and *Agenioideus*, such as the poorly developed pulvillar comb, the frequently bluish vestiture, short antennae in the males, slender appendages and delicate build of the body, etc. *Hesperopompilus* and *Pompilus s. str.* agree in a number of characters, most noteworthy of which are the peculiar tufts at the base of the male subgenital plate. This character is shared by the genus *Aporinellus*, which is probably a specialized offshoot of this same stock. From *Hesperopompilus* may also be derived the other subgenera of *Pompilus*, culminating in *Anoplochaes*, which has lost the tarsal comb and become somewhat specialized in its behavior-patterns.

The largest and most successful offshoot of the *Pompilus*-complex is the large genus *Anoplius* with its numerous subgenera. Of these, *Arachnophroctonus* appears to be most generalized and most *Pompilus*-like, and may have served as the stock from which the other subgenera arose. One subgenus, *Anoplius s. str.*, has lost the tarsal comb, and some of the species have acquired rather specialized habits. *Anoplius s. lat.* is one of the largest genera of the entire family in the Americas, having probably over 100 species in North and South America. *Tachypompilus* is a cosmopolitan genus of uncertain origins, but the bifid claws of the male suggest a possible relationship to *Anoplius*.

The position of the genus *Allochaes* is very uncertain. It seems to have been derived from some early *Pompilus*-like stock, and



may possibly be a relict of the stock which gave rise to the Old World genus *Homonotus* and its allies, since it shows some resemblances to that group. The genus *Paracyphononyx* is also uncertain in position. The superficial resemblance of this genus to *Notocyphus* leads me to suspect that it may exhibit convergence in structure and in habits to that genus, which is known to attack certain spiders in their nests and oviposit upon them *in situ*. Nothing is actually known of the biology of either *Paracyphononyx* or *Allochares*. Indeed, we know so little about the biology of so many critical groups in the Pompilidae that I venture to suggest that more can now be learned about the phylogeny of this family from field studies than from further analysis of the comparative external structure of these wasps.

The foregoing discussion, for the sake of brevity, is not fully documented as to the reasons behind many of the supposed relationships. In most cases, these reasons are discussed under the various genera and subgenera in the text. The highly tentative nature of these phylogenetic conclusions cannot be stated too forcibly. If it be argued that my phylogenetic tree is an exceedingly weak one and apt to be blown over in an early storm (which I admit)—then at least I have provided two trunks for its better support!

#### EXPLANATION OF FIGURES

Note: In all figures of male genitalia, the ventral aspect is shown on the left half of the figure, the dorsal aspect on the right. Numbering of the figures is continuous from Parts I and II of this study.

#### PLATE VI

- Fig. 171.—*Pompilus (Pompilus) plumbeus* (Fabricius), male genitalia.  
 Fig. 172.—*P. (Xerochares) expulsus* Schulz, male genitalia.  
 Fig. 173.—*P. (Hesperopompilus) jacintocensis* Evans, male genitalia.  
 Fig. 174.—*P. (H.) orophilus* Evans, male genitalia.  
 Fig. 175.—*P. (H.) exagetoides* new species, male genitalia.  
 Fig. 176.—*P. (H.) boharti* new species, male genitalia.

## PLATE VII

- Fig. 177.—*P. (Perissopompilus) phoenix* Evans, male genitalia.  
 Fig. 178.—*P. (P.) phoenix* Evans, sixth abdominal sternite of male.  
 Fig. 179.—*P. (Ammosphex) parvulus* (Banks), male genitalia.  
 Fig. 180.—*P. (A.) anomalus* (Dreisbach), male genitalia.  
 Fig. 181.—*P. (A.) angularis* (Banks), male genitalia.  
 Fig. 182.—*P. (A.) imbecillus* (Banks), male genitalia.

## PLATE VIII

- Fig. 183.—*P. (A.) solonus solonus* (Banks), male genitalia.  
 Fig. 184.—*P. (A.) solonus silvagus* new subspecies, male genitalia.  
 Fig. 185.—*P. (A.) michiganensis michiganensis* (Dreisbach), male genitalia.  
 Fig. 186.—*P. (A.) michiganensis dakota* (Dreisbach), male genitalia.  
 Fig. 187.—*P. (A.) occidentalis* (Dreisbach), male genitalia.  
 Fig. 188.—*P. (A.) luctuosus* Cresson, male genitalia.

## PLATE IX

- Fig. 189.—*P. (Arachnospila) fumipennis* Zetterstedt, male genitalia.  
 Fig. 190.—*P. (A.) scelestus* Cresson, male genitalia.  
 Fig. 191.—*P. (A.) arctus* Cresson, male genitalia.  
 Fig. 192.—*P. (Anoplochares) apicatus* Provancher, male genitalia.  
 Fig. 193.—*Allochares azurcus* (Cresson), male genitalia.  
 Fig. 194.—*Paracypphonyx fumercus* (Lepelletier), male genitalia.

## PLATE X

- Fig. 195.—*Aporinellus taeniatus* (Kohl), male genitalia.  
 Fig. 196.—*A. fasciatus* (Smith), male genitalia.  
 Fig. 197.—*A. bridwelli* new species, male genitalia.  
 Fig. 198.—*A. completus* Banks, male genitalia.  
 Fig. 199.—*A. sinuatus* new species, male genitalia.  
 Fig. 200.—*A. apicatus* (Banks), male genitalia.

## PLATE XI

- Fig. 201.—*Pompilus (Pompilus) plumbeus* (Fabricius), male subgenital plate.  
 Fig. 202.—*P. (Hesperopompilus) jacintocensis* Evans, male subgenital plate.  
 Fig. 203.—*P. (H.) orophilus* Evans, male subgenital plate.  
 Fig. 204.—*P. (H.) boharti* new species, male subgenital plate.  
 Fig. 205.—*P. (H.) exagctoides* new species, male subgenital plate.  
 Fig. 206.—*P. (Xerochares) expulsus* Schulz, male subgenital plate.  
 Fig. 207.—*P. (Perissopompilus) phoenix* Evans, male subgenital plate.  
 Fig. 208.—*P. (Ammosphex) angularis* (Banks), male subgenital plate.  
 Fig. 209.—*P. (A.) parvulus* (Banks), male subgenital plate.  
 Fig. 210.—*P. (A.) anomalus* (Dreisbach), male subgenital plate.  
 Fig. 211.—*P. (A.) michiganensis michiganensis* (Dreisbach), male subgenital plate.  
 Fig. 212.—*P. (A.) michiganensis dakota* (Dreisbach), male subgenital plate.

## PLATE XII

- Fig. 213.—*P. (A.) imbecillus* (Banks), apex of male abdomen.  
 Fig. 214.—*P. (A.) michiganensis michiganensis* (Dreisbach), apex of male abdomen.  
 Fig. 215.—*P. (A.) luctuosus* Cresson, apex of male abdomen.  
 Fig. 216.—*P. (A.) occidentalis* (Dreisbach), apex of male abdomen.  
 Fig. 217.—*P. (A.) solonus solonus* (Banks), apex of male abdomen.  
 Fig. 218.—*P. (A.) solonus silticragus* new subspecies, apex of male abdomen.  
 Fig. 219.—*P. (Arachnospila) scelestus* Cresson, apex of male abdomen.  
 Fig. 220.—*P. (A.) fumipennis* Zetterstedt, apex of male abdomen.  
 Fig. 221.—*P. (A.) arctus* Cresson, apex of male abdomen.  
 Fig. 222.—*P. (Anoplochares) apicatus* Provancher, apex of male abdomen.  
 Fig. 223.—*P. (A.) similis* (Banks), male subgenital plate.  
 Fig. 224.—*P. (Ammosphex) luctuosus* Cresson, hind basitarsus and tibial spurs of female.  
 Fig. 225.—*P. (A.) occidentalis* (Dreisbach), hind basitarsus and tibial spurs of female.  
 Fig. 226.—*P. (Pompilus) plumbeus* (Fabricius), inner side of last segment of front tarsus of male.  
 Fig. 227.—*P. (Hesperopompilus) jacintoensis* Evans, inner side of last segment of front tarsus of male.  
 Fig. 228.—*P. (Xerochaes) expulsus* Schulz, inner side of last segment of front tarsus of male.  
 Fig. 229.—*P. (Ammosphex) michiganensis* (Dreisbach), inner side of last segment of front tarsus of male.  
 Fig. 230.—*P. (Arachnospila) arctus* Cresson, inner side of last segment of front tarsus of male.  
 Fig. 231.—*P. (Anoplochaes) apicatus* Provancher, upper side of last segment of front tarsus of male.  
 Fig. 232.—*P. (Arachnospila) scelestus* Cresson, last segment of hind tarsus of female.  
 Fig. 233.—*P. (Ammosphex) michiganensis* (Dreisbach), clypeus of female.  
 Fig. 234.—*P. (A.) anomalus* (Dreisbach), clypeus of female.  
 Fig. 235.—*P. (A.) imbecillus* (Banks), clypeus of female.  
 Fig. 236.—*P. (A.) luctuosus* Cresson, clypeus of female.

## PLATE XIII

- Fig. 237.—*P. (Perissopompilus) phoenix* Evans, wings.  
 Fig. 238.—*P. (P.) perfasciatus* new species, wings.  
 Fig. 239.—*P. (Ammosphex) solonus* (Banks), wings.  
 Fig. 240.—*P. (A.) michiganensis* (Dreisbach), wings.  
 Fig. 241.—*P. (Arachnospila) scelestus* Cresson, wings.  
 Fig. 242.—*P. (Anoplochaes) similis* (Banks), marginal and second and third submarginal cells of fore wing.

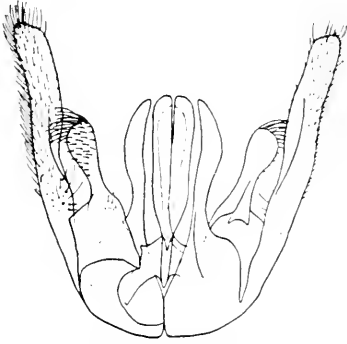
- Fig. 243.—*Aporinellus fasciatus* (Smith), marginal and second and third submarginal cells of specimen having three submarginal cells.  
 Fig. 244.—*A. fasciatus* (Smith), wings of a specimen having only two submarginal cells.  
 Fig. 245.—*A. taeniatus* (Kohl), marginal and second submarginal cells of fore wing.  
 Fig. 246.—*A. sinuatus* new species, marginal and second submarginal cells of fore wing.  
 Fig. 247.—*Paracyphononyx funereus* (Lepeletier), wings.  
 Fig. 248.—*P. funereus* (Lepeletier), antenna of male.  
 Fig. 249.—*P. funereus* (Lepeletier), male subgenital plate.

## PLATE XIV

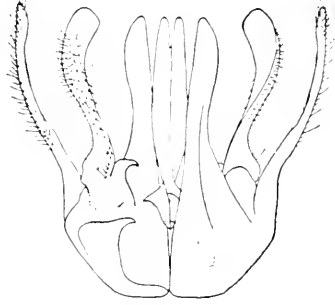
- Fig. 250.—*Aporinellus sinuatus* new species, head of female.  
 Fig. 251.—*A. completus* Banks, head of female.  
 Fig. 252.—*A. fasciatus* (Smith), head of female.  
 Fig. 253.—*A. sinuatus* new species, dorsal view of head and antenna of male.  
 Fig. 254.—*A. apicatus* (Banks), basal five segments of antenna of male.  
 Fig. 255.—*A. taeniatus* (Kohl), apical segment of hind tarsus of female.  
 Fig. 256.—*A. sinuatus* new species, antenna of female.  
 Fig. 257.—*A. apicatus* (Banks), antenna of female.  
 Fig. 258.—*A. fasciatus* (Smith), lateral view of propodeum of female.  
 Fig. 259.—*A. fasciatus* (Smith), apical margin of sixth abdominal sternite of male.  
 Fig. 260.—*A. completus* Banks, apical margin of sixth abdominal sternite of male.  
 Fig. 261.—*A. apicatus* (Banks), lateral view of propodeum of female.  
 Fig. 262.—*A. taeniatus* (Kohl), male subgenital plate.  
 Fig. 263.—*A. completus* Banks, male subgenital plate.  
 Fig. 264.—*A. fasciatus* (Smith), male subgenital plate.  
 Fig. 265.—*A. bridwelli* new species, male subgenital plate.

## PLATE XV

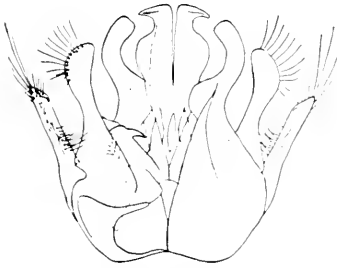
Chart suggesting possible relationships and phylogeny of the Nearctic genera of Pompilini. The line of dashes leading from Ancestor "A" represents one possible origin of the tribe; the dash-dot line leading from Ancestor "B" represents an entirely different theory of origin. These two types of lines should therefore be read separately, and not simultaneously. Solid lines apply to either theory.



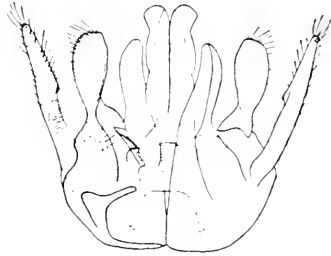
171. POMPILUS PLUMBEUS



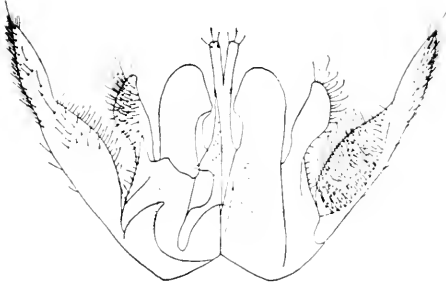
172. P. EXPULSUS



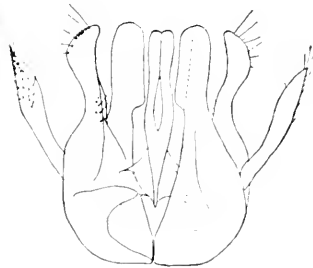
173. P. JACINTOENSIS



174. P. OROPHILUS



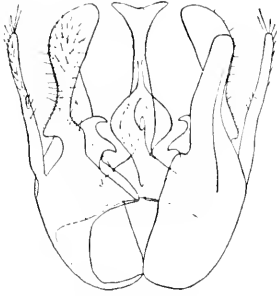
175. P. EVAGETOIDES



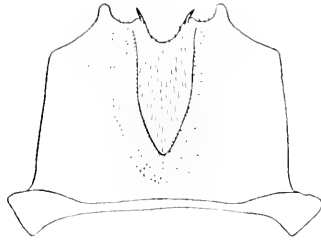
176. P. BOHARTI

EVANS—NEARCTIC SPIDER WASPS

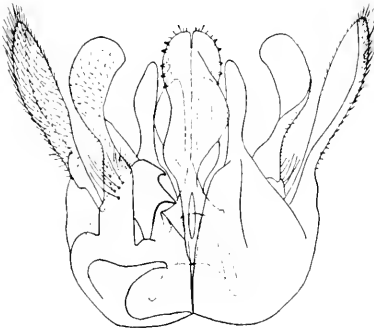




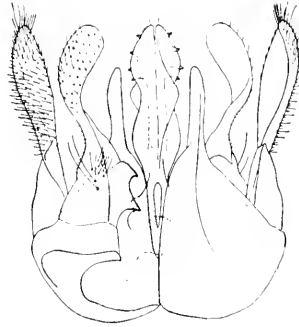
177. POMPILUS PHOENIX



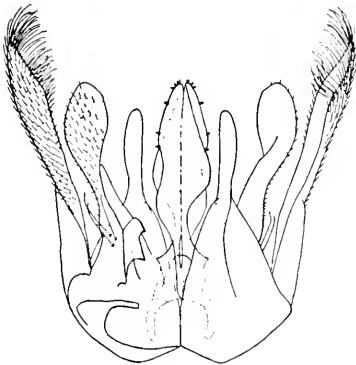
178 P. PHOENIX



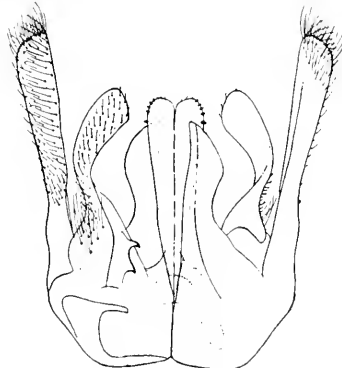
179. P. PARVULUS



180 P. ANOMALUS



181. P. ANGULARIS



182. P. IMBECILLUS

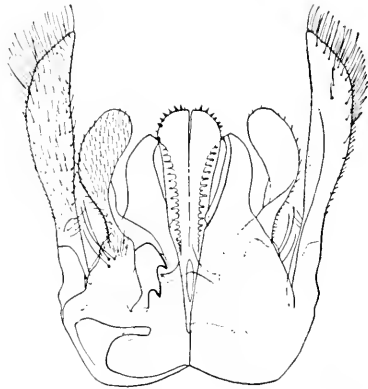
EVANS—NEARCTIC SPIDER WASPS



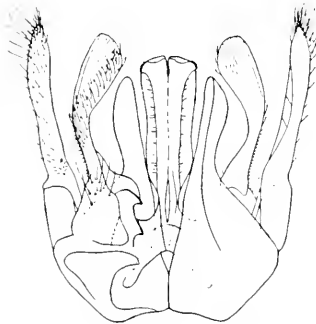




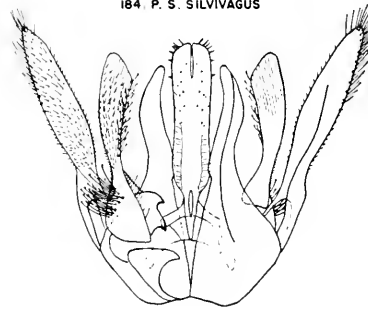
183. *POMPILUS SOLONUS SOLONUS*



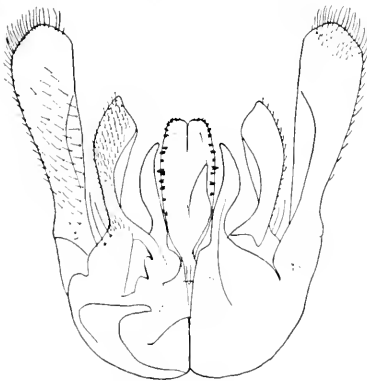
184. *P. S. SILVIVAGUS*



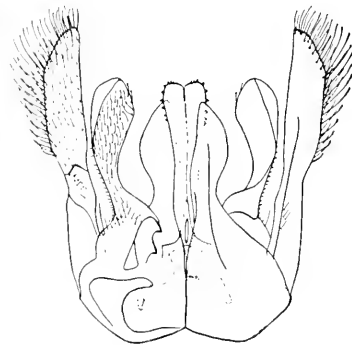
185. *P. MICHIGANENSIS MICHIGANENSIS*



186. *P. M. DAKOTA*



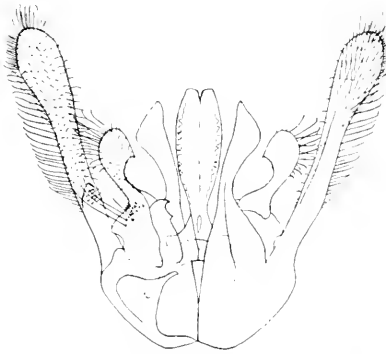
187. *P. OCCIDENTALIS*



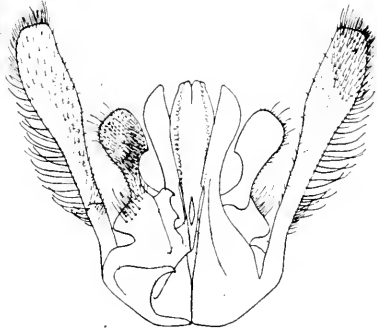
188. *P. LUCTUOSUS*

EVANS—NEARCTIC SPIDER WASPS

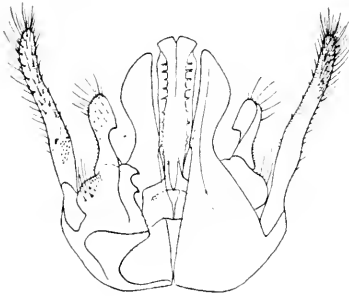




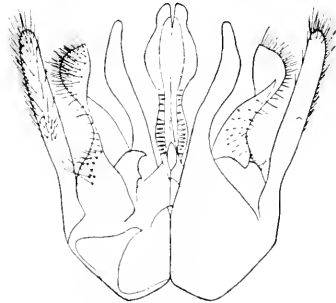
189 *POMPILUS FUMIPENNIS*



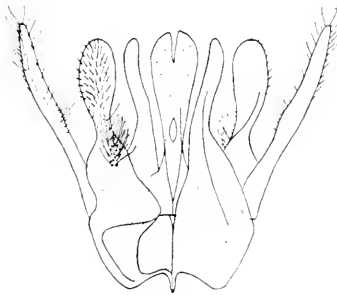
190. *P. SCELESTUS*



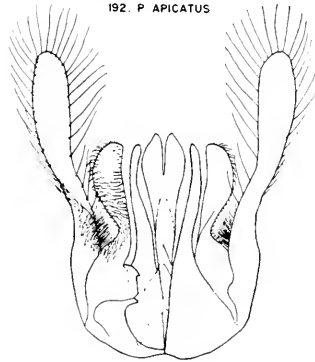
191 *P. ARCTUS*



192. *P. APICATUS*



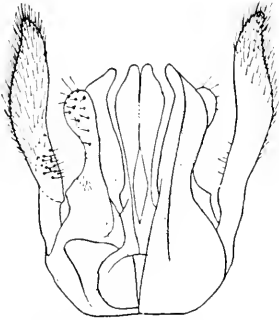
193 *ALLOCHARES AZUREUS*



194 *PARACYPHONONYX FUNEREUS*

EVANS—NEARCTIC SPIDER WASPS

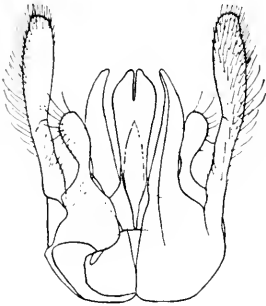




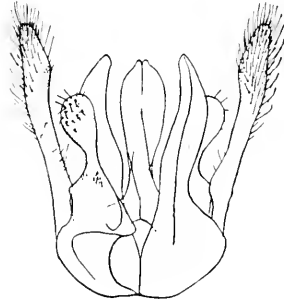
195. APORINELLUS TAENIATUS



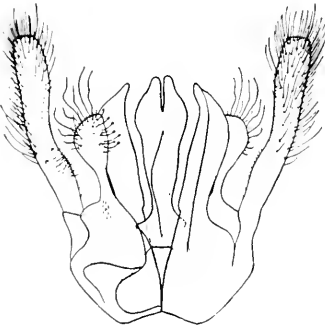
196. A. FASCIATUS



197. A. BRIDWELLI



198. A. COMPLETUS



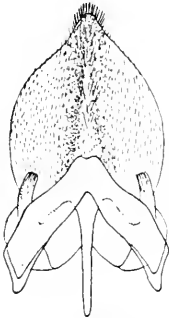
199. A. SINUATUS



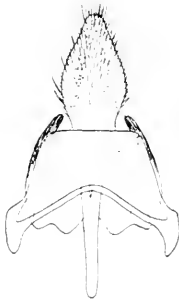
200. A. APICATUS

EVANS—NEARCTIC SPIDER WASPS

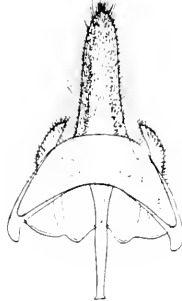




201 POMPILUS PLUMBEUS



202 P JACINTOENSIS



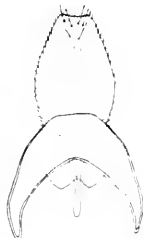
203. P. OROPHILUS



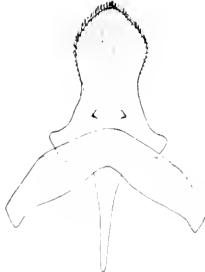
204 P BOHARTI



205 P EVAGETOIDES



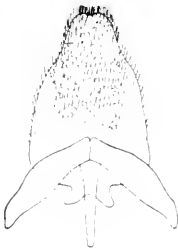
206 P EXPULSUS



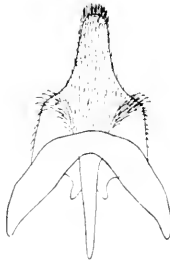
207 P PHOENIX



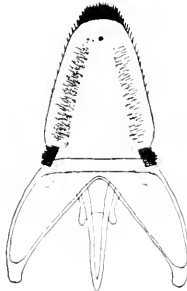
208 P ANGULARIS



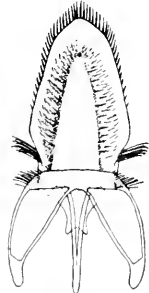
209 P PARVULUS



210. P ANOMALUS



211 P M MICHIGANENSIS



212 P M DAKOTA

EVANS—NEARCTIC SPIDER WASPS







213. POMILUS IMBECILLUS



214. P. MICHIGANENSIS



215. P. LUCTUOSUS



216. P. OCCIDENTALIS



217. P. S. SOLONUS



218. P. S. SILVIVAGUS



219. P. SCELESTUS



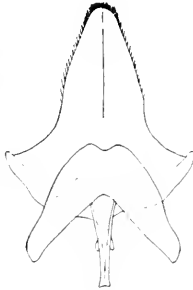
220. P. FUMIPENNIS



221. P. ARCTUS



222. P. APICATUS



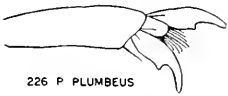
223. P. SIMILARIS



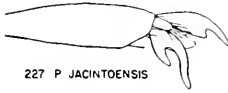
224. P. LUCTUOSUS



225. P. OCCIDENTALIS



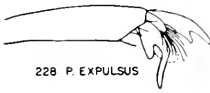
226. P. PLUMBEUS



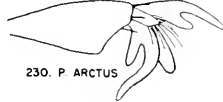
227. P. JACINTOENSIS



229. P. MICHIGANENSIS



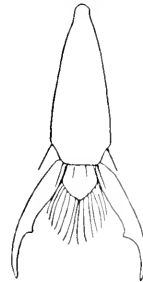
228. P. EXPULSUS



230. P. ARCTUS



231. P. APICATUS



232. P. SCELESTUS



233. P. MICHIGANENSIS



234. P. ANOMALUS



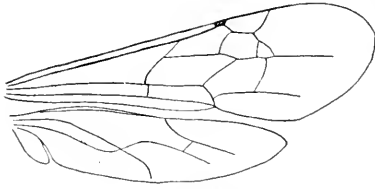
235. P. IMBECILLUS



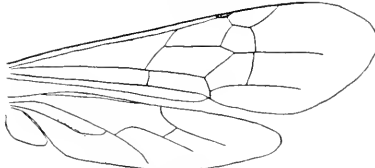
236. P. LUCTUOSUS

EVANS—NEARCTIC SPIDER WASPS

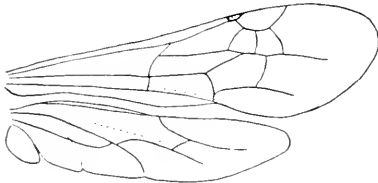




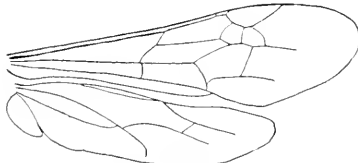
237. POMPILUS PHOENIX



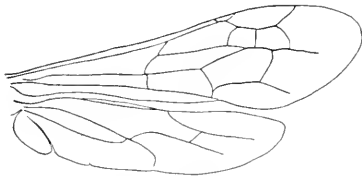
238. P. PERFASCIATUS



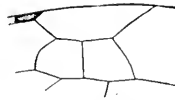
239. P. SOLONUS



240. P. MICHIGANENSIS



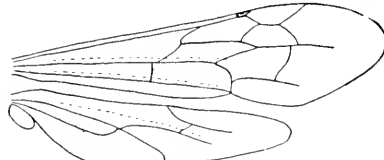
241. P. SCELESTUS



242. P. SIMILARIS



243. APORINELLUS FASCIATUS



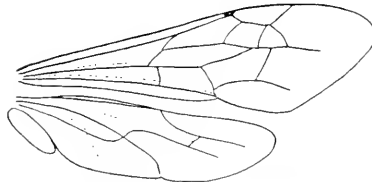
244. A. FASCIATUS



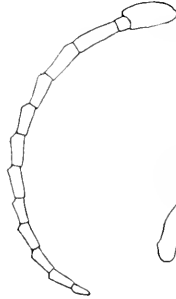
245. A. TAENIATUS



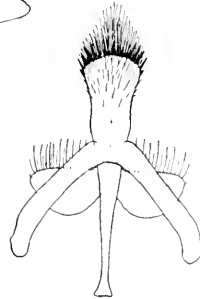
246. A. SINUATUS



247. PARACYPHONYX FUNEREUS



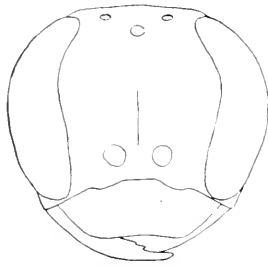
248. P. FUNEREUS



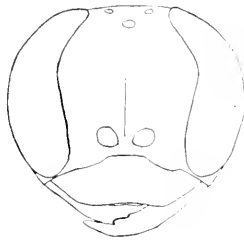
249.

EVANS—NEARCTIC SPIDER WASPS

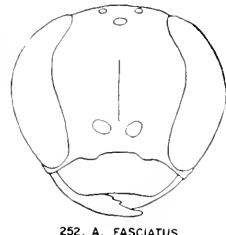




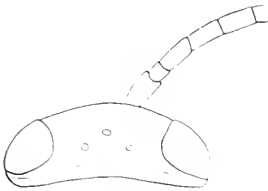
250. APORINELLUS SINUATUS



251. A. COMPLETUS



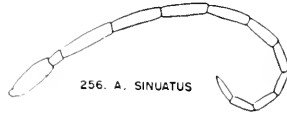
252. A. FASCIATUS



253. A. SINUATUS



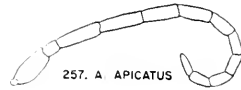
254. A. APICATUS



256. A. SINUATUS



255. A. TAENIATUS



257. A. APICATUS



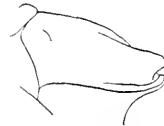
258. A. FASCIATUS



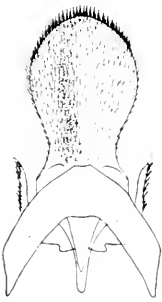
259. A. FASCIATUS



260. A. COMPLETUS



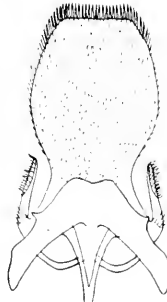
261. A. APICATUS



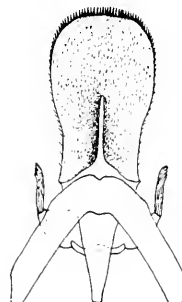
262. A. TAENIATUS



263. A. COMPLETUS

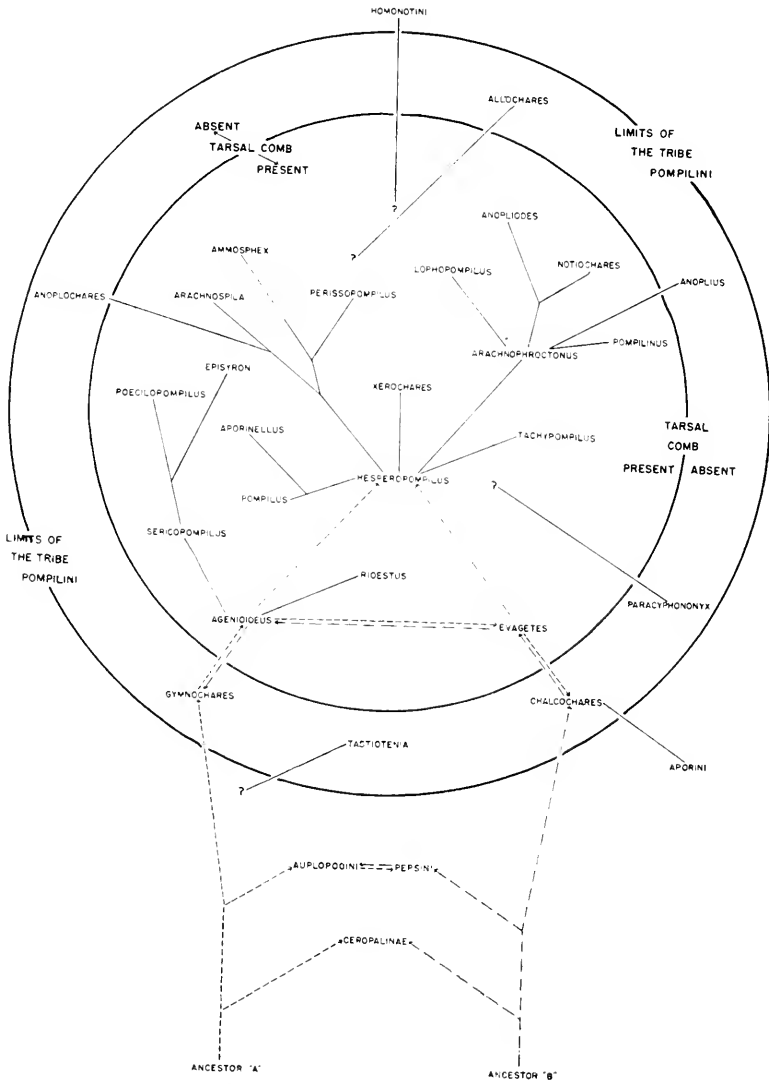


264. A. FASCIATUS



265. A. BRIDWELLI





EVANS—NEARCTIC SPIDER WASPS





## CHECK-LIST

The following is a listing of the genera and species of Nearctic Pompilini in the order in which they were considered in this study. The same numbering is used, and references to the volume and pages of the Transactions on which each was described or discussed are included.

### TRIBE POMPILINI Fox, 1894. 75: 147-150.

- I. Genus *Tastiotenia* Evans, 1950. 75: 150-152.
  1. *festiva* Evans, 1950. 75: 152-153.
- II. Genus *Chalcochares* Banks, 1917. 75: 153-155.
  1. *engleharti* (Banks), 1939. 75: 155-158.
  2. *hirsutifemur* (Banks), 1914. 75: 158-159.
- III. Genus *Evagetes* Lepelletier, 1845. 75: 159-167; 77: 310.
  1. *ingenuus* (Cresson), 1867. 75: 167-170.
  2. *parvus* (Cresson), 1865. 75: 170-174; 77: 311.
  3. *padrinus*
    - a. *padrinus* (Viereck), 1902. 75: 174-176.
    - b. *minusculus* (Banks), 1910. 75: 176-177.
  4. *hyacinthinus* (Cresson), 1867. 75: 177-182.
  5. *subangulatus* (Banks), 1919. 75: 182-184.
  6. *crassicornis*
    - a. *crassicornis* (Shuckard), 1835. 75: 184-187; 77: 311.
    - b. *consimilis* (Banks), 1912. 75: 187-189.
- IV. Genus *Agenioideus* Ashmead, 1902. 75: 189-191.
  - A. Subgenus *Ridestus* Banks, 1912. 75: 191-192.
    1. *biedermani* (Banks), 1910. 75: 192-195.
  - B. Subgenus *Agenioideus* Ashmead, 1902. 75: 195-196.
    1. *humilis* (Cresson), 1867. 75: 196-198; 77: 312.
  - C. Subgenus *Gymnochares* Banks, 1917. 75: 198-199.
    1. *birkmanni* (Banks), 1910. 75: 199-201; 77: 312.
- V. Genus *Sericopompilus* Howard, 1901. 75: 202-205.
  1. *angustatus* (Cresson), 1865. 75: 205-207; 77: 312.
  2. *apicalis* (Say), 1835. 75: 207-210.
  3. *neotropicalis* (Cameron), 1893. 75: 210-213.
- VI. Genus *Episyron* Schiødte, 1837. 75: 213-217.
  1. *quinquenotatus*
    - a. *quinquenotatus* (Say), 1835. 75: 217-221.
    - b. *hurdi* Evans, 1950. 75: 221-223.

2. *posterus* (Fox), 1893. 75: 223-226.
  3. *biguttatus*
    - a. *biguttatus* (Fabricius), 1798. 75: 226-229.
    - b. *californicus* (Banks), 1910. 75: 229-230.
  4. *oregon* Evans, 1950. 75: 231-233; 77: 312.
  5. *snoxi* (Viereck), 1906. 75: 233-236.
- VII. Genus *Poecilopompilus* Howard, 1901. 75: 236-240; 77: 313.
1. *algidus*
    - a. *algidus* (Smith), 1855. 75: 240-243.
    - b. *marcidus* (Smith), 1862. 75: 243-245.
    - c. *coquilletti* (Provancher), 1889. 75: 245-247.
  2. *interruptus*
    - a. *interruptus* (Say), 1835. 75: 247-251; 77: 313.
    - b. *ressoni* (Banks), 1944. 75: 251-253.
    - c. *flacopictus* (Smith), 1862. 77: 313-314.
- VIII. Genus *Tachypompilus* Ashmead, 1902. 75: 253-257.
1. *ferrugineus*
    - a. *ferrugineus* (Say), 1824. 75: 257-260; 77: 314.
    - b. *nigrescens* (Banks), 1944. 75: 260-261.
    - c. *burrus* (Cresson), 1869. 75: 262-263.
    - d. *yacapai* Evans, 1950. 75: 263-264.
  2. *torridus*
    - a. *torridus* (Smith), 1862. 75: 264-266.
    - b. *unicolor* (Banks), 1919. 75: 266-268; 77: 314.
- IX. Genus *Anoplius* Dufour, 1834. 76: 207-212.
- A. Subgenus *Lophopompilus* Radoszkowski, 1887. 76: 212-215.
    1. *acthiops* (Cresson), 1865. 76: 215-218.
    2. *cleora* (Banks), 1917. 76: 218-220.
    3. *carolinus* (Banks), 1921. 76: 220-222.
    4. *atrox* (Dahlbom), 1844. 76: 222-225.
    5. *bengtssoni* (Regan), 1923. 76: 225-226.
  - B. Subgenus *Notiochares* Banks, 1917. 76: 226-229.
    1. *amethystinus*
      - a. *amethystinus* (Fabricius), 1793. 76: 229-231.
      - b. *atramentarius* (Dahlbom), 1844. 76: 231-234; 77: 314.
  - C. Subgenus *Anopliodes* Banks, 1939. 76: 234-236.
    1. *parsonsi* (Banks), 1944. 76: 236-238.
    2. *holli* Banks, 1917. 76: 238-240.
  - D. Subgenus *Arachnophroctonus* Howard, 1901. 76: 240-246.
- Marginalis* Species-group
1. *bellicosus* (Banks), 1912. 76: 246-248.
  2. *relativus* (Fox), 1893. 76: 248-252.
  3. *xerophilus* Evans, 1947. 76: 253-255.
  4. *marginalis* (Banks), 1910. 76: 255-258.

*Apiculatus* Species-group5. *apiculatus*

- a. *apiculatus* (Smith), 1855. 76: 259-262.
- b. *autumnalis* (Banks), 1914. 76: 262-263.
- c. *pretiosus* (Banks), 1910. 76: 263-264.

6. *semirufus* (Cresson), 1867. 76: 264-267.*Americanus* Species-group7. *americanus*

- a. *americanus* (Beauvois), 1805. 76: 267-271.
- b. *trifasciatus* (Beauvois), 1805. 76: 271-272.
- c. *juxtus* (Cresson), 1865. 76: 273-275; 77: 315.

8. *moestus* (Banks), 1912. 76: 275-277.E. Subgenus *Pompilius* Ashmead, 1902. 76: 277-284.*Subcylindricus* Species-group

- 1. *grandiflexionis* Evans, 1950. 76: 284-286.
- 2. *subcylindricus* (Banks), 1917. 76: 286-288; 77: 315.
- 3. *percitus* Evans, 1950. 76: 289-290.
- 4. *texanus* (Dreisbach), 1949. 76: 290-291.
- 5. *krombeini* Evans, 1950. 76: 292-293.

*Cylindricus* Species-group

- 6. *cylindricus* (Cresson), 1867. 76: 294-297.
- 7. *californiae* Evans, 1948. 76: 297-299; 77: 315.
- 8. *estellina* (Banks), 1914. 76: 299-301.
- 9. *tenebrosus* (Cresson), 1865. 76: 301-304; 77: 315.
- 10. *insolens* (Banks), 1912. 76: 304-306.
- 11. *clystera* (Banks), 1914. 76: 307-309.
- 12. *rectangularis*
  - a. *rectangularis* (Dreisbach), 1949. 76: 309-310.
  - b. *gillaspayi* Evans, 1951. 76: 310-311.
- 13. *stenotus*
  - a. *stenotus* (Banks), 1914. 76: 311-312.
  - b. *bequaerti* (Dreisbach), 1949. 76: 312-313.
- 14. *townesi* Evans, 1951. 76: 313-315.
- 15. *marginatus* (Say), 1824. 76: 315-319; 77: 316.
- 16. *splendens* (Dreisbach), 1949. 76: 320-322.
- 17. *fraternus* (Banks), 1941. 76: 322-325.

F. Subgenus *Anoplius* Dufour, 1834. 76: 325-330.*Nigerrimus* Species-group

- 1. *nigerrimus* (Scopoli), 1763. 76: 330-333.
- 2. *depressipes* Banks, 1919. 76: 333-336.
- 3. *ithaca* (Banks), 1912. 76: 336-339.
- 4. *fulgidus* (Cresson), 1865. 76: 339-341.
- 5. *virginiensis* (Cresson), 1867. 76: 341-344.
- 6. *hispidulus* Dreisbach, 1950. 76: 344-346.
- 7. *basalis* Dreisbach, 1950. 76: 346-348.

*Illinoensis* Species-group

8. *imbellis* Banks, 1944. 76: 348-350.
  9. *illinoensis* (Robertson), 1901. 76: 350-353.
  10. *centralis*
    - a. *centralis* (Banks), 1910. 76: 353-355.
    - b. *tarsatus* Banks, 1919. 76: 355-357.
- X. Genus *Pompilus* Fabricius, 1798. 77: 203-208.
- A. Subgenus *Pompilus* Fabricius, 1798. 77: 208. (Not Nearctic)
  - B. Subgenus *Hesperopompilus* Evans, 1948. 77: 209-211.
    1. *rufopictus* Evans, 1948. 77: 211-212.
    2. *jacintocensis* Evans, 1948. 77: 212-214.
    3. *orophilus* Evans, 1947. 77: 214-216.
    4. *boharti* Evans, 1951. 77: 216-217.
    5. *evagctoides* Evans, 1951. 77: 217-218.
  - C. Subgenus *Xerocharax* Evans, 1951. 77: 218-219.
    1. *expulsus* Schulz, 1906. 77: 219-221.
  - D. Subgenus *PcrissoPompilus* Evans, 1951. 77: 222-223.
    1. *phoenix* Evans, 1948. 77: 223-225.
    2. *per fasciatus* Evans, 1951. 77: 225-226.
  - E. Subgenus *Animosphex* Wilcke, 1942. 77: 227-231.
 

*Angularis* Species-group

    1. *angularis* (Banks), 1910. 77: 232-234.
    2. *parvulus* (Banks), 1912. 77: 234-237.
    3. *anomalus* (Dreisbach), 1950. 77: 237-239.

*Luctuosus* Species-group

    4. *solonus*
      - a. *solonus* (Banks), 1914. 77: 239-241.
      - b. *silvicagus* Evans, 1951. 77: 241-242.
    5. *michiganensis*
      - a. *michiganensis* (Dreisbach), 1949. 77: 243-245.
      - b. *dakota* (Dreisbach), 1950. 77: 245-246.
    6. *imbecillus*
      - a. *imbecillus* (Banks), 1939. 77: 247-249.
      - b. *ojibwaec* Evans, 1951. 77: 249-250.
    7. *luctuosus* Cresson, 1865. 77: 250-253.
    8. *occidentalis* (Dreisbach), 1950. 77: 253-255.
  - F. Subgenus *Arachnospila* Kincaid, 1900. 77: 255-258.
    1. *arctus* Cresson, 1865. 77: 258-261.
    2. *scelestus* Cresson, 1865. 77: 261-265.
    3. *funipennis*
      - a. *funipennis* Zetterstedt, 1838. 77: 265-267.
      - b. *eureka* (Banks), 1919. 77: 267-269.
  - G. Subgenus *Anoplochares* Banks, 1939. 77: 269-271.
    1. *apicatus* Provancher, 1882. 77: 271-273.
    2. *similaris* (Banks), 1919. 77: 274-275.

- XI. Genus *Aporinellus* Banks, 1911. 77: 275-281.  
*Taeniatus* Species-group  
1. *taeniatus*  
a. *taeniatus* (Kohl), 1886. 77: 282-284.  
b. *wheeleri* Bequaert, 1919. 77: 284-285.  
c. *semirufus* Banks, 1929. 77: 285-286.  
d. *baboquivari* Evans, 1951. 77: 286-287.  
e. *rufus* Banks, 1912. 77: 287-288.  
*Fasciatus* Species-group  
2. *fasciatus* (Smith), 1855. 77: 288-291.  
3. *bridwelli* Evans, 1951. 77: 291-292.  
4. *completus* Banks, 1917. 77: 292-295.  
*Apicatus* Species-group  
5. *apicatus* (Banks), 1910. 77: 295-297.  
6. *sinuatus* Evans, 1951. 77: 297-300.
- XII. Genus *Allochares* Banks, 1917. 77: 301-302.  
1. *azureus* (Cresson), 1867. 77: 302-304.
- XIII. Genus *Paracyphononyx* Gribodo, 1884. 77: 304-306.  
1. *funcreus* (Lepeletier), 1845. 77: 306-308.



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