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CONTENTS

INTRODUCTION

THIS PAPER is a systematic revision of the bees of the genus *Hoplitis* Klug occurring in the Western Hemisphere. Although this genus is not ideal for studies of evolution and geographical distribution because of the scarcity of many of its species in collections, an attempt is made to shed light on the evolution of those sections of the genus which are sufficiently well known to make such speculation profitable.

In America there are 24 known species of *Hoplitis*, all occurring north of Mexico. Only one species is known to extend southward into that country, although two or three more will probably be found to do so when the fauna of northern Mexico is properly studied. Of the 24 American species several are polytypic, consisting of two or more subspecies. The species are placed in eight subgenera, several of which have, until recent years, been regarded in the United States as distinct genera. Indeed the subgenera *Andronicus*, *Alcidamea*, and *Monumetha* were considered as distinct genera by American authors from 1864 to 1939.

Because the accepted characters of these groups were the variously modified male antennae, the bee students of the time were frequently unable to place females in the correct genera. As a result, many species were described in the wrong genera, or even two or three times in different genera. Thus *Hoplitis* (*Andronicus*) *cylindrica* was first described from a male and placed in *Andronicus*. It was named again from a female under the generic name *Osmia* and was twice renamed from females placed in *Hoplitis!* Another example is *Hoplitis* (*Alcidamea*) *pilosifrons* which was first described from a male placed in the genus *Alcidamea*, next from a female placed in the genus *Hoplitis*, and finally under a third name in *Alcidamea* from a reared male whose pubescence had not had an opportunity to fade from the ochraceous color of freshly emerged individuals to the whitish of field collected specimens. The metallic species of the subgenus *Chlorosmia* were for 75 years included in *Osmia* because of their color, although they are clearly closely related to the non-metallic *H. albifrons*, which for this same period was placed in *Monumetha*.

Hoplitis,[1] as here understood, is characterized in previous publications (Michener, 1941, 1944) dealing with the generic characters of the tribe Megachilini. A synonymy is given for the genus in each of these papers, and the generic characters are discussed in full in the first, and in synoptic form in the second. *Hoplitis* is distinguished from other Megachilini by the following combination of characters:

Thorax not much elongate, the scutellum conspicuously convex, the metanotum somewhat declivous; parapsidal lines linear; anterior and lateral faces of mesepisterna not separated by carinae but merely by rounded angles; arolia present; posterior coxae without longitudinal carinae on inner ventral angles; second abdominal (first metasomal) tergum with anterior face flat or slightly convex (except for a broad longitudinal median sulcus), not separated from horizontal dorsal surface by a line or carina except sometimes for a short distance across summit of sulcus.

Hoplitis is very closely related to *Anthocopa*, and particularly in Eurasia, where both of these genera are more abundant and diversified than in America, the distinction between them becomes quite arbitrary. Nevertheless, they are believed to be natural groups and, because of their large size and wide distribution, worthy of recognition as genera.

[1] This is *Hoplitis* Klug, 1807, Mag. Insektenkunde, vol. 6, p. 225, not Hübner, [1819], Verzeichniss Bekannter Schmettlinge [*sic*], p. 147.

DISTRIBUTION AND PHYLOGENY

BECAUSE OF THE ABUNDANCE and diversity of *Hoplitis* and its allies in Eurasia and in the Ethiopian region, the smaller number of species in America, and the complete absence of the group from tropical America, it has been suggested previously (Michener, 1943, 1944a) that *Hoplitis* and *Anthocopa* arose in the Palearctic region and reached America subsequently. The distributional and morphological evidence and phylogenetic conclusions concerning American *Anthocopa* support this hypothesis (Michener, 1943), and the same is true of *Hoplitis*.

As with *Anthocopa*, *Hoplitis* appears to have entered North America by at least two independent migrations from Asia by way of Bering Strait. The American *Hoplitis* may be divided into two groups. The subgenera *Monumetha*, *Chlorosmia*, and *Andronicus* have the ninth sternum of the male drawn out into a slender median process which is provided with short, thickened, and often capitate or spatulate hairs. In these same subgenera the mandibles of the females are quadridentate. These specialized subgenera are related to a similarly specialized Palearctic group, and their ancestors are believed to constitute the latest wave of *Hoplitis* to enter North America. In support of this belief we may note that these three subgenera now range much farther north than any of our other subgenera, two of them extending nearly to the Arctic Circle, and one to a point only a little over 150 miles from the Siberian shore. Their adaptability to cold climates would have allowed them to occur in the Bering Strait region and to cross to the New World at a time in the latest Tertiary when this area was cold. Their recent arrival and differentiation are also suggested by the small number of species in each subgenus (one each in two, three in the remaining one) and the absence of desert derivatives of any of these subgenera. Curiously, however, these subgenera are not represented in the Old World, although there are closely related subgenera there.

The remaining North American subgenera (*Hoplitina*, *Alcidamea*, *Cyrtosmia*, *Dasyosmia*, and probably *Acrosmia*), hereafter called group 1, have the ninth sternum of the male relatively unmodified and the mandibles of the female tridentate or obviously derived from a tridentate condition. The ancestor (or ancestors) of group 1 probably entered North America earlier than that of *Monumetha*, *Chlorosmia*, and *Andronicus*, or group 2. The conclusion is suggested by the obvious fact that forms ancestral to group 1 must have existed earlier than forms with the characters of group 2. It is supported by the distribution of group 1, the northern limit of which appears to be in southern Canada. Unless future collecting demonstrates species of group 1 far to the north, the indications are that the ancestors of group 1 reached America in the Bering Strait area at a time when that region had a climate warmer than it now has. In further support of the conclusion that the ancestors of group 1 arrived before those of group 2, we may note that the subgenera of group 1 contain more species on the average than those of group 2, that one of the subgenera (*Dasyosmia*) of group 1 consists entirely of species living in the deserts, and that two of the other subgenera (*Hoplitina* and *Alcidamea*) contain desert representatives.

It has been indicated previously (Michener, 1944a) that in this group of bees, which in this hemisphere is primarily northern or montane, adaptation to the desert usually involves more or less marked morphological changes, so that several of the desert groups are regarded as subgenerically or generically distinct from their nearest relatives. These desert groups are concentrated in a narrow zone along the western edge of the Great Basin immediately east of the major mountain ranges of central California. The group most nearly related to each of the desert groups, in cases where nearest relatives can be recognized, occurs in (but is not necessarily limited to) more humid or higher parts of California adjacent to the area of concentration of desert groups.

This distributional pattern is repeated three times in *Hoplitis*, a genus which had not been properly studied in 1944 and data from which were scarcely included in the paper referred to above. In *Hoplitina* two species,

bullifacies and *mojavensis*, occur in the deserts of eastern California. Their nearest relative is *H. bunocephala* of central California. In *Alcidamea* the only strictly desert species is *H. elongaticeps*, occurring in the same part of the desert and apparently derived from a widespread form in the Pacific Coast states, *H. producta gracilis*. Finally the subgenus *Dasyosmia*, the immediate ancestor of which is not clear, is confined to the deserts. It contains only two species, one of which, *H. paroselae*, is known only from the deserts of eastern central California. The other occurs in this region but also eastward through the *Larrea* zone as far as New Mexico.

Several methods have been used to present distributional information for the various species. For common and well-known ones the localities of collection have been entered on maps and merely the peripheral localities listed in the text. For less common species all the localities are listed, and for rare species complete collection data are given for each specimen available.

EVOLUTION IN THE SUBGENUS *ALCIDAMEA*

OF THE VARIOUS AMERICAN SUBGENERA of *Hoplitis* the only one sufficiently well known to make a study of its evolution possible and at the same time represented by a considerable number of species and subspecies is *Alcidamea*. The aim of this section is to show the relationships of the various populations of *Alcidamea*, and particularly of those that belong to the *producta* complex. Within this complex or superspecies an attempt is made to determine in what sequence and from what ancestors the various populations arose.

It has been shown in the previous section that the main and presumably original center of evolution of *Hoplitis* is in Eurasia. A secondary center of evolution in North America produced the eight American subgenera. Of these, *Alcidamea* has evolved more extensively than any of the others, having apparently sent an offshoot westward across the Bering Strait after the characters of the subgenus were stabilized in America, possibly at the time that group 1 of the preceding section migrated in the opposite direction. The Old World group [including *H.* (*Alcidamea*) *parvula* ranging from maritime Siberia to western Europe] is less diversified and so far as known contains fewer species than the American groups. It is for this reason that it is believed to be derived from American ancestors.

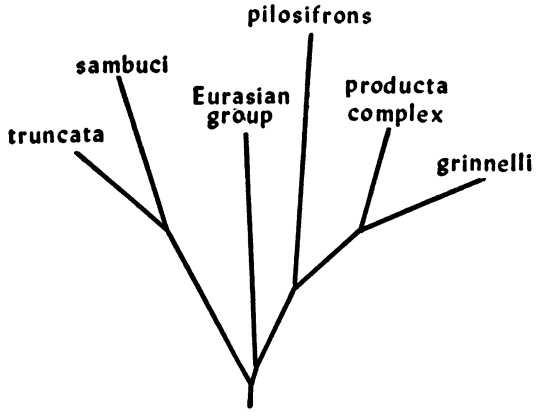


FIG. 1. Phylogenetic tree showing the probable relationships of the components of the subgenus *Alcidamea*.

As shown by the accompanying phylogenetic tree (fig. 1), *Alcidamea* in America is divisible into two morphologically strongly divergent groups, here called the *truncata* group and the *producta* group. As shown in figure 3, the *truncata* group consists of two allopatric species, one occurring in the Pacific Coast states, the other east of the Rocky Mountains. The distinguishing characters of these groups are detailed in the systematic treatment. *H. sambuci* is monotypic, while *truncata* consists of two subspecies. The *producta* group contains eight species. One of these, *pilosifrons*, of North America east of the Rocky Mountains (fig. 4), is very distinct from the rest, showing some approach to characters of the *truncata* group. The remaining species have never previously been separated on morphological characters, or indeed on any characters which are constant and suitable for such use in the light of the present study. Genitalically they are identical or nearly so. *H. grinnelli* may be distinguished from the others by the more slender scape of the male antennae and the presence of a band of pale hairs across the posterior margin of the sixth abdominal tergum of the female. It is a widespread species in the Pacific coast states (fig. 4), occurring sympatrically with every other species of the *producta* group except the eastern *pilosifrons*. As indicated elsewhere, *H. grinnelli* is polytypic, consisting of a northern and a southern subspecies, with a desert subspecies from Arizona and Sonora probably to be recognized when more material is available.

The remaining species of the *producta* group are termed the *producta* complex. This complex consists of one widespread and polytypic species, *producta*, and three comparatively localized species evidently derived from it. The apparent relationships of the subspecies of *producta* are indicated in figure 2. It is believed that *H. producta gracilis* is ancestral to the rest of the *producta* complex or is morphologically more similar to that ancestor than any other existing form. This conclusion was reached by comparing the structure of the various members of the *producta* complex with that of other species of *Alcidamea*. The subspecies *gracilis* has more

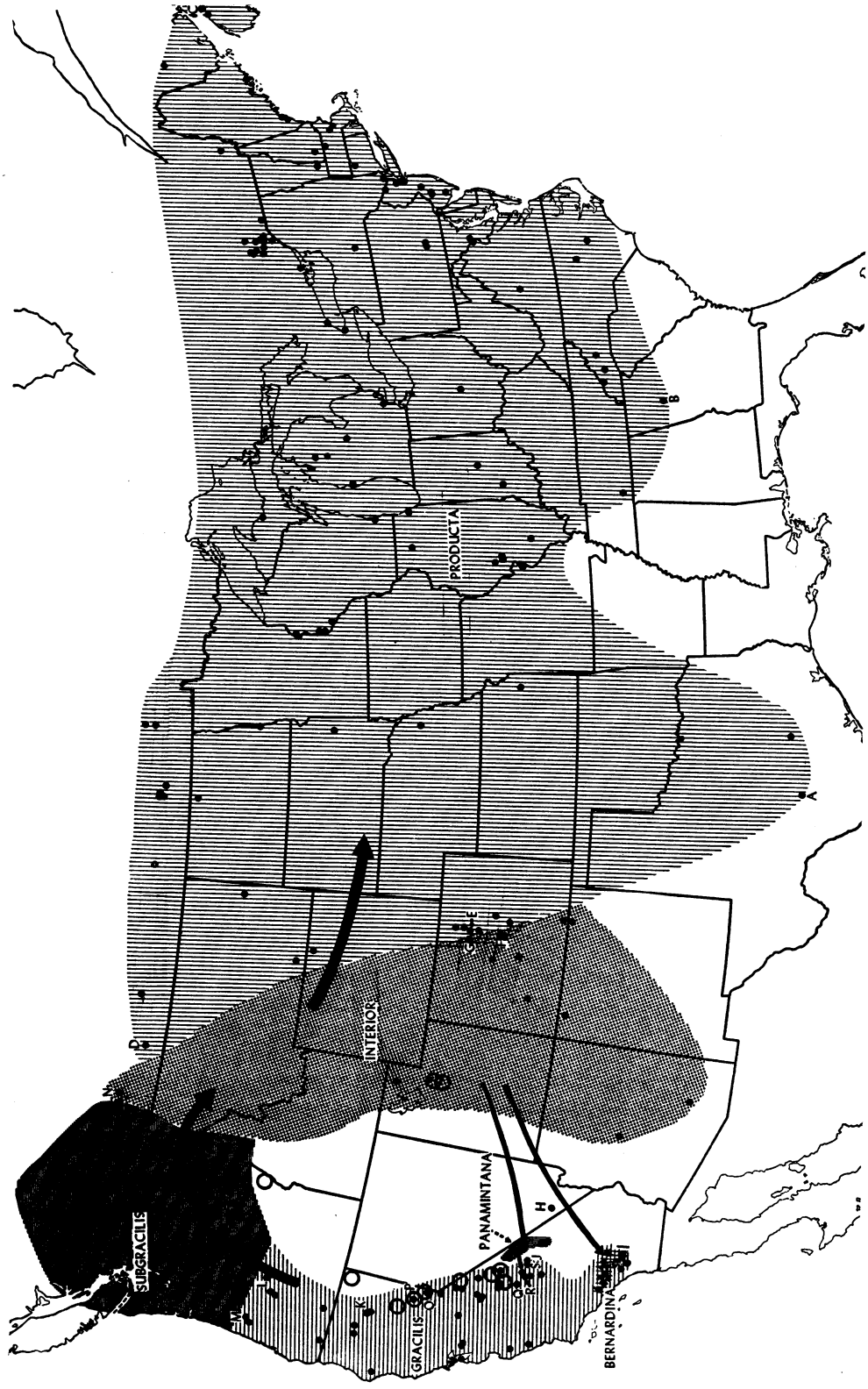


FIG. 2. Map showing the distribution of *Hoplitis* (*Alcidamea*) *producta* (by small symbols) and *H.* (*Alcidamea*) *wululis* (by large circles). Localities for *H. producta bernardina* are shown by triangles, for other subspecies of *producta* by dots. The known zone of intergradation between *producta* and *interior* is shown by overlapping of types of shading. Intergradation between other subspecies is either little known or so gradual and occurring over so broad a zone that it cannot well be shown on a map such as this.

characters in common with species outside the *producta* complex than do any other representatives of the complex. As the *producta* complex is obviously a recent and rapidly evolving group which for morphological reasons cannot be considered ancestral to other sections of *Alcidamea*, a reasonable premise is that the characteristics of *gracilis* are essentially those of the ancestor of the complex. Since *gracilis* possesses no characters which exclude it from consideration as ancestor to other members of the complex, there is no need to construct a hypothetical ancestral type.

The significant primitive characters are the small clypeal emargination of the female, the slender male flagellum (the broad flagellum must have arisen independently in the *truncata* group, in *pilosifrons*, and in *producta producta*), and the broad eyes of the male (eyes broader than genal areas).

Concerning a map such as figure 2, it must be understood that the distribution of genes (hence of morphological characters and of subspecies) is fluid, varying with climatic and physiographic change. Hence, while it is probably sound to regard all members of the *producta* complex as having arisen from something similar to *gracilis*, there is no assurance that *gracilis* has always occurred in, or been limited to, its present range.

Hoplitis producta gracilis is a small form occurring in California and southern Oregon (fig. 2). It is unknown in the desert and in desert mountain ranges, but where localized mesophytic conditions occur in otherwise desert areas, as at Lone Pine, California (fig. 2, j), *gracilis* is present. Specimens from Truckee (fig. 2, o), Gold Lake (p), and other localities in northeastern California often have the fringe of the sixth sternum of the male shorter than in most specimens of *gracilis*. So far as known no individuals from this region have the penultimate male antennal segment longer than broad, a common character in *gracilis* populations in more western areas and in southern California. Thus in this region we see indications of intergradation with the Rocky Mountain subspecies, *interior*, or with *subgracilis*.

In central Oregon *gracilis* merges into *subgracilis* of the north Pacific area. So few specimens are known from this area that the limits of its range cannot be clearly defined, most of the dots on figure 2 within the range of this form representing one or at most two specimens. Apparently, however, *subgracilis* ranges eastward into the Rocky Mountain area in northern Idaho and southeastern British Columbia. *H. producta subgracilis* differs from *gracilis* primarily by the narrower eyes of the male.

In the Rocky Mountain area occurs a subspecies, *interior*, evidently derived from *subgracilis*, and distinguished from it principally by the larger size and the ordinarily short fringe of the sixth sternum of the male. From the Rocky Mountains, as from the Northwest, specimens are so scarce as to make interpretation difficult. It is clear, however, that *interior* does not extend farther eastward than the eastern foot of the Rocky Mountains, where it intergrades with *H. producta producta*.

The latter, while rare or absent in much of the plains region, extends eastward to the Atlantic. It differs from *interior* by the broader male flagellum and especially by the clypeal margin of the female, which is more produced than in other subspecies, with the angles which demark the truncation being homologous not to the angles which do so in other subspecies and species of *Alcidamea* but to the lateral extremities of the clypeal emargination. In other language, the emargination of related forms has been enlarged and broadened to form the truncation of *producta producta* (figs. 22, 23, 24).

The two most interesting subspecies of *H. producta* are two Californian forms, both apparently derived from *interior*. Each has a limited and primarily montane distribution, and is separated from *interior* by broad stretches of desert presumably uninhabited by the species at present. The width of the uninhabited zone cannot be determined at present because of our poor knowledge of the distribution of *interior*. A single female specimen, undeterminable as to subspecies, is from the Charleston Mountains in southern Nevada (fig. 2, h), between the known range of *interior* and that of *panamintana*. It is probable that *interior* reached these Californian ranges during the pluvial periods associated with glaciation, and that after increased aridity isolated the populations on these ranges, morphological differences arose.

Hoplitis producta panamintana of the Panamint and Inyo Mountains of eastern

California is recognizable from *interior* primarily by the broadened process of the eighth tergum of the male. The character is highly variable, and some individuals are not readily separable from *interior*. There is evidence that there has been some gene flow across the Owens Valley from the range of *panamintana* to that of *gracilis*, for some specimens otherwise typical of *gracilis* from the Sierra Nevada near the range of *panamintana* have the process of the eighth tergum variably broad as in *panamintana*. This characteristic has not been observed in *gracilis* from other localities. Five specimens in a series of eight males from General Grant National Park (fig. 2, q), the only available male from Giant Forest, Tulare County (fig. 2, r), and the only available male from Lone Pine Canyon, Inyo County (fig. 2, s) show this character otherwise found only in *panamintana*. There is no evidence of migration in the opposite direction across the Owens Valley, from the range of *gracilis* to that of *panamintana*, for the latter exhibits none of the diagnostic subspecific characters of the former.

The other Californian subspecies derived from *interior* is *bernardina*, occurring primarily in the San Gabriel, San Bernardino, and San Jacinto Mountains of southern California. This subspecies is distinguishable from *interior* by the larger average size, usually more slender flagellum of the male antennae, and one or two other minor characters which apply to a majority of individuals but not to every one. Curiously enough its entire range is included within that of the subspecies *gracilis*, and there is no evidence of intergradation. Furthermore it would appear that there is opportunity for intersubspecific mating, for individuals of *gracilis* and *bernardina* have been taken at the same time and place on the same flowers in the San Bernardino Mountains by Prof. P. H. Timberlake. Thus in a series of four subspecies (*gracilis*, *subgracilis*, *interior*, and *bernardina*), circularly arranged, the end members overlap in distribution and behave as species. The existence of an isolating mechanism between the sympatric subspecies *gracilis* and *bernardina* is interesting in view of its apparent absence to the north where the range of *gracilis* approaches that of *panamintana*.

Turning to the distinct species of the *producta* complex, we find that each was apparently derived from one or another of the existing subspecies of *producta*. Indeed the morphological differences between these species and the subspecies from which they were derived are in every case less marked than the differences between such subspecies as *gracilis* and *producta* or *gracilis* and *bernardina*. As has been pointed out frequently by others, a purely morphological species concept cannot be utilized in modern systematic work.

Hoplitis colei, known from the southern parts of California and Nevada, is closely related to, and evidently derived from, *H. producta gracilis*. The two forms are sympatric in southern California, although *colei* often occurs in drier situations and at lower altitudes than is usual for *gracilis*. There is some evidence, as yet inconclusive, that *colei* is an oligolectic visitor of flowers of *Eriodictyon* and perhaps *Nama* (Hydrophyllaceae), while other species of *Alcidamea* are polylectic.

Hoplitis elongaticeps is the only strictly desert species of *Alcidamea*, being found in the Mojave Desert and the deserts of Inyo County, California. It, too, was derived from *H. producta gracilis*, and it is even possible that it is another subspecies of *producta*. It is here regarded as a separate species because it is known to be almost sympatric with *gracilis* in the region of Lone Pine, California, without evidence of gene interchange between the populations. At Lone Pine, a mesophytic area surrounded by desert, *gracilis* occurs. Four miles west of Lone Pine, in the desert, *elongaticeps* is present. A few miles farther west, on the east slope of the Sierra Nevada, *gracilis* appears again.

The remaining species of the *producta* complex is *H. uvulalis*, a large species occurring in the high and usually arid mountains to the west, north, and east of the Great Basin (fig. 2). It appears to have been derived from *interior* or possibly *bernardina* and differs from these subspecies primarily in its larger size. It is sympatric with the subspecies *gracilis*, *subgracilis*, and *interior* of the species *producta*, having actually been collected with the first two, and there is no evidence of hybridization. *H. uvulalis* is therefore regarded as a distinct species rather than as a subspecies of *producta*.

BIONOMICS

THE SPECIES OF *Hoplitis* are solitary bees, all of which appear to have but one generation a year. The season of flight is usually two or three months long, starting in April, May, or June. In any one locality no species appears to remain in flight for more than about two months. The remainder of the year is passed in the immature stages in the nests. The males often are in flight for some days before the first females appear.

Like other bees, the species of *Hoplitis* are dependent on nectar and pollen for food. In many groups of bees the females are restricted in their pollen collecting to a few related plants (oligolectic). Most species of *Hoplitis* are more or less polylectic. However, they are by no means as general feeders as such bees as *Apis* and *Bombus*. They collect pollen primarily from the plants with papilionaceous or tubular flowers, such as the Leguminosae, Scrophulariaceae, Labitaceae, Polemoniaceae, and Hydrophyllaceae. Even among these families there are definite preferences, there being usually one or two species of flower in each locality which seem to be visited in preference to others.

A few species seem to be more nearly oligolectic. Thus most if not all of the pollen collecting of *H.* (*Hoplitina*) *howardi* and *H.* (*Hoplitina*) *bunocephala* is from flowers of *Lotus* (Leguminosae), that of *H.* (*Dasyosmia*) *paroselae* apparently from *Parosela* (Leguminosae) (only two collections recorded), that of *H.* (*Alcidamea*) *colei* apparently from *Eriodictyon* (Hydrophyllaceae), and that of *H.* (*Cyrtosmia*) *hypocrita* from various Leguminosae.

Something is known of the nesting habits of several American species of *Hoplitis*. As with a great many other solitary bees, each nest consists of a row of cells, one above another, in a tubular hole in a stem, in wood, or in the soil. Each cell is provided with a mass of semi-solid pollen or bee bread on which an egg is laid. According to Graenicher (1905), the mass is conical in *H. producta*, and the egg is laid on the summit. After provisioning, the cell is sealed by the parent. The larva rapidly eats the pollen mass, then rests for a long period as a prepupa. Overwintering occurs in this stage, within a thin but tough and paper-like cocoon spun by the larva. The cocoons of *Hoplitis*, so far as known, lack the nipple-like projection at one end, usually characteristic of megachilid cocoons. Pupation takes place in the spring, and the adult emerges soon thereafter.

In common with those of most Megachilidae, the cells are separated by partitions of various materials characteristic for the species and often brought into the nest from outside by the maker of the nest. In the following account emphasis is placed on those features of the nests which appear to differ among the species and subgenera.

The species of the subgenus *Alcidamea* whose habits are known all nest in the pithy cores of dead stems or canes of various plants. Nests of *Hoplitis* (*Alcidamea*) *producta producta* have been described by several authors (Graenicher, 1905; Comstock, 1924; Hicks, 1926; Rau, 1928). This bee makes the partitions between cells of parts of leaves, chewed into a felt-like, pliable mass which dries to form a very firm, hard plug. Davidson (1896) described, under the name *producta*, nests which probably actually belonged to the closely related *H. grinnelli grinnelli*. The partitions are said to be made of pith and clay. *H. brachyodonta* (a probable synonym of *grinnelli grinnelli*) is reported by Hicks (1933) to use plant material apparently similar to that used by *producta* but sometimes supplemented by small pebbles. It may be that the use of soil material (clay or pebbles) is characteristic of *grinnelli*. It is also possible that the pith mentioned by Davidson was actually masticated and subsequently dried leaf material. Of *H. producta gracilis* and *H. sambuci* all that is known is that they nest in pithy stems. Nests of the former have been mentioned (as *productus*) by Linsley and MacSwain (1943), those of the latter by Titus (1904) and Linsley and MacSwain (1943). *H. sambuci* has also been reared from stems collected by the author in southern California.

Nests of the only known species of the subgenus *Cyrtosmia*, *H. hypocrita*, were described by Hicks (1926) and have been found

by the author in southern California. As in the subgenus *Alcidamea*, the nests are placed in dry pithy stems. The partitions between the cells consist of loose, uncemented, coarse particles of pith, apparently from the stem in which the nest is built.

The only species of the subgenus *Dasyosmia* whose nesting is known is *H. biscutellae*. Linsley and MacSwain (1943) record this species nesting in a bank. It is our only *Hoplitis* known to nest in soil.

The nests of *H.* (*Andronicus*) *cylindrica* have been described by Hicks (1926). They are built in dry pithy stems, as with *Alcidamea* and *Cyrtosmia*, and the partitions between the cells appear to consist of fine particles of pith cemented together to make hard compact masses. A curious feature is that the adults apparently normally escape by cutting their way out through the stem walls instead of by working through the plugs and debris above them and emerging through the original nest entrance.

Two nests of *Hoplitis* (*Chlorosmia*) *fulgida* were described by Hicks (1926). One was in a hole, apparently made by a beetle, in a stump; the other was in a woody stem. Partitions between the cells consist of masticated plant material and pebbles. The cells are irregularly and widely spaced, as with certain other Hymenoptera which appropriate abandoned burrows of other insects.

Although *H. albifrons* is a common and widespread species, the nesting habits of *Monumetha* are unknown. However, a female of *H. albifrons maura* collected by the author was carrying a pulpy green mass, apparently consisting of macerated leaf tissue.

SYSTEMATIC TREATMENT

KEY TO AMERICAN SUBGENERA[1]

MALES

1. Mandibles tridentate (fig. 17) . . *Cyrtosmia*
   Mandibles bidentate (fig. 18) 2
2. Second and third abdominal (first and second metasomal) sterna each with a median posterior spine or angle[2]; third and fourth abdominal sterna with subapical, sublateral shining elevated areas 3
   Second and third abdominal sterna without median posterior sharp spines or angles, although second may have elevated blunt apical angulation; third and fourth abdominal sterna usually without sublateral, subapical shining elevated areas 4
3. Body black; clypeus with very short, appressed silvery pubescence . . *Monumetha*
   Body brilliant green or blue; clypeus with long, erect pubescence . . . . . *Chlorosmia*
4. Last antennal segment expanded and produced to one side (figs. 40, 41) . *Acrosmia*
   Last antennal segment simple or slender and produced to a point 5
5. Eighth abdominal tergum at least feebly and commonly deeply emarginate medially (figs. 42–44); antennae normal; abdomen partly red . . . . . *Hoplitina*
   Eighth abdominal tergum truncated or pointed medially (sometimes trifid); antennae modified, the scape often thickened, the last antennal segment often pointed, the median or the basal flagellar segments sometimes broad; abdomen not red 6
6. Third to fifth flagellar segments conspicuously broader than others (fig. 30); second abdominal sternum with median apical elevation . . . . . *Andronicus*
   Third to fifth flagellar segments not broad; second abdominal sternum with apical margin simple (except in *H. biscutellae*) . . . 7
7. Antennal pedicel almost completely hidden in concavity in end of scape when antenna is in normal position (figs. 34–37); posterior coxae normal . . . . . *Alcidamea*
   Antennal pedicel exposed (figs. 32, 33); posterior coxae each with broad ventral tooth . . . . . *Dasyosmia*

[1] The subgenus *Hoplitis* in the strict sense is restricted to the Old World.

[2] This angle is not in the margin proper but in the slightly elevated area anterior to the margin.

FEMALES

1. Mandibles clearly quadridentate (figs. 15, 16). 2
   Mandibles tridentate (fig. 12), sometimes with a weak convexity between second and third teeth (figs. 13, 14) 4
2. Body brilliantly metallic green or blue . . . . . *Chlorosmia*
   Body black 3
3. Body with at least some black hair; distance between apices of first and fourth mandibular teeth over one and one-half times width of mandible at narrowest point . . . . . *Monumetha*
   Body with pubescence entirely pale; distance between apices of first and mandibular teeth less than one and one-half times width of mandible at narrowest point . *Andronicus*
4. Median mandibular tooth almost twice as far from third (upper) as from first (apical) tooth, a weak convexity present between second and third tooth (fig. 14). (Third tooth sometimes worn so that only two apical teeth followed by a long undulating margin) . . . . . *Cyrtosmia*
   Median mandibular tooth more nearly midway between first and third teeth 5
5. Abdomen partly red; seventh tergum nearly straight in profile . . . . . *Hoplitina*
   Abdomen black; seventh tergum more or less concave in profile 6
6. Apex of mandible nearly as broad as eye; distal portion of forewing with minute papillae, median portion with very few hairs . . . . . *Dasyosmia*
   Apex of mandible much narrower than eye; wings uniformly finely hairy throughout, without papillate areas . . . . *Alcidamea*

SUBGENUS HOPLITINA COCKERELL

Hoplitella COCKERELL, 1910 (not Levinsen, 1909), Canadian Ent., vol. 42, p. 169; COCKERELL, 1913, Canadian Ent., vol. 45, p. 34.

TYPE SPECIES: *Hoplitella pentamera* Cockerell = *Ashmeadiella howardi* Cockerell (monobasic).

Hoplitina COCKERELL, 1913, Canadian Ent., vol. 45, p. 34; COCKERELL, 1922, Amer. Mus. Novitates, no. 40, p. 5; MICHENER, 1936, Amer. Mus. Novitates, no. 875, p. 28; MICHENER, 1941, Amer. Midland Nat., vol. 26, p. 158; SANDHOUSE, 1943, Proc. U. S. Natl. Mus., vol. 92, p. 559; MICHENER, 1944, Bull. Amer. Mus. Nat. Hist., vol. 82, p. 263.

TYPE SPECIES: *Hoplitella pentamera* Cockerell = *Ashmeadiella howardi* Cockerell (monobasic).

The species of this subgenus are small, with the head and thorax black, the abdomen largely red, and the pubescence sparse and pale.

FEMALE: Clypeus slightly to strongly convex. Inner margins of eyes subparallel or converging below; genal area about as wide as, or a little narrower than, eye seen from side; hypostomal carinae rather low, reduced at angle, mandibles rather small, tridentate, with no indication of a tooth between second and third teeth; antennal pedicel longer than broad, longer than first flagellar segment which is equal to or longer than second; mouthparts rather long, maxillary galea nearly as long as face, second segment of labial palpus 1.5 to 2.0 times as long as first. Wings finely pubescent throughout, not or scarcely papillate. Abdominal terga without impunctate margins; seventh tergum scarcely concave in profile; seventh sternum unmodified.

MALE: Clypeus with more or less erect pubescence, projecting but little over base of labrum; inner margins of eyes slightly converging below; genal area narrower than eye seen from side; hypostomal carinae uniform and low; mandibles bidentate; antennae short, at most reaching tegulae; scape not thickened, 2.5 to 3.5 times as long as broad; pedicel exposed, as long as or longer than broad; flagellum unmodified. Posterior coxae normal. Abdomen with seventh tergum with impunctate marginal band; fifth and sixth sometimes with narrow impunctate margins; eighth tergum bilobed or at least feebly emarginate; second sternum subtruncate posteriorly, sometimes produced posteriorly in the middle; third not greatly enlarged, rounded or subtruncate posteriorly, fringed; fourth sternum broadly emarginate and fringed medially; seventh sternum with a median ridge, sometimes projecting posteriorly; hairs of ninth sternum simple.

This subgenus includes five described species, all found in California.

KEY TO THE SPECIES OF *Hoplitina*

FEMALES

1. Clypeus gently convex and uniformly punctate throughout, except for the apical margin . . . . . *howardi*
   Clypeus with a partially impunctate prominence or with upper portion conspicuously convex and shining, impunctate or nearly so . . . 2
2. Upper two-thirds of clypeus evenly convex . 3
   Clypeus with a high, basal, median, longitudinally keeled prominence . *bunocephala*
3. Clypeal truncation demarked by distinct angles . . . . . *bullifacies*
   Clypeal truncation rounded laterally so that it is not clearly demarked . . . . *mojavensis*

MALES

1. First flagellar segment about twice as long as broad; seventh abdominal tergum without lateral teeth, sixth sternum with lateral teeth . . . . . *linsdalei*
   First flagellar segment but little longer than broad; seventh abdominal tergum with a tooth at each side, sixth sternum without lateral teeth 2
2. Eighth abdominal tergum with distinct median apical emargination . . . . . *howardi*
   Eighth abdominal tergum subtruncate, the margin very weakly concave medially . . 3
3. Clypeus with basal, median, longitudinally keeled elevation; mesoscutum conspicuously more finely punctate than vertex . . . . . *bunocephala*
   Clypeus evenly convex basally; mesoscutum about as coarsely punctate as vertex . . . . . *bullifacies*

Hoplitis (Hoplitina) howardi (Cockerell)

howardi COCKERELL, 1910, Ann. Mag. Nat. Hist., ser. 8, vol. 5, p. 22 (♀, not ♂)(*Ashmeadiella*); MICHENER, 1939, Amer. Midland Nat., vol. 22, p. 8 (*Proteriades*).

pentamera COCKERELL, 1910, Canadian Ent., vol. 42, p. 169 (*Hoplitella*); COCKERELL, 1913, Canadian Ent., vol. 45, p. 34 (*Hoplitina*); BRAY, 1917, Pomona Jour. Ent. Zool., vol. 9, p. 97 (*Hoplitina*); COCKERELL, 1922, Amer. Mus. Novitates, no. 40, p. 6 (*Hoplitina*).

hesperia CRAWFORD, 1916, Insec. Inscit. Mens., vol. 4, p. 103 (*Hoplitina*); COCKERELL, 1922, Amer. Mus. Novitates, no. 40, p. 6 (*Hoplitina*).

The male described as *Ashmeadiella howardi* is *Ashmeadiella salviae* Michener. The male of *H. hesperia* described by Cockerell (1926, Pan-Pacific Ent., vol. 3, p. 87) is an undescribed species of *Proteriades*. The placement of *howardi* in *Proteriades* by Michener was an error.

This species may be distinguished from others of the subgenus in the male sex by the deeply emarginate eighth tergum and the presence of lateral teeth on the seventh, in

the female by the uniformly punctate disc of the clypeus. It is the only species of *Hoplitina* which is at all common in collections.

MALE: Length 5 to 7 mm. Head and thorax black, mandibles reddish subapically, flagellum brown beneath, tegulae reddish brown, distal tarsal segments brownish. Abdomen with second to fourth terga red, or the fourth black medially, the second and third sometimes infuscated medially; remaining terga black with testaceous margins, the fifth sometimes red laterally. Pubescence white, sometimes yellowish on dorsum of head and thorax, forming inconspicuous narrow apical fasciae on terga two to six. Head and thorax finely and rather closely punctate, the scutum practically as coarsely punctate as vertex. Clypeus gently convex, closely punctate except for the shining impunctate crenulate anterior margin; outer mandibular tooth much exceeding inner; maxillary palpus with third segment longer than any of the others; antennal scape about 2.5 times as long as broad; pedicel slightly longer than broad; first two flagellar segments little if any longer than broad, remaining segments progressively longer. Wings slightly brownish, the venation black. Propodeal triangle distinctly roughened above, shining below. Abdominal punctation rather dense, finer and denser near posterior margins of terga than elsewhere; seventh tergum with a tooth on each side and feeble median emargination; eighth tergum with rather small median emargination; posterior margin of second sternum straight, of third broadly rounded with median straight or feebly emarginate section, of fourth to sixth broadly and conspicuously emarginate and fringed, these sterna without lateral tubercles or teeth; seventh sternum with conspicuous longitudinal median ridge, posterior margin of sternum simple; ninth sternum with margins of free portion converging but little in basal three fifths, distal portion rounded or bluntly angulate medially and with rather long hairs; gonoforceps rather robust, parallel sided except for expanded basal portion and slightly expanded incurved apices; apical two-fifths of gonoforceps provided with long hairs, some of them nearly twice as long as subapical width of gonoforceps.

FEMALE: Length 6 to 7.5 mm. Abdomen with second and third terga red, sometimes infuscated middorsally, fourth tergum red, infuscated or black middorsally, remaining terga black except sometimes base of fifth laterally. Clypeus gently convex, rather coarsely punctate, truncation long, feebly crenulate, its ends rounded; genal area slightly narrower than eye, seen from side.

DISTRIBUTION: Southern and central California west of the main mountain divides. The species is known from the following localities, all in California: San Jacinto River, San Jacinto Mountains; Redlands; Claremont; San Gabriel Mountains; Los Angeles; Altadena; Eagle Rock; La Crescenta, Los Angeles County; Hastings Natural History Reservation, near Jamesburg, Monterey County; Potwisha, Sequoia National Park; Rock City, Mount Diablo, Contra Costa County.

Hoplitis howardi is found primarily in brush-covered foothill areas below 3000 feet altitude.

Collection dates range from April 12 to June 5.

This species has been collected most often on flowers of *Lotus*, *L. scoparius* being commonly visited. It has also been found on flowers of *Eriodictyon crassifolium* and *Cryptantha*.

The type of *howardi* is from the San Gabriel Mountains, California, the type of *pentamera* is from Claremont, California, and the type of *hesperia* is from Redlands, California. All are now in the collection of the United States National Museum.

Hoplitis (Hoplitina) bullifacies, new species

This species and *H. mojavensis* may be distinguished from other *Hoplitis* by the shining, impunctate, and strongly convex upper portion of the clypeus of the female. From *mojavensis* it differs by the well-defined clypeal truncation, larger size, and other characters.

FEMALE: Length 6 mm. Head and thorax black, the mandibles red apically, flagellum brown, dark above, tegulae testaceous, distal tarsal segments, apices of femora and of tibiae reddish; abdomen with terga two to six red, four to six progressively more infuscated middorsally (or six black except laterally), seven black. Pubescence sparse, white, forming weak apical fasciae on terga two to five,

terga six and seven pruinose with white hairs. Head and thorax rather finely punctate, the mesoscutum nearly as coarsely punctate as vertex. Clypeus with upper two-thirds strongly convex, almost impunctate and hairless; margin of clypeal truncation narrowly impunctate, straight, not crenulate, ends of truncation marked by conspicuous angles; supra-antennal area broadly and gently swollen in front of ocelli, the swelling divided by the depressed frontal line; genal area about as wide as eye seen from side, mandibular teeth equidistant; third segment of maxillary palpus about as long as four plus five, which are subequal. Propodeum with triangle roughened above, smooth and polished below. Wings scarcely brownish, venation black or nearly so. Abdominal terga rather closely punctured, more finely and closely so towards posterior margins of terga.

MALE: Length 5.5 mm. Abdomen with terga two to four red, three and four blackish middorsally, terga five to seven black, posterior margins broadly translucent testaceous. Clypeus evenly convex, finely punctate throughout, except for impunctate margin which is broadly and gently concave and not crenulate; supra-antennal area not swollen; antennal scape about three times as long as broad, remaining segments similar to those of *howardi*; outer mandibular tooth much exceeding inner; maxillary palpus with third segment not much longer than fourth. Seventh abdominal tergum with lateral teeth without median emargination; eighth with posterior margin very feebly concave medially; sterna as in *howardi* but margin of sixth scarcely concave, seventh with median ridge higher, especially posteriorly, and produced as a process behind rear margin of sternum; ninth sternum with free process parallel sided or nearly so, broadly rounded and hairy apically; gonoforceps rather robust and almost parallel sided beyond basal broad region, slightly expanded and broadly incurved apically, hairs apparently short if seen from above but apical two-fifths of under surface provided with numerous rather long hairs.

DISTRIBUTION: Desert of central eastern California. Holotype female and one female paratype: 4 miles west of Lone Pine, Inyo County, California, May 19, 1937 (C. D. Michener). These specimens will be deposited in the collection of the American Museum of Natural History. An additional female, differing from the types by being only 5 mm. in length, is from Curtago, California, on flowers of *Phacelia* related to *P. fremontii*, May 2, 1927 (P. H. Timberlake). The male described above, since it comes from a different locality from the types and has a much shorter third segment of the maxillary palpus, is only tentatively associated with this species and is not designated as an allotype. The specimen is from Mazourka Canyon, Inyo Mountains, Inyo County, California, 7500 feet altitude, on *Cryptantha*, May 21, 1937 (C. D. Michener).

This species and *H. mojavensis* are the desert representatives of the subgenus. They appear to be very rare, in contrast to superficially similar small megachilines of the genera *Proteriades* and *Ashmeadiella* found in the same region. There is certainly one and probably at least two other closely related species of *Hoplitina* in the Californian deserts, but available material is insufficient to warrant naming them.

Hoplitis (Hoplitina) mojavensis, new species

This minute species is closely related to *H. bullifacies*, differing most clearly in the rounded clypeal margin and the coarsely punctate lower portion of the clypeus in the female.

FEMALE: Length 4.5 mm. Agrees with the description of *H. bullifacies*, to which it is closely related, except for the smaller size and the following additional characters: Abdomen with terga two to four red, the last infuscated middorsally, five black medially, red laterally (and sometimes basally on dorsum), remaining terga black, posterior margins testaceous. Clypeus with no clearly defined truncation, the entire margin being broadly convex, slightly so (i.e., nearly straight) medially, strongly and somewhat irregularly so laterally; clypeal surface anterior and lateral to shining convexity with but few large, confluent punctures, instead of more or less normal punctation such as occurs in *bullifacies;* supra-antennal area less swollen, the swelling not, or scarcely, divided by the frontal line; genal area slightly narrower than eye seen from side; maxillary palpi with third segment

longer than fourth plus fifth, the fifth shorter than fourth.

DISTRIBUTION: Mojave Desert and desert of Inyo County, California. Holotype, female, and one female paratype: 11 miles south of Victorville, California, on *Phacelia fremontii*, April 25, 1937 (P. H. Timberlake). The holotype will be returned to the Timberlake collection at the Cirtus Experiment Station, Riverside, California, and the paratype will be retained in the collection of the American Museum of Natural History. One additional specimen is from west of Lone Pine, Inyo County, California, 6500 feet elevation, May 19, 1937, on flowers of *Phacelia* (C. D. Michener).

A single female specimen from Morongo, California, on *Nama dernissum*, April 19, 1937 (P. H. Timberlake), apparently represents another species close to *mojavensis*, differing by having the clypeal truncation feebly defined, the supra-antennal area not swollen, and mesoscutum conspicuously more finely punctate than the vertex.

Hoplitis (Hoplitina) bunocephala, new species

This species is most closely related to *H. bullifacies* and *H. mojavensis*, differing from both, as well as from other species of *Hoplitis*, in the high clypeal prominence of both sexes.

FEMALE: Length 5 mm. Head and thorax black, the mandibles red apically, flagellum brown, dark above, tegulae translucent piceous, distal tarsal segments reddish; abdominal terga two to five red, the fifth blackish middorsally (or all infuscated or black middorsally); sixth tergum red laterally, seventh black; terga except seventh with posterior margins testaceous. Pubescence white, sparse, forming very narrow bands on posterior margins of the abdominal terga; seventh and rear part of sixth tergum pruinose with white hairs. Head and thorax rather finely punctate, the mesoscutum conspicuously more finely so than vertex. Clypeus with a high prominence, longitudinally elongated, somewhat keeled, its higher portions impunctate and hairless; this prominence extends nearly full length of clypeus but is highest above middle of clypeus; anterior margin of clypeus rather broadly impunctate, truncate, not crenulate, lateral angles demarking truncation rounded; supra-antennal area not swollen; genal area narrower than eye seen from side; third segment of maxillary palpus (in paratype) a little longer than other segments. Propodeal triangle roughened above, smooth below. Wings slightly brownish, venation nearly black. Abdominal terga finely punctured, more finely and closely so near posterior margins than elsewhere.

MALE: Length 5 to 6 mm. Abdominal pattern similar to female but sixth tergum usually without red. Clypeus with median prominence similar to that of female but somewhat smaller; apical margin of clypeus impunctate, nearly straight, not, or scarcely, crenulate; outer mandibular tooth much exceeding inner; antennal scape about 2.5 times as long as broad; flagellar segments shorter than those of *howardi*, second flagellar segment broader than long, following segments progressively longer, fifth about as long as broad. Seventh abdominal tergum with lateral teeth, without median emargination; eighth with posterior margin very feebly concave medially; second sternum with posterior margin straight except for a small median point usually produced over the margin proper to an obtuse angle; third sternum with posterior margin broadly convex, thickened portion basad of thin margin sometimes formed into an inconspicuous blunt angle; fourth to sixth sterna fringed, their margins broadly concave (margin of sixth less concave than others); seventh sternum with high median ridge little produced beyond margin of sternum. Ninth sternum with free portion parallel-sided or slightly broader subapically than elsewhere, broadly rounded and virtually hairless apically; gonoforceps rather slender and almost parallel sided beyond basal broad region, incurved apically, hairs apparently short if seen from above but apical two-fifths of under surface provided with numerous long hairs, many of which are bent apically.

DISTRIBUTION: The two known localities for this species are in the foothills of the Great Valley of California. It is probable that the species is widespread in similar areas around this valley. Holotype female, allotype male, and two male paratypes: Mount Diablo, Contra Costa County, California, April 26,

1937, the holotype and one paratype on flowers of *Lotus* (C. D. Michener). One male paratype: Rock City, Mount Diablo, California, May 24, 1940 (E. G. Linsley). One female and one male paratype: 5 miles north of Ione, California, May 16, 1937, on *Lotus* (C. D. Michener). The holotype and allotype will be deposited in the collection of the American Museum of Natural History. Paratypes will be placed in the collections of that institution, the California Academy of Sciences, and Mr. P. H. Timberlake.

Hoplitis (Hoplitina) linsdalei, new species

This is the largest species of its subgenus, and because of the lack of the teeth of the seventh tergum of the male (a character unusual in *Hoplitis* although common in *Anthocopa*) and other morphological peculiarities, it is placed here only tentatively, pending the discovery of females.

MALE: Length 8 mm. Head and thorax black, mandibles reddish subapically, flagellum brown beneath, posterior lobe of pronotum brown, tegulae testaceous, distal portions of tarsi brownish; abdominal terga one to five red, some of them slightly infuscated middorsally, sixth tergum brownish red, seventh black. Pubescence sparse, white, forming very narrow and inconspicuous apical fasciae on terga two to five. Head and thorax finely and closely punctate, mesoscutum hardly more finely so than vertex; genal areas and mesepisterna (particularly the latter) more coarsely and less closely punctate than dorsum. Clypeus rather strongly and evenly convex, closely punctate except for the slightly thickened impunctate anterior margin which forms a rather well-defined truncation; outer mandibular tooth but little exceeding inner; maxillary palpus with third segment nearly twice as long as fourth plus fifth, fourth shortest; antennal scape about 3.5 times as long as broad; pedicel slightly longer than broad; flagellum long (for the subgenus), reaching anterior end of tegula, first segment about twice as long as broad, following segments progressively shorter except the last which is a little longer than next to last. Wings distinctly brownish, veins and stigma black. Legs rather robust; middle basitarsus broadened by a small expansion of the posterior margin near the base; middle coxae each produced ventrally, mesad of articulation of trochanter, to form a rounded shining projection. Abdominal terga rather conspicuously and densely punctured, more finely and closely so at posterior margins; seventh tergum without lateral teeth but with a broad, shallow, median emargination; eighth tergum deeply bilobed, the lobes narrowly rounded; second sternum produced posteriorly in the middle to a narrowly truncate, slightly down-curved, snout-like projection; third sternum with margin broadly convex, feebly fringed; fourth sternum with margin straight and unfringed except for small median fringed emargination; fifth and sixth sterna depressed medially, posterior margins straight, not fringed; sterna three to six with a rather small, shining, lateral elevation on each side, those of three to five rounded and progressively larger posteriorly, those of six each produced to a large tooth; seventh sternum with posterior margin notched medially; seventh sternum with strong longitudinal median ridge, bearing a dense mass of hairs on its summit and projecting as an apical process into the notch in the margin of the sternum; ninth sternum widest at base of free portion, tapering to bluntly pointed apex, margin distally fringed with rather long hairs; gonoforceps thick, robust, narrowest just basad of middle, slightly incurved apically, provided with numerous short hairs apically and along distal half of inner sides.

HOLOTYPE MALE: Hastings Natural History Reservation, near Jamesburg, Santa Lucia Mountains, Monterey County, California, elevation 1900 to 2700 feet, June 7, 1938 (C. D. Michener), in the collection of the American Museum of Natural History.

This species is named after Dr. J. M. Linsdale who has made ecological studies of great importance at the Hastings Natural History Reservation and who made possible the author's visits to this reservation.

SUBGENUS **ALCIDAMEA** CRESSON

Alcidamea CRESSON, 1864, Proc. Ent. Soc. Philadelphia, p. 385; PROVANCHER, 1882, Nat. Canadien, vol. 13, p. 171; PROVANCHER, 1883, Petite faune entomologique du Canada, hyménoptères, p. 689; CRESSON, 1887, Trans. Amer. Ent. Soc., suppl., p. 133; PROVANCHER, 1888, Additions

et corrections au vol. II Faune entomologique du Canada, hyménoptères, p. 297; ASHMEAD, 1899, Trans. Amer. Ent. Soc., vol. 26, p. 74; COCKERELL AND PORTER, 1899, Ann. Mag. Nat. Hist., ser. 7, vol. 4, p. 404; FRIESE, 1902, Zeitschr. Syst. Hymenopterologie u. Dipterologie, vol. 2, p. 188; ROBERTSON, 1903, Trans. Amer. Ent. Soc., vol. 29, p. 167; COCKERELL, 1906, Bull. Amer. Mus. Nat. Hist., vol. 22, p. 445; COCKERELL, 1910, Univ. Colorado Studies, vol. 7, pp. 185, 191; SLADEN, 1916, Canadian Ent., vol. 48, p. 272; MICHENER, 1936, Amer. Mus. Novitates, no. 875, p. 28; MICHENER, 1941, Amer. Midland Nat., vol. 26, p. 158; SANDHOUSE, 1943, Proc. U. S. Natl. Mus., vol. 92, p. 523; MICHENER, 1944, Bull. Amer. Mus. Nat. Hist., vol. 82, p. 263.

TYPE SPECIES: *Alcidamea producta* Cresson, by designation of Michener, 1941.

Autochelostoma SLADEN, 1916, Canadian Ent., vol. 48, p. 270; COCKERELL, 1922, Canadian Ent., vol. 54, p. 143.

TYPE SPECIES: *Autochelostoma canadensis* Sladen = *Alcidamea producta* Cresson (monobasic).

This subgenus contains small to medium-sized black species with the pubescence pale. From superficially similar groups such as *Andronicus* it differs in the tridentate mandibles of the female and in the last antennal segment of the male, which is drawn out into a sharply pointed apex.

FEMALE: Head and thorax rather finely to rather coarsely punctured. Clypeus slightly convex, produced over base of labrum, truncation variable; inner margins of eyes converging below; genal area as wide as, or slightly wider than, eye seen from side; hypostomal carinae rather high posteriorly but gradually reduced towards the front before the angle; mandibles short, broad, scarcely narrower medially than elsewhere, tridentate; antennae with first flagellar segment subequal to pedicel, longer than second flagellar segment; maxillary galea subequal in length to face or somewhat shorter; second segment of labial palpus 1.2 to 2.1 times length of first. Wings densely pubescent throughout, not papillate. Abdominal terga two to six coarsely punctured, without or with narrow impunctate margins; seventh tergum concave in profile, seventh sternum unmodified.

MALE: Clypeus with pubescence long and more or less erect; clypeus convex, apical margin somewhat thickened and produced over base of labrum; inner margins of eyes converging below; genal area about as wide as eye seen from side; hypostomal carinae low, rather uniform; mandibles short, bidentate; antennal scape thickened, two to three times as long as broad; pedicel usually almost completely hidden in concavity in apex of scape except when antenna is bent in an unusual manner; flagellum thick, the last segment bent and drawn out to a sharp point. Posterior coxae normal. Abdomen with eighth tergum produced to a pointed or to a broad truncate (or convex) median process; second sternum with posterior margin subtruncate; third larger than others, posterior margin broadly convex, subtruncate or emarginate medially, not fringed; fourth, fifth, and sixth fringed and straight or broadly emarginate posteriorly, fourth and fifth commonly with shining crescentic ridge on either side of midline; seventh with posterior margin subtruncate or convex, lacking median ridge or tuft; ninth with normal pubescence or hairs bent subapically, tapering to points.

This is the only Holarctic subgenus of *Hoplitis*. In addition to the American species, it contains such Eurasian species as *H. parvula* (Dufour and Perris). It is the largest and most difficult of the subgenera in America, containing several exceedingly similar species. The extreme forms of one of the species are morphologically much more different from one another than they are from certain closely related but apparently distinct species. A fuller discussion of evolution within the subgenus is presented in the introductory portion of this paper.

In the Western Hemisphere the species of this subgenus are divisible into two rather distinct groups, as indicated by the first couplets in the keys to species. *H. pilosifrons*, while belonging in the *producta* group, is to some extent intermediate, as indicated by the low protuberance of the third sternum of the male and the rather coarse punctation. The species of the *truncata* group are more coarsely punctate and usually larger than those of the *producta* group. Eurasian species do not belong in either of these groups.

KEY TO THE SPECIES OF *Alcidamea*

MALES

1. Eighth abdominal tergum truncate or sub-

truncate; third sternum without protuberance or projection 2
Eighth abdominal tergum pointed; third sternum with median protuberance or projection 3

2. Subapical breadth of eighth tergum less than one-half of distance between lateral teeth of seventh tergum; first flagellar segment broader than long or at least as broad as long . . . . . *sambuci*
Subapical breadth of eighth tergum over half of distance between lateral teeth of seventh tergum; first flagellar segment longer than broad . . . . . *truncata*

3. Projection of third abdominal sternum low, transverse, rounded as seen in profile; gonoforceps broad subapically, more than half as wide as basal width of these structures . . . . . *pilosifrons*
Projection of third abdominal sternum usually very high, not conspicuously transverse, angulate as seen in profile except in cases where the projection is extraordinarily high; gonoforceps slender beyond broad basal portions, distal portions less than half as wide as basal portions 4

4. Head longer than broad, produced noticeably above summits of eyes . . . *elongaticeps*
Head not, or rarely very slightly, longer than broad, not noticeably produced above summits of eyes 5

5. Antennal scape more than 2.5 times as long as broad; fringe of fourth abdominal sternum with dense median section so that there appears to be a median tuft, longer hairs of this tuft bent near the middle, so that distal portion of tuft is directed towards the body or parallel to it 6
Antennal scape greatly thickened, markedly less than 2.5 times as long as broad; fringe of fourth abdominal sternum variable but hairs not bent as described above 7

6. Projection of third abdominal sternum large and high, one-third to one-fifth as high as dorsoventral thickness of abdomen; margins of projection as seen in profile meeting in a strongly acute angle if projected . . . . . *grinnelli*
Projection of third abdominal sternum small and low, only about one-seventh as high as thickness of abdomen; margins of projection as seen in profile meeting in a right angle or slightly acute angle if projected . . . . . *brachyodonta*

7. Projection of third abdominal sternum small, only about one-seventh as high as dorsoventral thickness of abdomen; maxillary galeae at least as long as length of head (measured in side view from apex of clypeus to summit of vertex) . . . . . *colei*
Projection of third abdominal sternum larger, usually more than one-seventh as high as thickness of abdomen; maxillary galeae shorter than head 8

8. Length 9 mm. or more . . . . . *uvulalis*
Length 8 mm. or less . . . . . *producta*

FEMALES

1. Abdominal terga two to four each with deep transverse basal furrow behind gradulus (not visible if abdomen is elevated and segments retracted); rather robust, coarsely punctate species 2
Abdominal terga with basal furrows less deep, that of fourth segment nearly absent; usually more slender, more finely punctate species 3

2. Punctures of seventh tergum very fine, contrasting strongly with those of sixth . . . . . *sambuci*
Punctures of seventh tergum as coarse as those of sixth, at least medially . . . . *truncata*

3. Head markedly longer than broad; length 5.5 mm. or less . . . . . *elongaticeps*
Head at least as broad as long; length usually over 5.5 mm. 4

4. Maxillary galeae at least as long as head (measured in side view from apex of clypeus to summit of vertex); clypeal truncation broad, gently convex, not emarginate medially (fig. 25) . . . . . *colei*
Maxillary galeae shorter than head; clypeal margin with shallow median emargination 5

5. Punctures of posterior abdominal terga coarser than those of mesoscutum, those of sixth tergum coarser than, or at least as coarse as, those of fifth . . . . . *pilosifrons*
Punctures of abdominal terga finer than those of mesoscutum, those of fifth tergum ordinarily coarser than those of sixth 6

6. Sixth abdominal tergum with apical fascia of white pubescence . . . . . *grinnelli*
Sixth tergum not fasciate 7

7. Length 9 mm. or more; punctures of seventh abdominal tergum fine and close so that the tergum appears rather dull . . . *uvulalis*
Length almost always under 9 mm.; punctures of seventh abdominal tergum somewhat coarser, tergum less dull . . . . *producta*

Hoplitis (Alcidamea) truncata Cresson

This is a moderate-sized, rather robust, and coarsely punctate species, most closely re-

lated to *H. sambuci* but differing in numerous characters such as the more broadly truncate apex of the abdomen of the male and the carinate clypeus of the female.

MALE: Length 7 to 9 mm. Black, the distitarsi and tegulae often slightly rufescent, the tibial spurs pallid testaceous. Pubescence forming thin apical fasciae on abdominal terga two to six, at least laterally. Punctation of head and thorax coarse and close, that of vertex but little finer than that of mesoscutum, that of genal areas similar to that of mesepisterna; clypeus very finely and closely punctured except for impunctate anterior margin. Clypeus with truncation gently convex except medially where it is a little concave; first segment of labial palpus three-fourths to seven-eighths as long as second; antennae with scape 2.2 to 2.4 times as long as broad; first flagellar segment slightly longer than broad. Triangle of propodeum dull; wings dusky or brown. Eighth abdominal tergum produced to median subtruncate process more than half as wide as distance between lateral teeth of seventh tergum; posterior margin of third sternum with weak median emargination; posterior margin of seventh sternum broadly rounded except medially where the margin is straight or nearly so; ninth sternum with margins of free portion converging but little posteriorly in basal half, in distal half converging to angulate apex, ventral surface covered with coarse hairs which are bent subapically, dorsal surface with short simple hairs; gonoforceps narrowest about two-thirds of distance from base to apex, conspicuously broadened and bent inward subapically, terminating in blunt apices, pubescence moderately long and yellowish on under surface and outer margin in vicinity of bend, shorter and sparse on upper surface in same region, tips of gonoforceps bare.

FEMALE: Length 7.5 to 9.5 mm. Coloration and pubescence similar to male; tegulae usually entirely black; sixth abdominal tergum with apical fascia of white hairs similar to fasciae of preceding terga. Punctation coarser than in male, that of vertex and mesoscutum less dense, with conspicuous shining interspaces, that of mesepisterna somewhat coarser than that of genal areas. Clypeus with punctures about as coarse as those of vertex but dense; disc of clypeus usually with an irregular longitudinal median carina; anterior margin of clypeus with broad truncation, medially gently emarginate, the margin on either side of emargination usually elevated; distance between apices of first and second mandibular teeth slightly less than that between second and third. Punctation of abdomen progressively coarser and closer from tergum two to tergum seven.

This species is divided into two subspecies, as indicated below:

Hoplitis truncata truncata (Cresson)

truncata CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 108 (*Alcidamea*); CRESSON, 1879, Trans. Amer. Ent. Soc., vol. 7, p. 221 (*Alcidamea*); CRESSON, 1887, Trans. Amer. Ent. Soc., suppl., p. 301 (*Alcidamea*); ROBERTSON, 1897, Trans. Acad. Sci. St. Louis, vol. 7, p. 349 (*Alcidamea*); FRIESE, 1902, Zeitschr. Syst. Hymenopterologie u. Dipterologie, vol. 2, p. 188 (*Osmia*); ROBERTSON, 1903, Trans. Amer. Ent. Soc., vol. 29, p. 171 (*Alcidamea*); GRAENICHER, 1910, Bull. Pub. Mus. City of Milwaukee, vol. 1, p. 245 (*Alcidamea*); FRIESE, 1911, Das Tierreich, no. 28, p. 147 (*Osmia*); VIERECK, 1916, Connecticut Geol. Nat. Hist. Surv., bull. 22, p. 751 (*Andronicus* (*Alcidamea*) *truncatus*); CRESSON, 1916, Mem. Amer. Ent. Soc., no. 1, p. 133 (*Alcidamea*); LEONARD, 1926, Cornell Univ. Agr. Exp. Sta., mem. 101, p. 1028 (*Hoplitis*); ROBERTSON, 1928, Flowers and insects, p. 8 (*Alcidamea*); PEARSON, 1933, Ecol. Monogr., vol. 3, p. 381 (*Alcidamea*); GRAENICHER, 1935, Ann. Ent. Soc. Amer., vol. 28, p. 304 (*Hoplitis*); PROCTER, 1938, Biol. Surv. Mt. Desert Region, pt. 6, p. 445 (*Alcidamea*); BRIMLEY, 1938, Insects of North Carolina, p. 457 (*Alcidamea*); PROCTER, 1946, Biol. Surv. Mt. Desert Region, pt. 7, p. 507 (*Alcidamea*).

This subspecies differs from the following one in smaller average size (usually not over 8.5 mm. in length) and finer punctation; tegulae frequently slightly rufescent in male; clypeus of female with median impunctate line or carina often poorly developed, sometimes absent; antennal scape of male usually 2.3 or less times as broad as long; genital coxopodites much more than half as broad at narrowest point (postmedially) as at subapical expansion.

DISTRIBUTION: United States and southern Canada, primarily east of the Great Plains but occurring also in the northern part of the Plains west to the foot of the Rocky Moun-

tains (fig. 3). The following localities are marginal so far as present knowledge goes: Gainesville, Florida (a); Bar Harbor, Maine (b); Ironsides, Quebec (c); Haileybury, Ontario (d); Brainard, Minnesota (e); Beach, North Dakota (f); Fort Collins, Colorado (g); Carlinville, Illinois (h); and Hattiesburg, Mississippi (i).

Hoplitis truncata is primarily an insect of the eastern wooded portions of North America. It is apparently rare in the Great Plains area, although it occurs in North Dakota and at the foot of the Rocky Mountains in Colorado, where by good fortune material is available showing intergradation with *mescalerium*.

A single male specimen from Gregory Canyon near Boulder, Colorado (j), about 5600 feet altitude, June 20, 1922 (F. E. Lutz), is intermediate between this subspecies and *mescalerium*, having the size and coarse punctation of the latter but the genitalic characters and less dilated antennal scape of the nominate subspecies, *truncata*.

This species apparently flies earlier in the southern part of its range than in the northern. Dates range from April 14 to June 22 in the Carolinas, but in Toronto and vicinity the extremes are June 18 and August 17. As the specimen collected on the latter date is a male the species probably flies considerably later.

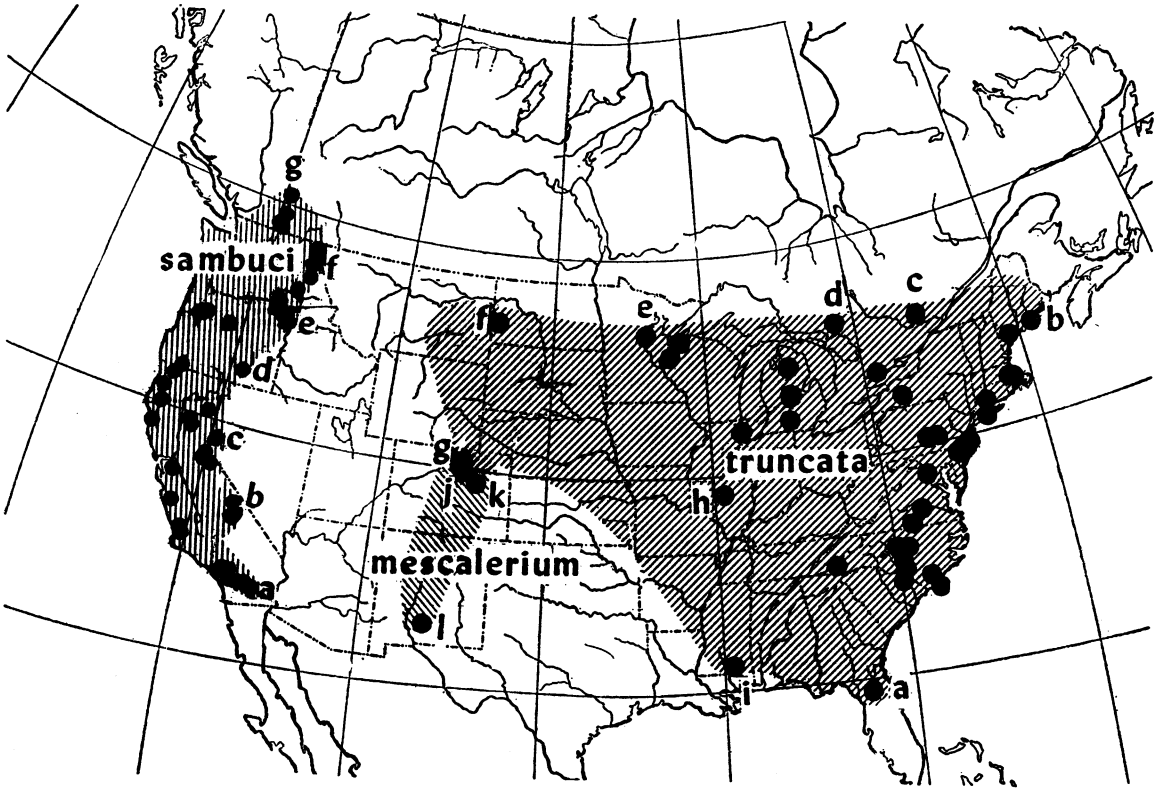


FIG. 3. Map showing the distribution of *Hoplitis* (*Alcidamea*) *truncata* and *H.* (*Alcidamea*) *sambuci*. The area of intergradation between the subspecies of *truncata* is indicated by the overlapping of types of shading.

Flower visiting records include *Tephrosia virginiana* (many specimens), *Pogonia gramminifolia*, *Rubus*, *Pentstemon*, *Oenothera*, and *Baptisia*.

The type specimen, from Georgia, is in the Academy of Natural Sciences of Philadelphia.

Hoplitis truncata mescalerium Cockerell

mescalerium COCKERELL, 1910, Entomologist, vol. 43, p. 90 (*Hoplitis*); COCKERELL, 1928, Univ.

Colorado Studies, vol. 16, p. 124 (*Hoplitis*); COCKERELL, 1932, Bull. Brooklyn Ent. Soc., vol. 27, p. 104 (*Hoplitis*).

This subspecies differs from the preceding in larger size (not under 8 mm. in specimens at hand) and coarser punctation; tegulae completely black; clypeus of female in all available specimens with at least a moderately well-developed carina, clypeal margin on either side of median emargination more elevated than in most specimens of *truncata;* antennal scape of male (in the known specimen) about 2.4 times as long as broad; genital coxopodites scarcely half as broad postmedially as at subapical expansion.

This subspecies is known from Mescalero, New Mexico (fig. 3, l) and Hubbard Ranch, near Elbert, Colorado (j), on flowers of *Gilia*, June 9 (Figgins). Intergradation with the subspecies *truncata* occurs near Boulder, Colorado, as indicated in the discussion of that subspecies.

The type specimen, from Mescalero, New Mexico, is in the United States National Museum.

Hoplitis (Alcidamea) sambuci Titus

sambuci TITUS, 1904, Proc. Ent. Soc. Washington, vol. 6, p. 101 (*Hoplitis*); COCKERELL, 1911, Ann. Mag. Nat. Hist., ser. 8, vol. 8, p. 763 (*Hoplitis*); BRAY, 1917, Pomona Jour. Ent. Zool., vol. 9, p. 97 (*Hoplitis*); COCKERELL, 1928, Univ. Colorado Studies, vol. 16, p. 124 (*Hoplitis*); COCKERELL, 1932, Bull. Brooklyn Ent. Soc., vol. 27, p. 204 (*Hoplitis*); LINSLEY AND MACSWAIN, 1943, Ann. Ent. Soc. Amer., vol. 36, p. 597 (*Hoplitis*).

This is a rather large, robust, coarsely punctate species. It is the western representative of the *truncata* group, distinguishable from *truncata* by many characters such as the black tibial spurs, the finely punctured seventh tergum of the female, and the relatively narrow process of the eighth tergum of the male.

MALE: Length 8 to 9 mm. Black, the distitarsi and tegulae sometimes slightly rufescent, the tibial spurs black. Pubescence forming narrow apical fasciae on terga two to five, at least laterally. Punctation of head and thorax rather coarse and close, that of vertex slightly finer than that of mesoscutum, that of genal areas much finer than that of mesepisterna; clypeus finely and closely punctate except for median area where there are usually large, irregular, elevated, shining interspaces. Clypeus with truncation gently convex except for a median shallowly concave region, the ends of which are marked by distinct small angles; first segment of labial palpus about two-thirds as long as second; antennae with scape about 2.5 times as long as broad, pedicel almost entirely concealed, first flagellar segment broader than long or at least as broad as long. Propodeal triangle dull laterally, shining medially. Wings slightly dusky. Eighth abdominal tergum produced to median subtruncate or rounded process less than one-third as broad as distance between lateral teeth of seventh tergum; posterior margin of third sternum with median emargination weak or absent; posterior margin of seventh sternum slightly produced medially and strongly rounded; ninth sternum with lateral margins of free portion converging but little, apex broadly rounded, apex and ventral surface provided with simple hairs which are thickened basally; gonoforceps narrowest about two-thirds of distance from base to apex, considerably broadened and curved inward subapically, bluntly pointed, pubescence long and yellowish on ventral surface of apical third, shorter on dorsal surface of same portion.

FEMALE: Length 8 to 11 mm. Coloration and pubescence similar to male, the tegulae wholly black; sixth abdominal tergum without apical pubescent fascia. Punctation coarser than in male, agreeing with above comments on male except that clypeus is closely punctured, the punctures being as large as those of mesoscutum. Clypeus lacking longitudinal carina; clypeal truncation rather short and broadly concave; distance between first and second mandibular teeth two-thirds of distance between second and third. Punctation of abdominal terga progressively coarser and closer from second to sixth terga; punctation of seventh tergum very fine and close.

DISTRIBUTION: Western North America from southern California to Idaho and southern British Columbia (fig. 3). The following locality records delimit the range as at present known: Santa Rosa Mountain, Riverside County, California (a); North Fork of Oak Creek, near Independence, Inyo County,

California (b); Carson Valley, Nevada (c); Harney County, Oregon (d); Baker, Oregon (e); Garwood, Idaho (f); British Columbia (g).

The species has been collected in southern California from close to sea level to an altitude of 8000 feet. It occurs in brush-covered and wooded areas, primarily west of the main mountain divides, but occasionally (localities b and c above) on the desert slopes of the ranges.

This species and its closest relative, *truncata*, are allopatric, being indeed separated by a broad belt of territory in which neither is known. They are morphologically so different in a wide variety of characters that they must be regarded as specifically distinct, although, as exemplified in the discussion of the *producta* complex of this subgenus, marked morphological divergence of populations is not always an indication of specific distinctness.

In the lowlands of southern California the species has been collected from April 9 to June 30. In the northern and higher parts of its range the season of flight lasts at least as late as August 12, July collections being common.

Flowers visited include *Lotus scoparius* (several records); *Lotus* sp.?, *Lupinus* (several records), *Salvia mellifera* (two records), *Cryptantha*.

The type, from Pullman, Washington, is in the collection of the United States National Museum.

Hoplitis (Alcidamea) pilosifrons (Cresson)

pilosifrons CRESSON, 1864, Proc. Ent. Soc. Philadelphia, p. 386 (*Alcidamea*); CRESSON, 1879, Trans. Amer. Ent. Soc., vol. 7, p. 221 (*Alcidamea producta* var.); CRESSON, 1887, Trans. Amer. Ent. Soc., suppl., p. 301 (*Alcidamea producta* var.); PROVANCHER, 1888, Additions et corrections au faune entomologique du Canada, hyménoptères, p. 331 (*Alcidamea*); DALLA TORRE, 1899, Catalogus hymenopterorum, vol. 10, p. 381 (*Alcidamea*); FRIESE, 1902, Zeitschr. Syst. Hymenopterologie u. Dipterologie, vol. 2, p. 188 (*Osmia*); FRIESE, 1911, Das Tierreich, no. 28, p. 146 (*Osmia*); VIERECK, 1916, Connecticut Geol. Nat. Hist. Surv., bull. 22, p. 751 (*Andronicus*); CRESSON, 1916, Mem. Amer. Ent. Soc., no. 1, p. 127 (*Alcidmaea*); BRIMLEY, 1938, Insects of North Carolina, p. 457 (*Alcidmaea*).

graceae COCKERELL, 1923, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 263 (*Hoplitis*); COCKERELL, 1928, Univ. Colorado Studies, vol. 16, p. 115 (*Hoplitis*).

mucronata COCKERELL, 1934, Bull. Brooklyn Ent. Soc., vol. 29, p. 18 (*Alcidamea*).

simplex, COCKERELL, 1923, (not Cresson, 1864), Ann. Mag. Nat. Hist., ser. 9, vol. 12, p. 243 (*Alcidamea*); COCKERELL, 1928, Univ. Colorado Studies, vol. 16, p. 115 (*Alcidamea*); (?) PEARSON, 1933, Ecol. Monogr., vol. 3, p. 381 (*Alcidamea*).

This is the most distinct species of the *producta* group of *Alcidamea*. It is a moderate-sized species, more coarsely punctate than the other species of the group, and unique in the group for the low, rounded, transverse protuberance of the third sternum of the male.

MALE: Length 7 to 9 mm. Black, the tegulae and distitarsi usually somewhat brownish, the under side of flagellum and upper side of distal segments testaceous; posterior margins of abdominal segments narrowly dark brown. Pubescence rather abundant, usually white, but reddish in freshly emerged examples, forming apical fasciae (sometimes worn off) on abdominal terga two to six. Punctation of head and thorax dense; clypeus finely punctured except for impunctate anterior margin; vertex usually more finely punctate than mesoscutum; mesepisterna about as coarsely punctate as mesoscutum. Clypeal margin slightly thickened, truncation defined by distinct angles, more than twice as broad as distance from one of these angles to lateral angle of clypeus; first segment of labial palpus almost three-fourths as long as second; antennal scape about twice as long as broad, flagellum with first segment longer than broad, flagellum tapering slightly so that penultimate segment is about three-fourths as broad as first segment. Triangle of propodeum dull; wings slightly brownish. Abdominal terga progressively more coarsely punctured from second to seventh, the posterior ones more coarsely punctured than mesoscutum; eighth tergum produced to a long, slender, median process, approximately parallel sided subapically and narrowly rounded apically; third sternum with large but rather low and rounded, transverse swelling; fourth, fifth, and sixth sterna with posterior margins medi-

ally emarginate, the emargination narrowest on fourth, widest on sixth, the margins fringed with long hairs which are denser in the emarginations than elsewhere; seventh sternum produced to an apex which is rather narrowly rounded, the subapical margins if projected would meet in an angle of approximately 90°; free portion of ninth sternum with margins diverging slightly to the broadly rounded (medially narrowly subtruncate) apex, provided on ventral surface and at apex with very long simple hairs; gonoforceps rather broad, especially distally, scarcely incurved, rounded apically, distal half hairy beneath, distal one-fifth with some long hairs above, outer margin in distal two-fifths with a band of conspicuous, long, curved hairs.

FEMALE: Length 7.5 to 9.5 mm. Coloration similar to male, tegulae usually darker, abdominal terga usually lacking brown margins. Sixth abdominal tergum with an apical fascia of white hairs which is thinner and less conspicuous than fasciae of preceding terga. Punctation coarser than that of male, that of clypeus coarser than elsewhere on head and thorax and with conspicuous shining interspaces between punctures, that of mesoscutum markedly coarser and less dense than in male. Clypeus lacking longitudinal carina, truncation very broad, over three times as wide as distance from its end to lateral angle of clypeus, demarked by rounded angles, broadly emarginate medially; anterolateral margins of clypeus concave; distance between apices of first and second mandibular teeth about half that between second and third. Abdominal punctation progressively coarser from second to sixth terga, that of sixth being coarser than seventh and ordinarily coarser than mesoscutum.

DISTRIBUTION: United States and southern Canada east of the eastern foot of the Rocky

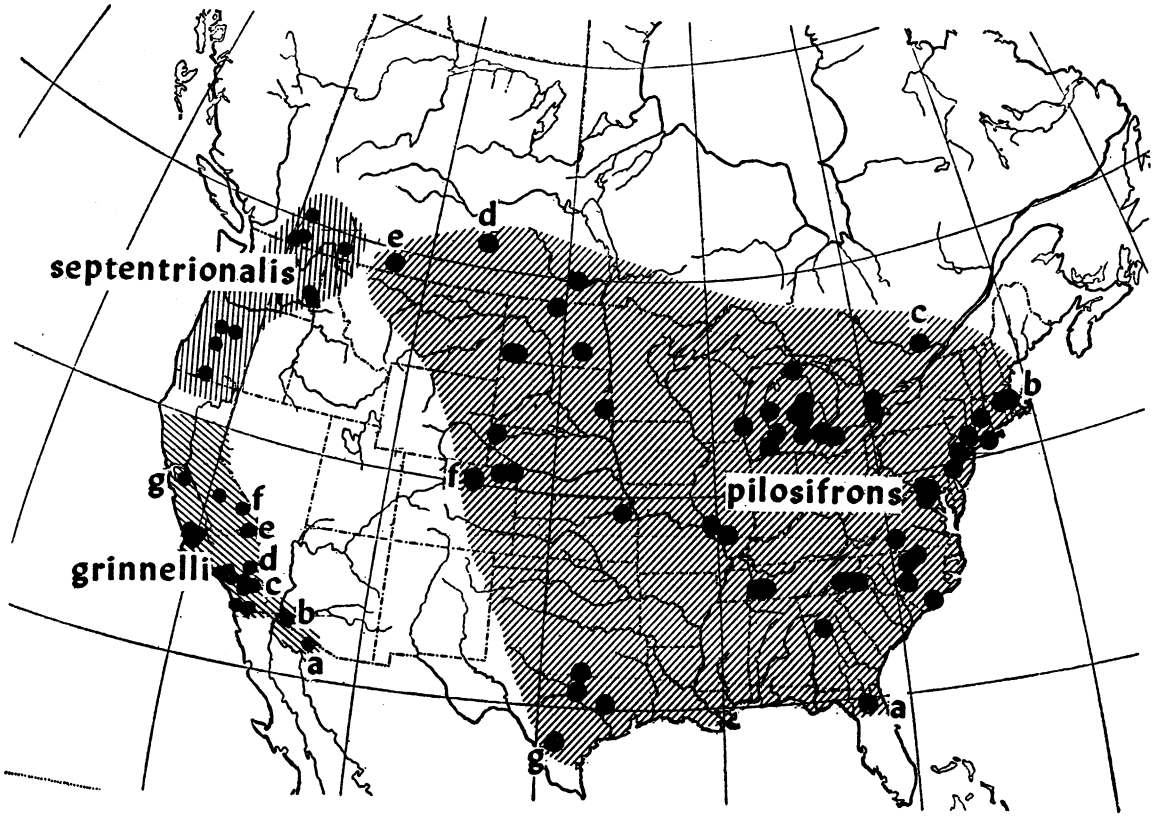


FIG. 4. Map showing the distribution of *Hoplitis* (*Alcidamea*) *pilosifrons* and *H.* (*Alcidamea*) *grinnelli*.

Mountains (fig. 4). Marginal localities are as follows: Gainesville, Florida (a); Forest Hills, Massachusetts (b); Ironsides, Quebec (c); Saskatoon, Saskatchewan (d); Lethbridge, Alberta (e); Boulder, Colorado (f); and Cotulla, Texas (g).

This species occurs both in the Great Plains and in the eastern wooded portions of North America. There are no records from the Rocky Mountains, although it reaches the foot of the mountains in Colorado, and there are no records for the southern Mississippi Valley.

Dates of collection range from April 29 to August 23, with most of the records falling in May and June.

Flower visiting records include *Pentstemon hirsutus*, *Lupinus*, *Rubus procumbens*, *Monarda pectinata*, and *Callirhoe involucrata*.

The type specimen of *pilosifrons* from Connecticut is in the Academy of Natural Sciences of Philadelphia; the type specimens of *graceae* from Sterling, Colorado, and of *mucronata* from Roggen, Morgan County, Colorado, are in the collection of the United States National Museum.

Hoplitis (Alcidamea) producta (Cresson)

This variable species is divisible into several subspecies, as indicated in the following pages. It may be distinguished from other species by the characters indicated in the keys.

MALE: Length 5 to 9 mm. Black, the tegulae and distitarsi usually somewhat brownish, the under side of flagellum and upper side of distal portion of flagellum brown; posterior margins of abdominal terga usually brownish. Pubescence rather abundant, usually white but ochraceous in freshly emerged specimens, forming apical fasciae (often worn off) at least laterally on abdominal terga two to six. Punctation of head and thorax dense; clypeus finely punctate except for impunctate anterior margin; vertex scarcely more finely punctate than mesoscutum; mesepisterna as coarsely punctate as mesoscutum. Clypeal margin slightly thickened, truncation defined by distinct angles, more than twice as broad as distance from one of these angles to lateral angle of clypeus; first segment of labial palpus one-half to three-fourths as long as second, antennal scape 2.0 to 2.3 times as long as broad. Propodeal triangle shining below (except sometimes in the subspecies *gracilis*); wings feebly dusky. Eighth abdominal tergum produced to a bluntly pointed median process, which is shorter than in *pilosifrons*, lateral margins converging posteriorly; third sternum with large median protuberance; fourth sternum with margin not or but little emarginate medially, fringed with straight hairs which are much denser medially than elsewhere; fifth sternum similar but often shallowly emarginate posteriorly; sixth sternum with posterior margin straight or broadly emarginate; seventh sternum with posterior margin rounded; ninth sternum with sides of free portion approximately parallel basally, converging to a sharp angle at apex, hairs moderately numerous, simple; gonoforceps slender, approximately parallel sided except for basal broad areas, slightly bent inward subapically, narrowly rounded at apices, bearing some simple hairs on apical two-fifths of under sides and apical one-fifth of upper sides.

FEMALE: Length 5 to 8.5 mm. Coloration similar to male but brownish areas less conspicuous. Sixth abdominal tergum not fasciate. Punctation coarser than in male, that of clypeus and supraclypeal area coarser than elsewhere on head and about as coarse as that of mesoscutum, which is markedly coarser than that of vertex and coarser than in male. Clypeus lacking longitudinal carina; distance between apices of first and second mandibular teeth more than half that between second and third. Abdominal punctation progressively coarser from second to fifth tergum, finer on sixth and seventh, that of fifth ordinarily finer than that of mesoscutum.

The evolution of the subspecies of *producta* is discussed in the introductory portion of this paper.

Hoplitis producta gracilis (Michener)

gracilis MICHENER, 1936, Pan-Pacific Ent., vol. 11, p. 183 (*Osmia*); MICHENER, 1941, Amer. Midland Nat., vol. 26, p. 157 (*Robertsonella*).

producta, LINSLEY AND MACSWAIN, 1946, (not Cresson, 1864), Ann. Ent. Soc. Amer., vol. 36, p. 597 (*Hoplitis*).

MALE: Length 5 to 7 mm. Flagellum rather slender, penultimate segment little if any

broader than basal; penultimate segment often longer than broad; eye (unlike other subspecies) broader than genal area seen from side. Propodeal triangle commonly finely roughened throughout, although sometimes smooth below as in other subspecies. Brown margins of abdominal terga often rather broad; fifth abdominal sternum usually very little emarginate medially; apical fringe of sixth sternum usually consisting of hairs at least three-fourths as long as those of fifth.

FEMALE: Length 5 to 7 mm. Smaller and more finely punctate than in other subspecies. Apical margins of clypeus with small median emargination usually less than half as broad as distance from lowermost point of clypeal margin to lateral angle of clypeus; margin between lowermost point and lateral angle angulate much as in *bernardina*, the angle being sufficiently conspicuous that it would be considered as demarking the very broad clypeal truncation (fig. 24), although it is not homologous with the angle which demarks the truncation in typical *producta*.

DISTRIBUTION: Southern California to central Oregon (fig. 2). Among available specimens, the following localities are marginal: Herkey Creek, San Jacinto Mountains (i), Lone Pine (j), Davis Creek, Modoc County (k), California; Redmond (l) and Corvallis (m), Oregon. One specimen from a series of four specimens from the latter locality approaches *subgracilis* in its characters.

In southern California this form occurs at least as low as 1500 feet altitude, although it is more common in the mountains. In central California it occurs at sea level as well as in the high mountains. It occurs on both the eastern and western sides of the Sierra Nevada, and even in such semi-arid locations as Lone Pine, Inyo County. This form occurs in wooded and brush-covered areas and is probably absent from the Great Valley of California.

As indicated in greater detail in the section on evolution in *Alcidamea*, males of *gracilis* from the Sierra Nevada west of the Panamint Mountain region often have the process of the eighth tergum broadened and apically rounded or subtruncate, as in *panamintana*.

Specimens have been collected from April 9 to July 21. Virtually all April records are from low altitudes in southern California.

The following flowers have been recorded as visited: *Lotus scoparius*, *L. davidsonii*, *Astragulus bolanderi*, *Glycorrhiza lepidota*, *Vicia americana*, *Phacelia davidsonii*, *P. distans*, *Gilia exilis*.

The type specimen from Mill Valley, Marin County, California, is in the collection of the California Academy of Sciences.

The recognition of the male of this form shows clearly that the previous placement in *Robertsonella* was an error. It was based largely on the broad truncation of the clypeus of the female, which is much as in *Robertsonella simplex* (Cresson). The characters separating *Robertsonella* from *Hoplitis* are at most very feeble in females.

Hoplitis producta subgracilis, new subspecies

Agrees with *gracilis* except that eye of male is only as wide as genal area and penultimate antennal segment of male is broader than long (or as long as broad). Female indistinguishable from *gracilis*.

DISTRIBUTION: Northern Oregon, northern Idaho, Washington, southern British Columbia (fig. 2).

TYPE MATERIAL: Holotype male: subalpine regions, Mount Jefferson, Oregon, July 18, 1907 (J. C. Bridwell). Paratype: White Ridge, Mount Jefferson, Oregon, August 4, 1907 (J. C. Bridwell). The types are in the collection of the United States National Museum.

Additional localities are Wallowa Lake (5500 feet altitude), Weston, and Hood River, Oregon; Pullman and White River near Mount Rainier, Washington; Coolin (Priest Lake), Idaho; Okanagan Falls, Penticton, Summerland, Vernon, Kaslo, Golden, Chilcotin, and Bear Lake, British Columbia. Since but one specimen is available from most of these localities, the best dividing line between *subgracilis* and *interior* is difficult to determine. The two males from Banff, Alberta (fig. 2, n), are obviously *interior*.

Hoplitis producta interior, new subspecies

MALE: Length 6 to 7.5 mm. Agrees with *bernardina*, described below, except for smaller average size and slightly more thickened flagellum, the basal segment of which is usually slightly broader than penultimate segment.

FEMALE: Length 7 to 7.5 mm. Agrees with *bernardina* except for smaller average size.

DISTRIBUTION: The Rocky Mountain region from Alberta to New Mexico (fig. 2).

TYPE MATERIAL: Holotype male: Poncha Pass, Colorado, June 20, 1933 (W. Steele). Allotype female: Leadville, Colorado, 10,300 feet altitude, August 3 to 5, 1919 (Pearce Bailey, Jr.). The types are in the collection of the American Museum of Natural History.

Additional specimens of this subspecies are from Aztec and Raton, New Mexico; Starkville and Ouray, Colorado; Banff, Alberta; Park City and Logan, Utah; and Oracle and 32 miles south of Prescott, Arizona.

A female from Kyle Canyon, Charleston Mountains, Nevada, 5600 feet altitude (fig. 2, h), June 4, 1941, on *Pentstemon* cannot be placed subspecifically. It must belong either to *interior* or *panamintana*.

Hoplitis producta bernardina, new subspecies

MALE: Length 7 to 8 mm. Flagellum not so robust basally as in typical *producta*, so that penultimate segment is about as broad as basal segment; penultimate segment broader than long. Fifth abdominal sternum distinctly emarginate medially; apical fringe of sixth sternum less than half as long as that of fifth.

FEMALE: Length 7 to 9 mm. Apical margin of clypeus with emargination not so broad as distance from end of emargination to lateral angle of clypeus; clypeal margin midway between lateral angle and lowermost point of clypeus forming a rounded angle (absent or feeble in typical *producta*) (see fig. 23).

DISTRIBUTION: The mountains (and rarely the lowlands) of southern California (fig. 2).

TYPE MATERIAL: Holotype male: Mill Creek, San Bernardino Mountains, California, 4800 feet altitude, May 13, 1940, on *Gilia exilis* (P. H. Timberlake). Allotype female: Mountain Home Creek, San Bernardino Mountains, California, June 4, 1935, on *Pentstemon cordifolium*. Paratypes: two collected with the holotype; one from Mill Creek, San Bernardino Mountains, California, 6000 feet altitude, June 26, 1938, on *Pentstemon grinnelli* (P. H. Timberlake); one from the same locality, 4400 feet altitude, May 30, 1938, on *Mimulus fremontii* (P. H. Timberlake); one, Forest Home, San Bernardino County, California, June 18, 1928 (E. C. Van Dyke); one, Cajon Pass, San Bernardino County, California, July 2, 1934 (I. McCracken); three from Lone Pine Canyon, San Gabriel Mountains, California, about 4000 feet altitude, June 16, 1928, on *Pentstemon spectabilis* (P. H. Timberlake); three, Alpine Inn, Mount Lowe, San Gabriel Mountains, 5000 feet altitude, June 12 (J. M. Aldrich); one, Idyllwild, San Jacinto Mountains, California, on *Astragalus parishii* (P. H. Timberlake); two, 7 miles west of Keen Camp, San Jacinto Mountains, California, May 17, 1939, on *Eriogonum* (R. F. Smith); one, Pinon Flat, San Jacinto Mountains, California, June 18, 1941 (E. C. Van Dyke). The holotype, allotype, and a series of paratypes will be returned to the collection of Mr. P. H. Timberlake, Citrus Experiment Station, Riverside, California. Additional paratypes will be found in the collections of the American Museum of Natural History, the United States National Museum, and the California Academy of Sciences.

A single female from the Puente Hills, California, May 11, 1930 (P. H. Timberlake), apparently belongs to this subspecies, although it is from a much lower altitude than other material of *bernardina*.

Hoplitis producta panamintana,
new subspecies

MALE: Length 6.5 to 8 mm. Agrees with description of *bernardina* except that process of eighth abdominal tergum is rather broad, rounded apically, subparallel sided subapically; longer hairs of under surfaces of male gonoforceps restricted to apical third or fourth. In one paratype the penultimate flagellar segment is slightly longer than broad, and in the holotype and one paratype the projection of the third sternum is immense and blunt as in the holotype of *uvulalis*. The outer portions of the tegulae are paler and more translucent than usual in the species.

DISTRIBUTION: Panamint and Inyo Mountains, California (fig. 2).

TYPE MATERIAL: Holotype male and three male paratypes: Tuber Canyon, Panamint Mountains, Inyo County, California, 8000 feet altitude, June 18, 1937 (C. D. Michener). One male paratype: Wild Rose Canyon, Panamint Mountains, California, 7000 feet

altitude, May 27, 1937, on *Phacelia* (C. D. Michener). The holotype and three paratypes will be deposited in the collection of the American Museum of Natural History. One paratype will be placed in the collection of Mr. P. H. Timberlake, Citrus Experiment Station, Riverside, California.

In the absence of females definitely associated with the males, the status of *panamintana* is open to some question. However, a female from the summit of Westgard Pass, Inyo County, California, June 15, 1937 (C. D. Michener) is tentatively associated with *panamintana*. This specimen is not distinguishable from *interior* or *bernardina*.

Further evidence that *panamintana* is a subspecies of *producta* is found in the presence of a character of *panamintana* in many individuals of the population of *gracilis* occurring in the Sierra Nevada near the range of *panamintana*. Thus there evidently is or has been some gene flow across the Owens Valley between *panamintana* and *gracilis*, although *panamintana* shows no *gracilis* characteristics.

Hoplitis producta producta (Cresson)

producta CRESSON, 1864, Proc. Ent. Soc. Philadelphia, p. 386 (*Alcidamea*); CRESSON, 1879, Trans. Amer. Ent. Soc., vol. 7, p. 221 (part) (*Alcidamea*); CRESSON, 1887, Trans. Amer. Ent. Soc., suppl., p. 301 (part) (*Alcidamea*); ROBERTSON, 1892, Trans. Acad. Sci. St. Louis, vol. 5, p. 579 (*Alcidamea*); DALLA TORRE, 1899, Catalogus hymenopterorum, vol. 19, p. 381 (*Alcidamea*); FRIESE, 1902, Zeitschr. Syst. Hymenopterologie u. Dipterologie, vol. 2, p. 188 (*Osmia*); ROBERTSON, 1903, Trans. Amer. Ent. Soc., vol. 29, p. 171 (*Alcidamea*); GRAENICHER, 1905, Bull. Wisconsin Nat. Hist. Soc., vol. 3, p. 155 (*Alcidamea*); BRITTON AND VIERECK, 1906, 29th Ann. Rept. Connecticut Agr. Exp. Sta., 1905, pt. 4, p. 220 (*Alcidamea*); GRAENICHER, 1906, Bull. Wisconsin Nat. Hist. Soc., vol. 4, p. 135 (*Alcidamea*); SMITH, 1910, Ann. Rept. New Jersey State Mus., 1909, p. 697 (*Andronicus*); FRIESE, 1911, Das Tierreich, no. 28, p. 146 (*Osmia*); CRAWFORD, 1913, Canadian Ent., vol. 45, p. 270 (*Alcidamea*); VIERECK, 1916, Connecticut Geol. Nat. Hist. Surv., bull. 22, p. 751 (*Andronicus* (*Alcidamea*) *productus*); CRESSON, 1916, Mem. Amer. Ent. Soc., no. 1, p. 128 (*Alcidamea*); COCKERELL, 1923, Ann. Mag. Nat. Hist., ser. 9, vol. 12, p. 243 (*Alcidamea*); CRIDDLE, CURRAN, VIERECK, AND BUCKELL, 1924, Rept. Ent. Soc. Ontario, no. 33, p. 99 (*Andronicus*); ROBERTSON, 1926, Psyche, vol. 33, p. 117 (*Alcidamea*); HICKS, 1926, Univ. Colorado Studies, vol. 14, p. 241 (*Alcidamea*); LEONARD, 1926, Cornell Univ. Agr. Exp. Sta., mem. no. 101, p. 1028 (*Alcidamea*); RAU, 1926, Psyche, vol. 35, p. 100 (*Alcidamea*); COCKERELL, 1928, Univ. Colorado Studies, vol. 16, p. 115 (*Alcidamea*); RAU, 1928, Psyche, vol. 35, p. 100 (*Alcidamea*); COCKERELL, 1935, Amer. Mus. Novitates, no. 766, p. 2 (*Alcidamea*); GRAENICHER, 1935, Ann. Ent. Soc. Amer., vol. 28, p. 304 (*Alcidamea*); COCKERELL, 1936, Amer. Mus. Novitates, no. 875, p. 16 (*Alcidamea*); BRIMLEY, 1938, Insects of North Carolina, p. 457 (*Alcidamea*); PROCTER, 1938, Biol. Surv. Mt. Desert Region, pt. 6, p. 445 (*Andronicus* and *Alcidamea*); MICHENER, 1941, Amer. Midland Nat., vol. 26, p. 158 (*Hoplitis*); PROCTER, 1946, Biol. Surv. Mt. Desert Region, pt. 7, p. 507 (*Alcidamea*).

canadensis SLADEN, 1916, Canadian Ent., vol. 48, p. 270 (*Autochelostoma*); COCKERELL, 1922, Canadian Ent., vol. 54, p. 143 (*Autochelostoma*).

helenae COCKERELL, 1934, Amer. Mus. Novitates, no. 732, p. 6 (*Alcidamea*).

simplex, COCKERELL, 1899 (not Cresson, 1864), Entomologist, vol. 32, p. 158 (*Alcidamea*); (?) COCKERELL AND PORTER, 1899, Ann. Mag. Nat. Hist., ser. 7, vol. 4, p. 404 (*Alcidamea*); (?) BRIDWELL, 1899, Trans. Kansas Acad. Sci., vol. 16, p. 210 (*Alcidamea*); COCKERELL, 1906, Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 74 (*Alcidamea*); COCKERELL, 1906, Bull. Amer. Mus. Nat. Hist., vol. 22, p. 445 (*Alcidamea*); TITUS, 1906, Jour. Ent. Soc. Washington, vol. 7, p. 159 (*Alcidamea*); COCKERELL, 1907, Univ. Colorado Studies, vol. 4, p. 253 (*Alcidamea*); LOVELL AND COCKERELL, 1907, Psyche, vol. 14, p. 18 (*Alcidamea*); GRAENICHER, 1910, Bull. Pub. Mus. City of Milwaukee, vol. 1, p. 245 (*Alcidamea*); COCKERELL, 1910, Psyche, vol. 17, p. 246 (*Alcidamea*); COCKERELL, 1911, Ann. Mag. Nat. Hist., ser. 8, vol. 8, p. 763 (*Alcidamea*); COCKERELL, 1912, Ent. News, vol. 23, p. 444 (*Alcidamea*); SLADEN, 1916, Canadian Ent., vol. 48, p. 272 (*Alcidamea*); ROBERTSON, 1926, Psyche, vol. 33, p. 117 (*Alcidamea*); ROBERTSON, 1928, Flowers and insects, p. 8 (*Alcidamea*).

bucconis, PROVANCHER, 1882 (not Say, 1837), Nat. Canadien, vol. 13, p. 208 (*Osmia*); PROVANCHER, 1883, Petite faune entomologique du Canada, hyménoptères, p. 708 (*Osmia*); PROVANCHER, 1888, Additions et corrections au Faune entomologique du Canada, hyménoptères, p. 325 (*Osmia*).

The type of *Autochelostoma canadensis* is an intersex, which accounts for its description as a distinct genus and species by Sladen. The

type of *Heriades simplex* Cresson (1864) is a *Robertsonella*, although it was long interpreted as an *Alcidamea*.

MALE: Length 6 to 8 mm. Flagellum thick, especially basally, tapering slightly so that penultimate segment is only about three-fourths as broad as first segment; penultimate segment broader than long. Fifth abdominal sternum often rather noticeably emarginate medially; apical fringe of sixth sternum usually less than half as long as that of fifth, very rarely elongate as in *gracilis*.

FEMALE: Length 6 to 8 mm. Apical margin of clypeus with the median, broadly concave truncation about as broad as distance from end of truncation to lateral angle of clypeus, margin between end of truncation and lateral angle of clypeus slightly convex.

DISTRIBUTION: This subspecies is widespread in the United States and southern Canada east of the Rocky Mountains (fig. 2). It is apparently rare or absent in the more arid portions of the Great Plains and in the Gulf Coast region. Among specimens available, the following localities are marginal: Kerrville, Texas (a); Atlanta, Georgia (b); Hants County, Nova Scotia (c); Lethbridge, Alberta (d); and Boulder, Colorado (e).

This subspecies ranges westward to the foot of the Rocky Mountains, but is replaced in the mountains by the subspecies *interior*. Although the type of *helenae* came from within a short distance of the range of *interior*, the specimen, like others from the area, is almost typical of *producta*. Specimen from Florissant (f) and Eldora (g), Colorado, are intermediate between *producta* and *interior*.

Specimens have been collected from April 27 to July 14.

Flowers recorded as visited are *Gilia*, *Pentstemon hirsutus*, and *Amorpha fruticosa*.

The type of *producta* from Virginia is in the Academy of Natural Sciences of Philadelphia; that of *canadensis* from "Ottawa (?)," Ontario, is in the Canadian National Collection, and that of *helenae* from Gregory Canyon near Boulder, Colorado, is in the American Museum of Natural History.

Hoplitis (Alcidamea) colei (Crawford)

colei CRAWFORD, 1916, Proc. Ent. Soc. Washington, vol. 18, p. 127 (*Alcidamea*).

MALE: Length 5 mm. Agrees with the description of *producta* except as indicated: first segment of labial palpus less than half as long as second; maxillary galeae at least as long as head; mouthparts, when folded, reaching at least to middle of anterior coxae; flagellum rather slender as in western subspecies of *producta*, penultimate segment little broader than basal segment and very little broader than long. Third abdominal sternum with projection very small but acutely angulate when seen in profile; fifth sternum but little emarginate posteriorly; sixth sternum with apical fringe long, as in *producta gracilis*.

FEMALE: Length 5 to nearly 7 mm. Agrees with the description of *producta* except for the characters of the mouthparts, which are as described above for the male *colei*. Clypeus with very broad apical truncation as in *producta gracilis*, differing from that form in that there is virtually no median emargination.

DISTRIBUTION: Apparently the arid and semi-arid foothill and mountain regions of southern California and Nevada. Specimens are at hand from the following localities: Andreas Canyon, near Palm Springs, California, April 11 and 24 and May 15, on *Eriodictyon crassifolium* (P. H. Timberlake); Sobaba Hot Springs, Riverside County, California, May 16, 1941 (E. C. Van Dyke); Lytle Creek, San Gabriel Mountains, California, July 4, 1933, on *Eriodictyon trichocalyx* (P. H. Timberlake); Mountain Home Creek, San Bernardino Mountains, California, June 17, 1934, on *Eriodictyon trichocalyx* (P. H. Timberlake); Altadena, Los Angeles County, California, May 5, 1934 (C. D. Michener); Kyle Canyon, Charleston Mountains, Nevada, 7500 feet altitude, July 25, 1942 (H. A. Scullen).

The type, from Redlands, California, is in the collection of the United States National Museum.

This species is closely related to, and probably derived from, *H. producta gracilis*. In southern California its range overlaps that of *gracilis*, but intermediate specimens are unknown. The long mouthparts may be an adaptation to the flowers of *Eriodictyon* and perhaps *Nama*, although, since the bees crawl into the flowers of this plant, the need for such an adaptation is not clear. However, the case is parallel to that of *Chelostoma*

minutum cockerelli Michener, found in the Palm Springs region with *H. colei* on flowers of *Eriodictyon*, and distinguished from other subspecies of *C. minutum* (which collectively have approximately the range of *H. producta gracilis*) primarily by the long mouthparts.

Hoplitis (Alcidamea) elongaticeps, new species

FEMALE: Length 5 (to 5.5) mm. Agrees with the description of *H. producta* and its subspecies *gracilis* except that the distance between the first and second mandibular teeth is nearly as great as that between second and third. Unlike *producta* and its subspecies the head is about 1.25 times as long as broad, instead of about as long as broad or a little broader.

MALE: Length 5 mm. Agrees with the description of *H. producta* and its subspecies *gracilis* except as indicated below: posterior margins of abdominal terga rather broadly brown; penultimate flagellar segment slightly broader than long (also true of many specimens of *gracilis*); projection of third sternum very small, although acutely angulate as seen in profile, much as in *colei*. Unlike *producta* and its subspecies the head is about 1.1 times as long as broad.

DISTRIBUTION: Mojave Desert and desert of Inyo County, California.

TYPE MATERIAL: Holotype female and one female paratype: 4 miles west of Lone Pine, Inyo County, California, May 19, 1937 (C. D. Michener); Allotype male: Highway 138, Mojave Desert, California, elevation 3500 feet altitude, on *Mimulus* (P. H. Timberlake). One female paratype from each of the following localities: 10 miles south of Adelanto, California, flying over ground, May 3, 1939 (P. H. Timberlake); Mazourka Canyon, Inyo Mountains, Inyo County, California, May 25, 1937, on *Parosela fremontii* (C. D. Michener). The holotype and two paratypes will be deposited in the collection of the American Museum of Natural History. The allotype and one paratype will be returned to Mr. P. H. Timberlake, Citrus Experiment Station, Riverside, California.

This is another species which, like *colei*, appears to have been derived from *producta gracilis*. It is the only apparently strictly desert member of its subgenus. Its range may overlap that of *gracilis*, for the latter has been taken at Lone Pine, only 4 miles from the type locality of *elongaticeps*. However, there is considerable mesophytic vegetation near Lone Pine, while 4 miles west of that town, conditions are very arid.

Hoplitis (Alcidamea) uvulalis (Cockerell)

uvulalis COCKERELL, 1902, Bull. Southern California Acad. Sci., vol. 1, p. 139 (*Alcidamea*); COCKERELL, 1903, Psyche, vol. 10, p. 76 (*Alcidamea*).

MALE: Length 9 to 10 mm. Agrees with the description of *H. producta* and its subspecies *bernardina* except for the large size and the more restricted pubescence of the male gonoforceps, the longer hairs of the under surfaces being restricted to the apical third or fourth. The penultimate antennal segment is sometimes longer than broad, and the projection of the third abdominal sternum is sometimes larger than in *producta*.

FEMALE: Length 9 to 11.5 mm. Agrees with the description of *H. producta* and its subspecies *bernardina* except for the large size and the unusually finely and closely punctate seventh abdominal tergum. The head is usually very slightly longer than broad, the reverse being the case in *producta* and its subspecies.

DISTRIBUTION: The higher Sierra Nevada in California north to Oregon and east to the mountains of Utah. Collecting data are as follows: North Fork of Bishop Creek, Inyo County, 8500 feet altitude, June 22, 1937 (C. D. Michener); West Walker River, Mono County, 7200 feet altitude, June 25, 1937 (C. D. Michener); Walker Lake, Mono County, California, July 23, 1915; Leavitt Meadows, Mono County, June 26, 1937; Sonora Pass, Alpine County, June 21, 1937; Wood Creek, Fresno County, 8000 feet altitude, July 22, 1910 (E. C. Van Dyke); Huntington Lake, Fresno County, 7000 feet altitude, July 7 (E. C. Van Dyke); Truckee, July 4, 1927 (E. P. Van Duzee); Gold Lake, Sierra County, July 12 and 19, 1921 (C. L. Fox); Meadow Valley, Plumas County, 3500 to 5000 feet altitude, June 16, 1924 (E. C. Van Dyke); all in California. Wallowa, Wallowa County, Oregon, June 27, 1936 (I. McCracken); Queen Mine, Cornucopia, Oregon, 5000 feet altitude, August 2, 1937 (Bolinger

and Jewett). Mount Timpanogas, Utah, July 8, 1922 (E. P. Van Duzee); American Fork Canyon, Utah, July 22.

The type, supposedly from Lancaster in the Mojave Desert, California, is in the collection of the United States National Museum. Actually the specimen probably came from the mountains bordering the Mojave Desert. Since the San Gabriel Mountains, south of the Mojave Desert, have been collected rather fully without this form's being found, it seems probable that the type actually came from the Tehachapi or southern Sierra Nevada, north of the Mojave Desert.

This species appears to have been derived from *H. producta bernardina* or *H. producta interior*.

Hoplitis (Alcidamea) grinnelli (Cockerell)

MALE: Length 5.5 to 7 mm. Agrees with *H. producta* as described above except as indicated below: Punctation somewhat finer; antennal scape more than 2.5 times as long as broad; flagellum rather slender, penultimate segment approximately as broad as basal one, usually slightly broader than long; eye noticeably broader than genal area seen from side. Fourth abdominal sternum with margin convex, fringe much denser medially than elsewhere, the long hairs of this median tuft-like portion of the fringe bent midway of their lengths so that the tuft is bent; fifth sternum with margin slightly convex to slightly concave; sixth somewhat concave, with apical fringe of hairs as long as those of fifth.

FEMALE: Length 6 to 8 mm. Agrees with *producta* as described herein except for the somewhat finer punctation; anterior margin of clypeus broadly bilobed. Fascia of sixth abdominal tergum conspicuous. Fifth and sixth abdominal terga about equally coarsely punctate and but little more finely so than mesoscutum.

Hoplitis grinnelli grinnelli (Cockerell)

grinnelli COCKERELL, 1910, Ann. Mag. Nat. Hist., ser. 8, vol. 5, p. 22 (*Alcidamea*); COCKERELL, 1922, Ann. Mag. Nat. Hist., ser. 9, vol. 10, p. 545 (*Alcidamea*).

(?) *producta*, DAVIDSON, 1896 (not Cresson, 1864), Ent. News, vol. 7, p. 216 (*Alcidamea*); FOWLER, 1901, Rept. Agr. Exp. Sta. Univ. California for 1898, p. 325 (part) (*Alcidamea*).

simplex, COCKERELL, 1903 (not Cresson, 1864), Psyche, vol. 10, p. 74 (*Alcidamea*).

In this subspecies the tegulae are usually pale translucent testaceous.

DISTRIBUTION: Southern and central California, primarily in the mountains and lowlands west of the mountains, more rarely in the deserts east of the mountains as far as Arizona and northern Sonora (fig. 4). Marginal localities are Sonoyta, Sonora (a); 5 miles east of Yuma, Arizona (b); Morongo Valley, San Bernardino County, California (c); Kramer Hills, Mojave Desert, California (d); Owens Lake, California (e); Westgard Pass, Inyo County, California (f); Mount Diablo, Contra Costa County, California (g); Dalzura, San Diego County, California (h). This form occurs primarily in brush-covered hilly or mountainous areas from sea level to 4000 feet altitude. Collections at higher altitudes are from particularly arid areas.

Certain specimens from the mountains have darker tegulae than usual in this subspecies. The two specimens known from Sonora (a) and Arizona (b) have darker tegulae, slightly paler wings, and perhaps more abundant pale pubescence. When more material is available it may be desirable to recognize an additional subspecies from this region.

Hoplitis grinnelli grinnelli has been collected from March 22 to July 3.

Flowers on which it has been collected are *Lotus glaber*, *L. strigosus*, *L. scoparius*, *Trifolium*, *Parosela fremontii*, *Salvia mellifera*, *Cryptantha*, *Rhamnus crocea*, *Larrea tridentata*, *Eriogonum*, and *Chorizanthe staticoides*.

The type, from the San Gabriel Mountains near Pasadena, is in the collection of the United States National Museum.

Hoplitis grinnelli septentrionalis,
new subspecies

Differs from *H. grinnelli grinnelli* in the tegulae, which are dark testaceous, frequently blackish along the inner margins (often as dark as in many specimens of *producta*).

TYPE MATERIAL: Holotype male: Salmon Arm, British Columbia, June 20, 1925 (A. A. Dennis). Allotype female and one paratype: Penticton, British Columbia, June 7, 1919

(E. R. Buckell). One paratype: Keremeos, British Columbia, June 26, 1923 (C. B. Garrett). The type series will be returned to the Canadian National Collection, Ottawa, Ontario, Canada.

Additional specimens of this subspecies are from Cranbrook, British Columbia; Colfax, Washington, July 9, 1925 (C. L. Fox); Pullman, Washington, June 1, 1919; Pamelia Lake and White Water Ridge, Mount Jefferson, Oregon, July 27 and August 4, 1907 (J. C. Bridwell); Horse Lake, Cascade Mountains, Lane County, Oregon, July 25 to 31, 1909 (J. C. Bridwell); Detroit, Oregon, July 11, 1907 (J. C. Bridwell); Eagle Ridge, Klamath Lake, Oregon, May 16, 1924 (C. L. Fox).

Hoplitis (Alcidamea) brachyodonta (Cockerell)

brachyodonta COCKERELL, 1933, Ent. News, vol. 44, p. 205 (*Alcidamea*); HICKS, 1933, Ent. News, vol. 44, p. 206 (*Alcidamea*).

This is probably a synonym of *H. grinnelli grinnelli*. It is known only in the male, which differs from small specimens of *grinnelli* in the unusually low projection of the third abdominal sternum, as indicated in the key. This projection is highly variable in *grinnelli*, but no specimens have been studied in which it is as small as in *brachyodonta*. As the type of *brachyodonta* was a reared specimen known to have been rescued from the attack of a chrysidid larva, it is easy to understand why it may have been depauperate.

Besides the holotype, only two specimens of this species are known. These are from near Holtville, California, March 20, 1930, on flowers of *Heliotropium curassavicum* (P. H. Timberlake) and Riverside, California, April 2, 1929, on flowers of *Chaenactis glabriuscula* (P. H. Timberlake).

The type from Pasadena, California, is in the collection of the United States National Museum.

CYRTOSMIA, NEW SUBGENUS

TYPE SPECIES: *Osmia hypocrita* Cockerell.

The species included in this subgenus is rather large, black, with the pubescence partly black, the scopa of the female entirely so. Superficially it resembles *Monumetha*, but is evidently not related to that subgenus, as shown, for example, by the long, slender, pointed male antennae and the short, broad ninth sternum of the male with simple pubescence. Probably it is more closely related to *Alcidamea* and *Dasyosmia*, from which it is easily distinguished by the tridentate mandibles of the male, the mandibles of the female which show an approach towards the quadridentate condition, and numerous other characters.

FEMALE: Head and thorax finely and closely punctate, the non-punctured areas mostly finely roughened and dull. Clypeus flat, with median longitudinal impunctate band, apical margin thin, produced, concave medially; inner margins of eyes converging below; head but little produced posteriorly behind ocelli but genal areas much wider than eyes; hypostomal carinae highest just behind angle, reduced gradually to the rear and rather rapidly at angle; mandibles rather small, tridentate, with a convexity representing a tooth in the space between second and third teeth (or if the inner tooth is low because of wear, they may be described as having two outer teeth, followed by a long, slightly undulating margin); first flagellar segment nearly twice as long as pedicel and much longer than second flagellar segment; mouthparts long, maxillary galea a little longer than face, second segment of labial palpus about 1.4 times as long as first; maxillary palpus with third segment much longer than any others, fifth slender, little if at all shorter than first, second, or fourth. Wings pubescent throughout, slightly papillate apically. Abdominal terga two to six with narrow impunctate margins; seventh tergum concave in profile; seventh sternum with strong longitudinal median ridge which does not bear scopal hairs, the ridge tapering anteriorly, deeply incised subapically, the apical portion produced posteriorly to a small blunt point.

MALE: Clypeus with long erect pubescence; clypeus produced over base of labrum to the unthickened apical truncation; inner margins of eyes converging below; genal area about as wide as eye seen from side; hypostomal carinae uniform, rather high; mandibles short, robust, tridentate, the notch between the second and third teeth shallow; antennae long, reaching scutellum; scape over 3.5 times as long as broad; pedicel exposed, slightly

broader than long; flagellar segments all much longer than broad, of approximately uniform width except the last which is more slender and pointed. Posterior coxae unmodified. Abdomen with seventh tergum bearing a median apical tooth in addition to the large lateral teeth; eighth tergum produced to a tridentate apex; second sternum subtruncate posteriorly; third nearly flat, larger than others but not greatly overlapping fourth, posterior margin convex medially; fourth to sixth sterna with posterior margins nearly straight, only the last fringed, fourth with small, dense, median tuft of hairs on posterior margin; seventh sternum with posterior margin rounded, without tuft or ridge; ninth sternum with marginal hairs only.

So far as known this subgenus includes only the type species, which ranges from the Rocky Mountains to the Pacific coast.

Hoplitis (Cyrtosmia) hypocrita (Cockerell)

hypocrita COCKERELL, 1906, Canadian Ent., vol. 38, p. 106 (*Osmia*); COCKERELL, 1907, Univ. Colorado Studies, vol. 4, p. 251 (*Osmia*); COCKERELL, 1910, Univ. Colorado Studies, vol. 7, p. 191 (*Osmia*); COCKERELL, 1911, Ann. Mag. Nat. Hist., ser. 8, vol. 8, p. 763 (*Alcidamea*); COCKERELL, 1912, Proc. U. S. Natl. Mus., vol. 42, p. 221 (*Alcidamea*); BRAY, 1917, Pomona Jour. Ent. Zool., vol. 9, p. 97 (*Alcidamea*); HICKS, 1926, Univ. Colorado Studies, vol. 15, p. 240 (*Alcidamea*); COCKERELL, 1928, Univ. Colorado Studies, vol. 16, p. 115 (*Alcidamea*); BECK, 1929, Bull. Brooklyn Ent. Soc., vol. 24, p. 306 (*Alcidamea*); COCKERELL, 1936, Ann. Mag. Nat. Hist., ser. 10, vol. 18, p. 632 (*Alcidamea*); COCKERELL, 1938, Ann. Mag. Nat. Hist., ser. 11, vol. 2, p. 151 (*Alcidamea*); COCKERELL, 1939, Proc. California Acad. Sci., ser. 4, vol. 23, p. 428 (*Alcidamea*); SANDHOUSE, 1939, Mem. Ent. Soc. Washington, vol. 1, p. 140 (*Hoplitis*).

This rather large species superficially resembles *H. albifrons argentifrons*, from which it is easily distinguished by the subgeneric characters.

MALE: Length 10 to 12 mm. Punctation fine and body surface, including propodeal triangle, dull. Pubescence long, white, fuscous, or black on posterior part of mesepisternum, on metepisternum, on sides of propodeum, on legs except posterior faces of fore femora, on fourth and following abdominal terga, and on abdominal sterna; some dark hair intermixed with the pale on third abdominal tergum. Clypeus nearly flat, without longitudinal impunctate band, ends of truncation marked by distinct angles, margin of clypeus broadly impunctate, indented on either side of midline; first segment of flagellum more than twice as long as broad, longer than any other segments, following segments progressively shorter except the last, which is about as long as the fifth. Ninth abdominal sternum with sides of basal two-thirds of free portion converging but little, the sternum abruptly narrowed about two-thirds of distance from base to apex and sides thence converging rapidly to the narrowly subtruncate apex, hairs few, confined to margins of apical portion, long, slender, mostly abruptly bent inward subapically; gonoforceps moderately slender, curved inward apically, slightly broadened in region of the curve where there are some long whitish hairs on outer margins; distal halves of gonoforceps with similar hairs on under surfaces. The other characters of importance are given in the subgeneric description.

FEMALE: Length 11 to 13 mm. Pubescence black, sides and upper part of clypeus, supraclypeal area, posterior margin of vertex and propodeum sometimes with white intermixed; pubescence of paraocular areas and supra-antennal area almost entirely white; pubescence of mesoscutum and mesoscutellum white, usually with a few black hairs intermixed on disc of mesoscutum; pubescence of second abdominal tergum largely white, and posterior margin of third white laterally.

DISTRIBUTION: The eastern foot of the Rocky Mountains in Colorado to southern British Columbia and southern California (fig. 5). The following localities are marginal so far as present data are concerned, or are in areas where the distribution is probably far from continuous: Durango (a), Los Pinos (b), and Boulder (c), Colorado; Salt Lake City (d) and Wellsville Canyon (e), Utah; Nicola Lake (f) and Penticton (g), British Columbia; Carson City, Nevada (h); Dulzura, San Diego County, California (i).

This species has usually been collected in hilly or mountainous situations from sea level to about 6000 feet altitude. Although generally absent in deserts, a specimen was col-

lected by the Boharts at Palmdale in the Mojave Desert, California. *H. hypocrita* is quite common in California but is evidently rare in the Rocky Mountain and northwestern areas.

Dates of collecting range from April 6 (Santa Catalina Island, California) to June 14 (Santa Lucia Mountains, California).

The species of this subgenus are large and robust forms, black (the legs sometimes red), with abundant and rather long pale pubescence.

Dasyosmia is probably most closely related to *Cyrtosmia*, from which it may easily be distinguished by such characters as the broad but clearly tridentate mandibles of the female, the more robust antennae of the male, and the distally papillate and basally largely bare wings of both sexes.

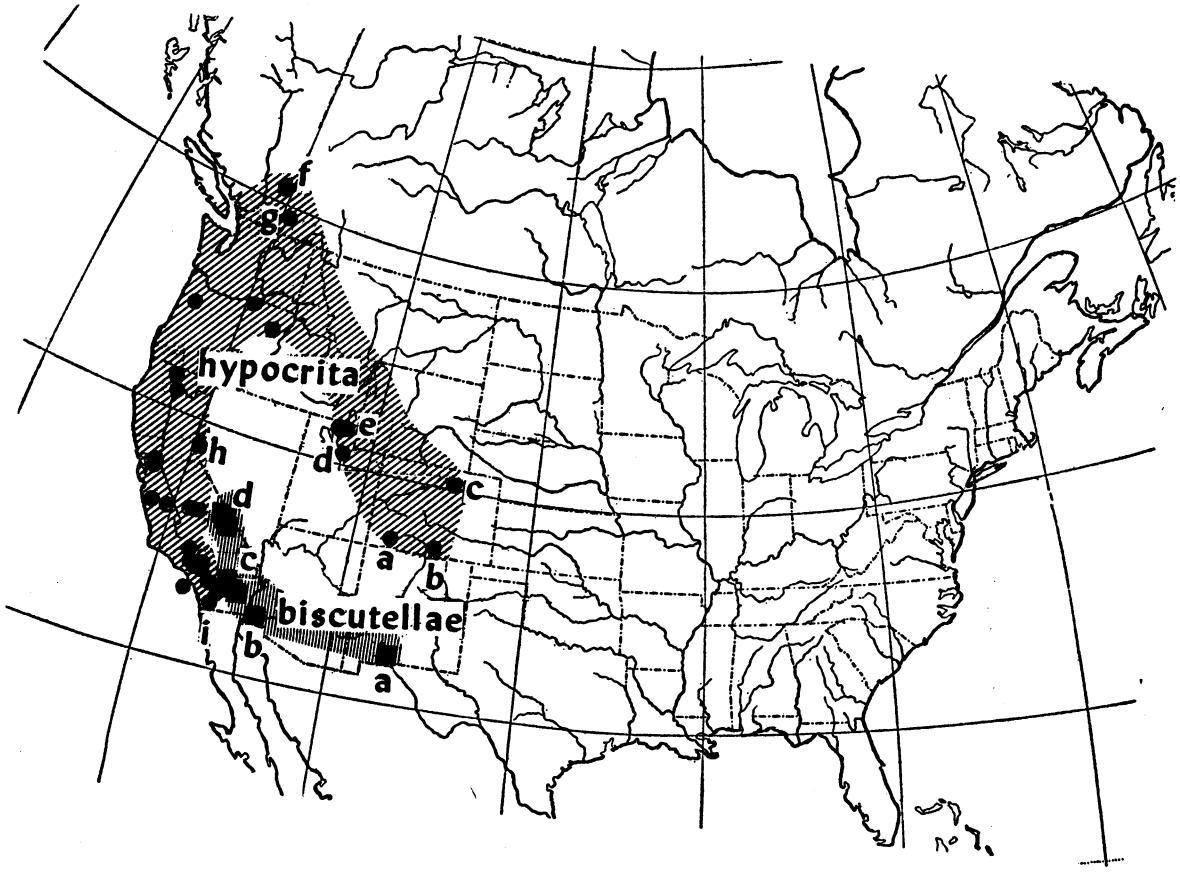


FIG. 5. Map showing the distribution of *Hoplitis* (*Cyrtosmia*) *hypocrita* and *H.* (*Dasyosmia*) *biscutellae*.

As the following list of flower records indicates, *hypocrita* is primarily a visitor of legumes: *Lotus scoparius* (many collections), *Astragalus parishii*, *Astragalus geniatus*, *Trifolium*, *Lathyrus*, *Lupinus*, and *Salvia mellifera*.

The type locality is Boulder, Colorado. The type specimen is in the collection of Mr. P. H. Timberlake, Citrus Experiment Station, Riverside, California.

DASYOSMIA, NEW SUBGENUS

TYPE SPECIES: *Alcidamea biscutellae* Cockerell.

FEMALE: Head and thorax coarsely, not closely punctate. Clypeus produced to a distinct truncation; inner margins of eyes slightly converging below; cheeks as wide as or wider than eyes, seen from side; hypostomal carinae high; mandibles rather broad apically, tridentate; first flagellar segment longer than pedicel or second flagellar segment; mouthparts short, maxillary galea much shorter than face, second segment of

labial palpus but little longer than first; third segment of maxillary palpus longer than any of the others, fifth slender, slightly shorter than any of others. Wings distinctly papillate distally, sparsely hairy, sometimes with bare areas medially and basally. Abdominal terga two to six with narrow impunctate posterior margins; seventh tergum concave in profile; seventh sternum unmodified.

MALE: Clypeus with long erect pubescence; clypeus produced over base of labrum, apical margin not thickened; inner margins of eyes subparallel or converging below; genal area about as wide as eye seen from side; hypostomal carinae high; mandibles rather broad, bidentate; antennae reaching tegulae, scape two and one-half to three times as long as broad, exposed portion of pedicel broader than long, flagellum somewhat flattened, the basal segments broadest, tapering very gradually towards distal one which is often pointed. Posterior coxae each with a large flattened ventral tooth.[1] Abdomen with seventh tergum with at least a slight median angle on posterior margin; eighth tergum produced to a median point, sometimes produced laterally as well so that it is tridentate; sterna three to six relatively simple, more or less fringed posteriorly, truncate or gently emarginate posteriorly, three to five sometimes with sublateral shining convexities; seventh sternum without median ridge or tuft of hairs, with a large median notch; pubescence of ninth sternum normal.

This subgenus includes two species found in the southwestern deserts. In one of these species the last antennal segment is pointed as in *Alcidamea*, while in the other it is rounded. Although this difference has often been regarded as a generic character (or subgeneric character in the classification here adopted), there is excellent reason to believe that *paroselae* and *biscutellae* should be included in a single subgenus. For example, both have wings which are papillate distally, sparsely hairy or with bare areas basally, both have mandibles which are unusually broad distally in the female, both have a large ventral tooth on each posterior coxa in the male, and both have unusually broad gonoforceps in the male and long, slender, parallel penis valves.

[1] This tooth suggests at first a greatly exaggerated carina, comparable to the feeble carina of each posterior coxa of *Anthocopa*. However, it appears to rise from the outer ventral line of the coxa rather than the inner ventral angle, and therefore cannot be considered homologous to the carina of *Anthocopa*. There is a similarly placed low ridge in males of the subgenus *Andronicus*.

KEY TO THE SPECIES OF *Dasyosmia*

1. Legs red; last antennal segment of male rounded; eighth abdominal tergum of male with a single median point . . . *paroselae*
   Legs black; last antennal segment of male pointed; eighth abdominal tergum of male tridentate . . . . . *biscutellae*

Hoplitis (Dasyosmia) biscutellae (Cockerell)

biscutellae COCKERELL, 1897, Ann. Mag. Nat. Hist., ser. 6, vol. 19, p. 400 (*Alcidamea*); COCKERELL, 1897, New Mexico College Agr., Agr. Exp. Sta., bull. 24, p. 28 (*Alcidamea*); COCKERELL, 1898, Bull. Denison Univ., vol. 11, p. 64 (*Alcidamea*); COCKERELL, 1898, Bull. Univ. New Mexico, vol. 1, p. 64 (*Alcidamea*); FRIESE, 1902, Zeitschr. Syst. Hymenopterologie u. Dipterologie, vol. 2, p. 188 (*Osmia*); FRIESE, 1911, Das Tierreich, no. 28, p. 145 (*Osmia*); COCKERELL, 1935, Pan-Pacific Ent., vol. 11, p. 51 (*Alcidamea*); COCKERELL, 1937, Amer. Mus. Novitates, no. 948, p. 10 (*Alcidamea*); LINSLEY AND MACSWAIN, 1943, Ann. Ent. Soc. Amer., vol. 36, p. 597 (*Hoplitis*).

This is a robust, hairy species with black legs. In the male the last antennal segment is pointed as in *Alcidamea*, and the eighth abdominal tergum is tridentate.

MALE: Length 9 to 13 mm. Black; tegulae, posterior margins of abdominal terga, and distal tarsal segments brownish. Pubescence dull white, long and dense on face, forming apical fasciae on terga two to six. Inner margins of eyes converging below; anterior margin of clypeus polished, impunctate, very broadly and shallowly biconcave so that there is a weak angle between the two concavities; hypostomal carinae each with a small tooth posteriorly and a large one at bend; mandibles normal; antennal scape widest apically, about 2.6 times as long as greatest breadth (somewhat flattened so that it appears much narrower in figure); flagellum considerably flattened, broadest basally, tapering very gradually towards apex, last segment slightly curved and pointed; vertex behind ocelli more coarsely punctate than rest of head; a large, shining, sparsely punctate area behind summit

of each eye; genal area more finely punctate than mesepisterna. Thorax coarsely punctate; propodeal triangle uniformly polished or feebly roughened above. Wings hyaline, often slightly brownish towards costal margins, veins nearly black. Posterior coxae with ventral teeth acute; posterior trochanters unmodified. Seventh abdominal tergum with a scarcely perceptible angle in the middle of posterior margin; eighth tergum produced to three large teeth; second sternum with large, slightly reflexed transverse lamella arising from posterior margin and standing between posterior trochanters; third to fifth sterna without shining impunctate area but with median portions scarcely punctate although finely roughened; posterior margins of these sterna approximately straight; sixth sternum with posterior margin broadly emarginate and provided with a very long fringe medially; seventh with short hairs, the posterior margin nearly bare and with broad median notch; ninth sternum with free portion rather broad, deeply bilobed apically, each lobe acutely pointed and hairy; gonoforceps very broad, slightly constricted just beyond basal expanded area, bent inward to pointed apices, provided in vicinity of bend with short hairs along outer margin which become progressively shorter and denser towards apices where similar hairs clothe under surfaces.

FEMALE: Punctation similar to male but slightly coarser. Anterior margin of clypeus truncate, not thickened, ends of truncation rounded; hypostomal carinae not toothed; genal area much wider than eye seen from side. Mandibles with distance between first and second teeth less than that between second and third, outer margin of third with a small convexity possibly representing another tooth.

DISTRIBUTION: This species is found in the southwestern deserts from New Mexico to California (fig. 5). It has been collected in the following localities: Mesilla Valley, New Mexico (a); Yuma, Arizona (b); 20 miles east of Indio; La Quinta; and Cathedral City (c), Riverside County, California; Lone Pine; Kearsarge; and Mazourka Canyon, Inyo Mountains (d), Inyo County, California.

This is a desert bee, ranging from sea level (Coachella Valley, California) up to at least 6000 feet above sea level (Inyo Mountains, California).

This species has been collected on flowers of *Larrea glutinosa* and *Encelia farinosa*.

Collections were made in April in the southern California deserts, in late May and early June at the higher altitudes in Inyo County.

The type from the Mesilla Valley, New Mexico, is in the collection of the United States National Museum.

Hoplitis (Dasyosmia) paroselae, new species

This species has the body form of *biscutellae*, its closest relative, from which it differs in the red legs, the rounded apical antennal segment in the male, the one-toothed rather than three-toothed eighth tergum of the male, and numerous other characters.

MALE: Length 11.5 to 12.5 mm. Black; mandibles except bases and apices translucent testaceous; tegulae dark brown; legs red except for coxae, trochanters, and bases of front femora; posterior margins of abdominal terga two to five narrowly brownish. Pubescence white, long and dense on face, abdominal fasciae weak. Inner margins of eyes but little converging below; anterior margin of clypeus rather broadly impunctate, shining, broadly and shallowly concave; hypostomal carinae not toothed; mandibles unusually broad, dorsal carina of outer margin produced to form a rounded lamella which is black in contrast to pale portion of mandible; antennal scape widest apically, about three times as long as broad; flagellum considerably flattened, first two segments broadest, third and fourth segments progressively narrower, remaining segments of approximately uniform width, the last rounded at apex; head finely and closely punctate, areas behind summits of eyes particularly finely and closely punctate. Thorax more coarsely punctate than head, median portion of mesoscutum with an area in which the punctures are separated by several diameters; propodeal triangle shining throughout, scarcely roughened above. Wings hyaline, venation brownish black. Posterior coxae with ventral teeth somewhat blunt; posterior trochanters each with a ventral

recurved spine arising basad of middle (fig. 6). Punctures of abdominal terga rather sparse except near impunctate marginal bands, surface between punctures finely roughened; seventh abdominal tergum with lateral teeth large and with a small median tooth on posterior margin; eighth tergum produced to a single large, bluntly pointed, median projection; second sternum with the thick median portion produced posteriorly in the middle over the thin marginal portion to form a narrow median truncation slightly exceeding the rest of the margin; third to sixth sterna with rear margins broadly and shallowly emarginate medially, second to fourth with shining, elevated, and nearly impunctate areas laterally, suggestive of *Monumetha* and *Chlorosmia;* sixth sternum with fringe shorter and less conspicuous than that of preceding sterna; seventh sternum with short pubescence, apical margin strongly bilobed so that there is a deep narrow notch between the lobes; ninth sternum with free portion narrowed rather rapidly for a short distance beyond base, then continued as slightly tapering ligulate process with narrowly rounded apex, apex nearly bare but rest of under side of free portion of sternum provided with hairs which are bent subapically, rather robust basally, tapering to slender apices; gonoforceps robust, broadest subapically, bent inward to acute apical point, distal half beneath and distal fourth above, except for the bare shining apex, clothed with short yellowish hairs.

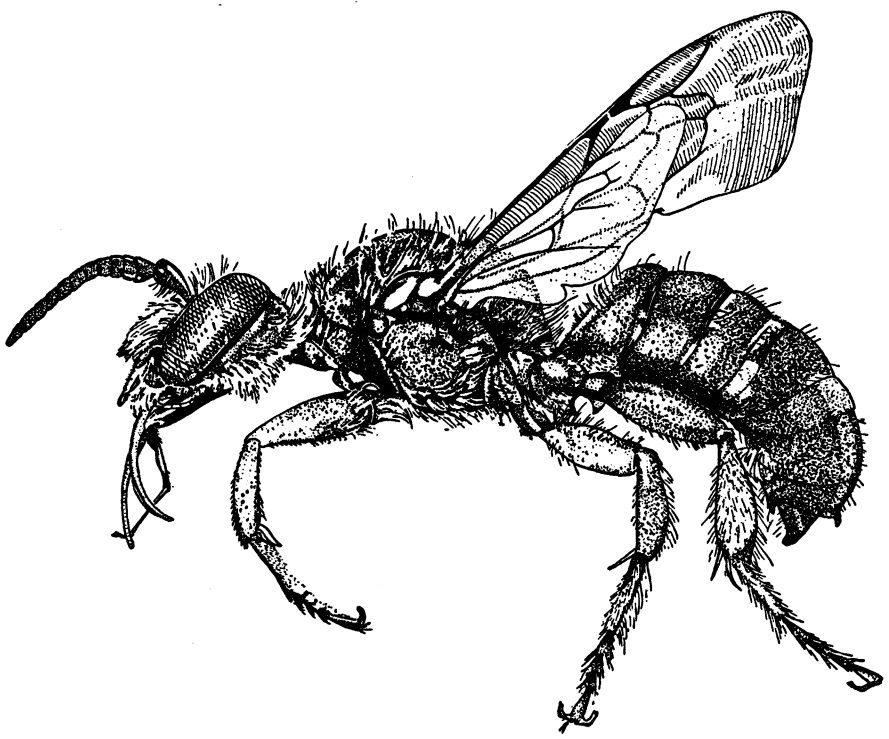


FIG. 6. Lateral view of *Hoplitis* (*Dasyosmia*) *paroselae*, male.

FEMALE: Length 9 to 11 mm. Coloration similar to male but mandibles black, reddish subapically; femora all infuscated basally, anterior ones black beneath. Pubescence sparser on face than in male; abdominal bands strong on terga two to four, weak on five, absent on six. Punctation similar to that of male but slightly coarser; clypeal punctures considerably coarser than in male, elongated except medially, producing a strigose appearance. Clypeal truncation not

thickened, much produced (convex in paratype); hypostomal carinae not toothed; genal area scarcely wider than eye seen from side. Mandibles with apices of the three teeth approximately equidistant.

DISTRIBUTION: The desert of Inyo County, California.

TYPE MATERIAL: Holotype male, allotype female, and one male paratype: Westgard Pass, Inyo County, California, May 27, 1937, on *Parosela fremontii* (C. D. Michener). One male paratype, same locality, June 3, 1937 (E. C. Van Dyke). One female paratype, Big Pine, Inyo County, California, June 8, 1937, on *Parosela polyadenia* (C. D. Michener). The holotype and allotype will be deposited in the collection of the American Museum of Natural History. Paratypes will be placed in the collections of the California Academy of Sciences and Mr. P. H. Timberlake at the Citrus Experiment Station, Riverside, California.

This species differs from all other North American *Hoplitis* in having red legs. In this respect it resembles *Anthocopa timberlakei* Cockerell and *A. nitidivitta* Michener, smaller and otherwise entirely different species also found in the Californian deserts.

ACROSMIA, NEW SUBGENUS

TYPE SPECIES: *Hoplitis (Acrosmia) plagiostoma*, new species.

This subgenus consists of moderate-sized species which are rather robust for *Hoplitis*. The body is black, the pubescence pale. *Acrosmia* is not related to any other American group, the curious last antennal segment of the male, which is produced to one side, being alone sufficient to distinguish it from our other subgenera. Apparently its closest relatives are certain Palearctic species.

MALE: Head and thorax conspicuously but not everywhere very densely punctate. Clypeal pubescence long and erect; clypeus scarcely produced over base of labrum, being so short that the mandibles when folded are nearly transverse; apical margin of clypeus slightly thickened, crenulate; inner margins of eyes parallel or slightly diverging below; genal area about as wide as eye seen from side; hypostomal carinae low and uniform; mandibles narrow, especially apically, the inner tooth much smaller than the outer; antennae not greatly elongated, reaching tegulae; antennal scape over 3.5 times as long as broad; pedicel longer than broad, much exposed; first flagellar segment as long as pedicel, last broadened and bent to one side; second segment of labial palpus about 1.5 times length of first; maxillary palpus with fourth segment slightly longer than others, fifth slender and somewhat shorter, third but little shorter than fourth. Posterior coxae normal. Wings pubescent throughout, not papillate distally. Abdominal terga two to seven with posterior margins impunctate; seventh with lateral teeth obtuse and rounded; eighth tergum bilobed; second sternum truncate posteriorly; third broad and flat, covering the fourth except laterally, margin medially thin and not fringed; fourth, fifth, and sixth sterna fringed, broadly emarginate posteriorly; seventh with a median spatulate process on posterior margin, covered with short, coarse capitate hairs; ninth with normal pubescence.

This subgenus contains two species, each known from a single male specimen from the Sierra Nevada Mountains of California. The rather robust form and the rather abrupt change in sculpture between the anterior and dorsal faces of the second tergum suggest *Anthocopa*. It is possible that when the female is known it will be necessary to transfer this subgenus to *Anthocopa*. The structure of the second abdominal tergum, however, is as in *Hoplitis*.

KEY TO THE SPECIES OF *Acrosmia*

MALES

1. Eighth abdominal tergum with median emargination as deep as broad; crenulated portion of clypeal margin extending below lateral convex portions of margin . . . . . *plagiostoma*

   Eighth abdominal tergum with median emargination shallow; crenulated portion of clypeal margin exceeded by lateral convex portions of margin . . . . . *perissocera*

Hoplitis (Acrosmia) plagiostoma, new species

From its only close relative, *H. perissocera*, this species may be distinguished in the male by the rounded projection of the last antennal segment, the deeply emarginate eighth tergum, the round median apical process of the seventh sternum, and other characters.

MALE: Length 8 mm. Black; mandibles red subapically; flagellum, except for the black apical segment, piceous above, testaceous beneath, the distal margins of segments paler; tegulae piceous; abdominal sterna and seventh and eighth terga reddish marginally. Pubescence yellowish white, forming narrow apical fasciae on abdominal terga two to six. Head much broader than long; face finely and densely punctate, covered with long hairs; clypeus not extending below lower ends of eyes, margin shining and impunctate, made crenulate by seven small convexities of which the median is broadest; median crenulated portion of clypeal margin slightly exceeding lateral portions; antennal scape over 3.5 times as long as broad; flagellum with last segment longest as well as broadest, its apical portion produced to one side to form a rounded projection; first flagellar segment next to longest, succeeding segments becoming progressively shorter and broader; flagellar segments two to five each with several long curved hairs on under sides; genal area more coarsely punctured than vertex and face. Mesoscutum and mesoscutellum scarcely more coarsely punctate than vertex, but mesepisterna more coarsely punctate, like genal area; propodeal triangle conspicuously roughened above, smooth and polished below. Wings slightly grayish, the venation nearly black. Abdominal terga distinctly punctured, more closely so towards posterior margins of terga near impunctate margins; eighth tergum deeply bilobed, emargination between lobes rounded as deep as wide, distinctly wider than apex of a lobe; third sternum rather large, posterior margin with median emargination; fourth sternum concealed beneath third except laterally; fifth more deeply emarginate and with longer fringe than the others; sixth broadly and shallowly emarginate; seventh broadly emarginate except for large median apical process which is almost round, constricted basally, and covered with short robust hairs which are capitate and subapically bent; ninth sternum with margins of free portion converging but little except near the rounded apex which is provided with numerous long simple hairs; gonoforceps bent strongly inward subapically, apices produced to slender, acutely pointed processes.

HOLOTYPE MALE: Sonora Pass, Alpine County, California, June 27, 1937, to be deposited in the collection of the American Museum of Natural History.

Hoplitis (Acrosmia) perissocera, new species

This species may be distinguished in the male from its only near relative, *H. plagiostoma*, by the pointed projection of the last antennal segment, the shallowly emarginate eighth tergum, and the triangular, apically pointed, median process of the seventh sternum.

MALE: Length 7.5 mm. Black, the mandibles red subapically, the flagellum testaceous except for first and last segments; the tegulae dark piceous, the posterior margins of abdominal terga two to seven and posterior sterna in large part brownish, distal tarsal segments brownish. Pubescence yellowish white, forming narrow apical fasciae on terga two to six. Head much broader than long; face finely and densely punctate, covered with long hairs; clypeus not extending below lower ends of eyes, margin shining and impunctate, made crenulate by five small convexities of which the median is broadest; median crenulated portion of clypeal margin exceeded by lateral convex portions; antennal scape about 4.2 times as long as broad; flagellum with last segment longest as well as broadest, its apical portion being produced to one side to form a pointed projection; first flagellar segment next to longest, succeeding segments becoming progressively shorter and broader (basal portion of flagellum thicker than in *plagiostoma*); flagellar segments one to six each with several long curved hairs on under surface; under surfaces of following segments with shorter hairs; genal area more coarsely punctured than vertex and face. Mesoscutum and mesoscutellum finely punctured, mesepisterna more coarsely so, like cheeks; propodeal triangle conspicuously roughened above, smooth and polished below. Wings subhyaline, venation dark brown. Abdominal terga distinctly punctured, more closely so towards posterior margin of each tergum next to impunctate band; eighth tergum bilobed, emargination between lobes broad, much less than half as deep as wide, over twice as broad as apical width of a lobe; posterior margin of third sternum rounded medially; fourth sternum

concealed by third except laterally, its posterior margin slightly and broadly concave; fifth and sixth sterna with posterior margins broadly and rather shallowly concave, their fringes of about equal length, although that of fifth is denser and whiter than that of sixth; seventh sternum with a pair of inconspicuous small lateral lobes on posterior margin, between them a long median apical process which is triangular, acutely pointed, and covered with hairs which are thick basally but taper to slender simple apices; gonoforceps bent strongly inward subapically to form slender, narrowly rounded apices, each gonoforceps with an apically directed lobe at the bend so that the margin between the apex of the lobe and the morphological apex of the gonoforceps is strongly concave.

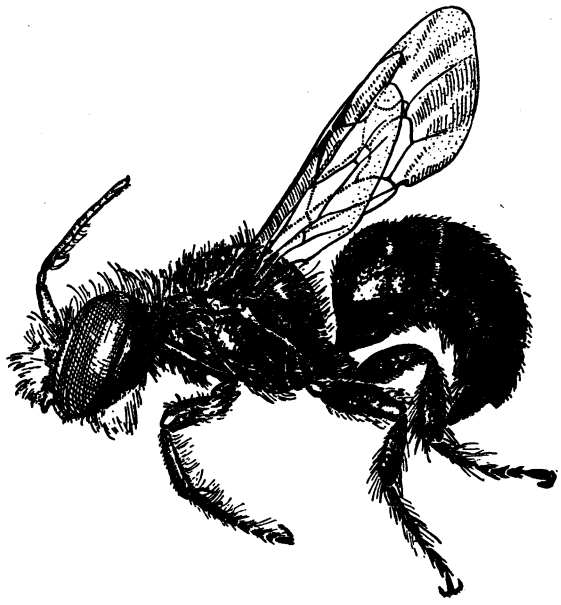


FIG. 7. Lateral view of *Hoplitis* (*Acrosmia*) *perissocera*, male.

HOLOTYPE MALE: Gold Lake, Sierra County, California, July 17, 1921, collected by C. L. Fox, in the collection of the California Academy of Sciences.

SUBGENUS MONUMETHA CRESSON

Monumetha CRESSON, 1864, Proc. Ent. Soc. Philadelphia, p. 387; CRESSON, 1887, Trans. Amer. Ent. Soc., suppl., p. 133; ASHMEAD, 1899, Trans. Amer. Ent. Soc., vol. 26, p. 74; FRIESE, 1902, Zeitschr. Syst. Hymenopterologie u. Dipterologie, vol. 2, p. 188; TITUS, 1904, Jour. New York Ent. Soc., vol. 12, p. 26; COCKERELL, 1910, Univ. Colorado Studies, vol. 7, p. 185; SLADEN, 1916, Canadian Ent., vol. 48, p. 271; MICHENER, 1936, Amer. Mus. Novitates, no. 875, p. 28; MICHENER, 1941, Amer. Midland Nat., vol. 26, p. 159; SANDHOUSE, 1943, Proc. U. S. Natl. Mus., vol. 92, p. 574; MICHENER, 1944, Bull. Amer. Mus. Nat. Hist., vol. 82, p. 263.

TYPE SPECIES: *Monumetha argentifrons* Cresson = *Chelostoma albifrons* Kirby, by designation of Titus, 1904.

This subgenus contains a single large black species with at least part of the pubescence, including the entire scopa, black. The pubescence of the lower portion of the face of the male is short and silvery, suggesting that of the male of the genus *Robertsonella*.

FEMALE: Head and thorax finely and densely punctate. Clypeus slightly convex, produced to a clearly defined, somewhat concave truncation; inner margins of eyes slightly diverging below; head produced far behind eyes and ocelli, genal area being much wider than eyes; hypostomal carinae highest posteriorly, gradually tapering away anteriorly; mandibles broad apically, conspicuously quadridentate; first flagellar segment much longer than pedicel or second segment; mouthparts long, maxillary galea as long as face, second segment of labial palpus about 1.6 times as long as first; maxillary palpi with third segment much the longest, fifth minute. Wings pubescent throughout, the hairs rather long and sparse in basal half; distal portions of wings feebly papillate. Abdominal terga two to six sparsely punctate, posterior margins impunctate. Seventh tergum concave in profile. Seventh sternum produced to a small, median, downcurved point.

MALE: Clypeus and lower portions of paraocular areas very finely and densely punctured and covered with short, appressed, silvery pubescence; clypeus produced far over base of labrum, apical margin somewhat thickened and gently concave; inner margins of eyes about parallel; genal area about as wide as eye seen from side; hypostomal carinae uniformly low; mandibles bidentate; antennal scape nearly three times as long as broad, pedicel exposed, flagellum somewhat flattened, of uniform width except for the last segment or two which taper, last segment

somewhat curved, the apex usually rounded. Posterior coxae normal. Abdomen with eighth tergum produced to a broad, slightly convex truncation; second and third[1] sterna each produced at posterior margin to slender median spine; fourth and fifth sterna of about equal size, fringed posteriorly, the posterior margins broadly and feebly emarginate; third to fifth sterna each with a pair of large, shining, impunctate elevated areas; sixth sternum with a fringe of long wavy hairs on posterior margin; seventh sternum with posterior margin subtruncate, with a sparse median tuft of hairs; ninth sternum with numerous hairs, those of under surface coarse and bent at apices.

This subgenus includes only *Hoplitis albifrons* Kirby.

Hoplitis (Monumetha) albifrons (Kirby)

This species is usually large with the body rather elongate so that it gives the impression of a parallel-sided bee. The pubescence is rather long and conspicuous, that of the abdomen largely black although frequently forming white fasciae.

MALE: Length 9 to 12 mm. Punctation fine and rather dense; propodeal triangle dull except below. Pubescence of head and thorax rather long (except as indicated in description of subgenus), white, that of genal areas, ventral side of head, venter of thorax, sides of propodeum, metepisterna, and rear margins of mesepisterna usually black or fuscous (I have seen no specimens without hairs in at least some of these regions black); ocellar region with some black or fuscous hairs, usually intermixed with white; abdomen with pubescence black or fuscous except for posterior margins of terga two to six which bear white fasciae which are often conspicuous; sides of second tergum often with much white hair. Clypeus rather flat, much produced so that lateral angles are nearer base than apex, truncation broad, gently concave, its margin thick and impunctate, angles demarking it broadly rounded; flagellum with first segment markedly longer than broad, the segments progressively shorter to about the seventh beyond which they become progressively longer; last antennal segment occasionally pointed instead of rounded in specimens from region of intergradation of the subspecies *maura* and *argentifrons*. Ninth abdominal sternum with free portion broad basally but tapering rapidly to slender, acutely pointed process clothed with short hairs, those of under surface being coarse and bent; gonoforceps narrowest about three-fifths of distance from base to apex, distal portions expanded and incurved, provided with long black hairs, extreme apices bare. Other important characters are given in the subgeneric description.

FEMALE: Length 9 to 16 mm. Pubescence of head and thorax varying from white or yellowish with fuscous or black on genal areas, vertex, sides and venter of thorax and intermixed with white on clypeus to wholly black; pubescence of legs often largely black; abdominal pubescence black, often with white apical fasciae at sides of terga two to three, sometimes also on terga four to six; scopa black.

The geographical variation of this species is analyzed elsewhere (Michener, 1947).

Hoplitis albifrons albifrons (Kirby)

albifrons KIRBY, 1837, *in* Richardson, Fauna Boreali-Americana, vol. 4, p. 270 (*Chelostoma*); SMITH, 1854, Catalogue of hymenopterous insects in the . . . British Museum, vol. 2, p. 220 (*Chelostoma*); CRESSON, 1864, Proc. Ent. Soc. Philadelphia, vol. 2, p. 282 (*Chelostoma*); BETHUNE, 1877, Canadian Ent., vol. 9, p. 155 (*Chelostoma*); SCHLETTERER, 1889, Zool. Jahrb. (Syst.), vol. 4, p. 648 (*Chelostoma*); DALLA TORRE, 1896, Catalogus hymenopterorum, vol. 10, p. 374 (*Eriades*); FRIESE, 1911, Das Tierreich, no. 28, p. 27 (*Eriades*); LEONARD, 1926, Cornell Univ. Agr. Exp. Sta., mem. 101, p. 1029 (*Monumetha*); GRAENICHER, 1935, Ann. Ent. Soc. Amer., vol. 28, p. 305 (*Monumetha*); SANDHOUSE, 1939, Mem. Ent. Soc. Washington, vol. 1, p. 140 (*Hoplitis*).

borealis CRESSON, 1864, Proc. Ent. Soc. Philadelphia, vol. 2, p. 388 (*Monumetha*); CRESSON, 1879, Trans. Amer. Ent. Soc., vol. 7, p. 221 (*Monumetha*) (part); EVANS, 1896, Canadian Ent., vol. 28, p. 131 (*Monumetha*); GRAENICHER, 1910, Bull. Pub. Mus. City of Milwaukee, vol. 1, p. 245 (*Monumetha*); CRESSON, 1916, Mem. Amer. Ent. Soc., no. 1, p. 113 (*Monumetha*).

obsoleta CRESSON, 1864, Proc. Ent. Soc. Philadelphia, vol. 2, p. 388 (*Monumetha*) (part); FRIESE, 1911, Das Tierreich, no. 28, p. 146 (*Osmia*) (part); CRESSON, 1916, Mem. Amer. Ent. Soc., no. 1, p. 126 (*Monumetha*).

[1] One small specimen examined lacks the spine on the third sternum.

oblonga PROVANCHER, 1882, Nat. Canadien, vol. 13, p. 230 (*Megachile*); PROVANCHER, 1883, Petite faune entomologique du Canada, hyménoptères, p. 714 (*Megachile*); PROVANCHER, 1888, Additions et corrections au vol. II Faune entomologique du Canada, hyménoptères, p. 326 (*Osmia*); FRIESE, 1911, Das Tierreich, no. 28, p. 146 (*Osmia*).

argentifrons, FRIESE, 1911 (not Cresson, 1864), Das Tierreich, no. 28, p. 144 (*Osmia*) (part); SLADEN, 1916, Canadian Ent., vol. 48, p. 271 (*Monumetha*) (part); CRIDDLE, CURRAN, VIERECK, AND BUCKELL, 1924, Rept. Ent. Soc. Ontario, vol. 33, p. 99 (*Monumetha*) (part).

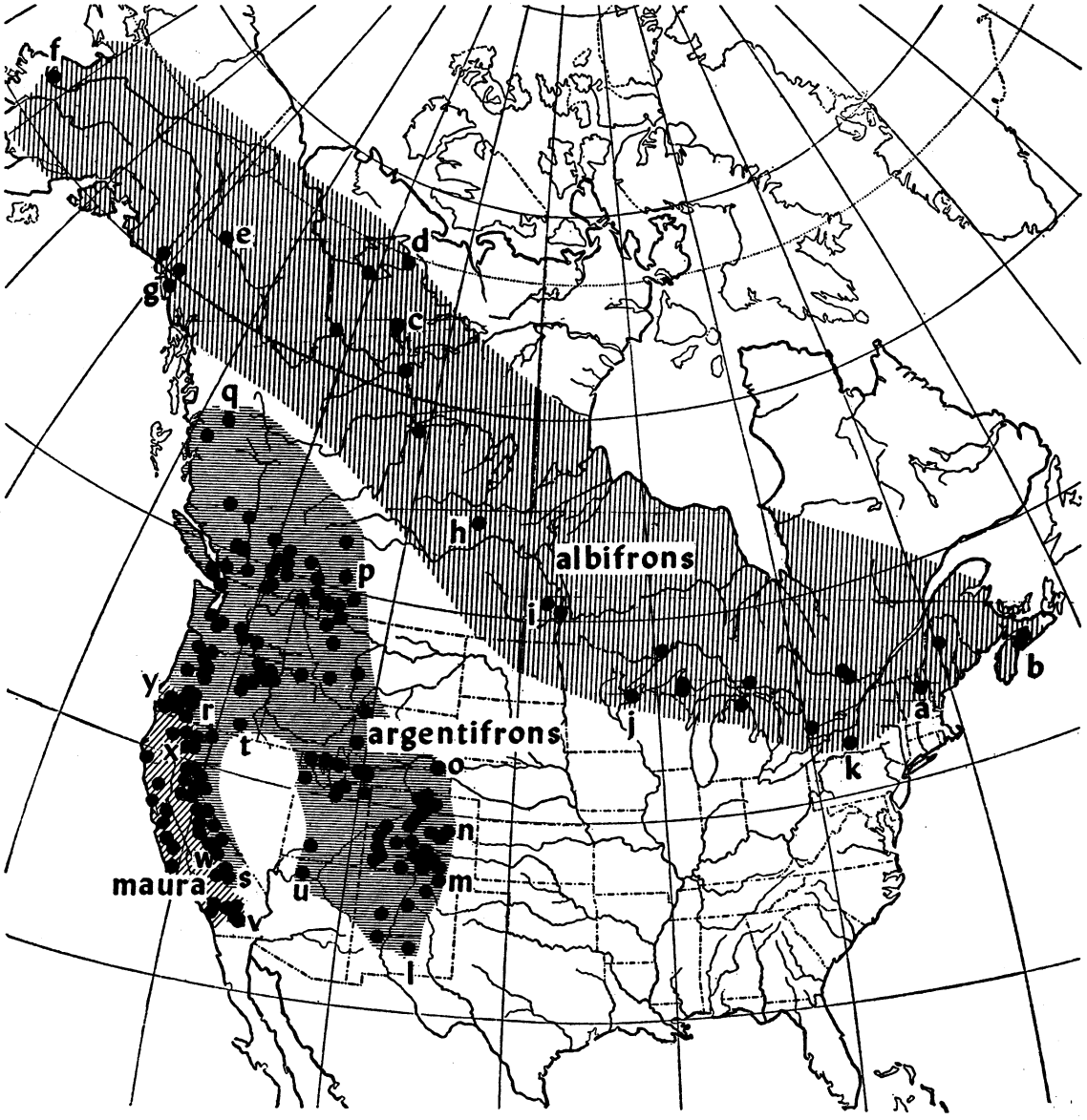


FIG. 8. Map showing the distribution of *Hoplitis* (*Monumetha*) *albifrons*.

FEMALE: Pubescence of middle of face more than half pale; pubescence of mesoscutum and mesoscutellum usually entirely pale; at least second and third abdominal terga with apical fasciae of white pubescence at sides.

DISTRIBUTION: Northern North America from New Hampshire and Nova Scotia to Hudson Bay and from Wisconsin to Great Bear Lake and Alaska (fig. 8). The following localities are marginal so far as present knowledge is concerned: Franconia, New Hampshire (a); Halifax County, Nova Scotia (b); Hudson Bay (exact locality unknown); Fort Rae (c), and Great Bear Lake (d), Northwest Territories; upper Stewart River, Yukon Territory (e); Yukon Delta (f) and Skagway (g), Alaska; Christopher Lake, Saskatchewan (h); Teulon, Manitoba (i); Douglas County, Wisconsin (j); and Ithaca, New York (k).

Collection dates range from June 14 to July 20.

This subspecies has been recorded visiting flowers of *Taraxicum*. No doubt it occurs on a wide variety of flowers, as do the western races of the species.

The type specimen of *albifrons* from latitude 65° N. is probably no longer in existence, that of *borealis* from Great Slave Lake and of *obsoleta* from Hudson Bay territory are in the Academy of Natural Sciences of Philadelphia, and that of *oblonga* probably from Cap Rouge, Quebec, is in the Provincial Museum in Quebec.

Hoplitis albifrons argentifrons (Cresson)

argentifrons CRESSON, 1864, Proc. Ent. Soc. Philadelphia, vol. 2, p. 387 (*Monumetha*); CRESSON, 1875, *in* Geographical and geological explorations and surveys west of the one hundredth meridian, vol. 5, p. 724; COCKERELL, 1901, Ann. Mag. Nat. Hist., ser. 7, vol. 7, p. 336 (*Monumetha*); FRIESE, 1902, Zeitschr. Syst. Hymenopterologie u. Dipterologie, vol. 2, p. 188 (*Osmia*); TITUS, 1904, Jour. New York Ent. Soc., vol. 12, p. 26 (*Monumetha*); COCKERELL, 1906, Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 74 (*Monumetha*); FRIESE, 1911, Das Tierreich, no. 28, p. 114 (*Osmia*); CRESSON, 1916, Mem. Amer. Ent. Soc., no. 1, p. 111 (*Monumetha*); CLEMENTS AND LONG, 1923, Exp. Pollination, Carnegie Inst. Washington Publ., no. 336, p. 253 (*Monumetha*); CRIDDLE, CURRAN, VIERECK, AND BUCKELL, 1924, Rept. Ent. Soc. Ontario, vol. 33, p. 99 (*Monumetha*) (part).

obsoleta, CRESSON, 1864, Proc. Ent. Soc. Philadelphia, vol. 2, p. 388 (*Monumetha*) (part, not type); FRIESE, 1911, Das Tierreich, no. 28, p. 146 (*Osmia*) (part).

borealis, CRESSON, 1876 (not 1864), Proc. Davenport Acad. Nat. Sci., vol. 1, p. 209 (*Monumetha*); CRESSON, 1879, Trans. Amer. Ent. Soc., vol. 7, p. 221 (*Monumetha*) (part); COCKERELL, 1893, Trans. Amer. Ent. Soc., vol. 20, p. 338 (*Monumetha*); COCKERELL, 1897, Bull. New Mexico College Agr. and Mech. Arts, no. 24, p. 21 (*Monumetha*); COCKERELL, 1898, Bull. Denison Univ., vol. 11, p. 64 (*Monumetha*); COCKERELL, 1898, Bull. Univ. New Mexico, vol. 1, p. 64 (*Monumetha*); BRIDWELL, 1899, Trans. Kansas Acad. Sci., vol. 16, p. 210 (*Monumetha*); COCKERELL, 1899, Entomologist, vol. 32, p. 156 (*Monumetha*); VIERECK, 1903, Trans. Amer. Ent. Soc., vol. 29, p. 47 (*Monumetha*).

albifrons, COCKERELL, 1906 (not Kirby, 1837), Bull. Amer. Mus. Nat. Hist., vol. 22, p. 446 (*Monumetha*); COCKERELL, 1906, Trans. Amer. Ent. Soc., vol. 32, p. 303 (*Monumetha*); COCKERELL, 1907, Univ. Colorado Studies, vol. 4, p. 253 (*Monumetha*); COCKERELL, 1919, Jour. New York Ent. Soc., vol. 27, p. 300 (*Monumetha*); COCKERELL, 1919, Ent. News, vol. 30, p. 294 (*Monumetha*); CLEMENTS AND LONG, 1923, Exp. Pollination, Carnegie Inst. Washington Publ., no. 336, p. 253 (*Monumetha*); COCKERELL, 1928, Univ. Colorado Studies, vol. 16, pp. 116, 124 (*Monumetha*); BECK, 1929, Bull. Brooklyn Ent. Soc., vol. 24, p. 306 (*Monumetha*); COCKERELL, 1934, Amer. Mus. Novitates, no. 697, p. 13 (*Monumetha*); COCKERELL, 1935, Amer. Mus. Novitates, no. 766, p. 1 (*Monumetha*); MICHENER, 1936, Amer. Mus. Novitates, no. 875, p. 16 (*Monumetha*).

alibifrons BECK, 1929, Bull. Brooklyn Ent. Soc., vol. 24, p. 306 (*Monumetha*) (error for *albifrons*).

FEMALE: Pubescence of middle of face usually more than half black; at least some black hairs mixed with the white on mesoscutum and sometimes a few on mesoscutellum; at least second and third abdominal terga with apical fasciae of white pubescence laterally.

DISTRIBUTION: The Rocky Mountain region from New Mexico to Alberta, thence westward to the Pacific from British Columbia to Oregon and to the higher parts and eastern slope of the Sierra Nevada in California (fig. 8). Marginal localities are as follows: Cloudcroft (l) and Fort Garland (m), New Mexico; Elbert, Colorado (n); Glendo, Platte County, Wyoming (o); Banff, Alberta (p); Lillooet, British Columbia (q); Crater Lake (r) and Andrews (t), Oregon; Mount Whitney, California (s); and North Rim of Grand Canyon, Arizona (u). Bridwell in 1899

recorded the species (as *borealis*) from Kansas, without definite locality data. This record is presumably an error.

Specimens from the Pacific coast states are highly variable and on the average more melanic than typical *argentifrons*. In this respect they approach the subspecies *maura*. The majority of the individuals of the Pacific coast population here included in *argentifrons* are much more similar to Rocky Mountain individuals of that subspecies than to *maura*. No specimens are known from within the range of *argentifrons* as demarked in figure 8, which are almost wholly black as in females of *maura*. Because of the high variability in the Pacific region, the population there is believed to be of hybrid origin, representing secondary intergradation between *maura* and *argentifrons*, which were probably geographically isolated at one time. Quantative data on the variability in this and other portions of the range of the species will be presented elsewhere.

It is in this same area, where the usual genetic balance has presumably been upset by hybridization, that many of the males have the last antennal segment drawn out to a point. This character was regarded as of generic importance by American authors until recently.

Except on the Northwest coast where it occurs at or near sea level, *argentifrons* is a montane form, usually occurring above 5000 feet altitude.

Specimens have been collected from May 30 to August 8.

Flower visiting records include *Cleome serrulata*, *Phacelia*, *Nama rothrockii*, *Rosa*, *Opuntia*, *Pedicularia groenlandica*, and *Erigeron*.

The type specimen of *argentifrons* from Pike's Peak, Colorado, is in the collection of the Academy of Natural Sciences of Philadelphia.

Hoplitis albifrons maura (Cresson)

maura CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 104 (*Osmia*); COCKERELL, 1903, Psyche, vol. 10, p. 76 (*Osmia*); FRIESE, 1911, Das Tierreich, no. 28, p. 146 (*Osmia*); CRESSON, 1916, Mem. Amer. Ent. Soc., no. 1, p. 123 (*Osmia*); MICHENER, 1936, Amer. Mus. Novitates, no. 875, p. 16 (*Monumetha*); SANDHOUSE, 1939, Mem. Ent. Soc. Washington, vol. 1, p. 140 (=*Hoplitis albifrons*); LINSLEY AND MICHENER, 1943, Pan-Pacific Ent., vol. 18, p. 29 (*Hoplitis albifrons* subsp.)

hesperius COCKERELL, 1903, Bull. Southern California Acad. Sci., vol. 2, p. 35 (*Andronicus*); COCKERELL, 1903, Psyche, vol. 10, p. 76 (*Andronicus*).

FEMALE: Pubescence wholly black, sometimes with a few white hairs on face.

DISTRIBUTION: This very distinctive subspecies occurs in California west of the Sierran divide and for the most part below an altitude of 5000 feet (fig. 8). Marginal localities are Keen Camp, Riverside County (v), Potwisha, Sequoia National Park (w), Hat Creek, Shasta County (x), California, and Grave Creek, Josephine County, Oregon (y).

At middle altitudes on the west side of the Sierra Nevada and across southernmost Oregon, *maura* intergrades with *argentifrons*. In two or three localities near the margin of the range of *maura* as delimited in figure 8, occasional specimens occur with a few white hairs on the dorsum of the thorax. Such specimens are indicative of hybridization with *argentifrons*, a subject discussed more fully under the latter subspecies.

Dates of collection range from May 21 to August 5.

Andronicus hesperius Cockerell is placed in the synonymy of *maura* only on the basis of the locality, as the type is a male in which sex valid subspecific characters have not been found.

The type of *maura* from California is in the Academy of Natural Sciences of Philadelphia, and that of *hesperius*, from Rock Creek, Mojave Desert,[1] California, is in the United States National Museum.

SUBGENUS CHLOROSMIA SLADEN

Chlorosmia SLADEN, 1916, Canadian Ent., vol. 48, p. 270; MICHENER, 1936, Amer. Mus. Novitates, no. 875, p. 28; MICHENER, 1941, Amer. Midland Nat., vol. 26, p. 159; SANDHOUSE, 1943, Proc. U. S. Natl. Mus., vol. 92, p. 538; MICHENER, 1944, Bull. Amer. Mus. Nat. Hist., vol. 28, p. 263.

[1] Rock Creek drains the northern side of the San Bernardino Mountains. It is probable that the specimen came from the foot of the mountains rather than from the desert.

TYPE SPECIES: *Osmia fulgida* Cresson (monobasic).

FEMALE: Head and thorax finely and densely punctate. Clypeus slightly convex, produced to a clearly defined truncation; inner margins of eyes approximately parallel; head produced well behind eyes and ocelli; hypostomal carinae highest posteriorly and medially, tapering anteriorly; mandibles rather broad apically, conspicuously quadridentate; first flagellar segment longer than pedicel or second segment; maxillary galea nearly as long as face; second segment of labial palpus 1.8 to 2.0 times as long as first; maxillary palpus with third segment the longest, fifth small to minute. Wings pubescent throughout, feebly papillate distally. Abdominal terga two to six with impunctate apical margins. Seventh tergum concave in profile. Seventh sternum with posterior margin evenly rounded.

MALE: Clypeal pubescence long and erect; clypeus produced over base of labrum, apical margin not thickened, conspicuously concave medially; inner margins of eyes slightly converging below; genal area narrower than eye seen from side; hypostomal carinae low and almost uniform in height; mandibles bidentate; antennae long, reaching scutellum, pedicel exposed, broader than long. Posterior coxae normal. Abdomen with eighth tergum broadly rounded or produced to a median point; second and third sterna each with a median angulation (sometimes rather obscure) or spine near posterior margin; fourth and fifth sterna of about equal size, fringed posteriorly, their posterior margins usually slightly emarginate medially; third to fifth sterna except marginally hairless and impunctate, highly polished, each with a pair of large, slightly elevated areas; sixth sternum with a fringe of short, dense hairs; seventh sternum emarginate medially, with a tuft of hairs arising in emargination, ninth sternum slender apically, the hairs of under surface dense, coarse, enlarged and bent apically.

The species of this subgenus range from the Rocky Mountain area to the Pacific Coast.

The females of the three species of the subgenus are exceedingly similar, and it is apparent that there are occasional individuals which cannot at present be placed with certainty in one species or another. *H. fulgida*, the smallest species, and *H. louisae*, the largest, may be distinguished by size. *H. viridimicans* is intermediate, its size range overlapping that of *fulgida* and at least reaching that of *louisae*. *H. viridimicans* is usually recognizable by the very narrow impunctate marginal bands of the abdominal terga, but this character is somewhat variable and not always definitive.

KEY TO THE SPECIES OF *Chlorosmia*

MALES

1. Antennal flagellum at least slightly thicker medially than basally; eighth abdominal (seventh metasomal) tergum with median apical point 2
   Antennal flagellum of uniform thickness; eighth tergum with apex broad, not pointed . . . . . *fulgida*
2. Flagellum greatly thickened medially, its segments five to nine at least as broad as long . . . . . *louisae*
   Flagellum but little thickened, all segments longer than broad . . . . . *viridimicans*

FEMALES

1. Abdominal terga with impunctate posterior margins almost lacking . . . *viridimicans*
   Abdominal terga with broad metallic impunctate posterior margins 2
2. Length under 12 mm. . . . . *fulgida*
   Length over 12 mm. . . . . *louisae*

Hoplitis (Chlorosmia) fulgida (Cresson)

This is the smallest and most slender species of *Chlorosmia*, easily recognized in the male by the slender and parallel sided male flagellum and the broad (not pointed) apex of the eighth abdominal tergum.

MALE: Length 7 to 11 mm. Metallic green or bluish; pubescence white or cinereous, sometimes ochraceous on dorsum of thorax. Genal area less than two-thirds as wide as eye; antennal scape about 2.6 times as long as broad; flagellum slender, of uniform width, all segments longer than broad, the first the longest, the following segments, to the ninth, progressively decreasing in length, last flagellar segment slightly flattened, rounded at apex. Middle tibia slightly more robust than anterior tibia. Second and third abdominal sterna each with a small median posterior angle or tooth; seventh sternum without longitudinal median ridge, median apical tuft of hairs sparse; ninth sternum with margins

of basal half of free portion converging strongly posteriorly, distal half of free portion slender, about parallel sided basally, tapering to narrowly rounded apex, ventral surface of slender distal portion (or median process) covered with coarse hairs which are bent and spatulate apically, dorsal surface with short, sparse, simple hairs; gonoforceps rather slender, approximately parallel sided from distal end of basal broad area to bend,

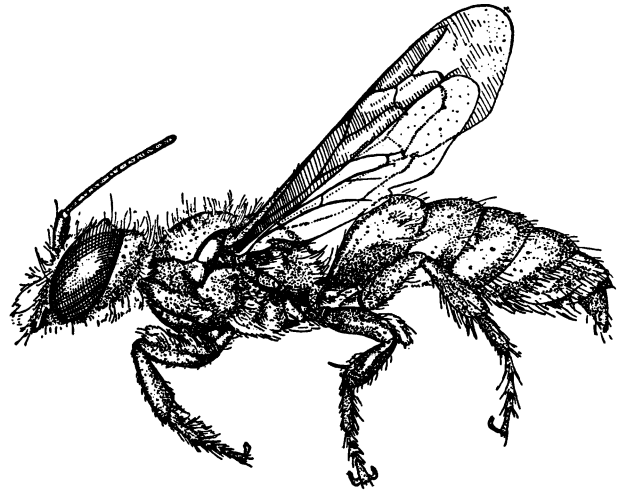


FIG. 9. Lateral view of *Hoplitis* (*Chlorosmia*) *fulgida*, male.

bent inward subapically and tapering thence to narrowly rounded apex, distal halves except for bare apices provided with rather long hairs on ventral surfaces and outer margins, dorsal surfaces near and beyond bend with few short hairs.

FEMALE: Length 7.5 to 12 mm. Metallic green, blue, or purplish; pubescence black to rather pale fuscous. Shining black margin of clypeal truncation usually broader medially than laterally; antennal scape usually slightly metallic in some areas. Impunctate bands of posterior margins of abdominal terga rather broad.

This species is divisible into two easily recognized subspecies, as indicated below.

Hoplitis fulgida fulgida (Cresson)

fulgida CRESSON, 1864, Proc. Ent. Soc. Philadelphia, vol. 3, p. 34 (*Osmia*); CRESSON, 1879, Trans. Amer. Ent. Soc., vol. 7, p. 220 (part) (*Osmia*); CRESSON, 1887, Trans. Amer. Ent. Soc., suppl., p. 300; COCKERELL, 1901, Ann. Mag. Nat. Hist., ser. 7, vol. 7, p. 336 (*Osmia*); VIERECK, 1903, Trans. Amer. Ent. Soc., vol. 29, p. 46 (*Osmia*); COCKERELL, 1906, Bull. Amer. Mus. Nat. Hist., vol. 22, p. 447 (*Osmia*); COCKERELL, 1907, Univ. Colorado Studies, vol. 4, p. 251 (*Osmia*); COCKERELL, 1907, Ann. Mag. Nat. Hist., ser. 7, vol. 20, p. 445 (*Osmia*); COCKERELL, 1910, Psyche, vol. 17, p. 246 (*Osmia*); COCKERELL, 1910, Canadian Ent., vol. 42, p. 311 (*Osmia*); FRIESE, 1911, Das Tierreich, no. 28, p. 152 (*Osmia*); COCKERELL, 1912, Proc. U. S. Natl. Mus., vol. 42, p. 220 (*Osmia*); SLADEN, 1916, Canadian Ent., vol. 48, p. 270 (*Chlorosmia*); CRESSON, 1916, Mem. Amer. Ent. Soc., no. 1, p. 119 (*Osmia*); COCKERELL, 1919, Jour. New York Ent. Soc., vol. 27, p. 300 (*Osmia*); COCKERELL, 1919, Ann. Mag. Nat. Hist., ser. 9, vol. 4, p. 358 (*Osmia*); COCKERELL, 1919, Ent. News, vol. 30, p. 294 (*Osmia*); CLEMENTS AND LONG, 1923, Exp. Pollination, Carnegie Inst. Washington Publ., no. 336, p. 253 (*Osmia*); SANDHOUSE, 1924, Proc. California Acad. Sci., ser. 4, vol. 13, p. 360 (*Osmia*) (part); HICKS, 1926, Univ. Colorado Studies, vol. 15, p. 243 (*Osmia*); COCKERELL, 1928, Univ. Colorado Studies, vol. 16, p. 120 (*Osmia*); BECK, 1929, Bull. Brooklyn Ent. Soc., vol. 24, p. 304 (*Osmia*); BECK, 1929, Bull. Brooklyn Ent. Soc., vol. 24, p. 306 (*Monumetha*); COCKERELL, 1933, Ann. Ent. Soc. Amer., vol. 26, p. 44 (*Osmia*); COCKERELL, 1934, Amer. Mus. Novitates, no. 697, p. 13 (*Osmia*); MICHENER, 1936, Amer. Mus. Novitates, no. 875, p. 29 (*Chlorosmia*); SANDHOUSE, 1939, Mem. Ent. Soc. Washington, vol. 1, p. 139 (*Hoplitis*) (part).

viridis CRESSON, 1864, Proc. Ent. Soc. Philadelphia, vol. 3, p. 35 (*Osmia*).

This subspecies differs from the following

in having the eighth abdominal tergum of the male narrowed subapically, leaving a broad, snout-like, median projection. The pubescence of the female is sometimes paler than in specimens of *platyura*.

A discussion of the intergradation between this subspecies and *platyura* will be found under the latter form.

DISTRIBUTION: Mountains of New Mexico to Yukon Territory, west to Alaska, British Columbia, Washington, and Oregon (fig. 10). The following localities are either marginal so far as existing locality data are concerned or in areas where the range may be discontinuous: Beulah, New Mexico (a); Elbert (b) and Mesa Verde (c), Colorado; Zion National Park (d) and Raft River Mountains (e), Utah; Big Horn Mountains, Wyoming (f);

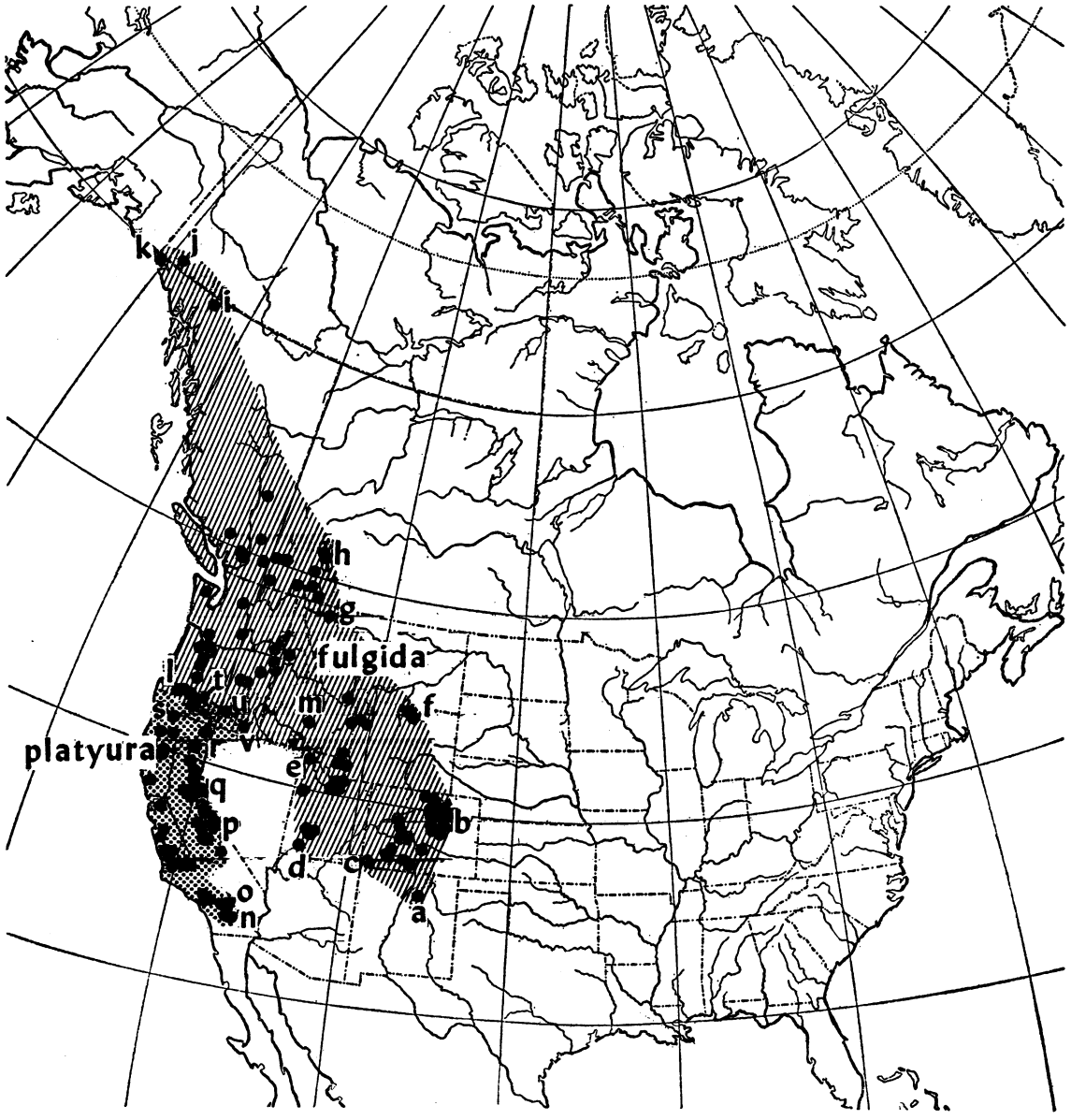


FIG. 10. Map showing the distribution of *Hoplitis* (*Chlorosmia*) *fulgida*. The zone of intergradation between the subspecies is shown by the overlapping of types of shading.

Glacier National Park, Montana (g); Banff, Alberta (h); Atlin, British Columbia (i); Whitehorse, Yukon Territory (j); Skagway, Alaska (k); Diamond Lake, Oregon (l); Craters of the Moon, Idaho (m).

This form is found chiefly in the far north and at high altitudes. Specimens have been collected as high as 10,000 feet above sea level in Colorado. All specimens examined have been from more or less mountainous localities except a few from the upper limits of the plains in Colorado.

Collecting dates throughout the distribution range from May (earliest record May 21 at Banff, Alberta) to August (latest records August 19 at Mount Hood, Oregon.) The majority of the specimens were taken in June and July.

Flower collecting records are *Rubus deliciosus*, *Potentilla*, *Rosa*, *Fragaria vesta*, *Geranium caespitosum*, and *Gentiana parryi*.

The type locality of both *fulgida* and *viridis* is "Colorado." The types are in the Academy of Natural Sciences of Philadelphia.

Hoplitis fulgida platyura (Cockerell)

platyura COCKERELL, 1911, Ann. Mag. Nat. Hist., ser. 8, vol. 8, p. 765 (*Osmia*); COCKERELL, 1912, Proc. U. S. Natl. Mus., vol. 42, p. 223 (*Osmia*); MICHENER, 1936, Amer. Mus. Novitates, no. 875, p. 29 (*Chlorosmia*).

lawae MICHENER, 1936, Amer. Mus. Novitates, no. 875, p. 29 (*Chlorosmia*); COCKERELL, 1937, Amer. Mus. Novitates, no. 948, p. 10 (*Chlorosmia*).

fulgida, CRESSON, 1879 (not 1864), Trans. Amer. Ent. Soc., vol. 7, p. 220 (*Osmia*) (part); SANDHOUSE, 1924, Proc. California Acad. Sci., ser. 4, vol. 13, p. 360 (*Osmia*) (part); SANDHOUSE, 1939, Mem. Ent. Soc. Washington, vol. 1, p. 139 (*Hoplitis*) (part).

In this subspecies the eighth abdominal tergum of the male is broadly and rather evenly rounded. The pubescence of the female is never so pale as in some individuals of *platyura platyura*.

DISTRIBUTION: California, except the more arid deserts and the Great Valley; also the mountains of western Nevada (fig. 10). Intergrades with *fulgida* in southern Oregon. The following localities are marginal so far as present locality data are concerned: Ribbonwood, San Jacinto Mountains (n), Morongo Valley, San Bernardino County (o), Mono Lake (p), California; Ormsby County, Nevada (q); Paynes Ranch, Modoc County (r), and Siskyou County (s), California.

Series of males from Eagle Ridge, Klamath Lake, Oregon (t); Drake Peak and Warner Mountains, Lake County, Oregon (u); and Fish Lake, Steens Mountains, Oregon (v), show intergradation between *platyura* and *fulgida*. Some individuals would be placed with *platyura* without hesitation, while others show considerable narrowing of the apical portion of the eighth abdominal tergum. In a considerable series of *fulgida* from more northern localities in Oregon, the apical portion of this tergum is commonly less narrowed than in the majority of Colorado specimens. Thus the Oregon population of this species is intermediate in its characteristics between that of California and that of the Rocky Mountain area.

Like the nominate subspecies, *platyura* occurs primarily in hilly or mountainous situations. It has been collected in California from 700 to 9500 feet above sea level. In the lowlands of southern California this species appears in April (earliest record, a female, Altadena, April 18) and flies through May. At high altitudes, however, it evidently appears in May and flies through July (latest record, a male, August 3).

Specimens have been collected visiting flowers of *Collinsia*, *Phacelia tenacetifolia*, *Nemophila*, *Stachys californica*, and *Lappula* sp.?

The differences between *lawae* and *platyura* are only individual variations.

The type locality of *platyura* is Claremont, California, and the type specimen is now in the United States National Museum. The type of *lawae* is from Gull Lake, Mono County, California, and is in the American Museum of Natural History.

Hoplitis (Chlorosmia) louisae (Cockerell)

louisae COCKERELL, 1934, Amer. Mus. Novitates, no. 679, p. 14 (*Osmia*).

viridimicans, SANDHOUSE, 1924 (not Cockerell, 1897), Proc. California Acad. Sci., ser. 4, vol. 13, pp. 360, 370 (*Osmia*); MICHENER, 1936, Amer. Mus. Novitates, no. 875, p. 29 (*Chlorosmia*); SANDHOUSE, 1939, Mem. Ent. Soc. Washington, vol. 1, p. 140 (*Hoplitis*) (part).

This is the largest species of its subgenus, readily recognizable in the male by the greatly broadened middle segments of the

flagellum and the elongate and pointed terminal segment.

MALE: Length 12 to 13 mm. Metallic green or bluish; pubescence of head, thorax, sides of second abdominal tergum and of posterior part of third tergum white or ochraceous, of abdomen otherwise fuscous or black. Genal area about three-fourths as wide as eye; antennal scape thickened, about twice as long as broad; flagellum with last segment longest, flattened, curved, bluntly pointed; first segment next to the longest and segments two to nine progressively shorter; flagellum much broadened, segments four to seven the broadest, the segments in both directions from these gradually reduced in width. Middle tibia considerably thickened. Eighth abdominal tergum abruptly narrowed subapically, leaving a pointed median process; second and third abdominal sterna each

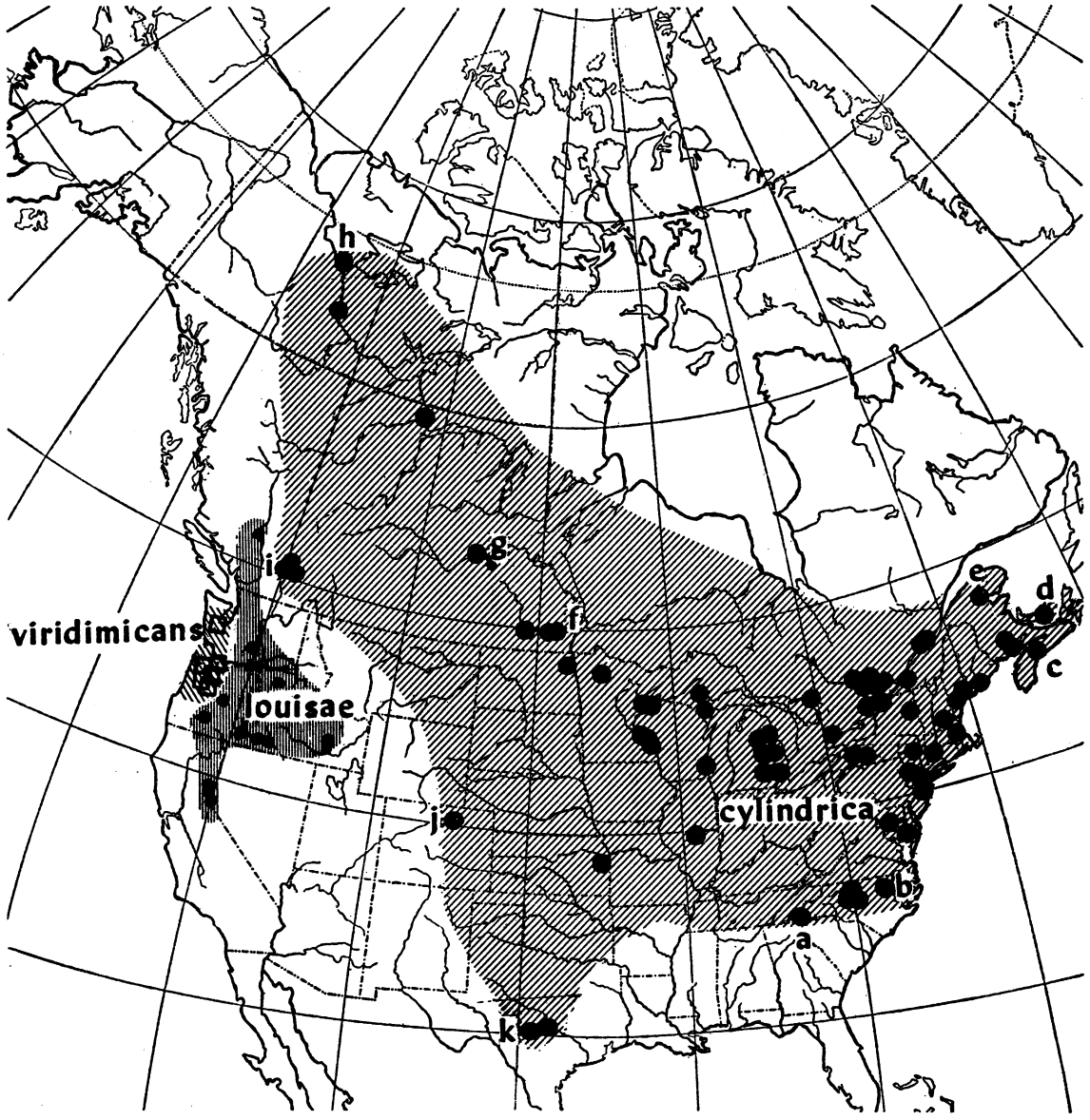


FIG. 11. Map showing the distribution of *Hoplitis* (*Andronicus*) *cylindrica*, *H.* (*Chlorosmia*) *louisae*, and *H.* (*Chlorosmia*) *viridimicans*.

produced to a median posterior spine, that on third longer than that on second; seventh sternum with conspicuous longitudinal median ridge terminating posteriorly in a dense tuft of hairs; ninth sternum with free portion abruptly narrowed at base, produced medially as long slender process which is slightly broader subapically than near base, rounded at apex, clothed ventrally with short robust hairs which are bent subapically and clothed dorsally with short, sparse, simple hairs; gonoforceps slender, narrowest about two-thirds of distance from base to apex, bent inward subapically and ending in rather broad rounded apex, region of bend provided with long hairs ventrally, but apex bare.

FEMALE: Length 12 to 13 mm. Metallic green or blue; pubescence black. Shining black margin of clypeal truncation narrow, not broader medially than laterally; antennal scape slightly metallic in some areas. Impunctate bands of posterior margins of abdominal terga rather broad.

DISTRIBUTION: Western North America from central California to British Columbia and east to Idaho, mostly at high elevations and in the main mountain ranges or east of them (fig. 11). The species has been collected in the following localities: Craters of the Moon, Idaho. Olympia and Yakima, Washington. Chilcotin, British Columbia. Wallowa Mountains, Baker County; Fish Lake, Steens Mountains, 7000 and 8500 feet elevation; Warner Mountains, Lake County; Wildhorse Canyon, near Andrews, 4270 feet altitude; Eagle Ridge, Klamath Lake; and Klamath Falls; Oregon. Truckee, Fallen Leaf Lake, and Lake Tahoe, California.

Dates of collection range from May 12 to July 20.

The type locality is Craters of the Moon, Idaho, and the type is in the collection of the American Museum of Natural History.

The name *louisae* was placed as a synonym of *viridimicans* by Sandhouse, but the discovery of the true male of the latter and of distinguishing characters in females as well shows that the two species are distinct.

Hoplitis (Chlorosmia) viridimicans (Cockerell)

viridimicans COCKERELL, 1897, Proc. Acad. Nat. Sci. Philadelphia, p. 334 (*Osmia*); FRIESE, 1911, Das Tierreich, no. 28, p. 159 (*Osmia*); COCKERELL, 1911, Proc. U. S. Natl. Mus., vol. 42, p. 225 (*Osmia*); SANDHOUSE, 1939, Mem. Ent. Soc. Washington, vol. 1, p. 140 (*Hoplitis*) (part).

The male of this species may be distinguished by the scarcely broadened middle flagellar segments (so that superficially the antennae resemble those of *fulgida*) combined with the pointed eighth abdominal tergum.

MALE: Length 8.5 to 10.5 mm. Metallic green. Pubescence dull white. Punctation of body slightly coarser than usual in *fulgida*. Genal area about two-thirds as wide as eye seen from side; antennal scape about 2.3 times as long as broad; flagellum slender, all segments longer than broad, first segment longest, the segments becoming progressively shorter to the ninth; tenth and eleventh segments longer, the latter flattened, curved, bluntly pointed apically and nearly as long as first; flagellar segments becoming progressively broader to the sixth, then progressively narrower, sixth about 1.3 times as wide as first. Middle tibiae not unusually robust; impunctate margins of abdominal terga slightly narrower than usual in *fulgida;* eighth abdominal tergum abruptly narrowed subapically, leaving a median, bluntly pointed process. Second abdominal sternum with median posterior angle, third with median posterior spine longer than basal width; seventh sternum with low, broad, median ridge and a moderately dense, median, apical tuft; ninth sternum as described for *louisae* except that the median apical process is longer; gonoforceps as described for *louisae*.

FEMALE: Length 10.5 to 12 mm. Metallic green; pubescence black. Shining black margin of clypeal truncation but little broader medially than laterally; antennal scape usually black and non-metallic. Depressed apical margins of abdominal terga two to six provided with pilferous punctures so that the impunctate margins are exceedingly narrow.

DISTRIBUTION: Oregon and Washington in the Cascade Mountains and west of them (fig. 11). Collection data are as follows: Surin, near Government Camp, Mount Hood, Oregon, July 21 and 25, 1929, and 1937 (E. C. Van Dyke); Alsea, Oregon, July 4, 1921 (H. A. Scullen); Whitewater Ridge and Pamelia Lake, 3000 feet altitude, Mount Jefferson,

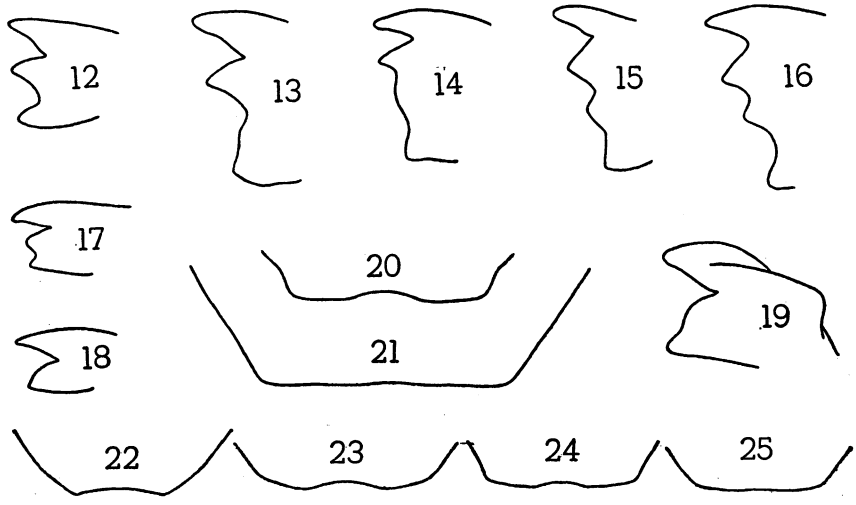
Oregon, July 18 to August 6, 1907 (J. C. Bridwell); McKenzie Ridge, high Cascade Mountains, Lane County, Oregon, June 25 to 31, 1909 (J. C. Bridwell); Mary's Peak, Oregon, July 4, 1909 (J. C. Bridwell); Horse Lake, high Cascade Mountains, Lane County, Oregon (J. C. Bridwell); Olympia, Washington (T. Kincaid).

In male antennal structure this species is intermediate between *fulgida* and *viridimicans*.

Geol. Nat. Hist. Surv., bull. 22, p. 742; MICHENER, 1936, Amer. Mus. Novitates, no. 875, p. 28; MICHENER, 1941, Amer. Midland Nat., vol. 26, p. 158; SANDHOUSE, 1943, Proc. U. S. Natl. Mus., vol. 92, p. 526; MICHENER, 1944, Bull. Amer. Mus. Nat. Hist., vol. 82, p. 263.

TYPE SPECIES: *Andronicus cylindricus* Cresson (monobasic).

The species of this subgenus is moderate sized, black, with rather sparse pale pubescence. In these features it resembles certain



FIGS. 12–16. Apex of mandible of female. 12. *Hoplitis howardi*. 13. *H. biscutellae*. 14. *H. hypocrita*. 15. *H. cylindrica*. 16. *H. fulgida*.

FIGS. 17–19. Apex of mandible of male. 17. *H. hypocrita*. 18. *H. truncata*. 19. *H. paroselae*.

FIGS. 20–25. Apex of clypeus of female. 20. *H. pilosifrons*. 21. *H. biscutellae*. 22. *H. producta producta*. 23. *H. producta bernardina*. 24. *H. producta gracilis*. 25. *H. colei*.

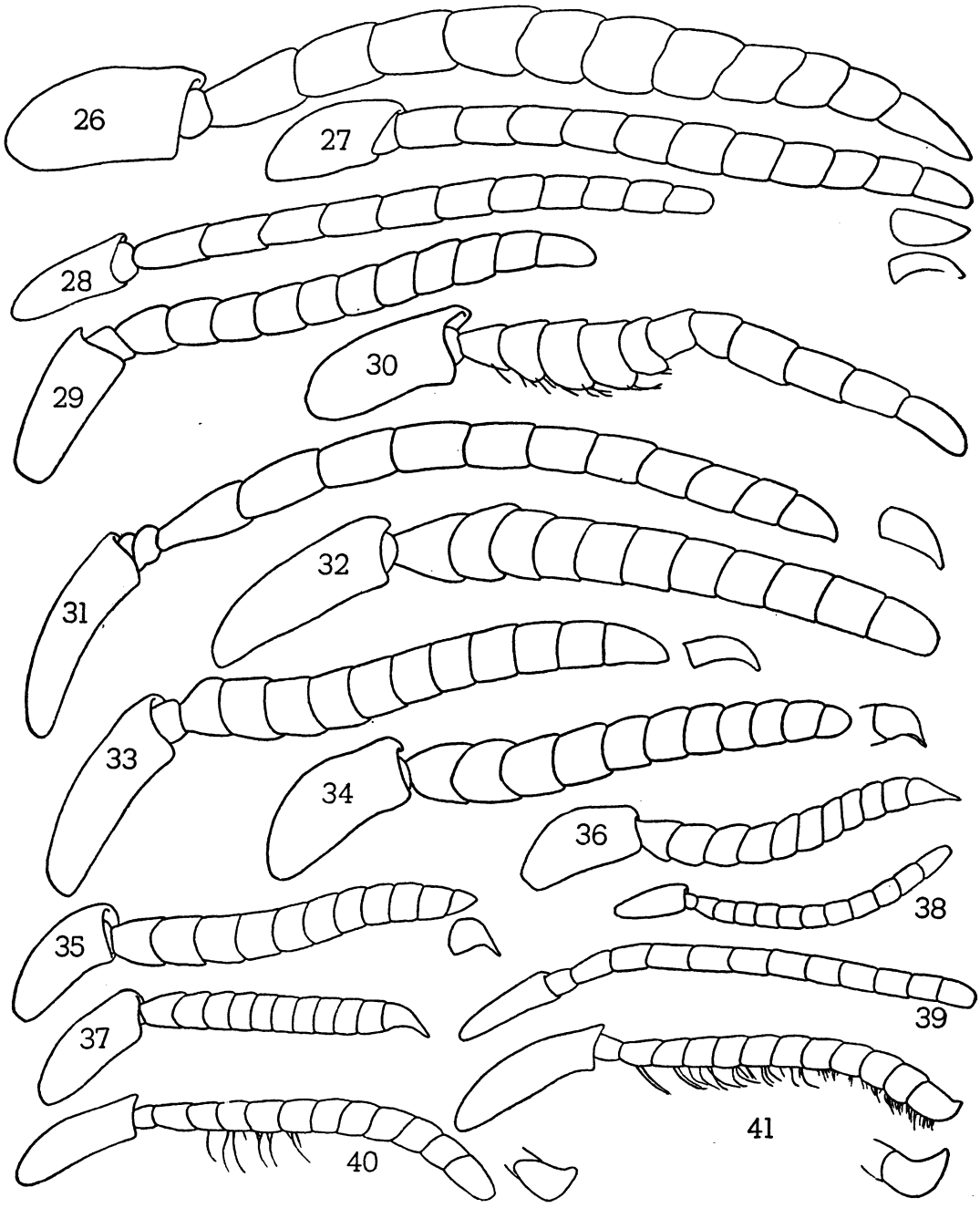
The type, from Olympia, Washington, is in the collection of the United States National Museum.

SUBGENUS **ANDRONICUS** CRESSON

Andronicus CRESSON, 1864, Proc. Ent. Soc. Philadelphia, p. 384; CRESSON, 1887, Trans. Amer. Ent. Soc., suppl., p. 133; PROVANCHER, 1888, Additions et corrections au vol. II Faune entomologique du Canada, hyménoptères, p. 297; ASHMEAD, 1899, Trans. Amer. Ent. Soc., vol. 26, p. 74; FRIESE, 1902, Zeitschr. Syst. Hymenopterologie u. Dipterologie, vol. 2, p. 188; ROBERTSON, 1903, Trans. Amer. Ent. Soc., vol. 29, p. 167; COCKERELL, 1906, Bull. Amer. Mus. Nat. Hist., vol. 22, p. 445; SLADEN, 1916, Canadian Ent., vol. 48, p. 272; VIERECK, 1916, Connecticut

Alcidamea. However, the quadridentate mandibles of the female, the slender median process of the ninth sternum of the male, and other characters indicate a closer relationship to *Monumetha* and *Chlorosmia*.

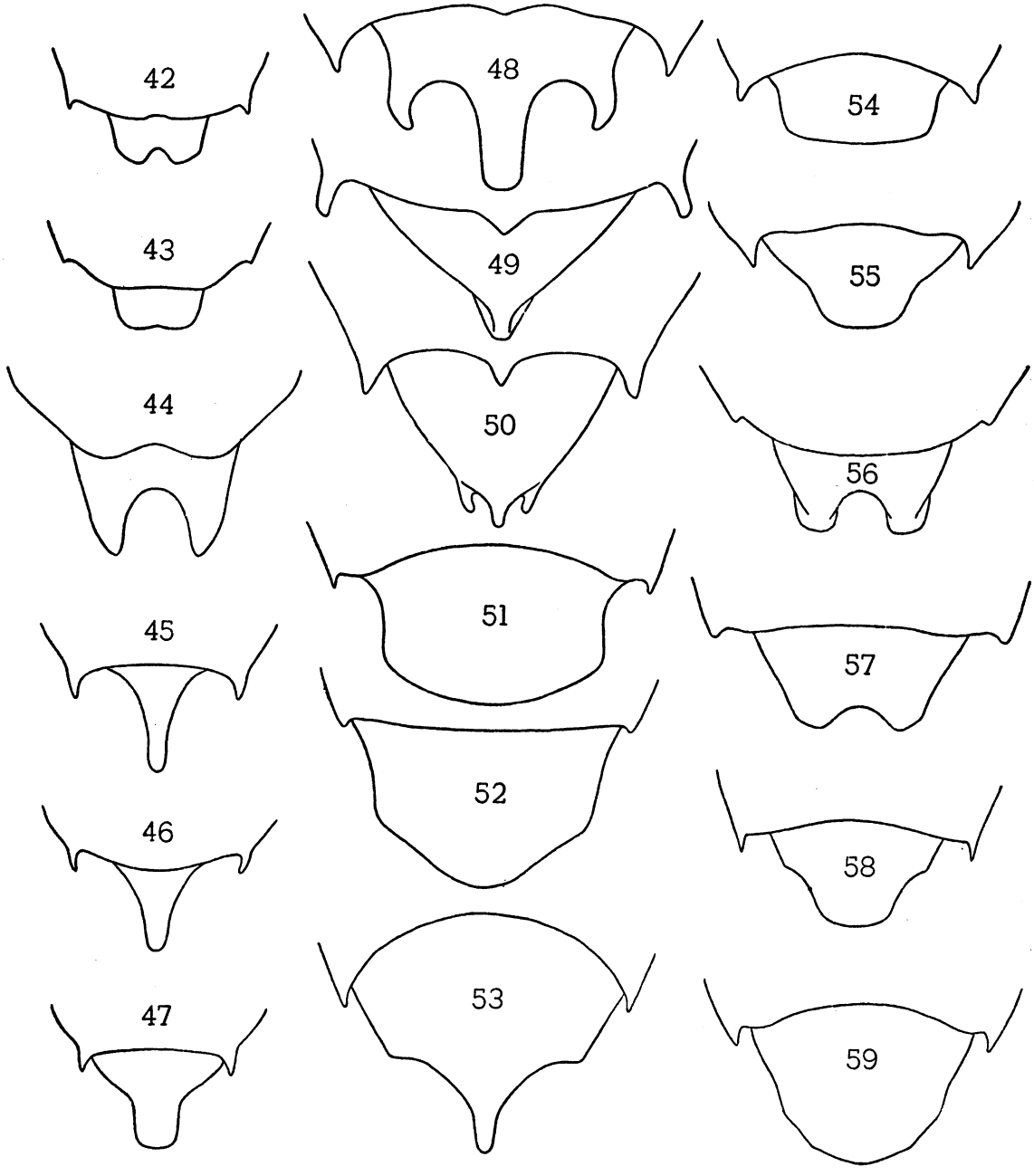
FEMALE: Head and thorax rather finely punctate. Clypeus slightly convex, produced to a feebly concave truncation; inner margins of eyes slightly converging below; genal area wider than eye seen from side; hypostomal carinae low and uniform; mandibles quadridentate; first flagellar segment longer than pedicel or second flagellar segment; mouthparts rather short, maxillary galea shorter than face, second segment of labial palpus about 1.6 times as long as first; maxillary



FIGS. 26–41. Antennae of male with different views of apical segment of some. 26. *Hoplitis louisae.* 27. *H. viridimicans.* 28. *H. fulgida.* 29. *H. albifrons.* 30. *H. cylindrica.* 31. *H. hypocrita.* 32. *H. paroselae.* 33. *H. biscutellae.* 34. *H. sambuci.* 35. *H. truncata.* 36. *H. producta producta.* 37. *H. grinnelli.* 38. *H. howardi.* 39. *H. linsdalei.* 40. *H. plagiostoma.* 41. *H. perissocera.*

palpi with second and third segments subequal in length, fourth shorter, and fifth even shorter. Wings feebly papillate distally, pubescent throughout. Abdominal terga with apical impunctate bands narrow and inconspicuous; seventh tergum concave in profile; seventh sternum unmodified.

MALE: Clypeus with long, more or less



FIGS. 42–59. Apical abdominal segments of male. 42. *Hoplitis howardi*. 43. *H. bunocephala*. 44. *H. linsdalei*. 45. *H. pilosifrons*. 46. *H. producta producta*. 47. *H. producta panamintana*. 48. *H. biscutellae*. 49. *H. paroselae*. 50. *H. hypocrita*. 51. *H. albifrons*. 52. *H. cylindrica*. 53. *H. louisae*. 54. *H. truncata*. 55. *H. sambuci*. 56. *H. plagiostoma*. 57. *H. perissocera*. 58. *H. fulgida fulgida*. 59. *H. fulgida platyura*.

erect hair; clypeus produced over base of labrum to unthickened truncate margin; inner margins of eyes converging below; genal area about as wide as eye seen from side; hypostomal carinae uniformly low; mandibles bidentate; antennal scape thickened, about two and one-half times as long as broad; exposed portion of pedicel broader than long; flagellum with segments two to five markedly broadened and bearing rather stout, curved hairs on lower margins, apical segment elongate but not pointed. Posterior coxae with a low shining ridge along outer ventral angle. Abdomen with eighth tergum produced to a rounded margin, just beneath which is a truncation; second sternum with posterior margin rounded, the margin bearing medially a small elevated prominence; third sternum flat or slightly concave, fringed, its margin strongly rounded; fourth sternum similar except for a small median notch in the margin; fifth largely covered by fourth, margin concave, fringed; sixth with the margin straight, fringed and with a preapical band of long erect hairs; seventh lacking longitudinal ridge with posterior margin broadly emarginate and bearing a tuft of hairs; ninth with apical portion long and slender, narrow basally, bearing beneath a dense clothing of short, coarse hairs, each of which is bent subapically and ends bluntly.

This subgenus is represented by a single species, *H. cylindrica*.

Hoplitis (Andronicus) cylindrica (Cresson)

cylindricus CRESSON, 1864, Proc. Ent. Soc. Philadelphia, p. 384 (*Andronicus*); CRESSON, 1879, Trans. Amer. Ent. Soc., vol. 7, p. 221 (*Andronicus*); CRESSON, 1887, Trans. Amer. Ent. Soc., suppl., p. 301 (*Andronicus*); PROVANCHER, 1888, Additions et corrections au vol. II Faune entomologique du Canada, hyménoptères, p. 330 (*Andronicus*); ROBERTSON, 1897, Trans. Acad. Sci. St. Louis, vol. 7, p. 349 (*Andronicus*); DALLA TORRE, 1899, Catalogus hymenopterorum, vol. 10, p. 381 (*Andronicus*); FRIESE, 1902, Zeitschr. Syst. Hymenopterologie u. Dipterologie, vol. 2, p. 188 (*Osmia*); ROBERTSON, 1903, Trans. Amer. Ent. Soc., vol. 29, p. 171 (*Andronicus*); TITUS, 1906, Proc. Ent. Soc. Washington, vol. 7, p. 160 (*Andronicus*); GRAENICHER, 1910, Bull. Pub. Mus. City of Milwaukee, vol. 1, p. 245 (*Andronicus*); FRIESE, 1911, Das Tierreich, no. 28, p. 144 (*Osmia*); SLADEN, 1916, Canadian Ent., vol. 48, p. 270 (*Andronicus*); COCKERELL, 1916, Occas. Papers Mus. Zool. Univ. Michigan, vol. 23, p. 3 (*Andronicus*); VIERECK, 1916, Connecticut Geol. Nat. Hist. Surv., bull. 22, p. 751 (*Andronicus*); CRESSON, 1916, Mem. Amer. Ent. Soc., no. 1, p. 116 (*Andronicus*); COCKERELL, 1919, Ann. Mag. Nat. Hist., ser. 9, vol. 4, p. 104 (*Andronicus*); LEONARD, 1926, Cornell Univ. Agr. Exp. Sta., mem. 101, p. 1028 (*Andronicus*); COCKERELL, 1926, Ann. Mag. Nat. Hist., ser. 9, vol. 17, p. 665 (*Andronicus*); ROBERTSON, 1928, Flowers and insects, p. 9 (*Andronicus*); COCKERELL, 1928, Univ. Colorado Studies, vol. 17, p. 115 (*Andronicus*); PEARSON, 1933, Ecol. Monogr., vol. 3, p. 378 (*Hoplitis*); GRAENICHER, 1935, Ann. Ent. Soc. Amer. vol. 28, p. 304 (*Andronicus*); BRIMLEY, 1938, Insects of North Carolina, p. 458 (*Andronicus*); SANDHOUSE, 1939, Mem. Ent. Soc. Washington, vol. 1, p. 140 (*Hoplitis*); Procter, 1946, Biol. Surv. Mount Desert Region, pt. 7, p. 507 (*Andronicus*).

spoliata PROVANCHER, 1888, Additions et corrections au vol. II Faune entomologique du Canada, hyménoptères, p. 324 (*Osmia*); DALLA TORRE, 1899, Catalogus hymenopterorum, vol. 10, p. 412 (*Osmia*); FRIESE, 1911, Das Tierreich, no. 28, p. 147 (*Osmia*).

monardae COCKERELL, 1914, Ann. Mag. Nat. Hist., ser. 8, vol. 14, p. 363 (*Hoplitis*); COCKERELL, 1924, Ann. Mag. Nat. Hist., ser. 9, vol. 14, p. 184 (*Hoplitis*); HICKS, 1926, Univ. Colorado Studies, vol. 15, p. 237 (*Hoplitis*).

hicksi COCKERELL, 1932, Bull. Brooklyn Ent. Soc., vol. 27, p. 203 (*Hoplitis*).

brevis, PROVANCHER, 1882 (not Say, 1837), Nat. Canadien, vol. 13, p. 229 (*Megachile*) (♀, not ♂); PROVANCHER, 1883, Faune entomologique du Canada, hyménoptères, p. 713 (*Megachile*) (♀, not ♂).

This is an elongate, parallel-sided species. The female is easily differentiated from other non-metallic species without black pubescence by the quadridentate mandibles; the male is unique in the marked broadening of the second to fifth flagellar segments.

MALE: Length 9.5 to 11 mm. Black, the flagellum brown beneath, the legs, abdominal sterna, and posterior margins of terga sometimes reddish black. Pubescence white or yellowish white, forming narrow apical bands on abdominal terga two to six. Punctation of head and thorax fine and dense, triangle of propodeum dull throughout. Anterior margin of clypeus truncate, impunctate. Mediotarsal segments and distitarsi thickened. Abdominal punctation rather strong, finer and denser towards posterior margins of terga, near im-

punctate marginal bands, interspaces between punctures commonly finely roughened; free portion of ninth sternum abruptly narrower basally, projecting as a slender, slightly spatulate process which bears beneath and on margins numerous coarse blunt hairs which are abruptly bent near apices, upper surface of process with short simple hairs; gonoforceps robust, abruptly bent inward subapically, bluntly pointed, outer margin at and beyond bend bearing a mass of long golden hairs, apical three-fifths of under surface densely clothed with similar hairs; volcellar lobe long, slender, acutely pointed.

FEMALE: Length 9 to 11 mm. Coloration similar to male but abdomen usually entirely black. Pubescence similar to that of male but sparser, forming similar abdominal fasciae on terga two to six. Punctation similar to that of male, coarser and less dense on dorsum of head and thorax.

DISTRIBUTION: The greater part of eastern North America, from North Carolina to Nova Scotia and from Texas nearly to the Arctic Circle in the Northwest Territories of Canada. There are also three records from southern British Columbia (fig. 11). The following localities are marginal so far as available locality data are concerned: Black Mountain (a) and Raleigh (b), North Carolina; Kings County, Nova Scotia (c); Dalvay House, Canadian National Park, Prince Edward Island (d); Dalhousie, New Brunswick (e); Treesbank, Manitoba (f); Prince Albert, Saskatchewan (g); Fort Norman, Northwest Territories (h); Okanagen Falls, British Columbia (i); Boulder, Colorado (j); Kerrville, Texas (k); Carlinville, Illinois (l). The species appears to be rare or absent in the southern Mississippi Valley, and the southern limit of its range is little understood. It was not collected by the author during an eighteen-month period at Hattiesburg, Mississippi. A specimen from the Coquillett collection in the United States National Museum is labeled Los Angeles, California. It seems almost certain that this locality is incorrect.

Through most of the range of the species dates of collection are between June 9 and August 4. However, specimens were collected in North Carolina as early as May 19 and in Austin, Texas, on April 15.

Flower visiting records are *Monarda citriodora*, *Amorpha* sp.? (many records), *Amorpha fruticosa*, *Amorpha canescens*, and *Houstonia purpurea* (two records).

The type of *cylindrica* from Connecticut is in the Academy of Natural Sciences of Philadelphia, that of *spoliata* from Cap Rouge, Quebec, is in the Provincial Museum in Quebec, that of *monardae* from Kerrville, Texas, is in the United States National Museum, and that of *hicksi* from Boulder, Colorado, is in the Timberlake collection at the Citrus Experiment Station, Riverside, California.

SPECIES OF UNCERTAIN POSITION

Monumetha imperfecta Provancher

imperfecta PROVANCHER, 1896, Nat. Canadien, vol. 23, p. 9 (*Monumetha*); FRIESE, 1902, Zeitschr. Syst. Hymenopterologie u. Dipterologie, vol. 2, p. 188 (*Osmia*); COCKERELL, 1903, Psyche, vol. 10, p. 76 (*Monumetha*); TITUS, 1906, Proc. Ent. Soc. Washington, vol. 7, p. 154 (*Monumetha*); FRIESE, 1911, Das Tierreich, no. 28, p. 146 (*Osmia*).

This species, known only from the original description, is evidently not a *Monumetha*, and probably not even a *Hoplitis*. It was based on a female (Provancher so states and mentions the "brosse ventrale") from Los Angeles, California, of which Provancher says "Abdomen noir, avec une bande transverse au milieu de tous les segments, excepté le terminal, cette bande rétrécie au milieu sur les segments 1, 2 et 3, . . ." Such remarks might better apply to a species of *Megachile* than to any of our known *Hoplitis*. Provancher frequently placed his species in the wrong genera.

Titus tentatively places the name as a synonym of *Hoplitis albifrons*, although he saw no specimen of *imperfecta*. This placement is not supported by the description, particularly since the females of *albifrons* from the Los Angeles region are wholly black.

Hoplitis (Alcidamea) alboscopata (Provancher)

alboscopatum PROVANCHER, 1888, Additions et corrections au vol. II Faune entomologique du

Canada, hyménoptères, p. 425 (*Heriades*); TITUS, 1906, Proc. Ent. Soc. Washington, vol. 8, p. 160 (*Alcidamea*).

After studying the female type of this species, Titus placed it in *Alcidamea*. The only *Alcidamea* known to me which seem to agree with Titus' description are the western *H. producta gracilis* and *H. producta subgracilis*. As the type of *alboscopata* was supposed to be from Cap Rouge, Quebec, it seems unlikely that *gracilis* is a synonym of *alboscopata*, unless Provancher gave the locality incorrectly. A study of the type, which is in the Provincial Museum in Quebec, will be necessary to establish the identity of the species.

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