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NOTES ON SOME ANTHIDIINE BEES OF MONTANA AND CALIFORNIA

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For the specimens on which the present paper is based and for valued data in connection therewith I am indebted to Professor R. A. Cooley, State Entomologist and Professor of Entomology at the University of Montana, who kindly sent me for identification the collection of Anthidiine bees in the possession of that institution, and to Professor P. H. Timberlake, of the Graduate School of Tropical Agriculture, University of California, whose careful observations upon the Anthidiine bees of Riverside, California, have furnished the clew to the merging of certain species hitherto believed to be distinct because each sex had been described under a separate specific name. Thanks are due also to Mr. S. A. Rohwer and Miss Grace Sandhouse of the U. S. National Museum for aid in arriving at some of the conclusions presented, and to Mr. E. T. Cresson of the Academy of Natural Sciences of Philadelphia for granting access to the types in that institution.

The types of the new varieties described in this paper have been deposited in The American Museum of Natural History; the paratypes, when such existed, have been returned to Professor Cooley.

So that the discussion might proceed by genera and also with a view to keeping distinct the insects from the two states considered, the California species, though constituting the smaller part of the material reviewed, have been given precedence over those from Montana.

***Anthidium edwardsii* Cresson, *tricuspidum* Provancher, *hesperium* Swenk, and *depressum* Schwarz**

The recently described *A. depressum* is to be considered a variety of *A. edwardsii* Cresson rather than as an independent species. Re-examination of the type of *edwardsii* inclines me to the belief that it, too, is characterized by the deep triangular depression near the apex of the clypeus that I had believed peculiar to *depressum*. The clypeus of the type of *edwardsii* is unfortunately rather densely covered with foreign matter that obscures its shape, but by glancing along the contour line from below

it is possible to detect evidence of such a depression. There are feeble maculations in the type above the tegulæ and on the femora (not mentioned in Cresson's description and unfortunately noted as absent in my recent key¹). *A. depressum* differs from *edwardsii* not only in the absence of maculations on the mesonotum, scutellum, and the femora beneath, and in the totally different character of the abdominal markings, but in the absence of red on the pygidium and other abdominal segments. Intermediate between *depressum* and *edwardsii* seems to be *tricuspidum* Provancher. I have not had a chance to examine the type of this species but several specimens identified as such in the collection of the U. S. National Museum agree structurally with *edwardsii* and *depressum* while evidencing degrees of intergrade between the abdominal markings established for *edwardsii* and those described for *tricuspidum*. The reddish pygidium and the strong suffusion with red of other segments of the abdomen, especially on the ventral side, characterize these insects as well as the type of *edwardsii*. In my estimation *tricuspidum* is a variety—and possibly a not very clearly separable variety—of *edwardsii* rather than an independent species.

Three males of *edwardsii* were recently sent me by Professor P. H. Timberlake. They were taken at Riverside, California, August 4 and August 14, 1925, visiting the flowers of *Trichostema lanceolatum*. With these males were sent me three females caught at the same flower on August 5 and August 6, 1925. These proved to be *A. hesperium* Swenk.

I am in accord with Professor Timberlake in believing that the males and females in question are one species. Strength is lent to this interpretation not only by the similarity of the two sexes, but by the records of distribution as recently reported by Professor Cockerell (Proc. Cal. Acad. Sci., Fourth Series, XIV, No. 15, pp. 346 and 354) for *A. hesperium* and *A. tricuspidum*. Thus three of the four localities in California where *hesperium* was taken proved also to be collecting grounds for *tricuspidum*, and vice versa.

A. edwardsii and its variety *tricuspidum* have hitherto been known only in the male sex; *hesperium* has been recorded only in the female sex. The name *edwardsii* having precedence, *hesperium* is to be considered a synonym of that species.

Two of the three females under consideration have L-shaped marks on the mesoscutum, like the specimens that I recently reported from Lindsay, California. The third specimen has, instead, the line over the

¹American Museum Novitates No. 253.

tegulae specified in Swenk's description. All three specimens have the first segment posteriorly emarginate instead of four-spotted, agreeing in this respect with most of the insects examined by Cockerell in 1925.

A paragraph from a letter of Professor Timberlake, sent me in the course of our correspondence about the specimens, may be quoted here as adding interesting data to the life history of the *edwardsii* group:

The *tricuspidum-hesperium* (or *edwardsii*) species is two-brooded at Riverside, appearing at the end of May and again early in August. The first brood occurs on the flowers of *Phacelia ramosissima* and *Lotus glaber* and the second brood is very abundant in some years at the flowers of *Trichostema*.

Anthidium collectum Huard and **angelarum** Titus

To Professor Timberlake I am indebted also for the elucidation of another problem. Among certain Anthidiine bees that he recently sent me were the males and females of what he believed to be a single species. Both had been caught visiting the flowers of *Lotus glaber*. The females in question proved to be *A. angelarum* Titus; the males are what I believe to be *A. collectum* Huard. Fortunately, in this case too, reliance need not be placed solely on the rather close resemblance of one sex to the other and upon their visitation of the same flowers: the locality records also support the inference that they are one species. Thus, Titus based his description of *angelarum* largely on five females taken by Coquillett in Los Angeles Co., California, while in redescribing *collectum* he had before him five males taken by the same collector in the same locality. It may be mentioned, too, that the original description of *collectum* (given by Provancher under the name of *compactum*) was likewise based on a specimen taken by Coquillett in Los Angeles. The female of *collectum* has hitherto been unknown. In Titus' description of *angelarum* only the female is mentioned. I think there can be little doubt that the insects represent one species to which the name of *collectum* applies by virtue of priority.

Professor Timberlake's comments about this species (quoted from the same letter from which citation has previously been made) are of interest in this connection:

Angelarum (or *collectum*) was very abundant in the spring of 1925 at flowers of *Lotus glaber*, first appearing March 11 [the record in question is for Riverside, California]. In 1926 I found it on March 10 on *Phacelia distans*, but it was not nearly so common as during the preceding year. The season is much later this year and I have not yet seen it [the letter of Professor Timberlake is dated March 29, 1927]. *A. fontis* [which in the female runs very close to "*angelarum*"] also occurs on *Lotus glaber* but this flies from May 22 to June 11 so far as my captures show. There is no question, I

believe, about the correct association of the sexes of the two species [*edwardsii* and *hesperium*; *collectum* and *angelarum*] that I sent you.

Timberlake does not mention the duration of the flight period of *collectum-angelarum* but, judging from the records cited by Cockerell and Titus, the adult insect is present in this locality or that over a fairly long period. Thus, males have been caught, according to these records, from May to July, and females from April to June.

***Anthidium porterae* Cockerell**

This species is represented in Montana by a male from Musselshell, August 16, 1917, and one from Billings, July 9, 1904. The insects were collected by K. M. King and R. A. Cooley.

***Anthidium tenuiflorae* Cockerell**

A large series of this species, collected from 1902 to 1926, is distributed among the following localities in Montana: Bozeman (elevation 4800 ft.), June 20–August 10; East Flathead (elevation 5700 ft.), July 25; Missoula, June 13–July 13; Armstead, July 11; Livingston, July 14; Billings, July 24; Gallatin County, July 19; Jefferson County, July 9; Lewistown, July 14; Pondera County, July 9–August 20. The specimens from Jefferson County and from Pondera County were collected by W. W. Stanley; most of the remaining specimens were taken by R. A. Cooley.

Two of the males—one from Billings and the other from Missoula—have two small maculations on the scutellum, suggestive of the condition in *emarginatum* though more restricted. A male from Bozeman, on the other hand, has one of the tubercles dotted with yellow, approaching *emarginatum* in this respect.

***Anthidium emarginatum* (Say)**

There is a single female of this species, taken at Huntley, Montana, July 23, 1917, by R. A. Cooley.

***Anthidium jocosum* Cresson**

A male taken by H. F. Dietz, July 4, 1912, at the Montana Experiment Station, Florence, is assigned to *jocosum* because of its light hue, reddish-brown pygidium and venter, the stripes on its tibiae, and the maculations on its tegulae and scutellum. Unlike the type, it lacks maculations on the apical segment and has the abdominal bands from segment

3 on rather more distinctly emarginate laterally than is indicated in the description of *jocosum*. The bands in question have a very slight interruption medially.

A female from Huntley, collected by R. A. Cooley, July 24, 1917, may possibly be the female of this insect. It is only slightly smaller ($6\frac{1}{2}$ mm.) than the rather small male ($7\frac{1}{2}$ mm.) above alluded to and has the general appearance of that male, notwithstanding its rather fuller maculation, which includes narrow L-shaped bands along the front and side margins of the mesoscutum (the mesoscutum of the male is immaculate) and maculations on its axillæ as well as the scutellum (confined to the scutellum in the male specimen), well-developed stripes on all the tibiæ, abbreviated apical stripes on the under side of the front and middle femora (the latter absent in the male specimen), and hind basitarsi (all of the basitarsi maculated in the male specimen). The band on the fourth segment of the abdomen is barely interrupted medianly, that on the fifth medianly emarginate, that on the sixth bisected by a very fine line of black. The bands from the third segment on to the apex are more shallowly and sinuously emarginate than in the male. There is a maculation on the clypeus between the lateral maculations, which, as noted in a previous paper, seems to occur not infrequently in females of the *jocosum* group, using that term in an inclusive sense, and the lateral face-marks do not completely fill the space between the clypeus and the inner margin of the eye, being placed slantingly along the sides of the clypeus as in the case of other females of this group.

***Anthidium utahense* Swenk**

A specimen from Yellowstone County, collected by H. C. Donohoe on June 28, 1926, has deep yellow markings and a faint maculation above the tegulæ, but its affiliations nevertheless seem to be with *utahense*.

***Anthidium brachyurum* Cockerell**

Six males—Missoula, July 5–16, 1904; Billings, July 9–24, 1924; and Huntley, July 19, 1917—have been assigned to this species rather than *utahense* because of the lighter shade of the maculations; but there is variability of hue even among these Montana specimens, making it very difficult to decide where the dividing line should be drawn, if indeed there be a dividing line, between *utahense* and *brachyurum*. One of four females assigned to *brachyurum* has a maculation between the lateral marks of the clypeus. The females are from the following localities: Missoula, June 29–July 26, 1904; Livingston, July 14, 1903; Boze-

man (elevation 4800 ft.), Aug. 16, 1901. With the exception of the specimen from Bozeman, which was caught by E. J. S. Moore, all of the insects were collected by R. A. Cooley.

***Dianthidium sayi* Cockerell**

This species is represented in Montana by specimens from the following localities: Billings, July 9–18, 1904; Musselshell, Aug. 16–20, 1917; Stevensville, Aug. 17, 1926; Yellowstone County, July 3–Aug. 8, 1926; Pondera County, Aug. 20, 1926; Jefferson County, Aug. 29, 1926. The insects were obtained by the following collectors: W. W. Stanley, K. M. King, J. R. Parker, H. C. Donohoe, and R. A. Cooley.

***Dianthidium pudicum* (Cresson)**

A male from Gallatin County, Montana, taken Aug. 23, 1917, is assignable to this species.

***Dianthidium parvum* (Cresson)**

A male of this species, caught Aug. 20, 1926, in Pondera County, Montana, by W. W. Stanley, has a line-like maculation in front of the anterior ocellus, recalling a similar maculation in the female of *parvum baculifrons* Cockerell. The abdominal maculations of this specimen, as well as the maculations behind the eye, are a deep uniform orange color, but there is suspicion that the depth of the coloration is due to cyanide.

***Dianthidium semiparvum gallatinæ*, new variety**

A male bee, collected August 23, 1917 in Gallatin County, is structurally too close to *semiparvum* to justify separation from that species, having the broad bulbous coxal spines that are among the characteristics of that insect, as distinguished from acute spines. Very exceptional among males of *Dianthidium*, however, it lacks maculations not only on the sixth but on the seventh segment of the abdomen, both of these segments being an undifferentiated black except for a narrow, deep-brownish, transparent border rimming the apex of the pygidium. As in *semiparvum* (and also *subparvum*) the scutellum is immaculate, but the legs show greater restriction of maculation than is evidenced by these bees. Thus, there is merely a narrow stripe, broadly flanked by black, on the front and middle tibiæ, while on the hind tibiæ there is only a basal and a much smaller apical maculation. Of the basitarsi only the hind pair are maculated, but the middle and hind knees have a yellow spot.

Two females—one from Gallatin County, the type locality of the male, but collected three weeks earlier, August 1, 1917, and a second taken at Bozeman on August 26, 1904—are referred to this subspecies.

They have the scutellum wholly black and, in addition, show restricted maculation of the abdomen. Thus, besides having segment 1 three-spotted and segment 6 immaculate, both of these specimens are four-spotted on segment 2 and in the case of one of them (the specimen from Gallatin County, which has been designated the allotype) this four-spotted condition applies also to segment 3. (In the case of the male there is a suggestion of subdivision in the bands of segment 2, approaching on one side at least the four-spotted condition.) The maculations of the legs are like those of *parvum*. From the female of *subparvum* the two members of that sex that are under consideration differ in the presence of spots on the anterior margin of the mesoscutum, and in the four-spotted condition of the second abdominal segment. The two females from Montana are rather different from the female described with some hesitation as the allotype of *semiparvum* and tend to confirm the doubts expressed at the time.

***Dianthidium ulkei* (Cresson) and *Dianthidium ulkei cooleyi*, new variety**

Among the nine specimens (all females) of *Dianthidium ulkei* from Montana are five which show a direction of variability that I do not find noted in the case of the fifty-three females and twenty-four males assigned to this species by Swenk. Nor do I find the condition paralleled among the specimens in the American Museum (thirty-one females and ten males). As the five specimens that share this peculiarity are all from Montana (four from the Montana Experiment Station at Musselshell and one from Billings) it would seem probable that a variety is in process of establishing itself. The remaining four specimens, also from Musselshell and taken like the preceding in August, 1917, are orthodox in their maculations if the term orthodox may be applied to a species as variable as *ulkei*; at any rate, these four seem to come within the limits of variability previously recognized.

Three of the five exceptional specimens have bright reddish-brown legs suggestive of the condition in *sayi*, while in the other two the ground color of the legs is mainly black but with considerable encroachment of reddish brown. The yellow stripes on the tibiae are of variable length but not reduced to mere basal spots as in *parvum*, and all of the specimens save one have a well-defined vertical stripe below the middle ocellus, a condition at least unusual in *parvum*. Furthermore, all of the specimens have a subapical tooth on the mandibles, a condition which, as pointed out in a previous paper, may have diagnostic value. Reddish brown is present on at least the first sternite and in one instance on all of the sternites except the apical one. The specimen thus distinguished, which represents the extreme, has reddish brown instead of black on the first tergite and in the emarginations of the band on the second tergite.

It has been designated *Dianthidium ulkei cooleyi* in honor of Professor R. A. Cooley of the University of Montana. The specimens were all taken between July 30 and August 19, those from Musselshell being collected by K. M. King.

Callanthidium formosum (Cresson)

This species, described from Colorado, and reported also from Oregon, extends into Montana, being represented by a male specimen from Bozeman, caught on July 15, 1904.