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T. D. A. Cockerell
University of Colorado

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BEES VISITING HELIANTHUS.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

The genus *Helianthus*, consisting of the annual and perennial sunflowers, is native only in America, though widely cultivated in the Old World. The common sunflower, *H. annuus*, is wholly sterile with its own pollen, and has to be visited by insects in order to produce seed. Presumably the same is true of the other species of the genus. The insects carrying the pollen are various, but the bees are far more important than all the rest combined; their incessant activity can only be appreciated by one who has worked with sunflowers throughout the summer.

At Goodview, Colorado, August 2, 1913. I took a census of insects on flowers of cultivated *H. annuus* (var. *coronatus*) for a short time, with this result: *Andrena helianthi*, 12; *Halictoides marginatus* (perhaps some were *Halictus*), 9; *Halictus armaticeps*, 4; *Melissodes*, 2 ♂, 1 ♀; *Panurginus innuptus*, 1; *Apis mellifera ligustica*, 1; *Syrphid*, 1. These were recognized as they flew, but on July 18, I collected a series of bees from the same flowers, at the same place, and found I had *Andrena helianthi* Rob., *Halictus armaticeps* Cress., *Halictoides marginatus* (Cr.), *Panurginus innuptus* (Ckll.), both sexes, *Melissodes aurigena* Cress., ♀, *M. confusiformis* Ckll., ♀, and *Megachile agustini* Ckll., ♂.

The domesticated honey-bee, belonging to the Old World genus, is here an insignificant factor in sunflower pollination. Mr. Collins of Boulder, who has many hives of bees, informs me that they do not go to sunflowers unless the supply of other nectar runs short. When they do make honey from sunflowers, it is very yellow.

The most important sunflower bee, with us, is certainly *Andrena helianthi*. In some localities it is probable that the species of *Megachile*, which work fast and carry a lot of pollen, do more work. *M. helianthi* Ckll. was collected by Rohwer on the wild sunflower (*Helianthus annuus lenticularis*) at Boulder, Colorado.

Flowers and insects

Hymenoptera - Apoidea

Property of G. E. BOHART

(*Andrena*
Megachile
Dufourea
Halictus
Panurginus
Apis
Melissodes
Anthophora
Bombus
Perdita
Diodia
Nomia
Triopelus
Nomada
Osmia)
[desc.
of
Melissodes
n spp.]

Mrs. C. Bennett, in August 1908, took males of *M. parallela* Sm. and *M. manifesta* Cr., at flowers of *Helianthus* at Denver. *M. augustini* Ckll., ♂, was collected at Boulder, Aug. 8, on *H. annuus coronatus*. Male bees visiting sunflowers get covered with pollen, and must be almost as useful as females.

At Sterling, Colorado, far out on the plains, I collected bees from *H. annuus lenticularis* on Aug. 3, 1911. Several of the species (Canad. Entom., Nov. 1911, p. 390) were the same as those found at Boulder, but others were present, and, in particular, *Anthophorula bruneri* (Crawf.) was abundant and evidently an important factor in pollination.

The above lists happen to lack now other types of bees which are more or less important visitors of sunflowers in Colorado; *Bombus* and the Anthidiines. The Bombi on sunflowers are principally males, and the same is true in European gardens, as may be seen by the list in Knuth's "Blütenbiologie." The Anthidiines (at Boulder *Heteranthidium zebratum* (Cr.), *Dianthidium perpictum* Ckll., and *D. sayi* Ckll.) and efficient, but not abundant enough to be of great consequence.

In suitable localities, *Perdita* abounds on sunflowers. Thus, in Nebraska (Swenk and Cockerell, 1907) eight species are recorded, some of them regular visitors, others only occasional. In Nebraska and New Mexico, *P. altipennis* and its immediate allies (subgenus *Cockerellia* Ashmead) are especially found on *Helianthus*, though there are members of this group attached to other Helianthoid Compositæ, as *Ratibida* and *Ximenesia*.

Diadasia cannot be regarded as a normal or regular visitor of *Helianthus*, yet it occurs from time to time. I collected males of *D. australis* Cr. on sunflower at San Bernardino, California, many years ago; and females of *D. enavata* Cr. on *H. lenticularis* at Mesilla, New Mexico.

At Falfurrias, Texas, May 18, 1907, Mr. A. C. Morgan collected one female each of *D. australis* Cr. and *D. afflicta* Cr., at flowers of *Helianthus*. The *D. australis* had collected much yellow pollen on the hind legs, but the large smooth grains were apparently cactaceous, certainly not from *Helianthus*. However, the compound microscope showed also a small quantity of the small grains of

Helianthus, scattered about. The *D. afflicta* carried only a little pollen on the legs, but it also had both sorts, and *Helianthus* grains also on the wings.

We must probably conclude that these species of *Diadasia*, regularly visiting Cactaceæ for nectar and pollen, rested from time to time on the discs of *Helianthus*, and accidentally became dusted with pollen from these. In this way, without actually feeding on *Helianthus*, these bees might become pollinating agents.

We are almost without records of sunflower visitors in the Pacific coast region, and I have no data from Central and South America, although rather numerous species of *Helianthus* exist in the mountains from Mexico to Peru. Graenicher in Wisconsin and Robertson in Illinois have made many observations of interest on the visitors of the perennial species. Records from Canada, the Atlantic seaboard and the Southern States are much to be desired. The Entomologists of the U. S. Department of Agriculture stationed in Texas have secured enormous series of insects of all orders, including a considerable number from *Helianthus*, but the labels do not, as a rule, show what species of *Helianthus* are involved. I have been very kindly permitted to examine many of the bees, and also to use the records kept on file in Washington. I give here some illustrative data:

- (1.) Dallas; Sept. 21, 1905. At *H. maximiliani*. C. R. Jones. *Nomia nortoni* Cr., det. Crawford; *Halictus armaticeps* Cr. (*ligatus* Auctt.); *Megachile parallela* Sm.
- (2.) Clarendon; Aug. 11, 1905. At sunflower. C. R. Jones. *Perdita xanthismæ* Ckll.; *Triepeolus remigatus* (Fabr.), det. Bishopp; *Melissodes obliqua* Say.
- (3.) Victoria; October 2. At *Helianthus*. Crawford and Leister. *Nomia heteropoda* Say.; *N. apacha* Cr.
- (4.) Wichita Falls; June 10, at *Helianthus*. J. D. Mitchell. *Nomia bolliana* Ckll.
- (5.) Falfurrias; May 18, at *Helianthus*. A. C. Morgan. *Nomada garcina* Ckll.; *N. texana* Cr.; *Osmia subfasciata* Cr., ♂; *Melisodes suffusa* Cr., ♂; *Anthophorula margani* Ckll.; *Halictus ligatus* Auctt. (det. Crawford); and other species recorded elsewhere in this paper.

Various species of *Megachile* have been recorded elsewhere. It will be observed that in Texas the species of *Nomia* become quite conspicuous. In New Mexico *N. triangulifera* Vachal occurs on *Helianthus*.

Do the bees distinguish the annual and perennial sunflowers, or between the species of either group? Are there species of bees adopted to particular species of *Helianthus*? At present we cannot produce any satisfactory evidence on this point; differences observed may be no more significant for the discussion than those between the visitors of the same species (*H. lenticularis*) in different regions. Robertson, in Illinois, finds *Andrena helianthi* Rob., *A. pulchella* Rob., and *A. aliciae* Rob., on perennial sunflowers. At Boulder we get only one of these on the annual species, *A. helianthi*; but in New Mexico *A. pulchella* appears on *H. lenticularis*. In the vicinity of Milwaukee, Wis., Graenicher gets four species of *Andrena* on sunflowers; *A. helianthi* Rob. (the most common), *A. aliciae* Rob., *A. peckhami* Ckll., and *A. clypeonitens* Ckll. These all visit perennial species.

In view of the fact that *Helianthus* is exclusively American, and possesses in our fauna a long series of more or less adapted bee-visitors, it becomes very interesting to enquire what happens when sunflowers are grown in the Old World. Do the bees of those regions find them out, and if so, are they allied to the regular American sunflower bees?

Aljken, in Bremen (Abh. Nat. Ver. Bremen, XXII, pp. 180-181) observed the bees visiting cultivated *H. annuus*. His list is as follows: *Bombus*, 8 species; *Psithyrus*, 3 species, all males; *Megachile*, 2 species, females; *Halictus leucozonius*; *Coelioxys acuminatus*; *Apis mellifera*; *Anthidium manicatum*. It will be seen at once that this closely corresponds in character with American lists, leaving out the genera peculiar to America, and also certain genera, as *Andrena*, our species of which appear to be oligotropic.

The perennial sunflowers in European gardens are visited by *Apis*, *Bombus*, *Psithyrus*, *Halictus*, *Megachile* and *Heriades*.

In Australia, Mrs. M. Anderson collected bees for me from flowers of *H. annuus*, and it was very interesting to find that

Trigona carbonaria Sm. freely visits them, collecting pollen. No species of *Trigona* occurs within the natural range of the *H. annuus* group.

At Gisborne, New Zealand, Mr. W. D. Cook kindly observed the insects on *H. annuus coronatus* in 1913-14. He did not send any specimens, but his account is sufficiently clear to permit the recognition of the bees, and I have inserted the names within brackets:—

"There seem to have been very few bees about this year; at any rate very few visited the sunflowers. I noticed a few ordinary German bees [*Apis mellifera* L.], a few bumble-bees, and a tremendous number of the common cream-coloured moth, and also a great many flies. [The bees] were nearly all a small black bumble-bee. There seem to be very few big bumble-bees about here (I mean the black one with the yellow band [*Bombus terrestris* L.]), but the one I saw most was about half the size and pure black (much larger than an ordinary bee)" [*Bombus ruderatus fidens* Harris.]

Thus in New Zealand the only bee-visitors were the introduced species of *Bombus* and *Apis*, as might be expected from the absence of native long-tongued bees. Had the sunflower reached that country before the bees, perhaps the flies would have been fairly satisfactory pollinators.

I add to this paper descriptive notes on some sunflower bees, two of which are new.

***Melissodes semiagilis* (Cockerell).**

Melissodes agilis semiagilis Cockerell, Ann. Mag. Nat. Hist., April 1906, p. 364, ♂.

♀. Length about 11 mm.; pubescence grayish-white, tinged with ochreous, vertex with black hairs, scutellum and posterior part of mesothorax with much black hair, the tegulae separated from the black patch by a band of pale hair about equal to their width; head broad; flagellum dusky reddish beneath, except at base; first abdominal segment with a narrow pallid hind margin, the others with hind margin dark; second segment with pale hair at extreme base, and a rather broad median hair band; third segment with median band twice as broad as that on second; tibia of hind

legs with scopa strongly plumose, long and loose, wholly pale; hair on inner side of hind tibiae fusco-ferruginous.

In my table in Trans. Amer. Ent. Soc., XXXII, the female runs to the vicinity of *M. gilensis communis* and *hortivagans*. It is smaller than *gilensis*, with much clearer wings, and hair on outer side of middle tibiae all pale (largely dark gray in *gilensis*). The same characters at once separate it from *hortivagans*. The wings are much paler and shorter than in *communis*, and the band on middle of second abdominal segment is much broader. The hind margin of fourth abdominal segment has dark hair only in middle, not right across as in *M. wheeleri*. Among Robertson's species *M. semiagilis* female resembles *M. vernoniae*, which has short, still clearer wings; but *vernoniae* has a patch of black hair on outer side of middle tibiae apically, the hair on abdomen whiter, and the hair on inner side of hind basitarsi black.

Hab.—Quanah, Indian Territory, at flowers of *Helianthus*, June 10, 1906 (*J. D. Mitchell*), U.S. Nat. Museum, 9♂, 4♀. A female from Dallas, Texas, at *Helianthus*, Sept. 22, 1905 (*F. C. Bishopp*) has a little dusky hair at apex of middle tibiae, and the hair on inner side of hind basitarsi is fuscous; but the general appearance and colour of the hair agrees exactly with *semiagilis*, not with *vernoniae*. Thus it rather approaches *M. simillima* Rob.

***Melissodes suffusa* Cresson, variety.**

♂. Differs from a cotype in having the flagellum only obscurely reddened (instead of bright clear ferruginous) beneath; otherwise normal.

Hab.—Falfurrias, Texas, on *Helianthus*, May 18, 1907, (*A. C. Morgan*).

***Melissodes bishoppi* sp. n.**

♂. Runs in my table in Trans. Amer. Ent. Soc., XXXII, to the vicinity of *M. aurigena* Cresson, which it closely resembles differing as follows: Third antennal joint (view from front) 192 μ long, fourth 752 (the same measurements for *aurigena* are 128 and 1040); the third joint very much longer than second; flagellum about 5½ mm. long (about 7½ in *aurigena*); nervures darker; second s. m. narrower; third t. c. angular in middle;