

FLOWERS AND INSECTS IN NEW MEXICO.

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In a certain sense we may say correctly that the flora of our country is fairly well known. New species, and even genera, are frequently described, but most of these are segregates from the more comprehensive groups of earlier authors, and radically new types are not often met with. Nevertheless, there is hardly a plant upon which new observations may not be made with ease. Our whole flora needs redescribing from living plants, every species needs close study to determine the character and range of its variations, and the relations between plants and insects offer a field for research which appears practically inexhaustible. The following notes record the results of some recent researches, and may serve as a contribution to entomophytology. They are classified according to locality.

RIO RUIDOSO, WHITE MOUNTAINS.

This is an alpine region in southern New Mexico, possessing a remarkably interesting flora, with quite a number of apparently endemic types. Prof. C. H. T. Townsend collected there a large number of bees, together with the flowers on which they were found. Some of these have been recorded, but the following data are new :

- (1) *Verbena macdougalii* Heller. A very common species in New Mexico, formerly regarded as *V. stricta*, but separated by Heller on what seem to be perfectly valid grounds. The lilac-purple flowers are arranged in long spikes, so that the plant looks entirely different from the ordinary kinds of *Verbena*, which are adapted to butterflies. At the foot of Baldy Mountain, near Elizabethtown, Mrs. O. St. John found a variation (mut. nov. *rosella*) with pink flowers. The ordinary form was growing at the same place, which had an altitude of about 9600 feet.

Although our common types of Verbena (*V. macdougalii*, *V. bipinnatifida*, and *V. bracteosa*) look so entirely different, they all have the throat of the corolla covered with the same peculiar moniliform hairs.

V. macdougalii is an excellent bee plant. On the Rio Ruidoso, Townsend collected from the flowers the following bees: *Anthophora cleomis* Ckll. ♀, *A. montana* Cress. ♀, *Clisodon terminalis* Cress., *Anthidium maculosum* Cress., *Anthophora californica* Cress. ♂, *Megachile fortis* Cress., *Melissodes ruidosensis* Ckll., *Synhalonia crenulaticornis* Ckll. ♂, *Calliopsis rhodophilus* Ckll. ♀. It will be noted that these are long-tongued bees.

- (2) *Monarda stricta* Wooton. Another very common New Mexico plant, only lately recognized as a distinct species. Its conspicuous heads of pink flowers are attractive to certain long-tongued bees, of which Townsend collected *Anthophora cardui* Ckll. ♂, *A. cleomis* Ckll. ♂, *Clisodon terminalis* Cress., and *Megachile fortis* Cress. The flowers are also visited by Bombus, as I have recorded elsewhere (*Annals and Magazine Natural History*, November, 1899), and Townsend took a single male *Melissodes montana* Cress. He also took a butterfly, *Epargyreus tityrus* Fabr., not hitherto recorded from New Mexico. These results accord fairly well with those of Loew, who observed the insect visitors of *Monarda* in the Botanic Garden at Berlin.

| | Bombus. | Other long-tongued bees. | Short-tongued bees. | Butterflies. |
|--------------------------------|---------|--------------------------|---------------------|--------------|
| <i>M. stricta</i> , New Mexico | 9 | 5 | 0 | 1 |
| <i>M. spp.</i> , Berlin | 2 | 2 | 1 | 2 |

Both lists are doubtless very incomplete.

- (3) *Rhus glabra* L. A widely distributed shrub, with conspicuous panicles of greenish flowers. The visitors might be expected to be much like those of the Umbelliferæ, but Townsend actually obtained a number of bees: *Bombus sonorus* Say, *B. prunellæ* Ckll., *Colletes gilensis* Ckll. ♂, *Coelioxys gilensis* Ckll., *Heriades gracilior* Ckll., *Colletes americana* Cress. ♂. He also obtained a butterfly, *Basilarchia weidemeyerii* Edw. In Europe Müller found the honeybee abundant on the allied *Rhus hirta*. In Illinois Robertson found fifty-eight species of insects on *R. glabra*, of which nineteen were bees, mostly short-tongued.
- (4) *Potentilla thurberi* Gray. This is a beautiful species, differing from the ordinary species of the genus by its dark crimson flowers, on which Townsend took the following: *Megachile fortis* Cr., *Colletes gilensis* Ckll. ♂, *Vespa occidentalis* Cr.
- (5) *Geranium atropurpureum* Heller. A common New Mexico plant, only recently recognized as distinct. Visited by males of *Colletes gilensis* Ckll., a short-tongued bee.

- (6) *Heliopsis scabra* Dunal. Visited by *Megachile fortis* Cr., *Anthidium perpictum* Ckll., *Megachile fidelis* Cr.,—all long-tongued bees. From *H. helianthoides*, in Illinois, Robertson collected twenty-two bees, fourteen being long-tongued.

A few other miscellaneous observations are to be recorded: *Anthophora cleomis*, ♂, at *Prunella vulgaris*, and ♀ at *Verbascum thapsus*; *Clisodon terminalis* at *Prunella vulgaris* and *Verbascum thapsus*; *Halictus angustior* at *Erysimum asperum*; *Melissodes ruidosensis* at *Erigeron macranthus*; *Vespa diabolica* at *Solidago trinervata* and *Sicyos parviflorus*; *Andrena barberi* at *Solidago trinervata*.

LA CUEVA, ORGAN MOUNTAINS.

This locality, also in southern New Mexico, is at the eastern side of the Mesilla valley, and has an altitude of about 5000 feet. The records given below are based on collections by Prof. C. H. T. Townsend:

- (1) *Datura meteloides* DC. A magnificent species, with large, heavily scented white flowers. Although no doubt properly a sphinx-moth flower, it was visited by the following bees: *Xylocopa arizonensis* Cr., *Caupolicana yarrowi* Cr., *Anthophora montana* Cr., *Agapostemon viridulus* Fabr. (new to New Mexico), *Augochlora neglectula* Ckll. The *Caupolicana* flies early in the morning, before sunrise. According to Mr. Friese (*in litt.*) the Chilian *C. curvipes* Friese (♂) agrees with *C. yarrowi*.
- (2) *Lippia wrightii* Gray (Verbenaceæ). A shrubby plant, characteristic of the region. Visited by *Xylocopa arizonensis* Cr., *Caupolicana yarrowi* Cr., *Anthophora montana* Cr., *Perdita albovittata* Ckll. (1 ♀), *Augochlora neglectula* Ckll., *Synhalonia crenulaticornis* Ckll. var. ♂ (clypeus yellow except the hind border broadly),—all bees, five long-tongued.
- (3) *Tourerea multiflora* (Nutt.) Visited by bees: *Perdita mentzeliarum* Ckll. and *Anthophora californica* Cr. I learn from Dr. Rydberg that *Tourerea*, Eaton and Wright, takes the place of *Hesperaster*; the combination here given will be credited to him.
- (4) *Phacelia congesta* Hooker. Visited by bees: *Ceratina nanula* Ckll. (3 ♀, 1 ♂), *Halictus ruidosensis* Ckll. (1 ♀), *Perdita phacelie* Ckll. These are all small bees.

Other observations are: *Nomada gutierreziae* Ckll., on *Verbesina encelioides*; *Nomia foxi* D.T. and *Exomalopsis solani* Ckll., on *Solanum elæagnifolium*; *Angochlora neglectula* Ckll., at *Parthenium incanum*.

ROMEROVILLE.

A locality about six miles from Las Vegas. In *Entomological News*, 1901, p. 40, five insects are recorded from Ribes, *sp.* at this place. It can now be stated that the Ribes is *R. leptanthum veganum* Ckll. (*Proceedings of the Biological Society of Washington*, 1902, p. 99).

LAS VEGAS.

- (1) *Asclepias verticillata* L. This is very attractive to flies; the following were taken from its flowers: *Syrirta pipiens* L. (July 3, N. Stern), *Eristalis latifrons* Loew (July 3, M. Winters), *Echinomyia algens* Wied. (July 21), *Peleteria tessellata* Fab. (July 21), *Myiophasia ænea* Wied. (July 21). *Lygæus reclinatus* Say is also common on the plant. Robertson collected 115 species of insects from this plant in Illinois.
- (2) *Ribes longiflorum* Nutt. The yellow-flowered currant, common both wild and cultivated in the vicinity. On May 12 Loyola Dillon and Olive Barnes collected on the flowers four species of bees and one wasp: *Bombus nevadensis aztecus* Ckll. ♀, *Halictus coriaceus* Smith ♀, *H. armaticeps* Cr. ♀, *H. pruinosis* Rob. ♀, *Odynerus, sp.* On May 9 of last year a ♀ *Synhalonia frater*, Cr. var. (new to New Mexico), was taken at the flowers. This and the Bombus can probably get some nectar, but the Halicti only get pollen.
- (3) *Anogra albicaulis* is a large white evening primrose, doubtless intended for moths, but on May 29 Eldon Tuttle and Leo Tipton discovered a minute new bee of the genus *Perdita* visiting its flowers at Las Vegas. *Perdita anogræ*, n. sp., ♂. Length about 3½ mm.; head and thorax very dark olive green; cheeks unarmed; face below antennæ all bright yellow except the clypeal dots, yellow not extending upwards in middle line, but at sides going a little above the antennæ and then terminating abruptly, just touching the facial foveæ, making slightly more than a right angle with the eye; eyes pale green, the lower half of the posterior orbital margin narrowly bordered with yellow; face and mesothorax not conspicuously hairy; antennæ pale orange, dark brown above as far as third joint of flagellum; vertex and mesothorax minutely sculptured, but rather shining; tubercles light yellow; pleura

all dark; tegulæ pale brownish, with a yellowish spot; wings rather small, hyaline, brilliantly iridescent; nervures and stigma sepia brown, third discoidal distinct; marginal cell obliquely truncate; second submarginal narrowed to a point above; legs brownish-orange, the femora black behind, tibiæ with a dark brown stripe on outer side, tarsi with at least the last joint darkened; abdomen rather broad, shining black, with transverse wedge-shaped bluish-white marks on the sides of segments two to four; ventral surface black.

In my table in *Bulletin of Laboratory of Denison University*, XI, this runs to section 30, where it is at once distinguished by its spotted abdomen. It is closely allied to *P. sexmaculata*, agreeing in the ornamentation of the face and color of the antennæ, but the color of the abdominal spots is entirely different, as also is the shape of the second submarginal cell, and *P. anogræ* is a smaller insect than *sexmaculata*.

- (4) *Verbena bipinnatifida* Nutt. is a plant with umbel-like heads of brilliant purple flowers, allied to the Verbena of gardens, and adapted to butterflies. On June 7 I saw it visited by the butterfly *Pyrameis cardui* and the day-flying hawk moth *Deilephila lineata*; but to my surprise I also saw a female *Anthophora montana*, a long-tongued bee, sucking vigorously and apparently successfully. She had not collected any pollen.
- (5) *Phlox nana* Nutt. A small species characteristic of our region, with brilliant pink flowers. It is adapted to butterflies, but on June 7 I saw a short-tongued bee, *Agapostemon texanus*, ♀, repeatedly trying to suck and of course getting nothing. Elias Nelson, in his revision of Phlox, says the corolla of *P. nana* is "red" or "white." It is always whitish beneath, but the upper surface is typically bright pink, varying, however, at Las Vegas to pale mauve (forma *lilacina*) and white with a large pink "eye" (forma *oculata*), the markings round the throat remaining the same in each case.
- (6) *Sophora sericea* Nutt. is a plant allied to Astragalus, with conspicuous white flowers. It seems to be adapted to bumblebees, and is visited by *Bombus morrisoni*.

ENGLE.

Engle is a locality near the Rio Grande about fifty miles north of Las Cruces. Nothing has hitherto been known of its insect fauna.

Astragalus bigelovii Gray. One of the so-called "loco-weeds" common in the southern part of New Mexico in open ground. The leaves are densely covered with white silky hairs.

Miss Nora Newberry, during the latter part of April and the first few days of May, collected from the flowers a number of long-tongued bees, which prove to be as follows :

- (1) *Synhalonia lycii* Ckll., both sexes ; the male was not before known. In the male the clypeus, labrum, and a small, broadly triangular supraclypeal area are cream-color. (In the males of *S. edwardsii* and *frater* the clypeus is very bright yellow, and there is no supraclypeal mark.)
- (2) *Anthophora affabilis* Cr. ♀. The identity of this has been confirmed by Mr. Fox, who compared it with Cresson's type. In the Mesilla valley it visits *Lycium torreyi*.
- (3) *Anthophora porterae* Ckll. Several females ; only two specimens of this species were previously known. It is readily distinguished from *A. affabilis* by the black hair mixed with the light on the mesothorax. The female nearly agrees with the description of *A. ignava* Cr., but Mr. Fox has kindly compared it with Cresson's type, and assures me that it is different. Mr. Fox remarks that the female seems to agree with *A. edwardsii* Cr., except that it is larger ; the male, however, has not the tooth on inner side of hind joint of posterior tarsi, and the lateral face-marks are not "lanceolate," but are shaped like a rose-thorn. A male *A. porterae* was taken at flowers of *Ribes longiflorum*, at Las Vegas, N.M., May 15, 1902, by Eldon Tuttle and Leo Tipton. It differs from the original type in having more yellow on the scape and rather more black hair on the mesothorax. A character overlooked in the original description is a little pencil of black hair overlapping the upper anterior corner of each eye.

It is to be noted that both *Synhalonia* and *Anthophora* visit *Ribes*, *Lycium*, and *Astragalus*, plants of very different affinities but similar in their adaptation to long-tongued bees

TROUT SPRING.

This is a locality in Gallinas Cañon, N.M., some miles above Las Vegas Hot Springs. It is of interest on account of the mixed boreal and austral elements in its fauna and flora, the result in large measure, no doubt, of the narrowness of the cañon, whereby some slopes get little or no sun, while others are well warmed. The abundance of *Pinus scopulorum* and *Populus angustifolia* indicate the Transition Zone, while *Heracleum lanatum*, *Dasiphora fruticosa*, and *Ribes irriguum* are

distinctly Canadian Zone types. A fine bush of the last mentioned grew on the north side of a huge rock, shaded from the sun. An Upper Austral representative is *Ribes longiflorum* (a variety, however, with the petals deep red, the calyx tube often reddish outside, the flowers about 14 mm. long, and the apex of the leaves obtuse, thus closely approaching the northern *R. aureum*, as restricted by Coville), while at its flowers we found the typically southern butterfly *Epargyreus tityrus* Fabr., which extends to South America and the West Indies. The bright yellow flowers of the Canadian Zone *Thermopsis* were visited by a female *Megachile wootoni* Ckll., a bee of a strictly alpine and boreal type. A magpie (*Pica pica hudsonica*) was also to be regarded as a boreal representative. The pink flowers of the Upper Austral and Transition *Phlox nana* were seen in the cañon a short distance below Trout Spring.¹

The insect visitors of one species of plant were rather carefully studied by my wife and myself, May 24, 1902.

Iris missouriensis Nutt. Visited by bees, butterflies, and flies. The bees crawl in under the petaloid divisions of the style, and so doubtless effect cross fertilization. The butterflies and flies (Bombyliidæ) suck from between the perianth segments, and appear to get their meal without paying for it.

The following insects were observed :

- (1) *Colias eurytheme* ♀, *Lycæna*, *Thanaos*,— all butterflies, sucking.
- (2) *Bombylius major* L., with proboscis 8–8½ mm. long, very abundant, sucking. In Europe a syrphid (*Rhingia*) with a proboscis 11 mm. long visits *Iris pseudacorus*, as is described by Müller.

The remaining species are bees :

- (3) *Megachile wootoni* Ckll., *Megachile latimanus* Say. A male of each found sitting on the flowers, perhaps waiting for the females.
- (4) *Synhalonia frater* Cresson. One of each sex.
- (5) *Anthophora bomboïdes neomexicana* Ckll. One ♂.
- (6) *Halictus coriaceus* Smith. One ♀.

¹ Mr. Eldon Tuttle lately found in Las Vegas a flower of *Phlox nana* with the limb 8-parted, a character which, if not aberrational, would take it out of the Polemoniaceæ. I have since found a flower with the limb 7-parted.

- (7) *Augochlora confusa* Rob. Two ♀. These differ from a specimen received from Mr. Robertson in having the basal area of metathorax bounded by a sharp rim, but Robertson's description indicates that such specimens occur also in Illinois. The species is new to New Mexico.
- (8) *Osmia pusilla* Cresson, one ♂; *Osmia*, two new species, males. I have sent these to Mr. Titus, who is revising the genus.

LAS VEGAS HOT SPRINGS.

Verbena macdougallii was visited July 11 by bombyliid flies, *Systoechus vulgaris* Lw. (det. Coq.), as observed by Miss M. Holzman.

Ribes cereum Dougl. was visited May 24 by *Bombus juxtus* Cresson.

I will take this opportunity to record from Las Vegas Hot Springs the dragon fly *Hyponeura lugens* Hagen. Prof. J. A. Needham, who kindly identified it, states that the genus is new to the United States, but there are specimens from Arizona in the Cornell University collection, not hitherto recorded.

APPENDIX.

Two New Species of Osmia.

The two new species of *Osmia* collected on flowers of Iris at Trout Spring, N.M., were sent to Mr. Titus with the expectation that they might prove identical with species which he had already described in MS. As this is not the case, they are briefly diagnosed below. Some additional notes and comments will be given by Mr. Titus when he publishes his revision of the American species of *Osmia*.

Osmia iridis Cockerell and Titus, *n. sp.*

♂. Length 9 mm., stout; head and thorax yellowish-green; abdomen dark blue-green; antennæ long, slender, entirely black, subtruncate at apex; pubescence of head and thorax abundant, erect, white; vertex very broad; mandibles entirely black; legs black, with black hair (white on first four femora), hind femora slightly bluish; abdomen short and broad, with white hair on first segment, on the others mixed black and white; sixth segment reflexed, entire. Hind tibial spurs black, strongly

curved at tips; eyes perfectly black; cheeks and sides of vertex with some long black hairs mixed with the pale; tegulæ black, with a slight green tinge; wings slightly dusky, nervures black; second submarginal cell long; anterior edge of clypeus nodulose; clypeus and front as densely punctured as is possible. Mr. Titus adds: "A very distinct species; apical margin of second ventral segment is different from any species heretofore seen. The antennæ are crenulated slightly beneath, and this gives them slight resemblance to males of *lignaria* section, but the species does not belong there. It would be well to note the hairiness of the labial palpal joints 1 and 2."

Osmia chlorops Cockerell and Titus, *n. sp.*

♂. Length about 10 mm., brassy green, with bluish tints on abdomen and thorax; the abdomen shining, the head and thorax densely punctured; pubescence white, long and abundant on face; legs strongly tinged with green. Head large, face almost golden; eyes (in life) green, black anteriorly; mandibles black; antennæ long, black, crenulated; first joint of flagellum covered with a seal-brown velvety pile; tegulæ with greenish punctured margins; wings somewhat dusky; hind tarsi with the basal joint broadened distally, and covered on the inner side with short brown-black hair; hind tibial spurs black, curved at tips; sixth dorsal segment of abdomen notched; apical segment deeply and broadly notched; third ventral segment deeply and broadly emarginate, the edges of the emargination fringed with short shining hairs.