Light Trap Collections of the Nocturnal Bee, *Sphecodogastra texana* (Cresson) (Hymenoptera, Halictidae)

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Introduction

In conducting research on the insect pests of pines grown for Christmas trees, Dr. Donald L. Schuder, of the Purdue Department of Ento-

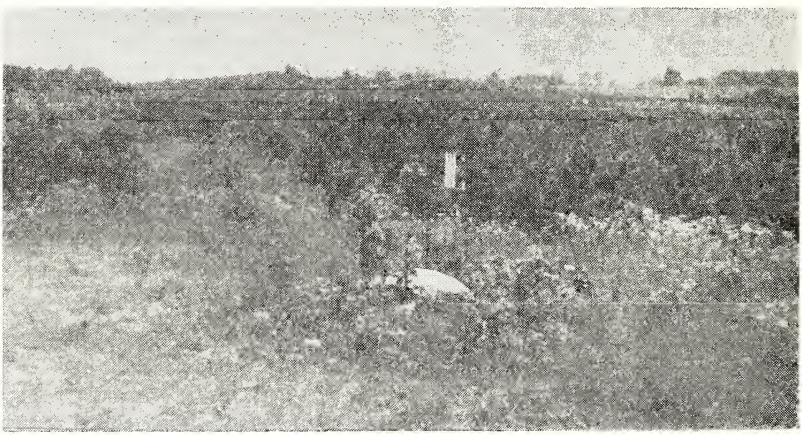

Fig. 1 (upper). Light trap site in LaPorte Co., Indiana.

mology, has employed a light trap as a survey instrument. During 1959 and 1960, the site (Fig. 1) of the research under consideration in this study was located approximately six miles northeast of LaPorte, Indiana.

The light trap (Fig. 2) was designed by the late John Taylor (U. S. Department of Agriculture and Purdue Department of Agricultural Engineering) and Dr. Howard Deay (Purdue Department of Entomology). The trap may be described briefly as being omnidirectional and had, as the radiant energy source, three BL-360 fluorescent tubes, set vertically over a funnel-topped collecting container. The killing agent employed was calcium cyanide which was placed in a small paper sack and changed daily.

In 1959, the trap was placed in operation on May 15; however, as a result of using too little cyanide, the first collections were not made until June 1. After this date, collections were made daily through September 9. In 1960, the trap was operated from May 15 through October 16.

The light trap collection for June 7, 1959, contained a female of *S. texana*. When subsequent collections began to yield additional specimens, occasionally in moderate numbers, the investigation reported herein began.

Review of Literature

This species of bee was described by Cresson (4, page 249) as *Sphecodes texana* (*v. et.* Graenicher, 6; Stevens, 13), not in *Parasphecodes* as cited by Michener (10) and by Mitchell (11). In 1887, Cresson (5) moved the species to *Parasphecodes*. Cockerell (2) placed it in *Halictus*, citing it as the only *Halictus* with a red abdomen. He also cautioned against

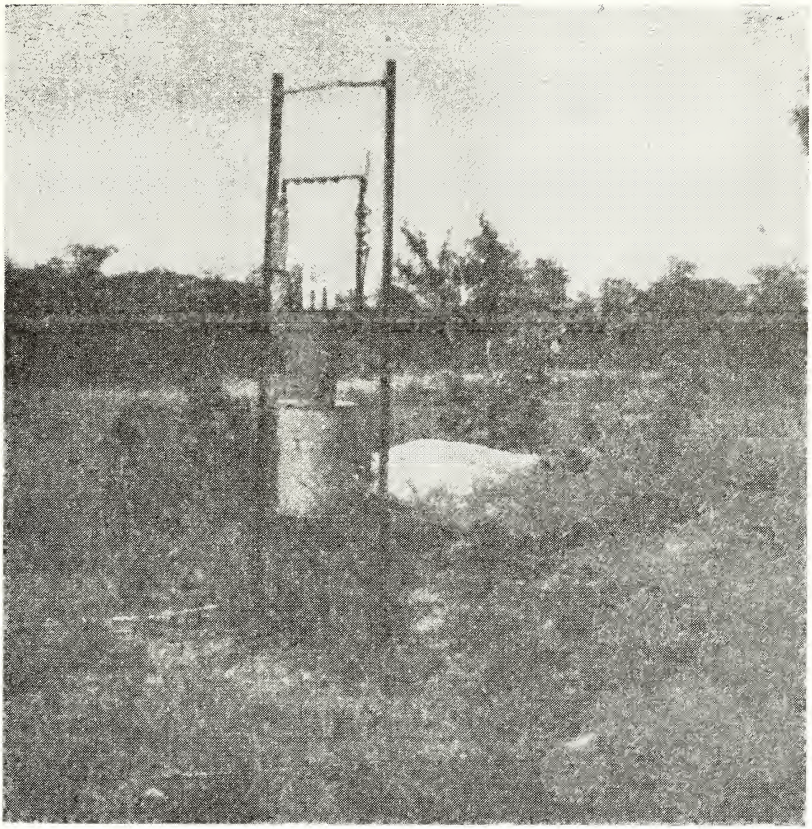

Fig. 2 (lower). Close-up photograph of the light trap.

confusing this species with the *Halictus texanus* Cresson (4, pg. 251) since the latter was a synonym of *H. ligatus* Say. Ashmead (1) erected the genus *Sphecodogastra* in 1899 with the genotype, *Parasphecodes texana*. Ducke referred the species to *Megalopta* (*fide* Stevens, 13). Michener (9) reduced *Sphecodogastra* to subgeneric status in the genus *Lasioglossum* but it was accorded generic status by Mitchell (11). The proper designation can hardly be expected until a thorough study of the Halictinae of the world is made.

Morphologically, *S. texana* is distinguished from all other Indiana bees by the very large ocelli. Stevens (13) measured the lateral diameter of the anterior ocellus in several species of halictine bees, including other species of *Sphecodogastra*, and found this structure in *S. texana* to average about 400 microns as compared to a range of 150-220 microns in the other species. A review of structural adaptations and crepuscular, noctural and matinal activities has been given by Linsley (8) and by Graenicher (6).

Biologically, *S. texana* is both a crepuscular and nocturnal species although there are also records (Table 1) of both matinal and diurnal

Table 1. Flower Visitation and Activity Records of *S. texana* (Cr.)

Flower Species	Time—Sex		Locality	Reference
Pyrus communis	daylight	(♀)	Mesilla, N. Mex.	Cockerell (2)
Senecio sp.	—do—	(♀♂)	Las Cruces, N. M.	—do—
Grindelia sp.			Lincoln, Nebr.	Crawford (3)
Oenothera rhombipetala	8-10:00 P.M.	(♀)	Prescott, Wisc.	Graenicher (6)
Allionia nyctaginea	before sunset	(♀)	Blue Rapids, Kans.	Stevens (13)
Megapterium missouriense	to 8:40 P.M.	(♀)	—do—	—do—
Hartmannia speciosa	sunset	(♀)	—do—	—do—
Mentzelia decapetala	7:30 P.M.	(♀)	Manhattan, Kans.	—do—
Allionia hirsuta	hour after sunset	(♀)	Oakes-LaMoure, N. D.	Stevens (13, 14)
Oenothera nuttalli (as *Anogra pallida*)	about 8:40 P.M.	(♀)	—do—	—do—
O. strigosa (as *Onagra strigosa*)	—do—		—do—	—do—
—do—	sunrise	(♂)	—do—	—do—
Helianthus petiolaris	early forenoon	(♂)	Sheldon, N. D.	—do—

activity. Mitchell (11) reported that it was more frequently taken at light traps than in visits to its host plants. The species is recorded as being oligolectic on species of Onagraceae (8, 11) but there are records of capture on species of flowers in other families. Many of these latter records were for males or denoted only nectar sources. Table 1 summarizes those published collection records of *S. texana* which mention time of activity and/or host plant.

The length of adult flight activity ranges from April (2) to October (2, 3) with most records between June and August. Hicks (7) described a nest of this species taken at White Rocks, Colorado on August 25, 1926. The nest burrow had been excavated vertically in the soil to a depth of

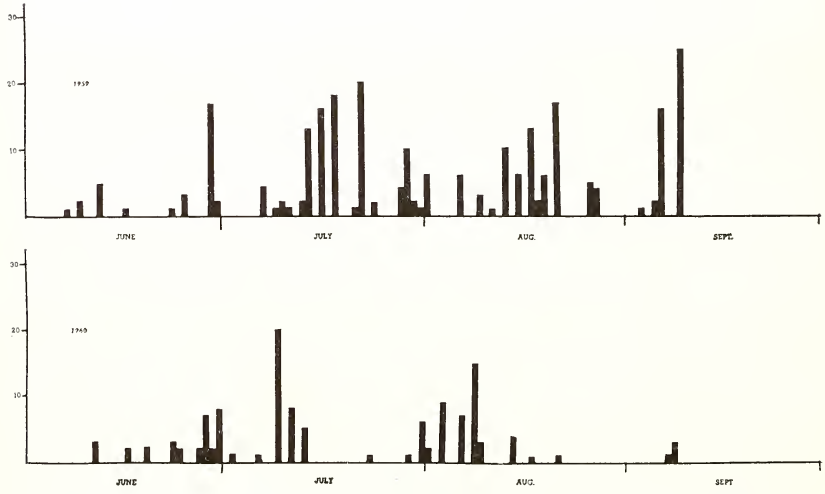

Fig. 3 (upper). Daily collections of *S. texana* (Cr.) during 1959. Number of specimens on vertical axis.

Fig. 4 (lower). Daily collections of *S. texana* (Cr.) during 1960. Number of specimens on vertical axis.

40.5 cm. The tumulus of sand surrounding the nest entrance was 3.5 cm. in height. The burrow diameter was recorded as being 5.5 mm. with the inner walls very smooth. The one bee was taken in a short lateral at the bottom of the burrow. No brood cells were found suggesting that the nest was in an early stage. Graenicher (6) interpreted the spring and fall collection records of Cockerell (2) to indicate at least two broods per year. Linsley (8) has recorded species of *Sphecodogastra* as being semisocial.

Results

The results of the light trap collections for 1959 are given in Fig. 3 and the results for 1960 are given in Fig. 4. Records of males are not plotted. In 1959, five males were collected, one each on August 17, 18, and 21, and two on August 26. In 1960, only three males were taken, one on August 1 and two on September 8. Comparative collection data are tabulated (Table 2) below.

Table 2. Comparative collection summary of *S. texana* females at a light trap, LaPorte Co., Indiana.

	1959			1960		
	No. ♀	♀ with pollen	% pollen collectors	No. ♀	♀ with pollen	% pollen collectors
June	32	4	12.5	31	1	3.2
July	111	18	16.2	43	8	18.6
August	85	10	11.8	42	7	16.7
September	44	0	0.0	4	0	0.0
Totals	272	32	11.0	120	16	13.3

Several trips were made to the light trap site to search for the nests of the species. None was ever located. Attention was later turned to the flowering plants of the area in order to determine the site of the pollen source. On two occasions, specimens were secured of every species of plant in flower at the time within a radius of several hundred yards of the light trap. There was no species of Onagraceae included. Pollen removed from the scopae of the bees appeared to be identical to that taken from the flowers of *Oenothera pycnocarpa* Atk. and Bartl. at West Lafayette and from the scopae of *Anthedonia compta* (Cr.), an *Oenothera* oligolege, collected in the same area.

Because of the dried conditions of the specimens, no study of ovariole development could be made. Measurements of external characters (head width, length of forewing, width of abdominal segments), while tending to show that individuals averaged larger in June and September, did not reveal the marked dimorphism of caste development. Neither mandibular wear nor wing wear were found useful for age determinations.

Discussion

The weather during the period of flight activity was warm and dry during 1959, cool and wet in 1960. These conditions could account for the differences in collections and population peaks. Weather records were not taken at the light trap site.

There are several points of similarity reflected in the collections. Population peaks, interpreted as brood peaks, were more distinct in 1959

but similar peaks were shown in 1960. The females taken during the first two weeks of each year had not collected pollen, a condition also noted for those females taken during the last week of August and thereafter. Pollen-collecting females were taken only during the periods from June 29-August 21, 1959, and June 30-August 17, 1960, with the percentage of pollen-collectors nearly equal for both years.

Inferences drawn from the collection data would indicate the semi-social behavior of *S. texana*, typical of the halictine groups in which this species belongs. This possibly indicates, in addition, that the nest reported by Hicks (7) really represented one in which a female was preparing for hibernation and not a nest in the early stages of construction.

That *S. texana* is attracted to light is well-known. However, there are evidences, largely unsupported, that the odor of cyanide may be an adjunct attractant. Schwarz (12) recorded an observation made by G. H. H. Tate in Papau who observed individuals of *Trigona planifrons* F. Smith to enter an open cyanide bottle and to die there although they were not otherwise prevented from leaving. The dead individuals covered the bottom of the bottle to a depth of one inch. This species of stingless bee was also collected at lights but in far fewer numbers. Diurnal bees, especially those restricted to cucurbit flowers (*e.g., Peponapis p. pruinosa* (Say), *Xenoglossa s. strenua* (Cr.)) or frequently found on these flowers (*e.g., Melissodes b. bimaculata* (Lep.), *Tetralonia* spp.) are taken almost daily in light traps. The frequency of these collections, the numbers of individuals taken and the set of conditions involved (light off, catch of previous night removed, fresh charge of cyanide) lend some support to this hypothesis.

In comparing the collections of *S. texana* made during the two years, certain of the differences involving frequency of collections and numbers of individuals, might be attributable to the greater amount of attention given to care of the trap in 1959 as compared to 1960. Cyanide charges were renewed almost daily in 1959 but in 1960 there were extended periods in which this was not done. If, as hypothesized, cyanide is an adjunct attractant, then the collections for the two years are not really comparable.

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