

Sphecodogastra antiochensis McGinley, 2003 (Hymenoptera: Halictidae: Halictinae)

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SUMMARY

Sphecodogastra antiochensis is a rare, specialist foraging bee with a very restricted distribution—the Antioch Dunes of Contra Costa County, California. Most of the Antioch Dunes have been lost to development or sand mining since the late 1800s. Approximately seventy acres of the dunes, degraded by off-road vehicle use, exotic plant species, and fire control activities, remain. In 1980, the surviving dunes were designated a National Wildlife Refuge.

Sphecodogastra antiochensis females fly between March and August (peaking in May) and males fly between May and October (peaking in June). During the flight period, this bee flies in the morning and evening, foraging times linked to the flowering of its major hostplant, the Antioch Dunes evening-primrose. *Sphecodogastra antiochensis* nests in the ground in stabilized sand dunes in open xeric areas.

CONSERVATION STATUS

Xerces Red List Status: Critically Imperiled

Other Rankings:

Canada – Species at Risk Act:	N/A
Mexico:	N/A
USA – Endangered Species Act:	None
USA – state legislation:	None
NatureServe:	N/A
IUCN Red List:	N/A

SPECIES PROFILE

DESCRIPTION

Sphecodogastra antiochensis McGinley is a small (length 8.8-9.5 mm), dark brown bee, with a moderately elongate head and a slender abdomen (andreniform). The wings (length 2.6-3.0 mm) are pale yellowish brown with amber colored veins and stigma. It has three submarginal cells and, like *Lasioglossum*, the veins weakened distally. It has

hairs covering both the head (pale yellowish brown) and thorax (pale yellowish white), hair bands covering the basal one-quarter of metasomal terga two to four (T2-T4), and moderately well developed apical hair bands on tergathree and four (T3, T4).

Females have scopae on the hind femur, which are reduced to a near linear row of nonplumose, hooked hairs (apically recurved setae), although the row of hairs is less clearly defined on *S. antiochensis* compared with other *Sphecodogastra*. (This scopal modification is related to the females' foraging specialization on Onagraceae flowers, whose pollen grains are interconnected by viscid threads.)

Sphecodogastra males are similar except that they have a more elongate head than females, are generally more slender, and the mesoscutum and pleuron have short, adpressed hairs.

TAXONOMIC STATUS

Sphecodogastra was established as a genus by Ashmead (1899) for *Sphecodes texana* Cresson (1872), a large halictid with orange abdomen, enlarged ocelli, and scopae modified for carrying Onagraceae pollen. Michener (1951) placed *Sphecodogastra* Ashmead as a subgenus of *Lasioglossum* and included four small, darkly pigmented species with modified scopae that were originally grouped with *Halictus* (*H. aberrans* Crawford, *H. lusorius* Cresson, *H. oenotherae* Stevens, and *H. texanus* Cresson). The subgenus was expanded when *Sphecodogastra noctivaga*, related to *S. texana*, was described by Linsley and MacSwain in 1962.

The inclusive concept of Michener has been disputed. Linsley and MacSwain (1962) placed the small, dark species in the *Lasioglossum* subgenus *Evyllaesus*. This was supported by Hurd (1979) and Moure and Hurd (1987), who restricted *Sphecodogastra* to only two species, *S. noctivaga* and *S. texana*.

Michener's (1951) inclusive concept of *Sphecodogastra* and its status as a subgenus of *Lasioglossum* was reinstated by Michener et al (1994) and restated in Michener (2000).

In his revision of *Sphecodogastra*, McGinley (2003) retains the inclusive concept but recognizes *Sphecodogastra* at the generic level, commenting: "Decisions on the most useful categorical levels should await a better understanding of the relative rankings involved. The monophyly of many currently recognized halictine taxa is open to question, and a number of these taxa (e.g., *Dialictus*, *Evyllaesus*) are possibly artificial as presently defined." However, recent work by Danforth et al (2003) indicated that *Sphecodogastra* should be transferred back to the subgenus *Evyllaesus*.

LIFE HISTORY

Sphecodogastra antiochensis has been recorded from March to October, with females flying earlier (March-August) than males (May-October). The peak month for females is May (67 percent of records) and for males is June (98 percent of records) (McGinley 2003).

This bee shows distinct patterns of daily flight activity, linked to the flowering of its major hostplant, the Antioch Dunes evening-primrose (*Oenothera deltoidea* var. *howellii*). In a study reported by McGinley (2003), Turner (1966) recorded morning and evening flight times. The mean time of flight initiation in the morning was two minutes before sunrise, although some bees left their nests as late as forty-eight minutes after sunrise. Bees opened their nests up to an hour before starting to forage. In the evening, foraging began approximately forty-seven minutes before sunset and continued until about thirty minutes after sunset.

Early in the season, *S. antiochensis* collected pollen and nectar during both daily flight periods. However, later in the season, it collected pollen primarily in the morning and in the evening foraged mainly for nectar. This change appeared to be associated with the later emergence of another halictid, *Agapostemon texanus* Cresson, that competed for pollen but also due to the fact that the evening-primrose flowers themselves opened later in the evening, by which time, presumably, light levels were too low for *S. antiochensis* to fly.

Female *Sphecodogastra* collect pollen primarily from Onagraceae, but will collect pollen from other sources when evening-primrose is not available. Interestingly, evening-primrose pollen is not necessary for larval development—Bohart and Youssef (1976) reared larvae of *Halictus galpinsiae* (now synonymized under *Sphecodogastra lusoria*) on alfalfa (*Medicago sativa*). However, all floral records for *S. antiochensis* are for Onagraceae: 135 on Antioch Dunes evening-primrose and 3 on other *Oenothera* species.

The specialization on Onagraceae may be because of efficiency of pollen collection (*S. lusoria* can gather a full pollen load in less than one minute) and reduced competition from other bees due to the precise timing of foraging and flowering. In addition, having nests closed during the day may reduce parasitism. Only one potential cleptoparasite (an adult *Sphecodes*) has been reported in association with *Sphecodogastra*.

Sphecodogastra antiochensis nests in the ground in stabilized sand dunes in open xeric areas. The details of nest architecture for *S. antiochensis* are not known. However, nests of other members of the genus (*S. lusoria*, *S. oenotherae*, and *S. texana*) usually have vertical and straight main burrows from 20 cm to 145 cm deep. The entrance is marked with conspicuous tumuli. Brood cells are horizontal or slightly downward sloping, connected to the main burrow by short lateral tunnels. These cells are partially lined with a waxy secretion. The greatest number of cells recorded in a *Sphecodogastra* nest is thirty-one (*S. lusoria*).

The species shows a slight tendency towards nesting in aggregations with up to seven burrows per square meter.

DISTRIBUTION

Sphecodogastra antiochensis is only known from the Antioch Dunes of Contra Costa County, California. It is geographically isolated from other species in its genus: the

nearest records are for *S. lusoria* at Delhi and Livingston, Merced County, California, approximately seventy miles southeast of Antioch.

The bee's hostplant, the Antioch Dunes evening-primrose (*Oenothera deltoides* var. *howellii*), is also endemic to the Antioch Dunes.

THREATS

Most of the Antioch Dunes have been lost to development or sand mining since the late 1800s. Approximately seventy acres of the dunes, degraded by off-road vehicle use, exotic plant species, and fire control activities, remain. In 1980, the surviving dunes were designated a National Wildlife Refuge to protect three species listed as endangered under the U.S. Endangered Species Act: Lange's Metalmark (*Apodemia mormo langei*; see Red List profile for more information), the Contra Costa wallflower (*Erysimum capitatum* var. *angustatum*), and the Antioch Dunes evening-primrose.

The NWR designation also offers some protection to the habitat of *Sphecodogastra antiochensis*. The U.S. Fish and Wildlife Service is actively managing populations of its evening-primrose hostplant through control of invasive plants and planting of seedlings. According to the California Department of Fish and Game's Habitat Conservation Planning Branch (http://www.dfg.ca.gov/hcpb/cgi-bin/more_info.asp?idKey=ssc_tespp&specy=plants&query=Oenothera%20deltoides%20var.%20howellii; accessed 11/24/04), the general population trend for the evening-primrose is an increase and the populations of the plant were stable in 1999. However, given the small and restricted population of the taxon it must be considered precarious, and because it is the primary pollen source for *S. antiochensis*, so must the bee.

There are apparently no efforts to protect or manage nesting sites.

CONSERVATION STATUS

Sphecodogastra antiochensis is a rare, specialist foraging bee with a very restricted distribution. Jerry Powell, Professor Emeritus at the University of California at Berkeley and a long-time champion of conservation at Antioch Dunes (e.g., Powell 1978), searched the site in June 1982 and found twenty-two individuals (reported in McGinley 2003). June is the peak month for male bees and the second most abundant month for females.

Despite a conservation designation for the dunes and active vegetation management, populations of the primary hostplant for *S. antiochensis*, the Antioch Dunes evening-primrose, remain at risk. Until the security of these populations can be guaranteed, the future of the bee will always be considered imperiled.

In addition to habitat threats, the small population size of this bee is in itself a threat to long-term survival due to reduced levels of genetic variation leading to inbreeding depression. Reduced genetic variation can make it harder for populations to withstand short-term disruption to habitat or adapt to long-term environmental change. A good review of this issue is given by Packer and Owen (2001).

The California Endangered Species Act does not allow listing of insects, so despite its precarious status, *Sphecodogastra antiochensis* has no protection under state legislation. The California Department of Fish and Game includes this bee on its Special Animals list.

CONSERVATION NEEDS

Adequate populations of Antioch Dunes evening-primrose (*Oenothera deltoides* var. *howellii*) must be maintained, as must appropriate areas of stabilized sand dunes for nesting.

RESEARCH NEEDS

Detailed surveys should be done to establish the size of the current population and nest site locations, as should studies of nesting habits, particularly its “social” behavior, nest site selection, and nest architecture.

RESOURCES

CONTACTS

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WEBSITES

Sphecodogastra antiochensis has no web presence.

Antioch Dunes evening-primrose (*Oenothera deltoides* var. *howellii*)

U.S. Fish and Wildlife Service endangered species profile.

http://ecos.fws.gov/species_profile/SpeciesProfile?sPCODE=Q1ZN

(Accessed 11/24/04)

U.S. Department of Agriculture PLANTS database.

<http://plants.usda.gov/>

(Accessed 11/24/04)

California Department of Fish and Game, Habitat Conservation Planning Branch, species profile.

[http://www.dfg.ca.gov/hcpb/cgi-](http://www.dfg.ca.gov/hcpb/cgi-bin/more_info.asp?idKey=ssc_tespp&specy=plants&query=Oenothera%20deltoides%20var.%20howellii)

[bin/more_info.asp?idKey=ssc_tespp&specy=plants&query=Oenothera%20deltoides%20var.%20howellii](http://www.dfg.ca.gov/hcpb/cgi-bin/more_info.asp?idKey=ssc_tespp&specy=plants&query=Oenothera%20deltoides%20var.%20howellii)

(Accessed 11/24/04)