Life history of *Olceclostera seraphica* (Lepidoptera: Bombycidae, Apatelodinae)

by

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Abstract: Larvae of *Olceclostera seraphica* (DYAR 1906) were collected in October 1993 in three counties in western Texas. Adults emerged in May 1994 and a mating was obtained. Observations are given for larvae in the field and in captivity, and emergence times and mating behavior of adults in captivity. New hostplant records are reported for captivity and in the field. These moths are now classified as Bombycidae, but were formerly placed in the family Apatelodidae.

Zur Biologie von *Olceclostera seraphica* (Lepidoptera: Bombycidae, Apatelodinae)

Zusammenfassung: Raupen von *Olceclostera seraphica* (DYAR 1906) wurden in drei Counties von Westtexas in Freiland gefunden. Sie fraßen dort an Esche (*Fraxinus greggi* GRAY, Oleaceae) und *Chilopis linearis glutinosa* (ENGELM.) FOSBERG. (Bignoniaceae); in der Zucht wurden auch *Fraxinus pennsylvanica* MARSHALL und *Syringa vulgaris* LINNAEUS (Oleaceae) sowie *Catalpa speciosa* (WARDER ex BARNEY) ENGELM. (Bignoniaceae) akzeptiert, nicht jedoch *Prunus virginiana* LINNAEUS (Rosaceae), eine Hauptfutterpflanze der verwandten *Apatelodes torrefacta* (J. E. SMITH 1797). Die Gattungen *Apatelodes, Olceclostera* und andere wurden bisher meist in einer rein amerikanischen Familie Apatelodidae aufgeführt; MINET (1994) stellte die Gruppe jedoch zu den Bombycidae. *O. seraphica* hat im Freiland zwei Generationen im April und Juli/August. Die Raupen sind dicht behaart, ventral abgeflacht und verbergen sich auf der Rinde von Ästen und Stämmen. Die Puppen liegen ohne Kokon in der Erde; früher als zu *O. seraphica* gehörig vermutete Netzkokons an der Futterpflanze gehören zu einer Geometridae-Art. Raupe und Falter werden abgebildet.

Introduction

Small gray moths of the genus *Olceclostera* BUTLER 1878 are distributed in several areas of North and South America. *Olceclostera angelica*

Nachr. entomol. Ver. Apollo, Frankfurt/Main, N.F. **15** (3): 245—252, November 1994; ISSN 0723-9912.

Received: 9/VI/1994, 7/VII/1994

(GROTE 1864) is found over the eastern half of North America from Ontario and Wisconsin south to South Carolina and Texas, and is known to feed on ash (*Fraxinus*) and lilac (*Syringa*), both Oleaceae, in the larval stage (TIETZ 1952, COVELL 1984). I collected several specimens at light in 1975 at Clemson, Pickens County, South Carolina. *Olceclostera indistincta* (Henry EDWARDS 1886) flies in peninsular Florida. *Olceclostera seraphica* (DYAR 1906) occurs in southern Texas (and undoubtedly Mexico), and has only hitherto been recorded to feed on desert willow (*Chilopsis linearis* (CAV.) SWEET, Bignoniaceae). MINET (1994: 74) figured a living adult from Mexico in resting position, possibly of this species. Other species of this genus occur in South America, including the type-species, *O. irrorata* BUTLER 1878 from Brazil (FRANCLEMONT 1973). This genus is closely related to *Apatelodes* PACKARD 1864, of which *A. torrefacta* (J. E. SMITH 1797) is found commonly and widely in eastern North America. The life history was described by ELIOT & SOULE (1902) and illustrated by VILLIARD (1969: 176—177). *Olceclostera* and *Apatelodes* have been classified in the small family Apatelodidae, which is limited to the New World in distribution (FRANCLEMONT 1973, COVELL 1984) and commonly subdivided into two subfamilies (Epiinae and Apatelodinae). MINET (1994) relegated the first group to a tribe within the Bombycinae and the latter group to a separate subfamily (i.e., Apatelodinae) within the Bombycidae.

The gray, hirsute larvae of *Olceclostera* (Fig. 1) are flattened ventrally as in the Chilean *Polythysana* WALKER 1855 (Saturniidae) (Kirby WOLFE, personal communication) and certain Lasiocampidae, hugging the stems of the hostplant. Larvae of *Olceclostera* resemble in appearance those of the following Palaearctic lasiocampids as were well illustrated in color by GÓMEZ DE AIZPÚRUA (1988): *Poecilocampa populi* (LINNAEUS), *Streblote panda* (HÜBNER), *Gastropacha quercifolia* (LINNAEUS), and *Phyllodesma suberifolia* (DUPONCHEL).

Field observations

In October 1993 I collected mature larvae of *Olceclostera seraphica* in western Texas. Populations were located using unpublished field notes given to me by Roy O. KENDALL of San Antonio, Texas. The field collecting data are as follows:
Texas, Val Verde County, Highway 90, at roadside park overlooking Pecos River gorge. On 17 October 1973, R. O. KENDALL and C. A. KENDALL collected 37 larvae on Gregg Ash (*Fraxinus greggii* GRAY). On 7 October 1993, R. S. PEIGLER and William G. ALTHER found 7 larvae in the ultimate and penultimate instars on *F. greggii*. Larvae were

difficult to locate on the densely foliated hostplants. The material from this locality was previously believed to represent *Olceclostera angelica* (PEIGLER & KENDALL 1993: 12).
Texas, Culberson County, 16 km north of Van Horn. On 1 October 1966, R. O. KENDALL and C. A. KENDALL collected about 50 mature larvae on *Chilopsis linearis glutinosa* (ENGELM.) FOSBERG. On 10 October 1993, R. S. PEIGLER and W. G. ALTHER found mature larvae at the same site. Stands of the hostplant were only found in a dry creek bed at the location 16 km north of Van Horn.
Texas, Jeff Davis County, Davis Mountains State Park, a few kilometers from Fort Davis. On 9 October 1993, PEIGLER and ALTHER collected more than 50 larvae on *Chilopsis*. These were in the last two larval instars. The larvae were easy to find on the sparsely foliated hostplants, feeding and resting openly on branches during the day. Many more larvae were left in the field uncollected.

While searching for larvae of *Olceclostera* in Val Verde County at the Pecos River overlook, a few larvae of *Sphinx libocedrus* Henry EDWARDS (Bombycoidea: Sphingidae) were also collected on *F. greggii* by PEIGLER and ALTHER. They had pale green and pale brown forms. An adult of *S. libocedrus* emerged 15 May 1994, providing a definitive identification. In August 1971, KENDALL (1976) collected larvae of *S. libocedrus* on *Forestiera pubescens* NUTTALL, Oleaceae, in San Antonio, Bexar County, Texas. He reported these in the 1976 paper erroneously as *Sphinx lugens* WALKER (R. O. KENDALL, personal communication 28 May 1994).

PEIGLER & KENDALL (1993) reported erroneously that *Olceclostera* make gold-colored, reticulate cocoons. Such cocoons are found commonly on the hostplant along with larvae of *O. seraphica.* Additional field observations in 1993 verified that the cocoons (all emerged previous summer) belong to a different moth, which according to KENDALL (personal communication) is *Eucaterva variaria* GROTE, Geometridae. More of these empty cocoons were observed on *Chilopsis* by PEIGLER and ALTHER north of Carlsbad, Eddy County, New Mexico, on the return trip to Colorado. The larvae of *Olceclostera* form naked pupae below ground, as is the case with *Apatelodes torrefacta* (ELIOT & SOULE 1902, VILLIARD 1969).

No larval or pupal parasitism was observed in 1993 in *O. seraphica.* The report by PEIGLER & KENDALL (1993) of *Enicospilus texanus* (ASHMEAD) (Ichneumonidae: Ophioninae) must now be corrected to cite *Eucaterva variaria* (Geometridae) as the host, not *O. seraphica.*

Voucher material of the following is in the Denver Museum of Natural History: mature larvae in alcohol and pinned adults with their pupal shells of *O. seraphica,* herbarium specimens of hostplants in the field, a pinned adult of *Sphinx libocedrus,* and cocoons of *Eucaterva variaria.* Larvae, pupae, and pinned adults of *O. seraphica* are also in the collections of Wolfgang A. NÄSSIG and Rolf G. OBERPRIELER.

Laboratory observations

Cut branches of *Chilopsis* were brought to Colorado in a plastic bag and kept in refrigeration to complete the rearing. The larvae also fed on *Fraxinus pennsylvanica* MARSHALL which was available in Colorado. Larvae rested on the sides of the screen cage as often as on the stems of the hostplant. Pupae were overwintered in moist sphagnum moss in a refrigerator.

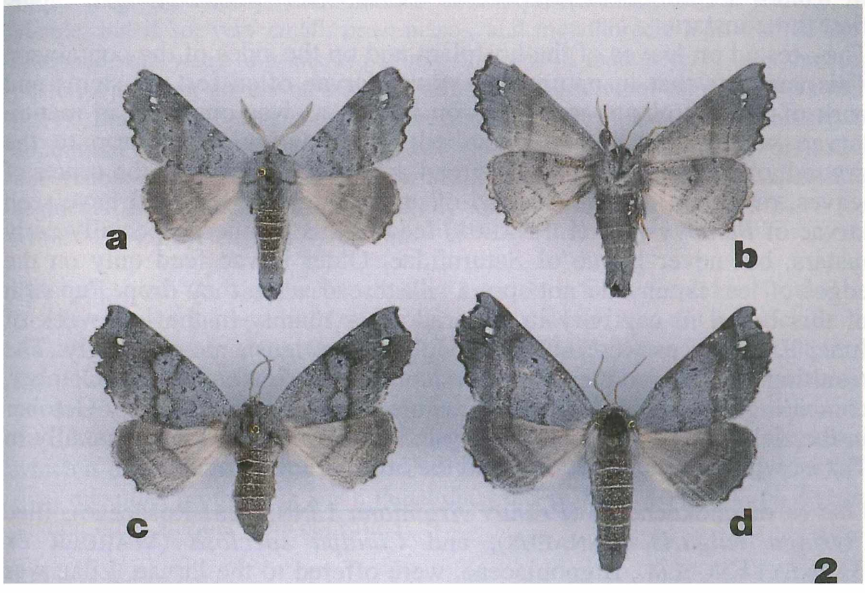
A male from Val Verde County emerged in Colorado 9 May 1994. Adults from Davis Mountains State Park emerged in Colorado as follows: 3 males, 10, 13, & 16 May 1994; 7 females, 6, 7, 9, 9, 11, 12, 22 May 1994. In Texas in 1967, KENDALL recorded 21 males and 14 females to emerge from 26 April, all through May, June, and July, with the last one on 20 August. Adults of both sexes all emerged between midnight (Mountain Daylight Time) and 0600 hrs in a cage in Colorado. KENDALL observed different emergence times in San Antonio, Texas, females emerging in late afternoon or early evening, and males after 2200 hrs.

In Colorado, a pair was kept for two consecutive nights in a large mating cage made by Marris House Nets (54 Richmond Park Avenue, Queen's Park, Bournemouth BH8 9DR, England), but did not mate. On 24 April 1974, KENDALL found a pair from stock from Val Verde County mating in a cage at 0600 hours, and recorded that separation occurred between 1830 and 2030 hrs. The female deposited 267 eggs on the first night before being killed and pinned. The eggs hatched on 3 May (incubation 9 days). On 6 June 1967, Kendall obtained a mating of stock from Culberson County "sometime during the night in a paper bag". The eggs hatched 13 June (incubation 7 days).

Color Plate:

Fig. 1: Mature larva of *Olceclostera seraphica* on *Fraxinus pennsylvanica.*

Fig. 2: Pinned adults of *Olceclostera seraphica.* **a:** Male. **b:** Female, ventral view. **c, d:** Females, showing variation.



I was successful in obtaining a pairing in the Marris House mating cage in Colorado in May 1994. A male from Val Verde County and a female from Davis Mountains State Park emerged before 0600 hrs on 9 May 1994. They were placed in the cage that morning. Protrusion of the genitalia by the female indicated that pheromone was being released, as is easily observed also in Saturniidae. Mating commenced at 1800 hrs, prior to darkness, with the male hanging head-down from the female, and continued the entire night and following day, with separation about 2045 hrs. Thus the copulation lasted about 26—27 hours. Oviposition was in a paper bag over the next few nights. A total of 236 eggs was deposited. Eggs are scattered in loose groups instead of in tight clusters. Eclosion began 22 May (incubation 12 days), and was virtually 100% (a few eggs were preserved before eclosion). The last two eggs were deposited the night of 15 May and hatched 26 May. In contrast, MILLER & COOPER (1977) reported that eggs laid during the last nights in the lives of females of *Callosamia promethea* (DRURY) failed to hatch.

Larvae fed freely on *Fraxinus pennsylvanica*. They moved about rapidly in the rearing containers and did not congregate. In the first 2—3 days after eclosion, they rested toward the ends of containers that were closer to windows or artificial lights. The following comments pertain to the first three instars.

They rested on leaves of the hostplant and on the sides of the containers. This suggests that in nature, the young larvae often rest on stems and bark of the hostplants as well as on leaves, as was observed in mature larvae in the field. When disturbed, larvae wriggle and drop to the ground, often hanging by a silk thread. Feeding was often in the center of leaves, resulting in holes, instead of on the edges of leaves. I have seen larvae of *Bombyx mori* (LINNAEUS) feed in this manner, especially early instars, but never larvae of Saturniidae. Older larvae feed only on the edges of leaves, and do not spin a silk thread when they drop. Pupation of this brood in captivity in Colorado was mainly in the last week of June. Emergences were all during July into August, mostly singly. The resulting larvae from these would mature in late September into October, coinciding with my collection of mature larvae last fall in early October in the field. These data collectively indicate two generations annually in Texas, with one flight in April and the other in July/August.

Leaves of chokecherry (*Prunus virginiana* LINNAEUS, Rosaceae), lilac (*Syringa vulgaris* LINNAEUS), and *Catalpa speciosa* (WARDER ex BARNEY) ENGELM., Bignoniaceae, were offered to the larvae. Lilac was freely accepted. *Catalpa,* which was also freely eaten by the larvae, was offered because it is in the same family as *Chilopsis*. It is worth noting that MINET (1994) cited Bignoniaceae as the hostplants utilized by

members of the neotropical subfamily Phiditiinae (Bombycidae). *Prunus* was offered because it is a common food of the related *Apatelodes torrefacta,* but larvae of *O. seraphica* would not accept it. However, it is likely that larvae of *O. seraphica* and *O. angelica* are more polyphagous in nature than currently recorded.

Several sib matings were obtained from the reared brood. Emergences were after midnight but before dawn. Matings occurred at dawn and ended at dusk (ca. 0530 hrs till 2100 hrs), lasting around 15 to 16 hours.

Descriptions of immature stages

Egg. Flattened and circular, micropyle on top ("upright" type of egg); diameter 1.6 mm, height about 0.3 mm. Yellow when first deposited, becoming dark gray prior to hatching, both color phases coinciding with those of *Bombyx mori.* Periphery opaque, bright brownish, center translucent. The center part of the eggshell is eaten as first meal after eclosion, the opaque ring of the egg largely remains.

Mature Larva (Fig. 1). FRANCLEMONT (1973) described the mature larva of *O. seraphica,* and STEHR (1987) gave a partial diagram.

Pupa (Fig. 3). Glossy, dark reddish brown to blackish. Galeae usually not visible, but if so, very small; pro-, meso-, and metathoracic legs well defined; antennae with weak imprints of pectinations; tips of metathoracic legs showing, posterior to wing covers on ventral midline, on abdominal segment 4 (as in *B. mori*); hindwing covers showing on abdominal segment 4, and barely on abdominal segment 3 (showing on abdominal segments 1—4 in *B. mori*); setae not visible (prominent in *B. mori*); scallops on anterior edge of abdominal segments 2—7 dorsally, visible laterally and ventrally on segments 5—7 (see MINET 1994: 82); length 17—22 mm.

The pupa of *O. seraphica* actually keys out to Saturniidae instead of Bombycidae in the key by NAKAMURA (1981), whose key did not include the Apatelodinae group since they do not occur in Japan. When viewing pupae of *Bombyx mori,* I am not able to decide what structures NAKAMURA considered to be the mesothoracic coxae. If they are the large oval structures below the maxillae, then it would appear that the prothoracic legs lie under the coxae, which is doubtful. I am thus uncertain as to the identity of surrounding structures (i.e., maxillae, prothoracic legs). Pupal diagrams of KHOTKO (1968, pl. 24) and several other authors were consulted.

Acknowledgments

I thank Roy O. KENDALL for access to his unpublished field notes and permission to quote freely from them here. William G. ALTHER (Department of

Zoology, Denver Museum of Natural History) assisted with field collecting in Texas. Rick WICKER made the photographs for the figures. Larvae of *O. seraphica* were collected in Davis Mountains State Park under Permit No. 58-93 issued to me by the Texas Parks & Wildlife Department.

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