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THE SPHINX MOTHS (LEPIDOPTERA: SPHINGIDAE) OF NEBRASKA

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ABSTRACT

A faunal study of the sphinx moths (Lepidoptera: Sphingidae) of Nebraska is presented. An overview of the family and its two subfamilies is given as well as descriptions of the adults and, when known, the larvae. Each of the 20 genera and 32 species is reviewed. The treatment for each species consists of synonymy, a brief diagnosis, distribution in general, Nebraska locality records, temporal distribution, food host plants, and remarks. The remarks include commentary on how to best distinguish the adults and a brief discussion of biology. A short description of genitalic preparation is included. Distribution maps, showing Nebraska county records, are given for all species. Color plates to facilitate identification of the adults and selected larva, a bibliography, and a glossary are included.

† † †

The name “Sphinx” moths was coined by Linné in 1758, probably based on the habit of the larva rising up in a defensive position when startled, thus loosely resembling the Egyptian Sphinx. Sphinx moths are also known as hawk moths or hummingbird moths. Their streamlined shape, narrow wings, and rapid flight are reminiscent of hawks, hence the name “hawkmoth”. Also, because of their ability to hover at flowers while feeding like a hummingbird, the common name “hummingbird moth” is also used. The wingspan of sphinx moths ranges from slightly over 2.5 cm to almost 25.0 cm (Scoble 1992).

NATURAL HISTORY

Sphinx moths are usually night fliers and so have large eyes. These moths have very good color recognition (D’Abrera 1986), but since they usually feed at night their perception of the ultraviolet spectrum is probably most acute. Olfaction is probably used to locate night-blooming flowers upon which they feed.

Most night-blooming flowers have muted colors, such as white or yellow, and have heavy fragrances that attract moths. Most adult sphinx moths have a long, hollow proboscis that is used for feeding. It varies in length from about three times the body length to reduced and non-functional (Hodges 1971). Length of the proboscis is related to feeding habits. Species with a proboscis over 100 mm tend to hover in front of flowers while those with a proboscis less than 40 mm tend to crawl into flowers for nectar (Willmott and Búrquez 1996).

The eggs of sphinx moths range in size from 1.0 to 3.0 mm and are rounded or slightly flattened, usually light green or light yellow in color, and with very little surface sculpturing. They are usually laid singly but occasionally are laid in masses. Eggs laid singly are probably an adaptation to help ensure survival of the hatching larvae. If a large number of larvae hatched at the same time on one food plant, many would probably

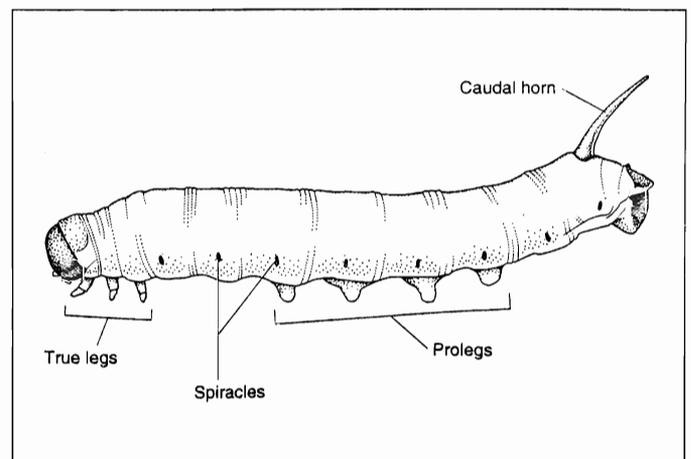


Figure 1. Diagram of a sphingid larva.

starve due to lack of sufficient food. The eggs hatch in several days, or, in some cases, may overwinter and hatch in the spring.

Sphingid larvae are easily recognized by their fleshy caudal horn, or button, and by 6–8 annulets on each body segment (Fig. 1). Saturniidae and Notodontidae may also have the caudal horn, but they lack the annulets (Stehr 1987). The color and pattern of these larvae can be highly variable as evidenced by the two specimens of *Hyles lineata* and by the variation in color and pattern of *Hemaris diffinis* (Plate 1). The larval stage lasts from several weeks to several months. The caterpillars are polypodous, meaning that they have a series of false legs (or prolegs) on the abdomen and three pairs of true legs on the thorax. They can reach 15 grams in weight and 10 cm in length.

The larvae are primarily eating-machines. They are usually host-specific to one type of plant and spend almost all their time, both day and night, eating. Feeding is dependent on temperature as well as the quantity and quality of available food. Lack of proper food can result in smaller larvae and, consequently, smaller adults. These smaller adults are just as fertile and active as their larger counterparts (Pittaway 1993). Larvae are generally glabrous, although some may have a few scattered hairs. They grow rapidly and molt their skin as they outgrow it. Usually there are five instars. Most sphingid larvae (Plate 1) are brightly colored, with a green or brown base color and contrasting markings. Either a dorsal caudal horn or a caudal “button” is present; the horn is completely harmless. Some larvae can also produce a sound similar to the buzzing of a bee, or a squeaking like that of a queen bee, for protection

Sphingid larvae normally pupate in the soil or in loose leaf litter. The pupal stage has no silken cocoon like most other moths, although sometimes sphingids will spin a very loose net to hold together leaves for pupation. Most of the pupae have a distinctive, hooked, free proboscis, while some others do not (Fig. 2). When the adult emerges, the wings are wet and limp. It takes about half an hour to fill the veins with haemolymph and to dry and harden the wings before flight.

Sphinx moths are preyed upon by birds, bats, small mammals, and other insects. The coloration of these moths enhances their ability to evade capture. Often the forewing is a mottled gray for better camouflage on tree trunks or other natural backgrounds. When in a resting position, they often resemble dead leaves. The often bright hind wing color is exposed in flight and may give a potential predator something to home-in on. When the moth abruptly alights and folds its wings, the targeted color or pattern quickly disappears and so

confuses a predator. Eyespots on the hind wings of some moths may resemble eyes and could cause smaller predators to believe them to be the head of a larger animal. Some of the bright coloration may well be used as FLASH coloration to confuse predators. In the larval stage, their green color may resemble green twigs or leaves, while the brown color may resemble dry twigs.

Mimicry is also used for defense. Lepidoptera often are colored to represent insects that either taste bad or have a bite or sting. For example, the body coloration and clear wings of *Hemaris* species resemble a bumble bee. One species of *Sphecodina* even makes a sound like the buzzing of a bee. As a result, they tend to be avoided by most predators even though they are harmless.

Distribution

Sphinx moths occur on all land masses of the world except Greenland, although in some areas they appear only as seasonal visitors. They are even known from the polar regions (Hodges 1971). They are strong flyers



Figure 2. Two basic types of sphingid pupae.

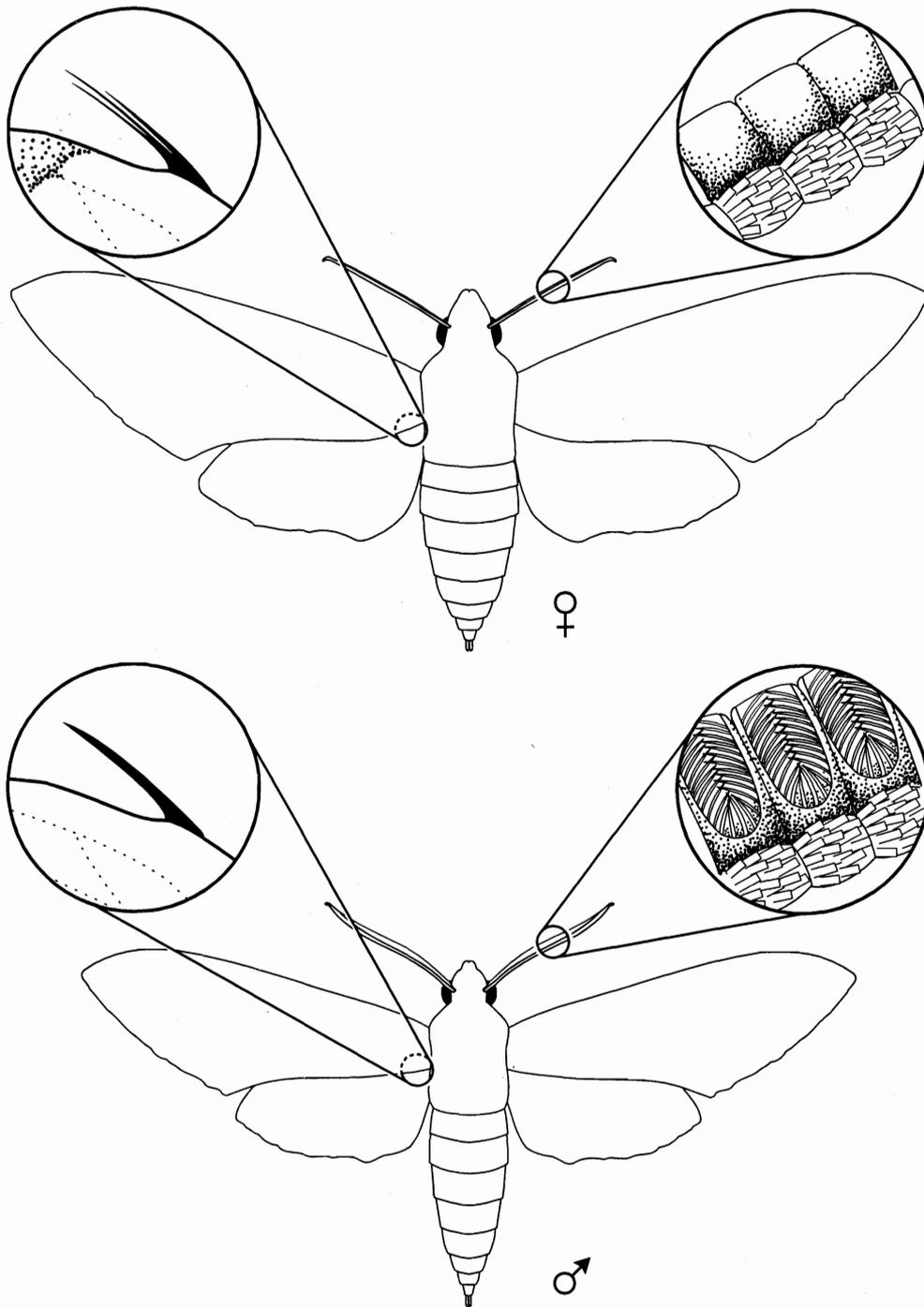
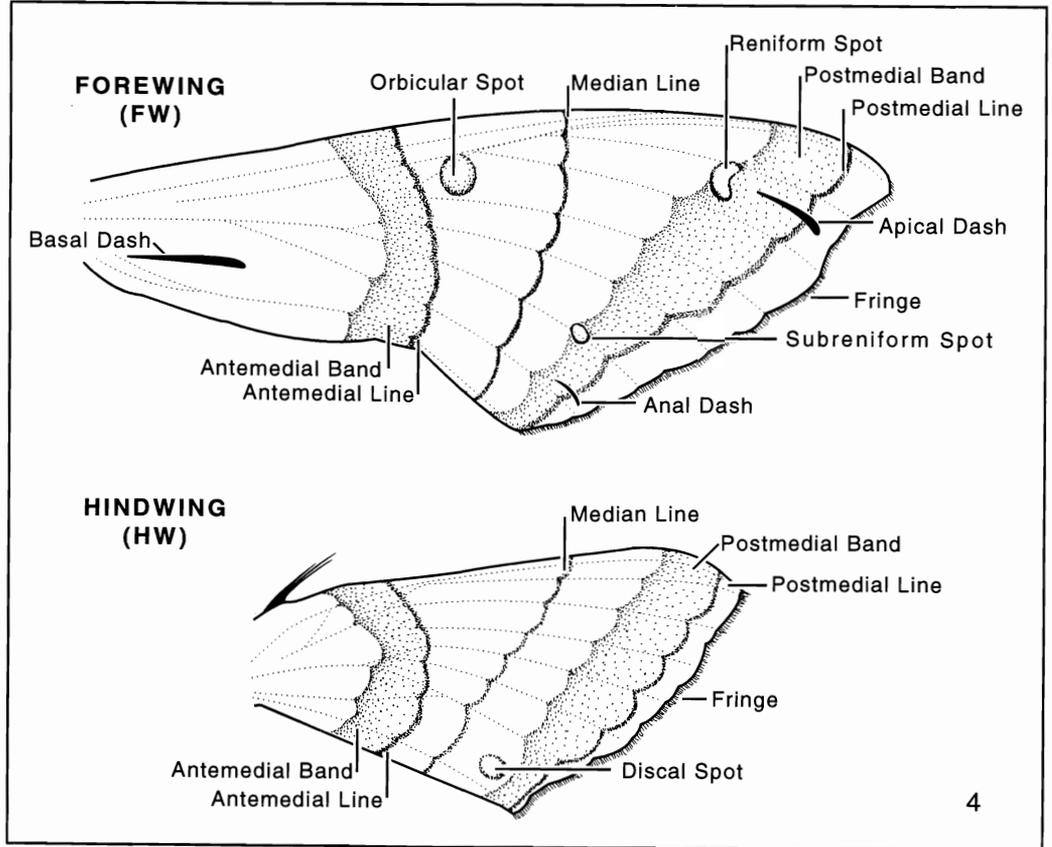
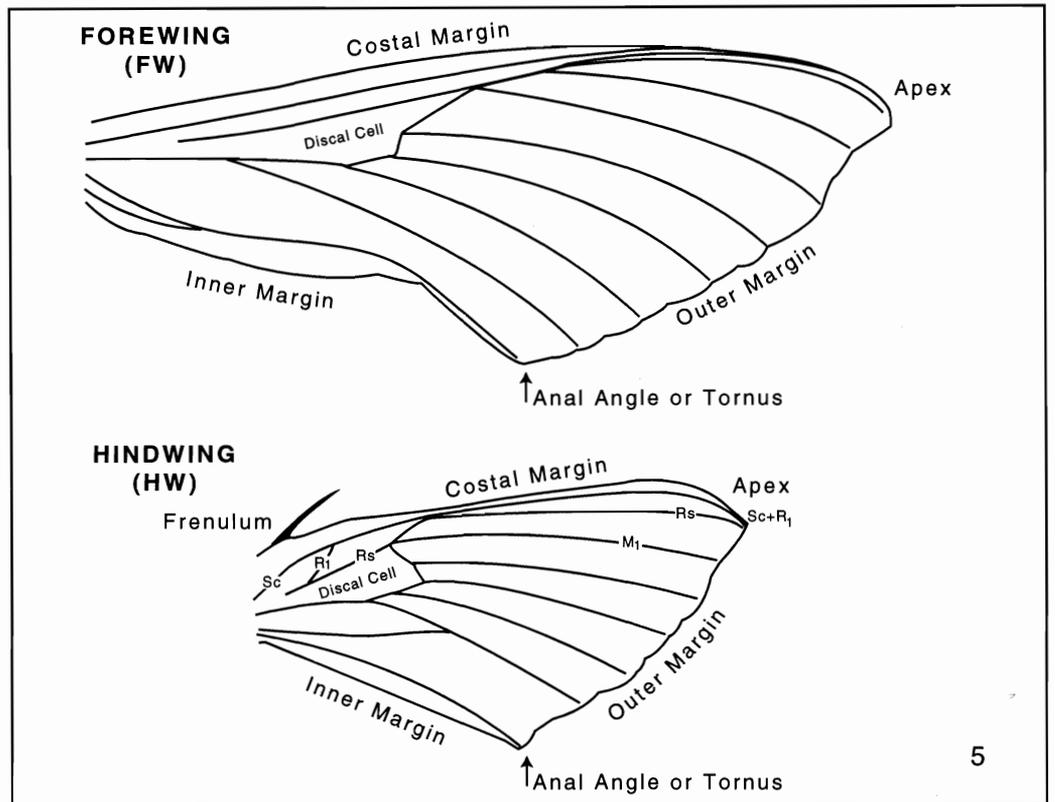


Figure 3. Female and male sphingids showing sexual dimorphism of body shape, antennae, and frenulum.



Wing Pattern Terminology of Sphingidae



Wing Venation and Terminology of Sphingidae

Figures 4 and 5. Wing pattern and wing venation, respectively, of sphinx moths.

and, unlike many other groups of Lepidoptera, there is an unusually small amount of intraspecific variation from region to region. This mixing of genes throughout the range of the species seemingly promotes more homogenous characteristics.

Although some sphinx moths fly during daylight hours (diurnal), most fly at dusk or dawn (crepuscular) or at night (nocturnal). Accurate observations of their nocturnal flight patterns are difficult. However, a scientist working on a ship 60 miles at sea off the coast of Australia observed flights of at least two species of sphingids that arrived after dusk, hovered around the ship's lights, and left in the direction of land about dawn (D'Abrera 1986). Also, Holland (1903) reported a specimen in his collection that was caught 500 miles from the nearest land on a ship in the Atlantic Ocean!

Anatomy

Adult sphingids have a stout body with the abdomen usually tapering to a point. The abdomen is usually heavier and thicker in the female than in the male (Fig. 3). They all have a spine-like frenulum found on the forward edge of the hind wing (Fig. 3). The frenulum is used, along with a hook or group of fibers called a retinaculum (located on the forewing), to help lock the forewing and the hind wing together in flight. The frenulum can be used to help determine the sex of an individual. Males have a single group of fibers while females have a multiple group of fibers (Fig. 3). Wings are normally scaled, but some species have only a very small amount of scaling with the remainder of the wing area being membranous. The forewing is narrow and tapers to a point, and the length is at least two times (but not greater than four times) the width. The outer margin is either scalloped or smooth.

Most adults have a well-developed proboscis (some up to 30 cm long) for feeding on deep-throated flowers such as petunia and trumpet vine. Adults feed only on nectar because they have no chewing mouth parts. Some species have a reduced proboscis and are not able to feed as adults. The antennae gradually thicken toward the middle and become more slender toward the apex, terminating in a characteristic hook. Antennae tend to be thicker in males than in females (Fig. 3). The antennae of males contain special sensing receptors for detecting female pheromones. These pheromones can often be detected by males from as far away as a mile.

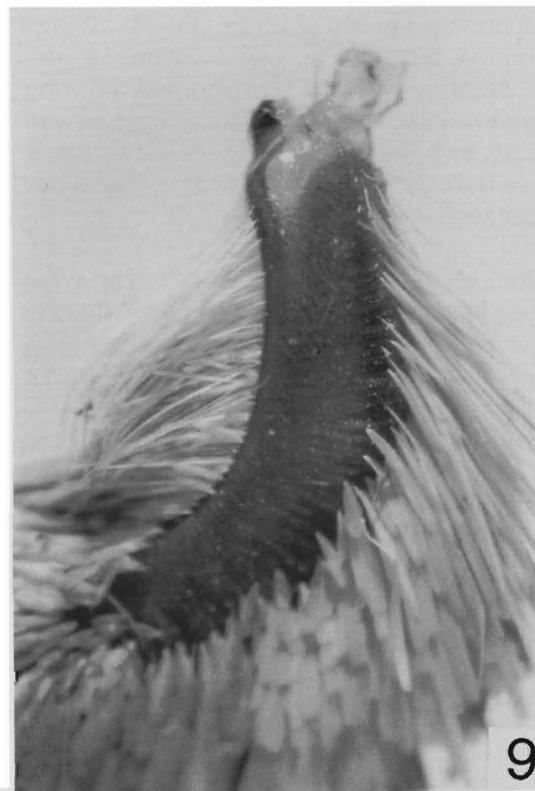
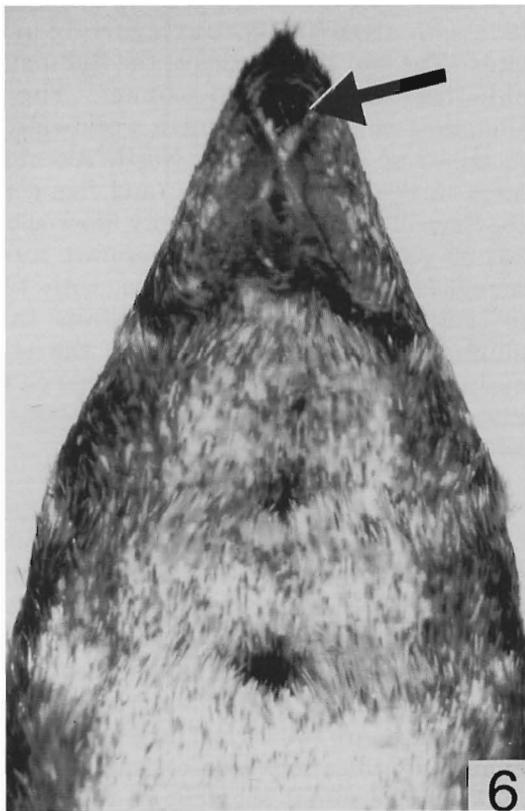
CLASSIFICATION AND TAXONOMY

The family name Sphingidae was coined by Samouelle in 1819. The family Sphingidae is divided into two subfamilies, five tribes, and 203 genera according to Bridges (1993), or 205 genera according to

D'Abrera (1986). It contains over 1,050 species (D'Abrera 1986), with about 115 species occurring in the United States. The two subfamilies of the Sphingidae are the Sphinginae and Macroglossinae. The subfamily Sphinginae contains 116 genera worldwide. There are two tribes of sphingines in North America, with 12 genera in the tribe Sphingini, and five genera in the tribe Smerinthini. The subfamily Macroglossinae contains 89 genera worldwide. There are three tribes of macroglossines in North America, with 12 genera in the tribe Dilophonotini, one genus in the tribe Philampelini, and ten genera in the tribe Macroglossinae. More work needs to be done on the classification because not all of the worldwide genera have yet been assigned to tribes.

Identification of sphinx moths uses the characters of coloration, wing shape and size, and color patterns (Figs. 4, 5). Colors and patterns can be similar between species, often making identifications difficult. Venation of the hind wing is also used to identify some species of sphingids. There is some sexual dimorphism, but usually the sexes tend to resemble each other. Most females are somewhat larger than males. Occasionally, identifications require examination of the genitalia. The terminal segment of the abdomen has a genital pore in the female (Fig. 6) and claspers in male (Fig. 7). The antennae are smooth and filiform in the female (Fig. 3), with the lower surface covered with bristle-like sensing structures in the male (Fig. 3). In the hind wing, vein R1 crosses to Se and R1 near the middle of the cell (Fig. 5). Thus the lack of a base for veins M1 and R1 serves to characterize the Sphingidae.

The subfamily Macroglossinae can be separated by the presence of a small patch of sensory setae on the glabrous area located on the median surface of the base of the first segment of the labial palp (Fig. 8); this is lacking in the Sphinginae (Fig. 9). Labial palps can be separated from mandibular palps by being much larger and located forward and outside of the mandibular palps. The Sphinginae and the Macroglossinae can each be further separated into tribes but usually only by genitalic dissection. Such dissections are beyond the intended scope of this work. Genitalia dissections can also be required to identify certain genera within tribes and also certain species within genera. The yellow spots on the abdomen are restricted to species in the genus *Manduca* (for the Nebraska species), and the presence of these spots can be used for generic identification. Likewise, a dark apical patch on the forewing is restricted to species in the genus *Eumorphia* and, again, all the Nebraska species have this character. Hodges (1971), Busck (1942), and Rothschild and Jordan (1903) are excellent publications for further study of identifications based on genitalic dissections.



Figures 6–9. Terminal abdominal segment (ventral view) of female (Fig. 6) showing genital pore and of male (Fig. 7) showing claspers. Base of first segment of labial palp showing setose area on median surface of *Macroglossinae* (Fig. 8) and a smooth area in the *Sphinginae* (Fig. 9).

Table 1. Host plants that have been listed as food sources for sphingids in the United States. This host plant list was compiled from many publications, communications from other researchers, and from personal observations. 1 = native to Nebraska; 2 = naturalized in Nebraska but not native; 3 = cultivated in Nebraska but not native or naturalized; 4 = not native, naturalized, or cultivated outdoors in Nebraska.

SPHINGIDAE	Plant Family	Plant Scientific name	Plant Common name
<i>Aellopos titan</i>	Annonaceae	<i>Annona glabra</i> (4)	pond apple
	Polemoniaceae	<i>Phlox</i> spp. (1, 2)	phlox
	Rubiaceae	<i>Casasia clusiifolia</i> (4)	seven year apple
<i>Agrius cingulatus</i>	Annonaceae	<i>Asimina triloba</i> (1)	pawpaw
	Convolvulaceae	<i>Ipomoea alba</i> (3)	moonflower
		<i>Ipomoea batatas</i> (3)	sweet potato
	Solanaceae	<i>Datura stramonium</i> (3)	jimson weed
		<i>Petunia</i> spp. (3)	petunia
<i>Amphion floridensis</i>	Solanaceae	<i>Capsicum annuum</i> (3)	cayenne pepper
	Vitaceae	<i>Ampelopsis</i> spp. (1)	—
		<i>Vitis</i> spp. (1)	grape
<i>Ceratonia amyntor</i>	Betulaceae	<i>Betula</i> spp. (1, 3)	birch
	Rosaceae	<i>Prunus</i> spp. (1, 3)	cherry
	Tiliaceae	<i>Tilia americana</i> (1)	basswood or linden
	Ulmaceae	<i>Ulmus</i> spp. (1, 2, 3)	elm
<i>Ceratonia catalpae</i>	Bignoniaceae	<i>Catalpa</i> spp. (2)	catalpa
<i>Ceratonia hageni</i>	Moraceae	<i>Maclura pomifera</i> (2)	Osage orange
<i>Ceratonia undulosa</i>	Fagaceae	<i>Quercus</i> spp. (1)	oak
	Oleaceae	<i>Chionanthus virginicus</i> (3)	fringe tree
		<i>Fraxinus</i> spp. (1)	ash
		<i>Ligustrum</i> spp. (3)	privet
		<i>Syringa vulgaris</i> (3)	lilac
		<i>Crataegus</i> spp. (1, 3)	hawthorn
		<i>Viburnum</i> spp. (1, 3)	—
<i>Darapsa myron</i>	Vitaceae	<i>Ampelopsis</i> spp. (1)	—
		<i>Parthenocissus quinquefolia</i> (1)	Virginia creeper
		<i>Vitis</i> spp. (1)	grape
		<i>Parthenocissus quinquefolia</i> (1)	Virginia creeper
<i>Deidemia inscripta</i>	Vitaceae	<i>Ampelopsis</i> spp. (1)	—
		<i>Parthenocissus quinquefolia</i> (1)	Virginia creeper
		<i>Vitis</i> spp. (1)	grape
		<i>Cynanchum</i> spp. (1)	sandvine
<i>Erinnyis obscura</i>	Asclepiadaceae	<i>Philibertia</i> spp. (4)	—
		<i>Sarcostemma clausum</i> (4)	white vine
	Caricaceae	<i>Carica papaya</i> (4)	papaya
<i>Eumorpha achemon</i>	Vitaceae	<i>Ampelopsis</i> spp. (1)	—
		<i>Vitis</i> spp. (1)	grape
<i>Eumorpha pandora</i>	Vitaceae	<i>Ampelopsis</i> spp. (1)	—
		<i>Parthenocissus quinquefolia</i> (1)	Virginia creeper
		<i>Vitis</i> spp. (1)	grape
<i>Hemaris diffinis</i>	Apocynaceae	<i>Apocynum</i> spp. (1)	dogbane
	Asclepiadaceae	<i>Asclepias incarnata</i> (1)	swamp milkweed
	Asteraceae	<i>Eupatorium</i> spp. (1)	Joe-pye weed
	Caprifoliaceae	<i>Lonicera</i> spp. (1, 2, 3)	honeysuckle
		<i>Symphoricarpos albus</i> (1)	snowberry
		<i>Symphoricarpos orbiculatus</i> (1)	coralberry
<i>Hemarias thysbe</i>	Loganiaceae	<i>Buddleja davidii</i> (1, 2)	butterfly bush
	Polemoniaceae	<i>Phlox</i> spp. (1, 2)	phlox
	Caprifoliaceae	<i>Lonicera</i> spp. (1, 2, 3)	honeysuckle
		<i>Symphoricarpos albus</i> (1)	snowberry
		<i>Symphoricarpos orbiculatus</i> (1)	coralberry
		<i>Crataegus</i> spp. (1, 3)	hawthorn
	Rosaceae	<i>Prunus</i> spp. (1, 3)	—
		<i>Prunus</i> spp. (1, 3)	—

Table 1. Continued.

SPHINGIDAE	Plant Family	Plant Scientific name	Plant Common name
<i>Hyles gallii</i>	Onagraceae	<i>Clarkia</i> spp. (4)	—
	Rubiaceae	<i>Asperula orientalis</i> (3)	woodruff
<i>Hyles lineata</i>	Salicaceae	<i>Galium</i> spp. (1)	bedstraw
	Nyctaginaceae	<i>Salix</i> spp. (1, 3)	willow
	Onagraceae	<i>Mirabilis</i> spp. (1)	four-o'clock
		<i>Fuchsia</i> spp. (3)	fuchsia
		<i>Gaura lindheimeri</i> (3)	gaura
	Portulacaceae	<i>Portulaca</i> spp. (1, 3)	portulaca
	Rosaceae	<i>Malus</i> spp. (1, 3)	apple
<i>Laothoe juglandis</i>	Salicaceae	<i>Salix</i> spp. (1, 3)	willow
	Fagaceae	<i>Fagus</i> spp. (3)	beech
	Juglandaceae	<i>Carya</i> spp. (1, 3)	hickory
		<i>Juglans cinera</i> (3)	butternut
		<i>Juglans nigra</i> (1)	black walnut
<i>Manduca quinquemaculata</i>	Rosaceae	<i>Prunus</i> spp. (1, 3)	—
	Solanaceae	<i>Lycopersicon esculentum</i> (3)	tomato
		<i>Nicotiana tabacum</i> (4)	tobacco
		<i>Solanum tuberosum</i> (3)	potato
		<i>Capsicum annuum</i> (3)	pepper
<i>Manduca sexta</i>	Solanaceae	<i>Atropa belladonna</i> (4)	deadly nightshade
		<i>Lycopersicon esculentum</i> (3)	tomato
		<i>Nicotiana tabacum</i> (4)	tobacco
		<i>Solanum tuberosum</i> (3)	potato
		<i>Capsicum annuum</i> (3)	pepper
<i>Pachysphinx modesta</i>	Salicaceae	<i>Populus</i> spp. (1, 3)	poplar
		<i>Populus</i> spp. (1, 3)	cottonwood
		<i>Salix</i> spp. (1, 3)	willow
		<i>Carpinus betulus</i> (3)	European hornbeam
<i>Paonias excaecatus</i>	Fagaceae	<i>Quercus</i> spp. (1, 3)	oak
	Rosaceae	<i>Malus</i> spp. (1, 3)	apple
		<i>Prunus</i> spp. (1, 3)	—
		<i>Prunus</i> spp. (1, 3)	cherry
		<i>Prunus</i> spp. (1, 3)	plum
		<i>Rosa</i> spp. (1, 2, 3)	rose
	Salicaceae	<i>Populus</i> spp. (1, 3)	poplar
	Tiliaceae	<i>Tilia americana</i> (1)	linden
	Ulmaceae	<i>Ulmus</i> spp. (1, 2, 3)	elm
	<i>Paonias myops</i>	Betulaceae	<i>Betula</i> spp. (1, 3)
Rosaceae		<i>Amelanchier</i> spp. (1, 3)	service berry
		<i>Crataegus</i> spp. (1, 3)	hawthorn
		<i>Prunus</i> spp. (1, 3)	—
		<i>Prunus</i> spp. (1, 3)	cherry
		<i>Rosa</i> spp. (1, 2, 3)	rose
Salicaceae		<i>Populus</i> spp. (1, 3)	popular
		<i>Salix</i> spp. (1, 3)	willow
Vitaceae		<i>Vitis</i> spp. (1)	grape
<i>Paratrea plebeja</i>		Bignoniaceae	<i>Campsis radicans</i> (2)
	Caprifoliaceae	<i>Lonicera</i> spp. (1, 2, 3)	honeysuckle
	Celastraceae	<i>Euonymus atropurpurea</i> (1)	burning bush
	Oleaceae	<i>Syringa vulgaris</i> (3)	lilac
	Passifloraceae	<i>Passiflora lutea</i> (4)	passion flower
	Verbenaceae	<i>Verbena</i> spp. (1, 3)	verbena
	<i>Proserpinus juanita</i>	Onagraceae	<i>Epilobium</i> spp. (1)
		<i>Oenothera</i> spp. (1, 3)	evening primrose

Table 1. Continued.

SPHINGIDAE	Plant Family	Plant Scientific name	Plant Common name
<i>Smerinthus jamaicensis</i>	Betulaceae	<i>Betula</i> spp. (1, 3)	birch
	Oleaceae	<i>Fraxinus</i> spp. (1, 3)	ash
	Rosaceae	<i>Malus</i> spp. (1, 3)	apple
	Rosaceae	<i>Prunus</i> spp. (1, 3)	plum
	Salicaceae	<i>Populus</i> spp. (1, 3)	cottonwood
	Salicaceae	<i>Populus</i> spp. (1, 3)	aspen
	Salicaceae	<i>Salix</i> spp. (1, 3)	willow
	Ulmaceae	<i>Ulmus</i> spp. (1, 2, 3)	elm
<i>Sphecodina abbotti</i>	Vitaceae	<i>Ampelopsis</i> spp. (1)	—
		<i>Vitis</i> spp. (1)	grape
<i>Sphinx canadensis</i>	Ericaceae	<i>Vaccinium</i> spp. (4)	blueberry
	Oleaceae	<i>Fraxinus americana</i> (1)	white ash
<i>Sphinx chersis</i>	Rosaceae	<i>Rubus chamaemorus</i> (4)	cloudberry
	Oleaceae	<i>Fraxinus</i> spp. (1, 3)	ash
	Oleaceae	<i>Ligustrum</i> spp. (3)	privet
	Oleaceae	<i>Syringa vulgaris</i> (3)	lilac
	Rosaceae	<i>Prunus</i> spp. (1, 3)	—
<i>Sphinx drupiferarum</i>	Salicaceae	<i>Populus</i> spp. (1, 3)	aspen
	Oleaceae	<i>Syringa vulgaris</i> (3)	lilac
	Rosaceae	<i>Malus</i> spp. (1, 3)	apple
		<i>Prunus americana</i> (1)	wild plum
		<i>Prunus persica</i> (3)	peach
		<i>Prunus</i> spp. (1, 3)	cherry
<i>Sphinx kalmiae</i>	Ulmaceae	<i>Celtis occidentalis</i> (1)	hackberry
	Ericaceae	<i>Kalmia latifolia</i> (4)	mountain laurel
	Oleaceae	<i>Chionanthus virginicus</i> (3)	fringe tree
		<i>Fraxinus</i> spp. (1, 3)	ash
		<i>Ligustrum</i> spp. (3)	privet
		<i>Syringa vulgaris</i> (3)	lilac
	Salicaceae	<i>Populus</i> spp. (1, 3)	poplar
	Caprifoliaceae	<i>Lonicera</i> spp. (1, 2, 3)	honeysuckle
<i>Sphinx vashti</i>		<i>Symphoricarpos albus</i> (1)	snowberry
	Ranunculaceae	<i>Aquilegia</i> spp. (1, 3)	columbine
	Bignoniaceae	<i>Catalpa</i> spp. (2)	catalpa
<i>Xylophanes tersa</i>	Rubiaceae	<i>Cephalanthus occidentalis</i> (1)	buttonbush
		<i>Manettia</i> spp. (4)	—
		<i>Pentas</i> spp. (3)	starcluster

SPHINGIDAE**SPHINGINAE****Sphingini****Genus *Agrius***

Agrius Hübner 1819: 140; *Timoria* Kaye 1919: 93.

The genus *Agrius* contains six species worldwide (Bridges 1993). Only one species is found in the United States (Hodges 1971) including Nebraska. This is the only sphingid found in Nebraska that has pink on both the abdomen and the dorsal surface of the base of the hind wings.

***Agrius cingulatus* (Fabricius)**

Pink-spotted Hawk Moth (Plate 2)

Sphinx cingulata Fabricius 1775: 545; *Sphinx affinis* Goeze 1780: 215; *Sphinx pungens* Eschscholtz 1821: 218; *Sphinx cingulata* var. *decolora* Edwards 1882: 11.

Description. FW generally dark brown, reniform spot light gray; 2-3 dark, undulating, antemedial lines with light brown transverse patch; postmedial line white, undulating; 2 black apical dashes present. HW generally dark gray, with light transverse bands; base with varying amounts of pink. Head and thorax dark gray. Abdomen dark gray with alternate black and pink bands on side. WS 9.5–12.0 cm.

Distribution. Rangewide: *Agrius cingulata* occurs in the eastern half of the United States from the Gulf coast north to Manitoba and Nova Scotia and south to Argentina and the West Indies. It occurs as a stray in eastern Kansas and Nebraska. Nebraska: This species occurs only in the eastern fourth of the state.

Locality Records (Map 1). 7 Nebraska specimens examined. LANCASTER COUNTY (1): Lincoln; PLATTE (4): Columbus; SALINE (1): Dorchester; YORK (1): McCool Junction.

Temporal. Rangewide: June to September (Hodges 1971). Nebraska: August (1), September (1), October (4).

Table 2. Features used for distinguishing *C. catalpae* and *C. undulosa*.

<i>Ceratonia catalpae</i>	<i>Ceratonia undulosa</i>
FW dashes indistinct	FW dashes distinct
FW ventral dark fringe dashes same color as FW ground color	FW ventral dark fringe dashes darker than FW ground color
HW ventral lines not serrate	HW ventral lines serrate
Underside of wings immaculate	Underside of wings maculate
Male harpe with blunt point and high, serrated top margin (Fig. 16b)	Male harpe with sharp point and smooth top margin (Fig. 14b).
Male aedeagus with large cornutus (Fig. 16a)	Male aedeagus without cornutus (Fig. 14a)
Female with "V" shaped signum (Fig. 17)	Female with tear shaped signum (Fig. 15)
Female with sinuous distal edge of genital plate (Fig. 17)	Female with "Y" shaped distal edge of genital plate (Fig. 15)

Larvae. Color variable, from greenish to brown, with 7 pale yellow, oblique stripes. Thorax with series of black dorsal spots. Head with 4 vertical pale yellow stripes.

Biology. The adult of this migratory species is known to feed on the flowers of moonflower (*Ipomoea alba*), petunia (*Petunia* sp.), and other deep-throated flowers (Hodges 1971). The larvae feed on such plants as jimson weed (*Datura stramonium*), pawpaw (*Asimina* spp.), and sweet potato (*Ipomoea batatas*) (Covell 1984).

Remarks. This is the only species of sphingid in Nebraska with pink on both the abdomen and hindwings. In some older publications such as Holland (1903), this species is referred to as "*Herse*" *cingulata* Fabricius. According to Bridges (1993), the genus *Herse* Oken was rejected by the International Commission of Zoological Nomenclature (ICZN) as an invalid work in zoological nomenclature (opinion #417) and, therefore, is not listed as a synonym for *Agrius* Hubner.

Genus *Ceratonia*

Ceratonia Harris 1839: 293; *Daremma* Walker 1856: 231; *Isogramma* Rothschild and Jordan 1903: 104; *Autogramma* Jordan 1946: 6.

The genus *Ceratonia* contains seven species in the Nearctic region (Bridges 1993). Five species are found in the United States (Hodges 1971), four in Nebraska. In many cases, it is difficult to identify species within this genus. Most species are very similar in color and markings, and identifications are most accurately done using genitalic characteristics.

Two of the species normally will not require dissection. *Ceratonia amyntor* can be separated by the forewing maculation, and *C. hageni* can be separated by a greenish dusting over the forewing and body, especially in fresh specimens. Also, *C. hageni* has a pulvillus between the tarsal claws (Fig. 13c) and a whitish apical patch on the forewing, unlike the rest of the Nebraska *Ceratonia*.

Table 2 shows the features I used for determining species of *C. catalpae* and *C. undulosa*

Ceratonia amyntor (Geyer) Elm Sphinx (Plates 1, 2, Fig. 12)

Agrius amyntor Geyer 1835: 3; *Ceratonia quadricornis* Harris 1839: 293; *Ceratonia ulmi* Boisduval 1875: 53.

Description. FW brown, reniform spot tan; antemedial lines dark brown, postmedial lines tan, undulating; one or more black apical dashes; apex with light brown anterior patch; light brown patch near middle of costal margin; fringe alternating light and dark brown. HW brown; apical ½ with dark brown oblique bands; fringe alternating light and dark brown. Head gray. Thorax brown with dark brown tegula. Abdomen brown with black medial and 2 black lateral lines. WS 8.8-11.5 cm.

Distribution. Rangewide: *Ceratonia amyntor* occurs commonly throughout the eastern half of the United States and Canada, from Nebraska, Kansas and Colorado south to Florida and north to Manitoba and Nova Scotia. Nebraska: This species occurs over the entire state.

Locality Records (Map 1). 46 Nebraska specimens examined. BANNER COUNTY (1): no data; BUFFALO (5): Kearney; CHERRY (2): Sparks, Wood Lake; CLAY (1): Clay Center; DAWES (3): Chadron; DIXON (2): Concord; GAGE (1): Adams; GARFIELD (1): Burwell; LANCASTER (5): Lincoln; LINCOLN (2): North Platte; MCPHERSON (1): no data; PLATTE (9): Columbus; RICHARDSON (2): Indian Cave State Park; SCOTTS BLUFF (4): Lyman, Mitchell, Scottsbluff; SHERIDAN (5): no data; SIOUX (1): Monroe Canyon.

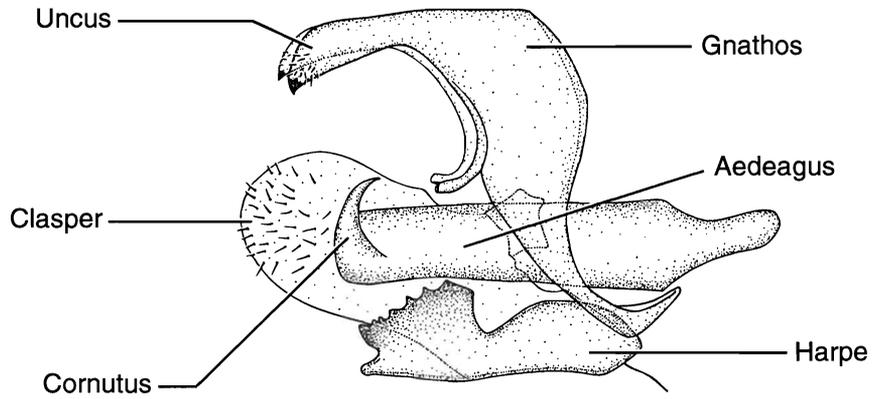
Temporal. Rangewide: April to October (Hodges 1971). Nebraska: May (10), June (18), July (13), August (3).

Larvae. Pale green, whitish dorsally, with 7 pairs of oblique white lines. Spiracles outlined in black. Thorax segments 2 and 3 each have a pair of dorsal horns in addition to a green caudal horn.

Biology. Larvae feed on basswood (*Tilia americana*), birch (*Betula* spp.), cherry (*Prunus* spp.), and most commonly on elm (*Ulmus* spp.) (Covell 1984). The pupa lacks the tongue case (Hodges 1971). This species probably does not feed as an adult, due to the reduced mouth parts (Hodges 1971).

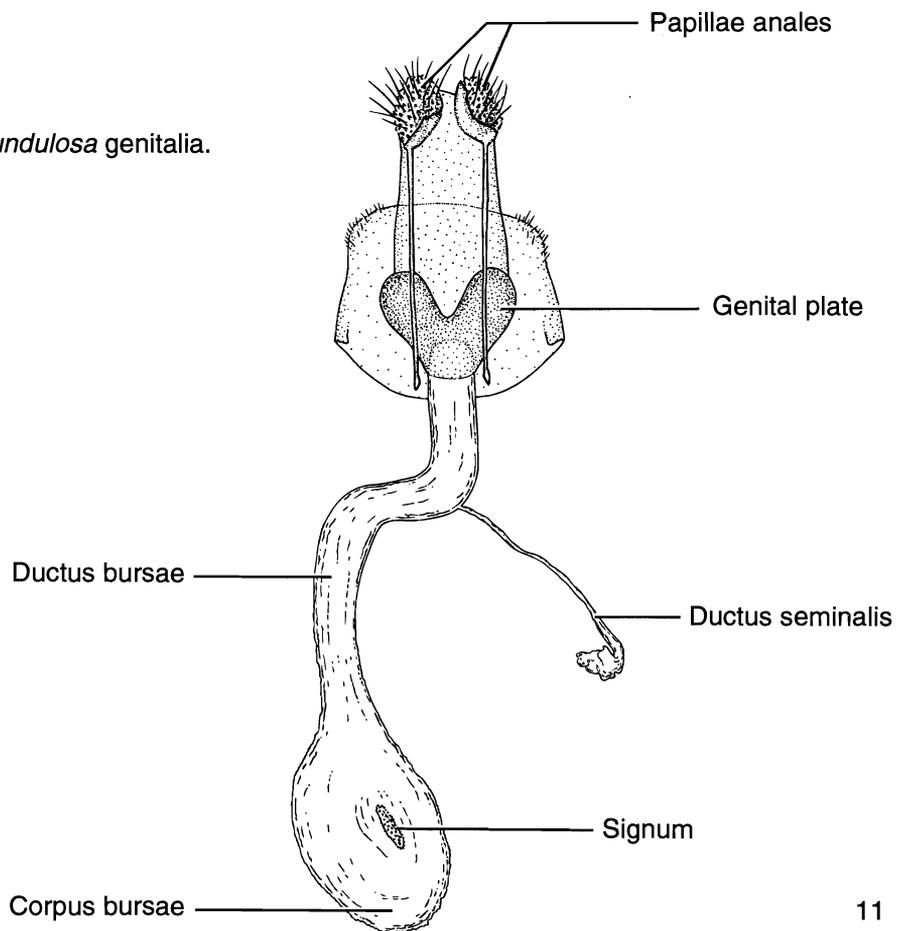
Remarks. *Ceratonia amyntor* is distinguished from other species of *Ceratonia* by the forewing pattern,

Male *Ceratomia catalpae* genitalia (left clasper and right harpe removed for clarity).



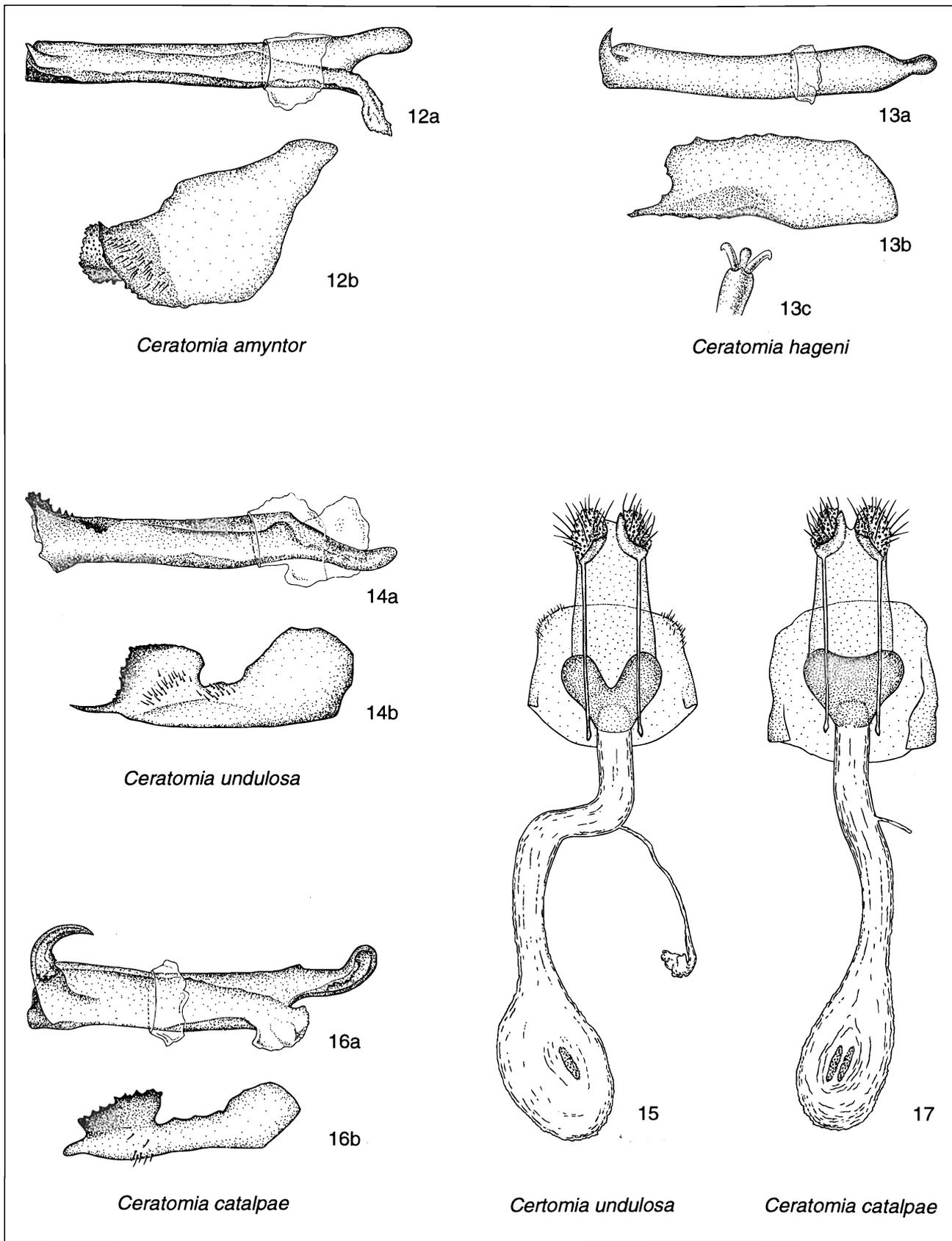
10

Female *Ceratomia undulosa* genitalia.



11

Figures 10 and 11. Diagram of the male genitalia of *Ceratomia catalpae* (Fig. 10) and female genitalia of *C. undulosa* (Fig. 11).



Figures 12–17. *Ceratomia* genitalia and tarsal claw: a, aedeagus and b, harpe of *C. amyntor* (Fig. 12), *C. hageni* (Fig. 13) with tarsal claw, *C. undulosa* [Figs. 14 (male) and 15 (female)], *C. catalpae* [Figs. 16 (male) and 17 (female)].

a concave outer margin on the forewing between the tornus and the middle of the outer margin, and a dark brown stripe on the tegula.

***Ceratomia catalpae* (Boisduval)**

Catalpa Sphinx (Plates 1, 2, Figs. 10, 16, 17)

Sphinx catalpae Boisduval 1875: 103; *Ceratomia kansensis* Howe and Howe 1950: 57.

Description. FW yellowish brown, reniform spot tan and outlined in dark brown; antemedial and postmedial lines dark brown and indistinct; apical dashes dark brown and indistinct to absent; fringe alternate yellowish brown and tan. HW yellowish brown with indistinct brown transverse bands, ventral post-discal band not dentate; fringe alternate yellowish brown and tan. Head and thorax yellowish brown with dark brown medial and two dark brown lateral lines. WS 6.5–9.5 cm.

Distribution. Rangewide: *Ceratomia catalpae* occurs over the entire eastern half of the United States from Florida to New York and west to Kansas and Nebraska. Nebraska: This species occurs normally in the eastern third of the state.

Locality Records (Map 1). 9 Nebraska specimens examined. DOUGLAS COUNTY (1): Omaha; JEFFERSON (1): Fairbury; LANCASTER (3): Lincoln; MERRICK (1): Chapman; PLATTE (1): Columbus; SHERIDAN (2): no data.

Temporal. Rangewide: April to October (Hodges 1971). Nebraska: June (1), July (3), August (2), September (2).

Larvae. Extremely variable. Head black. Body with dorsal surface black or black with narrow yellow lateral line followed by black lateral lines consisting of a series of dots and vertical dashes. Lateral surface yellow with series of vertical black stripes. Caudal horn black with black or yellow base. Anal prolegs and anal plate black. Two catalpa trees owned by me were completely defoliated in less than two weeks time in 1996 by a brood of these larvae.

Biology. The larvae feed on catalpa (*Catalpa* spp.) (Covell 1984). Eggs are laid in large masses on the underside of leaves, unlike most species of sphingids (Hodges 1971). Pupae lack a tongue case (Hodges 1971).

Remarks. Separation from other species of *Ceratomia* can be difficult. The reniform spot is tan and about the same color as the ground color of the wing and outlined in dark brown. The dark dashes on the ventral side of the outside margin of the forewing are the same color as the ground color of the rest of the wing. The postmedial line on the ventral side of the of the hindwing is weak or absent. The dusting of light colored scales on the forewing is buff or light brown. In general, the coloration is pale and the markings are indistinct. However, several specimens I reared from larvae had a much darker ground color and markings than normal, further complicating the separation of *Ceratomia catalpae* and *C. undulosa*. Positive identification requires dissection of the genitalia. *Ceratomia undulosa* is a similar species.

***Ceratomia hageni* Grote**

Hagen's Sphinx (Plate 2, Fig. 13)

Ceratomia hageni Grote 1874: 149.

Description. FW grayish brown with yellow-green dusting, gray patch near middle of costal margin; reniform spot gray and outlined in black; antemedial and postmedial lines dark brown, undulating; apex with gray anterior patch; fringe alternating gray-brown and tan. HW dark brown; oblique bands brown, indistinct; fringe alternate gray-brown and tan. Head yellowish gray. Thorax gray with dark brown tegula. Abdomen gray with yellow-green dusting; dark brown medial line and two dark brown lateral stripes. WS 7.6–9.2 cm.

Distribution. Rangewide: *Ceratomia hageni* occurs from eastern Nebraska north to Wisconsin, east to Indiana and Tennessee, and south to Texas. Nebraska: This species normally occurs in the southeastern fourth of the state.

Locality Records (Map 2). 32 Nebraska specimens examined. BUFFALO COUNTY (1): Kearney; CLAY (4): Clay Center; DAWSON (2): no data; GAGE (1): Beatrice; LANCASTER (3): Lincoln; PLATTE (18): Columbus; SALINE (3): Dorchester.

Temporal. Rangewide: April to October (Hodges 1971). Nebraska: May (1), June (4), July (2), August (20), September (4).

Larvae. Pale green with a series of short pale yellow oblique bands. Head green with a pair of yellow lateral streaks.

Biology. Larvae feed on osage orange (*Maclura pomifera*) (Covell 1984). Adults usually fly only after 10 PM (Hodges 1971)

Remarks. Separated from similar *Ceratomia* species by a green to yellow-green dusting on the forewings and abdomen, the apex of the forewing has a gray anterior patch, and by the presence of a pulvillus between the claws of the tarsus (Fig. 13c). Older publications such as Holland (1903) list this species as belonging to the genus *Isogramma*. This is an invalid genus (Bridges 1993) and therefore not included in the synonymy.

***Ceratomia undulosa* (Walker)**

Waved Sphinx (Plate 2, Figs. 11, 14, 15)

Daremma undulosa Walker 1856: 231; *Ceratomia repentinus* Clemens 1859: 180; *Ceratomia undulosa polingi* Clark 1929: 15; *Ceratomia undulosa borealis* Clark 1929: 18.

Description. FW brownish gray, reniform spot light gray and outlined in dark brown; antemedial and postmedial bands dark brown and undulating; 3-5 dark brown apical dashes; fringe alternating dark brown and tan. HW brown; oblique bands light brown; fringe alternating dark brown and tan; ventral post-discal band sharply dentate. Head gray. Thorax gray with black tegula. Abdomen brown; dark brown medial line and 2 dark brown lateral stripes. WS 7.2–11.0 cm.

Distribution. Rangewide: *Ceratomia undulosa* occurs over the entire eastern half of the United States and north into Manitoba and Nova Scotia. Nebraska: This species occurs over the entire state.

Locality Records (Map 2). 200 Nebraska specimens examined. BLAINE COUNTY (1): Dunning; BROWN (1) Niobrara

Valley Reserve; BUFFALO (18): Kearney; CLAY (16): Clay Center; COLFAX (2): no data; CUMMING (1): no data; DAKOTA (2): no data; DAWES (16): Chadron; DAWSON (2): Gallagher Canyon; DIXON (25): Concord; DOUGLAS (1): Omaha; FURNAS (3): Holbrook; GAGE (2): Adams, Beatrice; HAMILTON (8): Aurora; HARLAN (1): Alma; HOLT (1): no data; JEFFERSON (15): Fairbury; KNOX (1): no data; LANCASTER (21): Lincoln; LINCOLN (14): Maxwell, North Platte, Snell Canyon; MADISON (2): no data; PIERCE (1): no data; PLATTE (27): Columbus; RICHARDSON (3): Indian Cave State Park; SALINE (3): Dorchester; SHERIDAN (4): Hay Springs; SHERMAN (5): Loup City, Rockville; SIOUX (2): Sowbelly Canyon; WASHINGTON (1): Neale Woods.

Temporal. Rangewide: March to October (Hodges 1971). Nebraska: January (1), April (1), May (17), June (84), July (61), August (33), September (2).

Larvae. Green to yellow-green, with 7 pink dorsally, yellow ventrally, oblique lateral lines. Head with pair of pink bands. Caudal horn reddish. There is also a reddish form of the larvae (Wright 1993).

Biology. The larvae feed on privet (*Ligustrum* spp.), oak (*Quercus* spp.), hawthorn (*Crataegus* spp.), lilac (*Syringa vulgaris*), fringe tree (*Chionanthus virginicus*), but mainly on ash (*Fraxinus* spp.). The pupae lack a free tongue case (Hodges 1971).

Remarks. Distinguished from similar species of *Ceratonia* by a light gray reniform spot that is lighter than the ground color of the forewing and by the dark brown border. The dark dashes on the ventral side of the outside margin of the forewing are darker than the ground color of the wing. The postmedial line on the ventral side of the hind wing is usually present and strongly curved between veins. There is also a dusting of pale cream or white scales on the forewing. Positive identification requires genitalic dissection. *Ceratonia catalpae* is a similar species.

Genus *Manduca*

Manduca Hübner 1807: 346; *Phlegethonitus* Hübner 1819: 140; *Protoparce* Burmeister 1856: 63; *Macrosila* Walker 1856: 198; *Syzygia* Grote and Robinson 1865: 164, 189; *Diludia* Grote and Robinson 1865: 163, 188; *Chlaenogramma* Smith 1887: 153.

The genus *Manduca* contains 68 species that are confined to the New World (Bridges 1993). Nine species are found in the United States (Hodges 1971), with two species found in Nebraska. All the Nebraska species of *Manduca* have a series of five or six yellow-orange spots on the sides of the abdomen, and this distinguishes *Manduca* from all other genera in the state.

Manduca quinquemaculata (Haworth)

Five-spotted Hawkmoth or Tomato Hornworm
(Plates 1, 3)

Sphinx quinquemaculata Haworth 1803: 59; *Phelgethontius celeus* Hübner 1821: plate 64.

Description. FW gray to dark brown, center of wing dark

brown; light gray dusting on wing base and along costal margin; light gray stripe near the inner margin; sinuous black line on the posterior $\frac{1}{2}$; black line along inner margin inside the light gray stripe; fringe dark brown, with intermittent light gray dashes. HW light gray; dark gray along the costal margin; dark gray zigzag medial lines; fringe alternate dark gray and light gray dashes. Head light gray. Thorax light gray with a dark gray patch on anterior $\frac{1}{2}$. Abdomen dark gray, 5 yellow spots laterally, outlined in black; white transverse bands between and below spots. WS 9.0–13.5 cm.

Distribution. Rangewide: *Manduca quinquemaculata* occurs over the eastern half of the United States, west to Nebraska and South Dakota, north to Ontario and Nova Scotia, south to Florida and Texas and into Mexico. Nebraska: This species occurs over the entire State.

Locality Records (Map 2). 111 Nebraska specimens examined. ADAMS COUNTY (4): no data; ANTELOPE (1): no data; BANNER (1): Harrisburg; BOX BUTTE (1): Alliance; BUFFALO (4): Kearney; CHERRY (4): McKelvie National Forest, Wood Lake; CLAY (3): Clay Center; COLFAX (2): no data; DAKOTA (1): no data; DAWES (5): Chadron; DAWSON (3): Lexington; DIXON (3): no data; DODGE (1): Scribner; DUNDY (1): Parks; FRONTIER (2): Curtis; FURNAS (1): Holbrook; GAGE (2): Adams; GOSPER (3): no data; HALL (1): Alda; HAMILTON (2): Aurora; HOLT (1): no data; HOOKER (2): Mullen; JEFFERSON (4): Fairbury; KEARNEY (1): no data; LANCASTER (6): Hickman, Lincoln; LINCOLN (4): North Platte; LOUP (2): Calamus Reservoir; MCPHERSON (1): no data; MERRICK (2): Central City; OTOE (2): no data; PHELPS (2): Holdrege; PLATTE (12): Columbus; SALINE (1): no data; SCOTTS BLUFF (2): Mitchell; SHERIDAN (12): no data; THOMAS (2): Halsey National Forest; VALLEY (1): Ord, WAYNE (2): Wayne.

Temporal. Rangewide: May through October (Hodges 1971). Nebraska: April (1), May (2), June (16), July (45), August (26), September (15), October (2).

Larvae. Green or brown with 7 pairs of pale green oblique lateral lines connected by an irregular pale green line below and in front of spiracles. Hodges (1971) reported that the caudal horn was red. However, Wright (1993), Stehr (1987), Covell (1984), and Gilmore (1938) reported that the caudal horn was green with black edging and used this color character as a key for the identification of the larva of *M. quinquemaculata*.

Biology. Covell (1984) reported that the larvae feed on the leaves of potato (*Solanum tuberosum*), tobacco (*Nicotiana tabacum*) and tomato (*Lycopersicon* sp.). Heitzman (1987) reported larvae feeding on pepper (*Capsicum* spp.)

Remarks. *Manduca quinquemaculata* is separated from the only other species in this area, *Manduca sexta*, by the forewing maculation. *Manduca quinquemaculata* normally has five yellow spots on the abdomen (hence the origin of the scientific name). Occasionally the number of spots is increased to six. The larval stage can be a pest of tomatoes.

Manduca sexta (Linné)

Carolina Sphinx or Tobacco Hornworm (Plate 3)

Sphinx sexta Linné 1763: 27; *Sphinx carolina* Linné 1764: 346; *Sphinx nicotianae* Ménétriés 1857: 89 (*nomen nudum*);

Sphinx lycopersici Boisduval 1875: 71; *Sphinx nicotianae* Boisduval 1875: 75.

Description. FW gray; wing base light gray; light gray reniform spot; antemedial, medial, and postmedial lines dark brown; postmedial band gray brown; gray sinuous line near costal margin. HW light gray; dark gray along outer third of the costal margin; dark brown transverse bands. Head and thorax gray to dark gray. Abdomen dark gray, 5 yellow spots laterally outlined in black; white transverse band between and below spots. WS 10.2–12.3 cm.

Distribution. Rangewide: *Manduca sexta* occurs over the southern half of the United States, west to California, north to Wisconsin and New York and into Ontario and Quebec, and south into Mexico. Nebraska: This species probably occurs statewide, but there are no records for the north central portions of the state.

Locality Records (Map 3). 68 Nebraska specimens examined. ADAMS COUNTY (3): no data; BUFFALO (4): Cotton Mill Park, Kearney; CHASE (1): Enders Reservoir; CLAY (2): Hastings; CUSTER (1): no data; DAKOTA (1): no data; DAWES (1): Chadron; DAWSON (1): no data; DIXON (1): no data; FURNAS (1): Holbrook; GOSPER (1): no data; HALL (1): no data; HAMILTON (1): no data; JEFFERSON (1): Fairbury; KEARNEY (2): no data; LANCASTER (12): Lincoln, Malcolm; LINCOLN (1): North Platte; PLATTE (23): Columbus; RICHARDSON (2): no data; SCOTTS BLUFF (4): Mitchell, Scottsbluff, SEWARD (2): Goehner; SHERMAN (2): Rockville.

Temporal. Rangewide: January to December (Hodges 1971). Nebraska: May (3), June (6), July (14), August (31), September (11), October (1).

Larvae. Yellow-green with 7 pairs of yellow to white oblique lateral lines meeting dorsally with transverse black dashes. Series of black dashes above prolegs. Spiracles black with two small yellow dots. First thoracic segment with small, white lateral oval with red dot. Caudal horn red.

Biology. Covell (1984) indicated that larvae feed on the leaves of tomato (*Lycopersicon* spp.), potato (*Solanum tuberosum*), and tobacco (*Nicotiana tabacum*). Heitzman (1987) reported larvae feeding on pepper (*Capsicum* spp.). Pittaway (1993) observed larvae feeding on deadly nightshade (*Atropa belladonna*).

Remarks. *Manduca sexta* is separated from other species of *Manduca* by the forewing maculation. The abdomen of *M. sexta* usually has six yellow spots (hence the origin of the scientific name). Occasionally the number of spots is reduced to five. The only other species that occurs in this area is *Manduca quinquemaculata* from which it is easily separated by the forewing maculation. There are many subspecies of *Manduca sexta* in Central and South America (D'Abrera 1986). The larval stage is often a pest of tobacco.

Genus *Paratrea*

Paratrea Grote 1903: 207; *Atreides* Holland 1903: 16; *Atreus* Grote 1886: 41.

Paratrea is a monotypic genus that occurs only in

North America, ranging from Veracruz north to Canada (Hodges 1971). It resembles the genus *Sphinx* but can be differentiated by the solid-colored hind wings.

Paratrea plebeja (Fabricius)

Plebian Sphinx (Plate 3)

Sphinx plebeja Fabricius 1777: 273.

Description. FW gray; series of black dashes from apex to wing base; reniform spot white; postmedial line dark brown, faint; fringe alternating gray and white. HW dark brown; faint transverse blackish brown band; white inner margin. Head gray. Thorax gray with black lateral lines. Abdomen gray with black dorsal and lateral lines. WS 5.7–7.5 cm.

Distribution. Rangewide: Eastern half of the United States, Texas and Florida, north to Minnesota, New York and Canada, and south into Mexico. Nebraska: This species occurs in the southeastern fourth of the state.

Locality Records (Map 3). 18 Nebraska specimens examined. BUFFALO COUNTY (2): Kearney; FURNAS (1), Holbrook; LANCASTER (5): Lincoln; PLATTE (10): Columbus.

Temporal. Rangewide: April to November (Hodges 1971). Nebraska: May (1), June (2), July (2), August (10), September (2).

Larvae. Yellow-green with 7 pairs of oblique lateral bands bordered with gray or red. Caudal horn green or black.

Biology. Larvae feed on trumpet creeper (*Campsis radicans*), lilac (*Syringa vulgaris*), and passionflower (*Passiflora lutea*) (Covell 1984). Adults feed on the nectar of honeysuckle (*Lonicera* spp.), verbena (*Verbena* spp.), and burning bush (*Euonymus atropurpurea*) (Hodges 1971).

Remarks. *Paratrea plebeja* is identified by a gray forewing with a series of black dashes and a white reniform spot, the hind wing is brown with indistinct markings.

Genus *Sphinx*

Sphinx Linné 1758: 489; *Sphynx* Pallas 1771: 472; *Spectrum* Scopoli 1777: 413; *Sphinx* Füessly 1781: 1; *Hyloicus* Hübner 1819: 138; *Lethia* Hübner 1819: 140; *Sphinx* Gray 1832: 598; *Herse* Agassiz 1846: 35; *Lintneria* Butler 1877: 620; *Gargantua* Kirby 1892: 692; *Mesosphinx* Cockerell 1920: 33.

The genus *Sphinx* contains 48 species (Bridges 1991) occurring mainly in the New World but with a few species occurring in the Palearctic region from England to Japan (Hodges 1971). Twenty two species occur in the United States and Canada (Hodges 1971), and four are found in Nebraska. All the species of this genus have a series of black vertical stripes on the abdomen and have light and dark longitudinal bands on the hind wing.

Sphinx canadensis Boisduval

Canadian Sphinx (Plate 4)

Sphinx canadensis Boisduval 1875: 93; *Sphinx plota* Strecker 1875: 115.

Description. FW gray-brown; apical dash black; series of black dashes and indistinct lines. HW black; transverse

white band; inner margin white. Head and thorax gray. Abdomen gray-brown; alternate white and black lateral banding; black medial line. WS 6.3–8.5 cm.

Distribution. Rangewide: *Sphinx canadensis* occurs from northeastern United States, south to Arkansas and Missouri, west to Nebraska, and north to Manitoba and Newfoundland. Nebraska: This species occurs in the northwestern fourth of the state, probably only as a stray.

Locality Records (Map 3). 1 Nebraska specimen examined. DAWES COUNTY (1): Chadron.

Temporal. Rangewide: May to September (Hodges 1971). Nebraska: July (1).

Larvae. Larval stage undescribed.

Biology. Larvae feed on white ash (*Fraxinus americana*), blueberry (*Vaccinium* spp.), and cloud-berry (*Rubus chamaemorus*) (Covell 1984).

Remarks. This species is uncommon throughout its range. It is identified by its small size and lack of a reniform spot in the forewing.

Sphinx chersis (Hübner)

Ash Sphinx (Plate 4)

Lethia chersis Hübner 1823: 167; *Sphinx cinerea* Harris 1839: 295; *Sphinx oreodaphne* Edwards 1874: 109; *Hyloicus chersis pallescens* Rothschild and Jordan 1903: 129.

Description. FW gray, three black medial dashes; black apical dash; faint black submarginal line. HW dark gray with gray basal patch; pale gray transverse band. Head gray. Thorax gray with black line on proximal border of tegula; black medial line. WS 7.8–13.0 cm.

Distribution. Rangewide: Entire United States, British Columbia to Nova Scotia. Nebraska: This species occurs over the entire state except for the southern fourth.

Locality Records (Map 4). 29 Nebraska specimens examined. BUFFALO COUNTY (1): Kearney; CASS (1): Plattsmouth; CHERRY (1): Sparks; DAWES (9): Chadron; FURNAS (2): Holbrook; LANCASTER (2): Lincoln; LINCOLN (1): Maxwell; PLATTE (8): Columbus; SCOTTS BLUFF (4): Mitchell, Scottsbluff.

Temporal. Rangewide: May to October (Hodges 1971). Nebraska: May (2), June (5), July (7), August (14), October (1).

Larvae. Bluish green, head with a pair of yellow lateral bands, 7 pairs of white oblique lateral lines bordered with black. Caudal horn black. There is also a pale pink form (Hodges 1971).

Biology. Larvae feed on ash (*Fraxinus* spp.), lilac (*Syringa vulgaris*), privet (*Ligustrum* spp.), *Prunus* spp., and aspen (*Populus* spp.) (Covell 1984). Adults are known to feed on deep-throated flowers (Hodges 1971).

Remarks. Identified by the uniform gray color with a series of black dashes on the forewing and by its relatively large size (compared with similarly colored species.)

Sphinx drupiferarum Smith

Wild Cherry Sphinx (Plate 4)

Sphinx drupiferarum Smith 1797: 711; *Sphinx utahensis* Edwards 1881: 115; *Sphinx drupiferarum marginalis* Clark 1936: 71.

Description. FW dark gray, with light gray to white costal margin, outer margin with dark gray undulating post medial line; reniform spot faint brown with black mark on proximal side; series of five black dashes from apex to middle of wing. HW dark gray with light gray to white base; post medial line and outer marginal band light gray to white. Head dark gray with light gray side. Thorax dark gray with dark gray tegula. Abdomen light gray ventrally; dark gray to black lateral band on side with large light gray to white rectangular spots; gray lateral dorsal stripe with black dorsal line. WS 8.3–11.1 cm.

Distribution. Rangewide: Northern three fourths of United States, south to Georgia and west to Colorado and California, north to Nova Scotia and British Columbia. Nebraska: This species occurs over the entire state except for the south western fourth.

Locality Records (Map 4). 19 Nebraska specimens examined. BUFFALO COUNTY (1): Kearney; DAWES (2): Chadron; DIXON (1): no data; FURNAS (1): Holbrook; GAGE (1): Beatrice; GARDEN (1): Ash Hollow State Park; HAMILTON (1): Aurora; LANCASTER (2): Lincoln; PLATTE (4): Columbus; SCOTTS BLUFF (2): Mitchell; SHERMAN (1) Loup City; THOMAS (2): Halsey National Forest.

Temporal. Rangewide: May to July (Hodges 1971). Nebraska: May (4), June (12), July (1), August (1).

Larvae. Yellow-green with 7 pairs of white oblique bands bordered with purple. Caudal horn purple.

Biology. Covell (1984) reported that larvae feed on apple (*Malus* spp.), wild plum (*Prunus americana*), cherry (*Prunus* spp.), hackberry (*Celtis occidentalis*) and lilac (*Syringa vulgaris*). Heitzman (1987) observed larvae feeding on peach (*Prunus persica*).

Remarks. *Sphinx drupiferarum* is characterized by the forewing having the costal area pale gray to white and dark gray to black posteriorly and with the reniform spot faint.

Sphinx kalmiae Smith

Laurel Sphinx (Plate 4)

Sphinx kalmiae Smith 1797: 73.

Description. FW yellow-brown; reniform spot a black dot; apical dash dark brown; apex with brown patch; outer margin dark brown with white postmedial line; inner margin dark brown; fringe alternating yellow-brown and white. HW yellow-brown with dark brown antemedial and postmedial bands; fringe alternating yellow-brown and white. Head and thorax gray with yellow-brown to gray medial band. Abdomen yellow-brown with series of lateral, alternating, dark brown and white rectangular patches; medial line dark brown. WS 7.5–10.3 cm.

Distribution. Rangewide: *Sphinx kalmiae* occurs in the eastern half of the United States from Newfoundland south to North Carolina, west to Arkansas and Mississippi, then north to Saskatchewan. Nebraska: This species occurs only in the north eastern fourth of the state and then only as a stray.

Locality Records (Map 4). 1 Nebraska specimen examined. DIXON COUNTY (1): Concord.

Temporal. Rangewide: May to September. Nebraska: July (1).

Larvae. Head green with pair of black lateral bands. Body green, oblique blue-black bands with white central line,

followed by a broad yellow line; yellow line extending to base of caudal horn. Prolegs yellow with black markings. Caudal horn dark blue with black granules.

Biology. Adults will come to bait (Hodges 1971). Larvae feed on mountain laurel (*Kalmia latifolia*), lilac (*Syringa vulgaris*), privet (*Ligustrum* spp.), ash (*Fraxinus* sp.), poplar (*Populus* spp.), and fringe tree (*Chionanthus virginicus*) (Hodges 1971).

Remarks. Nebraska is at the very western edge of its range, and it is rare here. It is more common in Northeastern United States.

Sphinx vashti Strecker Vashti Sphinx (Plate 4)

Sphinx vashti Strecker 1878: 136; *Sphinx albescens* Tepper 1881: 1; *Sphinx mordecai* McDunnough 1923: 148; *Hyloicus gerhardi* Barnes and Benjamin 1924: 166.

Description. FW gray to light brown, basal area light gray to white, outer margin light gray to white; reniform spot absent; post medial line dark gray; series of dark gray dashes from apex to medial area. HW dark gray, basal area and medial band light gray to white. Head dark gray with light gray side. Thorax dark gray with incomplete dark gray to black horizontal stripes; dorsal band gray with black median line. WS 6.6–10.0 cm.

Distribution. Rangewide: Western half of the United States from Mississippi, Kansas, Nebraska, and Texas, west to California, and north to British Columbia and Manitoba. Nebraska: This species occurs over the entire state.

Locality Records (Map 5). 62 Nebraska specimens examined. ANTELOPE COUNTY (1): no data; BANNER (1): Wildcat Hills State Recreation Area; BLAINE (2): Dunning; BROWN (2): Niobrara Valley Reserve; CHERRY (1): Sparks; DAWES (16): Chadron; DAWSON (1): Lexington; DIXON (4): Concord; FURNAS (2): Holbrook; GOSPER (1): no data; HARLAN (2): Alma; HOOKER (1): Mullen; LANCASTER (3): Lincoln; LINCOLN (7): North Platte, Maxwell; MADISON (1): no data; NANCE (1): no data; PLATTE (6): Columbus; SCOTTS BLUFF (5): Mitchell, Scottsbluff; SHERIDAN (1): no data; SHERMAN (3): Loup City, Sherman Reservoir, SIOUX (1): no data.

Temporal. Rangewide: May to July (Hodges 1971). Nebraska: May (10), June (10), July (29), August (11).

Larvae. Green with 7 pair of white, oblique lateral lines bordered with black. Caudal horn black.

Biology. Larvae feed on snowberry (*Symphoricarpos albus*) (Covell 1984). Adults are reported to feed on honeysuckle (*Lonicera* spp.) and columbine (*Aquilegia* spp.) (Hodges 1971).

Remarks. *Sphinx vashti* is similar to *S. chersis* but is smaller, and the forewing is lighter gray. This species is highly variable in both forewing maculation and color.

Smerinthini Genus *Laothoe*

Laothoe Fabricius 1807: 287; *Amorpha* Hübner 1809: plate 171; *Cressonia* Grote & Robinson 1865: 161,186.

The genus *Laothoe* contains four species worldwide (Bridges 1991), two occurring only in the Palearctic

region (D'Abrea 1986). According to Hodges (1971), only one species occurs in the United States, including Nebraska.

Laothoe juglandis (Smith) Walnut Sphinx (Plates 1,5)

Sphinx juglandis Smith 1797: 57; *Smerinthus pallens* Strecker 1873: 54; *Sphinx instabilis* Butler 1877: 590; *Cressonia robinsoni* Butler 1877: 590; *Cressonia juglandis* var. *hyperbola* Slosson 1890: 59; *Cressonia juglandis alpina* Clark 1927: 101; *Cressonia juglandis manitobae* Clark 1930: 28.

Description. FW light brown; antemedial and postmedial lines gray-brown and straight; outer margin brown, scalloped; center of inner margin with brown, subrectangular patch, more pronounced and much darker in posterior 1/3 in male than in female; orbicular spot small and dark brown, larger and darker in male. HW light brown; oblique lines brown; outer margin scalloped. Head and thorax light brown. WS 4.3–7.5 cm.

Distribution. Rangewide: *Laothoe juglandis* occurs over the entire eastern half of the United States and north to Manitoba and Nova Scotia. Nebraska: This species occurs over the entire state except for the south western fourth.

Locality Records (Map 5). 27 Nebraska specimens examined. BROWN COUNTY (2): no data; DIXON (1): no data; GAGE (1): Beatrice; JEFFERSON (3): Fairbury; LANCASTER (13): Lincoln; MERRICK (1): Central City; PIERCE (1): no data; PLATTE (1): Columbus; RICHARDSON (1): Indian Cave State Park; SCOTTS BLUFF (3): Scottsbluff.

Temporal. Rangewide: March to September. Nebraska: May (3), June (9), July (11), August (4).

Larvae. Two forms have been reported; green with 7 pairs of yellow oblique lateral lines, yellow tipped granules and reddish dorsal blotch or red with 7 pairs of yellow oblique lateral lines, yellow tipped granules and occasionally with green, "V" shaped dorsal markings.

Biology. Adults do not feed at flowers (Heitzman 1987). Covell (1984) reported that larvae feed on butternut (*Juglans cinerea*), hickory (*Carya* spp.), *Prunus* spp., and black walnut (*Juglans nigra*). Hodges (1971) indicated that the larvae also feed on beech (*Fagus* spp.).

Remarks. This species is recognized by the scalloped margins on both the forewing and hind wing. Covell (1984) and Hodges (1983) both list this species in the genus *Laothoe*. Bridges (1993), D'Abrera (1986) and Holland (1903) place it in the genus *Cressonia*. This is one of the few Nebraska sphingids that exhibit sexual color dimorphism.

Genus *Pachysphinx*

Pachysphinx Rothschild and Jordan 1903: 339.

The genus *Pachysphinx* contains two species from the Nearctic. (D'Abrera 1986). Both occur in the United States and also in Nebraska (Hodges 1971). The species of this genus are the only large (WS of 10.0 cm or larger) *Nebraska* sphingid with scalloped outer margins on the forewings.

***Pachysphinx modesta* (Harris)**

Big Poplar Sphinx or Modest Sphinx (Plate 5)

Smerinthus modesta Harris 1839: 292; *Smerinthus princeps* Walker 1856: 255; *Smerinthus populicola* Boisduval 1875: 22; *Smerinthus cablei* Reizenstein 1881: 864; *Pachysphinx modesta borealis* Clark 1929: 18.

Description. FW gray to brown; basal $\frac{1}{3}$ light gray; postmedial band light gray; outer margin scalloped. HW light gray to brown with reddish brown central patch from wing base to near anal angle; anal angle with black patch subtriangular to angulate. Head, thorax and abdomen gray. WS 10.0–12.7 cm.

Distribution. Rangewide: *Pachysphinx modesta* occurs over the entire United States, north into British Columbia, Alberta, and Nova Scotia, and south into Mexico. Nebraska: This species occurs over the entire state.

Locality Records (Map 5). 125 Nebraska specimens examined. ADAMS COUNTY (2): no data; BROWN (2): Niobrara Valley Reserve; BUFFALO (2): Kearney; CASS (1): Plattsmouth; CHASE (1): Enders Reservoir; CLAY (2): no data; COLFAX (2): no data; DAKOTA (2): no data; DAWES (5): Chadron; DAWSON (2): no data; DIXON (9): Concord; FRONTIER (1): Curtis; FURNAS (9): Holbrook; GOSPER (5): no data; HALL (3): Mormon Island; HARLAN (1): Alma; HITCHCOCK (2): Swanson Reservoir; HOLT (2): Chambers; JEFFERSON (4): Fairbury; KNOX (1): no data; LANCASTER (5): Lincoln; LINCOLN (3): North Platte; MADISON (1): no data; MCPHERSON (1): no data; MERRICK (1): Central City; OTOE (1): no data; PHELPS (1): Holdrege; PIERCE (1) no data; PLATTE (24): Columbus; RICHARDSON (1): Indian Cave State Park; SALINE (1): no data; SARPY (1): Fontenelle Forest; SCOTTS BLUFF (4): Mitchell, Scottsbluff; SEWARD (1): no data; SHERIDAN (1): no data; SHERMAN (2): Rockville; SIOUX (1): Harrison; WAYNE (1): Carroll.

Temporal. Rangewide: January to December (Hodges 1971). Nebraska: April (1), May (4), June (32), July (53), August (28), September (1).

Larvae. Whitish green to yellow, with 7 pairs of oblique white lines. Thorax with 2 white bands. Head pink. Caudal horn short, slender. A reddish brown form also occurs (Hodges 1971). Reizenstein (1881) described the larva as "Its body is of a very clear bluish green color with a broad coral-red dorsal line. There are golden lateral stripes on each side of the body, which is dotted with innumerable golden atoms of the greatest brilliancy. The presence of coral red colored warts on the 4th segment is an astonishing ornamentation".

Biology. Covell (1984) reported that larvae feed on poplar (*Populus* spp.) and willow (*Salix* spp.). Hodges (1971) saw larvae feeding on cottonwood (*Populus* spp.). Hietzman (1987) reported larvae feeding on aspen (*Populus* spp.). Adults do not feed (Heitzman 1987).

Remarks. There are differences of opinions as to whether *Pachysphinx occidentalis* and *P. modesta* are separate species or subspecies. *Pachysphinx occidentalis* closely resembles *P. modesta* in all respects except for some minor differences in color and shape of the hind wings' black anal angle markings. Some authors report minor color and size

differences. I have not been able to observe these differences in the specimens available to me. The larvae also exhibit some minor differences, such as the caudal horn being longer in *P. occidentalis* than in *P. modesta*. According to Hodges (1971), *P. occidentalis* is geographically separated from *P. modesta*, and where the ranges do overlap slightly, hybrids occur. *Pachysphinx occidentalis* was originally described by Edwards (1875) as a subspecies of *P. modesta*. Examples from both geographic areas seem to grade from one to the other without any good separate, identifiable characteristics. The genitalia do not show any differences between the two. For these reasons, I choose to consider *P. occidentalis* as a geographic subspecies of *P. modesta*. More work with a larger number of specimens needs to be done on this problem.

Genus *Paonias*

Paonias Hübner 1819: 142; *Calasymbolus* Grote 1873: 23.

The genus *Paonias* contains three species in the Nearctic (D'Abrera 1986). All occur in the United States (Hodges 1981), with two occurring in Nebraska. All species of this genus in Nebraska have a large blue discal eyespot outlined in black on the hind wing, and there are no marks in the center of the eyespot.

***Paonias excaecatus* (Smith)**

Blinded Sphinx (Plate 5)

Sphinx excaecata Smith 1797: 49; *Paonias paponina* Geyer 1837: 12; *Calasymbolus excoecata borealis* Clark 1929: 19.

Description. FW light brown; reniform spot small and black; postmedial lines dark brown; outer margin scalloped, inner portions of scallop white. HW light brown; pink patch from wing base to anal angle; costal margin scalloped; fringe white; eyespot near anal angle blue with black border. Head light brown. Thorax light brown with dark brown dorsal stripe. Abdomen light brown. WS 5.2–9.5 cm.

Distribution. Rangewide: *Paonias excaecata* occurs over the northeastern half of the United States, northern California and Arizona into Florida, north to Alberta, British Columbia and Nova Scotia. Nebraska: This species occurs over the entire state.

Locality Records (Map 6). 177 Nebraska specimens examined. BROWN COUNTY (3): Niobrara Valley Reserve; BUFFALO (4): Kearney; CASS (1): Plattsmouth; CHERRY (2): Merritt Dam; CLAY (11): Clay Center; COLFAX (2): no data; DAKOTA (1): no data; DAWES (25): Chadron; DAWSON (1): no data; DIXON (33): Concord; DOUGLAS (3): Omaha; FURNAS (1): Holbrook; GAGE (3): Adams, Beatrice; HAMILTON (3): Aurora; HOLT (1): no data; JEFFERSON (3): Fairbury; KEARNEY (1): Kearney; LANCASTER (17): Lincoln; LINCOLN (4): North Platte; OTOE (1): no data; PLATTE (45): Columbus; SALINE (2): no data; SHERIDAN (9): no data, SHERMAN (2): Loup City, Rockville.

Temporal. Rangewide: March to October (Hodges 1971). Nebraska: May (8), June (76), July (65), August (28).

Larvae. Head green with white posterior. Body green with 6 pairs of yellow oblique bands and reddish brown dorsal blotches, many white granules. Spiracles white with black border. Caudal horn green with yellow transverse band.

Biology. Covell (1984) reported that larvae feed on basswood (*Tilia americana*), elm (*Ulmus* spp.), oak (*Quercus* spp.), poplar (*Populus* spp.), and *Prunus* sp. Hodges (1971) observed larvae feeding on rose (*Rosa* spp.) and European hornbeam (*Carpinus betulus*). Heitzman (1987) indicated larvae feed on cherry (*Prunus* spp.), apple (*Malus* spp.), and plum (*Prunus* spp.). Adults do not feed (Heitzman 1987).

Remarks. This species is recognized by the deeply scalloped outer margin of the forewing in combination with a pink hind wing having a blue eyespot with a black outline.

***Paonias myops* (Smith)**

Small-eyed Sphinx (Plate 5)

Sphinx myops Smith 1797: 51; *Smerinthus rosacearum* Boisduval 1875: 15; *Smerinthus myops* var. *cerasi* Boisduval 1875: 42; *Smerinthus tiliastri* Boisduval 1875: 42; *Calasymbolus myops occidentalis* Clark 1919: 112; *Calasymbolus myops mcCrearyi* Clark 1929: 19.

Description. FW brown; postmedial lines purplish; small yellow patch at both the apex and anal angle; outer margin scalloped. HW brown; small yellow spot at apex; small purplish lines from apex to center of wing; light yellow patch between wing base and tornus; tornus with blue eyespot outlined with black. Head brown. Thorax brown with red-brown to yellow-brown dorsal stripe. Abdomen yellow-brown. WS 4.5–7.5 cm.

Distribution. Rangewide: Entire United States except for the west coast, north to British Columbia, Manitoba and Nova Scotia, and south into Mexico. Nebraska: This species occurs over the entire state.

Locality Records (Map 6). 80 Nebraska specimens examined. ANTELOPE COUNTY (3): no data; BLAINE (1): Dunning; BROWN (1): no data; BUFFALO (2): Kearney; CHERRY (1): no data; DAWES (8): Chadron; DAWSON (1): no data; DIXON (6): Concord; FURNAS (2): Holbrook; GAGE (1): Beatrice; JEFFERSON (7): Fairbury; LANCASTER (3): Lincoln; LINCOLN (3): North Platte; MORRILL (1): Bridgeport; PLATTE (23): Columbus; SCOTTS BLUFF (2): Mitchell; SHERIDAN (6): no data; SHERMAN (8): Loup City, Rockville; THOMAS (1): Halsey National Forest.

Temporal. Rangewide: March to October (Hodges 1971). Nebraska: May (6), June (31), July (26), August (16).

Larvae. Green with 6 pairs of yellow, oblique bands and reddish brown dorsal patches. Caudal horn green.

Biology. Larvae feed on birch (*Betula* spp.), hawthorn (*Crataegus* spp.), poplar (*Populus* spp.), *Prunus* sp., and willow (*Salix* spp.) (Covell 1984), rose (*Rosa* spp.) (Holland 1903), cherry (*Prunus* spp.), service berry (*Amelanchier* spp.), and grape (*Vitis* spp.) (Hodges 1971). Adults do not feed (Heitzman 1987).

Remarks. Identified by the yellow hind wing with a single eyespot and doubly indented forewing (not scalloped).

Genus *Smerinthus*

Smerinthus Latreille 1802: 401; *Dilina* Dalman 1816: 205; *Merinthus* Meigen 1830: 148; *Bebroptera* Sodoffsky 1837: 84; *Eusmerinthus* Grote 1877: 132; *Copismerinthus* Grote 1886: 35; *Bellia* Tutt 1902: 386; *Daddia* Tutt 1902: 386; *Nicholsonia* Tutt 1902: 386; *Bellinca* Strand 1943: 98; *Nila* Strand 1943: 99.

The genus *Smerinthus* consists of 12 species that are worldwide (Bridges 1991). There are three species in the United States (Hodges 1971), one of which is known from Nebraska. The United States species can be identified by the presence on the hind wing of a large, blue eyespot with a black border that has either a black circle or a line in the center of the blue area.

***Smerinthus jamaicensis* (Drury)**

Twin-spot Sphinx (Plate 5)

Sphinx ocellatus jamaicensis Drury 1773: 43; *Smerinthus geminatus* Say 1824: 25; *Carasymbolus geminatus* var. *tripatitus* Grote 1886: 36.

Description. FW light brown; antemedial, medial and postmedial lines dark brown; dark brown patch near middle of medial band; apex and anal angle dark brown; outer margin scalloped. HW pink; outer margin light brown; blue eyespot bordered with black, one (occasionally more) horizontal black lines at center of spot; outer margin concave. Head tan. Thorax dark brown with tan tegula. Abdomen tan. WS 5.0–7.0 cm.

Distribution. Rangewide: Eastern three fourths of the United States from Arizona and Colorado north to British Columbia and Newfoundland. Nebraska: This species occurs over the entire state.

Locality Records (Map 6). 133 Nebraska specimens examined. ANTELOPE COUNTY (1): no data; BLAINE (1): Halsey; BROWN (4): Niobrara Valley Reserve; BUFFALO (4): Kearney; CHASE (2): Enders Reservoir; CHERRY (1): Valentine; CLAY (12): Clay Center; COLFAX (1): no data; DAWES (10): Chadron; DIXON (18): Concord; FRANKLIN (1): no data; FURNAS (5): Holbrook; GAGE (2): Beatrice; HALL (1): no data; JEFFERSON (4): Fairbury; LANCASTER (9): Lincoln; LINCOLN (2): North Platte; MADISON (2): no data; MERRICK (1): Central City; OTOE (1): no data; PLATTE (36): Columbus; RICHARDSON (1): Indian Cave State Park; SARPY (1): Fontenelle Forest; SCOTTS BLUFF (4): Mitchell, Scottsbluff; SEWARD (1): no data; SHERIDAN (5): Smith Lake; SIOUX (4): no data; THOMAS (1): Halsey.

Temporal. Rangewide: March to October (Hodges 1971). Nebraska: May (7), June (47), July (28), August (33), September (1), October (1).

Larvae. Blue-green with 6 or 7 pale greenish white, oblique lateral lines and a pair of subdorsal lateral lines.

Biology. Larvae feed on apple (*Malus* spp.), ash (*Fraxinus* spp.), birch (*Betula* spp.), elm (*Ulmus* spp.), plum (*Prunus* spp.), willow (*Salix* spp.) (Covell 1984), cottonwood (*Populus* spp.) and aspen (*Populus* spp.) (Heitzman 1987). Adults have reduced mouthparts and probably do not feed (Heitzman 1987).

Remarks. Identified by the blue discal spot divided by a black bar on the hind wing.

MACROGLOSSINAE
Dilophonotini
Genus *Aellopos*

Aellopos Hübner 1819: 131; *Oelopus* Edwards 1887: 163.

The genus *Aellopos* contains seven species (Bridges 1991) in the Neotropical/Nearctic realms. Of these, four occur in the United States (Hodges 1971) with only one occurring in Nebraska. All United States species can be identified by the presence of a white, transverse band on the dorsal side of the abdomen.

***Aellopos titan* (Cramer)**
 Titan Sphinx (Plate 6)

Sphinx titan Cramer 1777: 151; *Sesia cubana* Clark 1936: 85; *Sesia aguacana* Gehlen 1944: 166.

Description. FW generally dark brown, reniform spot black; medial and postmedial lines with row of white spots. HW generally dark brown; costal margin yellowish white; anal angle white. Head and thorax olive-brown. Abdomen with white, transverse band at middle, olive-brown anterior to band; apex tufted. WS 9.5–12.0 cm.

Distribution. Rangelwide: *Aellopos titan* occurs sporadically through the northeastern half of the United States, more commonly through the southeastern half, and south to Argentina, Uruguay and the West Indies. Nebraska: This species occurs in the eastern two thirds of the state.

Locality Records (Map 7). 4 Nebraska specimens examined. CHERRY COUNTY (1): Hackberry Lake; FURNAS (1): Holbrook; NUCKOLLS (1): Superior; PLATTE (1): Columbus.

Temporal. Rangelwide: June to October (Hodges 1971). Nebraska: June (2), July (1), August (1).

Larvae. Greenish white or brown with dark green, medial band and 7 pairs of oblique, white bands with black or green margins. Anal prolegs black. Caudal horn green.

Biology. The adults of this species feed on seven year apple (*Casasia clusiifolia*) (Covell 1984) and phlox (*Phlox* spp.) (Hodges 1971). The larvae are known to feed on pond apples (*Annona glabra*) (Covell 1984).

Remarks. This is the only species of sphingid with a white, horizontal, abdominal stripe, black reniform spot, and two rows of white spots on the forewing. Adults occur only occasionally in Nebraska due to the rarity of acceptable food plants.

Genus *Erinnyis*

Erinnyis Hübner 1819: 139; *Anceryx* Walker 1856: 78,222; *Dilophonota* Burmeister 1856: 69.

The genus *Erinnyis* contains ten species (Bridges 1991). Eight of these occur in North America (Hodges 1971), with only one occurring in Nebraska. The species occurring in United States are usually characterized by a rather nondescript brown or gray forewing with the basal $\frac{2}{3}$ of the hind wing being either bright yellow or yellow-orange.

***Erinnyis obscura* (Fabricius)**
 Obscure Sphinx (Plate 6)

Sphinx obscura Fabricius 1775: 538; *Erinnyis stheno* Hübner 1824; *Erinnyis cinerosa* Grote and Robinson 1865: 168; *Anceryx rhaebus* Boisduval 1870: 72.

Description. FW gray, may be dark gray at base in females, series of small, black dots over entire area; blackish band from near apex to base of wing in male, band missing in female; small blackish area at anal angle. HW orange; inner margin dark gray. Head gray. Thorax gray with two, faint medial lines. WS 5.6–6.5 cm.

Distribution. Rangelwide: *Erinnyis obscura* occurs in the southern half of the United States from California to Florida and north to Nebraska and Pennsylvania, south to Uruguay and the West Indies. Nebraska: This species occurs sporadically in the eastern fourth of the state.

Locality Records (Map 7). 4 Nebraska specimens examined. HALL COUNTY (1): no data; LANCASTER (1): Lincoln; PLATTE (2): Columbus.

Temporal. Rangelwide: January to December (Hodges 1971). Nebraska: August (2), September (2).

Larvae. Pale yellow or yellow-green with a pair of gray dorsolateral lines from head to caudal horn.

Biology. Larvae feed on papaya (*Carica papaya*) and white vine (*Sarcostemma clausum*) (Covell 1984). Hodges (1971) reported larvae feeding on *Philibertia* spp. and sandvine (*Cynanchum* spp.).

Remarks. *Erinnyis obscura* exhibits color and pattern dimorphism between the sexes. *Erinnyis obscura* and *E. dominicus* may be different color forms of the same species and are not separable by genitalia (Hodges 1971).

Genus *Hemaris*

Hemaris Dalman 1816: 207; *Haemorrhagia* Grote and Robinson 1865: 173; *Chamaesesia* Grote 1877: 220.

The genus *Hemaris* contains 17 species (Bridges 1991) that occur only in the northern hemisphere. Only four species occur in the United States (Hodges 1971), with two occurring in Nebraska. Species of *Hemaris* are identified by the lack of scales on both the forewing and the hind wing. Both species in Nebraska are day-fliers and resemble bumblebees.

***Hemaris diffinis* (Boisduval)**
 Snowberry Clearwing (Plates 1, 6)

Macroglossa diffinis Boisduval 1836: 15; *Macroglossa thetus* Boisduval 1855: 32; *Sesia axillaris* Grote and Robinson 1868: 180; *Hemaris tenuis* Grote 1873: 4; *Hemaris marginalis* Grote 1873: 6; *Hemariius palpalis* Grote 1874: 145; *Sesia grotei* Butler 1874: 365; *Macroglossa fumosa* Strecker 1874: 93; *Macroglossa aethra* Strecker 1875: 107; *Hemaris cynoglossum* Edwards 1875: 88; *Hemaris rubens* Edwards 1875: 88; *Hemaris metathetis* Butler 1877: 519; *Haemorrhagia diffinis ariadne* Barnes and McDunnough 1910: 202; *Hemaris diffinis mcdunnoughi* Clark 1927: 104; *Hemaris diffinis jordani* Barnes and Benjamin 1927: 51.

Description. FW clear (scaleless); costal margin, apex, and outer margin light reddish brown. HW clear; outer margin and inner margin light reddish brown; anal angle to base of wing light reddish brown. Head and thorax light olive-green to yellow-green. Abdomen black with two yellow stripes at apex; black and yellow tuft. WS 3.5–5.0 cm.

Distribution. Rangewide: Entire United States, north to British Columbia, Northwest Territories, and Nova Scotia. Nebraska: This species occurs over the entire state.

Locality Records (Map 7). 124 Nebraska specimens examined. BOYD COUNTY (1): Spencer; BROWN (6): Keller State Recreation Area, Niobrara Valley Reserve, Springview; BUFFALO (2): Gibbon, Kearney; CASS (2): Louisville; CLAY (1): no data; COLFAX (2): Schyler; CUSTER (3): Arnold, Broken Bow, Oconto; DAKOTA (2): no data; DAWES (11): Bordeau Creek, Chadron; DAWSON (6): Gothenburg; DOUGLAS (3): Omaha; FRANKLIN (2): Limestone Bluffs Wildlife Management Area; FRONTIER (1): Curtis; FURNAS (8): Cambridge; GAGE (1): Adams; HITCHCOCK (2): no data; JEFFERSON (1): Steel City; KEITH (1): Cedar Point Biological Station; KEWA PAHA (5): Carnes; LANCASTER (24): Hickman, Lincoln; LINCOLN (1): Brady; MERRICK (1): Central City; NUCKOLLS (1): Superior; PHELPS (1): no data; PIERCE (1): no data; PLATTE (8): Columbus; RICHARDSON (3): Indian Cave State Park, Rulo; SALINE (1): DeWitt; SARPY (1): Bellevue; SEWARD (1): no data; SCOTTS BLUFF (2): no data; SHERMAN (1): Loup City; SIOUX (14): Monroe Canyon, War Bonnet Canyon; THAYER (1): Hebron; THOMAS (5): Halsey.

Temporal. Rangewide: Spring to mid-summer (Hodges 1971). Nebraska: April (13), May (15), June (27), July (39), August (16), September (4).

Larvae. Green with white, subdorsal lines, lacking the usual double dorsal lines. Spiracles reddish. These larvae can be quite variable as evidenced by the specimen illustrated in Plate 1. This specimen was reared by James Kalish of the Entomology Department, University of Nebraska.

Biology. Larvae feed on dogbane (*Apocynum* spp.), honeysuckle (*Lonicera* spp.), and snowberry (*Symphoricarpos albus*) (Covell 1984). Heitzman (1987) reported larvae feeding on coralberry (*Symphoricarpos orbiculatus*). Adults are day fliers and feed on nectar from swamp milkweed (*Asclepias incarnata*), joe-pye weed (*Eupatorium* spp.), *Phlox* spp., and butterfly bush (*Buddleja davidii*).

Remarks. *Hemaris diffinis* is identified by both the clear hind wing and forewing (with dark scales on the outer margin) and a dark patch at the wing base. It is separated from other species of *Hemaris* by a yellow area with a dark stripe on the ventral side of the thorax. This species is a bumblebee mimic.

Hemaris thysbe (Fabricius)

Hummingbird Clearwing (Plate 6)

Sesia thysbe Fabricius 1775: 548; *Sphinx pelasgus* Cramer 1779: 176; *Sesia cimbriciformis* Stephens 1828:135; *Sesia ruficaudis* Kirby 1837: 303; *Sesia fuscicaudis* Walker 1856: 83; *Haemorrhagia buffaloensis* Grote and Robinson 1867: 439; *Haemorrhagia florensis* Grote and Robinson 1867: 439;

Sesia uniformis Grote and Robinson 1868: 181; *Macroglossa etolus* Boisduval 1875: 370; *Macroglossa pyramus* Boisduval 1875: 372.

Description. FW clear (scaleless); costal margin, apex, and outer margin deep red-brown. HW clear; base olive-green to deep reddish brown; outer margin, anal angle, and inner margin to base of wing deep reddish brown. Head and thorax olive-green. Abdomen with proximal ½ olive-green, distal ½ black with yellow stripes at apex; abdominal tuft black and yellow. WS 4.0–5.5 cm.

Distribution. Rangewide: *Hemarius thysbe* occurs throughout the eastern three fourths of the United States from Florida and Texas into British Columbia, Quebec, Newfoundland, and into Alaska. Nebraska: This species occurs in the eastern fourth of the state and probably then only as a stray.

Locality Records. (Map 8). 3 Nebraska specimens examined. CASS COUNTY (1): South Bend; DOUGLAS (1): Omaha; FURNAS (1): Holbrook.

Temporal. Rangewide: March to October (Hodges 1971). Nebraska: May (1), June (1), August (1).

Larvae. Green with the usual oblique lines absent, white dorsal line with dark red areas around spiracles. May have pale dorsolateral lines separated by red lines. Last two segments of abdomen with pink ventral markings. Caudal horn dark.

Biology. Larvae feed on hawthorn (*Crataegus* spp.), honeysuckle (*Lonicera* spp.), *Prunus* spp. and snowberry (*Symphoricarpos albus*) (Covell 1984), and coralberry (*Symphoricarpos orbiculatus*) (Heitzman 1987). Adults are day fliers and may be found feeding on flowers (Hodges 1971).

Remarks: *Hemaris thysbe* is characterized by both a clear forewing and hind wing with dark scales at the outer margin and a patch at the wing base. It is separated from other species of *Hemaris* by the presence of yellow (without dark stripes) on the ventral side of the thorax. This species is a bumblebee mimic.

Philampelini Genus *Eumorpha*

Eumorpha Hübner 1807: 167; *Pholus* Hübner 1819: 134; *Daphnis* Hübner 1819: 134; *Argeus* Hübner 1819: 134; *Dupo* Hübner 1819: 137; *Philampelus* Harris 1839: 21; *Tinostoma* Rothschild and Jordan 1903: 475, 497.

The genus *Eumorpha* contains 21 species (Bridges 1991) that occur primarily in the Neotropics. Nine species occur in the United States (Hodges 1971), with two species occurring in Nebraska. Most species of this genus have a dark brown patch near the apex on the costal margin of the forewing and a dark brown patch about one half the distance along the inner margin of the forewing. The hind wing in most species has a variably-sized pink region. These colors and patterns are used for identification of the Nebraska species of *Eumorpha*.

***Eumorpha achemon* (Drury)**

Achemon Sphinx (Plate 6)

Sphinx achemon Drury 1775: 51; *Sphinx cranton* Cramer 1777: 148.**Description.** FW light pinkish brown to light brown; wing veins orange; apical patch dark brown; subrectangular patch at middle of inner margin dark brown; subrectangular patch at anal angle dark brown. HW pink; posterior $\frac{1}{3}$ light brown; series of spots near anal angle dark brown. Head gray. Thorax gray with dark brown tegula. Abdomen light brown. WS 8.2–10.2 cm.**Distribution.** Rangewide: *Eumorpha achemon* occurs in the eastern half of the United States from Florida and Texas north to North Dakota and Massachusetts, west to Nebraska and Kansas, and south to Mexico. Holland (1903) extended the range to the west coast of the United States, but I haven't been able to verify this. Nebraska: This species occurs over the entire state.**Locality Records.** (Map 8). 80 Nebraska specimens examined. ANTELOPE COUNTY (1): no data; BROWN (1): no data; BUFFALO (10): Kearney; CHERRY (1): Valentine; CHEYENNE (1): no data; COLFAX (1): no data; DAWES (8): Chadron; DAWSON (1): no data; DIXON (3): no data; DOUGLAS (1): Omaha; FURNAS (1): Holbrook; HALL (1): Mormon Island; HAMILTON (1): Aurora; KEITH (1): Paxton; LANCASTER (3): Lincoln; LINCOLN (8): North Platte, Sutherland; PLATTE (19): Columbus; SCOTTS BLUFF (4): Mitchell, Scottsbluff; SHERIDAN (3): no data; THOMAS (1): Halsey National Forest.**Temporal.** Rangewide: Mid-spring into August (Hodges 1971). Nebraska: May (2), June (14), July (36), August (9), September (4).**Larvae.** Brown to yellow-brown with 6 pairs of large, cream, angular blotches outlined in black and with small black spiracular spots on the side of the abdomen. Third segment of body enlarged (Wright 1993). Caudal horn replaced with black button on last instar.**Biology.** Larvae feed on *Ampelopsis* spp. and grape (*Vitis* spp.) (Covell 1984).**Remarks.** Distinguished from other species of *Eumorpha* by the pink, basal two thirds of the hind wing and a series of black dashes at the anal angle of the hind wing.***Eumorpha pandora* (Hübner)**

Pandora's Sphinx (Plates 1, 6, 8)

Daphnis pandorus Hübner 1821: 161; *Philampelus pandorus ampelophaga* Walker 1856: 174; *Pholus intermedia* Clark 1917: 67.**Description.** FW olive-green; veins pinkish; reniform spot black and double; antemedial and postmedial lines faint and dark green; apical patch dark green; apex of outer margin concave; patch along inner margin from base to middle of wing olive-green and dark green; triangular patch at anal angle dark green. HW light olive-green, with some pink veins; outer margin olive-green with 2 scallops; rectangular patch near wing base black; band from near apex to anal angle black; irregular area near anal angle pinkish; broken black line near proximal $\frac{1}{2}$ margin. Head light olive-green. Thorax light olive-green with dark olive-green tegula. Abdomen dark olive-green

to light olive-green. WS 8.7–11.5 cm.

Distribution. Rangewide: *Eumorpha pandora* occurs in the eastern half of the United States and north to Nova Scotia. Nebraska: This species occurs in the eastern half of the state.**Locality Records** (Map 8). 24 Nebraska specimens examined. ADAMS COUNTY (3): no data; BROWN (1): no data; BUFFALO (3): Kearney; COLFAX (1): no data; FURNAS (1): Holbrook; HALL (1): Grand island; HAMILTON (1): Aurora; KNOX (1): Crofton; LANCASTER (1): Lincoln; NEMAHA (1): Auburn; PLATTE (8): Columbus; SARPY (1): Bellevue; WHEELER (1): Pibel Lake.**Temporal.** Rangewide: May to October (Hodges 1971). Nebraska: June (3), July (12), August (2), September (4), October (1).**Larvae.** Green to reddish brown with 5 large, white, oval patches laterally, and with black spiracular dots. Third segment of body enlarged (Wright 1993). Caudal horn replaced with a black "caudal button" on last instar.**Biology.** Larvae feed on Virginia creeper (*Parthenocissus quinquefolia*), grape (*Vitis* spp.) and *Ampelopsis* spp. (Covell 1984).**Remarks.** Distinguished from other species of *Eumorpha* by the olive-green color of both the forewing and the hind wing. Previous authors have referred to this species as *pandorus*. Inasmuch as this species was named after a classical Greek goddess, it should never have had a gender-specific suffix (International Rules of Nomenclature). Even if a gender-specific suffix were to be used, it would have to be *pandora* to agree with the feminine genus *Eumorpha*.**Macroglossini
Genus *Amphion****Amphion* Hübner 1819: 135.

This genus contains only one species (Bridges 1991). It occurs in the United States, including Nebraska and Canada (Hodges 1971). It is a small species with a wingspan less than 5.5 cm, a tufted abdomen, and two yellow horizontal lines on the abdomen. These characters may be used for the identification of this sphingid.

***Amphion floridensis* Clark**

Nessus Sphinx (Plate 7)

Sphinx nessus Cramer 1777: 16 (name preoccupied); *Amphion nessus floridensis* Clark 1920: 7-23.**Description.** FW reddish brown, with dark orange spot on anterior margin near apex, medial band dark brown; postmedial line tan. HW dark brown with proximal $\frac{1}{2}$ dark orange; inner margin yellow. Head and thorax reddish brown. Abdomen dark brown with 2 transverse yellow bands on posterior $\frac{1}{2}$; apex tufted. WS 3.7–5.5 cm.**Distribution.** Rangewide: *Amphion floridensis* occurs over the entire eastern half of the United States and into Manitoba and Nova Scotia. Nebraska: This species occurs over the northern half of the state.**Locality Records** (Map 9). 15 Nebraska specimens examined. CASS COUNTY (2): South Bend; DAWES (1): Chadron;

KEYA PAHA (1): Norden; LANCASTER (2): Lincoln, Hallam; PIERCE (1): Pierce; PLATTE (2): Columbus; RICHARDSON (2): Indian Cave State Park; SIOUX (4): War Bonnet Canyon.

Temporal. Rangewide: February to September (Hodges 1971). Nebraska: May (2), June (67), July (3).

Larvae. Pale brown with yellow granulation and 9 pairs of oblique lateral lines, dorsal line black. Head black dorsally, yellow-green laterally. Caudal horn black.

Biology. Larvae are known to feed on *Ampelopsis* spp., grape (*Vitis* spp.), and cayenne pepper (*Capsicum annuum*) (Covell 1984). Adults are day and dusk flyers (Hodges 1971).

Remarks. This species is recognized by the presence of two bright yellow horizontal bands on the abdomen. Known originally as *Amphion nessus* Cramer, the name was preoccupied by *nessus* Drury 1773. The next available name, *floridensis* Clark 1920, replaced *nessus*.

Genus *Darapsa*

Otus Hübner 1819: 142 (Homonym); *Darapsa* Walker 1856: 182; *Everyx* Ménétriés 1857: 93; *Ampeloeca* Rothschild and Jordan 1903: 522.

This genus contains three Nearctic species (Bridges 1991). All species of *Darapsa* occur in the United States (Hodges 1971), with one occurring in Nebraska. The species in this genus are drab green or brown and have little pattern in the forewings and almost no pattern in the hind wings.

Darapsa myron (Cramer)

Hog Sphinx (Plate 7)

Sphinx myron Cramer 1780: 175; *Sphinx pampinatrix* Smith 1797: 55; *Otus cnotus* Hübner 1823: 23; *Ampeloeca myron texana* Clark 1920: 72.

Description. FW light brown to light olive-green; reniform spot brown to olive-green and triangular to crescent shaped; antemedial and postmedial bands brown to olive-green; outer margin concave; fringe brown. HW orange; patch at anal angle brown to olive-green; anal angle convex. Head, thorax and abdomen light brown to olive-green. WS 5.0–6.5 cm.

Distribution. Rangewide: Entire eastern half of the United States to Texas and north into Ontario and New York, west to North Dakota, Nebraska and Kansas. Nebraska: This species occurs over the entire state except for the southwestern fourth.

Locality Records (Map 9). 66 Nebraska specimens examined. ANTELOPE COUNTY (2): no data; BUFFALO (2): Kearney; CHERRY (2): no data; DAWES (8): Chadron; DIXON (3): no data; DOUGLAS (1): Omaha; FURNAS (3): Holbrook; HALL (1): Mormon Island; HARLAN (1): Alma; JEFFERSON (3): Fairbury; KNOX (1): Niobrara State Park; LANCASTER (7): Lincoln; LINCOLN (1): North Platte; PLATTE (26): Columbus, Wichey Island; SARPY (1): Fontenelle Forest; SEWARD (1): no data; SHERMAN (1): no data; SIOUX (3): War Bonnet Canyon; WASHINGTON (2): Neale Woods.

Temporal. Rangewide: April to September (Hodges 1971). Nebraska: May (2), June (20), July (27), August (13).

Larvae. Green dorsally, bluish ventrally with 7 pairs of green and white, oblique, lateral lines and a series of dark red spots on lateral margin of the body segments. Dorsally with series of yellow markings with red dots. Caudal horn bluish. Colors fade to brown just before pupation. Third segment of body enlarged (Wright 1993).

Biology. Larvae feed on *Ampelopsis* spp., *Viburnum* spp., Virginia creeper (*Parthenocissus quinquefolia*) (Covell 1984), and grape (*Vitis* spp.) (Holland 1903).

Remarks. This species is recognized by the forewing having a concave outer margin, and the hind wing orange with olive-green shading on the anal angle.

Genus *Deidamia*

Deidamia Clemens 1859: 137; *Tricholon* Boisduval 1875: 302.

The genus *Deidamia* contains only one species (Bridges 1991). The single species occurs in the United States and eastern Canada (Bridges 1971) as well as in Nebraska.

Deidamia inscripta (Harris)

Lettered Sphinx (Plate 7)

Pterogon inscriptum Harris 1839: 306.

Description. FW grayish brown; apex black with white spot; antemedial and medial bands dark brown, outer margin deeply scalloped; posterior half of outer margin and anal area dark brown. HW reddish brown; outer margin dark brown; anal area concave; fringe gray. Head and thorax gray. Abdomen gray; 2 small dark brown spots laterally on proximal ½. WS 3.6–7.0 cm.

Distribution. Rangewide: *Deidamia inscripta* occurs throughout the eastern half of the United States from Florida and Louisiana north to Ontario and Quebec, west to North Dakota, Nebraska and Kansas. Nebraska: This species occurs over the entire state.

Locality Records (Map 9). 28 Nebraska specimens examined. BUFFALO COUNTY (5): Fawnswood Lake; DAWES (4): Chadron; DIXON (2): no data; FURNAS (2): Holbrook; KEYA PAHA (1): Norden; MADISON (5): no data; OTOE (1): no data; PLATTE (7): Columbus; SIOUX (1): no data.

Temporal. Rangewide: Early spring to June (Hodges 1971). Nebraska: May (25), June (3).

Larvae. Green with 7 pairs of oblique, lateral lines and 2 dorsal bands on thoracic segments to base of caudal horn. Head with pair of yellow-green lateral bands.

Biology. Larvae feed on *Ampelopsis* spp., Virginia creeper (*Parthenocissus quinquefolia*) and grape (*Vitis* spp.) (Covell 1984).

Remarks. Identification is based on a reddish brown hind wing, and a forewing that is deeply scalloped with a small black and white spot near the apex. Adults seem to fly most commonly just before dawn, although they will fly during the day or night (Hodges 1971).

Genus *Hyles*

Hyles Hübner 1819: 137; *Celero* Agassiz 1846: 14; *Hawaiiina* Tutt 1903: 76.

The genus *Hyles* contains 19 species (Bridges 1991). There are two species in the United States (Hodges 1971), both occurring in Nebraska. In the United States, the species of *Hyles* are recognized by a light colored, longitudinal stripe that extends from the apex of the forewing to the base and by white, vertical stripes on the side of the abdomen.

Hyles gallii (Rottenberg)

Gallium Sphinx (Plate 7)

Sphinx gallii Rottenburg 1775: 107; *Deilephila intermedia* Kirby 1837: 302; *Deilephila chamaenerii* Harris 1839: 305; *Deilephila oxybaphi* Clemens 1859: 145; *Deilephila canadensis* Guenee 1868: 7.

Description. FW dark olive-brown; tan stripe from apex to wing base, with small amount of white on proximal edge; inner margin gray to gray-brown; black area at base of wing. HW light pink to red-orange, dark brown at wing base; dark brown stripe from apex to anal angle; small white area at anal angle. Head dark olive-brown with white stripe above eye. Thorax dark olive-brown with white tegula. Abdomen dark olive-brown with indistinct, white medial spots; two black and white broken lateral stripes on posterior. WS 6.3–9.0 cm.

Distribution. Rangelwide: *Hyles gallii* occurs in the northern half of the United States from Pennsylvania, Colorado and California to the Yukon Territories, North West Territories and Labrador. It also occurs in temperate Europe and northern Turkey to Japan (D'Abrera 1986). Nebraska: This species occurs sporadically over the northern half of the state.

Locality Records (Map 10). 3 Nebraska specimens examined. DAWES COUNTY (1): Chadron; DIXON (1): no data; SCOTTS BLUFF (1): Mitchell.

Temporal. Rangelwide: May into summer (Hodges 1971). Nebraska: May(1), June(1), July (1).

Larvae. Extremely variable. Red-brown or brown; paired dorsolateral spots are black or greenish yellow outlined in black, with a series of yellow dots below the spots, arranged in lateral rows. Spiracles pale yellow outlined in black. Caudal horn black or red.

Biology. Larvae feed on bedstraw (*Galium* spp.) and willow (*Salix* spp.) (Covell 1984). Hodges (1971) reports larvae also feeding on woodruff (*Asperula orientalis*) and *Clarkia* spp.

Remarks. *Hyles gallii* is rare in Nebraska because Nebraska is at the southern edge of its range. It is distinguished from other species of *Hyles* by a broad, tan stripe on the forewing without white stripes on the veins, and a broad pink stripe on the hind wing from the apex to the anal angle.

Hyles lineata (Fabricius)

White Lined Sphinx (Plates 1, 7)

Sphinx lineata Fabricius 1775: 541; *Sphinx daucus* Cramer 1777: 148.

Description. FW dark brown with tan veins; brown spot at wing base; costal margin brown; tan stripe from apex to wing base; inner margin gray. HW dark brown with pink medial stripe; inner and outer margins white. Head brown. Thorax brown with white, lateral stripes. Abdomen brown with alternating, broken, black and white lateral stripes; some pink on sides. WS 6.3–9.0 cm.

Distribution. Rangelwide: *Hyles lineata* occurs over the entire United States. It also is found in all of Central America, South America (except Brazil), the West Indies, and Hawaii (D'Abrera 1986). Presumably, it also occurs in Brazil. Nebraska: This species occurs over the entire state.

Locality Records (Map 10). 185 Nebraska specimens examined. ADAMS COUNTY (23): no data; BROWN (3): no data; BUFFALO (6): Kearney; CHEYENNE (1): no data; CLAY (25): Clay Center; COLFAX (1): no data; DAWES (15): Chadron; DAWSON (4): no data; DIXON (16): Concord; DOUGLAS (2): Omaha; FILMORE (1): Fairmont; FRONTIER (2): Curtis, Harry Strunk Lake; FURNAS (3): Holbrook; GAGE (2): Adams, Beatrice; HALL (2): Mormon Island; HAMILTON (2): Aurora; HARLAN (1): Huntley; JEFFERSON (1): Fairbury; KEARNEY (3): Kearney; LANCASTER (18): Hickman, Lincoln; LINCOLN (12): Maxwell, North Platte; MADISON (2): no data; MERRICK (2): Central City; NUCKOLLS (1): no data; PERKINS (1): Grant; PLATTE (26): Columbus; POLK (1): no data; SCOTTS BLUFF (16): Mitchell, Scottsbluff; SEWARD (1): no data; SHERIDAN (4): no data; SHERMAN (2): Litchfield; WASHINGTON (1): Blair.

Temporal. Rangelwide: Spring through fall (Hodges 1971). Nebraska: April (2), May (13), June (52), July (45), August (40), September (43), October (7).

Larvae. Head green, with white or yellow granules. Body green, with series of subdorsal oval spots that are white or yellow with red dot inside and outlined in black. In dark forms, black outlines merge into a pair of longitudinal stripes either side of midline. Spiracle dots a series of 2 or 3 yellow or reddish, vertical ovals outlined in black. Caudal horn greenish yellow or black. Anal proleg and anal plate green with white or yellow granules. These larvae can be quite variable, as evidenced by the 2 specimens illustrated in Fig. 1.

Biology. Covell (1984) indicated that larvae feed on apple (*Malus* spp.), four-o'clock (*Mirabilis* sp.) and willow (*Salix* spp.). Hodges (1971) reports larvae also feeding on portulaca (*Portulaca* spp.) and fuchsia (*Fuchsia* spp.). Adults are found on various flowers, including *Phlox* sp. and *Gaura lindheimeri* (Hodges 1971).

Remarks. *Hyles lineata* is separated from other species of *Hyles* by a forewing that has a tan stripe extending from the apex to the wing base and with white stripes on the wing veins and a wide pink stripe on the hind wing from the apex to the anal angle. Larvae will aggressively strike if touched, although they are totally harmless. The pupae lack the usual sphingid free tongue case, having instead a proboscis which is totally inclosed in the pupal case.

Genus *Proserpinus*

Proserpinus Hübner 1819: 132; *Pterogon* Boisduval 1828: 32; *Pteropogon* Meigen 1829: 129; *Lepisesia* Grote 1865: 38; *Pogolon* Boisduval 1875: 314; *Diences* Butler 1881: 308.

The genus *Proserpinus* contains six Holarctic species (Bridges 1991), with six occurring in the United States (Hodges 1971). Only one occurs in Nebraska. The Nebraska species can be identified by its small size (less than 5 cm) and by the proximal three fourths of the hind wing being yellow-orange.

Proserpinus juanita (Strecker)

Strecker's Day-sphinx (Plate 7)

Pterogon juanita Strecker 1877: 112; *Proserpinus juanita oslari* Rothschild and Jordan 1903: 610.

Description. FW light olive-green; reniform spot small, black, oblong; medial band dark olive-green; apex dark green with small olive-green spot. HW yellowish orange; proximal ½ inner margin dark green; distal ½ of inner margin black to dark reddish brown; fringe pale olive-green. Head, thorax, and abdomen light olive-green. WS 4.3–4.8 cm.

Distribution. Rangewide: South central United States, Arizona, Colorado. Specimens were also taken by Bowman in Alberta (Hodges 1971). Nebraska: This species occurs in the north western fourth of the state.

Locality Records (Map 10). 15 Nebraska specimens examined. DAWES COUNTY (4): Chadron, Meng Ranch; DAWSON (1): Gothenburg; KEWA PAHA (1): Norden; SIOUX (9): Crawford, Monroe Canyon, Sowbelly Canyon.

Temporal. Rangewide: Late spring through late summer (Hodges 1971). Nebraska: May (3), June (4), July (1).

Larvae. Green with pale dorsal line. Final instar is bright red with a whitish lateral band and a series of black dots and lines; ventral surface cream colored. Spiracles outlined in black. Caudal horn reduced to a "caudal button" ringed with black.

Biology. Larvae feed on evening primrose (*Oenothera* spp.) and willow-herbs (*Epilobium* spp.) (Covell 1984).

Remarks. Separated from similar species of *Proserpinus* by the presence, on the hind wing, of a black outer border and a green to olive-green underside of the hind wing. They are also somewhat larger than other species of *Proserpinus*. Adults are mainly day-flying (Heitzman 1987).

Genus *Sphecodina*

Sphecodina Blanchard 1840: 478; *Brachynota* Boisduval 1870: 66; *Maredu* Kirby 1880: 330.

The genus *Sphecodina* contains two species (Bridges 1991), one Nearctic and one Palearctic (Hodges 1971). Only one species of this genus occurs in the United States (Hodges 1971), and it also occurs in Nebraska.

Sphecodina abbotti (Swainson)

Abbott's Sphinx (Plate 7)

Thyreus abbotti Swainson 1821: 60.

Description. FW dark brown with postmedial band black on anterior ½; black curved lines from center of postmedial band to center of inner margin; band of light brown from near apex to center of inner margin; black, wedge-shaped markings near apex; apical dash black; outer margin scalloped. HW yellow, outer ⅓ along inner margin dark brown; series of black lines from anal angle along proximal half of the inner margin. Head and thorax gray, with black horizontal lines. Abdomen dark brown with broad, gray, horizontal band; apex yellow and dark brown, tufted. WS 5.8–7.0 cm.

Distribution. Rangewide: Eastern half of the United States from Maine and Florida west to Texas and Nebraska and north into southern Canada. Nebraska: This species occurs in the southeastern fourth of the state.

Locality records (Map 11). 8 Nebraska specimens examined. CASS COUNTY (1): Louisville; HALL (1): Mormon Island; PLATTE (5): Columbus; SARPY (1): Fontenelle Forest.

Temporal. Rangewide: March to August (Hodges 1971). Nebraska: May (2), June (4).

Larvae. Extremely variable. Brown to pinkish with either dark reddish brown, oblique, lateral lines or broad, green, semicircular patches both dorsally and laterally. Caudal horn replaced by a "caudal button".

Biology. Larvae feed on grape (*Vitis* spp.) and *Ampelopsis* spp. (Hodges 1971). Males seem to fly mainly at dusk while females seem to fly mainly at about midnight (Covell 1984).

Remarks. *Sphecodina abbotti* is recognized by the yellow band on the costal margin of the hindwing. This species makes a loud buzzing sound while feeding, similar to the buzz of a night-flying hymenopteron, probably as a defensive mechanism (Heitzman 1987).

Genus *Xylophanes*

Xylophanes Hübner 1819: 136; *Isoples* Hübner 1819: 135; *Deilonche* Grote 1886: 30; *Gonenyo* Rothschild 1894: 298.

The genus *Xylophanes* contains 89 species (Bridges 1991). Four species occur in the United States (Hodges 1971), with only one occurring in Nebraska.

Xylophanes tersa (Linné)

Tersa sphinx (Plate 7)

Sphinx tersa Linné 1771: 538.

Description. FW light brown with series of buff lines from apex to anal angle; reniform spot very small, black; post medial line brown. HW dark brown with black costal margin and jagged yellow to yellow-white medial area. Head and thorax yellow-buff with buff lateral stripes and olive-brown dorsal band, tegula with lateral orange stripe. Abdomen long, pointed, yellow-buff ventrally, and yellow-brown dorsally. WS 6.0–8.0 cm.

Distribution. Rangewide: Eastern three fourths of United States from Arizona to New York and into Ontario, and south to Argentina and the West Indies. Nebraska: This species occurs over the entire state, probably only as a stray.

Locality Records (Map 11). 5 Nebraska specimens examined. PLATTE COUNTY (4): Columbus; SCOTTS BLUFF (1): no data.

Temporal. Rangewide: Summer and fall (Hodges 1971). Nebraska: June (3), July (1), August (1).

Larvae. Yellow-brown with a pair of dorsal lines and a yellow, lateral stripe paired with black spots. Caudal horn black.

Biology. Larvae feed on *Manettia* spp., buttonbush (*Cephalanthus* spp.) and starcluster (*Pentas* spp.) (Covell 1984). Heitzman (1987) reported larvae also feed on catalpa (*Catalpa* spp.).

Remarks. This species is identified by the unusually long and pointed abdomen and by the contrasting bright yellow and black markings on the hind wing.

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- Cornutus—chitinized spine at the apex of the aedeagus in the male genitalia.
- Corpus bursae—pouch at the end of the *ductus bursae* in the female genitalia.
- Crepuscular—active at dawn or dusk.
- Dimorphism—having different, distinct forms between individuals of the same species.
- Discal—central area.
- Diurnal—active during the day.
- Dorsal—upper surface of back or wing.
- Ductus bursae—duct in the female genitalia between the genital plate and the *corpus bursae*.
- Ductus seminalis—tube connecting to the *ductus bursae* in the female genitalia.
- Frenulum—spine located at the base of the costal margin of the hind wing for locking together the hind wing and the forewing while in flight.
- Filiform—thread-like.
- Genital plate—a sclerotized structure surrounding the *ductus bursae* in the female genitalia.
- Genital pore—aperture in abdomen of female Lepidoptera.
- Glabrous—without hair or pubescence.
- Gnathos—paired appendages arising from the tegumen in the male genitalia.
- Harpe—paired appendages on the claspers of the males.
- Instar—stage between molts during larva stage.
- Integument—outer covering of an insect's body.
- Labial palp—pair of sensing appendages that project forward from the lower part of the head.
- Lateral—relating to the side.
- Medial—at the middle.
- Nocturnal—active at night.
- Orbicular—spherical.
- Papillae anales—paired ovipositor lobes located at the distal end of the abdomen in the female.
- Pheromone—chemical secreted by an organism for conveying information to another individual.
- Polypodous—having many feet.
- Postmedial—after the middle.
- Proboscis—tubular feeding structure of certain adult insects that can also be expressed in the pupal stage.
- Pulvillus—pad-like structure between the tarsal claws containing sensing receptors.
- Pupa—transition stage in the metamorphosis of Lepidoptera between larva and adult.
- Reniform—kidney shaped.
- Retimaculum—structure on the inner margin of the forewing for the frenulum to attach to during flight.
- Scale—flattened, modified hairs, which, in most species, form the wing covering and cause the wing coloration.
- Sclerotized—hardened by the deposition of chitin.
- Setae—hairs or bristles.
- Signum—sclerotised structure in the wall of the *corpus bursae* of the female.
- Spiracles—breathing pores located in the lateral side of the abdomen of insects.
- Subreniform—almost kidney shaped.
- Tarsal—pertaining to the feet.
- Tegula—a small appendage just above and in front of the base of the forewing.
- Tegumen—a hood-like sclerotized structure in the male genitalia.

GLOSSARY

(Modified from J. R. Torre-Bueno 1937.)

- Aedeagus—distal part of the phallus in the male genitalia.
- Anal angle—angle between inner and outer margin of wing.
- Annulets—in Lepidoptera, a series of rings on each body segment.
- Antemedial—before the middle.
- Apex—point where costal and outer margins of the wing meet; point of wing furthest from base.
- Apical—at or near the apex.
- Base—that point of any structure nearest the body.
- Caudal—anal end of abdomen.
- Caudal horn—horn-like structure located on the dorsal side of the terminal segment of the abdomen of certain larvae.
- Clasper—paired clasping structure in the genitalia of certain male Lepidoptera.
- Chitin—chemical polysaccharide which hardens tissue and produces the exoskeleton and other hard parts of an insect.

- Tornus—anal angle of wing.
 Transverse—across.
 Uncus—a curved hook on the tegumen above the aedeagus in
 the male genitalia.
 Ventral—bottom surface of the body or wing.

CHECKLIST OF THE SPHINGIDAE OF NEBRASKA

SPHINGINAE

Sphingini

- Agrius cingulatus* (Fabricius) 98 (Map 1; Plate 2)
Ceratonia amyntor (Geyer) 99 (Fig. 12; Map 1; Plates 1, 2)
C. catalpae (Boisduval) 102 (Figs. 10, 16, 17; Map 1; Plates 1, 2)
C. hageni Grote 102 (Fig. 13; Map 2; Plate 3)
C. undulosa (Walker) 102 (Figs. 11, 14, 15; Map 2; Plate 3)
Manduca quinquemaculata (Haworth) 103 (Map 2; Plates 1, 3)
M. sexta (Linné) 103 (Map 3; Plate 3)
Paratreia plebeja (Fabricius) 104 (Map 3; Plate 3)
Sphinx canadensis Boisduval 104 (Map 3; Plate 4)
S. chersis (Hübner) 105 (Map 4; Plate 4)
S. drupiferarum Smith 105 (Map 4; Plate 4)
S. kalmiae Smith 105 (Map 4; Plate 4)
S. vashti Strecker 106 (Map 5; Plate 4)

Smerinthini

- Laothoe juglandis* (Smith) 106 (Map 5; Plates 1, 5)
Pachysphinx modesta (Harris) 107 (Map 5; Plate 5)
Paonias excaecatus (Smith) 107 (Map 6; Plate 5)
P. myops (Smith) 108 (Map 6; Plate 5)
Smerinthus jamaicensis (Drury) 108 (Map 6; Plate 5)

MACROGLOSSINAE

Dilophonotini

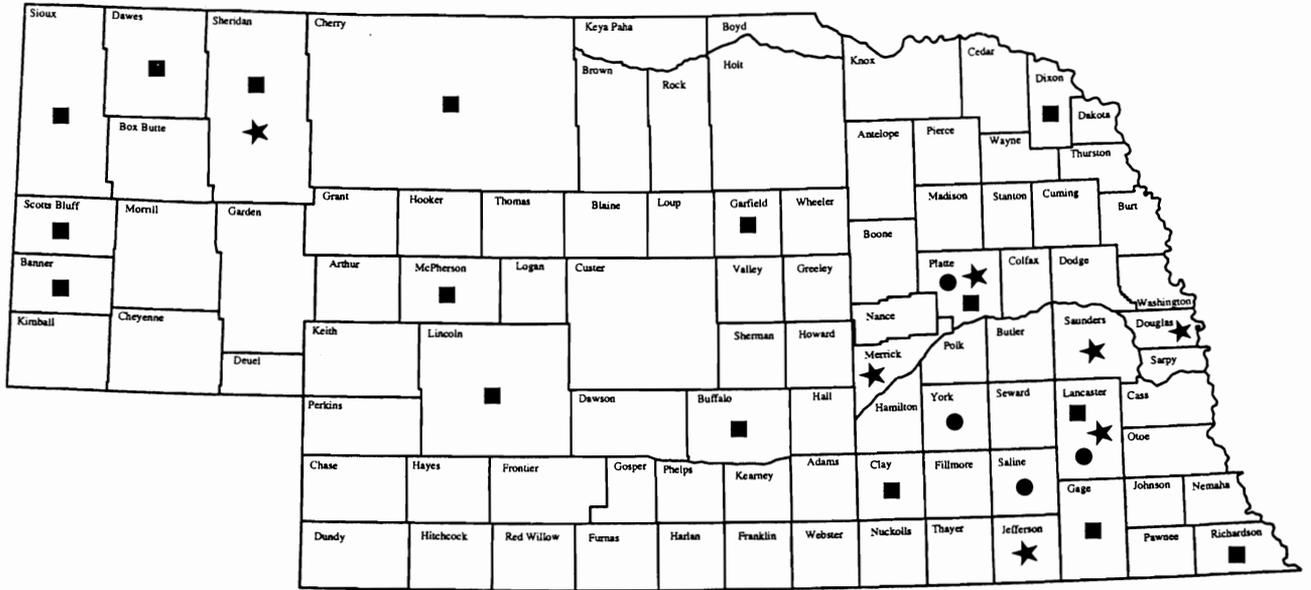
- Aellopos titan* (Cramer) 109 (Map 7; Plate 6)
Erinnyis obscura (Fabricius) 109 (Map 7; Plate 6)
Hemaris diffinis (Boisduval) 109 (Map 7; Plates 1, 6)
H. thysbe (Fabricius) 110 (Map 8; Plate 6)

Philampelini

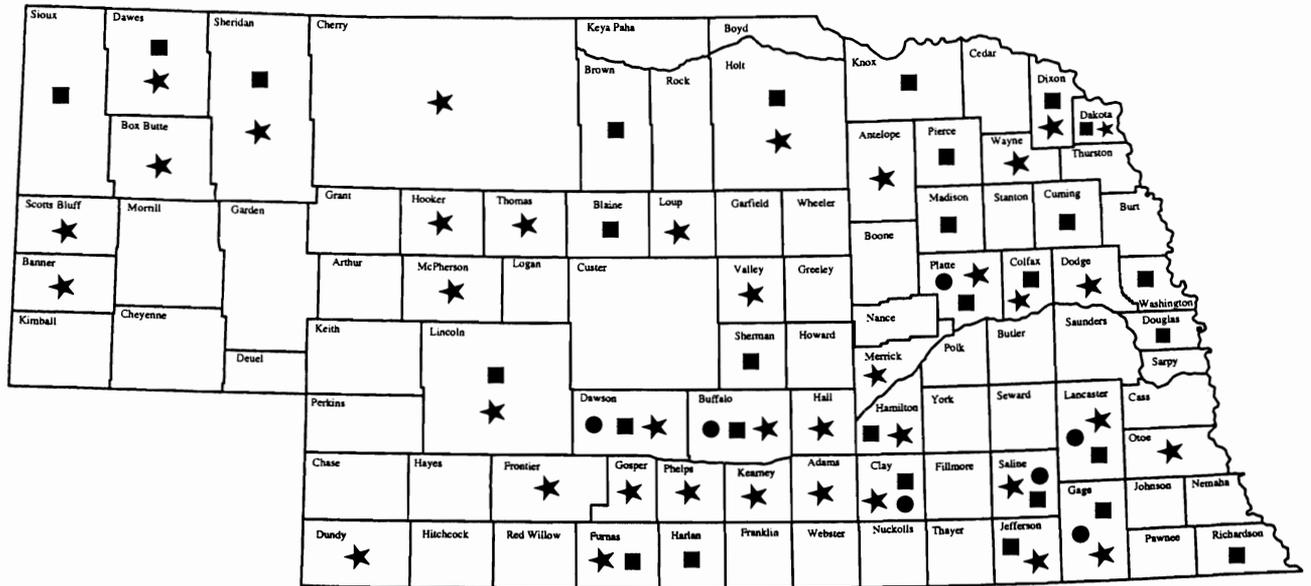
- Eumorpha achemon* (Drury) 111 (Map 8; Plate 6)
E. pandora (Hübner) 111 (Map 8; Plates 1, 6, 8)

Macroglossini

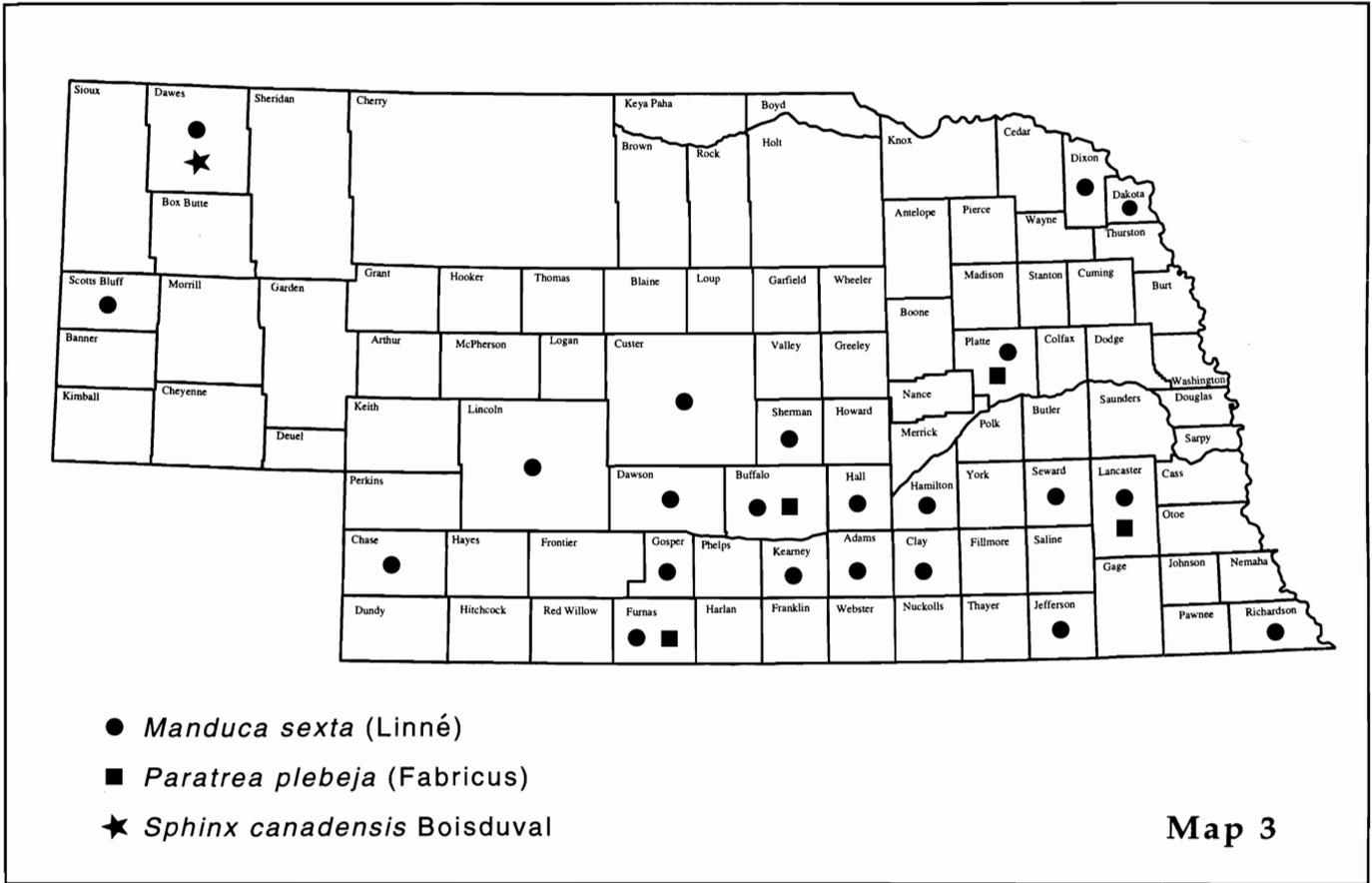
- Amphion floridensis* Clark 111 (Map 9; Plate 7)
Darapsa myron (Cramer) 112 (Map 9; Plate 7)
Deidamia inscripta (Harris) 112 (Map 9; Plate 7)
Hyles gallii (Rottenburg) 113 (Map 10; Plate 7)
H. lineata (Fabricius) 113 (Map 10; Plates 1, 7)
Proserpinus juanita (Strecker) 114 (Map 10; Plate 7)
Sphecodina abbotti (Swainson) 114 (Map 11; Plate 7)
Xylophanes tersa (Linné) 114 (Map 11; Plate 7)



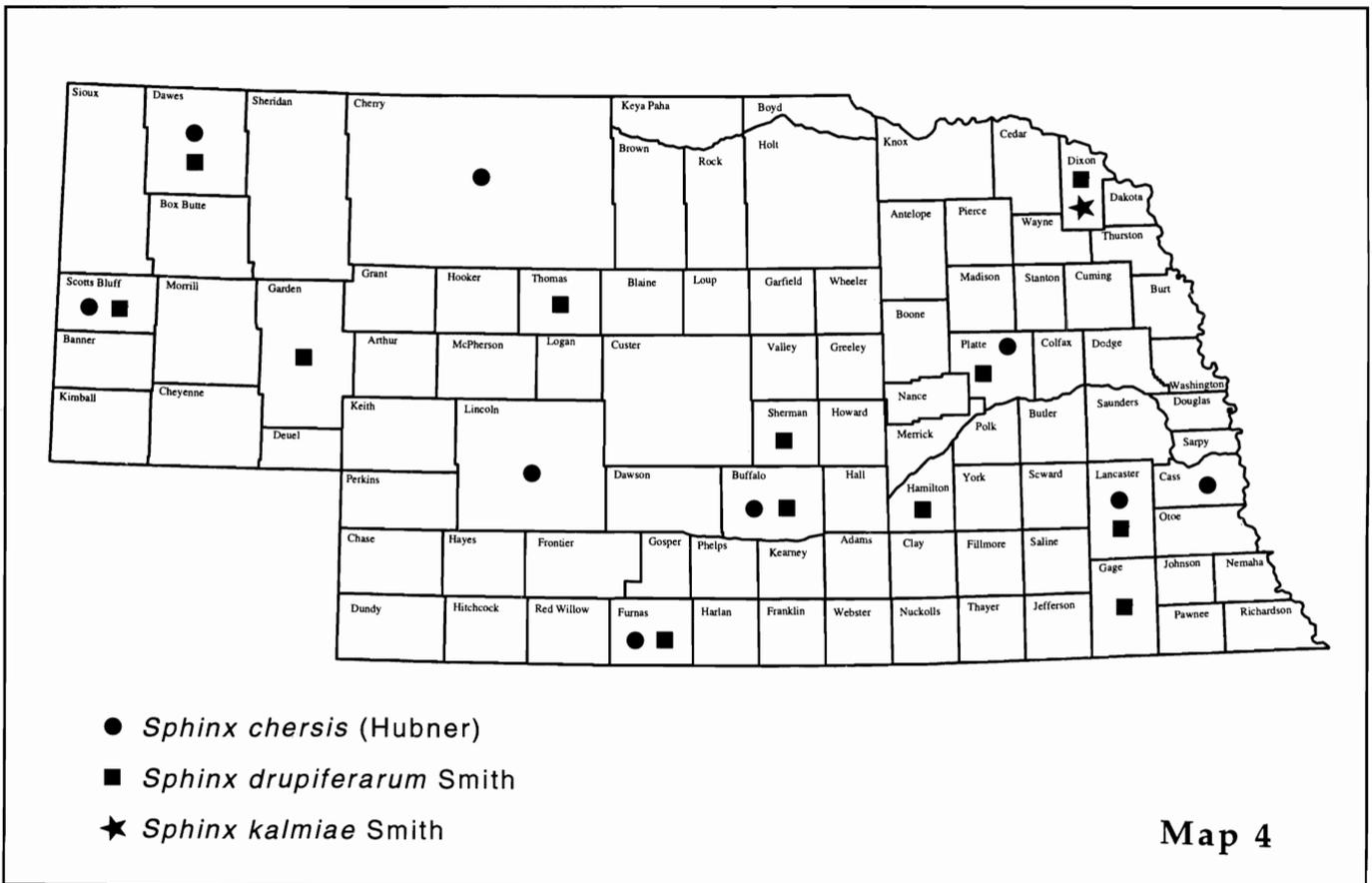
Map 1



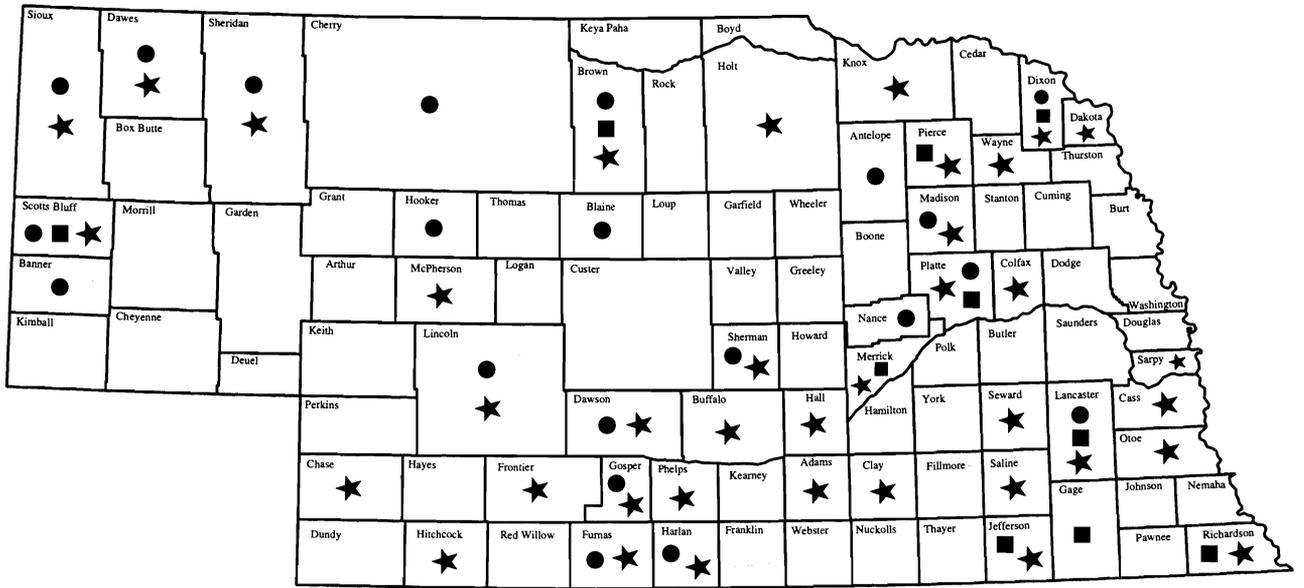
Map 2



Map 3

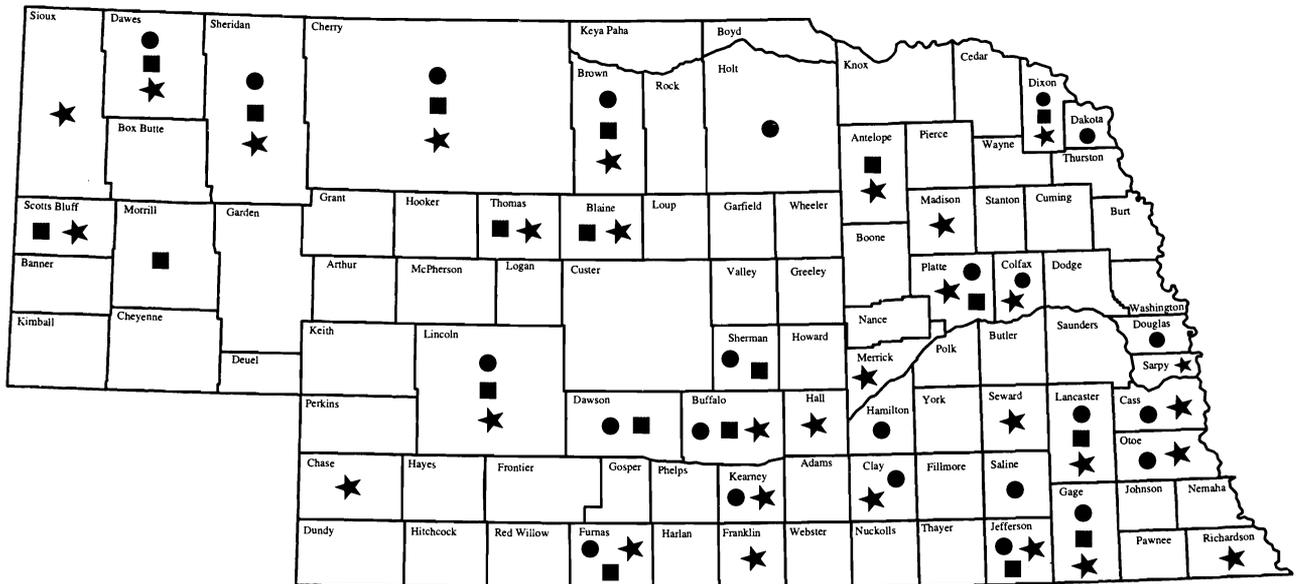


Map 4



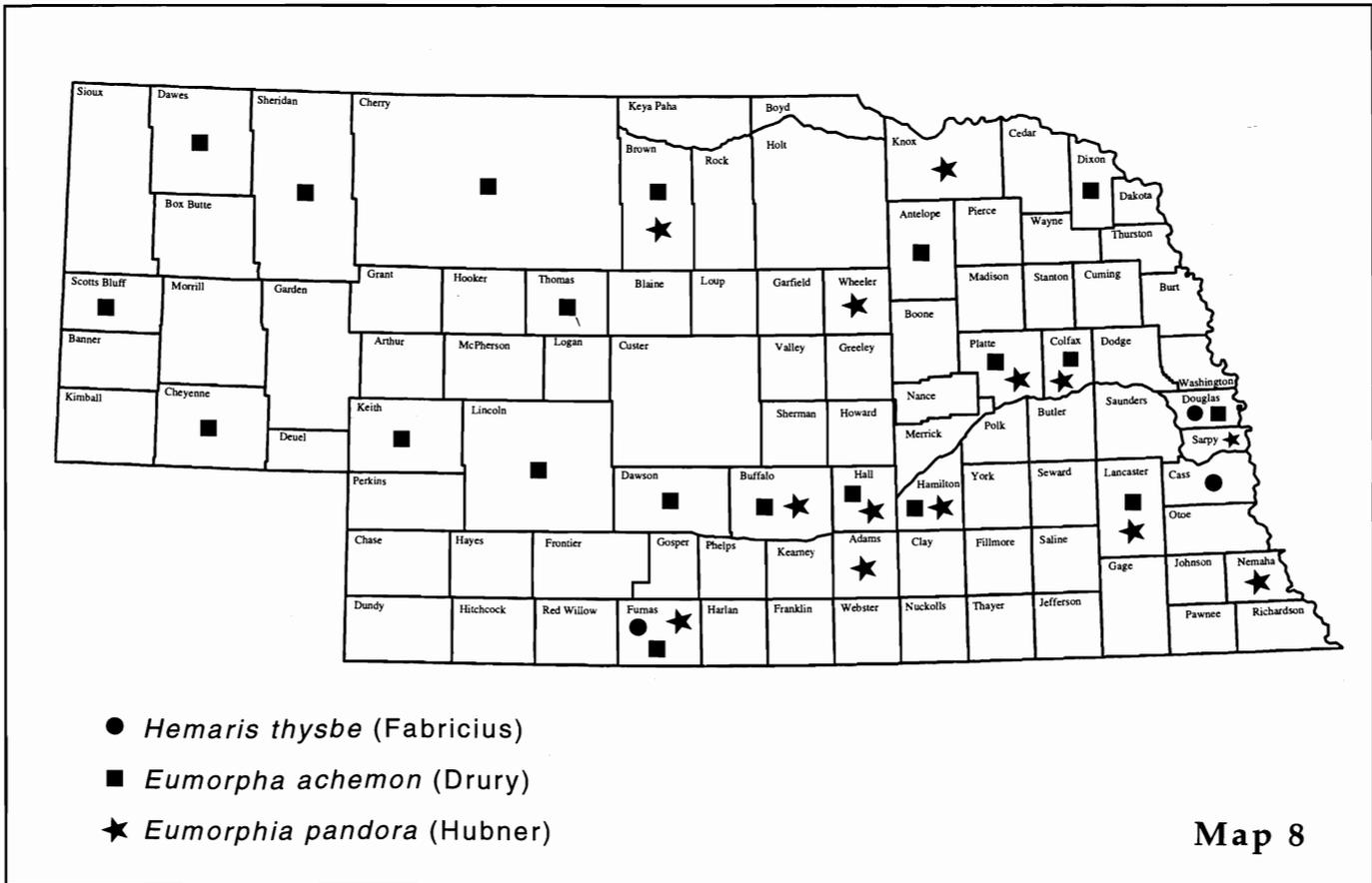
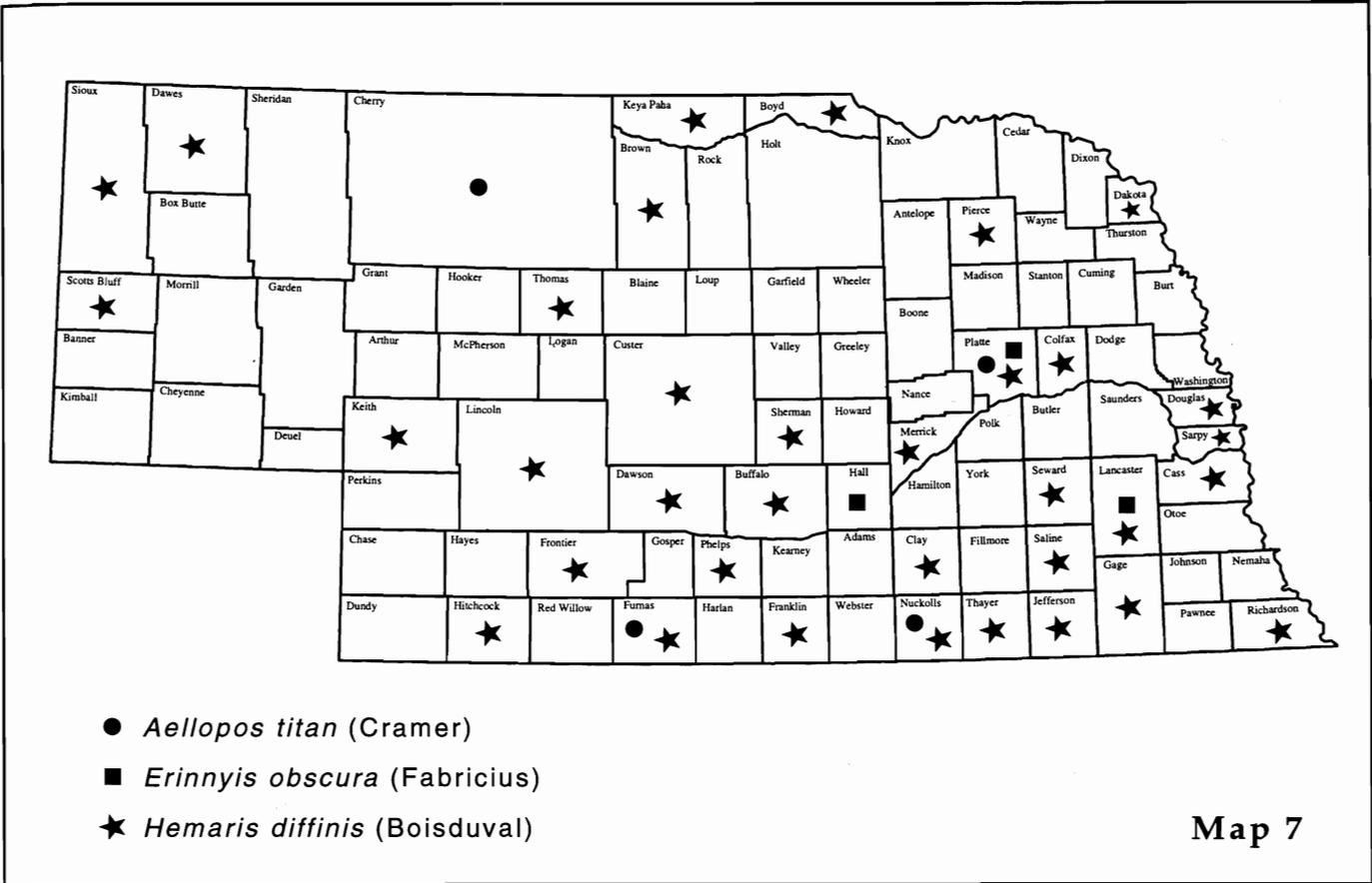
- *Sphinx vashti* Strecker
- *Laothoe juglandis* (Smith)
- ★ *Pachysphinx modesta* (Harris)

Map 5



- *Paonias excaecatus* (Smith)
- *Paonias myops* (Smith)
- ★ *Smerinthus jamiacensis* (Drury)

Map 6



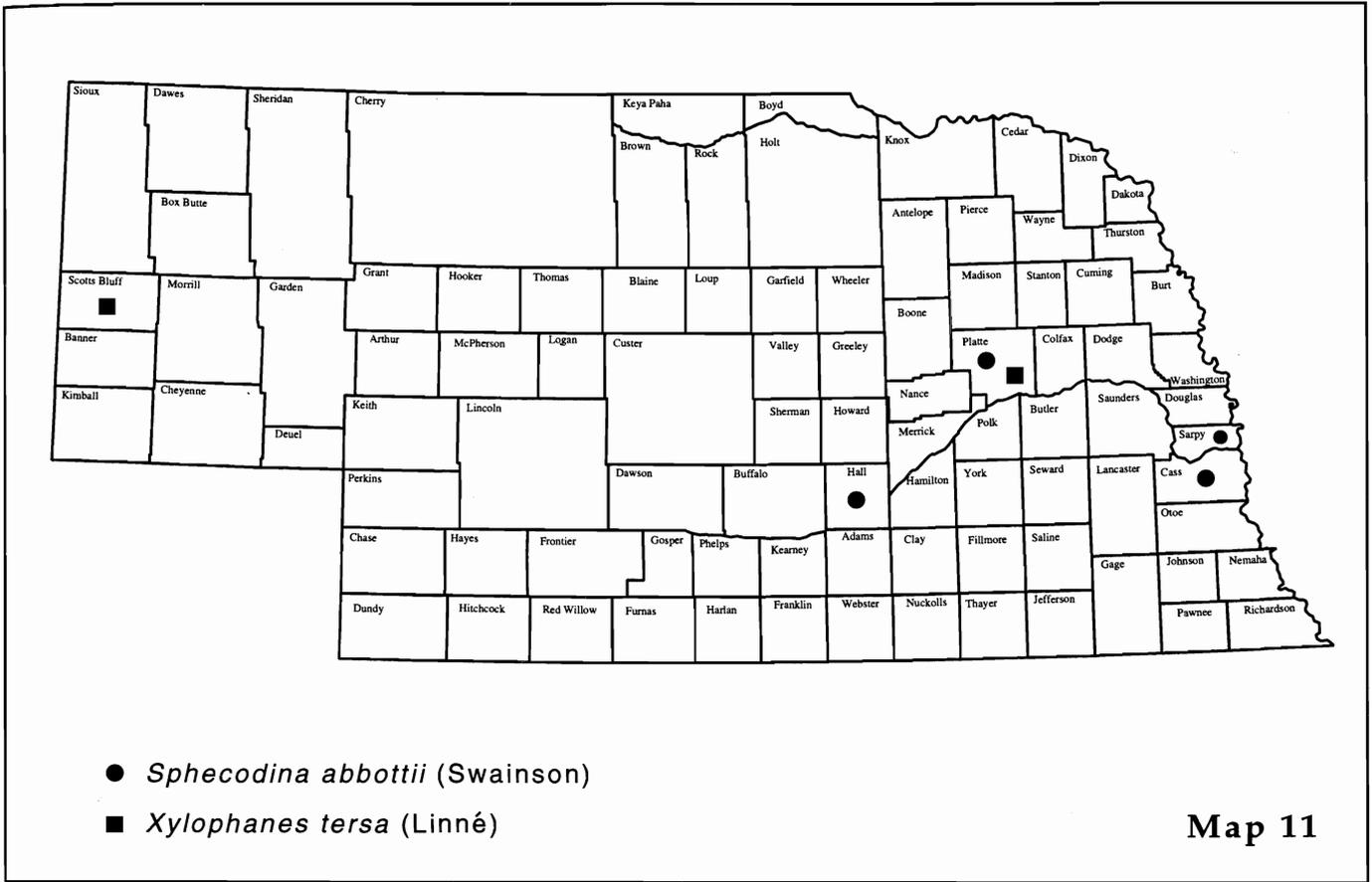




Plate 1. Sphingid larvae. From left to right and top to bottom: (1) *Laothoe juglandis*, (2) *Ceratomia catalpae*, (3) *Hemaris diffinis*, (4) *Manduca quinquemaculata*, (5) *Ceratomia amyntor*, (6) *Eumorphia pandora*, and two types (7, 8) of *Hyles lineata*. Numbers 1, 5, and 7 courtesy of J. Heitzman; numbers 3, 4, and 6 courtesy of James Kalish; numbers 2 and 8 by the author.



Plate 2. From top to bottom: *Agrius cingulatus*, *Ceratomia amyntor*, *Ceratomia catalpae*, *Ceratomia hageni*, all $\times 1$.



Plate 3. From top to bottom: *Ceratomia undulosa*, *Manduca quinquemaculata*, *Manduca sexta*, *Paratreia plebeja*, all $\times 1$.



Plate 4. From top to bottom: *Sphinx canadensis*, *Sphinx chersis*, *Sphinx drupiferarum*, *Sphinx kalmiae*, *Sphinx vashti*, all $\times 1$.



Plate 5. From top to bottom: *Laothoe juglandis*, *Pachysphinx modesta*, *Paonias excaecatus*, *Paonias myops*, *Smerinthus jamaicensis*, all $\times 1$.



Plate 6. From left to right and top to bottom: *Aellopos titan*, *Erinnyis obscura*, *Hemaris diffinis*,
Hemaris thysbe, *Eumorpha achemon*, *Eumorpha pandora*, all $\times 1$.



Plate 7. From left to right and top to bottom: *Amphion floridensis*, *Darapsa myron*, *Deidamia inscripta*, *Hyles gallii*, *Hyles lineata*, *Proserpinus juanita*, *Sphecodina abbotti*, *Xylophanes tersa*, all $\times 1$.



Plate 8. Pandora's sphinx moth (*Eumorpha pandora*) feeding on hedge bindweed (*Calystegia sepium*). Painting by Dan Schmidt.

