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## *Hypena opulenta* Ukrainian swallow-wort moth

*Hypena opulenta* is a biological control agent approved in North America for release against swallow-worts.

### CLASSIFICATION

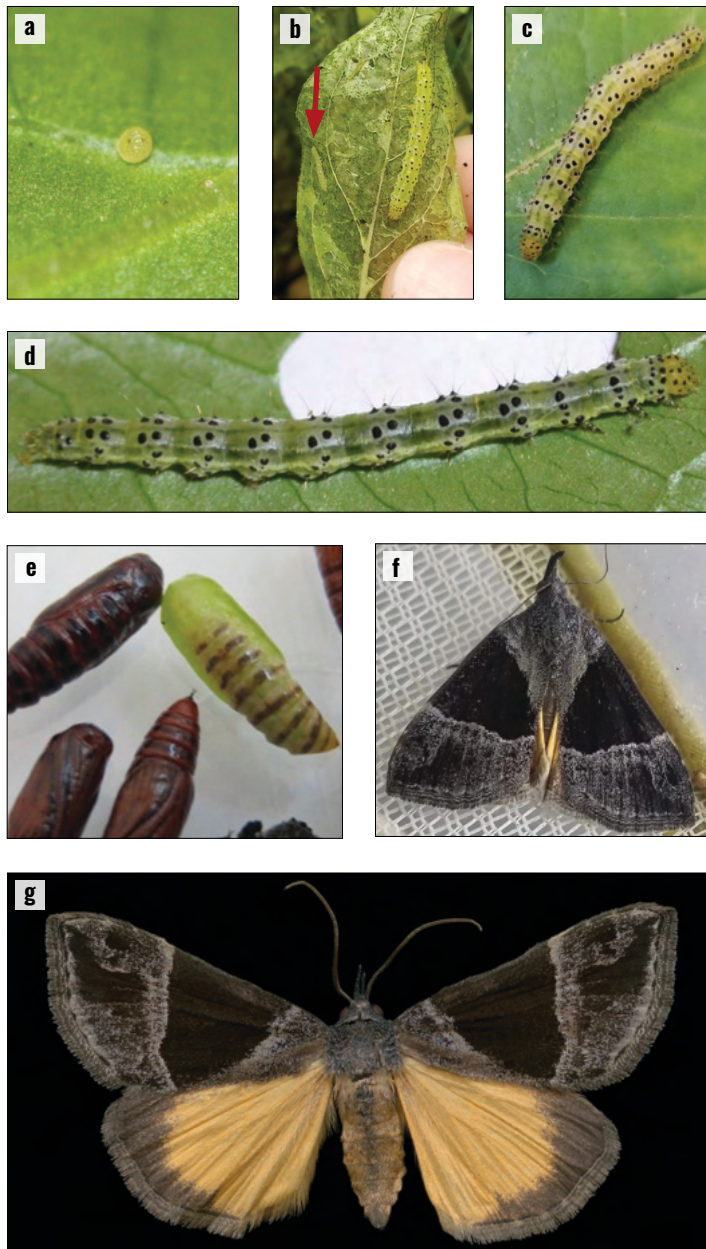
RANKING	SCIENTIFIC NAME	COMMON NAME
Kingdom	Animalia	Animals
Phylum	Arthropoda	Arthropods
Class	Insecta	Insects
Order	Lepidoptera	Moths and butterflies
Family	Erebidae	Erebid moths
Genus	<i>Hypena</i>	
Species	<i>Hypena opulenta</i> (Christoph)	Ukrainian swallow-wort moth

### DESCRIPTION

Eggs are small, spherical, and pale yellow (Fig. 1a). Larvae are pale green initially (Fig. 1b) but gradually turn a deep green with prominent black spots and faint longitudinal stripes (Fig. 1c,d). At maturity, larvae are up to 2.2 cm long and have a yellow head capsule. Pupae are up to 2 cm long and are bright green initially, but as they harden, they turn a dark reddish-brown (Fig. 1e). Adults are up to 1 cm long with a 3-cm wide wingspan. The forewings are a mottled gray-brown with dark brown centers (Fig. 1f) while the hindwings are pale yellow with brown edges (Fig. 1g).

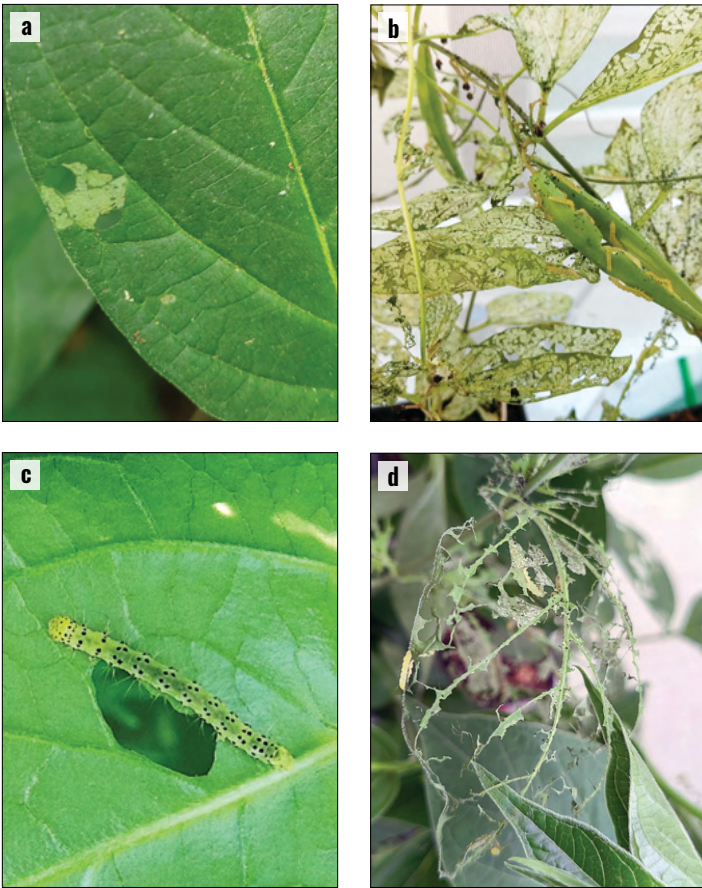
### LIFE CYCLE

Pupae overwinter in soil and plant litter. Adults emerge in spring and lay up to 400 eggs singly on the undersides of swallow-wort leaves or leaf petioles. Hatching larvae feed on swallow-wort leaves through five instars. Early instars strip the photosynthetic tissue off leaves while leaving the upper leaf cuticle and epidermis intact, creating a “window-pane” effect (Fig. 2a,b), while later instars skeletonize leaves by feeding on all leaf tissue between the largest veins (Fig. 2c,d).



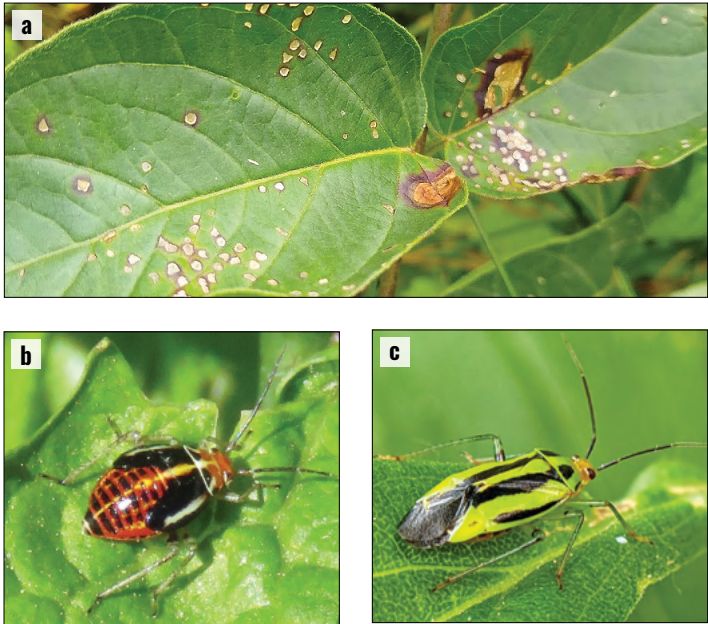
**Figure 1.** *Hypena opulenta* (a) egg; (b) early-instar (red arrow) and mid-instar larvae; (c,d) later-instar larvae; (e) immature (green) and mature (brown) pupae; (f,g) adult (a,e: Lisa Tewksbury, University of Rhode Island; b,c,f: Brianna Foster, Michigan State University; d: Jeromy Biazzo, USDA-ARS; g: Jeem 123, voucher specimen provided by Naomi Cappuccino, Carleton University CC BY-SA 3.0)

Fifth instars prepare pupation sites by constructing a silk chamber either on leaves or in the soil or leaf litter. New adults emerge in late summer. There can be up to two overlapping



**Figure 2.** *Hypena opulenta* feeding damage (a,b) leaf “window-pane” effect from early-instar larvae; (c,d) late-instar larvae skeletonizing leaves; b,d damage at artificially high densities in a cage (a,d: Brianna Foster, Michigan State University; b: Marianna Szűcs, Michigan State University; c: Naomi Capuccino, Carleton University)

generations per year, depending on temperature and the length of the growing season. Laboratory development time from egg to adult is 5–6 weeks on average. In Canada, two generations have been observed (Fig. 3). If the insect establishes in the USA, a similar pattern of two generations is expected in northern states (e.g., New York and Michigan) whereas further south, a single generation is more likely.



**Figure 4.** Fourlined plant bug (a) feeding marks on a swallow-wort leaf; (b) nymph; (c) adult (a: Marianna Szűcs, Michigan State University; b: Andy Daun, iNaturalist.org CC BY-NC 4.0; c: Claire O’Neill, iNaturalist.org CC BY-NC 4.0)

**DAMAGE**

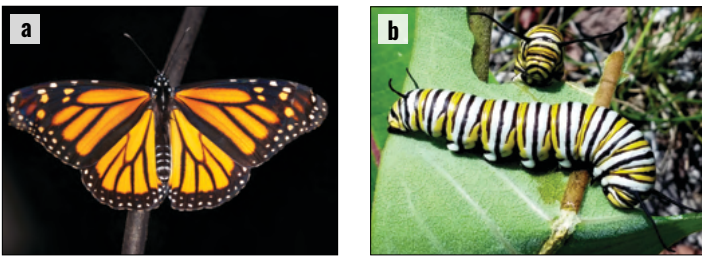
Defoliation by larvae reduces plant biomass and reproductive output.

**FIELD IDENTIFICATION**

Where established, larvae can be observed feeding on swallow-wort foliage throughout summer and up to early September if there are two generations (Fig. 1b–d). Their conspicuous coloration helps differentiate them from other species. No other biocontrol agents are established on swallow-worts in North America, and due to the toxicity of the plant sap, most other insect species avoid swallow-worts. A few generalist species, such as the native fourlined plant bug (*Poecilocapsus lineatus*), may occasionally feed on swallow-worts for a short period. Damage caused by

BLACK SWALLOW-WORT		SEEDLINGS/SPROUTING		SEEDLINGS/ FLOWERING		FEW SEEDLINGS/ FLOWERING/ MATURE/ SEED DISPERSAL							
PALE SWALLOW-WORT		SEEDLINGS/SPROUTING		SEEDLINGS/ FLOWERING		FEW SEEDLINGS/ MATURE/ SEED DISPERSAL							
<i>Hypena opulenta</i>	Egg												
	Larva												
	Pupa												
	Adult												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

**Figure 3.** Schematic life cycle of *Hypena opulenta* and swallow-worts in North America. Bars indicate the approximate length of activity for each life stage; dates will vary depending on local conditions. Black bars represent the inactive and/or overwintering periods. Swallow-wort seeds often sprout throughout the entire growing season. There are multiple overlapping *H. opulenta* generations per year, but most frequently 1–2 in the native range.



**Figure 5.** Monarch butterfly (a) adult; (b) larva (a: Fam-esquivel, iNaturalist.org CC BY-NC 4.0; b: Ken Potter, iNaturalist.org CC BY-NC 4.0)

fourlined plant bugs typically consists of smaller, distinct feeding marks (**Fig. 4a**), so heavy “window-pane” feeding and leaf skeletonization (**Fig. 2**) are generally indicative of *H. opulenta* establishment, even if larvae are not observed actively feeding. Fourlined plant bugs can be readily differentiated because they are true bugs rather than moths; their nymphs are bright red and black (**Fig. 4b**), and their adults are black with bright greenish-yellow with four distinct black lines (**Fig. 4c**). Monarch butterflies (*Danaus plexippus*; **Fig. 5a**) occasionally lay eggs on swallow-worts; however, their larvae die without completing development on swallow-worts. Monarch butterfly larvae are readily distinguished from *H. opulenta* by having conspicuous yellow, black, and white stripes (**Fig. 5b**).

## PREFERRED HABITAT

*Hypena opulenta* prefers shaded habitats and performs poorly under direct sunlight.

## HISTORY AND CURRENT STATUS

Individuals sourced from Ukraine were released on pale swallow-wort in Ontario, Canada beginning in 2013 and on both black and pale swallow-wort in multiple northeastern states in the USA beginning in 2017.



**Figure 6.** *Hypena opulenta* reported distribution in North America (Winston et al. 2022)

Establishment has been confirmed in Ontario (**Fig. 6**). Although it is still too early to determine the moth's overall impact in Canada, damage is becoming increasingly apparent around release sites, and initial results are promising. In the USA as of 2022, although overwintering and feeding damage have been observed on swallow-worts at select locations, field establishment has not yet been confirmed (**Fig. 6**).

## NONTARGET EFFECTS

None observed at North American field-release sites.

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## ACKNOWLEDGMENTS

The authors thank two anonymous reviewers for providing helpful comments on earlier versions of this publication. This fact sheet was produced by the North American Invasive Species Management Association (NAISMA) with financial support from USDA Forest Service. The layout was designed by Rachel Winston, MIA Consulting.

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## SUGGESTED CITATION

Tewksbury, L., M. Szűcs, L.R. Milbrath, R.S. Bouchier, and N. Capuccino. 2023. Swallow-wort Biocontrol Agents: History and Ecology in North America. In: R.L. Winston, Ed. Biological Control of Weeds in North America. North American Invasive Species Management Association, Milwaukee, WI. NAISMA-BCW-2023-30-SWALLOW-WORTS-A.