

***Depressaria depressana* (Fabricius) (Depressariidae), New to the Midwestern USA**

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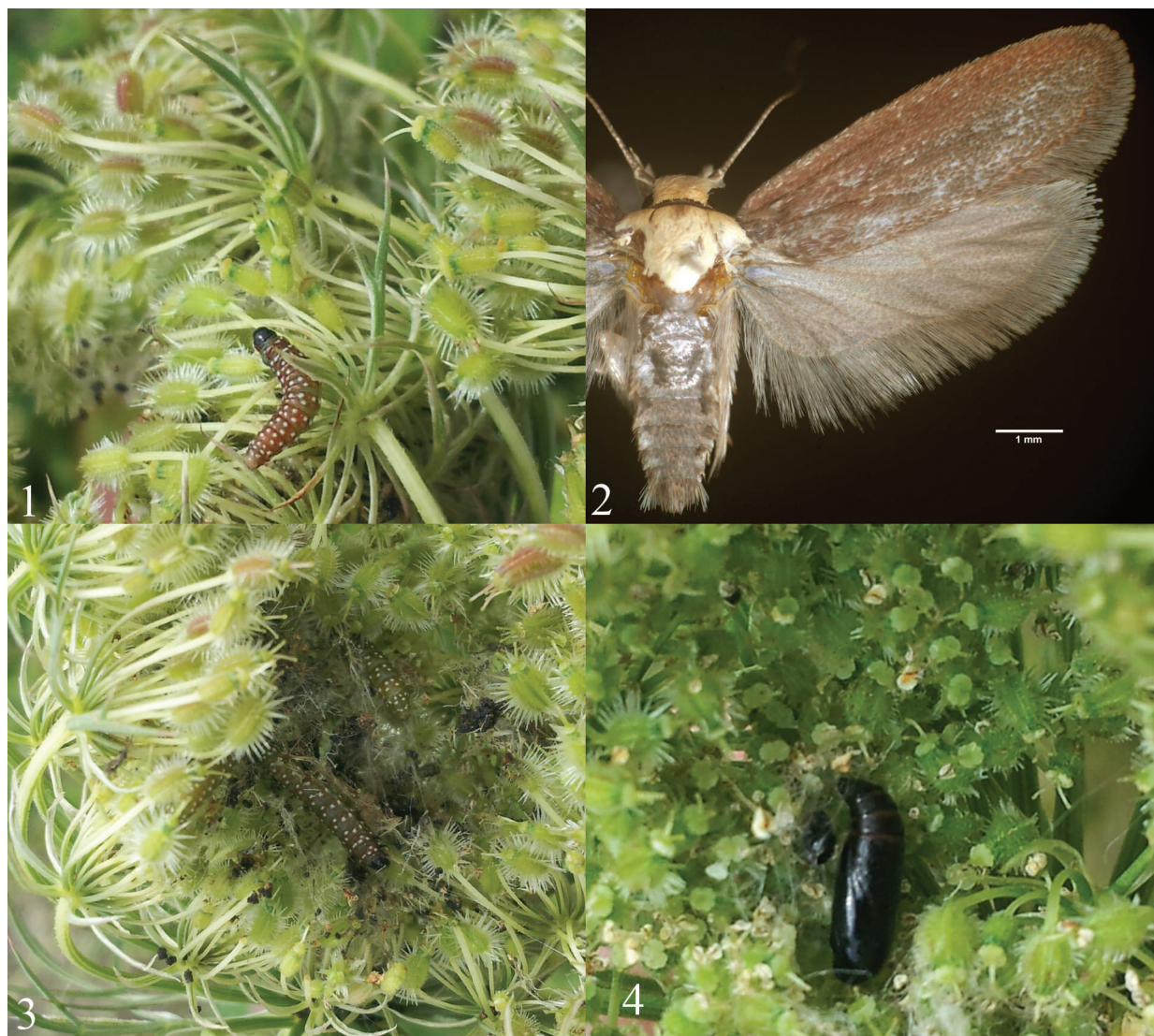
DEPRESSARIA DEPRESSANA (FABRICIUS) (DEPRESSARIIDAE), NEW TO THE MIDWESTERN USA

Additional key words: Introduced species, Apiaceae, Ichneumonidae, Chalcididae

Characterization. *Depressaria depressana* (Fabricius) (Depressariidae), known as Blunt's flat-body or purple carrot-seed moth, is native to the Palearctic region, occurring from Europe to China and the Russian Far East (Landry et al. 2013). The larva (Fig. 1) is brownish red with irregularly-shaped dull green regions laterally and ventrally, as well as dorsally along the intersegmental margins; the head, prothoracic shield, thoracic legs, and spiracular peritremes are black, and the setal pinacula are white. The adult (Fig. 2) is uniformly purplish brown dorsally, with the head and thorax, including the tegulae, white. In Europe, the larva of *D. depressana* is recorded to feed on the inflorescences of many apiaceous hostplants, including *Daucus carota* L., *Pastinaca sativa* L., *Peucedanum oreoselinum* (L.) Moench, and several species in the genera *Carum* L., *Pimpinella* L., and *Seseli* L. (Palm 1989; Landry et al. 2013). The moth is univoltine, spending most of the year in the adult stage.

Occurrence in North America. Landry et al.

(2013) appropriately concluded that *D. depressana* is a recent introduction into North America, on the basis of the fact that it was not included in monographs on Nearctic "Oecophoridae" (including Depressariidae) by Clarke (1941) and Hodges (1974) (of *Depressaria* species, Hodges stated that only "*cinereocostella*, *pastinacella*, *eleanorae*, and *alienella* occur in eastern North America"). Landry et al. (2013) recorded *D. depressana* from the Canadian provinces of Ontario and Quebec, with the earliest date being 2008. In addition, J.-F. Landry (in litt.) reports: "I have reared adults from maturing larvae collected in the flower umbels of *Daucus carota* near Ottawa on 20 Sep 2014, with adults emerging from 25 Sep to 20 Oct 2014. Eleven voucher specimens in the CNC." The moth also has been documented from the northeastern region of the USA. Photographs of the larva and adult of *D. depressana* from New York, Massachusetts, and Connecticut have been posted onto the BugGuide (2003–2015) web site, with the earliest date being 2010.



FIGS. 1–4. **1.** Larva of *Depressaria depressana* in umbel of *Daucus carota*, Champaign County Illinois, 11 July 2015. **2.** Adult *Depressaria depressana*, reared from larva collected in umbel of *Daucus carota*, Champaign County Illinois, 10 July 2015, emerged 21 July 2015. **3.** Multiple larvae of *Depressaria depressana* in umbel of *Daucus carota*, Champaign County Illinois, 11 July 2015. **4.** Pupa of *Depressaria depressana* in umbel of *Daucus carota*, Champaign County Illinois, 11 July 2015.

Very recently, it has become evident that *D. depressana* has expanded its range into the midwestern US. On 26 September 2014, James Vargo collected an adult *D. depressana* at UV light in Newton County in northern Indiana, and, on 2 August 2015, an adult *D. depressana* was photographed in Summit County in northern Ohio (photograph posted onto BugGuide). In July 2015, larvae and pupae of *D. depressana* were collected from inflorescences of *Pastinaca sativa* and *Daucus carota* in central Illinois, which at present represents the greatest southern and western range extension of the moth from its presumed point of introduction in southeastern Canada. A sample of two larvae on *P. sativa* was collected on 2 July 2015 near

Urbana, along the entrance gate of Phillips Tract, a preserve owned by the University of Illinois at Urbana-Champaign. On 10 July 2015, an additional 21 individuals (11 larvae, 10 pupae) were collected on *P. sativa* and *D. carota* at Phillips Tract and also at a nearby overpass crossing Interstate Highway 74. In addition, on 13 July 2015, two *D. depressana* pupae were collected in a flower of *D. carota*, at a separate site approximately 5.5 km north of Urbana. Larvae and pupae were collected in situ on their hostplants and were reared to eclosion; adults were photographed and dissected, confirming their identity as *D. depressana*.

Similar species. *Depressaria alienella* Busck, the adult of which is externally similar to that of *D.*

depressana, is native to northeastern and far-western North America. The two species differ in a number of respects. Characters for differentiating adults of *D. alienella* and *D. depressana* on both external appearance and genital morphology were given by Landry et al. (2013). Furthermore, the host plants of *D. alienella* belong to the genera *Artemisia* L. and *Achillea* L. (Asteraceae) (Walsingham 1881; Clarke 1941). Also, Busck (1902) described the larva of *Depressaria emeritella* Stainton (a Palearctic species that in the adult stage closely resembles *D. alienella*, but now is believed not to occur in North America), as being “green with dorsal and subdorsal lines darker; head yellowish-green; first thoracic segment black dotted.” It is not clear, however, whether this was a second-hand description based on European accounts of the larva of *D. emeritella* (it closely matches, e.g., Stainton’s (1861) description and figure of that species) or if Busck actually examined the larva of the native North American moth that he later described as *D. alienella* (Busck 1904).

Depressaria pastinacella (Duponchel), another Eurasian invasive species, can also be found on umbels of *Pastinaca sativa* in central Illinois in July, but it is unlikely to be mistaken for *D. depressana*. Morphologically, it can be distinguished by its pale body color and dark pinacula. It is also considerably larger in size: preserved final-instar larvae of *D. pastinacella* from Illinois average 19.5 mm in length ($n = 5$, range = 18.0–21.0 mm), versus 10.8 mm in *D. depressana* ($n = 2$, range = 10.0–11.5 mm). The two species differ phenologically and ecologically as well. In central Illinois, *D. pastinacella* larvae feed on flowers and immature fruits of wild parsnip primarily in June and larval development is largely complete by early July (Nitao and Berenbaum 1988). By contrast, *D. depressana* larvae are most abundant in July, when *P. sativa* inflorescences contain primarily immature seeds and *D. carota* inflorescences have not yet fully opened. Another difference is that multiple *D. pastinacella* larvae are not commonly found in a single umbel; the larvae are territorial and actively exclude potential usurpers (Green et al. 1998). By contrast, multiple individuals of *D. depressana* can be found occupying the same umbel (Palm, 1989; Fig. 3). Moreover, *D. depressana* pupates within the umbel (Fig. 4), whereas *D. pastinacella* burrows into the hollow stem of its host plant and spins a silken cocoon in which to pupate (Zangerl et al. 2002).

Parasitoid associations. No parasitoid records have been reported previously for *D. depressana* in North America. Two of the 11 *D. depressana* caterpillars collected during this study produced a single specimen



FIGS. 5–7. **5.** Adult Phygadeuontinae sp. (Ichneumonidae) reared from *Depressaria depressana* larva collected on *Daucus carota*, Champaign County Illinois, 10 July 2015, parasitoid emerged 22 July 2015. **6.** Adult *Itopectis conquisitor* (Ichneumonidae) reared from *Depressaria depressana* larva collected on *Daucus carota*, Champaign County Illinois, 10 July 2015, parasitoid emerged 22 July 2015. **7.** Adult *Conura* sp. (Chalcididae) reared from *Depressaria depressana* pupa collected on *Pastinaca sativa*, Champaign County Illinois, 10 July 2015, parasitoid emerged 10 August 2015.

of ichneumonid wasp. One of these ichneumonids is a phygadeuontine (Fig. 5). Phygadeuontinae is the largest subfamily of Ichneumonidae; species in this subfamily are typically idiobiont ectoparasitoids of holometabolous larvae, although life histories in this subfamily are diverse and include endoparasitoids and ectoparasitoids, koinobionts and idiobionts, hyperparasitoids, and some egg-sac parasitoids of chelicerates (Goulet & Huber 1993). The other larval parasitoid that we reared is a male *Itopectis conquisitor* (Say) (Ichneumonidae: Pimplinae) (Fig. 6). *I. conquisitor* females typically oviposit in the mature larvae or prepupae of Lepidoptera from several families and are sometimes hyperparasitoids of other parasitoid wasps (Townes 1940). We do not know of any previous records of *I. conquisitor* attacking *Depressaria* larvae; however, this species is highly polyphagous and widespread in North America (Townes 1940). *I. conquisitor* has been uncommonly reared from other Gelechioidea families, including Gelechiidae (Miller 1955; Pogue 1985; Loeffler 1994 (as a hyperparasitoid)) and Coleophoridae (Miller 1976). Other *Itopectis* species, *I. quadricingulatus* (Provancher) and *I. melanocephalus* (Gravenhorst), attack several *Depressaria* species, including *D. pastinacella* and *D. daucella* (Denis & Schiffermüller) (Townes 1940; Gürbüz et al. 2009). In addition to the two ichneumonids that were reared from *D. depressana* larvae, a chalcidid of the genus *Conura* Spinola (Fig. 7) was reared from one of the 10 *D. depressana* pupae collected in this study. *Conura* species are typically parasites of the pupae of Lepidoptera, although some species attack Coleoptera or Hymenoptera, and some species are secondary parasites of braconid or ichneumonid-infested hosts (Bouček & Halstead 1997).

Ecological implications. In view of its status as more of an Apiaceae generalist than *D. pastinacella*, the possibility arises that in North America *D. depressana* may acquire native Apiaceae species as host plants. In fact, even the more specialized *D. pastinacella* has incorporated at least one North American apiaceous native species, *Heracleum sphondylium* subsp. *montanum* (Schleich. ex Gaudin) Briq. (reported in literature as *H. maximum* W. Bartram and *H. lanatum* Michx.), into its diet (Berenbaum and Zangerl 1991). A cursory examination of a population of *Zizia aurea* Koch, flowering in the general proximity of infested *D. carota* and *P. sativa* populations (within a 3-km radius), failed to reveal any evidence of colonization of this native hostplant by *D. depressana*. Given the likelihood that this species is expanding its range throughout the eastern and central

states, however, other native Apiaceae may be at risk of becoming incorporated into the hostplant range of this invasive species.

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