

NOTES ON THE BIOLOGY OF
AGONOPTERIX ALSTROEMERIANA (CLERCK),
WITH DESCRIPTIONS OF THE IMMATURE
STAGES (OECOPHORIDAE)

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ABSTRACT. Larvae collected from *Conium maculatum* L. (Umbelliferae) in Tompkins County, New York, were reared and determined as *Agonopterix alstroemeriana* (Clerck), recorded in the United States only since 1973. The larva forms a tubular roll on leaves of *Conium maculatum*, its sole host. Pupation occurs in late May and early June; adults emerge in mid- to late June.

The last instar larva is greenish in color, with a dorsal and two subdorsal dark green stripes. Earlier instar larvae are predominantly yellow with black head capsules. Ultimate instar larvae of *A. alstroemeriana* can be distinguished from other species of *Agonopterix* by the black posterior margins of the epicrania, the conspicuous pinacula, and scalelike setae dorsal to the tarsal claws.

Larvae of *Agonopterix alstroemeriana* (Clerck) were collected and reared on *Conium maculatum* L. (Umbelliferae) at three different sites in Tompkins County, New York, during the summers of 1977, 1978, and 1979. *A. alstroemeriana* is recorded in North America only since 1973 (Hodges et al., in press); since it is not included in the recent revision of the Oecophoridae of North America (Hodges, 1974), this paper documents for the first time the biology of this European species in eastern North America.

METHODS

Larvae were collected from *C. maculatum* growing in Coy Glen, Brooktondale, and the city of Ithaca, all in Tompkins County; *C. maculatum* was one of 12 species of Umbelliferae examined at weekly intervals from May through August 1979 for a study on insect associates of umbellifers (Berenbaum, 1981). All larvae were reared on *C. maculatum* in a controlled-environment chamber, with day/night temperatures of 26.5°/15.5°C and photoperiod of 16/8 h.

For morphological examination larvae were fixed in boiling water and preserved in 70% ethanol. Twenty-six reared adults and six larvae

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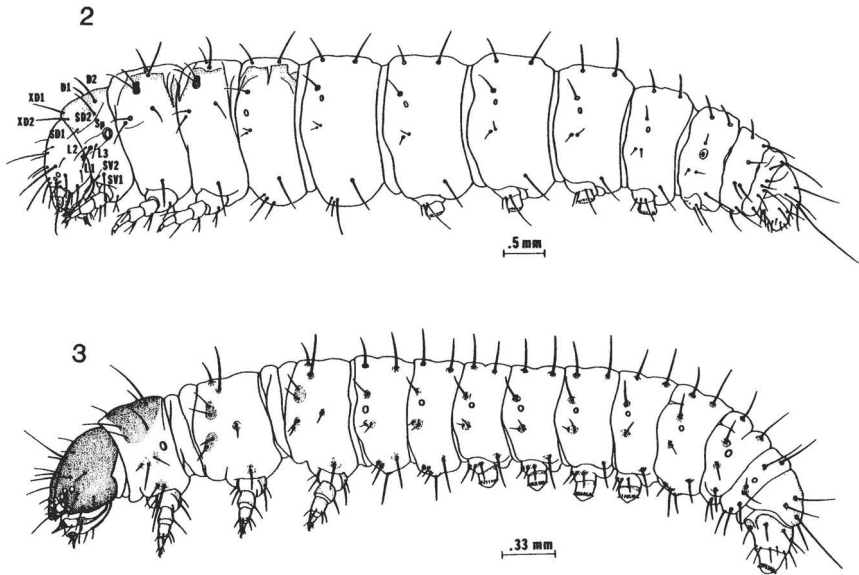


FIG. 1. Leaf rolls on *Conium maculatum* used as larval shelter for *A. alstroemeriana*.

were examined in detail; microscopic slides of the genitalia, wings and larval mouthparts were stained in mercurochrome and mounted in balsam after clearing in clove oil.

Natural History

Laboratory rearing suggests that adults overwinter and lay eggs in early spring; this is not inconsistent with other species in the genus *Agonopterix* (Hodges, 1974). Early instar larvae can be found in Tompkins County in early May, at which time they form characteristic tight tubular leaf rolls on leaves of *Conium maculatum*. Weekly census of stands of *C. maculatum* revealed a steady decline in numbers of caterpillars during June and July, when adult emergence takes place (Table 1). Both flowering and nonflowering individuals of *C. maculatum* are attacked. In addition to rolling leaves, *A. alstroemeriana* also webs together flowers and developing seeds. Inspection of *C. maculatum* throughout July and August failed to reveal larvae; presumably, *A. alstroemeriana* is univoltine in New York, as are the other umbellifer-feeding oecophorids in the area (Hodges, 1974). Larvae have a tendency to abandon leaf rolls frequently, particularly after disturbance; on a given plant, then, a high proportion of leaf rolls are



FIGS. 2, 3. Larva of *A. alstroemeriana*: **2**, mature larva showing dorsal setae (D1, D2), lateral setae (L1, L2, L3), subdorsal setae (SD1, SD2), spiracle (SP), subventral setae (SV1, SV2), and cervical shield setae (XD1, XD2); **3**, penultimate instar larva.

vacant. Population densities can reach high levels, with up to 40 catpillars per stem.

A weekly census of insects on 11 other species of Umbelliferae in Tompkins County, some of which grow sympatrically with *C. maculatum* (e.g., *Pastinaca sativa* L. and *Daucus carota* L.) in abandoned fields and ditches, did not reveal *A. alstroemeriana*. In New York as in Europe (Stainton, 1861; Schütze, 1931; Toll, 1964), *C. maculatum* appears to be the sole host for *A. alstroemeriana*.

Description of Last-Instar Larva (terminology after MacKay, 1972)

General. Mature larva (Fig. 2) light green with three dark green longitudinal stripes. Prothoracic shield concolorous with body except for black posterior margin of epicranium and small ocular spot. Fully grown larva approximately 10 mm long. Smaller larvae lacking green stripes, with both head and cervical shield blackish-brown (Fig. 3).

Head (Figs. 4–9). Mandible with seven apical teeth and two lateral setae (Fig. 4). Molar grooves on teeth 1, 3 and 4 but most prominent on first tooth. Epicranium with black posterior margin (Fig. 5). Proximomedial area of hypopharyngeal complex (Fig. 6—terminology after Godfrey, 1972) covered by very fine setae. One pair of stipular setae present. Spinneret (Fig. 7) with rounded apex and silk pore. Labial palpi with second segment reduced and third segment hairlike, with hairlike papilla on the basal segment. Adfrontal area and labrum as shown (Fig. 8) (terminology after Hinton, 1946). Adf_1 between epicranial and adfrontal sutures; Adf_2 more widely separated. Frontal

TABLE 1. Per stem number of *A. alstroemeriana* larvae on *Conium maculatum* in Coy Glen, Ithaca, New York (summer 1979).

Date	Mean number \pm S.E.
24 May	21.4 \pm 5.87
31 May	13.8 \pm 2.96
7 June	11.8 \pm 3.20
14 June	14.6 \pm 5.80
21 June	5.8 \pm 1.50
28 June	0.4 \pm 0.40
5 July	0.2 \pm 0.20
12 July	0.2 \pm 0.20
19 July	0.0 \pm 0.00

¹ Five stems examined on each sampling date.

² No *A. alstroemeriana* present on subsequent sampling dates (through 31 August).

setae located above frontal punctures; clypeal setae near the edge or outside of frontal triangle. Labrum with three lateral setae and three medial setae—L1 and L2 closer together than to L3, and M1, M2 and M3 in a triangle. On epicrania (Fig. 9), P2 only slightly higher than P1 and A1 and A3 much longer than A2; L1 as shown.

Thorax. On the prothorax (Fig. 2), XD1, XD2 and SD1 in a straight line; SD2 separate from D1 and D2. Three prespiracular setae and two setae in the SV group; cervical shield unmarked. Chaetotaxy of metathorax: D1 and D2 closer to each other than on abdominal segments; SD1 and SD2 on the same pinaculum as L1 and L2; L3 widely separated. SV1 behind coxa. All thoracic legs with two scalelike setae dorsad of tarsal claw.

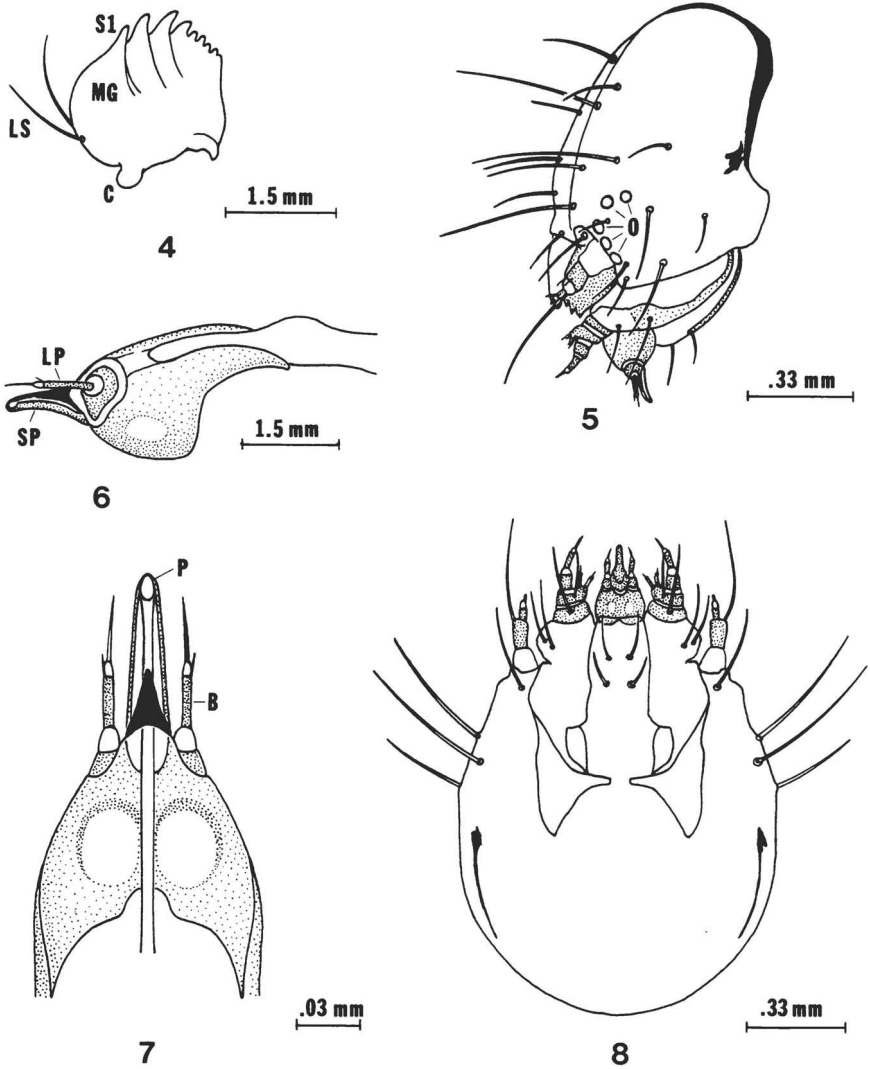
Abdomen. One ventral seta present on each side of midline of abdominal segments (Fig. 10). D1 and D2 widely spaced; SD1 above spiracle, L1 and L2 below it and close to each other. L3 close to SV group. SV setae for abdominal segments 1, 2, 7, 8 and 9 are 2, 3, 2, 1 and 1 respectively. Chaetotaxy of abdominal segment 9 as shown.

Pupa. Pupa (Figs. 11–13) red-brown and pubescent, covered with dense fine hairs. Antennae long and curled around wing pads; vertex rounded and prominent. Mesothoracic and metathoracic legs exposed; prothoracic femora concealed by maxillae. Segments 5 and 6 with proleg scars. Cremaster present as small tubercle with 4 hooked setae. Another pair of setae visible in dorsal view on each side of cremaster. Sexes distinguished by the position of genital openings, with ostium ductus ejacularis on the ninth segment and ostium bursae on eighth segment. Total length of pupa approximately 6–7 mm.

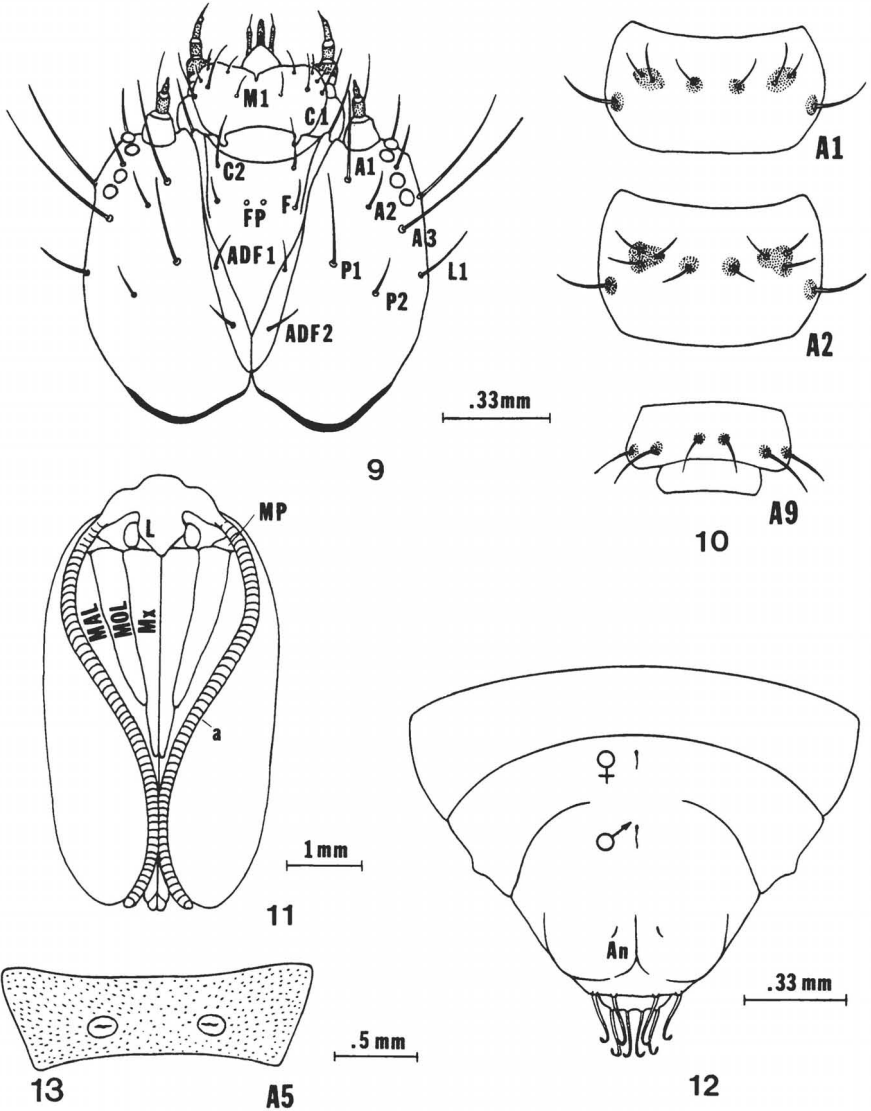
Adult (Fig. 14). As described (Stainton, 1861; Clarke, 1941).

DISCUSSION

The larvae of *A. alstroemeriana* should be confused with no other eastern North American *Agonopterix* species. Mature larvae can be distinguished from larvae of *A. clemensella* by the markings on the epicrania and the conspicuous pinacula, and from larvae of *A. flavicomella* by the absence of a black cervical shield. The host plant also appears to be definitive—*Conium maculatum* is the only host recorded for *A. alstroemeriana*, and *A. alstroemeriana* is the only oecophorid reported to feed on *Conium*. Larvae of *A. clemensella*, in fact, die when confined to foliage of *C. maculatum* (personal observation).



FIGS. 4-8. Structures of larval head of *A. astroemeriana*: **4**, mandible, mesal view, showing condyle (C), lateral mandibular setae (LS), molar groove (MG), and first scissorial tooth (S); **5**, lateral view of epicrania showing markings with ocelli (O); **6**, hypopharyngeal complex, lateral view showing labial palps (LP) and spinneret (SP); **7**, spinneret, dorsal view, showing basal segment of labial palps (B) and silk pore (P); **8**, head, ventral view.



FIGS. 9-13. Structures of immature stages of *A. alstroemeriana*: **9**, larval head, dorsal view, showing adfrontal setae (ADF1, ADF2), clypeal setae (C1, C2), frontal setae (F), frontal punctures (FP), first lateral setae (L1), first medial setae (M1), anterior setae (A1, A2, A3), lateral setae (L1) and posterior setal group (P1, P2, P3); **10**, larval abdominal segments 1, 2, and 9, ventral view, showing lateral setae (L3), subventral setae (SV1, SV2, SV3) and ventral setae (V1); **11**, pupal head and thorax, mesal view, showing antennae (A), labrum (L), mesothoracic legs (MOL), maxillary palps (MP) and maxillae (MX); **12**, terminal abdominal segments of pupa showing male and female genital openings superimposed, ventral view, showing anal slit (An) and cremaster (C); **13**, fifth abdominal segments of pupa showing proleg scars and a portion of the fine setae covering most of the abdominal segments, ventral view.

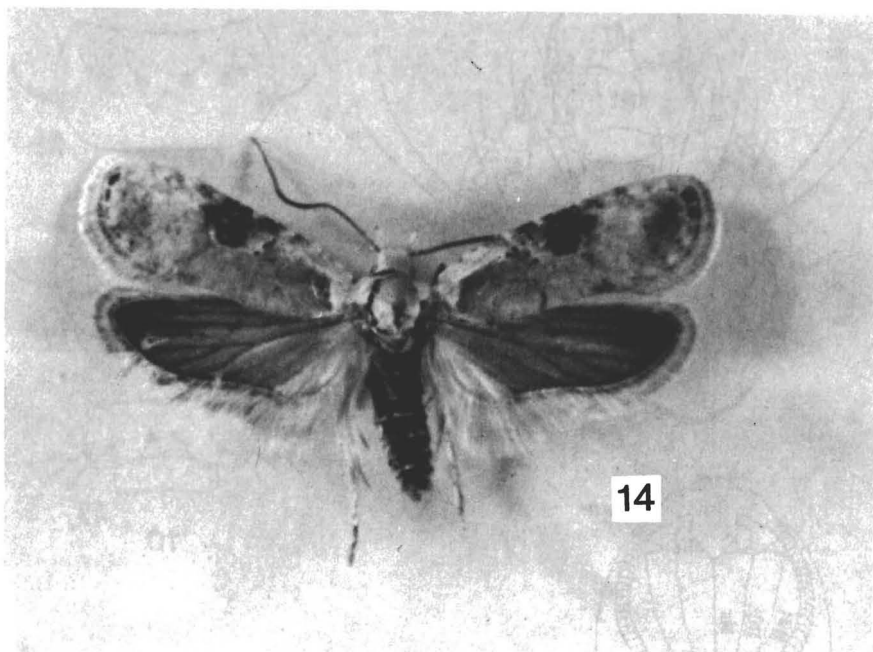


FIG. 14. Adult of *A. alstroemeriana*.

The adult is a typical *Agonopterix* in form and maculation, lacking the longitudinal streaks characterizing species of *Depressaria*. The only American oecophorid similar in coloration to *A. alstroemeriana* is *Martyrhilda canella* (Busck). Tufted labial palps and a simple distal process of the sacculus distinguish *Agonopterix* from *Martyrhilda*; moreover, *M. canella* has a dark head and lacks a brick red spot below the black patch on the forewings. The key to *Agonopterix* by Hodges (1974) may be amended as follows to include *A. alstroemeriana*:

0. Head, thorax and basal streak of costa pure white, concolorous; discal cell of forewing with a black patch lying above a brick red spot -- *A. alstroemeriana*
 0'. Not as above ----- 1 (start key)

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