Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.
Key to Large Lepidopterous Larvae on New Foliage of Douglas-fir and True Firs

V. M. Carolin, Jr., and Robert E. Stevens

Presents a key primarily for field use, emphasizing characters visible with a hand lens. The key separates larvae of associates of the western spruce budworm, Choristoneura occidentalis Freeman, in advanced instars.

Keywords: Lepidoptera, larvae, Choristoneura occidentalis, Pseudotsuga menziesii, Abies spp.

Field workers involved in surveys or related activities on western spruce budworm often collect and count large larvae on expanding or expanded new foliage of host trees. Other foliage-feeding Lepidoptera occur on the new foliage, and it is important to be able to separate and distinguish between the various species.

This key is the second prepared by the authors for trial use by survey, control, and research personnel working on western spruce budworm. The previous one (Carolin and Stevens 1979) dealt with small larvae in opening buds and new shoots of Douglas-fir and true firs. Both keys are based primarily on notes prepared by the senior author during field studies on spruce budworm in Oregon and Washington during the period 1955-1962. This key to larger larvae includes new material from the Southwest, and experience has shown it is useful throughout the range of western spruce budworm. Also provided (table 1), is a summary of hosts and western distribution of included species.

This key is meant for larvae exceeding 10-12 mm in length; the features used in it can easily be seen with a 10X hand lens. Coloration and markings on the head, prothoracic shield, and the dorsal surface in general are particularly useful in recognition of these larger larvae. Size and shape are easier to define than in the smaller larvae found in opening buds and new shoots. A few species retain a generally similar appearance throughout the larval stage, but most develop new and often striking characteristics as they approach larval maturity. Hence the need for a second key.

As with the previous key, only lepidopterous larvae are included. Hymenopterous species noted in the introduction to the first key change little during development, but are easier to recognize because of their larger size. Some sawfly larvae in the genus Neodiprion which feed in colonies on older foliage (only one species of Neodiprion, still unidentified, is known from new foliage) wander as they approach maturity and may be found on the new foliage. They can be recognized by the number of abdominal prolegs, body wrinkles, and shape of the head. Figure 1 compares a typical lepidopterous larva and a Neodiprion sawfly larva, and also shows major characteristics used in the key.

The users of a larval key often have difficulty recognizing a variety of patterns of longitudinal lines and stripes. The markings are sometimes more striking than can be adequately described. Figure 2 illustrates several of these. Together with larval size and shape, recognition of these patterns simplifies separation of these particular species.

We solicit additions to the key and comments about it. Additions should be in the form of authoritatively identified adults reared from larvae, the characteristics of which have been duly recorded during the rearing process. The junior author will arrange for determination of specimens not previously identified.

At the end of a trial period, we will revise the keys and add illustrations that will help users in picking out diagnostic characters. We hope the product will be of general utility to workers concerned with insects feeding on the new foliage of Douglas-fir and true firs.

1 Carolin, now retired, was an entomologist with the Pacific Northwest Forest and Range Experiment Station, Portland, Oreg. Stevens is an entomologist with the Rocky Mountain Forest and Range Experiment Station, in Fort Collins, in cooperation with Colorado State University.
Table 1.—Summary of species contained in key to large lepidopterous larvae on new foliage of Douglas-fir and true firs

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>Western distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geometridae</td>
<td>Enypia griseata Grossbeck</td>
<td>Southwest</td>
</tr>
<tr>
<td>Enypia sp. nr. griseata Grossbeck</td>
<td></td>
<td>Pacific slope†</td>
</tr>
<tr>
<td>Eupithecia annulata (Hulst)</td>
<td></td>
<td>Pacific slope, northern Rocky Mountains</td>
</tr>
<tr>
<td>Eupithecia catalinata McDunnough</td>
<td></td>
<td>Southwest</td>
</tr>
<tr>
<td>Lambdina fiscellaria lugubrosa (Hulst)</td>
<td></td>
<td>Pacific slope, northern Rocky Mountains</td>
</tr>
<tr>
<td>Melanolophia imitata (Walker)</td>
<td></td>
<td>Pacific slope</td>
</tr>
<tr>
<td>Nepytia phantasmaria (Strecker)</td>
<td></td>
<td>Pacific slope</td>
</tr>
<tr>
<td>Stenoporpia sp.</td>
<td></td>
<td>Pacific slope</td>
</tr>
</tbody>
</table>

| Gelechiidae     | Unidentified species                                                   | Pacific slope                                            |

| Noctuidae       | Achytonix epipaschia (Grote)                                           | Pacific slope, Southwest                                  |
| Feralia decepita McDunnough |                                                                | Pacific slope                                            |
| Xylomyges simplex (Walker)       |                                                                        | Pacific slope, Southwestern                               |

| Plutellidae     | Ypsolophus neila (Busck)                                               | Southwestern                                             |

| Pyralidae       | Dioryctria reniculelloides Mutuura and Munroe                         | Pacific slope, northern Rocky Mountains                  |

| Tortricidae     | Olethreutinae                                                                 |
| Griselda radicana (Heinrich) |                                                    | Pacific slope, Rocky Mountains, Southwest         |
| Zeiraphera hesperiana Mutuura and Freeman |                                                              | Pacific slope, Southwest                            |

| Tortricinae     | Acleris gloverana (Walsingham)                                         | Pacific slope, northern Rocky Mountains                |
| Archips sp.     |                                                                        | Pacific slope                                           |
| Argyrotaenia dorsalana (Dyar) |                                                        | Pacific slope, Southwest                                |
| Argyrotaenia klooti Obraztsov |                                                        | Pacific slope, Southwest                                |
| Argyrotaenia provana (Kearfott) |                                                    | Pacific slope, Southwest                                |
| Choristoneura occidentalis Freeman |                                                      | Pacific slope, Rocky Mountains, Southwest            |
| Choristoneura retiniana (Walsingham) = viridis Freeman |                                                | Pacific slope, Rocky Mountains, Southwest         |
| Choristoneura n. sp. |                                                        | Pacific slope                                            |

†Used here to include the area west of the Continental Divide between British Columbia and northern California.

Figure 1.—Comparison of: (A) typical lepidopterous larva, and (B) a hymenopterous larva in the sawfly genus Neodiprion. (3.5X)

Figure 2.—Examples of longitudinal dorsal markings: (A) central stripe (Zeiraphera hesperiana); (B) irregular lines (Dioryctria reniculelloides); (C) regular lines (Xylomyges simplex). (3.5X)
Key to Large Lepidopterous Larvae on New Folage of Douglas-fir and True Firs

Section I. Geometridae

1. Dorsum marked with longitudinal lines or stripes ........................................ 4
2. Head light brown, unicolorous; dorsal orange-red-brown; pleural areas with yellow lateral stripe; venter yellow; body length 25-35 mm ........................................... Stenoporia sp.
3. Head with brown streaking as well as motting, four black dots visible above; dorsal pale orange-brown, or pale green with orange-brown in intersegmental areas; body length 12-20 mm ......................... 4th instar Lambdina fiscellaria lugubrosa
4. Head orange-red; dorsal orange-red with three longitudinal purple lines; body length 10-14 mm ................... Eupithecia spp.
5. Head green or yellow-brown; dorsal with two longitudinal whitish lines; pleural areas with whitish lines ............................................................... 5
6. Head pale yellow-brown; dorsal light bluish green with wide whitish yellow lines; pleural areas with two whitish yellow lines, one wide and one narrow; body length 16-25 mm. Inland forests ............. Enypia spp.
7. Head green; dorsal apple green to dark green with white lines; pleural areas with a single yellow line or stripe. Coastal forests ........................................... 6
8. Head green with no markings; body length 20-37 mm; feeds mostly on old foliage .................. Melanophila imitata
9. Head green with 10 black dots; body length 20-28 mm ........................................................................ Nuphia phantasmaria

Section II. Tortricidae, Gelechiidae, Plutellidae, Pyralidae, and Noctuidae

1. Dorsum prominently marked with longitudinal lines or stripes ........................................ 11
2. Head, prothoracic shield, and remainder of body emerald green; prothoracic shield collar-like; setal areas and anal shield inconspicuous; body form slender, length 12-18 mm ........................................... Argyrotrea provana
3. Head and prothoracic shield yellow-brown, light brown, or chestnut brown ......................... 5
4. Body yellow-green to green; prothoracic shield sometimes pale in front; body length 10-14 mm penultimate instar Acleris gloverana
5. Body lemon yellow; prothoracic shield solid black; body form terete and stout; body length 12-16 mm ........................................... Archips sp.
6. Head pale brown to chestnut brown with no dark markings above; prothoracic shield various; setal areas various ..................................................... 7
7. Head chestnut brown with two dark triangles on each side, dorsally; prothoracic shield dark brown to black; setal areas conspicuous ........................................ 6
8. Dorsum olive brown to dark brown, with prominent ivory setal areas; pleural areas and venter pale yellow to light tan; body length 10-16 mm .......................... 5th instar Choristoneura occidentalis
9. Dorsum lime green with olive tinge, with pale yellow setal areas; pleural areas and venter usually greenish but sometimes yellowish; body length 9-15 mm ......................... 5th instar Choristoneura retinata (= viridis)
10. Head mostly light brown, but with two-toned appearance from greenish color around labrum or dark streak on lower part of head; prothoracic shield indistinct, concolorous with body; body pale green with small yellowish setal areas and with yellow in intersegmental areas; body form slender, length 10-14 mm ........................................... Argyrotreaa dorsalana
11. Head brownish, unicolorous; prothoracic shield distinct, different color than body; body stout, length greater than 14 mm ......................... 8
12. Body reddish brown to olive brown above, with large ivory setal areas and large anal shield; head and prothoracic shield orange-brown to chestnut brown ......................... 10
13. Body grass green, with small or moderately large pale setal areas; head usually a lighter brown; prothoracic shield a different color than head ................................................ 9
14. Head yellow-brown at start of stadium, later becoming chestnut brown; prothoracic shield pale brown to transparent, but marked with a thick black line at

---

2Includes Olethreutidae as a subfamily, Olethreutinae, per revised checklist of North American lepidoptera (Hodges et al., 1981.)
9. Head light tan; prothoracic shield pale yellow-brown with two black dots at base on each side of split in shield; setal areas pale yellow and conspicuous; anal shield oblong-orbicular, pale yellow; body length 16-22 mm ............ last instar Choristoneura retiniana (= viridis)

10. Larger larvae; setal areas oblong; anal shield oblong-orbicular, ivory to pale yellow; body length 17-28 mm ............ last instar Choristoneura occidentalis

11. Dorsum various shades of yellow, orange, red, or brown, marked with either lines or stripes .... 17

12. Dorsum marked with white longitudinal lines ...... 19

13. Dorsum with five white longitudinal lines, the lowermost ones bordered by a lateral red line; head light greenish brown; body length 30-37 mm .......... Feralia deceptiva

14. Head black, globose, and wider than body; prothoracic shield very pale; body light green to olive, setal areas large and black .... 16

15. Head green, narrower than body; body bright green, sometimes with blue tinge, setal areas inconspicuous; wide longitudinal lines extended over prothorax and anal segment; body length 10-17 mm .......... penultimate instar Aclytonix epipaschia

16. Anal shield very pale; dorsum olive (brownish green), setal areas scarcely raised; body length 10-14 mm .......... Xylomyges simplex

17. Large white eyespot around lateral seta on 8th abdominal segment; two irregular (undulating) white lines running through dorsocentral setae; head and prothoracic shield light brown .......... 21

18. No eyespot on 8th abdominal segment; longitudinal lines or stripes with essentially even margins .... 18

19. Body form stout; head wider than long; head and prothoracic shield orange brown to chestnut brown, the latter usually margined at the rear with a black line; dorsum pale yellow to orange yellow, with a broad central olive brown or chocolate brown stripe; body length 12-15 mm .......... last instar Zeiraphera hesperiana

20. Body form slender; head no wider than long, pale brown to chestnut brown; dorsum with longitudinal lines or thin stripes .... 19

21. Dorsum purplish, with two narrow and one broad yellowish green longitudinal lines on either side of the dorsal midline; setae and setal bases black and conspicuous; venter light greenish white; body length 9-12 mm. Larvae web ends of new needles together and feed inside enclosure ........ Ypsolophus nella

22. Dorsum yellow or brown; setae and setal bases inconspicuous ........................................ 20

23. Larvae yellow to bright yellow; dorsum marked with three orange-red or orange-brown light to heavy lines; body length 9-12 mm .......... last instar Griselda radicana

24. Body pale brown; dorsum marked with three red-lavender stripes; body length 12-14 mm .......... unidentified species Gelechiidae

25. Dorsum pinkish brown or reddish brown; an irregular white line in pleural area; body length 10-15 mm .......... penultimate instar Dioryctria reniculelloides

26. Dorsum pale yellow-orange to orange-red; one irregular chocolate brown stripe on each side of dorsum; body length 16-20 mm .......... last instar Dioryctria reniculelloides

3Griselda radicana later enters a 3- to 4-week nonfeeding period in which it loses its markings and coloration, becoming a whitish nondescript larva hiding among foliage debris. Pupation follows.

Literature Cited
