

The Larvae of *Choristoneura fumiferana* (Clem.) and *C. pinus* Free. (Lepidoptera: Tortricidae)¹

By MARGARET R. MACKEY²

Division of Forest Biology, Ottawa, Canada

Introduction

It has long been known that a series of late-instar larvae of *Choristoneura fumiferana* (Clem.) may be distinguished from one of *C. pinus* Free. by colour differences of the head and prothoracic shield: specimens of the former usually have dark heads and light prothoracic shields; specimens of the latter usually have light heads and dark prothoracic shields. However, intensive study of the larvae, including numerous specimens of *C. fumiferana* from the spruce-balsam fir areas of Algonquin Park, Ontario, and of *C. pinus* from jack-pine areas at Normandale, Ontario, has shown that there are highly significant structural differences in the head; these differences serve to identify small series of either species and most single specimens.

Descriptions of the larvae of both species, and a short discussion of their differences, are given herein. The systems followed in naming the setae are those of Fracker (1915) and Heinrich (1916).

Choristoneura fumiferana (Clem.)

Second Instar.—Average head length: 0.53 mm.; average head width: 0.65 mm.; average length of median dorsal line from anterior edge of postclypeus to termination of adfrontal sutures: 0.40 mm.; average width of postclypeus: 0.30 mm. Head and shield usually dark brown; body whitish. Integument with papillae very large and very few in number compared with those of later instars. Mandible lacking small tooth at base of first tooth, which is usually apparent in late-instar larvae.

Ultimate Instar (Figs. 1 & 7).—Average length: 20 to 22 mm.; average length of head: 1.52 mm.; average width of head: 1.82 mm. Integument (cf. Fig. 3) densely spinulated; spinules short, stout, and dark; minute papillae on which spinules are set heavily pigmented in dark areas of body, much less so in light areas. Dorsum and ventrum dark brown, spiracular and subspiracular areas brownish-yellow; colouring of body due to pigmentation of papillae; setal bases, except those of prothorax, on slightly raised yellowish areas, which are conspicuous on dorsum and ventrum. Setae moderately long. Spiracles circular, dark-rimmed, pale-centred.

Head (cf. Figs. 12 & 13) usually dark brown, overlaid with an almost black pattern; some specimens with a dark-brown pattern on a tan ground colour. Anterior seta 2 (A_2) about equidistant from A_1 and A_3 , and at the apex of a triangle formed by these three setae. Ocellus II equidistant from ocelli I and III, that distance being more or less equal to its diameter. Lateral seta (L_1) farther from ocellar seta 2 (O_2) than from A_3 . Average length (Fig. 7) of median dorsal line from anterior edge of postclypeus posteriorly to termination of adfrontal sutures: 1.17 mm.; average width of postclypeus: 0.81 mm.

Median longitudinal width of postclypeus more or less equal to that of preclypeus. Width of labrum about one and three-quarters times length; sides of notch on anterior margin forming an angle of 106° to 130° (18 specimens measured).

Mandible (cf. Fig. 11) with five teeth, the first three large and sharply pointed, the fourth smaller but pointed, the fifth straight-edged; internal ridges

¹Contribution No. 60, Division of Forest Biology, and No. 3006, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

²Agricultural Research Officer.

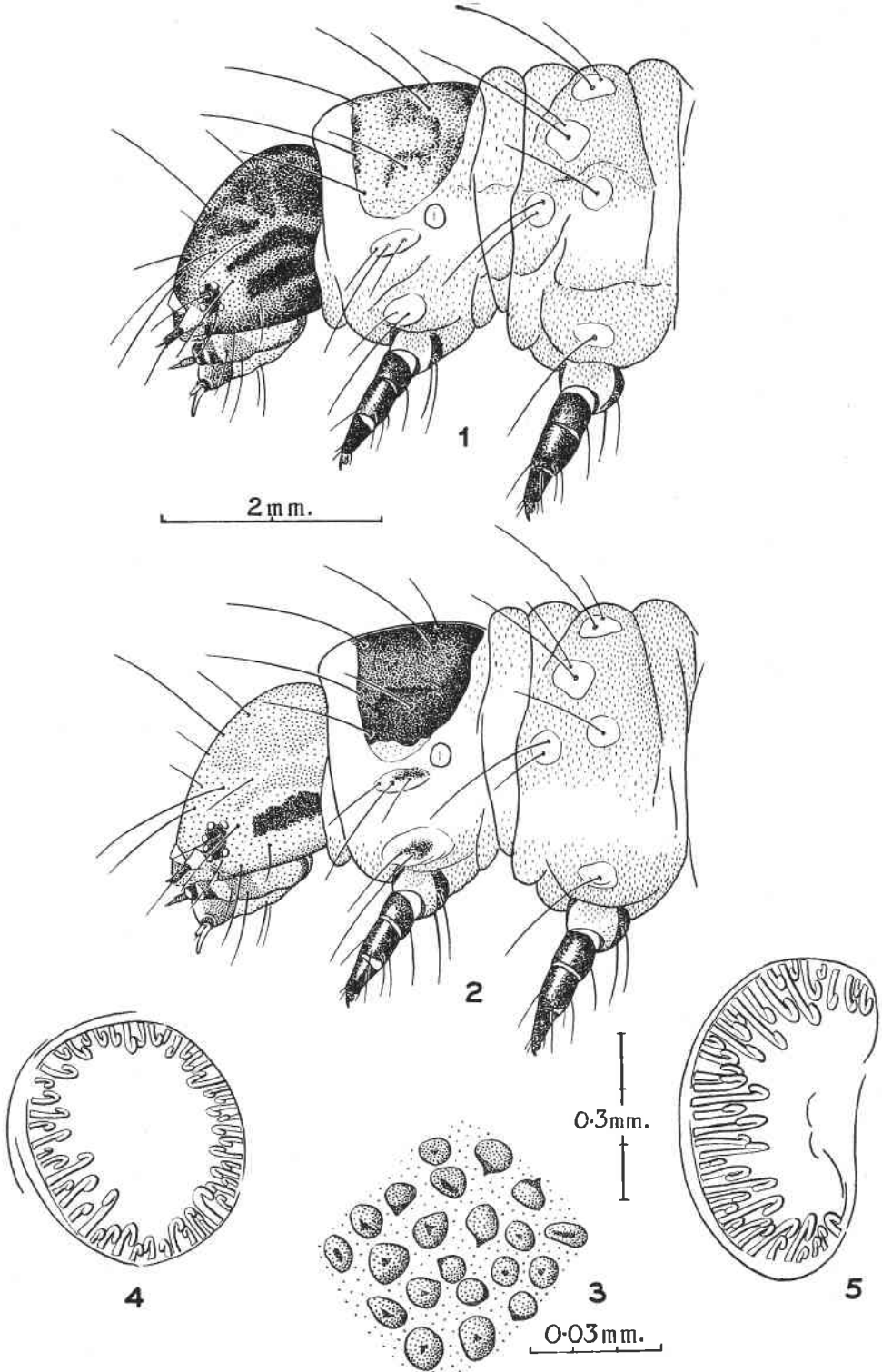
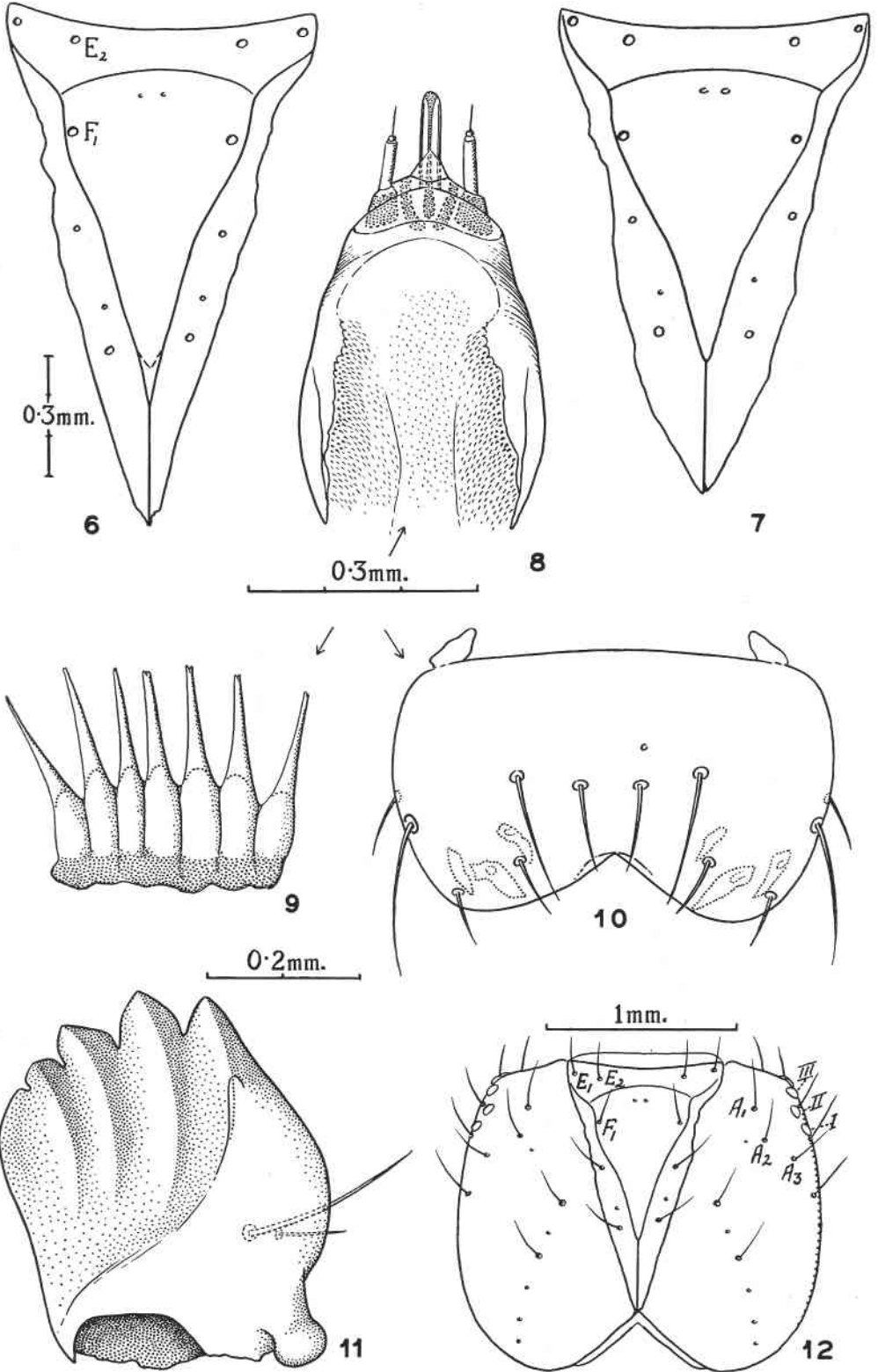


Fig. 1. *C. fumiferana* (Clem.). Head, prothorax, mesothorax.

Figs. 2-5. *C. pinus* Free. 2, head, prothorax, mesothorax; 3, integument highly magnified, showing spinules; 4, crotchets of left ventral proleg of sixth abdominal segment; 5, crotchets of left anal proleg.



from ocellar seta 2 (O_2) than from A_3 . Average length (Fig. 7) of median from first tooth, at base of latter, a small tooth, sometimes difficult to observe.

Spinneret (cf. Fig. 8) rounded at tip; as long as or longer than labial palps, length approximately four and one-half to five times width. Free margin of blade of maxillula edged anteriorly with about six or seven very small, tooth-like processes; lobes clothed with small spines; gorge armed with minute spines, which are often scarcely discernible under high magnification, and limits of gorge itself usually difficult to define.

Prothoracic shield sclerotized, yellowish with some diffusion of dark-brown pigment; some specimens with considerable dark-brown pigment. Prothoracic Kappa and Pi setal groups on raised sclerotized areas, yellowish in colour with seldom any dark-brown pigmentation; middle seta of Kappa group ventrad of or in horizontal line with other two.

Pi group of setae (cf. Fig. 14) on mesothorax and metathorax unisetose, on seventh abdominal segment tristetose, on eighth abdominal segment bisetose.

Anal shield sclerotized, yellowish in colour. Prongs of anal fork (cf. Fig. 9) variable in number but most commonly six, seven, or eight; bases stout; tips needle-like or more often furcate.

Thoracic legs dark brown. Ventral and anal prolegs light in colour; proleg shields sclerotized but not conspicuous; crotchets (cf. Figs. 4 & 5) uniserial, biordinal; crotchets of ventral proleg of sixth abdominal segment 45 to 60, those of anal proleg 30 to 50 in number.

Choristoneura pinus Free.

Ultimate Instar (Figs. 2-6, 8-13).—Average length: 20 to 22 mm.; average length of head: 1.70 mm.; average width of head: 1.93 mm. Integument (Fig. 3), colour, and colour pattern of body as in *C. fumiferana*.

Head (Figs. 12 & 13) usually brownish-yellow, overlaid with a slightly darker pattern, and with lateral bar and ocellar area dark brown, almost black; some specimens with a dark-brown pattern on a tan ground colour. Anterior setae and ocelli as in *C. fumiferana*. Average length (Fig. 6) of median dorsal line from anterior edge of postclypeus posteriorly to termination of adfrontal sutures: 1.34 mm.; average width of postclypeus: 0.84 mm. Width of labrum (Fig. 10) as in *C. fumiferana*, but sides of notch on anterior margin forming an angle of 80° to 115° (28 specimens measured).

Mandible (Fig. 11) as in *C. fumiferana*.

Hypopharynx (Fig. 8) as in *C. fumiferana*, but a possible tendency for spinneret to average slightly more in length than that of *C. fumiferana*.

Prothoracic shield usually dark brown, almost black; some specimens with considerable yellowish pigment. Prothoracic Kappa and Pi setal groups on raised sclerotized areas, yellowish, with usually some dark-brown pigmentation.

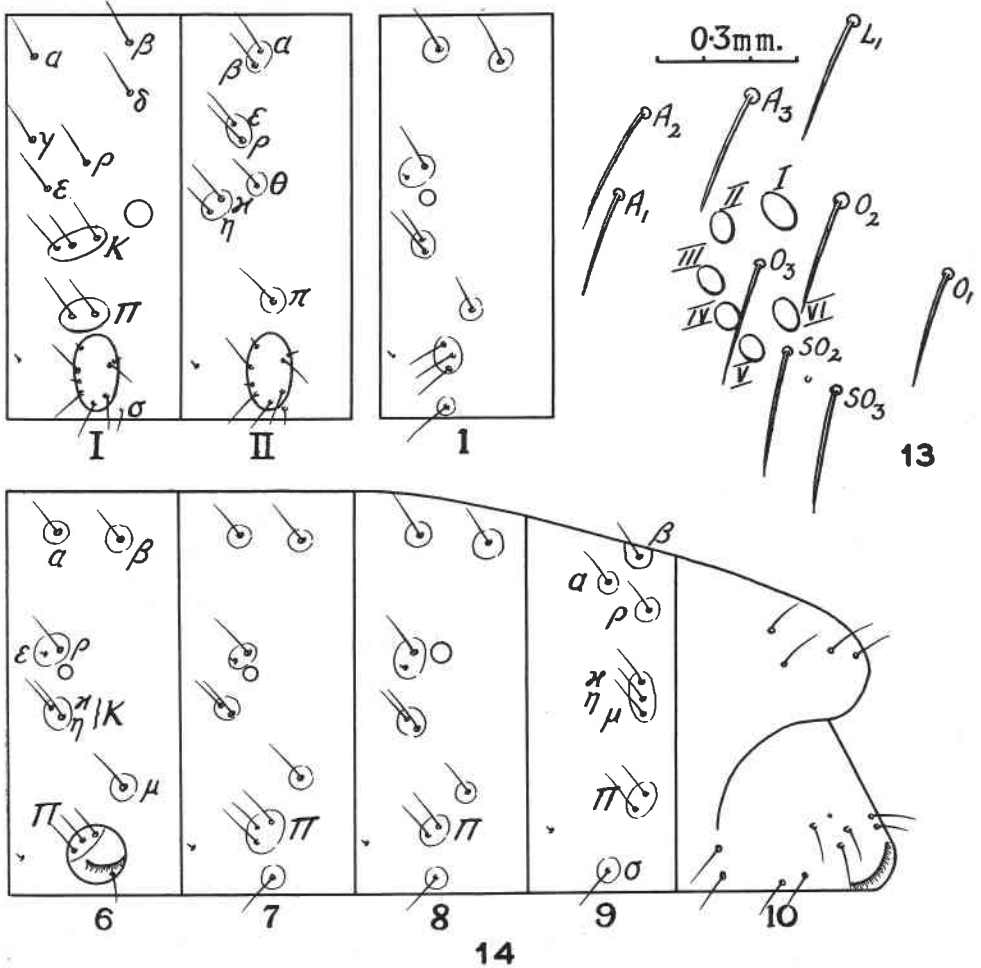
Setae of thoracic and abdominal segments (Fig. 14) as in *C. fumiferana*.

Anal shield sclerotized, yellowish, often with dark-brown pigmentation posteriorly. Anal fork (Fig. 9) as in *C. fumiferana*.

Thoracic legs, prolegs, and crotchets of prolegs (Figs. 4 & 5) as in *C. fumiferana*.

Figs. 6, 8-12. *C. pinus*. 6, postclypeal, frontal, and adfrontal areas; 8, hypopharynx, spinneret, and labial palp; 9, anal fork ventral view; 10, labrum; 11, mandible; 12, setal map of head capsule.

Fig. 7. *C. fumiferana*. Postclypeal, frontal, and adfrontal areas.



Figs. 13, 14. *C. pinus*. 13, relative positions of ocelli and surrounding setae; 14, setal maps of first and second thoracic segments and 1st, 6th, 7th, 8th, 9th, and 10th abdominal segments.

Discussion of Differences

It is apparent that even in such closely related species as *C. fumiferana* and *C. pinus* there may be sufficient structural and colour characteristics to distinguish the larvae of one species from the other.

In the above species the structural differences occur entirely in the head. The head capsule of *C. pinus* is usually larger than that of *C. fumiferana*, and its length in relation to its width greater, similarly the length of the median dorsal line from the anterior edge of the postclypeus to the termination of the adfrontals in relation to the width of the postclypeus.

Measurements were made of the length and width of the heads of 75 last instar specimens of *C. fumiferana*: the width divided by the length averaged 1.20 within a range of 1.13 to 1.25. The same measurements were made of 34 late instar specimens of *C. pinus*: the width divided by the length averaged 1.13, but within a range of 1.05 to 1.30 with 18 of the specimens falling in the *fumiferana* range.

Measurements of the width of the postclypeus and of the length of the median dorsal line from the anterior edge of the postclypeus to the termination of the adfrontals were found to be more constant. I have, therefore, designated the latter divided by the former as the *postclypeal index*. The postclypeal index for 51 last instar specimens of *C. fumiferana* averaged 1.46 within a range of 1.40 to 1.54, and for 73 last instar specimens of *C. pinus* 1.58 within a range of 1.50 to 1.70, with about 20 per cent of each species falling between 1.50 and 1.54. Student's *t* test showed these means to be significantly different at the one per cent level.

Corresponding to the proportionately narrower postclypeus of *C. pinus*, the distances between the frontal setae (F_1) and between the epistomal setae (E_2) average slightly less than in *C. fumiferana* (Figs. 6 & 7). No other setal differences were noticed on the head capsule.

The tendency toward a deeper notch on the anterior margin of the labrum, and a spinneret with a possibly longer average length are other characteristics not at all incompatible with the longer head structures of *C. pinus*.

Several dozen specimens of second-instar larvae of *C. fumiferana* and a few third and fourth instars of both species were also studied. Early instars of *C. fumiferana* and *C. pinus* have heads and prothoracic shields of about the same colour, so that such specimens cannot be identified by colour differences. Measurements were made of the width and length of the heads of 18 specimens of second instar larvae of *C. fumiferana*: the width divided by the length averaged 1.24 within a range of 1.14 to 1.39. The postclypeal index of 21 specimens averaged 1.35 within a range of 1.23 to 1.46. The differences between the postclypeal indices and the head measurements not only agreed with those of late instar larvae of their respective species, but indicated a possibly greater divergence in average postclypeal indices. It seems probable, therefore, that these measurements are useful in all stages with the possible exception of the first instar, which to date has not been studied, and that further study of earlier instars may prove the postclypeal index more reliable for early than for late instars.

Accurate measurements of the width of the postclypeus were difficult to obtain in second-instar larvae, even in specimens that had been in KOH solution. However, it is preferable to use the postclypeal index, where possible, for identification, and other measurements only as a check in doubtful specimens.

Acknowledgments

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