

SCIENTIFIC NOTE

**Pacific Flatheaded Borer, *Chrysobothris mali* Horn
(Coleoptera: Buprestidae), found attacking apple saplings
in the Southern Interior of British Columbia****SUSANNA ACHEAMPONG¹, GABRIELLA M.G. ZILAHIBALOGH², ROBERT G. FOOTTIT³, GARY J.R. JUDD⁴, AND T. DIMARIA⁵****Key words:** *Chrysobothris mali*, Pacific flatheaded borer, *Malus domestica*

The Pacific flatheaded borer, *Chrysobothris mali* Horn (Coleoptera: Buprestidae), is widely distributed throughout western North America, occurring west of the Rocky Mountains from California to British Columbia and western provinces (Furness and Carolin 1977; Soloman 1995). It feeds on 41 genera of plants in 20 families, including *Malus* (Burke 1929). We investigated borer damage to young apple, *Malus domestica*, saplings reported by a grower in July 2015 in Kelowna, British Columbia. The saplings were planted in April 2014 and 2015. Larvae were actively feeding on B9 and M9 rootstocks imported from the Netherlands and grafted with gala and honeycrisp apple varieties. The report was a concern, because flatheaded borer is not a pest of apples in British Columbia. Apple clearwing moth, a serious pest of apples in British Columbia was imported on rootstock from the Netherlands. The study was conducted to identify the *Chrysobothris* species, its distribution and infestation levels to help guide management recommendations.

Infested trees had dark-coloured, cracked bark with frass showing through. Frass was evident around the base of some infested trees. Larvae were found beneath the bark and inside the wood, and larval galleries were exposed when bark was removed; one larva was found in a sapling, rarely two in a sapling. The galleries occasionally encircled the stem, which killed the sapling. Leaf symptoms on infested saplings varied from yellow to purple.

Surveys were conducted in 19 young apple plantings and nurseries in the Okanagan and Similkameen valleys of British Columbia, from July to October 2015, to determine distribution and infestation levels. All saplings at each survey site were visually inspected for damage and presence of larvae (Table 1). Survey sites were located in Kelowna, Oyama, Winfield, Lavington, Cawston, and Keremeos. Site selections were based on information about young apple plantings provided by B.C. Tree Fruits Ltd. We inspected infested saplings at the original site, but it was not included in our surveys, because the grower had removed some of the infested trees.

To confirm whether the borer was a native or imported *Chrysobothris* species, 20 infested saplings, including six from the original site, were sent to the Canadian Food Inspection Agency (CFIA) Entomology laboratory in Ottawa for larval and adult identifications. Infested saplings were also kept in the B.C. Ministry of Agriculture

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Laboratory in Kelowna for rearing out adults. Four larvae were sent to Robert Footitt (AAFC) for DNA barcoding.

Two of four larval specimens were barcode sequenced, producing identical sequences, and matched to *C. mali*. Species identifications were based on sequencing of the DNA barcode region of the mitochondrial gene Cytochrome C oxidase subunit I (COI). DNA was extracted, amplified, and sequenced according to standard DNA barcode protocols ([http://www.barcodeoflife.org/sites/default/files/Protocols for High Volume DNA Barcode Analysis.pdf](http://www.barcodeoflife.org/sites/default/files/Protocols%20for%20High%20Volume%20DNA%20Barcode%20Analysis.pdf)), then compared to reference sequences in BOLD (Barcode of Life Data Systems (<http://www.boldsystems.org>), based on specimens in the Canadian National Collection, collected in Alberta, Saskatchewan and California. The match to *C. mali* ranged from 99.5 to 98.8 percent, whereas the similarity to 22 other species ranged from 82.0 to 95.0 percent. Sequences were deposited in GenBank, National Center for Biotechnology Information, U.S. National Library of Medicine, Bethesda, MD, USA (<http://www.ncbi.nlm.nih.gov/genbank/>; GenBank Accession No. KX283168).

The CFIA and the B.C. Ministry of Agriculture laboratories reared out adult *C. mali*. *Chrysobothris mali* larvae were detected at low infestation levels (0.01 to 0.22%) in 15 of the 19 survey sites (Table 1).

Table 1

Flatheaded borer larval infestation levels in young apple orchards/nurseries in the Okanagan and Similkameen valleys of British Columbia in 2015.

Orchard/Nursery	Number of trees examined	Number of infested trees	Infestation Level (%)
A	42,000	10	0.02
B	14,000	1	0.01
C	14,000	1	0.01
D	90,000	45	0.05
E	15,000	33	0.22
F	10,000	0	0
G	17,500	21	0.12
H	35,000	11	0.03
I	55,000	10	0.02
J	4,000	0	0
K	150,000	147	0.10
L	40,000	0	0
M	15,000	4	0.02
N	245,000	1	0
O	5,000	1	0.02

There were previous unconfirmed reports of *C. mali* damage to young apple trees in Kelowna in 2003 (Philip 2003). Our study provides the first confirmed record of *C. mali* causing damage on young fruit trees in the Okanagan. *Chrysobothris mali* has previously been reported as a pest of newly planted fruit trees and of young nursery trees in California (Burke 1919; Burke 1929; McNelly *et al.* 1969). McNelly *et al.* (1969) reported that young trees stressed by sunburn, drought, or bark injury, or planted too late in the spring were particularly subject to attack.

Chrysobothris mali produces a single generation per year. It overwinters as mature larvae in the heartwood. Pupation occurs between April and May. Adult emergence and oviposition occurs in June and July (Burke 1929). Eggs are laid in cracks and crevices in the bark. Eggs hatch, and larvae mine into the cambium and pack frass in the mine behind it (Davis *et al.* 1968).

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