

Pine needle scale: an emerging pest in Christmas tree plantations in Québec

Jean-Frédéric Guay, Amy Bernier-Desmarais, Jean-François Doherty and Conrad Cloutier
Université Laval, Département de biologie, Québec QC Canada



Highlights

The pine needle scale *Chionaspis pinifoliae* (Hemiptera: Diaspididae) (Figure 1) is a native insect species of North America, sometimes reported on balsam fir *Abies balsamea* and Fraser fir *Abies fraseri* in commercial Christmas tree plantations, but also on other ornamental pine and spruce conifer species. In Québec, it has the status of an emerging pest of Christmas trees and is not known to cause any significant damage. Although not generally monitored by growers, it can be an obstacle for exportation to Christmas tree markets where scale insects are strictly regulated.

Our recent observations (Guay *et al.* 2018) allowed to describe the life cycle of this pest in Christmas tree plantations in southern Québec and confirm the presence of specialised natural enemies. These findings will help growers in their monitoring efforts and in elaborating Integrated Pest Management (IPM) strategies.

Results and recommendations

Our sampling was conducted in commercial Fraser fir plantations located in southern Québec (Courcelles and Weedon localities, Estrie region) and on naturally growing indigenous conifers in the periphery of the plantations.

Pine needle scales were frequently observed on indigenous balsam fir, white spruce (*Picea glauca*), and black spruce (*Picea mariana*) surrounding infested Fraser fir plantations, but not on eastern white cedar (*Thuja occidentalis*). Pine trees were absent from the sampled plantations, but are a known host of the scale in Québec (Martel & Sharma, 1968). Presence of the scale on host conifers in landscapes surrounding Christmas tree growing areas could explain its sporadic presence in plantations. However, its regular introduction on contaminated seedlings from tree nurseries remains possible.



Figure 1 Pine needle scale with (A) and without its waxy scale cover (B).

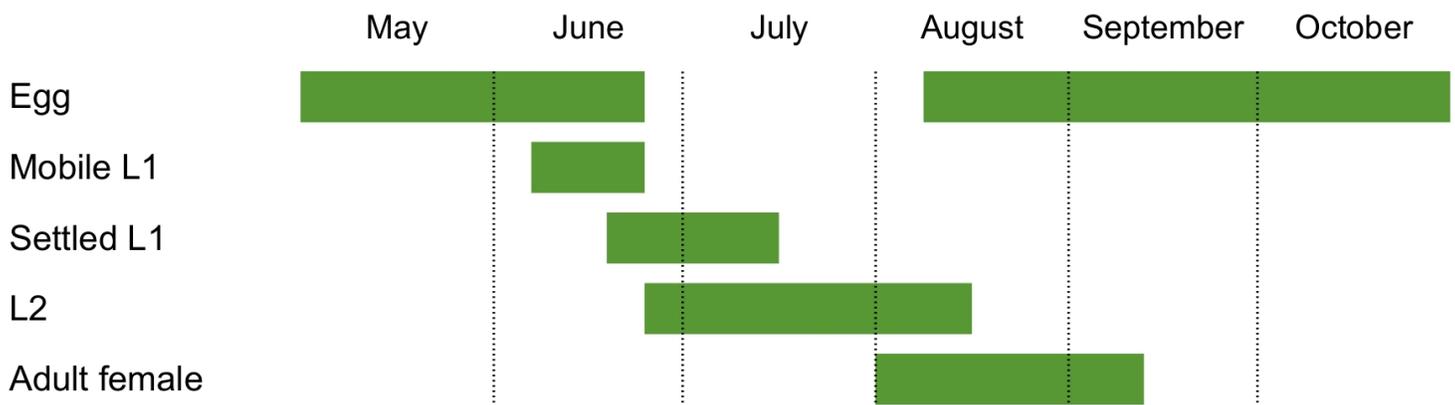


Figure 2 Life cycle of the pine needle scale (asexual form without males), as observed on Fraser fir (Courcelles).

The life cycle observed in Christmas tree plantations (Fraser fir) was that of a single-generation form (Figure 2). The hatching of overwintered eggs (Figure 3A) occurred around mid-June, after which the mobile L1 or crawlers (Figure 3B) settled rapidly on the needles. The transition to the L2 stage (Figure 3C) began in early July. Adults (Figure 3D) matured in early August, followed by egg laying, which continued into late September.

Two reproductive forms of the scale exist. In Courcelles, we observed a parthenogenetic form (no males), while in Weedon, a sexual form with males and a similar life cycle was found, confirming the occurrence of both reproductive forms in Québec.

Dispersion of mobile L1 is limited to adjacent needles and shoots (lower side), resulting in localised infestation spots. Generally, lower branches are affected first. Because of high natural mortality and the fact that empty scales may persist over several years, frequent scale content examination is required to accurately assess infestation levels in a plantation.

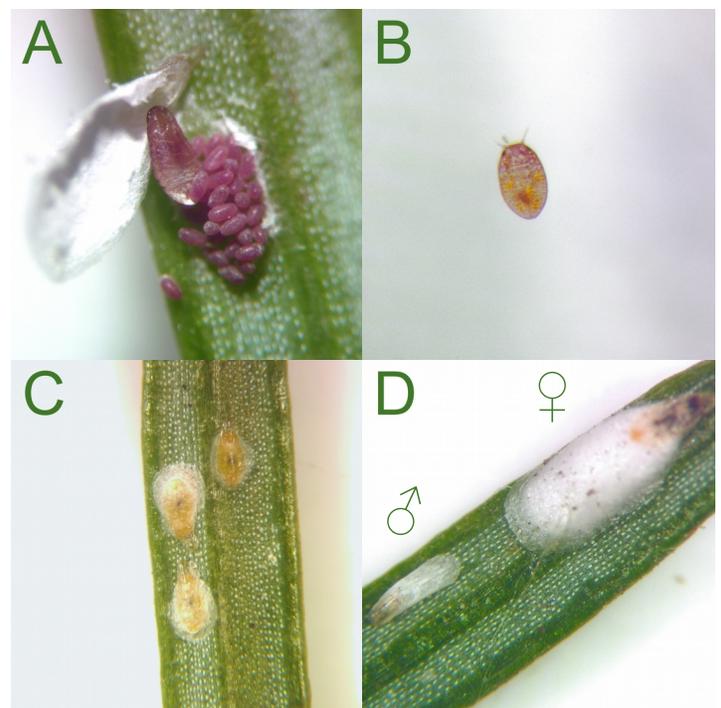


Figure 3 Development stages of the pine needle scale: (A) egg mass under the waxy scale of the female; (B) mobile L1; (C) immobile L2; (D) adult male (left) and female (right).

Signs of parasitism and predation were observed regularly. Parasitism (Figure 4A) was attributable to parasitoid wasps, while traces of predation (Figure 4B) were characteristic of larvae and adults of micro lady beetles. The presence of natural enemies suggests a potential for the natural control of pine needle scales in commercial Christmas tree plantations. A strategy to increase their abundance and potential impact implies modifying current farming practices, including optimised weed control to promote the establishment of native plants as additional food sources and shelters for natural enemies (Tooker & Hanks, 2000).

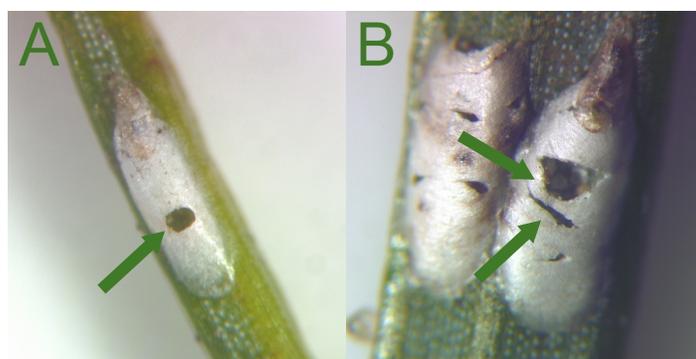


Figure 4 Signs of predation from natural enemies of the pine needle scale: (A) Emergence holes of a parasitoid wasp; (B) Predation traces caused by micro lady beetles.

The application of insecticides to control other Christmas tree pests (balsam twig aphid, balsam gall midge) should also be reduced, in order to promote natural enemy diversity. If treatments against pine needle scales are deemed necessary, they should target the unprotected mobile L1 stage occurring shortly after hatching of overwintering eggs in late spring, by using a **predictive degree-day model** (Doherty *et al.* 2018). To ensure control success, applications should target the base of trees, where most scale insects are located.

Acknowledgements

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