



**Quick scan number: QS. Ent.2017.001**

<b>Quick scan date:</b> 17 March 2017		
1	<p>What is the scientific name (if possible up to species level + author, also include (sub)family and order) and English/common name of the organism? <i>Add picture of organism/damage if available and publication allowed.</i></p>	<p><i>Neodiprion abietis</i> (Harris, 1841), the balsam fir sawfly, Hymenoptera: Diprionidae (conifer sawflies)</p> 
2	<p>What prompted this quick scan? <i>Organism detected in produce for import, export, in cultivation, nature, mentioned in publications, e.g. EPPO alert list, etc.</i></p>	<p>Interception of a pupa of the sawfly on cut branches of <i>Gaultheria</i> on 17-10-2016 at De Kwakel, NL. The consignment originated from the United States of America.</p>
3	<p>What is the current area of distribution?</p>	<p>The species is only known from North America with a transcontinental distribution in southern Canada and the United States of America (Cunningham 1981, Lucarotti et al. 2011). It is also present on Saint Pierre et Miquelon, an overseas collectivity of France close to Canada (Linnen &amp; Farrell 2008)</p>
4	<p>What are the host plants?</p>	<p>Several fir species are known as host (<i>Abies amabilis</i>, <i>A. balsamea</i>, <i>A. concolor</i>, <i>A. grandis</i>, <i>A. lasiocarpa</i>) as well as spruce (<i>Picea engelmannii</i>, <i>P. glauca</i>, <i>P. mariana</i> and <i>P. sitchensis</i>) and Douglas fir (<i>Pseudotsuga menziesii</i>) (Linnen &amp; Farrell 2008, BC Ministry of Agriculture 2012, Johns et al. 2013)</p>

5	<p>Does the organism cause any kind of plant damage in the current area of distribution and/or does the consignment demonstrate damage suspected to have been caused by this organism?  <i>Yes/no + plant species on which damage has been reported + short description of symptoms.</i>  <i>Please indicate also when the organism is otherwise harmful (e.g. predator, human/veterinary pathogen vector, etc.).</i></p>	<p>The balsam fir sawfly is primarily a defoliator of firs, especially of <i>Abies balsamea</i> in Canada. Larvae feed on 1- to 2-year-old needles, rarely on new needles. Feeding leads to sparse foliage and reduces tree vigour. Tree mortality is rare, but severe outbreaks may kill small trees and spoil survivors. Localized outbreaks occur periodically (NRC 2008). Additionally, in high pest density areas damage is occasionally found on black (<i>P. mariana</i>) and white spruce (<i>P. glauca</i>) (Thurston 2002; NRC 2008; see also question 12).</p> <p>In Ontario, the balsam fir sawfly is described as a major forest pest (Biggs &amp; Jansons 1984). In eastern Canada, it has become an important pest of young and semi-mature balsam fir, particularly in young to middle-aged stands of open-growing or thinned stands. When sawfly populations reach epidemic levels, densely growing balsam fir plantations will also be attacked (Ostaff et al. 2006). In western Newfoundland (Canada) in a 336,805 ha forest, 56% of the dominant <i>A. balsamea</i> had been defoliated by balsam fir sawfly since 1991 (Iqbal et al. 2012). For this region, <i>N. abietis</i> had a significant effect on forest growth, wood volume increments and yield. It was estimated to reduce the total operable softwood growing stock and softwood harvest level by 26% and 31%, respectively.</p> <p>In California, the level of defoliation of <i>Abies concolor</i> ranges from light to almost 90% of 1-year and older needles. Smaller trees are more severely defoliated than larger trees. On the smaller trees defoliation is evenly distributed throughout the crown, while of the larger size classes or dominant trees about the lower two-thirds of the crowns is affected (California Forest Pest Council 2000).</p> <p><i>N. abietis</i> is known as pest of <i>Abies balsamea</i> grown for ornamental purposes or as Christmas tree (NRC 2008; USDA 2008; Swier 2016).</p>
6	<p>Assess the probability of establishment in the Netherlands (NL) (i.e. the suitability of the environment for establishment).</p> <ol style="list-style-type: none"> <li>a. In greenhouses (low, medium, high)</li> <li>b. Outdoors (low, medium, high)</li> <li>c. Otherwise (e.g. storage facilities, human environment)</li> </ol>	<ol style="list-style-type: none"> <li>a. Low (no infestations known from greenhouses; indoor infestations are unlikely)</li> <li>b. High: host plants are widely distributed and the climate is likely suitable for establishment because the pest is currently present from coast to coast in Canada and the USA</li> <li>c. Not relevant</li> </ol>

7	Assess the probability of establishment in the EU (i.e. the suitability of the environment for establishment).	The probability of establishment is high (see question 6; Sheenan & Dahlsten 1985). In Europe, one species of the genus <i>Neodiprion</i> is known to be present: <i>N. sertifer</i> (Geoffroy), the European pine sawfly. This sawfly does not live on firs, but it commonly lives on various pine species. It has been introduced into the United States in 1925 where it attacks pines over large areas since then (Hoover & Barr 2002). The biology of the North American species <i>N. abietis</i> is very similar to that of the European species and European conditions are likely suitable for establishment of <i>N. abietis</i> .
8	What are the possible pathways that can contribute to spread of the organism after introduction? How rapid is the organism expected to spread (by natural dispersal and human activity)?	Human assisted spread: trade of infested host plants. Natural spread: adult female sawflies can fly over long distances and after introduction the pest is expected to spread rapidly, in the EU at least several kilometres per year.  Up to now this species has not been reported from other continents. This may be due to the EU import prohibition of live conifers, other than seeds, from North-America (Annex III of Directive 2000/29/EC).
9	Provide an assessment of the type and amount of direct and indirect damage (e.g. lower quality, lower production, export restrictions, threat to biodiversity, etc.) likely to occur if the organism would become established in NL and the EU, respectively?	<u>Potential impact for European forests</u> European <i>Abies</i> species are different from the North American <i>Abies</i> species. Among the European species, silver fir ( <i>Abies alba</i> ) is the most important one in terms of economic and ecological significance ( <a href="http://www.euforgen.org/species/abies-alba/">http://www.euforgen.org/species/abies-alba/</a> , 21 February 2017). The North American species <i>A. grandis</i> has been introduced for wood production in many European countries. Assuming that all <i>Abies</i> spp. are host plants, the potential impact for production forests could be significant. Wood production losses may be similar to those in North America and may be several dozen of percent (see question 5).  <u>Potential impact for ornamental tree nurseries</u> Damage in (usually small or isolated) stands of ornamental trees may be limited. <i>N. abietis</i> is considered a pest in commercial nurseries (Cunningham 1981) but reports are lacking about economic impact in ornamentals.
10	Has the organism been detected on/in a product other than plants for planting (e.g. cut flowers, fruit, vegetables)? If "no", go to question 12	Yes
11	If the organism has been found on/in a product other than plants for planting (e.g. cut flowers, fruit, vegetables), what is the probability of introduction (entry + establishment)? <i>Only to be answered in case of an interception or a find.</i>	From the north-western part of North America, twigs of salal are imported yearly in high numbers into the EU for use in flower bouquets. In Canada, salal is commonly harvested from the undergrowth in forests (Hobby & al. 2010, Tirmenstein 1990) and exported to floral auctions in the Netherlands as a main destination. It is unknown how frequently <i>N. abietis</i> is associated with this product because this product is not subject to regular phytosanitary inspections (i.e. not included in Annex V of Directive 2000/29/EC).

12	Additional remarks	<p><i>Neodiprion abietis</i> has been assigned to a species complex because strong host specialization of strains has been observed (Knerer &amp; Atwood 1972, Linnen &amp; Farrell 2008, Lucarotti et al. 2011). In the field, differences in developmental rates, larval survival on various food plants and host selection by the females supply isolating mechanisms between the different strains. Of the import interception (see Question 2) neither the U.S. state nor the host plant from which it originated is known, which makes it impossible to assign one of the known strains to the specimen that was intercepted. Most sawfly cocoons are usually found in the litter and soil, and are occasionally attached to individual needles of trees (Sheenan &amp; Dhalsten 1985).</p>
13	References	<ul style="list-style-type: none"> <li>• B.C. Ministry of Agriculture (2012) Nursery Production Guide. Available: <a href="http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/animal-and-crops/crop-production/nursery-plant-production-guide.pdf">http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/animal-and-crops/crop-production/nursery-plant-production-guide.pdf</a> [accessed 15-02-2017].</li> <li>• Biggs WD, Jansons V (1984) Results of forest insect and disease surveys in the North Central Region of Ontario, 1983. <i>Great Lakes Forest Research Centre, Canadian Forestry Service, Department of the Environment. Miscellaneous Report 2</i>, 1-29. Available: <a href="http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/9348.pdf">http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/9348.pdf</a> [accessed 21-12-2016]</li> <li>• California Forest Pest Council (2000) Forest Pest Conditions in California – 2000. <a href="https://www.fs.usda.gov/Internet/fse_documents/fsbdev3_045380.pdf">https://www.fs.usda.gov/Internet/fse_documents/fsbdev3_045380.pdf</a></li> <li>• Cunningham JC (1981) Chapter 56. <i>Neodiprion abietis</i> (Harris), Balsam Fir Sawfly (Hymenoptera: Diprionidae). In: Kelleher JS &amp; Hulme MA. Biological Control Programmes against Insects and Weeds in Canada 1969-1980. Commonwealth Agricultural Bureaux pp. 321-322. Available: <a href="https://www.esc-sec.ca/cabi/vol_3_bccanada.pdf">https://www.esc-sec.ca/cabi/vol_3_bccanada.pdf</a> [accessed 10-2-2017]</li> <li>• Hobby T, Dow K &amp; MacKenzie S (2010) Commercial development of salal on southern Vancouver Island. <i>BC Journal of Ecosystems and Management</i> 11, 62–71. Available: <a href="http://jem.forrex.org/index.php/jem/article/view/57/28">http://jem.forrex.org/index.php/jem/article/view/57/28</a> [accessed 5-01-2017]</li> <li>• Hoover GA &amp; Barr NB (2002) European Pine Sawfly, <i>Neodiprion sertifer</i>. <i>Entomological Notes. The Pennsylvania State University</i>. <a href="http://ento.psu.edu/extension/factsheets/pdf/eupinesawfly.pdf">http://ento.psu.edu/extension/factsheets/pdf/eupinesawfly.pdf</a> [accessed 21-12-2016]</li> <li>• Iqbal J, Hennigar CR &amp; MacLean DA (2012) Modeling insecticide protection versus forest management approaches to reducing balsam fir sawfly and hemlock looper damage. <i>Forest Ecology and Management</i> 265, 150–160.</li> <li>• Johns RC, Fidgen J &amp; Ostaff DP (2013) Host-tree oviposition preference of balsam fir sawfly, <i>Neodiprion abietis</i> (Hymenoptera: Diprionidae), in New Brunswick, Canada. <i>Canadian Entomologist</i> 145, 430-434.</li> <li>• Knerer G &amp; Atwood CE (1972) Evolutionary trends in the subsocial sawflies belonging to the <i>Neodiprion abietis</i> complex (Hymenoptera: Tenthredinoidea). <i>American Zoologist</i> 12, 407–418.</li> <li>• Linnen CR &amp; Farrell BD (2008) Phylogenetic analysis of nuclear and mitochondrial genes reveals evolutionary relationships and mitochondrial introgression in the sertifer species group of the genus</li> </ul>

		<p><i>Neodiprion</i> (Hymenoptera: Diprionidae). <i>Molecular Phylogenetics and Evolution</i> 48, 240–25. Available [accessed 5-1-2017]  <a href="http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.608.6421&amp;rep=rep1&amp;type=pdf">http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.608.6421&amp;rep=rep1&amp;type=pdf</a></p> <ul style="list-style-type: none"> <li>• Lucarotti CJ, Whittome-Waygood BH &amp; Levin DB (2011) Histology of the larval <i>Neodiprion abietis</i> (Hymenoptera): Diprionidae) digestive tract. <i>Psyche</i> 2011, Article ID 910286, 10 pages. Available: <a href="https://www.hindawi.com/journals/psyche/2011/910286/">https://www.hindawi.com/journals/psyche/2011/910286/</a> [accessed 21-12-2016]</li> <li>• NRC [Natural Resources Canada] (2008) Christmas Tree Insects and Diseases - A Field Guide. Available: <a href="http://www.cfs.nrcan.gc.ca/pubwarehouse/pdfs/28835.pdf">http://www.cfs.nrcan.gc.ca/pubwarehouse/pdfs/28835.pdf</a> [accessed 15-02-2017].</li> <li>• Ostaff DP, Piene H, Quiring DT, Moreau G, Farrell JCG &amp; Scarr T (2006) Influence of pre-commercial thinning of balsam fir on defoliation by the balsam fir sawfly. <i>Forest ecology and management</i>, 223 (1): 342-348. Available: <a href="http://professeur.umoncton.ca/umcm-moreau_gaetan/files/umcm-moreau_gaetan/wf/wf/2006_BFS_growth_rate.pdf">http://professeur.umoncton.ca/umcm-moreau_gaetan/files/umcm-moreau_gaetan/wf/wf/2006_BFS_growth_rate.pdf</a> [accessed 10-2-2017]</li> <li>• Sheehan KA &amp; Dahlsten DL (1985) Bionomics of <i>Neodiprion</i> Species on white fir in Northeastern California. <i>Hilgardia</i>, 53(8): 1-24.</li> <li>• Swier SR (2016) Conifer sawflies. Fact Sheet 40 UNH Cooperative Extension Pes. Available: <a href="https://extension.unh.edu/resources/files/Resource002821_Rep4176.pdf">https://extension.unh.edu/resources/files/Resource002821_Rep4176.pdf</a>. [accessed 15-02-2017].</li> <li>• Thurston GS (2002) Chapter 38 - <i>Neodiprion abietis</i> (Harris), balsam fir sawfly (Hymenoptera: Diprionidae). In: Mason P &amp; Huber JT (eds), <i>Biological control programmes in Canada, 1981-2000</i>, CABI International pp. 196-198.</li> <li>• Tirmenstein, D (1990) <i>Gaultheria shallon</i>. In: <i>Fire Effects Information System</i>, [Online]. USDA, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <a href="http://www.fs.fed.us/database/feis//plants/shrub/gausha/all.html">http://www.fs.fed.us/database/feis//plants/shrub/gausha/all.html</a> [accessed 5-01-2017].</li> <li>• USDA Forest Service and Michigan State University Extension Christmas Tree Pest Manual, second edition published in 1998 (Extension Bulletin E-2676). Available: <a href="http://www.na.fs.fed.us/spfo/pubs/misc/xmastree/index.htm">http://www.na.fs.fed.us/spfo/pubs/misc/xmastree/index.htm</a>. [accessed 15-02-2017].</li> </ul>
14	<b>Conclusions</b>	<p>This Quicksan was initiated after the interception of the sawfly <i>Neodiprion abietis</i> on cut branches of <i>Gaultheria</i> originating in North America. <i>N. abietis</i> is known as a significant forest pest of <i>Abies</i> in North America. European conditions are likely suitable for establishment of the species. The potential impact of <i>N. abietis</i> for Europe is uncertain because European <i>Abies</i> species are different from the <i>Abies</i> species that are severely affected in North America.</p>
15	<b>Follow-up measures</b>	<p>The NPPO will continue to inspect consignments of <i>Gaultheria</i> branches as part of the national survey programme.</p>