Adelges piceae 正體中文

System: Terrestrial

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Homoptera	Adelgidae

Common name balsam woolly adelgid (English), balsam woolly aphid (English), puceron lanigère du sapin (French)

Synonym

Similar species *Adelges tsugae*

Summary Adelges piceae is a tiny, non-flying, sucking insect that causes great damage to fir forests in Canada and the United States. It is a serious pest to landscape and natural fir, and to the Christmas fir tree industry. Adelges piceae is invasive outside of its native central Europe from where it spread via timber imports. Adelges piceae is limited in its northern distribution by cold weather. Adelges piceae eggs and newly hatched nymphs are spread by wind, on animals, clothing, vehicles and other equipment.

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Species Description
Adults are blackish purple, roughly spherical in shape, less than 1mm long, almost invisible to the naked eye, and covered with secretions of waxy threads that appear as a dense, white, wool mass. Eggs are orange in colour. The first immature motile stage of *A. piceae*, known as a \"crawler\", is also orange with legs and black eyes. The following instars are sessile and resemble the adult. In North America, A. piceae is parthenogenetic. Eggs and crawlers can be identified with the aid of a hand lens.

Notes
European firs and Asian firs are not seriously affected by *A. piceae*.

Lifecycle Stages
Spread of *Adelges piceae* occurs during the egg and newly hatched nymph or \"crawler\" stages when they fall or are blown down from infested crowns in the spring, summer, and fall. Each egg is attached to the bark behind its mother underneath the waxy threads and hatches after a few days in warm weather. From the egg hatches the active crawler, which is amber coloured and has red eyespots. The crawler is the only mobile stage in its life cycle, and it is capable of crawling more than 30 m. It can live over eight days but will die within two unless it finds a suitable site to feed, which it will do for all of its adult life. When a crawler begins feeding, it transforms into a first instar nymph and becomes stationary. It then transforms into a flattened, wax-fringed resting stage known as the neosistens. Two immature forms closely resembling the adult follow the neosistens. These two forms along with the adult are known collectively as the sistentes. A rare stage, known as the progrediens, has been observed in Europe and the maritime provinces of Canada. In one form, it is wingless and in another, winged. The wingless form is very similar to the sistentes. The winged form is about 1mm long in the adult stage, has conspicuous membranous wings, five segmented antennae, and generally lacks wax pores.

Habitat Description
Adelges piceae can be found in natural stands of all kinds of fir, especially Fraser and Balsam firs. Distribution is limited at higher altitudes and latitudes by cold weather as mortality occurs above the snowline or where temperatures fall below 30 degrees F.

Reproduction
In North America *A. piceae* reproduces by parthenogenesis, a type of asexual reproduction, forming only female eggs by mitosis. Fertilisation does not occur as males do not exist in North America. The female lays a waxy mass of eggs. During spring and summer, a single female can lay over 200 eggs per clutch but normally only 10 to 40 are laid. *A. piceae* produces two clutches per year, and occasionally three in the southern Appalachians.

Nutrition
In North America, *A. piceae* feeds on all true firs, but a majority of infestation is on Balsam and Fraser firs. They feed anywhere on the tree where they can reach the parenchyma of the cortex (living portion of the bark) with their mouthparts.

General Impacts
Adelges piceae feeds on all true firs with long, tube-like mouthparts, and they also secrete an irritating, salivary substance that elicits a defensive response from trees where the adelgid is not native. Balsam fir is the main host of *A. piceae* , where it attacks both stems and shoots . The principal injury associated with stem infestations seems to be obstruction of the water-conducting tissue. But some decline is probably related to obstruction in the phloem tissue, which has an important role in transporting and storing food. Stem attack results in the formation of dense compression wood, reducing the quality of the wood fiber that is used in pulp and paper manufacturing. Prolonged shoot attack will hinder bud growth and height growth. Tree vigor declines as photosynthetic function decreases and foliage is lost. No new needles replace those that are naturally shed. This ultimately leads to top kill and mortality of the whole tree. Infested Balsam and Fraser firs may be killed in only 3 to 4 years.
North American hosts are so sensitive to attack that the damage seems out of proportion to the insect's size and method of feeding. Billions of feet of fir timber have been destroyed by *A. piceae* in North America. It is a serious pest to seed production, landscape and natural fir, and fir Christmas tree industry. Attempts to control the insect have been unsuccessful, and the U. S. Fish and Wildlife Service listed the Fraser fir as a species of special concern. The massive decline of Fraser firs has placed plants and animals of the spruce-fir plant association in jeopardy. Twenty-seven species of mosses and liverworts frequently occur on the bark of Fraser firs, and eight of them occur exclusively on the bark of firs. A small tarantula and a lichen, which are federally listed endangered species, and two salamander species, are among the native species that occur only in spruce-fir forests.

Management Info
Physical: Other management techniques include clearing and burning infested trees. Infested trees can be cut in winter when the nymphs are still present, and infested material should be burned on-site to eliminate the risk of future contamination. Bark should be stripped from felled trees before transporting to non-infested regions. \r\nChemical: Spraying of individual trees from the ground with lindane has proved effective for control, but spraying is warranted only in accessible areas supporting relatively high-value trees. Some of the chemicals that are effective on *A. piceae* are Asana XL, horticultural oil, insecticidal soap, Lorsban 4E. Asana and lindane can be used any time of year that trees can be treated. Lorsban and insecticidal soap should only be used from November through March in the USA. Any other time of year, a second application is necessary after four weeks. Horticultural oil should only be used from December through February (winter) as it may burn trees if they are not dormant. Lindane and Asana may cause an outbreak of the spruce spider mite as they kill mite predators. When using these chemicals in the spring, summer or fall, consider adding a miticide to the spray mix. \r\nBiological: On stem-attacked trees that survive more than 1 or 2 years, *A. piceae* may be controlled by the tree itself. The outer bark may die in increasingly large patches, and a wound layer of still living, but impermeable bark may be formed. The population then is increasingly restricted to a smaller and smaller area until most insects die. The tree also produces juvenile hormone analogs that may reduce adelgid populations. \r\nNo parasites of *A. piceae* are known, but many predaceous enemies have been noted. Unfortunately, most of them are general feeders and unreliable. To remedy the lack of effective native predators, several species of insect predators have been introduced to North America from other parts of the world, six of which from Europe have become established. Three are beetles (*Laricobius erichsonii*, *Pullus impexus*, and *Aphidecta obliterata*), and three are flies (*Aphidoletes thompsoni*, *Cremifania nigrocellulata*, and *Leucopis obscura*). As yet, none of these predators have achieved detectable control. They appear to feed on *A. piceae* lifecycle stages that are unimportant in determining the trend in its population.

Pathway
Adelges piceae was introduced from Europe and probably first entered the northeastern United States and southeastern Canada. It appeared later on the west coast and in the southeastern United States. Infested nursery stock is the presumed source of introduction into these regions.

Principal source:

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[6] CANADA
[1] NORTH AMERICA
[13] UNITED STATES

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