

Scientific Note

First report of *Adelges abietis* (Linnaeus) (Hemiptera: Adelgidae) in Idaho

The eastern spruce gall adelgid, *Adelges abietis* (Linnaeus 1758) (Hemiptera: Adelgidae) is an invasive pest of spruce trees, *Picea* (Pinaceae), that was introduced to North America from Europe prior to the 20th century (Drooz 1985). The preferred host of *A. abietis* is Norway spruce, *P. abies* (Linnaeus) H. Karst, but the insect also infests white (*P. glauca* (Moench) Voss), red (*P. rubens* Sargent) and blue spruces (*P. pungens* Engelm). The adelgid is established in eastern North America (southeastern Canada and the northeastern United States down to Tennessee), the Great Lakes region (Drooz 1985), four western states (South Dakota, Montana, Wyoming and Alaska) (<http://www.fs.fed.us/nrs/tools/afpe/maps/ESGA.pdf>, accessed 25 October 2012) and three western provinces (British Columbia, Alberta and Yukon) (http://www.exoticpests.gc.ca/static/images/maps/Adelges_abietis_eng.gif, accessed 19 June 2012). There is anecdotal evidence of the adelgid from Washington State, however the above-referenced USDA-Forest Service resource does not list the insect occurring in the state of Washington. The established populations of *A. abietis* that are closest to Idaho occur in western Montana (Lincoln County) and southern British Columbia. This report represents a new state record of *A. abietis* in Idaho and documents occurrence of the species in the state of Washington by including information for specimens collected in the eastern portion of the state.

Galls on Norway spruce were collected from two locations: 1) in November 2011 from the Finch Arboretum (Corey Glen area) in Spokane, Spokane County, WA, approximately 40 km west of the Idaho border (specimens were given to T. Kohlhauff, Spokane County Cooperative Extension, by C. Deffe, Spokane Community College) and 2) in March and May, 2012 from the University of Idaho campus in Moscow, Latah County, ID. Galls from both locations had the characteristic pineapple shape and were the size (1.5 to 2.0 cm long) and location (near the base of the current year's needles) to suggest that they had been caused by an infestation of *A. abietis*. First instar nymphs from Washington and alate adults from Idaho were confirmed to be *A. abietis* using morphological characteristics (Blackman & Eastop 1994). Voucher specimens have been placed in the William Barr Insect Museum at the University of Idaho (Moscow, ID). Nymphs that had settled at the base of buds (Washington) and from inside galls (Idaho) were confirmed to be *A. abietis* using DNA barcode sequences generated with standard protocols (Footitt et al. 2009). The DNA barcode sequences in the COI barcode region were identical and matched exactly the sequences in GenBank deposited by Footitt et al. (2009), accession numbers FJ502356 through FJ502372. DNA sequences from several Idaho specimens were deposited in GenBank under accession numbers JX657684 through JX657687.

Species identification of gall-forming adelgids can also be facilitated by using the gall's shape, size and position on the twig. In contrast to the pineapple-shaped galls produced by *A. abietis*, the galls formed by the native Cooley spruce gall adelgid,

A. cooleyi (Gillette 1907), are usually larger (up to 75 mm in length) and occur at the ends of spruce twigs (Cumming 1959). Although no galls are produced on its alternate host, *A. cooleyi* can utilize Douglas-fir, *Pseudotsuga menziesii* Carrière (Pineaceae), as a host, while *A. abietis* only infests spruce and does not have an alternate host. Gall formation on spruce twigs can result in limb distortions and misshapen crowns, thereby weakening limbs at the point of gall formation and decreasing the aesthetic value of trees. Because of the damage caused by the galls, the adelgid can be a serious pest in nurseries, Christmas tree plantations and ornamental plantings of spruce (Drooz 1985).

Adelges abietis is entirely female, with reproduction occurring parthenogenetically. The adelgid overwinters as sessile nymphs at the base of buds under wax-like coverings they excrete (Wilford 1937, cited in Drooz 1985). The following spring, the nymphs develop to the adult stage and lay eggs at approximately the same time as bud-break. After hatching, the crawlers move to the base of new needles where they feed, completing the formation of pineapple-shaped galls in which they live and develop (Plumb 1953). The galls open during late summer or early autumn and mature nymphs exit and develop into alate females capable of laying over 100 eggs before they die. After eggs hatch, the crawlers move to the overwintering sites.

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