NPAG Report
***Semanotus bifasciatus* Motschulsky: Juniper bark borer**
Coleoptera: Cerambycidae
NPAG Chair Approval Date: July 26, 2011

Semanotus bifasciatus adults. Source: http://www2.gol.com/users/nanacorp/ZUKAN/byakusin.htm

This report is an internal PPQ document, intended to be used as an aid in PPQ decision making. The technical recommendations listed at the end of this document do not necessarily represent PPQ policy.

Initiating Event and Pest Identification: On December 28, 2010, Paul Larkins, PPQ-ER, notified NPAG that *Semanotus bifasciatus* Motschulsky had been intercepted in Tampa, Florida on handicrafts from China (USDA-APHIS, 2010). The specimen (1 adult) had been found crawling on a wooden crate and was identified to species by Natalia Vandenberg (SEL) on December 27, 2010. Because this pest had been identified in a risk assessment of wood décor and craft products from China as a quarantine pest likely to follow the pathway (USDA-APHIS, 2007), NPAG initiated a report.

Synonym: *Hylotrupes bifasciatus* Motschulsky (Hua et al., 2009).

Data Sheets: Partial datasheet in CABI Forestry Compendium (CABI-FC, 2011)

Current PPQ Policy: *Semanotus bifasciatus* is not listed in PestID (AQAS, 2011, queried 1/3/2011). The genus *Semanotus* is listed as reportable/actionable. There are no listings of *Semanotus* in the Global Pest and Disease Database (GPDD, 2011, queried April 13, 2011), or in the Offshore Pest Information System (OPIS, 2011, queried April 13, 2011).

Pest Situation Overview:

Exotic status: *Semanotus bifasciatus* is exotic to the United States. There have been at least two port interceptions of *Semanotus bifasciatus* on wood products from China since 2008 and another five *Semanotus* interceptions (on wood products from China) identified to genus only (AQAS Oracle queried 5/5/2011). There are no reports of this species in the United States or its territories.

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Biology: *Semanotus bifasciatus* is reported to be a serious borer pest of *Platycladus orientalis* (Ma et al., 2008). It is considered a secondary pest[1] of host trees in Japan, the Korean Peninsula and China (Iwata et al., 2007), but this includes a history of damage to standing trees and shrubs (Kim and Park, 1984). Additionally, in recent years its damage has constituted a threat to the protection of antique cypresses in some regions (Gao, 2007). Feeding by *S. bifasciatus* can weaken trees, cause windbreak, or kill trees (Zhang 2003). Adults are active at temperatures of 5° to 20°C and very active after sunset (Iwata et al., 2007). In lumber yards of China, *Semanotus bifasciatus* occurs sympatrically with *Callidiellum rufipenne*, infesting the same hosts, but preferring different portions of the log; *C. rufipenne* prefers the upper, drier, portions of the log while *S. bifasciatus* prefers the lower, moister, portions (Iwata et al., 2007). Adults overwinter in a state of dormancy rather than diapause and warm winters may accelerate the life cycle of *S. bifasciatus* (Ma et al., 2008). In Korea, the species is univoltine, with an adult population peak from late March to late April. The egg stage lasts 15 to 19 days, the larval stage 112-126 days, the pupal stage 15-21 days, and the adult lifespan 19 days for females and 16 days for males (Kim and Park, 1984). Eggs are laid in the cracks or scars of trunks on the lower portion (within 2 meters from ground level) of the bole (Shen et al., 2001; Zhang, 2003). Larvae develop in the phloem (inner bark) and bore into the xylem to pupate; they may bore upward, downward, or horizontally into the wood (Kim and Park, 1984). The early instars feed on phloem and xylem and bore many tunnels; mature larvae bore into the heartwood (Zhang 2003).

Prevalence and global distribution: **Asia** – China (particularly in the northern provinces, but also in some southern provinces), the Republic of Korea, and Japan (CABI-FC, 2011; Hua et al., 2009).

Host range: **Cupressaceae** – *Chamaecyparis obtusa* (hinoki cypress), *Chamaecyparis* spp., *Cunninghamia lanceolata* (Chinese fir), *Cupressus arizonica* (Arizona cypress), *Cupressus funebris* (Chinese weeping cypress), *Juniperus chinensis* (Chinese juniper), *Juniperus virginiana* (eastern redcedar), *Platycladus orientalis* (Chinese arborvitae), *Thuja occidentalis* (eastern white cedar), *Thujopsis dolabrata* (hiba); **Pinaceae** – *Pinus* spp. (CABI-FC, 2011; Gao et al., 2008; Hua et al., 2009; Iwata et al., 2007; Ma et al., 2008).

Potential distribution in the United States and spread: *Semanotus bifasciatus* is widely distributed throughout China, the Republic of Korea, and Japan (Hua et al., 2009). The areas of known distribution are represented by Plant Hardiness Zones 1 through 11 and includes almost every climate class in the United States. It is expected that this cerambycid could establish in the United States wherever host trees may be found, including Alaska. Potential host trees within one or more of the genera *Chamaecyparis*, *Cupressus*, *Juniperus*, *Thuja*, and *Pinus* are present in every state.

Potential pathways of introduction: *Semanotus bifasciatus* has been intercepted at least twice on wood packaging materials from China and there have been an additional six interceptions of *Semanotus* sp., also on wood packaging materials from China (Touhey, 2011). *Semanotus bifasciatus* was listed as a quarantine pest likely to follow the pathway in a risk assessment on wood décor and craft products from China (USDA-APHIS, 2007).

Detection and control: Description: Length 7-18 mm; head and prothorax black, legs and antennae black brown; elytra brown, on middle and end of elytra each with a broad black band, punctures of median dark band about three times as dense as those of following yellow brown part (Hua et al., 2009).

Biological control: Parasitoids *Pyemotes tritici* and *P. ventricosus* (Trombidiformes: Pyemotidae) have been utilized in China to control *Semanotus bifasciatus* and other boring insects (Ma et al., 2009).

[1] Wood-feeding insects may be placed in two pest categories: primary and secondary (Knight and Heikkenen, 1980). Primary borers are able to attack a healthy, living tree and complete their normal development, whereas secondary borers are incapable of attacking and completing normal development in healthy trees and generally attack weakened or stressed trees. Secondary forest pests are capable of causing both environmental and economic damage.

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Other parasitoids in China include *Scleroderma guani* and *S. sichuanensis* (Hymenoptera: Bethylidae) (Ma et al., 2010; Smith et al., 2003).

Trapping/chemical attractants: Electroantennogram responses to volatile compounds from the phloem and xylem of *Platycladus orientalis* suggest that thujopsene and cedrol may be active components to attract *S. bifasciatus* (Wu et al., 2007).

Potential economic impacts: *Semanotus bifasciatus* has a fairly wide host range within the family Cupressaceae (Hua et al., 2009) and many of the listed species are present and, in some cases (e.g., *Juniperus virginiana* and *Thuja occidentalis*), native. Trees within this family are popular in the nursery industry and some (*Chamaecyparis nootkatensis* [Alaska cedar), *C. lawsonia* (Port Orford cedar), *C. thyoides* (Atlantic white cedar), and *Thuja plicata* [western redcedar)) are utilized as timber trees. In its native range, nursery stock is frequently impacted with high infestation rates (100% of trees infested) from *S. bifasciatus* (Shen et al. 2001). Economic impacts, if *S. bifasciatus* should become established in the United States, may include control costs, ornamental tree replacement costs, and losses in wood quality for those species utilized for timber production.

Trade implications: The United States exports logs from trees within the family Cupressaceae to a number of countries, including Japan, China, and Turkey, but logs are generally treated prior to export (heat treated or fumigated) (Laney Campbell, PPQ-ER, personal communication April 27, 2011). Thus, trade implications are unlikely.

Potential environmental impacts: Although *Semanotus bifasciatus* is reported as a secondary pest in its native range and attacks recently dead, dying, or stressed host trees, it is important to note that in recent years it has caused tremendous losses to antique cypress and cedar stands in the Shanxi province of China (Zhang 2003). As a secondary pest in the United States, it will likely incorporate itself into the environment and become a pest of junipers and other trees within Cupressaceae, however, stressed trees (due to environmental factors [e.g., drought, nutrient deficiencies], disease, or old age) are widespread throughout our ecosystems and may be negatively impacted by the addition of another wood boring pest. Similar species already present include *Semanotus ligneus*, the cedar tree borer, and *Callidiellum rufipenne*, the Japanese cedar longhorned beetle. *Semanotus ligneus* is widespread in conifer forests throughout North America and is considered a pest (Arnett Jr., 2000). *Callidiellum rufipenne* has become established in the north-eastern United States and attacks cypress, false cypress, juniper, and other species of Cupressaceae (Maier, 2008). In the early days of its establishment, there were reports of *C. rufipenne* attacking healthy living trees (USDA-APHIS, 1999), but further research suggested that the attacks on living trees were more likely to occur in nurseries and residential landscapes because the trees were stressed (Maier, 2007).

NPAG teleconferences: None held.

Current regulatory response and activities: The genus *Semanotus* is listed as reportable/actionable, so if any species within the genus is intercepted at the ports, action is taken.

Need for new technology or knowledge: None.

National Plant Board consultation: None.

Forest Service consultation: Agree with recommendation – this species is a potential pest in North America and recommending a reportable/actionable policy seems reasonable (Rabaglia, 2011).

The following technical recommendations are based on the best available science at the time of the report completion and are intended to be used as an aid in PPQ decision-making.

NPAG Recommended PPQ Policy: Establish a reportable/actionable policy for *Semanotus bifasciatus*.

Recommendations:

1) NPAG recommends that PPQ establish a reportable/actionable policy for *Semanotus bifasciatus* because this cerambycid is a pest in its native range, has been intercepted recently, and could become established in the United States. **Action Leader: Joe Cavey, PPQ-PHP-NIS**

Direct referral to Joe Cavey, PPQ-PHP-NIS

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Signature Date: **July 26, 2011**

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