NPAG Report
***Asproparthenis punctiventris* (Germar): Sugarbeet weevil**
Coleoptera/Curculionidae
NPAG Chair Approval Date: May 3, 2011

Asproparthenis punctiventris and sugarbeet damage (Benada et al., 1987)

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: Paul Larkins (PPQ-ER) notified NPAG on November 17, 2010 of an interception of *Asproparthenis punctiventris* (sugarbeet weevil) on roofing tile from Spain arriving at San Juan, Puerto Rico (PR) Sea Port on November 12, 2010 (APHIS, 2011a). Jens Prena (USDA-ARS-SEL) identified the adult weevil on November 16, 2010. An NPAG pre-assessment indicated that a full report should be completed since the weevil is a significant pest of sugarbeet and is not yet present in the United States.

Data Sheets: CABI (2011) (updated January 4, 2011; accessed March 31, 2011).

Current PPQ Policy: The species and genus, including synonyms (*Bothynoderes punctiventris, Cleonis punctiventris*), are not listed in PestID (2010) (queried December 14, 2010). *Asproparthenis punctiventris* is not on the APHIS Regulated Plant Pest List (APHIS, 2000), in the Offshore Pest Information System (APHIS, 2011c), or on a U.S. society pest list (GPDD, 2011) (all queried March 31, 2011).

Asproparthenis punctiventris is listed as an A1 pest by the Caribbean Plant Protection Commission (CPPC) (EPPO, 2011).

Pest Situation Overview:

Exotic status: *Asproparthenis punctiventris* is not present in the United States (CABI, 2011). The weevil was intercepted on roofing tile arriving at San Juan, PR Sea Port from Spain (APHIS, 2011a); it is the first interception of the weevil that is recorded in PestID (Tanner, 2011). *Asproparthenis punctiventris* is a pest of sugarbeet and poses an imminent threat because it could be introduced to the United States on table beet or as a hitchhiker on non-host commodities.

Biology: *Asproparthenis punctiventris* is native to Russia and the Ukraine, where it is widely distributed in traditional sugarbeet growing areas (David'yan, 2004). Females oviposit 3-5 days after

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mating; males die quickly after mating (Eckstein, 1935). Oviposition is dependent on a temperature threshold of approximately 16-17ºC (61-63ºF) and occurs optimally between 27– 34ºC (81-93ºF) (CABI, 2011). Fecundity varies considerably according to food availability but is not more than 750 eggs (CABI, 2011). Larvae are usually found in the soil at a depth of 10-30 cm and feed on the roots of beet, producing longitudinal root cavities (David'yan, 2004). Adults do not become sexually mature in the year in which they emerge from the pupa and overwinter in the soil at depths of 10-60 cm (typically 25 cm). Overwintered adults begin to make their way up to the surface of the soil as soon as the temperature of the upper soil layers rises above the temperature of lower soil layers (April or May in Central Europe) (Pyatnitzkii, 1940). In Central Europe, up to 20% of adults over-winter for two winters and about 10% over-winter for three (CABI, 2011).

Flight occurs only in sunlight and at air temperatures above 22°C (72°F), but even under favorable conditions only a small percentage of the population fly (CABI, 2011). Adults move randomly to detect hosts and are not attracted to sugarbeet fields from a distance. Once hosts have been detected, voracious maturation feeding occurs (Eckstein, 1935).

The sugarbeet weevil is one of the most important insect pests of sugarbeet throughout central, eastern and southeastern parts of Europe (CABI, 2011). Over-wintering adult beetles cause heavy damage by feeding on sugarbeet seedlings and clipping off young plants (Benada et al., 1987). The larvae feed on roots. When larvae attack young plants they destroy the cortical root layer, which results in wilting and plant death (Susurluk, 2008). When the larvae attack older plants, they form deep cavities in the tuber, which slows plant growth and causes deformation (Susurluk, 2008). *Asproparthenis punctiventris* is not known as a vector of plant pathogens (CABI, 2011).

Prevalence and global distribution: Asia- Armenia, Azerbaijan, China, Georgia (Republic of), Iran, Iraq, Kazakhstan, Mongolia, Tajikistan, Turkey, Turkmenistan, Uzbekistan; **Europe-** Austria, Bulgaria, Croatia, Czechoslovakia (former), France, Germany, Greece, Hungary, Italy, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovenia, Spain, Switzerland, Ukraine (CABI, 2011; EPPO, 2011).

Host range: Amaranthaceae – *Amaranthus retroflexus* (redroot amaranth); **Chenopodiaceae** - *Atriplex laciniata* (frosted orache), *A. tatarica* (Tatarian orache), *Beta vulgaris* subsp. *vulgaris* (sugarbeet, table beet, chard, fodder beet), *Chenopodium album* (lambsquarters), *C. capitatum* (blite goosefoot), *Salsola kali* (Russian thistle), *Suaeda* sp. (seepweed); **Polygonaceae** *Polygonum aviculare* (prostrate knotweed) (CABI, 2011; David'yan, 2004; Hill, 1987; Muška, 2009).

Originally, the CABI datasheet (queried 12/14/2010) listed corn, tobacco, and potato as hosts, which influenced the decision to begin a full NPAG report. CABI later removed the hosts from the datasheet however, when challenged to provide references (McGillivray, 2011).

Sugarbeet (*Beta vulgaris* L. subsp. *vulgaris*) is the major host of *A. punctiventris* (CABI, 2011) but common table beet, chard (Hill, 1987), and fodder beet (Muška, 2009) have also been mentioned as hosts. Since all cultivated beet groups belong to the same plant species, beet insect pests may not necessarily be specific to one variety (Harveson et al., 2009). *Asproparthenis punctiventris* is polyphagous within Chenopodiaceae so it is likely that the cultivated beet groups within *Beta vulgaris* L. subsp. *vulgaris* are all hosts.

Potential distribution in the United States and spread:
Asproparthenis punctiventris is widely distributed in Europe and parts of Asia, occurring in USDA plant hardiness zones 3-9 (Magarey et al., 2008). Based on its known distribution, *A. punctiventris* may be able to establish in most any part of the contiguous United States, wherever host plants are grown. It is a good invader based on its broad distribution and will likely establish if introduced.

According to some sources, the weevil occurs in predominantly dry, warm regions (Benada et al., 1987; Tomaseva et al., 2007; Tóth et al., 2007) and adults are most damaging during hot dry springs (David'yan, 2004). In the absence of sugarbeet, the weevil feeds on *Atriplex tatarica*, *A. laciniata,* and *Chenopodium* sp. and less often on *Polygonum aviculare, Amaranthus retroflexus,* and *Suaeda* sp. (David'yan, 2004).

Sugarbeet is a root crop that flourishes in temperate climates but can adapt to many soil and climatic conditions (Ali, 2004). Farms are located in California, Colorado, Idaho, Michigan, Minnesota, Montana, Nebraska, North Dakota, Oregon, Washington, and Wyoming, where 1.18 million acres of sugarbeet were planted in 2009 (ASGA, 2011; NASS, 2011a). The wild hosts of *A. punctiventris* are also present in the United States except for *Chenopodium capitatum*. Of the wild hosts, redroot amaranth, lambsquarters, and knotweed (all weeds) occur throughout the contiguous United States. (NRCS, 2010).

Adult flight is rarely observed (CABI, 2011) so spread may occur primarily through walking. However, the sugarbeet weevil has been reported to fly up to 8-10 km in one day with frequent landings (Anonymous, 2011). Emerging from the soil in spring, adults move in all directions, crawling 200-300 meters in a day (Eckstein, 1935). Adults move randomly to detect hosts and are not attracted to sugarbeet fields from a distance (CABI, 2011).

Figure 2 shows the areas (in green) where sugarbeet is currently grown. Syngenta recently introduced a heat tolerant sugarbeet bred for tropical and subtropical regions, which could expand the U.S. growing region in the future (Pimprikar, n.d.).

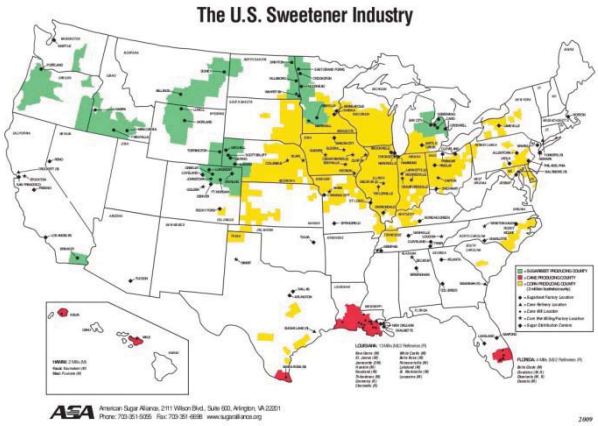

Figure 2. 2009 Sugarbeet producing counties (green), cane producing counties (red) and corn producing counties (yellow) in the United States (ASGA, 2011).

Sugarbeet is a raw-material source for manufactured sugar and is not transported far from where it is grown. Sugarbeet processing factories in the United States are located in or near production areas to minimize transportation costs of hauling beets and deterioration of sugar content after beets are harvested (Ali, 2004). Table beets on the other hand are likely to be transported interstate, which could provide a means of dispersal for the weevil. All stages of *A. punctiventris* could be transported with soil accompanying root grown crops infested with *A. punctiventris* since 20% of adults overwinter for two years and all other stages develop in the soil (CABI, 2011).

In the plant trade, all stages of *A. punctiventris* could spread by the movement of infested potting material, although none of the reported hosts are popular horticultural plants moved in the trade. Table beet transplants cannot be ruled out entirely, however, table beet is a short-seasoned crop that is grown from seed and not typically as nursery transplants (MSU, 2005). Two species of *Amaranthus*

(*A. tricolor and A. caudatus*) are colorful annuals sold as ornamentals but there is no market data available. A few *Polygonum* species may also be sold at specialty nurseries.

Potential pathways of introduction:
Asproparthenis punctiventris was intercepted on roofing tile from Spain. Tile is a source of numerous pest interceptions recorded in the PestID database and is one pathway for the introduction of the sugarbeet weevil. Additionally, table beet may serve as a pathway from infested countries since larvae bore into the beet root (Hill, 1987). Importation of table beet is allowed from many countries (APHIS, 2011b). Since 1985, the PPQ 280 database shows that the largest exporter of table beet to the United States is Mexico followed by Canada and Costa Rica (APHIS, 2010, queried 04/08/2011), but currently there are no countries with sugarbeet weevil that are allowed to import beet into the United States (APHIS, 2011b).

Asproparthenis punctiventris would not likely be introduced into the United States on sugarbeet. Sugarbeet is not a traded commodity because it is a perishable vegetable (ASGA, 2011).

No legal pathway for introduction exists for propagative material of *Amaranthus, Atriplex, Chenopodium* or *Polygonum* spp. since all propagules are prohibited from all countries except seed from Canada (PPQ, 2011). *Beta vulgaris* subsp. *vulgaris* seed is allowable from all countries (PPQ, 2011) but seed is not a pathway based on the weevil's feeding habits. Only one species of *Suaeda* is restricted but even importation of non-restricted species into the United States is rare. Since 1985, only four shipments of *Suada* propagative material are documented in the PPQ 280 database (3 shipments from Mexico and a single plant from Kyrgyzstan, queried 04/08/2011)(APHIS, 2011d).

Detection and control: Adults have a black body (14.5–17 mm) narrowed at the apex and are covered with dense, grayish-brown scales and tiny hairs. The head is prolonged with a short rostrum or snout. Being approximately one-half inch in size, adult weevils are visible to the naked eye. The adult weevil was identified by Jens Prena (ARS-SEL) using the taxonomic key *Die Kaefer Mitteleuropas* (Freude et al., 1998; Prena, 2010). The larvae are yellow-white and range from 2.2 to 14 mm in size, while eggs are oval and yellow and range from 1.0-1.4 mm in size (Benada et al., 1987; CABI, 2011). Since adults, pupae, larvae, and eggs can reside in soil, any soil originating from infested regions should be inspected carefully. Eggs may require a hand lens to detect.

Over the years, many insecticides have been used to control *A. punctiventris*. Seed treatment with thiamethoxam or imidacloprid gives good protection of seedlings (Kereši et al., 2006). Deltamethrin was also shown to kill 70-75% of emerging sugarbeet weevil adults (CABI, 2011). In the United States, other root weevils in the genus *Otiorhynchus* (Coleoptera:Curculionidae) are controlled with pyrethroid insecticides such as bifenthrin, cyfluthrin, and lambda-cyhalothrin, which are applied to the foliage and base of the plants where adults rest during the day (Cranshaw, 2006). Larvae that develop in the soil are controlled with a systemic insecticide like imidacloprid, which is used as a soil drench. In general, sugarbeets are highly sensitive to insects and disease and therefore require continuous monitoring and management (Ali, 2004). Information on insect management of sugarbeet crops is available from agricultural extensions (Hein and Johnson, 2010).

Cultural methods that may help manage the sugarbeet weevil include deep plowing to kill eggs (90% effective) and digging trenches around beet fields to catch adults as they search for hosts (CABI, 2011). Other cultural control methods include sowing of winter wheat after sugarbeet, planting new sugarbeet crops 1-3 km away from the previous one, early sowing, close spacing, soil cultivation between rows at the time of larval hatching, 2-3 irrigations in June-August to contribute to the reproduction of entomopathogenic fungi that attack the weevil, and control of weeds of the family Chenopodiaceae (Čamprag, 1983).

Potential economic impacts: The sugarbeet weevil is one of the most important insect pests of sugarbeet throughout central, eastern and southeastern parts of Europe (CABI, 2011). Over-wintering

adult beetles cause heavy damage by feeding on sugarbeet seedlings and clipping off young plants (Benada et al., 1987). The larvae feed on roots. When larvae attack young plants they destroy the cortical root layer, which results in wilting and plant death (Susurluk, 2008). When the larvae attack older plants, they form deep cavities in the tuber, which slows plant growth and causes deformation.

In 2009, the United States produced 29 million tons of sugarbeets valued at $1.5B (NASS, 2011). Over 4.5 million tons of sugar is produced each year in the United States from sugarbeets and beet sugar represents 54 percent of U.S. sugar production. The introduction of *A. Punctiventris* into sugarbeet growing areas could result in yield losses if the weevil is not managed properly, particularly in years with hot dry springs. As the temperature increases, adults feed more heavily and weevils can destroy 3-4 times as many plants (CABI, 2011).

A current value for U.S. table beet is not available, but in 1999, the value was $6.9 M (NASS, 2011b). San Benito County in California is one of the largest producers of table beet (Garrett, 2011). Yield loss could result if *A. Punctiventris* is not managed properly. Organic growers could incur heavier yield losses without the use of pesticides. In 2005, there were 153 growers of organic table beet in California; the crop was valued at $1.3M that year (Klonsky and Richter, 2007).

Ninety-five percent of U.S. table beet seed is produced in Washington, which reported a market value of $5.5 M in 2006 (du Toit, 2007). The current value of sugarbeet seed could not be found but the annual value from 1975 to 2000 was between $4-8 M (OSU, n.d.). The Willamette Valley in Oregon is the source for all sugarbeet seed used in North America.

Trade implications: According to the EXCERPT database, *A. puncti*ventris (listed as *Bothynoderes punctiventris* and *Cleonis punctiventris* synonyms) is prohibited in the Republic of Korea and Former Yugoslav Republic of Macedonia (CERIS, 2011 queried 04/12/11). *Asproparthenis punctiventris* is also listed as an A1 pest by the Caribbean Plant Protection Commission (CPPC) (EPPO, 2011).

For sugarbeet, the establishment of *A. punctiventris* in the United States would not likely cause trade implications since sugarbeet is not an exported crop. However, trade might be negatively affected for table beet. The top importing countries of U.S. table beets are not known with certainty since trade data for beets is combined with a number of other root vegetables (radish, salsify, celeric, etc.). However, from 2000-2010 the top five countries where U.S. beets (plus other edible roots) were exported were Canada, South Africa, South Korea, Germany, and Taiwan (FAS, 2011).

Potential environmental impacts: There are 17 species of *Polygonum*, 9 species of *Chenopodium*, 5 species of *Atriplex*, 5 species of *Suaeda*, and 3 species of *Amaranthus* that are considered to be threatened or endangered by some states (NRCS, 2010). The following plants are also on the Federal Endangered or Threatened list: *Amaranthus brownie, Amaranthus pumilus, Atriplex coronata notatior, Polygonum hickmanii,* and *Suaeda californica* (USFWS, 2011). Some of these plants could be damaged or killed by weevil feeding.

NPAG teleconferences: None held

Current regulatory response and activities: *Asproparthenis punctiventris* was intercepted on roofing tiles from Spain arriving at San Juan, PR Sea Port on November 12, 2010. The tile was denied entry and the shipper chose to re-export. APHIS-PPQ does not keep records on re-exports, so movement after it left the port is not known (Larkins, 2011).

Tile is not a regulated commodity; imported tile shipments are inspected at the discretion of port inspectors. However, the historical frequency of pest interceptions on Italian tile has created an unwritten protocol for holding and inspecting Italian shipments more frequently at ports of unloading than from other countries (Larkins, 2011).

NPAG contacted Quarantine Policy, Analysis and Support (QPAS) on April 5, 2011 to inquire if a Significant Pest Bulletin on *Asproparthenis punctiventris* could be posted on the QPAS intranet site, as a pest alert for CBP port of entry inspectors. Candace Funk (PPQ-QPAS) replied that in order for a pest to be written up in a pest bulletin, the pest must be significantly unique in that it cannot be detected under normal routine inspection (Funk, 2011). Candace did not think that the weevil required special inspection instructions so a pest bulletin would be unlikely.

Need for new technology or knowledge: None

National Plant Board consultation: None

Forest Service consultation: None

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: NPAG considers *Asproparthenis punctiventris* to be a threat and recommends that PPQ establish a reportable/actionable policy.

Recommendations:

1.) NPAG considers *Asproparthenis punctiventris* to be a threat and recommends that PPQ establish a reportable/actionable policy because the weevil is not present in the United States and is a serious pest in Europe and Asia. Although no countries currently infested with *A. punctiventris* export table beet to the United States, the weevil could spread to countries exporting table beet to the United States in the future or could hitchhike on non-host commodities. **Action Leader:** Joe Cavey (PPQ-PHP-NIS).

Direct referral to: Joe Cavey (PPQ-PHP-NIS)

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