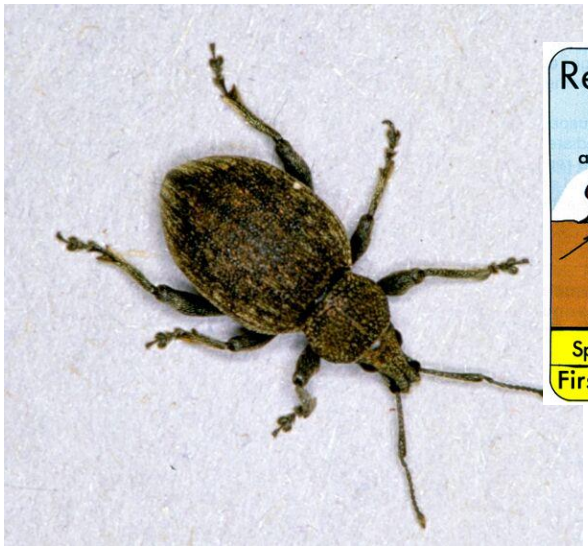
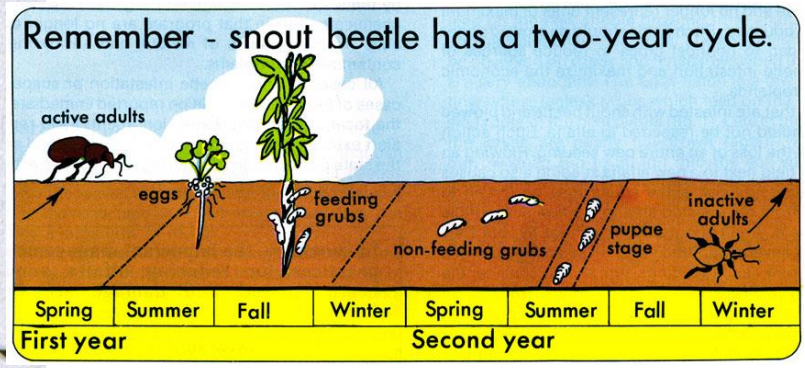
Invertebrates

Alfalfa Snout Beetle (Otiorhynchus ligustici)



Life History



LIFE HISTORY (CONT).

Year 1
May: adult beetles emerge and feed on alfalfa foliage for three weeks to build fat reserves for egg laying
May-June: adults enter a non-feeding dispersal phase, laying eggs at the base of host plants. One adult can lay up to 500 eggs.
June-November: larvae feed on alfalfa plant roots, the most heavily damaged plants begin to die in August. Remaining plant death occurs in September-October. In November larvae burrow deep into the soil for a full year, they become adults the following summer.
Year 2
April-May: stand loss is seen, field are patchy or barren. Surviving plants may fill in quickly and areas may not be seen as damaged.
June-Aug: larvae remain in hibernation but finish developing and turn into adults
Year 3
April-May: ASB that began in Year 1 now emerge in alfalfa fields as adults

ANATOMY AND PHYSIOLOGY

The adults are mottled gray and humpbacked, do not fly, are about 1/2 inch long, and are all females.

DIET

The ASB feeds on red and white clover, broad-leafed dock, wild carrot, wild strawberries, blackberries, dogwood, alfalfa, other legumes and weeds.

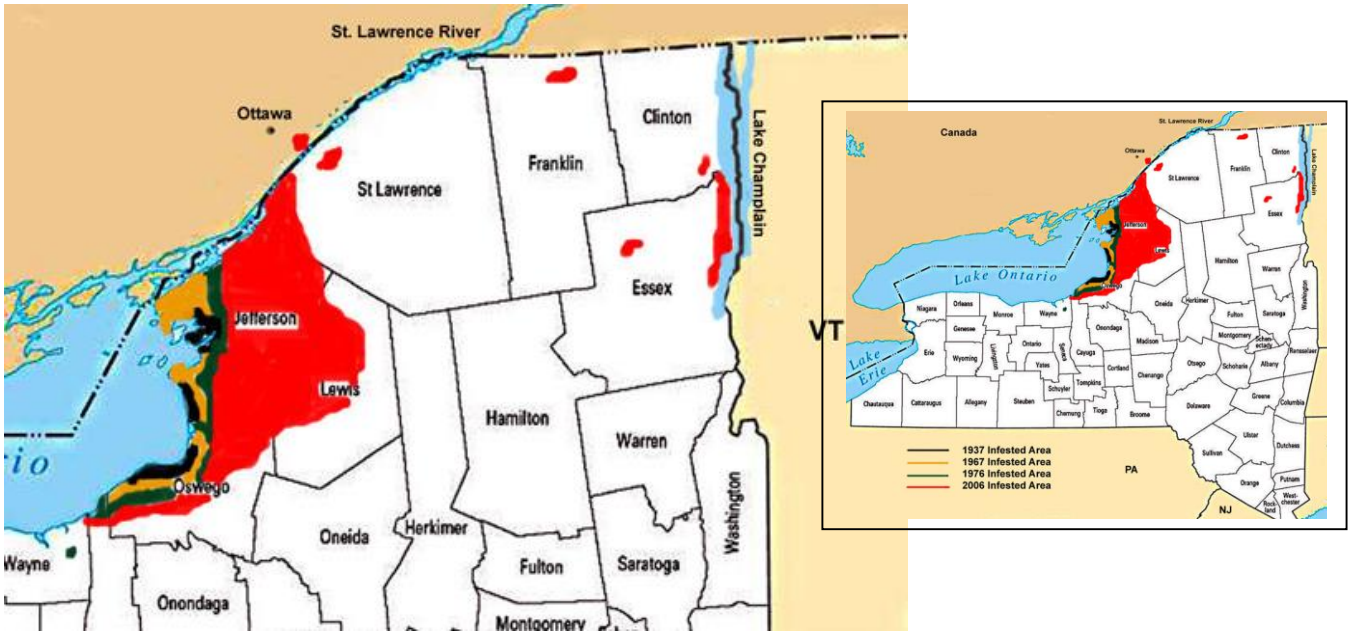
REPRODUCTION

BEHAVIOR

Invertebrates

Distribution

- Oswego, Jefferson, Cayuga, Wayne, Lewis, St. Lawrence, Clinton, and Essex counties of New York and in Ontario, Canada, bordering the St. Lawrence River.
- transported in gravel, hay, farm equipment, and water and disperse by walking. Circumstantial evidence also indicates the adults are transported with the movement of beehives.



HABITAT

HISTORY

• An estimate of 500,000 acres of land is infested by the ASB.
• Within one growing season an entire stand of alfalfa can be destroyed.
• This crop loss results in 22-25% rise in milk production due to rising feed costs.
• The estimated cost per acre is $1100 for the second year and $530 per acre in the third year.

CONTROL METHODS

- Pesticide (note: ineffective b/c of economic reasons)
- Biological controls: nematodes and resistant alfalfa

Research sources: No Wikipedia source, google search needed

A+ source: http://www.alfalfasnoutbeetle.org/
http://www.nysipm.cornell.edu/fieldcrops/scouting_info/alf/scout_cal/asb_guide.asp

Extremely optional: http://www.youtube.com/watch?v=aD0eqbCfYAQ

Invertebrates

Asian Longhorned Beetle ; *Anoplophora glabripennis*

LIFE HISTORY

Adult Asian longhorned beetles active during the summer and early-autumn months. After mating, females deposit their eggs in depressions chewed into the bark of hardwood trees (females can lay 35 to 90 eggs in a season). After hatching (typically 10-15 days), beetle larvae feed by tunneling under the tree bark into the cambium (fresh sapwood) for several weeks. The larvae then tunnel into the xylem (heartwood) were they feed through the winter, forming galleries in the trunk and branches of infested trees. Adult beetles chew their way out through round holes approximately 3/8 inch in diameter, emerging from June through October (presence of the adult emergence can often be detected from sawdust around and beneath these holes, and by sap oozing from the holes).

ANATOMY AND PHYSIOLOGY

Asian longhorned beetle adults can reach 1½ inch in length with very long antennae (reaching up to twice the length of the insect's body). The beetle is shiny black with small, irregular white markings on its body and antennae.

DIET

- hardwood species, most notably maples, elm, horsechestnut, willow, sycamore and birch.

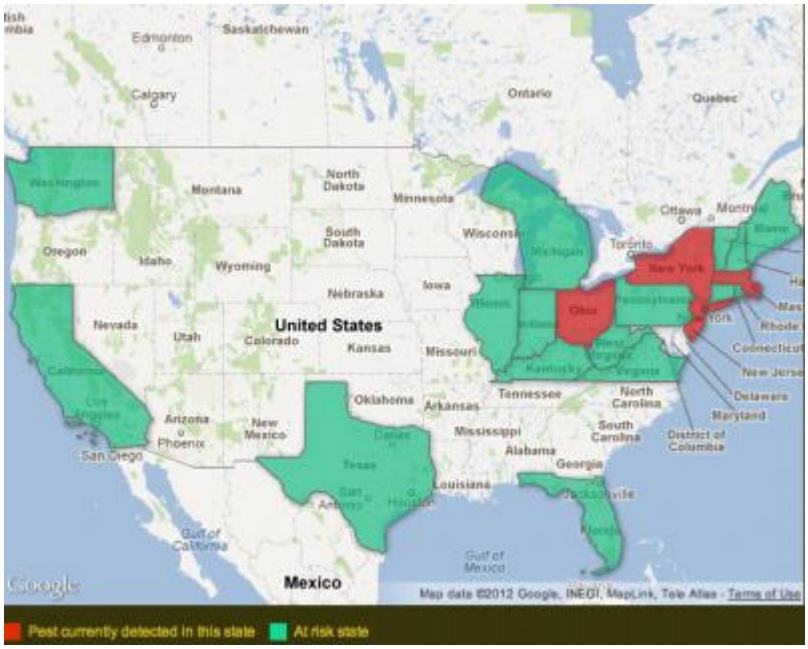
REPRODUCTION

BEHAVIOR

HABITAT

Invertebrates

DISTRIBUTION



HISTORY

- Introduced into the U.S. on wood pallets and wood packing material in cargo shipments from Asia (the beetle's native range includes China and Korea)

ALB was first discovered in the US in 1996 on several hardwood trees in Brooklyn, NY. Additional infestations were found in Long Island, Manhattan and Queens. 1998: Chicago, IL. 2002: Jersey City, NJ. Asian. 2004: Middlesex and Union counties, NJ. 2007: the insect's NYC range was found to extend to Staten Island and Prall's Island in the Hudson River. 2003: Toronto, Canada. 2008: large number in and around Worcester, MA in urban and rural forests. 2011: Tate Township Ohio.

CONTROL METHODS

- Infested trees cut down
- Research underway for pesticide
- Shipment of wood regulated
- Quarantines around infested areas

LAWS AND REGULATIONS

Research sources:

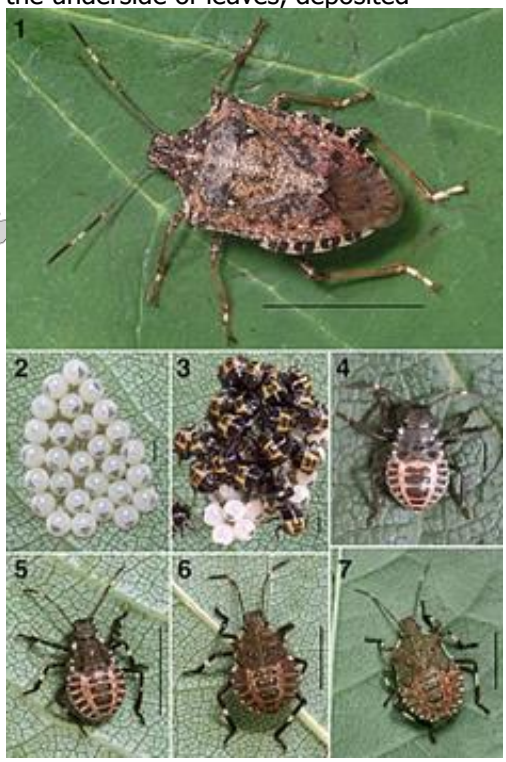
A+ source: http://www.nyis.info/index.php?action=invasive_detail&id=26 Wikipedia: Yes

Invertebrates

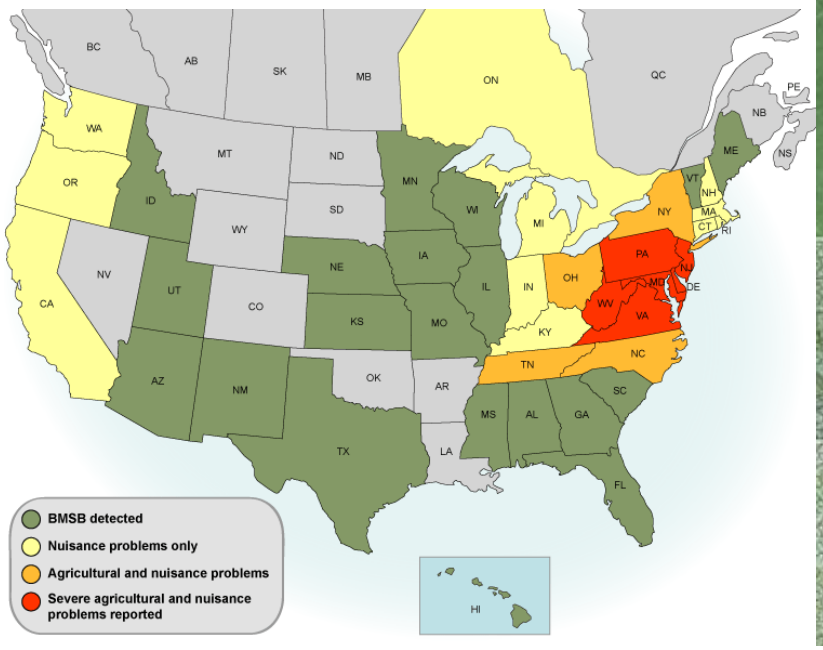
Brown Marmorated Stink Bug Halyomorpha halys

Life History

Brown marmorated stink bug (BMSB) overwinters as adults in a protective sleeplike state, emerges in the spring, and begins mating in about two weeks. Development from egg to adult requires approximately 538 degree days, a measure of temperature and time for insect growth, with an additional 148 degree day period before eggs are laid. Its light-green eggs are often laid on the underside of leaves, deposited in masses of approximately 28 eggs.



Distribution



Reproduction

BMSB commonly mates multiple times, and the female may deposit as many as about 486 eggs in a lifetime. BMSB may be able to produce several broods in a single year, thus increasing the potential and duration of risk for crop damage.

Anatomy and Physiology

While the adults blend in with tree bark, the nymphs are more brightly colored. BMSB has five nymphal stages ranging from 2.4 mm to 12 mm in length. Early-stage nymphs do not venture very far from the newly hatched egg mass. The legs and antenna of nymphs are black with white banding.[5] Early-stage nymphs have dark reddish eyes and a yellow-reddish underbelly with black stripes.

Habitat Characteristics

Ecology

Diet (see backside)

Invertebrates

Grapes, Orchard Crops (apples, hazelnuts, peach, pear), Ornamentals (Catalpa, paulownia, tree of heaven), small fruit (blueberry, raspberry, cane berry), vegetables, (eggplant, lima beans, okra, pepper, snap beans, sweet corn, tomatoes). Effect on BMSB's effect on field crops being monitored.

History

In China, BMSB feeds on Eucommia, a small tree threatened in the wild but cultivated for use in traditional Chinese medicine. BMSB also attacks a variety of fruit and ornamental trees. In northern Japan, the first documented outbreaks of BMSB occurred in the 1990s; in that region in 2011 the insect had become a significant pest. In Korea, BMSB is a major pest on soybean, sweet persimmon, yuzu, and citrus. Recent research in China, Korea, and Japan has sought to understand the biology of BMSB and find a sustainable and effective defense. Cross-cultural partnership has become essential now that BMSB has arrived in the Americas. BMSB was accidentally imported from Asia to North America in the late 1990s. Spreading from the place of early sightings in Allentown, PA, BMSB quickly became a nuisance pest, overwintering in homes, office buildings, and warehouses. With few natural predators and an abundance of food sources, the invasive insect spread quickly. Karen Bernhard collected the first specimens of the insect in North America and in 2001 Rick Hoebeke identified them as BMSB. By 2004 the stink bug was widely identified on farms and in forests. In 2010, the invader caused catastrophic damage in most mid-Atlantic states, with some growers of sweet corn, peppers, tomatoes, apples, and peaches reporting total losses that year. In 2011 the stink bug continued to present season-long and significant problems for growers.

Control Methods

MONITORING TOOLS:Monitoring and trapping of BMSB could form the basis of a cost-effective and safe control program. Yet mass trapping of BMSB has not yet been shown to be an effective control. Trapping can, however, indicate presence of BMSB and need for intervention.

ATTRACT-AND-KILL: An attract-and-kill strategy for BMSB would involve luring large numbers of the insects to a specific area, and then treating that area.

NATURAL ENEMIES researchers have identified a group of tiny parasitic wasps, *trissolcus,* that is known to attack bmsb eggs. In addition, a naturally occurring fungus, *ophiocordyceps nutans*, attacks bmsb in japan, and other fungi have been shown to target bmsb in laboratory studies. Ultimately, a program of natural biological control could provide the safest, most effective, and economical approach to tackling bmsb.

CHEMICAL CONTROLS

Project researchers are working to identify insecticides that effectively control BMSB, so that growers can select materials based on their economic and environmental impacts.

Laws and Regulation

Sources: A+ source: stopbmsb.org. Wikipedia: Yes.

Invertebrates

COMMON NAME: **Emerald Ash Borer**—*Agrilus planipennis*

Life History

1-year life cycle, emerging from beneath the bark of ash trees beginning in **late-May or early-June** with peak activity between mid-June and early-July. EAB adult flight season is finished by early August. **Life span: 3 weeks**. Newly emerged adults must feed for at least several days before mating; mated females feed for an additional 1 to 2 weeks before laying eggs (females can mate multiple times; males do not). An "average" female may lay from **60 to 100 eggs** during her lifespan, placing the eggs singly in bark crevices or under bark flaps on the trunk or branches (some long-lived females may lay more than 200 eggs). Eggs hatch in 7 to 10 days. EAB larvae go through five life stages (instars). After hatching, the first instar larvae chew their way out. Larval feeding ends in autumn, at which time the fifth instar larvae excavate pupal chambers 1/2 inch beneath the surface of the sapwood and overwinter as pre-pupae. Pupal chambers can also be found in the outer bark when it is thick enough. Pupation generally takes place the following spring (late-April to May), with adults staying in the pupal chambers for 1 to 2 weeks, at which time they emerge headfirst through a distinctive 1/8 inch to 1/6 inch (3 mm to 4 mm) D-shaped exit hole, beginning the cycle of life over again.

Anatomy and Physiology

- Adults: Bright, metallic green. ½" long, flattened back. Purple abdominal segments beneath wing covers
- Larvae: Slightly flattened. White to cream-colored larvae. 1 ½ inches. 10 abdominal segments with the last 3 or four segments resembling bells that are nested one upon the other.

Habitat Characteristics

Behavior

History

Native to Asia (Eastern Russia, Northern China, Japan, and Korea), the beetle's first North American populations were confirmed in the summer of 2002 in southeast Michigan and in Windsor, Ontario. EAB was likely introduced to the area in the mid-1990's in **ash wood used for shipping** pallets and packing materials in cargo ships or shipping containers.

Diet

Invertebrates

Distribution

They are strong flyers. However, the rapid spread of the beetle through North America is most likely due to the transport of infested firewood, ash nursery stock, unprocessed ash logs, and other ash products.

Control Methods

both Federal and State agencies have instituted quarantines of infested areas to regulate the transport of ash products

Prevention of EAB is possible by the use of a systemic insecticide into the base of the tree. This treatment can prevent damage to the tree for up to two years. Soil injections are another option for the prevention of EAB. Sprayed pesticide is less effective.

Laws and Regulation

USDA established quarantines that prohibit movement of ash material and hardwood firewood within and out of several states. Illinois, Indiana, and Ohio, together with the Lower Peninsula of Michigan, are quarantined. Also exist in select areas of Kentucky, Maryland, Minnesota, Missouri, New York.

Ecology

Sources:

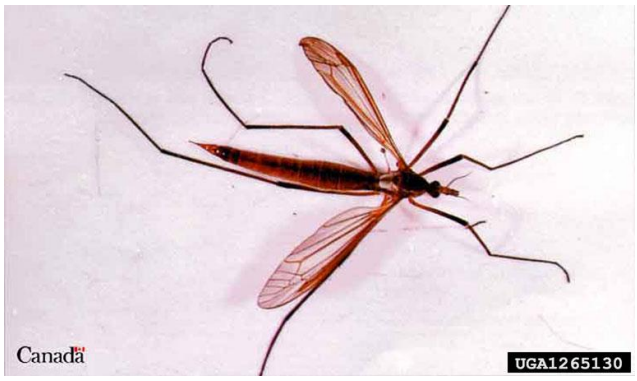
A+ source: http://www.nyis.info/index.php?action=eab. TWO Wikipedia pages!

Invertebrates

European Crane Fly (Tipula paludosa)

Life History

During the summer months, *T. paludosa* larvae will reside below the soil surface and pupate. By end of August or early September, the adults emerge, mate, and lay 200-300 eggs within 24 hours. Once the eggs hatch, the larvae will feed throughout the fall and spring. *T. paludosa* complete one generation per year and *T. oleracea* will complete two generations per year with adults emerging in the spring in addition to the fall. *T. oleracea* females are better fliers, which could contribute to their eggs being more dispersed than *T. paludosa* eggs (Peck 2006).



Distribution

European crane flies (*Tipula Paludosa*) were first detected in New York State in 2004. This species has been found in Erie, Monroe and Niagara counties in New York and is most prevalent in the western half of the Erie Canal corridor. It is a widespread pest across the world.

Anatomy and Physiology

Adult: Half-inch. Six long legs. Dark-colored band on the leading edge of the wing next to a light colored band. The rest of the wing has no pigmented areas, which is useful for distinguishing them apart from some native species.

Eggs: black and oval shaped and can be found near the soil surface.

Larvae: gray-brown and worm-like. Tough skin with visible veins. The empty pupal cases may be seen in low turf and look like small grey-black twigs.

Reproduction

Habitat

Prefer moist soils and mild winters and cool summers

Found in many different types of turf grass (at homes and golf courses), sod farms, and grass fields. Also favor areas with thatch buildup.

Ecology

Larvae can be important in the soil ecosystem, because they process organic material and increase microbial activity.[6] Larvae and adults are also valuable prey items for many animals, including insects, spiders, fish, amphibians, birds, and mammals.[5]

Diet

Larvae feed on roots, stems, and leaves of a variety of grasses, legumes, and other plants, causing damage to lawns, pastures, and hayfields

Behavior

Invertebrates

History

Native to northwestern Europe. Most likely introduced through the transport of infested materials. See *distribution.*

Control Methods

Monitoring: Surveying for crane fly larvae should be performed in the early spring by observing turf damage. To survey, take core samples or turn over the top 1-2 inches of sod in one square foot plots and count the larvae. Pouring warm water with dish soap on a mowed plot will also make the larvae emerge if you prefer not to dig the sod up; however, this method may not be as successful. In the fall, surveying for the pupal cases can be performed in low cut grass. In the fall, adults should be noticeable especially in large infestations. Since *T. paludosa* adults do not fly far, the surrounding areas should be surveyed for eggs and larvae in the current and future years.

Manual and Mechanical Control: Maintaining proper turf grass health may help to allow the grass to recover from damage faster. Applying fertilizers in the fall will help maintain turf quality. Increasing soil aeration and dethatching in the spring may help reduce crane fly populations. Also, because larvae thrive in moist soils, timing of irrigation may be critical during the oviposition stage of the lifecycle and throughout the fall season. Draining soils during the critical period of the life cycle may be beneficial to reduce fly populations in infested soils. Eggs that are laid at the soil surface and the larvae that emerge can be raked up and destroyed to prevent future damage from occurring.

Biological Controls: Crane flies have some natural predators, such as various species of birds or microorganisms. *Beauveria bassiana* is a fungus that has been seen to attack crane flies. Nematodes applied in the spring have been effective in some areas as well (mainly the Northwestern United States) in 55 degree temperatures and irrigated soil. For some fly populations, manual and biological control methods are environmentally preferred.

Chemical Controls: Chemical controls for crane flies are most effective if applied in the fall during the egg laying period, but may be used in the spring as well. Imidacloprid, trichlorfon, carbaryl and chlorpyrifos are effective against crane flies

Laws and Regulation

Source: http://www.nyis.info/index.php?action=invasive_detail&id=50

Wikipedia: Yes!

Invertebrates

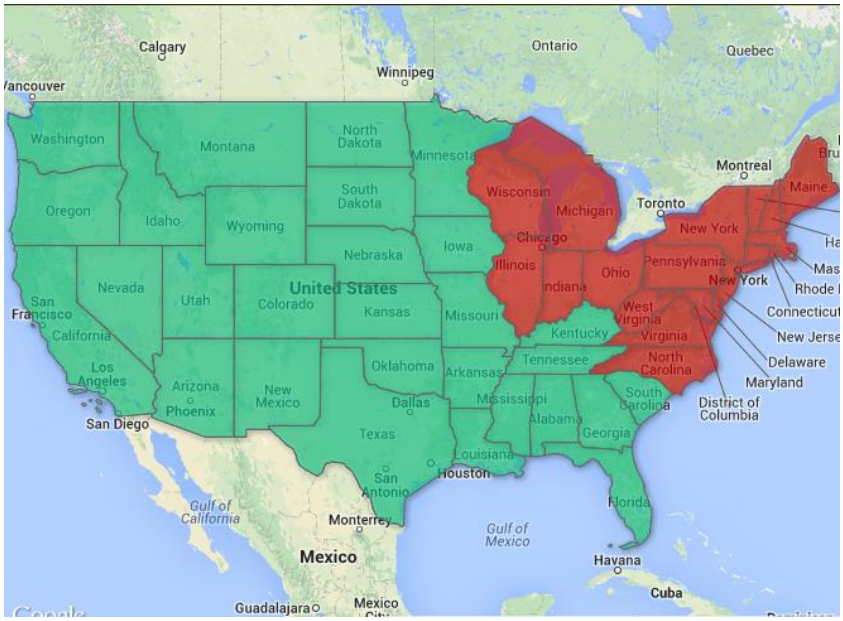
European Gypsy Moth—*Lymantria dispar*

Life History

Females lay eggs on the trunks of trees, each egg mass including several hundred eggs. Gypsy Moths overwinter in the egg stage, and hatch in April or May. There is one generation per year. Gypsy Moths have preference for oaks, but they will attack the foliage of most trees and shrubs. Females do not fly. Caterpillars climb trees and feed mostly at night. They are capable of denuding foliage from trees, and this activity will kill many trees if repeated over a few years. Trees also become weakened and more susceptible to diseases and wood boring insects.

Distribution

Young larvae have hairs with small air pockets that create buoyancy, allowing them to travel great distances with strong wind. They have been found as high as 2,000 feet in the air, and can travel five miles a day by this method. Adult females commonly pupate and deposit egg masses on motor vehicles, especially trucks and recreational vehicles that are parked near or under trees. Continues its spread, extending into Virginia, North Carolina and Michigan, with isolated pockets in the Pacific Coast states.



Invertebrates

Anatomy and Physiology

The young caterpillars are black and hairy, later becoming mottled gray with tufts of bristlelike hairs, and blue and red spots on the back. Adults differ in appearance, males being brown with a fine, darker brown pattern on the wings. Females are nearly white, with a few dark markings on the wings.

Reproduction

Habitat Characteristics

Ecology

Diet

Prefers approximately 150 primary hosts but feeds on >300 species of trees and shrubs. Some of those include: Aspen, Birch, Cedar, Cottonwood, Fruit trees, Larch, Oak, Poplar, Willow

Behavior

History

imported into the United States in the mid-nineteenth century with the intent of finding a species of silk producing moth that could be hybridized to compete favorably with the Silkworm Moth, yet not be subject to the many diseases that the Silkworm Moth suffered in cultures. This experiment was conducted by Leopold Trouvelot, an amateur lepidopterist from Medford, Massachusetts, who at one time had more than a million larvae in cultivation behind his house. In 1868 or 1869, several individuals of adult Gypsy Moths escaped from his house, with ten years elapsing before the neighborhood trees were badly defoliated by resulting populations of the moth. From that start, Gypsy Moths have become one of the most important forest pests in the United States, defoliating millions of acres in the northeastern U.S.

Control Methods

Egg masses can be scraped from trees and burned. Sticky bands may be placed around trees to prevent the larvae from climbing to the foliage. After World War II, DDT was used for chemical control and was very effective. However, many other animals from Honeybees to bald eagles were killed or affected also. Nearly 50 species of insects that are parasitic on Gypsy Moths have been introduced for biological control, and this strategy has undoubtedly prevented the Gypsy Moth from becoming even more destructive. Bacterial, fungal, and viral diseases are other likely control agents, currently being explored as possibilities in integrated pest management for the Gypsy Moth.

Laws and Regulation

USDA-enforced quarantines forbidding movement of its larvae, eggs, etc.

Additional sources: http://www.hungrypests.com/the-threat/european-gypsy-moth.php (check out "quick links"!) Wikipedia: yes.

Invertebrates

European Pepper Moth (Duponchelia fovealis)

Life History

The moth is active at night and lays white eggs in small clusters on the undersides of foliage, usually close to a main vein. Eggs have been recorded on stems and on the tops of leaves but usually are found on undersides of foliage. The egg clusters are in groups of 3 to 10 and are usually laid in overlapping patterns. The eggs turn pink, then red as the embryo develops and end up brown colored just before hatching. The larvae feed mainly at night and avoid light. As the larvae grow their body color changes from a creamy white to a dirty brown color. The larvae lose their spots just before pupation. The length of development depends on temperature, but in a greenhouse at 68 °F the egg stage is 4 – 9 days, the larval stage is 3 – 4 weeks, one to 2 weeks for pupation and adults for one to two weeks. Females mate soon after emerging.

Distribution

Adults are good fliers (upwards of 100 km or 62 miles), but they can also be dispersed through propagative and non-propagative material such as fruit, herbs, fresh vegetable products and cut flowers, due to the fact that they can bore into stems and fruit and are well hidden among the soil and leaves as well as between the container sides and the soil (see History)

Anatomy and Physiology

The larvae have a dark colored head capsule and a dark colored hardened dorsal plate just behind the head. On segments just behind the head there are two rows of transverse spots. There is at least one stout hair sticking out of each spot.

Reproduction

Habitat Characteristics

Ecology

Diet

Behavior

History

Invertebrates

The European pepper moth, Duponchelia fovealis (Zeller), is a native to both freshwater and saltwater marshlands of southern Europe, the eastern Mediterranean region, Malta, Crete, Sardinia and Sicily), the Canary Islands, Syria and Algeria. In Malta, it is fairly common in gardens in orchards and has been noted to overwinter outdoors, reproducing on wild plants in northern Italy.

In the United States, the moth was first detected on begonia in San Diego County, California in 2004. This population was eradicated. In 2010, it showed up again in San Diego County. By September 2011 it had been detected in 17 counties in California. It has also been detected in Alabama, Arizona, Colorado, Florida, Georgia, Kentucky, Mississippi, New York, North Carolina, Oklahoma, Oregon, South Carolina, Tennessee, Texas and Washington. European pepper moth has also been recorded as a problem in greenhouse grown chrysanthemums and other cut flower species in Ontario. It is not known whether this pest is mainly a greenhouse problem or whether it could cause damage in field and landscape plantings.

In June 2013, European pepper moth larvae were found infesting zonal geraniums and petunias in Central Maryland in a commercial greenhouse.

Control Methods

Cultural control: Removing debris and lower leaves will reduce habitat for the larvae. The problem is that most plants grown in greenhouses are grown to have leaves all of the way down to the soil level. If this moth becomes established in the greenhouse then making the effort to remove lower foliage will help reduce larval populations.

Chemical and biological control: Older larvae which bore into stems or fruit are less accessible to insecticides and therefore are more difficult to control. Repeated sprays ofBacillus thuringiensis can be directed to foliage to kill larvae feeding on the foliage. Spinosad materials should also be effective in controlling the caterpillars. Acephate in preliminary trials has been shown to be one of the more effective materials for control.

Biocontrol agents for the larval stage include:

- Bt - which is a formulation of the toxin produced by Bacillus thuringiensis
- Dalotia coriaria - a rove beetle (Coleoptera: Staphylinidae), though it may be listed commercially as Atheta coriaria
- Heterorhabditis bacteriophora and Steinernema spp. - entomopathogenic nematodes (Nematoda: Rhabditida)

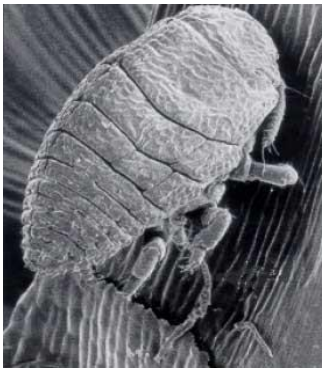
Laws and Regulation

Traditional containment through quarantine, has been discarded as impractical. This is a relatively new problem.

Sources: Not many. A+ source: http://extension.umd.edu/learn/greenhouse-ipm-pest-alert-european-pepper-moth. Wikipedia: yes. Be sure to check out that huge list of host plants!

Invertebrates

Hemlock Wooly Adelgid (Adelges tsugae)

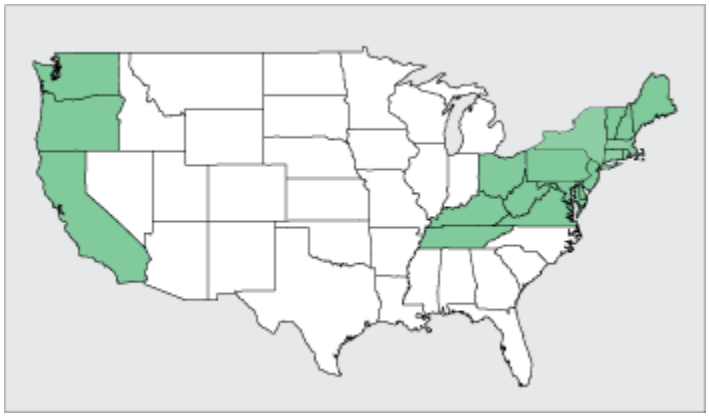



Life History

Each generation has six stages of development: egg, four juvenile (nymph) stages, and the adult.

Distribution

Native range: Japan.



Reproduction

One female in the winter generation produces an average of 200 eggs which in turn mature and each female of this adult spring generation produces on average another 200 eggs each. That's 40,000 eggs in one year, starting from one individual female!

Ecology

- Feeds at base needles, eventually depleting the resources in the tree, ultimately leading to loss of branches and death of tree
- Hemlock wood is commonly used in barns and on-farm building projects
- Groves of hemlock provide habitat and cover for popular game species including deer, ruffed grouse, turkey, rabbit, and snowshoe hare
- Loss of hemlock groves can result in loss of cool, damp and shaded microclimate that supports unique terrestrial plant communities

Invertebrates

- Loss of hemlock groves can result in warmer stream water temperatures for fish and stream salamanders, harming those species
- Declines in hemlock can result in losses of unique plant and animal assemblages and drastic changes to ecosystem processes

Diet

The hemlock woolly adelgid feeds deep within plant tissues by inserting its long sucking mouthparts (stylets) into the underside of the base of hemlock tree needles. It taps directly into the tree's food storage cells, not the sap. The tree responds by walling off the wound created by the insertion of the stylets. This disrupts the flow of nutrients to the needles and eventually leads to the death of the needles and twigs. Needles will dry out and lose color, turning gray and eventually dropping from the tree. Terminal buds will also die resulting in little to no new shoot growth. Dieback of major limbs can occur within two years and generally progresses from the bottom of the tree upward (McClure et al 2001).

History

Hemlock woolly adelgid was first detected on the east coast of North America in Richmond, Virginia, in the mid-1950s. Since its likely accidental introduction from southern Japan HWA was first detected in New York State in the early 1980s. Outbreaks have expanded from initial infestations on Long Island and in the Hudson Valley to the Rochester area, the Catskill Mountains, and recently into the Finger Lakes region.

Control Methods

Pesticides injected into soil incorporates into the tree's sap and provide protection for years. Cons: expensive, costly to water quality, and effective to only one individual tree.

Biological: Over the last 10 years, scientists have evaluated the effectiveness of several HWA predators from Japan and the Pacific Northwest including the beetles, *Sasajiscymnus tsugae*, *Scymnus* spp., and *Laricobius nigrinus* as well as fungal pathogens. Some promising evidence has emerged, but further study is needed to test the effectiveness of biological control at larger geographical scales and over the long-term

Laws and Regulation

Invertebrates

Sirex Woodwasp (*Sirex noctilio*)

Life History

The female Sirex woodwasp injects her ovipositor into the trunk of a pine tree, just into the wood, and injects one egg at a time along with the symbiotic fungus, *Amylostereum areolatum*, and a toxic mucus. This typically occurs mid-bole (10-30+ feet up) on pole-sized and larger trees (6-8" in diameter and up). Trees that are already suppressed or stressed, due to other site or environmental conditions, seem to be preferred by the female wasps. The mucus quickly kills tree cells from the egg-laying site upwards. The toxic mucus suppresses the tree's defenses and decreases the tree's ability to protect itself from the wood decaying fungus. When the larva hatches, it feeds on the fungus-decayed wood and enzymes, and possibly the fungus as well, as it bores through the wood. Females lay 25 to 400 eggs. Fertilized eggs become females and unfertilized eggs become males. Larvae feed in the tree for 10-11 months and then pupate near the bark. Adults emerge after three weeks. Peak adult emergence is in July, but can occur from July through September. There is believed to be one generation per year in New York.

Distribution

It is thought that the Sirex woodwasp can spread approximately 25 miles per year. Introduced inadvertently into New Zealand, Australia, Uruguay, Argentina, Brazil, Chile, and South Africa. In these Southern Hemisphere countries, sirex woodwasp attacks exotic pine plantations, and it has caused up to 80 percent tree mortality.

Anatomy and Physiology

- Large, robust insects, usually 1.0 to 1.5 inches long. Adults have a spear-shaped plate (cornus) at the tail end; in addition females have a long ovipositor under this plate. Larvae are creamy white, legless, and have a distinctive dark spine at the rear of the abdomen.

Body dark metallic blue or black; abdomen of males black at base and tail end, with middle segments orange.

- Legs reddish-yellow; feet (tarsi) black; males with black hind legs.
- Antennae entirely black.

Invertebrates

Reproduction

Habitat Characteristics

Ecology

Symptoms

Foliage of infested trees initially wilts, and then changes color from dark green to light green, to yellow, and finally to red, during the 3-6 months following attack. Infested trees may have resin beads or dribbles at the egg laying sites, which are more common at the mid-bole level. Larval galleries are tightly packed with very fine sawdust. As adults emerge, they chew round exit holes that vary from 1/8 to 3/8 inch in diameter.

Diet

In its native range *S. noctilio* attacks Scots *(P. sylvestris)* Austrian *(P. nigra)*and maritime *(P. pinaster)* pines and is known to attack North American pines including red (*P. resinosa),* loblolly (*P. taeda*), slash (*P. ellotti*), ponderosa (*P. ponderosa*), lodgepole (*P. contorta*) and Monterey (*P. radiata*). White pine (*P. strobus*) is also attacked but is less preferred.Behavior

History

Native range: Europe, Asia and north Africa. First discovered in North America in 2004 in a trap in Fulton, NY (Oswego County). Accidentally introduced through imported wood products

Control Methods

Sirex woodwasp has been successfully managed using biological control agents. The key agent is a parasitic nematode, *Deladenus siricidicola*, which infects sirex woodwasp larvae, and ultimately sterilizes the adult females. These infected females emerge and lay infertile eggs that are filled with nematodes, which sustain and spread the nematode population. The nematodes effectively regulate the woodwasp population below damaging levels. As sirex woodwasp establishes in new areas, this nematode can be easily mass-reared in the laboratory and introduced by inoculating it into infested trees. In addition to the nematode, hymenopteran parasitoids have been introduced into sirex woodwasp populations in the Southern Hemisphere, and most of them are native to North America (e.g., *Megarhyssa nortoni, Rhyssa persuasoria, Rhyssa hoferi, Schlettererius cinctipes,* and*Ibalia leucospoides*).

Laws and Regulation

A+ sources: http://www.nyis.info/index.php?action=invasive_detail&id=47

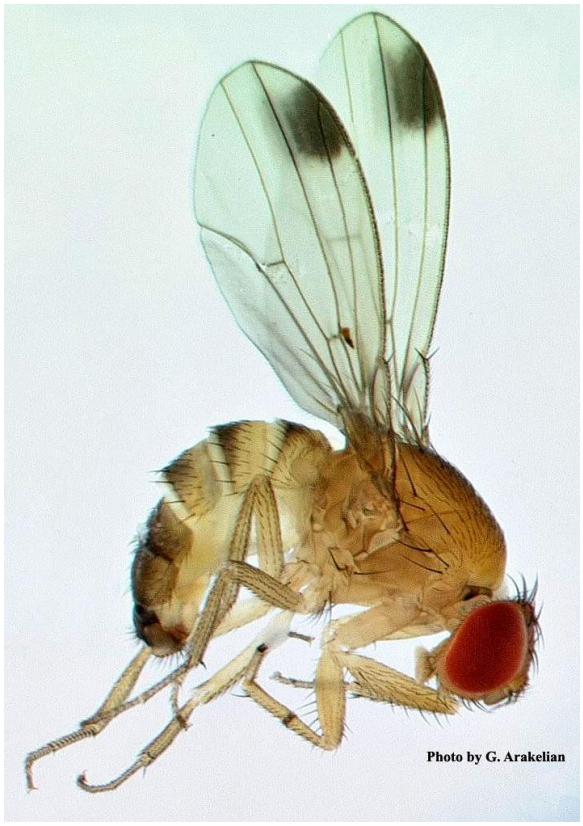
Wikipedia: yes

Invertebrates

Spotted Wing Dresophila (Drosophila suzukii)

Life History

SWD lay their eggs in ripe or ripening fruit and berries. When the larvae hatch, they consume the fruit leaving it deformed.



Distribution

Additionally, infest fruit may be shipped from different parts of the country and sold at markets, which increases the spread of SWD.

Anatomy and Physiology

SWD is about 2-3 mm in size with bright red eyes. The majority of the insect's body is a pale brown with black horizontal stripes on the abdomen region. You can distinguish a male SWD from other vinegar flies in the Drosophila genus by a dark spot along the front edge of the wing near the wingtip. This spot may be missing on some SWD males, but another defining characteristic for males is the presence of two black bands on each front leg. Female SWD tend to have a larger, saw-like ovipositor than other species, however they look very similar to other vinegar flies. The white larvae of SWD are small and cylinder shaped.

Reproduction

This insect has a high reproductive rate. Within one year, the SWD can complete at least 15 generations. During the 2-9 weeks time frame that adults live, a female can lay 100-600 eggs in fruit, when fruit starts to color and sugar levels begin to rise. Eggs hatch in 2 hours to 3 days, and the larvae feed in the fruit for about 3 to 13 days. Pupate for 3 to 15 days either inside or outside the fruit before emerging as adults. Multiple generations per year.

Habitat Characteristics

SWD are seen more in moderate climates and prefer the early summer or fall when temperatures are cooler (approximately 68° F). Adults will hibernate when temperatures drop to 40°F. In freezing temperatures, the larvae usually cannot survive.

Diet

Invertebrates

SWD affects many fruit and berries including, cherries, peaches, plums, pears, apples, raspberries, blackberries, strawberries, grapes, blueberries, and tomatoes. The invasive insect also can infest non-commercial hosts such as crabapple, autumn olive, Japanese yew, beach plum, and wild rose. This insect not only infects already ripened fruit, but can affect fruit in the earlier stages of development as well.

Behavior

Various fruit crops will develop and ripen at different times throughout the growing season. The SWD will take advantage of this and move from one crop to another as the season progresses.

History

Native to: South Asia. SWD was first observed in California in 2008. In 2011, SWD was found in the Northeast in Pennsylvania. There, SWD had been most problematic on fall raspberries and blackberries, though late season peaches and grapes have also been affected. Because this pest is similar in appearance to common vinegar flies, the greatest problems have occurred where populations when unnoticed and thus remained untreated until they were quite high.

Control Methods

To control already established infestations of SWD, remove all ripe and cull fruit when harvesting. Also, try to pick the fruit as soon as possible and do not leave harvested fruit exposed for long periods of time. Any fruit that has become infested should be promptly removed and disposed of properly. All damaged fruit should be buried, covered with plastic, or disposed of in a closed container. Leaving the infested fruit to decompose in the field where they dropped will give eggs and larvae still present on the fruit a chance to fully develop into mature insects causing the population on SWD to increase.

There are some biological control agents, such as parasitoids that have seen to have an effect on species within the Drosophila genus. Researchers at Oregon State University are exploring biological control methods specifically for SWD however, it is still unknown if these predators are a reliable biocontrol method at this time. Some pesticides that are approved may be applied across fields for SWD control. These treatments may need to be reapplied almost every 1-2 weeks. Three groups of pesticides, the pyrethroids, spinosyns and organophosphates have been found to be effective. Since SWD has such a high reproductive rate, with multiple generations per year, it is suggested to use a variety of pesticides to reduce chemical resistance evolving within this species.

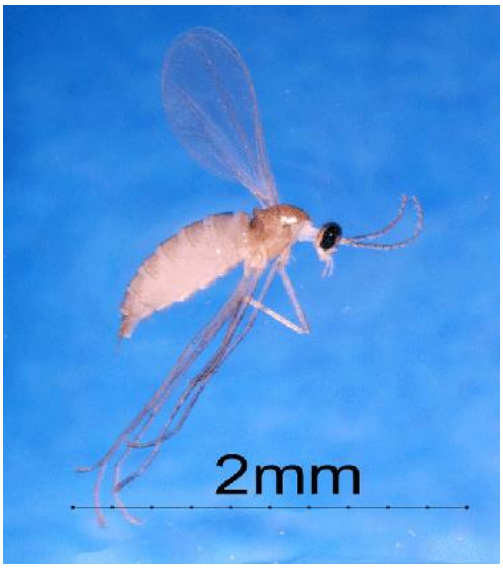
Laws and Regulation

A+ source:
http://www.nyis.info/user_uploads/files/PennState%20Spotted%20Wing%20Drosophila%20Factsheet.pdf. Also: http://www.nyis.info/index.php?action=invasive_detail&id=59.
http://www.ipm.msu.edu/uploads/files/E-3140.pdf. Wikipedia: Yes. Explore!!!

Invertebrates

Swede midge (Contarinia nasturtii Keiffer)

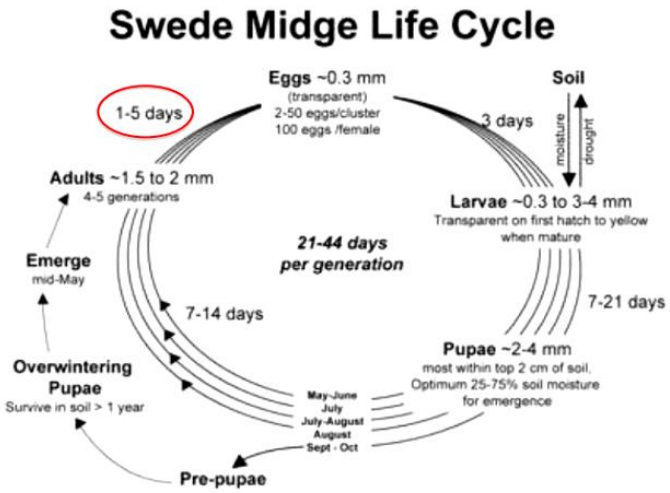
also known as the cabbage crowngall fly and cabbage gall midge



Life History

Adult midges emerge in the spring from pupae that have over-wintered in the soil. Adult flies mate soon after and females search for suitable host plants. The females lay their eggs on the growing point of young plants. Larvae hatch from the eggs after a few days and begin to feed in groups on the growing plant tissue. Larvae complete their development in 7 - 21 days after which they drop to the ground and pupate in the soil. Adults can emerge within two weeks, restarting the cycle. Depending on temperature and length of growing season, there can be up to five overlapping generations of Swede midge per year.

As they feed, larvae produce a secretion that breaks down the surface of the growing point of the plant and liquefies the cell contents, resulting the formation of leaf and flower galls and a misshapen growing point. Damage Distorted growing tips and may produce multiple (or no) growing tips; young leaves may become swollen or crumpled and leaf petioles or stems may exhibit brown scarring.



Invertebrate

Distribution

Native to: Europe and southwestern Asia.

It is believed the midge was introduced into NY from the Canadian province of Ontario where it was first found on broccoli in 1996. By the end of 2007, the Swede midge had been confirmed in 12 NY counties (Allegany, Chenango, Franklin, Herkimer, Jefferson, Livingston, Onondaga, Otsego, Rensselaer, Steuben, Suffolk, and Yates).

Anatomy and Physiology

Reproduction

Each female can lay about 100 eggs during their one to five day lifespan.

Habitat Characteristics

Ecology

Diet

Swede midges feed only on cruciferous (think: green leaf vegetables) vegetable crops, such as cabbage, cauliflower, broccoli, and Brussels sprouts, frequently causing severe losses. The insect also damages canola, collard, horseradish, kale, mustard, rutabaga, turnip, and radish.

Behavior

History

see *distribution*

Control Methods

Insecticides can be used to kill adults or prevent them from laying viable eggs. However, controlling larvae is much more difficult because insecticide would have to enter the plant tissue upon which the larvae are feeding. Currently, the best way to manage Swede midge damage is to limit the spread of the insect into new areas. Adults are very weak fliers, so the primary vector of introduction is believed to be the movement of transplants which may contain eggs or larvae, or movement of soil which may contain pupae. Repeated working of infested soil can reduce the number of viable pupae. Also, because adult Swede midges cannot travel far, crop rotation using non-cruciferous plants can help to reduce the likelihood of spreading an infestation.

Laws and Regulation

Sources: A+ source: http://www.nyis.info/index.php?action=invasive_detail&id=22