

SPINED SOLDIER BUGS

ORDER : HEMIPTERA (*hemisus*=one-half, *pteryx*=wing, refers to forewings which are half leathery and half membranous)

Family : Pentatomidae

Genus : *Podisus* spp.

IMPORTANCE Important forest predators. Native obligate predators of moth and beetle larvae. *P. maculiventris* introduced to France in 1930's for biological control, considered "most useful of American predaceous Hemiptera." Commercially available for tent caterpillar control. Released in home and garden for pest control.

DISTRIBUTION North America: 9 spp.

BIOLOGY Each female lays up to 40 batches of 20-30 eggs in multiple rows, in or on plants or in crevices during 5-6 week season. Nymph to adult (5 instars): 6-8 weeks. First instar remains near eggs and molts. Adult: 5-8 weeks. Overwinter as adults, emerge in spring. 1-2 generations per year. Paurometabolous development (gradual metamorphosis: terrestrial nymphs resemble wingless adults). Emit strong odour when disturbed.

FOOD SOURCE Wide range of caterpillars (including eastern blackheaded budworm larvae and pupae in Eastern Canada), and sawfly larvae. First instar feeds on other eggs, water or plant juices. Predatory feeding begins in second instar, use stylets to pierce prey, secrete digestive enzymes, and suck up predigested food (Fig. 9). May feed on plants if insect prey unavailable.

SEASONAL OCCURRENCE (Adults) :

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
			X	X	X	X	X	X	X	X	X

MONITORING

Methods - Branch beatings, sweep net.

Habitats - On trees or other vegetation, in debris, or water.

CONSERVATION

Pesticide Use - Use pesticides only as a last resort.

Attractants - Maintain permanent groundcover for shelter. (42)

RECOMMENDED READINGS : 42, 50

SPINED SOLDIER BUGS

DESCRIPTION

Adults 10-12 mm. Medium size, yellow to brown, resemble stink bugs with a spine-like projection on each anterior corner of shield-shaped body. Wings held flat on body with clear tips overlapping at rest. Long antennae, slender beak with piercing, sucking mouthparts folded beneath body. Order name refers to basal parts of outer wings which are thicker than the membranous distal portions.

Eggs Barrel-shaped.

Immatures Nymphs resemble small adults without wings.



Figure 9 - Spined soldier bug with prey.

DAMSEL BUGS

ORDER : HEMIPTERA (*hemisus*=one-half, *pteryx*=wing, refers to forewings which are half leathery and half membranous)

Family : Nabidae

IMPORTANCE Both adults and nymphs are fast, aggressive and predaceous. Important in natural pest control in orchards. Even if prey not consumed, death occurs due to paralysis inflicted by sharp mouthparts. Potential for use in biological control. May bite if handled.

DISTRIBUTION Worldwide: 400 spp. North America: 48 spp. Canada: 12 spp.
(36,87)

BIOLOGY Nocturnal. Eggs laid in rows in plant stems. Egg hatch: 1 week, nymphs immediately feed on prey larger than themselves. Nymph to adult: 3-4 weeks, adults overwinter, 2 or more generations per year, paurometabolous development (gradual metamorphosis: terrestrial nymphs resemble wingless adults).

FOOD SOURCE Aphids, caterpillars, moth eggs, spider mites, lygus bugs, psyllids, and leafhoppers. Seize prey with forelegs, insert beak into suture, emit digestive enzymes through stylets, suck up predigested food. Even if prey not eaten, paralysis leads to death within 24 hours.

SEASONAL OCCURRENCE

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
X	X	X	X	X	X	X	X	X	X	X	X

MONITORING

Methods - Branch beatings, sweep net.

Habitats - In trees, grasses, low-growing plants, on ground.

CONSERVATION Attractants - Plant alfalfa borders.

Mowing - Leave some flowering weeds between rows.

Pesticide Toxicities - More susceptible to insecticides in general than most beneficials.

High: aldrin, azinphosmethyl, diazinon, dimethoate, fenthion, malathion.

Potentially high: (environment-dependent): carbaryl (Sevin™), carbofuran.

Low to moderate: synthetic pyrethroids.

Variable (safer with ultra low volume spray than conventional spray): *Bacillus thuringiensis* (variety not stated), chinomethionate (Morestan™).

Safe: endosulfan (Thiodan™). (35,42,43,77,97,107)

RECOMMENDED READINGS : 42, 88

DAMSEL BUGS

DESCRIPTION

Adults 7-11 mm. Small to medium, tan or grey, slender, fast-moving, with long legs (thick, spiny front pair) adapted for grasping prey, thin antennae, well-developed wings, thorax tapered to narrow head. Long beak folded beneath body when not in use.

Immatures Nymphs resemble small, pale adults without wings.



Figure 11 - Damsel bug.



Figure 10 - Damsel bug.

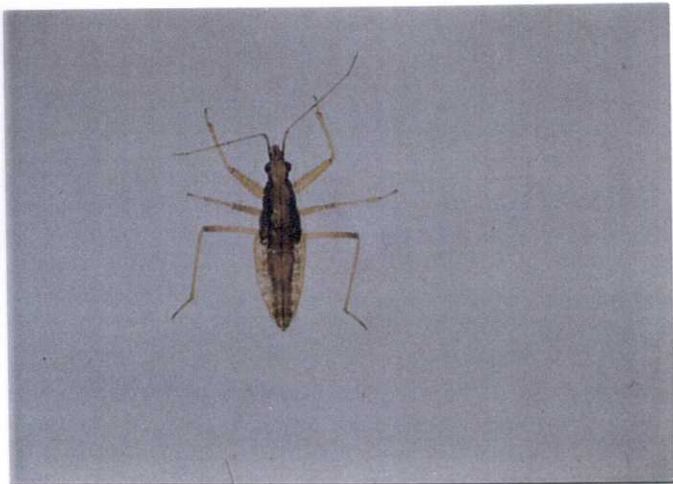


Figure 12 - Damsel bug nymph.

MINUTE PIRATE BUGS (or FLOWER BUGS)

ORDER : HEMIPTERA (*hemisus*=one-half, *pteryx*=wing, refers to forewings which are half leathery and half membranous)

Family : Anthocoridae

IMPORTANCE Most species (both adults and nymphs) are predaceous, a few are plant or pollen feeders. Commercially available for greenhouse biological control. Painful bite to humans.

DISTRIBUTION Worldwide: 500 spp. North America : 85 spp. Canada : 41 spp. (36,87)

BIOLOGY Eggs inserted into plant stem, midrib or other soft tissue. Live young may be produced. Egg to adult: 4-6 weeks, egg hatch: 3-5 days, nymphs: 2-3 weeks. Adults overwinter in bark crevices or plant material. Several generations per year. Paurometabolous development (incomplete metamorphosis: terrestrial nymphs resemble wingless adults).

FOOD SOURCE Aphids, spider mites (all life stages, nymphs: 33 mites/day), scales, thrips, springtails, small caterpillars, moth eggs, balsam woolly adelgid (*Acomporis lepidus*), Cooley spruce gall adelgid (*Tetrphleps latipennis*, common in Pacific Northwest forests). Specially modified mouthparts used to pierce prey and suck out body fluids.

SEASONAL OCCURRENCE :

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
X	X	X	X	X	X	X	X	X	X	X	X

MONITORING

Methods - Branch beatings, malaise trap, sweep net.

Habitats - Under bark, in flowers, vegetation, leaf litter, fungi, mammal burrows, bird nests, houses. Coniferous hosts include true fir, Douglas-fir, spruce, pine and larch.

CONSERVATION

Attractants - Encourage alfalfa and pollen plants.

Mowing - Leave some flowering weeds such as California buckwheat, daisies, goldenrod, stinging nettle, and yarrow between rows.

Pesticide Toxicities -

High : aldicarb, azinphosmethyl, chlordane, cypermethrin (Ripcord™), deltamethrin (Decis™), diazinon, dicrotophos, dimethoate, fenthion, fenvalarate (Sumicide™), malathion, methidathion, methylparathion, mevinphos (Phosdrin™), mexacarbate (Zectran™), parathion, permethrin (Ambush™), sulphur.

Potentially high (environment-dependent) : carbaryl, carbofuran, demeton, phorate, phosmet, phosphamidon, propoxur, ryania, trichlorfon.

Moderate: endosulfan (Thiodan™), fenvalarate, insecticidal soap, nicotine (Nicotine Sulfate™), permethrin, pirimicarb (Pirimor™), synthetic pyrethroids.

Low : benomyl (Benlate™), disulfoton, fenbutatin oxide (Vendex™), iprodione (Rovral™).

Safe : *Bacillus thuringiensis* (variety not specified), chinomethionat (Chinomethionate™), dichloran (Botran™), ferbam, fixed nicotine, lead arsenate, lime sulfur, methoxychlor, naled, petroleum oils.

(29,35,42,43,77,96,97,107,127)

RECOMMENDED READINGS : 42, 88

MINUTE PIRATE BUGS (or FLOWER BUGS)

DESCRIPTION

Adults 2-5 mm. Small to minute, flattened, oval to elongate, black and/or brown with white marks, smooth, shiny or dull, with pointed head and beak. (Figs. 13 and 14). Fast-moving. Wings held flat on body at rest. Order name refers to the front half of the first pair of wings which are hardened.

Eggs Round white caps visible. (eggs inserted into plant tissue).

Nymphs 2-4 mm. Shiny, wingless, yellowish-pink to reddish-brown (Figs. 15 and 16).



Figure 13 - Minute pirate bug.



Figure 14 - Minute pirate bug.



Figure 15 - Minute pirate bug nymphs.



Figure 16 - Minute pirate bug nymph.

PREDACEOUS PLANT BUGS

ORDER : HEMIPTERA (*hemisus*=one-half, *pteryx*=wing, refers to forewings which are half leathery and half membranous)

Family : Miridae

Genus : *Deraeocoris* spp.

IMPORTANCE Most plant bugs are pests (e.g. lygus bugs), but predaceous species (e.g. *Deraeocoris* sp.) often occur in high numbers. Important predators in Oregon and Washington orchards. Successful biological control agents include *Blepharidopterus angulatus* (vs. forest tree mites), *Cyrtorhinus mundulus* (vs. sugarcane leafhoppers) and *C. fulvus* (vs. taro leafhoppers).

DISTRIBUTION Worldwide. North America : 60 spp.

BIOLOGY Eggs laid on stems or foliage, or inserted into plant tissue with blade-like ovipositor. 5 nymphal instars from late spring to early summer. Adults overwinter near orchards, 2 generations/year. Paurometabolous development (incomplete metamorphosis: terrestrial nymphs resemble wingless adults). Defensive abdominal gland secretions mimic ant alarm pheromones.

FOOD SOURCE Aphids, mites, scales, springtails, soft-bodied insects and their eggs.

SEASONAL OCCURRENCE :

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
			X	X	X	X	X	X	X	X	

MONITORING

Methods - Branch beatings, malaise trap, sweep net.

Habitats - Vegetation infested with woolly adelgids.

CONSERVATION Pesticide Toxicities -

High: aldicarb, azinphos-methyl, diazinon, dicrotophos, dimethoate, fenthion, malathion, methidathion, methylparathion, mevinphos, mexacarbate (Zectran™), parathion.

Potentially high (environment-dependent): carbaryl, carbofuran, demeton, phorate, phosmet, phosphamidon, propoxur, ryania, trichlorfon.

Moderate : disulfoton, nicotine (Nicotine Sulphate™), sulphur.

Low : fenvalerate, permethrin.

Safe : *Bacillus thuringiensis* (variety not specified), chinomethionat (Chinomethionat™), cryolite, endosulfan, ferbam, glyodin, methoxychlor, mineral oil (Petroleum oil), naled.

(35,39,45,77,98,107)

RECOMMENDED READINGS : 88, 98

PREDACEOUS PLANT BUGS

DESCRIPTION

Adults 4-10 mm. Small to medium, oval to elongate, brownish-black with white markings, long thin antennae, thin legs, wide head with beak, hardened half of hind wing (referred to by order name) bent downward (Fig. 17).

Eggs Elongate, cylindrical, curved, laid in plant tissue.

Nymphs 4 mm. Pink to light grey with dark markings (Figs. 18 and 19), able to use rectum for extra footing.



Figure 17 - Predaceous plant bug.



Figure 18 - Predaceous plant bug nymph.



Figure 19 - Predaceous plant bug nymph.