



Photo by Lyle Buss, UF



Hemipteran Beneficials & Pests

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Identification is the very first step in any Integrated Pest Management (IPM) strategy!

Want effective pest management?
Get to know the players!!

Identification is important for both beneficials & pests

Why?

- 1) Cannot implement successful IPM without a correct identification
- 2) Some beneficial and pest insects look superficially similar
- 3) Protect beneficial insects

Choosing insecticides and when to use them

Natural Enemies → Biological Control

The enemy of your enemy is your friend (therefore, beneficial)

Classical: Introduction of specialist natural enemies from the homeland of an introduced pest

Augmentation

- Inundative: Single mass release; goal to overwhelm
- Inoculative: Smaller releases; goal for populations to establish

Conservation: Enhance habitat for beneficial insects (e.g., plant insectary plants)

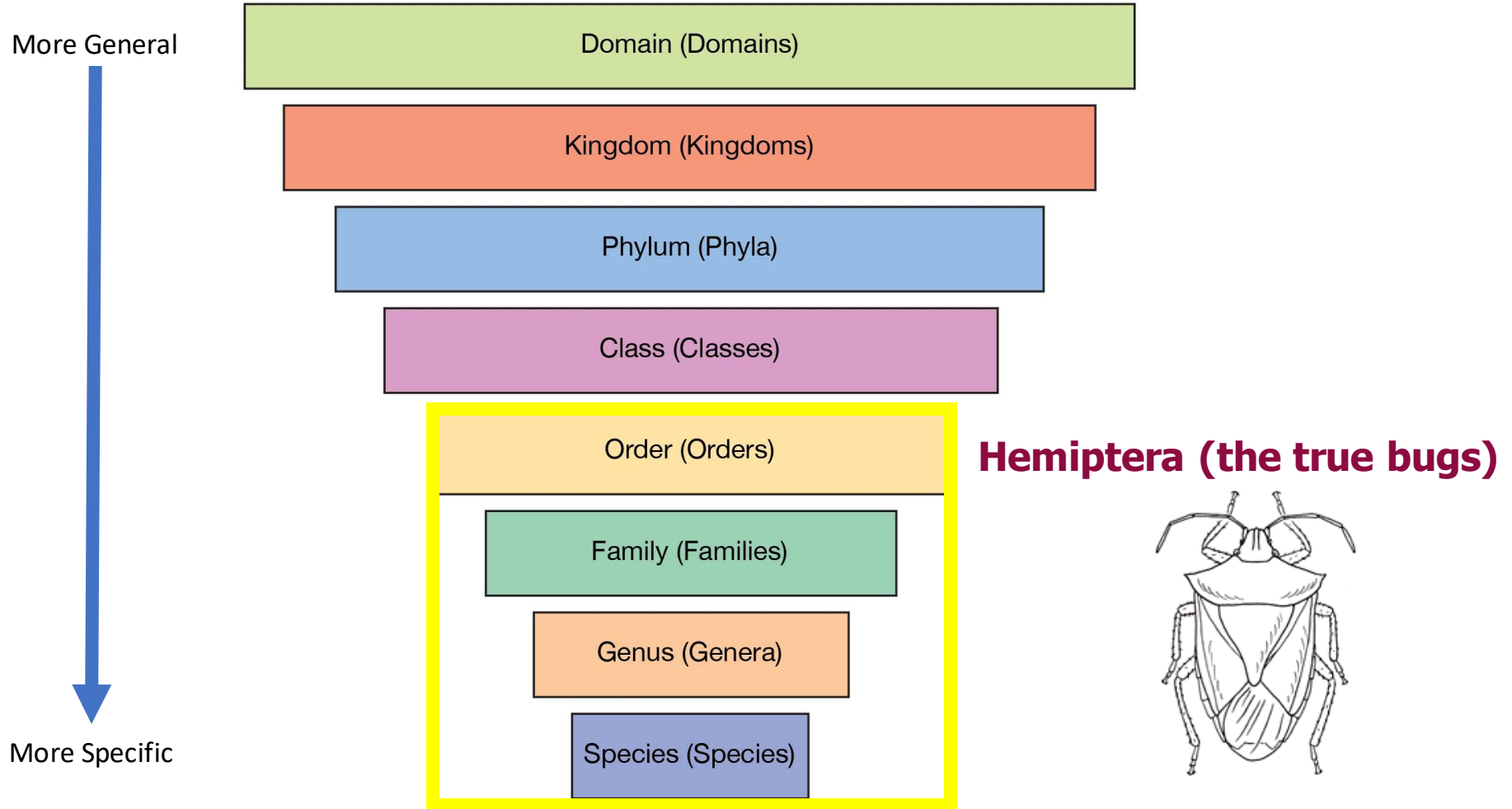
Insectary plants



Dill (*Anethum graveolens*)



How animals are classified



Arthropoda: (Order) Hemiptera – aphids, assassin bugs, mealy bugs, scales, true bugs, white flies, etc.

Large group. Some are pests, some are beneficial

All members have:

- Incomplete metamorphosis
- Piercing-sucking mouthparts

Suborder Heteroptera

- Species have forewings w/ both membranous & hardened portions (i.e., hemelytra)
- Antennae 4 or 5 segmented

Squash bug (*Anasa tristis*)



Assassin bug



Conchuela stink bug

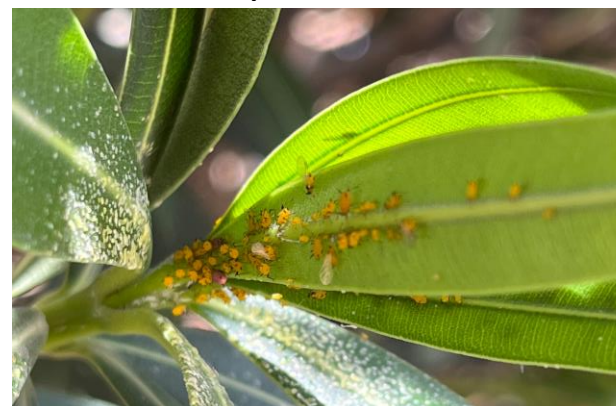


Hemelytra

Example of piercing-sucking mouthparts (on an aphid)



Oleander aphids



Hemipterans have Incomplete Metamorphosis

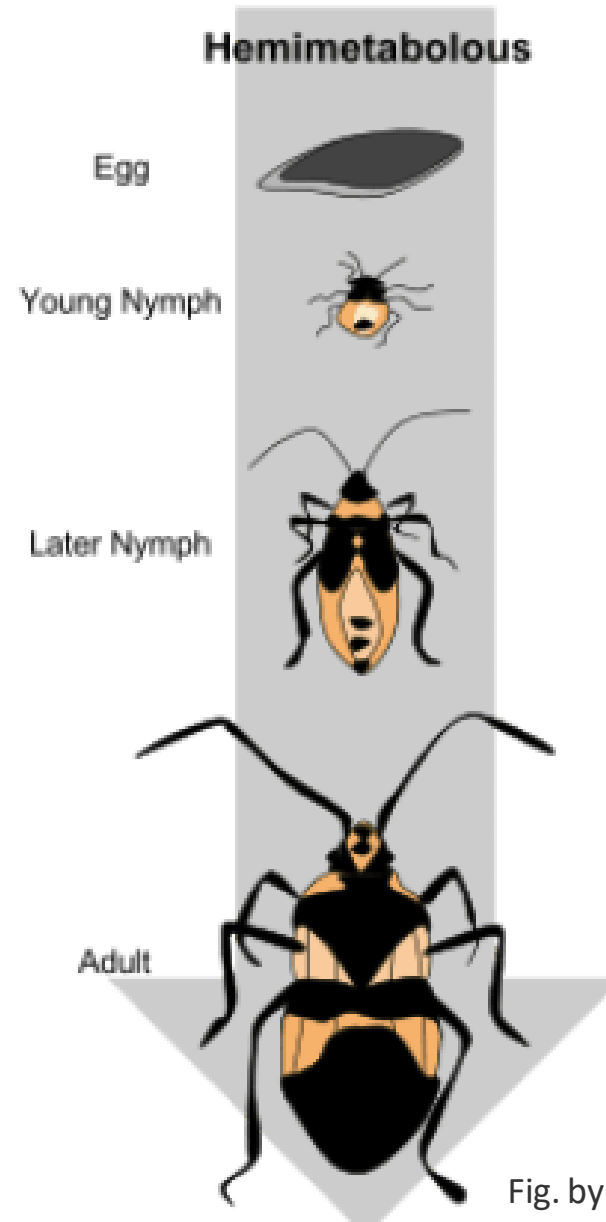


Fig. by Dr. Samanthi

Hemiptera: Aphidoidea – Aphids

Numerous species – host specificity varies

Small, 1/16 – 1/8 in. long

Piercing-sucking mouthparts

- Suck sap → weaken plants; can kill plant

Honeydew makers

- Attracts ants

Vary in color

Incomplete development

Winged & wingless forms

(crowded colonies produce winged forms)



Green peach aphid (*Myzus persicae*)



Photo: Scott Bauer



By Alvesgaspar - Own work, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=10556413>



Aphid damage

Stunt & weaken plants → can kill plant

Honeydew makers

- Attracts ants
- Mold growth

May vector plant viruses (e.g., cucumber mosaic virus, lettuce mosaic virus, & turnip mosaic virus)

- Squash, cucumber, pumpkins, melons, tomatoes, spinach, lettuce, & beets = all susceptible to viral transmission

Ants tending aphids –
they LOVE the sticky honeydew



Photo: Alex Wild

Alfalfa stunting due to blue alfalfa aphid feeding



Photo: K-State

Pea aphid (*Acyrtosiphon pisum*)

Pest of alfalfa, peas, & clovers

Characteristics:

- 1/8 – 1/4 in. long
- Light to dark green
- Nymphs → small
- May be winged or wingless
- Found all over the plant

Damage in the spring, early summer, and then again in the fall



Oleander aphid (*Aphis nerii*)

Wide range of host plants (e.g., Apocynaceae, Asclepiadaceae, Compositae, Convolvulaceae, and Euphorbiaceae)

- Mostly pests of plants in the dogbane family (Apocynaceae): milkweeds, oleander, periwinkle, etc.

Characteristics:

- May be winged or wingless
- Winged adults are yellow & black
- Nymphs are yellow/orange w/ dark cornicles, antennae, & legs
- Tiny: 1.5 to 2.6 mm in length

Damage:

- Can vector a variety of viruses (*Potyvirus* and *Cucumovirus*)
- Feeding leads to stunted plant growth
- May cause sooty mold growth



Woolly apple aphid (*Eriosoma lanigerum*)

Serious pest of apple. Pest of elm (overwintering host)

Characteristics:

- Body is a reddish brown to purple, but is covered by white, wool-like wax
- Up to 2 mm long

Damage:

- Formation of root galls causes stunting in trees
- Sooty mold growth



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Some of the waxy covering removed to show body



Joseph Berger, Bugwood.org

UGA2102025

Blue alfalfa aphid/Bluegreen aphid (*Acyrtosiphon kondoi*)

Pest of alfalfa

Characteristics:

- ~ 1/8 inch long (slightly smaller than the pea aphid)
- Blueish green
- Congregate in clusters on the terminal growth

Damage:

- Blue alfalfa injects a toxin that stunts growth, reduces yield → may even kill plants
- May cause sooty mold growth
- Damage occurs in the early spring (when they have high populations)



Cowpea aphid (*Aphis craccivora*)

Pest of alfalfa and many other plants (e.g., lentils, peanuts, French beans, etc.)

Characteristics:

- ~ 1/10 in. long
- Glossy black or dark brown – legs are pale in color

Damage:

- Inject a toxin while feeding →stunts and may kill plants
- May transmit viruses (over 30 different viruses can be spread by this aphid)
- Damage may occur year-round (but limited in temperatures above 95°F or below 45°F)
- Up to 20 generations per year



Spotted alfalfa aphid (*Therioaphis maculata*)

Major pest of alfalfa

Characteristics:

- Tiny, adult = ~ 1/16 in.
- Fast moving
- Pale yellow to grey
- 4-6 rows of dark spots w/ small spines (on the upper abdomen/top)
- Smoky-veined wings (on winged form)
- Found on the undersides of lower leaves
 - If population increases, they can be found all over the plant

Damage:

Damage may occur year-round (limited in temperatures above 95°F or below 45°F)

Up to 20 generations per year

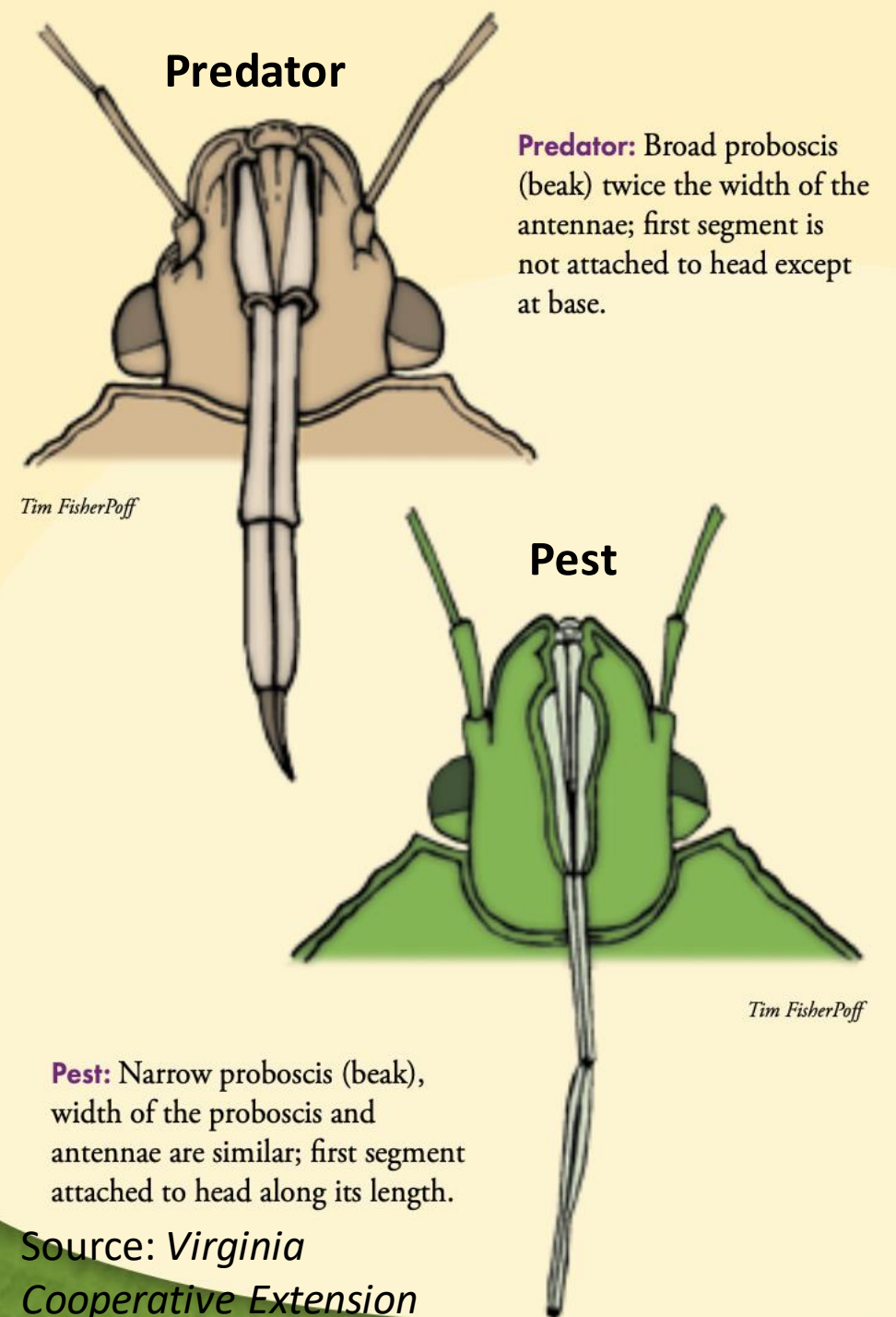
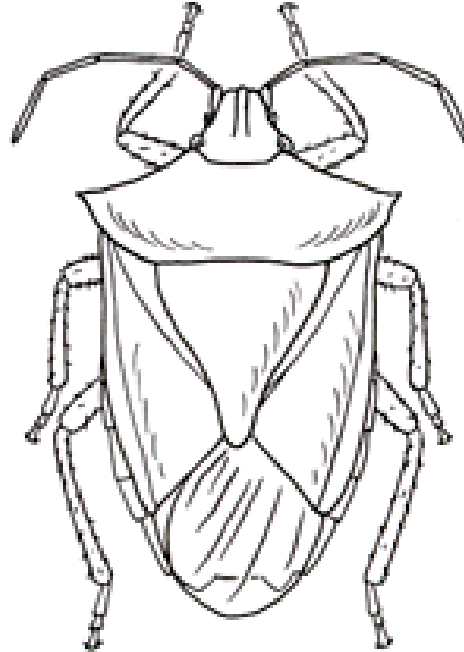


Hemiptera: Pentatomidae – Stink Bugs

Some are beneficial, some are pests

Characteristics:

- Vary in size, but typically 1/2" long
- Sides of pronotum w/ prominent tooth or lobe
- Leathery portion of forewing is broad & extends down
- Antennae 5-segmented
- Unpleasant odor when disturbed



Pest Hemiptera: Pentatomidae – Stink Bugs

Characteristics:

- Have a thin, straw-like beak (similar diameter as antennae)
- Come in many different colors and patterns
- Feed on plants
 - Different plant parts (e.g., stems, leaves, fruits)

Brown Marmorated Stink Bug



Conchuela stink bug
(*Chlorochroa sayi*)



Conchuela stink bug
(*C. ligata*)



Bagrada bug –
invasive pest of *Brassica* crops



Beneficial Hemiptera: Pentatomidae: Asopinae – Stink Bugs

Characteristics:

- Have a thick beak
- Come in many different colors & patterns
- Generalist predators
 - Prefer to feed on immature insects
 - Have been observed to prey on Colorado potato beetle larvae

Twospotted stink bug (*Perillus bioculatus*)



Predatory stink bug
(*Zicrona americana*)



Photo: Jim Moore, Bugguide.net

Twospotted stink bug
(*P. bioculatus*) nymph



Spined Solider Bug (*Podisus maculiventris*)



Podisus sp. nymph feeding on a moth



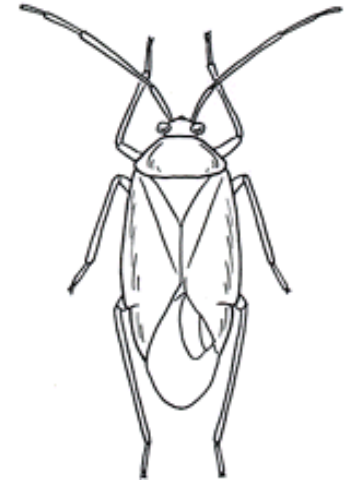
Hemiptera: Miridae – Plant Bug

Some are beneficial, some are pests
Over 10,000 known species

Characteristics:

- < 1/2" long
- Beak 4-segmented
- Antennal segments similar

The green mirid (*Creontiades dilutes*)
feeds on over 100 plant species = pest



Dicyphus hesperus preys on the greenhouse whitefly (*Trialeurodes vaporariorum*), & the two-spotted spider mite (*Tetranychus urticae*)



Hemiptera: Lygaeidae – Seed Bugs

Considered a pest sometimes (more of a nuisance pest)

Many spp. feed on seeds

Characteristics:

- 5/8 – 3/4" long
- Usually orange/red & black
- Shape is elongate or oval
- 4-segmented antennae
- Have 2 ocelli (simple eyes)

Seed bug (*Neortholomus scolopax*)
Feeds on native grasses



Photo: Salvador Vitanza, Bugguide.net

Large milkweed bug (*Oncopeltus fasciatus*) w/ nymphs



Photo: Greg Hume (Greg5030) - Own work, CC BY 3.0,
<https://commons.wikimedia.org/w/index.php?curid=47>

Small milkweed bug (*Lygaeus kalmii*)
Feed on flower nectar & milkweed seeds

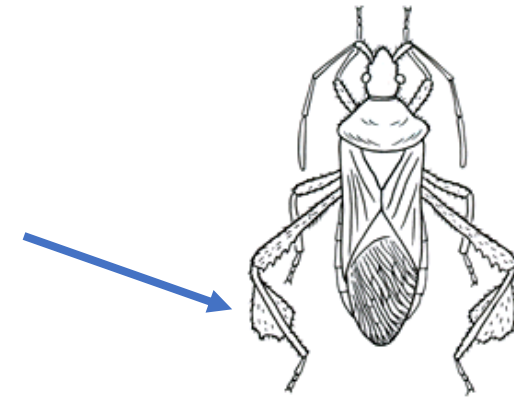


Hemiptera: Coreidae – Leaf-footed Bugs

Some are pests. Major pest = squash bug
Sap-sucking insects

Characteristics:

- Hind tibia usually thickened or expanded, sometimes looks like a leaf
- Narrow head
- No ocelli (simple eyes)



Squash bug



© Joyce Gross



Photo: Stephanie Boucher



Pest Hemiptera: Coreidae – Squash bug (*Anasa tristis*)

A **major** pest of cucurbits (e.g., squash, pumpkins, gourds, cucumbers, melons, etc.) in NM

Characteristics:

- Incomplete metamorphosis

Eggs:

- Copper to black in color
- Clusters on the undersides of leaves

Nymphs:

- Bright green to pale green

Adults:

- 1 – 1.5 in. long
- Dusty-grey

Eggs



Young nymphs



Adult



Squash bug damage

Damage through feeding & may transmit diseases

Feeding: can cause wilting, yellowing, necrosis, & plant death

Vector plant pathogens: the bacterium *Serratia marcescens* → causes cucurbit yellow vine disease (CYVD)

Watermelon showing symptoms of CYVD



Damage caused by squash bug feeding





Leafhoppers (Hemiptera: Cicadellidae)

Some species are pests: for example, beet leafhopper, and the blue-green leafhopper (*Graphocephala atropunctata*) which feeds on more than 150 species of plants.

Stunt plant growth, Leaf stippling (bleached specks)

Characteristics:

- Incomplete development
- Piercing-sucking mouthparts
- Adults are small, ~1/8 in.
- Green, yellowish, or brown
- Long rows of small spines along hind legs

Beet Leafhopper (*Circulifer tenellus*)



Leafhopper mouthparts
(shown on beet leafhopper)



Leaf stippling on apple leaves
from feeding by rose
leafhopper



Pest Hemiptera: Cicadellidae – Beet leafhopper (*Circulifer tenellus*)

Pests of tomatoes, peppers, beans, melons, beets
melons, etc.

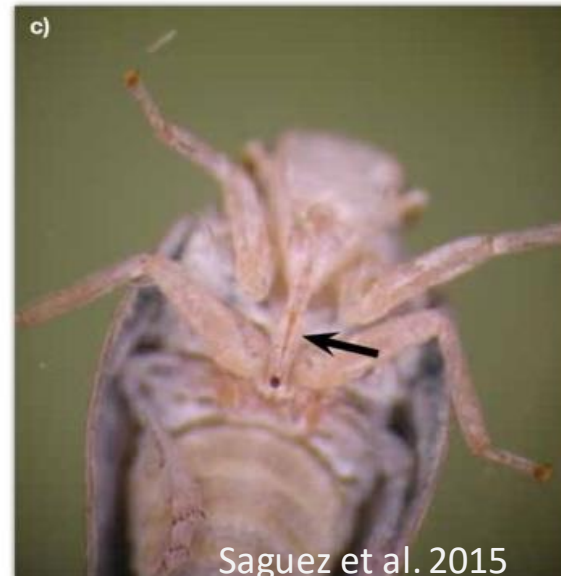
Characteristics:

- 3 mm (1/8 in) long
- Wedge-shaped body
- Pale green to brown
- Fly or jump away

Beet Leafhopper (*Circulifer tenellus*)



UC IPM



Saguez et al. 2015



Photo: A.C. Magyarosy, Bugwood.org

UGA0454052

Beet leafhopper (*C. tenellus*) damage

Stunting of the plant, yellowing, curling foliage (shriveled petals & leaves), poor quality, plant death

Curly top virus; beet leafhopper (*Circulifer tenellus*) = vector

Damage in melons



Stippling



Curly top virus infection



Beneficial Hemiptera: Reduviidae – Assassin, Ambush bugs

Characteristics:

- Somewhat large, 1/2 — 3/4" long
- Elongate head w/ a constricted "neck"
- Piercing-sucking mouthparts ("beak")
 - Appears thick
 - Curved beak folds under the body

Numerous species:

- *Zelus* and *Sinea* spp. are the most common in NM
 - *Zelus* spp. are elongate & vary in color (brown, green, grey, orange, &/or red)
 - *Sinea* spp. are shorter, typically stout, w/ spiny front legs

Many assassin bugs prefer caterpillars, but they will prey upon just any insect

Sinea sp.



Salvador Vitanza, Ph.D.

Wheel bug (*Arilus cristatus*)



Zelus sp. egg mass



Photo: Nathaniel Walton, MSU Extension

Leafhopper assassin
(*Zelus renardii*)



Photo: Goula Marta

Beneficial Hemiptera: Geocoridae – Big-Eyed Bugs (*Geocoris* spp.)

Characteristics:

- Small, 1/6" long
- Have large, bulging eyes that extend past the width of their thorax
- Long, straw-like beak
- Vary in color, but adults are typically a combination of grey, brown, or tan

Eat a lot of PESTS!

Early instar nymphs feed on mites & insect eggs
Later nymphs & adults feed on aphids, flea beetles, leafhoppers, Lygus bugs, lepidopteran (moths) eggs & caterpillars, thrips, spider mites, & white flies

Sometimes inject their mouthparts into plants for moisture → does not harm the plant. However, makes *Geocoris* sp. susceptible to certain systemic insecticides

Big-eyed bug (*Geocoris* sp.)



Big-eyed bug (*G. punctipes*) nymph



Photo: Lyle J. Buss, UF

Big-eyed bug feeding on a whitefly nymph



Photo: Jack Dykinga, ARS

Beneficial Hemiptera: Nabidae – Damsel Bugs (*Nabis* spp.)

Characteristics:

- 3/8—1/2" long
- Have a slender body & narrow toward the head
- Slightly enlarged forelegs
- Brown or tan in color. Some spp. have darker markings
- Wings are held crossed over back (at rest) & extend to the tip of their abdomen

Eat a lot of PESTS!

Adults and nymphs feed on small, soft-bodied insects

Damsel bug



Damsel bug feeding on a caterpillar



Beneficial Hemiptera: Anthocoridae – Minute pirate bugs (*Orius* spp.)

Characteristics:

- Tiny, < 1/8" long
- Have black bodies w/ black & white forewings (resembles an "X" pattern)
- Body is somewhat flattened
- Have a prominent beak
- Nymphs are pale in color, from yellow to orange

Adult minute pirate bug



Minute pirate bug feeding on whitefly nymphs



Minute pirate bug nymph



RAVENOUS predators

Eat aphids, mites, small caterpillars, thrips, whiteflies, and insect eggs

Photo: Adam Sisson, ISU, Bugwood.org

Photo: Jack Dykinga, USDA

Unknown bugs in/on your plants?

Try to identify it!

Bug Guide:

<https://bugguide.net/>

Still unsure?

- Send specimens to the NMSU Plant Diagnostic Clinic: <https://plantclinic.nmsu.edu>
- Live or intact (i.e., don't squish it!) in baggie, container, jar, or pill bottle; attach submission; bring them to your County Agent
- Photos – good, clear images, **magnified**; attach to email with your name, host of pest, damage observed, location & send to your County Agent

Resources

Common pests and IPM Strategies

<https://pubs.nmsu.edu/h/H176/index.html>

Squash bug IPM:

<https://pubs.nmsu.edu/h/H183.pdf>

Pocket Guide to the Beneficial Insects of New Mexico:

https://aces.nmsu.edu/pubs/insects/docs/Beneficial_Insects.pdf

Using Insectary Plants to Attract and Sustain Beneficial Insects for Biological Pest Control:

<http://aces.nmsu.edu/pubs/h/H169/welcome.html>

IPM for Home Gardeners:

<https://aces.nmsu.edu/pubs/circulars/CR655.pdf>

Questions about the presentation or plant problems?

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Tarantula Hawk Wasp
Your state insect!

Aphid management

Cultural

- Keep plants well-watered & fertilized (aphids target plants exhibiting stress)
- Remove weeds

Mechanical

- Remove aphids using a stream of high-pressure water (repeat daily, until populations decline)
- Floating row covers – install at the time of planting
- Regularly check plants to ensure no aphids have made it past the row cover barrier

Chemical

- Insecticides are available (e.g., permethrin) however, they are highly toxic to beneficial insects

Organic options:

- Neem oil
- Insecticidal soaps & horticultural oils

These are contact insecticides = will only kill aphids that come into direct contact

Apply to both sides of leaves

Aphid management

Biological

Depending on the presence & abundance of natural enemies = infestations may be managed

Support beneficial enemies

Several spp. of natural enemies are commercially available for supplemental releases

Big-eyed bugs
(Hemiptera:
Geocoridae)



Minute pirate bugs
(Hemiptera:
Anthocoridae)



Lady beetles (Coleoptera: Coccinellidae)



Hoverflies (Diptera: Syrphidae)



Lacewing larvae (Neuroptera)



Parasitoid wasps
(Hymenoptera)



Beet leafhopper (*C. tenellus*) management

Cultural

- Remove weeds in & around fields
- Yellow sticky cards – detection ONLY
- Monitor for signs of *curly top virus*
- Plant Extra Plants
 - Destroy infected ones

Mechanical

Floating row Covers

Biological

Natural enemies: big-headed flies, ants, assassin bugs, & egg parasitoids (families Mymaridae & Trichogrammatidae)

Beauveria bassiana may be applied for beet leafhopper control

Chemical

Not recommended

Yellow sticky cards



Row covers



Squash bug management

Cultural

Best control method = prevention through sanitation

- Remove old pants after harvest
- Remove plant debris during growing season
- Early detection of nymphs &/or eggs is most important

Mechanical

- Handpick nymphs, eggs, & adults

Biological control

- Ground beetles (Carabidae) eat the eggs
- Damsel & big-eyed bugs eat the nymphs



Chemical

- Insecticides are last resort (arbaryl, permethrin, bifenthrin, esfenvalerate)
- Applied early in the season, early in the morning or late in the evening (when squash bugs are inactive)
- Organic options: Apply diatomaceous earth around the base of plants