IPM and Organic Management for 10 Landscape and Garden Insects (Campfire)




Dr. Vera Krischik
Associate Professor and Extension Specialist
Department of Entomology, University of Minnesota
phone: 612.625.7044; email: krisc001@umn.edu

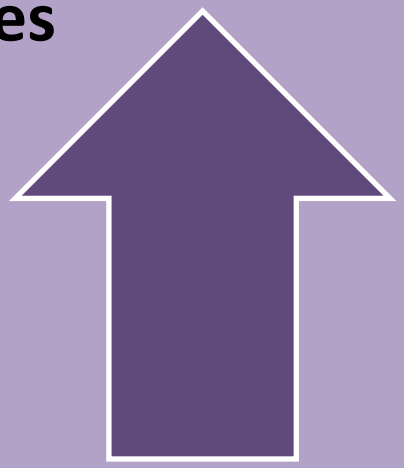
NCIPM webinars website+pollinator+plant videos
http://ncipmhort.cfans.umn.edu/

UM CFANS CUES website cues.cfans.umn.edu/

UM AFNR extension greenhouse, nursery, and landscape website
www.extension.umn.edu/garden/plant-nursery-health/

Top 10 gardens pests

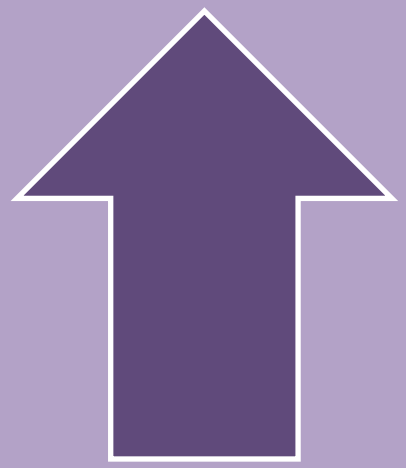
- 1. Japanese beetle; grapes, apples, vines
- 2. squash vine borer
- 3. aphids of all kinds
- 4. striped cucumber beetle
- 5. potato beetle
- 6. asparagus beetle
- 7. spotted cucumber beetle
- 8. cutworms
- 9. *Harmonia* Asian lady beetle
- 10. tarnished or four lined plant bugs



worst

Top 10 landscape pests

- 1. Japanese beetle; lindens, roses
- 2. emerald ash borer: ash
- 3. aphids
- 4. borers
- 5. scales
- 6. slugs
- 7. sawflies on conifers
- 8. conifer mites
- 9. caterpillars
- 10. galls



worst

What is PM?

* A system utilizing multiple methods
* A decision making process
* A risk reduction system
* Information intensive
* Biologically based
* Cost effective
* Site specific
* Multiple tactics:
    legal, cultural, physical,
    genetic, biological, chemical

When should biological control be used?

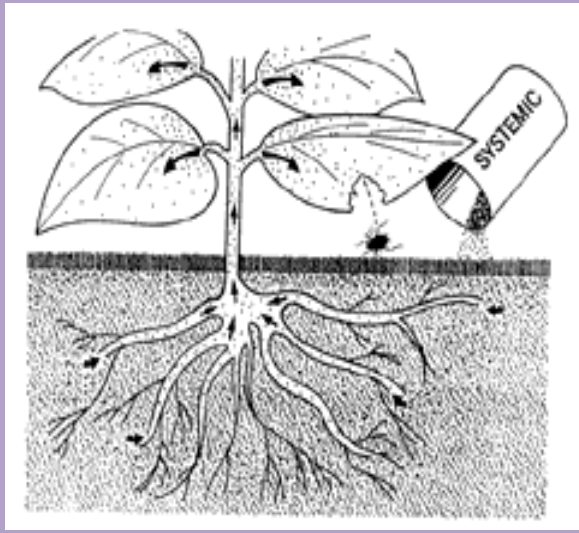
Biological control is most effective when enemies are release during low pest densities.

When using biological control agents in the greenhouse, it is important to avoid broad-spectrum pesticides; these may be detrimental to biological control agents. Carefully choose biorational insecticides to conserve biologyical control agents in the greenhouse.

Contact compared to systemic insecticides

Contact insecticides:

- Many used; sprayed on foliage
- Insect must eat leaf or walk on leaf to be killed
- Toxicity lasts 1-3 weeks
- Flowers that open after spraying do not contain insecticides.



Systemic insecticides:

- Uncommon; treated-seed, soil drench, trunk-inject
- Insect must eat leaf, pollen, or nectar to be killed
- Toxicity can least for months to years, unknown
- Flowers that open will have the insecticide in pollen and nectar for months to years, unknown

Use insecticides compatible with biocontrol.

Acelepryn, chlorantraniliprole for grubs in soil and on landscape plants.

Spinosad for caterpillars and sawflies

Neem oil, soaps, and oils for aphids

Need imidacloprid or dinotefuran for borers.

What is organic pest control?

- Organic means a practice that is governed by certification in each state to grow food without the use of synthetic pesticides in soils that are considered living and maintained by adding organic materials and not synthetic fertilizers.
- The National Organic Standards Board (NOSB)advises the National Organic Program (NOP).
- An organic certification is obtained from a USDA certified organic agency.
- The OMRI Organic Materials Research Institute has a list of organically approved products. Excluded are nitrogen(N), phosphate (P), or potash/potassium (K), and ammonia and nitrate fertilizers.

How to control overwintering insects?

- Tillage exposing insects in the soil
- Horticultural oils in the fall to killing overwintering stages on woody plants
- Removal of weeds to remove overwintering sites.
- Removal of all debris that may harbor pests.

Characteristics of organic pesticides

- Short residual
- Degrade due to light, water, microbes.
- Work on smaller insects and immatures
- Less harmful to beneficial insects, predators, parasitoids, bees.
- Low mammalian toxicity.
- May take longer to kill a pest.

Organic OMRI=natural sources pesticide?

- **OMRI approved**
- ***Bacillus thuringiensis*, *Beauveria bassiana*, Boric acid, *Cydia pomonella granulosis*, diatomacous earth (HT), garlic, Koalin clay, limonene, neem (azadiractin), horticultural oil, pyrethrins (HT), ryania (HT), ryanodine (MT), Sabadilla (HT), spinosad (HT), pheromone, boric acid**

Microbial insecticides OMRI approved

- BT
- *Beauveria bassiana*, Mycotrol-O, many
- *Chromobacterium subtsugae*, *Grandevo*, many
- *Cydia pomonella granulosis*, *CYD-X*, codling moth
- Spinosad, Entrust, soil bacteria toxin, caterpillars
- Nematodes, *Steinernema* and *Heterorhabditis*, *Biosafe, Bio Vector, Nemasys*, soil inhabiting insects

Types of BT

- BT is a protein crystal that puts an hole in the insect's gut wall after ingestion.
- Kurstaki, moth larvae, Dipel, Javelin
- Aizawai, moth larvae and suckers, Xentari
- tenebrionis, beetle larvae, Trident
- galleria, grubs, Grubgone
- bifenthrin, NOT organic, grubs, Grub B Gone Ortho
- chlorantraniliprole, NOT organic but conserves beneficials, grubs, Grub Ex Scotts
- israelensis, fly larvae, Aquabac
- Burkholderia, caterpillars, Venerate

Beauveria bassiana is a fungus

- *Beauveria bassiana* is a fungus which causes a disease. When spores of this fungus come in contact with the cuticle (skin) of susceptible insects, they germinate and grow directly through the cuticle to the inner body of their host. Here the fungus proliferates throughout the insect's body, producing toxins and draining the insect of nutrients, eventually killing it.
- Unlike bacterial and viral pathogens of insects, *Beauveria* and other fungal pathogens infect the insect with contact and do not need to be consumed by their host to cause infection.

Cydia pomonella granulosis virus

- Kills codling moth larvae on apples.
- Use pheromone or insect behavior disruptant, codling moth, Isomate-CPlus

OMRI Botanical insecticides are toxic to bees, beneficial, and mammals

- ~~Nicotine (leaves tobacco), rotenone (roots of *Derris* sp, other legumes) Ryania (Ryania shrub), Sabadilla (tropical lily), no longer approved~~
- Pyrethrins, Pyganic
- Linalool (citrus peel oil derivatives) consumer
- Limonene (citrus peel oil derivatives)Avenger, OrangGuard
- Neem oil, clarified hydrophobic extract of neem, Dyna-Gro, Triact70
- Azadirachtin (*Azadiractin indica* tree fruits), Azatin, AzaGuard
- Garlic oils? Consumer, aphids, beetles, caterpillars, Garlic barrier
- Hot peeper extract, Capasaicin, ? Consumer, Nemitol
- Rosemary oil, with peppermint oil, Ecotrol, Ecotec
- New in progress, Citronella, Pennyroyal

Neem Oil

- From Indian neem tree, *Azarchta indica*
- Clarified hydrophobic extract of neem, very little azadirachtin in neem oil
- MOA suffocates by blocking breathing pores.
- Good for soft bodied, aphids, spider mites, scales, whiteflies, mealybugs
- Can kill beneficials
- Low mammalian toxicity

Dusts

- Kaolin clay, Surround, can kill stink bugs

Pyrethrins/Pyrethrum

- South African daisy, *Tanacetum cinerariafolia*
- *Requires PBO, piperonyl butoxide synergist, PyGanic*

Oils and soaps

- **Oils, mites, scales,aphids**
- **Triact 70, clarified hydrophobic extract of Neem oil**
- **Mantis EC is an agriculture grade organic insecticide/miticide formulated with the natural insecticidal activity of rosemary, peppermint, and NON-GMO soybean botanical oils.**

Botanical Oils (Insecticidal Oils)

Mantis EC is an agriculture grade organic insecticide/miticide formulated with the natural insecticidal activity of rosemary, peppermint, and NON-GMO soybean botanical oils.

Turf pest: Japanese beetle

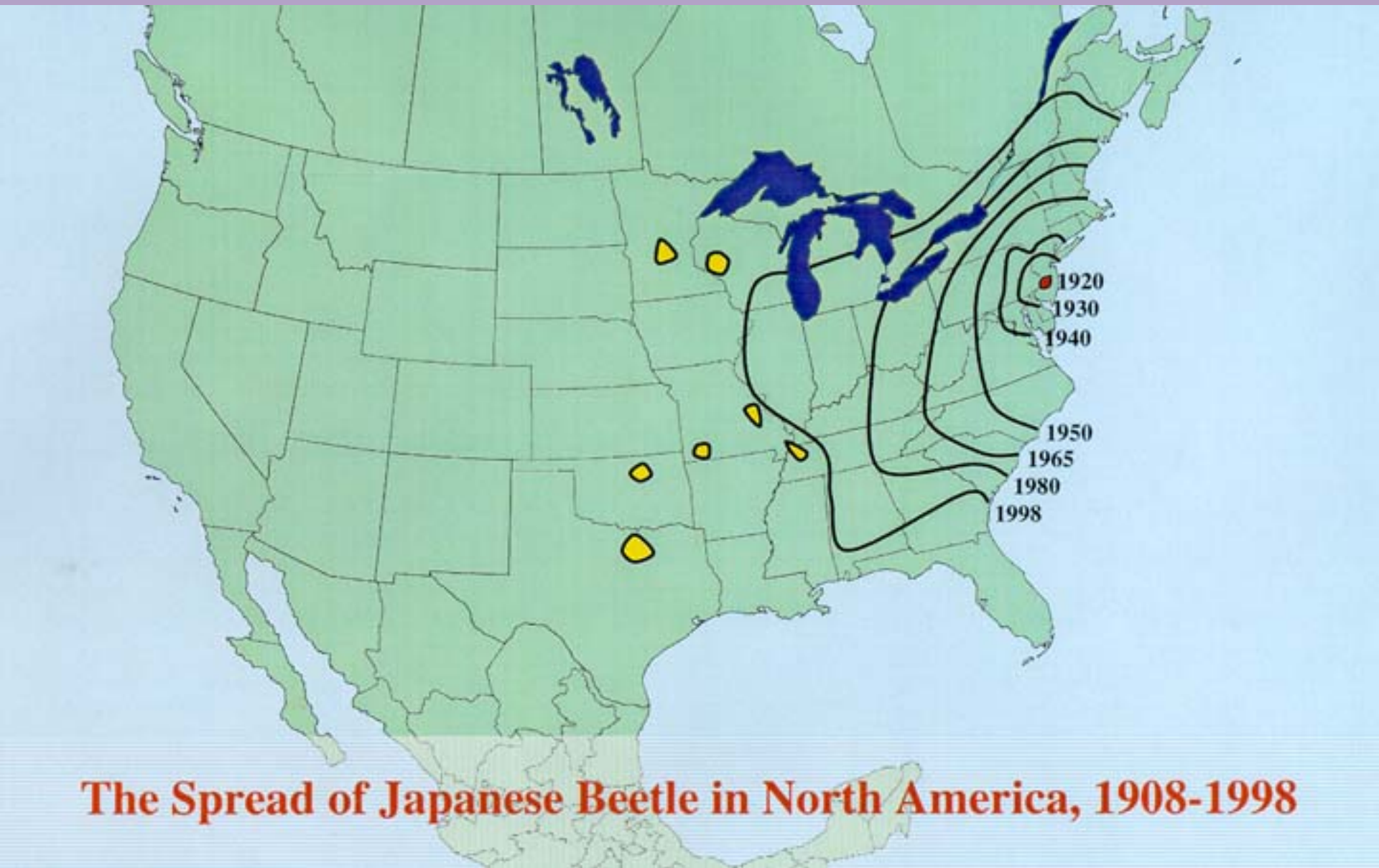
Five tufts of white hairs along the wing margins.

Turf pest: Japanese beetle

Identification:

The Japanese beetle is an exotic scarab originally established in New Jersey. Japanese beetles are approximately 7/16 inch long. The front of the beetle is dark metallic green and the wing covers are dark tan. There are five small, white patches of short hairs along each side of the dorsal abdomen on the beetle. These white patches are a key characteristic for identification. If it does not have these white hair patches, it is the False Japanese beetle.

Turf pest: Japanese beetle



Turf pest: Japanese beetle

Damage, scouting, and management:
Pheromone traps use a rose-scented lure to attract the adult beetles and can be purchased in garden centers. however, if you have them you will attract thousands. Better to place traps in the sun away from roses, lindens, grapes along tree line. Traps can be purchased from Garden Centers or

Turf pest: Japanese beetle

Damage, scouting, and management:
One of the favored foods of adult Japanese beetles is rose, grape, Norway maple, and linden foliage. Adults feed on over three hundred species of plants. Inspect your plants for skeletonized leaves and the presence of adult beetles

Larvae feed on the roots of grasses. Look for grass that plugs from the soil without roots.

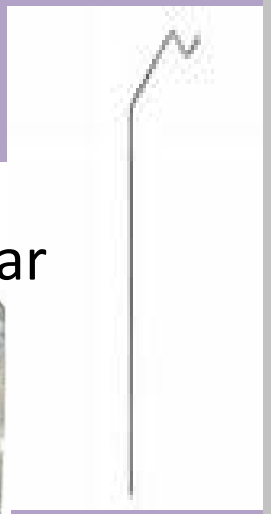
Turf pest: Japanese beetle

Damage, scouting, and management:
or Gemplers, Janesville, WI 53546

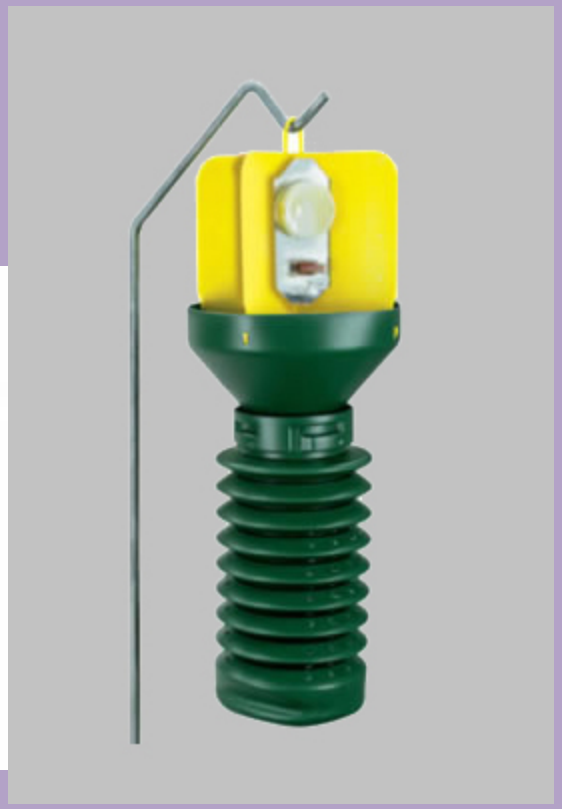
trap

lure in trap

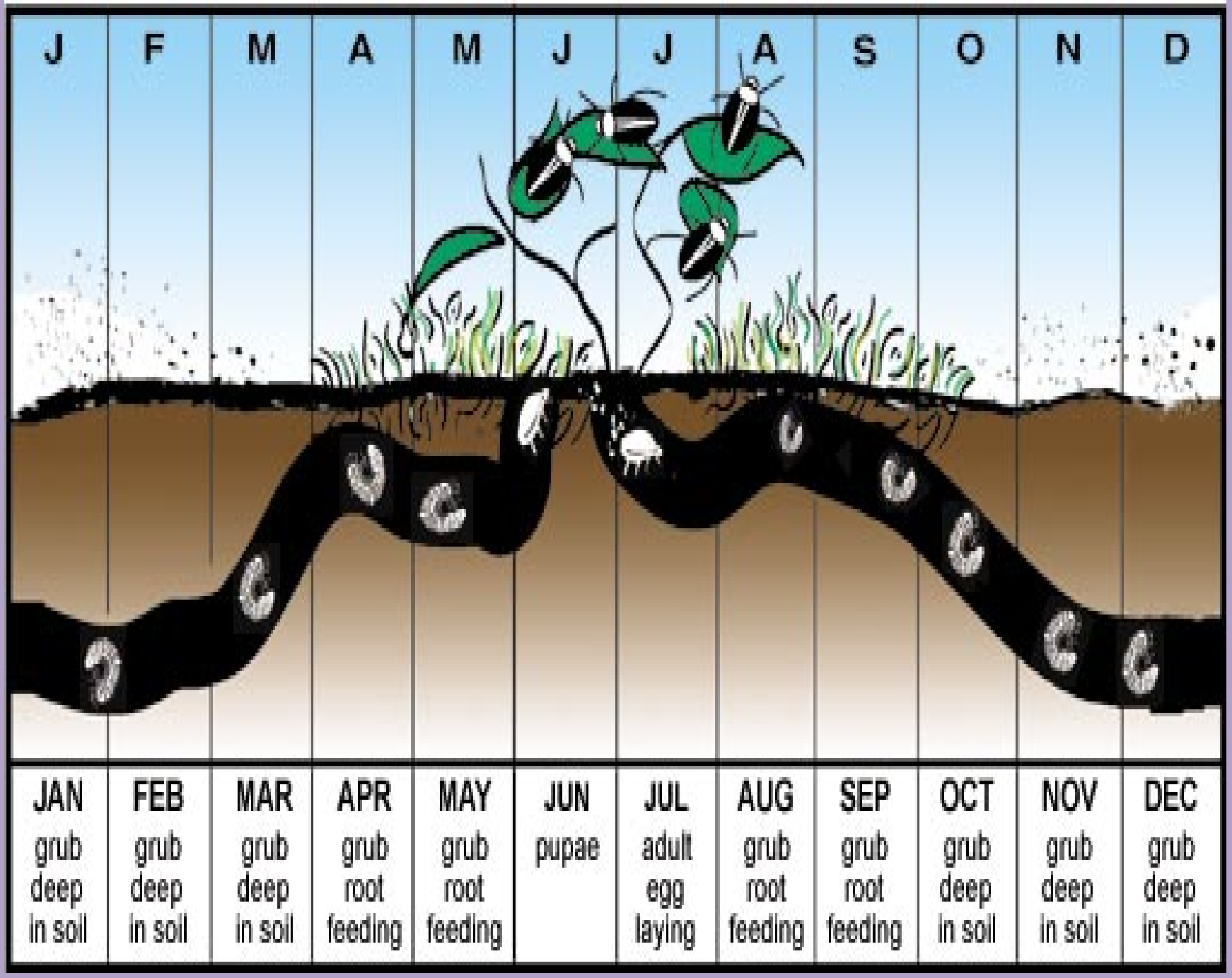
double lure:
pheromone and rose scent



stand or rebar



complete trap


J F M A M J J A S O N D
JAN grub deep in soil
FEB grub deep in soil
MAR grub deep in soil
APR grub root feeding
MAY grub root feeding
JUN pupae
JUL adult egg laying
AUG grub root feeding
SEP grub root feeding
OCT grub deep in soil
NOV grub deep in soil
DEC grub deep in soil

Japanese beetle

Five tufts of white hairs along the wing margins.

False Japanese beetle

False Japanese beetles lacks the 5 tufts of white hair along the wing margin.

Rose chafer

Note the long legs and pale color.

Northern masked chafer

Northern masked chafer has dark areas in a circular patch behind the head.

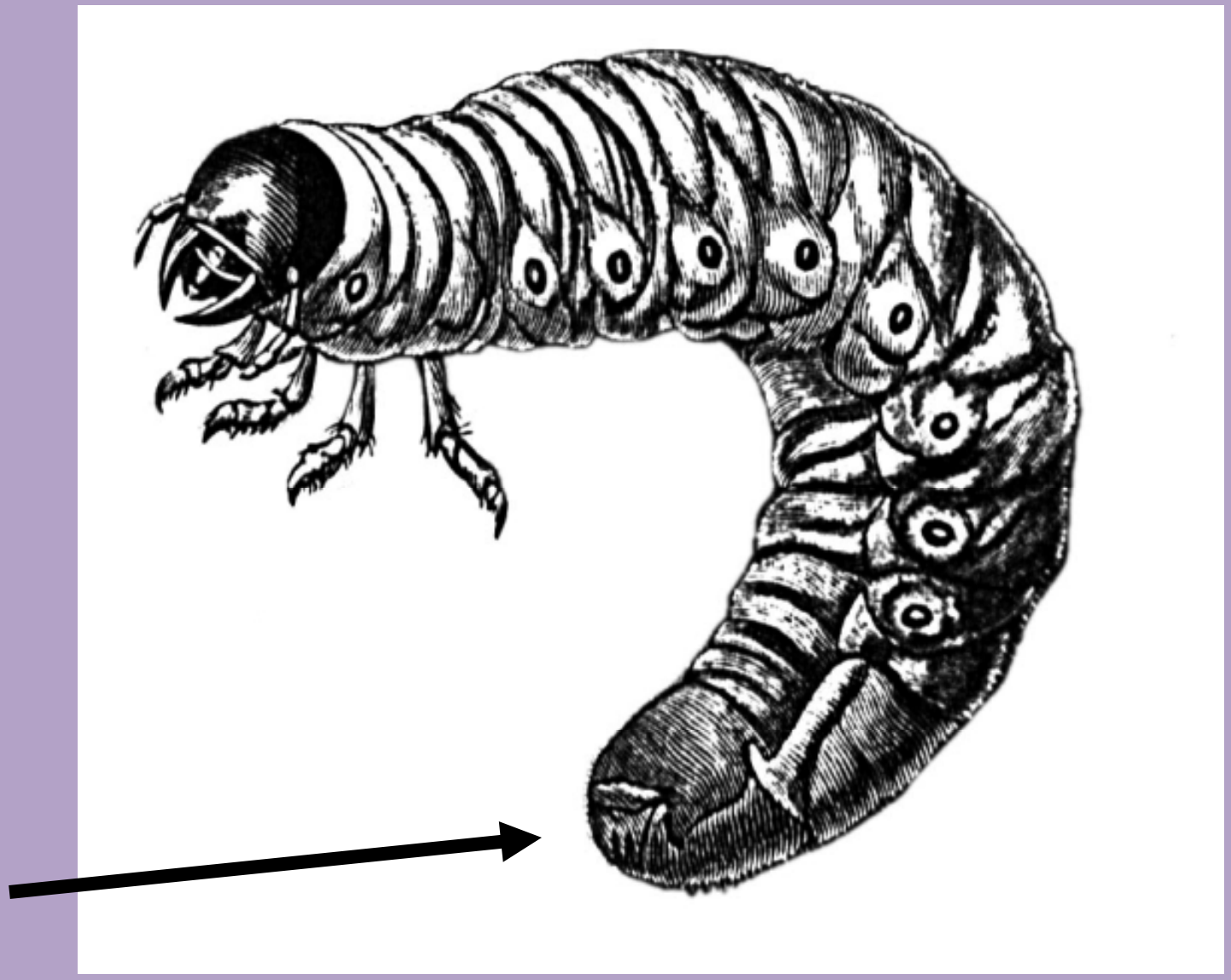
Black turfgrass *Ataenius*

Smallest scarab beetle in turf.

Phyllophaga May/June beetle

These May/June beetles are attracted to lights. The largest species has a three year life cycle.

Raster



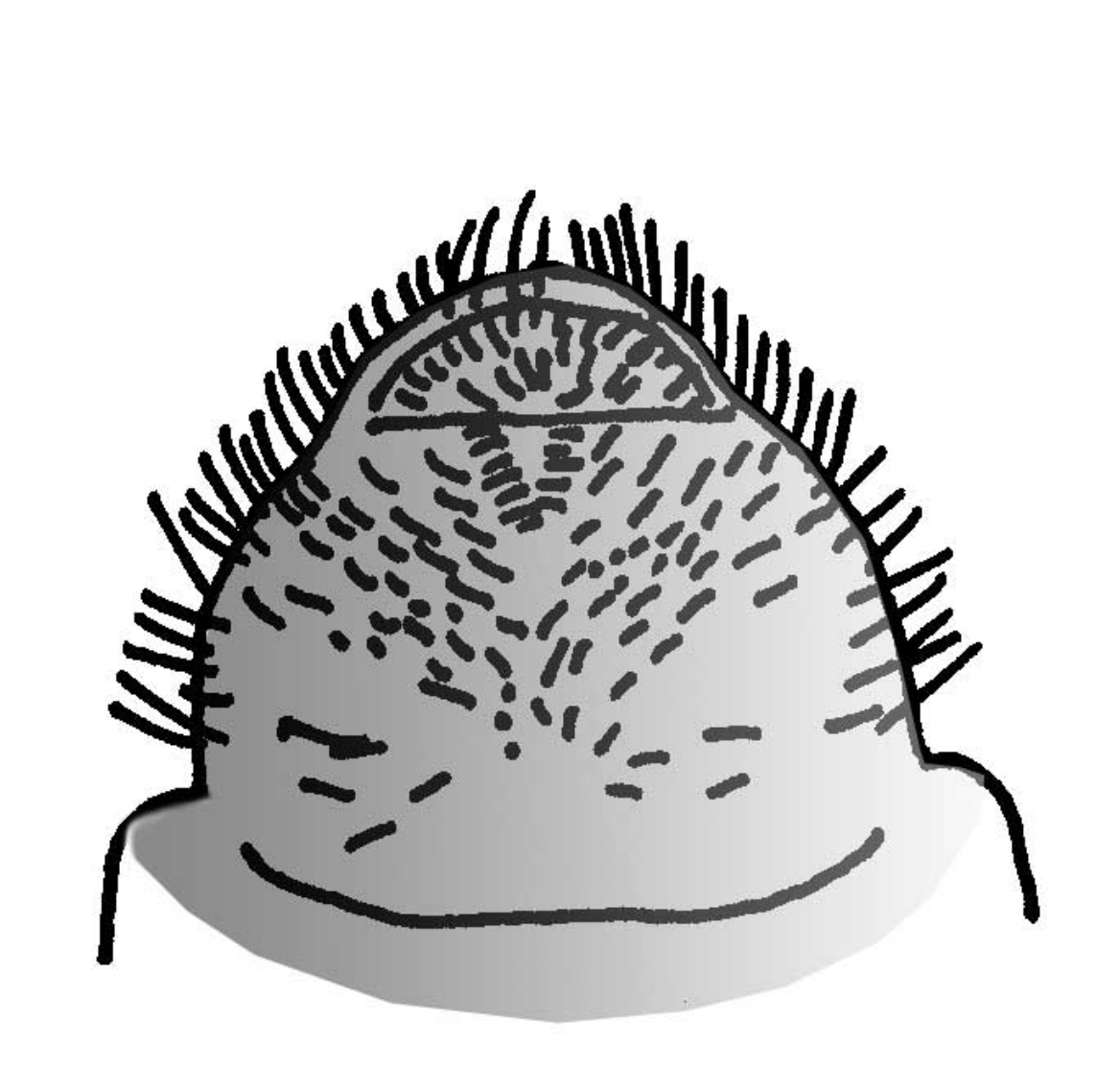
Life history of scarabs in turf

species	species	years	larval food	adult food
	JB	one year	turf	adults feed on grape, linden, rose
	false JB	one year	unknown	adults feed on grape, linden, rose
	rose chafer	one year	unknown	adults feed on grape, linden, rose
	masked chafer	one year	turf	adults do not feed; do not leave turf
	*Ataenius* *Aphodius*	3 gen. year June, July, Sept	turf, manure	adults feed on turf; adults overwinter in woodlots
	Large June beetle	three years	turf	adults feed on grape, linden, rose

Japanese beetle

Five tufts of white hairs along the wing margins.

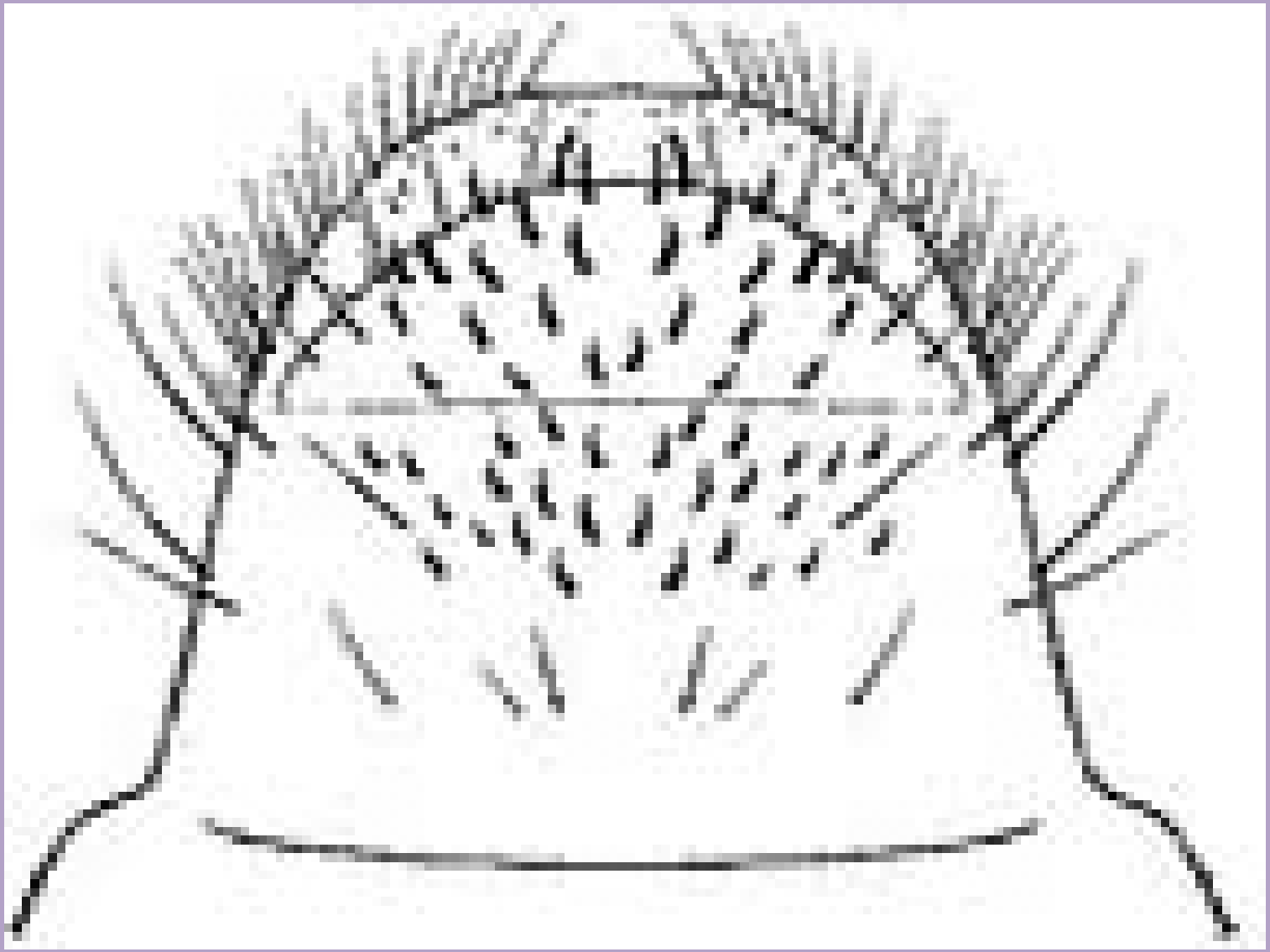
Raster of Japanese beetle



masked chafer

Masked chafer has dark areas in a circular patch behind the head.

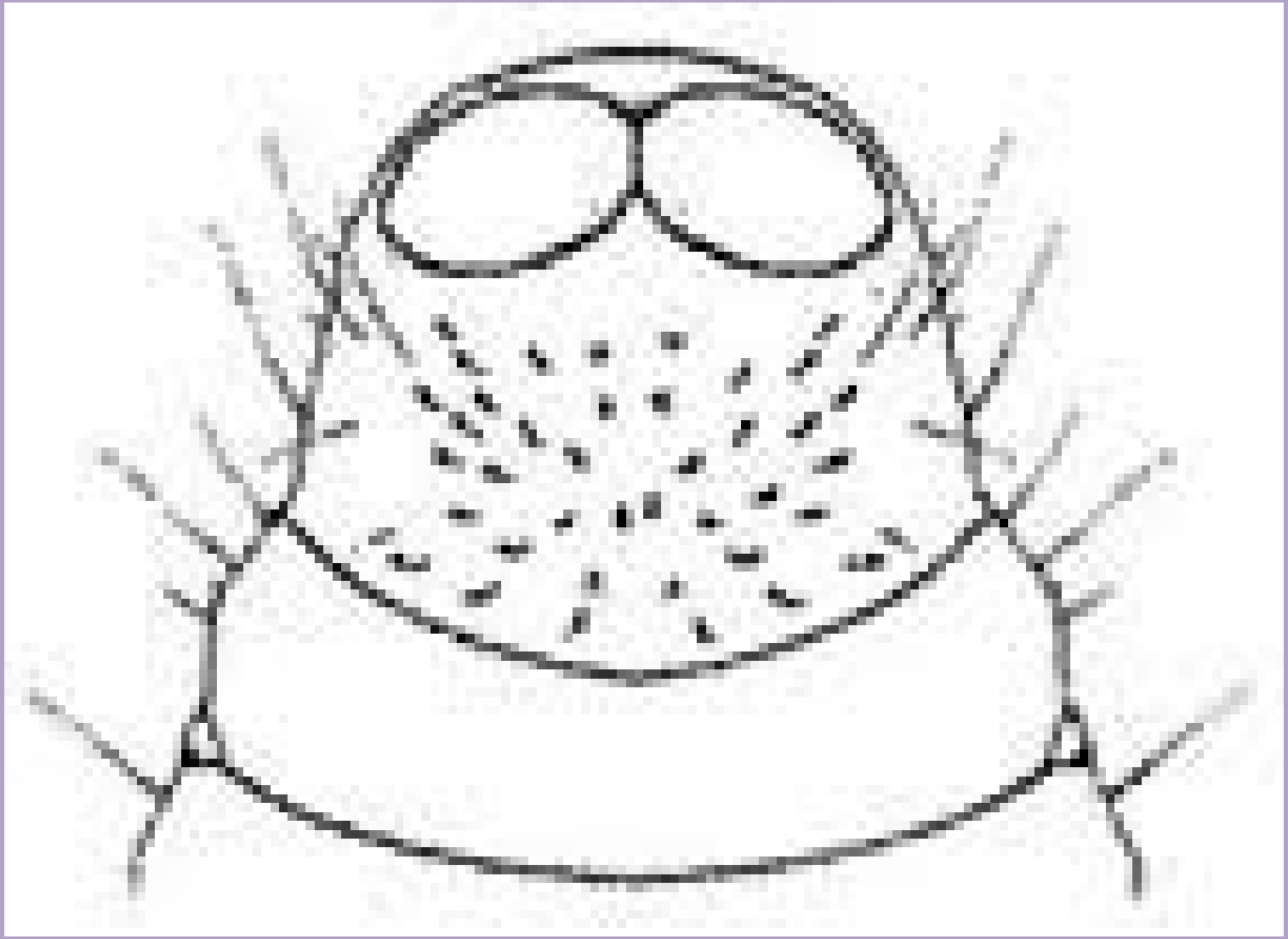
Raster of masked chafer beetle



black turf grass Ataenius

Smallest scarab beetle in turf

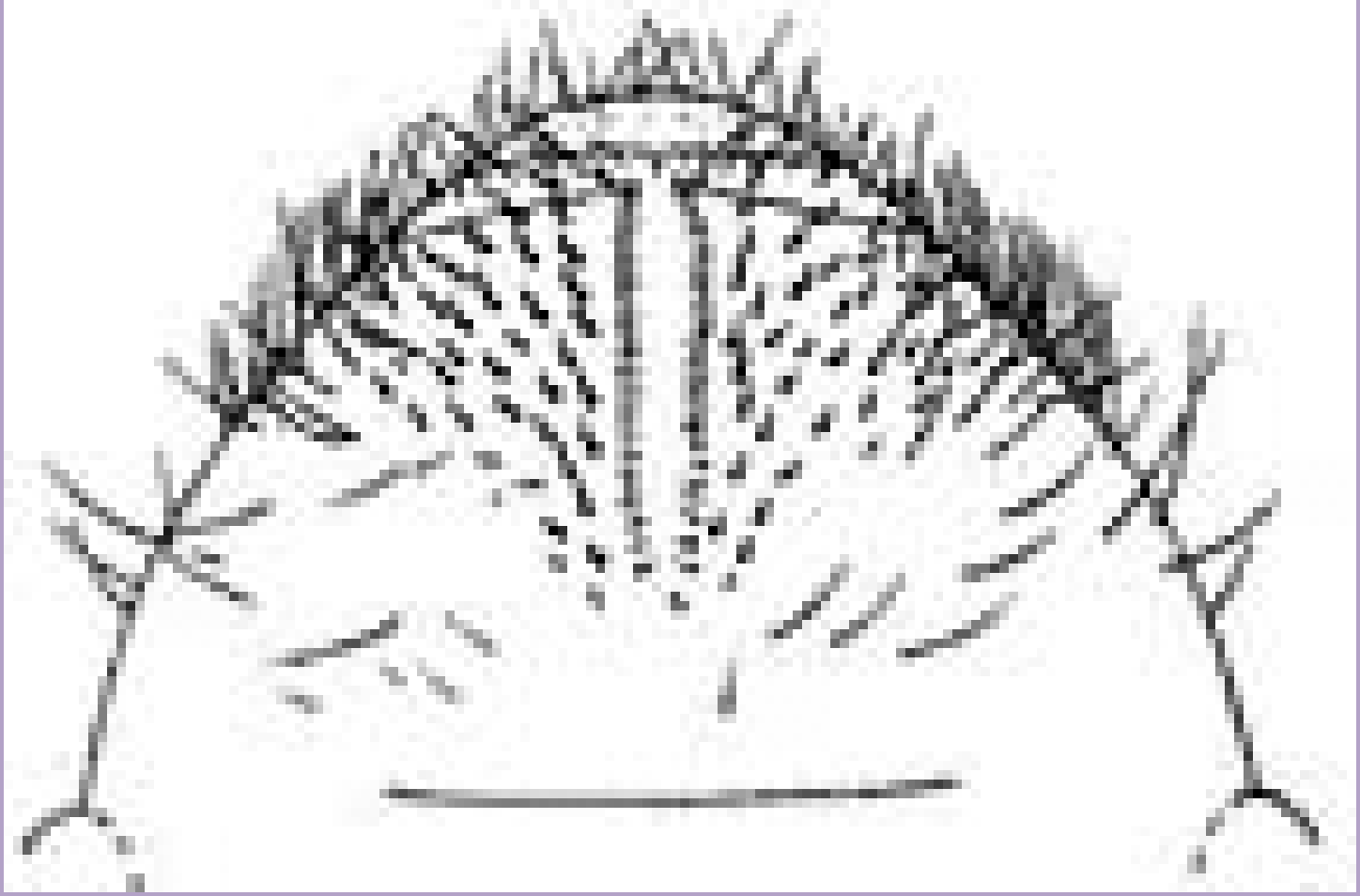
Raster of black turfgrass *Ataenius*



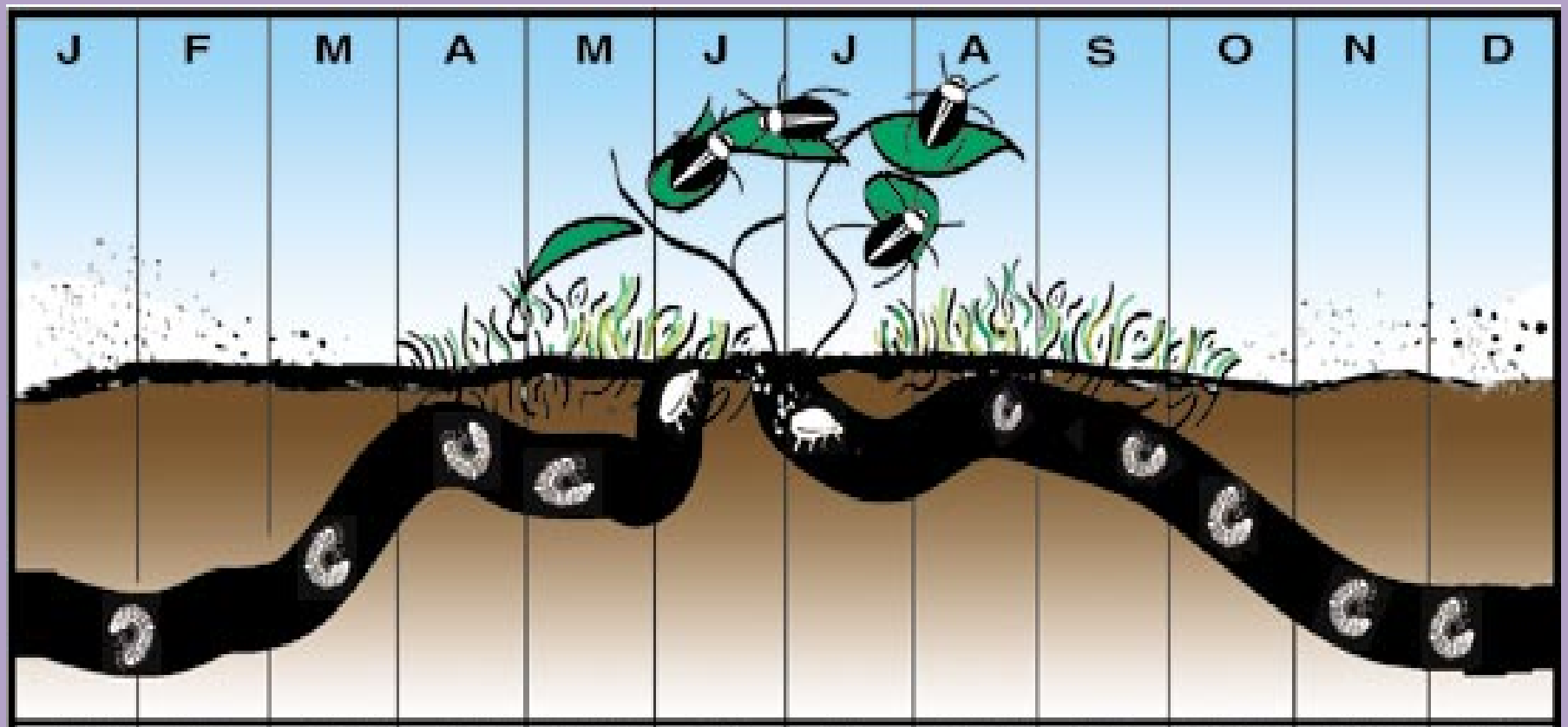
Phyllophaga May/June beetle

These may/June beetles attracted to lights.
This largest species have a three year life cycle.

Raster of *Phyllophaga* May/June beetle

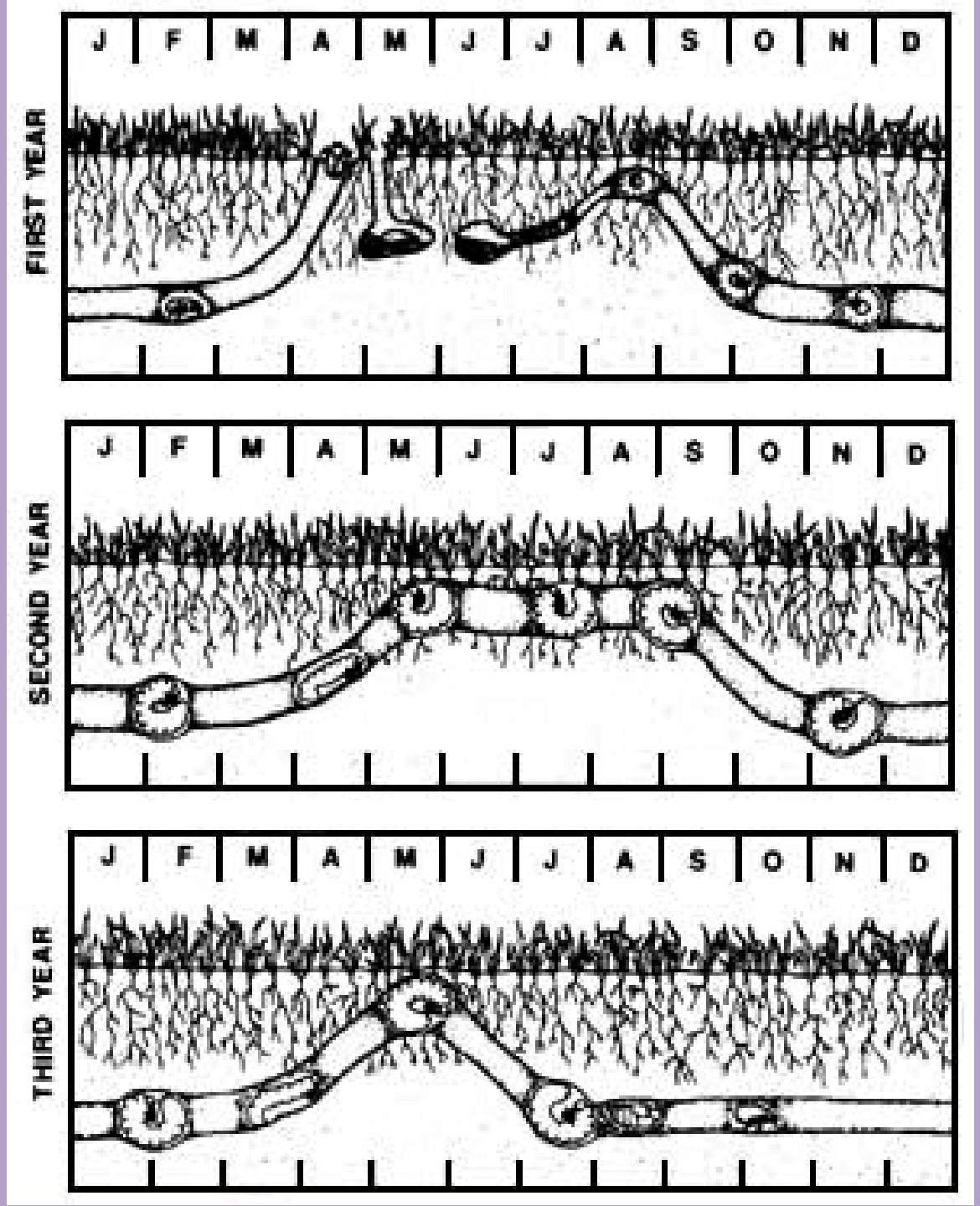


One year life cycle of Japanese beetle



JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
grub deep in soil	grub deep in soil	grub deep in soil	grub root feeding	grub root feeding	pupae	adult egg laying	grub root feeding	grub root feeding	grub deep in soil	grub deep in soil	grub deep in soil

Three year cycle of *Phyllophaga* May/June beetle

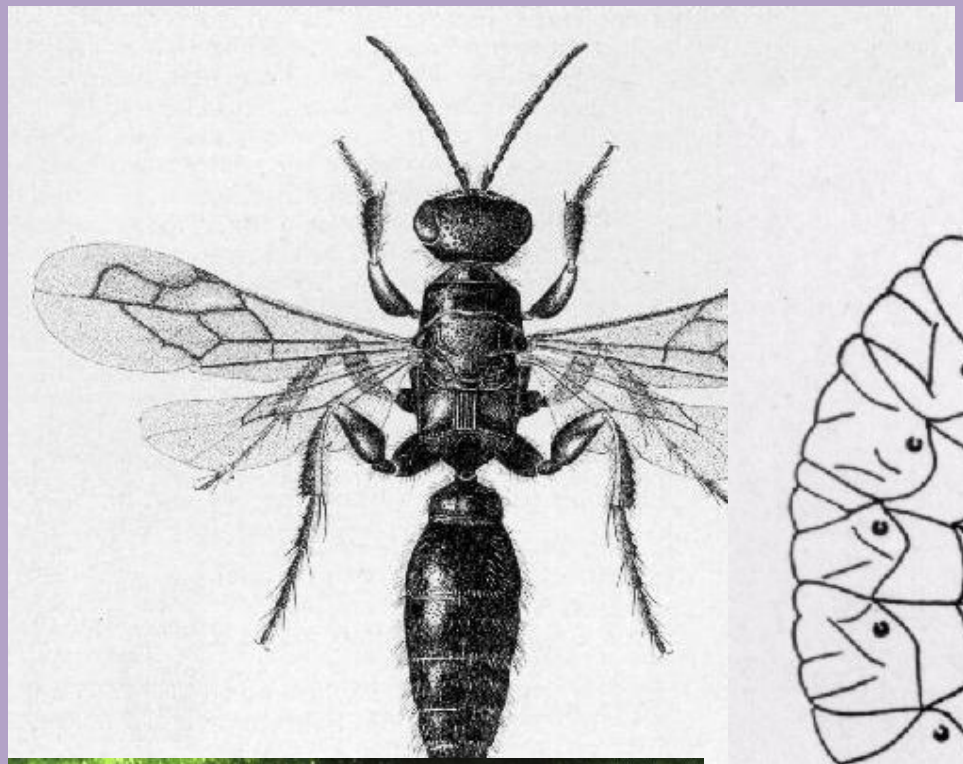


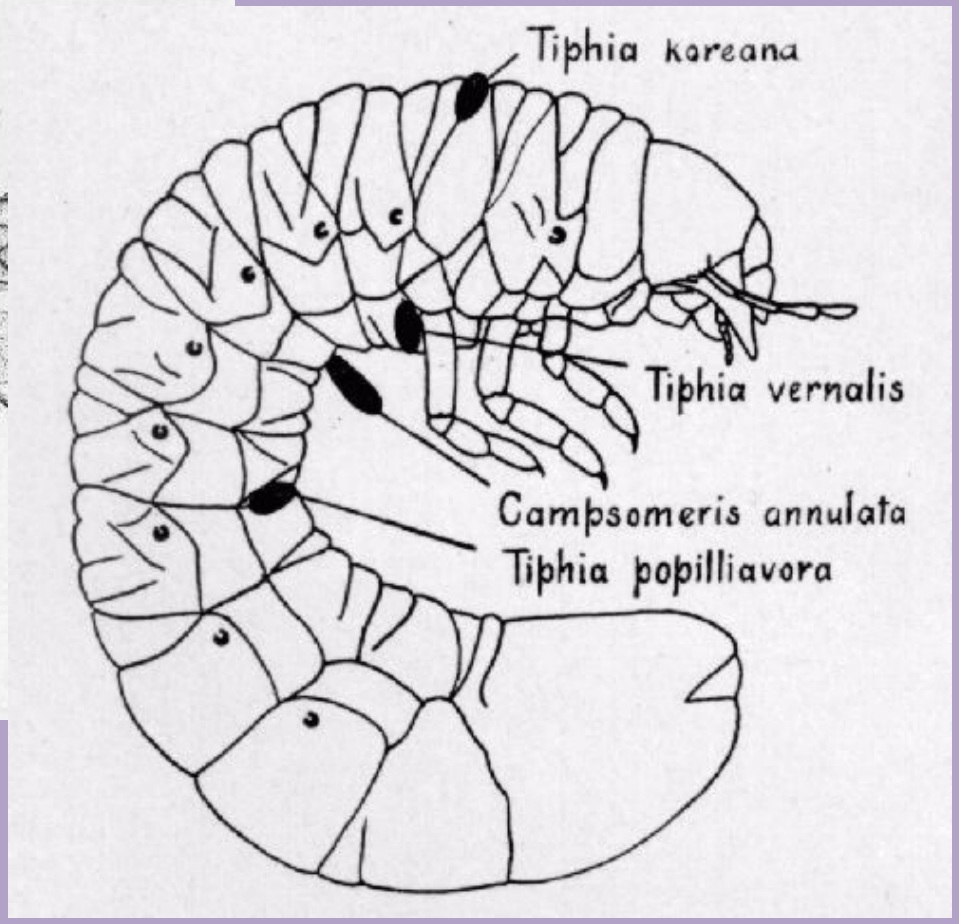
Ecosystem management

- **Japanese beetle parasites *Tiphia vernalis* (Hymenoptera) and *Istocheta* sp. (Diptera) known to be active in MA and CT, are absent in MI, and probably MN.**

- **MDA is releasing both in MN**

Ecosystem management: *Tiphia vernalis*





Females of different species lay eggs on distinct parts of grub.

Ecosystem management: *Tiphia vernalis*

- **In the northeastern U.S., adult spring *Tiphia* wasps feed primarily on the honeydew exuded from aphids, scale insects, and leafhoppers.**

- **The wasp will also feed on the nectar of blossoms, such as forsythia, and on the extra-floral nectaries of peonies.**

- **In China the knowledge of food plants to increase the rates of *Tiphia* parasitization of white grubs to an average of 85%.**

Ecosystem management: *Isotecha aldrichi,* tachnid fly

- **This solitary fly is an internal parasite of adult Japanese beetle.**
- **The female flies deposit 100 eggs during a period of about 2 weeks.**
- **The eggs are usually laid on the thorax of the female beetles and the maggot bores directly into the body cavity.**
- **Food sources: aphid nectar and Japanese knotweed (*Polygonum cuspidatum*), a persistent perennial weed native to Japan.**

Ecosystem management: Protozoan parasites

- **Protozoan pathogens, *Ovavesicula popilliae* and *Gregarina* sp., are abundant where JB has been long established as in CT and NY and suppress population growth. *Ovavesicula*, known to infect approximately 25% of all JB grubs in CT was only found at 1 location in MI.**

- **The Gregarine parasite found in the digestive system of Japanese beetle larvae in MI is *Stictospora villani.***

- ***Stictospora sp.*, found in 70% of Japanese beetle larvae in CT was only found in 20% of all MI larvae, and at only 60% of all sites in MI, compared with 100% of all sites in CT.**

- **In a greenhouse *Stictospora sp*. persisted in soil after infected grubs were removed and caused a 20% reduction in survival of healthy grubs.**