

**RUTGERS**

New Jersey Agricultural  
Experiment Station

# **Managing Turfgrass Insects of the Northeast**

## **Part 2: Root-infesting insect pests**

(updated 3-14-2022)

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**Rutgers Cooperative Extension**

- **ROOT-INFESTING PESTS (3-78)**
  - **White grubs (4-74)**
  - **Crane flies (75-87)**

## **Root-infesting pests**

- **White grubs**
- **European crane fly**
- **Mole crickets**
- **Ground pearls**
- **March flies**

# White grubs

## (Coleoptera: Scarabaeidae)

- Most widespread and destructive insect pests in cool-season and transition zones
- Primary damage: feeding on roots near soil surface (severe in hot dry weather)
- Secondary damage: vertebrate predators foraging on grubs



# White grubs - Signs of infestation

1. Thinning, yellowing, wilting

NYAES

2. Scattered, irregular dead patches

NYAES

3. Dead patches join, increase in size

NYAES

4. Turf spongy underfoot, easily pulled up

NYAES

# White grubs - Signs of infestation

5. Turf easily pulled up



D. Potter

6. C-shaped white grubs under turf



D. Potter

7. Vertebrate predator foraging



D. Shetlar

8. Vertebrate predator damage

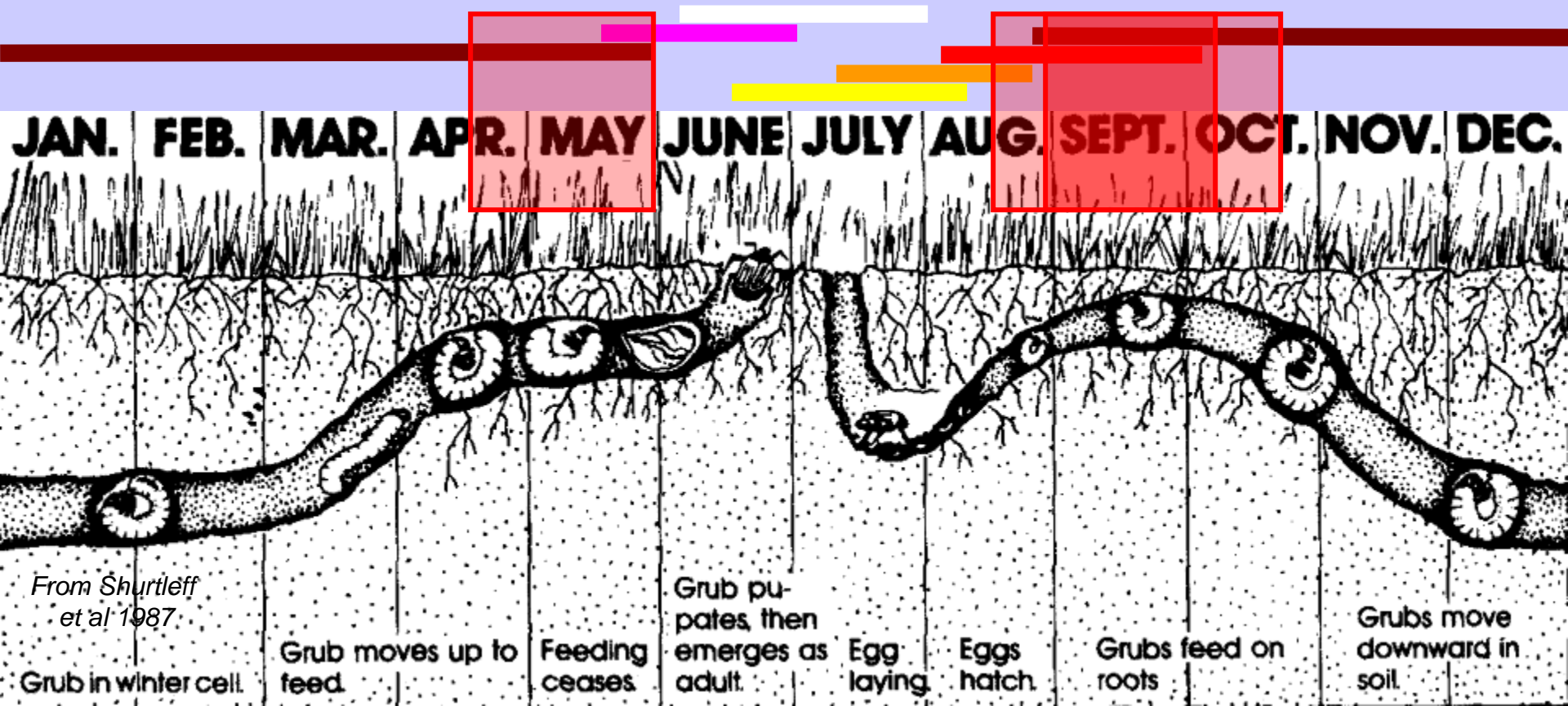
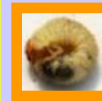


F. Baxendale

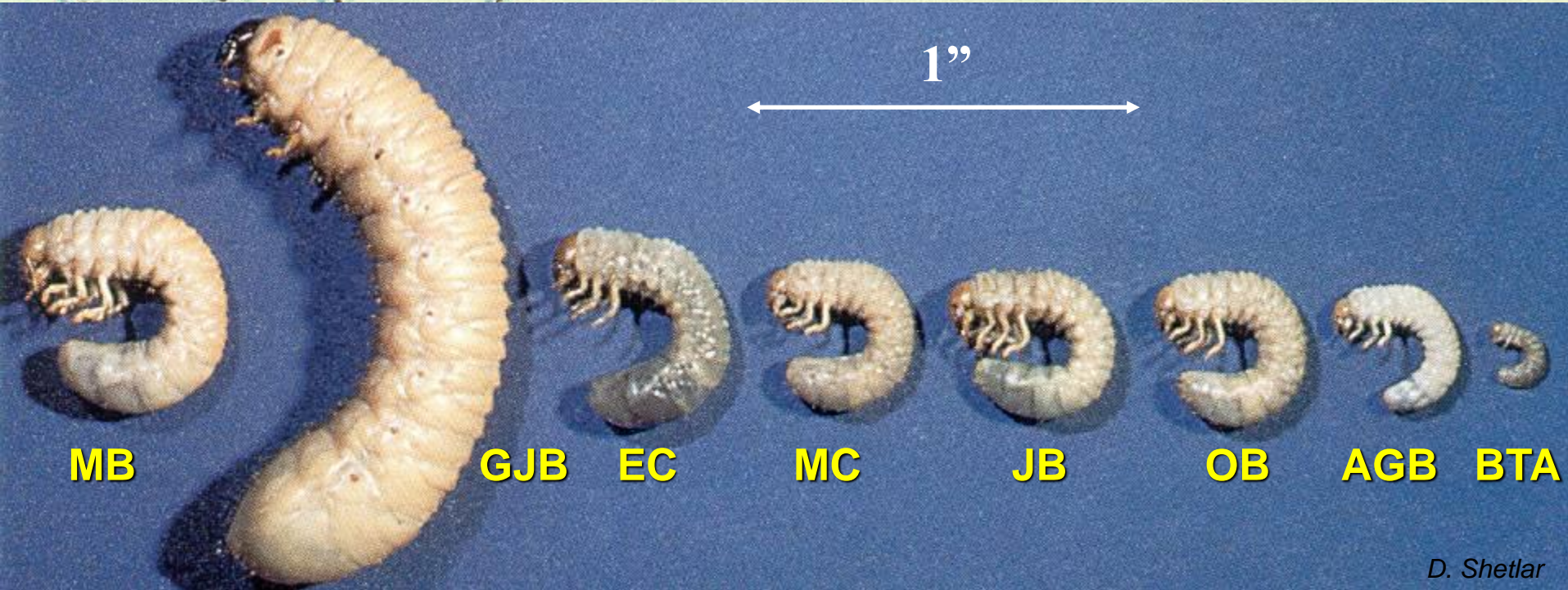
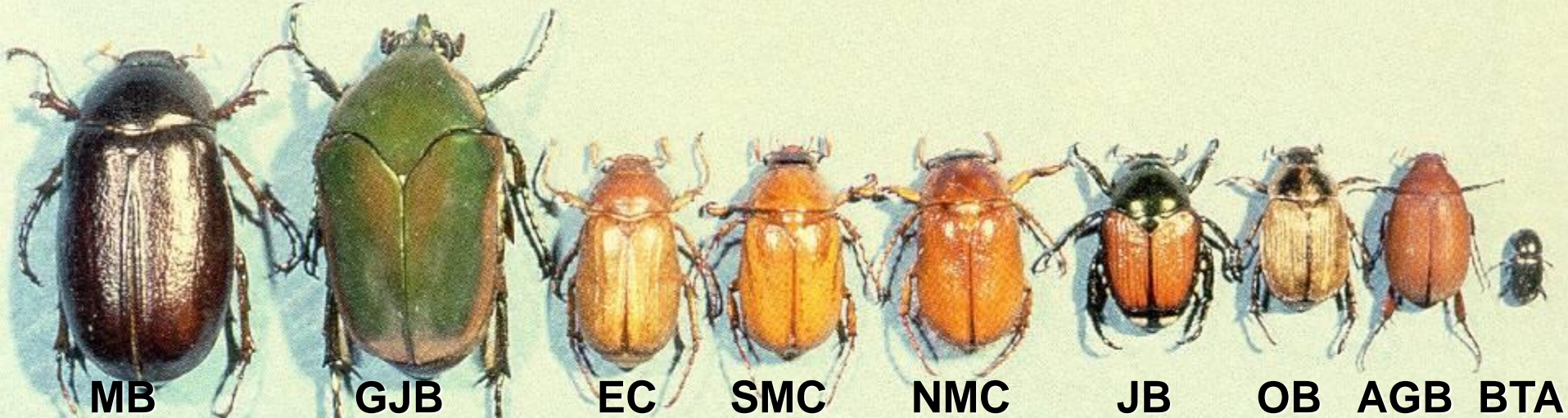
# White grub – Seasonal Lifecycle



Egg L1



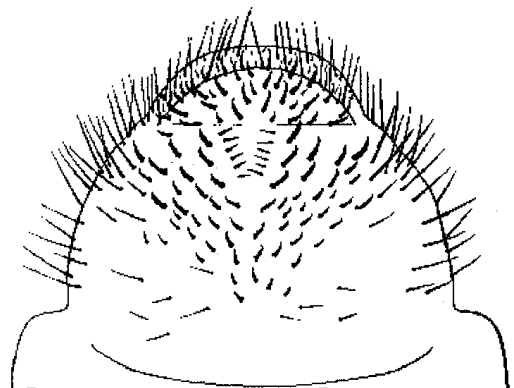
From Shurtleff et al 1987



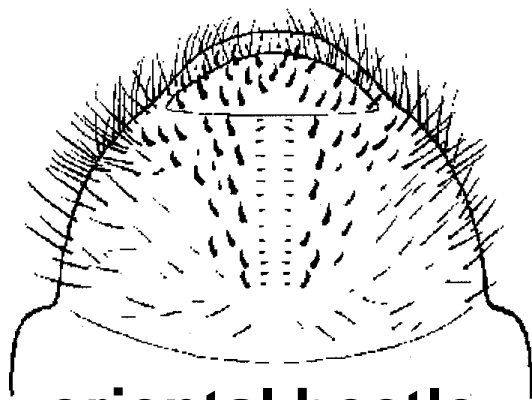
D. Shetlar

MB, May beetle; GJB, green June beetle; EC, European chafer; MC, masked chafer (S/N, southern/northern); JB, Japanese beetle; OB, oriental beetle; AGB, Asiatic garden beetle; BTA, black turfgrass ataenius

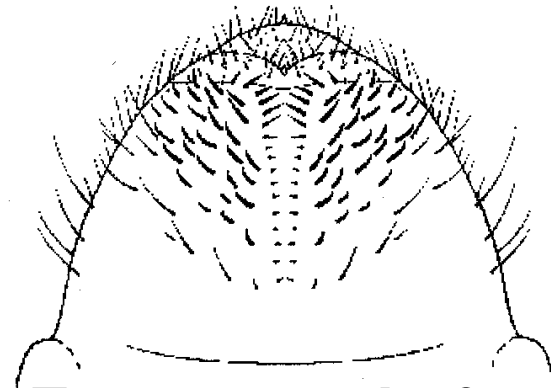




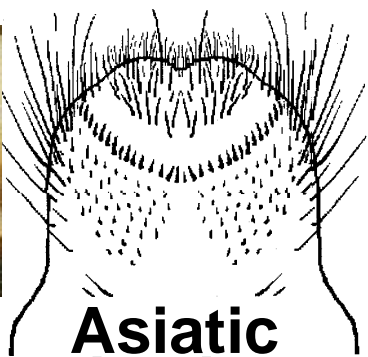
**Japanese beetle**



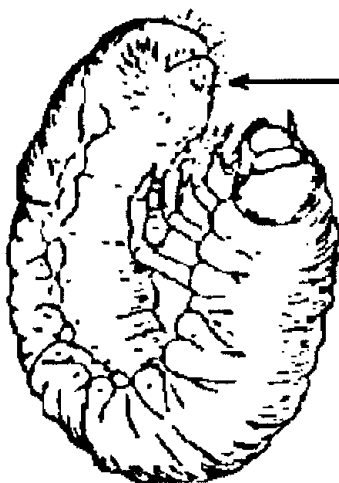
**oriental beetle**



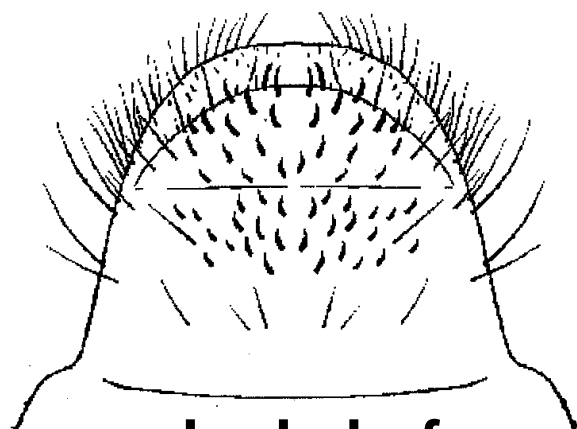
**European chafer**



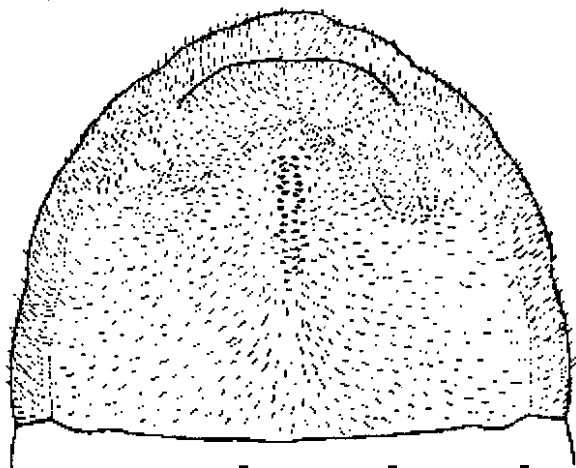
**Asiatic garden beetle**



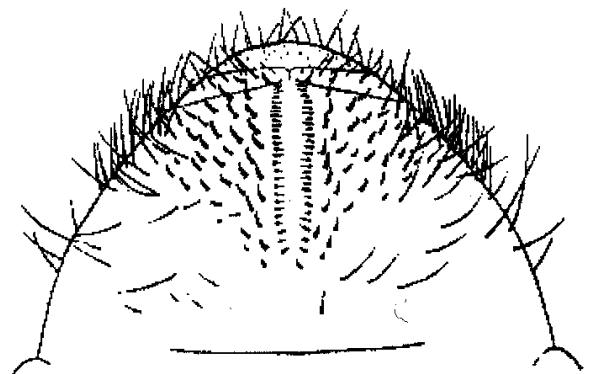
**raster**



**masked chafer**



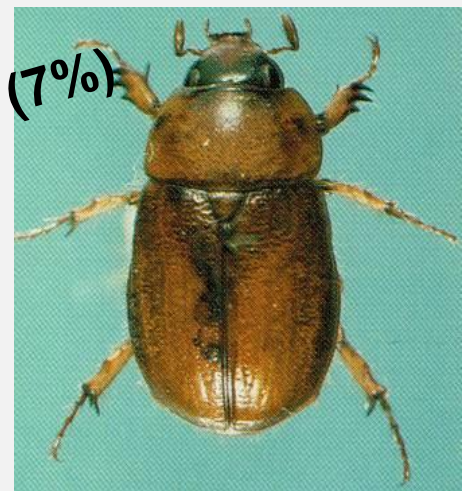
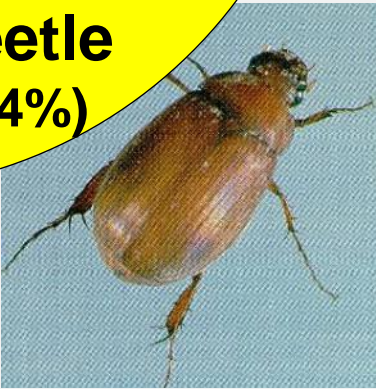
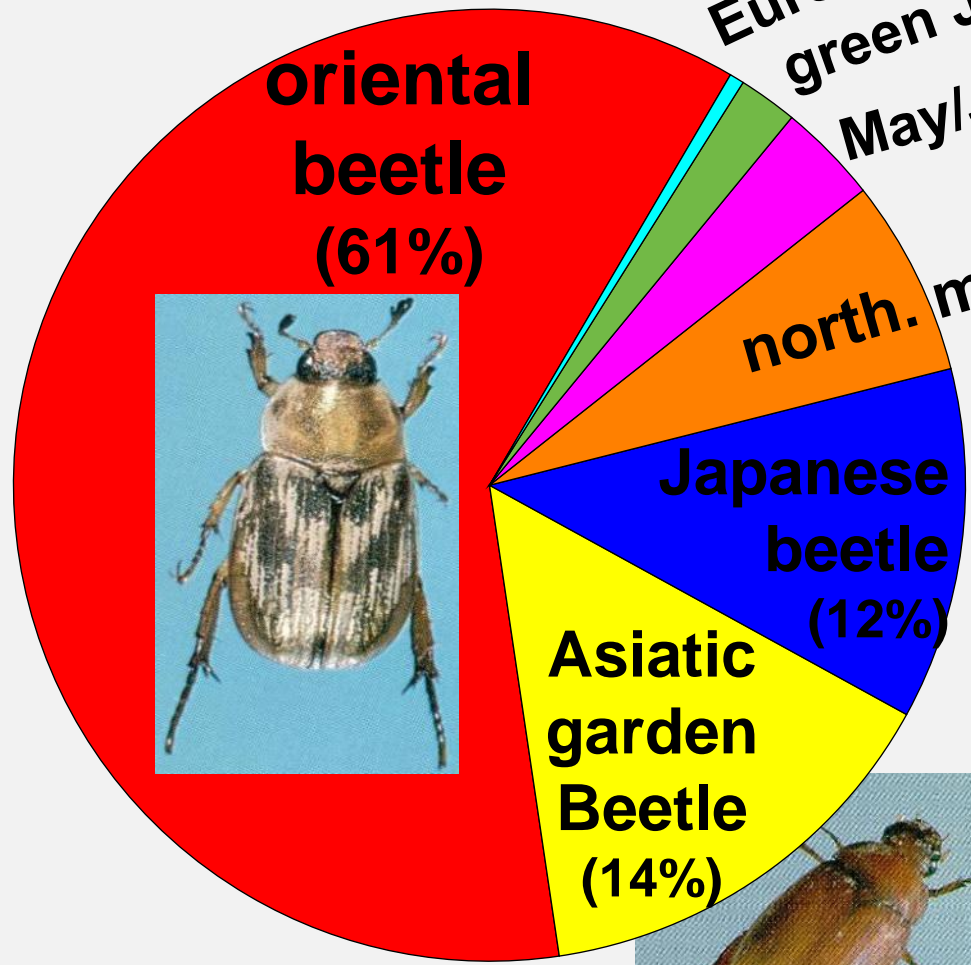
**green June beetle**



**May/June beetle**

# White grubs complex in NJ lawns

European chafer (1%)  
green June beetle (2%)  
May/June beetles (3%)



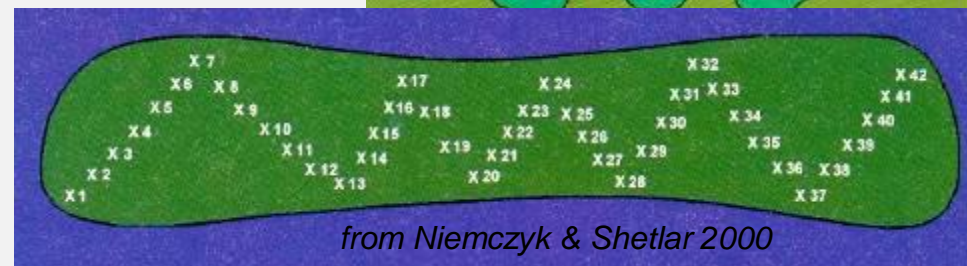
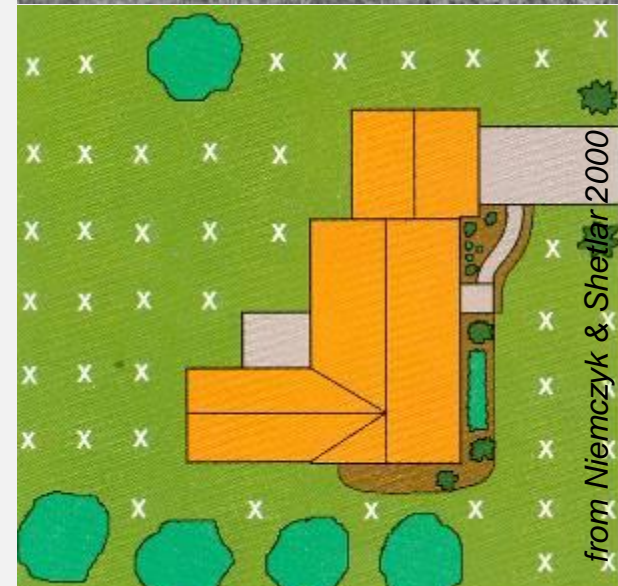
# White Grubs - Monitoring

Keep close eye & sample sites w/:

- adult activity in June/July (traps)
- areas infested in previous years
- vertebrate predator activity

Sample in mid-August using:

- Cup cutters or spade
- Several samples per area
- Best in a grid pattern



# White grub damage thresholds\*

Species	grubs/ft <sup>2</sup>
- May beetles	3-4
- European chafer	3-8
- oriental beetle, Japanese beetle, green June beetle, masked chafers	<b>6-20</b>
- Asiatic garden beetle	12-20
- Black turfgrass ataenius, spring	30-80
“ “ “ , summer	15-40

\*values vary greatly with turfgrass type and condition. Healthy, vigorous turfgrass can tolerate higher densities.

# White grubs – Cultural control

- **Good turfgrass management to increase tolerance and recuperative potential**
- Irrigation and light fertilization to mask damage and improve recovery
- No resistant turfgrass cultivars known
- Endophytic fungi do not provide much resistance
- **Tall fescue relatively tolerant**

# Preventive control

- Application before infestation is recognized, ideally around egg-hatch
  - Long residual insecticides (Acelepryn, Arena, Meridian, Merit, Mach2)
  - Pro: Insurance
  - Contra: Often unnecessary, expensive, long term suppression of natural enemies
- **Restrict to high-risk areas (history of infestation, high adult activity, lowest tolerance for damage)**

# Curative control

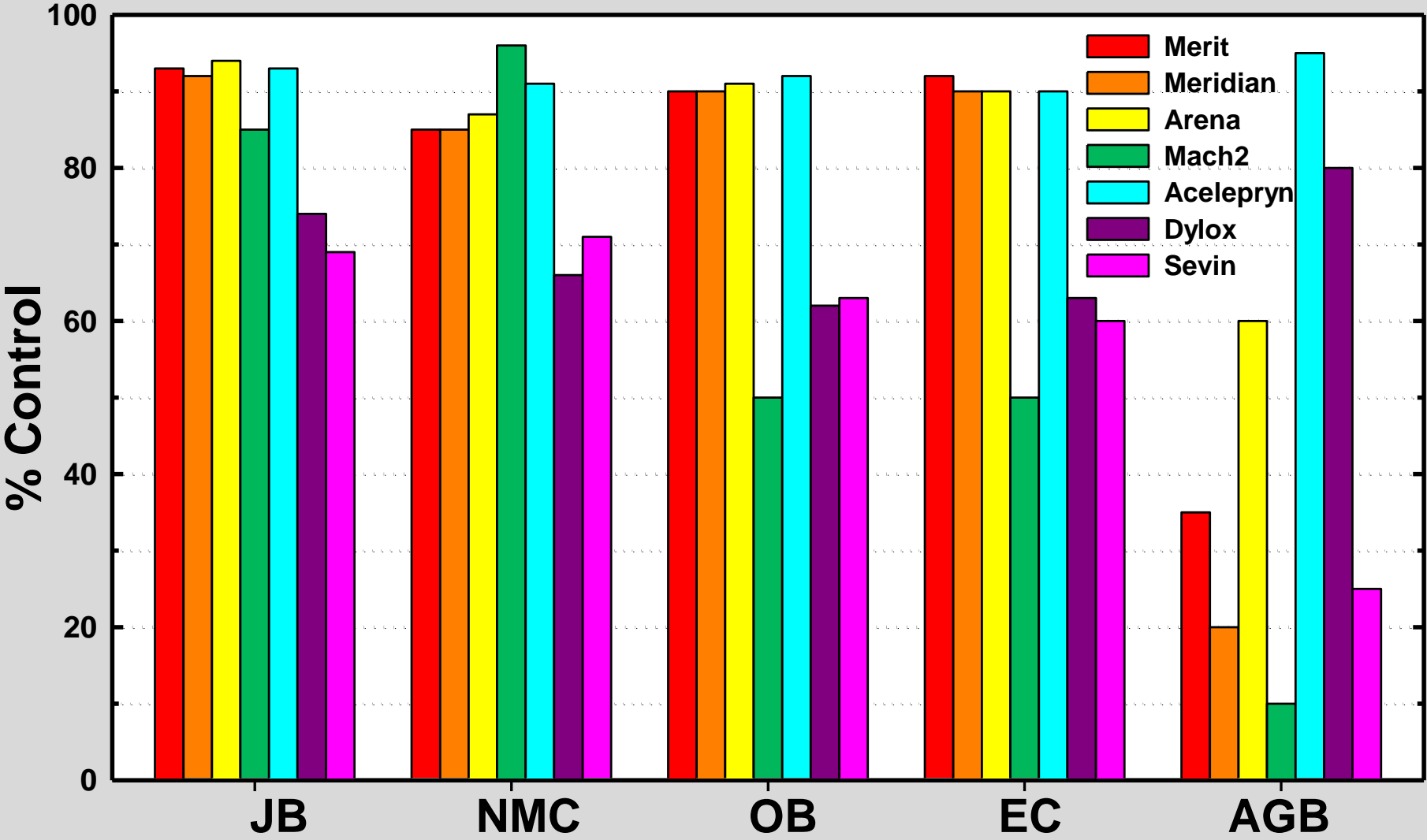
- Application when infestation is recognized (sampling, damage) to infested areas
  - Short or long residual insecticides (Arena, Dylox, Sevin)
  - Pro: Cheaper, more localized negative effect on natural enemies
  - Contra: Labor (sampling) or risk (damage)
- **Use in areas with higher damage tolerance**

# White grub – Seasonal Lifecycle





# White Grub Insecticide Efficacy



# Multi Target Principle

- Correct AI at right time and rate can control more than 1 (potential) pest
- But **prioritize key pest !!!**
- Use to reduce labor AND 'toxicity load' for environment AND negative impacts on beneficials.

# Key pests: *Timing of critical stages and damage\**

Pest		Apr	May	June	July	Aug	Sept	Oct
ABW	Lv		■	■	■	■	■	■
	Ad	■	■	■	■	■	■	■
	Da				■	■	■	■
WG	Lv	■	■	■	■	■	■	■
	Da		■	■	■		■	■
CB	Ny		■	■	■	■	■	■
	Ad	■	■	■	■	■	■	■
	Da					■	■	■
BCW	Lv		■	■	■	■	■	■
	Da			■	■	■	■	■
SWW	Lv	■	■	■	■	■	■	■
	Da		■	■	■	■	■	■
BB	Lv		■	■	■	■	■	■
	Ad	■	■	■	■	■	■	■
	Da					■	■	■

**\*Average timing for NJ**

**ABW = annual bluegrass weevil; WG = white grubs;**

**CB = chinch bug; BCW = black cutworm; BB = billbugs;**

**SWW = sod webworms;**

**Ad = adults; Lv = larvae; Ny = nymphs; Da = turf damage**

# Multi target - Key pest: *White Grubs*

Pest		Apr	May	June	July	Aug	Sept	Oct
ABW	Lv							
	Ad							
	Da							
WG	Lv							
	Da							
CB	Ny							
	Ad							
	Da							
BCW	Lv							
	Da							
SWW	Lv							
	Da							
BB	Lv							
	Ad							
	Da							

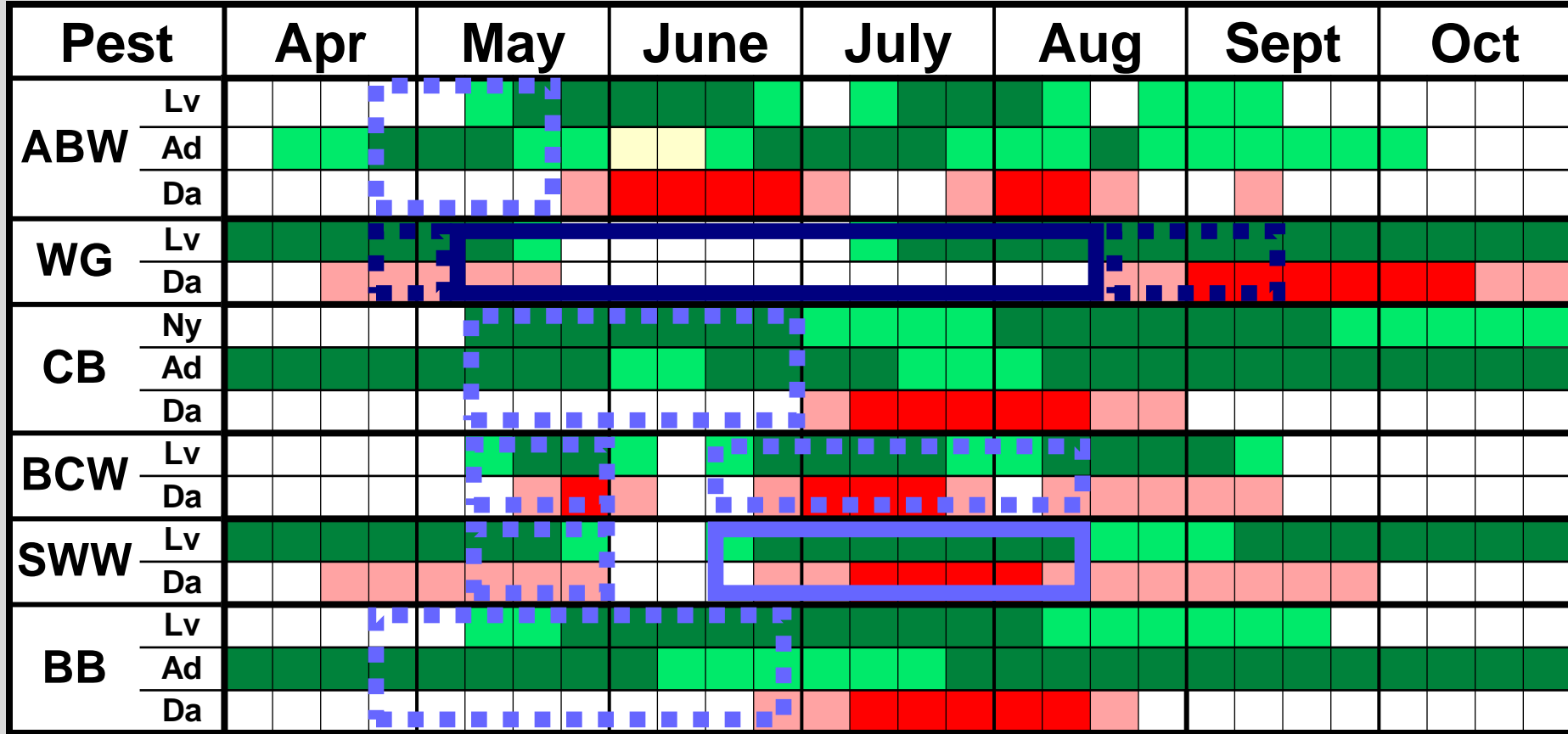
- Acelepryn: WG control @ 0.1 lb ai/ac  
 → up to 0.2 lb ai/ac for early and late applications.  
 → also SWW, BB, BCW control  
 → CB only suppression.  
 → for ABW control: 0.16-0.26 lbs ai/ac.

# Multi target - Key pest: *White Grubs*

Pest		Apr	May	June	July	Aug	Sept	Oct
ABW	Lv							
	Ad							
	Da							
WG	Lv							
	Da							
CB	Ny							
	Ad							
	Da							
BCW	Lv							
	Da							
SWW	Lv							
	Da							
BB	Lv							
	Ad							
	Da							

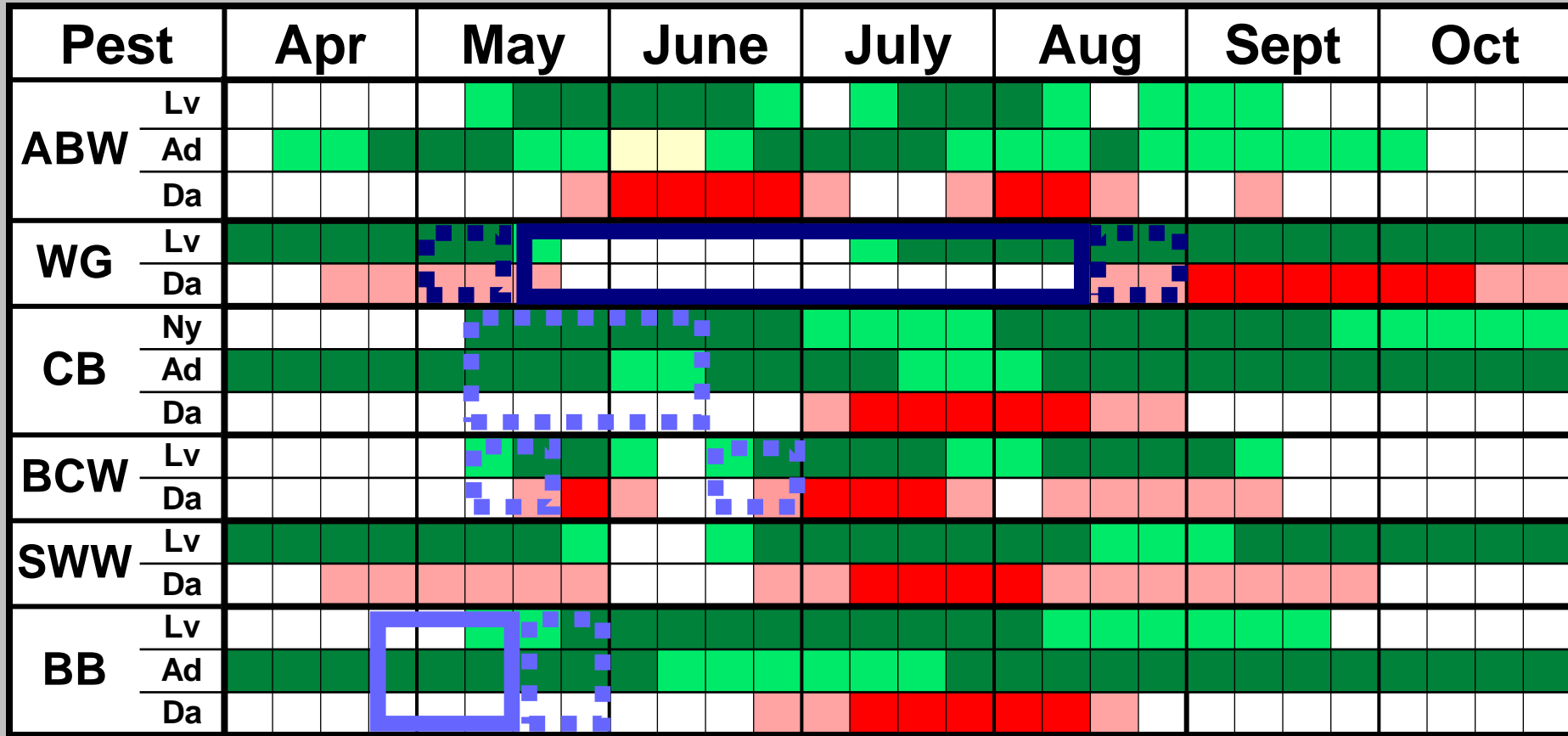
- **Tetrino**: WG control @ 0.045-0.09 lb ai/ac  
 → 0.09 lb ai/ac for early and late applications  
 → also CB, BCW, SWW control  
 → also BB, ABW control if mid-May at 0.09 lb ai/ac

# Multi target - Key pest: *White Grubs*



- Arena: WG control @ 0.2 lb ai/ac  
 → up to 0.4 lb ai/ac for early and late applications.  
 → also SWW control.  
 → for BB control: 0.3-0.4 lbs ai/ac.  
 → for CB, BCW, ABW control: 0.4 lbs ai/ac.

# Multi target - Key pest: *White Grubs*



- Merit : WG control @ 0.3 lb ai/ac  
 → up to 0.4 lb ai/ac for early and late applications.  
 → also BB control.  
 → CB, BCW only suppression.

# Multi target - Key pest: *White Grubs*

Pest		Apr	May	June	July	Aug	Sept	Oct
ABW	Lv							
	Ad							
	Da							
WG	Lv							
	Da							
CB	Ny							
	Ad							
	Da							
BCW	Lv							
	Da							
SWW	Lv							
	Da							
BB	Lv							
	Ad							
	Da							

- Meridian: WG control @ 0.2 lb ai/ac  
 → up to 0.27 lb ai/ac for early and late applications.  
 → also BB control.  
 → CB only suppression.



# White Grub Adult Peak Activity\*

Species	peak
European chafer	late June
Oriental beetle	late June
Japanese beetle	early July
Masked chafers	early July
Green June beetle	mid-July
Asiatic garden beetle	July
May beetles	April to August
Black turfgrass ataenius	late May & mid-July

\*at New Jersey latitude

# Oriental beetle (*Anomala orientalis*) Adult

- 0.3-0.5" long
- Straw-colored with variable black marking on thorax and elytra
- dark brown head
- Variants from all straw-colored to all black
- Elytra do not quite reach tip of abdomen



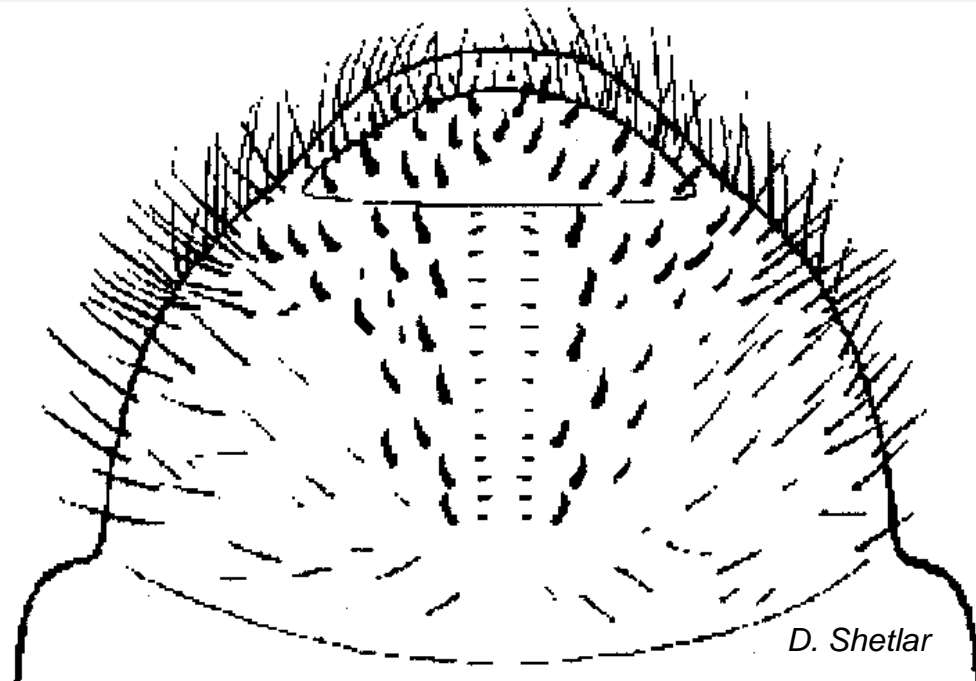
H. Tashiro



H. Tashiro

# Oriental beetle - Larva

- 0.1 (L1) – 1” (L3) long
- Yellow-brown head capsule
- Raster: 2 parallel rows of 10-16 short, inward-pointing spines
- Anal slit: transverse

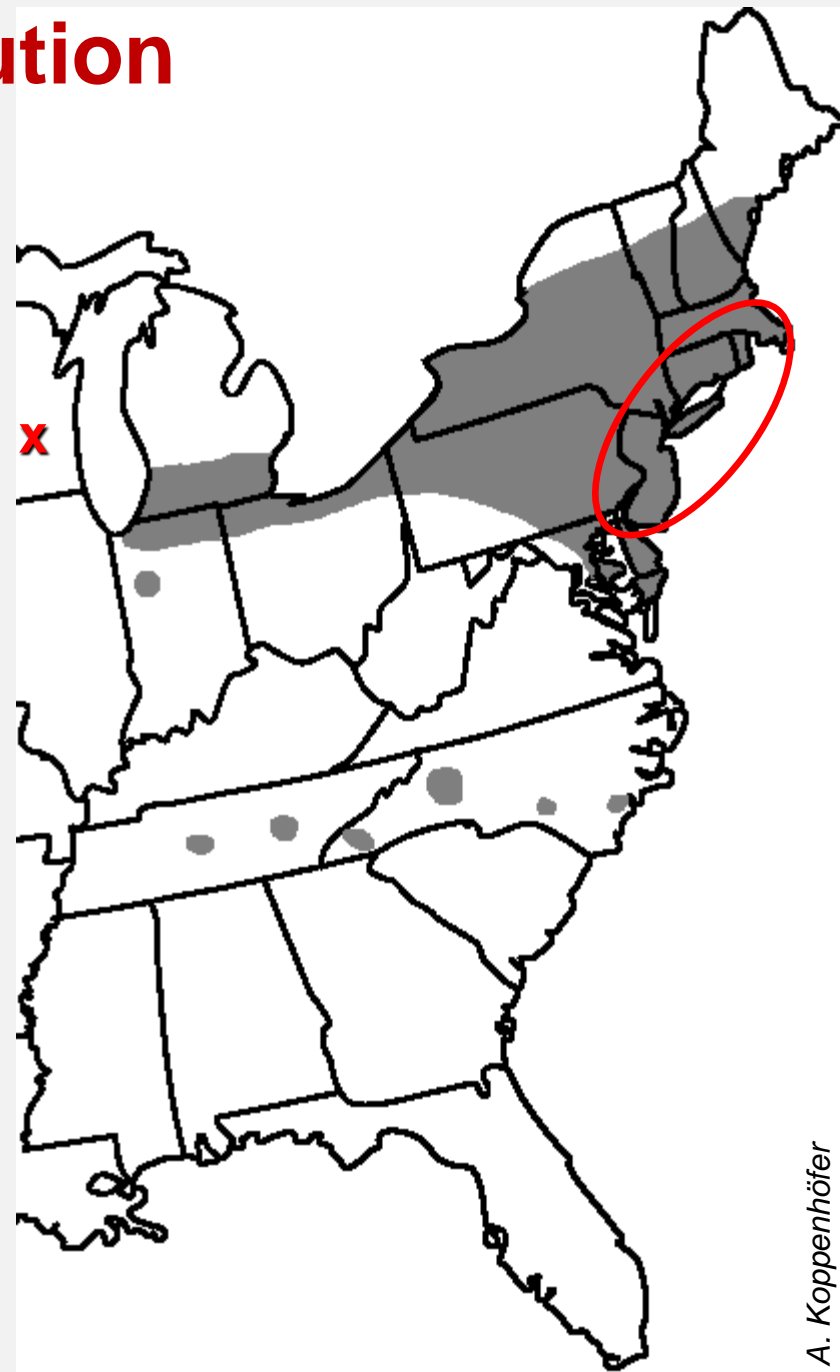


# Oriental beetle

- Pest of regional importance in Northeast.  
But most important in NJ!
- Grubs: feed on all cool-season turfgrasses, potted plants, strawberry beds, nursery stock.
- Adults: feed on various ornamental plants, cause no serious damage.

# Oriental beetle distribution

- Native to the Philippines, introduced into Hawaii and CT (< 1920) via Japan
- Presently most common in NJ, CT, SE NY, RI
- Established in MA, NH, VT, ME, NY, PA, OH, MI, DE, MD, VA, WV, NC, SC, TN
- Natural spread slow
- Long distance spread in infested nursery stock: recently in WI and NE



# Control timing & choices – Current (Avg. timing NJ)

		Stage	Apr	May	June	July	Aug	Sept	Oct
<i><b>Oriental beetle</b></i>	Pu			■	■	■			
	Ad				■	■	■		
	Egg				■	■	■	■	
	L1					■	■	■	■
	L2						■	■	■
	L3	■	■	■	■			■	■
<b>Damage</b>	(L2) L3		■	■			■	■	■
<b>Acelepryn</b>	L1-2	■	■	■	■	■	■		
<b>Tetrino</b>	L1-2		■	■	■	■	■	■	
<b>Ference</b>	L1-2			■	■	■	■	■	
<b>Merit*</b>	L1-2		■	■	■	■	■	■	
<b>Meridian#</b>	L1-2		■	■	■	■	■	■	
<b>Arena^#</b>	L1-3		■	■	■	■	■	■	■
<b>Suprado</b>	L1-2			■	■	■	■	■	
<b>Dylox</b>	L2-3						■	■	■
<b>Sevin</b>	L2-3						■	■	■
<b>H.bacterio.</b>	L2-3						■	■	■
<b>Insecticide</b>	<b>Target</b>		<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Oct</b>

\*AI imidacloprid: also in Triple Crown, Allectus; ^AI clothianidin, also in Aloft; #, not in NY

# Control timing & choices – Neonics (Avg. timing NJ)

		Stage	Apr	May	June	July	Aug	Sept	Oct
<b><i>Oriental beetle</i></b>	Pu			■	■	■			
	Ad				■	■	■		
	Egg				■	■	■	■	
	L1					■	■	■	■
	L2						■	■	■
	L3	■	■	■	■				■
<b>Damage</b>	(L2) L3		■	■			■	■	■
<b>Acelepryn</b>	L1-2	■	■	■	■	■	■		
<b>Tetrino</b>	L1-2		■	■	■	■	■		
<b>Ference</b>	L1-2			■	■	■	■		
<b>Merit *</b>	L1-2	■	■	■	■	■	■	■	■
<b>Meridian#</b>	L1-2	■	■	■	■	■	■	■	■
<b>Arena *#</b>	L1-3	■	■	■	■	■	■	■	■
<b>Suprado</b>	L1-2			■	■	■	■		
<b>Dylox</b>	L2-3					■	■	■	
<b>Sevin</b>	L2-3					■	■	■	
<b>H.bacterio.</b>	L2-3					■	■	■	
<b>Insecticide</b>	<b>Target</b>		<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Oct</b>

\*AI imidacloprid: also in Triple Crown, Allectus; ^AI clothianidin, also in Aloft #, not in NY

# Control timing & choices – w/o Neonics

(Avg. timing NJ)



	Stage	Apr	May	June	July	Aug	Sept	Oct
<b><i>Oriental beetle</i></b>	Pu		■	■	■			
	Ad			■	■	■		
	Egg			■	■	■	■	
	L1				■	■	■	■
	L2						■	■
	L3	■	■	■	■			■
<b>Damage</b>	(L2) L3		■	■			■	■
<b>Acelepryn</b>	L1-2	■	■	■	■	■	■	
<b>Tetrino</b>	L1-2		■	■	■	■	■	
<b>Ference</b>	L1-2			■	■	■	■	
<b>Suprado</b>	L1-2			■	■	■	■	
<b>Dylox</b>	L2-3					■	■	
<b>Sevin</b>	L2-3					■	■	
<b>H.bacterio.</b>	L2-3					■	■	
<b>Insecticide</b>	<b>Target</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Oct</b>



# Japanese beetle (*Popillia japonica*) - Adult

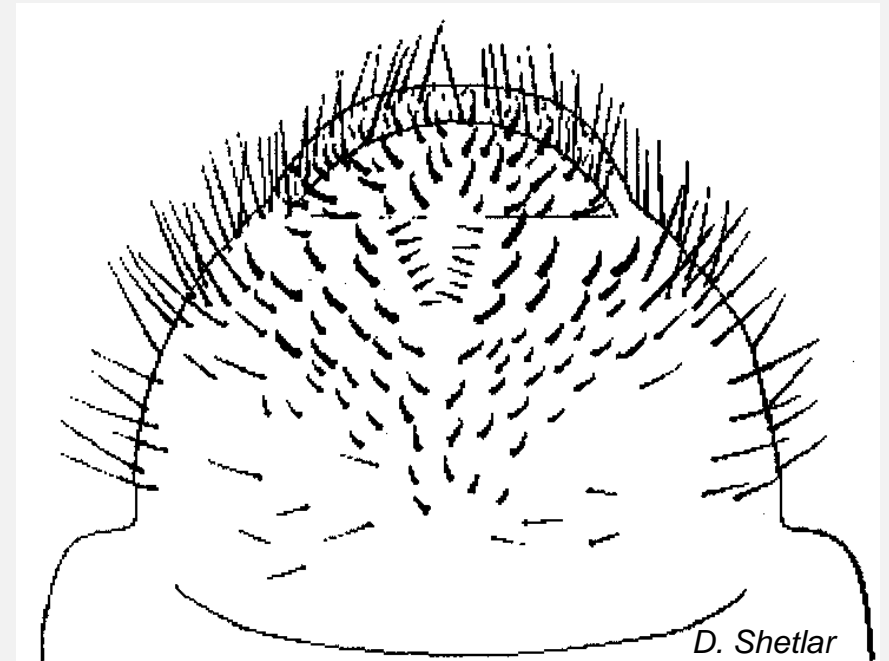


NYAES

- 0.3-0.5" long
- Metallic green thorax and head
- Darker green legs
- Coppery brown elytra do not quite reach tip of abdomen
- 5 rows of white hair on each side of abdomen

# Japanese beetle - Larva

- 0.1 (L1) – 1” (L3) long
- Yellow-brown head capsule
- Raster: 2 rows of 6-7 spines in V-shape
- Anal slit: transverse



## **Japanese beetle**

Grubs: feed on all cool-season turfgrasses, many weeds, and other plants.

Adults: feed on > 300 ornamental and woody landscape plants.

# Feeding preferences of adult Japn. beetle

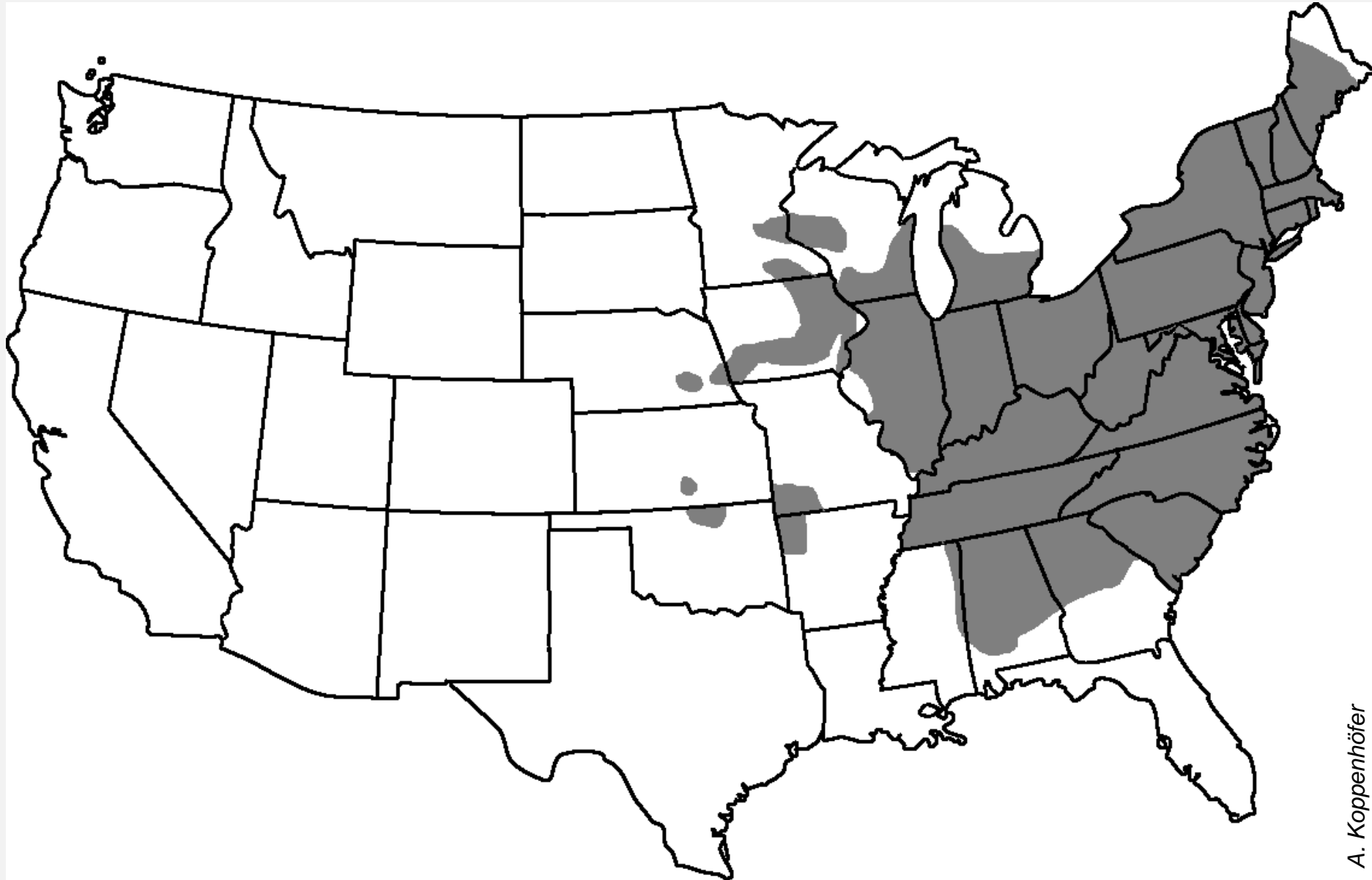
## Preferred plants:

Grape, linden, Japn. / Norway maple, birch, pin oak, horse chestnut, Rose-of-Sharon, ornament. apple, plum, cherry, rose, mountain ash, willow, elm, Virginia creeper

## Rarely attacked plants:

Red / silver maple, tuliptree, magnolias, red mulberry, forsythia, ash, privet, lilac, spruce, hydrangea, taxus (yew)

# Distribution of Japanese beetle



# Control timing & choices – Current (Avg. timing NJ)

		Stage	Apr	May	June	July	Aug	Sept	Oct
<b>Japanese beetle</b>	Pu								
	Ad								
	Egg								
	L1								
	L2								
	L3								
<b>Damage</b>	(L2) L3								
<b>Acelepryn</b>	L1-2								
<b>Tetrino</b>	L1-2								
<b>Ference</b>	L1-2								
<b>Merit*</b>	L1-2								
<b>Meridian#</b>	L1-2								
<b>Arena^#</b>	L1-3								
<b>Suprado</b>	L1-2								
<b>Dylox</b>	L2-3								
<b>Sevin</b>	L2-3								
<b>H.bacterio.</b>	L2-3								
<b>Insecticide</b>	<b>Target</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Oct</b>	

\*AI imidacloprid: also in Triple Crown, Allectus; ^AI clothianidin, also in Aloft; #, not in NY

# Control timing & choices – w/o Neonics

(Avg. timing NJ)



		Stage	Apr	May	June	July	Aug	Sept	Oct
<b>Japanese beetle</b>	Pu								
	Ad								
	Egg								
	L1								
	L2								
	L3								
<b>Damage</b>	(L2) L3								
<b>Acelepryn</b>	L1-2								
<b>Tetrino</b>	L1-2								
<b>Ference</b>	L1-2								
<b>Suprado</b>	L1-2								
<b>Dylox</b>	L2-3								
<b>Sevin</b>	L2-3								
<b>H.bacterio.</b>	L2-3								
<b>Insecticide</b>	<b>Target</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Oct</b>	

# Asiatic garden beetle (*Maladera castanea*) - Adult



- 0.3-0.43" long
- Velvety, chestnut brown, iridescent sheen
- Elytra do not cover last 2 abdominal segments
- Lower side of thorax partially covered with yellow hair.
- Scattered, small erect hair on top of head



# Asiatic garden beetle - Larva

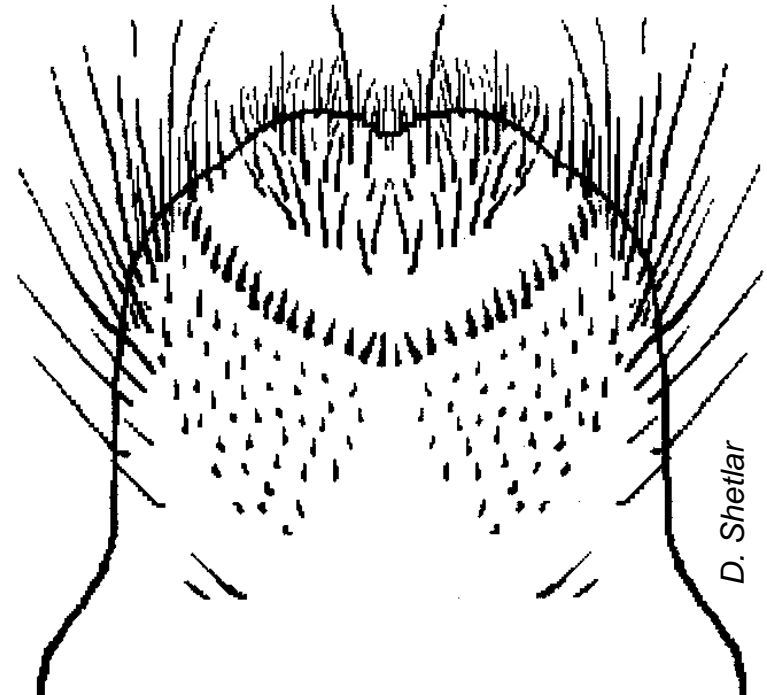
- 0.06 (L1) – 0.75" (L3) long
- Brown head capsule
- Raster: 1 transverse, crescent shaped row of spines
- Anal slit: Y-shaped
- Stipes: whitish, bulbous structure on each maxilla



D. Shetlar



J. Ogrodnick



D. Shetlar

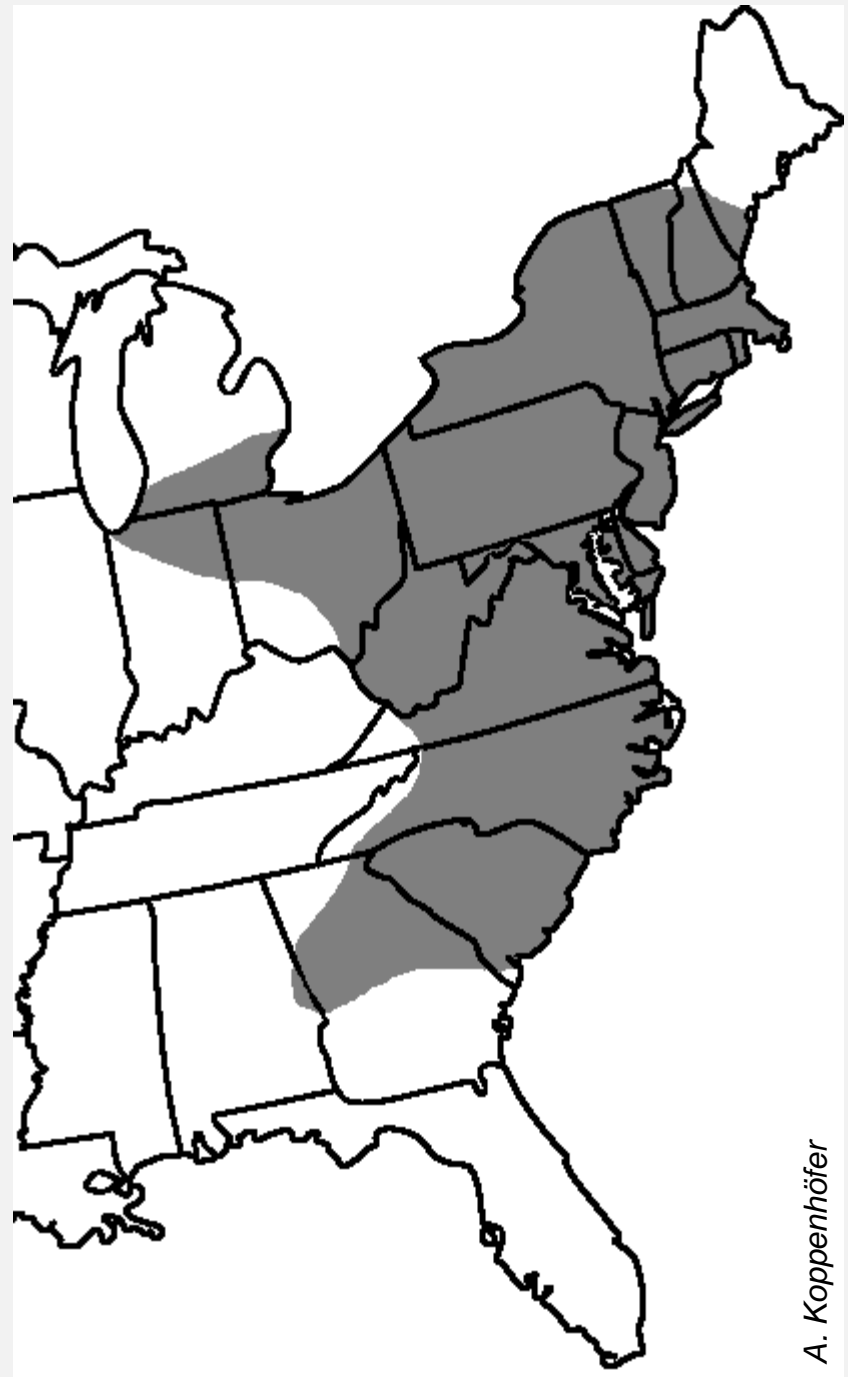
## **Asiatic garden beetle**

Minor pest in turfgrass.

Grubs: feed on all cool-season turfgrasses, weeds, flowers, vegetables.

Adults: feed on > 100 plant species; are attracted to weedy areas and lay eggs.

# Distribution of Asiatic garden beetle



# Control timing & choices (Avg. timing for NJ)

		Stage	Apr	May	June	July	Aug	Sept	Oct
<b>Asiatic garden beetle</b>	Pu								
	Ad								
	Egg								
	L1								
	L2								
	L3								
	Damage	(L2) L3							
Acelepryn	L1-2								
Tetrino	L1-2								
Ference	L1-2								
Suprado	L1-2								
Merit	L1-2								
Meridian#	L1-2								
Arena#	L1-3								
Dylox	L2-3								
Sevin	L2-3								
H.bacterio.	L2-3								
Insecticide	Target	Apr	May	June	July	Aug	Sept	Oct	

\*AI imidacloprid: also in Triple Crown, Allectus; ^AI clothianidin, also in Aloft; #, not in NY

# Control timing & choices – w/o Neonics

(Avg. timing NJ)



		Stage	Apr	May	June	July	Aug	Sept	Oct
<b>Asiatic garden beetle</b>	Pu								
	Ad								
	Egg								
	L1								
	L2								
	L3								
<b>Damage</b>	(L2) L3								
<b>Acelepryn</b>	L1-2								
<b>Tetrino</b>	L1-2								
<b>Ference</b>	L1-2								
<b>Suprado</b>	L1-2								
<b>Dylox</b>	L2-3								
<b>Sevin</b>	L2-3								
<b>H.bacterio.</b>	L2-3								
<b>Insecticide</b>	<b>Target</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Oct</b>	

\*AI imidacloprid: also in Triple Crown, Allectus; ^AI clothianidin, also in Aloft; #, not in NY

# Masked chafer (*Cyclocephala* spp.) - Adult



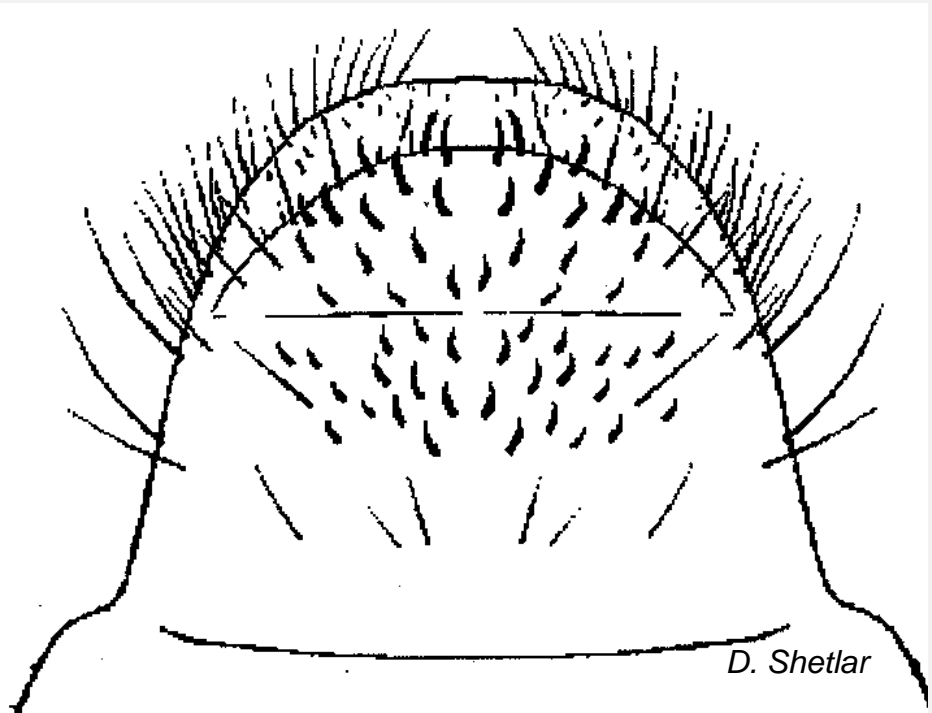
- 0.4-0.5” long
- Dull yellow-brown (NMC) to reddish brown (SMC)
- Band of chocolate-brown across head and eyes (‘masked’)

# Masked chafer - Larva

- 0.12 (L1) – 1" (L3)
- Chestnut-brown head capsule
- Raster: 25-30 evenly spaced coarse, hooked bristles in no distinct pattern
- Anal slit: transverse



*D. Shetlar*



*D. Shetlar*

# Masked chafers

Serious turfgrass pests in Midwest, northcentral states, and transition zone.

Grubs:

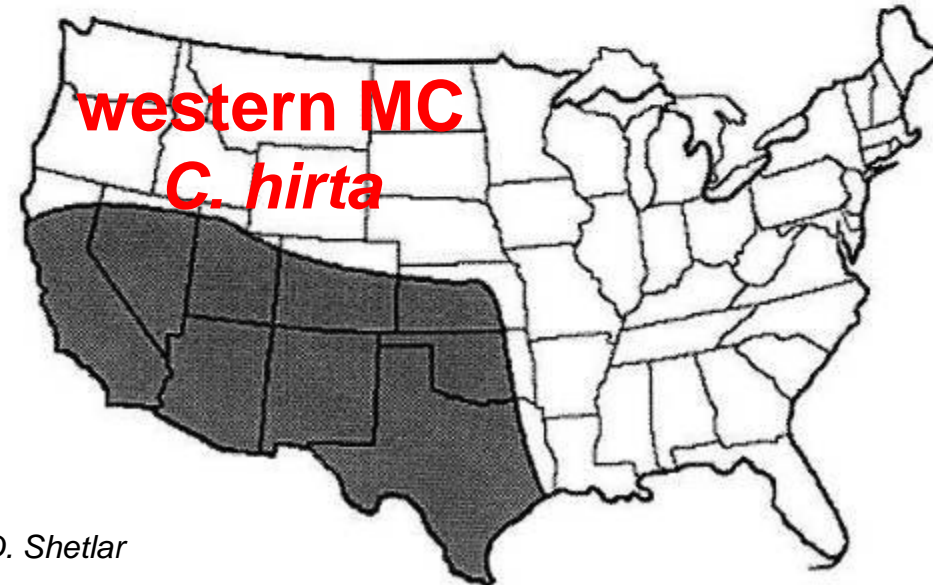
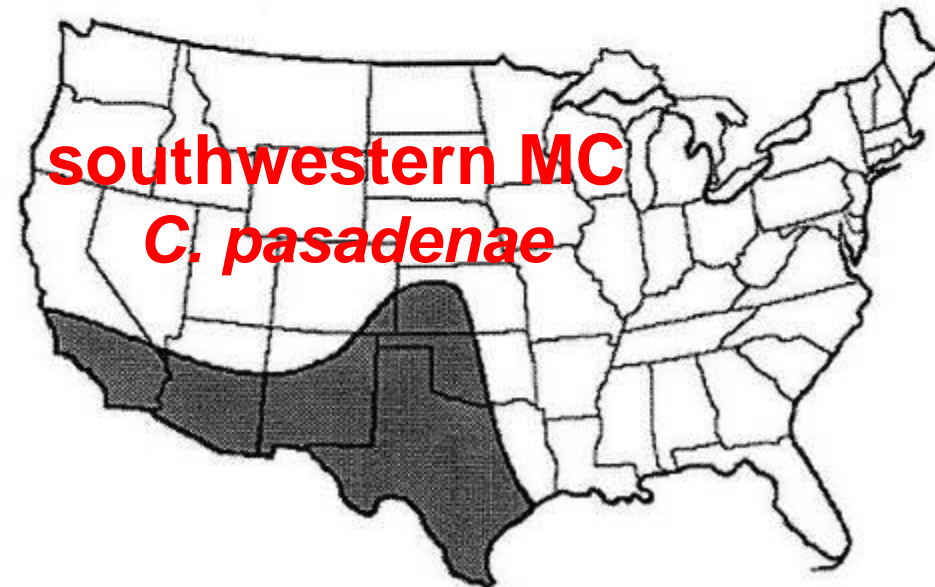
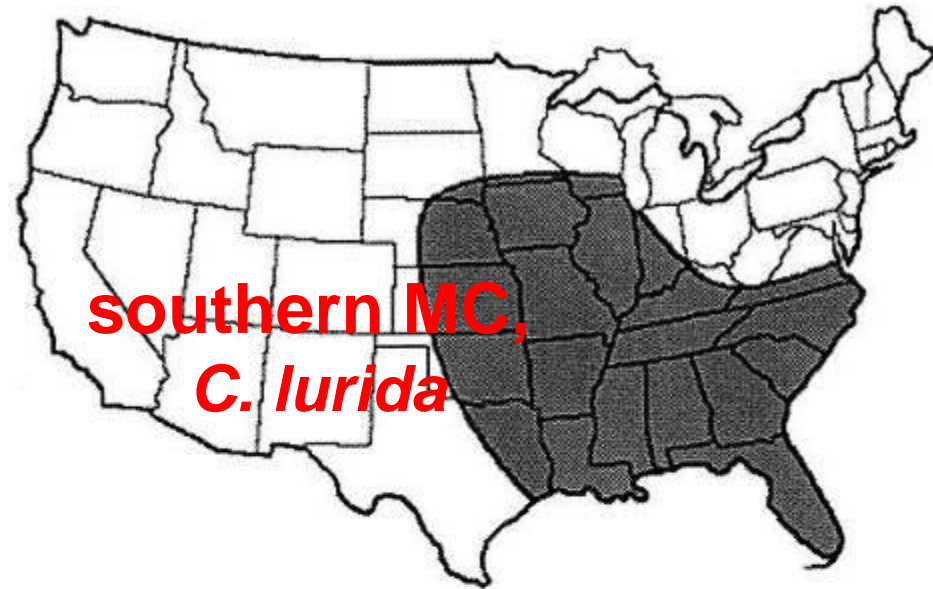
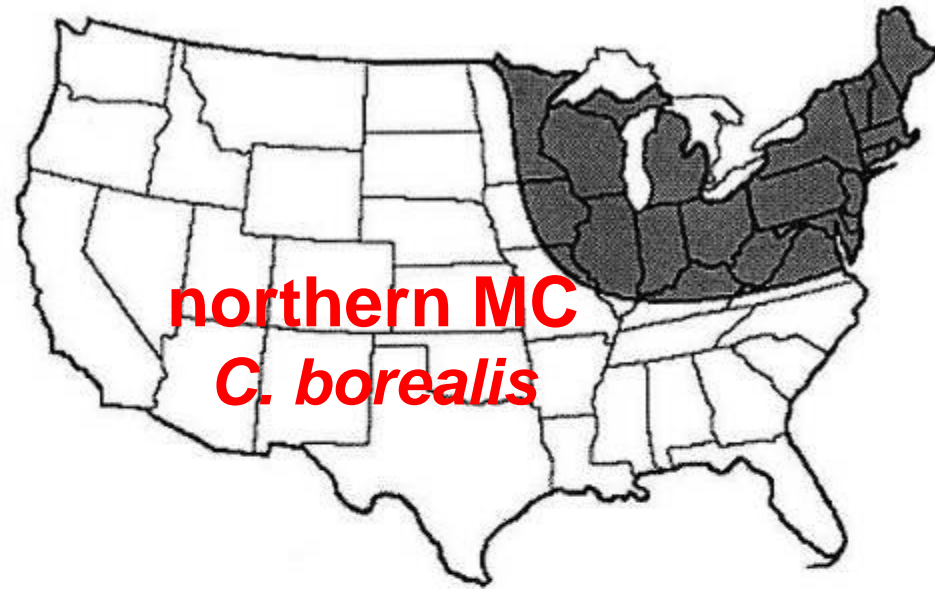
- feed on all cool-season turfgrasses and decomposing organic matter.

Adults:

- do not feed.



# Distribution of masked chafer



# Control timing & choices – Current (Avg. timing NJ)

		Stage	Apr	May	June	July	Aug	Sept	Oct
<b>Masked chafer</b>	Pu			■	■	■			
	Ad				■	■	■		
	Egg				■	■	■		
	L1					■	■	■	
	L2						■	■	■
	L3	■	■	■	■			■	■
<b>Damage</b>	(L2) L3		■	■			■	■	■
<b>Acelepryn</b>	L1-2	■	■	■	■	■	■		
<b>Tetrino</b>	L1-2		■	■	■	■	■	■	
<b>Ference</b>	L1-2			■	■	■	■	■	
<b>Merit*</b>	L1-2		■	■	■	■	■		
<b>Meridian#</b>	L1-2		■	■	■	■	■		
<b>Arena^#</b>	L1-3		■	■	■	■	■	■	
<b>Suprado</b>	L1-2			■	■	■	■	■	
<b>Dylox</b>	L2-3						■	■	■
<b>Sevin</b>	L2-3						■	■	■
<b>H.bacterio.</b>	L2-3						■	■	■
<b>Insecticide</b>	<b>Target</b>		<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Oct</b>

\*AI imidacloprid: also in Triple Crown, Allectus; ^AI clothianidin, also in Aloft; #, not in NY

# Control timing & choices – w/o Neonics

(Avg. timing NJ)



		Stage	Apr	May	June	July	Aug	Sept	Oct	
<b>Masked chafer</b>	Pu			■ ■ ■ ■ ■	■ ■ ■ ■ ■					
	Ad				■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■				
	Egg				■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■				
	L1					■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■			
	L2						■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	
	L3	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■				■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■
Damage	(L2) L3		■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■			■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	
Acelepryn	L1-2	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■			
Tetrino	L1-2		■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■			
Ference	L1-2			■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■			
Suprado	L1-2			■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■			
Dylox	L2-3						■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	
Sevin	L2-3						■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■		
H.bacterio.	L2-3						■ ■ ■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■ ■ ■		
Insecticide	Target		Apr	May	June	July	Aug	Sept	Oct	

**European chafer**  
**(*Rhizotrogus majalis*)**  
**- Adult**

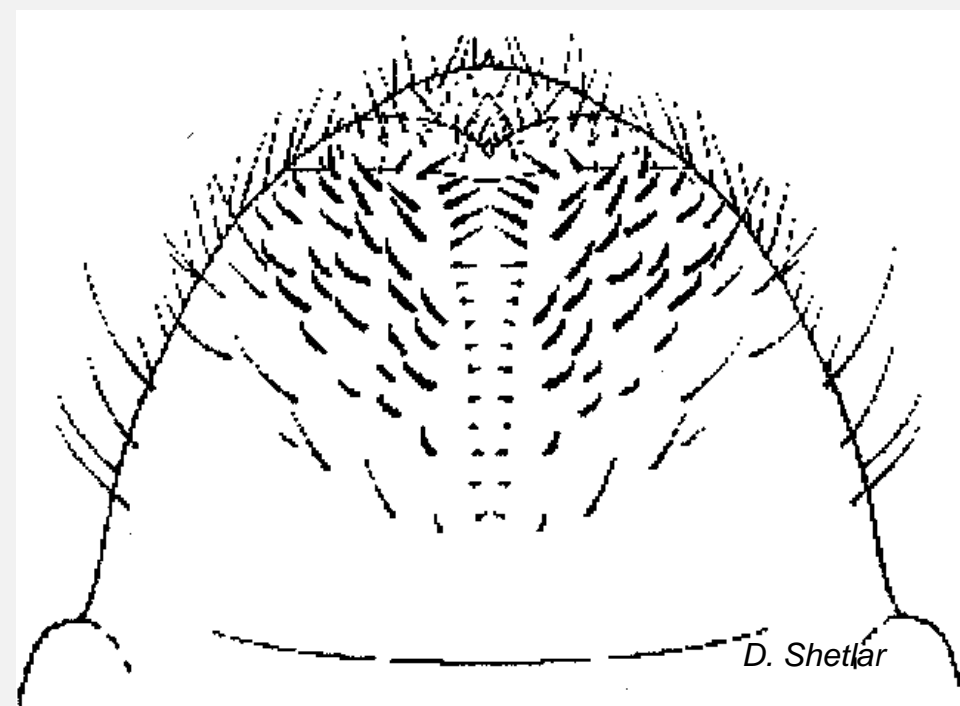
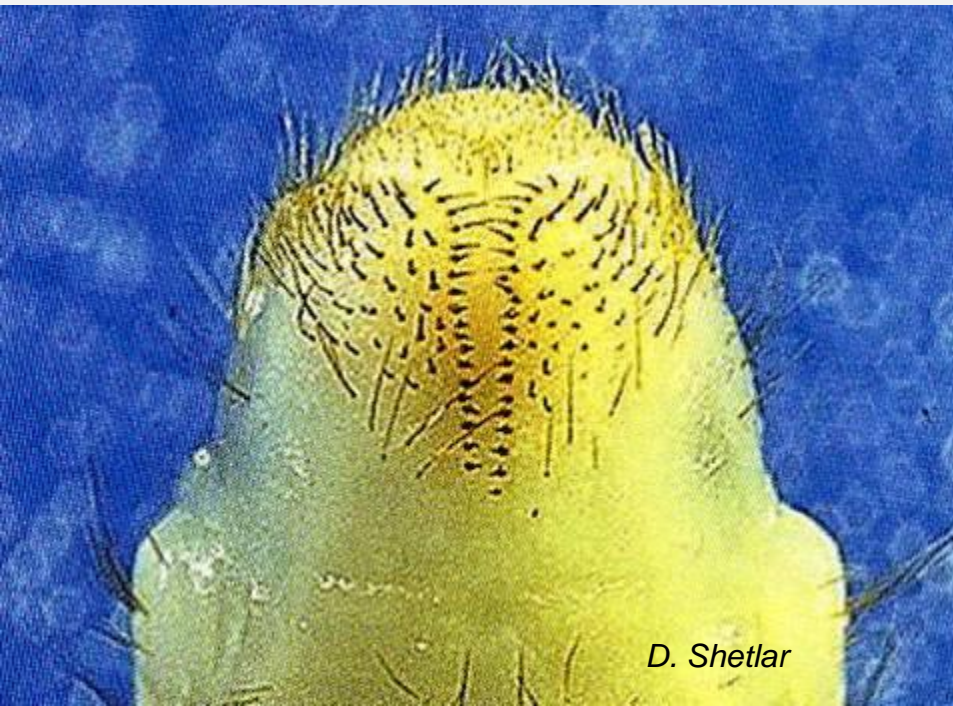


G. Catlin

- 0.5 – 0.6” long
- Uniform light reddish-brown
- Slightly darker head and pronotum
- Elytra have distinct longitudinal grooves
- Elytra do not quite reach tip of abdomen
- Band of light yellow hair between pronotum and elytra

## European chafer - Larva

- 0.1 (L1) – 1” (L3) long
- Yellow-brown head capsule
- Raster: 2 almost parallel rows of small spines diverging toward tip of abdomen
- Anal slit: Y-shaped



# European chafer, *Rhizotrogus majalis*

Most serious pest of low-maintenance and home lawns in the Northeast.

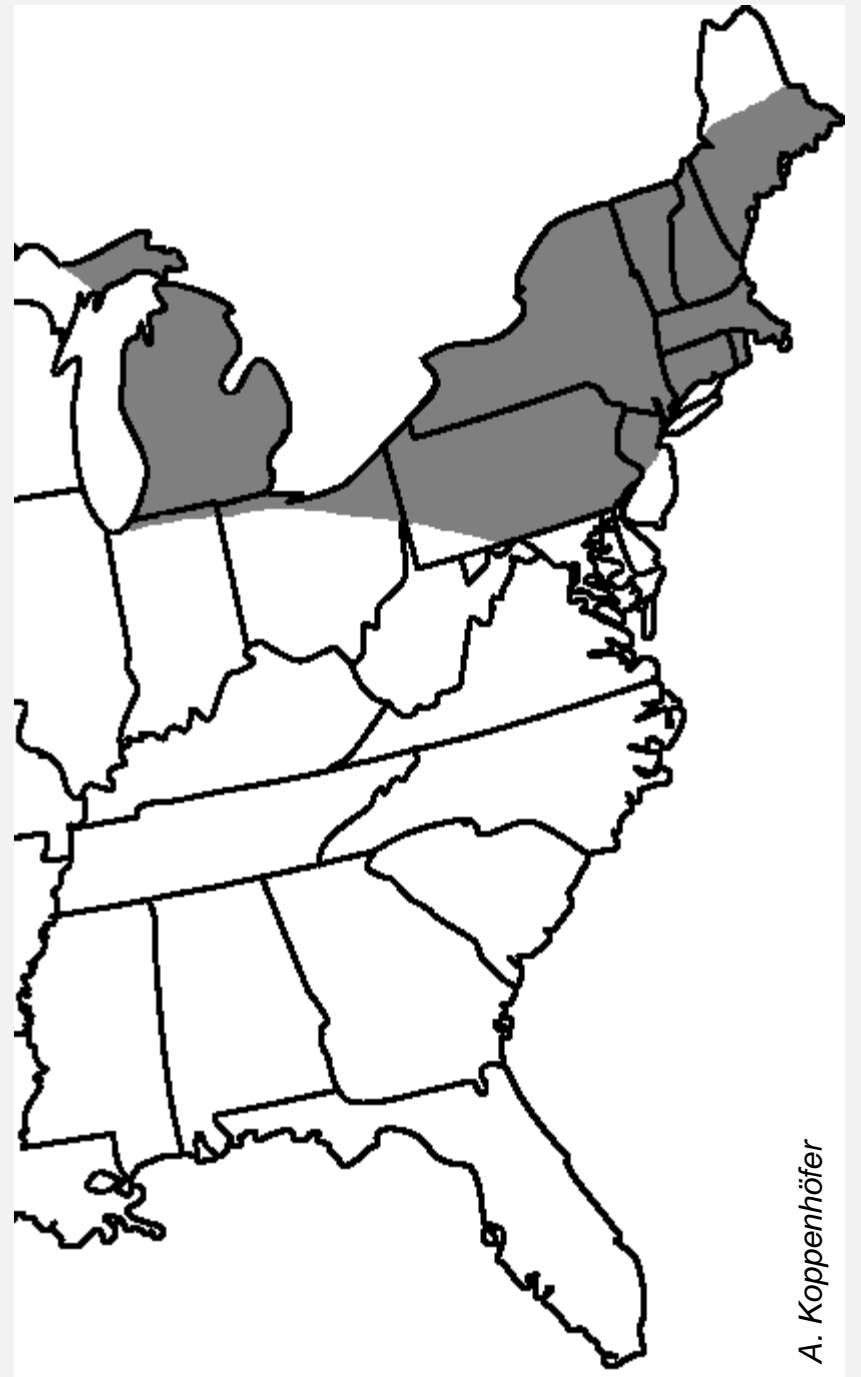
Grubs:

- feed on all cool-season turfgrasses, weeds, field and forage crops, nursery stock.
- feed later in fall and earlier in spring.

Adults:

- feed on leaves of trees but cause no damage.

# Distribution of European chafer



# Control timing & choices (Avg. timing for NJ)

		Stage	Apr	May	June	July	Aug	Sept	Oct
<b>European chafer</b>	Pu			■	■	■			
	Ad			■	■	■	■		
	Egg				■	■	■	■	
	L1					■	■	■	■
	L2						■	■	■
	L3	■	■	■	■			■	■
	Damage	(L2) L3	■	■	■			■	■
Acelepryn	L1-2	■	■	■	■	■	■		
Tetrino	L1-2		■	■	■	■	■		
Ference	L1-2			■	■	■	■		
Merit*	L1-2		■	■	■	■	■		
Meridian#	L1-2		■	■	■	■	■		
Arena#	L1-3		■	■	■	■	■		
Suprado	L1-2			■	■	■	■		
Dylox	L2-3		■	■			■	■	
Sevin	L2-3						■	■	
H.bacterio.	L2-3						■	■	
Insecticide	Target	Apr	May	June	July	Aug	Sept	Oct	

\*AI imidacloprid: also in Triple Crown, Allectus; ^AI clothianidin, also in Aloft; #, not in NY



# Control timing & choices (Avg. timing for NJ)

		Stage	Apr	May	June	July	Aug	Sept	Oct
<b>European chafer</b>	Pu			■	■	■			
	Ad			■	■	■	■		
	Egg				■	■	■	■	
	L1					■	■	■	■
	L2						■	■	■
	L3	■	■	■	■				■
<b>Damage</b>	(L2) L3	■	■	■				■	■
<b>Acelepryn</b>	L1-2	■	■	■	■	■	■		
<b>Tetrino</b>	L1-2		■	■	■	■	■	■	
<b>Ference</b>	L1-2			■	■	■	■	■	
<b>Suprado</b>	L1-2			■	■	■	■	■	
<b>Dylox</b>	L2-3		■	■			■	■	■
<b>Sevin</b>	L2-3						■	■	■
<b>H.bacterio.</b>	L2-3						■	■	■
<b>Insecticide</b>	<b>Target</b>		<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Oct</b>

# Green June beetle (*Cotinis nitida*) - Adult



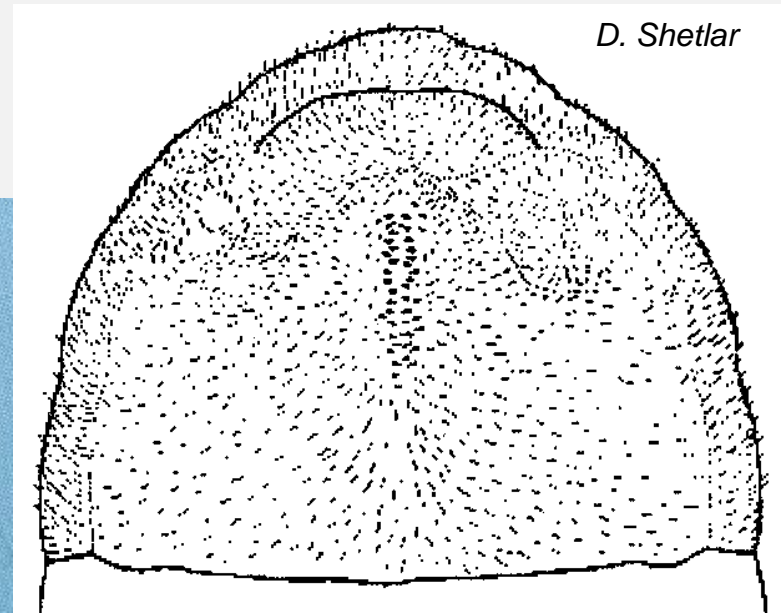
- 0.75 - 1" long
- Dull brown with lengthwise green stripes to uniform, velvety green
- Underside shiny, metallic green/gold

# Green June beetle - Larva

- 0.2 (L1) – 2” (L3)
- More robust, parallel-sided than other grubs
- Relatively short legs and mouthparts
- Crawl on their back on soil surface at night



H. Tashiro



D. Shetlar

# Green June beetle, *Cotinus nitida*

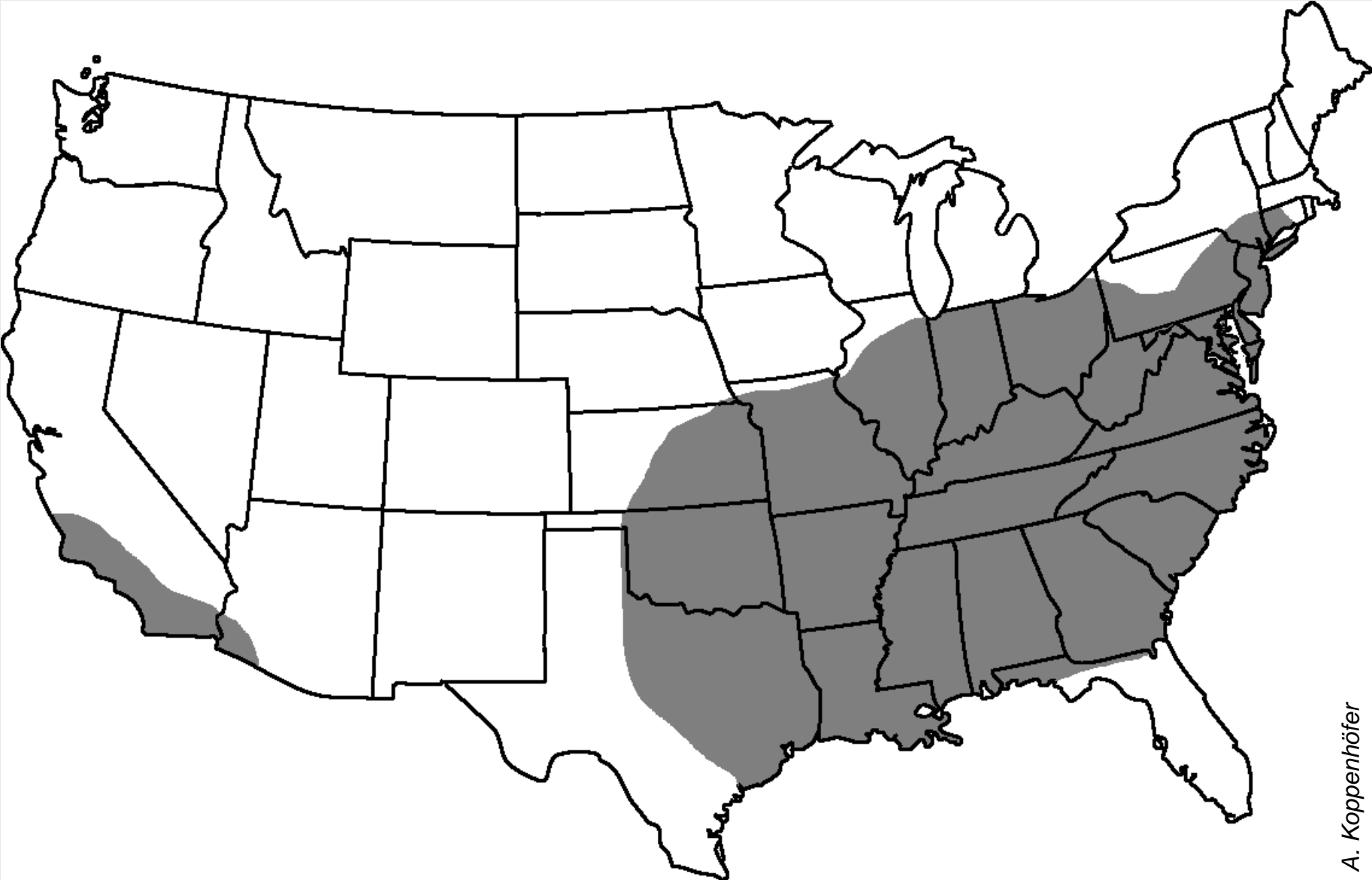
## Grubs:

- feed mostly on decomposing organic matter.
- cause damage through tunneling activity.
- migrate at night on soil surface.
- crawl on their backs.

## Adults:

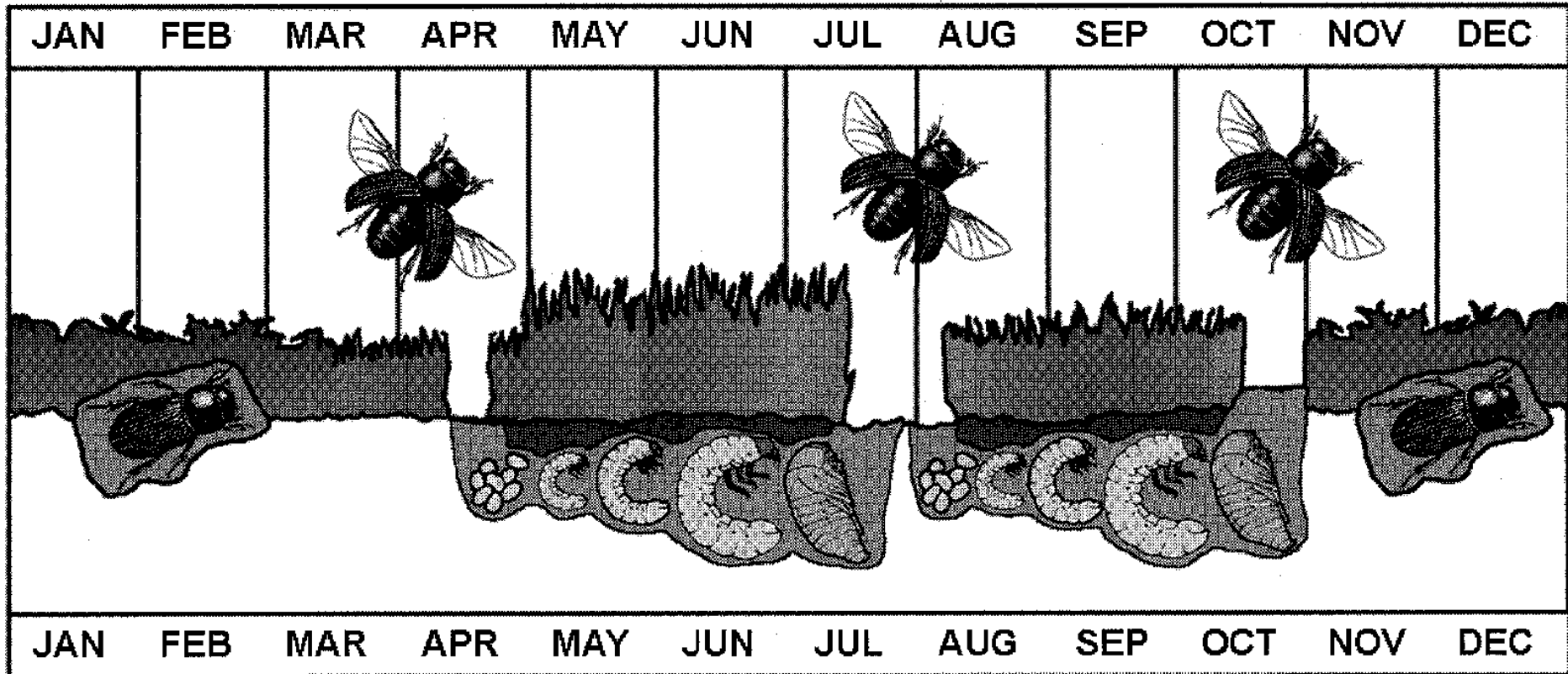
- feed on sugary food (overripe fruit, tree sap).
- can be a nuisance (buzz-bombing males).

# Distribution of green June beetle



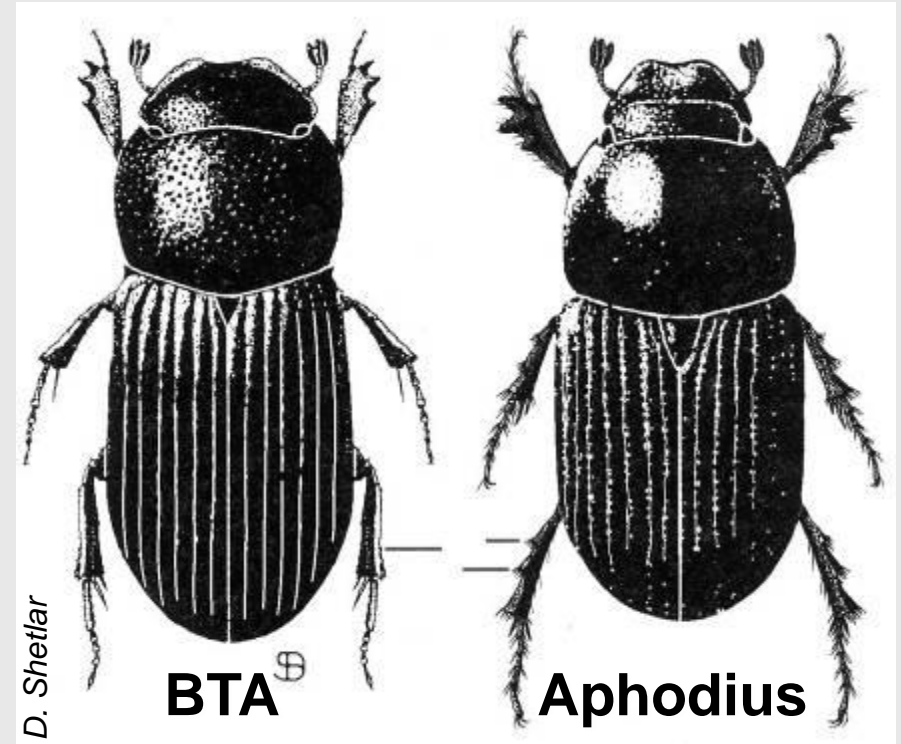
# Black turfgrass ataenius

## Seasonal life-cycle



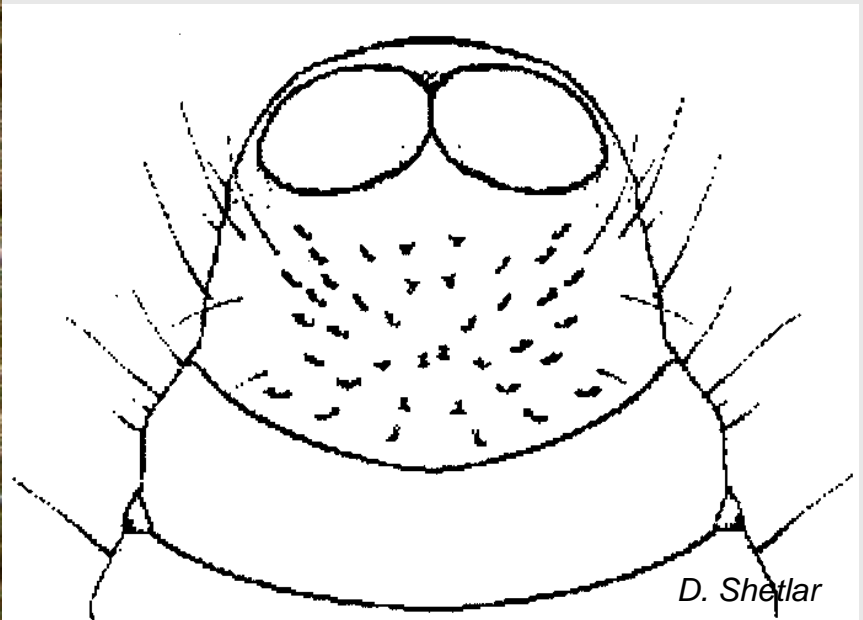
# Black turfgrass ataenius (*Ataenius spretulus*) - Adults

- 0.1-0.2” long
- Shiny black
- Distinct lengthwise ridges on elytra



# Black turfgrass ataenius - Larva

- 0.05 (L1) – 0.4” (L3)
- Brown head capsule
- Raster: scattered spines
- 2 distinctive pad-like structures at tip of abdomen





# Black turfgrass ataenius

Localized major pest of golf courses in Midwest and Northeast

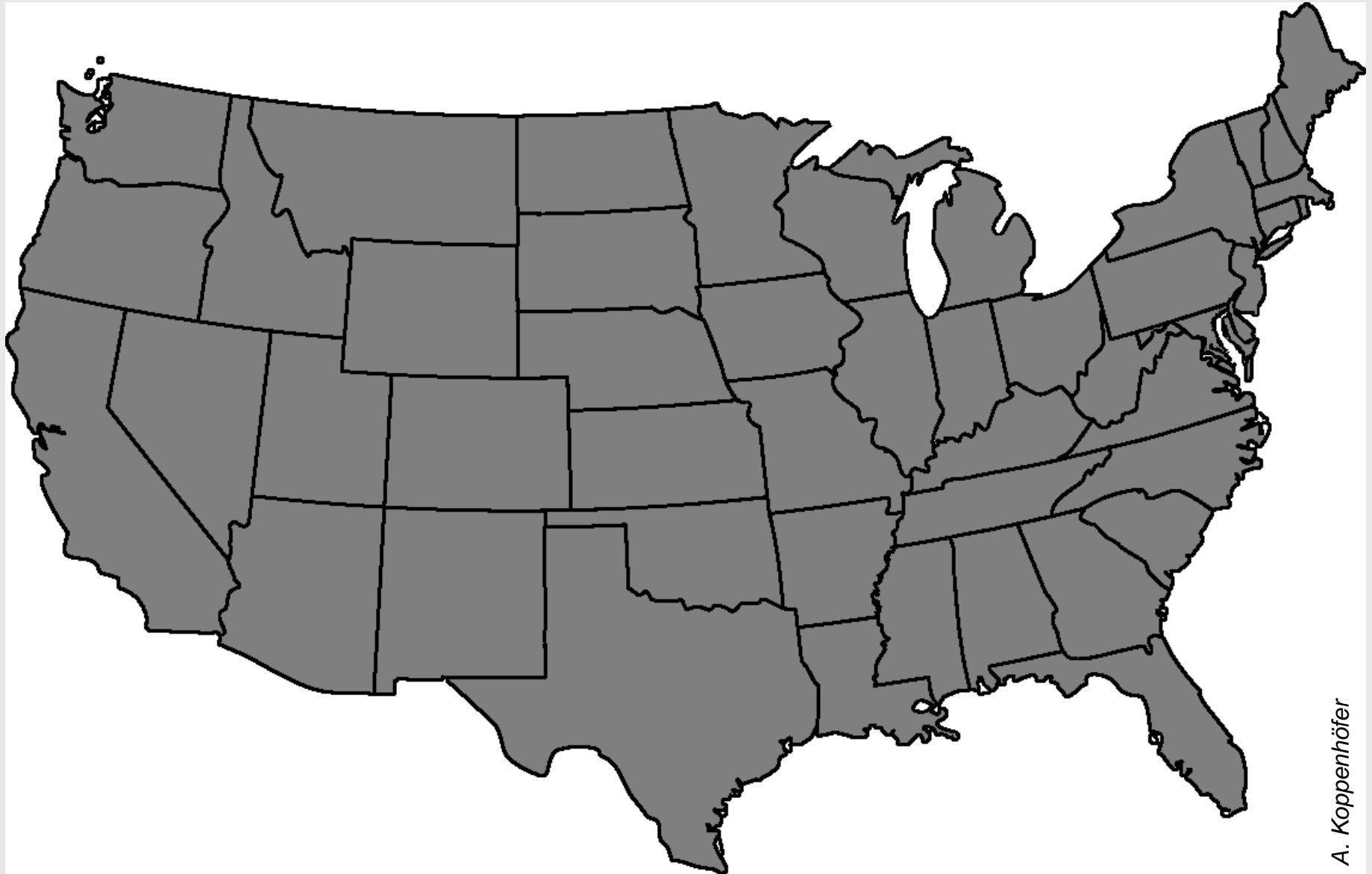
Grubs:

- cause damage on bentgrass, annual bluegrass and Kentucky bluegrass.

Adults:

- do not cause feeding damage but can attract foraging birds.

# Distribution of black turfgrass *ataenius*



# Control timing & choices

(Avg. timing for NJ)



<i><b>Black turfgrass ataenius</b></i>	Stage	Apr	May	June	July	Aug	Sept	Oct	
	Pu								
	Ad								
	Egg								
	L1-3								
Damage	(L2) L3								
Acelepryn	L								
Tetrino	L1-2								
Ference	L1-2								
Merit	L								
Meridian #	L								
Arena #	L								
Suprado	L1-2								
Dylox	L								
Sevin	L								
H.bacterio.	L								
Pyrethroids	Ad								
Insecticide	Target	Apr	May	June	July	Aug	Sept	Oct	

#, not in NY

# Control timing & choices – w/o Neonics

(Avg. time NJ)



<i><b>Black turfgrass ataenius</b></i>	Stage	Apr	May	June	July	Aug	Sept	Oct	
	Pu								
	Ad								
	Egg								
	L1-3								
Damage	(L2) L3								
Acelepryn	L								
Tetrino	L1-2								
Ference	L1-2								
Suprado	L1-2								
Dylox	L								
Sevin	L								
H.bacterio.	L								
Pyrethroids	Ad								
Insecticide	Target	Apr	May	June	July	Aug	Sept	Oct	

# May/June beetles (*Phyllophaga* spp.)



NYAES

***P. anxia***



NYAES

***P. crinita***



NYAES

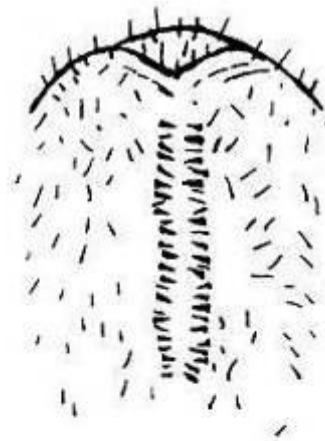
***P. crenulata***

## May/June beetles - Adult

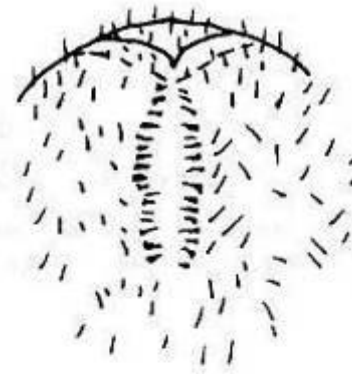
- > 200 spp. in USA; ~25 spp. can cause damage to turfgrass
- 0.3 - 1" long
- Parallel-sided to oval shape
- Colors range from light brown to reddish-brown to almost black
- Some species nearly hairless other species quite fuzzy

- 1 – 1.5” (L3)
- Brown head capsule
- Raster: 2 rows of short spines in zipper pattern
- Anal slit: V- or Y-shaped

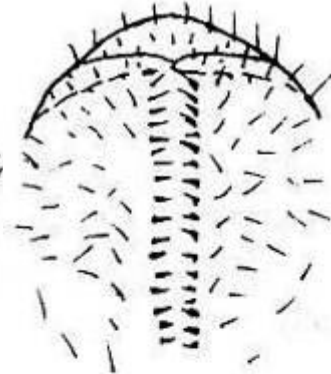
## May/June beetles Larva



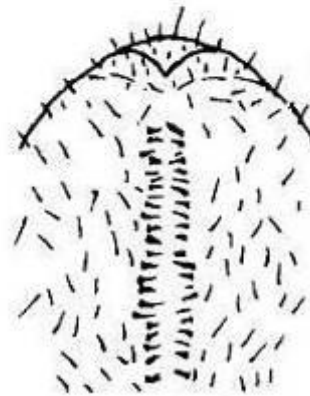
*P. anxia*



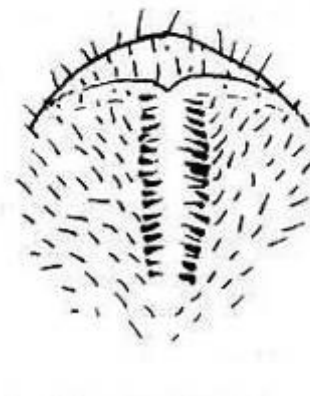
*P. crenulata*



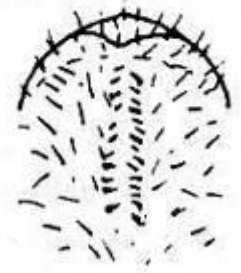
*P. ephilida*



*P. fusca*



*P. futilis*



*P. gracilis*



D. Shetlar

## May/June beetles (*Phyllophaga* spp.)

May beetles rarely warrant control in the northern USA.

Grubs:

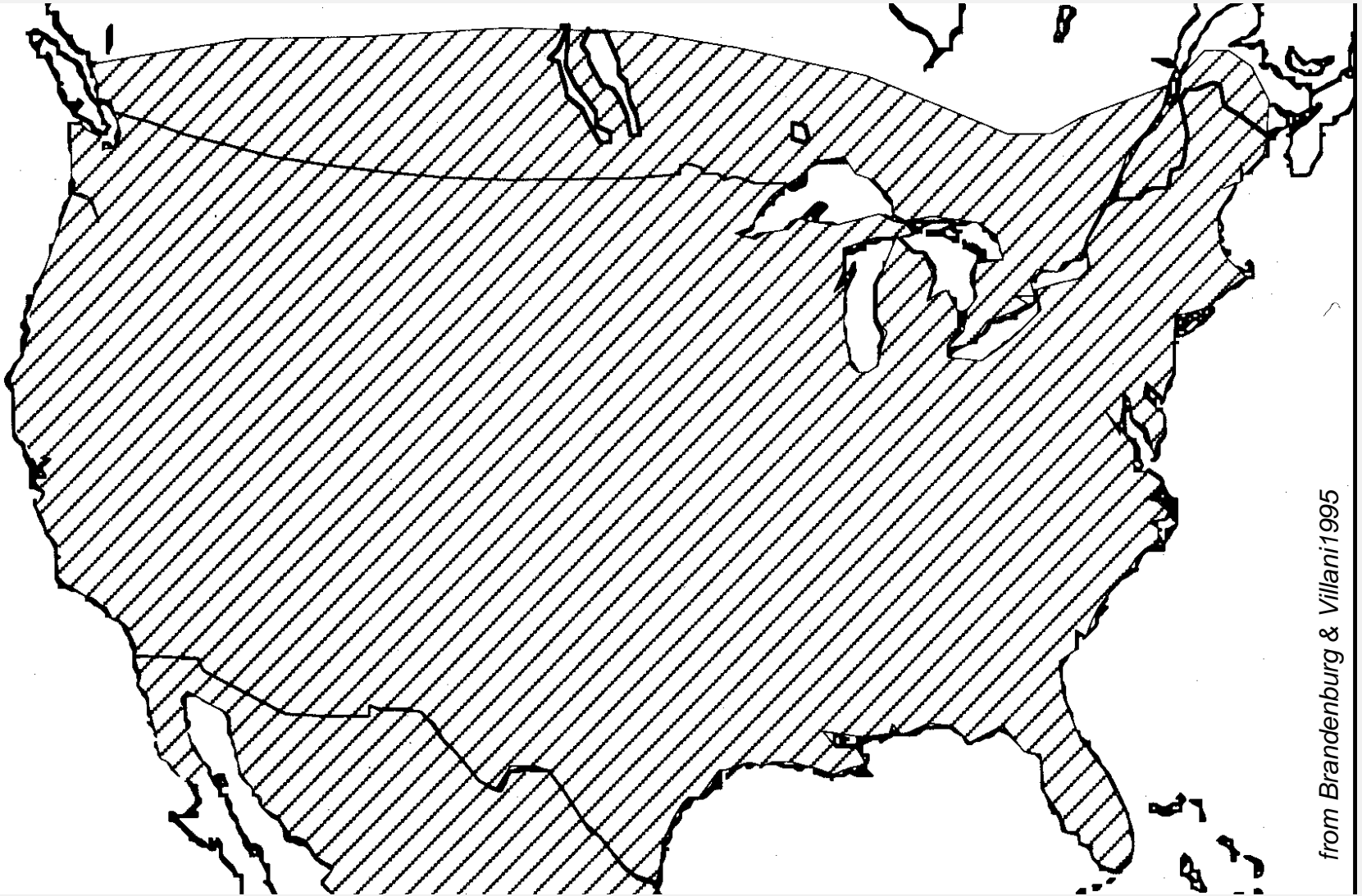
- feed on most turfgrasses, field crops, and nursery stock.

Adults:

- can defoliate trees.
- some spp. do not fly in May.



# Distribution of May/June Beetles

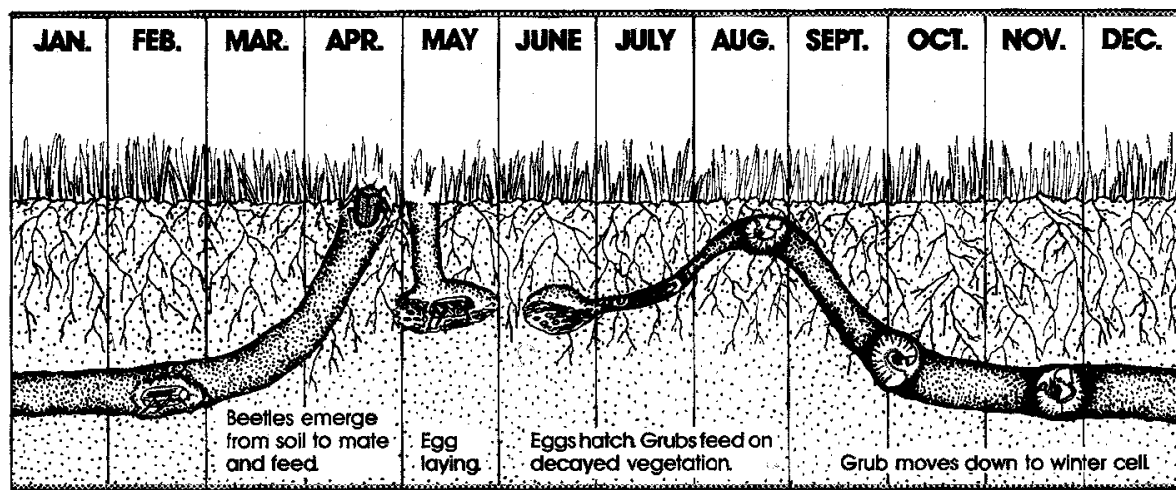


from Brandenburg & Villani 1995

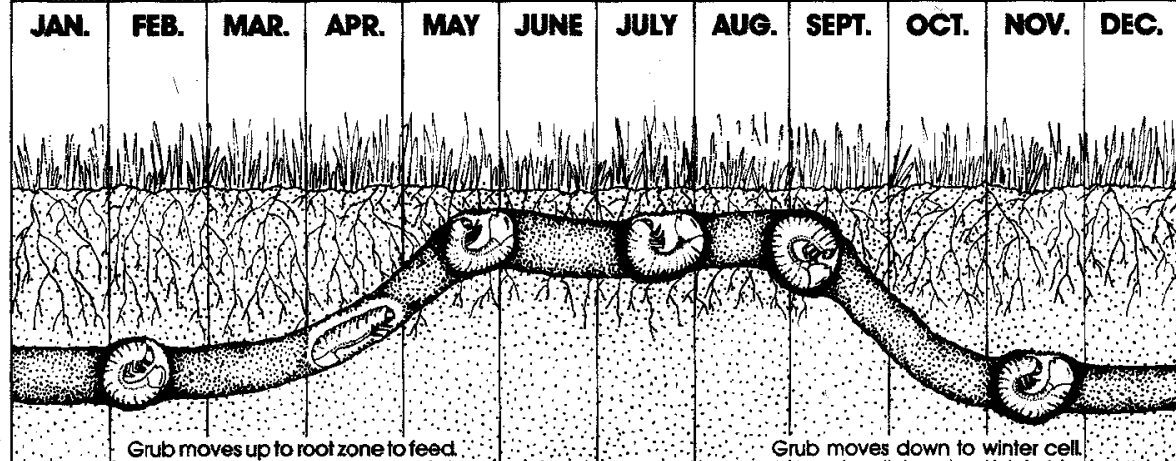
# 3-year life-cycle of May/June beetles

from Shurtleff et al 1987

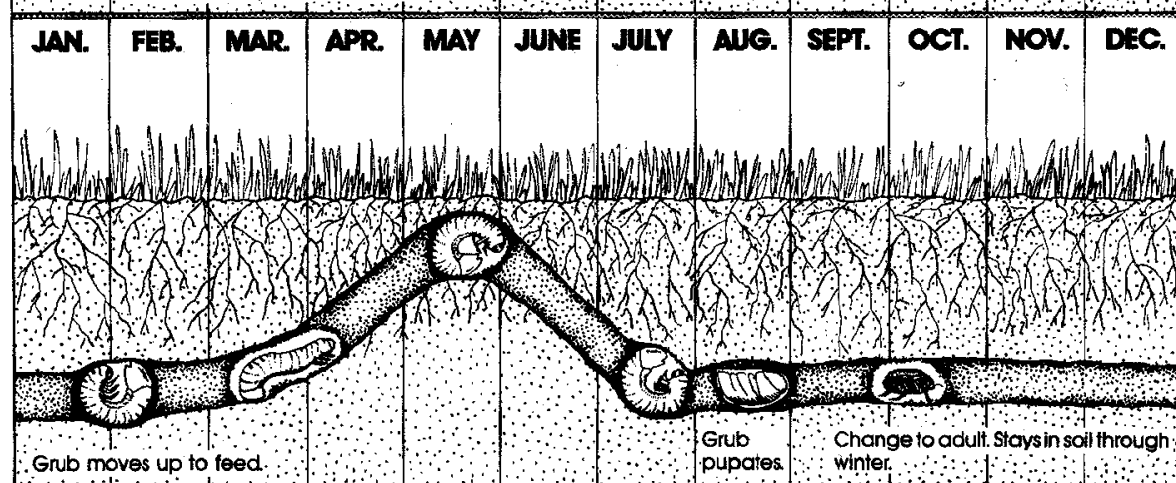
**FIRST YEAR**



**SECOND YEAR**



**THIRD YEAR**



# Crane Flies - *Tipula* spp. (Diptera: Tipulidae)



# Crane Flies - Pest status & injury

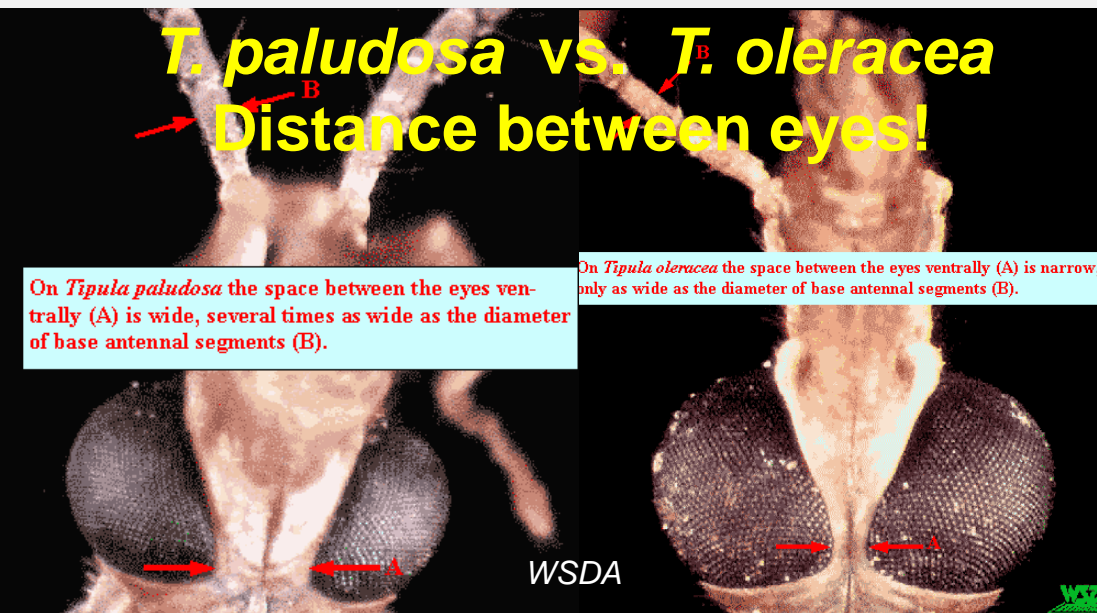
- **Common crane fly (*T. oleracea*)** and especially **European crane fly (*T. paludosa*)** can be serious pests of cool-season grasses in areas with cool summers, mild winters, and abundant rainfall.
- Many other **native crane flies** across USA, but **rarely cause problems.**

# Crane Fly Pests - Distribution



# Crane Flies – Adult

- Look like giant mosquitoes
- Body brownish-tan, slender,  $\frac{3}{4}$ -1" long
- 1 pair of narrow, smoky-brown wings
- Very long, slender legs.



# Crane Flies – Larvae

- Worm-like, cylindrical; olive-green to greenish-brown; up to 1” long
- Tough-skinned → ‘Leatherjackets’
- Tail-end with 2 breathing holes on a plate-like structure surrounded by 6 finger-like lobes
- Withdraw small, black-pointed head when disturbed.



D. Shetlar



# Crane fly life cycles (Avg. timing for Northeast)

Species	Stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
<i>Europ. crane fly</i>	Pu								█	█	█		
	Ad									█	█	█	█
	Egg									█	█	█	█
	L1										█	█	█
	L2											█	█
	L3	█	█	█	█	█	█	█	█	█	█	█	█
	L4						█	█	█	█	█	█	█
Damage	L3-4					█	█	█	█				
<i>Comm. crane fly</i>	Pu			█	█	█	█			█	█	█	
	Ad				█	█	█			█	█	█	█
	Egg					█	█	█	█	█	█	█	█
	L1						█	█	█		█	█	█
	L2							█	█	█	█	█	█
	L3	█	█	█					█	█	█		█
	L4	█	█	█	█				█	█	█		█
Damage	L3-4												





# Crane Flies - Injury

- Active larvae feed in top 1" of soil and thatch
- Feed (rasp) on root hairs, roots, and crowns
- Large larvae may emerge to feed on stems and grass blades, espec. in warm, damp nights.
- Cause yellowing, thinning → bare spots
- Additional damage by pecking birds and digging skunks and raccoons.



# Crane Flies - Monitoring

- Prefer moist, thatchy turf and wet soils high in organic matter
- Protruding pupal cases of emerged adults visible on short-cut grass.
- Adults don't fly far → flying adults and pupal cases suggest where larvae will be in next generation.



P. Sherratt



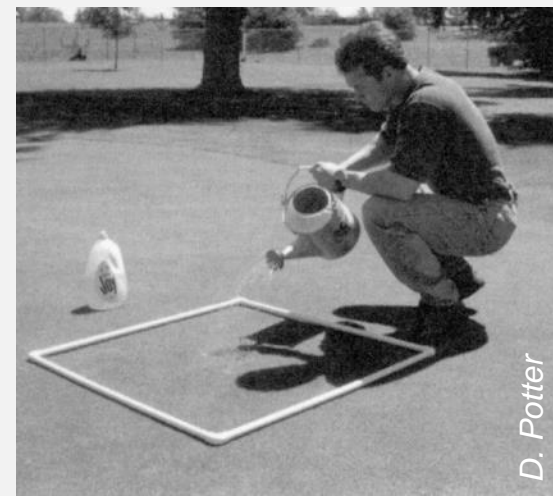
D. Shetlar

# Crane Flies - Monitoring

- Check upper soil and thatch for larvae, best with core samples.
- Disclosing solution not reliable
- Wet September followed by mild winter encourages outbreaks.
- Threshold: 15-40 larvae/ft<sup>2</sup>



D. Potter



D. Potter

# Crane Flies - Management

- Manipulate irrigation to better drain chronically infested areas during oviposition period and shortly thereafter (September)
- Increase turf vigor for higher tolerance.
- Rake up larvae when they feed at soil surface at night.

# Insecticide Efficacy vs. European Crane Fly\*

Acceptable (>70%)	Variable	Unaccept. (<50%)
<b>Preventive (Sept./Oct. vs. L1-L2)</b>		
Arena	Sevin	Ornazin
Talstar	Provaunt	Nemasys
Dylox	BotaniGard	Gnatrol
Acelepryn	Tempo	
Allectus		
Merit		
<b>Curative (May vs. L3/L4)</b>		
	Dylox	Acelepryn
	Sevin	Arena
	Merit	Provaunt
	Aloft	Meridian

\*Peck et al. (2010)

# Control timing & choices

(Avg. timing for Northeast)



		Stage	Apr	May	June	July	Aug	Sept	Oct	Nov
<b>European crane fly</b>	Pu						■	■	■	
	Ad							■	■	■
	Egg							■	■	■
	L1-2							■	■	■
	L3-4		■	■	■	■	■	■	■	■
<b>Damage</b>	(L3) L4		■	■	■	■	■			
<b>Acelepryn</b>	L							■	■	■
<b>Ference</b>	L							■	■	■
<b>Merit</b>	L	■	■	■	■					
<b>Arena #</b>	L							■	■	■
<b>Dylox</b>	L	■	■	■	■					
<b>Talstar</b>	L							■	■	■
<b>Sevin</b>	L	■	■	■	■			■	■	■
<b>Provaunt</b>	L							■	■	■
<b>Tempo</b>	L							■	■	■
<b>BotaniGard</b>	L							■	■	■
<b>Insecticide</b>	<b>Target</b>		Apr	May	June	July	Aug	Sept	Oct	Nov

#, not in NY

# Control timing & choices – w/o Neonics

(Avg. time NJ)



		Stage	Apr	May	June	July	Aug	Sept	Oct	Nov
<b>European crane fly</b>	Pu						■	■	■	■
	Ad							■	■	■
	Egg							■	■	■
	L1-2							■	■	■
	L3-4	■	■	■	■	■	■	■	■	■
<b>Damage</b>	(L3) L4	■	■	■	■	■				
<b>Acelepryn</b>	L							■	■	■
<b>Ference</b>	L							■	■	■
<b>Dylox</b>	L	■	■	■	■			■	■	■
<b>Talstar</b>	L							■	■	■
<b>Sevin</b>	L	■	■	■	■			■	■	■
<b>Provaunt</b>	L							■	■	■
<b>Tempo</b>	L							■	■	■
<b>BotaniGard</b>	L							■	■	■
<b>Insecticide</b>	<b>Target</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Oct</b>	<b>Nov</b>	

<http://njaes.rutgers.edu/pubs/>

→ Gardening and landscaping → 'Lawns' or  
'All gardening and landscaping fact sheets.'

FS1007 - sod webworms

FS1008 - hairy chinch bug

FS1009 - white grubs

FS1013 - black cutworm

FS1014 – nematodes (plant-parasitic)

FS1015 - billbugs

FS1016 - annual bluegrass weevil (*Hyperodes*)

FS013 - ants

FS0025 - moles



## **My Rutgers Entomology Webpage:**

**<http://entomology.rutgers.edu/personnel/albrecht-koppenhofer/>**

**→ Extension presentations**

**→ Extension publications**

- Niemczyk H.D., Shetlar D.J. 2000. Destructive turf insects, 2<sup>nd</sup> edition. H.D.N. Books. 148pp.**
- Vittum P.J., Villani M.G., Tashiro H. 1999. Turfgrass insects of the United States and Canada. Cornell University Press. 496pp.**
- Potter D.A. 1998. Destructive turfgrass insects. Ann Arbor Press. 344pp.**
- Brandenburg R.L., Freeman C.P. 2012. Handbook of turfgrass insect pests, 2<sup>nd</sup> edn. Entomological Society of America. 136pp.**
- Watschke T.L., Dernoeden P.H., Shetlar D.J. 1994. Managing turfgrass pest. Lewis Publishers. 361pp.**