

Identification tool for major early season crop pests in Quebec



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What you need

- » Stereo microscope
- » Forceps
- » Petri dish
- » Liquid or fine brush to clean the specimens



Wireworms Survey

» Genus/species abundance

Genus and species of wireworms captured during spring survey conducted between 2011 and 2015

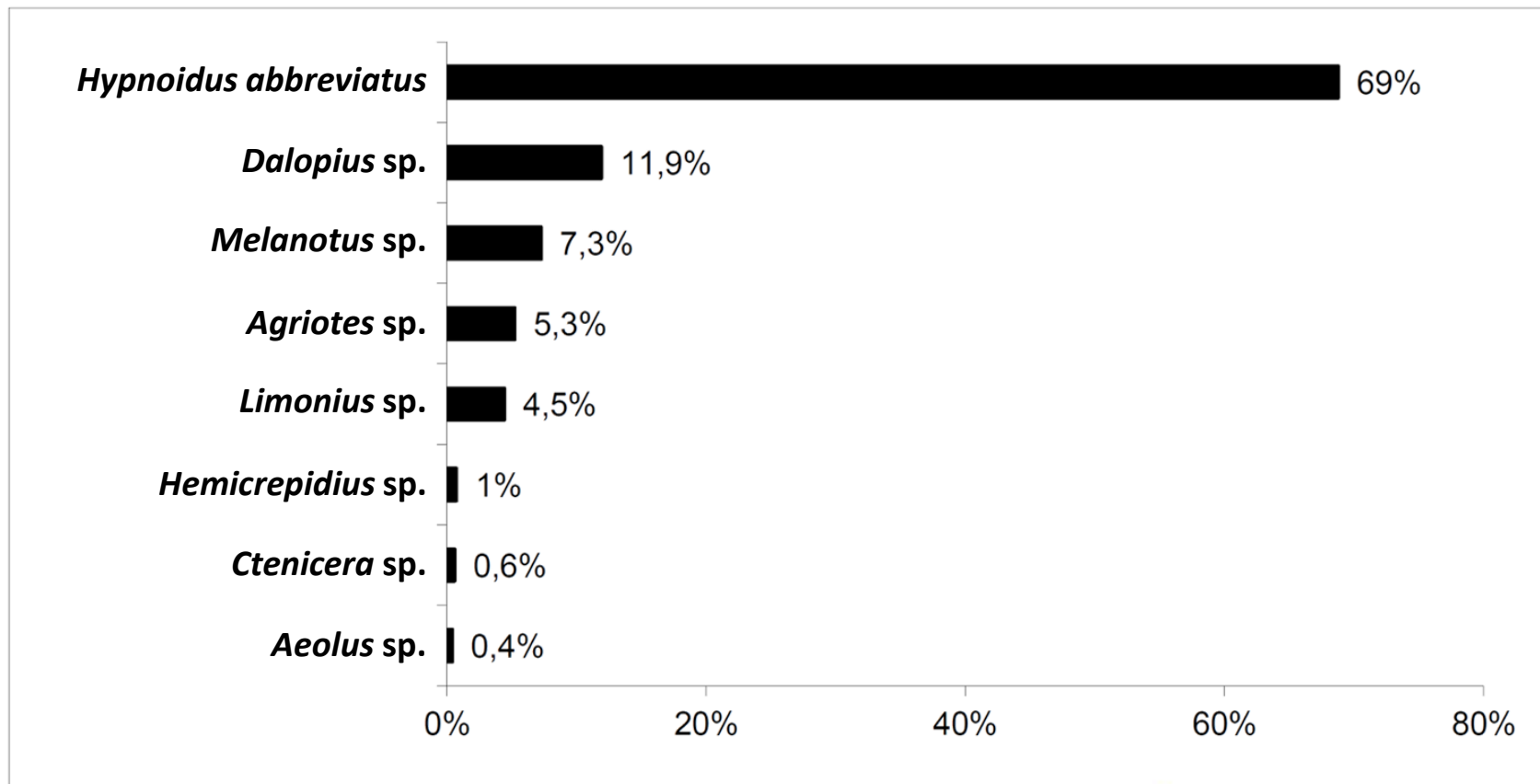
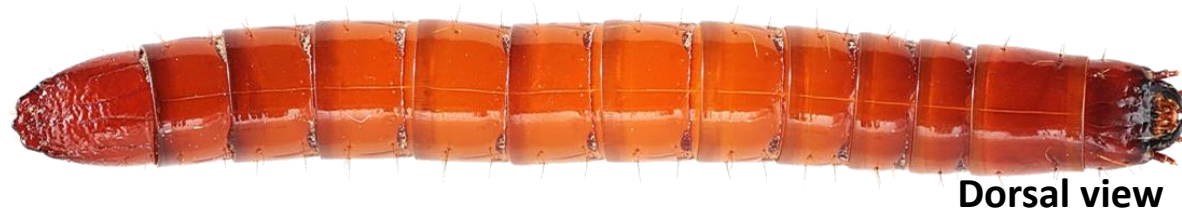


Figure from Réseau d'avertissements phytosanitaires (RAP), 2016

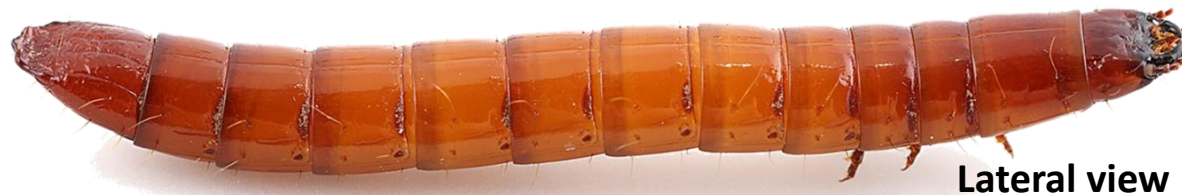
Identifying Wireworms

» Wireworm anatomy

- Elongated body with multiple distinctly visible segments
- Variable coloration, from yellow to reddish brown
- Cuticle robust and hard, hence the name wireworm
- Six short legs



Dorsal view



Lateral view



Ventral view

Identifying Wireworms

» Features to look for

- Color (not always reliable)
- Size
- The 9th abdominal segment (in dorsal view)



Identifying Wireworms

» Other soil arthropods that may be confused with wireworms

Millipede



Centipede



Millipede

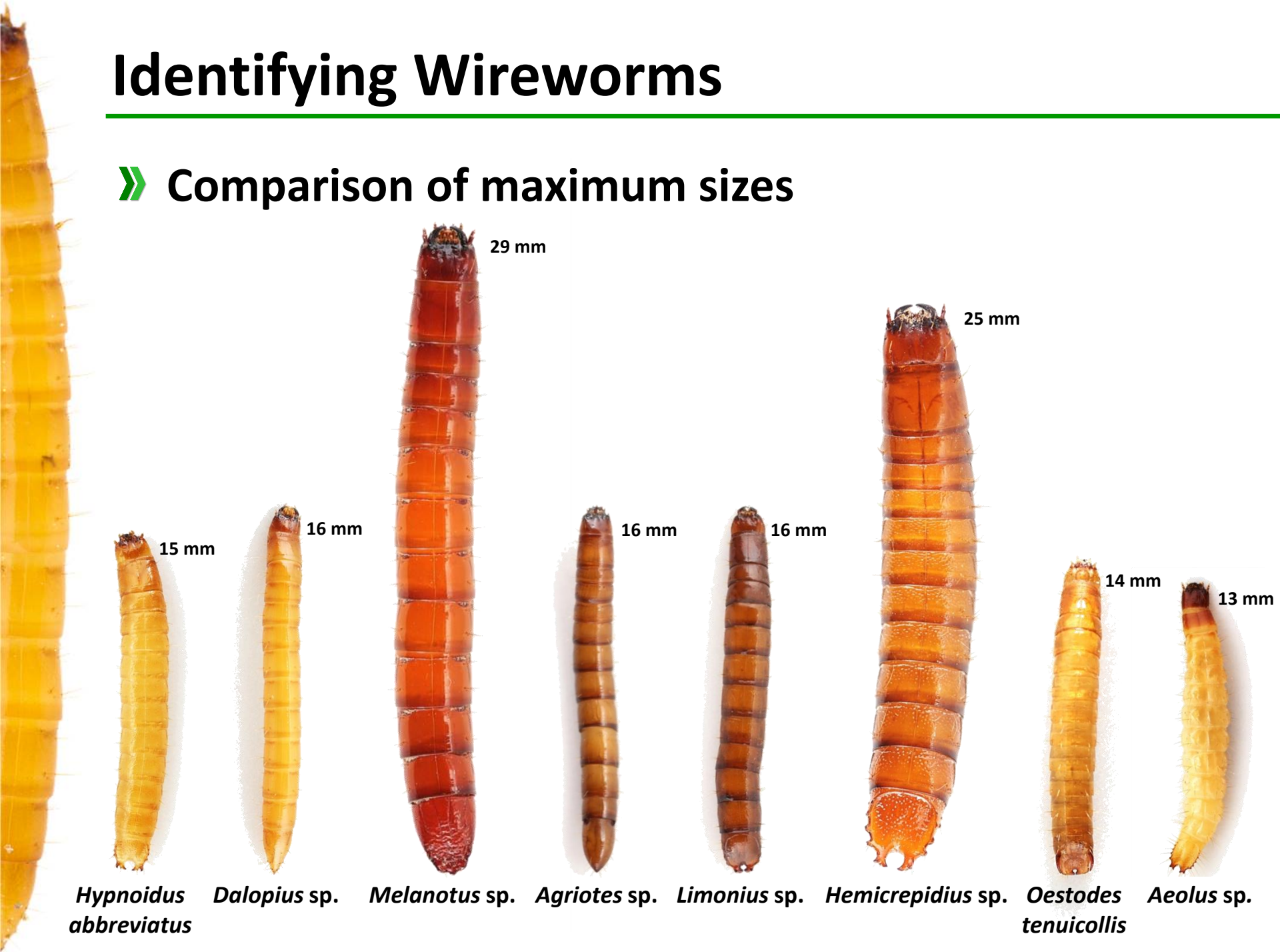


Carabid larva



Identifying Wireworms

» Comparison of maximum sizes



Identifying Wireworms

» *Hypnoidus abbreviatus*

L_{max} : 15 mm

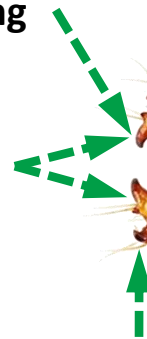


Dorsal view

Sharp claw-shaped
inner prong

Inner prongs
form an open
circle

Outer prong well
developed, sharp and
curved



Visible eye

Dorso-lateral view



Dorsal view

Identifying Wireworms

» *Dalopius* sp.

L_{max} : 16 mm

Dorsal view

Sharp
apex

Tubercles with
bristles

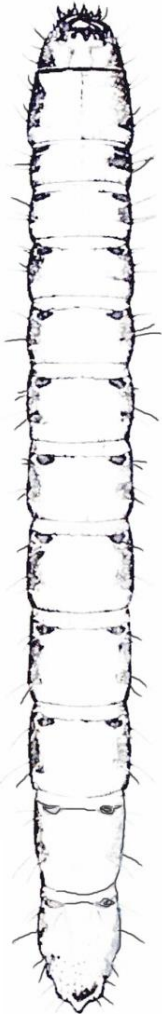
Straight
sides

Dorsal view

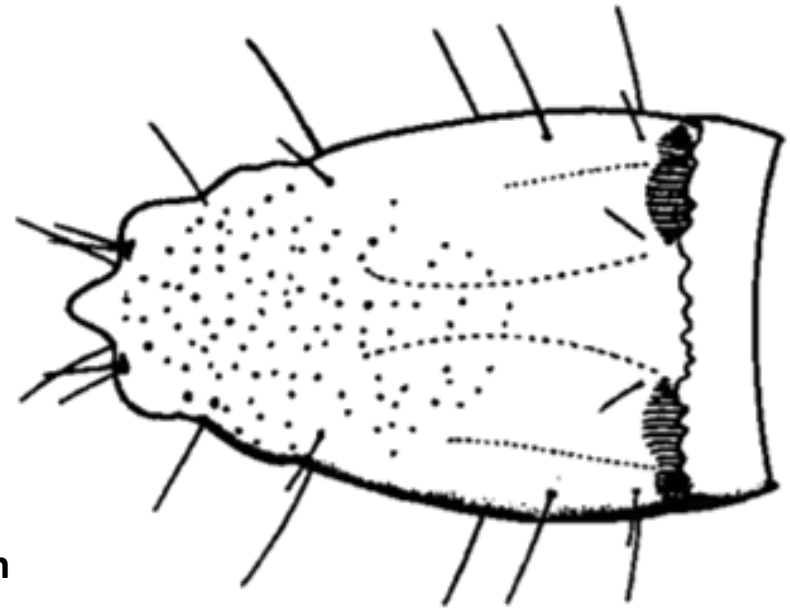
Identifying Wireworms

» *Melanotus* sp.

L_{max} : 29 mm



Dorsal view



Rough surface

Trilobed apex



Dorsal view

Identifying Wireworms

» *Agriotes* sp.

L_{max} : 16 mm



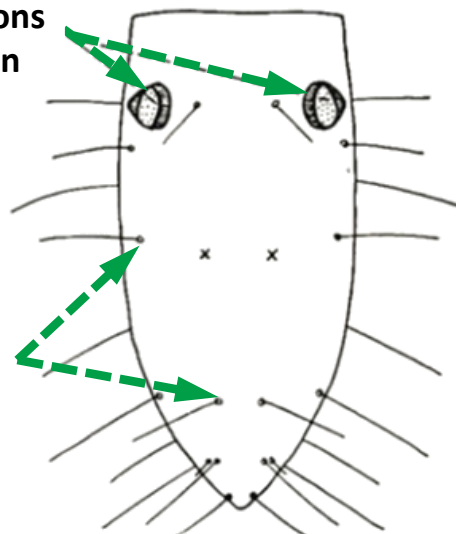
Agriotes mancus



Dorsal view

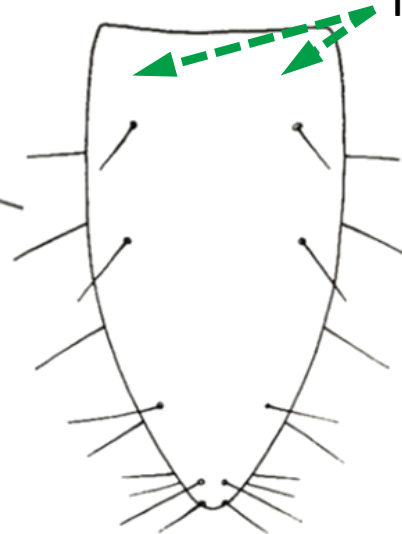
Round muscular impressions common

Absence of tubercles



Agriotes mancus

Muscular impressions may be absent



Agriotes limosus

Sharp apex

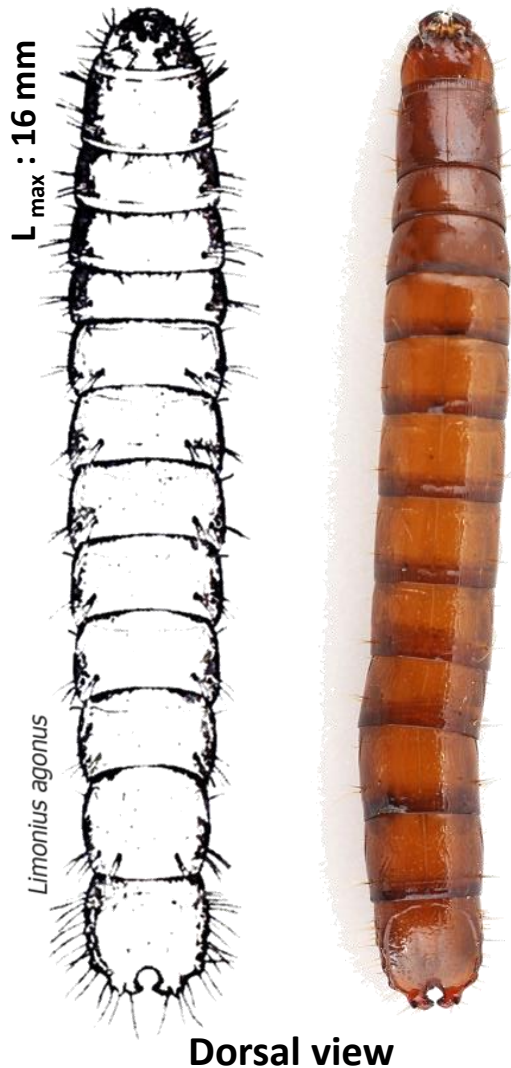
Rounded sides



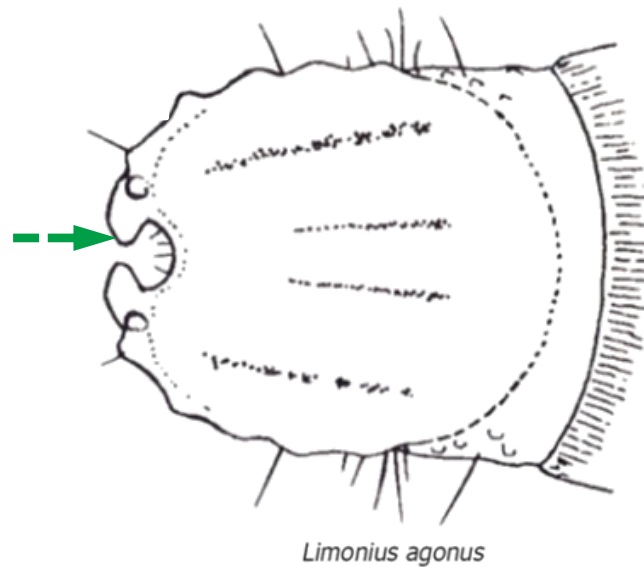
Dorsal view

Identifying Wireworms

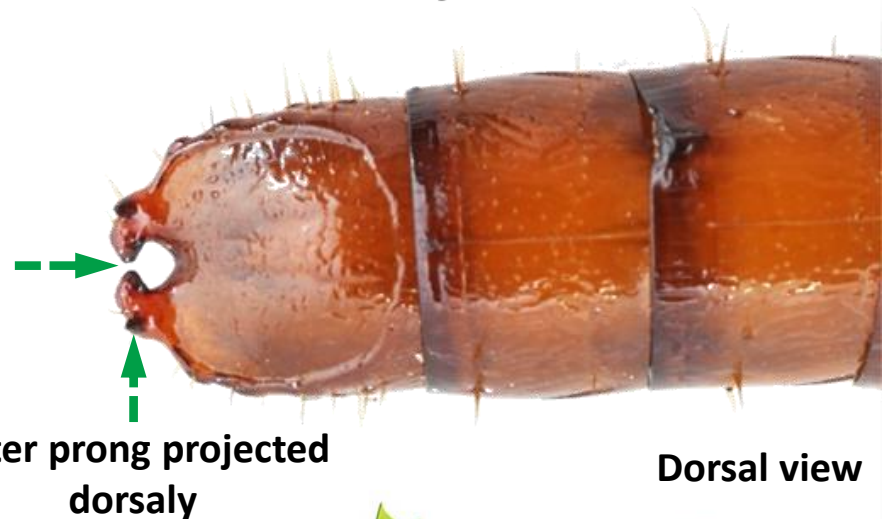
» *Limonius* sp.



Blunt claw-shaped inner prong



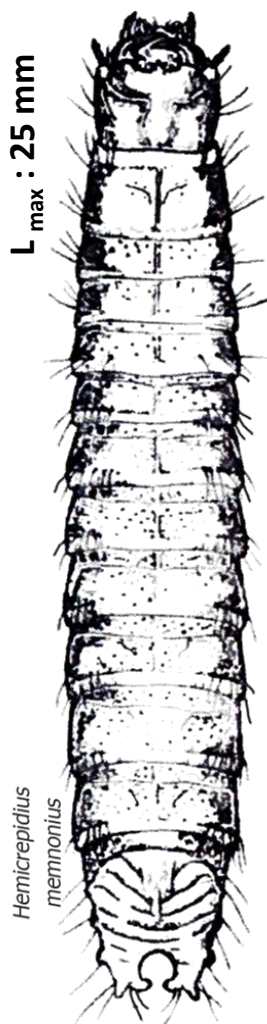
Inner prongs form an almost closed circle



Identifying Wireworms

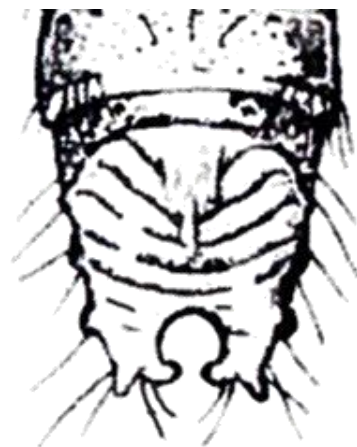
» *Hemicrepidius* sp.

L_{max} : 25 mm



Dorsal view

Broad and
squat body



Eye not visible

Dorso-lateral view

Inner prongs
form an open
circle



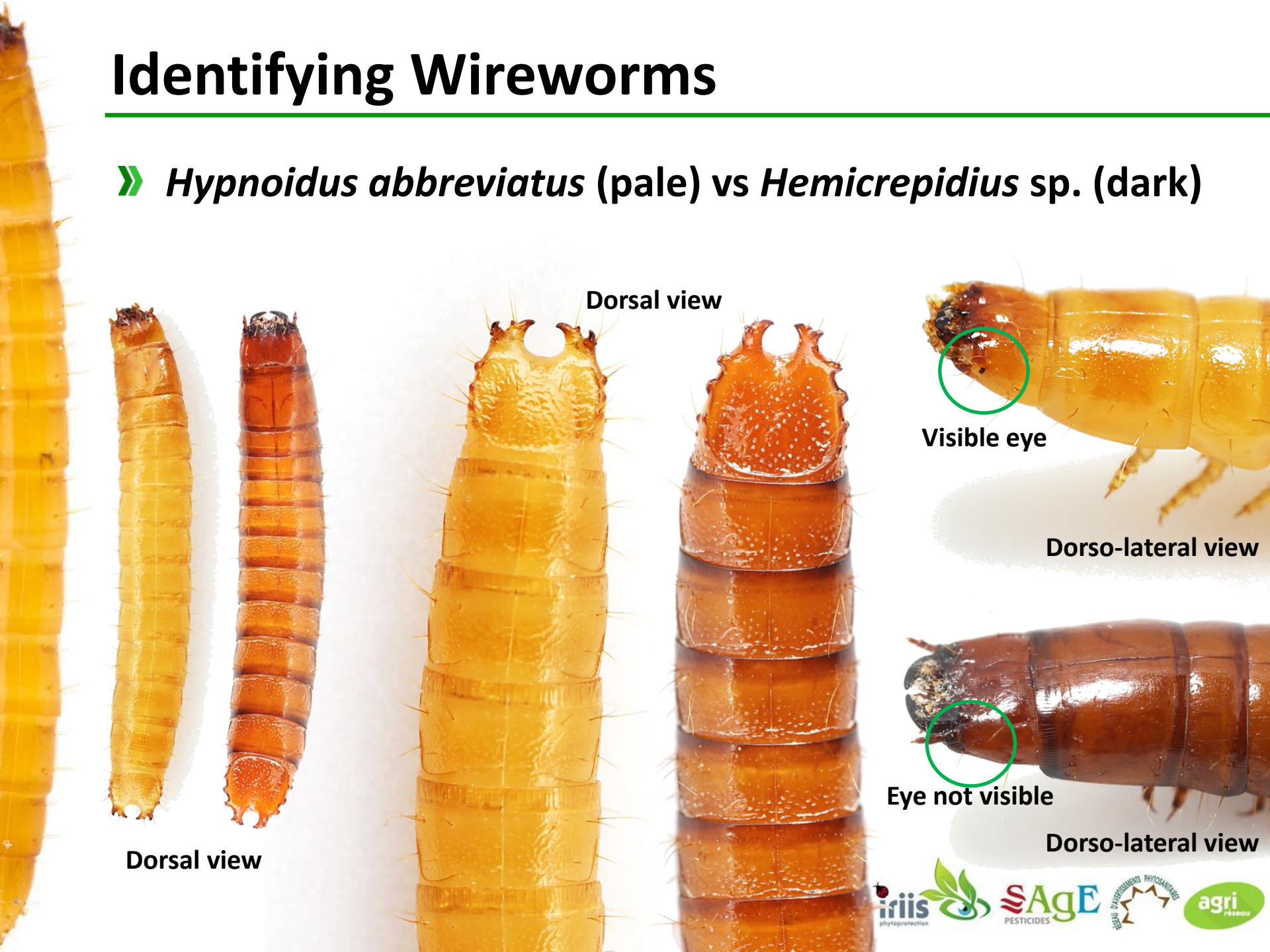
Outer prong less
developed than

Hypnoidus abbreviatus

Dorsal view

Identifying Wireworms

» *Hypnoidus abbreviatus* (pale) vs *Hemicrepidius* sp. (dark)



Identifying Wireworms

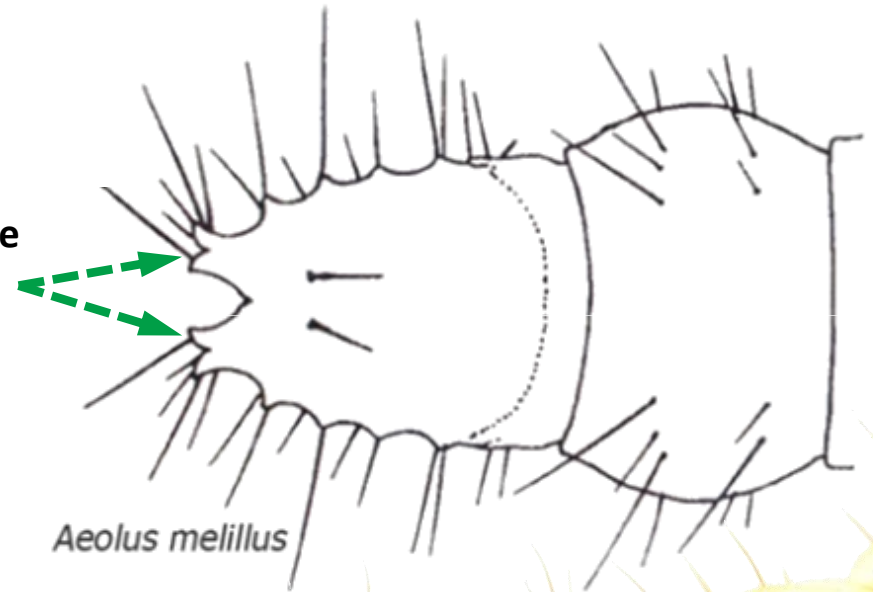
» *Aeolus* sp.

L_{max} : 13 mm



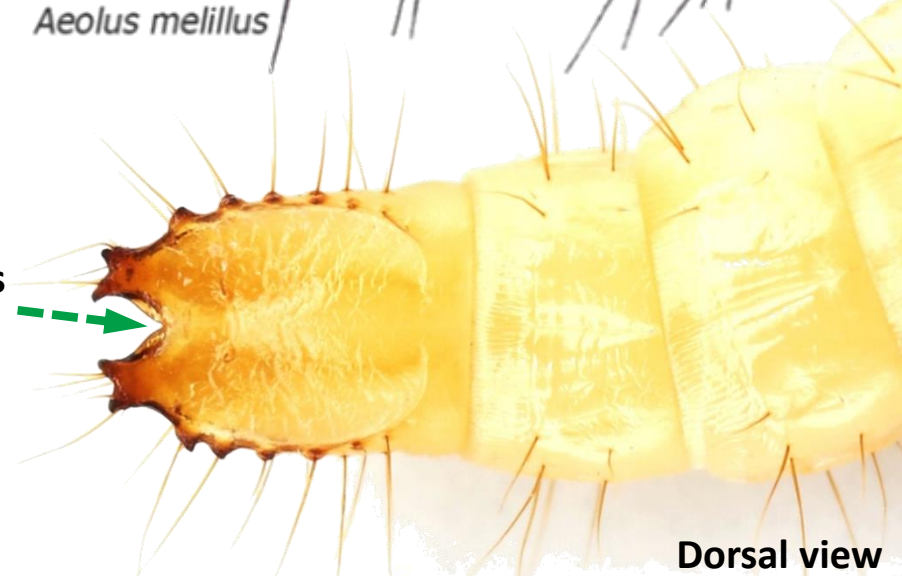
Dorsal view

Bifid inner prongs are strongly projected backwards



Aeolus melillus

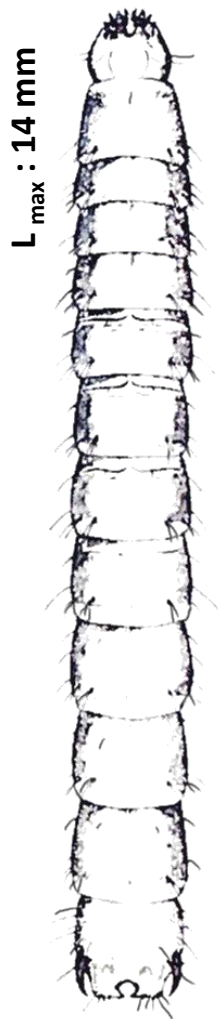
Notch forms a sharp V



Dorsal view

Identifying Wireworms

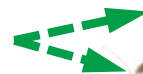
» *Oestodes tenuicollis*



Dorsal view



Two long and slightly curved horns



Lateral view

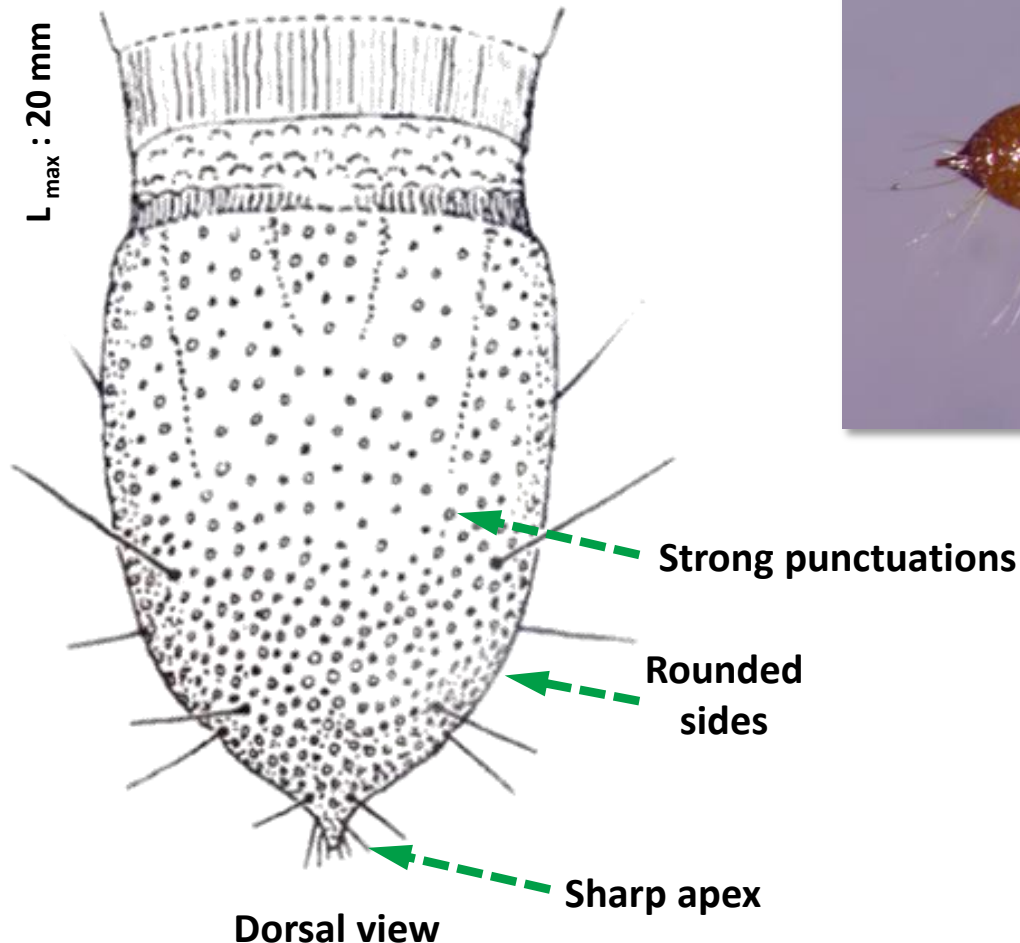
Apex flat with a small circular notch



Dorsal view

Identifying Wireworms

» *Ampedus* sp.



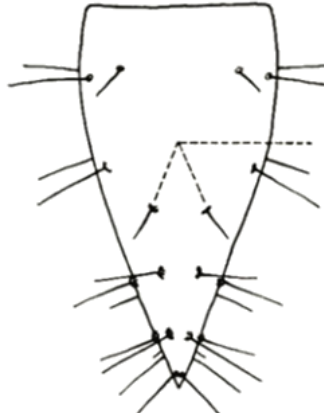
© 2009 MJ Hatfield

Lateral view

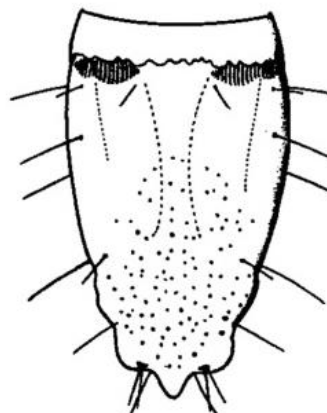
Identifying Wireworms - Recap



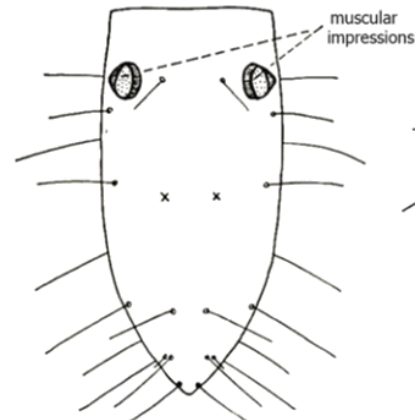
Hypnoidus abbreviatus



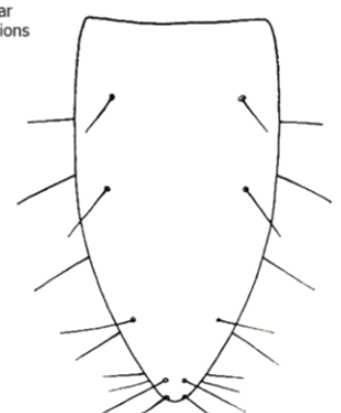
Dalopius sp.



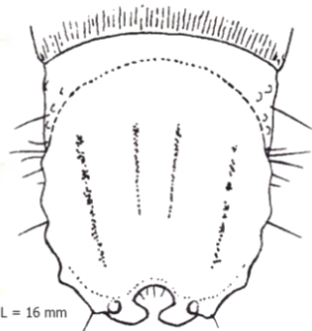
Melanotus sp.



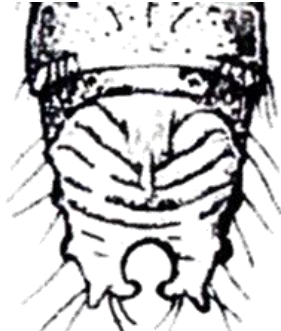
Agriotes sp.



Agriotes sp.



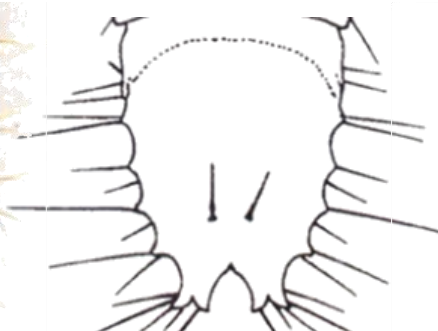
Limonius sp.



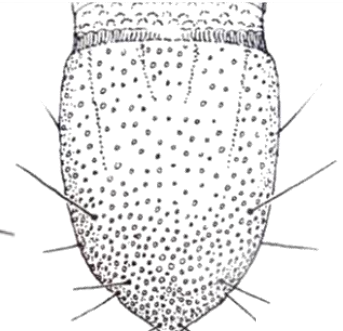
Hemicrepidius sp.



Oestodes tenuicollis



Aeolus sp.



Ampedus sp.

White Grubs



White Grubs

June beetle
Phyllophaga anxia



European chafer
Amphimallon majale



Japanese beetle
Popillia japonica

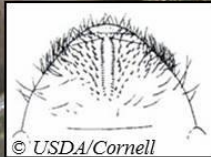
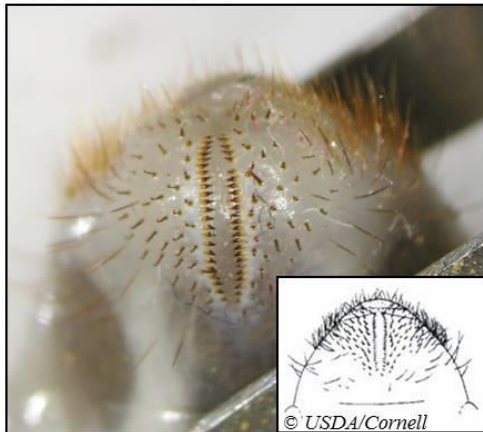


Identifying White Grubs



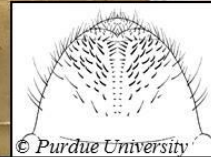
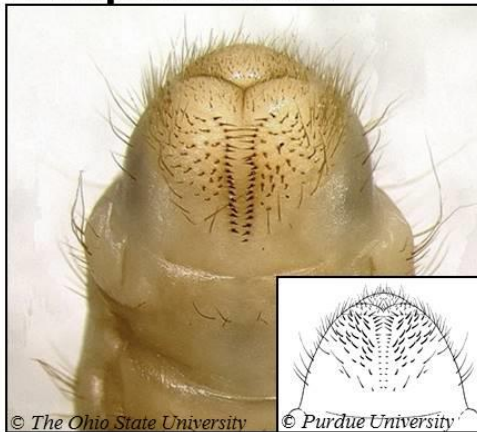
Look at the underside of the last abdominal segment to see the spines forming the raster pattern

June beetle



© USDA/Cornell

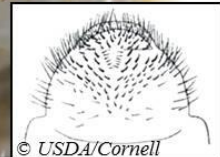
European chafer



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Japanese beetle



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Criteria	June beetle	European chafer	Japanese beetle
Size at maturity	25 – 45 mm	25 – 30 mm	20 – 25 mm
Raster pattern	Two parallel rows of over 20 spines of the same length	Two rows of parallel spines; the spines at the apical end being longer, stronger and divergent	Wide and having spines arranged in a "V" shape

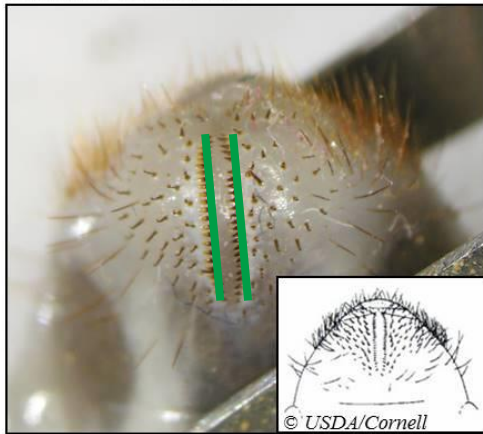
Fig. Criteria for distinguishing between larvae of June beetle, European chafer and Japanese beetle.

Identifying White Grubs



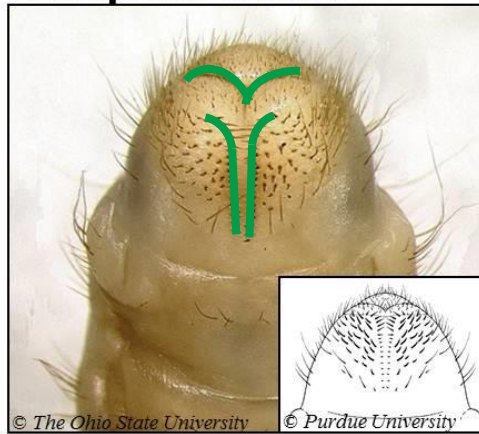
Look at the underside of the last abdominal segment to see the spines forming the raster pattern

June beetle



© USDA/Cornell

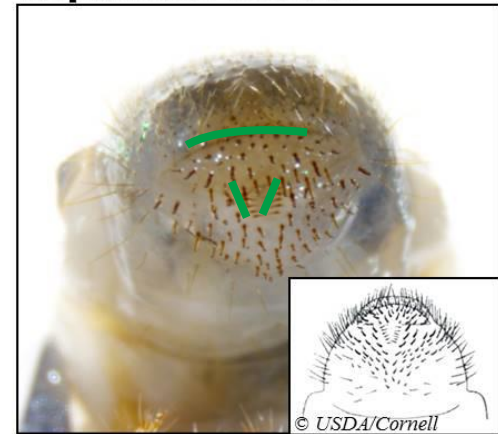
European chafer



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Japanese beetle



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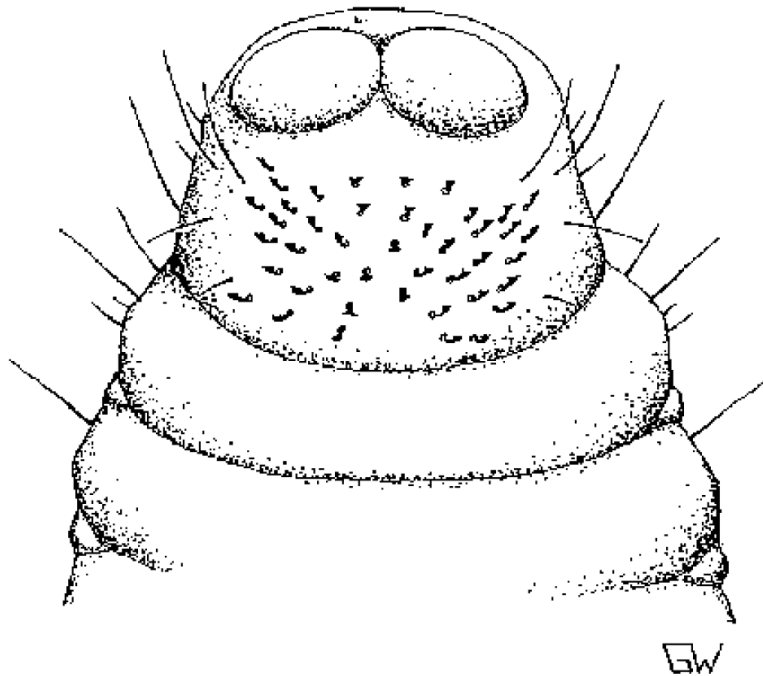
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Fig. Criteria for distinguishing between larvae of June beetle, European chafer and Japanese beetle.

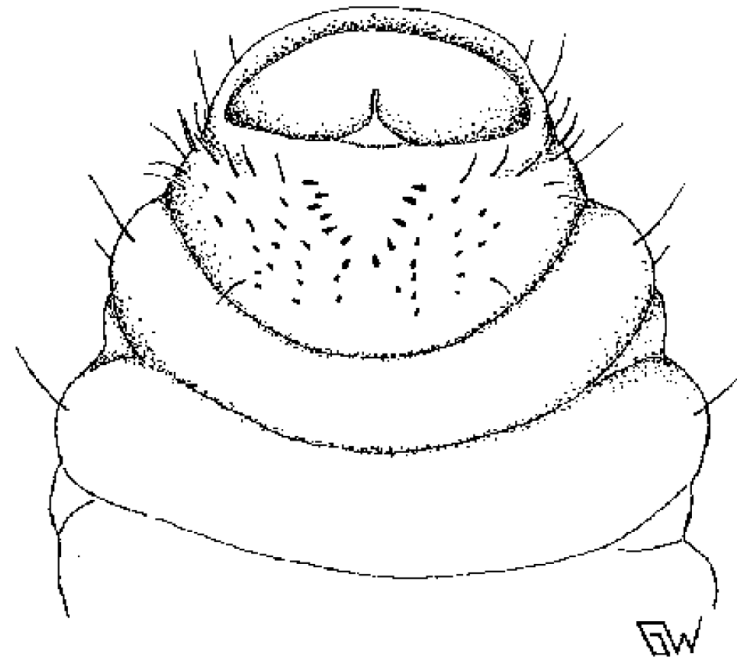
Identifying White Grubs

» Other genera

Ataenius sp.



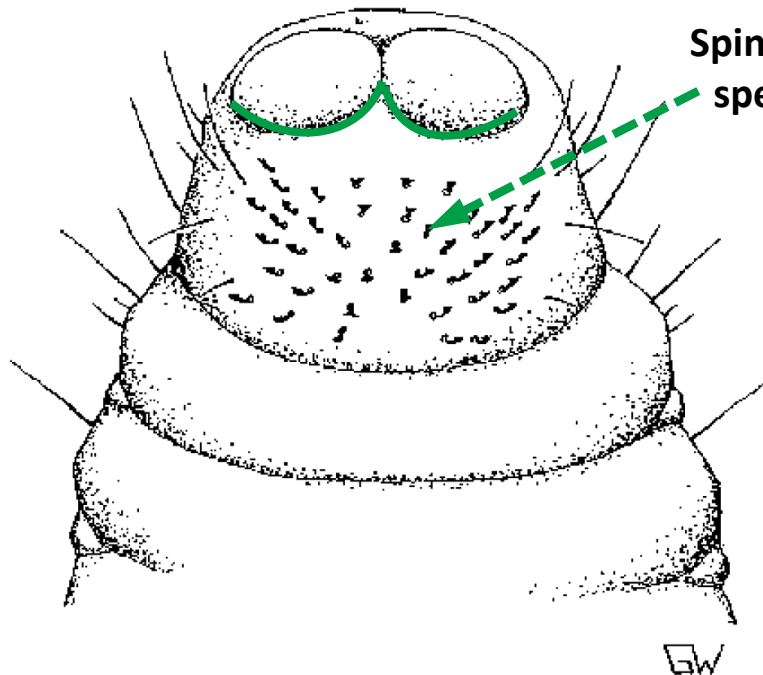
Aphodius sp.



Identifying White Grubs

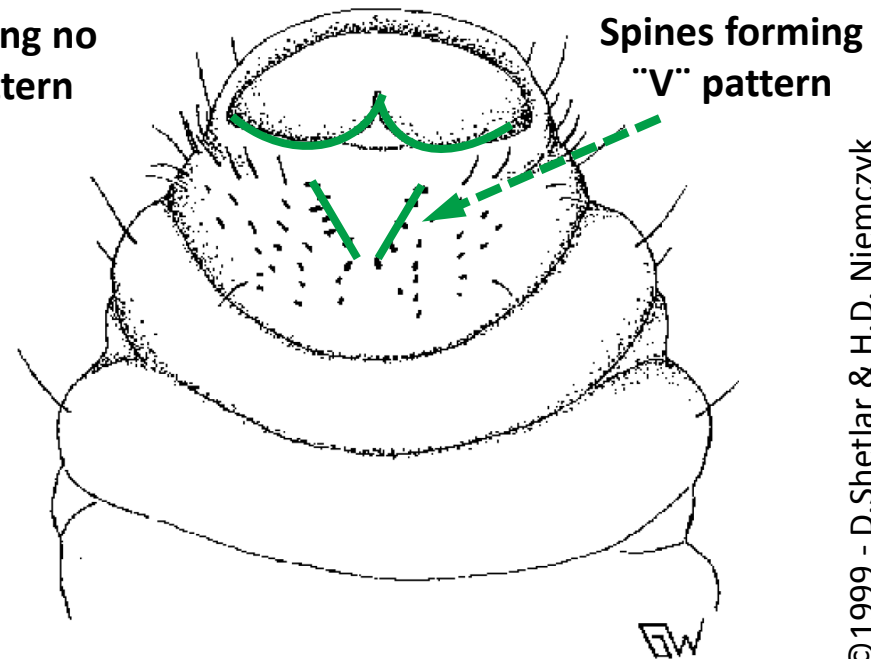
» Other genera

Ataenius sp.



Spines forming no specific pattern

Aphodius sp.



Spines forming "V" pattern

©1999 - D.Shetlar & H.D. Niemczyk

Flies of the genus *Delia*



Identifying the genus *Delia*

» Savage J. *et al.* 2016

- An excellent paper on the flies of the genus *Delia* is available on the Internet. It contains, among other things, information on species and interactive identification keys for all stages of development.
- The identification keys are available in French and English.
- J. Savage *et al.* 2016. Identification of *Delia* pest species (Diptera: Anthomyiidae) in cultivated crucifers --other and vegetable crops in Canada. Canadian Journal of Arthropod Identification. http://cjai.biologicalsurvey.ca/sffb_29/pdf.html

Identifying the genus *Delia*

» Savage J. *et al.* 2016

- The following figures come from this paper. It is strongly suggested to use the identification keys of Savage *et al.* directly on the Internet for identification of specimens.

Key to adults : http://cjai.biologicalsurvey.ca/sffb_29/sffb_29_1.HTM

Key to larvae : http://cjai.biologicalsurvey.ca/sffb_29/sffb_29_13.HTM

Key to puparia : http://cjai.biologicalsurvey.ca/sffb_29/sffb_29_18.HTM

Key to eggs : http://cjai.biologicalsurvey.ca/sffb_29/sffb_29_21.HTM

Identifying larvae of the genus *Delia*

» Larva :

- Size: about 8 mm long
- Body without legs and slender towards the front (head)
- Black mouth hooks are visible at the head
- To differentiate the species, look at posterior tubercles and anterior spiracles

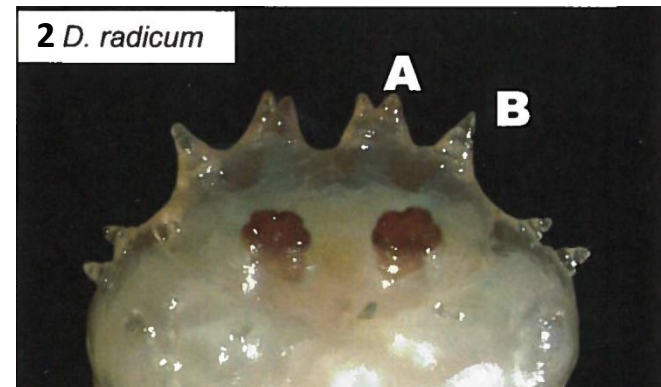
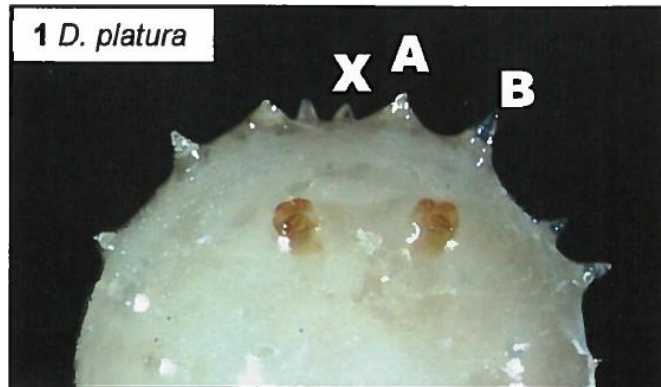
Cabbage maggot – *Delia radicum*



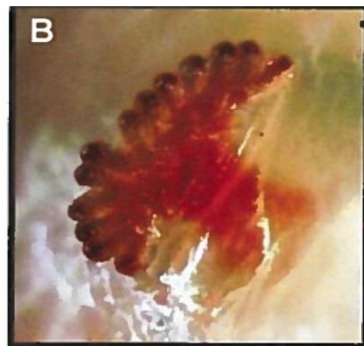
Seedcorn maggot – *Delia platura*



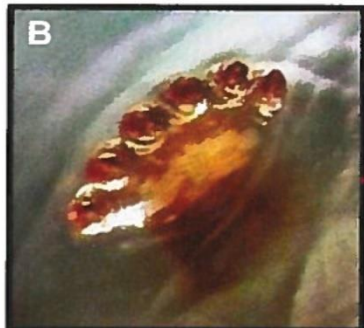
Identifying larvae of the genus *Delia*



Figs 1-2. Postero-dorsal view of (1) *D. platura* and (2) *D. radicum* larvae



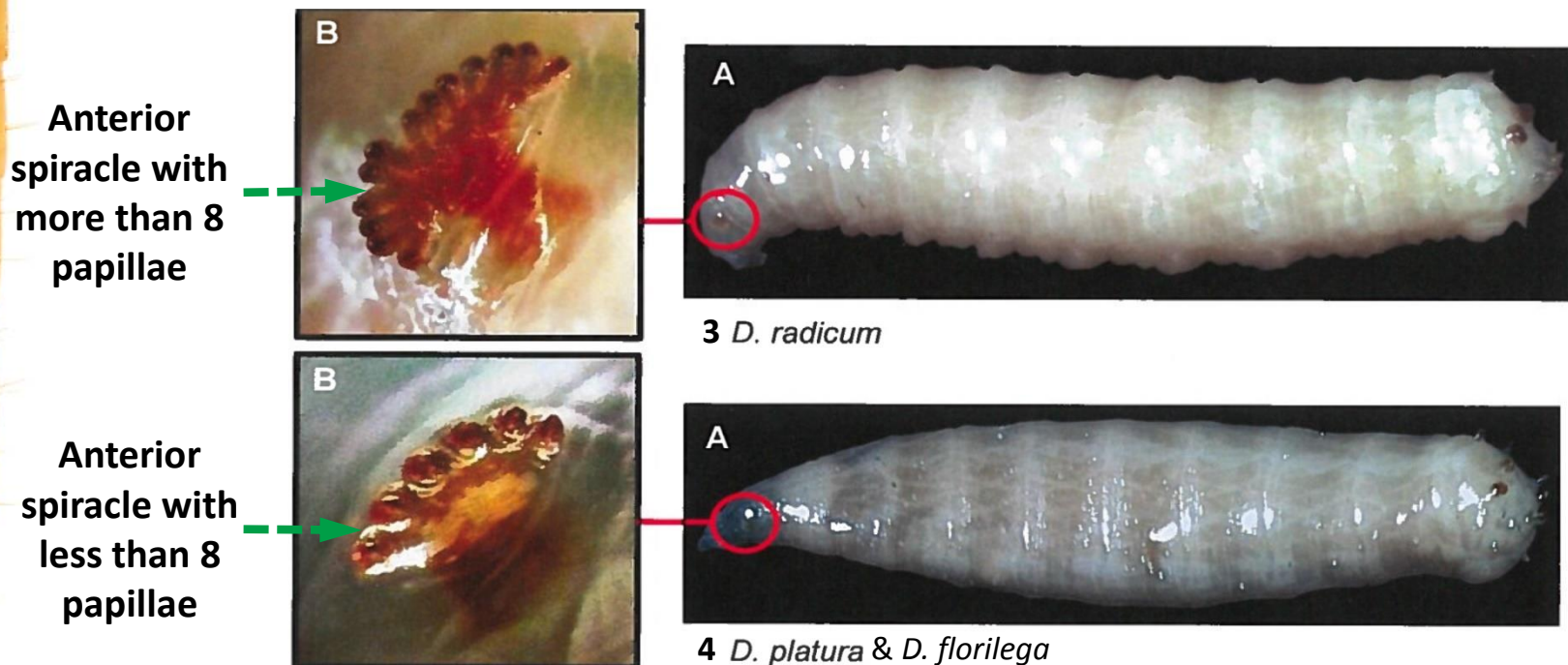
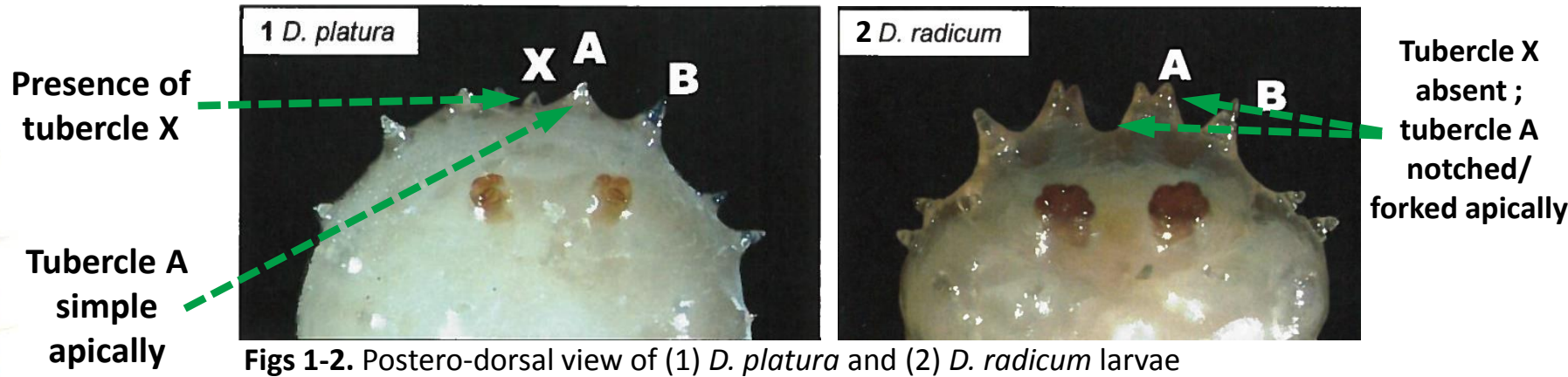
3 *D. radicum*



4 *D. platura* & *D. florilega*

Figs 3-4. Third instar larvae of (3) *D. radicum* and (4) *D. platura*/*D. florilega* in (A) lateral view and (B) with a closer view of anterior spiracle

Identifying larvae of the genus *Delia*



Figs 3-4. Third instar larvae of (3) *D. radicum* and (4) *D. platura*/*D. florilega* in (A) lateral view and (B) with a closer view of anterior spiracle

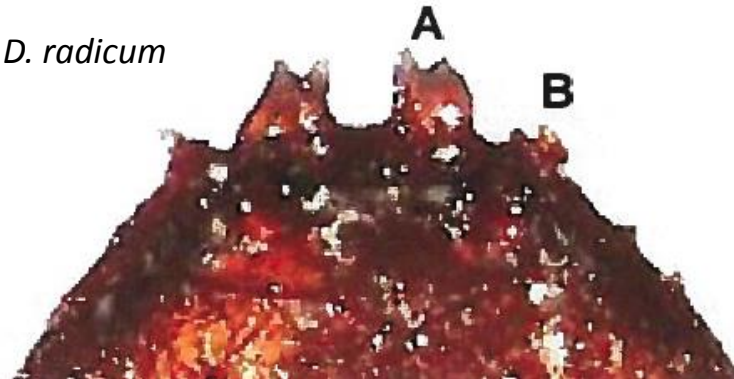
Identifying puparia of the genus *Delia*

» Puparia :

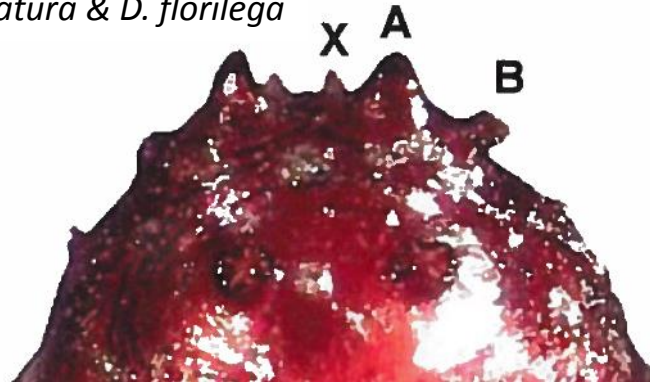
- Size: 4.0 to 6.0 mm
- Oval and brownish
- Posterior tubercles always visible



5 *D. radicum*



6 *D. platura* & *D. florilega*

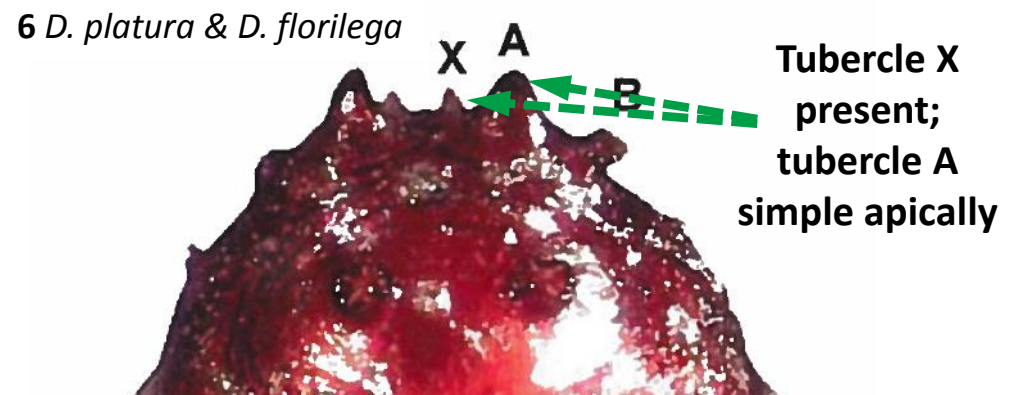
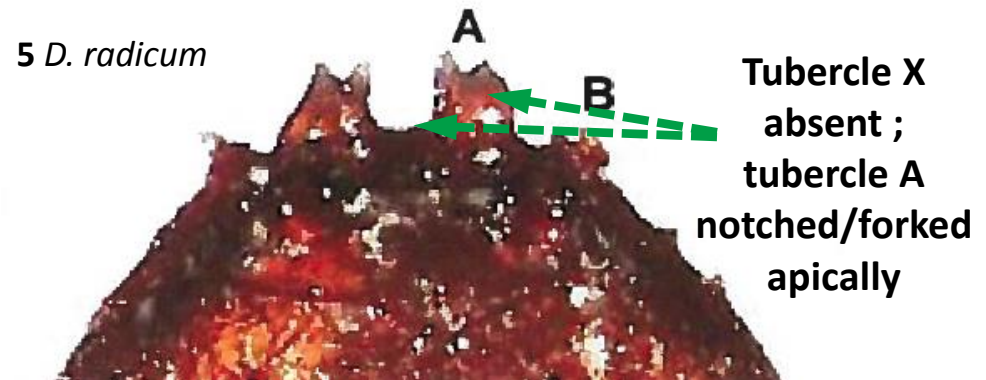


Figs 5-6. Postero-dorsal view of puparia rear portion of (5) *D. radicum* and (6) *D. platura*/*D. florilega*

Identifying puparia of the genus *Delia*

» Puparia :

- Size: 4.0 to 6.0 mm
- Oval and brownish
- Posterior tubercles always visible



Figs 5-6. Postero-dorsal view of puparia rear portion of (5) *D. radicum* and (6) *D. platura*/*D. florilega*

LE LABORATOIRE DE DIAGNOSTIC EN PHYTOPROTECTION

UN SERVICE DE DIAGNOSTIC
ET D'IDENTIFICATION
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DES CULTURES
DU QUÉBEC



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* Des frais peuvent s'appliquer.

For more information :

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