OSU Oregon State University

SLIME TIME

Intro to Slugs and Snails

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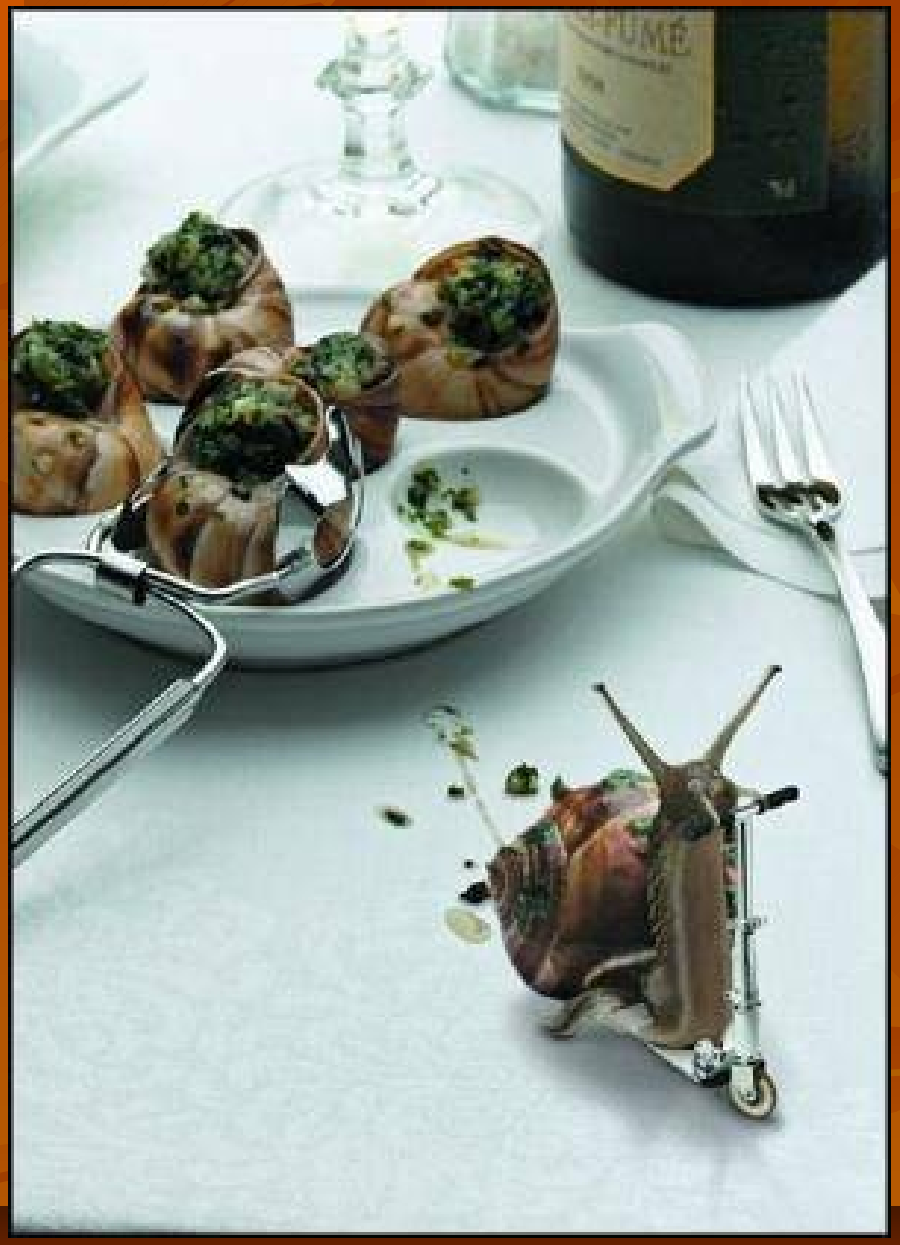
Most “troublesome” snails and slugs are exotic escapees.

In 1960, John Burch wrote that 725 species of land snails and 40 slug species were recognized in the continental United States (US), of those 44 snails and 11 slugs were introduced

By 2005, more than 80 alien gastropod species had established self-sustaining populations in the mainland United States and Canada

Robinson, D.G., and Slapcinsky, J. 2005



Pathways of Introduction

Deliberate

- 4% Aquarium industry
- 4% Baggage
- % Food
- Medicinal purposes (extracting compounds)
- Biological control
- Pets
- Aesthetics

Inadvertant

- 23% Tile
- 7% Agricultural products (food)
- 29% Horticulture products (cut flowers, live plants, seeds, turf, leaves, etc)
- 16% Commercial and domestic shipments (attached to products or packaging or shipping containers)
- 1% Military shipments
- Planes-trains-automobiles
- Soil
- 4% Aquarium industry
- Aquaculture

4,900 interceptions in the US from 1993 through 1998

Cowie and Robinson. 2003. Pathways of introduction of nonindigenous land and freshwater snails and slugs

Pathways of Introduction

Deliberate

- Aquarium industry
- 2 Baggage
- Food
- Medicinal purposes (extracting compounds)
- Biological control
- Pets
- Aesthetics

62 interceptions in Canada from 1963-1971

Inadvertant

- Tile
- 7 Agricultural products (food)
- 50 Horticulture products (cut flowers, live plants, seeds, turf, leaves, etc)
- 3 Commercial and domestic shipments (attached to products or packaging or shipping containers)
- Military shipments
- Planes-trains-automobiles
- Soil
- Aquarium industry
- Aquaculture

Pathways of Introduction

Deliberate

- Aquarium industry
- Food — 10
- Medicinal purposes (extracting compounds) — 11
- Biological control
- Pets — 1
- Aesthetics

22 interceptions in New Zealand from 1955-1978

Inadvertant

- Tile
- Agricultural products (food)
- Horticulture products (cut flowers, live plants, seeds, turf, leaves, etc)
- Commercial and domestic shipments (attached to products or packaging or shipping containers)
- Military shipments
- Planes-trains-automobiles
- Soil
- Aquarium industry
- Aquaculture

Alien non-marine snails and slugs of priority quarantine importance in the United States: A preliminary risk assessment

Cowie et al 2009

- Range
- Phylogenetic relationships
- Adult size
- Egg/juvenile size
- Reproductive potential
- Semelparous or iteroparous
- Selfing, outcrossing
- Introduction pressure
- Invasion history
- Major pest
- A “multi-pest” elsewhere
- Economic potential

The Importance of Slime

The Importance of Slime

- Defense – emit a thic that allows slugs to shorten and s which makes it more diff es an unpleasant tas
- Water retention – (hydroscopic) anc through a “tight sc
- Nutrition – someti collected in the sli
- Used in the matin

Biology

- algae
- anim
- carri
- centi
- fungi
- green
- insec
- liche
- worms
- other slugs

h, foot

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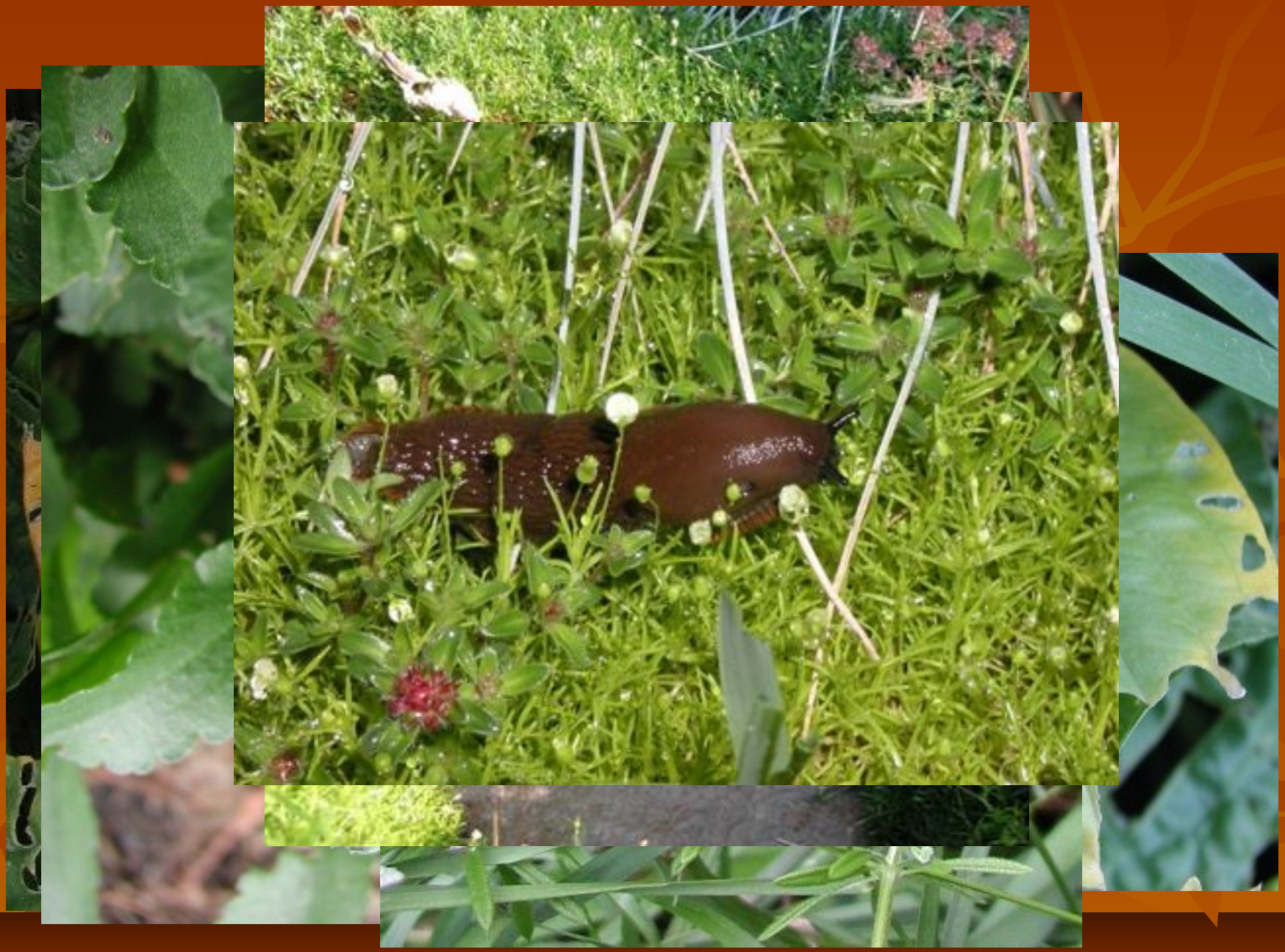


- He
- Ex
- Pr
- In

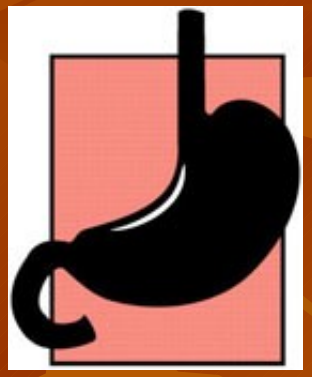
are laid in

Behavior

- Aestivation: snails s
- Only 5% of slugs ab
- Slugs can damage r
- Snails and slugs can
- Can sense humidity moisture
- Awareness of light a
- They home in on sc

Taxonomy

- Phylum: Mollusca
- Class: Gastropods **(stomach – foot)**
- Land snails: Pulmonata
- Order: Stylommatophora



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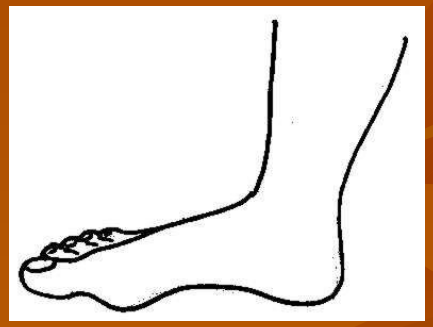

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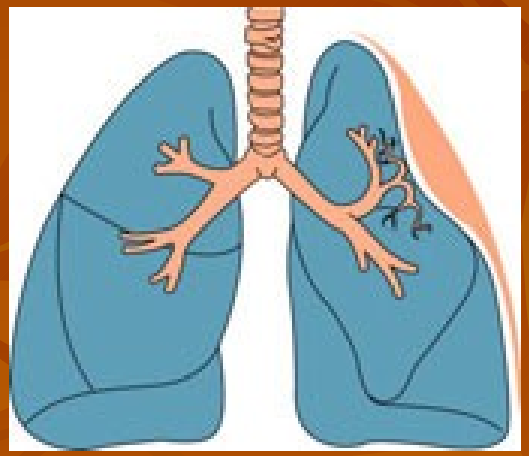

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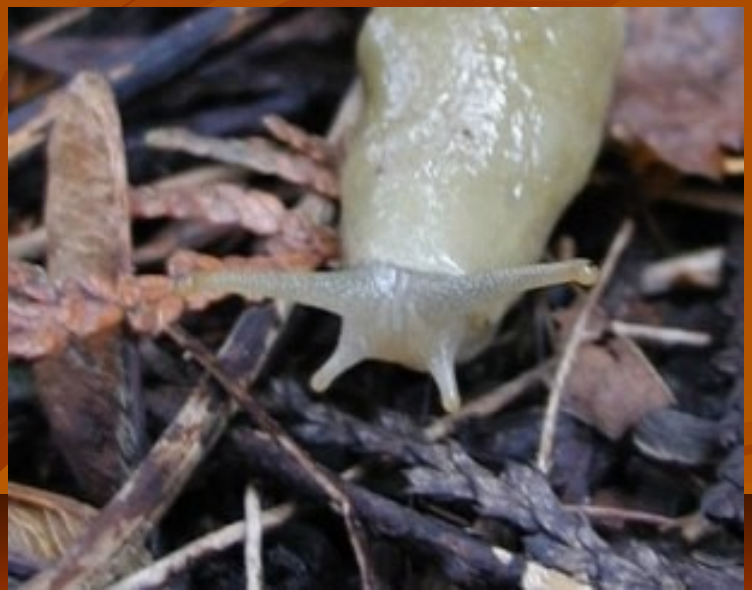
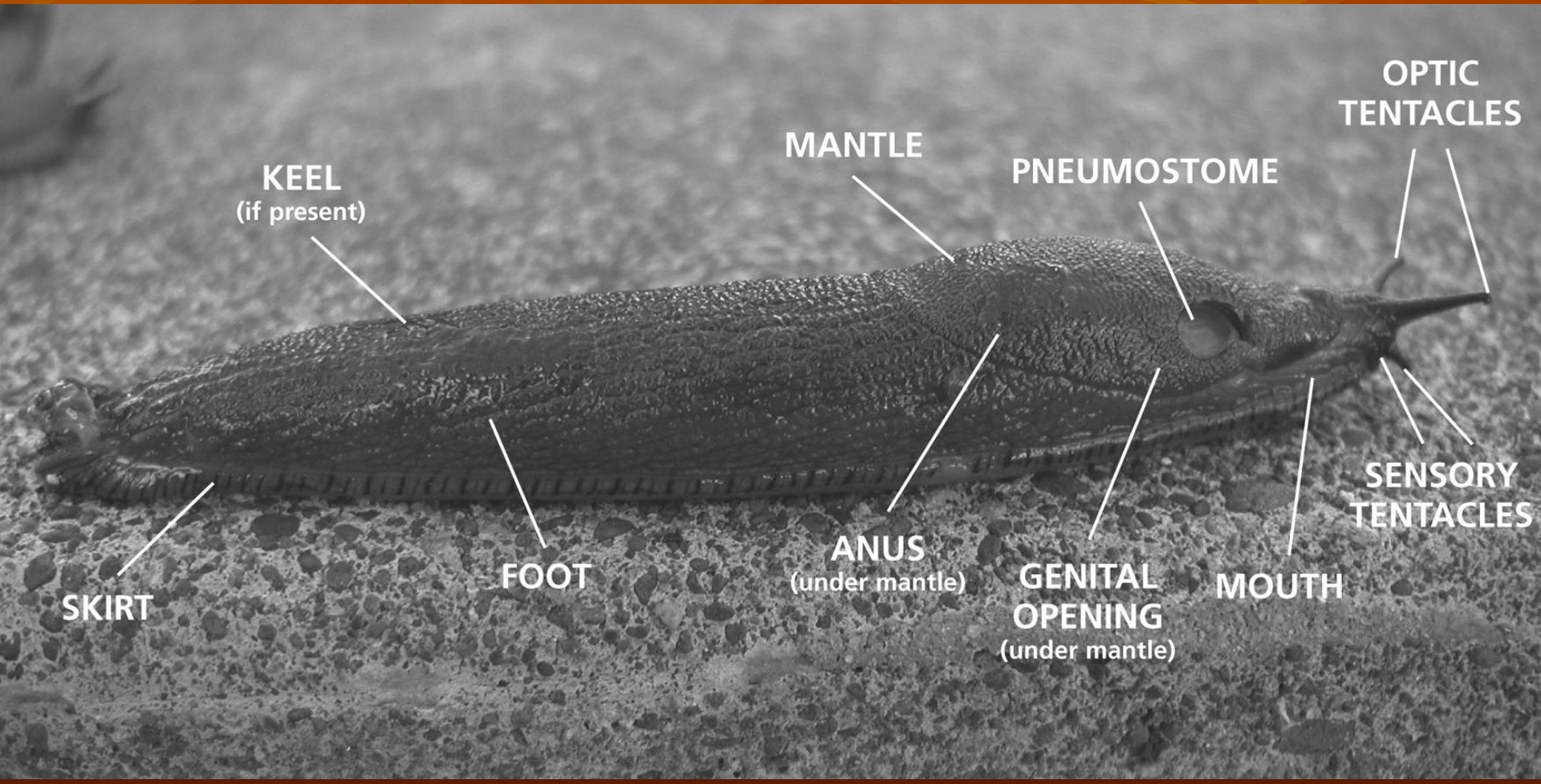


Identification

Slug Anatomy 101

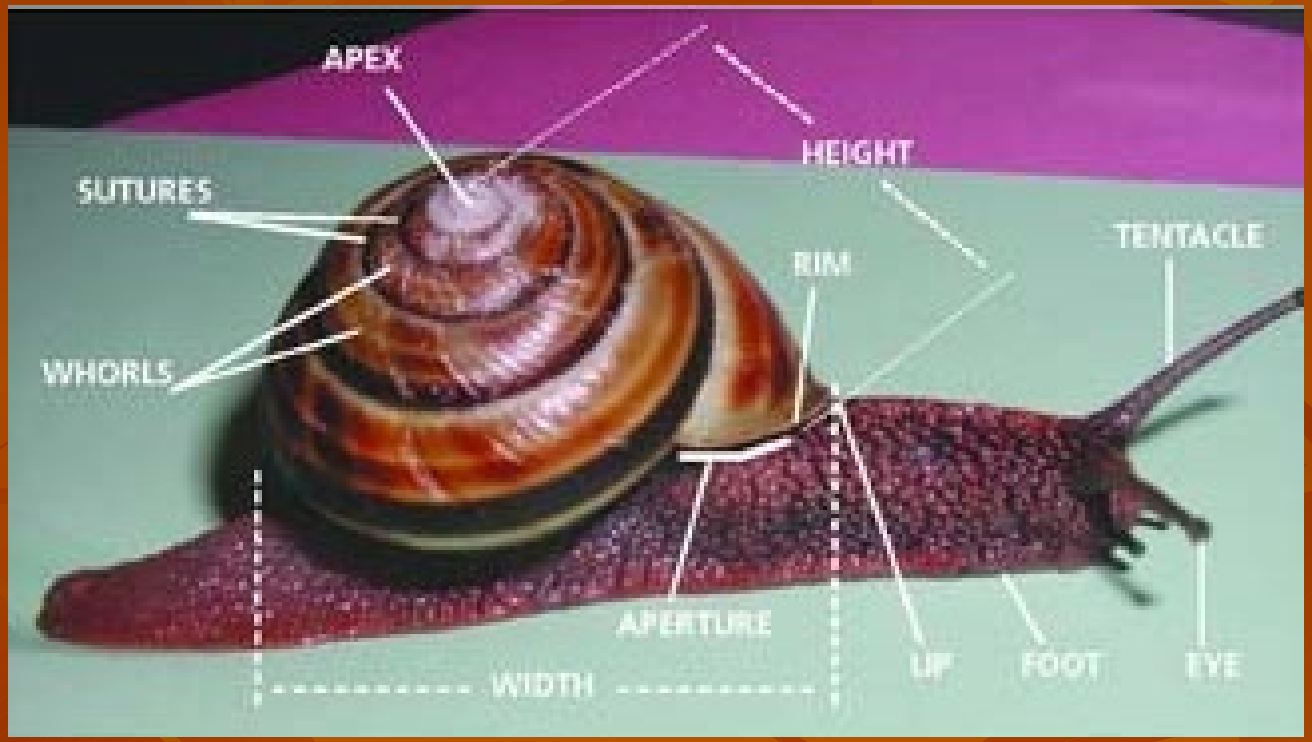


Identification

Image/artwork -Slinkachu

Snails

Name that snail



Dispersal

Management

- Manage… under the juris… es
- Be awa… ents
- Some st… ree certifica…
- Regulat… untry
- Pesticid… check the label an… s

Biological Control

- small
- Snake
- Spide
- Amph
- Birds
- carniv
- sciom
- micro
- Predatory slugs
- humans

Hyposmocoma

- Trap Cro

Drip irrigation

Morning vs evening irrigation

Irrigation

Trial on cabbage:

- With evening watering and no bait pellets, percent leaf loss ranged from 40 to 60%.
- Evening watering plus bait pellets resulted in 6-12% leaf loss
- Morning watering with no bait applied also resulted in a 6-12% leaf loss (Speiser and Hochstrasser, 1998).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repellents

- "repellent" refers to a substance that deters surface contact (Hollingsworth, in press)

Monoterpines

- geraniol (*Pelargonium graveolens*)
- carvone (oil from caraway seeds)

Copper

Garlic extract

6% solution of urea formaldehyde fertilizer

Tex-R® is a matting material impregnated with copper for contact exposure (98% reduction in snail activity/90% slug died). 93% less slugs, 90% less slug eggs, 68% fewer damaged leaves on Tex-R vs Mypex.

38% fewer snails but Tex-R had growth of algae (DEFRA 2002)

A 2.3% solution of insecticidal soap (containing potassium salts of fatty acids as the active ingredient) removed 88% of brown garden snails within 15 minutes following dipping (Parrella, 1985)

Anti-feedent

"anti-feedant" refers to substances in which the deterrence is associated with "tasting" of the substrate (Hollingsworth, in press)

Octenol (mushroom Clitopilus prunulus)

Limonene

Saponins from seeds of quinoa (Chenopodium quinoa von Willdenow)

Extracts of spinach (Spinacia oleracea L.)

Extracts of plants in the family Umbelliferae

Extracts of azadirachtin from neem

vulgarone B, a sesquiterpene (*Artemisia douglasiana)*

More potential products

- Caffeine (toxicant and repellent - highly soluble in water)
- uscharin (*Calotropis procera*)

Chemical Control

- Mostly carbamates:
- Metaldehyde
- Methiocarb = Mesurol
- Iron phosphate = Sluggo or Escargot

Chemical Control

Nursery site label

- Carbaryl
- Malathion
- Cinnacure
- Orange Guard

High rates of cinnamamide killed 100% of slugs, reduced snail activity and damage also reduced slug egg hatching rates. (DEFRA)

snails and slugs - Windows Internet Explorer

http://oregonstate.edu/dept/nurspest/mollusks.htm

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snails and slugs

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Oregon State University

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Snails/Slugs

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Slugs
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slug gallery New
slug taxonomy work in progress
banana slug
European red slug
Spotted leopard slug UPDATED

Snails
brown garden snail
banded wood snail
Crinkled ambersnail
Giant African Snail
Wrinkled dune snail New

IAFAQ's NEW
Links
Slug and Snail References

Snails and Slugs

Great new resource: Terrestrial Mollusk Tool ID tool.

Speeding slugs? You betcha. Check the link to see a great short film by Kurtis Hough called Mossgrove. It was filmed here in Oregon.

Check out my article in the *Digger* Magazine, Slime and Punishment

Special Treat - OPB Field Guide Takes on Slugs! Check the link for their video of slugs in Oregon.

This section of the website is devoted to information for the identification and management of snails and slugs in Pacific Northwest nurseries. The Pacific Northwest is home to a variety of slugs and snails, native and exotic. The native species play a critical ecological role in the natural environment. Exotic species, though, tend to ravage our crops and landscapes in a sometimes irritating and often expensive manner. Knowing more about these pest species can aid in prevention and effective management. This is a growing area of the website and will continue to be updated.

http://oregonstate.edu/dept/nurspest/Limaxmaximus.htm

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The End

Ray briefs the New Snails …