

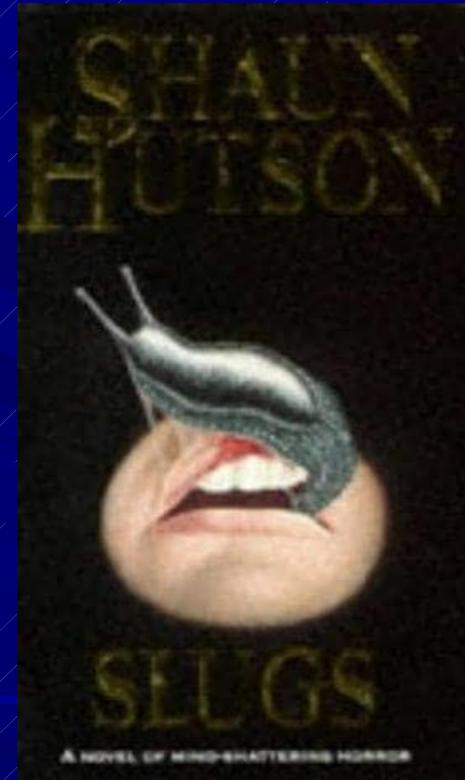
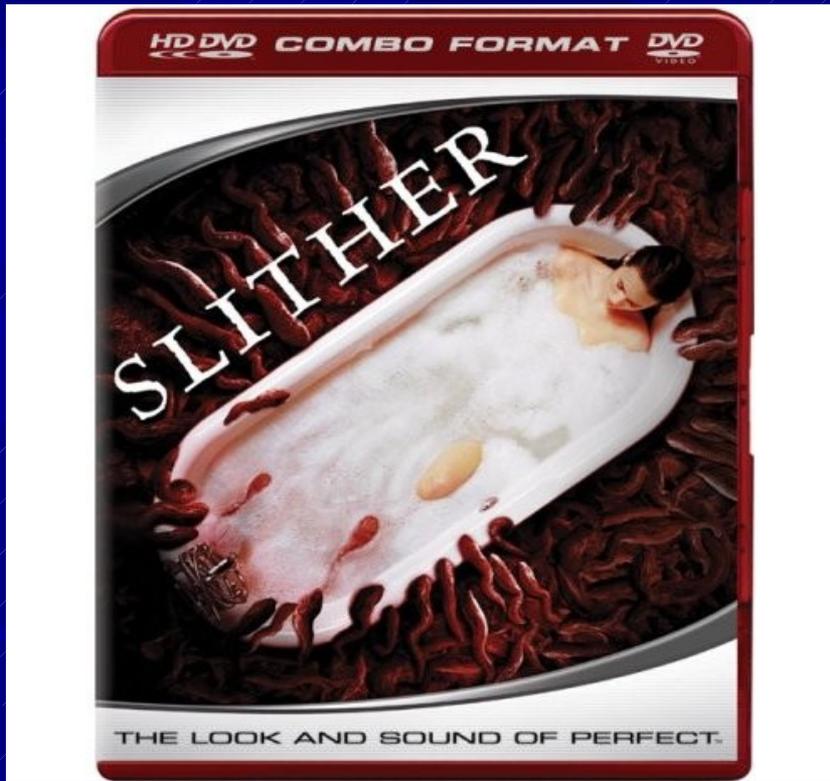
European Invaders: California's Invasive Slugs and Snails and Novel Approaches to their Control

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Background Information

- Traditionally a repulsive organism



- Slug phobias – American Journal of Clinical Hypnosis

Snails and Slugs as Pests

- Direct pests of agriculture and horticulture
 - Human food = Gastropod food



- Vectors of diseases of humans - *Escherichia coli*

The California Story!

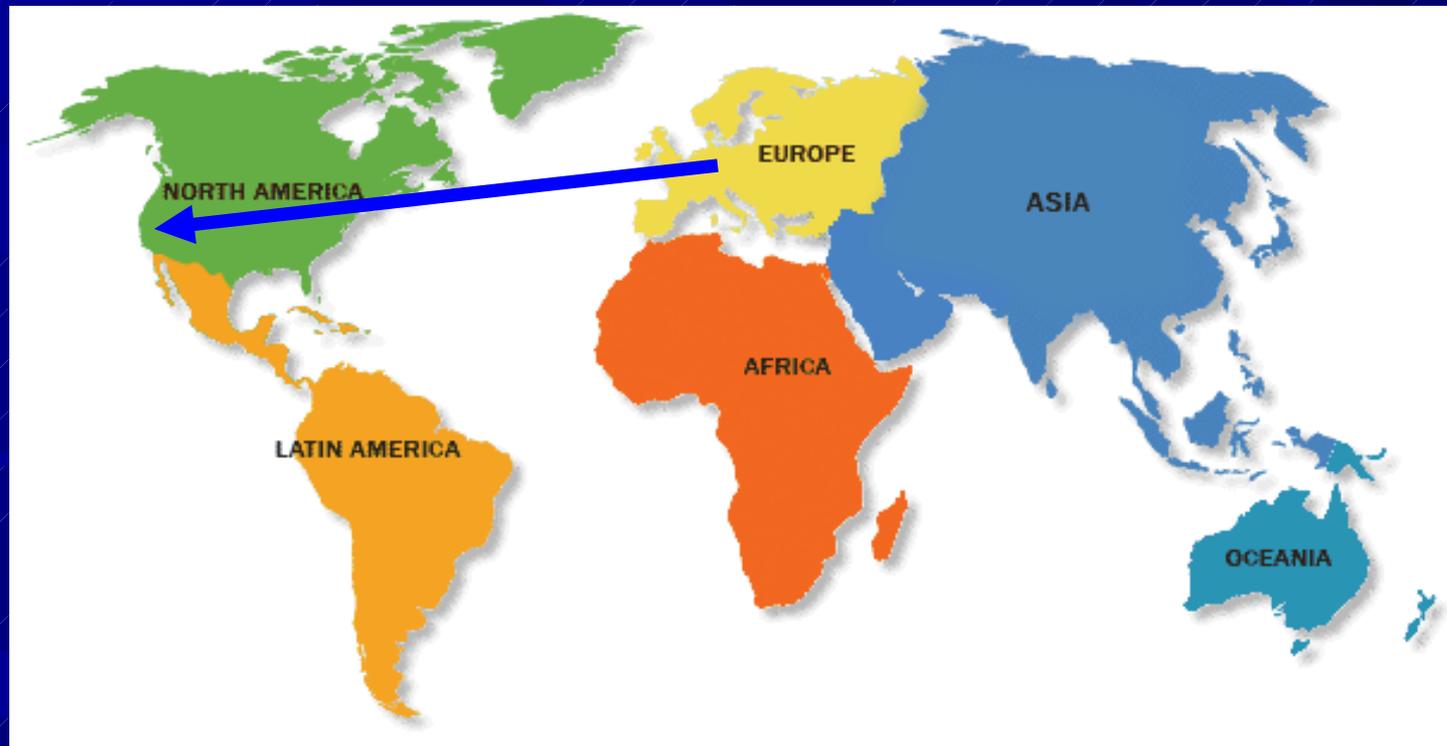
- Total number of species - 279



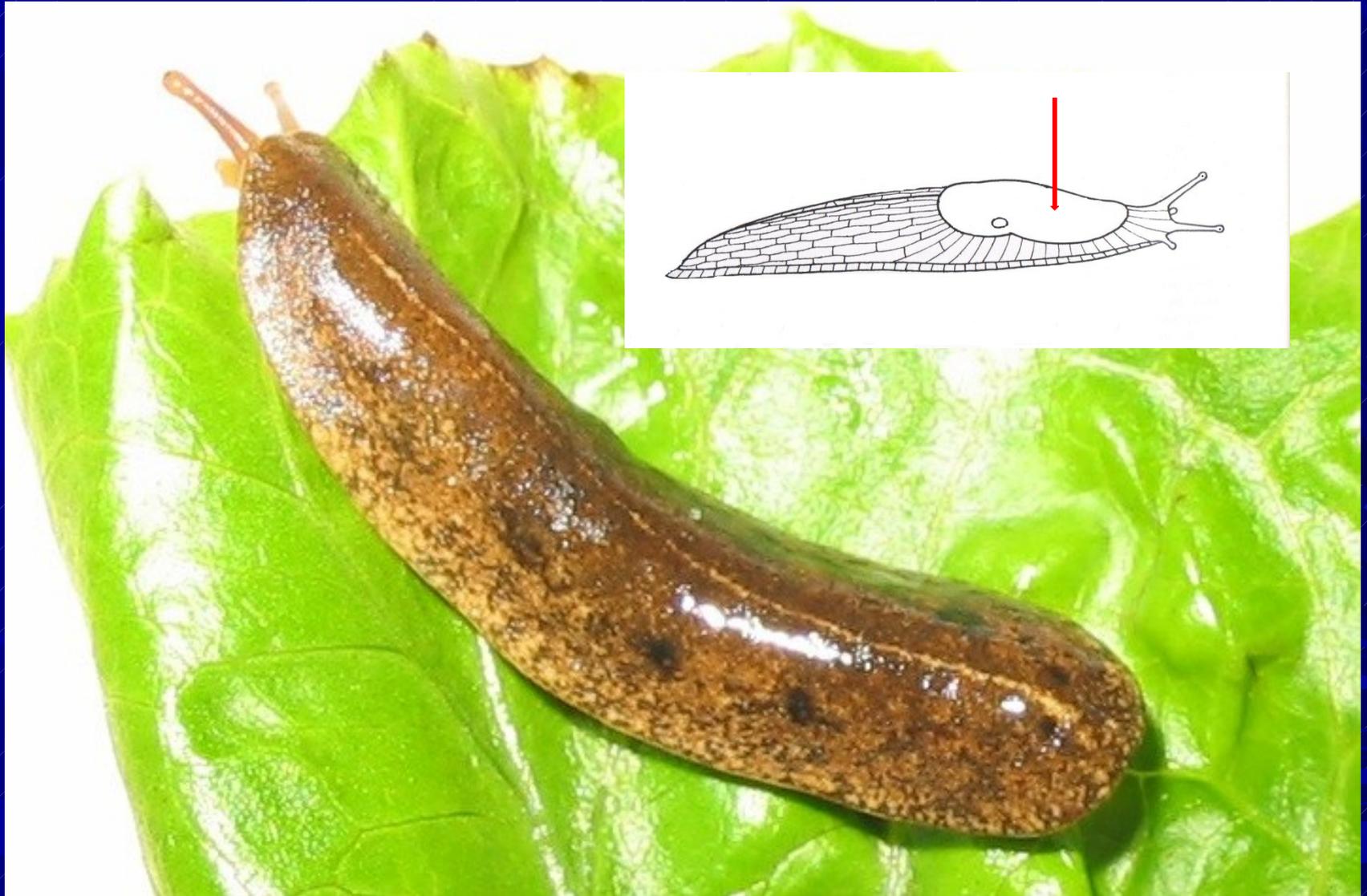
Ariolimax dolichophallus

The Invasive Fauna

- 37 species
- Predominantly European



Veronicella cubensis – Cuban Slug



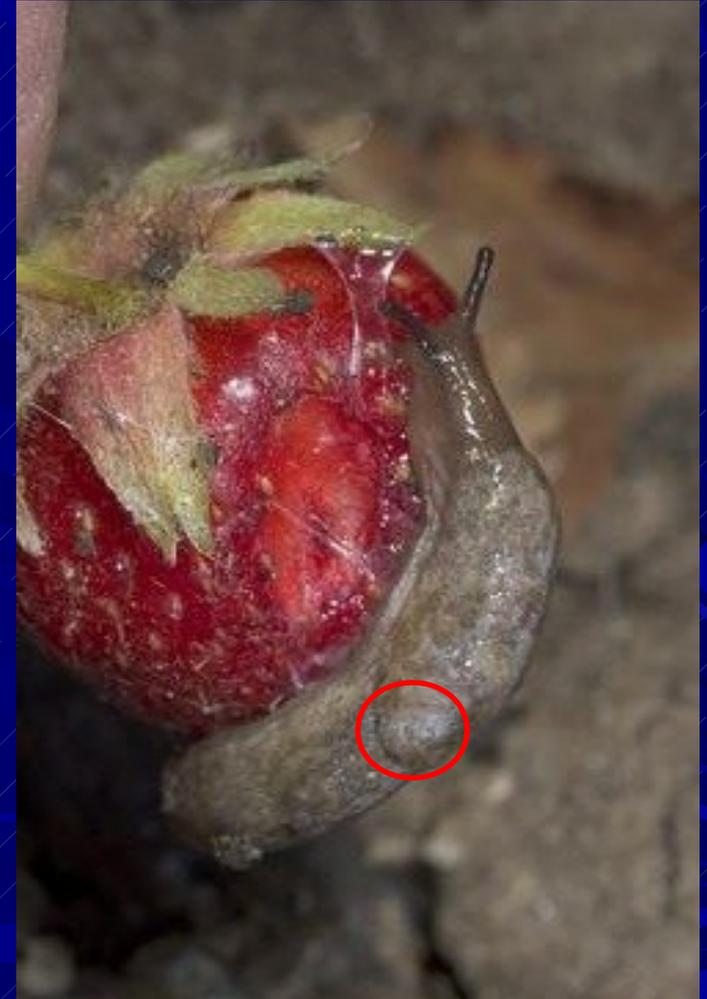
Lehmannia valentiana – Valentia Slug



Testacella haliotideae – Shelled Slug



Deroceras reticulatum – Gray Garden Slug



Arion subfuscus – Dusky Slug





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Division of Agriculture and Natural Resources

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SLUGS

A Guide to the Invasive and Native Fauna of California

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Essential oils

- Effective against other pests
- Not tested with snails and slugs
- Bitter Orange, Cedarwood, Cinnamon, Clove, Eucalyptus, Garlic, Lemongrass, Peppermint, Pine, Rosemary and Spearmint

Essential oils



1. Clove bud oil
2. Pine oil
3. Spearmint oil
4. Lemongrass oil
5. Peppermint oil

Essential oils

- Clove oil was very toxic to the eggs and juvenile snails but is it phytotoxic?
- Step 2 – Potted Plant Trials
 - 5% clove oil solution (positive control)
 - Test solution
 - Water (negative control)

Essential oils



Positive control



Negative control



Test concentration



Essential oils

- Clove oil can be lethal to brown garden snail eggs and juveniles without being phytotoxic
- Also exempt from pesticide registration requirements
- Facilitates its development as a commercially available molluscicide

Biological Control

- Under researched for gastropods eventhough:
 1. Diverse fauna of natural enemies
 2. Biocontrol agent is available in Europe

Biological Control



- Nematode: *Phasmarhabditis hermaphrodita*
 - Lethal to a large range of pest slugs
 - 12 million infective juveniles in clay
 - Easy to apply
 - Gastropod specific
-
- 89% reduction in damage to winter wheat
 - >95% reduction in orchid damage

Biological Control

- Not available in North America!



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David Yoo



Sarinah Simmons

Questions