SLIME ME Terrestrial Gastropods of Maine

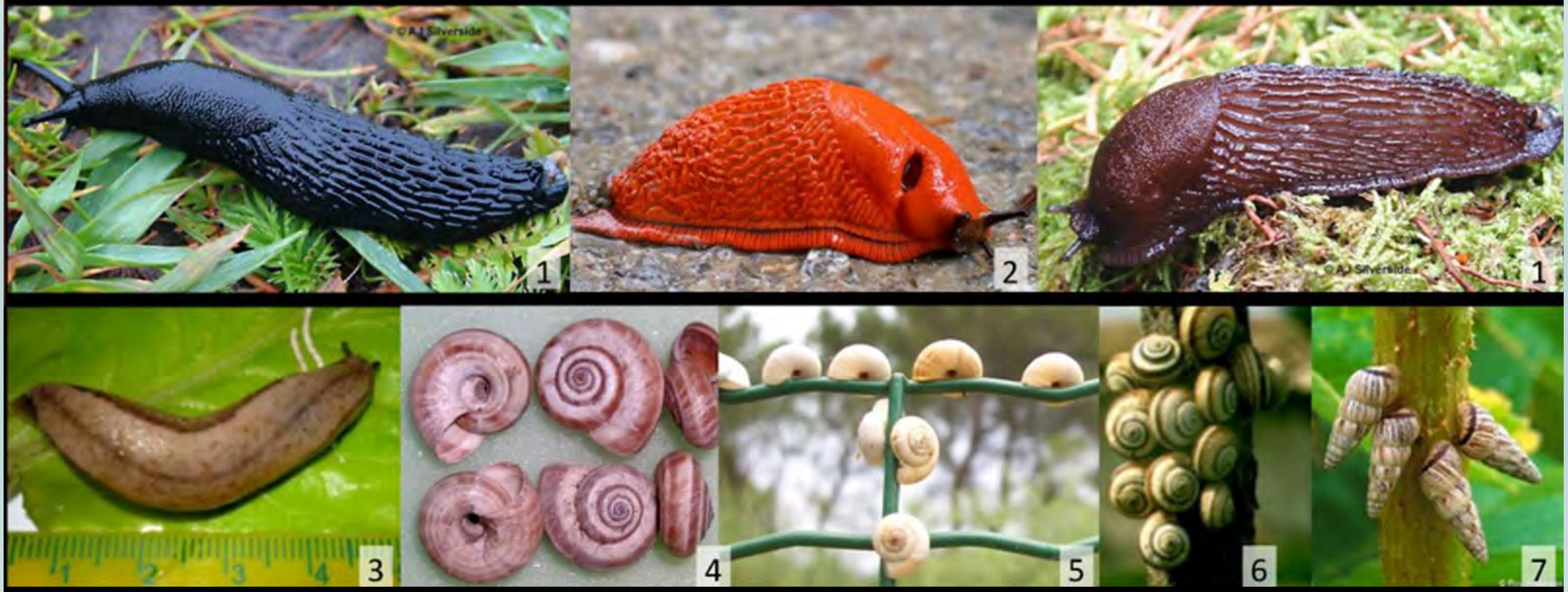


Photo credits: (1) *Arion ater* © A.J. Silverside, lastdragon.org; (2) *Arion rufus* © J. Herder, digitalnature.org; (3) *Meghimatium pictum* © Paulo Lenhard, Project AM, terrslugs.lifedesks.org; (4) *Monacha sp.* © L. Kolouch, biolib.cz; (5) *Cernuella virgata* © Vmenkov, Wikipedia; (6) *Cernuella virgata* © L. Poggiani, HU lavalle delmetauro. itU; (7) *Cochlicella sp.* © Dr. Roy Anderson, MolluscIreland.

maine MAINE DEPARTMENT OF AGRICULTURE CONSERVATION & FORESTRY

iNaturalist Explore Learn Record

Karen Coluzzi, Maine DACF – Merrymeeting Bay, 3/11/2026

Acknowledgements: Haley Depner-Bruce, Maine DACF

Background

- **Master of Science in Entomology** University of Maine, Orono; 2005
  - Researched biocontrol of Colorado potato beetle

- **State Survey Coordinator** Maine Department of Agriculture, Conservation and Forestry
  - 2003 – present
  - Division of Animal and Plant Health (formerly, Plant Industry)
  - Administers CAPS Program
  - Secures federal funding to conduct survey and outreach projects

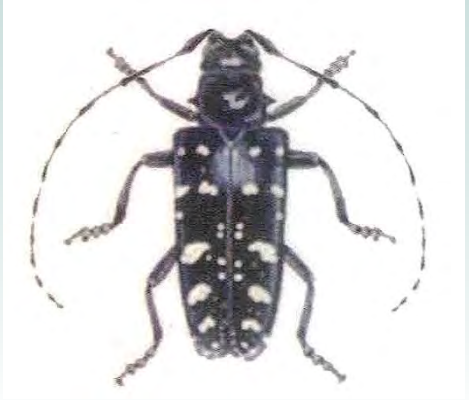
CAPS
Cooperative Agricultural Pest Survey

- **Funded** through USDA (APHIS PPQ – Animal and Plant Health Inspection Service, Plant Protection Quarantine)
- **Purpose:** to provide a second line of defense behind port inspections against the entry of harmful *plants pests and weeds*.
  - Protects our agriculture and natural resources from exotic organisms that could establish and potentially become invasive
  - Each state has a CAPS Program
- **How it works:**
  - Choose target pests from USDA's priority pest list
  - Develop workplans
    - 12-month projects
    - Survey – traps/lures, sampling, visual

CAPS
Cooperative Agricultural Pest Survey

- **How it works (continued):**
  - Conduct outreach projects
    - Additional work with competitive funds
    - Enhance/increase public awareness
    - *Because private citizens often find things first*

- **Examples of Outreach Projects conducted under CAPS in Maine**:
  - Forest Pest Outreach and Survey Project



  - Firewood Outreach

CAPS

Cooperative Agricultural Pest Survey

- **<u>Examples of Outreach Projects (continued)</u>**:
  - Terrestrial Mollusk Outreach (aka Slime ME)

Why?

USDA Watchlist

- **<u>Terrestrial Snails and Slugs are on the National Priority Pest List</u>** over 20 species
  - Invasive species – threats to agriculture and animal health

Giant African Land Snail – in HI and FL

Spanish Slug (Arion vulgaris) – in Canada

In Maine

- **Arion ater (European black slug)**

Spanish Slug (Arion vulgaris) – in Canada

- Reported by a citizen; collected and confirmed in Maine, 2018
- Only found on Vinalhaven
- Need molecular analyses to tell apart from Arion vulgaris

2021 - CAPS Survey

2021

Survey Project

To determine how widespread Arion ater is in Maine

- On islands, near ferry terminals, in garden centers
- Visual survey – 10 sites; using beer-baited cardboard
- Outreach – sent letters and postcards to land trusts, extension offices, etc.

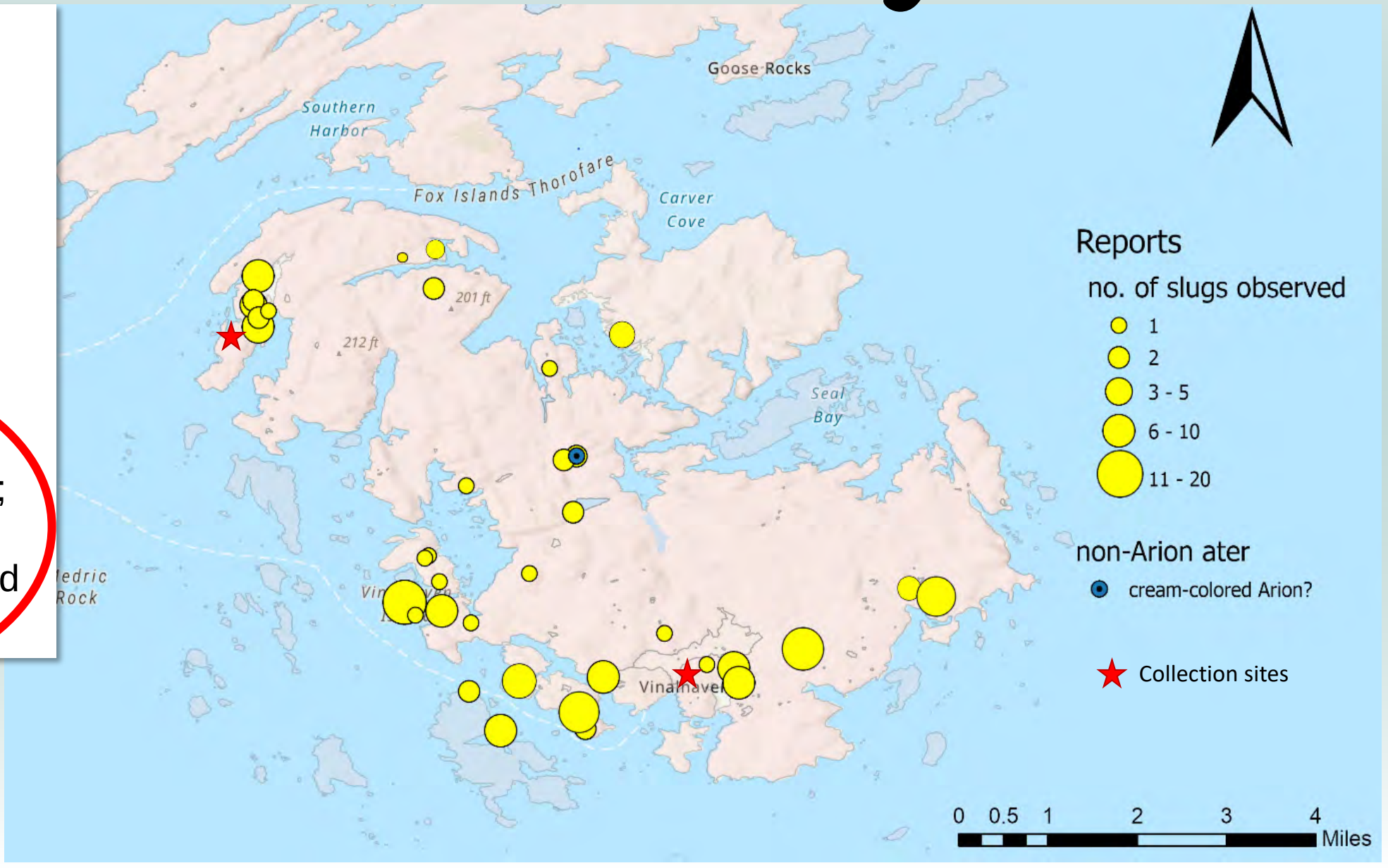
2021 – CAPS Survey

2021

Survey Project Results

- Visual survey – 10 locations; no Arion recovered

- Outreach – 53 reports with photos; most were large black slugs assumed to be Arion ater.



Exotic snails and slugs on USDA Watchlist

Maine's Target List	
Spanish slug	***Arion vulgaris***
Chinese slug	***Meghimatium pictum***
Hygromiid snails	***Cernuella spp.***
Maritime garden snail	***Cernuella virgata***
Cochlicellid snails	***Cochlicella spp.***
Hygromiid snails	***Monacha spp.***

common name	scientific name
Spanish slug	*Arion vulgaris*
Leatherleaf slugs	*Belocaulus spp.*
Leatherleaf slugs	*Colosius spp.*
Leatherleaf slugs	*Laevicaulis spp.*
Chinese slug	*Meghimatium pictum*
Leatherleaf slugs	*Sarasinula spp.*
Leatherleaf slugs	*Semperula spp.*
Leatherleaf slugs	*Veronicella spp.*
Wrinkled snail	*Candidula intersecta*
Brown lipped snail	*Cepaea nemoralis*
Hygromiid snails	*Cernuella spp.*
Maritime garden snail	*Cernuella virgata*
Cochlicellid snails	*Cochlicella spp.*
Burgundy snail	*Helix pomatia*
Girdled snail	*Hygromia cinctella*
Giant African snail	*Lissachatina fulica*
Hygromiid snails	*Monacha spp.*
Jumping snail	*Ovachlamys fulgens*
Golden apple snail	*Pomacea canaliculata*
Eastern heath snail	*Xerolenta obvia*
Hygromiid snail	*Xerotricha conspurcata*

SLIME ME 2024

Citizen Science Project

- To document terrestrial snails and slugs in ME
- While looking for invasive species

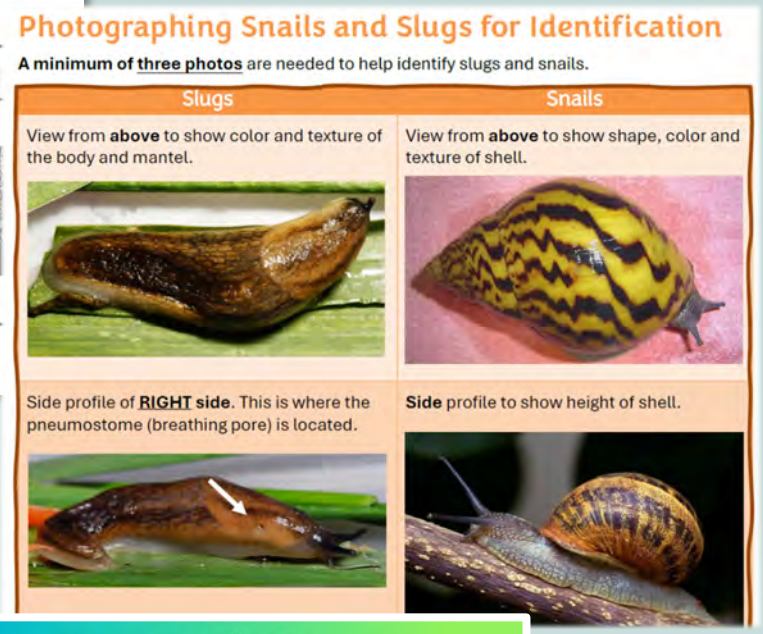
1. **iNaturalist**
   - Observers upload photos, location, and tentative i.d. (AI suggested)
   - Create project page: SLIME ME - catalogs all the uploads.
   - We review the page for accuracy and suspicious snails and slugs.

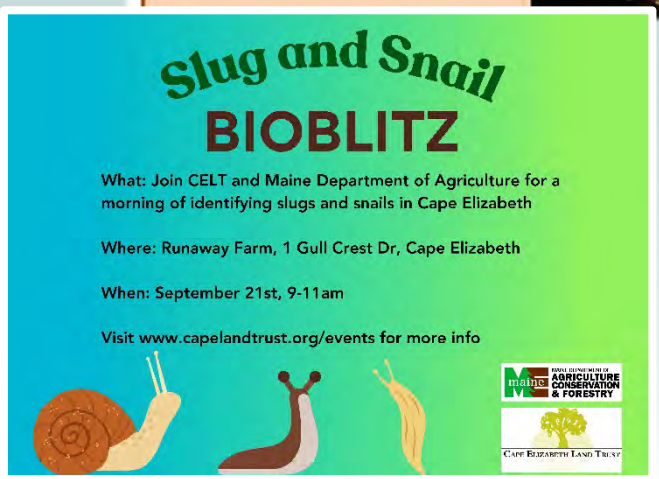
SLIME ME 2024

2. **Outreach materials**
   - Designed materials to introduce the project to the public

3. **Trainings**
   - Two in-person trainings about exotic mollusks, using iNaturalist, how to photograph specimens properly for ease of identifying…

4. **Bioblitz**
   - Hold two collecting events

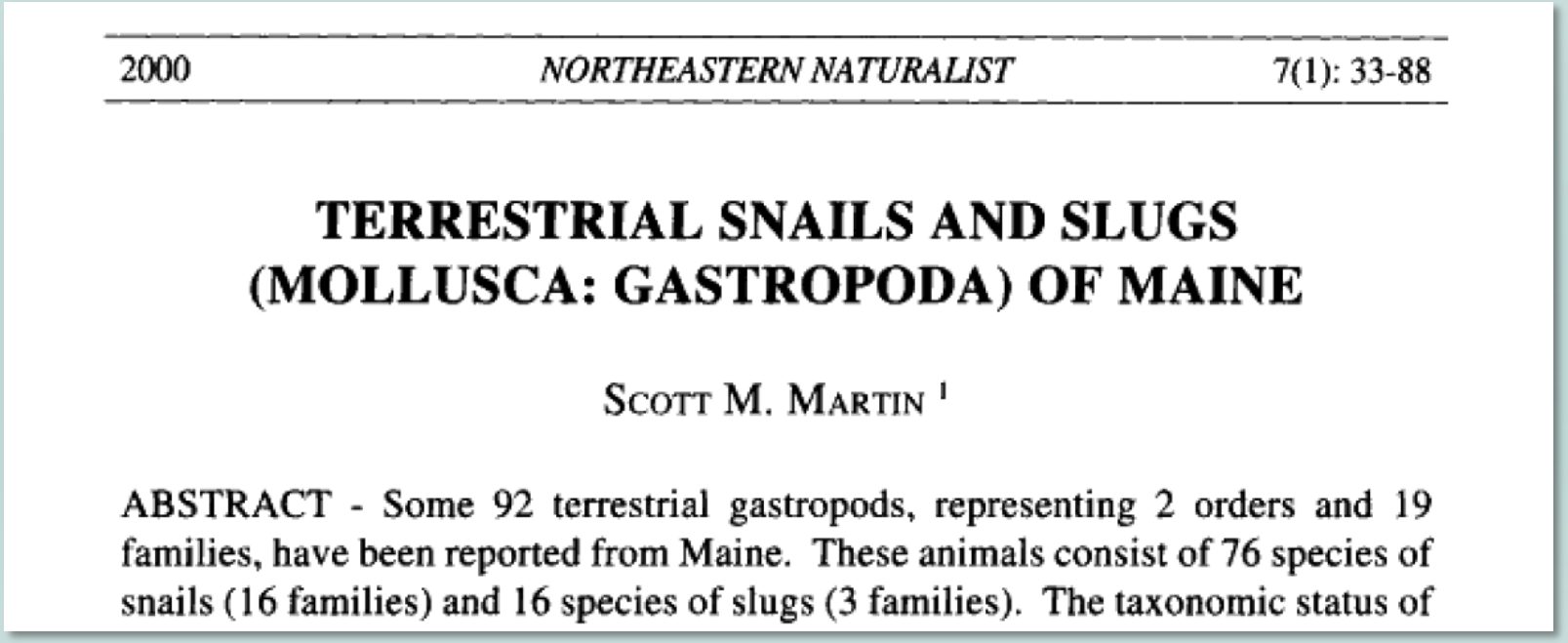




SLIME ME 2024

Past vs. Present

- Compare current observations with the terrestrial snails and slugs documented in Maine in 2000.
- Lists 92 species



2000 NORTHEASTERN NATURALIST 7(1): 33-88

TERRESTRIAL SNAILS AND SLUGS (MOLLUSCA: GASTROPODA) OF MAINE

SCOTT M. MARTIN [1]

ABSTRACT - Some 92 terrestrial gastropods, representing 2 orders and 19 families, have been reported from Maine. These animals consist of 76 species of snails (16 families) and 16 species of slugs (3 families). The taxonomic status of

Though:

- Original identifications could be wrong
- Species names were used interchangeably in the past

- This comparison could *help determine if some species have gone extinct, have been misidentified, or are new to the state*.

What are snails and slugs?

Kingdom: Animal = multicellular, eukaryotic organisms
Phylum: Mollusca = invertebrates; mantle covering the internal organs
Class: **Gastropoda** = "belly foot"; snails and slugs

Some famous mollusks:

Bivalves (clams)

Cephalopods

Gastropods

What are snails and slugs?

- **Gastropods**: second only to the insects in terms of diversity
- 65,000 to 80,000 living species
- found in saltwater, freshwater, and terrestrial habitats

Marine (saltwater)

whelks, conchs, periwinkles

nudibranchs (sea slugs)

Aquatic (freshwater)

apple and mystery snails

rare

Terrestrial (land)

garden snails, amber snails

leopard, garden, round-back

Snails vs. Slugs

snails: can withdraw into an external shell

- Protection from predators
- Protection from desiccation

white-lipped snail; *Cepea hortensis.*
Photo by: Arnstein Rønning

semislug: retains a partial external shell

- No apparent benefits

Semi-slug, *Helicarion nigra*.
Photo by: Adnan Moussalli

slugs: without an external shell

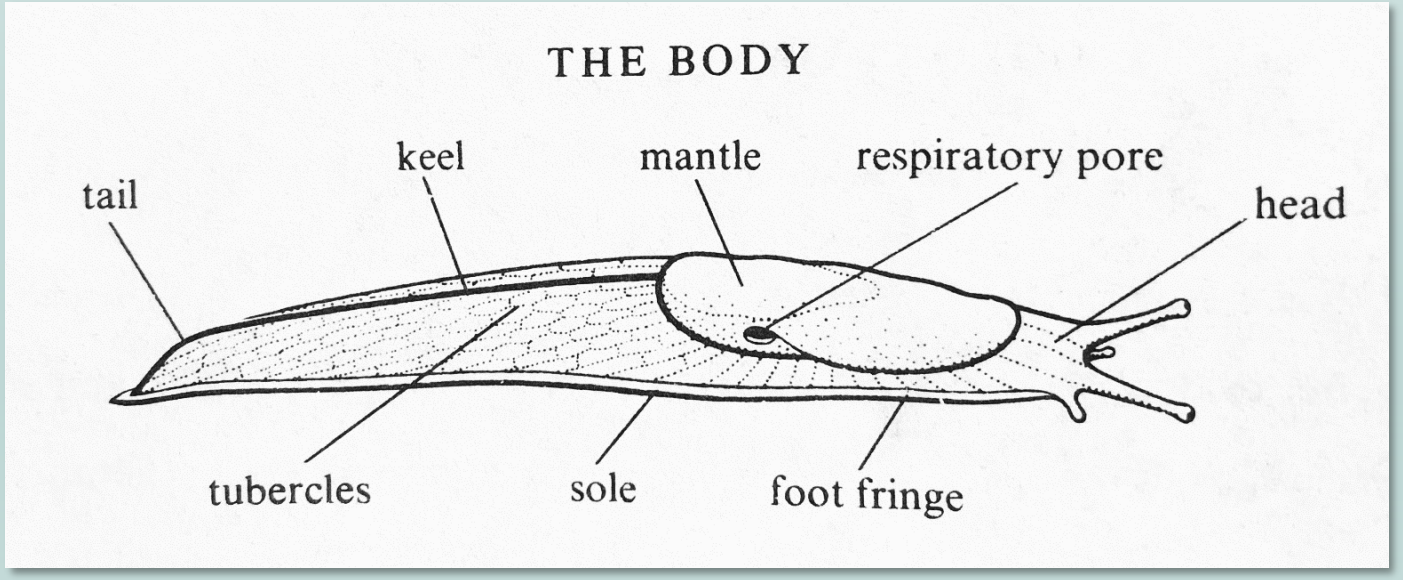
- No calcium environment
- Hide in small holes

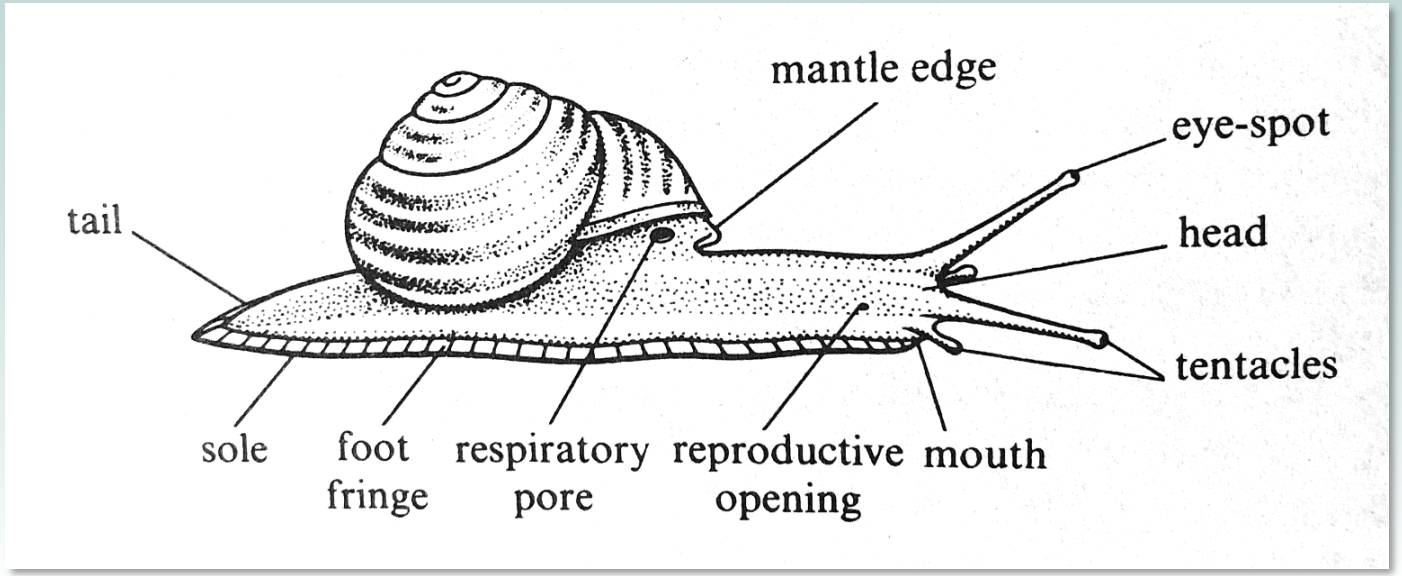
dusky slug; *Arion subfuscus*
Photo by: Gary Bernon, USDA APHIS

Snail and Slug Anatomy

External anatomy similar

- Mantle
- Pneumostome (breathing pore)
- Tentacles
  - upper pair with eyes
  - lower pair sensory
- Mouth with *radula* (toothed tongue)
- Foot
  - foot fringe
  - sole





Life Cycle of Snails

Oviparous (mostly; fertilized eggs are laid)

- Some snails (and slugs) mate once then die; some can mate multiple times
- Egg-laying usually occurs in summer or fall
- They hatch with a small translucent shell
- The shell grows by adding calcium to the outer edge

Life Cycle of Slugs

Oviparous (mostly; fertilized eggs are laid)

- Laid singly or in clusters
  - Where they won't dry out (soil, under wood or leaf litter…)
- Eggs hatch in 2-4 weeks
- Juveniles are active and feed as soon as they hatch
- Adults are bigger versions of juveniles – *in appearance*

Photo by: J. Obermeyer

Derocerus laeve Photo: Charlene Donahue

What do they eat?

- Herbivores
  - Plant material – leaves, stems, fruit, bark, wood
- Fungivores
  - Fungi, algae, mushrooms
- Detritivores
  - Animal scat, carcasses, rotting organic matter
- Carnivores
  - Insects, nematodes, earthworms, other slugs
- Inorganic material
  - Soil and rock particles, especially snails

Are snails and slugs bad?

The PROS:

- Help decompose organic matter – nature's recyclers
- Food for birds, amphibians, beneficial insects, and *humans!*
- Pollinators and spore dispersers

Photo by: Karl H. Switak

Are snails and slugs bad?

The CONS:

- Some feed on important ornamental and agricultural crops

- Can transmit harmful diseases; e.g. rat lungworm

Snails in Maine (Martin, 2000)

76 species are known

- 72 species are native to U.S.
- **4 are non-native** *(pictured here).* P.S. “non-native” doesn’t equal invasive.

Rotund disc (small)

Discus rotundatus
Photo: Roy Anderson

Cellar glass snail (small)

Oxychilus cellarius
Photo: Roy Anderson

Hairy hellicellid (small)

Trochulus hispidus
Photo: Roy Anderson

Brown garden snail (big)

Cornu aspersum
Photo: juliegraham173

Native Snails (Martin, 2000)

72 species are native to U.S.

Here are some

Vertigo Snails
(Vertigo spp.)

Glyph Snails
(Glyphyalinia rhoadsi/indentata)

White-Lipped Garden Snail
(Cepaea hortensis)

Pillar Snails
(*Cochlicopa spp.*)

White-Lip Globe
(Mesodon thyroidus)

Boreal Top
(Zoogenetes harpa)

Blue Glass Snail
(*Perpolita binneyana*)

Pill Snails
(Euchemotrema spp.)

Flamed Tigersnail
(*Anguispira alternata*)

Slugs in Maine (Martin, 2000)

16 species are known

- **5 species are native to U.S.** *(pictured here)*

Mantleslugs – the mantle covers the whole body.

Meadow slug > 1”

Derocerus leave
Photo: Charlene Donahue

Pale mantleslug > 1”

Pallifera dorsalis
Photo:© Jason M Crockwell

Redfoot mantleslug ~1.5”

Pallifera ohioensis
Photo:© Dan Dourson

Winding mantleslug ~3”

Philomycus flexuolaris
Photo:© Jason M Crockwell

Carolina mantleslug ~3.5”

Philomycus carolinianus
Photo: Matthew Hammond

Non-native Slugs (Martin, 2000)

- **11 species are non-native**

Limacids – “keelback” slugs

Milky slug ~ 2”

Deroceras reticulatum
Photo: Bruce Martin

Tree slug ~ 3”

Lehmannia marginata
Photo: Elliot, eskybar123

Yellow cellar slug ~ 3”

Limacus flavus
Photo: James Calder

Leopard slug > 5”

Limax maximus
Photo: Surry Docks Farm

Non-native Slugs (Martin, 2000)

Arionids – "roundback" slugs – *7 species*

Hedgehog slug < 1"

Arion intermedius
Photo: Jesse Rorabaugh

Brown-banded Arion ~ 1.5"

Arion circumscriptus
Photo: AJ Dreves

Garden Arion ~ 1.5"

Arion hortensis
Photo: Peter Wilson

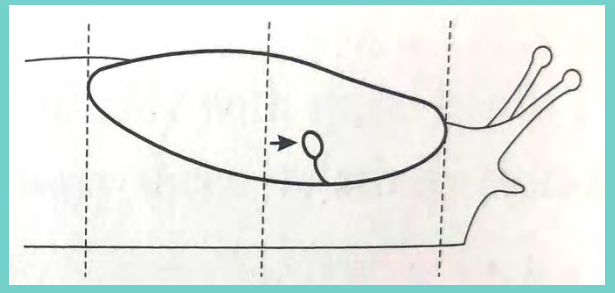
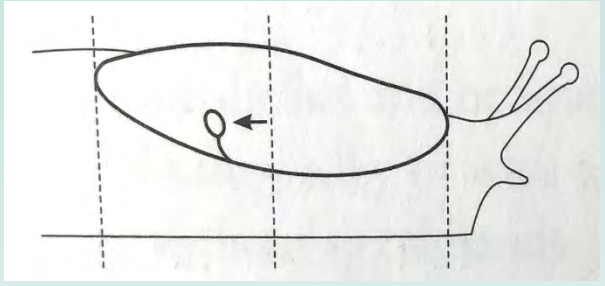
Dusky slug ~ 2.5"

Arion subfuscus
Photo: Gary Bernon

Black slug > 3.5"

Arion ater?
Photo: Juan I. Dean

Limacid vs. Arion

	Keel	Breathing pore (pneumostome)	
Arion spp.	none	 Anterior half of mantle	
Limacid spp.		 Posterior half of mantle	

Photographing Slugs for Identification

View from **above** to show color and texture of the body and mantel.

Side profile of **RIGHT side.** This is where the pneumostome (breathing pore) is located.

Include the **sole** (underside) of the slug to show the color of the sole and the mucus .

Slug dorsal view: Joseph Berger, Bugwood.org
Slug right side: Joseph Berger, Bugwood.org
Slug underside: Frank Peairs, Colorado State University, Bugwood.org

Photographing Snails for Identification

View from **above** to show shape, color and texture of shell.

Side profile to show height of shell.

Include the **shell opening** to illustrate the shape of the aperture.

Snail dorsal view: Yuri Yashin, achatina.ru, Bugwood.org
Snail side profile: Dani Barchana, Bugwood.org
Snail underside: Charles Olsen, Charles Olsen Insect Collection, USDA APHIS PPQ, Bugwood.org

How to use iNaturalist

- Download app or log on to inaturalist.com
- Create an account
- Take photos directly from phone in app or upload from a photo gallery or desktop computer
- Click SHARE
  - All terrestrial gastropod observations in Maine automatically added to project.
- Join project to see what others have found!

https://www.inaturalist.org/projects/slime-me-terrestrial-gastropods-of-maine

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About

Leave 13

This citizen science project aims to catalogue terrestrial gastropods found in Maine to better understand our local biodiversity and to screen for newly introduced invasive slugs and snails. The reliance on targeted surveys to look for potentially harmful slugs and snails can be time consuming, inefficient, and ineffective for a

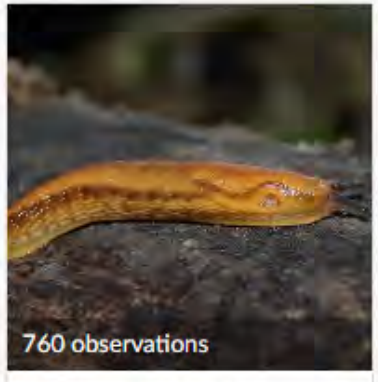
Read More ›

Your Membership

Edit Project

Project Journal

Overview | 5,613 OBSERVATIONS | 62 SPECIES | 438 IDENTIFIERS | 2,498 OBSERVERS | Stats



Western Dusky Slug
Arion subfuscus

Leopard Slug
Limax maximus

Oval Ambersnail
Novisuccinea ovalis

Eastern Whitelip
Neohelix albolabris

Tree Slug
Lehmannia marginata

SLIME ME Terrestrial Gastropods of Maine

iNaturalist page

- Watchlist:

Maine's Target List	
Spanish slug	*Arion vulgaris*
Chinese slug	*Meghimatium pictum*
Hygromiid snails	*Cernuella spp.*
Maritime garden snail	*Cernuella virgata*
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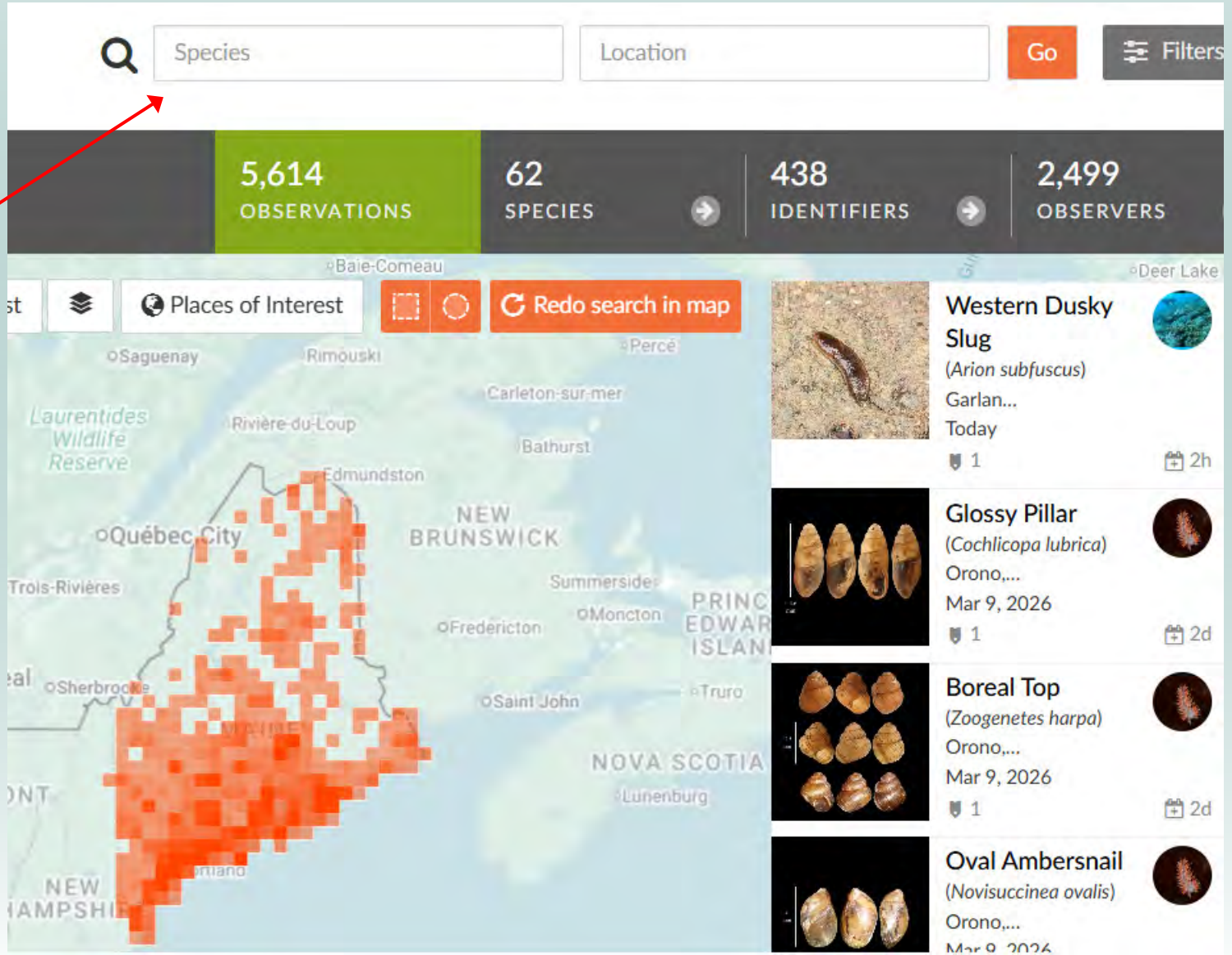

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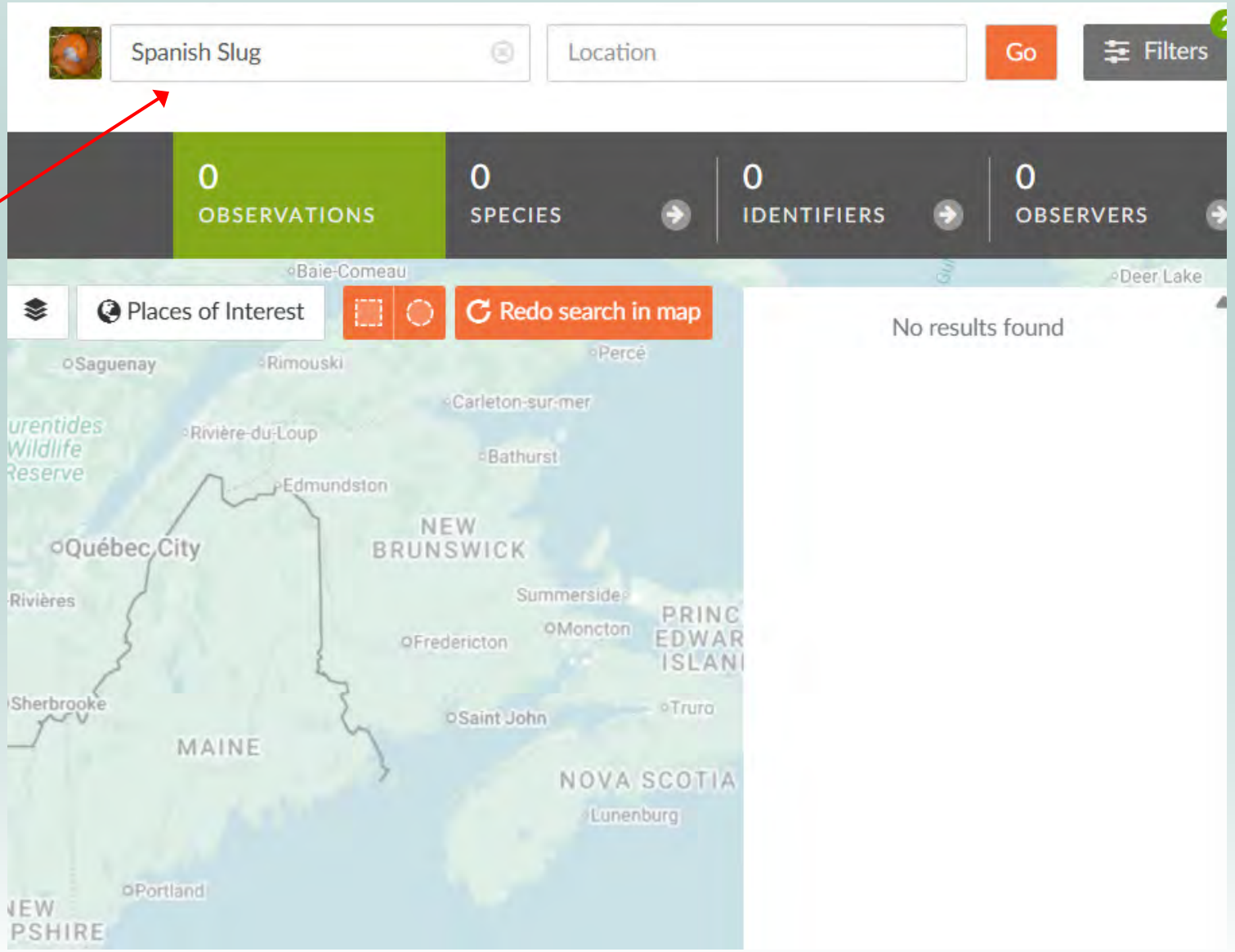
No results found for all targets on watchlist

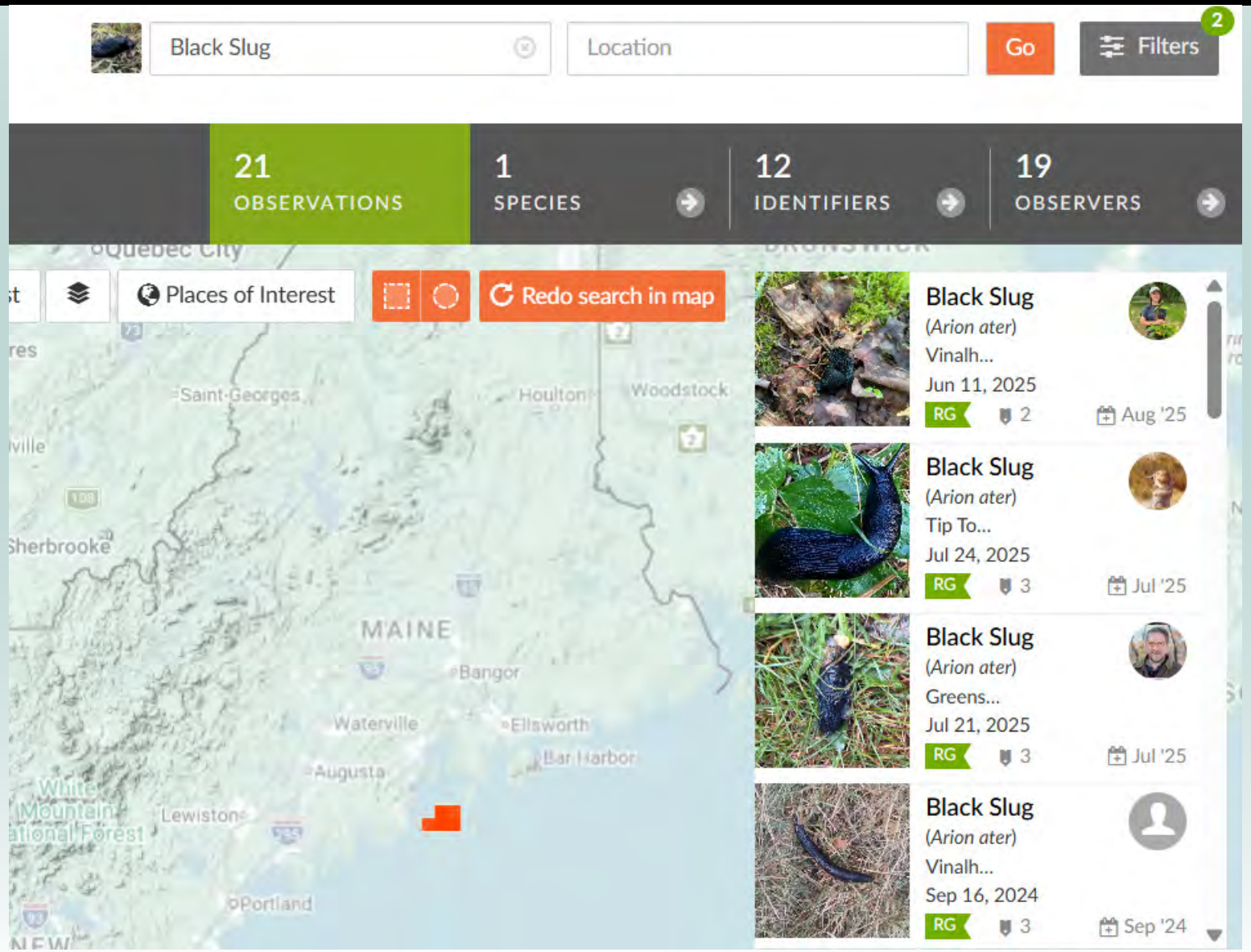


SLIME ME Terrestrial Gastropods of Maine

iNaturalist page

- Search for Arion ater

- 21 observations of Arion ater
- all on Vinalhaven



Future Work

1. Compare iNaturalist observation species with Martin, 2000
   - 92 species vs. 62
     - Which species are missing
     - Which species have been renamed or lumped together
     - Are there any species differences?

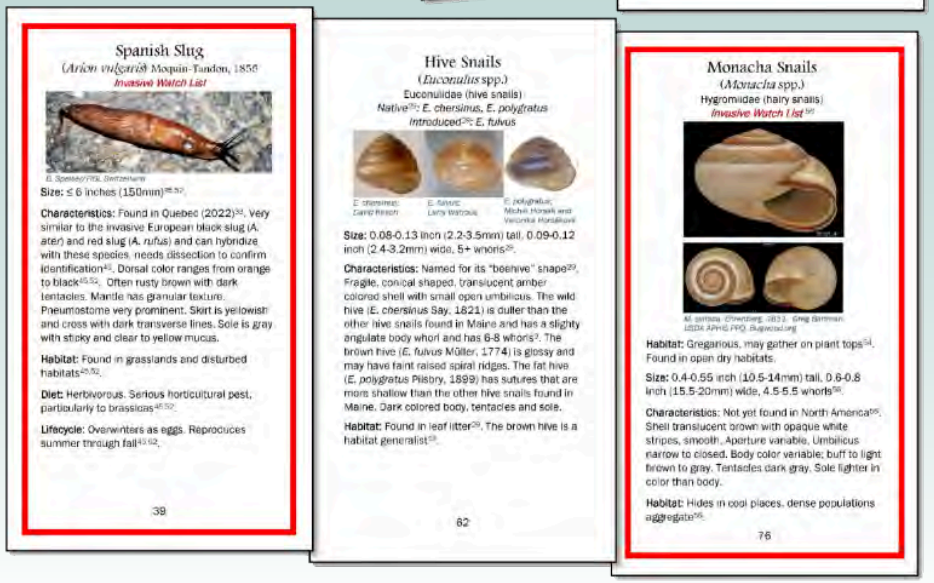
2. Continue monitoring page for any new species / verify identifications

3. Finish Field Guide!

SLIME ME 2024

Field Guide

- Create a pictorial guide of terrestrial snails and slugs in Maine
  - Based on Martin's document
  - New observations in iNaturalist
  - Including species that are exotic and on the "watch list"
- Not ready
  - Federal government disruptions halted vetting process
  - Grant funding ended



Questions?

Image: vetexplainspets.com