

Biological Control of Invasive Annual Grasses

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Invasive annual grasses in the Intermountain West

- ❖ Cheatgrass (*Anisantha tectorum*)
- ❖ Red brome (*Anisantha rubens*)
- ❖ Medusahead (*Taeniatherum caput-medusae*)
- ❖ Wiregrass (*Ventenata dubia*)

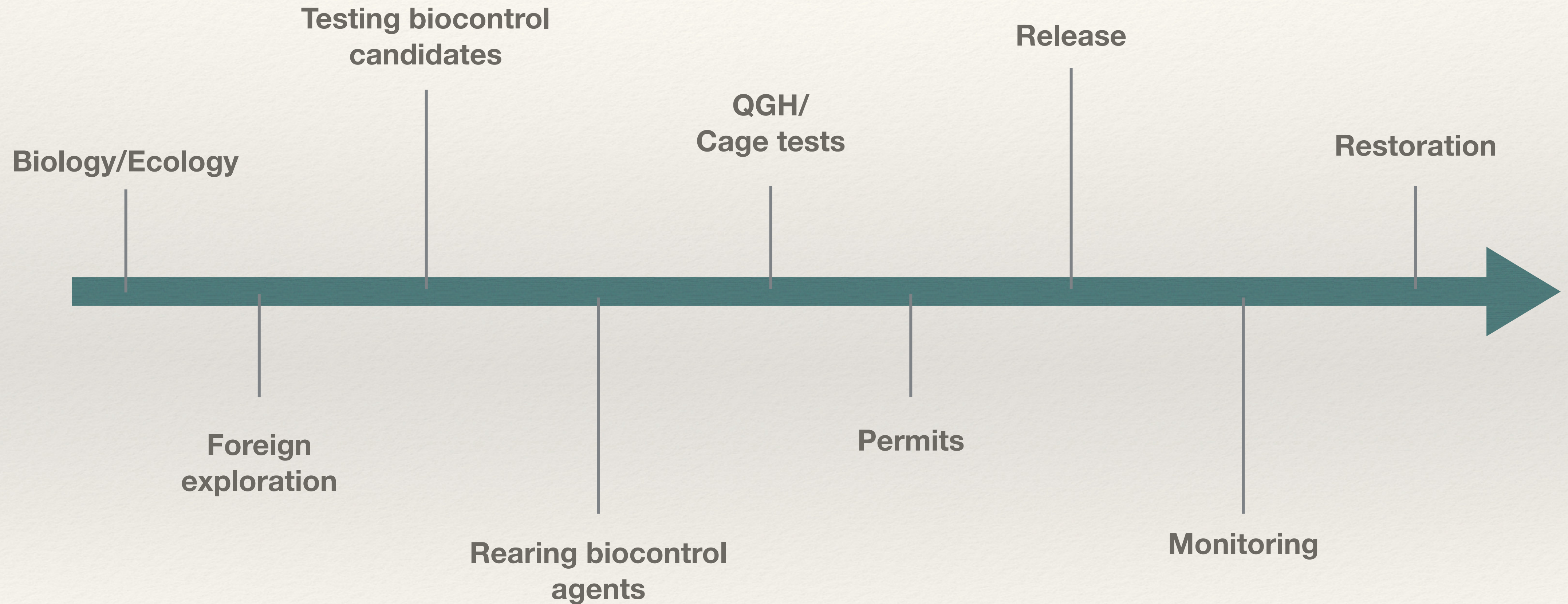


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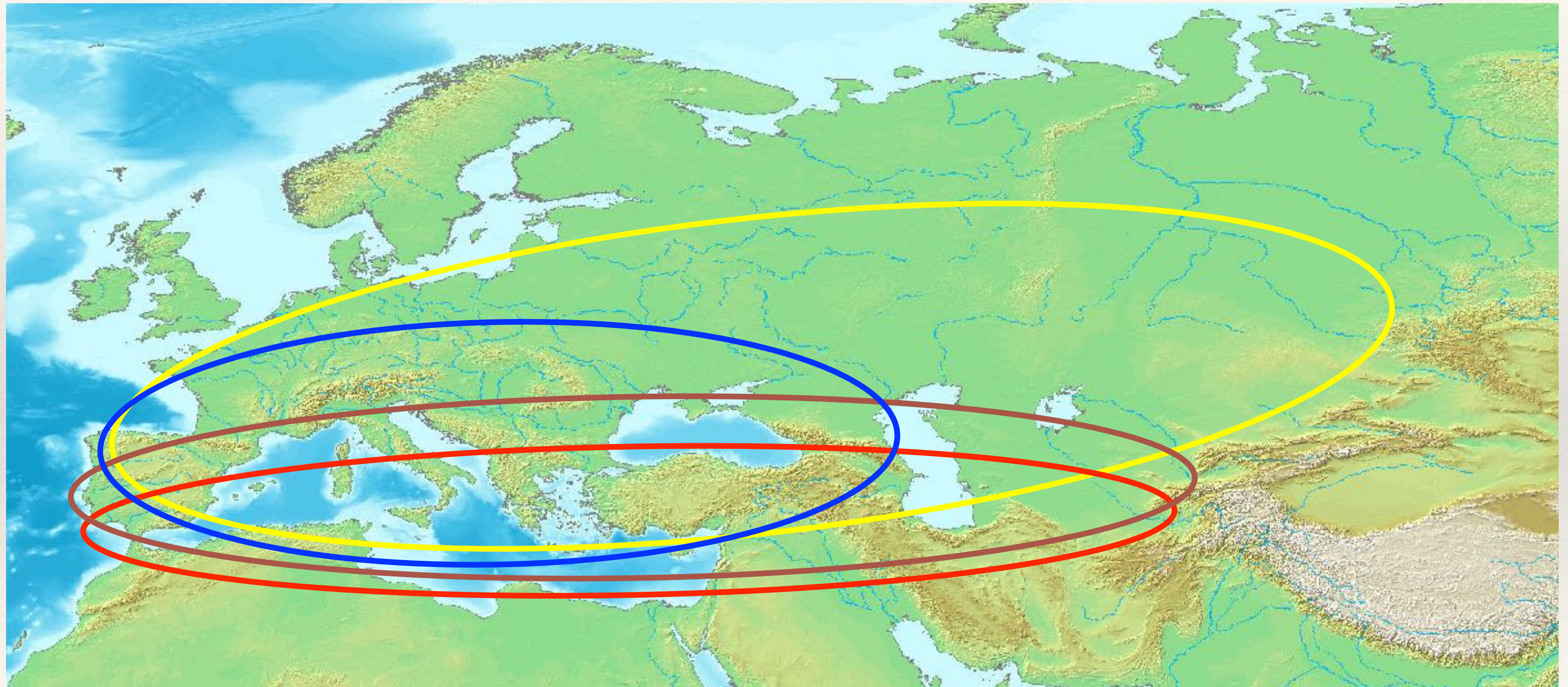
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Biological Control Timeline



IAG native ranges (approximate)



— cheatgrass — medusahead — red brome — wiregrass

Natural enemy exploration

- ❖ Where to look?
 - ❖ Target plant may be rare in native range
 - ❖ Visit local herbarium
- ❖ Be aware of related “look-alike” species
 - ❖ More common in native range than invaded range
- ❖ Establish contacts
 - ❖ Local knowledge
 - ❖ Logistical support

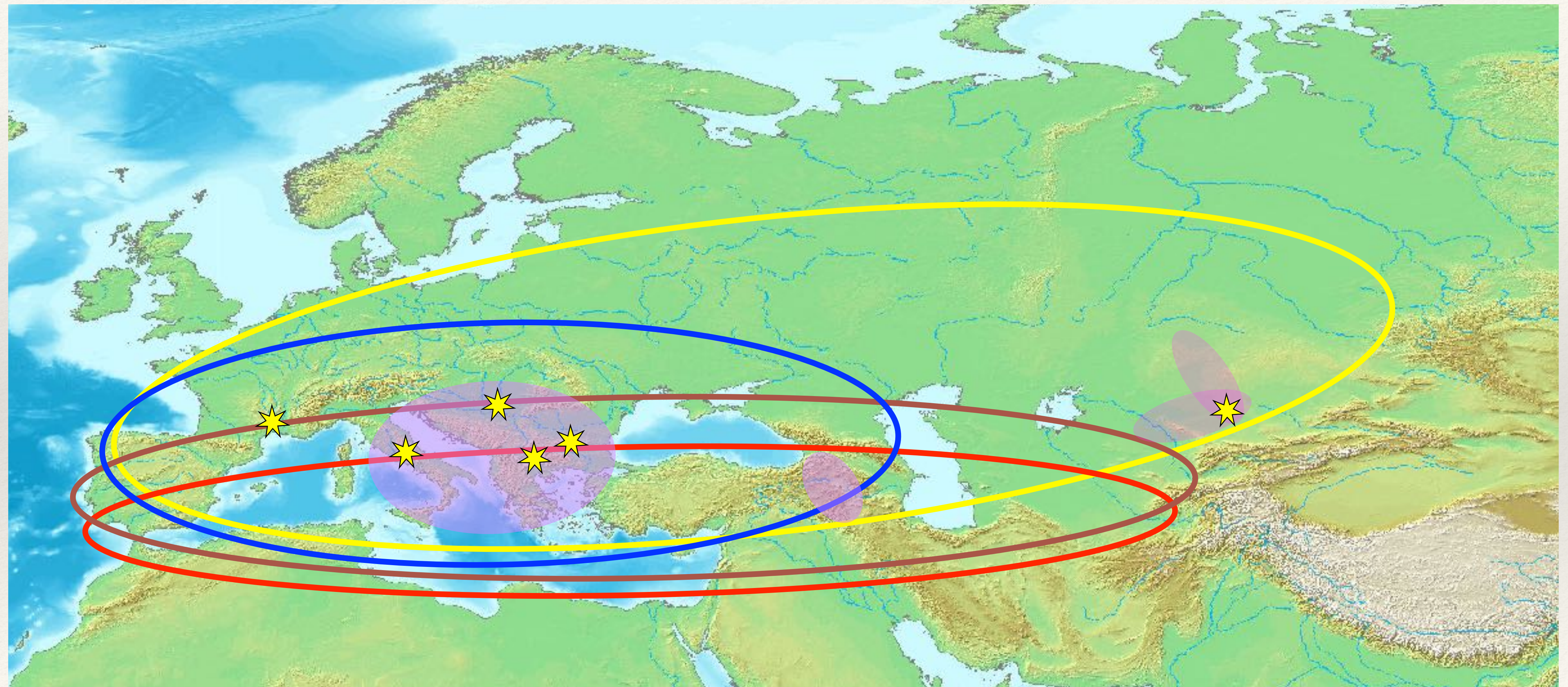


Climate matching + soil types

- ❖ With experience, develop a habitat profile for the target
- ❖ Medusahead favors clay, occluded soils
- ❖ Cheatgrass competes best in shallow soils; look for exposed bedrock
- ❖ Recognize frequently sympatric “friends”
- ❖ Similarities with invaded range
 - ❖ Climate
 - ❖ Habitat types

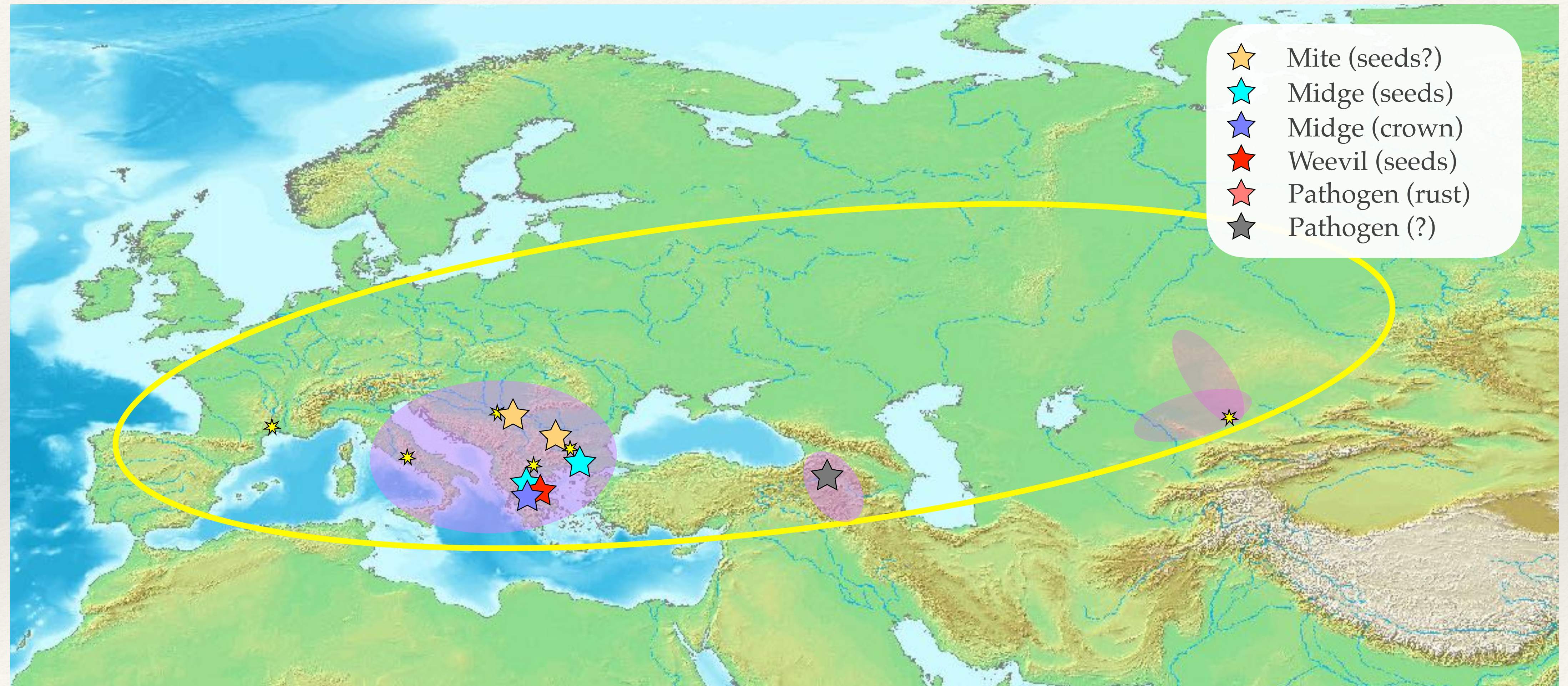


LAG native range surveys 2014-23



— cheatgrass — medusahead — red brome — wiregrass

Cheatgrass natural enemies discovered



— cheatgrass — medusahead — red brome — wiregrass

Aculodes marcelli (Acari: Eriophyidae)

- ❖ New species discovered in central Bulgaria in 2017
- ❖ Close relative of medusahead mite
- ❖ Vagrant mite (does not induce galls)
 - ❖ Tests underway to determine impact
 - ❖ Seed damage? Reduced germination?



Stenodiplosis tectori (Diptera: Cecidomyiidae)

- ❖ New species discovered in northern Greece in 2018
- ❖ Close relative of well studied midge on smooth brome
 - ❖ Extensive biological information for that system
- ❖ Larvae replace seeds
 - ❖ One larvae, one seed replaced
 - ❖ Multivoltinism possible



Mayetiola bromi (?) (Diptera: Cecidomyiidae)

- ❖ Found in central Greece in 2023
 - ❖ Described from cheatgrass
- ❖ Close relative of well studied hessian fly
 - ❖ DNA fingerprinting separates them
 - ❖ Adult specimens needed for definitive ID
- ❖ Larvae feed in stem and prevent flowering
 - ❖ No seeds produced from stem



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Pachytychius nr. *hordei* (Coleoptera: Curculionidae)

- ❖ Found in central Greece in 2019
- ❖ Cryptic species of well studied minor cereal pest
 - ❖ DNA fingerprinting separates them
 - ❖ Adult specimens, full life-cycle needed for new species description
- ❖ Larvae feed in seeds
- ❖ Field observations of sympatric cereals



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Photo: Franca Di Cristina

Puccinia spp. (?) (Basidiomycota: Pucciniaceae)

- ❖ Found in northern Greece in 2023
- ❖ No rusts have been recorded from cheatgrass
 - ❖ Several common cereal rusts
- ❖ Samples sent to USDA-ARS, Frederick, MD for further analysis

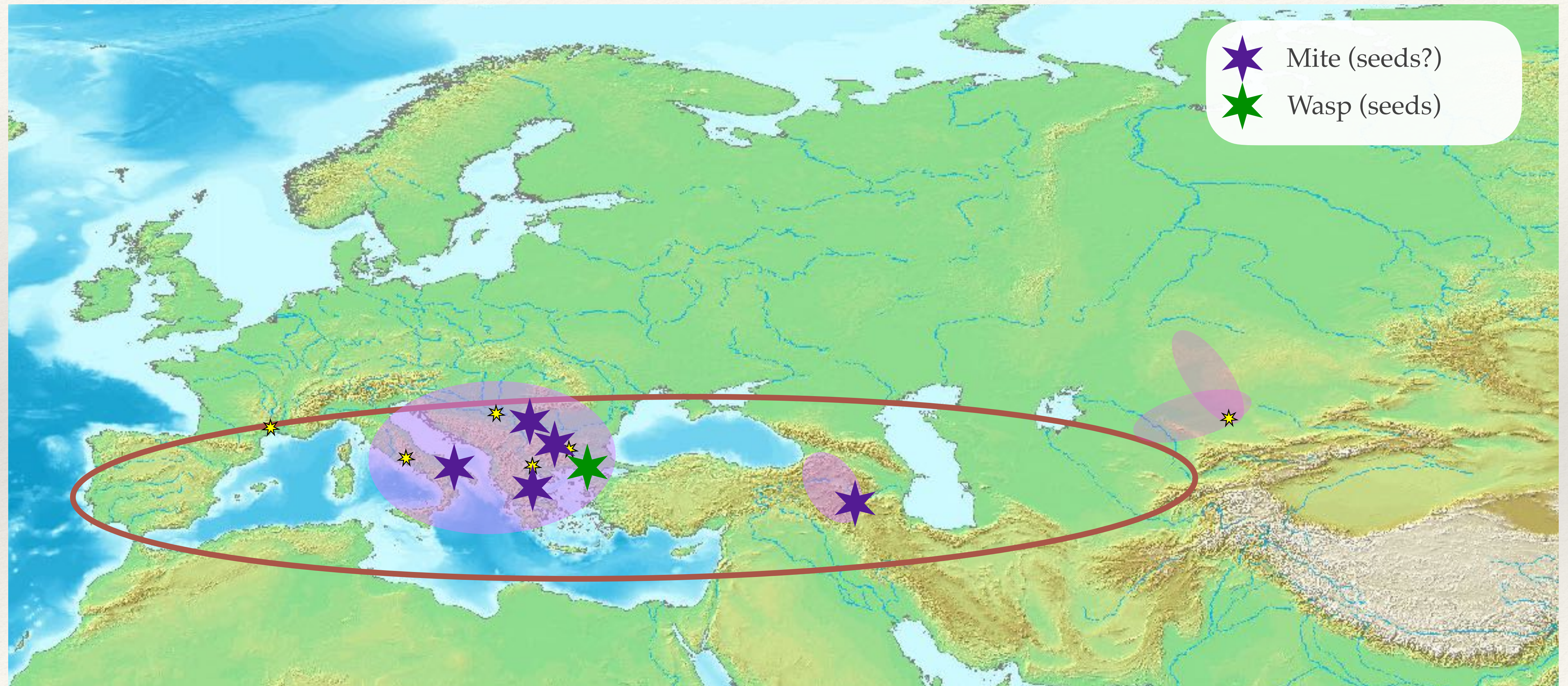


Unknown pathogen

- ❖ Found in Armenia in 2023
- ❖ Black streaks on leaves
- ❖ Samples sent to USDA-ARS, Frederick, MD for further analysis



Medusahead natural enemies discovered



— cheatgrass — medusahead — red brome — wiregrass

Aculodes altamurgiensis (Acari: Eriophyidae)

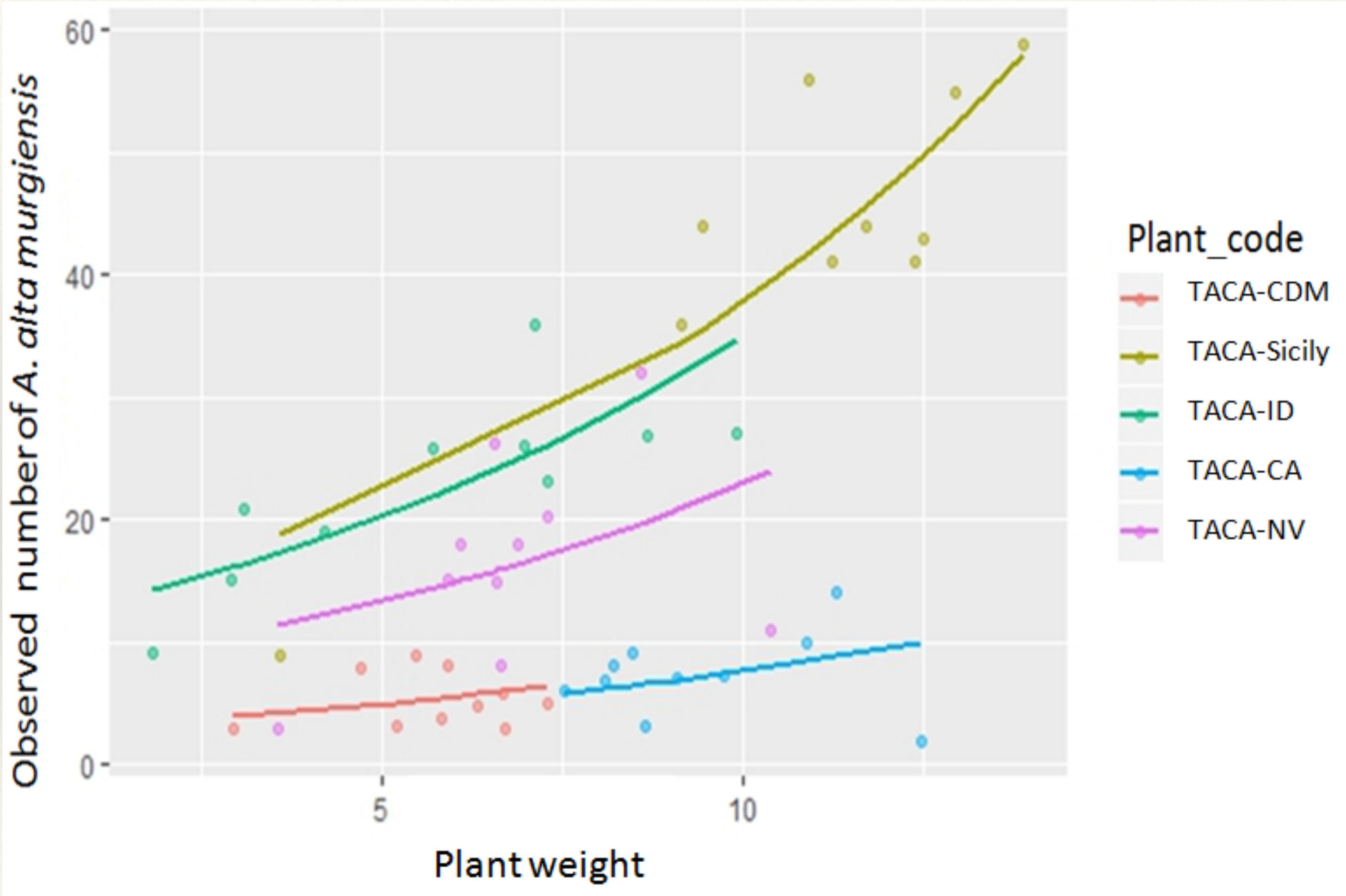
- ❖ New species discovered in southern Italy in 2014
- ❖ Close relative of cheatgrass mite
- ❖ Vagrant mite (does not induce galls)
 - ❖ Tests underway to determine impact
 - ❖ Seed damage? Reduced germination?
- ❖ Found in Lassen Co., Calif., in 2019
 - ❖ Subsequent searches unsuccessful
 - ❖ eDNA protocol under development



Photo: Dragica Smiljanic

Aculodes altamurgiensis (Acari: Eriophyidae)

<u>Test plant</u>	<u>Mite attack</u>
<i>Taca</i> (NV)	++
<i>Taca</i> (ID)	+++
<i>Taca</i> (CA)	+
<i>Taca</i> (Apulia, CDM)	+
<i>Taca</i> (Sicily)	+++
Bread wheat	-
Durum wheat	-
Barley	-
Foxtail barley	-
Maize	-
Oat	-



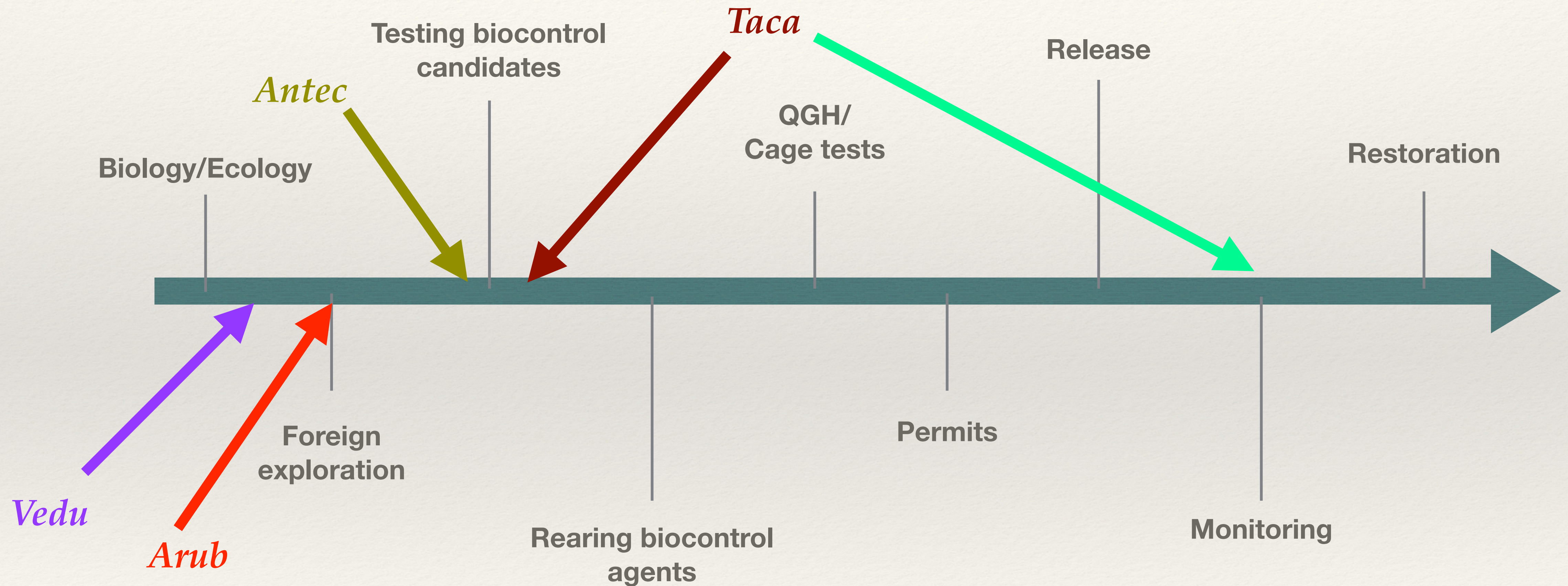
Tetramesa amici (Hymenoptera: Eurytomidae)

- ❖ New species discovered in northern Greece in 2017
- ❖ Seed galling
- ❖ Only one wild population known
 - ❖ Very close to Greek-Turkish border
 - ❖ Greek border police not very interested in USDA biocontrol programs
 - ❖ Search for additional populations



Photo: Javid Kashfi

LAG Biological Control Timeline



LAG biocontrol 2024 (and beyond)

- ❖ Get candidate agents into laboratory colonies
- ❖ Boots on ground in native range
- ❖ Preparation
- ❖ Right place, right time



Photo: Dragica Smiljanic

Acknowledgements

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