

Detecting an Eel Parasite Through eDNA and Zooplankton Tows



crustacean research & monitoring section

Jordan Parish

Marine Resources Research Institute



Zooplankton

- Nutrient recyclers

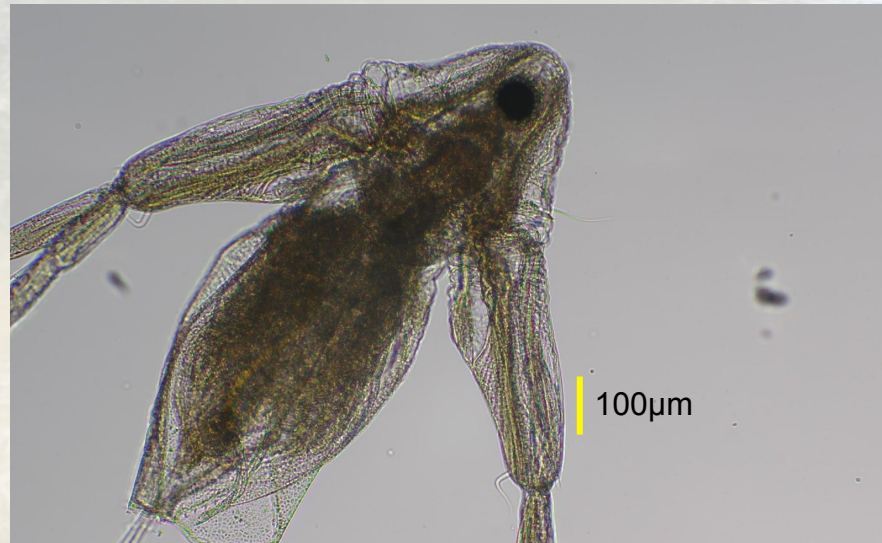
Mesocyclops



Daphnia



Diaphanosoma



Zooplankton

- Nutrient recyclers
- Key links in food webs

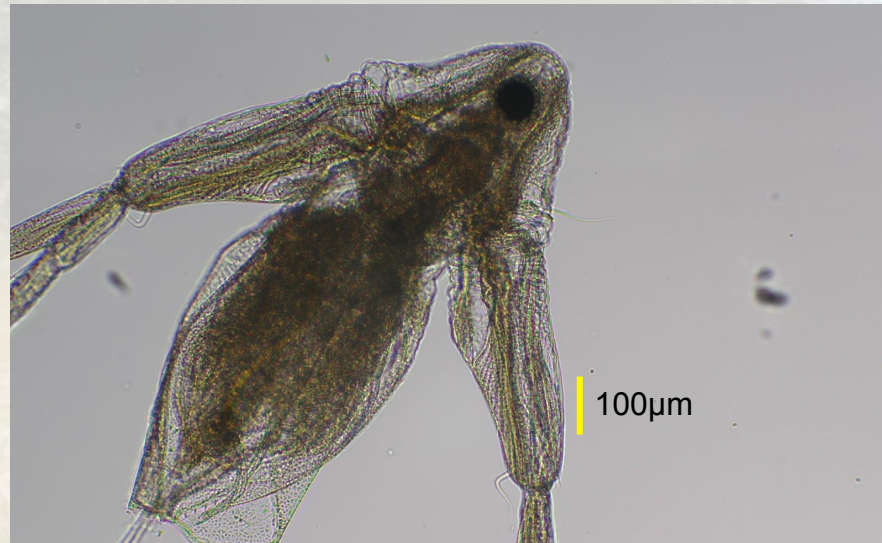
Mesocyclops



Daphnia



Diaphanosoma



Zooplankton

- Nutrient recyclers
- Key links in food webs
- Intermediate hosts

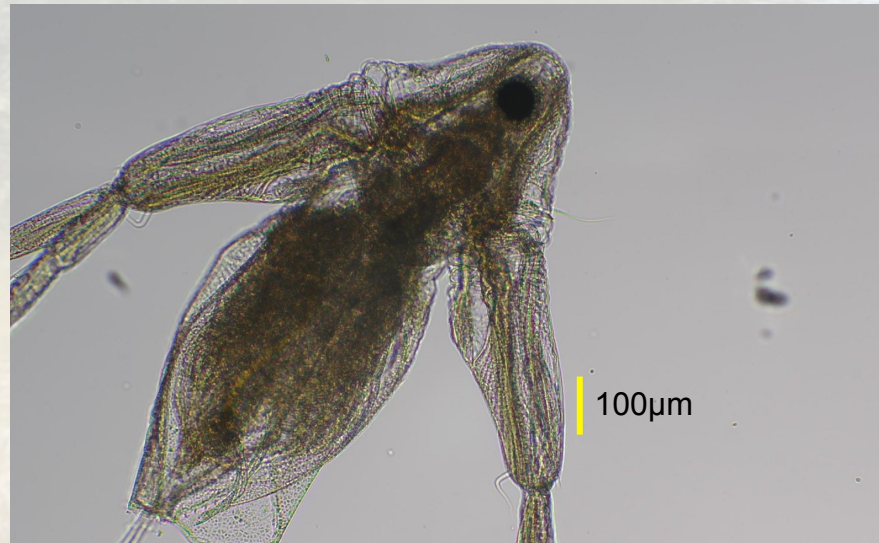
Mesocyclops



Daphnia



Diaphanosoma

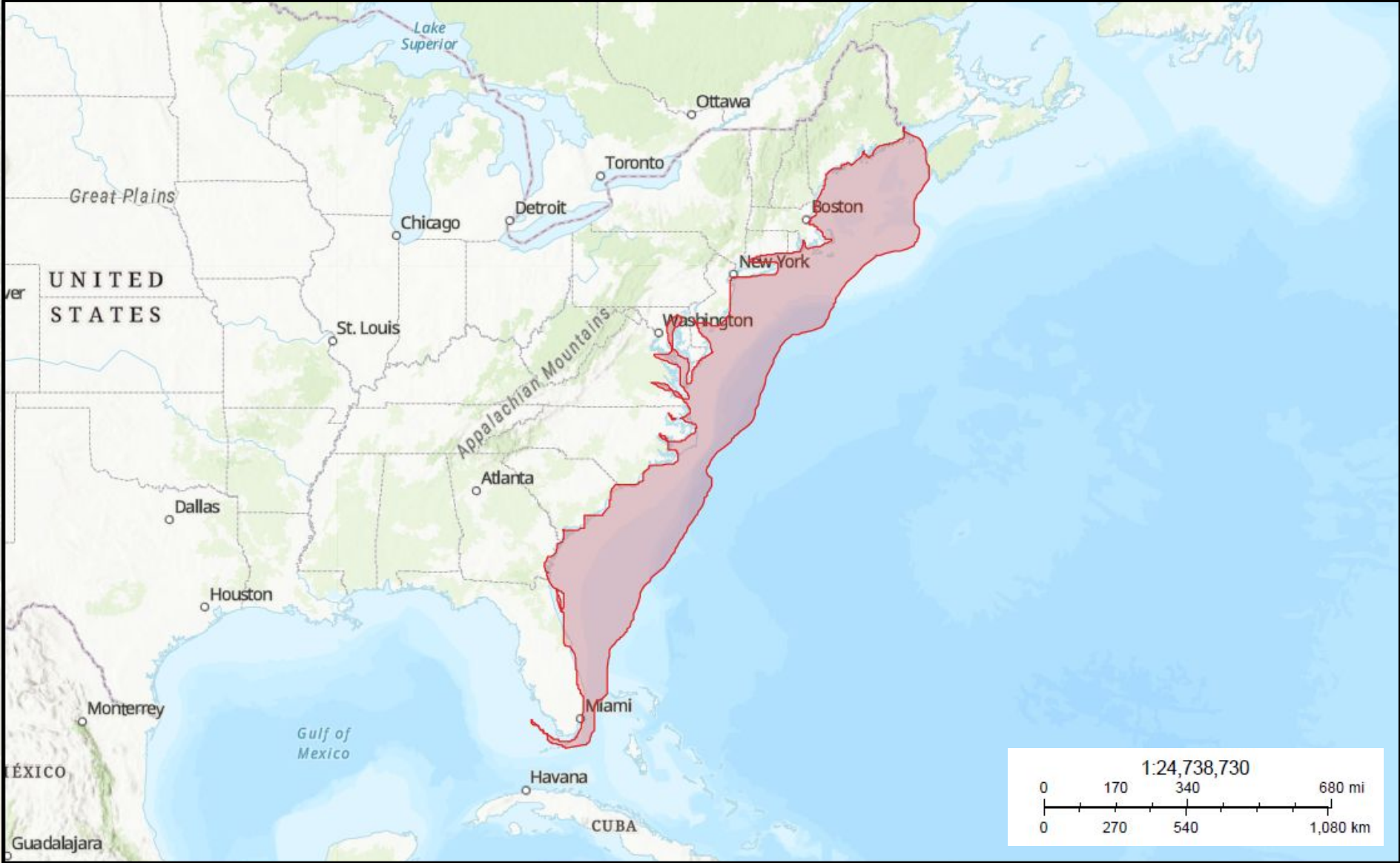




Anguillicola crassus

- Nematode
- Damages *Anguilla* spp. swimbladder
- Native to Asia
- First North American wild record in 1996 from SC

A. *Crassus* U.S. East Coast Distribution



A. crassus Life Cycle



Eggs

A. crassus Life Cycle



Eggs



Free-living






In intermediate host



Larval
stages 2-3



A. crassus Life Cycle

-  Free-living
-  In intermediate host
-  In definitive host



Eggs






Larval
stages 2-3



preadult
-> Adult



A. crassus Life Cycle

-  Free-living
-  In intermediate host
-  In definitive host



Eggs



Larval
stages 2-3



preadult
-> Adult



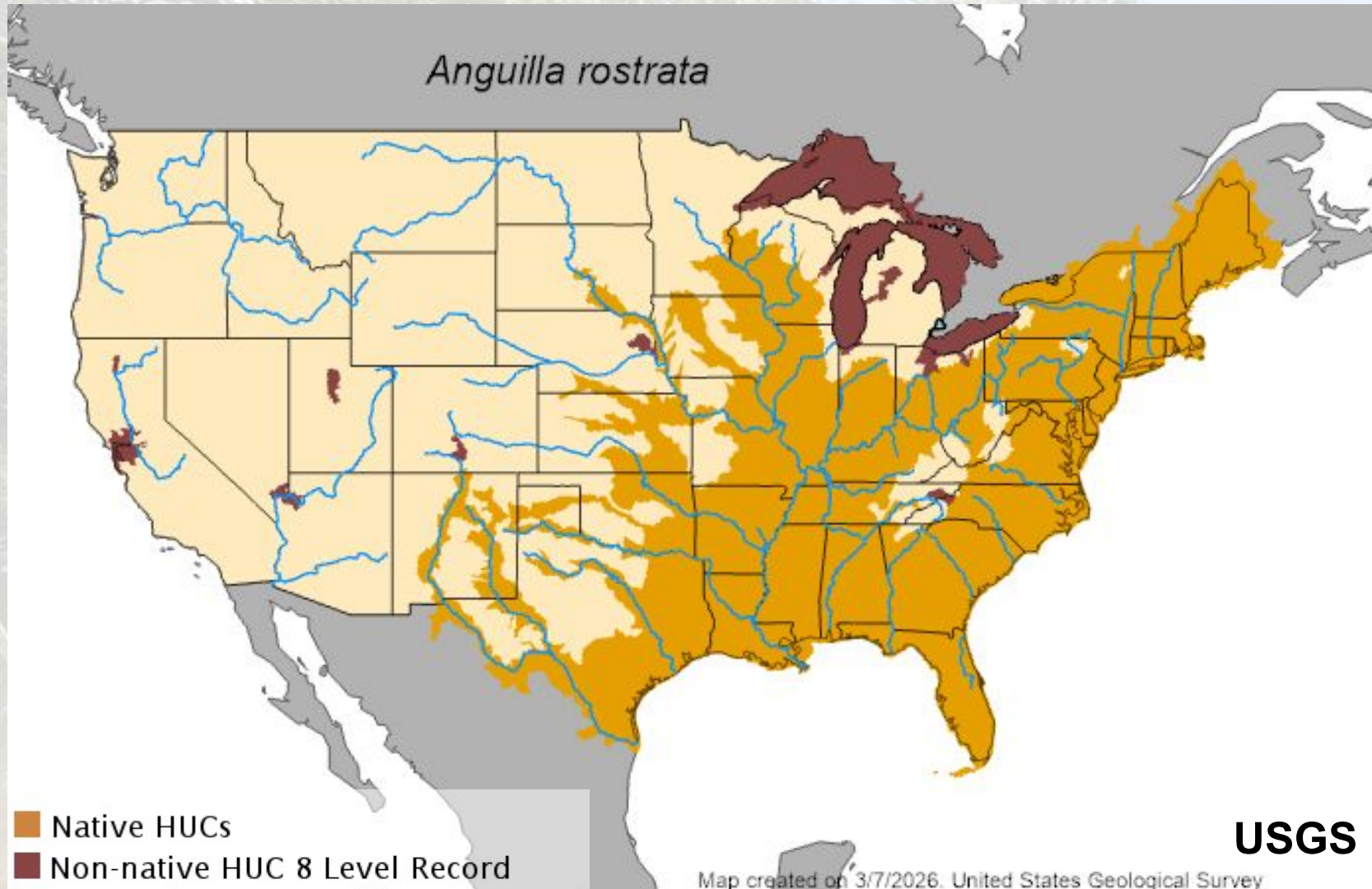
Anguilla rostrata (American Eel)

- Early life stages harvested for aquaculture
- SWAP species
- Link marine and freshwater food webs



Joel Sartore 2025

Anguilla rostrata Distribution

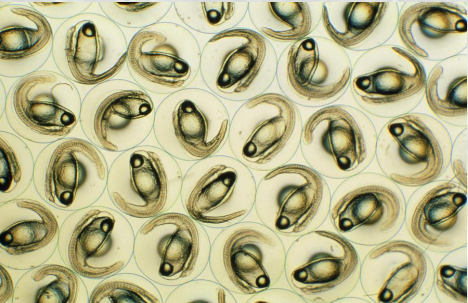


American Eel Life Cycle



American Eel Life Cycle

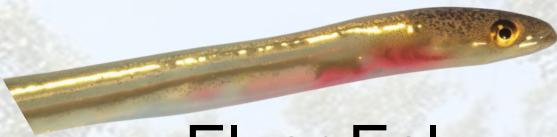
Eggs



Credit: Science Photo Library



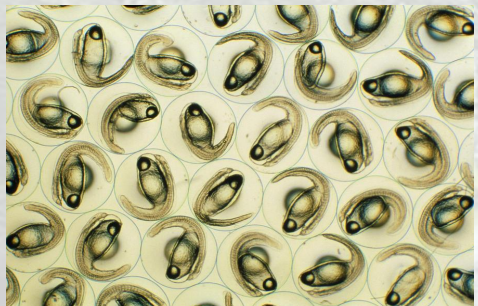
■ Saltwater
■ Freshwater



Elver Eel
(juvenile)

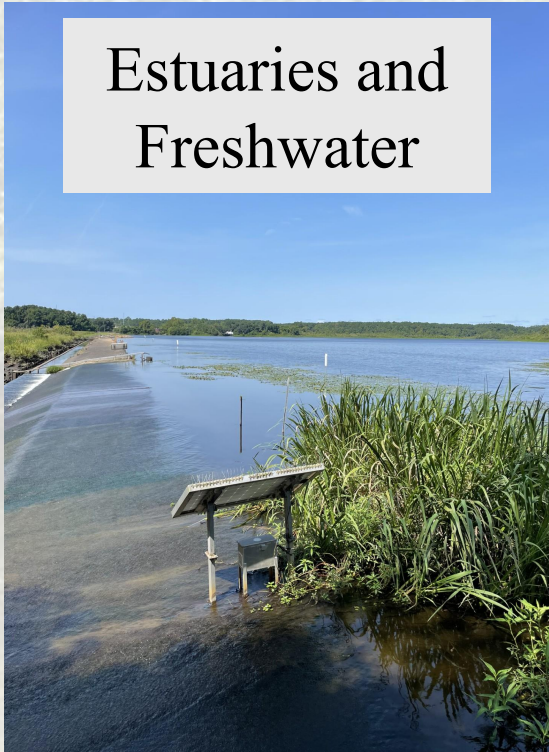


Eggs



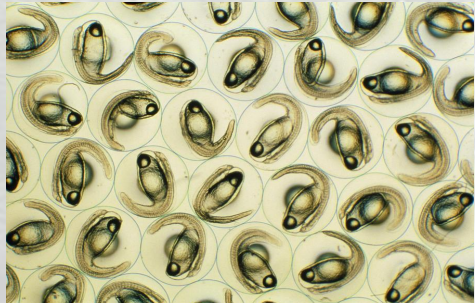
Credit: Science Photo Library

Estuaries and
Freshwater

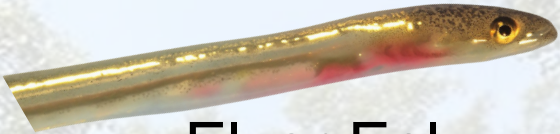


■ Saltwater
■ Freshwater

Eggs

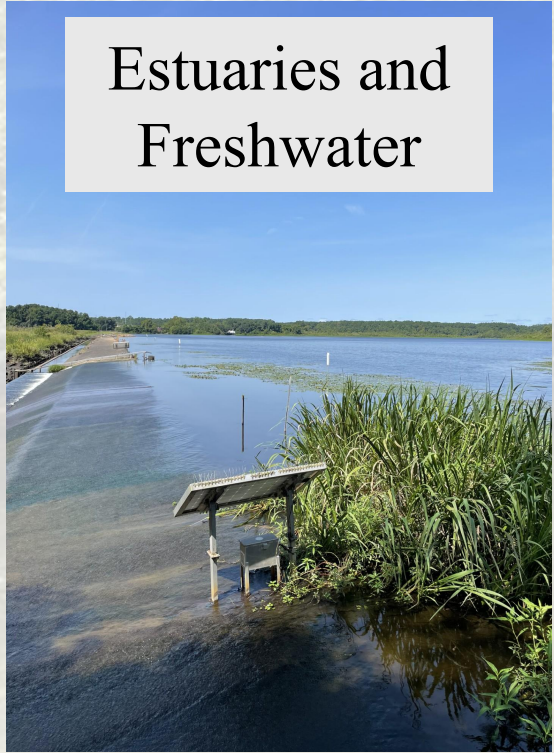


Credit: Science Photo Library



Elver Eel
(juvenile)

Estuaries and
Freshwater

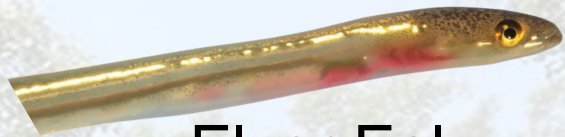


Yellow Eel
(Immature Adult)



Oklahoma Department of Wildlife Conservation

■ Saltwater
■ Freshwater



Elver Eel
(juvenile)



Yellow Eel
(Immature Adult)

Oklahoma Department of Wildlife Conservation

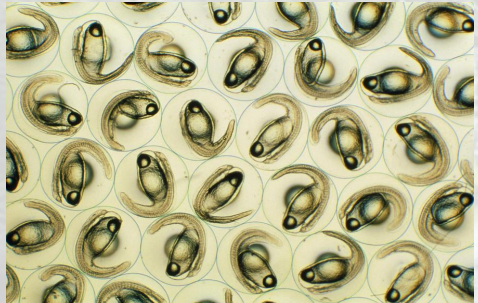


Silver Eel
(Mature Adult)

Credit: National Park service



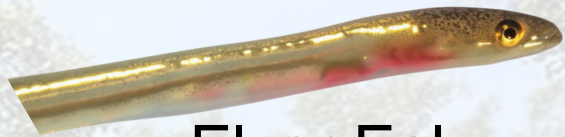
Eggs



Credit: Science Photo Library



■ Saltwater
■ Freshwater



Elver Eel
(juvenile)



Yellow Eel
(Immature Adult)

Oklahoma Department of Wildlife Conservation



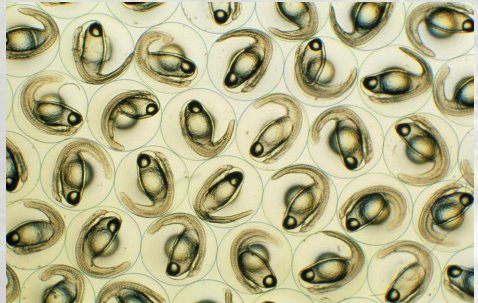
Silver Eel
(Mature Adult)

Credit: National Park service

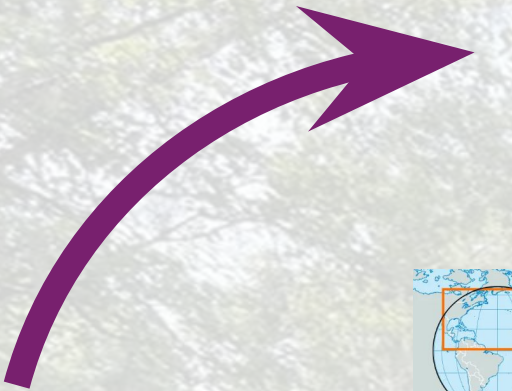


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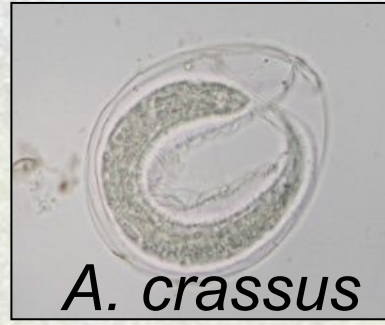
Eggs



Credit: Science Photo Library



Host-Parasite Dynamic



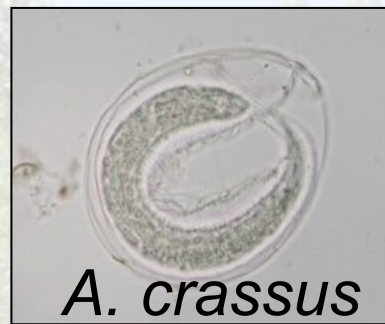
Eggs

- Outside of eel
- Inside of eel



Zooplankton

Host-Parasite Dynamic



Eggs

- Outside of eel
- Inside of eel

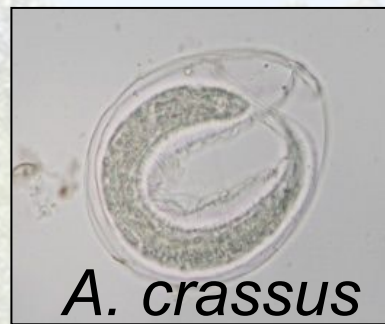


Zooplankton



Juvenile eel

Host-Parasite Dynamic



Eggs

■ Outside of eel
■ Inside of eel



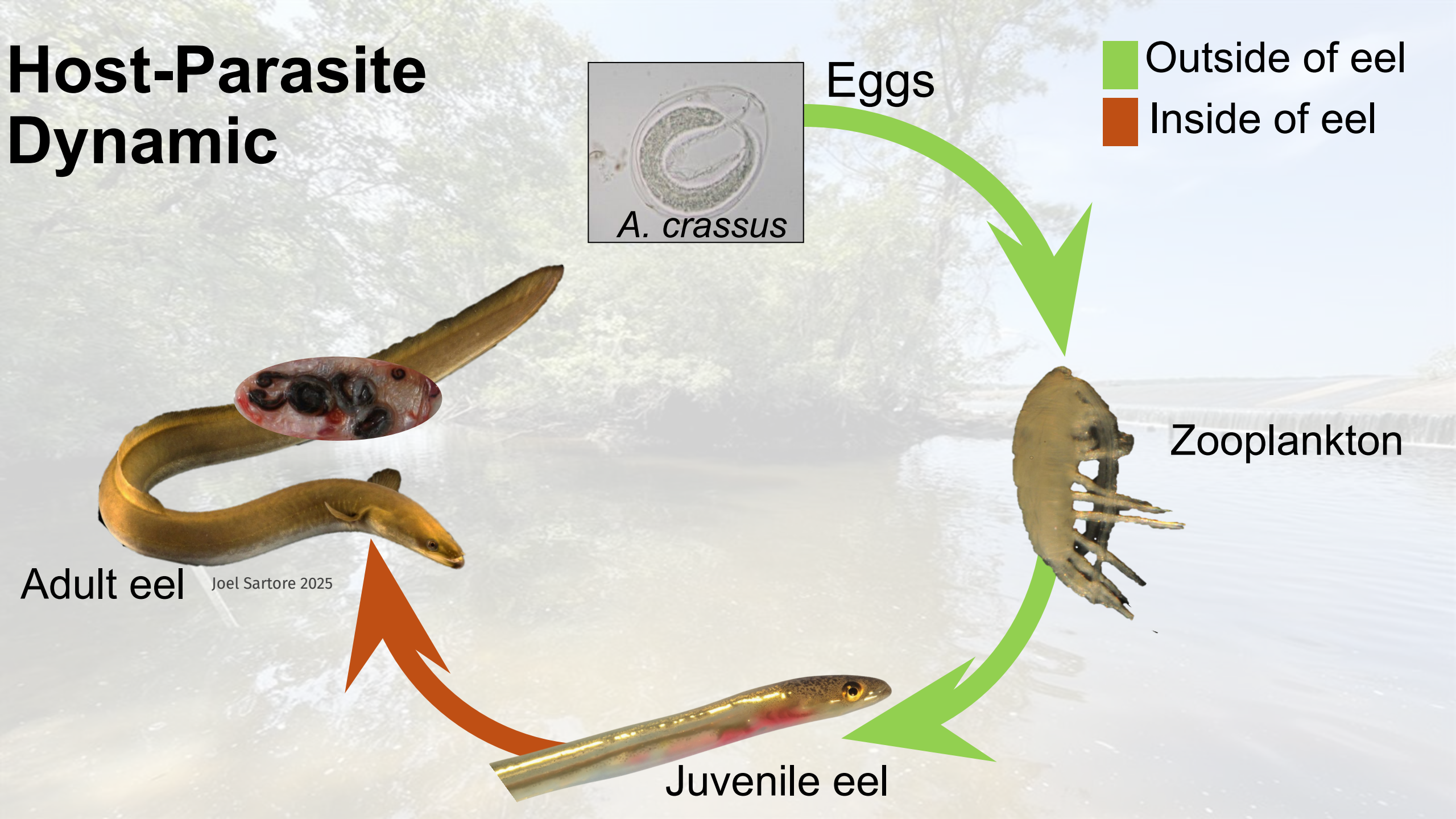
Zooplankton



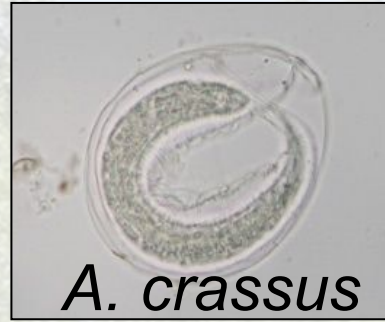
Adult eel Joel Sartore 2025



Juvenile eel



Host-Parasite Dynamic



Eggs

■ Outside of eel
■ Inside of eel



Zooplankton



Adult eel Joel Sartore 2025

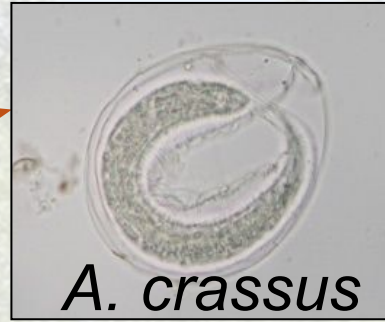


Juvenile eel



Host-Parasite Dynamic

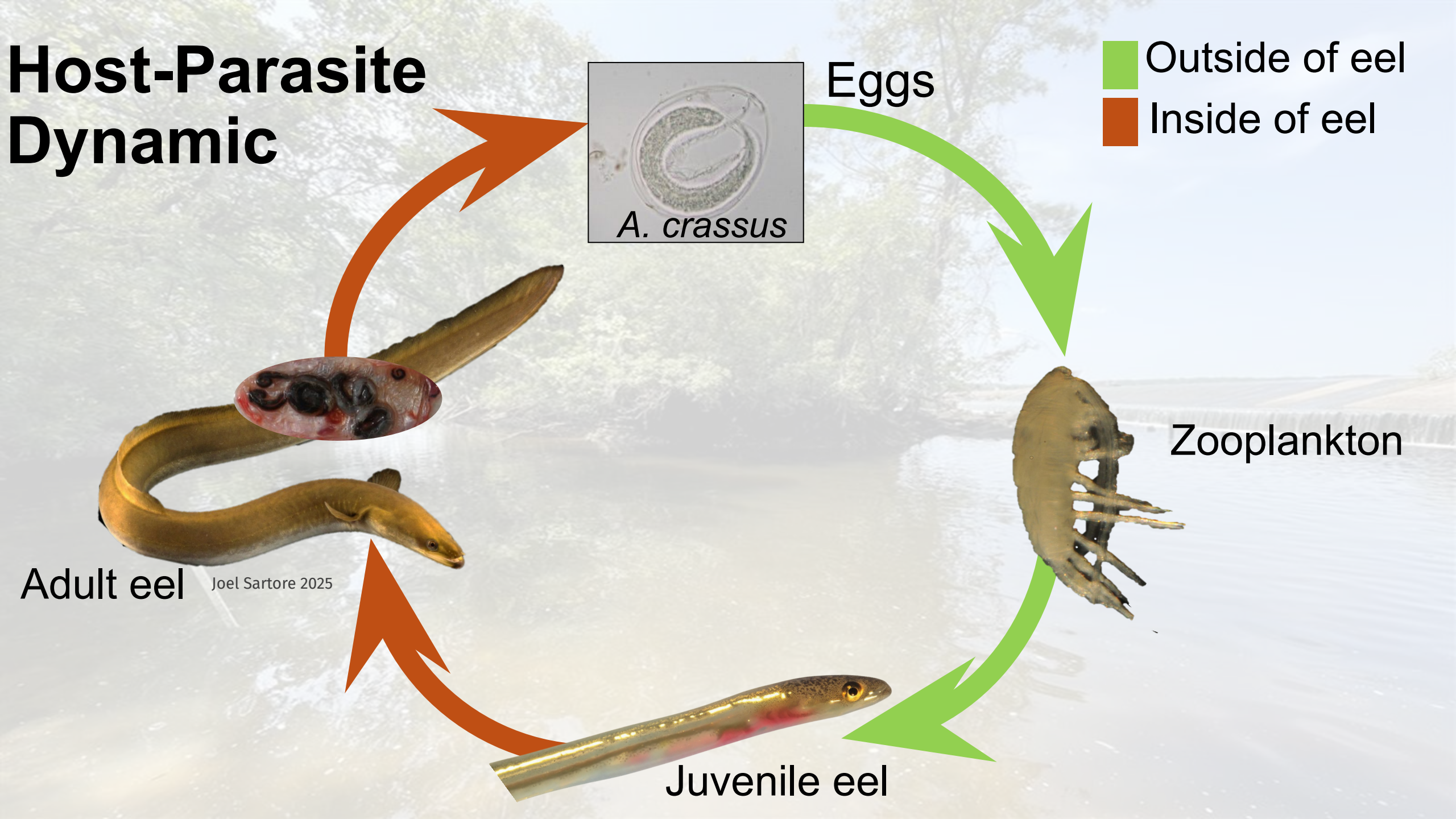
■ Outside of eel
■ Inside of eel



Eggs

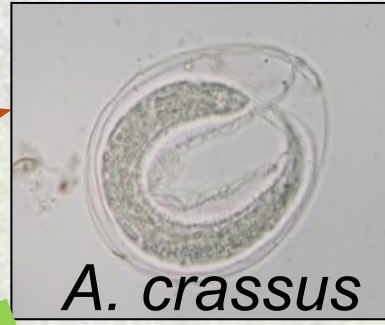


Joel Sartore 2025



Host-Parasite Dynamic

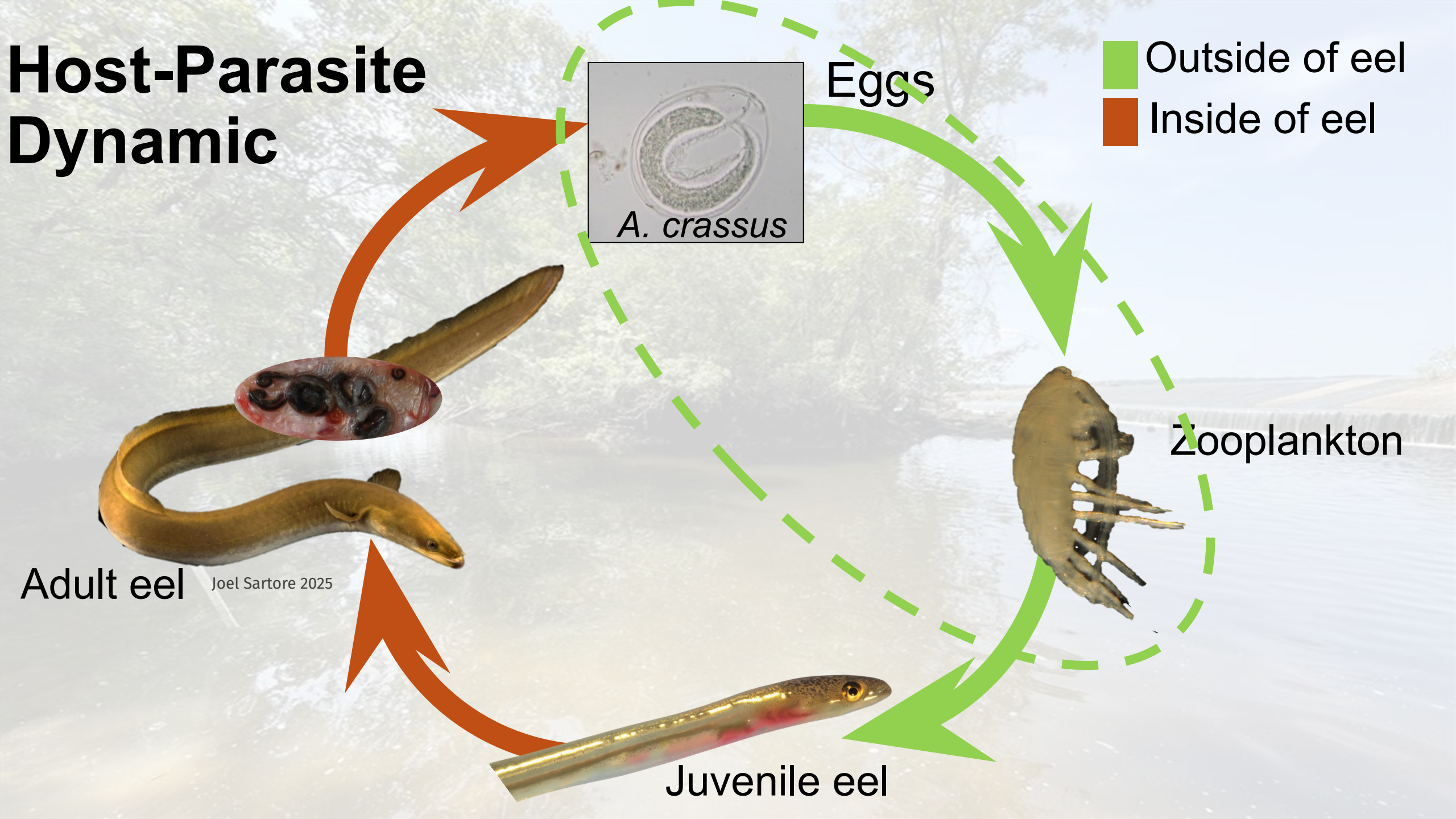
■ Outside of eel
■ Inside of eel

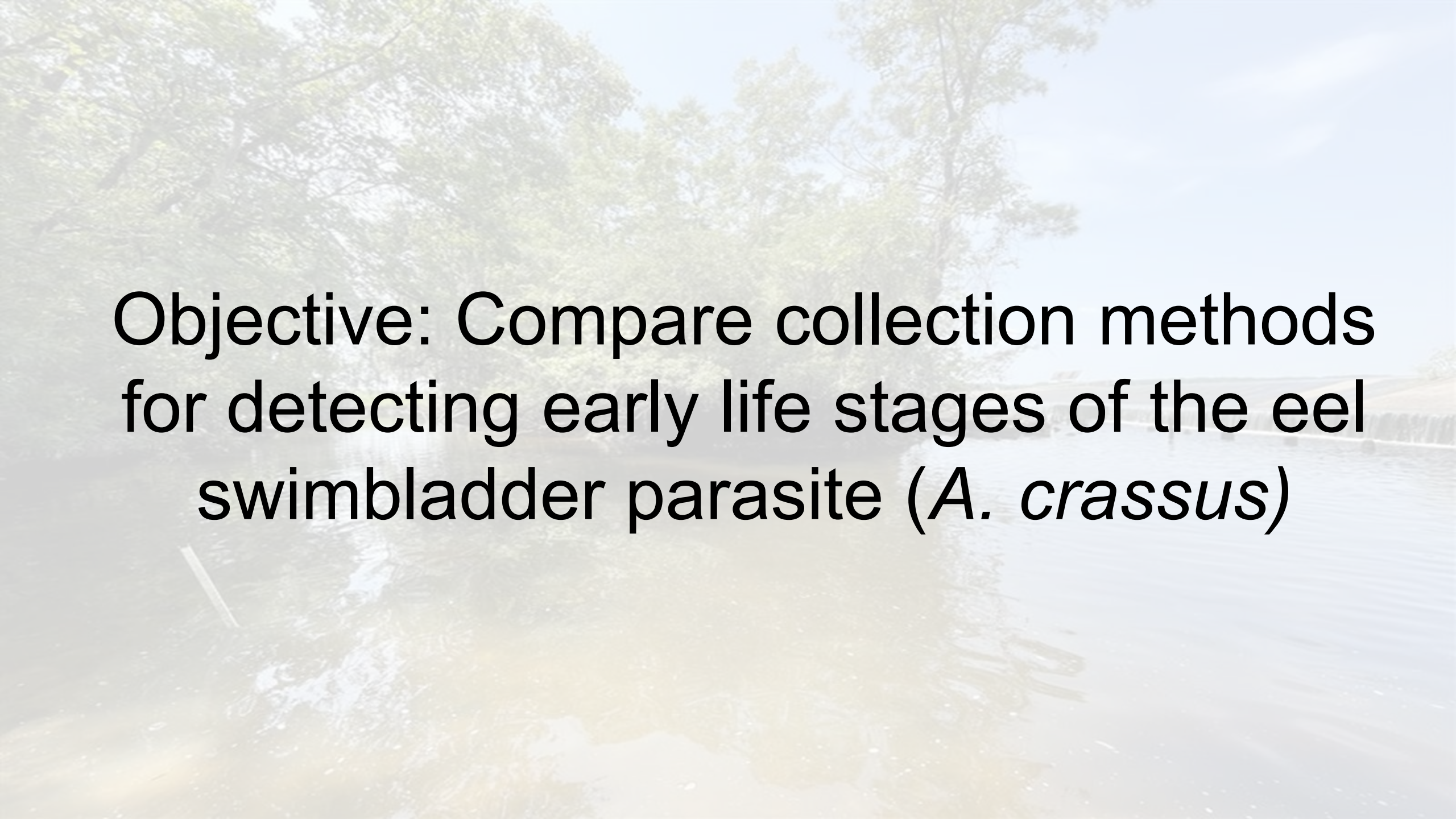


Eggs



Joel Sartore 2025



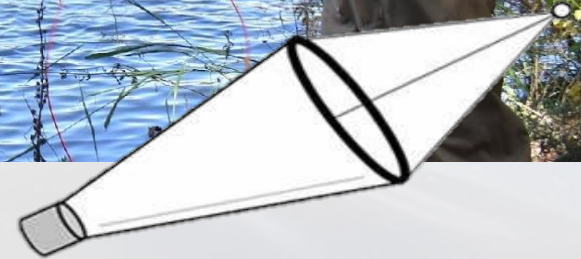


Objective: Compare collection methods for detecting early life stages of the eel swimbladder parasite (*A. crassus*)



Collection method: Zooplankton Tows

- 2 replicates
- 15 tows per replicate
- 153-micron mesh
- Preserved in 95% EtOH



Collection method: Zooplankton Tows

- 2 replicates
- 15 tows per replicate
- 153-micron mesh
- Preserved in 95% EtOH



Collection method: eDNA

- 2 replicate samples, 1 control
- Average 2.61 L per replicate
- 5-micron filter
- Frozen -80



Collection method: eDNA

- 2 replicate samples, 1 control
- Average 2.61 L per replicate
- 5-micron filter
- Frozen -80



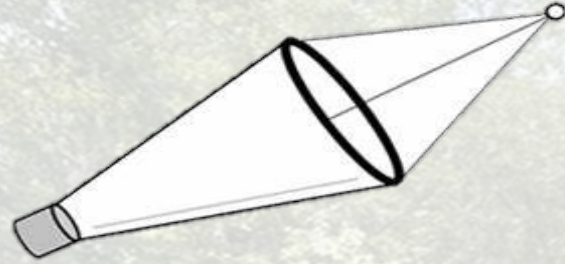
Genetics Methods

- QIAcube HT isolation
- Dneasy Powersoil Pro kit
- RT-qPCR



Results

~~Zooplankton
Tows~~

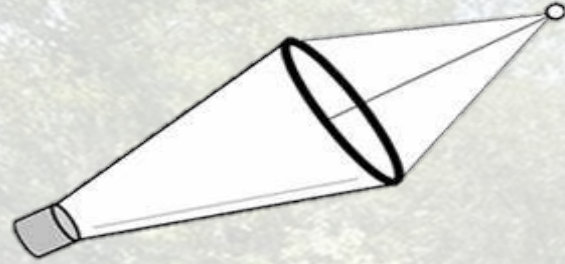


eDNA



Results

~~Zooplankton
Tows~~



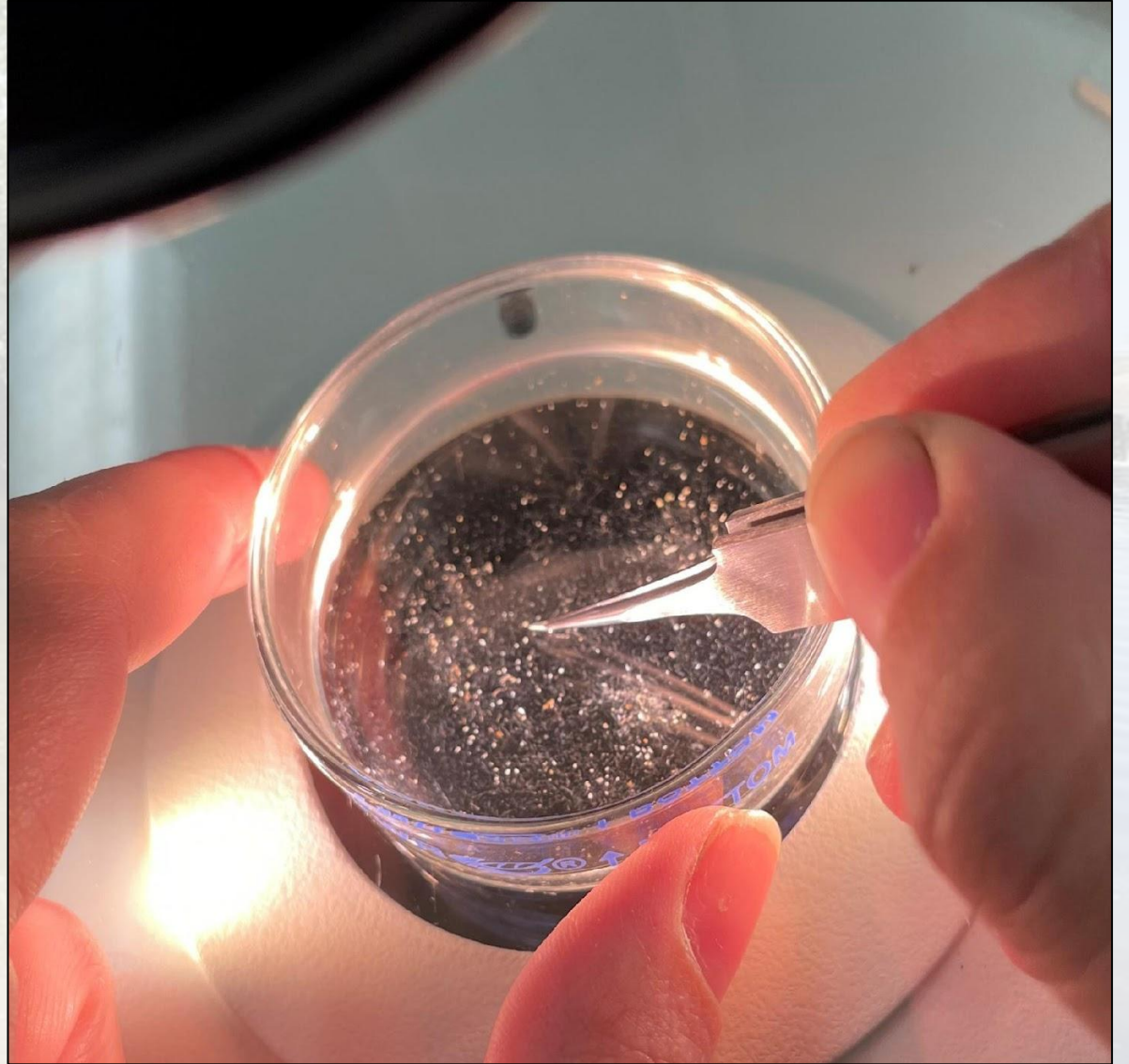
~~eDNA~~



Future Directions

- Identify which zooplankton are infected
- Study seasonal patterns of infected zooplankton

Preliminary Work



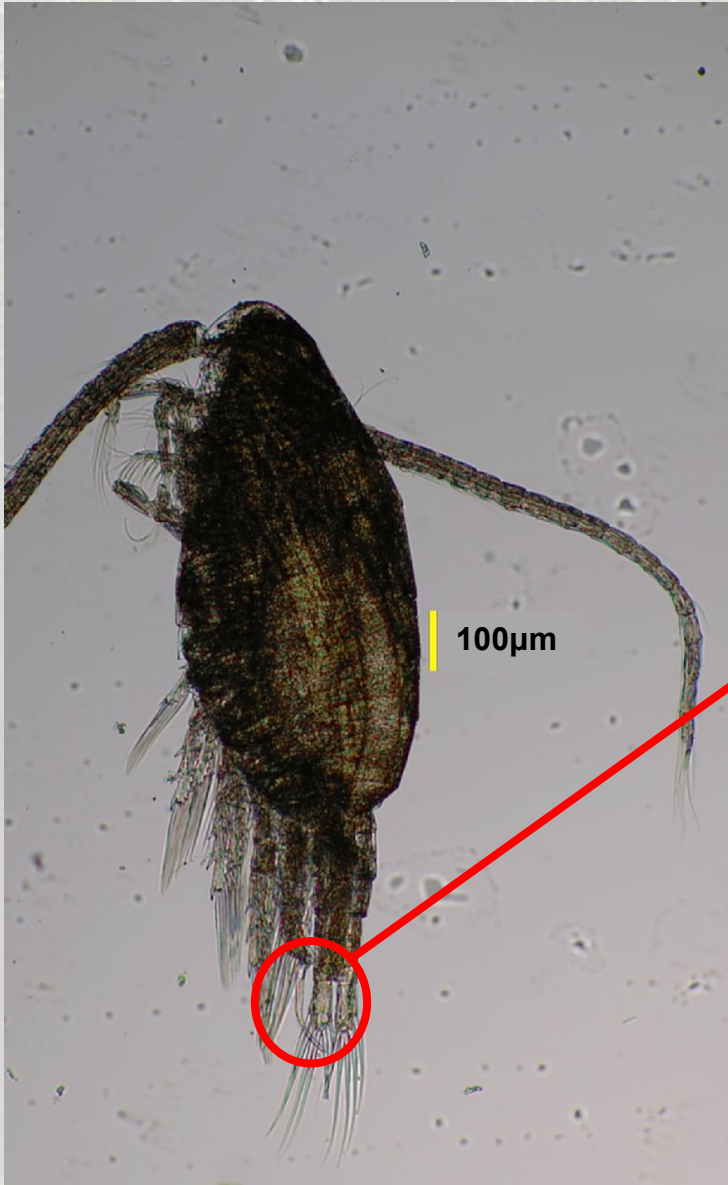
Preliminary Work



Skistodiaptomous pallidus

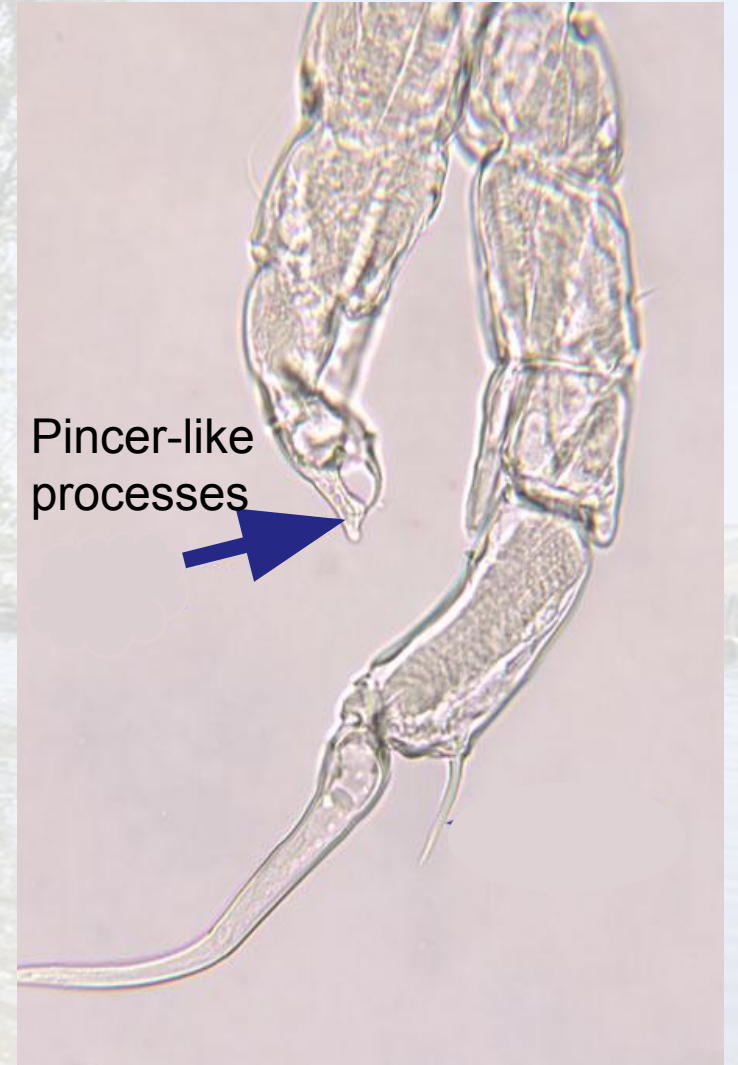
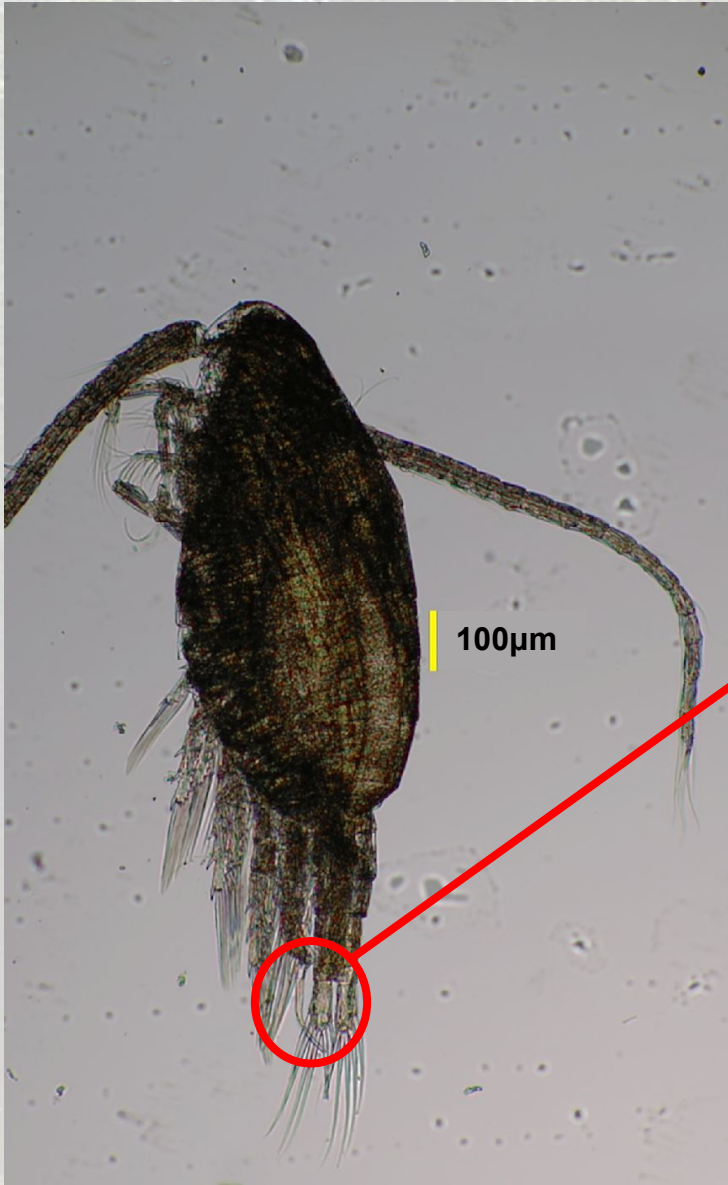


Daphnia lumholtzi



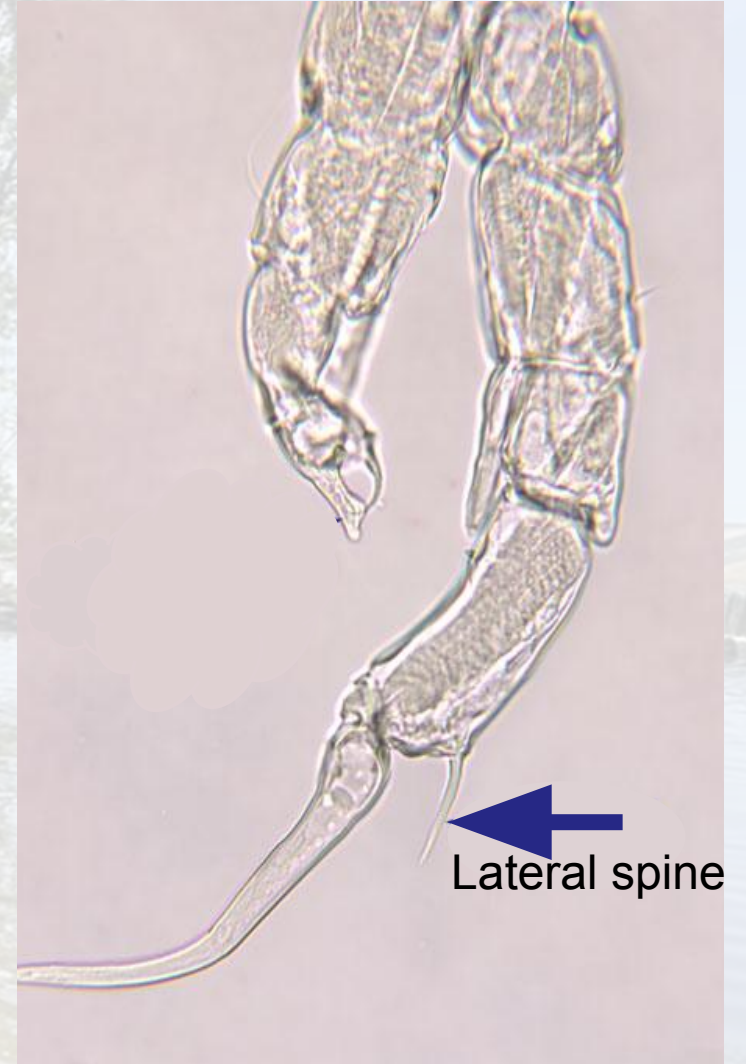
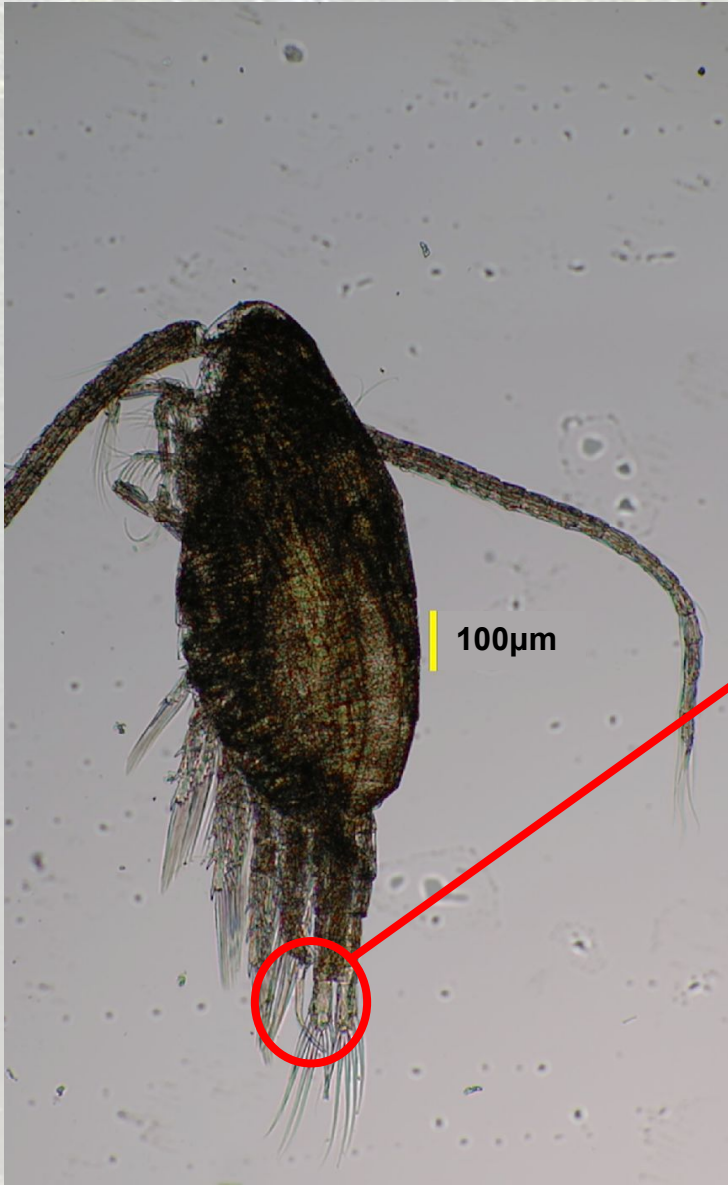
Brandorff 2011

Skistodiaptomous pallidus



USGS picture

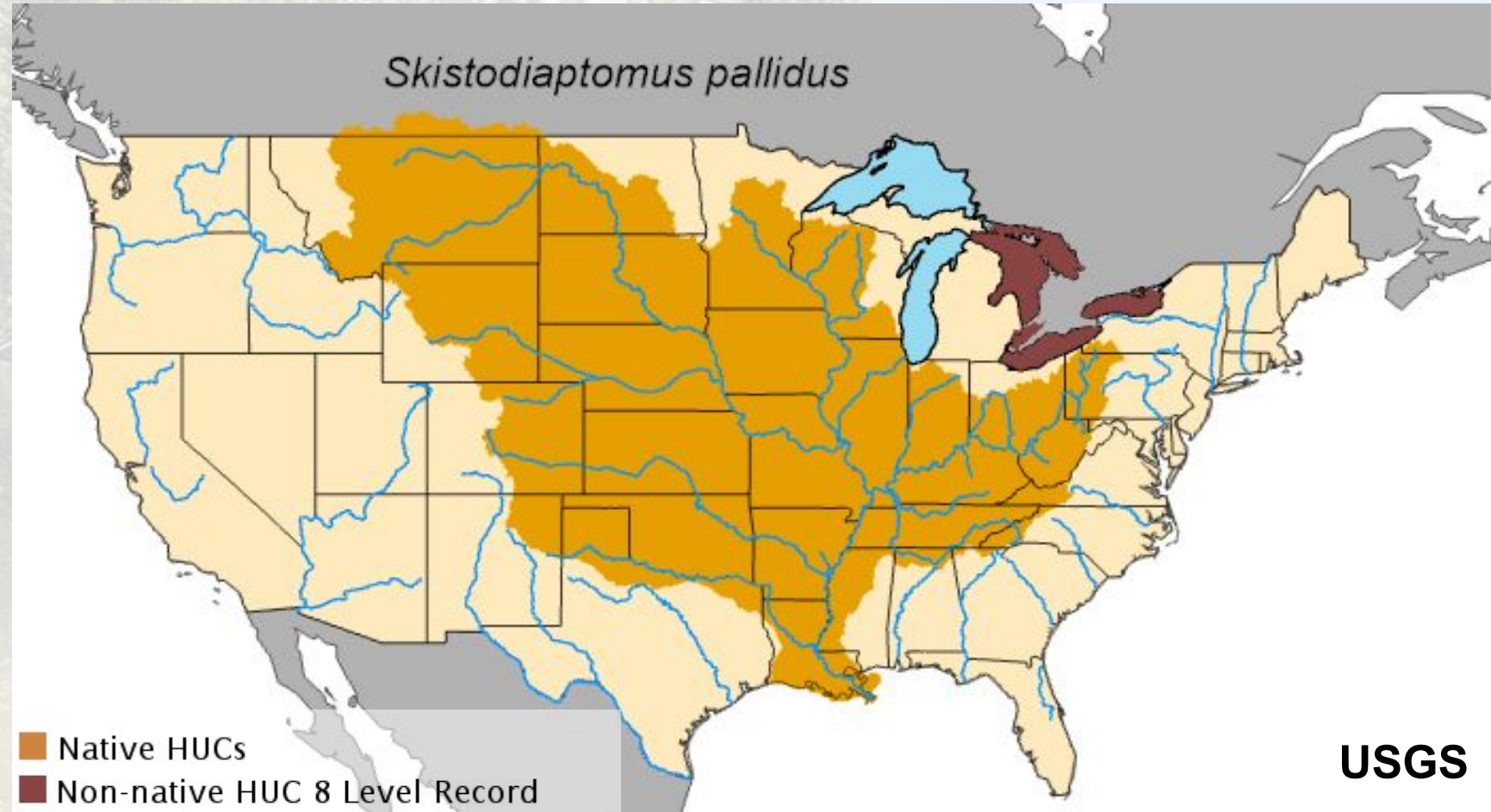
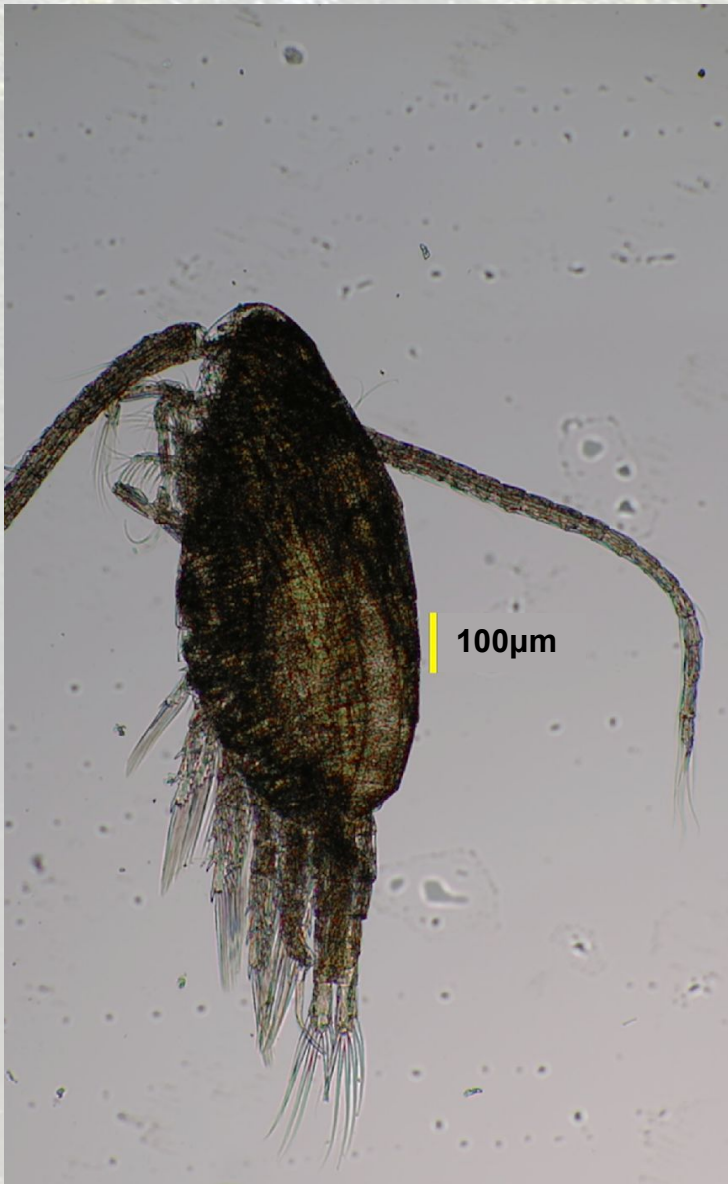
Skistodiaptomous pallidus



USGS picture

Skistodiaptomous pallidus

What we know about *Skistodiaptomus pallidus*



Skistodiaptomus pallidus

What we know about *Skistodiaptomous pallidus*

- Native to western North America
- Omnivorous predator



Skistodiaptomous pallidus

What we know about *Skistodiaptomous pallidus*

- Native to western North America
- Omnivorous predator
- Intermediate host to thorny-headed worm

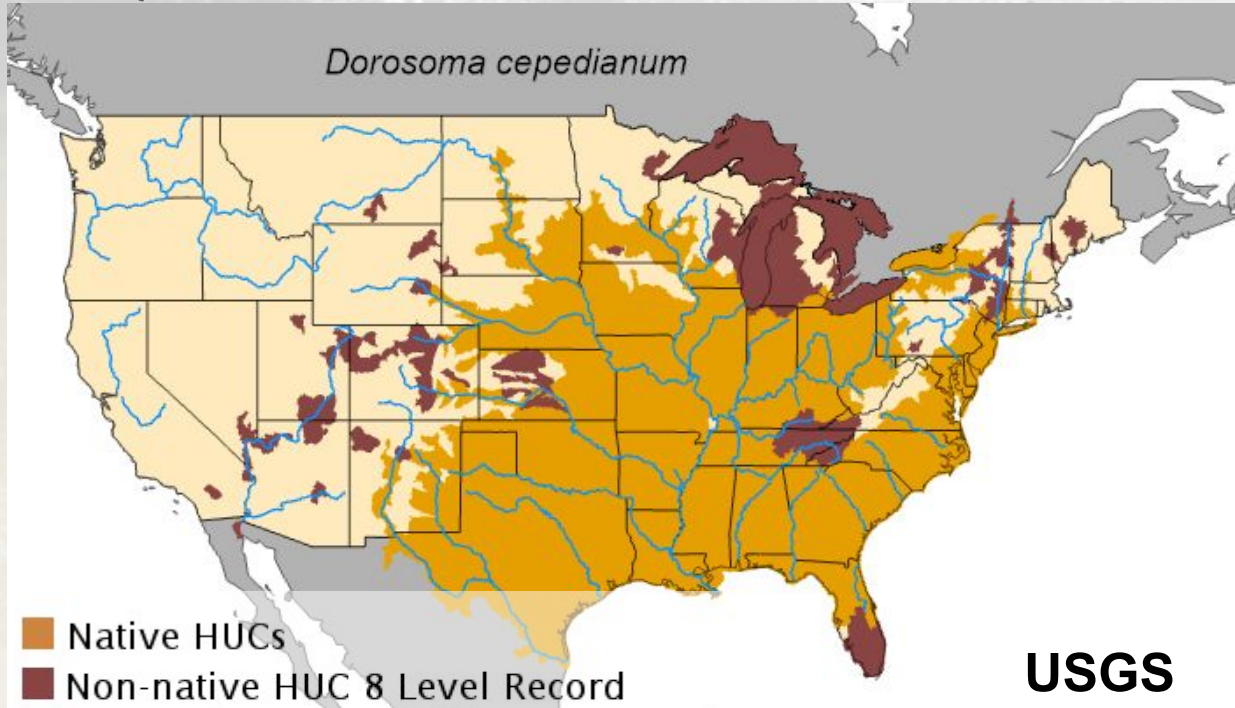


Skistodiaptomous pallidus

What we know about *Skistodiaptomous pallidus*



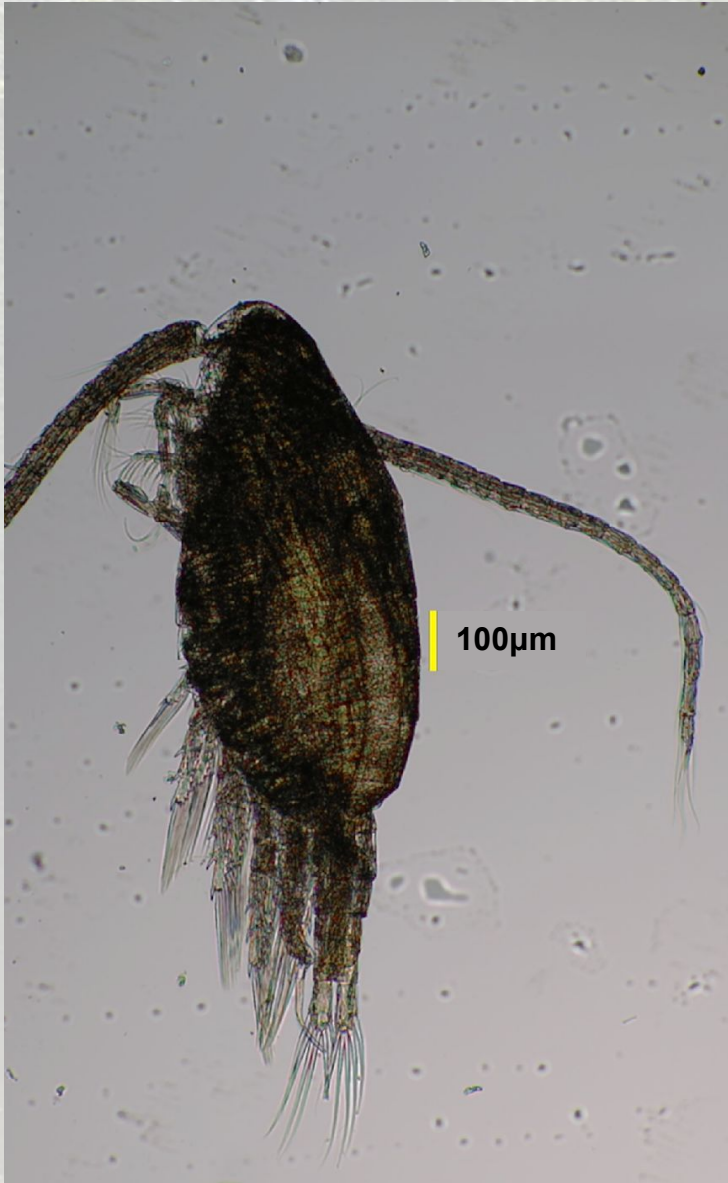
Gizzard shad



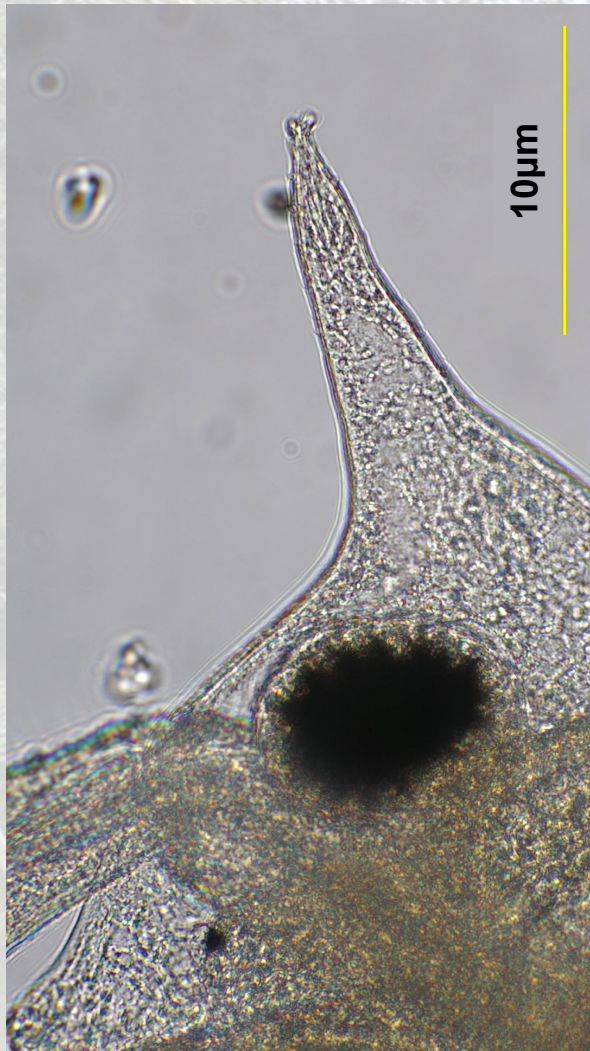
Skistodiaptomous pallidus

What we know about *Skistodiaptomous pallidus*

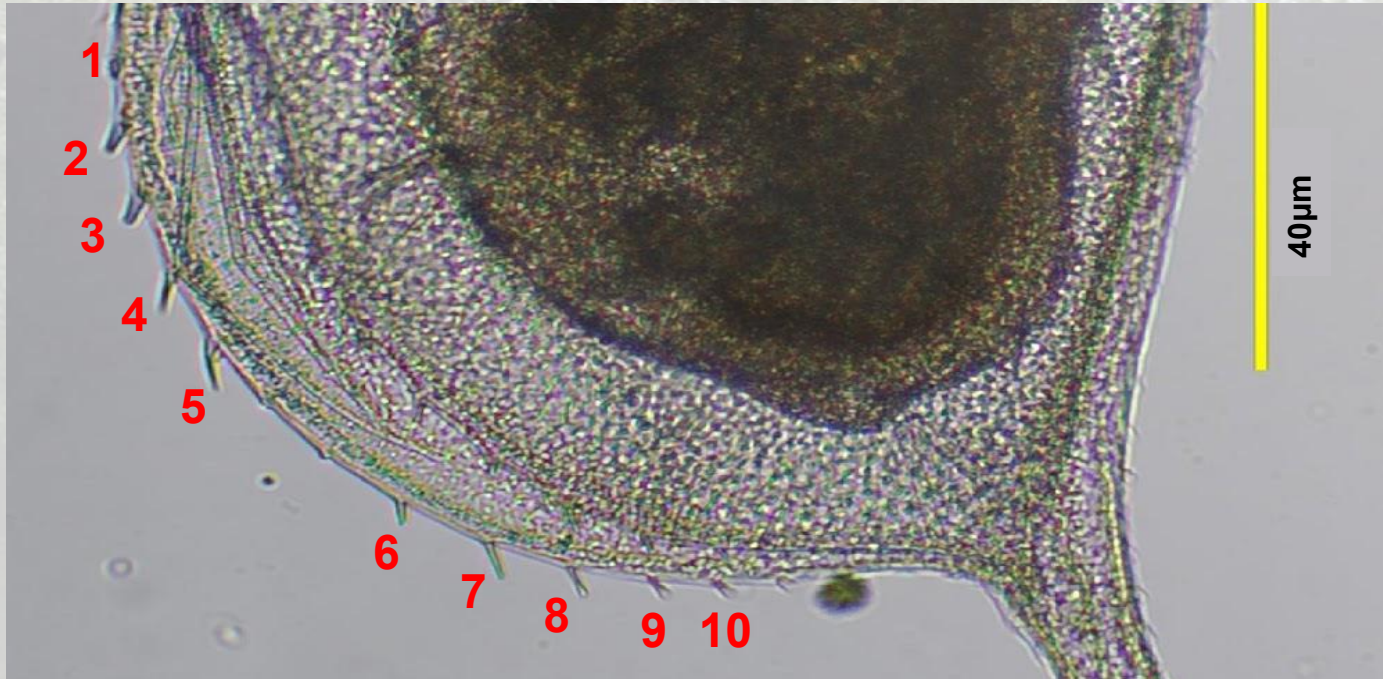
- Native to western North America
- Omnivorous predator
- Intermediate host to thorny-headed worm



Skistodiaptomous pallidus

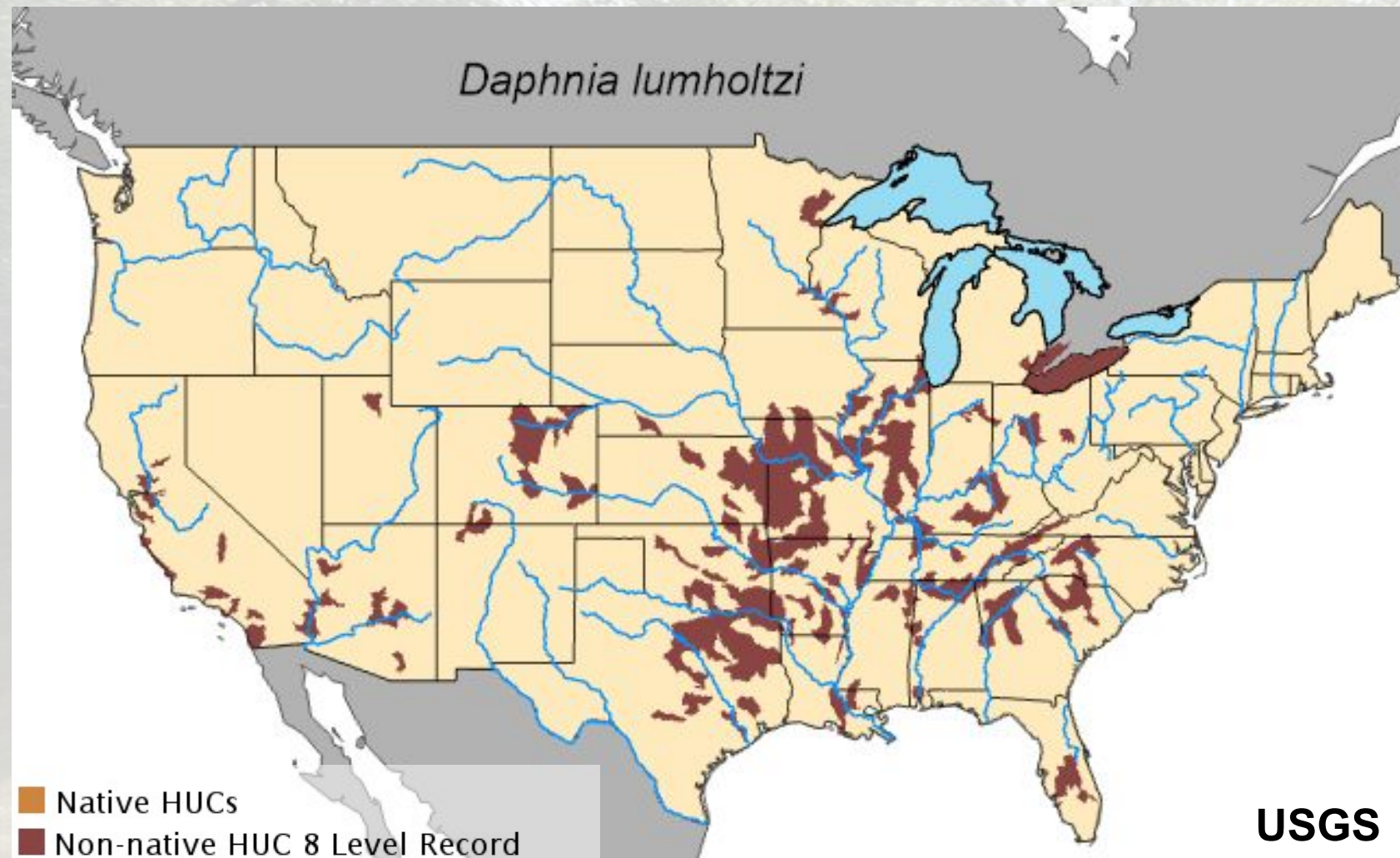


Daphnia lumholtzi



Daphnia lumholtzi

What we know about *Daphnia lumholtzi*



Daphnia lumholtzi

What we know about *Daphnia lumholtzi*

- Native to East Africa, East Australia, and India



Daphnia lumholtzi

What we know about *Daphnia lumholtzi*

- Native to East Africa, East Australia, and India
- Suspected imports with Nile Perch



Daphnia lumholtzi

What we know about *Daphnia lumholtzi*

- Native to East Africa, East Australia, and India
- Suspected imports with Nile Perch
- Spines impact feeding of predators



Daphnia lumholtzi



Thank you!
parish@dnr.sc.gov

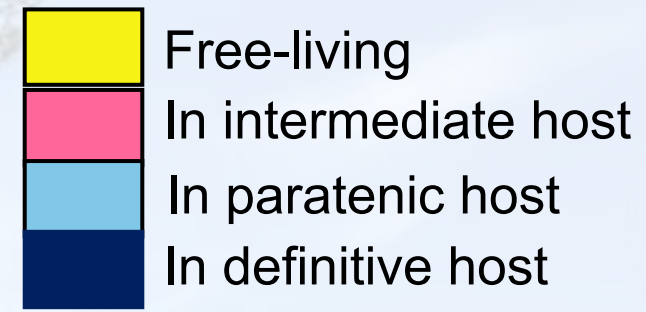
SCDNR Shellfish Research Section: All
SCDNR Genetics Section: Matt Walker, Nichelle VanTassel, and Rich Harrington

SCDNR Diadromous Section: Jake Sherry and Bill Post

CofC: Isaure de Buron



A. crassus Life Cycle



Eggs



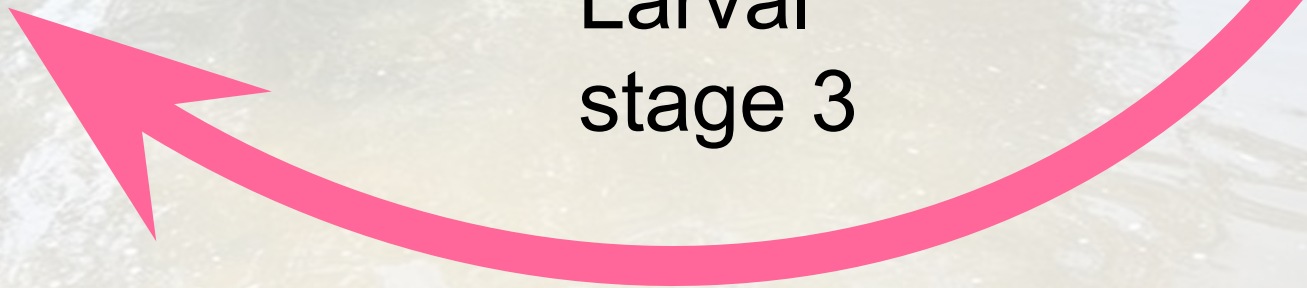
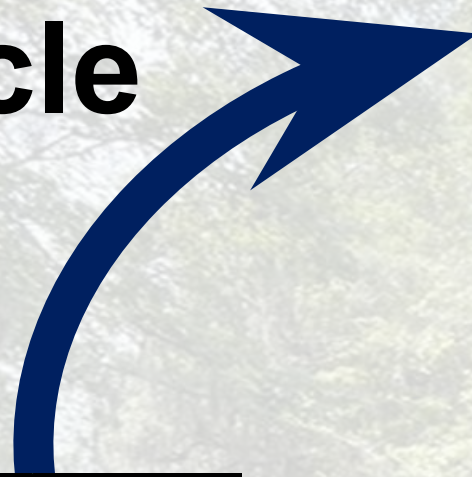
Larval
stages 2-3



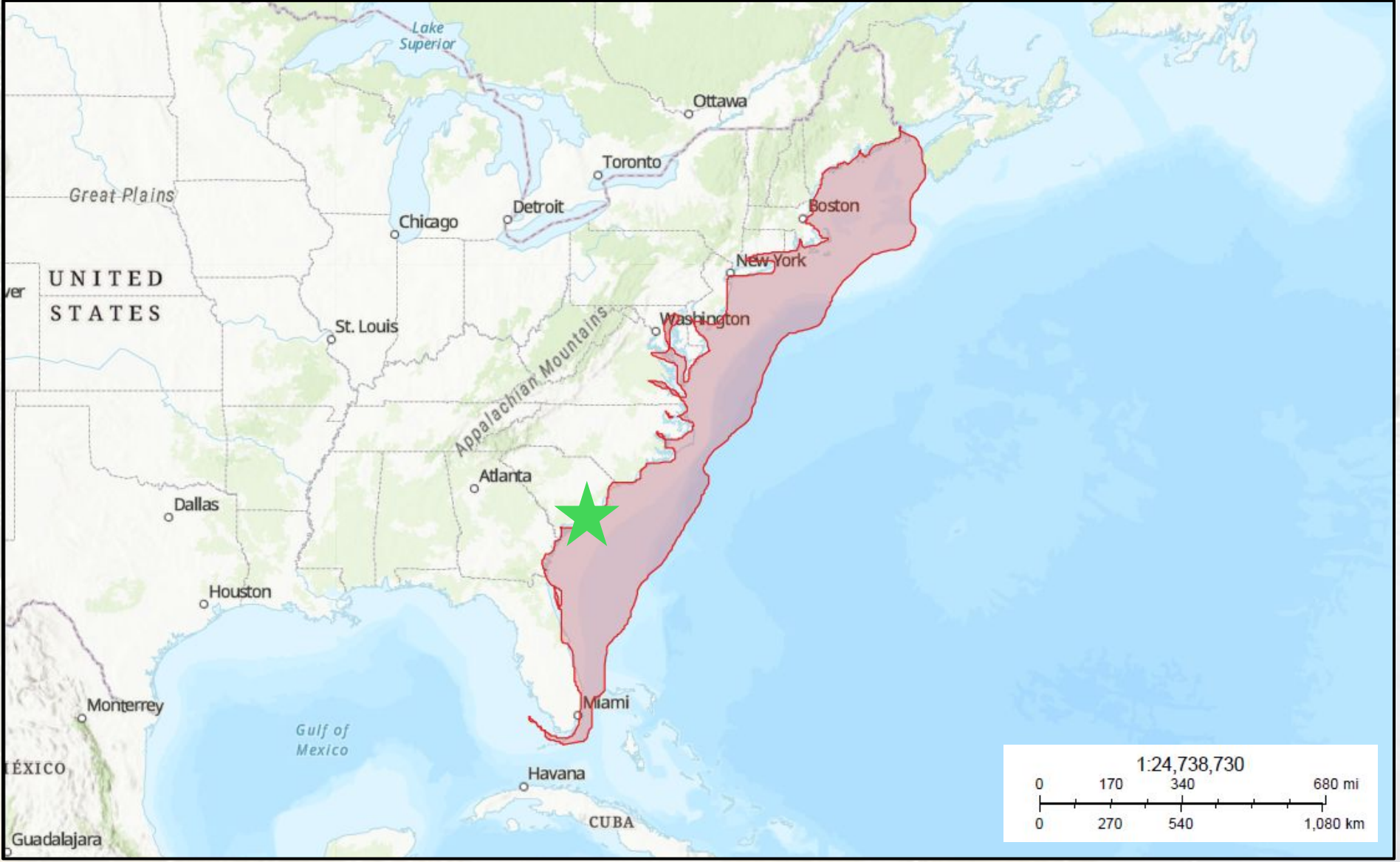
Larval
stage 3



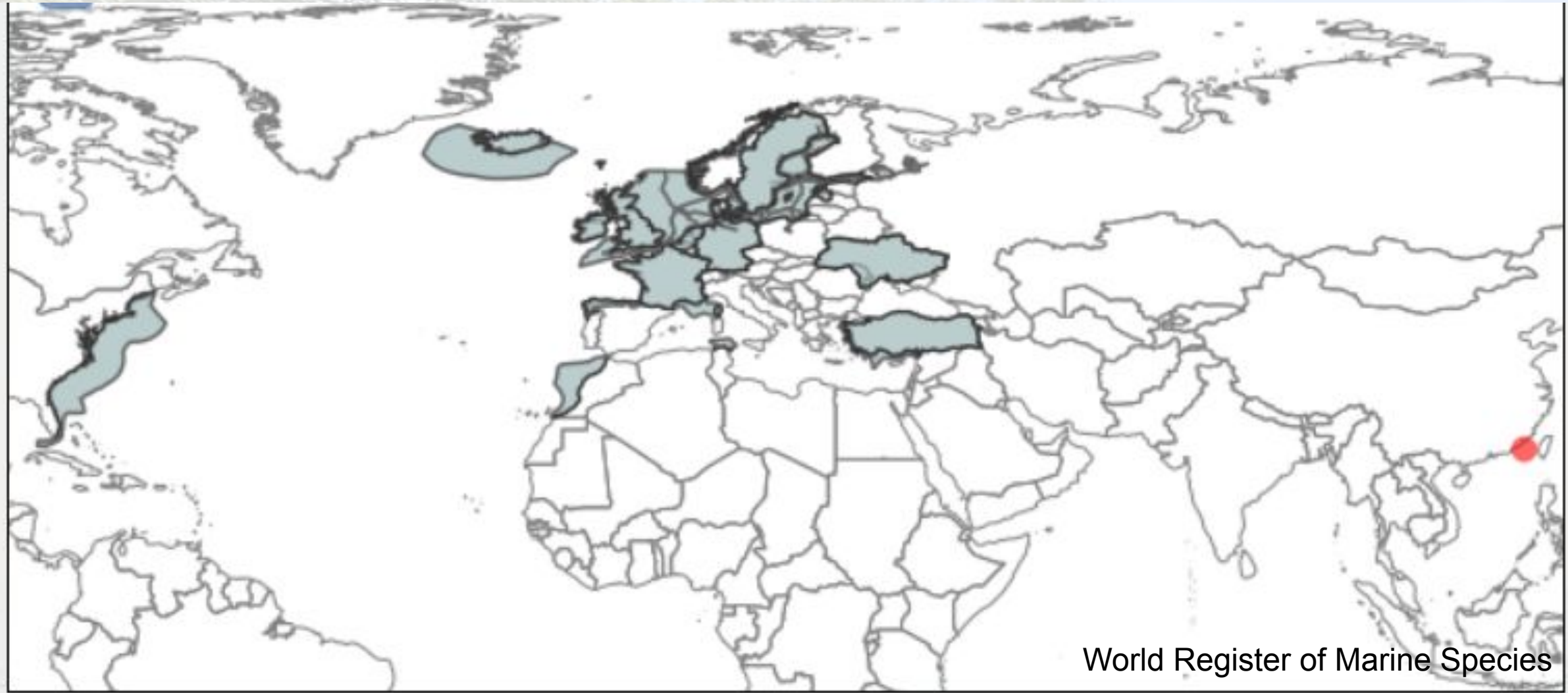
preadult
-> Adult



A. *Crassus* U.S. Distribution



A. crassus Distribution



World Register of Marine Species

- Present
- Present in aphia/obis/gbif/idigbio
- Inaccurate
- Introduced: alien
- Containing type locality

A. crassus Distribution



● Present ● Present in aphia/obis/gbif/idigbio ● Inaccurate ● Introduced: alien ● Containing type locality

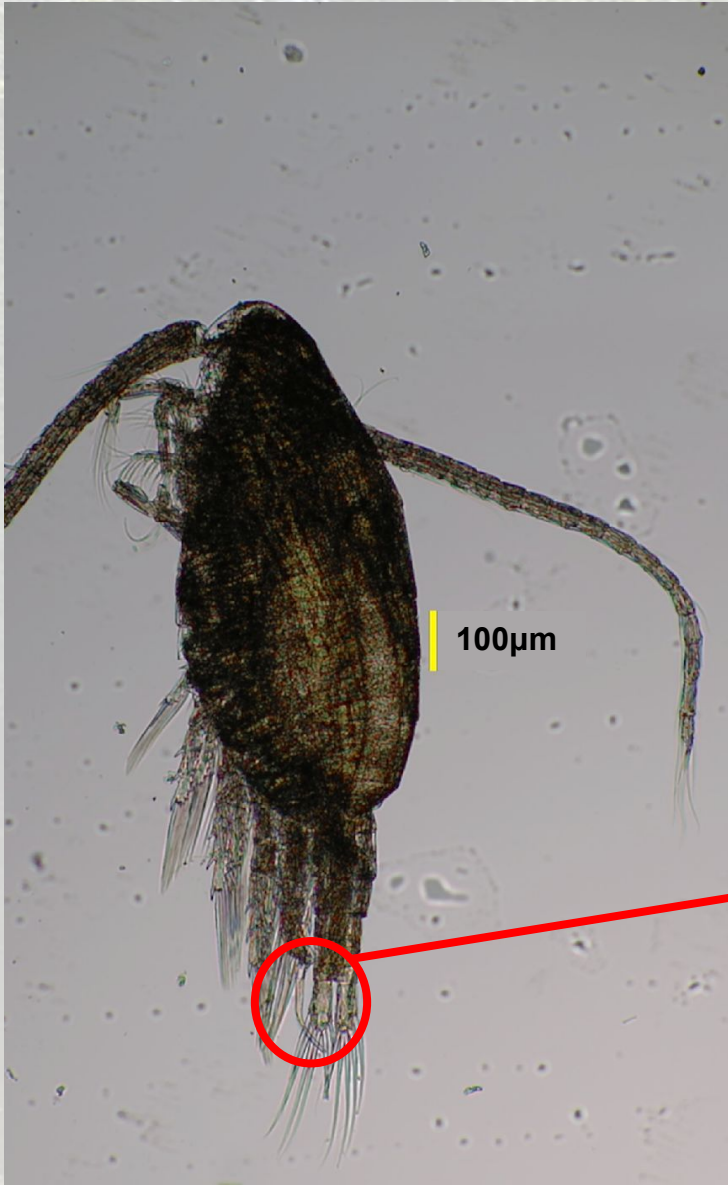
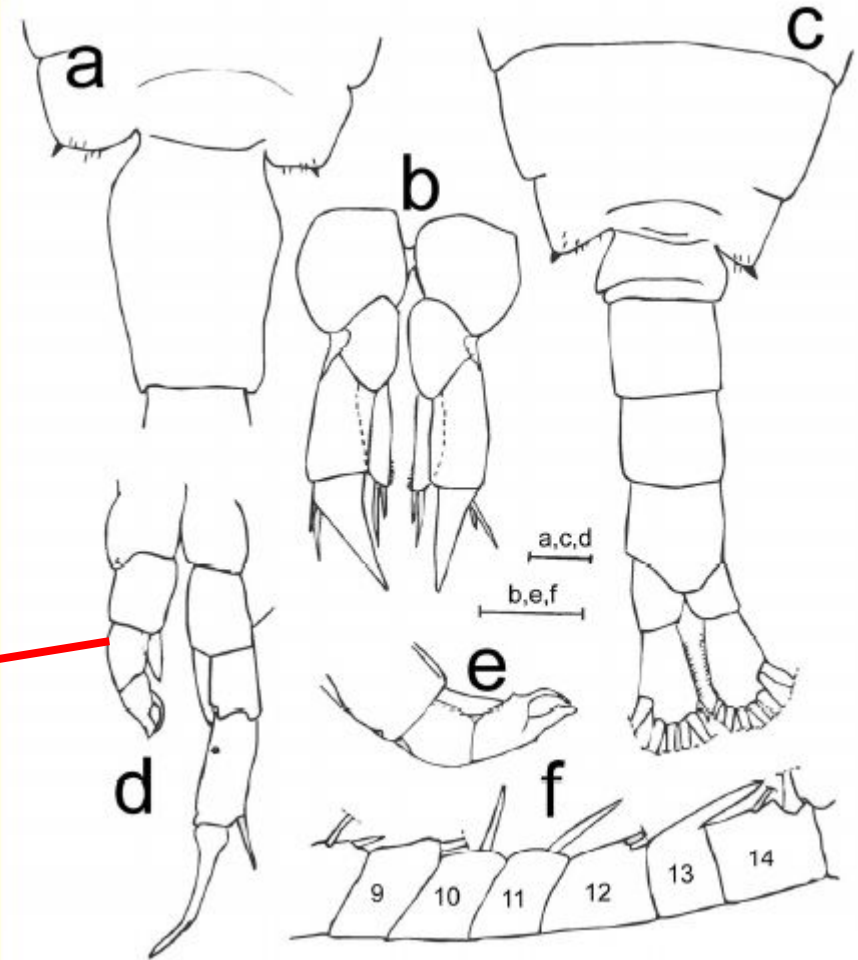
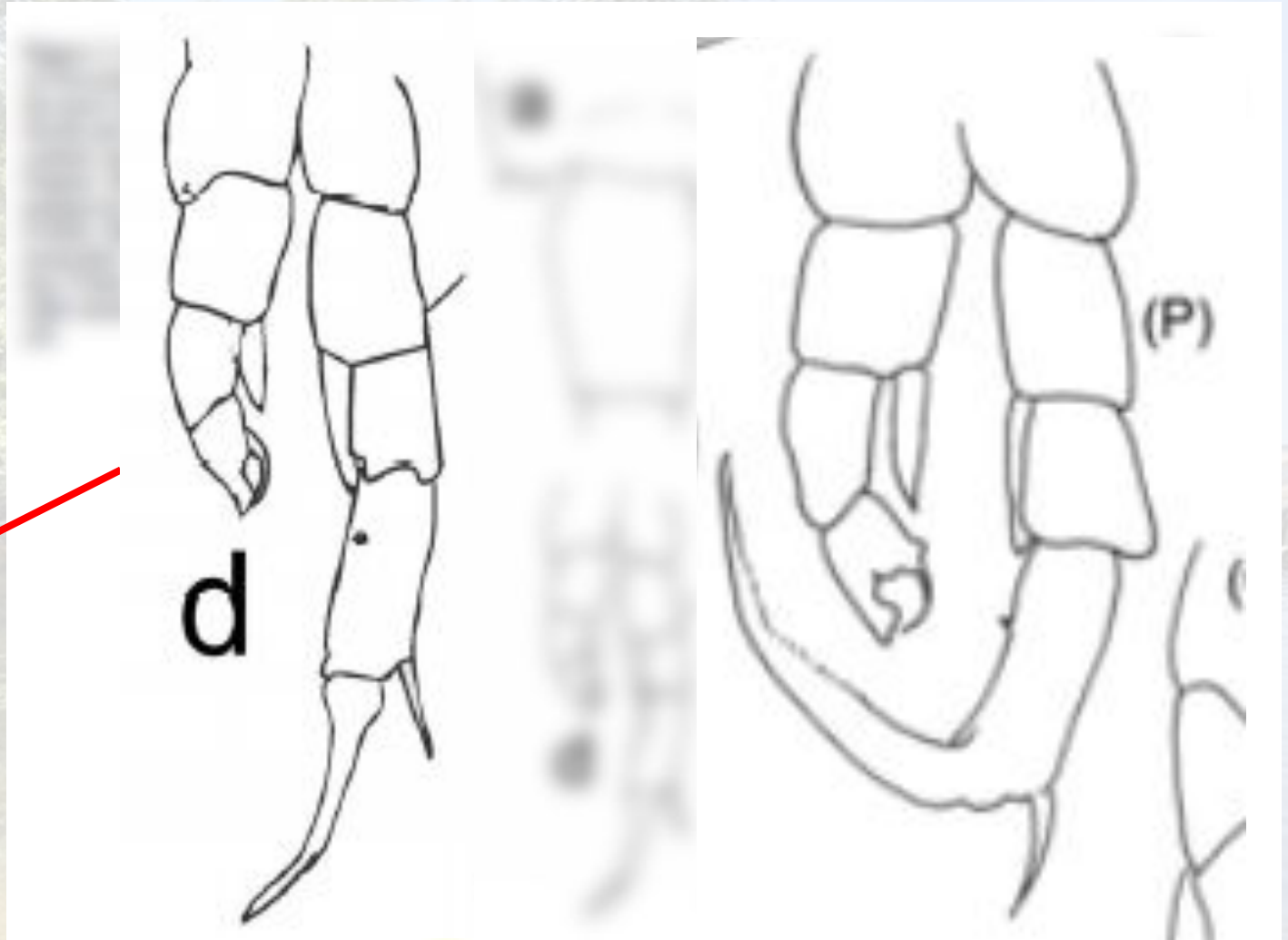
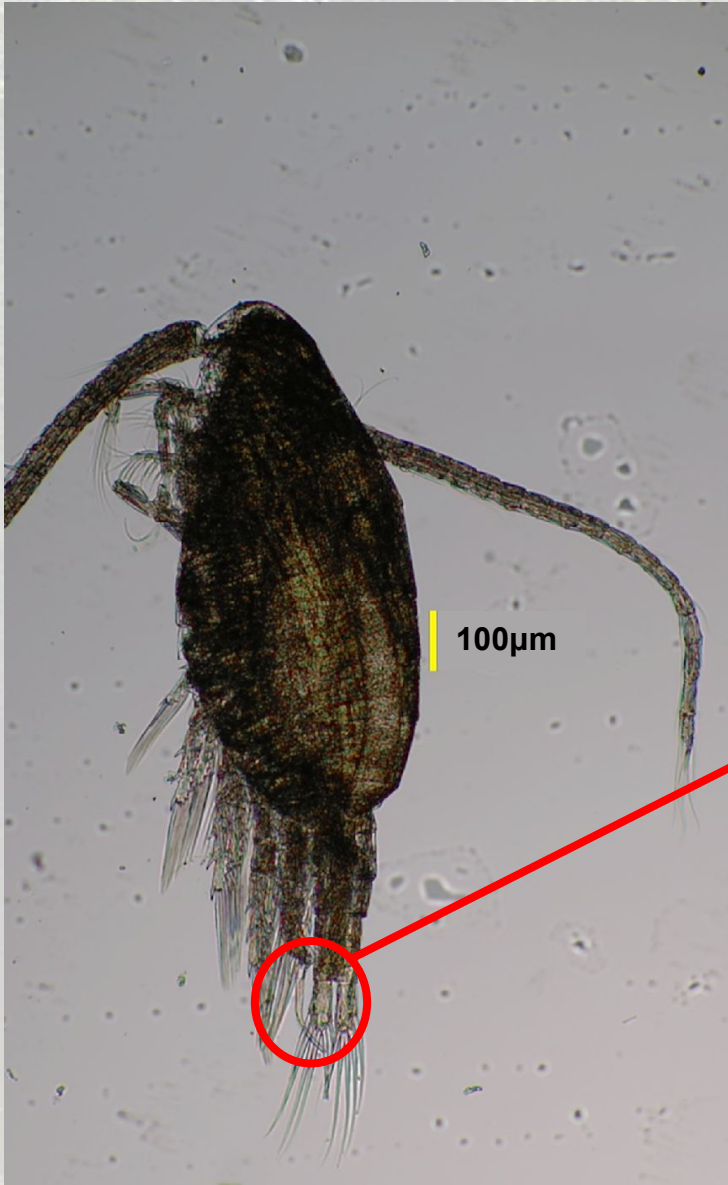


Figure 2. Morphological details of *Skistodiaptomus pallidus* from the moat of Bremen; a Female: fourth and fifth pedigerous somites and genital somite; b Female: fifth leg; c Male: last pedigerous somites and urosome; d Male: fifth leg; e Male: exopodite 1 and 2 of left fifth leg; f Male: segments 9 to 15 of right antennule, scale bars = 50 µm



Brandorff 2011

Skistodiaptomous pallidus



Brandorff 2011

Thorp and Covich

Skistodiaptomous pallidus