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THE ISOTOPIC NICHES OF INVASIVE GOBIIDAE IN THE LAKE ERIE-LAKE HURON CORRIDOR
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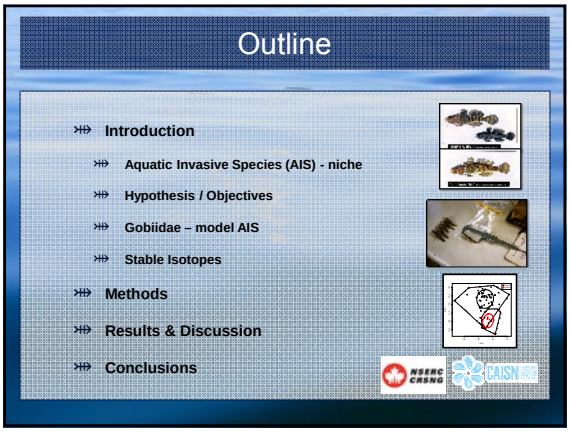
Outline
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Aquatic Invasive Species (AIS) - niche
Hypothesis / Objectives
Gobiidae – model AIS
Stable Isotopes
Methods
Results & Discussion
Conclusions
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Invasive Species Alert
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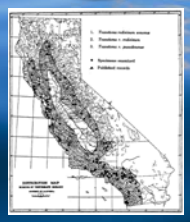
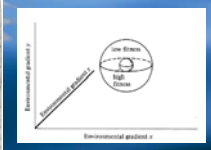
- Some invasive species more successful than others
- Mechanistic traits for prolonged survival
- Potential for phenotypic plasticity, acclimation or adaptation

## Niche Concept





Grinnel, J. 1917. The Auk

Hutchinson, G. E. 1957. Quant Biol

## Hypotheses & Objectives

**Hypotheses**

- A broad ecological niche is associated with higher AIS post-established success rate
- Potential for niche flexibility is associated with higher AIS post-established success rate

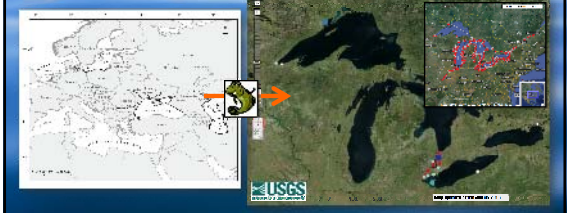
**Objectives:**

- Compare successful and less successful AIS
- Depict population niche space from stable isotopes ($\delta^{13}C$ & $\delta^{15}N$)
- Relate to potential for variability in phenotype

## Gobiidae

- Diverse: >2000 species, in >200 genera
- Pelagic dispersal, benthic, widespread
- High genetic & phenotypic diversity (native + invaded)
- Successful, less successful and yet to invade

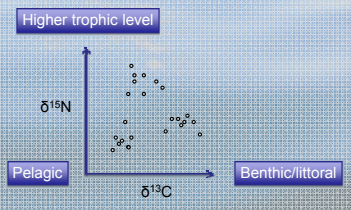

## Goby Invasion




Kornis et al. 2012.
Benson, 2011. USGS.GOV

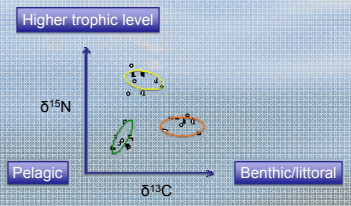
## Techniques: Stable Isotopes

**Stable isotopes** in trophic and food web ecology



## Techniques: Stable Isotopes

**Isotopic Niche (SIBER)**




## Project Objectives

1) To assess the isotopic niches of round and tubenose goby (Lake St. Clair region)

1) To assess the isotopic niche of round goby at established sites and at the invasion front (throughout Great Lakes)

-Dressiends were also collected to provide baseline for each location

## Methods

**Collection**

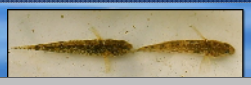
- Seine, minnow traps, rod & line
- snorkel/sled dredge (baseline)

**Analyses**

- Size, sex
- gut contents (RNAlater)
- muscle, liver

Photo credits: K. Stojanovic & H. Pettitt-Wade

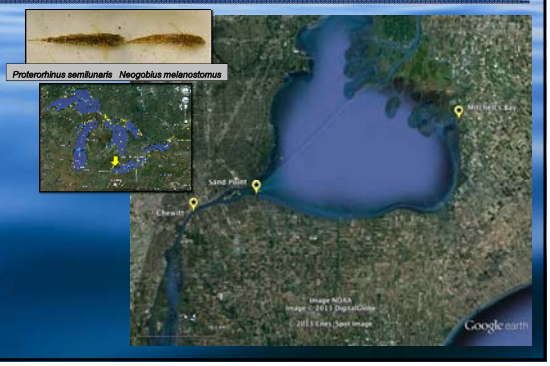
## Round goby & tubenose goby comparison



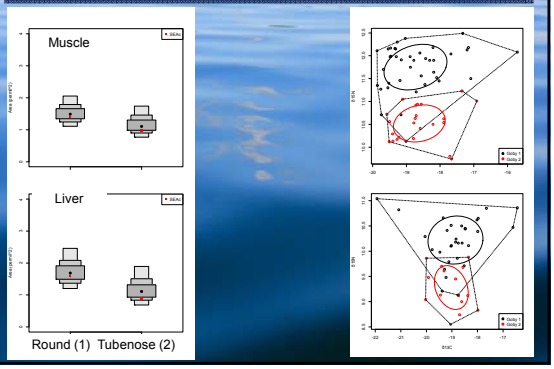
*Proterorhinus semilunaris* *Neogobius melanostomus*

**Hypothesis:** Round goby have a broader niche than tubenose goby

## Round goby & tubenose goby comparison




## Round goby & tubenose goby comparison: Mitchell's Bay (2011) Isotope Ellipses



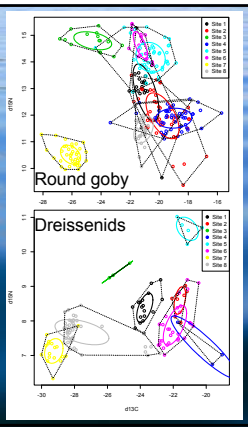
## Time since establishment and potential for niche flexibility

**Hypothesis:** Round goby have more potential for niche flexibility than tubenose goby, particularly at more recently established locations

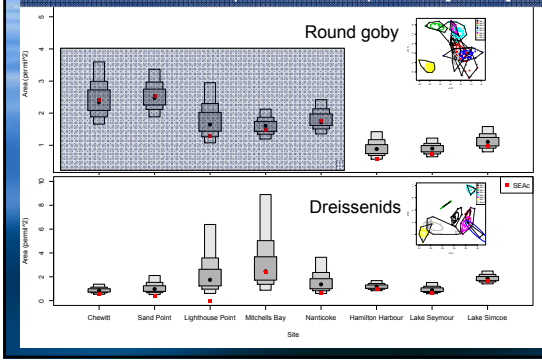
## Round goby populations and time since establishment: Collections

## Round goby populations and time since establishment: Isotope Ellipses

1. Chewitt Bay, **Lake St Clair**
2. Sand Point, **Lake St Clair**
3. Lighthouse Point, **Lake St Clair**
4. Mitchells Bay, **Lake St Clair**
5. Nanticoke, Lake Erie
6. Hamilton Harbour, Lake Ontario
7. Lake Seymour, Trent Severn
8. Lake Simcoe

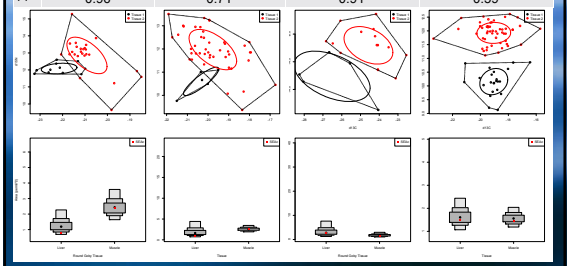


## Round goby populations and time since establishment: Ellipse area comparison [SEA$_C$]



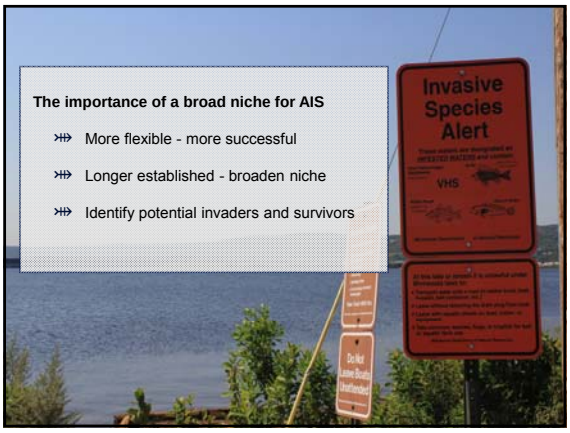

## Potential for niche flexibility: Liver and Muscle Ellipses

| | Chewitt Bay | Sand Point | Lighthouse Point | Mitchell's Bay |
|---|---|---|---|---|
| Test | Liver < Muscle | Liver < Muscle | Muscle < Liver | Muscle < Liver |
| Pr | 0.96 | 0.71 | 0.91 | 0.59 |



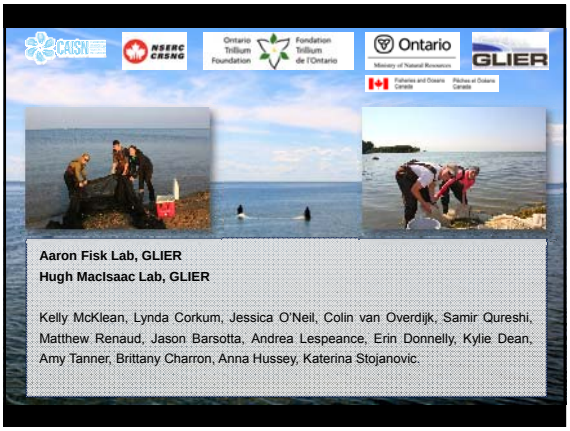
## Summary & Significance

1. Round goby feed at higher trophic level than tubenose
2. Round Goby have a larger isotopic niche than tubenose
3. Round goby have broader niche in longer established locations
4. Round Goby have higher potential for niche flexibility than tubnose goby




**The importance of a broad niche for AIS**

- More flexible - more successful
- Longer established - broaden niche
- Identify potential invaders and survivors



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