Sampling, survey and relocation methodology

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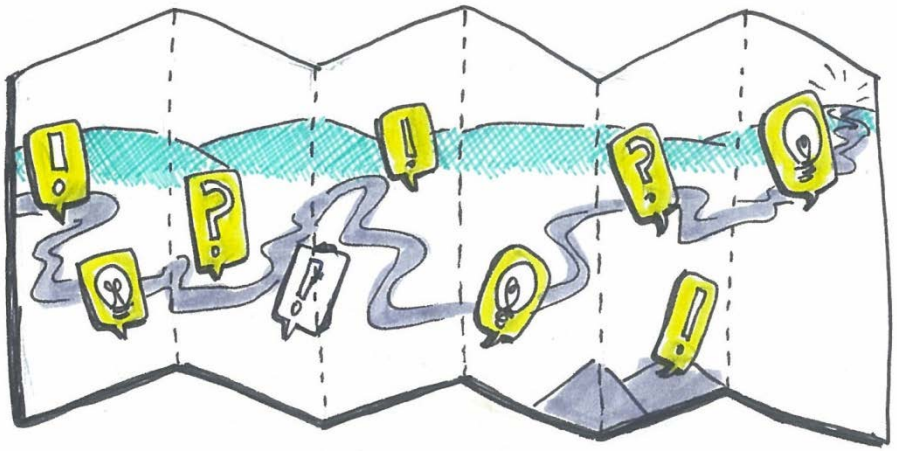
Roadmap



- Conservation framework
- Sampling (presence/absence)
- Translocation

Conservation Framework

Research Needs for Freshwater Mollusk Conservation:

Priority 1:
- Systematics
- Status & Distribution

Priority 2:
Water Quality Limits
- DO
- pH
- Temperature
- Conductivity
- Toxicology

Priority 3:
Biological Data
- Diet - Feeding
- Reproduction
- Metabolism

Priority 4:
- Habitat evaluation
- Associative ecological data

Fusconaia mitchelli (False spike)

Conservation measures can be taken within current regulatory framework (ESA, CWA, etc.) but DATA ARE REQUIRED

P. Johnson, unpublished data

Sampling

Sampling (presence/absence)

Technique:

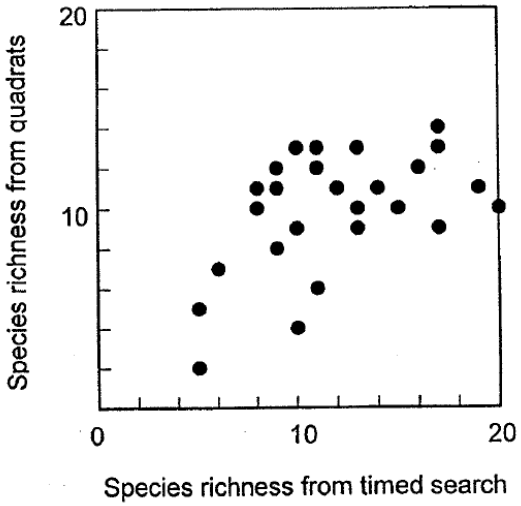
- Semi-quantitative
  - SCUBA, snorkeling, grubbing
  - Fixed area
  - Transects

Pros:

- Provides a better estimate of species richness and a more cost effective means of estimating abundance
- Easy to implement and inexpensive

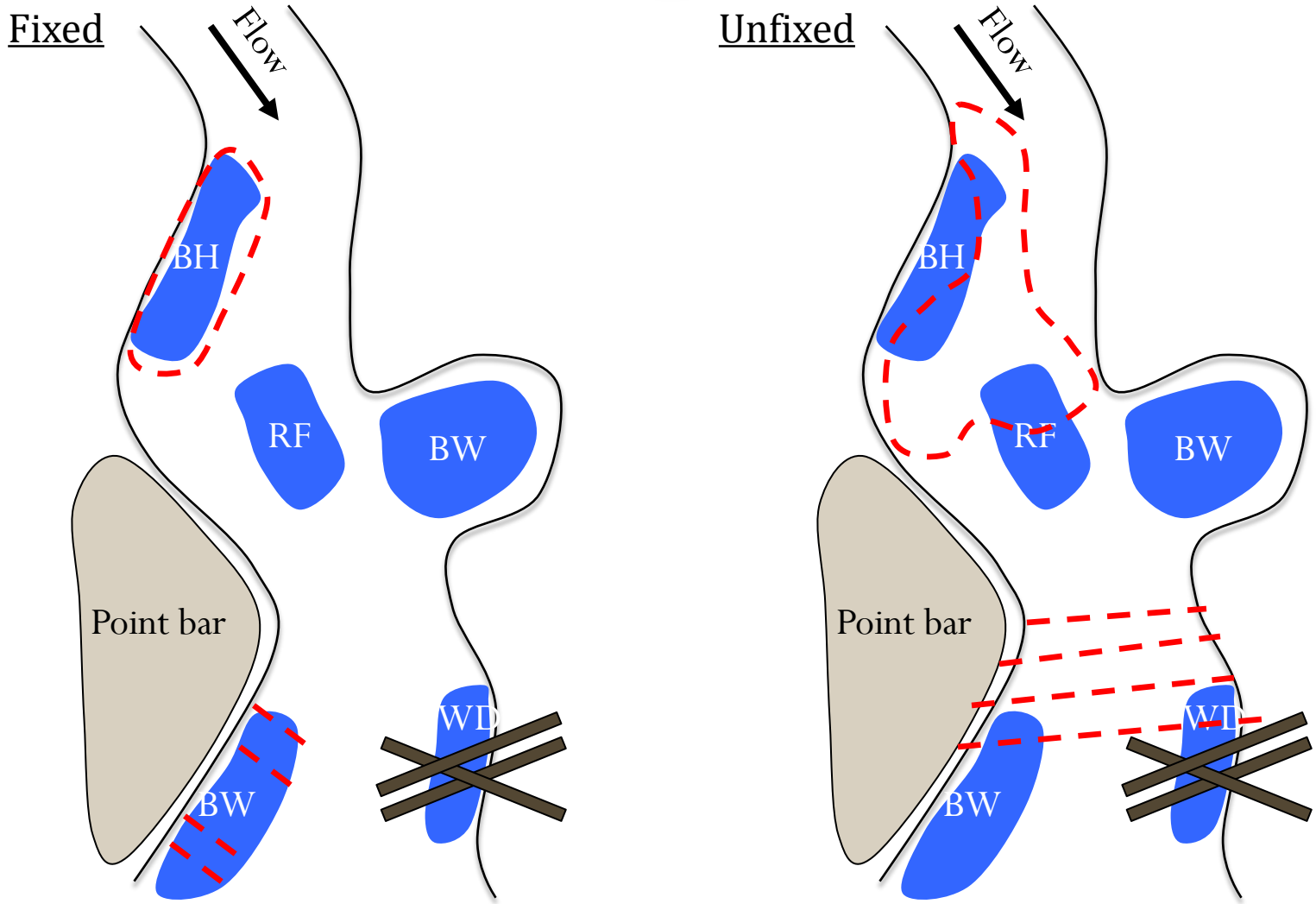
Cons:

- Biased toward large and sculptured individuals
- Requires knowledge of mussel habitat (fixed, transect)
- Spend a lot of time searching unsuitable habitat (transect)
- Biased by samplers' ability to find mussels

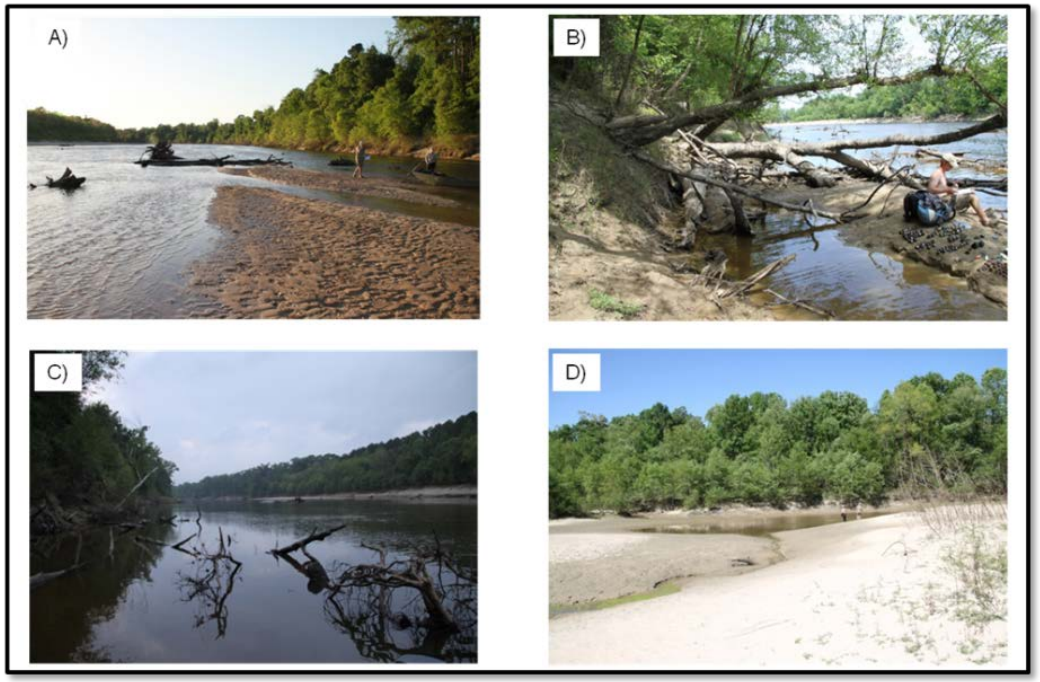


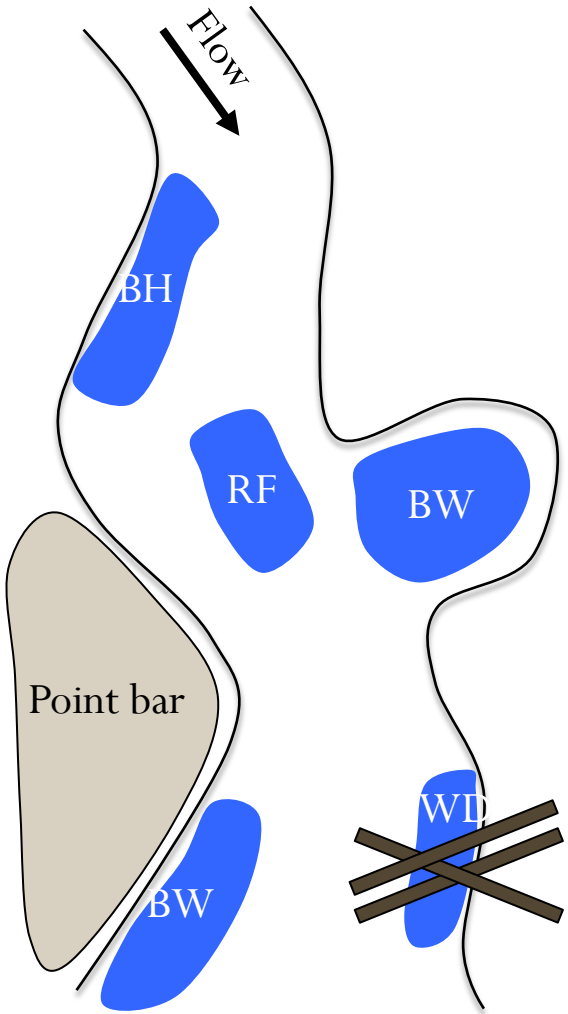
Vaughn et al. (1997)

Sampling (presence/absence)



Sampling – (presence/absence)

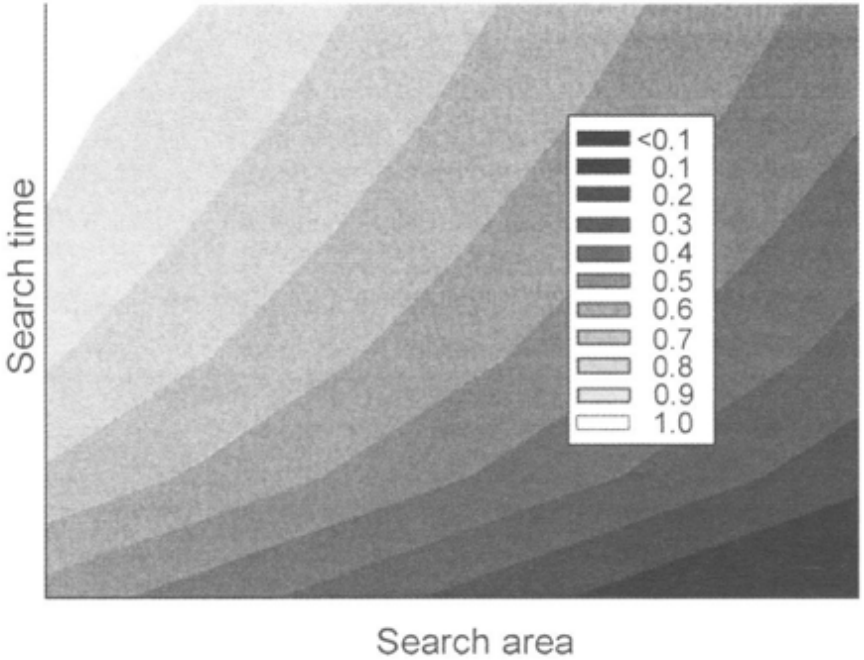




Sampling

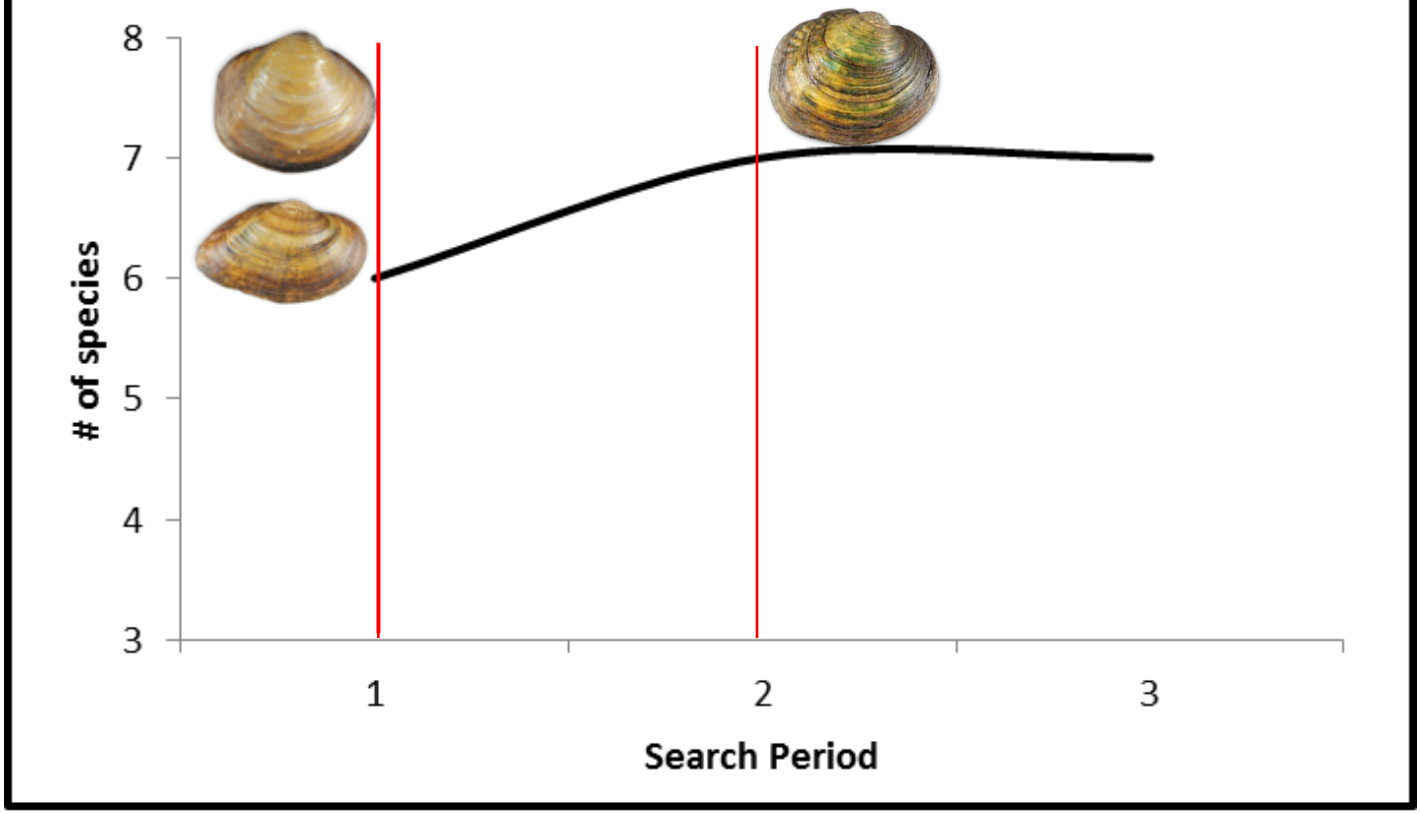
Detecting a species is related:

- Abundance
- Spatial distribution
- Sampling effort
  - Time/sites
- Detectability
- Experience



Smith (2009)

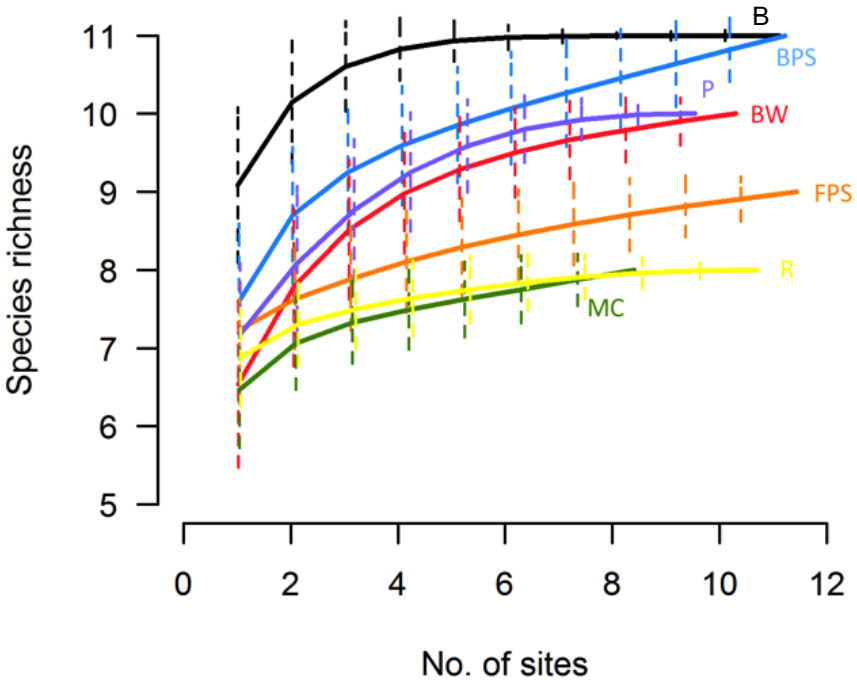
Sampling – # hours



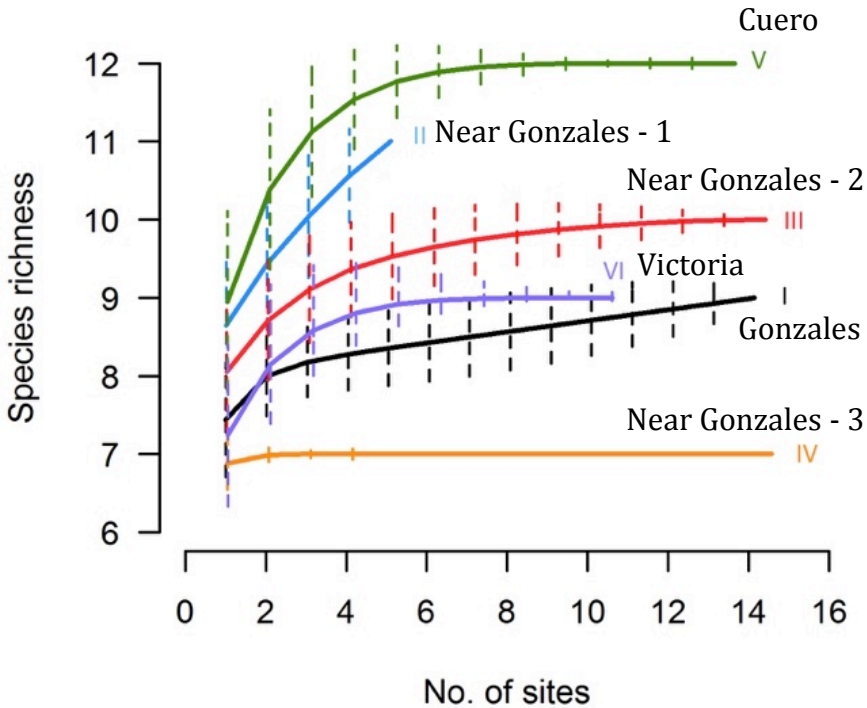
Sampling – # sites

Guadalupe River (Central Texas):

Habitat:



Reach:



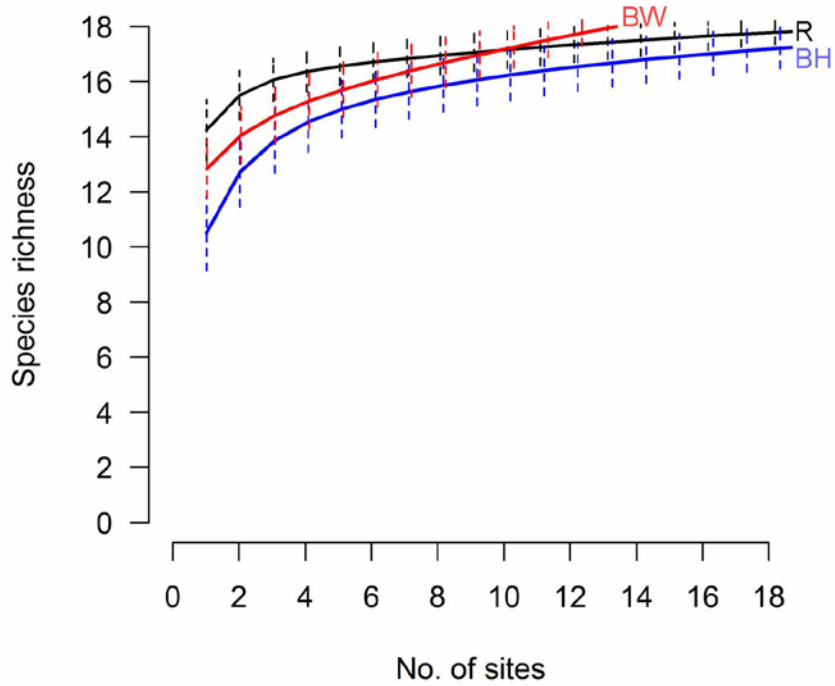
*sample-based species accumulation curves

Tsakiris et al. (2016)

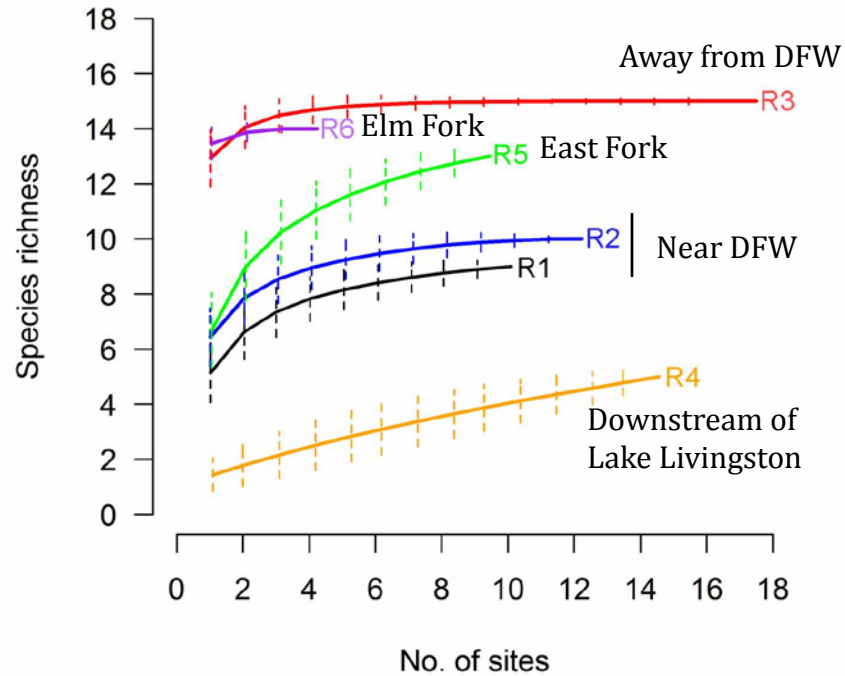
Sampling – # sites

Trinity River (East Texas):

Habitat:



Reach:

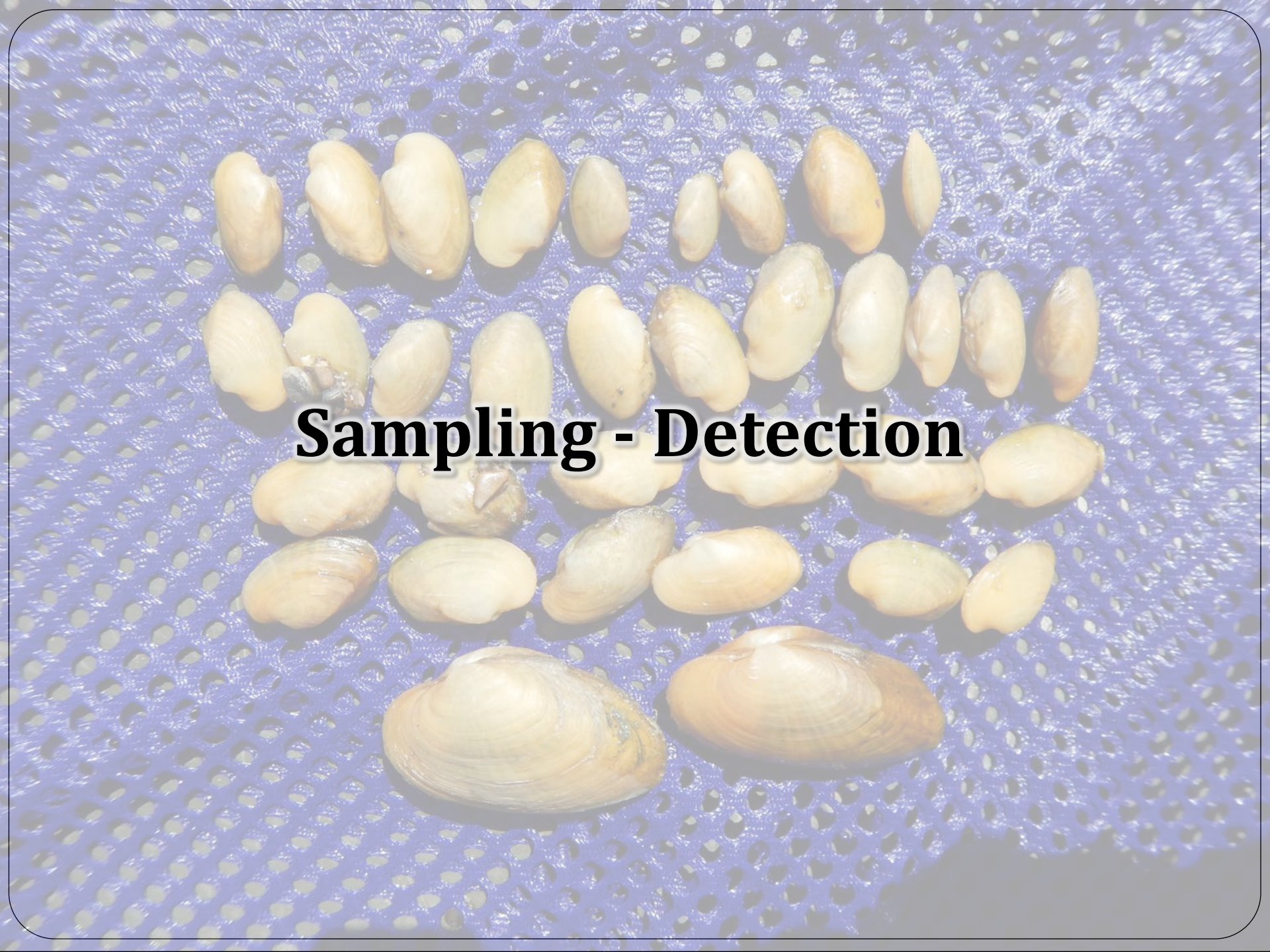


*sample-based species accumulation curves

Randklev et al. (2017)

Effort – Take-home message

- **Number of hours/sites to detect species can vary based on**:
  - Habitat
  - Stream position
  - Proximity to impacts
- **Should be determined *a priori* and based:**
  - Goals
  - Risk
  - Preliminary sampling



Sampling - Detection

Sampling – detection

Detection:

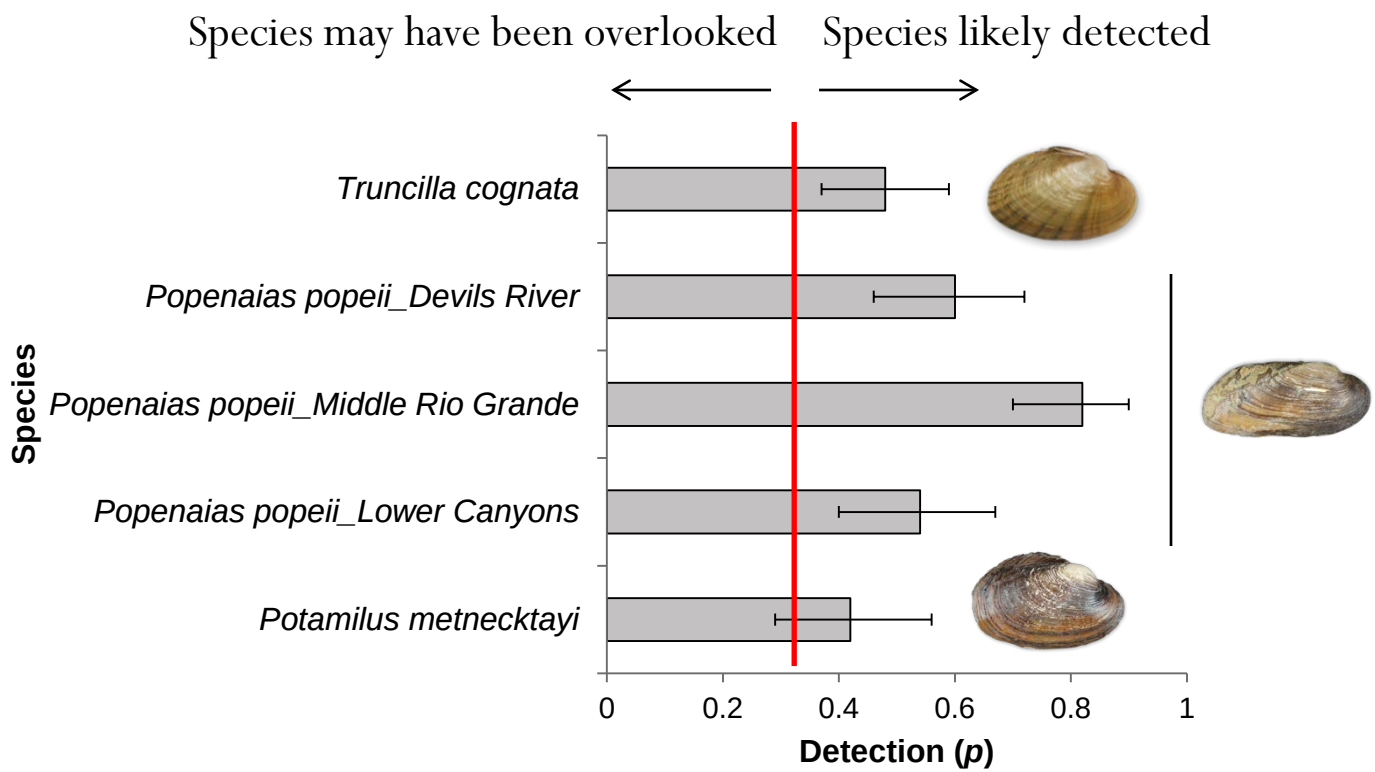
- Observer effects (i.e., capture efficiency - effort, time, exp.)
- Life history
- Environmental conditions
- Abundance

Issues:

- Most surveys assume detection is perfect, which is incorrect
- Occupancy may be underestimated
  - Falsely suggest local extirpation and range contractions

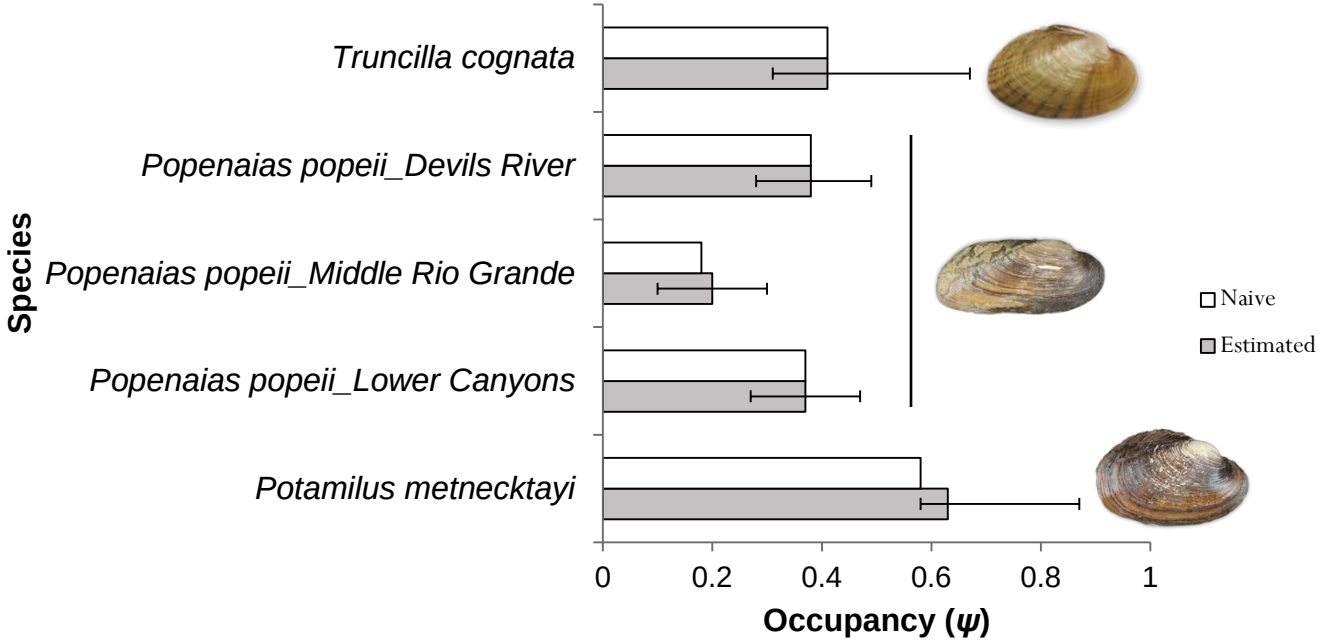
Sampling – detection

Rio Grande:



Sampling – detection

Rio Grande:



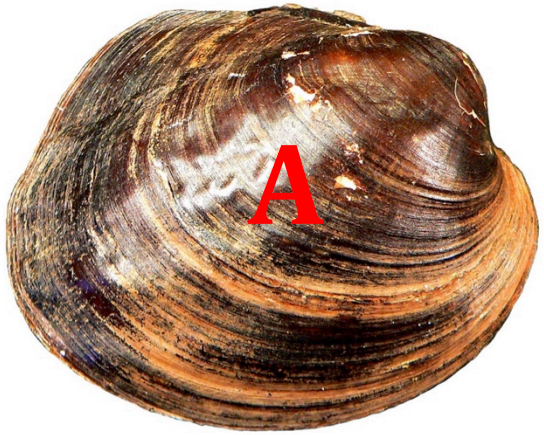
Detection – Take-home message

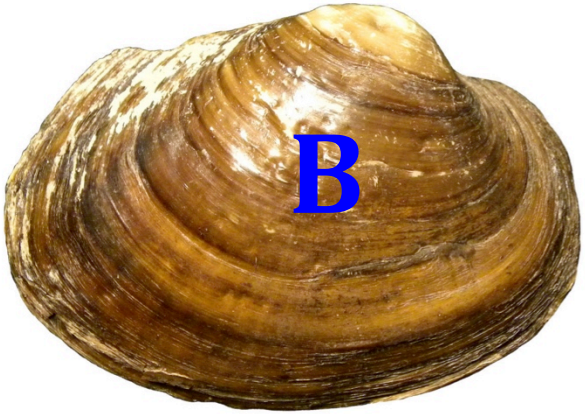
- **Detection is not perfect**:
  - Varies by species and population
  - Influenced by environment and observer effects
  - Biased estimates of occupancy

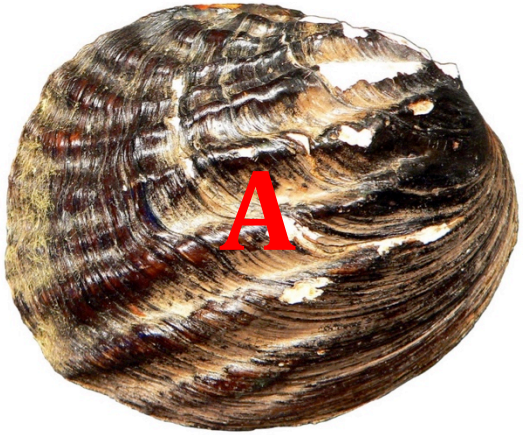
- **Important part of survey design**:
  - Provides confidence in the data
  - Minimize bias
  - Advance understanding of factors that influence mussel populations

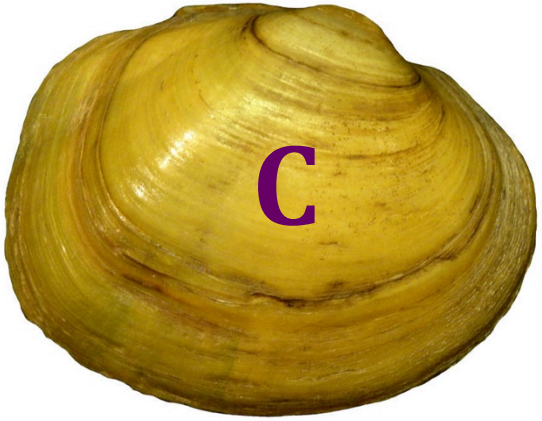
Sampling - Identification

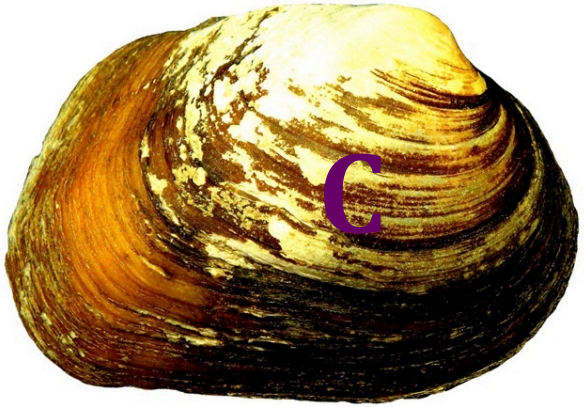
Species Identification





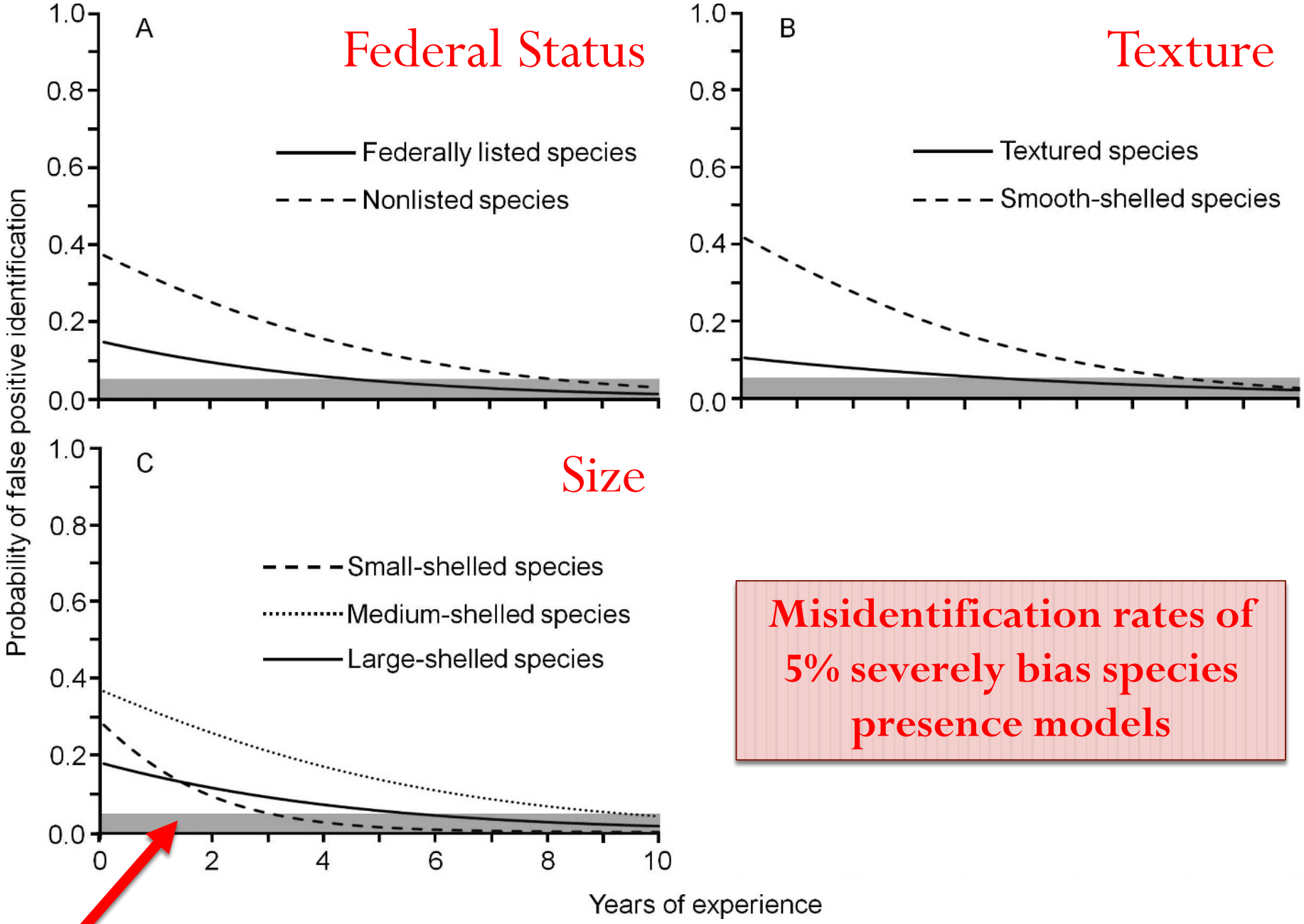






Species Identification

- Important for:
  - Status assessments
  - Monitoring programs
  - Species distribution models
- Biases:
  - Obscure declines
  - Suggest false patterns
  - Waste resources

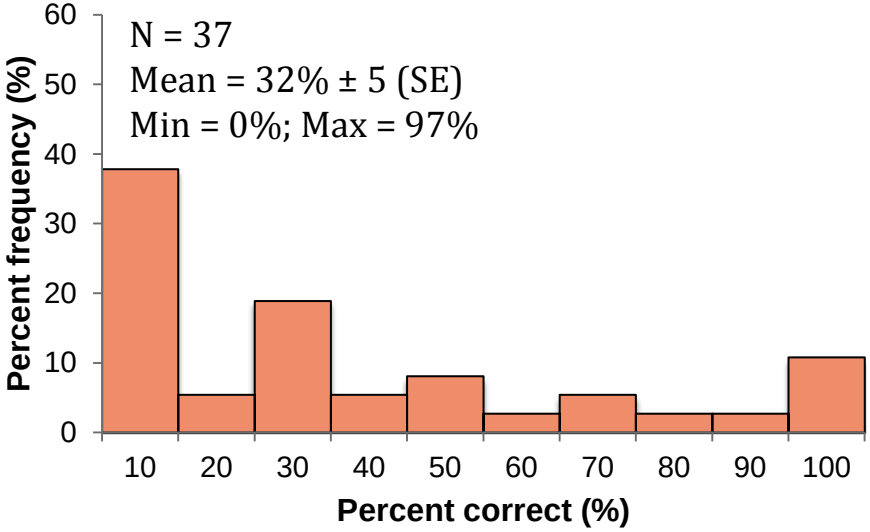


Misidentification rates of 5% severely bias species presence models

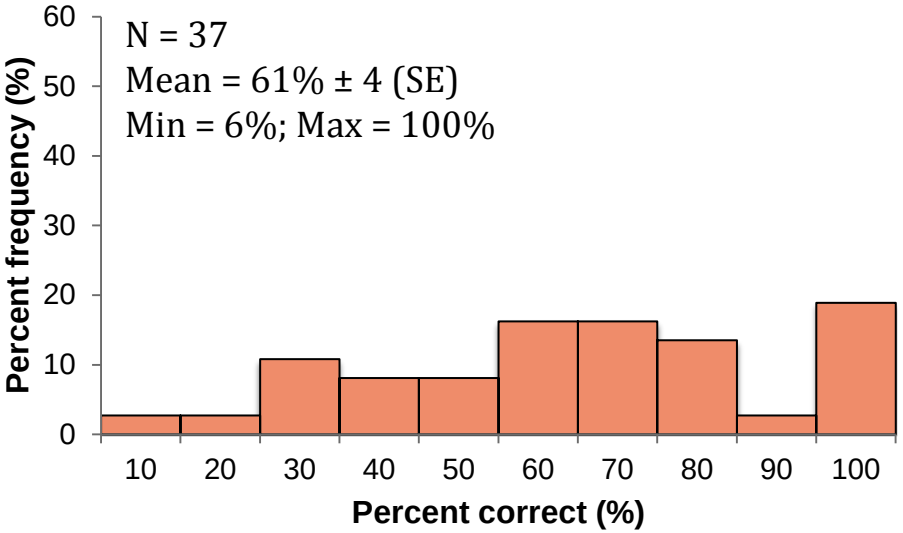
Source: Figure 1 - Shea et al. 2011

Species Identification - Texas

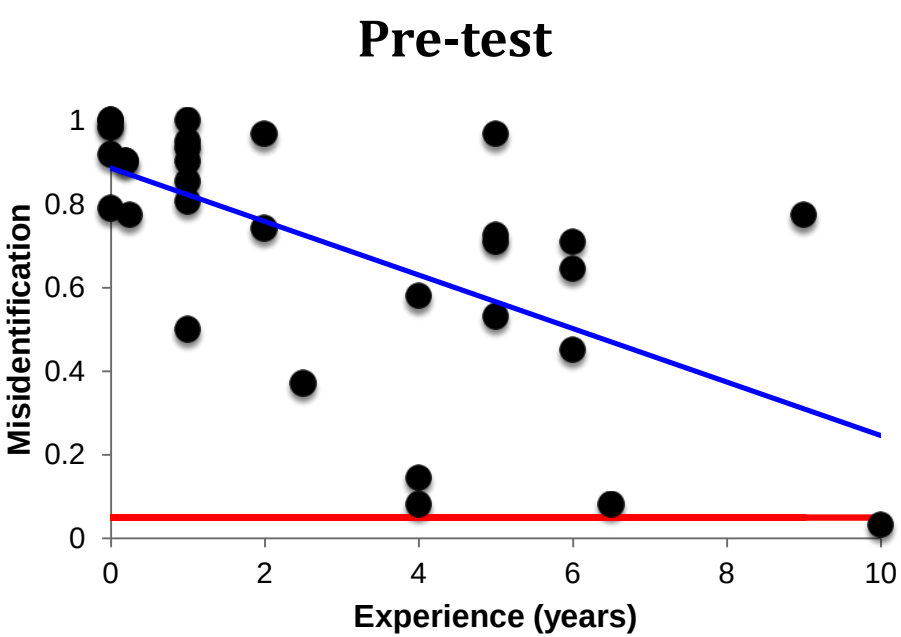
Pre-test

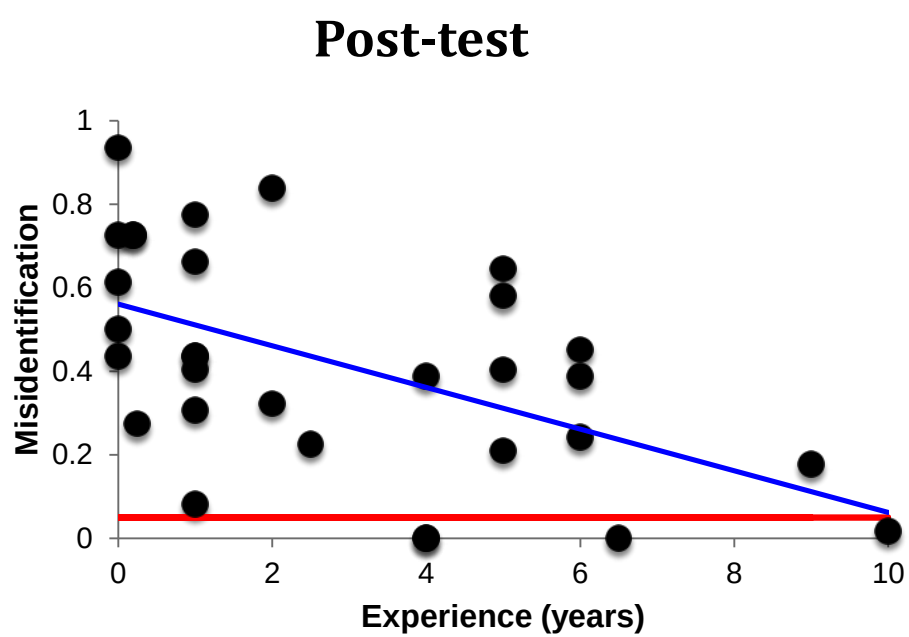


Post-test



Species Identification - Texas





Sex Identification

- Important for:
  - Assessments of viability and persistence
- Biases:
  - Obscure declines
  - Suggest false patterns
  - Waste resources

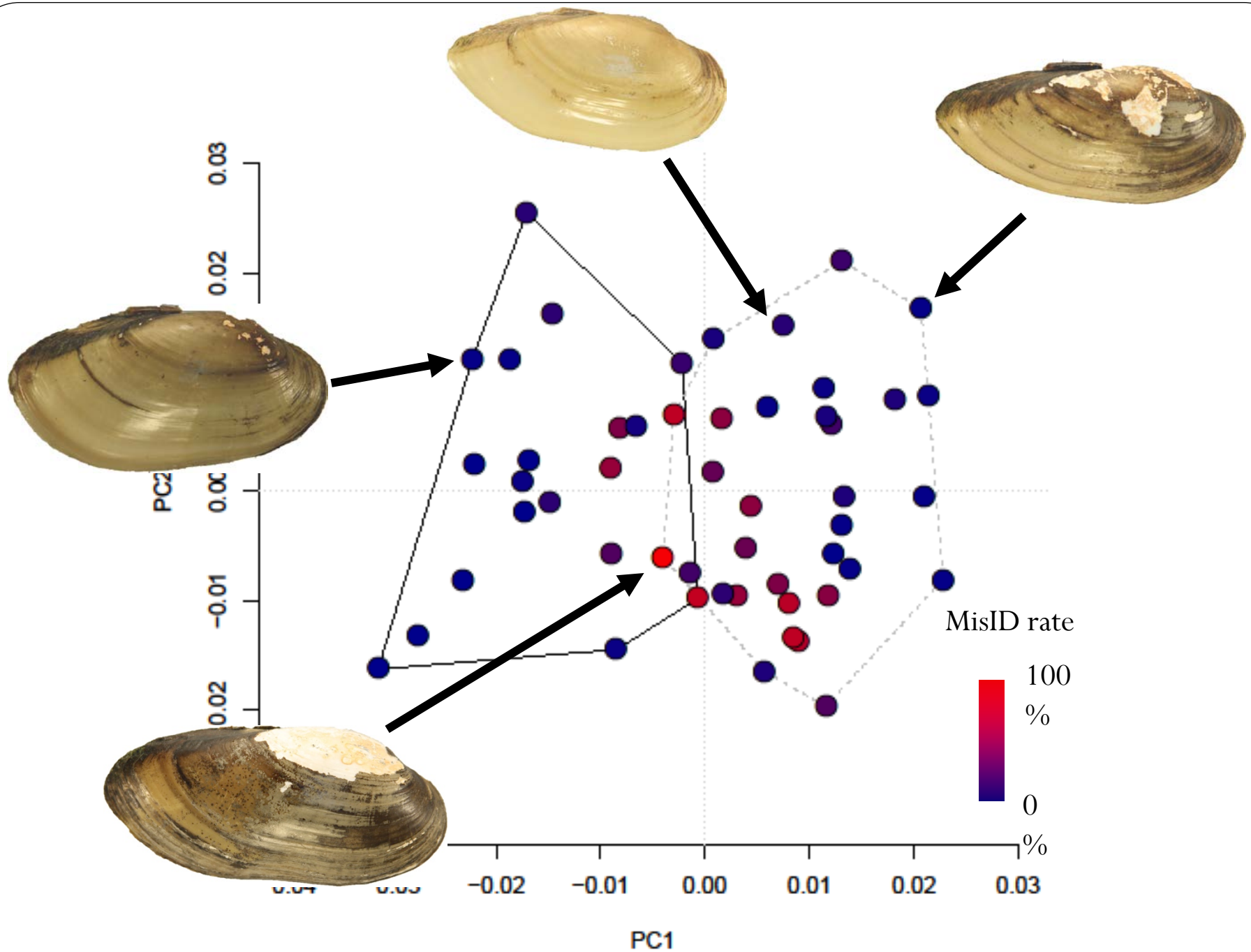
Lampsilis teres, yellow sandshell

Male

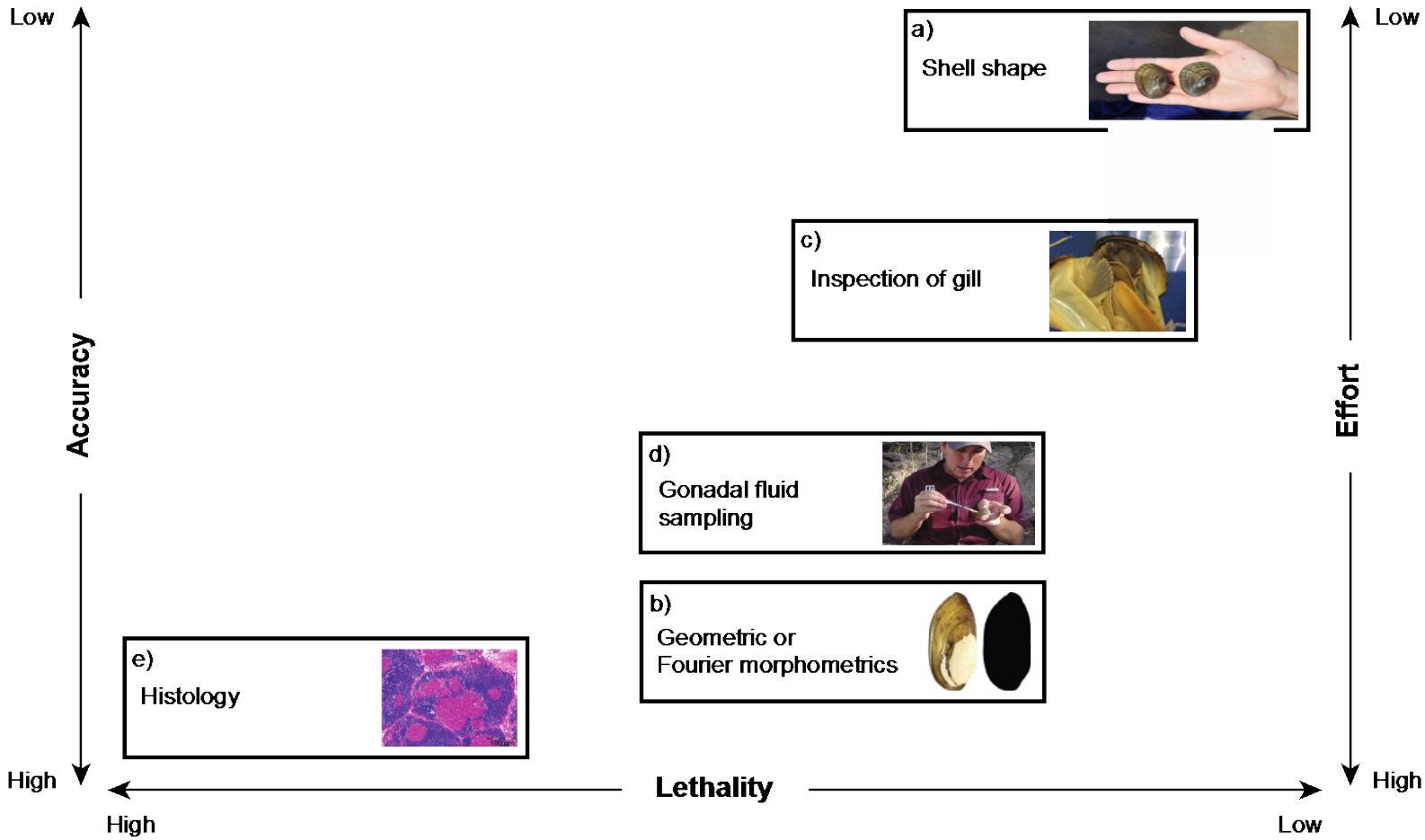
Female

Quadrula petrina, Texas pimbleback

?

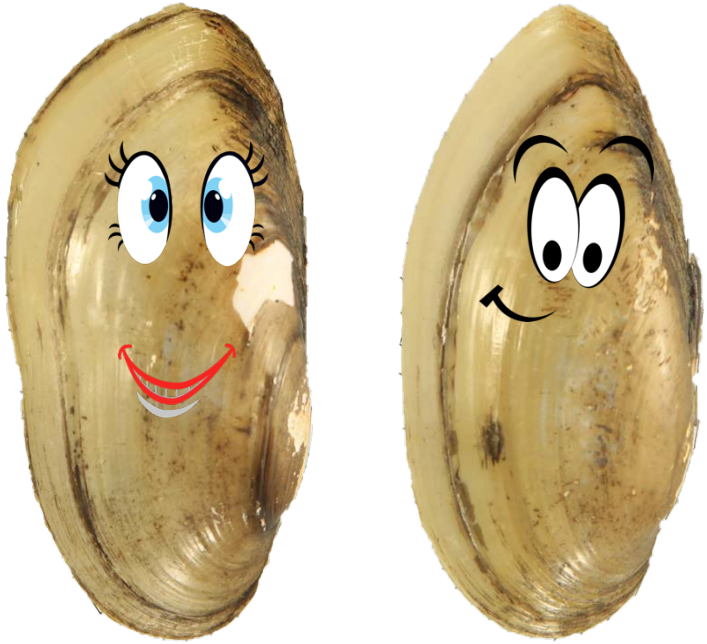

0.03
0.02
0.00
−0.01
0.02
PC2
−0.02
−0.01
0.00
0.01
0.02
0.03
PC1
MisID rate
100
%
0
%

Sex Identification



Identification – Take-home message

- **Identifications are not perfect**:
  - Varies by species and population
  - Influenced by environment and observer effects
  - Biased estimates of occupancy
- **Important part of survey design**
  - Provides confidence in the data
  - Minimize bias
  - Provides confidence in status assessments
  - State/Feds should require proficiency



Translocation

Translocation

Translocation:

- Avoid impacts from construction activities
- Augment existing populations
- Reintroduce extirpated populations
- Temporary hold in artificial refugia

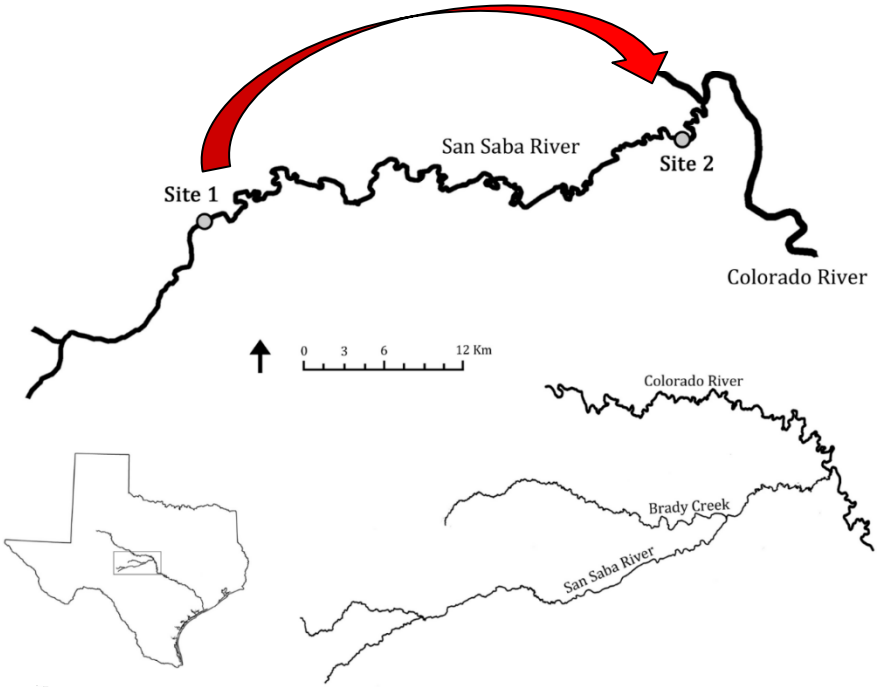
Historically poor success

- Limited guidance
- Little understanding of factors influencing translocation success?

Translocation – San Saba

Site selection

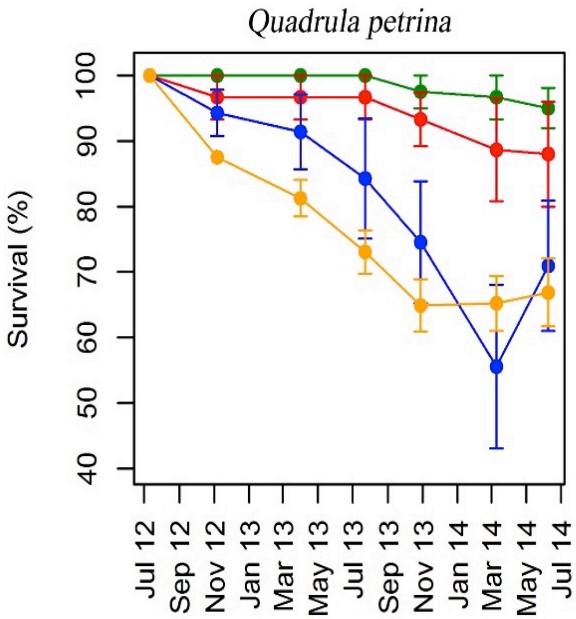
- **Site 1**: Bridge replacement
- **Site 2**: Translocation site

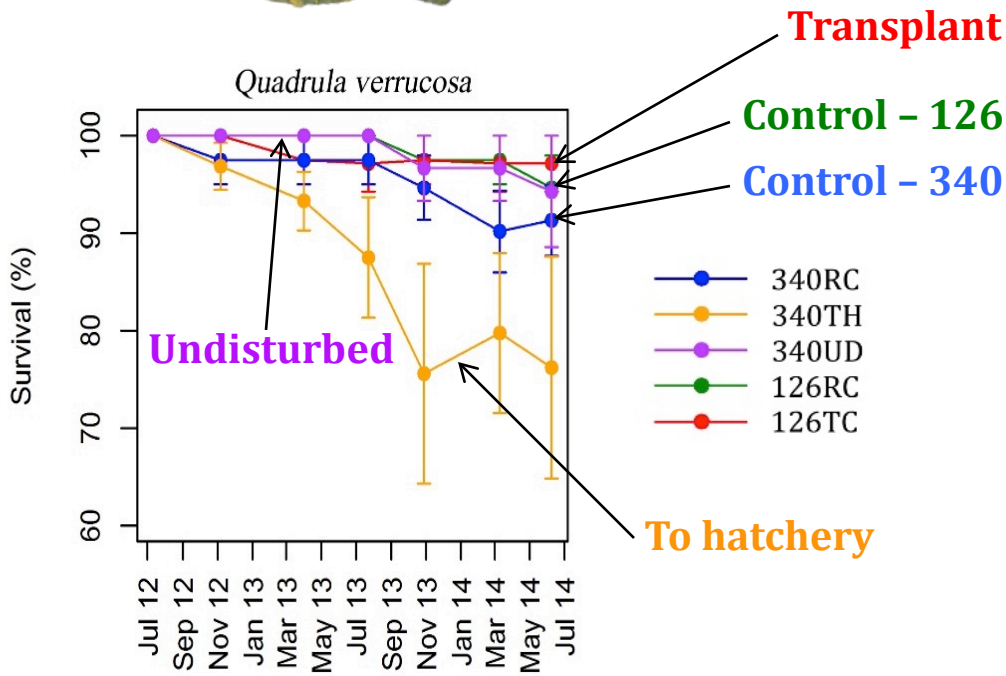


Pistolgrip

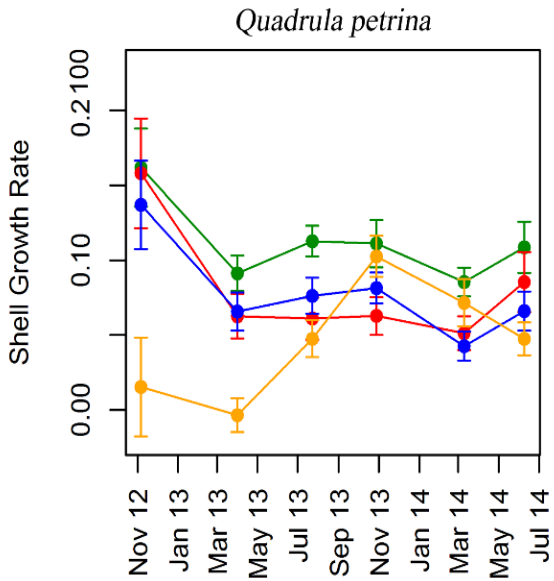
Texas pimpleback

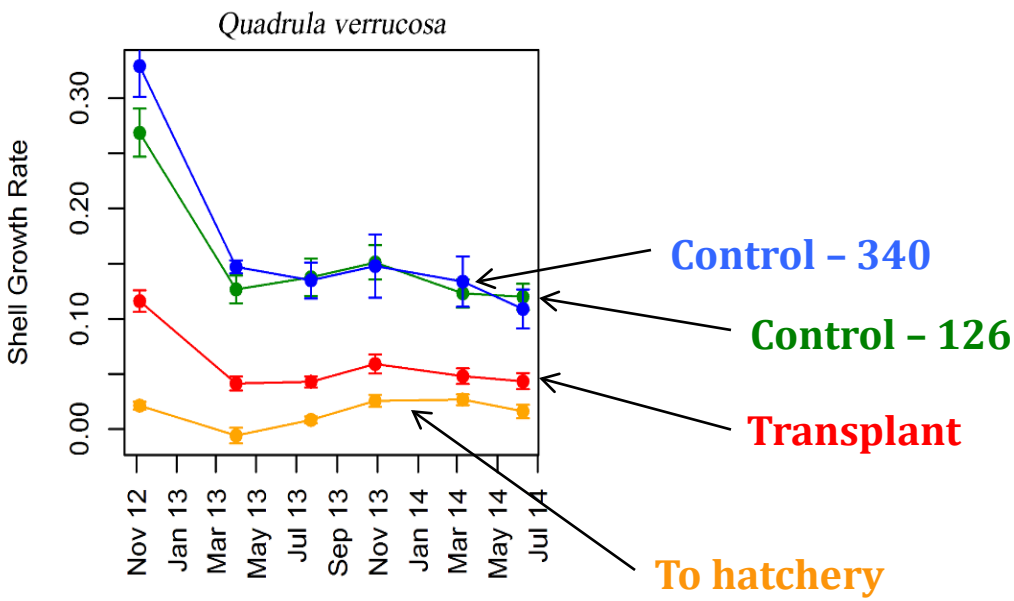
Translocation - survival





Translocation - growth





Translocation – Take-home message

Sampling and handling practices

- Translocate to sites with mussels
- Use PIT tags to ensure high recovery
- Minimize emersion
- Post-translocation monitoring a must

Minimize site differences

- Translocate within the same river (or habitats)
- Reduce distances between translocation sites
- Use genetic techniques if differences in local genetic diversity are suspected

Infer success based on multiple endpoints

- Survival by itself not sufficient
- Growth and reproduction
- Sublethal measures of stress

Questions?