

Smalltooth Sawfish Population Genetics



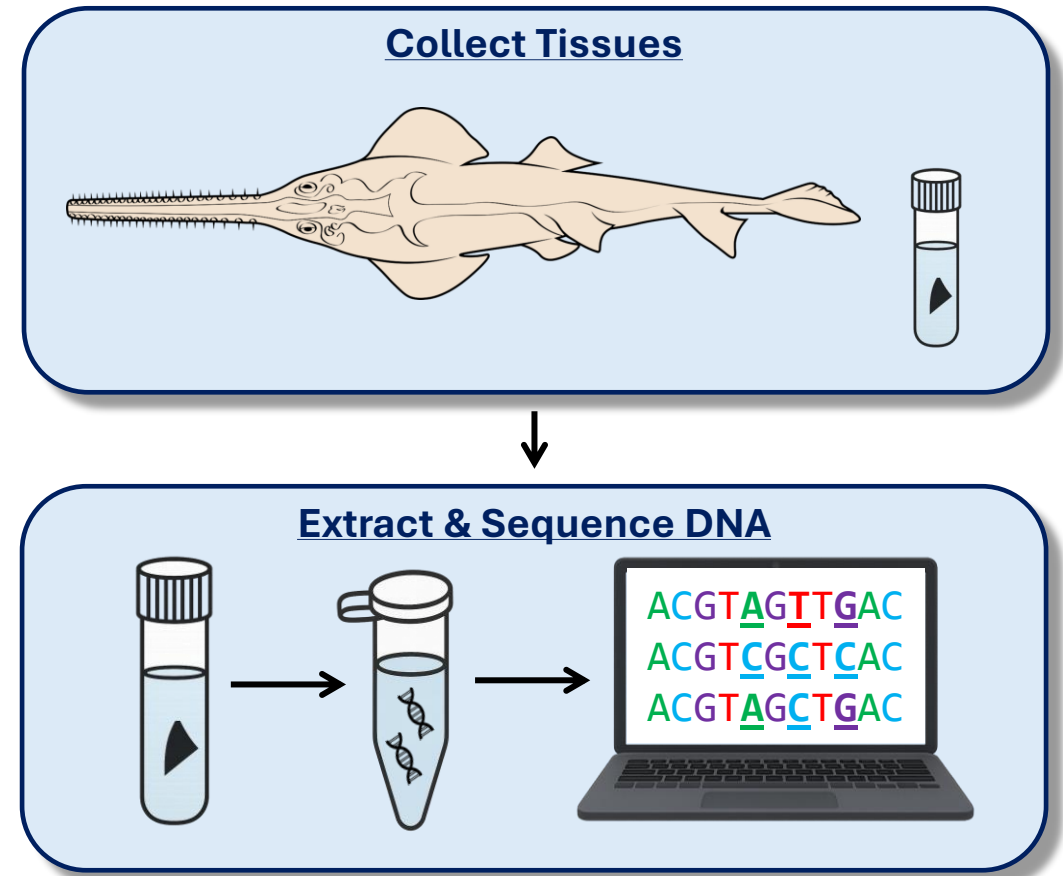
South Atlantic Fisheries Management Council Shrimp Workgroup

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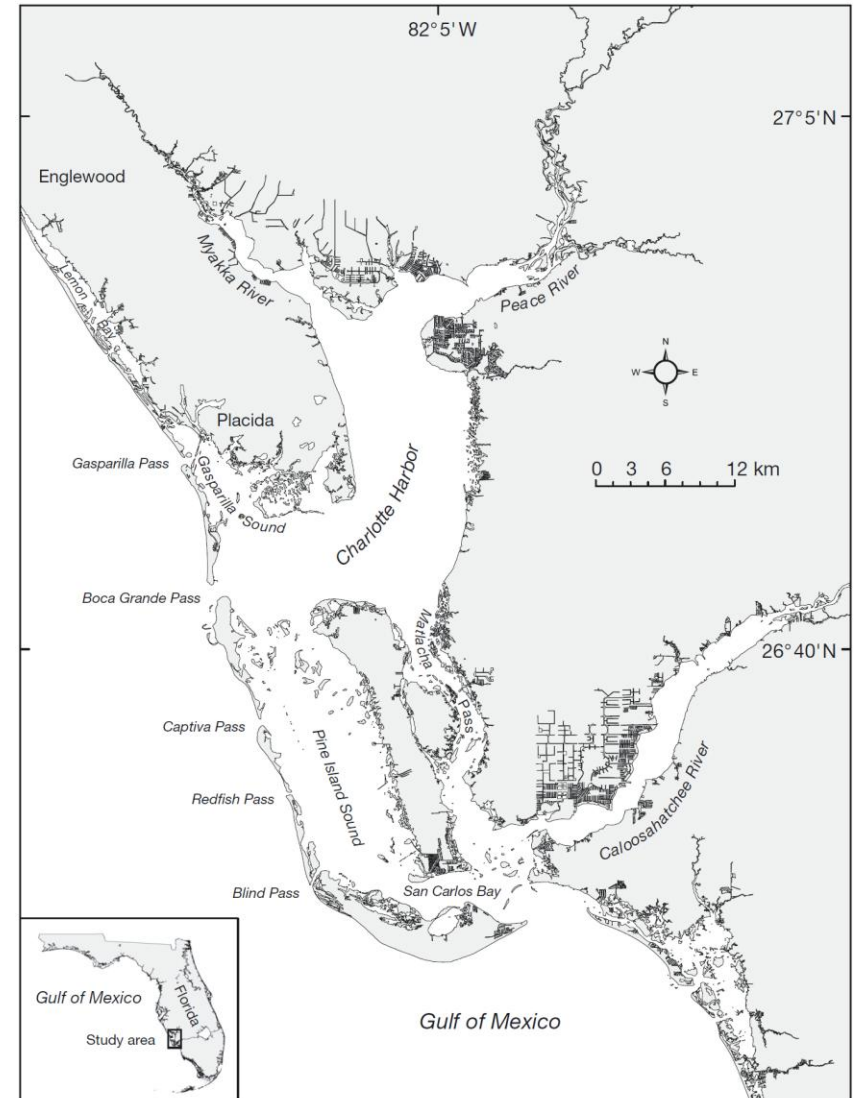
Population genetics

- How is genetic variation distributed?
- Describe populations
- Detect recaptures and kin
 - Examine movement and habitat use
 - Estimate abundance



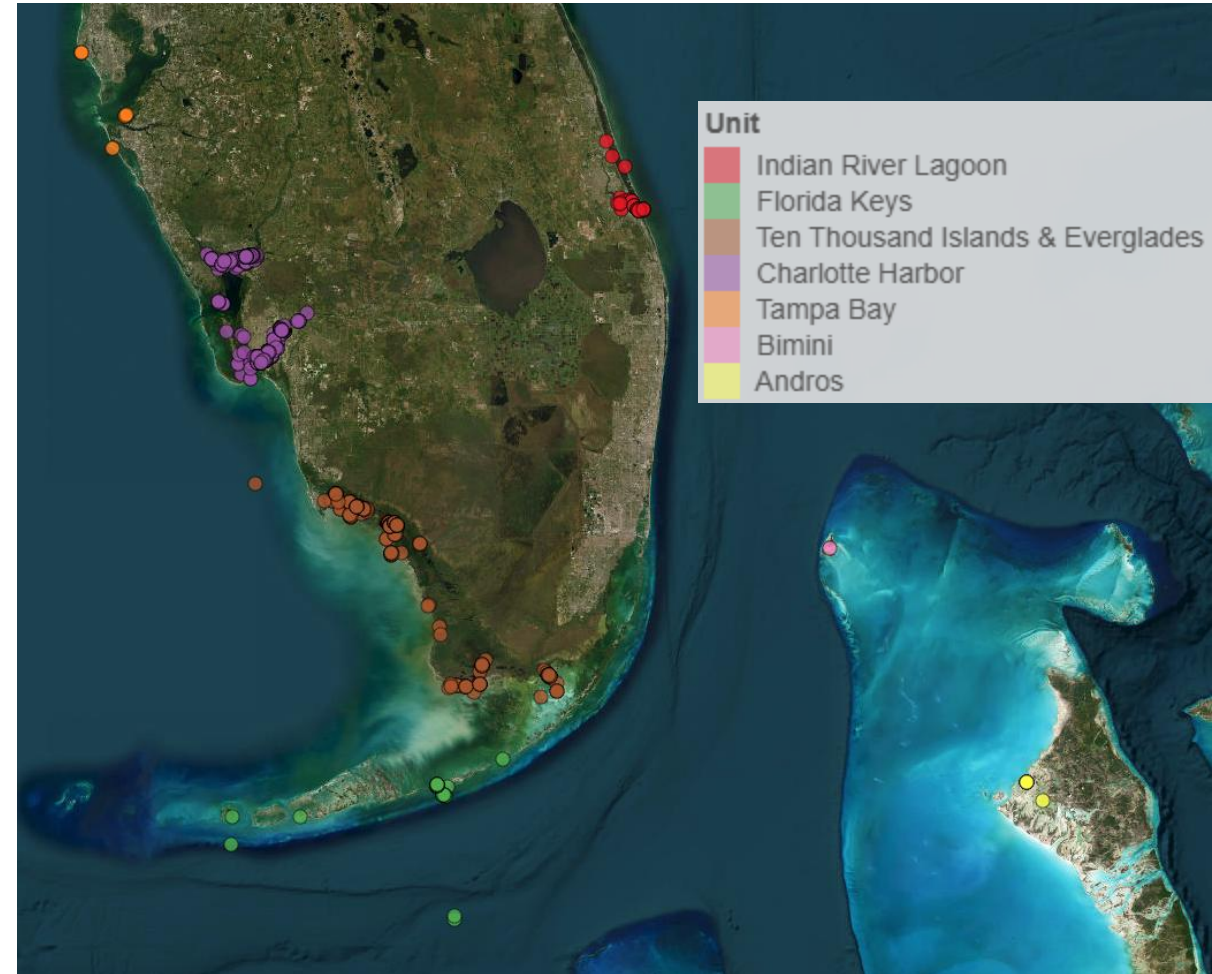
Population genetics of smalltooth sawfish

- Insights from sibling pairs
 - Females give birth every **2 years**
 - Females return to the **same area** to give birth
 - Females **remated** with the same male years later
 - 9 females used areas for **10+ years**
- **Asexual reproduction**
 - 7 sawfish with same genetic variants at 14+ markers
 - **1 in 400 billion** chance due to sexual reproduction
 - First observation in wild vertebrates
 - Limited viable mating pairs?



Current project

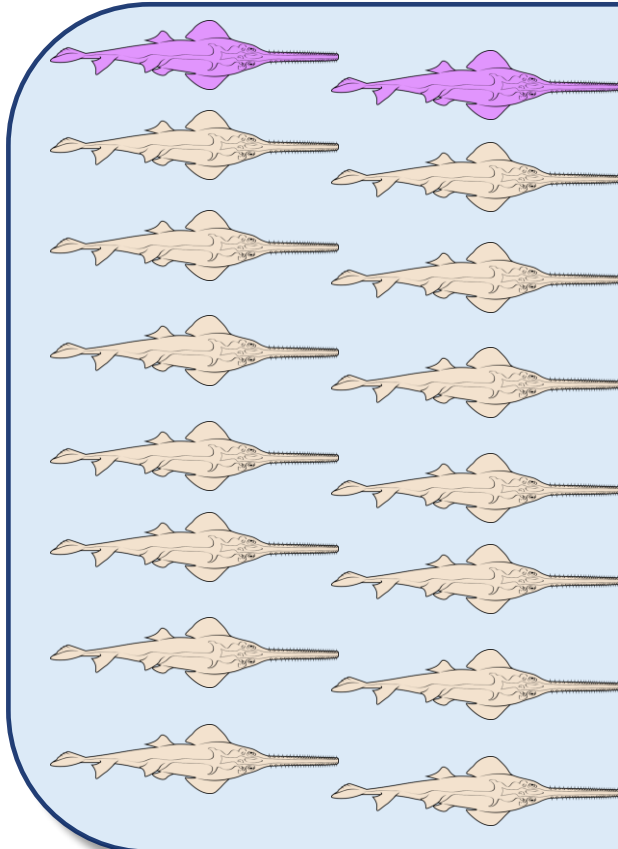
- >1,000 samples
 - Florida and The Bahamas
 - Collected 2004-2024
 - Assign year-of-birth cohorts
- Population genomics
 - Thousands of markers
 - Maternally-inherited DNA
- Corroborated previous findings
 - **Estimate current and past abundance**



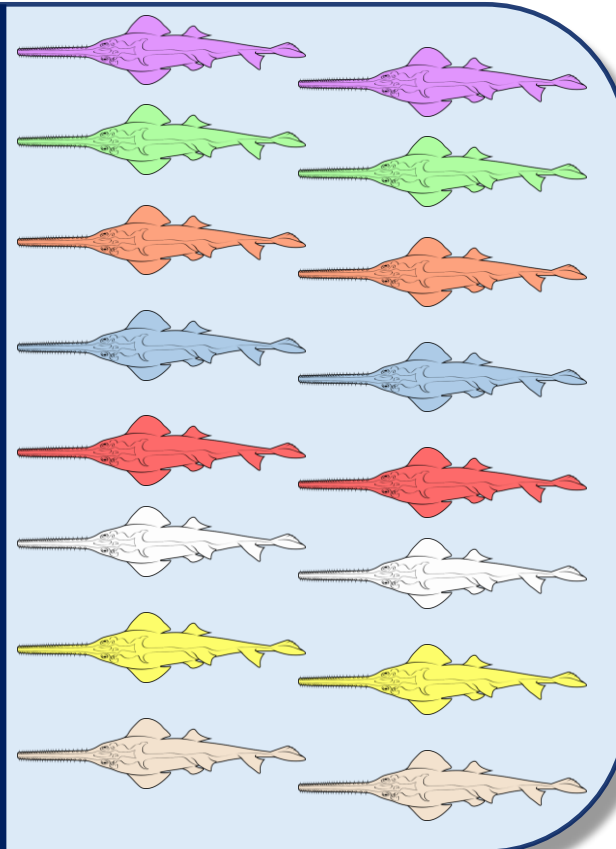
Close-kin mark-recapture

- Estimate number of breeding adults

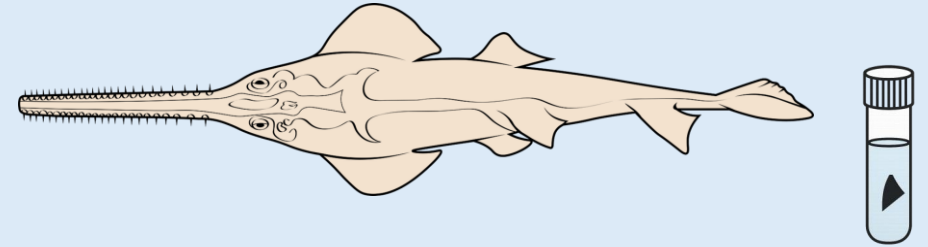
Sample A



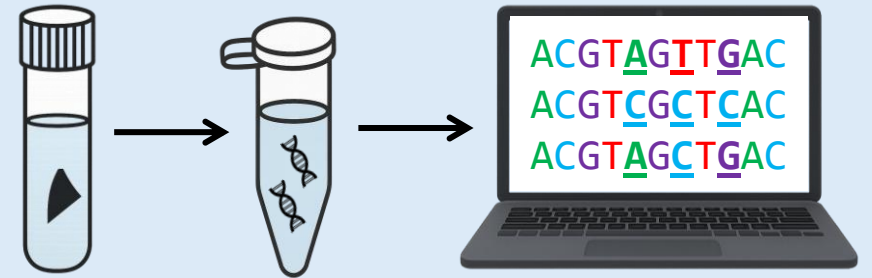
Sample B



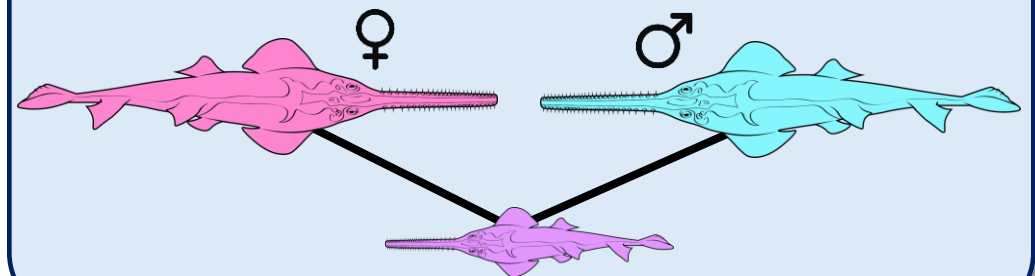
Collect Tissues



Extract & Sequence DNA

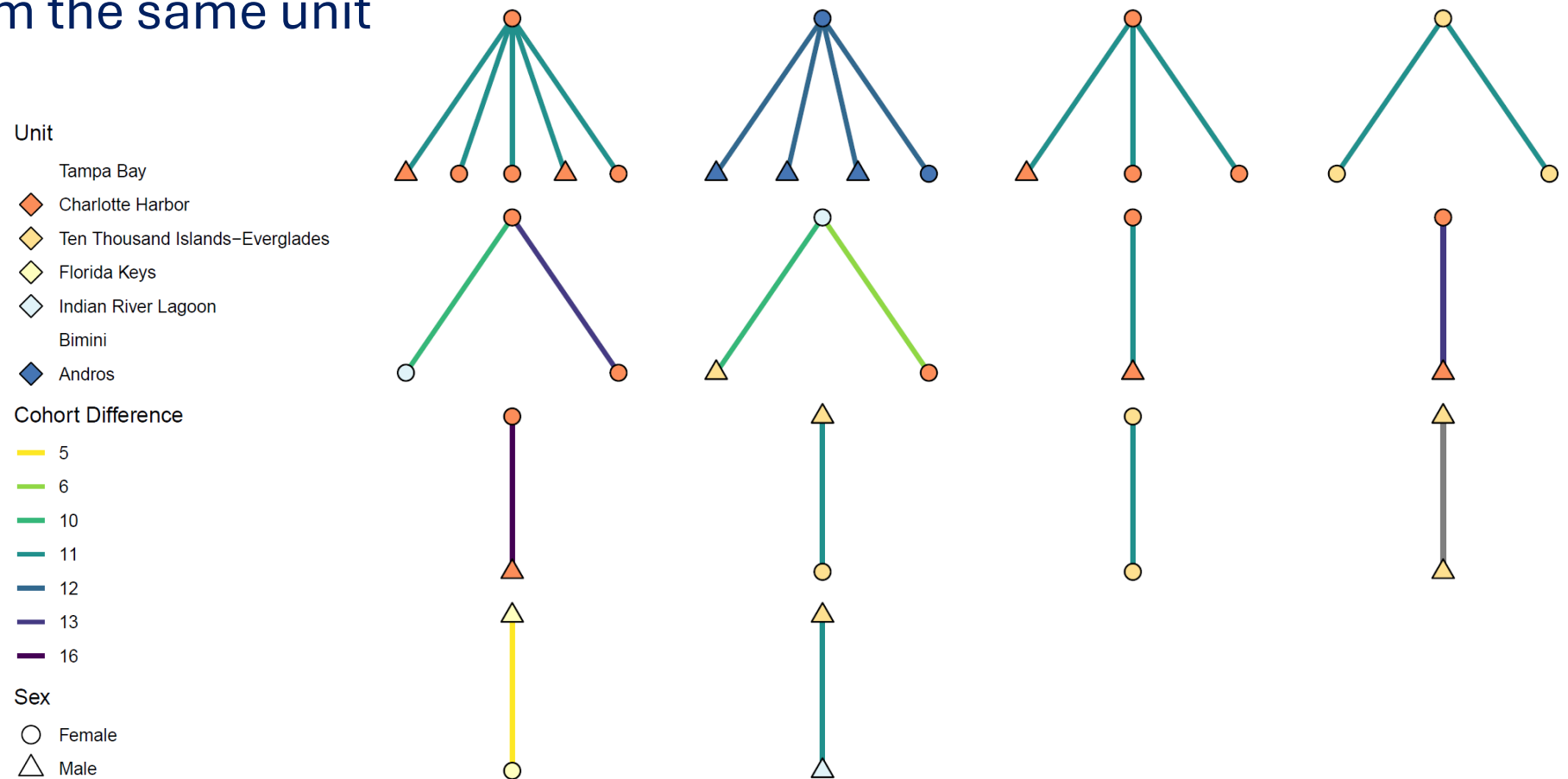


Find Kin Pairs



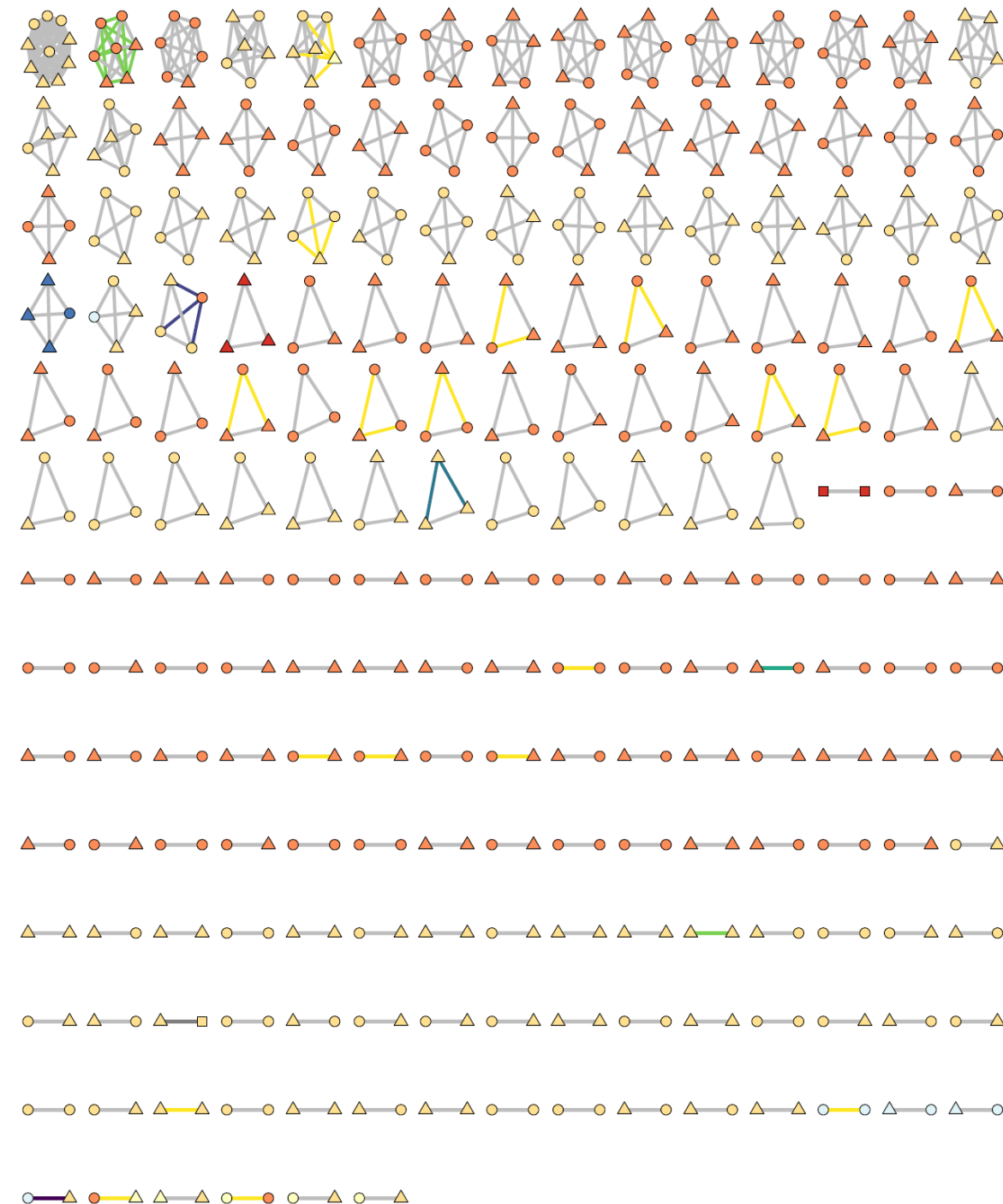
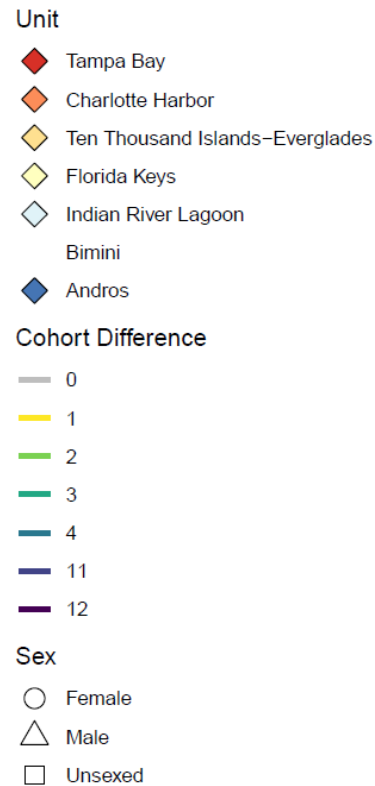
Parents and offspring

- 26 pairs (24 mothers and 2 fathers)
 - 85% from the same unit



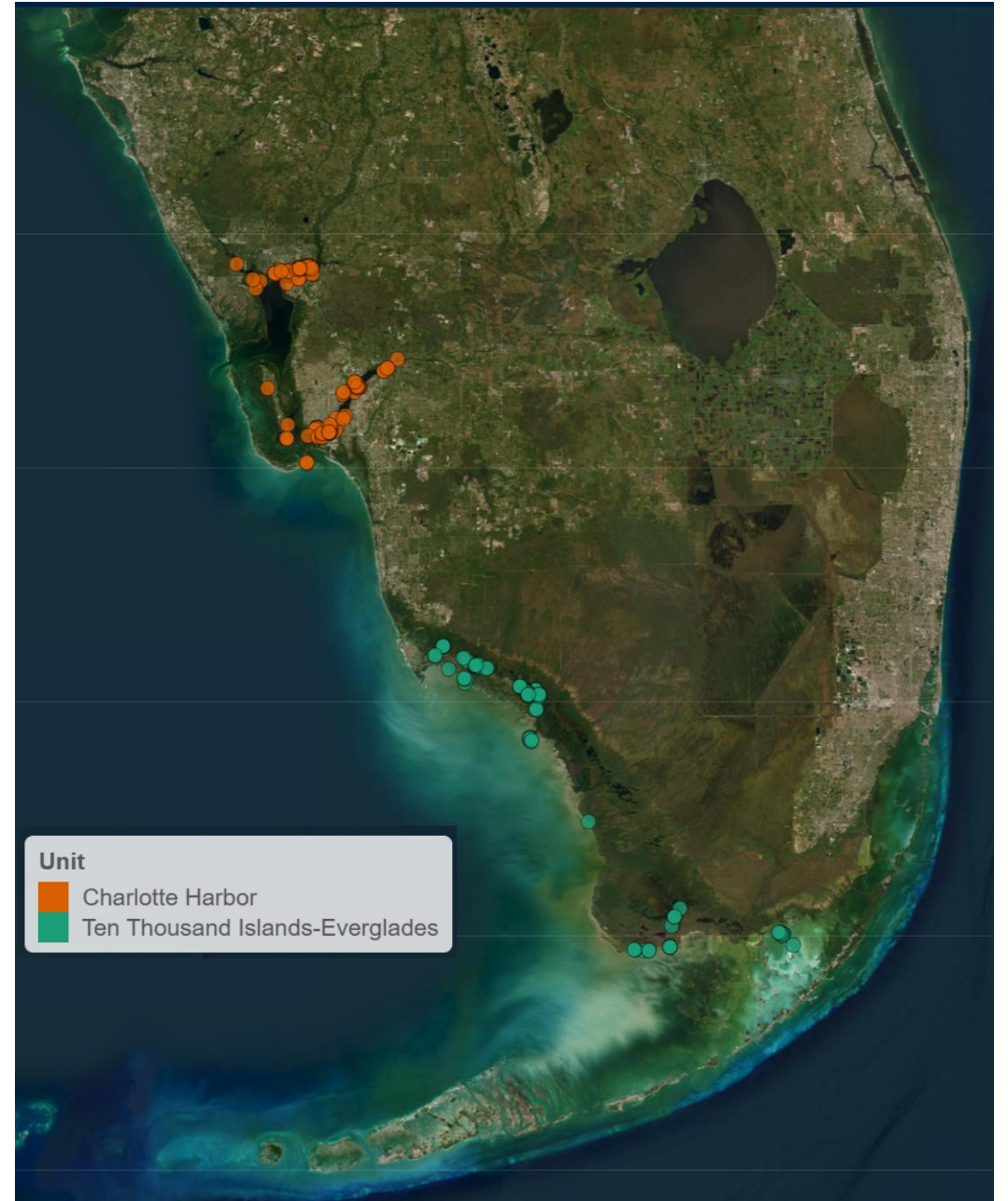
Full siblings

- 648 pairs
 - 92% born in the same cohort
 - 52 pairs born 1-12 cohorts apart
 - 91% in same unit



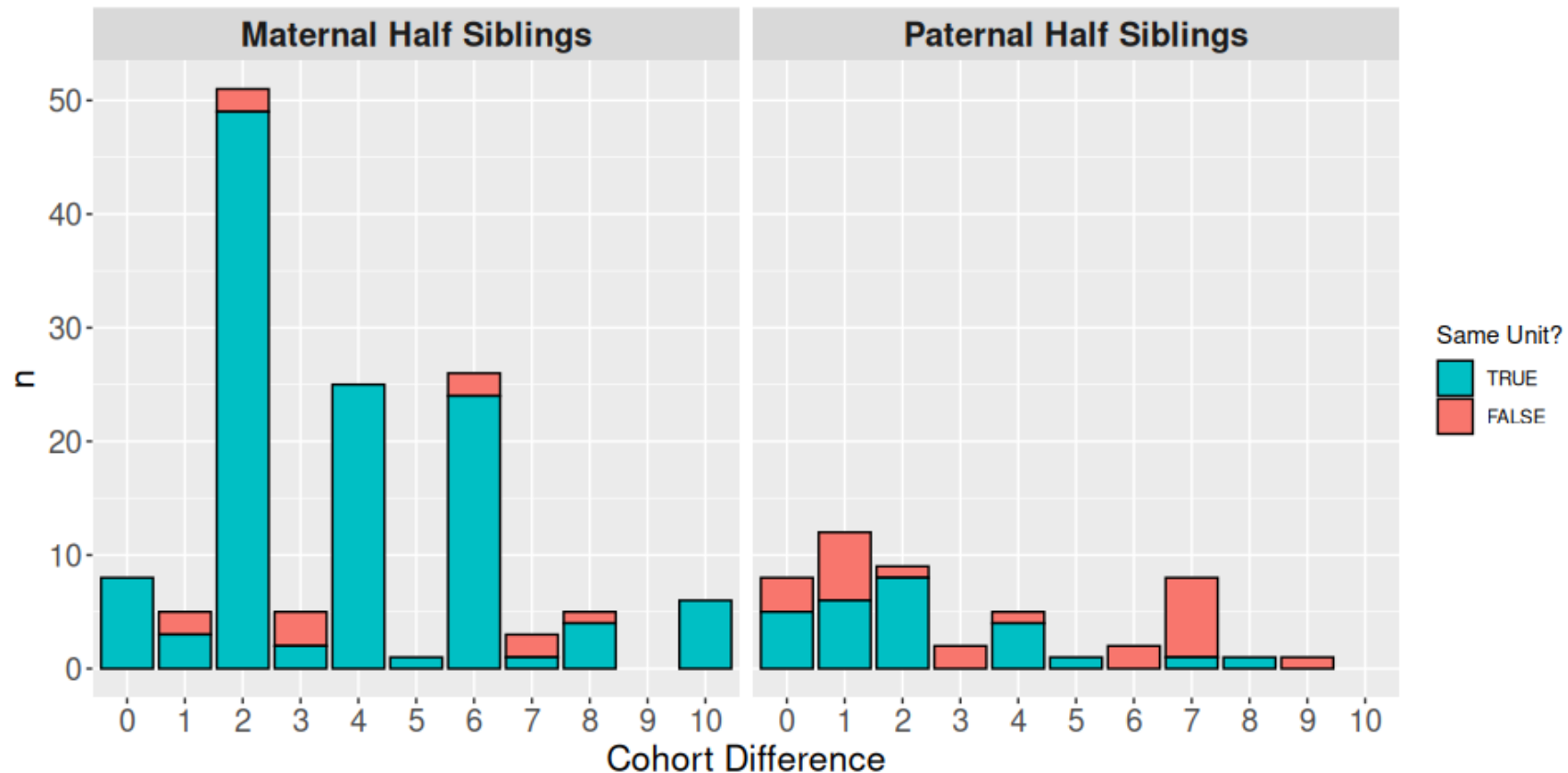
Half siblings

- More distantly related
 - Harder to detect
- 565 sawfish
 - Born 2010-2020 in 2 main units
- 184 pairs
 - 135 share a mother (73%)
 - 49 share a father (27%)



Half siblings

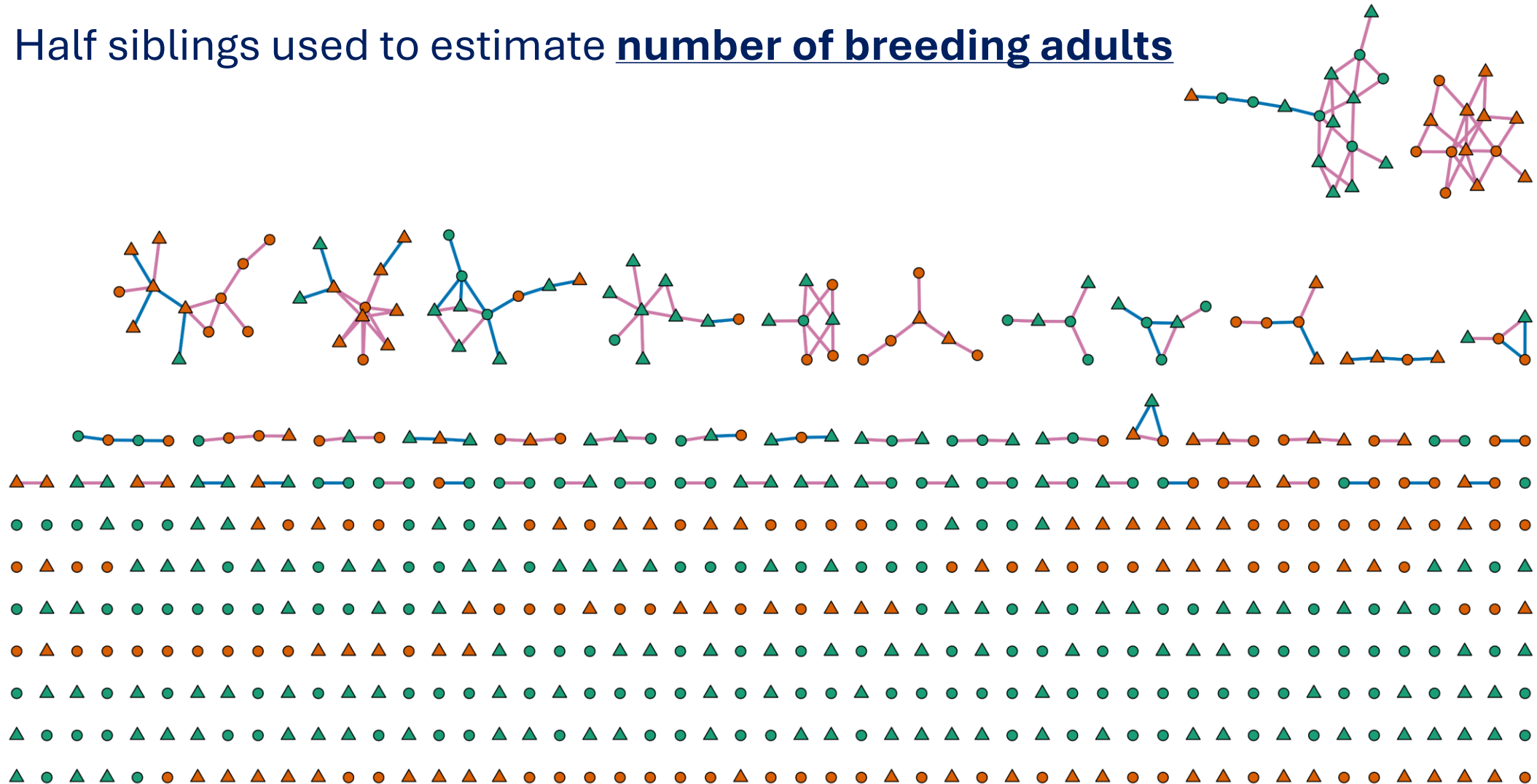
- Maternal half sibs (135 pairs)
 - 94% from different cohort
 - 91% from same unit
- Paternal half sibs (49 pairs)
 - 84% from different cohort
 - 53% from same unit



Sawfish: 565
Relationships: 184

Unit ◆ Charlotte Harbor ◆ Ten Thousand Islands-Everglades
Sex ○ Female △ Male
Relationship Type — Maternal Half Sibling — Paternal Half Sibling

- Half siblings used to estimate number of breeding adults



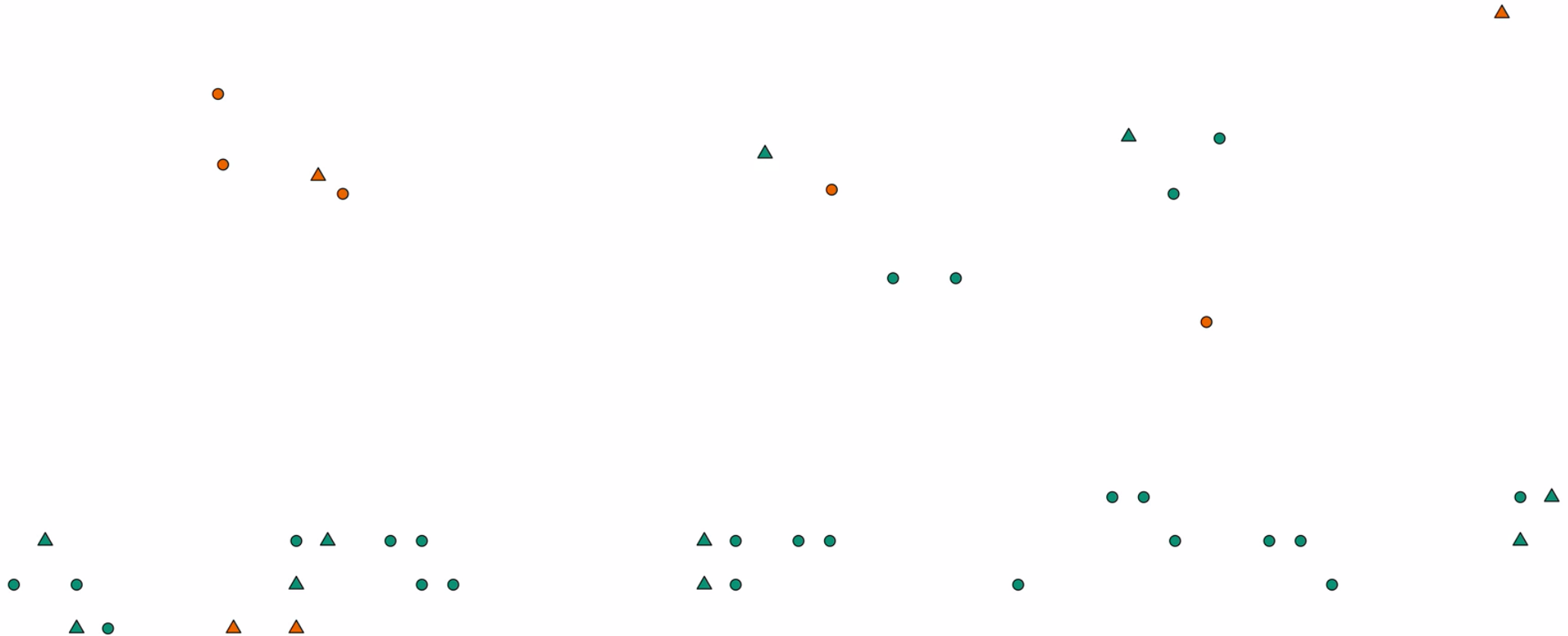
Cohort: 2010

Sawfish: 43

Relationships: 0

Unit ◆ Charlotte Harbor ◆ Ten Thousand Islands-Everglades
Sex ○ Female △ Male
Relationship Type — Maternal Half Sibling — Paternal Half Sibling

- Half siblings used to estimate number of breeding adults



Cohort: 2020

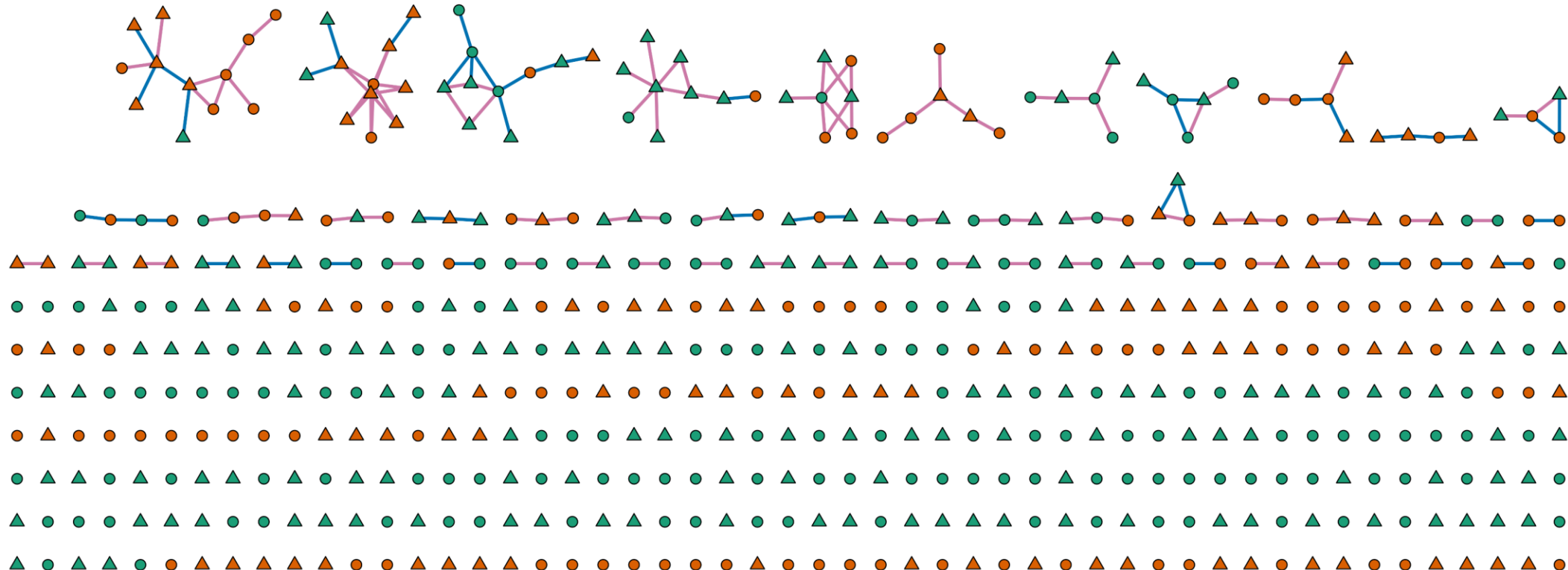
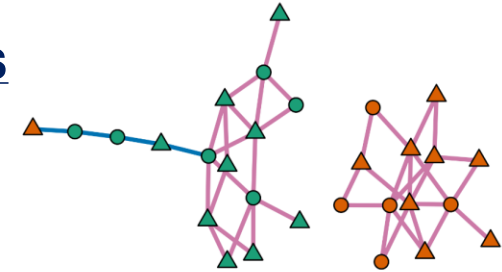
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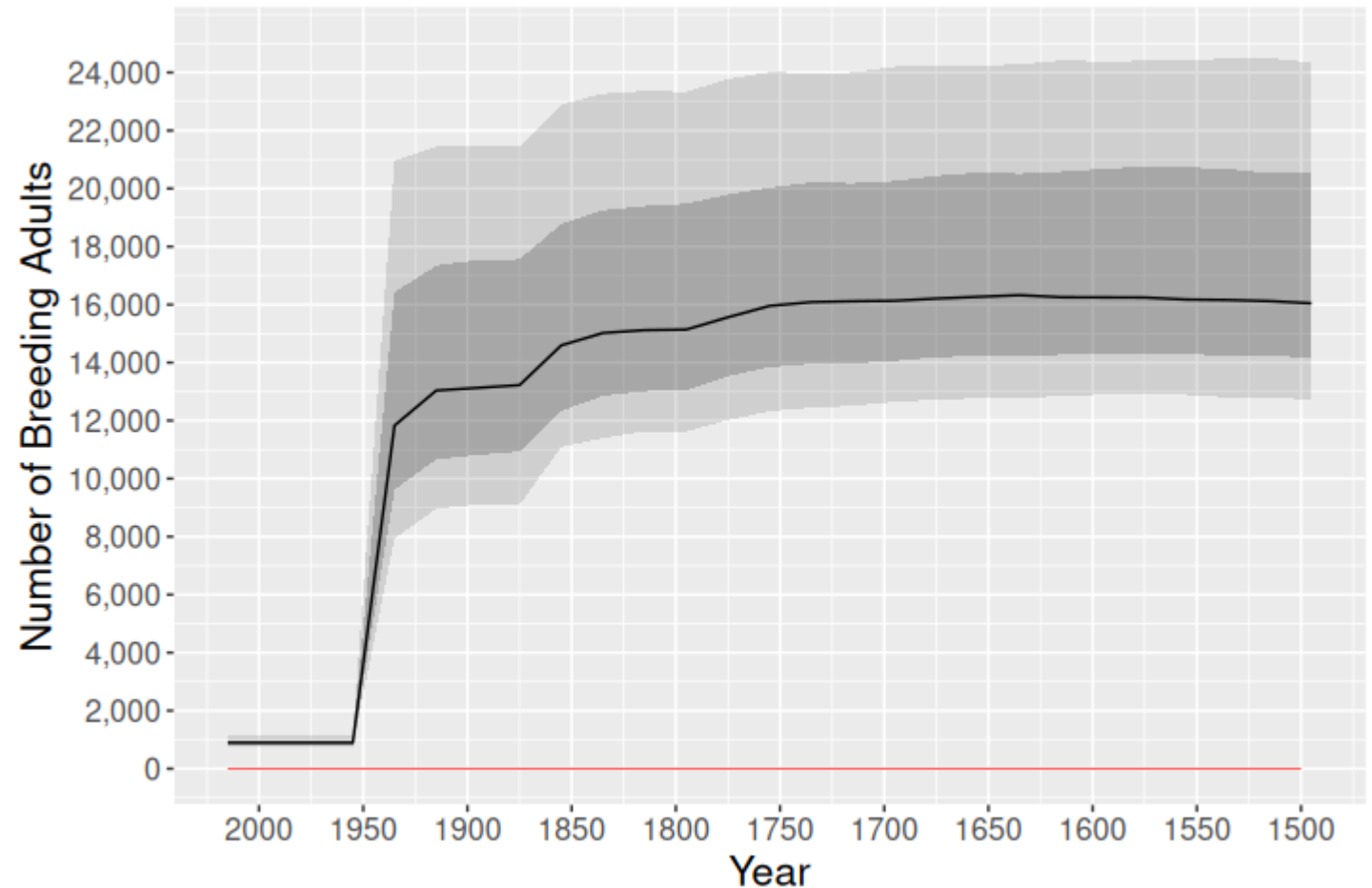
- Average: ~1,000
- Range: 400 – 2,000



Past abundance

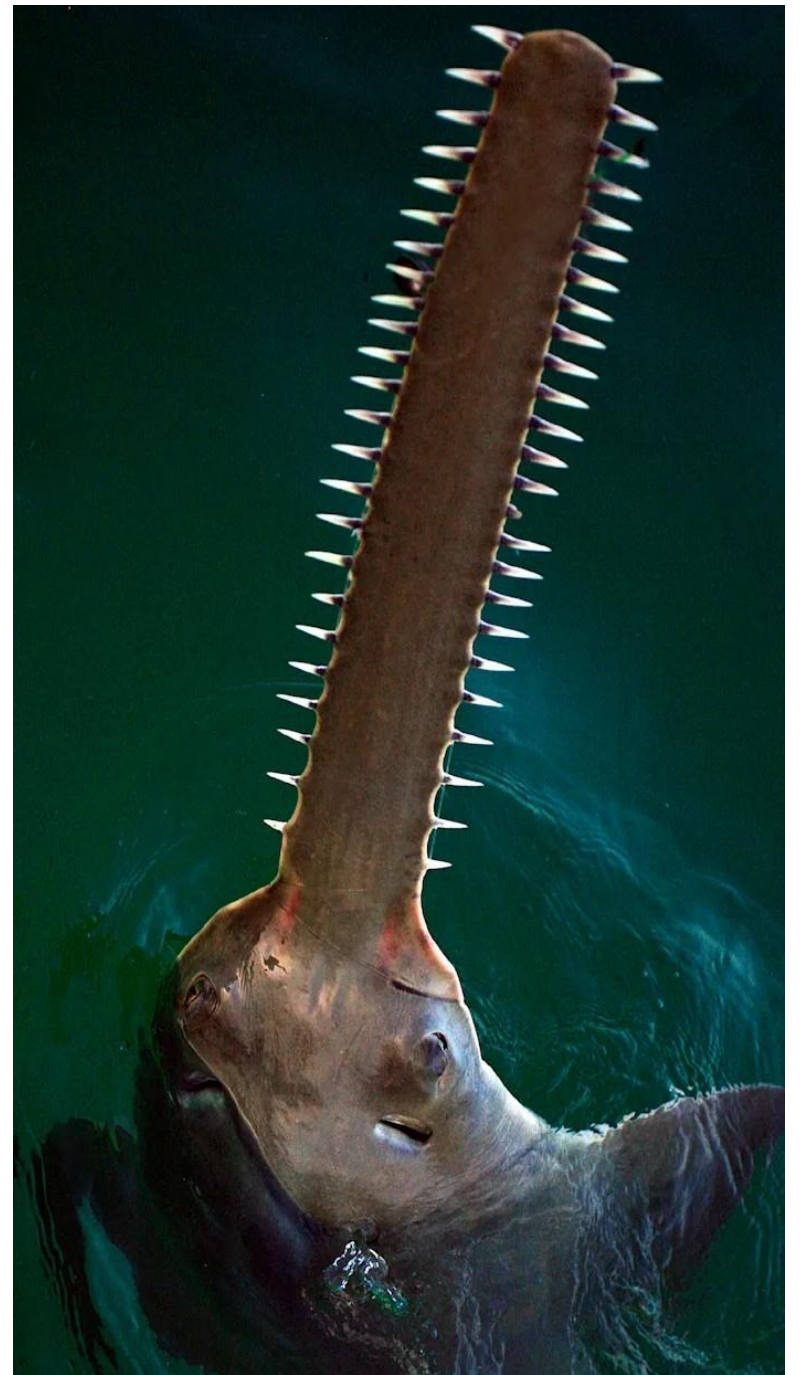
- Infer abundance metric for past generations

➤ ~95% decline



Conclusions

- Very small population
- ~1,000 breeding adults
- ~5% of virgin population ~250 years ago
- Providing data for population viability assessment
- Developed capacity for long-term monitoring



Thank you!

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