



Spawning Aggregation Length Demographics Reveal Disparities Between Physiological and Functional Maturity in Snapper

When gonad development doesn't always equal spawning contribution

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Key Parameters in Fisheries Management

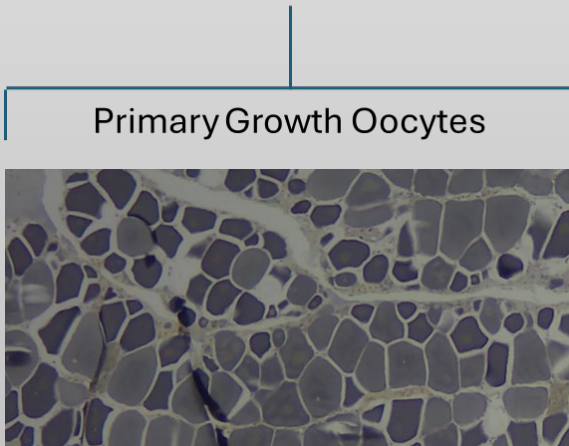
- Mortality Rate
 - Fishing mortality
 - Natural mortality
- Growth Reference Points
 - Maximum size/age
 - Growth rate
- Reproductive Reference Points
 - **Size/age at maturity**
 - L_{50} and max length
 - Informs spawning stock biomass



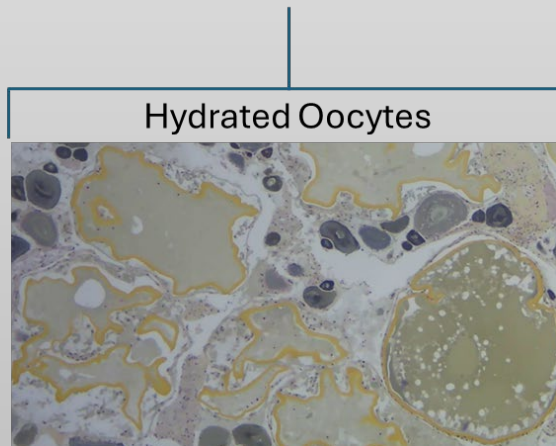
What is Length at Maturity?

- Point where 50% of fish at that length are mature
- Considered inflection point where fish start spawning

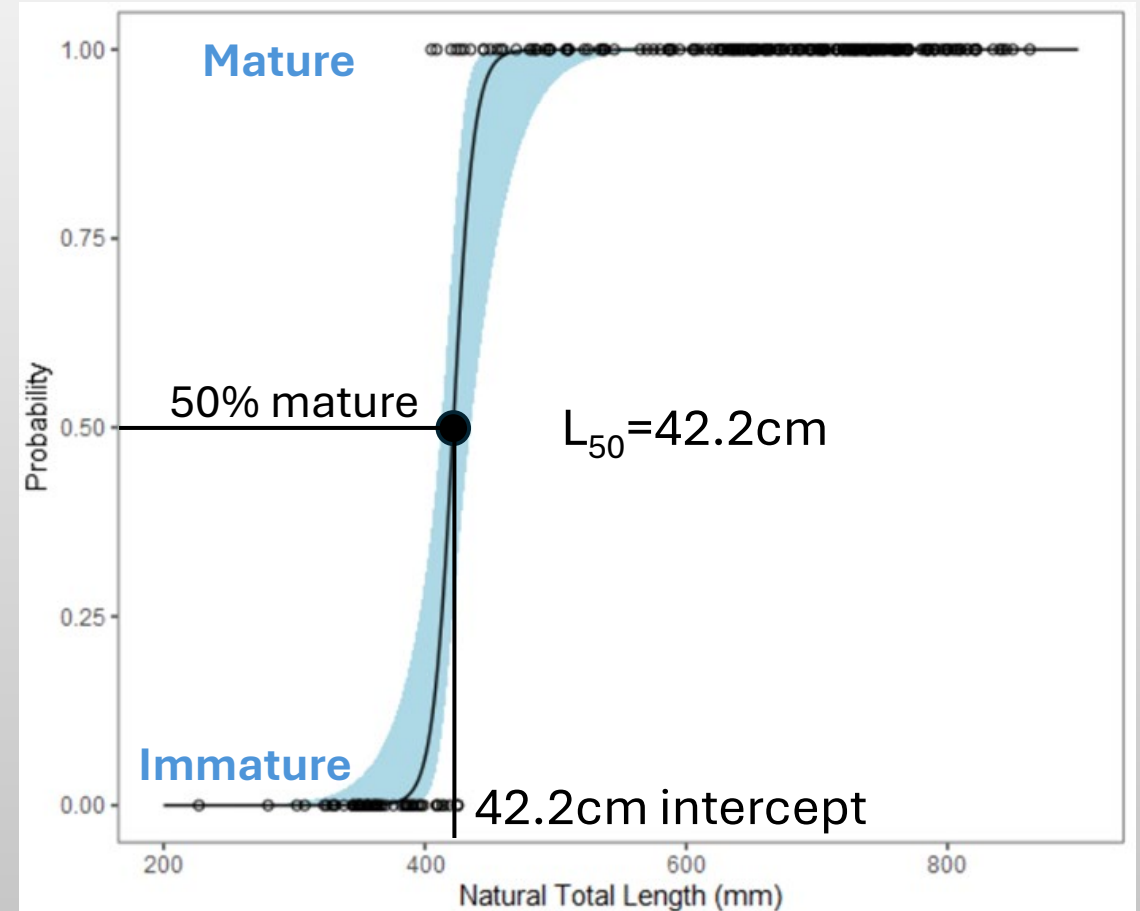
Immature Egg



Mature Egg



Predicted Length at Maturity For Mutton Snapper



Lowerre-Barbieri, Susan, and Claudia Friess. 2023. Mutton Snapper Reproduction. SEDAR79-DW-12. SEDAR, North Charleston, SC. 21 pp.

Just Because They Can Doesn't Mean They Will

Currently Established Method

- Physiological Maturity
 - Individuals have the **ability** to spawn
 - Based on reproductive tissue development



Alternative Method

- Functional Maturity
 - Individuals are **currently** spawning
 - Based on behavior and presence at spawning aggregation site



Western Dry Rocks



- Enacted in 2021
- 4-month seasonal closure
- Multispecies aggregation site
- Historically heavy fishing pressure

Western Dry Rocks Aggregation Data Sources

Visual Surveys

- Reef Visual Census
- Belt Transects



Length Demographics
Abundance
Density



Direct Surveys

- Hook and line
- Spearfishing



Length and Age Demographics
Movements via Telemetry
Reproductive Patterns



Mutton snapper

Lutjanus analis



Gray snapper

Lutjanus griseus



Directly Sampled Snapper Aggregations

Marquesas

Key West

Eyeglass Bar

Toppino Reef

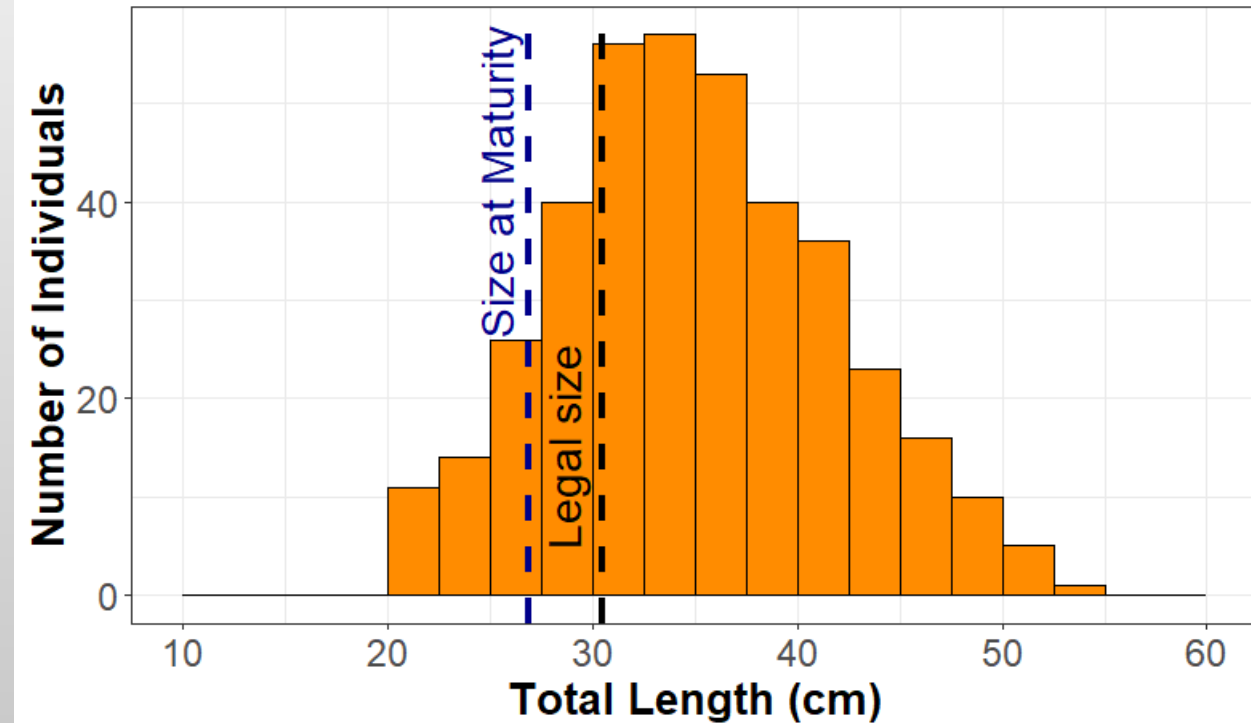
Western Dry Rocks

Species		
	Mutton Snapper	N=247
	Gray Snapper	N=389

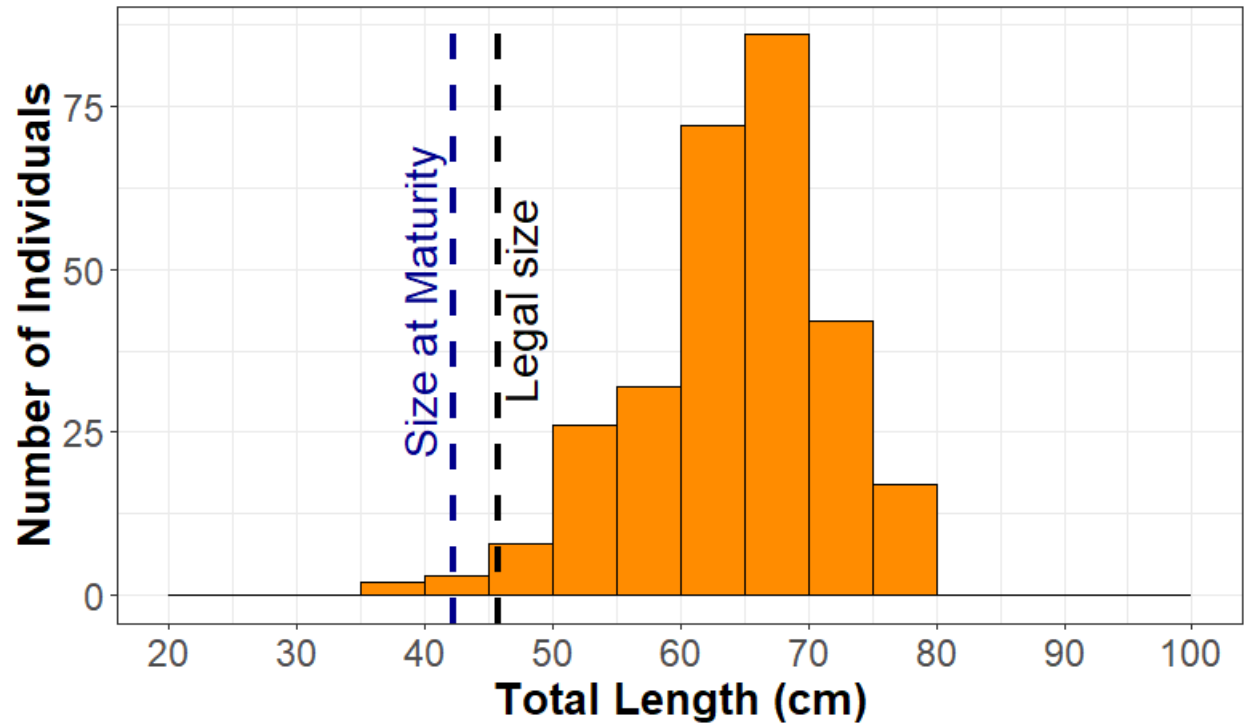


Aggregation Demographics from Direct Sampling

Length Frequency of Aggregating Gray Snapper

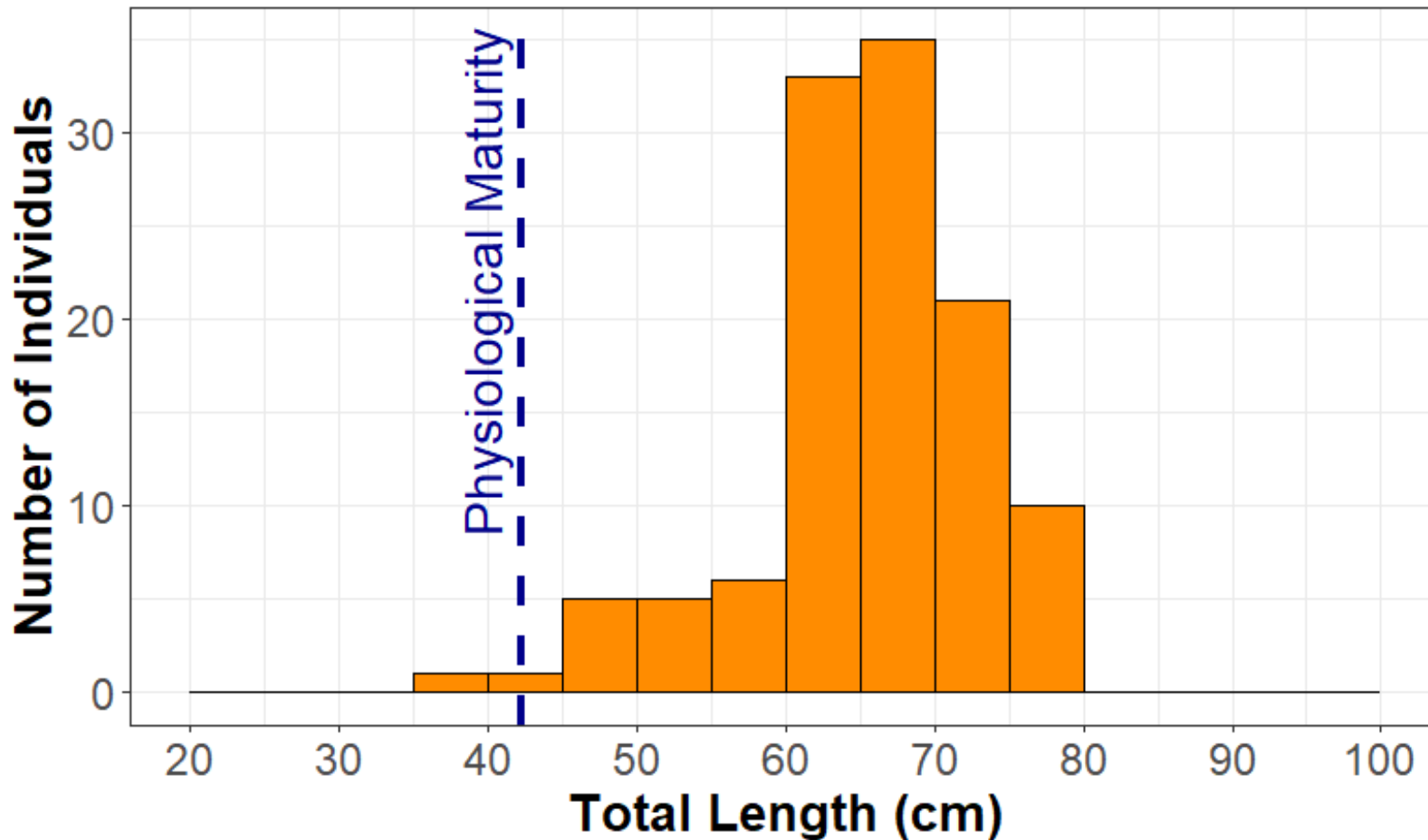


Length Frequency of Aggregating Mutton Snapper

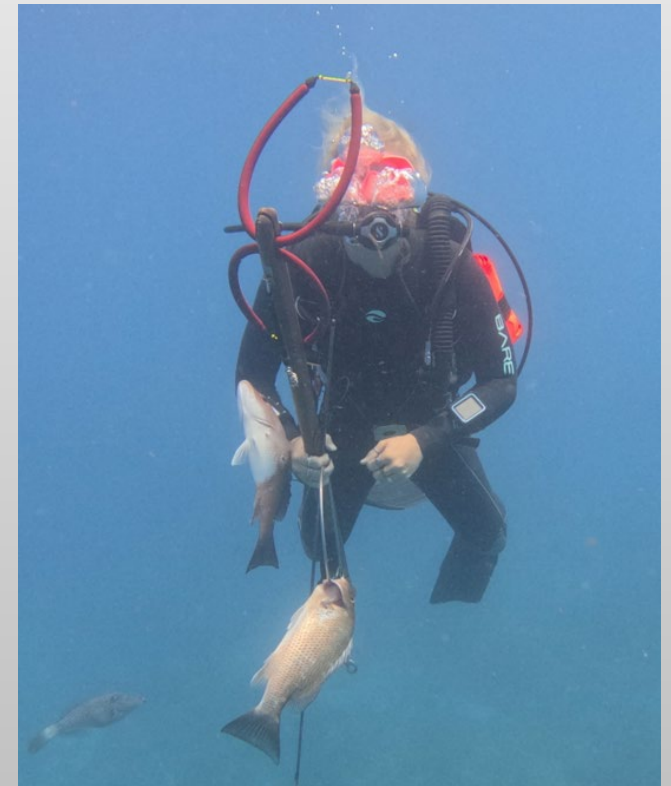


Female Mutton Snapper Aggregation Demographics

Demographics of Aggregating Female Mutton Snapper

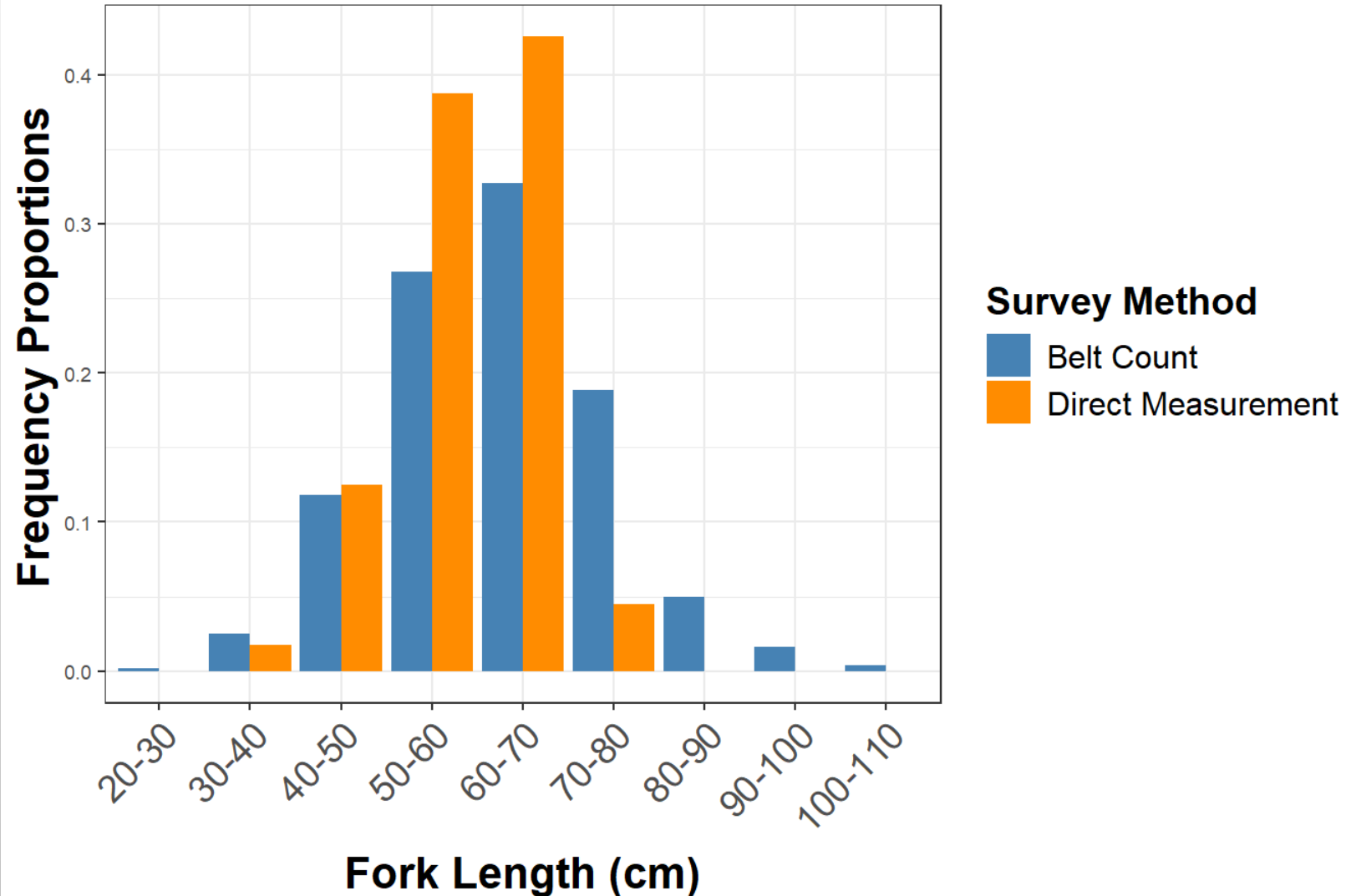


~20cm gap between predicted and actual size seen



Checking for Sampling Bias

Demographics of Mutton Snapper Aggregation by Survey

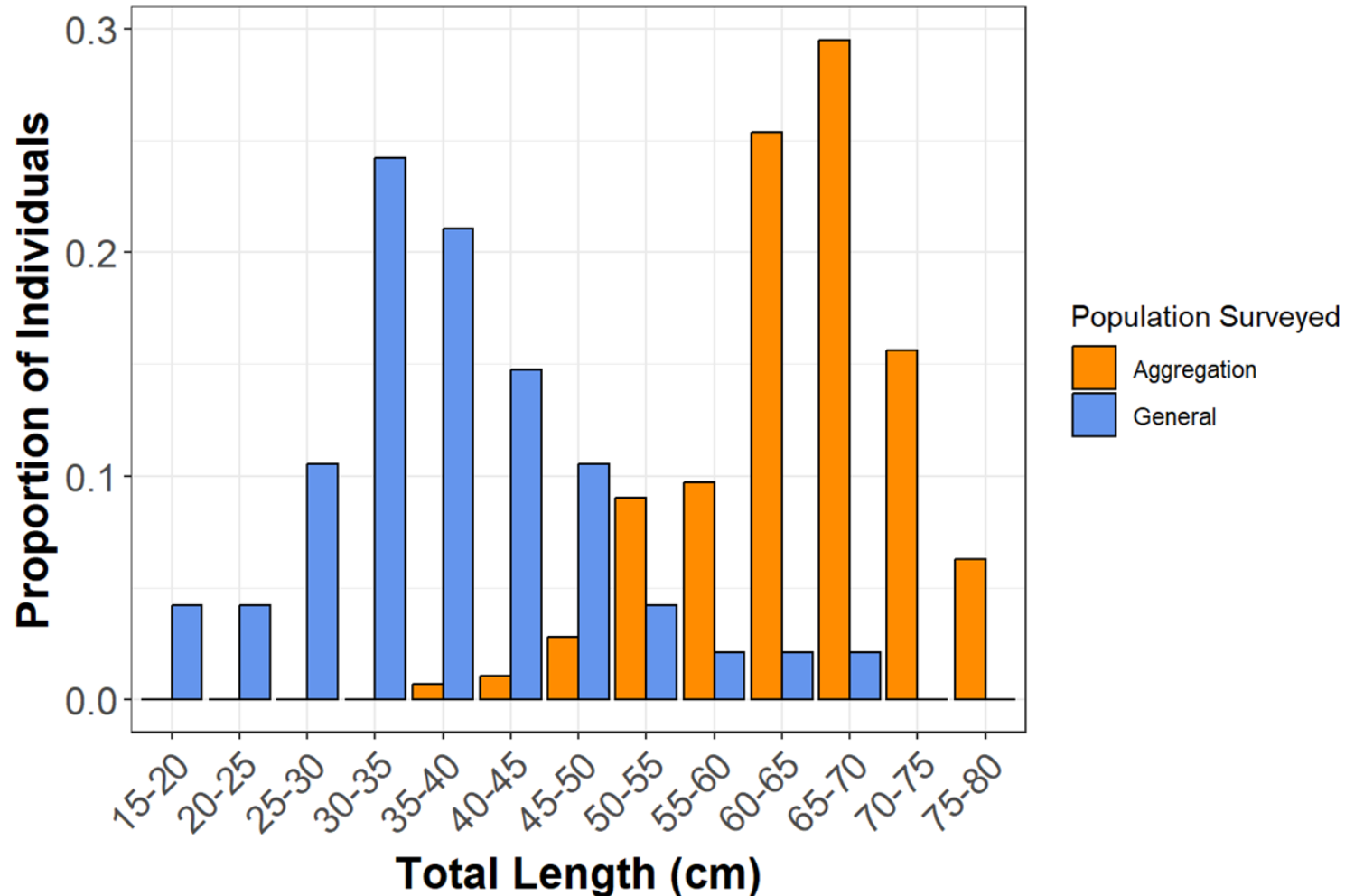


Good agreeance
between methodologies



Keys-wide Mutton Population Size Demographics

Keys-wide RVC vs Aggregation Length Frequency

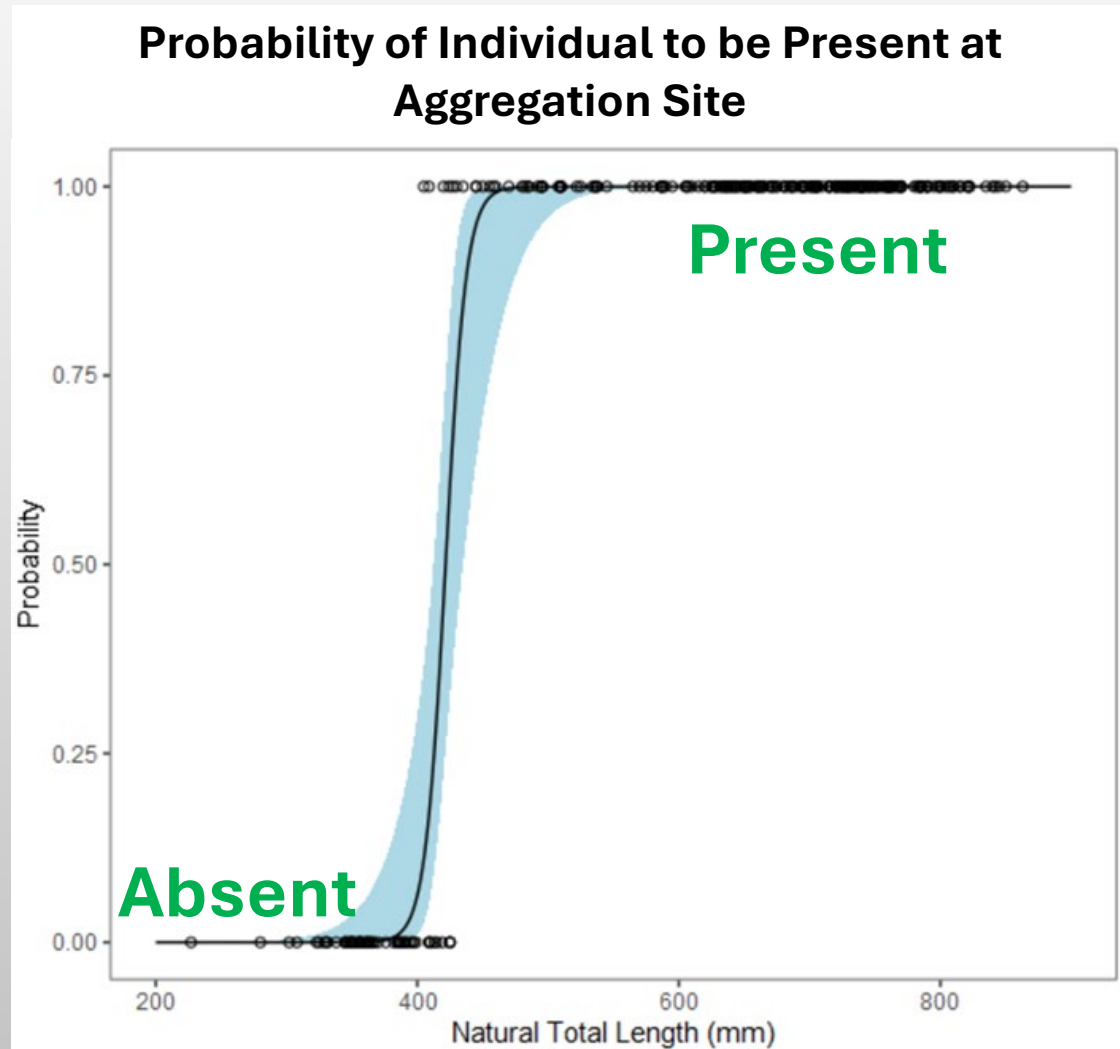


Aggregation divergence
from general population



Allen, Shanae D. 2024. Weighted Length Compositions for U.S. Mutton Snapper (*Lutjanus analis*). SEDAR79-AP01. SEDAR, North Charleston, SC. 70 pp.

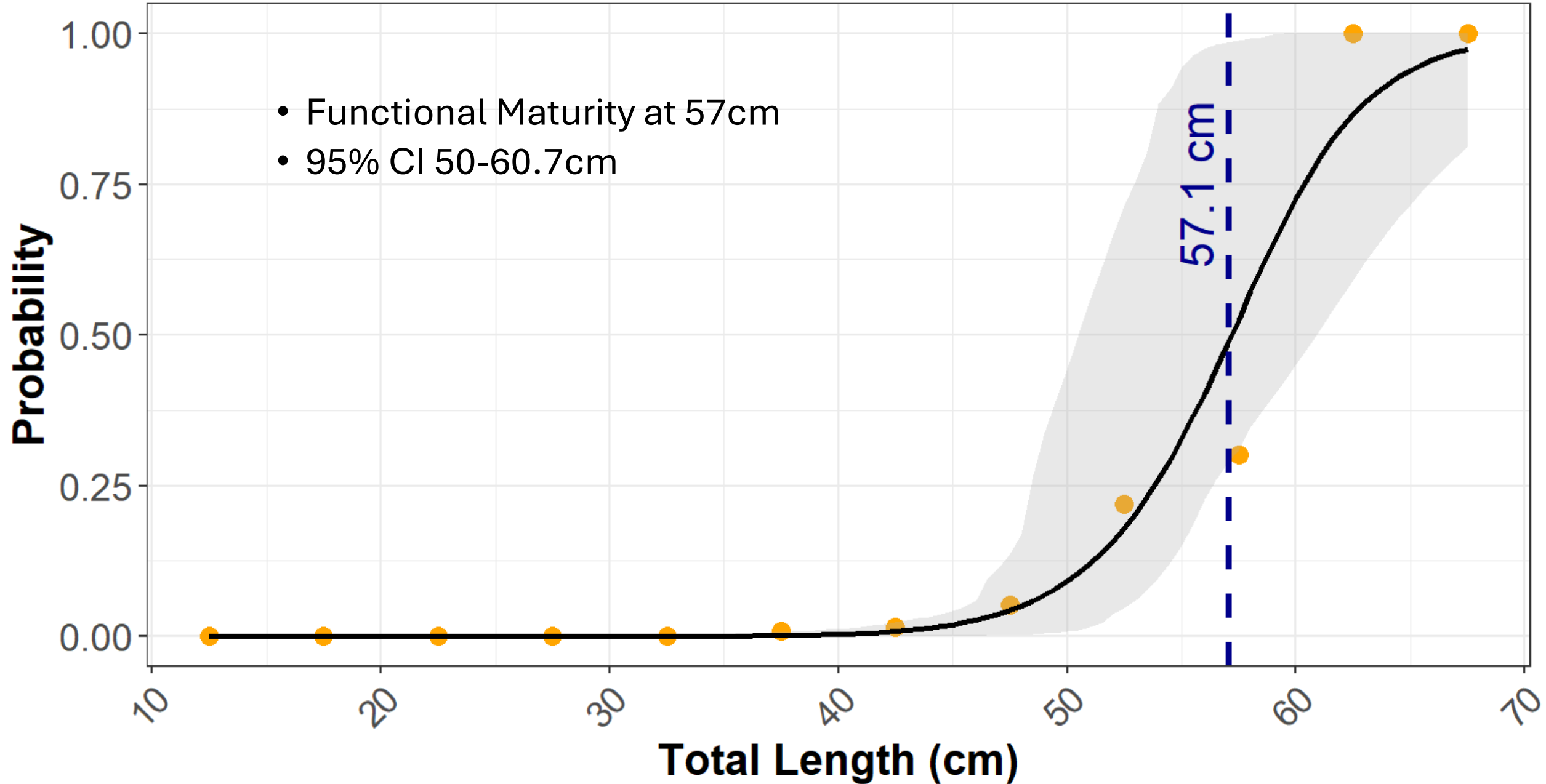
Method to Calculate Functional Maturity



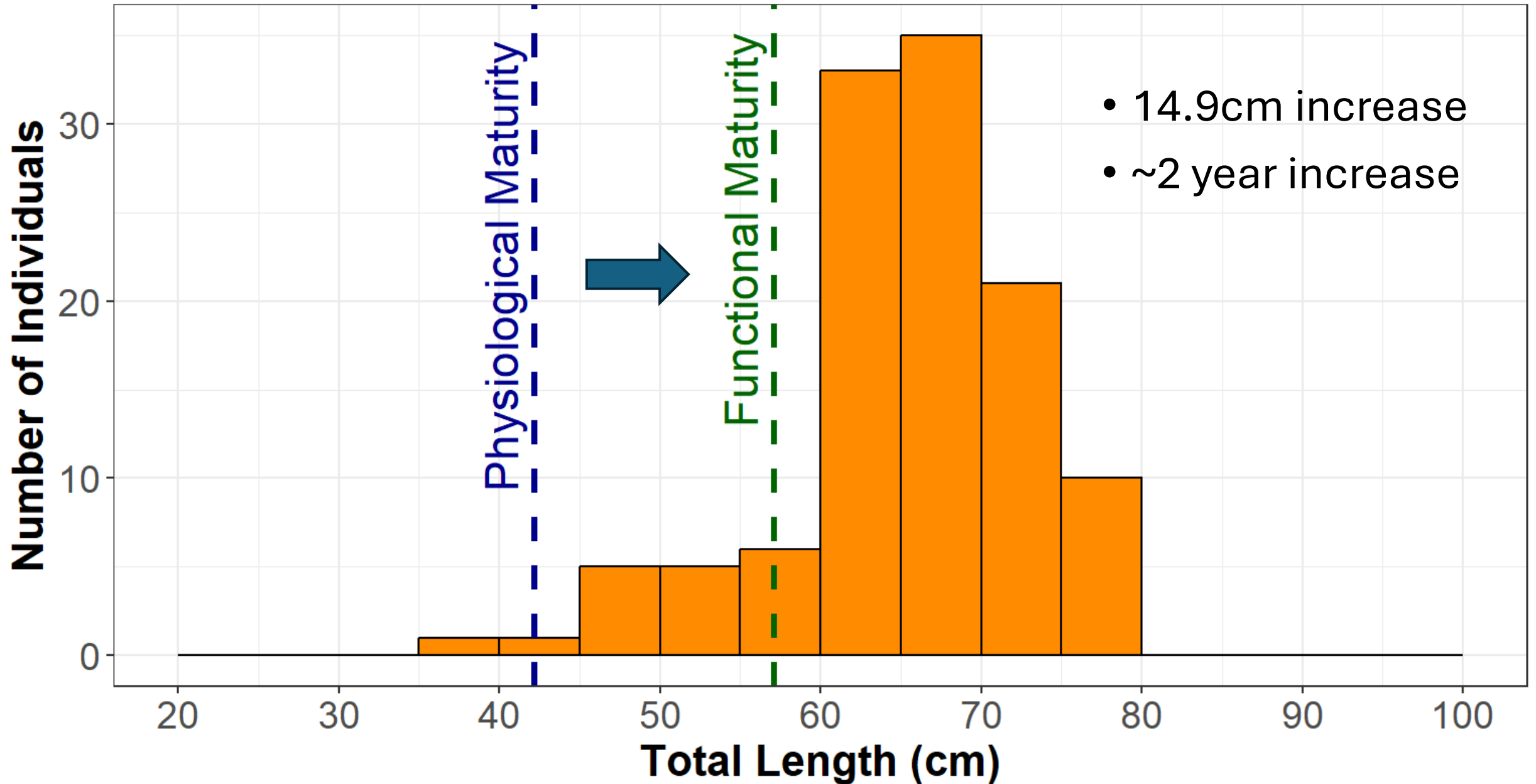
Hurdles

- Lack of “absent” data points
- Participation is not 100% at any length
- Largest size classes underrepresented in most fisheries independent techniques

Probability of Mutton Spawning Aggregation Participation



Demographics of Aggregating Female Mutton Snapper



Takeaways

- Value of multiscale datasets
- Disparity between **physiological** and **functional** maturity
- Probable overestimation of stock spawning potential
 - Overestimating by 2 spawning seasons
 - Supports value of spatial protections



Moving Forward

- Research emphasis on movement and behavior of 42-57cm muttons
- Potential to apply functional maturity to data poor species where physiological maturity data is not available or cost prohibitive

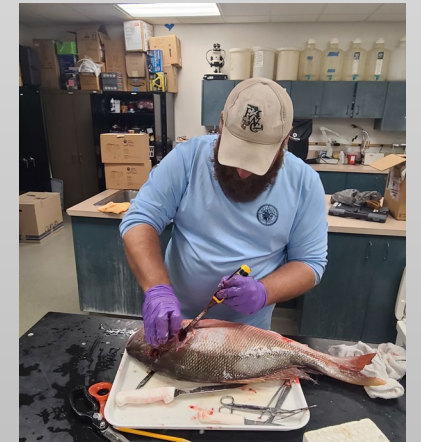
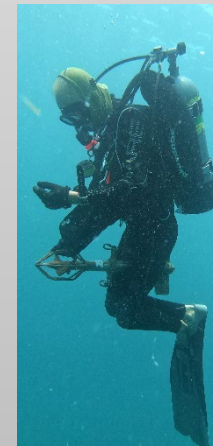




Thank you



- Shanae Allen
- Dan Zier
- Rush Maltz



Maturity Cascade drivers(stimuli) in fish

Physiological

- Size
- Age
- Body condition

Years

Environmental

- Photoperiod
- Temperature
- Lunar Period
- Tidal/current

Seasonal-Hours



Behavioral

- Aggregation Formation
- Courtship

Weeks to Hours

Insert diagram from
Pauly paper?