# SEDAR 98: US Gulf of America Red Snapper (*Lutjanus campechanus*)

## Review Workshop

## Data

NOAA FISHERIES

Gulf Fisheries Branch, SEFSC




September 22-25, 2026

# Outline

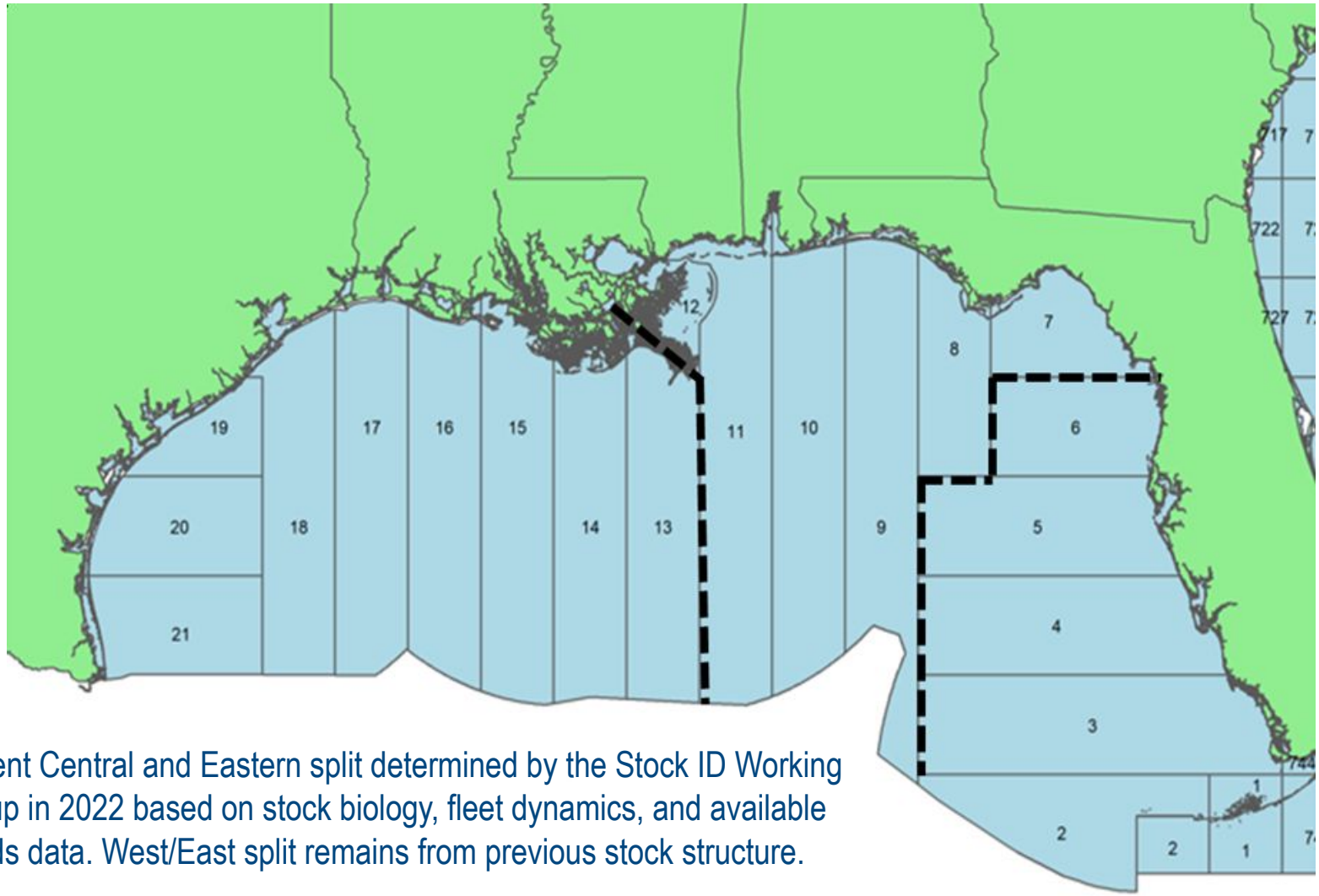
- Data Review
  - Stock definition
  - Assessment history
  - Regulations
  - Life history
  - Removals
  - Size compositions
  - Age compositions
  - Indices of abundance & composition
  - Key data differences from SEDAR 52

**Red Snapper : *Lutjanus Campechanus***



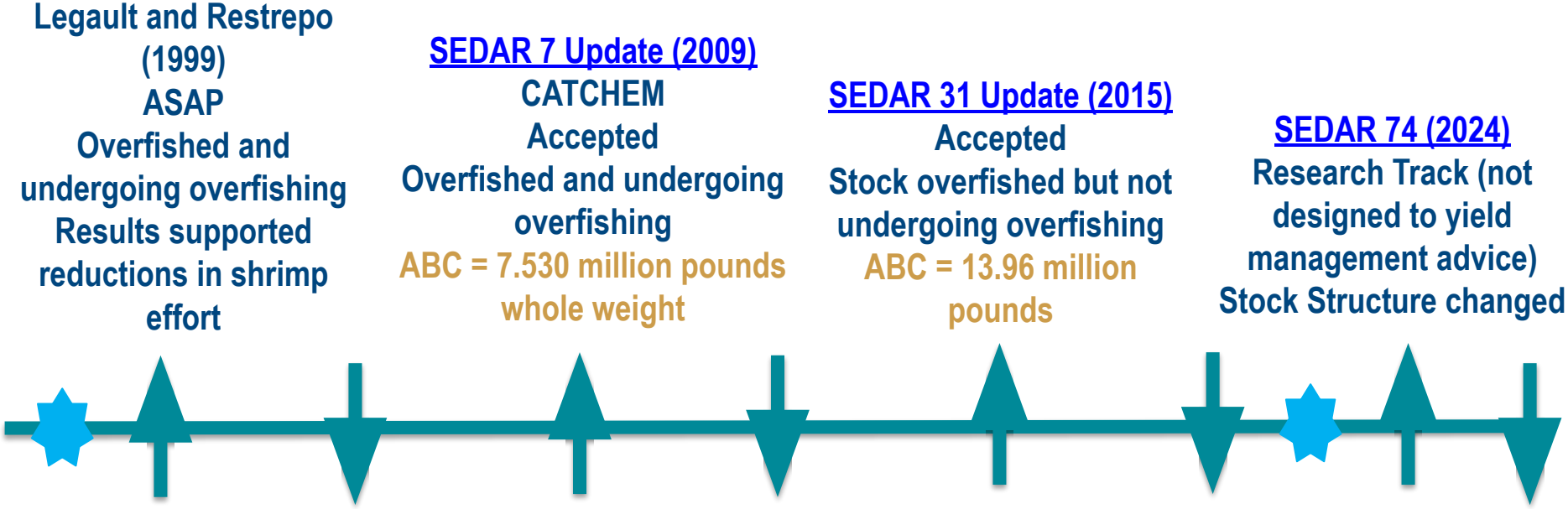

- Assessment Model
  - Model building
  - AP Model configuration
  - AP Model results
  - AP Model diagnostics
  - AP Model sensitivities
  - AP Model projections

# Gulf of Mexico Red Snapper Stock Definition West (13-21), Central (7-12), Eastern (1-6)




Recent Central and Eastern split determined by the Stock ID Working Group in 2022 based on stock biology, fleet dynamics, and available trends data. West/East split remains from previous stock structure.

# Past Assessment History



Legault and Restrepo (1999)
ASAP
Overfished and undergoing overfishing
Results supported reductions in shrimp effort

SEDAR 7 (2005)
CATCHEM
Accepted
Overfished and undergoing overfishing
(TAC =9.12 lowered to 5.0 million pounds)
Initiated rebuilding plan to SPR 26% by 2032

SEDAR 7 Update (2009)
CATCHEM
Accepted
Overfished and undergoing overfishing
ABC = 7.530 million pounds whole weight

SEDAR 31 (2013)
Accepted
Stock overfished but not undergoing overfishing
ABC = 11.0 million pounds

SEDAR 31 Update (2015)
Accepted
Stock overfished but not undergoing overfishing
ABC = 13.96 million pounds

SEDAR 52 (2018)
Accepted
Overfished but not experiencing overfishing
ABC = 13.74 million pounds

SEDAR 74 (2024)
Research Track (not designed to yield management advice)
Stock Structure changed

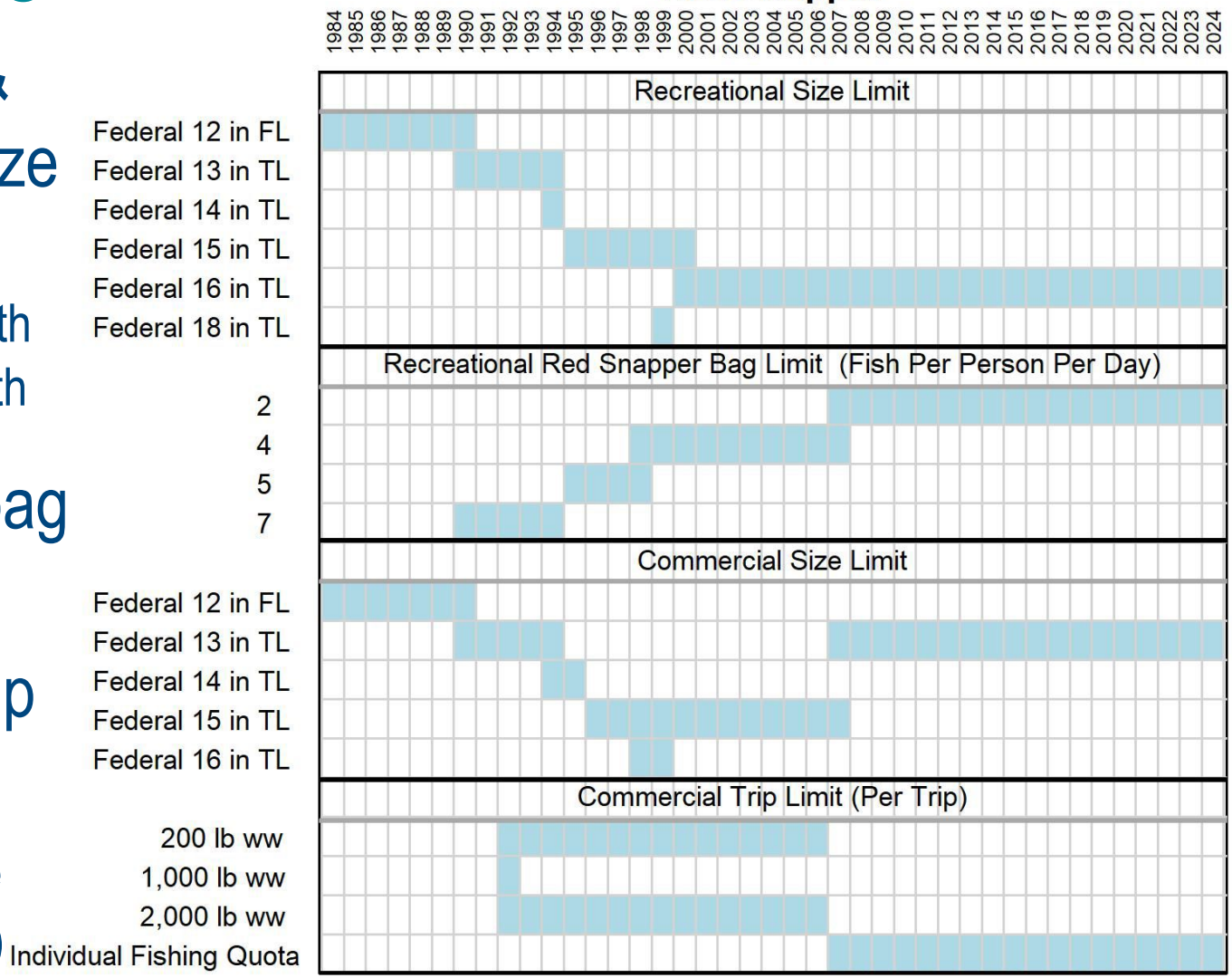
SEDAR 98
Use SEDAR 74 stock structure and address previous CIE and stakeholder concerns

Additional Assessments
Annual Assessments Since 1984
2021 Interim Analysis (ABC =15.4), 2023 revision (ABC =16.31)

# Regulations

- Recreational & Commercial size limits
  - TL = Total Length
  - FL = Fork Length
- Recreational bag limits
- Commercial trip limits
  - Pounds whole weight (lb ww)

## Gulf reef fish management histories




Overlapping cells reflect change in that year

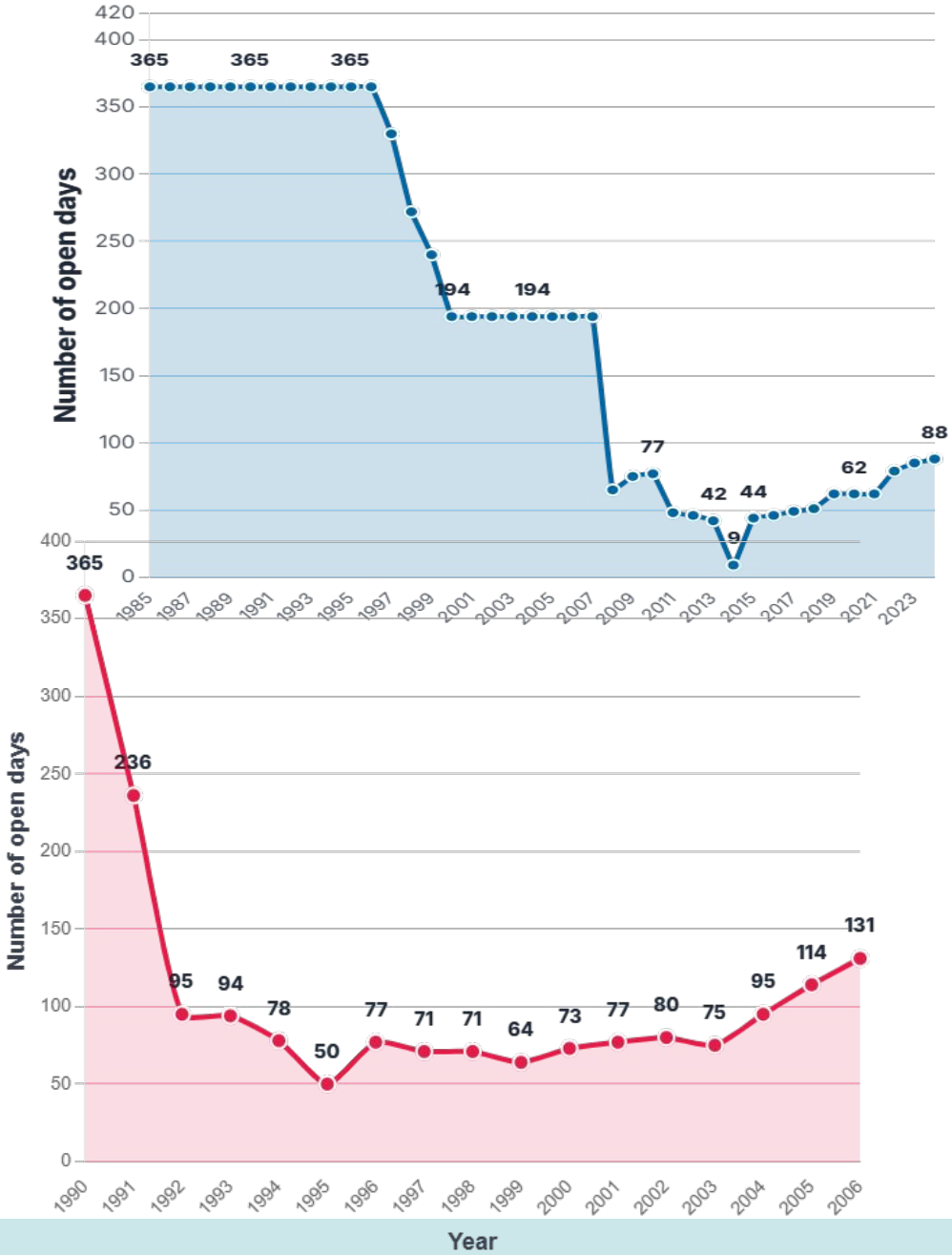
# Season Length

## Recreational

- Private and Charter split in 2015

## Commercial

- Open/closed seasons until IFQ implementation in 2007 (everything open after)



# Outline

- Data Review
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  - **Life history**
  - Removals
  - Size compositions
  - Age compositions
  - Indices of abundance & composition
  - Key data differences from SEDAR 52

# Morphometrics

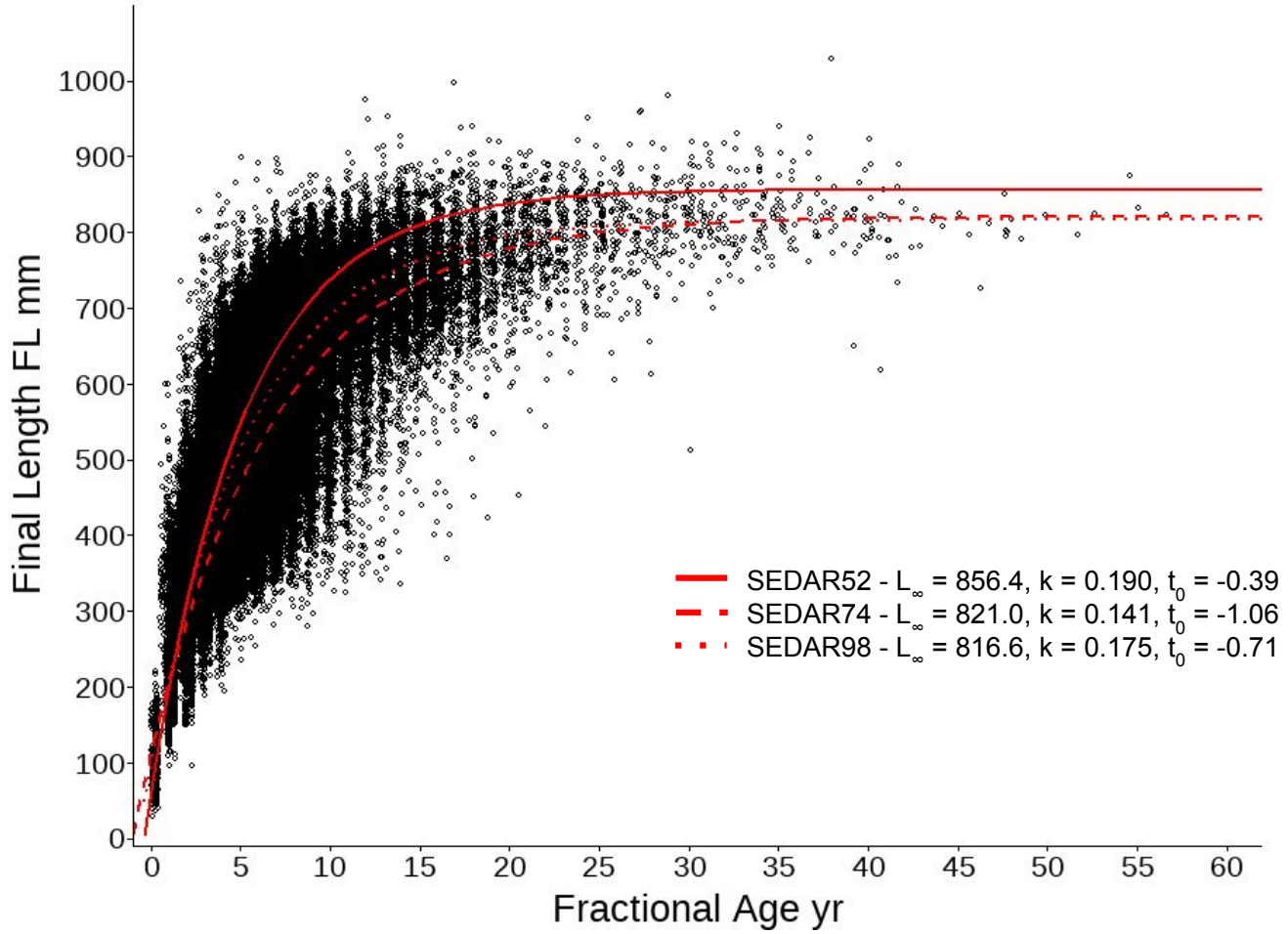
- Many conversions from SEDAR 74 updated through 2019
- One gutted to whole weight update for SEDAR 98
- Body weight units:
  - Centimeters (cm) -> fork length (FL)
  - Kilograms (kg) -> whole weight (WW)
- Length-weight relationship fixed in the assessment model at values used in SEDAR 74

| Regression | Equation |
|---|---|
| FL to WW | $WW = 1.7\ E^{-05} * (FL^3)$ |

## SEDAR 74-DW Table 9

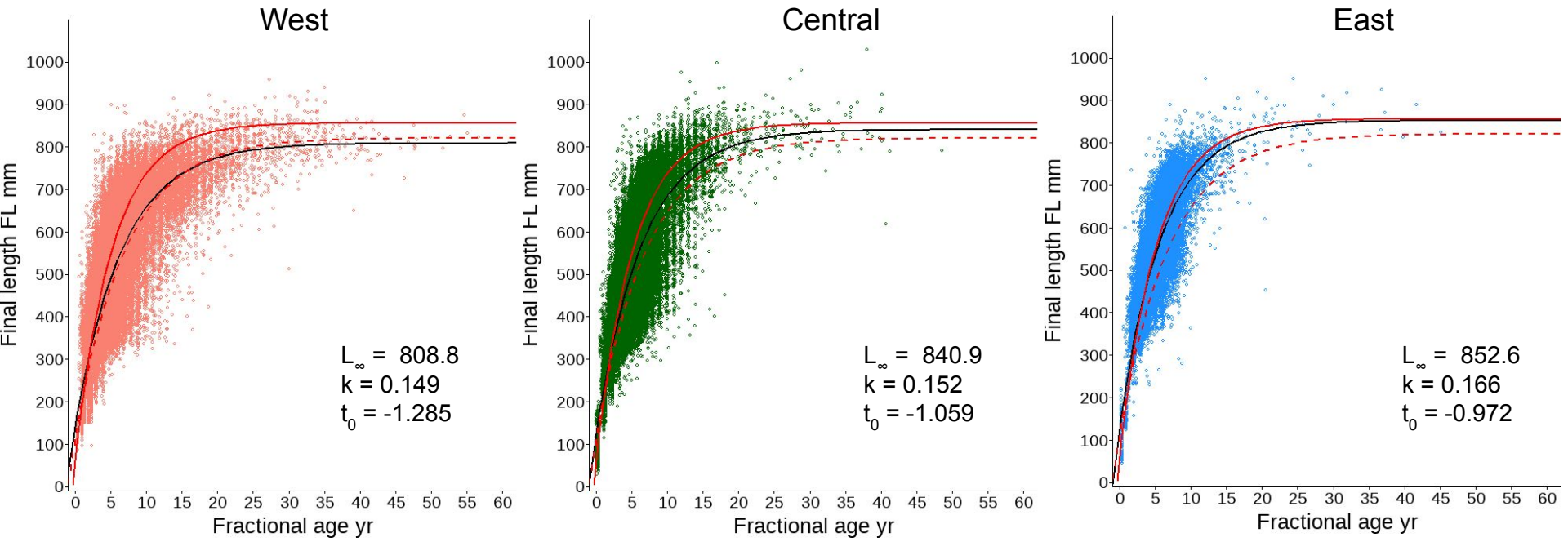
| Conversion | Units | Equation | n | a | b | Fit statistic | Data range | |
|---|---|---|---|---|---|---|---|---|
| MTL to FL | cm | FL=a+b*MTL | 21286 | 0.138 | 0.926 | $r^2 = 0.998$ | MTL=4.1-99.4 | FL=3.8-92.5 |
| MTL to FL | in | FL=a+b*MTL | | 0.054 | 0.926 | | MTL=1.6-39.1 | FL=1.5-36.4 |
| SL to FL | cm | FL=a+b*SL | 2842 | 1.756 | 1.137 | $r^2 = 0.987$ | SL=7.8-79.0 | FL=9.5-89.0 |
| SL to FL | in | FL=a+b*SL | | 0.692 | 1.137 | | SL=3.1-31.1 | FL=3.7-35.0 |
| NTL to FL | cm | FL=a+b*NTL | 22327 | -8.51E-02 | 0.930 | $r^2 = 0.993$ | NTL=16.3-97.6 | FL=15.4-92.0 |
| NTL to FL | in | FL=a+b*NTL | | -3.35E-02 | 0.930 | | NTL=6.4-38.4 | FL=6.1-36.2 |
| SL to MTL | cm | MTL=a+b*SL | 2253 | 1.968 | 1.228 | $r^2 = 0.986$ | SL=7.9-79.0 | MTL=10.2-95.4 |
| SL to MTL | in | MTL=a+b*SL | | 0.775 | 1.228 | | SL=3.1-31.1 | MTL=4.0-37.6 |
| SL to NTL | cm | NTL=a+b*SL | 563 | 2.843 | 1.214 | $r^2 = 0.970$ | SL=23.5-77.5 | NTL=31.1-92.0 |
| SL to NTL | in | NTL=a+b*SL | | 1.119 | 1.214 | | SL=9.3-30.5 | NTL=12.2-36.2 |
| FL to NTL | cm | NTL=a+b*FL | 22327 | 0.499 | 1.067 | $r^2 = 0.993$ | FL=15.4-92.0 | NTL=16.3-97.6 |
| FL to NTL | in | NTL=a+b*FL | | 0.196 | 1.067 | | FL=6.1-36.2 | NTL=6.4-38.4 |
| FL to MTL | cm | MTL=a+b*FL | 21286 | -4.86E-02 | 1.078 | $r^2 = 0.998$ | FL=3.8-92.5 | MTL=4.1-99.4 |
| FL to MTL | in | MTL=a+b*FL | | -1.92E-02 | 1.078 | | FL=1.5-36.4 | MTL=1.6-39.1 |
| NTL to MTL | cm | MTL=a+b*NTL | NA | NA | NA | NA | NA | NA |
| NTL to MTL | in | MTL=a+b*NTL | | 0.133* | 1.022* | | NA | NA |
| GW to WW | kg | WW=a+b*GW | 229 | -0.123 | 1.115 | $r^2 = 0.996$ | GW=0.1-14.7 | WW=0.1-16.5 |
| GW to WW | lbs | WW=a+b*GW | | -0.271 | 1.115 | | GW=0.1-32.4 | WW=0.1-36.4 |
| WW to GW | kg | GW=a+b*WW | 229 | 0.1261 | 0.8934 | $r^2 = 0.996$ | GW=0.1-14.7 | WW=0.1-16.5 |
| WW to GW | lbs | GW=a+b*WW | | 0.2779 | 0.8934 | | GW=0.1-32.4 | WW=0.1-36.4 |
| SL to WW | kg, cm | WW=a*(SL^b) | 2799 | 6.78E-05 | 2.7667 | RSE = 0.598 | SL=12.1-79.0 | WW=0.05-13.0 |
| SL to WW | lbs, in | WW=a*(SL^b) | | 1.97E-03 | 2.767 | RSE = 1.319 | SL=4.8=31.1 | WW=0.1-28.7 |
| FL to WW | kg, cm | WW=a*(FL^b) | 42716 | 1.60E-05 | 3.016 | RSE = 0.343 | FL=3.8-92.5 | WW=0.001-16.5 |
| FL to WW | lbs, in | WW=a*(FL^b) | | 5.88E-04 | 3.016 | RSE = 0.757 | FL=1.5-36.4 | WW=0.002-36.4 |
| NTL to WW | kg, cm | WW=a*(NTL^b) | 27238 | 1.26E-05 | 3.020 | RSE = 0.377 | NTL=10.6-98.4 | WW=0.02-15.5 |
| NTL to WW | lbs, in | WW=a*(NTL^b) | | 4.64E-04 | 3.020 | RSE = 0.830 | NTL=4.2-38.7 | WW=0.04-34.2 |
| MTL to WW | kg, cm | WW=a*(MTL^b) | 15407 | 1.01E-05 | 3.076 | RSE = 0.380 | MTL=4.1-98.5 | WW=0.001-16.5 |
| MTL to WW | lbs, in | WW=a*(MTL^b) | | 3.92E-04 | 3.076 | RSE = 0.837 | MTL=1.6-38.8 | WW=0.002-36.4 |

# Age and Growth



# Age and Growth

**Region-specific growth curves**




SEDAR52
$L_\infty$ = 856.4
k = 0.190
$t_0$ = -0.39

SEDAR74
$L_\infty$ = 821.0
k = 0.141
$t_0$ = -1.06

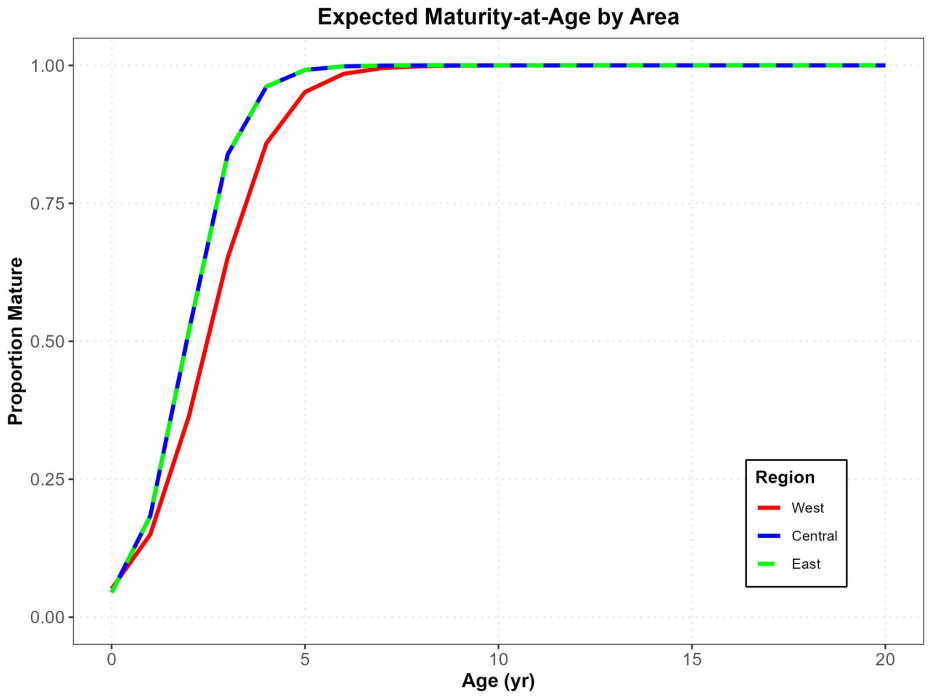
SEDAR98
$L_\infty$ = region-specific
k = region-specific
$t_0$ = region-specific

- von Bertalanffy growth parameters estimated externally using paired length and age data
- Parameters fixed in SS model

# Maturity

| Area | A50 | Slope |
|---|---|---|
| West | 2.47 | -1.18 |
| East/Central | 1.95 | -1.57 |

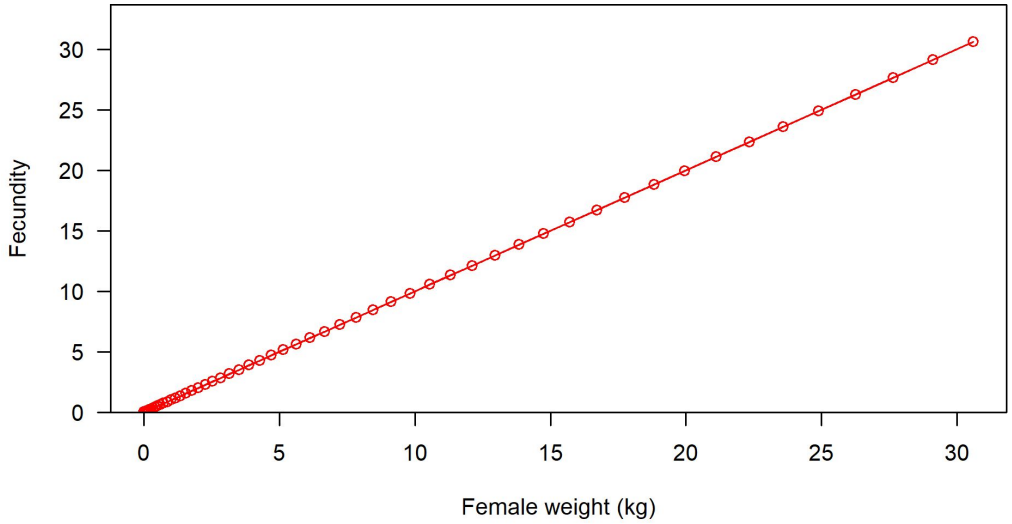
- 1:1 sex ratio
- Life History Working Group (LHWG) established area-specific and time-varying maturity relationships
  - 1 – overfished (1991-2008)
  - 2 – rapidly recovering (2009-2016)
  - 3 – stabilizing (2017-2019)
- Time-variation increased model runtime and did not significantly impact SSB
- Insufficient data to separate East from Central
- **Assessment Decision: Fixed regional maturity relationships in East/Central and West**




Source: Life History Working Group S74 Data Workshop Report Figure 18

# Fecundity

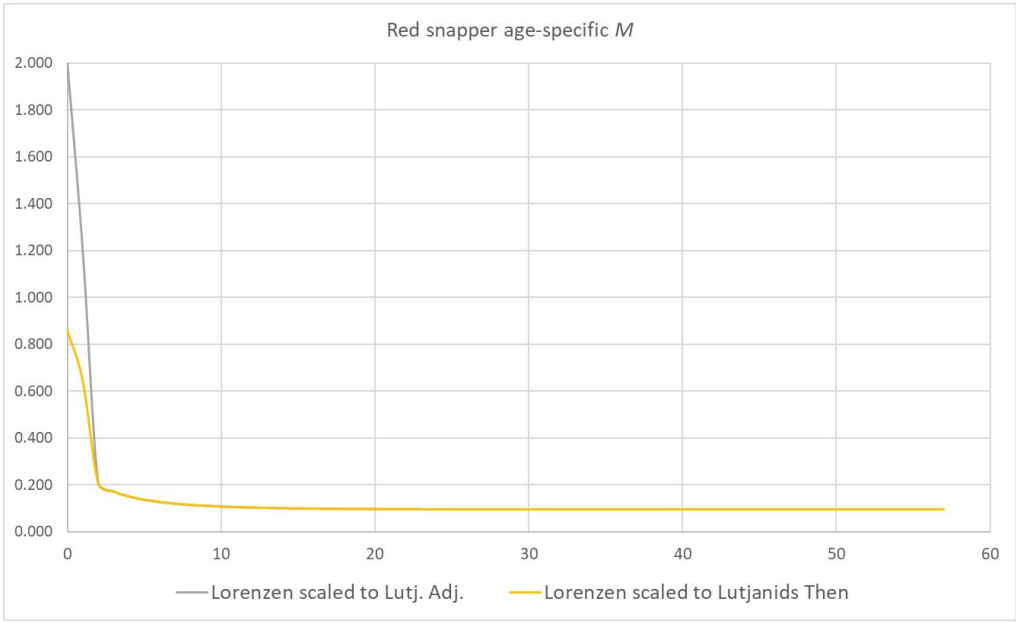
- Attempted updated fecundity-at-age vector for 74
  - Low sample size for fish aged 10 or older
  - Uncertainty in fecundity-at-age vectors given different regions
- **Assessment Decision: Use spawning stock biomass as measure of reproductive potential instead of Total Egg Production at age**




Source: Figure 21 SEDAR 74 Life History DW report

# Natural Mortality

- Max age 57
- Average M estimation uses Then et al. (2015) - Lutjanid-specific (0.1040 $yr^{-1}$)
- Alternative Hamel and Cope (2022) (0.0947 $yr^{-1}$) tested in sensitivity
- M for age 0 and 1 fixed at higher rates due to shrimp bycatch (Gazey et. al 2008)
- M for 2+ scaled by age using Lorenzen (1996) function



# Recreational Discard Mortality

- Discard mortality rates determined by an **ad hoc group during SEDAR 74**
- Uses direct measurements from peer reviewed publications where possible
- Also uses meta-analysis approach (Campbell et al. 2014) using median fishing depth
  - considers delayed mortality
- Different discard mortality rates for open and closed season only estimable in the West due to sample size limitations

Table 2. Discard mortality recommendations for SEDAR74, expressed as percentages with +/- standard error, for the recreational directed fleets.

| | *Western Gulf* | | *Central Gulf* | | *Eastern Gulf* | |
|---|---|---|---|---|---|---|
| *Fleet* | Open | Closed | Open | Closed | Open | Closed |
| *Private boat* | 35.5 +/- 10 | 21.1 +/- 7 | 29.7 +/- 10 | 29.7 +/- 10 | 31.5 +/- 10 | 31.5 +/- 10 |
| *Charter* | 41.2 +/- 16 | 26.2 +/- 8 | 16.9 +/- 9 | 16.9 +/- 9 | 26.8 +/- 5 | 26.8 +/- 5 |
| *Headboat* | 40.6 +/- 6 | 24.6 +/- 5 | 24.4 +/- 5 | 24.4 +/- 5 | 27.9 +/- 5 | 27.9 +/- 5 |

Source: **SEDAR74- AP-02**

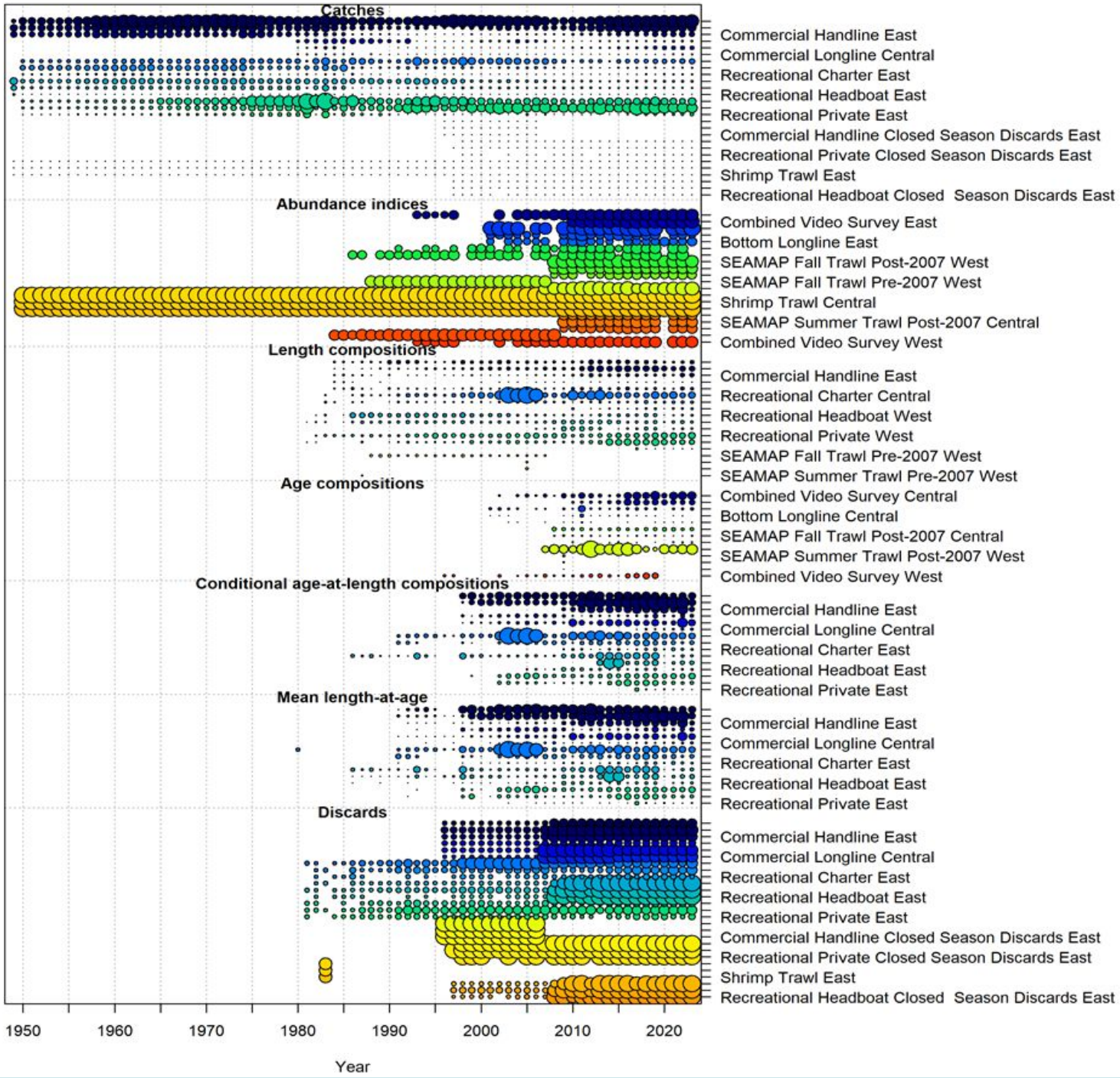
# Commercial Discard Mortality

- Discard mortality rates determined by an **ad hoc group during SEDAR 74**
- Uses data from Commercial Logbook Program and Reef Fish Observer Program
- Estimated as the midpoint between % discarded dead and % discarded dead+discarded w/ barotrauma
- Insufficient sample sizes to determine open/closed season rates

| | East | Central | West |
|---|---|---|---|
| **Commercial Handline** | 24.7 | 19.2 | 21.2 |
| **Commercial Longline** | 26.4 | 40.7 | 22.1 |

# Questions about Life History?

# Fig. 1


Catches
Commercial Handline East
Commercial Longline Central
Recreational Charter East
Recreational Headboat East
Recreational Private East
Commercial Handline Closed Season Discards East
Recreational Private Closed Season Discards East
Shrimp Trawl East
Recreational Headboat Closed Season Discards East
Abundance indices
Combined Video Survey East
Bottom Longline East
SEAMAP Fall Trawl Post-2007 West
SEAMAP Fall Trawl Pre-2007 West
Shrimp Trawl Central
SEAMAP Summer Trawl Post-2007 Central
Combined Video Survey West
Length compositions
Commercial Handline East
Recreational Charter Central
Recreational Headboat West
Recreational Private West
SEAMAP Fall Trawl Pre-2007 West
SEAMAP Summer Trawl Pre-2007 West
Age compositions
Combined Video Survey Central
Bottom Longline Central
SEAMAP Fall Trawl Post-2007 Central
SEAMAP Summer Trawl Post-2007 West
Combined Video Survey West
Conditional age-at-length compositions
Commercial Handline East
Commercial Longline Central
Recreational Charter East
Recreational Headboat East
Recreational Private East
Mean length-at-age
Commercial Handline East
Commercial Longline Central
Recreational Charter East
Recreational Headboat East
Recreational Private East
Discards
Commercial Handline East
Commercial Longline Central
Recreational Charter East
Recreational Headboat East
Recreational Private East
Commercial Handline Closed Season Discards East
Recreational Private Closed Season Discards East
Shrimp Trawl East
Recreational Headboat Closed Season Discards East
1950
1960
1970
1980
1990
2000
2010
2020
Year

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  - **Removals**
  - Size compositions
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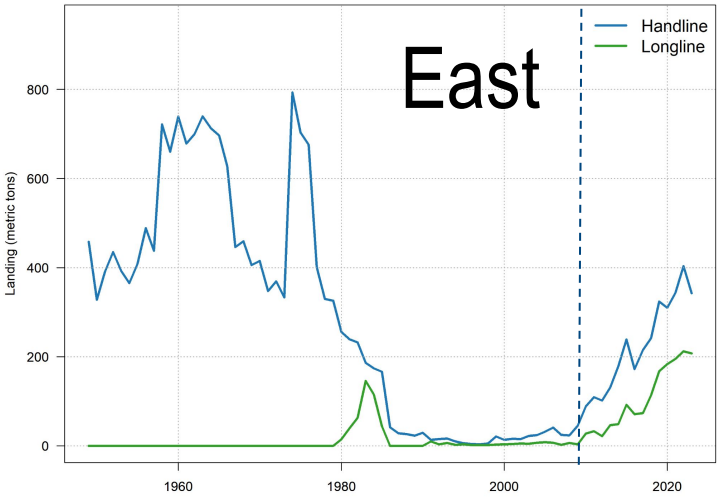
# Commercial Removals

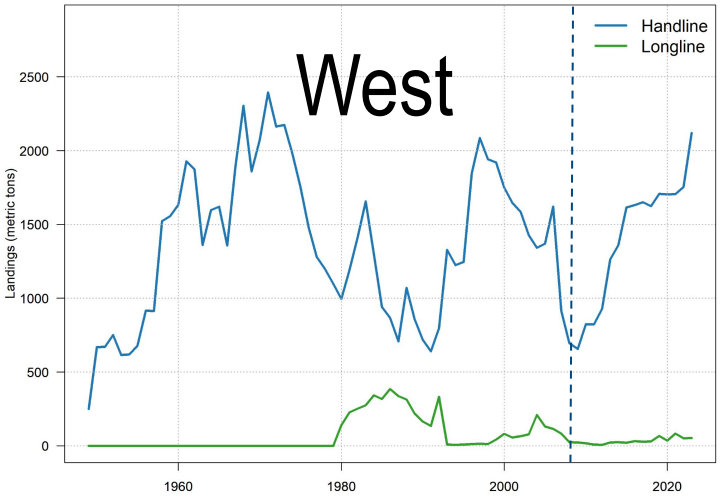
SEDAR 74 DW
Landings DW02
Discards DW03

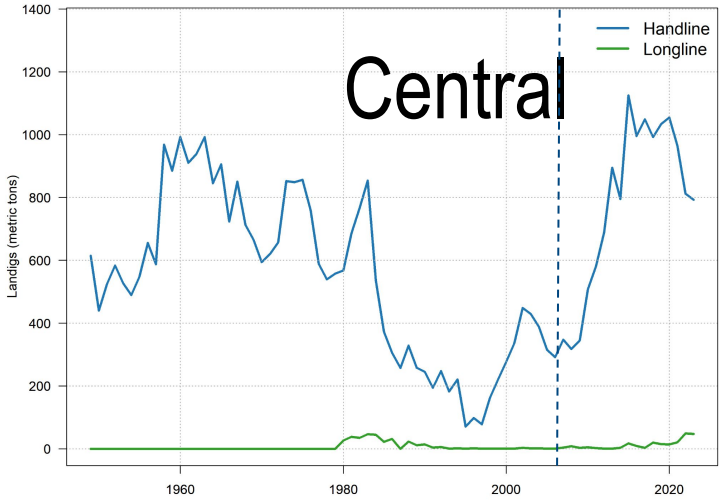
| Data Source | Years | Notes |
|---|---|---|
| Handline Landings (whole weight) | 1964-2023 | Estimated using the Trip Ticket Program managed by the states which begin at different times & Coastal Logbooks (used to assign gear and area to landings); Estimation methodology update with IFQ in 2007 (annual correction factors). |
| Longline Landings | 1980-2023 | |
| Historic Commercial Landings | Pre-1963 | Landings reported by port and assigned to regions using historical references (SEDAR7-AW22); split East/Central using ratio from 1964-1968 (SEDAR 74 Data Workshop report) |
| Handline Discards (Open/Closed) (numbers) | 1995-2006 2007-2023 | Pre 2007 - self reported in commercial discard logbook data and coastal logbook data Post 2007 - estimated using reef fish observer data |
| Longline Discards (Open) | | |

# Commercial Landings Magnitude

- Most landings from West
- 1980s-1990s population severely overfished; drop in landings
- Season length drop from 365 to ~70 days in the 90s
- Trip limits switch to Individual Fishing Quota implementation in 2007

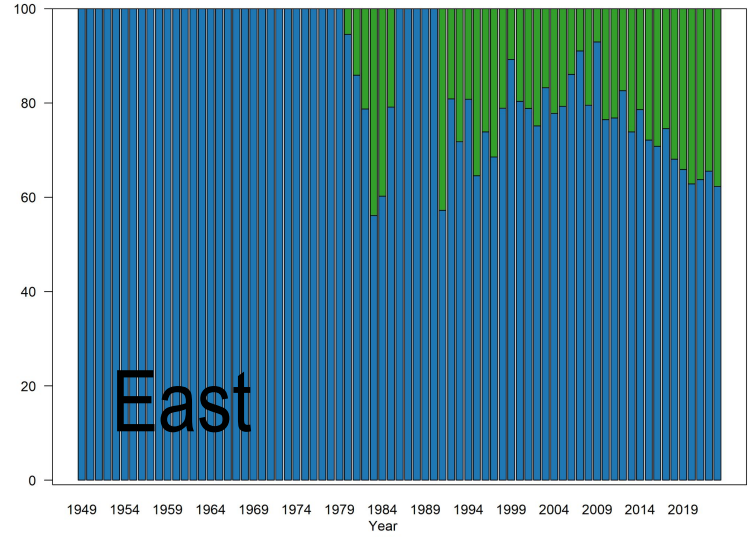


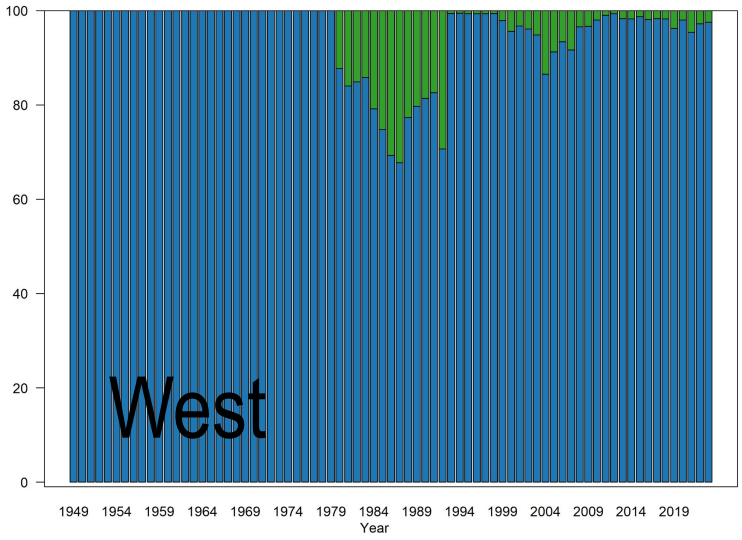



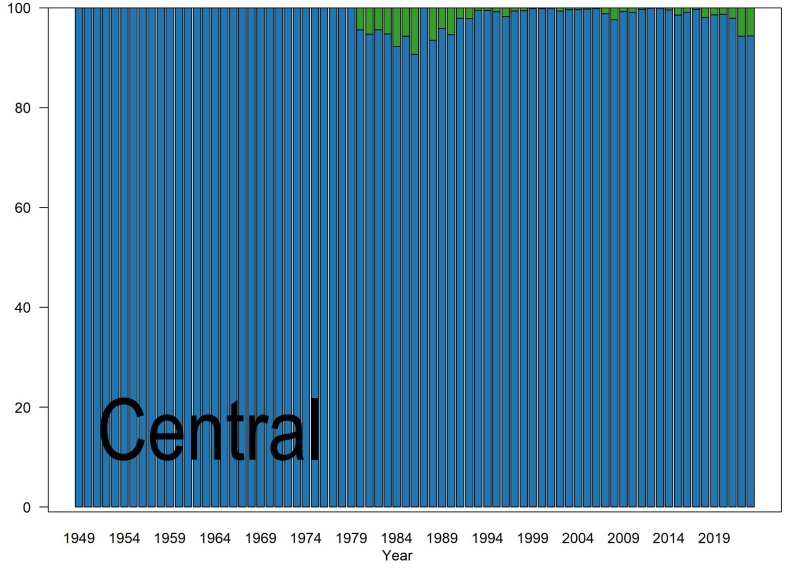



# Commercial Landings Proportions

- Commercial sector dominated by Handline landings in all regions
- Longline fleet began in 1980

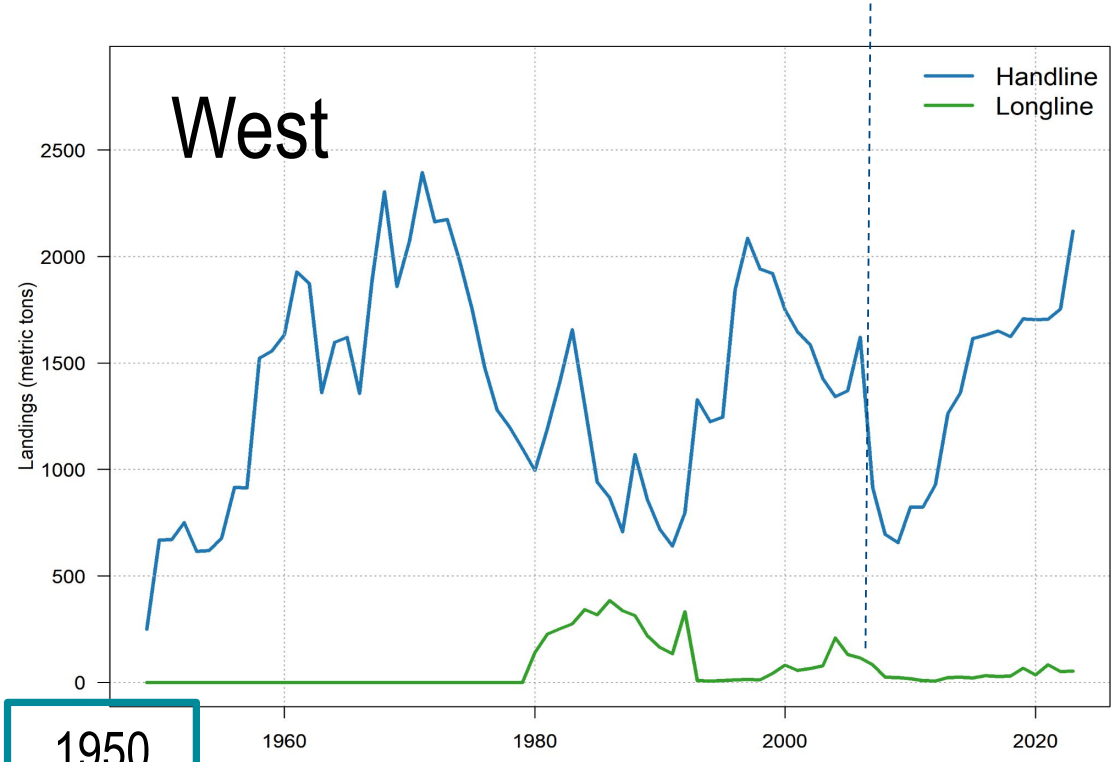


# Commercial Landings Uncertainty

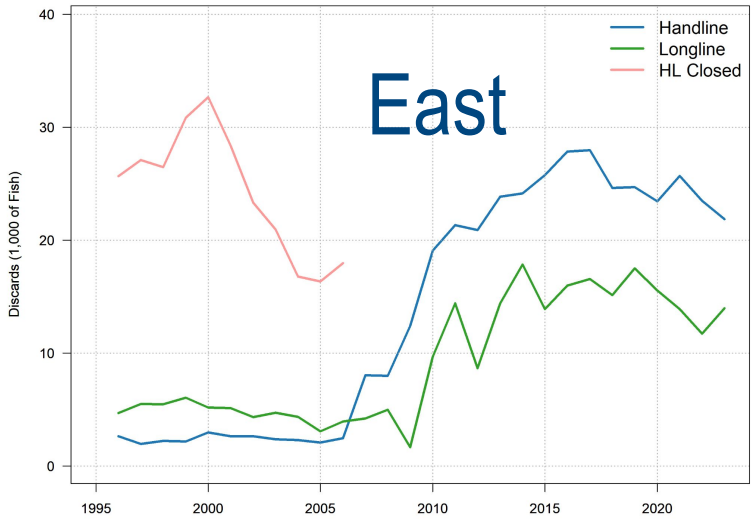
- WG provided expert opinion values
- All years fixed at 0.05 initially for model stability
- Tested in sensitivities

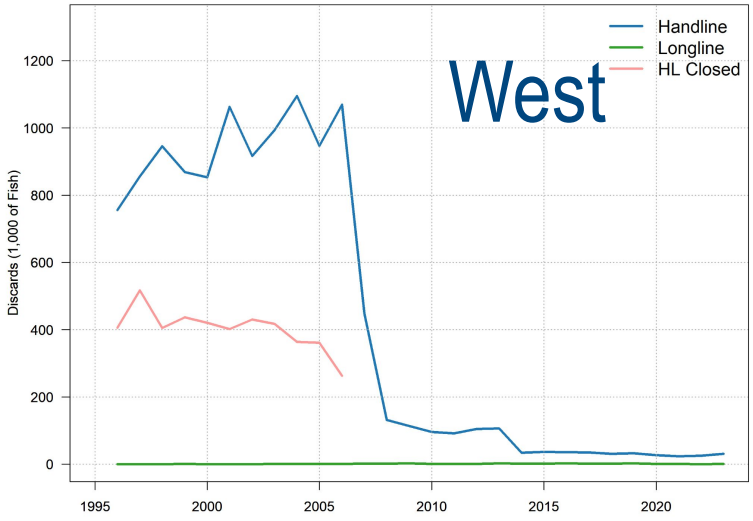


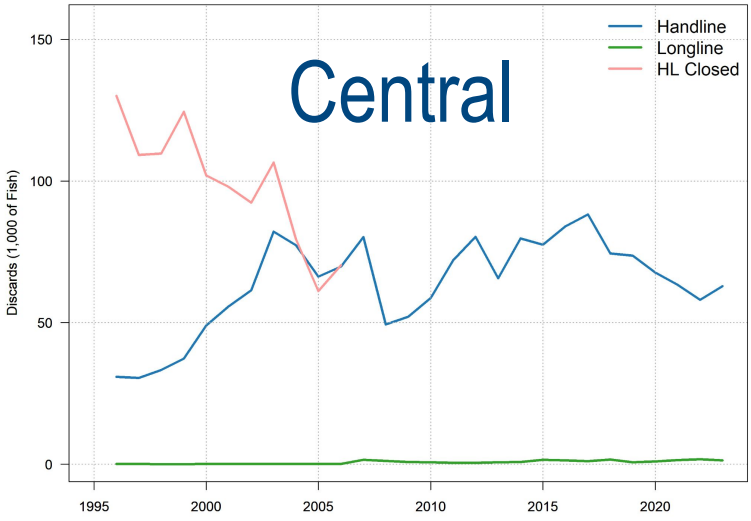

| YEAR | WEST | CENTRAL | EAST |
|---|---|---|---|
| 1872-1961 | 0.50 | 0.60 | 0.60 |
| 1962-1976 | 0.25 | 0.25 | 0.25 |
| 1977-1985 | 0.20 | 0.20 | 0.20 |
| 1986 | 0.20 | 0.17 | 0.15 |
| 1987 | 0.20 | 0.17 | 0.15 |
| 1988 | 0.20 | 0.17 | 0.15 |
| 1989 | 0.20 | 0.16 | 0.15 |
| 1990 | 0.20 | 0.16 | 0.15 |
| 1991 | 0.20 | 0.16 | 0.15 |
| 1992 | 0.20 | 0.16 | 0.15 |
| 1993 | 0.20 | 0.17 | 0.15 |
| 1994 | 0.20 | 0.17 | 0.15 |
| 1995 | 0.20 | 0.18 | 0.15 |
| 1996 | 0.20 | 0.18 | 0.15 |
| 1997 | 0.20 | 0.18 | 0.15 |
| 1998 | 0.20 | 0.18 | 0.15 |
| 1999 | 0.20 | 0.16 | 0.15 |
| 2000 | 0.17 | 0.16 | 0.15 |
| 2001 | 0.17 | 0.16 | 0.15 |
| 2002 | 0.17 | 0.15 | 0.15 |
| 2003 | 0.17 | 0.15 | 0.15 |
| 2004 | 0.18 | 0.15 | 0.15 |
| 2005 | 0.18 | 0.15 | 0.15 |
| 2006 | 0.18 | 0.15 | 0.15 |
| 2007 to present | 0.05 | 0.05 | 0.05 |

# Commercial Discards
# Open and Closed Season

- Longline closed season combined with open season to improve model stability (removed a fleet; reduced F parameters)
- Handline discards dominate all areas
- All discards considered open season after IFQ

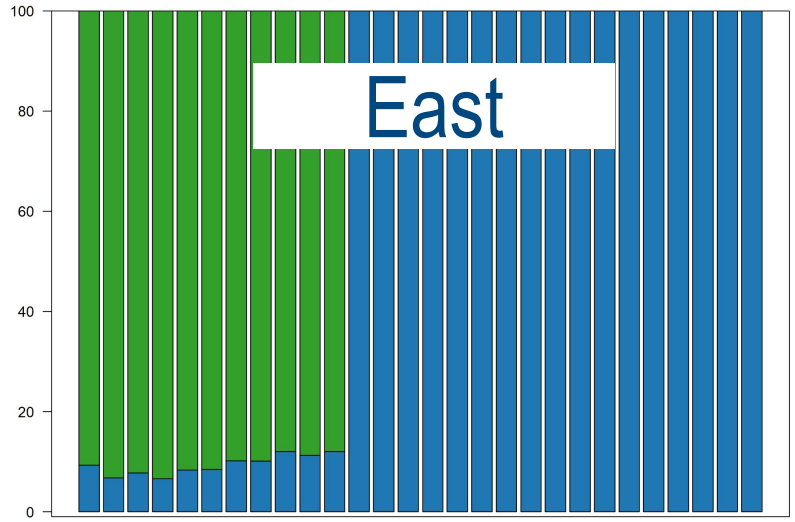


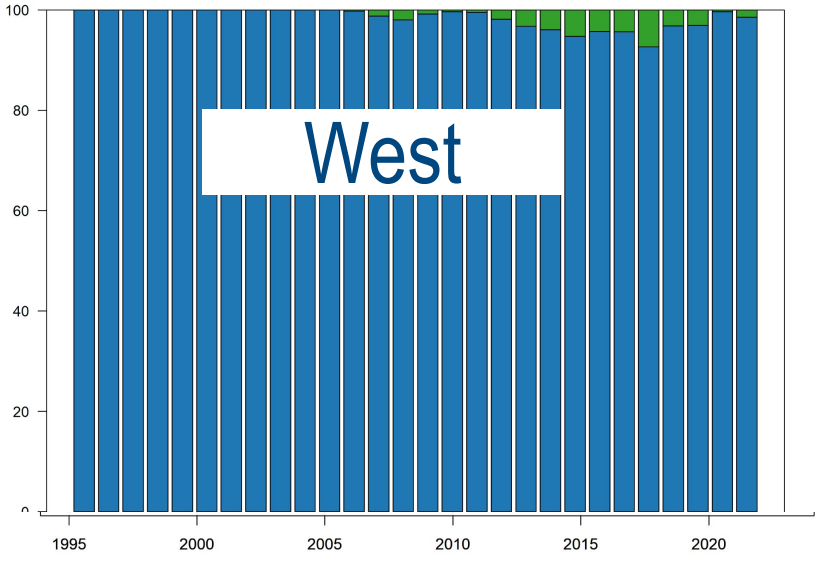



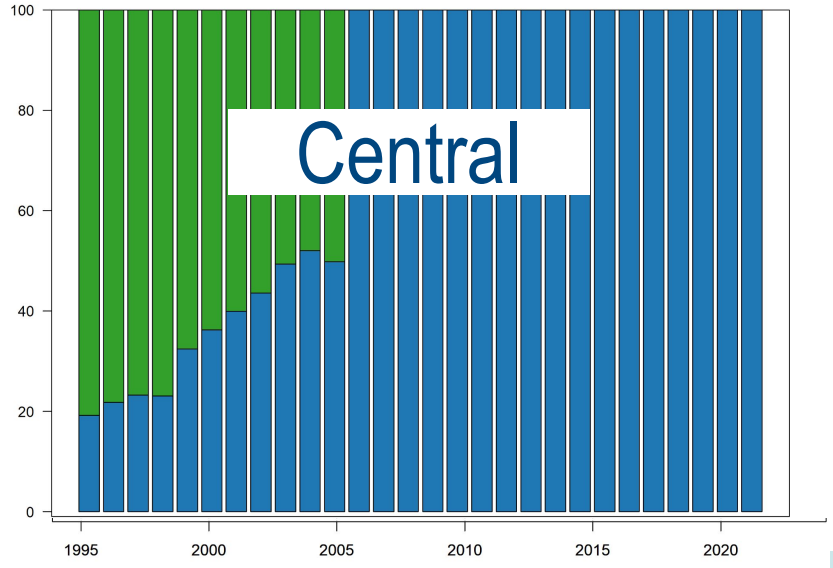



# Commercial Open Season Discard Proportions

- Discards begin in 1995 compared to landings in 1950s
- Continuously Handline-dominated

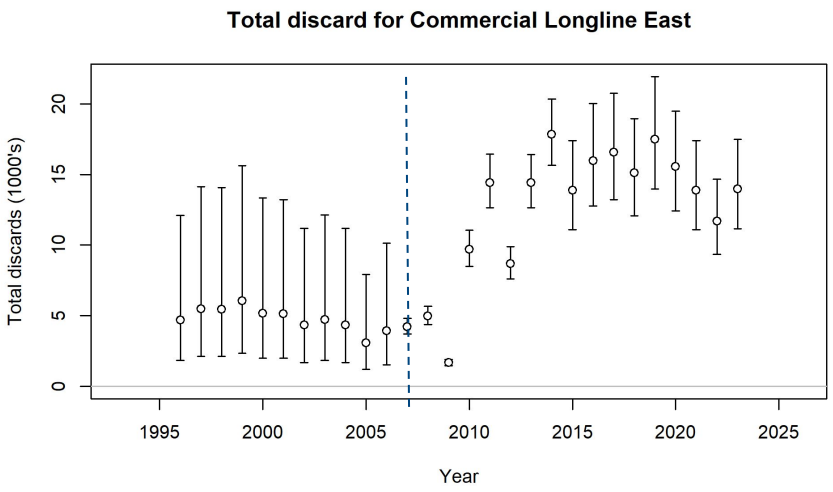


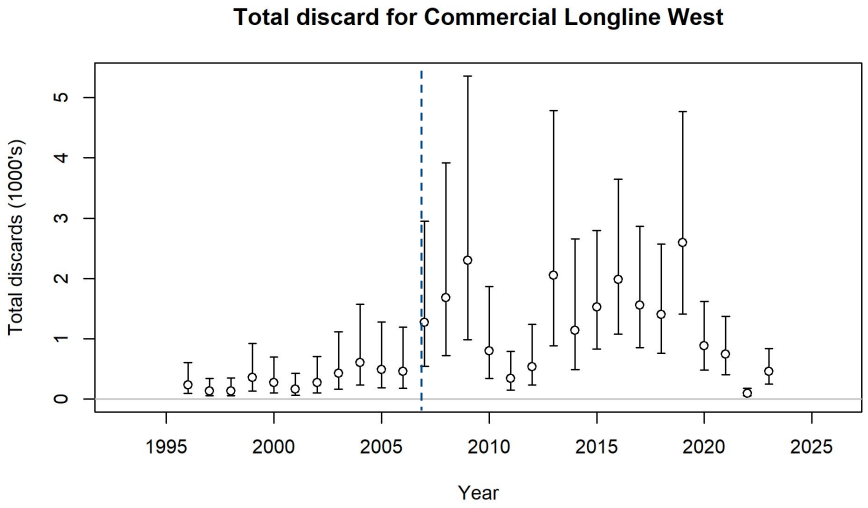



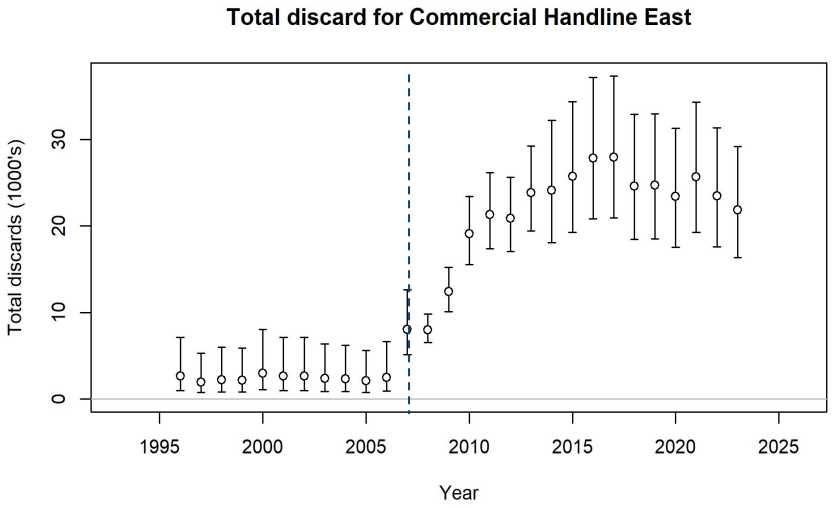



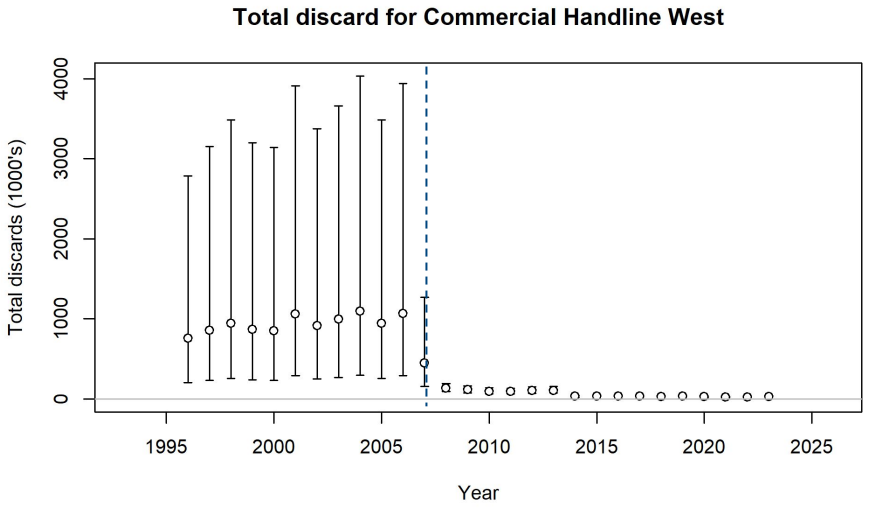
# Commercial Discard Uncertainty

IFQ



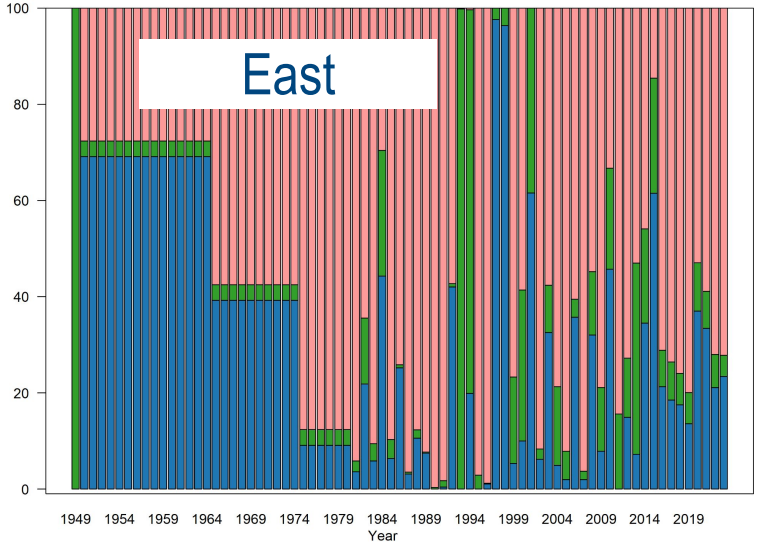



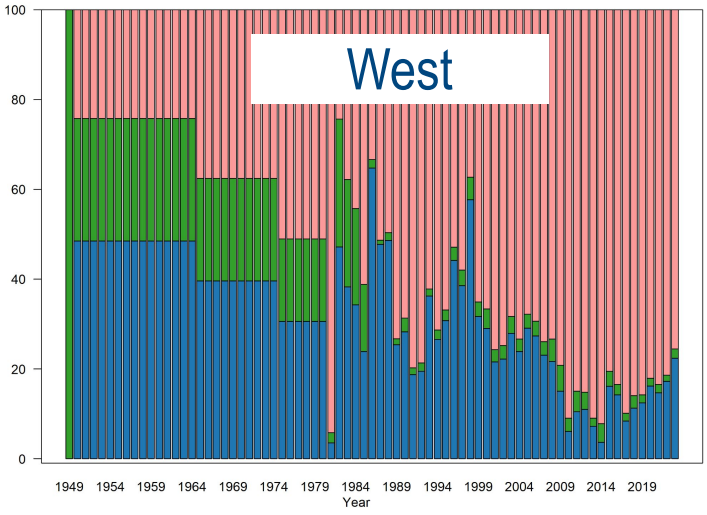
# Recreational landings (numbers)

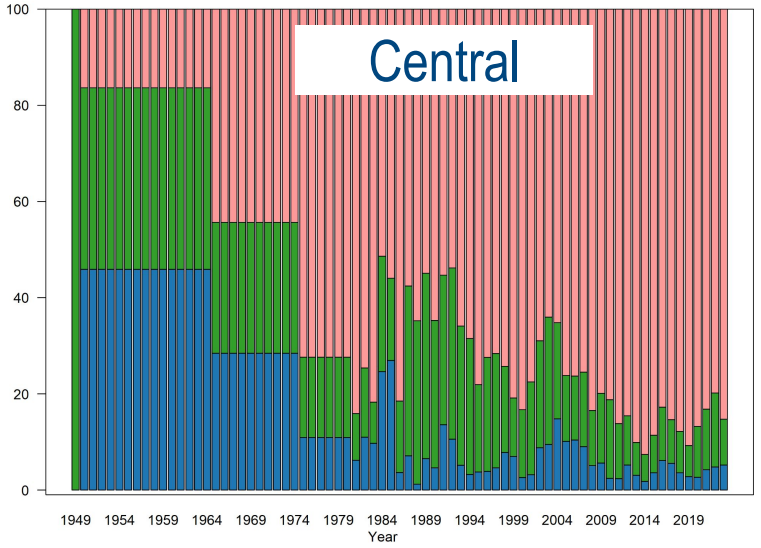
| Data Source | Years | Notes |
|---|---|---|
| Marine Recreational Information Program (MRIP) - Private (DW04 & DW05) | 1981-2023 | Continuous time series that uses the Federal Fishing Effort Survey: includes calibrations of state data - LA Creel (2014) and TPWD (1983) data. |
| MRIP - Charter/"For-Hire" | 1981-2023 | Same as previous note; in addition, season length began to differ from private in 2015 (Reef Fish Exemption) |
| Southeast Region Headboat Survey (SRHS) (DW01) | 1981-1985<br><br>1986-2023 | Collected as part of MRIP; split from charter using state by state averages from 1869-1990<br>Estimated using self reported logbook for each trip |
| Historical Landings (DW08) | 1955-1980 | Back-calculated using the FHWAR method; using information collected from a survey that took place every 5 years; split into areas using recent ratios. |
| MRIP Private (Open/Closed) Discards (DW18) | 1980 open<br>1996 closed | LA Creel discards are calibrated to MRIP. Texas discards are imputed using Louisiana discards since we do not receive discards from Texas (TPWD) |
| SRHS Open/Closed Season Discards (DW10) | 1981-2007<br><br>2008-2023 | MRIP:SRHS discard ratio used due to lack of At-Sea Observer coverage until 2008<br>Logbook discard estimates |
| MRIP Charter Open Season Discards | Central:1981-2023<br>West:1982-2023 | Similar to private; in addition, not many boats in Texas data. |

# Recreational Landing Proportions

- Recreational fishery dominated by private landings
- Stair-step pattern due to ratio year intervals for back calculation (pre-1980)

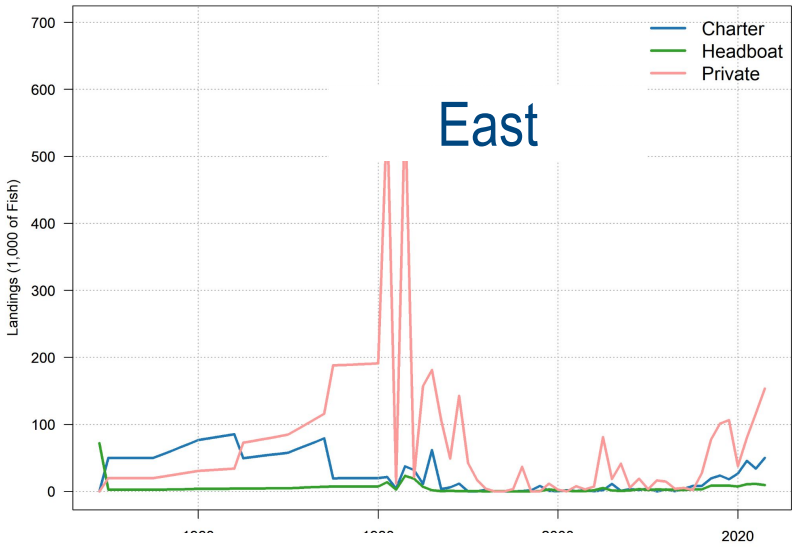


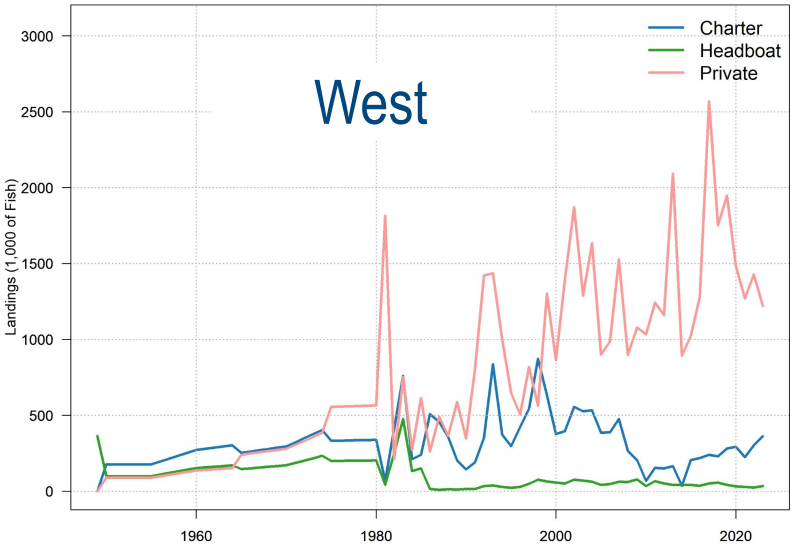



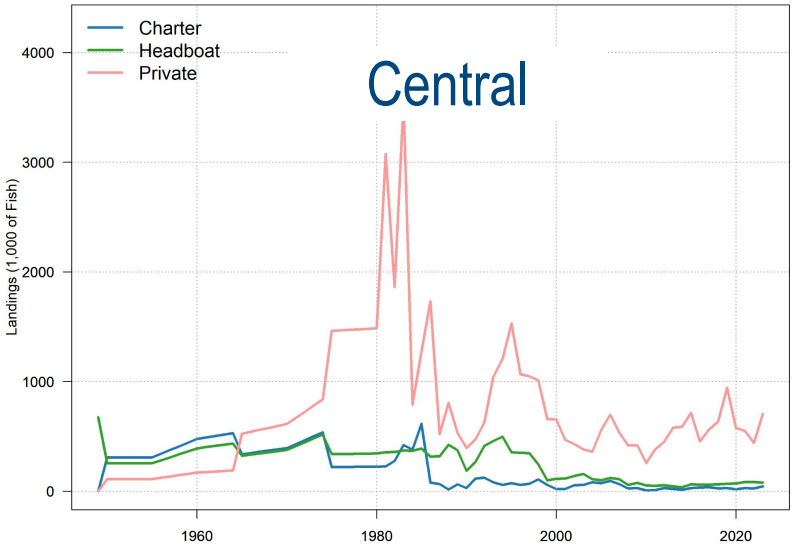



# Recreational Landings Magnitude

- Drop in landings around the 1990s similar to commercial (season length changes)
- Gradual increase in the West vs. Central or East
- 6 changes in size limits and 4 changes in bag limits since 1984

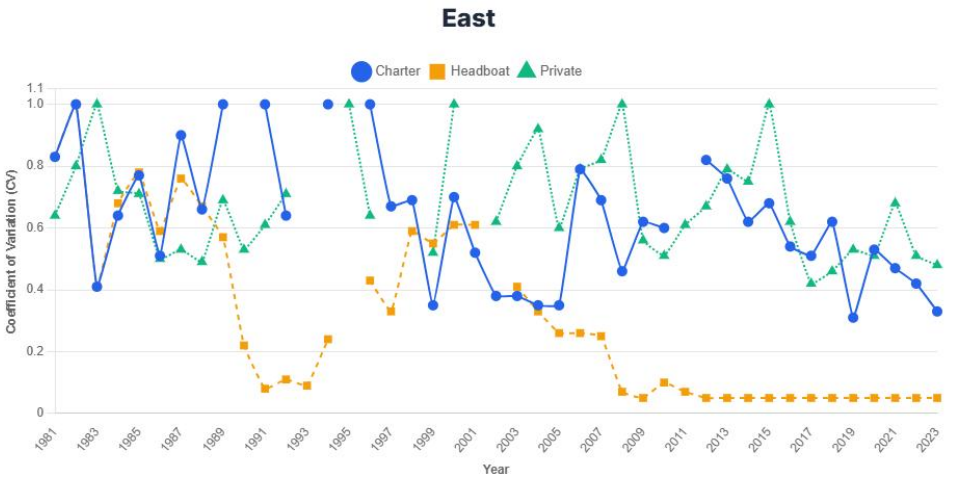


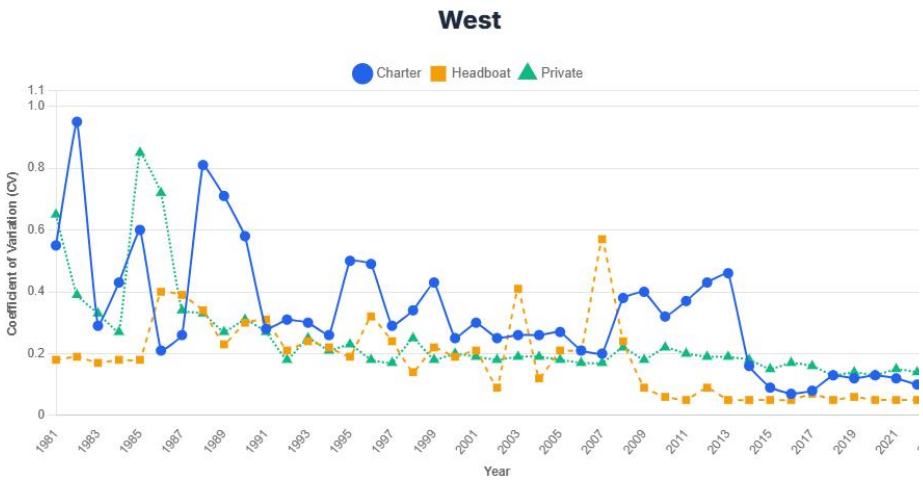



# Recreational Landings Uncertainty

- High uncertainty early on (pre-1980) for all fleets but gradually decreases for most regions
- High uncertainty continuously throughout the East; fewer boats (i.e., headboat)

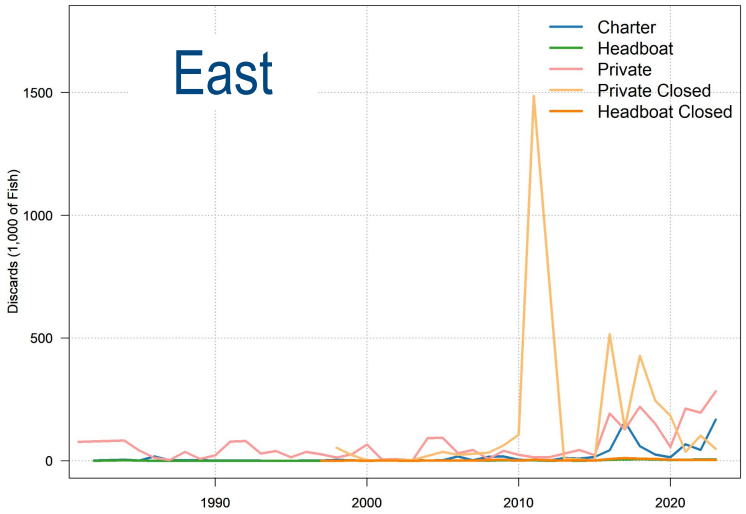


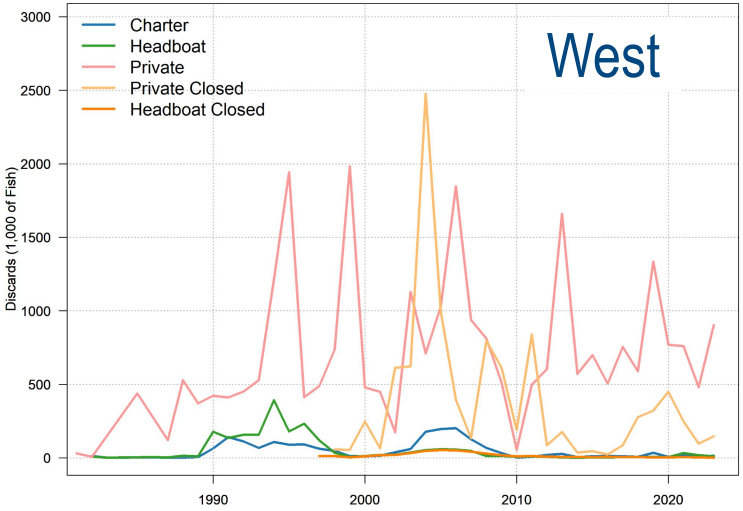



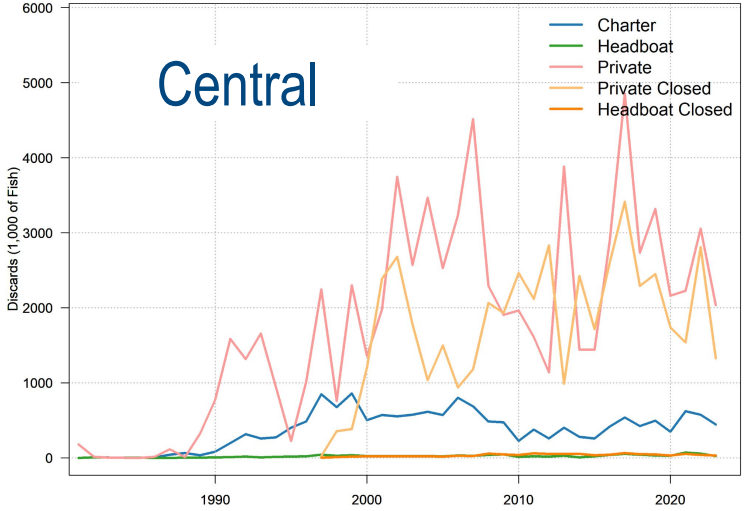



# Recreational Discards in Numbers

- Dominated by the private fleet again

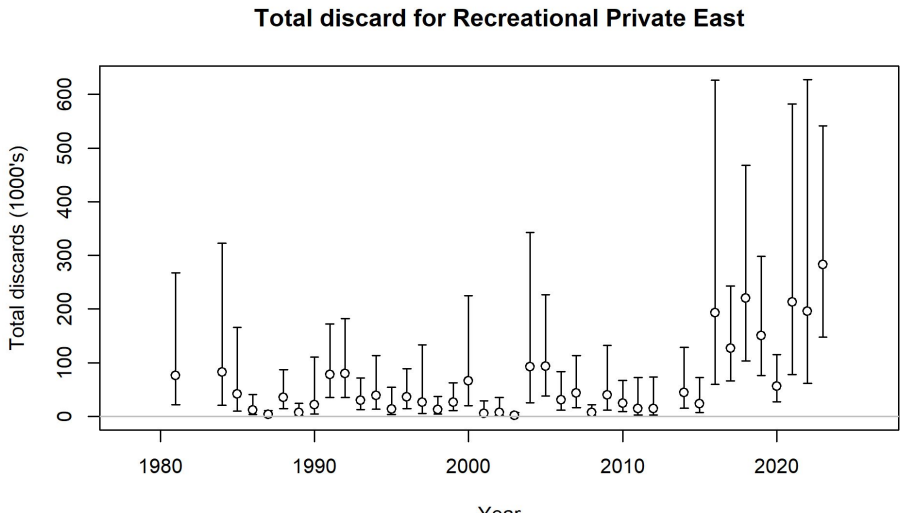


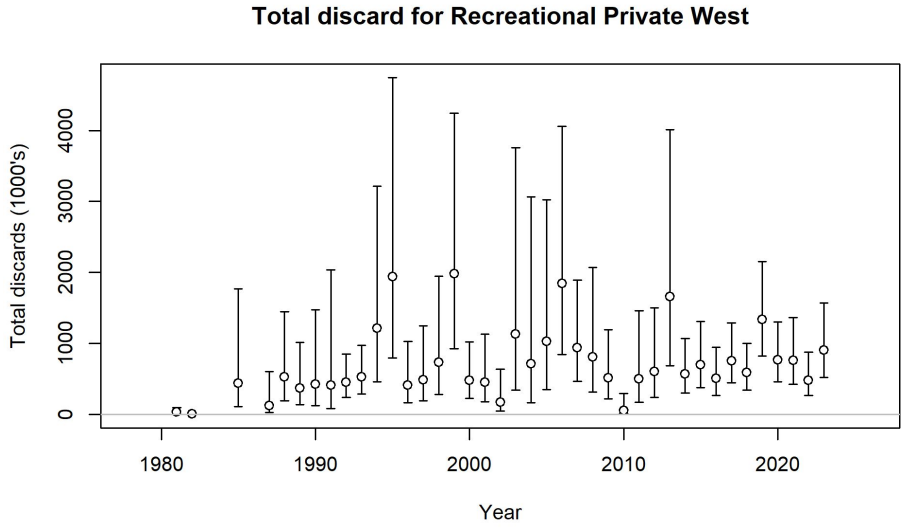



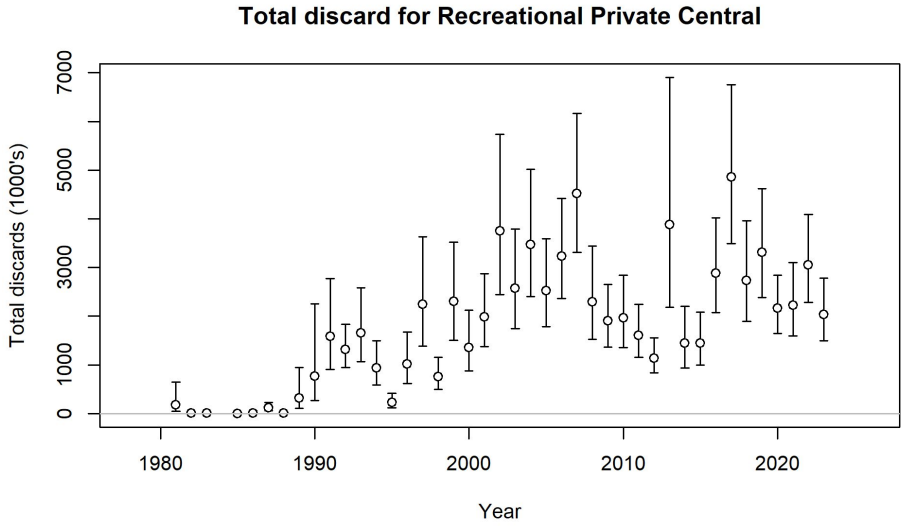



# Open Season Discards Recreational Private

- Large magnitude of uncertain discards



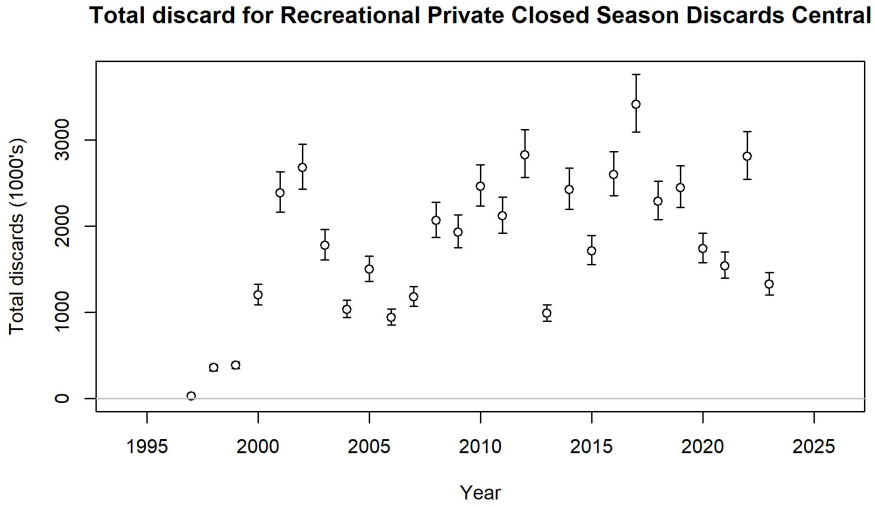
# Closed Season Discards Recreational Private

- Later start year & less uncertainty



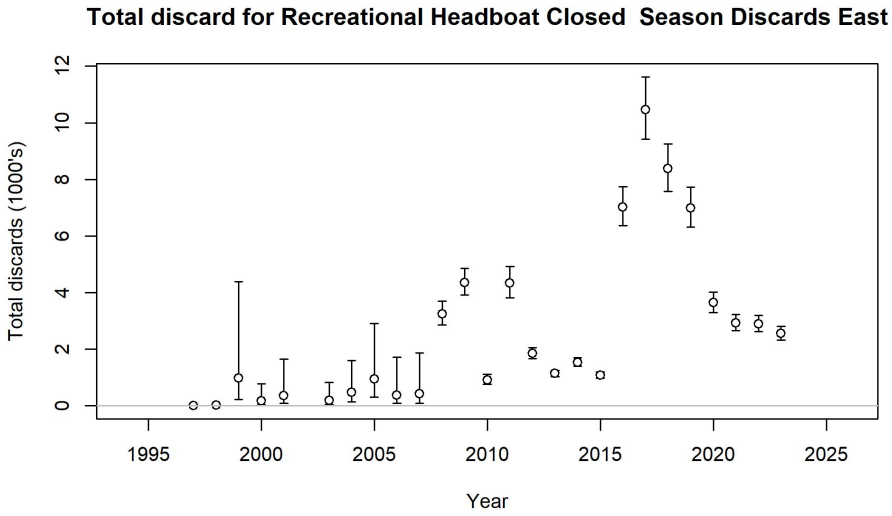


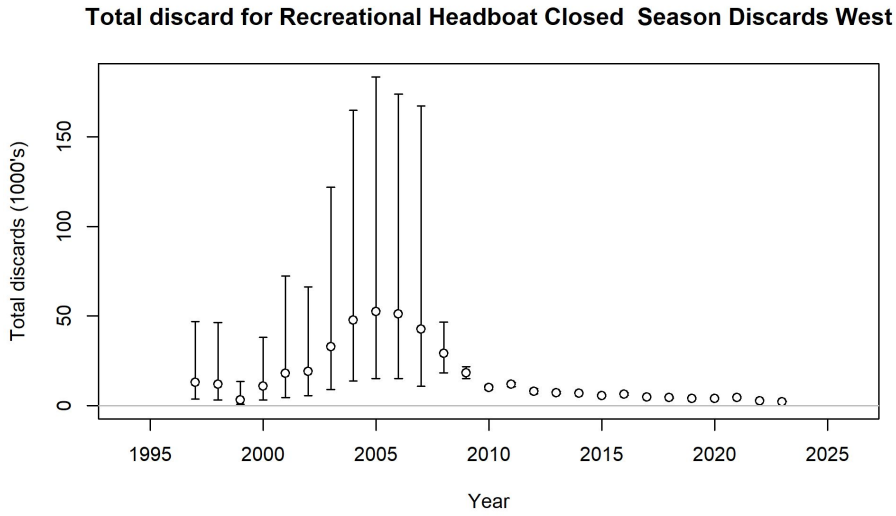


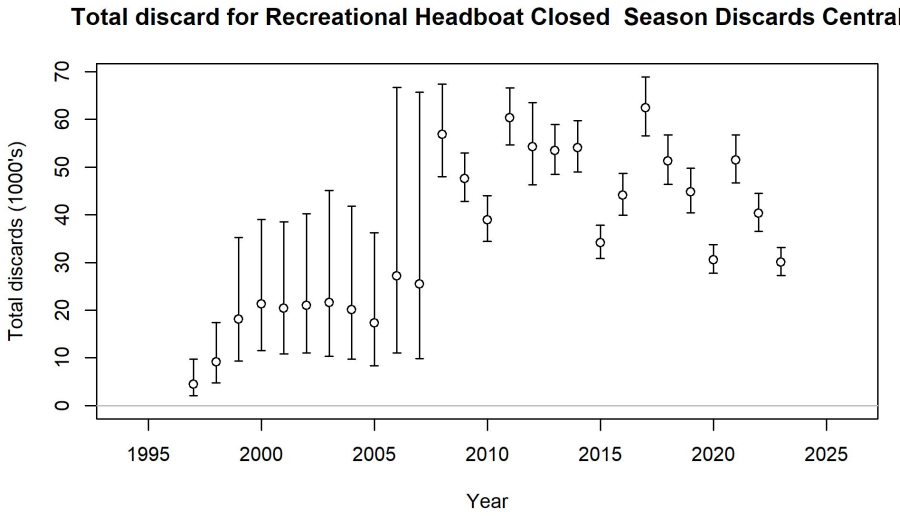


# Closed Season Discards Headboat

- Low magnitude & high uncertainty early on

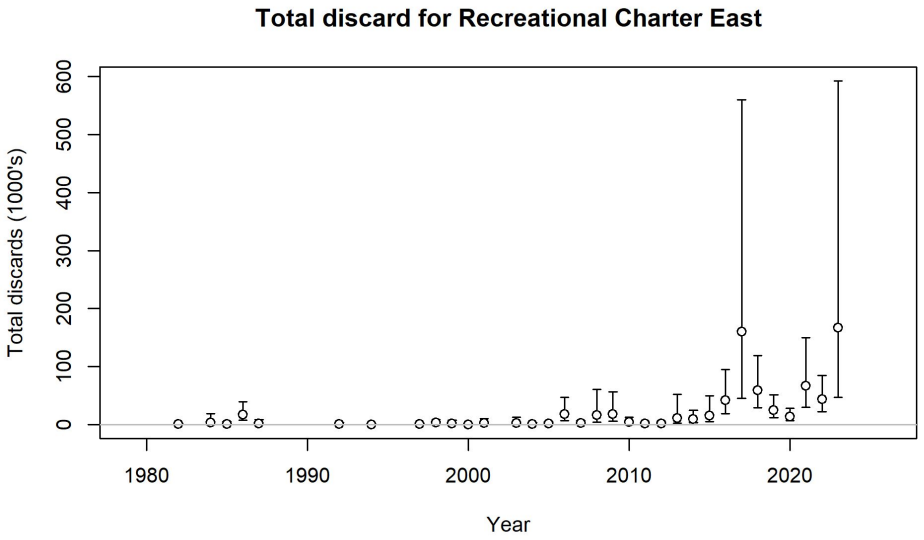


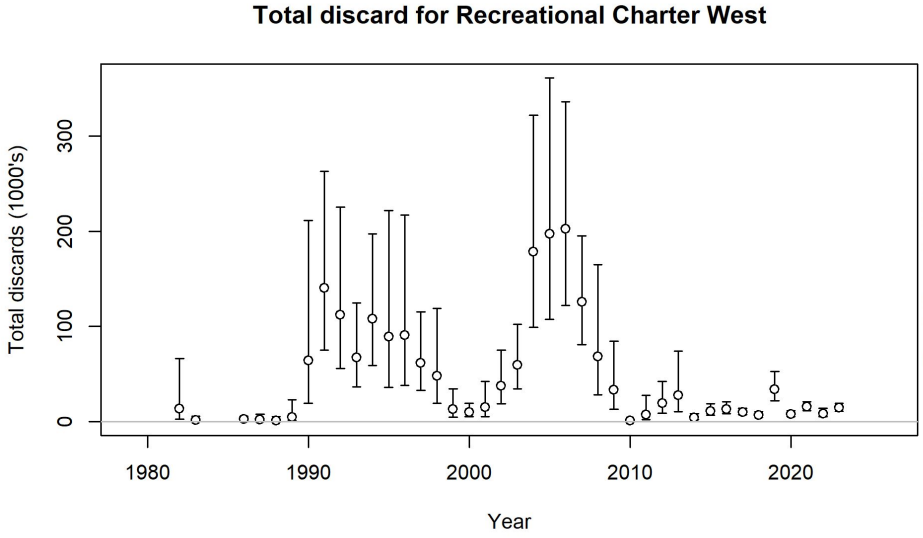



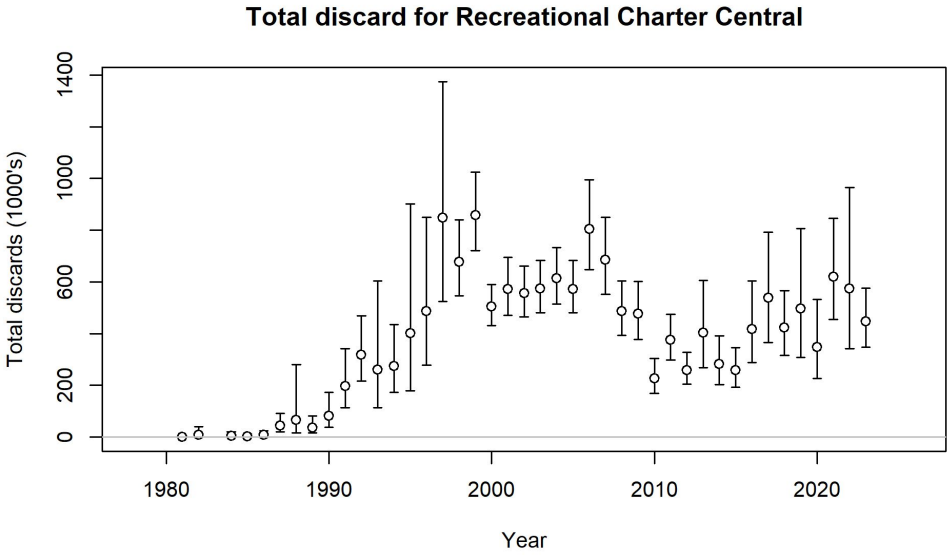



# Charter Boat Discards

- High uncertainty specifically in the East



# Removal Issues to Consider

- Uncertainty in landings and discards
- Changes in regulations, especially IFQ (2007)
- Regulations influencing behavioral changes in fishing that impact magnitude and composition of landings (i.e., derby fishing)

# Shrimp bycatch

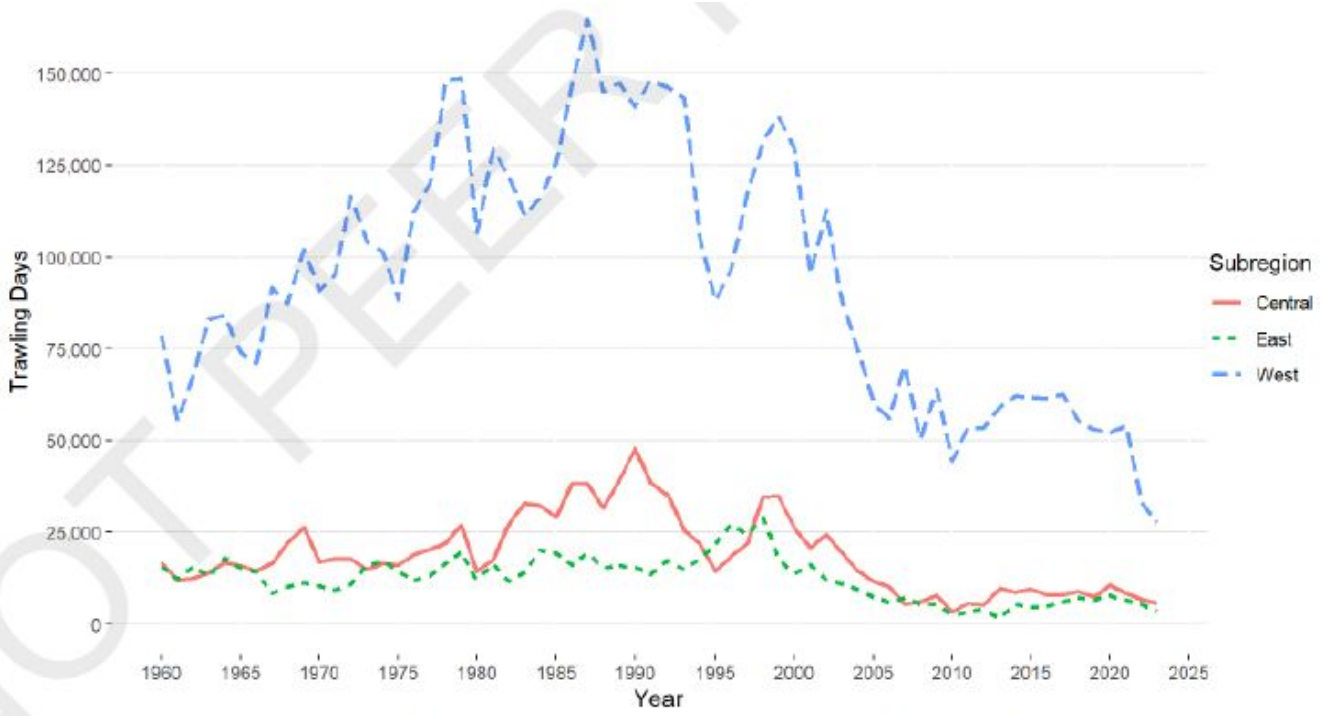
## Data Workshop

- Utilize the new estimates of shrimp fishery effort and bycatch, as appropriate, based on the peer review of such data from SEDAR 87. Document any change in start year from previous data provisions (previous start year 1950).
    - Evaluate the existing composition data and recommend whether the data are sufficient to represent the bycatch by the fleet.
- Document all new methodologies:
    - Address program objectives, methods, coverage, sampling intensity, and other relevant characteristics.
- Provide maps of shrimp fishery effort and any changes to observer coverage.

- New methodology used for Red Snapper
    - Update in effort information and bycatch estimation

# Shrimp effort: 1960-2023

- Effort in days provided from 1960-2023
  - 1960-2006: Port interview effort calibrated to ELB information
    - 1984-2006: Included area strata information
  - 2007-2023: Electronic Logbook (ELB) information on chips

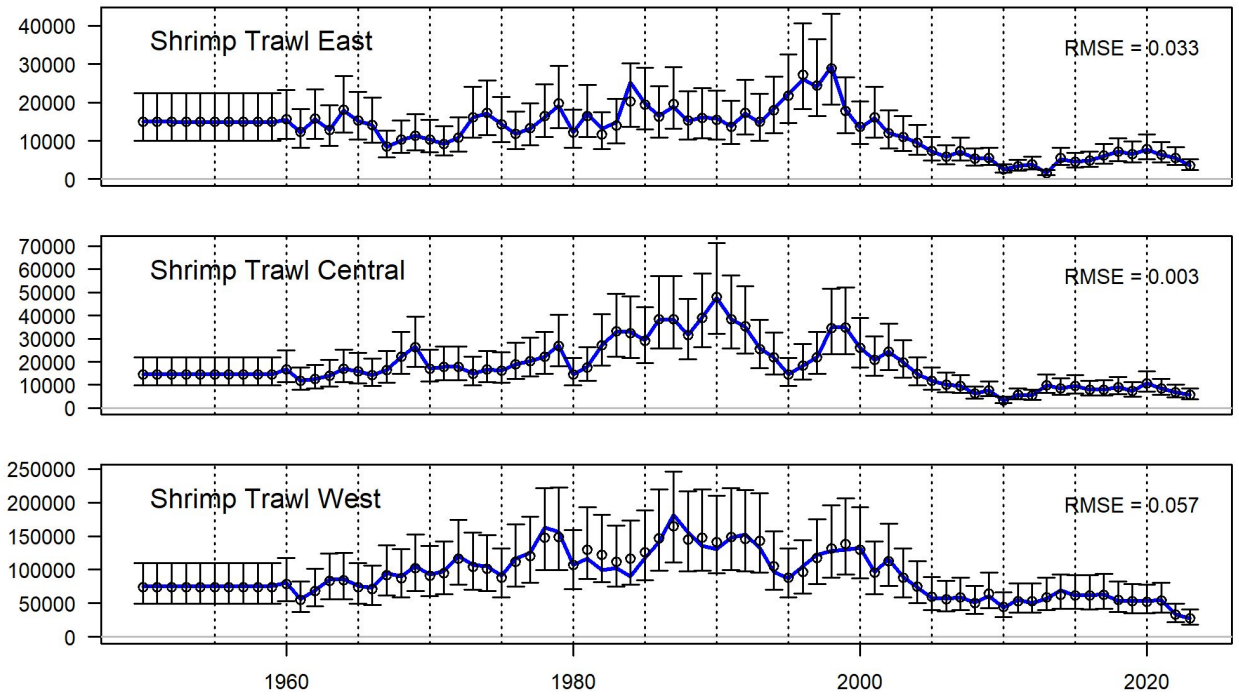



NOT PEER

DW Report

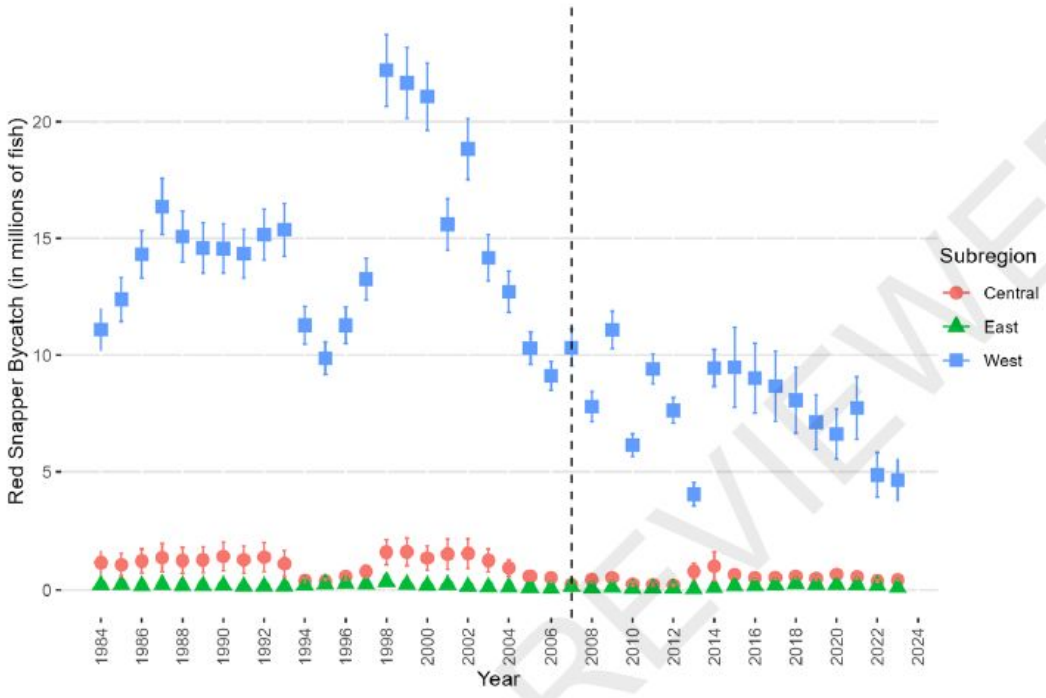
# Shrimp effort: 1950-1984

- Effort in days was recorded back to 1960 but did not have variables to help determine bycatch (i.e., time of day or trawl configuration)
- 1960-1984: Used previously estimated effort split by region using shrimp landings
- 1950-1960: Average effort from 1960-1965



# Shrimp bycatch: 1984-2023

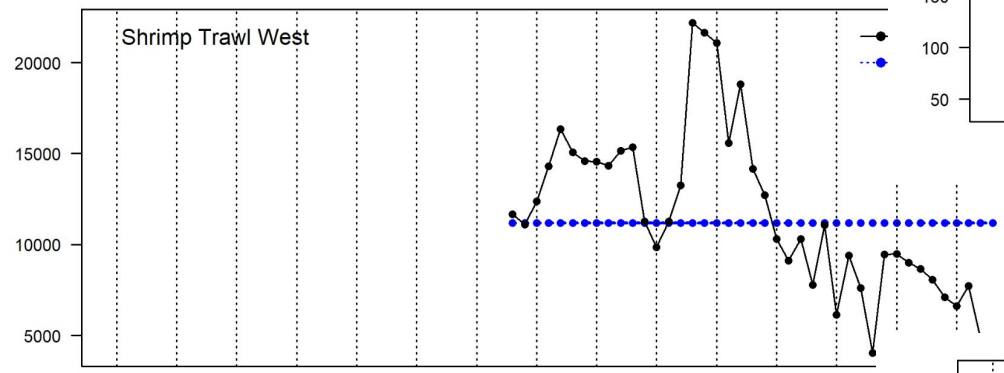
- Observer data on shrimp landings began in 2007
- Updated effort and shrimp landings (SEDAR87-DW06) used to hindcast shrimp bycatch from 1984-2006
    - Updated shrimp methodology included stratification by area, season, and depth, allowing better estimating of shrimp landings and bycatch

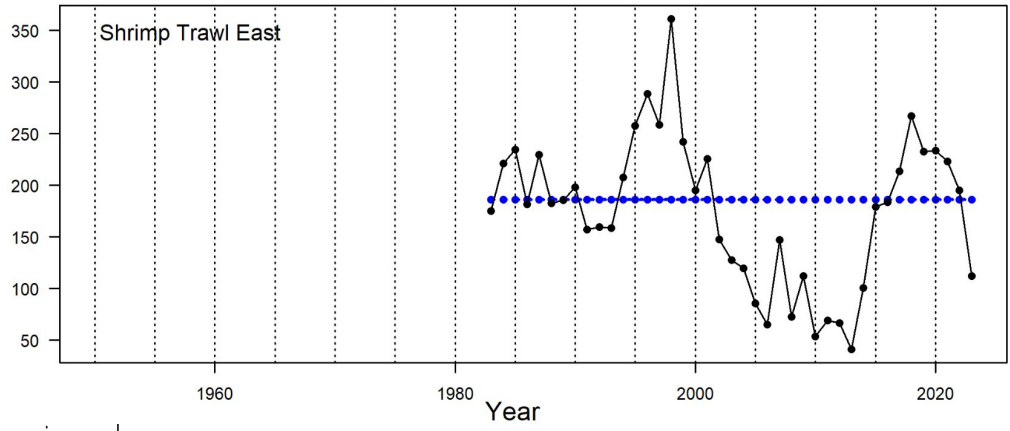


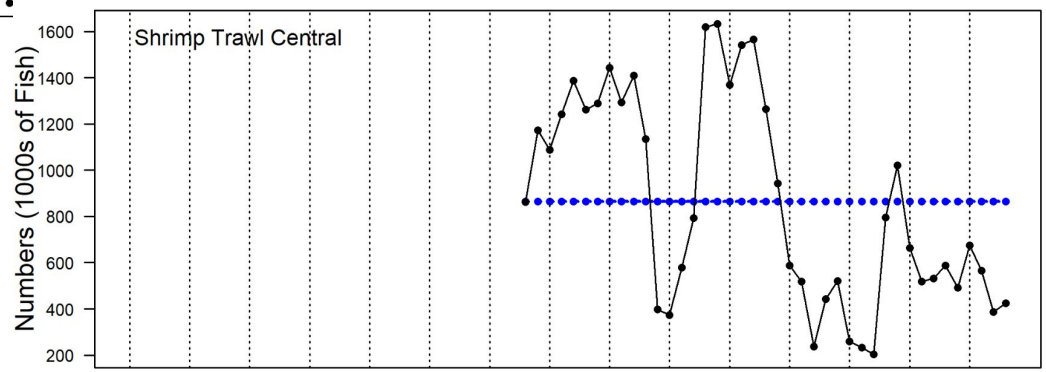

REVIEWED

# Shrimp bycatch estimates within SS

- Fit to median value of all available data (1984-2023) using the super-period approach in Stock Synthesis
  - Removes inter-annual variability



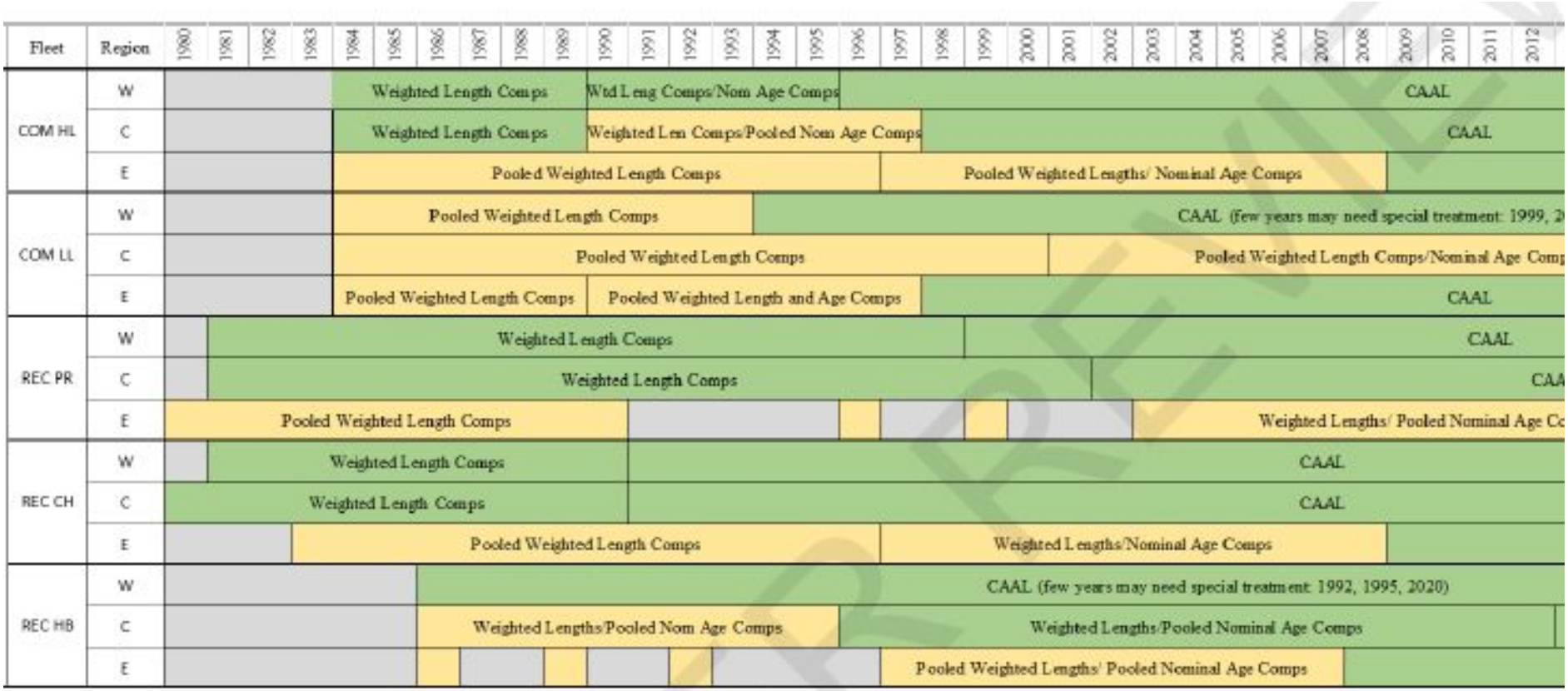



# Outline

- Data Review
  - Stock definition
  - Assessment history
  - Regulations
  - Life history
  - Removals
  - **Size compositions**
  - Age compositions
  - Indices of abundance & composition
  - Key data differences from SEDAR 52

# Available Data Reviewed By Working Group

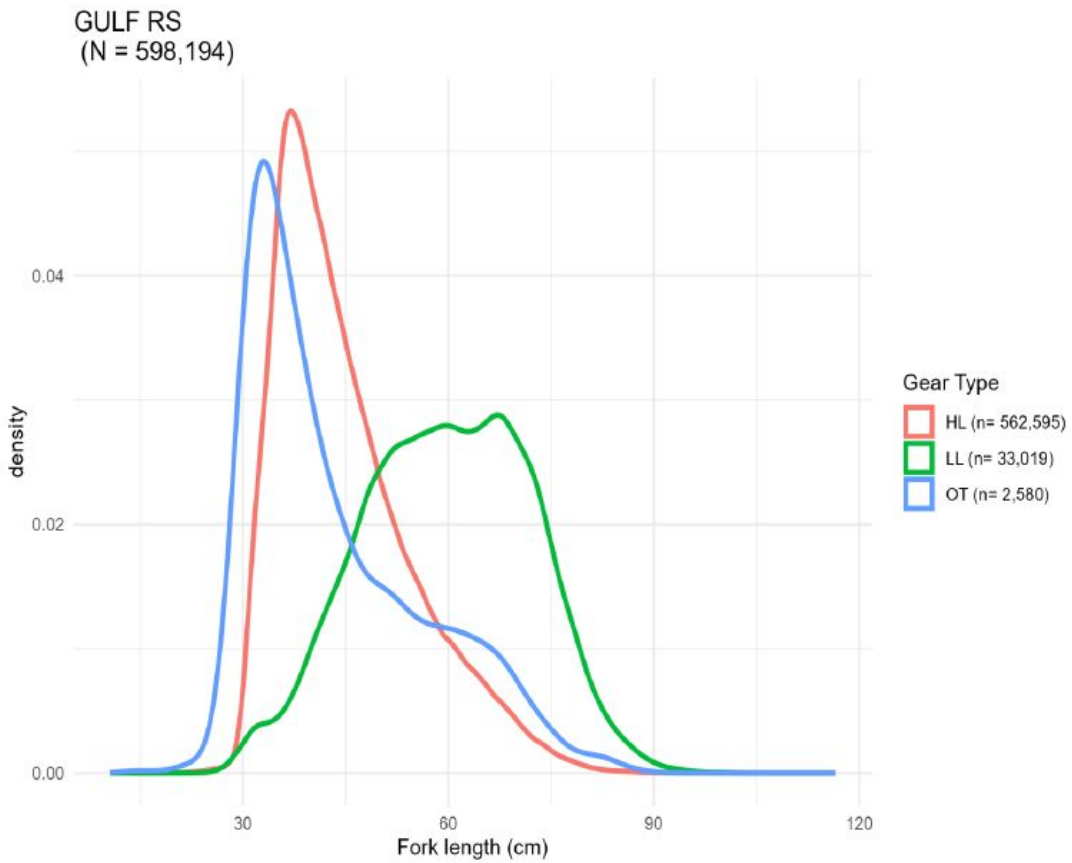



- Nominal & Weighted Age and Length and Conditional Age-At-Length (CAAL) available for directed fleets

# Directed Fleet Length Comp

Commercial Landings DW03
Commercial Discards DW06
Recreational Landings DW07
Recreational Discards SEDAR 98 DW, DW15 (FL only)

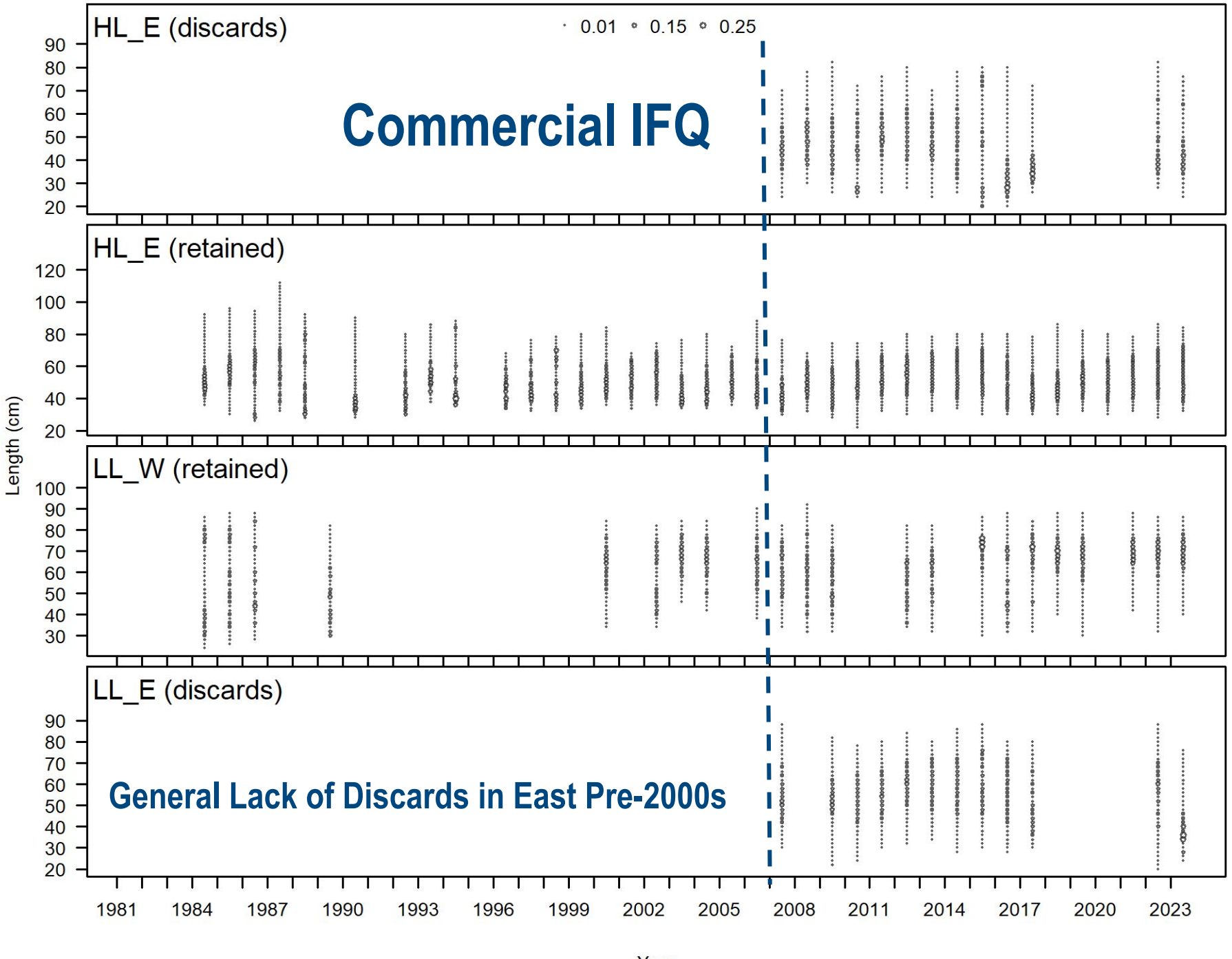
- Received nominal and weighted length compositions (by landings) for commercial and recreational fleets by area
- Example: Commercial fleets w/ different composition distributions

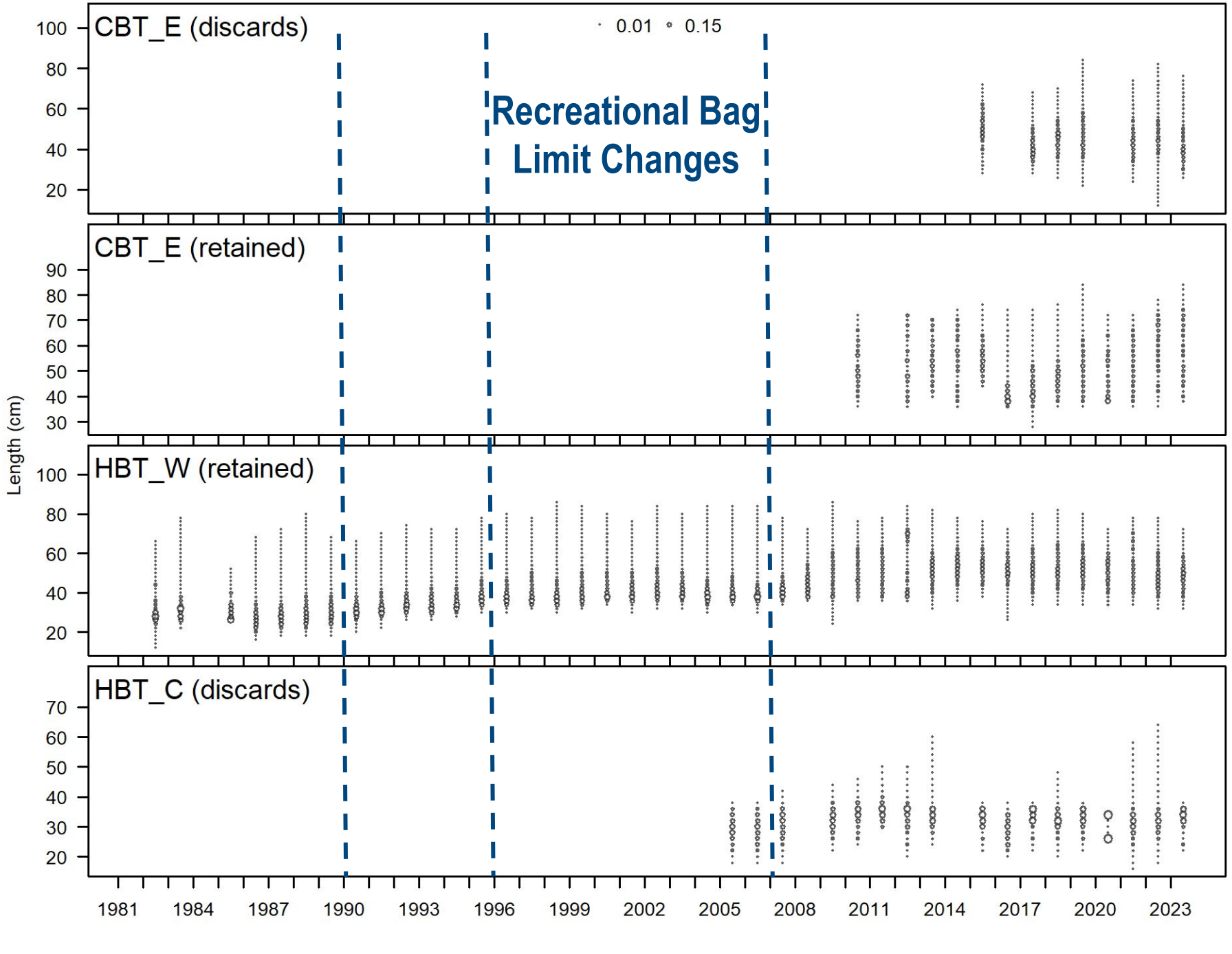


# Length Composition Used In Model

SEDAR 98 DW
Commercial DW03, DW06
Recreational DW07

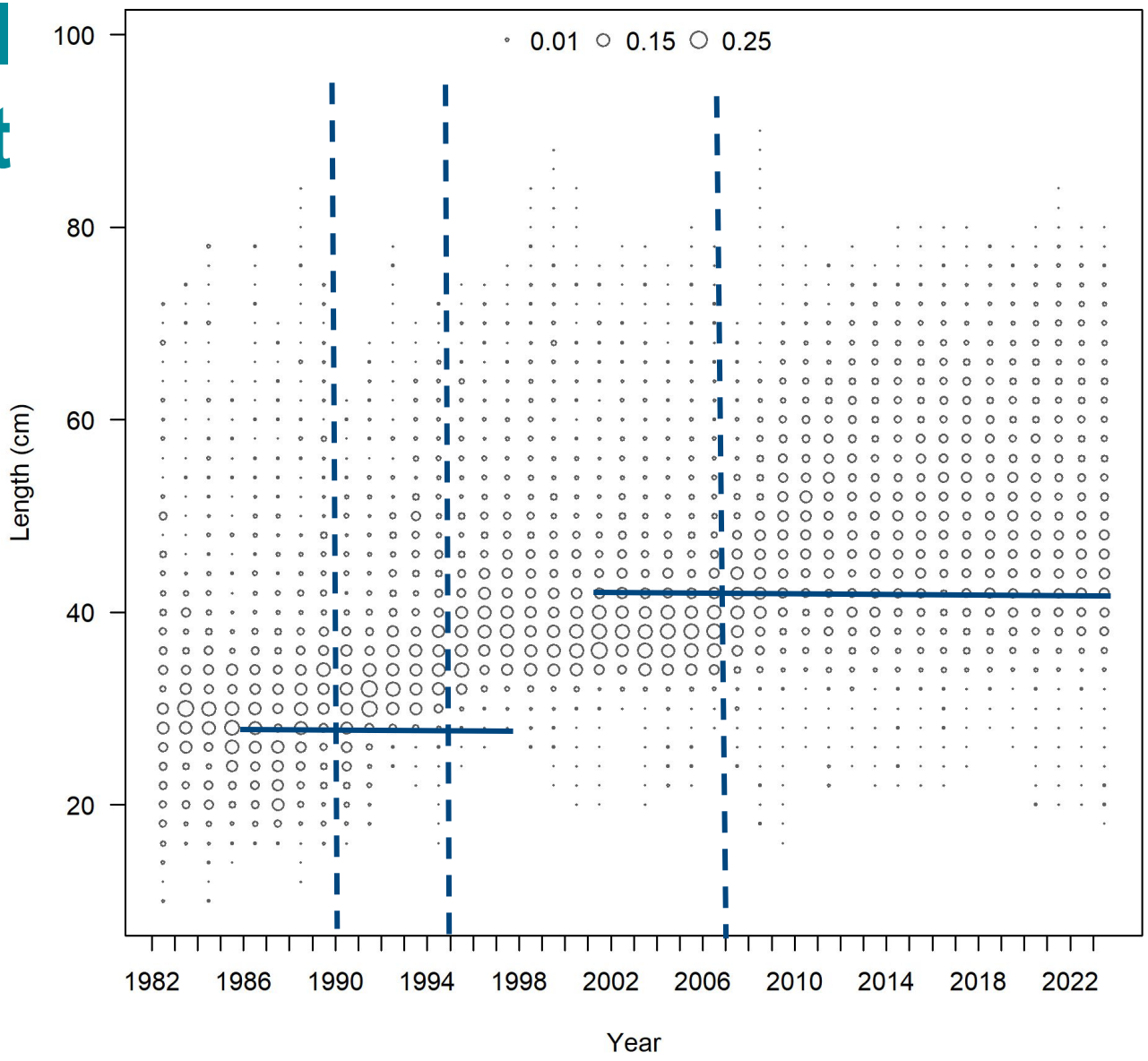
| Data Source | Years | Notes |
|---|---|---|
| Handline (weighted length) | 1984 - 2023 | Trip Intercept Program<br>Some years removed due to less than 30 fish (applicable to all data sources) |
| Longline (weighted length) | | |
| Handline Discards (Open) (weighted length) | 2007 - 2023 | Reef fish observer data; no closed season composition data |
| Longline Discards (Open) (weighted length) | | |
| Private (weighted length) | 1981 - 2023 | Few fish sampled in the East until 2017<br>No discard composition |
| Charter (weighted length) | 1981 - 2023 | Few fish sampled in the East until 2009 |
| Headboat | 1982 | Central-Nominal<br>East/West - Weighted |
| Charter Discards (Open) | 2009 - 2023 | East - Nominal; Central - Weighted; West - NA |
| Headboat Discards (Open/Closed) | 2005 - 2023 | Central/East -Weighted; West - None<br>Closed: modeled using a super period |


HL_E (discards)
0.01
0.15
0.25
Commercial IFQ
HL_E (retained)
LL_W (retained)
LL_E (discards)
General Lack of Discards in East Pre-2000s
Length (cm)
Year
1981
1984
1987
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
2020
2023


CBT_E (discards)
0.01
0.15
Recreational Bag Limit Changes
CBT_E (retained)
HBT_W (retained)
HBT_C (discards)
Length (cm)
Year
1981
1984
1987
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
2020
2023

# Recreational Private West

- Minimum size limits begin in 1985 at 12 inches FL (30 cm)
- 16 inches FL (41 cm) in 2000
- 4 changes in total (2 shown)

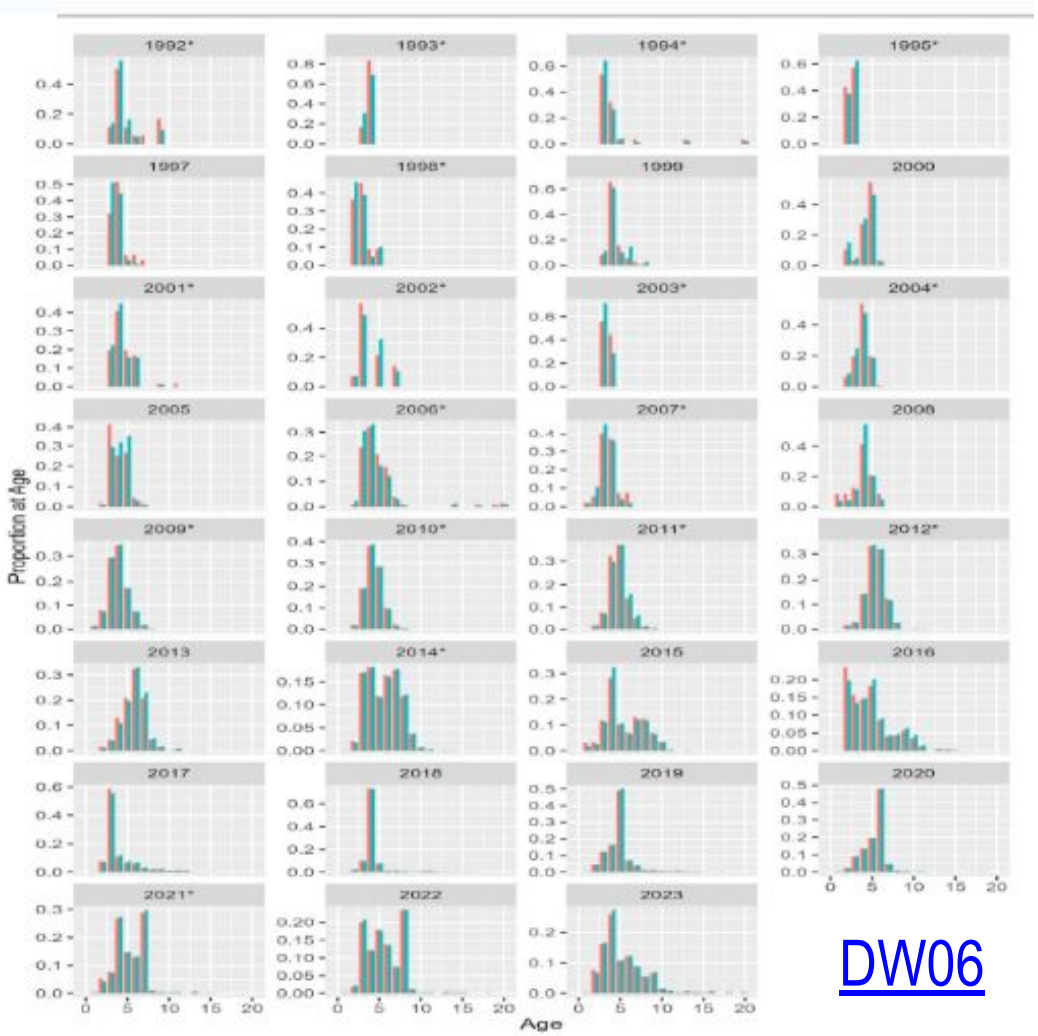


# Outline

- Data Review
  - Stock definition
  - Assessment history
  - Regulations
  - Life history
  - Removals
  - Size compositions
  - **Age compositions**
  - Indices of abundance & composition
  - Key data differences from SEDAR 52

# Directed Fleet Age Comp

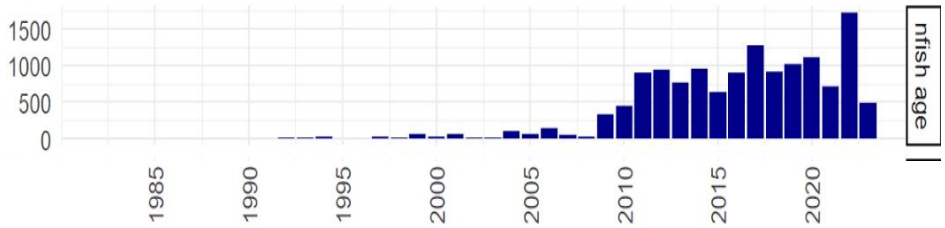
- Received:
  - Nominal and Weighted age composition
  - conditional age-at-length **(new to 98)**
  - Mean age-at-length **(new to 98)**
- Age compositions are weighted by length composition
- Weighting procedures do not have a meaningful impact on age compositions and appear largely the same after weighting in most cases (Ex. Com HL - East)




DW06

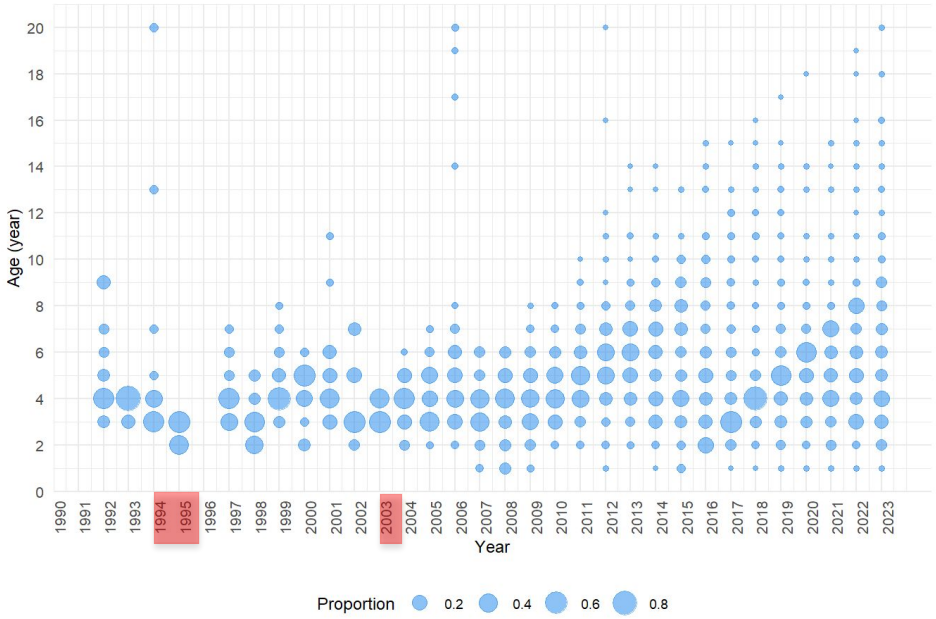
***Figure 18.*** *Nominal and weighted Red Snapper age compositions from the commercial handline east fleet. Years that are recommended to be dropped are denoted with an *.*

## Commercial Handline East:



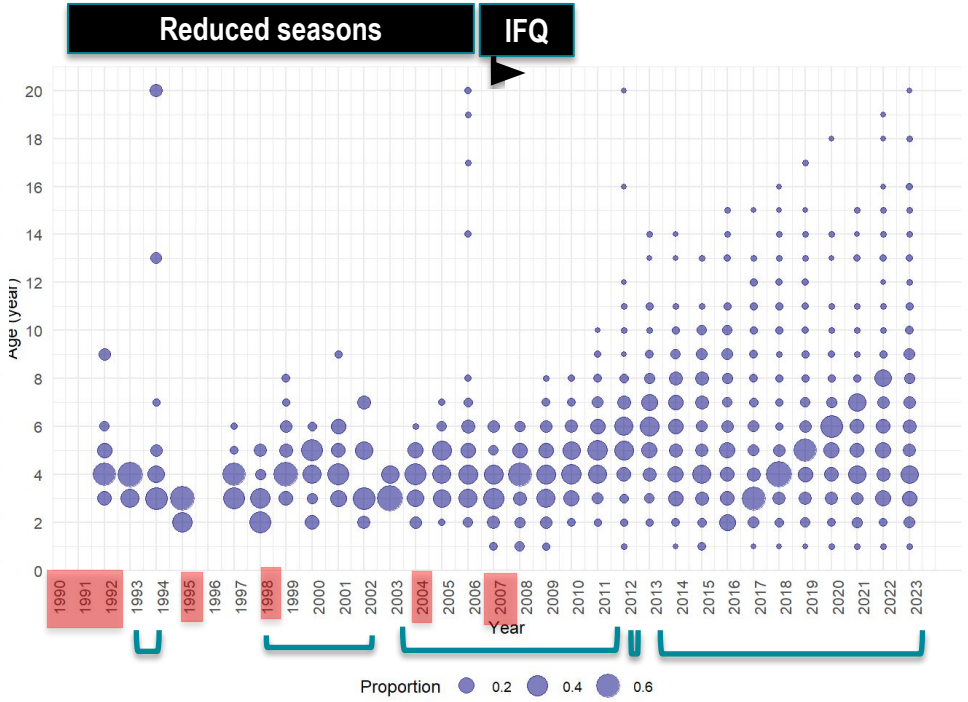

- Generally landing younger Red Snapper
- Evidence of cohort tracking
- Size limits could impact a range of ages
- A few years below sample size cutoffs

## Nominal




Fewer than 10 ages or 10 trips

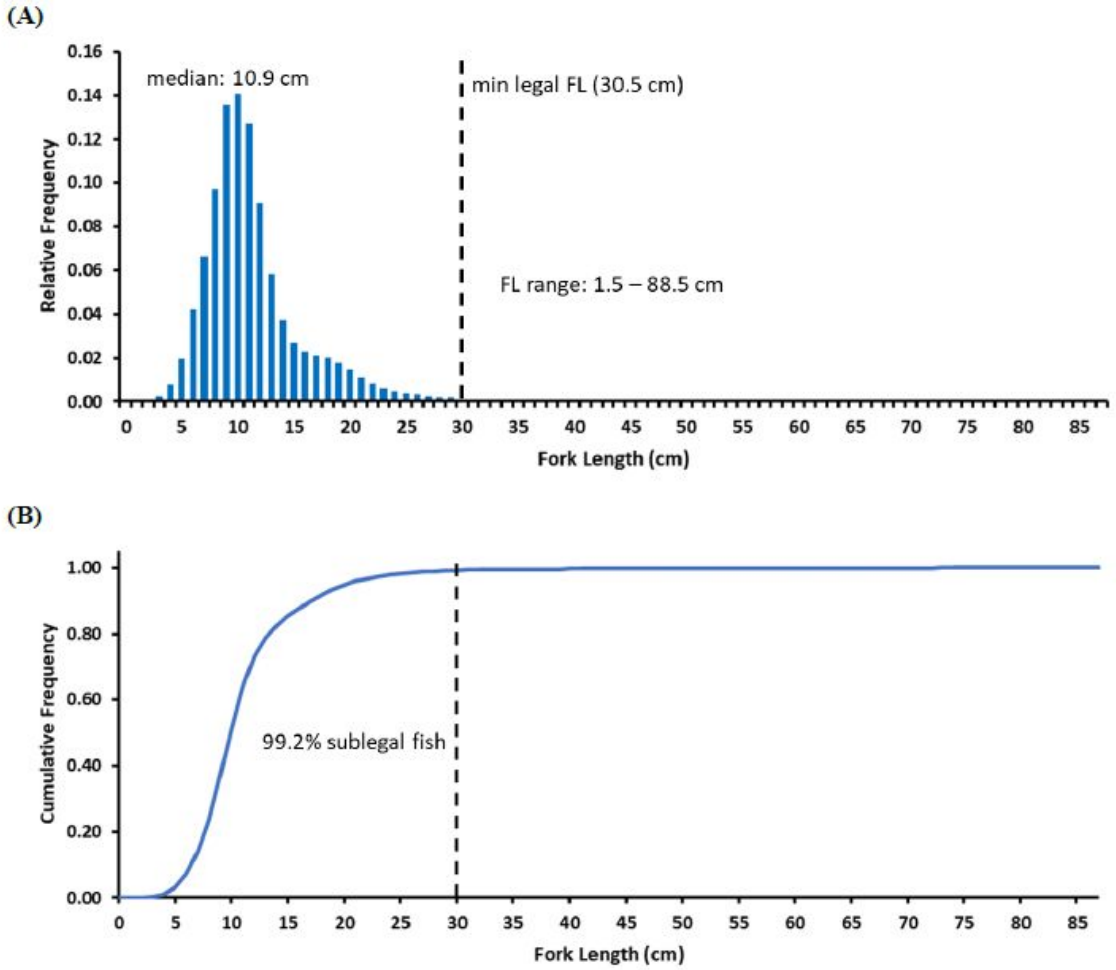
## Weighted




\+ length samples < 30 in a subregion

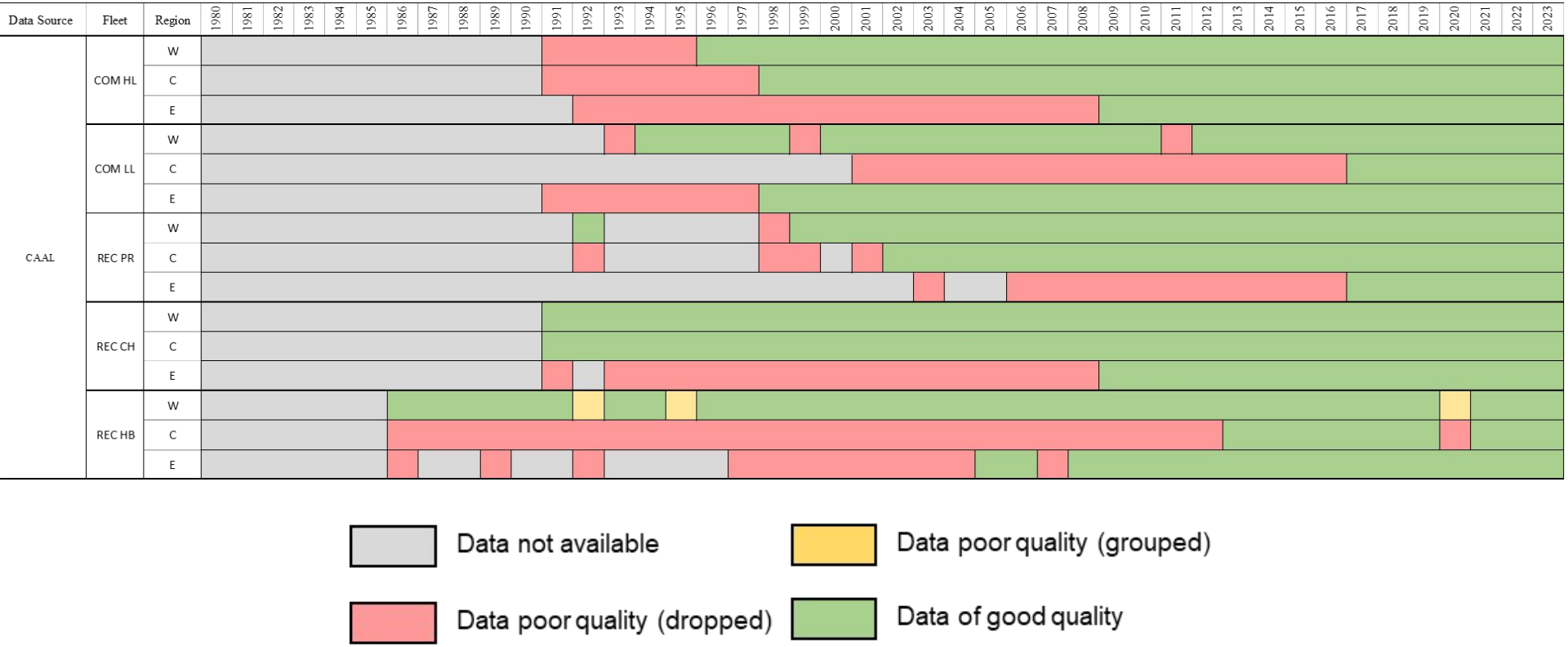
# Shrimp Fleet Composition

- Lengths collected by observers on shrimp trips from 2007-2023
- Converted to age using year-region specific age length keys (DW13)
- Age used to directly relate to early mortality of age-0 and -1 fish



# Directed Fleet Conditional age-at-length

CAAL: Several fleets/regions have recent years with adequate sample sizes and considerable spread in age-length data



# Why use conditional age-at-length?

- Input conditional age-at-length for each fleet to accompany the abundance of length composition data
  - Avoids double use of fish for both age and size information (i.e., age conditional on length)
  - Contains more detailed information about the relationship between size and age

# Conditional age-at-length Used in Model

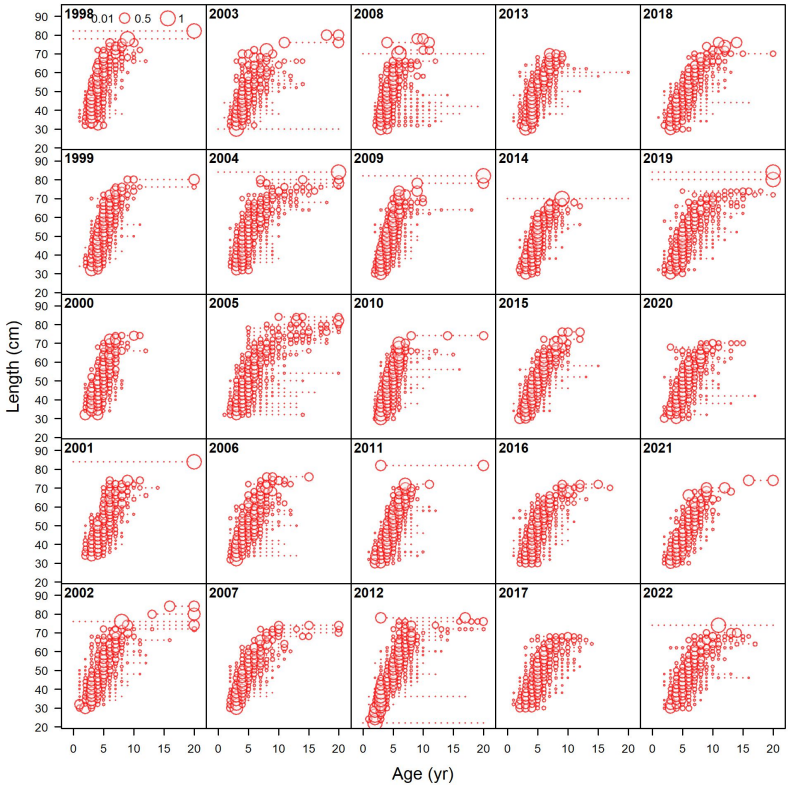
Age Samples DW09

| Data Source | Years | Notes |
|---|---|---|
| Handline (DW06) | West/Central 1998 - 2023<br>East 2009 - 2023 | Lengths are from the Trip Interview Program<br>Ages are a subset of the lengths processed by the Panama City NOAA Lab<br>Increased intensity of otolith sampling in 2000<br>Less samples for LL vs HL |
| Longline | West/East 1998 - 2023<br>Central 2017 - 2023 | |
| Private (DW07) | West 1999 - 2023<br>Central 2002 - 2023<br>East 2017 - 2023 | Data from Port sampler interviews and subsamples<br>Intensity of otolith sampling for recreational fleets increased around 2009-2010 |
| Charter | Central/West 1991 - 2023<br>East 2009 - 2023 | |
| Headboat | West 1986 - 2023<br>Central 2013 - 2023<br>East 2005 - 2023 | Headboat Program has collected the most otoliths of any program |

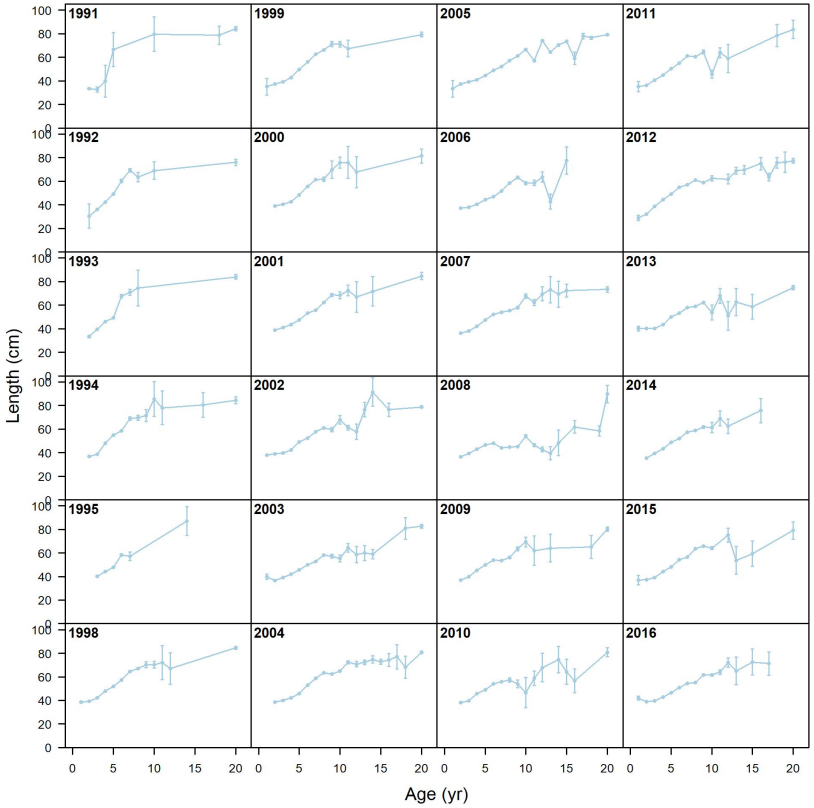
# Commercial Handline West

- Observed mean length-at-age included in model as a check of expected mean length-at-age (not in likelihood)

## Conditional age-at-length



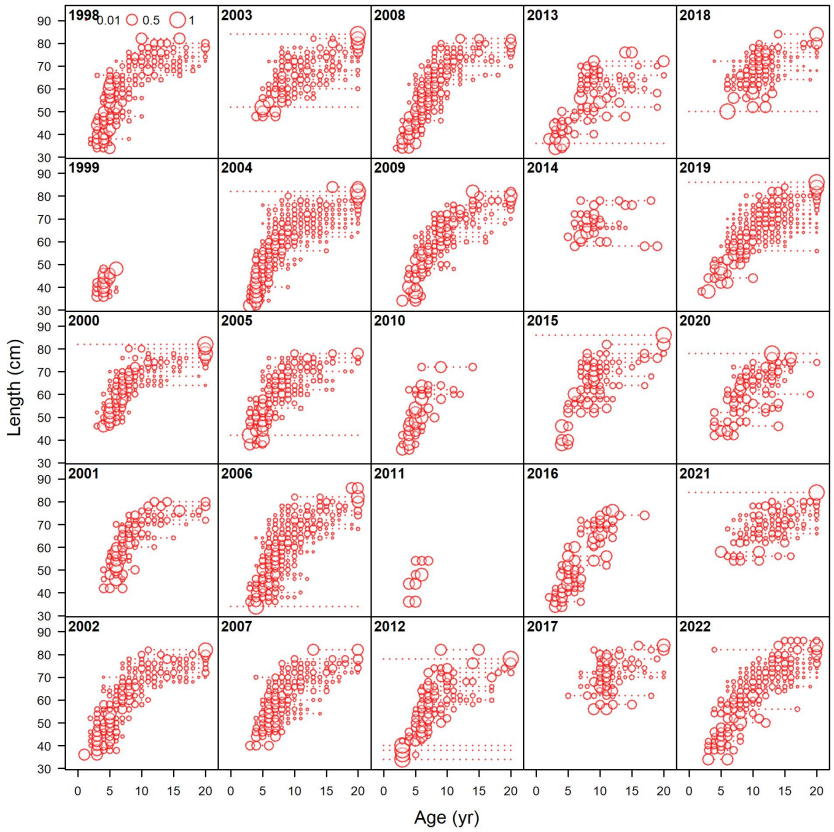

## Mean length-at-age



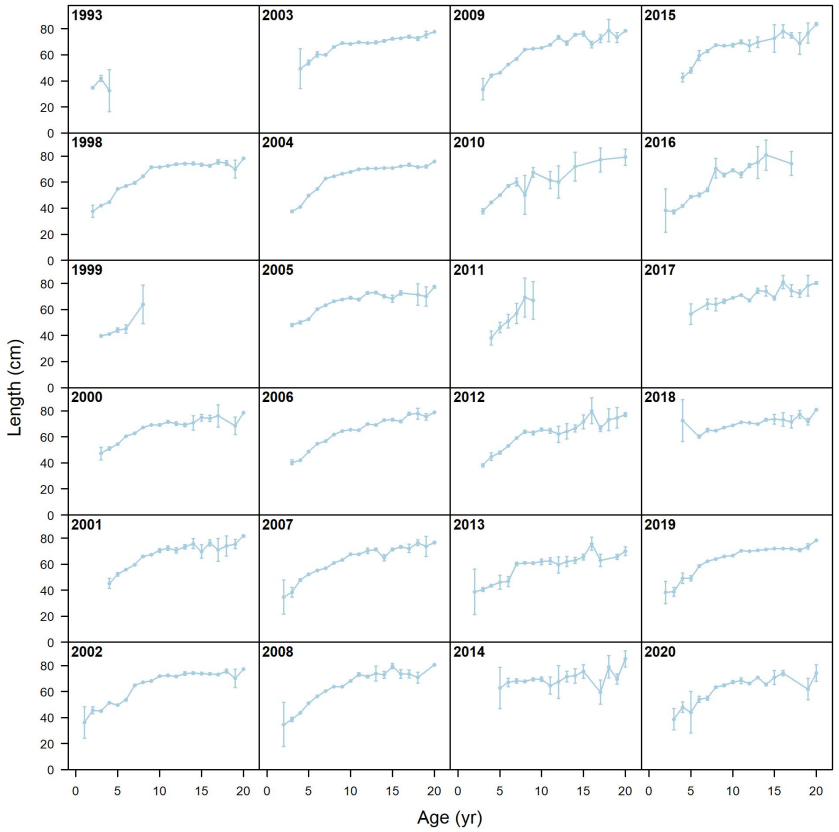
# Commercial Longline West

- Observed mean length-at-age included in model as a check of expected mean length-at-age (not in likelihood)

## Conditional age-at-length



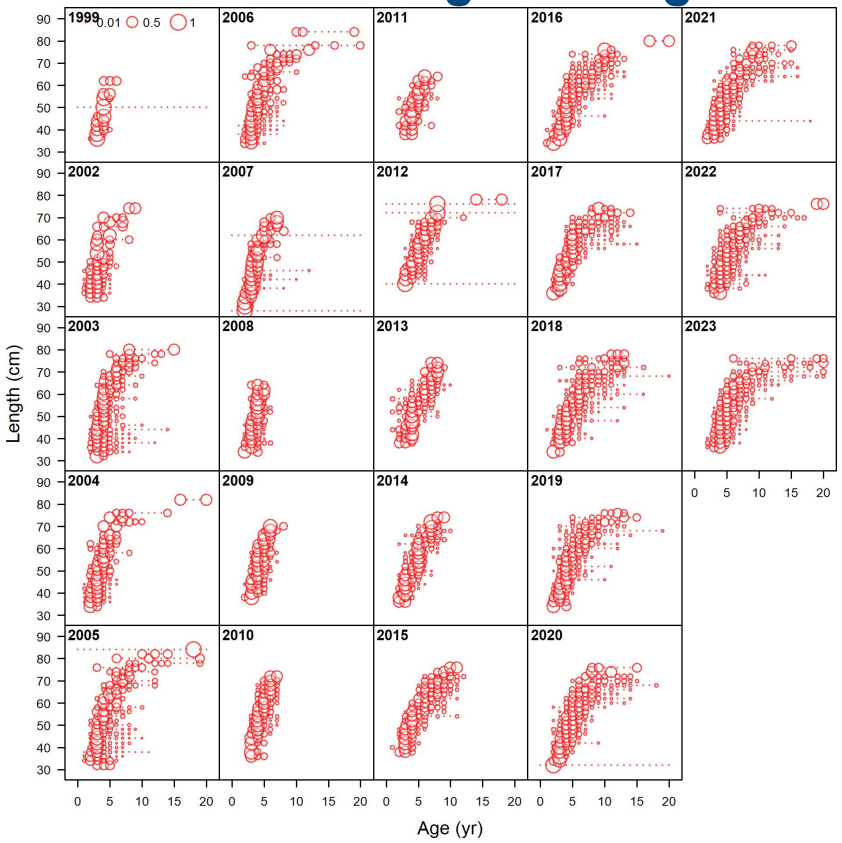

## Mean length-at-age



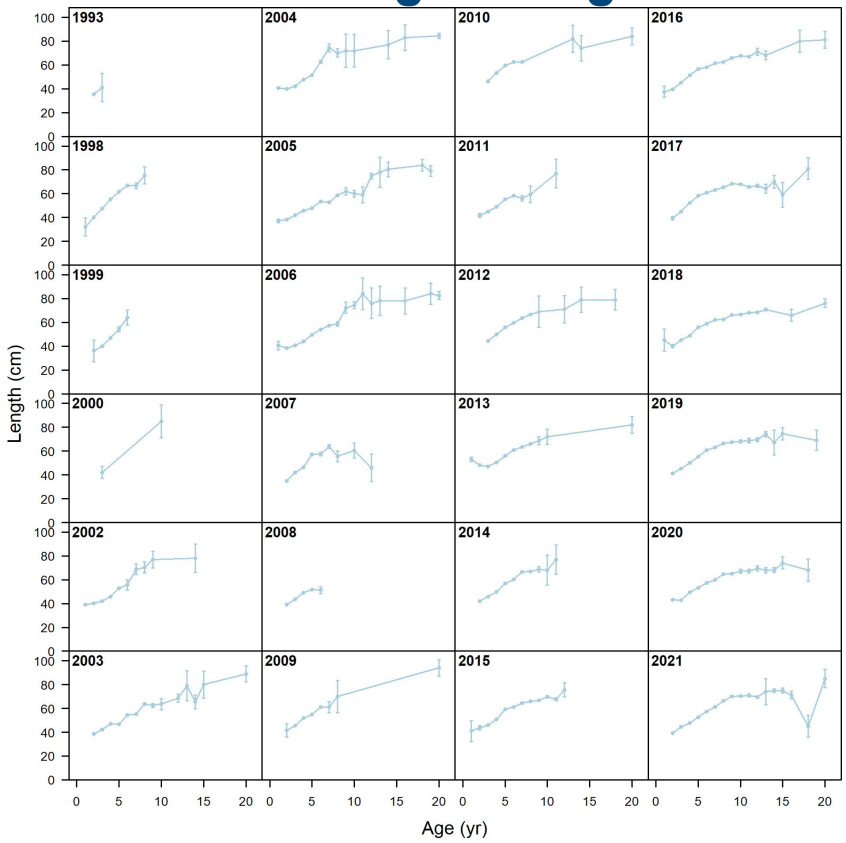
# Recreational Private West

- Observed mean length-at-age included in model as a check of expected mean length-at-age (not in likelihood)

## Conditional age-at-length



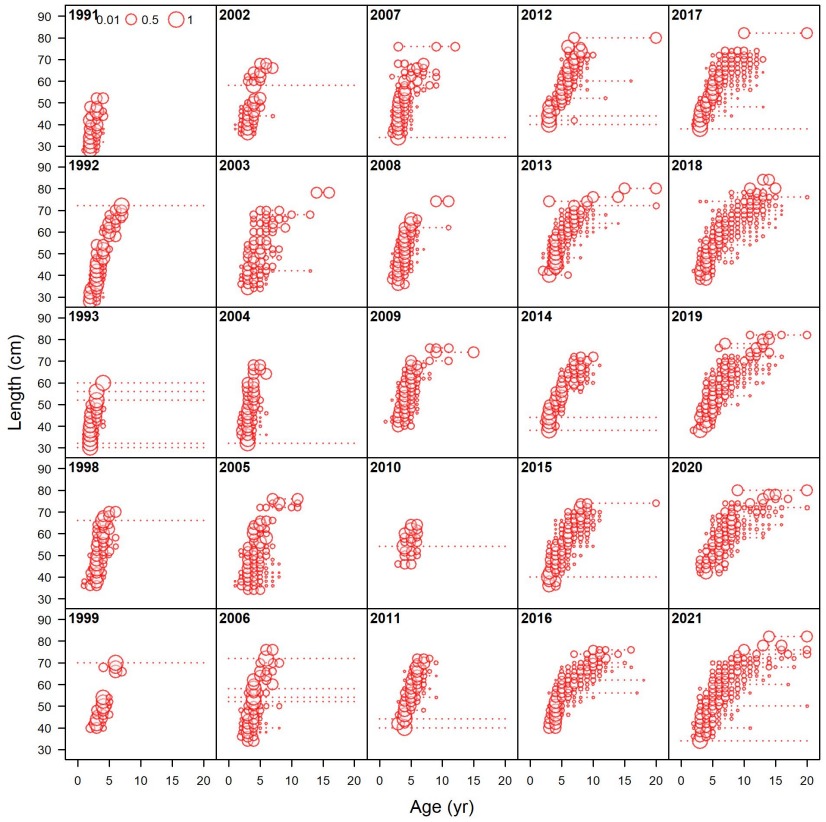

## Mean length-at-age



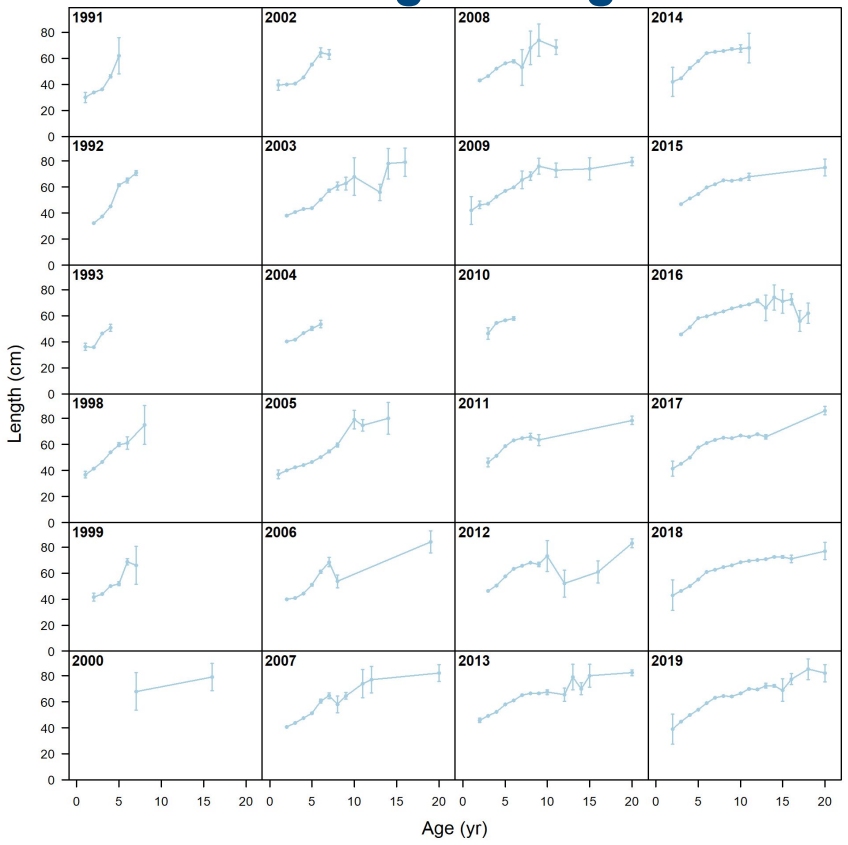
# Recreational Charter West

- Observed mean length-at-age included in model as a check of expected mean length-at-age (not in likelihood)

## Conditional age-at-length



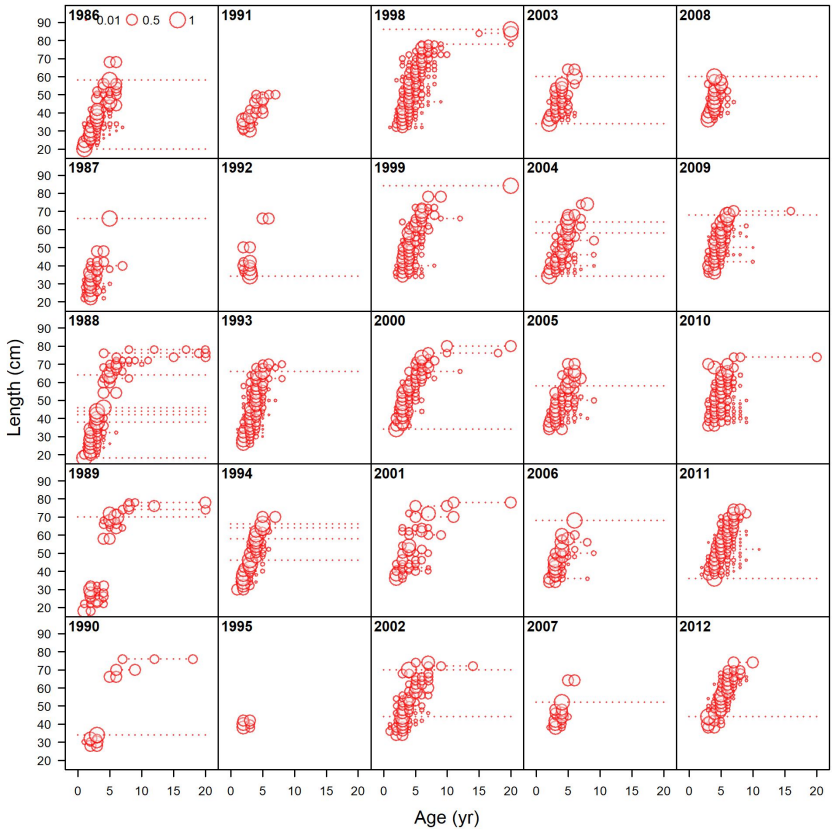

## Mean length-at-age



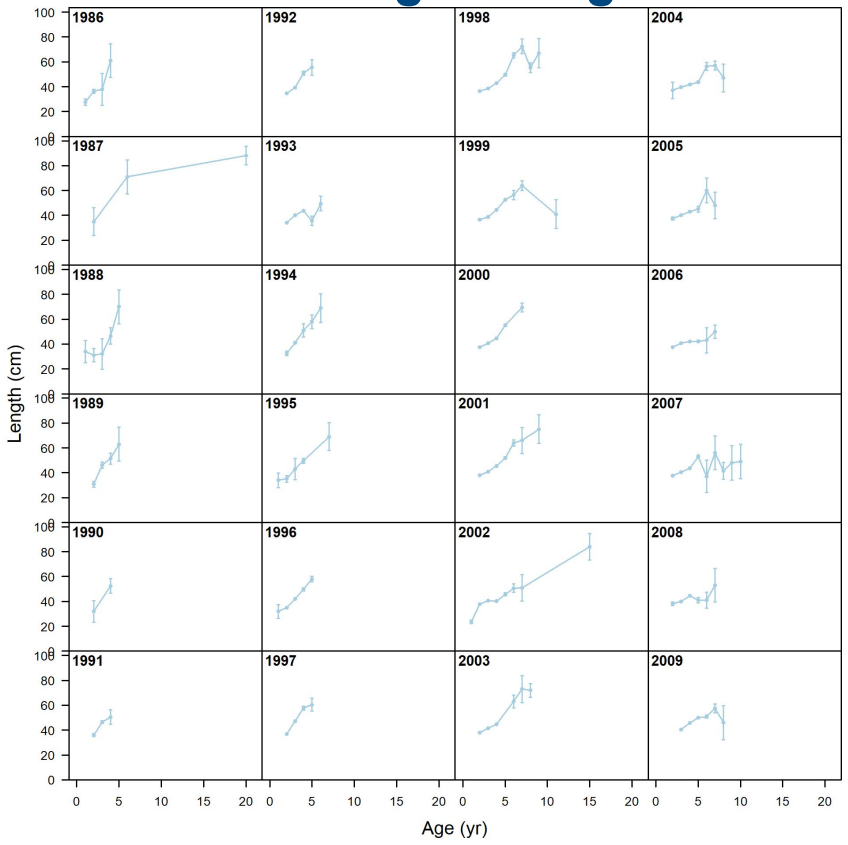
# Recreational Headboat West

- Observed mean length-at-age included in model as a check of expected mean length-at-age (not in likelihood)

## Conditional age-at-length




## Mean length-at-age



# Composition Summary

- Directed Fleets use a combination of weighted length compositions and conditional age-at-length where available
- Shrimp trawl bycatch used length converted ages using a year-region specific age-length key
- Surveys use otolith ages where possible (presented next)

# Outline

- Data Review
  - Stock definition
  - Assessment history
  - Regulations
  - Life history
  - Removals
  - Size compositions
  - Age compositions
  - **Indices of abundance & composition**
  - Key data differences from SEDAR 52

# Indices of Relative Abundance & Composition

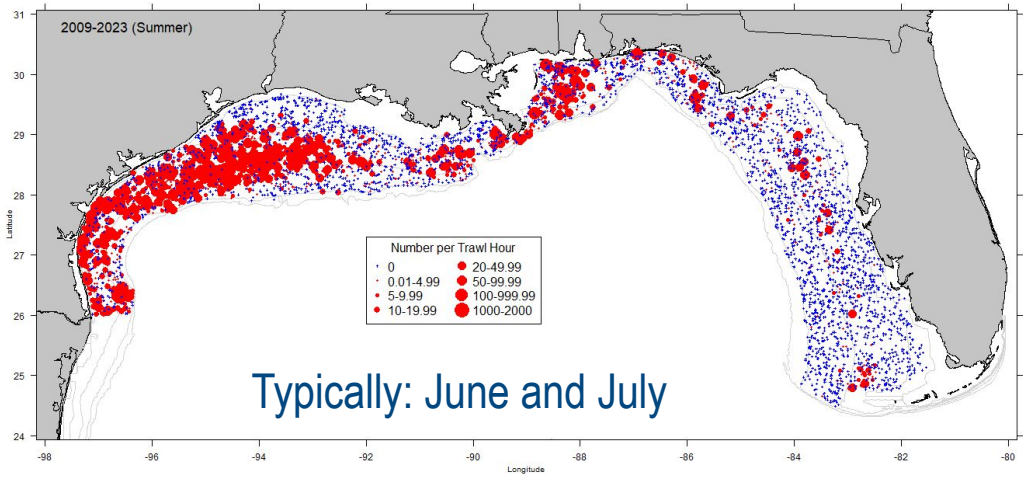
All index comp input as age using ALK (**DW13**) unless otherwise noted

| Data Source | Years | Notes |
|---|---|---|
| SEAMAP Summer Trawl Early (DW26)<br>SEAMAP Summer Trawl Late | 1982 - 2007<br>2008 - 2023 | Primarily age-1<br>Early only available in the West |
| SEAMAP Fall Trawl Early (DW26)<br>SEMAP Fall Trawl Late | 1988 - 2007<br>2008 - 2023 | Primarily age-0<br>Early only available in the West |
| NMFS Bottom Longline (DW17) | 2001 - 2023 | Age 2+ and uses otolith ages |
| G-FISHER Reef Fish Video Survey (DW16)<br>G-FISHER East (DW22) | 1993 - 2023<br>2010 - 2023 | Previously known as the Combined Video Survey; Covers natural reef habitat; juveniles through adults |
| SEAMAP Fall Larval Survey (DW19) | 1986 - 2023 | Used as an index of spawning biomass<br>Not available in the east - low samples<br>No composition |
| Reef Fish Commercial Observer (DW24) | 2007 - 2023 | Only Fishery-Dependent Index; Post IFQ; Only in East |

- CV converted to SE: $log_e(SE) = \sqrt{(log_e(1 + CV^2))}$

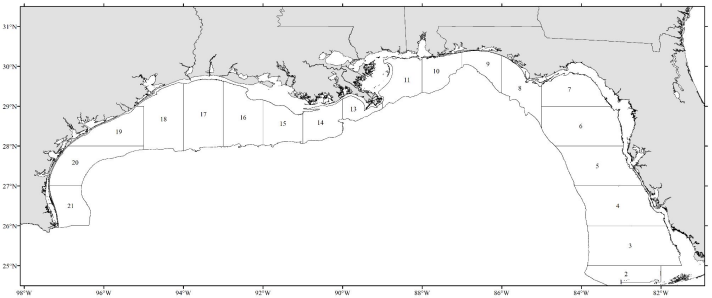
# SEAMAP Summer and Fall Trawl

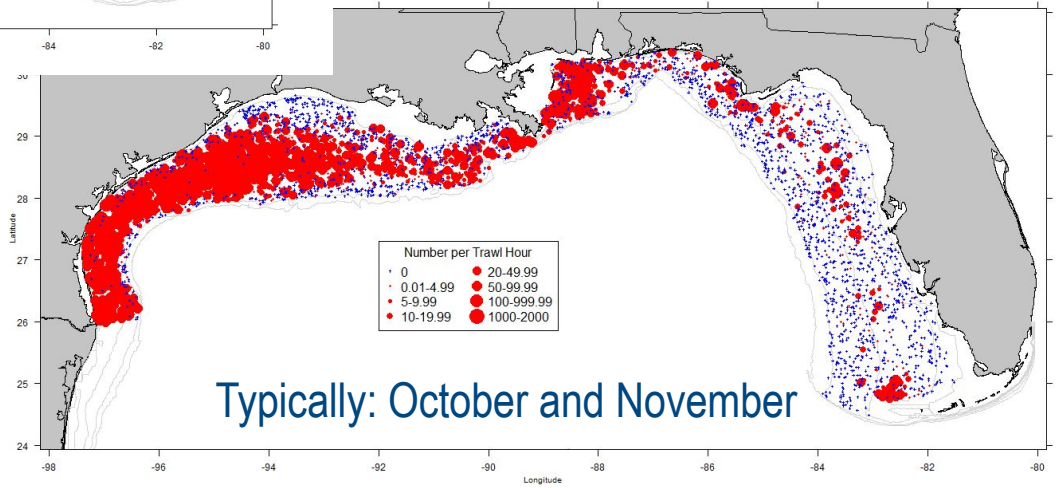
- In 2008, sampling expanded further East and changed from a depth-and-time stratification for random sampling to an area-weighted stratification; prompted the use of the “Early” and “Late” index distinction




Typically: June and July

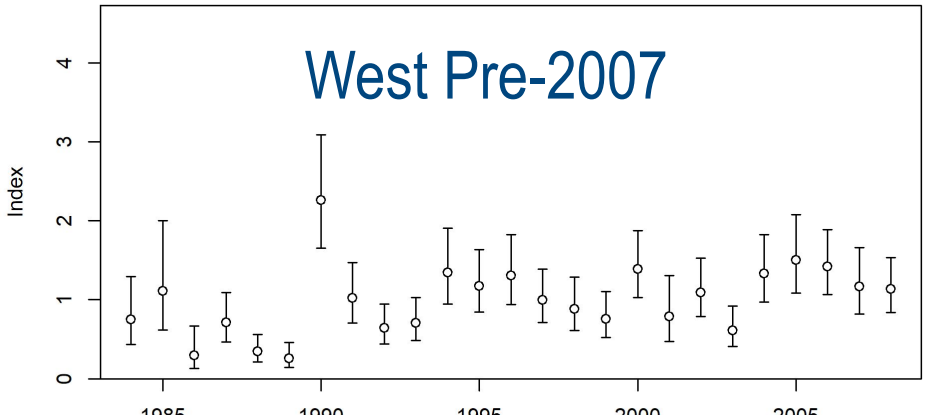
- “Early” index available only in West and carried forward from SEDAR 74
- Fit using a delta-lognormal model for presence/absence and non zero abundance

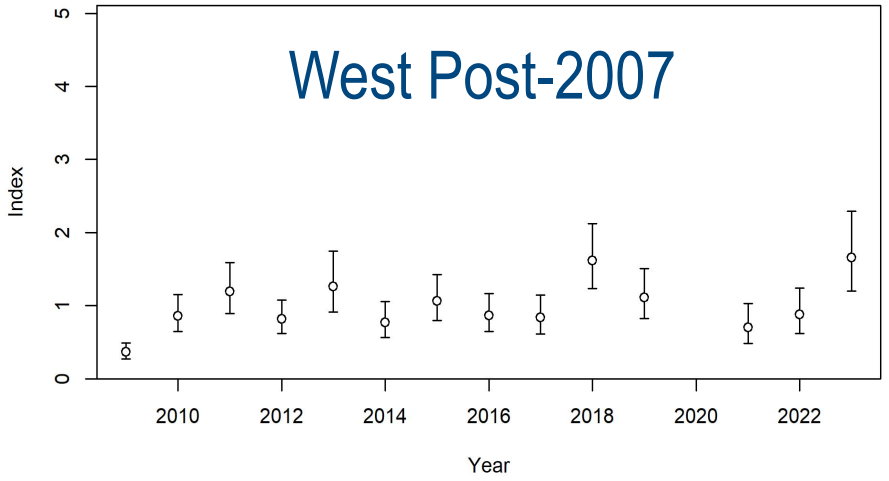


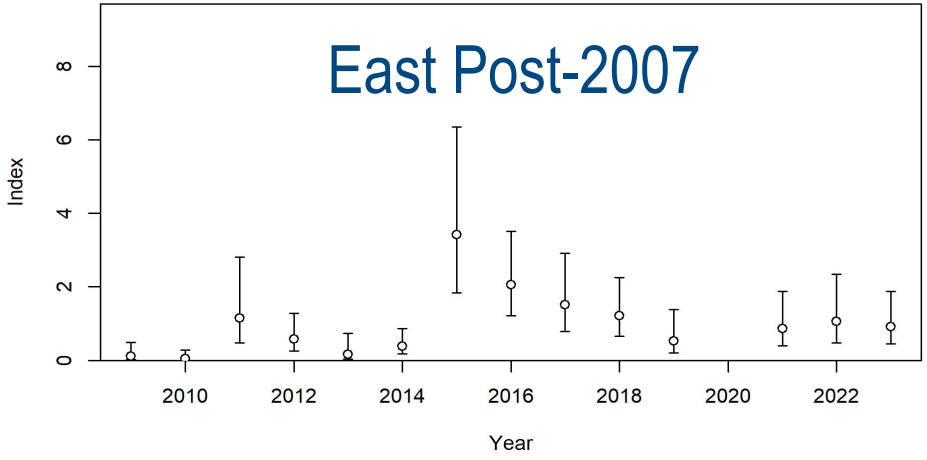


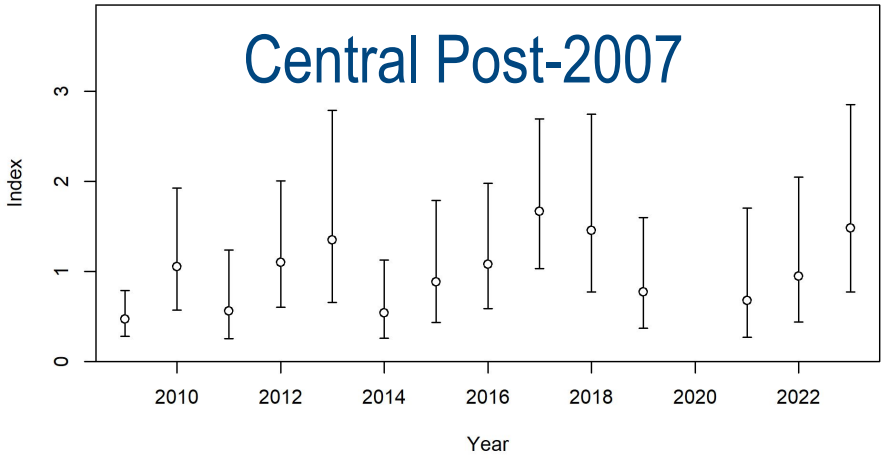

Typically: October and November

# SEAMAP Summer Trawl

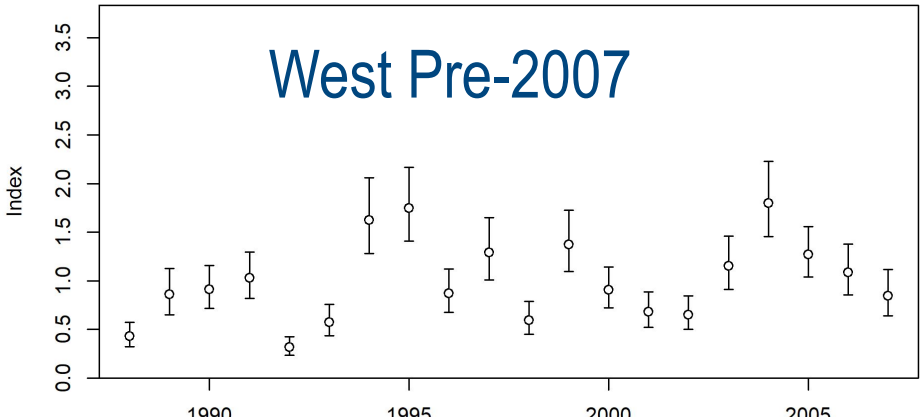


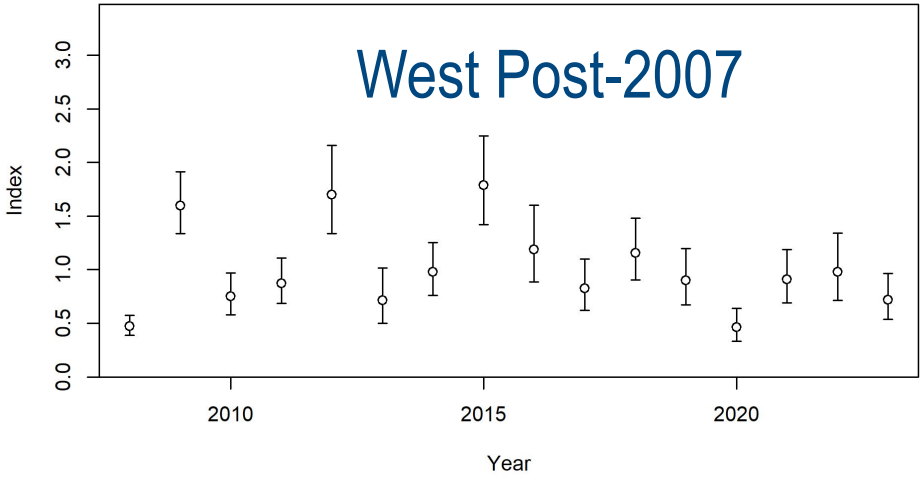



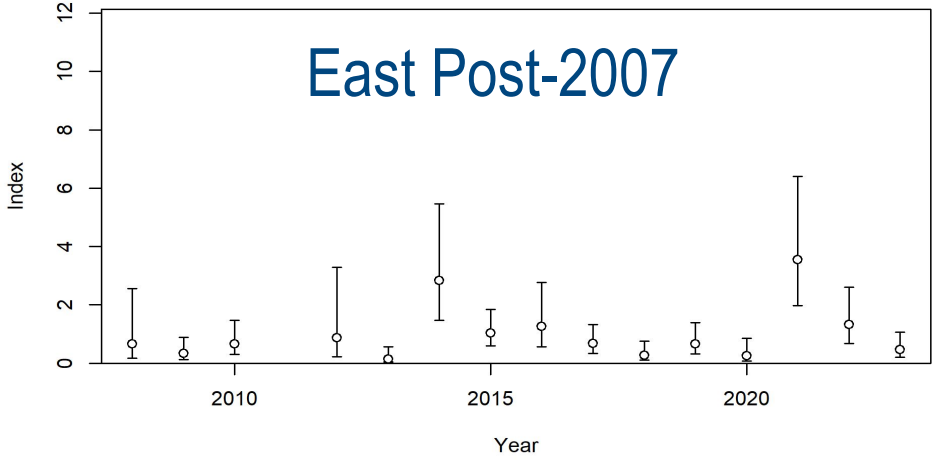



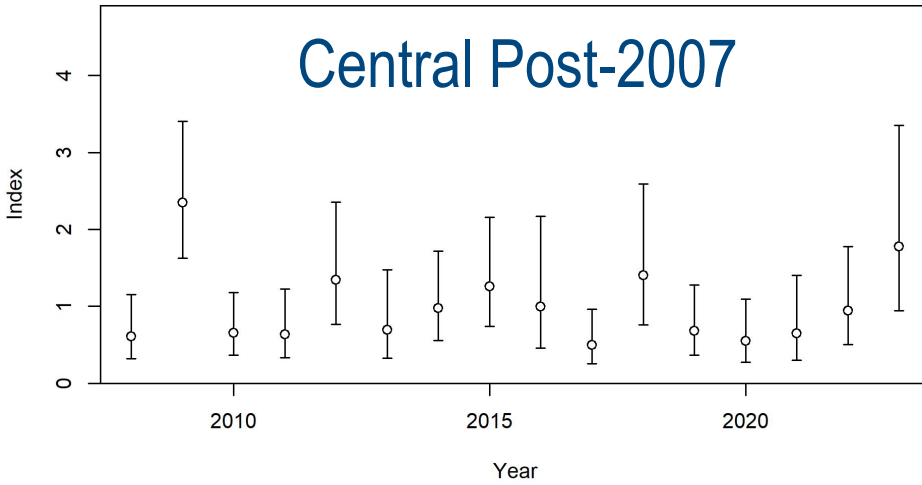



# SEAMAP Fall Trawl



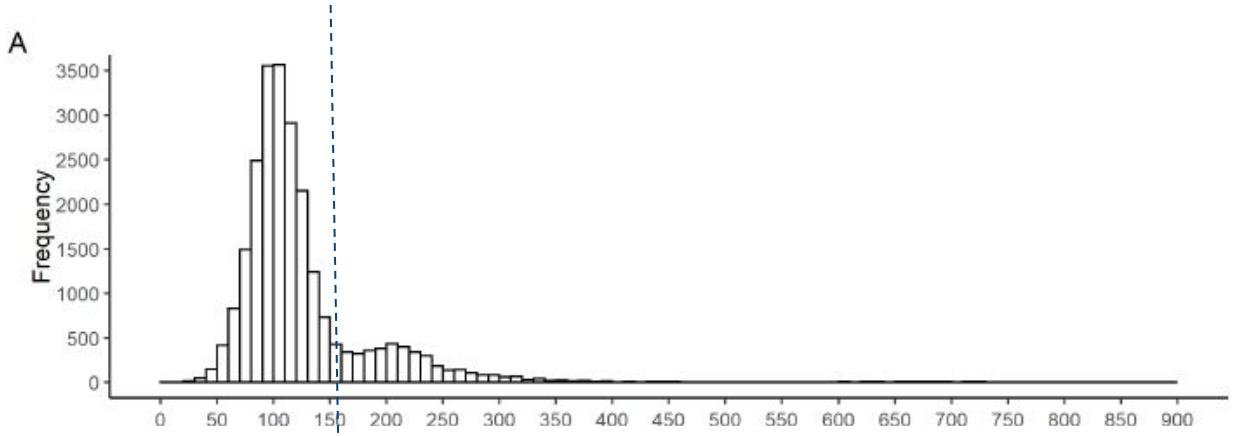



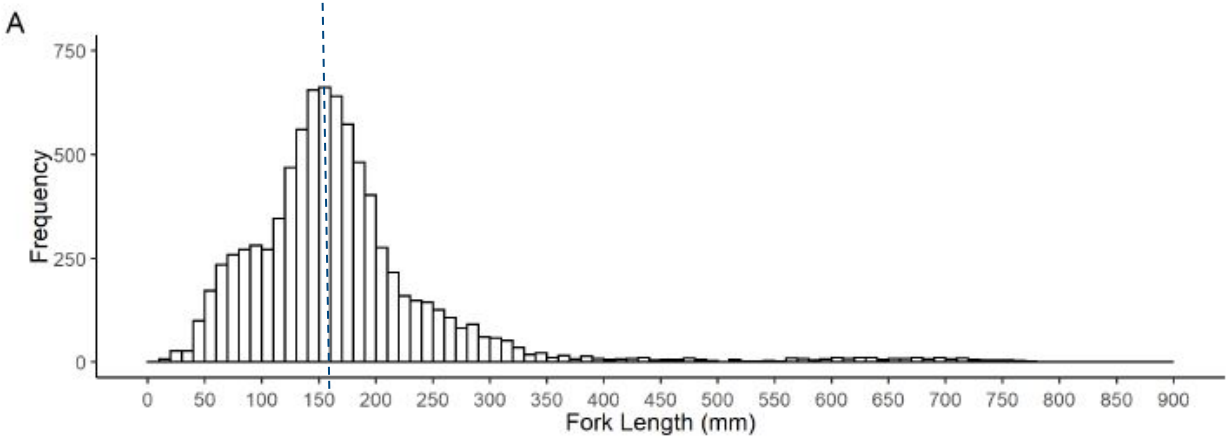



# SEAMAP Summer and Fall Trawl Lengths

Fall Trawl West



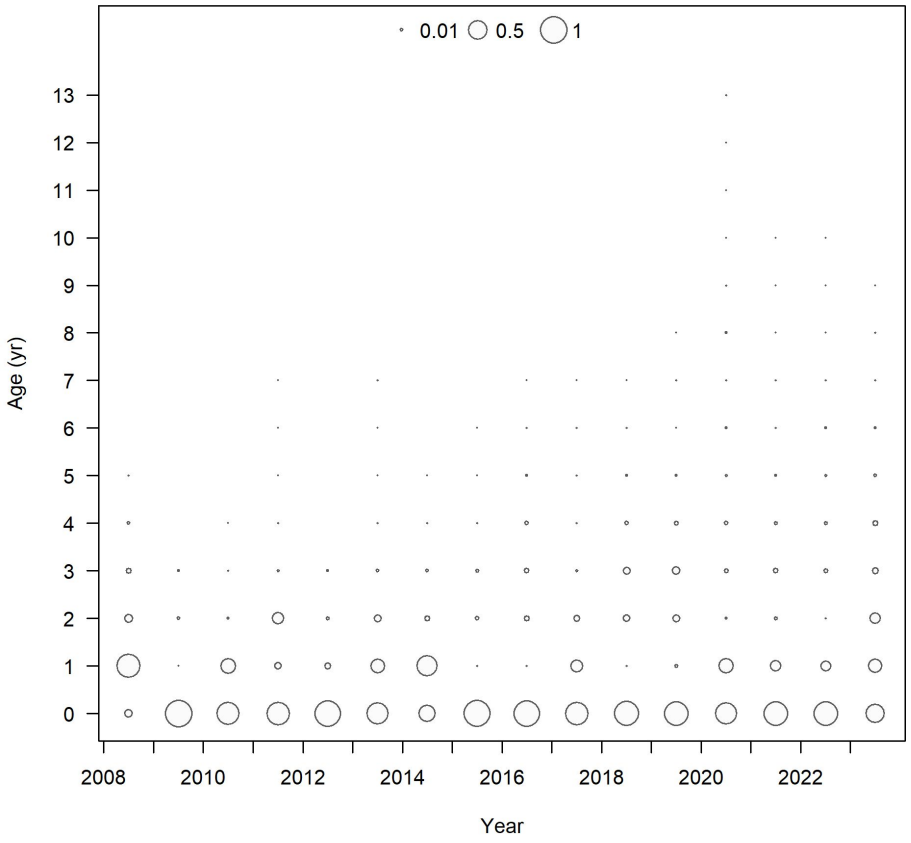

Summer Trawl West



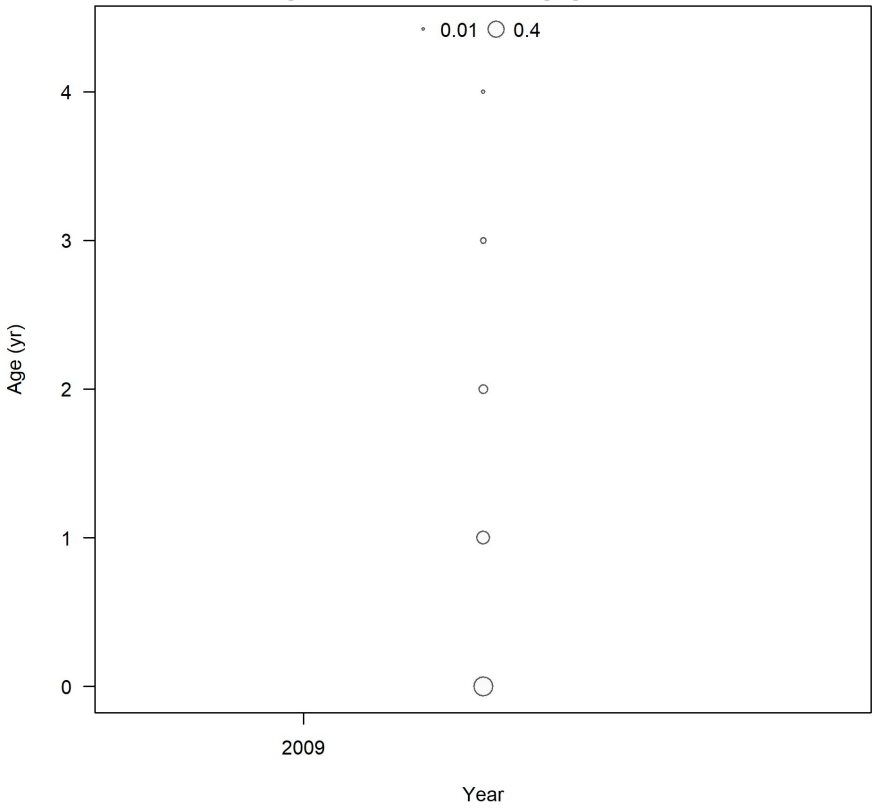
# SEAMAP Summer and Fall Trawl Ages

- ALK converted ages with the intention of representing the goal of the different surveys

## Fall Trawl West

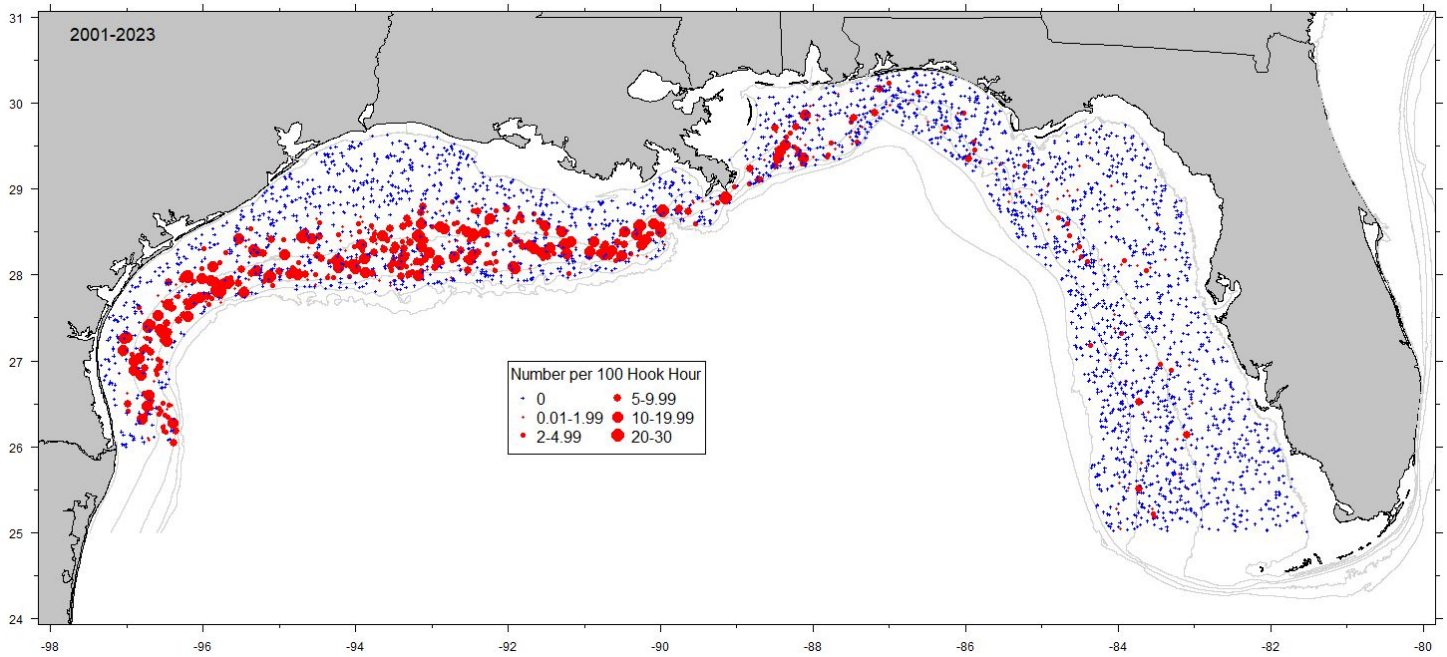



## Summer Trawl West
## "Super-Year" approach

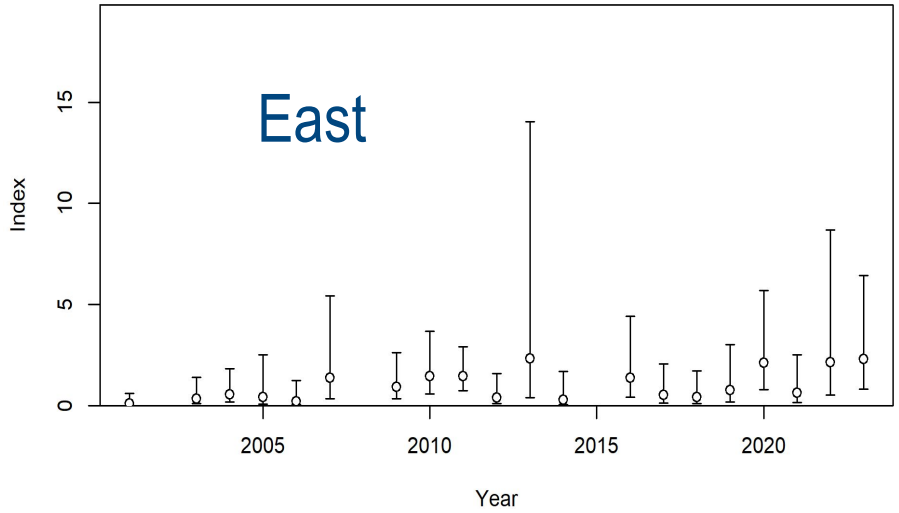


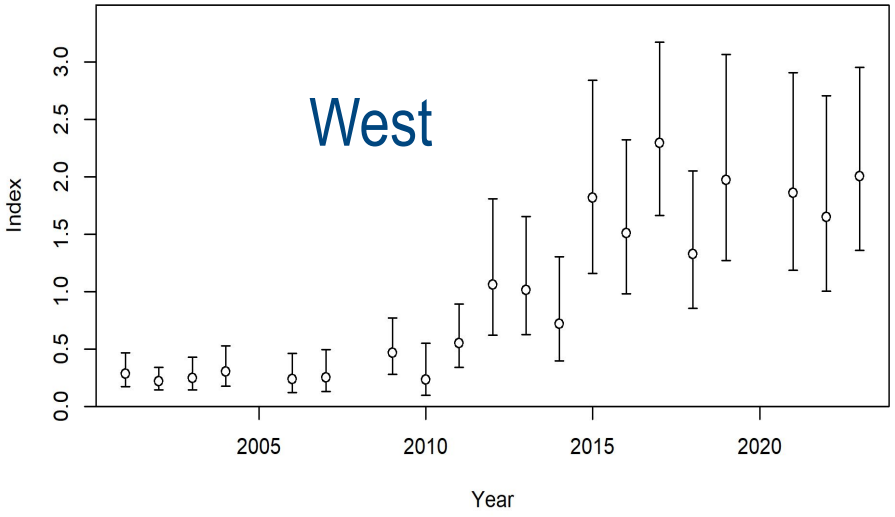
# NMFS Bottom Longline

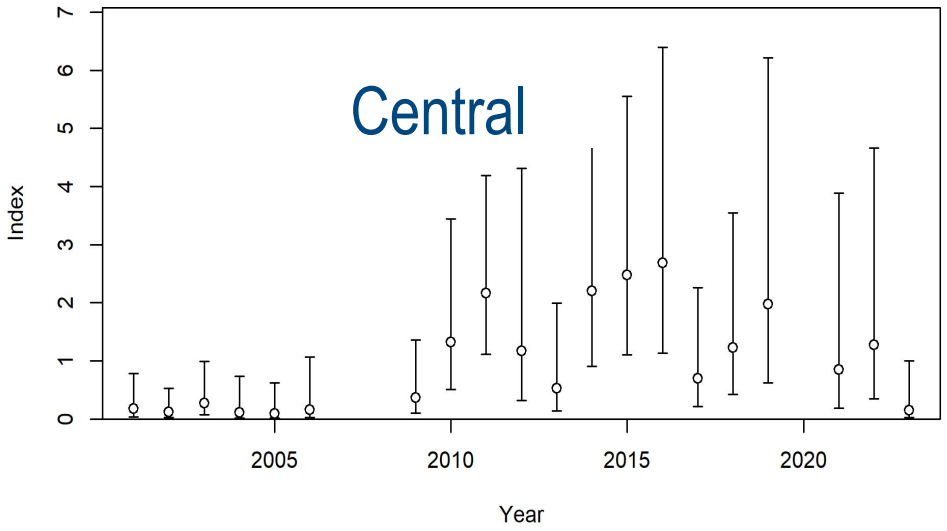
- Samples collected throughout the Gulf using circle hooks with a depth cutoff at 183m
- Index created using a delta-lognormal model
- Encountered large, older fish
- Only surveyed to provide otolith ages



# NMFS Bottom Longline

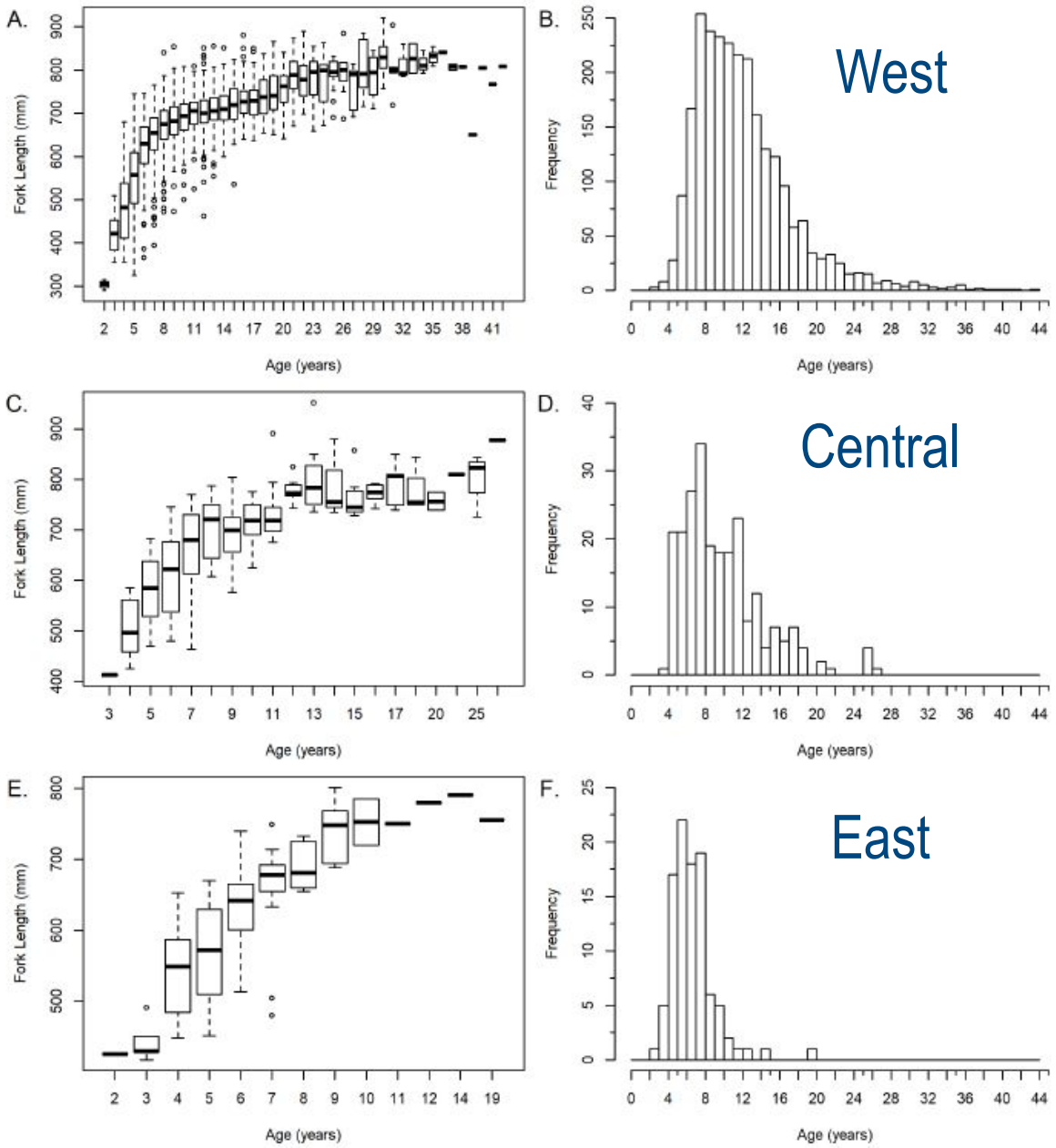


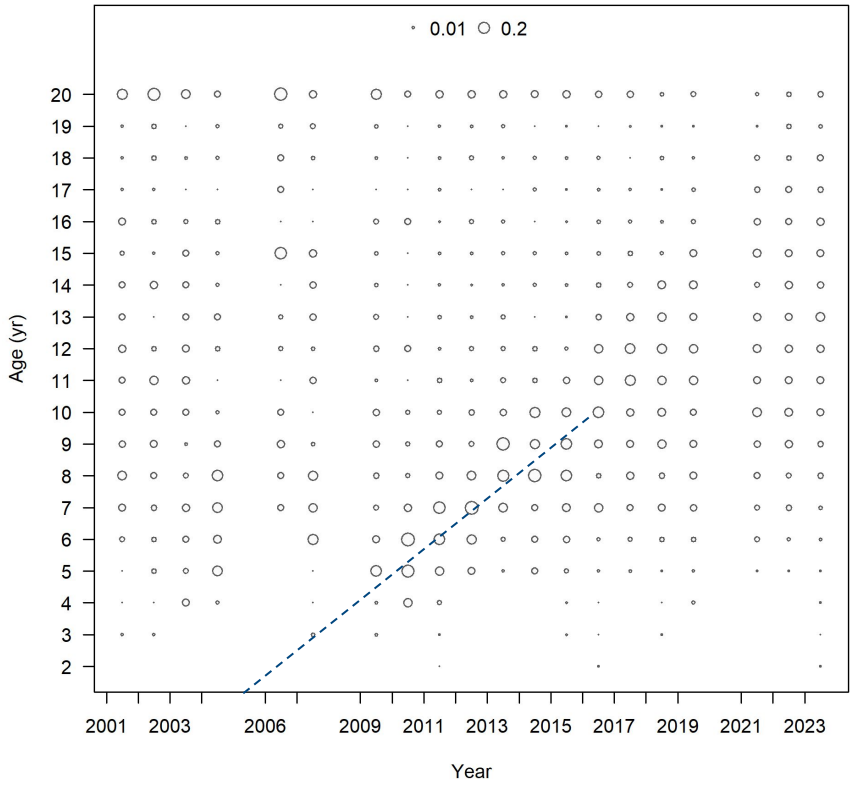
# BLL Composition

- Large number of positive occurrences in the West compared to the East and Central
- Oldest and largest range of fish age in the West

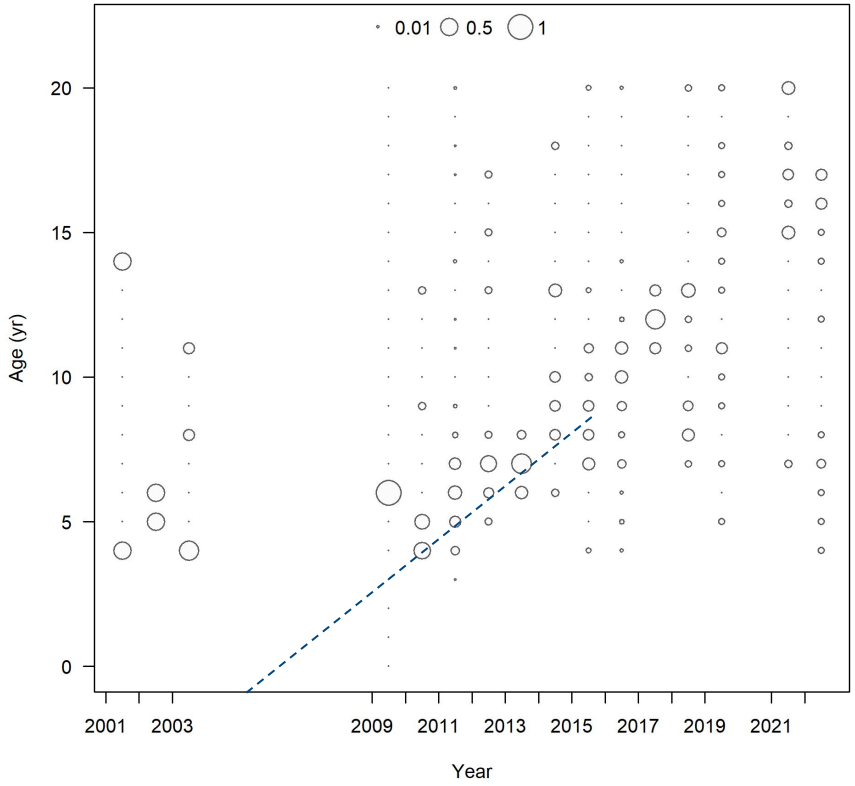


# BLL Cohort Tracking

## West

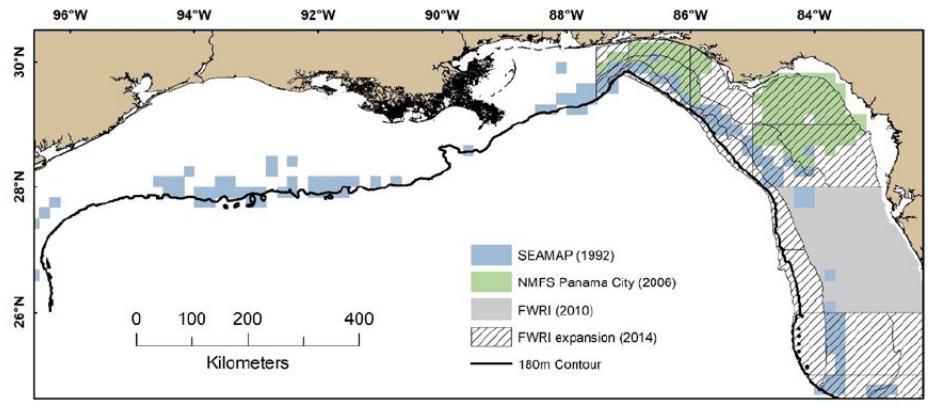


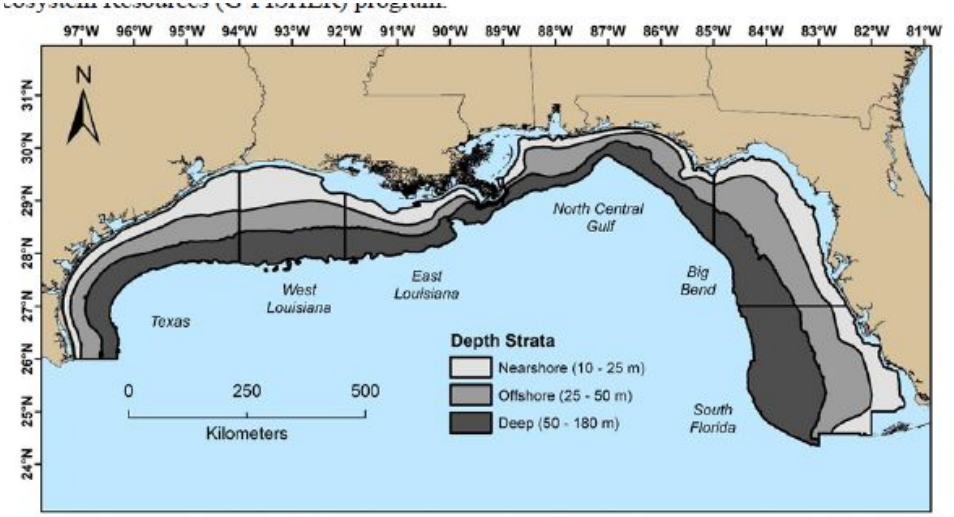

## Central



# G-FISHER Video Survey West

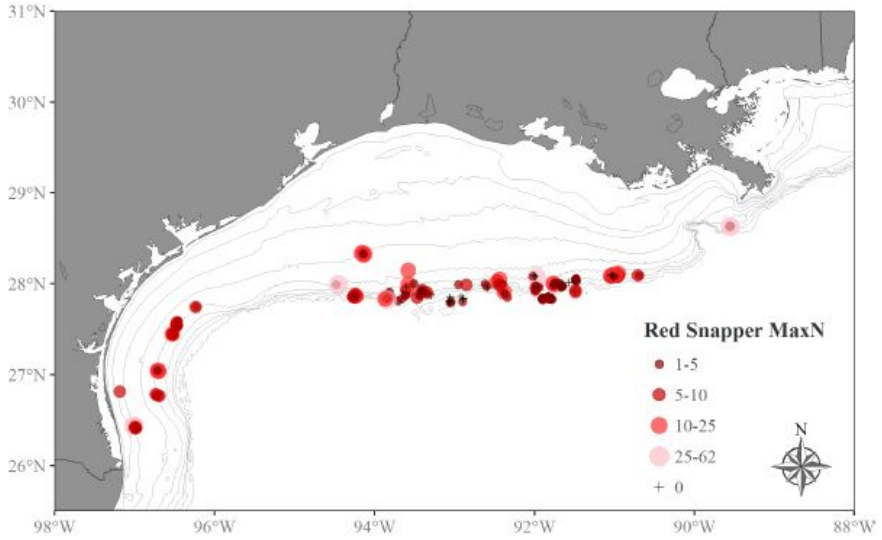
- Major revamp of combined index development through the **G-FISHER project** using habitat-based approach
  - Includes reef relief as a variable in negative binomial model, but the sampling site habitat data has not been fully updated; therefore, the site selection is still based on old SEAMAP site information

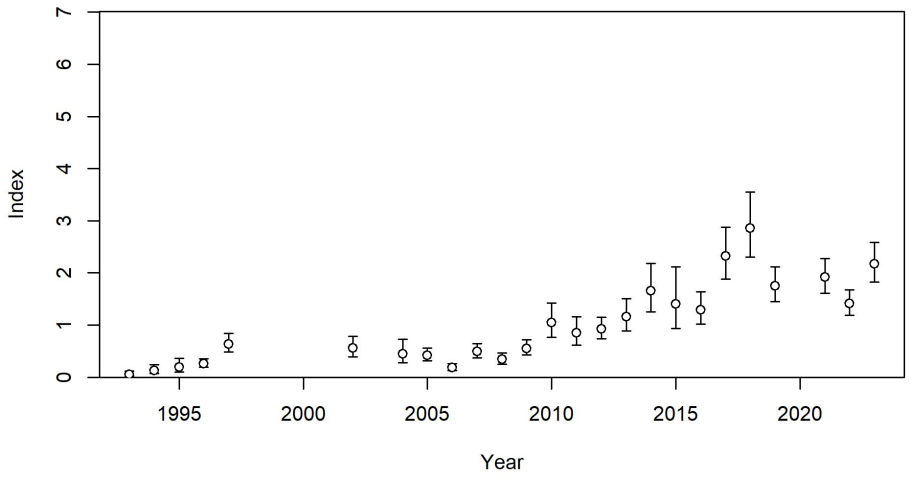


# G-FISHER Video Survey West

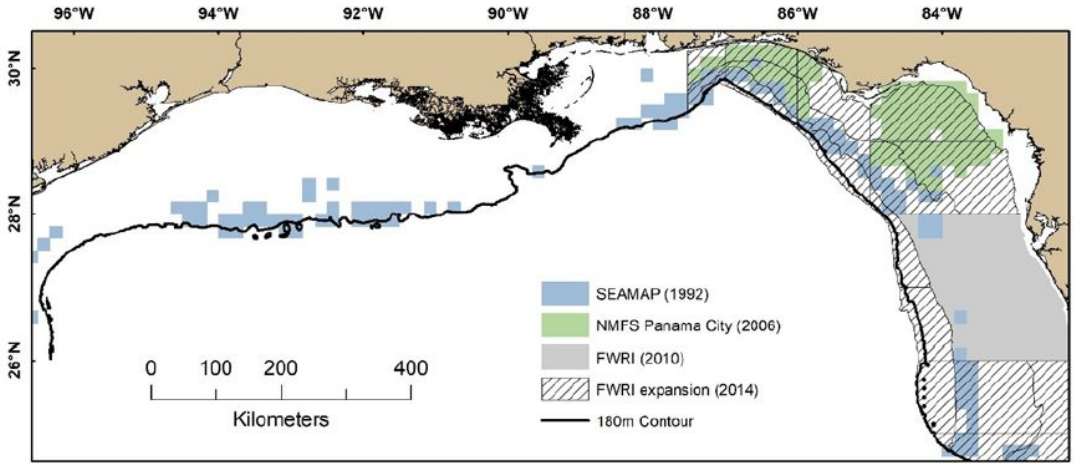
- Samples in the West mostly in the deep 50-180 m depth

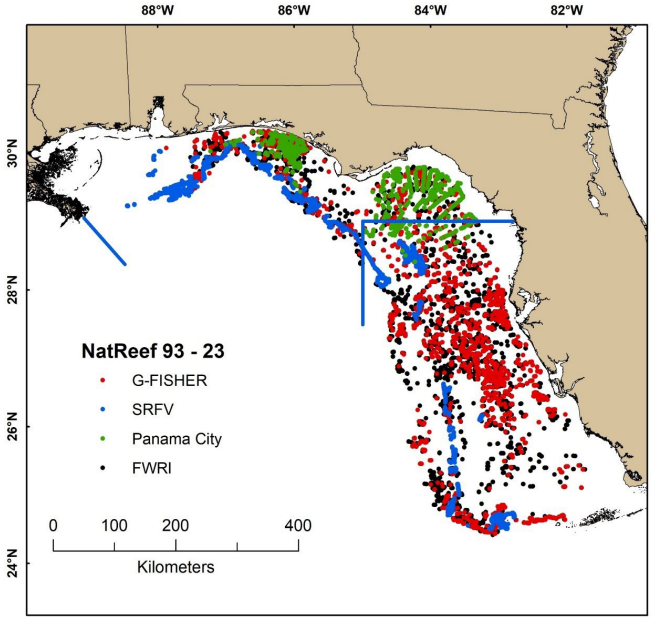


# G-FISHER Video Survey East/Central

- Combined data from multiple video surveys; includes habitat data
  - NMFS Mississippi Lab 1992 - high relief banks along the shelf
  - NMFS Panama City 2005 - shallow reef (5-60 m)
  - FWRI 2008 - focused on reef in central part of West Florida Shelf
  - Very low catch rates and inadequate spatial coverage in East prior to 2010

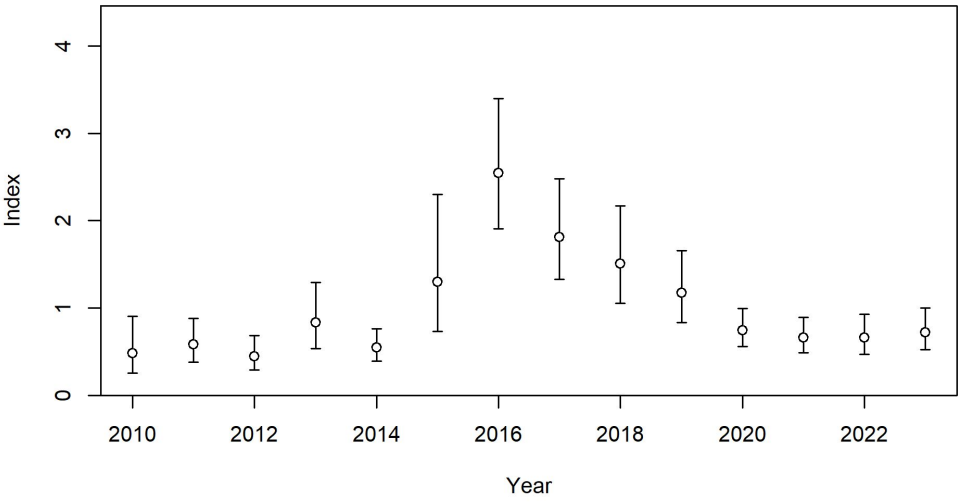


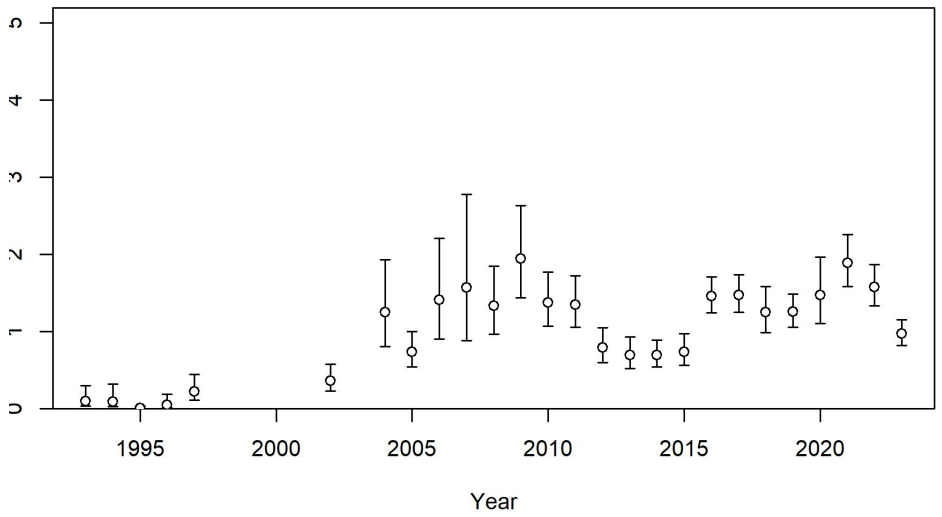
# G-FISHER Video Survey East/Central

- Index constructed using a negative binomial model w/ habitat and survey variables
- Habitat variable determined using CART model

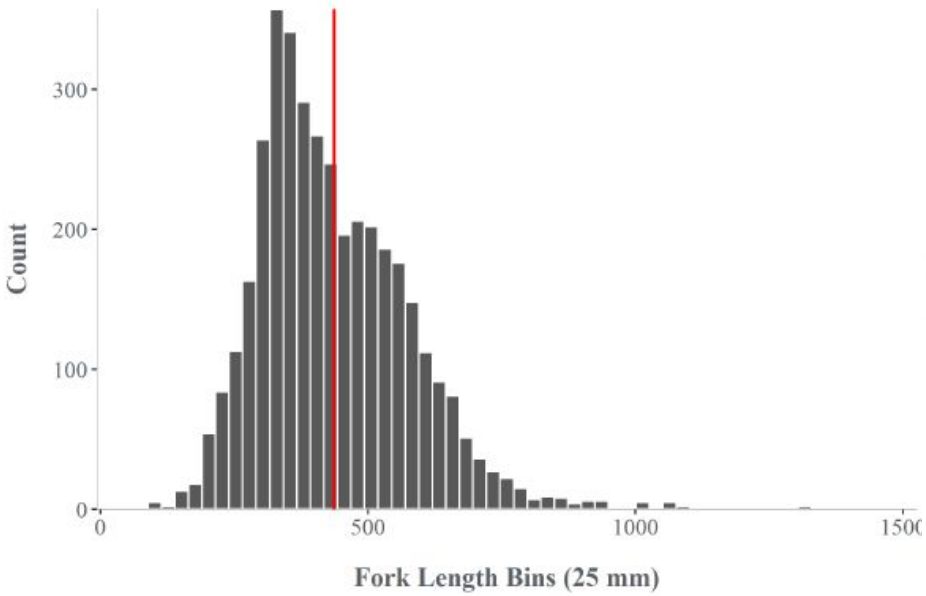
East

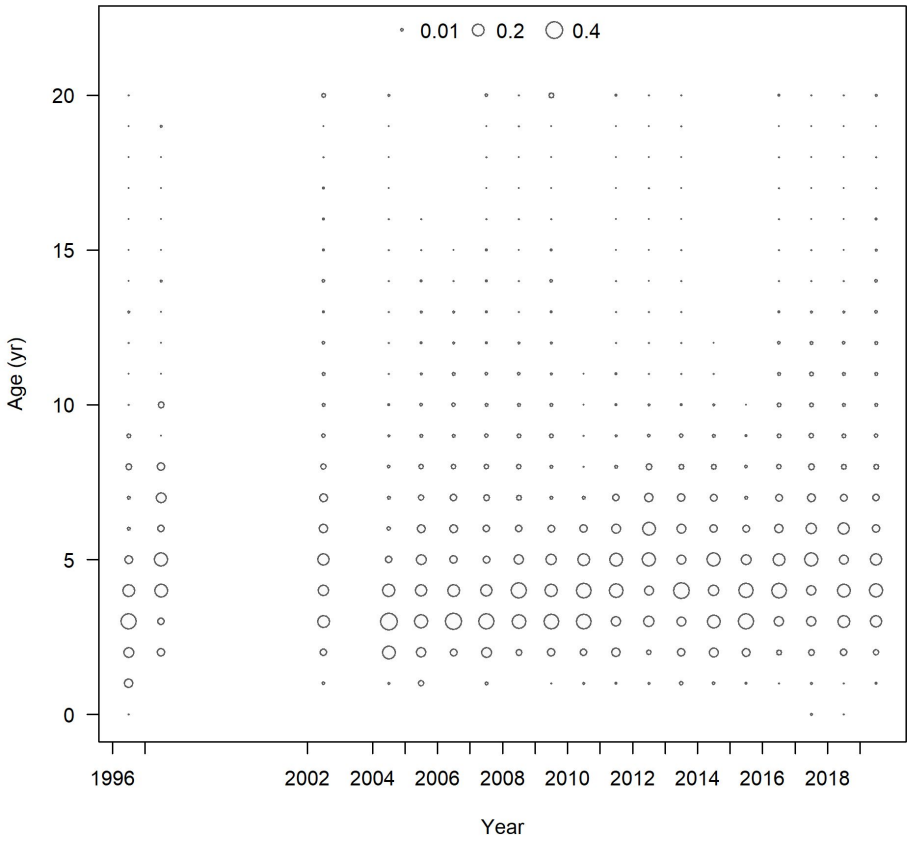



Central



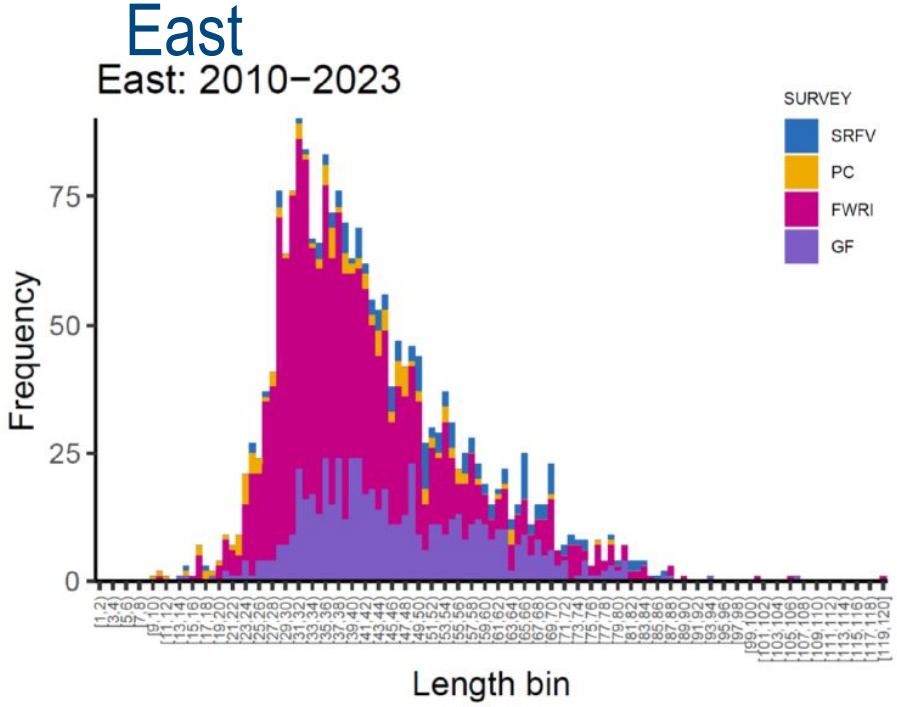
# G-FISHER West ALK - Age Composition

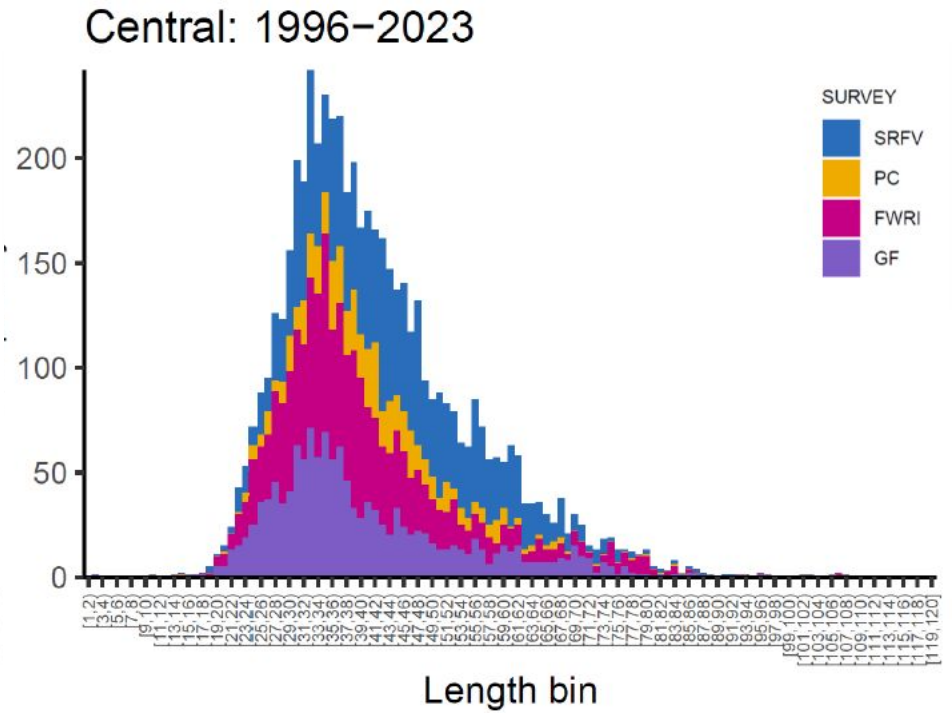


# G-FISHER East/Central Length Composition

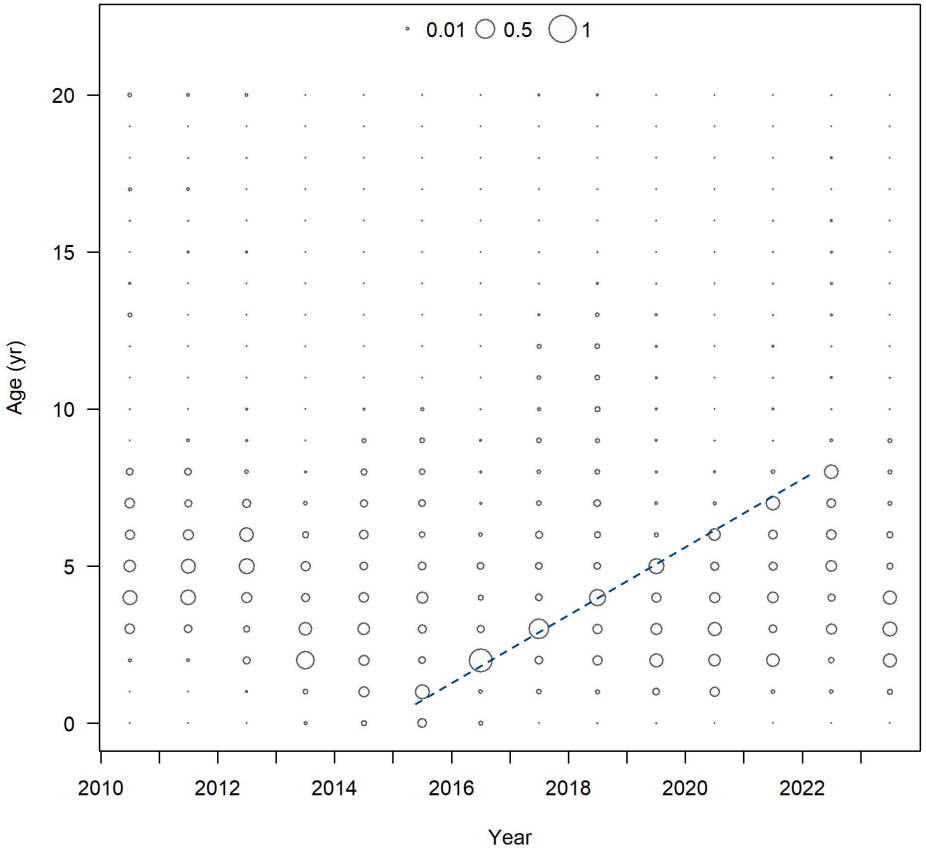
- Similar distribution across East and Central
- Differences in sample sizes across surveys, specifically in the East



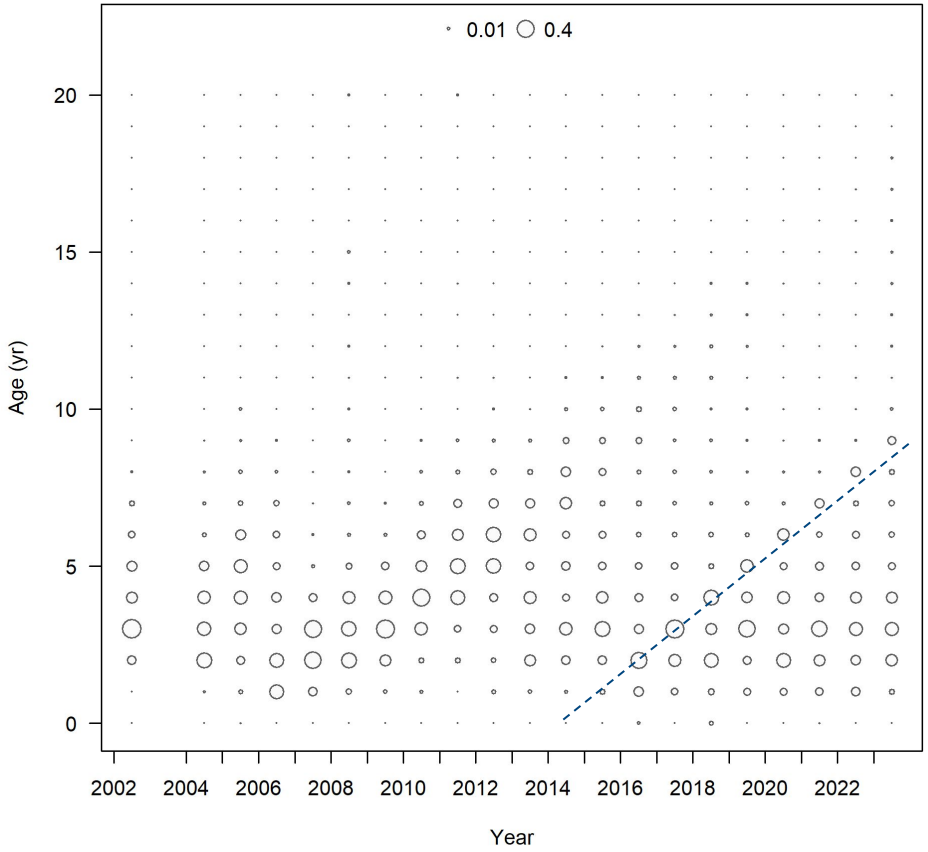



# G-FISHER East/Central ALK - Age Composition

## East

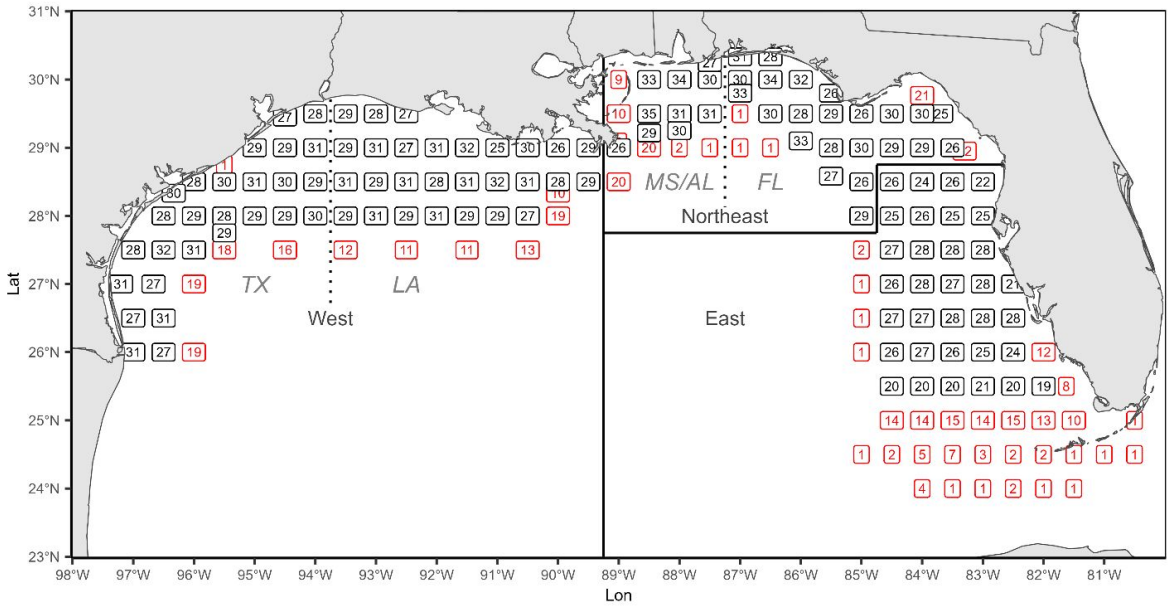



## Central



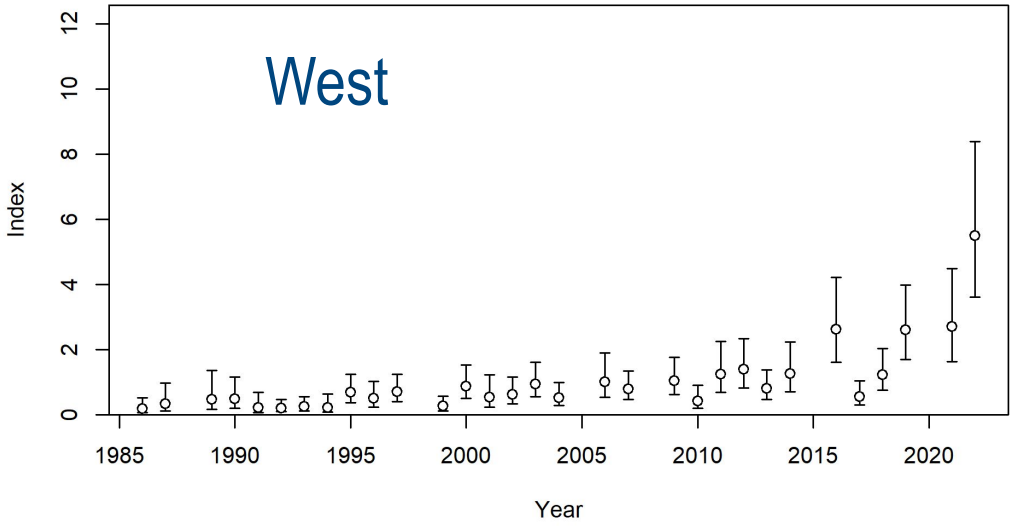
# SEAMAP Fall Plankton Survey

- Indices from bongo net samples assumed to represent the trends in the adult spawning biomass
- No composition data needed
- Index data restricted in larvae size (3.75-9.75mm) and repeatedly sampled sites
- Index developed using a delta-lognormal model

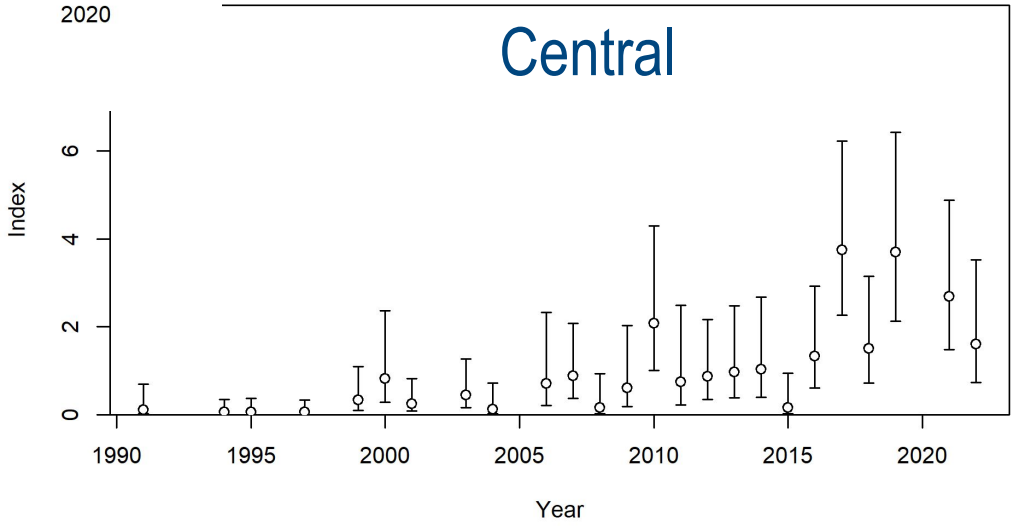



Sampling sites in red not included due to lack of repeated sampling

# SEAMAP Fall Larval Survey



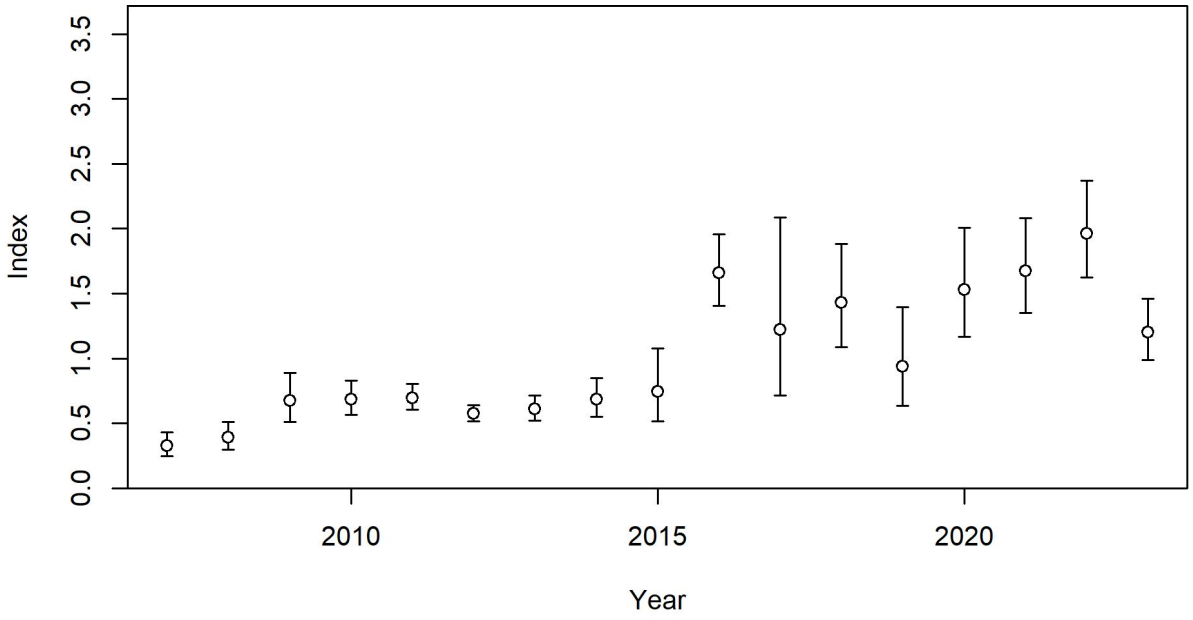

- Increase in index since 2010 in both regions



DW24

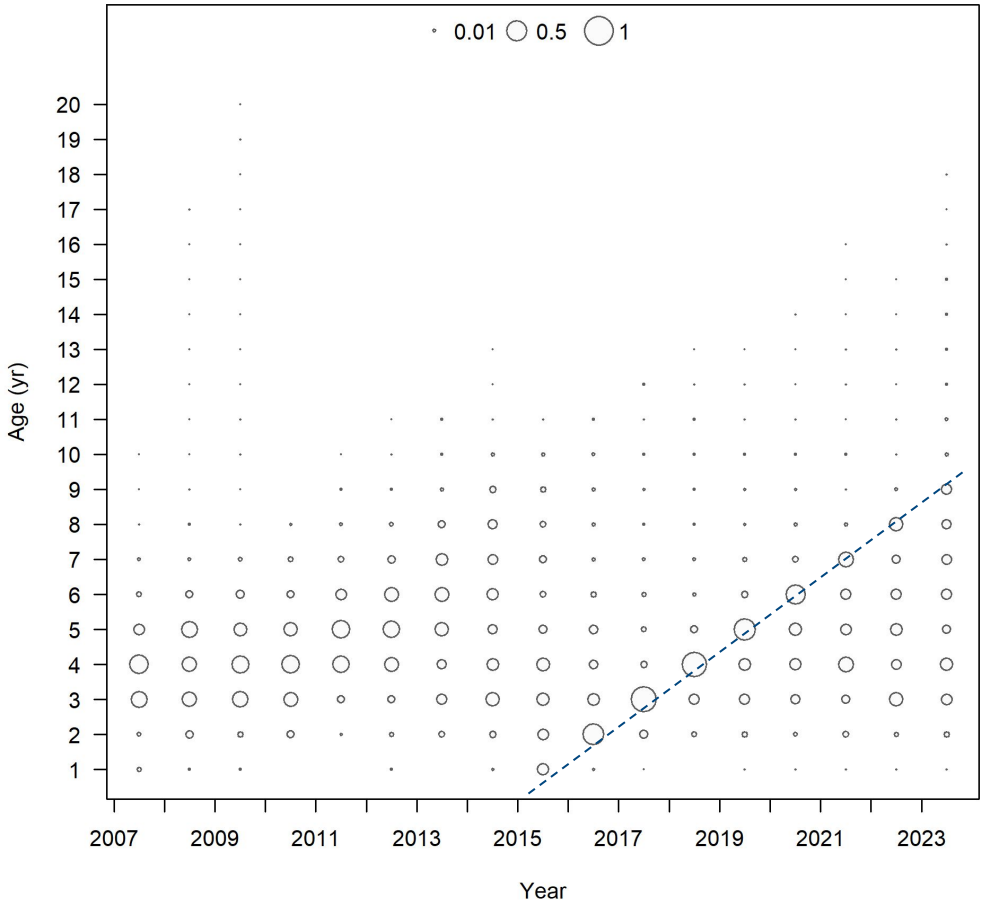
# Post-IFQ Commercial Reef Fish Observer Survey

- East is the only area where CPUE assumptions aren't violated
- Samples from both kept and discarded fish, reducing the impact of management regulations
- Vertical line gear within 500x500m grid cells
- Index built using a Horvitz-Thompson ratio-of-means estimator for a depth-stratified sample frame



# Commercial Reef Fish Observer Composition

- Provided lengths converted to ages using year-region specific ALK



# External Survey
# Great Red Snapper Count (GRSC)

GRSC Report

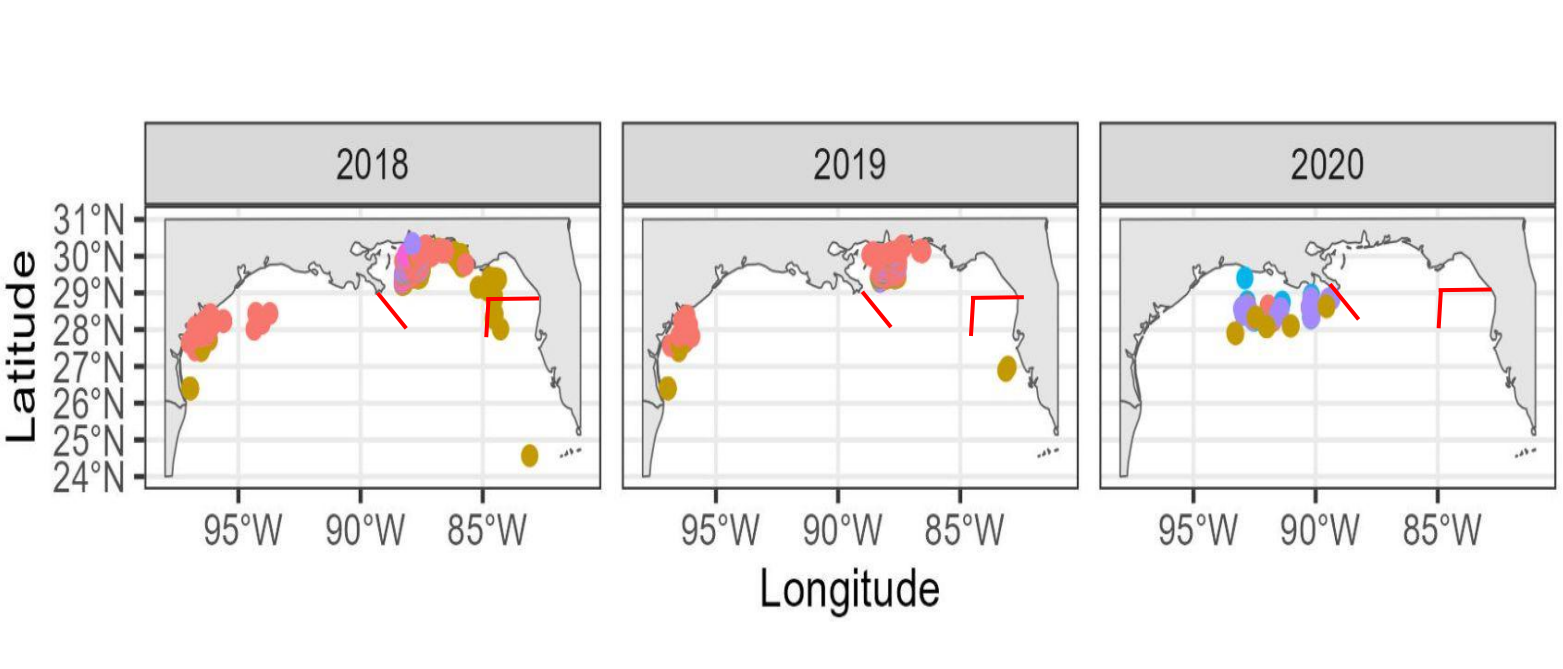
SEDAR 74 included GRSC number of fish in 2018 as absolute index of abundance

- **Issue 1:** The provided abundance was not absolute; therefore, we needed an estimated catchability coefficient.
- **Issue 2:** No coefficient provided during workshop or after.
- **Solution:** The SEDAR 74 absolute assumption was determined incorrect by the CIE; therefore, our only option for SEDAR 98 is to include the GRSC numbers in a sensitivity run with estimated coefficients and assumed priors.

New for SEDAR 98- Length composition

- **Goal:** Utilize new data within the sensitivity run.
- **Issue:** Provided data are not sufficient across years, areas, gear, or sampling habitat. Explore data using our shiny app here.
- **Solution:** Inclusion into sensitivity run with many assumptions and caveats.

# GRSC - Temporal and Spatial Coverage



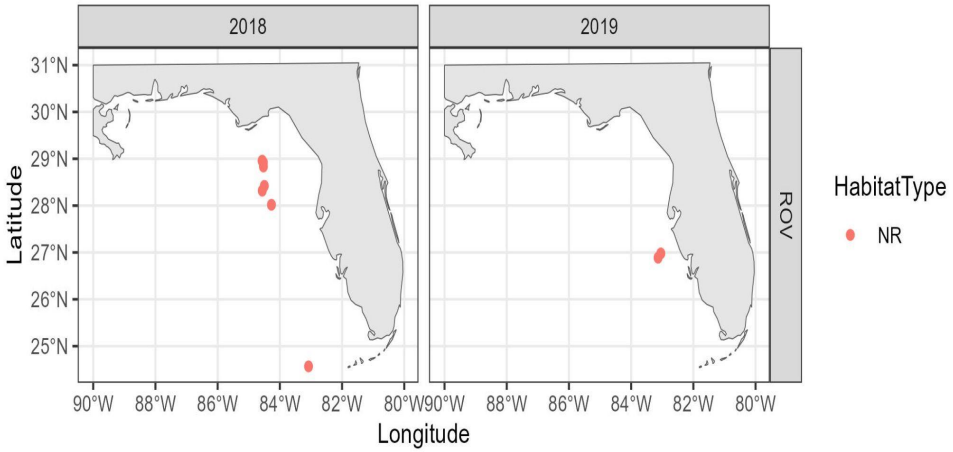

Sparse spatial coverage from year to year

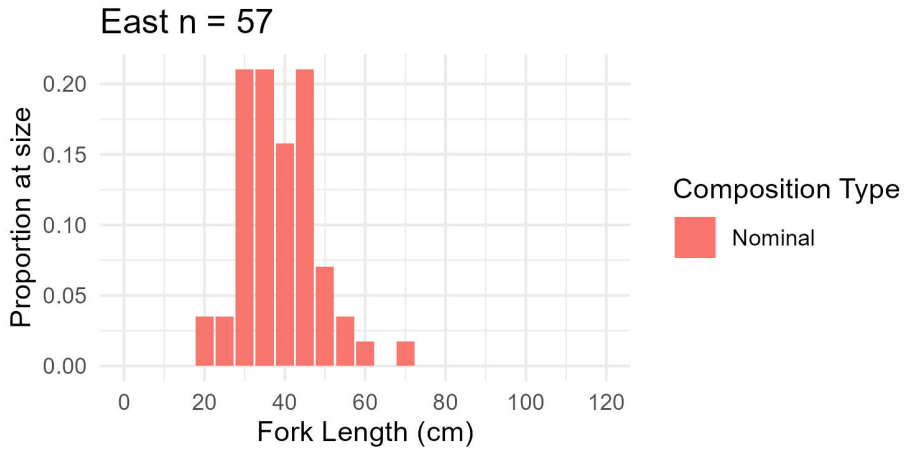
Possible representative spatial coverage of the **Central** region in 2018

# East Area LFD

**Solution:**

- Use 2018 and 2019 data
- No weighting needed because comp does not vary by gear or habitat.
- Assumptions:
  - These 57 fish represent the entire Eastern stock ID region
  - There were no larger UCB fish

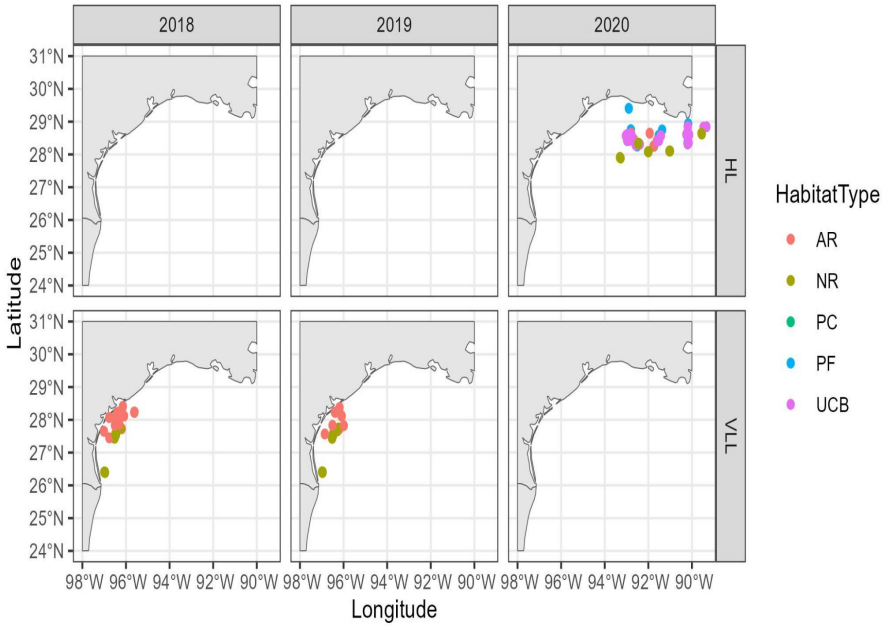


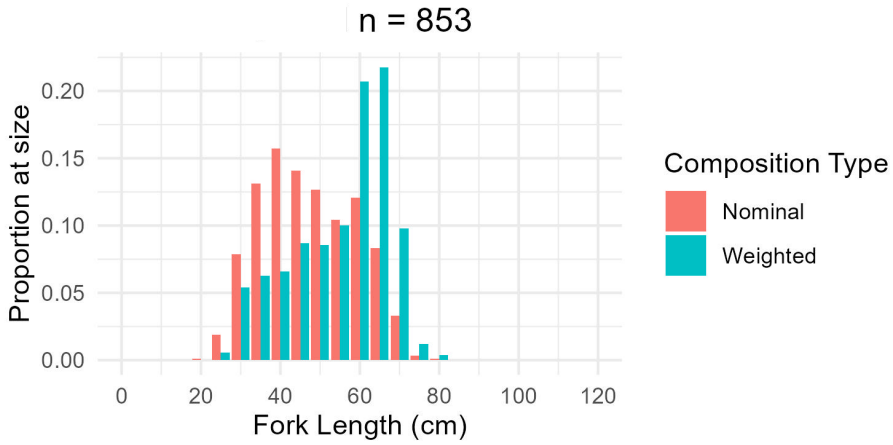



# West Area LFD

## Solution:

- Data received from TX was not collected as part of the GRSC project
- Use West GRSC index habitat proportions to weight the comp.
- Assume LA data represent Texas population

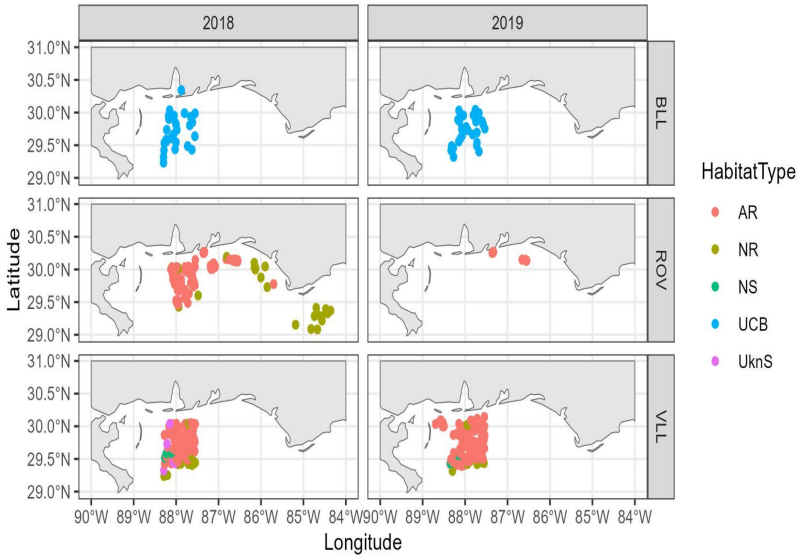


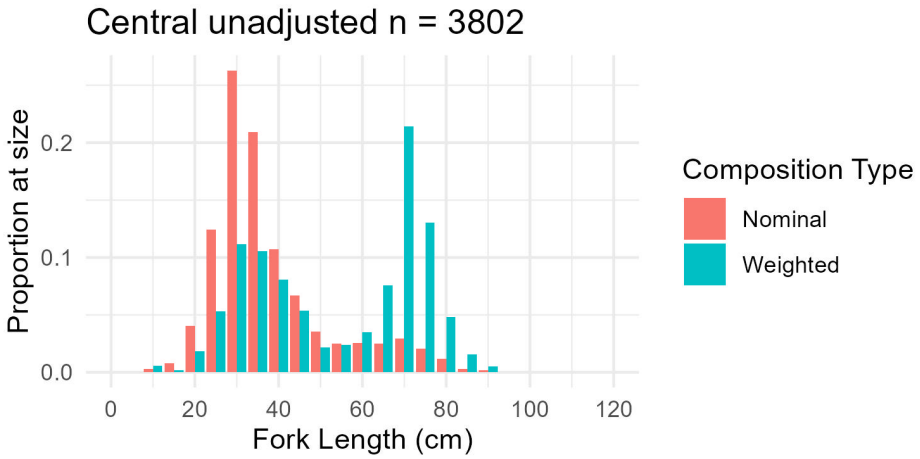



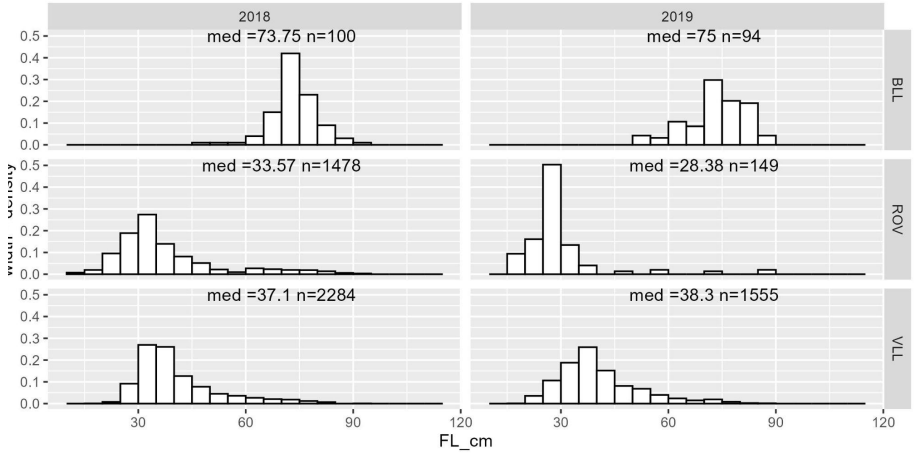
# Central Area LFD

## Solution:

- Use 2018 all gears to capture the range of the population & weight by habitat type
- Assume MS population is similar to the AL population
- Assume FL- NR and UCB are similar in proportion to the AL -NR and UCB



# Questions about the data?

# Outline

- Data Review
  - Stock definition
  - Assessment history
  - Regulations
  - Life history
  - Removals
  - Size compositions
  - Age compositions
  - Indices of abundance & composition
  - **Key data differences from SEDAR 52**

# Key Data Differences from SEDAR 52 to 98

1. Shift from 2-Area to 3-Area spatial structure
    a. Helped to identify regional-specific dynamics
2. Updated model start year to eliminate highly uncertain data
3. Transitioned from fecundity based on total egg production to spawning stock biomass
4. Modeled recreational fleets separately (charter and private are no longer combined)
    a. Included MRIP Fishing Effort Survey calibrations
5. Reevaluated discard mortality rates
6. Reevaluated growth parameters regionally
7. Removed most fishery-dependent indices
8. Updated shrimp effort and bycatch estimation methodology
9. Incorporated length composition and conditional age-at-length

# End of Data Overview

Thank you for your time.