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SEDAR 81: US Gulf of Mexico Spanish Mackerel Operational Assessment



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Gulf Branch SFD
NOAA Fisheries - SEFSC

CMP AP Meeting • February 2024 • Tampa, FL

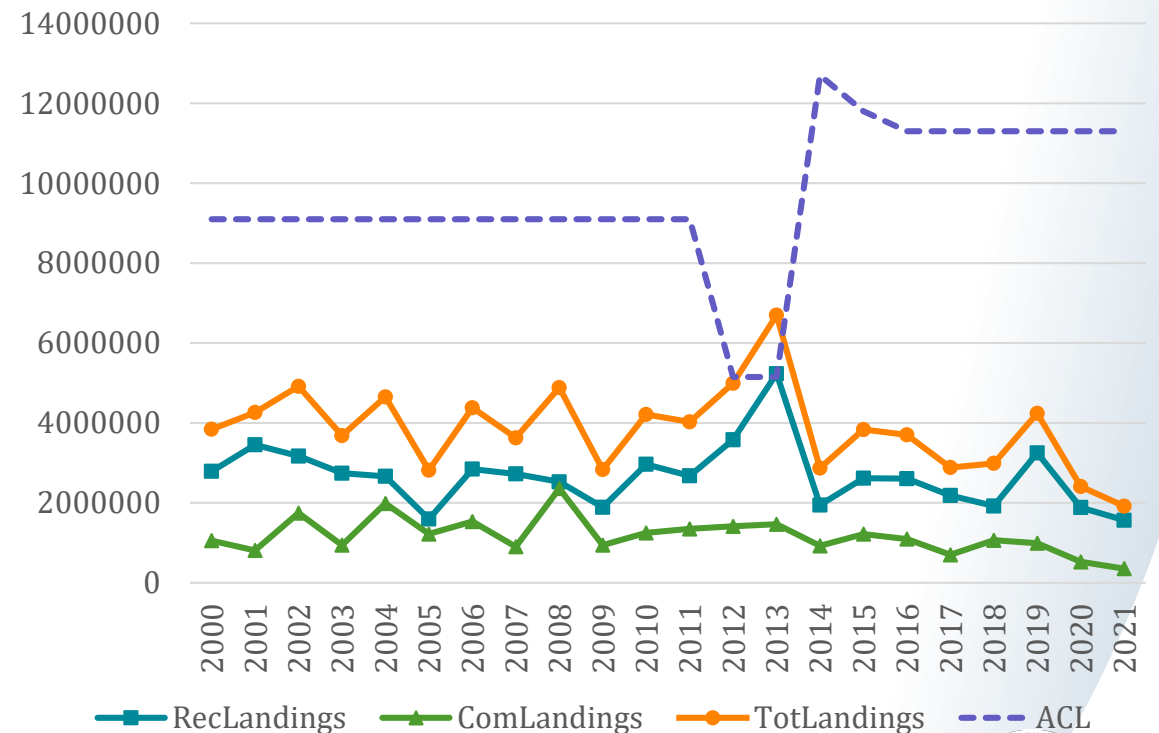
Management

- Stock Boundaries

- Fish landed **north of US Highway 1** in Monroe County Florida are assigned to the Gulf of Mexico stock and managed by the GMFMC

- Management actions WP-01

- 12 in **minimum size limit** since 1983
- **Bag limits** since 1987
- **ACL** since 1983 (commercial and recreational combined)
- **Spatial closures** and **prohibited gears**



<https://www.fisheries.noaa.gov/gulf-mexico-historical-stock-landings-and-annual-catch-limit-monitoring#spanish-mackerel>

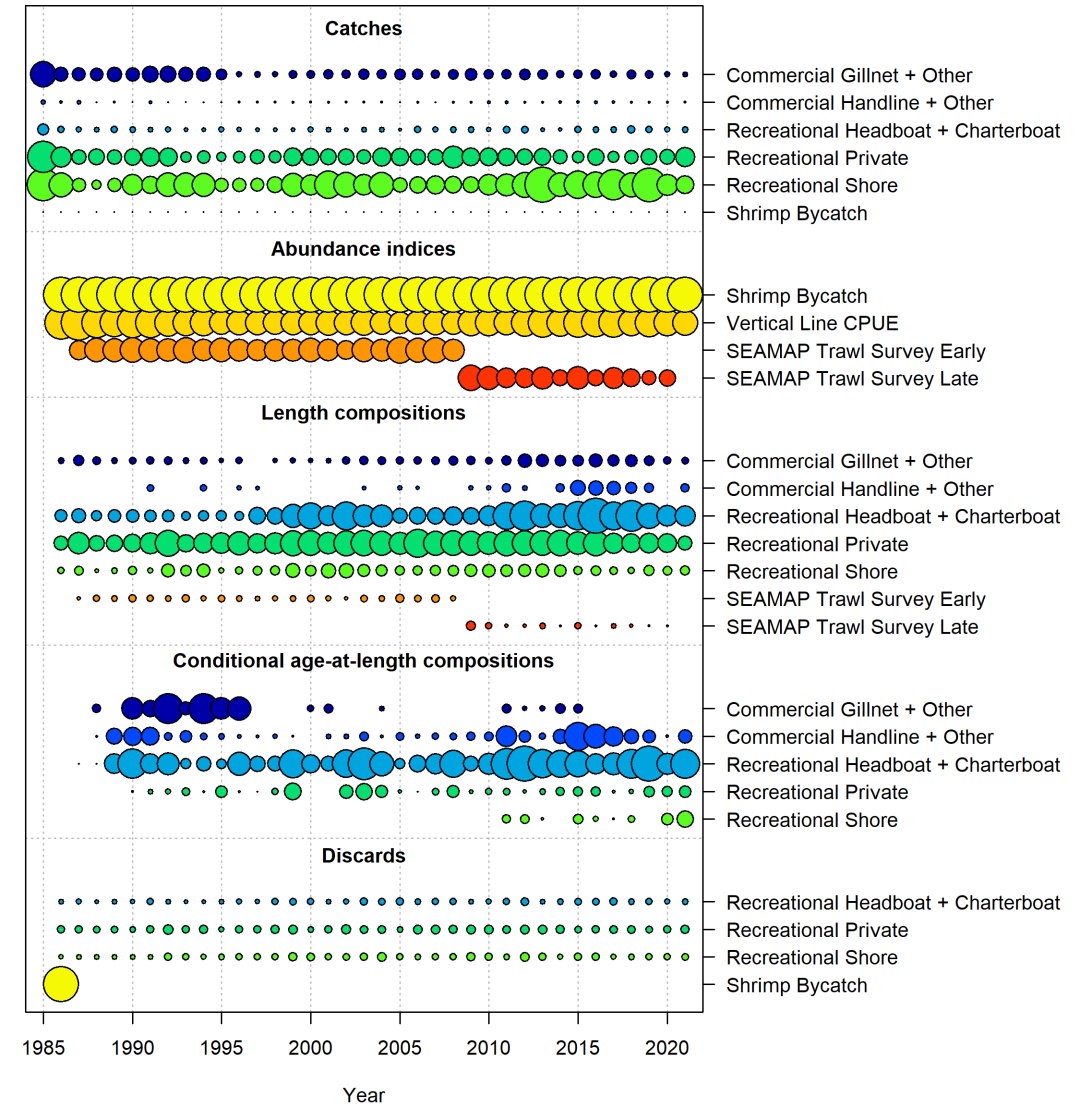


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Model structure

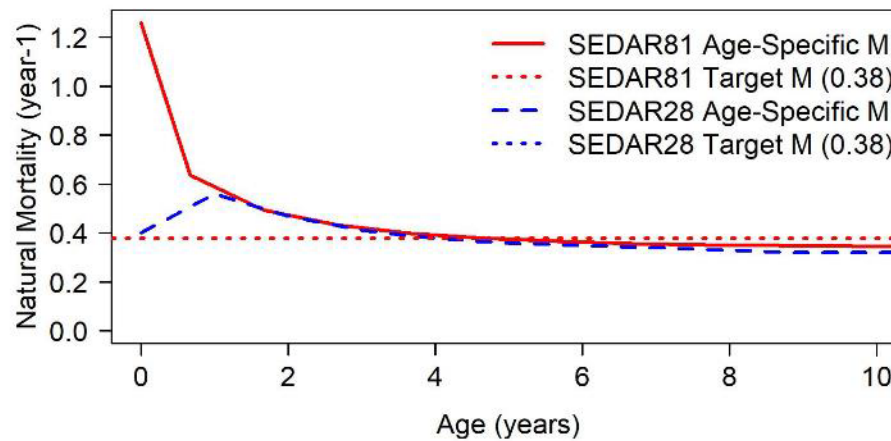
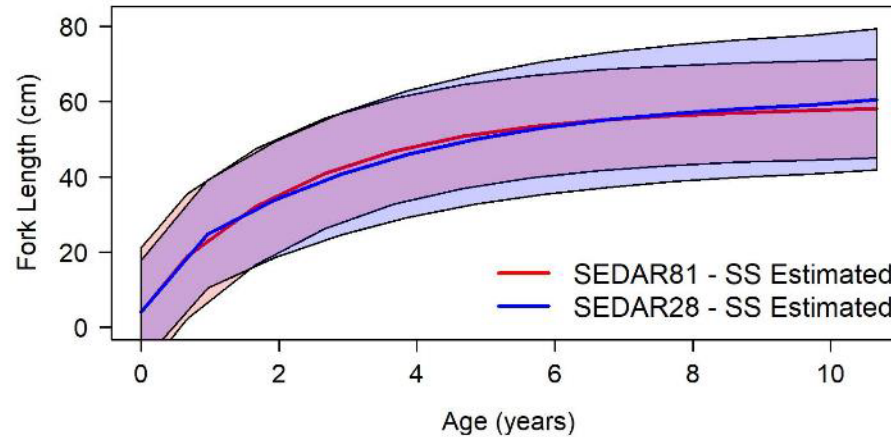
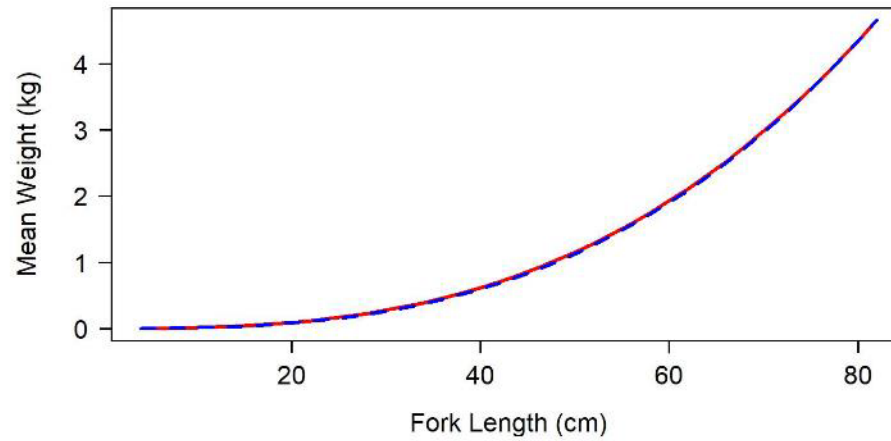
- Years
 - 1986-2021
- Fleets
 - 2 commercial
 - Gillnet (GN) + Other (OTH)
 - Handline (HL) + Other (OTH)
 - 3 recreational
 - Headboat (HB) & Charterboat (CH)
 - Private (PR)-FES
 - Shore (SH)-FES
 - Shrimp bycatch (dead discards; median value scaled by effort)

- Indices
 - Commercial VL
 - SEAMAP Trawl (early and late)
 - Shrimp effort (for scaling annual discards)
- Age and length compositions



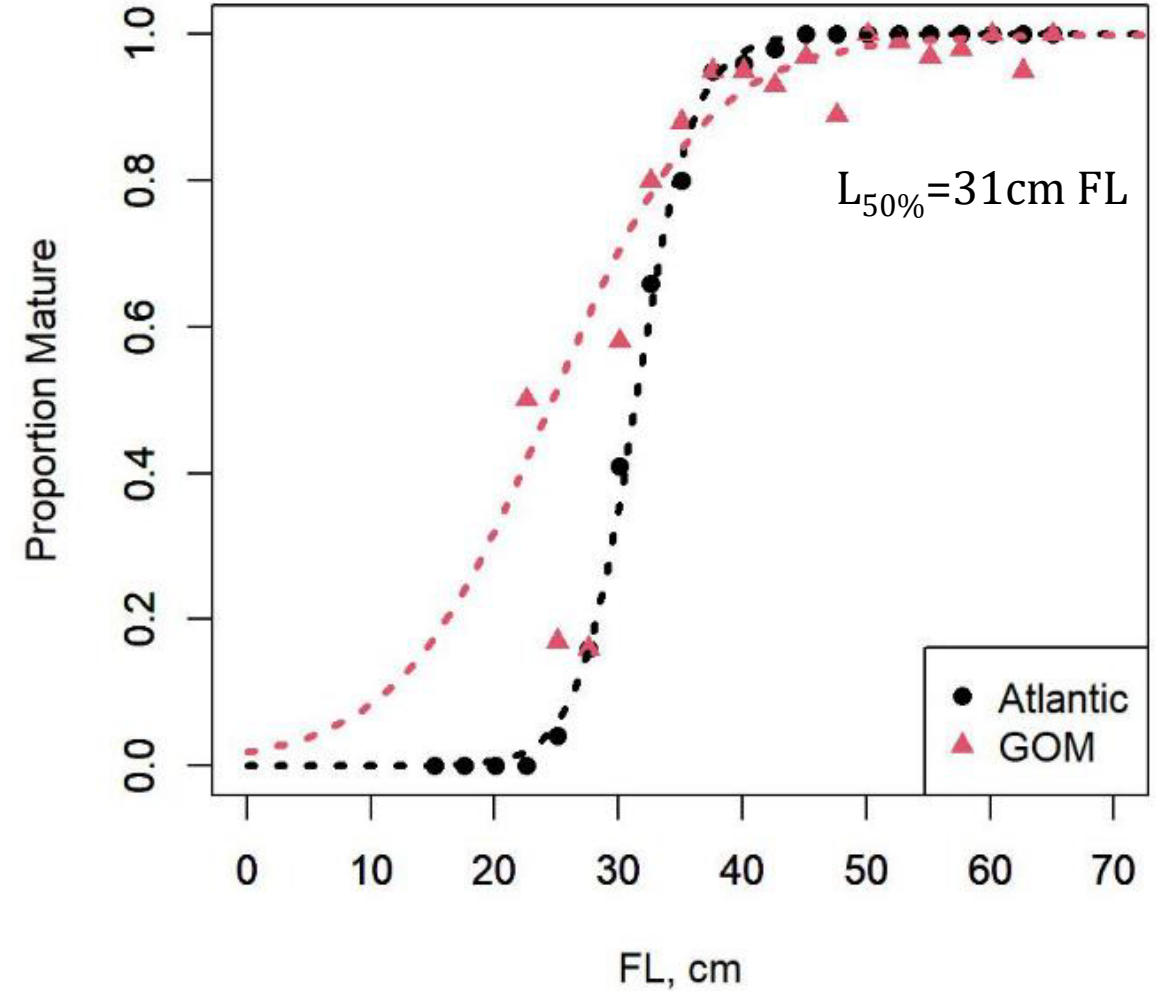
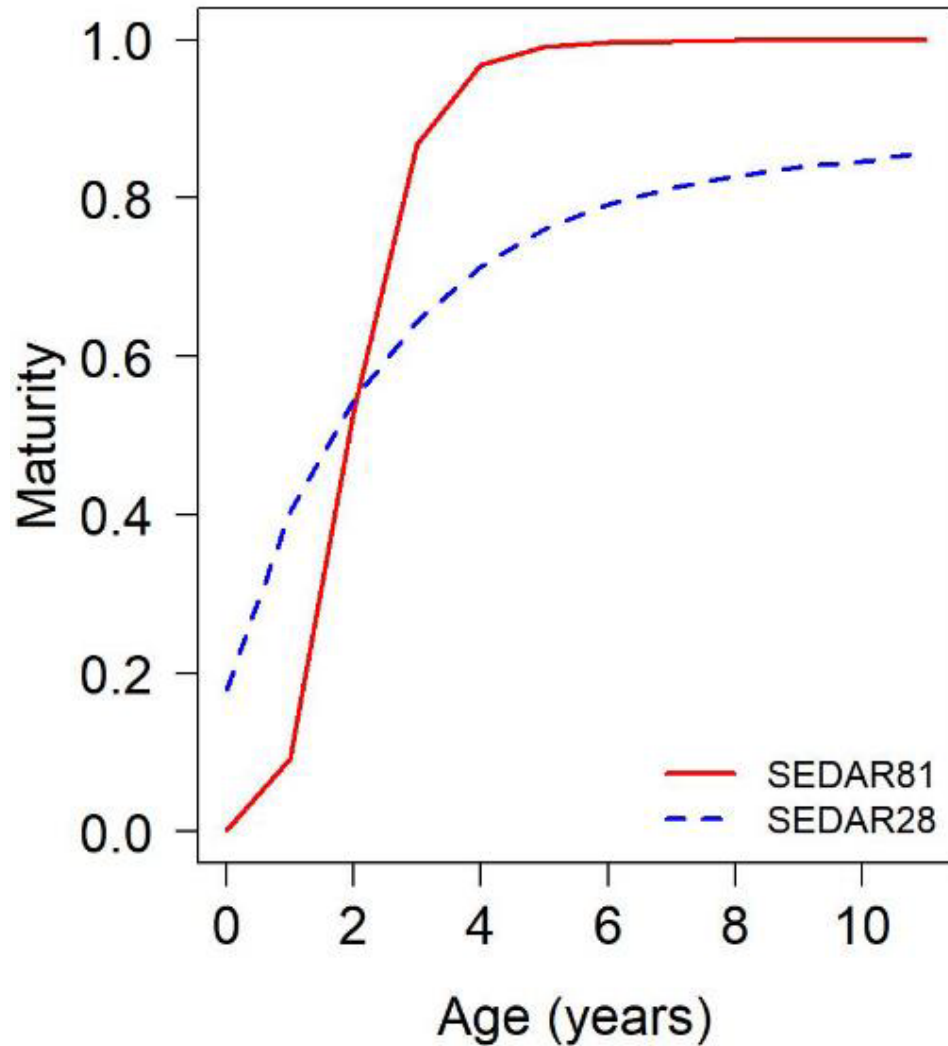
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Life History



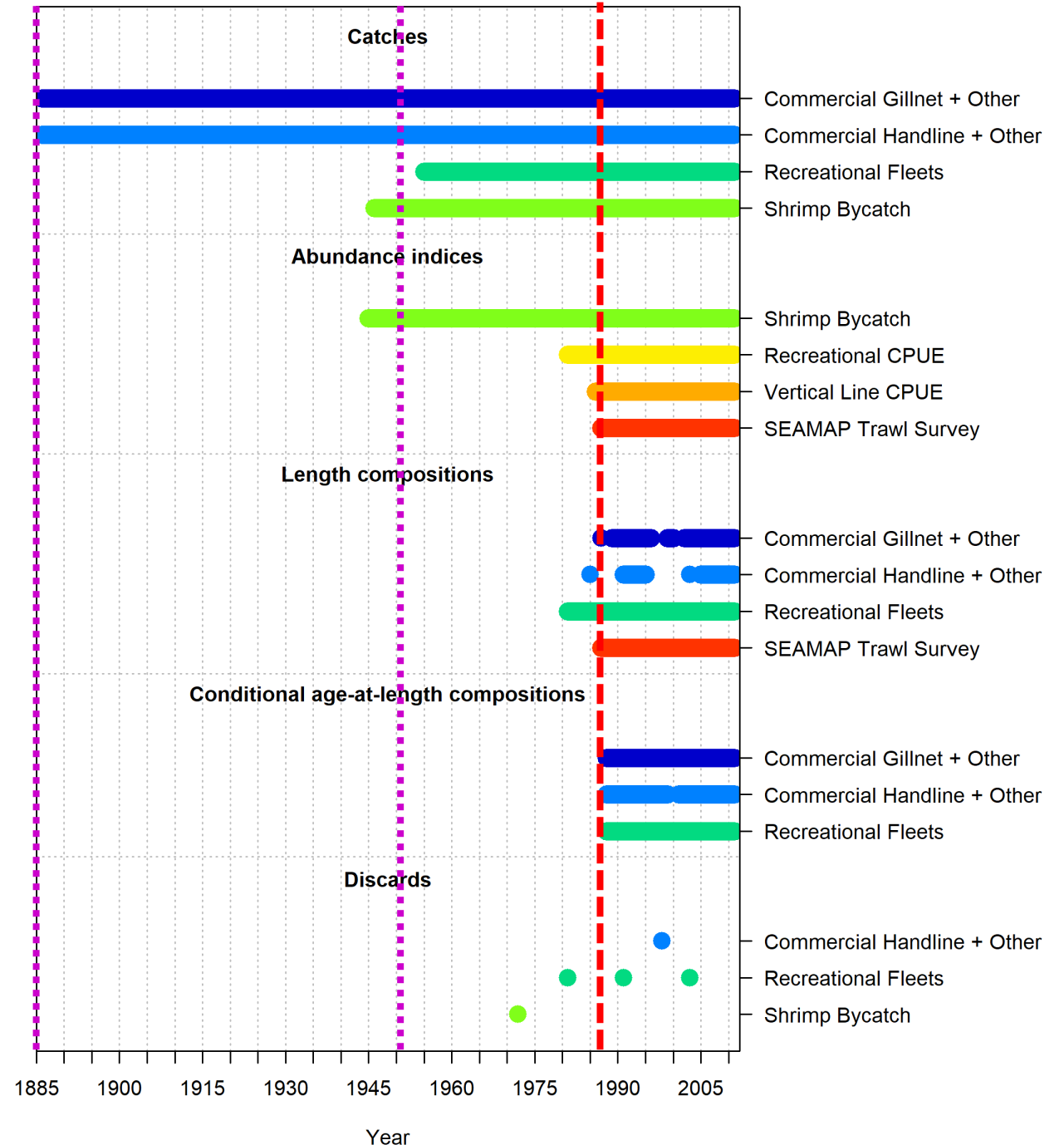
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Life History



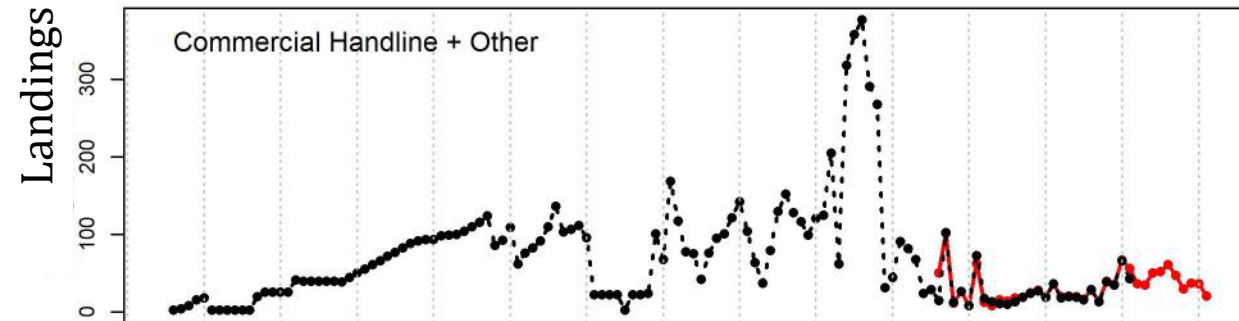
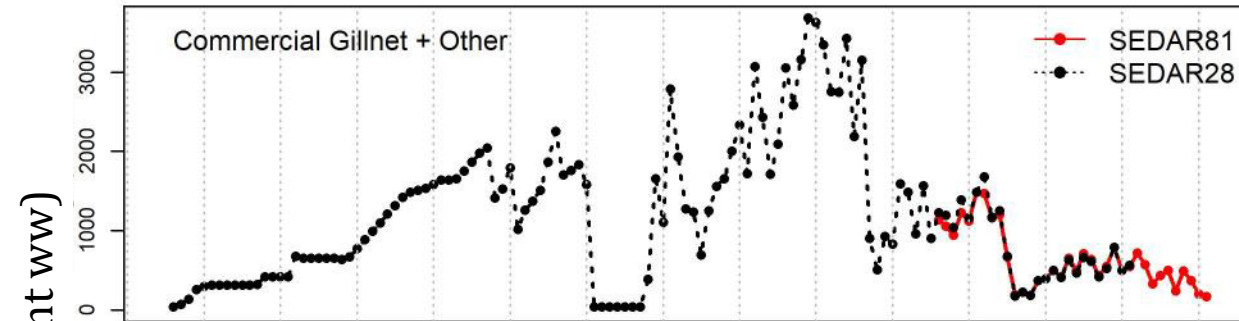
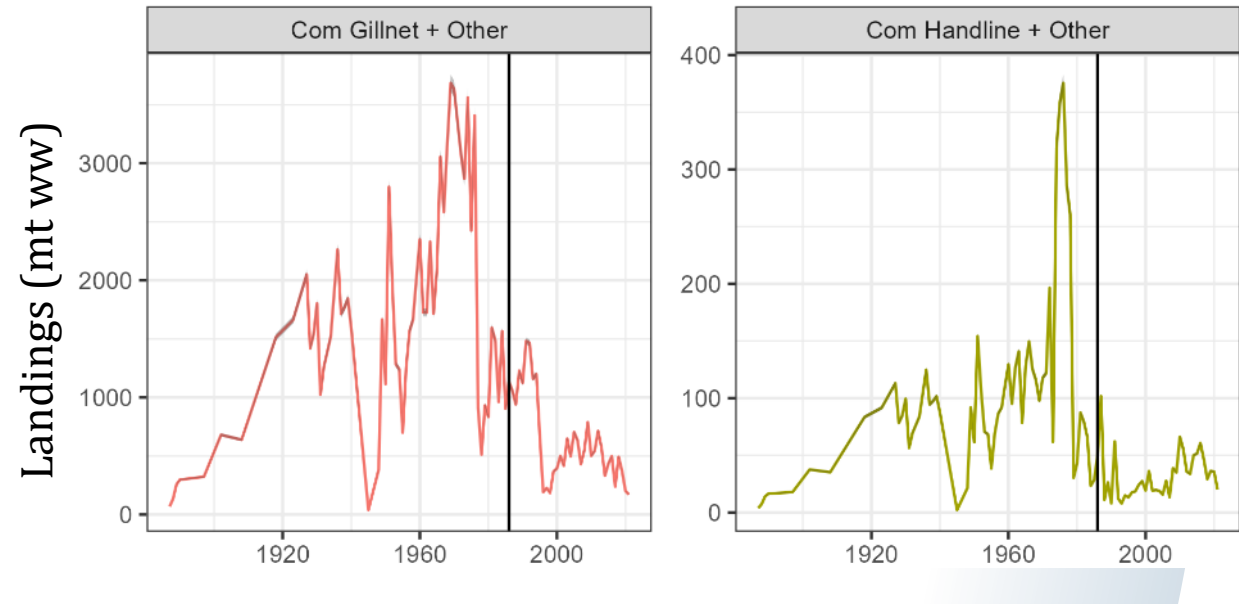
Start Year

- SEDAR 28: 1886
(unfished conditions)
- SEDAR 81: 1986
 - Attempted 1886, 1950



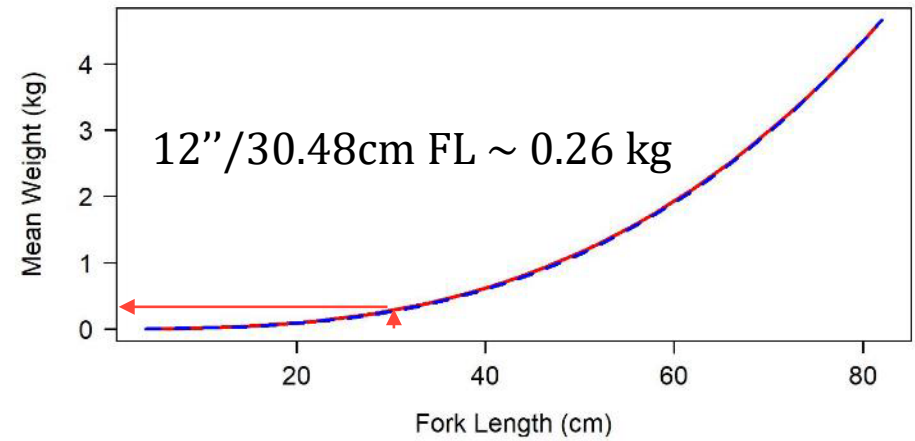
Commercial Landings

| Data Component | Decision |
|-------------------|---|
| Landings WP-04 | <ul style="list-style-type: none"> • Same 2 fleets : GN + other, HL + other • HL : landings + dead discards |
| CVs | <ul style="list-style-type: none"> • Unchanged 0.01 |

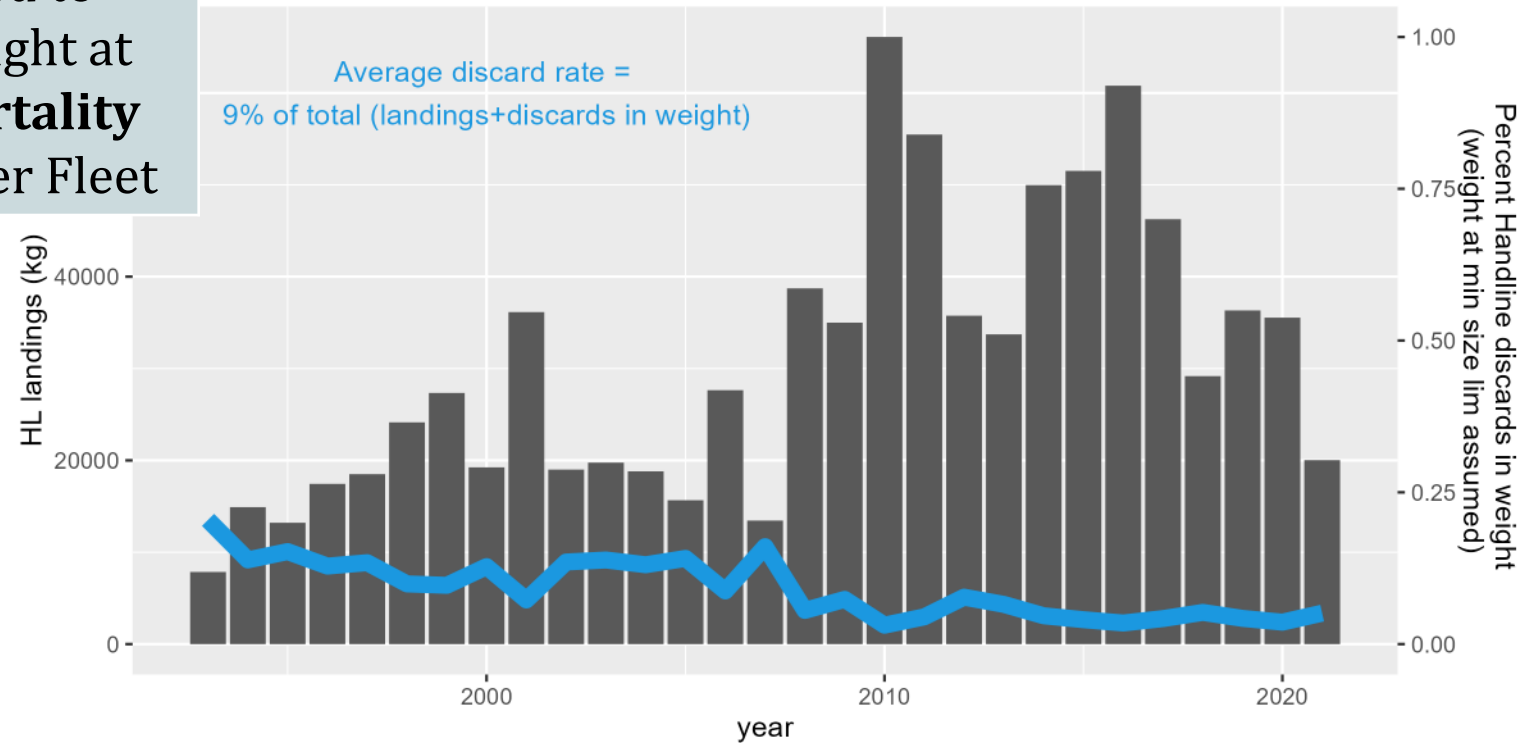


Commercial Discards

| Data Component | Decision |
|-------------------|---|
| Discards WP-05 | <ul style="list-style-type: none"> • GN : unchanged, none • HL : dead discards added to landings (assuming weight at size limit and 10% mortality rate) ~ 1% of HL + Other Fleet |

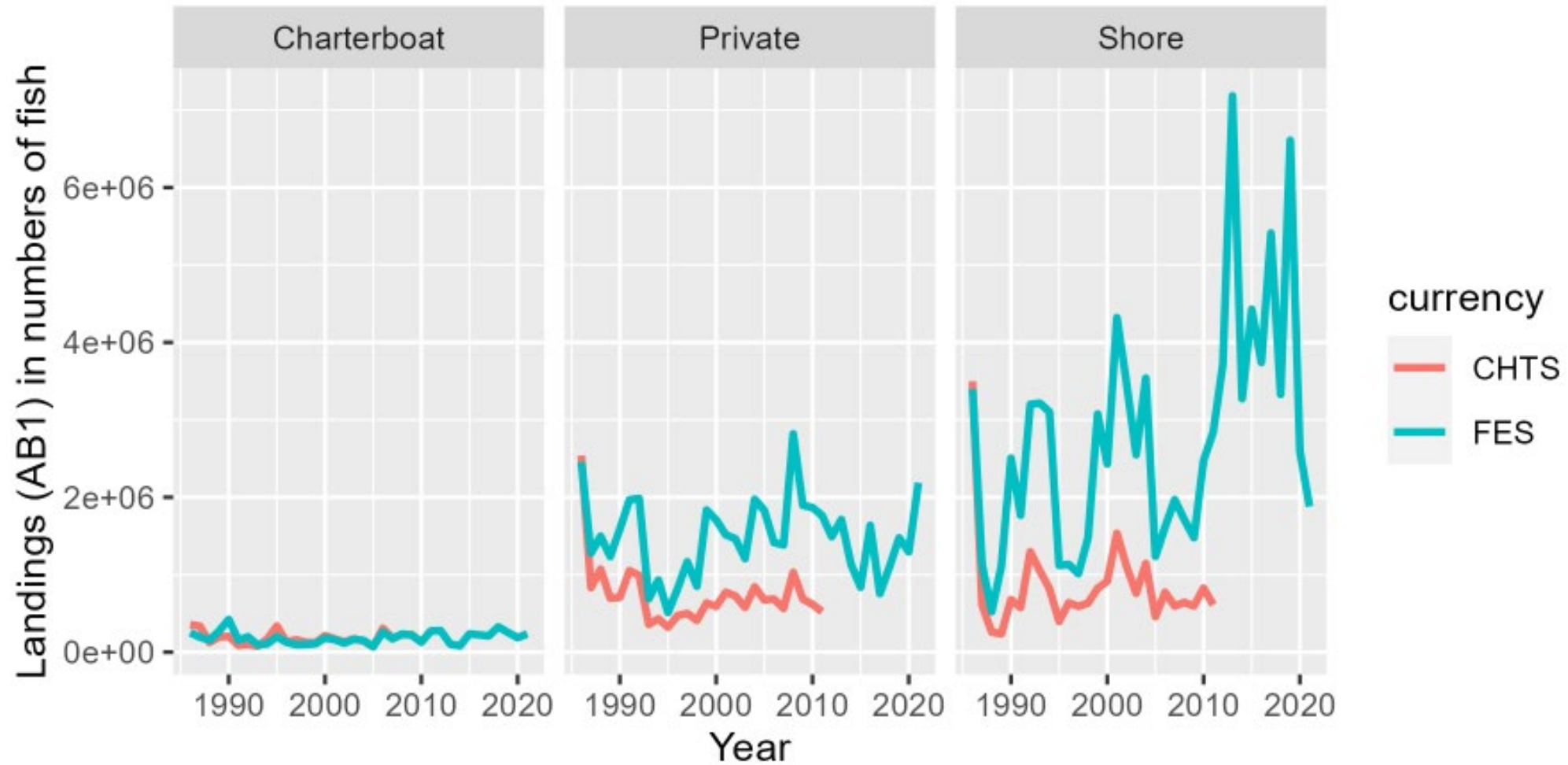


Insufficient data to estimate discards from reef fish observer data. Instead, discard rates computed from the discard logbook data (02-21) and applied to gear specific total effort from the coastal logbook program (93-21)



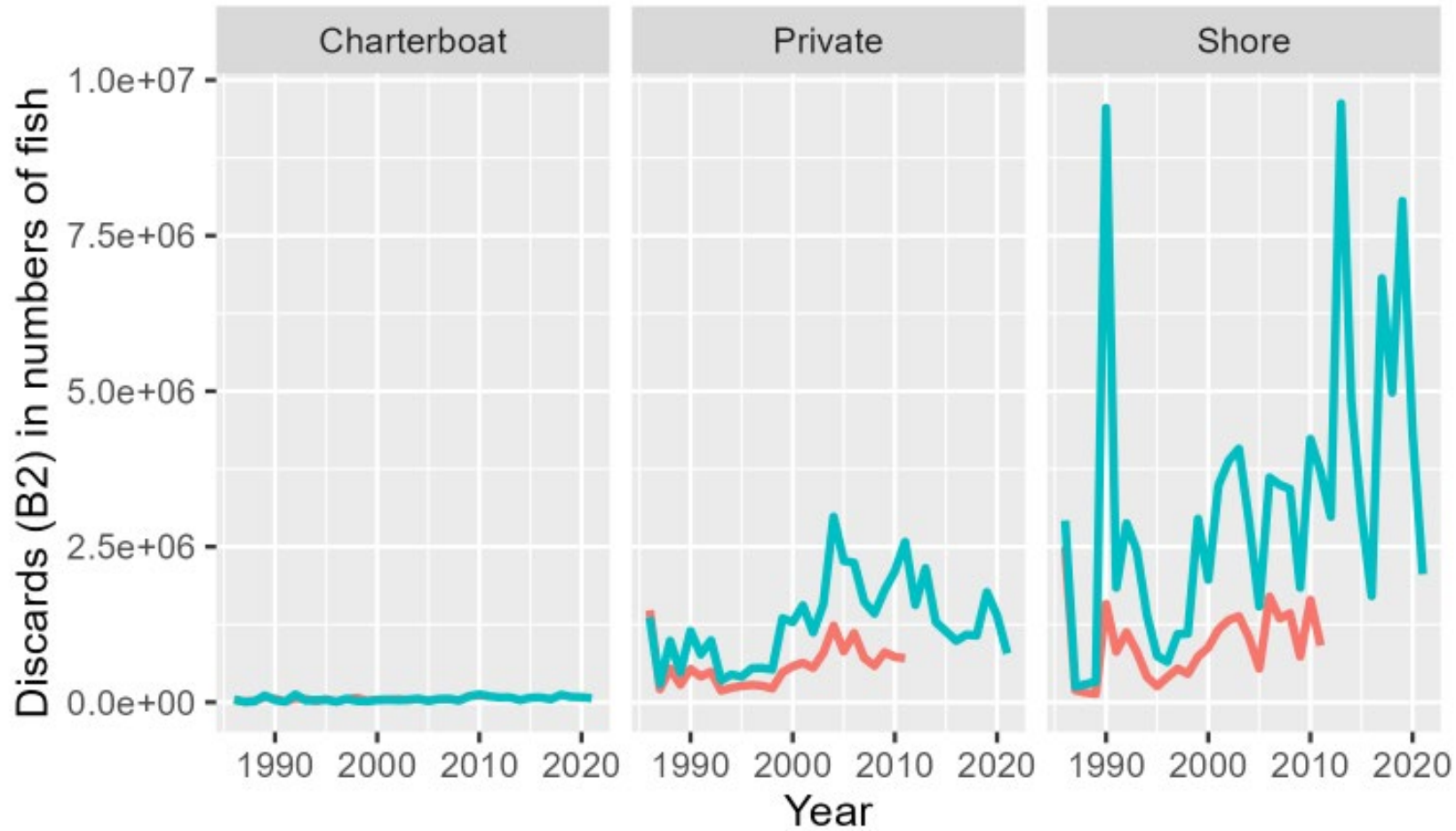
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Recreational Landings



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Recreational Discards

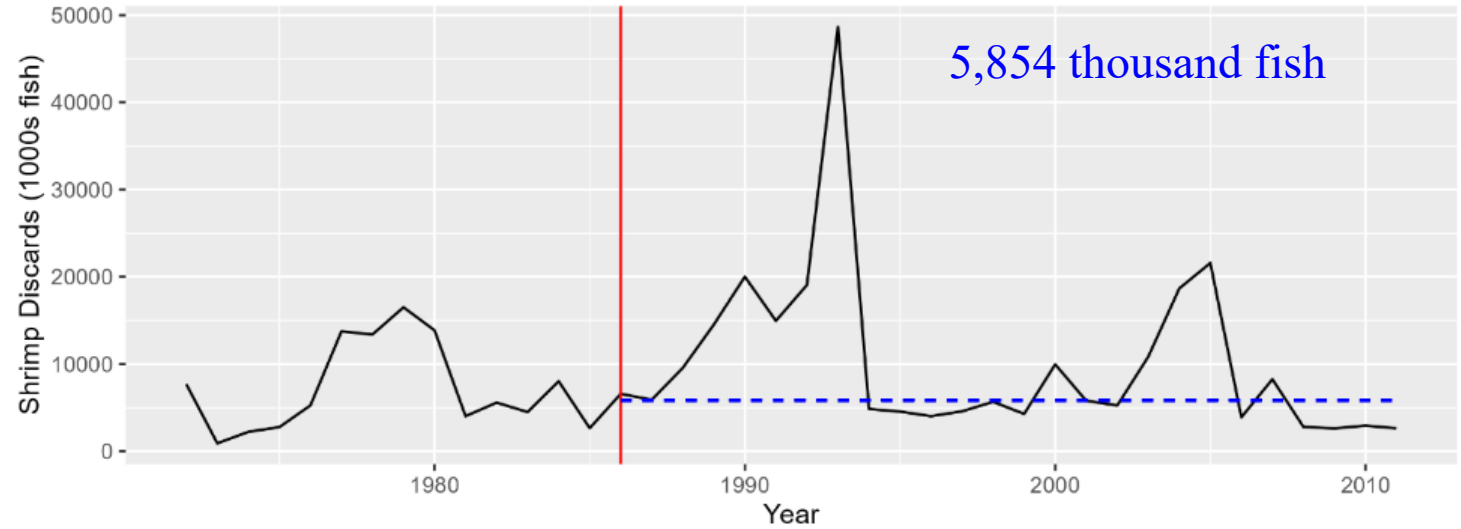
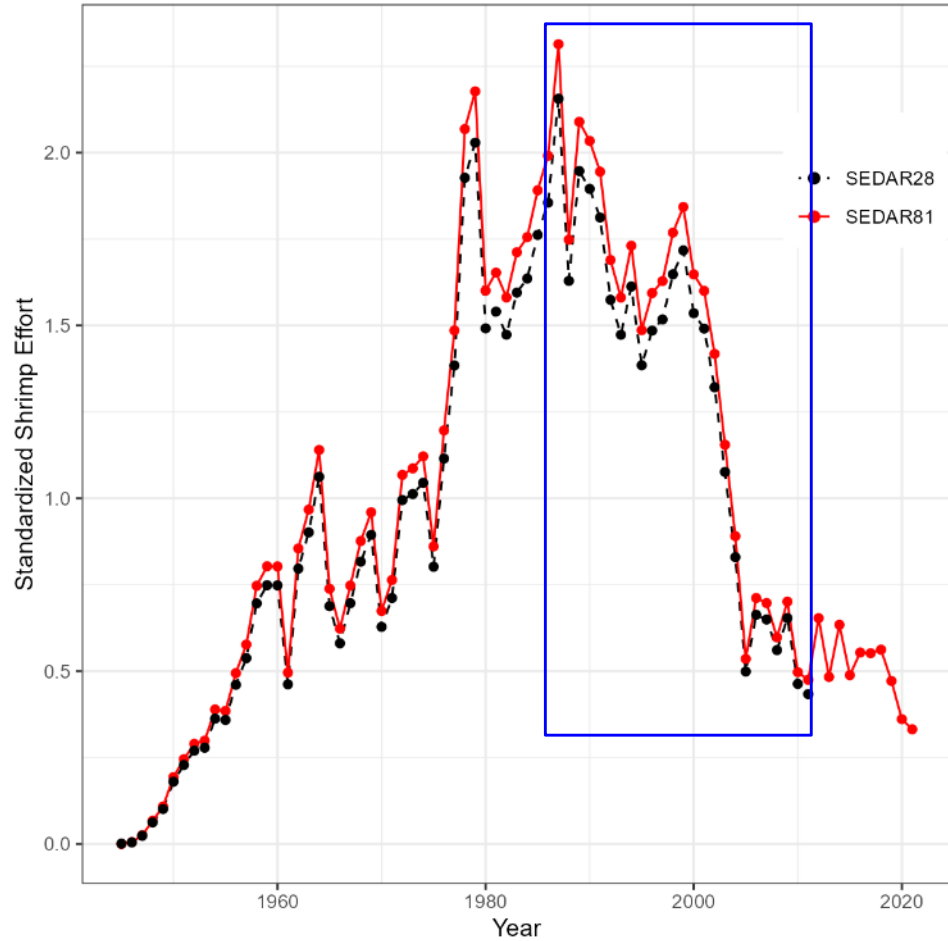


- **Discard Mortality: 20%**



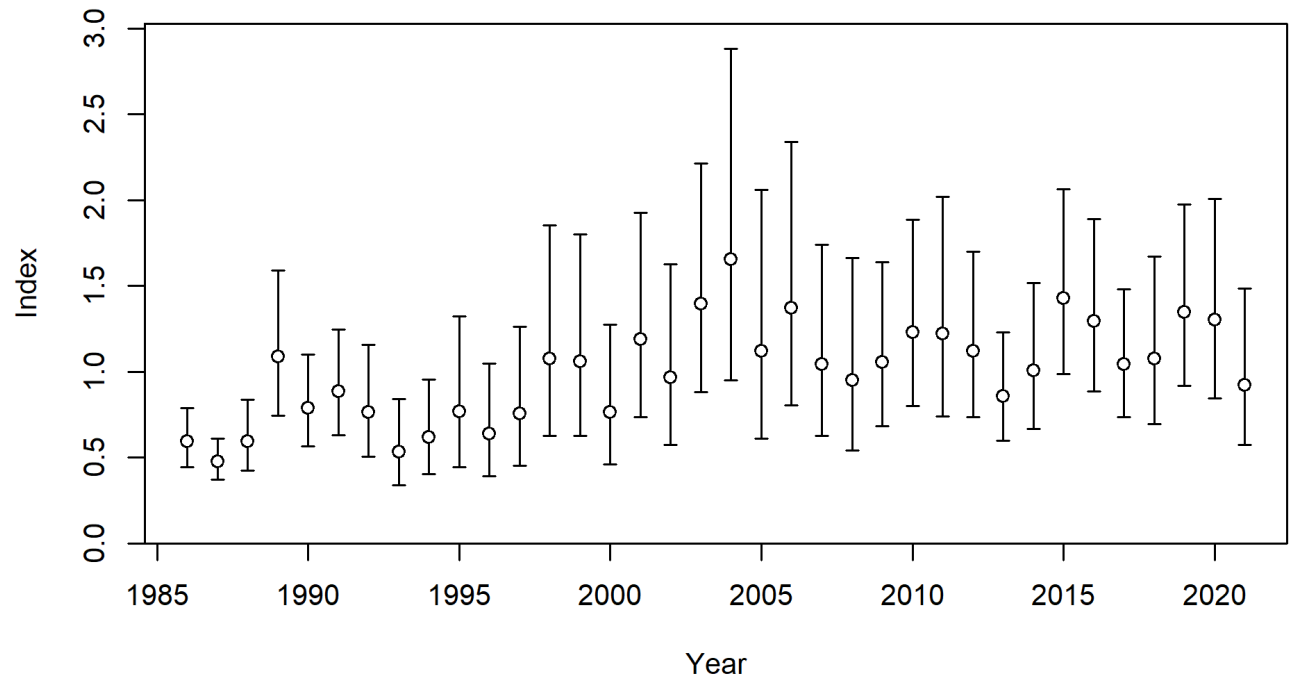
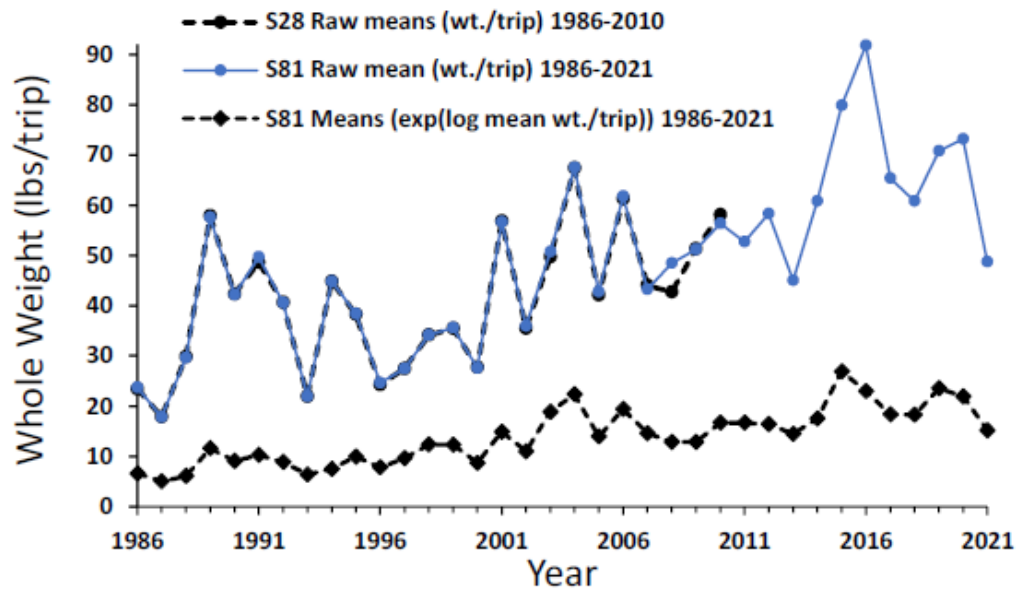
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Shrimp Bycatch



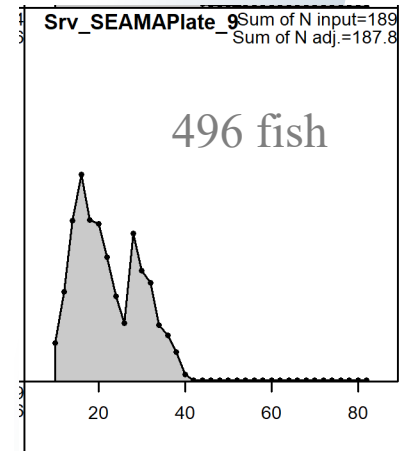
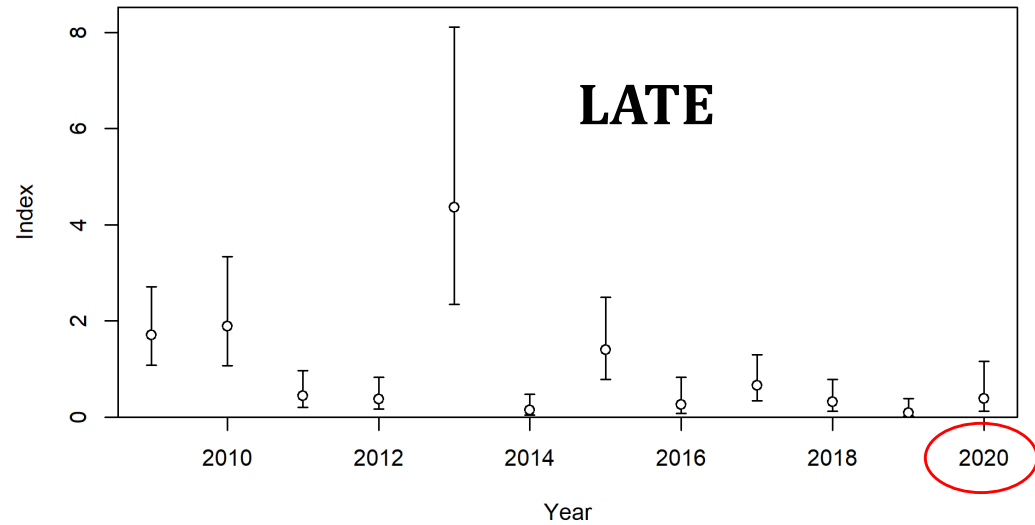
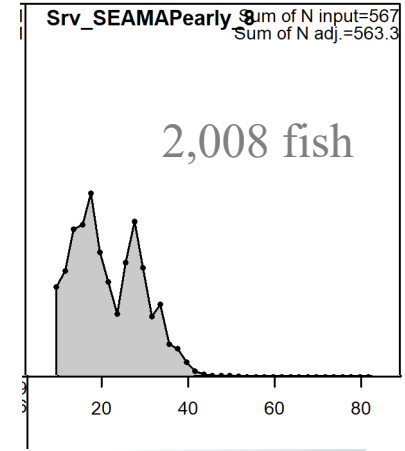
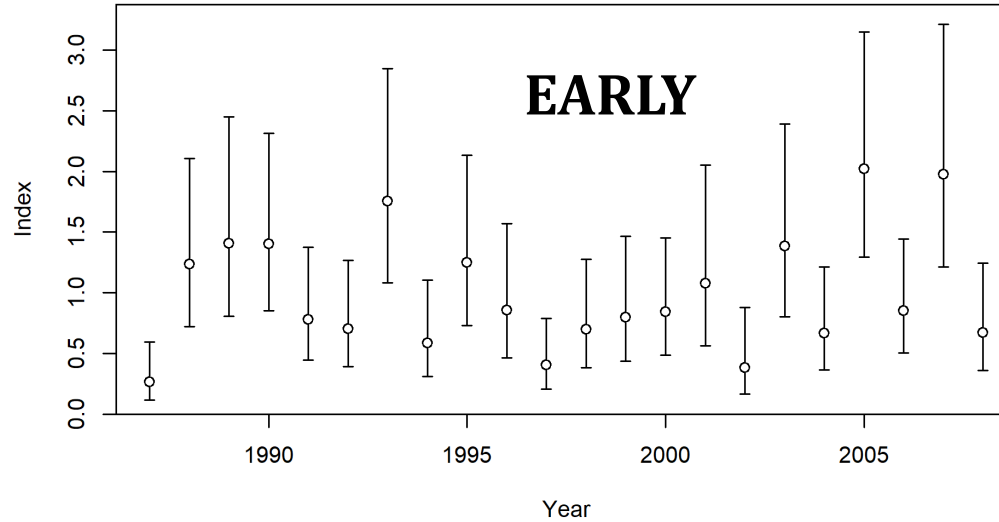
FD Indices: VL CPUE Index WP-08

b. Mean (whole wt./trip) from raw and log-transformed data



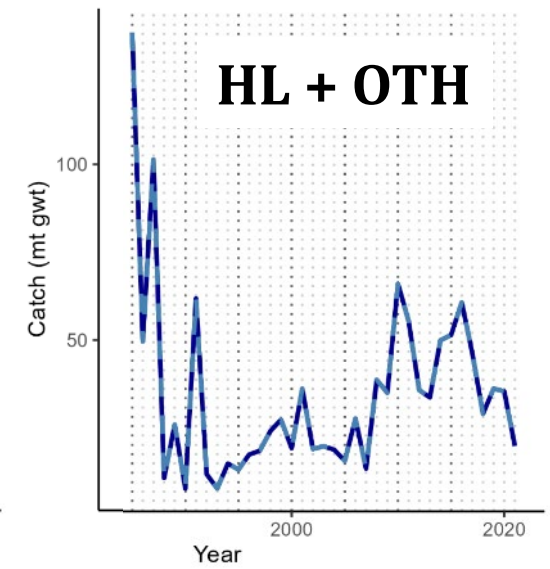
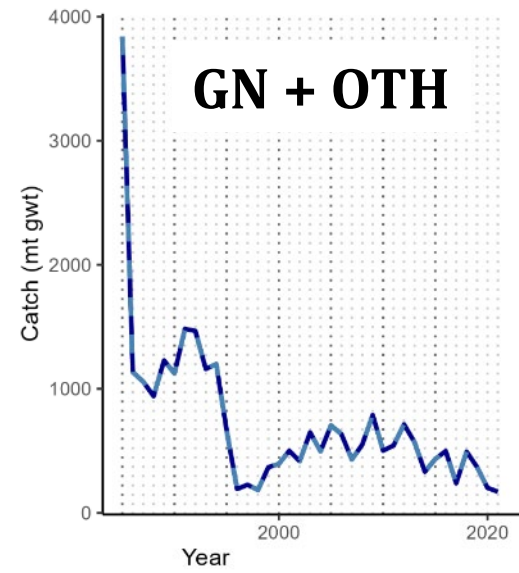
FI Indices

| Data Component | Decision |
|--|--|
| SEAMAP Index <div style="border: 1px solid black; padding: 2px; display: inline-block;">WP-09</div> | <ul style="list-style-type: none"> Split: early (pre 2008, NW/Central GOM), late (post 2008, entire Northern GOM) |

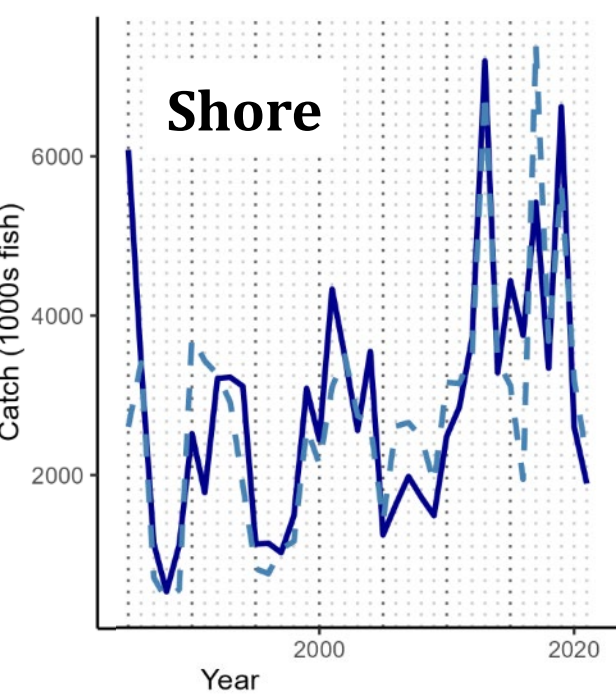
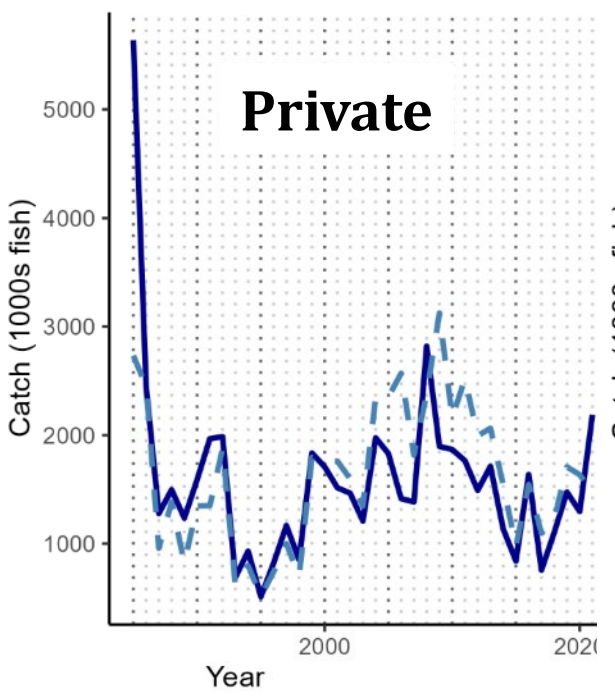
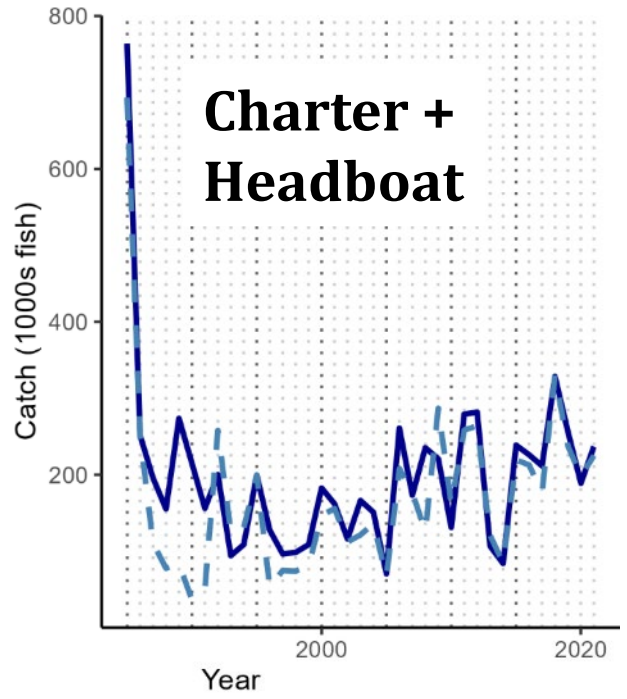


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Model fits to Catches



Legend
— Expected
— Observed

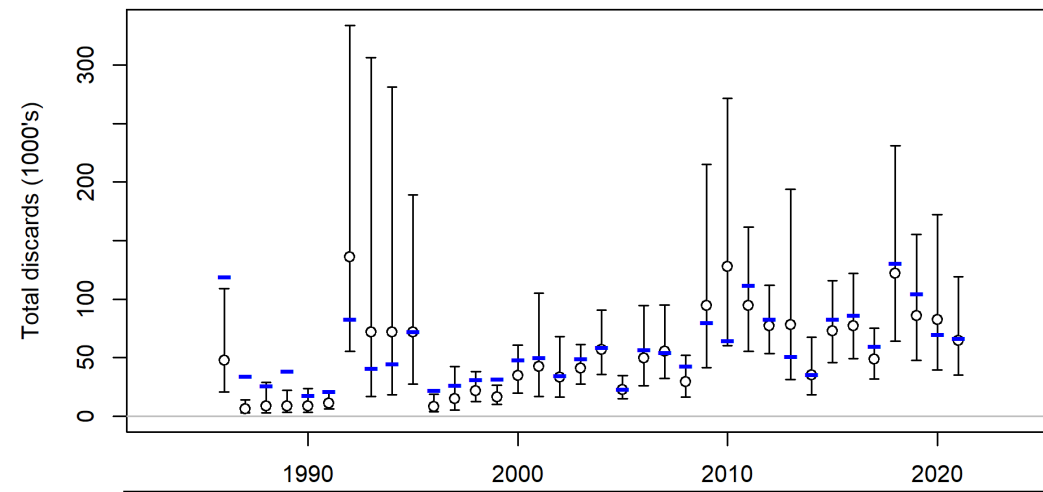


Legend
— Expected
— Observed

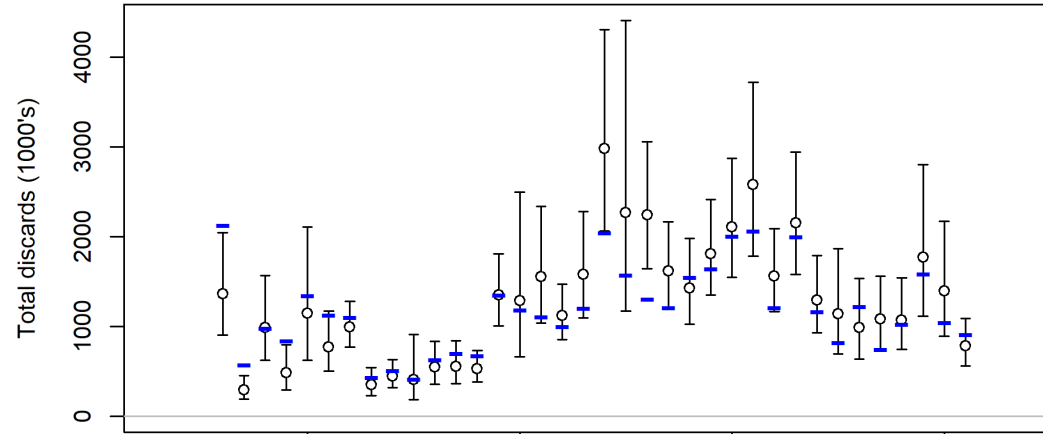


Recreational Discards

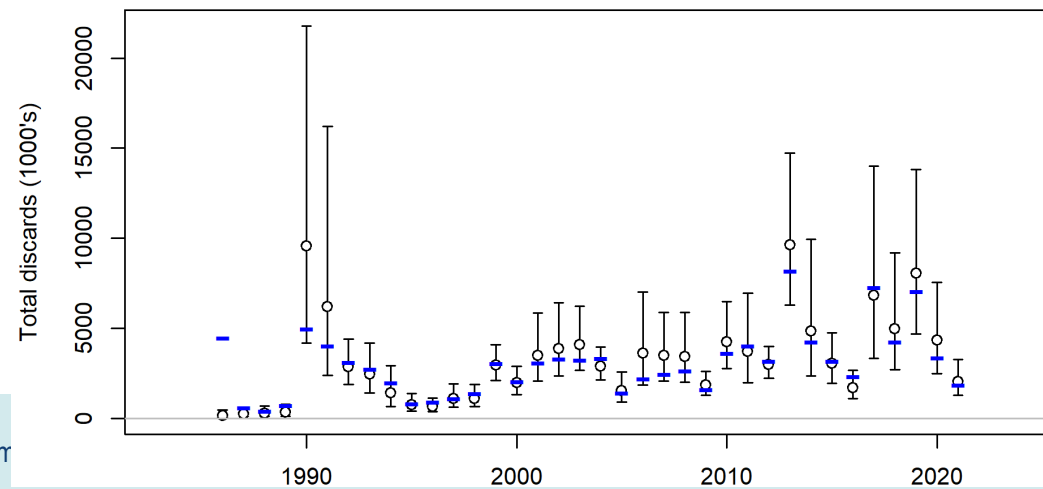
HB



CB

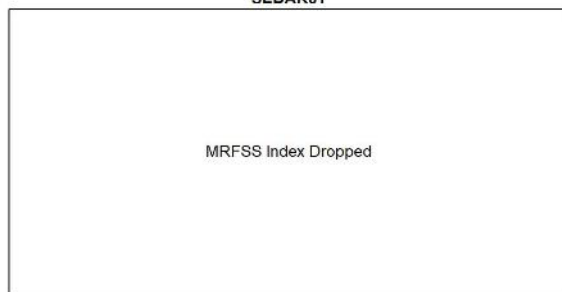


Pr

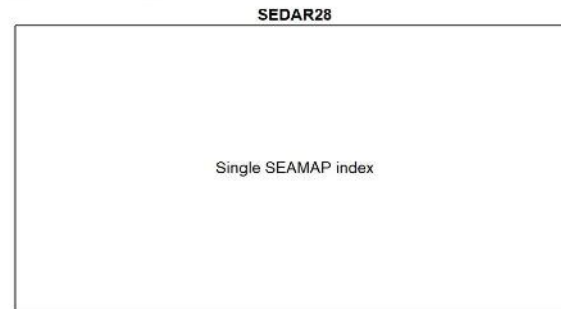
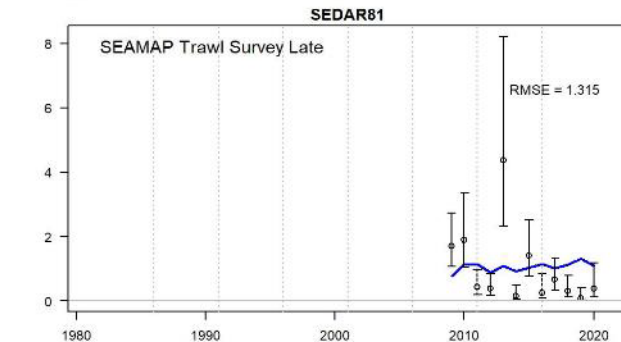
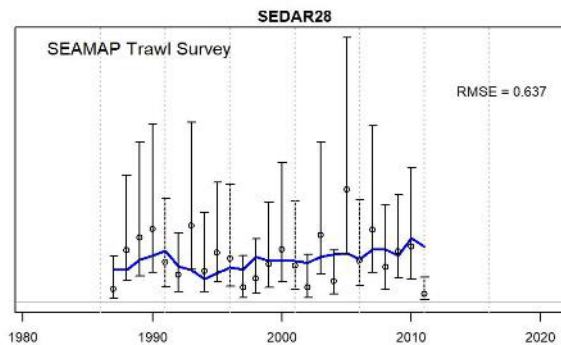
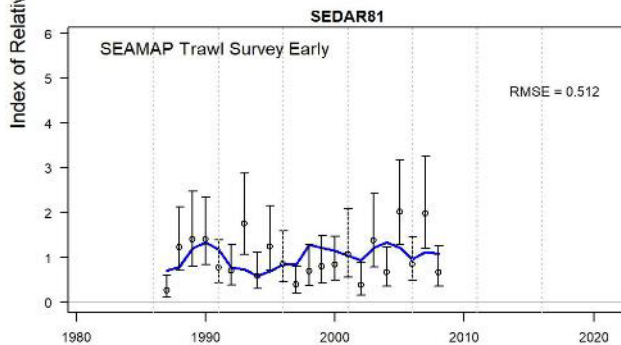
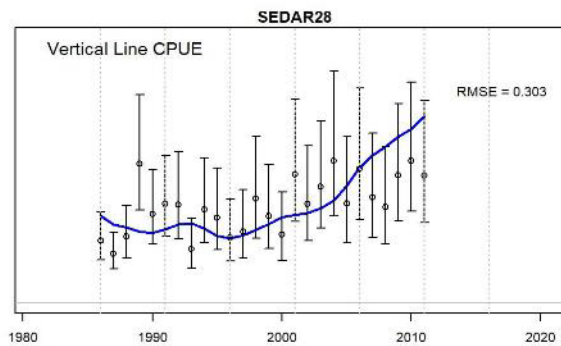
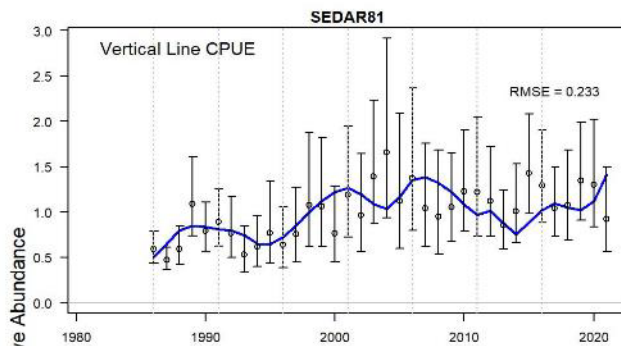
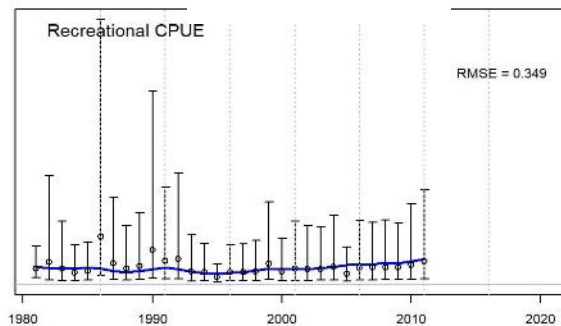


Index Fits

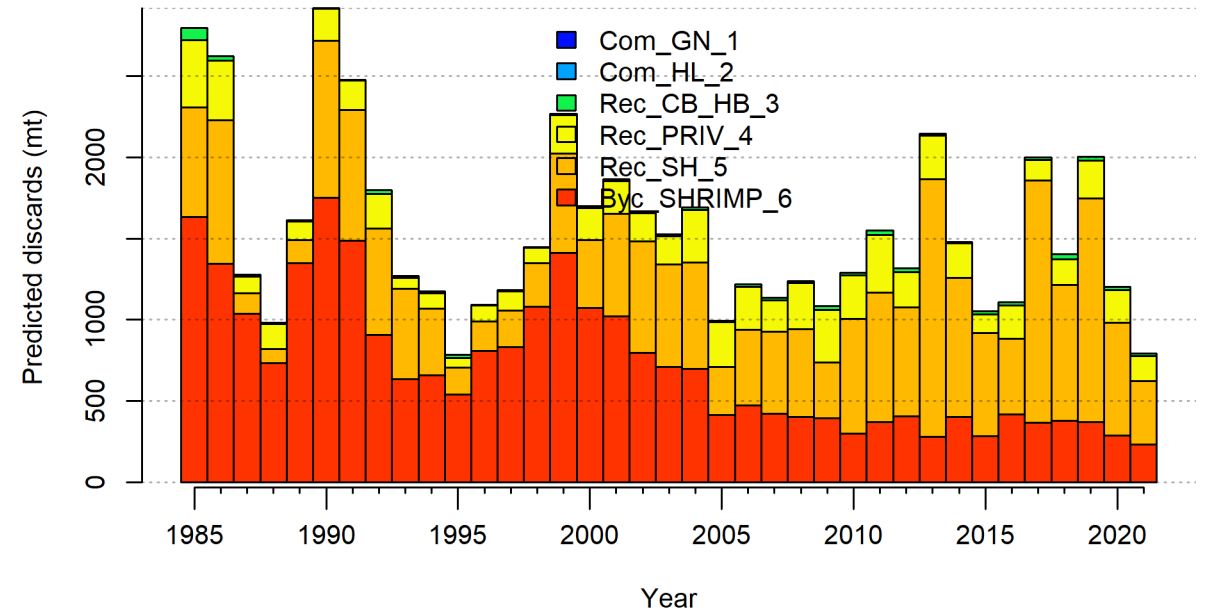
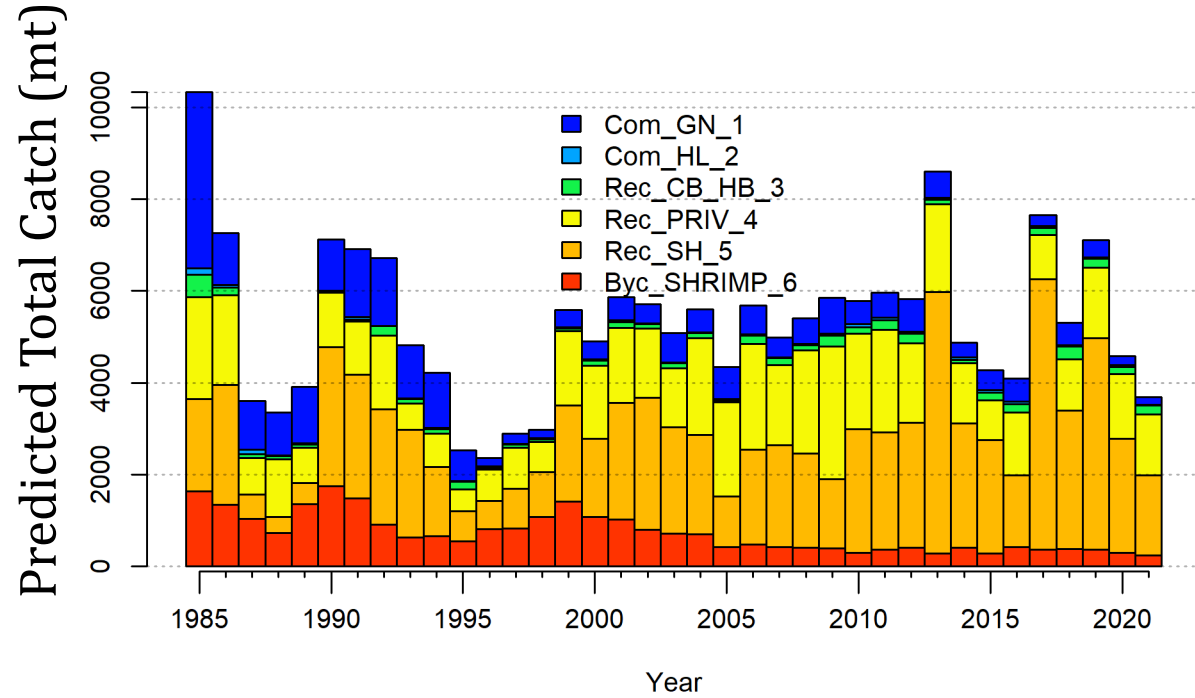
SEDAR 81



SEDAR 28

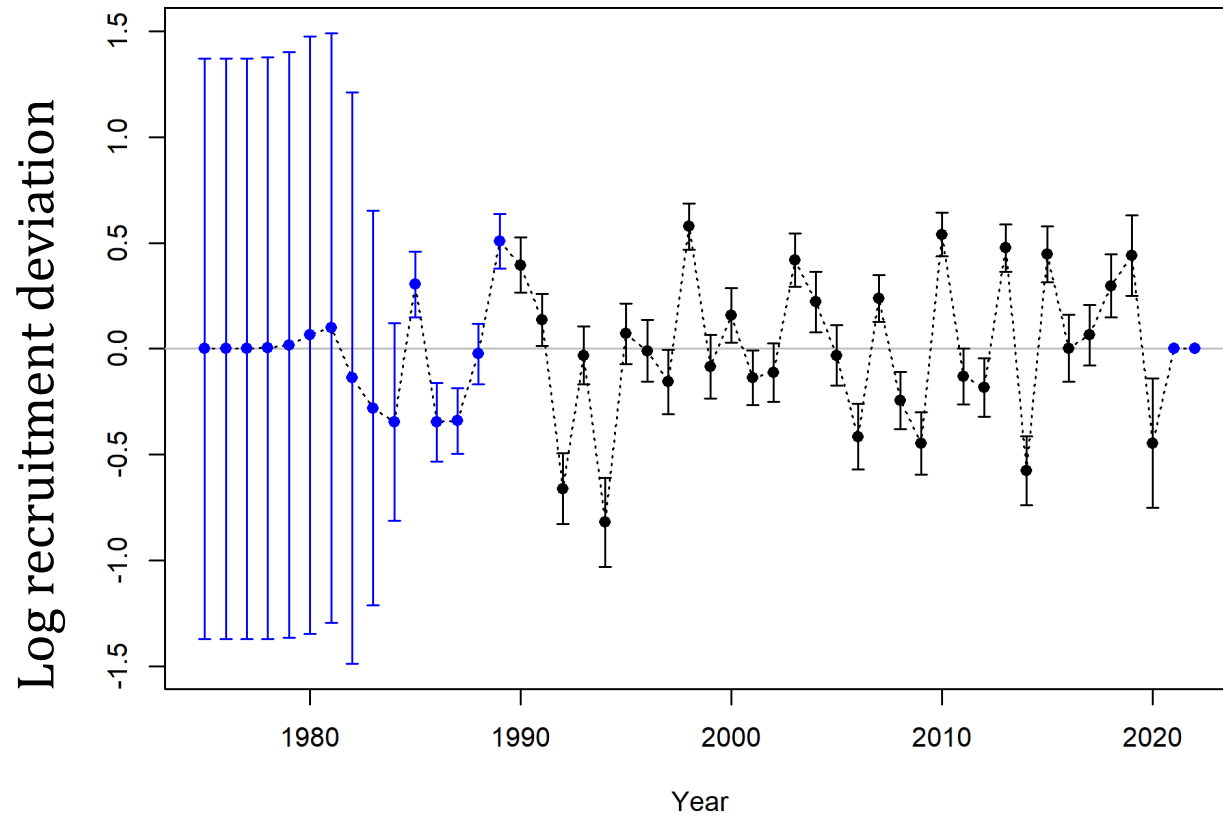


Shrimp Bycatch

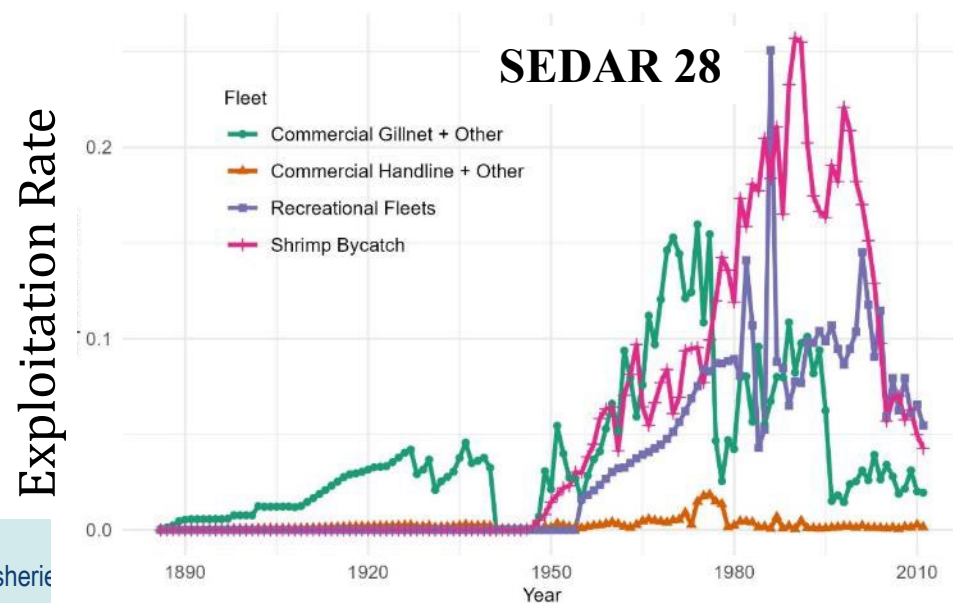
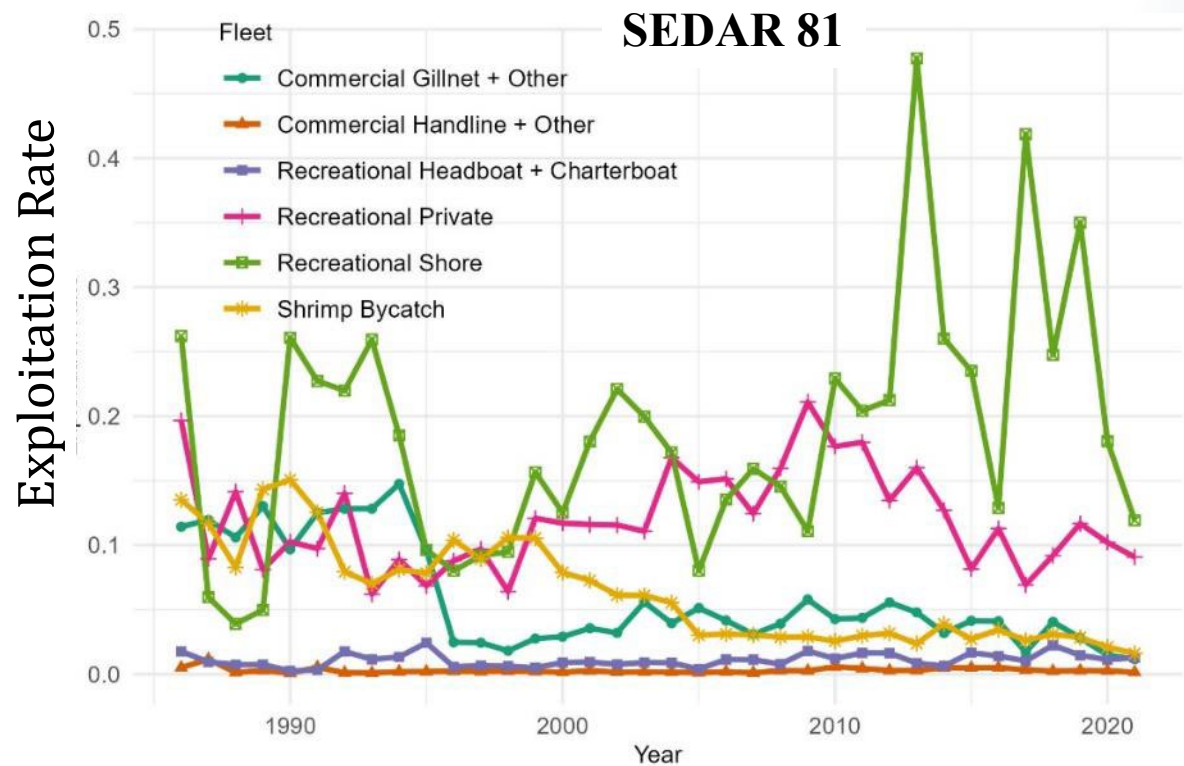
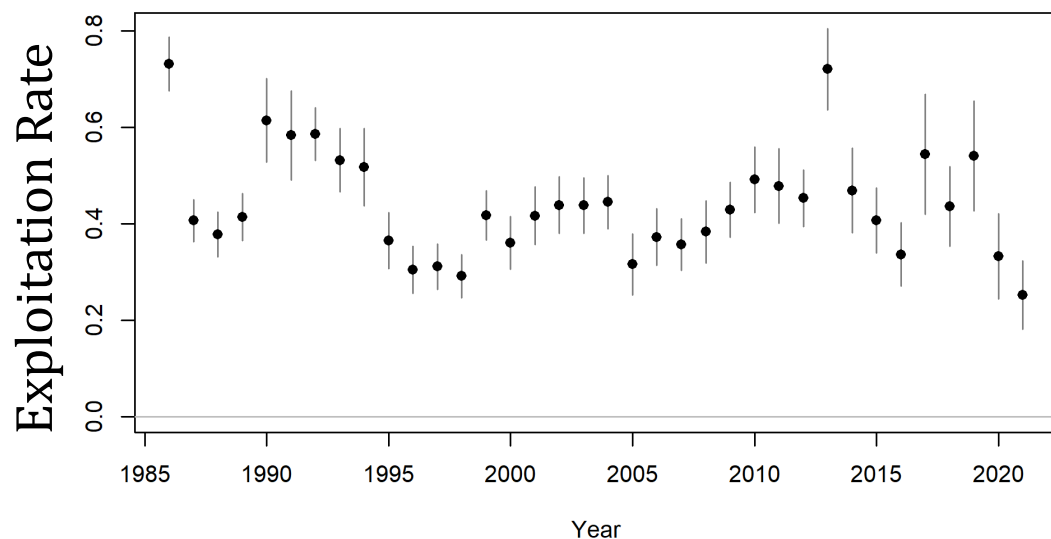


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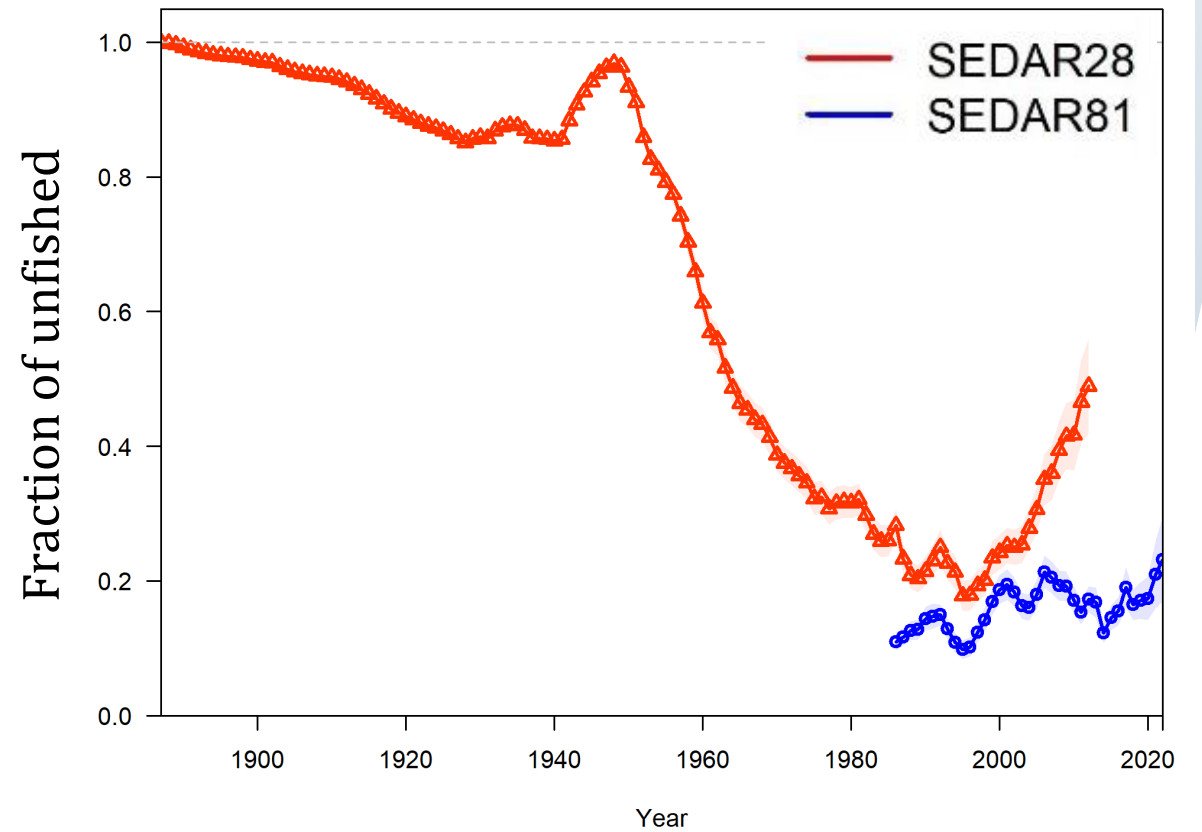
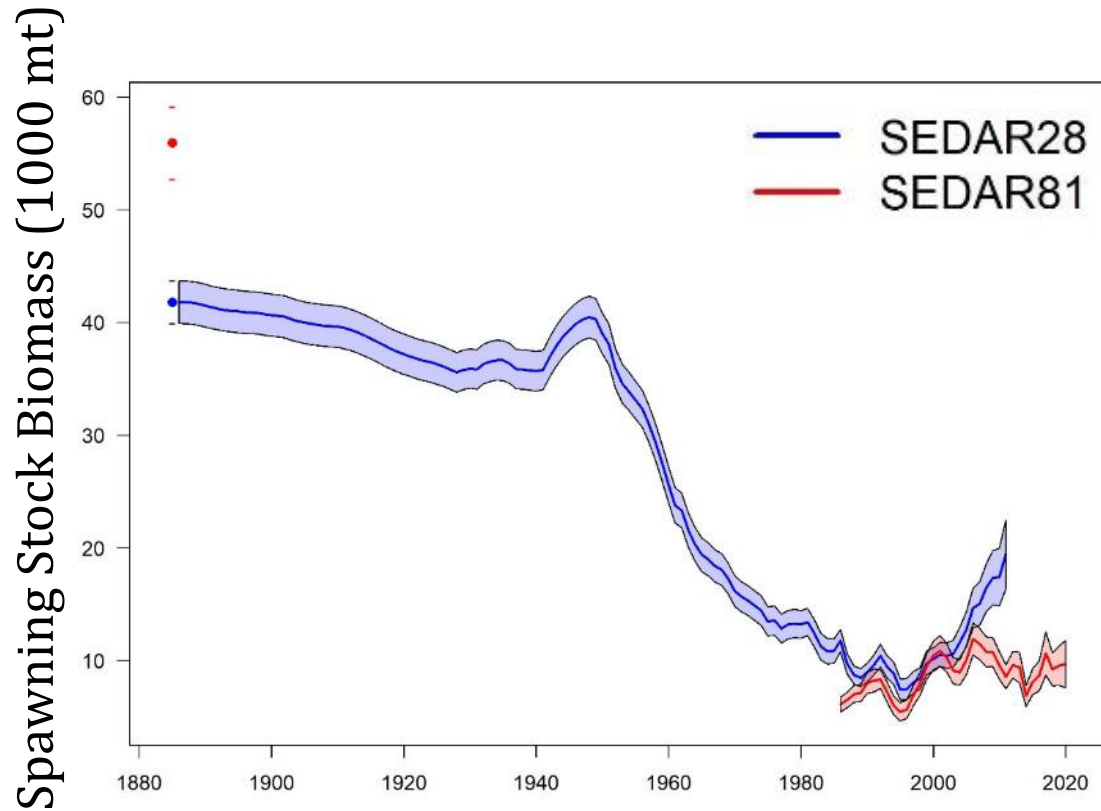
Recruitment



Exploitation Rate



SSB and SSB/SSB₀ trajectories



Conclusions & Recommendations

- Improvements

- Characterization of recreational fleets' selectivity and retention
 - Splitting into 3 components
 - Post stratification of length data
 - Some discard length data to inform retention
- Fit to the VL index
- Maturity function (correction)
- Improved diagnostics

- Some issues remain

- Poor prediction skills of indices
- Uncertainty in shrimp bycatch time series
- Sensitivity to fixed values of M , steepness, σ_R
- Gaps in sampling for composition data
- Insufficient discard length data
- Trade-offs between fitting to length vs. fitting to age data (likelihood profiles)
- Misfits to GN length compositions



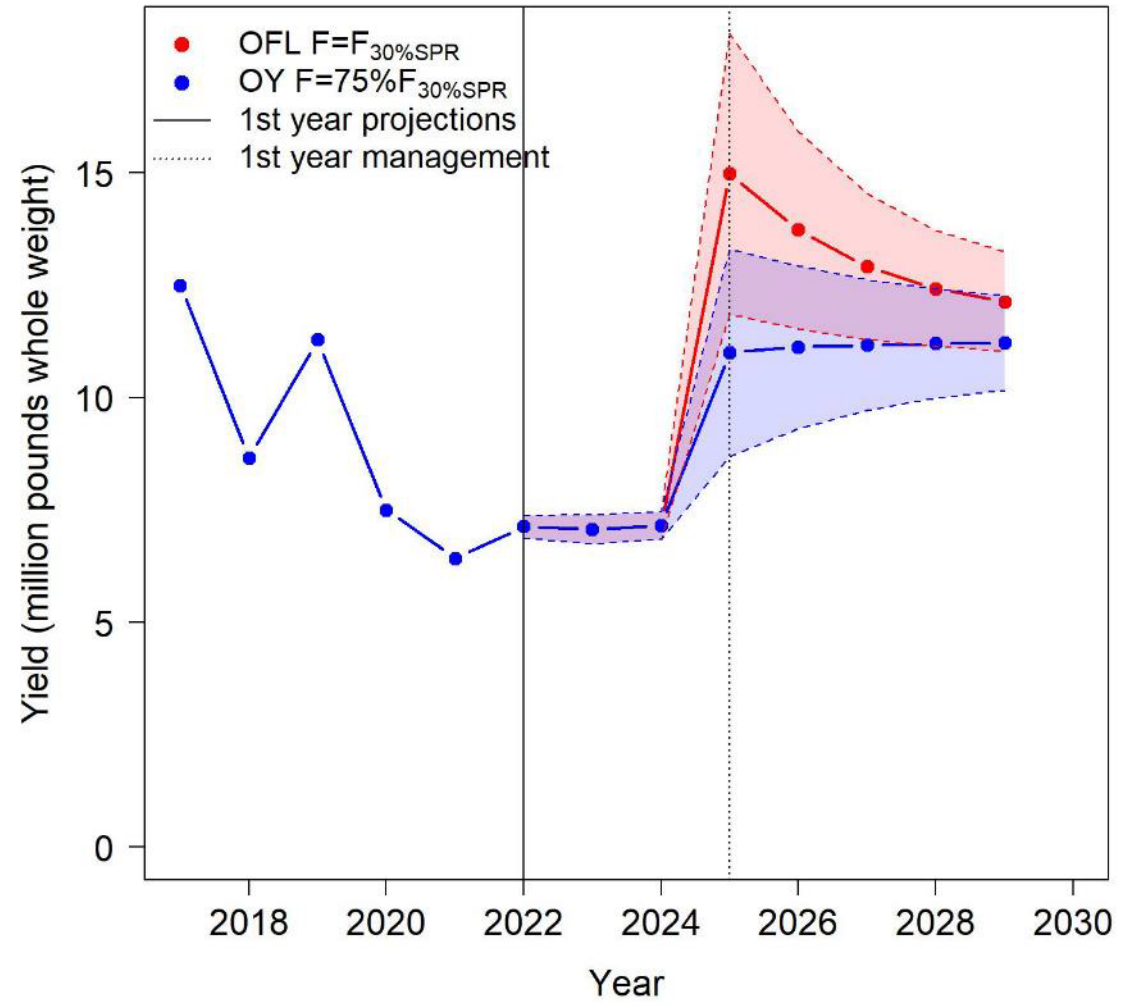
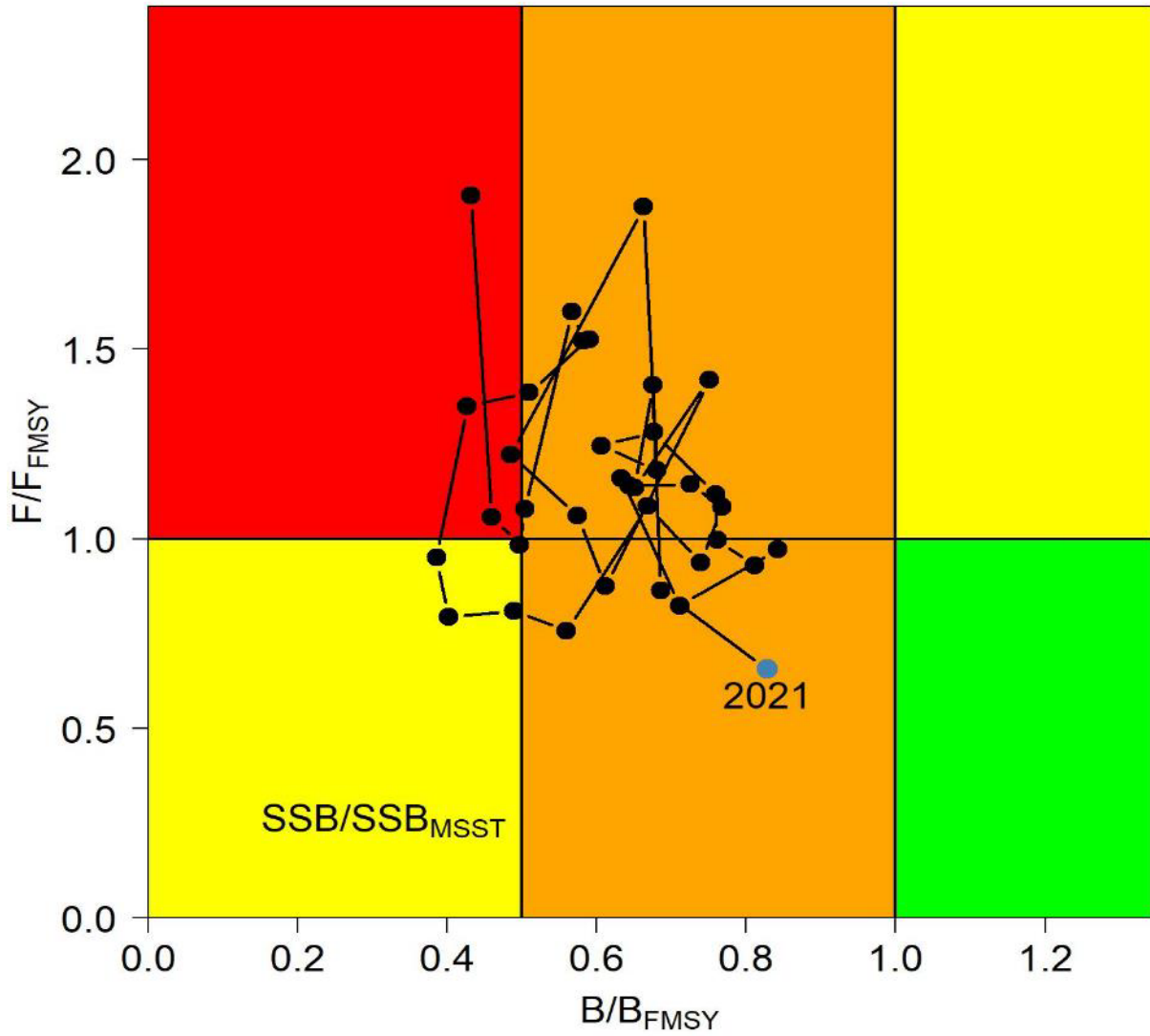
Catch Equivalency Table

| Year | SEDAR 28 CHTS OFL (stochastic) | SEDAR 28 CHTS OFL (deterministic) | SEDAR 28 FES OFL (deterministic) | % Difference OFL CHTS vs. FES (deterministic) |
|------|-----------------------------------|--------------------------------------|-------------------------------------|---|
| 2013 | 14,396,226 | 13,340,707 | 15,980,894 | 20 |
| 2014 | 12,897,078 | 12,086,476 | 14,772,100 | 22 |
| 2015 | 12,059,320 | 11,311,376 | 14,433,537 | 28 |
| 2016 | 11,530,209 | 10,831,056 | 14,313,782 | 32 |
| 2017 | 11,133,375 | 10,522,276 | 14,240,611 | 35 |
| 2018 | 10,824,727 | 10,319,782 | 14,188,582 | 37 |
| 2019 | 10,670,403 | 10,183,294 | 14,151,632 | 39 |



MSRA benchmarks and reference points

| Criteria | Definition | Value |
|--------------------------------|--|---------|
| Base M | Target M for fully selected ages in the Lorenzen (2005) scaling | 0.38 |
| Steepness | Steepness of the Beverton-Holt stock-recruit relationship (fixed) | 0.80 |
| R0 | Virgin Recruitment (1000s) | 104,409 |
| Generation Time | Fecundity-weighted mean age | 5 |
| SSB0 | Virgin spawning stock biomass (mt) | 55,928 |
| Mortality Rate Criteria | | |
| $F_{MSYproxy}$ | $F_{30\%SPR}$ | 0.38 |
| MFMT | $F_{MSYproxy}$ | 0.38 |
| $F_{current}$ | Geometric mean of the last 3 years of the assessment ($F_{2019-2021}$), including shrimp bycatch fleet | 0.36 |
| $F_{current}/MFMT$ | Current stock status based on MFMT | 0.93 |
| Biomass Criteria | | |
| $SSB_{MSYproxy}$ | Equilibrium SSB at $F_{30\%SPR}$ | 14,168 |
| MSST | $(1-M) * SSB_{MSYproxy}$ | 8,754 |
| $SSB_{current}$ | SSB_{2021} | 11,734 |
| $SSB_{current}/SSB_{FMSY}$ | Current stock status based on $SSB_{F30\%SPR}$ | 0.83 |
| $SSB_{current}/MSST$ | Current stock status based on MSST | 1.34 |
| $SSB_{current}/SSB0$ | SSB ratio in 2021 | 0.21 |



OFL Projections : $F=F_{30\%SPR}$

| Year | R (1000s) | F | F/FMSY | SSB (mt) | SSB/ SSBFMSY | SSB/ MSST | SSB/SSB0 | OFL (mp ww) |
|-------------|--------------|-------|--------|-------------|-----------------|--------------|----------|----------------|
| 2022 | 86,494 | 0.271 | 0.71 | 12,964 | 0.915 | 1.481 | 0.232 | 7.131 |
| 2023 | 88,258 | 0.240 | 0.62 | 14,238 | 1.005 | 1.626 | 0.255 | 7.069 |
| 2024 | 90,542 | 0.216 | 0.56 | 16,208 | 1.144 | 1.852 | 0.290 | 7.157 |
| 2025 | 92,472 | 0.384 | 1.00 | 18,244 | 1.288 | 2.084 | 0.326 | 14.980 |
| 2026 | 91,102 | 0.384 | 1.00 | 16,759 | 1.183 | 1.914 | 0.300 | 13.732 |
| 2027 | 90,031 | 0.384 | 1.00 | 15,731 | 1.110 | 1.797 | 0.281 | 12.915 |
| 2028 | 89,339 | 0.384 | 1.00 | 15,120 | 1.067 | 1.727 | 0.270 | 12.429 |
| 2029 | 88,905 | 0.384 | 1.00 | 14,756 | 1.041 | 1.686 | 0.264 | 12.137 |

Constant catch

- three-year (2025-2027) : 13.876 mp ww
- five-year (2025-2029): 13.239 mp ww



ABC Projections : $F=75\%F_{30\%SPR}$

| Year | R (1000s) | F | F/FMSY | SSB (mt) | SSB/ SSBFMSY | SSB/ MSST | SSB/SSB0 | OY (mp ww) |
|-------------|--------------|-------|--------|-------------|-----------------|--------------|----------|---------------|
| 2022 | 86,494 | 0.271 | 0.71 | 12,964 | 0.915 | 1.481 | 0.232 | 7.131 |
| 2023 | 88,257 | 0.240 | 0.62 | 14,238 | 1.005 | 1.627 | 0.255 | 7.069 |
| 2024 | 90,541 | 0.216 | 0.56 | 16,208 | 1.144 | 1.852 | 0.290 | 7.157 |
| 2025 | 92,471 | 0.288 | 0.75 | 18,244 | 1.288 | 2.084 | 0.326 | 11.004 |
| 2026 | 91,101 | 0.288 | 0.75 | 18,483 | 1.305 | 2.111 | 0.330 | 11.128 |
| 2027 | 90,031 | 0.288 | 0.75 | 18,561 | 1.310 | 2.120 | 0.332 | 11.175 |
| 2028 | 89,338 | 0.288 | 0.75 | 18,603 | 1.313 | 2.125 | 0.333 | 11.201 |
| 2029 | 88,905 | 0.288 | 0.75 | 18,629 | 1.315 | 2.128 | 0.333 | 11.217 |

Constant catch

- three-year (2025-2027) : 11.102 mp ww
- five-year (2025-2029): 11.145 mp ww



SSC Motions: *all carried with no opposition*

Motion: The SSC accepts the SEDAR 81 Gulf of Mexico Spanish Mackerel Operational Assessment as consistent with the best scientific information available. Under the current MSY proxy of F30%SPR, the assessment indicates the stock is not overfished and not overfishing as of 2021.

Motion: The SSC sets the OFL for Gulf Spanish mackerel based on SEDAR 81 and the revised projections, using a constant catch of 12.074 mp ww for 2025 – 2027.

Motion: The SSC sets the ABC for Gulf Spanish mackerel based on the SEDAR 81 revised projections, using the yield at 75% of F30%SPR. The constant catch for 2025 – 2027 is 9.630 mp ww.