Northern Stock Red Drum SS Model Results

Angela Giuliano

August 13, 2024

Fishing Fleets

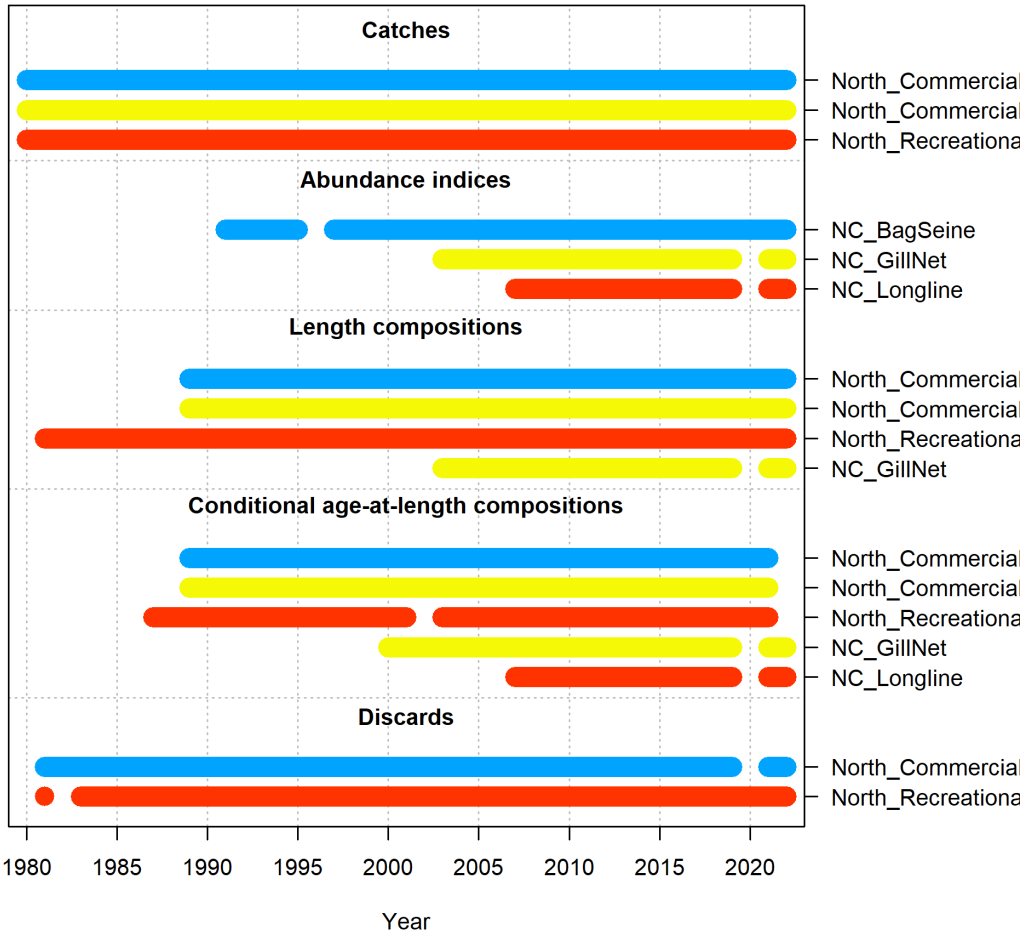
Fishing Fleet Name	Years	Discard Mortality	Catch Error Type	Selectivity	Retention Periods	Composition Error Type
North_Commercial_GNBS	1981-2022	1	Lognormal	Double Normal Length and Derived Age	1981-1991, 1992-1997, 1998-2022	Multinomial
North_Commercial_Other	1981-2022	n/a	Lognormal	Double Normal Length and Derived Age	1981-2022*	Multinomial
North_Recreational	1981-2022	0.08	Lognormal	Double Normal Length and Derived Age	1981-1991, 1992-1997, 1998-2022	Multinomial

*The commercial other fleet is a selectivity block, not a retention block, due to a lack of discard information.

Fishery Independent Surveys

Survey Name	Years	Timing	Catch Error Type	Selectivity	Composition Error Type
NC_BagSeine	1991-1995, 1997-2022	October 1	Lognormal	Age-0 Recruitment (SS special survey type 33)	NA
NC_GillNet	2003-2019, 2021-2022	October 1	Lognormal	Double Normal Length and Derived Age	Multinomial
NC_Longline	2007-2019, 2021-2022	September 1	Lognormal	Logistic Age	Multinomial

Data


Catches
North_Commercial
North_Commercial
North_Recreationa
Abundance indices
NC_BagSeine
NC_GillNet
NC_Longline
Length compositions
North_Commercial
North_Commercial
North_Recreationa
NC_GillNet
Conditional age-at-length compositions
North_Commercial
North_Commercial
North_Recreationa
NC_GillNet
NC_Longline
Discards
North_Commercial
North_Recreationa
1980
1985
1990
1995
2000
2005
2010
2015
2020
Year

Two Models Considered

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- Estimated Selectivity Model
  - Selectivity parameters estimated for all 3 fleets
  - Narrow rec fleet selectivity & low selectivity for larger fish
  - Model convergence often not achieved
- Hybrid Selectivity Model
  - Fixed selectivity for Comm_GNBS and Rec fleets
    - Based on simulation assessment
  - Estimated selectivity for Comm_Other
    - Initial fits to comp data suggested misspecification in simulation assessment
  - Retention parameters were still estimated in the model

Model Parameters & Convergence/Stability

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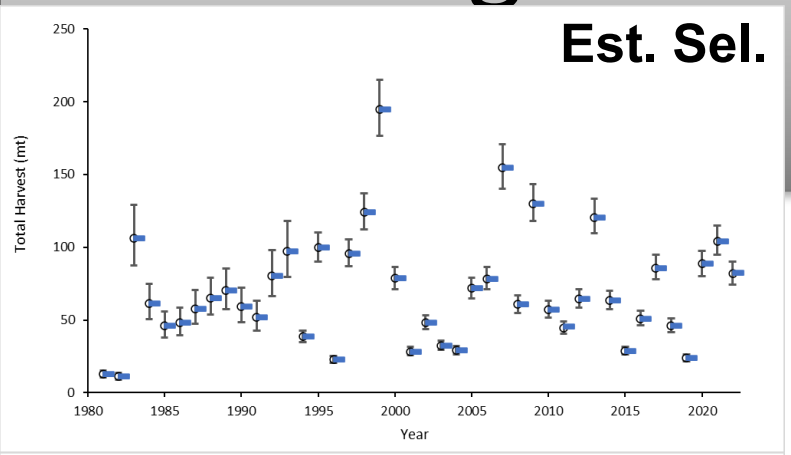
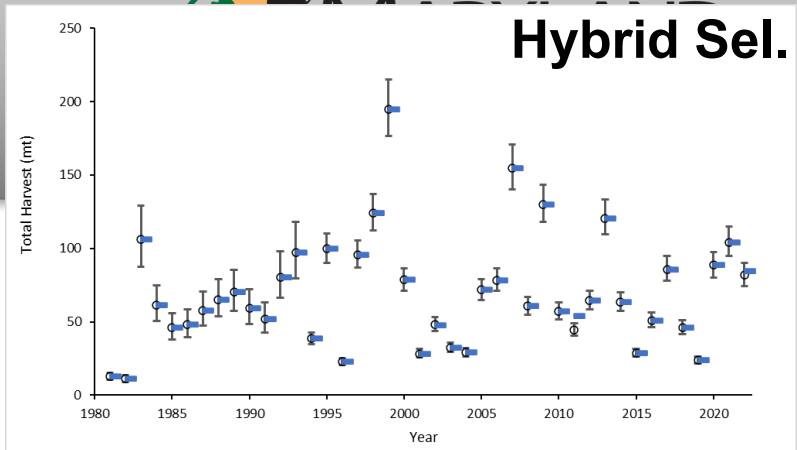
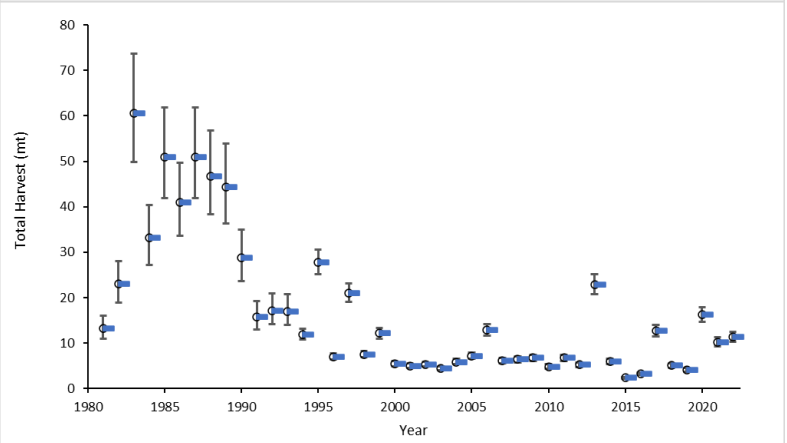
	Estimated Selectivity Model	Hybrid Selectivity Model
Maximum Gradient	0.00425	0.01789
Hessian Matrix Positive Definite	Yes	Yes
Estimated Parameters	62	54
Estimated Deviations	54	54
Parameters within 1% of Bounds	13	0
Parameters Highly Correlated (>+0.95)	0	0
Parameters with Low Correlations (<0.01) with All Other Parameters	9	3

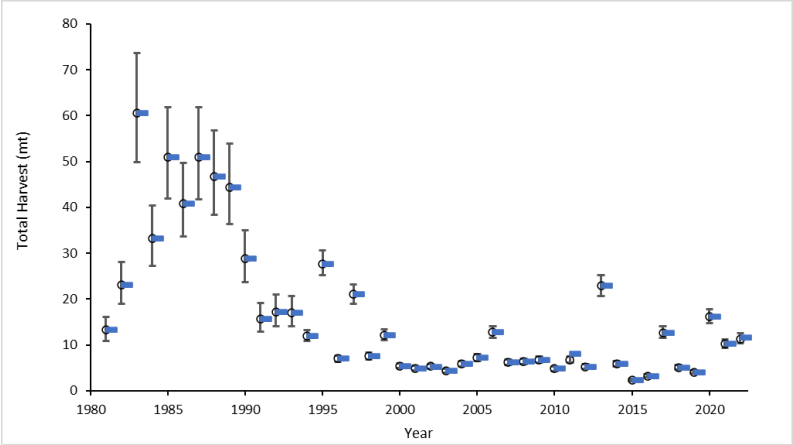
Fishing Fleet Harvest



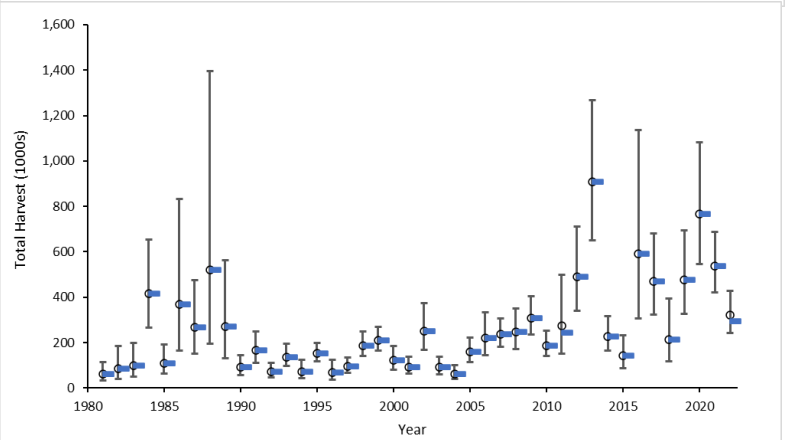


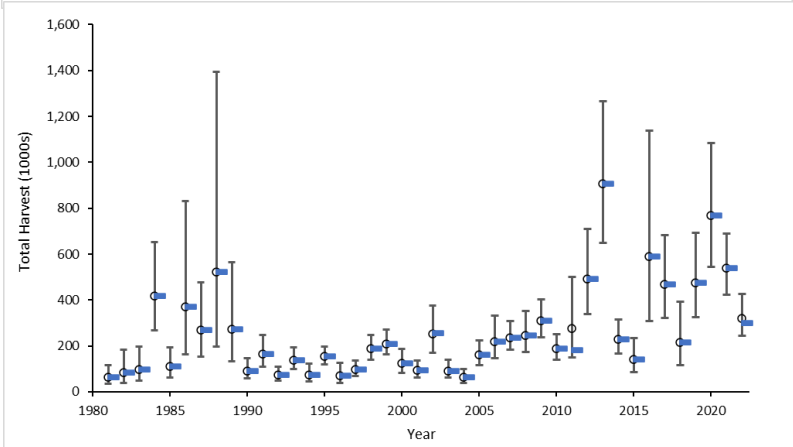
Comm_GNBS





Comm_Other





North_Rec

Fishing Fleet Discards

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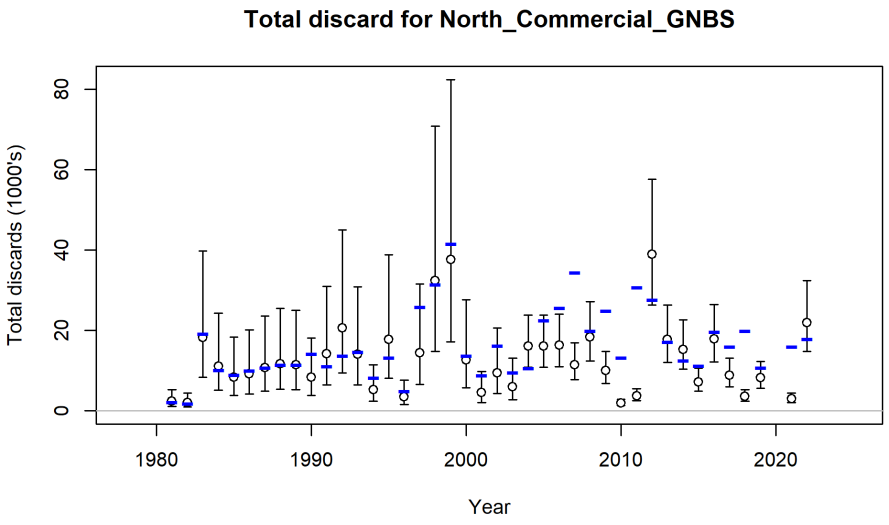
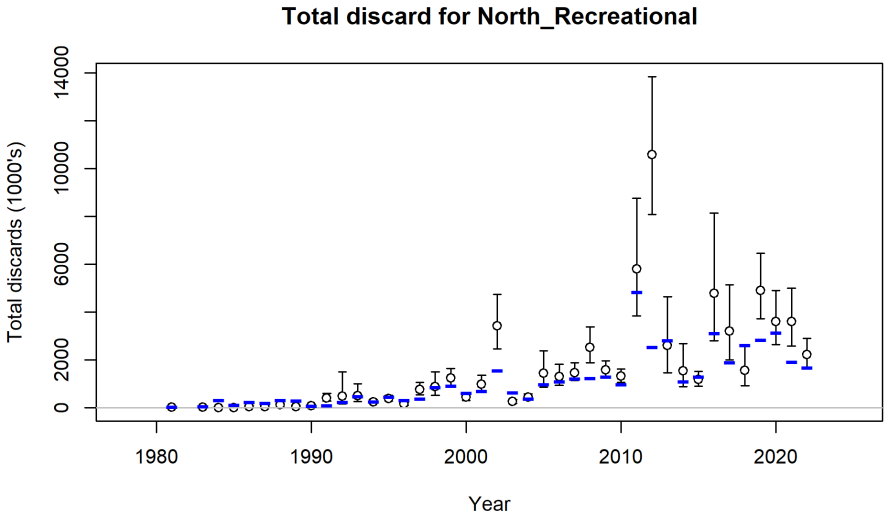
Est. Sel.





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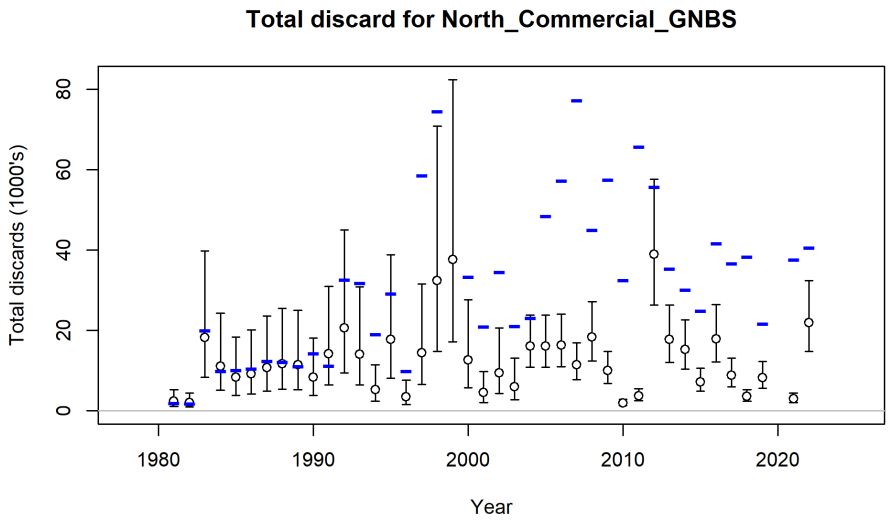

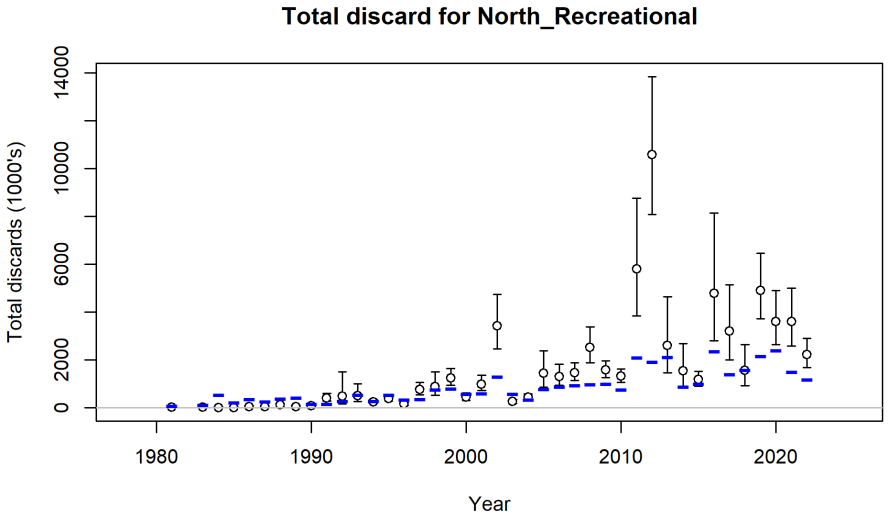

Age-0 Bag Seine Index

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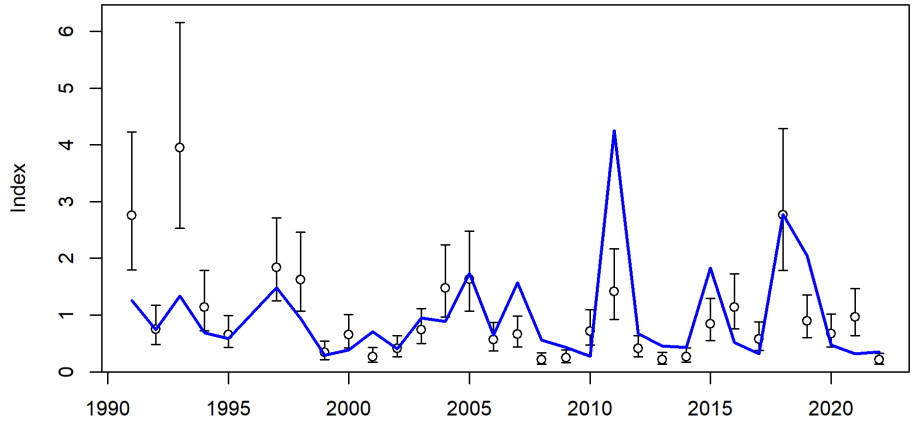

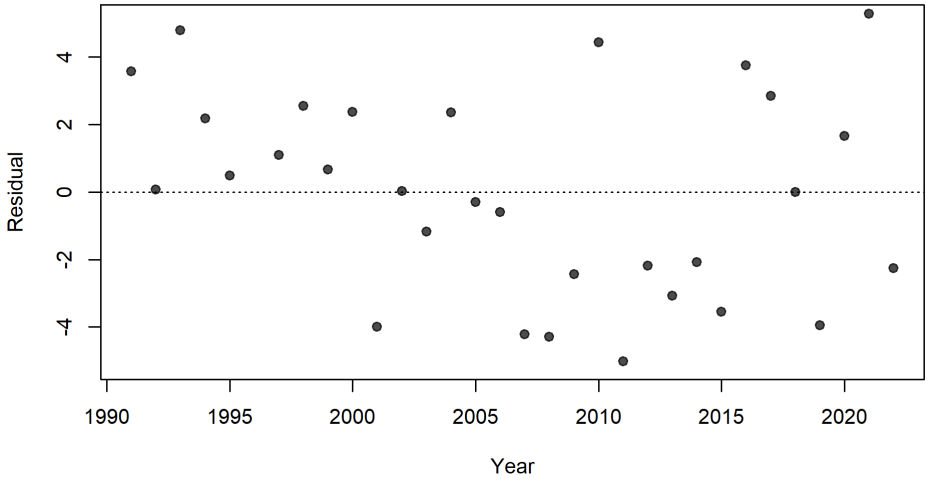

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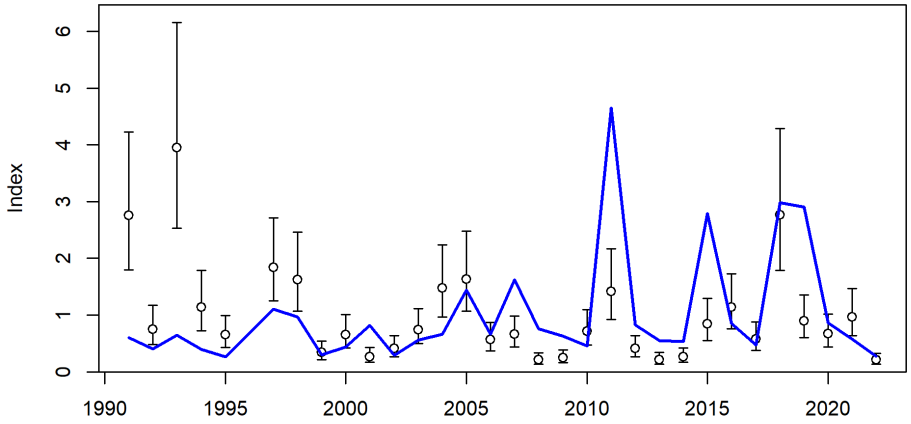

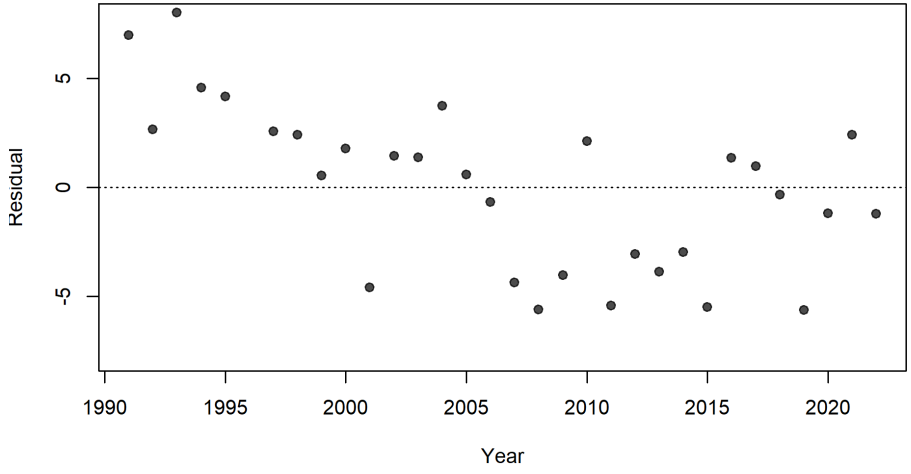

Sub-Adult Gill Net Index

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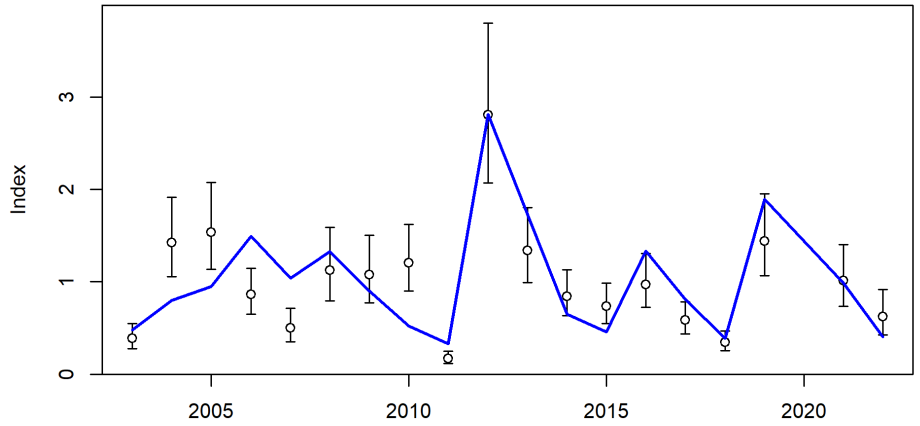

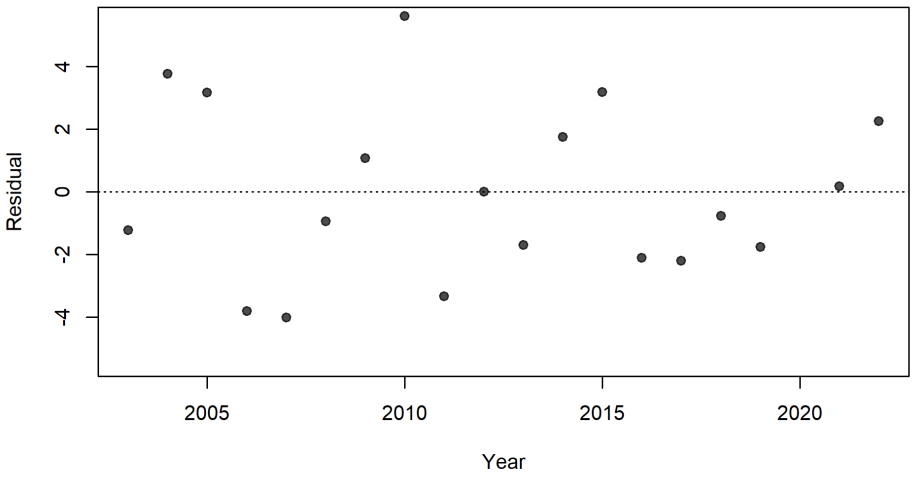

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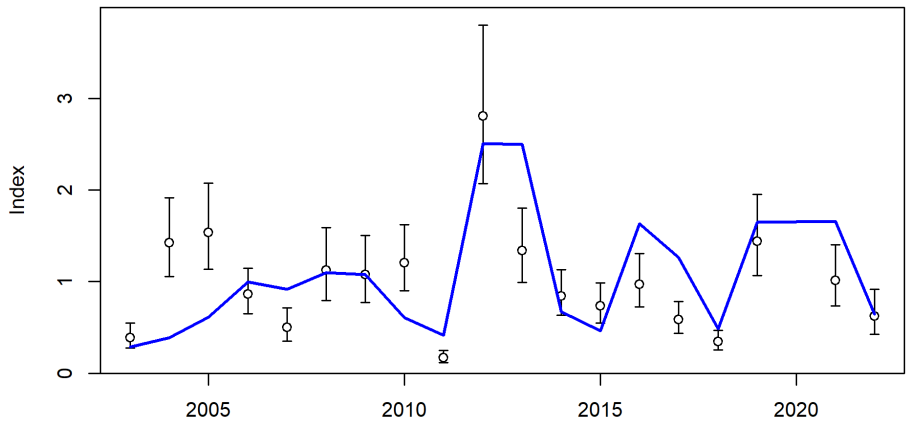

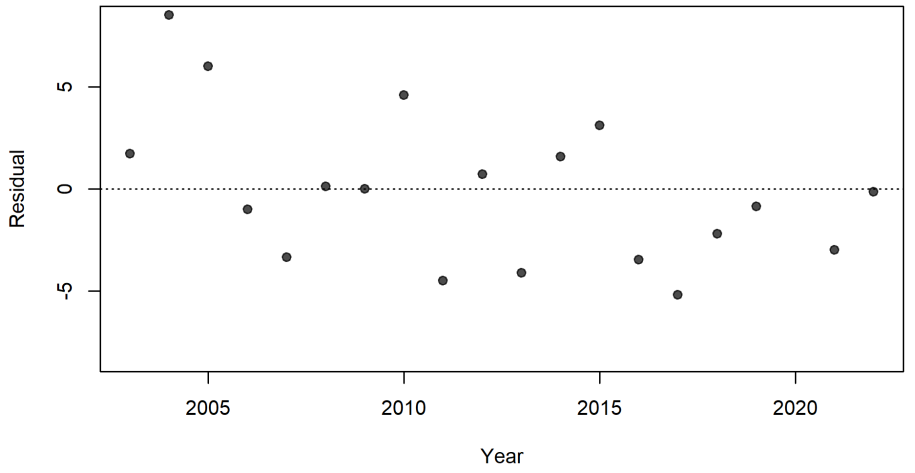

Adult Longline Index

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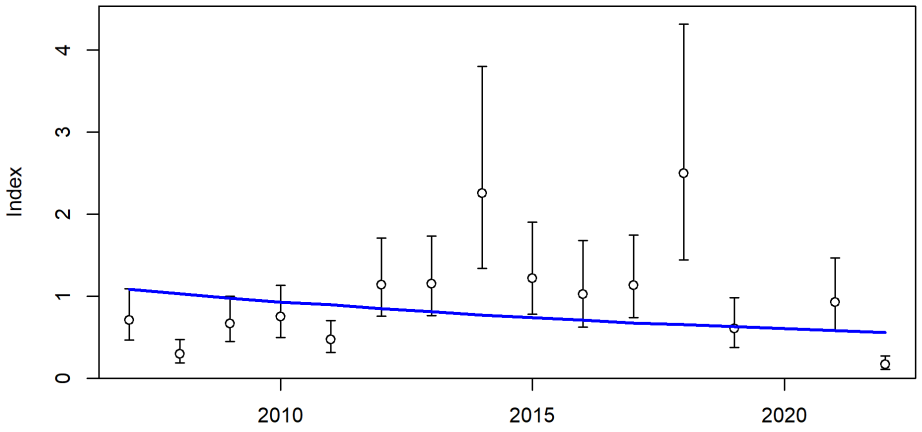

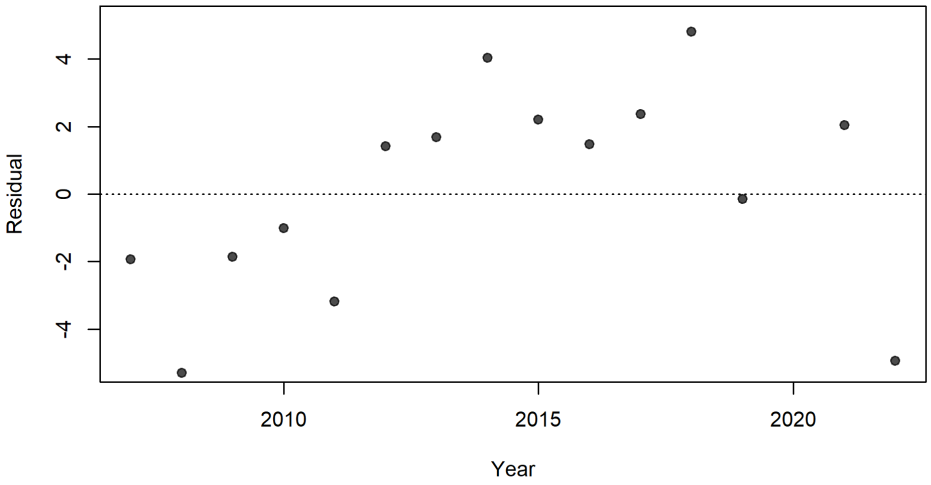

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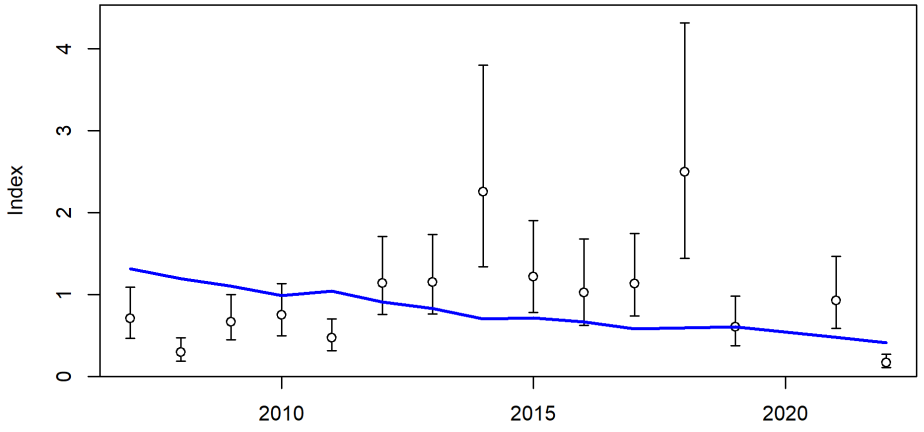

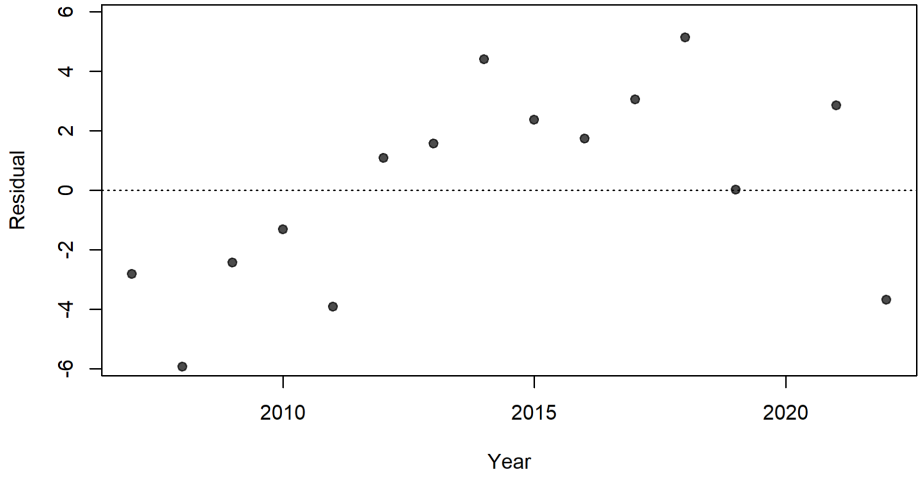

Length Compositions

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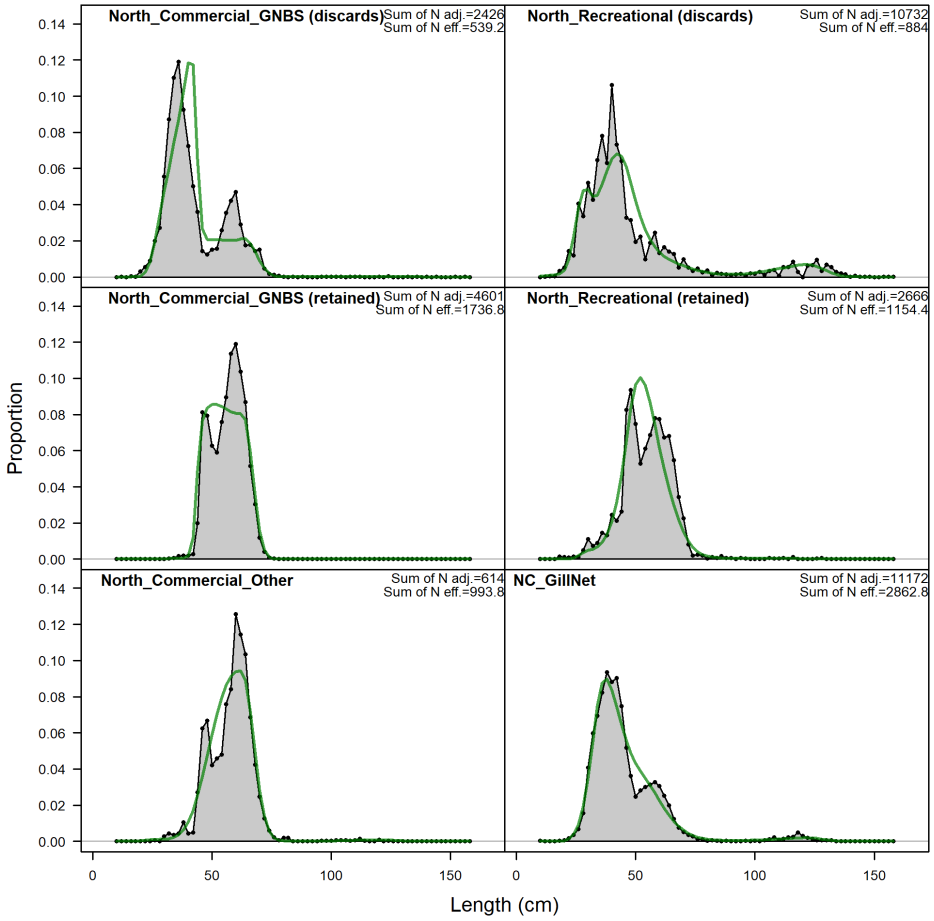

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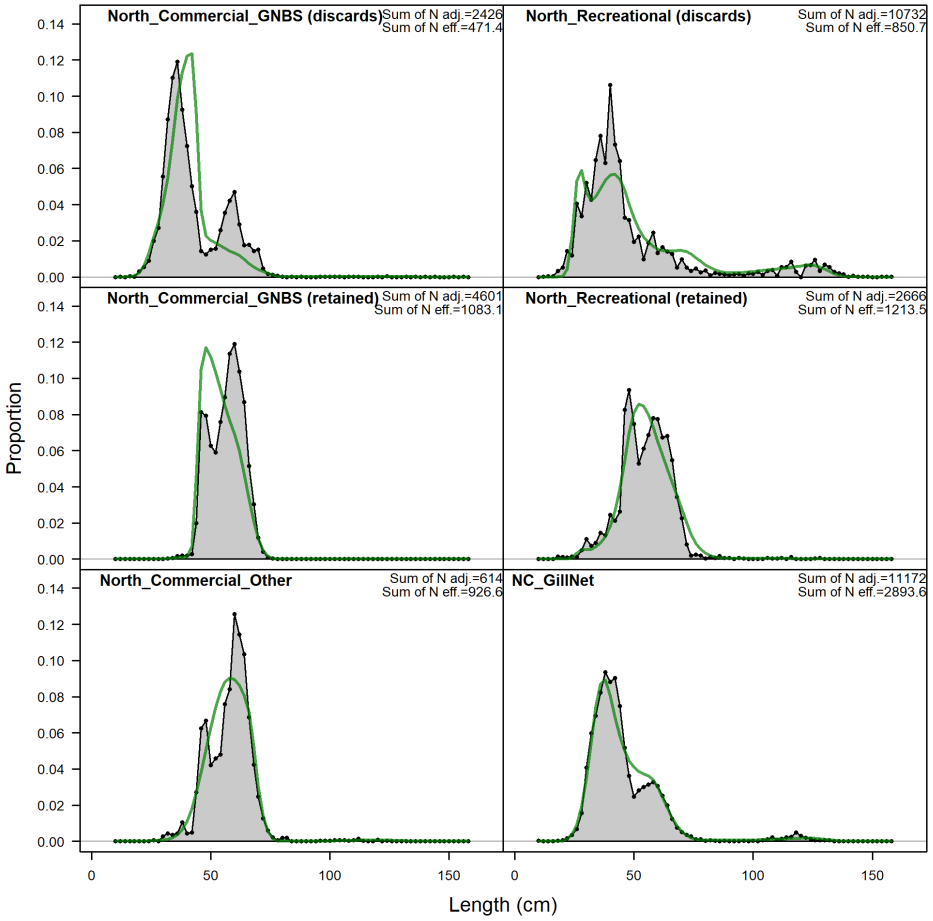

Conditional Age-at-Length

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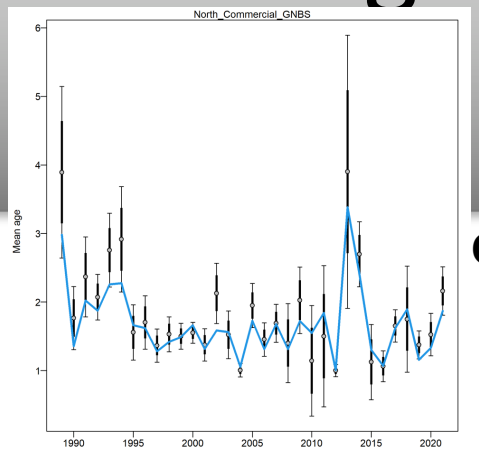
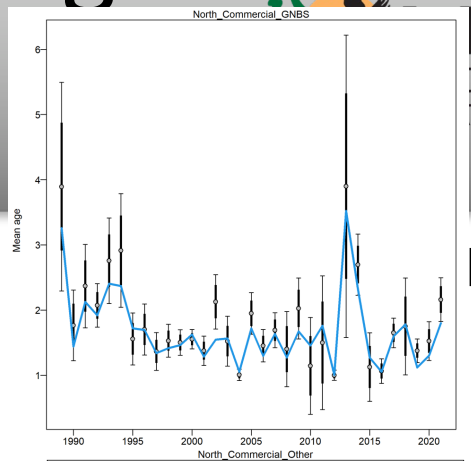
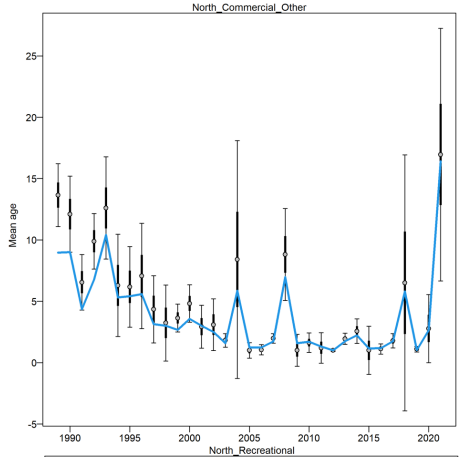


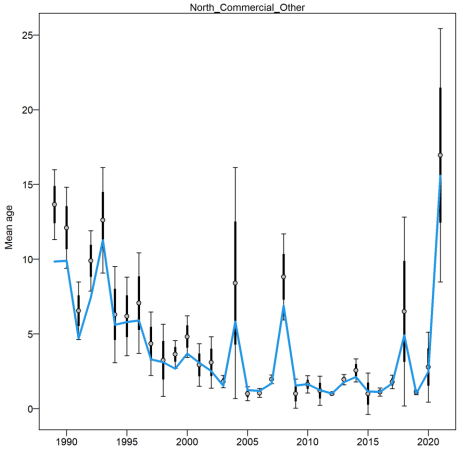
Comm_GNBS

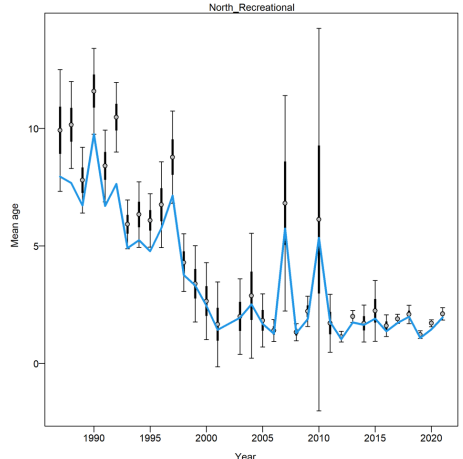


Hybrid Sel.

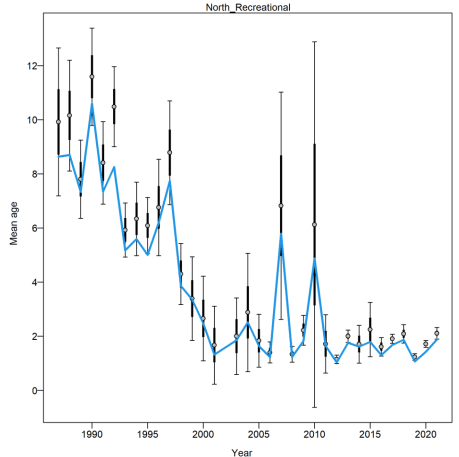


Comm_Other





North_Rec



Conditional Age-at-Length

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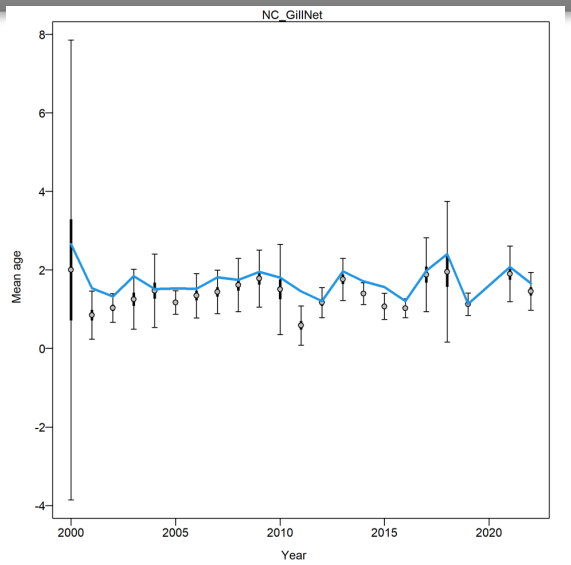
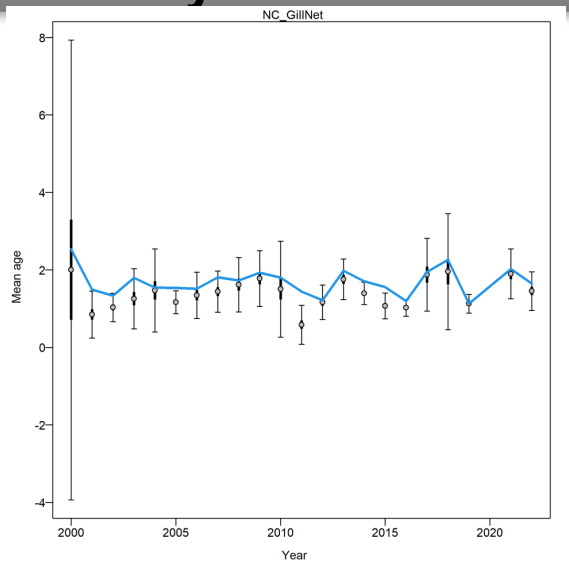
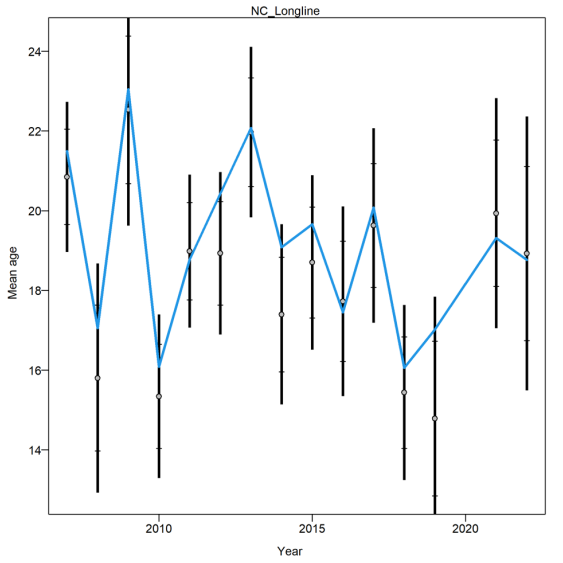
Est. Sel.



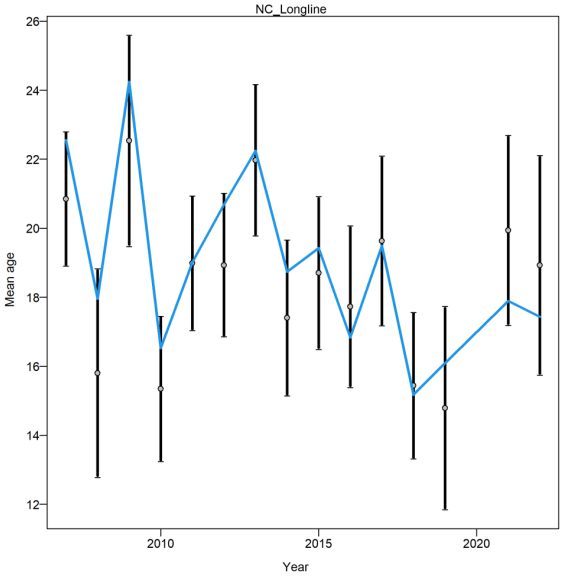
Gill Net Index

Hybrid Sel.





Longline Index



Length-Based Selectivity

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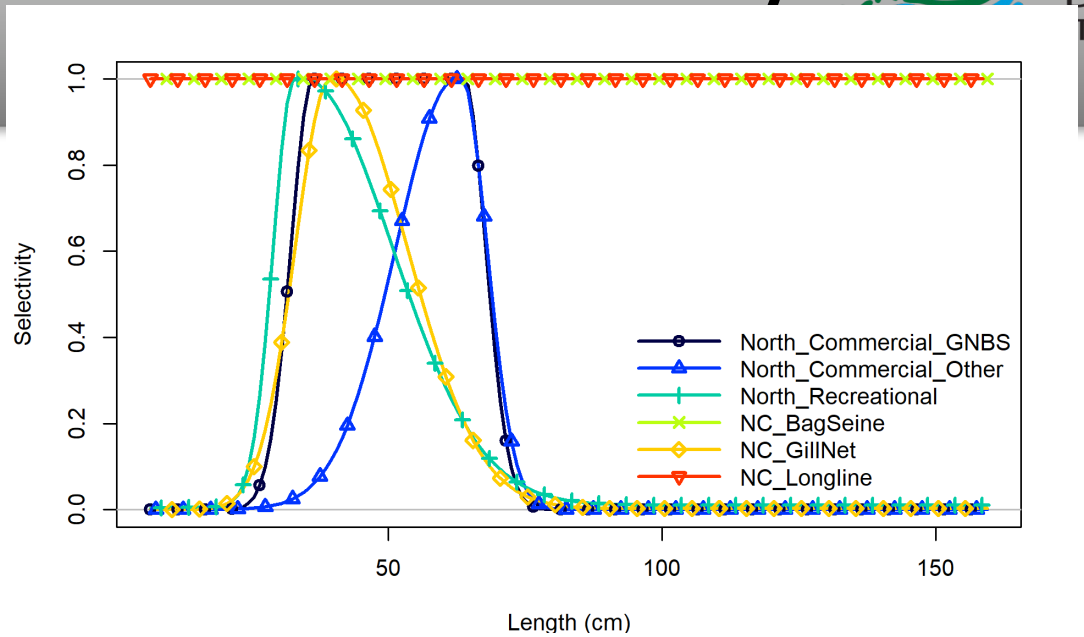
Est. Sel.



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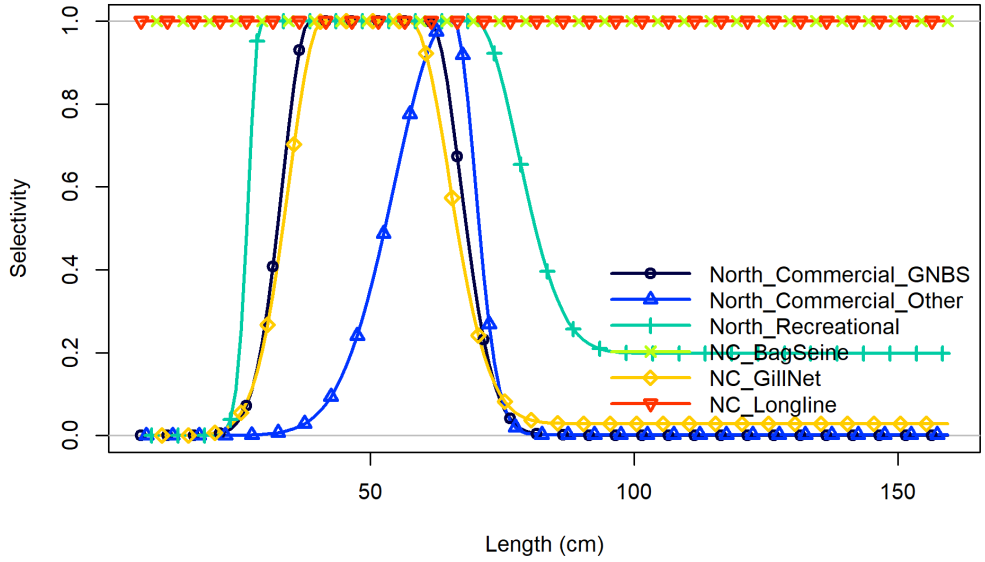

Age-Based Selectivity

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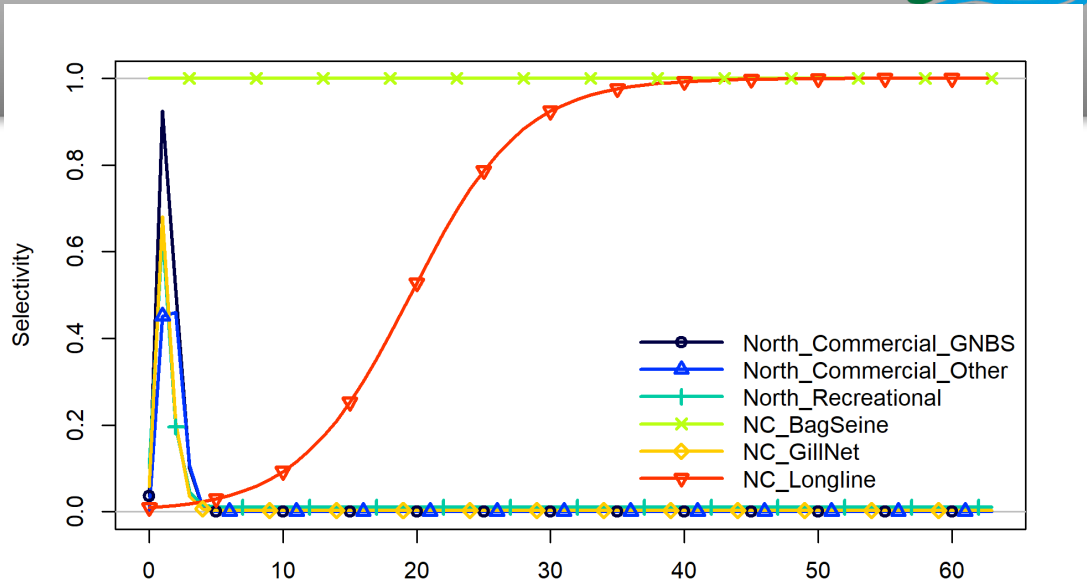

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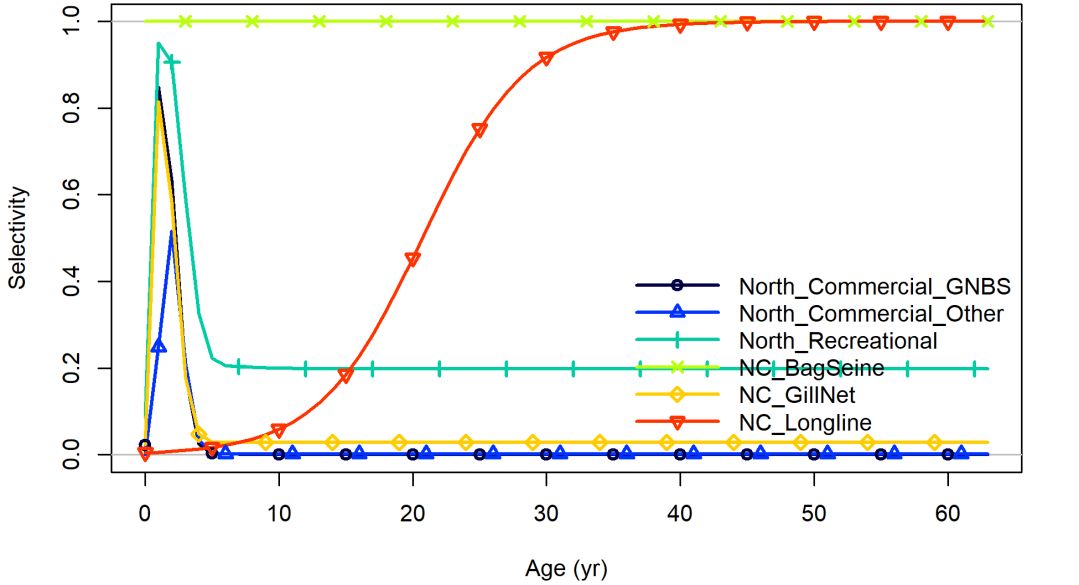

Retention

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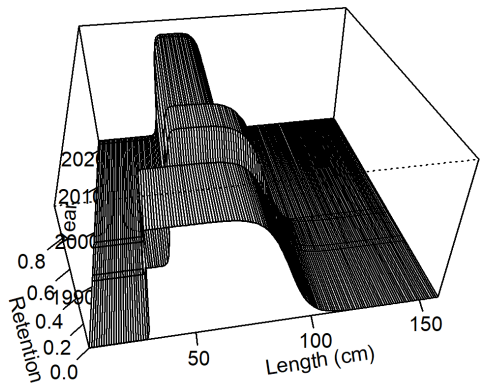
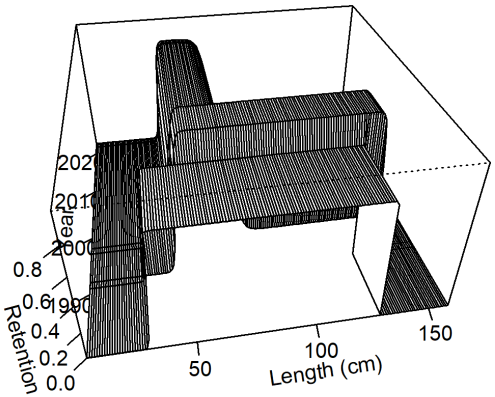
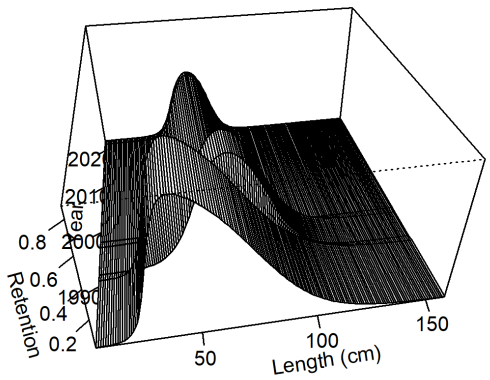
Est. Sel. **Hybrid Sel.**

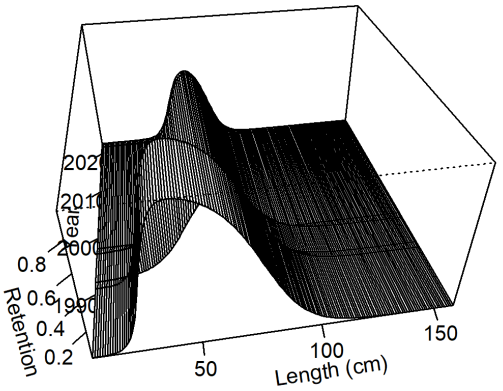


Comm_GNBS





North_Rec



Recruitment

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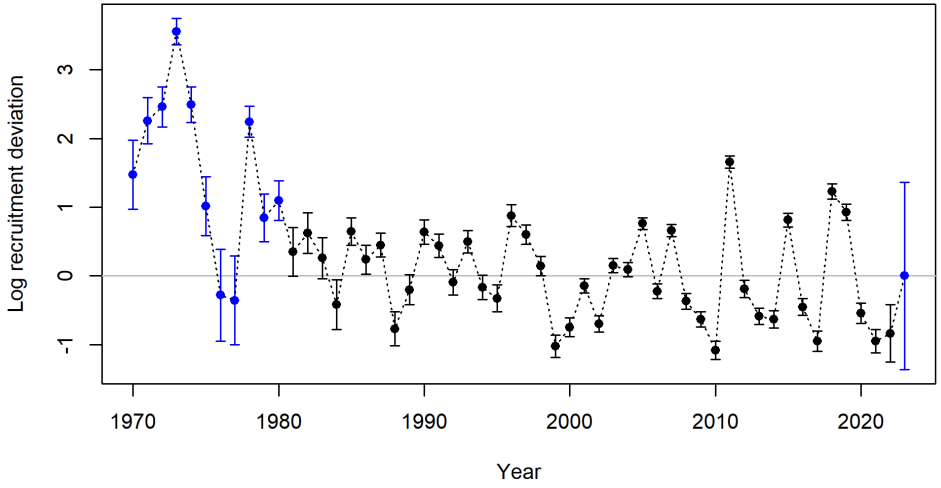
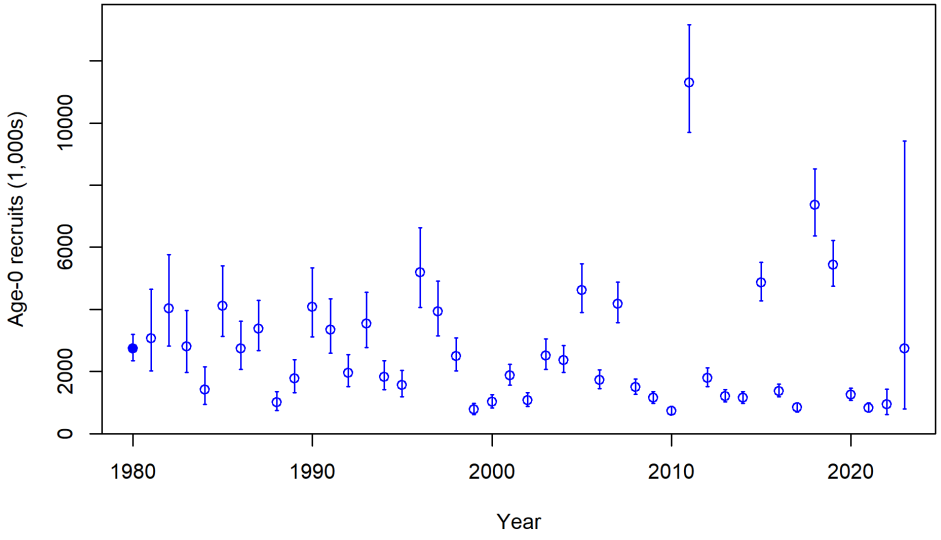
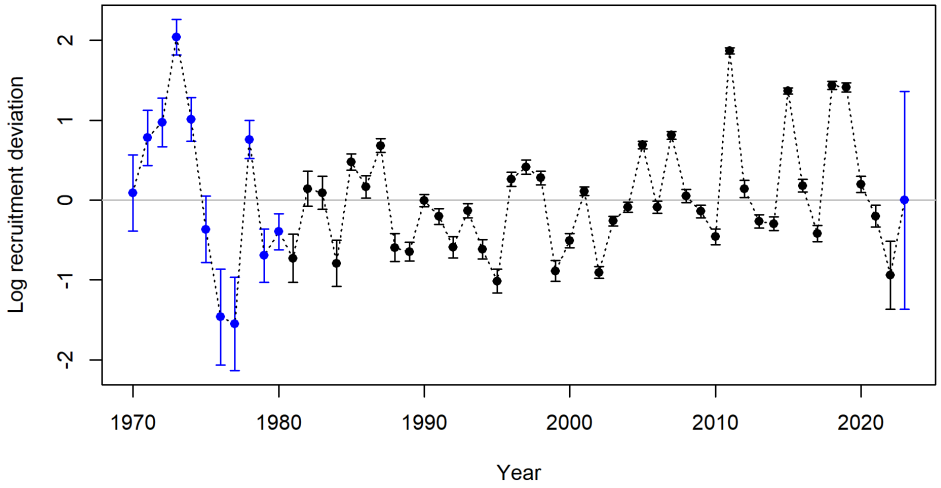
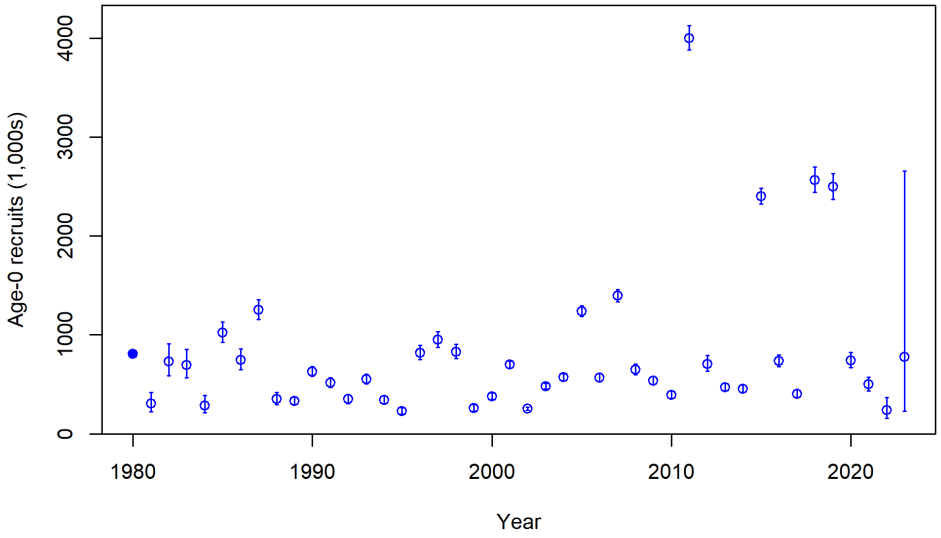
Est. Sel.





Hybrid Sel.





Abundance

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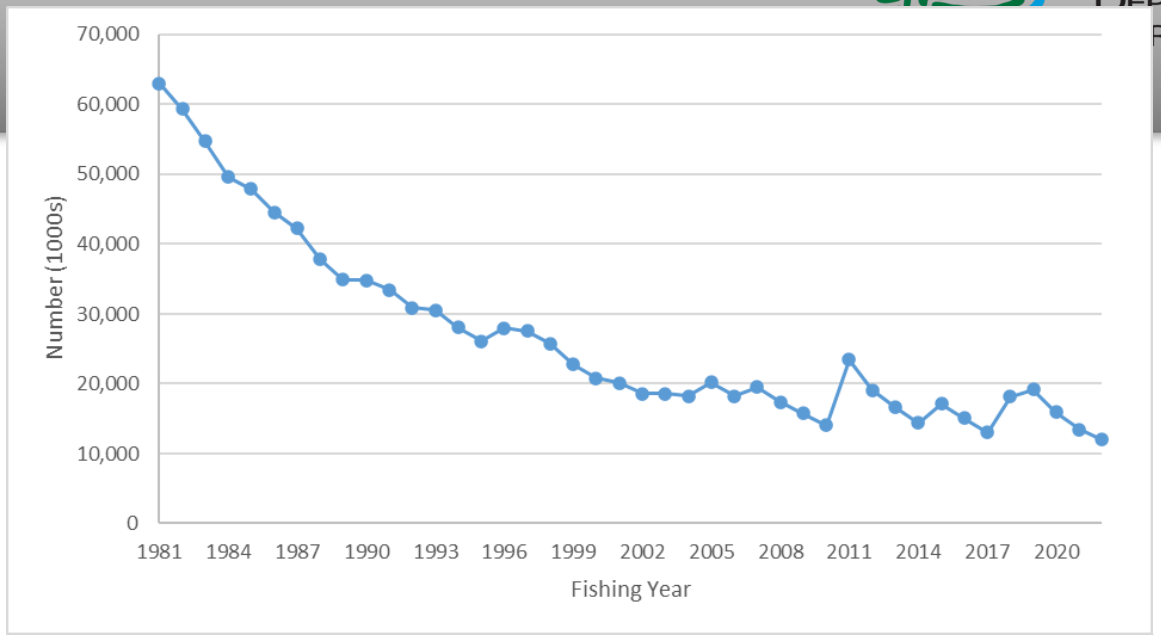
Est. Sel.



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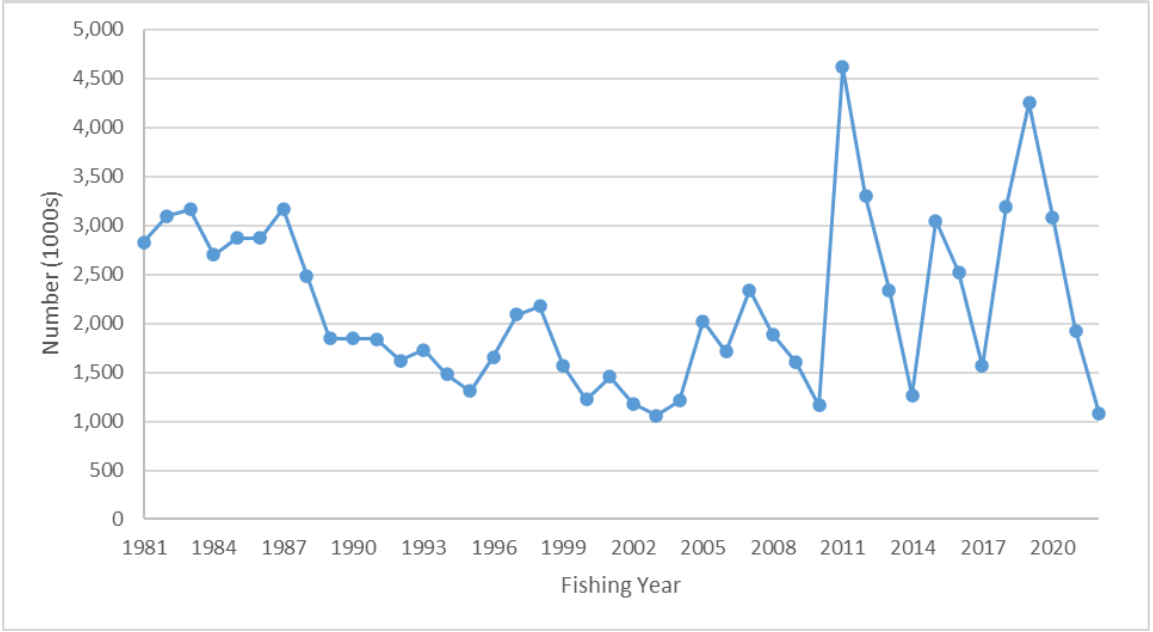

Spawning Stock Biomass

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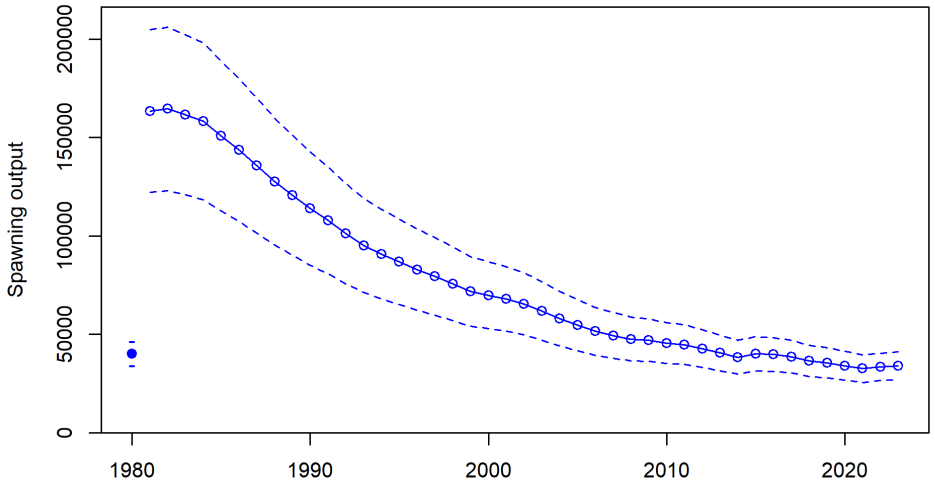
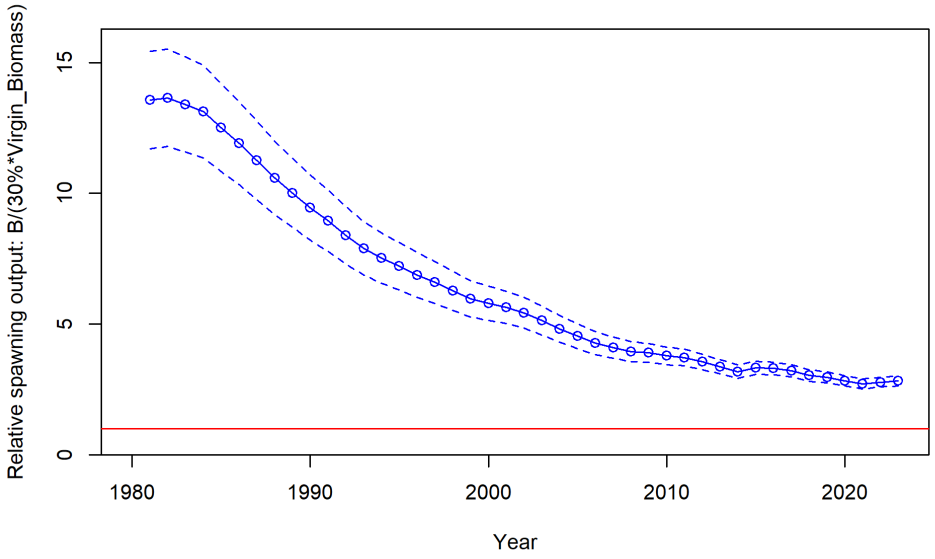
Est. Sel.





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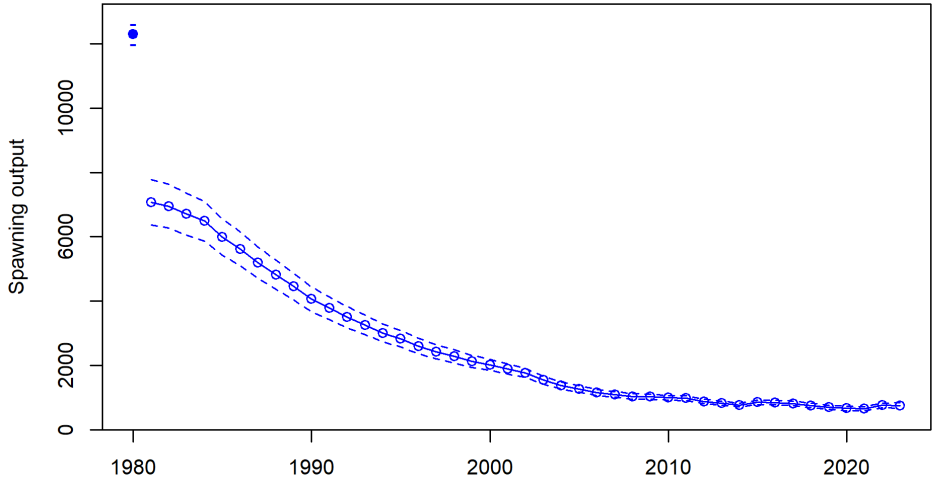

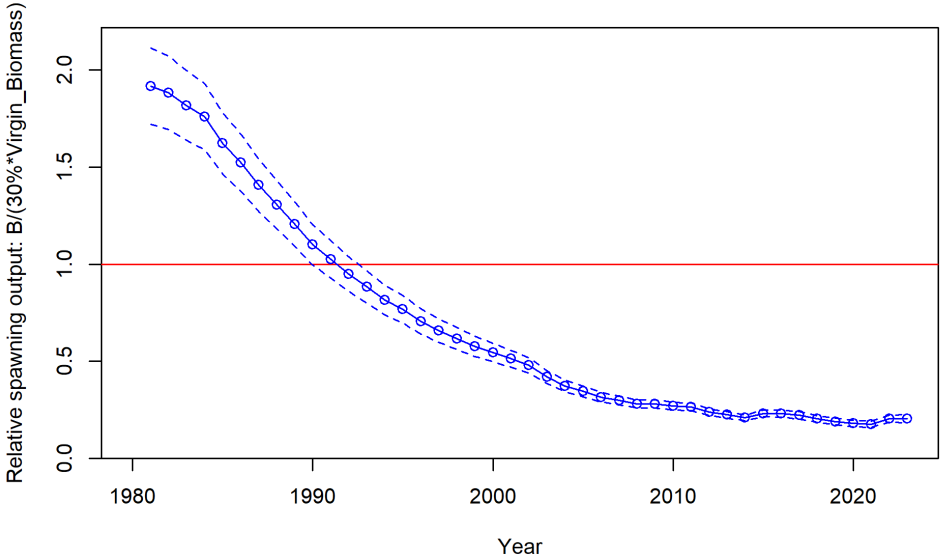

Fishing Mortality

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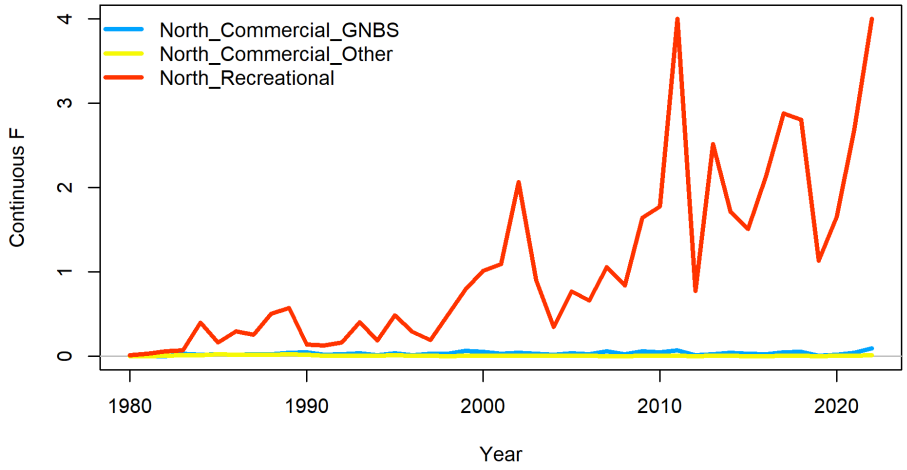
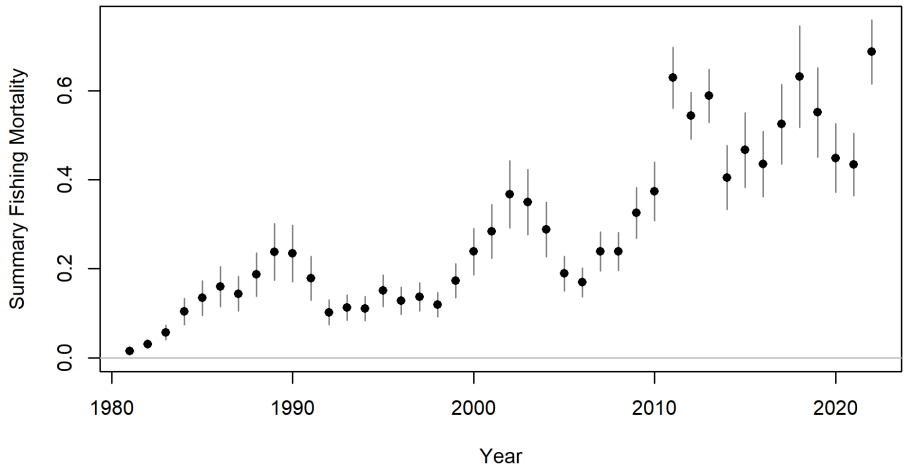
Est. Sel.





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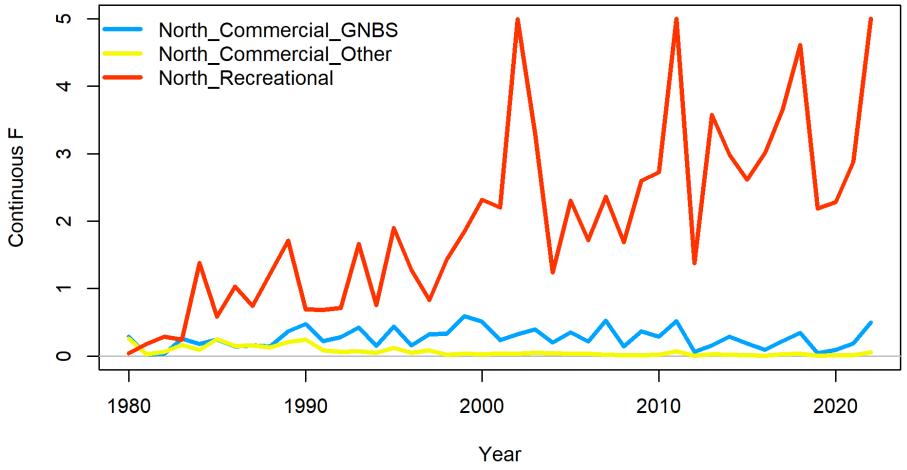

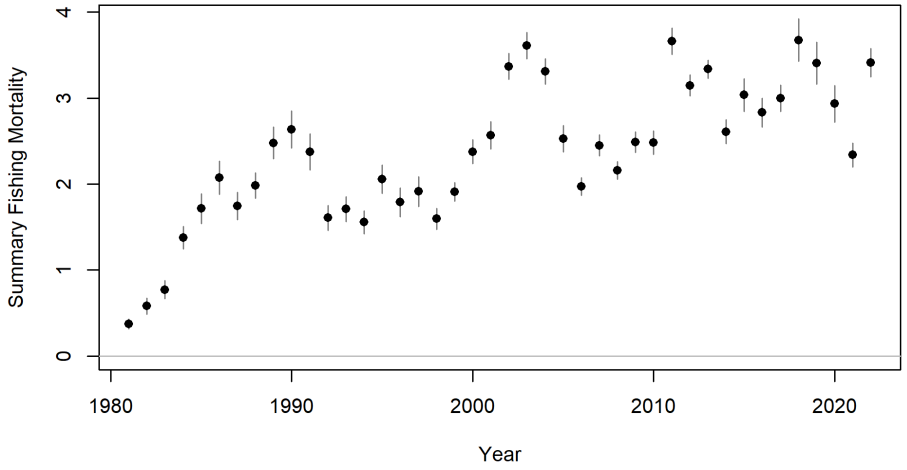

Spawning Potential Ratio

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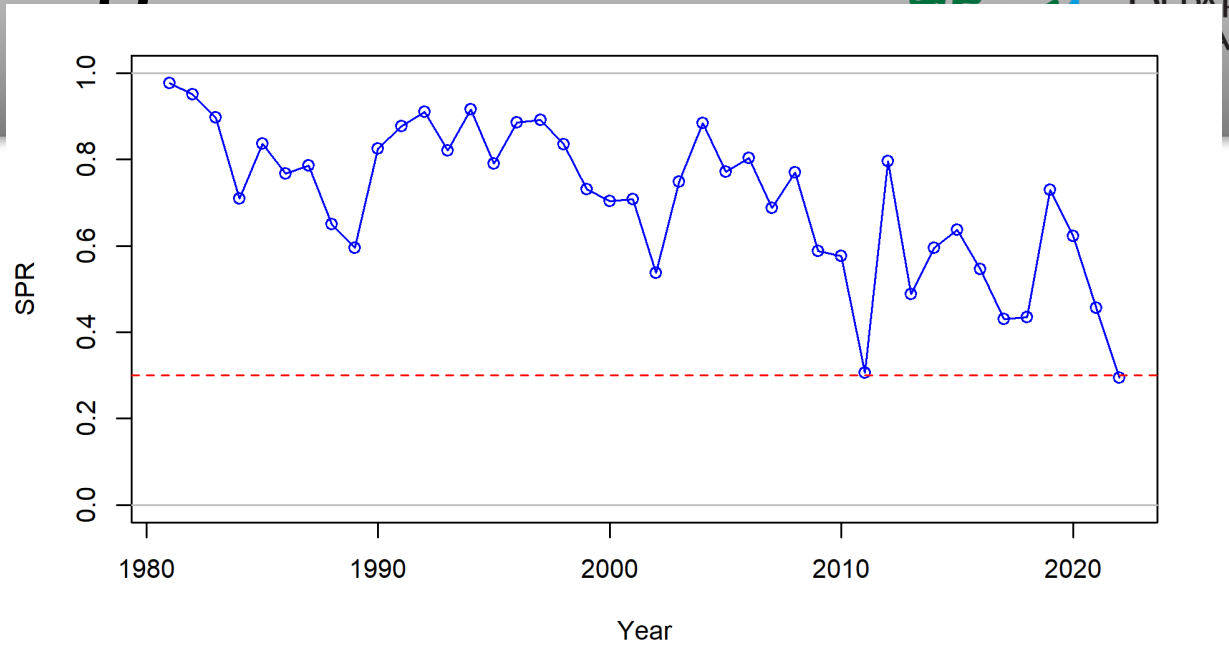
Est. Sel.



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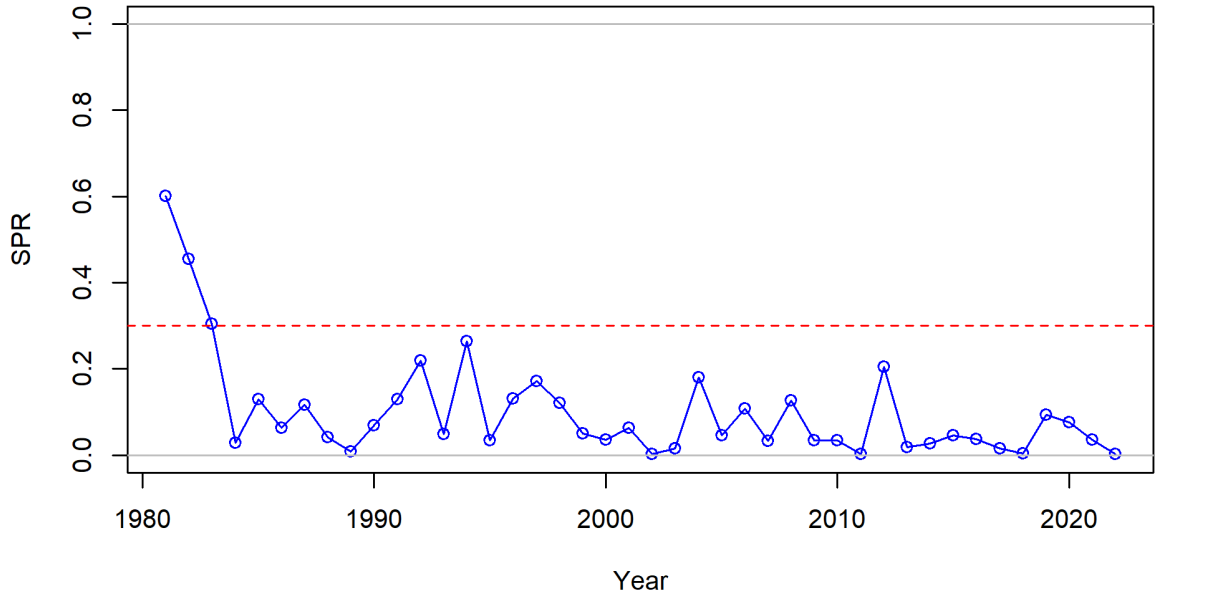
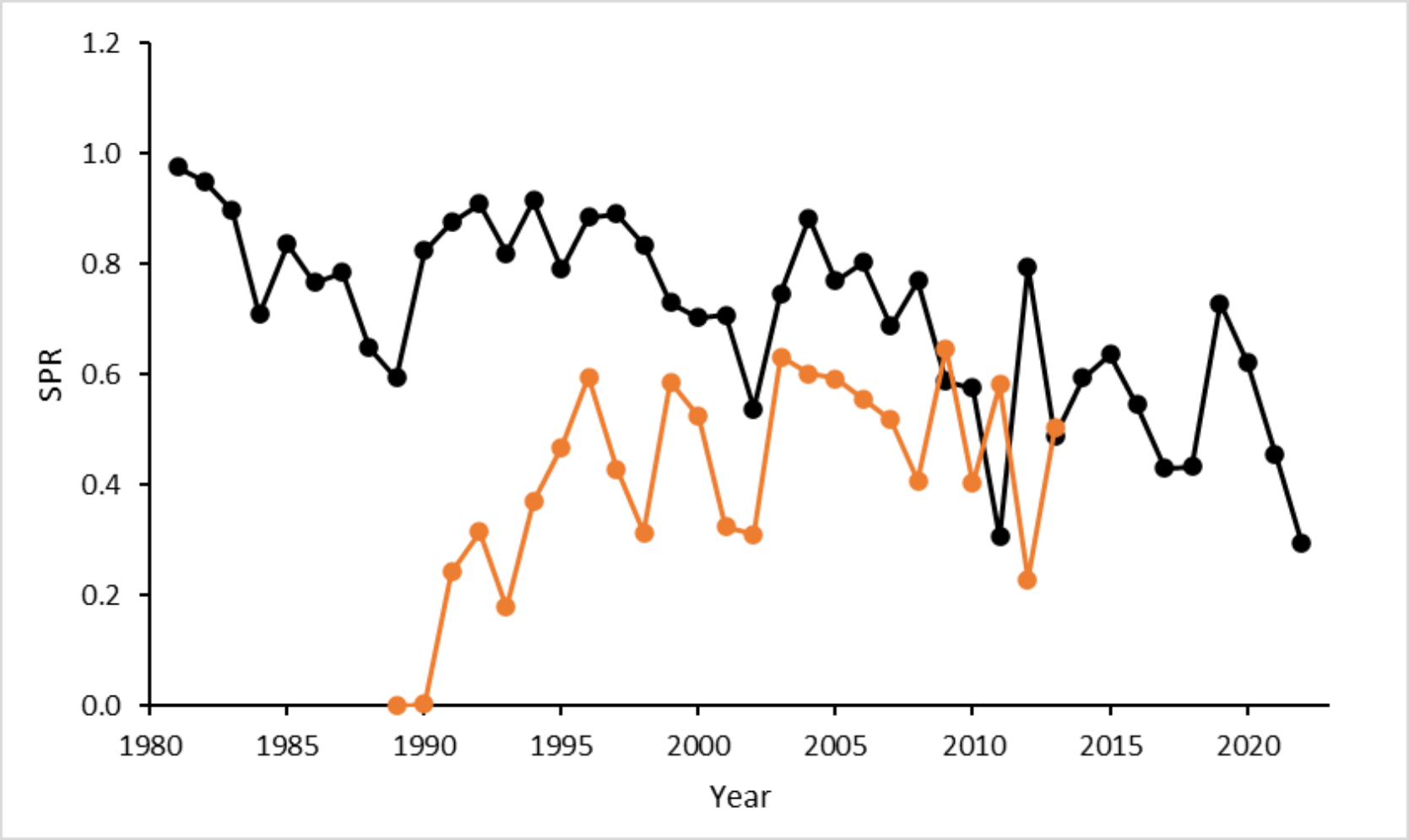
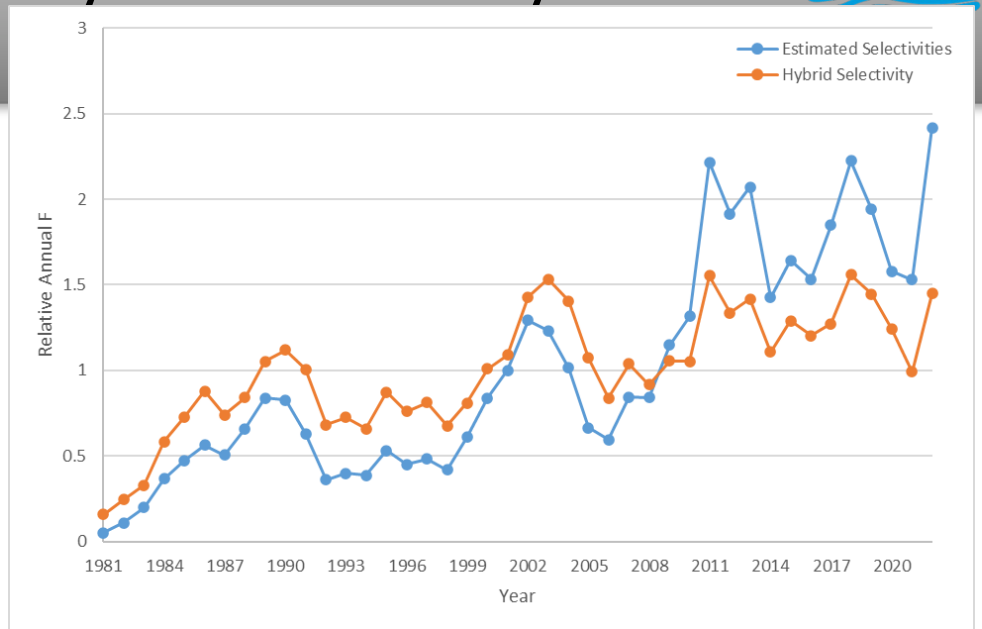
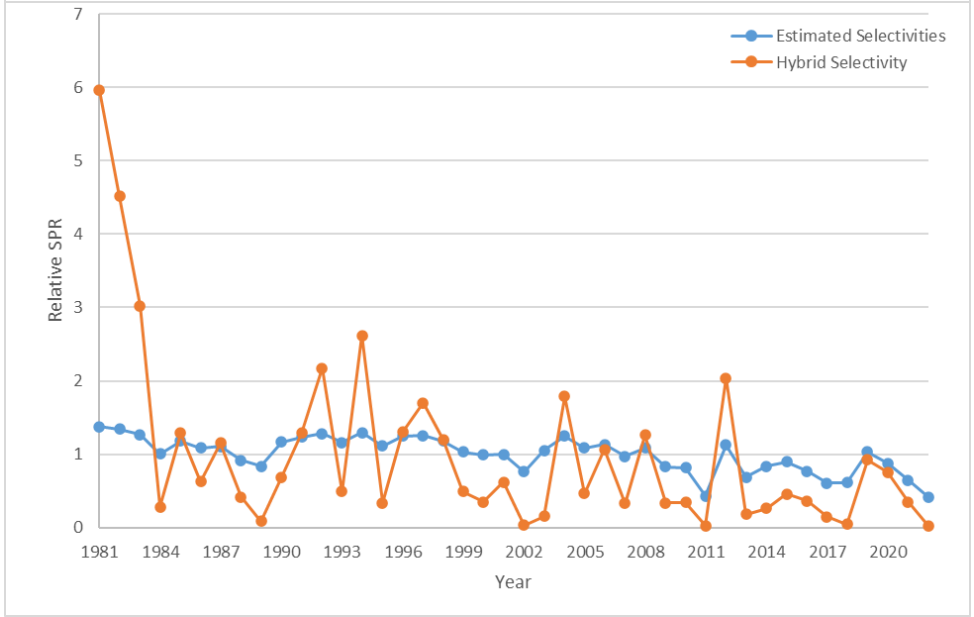


Historical Retrospective



Model Concerns

- Estimated Selectivity Model
  - Model not very stabile and often not converging
  - High recruitment deviations in 1970s which drives abundance trends through time
  - Narrow recreational selectivity pattern with no selectivity for larger fish
  - Low initial F's and high stock biomass through time
- Hybrid Selectivity Model
  - Recruitment deviations in 1970s more aligned with other large year classes (i.e. 2011)
  - Wider selectivity for the recreational fishery more aligned with expectations
  - Still low initial Fs
  - Fs overall are unreasonably high
- **No recommended model for stock status**

F and SPR Comparisons Between Estimated and Hybrid Selectivity Models

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