Norton Sound Red King Crab SAFE 2021

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Crab Plan Team: Seattle-Virtual

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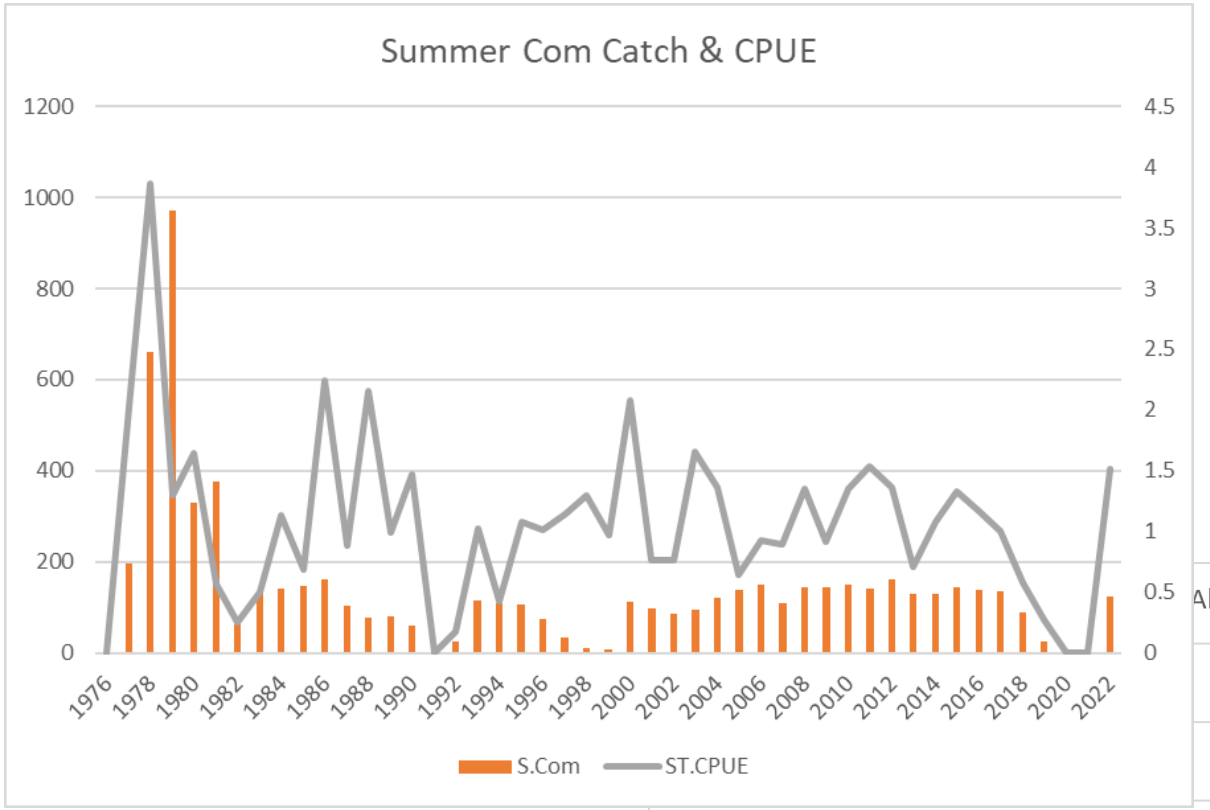
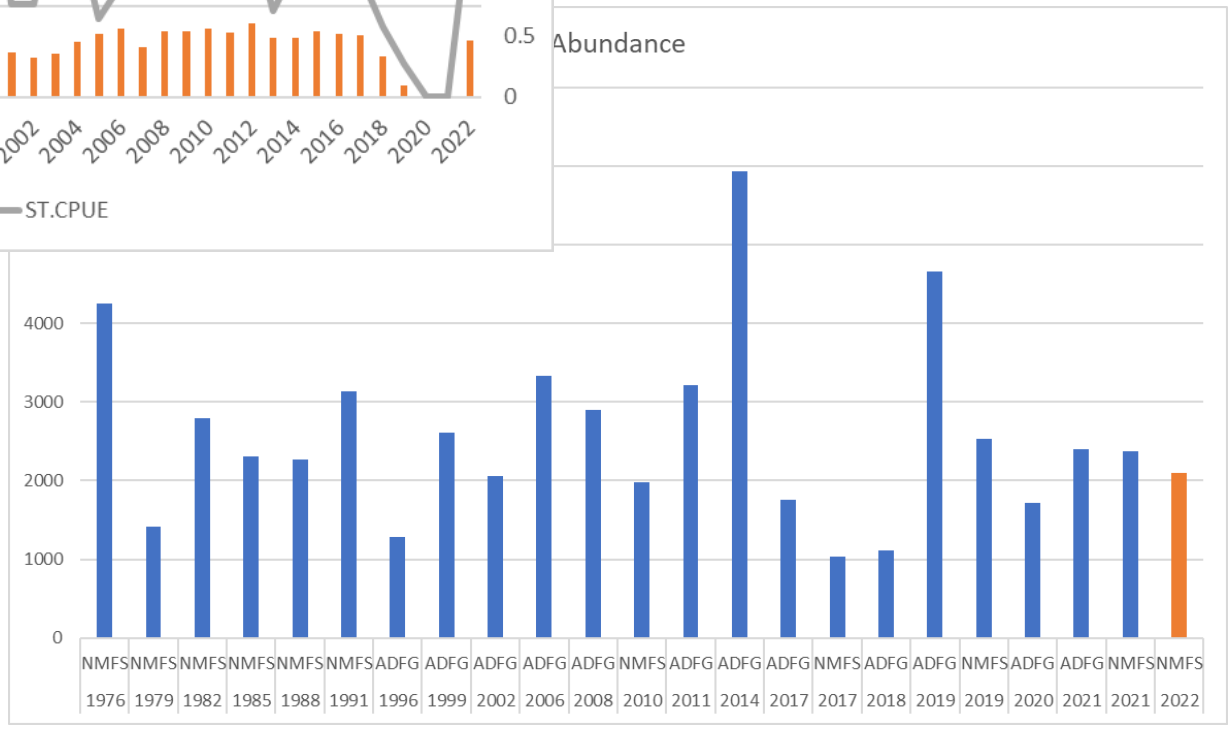
3 issues to discuss

- Model selection for the Jan 2023 final assessment
- Estimate discards WITHOUT data.
- Length-independent vs. length-dependent OFL-ABC

Summer Com Catch and CPUE , and Trawl abundance





Fishery & Data Sept 2022

- ABC: 0.40 mil. lb. Total catch: 0.34 + 0.02 – 0.08? mil. lb depending on discards estimation method.

- NOAA 2022 NBS trawl survey: (Sept 07 2022)
  - 8/3,4,11,12 : 2,103,000 (CV: 0.368)
  - Not included in the draft SAFE, but adding data did not change model results (will update for Jan 2023).

NSRKC draft Assessment Models

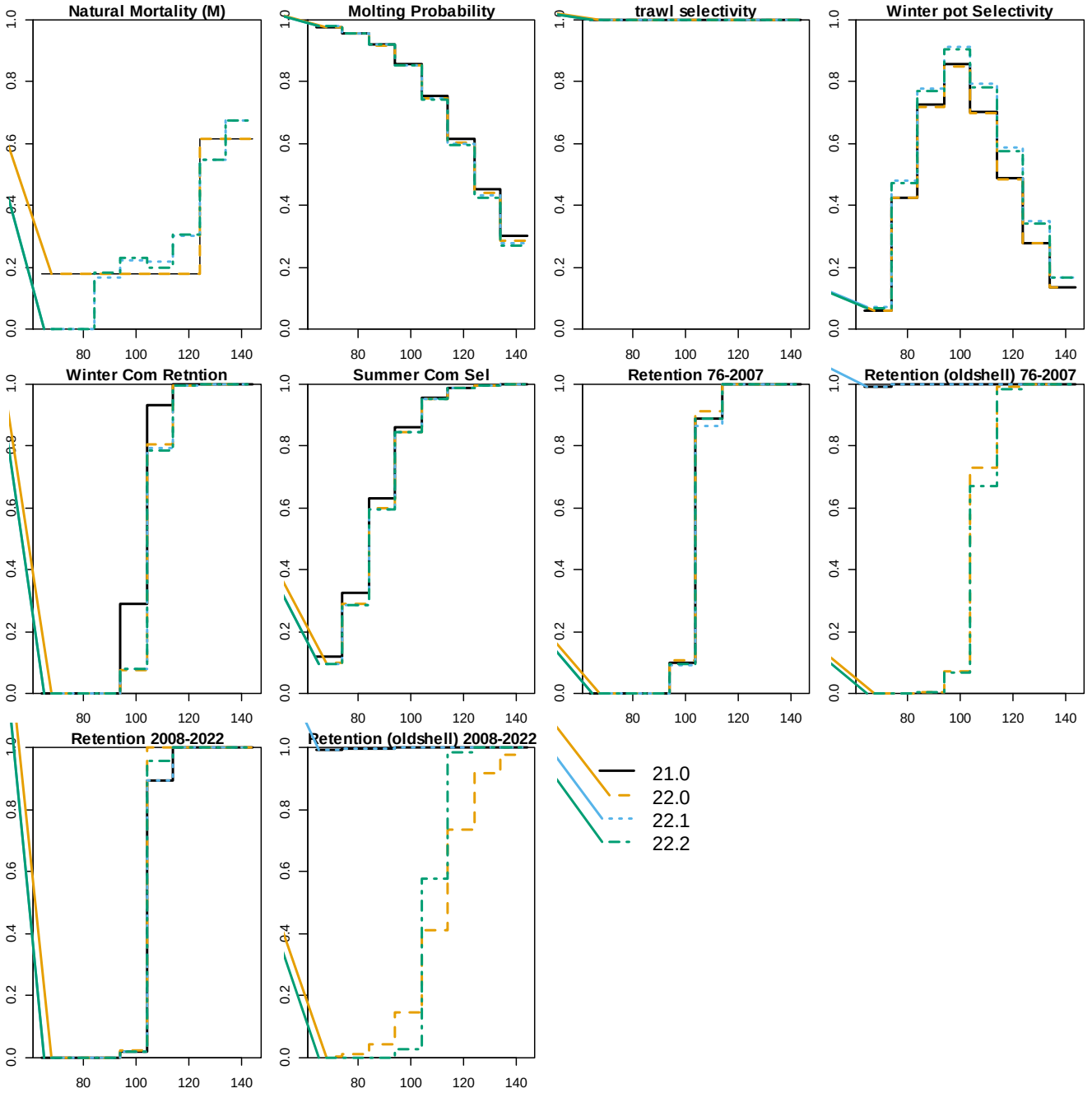
- Model 21.0: 2022 final model with data update (without NOAA NB Trawl data)

- Model 22.0: Model 21.0 + shell specific retention probability
  - CPT: Oldshell crabs are more likely to be discarded)

- Model 22.1: Model 21.0 + individual *M* estimate
  - SSC: May explain the lack of model fit to trawl and Com retain size-shell composition

- Model 22.2: Model 22.0 + individual *M* estimate

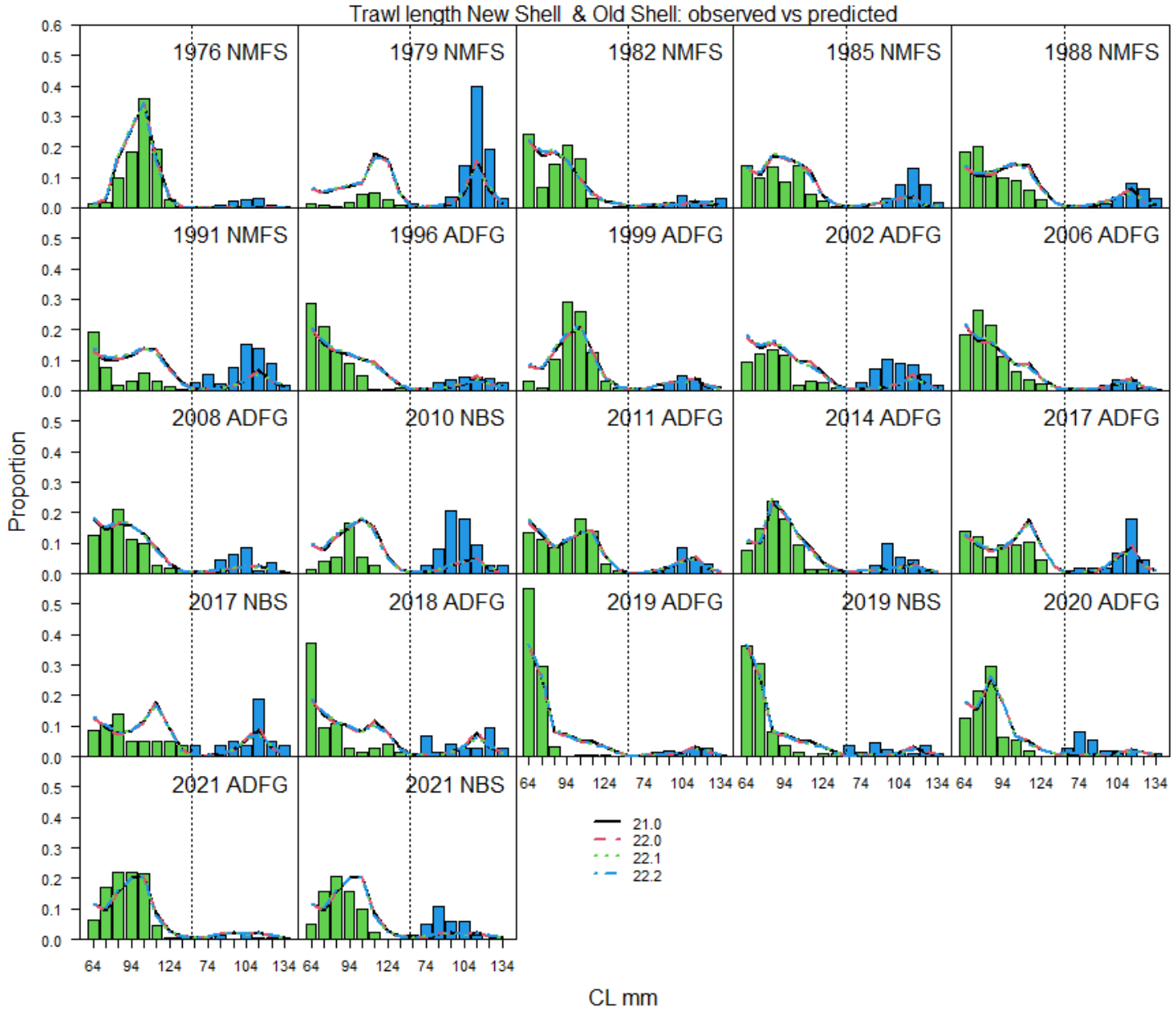
M, molting, selectivity, retention



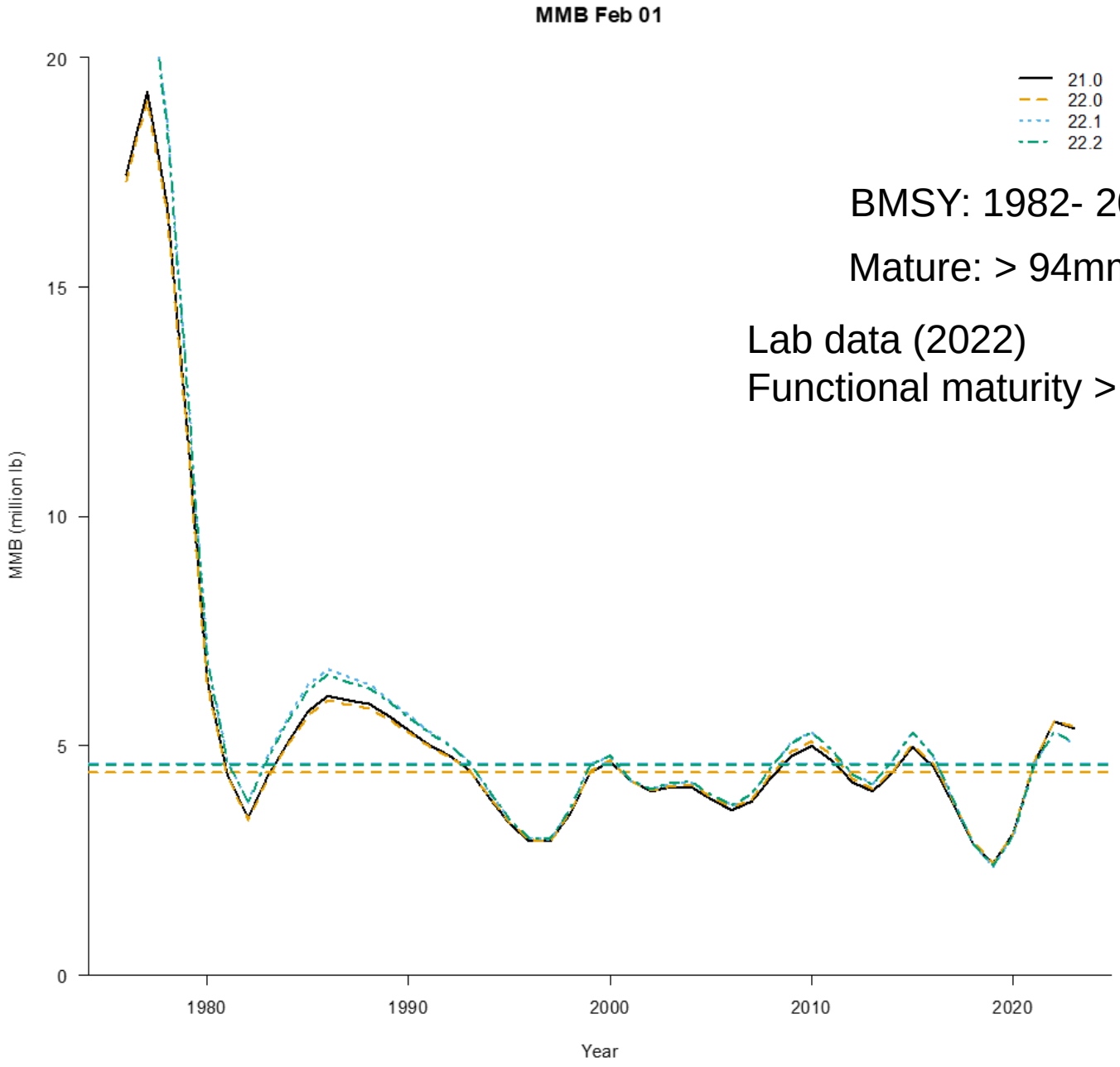
NSRKC Final Assessment Models

Model	21.0	22.0	22.1	22.2
Additional Parameters		+4	+8	+12
AIC change		+6	+5.4	+24
Total	347.9	346.1	342.6	341.1
Trawl Survey	11.0	10.8	10.5	10.5
Discards	3.5	4.5	3.3	3.6
St.CPUE	-14.8	-14.9	-15.1	-15.0
Length-Shell prop				
Trawl	129.0	126.4	125.5	123.7
Winter pot	39.5	39.3	39.3	39.1
S. com retain	49.3	48.5	48.7	48.9
S. com total, discards	24.3	25.0	24.9	25.1
W. Com retain	2.7	2.9	2.5	2.7
Recruit	19.5	19.6	20.1	20.1
Tag recovery	83.9	83.9	82.9	83.4
Max grad (e-6)	4.9	2009	14.7	4.55
RMSE Trawl	0.34	0.34	0.33	0.33
RMSE CPUE	0.44	0.44	0.44	0.44

NSRKC Trawl Survey



MMB



BMSY: 1982- 2023

Mature: > 94mm CL

Lab data (2022)
Functional maturity > 75mm CL

Model results

- As expected, no surprises
- Lower oldshell retention prob (22.0)
- Size-dependent Increasing M (22.1)
  - Could be unrealistic….
- Little-no improvements in model fits
- Little-no change in model estimates: MMB, BMSY

Author Recommendation

- Model Parsimony vs Realism in the absence of clear winner

- Model 21.0
  - Retention probability clearly differed between newshell and oldshell, however, this did not improve model fit. (model parsimony).

- Model 22.0
  - Even though it did not improve model performance, shell-specific retention probabilities should be kept to be true to reality. (model realism)

Estimate discards WITHOUT data.

Year	Discards data	OFL	Rationale
-2019	No survey	Retained	No discards data = No total catch = Retained OFL
2016-2019	*Oppotunistic* observer survey		Develop an *ad hoc* method to estimate *ad hoc* discards Flawed data are better than no data(?)
2020	*ad hoc* discards	Total	Discards data exist = total catch = Total OFL
2021-	No survey	Total	Total OFL = estimate discards WITOUT data

Several *ad hoc* methods can be developed.

Scientific Criteria for selecting the BEST method estimating discards from opportunistic survey data?

Scientific Criteria for the BEST method estimating discards from NO data?

Estimate discards WITHOUT data.

- Author recommendation: Retained OFL-ABC
  - Observer survey: opportunistic, will not resume for foreseeable future
  - Consistent with available data
  - Scientifically Honest

- If CPT-SSC do keep Total OFL: Author requests
  - Scientific Criteria for selecting a method estimating discards from opportunistic survey data
  - Scientific Criteria for selecting a method estimating discards from NO data

Length-independent vs. length-dependent F_{OFL} for calculation of OFL

- *Length independent*
- $F_{OFL} = \Upsilon M$ *(M = 0.18)*
- $OFL = F_{OFL} * B \quad B = \sum B_l$
- *Length dependent*
- $F_{OFL,l} = \Upsilon M_l$ (M_l *: model estimate*)
- $OFL = \sum F_{OFL,l} * B_l$

Length-independent vs. length-dependent F_{OFL} for calculation of OFL

- Author recommendation: length-dependent
  - Consistent with model structure
  - Length-independent:
    - Appropriate when length-independent *M* (e.g. *M*=0.18) is preassigned.
    - May be in appropriate when length-dependent *M* is estimated (which M be used to set F_{OFL} ?)
  - ABC buffer is the right place to deal with uncertainties about OFL.