

Norton Sound Red King Crab SAFE 2025

Sept 11 2024

Crab Plan Team:
NPFMC-Online
Seattle, WA

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NSRKC Agenda

- Determine transition to GMACS for the final draft Nov 2024.
 - Model 21.0: Default baseline model
 - GMACS (renamed to Model 24.0): After adoption of the model.
- Transition criteria
 - Statistical cut-off
 - ABC

The author replies to CPT/SSC

- CPT: Don't bother, just do 21.0-GMACS transition
- SSC:
 - Provide details on trawl surveys
 - Provided (Table T.1)
 - Trawl survey selectivity separated to 3
 - No difference (But can present for the final draft)
 - Develop an index of abundance, explore VAST, sdmTMB
 - Request rationale (hopefully, not just because...) and product expectation

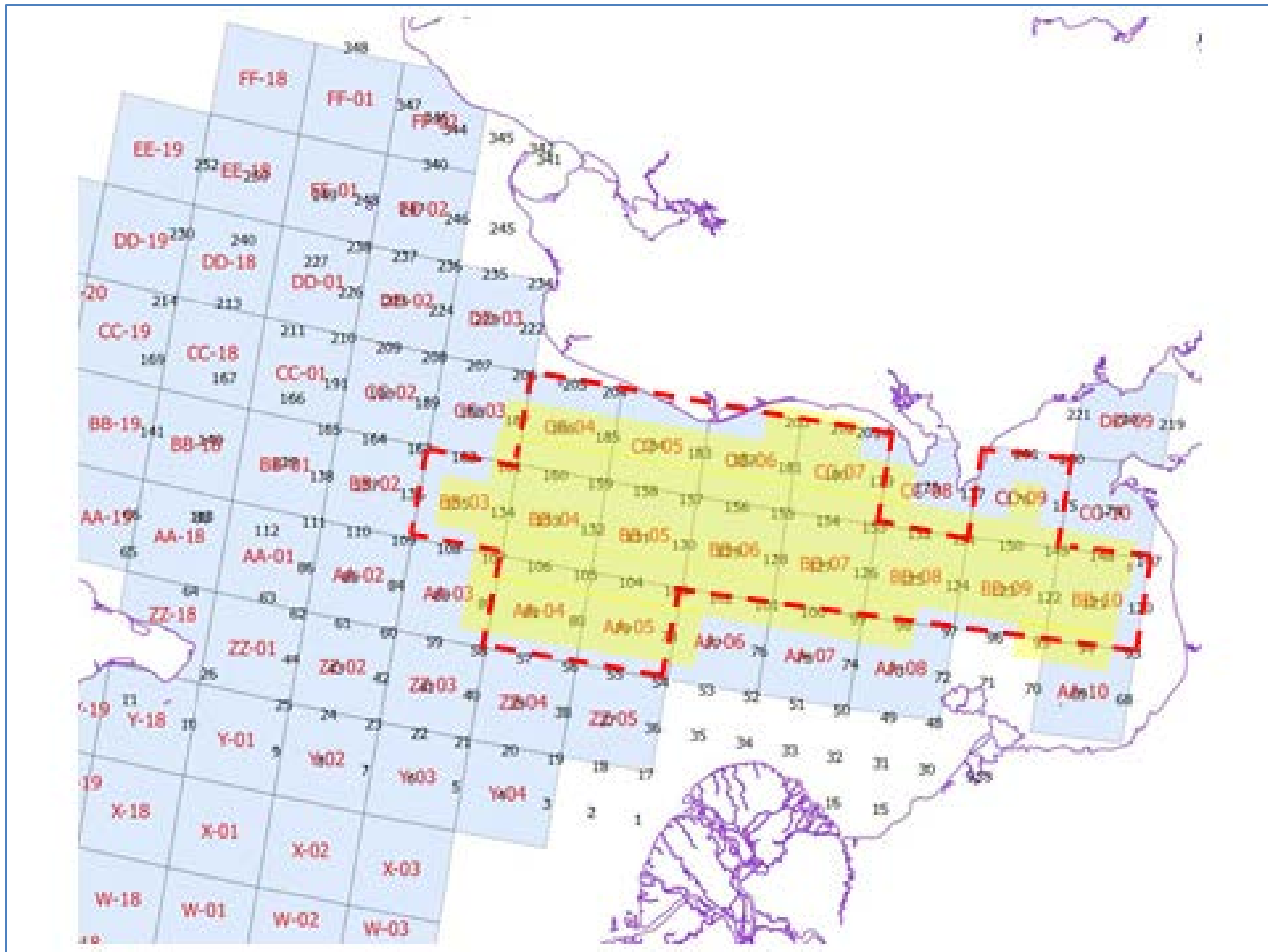
New Data: Catch (Winter, Summer) and Trawl abundance: All data final

- Winter Com: 4,384 (13,675 lb)
- Winter Subsistence:
 - Catch: male 55,00, female 181
 - Retain: male 47,08 (13,324 lb), female 0
- Summer Com: 140,379 (432, 635 lb) (6/15-7/13)
- Bycatch from other fisheries (??? Lb)
- Discards mortality 14,375 lb (model 21.0)
- Total Catch 0.474 million lb < ABC (0.513).
 - **Overfishing did not occur**
- ADF&G Trawl abundance (7/20-8/05)
 - 1.41 million (CV 0.28)

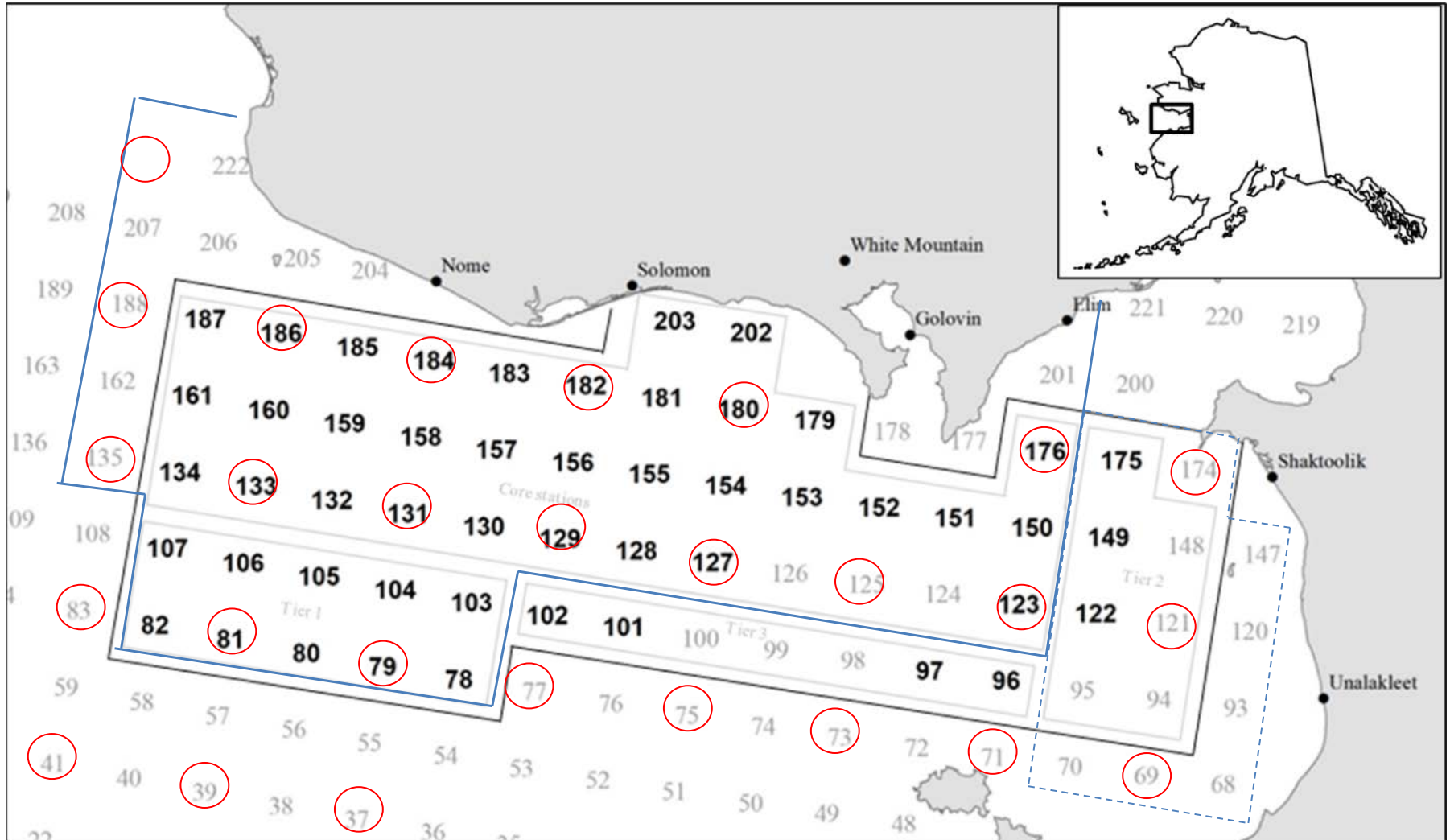
Trawl Survey Design

Survey	Net	Net width	Tow Distance	Survey Grids	Survey strategy
NMFS (1976-1992)	83-112 Eastern Otter	50ft	1.3 – 1.7 (30 min tow).	10 nm	?
ADF&G (1996-present)	400 Eastern Otter	40ft	1.0 ~20 min	10 nm	As time allows
NOAA NBS (2010-present)	83-112 Eastern Otter	~50ft (measured)	1.3 – 2.5 (30 min tow).	20 nm	Survey all stations?

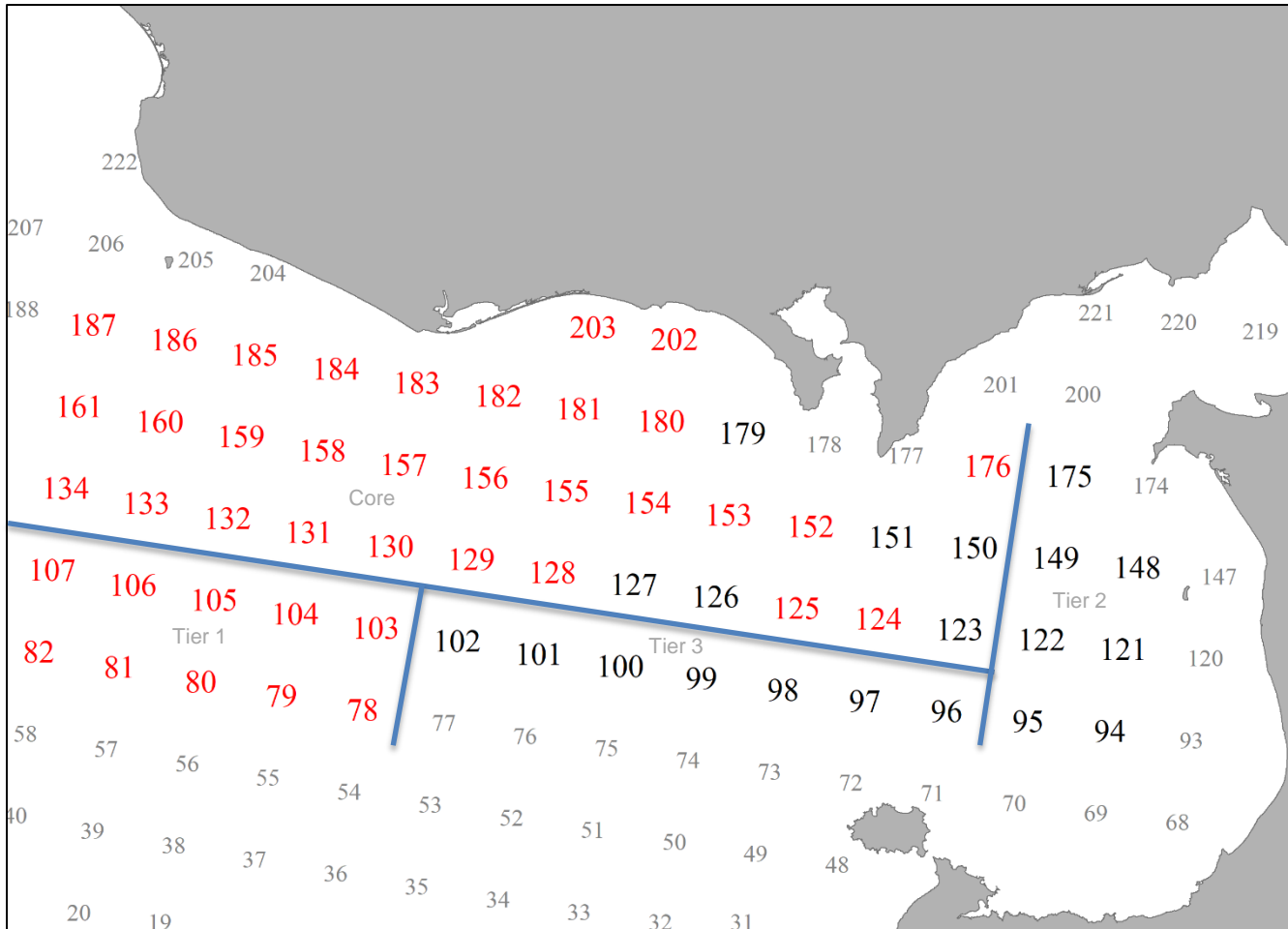
Trawl Survey Design



Trawl Survey Design



Trawl Survey 2024

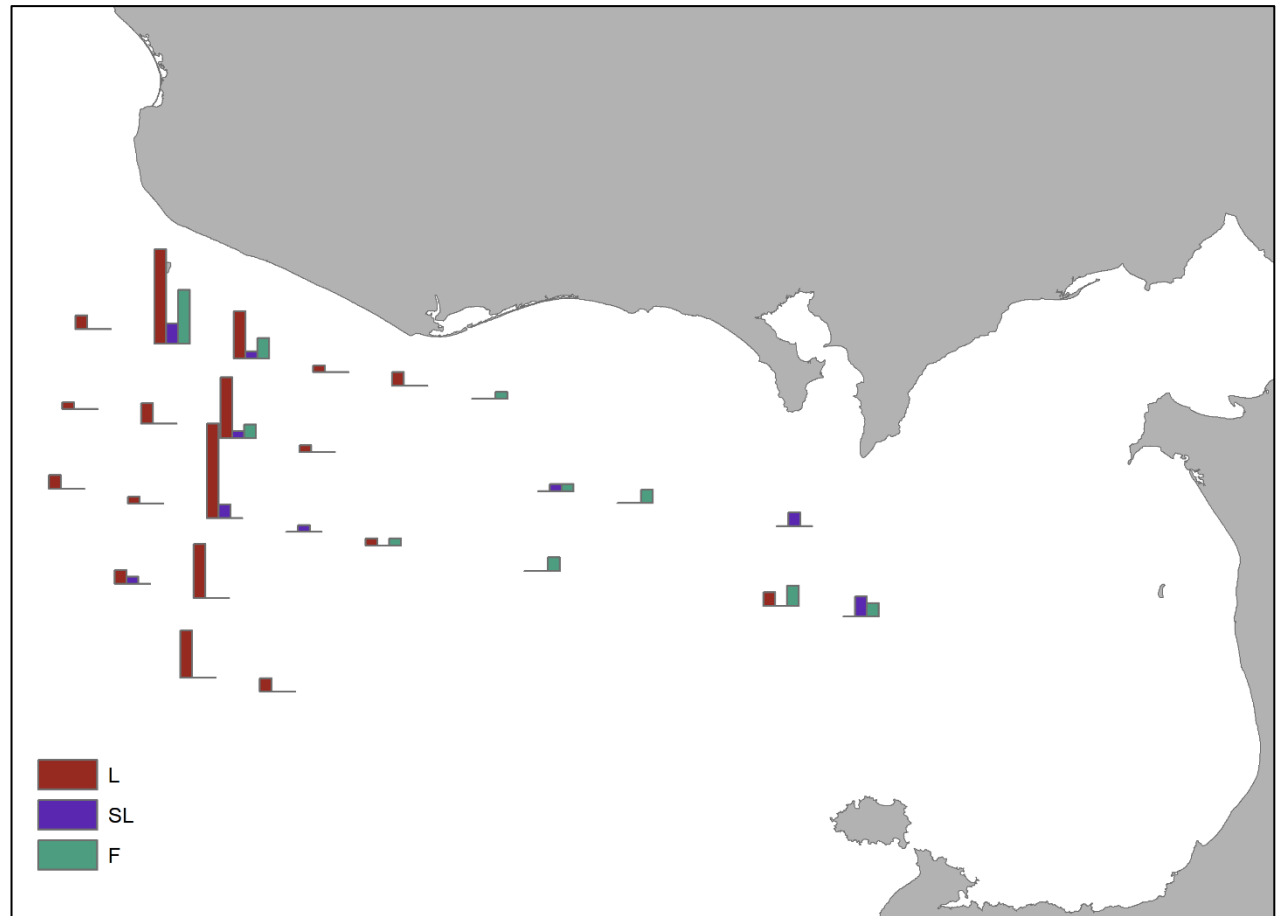


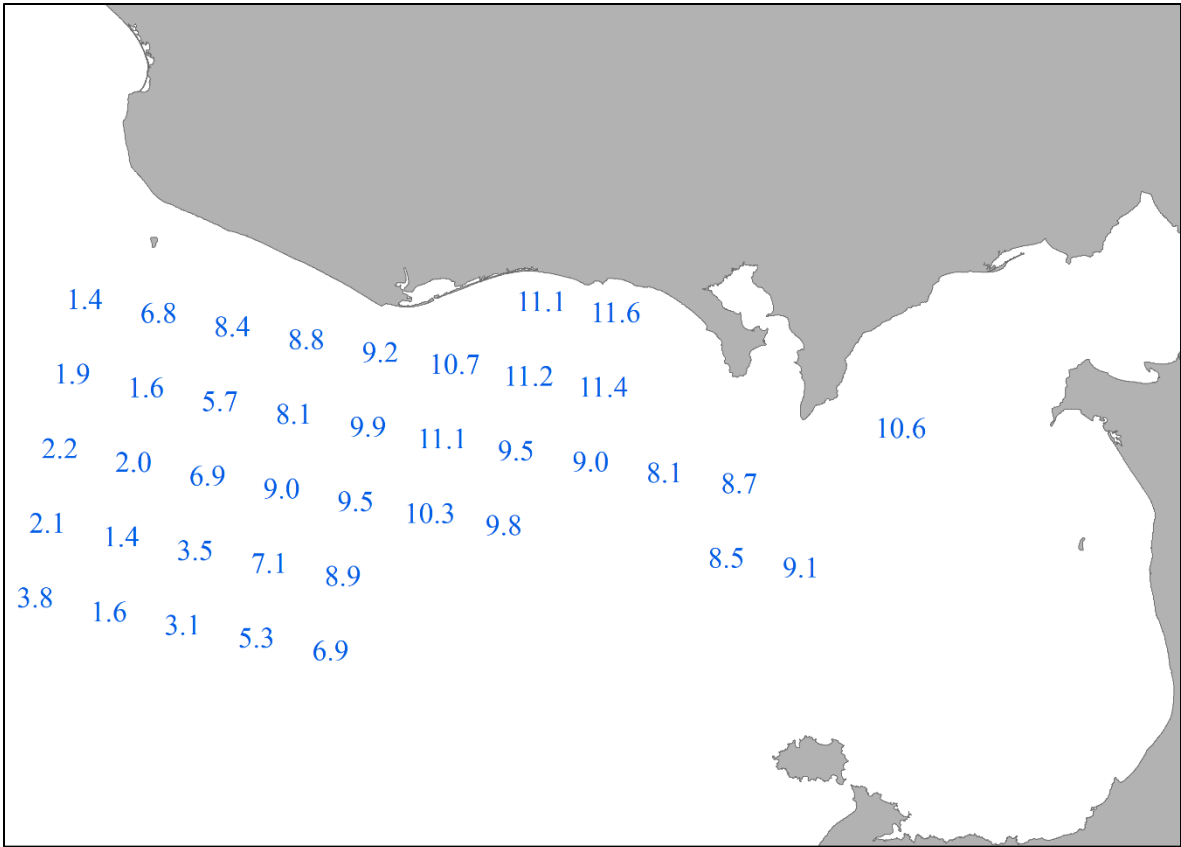
2024 Norton Sound red king crab bottom trawl survey July 20-August 2

Completed 40 out of 60 tows Core and Tier 1

119 red king
crab

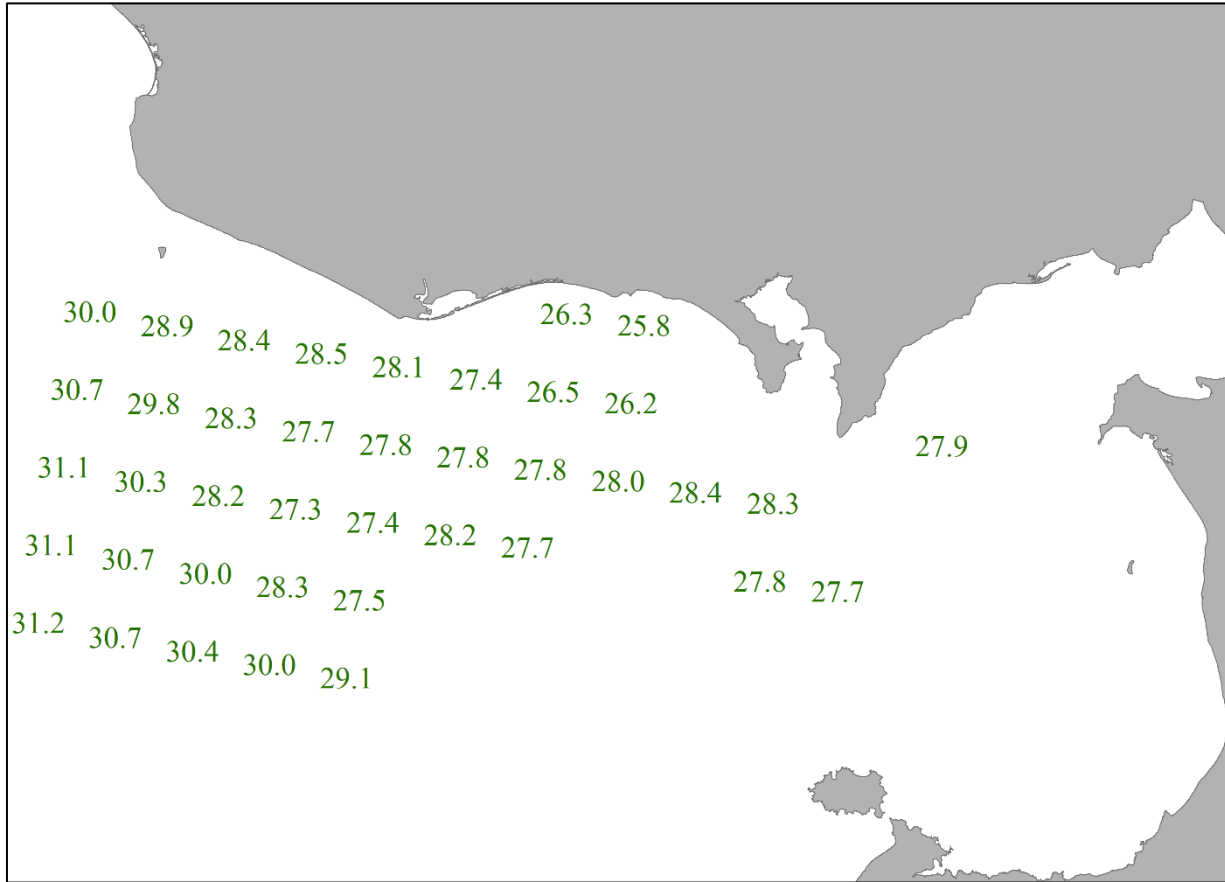
15 Sublegals
79 Legals
25 Females





Average temperature was 7.15 C

Similar to last 3 years and well below the warmest years of 2017-2019.



Average Salinity- 28.58
PSU- similar to last three years and more saline than warm years

(could be a function of sampling locations)

Configure GMAC to 21.0: Season

Model 21.0

- Feb 01 population (N_w)
 - Winter fishery
 - Mortality
- July 01 population (N_s)
 - Mortality
 - Summer fishery
- Post Fishery population: (N_{saf})
 - Molting and Growth
 - Mortality
- Jan 31 population
 - Recruits

GMACS (2.20.14) Compiled with ADMB 13.2

- Season 1 : Feb 01: 0
 - Winter fishery
- Season 2: Mortality: Feb 01 to Summer fishery starts
- Season 3: Mortality: fishery starts to end
 - Summer fishery
 - Molting and Growth
- Season 4: Mortality: to Nov 01 (just because, legacy setting)
- Season 5: Mortality: Nov 01 to Jan 31
- Season 6: Recruit

Configure GMAC to 21.0: Trawl Survey Assessment

Model 21.0

- Case1: Survey occurs AFTER fishery (mid-fishery < mid-survey)
- $N_{ss} = [(N_s)e^{-bfM} - C_s]e^{-afM}$
- Case 2: Survey occurs DURING the fishery (mid-fishery > mid-survey))
- $N_{ss} = [(N_s)e^{-afM} - p_c C_s]$

GMACS

- All Trawl surveys occur in season 3 with timing adjustment.

Configure GMAC to 21.0: Trawl Survey Assessment

ADFG/NOAA Trawl survey

#Index	Year	Season	Fleet	Sex	Maturity	Value	CV	Type	Time
1	1976	3 4	1 0		4247.462	0.311	2	1.411765	
1	1979	3 4	1 0		1417.215	0.204	2	1	
1	1982	3 4	1 0		2791.733	0.289	2	1.318182	
1	1985	3 4	1 0		2306.321	0.254	2	2.363636	
1	1988	3 4	1 0		2263.353	0.288	2	2.2	
1	1991	3 4	1 0		3132.508	0.428	2	6.25	

ADFG Trawl survey

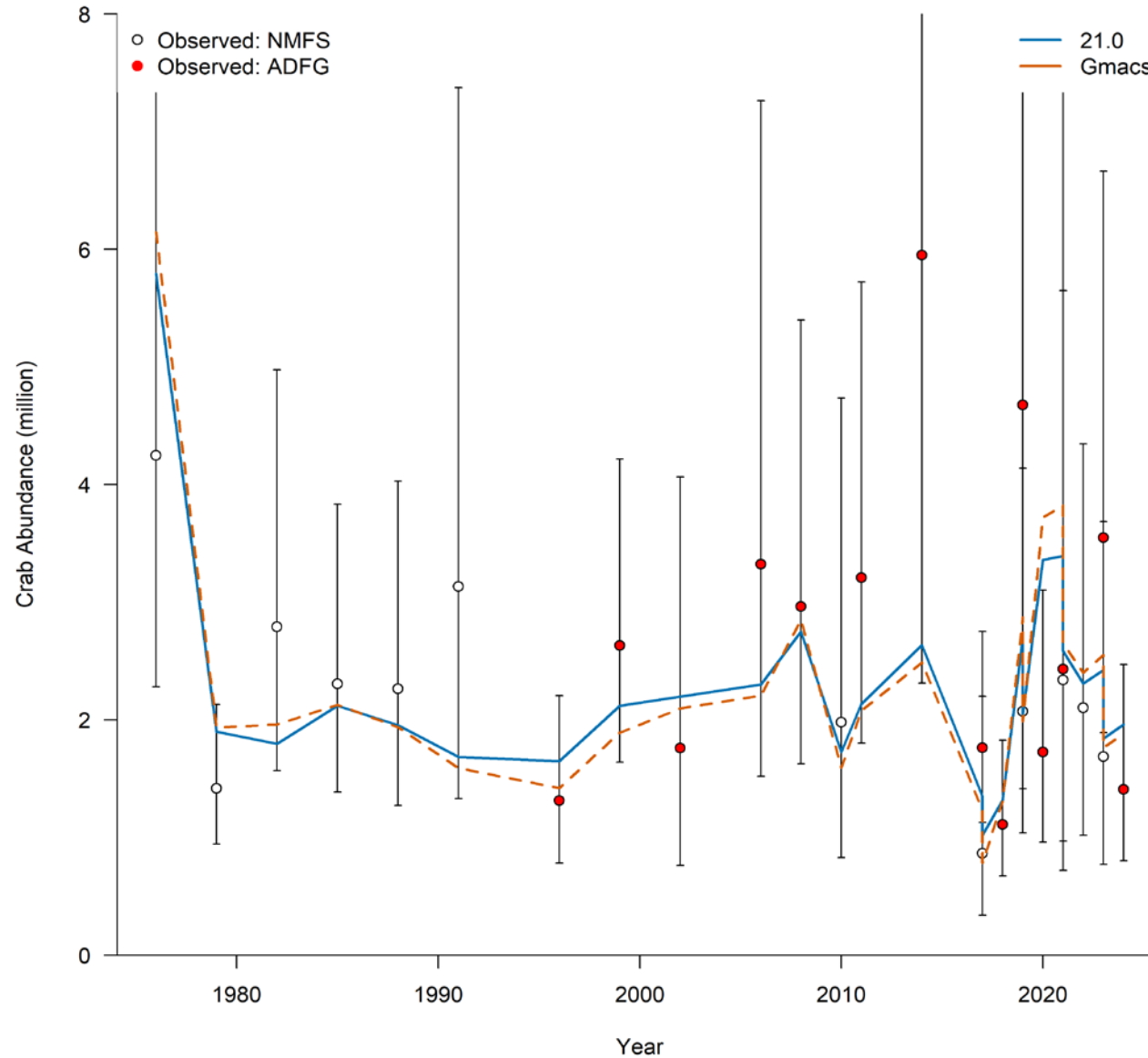
2	1996	3 5	1 0		1313.757	0.259	2	0.6612903	
2	1999	3 5	1 0		2630.53	0.236	2	0.4920635	
2	2002	3 5	1 0		1769.85	0.418	2	0.5897436	
2	2006	3 5	1 0		3322.53	0.391	2	0.6865672	
2	2008	3 5	1 0		2962.1	0.30	2	0.5571429	
2	2011	3 5	1 0		3209.285	0.289	2	1.03125	
2	2014	3 5	1 0		5949.46	0.473	2	0.58	
2	2017	3 5	1 0		1762.072	0.223	2	1.241379	
2	2018	3 5	1 0		1109.39	0.249	2	0.8857143	
2	2019	3 5	1 0		4675.99	0.598	2	0.4666667	
2	2020	3 5	1 0		1725.99	0.298	2	0.7	
2	2021	3 5	1 0		2430.44	0.608	2	0.5166667	
2	2023	3 5	1 0		3548.08	0.315	2	1.214286	
2	2024	3 5	1 0		1407.401	0.281	2	1.413793	

NOAA NBS survey

3	2010	3 6	1 0		1980.079	0.436	2	0.6071429	
3	2017	3 6	1 0		864.497	0.467	2	1.965517	
3	2019	3 6	1 0		2071.94	0.346	2	0.5882353	
3	2021	3 6	1 0		2338.06	0.441	2	0.6666667	
3	2022	3 6	1 0		2103.02	0.363	2	0.6166667	
3	2023	3 6	1 0		1686.34	0.391	2	1.3	

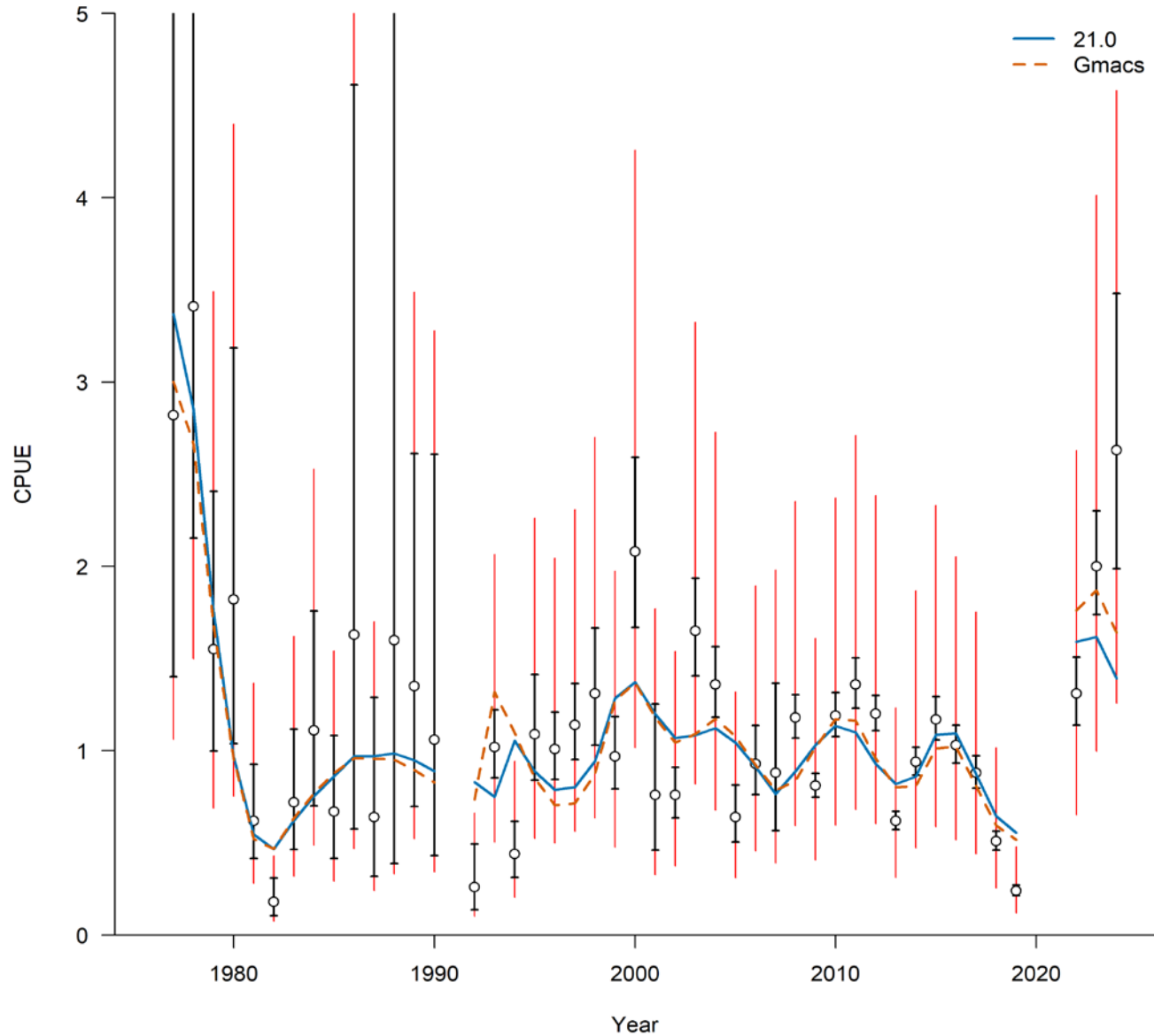
Model 21.0 vs. GMACS: Trawl Survey

Trawl survey crab abundance

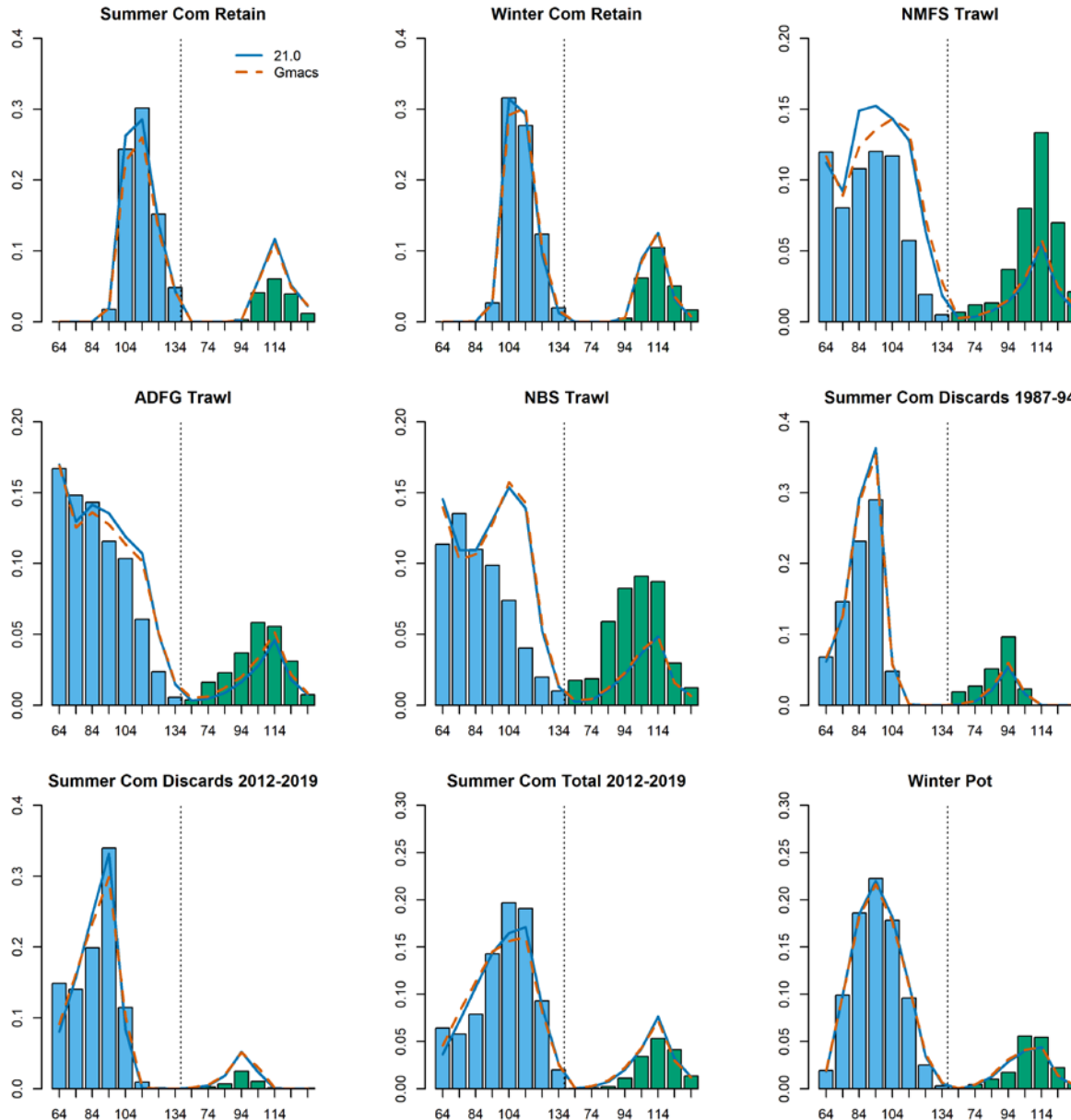


Model 21.0 vs. GMACS: St. CPUE

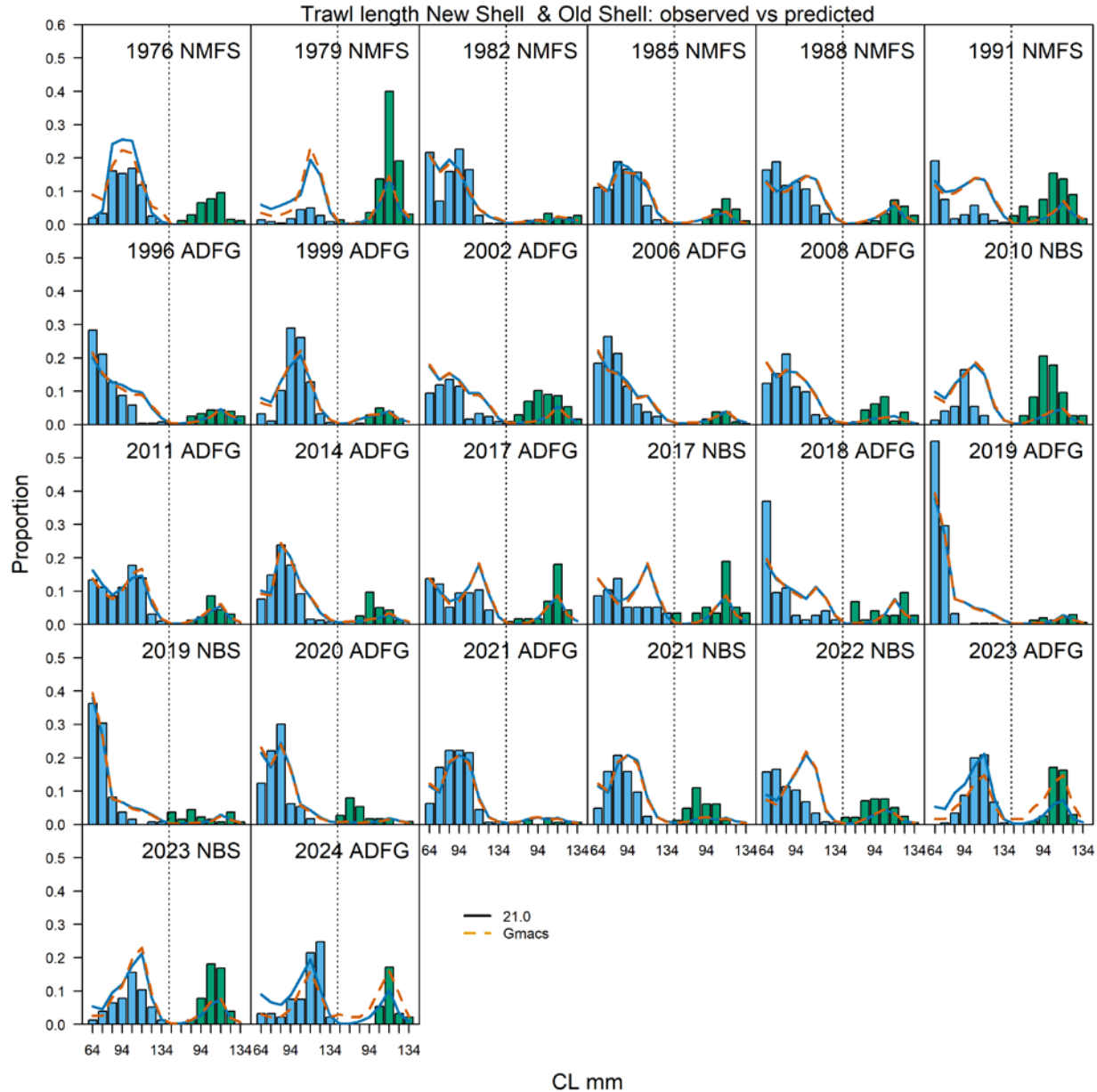
Summer commercial standardized cpue



Model 21.0 vs. GMACS: Length Shell

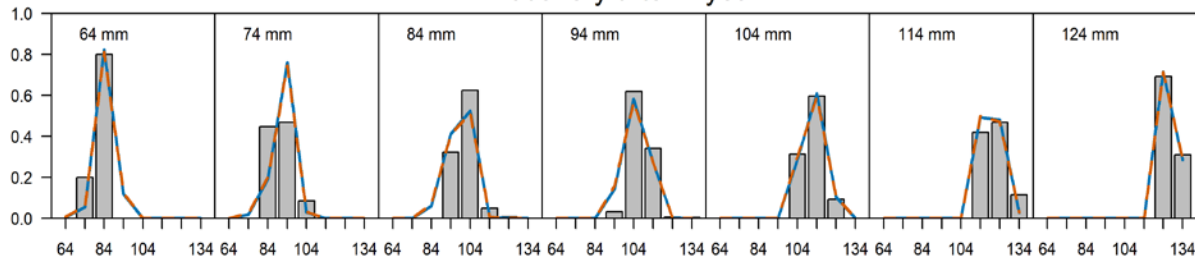


Model 21.0 vs. GMACS: Length Shell

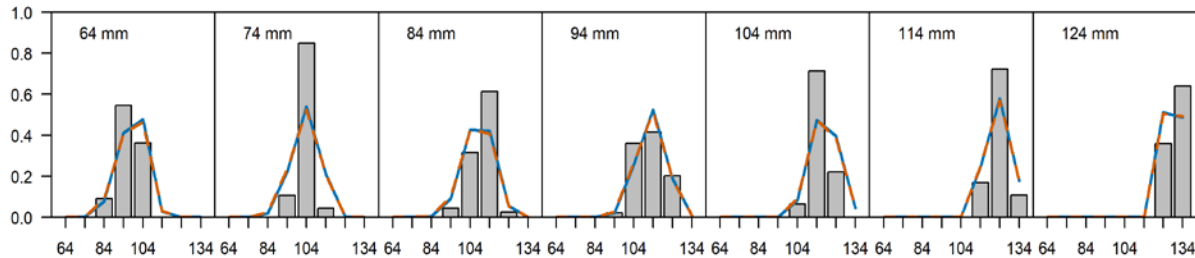


Model 21.0 vs. GMACS: Tag recovery

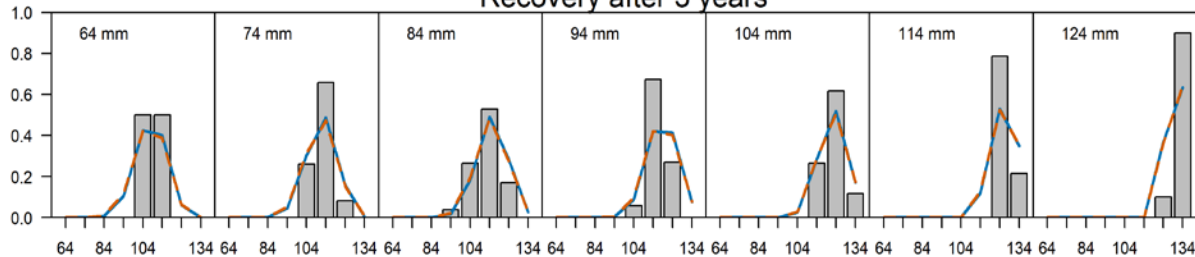
Tag recovery data observed vs predicted
Recovery after 1 year



Recovery after 2 years



Recovery after 3 years

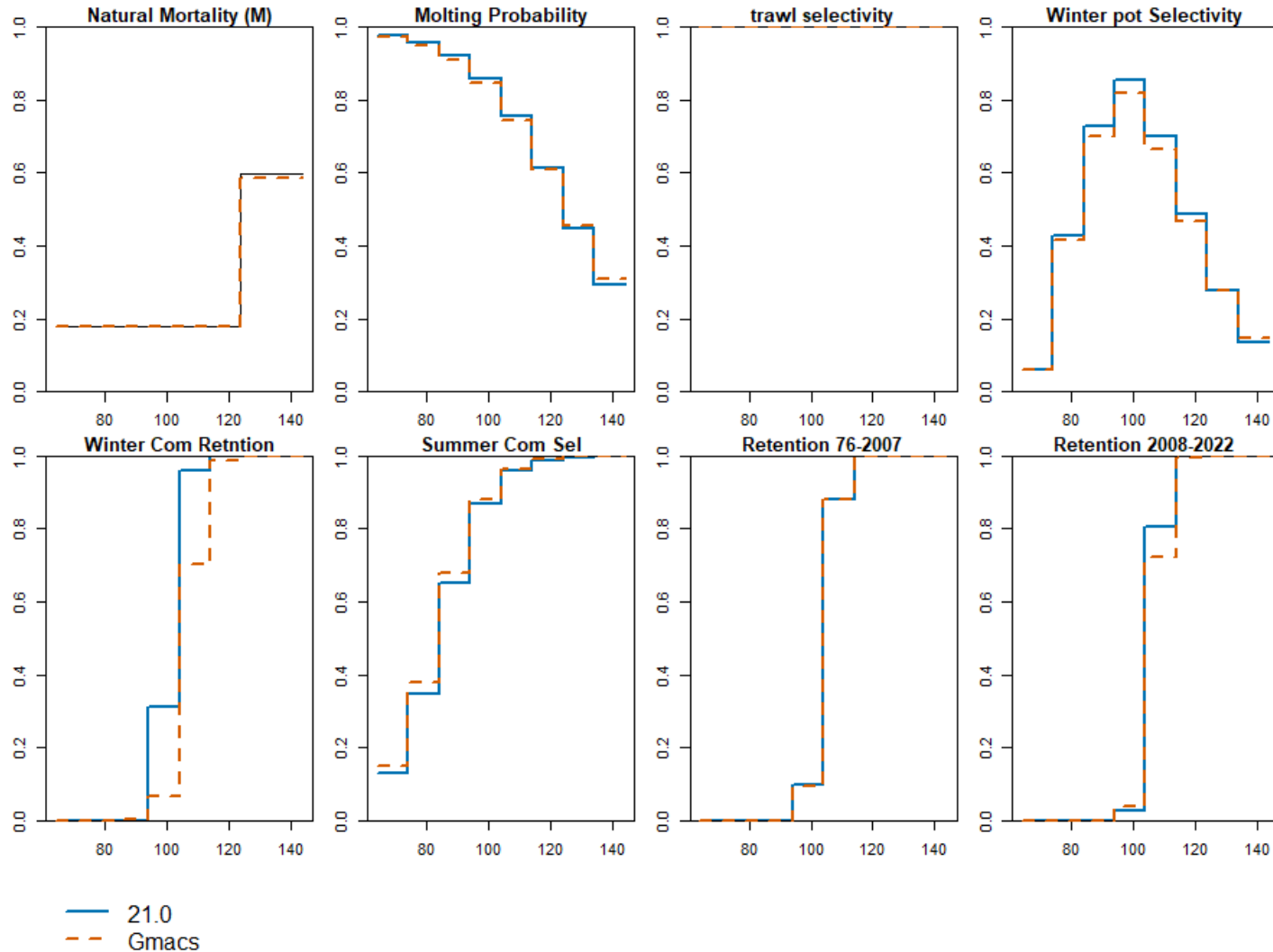


— 21.0
— GMACS

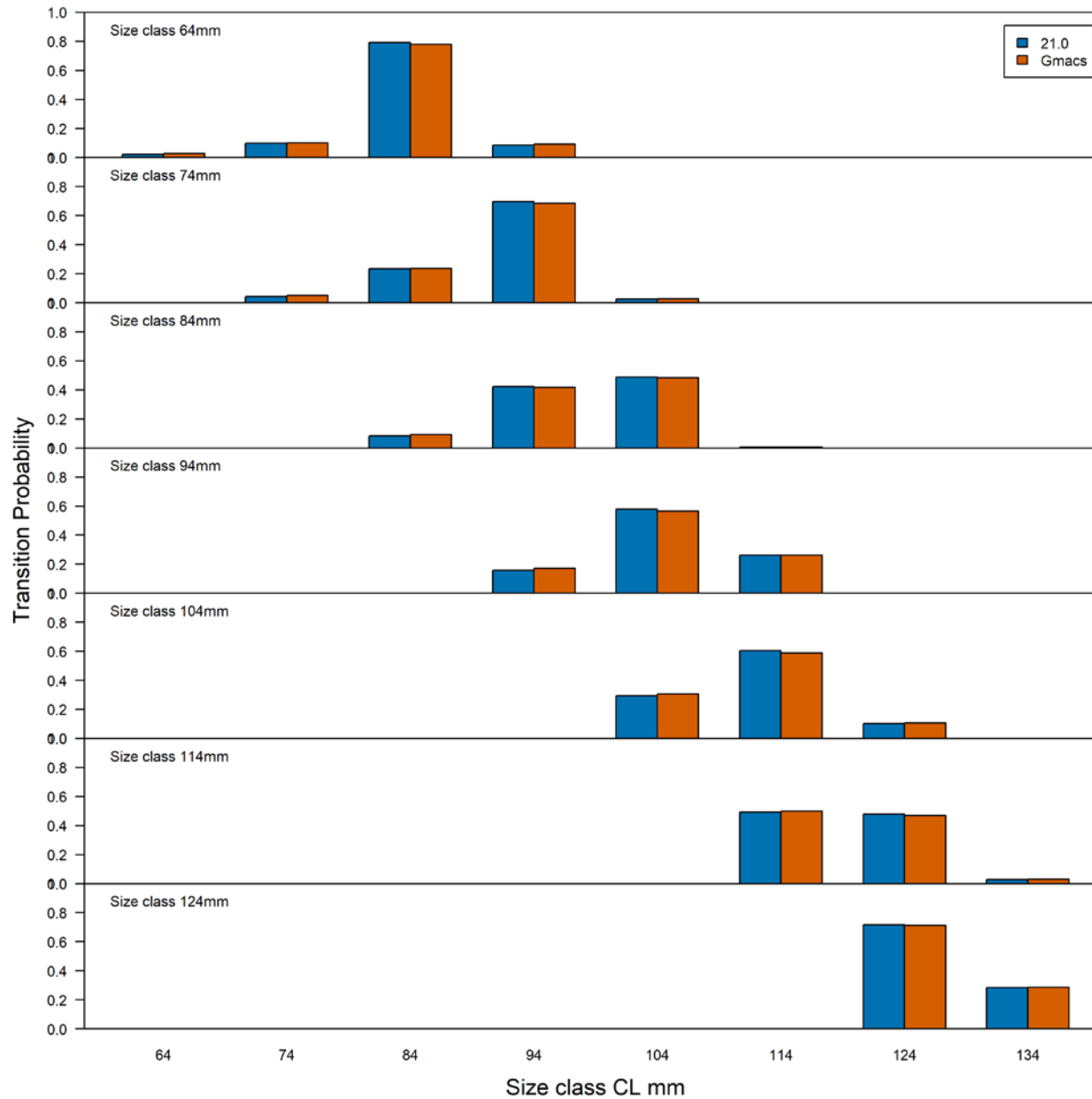
Model 21.0 vs. GMACS: Likelihood Calculated using the 21.0 formula

	Model 21.0	GMACS
Trawl Survey (RMSE)	0.350	0.371
CPUE (RMSE)	0.411	0.404
Length-shell comp		
Trawl	179.0	174.9
Winter pot	40.0	38.3
Summer Com	50.0	51.2
Summer Com Dis	26.9	24.5
Summer Com Total	10.7	11.6
Winter com	3.1	2.9
Tag	110.6	114.6

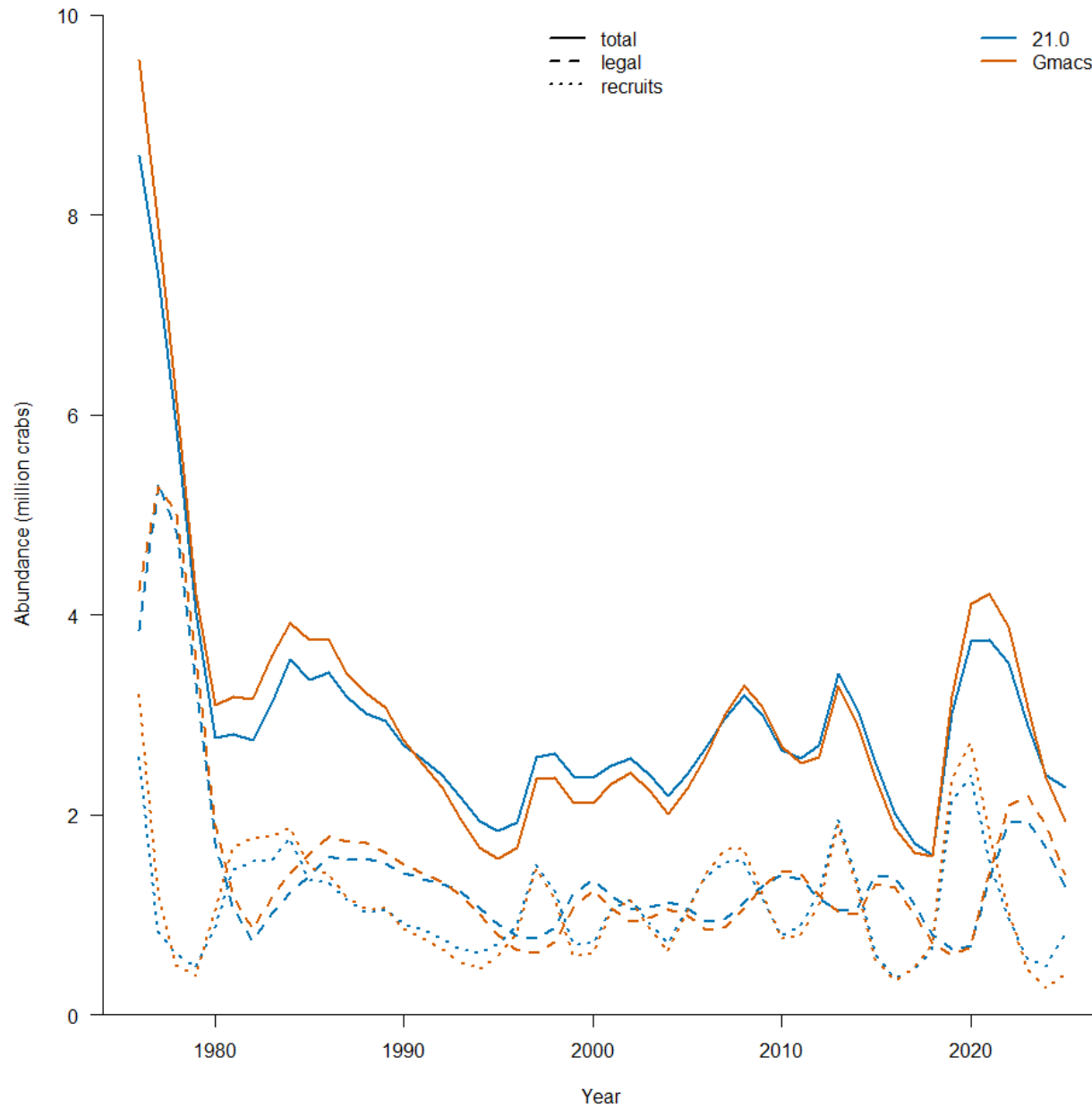
Model 21.0 vs. GMACS: Selectivity



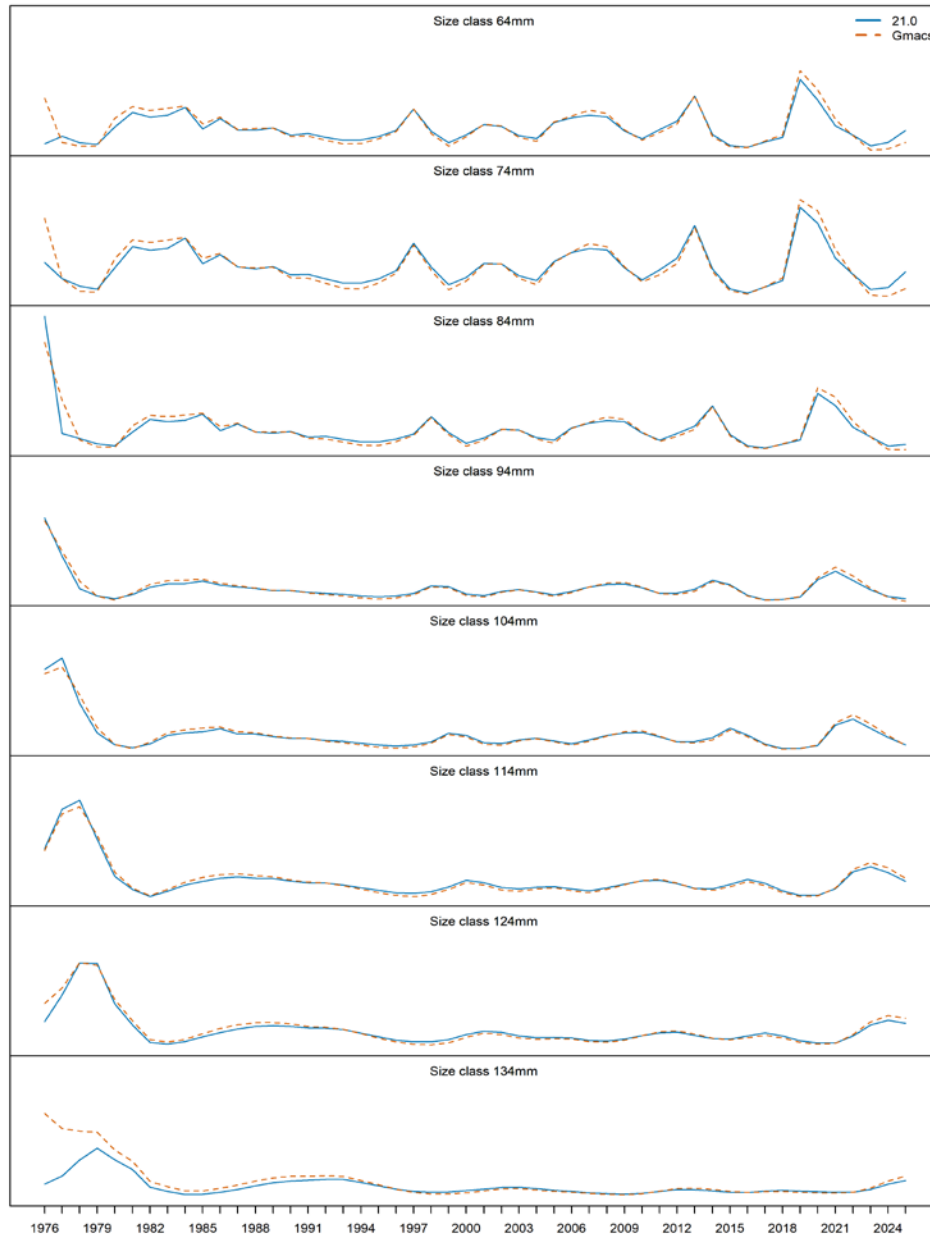
Model 21.0 vs. GMACS: Transition Probability



Model 21.0 vs. GMACS: Abundance

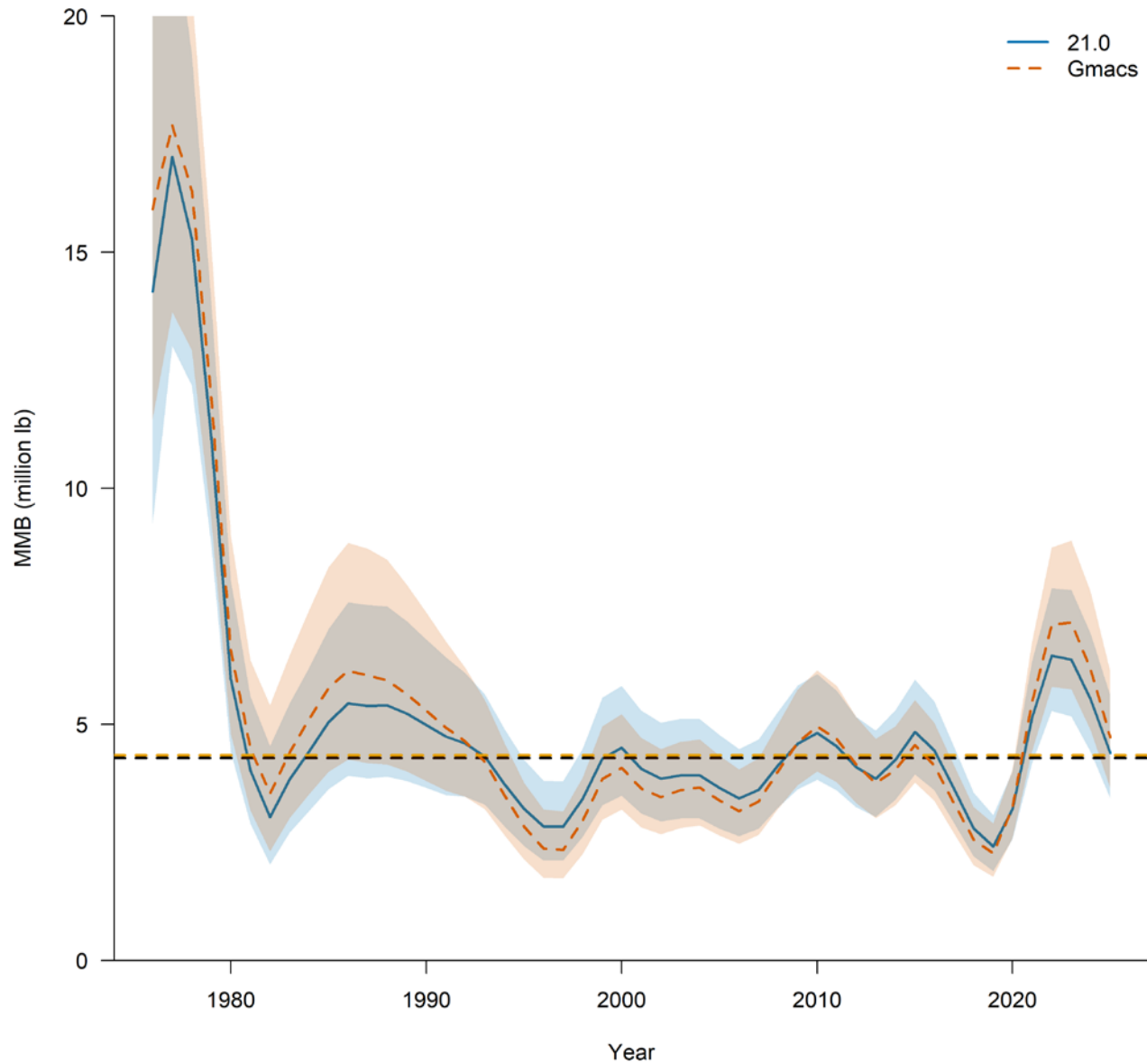


Model 21.0 vs. GMACS: by size class



Model 21.0 vs. GMACS: MMB: BMSY

MMB Feb 01



OFL: Status

	Model 21.0	GMACS
BMSY (mil lb)	4.28	4.34
MMB (2025) (mil lb)	4.39	4.72
B/BMSY	1.03	1.09
Tier	4a	4a
FOFL	0.18	0.18

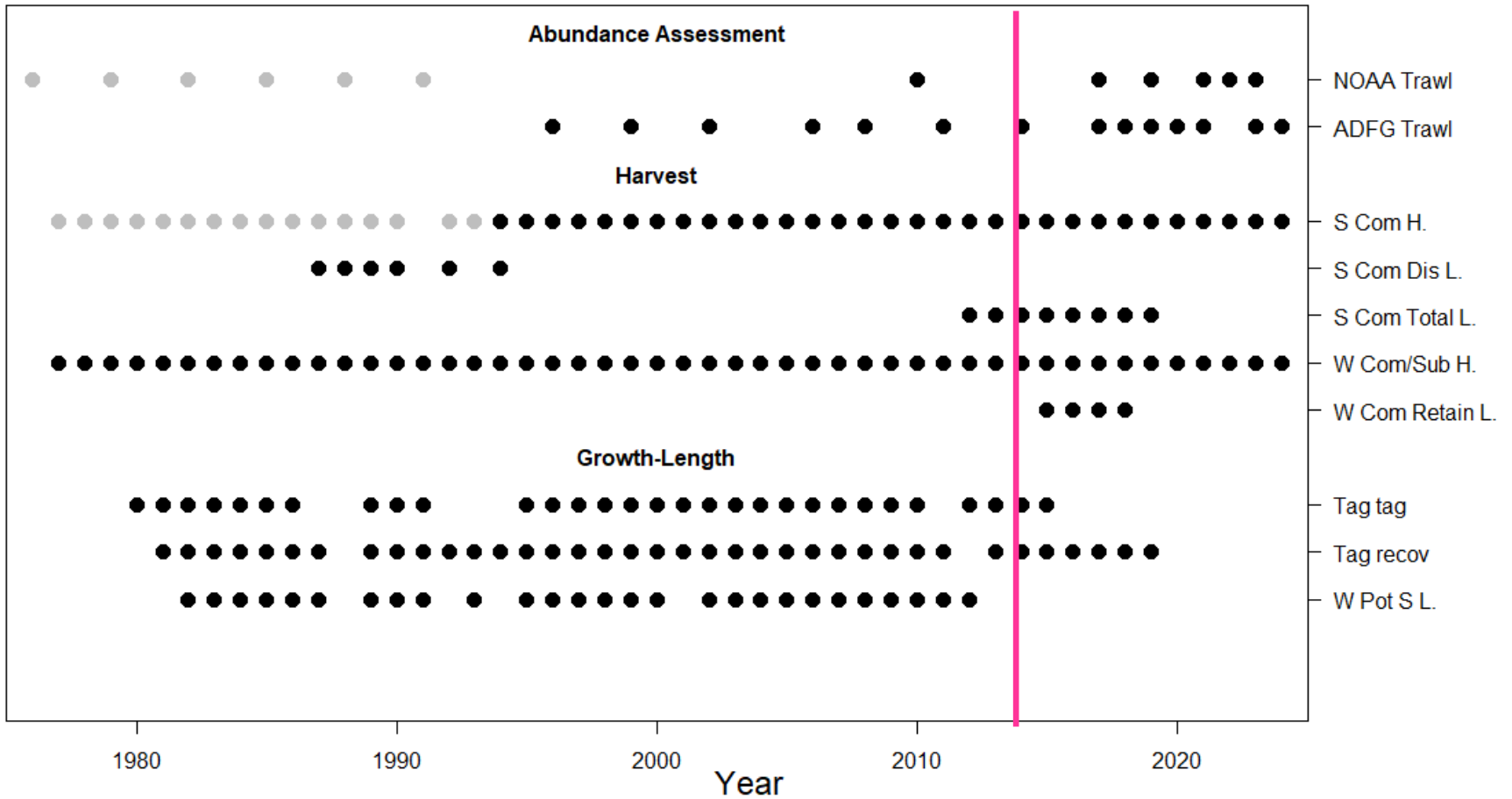
OFL

OFL (mil lb)	Total	Retained	Unretained
21.0 (formula)	0.58	0.56	0.02
GMACS (formula)	0.63	0.62	0.01
GMACS(model output)	1.15	1.12	0.03

NSRKC Agenda

- Determine transition to GMACS for the final draft Nov 2024.
 - Enough evidence to move forward with the transition?
 - GMACS OFL?
- Author recommendation
 - Transition to GMACS with OFL calculation updates
 - GMACS modification (?) Retrospective Analyses
 - André, Buck, Cody, Tyler?

NSRKC Agenda



Something I learned about GMACS

- Season assignments for catch-fleet are entered in both
 - Catch / Survey
 - Sex-Shell-Size composition
- What happens when the two entries do not match?