Norton Sound red king crab stock assessment

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Executive summary

1. **Stock**: Red king crab, *Paralithodes camtschaticus*, in Norton Sound, Alaska.
2. **Catches**: The Norton Sound red king crab (NSRKC) stock supports three fisheries: male-only summer and winter directed commercial fisheries and a year-round subsistence fishery. The summer commercial fishery began in 1977 and the highest catches occurred in 1977-1981, peaking in 1979 at 970,962 crab. From 1982 to the present, summer commercial catch has not exceeded 161,113 crab. The Norton Sound red king crab fishery began operating as super-exclusive in 1994, meaning that vessels registered for the fishery cannot participate in any other king crab fishery in the same registration year. From 1994 to 2025, the summer commercial fishery has accounted for an average of 94% of commercially-harvested crab by weight each year.

   In 2025, commercial fishers harvested 2,657 crab (7,360 lb) in winter and 100,758 crab (346,364 lb) in summer. Crab per pot lift (catch per unit effort, CPUE) in the summer commercial fishery was down 57% from 2024, and was 22% below the time series mean.

   Winter 2025 subsistence fishers caught 2,239 male crab and 59 female crab, and retained 1,897 male crab (5,255 lb), with 100% of permits returned. Summer subsistence fishers caught 526 male crab and 29 female crab, and retained 467 (1,605 lb) male crab, with 100% of permits returned. In total, a harvest of 105,779 male crab (360,584 lb) was reported for the commercial and subsistence fisheries in 2025. Discard mortality data are not available because vessels participating in the 2025 NSRKC fisheries did not have observers on board. The discard mortality estimate from model 25.0a2, the author-recommended model, is 8,840 lb. Combining retained and discard mortality, total fishing mortality in 2025 was 369,427 lb (0.168 kt).

   For 2025, the OFL was 0.284 kt (628,000 lb) and the ABC was 0.199 kt (440,000 lb). The GHL was 410,000 lb. Total fishing mortality was below the ABC and overfishing did not occur during 2025.
3. **Data sources**: The data sources used in this assessment are summarized in Figure 1 and include retained catch, discards, total catch, size compositions, and catch per unit effort (CPUE) from the summer commercial fishery; retained catch, total catch, and size compositions from the winter commercial fishery; retained catch from the winter subsistence fishery; growth information from a tagging study; size compositions from the winter pot survey; and abundance and size compositions from the National Oceanic and Atmospheric Administration (NOAA) Norton Sound (NS) trawl survey (1976-1991), the NOAA Northern Bering Sea (NBS) trawl survey (2010-present), and the Alaska Department of Fish and Game (ADF&G) trawl survey (1996-present).
4. **Stock biomass**: Abundance of the Norton Sound red king crab stock has been monitored by the NOAA NS trawl survey (1976-1991), the NOAA NBS trawl survey (2010-2025), and the ADF&G trawl survey (1996-2024; next scheduled for 2026). In 2025, estimated abundance from the NOAA NBS trawl survey was 1.63 million crab (CV = 0.64).

5. **Recruitment**: Recruitment is based on the estimated number of male crab 64-93 mm in carapace length (CL) in each year. As estimated by the authors' recommended model, 25.0a2, average recruitment over 1976-2024 was 772,504 lb. Data from the NBS trawl survey appear to show a recruitment pulse first apparent in 2019 moving though the population (Figure 2).

6. **Management performance**: The tables below show the status and catch specifications based on the model the authors recommend for harvest specifications (25.0a2) in both 1,000 t and million lb (Tables 1 - 2). The minimum stock size threshold (MSST) is calculated as $B_{MSY}/2$. The ABC is calculated as (1 - 0.3) * OFL, using the authors' recommended ABC buffer of 30%, which is the same buffer accepted for 2025 harvest specifications. The GHL listed is the total commercial GHL, including summer, winter, and Community Development Quota (CDQ) commercial fisheries. Harvest specifications for this stock in the 2026 fishing season are set in December 2025.

Table 1: Status and catch specifications (1,000 t) for the author-recommended model, 25.0a2.

Year	MSST	Biomass (MMB_{mating})	GHL	Retained catch	Total catch	OFL	ABC	Model
2021/21	1.02	2.29	0.14	0.003	0.003	0.20	0.16	
2022/22	0.95	2.42	0.15	0.15	0.16	0.30	0.18	
2023/23	1.20	2.40	0.178	0.192	0.201	0.292	0.204	
2024/24	1.00	2.50	0.219	0.209	0.215	0.332	0.233	
2025/25	0.98	2.15	0.186	0.164	0.168	0.284	0.199	
2026/26	1.00	1.56				0.193	0.135	25.0a2

Table 2: Status and catch specifications (million lb) for the author-recommended model, 25.0a2.

Year	MSST	Biomass (MMB_{mating})	GHL	Retained catch	Total catch	OFL	ABC	Model
2021/21	2.25	5.05	0.31	0.007	0.007	0.59	0.35	
2022/22	2.08	5.33	0.34	0.34	0.36	0.67	0.40	
2023/23	2.65	5.29	0.392	0.425	0.444	0.643	0.450	
2024/24	2.2	5.52	0.483	0.460	0.474	0.733	0.513	
2025/25	2.16	4.72	0.410	0.361	0.369	0.628	0.440	
2026/26	2.21	3.43				0.426	0.298	25.0a2

7. **Basis for the OFL**: Estimated mature-male biomass (MMB) is used as the measure of biomass for this Tier 4 stock, with males measuring $\geq$ 94 mm CL considered mature. The B_{MSY} proxy is obtained by averaging estimated MMB over a specific reference period, here 1980 to the most recent year.

Table 3: Basis for the OFL (1,000 t) from the author-recommended model, 25.0a2.

Year	Tier	B_{MSY}	Biomass (MMB_{mating})	B/B_{MSY}	F_{OFL}	Basis for B_{MSY}	Natural mortality	Model
2021/21	4a	2.05	2.29	1.1	0.18	1980-2020	0.18	
2022/22	4a	1.90	2.42	1.3	0.18	1980-2021	0.18	
2023/23	4a	1.98	2.40	1.2	0.18	1980-2022	0.18	
2024/24	4a	2.02	2.50	1.2	0.18	1980-2023	0.18	
2025/25	4a	1.96	2.15	1.09	0.18	1980-2024	0.18	
2026/26	4b	2.00	1.56	0.78	0.17	1980-2025	0.23	25.0a2

Table 4: Basis for the OFL (million lb) from the author-recommended model, 25.0a2.

Year	Tier	B_{MSY}	Biomass (MMB_{mating})	B/B_{MSY}	F_{OFL}	Basis for B_{MSY}	Natural mortality	Model
2021/21	4a	4.53	5.05	1.1	0.18	1980-2020	0.18	
2022/22	4a	4.17	5.33	1.3	0.18	1980-2021	0.18	
2023/23	4a	4.37	5.29	1.2	0.18	1980-2022	0.18	
2024/24	4a	4.45	5.52	1.2	0.18	1980-2023	0.18	
2025/25	4a	4.33	4.72	1.09	0.18	1980-2024	0.18	
2026/26	4b	4.42	3.43	0.78	0.17	1980-2025	0.23	25.0a2

8. **Probability density function (PDF) of the OFL:** The PDFs of the OFL for models 24.0b6, 24.0b7, 25.0a1, and 25.0a2 are shown in Figures 3 - 6.
9. **Basis for the ABC recommendation:** The CPT and SSC recommended an ABC buffer of 30% for setting harvest specifications for 2025 for the following reasons: 1) uncertainty in the biological characteristics of the stock; 2) difficulty in managing to a total mortality due to lack of information about discards; 3) the model's overestimation of the abundance of the largest male crab; 4) the use of a higher natural mortality value for larger males in order to correct for this overestimation of abundance rather than the size-independent M used by other Bering Sea and Aleutian Islands (BSAI) king crab stock assessment models; and 5) a retrospective pattern in model-estimated mature male biomass (Appendix A). Since these concerns remain largely unchanged, the authors recommend using a 30% ABC buffer for setting 2026 harvest specifications.
10. **Summary of rebuilding analyses:** The NSRKC stock is not currently subject to a rebuilding plan.

A. Summary of major changes

1. Changes to the management of the fishery

There are no changes to the management of the fishery.

2. Changes to the input data

The following time series were updated with 2025 data: winter subsistence fishery total and retained catch, winter commercial fishery retained catch, summer commercial fishery retained catch and size compositions, NOAA NBS trawl survey abundance and size compositions, and standardized summer commercial fishery CPUE.

3. Changes to the assessment methodology

This assessment has used the Generalized size-structured Model for Assessing Crustacean Stocks (GMACS) framework since 2024. The model used for 2025 harvest specifications was accepted by the Crab Plan Team (CPT) in November 2024 and is detailed in the 2024 SAFE document (Hamazaki 2024).

In this document, we present six model options for 2026 harvest specifications (Figure 7). Model 24.0b was presented at the May 2025 CPT meeting and is the base model (Stern and Palof 2025). Model 25.0a was also presented at the May 2025 CPT model and is model 24.0b with shell condition removed and the fixed value of M for males $\leq$ 123 mm CL increased to 0.23 from the value of 0.18 used in the base model, where 0.23 is the M value estimated in the most recent Bristol Bay red king crab (BBRKC) stock assessment (Palof 2025).

In response to suggestions from the North Pacific Fishery Management Council (NPFMC) Scientific and Statistical Committee (SSC) and the CPT, we present four other models that represent two different approaches to addressing the potentially unrealistically high fishing mortality (F) values for some years of the winter commercial fishery that are estimated by models 24.0b and 25.0a. Model 24.0b6, based on model 24.0b, uses an upper bound on F borrowed from the current BBRKC model for the winter commercial fishery; use of this bound leads to lower, and likely more realistic, estimated F values. Model 25.0a1, based on model 25.0a, also uses the BBRKC upper bound on F for the winter commercial fishery. Model 24.0b7, based on model 24.0b, uses a different selectivity pattern for the winter commercial fishery than is used in model 24.0b: rather than using the same, dome-shaped functional form for selectivity for the winter commercial fishery as is used for the winter pot survey, this model uses the same, asymptotic functional form for selectivity for the winter commercial fishery as is used for the summer commercial fishery. This change in the functional form for selectivity for the winter commercial fishery also leads to lower estimated F values. Model 25.0a2, based on model 25.0a, uses the same selectivity pattern configuration as model 24.0b7.

The approach of mirroring selectivity parameters for the winter commercial and subsistence fisheries to those estimated for the winter pot survey was likely taken due to observations suggesting that large males may migrate offshore in the spring and summer before returning to near-shore waters in the late winter (Powell et al. 1983; Bell et al. 2016), meaning that the availability of large males could be different in the winter versus summer. However, sharing selectivity parameters between the summer and winter commercial fisheries may still be more appropriate than sharing selectivity parameters between the winter commercial fishery and the winter pot survey. Escape rings are required for king crab pots used in the Norton Sound summer and winter commercial fisheries (Alaska Admin Code 5 AAC 34.925), meaning that commercial pots may be less likely to capture small crab than survey pots without escape rings. Due to the lack of observers, data on the size composition of discarded and total catch are unavailable for the winter commercial fishery, but the percentages of retained winter commercial catch in each size bin are more similar to those in the summer commercial fishery retained catch than those in the winter pot survey catch (see section E.2.h, below). The selectivity configuration in models 24.0b7 and 25.0a2 reflects this rationale.

B. Responses to SSC and CPT comments

The status of SSC and CPT recommendations is summarized in Table 7.

SSC comments on assessments in general, October 2025

The SSC recommends continued progress towards making SAFE documents as consistent in structure and content as practicable. The SSC recognizes that assessments vary among stocks, however documents that are as similar as possible will facilitate review and ensure accessibility to a wide audience.

We have attempted to make this document consistent with other BSAI crab SAFE documents.

The SSC notes that crab stock assessment authors currently use the OFL for catch projections. The SSC recommends that the authors and CPT provide a justification if catches are set to the OFL in projections, or use a more realistic estimate of future catches as is done in groundfish assessments.

This item will likely be discussed during the January 2026 CPT modeling workshop, as setting the catch equal to the OFL in projections is currently standard for projections in GMACS.

CPT comments on assessments in general, September 2025

The CPT proposed that using “minimal to moderate concern”, “substantial concern”, and “extreme concern” to correspond with levels 1, 2, and 3 in the risk table would more effectively describe concern levels and allow them to be tracked year to year.

We have used the CPT’s proposed descriptions of the concern levels in the NSRKC risk table presented here (Appendix B).

SSC comments specific to NSRKC assessment, June 2025

. . . the CPT recommended bringing forward 24.0b as the base model and 25.0a, which does not include shell condition for males, a fixed M of 0.23 for males less than 123mm and an estimated male M for those greater than 123mm. The SSC concurs with the models to be brought forward but requests an additional model based on 24.0b that explores alternative parameterizations of selectivity or, if necessary, constraining F to address high values of F seen in 24.0b. The SSC was generally not in favor of the latter option, as F is indirectly linked to the scale of the population and may lead to unrepresentative changes in reference points.

We bring forward six models in this document: 24.0b, 25.0a, and two models based on each of these that represent different approaches to addressing the high estimated fishing mortality (F) values for the winter commercial fishery. In the first approach, we used an upper bound on F borrowed from the current Bristol Bay red king crab stock assessment model for the winter commercial fishery (models 24.0b6 and 25.0a1). Use of this bound leads to lower, and likely more realistic, estimated F values (Figure 8). In the second approach, we used a different selectivity pattern for the winter commercial fishery than is used in the base model: rather than using the same, dome-shaped functional form for selectivity for the winter commercial fishery as is used for the winter pot survey, we used the same, asymptotic functional form for selectivity for the winter commercial fishery as is used for the summer commercial fishery (models 24.0b7 and 25.0a2). This change in the functional form for selectivity for the winter commercial fishery also leads to lower estimated F values (Figure 9).

One of the more long-standing recommendations echoed by both the SSC and CPT for this stock is the development of model-based indices of abundance. The SSC... concurs with the CPT suggestion that this be explored further in a research model framework. Given that selectivities are assumed to be the same across all three surveys in this assessment, the SSC suggests a single model-based index that includes all three surveys and a broad prediction grid reflecting the distribution of the stock could be a viable option for the future.

We continue to pursue development of model-based indices of abundance for NSRKC in a research model framework and presented this work at the September 2025 CPT meeting (Stern 2025b). We plan to present further updates in 2026.

SSC comments on assessments in general, June 2025

The SSC notes that a historical retrospective is different from a within model retrospective and requests that crab assessments include a plot comparing the model-estimated time series of mature male biomass from the current assessment with the time series from the ten previous assessments (i.e., historical retrospective).

A historical retrospective plot is included in this assessment (Figure 10).

The SSC recommended that the CPT provide GMACS version updates in each CPT report with information on changes between versions and that authors clearly identify which GMACS versions were used and a brief summary of the effects on the assessment.

The GMACS version used in this assessment is 2.20.20, the same version used for the proposed models in May 2025.

The SSC recommends that each crab SAFE chapter include a clear description of the buffers used in harvest specification over the most recent five years, as a basis for comparing the current year's buffer recommendations.

The buffers and buffer justifications used in harvest specifications for NSRKC over the most recent five years are presented in Appendix A.

The SSC recommends that both new and ongoing concerns regarding the stock should be recorded in the risk table, not just new concerns... The CPT intends to include the uncertainty due to the tier level in the risk table, since this uncertainty plays a role in the buffer consideration. The SSC suggests that if the CPT follows this course, that the tier level concern be listed separately in the risk table.

We have followed these recommendations in the risk table for this stock, presented in Appendix B.

CPT comments specific to NSRKC assessment, May 2025

The CPT recommended that the author investigate how realistic the parameter space explored in the MLE solution (24.0b) is, suggesting that a better approach would be to place a prior on F that would penalize high F values.

We present models employing an upper bound on F in this document (models 24.0b6 and 25.0a1).

The CPT recommended bringing forward models 24.0b (base) and 25.0a (no shell condition, M fixed at 0.23 for males $\leq$ *123 mm CL and estimated for males* $>$ *123 mm CL) for setting specifications in November. When bringing forward model 24.0b, the author should ensure the solution is at the actual MLE, and confirm that this MLE includes realistic explorations of the parameter space. This may include a prior on F to penalize solutions based on unrealistically high values for the winter commercial fishery.*

We bring forward six models in this document: 24.0b, 25.0a, and two models based on each of these that represent different approaches to addressing the high estimated fishing mortality (F) values for the winter commercial fishery.

The CPT highlighted the need for continued work on model-based abundance estimates for NSRKC, as survey area consistency has been a reoccurring issue in the assessment... The CPT encouraged the continued development of assessments based on model-based survey indices as a research topic separate from models for management consideration. Specifically, CPT encouraged explorations of the sensitivities of selectivity for joint model-based indices spanning multiple trawl survey time series. In discussion of the appropriate prediction model, the CPT noted that this decision depends on assumptions related to catchability (Q) for different surveys with areas inside and outside of the different prediction areas. The CPT also discussed the possibility of matching the prediction area to the area that matches the fishery, and this comparison might be informed by evaluating the proportion of the fishery that has occurred outside the prediction area. This analysis might be useful for identifying areas that have only rarely been fished that might not be important for prediction area considerations. Further updates on NSRKC model based indices will be reviewed as research models to ensure that inclusion of the model based indices coincides with how they are used in the assessment model.

Work on model-based abundance estimates for NSRKC continues, with preliminary results and research-track assessment models presented at the September 2025 CPT meeting (Stern 2025b).

CPT comments on assessments in general, May 2025

Given that baseline buffers or buffer ranges are not specified by tier level for crab stocks, buffers should consider uncertainty associated with tier level if warranted... The risk table should also be used to evaluate additional uncertainty, on a stock-by-stock basis, that is not already incorporated in the assessment model, tier level, or harvest control rules.

We have followed these guidelines in completing the risk table for NSRKC (Appendix B).

At their discretion, assessment authors should coordinate with ESP authors (and ESR authors when an ESP is not available) to discuss ecosystem considerations prior to completion of a risk table.

An Ecosystem and Socioeconomic Profile (ESP) has not yet been created for NSRKC. We coordinated with Ecosystem Status Report (ESR) author Dr. Ebett Siddon, who provided useful information on ecosystem considerations; this information was used in completion of the risk table.

Risk tables should be conducted for all annual crab stock assessments (Snow crab, Tanner crab, BBRKC, NSRKC, and AIGKC). A full risk table will be contained as an appendix in each individual SAFE chapter with rationale given for risk table scoring.

We provide a full risk table and rationale for scoring in Appendix B.

SSC comments specific to NSRKC assessment, December 2024

In response to a CPT and SSC request in October, jittering results were presented at the CPT meeting and a table of the results was provided in the assessment. The author indicated that both models performed acceptably. The SSC supports the CPT recommendation related to the presentation of this analysis, and further requests a full suite of diagnostics and sensitivities per best practices for the next cycle for the new GMACS model.

We present jittering results for models 24.0b, 24.0b6, 24.0b7, 25.0a, 25.0a1, and 25.0a2 below. We welcome feedback on the presentation of the jittering analysis and suggestions for further diagnostics that would be helpful in evaluating model performance.

There were two issues discovered with Model 24.0 that the author and CPT have prioritized for further work during this transition. First, the inclusion of the winter subsistence total catch data were problematic and these data were removed from the GMACS model. Second, the calculation of the OFL in the GMACS framework did not accommodate multiple fisheries operating at different times of the year, so OFL needed to be calculated outside of the assessment model. The SSC supports the resolution of these issues to finalize this transition.

At the CPT modeling workshop in January 2025, André Punt modified GMACS to enable calculation of the OFL when multiple fisheries occur at different times of year; we thank Dr. Punt for resolving this issue. Using GMACS version 2.20.20, we are able to correctly calculate the OFL for the Norton Sound red king crab stock. We have not yet resolved the issues with including the winter subsistence total catch data in the model; only winter subsistence retained catch data are included in the models presented here.

In terms of the buffer, the CPT recommended a continuation of the 30% buffer as the move to GMACS didn't directly address all of the persistent issues with this assessment. These include uncertainty in the biological characteristics of the stock; a lack of information on discards which makes it difficult to manage to a total mortality; overestimation of the largest male crab which can only be resolved with the higher M *at the larger sizes classes and whether that is appropriate. The SSC noted that the concern over parameters on bounds had been alleviated, but the move to GMACs resulted in a higher retrospective bias than the previous model. For these reasons, the SSC concurs with the use of the 30% buffer for this assessment. The SSC requests the authors focus on addressing these issues, following finalization of the transition to GMACS.*

We address some of these issues in this document and plan to address the others in future. We investigated whether excluding shell condition improves estimation of the largest male crab (models 25.0a, 25.0a1, 25.0a2). In proposed models presented to the CPT in May 2025, we examined the effects on model fits to size compositions of using a size-independent M and of using the M value estimated for the Bristol Bay red king crab stock (Palof 2025) both with shell condition included and with shell condition excluded; models 25.0a, 25.0a1, and 25.0a2 in this document all use the M value borrowed from BBRKC. We show the retrospective patterns for all of the models presented in this document. We do not address uncertainty in the biological characteristics of the stock and the lack of information on discards here but will investigate these issues in a future assessment cycle.

The SSC looks forward to the presentation of the author's work implementing model-based methodologies to develop a combined index for this stock and appreciate the progress made on the SSC's past comments on index standardization.

Work on model-based abundance estimates for NSRKC continues, with results and research-track assessment models presented at the September 2025 CPT meeting (Stern 2025b). We plan to present further progress on this work in 2026.

The SSC would be interested in seeing a model that uses a prior for a size-independent natural mortality from Bristol Bay red king crab, as a continuation of the model considered for harvest specifications in February 2024.

We presented models using an upper bound for size-independent natural mortality from Bristol Bay red king crab in May 2025; the CPT and SSC did not recommend bringing forward those models for this document.

The SSC also supports the other recommendations from the CPT, such as including fits to catch data in the assessment, investigating the retrospective pattern and reviewing how shell condition influences size composition fits.

In this document, we present models (25.0a, 25.0a1, and 25.0a2) with shell condition removed from the size compositions, such that males with both shell conditions (newshell and oldshell) are combined, and show the effects of shell condition removal on size composition fits. We include plots of model fits to catch data. We present plots showing retrospective patterns for all six of the models.

There were multiple readability issues noted in the current document and the SSC requests that this assessment be aligned with current standards outlined in the crab SAFE guidelines.

We have endeavored to align this document with the crab SAFE guidelines and ensure that readability issues are addressed.

CPT comments specific to NSRKC assessment, November 2024

The main difference between the bespoke model and 24.0 is that fishing mortality (i.e., catch) is subtracted exactly in the bespoke model, whereas model 24.0 estimates fishing mortality as a rate, F. Hamachan noted that the fits to total catch during the winter subsistence fishery were poor and this dataset was ultimately removed from model 24.0, although it was included in the bespoke model. Catch during the winter subsistence fishery is typically very minor, and fits to retained winter subsistence catch are included in model 24.0. Fits to catch data were not shown, but are requested for future assessments.

We show fits to catch data below. We have not yet determined how best to include total catch from the winter subsistence fishery in the model, but plan to explore this issue in a future assessment cycle.

The CPT requested that jitter results be presented as plots during the next cycle, following guidance for all assessments to be discussed at the January modeling workshop.

We present jitter results in Figure 11 and Table 8.

Model 24.0 had greater retrospective bias than the bespoke model, but there was not clear evidence as to a potential reason other than differences in model structure. It was noted that this retrospective analysis evaluated the projection year for both the bespoke model and 24.0, which may be more aptly interpreted as a one step ahead residual analysis. All other BSAI crab assessments evaluate retrospective bias without including the projection year.

We present retrospective analyses excluding the projection year below.

C. Introduction

1. Scientific name

Red king crab, *Paralithodes camtschaticus*, in Norton Sound, Alaska.

2. General distribution

Red king crab are distributed throughout the North Pacific, from the Gulf of Alaska and northern British Columbia, including populations in Southeast Alaska and around Kodiak Island, to the Bering and Chukchi Seas, the Sea of Okhotsk, the Kuril Islands, and Hokkaido (Stevens and Lovrich 2014). Norton Sound red king crab (NSRKC) is one of the northernmost red king crab populations that supports a commercial fishery (Powell et al. 1983). For management purposes, the NSRKC stock is defined as those red king crab in the Norton Sound Section (Q3) of ADF&G Registration Area Q (Menard et al. 2022). The Norton Sound Section consists of all waters in Registration Area Q north of the latitude of Cape Romanzof (61° 49’ N latitude), east of the International Dateline, and south of 66° N latitude (Figure 12; Menard et al. 2022). Data from the NOAA NBS and Eastern Bering Sea trawl surveys indicate that the NSRKC stock is usually separated from the Bristol Bay red king crab stock by areas in which no red king crab were found, although this is not the case in all survey years (Figure 13; Markowitz et al. 2023).

3. Evidence of stock structure

Red king crab from Norton Sound and the Chukchi Sea form a distinct genetic subgroup within the Gulf of Alaska-Eastern Bering Sea-Norton Sound/Chukchi Sea genetic grouping, based on analysis of genetic structure using whole genome sequencing (St. John et al. 2025). An earlier analysis using SNP loci as well as mitochondrial DNA found that Norton Sound red king crab fell within the Okhotsk Sea/Norton Sound/Aleutian Islands evolutionary lineage and were genetically isolated from southeastern Bering Sea red king crab populations; this study did not include samples from Chukchi Sea red king crab (Grant and Cheng 2012).

4. Life history

Female NSRKC attain 50% sexual maturity at 68 mm CL (Powell et al. 1983). Female NSRKC mature at smaller sizes and have higher fecundity than RKC females studied in Kodiak, Adak, Bristol Bay, and the Pribilof Islands (Powell et al. 1983; Otto et al. 1989). Male NSRKC attain 50% maturity at 50-59 mm CL and 95% maturity at 70-79 mm CL (Paul et al. 1991). Examination of grasping pairs found that male crab were nearly always larger than the female crab with which they mated (Powell and Nickerson 1965), suggesting that functional maturity of male crab may occur at a larger size than physiological maturity.

NSRKC molt annually until reaching approximately 110 mm CL, after which they molt biennially (Bell et al. 2016). The timing of molting may be more variable for NSRKC than for other RKC stocks in Alaska due to the lack of deep water refugia commonly used by molting crab (Powell et al. 1983). Norton Sound is uniformly shallow, with depth typically 10-35 m (Powell et al. 1983). The growth increment for legal male crab, defined as 103-115 mm CL, was estimated as 11 mm using tagging data (Bell et al. 2016). The growth increment for sublegal male crab, defined as $<$ 103 mm CL, was estimated to be slightly larger at 13 mm (Bell et al. 2016). Mating occurs immediately after female crab have molted, likely in April-June (Powell et al. 1983) or January-June (Otto et al. 1989). Norton Sound red king crab migrate from offshore to nearshore waters in late winter and early spring before moving back to offshore waters in the summer (Bell et al. 2016).

Little information is available to estimate NSRKC natural mortality. Based on tagging information, Powell et al. (1983) estimated a natural mortality rate of at least 0.37. The natural mortality rate of 0.18, used for males with CL $\leq$ 123 mm in models 24.0b, 24.0b6, and 24.0b7, was calculated using $M = -ln(p)/t_{max}$, assuming that a proportion (p) equal to 0.01 of crab reach the estimated maximum age (t_{max}) of 25 years old (Hoenig 1983; Hamazaki 2024).

5. Management history

A complete summary of the management history is provided in the ADF&G Annual Management Report for the Norton Sound, Port Clarence, and Arctic/Kotzebue management areas (Menard et al. 2022).

A distinguishing characteristic of the NSRKC fisheries is that all fisheries, surveys, research, and management are primarily conducted by local residents of Norton Sound. Commercial fisheries are designated as super-exclusive: a vessel registered for the Norton Sound crab fishery may not be used to take king crabs in any other registration areas. The NSRKC commercial fisheries occur in summer (June – August) and winter (December – May), while the subsistence fishery is open year-round. The majority of NSRKC harvest occurs during the summer commercial fishery; the winter commercial and subsistence fisheries occur through the ice and take a much smaller harvest. In Norton Sound, a legal crab is defined as $\geq$ 4.75 inches carapace width (CW; Menard et al. 2022), which is approximately equivalent to $\geq$ 104 mm CL. In 2005 and 2006, commercial buyers, specifically the Norton Sound Economic Development Corporation (NSEDC), accepted only legal crab of $\geq$ 5 inches CW. This preference became permanent in 2008.

6. ADF&G harvest strategy

Since 1997, NSRKC has been managed based on a guideline harvest level (GHL). From 1999 to 2011, the GHL for the summer commercial fishery was determined using model estimated biomass: (1) 0% harvest rate of legal crab when estimated legal biomass $<$ 1.5 million lb; (2) $\leq$ 5% of legal male biomass when the estimated legal biomass falls within the range 1.5-2.5 million lb; and (3) $\leq$ 10% of legal male biomass when estimated legal biomass $>$ 2.5 million lb. In 2012, the summer commercial fishery GHL was revised to (1) 0% harvest rate of legal crab when estimated legal biomass $<$ 1.25 million lb; (2) $\leq$ 7% of legal male biomass when the estimated legal biomass falls within the range 1.25-2.0 million lb; (3) $\leq$ 13% of legal male biomass when the estimated legal biomass falls within the range 2.0-3.0 million lb; and (4) $\leq$ 15% of legal male biomass when estimated legal biomass $>$3.0 million lb. In 2015 the Board of Fisheries passed regulations revising the GHL to include summer and winter commercial fisheries and setting the GHL for the winter commercial fishery at 8% of the total GHL. The Community Development Quota (CDQ) harvest share is 7.5% of the GHL and can be harvested in both summer and winter.

7. History of the basis and estimates for B_{MSY}

NSRKC is a Tier 4 crab stock, meaning that the information necessary to reliably estimate B_{MSY} is lacking and instead a B_{MSY} proxy is obtained by averaging estimated biomass over a specific reference period (NPFMC 2024). For NSRKC, the B_{MSY} proxy is calculated as the mean model-estimated mature male biomass (MMB) from 1980 to the present. The choice of this time period was based on a hypothesized shift in stock productivity due to a climatic regime shift indexed by the Pacific Decadal Oscillation (PDO) in 1976-77.

8. History of the target fishery

The large vessel commercial fishery for NSRKC began in 1977, with legal size set at $\geq$ 5 inches CW. In 1978, legal size was changed to $\geq$ 4.75 inches CW. The fishery was closed in the 1991 season due to staff constraints. The large vessel commercial fishery ended in 1993, when the fishery was restricted to small vessels. Other important changes in regulations in the 1990's include super exclusive designation (1994), implementation of the CDQ allocation (1998), and implementation of the GHL (1999). In the 2000's, changes in the fishery included implementation of the North Pacific License Limitation Program (2000); revision of the summer commercial fishery closure areas intended to protect crab accessed by the inshore subsistence fishery (2002; Figure 14); expansion of the Norton Sound Section (Q3) of Registration Area Q to include the portion of the former St. Lawrence Island Section south of 66° N latitude and west of 168° W longitude (2006); changes in escape ring requirements for pots and the start date of the open access fishery (2008); and the market-preferred size of $\geq$ 5 inches CW becoming the standard commercial retained size. In the 2010's, the BOF adopted a revised GHL for the summer commercial fishery (2012), the winter GHL for commercial fisheries was established and modified winter fishing season dates were implemented (2016), and the NSEDC stopped purchasing crab harvested in the winter commercial fishery. In 2020, the BOF closed the summer commercial fishery east of 167° W longitude. In 2020-2021, the summer commercial fisheries opened but, as the NSEDC was not purchasing crab harvested in these fisheries, commercial harvests were very small.

The timing of the winter commercial fishing season has changed over time in response to ice stability. The winter commercial fishery period was originally January 1 to April 30, before changing in 1985 to November 15 to May 15. In 2015, the period was changed to January 15 to April 30 after fisheries opened on November 15 in 2014, such that the January 15 starting date was into effect in 2016. In 2021, the period was changed to February 1 to April 30. The NSEDC stopped purchasing winter fishery crab in 2019, and since then winter commercial catches have been harvested by catcher-seller permit holders.

The subsistence fishery has a long history; however, harvest information for the winter subsistence fishery is available only since the 1977/78 season. The majority of subsistence crab harvest occurs in winter using hand lines and pots through nearshore ice. Subsistence harvesters must obtain a permit before fishing and record daily effort and catch. There are no size or sex-specific harvest limits, but the majority of retained catch is males of near legal size. Summer subsistence fishery harvest has been monitored since 2004. The summer subsistence fishery harvest is not currently included in the assessment model. Harvest in both the winter commercial and subsistence fisheries is influenced by the availability of stable ice conditions. Small harvests can occur due to poor ice conditions, regardless of crab abundance.

D. Data

For this assessment, we replicated the methods used in 2024 to analyze the data used in the model as closely as possible. We updated only the 2025 values for the harvest and abundance time series and the size compositions. We plan to present model runs using recalculated time series in May 2026, with data processing methods updated such that all time series are fully reproducible.

1. Summary of new information

The following time series were updated with 2025 data: winter subsistence fishery total and retained catch, winter commercial fishery retained catch, summer commercial fishery retained catch and size compositions, NOAA NBS trawl survey abundance and size compositions, and standardized summer commercial fishery CPUE.

2. Data which should be presented as time series

The data sources used in this assessment are summarized in Figure 1 and include retained catch, discards, total catch, size compositions, and CPUE from the summer commercial fishery; retained catch, total catch, and size compositions from the winter commercial fishery; retained catch from the winter subsistence fishery; growth information from a tagging study; size compositions from the winter pot survey; and abundance and size compositions from the National Oceanic and Atmospheric Administration (NOAA) Norton Sound (NS) trawl survey (1976-1991), the NOAA Northern Bering Sea (NBS) trawl survey (2010-present), and the Alaska Department of Fish and Game (ADF&G) trawl survey (1996-present). All data included in the assessment model are displayed in Appendix C.

a. Total catch

Catch data used for the assessment model are shown in Appendix C. These include summer commercial fishery retained catch, winter commercial fishery retained catch, and winter subsistence fishery retained catch. Winter subsistence fishery total catch is included but is not currently fitted by the model; the emphasis is set to 0 for this data set due to large changes in model output observed when emphasis was set to 1. Summer subsistence total and retained catch are not included in the model; the authors plan to explore including these time series in future assessment cycles.

b. Information on bycatch and discards

Bycatch information is not currently included in the model. The only bycatch mortality in the federal groundfish fisheries that the authors were able to find occurred in the fixed gear fisheries and totaled 13 kg in 2018, 24 kg in 2019, and 4 kg in 2020. Bycatch mortality for all other years was zero. Previous investigations showed that this bycatch occurred west of 168° longitude, raising questions about whether the documented bycatch should be included in the model. The NSRKC fisheries are not systematically observed and discard information is available only for the summer commercial fishery and only in a subset of years (1987-1990, 1992, 1994, 2012-2019). Size composition data from the discarded catch are included for that subset of years.

c. Catch-at-length for fisheries, bycatch, and discards

Catch-at-length time series used in the assessment model are shown in Appendix C and include catch-at-length data from the summer commercial fishery retained, discarded, and total catch as well as the winter commercial fishery retained catch. Length measurements are not collected for the subsistence harvest.

d. Survey biomass estimates

Survey abundance estimates used for the assessment model are shown in Appendix C and include estimates from the NOAA Norton Sound, ADF&G, and NOAA NBS trawl surveys. The spatial area over which abundance is estimated is inconsistent among the three surveys. The model currently uses design-based estimates of abundance from the ADF&G survey and NOAA NBS survey that are calculated using a smaller spatial area (maximum 5,641 nm^2 or 19,348 km^2) than are those for the NOAA Norton Sound survey (7,600 nm^2 or 26,067 km^2) (Hamazaki 2024). The abundance estimate from the ADF&G trawl survey is unexpanded, meaning it is likely an underestimate of stock abundance (Hamazaki 2024). Work to develop a spatiotemporal model-based index of abundance for the NSRKC trawl surveys with a consistent spatial area used for estimating abundance continues with research-track models (Stern 2025a, Stern 2025b) and updates will be presented in future assessment cycles.

e. Survey catch-at-length

Survey size composition data used for the assessment model are shown in Appendix C and include catch-at-length data from the NOAA Norton Sound survey, the ADF&G trawl survey, the NOAA NBS trawl survey, and the winter pot survey. When replicating past years' data processing methods for this assessment, the authors observed that the spatial restrictions applied to the NOAA NBS trawl survey data set when calculating abundance estimates are not applied to the size composition data, meaning that the population of crab from which size composition data are drawn is different from the population of crab used to estimate abundance. The authors intend to explore reconciling the size composition and abundance NOAA NBS survey data sets used in the assessment model in future assessment cycles.

f. Catch-per-unit-effort time series

Standardized summer commercial fishery CPUE is included in the NSRKC assessment model as three separate indices of abundances, reflecting three time periods among which the fishery differed in important aspects: the large scale commercial fishery (1977-1992; industry-preferred male size $>$ 4.75 inches CL); the small vessel commercial fishery with industry-preferred male size $>$ 4.75 inches CL (1993-2007), and the small vessel commercial fishery with industry-preferred male size $>$ 5 inches CL (2008-2025). The methods for CPUE standardization were developed by Bishop and colleagues (2013) and are summarized in Appendix B of Hamazaki (2024). Standardized CPUE is not calculated for 1991, 2020, or 2021; a commercial fishery was closed in 1991 and very few crab were harvested during the 2020 and 2021 commercial fisheries. The authors plan to review and update the CPUE standardization methods in a future assessment cycle.

g. Other time series data

Norton Sound red king crab tagging was initially conducted as a part of mark-recapture abundance survey in 1980-1982 and 1985 (Brannian 1987). From 1986 to 2012, crabs were tagged during the winter pot survey. The winter pot surveys tagged mostly sublegal crab and very few were recovered. Tagging resumed from 2012-2015 for a spring migration movement survey. In all of these studies, most of the tagged crab were recovered by commercial fishermen, although subsistence fishermen also recovered some tags.

3. Data which may be aggregated over time

a. Growth-per-molt; frequency of molting

Growth is estimated using tagging data.

b. Weight-at-length

Weight-at-length is input as a vector, with the following weights in lb specified by size class: size class 1 = 0.52, size class 2 = 0.82, size class 3 = 1.20, size class 4 = 1.70, size class 5 = 2.32, size class 6 = 2.99, size class 7 = 3.68, size class 8 = 4.37 (see control files in Appendix C).

4. Data sources that were available but were excluded from the assessment

- Retained catch from the summer subsistence fishery, 2005-present.
- Environmental covariates from trawl surveys, including surface and bottom temperatures.
- Data on females from trawl surveys, including abundance estimates and length measurements.
- Tag recovery locations from tagging studies conducted over 2012-2019.
- Satellite tag migration tracking information from a 2016 NOAA study and a 2020-2021 ADF&G study.
- Monthly hormone level data collected in 2014-2015.
- Data from lab studies of NSRKC functional maturity and mating success collected in 2021-2022.
- Abundance and size composition data from summer pot surveys conducted in 1980-1982 and 1985.
- CPUE from the winter pot surveys conducted in 1987, 1989-1991, 1993, 1995-2000, and 2002-2012.
- CPUE and size compositions from the preseason spring pot surveys conducted in 2011-2015.
- CPUE and size compositions from the postseason fall pot surveys conducted in 2013-2015.

E. Analytic approach

1. History of modeling approaches for this stock

The GMACS version of the NSRKC stock assessment model, model 24.0, was recommended by the CPT and the SSC in November and December 2024, respectively, for 2025 harvest specifications. The history of model development prior to the transition to GMACS is detailed in Hamazaki (2024).

Model changes since model 24.0 was accepted for use in the assessment include correcting errors in the input data file and transitioning the model to a GMACS version (2.20.20) with the ability to correctly calculate the OFL for stocks with multiple fisheries occurring in different seasons. A bridging analysis documenting the effects of these changes was presented in Stern and Palof (2025).

2. Model description

a. Description of overall modeling approach

The model is a male-only size-structured model based on abundance that combines data from surveys, fishery catches and discards, and mark-recovery studies using a maximum likelihood modeling framework to estimate population dynamics under fisheries. The model estimates abundances of male crab with CL $\geq$ 64 mm in 10 mm length intervals (8 length classes). Few crab measuring $<$ 64 mm CL were caught during surveys or fisheries. The model assumes that newshell crab are molted and oldshell crab are unmolted. Natural mortality is set to a fixed value for males with CL $\leq$ 123 mm and estimated for males with CL $>$ 123 mm. For models 24.0b, 24.0b6, and 24.0b7, the fixed value of M is 0.18, while for models 25.0a, 25.0a1, and 25.0a2, the fixed value of M is 0.23. The timeline of events in the model is as follows:

- Model starts on February 1
- The initial population date is February 1, 1976, with the population consisting of newshell crab only
- Instantaneous fishing mortality occurs on February 1 for winter fisheries
- Instantaneous fishing mortality occurs on July 1 for summer fisheries
- Instantaneous molting and recruitment occur on July 1

b. Reference software used

The Generalized size-structured Model for Assessing Crustacean Stocks (GMACS) version 2.20.20, compiled with AD Model Builder 13.2. GMACS source code and information is available at https://github.com/GMACS-project.

c. Description of all likelihood components

Likelihood components are shown in Tables 9 - 11.

d. Description of how the state of the population at the start of the first year of the assessment period is determined and the size-range that the model covers

The first year of the assessment period was set to 1976, when the first Norton Sound trawl survey was conducted. The model covers 8 length classes, beginning at CL of 64 mm, with a length class increment of 10 mm.

e. Parameter estimation framework

A maximum likelihood approach was used to estimate parameters. Parameters estimated outside of the model include M for males with CL $\leq$ 123 mm, and the discard mortality rate (set at 0.2). Priors, bounds, and constraints on parameters are detailed in the model control files, shown in Appendix C. Recruitment during the projected year is the average of the past 5 years to reflect the most recent recruitment conditions.

f. Definition of model outputs

Mature male biomass is defined as the biomass of males with CL $\geq$ 94 mm. Male recruit biomass is defined as the biomass of males with CL of 64-93 mm.

g. Critical assumptions and consequences of assumption failures

- Instantaneous annual natural mortality (M) is fixed for males with CL $\leq$ 123 mm and increases for males with CL $>$ 123 mm. M is constant over time. Estimating a higher M for larger males is an approach employed to rectify the model's historical overestimation of large male abundance. Models using size-independent M were presented at the May 2025 CPT meeting but not recommended by the CPT or SSC. The authors plan to continue exploring model runs with size-independent M in future interations of this assessment.

- Modeled male size at maturity is 94 mm CL. According to a past assessment, this size at maturity was inferred from BBRKC data, incorporating the smaller size of NSRKC (Hamazaki 2024). The authors have not yet located more detailed documentation of the methods used to arrive at this estimate for size at maturity. Studies of NSRKC size at functional maturity in the lab are ongoing, and observations of mating pairs in the wild are needed.

- Molting occurs after the summer fishery. Recruitment occurs at the same time.

- Molting probability is a descending logistic function of crab size.

- Growth increment is a function of length and is constant over time. Molted crab do not shrink.

- ADF&G trawl survey abundance has the same scale as the population, i.e., catchability (q) is equal to 1.

- Survey selectivity is an asymptotic, one-parameter logistic function equal to 1.0 at the length class 134 mm CL and is the same across years and surveys.

- Winter pot survey selectivity is a dome-shaped function combining a reverse logistic function starting from length class 84 mm CL and a model estimate for length classes with CL $<$ 84 mm. This assumption is likely based upon the observed percentages of crab by size class that were caught in the winter pot survey (Table 12). The selectivity is constant over time.

- Fisheries occur twice annually, on February 1 and on the midpoint of the summer commercial fishery period, and are instantaneous.

- Summer commercial fishery selectivity is an asymptotic, one-parameter logistic function of length, with selectivity for length class 134 mm CL set to 1.0. Selectivity is constant over time.

- Selectivity for the winter commercial and subsistence fisheries is similar to selectivity for the winter pot survey, such that selectivity parameters for these fisheries are mirrored to those estimated for the winter pot survey.

- Retention probability is a logistic function with an asymptote $<$ 1.0; not all legal-sized crab are retained.

- The winter subsistence fishery retains crab $>$ 94 mm CL. By regulation, the subsistence fishery has no size limit for retention. The size of crab caught in the subsistence fishery is not recorded.

- The discard handling mortality rate for all fisheries is 20%, consistent with other BSAI crab stocks.

h. Changes to any of the above since the previous assessment

- The M value for males with CL $\leq$ 123 mm is set to 0.18 for models 24.0b, 24.0b6, and 24.0b7, and to 0.23 for models 25.0a, 25.0a1, and 25.0a2.

- In the base model, 24.0b, the bounds on F for the winter commercial fishery include an upper bound of 10 on the estimated annual male F, as for all of the other gear types in the model. In models 24.0b6 and 25.0a1, the upper bound on the estimated annual male F for the winter commercial fishery is changed to 2.95, a value borrowed from the BBRKC stock assessment model. In the BBRKC stock assessment model, the upper bound on estimated annual male F is 2.95 for the pot fishery and 10 for all of the other gear types.

- In the base model, 24.0b, selectivity parameters for the winter commercial and subsistence fisheries are mirrored to those estimated for the winter pot survey. This approach was likely taken due to observations suggesting that large males may migrate offshore in the spring and summer before returning to near-shore waters in the late winter (Powell et al. 1983; Bell et al. 2016), meaning that the availability of large males could be different in the winter versus summer. However, sharing selectivity parameters between the summer and winter commercial fisheries may still be more appropriate than sharing selectivity parameters between the winter commercial fishery and the winter pot survey. Escape rings are required for king crab pots used in the Norton Sound summer and winter commercial fisheries (Alaska Admin Code 5 AAC 34.925), meaning that commercial pots may be less likely to capture small crab than survey pots without escape rings. Due to the lack of observers, data on the size composition of discarded and total catch are unavailable for the winter commercial fishery, but the percentages of retained winter commercial catch in each size bin are more similar to those in the summer commercial fishery retained catch than those in the winter pot survey catch (Table 12; Figures 46, 47, 53). Reflecting this rationale, models 24.0b7 and 25.0a2 are configured such that selectivity parameters for the winter commercial and subsistence fisheries are mirrored to those estimated for the summer commercial fishery.

i. Outline of methods used to validate the code to implement the model and whether the code is available

Files needed to implement the model are available on the GMACS GitHub model repository and GMACS source code is available at https://github.com/GMACS-project. Results are compared to those of previous assessments. GMACS code is validated by CPT members.

3. Model selection and evaluation

a. Alternative model configurations

The model configurations evaluated in this report are the following:

Model 24.0b - May 2025: The model recommended as the new base model by the CPT and SSC in May and June 2025, respectively, with only the data that were available in May 2025. A bridging analysis comparing the recommended model from the 2024 SAFE (24.0) with model 24.0b was presented in the proposed model runs document from May 2025 (Stern and Palof 2025) and is not repeated here.

Model 24.0b: Model 24.0b with updated data, including catch information from the 2025 commercial and subsistence fisheries, size compositions from the 2025 summer commercial retained catch, and abundance and size composition information from the 2025 NOAA NBS trawl survey.

Model 25.0a: Model 24.0b with two modifications: 1) size composition data are combined for all males rather than being split into separate data sets for newshell males and oldshell males; and 2) natural mortality for males with carapace length (CL) $\leq$ 123 mm is fixed at the value estimated in the most recent BBRKC stock assessment (Palof 2025) rather than at 0.18, as in model 24.0b. For both models 24.0b and 25.0a, natural mortality is estimated for males with CL $>$ 123 mm.

Model 24.0b6: Model 24.0b with an upper bound on the fishing mortality rate (F) for the winter commercial fishery, as requested by the CPT, in order to restrict the model from producing what CPT and SSC members thought were unrealistically high estimated F values for this fishery in some years of the time series.

The value for the upper bound was taken from the upper bound used for the pot fishery fishing mortality rate in the most recent version of the BBRKC model.

Model 24.0b7: An alternative approach to restricting the model from producing high estimated F values for the winter commercial fishery, model 24.0b7 follows the SSC's recommendation of modifying model 24.0b by changing selectivity rather than using a different upper bound for F. In the base model, the selectivity pattern for the winter commercial fishery is specified as dome-shaped, with selectivity parameters shared among the winter commercial fishery, subsistence fishery, and winter pot survey, while the selectivity pattern for the summer commercial fishery is specified as logistic. Model 24.0b7 differs from the base model in instead specifying a logistic selectivity pattern with shared parameters for the winter commercial fishery, subsistence fishery, and summer commercial fishery, while the selectivity pattern for the winter pot survey remains dome-shaped.

Model 25.0a1: Model 25.0a with the same upper bound on F for the winter commercial fishery as in model 24.0b6.

Model 25.0a2: Model 25.0a with the same fishery selectivity pattern configuration as model 24.0b7.

b. Progression of results

The impacts of adding 2025 data can be observed by comparing models 24.0b - May and 24.0b. Fits to all catches (winter commercial retained, summer commercial retained, and subsistence retained) were improved for model 24.0b compared to model 24.0b - May (Table 9). Fits to indices of abundance were similar, with model 24.0b showing slightly improved fits to the NOAA NBS trawl survey index and slightly worse fits to the NOAA NS and ADF&G trawl survey indices compared to model 24.0b - May. Model 24.0b showed worse fits to the summer commercial fishery retained catch size compositions as well as the NBS trawl survey size compositions, and slightly better fits to the summer commercial fishery discard and ADF&G trawl survey size compositions (Table 9). The estimated mature male biomass trajectory is very similar for models 24.0b and 24.0b - May (Figure 15). Overall, the addition of 2025 data does not seem to have had unexpected or concerning effects on the base model fits or estimates. For results from all the models to be considered for harvest specifications, please see below.

c. Model numbering conventions

We have endeavored to follow the conventions for numbering models.

d. Evidence of search for balance between realistic and simpler models

Models 25.0a, 25.0a1, and 25.0a2 represent simplifications of the base model due to excluding shell condition.

e. Convergence status/criteria

We used the default ADMB convergence criteria.

f. Sample sizes for length composition data

Input sample sizes for length composition data are shown in Appendix C.

g. Credible parameter estimates

All estimated parameters seem to be credible and within bounds.

h. Model selection criteria

A variety of model selection criteria are considered, including likelihood values (when comparable among models), analysis of residuals, and retrospective analysis.

i. Residual analysis

Residual plots are presented below.

j. Model evaluation

Model evaluation is provided under Results below.

k. Jittering

We performed 200 jitter runs for each model using GMACS, with starting parameter values for the jitter runs randomly selected within a range of 0.3 standard deviations from the existing initial parameter values. Jittering results are discussed in the "Model convergence" section of the results and shown in Table 8 and Figure 11.

4. Results

Model convergence

We evaluated model convergence by using parameter jittering to find the parameter values that minimized the model objective function, checking that the model Hessian was invertible and that the maximum gradient at the candidate MLE was close to zero. Starting parameter values for the jitter runs were randomly selected within a range of 0.3 standard deviations from the existing initial parameter values. We performed 200 jitter runs for each of models 24.0b, 24.0b6, 24.0b7, 25.0a, 25.0a1, and 25.0a2.

For each model, the jittering analysis appeared to identify the set of parameters corresponding to the minimum objective function value, with many model runs converging to the same minimum objective function value (Table 8, Figure 11). Higher proportions of model runs converged to the MLE for models 24.0b6, 24.0b7, 25.0a1, and 25.0a2 than for models 24.0b and 25.0a. Maximum gradients at the MLE were small for all models.

Fits to fishery catch data

Fits to fishery catch data are nearly identical among all six models (Figures 16 - 17 and Tables 10 - 11), demonstrating that removing shell condition and changing the value of natural mortality for males with CL $\leq$ 123 mm have little effect on fits to catch data. Note that subsistence total catch was not fitted in any of these models (emphasis set to 0), due to the previously-reported finding that including these data leads to differences in model fit and references points. Approaches to including subsistence total catch data will be explored further in future iterations of this assessment.

Fits to abundance indices

Compared to the base model (24.0b), both models representing approaches to reducing high F estimates for the winter commercial fishery (24.0b6 and 24.0b7) have overall poorer fits to the abundance indices, showing improved fits only to the fishery CPUE indices from 1977-1992 and 1993-2006 (Figures 18 - 23 and Table

10). Compared to model 25.0a1, both models representing approaches to reducing high F estimates for the winter commercial fishery (25.0a1 and 25.0a2) show improved fits to the NOAA NBS survey index as well as to the fishery CPUE indices from 1977-1992 and 1993-2006 but poorer fits to the other indices of abundance (Figures 24 - 29 and Table 11). Overall fits to index data were better for models 25.0a1 and 25.0a2 than for models 24.0b6 and 24.0b7.

Fits to size compositions

Fits to size composition time series were generally similar among models 24.0b, 24.0b6, and 24.0b7, with models 24.0b6 and 24.0b7 having better fits to the winter commercial fishery retained catch size compositions and slightly worse fits to the ADF&G and NOAA NBS trawl survey size compositions (Figures 30 - 45 and Table 10). Fits to size composition time series were also similar among models 25.0a, 25.0a1, and 25.0a2, with models 25.0a1 and 25.0a2 having better fits to the winter commercial fishery retained catch, summer commercial fishery discard, summer commercial fishery total, and NOAA NS trawl survey size compositions (Figures 46 - 61 and Table 11). One-Step-Ahead residuals for model fits to size composition time series are shown in Figures 62 - 101.

Estimated population quantities

Recruitment

The base model (24.0b) estimates a recruitment trajectory notably different from those estimated by models 24.0b6 and 24.0b7, with higher estimated recruitments in the years leading up to 2014 (Figure 102). This is consistent with model 24.0b's better fit to the high estimated abundance in the ADF&G trawl survey in 2014 (Figure 18). Model 25.0a similarly estimates higher recruitments in the years before 2014 than do models 25.0a1 and 25.0a2 (Figure 103). Both approaches to reducing high F estimates for the winter commercial fishery appear to have the effect of moderating the spike in estimated recruitment in the years leading up to 2014.

Mature male biomass

Models 24.0b and 25.0a estimate mature male biomass (MMB) trajectories that differ from those of models 24.0b6, 24.0b7, 25.0a1, and 25.0a2 in that the scale of the population is higher in the years leading up to 2014, reflecting the better fits of models 24.0b and 25.0a to the ADF&G trawl survey time series, which documents high estimated abundance in 2014 (Figures 104 - 105). Estimated MMB trajectories are similar among all six models for the years 2020-2025.

Estimated fishery selectivity

Note that, in models 24.0b, 24.0b6, 25.0a, and 25.0a1, selectivity for the winter pot survey is specified as dome-shaped, and selectivity for the winter commercial and subsistence fisheries is mirrored to the selectivity estimated for the winter pot survey. Selectivity for the summer commercial fishery is asymptotic. In models 24.0b7 and 25.0a2, selectivity for the winter pot survey is also specified as dome-shaped, but selectivity for the winter commercial and subsistence fisheries is mirrored to the selectivity estimated for the summer commercial fishery. See section E.2.h. for the rationale behind this change in selectivity for the winter commercial and subsistence fisheries.

Compared to model 24.0b6, which uses an upper bound borrowed from the BBRKC stock assessment model for the winter commercial fishery F, model 24.0b estimates notably higher selectivity for all but the largest size classes in the winter commercial and subsistence fisheries, as well as the winter pot survey (Figure 106). Model 24.0b7 estimates selectivity in the winter pot survey similar to that for model 24.0b6. Similarly, model

25.0a estimates notably higher selectivity for all but the largest size classes in the winter commercial and subsistence fisheries, as well as the winter pot survey, than does model 25.0a1, which uses an upper bound borrowed from the BBRKC stock assessment model for the winter commercial fishery F (Figure 107). Model 25.0a2 estimates selectivity in the winter pot survey similar to that for model 25.0a.

Estimated survey selectivity

In the base model, survey selectivity is estimated only for the NOAA Norton Sound trawl survey. Selectivity for the ADF&G and NOAA NBS trawl surveys is mirrored to that of the NOAA Norton Sound trawl survey, meaning that the estimated values are assigned to the surveys without estimated selectivity. Survey selectivity for the NOAA Norton Sound trawl survey is estimated to be equal to 1 for all 8 size bins. Selectivity for the winter pot survey is discussed in the previous section.

Estimated fishing mortality

Both approaches to producing more realistic estimates of fully-selected fishing mortality in the winter commercial fishery appear to be effective: models 24.0b6 and 24.0b7 both produce low and consistent estimates of F for the winter commercial fishery, as do models 25.0a1 and 25.0a2 (Figures 8 - 9). The choice between these approaches may therefore depend upon whether placing an upper bound on F or changing the functional form of selectivity for the winter commercial fishery is deemed more appropriate.

Estimated natural mortality

Estimated natural mortality for males with CL $>$ 123 mm is slightly higher for models 24.0b6 and 24.0b7 than for model 24.0b (Figure 108), and similarly is higher for models 25.0a1 and 25.0a2 than for model 25.0a (Figure 109).

Retrospective analyses

Retrospective analyses for models were performed by sequentially removing each of the most recent 10 years of data, fitting the model, and recording the estimated MMB. Comparing the estimated MMB time series as each year of data is removed permits identification of retrospective patterns, in which estimates show consistent deviations with each “peel” (removal of a year of data). The Mohn’s ρ value for model 24.0 reported in the 2024 SAFE was 0.201 (Hamazaki 2024), indicating that MMB estimates generally increased as each year of data was removed.

The retrospective pattern for the base model (24.0b) is less extreme (Mohn’s $\rho = 0.089$) than for models 24.0b6 (Mohn’s $\rho = 0.160$) and 24.0b7 (Mohn’s $\rho = 0.175$) (Figures 110 - 112). Similarly, the retrospective pattern for model 25.0a is less extreme (Mohn’s $\rho = 0.064$) than for models 25.0a1 (Mohn’s $\rho = 0.119$) and 25.0a2 (Mohn’s $\rho = 0.126$) (Figures 113 - 115). Retrospective patterns are less extreme for the models without shell condition and with a higher natural mortality value for males with CL $\leq$ 123 mm (models 25.0a, 25.0a1, and 25.0a2), indicating that these models may have an improved ability to estimate stock biomass in the terminal year.

Uncertainty and sensitivity analyses

Uncertainty for parameters and derived quantities was estimated using the covariance matrix obtained by inverting the model Hessian matrix at the MLE. Estimated standard errors of parameters for models 24.0b6, 24.0b7, 25.0a1, and 25.0a2 are summarized in Tables 13 - 16. Estimated standard deviations of mature male biomass and male recruitment for models 24.0b and 25.0 are listed in Tables 17 - 20. The probability density function of the OFL for models 24.0b6, 24.0b7, 25.0a1, and 25.0a2 is shown in Figures 3 - 6.

Comparison of alternative model scenarios

Both the base model (24.0b) and the version of that model updated to better align with other BSAI king crab assessment models (25.0a, with $M = 0.23$ and shell condition excluded as for BBRKC and St. Matthew Island blue king crab) estimate F values for the winter commercial fishery in approximately 2010 - 2020 that were considered unrealistically high by the CPT and SSC when the models were reviewed in May/June 2025. The authors do not recommend using either of these models for harvest specifications. The factors driving the high estimated F values remain unknown. The initial hypothesis that the model's attempt to fit the high ADF&G survey abundance estimate in 2014 led to high estimated recruitment followed by high estimated F was not supported: a model run with the 2014 ADF&G survey abundance estimate removed still estimated high F values for the winter commercial fishery in 2010 - 2020.

Models 24.0b6, 24.0b7, 25.0a1, and 25.0a2 use two alternative approaches for addressing the problems with F estimation, following CPT and SSC recommendations. Models 24.0b6 and 25.0a1 use an upper bound on F for the winter commercial fishery borrowed from the BBRKC stock assessment, while models 24.0b7 and 25.0a2 are configured such that selectivity for the winter commercial fishery shares parameters with the summer commercial fishery rather than the winter pot survey. Both of these approaches lead to lower and likely more realistic estimates of F for the winter commercial fishery. Models 24.0b6 and 24.0b7 have nearly identical fits to the data sources, as do models 25.0a1 and 25.0a2.

While the authors think that all four of these models are viable candidates to use for harvest specifications, the authors think that models 25.0a1 and 25.0a2 are preferable to models 24.0b6 and 24.0b7 for the following reasons. First, excluding shell condition eliminates a source of uncertainty unaccounted for in the models, which currently assume that newshell versus oldshell classifications are made with complete accuracy. Second, using the M value estimated in the most recent BBRKC stock assessment for NSRKC males with CL ≤ 123 mm leverages the greater data availability for the BBRKC stock to better inform assessment of the NSRKC stock. Third, models 25.0a1 and 25.0a2 both have less extreme retrospective patterns than do models 24.0b6 and 24.0b7, potentially indicating improved ability to predict stock biomass in the terminal year.

The choice between models 25.0a1 and 25.0a2 rests primarily upon whether placing an upper bound on F or changing the functional form of selectivity for the winter commercial fishery is deemed more appropriate. Using an upper bound on F for the winter commercial fishery would align with the approach taken in the BBRKC stock assessment model, and the authors consider model 25.0a1 a good option for 2026 harvest specifications. However, as the SSC noted in June 2025, using an alternative parameterization of selectivity is likely the preferable approach given that F is indirectly linked to the scale of the population. In addition, sharing selectivity parameters between the summer and winter commercial fisheries may be more appropriate than sharing selectivity parameters between the winter commercial fishery and the winter pot survey. Escape rings are required for king crab pots used in the Norton Sound summer and winter commercial fisheries (Alaska Admin Code 5 AAC 34.925), meaning that commercial pots may be less likely to capture small crab than survey pots without escape rings. Due to the lack of observers, data on the size composition of discarded and total catch are unavailable for the winter commercial fishery, but the percentages of retained winter commercial catch in each size bin are more similar to those in the summer commercial fishery retained catch than those in the winter pot survey catch (Table 12; Figures 46, 47, 53). The authors thus recommend model 25.0a2 for 2026 harvest specifications.

Stock projections

Projections for this stock will be shown following the development of guidance on the appropriate way to use the GMACS projection module for tier 4 stocks; the CPT plans to take up this issue during the January 2026 modeling workshop.

F. Calculation of the OFL

The overfishing level (OFL) is the total catch associated with the F_{OFL} fishing mortality. The NSRKC stock is currently managed as Tier 4, and only a Tier 4 analysis is presented here. Thus, given stock estimates or suitable proxy values of B_{MSY} and F_{MSY}, along with two additional parameters α and β, F_{OFL} is determined by the control rule

$$F_{OFL} = \begin{cases} F_{MSY}, & \text{when } B/B_{MSY} > 1 \\ F_{MSY}\frac{(B/B_{MSY}-\alpha)}{(1-\alpha)}, & \text{when } \beta < B/B_{MSY} \leq 1 \end{cases} \tag{1}$$

$$F_{OFL} < F_{MSY} \text{ with directed fishery } F = 0 \text{ when } B/B_{MSY} \leq \beta$$

where B is quantified as mature male biomass (MMB) at mating and, under Tier 4, $F_{MSY} = M$.

Table 5: Comparisons of management measures for models 24.0b, 24.0b6, and 24.0b7. Biomass and OFL are in 1,000 tons. Model 24.0b is the base model. Model 24.0b6 is model 24.0b with an upper bound on fishing mortality for the winter commercial fishery borrowed from the Bristol Bay red king crab assessment. Model 24.0b7 is model 24.0b with selectivity for the winter commercial fishery sharing parameters with selectivity for the summer commercial fishery rather than the winter pot survey.

Model	MMB_{2026}	B_{MSY}	MMB/B_{MSY}	F_{OFL}	OFL_{2026}	ABC_{2026}	MSST	M
24.0b	1.54	2.08	0.74	0.128	0.062	0.044	1.04	0.18
24.0b6	1.58	1.92	0.82	0.145	0.158	0.111	0.96	0.18
24.0b7	1.57	1.92	0.82	0.144	0.169	0.118	0.96	0.18

Table 6: Comparisons of management measures for model 25.0a, 25.0a1, and 25.0a2. Biomass and OFL are in 1,000 tons. Model 25.0a is model 24.0b with 1) shell condition removed, and 2) natural mortality for small males fixed at 0.23 rather than 0.18. Model 25.0a1 is model 25.0a with an upper bound on fishing mortality for the winter commercial fishery borrowed from the Bristol Bay red king crab assessment. Model 25.0a2 is model 25.0a with selectivity for the winter commercial fishery sharing parameters with selectivity for the summer commercial fishery rather than the winter pot survey.

Model	MMB_{2026}	B_{MSY}	MMB/B_{MSY}	F_{OFL}	OFL_{2026}	ABC_{2026}	MSST	M
25.0a	1.55	2.10	0.74	0.163	0.086	0.060	1.05	0.23
25.0a1	1.57	2.01	0.78	0.175	0.186	0.130	1.00	0.23
25.0a2	1.56	2.00	0.78	0.173	0.193	0.135	1.00	0.23

G. Calculation of the ABC

The ABC is calculated as the OFL multiplied by (1 - the ABC buffer). For this stock, the ABC buffer was 10% in 2011-2014, 20% in 2015-2019, 30% in 2020, 40% in 2021-2022, and 30% in 2023-2024 (Appendix A). The CPT and SSC recommended an ABC buffer of 30% for setting harvest specifications for 2025 for the following reasons: 1) uncertainty in the biological characteristics of the stock; 2) difficulty in managing to a total mortality due to lack of information about discards; 3) the model's overestimation of the abundance of the largest male crab; 4) the use of a higher natural mortality value for larger males in order to correct for this overestimation of abundance rather than using a size-independent M, as do other BSAI crab stock assessment models; and 5) a retrospective pattern in model-estimated mature male biomass. Given that these concerns are largely unchanged, the authors recommend using a 30% buffer again for the 2026 harvest specifications.

H. Rebuilding analyses

This stock is not currently subject to a rebuilding plan.

I. Data gaps and research priorities

A key research priority is incorporating a spatiotemporal model-based index of abundance into the stock assessment model in order to ensure that abundance information from the trawl surveys is combined in a spatially consistent framework. Other priorities include exploring ways to incorporate the winter subsistence total catch data and the summer subsistence catch data into the model. Addressing uncertainty in the biological characteristics of the stock and acquiring information on discards continue to be priorities for this assessment.

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Tables

Table 7: Status of recommendations made by the Scientific and Statistical Committee (SSC) and Crab Plan Team (CPT) for the Norton Sound red king crab assessment model and for Bering Sea/Aleutian Islands crab models in general. Recommendations addressed in the current document are listed first, followed by recommendations that will be addressed in future iterations of the assessment.

Recommendation	Date	Body	Status
Consistent structure, content for crab SAFE documents	10/2025	SSC	Addressed here
Use different descriptions of risk table concern levels	09/2025	CPT	Addressed here
Address high F using prior or selectivity parameterization	6/2025	CPT and SSC	Addressed here
Provide risk table that follows guidelines	6/2025	CPT and SSC	Addressed here
Develop model-based indices of abundance	6/2025	CPT and SSC	In progress
Provide historical retrospective plot	6/2025	SSC	Addressed here
Identify GMACS version used and track changes	6/2025	SSC	Addressed here
Summarize ABC buffer history over past 5 years	6/2025	SSC	Addressed here
Present jittering results as plots	12/2024	CPT and SSC	Addressed here
Full suite of diagnostics and sensitivities	12/2024	SSC	Addressed here
Calculate OFL within GMACS	12/2024	CPT and SSC	Addressed here
Address overestimation of largest male crab	12/2024	CPT and SSC	Addressed here
Evaluate use of size-dependent M	12/2024	CPT and SSC	Addressed in May 2025
Evaluate model-based indices of abundance	12/2024	CPT and SSC	In progress
Use prior from BBRKC for size-independent M	12/2024	SSC	Addressed here
Include fits to catch data	12/2024	CPT and SSC	Addressed here
Investigate retrospective patterns	12/2024	CPT and SSC	Addressed here
Review shell condition effects on size comp fits	12/2024	CPT and SSC	Addressed here
Align document with crab SAFE guidelines	12/2024	SSC	Addressed here
Additional residual diagnostics for size comp data	10/2024	SSC	Addressed here
Individual plots of fits to survey indices	9/2024	CPT	Addressed here
Use realistic estimate of future catches in projections	10/2025	SSC	Not yet addressed
Include winter subsistence total catch data	12/2024	CPT and SSC	Not yet addressed
Address uncertainty about stock biology	12/2024	CPT and SSC	Not yet addressed
Address lack of discard information	12/2024	CPT and SSC	Not yet addressed

Table 8: Summary of convergence diagnostics from jitter runs.

Model	Parameters	Jitter.runs	Converged.to.MLE	Objective.function.value	Max.gradient
24.0b	230	200	21	4226.31	0.000014
24.0b6	230	200	154	4228.64	0.000001
24.0b7	230	200	163	4228.91	0.000018
25.0a	230	200	9	2512.98	0.000008
25.0a1	230	200	106	2513.41	0.000213
25.0a2	230	200	107	2513.88	0.000278

Table 9: Comparisons of negative log-likelihood values for the base model, 24.0b, without 2025 data (24.0b - May) and with 2025 data (24.0b).

Component	24.0b - May	24.0b
Winter comm. retained catch	-119.03	-121.62
Subsistence retained catch	-121.63	-124.22
Subsistence total catch	0.00	0.00
Summer comm. retained catch	-116.45	-119.03
NMFS trawl survey 1976-1991	-3.57	-3.53
ADF&G trawl survey	-7.05	-6.91
NOAA NBS survey	-5.52	-5.62
Fishery CPUE 1977-1992	-2.70	-2.67
Fishery CPUE 1993-2006	-4.95	-4.93
Fishery CPUE 2007-2024	-13.24	-14.25
Winter com. retained size comp.	57.08	57.13
Summer com. retained size comp.	703.53	721.55
Summer com. discard size comp.	280.04	279.98
Summer com. total size comp	216.45	216.61
NMFS trawl survey size comp.	316.81	316.14
ADF&G trawl survey size comp.	280.61	278.95
NBS trawl survey size comp.	155.40	188.98
Winter pot survey size comp.	614.68	614.86
Recruitment deviations	52.33	54.30
Tagging	1724.14	1726.20
Growth	1724.14	1726.20
F penalty	14.21	14.21
Prior	95.34	95.22
Total	4180.59	4226.31
Total estimated parameters	226.00	230.00

Table 10: Comparisons of negative log-likelihood values for models 24.0b, 24.0b6, and 24.0b7. Model 24.0b is the base model. Model 24.0b6 is model 24.0b with an upper bound on F for the winter commercial fishery borrowed from the Bristol Bay red king crab stock assessment. Model 24.0b7 is model 24.0b with selectivity parameters for the winter commercial fishery shared with the summer commercial fishery.

Component	24.0b	24.0b6	24.0b7
Winter comm. retained catch	-121.62	-121.63	-121.63
Subsistence retained catch	-124.22	-124.22	-124.22
Subsistence total catch	0.00	0.00	0.00
Summer comm. retained catch	-119.03	-119.03	-119.03
NMFS trawl survey 1976-1991	-3.53	-3.27	-3.30
ADF&G trawl survey	-6.91	-3.81	-3.45
NOAA NBS survey	-5.62	-5.57	-5.54
Fishery CPUE 1977-1992	-2.67	-2.97	-2.98
Fishery CPUE 1993-2006	-4.93	-5.07	-5.07
Fishery CPUE 2007-2025	-14.25	-11.94	-11.63
Winter com. retained size comp.	57.13	50.99	50.98
Summer com. retained size comp.	721.55	721.54	721.61
Summer com. discard size comp.	279.98	279.64	279.50
Summer com. total size comp	216.61	216.81	216.75
NMFS trawl survey size comp.	316.14	317.04	316.94
ADF&G trawl survey size comp.	278.95	281.12	281.18
NBS trawl survey size comp.	188.98	191.31	191.49
Winter pot survey size comp.	614.86	613.90	613.53
Recruitment deviations	54.30	52.79	52.78
Tagging	1726.20	1726.67	1726.66
Growth	1726.20	1726.67	1726.66
F penalty	14.21	14.21	14.21
Prior	95.22	95.37	95.36
Total	4226.31	4228.64	4228.91
Total estimated parameters	230.00	230.00	230.00

Table 11: Comparisons of negative log-likelihood values for models 25.0a, 25.0a1, and 25.0a2. Model 25.0a is model 24.0b with shell condition excluded and with natural mortality for small males fixed at 0.23 rather than 0.18. Model 25.0a1 is model 25.0a with an upper bound on F for the winter commercial fishery borrowed from the Bristol Bay red king crab stock assessment. Model 25.0a2 is model 25.0a with selectivity parameters for the winter commercial fishery shared with the summer commercial fishery.

Component	25.0a	25.0a1	25.0a2
Winter comm. retained catch	-121.63	-121.63	-121.63
Subsistence retained catch	-124.22	-124.22	-124.22
Subsistence total catch	0.00	0.00	0.00
Summer comm. retained catch	-119.04	-119.04	-119.03
NMFS trawl survey 1976-1991	-3.38	-3.17	-3.18
ADF&G trawl survey	-6.25	-4.74	-4.56
NOAA NBS survey	-5.55	-5.64	-5.63
Fishery CPUE 1977-1992	-3.34	-3.60	-3.63
Fishery CPUE 1993-2006	-6.85	-6.91	-6.89
Fishery CPUE 2007-2025	-15.39	-13.78	-13.63
Winter com. retained size comp.	26.04	22.30	22.69
Summer com. retained size comp.	279.38	279.54	279.51
Summer com. discard size comp.	108.11	107.75	107.72
Summer com. total size comp	79.48	78.93	78.92
NMFS trawl survey size comp.	45.22	45.16	45.17
ADF&G trawl survey size comp.	114.51	116.03	115.96
NBS trawl survey size comp.	56.56	57.41	57.48
Winter pot survey size comp.	303.18	302.79	302.63
Recruitment deviations	51.71	51.20	51.16
Tagging	1688.88	1689.51	1689.52
Growth	1688.88	1689.51	1689.52
F penalty	14.21	14.21	14.21
Prior	95.23	95.44	95.46
Total	2512.98	2513.41	2513.88
Total estimated parameters	230.00	230.00	230.00

Table 12: Percentage of crab in each size bin by fleet. Totals may not sum to 100 due to rounding. SC = summer commercial fishery; WC = winter commercial fishery.

Size class midpoint	ADFG survey	NBS survey	NS survey	SC retain	SC discard	SC total	WC	Winter pot survey
68	16	12	14	0	12	6	0	2
78	15	14	9	0	16	6	0	10
88	16	15	11	0	24	8	0	20
98	15	17	14	2	37	15	3	24
108	16	16	20	31	10	23	38	23
118	14	15	20	39	1	24	38	15
128	7	9	10	21	0	13	17	5
138	2	2	3	7	0	3	4	1

Table 13: Summary of Norton Sound red king crab estimated model parameter values and standard errors (SE) for model 24.0b6, the base model with an upper bound on F for the winter commercial fishery.

Count	Parameter	Estimate	SE
1	Log(Rinitial):	9.1239	0.1135
2	Log(Rbar):	6.2575	0.1483
3	Recruitment_ra-males:	72.9231	1.9352
4	Recruitment_rb-males:	0.0696	0.4857
5	Scaled_logN_for_male_mature_mature_newshell_class_2:	-0.1780	0.4063
6	Scaled_logN_for_male_mature_mature_newshell_class_3:	0.6881	0.3732
7	Scaled_logN_for_male_mature_mature_newshell_class_4:	0.9128	0.3580
8	Scaled_logN_for_male_mature_mature_newshell_class_5:	0.8620	0.3369
9	Scaled_logN_for_male_mature_mature_newshell_class_6:	0.3188	0.3640
10	Scaled_logN_for_male_mature_mature_newshell_class_7:	-0.3687	0.4185
11	Scaled_logN_for_male_mature_mature_newshell_class_8:	-0.6894	0.4531
12	Alpha_base_male:	35.0909	1.1375
13	Beta_base_male:	0.2227	0.0115
14	Gscale_base_male:	3.8465	0.1347
15	Molt_probability_mu_base_male_period_1:	124.8130	1.2174
16	Molt_probability_CV_base_male_period_1:	0.1273	0.0061
17	Sel_Winter_Com_male_base_Dec_Logistic_cv:	0.5709	0.0332
18	Sel_Winter_Com_male_base_Dec_Logistic_cv:	4.7647	0.0585
19	Sel_Winter_Com_male_base_Dec_Logistic_extra_par1:	-2.4900	0.3000
20	Sel_Winter_Com_male_base_Dec_Logistic_extra_par2:	-2.8142	0.3879
21	Sel_Winter_Com_male_base_Dec_Logistic_extra_par3:	-0.8678	0.2650
22	Sel_Summer_Com_male_base_Dec_Logistic_mean:	-0.3558	0.2507

23	Sel_NMFS_Trawl_male_base_Dec_Logistic_mean:	-2.0900	0.0286
24	Ret_Winter_Com_male_base_Logistic_mean:	-11.5106	9.2059
25	Ret_Winter_Com_male_Logistic_cv_block_group_2_block_1:	4.6634	0.0211
26	Ret_Subsistence_male_base_class_1:	1.0496	0.3034
27	Ret_Summer_Com_male_base_Logistic_cv:	4.6428	0.0058
28	Ret_Summer_Com_male_Logistic_mean_block_group_1_block_1:	0.8547	0.0967
29	Ret_Summer_Com_male_Logistic_cv_block_group_1_block_1:	4.6653	0.0055
30	Log_vn_aggregated_size_comp1:	0.8775	0.1217
31	Log_fbar_Winter_Com:	-5.5929	0.3320
32	Log_fbar_Subsistence:	-5.5237	2.2481
33	Log_fbar_Summer_Com:	-2.1632	0.7136
225	Survey_q_survey_1:	0.7727	0.1371
226	Survey_q_survey_3:	0.7215	0.1291
227	Survey_q_survey_4:	0.0007	0.0001
228	Survey_q_survey_5:	0.0014	0.0002
229	Survey_q_survey_6:	0.0011	0.0001
230	Log_add_cvt_survey_4:	-1.0529	0.1460

Table 14: Summary of Norton Sound red king crab estimated model parameter values and standard errors (SE) for model 24.0b7, the base model with selectivity parameters for the winter commercial fishery shared with the summer commercial fishery.

Count	Parameter	Estimate	SE
1	Log(Rinitial):	9.1239	0.1135
2	Log(Rbar):	6.2575	0.1483
3	Recruitment_ra-males:	72.9231	1.9352
4	Recruitment_rb-males:	0.0696	0.4857
5	Scaled_logN_for_male_mature_mature_newshell_class_2:	-0.1780	0.4063
6	Scaled_logN_for_male_mature_mature_newshell_class_3:	0.6881	0.3732
7	Scaled_logN_for_male_mature_mature_newshell_class_4:	0.9128	0.3580
8	Scaled_logN_for_male_mature_mature_newshell_class_5:	0.8620	0.3369
9	Scaled_logN_for_male_mature_mature_newshell_class_6:	0.3188	0.3640
10	Scaled_logN_for_male_mature_mature_newshell_class_7:	-0.3687	0.4185
11	Scaled_logN_for_male_mature_mature_newshell_class_8:	-0.6894	0.4531
12	Alpha_base_male:	35.0909	1.1375
13	Beta_base_male:	0.2227	0.0115
14	Gscale_base_male:	3.8465	0.1347
15	Molt_probability_mu_base_male_period_1:	124.8130	1.2174
16	Molt_probability_CV_base_male_period_1:	0.1273	0.0061
17	Sel_Winter_Com_male_base_Dec_Logistic_cv:	0.5709	0.0332
18	Sel_Winter_Com_male_base_Dec_Logistic_cv:	4.7647	0.0585
19	Sel_Winter_Com_male_base_Dec_Logistic_extra_par1:	-2.4900	0.3000
20	Sel_Winter_Com_male_base_Dec_Logistic_extra_par2:	-2.8142	0.3879
21	Sel_Winter_Com_male_base_Dec_Logistic_extra_par3:	-0.8678	0.2650
22	Sel_Summer_Com_male_base_Dec_Logistic_mean:	-0.3558	0.2507
23	Sel_NMFS_Trawl_male_base_Dec_Logistic_mean:	-2.0900	0.0286
24	Ret_Winter_Com_male_base_Logistic_mean:	-11.5106	9.2059
25	Ret_Winter_Com_male_Logistic_cv_block_group_2_block_1:	4.6634	0.0211
26	Ret_Subsistence_male_base_class_1:	1.0496	0.3034
27	Ret_Summer_Com_male_base_Logistic_cv:	4.6428	0.0058
28	Ret_Summer_Com_male_Logistic_mean_block_group_1_block_1:	0.8547	0.0967
29	Ret_Summer_Com_male_Logistic_cv_block_group_1_block_1:	4.6653	0.0055
30	Log_vn_aggregated_size_comp1:	0.8775	0.1217
31	Log_fbar_Winter_Com:	-5.5929	0.3320
32	Log_fbar_Subsistence:	-5.5237	2.2481
33	Log_fbar_Summer_Com:	-2.1632	0.7136
225	Survey_q_survey_1:	0.7727	0.1371
226	Survey_q_survey_3:	0.7215	0.1291

227	Survey_q_survey_4:	0.0007	0.0001
228	Survey_q_survey_5:	0.0014	0.0002
229	Survey_q_survey_6:	0.0011	0.0001
230	Log_add_cvt_survey_4:	-1.0529	0.1460

Table 15: Summary of Norton Sound red king crab estimated model parameter values and standard errors (SE) for model 25.0a1, the model with no shell condition, M for small males fixed at 0.23, and an upper bound on F for the winter commercial fishery.

Count	Parameter	Estimate	SE
1	Log(Rinitial):	9.2582	0.1446
2	Log(Rbar):	6.4817	0.1512
3	Recruitment_ra-males:	72.8117	2.6585
4	Recruitment_rb-males:	0.0858	0.6896
5	Scaled_logN_for_male_mature_mature_newshell_class_2:	-0.1319	0.4318
6	Scaled_logN_for_male_mature_mature_newshell_class_3:	0.4146	0.4194
7	Scaled_logN_for_male_mature_mature_newshell_class_4:	0.6268	0.4055
8	Scaled_logN_for_male_mature_mature_newshell_class_5:	0.6149	0.3965
9	Scaled_logN_for_male_mature_mature_newshell_class_6:	0.2889	0.4034
10	Scaled_logN_for_male_mature_mature_newshell_class_7:	-0.3106	0.4388
11	Scaled_logN_for_male_mature_mature_newshell_class_8:	-0.5208	0.4688
12	Alpha_base_male:	40.1724	2.7598
13	Beta_base_male:	0.2869	0.0313
14	Gscale_base_male:	4.8490	0.2715
15	Molt_probability_mu_base_male_period_1:	134.7007	9.1566
16	Molt_probability_CV_base_male_period_1:	0.0712	0.0117
17	Sel_Winter_Com_male_base_Dec_Logistic_cv:	0.5784	0.0450
18	Sel_Winter_Com_male_base_Dec_Logistic_cv:	4.7807	0.0740
19	Sel_Winter_Com_male_base_Dec_Logistic_extra_par1:	-2.4805	0.4410
20	Sel_Winter_Com_male_base_Dec_Logistic_extra_par2:	-2.8525	0.5298
21	Sel_Winter_Com_male_base_Dec_Logistic_extra_par3:	-0.8835	0.3531
22	Sel_Summer_Com_male_base_Dec_Logistic_mean:	-0.2469	0.3302
23	Sel_NMFS_Trawl_male_base_Dec_Logistic_mean:	-2.1010	0.0392
24	Ret_Winter_Com_male_base_Logistic_mean:	-11.5054	29.7938
25	Ret_Winter_Com_male_Logistic_cv_block_group_2_block_1:	4.6522	0.0351
26	Ret_Subsistence_male_base_class_1:	0.9395	0.5223
27	Ret_Summer_Com_male_base_Logistic_cv:	4.6445	0.0080
28	Ret_Summer_Com_male_Logistic_mean_block_group_1_block_1:	0.8513	0.1351
29	Ret_Summer_Com_male_Logistic_cv_block_group_1_block_1:	4.6654	0.0076
30	Log_vn_aggregated_size_comp1:	0.8616	0.1679
31	Log_fbar_Winter_Com:	-5.8385	0.3898
32	Log_fbar_Subsistence:	-5.6444	2.2551
33	Log_fbar_Summer_Com:	-2.1975	0.7147
225	Survey_q_survey_1:	0.7457	0.1461
226	Survey_q_survey_3:	0.7104	0.1278

227	Survey_q_survey_4:	0.0007	0.0002
228	Survey_q_survey_5:	0.0013	0.0002
229	Survey_q_survey_6:	0.0011	0.0001
230	Log_add_cvt_survey_4:	-1.1902	0.1565

Table 16: Summary of Norton Sound red king crab estimated model parameter values and standard errors (SE) for model 25.0a2, the model with no shell condition, M for small males fixed at 0.23, and selectivity parameters for the winter commercial fishery shared with the summer commercial fishery.

Count	Parameter	Estimate	SE
1	Log(Rinitial):	9.2686	0.1465
2	Log(Rbar):	6.4795	0.1514
3	Recruitment__ra-males:	72.8124	2.6401
4	Recruitment__rb-males:	0.0847	0.6769
5	Scaled__logN__for__male__mature__mature__newshell__class__2:	-0.1337	0.4316
6	Scaled__logN__for__male__mature__mature__newshell__class__3:	0.4131	0.4194
7	Scaled__logN__for__male__mature__mature__newshell__class__4:	0.6270	0.4054
8	Scaled__logN__for__male__mature__mature__newshell__class__5:	0.6167	0.3965
9	Scaled__logN__for__male__mature__mature__newshell__class__6:	0.2914	0.4034
10	Scaled__logN__for__male__mature__mature__newshell__class__7:	-0.3079	0.4389
11	Scaled__logN__for__male__mature__mature__newshell__class__8:	-0.5180	0.4690
12	Alpha__base__male:	40.1553	2.7687
13	Beta__base__male:	0.2867	0.0315
14	Gscale__base__male:	4.8483	0.2722
15	Molt__probability__mu__base__male__period__1:	134.6975	9.1943
16	Molt__probability__CV__base__male__period__1:	0.0713	0.0117
17	Sel__Winter__Com__male__base__Dec__Logistic__mean:	0.5804	0.0453
18	Sel__NMFS__Trawl__male__base__Dec__Logistic__mean:	-2.1011	0.0391
19	Sel__Winter__Pot__male__base__Dec__Logistic__cv:	-11.5049	31.0374
20	Sel__Winter__Pot__male__base__Dec__Logistic__cv:	4.7921	0.0525
21	Sel__Winter__Pot__male__base__Dec__Logistic__extra__par1:	-2.3194	0.4273
22	Sel__Winter__Pot__male__base__Dec__Logistic__extra__par2:	-2.7896	0.4981
23	Sel__Winter__Pot__male__base__Dec__Logistic__extra__par3:	-0.8198	0.3049
24	Ret__Winter__Com__male__base__Logistic__mean:	-0.1865	0.2770
25	Ret__Winter__Com__male__Logistic__cv__block__group__2__block__1:	4.6070	0.0109
26	Ret__Subsistence__male__base__class__1:	0.0000	0.0864
27	Ret__Summer__Com__male__base__Logistic__cv:	4.6444	0.0080
28	Ret__Summer__Com__male__Logistic__mean__block__group__1__block__1:	0.8512	0.1352
29	Ret__Summer__Com__male__Logistic__cv__block__group__1__block__1:	4.6658	0.0076
30	Log__vn__aggregated__size__comp1:	0.8632	0.1682
31	Log__fbar__Winter__Com:	-6.5402	0.7134
32	Log__fbar__Subsistence:	-6.1257	2.2379
33	Log__fbar__Summer__Com:	-2.1950	0.7148
225	Survey__q__survey__1:	0.7356	0.1452

226	Survey_q_survey_3:	0.7160	0.1289
227	Survey_q_survey_4:	0.0007	0.0002
228	Survey_q_survey_5:	0.0013	0.0002
229	Survey_q_survey_6:	0.0011	0.0001
230	Log_add_cvt_survey_4:	-1.1842	0.1562

Table 17: Norton Sound red king crab estimated mature male biomass (MMB), male recruit biomass, and standard deviations (SD) for model 24.0b6, in million lb.

Year	MMB	SD MMB	Male recruits	SD male recruits
1976	15.14	2.40	0.29	0.15
1977	16.94	2.03	0.22	0.09
1978	15.67	1.71	0.23	0.08
1979	11.39	1.30	0.86	0.24
1980	6.26	0.94	1.12	0.27
1981	4.27	0.71	1.02	0.24
1982	3.32	0.68	1.08	0.28
1983	4.16	0.77	1.12	0.27
1984	4.81	0.87	0.71	0.18
1985	5.44	0.97	0.87	0.22
1986	5.78	1.03	0.59	0.15
1987	5.69	1.02	0.62	0.14
1988	5.61	0.98	0.63	0.15
1989	5.35	0.90	0.44	0.11
1990	5.03	0.82	0.45	0.11
1991	4.70	0.73	0.36	0.10
1992	4.45	0.63	0.28	0.08
1993	4.05	0.54	0.28	0.08
1994	3.37	0.46	0.40	0.09
1995	2.74	0.38	0.57	0.11
1996	2.29	0.34	1.09	0.21
1997	2.27	0.34	0.50	0.13
1998	2.87	0.39	0.22	0.07
1999	3.74	0.47	0.45	0.12
2000	3.98	0.49	0.74	0.16
2001	3.55	0.46	0.70	0.14
2002	3.37	0.43	0.42	0.12
2003	3.52	0.44	0.34	0.10
2004	3.58	0.44	0.80	0.15
2005	3.32	0.41	0.94	0.17
2006	3.10	0.38	1.08	0.20
2007	3.32	0.39	0.99	0.18
2008	3.94	0.44	0.60	0.15
2009	4.55	0.49	0.36	0.09
2010	4.89	0.52	0.56	0.11
2011	4.63	0.50	0.75	0.14
2012	4.11	0.44	1.44	0.18
2013	3.73	0.41	0.44	0.10
2014	4.01	0.41	0.21	0.06
2015	4.53	0.43	0.20	0.04
2016	4.11	0.41	0.36	0.06
2017	3.34	0.36	0.52	0.09
2018	2.57	0.30	2.16	0.30
2019	2.30	0.28	1.53	0.26
2020	3.33	0.36	0.72	0.16
2021	5.64	0.58	0.45	0.11
2022	7.20	0.72	0.16	0.05
2023	7.09	0.75	0.18	0.06
2024	6.07	0.69	0.17	0.07
2025	4.67	0.58	0.32	0.22

Table 18: Norton Sound red king crab estimated mature male biomass (MMB), male recruits, and standard deviations (SD) for model 24.0b7, in million lb.

Year	MMB	SD MMB	Male recruits	SD male recruits
1976	15.27	2.44	0.29	0.15
1977	17.08	2.07	0.23	0.09
1978	15.80	1.75	0.23	0.08
1979	11.50	1.34	0.88	0.24
1980	6.35	0.97	1.14	0.27
1981	4.34	0.73	1.03	0.24
1982	3.39	0.71	1.09	0.29
1983	4.24	0.79	1.14	0.28
1984	4.90	0.89	0.72	0.19
1985	5.54	1.00	0.89	0.22
1986	5.89	1.06	0.59	0.15
1987	5.79	1.05	0.63	0.14
1988	5.71	1.00	0.64	0.15
1989	5.44	0.92	0.44	0.11
1990	5.11	0.83	0.45	0.11
1991	4.76	0.74	0.36	0.10
1992	4.50	0.64	0.27	0.08
1993	4.09	0.55	0.28	0.08
1994	3.40	0.46	0.40	0.09
1995	2.76	0.39	0.57	0.11
1996	2.30	0.35	1.09	0.21
1997	2.28	0.34	0.50	0.13
1998	2.88	0.39	0.22	0.07
1999	3.74	0.48	0.44	0.12
2000	3.99	0.49	0.74	0.16
2001	3.56	0.46	0.69	0.14
2002	3.37	0.43	0.42	0.12
2003	3.52	0.44	0.34	0.10
2004	3.57	0.44	0.79	0.15
2005	3.31	0.41	0.92	0.16
2006	3.08	0.38	1.05	0.20
2007	3.27	0.39	0.95	0.18
2008	3.87	0.42	0.57	0.14
2009	4.44	0.48	0.35	0.09
2010	4.75	0.50	0.53	0.10
2011	4.47	0.47	0.72	0.13
2012	3.94	0.42	1.44	0.18
2013	3.56	0.39	0.44	0.10
2014	3.85	0.39	0.22	0.06
2015	4.41	0.42	0.20	0.04
2016	4.03	0.40	0.36	0.06
2017	3.30	0.35	0.52	0.09
2018	2.56	0.30	2.15	0.29
2019	2.30	0.28	1.51	0.26
2020	3.33	0.36	0.71	0.16
2021	5.62	0.58	0.45	0.11
2022	7.17	0.72	0.16	0.05
2023	7.05	0.74	0.18	0.06
2024	6.04	0.69	0.17	0.07
2025	4.64	0.58	0.32	0.22

Table 19: Norton Sound red king crab estimated mature male biomass (MMB), male recruits, and standard deviations (SD) for model 25.0a1, in million lb.

Year	MMB	SD MMB	Male recruits	SD male recruits
1976	17.98	3.52	0.43	0.26
1977	18.82	2.83	0.30	0.13
1978	16.64	2.26	0.28	0.11
1979	11.67	1.62	0.65	0.26
1980	6.21	1.11	1.54	0.43
1981	4.03	0.80	1.26	0.37
1982	3.08	0.76	1.22	0.42
1983	4.23	0.92	1.25	0.40
1984	5.03	1.06	0.92	0.29
1985	5.65	1.18	1.03	0.34
1986	5.92	1.24	0.69	0.23
1987	5.80	1.21	0.70	0.20
1988	5.67	1.15	0.74	0.22
1989	5.33	1.05	0.50	0.16
1990	4.96	0.94	0.61	0.18
1991	4.58	0.84	0.46	0.16
1992	4.33	0.72	0.51	0.18
1993	4.00	0.63	0.48	0.16
1994	3.44	0.54	0.55	0.16
1995	3.03	0.48	0.72	0.18
1996	2.76	0.45	1.39	0.34
1997	2.85	0.46	0.62	0.21
1998	3.60	0.52	0.29	0.11
1999	4.49	0.64	0.50	0.19
2000	4.55	0.62	1.05	0.27
2001	3.93	0.56	0.76	0.20
2002	3.74	0.54	0.52	0.18
2003	3.95	0.57	0.47	0.17
2004	3.92	0.56	0.90	0.24
2005	3.58	0.51	1.08	0.26
2006	3.36	0.47	1.32	0.32
2007	3.58	0.49	1.20	0.30
2008	4.26	0.54	1.04	0.29
2009	4.93	0.62	0.47	0.15
2010	5.39	0.65	0.62	0.16
2011	5.25	0.64	0.87	0.22
2012	4.65	0.57	1.76	0.28
2013	4.17	0.53	0.53	0.15
2014	4.49	0.53	0.24	0.08
2015	5.00	0.54	0.21	0.06
2016	4.39	0.48	0.37	0.08
2017	3.41	0.39	0.54	0.12
2018	2.52	0.32	1.97	0.35
2019	2.19	0.28	1.92	0.38
2020	3.14	0.38	1.12	0.29
2021	5.33	0.60	0.60	0.18
2022	7.05	0.75	0.21	0.08
2023	7.08	0.78	0.25	0.10
2024	6.04	0.71	0.32	0.14
2025	4.59	0.59	0.47	0.33

Table 20: Norton Sound red king crab estimated mature male biomass (MMB), male recruits, and standard deviations (SD) for model 25.0a2, in million lb.

Year	MMB	SD MMB	Male recruits	SD male recruits
1976	18.19	3.59	0.43	0.25
1977	19.01	2.89	0.30	0.13
1978	16.81	2.31	0.28	0.11
1979	11.79	1.66	0.66	0.26
1980	6.29	1.15	1.56	0.44
1981	4.09	0.82	1.27	0.37
1982	3.14	0.78	1.24	0.42
1983	4.30	0.95	1.27	0.40
1984	5.11	1.09	0.93	0.30
1985	5.74	1.21	1.04	0.34
1986	6.02	1.27	0.70	0.23
1987	5.90	1.24	0.71	0.21
1988	5.75	1.18	0.74	0.23
1989	5.41	1.07	0.50	0.16
1990	5.02	0.96	0.61	0.18
1991	4.63	0.85	0.46	0.16
1992	4.37	0.74	0.50	0.18
1993	4.03	0.64	0.48	0.16
1994	3.47	0.54	0.55	0.16
1995	3.04	0.48	0.72	0.18
1996	2.77	0.46	1.39	0.34
1997	2.86	0.46	0.62	0.21
1998	3.60	0.53	0.29	0.11
1999	4.50	0.64	0.50	0.19
2000	4.56	0.63	1.05	0.27
2001	3.94	0.57	0.76	0.20
2002	3.74	0.54	0.52	0.18
2003	3.96	0.57	0.47	0.17
2004	3.92	0.56	0.89	0.24
2005	3.58	0.51	1.06	0.25
2006	3.35	0.47	1.30	0.32
2007	3.55	0.48	1.18	0.30
2008	4.21	0.53	1.00	0.28
2009	4.86	0.61	0.46	0.14
2010	5.29	0.64	0.60	0.15
2011	5.12	0.62	0.83	0.21
2012	4.51	0.55	1.75	0.28
2013	4.01	0.50	0.54	0.15
2014	4.34	0.51	0.24	0.08
2015	4.88	0.53	0.21	0.06
2016	4.31	0.47	0.37	0.08
2017	3.38	0.39	0.54	0.12
2018	2.51	0.32	1.97	0.35
2019	2.19	0.28	1.90	0.38
2020	3.14	0.38	1.11	0.28
2021	5.31	0.60	0.59	0.17
2022	7.01	0.75	0.21	0.08
2023	7.03	0.77	0.25	0.10
2024	5.99	0.70	0.31	0.14
2025	4.55	0.59	0.47	0.33

Figures

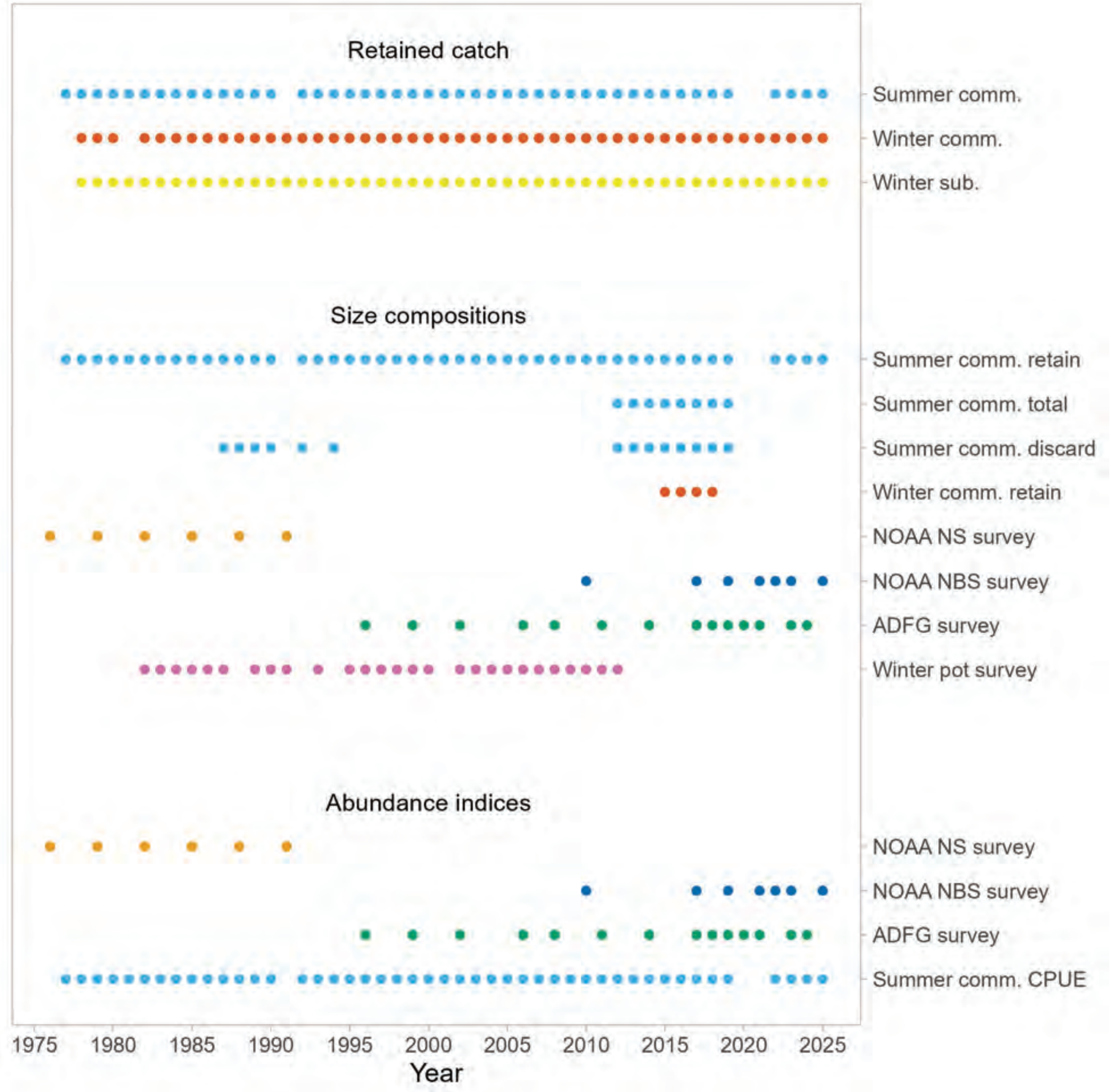

Figure 1: Data sources available for the Norton Sound red king crab stock assessment. Acronyms and abbreviations: National Oceanic and Atmospheric Administration, NOAA; Norton Sound, NS; Northern Bering Sea, NBS; Alaska Department of Fish and Game, ADFG; catch per unit effort, CPUE; comm., commercial; sub., subsistence.

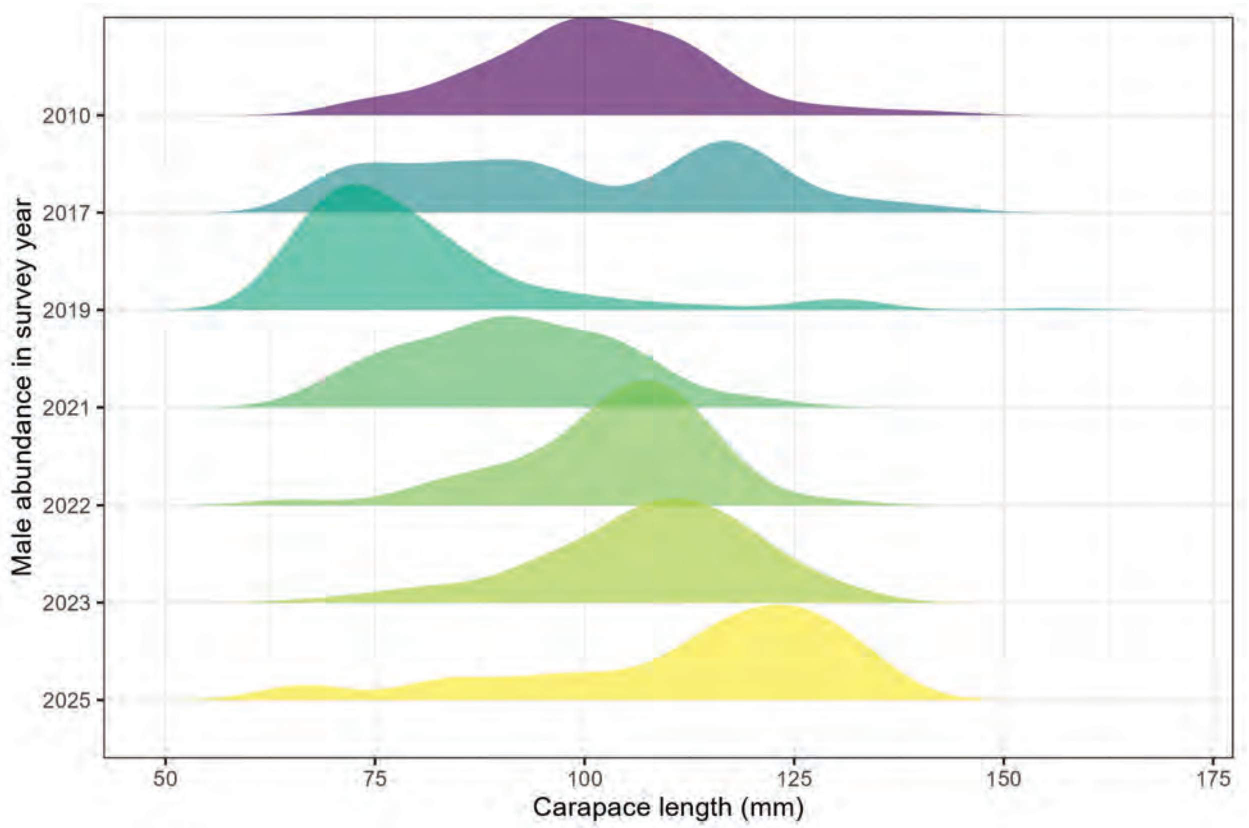

Figure 2: National Oceanic and Atmospheric Administration Northern Bering Sea trawl survey abundances by carapace length for male Norton Sound red king crab from 2010 to 2025.

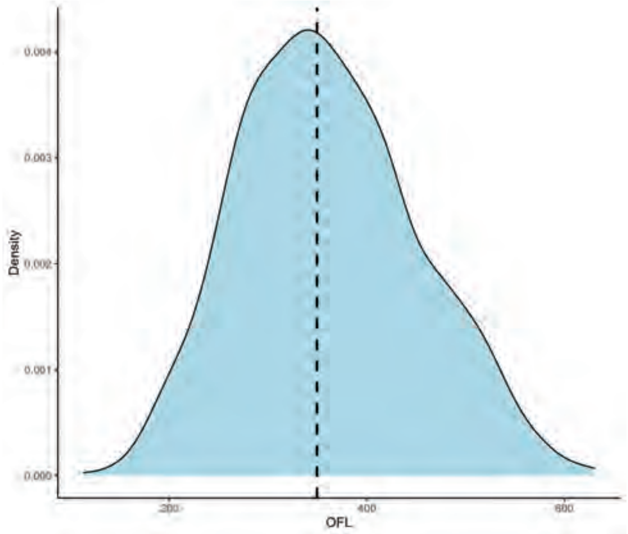

Figure 3: The probability density function of the OFL for model 24.0b6, based on 1,000 Markov chain Monte Carlo (MCMC) draws. The vertical dashed line represents the OFL from the original model run.

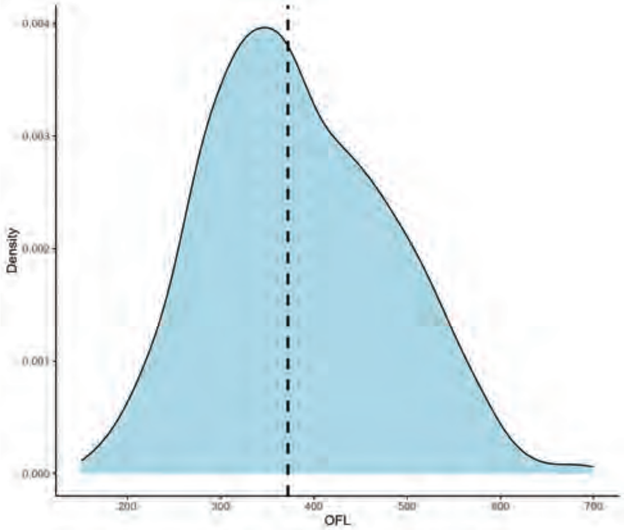

Figure 4: The probability density function of the OFL for model 24.0b7, based on 1,000 Markov chain Monte Carlo (MCMC) draws. The vertical dashed line represents the OFL from the original model run.

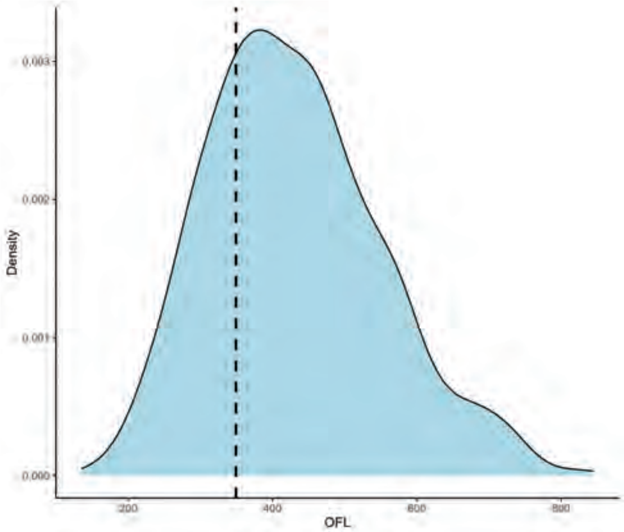

Figure 5: The probability density function of the OFL for model 25.0a1, based on 1,000 Markov chain Monte Carlo (MCMC) draws. The vertical dashed line represents the OFL from the original model run.

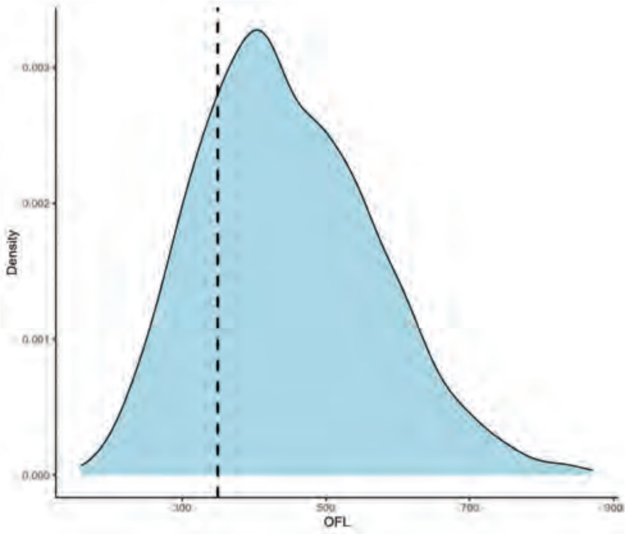

Figure 6: The probability density function of the OFL for model 25.0a2, based on 1,000 Markov chain Monte Carlo (MCMC) draws. The vertical dashed line represents the OFL from the original model run.

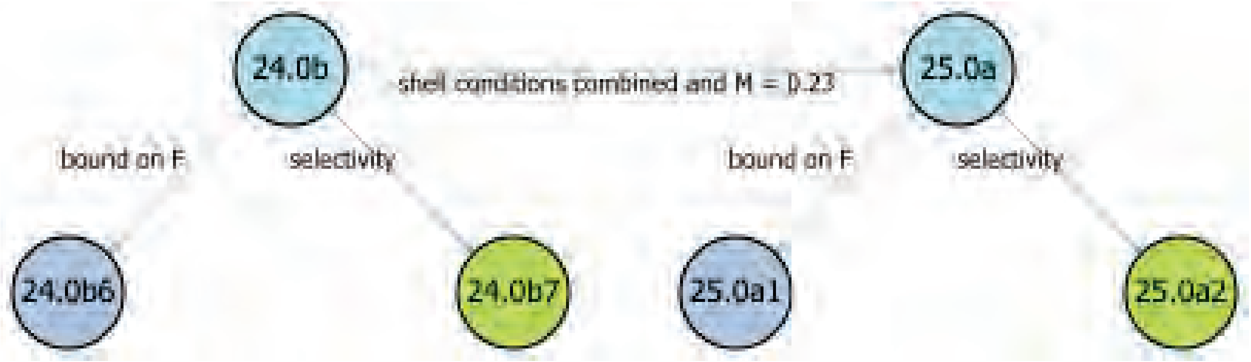

Figure 7: Flow chart of models presented in this document. Model 24.0b is the base model. Model 24.0b6 is model 24.0b with an upper bound on F for the winter commercial fishery borrowed from the Bristol Bay red king crab assessment model. Model 24.0b7 is model 24.0b with selectivity for the winter commercial fishery and subsistence fishery sharing parameters with selectivity for the summer commercial fishery rather than the winter pot survey. Model 25.0a is model 24.0b with shell condition excluded and a higher fixed M value of 0.23 for males with carapace length $\leq$ 123 mm. Model 25.0a1 is model 25.0a with an upper bound on F for the winter commercial fishery borrowed from the Bristol Bay red king crab assessment model. Model 25.0a2 is model 25.0a with selectivity for the winter commercial fishery and subsistence fishery sharing parameters with selectivity for the summer commercial fishery rather than the winter pot survey.

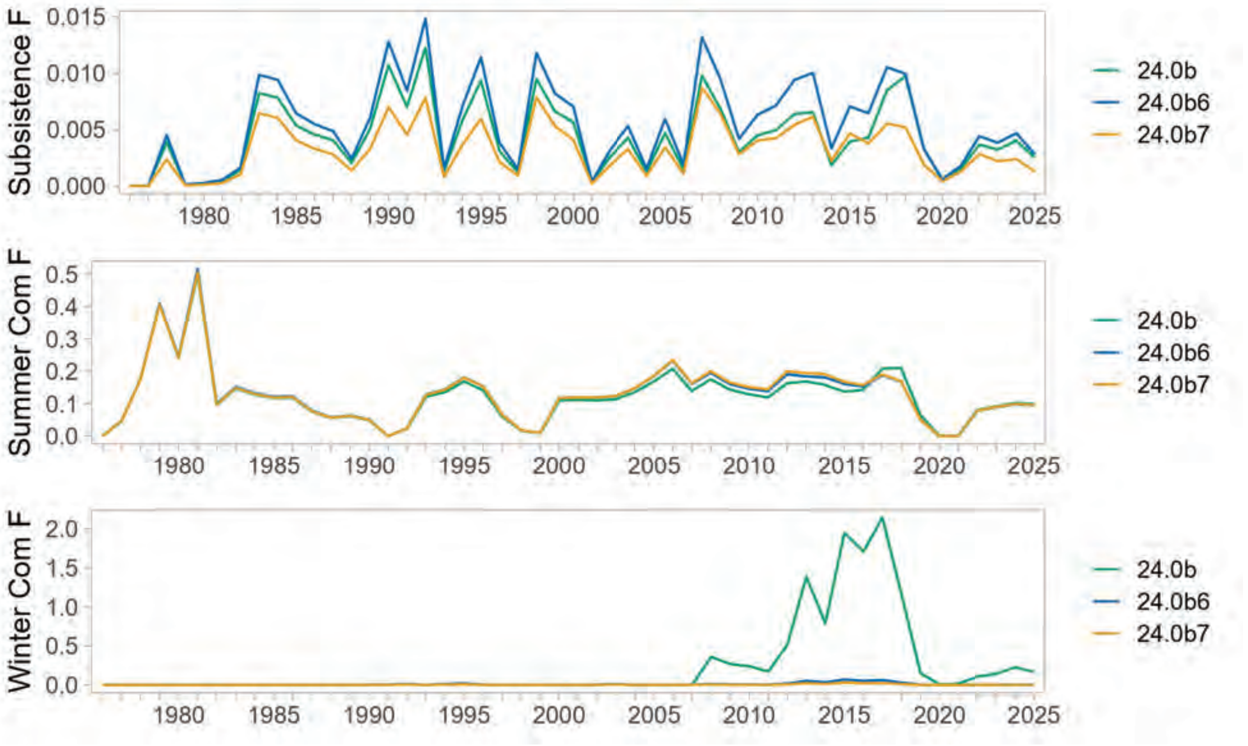

Figure 8: Comparison of estimated fishing mortality (F) for the subsistence, summer commercial, and winter commercial fisheries for the base model (24.0b), 24.0b with an upper bound on F for the winter commercial fishery borrowed from the Bristol Bay red king crab assessment model (24.0b6), and 24.0b with selectivity for the winter commercial fishery and subsistence fishery sharing parameters with selectivity for the summer commercial fishery rather than the winter pot survey (24.0b7). Note that the scale for F differs among the panels.

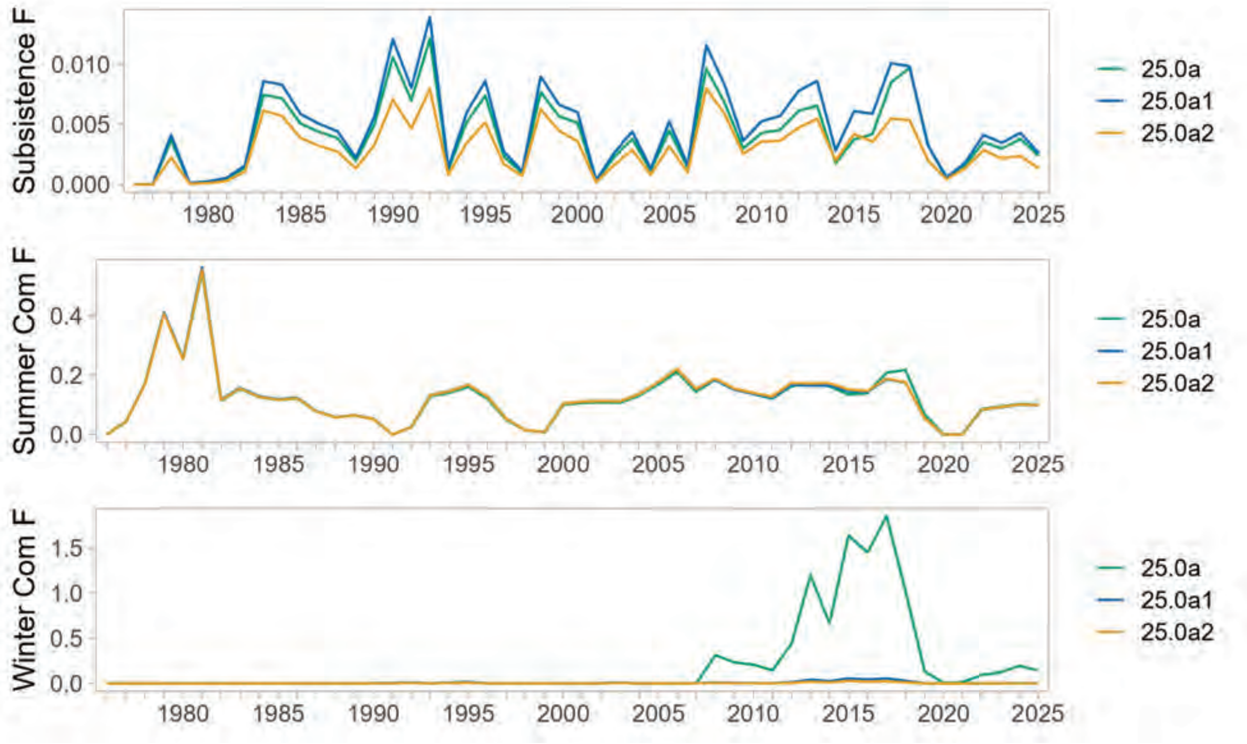

Figure 9: Comparison of estimated fishing mortality (F) for the subsistence, summer commercial, and winter commercial fisheries for the model with shell condition excluded and a higher fixed M value of 0.23 for males with carapace length $\leq$ 123 mm (model 25.0a), 25.0a with an upper bound on F for the winter commercial fishery borrowed from the Bristol Bay red king crab assessment model (25.0a1), and 25.0a with selectivity for the winter commercial fishery and subsistence fishery sharing parameters with selectivity for the summer commercial fishery rather than the winter pot survey (25.0a2). Note that the scale for F differs among the panels.

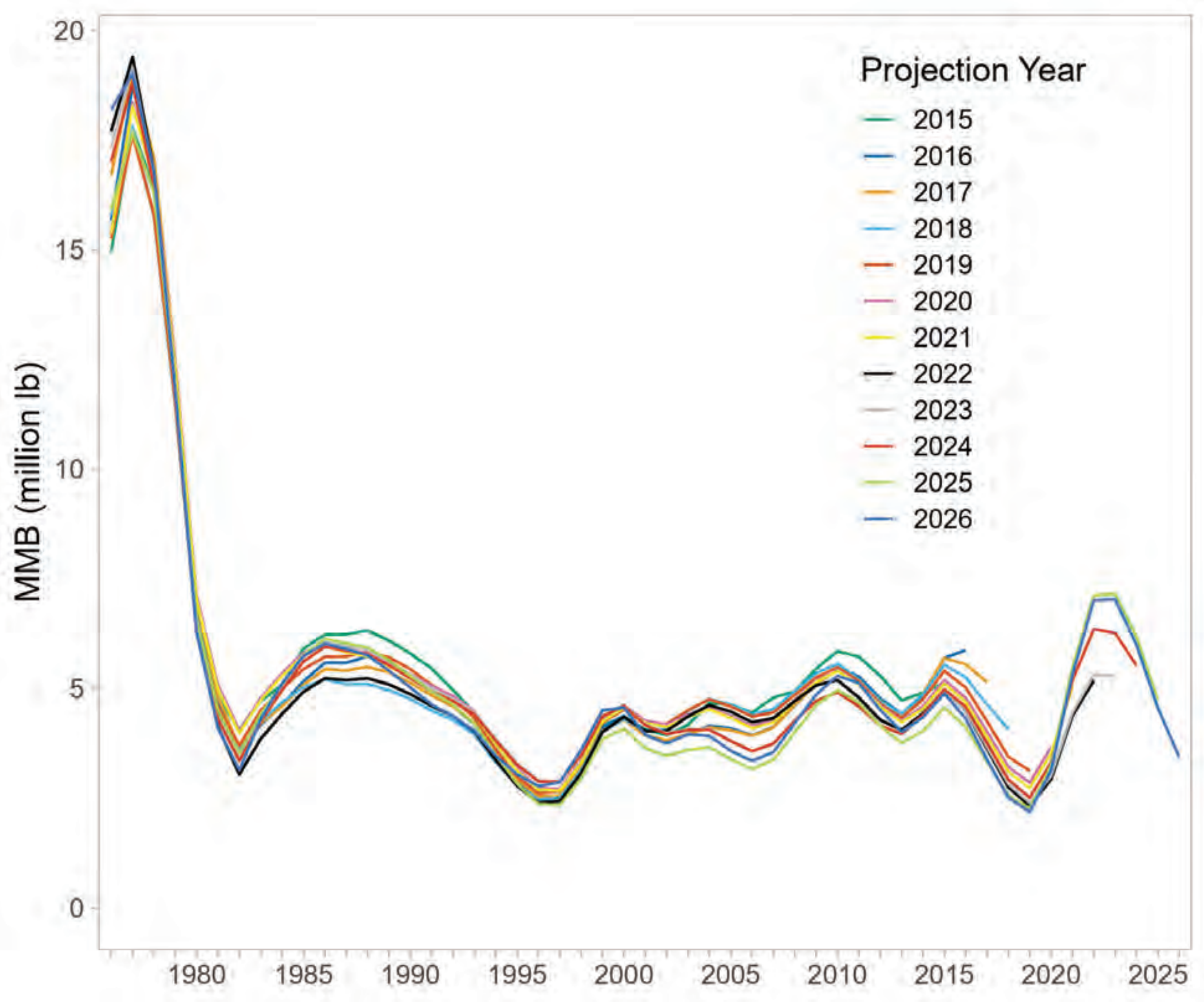

Figure 10: Comparison of historical estimates of mature male biomass of Norton Sound red king crab using the model selected in each year. Data were compiled from reported MMB values for the chosen model in the published SAFE document from the assessment year. The legend shows the year for which model projections were made.

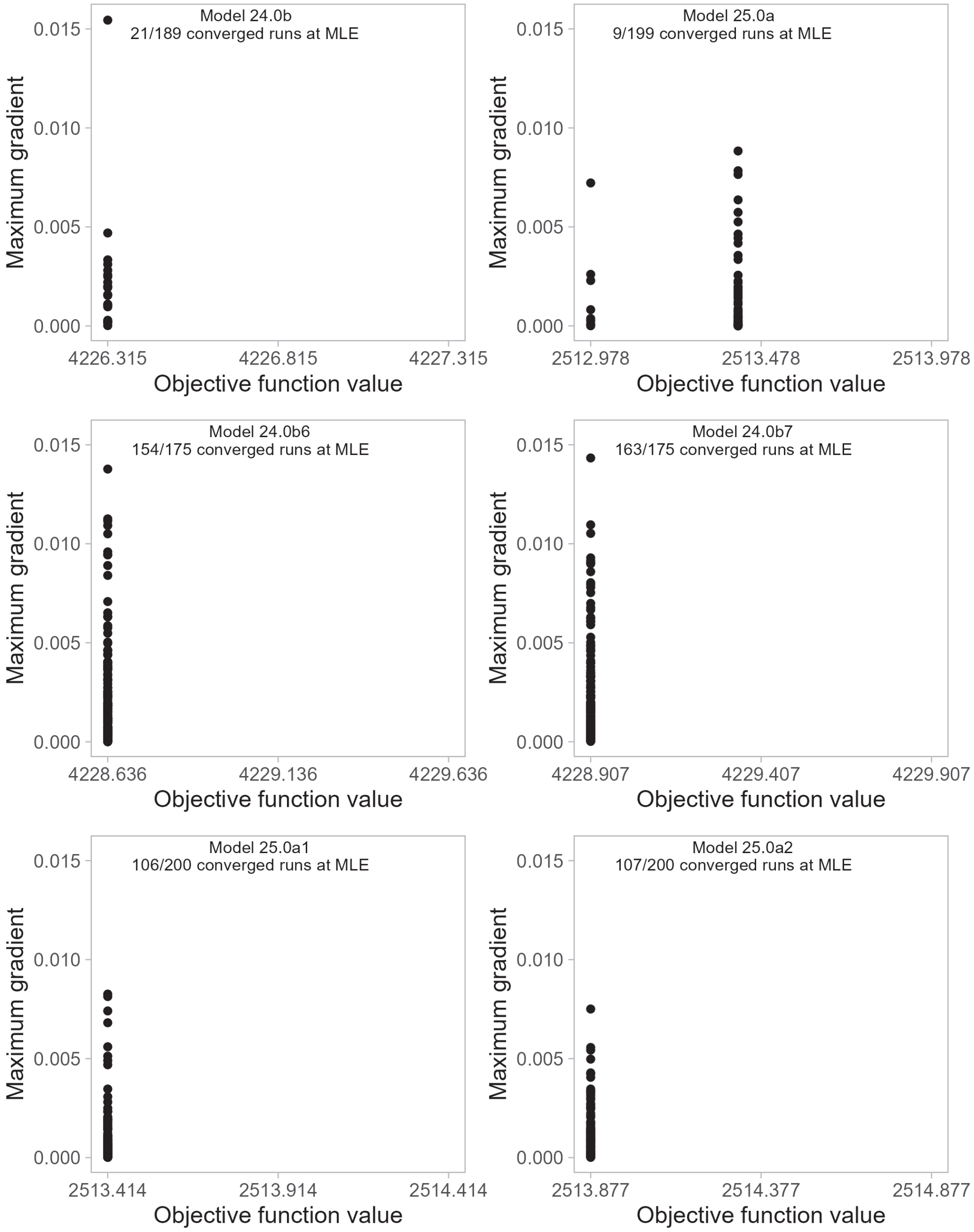

Figure 11: Results from 200 jitter runs for the six models presented as candidates for harvest specifications.

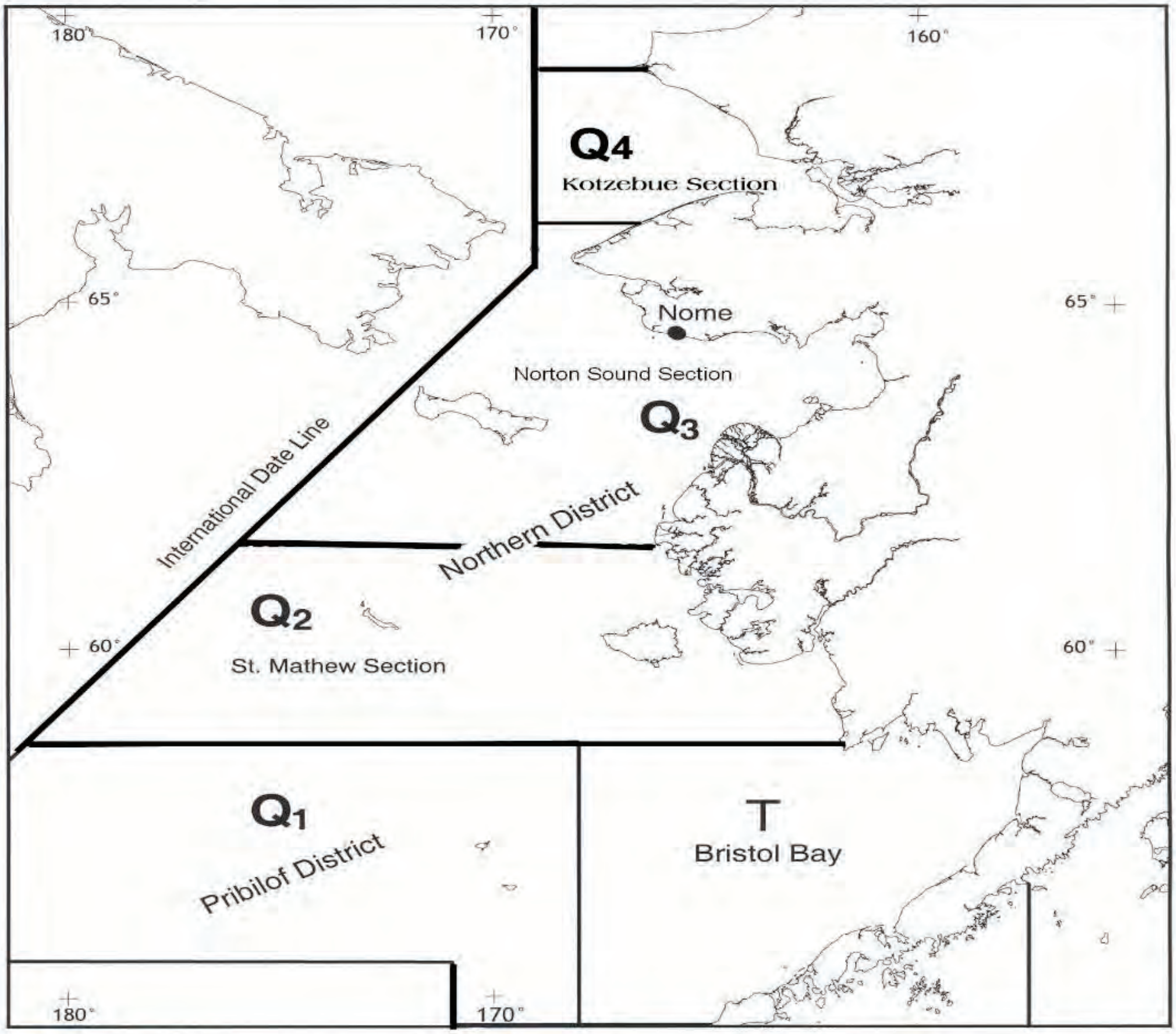

Figure 12: King crab fishing districts and sections of Alaska Department of Fish and Game Registration Area Q. Source: Menard et al. (2022).

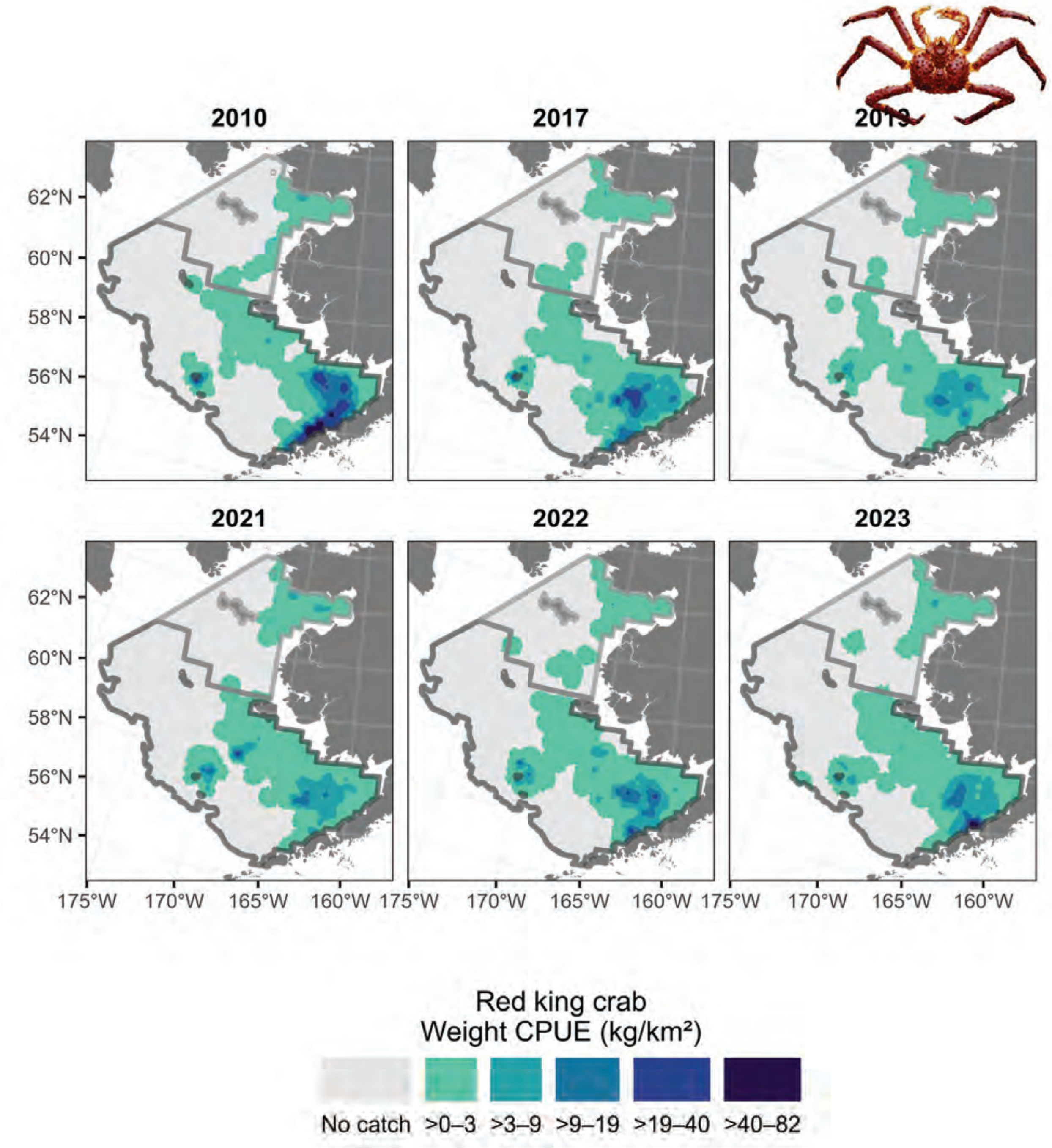

Figure 13: Distribution of red king crab from the 2010, 2017, 2019, and 2021-2023 Eastern and Northern Bering Sea trawl surveys. Source: Markowitz et al. (2023).

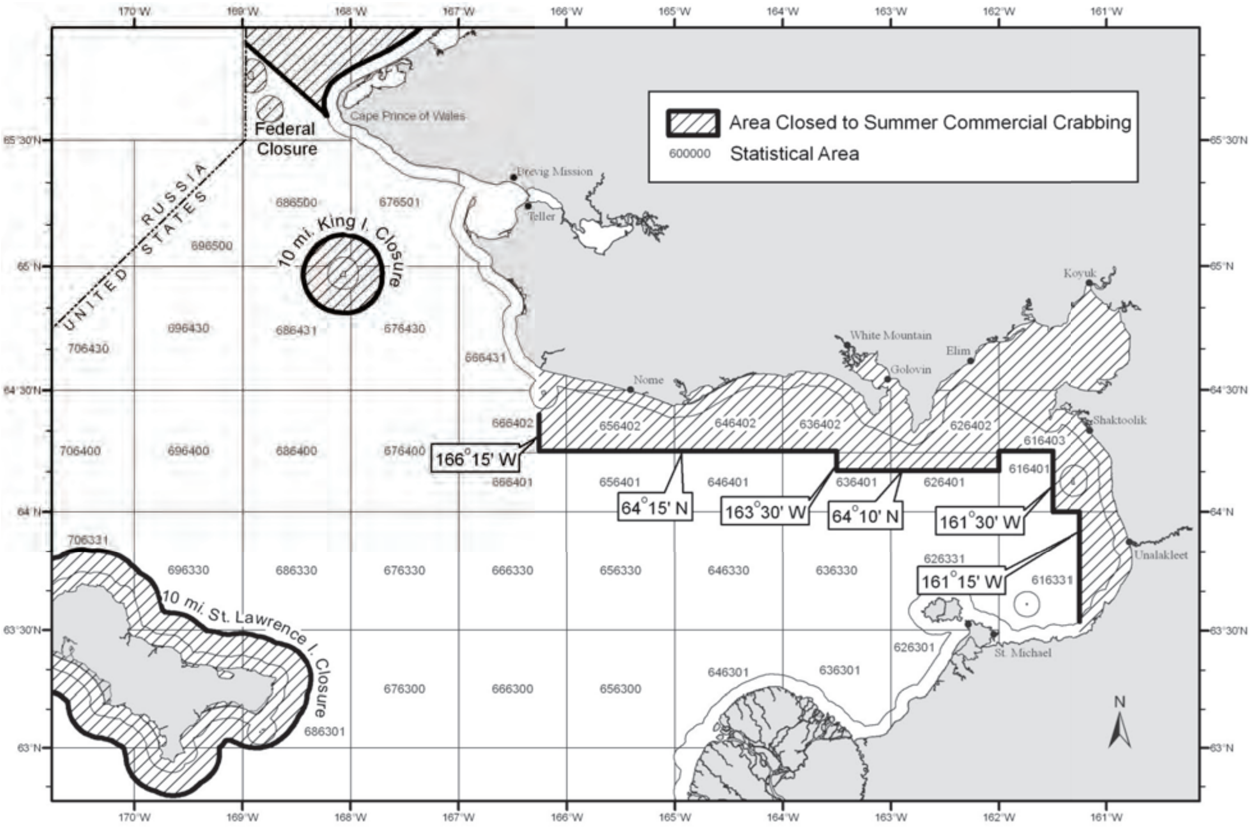

Figure 14: Waters closed to the Norton Sound summer commercial crab fishery. Source: Menard et al. (2022).

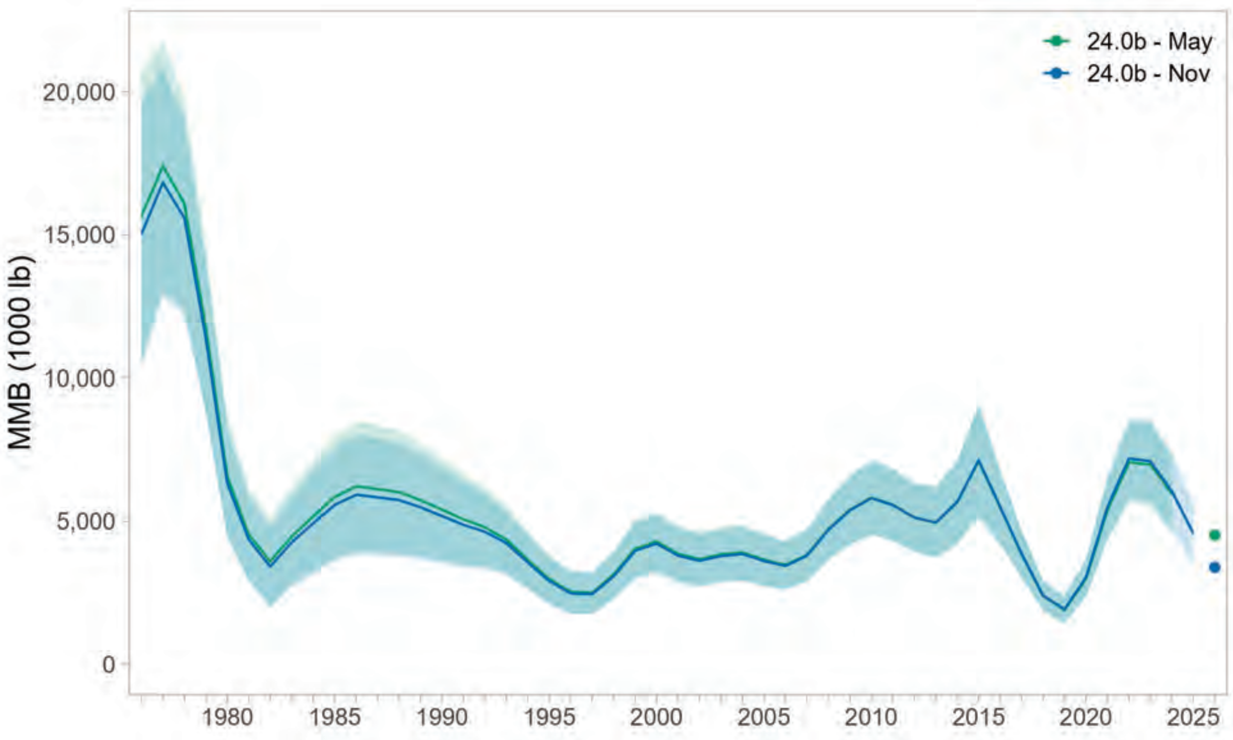

Figure 15: Comparisons of estimated mature male biomass (MMB) time series over 1976-2025 for models 24.0b - May (including only data updated through 2024) and model 24.0b (including data updated through 2025). Points represent projected values for 2026.

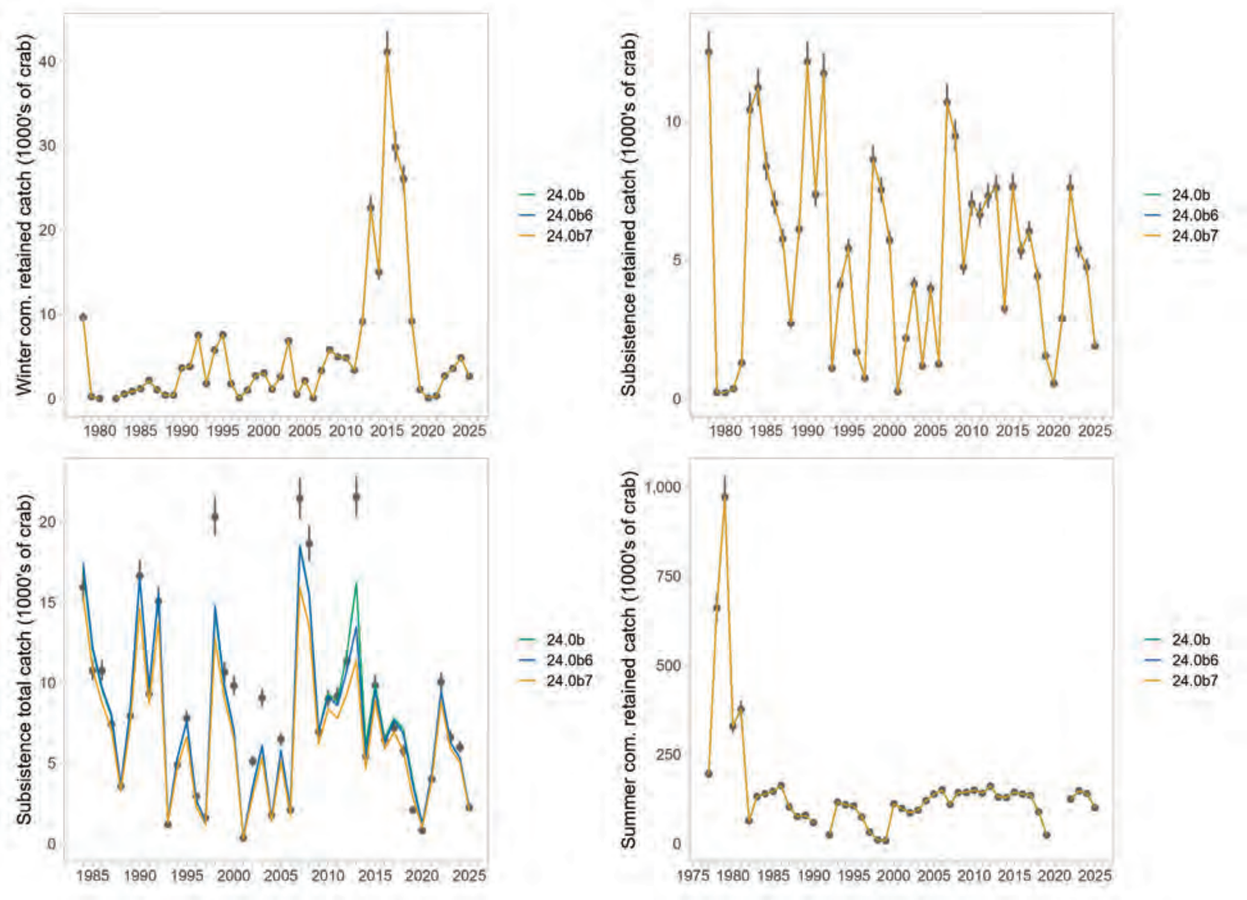

Figure 16: Observed and model-estimated catch of male red king crab caught in the winter commercial, summer commercial, and subsistence fisheries for models 24.0b, 24.0b6, and 24.0b7. Model 24.0b is the base model. Model 24.0b6 is model 24.0b with an upper bound on F for the winter commercial fishery borrowed from the Bristol Bay red king crab stock assessment. Model 24.0b7 is model 24.0b with selectivity parameters for the winter commercial fishery shared with the summer commercial fishery. Note that subsistence total catch was not fitted in these models (emphasis set to 0).

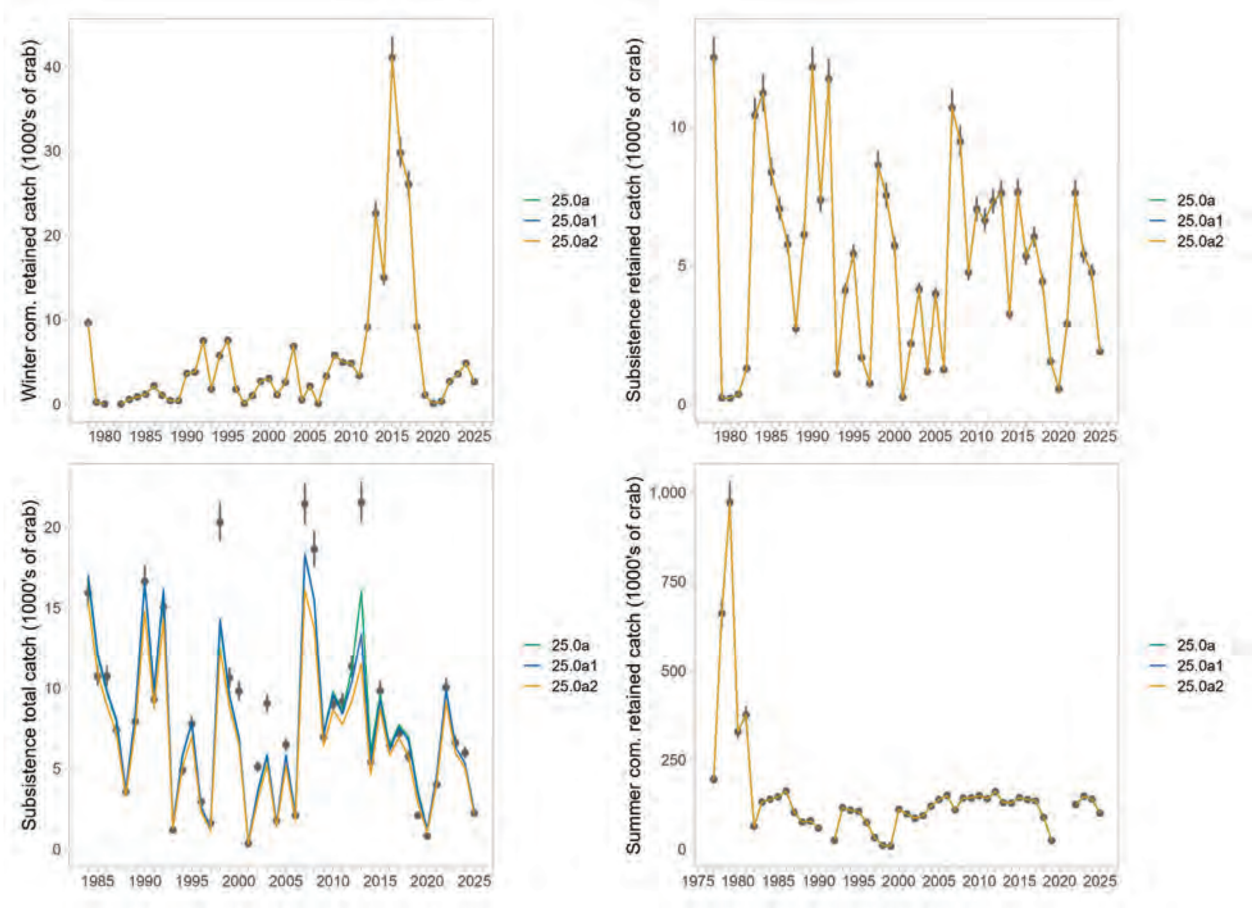

Figure 17: Observed and model-estimated catch of male red king crab caught in the winter commercial, summer commercial, and subsistence fisheries for models 25.0a, 25.0a1, and 25.0a2. Model 25.0a is model 24.0b with shell condition excluded and with natural mortality for small males fixed at 0.23 rather than 0.18. Model 25.0a1 is model 25.0a with an upper bound on F for the winter commercial fishery borrowed from the Bristol Bay red king crab stock assessment. Model 25.0a2 is model 25.0a with selectivity parameters for the winter commercial fishery shared with the summer commercial fishery. Note that subsistence total catch was not fitted in these models (emphasis set to 0).

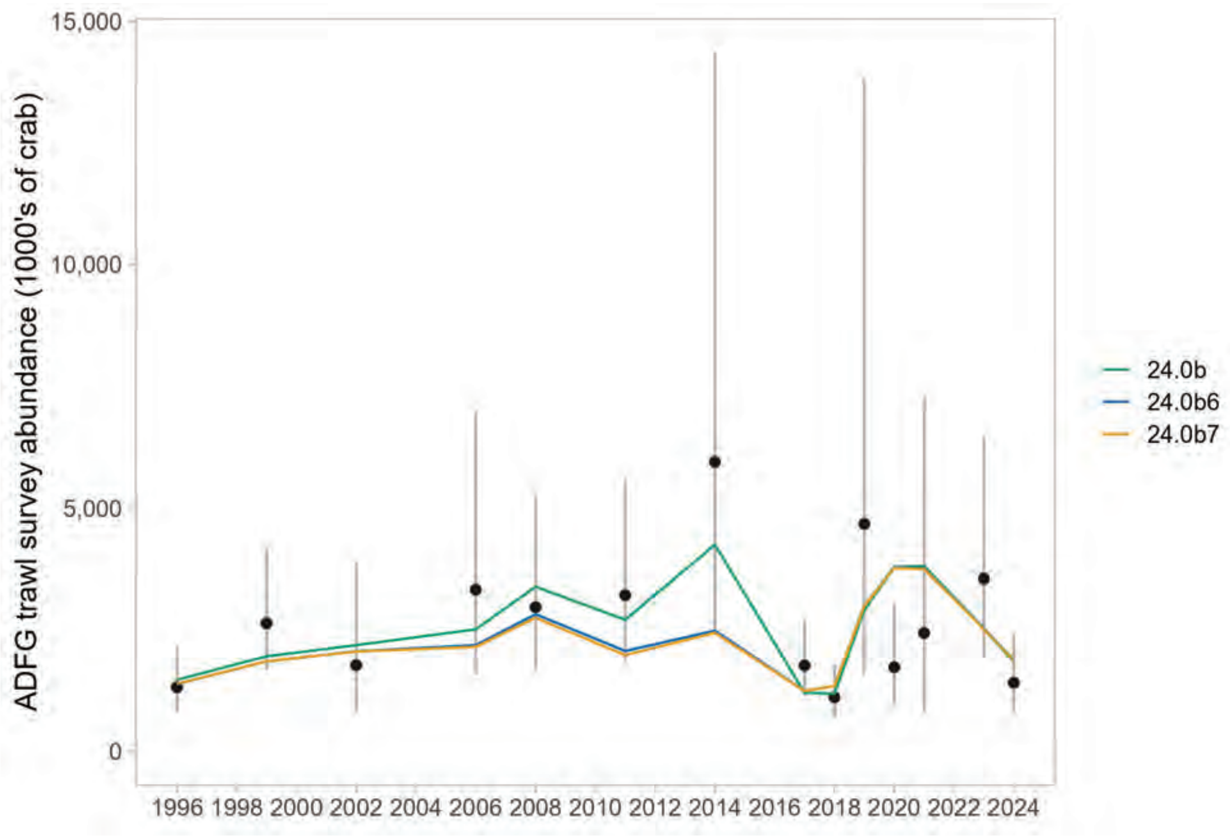

Figure 18: Model fits to the design-based index of abundance from the Alaska Department of Fish and Game (ADFG) trawl survey for models 24.0b, 24.0b6, and 24.0b7.

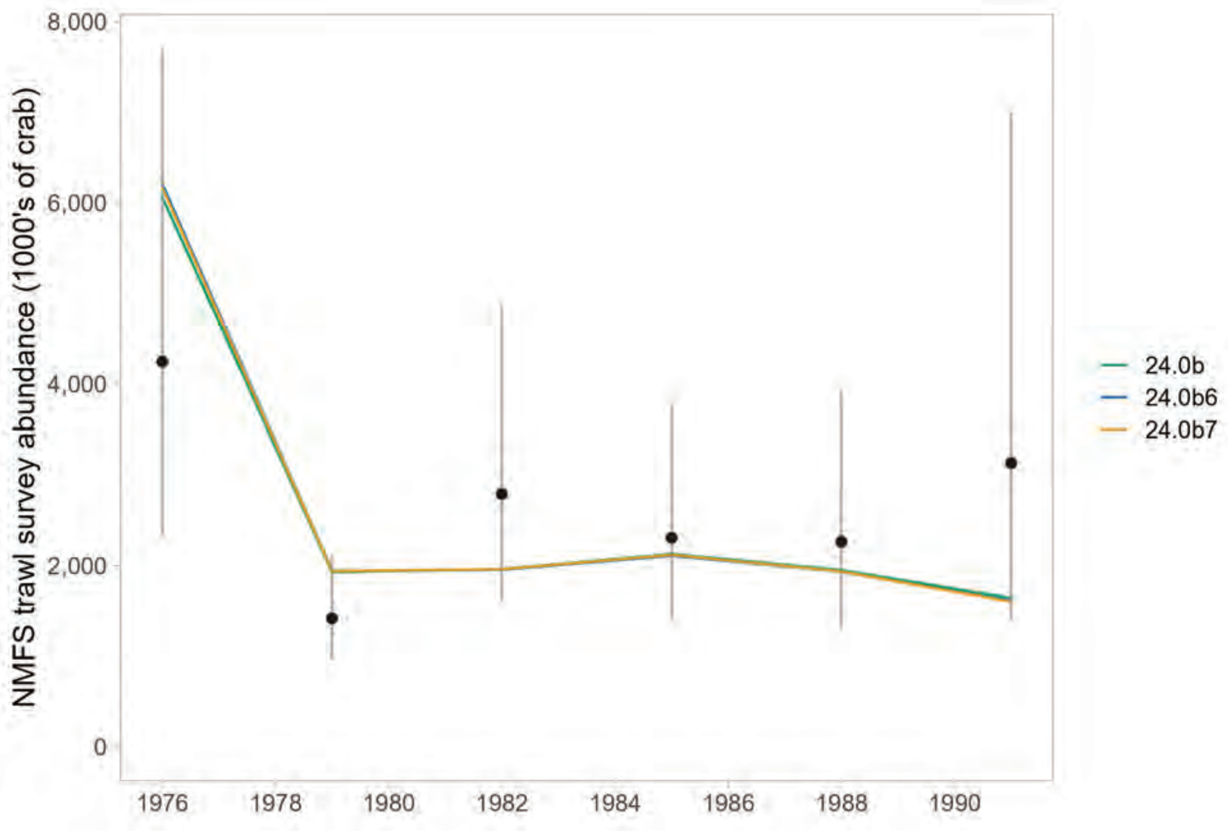

Figure 19: Model fits to the design-based index of abundance from the National Oceanic and Atmospheric Administration (NOAA) Norton Sound trawl survey for models 24.0b, 24.0b6, and 24.0b7.

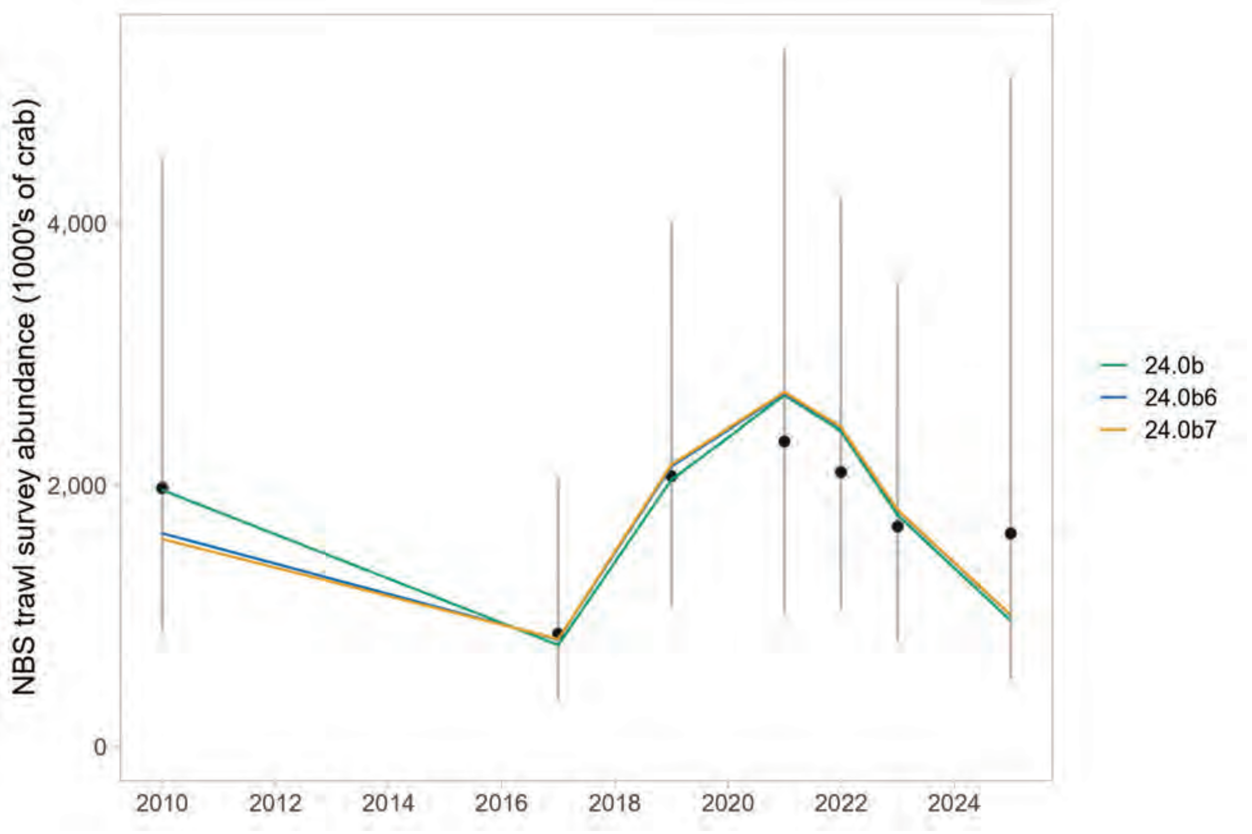

Figure 20: Model fits to the design-based index of abundance from the National Oceanic and Atmospheric Administration (NOAA) Northern Bering Sea (NBS) trawl survey for models 24.0b, 24.0b6, and 24.0b7.

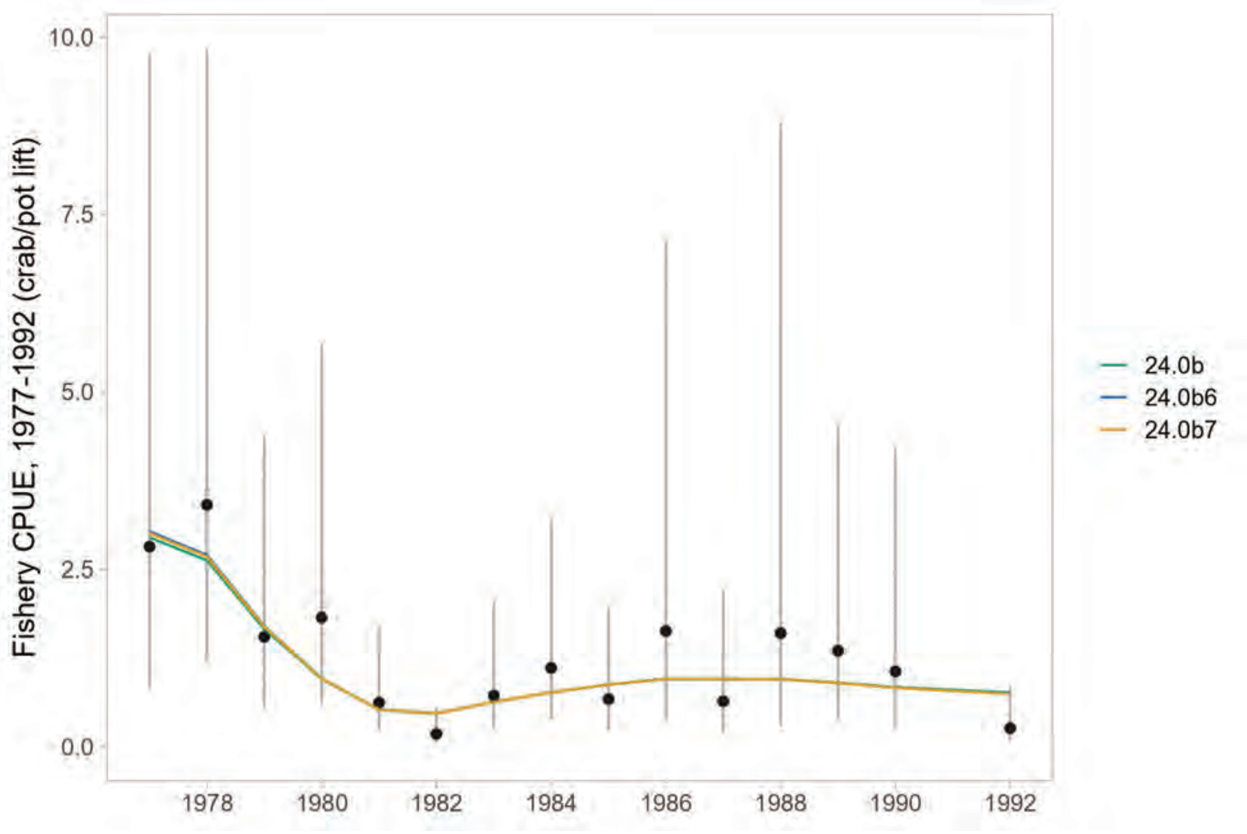

Figure 21: Model fits to the summer commercial fishery standardized catch per unit effort (CPUE) index (1977-1992) for models 24.0b, 24.0b6, and 24.0b7.

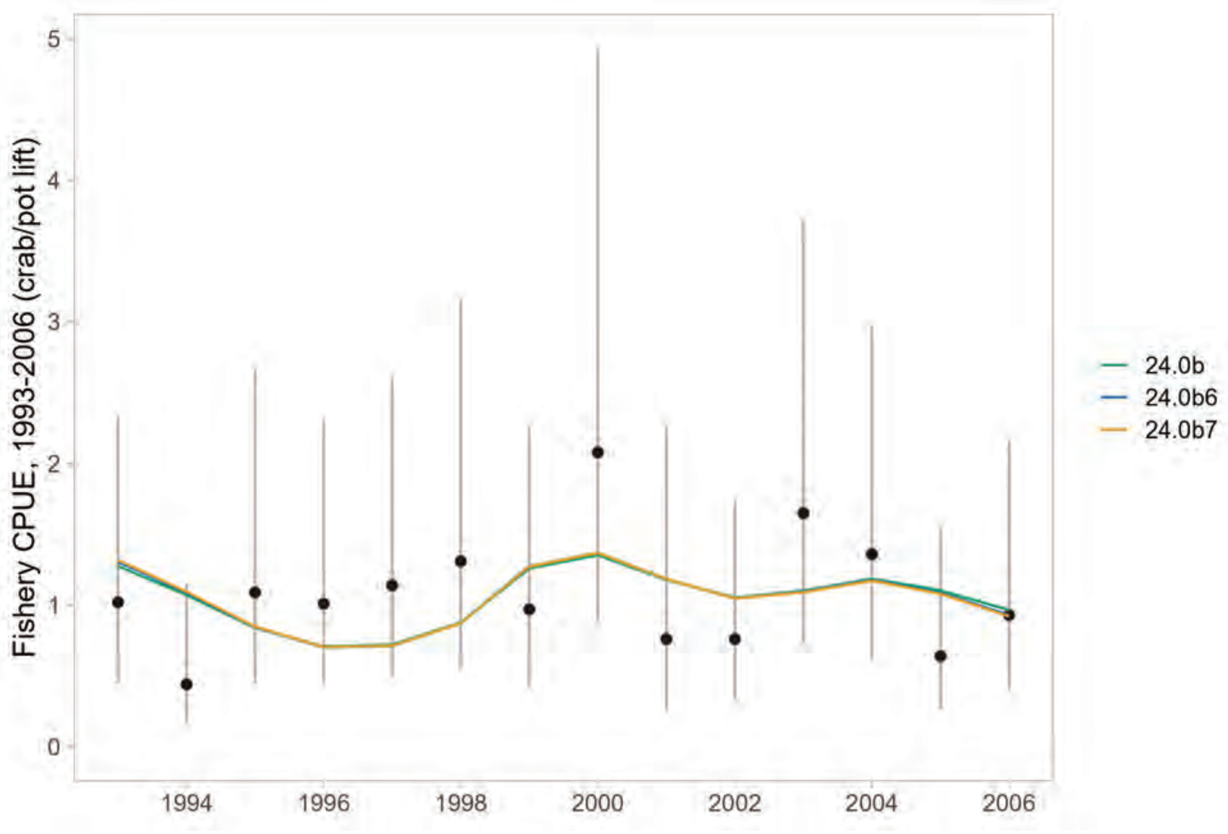

Figure 22: Model fits to the summer commercial fishery standardized catch per unit effort (CPUE) index (1993-2006) for models 24.0b, 24.0b6, and 24.0b7.

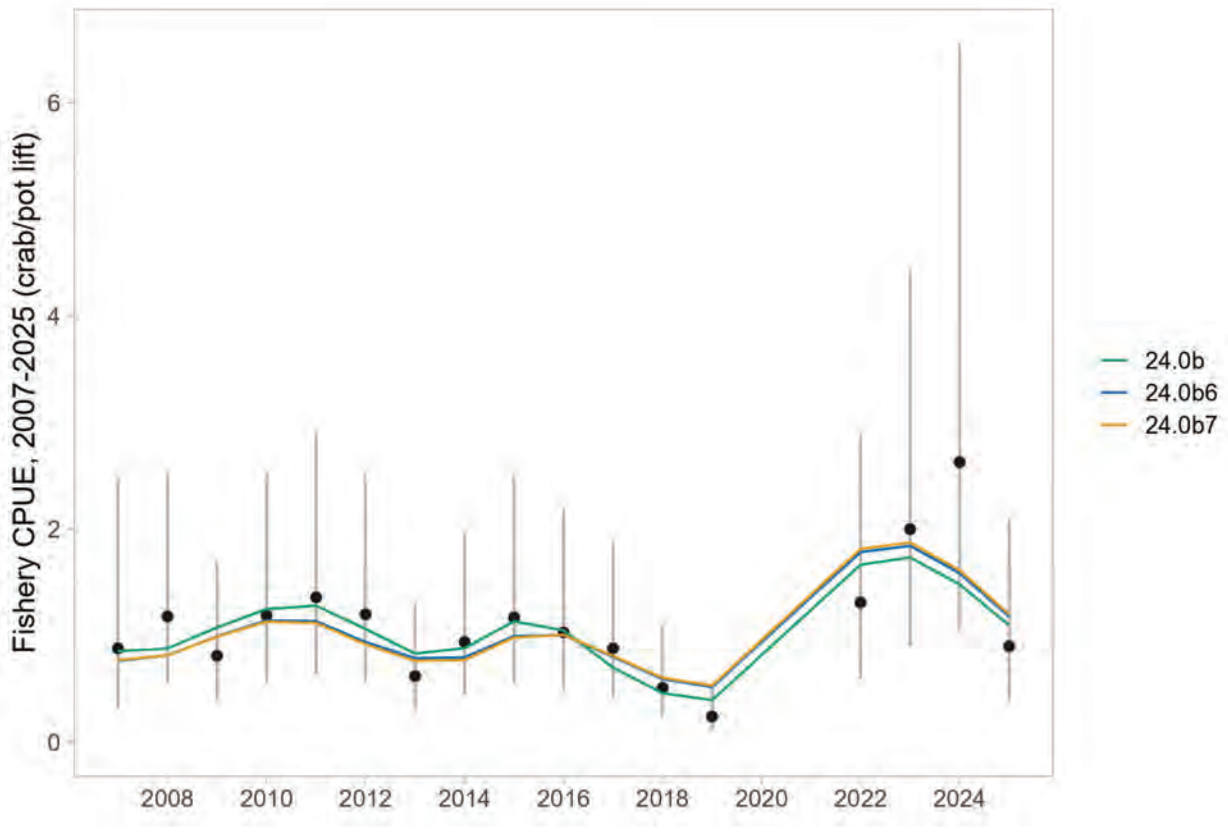

Figure 23: Model fits to the summer commercial fishery standardized catch per unit effort (CPUE) index (2007-2025) for models 24.0b, 24.0b6, and 24.0b7.

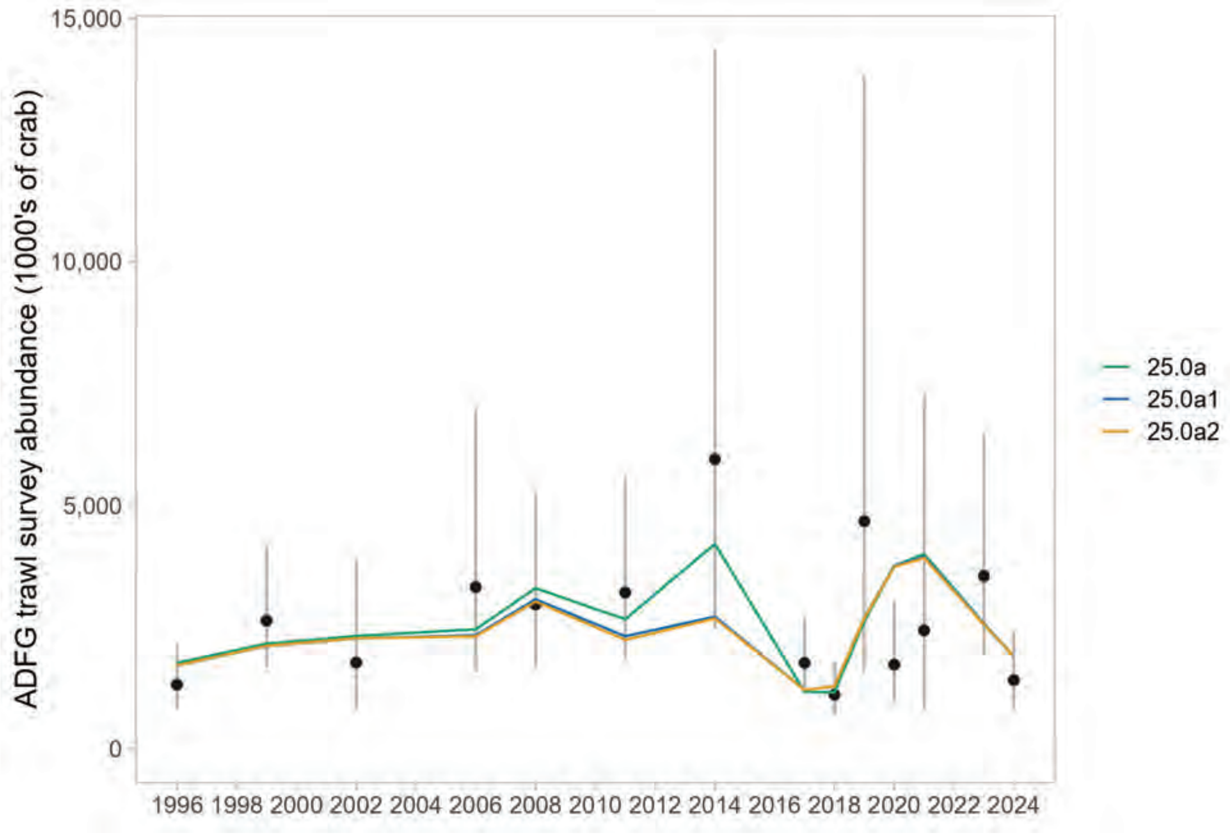

Figure 24: Model fits to the design-based index of abundance from the Alaska Department of Fish and Game (ADFG) trawl survey for models 25.0a, 25.0a1, and 25.0a2.

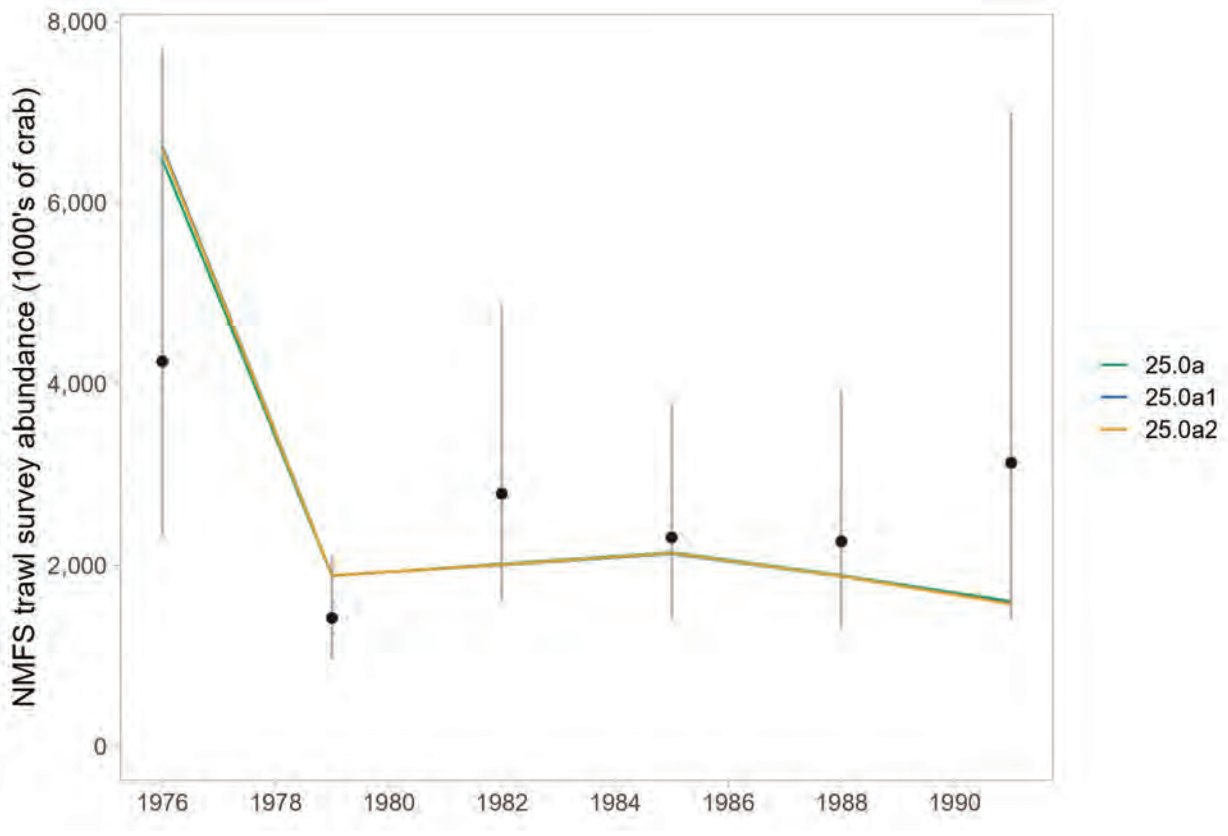

Figure 25: Model fits to the design-based index of abundance from the National Oceanic and Atmospheric Administration (NOAA) Norton Sound trawl survey for models 25.0a, 25.0a1, and 25.0a2.

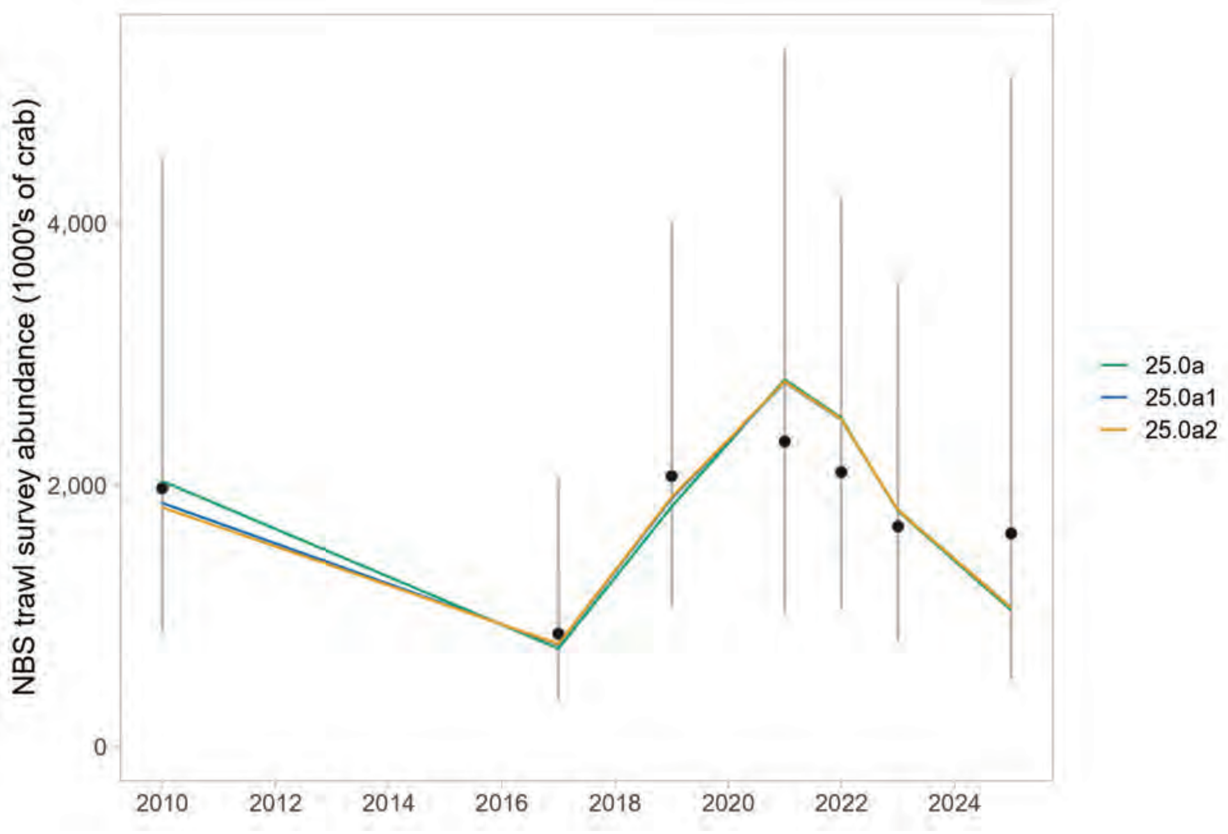

Figure 26: Model fits to the design-based index of abundance from the National Oceanic and Atmospheric Administration (NOAA) Northern Bering Sea (NBS) trawl survey for models 25.0a, 25.0a1, and 25.0a2.

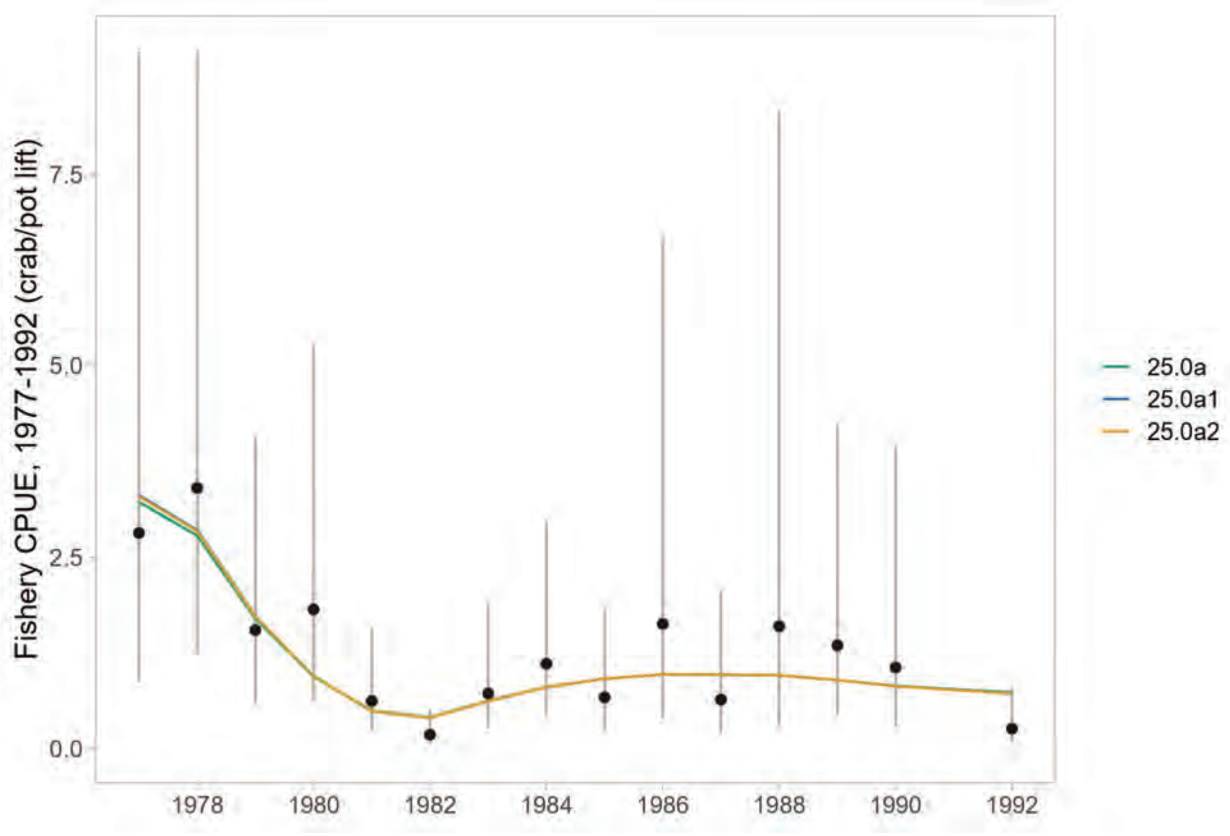

Figure 27: Model fits to the summer commercial fishery standardized catch per unit effort (CPUE) index (1977-1992) for models 25.0a, 25.0a1, and 25.0a2.

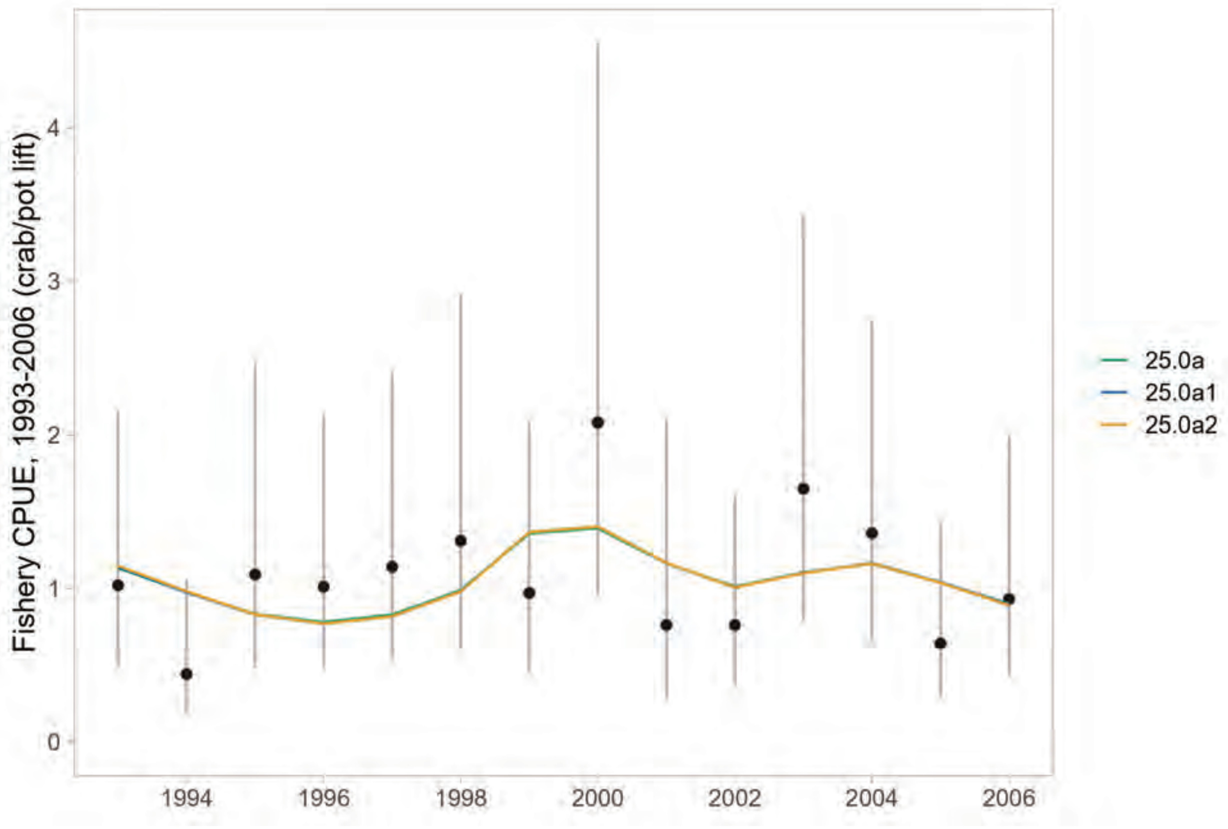

Figure 28: Model fits to the summer commercial fishery standardized catch per unit effort (CPUE) index (1993-2006) for models 25.0a, 25.0a1, and 25.0a2.

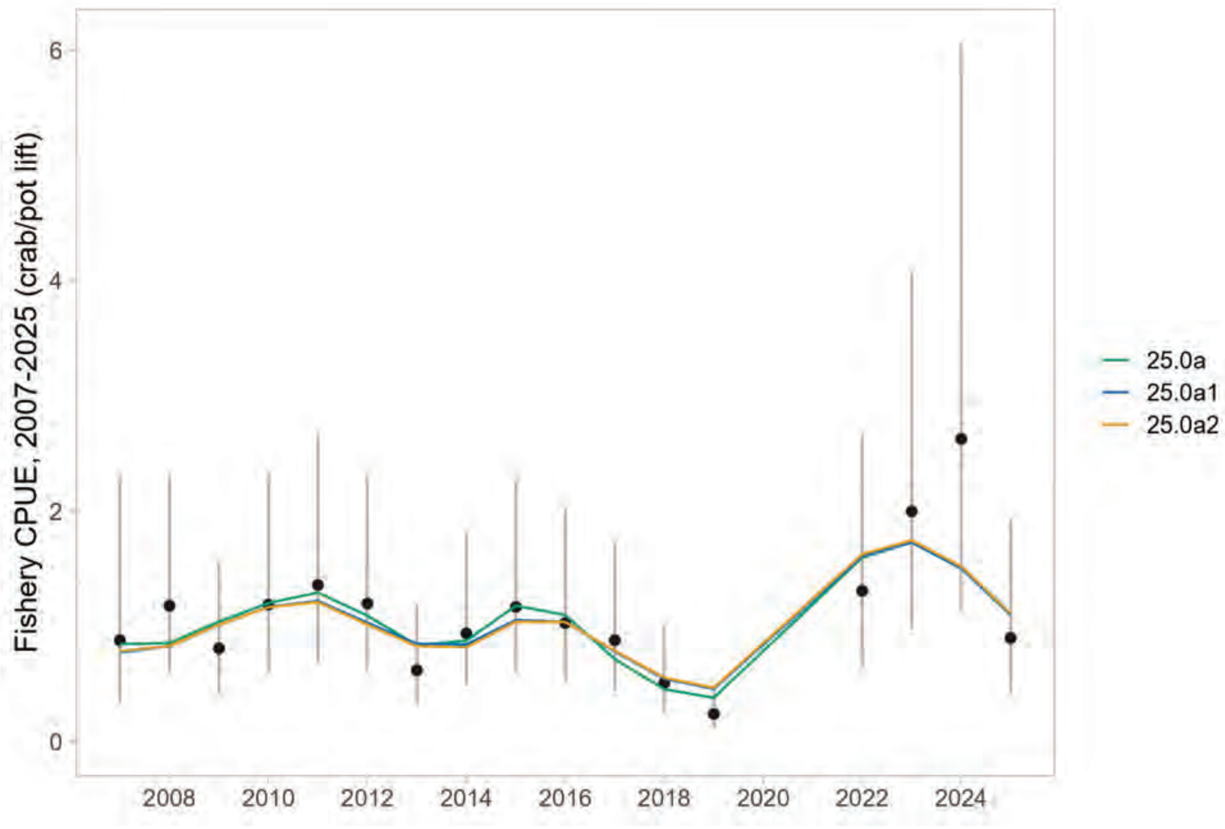

Figure 29: Model fits to the summer commercial fishery standardized catch per unit effort (CPUE) index (2007-2025) for models 25.0a, 25.0a1, and 25.0a2.

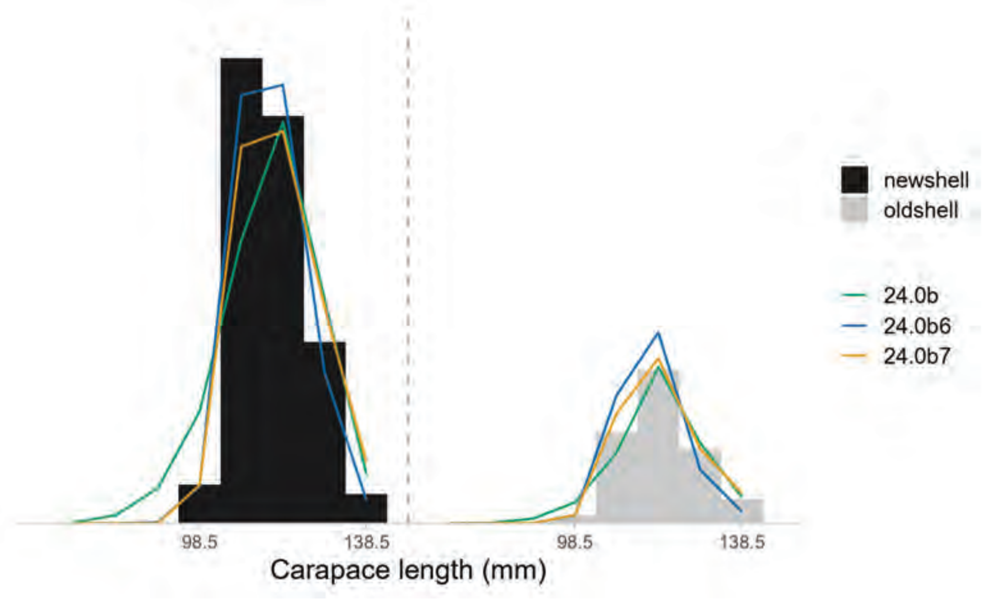

Figure 30: Aggregated observed and model-estimated size frequencies of male red king crab retained in the directed winter commercial fishery for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

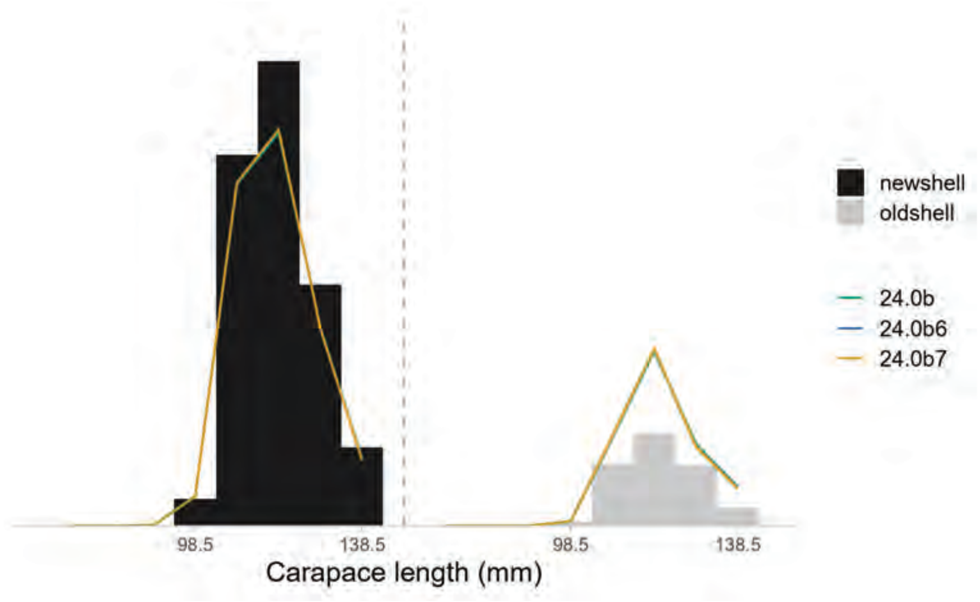

Figure 31: Aggregated observed and model-estimated size frequencies of male red king crab retained in the directed summer commercial fishery for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

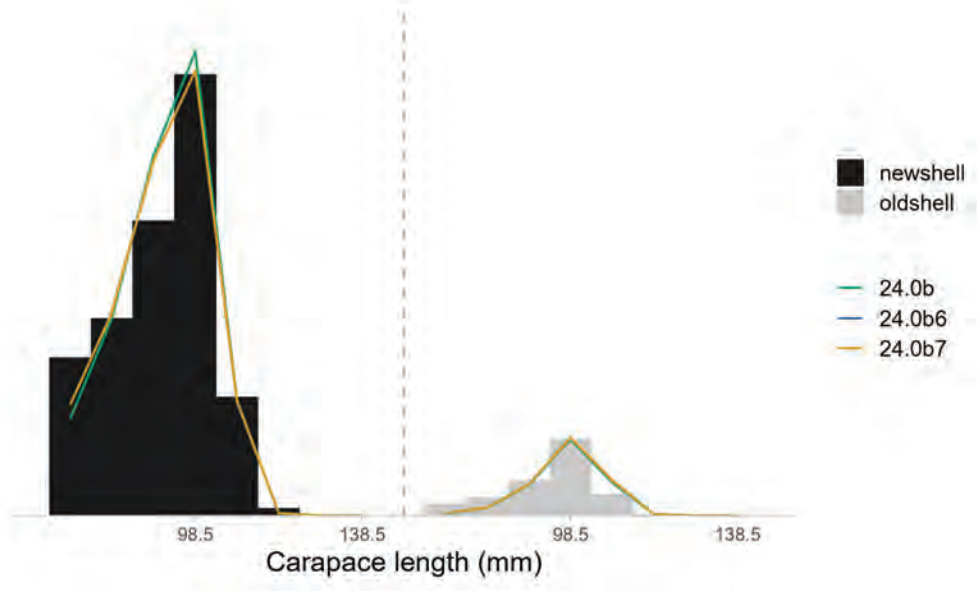

Figure 32: Aggregated observed and model-estimated size frequencies of male red king crab discarded in the directed summer commercial fishery for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

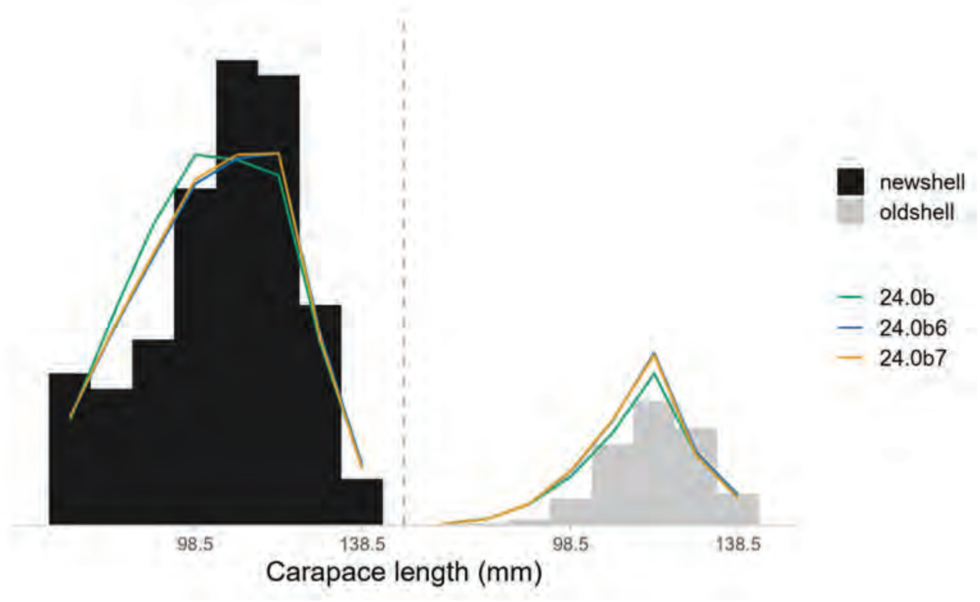

Figure 33: Aggregated observed and model-estimated size frequencies of all male red king crab caught in the directed summer commercial fishery for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

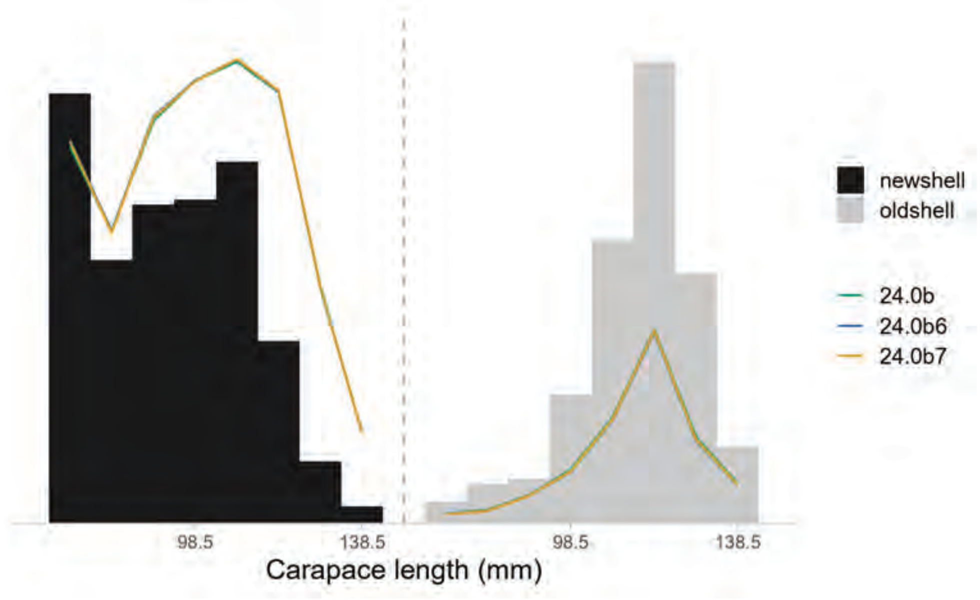

Figure 34: Aggregated observed and model-estimated size frequencies of all male red king crab caught in the National Oceanic and Atmospheric Administration (NOAA) Norton Sound trawl survey for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

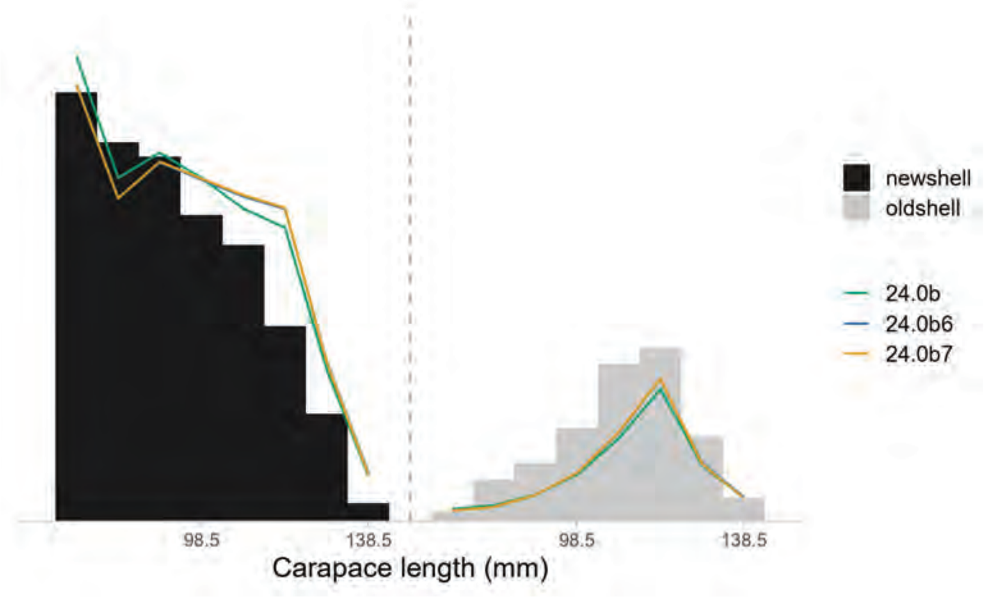

Figure 35: Aggregated observed and model-estimated size frequencies of all male red king crab caught in the Alaska Department of Fish and Game (ADFG) trawl survey for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

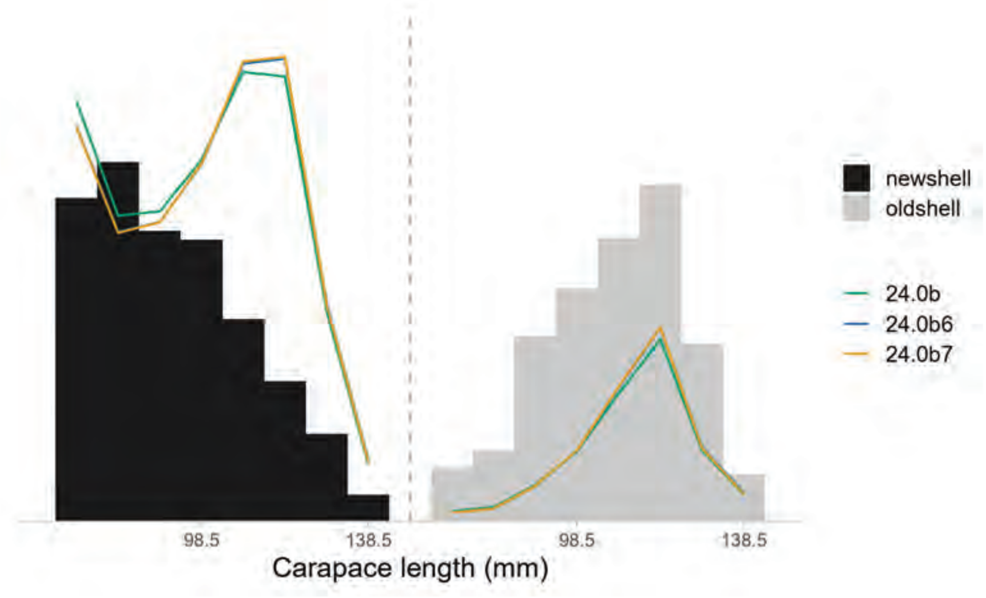

Figure 36: Aggregated observed and model-estimated size frequencies of all male red king crab caught in the National Oceanic and Atmospheric Administration (NOAA) Northern Bering Sea (NBS) trawl survey for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

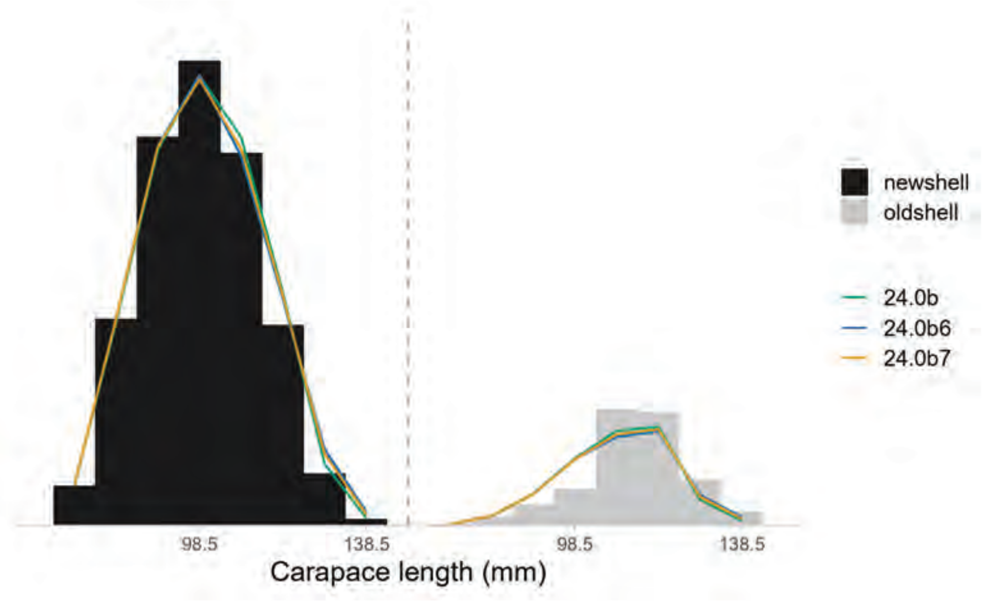

Figure 37: Aggregated observed and model-estimated size frequencies of all male red king crab caught in the Alaska Department of Fish and Game (ADFG) winter pot survey for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

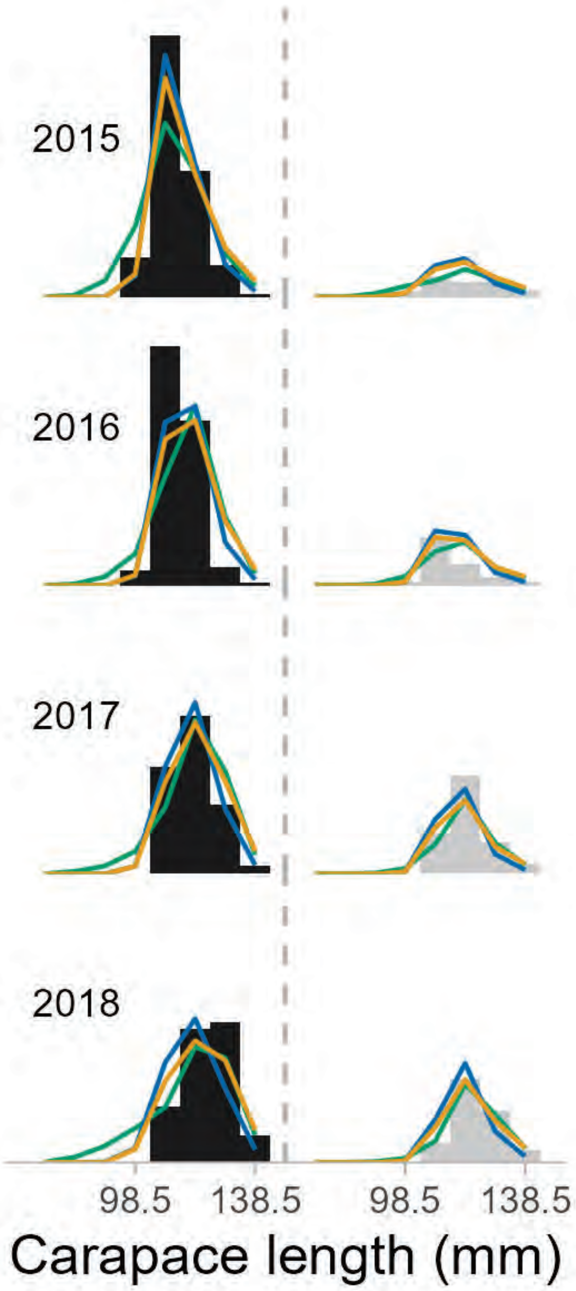

Figure 38: Annual observed and model-estimated size frequencies of male red king crab retained in the directed winter commercial fishery for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

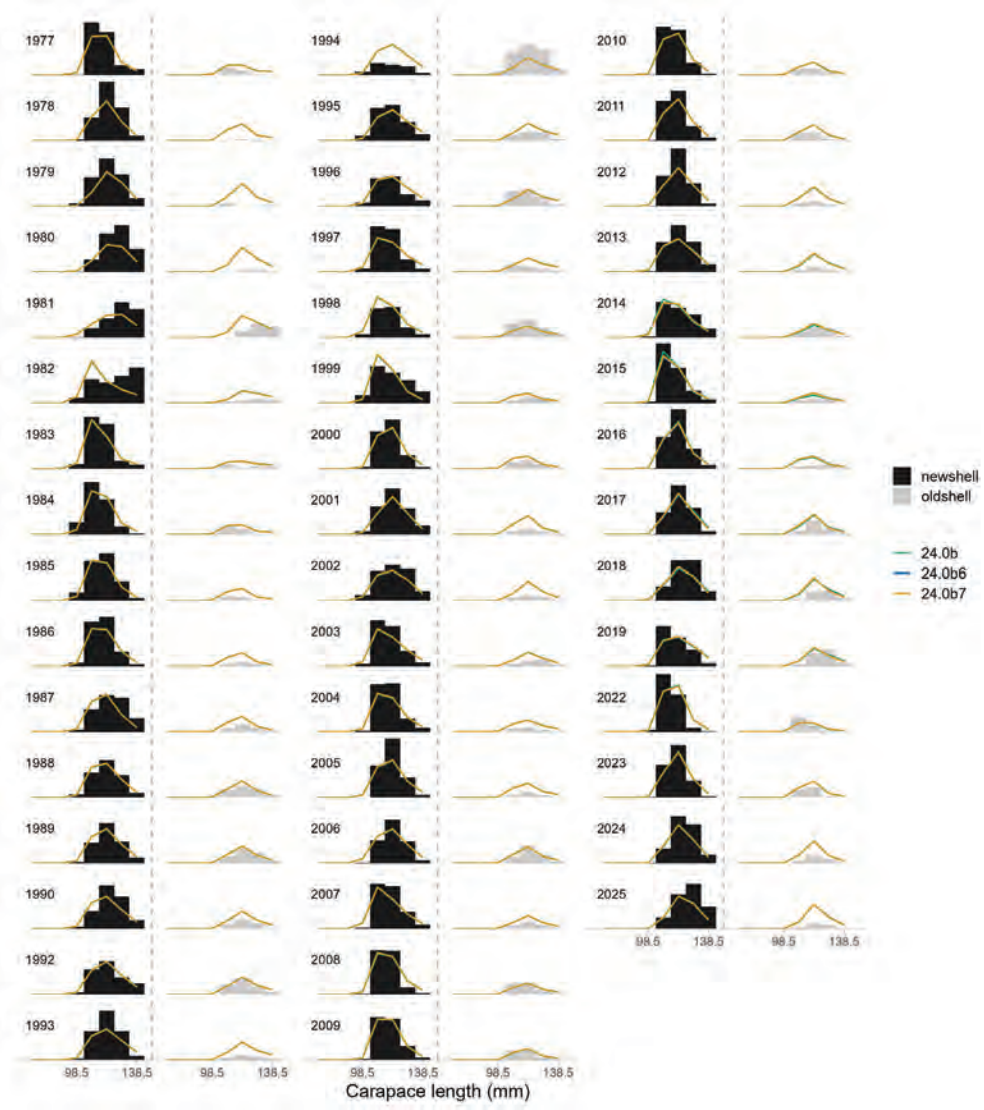

Figure 39: Annual observed and model-estimated size frequencies of male red king crab retained in the directed summer commercial fishery for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

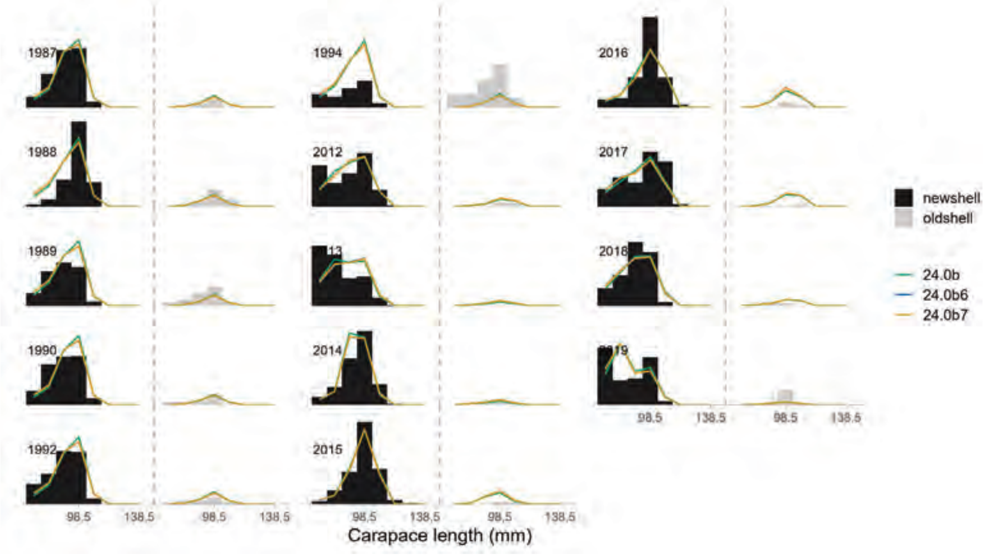

Figure 40: Annual observed and model-estimated size frequencies of male red king crab discarded in the directed summer commercial fishery for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

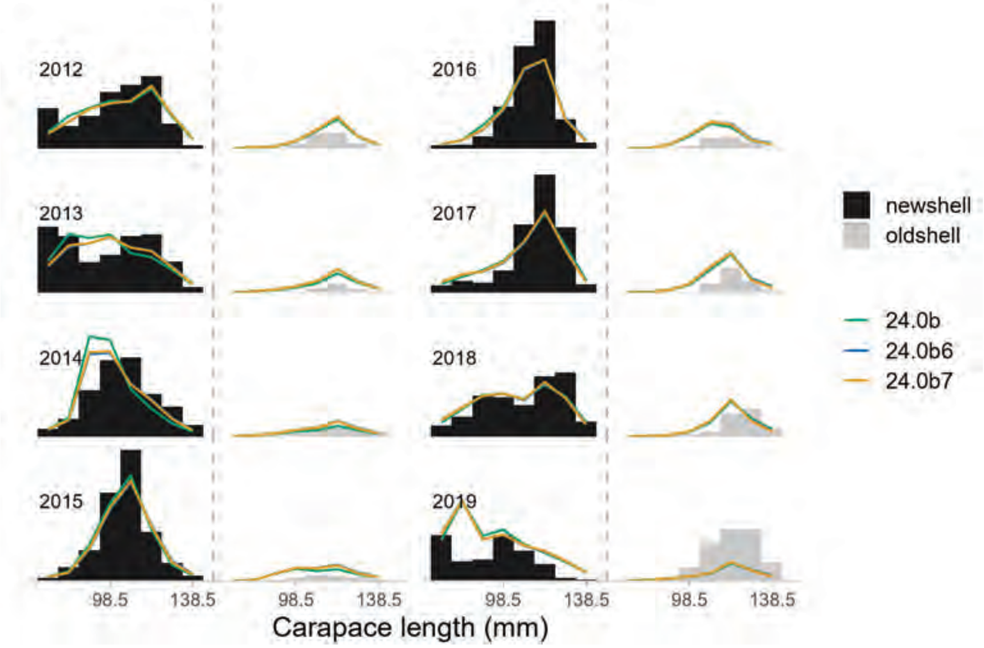

Figure 41: Annual observed and model-estimated size frequencies of all male red king crab caught in the directed summer commercial fishery for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

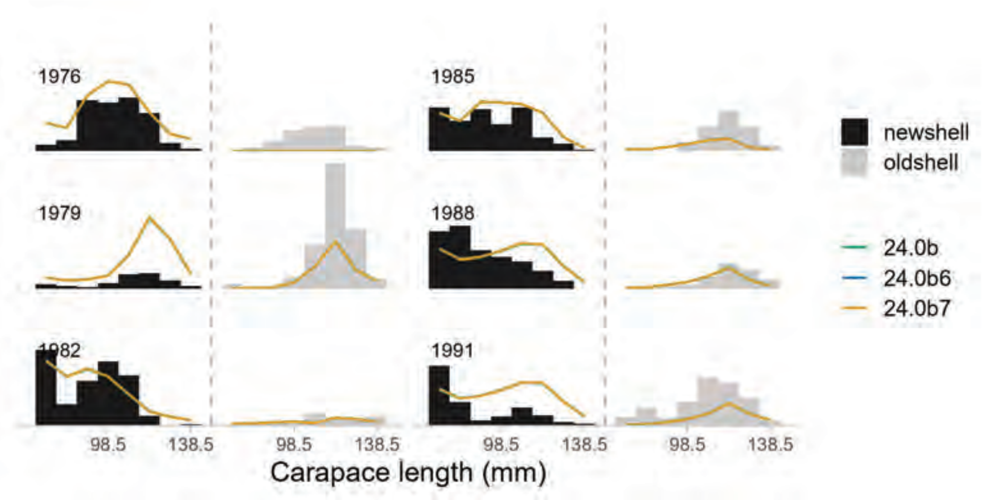

Figure 42: Annual observed and model-estimated size frequencies of all male red king crab caught in the National Oceanic and Atmospheric Administration (NOAA) Norton Sound trawl survey for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

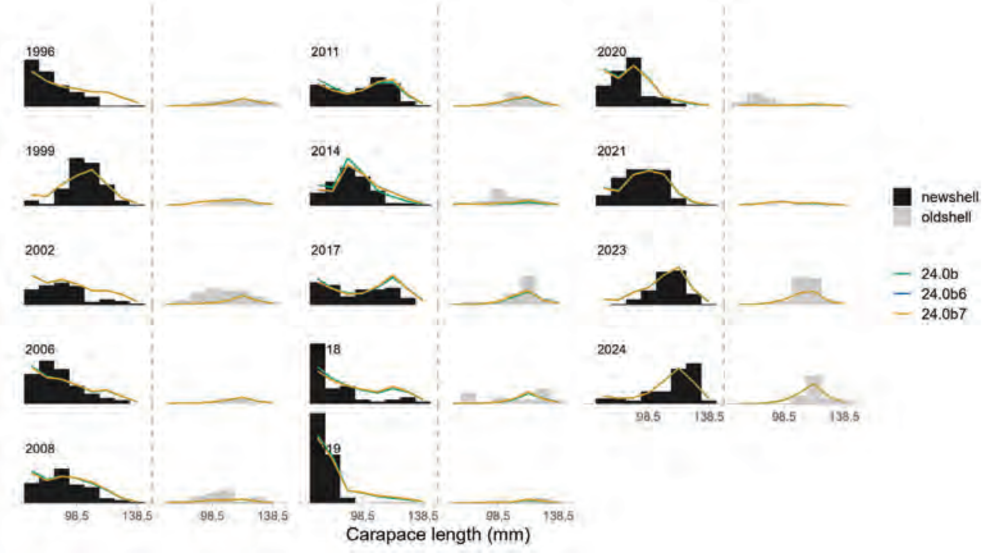

Figure 43: Annual observed and model-estimated size frequencies of all male red king crab caught in the Alaska Department of Fish and Game (ADFG) trawl survey for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

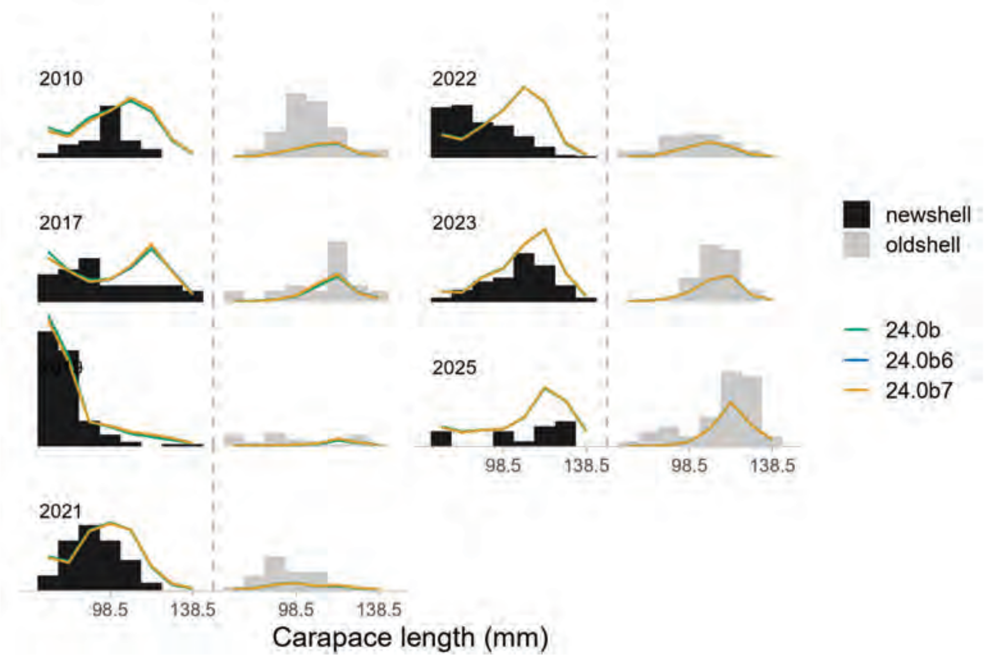

Figure 44: Annual observed and model-estimated size frequencies of all male red king crab caught in the National Oceanic and Atmospheric Administration (NOAA) Northern Bering Sea (NBS) trawl survey for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

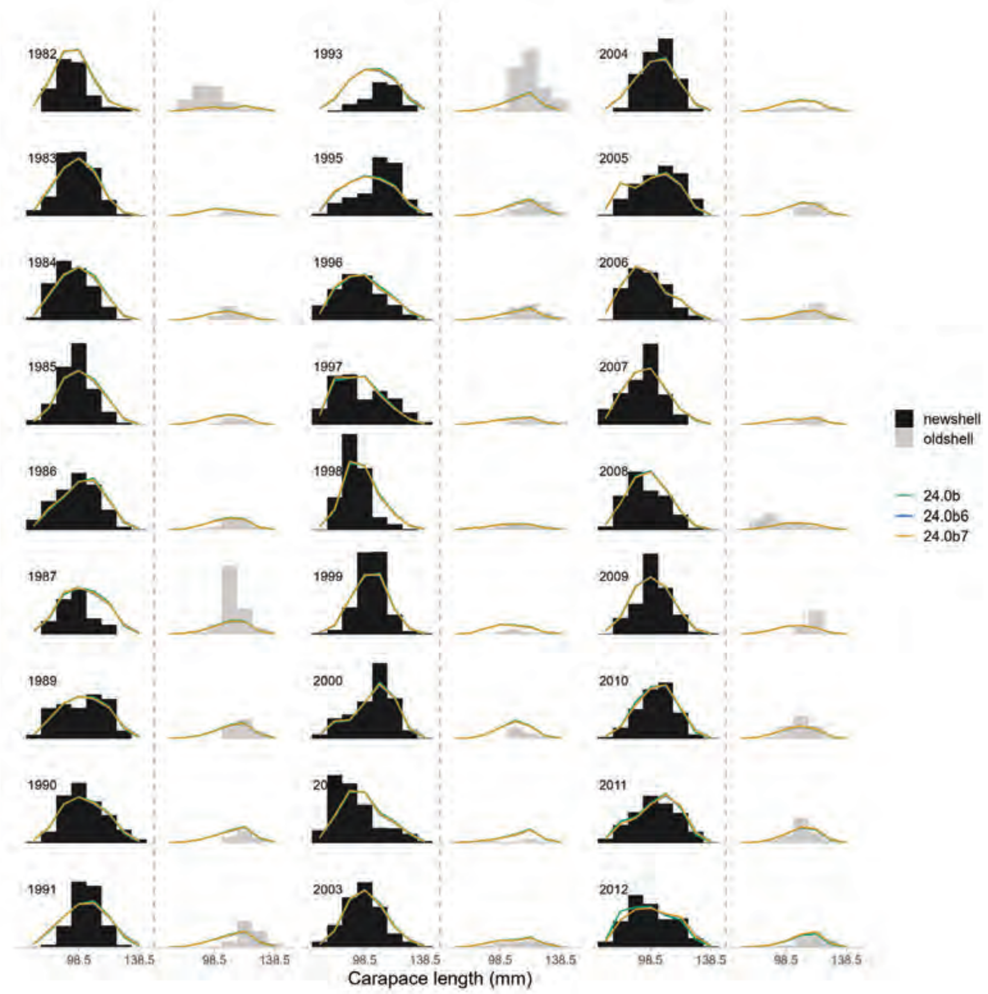

Figure 45: Annual observed and model-estimated size frequencies of all male red king crab caught in the Alaska Department of Fish and Game (ADFG) winter pot survey for models 24.0b, 24.0b6, and 24.0b7. Black bars represent crab classified as newshell and grey bars represent crab classified as oldshell.

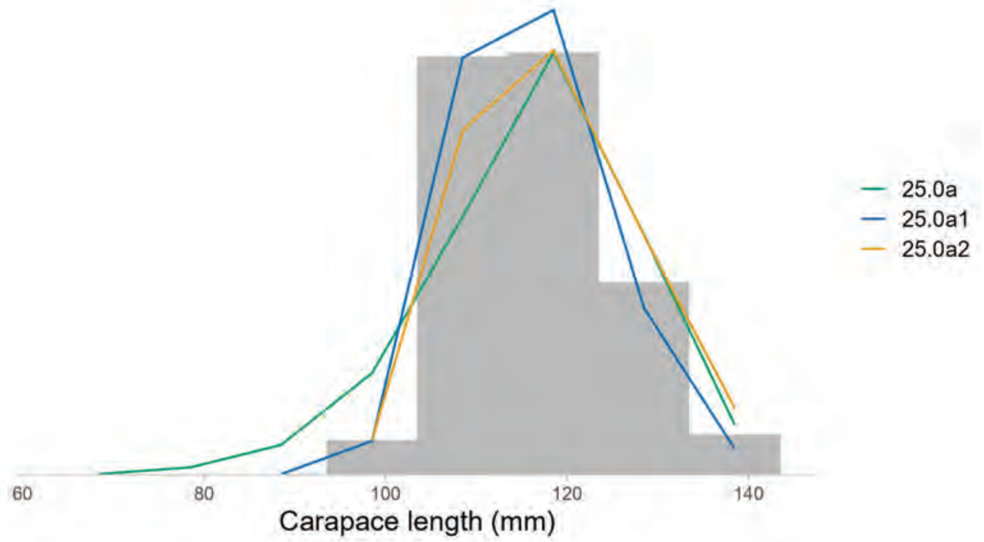

Figure 46: Aggregated observed and model-estimated size frequencies of male red king crab retained in the directed winter commercial fishery for models 25.0a, 25.0a1, and 25.0a2.

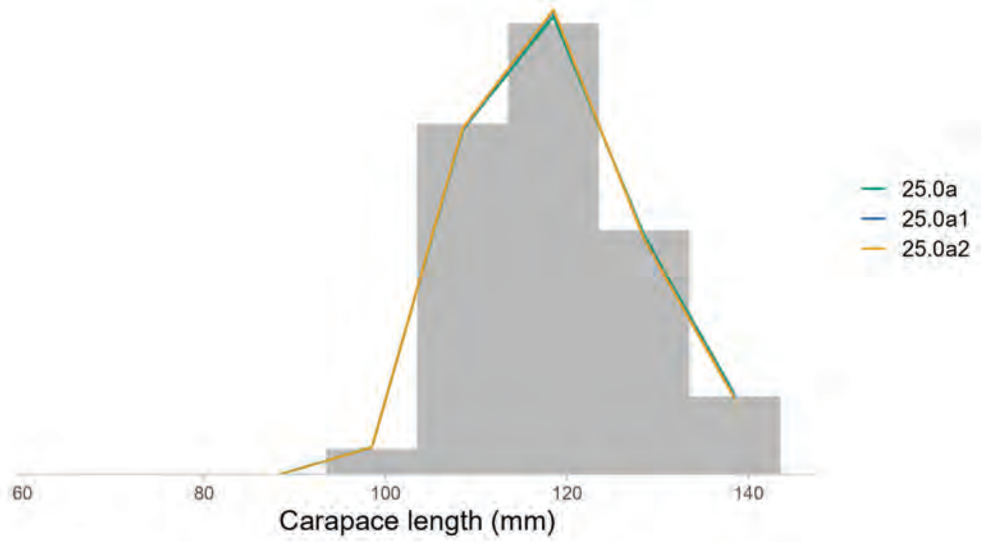

Figure 47: Aggregated observed and model-estimated size frequencies of male red king crab retained in the directed summer commercial fishery for models 25.0a, 25.0a1, and 25.0a2.

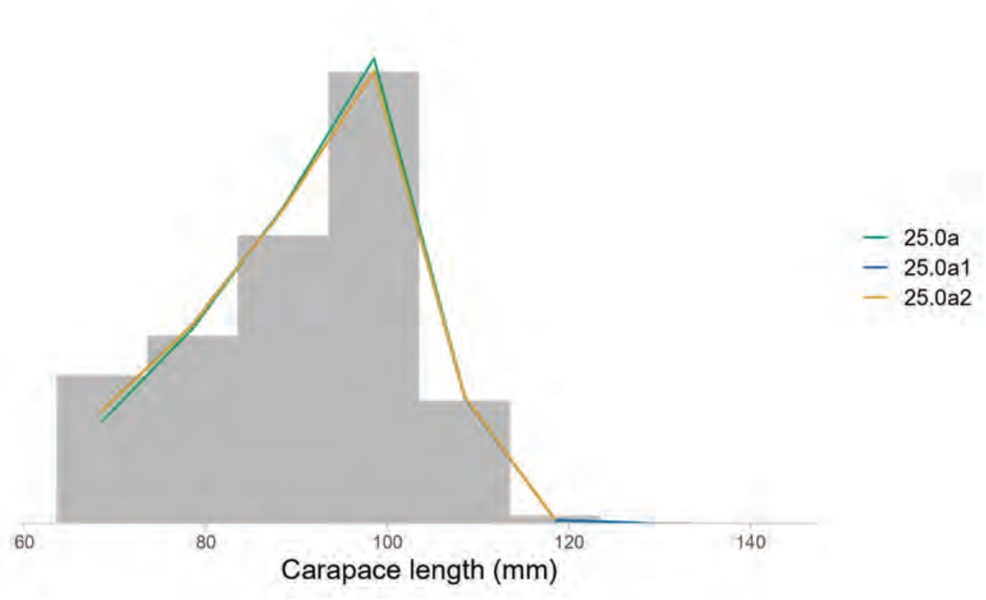

Figure 48: Aggregated observed and model-estimated size frequencies of male red king crab discarded in the directed summer commercial fishery for models 25.0a, 25.0a1, and 25.0a2.

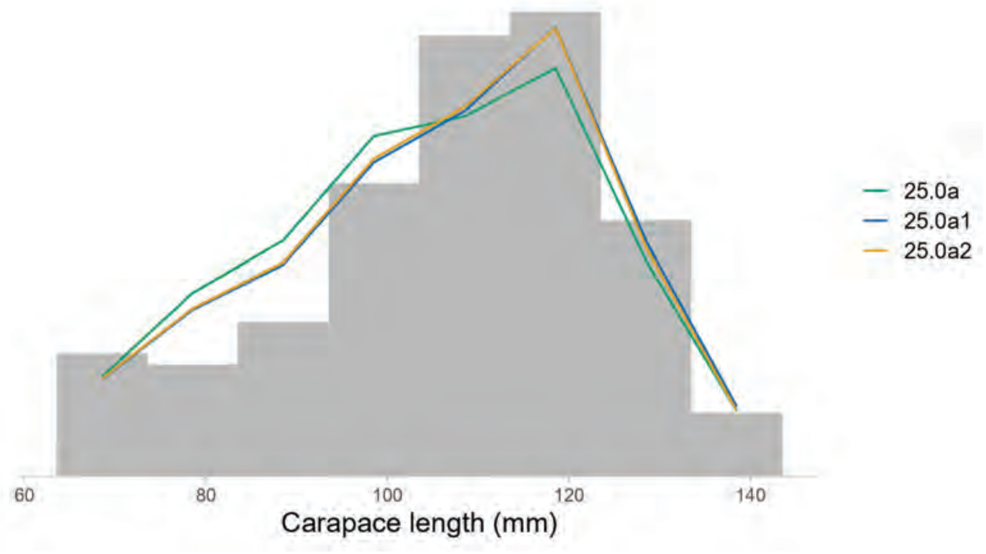

Figure 49: Aggregated observed and model-estimated size frequencies of all male red king crab caught in the directed summer commercial fishery for models 25.0a, 25.0a1, and 25.0a2.

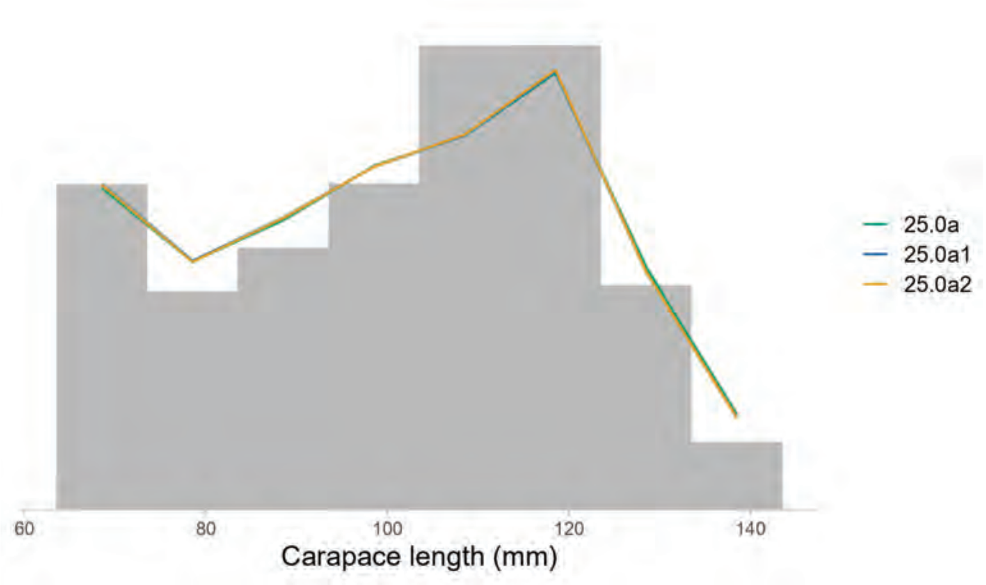

Figure 50: Aggregated observed and model-estimated size frequencies of all male red king crab caught in the National Oceanic and Atmospheric Administration (NOAA) Norton Sound trawl survey for models 25.0a, 25.0a1, and 25.0a2.

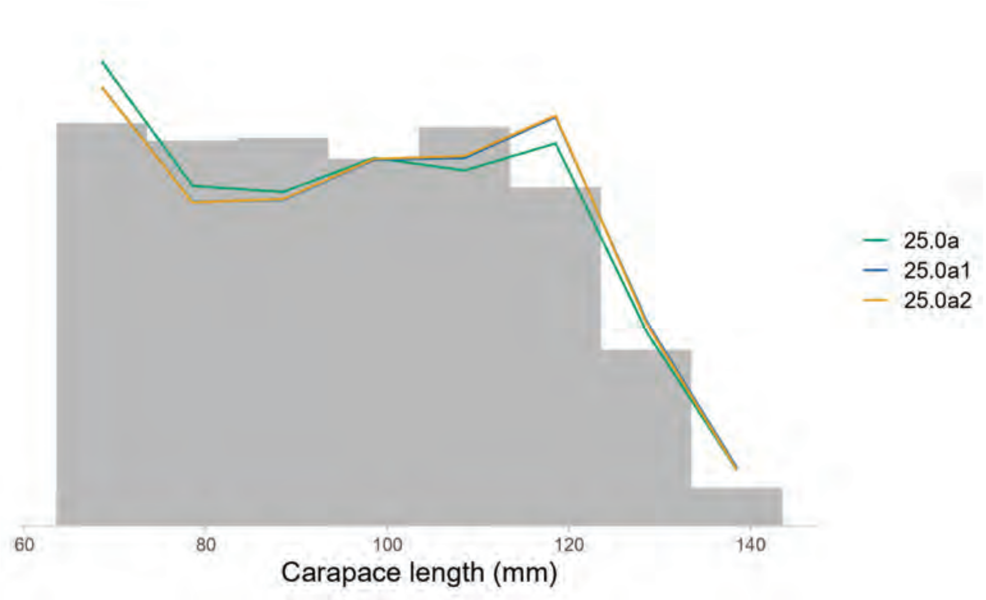

Figure 51: Aggregated observed and model-estimated size frequencies of all male red king crab caught in the Alaska Department of Fish and Game (ADFG) trawl survey for models 25.0a, 25.0a1, and 25.0a2.

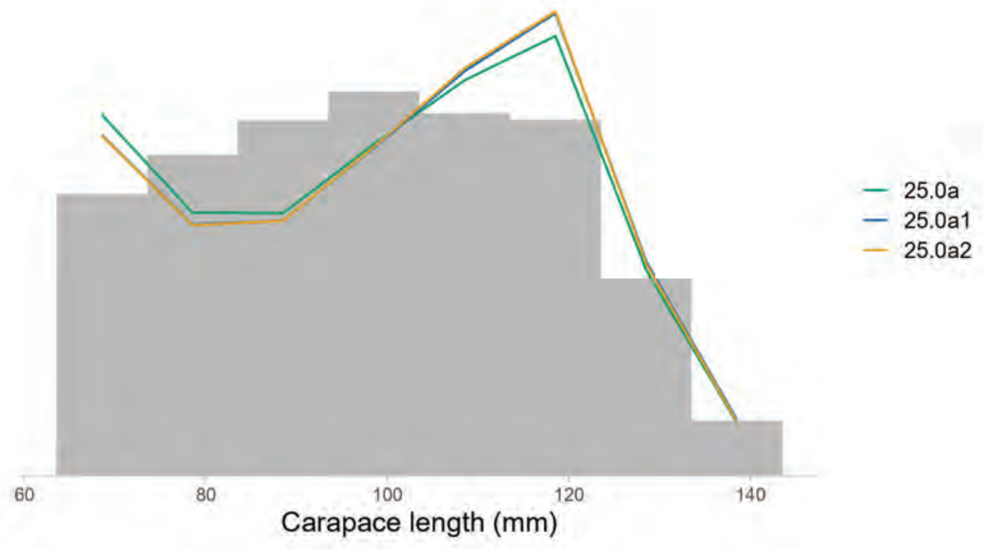

Figure 52: Aggregated observed and model-estimated size frequencies of all male red king crab caught in the National Oceanic and Atmospheric Administration (NOAA) Northern Bering Sea (NBS) trawl survey for models 25.0a, 25.0a1, and 25.0a2.

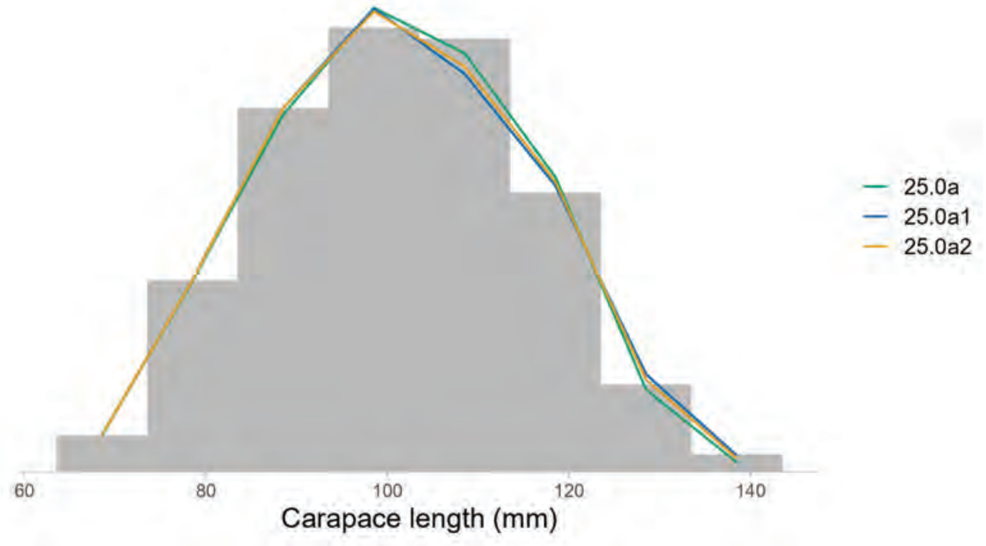

Figure 53: Aggregated observed and model-estimated size frequencies of all male red king crab caught in the Alaska Department of Fish and Game (ADFG) winter pot survey for models 25.0a, 25.0a1, and 25.0a2.

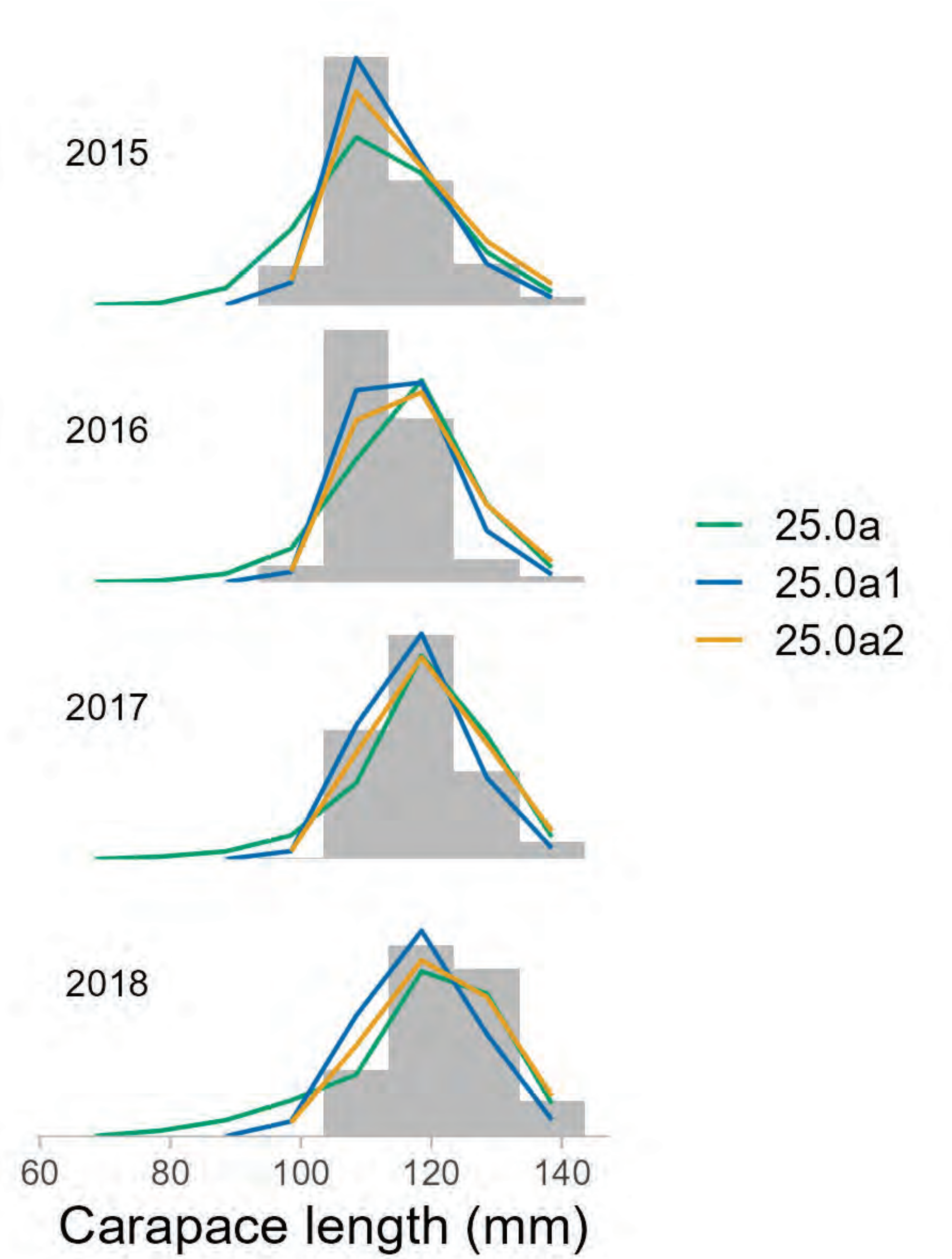

Figure 54: Annual observed and model-estimated size frequencies of male red king crab retained in the directed winter commercial fishery for models 25.0a, 25.0a1, and 25.0a2.

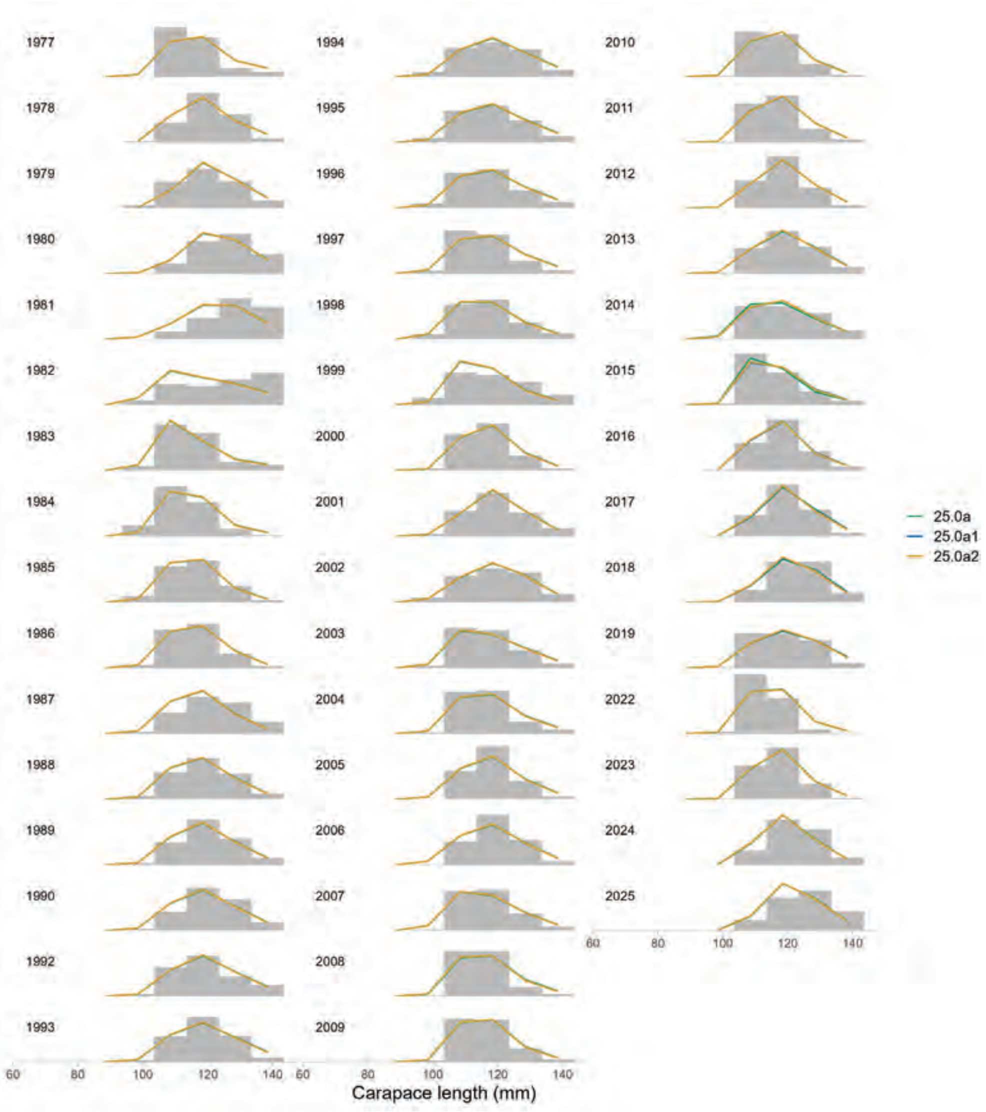

Figure 55: Annual observed and model-estimated size frequencies of male red king crab retained in the directed summer commercial fishery for models 25.0a, 25.0a1, and 25.0a2.

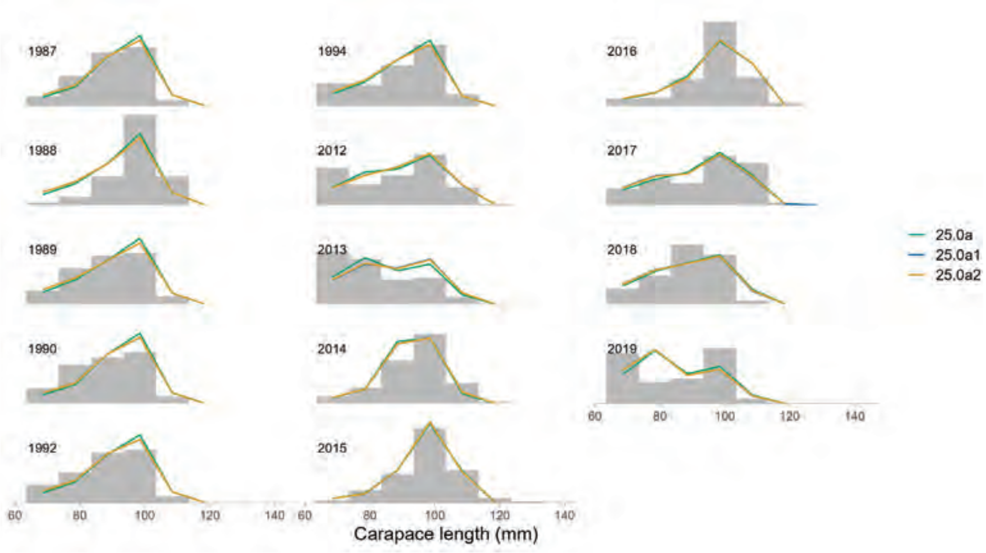

Figure 56: Annual observed and model-estimated size frequencies of male red king crab discarded in the directed summer commercial fishery for models 25.0a, 25.0a1, and 25.0a2.

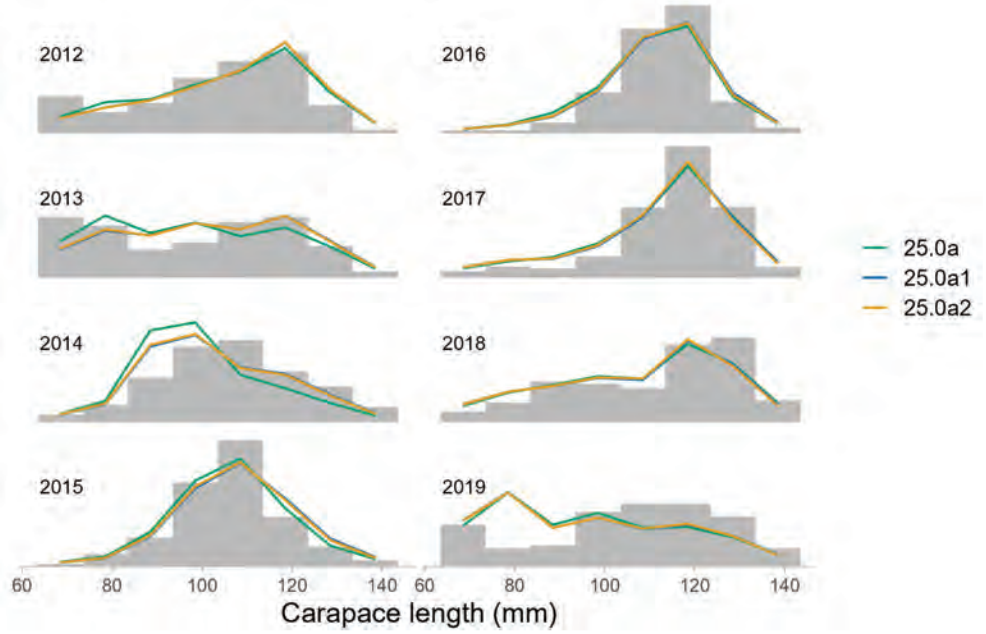

Figure 57: Annual observed and model-estimated size frequencies of all male red king crab caught in the directed summer commercial fishery for models 25.0a, 25.0a1, and 25.0a2.

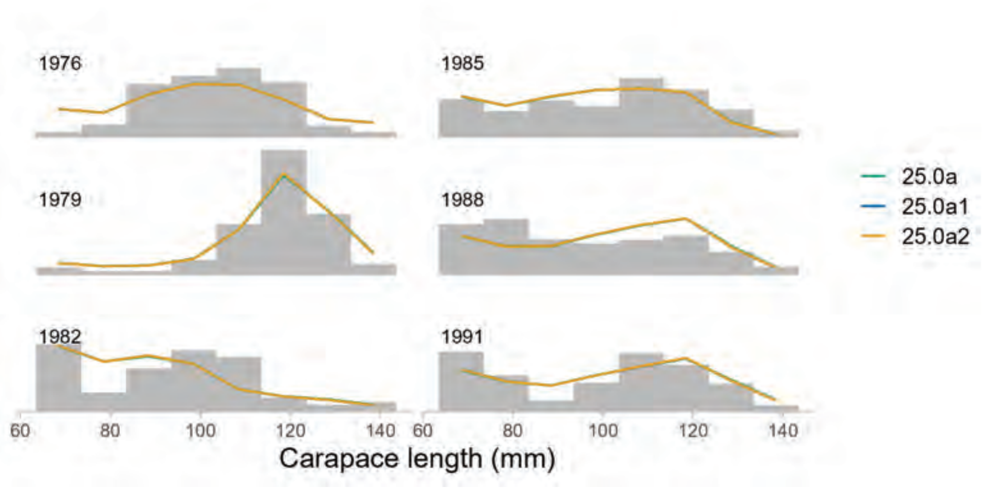

Figure 58: Annual observed and model-estimated size frequencies of all male red king crab caught in the National Oceanic and Atmospheric Administration (NOAA) Norton Sound trawl survey for models 25.0a, 25.0a1, and 25.0a2.

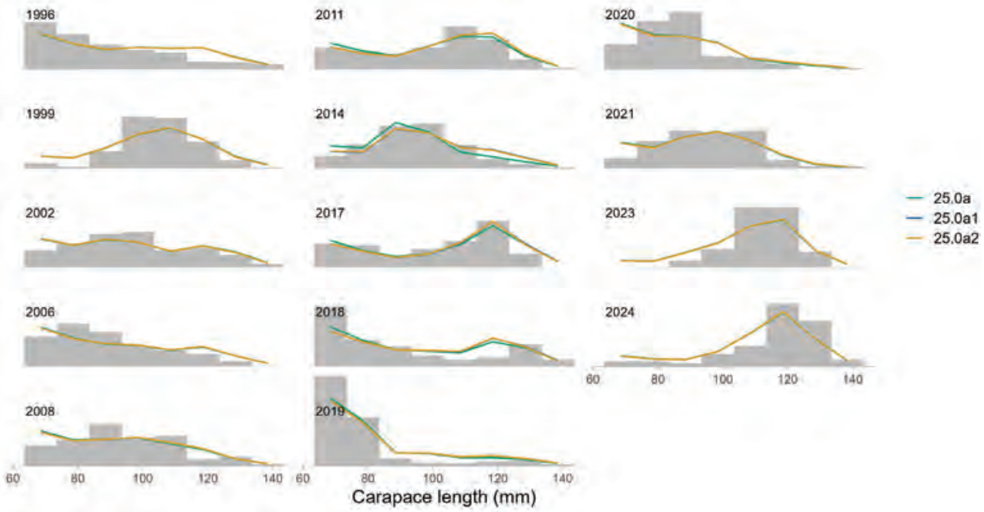

Figure 59: Annual observed and model-estimated size frequencies of all male red king crab caught in the Alaska Department of Fish and Game (ADFG) trawl survey for models 25.0a, 25.0a1, and 25.0a2.

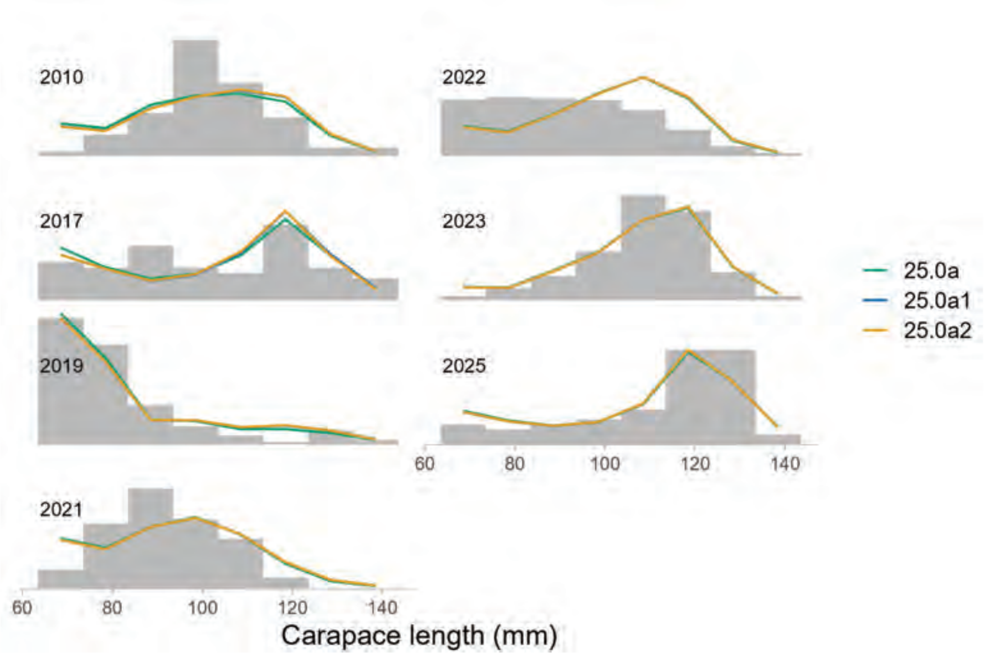

Figure 60: Annual observed and model-estimated size frequencies of all male red king crab caught in the National Oceanic and Atmospheric Administration (NOAA) Northern Bering Sea (NBS) trawl survey for models 25.0a, 25.0a1, and 25.0a2.

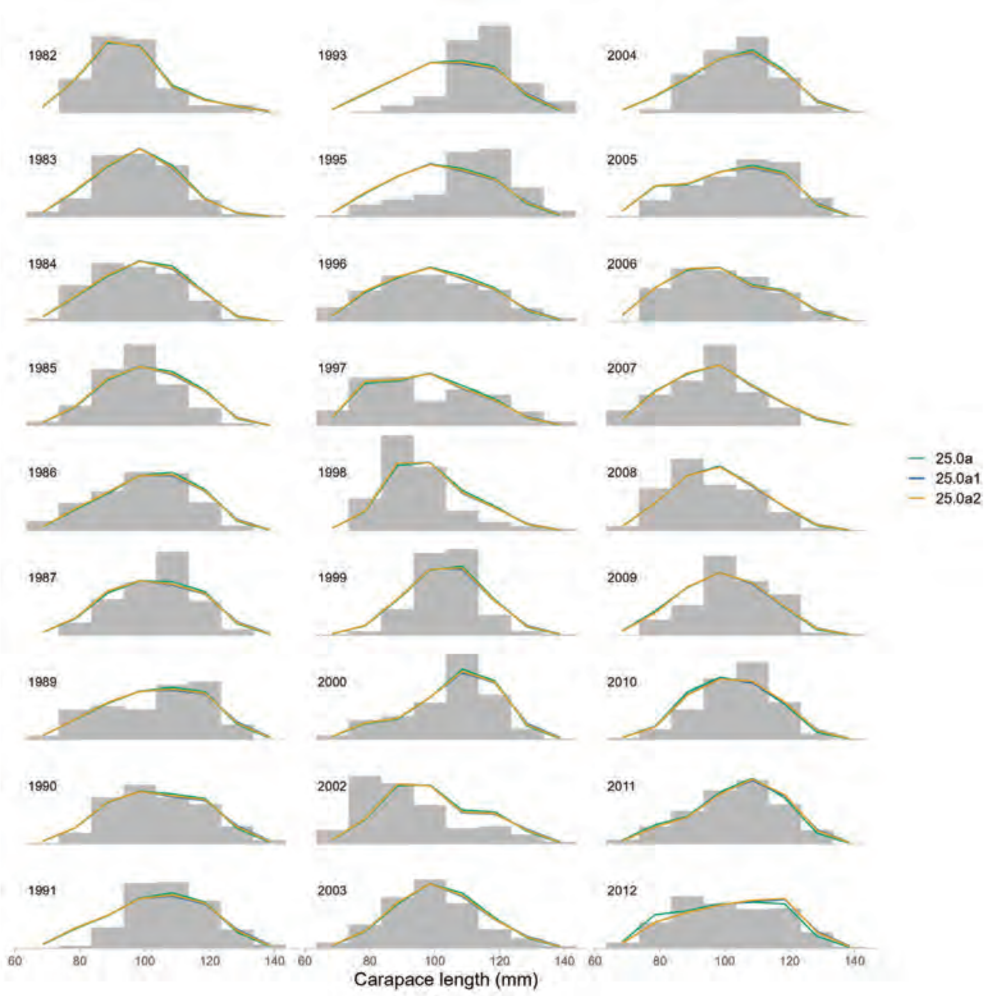

Figure 61: Annual observed and model-estimated size frequencies of all male red king crab caught in the Alaska Department of Fish and Game (ADFG) winter pot survey for models 25.0a, 25.0a1, and 25.0a2.

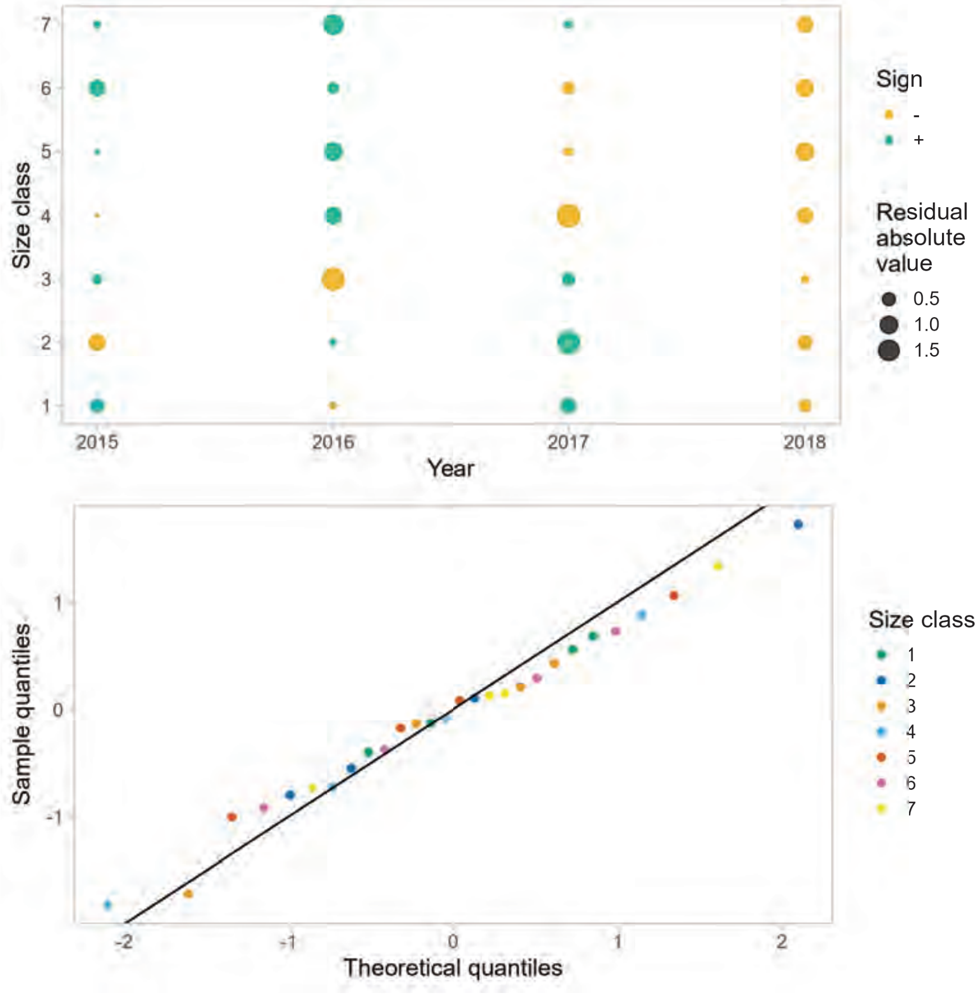

Figure 62: One-Step-Ahead residuals for model 24.0b6 fits to newshell male size composition data from the winter commercial fishery retained catch.

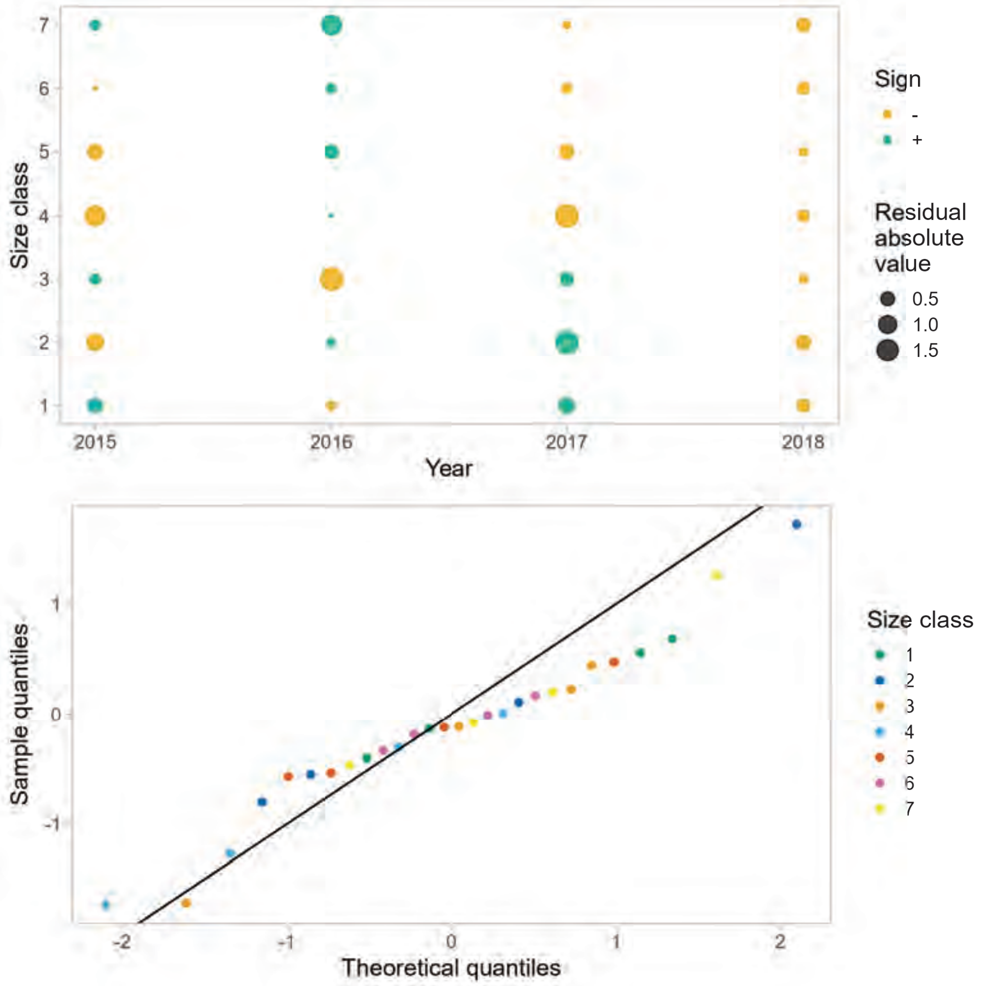

Figure 63: One-Step-Ahead residuals for model 24.0b6 fits to oldshell male size composition data from the winter commercial fishery retained catch.

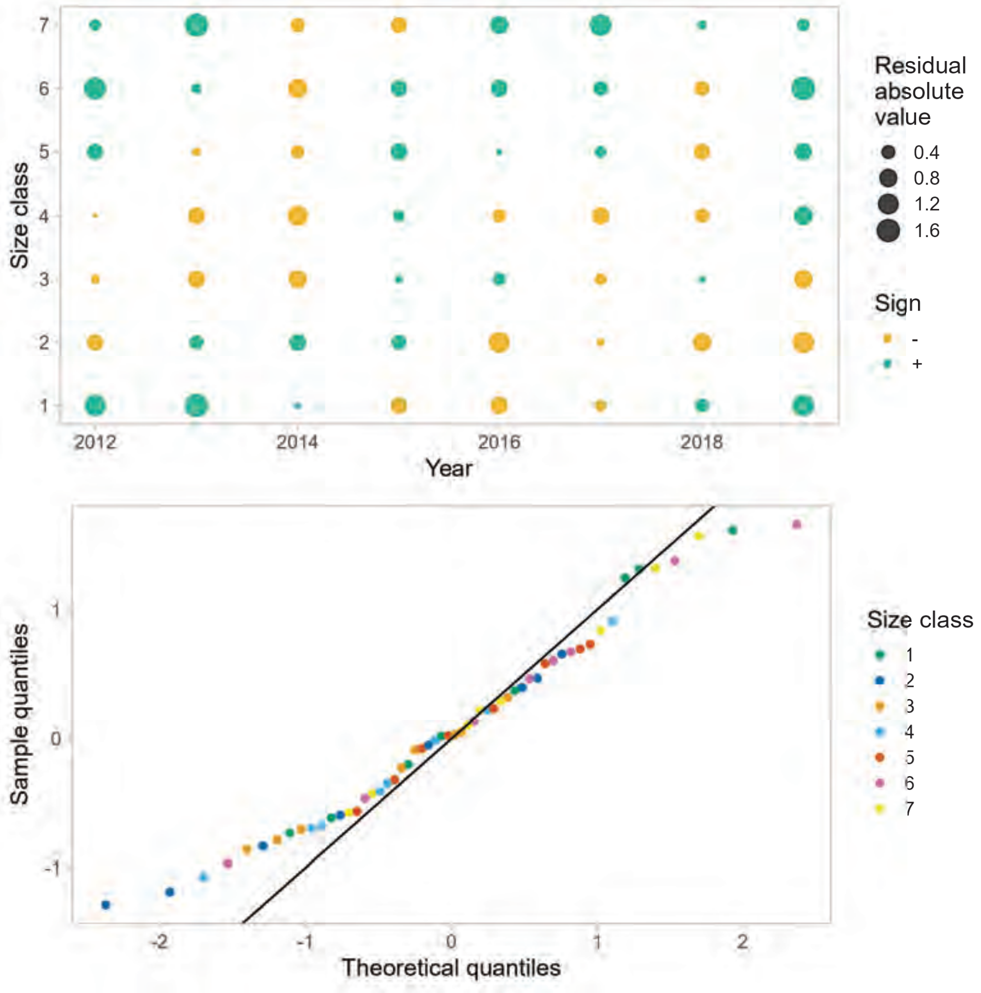

Figure 64: One-Step-Ahead residuals for model 24.0b6 fits to newshell male size composition data from the summer commercial fishery total catch.

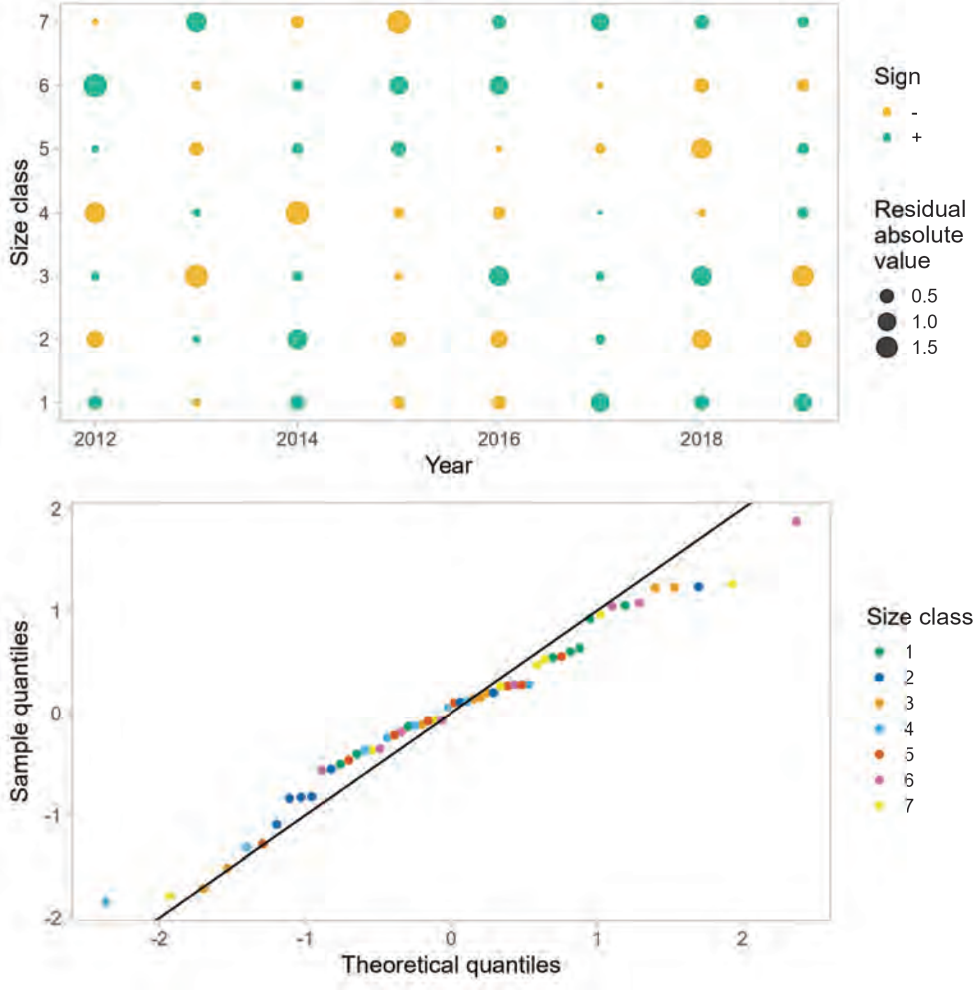

Figure 65: One-Step-Ahead residuals for model 24.0b6 fits to oldshell male size composition data from the summer commercial fishery total catch.

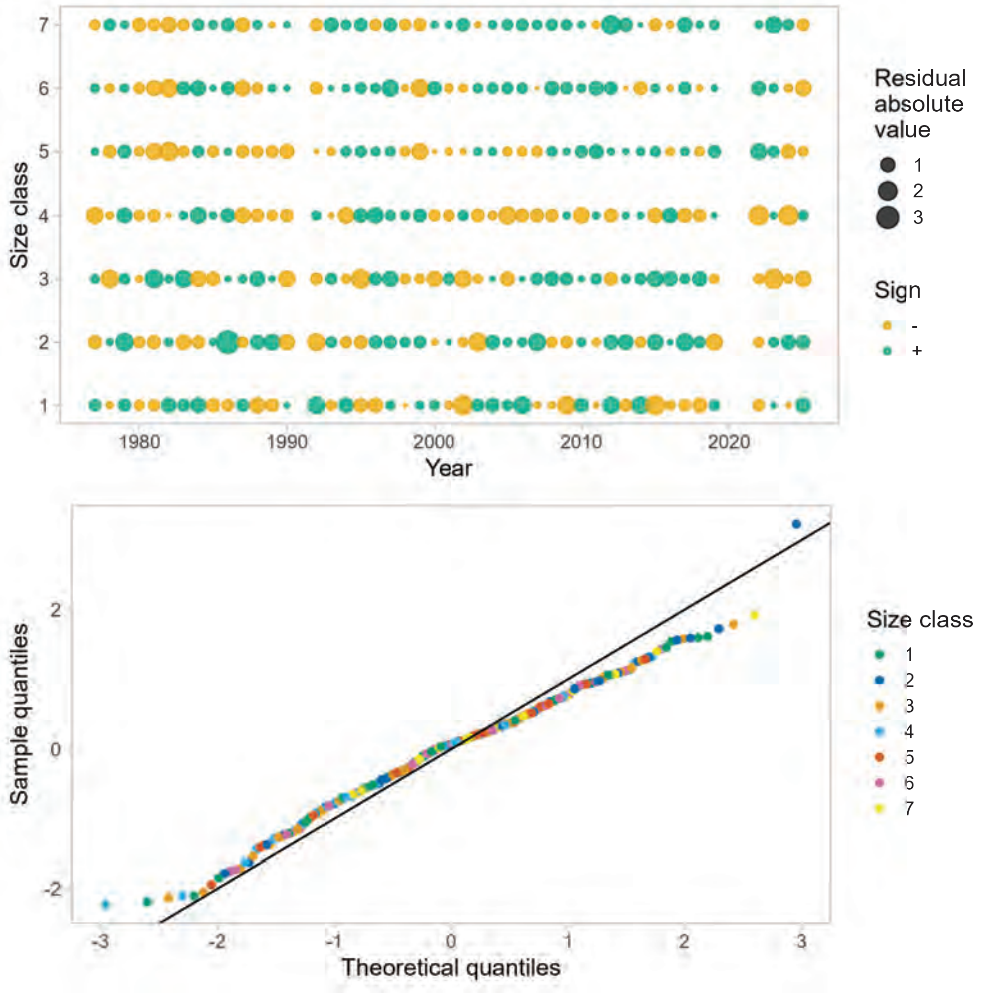

Figure 66: One-Step-Ahead residuals for model 24.0b6 fits to newshell male size composition data from the summer commercial fishery retained catch.

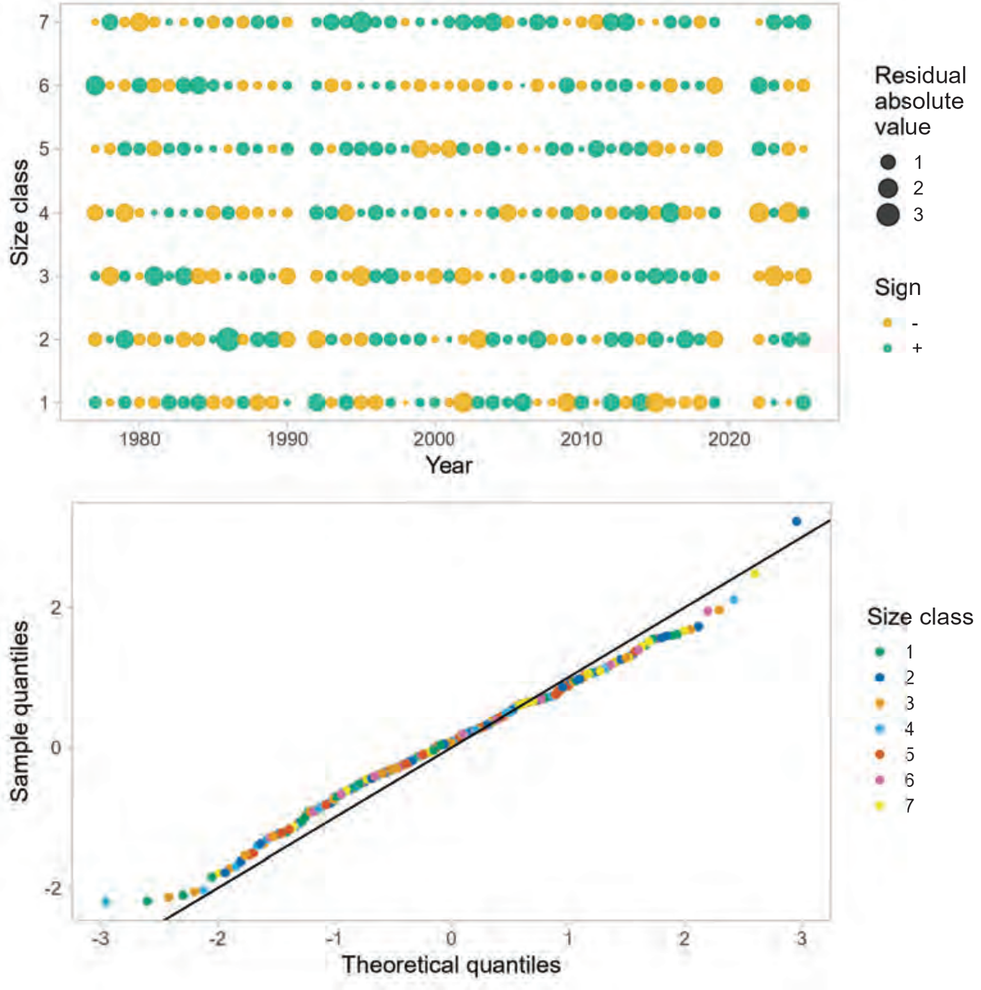

Figure 67: One-Step-Ahead residuals for model 24.0b6 fits to oldshell male size composition data from the summer commercial fishery retained catch.

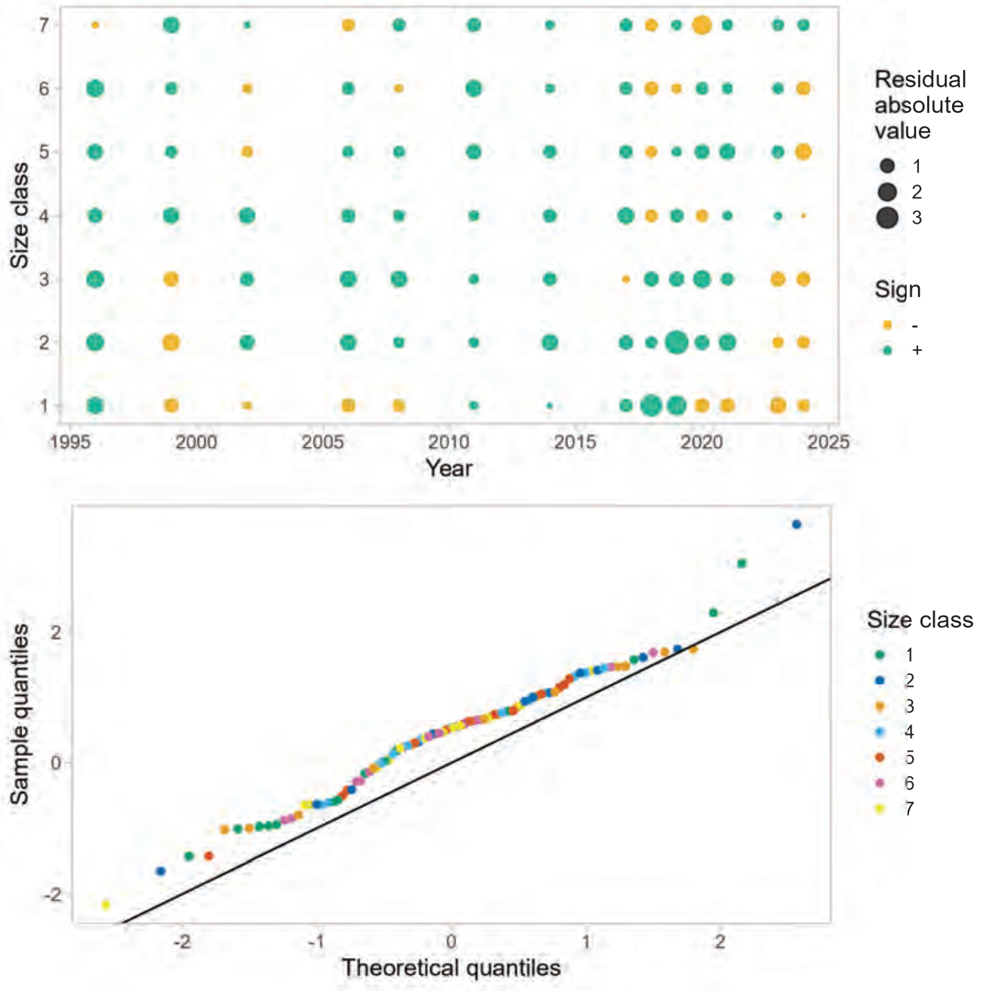

Figure 68: One-Step-Ahead residuals for model 24.0b6 fits to newshell male size composition data from the Alaska Department of Fish and Game (ADFG) trawl survey.

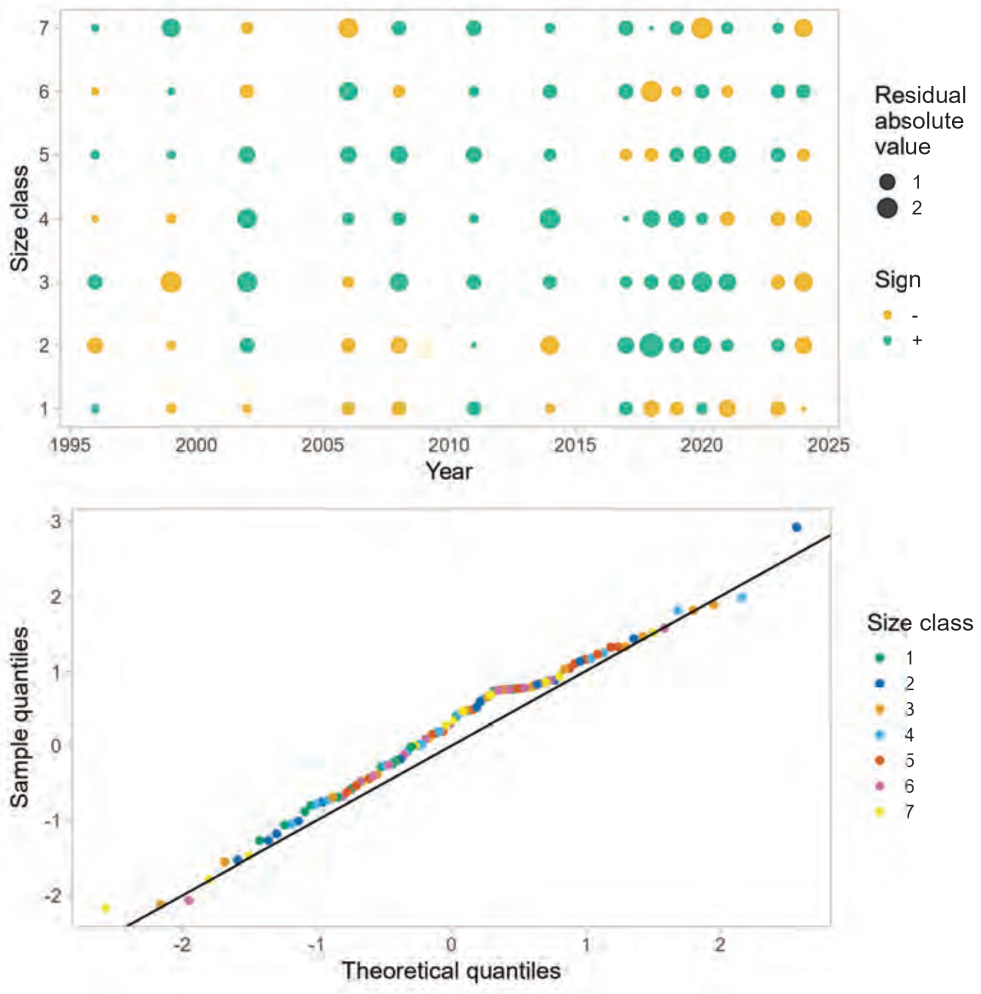

Figure 69: One-Step-Ahead residuals for model 24.0b6 fits to oldshell male size composition data from the Alaska Department of Fish and Game (ADFG) trawl survey.

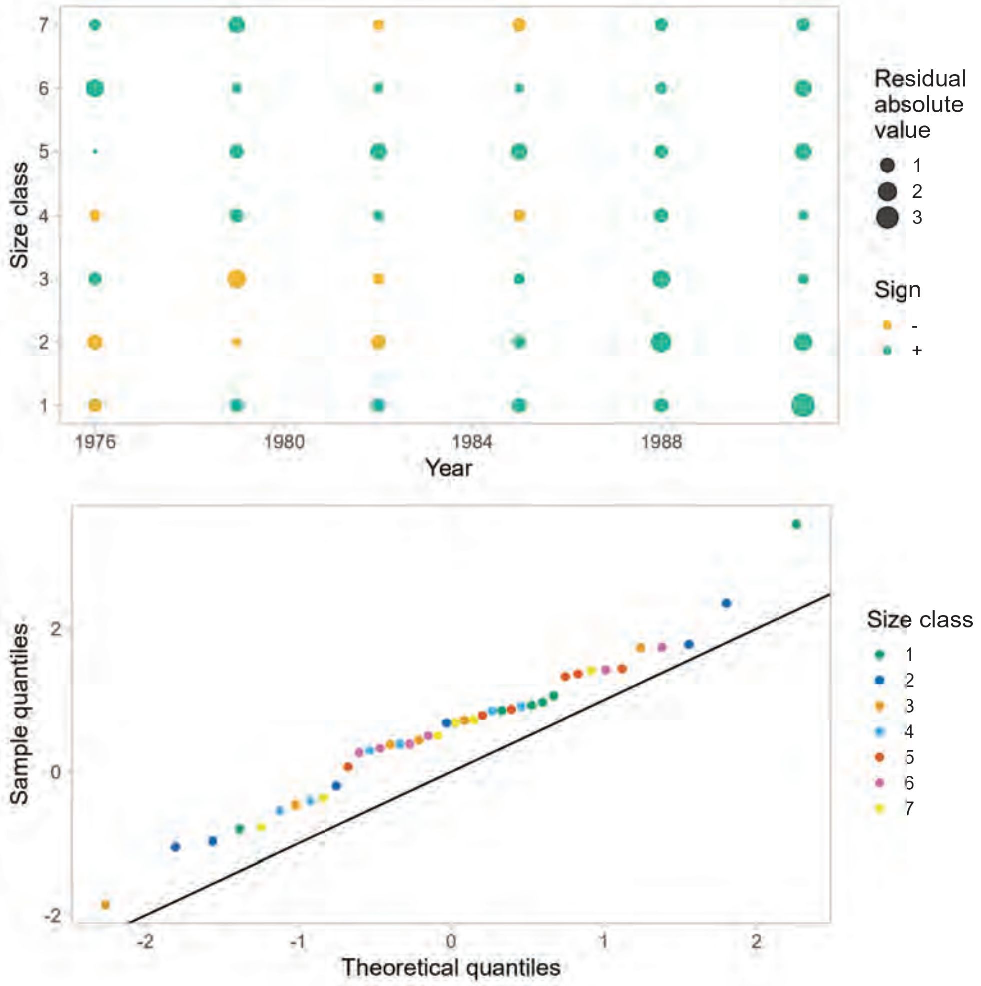

Figure 70: One-Step-Ahead residuals for model 24.0b6 fits to newshell male size composition data from the National Oceanic and Atmospheric Administration (NOAA) Norton Sound trawl survey.

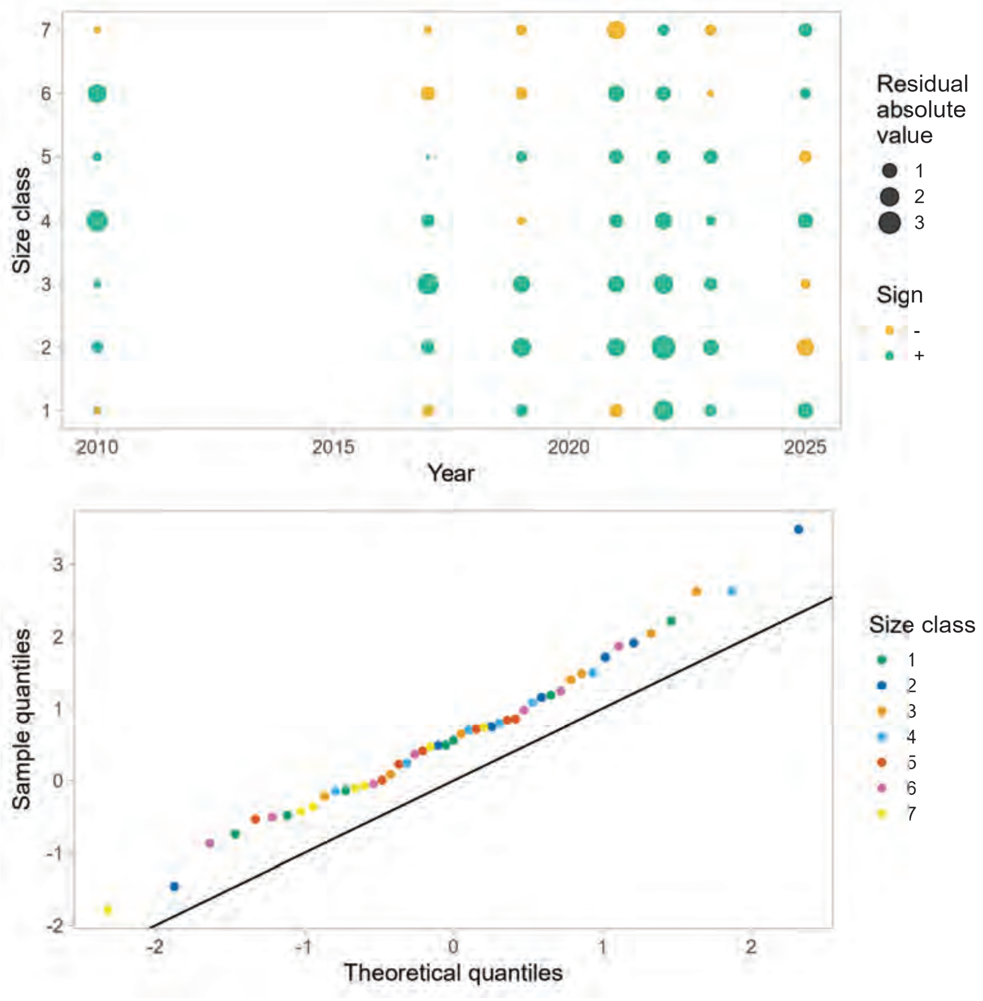

Figure 71: One-Step-Ahead residuals for model 24.0b6 fits to newshell male size composition data from the National Oceanic and Atmospheric Administration (NOAA) Northern Bering Sea (NBS) trawl survey.

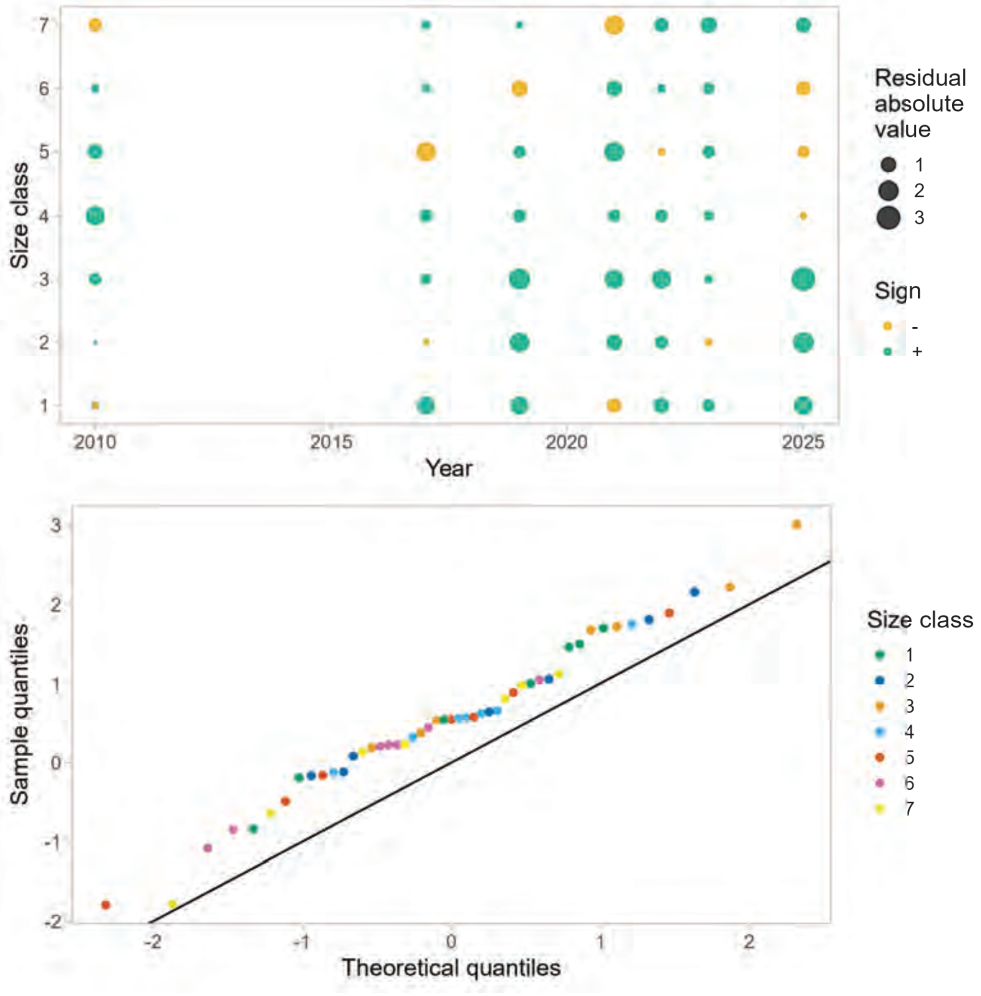

Figure 72: One-Step-Ahead residuals for model 24.0b6 fits to oldshell male size composition data from the National Oceanic and Atmospheric Administration (NOAA) Northern Bering Sea (NBS) trawl survey.

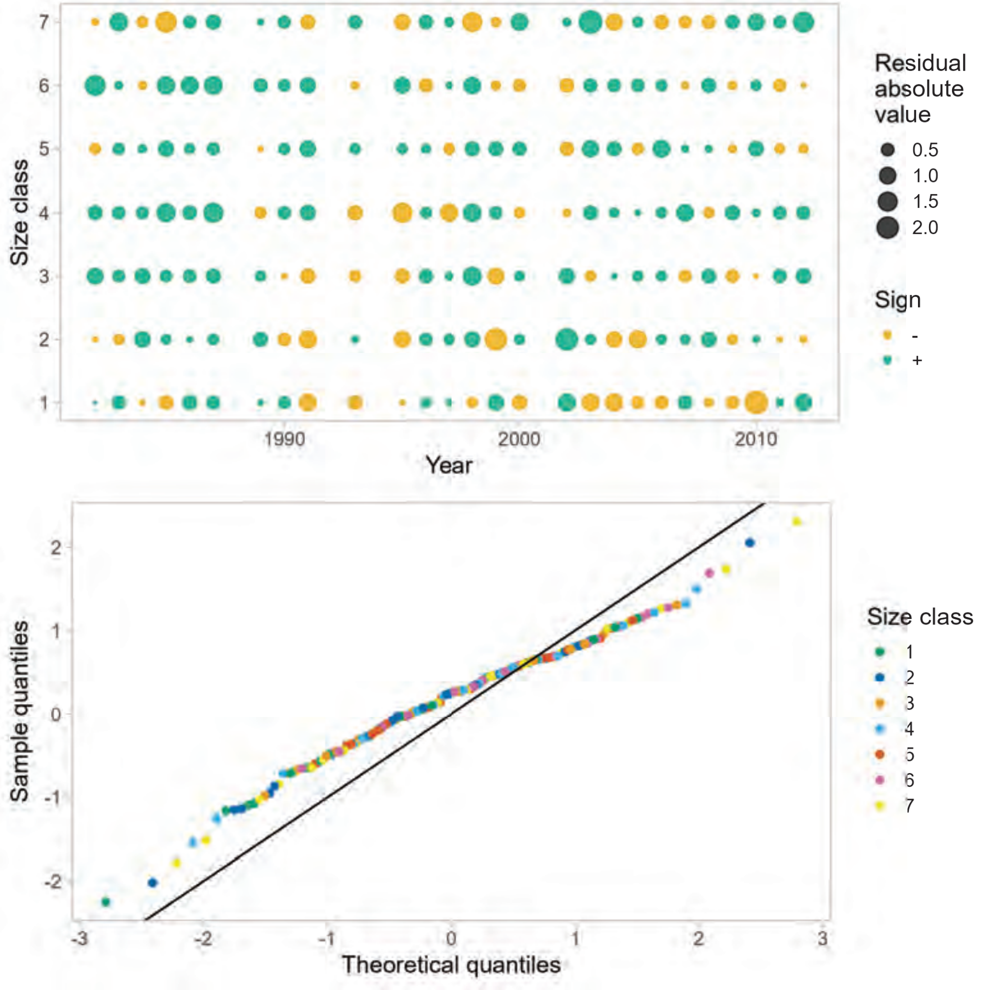

Figure 73: One-Step-Ahead residuals for model 24.0b6 fits to newshell male size composition data from the Alaska Department of Fish and Game (ADFG) winter pot survey.

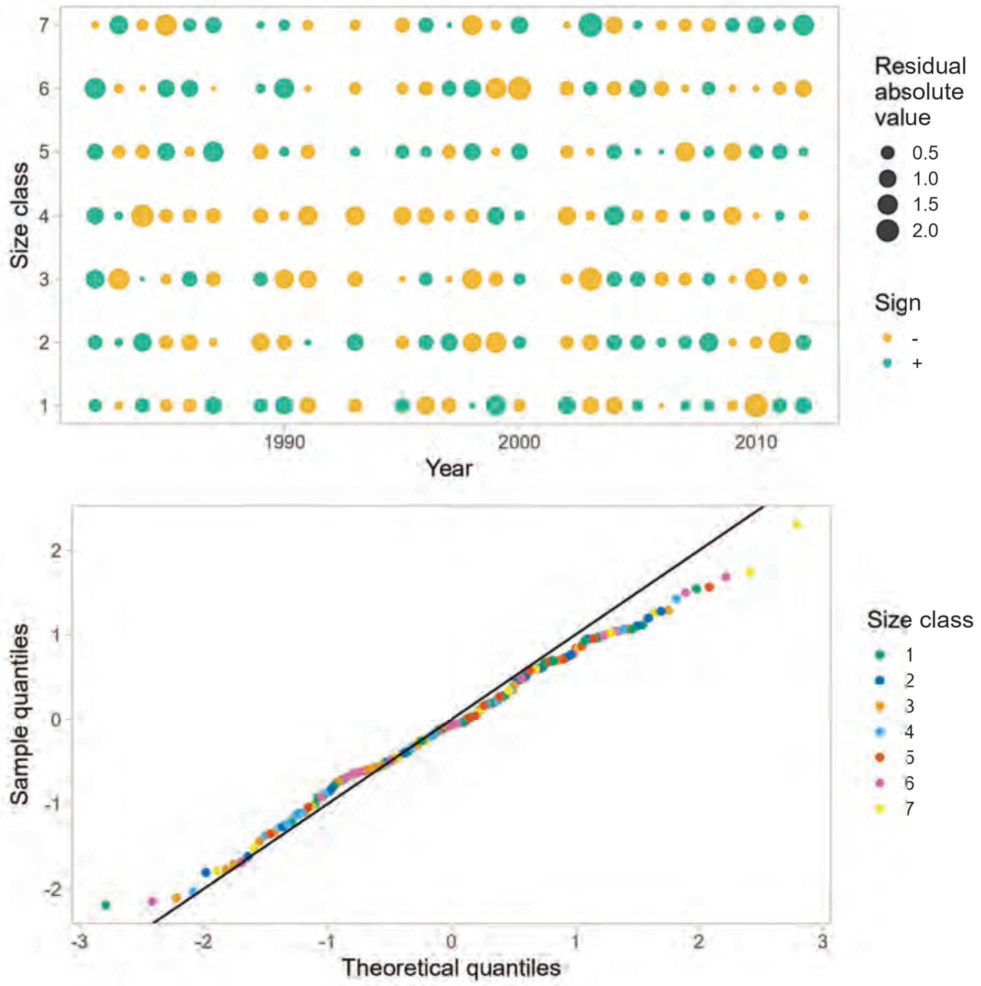

Figure 74: One-Step-Ahead residuals for model 24.0b6 fits to oldshell male size composition data from the Alaska Department of Fish and Game (ADFG) winter pot survey.

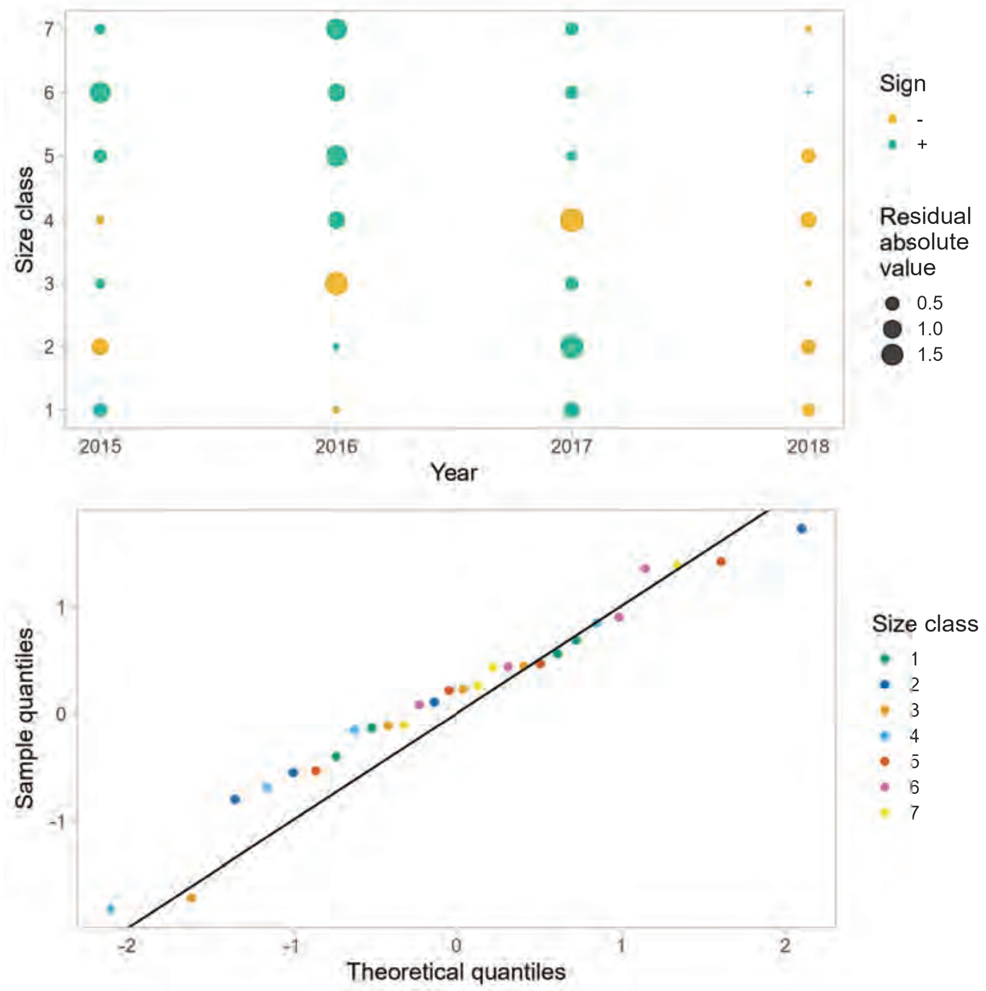

Figure 75: One-Step-Ahead residuals for model 24.0b7 fits to newshell male size composition data from the winter commercial fishery retained catch.

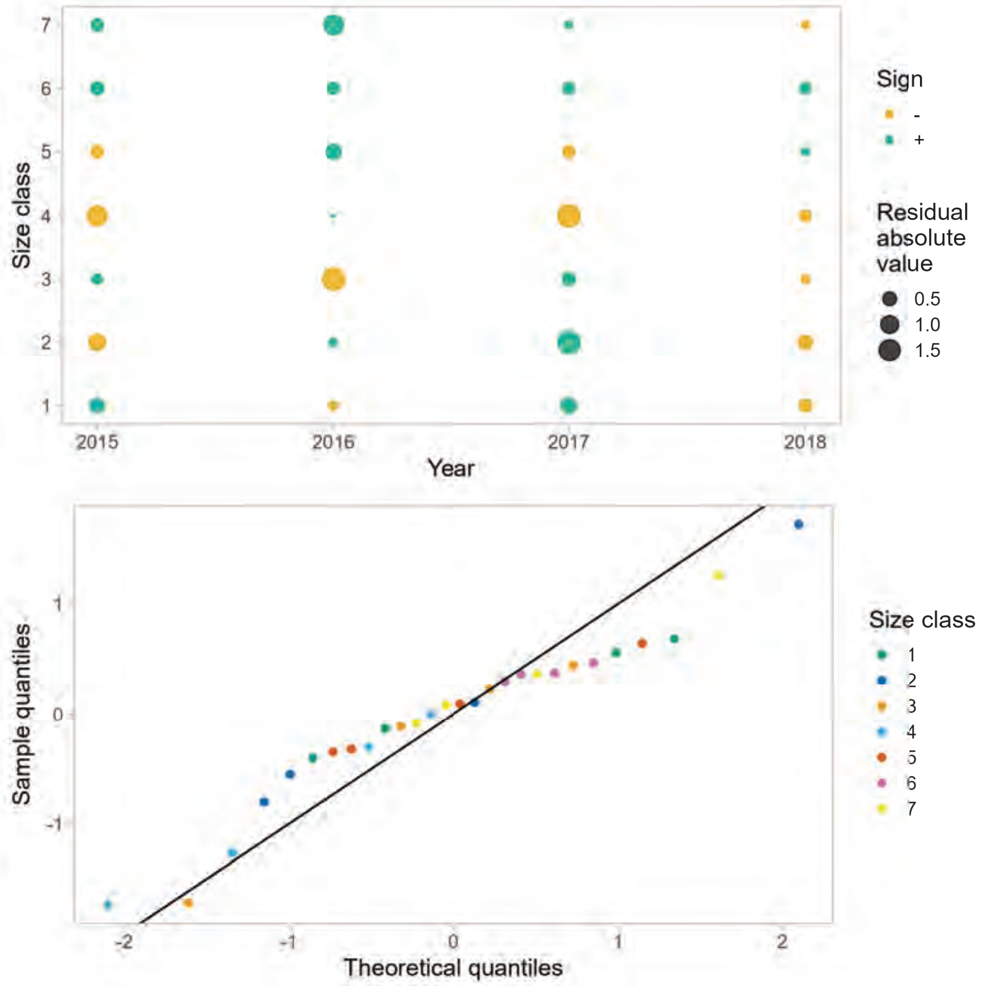

Figure 76: One-Step-Ahead residuals for model 24.0b7 fits to oldshell male size composition data from the winter commercial fishery retained catch.

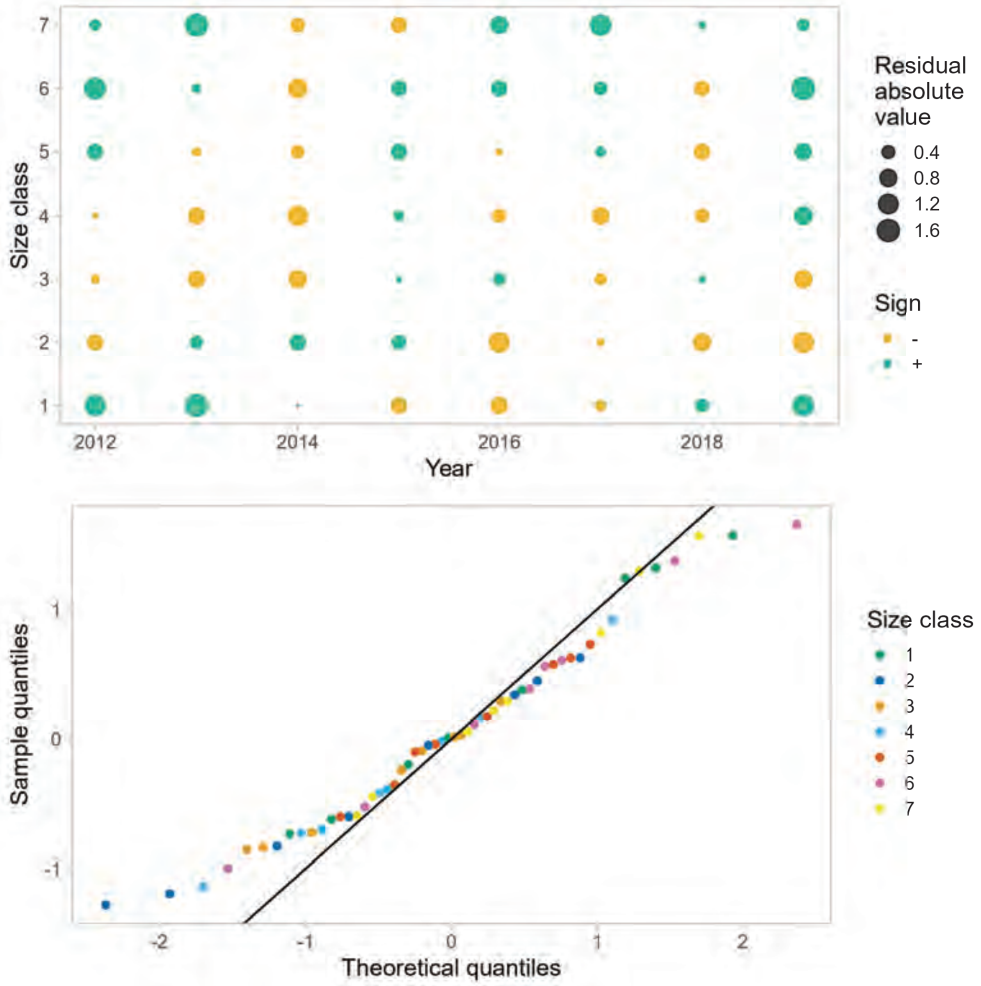

Figure 77: One-Step-Ahead residuals for model 24.0b7 fits to newshell male size composition data from the summer commercial fishery total catch.

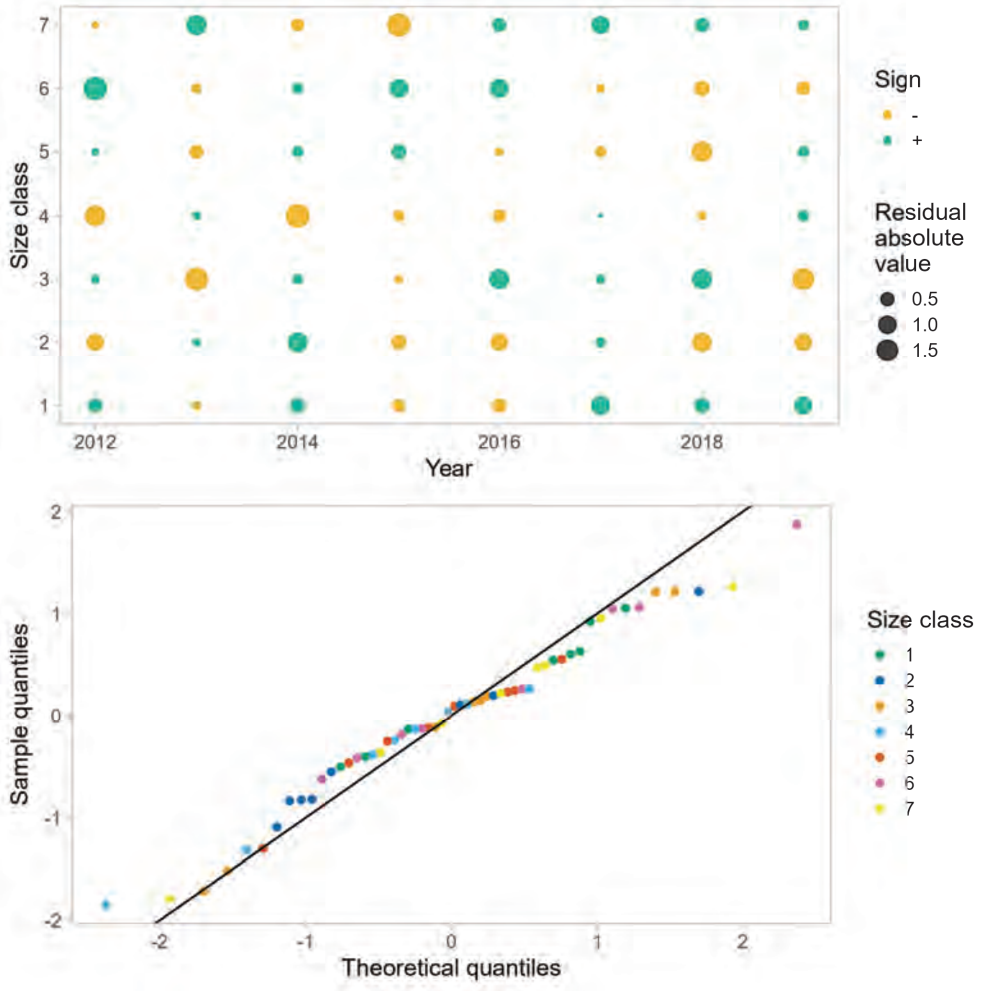

Figure 78: One-Step-Ahead residuals for model 24.0b7 fits to oldshell male size composition data from the summer commercial fishery total catch.

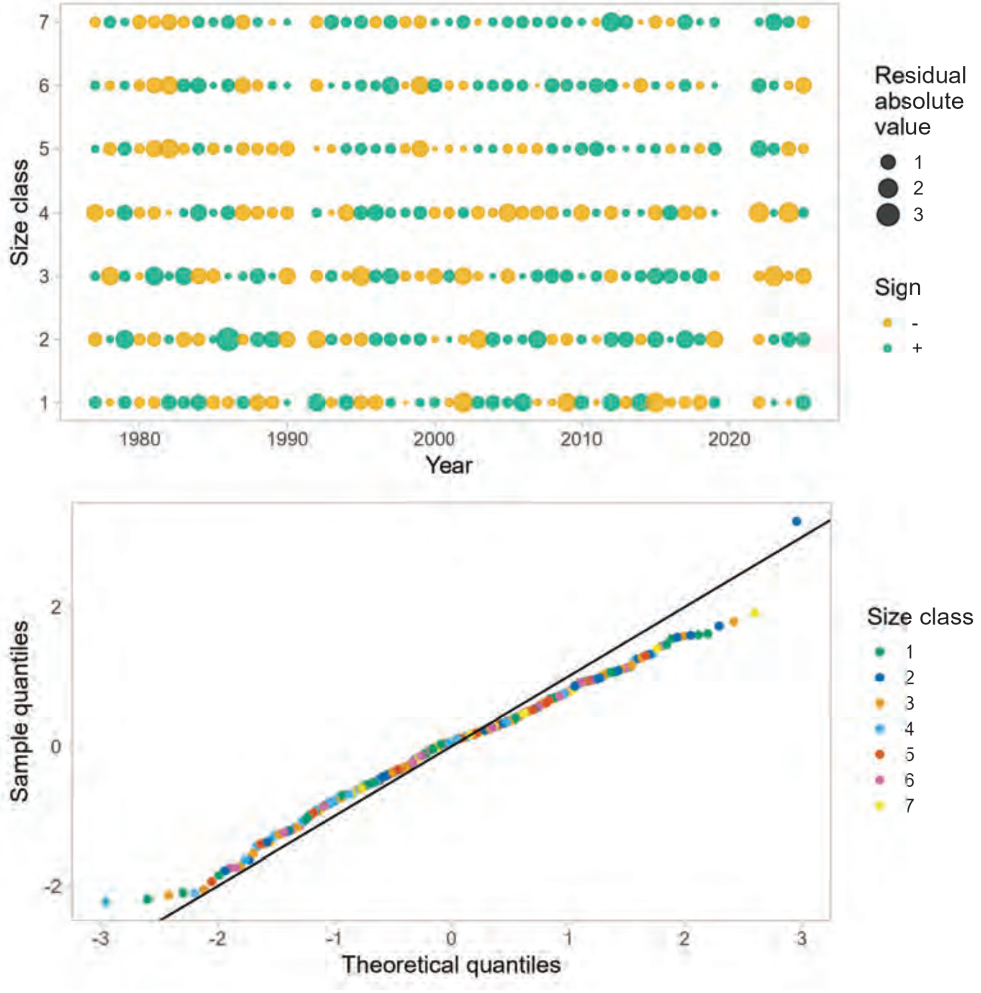

Figure 79: One-Step-Ahead residuals for model 24.0b7 fits to newshell male size composition data from the summer commercial fishery retained catch.

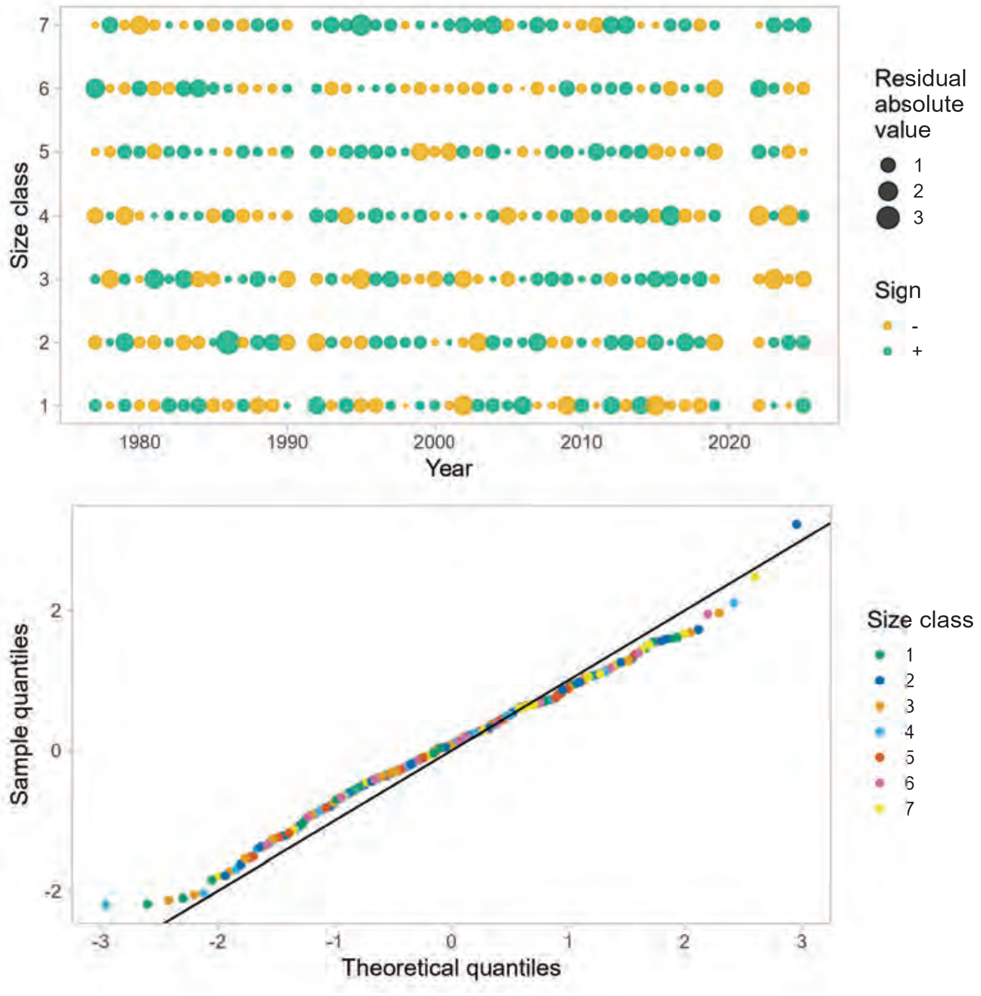

Figure 80: One-Step-Ahead residuals for model 24.0b7 fits to oldshell male size composition data from the summer commercial fishery retained catch.

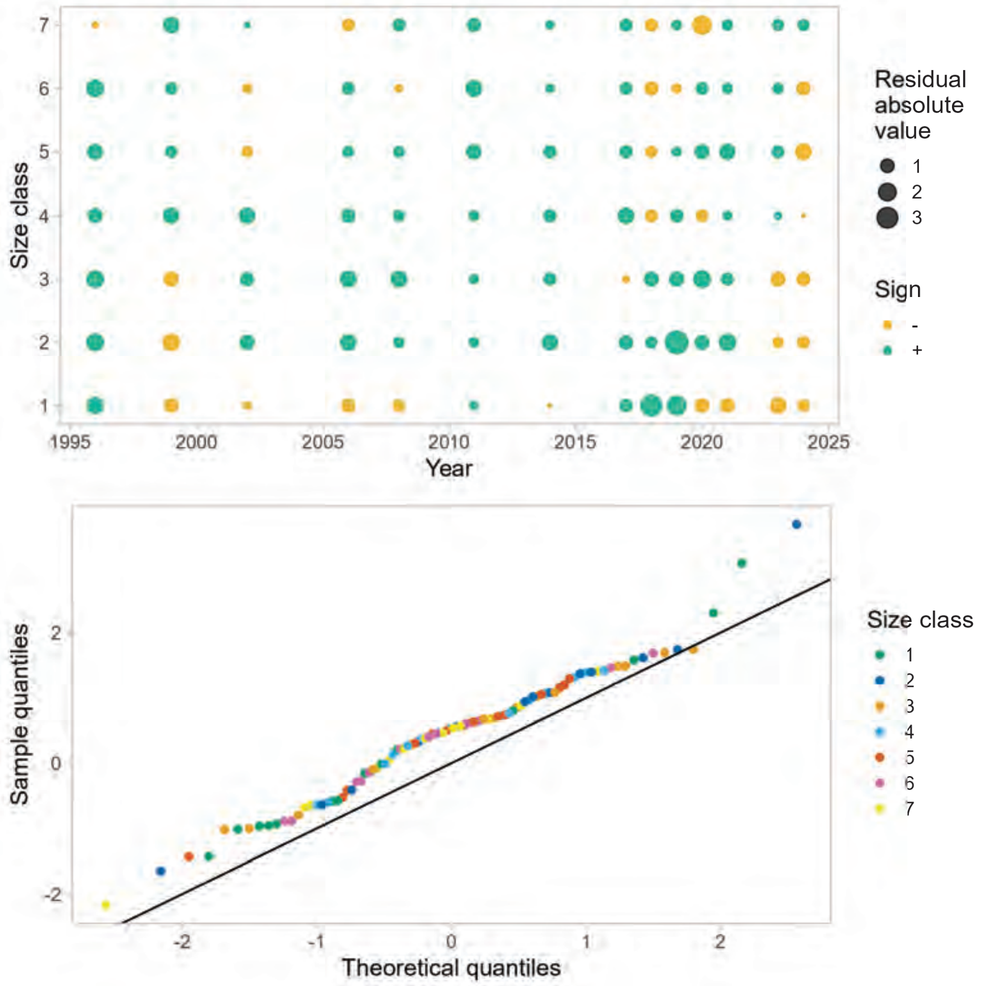

Figure 81: One-Step-Ahead residuals for model 24.0b7 fits to newshell male size composition data from the Alaska Department of Fish and Game (ADFG) trawl survey.

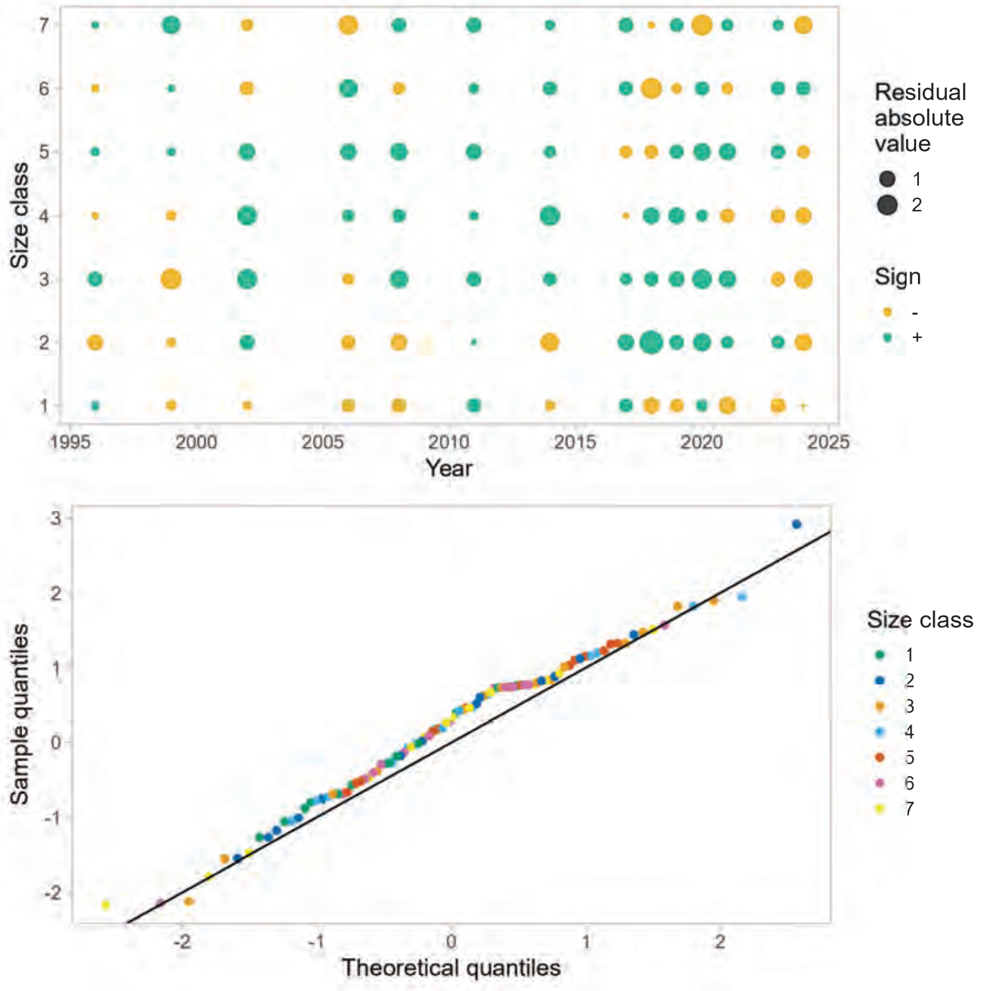

Figure 82: One-Step-Ahead residuals for model 24.0b7 fits to oldshell male size composition data from the Alaska Department of Fish and Game (ADFG) trawl survey.

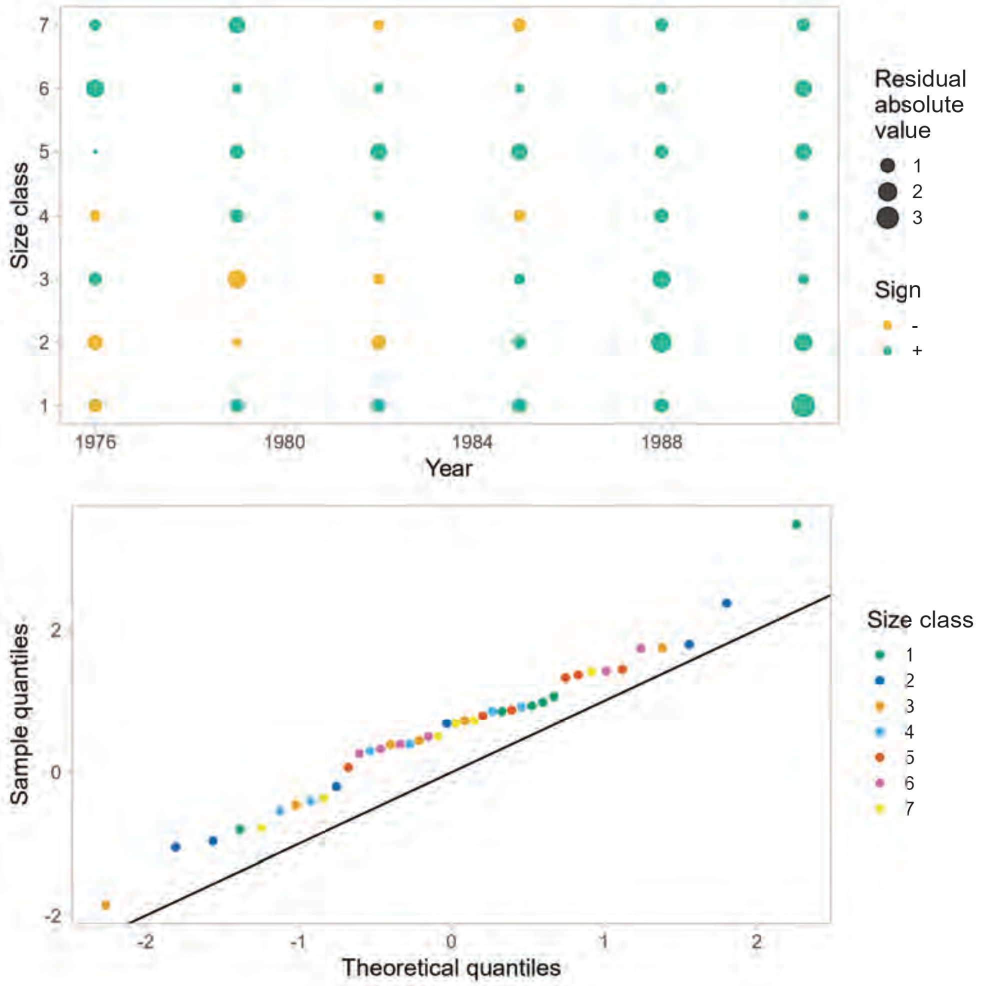

Figure 83: One-Step-Ahead residuals for model 24.0b7 fits to newshell male size composition data from the National Oceanic and Atmospheric Administration (NOAA) Norton Sound trawl survey.

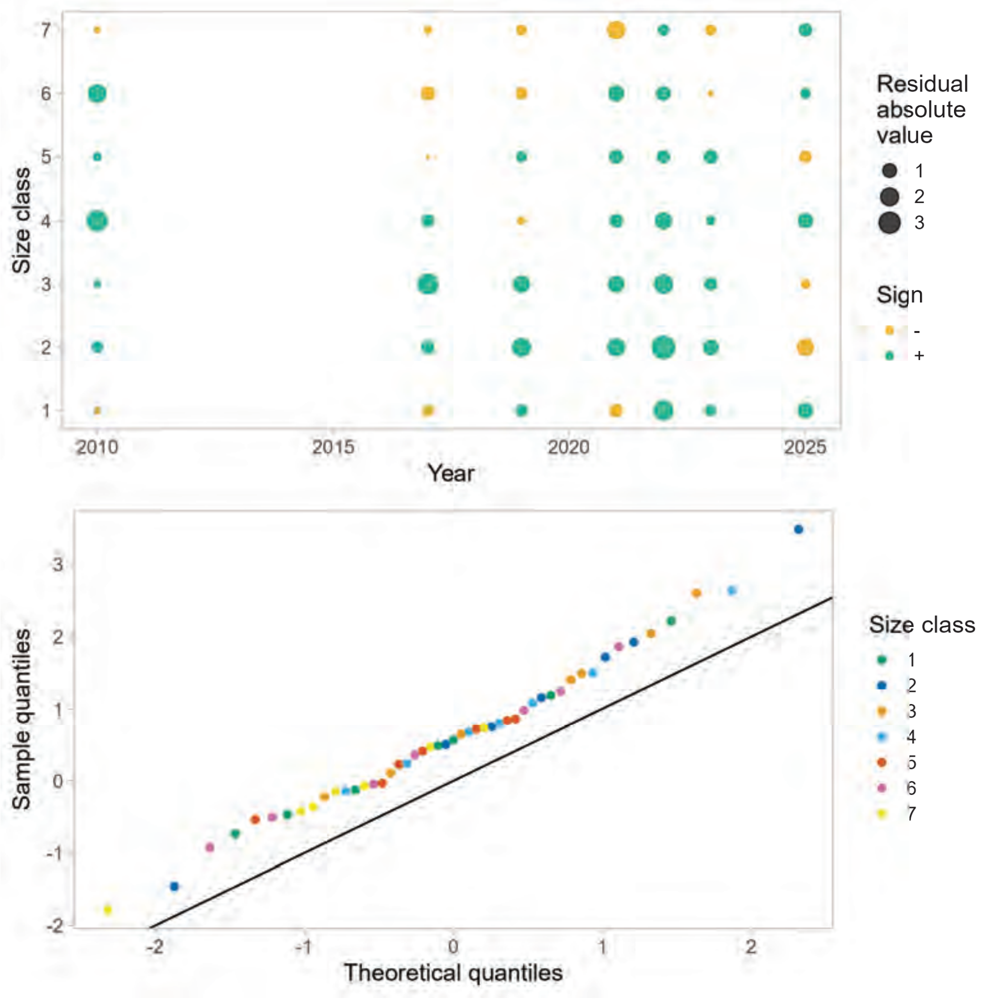

Figure 84: One-Step-Ahead residuals for model 24.0b7 fits to newshell male size composition data from the National Oceanic and Atmospheric Administration (NOAA) Northern Bering Sea (NBS) trawl survey.

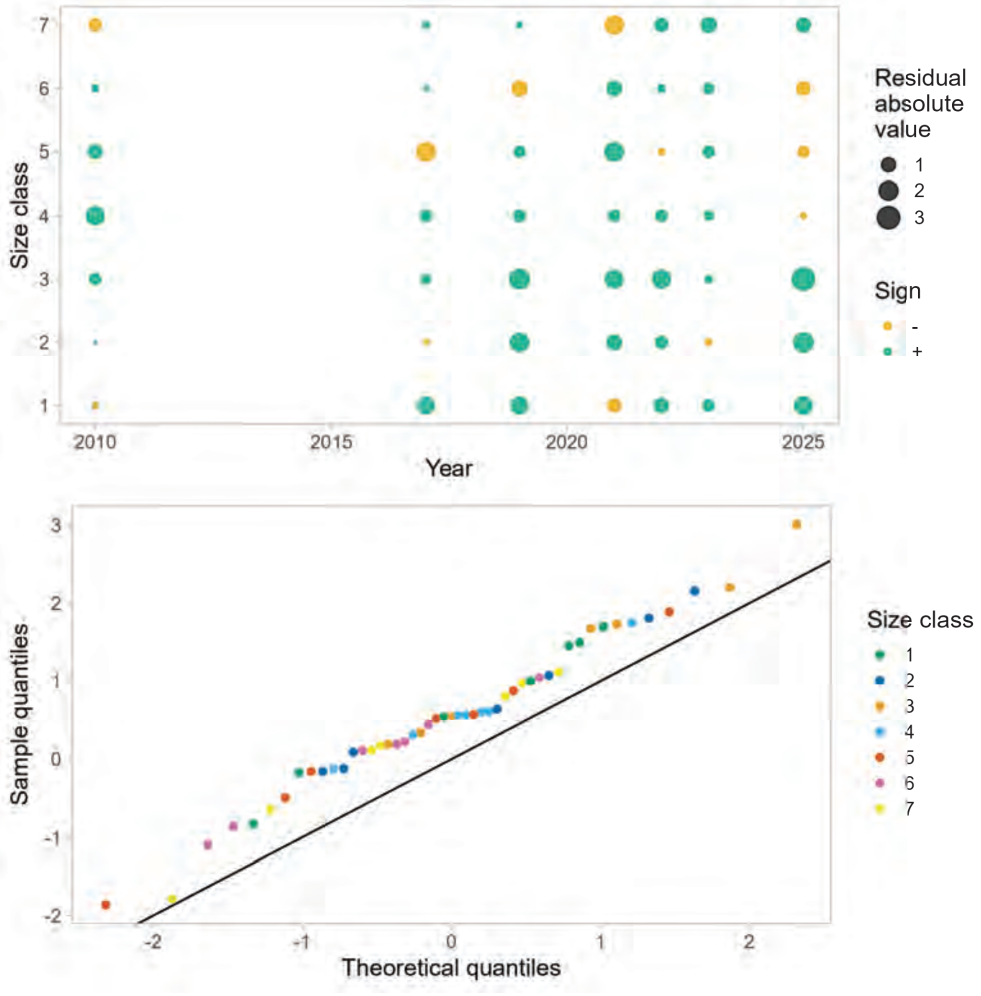

Figure 85: One-Step-Ahead residuals for model 24.0b7 fits to oldshell male size composition data from the National Oceanic and Atmospheric Administration (NOAA) Northern Bering Sea (NBS) trawl survey.

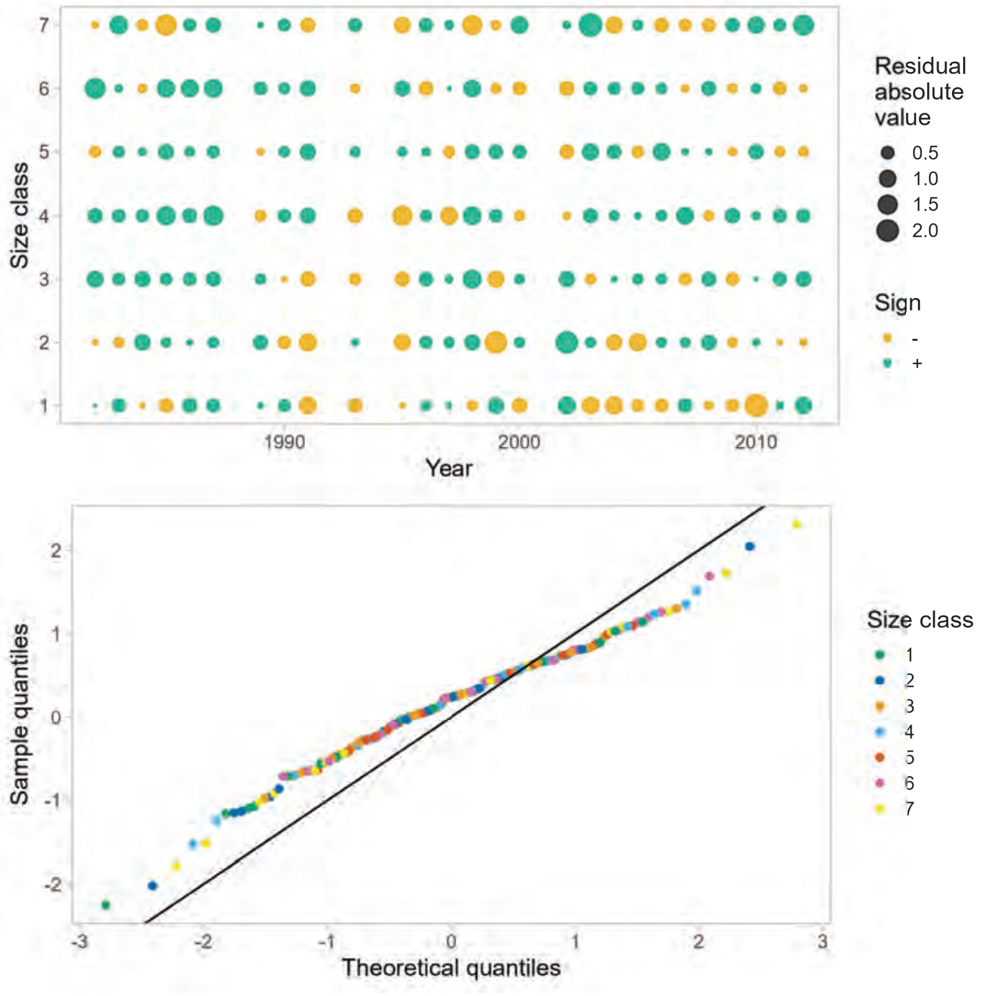

Figure 86: One-Step-Ahead residuals for model 24.0b7 fits to newshell male size composition data from the Alaska Department of Fish and Game (ADFG) winter pot survey.

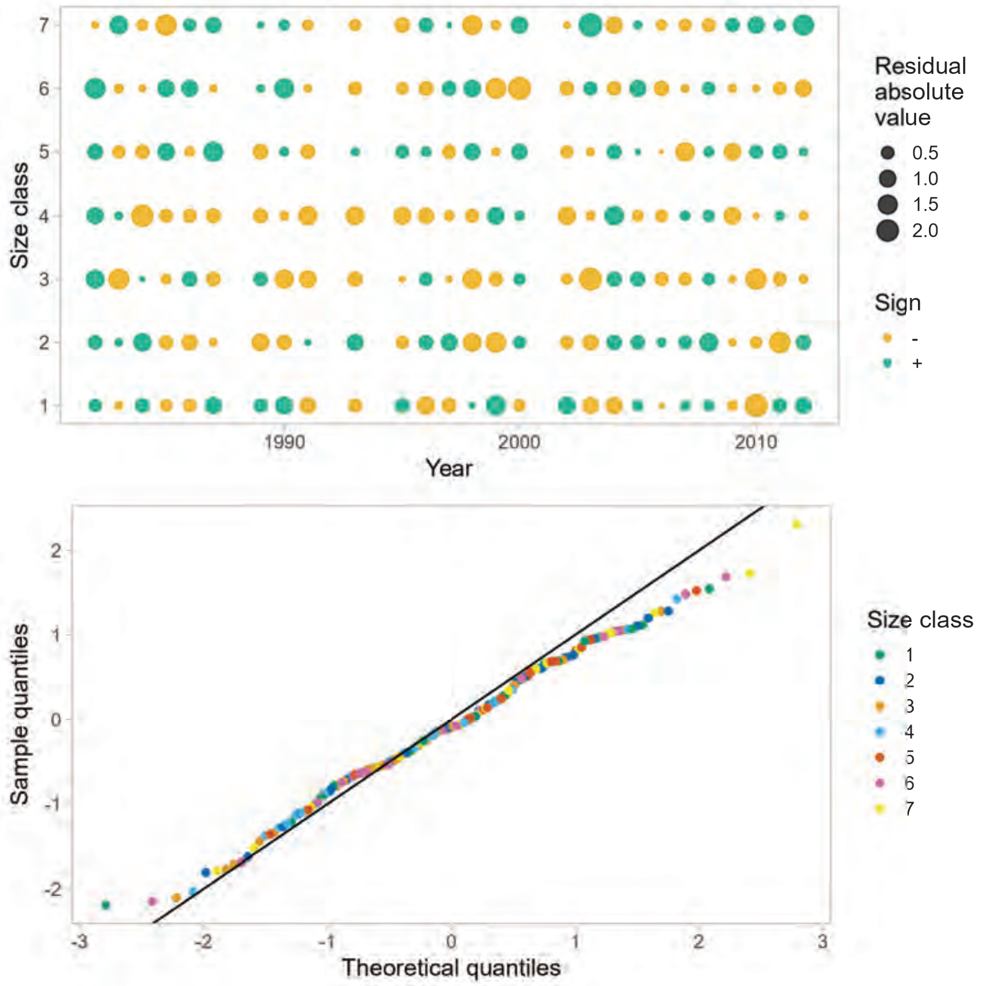

Figure 87: One-Step-Ahead residuals for model 24.0b7 fits to oldshell male size composition data from the Alaska Department of Fish and Game (ADFG) winter pot survey.

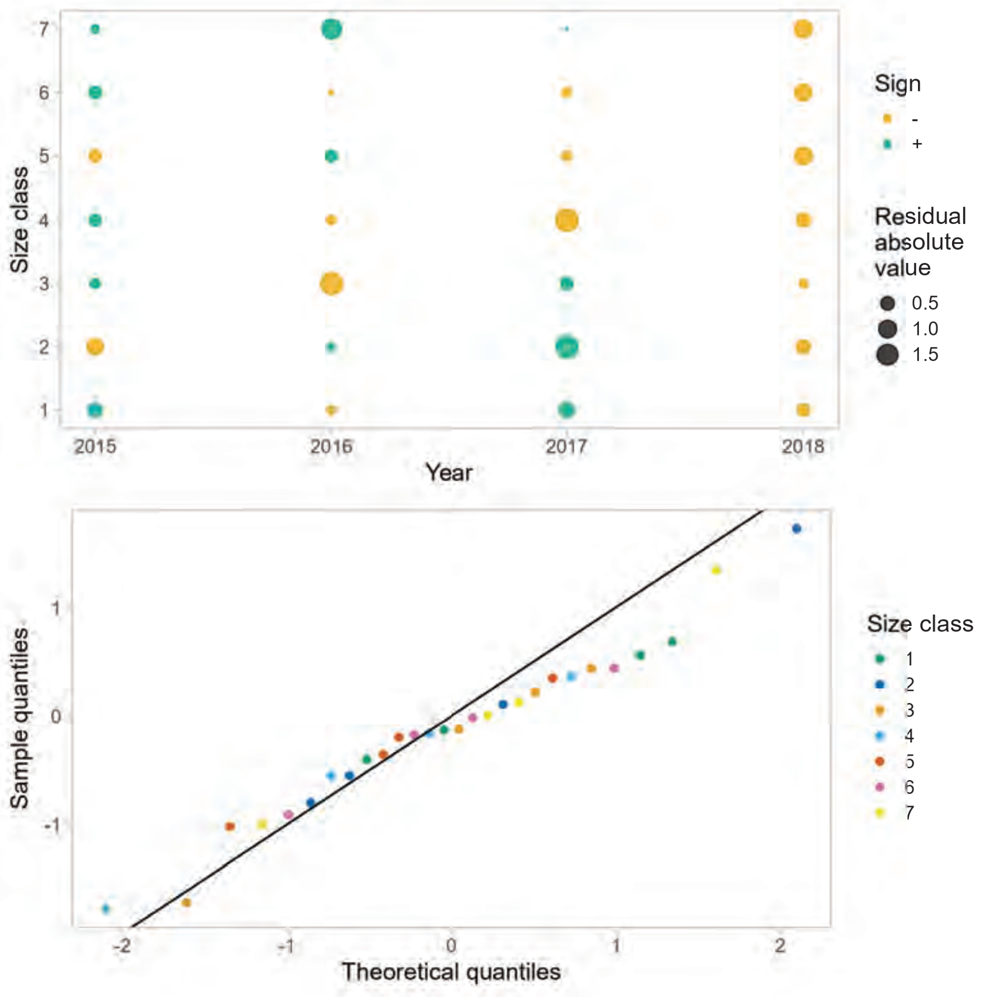

Figure 88: One-Step-Ahead residuals for model 25.0a1 fits to size composition data from the winter commercial fishery retained catch.

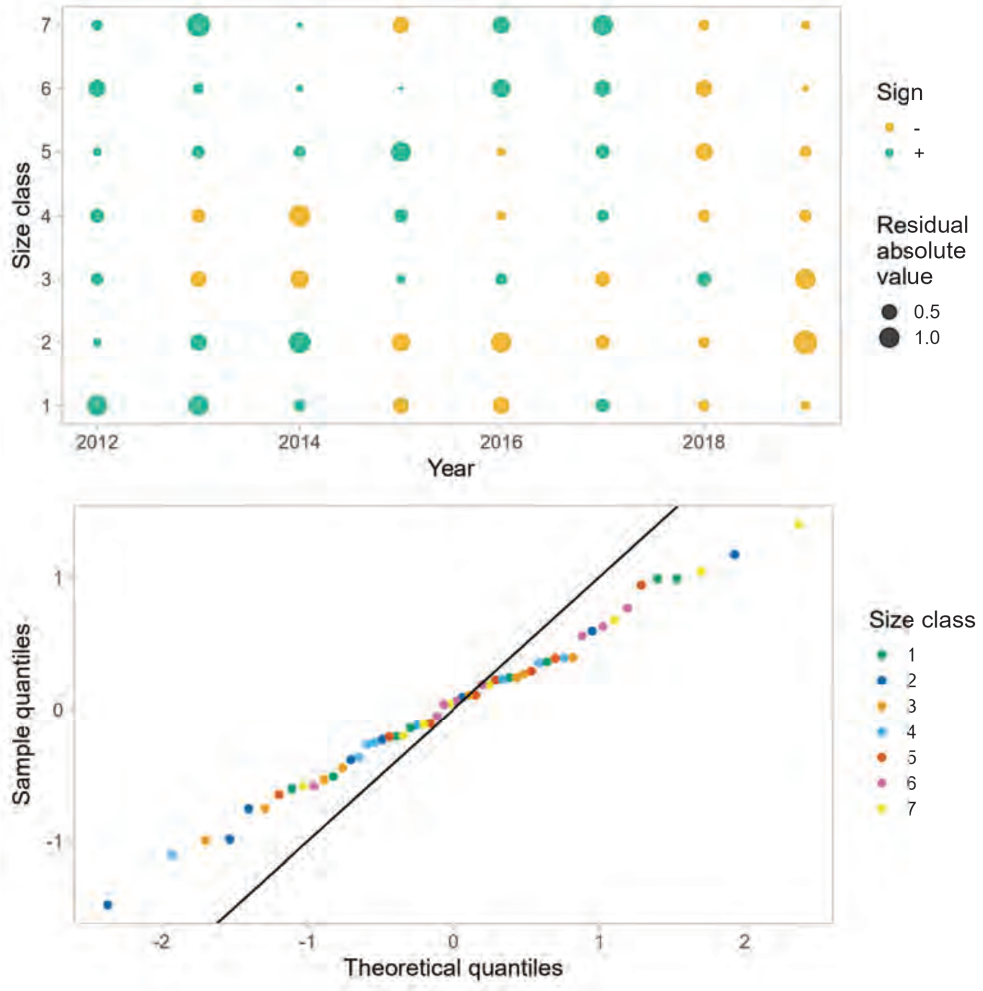

Figure 89: One-Step-Ahead residuals for model 25.0a1 fits to size composition data from the summer commercial fishery total catch.

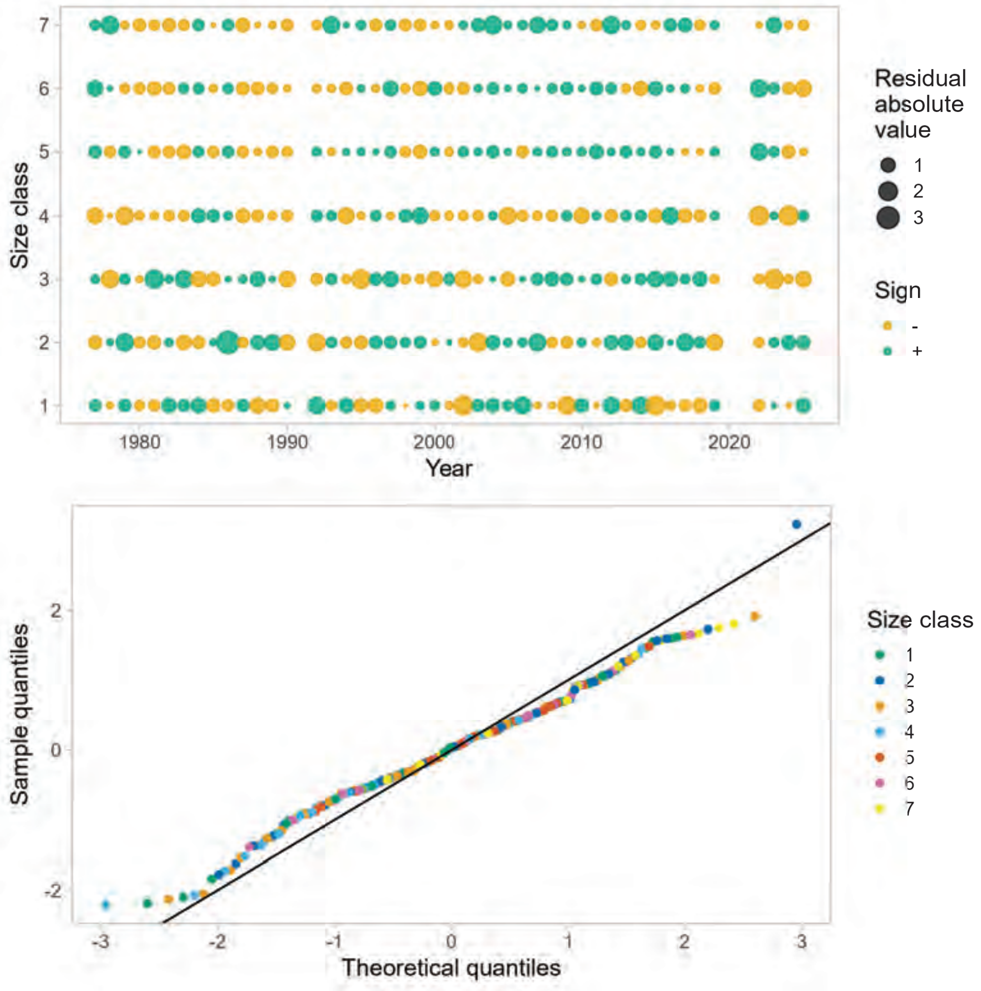

Figure 90: One-Step-Ahead residuals for model 25.0a1 fits to size composition data from the summer commercial fishery retained catch.

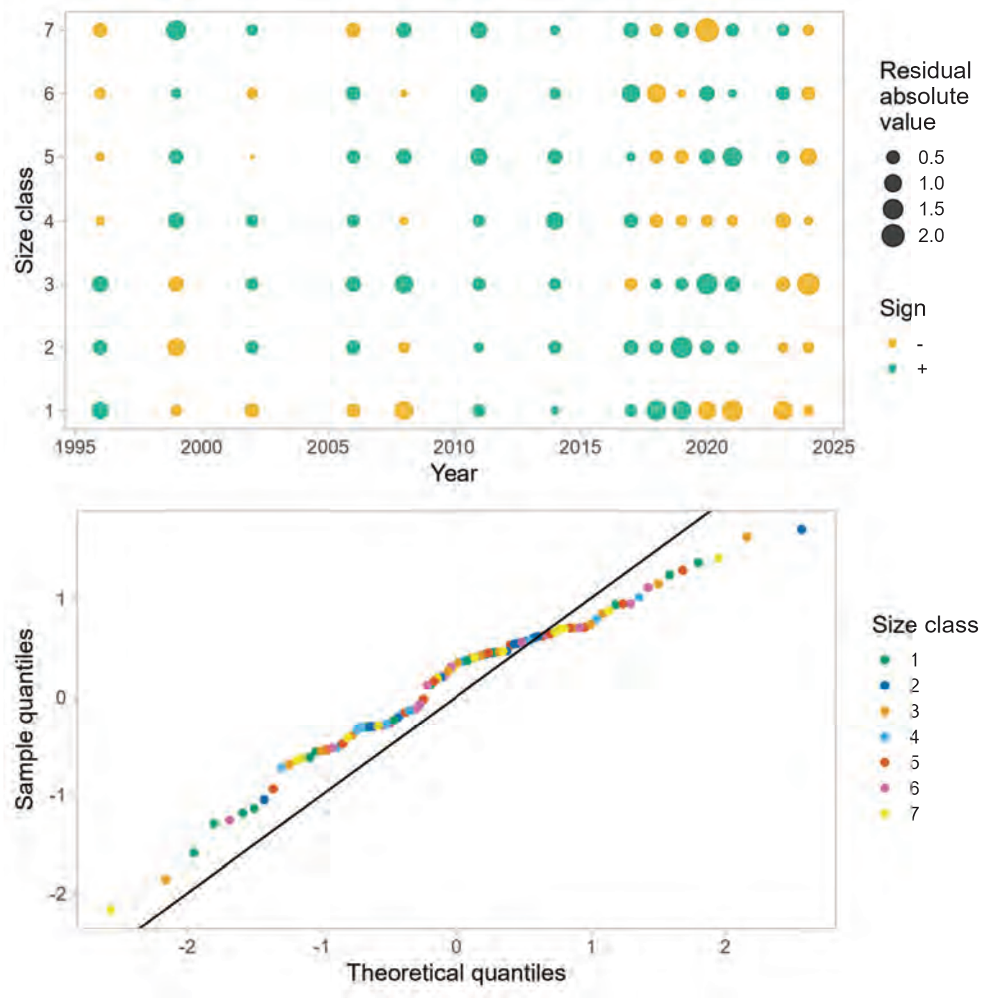

Figure 91: One-Step-Ahead residuals for model 25.0a1 fits to size composition data from the Alaska Department of Fish and Game (ADFG) trawl survey.

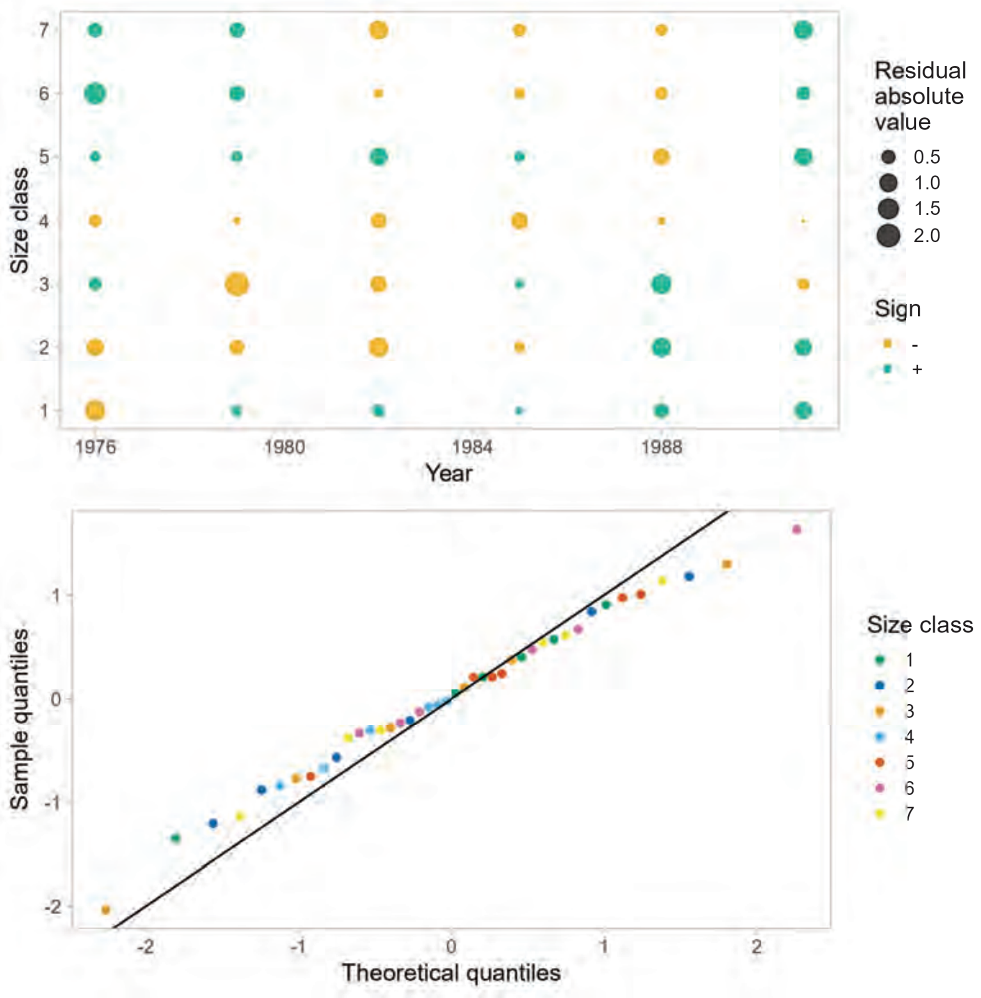

Figure 92: One-Step-Ahead residuals for model 25.0a1 fits to size composition data from the National Oceanic and Atmospheric Administration (NOAA) Norton Sound trawl survey.

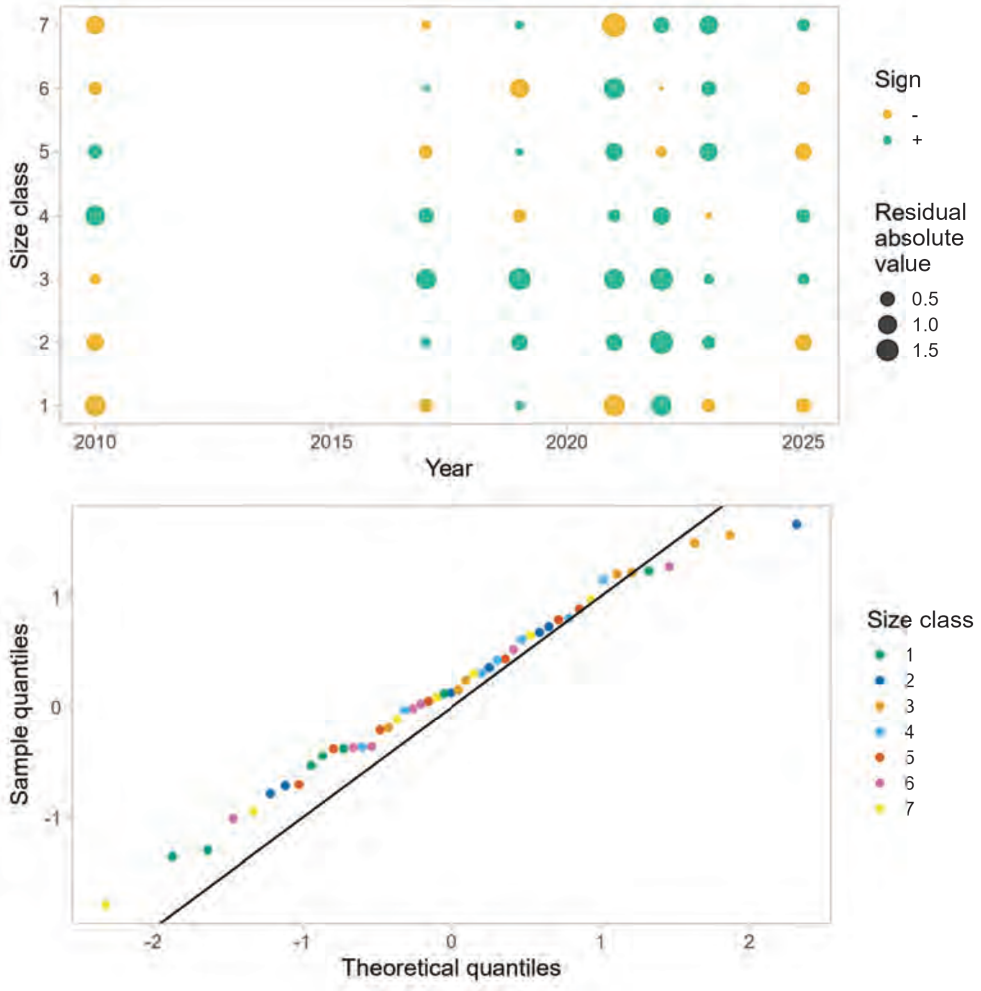

Figure 93: One-Step-Ahead residuals for model 25.0a1 fits to size composition data from the National Oceanic and Atmospheric Administration (NOAA) Northern Bering Sea (NBS) trawl survey.

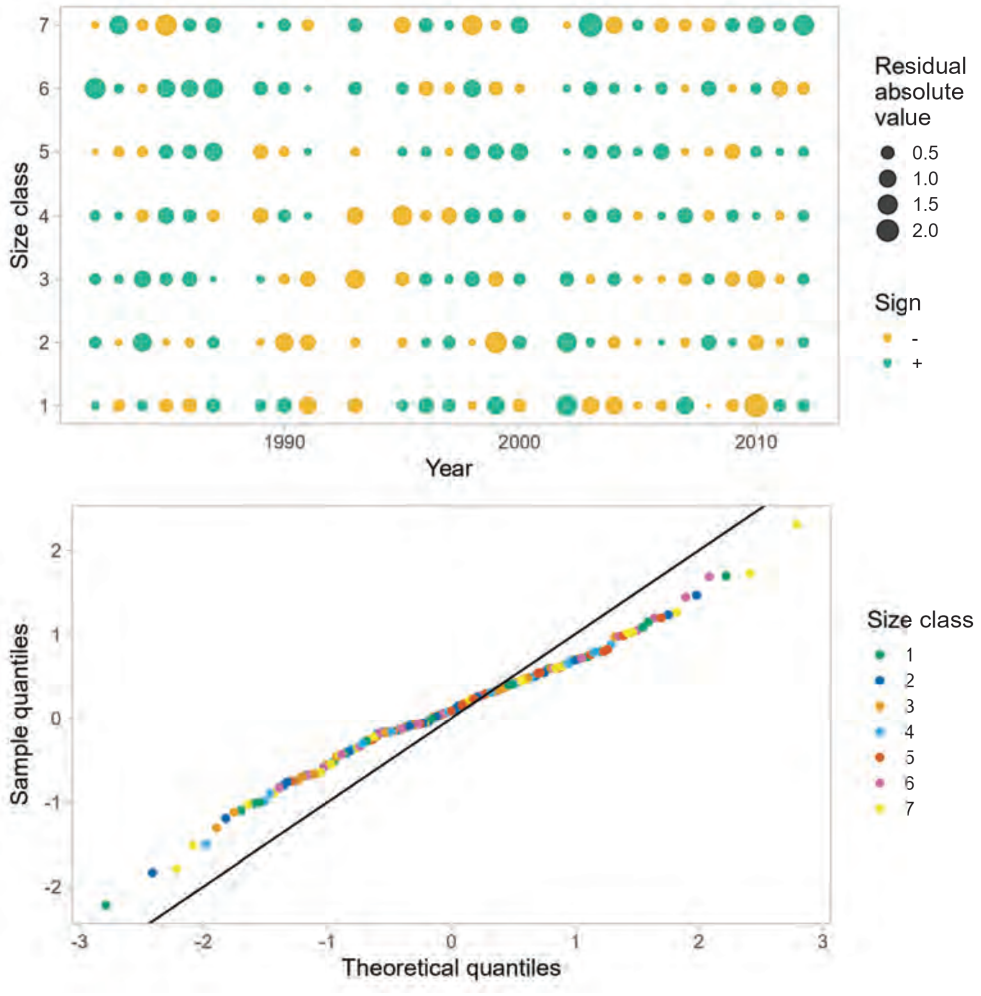

Figure 94: One-Step-Ahead residuals for model 25.0a1 fits to size composition data from the Alaska Department of Fish and Game (ADFG) winter pot survey.

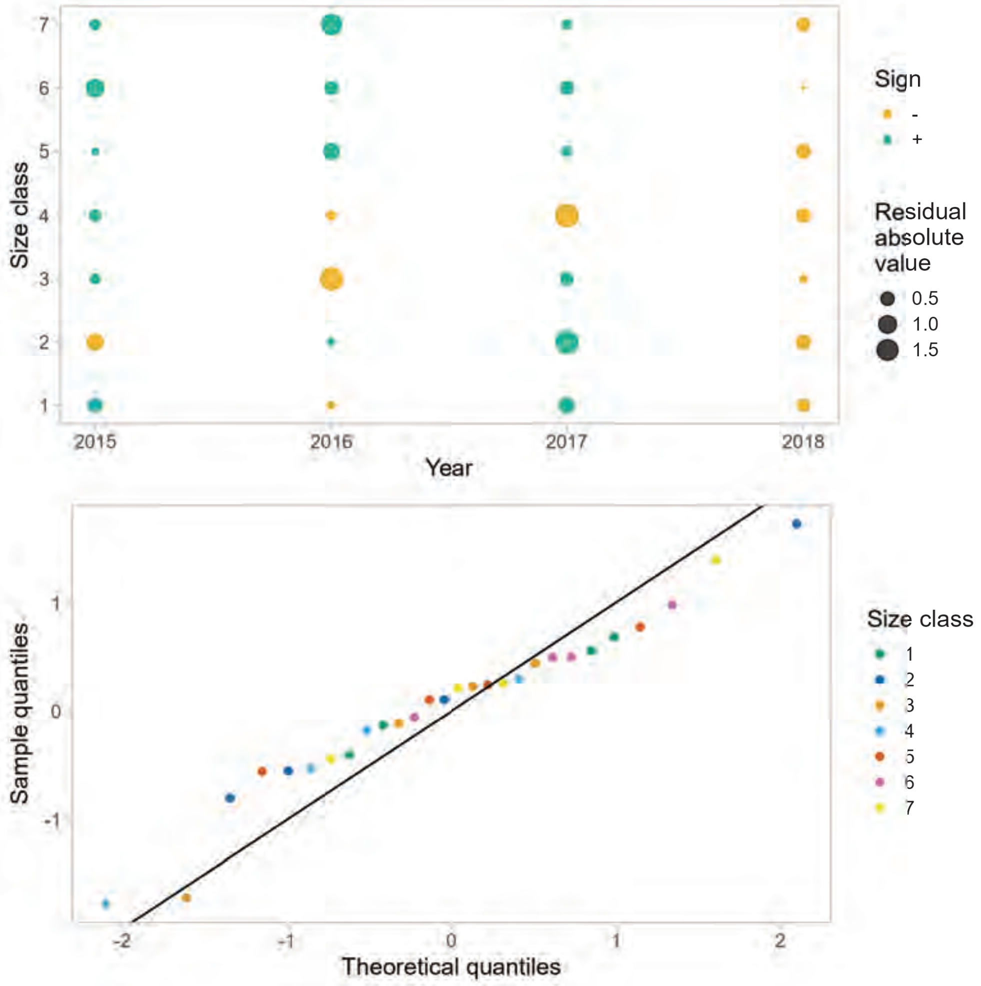

Figure 95: One-Step-Ahead residuals for model 25.0a2 fits to size composition data from the winter commercial fishery retained catch.

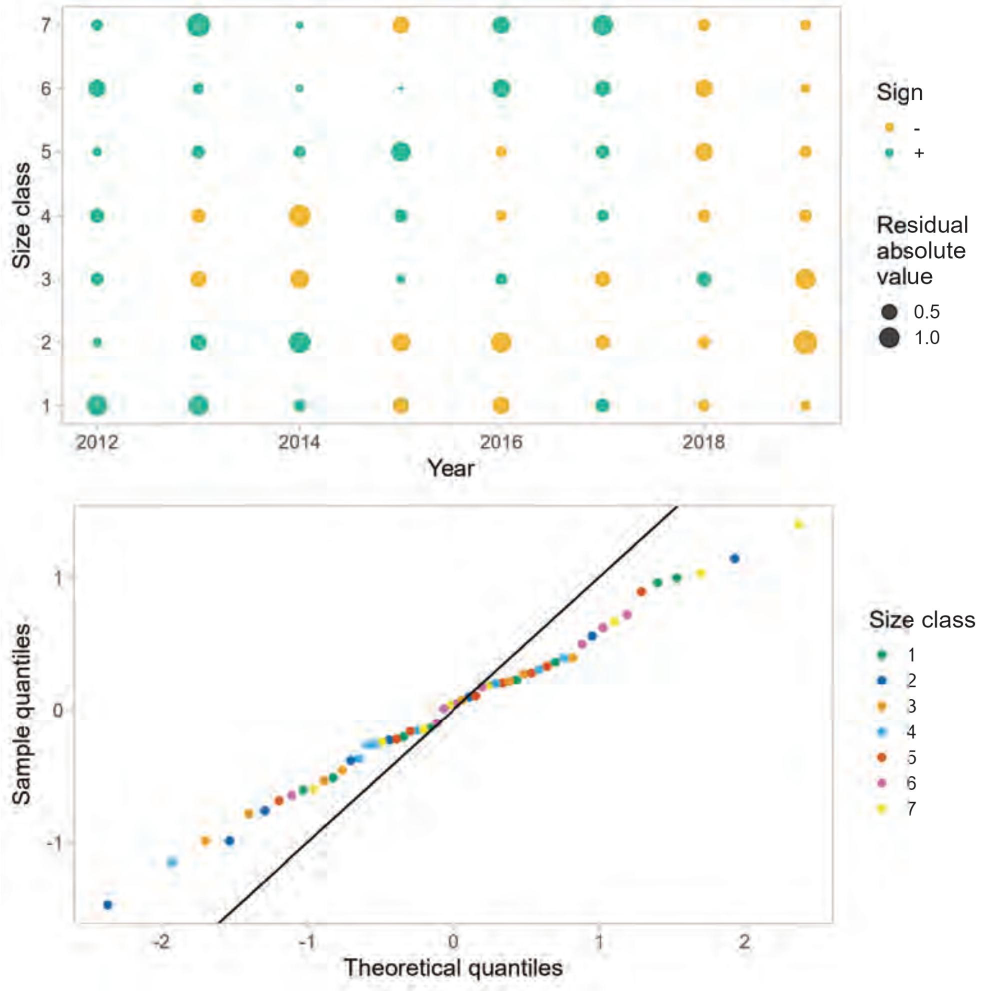

Figure 96: One-Step-Ahead residuals for model 25.0a2 fits to size composition data from the summer commercial fishery total catch.

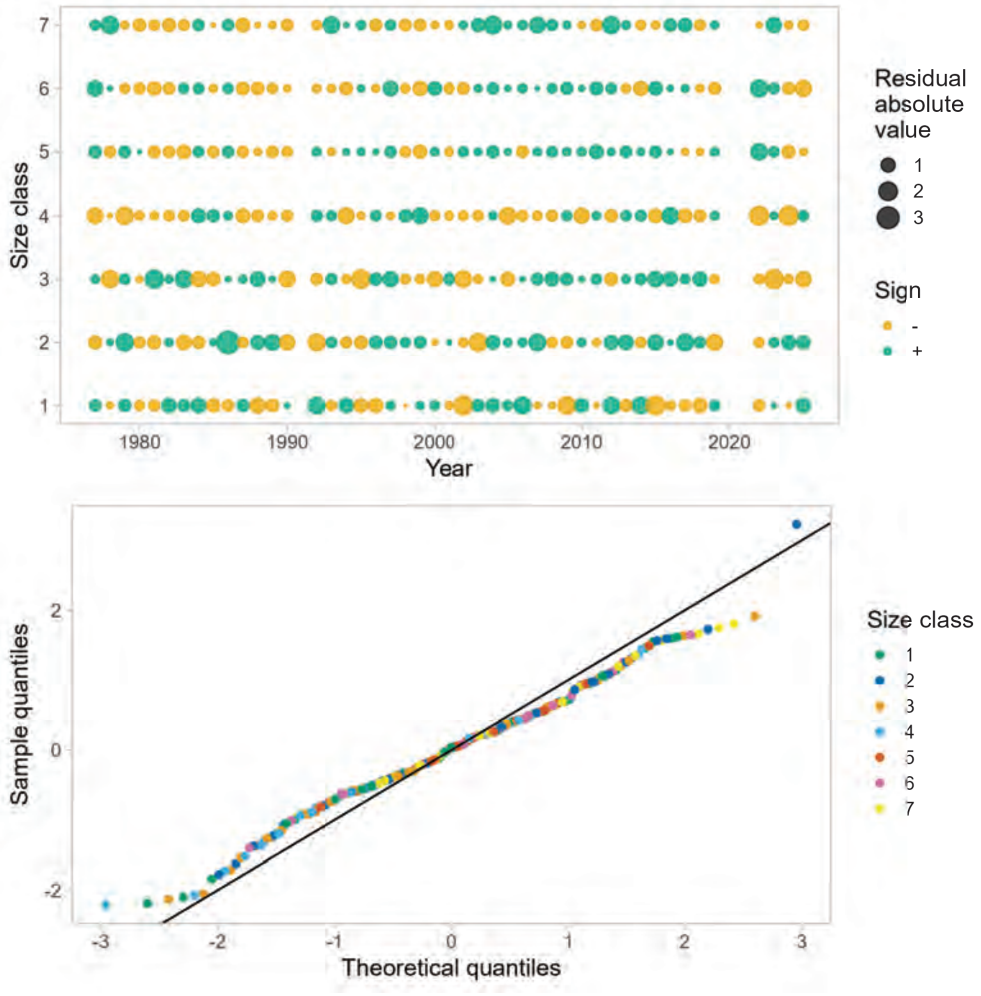

Figure 97: One-Step-Ahead residuals for model 25.0a2 fits to size composition data from the summer commercial fishery retained catch.

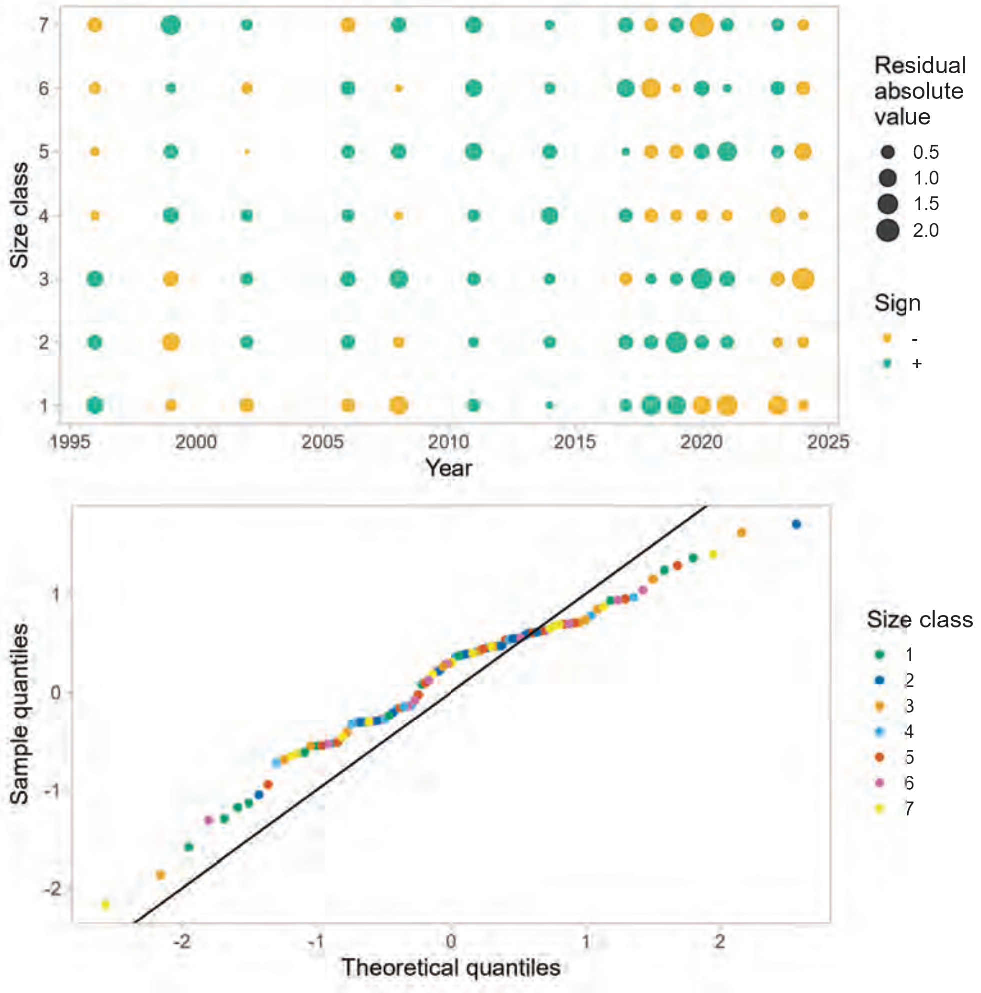

Figure 98: One-Step-Ahead residuals for model 25.0a2 fits to size composition data from the Alaska Department of Fish and Game (ADFG) trawl survey.

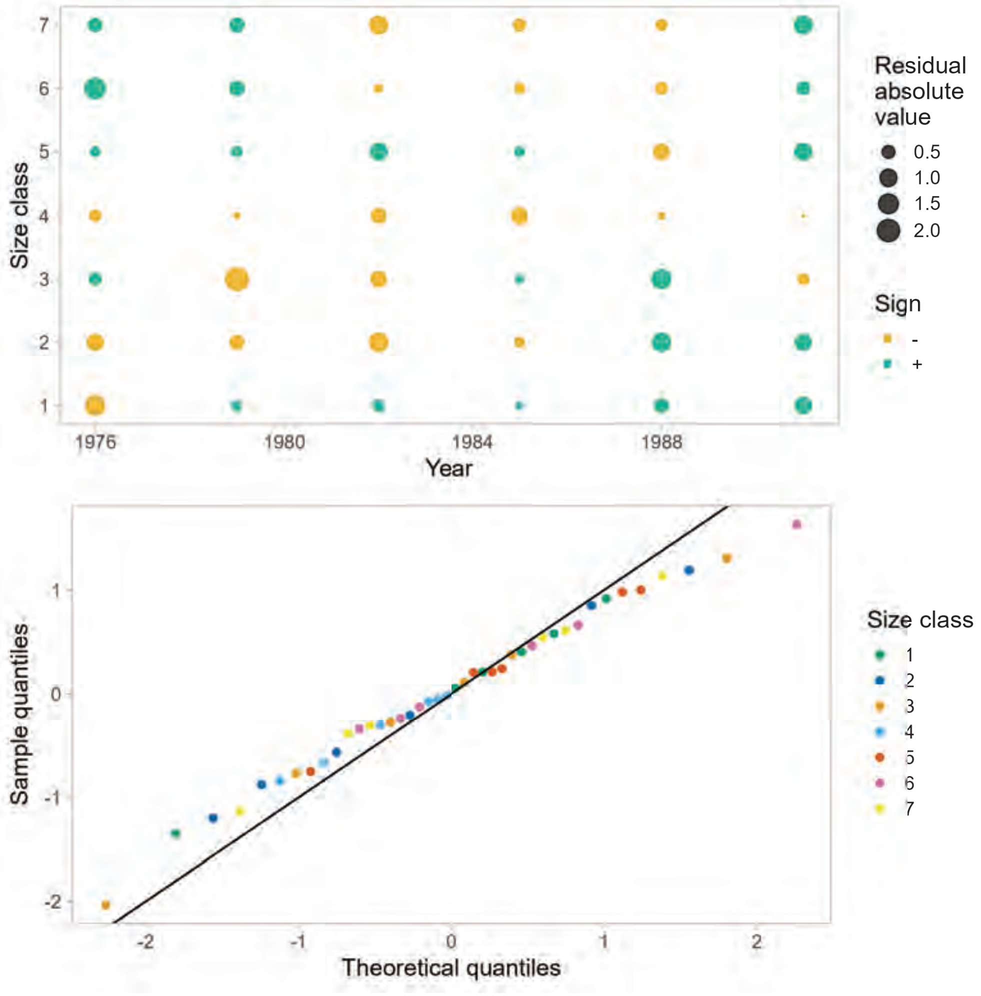

Figure 99: One-Step-Ahead residuals for model 25.0a2 fits to size composition data from the National Oceanic and Atmospheric Administration (NOAA) Norton Sound trawl survey.

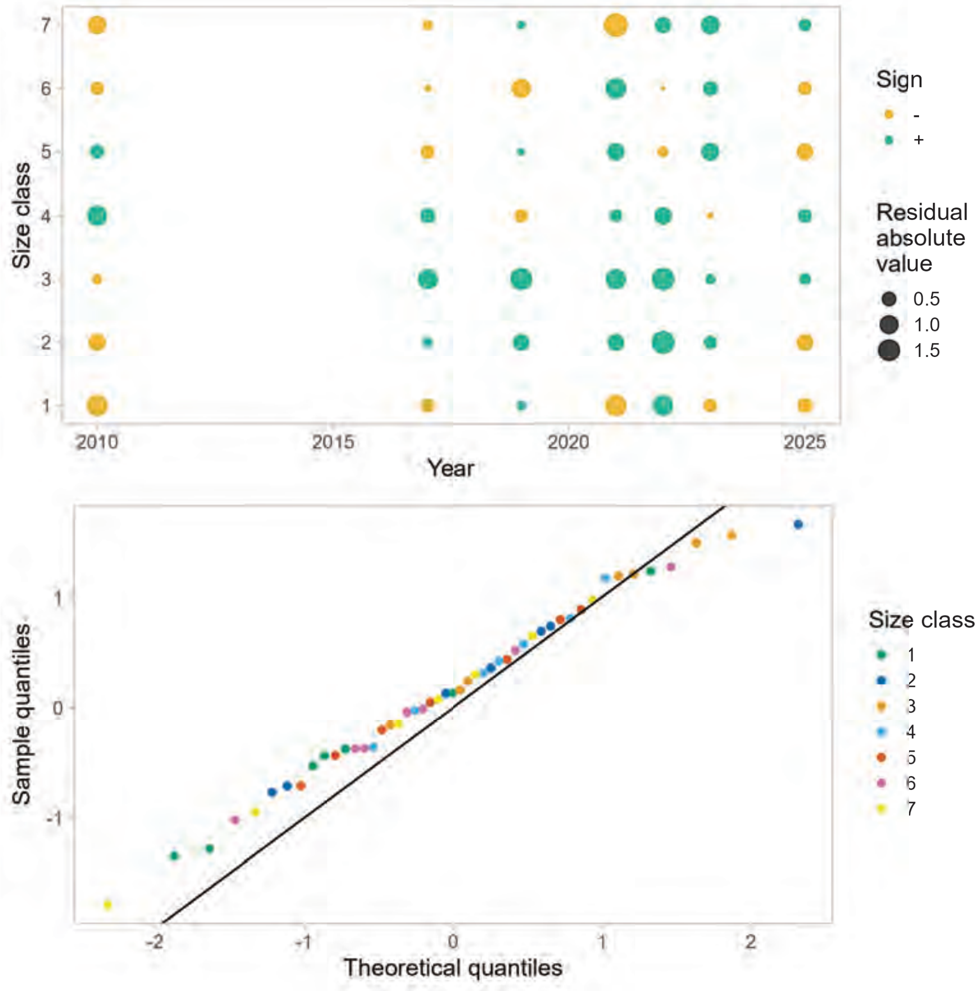

Figure 100: One-Step-Ahead residuals for model 25.0a2 fits to size composition data from the National Oceanic and Atmospheric Administration (NOAA) Northern Bering Sea (NBS) trawl survey.

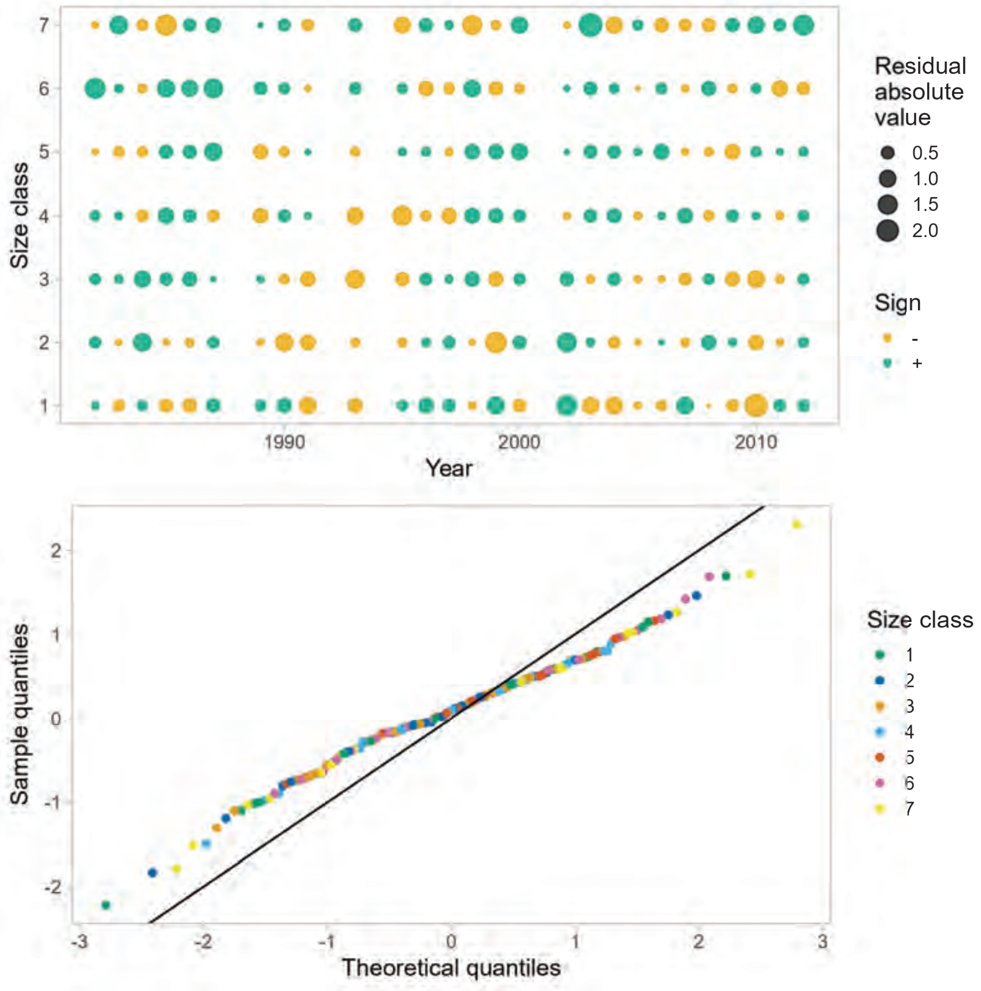

Figure 101: One-Step-Ahead residuals for model 25.0a2 fits to size composition data from the Alaska Department of Fish and Game (ADFG) winter pot survey.

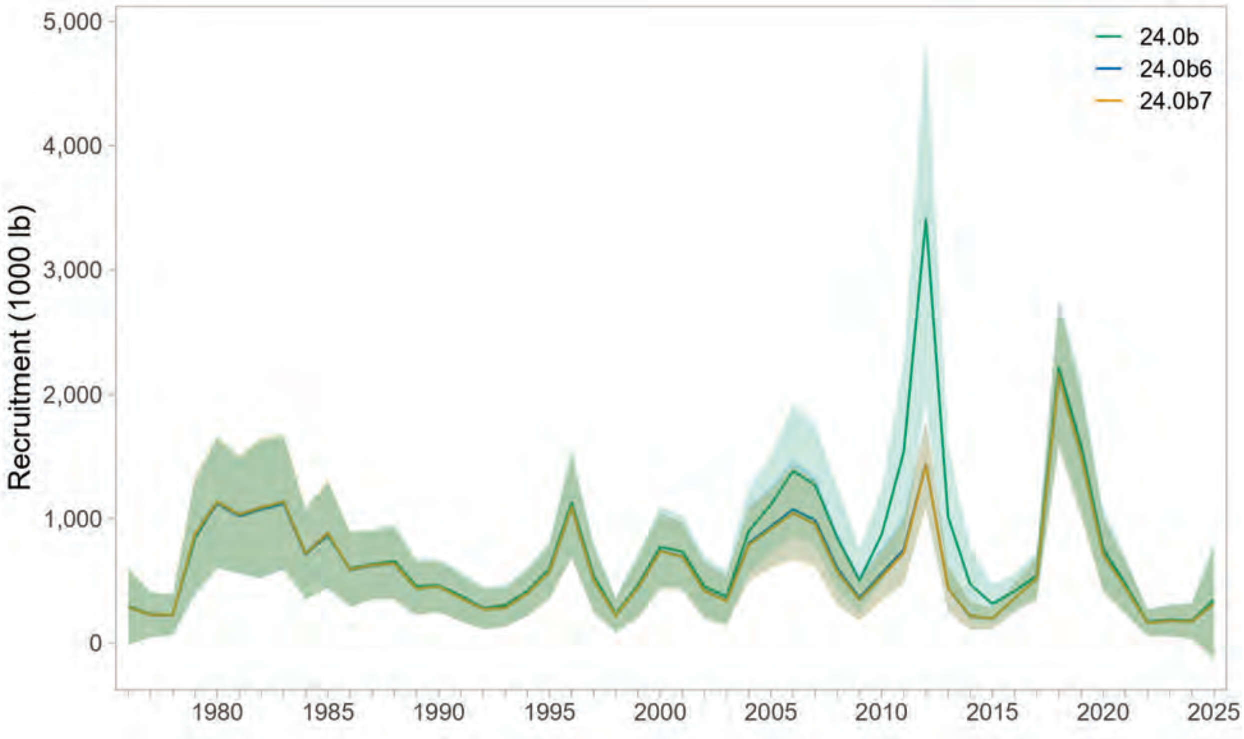

Figure 102: Estimated recruitment (1000 lb) over 1976-2025 for models 24.0b, 24.0b6, and 24.0b7.

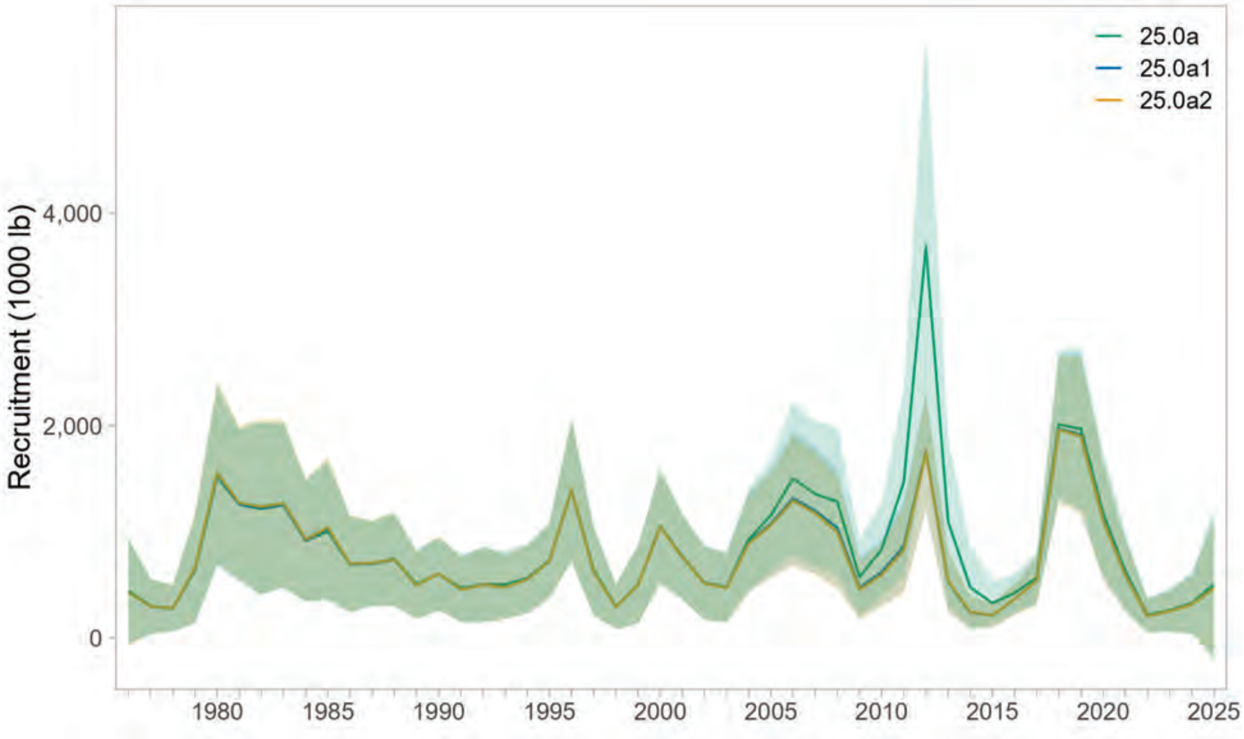

Figure 103: Estimated recruitment (1000 lb) over 1976-2025 for models 25.0a, 25.0a1, and 25.0a2.

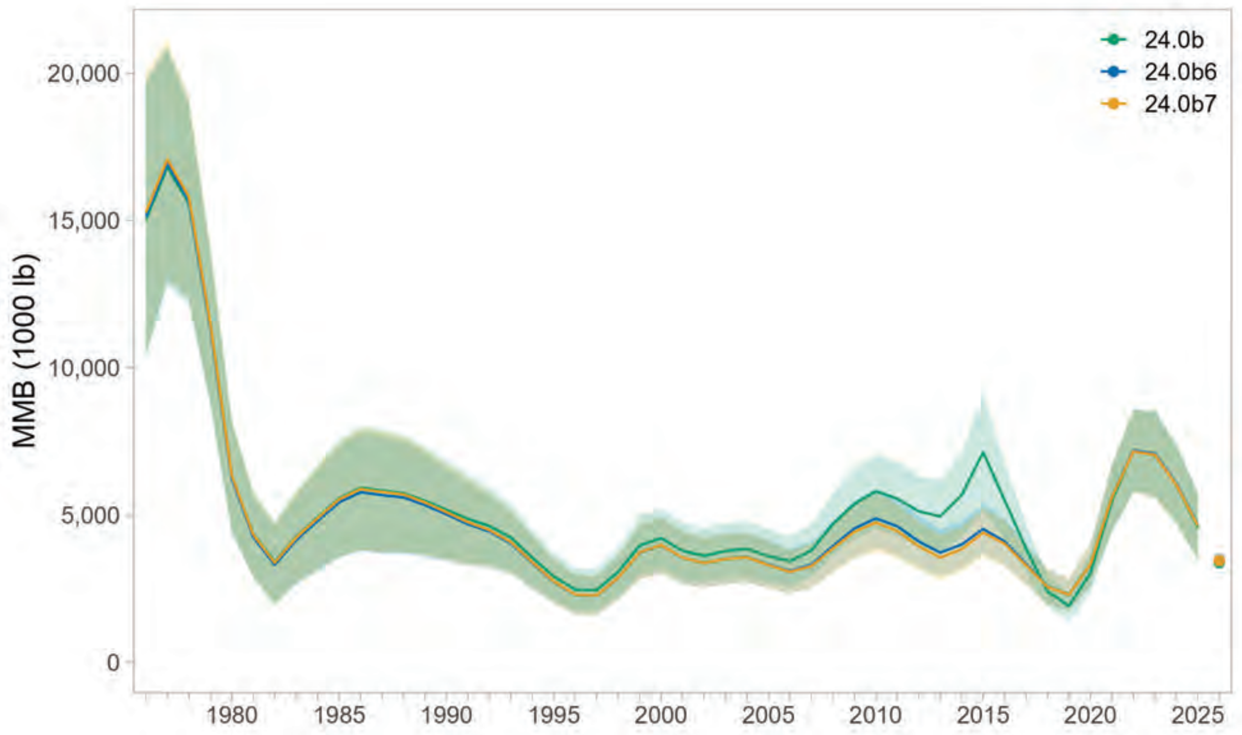

Figure 104: Comparisons of estimated mature male biomass (MMB) time series over 1976-2025 for models 24.0b, 24.0b6, and 24.0b7. Points represent projected values for 2026.

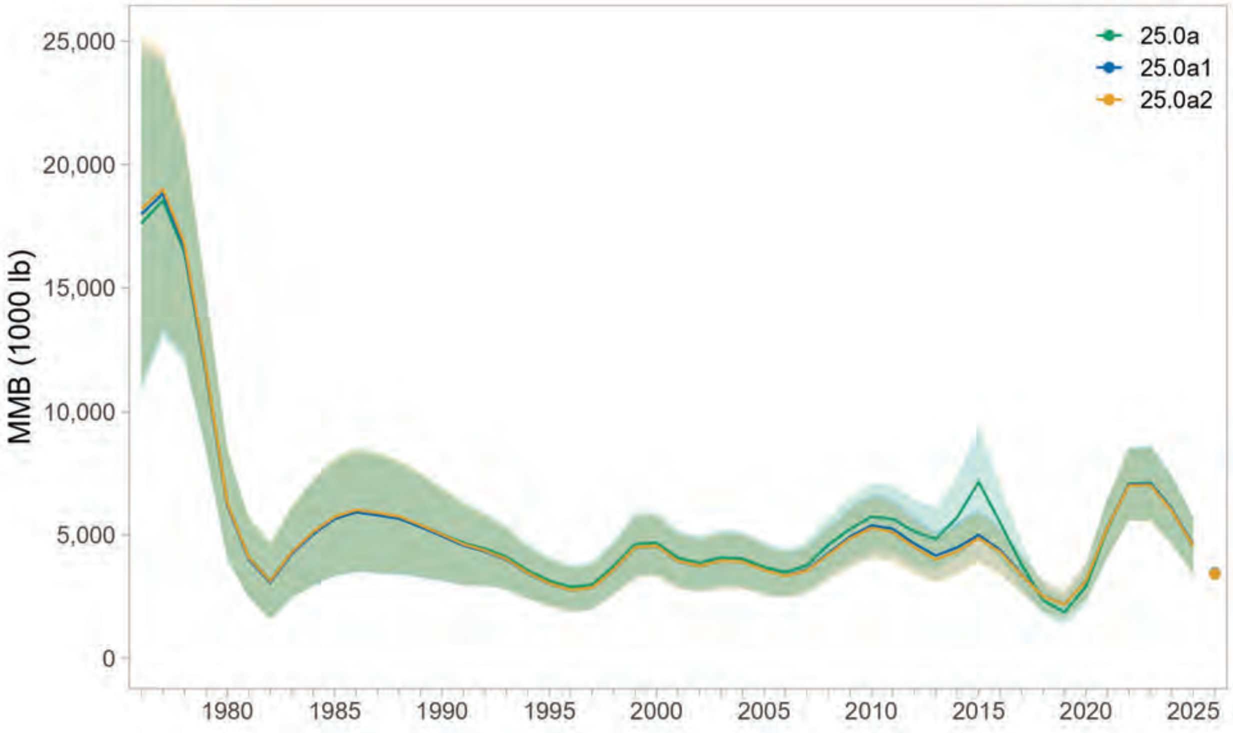

Figure 105: Comparisons of estimated mature male biomass (MMB) time series over 1976-2025 for models 25.0a, 25.0a1, 25.0a2. Points represent projected values for 2026.

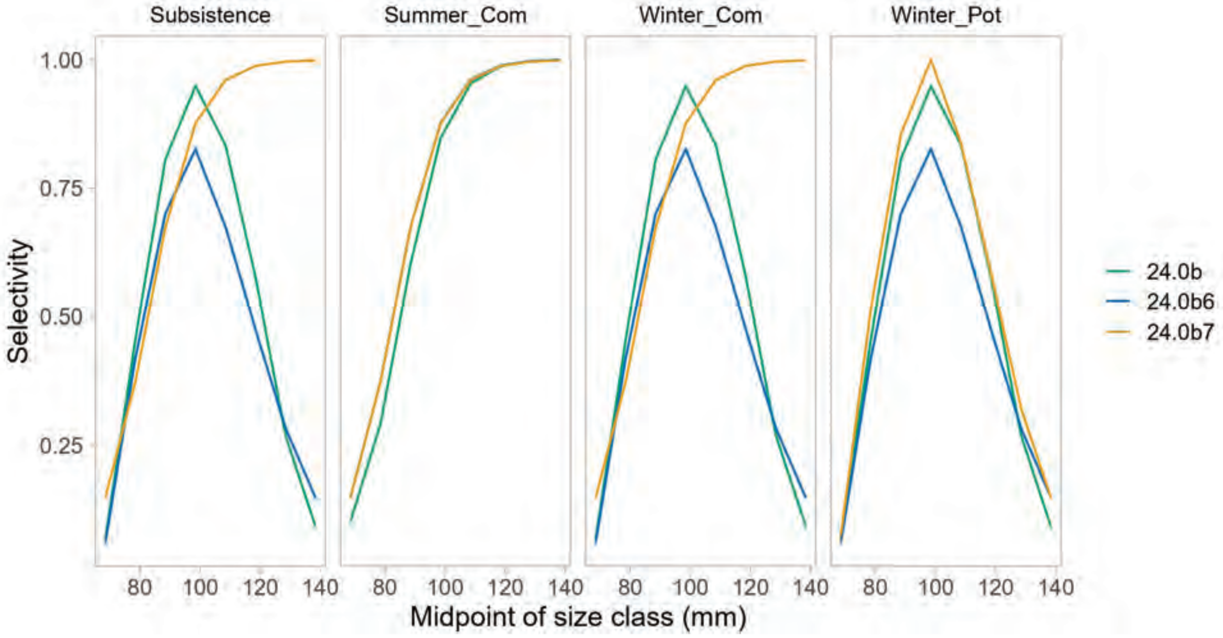

Figure 106: Comparisons of estimated fishery capture selectivities in the summer commercial, winter commercial, and winter subsistence fisheries for models 24.0b, 24.0b6, and 24.0b7.

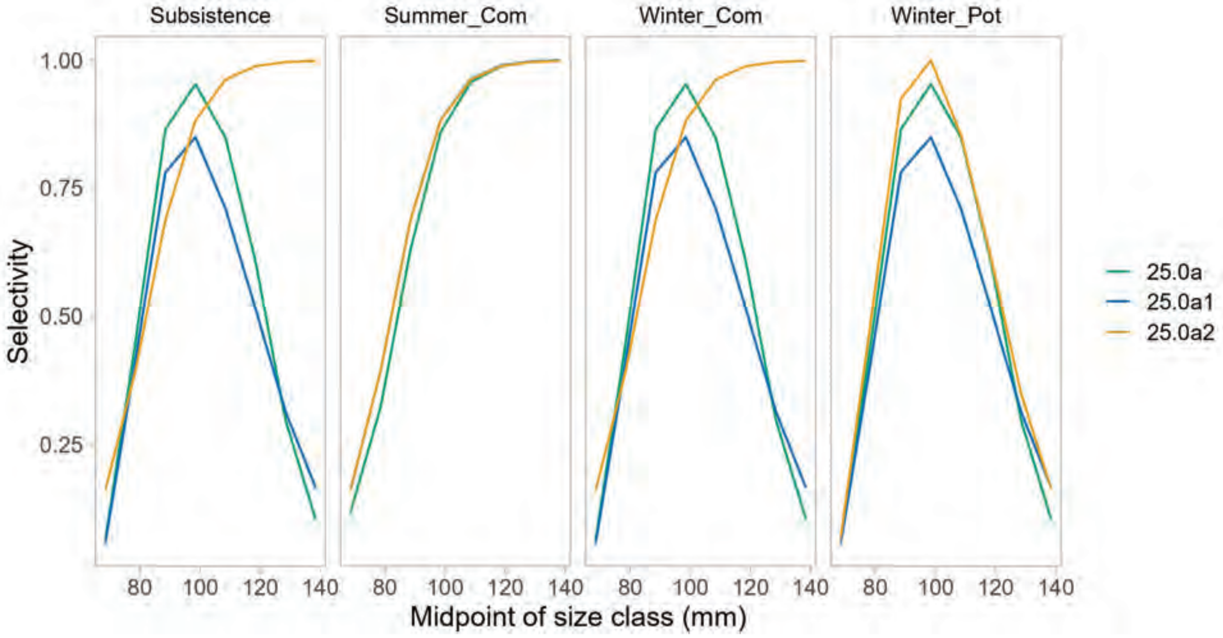

Figure 107: Comparisons of estimated fishery capture selectivities in the summer commercial, winter commercial, and winter subsistence fisheries for models 25.0a, 25.0a1, and 25.0a2.

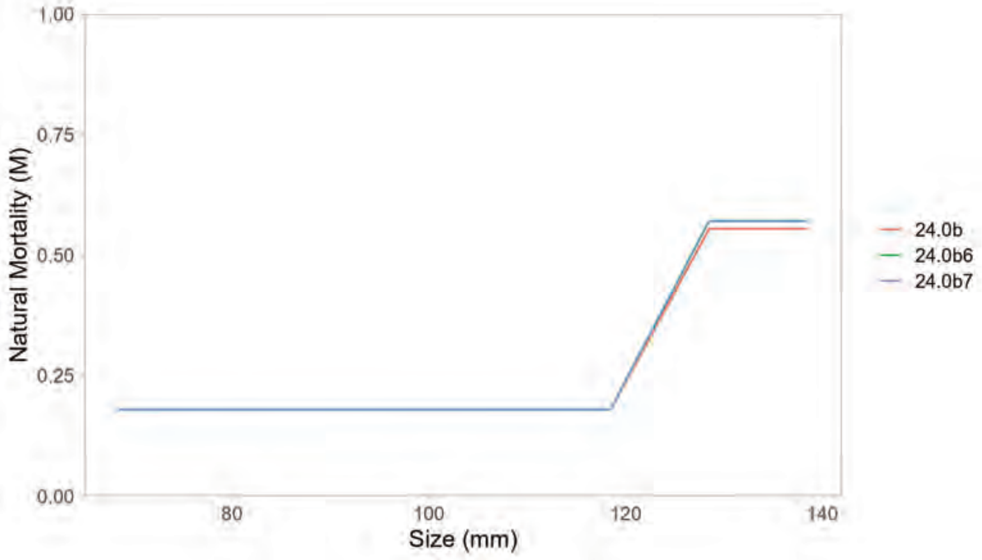

Figure 108: Natural mortality estimates for models 24.0b, 24.0b6, and 24.0b7.

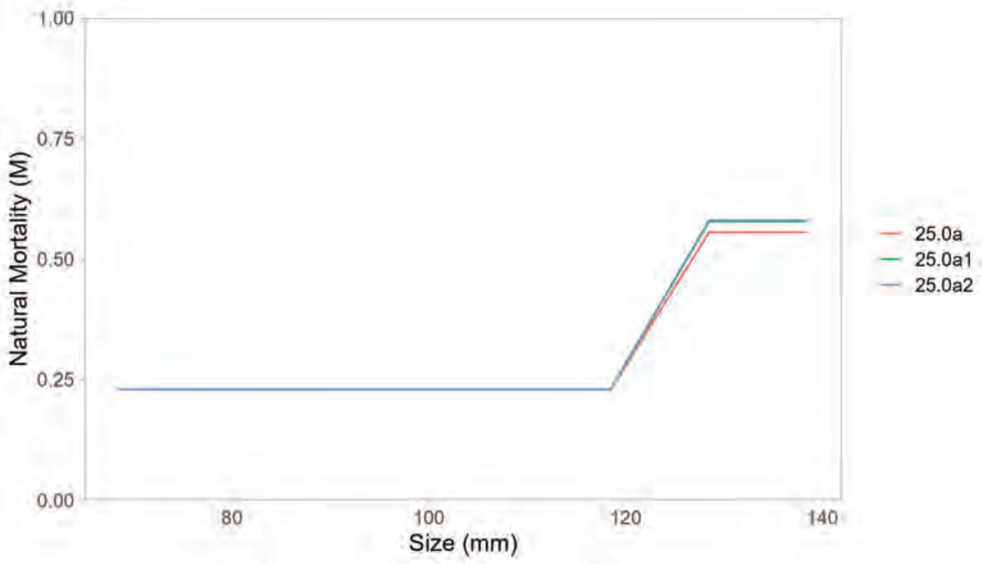

Figure 109: Natural mortality estimates for models 25.0a, 25.0a1, and 25.0a2.

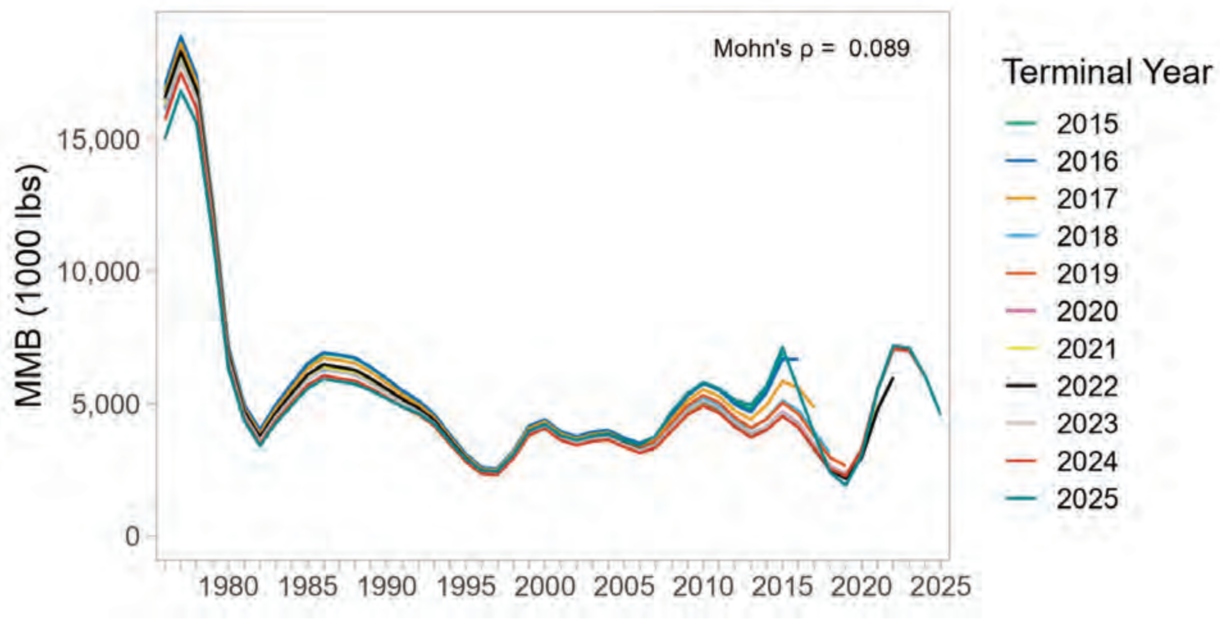

Figure 110: Retrospective patterns in estimated mature male biomass (MMB) for the base model, 24.0b.

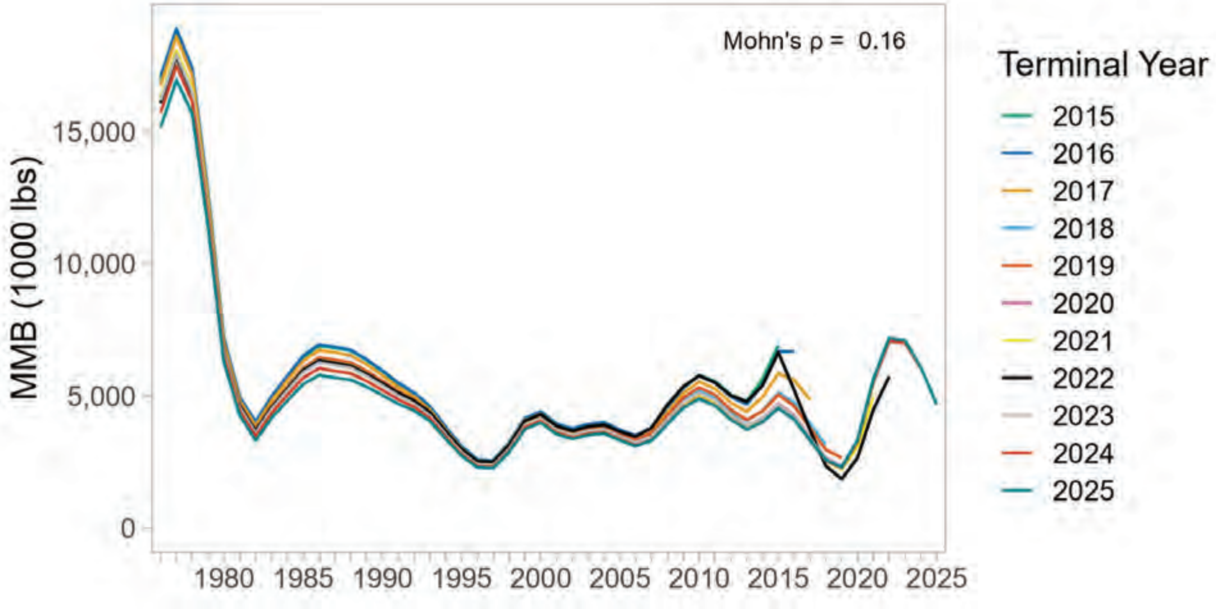

Figure 111: Retrospective patterns in estimated mature male biomass (MMB) for model 24.0b6, with an upper bound from BBRKC on the fishing mortality rate for the winter commercial fishery.

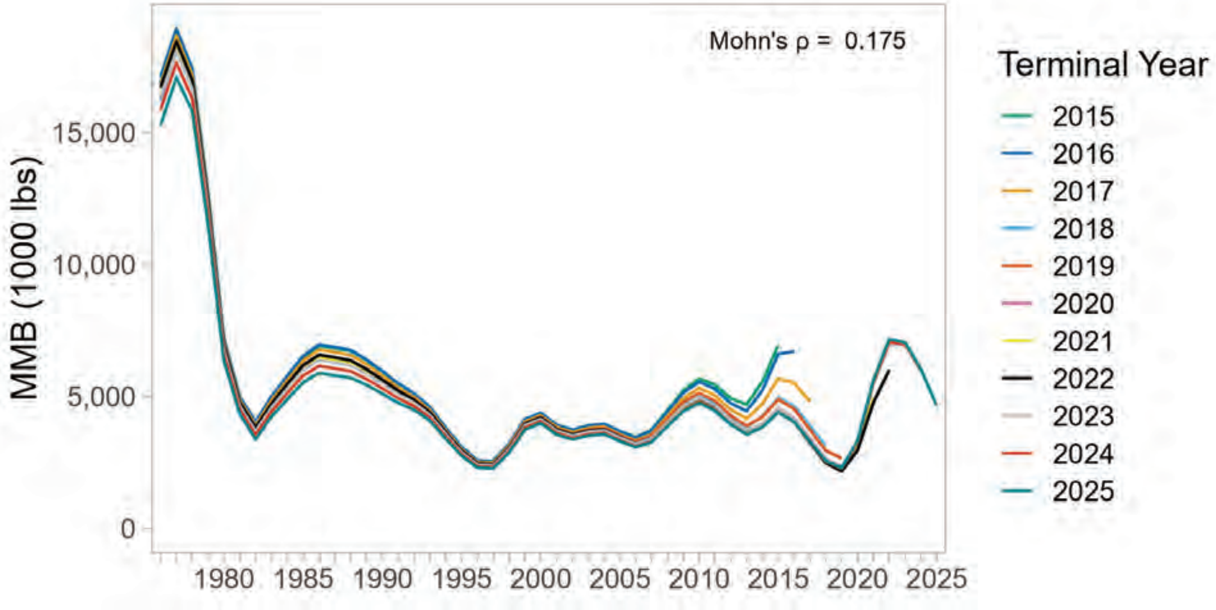

Figure 112: Retrospective patterns in estimated mature male biomass (MMB) for model 24.0b7, with selectivity for the winter commercial fishery and subsistence fishery sharing parameters with the summer commercial fishery selectivity.

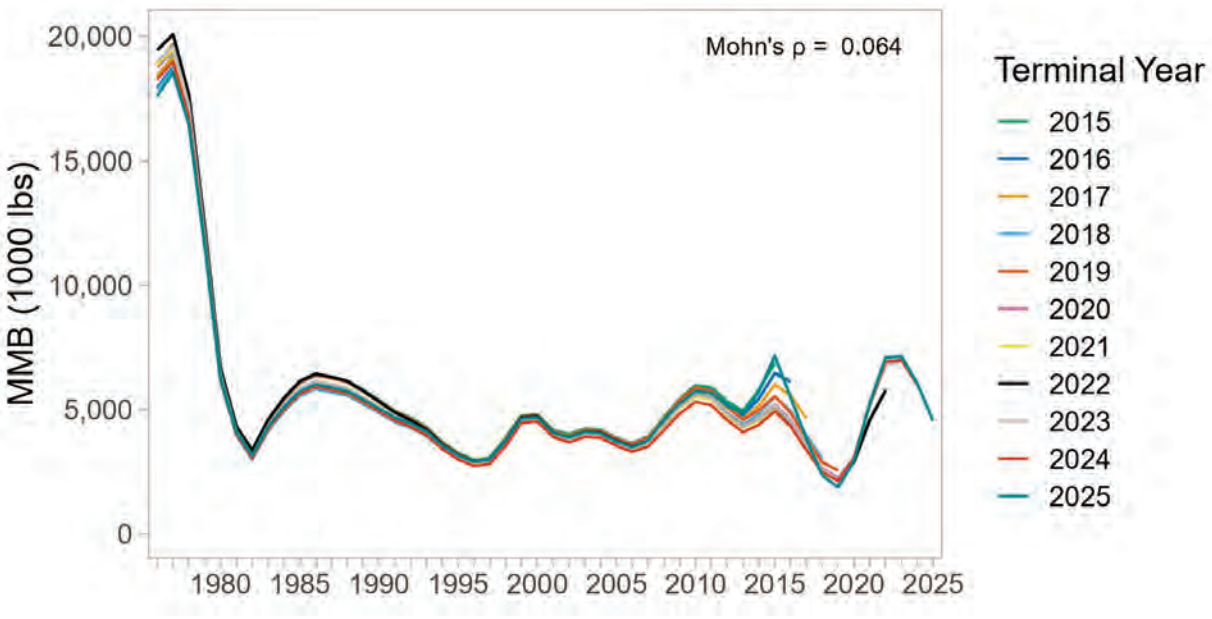

Figure 113: Retrospective patterns in estimated mature male biomass (MMB) for model 25.0a, with shell condition removed and natural mortality for small males fixed at M = 0.23.

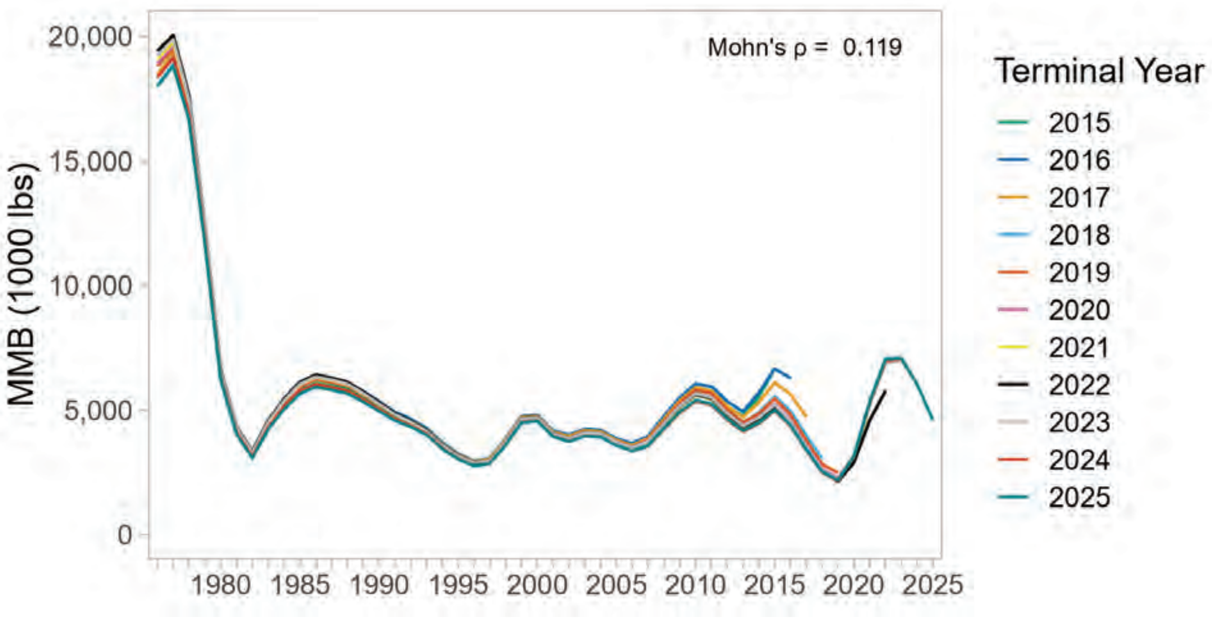

Figure 114: Retrospective patterns in estimated mature male biomass (MMB) for model 25.0a1, with an upper bound from BBRKC on the fishing mortality rate for the winter commercial fishery.

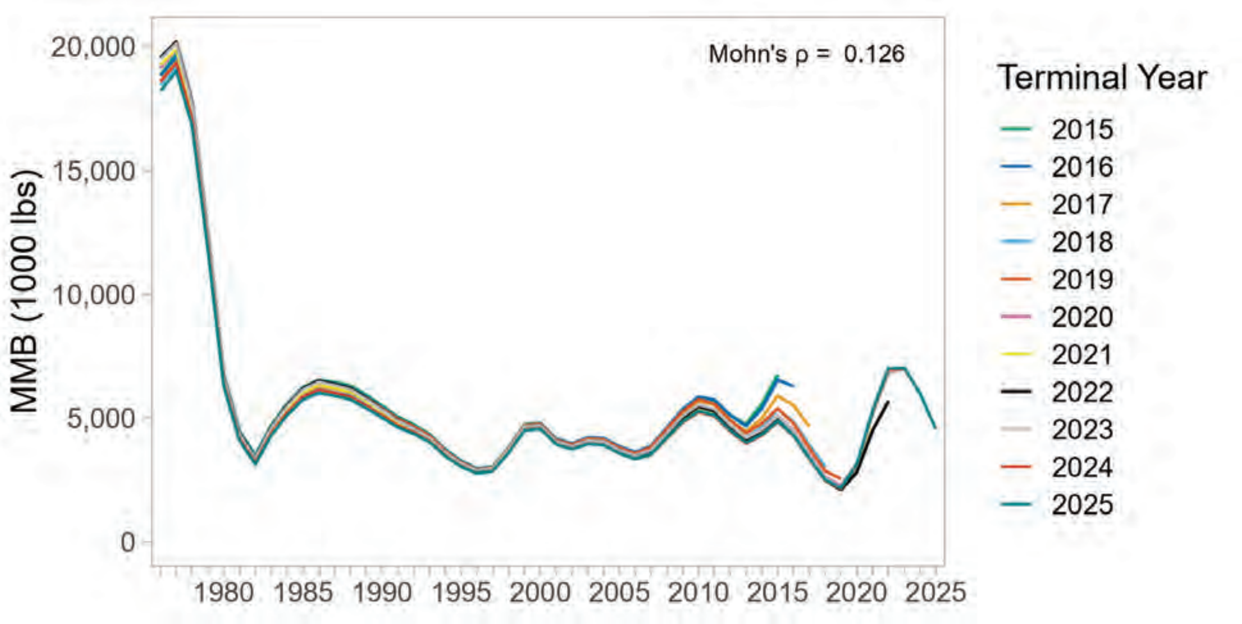

Figure 115: Retrospective patterns in estimated mature male biomass (MMB) for model 25.0a2, with selectivity for the winter commercial fishery and subsistence fishery sharing parameters with the summer commercial fishery selectivity.

Norton Sound red king crab stock assessment

Appendix A: History of Acceptable Biological Catch buffers and buffer justifications for the Norton Sound red king crab stock

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November 2025

Table 1: History of Acceptable Biological Catch (ABC) buffers and buffer justifications for the Norton Sound red king crab stock. Source: Crab Stock Assessment and Fishery Evaluation (SAFE) Report Introductions, https://www.npfmc.org/library/safe-reports/.

Year	ABC buffer	Justifications
2020	30%	- very low fishery catch per unit effort (CPUE) - unusually large numbers of old-shell males in the fishery
2021	40%	- status of the stock (few legal males in the system) - Overfishing limit based on legal crab rather than retained size of crab
2022	40%	- natural mortality and size-at-maturity are borrowed from other stocks - impact of seasonal movement on survey estimates - uncertainty in stock vs. survey areas - shortage of discard data on which to base estimates of total catch mortality - absence of standardized CPUE for 2020 and 2021 - discrepancies in Alaska Department of Fish & Game and National Oceanic and Atmospheric Administration Northern Bering Sea survey estimates - some parameters at bounds - overestimation of proportion of large crab - very high natural mortality in largest size class - retrospective patterns - new information on barren females in surveys not presented
2023	30%	- same justifications as for 2022 with the exception of the concern about information on barren females, which was not mentioned in 2023
2024	30%	- natural mortality and size-at-maturity are borrowed from other stocks - impact of seasonal movement on survey estimates - uncertainty in stock vs. survey areas - lack of information about discards - overestimation of the abundance of the largest male crab - use of a higher natural mortality value for larger males in order to correct for this overestimation rather than using a size-independent natural mortality - retrospective pattern in model-estimated mature male biomass

Norton Sound red king crab stock assessment

Appendix B: Risk table and ecosystem considerations for the Norton Sound red king crab stock

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November 2025

Introduction

In response to the requests from the SSC and CPT that stock assessment authors provide risk tables for all annually-assessed BSAI crab stocks, we present a draft risk table for the Norton Sound red king crab (NSRKC) stock. The following table was used to complete the draft risk table, with the CPT-proposed modification that levels 1, 2, and 3 correspond to “minimal to moderate concern”, “substantial concern”, and “extreme concern”, respectively.

The table is applied by evaluating the severity of four types of considerations that could be used to support a scientific recommendation to reduce the ABC from the maximum permissible. These considerations are stock assessment considerations, population dynamics considerations, environmental/ecosystem considerations, and fishery performance. Examples of the types of concerns that might be relevant include the following:

1. Assessment considerations:
    a. Data-inputs: biased ages, skipped surveys, lack of fishery-independent trend data
    b. Model fits: poor fits to fishery or survey data, inability to simultaneously fit multiple data inputs
    c. Model performance: poor model convergence, multiple minima in the likelihood surface, parameters hitting bounds
    d. Estimation uncertainty: poorly-estimated but influential year classes
    e. Retrospective bias in biomass estimates.
2. Population dynamics considerations: decreasing biomass trend, poor recent recruitment, inability of the stock to rebuild, abrupt increase or decrease in stock abundance.
3. Environmental/ecosystem considerations: adverse trends in environmental/ecosystem indicators, ecosystem model results, decreases in ecosystem productivity, decreases in prey abundance or availability, increases or increases in predator abundance or productivity.
4. Fishery performance: fishery CPUE is showing a contrasting pattern from the stock biomass trend, unusual spatial pattern of fishing, changes in the percent of TAC taken, changes in the duration of fishery openings.

For crab stocks, an additional consideration type is used: tier considerations, which captures uncertainty due to the stock tier level.

	Assessment-related considerations	Population dynamics considerations	Environmental/ ecosystem considerations	Fishery performance
Level 1: No concern	Typical to moderately increased uncertainty/minor unresolved issues in assessment	Stock trends are typical for the stock; recent recruitment is within normal range	No apparent environmental/ ecosystem concerns	No apparent fishery/resource-use performance and/or behavior concerns
Level 2: major concern	Major problems with the stock assessment; very poor fits to data; high level of uncertainty; strong retrospective bias	Stock trends are highly unusual; very rapid changes in stock abundance, or highly atypical recruitment patterns	Multiple indicators showing consistent adverse signals a) across the same trophic level as the stock, and/or b) up or down trophic levels (i.e., predators and prey of the stock)	Multiple indicators showing consistent adverse signals a) across different sectors, and/or b) different gear types
Level 3: extreme concern	Severe problems with the stock assessment; severe retrospective bias. Assessment considered unreliable	Stock trends are unprecedented; more rapid changes in stock abundance than have ever been seen previously, or a very long stretch of poor recruitment compared to previous patterns	Extreme anomalies in multiple ecosystem indicators that are highly likely to impact the stock; potential for cascading effects on other ecosystem components	Extreme anomalies in multiple performance indicators that are highly likely to impact the stock

Summary and ABC recommendations

An Ecosystem and Socioeconomic Profile (ESP) has not yet been created for NSRKC. The information on environmental/ecosystems conditions used in this table is derived from the September 2025 Eastern Bering Sea (EBS) Ecosystem Status Report (ESR) presentation (Siddon 2025), as the 2025 report is not yet available.

The following is a summary of the risk table for Norton Sound red king crab:

Assessment-related considerations	Population dynamics considerations	Environmental/ ecosystem considerations	Fishery performance considerations
Level 2: uncertainty in stock versus survey areas; lack of discard data; higher M for large males	Level 1: low recent recruitment	Level 1: corrosive bottom waters (pH < 7.8) in Norton Sound	Level 1: crab per pot lift down from 2024 and below time series mean

Overall, the level of concern is similar to that in the previous assessment. The authors recommend using a 30% ABC buffer for 2026 harvest specifications, as was used for 2025 harvest specifications.

Details

Assessment considerations:

Level 2: substantial concern. As noted in the ABC buffer justifications for 2022-2024, uncertainty exists about the overlap between the stock and survey areas. The ADF&G and NOAA NBS trawl survey abundance estimates that are used in the stock assessment model are calculated over a spatial area that encompasses much of the historical harvest but likely not the complete distribution of the stock, meaning that survey abundance estimates may not accurately capture stock abundance. Work on developing a model-based index that unites information from the ADF&G and NOAA NBS trawl surveys while predicting abundance over an area that better represents the stock distribution is ongoing (Stern 2025). Other recurring concerns for the assessment include the lack of information about discards in the directed fisheries due to lack of observers, and the use of a higher natural mortality value for larger males in order to correct for the model's overestimation of the abundance of the largest male crab.

Population dynamics considerations:

Level 1: minimal to moderate concern. Recruitment estimates for the most recent years are low relative to the historical time series: recruitment estimates for 2022, 2023, and 2024 were 27%, 32%, and 41% of the time series mean recruitment, respectively. The 2025 EBS ESR presentation documented evidence of corrosive bottom waters (pH < 7.8) in Norton Sound, which may impact the growth and survival of red king crab (Siddon 2025). However, analyses linking these patterns are currently lacking.

Environmental/ecosystem considerations:

Level 1: minimal to moderate concern. In general, there is a lack of a mechanistic understanding for the direct and indirect effects of ecosystem indicators on the survival and productivity of NSRKC. Relevant ecosystem indicator patterns documented in the 2025 EBS ESR presentation include sea surface temperatures in the Northern Bering Sea that were near average, bottom temperatures in Norton Sound that were similar to those measured in 2022 but warmer than in 2023, and corrosive bottom waters (pH < 7.8) in Norton Sound (Siddon 2025).

Fishery performance:

Level 1: minimal to moderate concern. Standardized catch-per-unit-effort (CPUE) of retained crab in the 2025 summer commercial fishery was down 57% from 2024, and was 22% below the time series mean. Total fishing mortality in 2025 was 369,426 lb, below the OFL (628,000 lb), ABC (440,000 lb), and GHL (410,000 lb).

Tier considerations:

NSRKC is a Tier 4 stock, and this tier placement indicates greater uncertainty associated with model outputs due to reduced data availability compared to the Tier 3 stocks.

Literature cited

Siddon E (2025) Eastern Bering Sea Ecosystem Status Report presentation. North Pacific Fishery Management Council, 1007 West 3rd Ave., Suite 400, Anchorage, Alaska 99501. PDF.

Stern CA (2025) Impacts of spatiotemporal index standardization on the stock assessment of Norton Sound red king crab. North Pacific Fishery Management Council, Anchorage, AK. PDF.

Norton Sound red king crab stock assessment

Appendix C: Model data and control files

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November 2025

Model 24.0b6 data file

```
#=======================================================================================================
# Gmacs Main  Data  File  NSRKC 2024 - Nov 2025 - used with GMACS version 2.20.20
# GEAR_INDEX   DESCRIPTION
#    1        : Winter Commercial Fishery Retained catch
#    2        : Winter Subsistence Fishery Retained catch
#    3        : Winter Subsistence Fishery Total catch
#    4        : Summer Commercial Fishery Retained catch
#    5        : Summer Commercial Fishery Total catch
#    6        : ADF&G Survey
#    7        : NMFS Survey
#    8        : Pot CPUE

# Fisheries:  1 Winter Pot Fishery, 2 Winter Subsistace, 3 Summer Pot Fishery
# Surveys:    4 NMFS Trawl Survey, 5 ADFG Trawl Survey, 6 NBS Trawl Survey, 7 Winter Pot survey
#=======================================================================================================

1976  # Start year
2025  # End year
#2025  # Projection year
7     # Number of seasons
7     # Number of distinct data groups (fleet, among fishing fleets and surveys)
1     # Number of sexes
2     # Number of shell condition types
1     # Number of maturity types
8     # Number of size-classes in the model
#6     # Season recruitment occurs
7     # Season recruitment occurs
#3     # Season molting and growth occurs
4     # Season molting and growth occurs
1     # Season to calculate SSB
1     # Season for N output
# maximum size-class (males then females)
8
# size_breaks (a vector giving the break points between size intervals with dimension nclass+1)
63.5    73.5    83.5    93.5    103.5   113.5   123.5   133.5   143.5
# Natural mortality per season input type (1 = vector by season, 2 = matrix by season/year)
2
# Proportion of the total natural mortality to be applied each season (each row must add to 1)
# 1. Winter Fishery (Feb01)
# 2. Mortality between winter and summer fishery
# 3. Summer fishery
# 4. Time between summer fishery and Nov 1 (Molt and recruit)
# 5. Time to Feb 01
# 6. Feb 01 recruit

0   0   0.3452055   0.1863014   0.1351932   0.3333  0 # 1976
0   0   0.3452055   0.1863014   0.1351932   0.3333  0 # 1977
```

```
0   0   0.3452055   0.1863014   0.1351932   0.3333  0 # 1978
0   0   0.4493151   0.04109589  0.176289    0.3333  0 # 1979
0   0   0.4493151   0.04109589  0.176289    0.3333  0 # 1980
0   0   0.4493151   0.1013699   0.1160151   0.3333  0 # 1981
0   0   0.5150685   0.06027397  0.09135753  0.3333  0 # 1982
0   0   0.4931507   0.0109589   0.1625904   0.3333  0 # 1983
0   0   0.4931507   0.03835616  0.1351932   0.3333  0 # 1984
0   0   0.4931507   0.06027397  0.1132753   0.3333  0 # 1985
0   0   0.4931507   0.06575342  0.1077959   0.3333  0 # 1986
0   0   0.4931507   0.03013699  0.1434123   0.3333  0 # 1987
0   0   0.4931507   0.02739726  0.1461521   0.3333  0 # 1988
0   0   0.4931507   0.008219178 0.1653301   0.3333  0 # 1989
0   0   0.4931507   0.0109589   0.1625904   0.3333  0 # 1990
0   0   0.4931507   0.0109589   0.1625904   0.3333  0 # 1991
0   0   0.4931507   0.005479452 0.1680699   0.3333  0 # 1992
0   0   0.4109589   0.1561644   0.09957671  0.3333  0 # 1993
0   0   0.4109589   0.07945205  0.176289    0.3333  0 # 1994
0   0   0.4109589   0.1643836   0.09135753  0.3333  0 # 1995
0   0   0.4109589   0.169863    0.08587808  0.3333  0 # 1996
0   0   0.4109589   0.1150685   0.1406726   0.3333  0 # 1997
0   0   0.4109589   0.169863    0.08587808  0.3333  0 # 1998
0   0   0.4109589   0.1726027   0.08313836  0.3333  0 # 1999
0   0   0.4109589   0.2410959   0.01464521  0.3333  0 # 2000
0   0   0.4109589   0.1863014   0.06943973  0.3333  0 # 2001
0   0   0.3671233   0.2136986   0.08587808  0.3333  0 # 2002
0   0   0.3671233   0.1890411   0.1105356   0.3333  0 # 2003
0   0   0.3671233   0.1452055   0.1543712   0.3333  0 # 2004
0   0   0.3671233   0.1972603   0.1023164   0.3333  0 # 2005
0   0   0.3671233   0.1835616   0.1160151   0.3333  0 # 2006
0   0   0.3671233   0.169863    0.1297137   0.3333  0 # 2007
0   0   0.3890411   0.1917808   0.08587808  0.3333  0 # 2008
0   0   0.3671233   0.260274    0.03930274  0.3333  0 # 2009
0   0   0.4027397   0.1534247   0.1105356   0.3333  0 # 2010
0   0   0.4027397   0.08767123  0.176289    0.3333  0 # 2011
0   0   0.4054795   0.1890411   0.07217945  0.3333  0 # 2012
0   0   0.4164384   0.1945205   0.0557411   0.3333  0 # 2013
0   0   0.3945205   0.1369863   0.1351932   0.3333  0 # 2014
0   0   0.4054795   0.06849315  0.1927274   0.3333  0 # 2015
0   0   0.4000000   0.06575342  0.2009466   0.3333  0 # 2016
0   0   0.3972603   0.07945205  0.1899877   0.3333  0 # 2017
0   0   0.3917808   0.09589041  0.1790288   0.3333  0 # 2018
0   0   0.3945205   0.1643836   0.1077959   0.3333  0 # 2019
0   0   0.3945205   0.1643836   0.1077959   0.3333  0 # 2020
0   0   0.3945205   0.1643836   0.1077959   0.3333  0 # 2021
0   0   0.3671233   0.109589    0.189987    0.3333  0 # 2022
0   0   0.3835616   0.07671233  0.206426    0.3333  0 # 2023
0   0   0.3643836   0.07945205  0.2228644   0.3333  0 # 2024
0   0   0.4036036   0.097297297  0.1657658  0.333333  0 #   2025 # is this order correct?

# Fishing fleet names (delimited with : no spaces in names)
Winter_Com Subsistence Summer_Com
# Survey names (delimited with : no spaces in names)
NMFS_Trawl ADFG_Trawl NBS_Trawl Winter_Pot
# Are the seasons instantaneous (0) or continuous (1)
1 1 1 1 1 1 1
# Use Old format (0)
0
# Number  of  catch data  frames
 4
# Number  of  rows  in  each  data  frame
 47  48  42 46
##  CATCH DATA
##  Type of catch: 1 = retained, 2 = discard
##  Units of catch: 1 = biomass, 2 = numbers

##      Winter commercial
# year  seas    fleet   sex     obs     cv      type    units   mult    effort  discard_mortality
1978    2   1   1   9.625   0.03    1   2   1   0   0.2
1979    2   1   1   0.221   0.03    1   2   1   0   0.2
1980    2   1   1   0.022   0.03    1   2   1   0   0.2
#1981   2   1   1   0   0.03    1   2   1   0   0.2
1982    2   1   1   0.017   0.03    1   2   1   0   0.2
```

```
1983    2   1   1   0.549   0.03    1   2   1   0   0.2
1984    2   1   1   0.856   0.03    1   2   1   0   0.2
1985    2   1   1   1.168   0.03    1   2   1   0   0.2
1986    2   1   1   2.168   0.03    1   2   1   0   0.2
1987    2   1   1   1.04    0.03    1   2   1   0   0.2
1988    2   1   1   0.425   0.03    1   2   1   0   0.2
1989    2   1   1   0.403   0.03    1   2   1   0   0.2
1990    2   1   1   3.626   0.03    1   2   1   0   0.2
1991    2   1   1   3.8 0.03    1   2   1   0   0.2
1992    2   1   1   7.478   0.03    1   2   1   0   0.2
1993    2   1   1   1.788   0.03    1   2   1   0   0.2
1994    2   1   1   5.753   0.03    1   2   1   0   0.2
1995    2   1   1   7.538   0.03    1   2   1   0   0.2
1996    2   1   1   1.778   0.03    1   2   1   0   0.2
1997    2   1   1   0.083   0.03    1   2   1   0   0.2
1998    2   1   1   0.984   0.03    1   2   1   0   0.2
1999    2   1   1   2.714   0.03    1   2   1   0   0.2
2000    2   1   1   3.045   0.03    1   2   1   0   0.2
2001    2   1   1   1.098   0.03    1   2   1   0   0.2
2002    2   1   1   2.591   0.03    1   2   1   0   0.2
2003    2   1   1   6.853   0.03    1   2   1   0   0.2
2004    2   1   1   0.522   0.03    1   2   1   0   0.2
2005    2   1   1   2.121   0.03    1   2   1   0   0.2
2006    2   1   1   0.075   0.03    1   2   1   0   0.2
2007    2   1   1   3.313   0.03    1   2   1   0   0.2
2008    2   1   1   5.796   0.03    1   2   1   0   0.2
2009    2   1   1   4.951   0.03    1   2   1   0   0.2
2010    2   1   1   4.834   0.03    1   2   1   0   0.2
2011    2   1   1   3.365   0.03    1   2   1   0   0.2
2012    2   1   1   9.157   0.03    1   2   1   0   0.2
2013    2   1   1   22.639  0.03    1   2   1   0   0.2
2014    2   1   1   14.986  0.03    1   2   1   0   0.2
2015    2   1   1   41.046  0.03    1   2   1   0   0.2
2016    2   1   1   29.792  0.03    1   2   1   0   0.2
2017    2   1   1   26.008  0.03    1   2   1   0   0.2
2018    2   1   1   9.18    0.03    1   2   1   0   0.2
2019    2   1   1   1.05    0.03    1   2   1   0   0.2
2020    2   1   1   0.08    0.03    1   2   1   0   0.2
2021    2   1   1   0.32    0.03    1   2   1   0   0.2
2022    2   1   1   2.708   0.03    1   2   1   0   0.2
2023    2   1   1   3.580   0.03    1   2   1   0   0.2
2024    2   1   1   4.830   0.03    1   2   1   0   0.2
2025    2   1   1   2.657   0.03    1   2   1   0   0.2

#       Subsistence retained
1978    2   2   1   12.506  0.03    1   2   1   0   0.2
1979    2   2   1   0.224   0.03    1   2   1   0   0.2
1980    2   2   1   0.213   0.03    1   2   1   0   0.2
1981    2   2   1   0.36    0.03    1   2   1   0   0.2
1982    2   2   1   1.288   0.03    1   2   1   0   0.2
1983    2   2   1   10.432  0.03    1   2   1   0   0.2
1984    2   2   1   11.22   0.03    1   2   1   0   0.2
1985    2   2   1   8.377   0.03    1   2   1   0   0.2
1986    2   2   1   7.052   0.03    1   2   1   0   0.2
1987    2   2   1   5.772   0.03    1   2   1   0   0.2
1988    2   2   1   2.724   0.03    1   2   1   0   0.2
1989    2   2   1   6.126   0.03    1   2   1   0   0.2
1990    2   2   1   12.152  0.03    1   2   1   0   0.2
1991    2   2   1   7.366   0.03    1   2   1   0   0.2
1992    2   2   1   11.736  0.03    1   2   1   0   0.2
1993    2   2   1   1.097   0.03    1   2   1   0   0.2
1994    2   2   1   4.113   0.03    1   2   1   0   0.2
1995    2   2   1   5.426   0.03    1   2   1   0   0.2
1996    2   2   1   1.679   0.03    1   2   1   0   0.2
1997    2   2   1   0.745   0.03    1   2   1   0   0.2
1998    2   2   1   8.622   0.03    1   2   1   0   0.2
1999    2   2   1   7.533   0.03    1   2   1   0   0.2
2000    2   2   1   5.723   0.03    1   2   1   0   0.2
2001    2   2   1   0.256   0.03    1   2   1   0   0.2
2002    2   2   1   2.177   0.03    1   2   1   0   0.2
2003    2   2   1   4.14    0.03    1   2   1   0   0.2
2004    2   2   1   1.181   0.03    1   2   1   0   0.2
```

```
2005    2   2   1   3.973   0.03    1   2   1   0   0.2
2006    2   2   1   1.239   0.03    1   2   1   0   0.2
2007    2   2   1   10.69   0.03    1   2   1   0   0.2
2008    2   2   1   9.485   0.03    1   2   1   0   0.2
2009    2   2   1   4.752   0.03    1   2   1   0   0.2
2010    2   2   1   7.044   0.03    1   2   1   0   0.2
2011    2   2   1   6.64    0.03    1   2   1   0   0.2
2012    2   2   1   7.311   0.03    1   2   1   0   0.2
2013    2   2   1   7.622   0.03    1   2   1   0   0.2
2014    2   2   1   3.252   0.03    1   2   1   0   0.2
2015    2   2   1   7.651   0.03    1   2   1   0   0.2
2016    2   2   1   5.34    0.03    1   2   1   0   0.2
2017    2   2   1   6.039   0.03    1   2   1   0   0.2
2018    2   2   1   4.424   0.03    1   2   1   0   0.2
2019    2   2   1   1.54    0.03    1   2   1   0   0.2
2020    2   2   1   0.55    0.03    1   2   1   0   0.2
2021    2   2   1   2.892   0.03    1   2   1   0   0.2
2022    2   2   1   7.630   0.03    1   2   1   0   0.2
2023    2   2   1   5.407   0.03    1   2   1   0   0.2
2024    2   2   1   4.751   0.03    1   2   1   0   0.2
2025    2   2   1   1.897   0.03    1   2   1   0   0.2

# Subsistence total
#1978   2   2   1   0       0.03    0   2   1   0   0.2
#1979   2   2   1   0       0.03    0   2   1   0   0.2
#1980   2   2   1   0       0.03    0   2   1   0   0.2
#1981   2   2   1   0       0.03    0   2   1   0   0.2
#1982   2   2   1   0       0.03    0   2   1   0   0.2
#1983   2   2   1   0       0.03    0   2   1   0   0.2
1984    2   2   1   15.923  0.03    0   2   1   0   0.2
1985    2   2   1   10.757  0.03    0   2   1   0   0.2
1986    2   2   1   10.751  0.03    0   2   1   0   0.2
1987    2   2   1   7.406   0.03    0   2   1   0   0.2
1988    2   2   1   3.573   0.03    0   2   1   0   0.2
1989    2   2   1   7.945   0.03    0   2   1   0   0.2
1990    2   2   1   16.635  0.03    0   2   1   0   0.2
1991    2   2   1   9.295   0.03    0   2   1   0   0.2
1992    2   2   1   15.051  0.03    0   2   1   0   0.2
1993    2   2   1   1.193   0.03    0   2   1   0   0.2
1994    2   2   1   4.894   0.03    0   2   1   0   0.2
1995    2   2   1   7.777   0.03    0   2   1   0   0.2
1996    2   2   1   2.936   0.03    0   2   1   0   0.2
1997    2   2   1   1.617   0.03    0   2   1   0   0.2
1998    2   2   1   20.327  0.03    0   2   1   0   0.2
1999    2   2   1   10.651  0.03    0   2   1   0   0.2
2000    2   2   1   9.816   0.03    0   2   1   0   0.2
2001    2   2   1   0.366   0.03    0   2   1   0   0.2
2002    2   2   1   5.119   0.03    0   2   1   0   0.2
2003    2   2   1   9.052   0.03    0   2   1   0   0.2
2004    2   2   1   1.775   0.03    0   2   1   0   0.2
2005    2   2   1   6.484   0.03    0   2   1   0   0.2
2006    2   2   1   2.083   0.03    0   2   1   0   0.2
2007    2   2   1   21.444  0.03    0   2   1   0   0.2
2008    2   2   1   18.621  0.03    0   2   1   0   0.2
2009    2   2   1   6.971   0.03    0   2   1   0   0.2
2010    2   2   1   9.004   0.03    0   2   1   0   0.2
2011    2   2   1   9.183   0.03    0   2   1   0   0.2
2012    2   2   1   11.341  0.03    0   2   1   0   0.2
2013    2   2   1   21.524  0.03    0   2   1   0   0.2
2014    2   2   1   5.421   0.03    0   2   1   0   0.2
2015    2   2   1   9.84    0.03    0   2   1   0   0.2
2016    2   2   1   6.468   0.03    0   2   1   0   0.2
2017    2   2   1   7.185   0.03    0   2   1   0   0.2
2018    2   2   1   5.767   0.03    0   2   1   0   0.2
2019    2   2   1   2.079   0.03    0   2   1   0   0.2
2020    2   2   1   0.815   0.03    0   2   1   0   0.2
2021    2   2   1   3.999   0.03    0   2   1   0   0.2
2022    2   2   1   10.041  0.03    0   2   1   0   0.2
2023    2   2   1   6.613   0.03    0   2   1   0   0.2
2024    2   2   1   5.9879  0.03    0   2   1   0   0.2
2025    2   2   1   2.239   0.03    0   2   1   0   0.2
```

```
# Summer Commercial Retain
1977    4   3   1   195.877 0.03    1   2   1   0   0.2
1978    4   3   1   660.829 0.03    1   2   1   0   0.2
1979    4   3   1   970.962 0.03    1   2   1   0   0.2
1980    4   3   1   329.778 0.03    1   2   1   0   0.2
1981    4   3   1   376.313 0.03    1   2   1   0   0.2
1982    4   3   1   63.949  0.03    1   2   1   0   0.2
1983    4   3   1   132.205 0.03    1   2   1   0   0.2
1984    4   3   1   139.759 0.03    1   2   1   0   0.2
1985    4   3   1   146.669 0.03    1   2   1   0   0.2
1986    4   3   1   162.438 0.03    1   2   1   0   0.2
1987    4   3   1   103.338 0.03    1   2   1   0   0.2
1988    4   3   1   76.148  0.03    1   2   1   0   0.2
1989    4   3   1   79.116  0.03    1   2   1   0   0.2
1990    4   3   1   59.132  0.03    1   2   1   0   0.2
#1991   4   3   1   0   0.03    1   2   1   0   0.2
1992    4   3   1   24.902  0.03    1   2   1   0   0.2
1993    4   3   1   115.913 0.03    1   2   1   0   0.2
1994    4   3   1   108.824 0.03    1   2   1   0   0.2
1995    4   3   1   105.967 0.03    1   2   1   0   0.2
1996    4   3   1   74.752  0.03    1   2   1   0   0.2
1997    4   3   1   32.606  0.03    1   2   1   0   0.2
1998    4   3   1   10.661  0.03    1   2   1   0   0.2
1999    4   3   1   8.734   0.03    1   2   1   0   0.2
2000    4   3   1   111.728 0.03    1   2   1   0   0.2
2001    4   3   1   98.321  0.03    1   2   1   0   0.2
2002    4   3   1   86.666  0.03    1   2   1   0   0.2
2003    4   3   1   93.638  0.03    1   2   1   0   0.2
2004    4   3   1   120.289 0.03    1   2   1   0   0.2
2005    4   3   1   138.926 0.03    1   2   1   0   0.2
2006    4   3   1   150.358 0.03    1   2   1   0   0.2
2007    4   3   1   110.344 0.03    1   2   1   0   0.2
2008    4   3   1   143.337 0.03    1   2   1   0   0.2
2009    4   3   1   143.485 0.03    1   2   1   0   0.2
2010    4   3   1   149.822 0.03    1   2   1   0   0.2
2011    4   3   1   141.626 0.03    1   2   1   0   0.2
2012    4   3   1   161.113 0.03    1   2   1   0   0.2
2013    4   3   1   130.603 0.03    1   2   1   0   0.2
2014    4   3   1   129.656 0.03    1   2   1   0   0.2
2015    4   3   1   144.225 0.03    1   2   1   0   0.2
2016    4   3   1   138.997 0.03    1   2   1   0   0.2
2017    4   3   1   135.322 0.03    1   2   1   0   0.2
2018    4   3   1   89.613  0.03    1   2   1   0   0.2
2019    4   3   1   23.964  0.03    1   2   1   0   0.2
#2020   4   3   1   0   0.03    1   2   1   0   0.2
#2021   4   3   1   0   0.03    1   2   1   0   0.2
2022    4   3   1   125.042 0.03    1   2   1   0   0.2
2023    4   3   1   148.062 0.03    1   2   1   0   0.2
2024    4   3   1   140.379 0.03    1   2   1   0   0.2
2025    4   3   1   100.758 0.03    1   2   1   0   0.2

##  RELATIVE  ABUNDANCE DATA
##  Units of abundance: 1 = biomass, 2 = numbers
## Use old format (0)
0
##  Number  of  relative  abundance indicies
6
# Type of ’survey’ catchability (1=Selectivity; 2=Selectivity+Retention), by data frame
1 1 1 2 2 2
##  Number  of  rows  in    index
73
# ADFG/NOAA Trawl survey
#Index  Year    Season  Fleet   Sex Maturity    Value   CV  Type    Time
1   1976    4   4   1   0   4247.462    0.311   2   1.411765
1   1979    4   4   1   0   1417.215    0.204   2   1
1   1982    4   4   1   0   2791.733    0.289   2   1.318182
1   1985    4   4   1   0   2306.321    0.254   2   2.363636
1   1988    4   4   1   0   2263.353    0.288   2   2.2
1   1991    4   4   1   0   3132.508    0.428   2   6.25

#   ADFG    Trawl survey
2   1996    4   5   1   0   1313.757    0.259   2   0.6612903
```

```
2   1999    4   5   1   0   2630.53     0.236   2   0.4920635
2   2002    4   5   1   0   1769.85     0.418   2   0.5897436
2   2006    4   5   1   0   3322.53     0.391   2   0.6865672
2   2008    4   5   1   0   2962.1      0.30    2   0.5571429
2   2011    4   5   1   0   3209.285    0.289   2   1.03125
2   2014    4   5   1   0   5949.46     0.473   2   0.58
2   2017    4   5   1   0   1762.072    0.223   2   1.241379
2   2018    4   5   1   0   1109.39     0.249   2   0.8857143
2   2019    4   5   1   0   4675.99     0.598   2   0.4666667
2   2020    4   5   1   0   1725.99     0.298   2   0.7
2   2021    4   5   1   0   2430.44     0.608   2   0.5166667
2   2023    4   5   1   0   3548.08     0.315   2   1.214286
2   2024    4   5   1   0   1407.401    0.281   2   1.413793


#   NOAA    NBS survey
3   2010    4   6   1   0   1980.079    0.436   2   0.6071429
3   2017    4   6   1   0   864.497     0.467   2   1.965517
3   2019    4   6   1   0   2071.94     0.346   2   0.5882353
3   2021    4   6   1   0   2338.06     0.441   2   0.6666667
3   2022    4   6   1   0   2103.02     0.363   2   0.6166667
3   2023    4   6   1   0   1686.34     0.391   2   1.3
3   2025    4   6   1   0   1632.63     0.636   2   1.3

#   ST  CPUE
4   1977    4   3   1   0   2.82    0.35    2   0.5
4   1978    4   3   1   0   3.41    0.23    2   0.5
4   1979    4   3   1   0   1.55    0.22    2   0.5
4   1980    4   3   1   0   1.82    0.28    2   0.5
4   1981    4   3   1   0   0.62    0.20    2   0.5
4   1982    4   3   1   0   0.18    0.27    2   0.5
4   1983    4   3   1   0   0.72    0.22    2   0.5
4   1984    4   3   1   0   1.11    0.23    2   0.5
4   1985    4   3   1   0   0.67    0.24    2   0.5
4   1986    4   3   1   0   1.63    0.52    2   0.5
4   1987    4   3   1   0   0.64    0.35    2   0.5
4   1988    4   3   1   0   1.60    0.71    2   0.5
4   1989    4   3   1   0   1.35    0.33    2   0.5
4   1990    4   3   1   0   1.06    0.45    2   0.5
4   1992    4   3   1   0   0.26    0.32    2   0.5
5   1993    4   3   1   0   1.02    0.09    2   0.5
5   1994    4   3   1   0   0.44    0.17    2   0.5
5   1995    4   3   1   0   1.09    0.13    2   0.5
5   1996    4   3   1   0   1.01    0.09    2   0.5
5   1997    4   3   1   0   1.14    0.09    2   0.5
5   1998    4   3   1   0   1.31    0.12    2   0.5
5   1999    4   3   1   0   0.97    0.10    2   0.5
5   2000    4   3   1   0   2.08    0.11    2   0.5
5   2001    4   3   1   0   0.76    0.25    2   0.5
5   2002    4   3   1   0   0.76    0.09    2   0.5
5   2003    4   3   1   0   1.65    0.08    2   0.5
5   2004    4   3   1   0   1.36    0.07    2   0.5
5   2005    4   3   1   0   0.64    0.12    2   0.5
5   2006    4   3   1   0   0.93    0.10    2   0.5
6   2007    4   3   1   0   0.88    0.22    2   0.5
6   2008    4   3   1   0   1.18    0.05    2   0.5
6   2009    4   3   1   0   0.81    0.04    2   0.5
6   2010    4   3   1   0   1.19    0.05    2   0.5
6   2011    4   3   1   0   1.36    0.05    2   0.5
6   2012    4   3   1   0   1.20    0.04    2   0.5
6   2013    4   3   1   0   0.62    0.04    2   0.5
6   2014    4   3   1   0   0.94    0.04    2   0.5
6   2015    4   3   1   0   1.17    0.05    2   0.5
6   2016    4   3   1   0   1.03    0.05    2   0.5
6   2017    4   3   1   0   0.88    0.05    2   0.5
6   2018    4   3   1   0   0.51    0.05    2   0.5
6   2019    4   3   1   0   0.24    0.06    2   0.5
6   2022    4   3   1   0   1.31    0.07    2   0.5
6   2023    4   3   1   0   2.00    0.07    2   0.5
6   2024    4   3   1   0   2.63    0.14    2   0.5
6   2025    4   3   1   0   0.90    0.10    2   0.5
```

```
## Use old format (0)
0
##  Number  of  length  frequency matrices
16
##  Number  of  rows  in  each  matrix
4 4 46 46 14 14 8 8 6 6 14 14 7 7 27 27
##  Number  of  bins  in  each  matrix  (columns  of  size  data)
8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
##  SIZE  COMPOSITION DATA  FOR ALL FLEETS
##  SIZE  COMP  LEGEND
##  Sex:  1 = male, 2 = female, 0 = both  sexes combined
##  Type  of  composition:  1 = retained, 2 = discard,  0 = total composition
##  Maturity  state:  1 = immature, 2 = mature, 0 = both  states  combined
##  Shell condition:  1 = new shell,  2 = old shell,  0 = both  shell types combined

##Winter        Com     Retain  newshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,       Nsamp,  DataVec
2015    2   1   1   1   1   0   10  0   0   0   43  287 138 35  3
2016    2   1   1   1   1   0   10  0   0   0   29  462 318 35  5
2017    2   1   1   1   1   0   10  0   0   0   1   110 162 71  9
2018    2   1   1   1   1   0   10  0   0   0   0   43  102 107 21

##Winter        Com     Retain  oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,       Nsamp,  DataVec
2015    2   1   1   1   2   0   10  0   0   0   6   23  17  17  7
2016    2   1   1   1   2   0   10  0   0   0   8   93  42  16  8
2017    2   1   1   1   2   0   10  0   0   0   1   42  101 32  11
2018    2   1   1   1   2   0   10  0   0   0   0   15  64  39  10

##Summer    Com Retain  newshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1977    4   3   1   1   1   0   10  0   0   0   5   650 530 119 70
1978    4   3   1   1   1   0   10  0   0   0   4   72  184 103 16
1979    4   3   1   1   1   0   10  0   0   0   42  386 636 425 109
1980    4   3   1   1   1   0   10  0   0   0   4   105 327 396 196
1981    4   3   1   1   1   0   10  0   0   0   7   131 275 502 406
1982    4   3   1   1   1   0   10  0   0   0   46  210 180 239 313
1983    4   3   1   1   1   0   10  0   0   0   31  331 287 51  27
1984    4   3   1   1   1   0   10  0   0   0   93  404 270 62  7
1985    4   3   1   1   1   0   10  0   0   1   173 840 1000    417 53
1986    4   3   1   1   1   0   10  0   0   0   33  405 448 134 20
1987    4   3   1   1   1   0   10  0   0   0   33  355 578 539 215
1988    4   3   1   1   1   0   10  0   1   0   36  305 457 274 58
1989    4   3   1   1   1   0   10  0   0   0   33  426 826 442 117
1990    4   3   1   1   1   0   10  0   0   0   19  185 447 331 88
#1991   4   3   1   1   1   0   10  0   0   0   0   0   0   0   0
1992    4   3   1   1   1   0   10  0   0   0   44  515 682 350 229
1993    4   3   1   1   1   0   10  0   0   0   253 4116    7013    4095    589
1994    4   3   1   1   1   0   10  0   0   0   10  38  33  28  8
1995    4   3   1   1   1   0   10  0   0   0   46  307 335 176 60
1996    4   3   1   1   1   0   10  0   0   0   25  176 188 74  37
1997    4   3   1   1   1   0   10  0   0   0   35  438 409 119 30
1998    4   3   1   1   1   0   10  0   0   0   30  246 256 85  28
1999    4   3   1   1   1   0   10  0   0   0   36  165 137 103 53
2000    4   3   1   1   1   0   10  0   0   0   334 5149    6743    1884    266
2001    4   3   1   1   1   0   10  0   0   0   487 4472    7394    4116    1455
2002    4   3   1   1   1   0   10  0   0   0   231 1222    1469    1316    382
2003    4   3   1   1   1   0   10  0   0   0   121 1923    1671    634 162
2004    4   3   1   1   1   0   10  0   0   0   84  3660    3727    1016    324
2005    4   3   1   1   1   0   10  0   0   0   12  1361    2524    860 117
2006    4   3   1   1   1   0   10  0   0   0   14  1222    2337    1168    167
2007    4   3   1   1   1   0   10  0   0   0   68  2189    2087    842 208
2008    4   3   1   1   1   0   10  0   0   0   27  2025    2004    322 63
2009    4   3   1   1   1   0   10  0   0   0   63  2076    1985    675 132
2010    4   3   1   1   1   0   10  0   0   0   31  2275    2135    586 60
2011    4   3   1   1   1   0   10  0   0   0   11  809 1013    294 60
2012    4   3   1   1   1   0   10  0   0   0   13  1224    2336    932 113
2013    4   3   1   1   1   0   10  0   0   0   27  1450    2253    1465    369
2014    4   3   1   1   1   0   10  0   0   0   40  1324    1105    866 335
2015    4   3   1   1   1   0   10  0   0   0   58  1987    1177    418 122
2016    4   3   1   1   1   0   10  0   0   0   5   392 731 247 48
```

```
2017    4   3   1   1   1   0   10  0   0   0   4   602 1341    728 86
2018    4   3   1   1   1   0   10  0   0   0   9   300 842 845 197
2019    4   3   1   1   1   0   10  0   0   0   10  364 260 151 29
#2020   4   3   1   1   1   0   10  0   0   0   0   0   0   0   0
#2021   4   3   1   1   1   0   10  0   0   0   0   0   0   0   0
2022    4   3   1   1   1   0   10  0   0   0   56  1375    892 96  5
2023    4   3   1   1   1   0   10  0   0   0   10  645 1027 331 25
2024    4   3   1   1   1   0   10  0   0   0   4   312 1008    833 184
2025    4   3   1   1   1   0   10  0   0   0   4   199 610 790 396

##Summer    Com Retain  oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1977    4   3   1   1   2   0   10  0   0   0   0   97  62  10  6
1978    4   3   1   1   2   0   10  0   0   0   0   2   4   3   1
1979    4   3   1   1   2   0   10  0   0   0   0   42  1   5   14
1980    4   3   1   1   2   0   10  0   0   0   0   3   12  17  8
1981    4   3   1   1   2   0   10  0   0   0   0   8   90  207 158
1982    4   3   1   1   2   0   10  0   0   0   4   14  24  33  30
1983    4   3   1   1   2   0   10  0   0   0   3   29  8   17  18
1984    4   3   1   1   2   0   10  0   0   0   10  63  47  6   1
1985    4   3   1   1   2   0   10  0   0   0   7   90  84  23  3
1986    4   3   1   1   2   0   10  0   0   0   2   23  43  27  3
1987    4   3   1   1   2   0   10  0   0   0   5   53  129 60  18
1988    4   3   1   1   2   0   10  0   0   0   9   98  148 107 29
1989    4   3   1   1   2   0   10  0   0   0   11  144 315 221 60
1990    4   3   1   1   2   0   10  0   0   0   1   48  95  61  14
#1991   4   3   1   1   2   0   10  0   0   0   0   0   0   0   0
1992    4   3   1   1   2   0   10  0   0   0   7   203 331 153 52
1993    4   3   1   1   2   0   10  0   0   0   7   308 778 512 133
1994    4   3   1   1   2   0   10  0   0   0   10  76  101 81  19
1995    4   3   1   1   2   0   10  0   0   0   9   57  87  75  15
1996    4   3   1   1   2   0   10  0   0   0   11  94  107 62  13
1997    4   3   1   1   2   0   10  0   0   0   4   67  50  32  14
1998    4   3   1   1   2   0   10  0   0   0   23  118 151 86  32
1999    4   3   1   1   2   0   10  0   0   0   1   13  27  25  2
2000    4   3   1   1   2   0   10  0   0   0   48  914 1125    609 141
2001    4   3   1   1   2   0   10  0   0   0   17  483 996 476 134
2002    4   3   1   1   2   0   10  0   0   0   24  147 219 165 44
2003    4   3   1   1   2   0   10  0   0   0   6   114 243 276 76
2004    4   3   1   1   2   0   10  0   0   0   4   245 333 143 70
2005    4   3   1   1   2   0   10  0   0   0   0   110 242 102 32
2006    4   3   1   1   2   0   10  0   0   0   2   334 922 464 77
2007    4   3   1   1   2   0   10  0   0   0   5   151 351 186 38
2008    4   3   1   1   2   0   10  0   0   0   8   516 535 204 62
2009    4   3   1   1   2   0   10  0   0   0   7   463 479 114 32
2010    4   3   1   1   2   0   10  0   0   0   11  322 322 136 24
2011    4   3   1   1   2   0   10  0   0   0   5   156 150 42  12
2012    4   3   1   1   2   0   10  0   0   0   1   131 214 79  13
2013    4   3   1   1   2   0   10  0   0   0   2   85  256 137 28
2014    4   3   1   1   2   0   10  0   0   0   1   193 405 336 77
2015    4   3   1   1   2   0   10  0   0   0   3   99  137 137 35
2016    4   3   1   1   2   0   10  0   0   0   2   27  36  45  10
2017    4   3   1   1   2   0   10  0   0   0   3   100 384 164 22
2018    4   3   1   1   2   0   10  0   0   0   0   23  197 196 50
2019    4   3   1   1   2   0   10  0   0   0   0   18  119 154 31
#2020   4   3   1   1   2   0   10  0   0   0   0   0   0   0   0
#2021   4   3   1   1   2   0   10  0   0   0   0   0   0   0   0
2022    4   3   1   1   2   0   10  0   0   0   20  359 149 24  5
2023    4   3   1   1   2   0   10  0   0   0   1   169 209 36  5
2024    4   3   1   1   2   0   10  0   0   0   0   59  178 96  12
2025    4   3   1   1   2   0   10  0   0   0   0   30  101 68  12

##Summer    Com Discards    newshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1987    4   3   1   2   1   0   10  69  216 367 379 37  0   0   0
1988    4   3   1   2   1   0   10  9   29  108 344 99  0   0   0
1989    4   3   1   2   1   0   10  71  193 242 216 25  0   0   0
1990    4   3   1   2   1   0   10  40  115 137 139 19  0   0   0
1992    4   3   1   2   1   0   10  65  99  173 171 19  0   0   0
1994    4   3   1   2   1   0   10  63  50  92  126 19  0   0   0
2012    4   3   1   2   1   0   10  242 137 195 313 97  9   0   0
2013    4   3   1   2   1   0   10  845 722 390 416 113 6   2   0
```

```
2014    4   3   1   2   1   0   10  79  175 460 724 207 14  4   0
2015    4   3   1   2   1   0   10  26  120 278 709 303 37  11  1
2016    4   3   1   2   1   0   10  19  22  71  215 71  7   0   0
2017    4   3   1   2   1   0   10  53  88  73  166 137 8   0   0
2018    4   3   1   2   1   0   10  52  91  189 160 12  0   0   0
2019    4   3   1   2   1   0   10  30  13  14  25  2   0   0   0

##Summer    Com Discards    oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1987    4   3   1   2   2   0   10  0   2   23  47  5   0   0   0
1988    4   3   1   2   2   0   10  2   8   23  69  31  0   0   0
1989    4   3   1   2   2   0   10  18  34  67  109 25  0   0   0
1990    4   3   1   2   2   0   10  8   9   10  27  3   0   0   0
1992    4   3   1   2   2   0   10  3   13  11  23  5   0   0   0
1994    4   3   1   2   2   0   10  61  63  128 205 43  0   0   0
2012    4   3   1   2   2   0   10  2   2   2   22  22  0   1   0
2013    4   3   1   2   2   0   10  2   1   1   7   2   2   0   0
2014    4   3   1   2   2   0   10  0   4   15  50  19  3   1   0
2015    4   3   1   2   2   0   10  0   0   2   24  17  6   1   4
2016    4   3   1   2   2   0   10  0   0   1   12  6   2   0   0
2017    4   3   1   2   2   0   10  2   2   3   2   7   0   0   0
2018    4   3   1   2   2   0   10  0   6   12  7   1   0   0   1
2019    4   3   1   2   2   0   10  0   0   1   8   1   0   0   0

##Summer    Com total   newshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
2012    4   3   1   0   1   0   10  242 137 195 339 385 437 150 19
2013    4   3   1   0   1   0   10  845 722 390 481 722 747 397 68
2014    4   3   1   0   1   0   10  79  175 460 754 782 419 296 115
2015    4   3   1   0   1   0   10  26  120 278 794 1177    440 162 48
2016    4   3   1   0   1   0   10  19  22  71  247 607 755 173 35
2017    4   3   1   0   1   0   10  53  88  73  168 514 894 496 63
2018    4   3   1   0   1   0   10  52  91  189 181 144 277 294 69
2019    4   3   1   0   1   0   10  30  13  14  30  20  11  2   1

##Summer    Com total   oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
2012    4   3   1   0   2   0   10  2   2   2   25  91  92  34  4
2013    4   3   1   0   2   0   10  2   1   1   8   55  103 43  12
2014    4   3   1   0   2   0   10  0   4   15  54  97  119 87  50
2015    4   3   1   0   2   0   10  0   0   2   27  54  42  32  13
2016    4   3   1   0   2   0   10  0   0   1   14  64  67  34  5
2017    4   3   1   0   2   0   10  2   2   3   3   64  186 86  20
2018    4   3   1   0   2   0   10  0   6   12  10  25  109 127 40
2019    4   3   1   0   2   0   10  0   0   1   9   25  34  34  12

##NMFS      Trawl   newshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1976    4   4   1   0   1   0   20  10  17  81  77  85  60  13  4
1979    4   4   1   0   1   0   20  3   2   1   4   10  11  6   2
1982    4   4   1   0   1   0   20  71  20  42  60  47  9   0   1
1985    4   4   1   0   1   0   20  29  20  28  18  29  9   5   1
1988    4   4   1   0   1   0   20  60  66  40  33  29  19  8   0
1991    4   4   1   0   1   0   20  66  26  6   10  20  11  4   2

##NMFS      Trawl   oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,       DataVec
1976    4   4   1   0   2   0   20  0   6   15  33  39  40  8   6
1979    4   4   1   0   2   0   20  3   1   2   8   30  88  42  7
1982    4   4   1   0   2   0   20  0   0   4   5   11  6   7   9
1985    4   4   1   0   2   0   20  0   0   0   6   16  27  16  4
1988    4   4   1   0   2   0   20  0   0   2   4   12  27  20  10
1991    4   4   1   0   2   0   20  9   19  8   26  53  47  31  6

#   ADFG    Trawl   Newshell
1996    4   5   1   0   1   0   20  78  58  35  24  16  1   1   2
1999    4   5   1   0   1   0   20  9   3   29  82  74  36  9   2
2002    4   5   1   0   1   0   20  23  29  33  28  4   8   6   2
2006    4   5   1   0   1   0   20  69  98  80  42  23  14  9   0
2008    4   5   1   0   1   0   20  34  42  58  31  27  8   5   2
2011    4   5   1   0   1   0   20  42  35  27  35  56  44  10  3
2014    4   5   1   0   1   0   20  30  57  91  69  36  6   5   3
```

```
2017    4   5   1   0   1   0   20  16  14  6   11  11  12  5   0
2018    4   5   1   0   1   0   20  27  7   8   2   1   2   3   1   # Was ‘14.6
2019    4   5   1   0   1   0   20  169 91  10  0   1   1   1   0
2020    4   5   1   0   1   0   20  14  24  33  7   6   2   0   0
2021    4   5   1   0   1   0   20  10  27  35  35  34  7   1   1
2023    4   5   1   0   1   0   20  0   1   8   21  48  50     16   1
2024    4   5   1   0   1   0   20  3   3   2   7   7   20     23   2

##  ADFG    Trawl   Oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1996    4   5   1   0   2   0   20  1   1   7   9   12  12  11  7
1999    4   5   1   0   2   0   20  0   0   1   8   14  11  5   0
2002    4   5   1   0   2   0   20  2   7   17  25  22  21  13  4
2006    4   5   1   0   2   0   20  0   0   0   6   14  14  3   1
2008    4   5   1   0   2   0   20  0   2   12  17  23  3   10  1
2011    4   5   1   0   2   0   20  0   1   4   7   27  14  10  0
2014    4   5   1   0   2   0   20  0   0   10  38  20  17  5   0
2017    4   5   1   0   2   0   20  1   2   2   2   8   21  5   0
2018    4   5   1   0   2   0   20  0   5   1   3   2   2   7   2
2019    4   5   1   0   2   0   20  1   1   4   6   4   7   9   2
2020    4   5   1   0   2   0   20  3   9   6   2   2   2   0   1
2021    4   5   1   0   2   0   20  0   0   2   0   3   1   1   1
2023    4   5   1   0   2   0   20  0   0   2   6   41  39  7   0
2024    4   5   1   0   2   0   20  0   0   0   0   5   16  3   2

##NOAA  NBS Trawl   newshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
2010    4   6   1   0   1   0   20  1   3   4   12  4   2   0   0
2017    4   6   1   0   1   0   20  5   6   8   3   3   3   3   2
2019    4   6   1   0   1   0   20  49  41  11  5   2   0   1   1
2021    4   6   1   0   1   0   20  4   13  17  13  8   2   0   0
2022    4   6   1   0   1   0   20  60  63  42  38  26  13  3   2
2023    4   6   1   0   1   0   20  1   3   5   6   12  9   4   1
2025    4   6   1   0   1   0   20  3   0   0   3   1   4   5   0

##NOAA  NBS Trawl   oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
2010    4   6   1   0   2   0   20  0   2   6   15  13  7   2   2
2017    4   6   1   0   2   0   20  2   0   2   3   2   11  3   2
2019    4   6   1   0   2   0   20  5   2   6   3   2   1   5   1
2021    4   6   1   0   2   0   20  1   4   9   5   5   1   0   0
2022    4   6   1   0   2   0   20  8   8   27  29  29  19  9   2
2023    4   6   1   0   2   0   20  0   0   1   6   14  13  3   0
2025    4   6   1   0   2   0   20  1   3   4   2   6   15  14  2

##Winter        Pot     Survey  newshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,       Nsamp,  DataVec
1982    2   7   1   0   1   0   10  0   72  164 154 50  14  12  0
1983    2   7   1   0   1   0   10  68  215.5   711.5   719 543 178 18  3.5
1984    2   7   1   0   1   0   10  23  271 433.5   379 248.5   99.5    9   0.5
1985    2   7   1   0   1   0   10  16  72  199 279.5   122.5   44  7   0.5
1986    2   7   1   0   1   0   10  25.5    72.5    102 145 115 49  7   0.5
1987    2   7   1   0   1   0   10  0   8   22  28  10  6   0   0
1989    2   7   1   0   1   0   10  8   66  74.5    66.5    95.5    86.5    17  0
1990    2   7   1   0   1   0   10  7   102.5   430 542 372 253 118 29.5
1991    2   7   1   0   1   0   10  2   16  118 366 343 123 13  1
1993    2   7   1   0   1   0   10  0   1   6   10  23  21  5   0
1995    2   7   1   0   1   0   10  8   49  68  84  219 199 61  11
1996    2   7   1   0   1   0   10  102 215 320 307 181 106 40  7
1997    2   7   1   0   1   0   10  28  85  87  44  58  45  21  4
1998    2   7   1   0   1   0   10  1   122 364 234 48  21  3   0
1999    2   7   1   0   1   0   10  6   25  152 464 469 109 17  3
2000    2   7   1   0   1   0   10  10  50  60  93  189 101 20  1
2002    2   7   1   0   1   0   10  45  244 215 137 53  52  32  7
2003    2   7   1   0   1   0   10  20  80  180 233 145 49  20  4
2004    2   7   1   0   1   0   10  0   5   48  77  94  42  4   0
2005    2   7   1   0   1   0   10  2   30  57  72  88  75  30  1
2006    2   7   1   0   1   0   10  2   72  116 107 80  28  10  1
2007    2   7   1   0   1   0   10  11  22  31  56  21  7   0   0
2008    2   7   1   0   1   0   10  50  514 884 596 513 234 24  4
2009    2   7   1   0   1   0   10  1   37  69  184 106 44  5   2
2010    2   7   1   0   1   0   10  4   27  74  124 141 65  10  1
```

```
2011    2   7   1   0   1   0   10  11  46  80  122 102 78  29  1
2012    2   7   1   0   1   0   10  17  76  154 128 82  85  27  3

##Winter        Pot     Survey  oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,       Nsamp,  DataVec
1982    2   7   1   0   2   0   10  0   36  82  79  29  11  14  2
1983    2   7   1   0   2   0   10  0   0   0   10  49  24.5    21.5    21
1984    2   7   1   0   2   0   10  0   0   1   29.5    107.5   54.5    11  9.5
1985    2   7   1   0   2   0   10  0   0   1   5   22.5    18.5    1   0
1986    2   7   1   0   2   0   10  0   0   2   8.5 34.5    25  7   0
1987    2   7   1   0   2   0   10  0   0   1   6   43  16  4   0
1989    2   7   1   0   2   0   10  0   0   0   1   26  42  16  1
1990    2   7   1   0   2   0   10  0   0   0   2   54.5    116 44  5.5
1991    2   7   1   0   2   0   10  0   0   0   5   34  149 92  21
1993    2   7   1   0   2   0   10  0   0   0   3   35  49  19  9
1995    2   7   1   0   2   0   10  0   1   0   3   28  61  53  13
1996    2   7   1   0   2   0   10  0   0   5   20  87  114 55  21
1997    2   7   1   0   2   0   10  0   0   0   0   7   10  5   4
1998    2   7   1   0   2   0   10  0   1   6   14  28  15  16  8
1999    2   7   1   0   2   0   10  0   0   0   13  29  9   8   3
2000    2   7   1   0   2   0   10  0   0   0   1   29  13  7   1
2002    2   7   1   0   2   0   10  5   4   7   6   4   12  4   1
2003    2   7   1   0   2   0   10  1   5   5   18  20  22  17  5
2004    2   7   1   0   2   0   10  0   0   3   5   6   4   6   2
2005    2   7   1   0   2   0   10  0   1   1   1   16  24  5   2
2006    2   7   1   0   2   0   10  0   4   5   9   22  38  15  3
2007    2   7   1   0   2   0   10  0   0   1   1   3   6   0   0
2008    2   7   1   0   2   0   10  22  148 239 120 118 53  28  5
2009    2   7   1   0   2   0   10  0   0   1   1   20  52  2   1
2010    2   7   1   0   2   0   10  0   0   4   33  58  31  5   1
2011    2   7   1   0   2   0   10  1   0   7   19  66  27  7   0
2012    2   7   1   0   2   0   10  0   2   2   6   35  35  21  2

##  Growth data (increment)
# Type of growth increment (0=no growth data;1=size-at-release; 2= size-class-at-release)
3
# nobs_growth
66
# Class-at-release; Sex; Class-at-recapture;  Years-at-liberty;  number transition matrix; sample size
1 1 2 1 1 3 1993 1
1 1 3 1 1 3 1993 4
1 1 3 2 1 3 1993 1
1 1 4 2 1 3 1993 6
1 1 5 2 1 3 1993 4
1 1 5 3 1 3 1993 11
1 1 6 3 1 3 1993 11
2 1 3 1 1 3 1993 21
2 1 4 1 1 3 1993 22
2 1 4 2 1 3 1993 12
2 1 5 1 1 3 1993 4
2 1 5 2 1 3 1993 96
2 1 5 3 1 3 1993 19
2 1 6 2 1 3 1993 5
2 1 6 3 1 3 1993 48
2 1 7 3 1 3 1993 6
3 1 4 1 1 3 1993 47
3 1 4 2 1 3 1993 5
3 1 4 3 1 3 1993 2
3 1 5 1 1 3 1993 91
3 1 5 2 1 3 1993 36
3 1 5 3 1 3 1993 14
3 1 6 1 1 3 1993 7
3 1 6 2 1 3 1993 70
3 1 6 3 1 3 1993 28
3 1 7 1 1 3 1993 1
3 1 7 2 1 3 1993 3
3 1 7 3 1 3 1993 9
4 1 4 1 1 3 1993 10
4 1 4 2 1 3 1993 2
4 1 5 1 1 3 1993 196
4 1 5 2 1 3 1993 34
4 1 5 3 1 3 1993 3
```

```
4 1 6 1 1 3 1993 108
4 1 6 2 1 3 1993 39
4 1 6 3 1 3 1993 35
4 1 7 1 1 3 1993 2
4 1 7 2 1 3 1993 19
4 1 7 3 1 3 1993 14
4 1 8 1 1 3 1993 1
5 1 5 1 1 3 1993 75
5 1 5 2 1 3 1993 7
5 1 6 1 1 3 1993 143
5 1 6 2 1 3 1993 77
5 1 6 3 1 3 1993 9
5 1 7 1 1 3 1993 22
5 1 7 2 1 3 1993 24
5 1 7 3 1 3 1993 21
5 1 8 3 1 3 1993 4
6 1 6 1 1 3 1993 88
6 1 6 2 1 3 1993 11
6 1 7 1 1 3 1993 98
6 1 7 2 1 3 1993 47
6 1 7 3 1 3 1993 11
6 1 8 1 1 3 1993 24
6 1 8 2 1 3 1993 7
6 1 8 3 1 3 1993 3
7 1 7 1 1 3 1993 56
7 1 7 2 1 3 1993 9
7 1 7 3 1 3 1993 1
7 1 8 1 1 3 1993 25
7 1 8 2 1 3 1993 16
7 1 8 3 1 3 1993 9
8 1 8 1 1 3 1993 26
8 1 8 2 1 3 1993 8
8 1 8 3 1 3 1993 1

# Environmental data
## Use old format (0)
0
# Number of series
0
# Year ranges

# Indices
# Index Year Value

##  eof

## eof
9999
```

Model 24.0b6 control file

```
## GMACS Version 2.20.20 - Nov 2025 - F prior from BBRKC pot fishery used for winter commercial fishery

# Block structure
# Number of blocks
2
# Block structure
1 1
# The blocks
2008 2026
2008 2026

##  ------------------------------------------------------------------------------------ ##
##  GENERAL  CONTROLS
##  ------------------------------------------------------------------------------------ ##
#
1976       # First year of recruitment estimation,rec_dev.
2025       # last year of recruitment estimation, rec_dev
```

```
    0       # Terminal molting (0 = off, 1 = on). If on, the calc_stock_recruitment_relationship() isn't called in the procedure
    2       # phase for recruitment estimation,earlier -1. rec_dev estimation phase, BBRKC uses 2
   -2       # phase for recruitment sex-ratio estimation
   0.5      # Initial value for Expected sex-ratio
    3       # Initial conditions (0 = Unfished, 1 = Steady-state fished, 2 = Free parameters, 3 = Free parameters (revised))
    1       # Reference size-class for initial conditons = 3
    1       # Lambda (proportion of mature male biomass for SPR reference points).
    0       # Stock-Recruit-Relationship (0 = none, 1 = Beverton-Holt)
    1       # Use years specified to computed average sex ratio in the calculation of average recruitment for reference points (0 = off -i.e. Rec b
   200      ### Year to compute equilibria
    5       # Devpar phase (!!)
    0       # First year of bias-correction
    0       # First full bias-correction
    0       # Last full bias-correction
    0       # Last year of bias-correction

# Expecting 23 theta parameters
# Core parameters
## Initial: Initial value for the parameter (must lie between lower and upper)
## Lower & Upper: Range for the parameter
## Phase: Set equal to a negative number not to estimate
## Prior type:
## 0: Uniform   - parameters are the range of the uniform prior
## 1: Normal    - parameters are the mean and sd
## 2: Lognormal - parameters are the mean and sd of the log
## 3: Beta      - parameters are the two beta parameters [see dbeta]
## 4: Gamma     - parameters are the two gamma parameters [see dgamma]
# Initial_value    Lower_bound    Upper_bound Phase Prior_type        Prior_1        Prior_2
     7.00000000   -15.00000000    20.00000000    -1          0   -10.00000000    20.00000000 # Log(R0)
     10.11100000   -15.00000000    20.00000000     1          0   -10.00000000   20.00000000 # Log(Rinitial)
     8.00000000   -15.00000000    20.00000000     1          0   -10.00000000    20.00000000 # Log(Rbar)
    72.50000000    65.00000000   130.00000000     3          1    72.50000000     7.25000000 # Recruitment_ra-males
     0.75000000     0.00000001     1.60000000     3          0     0.10000000     5.00000000 # Recruitment_rb-males
    -0.10000000   -15.00000000     0.75000000    -2          0   -10.00000000     0.75000000 # log(SigmaR)
     0.75000000     0.20000000     1.00000000    -4          3     3.00000000     2.00000000 # Steepness
     0.00100000     0.00000000     1.00000000    -3          3     1.01000000     1.01000000 # Rho
     0.64670000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_2
     1.00340000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_3
     1.36040000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_4
     1.40420000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_5
     1.45990000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_6
     1.26570000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_7
     0.72280000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_8
  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_1
  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_2
  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_3
  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_4
  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_5
  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_6
  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_7
  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_8
##Allometry
# weight-at-length input  method  (1 = allometry  [w_l = a*l^b],  2 = vector by sex; 3= matrix by sex)
2
 0.5239661 0.8202686 1.197317 1.700319 2.317965 2.988772 3.68294 4.367152 # this is from the version 2.20.14 ctl file
# 0.52420370 0.82067430 1.19824500 1.70175900 2.32125400 2.99365100 3.68849500 4.37139500
# Proportion mature by sex and size
 0.00000000 0.00000000 0.00000000 1.00000000 1.00000000 1.00000000 1.00000000 1.00000000
# Proportion legal by sex and size
 0.00000000 0.00000000 0.00000000 0.00000000 1.00000000 1.00000000 1.00000000 1.00000000

## ================================================================================ ##
## GROWTH PARAMETER CONTROLS                                                        ##
## ================================================================================ ##
##
# Maximum number of size-classes to which recruitment must occur
 3
# Use functional maturity for terminally molting animals (0=no; 1=Yes)?
0
# Growth transition
##Type_1: Options for the growth matrix
#  1: Pre-specified growth transition matrix (requires molt probability)
```

```
#  2: Pre-specified size transition matrix (molt probability is ignored)
#  3: Growth increment is gamma distributed (requires molt probability)
#  4: Post-molt size is gamma distributed (requires molt probability)
#  5: Von Bert.: kappa varies among individuals (requires molt probability)
#  6: Von Bert.: Linf varies among individuals (requires molt probability)
#  7: Von Bert.: kappa and Linf varies among individuals (requires molt probability)
#  8: Growth increment is normally distributed (requires molt probability)
## Type_2: Options for the growth increment model matrix
#  1: Linear
#  2: Individual
#  3: Individual (Same as 2)
#  Block: Block number for time-varying growth
## Type_1 Type_2  Block
        8      1      0
# Molt probability
# Type: Options for the molt probability function
#  0: Pre-specified
#  1: Constant at 1
#  2: Logistic
#  3: Individual
#  Block: Block number for time-varying growth
## Type Block
      2     0

## General parameter specificiations
##  Initial: Initial value for the parameter (must lie between lower and upper)
##  Lower & Upper: Range for the parameter
##  Prior type:
##   0: Uniform   - parameters are the range of the uniform prior
##   1: Normal    - parameters are the mean and sd
##   2: Lognormal - parameters are the mean and sd of the log
##   3: Beta      - parameters are the two beta parameters [see dbeta]
##   4: Gamma     - parameters are the two gamma parameters [see dgamma]
##  Phase: Set equal to a negative number not to estimate
##  Relative: 0: absolute; 1 relative
##  Block: Block number for time-varying selectivity
##  Block_fn: 0:absolute values; 1:exponential
##  Env_L: Environmental link - options are 0:none; 1:additive; 2:multiplicative; 3:exponential
##  EnvL_var: Environmental variable
##  RW: 0 for no random walk changes; 1 otherwise
##  RW_blk: Block number for random walks
##  Sigma_RW: Sigma used for the random walk

# Inputs for sex * type 1
# MAIN PARS: Initial  Lower_bound  Upper_bound Prior_type       Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           36.998620     0.000000   200.000000          0     0.000000    20.000000      2      0      0      0      0      0      0   0.3000 # A
            0.243015    -0.200000    20.000000          0     0.000000    10.000000      2      0      0      0      0      0      0   0.3000 # B
            3.773156     2.000000    10.000000          0     0.000000     3.000000      5      0      0      0      0      0      0   0.3000 # G
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve
# Inputs for sex * type 2
# MAIN PARS: Initial  Lower_bound  Upper_bound Prior_type       Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
          122.965900    50.000000   200.000000          0     0.000000   170.000000      2      0      0      0      0      0      0   0.3000 # M
            0.127616     0.000000     1.000000          0     0.000000     3.000000      2      0      0      0      0      0      0   0.3000 # M
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve


## ==================================================================================== ##
## NATURAL MORTALITIY PARAMETER CONTROLS                                                ##
## ==================================================================================== ##
##
# Relative: 0 - absolute values; 1+ - based on another M-at-size vector (indexed by ig)
# Type: 0 for standard; 1: Spline
#  For spline: set extra to the number of knots, the parameters are the knots (phase -1) and the log-differences from base M
# Extra: control the number of knots for splines
# Brkpts: number of changes in M by size
# Mirror: Mirror M-at-size over to that for another partition (indexed by ig)
# Block: Block number for time-varying M-at-size
# Block_fn: 0:absolute values; 1:exponential
# Env_L: Environmental link - options are 0: none; 1:additive; 2:multiplicative; 3:exponential
# EnvL_var: Environmental variable
# RW: 0 for no random walk changes; 1 otherwise
# RW_blk: Block number for random walks
```

```
# Sigma_RW: Sigma for the random walk parameters
# Mirror_RW: Should time-varying aspects be mirrored (Indexed by ig)
## Relative?   Type   Extra  Brkpts  Mirror   Block  Blk_fn Env_L   EnvL_Vr      RW  RW_blk Sigma_RW Mirr_RW
          0       0       0       1       0       0       1       0       0       0       0   0.3000       0
# MaxMbreaks
7  # sex*maturity state: male & 1

#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    0.18000000     0.00000000     0.20000000           0     0.00000000     0.20000000     -1 # M_base_male_mature
    0.50000000     0.05000000     1.00000000           1     0.00000000     0.25000000      3 # M estimated for males > 123 mm carapace length

## ==================================================================================== ##
## SELECTIVITY PARAMETERS CONTROLS                                                      ##
## ==================================================================================== ##
##
# ## Selectivity parameter controls
# ## Selectivity (and retention) types
# ##  <0: Mirror selectivity
# ##   0: Nonparametric selectivity (one parameter per class)
# ##   1: Nonparametric selectivity (one parameter per class, constant from last specified class)
# ##   2: Logistic selectivity (inflection point and slope)
# ##   3: Logistic selectivity (50% and 95% selection)
# ##   4: Double normal selectivity (3 parameters)
# ##   5: Flat equal to zero (1 parameter; phase must be negative)
# ##   6: Flat equal to one (1 parameter; phase must be negative)
# ##   7: Flat-topped double normal selectivity (4 parameters)
# ##   8: Declining logistic selectivity with initial values (50% and 95% selection plus extra)
# ##   9: Cubic-spline (specified with knots and values at knots)
# ##      Inputs: knots (in length units); values at knots (0-1) - at least one should have phase -1
# ##  10: One parameter logistic selectivity (inflection point and slope)
## Selectivity specifications --
# ## Extra (type 1): number of selectivity parameters to estimated
# #  Winter_Com Subsistence Summer_Com NMFS_Trawl ADFG_Trawl NBS_Trawl Winter_Pot
 0 0 0 0 0 0 0 # is selectivity sex=specific? (1=Yes; 0=No)
 8 -1 10 10 -4 -4 -1 # male selectivity type. Only NMFS_Trawl survey selectivity is being estimated. All other trawl survey selectivities are mirr
 0 0 0 0 0 0 0 # selectivity within another gear
 3 0 0 0 0 0 0 # male extra parameters for each pattern
 0 0 1 1 1 1 1 # male: is maximum selectivity at size forced to equal 1 (1) or not (0)
 0 0 0 0 0 0 0 # size-class at which selectivity is forced to equal 1 (ignored if the previous input is 1)
## Retention specifications --
 0 0 0 0 0 0 0 # is retention sex=specific? (1=Yes; 0=No)
 2 0 2 6 6 6 6 # male retention type
 1 1 1 0 0 0 0 # male retention flag (0 = no, 1 = yes)
 0 0 0 0 0 0 0 # male extra parameters for each pattern
 0 0 0 0 0 0 0 # male - should maximum retention be estimated for males (1=Yes; 0=No)

## General parameter specificiations
##  Initial: Initial value for the parameter (must lie between lower and upper)
##  Lower & Upper: Range for the parameter
##  Prior type:
##   0: Uniform   - parameters are the range of the uniform prior
##   1: Normal    - parameters are the mean and sd
##   2: Lognormal - parameters are the mean and sd of the log
##   3: Beta      - parameters are the two beta parameters [see dbeta]
##   4: Gamma     - parameters are the two gamma parameters [see dgamma]
##  Phase: Set equal to a negative number not to estimate
##  Relative: 0: absolute; 1 relative
##  Block: Block number for time-varying selectivity
##  Block_fn: 0:absolute values; 1:exponential
##  Env_L: Environmental link - options are 0:none; 1:additive; 2:multiplicative; 3:exponential
##  EnvL_var: Environmental variable
##  RW: 0 for no random walk changes; 1 otherwise
##  RW_blk: Block number for random walks
##  Sigma_RW: Sigma used for the random walk

# Inputs for type*sex*fleet: selectivity male Winter_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           128.894800    40.000000   200.000000          0    10.000000   200.000000      2      0      0      0      0      0      0   0.3000 # S
             0.154697     0.010000    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S
             0.045586     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S
             0.375288     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S
             0.733787     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S
```

```
# Inputs for type*sex*fleet: selectivity male Summer_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
             0.143640     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S

# Inputs for type*sex*fleet: selectivity male NMFS_Trawl
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
             0.092094     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S

# Inputs for type*sex*fleet: selectivity male ADFG_Trawl
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
#             0.092094     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #

# Inputs for type*sex*fleet: selectivity male NBS_Trawl
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
#             0.092094     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #

# Inputs for type*sex*fleet: retention male Winter_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           100.49375    50.000000   200.000000          0     1.000000   900.000000     -2      2      0      0      0      0      0   0.3000 # Re
             2.48336     0.001000    20.000000          0     1.000000   900.000000     -2      2      0      0      0      0      0   0.3000 # Re
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve
           100.49375    50.000000   700.000000          0     0.100000   100.000000      2      0 # Ret_Summer_Com_male_period_2_par_1
              2.4833     1.000000    20.000000          0     0.100000   100.000000      2      0 # Ret_Summer_Com_male_period_2_par_2

# Inputs for type*sex*fleet: retention male Subsistence
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
             0.000001     0.000000     0.000002          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.000001     0.000000     0.000002          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.000001     0.000000     0.000002          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R

# Inputs for type*sex*fleet: retention male Summer_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           104.310600    50.000000   700.000000          0     1.000000   900.000000      2      1      0      0      0      0      0   0.3000 # R
             2.421736     1.000000    20.000000          0     1.000000   900.000000      2      1      0      0      0      0      0   0.3000 # R
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve
           105.150900    50.000000   700.000000          0     0.100000   100.000000      2      0 # Ret_Summer_Com_male_period_2_par_1
             1.648215     1.000000    20.000000          0     0.100000   100.000000      2      0 # Ret_Summer_Com_male_period_2_par_2

## ==================================================================================== ##
## CATCHABILITY PARAMETER CONTROLS                                                      ##
## ==================================================================================== ##
##
# Catchability (specifications)
# Analytic: should q be estimated analytically (1) or not (0)
# Lambda: the weight lambda
# Emphasis: the weighting emphasis
# Block: Block number for time-varying M-at-size
# Block_fn: 0:absolute values; 1:exponential
# Env_L: Environmental link - options are 0: none; 1:additive; 2:multiplicative; 3:exponential
# EnvL_var: Environmental variable
# RW: 0 for no random walk changes; 1 otherwise
# RW_blk: Block number for random walks
# Sigma_RW: Sigma for the random walk parameters
## Analytic  Lambda Emphass  Mirror   Block   Env_L EnvL_Vr      RW  RW_blk Sigma_RW
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
# Catchability (parameters)
#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    0.77700000     0.10000000     2.00000000           0     0.10000000     1.00000000      2 # NMFS trawl survey
    1.00000000     0.10000000     2.00000000           0     0.10000000     1.00000000     -2 # ADF&G trawl survey
    0.77700000     0.10000000     2.00000000           0     0.10000000     1.00000000      2 # NBS trawl survey
    0.00150000     0.00000000     2.00000000           0     0.00000000     1.00000000      1 # block 1 - std CPUE
```

```
    0.00150000     0.00000000     2.00000000           0     0.00000000     1.00000000      1 # block 2 - std CPUE
    0.00150000     0.00000000     2.00000000           0     0.00000000     1.00000000      1 # block 3 - std CPUE

## ==================================================================================== ##
## ADDITIONAL CV PARAMETER CONTROLS                                                     ##
## ==================================================================================== ##
##
# Catchability (specifications)
# Mirror: should additional variance be mirrored (value > 1) or not (0)?
# Block: Block number for time-varying M-at-size
# Block_fn: 0:absolute values; 1:exponential
# Env_L: Environmental link - options are 0: none; 1:additive; 2:multiplicative; 3:exponential
# EnvL_var: Environmental variable
# RW: 0 for no random walk changes; 1 otherwise
# RW_blk: Block number for random walks
# Sigma_RW: Sigma for the random walk parameters
##   Mirror   Block   Env_L EnvL_Vr     RW   RW_blk Sigma_RW
          0       0       0       0       0       0   0.3000
          0       0       0       0       0       0   0.3000
          0       0       0       0       0       0   0.3000
          0       0       0       0       0       0   0.3000
          4       0       0       0       0       0   0.3000
          4       0       0       0       0       0   0.3000
## Mirror Block Env_L EnvL_Var  RW RW_blk Sigma_RW
# Additional variance (parameters)
#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
    0.10000000     0.00000001     2.00000000           0     1.00000000   100.00000000      4
#    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
#    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4

## ==================================================================================== ##
## CONTROLS ON F                                                                        ##
## ==================================================================================== ##
##
# Controls on F
#   Initial_male_F Initial_fema_F Pen_SD (early) Pen_SD (later) Phz_mean_F_mal Phz_mean_F_fem   Lower_mean_F   Upper_mean_F Low_ann_male_F  Up_ann
          0.020000       0.000000       0.500000      45.500000       1.000000      -1.000000     -15.000000       4.000000     -10.000000       2
          0.020000       0.000000       0.500000      45.500000       1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.120000       0.000000       0.500000      45.500000       1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10

## ==================================================================================== ##
## SIZE COMPOSITIONS OPTIONS                                                            ##
## ==================================================================================== ##
##
# Options when fitting size-composition data
## Likelihood types:
##  1:Multinomial with estimated/fixed sample size
##  2:Robust approximation to multinomial
##  3:logistic normal
##  4:multivariate-t
##  5:Dirichlet

#  Winter_Com Winter_Com Summer_Com Summer_Com Summer_Com Summer_Com Summer_Com Summer_Com NMFS_Trawl NMFS_Trawl ADFG_Trawl ADFG_Trawl NBS_Trawl N
#  male male male male male male male male male male male male male male male male
#  retained retained retained retained discard discard total total total total total total total total total total
#  newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell
#  immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature
  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Type of likelihood
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Auto tail compression
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Auto tail compression (pmin)
  1   1   2   2   3   3   4   4   5   5   6   6   7   7   8   8 # Composition aggregator codes
  1   1   1   1   1   1   1   1   2   2   2   2   2   2   2   2 # Set to 1 for catch-based predictions; 2 for survey or total catch predictions
#  -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4 # Phz for estimating effective sample size (if appl.)
  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Lambda for effective sample size
  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Lambda for overall likelihood. Or emphasis?
```

```
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Survey to set Q for this comp. Does 0 keep this as is? Ask Buck. Added in versio
#  0   0   0   0   0   0   0   0   3   4   1   2   5   6   5   6 # Survey to set Q for this comp. Does 0 keep this as is? Ask Buck. Added in versi
#  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Survey to set Q for this comp. Does 0 keep this as is? Ask Buck. Added in versi
#  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Initial value for effective sample size multiplier

# Effective sample size parameters (number matches max(Composition Aggregator code))
#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_1(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_2(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_3(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_4(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_5(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_6(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_7(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_8(possibly e

## ================================================================================= ##
## EMPHASIS FACTORS                                                                  ##
## ================================================================================= ##

1.0000 # Emphasis on tagging data

 1.0000 1.0000 0.0000 1.0000 # Emphasis on Catch: (by catch dataframes)

#AEP AEP AEP AEP
   1.0000   0.0000   0.0000   0.0000 # Winter_Com
   0.1000   0.0000   0.0000   0.0000 # Subsistence
   1.0000   0.0000   0.0000   0.0000 # Summer_Com
   0.0000   0.0000   0.0000   0.0000 # NMFS_Trawl
   0.0000   0.0000   0.0000   0.0000 # ADFG_Trawl
   0.0000   0.0000   0.0000   0.0000 # NBS_Trawl
   0.0000   0.0000   0.0000   0.0000 # Winter_Pot
#
## Emphasis Factors (Priors/Penalties: 13 values) ##
     1.0000 #--Log_fdevs
     0.0000 #--MeanF
     0.0000 #--Mdevs
     1.0000 #--Rec_devs
    15.0000 #--Initial_devs
     1.0000 #--Fst_dif_dev
     3.0000 #--Mean_sex_ratio
    60.0000 #--Molt_prob
     0.1000 #--free selectivity
     1.0000 #--Init_n_at_len
     0.0000 #--Fvecs
     0.0000 #--Fdovss
     1.0000 #--Random walk in selectivity

# eof_ctl
9999
```

Model 24.0b7 data file

```
#========================================================================================================
# Gmacs Main  Data  File  NSRKC 2024 - Nov 2025 - used with GMACS version 2.20.20
# GEAR_INDEX   DESCRIPTION
#    1        : Winter Commercial Fishery Retained catch
#    2        : Winter Subsistence Fishery Retained catch
#    3        : Winter Subsistence Fishery Total catch
#    4        : Summer Commercial Fishery Retained catch
#    5        : Summer Commercial Fishery Total catch
#    6        : ADF&G Survey
#    7        : NMFS Survey
#    8        : Pot CPUE

# Fisheries:  1 Winter Pot Fishery, 2 Winter Subsistace, 3 Summer Pot Fishery
# Surveys:    4 NMFS Trawl Survey, 5 ADFG Trawl Survey, 6 NBS Trawl Survey, 7 Winter Pot survey
#========================================================================================================
```

```
1976  # Start year
2025  # End year
#2025  # Projection year
7     # Number of seasons
7     # Number of distinct data groups (fleet, among fishing fleets and surveys)
1     # Number of sexes
2     # Number of shell condition types
1     # Number of maturity types
8     # Number of size-classes in the model
#6     # Season recruitment occurs
7     # Season recruitment occurs
#3     # Season molting and growth occurs
4     # Season molting and growth occurs
1     # Season to calculate SSB
1     # Season for N output
# maximum size-class (males then females)
8
# size_breaks (a vector giving the break points between size intervals with dimension nclass+1)
63.5    73.5    83.5    93.5    103.5   113.5   123.5   133.5   143.5
# Natural mortality per season input type (1 = vector by season, 2 = matrix by season/year)
2
# Proportion of the total natural mortality to be applied each season (each row must add to 1)
# 1. Winter Fishery (Feb01)
# 2. Mortality between winter and summer fishery
# 3. Summer fishery
# 4. Time between summer fishery and Nov 1 (Molt and recruit)
# 5. Time to Feb 01
# 6. Feb 01 recruit

0   0   0.3452055   0.1863014   0.1351932   0.3333  0 # 1976
0   0   0.3452055   0.1863014   0.1351932   0.3333  0 # 1977
0   0   0.3452055   0.1863014   0.1351932   0.3333  0 # 1978
0   0   0.4493151   0.04109589  0.176289    0.3333  0 # 1979
0   0   0.4493151   0.04109589  0.176289    0.3333  0 # 1980
0   0   0.4493151   0.1013699   0.1160151   0.3333  0 # 1981
0   0   0.5150685   0.06027397  0.09135753  0.3333  0 # 1982
0   0   0.4931507   0.0109589   0.1625904   0.3333  0 # 1983
0   0   0.4931507   0.03835616  0.1351932   0.3333  0 # 1984
0   0   0.4931507   0.06027397  0.1132753   0.3333  0 # 1985
0   0   0.4931507   0.06575342  0.1077959   0.3333  0 # 1986
0   0   0.4931507   0.03013699  0.1434123   0.3333  0 # 1987
0   0   0.4931507   0.02739726  0.1461521   0.3333  0 # 1988
0   0   0.4931507   0.008219178 0.1653301   0.3333  0 # 1989
0   0   0.4931507   0.0109589   0.1625904   0.3333  0 # 1990
0   0   0.4931507   0.0109589   0.1625904   0.3333  0 # 1991
0   0   0.4931507   0.005479452 0.1680699   0.3333  0 # 1992
0   0   0.4109589   0.1561644   0.09957671  0.3333  0 # 1993
0   0   0.4109589   0.07945205  0.176289    0.3333  0 # 1994
0   0   0.4109589   0.1643836   0.09135753  0.3333  0 # 1995
0   0   0.4109589   0.169863    0.08587808  0.3333  0 # 1996
0   0   0.4109589   0.1150685   0.1406726   0.3333  0 # 1997
0   0   0.4109589   0.169863    0.08587808  0.3333  0 # 1998
0   0   0.4109589   0.1726027   0.08313836  0.3333  0 # 1999
0   0   0.4109589   0.2410959   0.01464521  0.3333  0 # 2000
0   0   0.4109589   0.1863014   0.06943973  0.3333  0 # 2001
0   0   0.3671233   0.2136986   0.08587808  0.3333  0 # 2002
0   0   0.3671233   0.1890411   0.1105356   0.3333  0 # 2003
0   0   0.3671233   0.1452055   0.1543712   0.3333  0 # 2004
0   0   0.3671233   0.1972603   0.1023164   0.3333  0 # 2005
0   0   0.3671233   0.1835616   0.1160151   0.3333  0 # 2006
0   0   0.3671233   0.169863    0.1297137   0.3333  0 # 2007
0   0   0.3890411   0.1917808   0.08587808  0.3333  0 # 2008
0   0   0.3671233   0.260274    0.03930274  0.3333  0 # 2009
0   0   0.4027397   0.1534247   0.1105356   0.3333  0 # 2010
0   0   0.4027397   0.08767123  0.176289    0.3333  0 # 2011
0   0   0.4054795   0.1890411   0.07217945  0.3333  0 # 2012
0   0   0.4164384   0.1945205   0.0557411   0.3333  0 # 2013
0   0   0.3945205   0.1369863   0.1351932   0.3333  0 # 2014
0   0   0.4054795   0.06849315  0.1927274   0.3333  0 # 2015
0   0   0.4000000   0.06575342  0.2009466   0.3333  0 # 2016
0   0   0.3972603   0.07945205  0.1899877   0.3333  0 # 2017
0   0   0.3917808   0.09589041  0.1790288   0.3333  0 # 2018
```

```
0   0   0.3945205   0.1643836   0.1077959   0.3333  0 # 2019
0   0   0.3945205   0.1643836   0.1077959   0.3333  0 # 2020
0   0   0.3945205   0.1643836   0.1077959   0.3333  0 # 2021
0   0   0.3671233   0.109589    0.189987    0.3333  0 # 2022
0   0   0.3835616   0.07671233  0.206426    0.3333  0 # 2023
0   0   0.3643836   0.07945205  0.2228644   0.3333  0 # 2024
0   0   0.4036036   0.097297297  0.1657658  0.333333  0 #   2025 # is this order correct?

# Fishing fleet names (delimited with : no spaces in names)
Winter_Com Subsistence Summer_Com
# Survey names (delimited with : no spaces in names)
NMFS_Trawl ADFG_Trawl NBS_Trawl Winter_Pot
# Are the seasons instantaneous (0) or continuous (1)
1 1 1 1 1 1 1
# Use Old format (0)
0
# Number  of  catch data  frames
 4
# Number  of  rows  in  each  data  frame
 47  48  42 46
##  CATCH DATA
##  Type of catch: 1 = retained, 2 = discard
##  Units of catch: 1 = biomass, 2 = numbers

##      Winter commercial
# year  seas    fleet   sex     obs     cv      type    units   mult    effort  discard_mortality
1978    2   1   1   9.625   0.03    1   2   1   0   0.2
1979    2   1   1   0.221   0.03    1   2   1   0   0.2
1980    2   1   1   0.022   0.03    1   2   1   0   0.2
#1981   2   1   1   0   0.03    1   2   1   0   0.2
1982    2   1   1   0.017   0.03    1   2   1   0   0.2
1983    2   1   1   0.549   0.03    1   2   1   0   0.2
1984    2   1   1   0.856   0.03    1   2   1   0   0.2
1985    2   1   1   1.168   0.03    1   2   1   0   0.2
1986    2   1   1   2.168   0.03    1   2   1   0   0.2
1987    2   1   1   1.04    0.03    1   2   1   0   0.2
1988    2   1   1   0.425   0.03    1   2   1   0   0.2
1989    2   1   1   0.403   0.03    1   2   1   0   0.2
1990    2   1   1   3.626   0.03    1   2   1   0   0.2
1991    2   1   1   3.8 0.03    1   2   1   0   0.2
1992    2   1   1   7.478   0.03    1   2   1   0   0.2
1993    2   1   1   1.788   0.03    1   2   1   0   0.2
1994    2   1   1   5.753   0.03    1   2   1   0   0.2
1995    2   1   1   7.538   0.03    1   2   1   0   0.2
1996    2   1   1   1.778   0.03    1   2   1   0   0.2
1997    2   1   1   0.083   0.03    1   2   1   0   0.2
1998    2   1   1   0.984   0.03    1   2   1   0   0.2
1999    2   1   1   2.714   0.03    1   2   1   0   0.2
2000    2   1   1   3.045   0.03    1   2   1   0   0.2
2001    2   1   1   1.098   0.03    1   2   1   0   0.2
2002    2   1   1   2.591   0.03    1   2   1   0   0.2
2003    2   1   1   6.853   0.03    1   2   1   0   0.2
2004    2   1   1   0.522   0.03    1   2   1   0   0.2
2005    2   1   1   2.121   0.03    1   2   1   0   0.2
2006    2   1   1   0.075   0.03    1   2   1   0   0.2
2007    2   1   1   3.313   0.03    1   2   1   0   0.2
2008    2   1   1   5.796   0.03    1   2   1   0   0.2
2009    2   1   1   4.951   0.03    1   2   1   0   0.2
2010    2   1   1   4.834   0.03    1   2   1   0   0.2
2011    2   1   1   3.365   0.03    1   2   1   0   0.2
2012    2   1   1   9.157   0.03    1   2   1   0   0.2
2013    2   1   1   22.639  0.03    1   2   1   0   0.2
2014    2   1   1   14.986  0.03    1   2   1   0   0.2
2015    2   1   1   41.046  0.03    1   2   1   0   0.2
2016    2   1   1   29.792  0.03    1   2   1   0   0.2
2017    2   1   1   26.008  0.03    1   2   1   0   0.2
2018    2   1   1   9.18    0.03    1   2   1   0   0.2
2019    2   1   1   1.05    0.03    1   2   1   0   0.2
2020    2   1   1   0.08    0.03    1   2   1   0   0.2
2021    2   1   1   0.32    0.03    1   2   1   0   0.2
2022    2   1   1   2.708   0.03    1   2   1   0   0.2
2023    2   1   1   3.580   0.03    1   2   1   0   0.2
```

```
2024    2   1   1   4.830   0.03    1   2   1   0   0.2
2025    2   1   1   2.657   0.03    1   2   1   0   0.2

#       Subsistence retained
1978    2   2   1   12.506  0.03    1   2   1   0   0.2
1979    2   2   1   0.224   0.03    1   2   1   0   0.2
1980    2   2   1   0.213   0.03    1   2   1   0   0.2
1981    2   2   1   0.36    0.03    1   2   1   0   0.2
1982    2   2   1   1.288   0.03    1   2   1   0   0.2
1983    2   2   1   10.432  0.03    1   2   1   0   0.2
1984    2   2   1   11.22   0.03    1   2   1   0   0.2
1985    2   2   1   8.377   0.03    1   2   1   0   0.2
1986    2   2   1   7.052   0.03    1   2   1   0   0.2
1987    2   2   1   5.772   0.03    1   2   1   0   0.2
1988    2   2   1   2.724   0.03    1   2   1   0   0.2
1989    2   2   1   6.126   0.03    1   2   1   0   0.2
1990    2   2   1   12.152  0.03    1   2   1   0   0.2
1991    2   2   1   7.366   0.03    1   2   1   0   0.2
1992    2   2   1   11.736  0.03    1   2   1   0   0.2
1993    2   2   1   1.097   0.03    1   2   1   0   0.2
1994    2   2   1   4.113   0.03    1   2   1   0   0.2
1995    2   2   1   5.426   0.03    1   2   1   0   0.2
1996    2   2   1   1.679   0.03    1   2   1   0   0.2
1997    2   2   1   0.745   0.03    1   2   1   0   0.2
1998    2   2   1   8.622   0.03    1   2   1   0   0.2
1999    2   2   1   7.533   0.03    1   2   1   0   0.2
2000    2   2   1   5.723   0.03    1   2   1   0   0.2
2001    2   2   1   0.256   0.03    1   2   1   0   0.2
2002    2   2   1   2.177   0.03    1   2   1   0   0.2
2003    2   2   1   4.14    0.03    1   2   1   0   0.2
2004    2   2   1   1.181   0.03    1   2   1   0   0.2
2005    2   2   1   3.973   0.03    1   2   1   0   0.2
2006    2   2   1   1.239   0.03    1   2   1   0   0.2
2007    2   2   1   10.69   0.03    1   2   1   0   0.2
2008    2   2   1   9.485   0.03    1   2   1   0   0.2
2009    2   2   1   4.752   0.03    1   2   1   0   0.2
2010    2   2   1   7.044   0.03    1   2   1   0   0.2
2011    2   2   1   6.64    0.03    1   2   1   0   0.2
2012    2   2   1   7.311   0.03    1   2   1   0   0.2
2013    2   2   1   7.622   0.03    1   2   1   0   0.2
2014    2   2   1   3.252   0.03    1   2   1   0   0.2
2015    2   2   1   7.651   0.03    1   2   1   0   0.2
2016    2   2   1   5.34    0.03    1   2   1   0   0.2
2017    2   2   1   6.039   0.03    1   2   1   0   0.2
2018    2   2   1   4.424   0.03    1   2   1   0   0.2
2019    2   2   1   1.54    0.03    1   2   1   0   0.2
2020    2   2   1   0.55    0.03    1   2   1   0   0.2
2021    2   2   1   2.892   0.03    1   2   1   0   0.2
2022    2   2   1   7.630   0.03    1   2   1   0   0.2
2023    2   2   1   5.407   0.03    1   2   1   0   0.2
2024    2   2   1   4.751   0.03    1   2   1   0   0.2
2025    2   2   1   1.897   0.03    1   2   1   0   0.2

# Subsistence total
#1978   2   2   1   0       0.03    0   2   1   0   0.2
#1979   2   2   1   0       0.03    0   2   1   0   0.2
#1980   2   2   1   0       0.03    0   2   1   0   0.2
#1981   2   2   1   0       0.03    0   2   1   0   0.2
#1982   2   2   1   0       0.03    0   2   1   0   0.2
#1983   2   2   1   0       0.03    0   2   1   0   0.2
1984    2   2   1   15.923  0.03    0   2   1   0   0.2
1985    2   2   1   10.757  0.03    0   2   1   0   0.2
1986    2   2   1   10.751  0.03    0   2   1   0   0.2
1987    2   2   1   7.406   0.03    0   2   1   0   0.2
1988    2   2   1   3.573   0.03    0   2   1   0   0.2
1989    2   2   1   7.945   0.03    0   2   1   0   0.2
1990    2   2   1   16.635  0.03    0   2   1   0   0.2
1991    2   2   1   9.295   0.03    0   2   1   0   0.2
1992    2   2   1   15.051  0.03    0   2   1   0   0.2
1993    2   2   1   1.193   0.03    0   2   1   0   0.2
1994    2   2   1   4.894   0.03    0   2   1   0   0.2
1995    2   2   1   7.777   0.03    0   2   1   0   0.2
```

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1996    2   2   1   2.936   0.03    0   2   1   0   0.2
1997    2   2   1   1.617   0.03    0   2   1   0   0.2
1998    2   2   1   20.327  0.03    0   2   1   0   0.2
1999    2   2   1   10.651  0.03    0   2   1   0   0.2
2000    2   2   1   9.816   0.03    0   2   1   0   0.2
2001    2   2   1   0.366   0.03    0   2   1   0   0.2
2002    2   2   1   5.119   0.03    0   2   1   0   0.2
2003    2   2   1   9.052   0.03    0   2   1   0   0.2
2004    2   2   1   1.775   0.03    0   2   1   0   0.2
2005    2   2   1   6.484   0.03    0   2   1   0   0.2
2006    2   2   1   2.083   0.03    0   2   1   0   0.2
2007    2   2   1   21.444  0.03    0   2   1   0   0.2
2008    2   2   1   18.621  0.03    0   2   1   0   0.2
2009    2   2   1   6.971   0.03    0   2   1   0   0.2
2010    2   2   1   9.004   0.03    0   2   1   0   0.2
2011    2   2   1   9.183   0.03    0   2   1   0   0.2
2012    2   2   1   11.341  0.03    0   2   1   0   0.2
2013    2   2   1   21.524  0.03    0   2   1   0   0.2
2014    2   2   1   5.421   0.03    0   2   1   0   0.2
2015    2   2   1   9.84    0.03    0   2   1   0   0.2
2016    2   2   1   6.468   0.03    0   2   1   0   0.2
2017    2   2   1   7.185   0.03    0   2   1   0   0.2
2018    2   2   1   5.767   0.03    0   2   1   0   0.2
2019    2   2   1   2.079   0.03    0   2   1   0   0.2
2020    2   2   1   0.815   0.03    0   2   1   0   0.2
2021    2   2   1   3.999   0.03    0   2   1   0   0.2
2022    2   2   1   10.041  0.03    0   2   1   0   0.2
2023    2   2   1   6.613   0.03    0   2   1   0   0.2
2024    2   2   1   5.9879  0.03    0   2   1   0   0.2
2025    2   2   1   2.239   0.03    0   2   1   0   0.2

# Summer Commercial Retain
1977    4   3   1   195.877 0.03    1   2   1   0   0.2
1978    4   3   1   660.829 0.03    1   2   1   0   0.2
1979    4   3   1   970.962 0.03    1   2   1   0   0.2
1980    4   3   1   329.778 0.03    1   2   1   0   0.2
1981    4   3   1   376.313 0.03    1   2   1   0   0.2
1982    4   3   1   63.949  0.03    1   2   1   0   0.2
1983    4   3   1   132.205 0.03    1   2   1   0   0.2
1984    4   3   1   139.759 0.03    1   2   1   0   0.2
1985    4   3   1   146.669 0.03    1   2   1   0   0.2
1986    4   3   1   162.438 0.03    1   2   1   0   0.2
1987    4   3   1   103.338 0.03    1   2   1   0   0.2
1988    4   3   1   76.148  0.03    1   2   1   0   0.2
1989    4   3   1   79.116  0.03    1   2   1   0   0.2
1990    4   3   1   59.132  0.03    1   2   1   0   0.2
#1991   4   3   1   0   0.03    1   2   1   0   0.2
1992    4   3   1   24.902  0.03    1   2   1   0   0.2
1993    4   3   1   115.913 0.03    1   2   1   0   0.2
1994    4   3   1   108.824 0.03    1   2   1   0   0.2
1995    4   3   1   105.967 0.03    1   2   1   0   0.2
1996    4   3   1   74.752  0.03    1   2   1   0   0.2
1997    4   3   1   32.606  0.03    1   2   1   0   0.2
1998    4   3   1   10.661  0.03    1   2   1   0   0.2
1999    4   3   1   8.734   0.03    1   2   1   0   0.2
2000    4   3   1   111.728 0.03    1   2   1   0   0.2
2001    4   3   1   98.321  0.03    1   2   1   0   0.2
2002    4   3   1   86.666  0.03    1   2   1   0   0.2
2003    4   3   1   93.638  0.03    1   2   1   0   0.2
2004    4   3   1   120.289 0.03    1   2   1   0   0.2
2005    4   3   1   138.926 0.03    1   2   1   0   0.2
2006    4   3   1   150.358 0.03    1   2   1   0   0.2
2007    4   3   1   110.344 0.03    1   2   1   0   0.2
2008    4   3   1   143.337 0.03    1   2   1   0   0.2
2009    4   3   1   143.485 0.03    1   2   1   0   0.2
2010    4   3   1   149.822 0.03    1   2   1   0   0.2
2011    4   3   1   141.626 0.03    1   2   1   0   0.2
2012    4   3   1   161.113 0.03    1   2   1   0   0.2
2013    4   3   1   130.603 0.03    1   2   1   0   0.2
2014    4   3   1   129.656 0.03    1   2   1   0   0.2
2015    4   3   1   144.225 0.03    1   2   1   0   0.2
2016    4   3   1   138.997 0.03    1   2   1   0   0.2
```

```
2017    4   3   1   135.322 0.03    1   2   1   0   0.2
2018    4   3   1   89.613  0.03    1   2   1   0   0.2
2019    4   3   1   23.964  0.03    1   2   1   0   0.2
#2020   4   3   1   0   0.03    1   2   1   0   0.2
#2021   4   3   1   0   0.03    1   2   1   0   0.2
2022    4   3   1   125.042 0.03    1   2   1   0   0.2
2023    4   3   1   148.062 0.03    1   2   1   0   0.2
2024    4   3   1   140.379 0.03    1   2   1   0   0.2
2025    4   3   1   100.758 0.03    1   2   1   0   0.2

##  RELATIVE  ABUNDANCE DATA
##  Units of abundance: 1 = biomass, 2 = numbers
## Use old format (0)
0
##  Number  of  relative  abundance indicies
6
# Type of ’survey’ catchability (1=Selectivity; 2=Selectivity+Retention), by data frame
1 1 1 2 2 2
##  Number  of  rows  in    index
73
# ADFG/NOAA Trawl survey
#Index  Year    Season  Fleet   Sex Maturity    Value   CV  Type    Time
1   1976    4   4   1   0   4247.462    0.311   2   1.411765
1   1979    4   4   1   0   1417.215    0.204   2   1
1   1982    4   4   1   0   2791.733    0.289   2   1.318182
1   1985    4   4   1   0   2306.321    0.254   2   2.363636
1   1988    4   4   1   0   2263.353    0.288   2   2.2
1   1991    4   4   1   0   3132.508    0.428   2   6.25

#   ADFG    Trawl survey
2   1996    4   5   1   0   1313.757    0.259   2   0.6612903
2   1999    4   5   1   0   2630.53     0.236   2   0.4920635
2   2002    4   5   1   0   1769.85     0.418   2   0.5897436
2   2006    4   5   1   0   3322.53     0.391   2   0.6865672
2   2008    4   5   1   0   2962.1      0.30    2   0.5571429
2   2011    4   5   1   0   3209.285    0.289   2   1.03125
2   2014    4   5   1   0   5949.46     0.473   2   0.58
2   2017    4   5   1   0   1762.072    0.223   2   1.241379
2   2018    4   5   1   0   1109.39     0.249   2   0.8857143
2   2019    4   5   1   0   4675.99     0.598   2   0.4666667
2   2020    4   5   1   0   1725.99     0.298   2   0.7
2   2021    4   5   1   0   2430.44     0.608   2   0.5166667
2   2023    4   5   1   0   3548.08     0.315   2   1.214286
2   2024    4   5   1   0   1407.401    0.281   2   1.413793


#   NOAA    NBS survey
3   2010    4   6   1   0   1980.079    0.436   2   0.6071429
3   2017    4   6   1   0   864.497     0.467   2   1.965517
3   2019    4   6   1   0   2071.94     0.346   2   0.5882353
3   2021    4   6   1   0   2338.06     0.441   2   0.6666667
3   2022    4   6   1   0   2103.02     0.363   2   0.6166667
3   2023    4   6   1   0   1686.34     0.391   2   1.3
3   2025    4   6   1   0   1632.63     0.636   2   1.3

#   ST  CPUE
4   1977    4   3   1   0   2.82    0.35    2   0.5
4   1978    4   3   1   0   3.41    0.23    2   0.5
4   1979    4   3   1   0   1.55    0.22    2   0.5
4   1980    4   3   1   0   1.82    0.28    2   0.5
4   1981    4   3   1   0   0.62    0.20    2   0.5
4   1982    4   3   1   0   0.18    0.27    2   0.5
4   1983    4   3   1   0   0.72    0.22    2   0.5
4   1984    4   3   1   0   1.11    0.23    2   0.5
4   1985    4   3   1   0   0.67    0.24    2   0.5
4   1986    4   3   1   0   1.63    0.52    2   0.5
4   1987    4   3   1   0   0.64    0.35    2   0.5
4   1988    4   3   1   0   1.60    0.71    2   0.5
4   1989    4   3   1   0   1.35    0.33    2   0.5
4   1990    4   3   1   0   1.06    0.45    2   0.5
4   1992    4   3   1   0   0.26    0.32    2   0.5
5   1993    4   3   1   0   1.02    0.09    2   0.5
```

```
5   1994    4   3   1   0   0.44    0.17    2   0.5
5   1995    4   3   1   0   1.09    0.13    2   0.5
5   1996    4   3   1   0   1.01    0.09    2   0.5
5   1997    4   3   1   0   1.14    0.09    2   0.5
5   1998    4   3   1   0   1.31    0.12    2   0.5
5   1999    4   3   1   0   0.97    0.10    2   0.5
5   2000    4   3   1   0   2.08    0.11    2   0.5
5   2001    4   3   1   0   0.76    0.25    2   0.5
5   2002    4   3   1   0   0.76    0.09    2   0.5
5   2003    4   3   1   0   1.65    0.08    2   0.5
5   2004    4   3   1   0   1.36    0.07    2   0.5
5   2005    4   3   1   0   0.64    0.12    2   0.5
5   2006    4   3   1   0   0.93    0.10    2   0.5
6   2007    4   3   1   0   0.88    0.22    2   0.5
6   2008    4   3   1   0   1.18    0.05    2   0.5
6   2009    4   3   1   0   0.81    0.04    2   0.5
6   2010    4   3   1   0   1.19    0.05    2   0.5
6   2011    4   3   1   0   1.36    0.05    2   0.5
6   2012    4   3   1   0   1.20    0.04    2   0.5
6   2013    4   3   1   0   0.62    0.04    2   0.5
6   2014    4   3   1   0   0.94    0.04    2   0.5
6   2015    4   3   1   0   1.17    0.05    2   0.5
6   2016    4   3   1   0   1.03    0.05    2   0.5
6   2017    4   3   1   0   0.88    0.05    2   0.5
6   2018    4   3   1   0   0.51    0.05    2   0.5
6   2019    4   3   1   0   0.24    0.06    2   0.5
6   2022    4   3   1   0   1.31    0.07    2   0.5
6   2023    4   3   1   0   2.00    0.07    2   0.5
6   2024    4   3   1   0   2.63    0.14    2   0.5
6   2025    4   3   1   0   0.90    0.10    2   0.5


## Use old format (0)
0
##  Number  of  length  frequency matrices
16
##  Number  of  rows  in  each  matrix
4 4 46 46 14 14 8 8 6 6 14 14 7 7 27 27
##  Number  of  bins  in  each  matrix  (columns  of  size  data)
8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
##  SIZE  COMPOSITION DATA  FOR ALL FLEETS
##  SIZE  COMP  LEGEND
##  Sex:  1 = male, 2 = female, 0 = both  sexes combined
##  Type  of  composition:  1 = retained, 2 = discard,  0 = total composition
##  Maturity  state:  1 = immature, 2 = mature, 0 = both  states  combined
##  Shell condition:  1 = new shell,  2 = old shell,  0 = both  shell types combined

##Winter        Com     Retain  newshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,       Nsamp,  DataVec
2015    2   1   1   1   1   0   10  0   0   0   43  287 138 35  3
2016    2   1   1   1   1   0   10  0   0   0   29  462 318 35  5
2017    2   1   1   1   1   0   10  0   0   0   1   110 162 71  9
2018    2   1   1   1   1   0   10  0   0   0   0   43  102 107 21

##Winter        Com     Retain  oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,       Nsamp,  DataVec
2015    2   1   1   1   2   0   10  0   0   0   6   23  17  17  7
2016    2   1   1   1   2   0   10  0   0   0   8   93  42  16  8
2017    2   1   1   1   2   0   10  0   0   0   1   42  101 32  11
2018    2   1   1   1   2   0   10  0   0   0   0   15  64  39  10

##Summer    Com Retain  newshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1977    4   3   1   1   1   0   10  0   0   0   5   650 530 119 70
1978    4   3   1   1   1   0   10  0   0   0   4   72  184 103 16
1979    4   3   1   1   1   0   10  0   0   0   42  386 636 425 109
1980    4   3   1   1   1   0   10  0   0   0   4   105 327 396 196
1981    4   3   1   1   1   0   10  0   0   0   7   131 275 502 406
1982    4   3   1   1   1   0   10  0   0   0   46  210 180 239 313
1983    4   3   1   1   1   0   10  0   0   0   31  331 287 51  27
1984    4   3   1   1   1   0   10  0   0   0   93  404 270 62  7
1985    4   3   1   1   1   0   10  0   0   1   173 840 1000    417 53
```

```
1986    4   3   1   1   1   0   10  0   0   0   33  405 448 134 20
1987    4   3   1   1   1   0   10  0   0   0   33  355 578 539 215
1988    4   3   1   1   1   0   10  0   1   0   36  305 457 274 58
1989    4   3   1   1   1   0   10  0   0   0   33  426 826 442 117
1990    4   3   1   1   1   0   10  0   0   0   19  185 447 331 88
#1991   4   3   1   1   1   0   10  0   0   0   0   0   0   0   0
1992    4   3   1   1   1   0   10  0   0   0   44  515 682 350 229
1993    4   3   1   1   1   0   10  0   0   0   253 4116    7013    4095    589
1994    4   3   1   1   1   0   10  0   0   0   10  38  33  28  8
1995    4   3   1   1   1   0   10  0   0   0   46  307 335 176 60
1996    4   3   1   1   1   0   10  0   0   0   25  176 188 74  37
1997    4   3   1   1   1   0   10  0   0   0   35  438 409 119 30
1998    4   3   1   1   1   0   10  0   0   0   30  246 256 85  28
1999    4   3   1   1   1   0   10  0   0   0   36  165 137 103 53
2000    4   3   1   1   1   0   10  0   0   0   334 5149    6743    1884    266
2001    4   3   1   1   1   0   10  0   0   0   487 4472    7394    4116    1455
2002    4   3   1   1   1   0   10  0   0   0   231 1222    1469    1316    382
2003    4   3   1   1   1   0   10  0   0   0   121 1923    1671    634 162
2004    4   3   1   1   1   0   10  0   0   0   84  3660    3727    1016    324
2005    4   3   1   1   1   0   10  0   0   0   12  1361    2524    860 117
2006    4   3   1   1   1   0   10  0   0   0   14  1222    2337    1168    167
2007    4   3   1   1   1   0   10  0   0   0   68  2189    2087    842 208
2008    4   3   1   1   1   0   10  0   0   0   27  2025    2004    322 63
2009    4   3   1   1   1   0   10  0   0   0   63  2076    1985    675 132
2010    4   3   1   1   1   0   10  0   0   0   31  2275    2135    586 60
2011    4   3   1   1   1   0   10  0   0   0   11  809 1013    294 60
2012    4   3   1   1   1   0   10  0   0   0   13  1224    2336    932 113
2013    4   3   1   1   1   0   10  0   0   0   27  1450    2253    1465    369
2014    4   3   1   1   1   0   10  0   0   0   40  1324    1105    866 335
2015    4   3   1   1   1   0   10  0   0   0   58  1987    1177    418 122
2016    4   3   1   1   1   0   10  0   0   0   5   392 731 247 48
2017    4   3   1   1   1   0   10  0   0   0   4   602 1341    728 86
2018    4   3   1   1   1   0   10  0   0   0   9   300 842 845 197
2019    4   3   1   1   1   0   10  0   0   0   10  364 260 151 29
#2020   4   3   1   1   1   0   10  0   0   0   0   0   0   0   0
#2021   4   3   1   1   1   0   10  0   0   0   0   0   0   0   0
2022    4   3   1   1   1   0   10  0   0   0   56  1375    892 96  5
2023    4   3   1   1   1   0   10  0   0   0   10  645 1027 331 25
2024    4   3   1   1   1   0   10  0   0   0   4   312 1008    833 184
2025    4   3   1   1   1   0   10  0   0   0   4   199 610 790 396

##Summer    Com Retain  oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1977    4   3   1   1   2   0   10  0   0   0   0   97  62  10  6
1978    4   3   1   1   2   0   10  0   0   0   0   2   4   3   1
1979    4   3   1   1   2   0   10  0   0   0   0   42  1   5   14
1980    4   3   1   1   2   0   10  0   0   0   0   3   12  17  8
1981    4   3   1   1   2   0   10  0   0   0   0   8   90  207 158
1982    4   3   1   1   2   0   10  0   0   0   4   14  24  33  30
1983    4   3   1   1   2   0   10  0   0   0   3   29  8   17  18
1984    4   3   1   1   2   0   10  0   0   0   10  63  47  6   1
1985    4   3   1   1   2   0   10  0   0   0   7   90  84  23  3
1986    4   3   1   1   2   0   10  0   0   0   2   23  43  27  3
1987    4   3   1   1   2   0   10  0   0   0   5   53  129 60  18
1988    4   3   1   1   2   0   10  0   0   0   9   98  148 107 29
1989    4   3   1   1   2   0   10  0   0   0   11  144 315 221 60
1990    4   3   1   1   2   0   10  0   0   0   1   48  95  61  14
#1991   4   3   1   1   2   0   10  0   0   0   0   0   0   0   0
1992    4   3   1   1   2   0   10  0   0   0   7   203 331 153 52
1993    4   3   1   1   2   0   10  0   0   0   7   308 778 512 133
1994    4   3   1   1   2   0   10  0   0   0   10  76  101 81  19
1995    4   3   1   1   2   0   10  0   0   0   9   57  87  75  15
1996    4   3   1   1   2   0   10  0   0   0   11  94  107 62  13
1997    4   3   1   1   2   0   10  0   0   0   4   67  50  32  14
1998    4   3   1   1   2   0   10  0   0   0   23  118 151 86  32
1999    4   3   1   1   2   0   10  0   0   0   1   13  27  25  2
2000    4   3   1   1   2   0   10  0   0   0   48  914 1125    609 141
2001    4   3   1   1   2   0   10  0   0   0   17  483 996 476 134
2002    4   3   1   1   2   0   10  0   0   0   24  147 219 165 44
2003    4   3   1   1   2   0   10  0   0   0   6   114 243 276 76
2004    4   3   1   1   2   0   10  0   0   0   4   245 333 143 70
2005    4   3   1   1   2   0   10  0   0   0   0   110 242 102 32
```

```
2006    4   3   1   1   2   0   10  0   0   0   2   334 922 464 77
2007    4   3   1   1   2   0   10  0   0   0   5   151 351 186 38
2008    4   3   1   1   2   0   10  0   0   0   8   516 535 204 62
2009    4   3   1   1   2   0   10  0   0   0   7   463 479 114 32
2010    4   3   1   1   2   0   10  0   0   0   11  322 322 136 24
2011    4   3   1   1   2   0   10  0   0   0   5   156 150 42  12
2012    4   3   1   1   2   0   10  0   0   0   1   131 214 79  13
2013    4   3   1   1   2   0   10  0   0   0   2   85  256 137 28
2014    4   3   1   1   2   0   10  0   0   0   1   193 405 336 77
2015    4   3   1   1   2   0   10  0   0   0   3   99  137 137 35
2016    4   3   1   1   2   0   10  0   0   0   2   27  36  45  10
2017    4   3   1   1   2   0   10  0   0   0   3   100 384 164 22
2018    4   3   1   1   2   0   10  0   0   0   0   23  197 196 50
2019    4   3   1   1   2   0   10  0   0   0   0   18  119 154 31
#2020   4   3   1   1   2   0   10  0   0   0   0   0   0   0   0
#2021   4   3   1   1   2   0   10  0   0   0   0   0   0   0   0
2022    4   3   1   1   2   0   10  0   0   0   20  359 149 24  5
2023    4   3   1   1   2   0   10  0   0   0   1   169 209 36  5
2024    4   3   1   1   2   0   10  0   0   0   0   59  178 96  12
2025    4   3   1   1   2   0   10  0   0   0   0   30  101 68  12

##Summer    Com Discards    newshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1987    4   3   1   2   1   0   10  69  216 367 379 37  0   0   0
1988    4   3   1   2   1   0   10  9   29  108 344 99  0   0   0
1989    4   3   1   2   1   0   10  71  193 242 216 25  0   0   0
1990    4   3   1   2   1   0   10  40  115 137 139 19  0   0   0
1992    4   3   1   2   1   0   10  65  99  173 171 19  0   0   0
1994    4   3   1   2   1   0   10  63  50  92  126 19  0   0   0
2012    4   3   1   2   1   0   10  242 137 195 313 97  9   0   0
2013    4   3   1   2   1   0   10  845 722 390 416 113 6   2   0
2014    4   3   1   2   1   0   10  79  175 460 724 207 14  4   0
2015    4   3   1   2   1   0   10  26  120 278 709 303 37  11  1
2016    4   3   1   2   1   0   10  19  22  71  215 71  7   0   0
2017    4   3   1   2   1   0   10  53  88  73  166 137 8   0   0
2018    4   3   1   2   1   0   10  52  91  189 160 12  0   0   0
2019    4   3   1   2   1   0   10  30  13  14  25  2   0   0   0

##Summer    Com Discards    oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1987    4   3   1   2   2   0   10  0   2   23  47  5   0   0   0
1988    4   3   1   2   2   0   10  2   8   23  69  31  0   0   0
1989    4   3   1   2   2   0   10  18  34  67  109 25  0   0   0
1990    4   3   1   2   2   0   10  8   9   10  27  3   0   0   0
1992    4   3   1   2   2   0   10  3   13  11  23  5   0   0   0
1994    4   3   1   2   2   0   10  61  63  128 205 43  0   0   0
2012    4   3   1   2   2   0   10  2   2   2   22  22  0   1   0
2013    4   3   1   2   2   0   10  2   1   1   7   2   2   0   0
2014    4   3   1   2   2   0   10  0   4   15  50  19  3   1   0
2015    4   3   1   2   2   0   10  0   0   2   24  17  6   1   4
2016    4   3   1   2   2   0   10  0   0   1   12  6   2   0   0
2017    4   3   1   2   2   0   10  2   2   3   2   7   0   0   0
2018    4   3   1   2   2   0   10  0   6   12  7   1   0   0   1
2019    4   3   1   2   2   0   10  0   0   1   8   1   0   0   0

##Summer    Com total   newshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
2012    4   3   1   0   1   0   10  242 137 195 339 385 437 150 19
2013    4   3   1   0   1   0   10  845 722 390 481 722 747 397 68
2014    4   3   1   0   1   0   10  79  175 460 754 782 419 296 115
2015    4   3   1   0   1   0   10  26  120 278 794 1177    440 162 48
2016    4   3   1   0   1   0   10  19  22  71  247 607 755 173 35
2017    4   3   1   0   1   0   10  53  88  73  168 514 894 496 63
2018    4   3   1   0   1   0   10  52  91  189 181 144 277 294 69
2019    4   3   1   0   1   0   10  30  13  14  30  20  11  2   1

##Summer    Com total   oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
2012    4   3   1   0   2   0   10  2   2   2   25  91  92  34  4
2013    4   3   1   0   2   0   10  2   1   1   8   55  103 43  12
2014    4   3   1   0   2   0   10  0   4   15  54  97  119 87  50
2015    4   3   1   0   2   0   10  0   0   2   27  54  42  32  13
```

```
2016    4   3   1   0   2   0   10  0   0   1   14  64  67  34  5
2017    4   3   1   0   2   0   10  2   2   3   3   64  186 86  20
2018    4   3   1   0   2   0   10  0   6   12  10  25  109 127 40
2019    4   3   1   0   2   0   10  0   0   1   9   25  34  34  12

##NMFS      Trawl   newshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1976    4   4   1   0   1   0   20  10  17  81  77  85  60  13  4
1979    4   4   1   0   1   0   20  3   2   1   4   10  11  6   2
1982    4   4   1   0   1   0   20  71  20  42  60  47  9   0   1
1985    4   4   1   0   1   0   20  29  20  28  18  29  9   5   1
1988    4   4   1   0   1   0   20  60  66  40  33  29  19  8   0
1991    4   4   1   0   1   0   20  66  26  6   10  20  11  4   2

##NMFS      Trawl   oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,       DataVec
1976    4   4   1   0   2   0   20  0   6   15  33  39  40  8   6
1979    4   4   1   0   2   0   20  3   1   2   8   30  88  42  7
1982    4   4   1   0   2   0   20  0   0   4   5   11  6   7   9
1985    4   4   1   0   2   0   20  0   0   0   6   16  27  16  4
1988    4   4   1   0   2   0   20  0   0   2   4   12  27  20  10
1991    4   4   1   0   2   0   20  9   19  8   26  53  47  31  6

#   ADFG    Trawl   Newshell
1996    4   5   1   0   1   0   20  78  58  35  24  16  1   1   2
1999    4   5   1   0   1   0   20  9   3   29  82  74  36  9   2
2002    4   5   1   0   1   0   20  23  29  33  28  4   8   6   2
2006    4   5   1   0   1   0   20  69  98  80  42  23  14  9   0
2008    4   5   1   0   1   0   20  34  42  58  31  27  8   5   2
2011    4   5   1   0   1   0   20  42  35  27  35  56  44  10  3
2014    4   5   1   0   1   0   20  30  57  91  69  36  6   5   3
2017    4   5   1   0   1   0   20  16  14  6   11  11  12  5   0
2018    4   5   1   0   1   0   20  27  7   8   2   1   2   3   1  # Was ‘14.6
2019    4   5   1   0   1   0   20  169 91  10  0   1   1   1   0
2020    4   5   1   0   1   0   20  14  24  33  7   6   2   0   0
2021    4   5   1   0   1   0   20  10  27  35  35  34  7   1   1
2023    4   5   1   0   1   0   20  0   1   8   21  48  50     16   1
2024    4   5   1   0   1   0   20  3   3   2   7   7   20     23   2

##  ADFG    Trawl   Oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1996    4   5   1   0   2   0   20  1   1   7   9   12  12  11  7
1999    4   5   1   0   2   0   20  0   0   1   8   14  11  5   0
2002    4   5   1   0   2   0   20  2   7   17  25  22  21  13  4
2006    4   5   1   0   2   0   20  0   0   0   6   14  14  3   1
2008    4   5   1   0   2   0   20  0   2   12  17  23  3   10  1
2011    4   5   1   0   2   0   20  0   1   4   7   27  14  10  0
2014    4   5   1   0   2   0   20  0   0   10  38  20  17  5   0
2017    4   5   1   0   2   0   20  1   2   2   2   8   21  5   0
2018    4   5   1   0   2   0   20  0   5   1   3   2   2   7   2
2019    4   5   1   0   2   0   20  1   1   4   6   4   7   9   2
2020    4   5   1   0   2   0   20  3   9   6   2   2   2   0   1
2021    4   5   1   0   2   0   20  0   0   2   0   3   1   1   1
2023    4   5   1   0   2   0   20  0   0   2   6   41  39  7   0
2024    4   5   1   0   2   0   20  0   0   0   0   5   16  3   2

##NOAA  NBS Trawl   newshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
2010    4   6   1   0   1   0   20  1   3   4   12  4   2   0   0
2017    4   6   1   0   1   0   20  5   6   8   3   3   3   3   2
2019    4   6   1   0   1   0   20  49  41  11  5   2   0   1   1
2021    4   6   1   0   1   0   20  4   13  17  13  8   2   0   0
2022    4   6   1   0   1   0   20  60  63  42  38  26  13  3   2
2023    4   6   1   0   1   0   20  1   3   5   6   12  9   4   1
2025    4   6   1   0   1   0   20  3   0   0   3   1   4   5   0

##NOAA  NBS Trawl   oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
2010    4   6   1   0   2   0   20  0   2   6   15  13  7   2   2
2017    4   6   1   0   2   0   20  2   0   2   3   2   11  3   2
2019    4   6   1   0   2   0   20  5   2   6   3   2   1   5   1
2021    4   6   1   0   2   0   20  1   4   9   5   5   1   0   0
```

```
2022    4   6   1   0   2   0   20  8   8   27  29  29  19  9   2
2023    4   6   1   0   2   0   20  0   0   1   6   14  13  3   0
2025    4   6   1   0   2   0   20  1   3   4   2   6   15  14  2

##Winter        Pot     Survey  newshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,       Nsamp,  DataVec
1982    2   7   1   0   1   0   10  0   72  164 154 50  14  12  0
1983    2   7   1   0   1   0   10  68  215.5   711.5   719 543 178 18  3.5
1984    2   7   1   0   1   0   10  23  271 433.5   379 248.5   99.5    9   0.5
1985    2   7   1   0   1   0   10  16  72  199 279.5   122.5   44  7   0.5
1986    2   7   1   0   1   0   10  25.5    72.5    102 145 115 49  7   0.5
1987    2   7   1   0   1   0   10  0   8   22  28  10  6   0   0
1989    2   7   1   0   1   0   10  8   66  74.5    66.5    95.5    86.5    17  0
1990    2   7   1   0   1   0   10  7   102.5   430 542 372 253 118 29.5
1991    2   7   1   0   1   0   10  2   16  118 366 343 123 13  1
1993    2   7   1   0   1   0   10  0   1   6   10  23  21  5   0
1995    2   7   1   0   1   0   10  8   49  68  84  219 199 61  11
1996    2   7   1   0   1   0   10  102 215 320 307 181 106 40  7
1997    2   7   1   0   1   0   10  28  85  87  44  58  45  21  4
1998    2   7   1   0   1   0   10  1   122 364 234 48  21  3   0
1999    2   7   1   0   1   0   10  6   25  152 464 469 109 17  3
2000    2   7   1   0   1   0   10  10  50  60  93  189 101 20  1
2002    2   7   1   0   1   0   10  45  244 215 137 53  52  32  7
2003    2   7   1   0   1   0   10  20  80  180 233 145 49  20  4
2004    2   7   1   0   1   0   10  0   5   48  77  94  42  4   0
2005    2   7   1   0   1   0   10  2   30  57  72  88  75  30  1
2006    2   7   1   0   1   0   10  2   72  116 107 80  28  10  1
2007    2   7   1   0   1   0   10  11  22  31  56  21  7   0   0
2008    2   7   1   0   1   0   10  50  514 884 596 513 234 24  4
2009    2   7   1   0   1   0   10  1   37  69  184 106 44  5   2
2010    2   7   1   0   1   0   10  4   27  74  124 141 65  10  1
2011    2   7   1   0   1   0   10  11  46  80  122 102 78  29  1
2012    2   7   1   0   1   0   10  17  76  154 128 82  85  27  3

##Winter        Pot     Survey  oldshell
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,       Nsamp,  DataVec
1982    2   7   1   0   2   0   10  0   36  82  79  29  11  14  2
1983    2   7   1   0   2   0   10  0   0   0   10  49  24.5    21.5    21
1984    2   7   1   0   2   0   10  0   0   1   29.5    107.5   54.5    11  9.5
1985    2   7   1   0   2   0   10  0   0   1   5   22.5    18.5    1   0
1986    2   7   1   0   2   0   10  0   0   2   8.5 34.5    25  7   0
1987    2   7   1   0   2   0   10  0   0   1   6   43  16  4   0
1989    2   7   1   0   2   0   10  0   0   0   1   26  42  16  1
1990    2   7   1   0   2   0   10  0   0   0   2   54.5    116 44  5.5
1991    2   7   1   0   2   0   10  0   0   0   5   34  149 92  21
1993    2   7   1   0   2   0   10  0   0   0   3   35  49  19  9
1995    2   7   1   0   2   0   10  0   1   0   3   28  61  53  13
1996    2   7   1   0   2   0   10  0   0   5   20  87  114 55  21
1997    2   7   1   0   2   0   10  0   0   0   0   7   10  5   4
1998    2   7   1   0   2   0   10  0   1   6   14  28  15  16  8
1999    2   7   1   0   2   0   10  0   0   0   13  29  9   8   3
2000    2   7   1   0   2   0   10  0   0   0   1   29  13  7   1
2002    2   7   1   0   2   0   10  5   4   7   6   4   12  4   1
2003    2   7   1   0   2   0   10  1   5   5   18  20  22  17  5
2004    2   7   1   0   2   0   10  0   0   3   5   6   4   6   2
2005    2   7   1   0   2   0   10  0   1   1   1   16  24  5   2
2006    2   7   1   0   2   0   10  0   4   5   9   22  38  15  3
2007    2   7   1   0   2   0   10  0   0   1   1   3   6   0   0
2008    2   7   1   0   2   0   10  22  148 239 120 118 53  28  5
2009    2   7   1   0   2   0   10  0   0   1   1   20  52  2   1
2010    2   7   1   0   2   0   10  0   0   4   33  58  31  5   1
2011    2   7   1   0   2   0   10  1   0   7   19  66  27  7   0
2012    2   7   1   0   2   0   10  0   2   2   6   35  35  21  2

##  Growth data (increment)
# Type of growth increment (0=no growth data;1=size-at-release; 2= size-class-at-release)
3
# nobs_growth
66
# Class-at-release; Sex; Class-at-recapture;  Years-at-liberty;  number transition matrix; sample size
1 1 2 1 1 3 1993 1
1 1 3 1 1 3 1993 4
```

```
1 1 3 2 1 3 1993 1
1 1 4 2 1 3 1993 6
1 1 5 2 1 3 1993 4
1 1 5 3 1 3 1993 11
1 1 6 3 1 3 1993 11
2 1 3 1 1 3 1993 21
2 1 4 1 1 3 1993 22
2 1 4 2 1 3 1993 12
2 1 5 1 1 3 1993 4
2 1 5 2 1 3 1993 96
2 1 5 3 1 3 1993 19
2 1 6 2 1 3 1993 5
2 1 6 3 1 3 1993 48
2 1 7 3 1 3 1993 6
3 1 4 1 1 3 1993 47
3 1 4 2 1 3 1993 5
3 1 4 3 1 3 1993 2
3 1 5 1 1 3 1993 91
3 1 5 2 1 3 1993 36
3 1 5 3 1 3 1993 14
3 1 6 1 1 3 1993 7
3 1 6 2 1 3 1993 70
3 1 6 3 1 3 1993 28
3 1 7 1 1 3 1993 1
3 1 7 2 1 3 1993 3
3 1 7 3 1 3 1993 9
4 1 4 1 1 3 1993 10
4 1 4 2 1 3 1993 2
4 1 5 1 1 3 1993 196
4 1 5 2 1 3 1993 34
4 1 5 3 1 3 1993 3
4 1 6 1 1 3 1993 108
4 1 6 2 1 3 1993 39
4 1 6 3 1 3 1993 35
4 1 7 1 1 3 1993 2
4 1 7 2 1 3 1993 19
4 1 7 3 1 3 1993 14
4 1 8 1 1 3 1993 1
5 1 5 1 1 3 1993 75
5 1 5 2 1 3 1993 7
5 1 6 1 1 3 1993 143
5 1 6 2 1 3 1993 77
5 1 6 3 1 3 1993 9
5 1 7 1 1 3 1993 22
5 1 7 2 1 3 1993 24
5 1 7 3 1 3 1993 21
5 1 8 3 1 3 1993 4
6 1 6 1 1 3 1993 88
6 1 6 2 1 3 1993 11
6 1 7 1 1 3 1993 98
6 1 7 2 1 3 1993 47
6 1 7 3 1 3 1993 11
6 1 8 1 1 3 1993 24
6 1 8 2 1 3 1993 7
6 1 8 3 1 3 1993 3
7 1 7 1 1 3 1993 56
7 1 7 2 1 3 1993 9
7 1 7 3 1 3 1993 1
7 1 8 1 1 3 1993 25
7 1 8 2 1 3 1993 16
7 1 8 3 1 3 1993 9
8 1 8 1 1 3 1993 26
8 1 8 2 1 3 1993 8
8 1 8 3 1 3 1993 1

# Environmental data
## Use old format (0)
0
# Number of series
0
# Year ranges
```

```
# Indices
# Index Year Value

##  eof

## eof
9999
```

Model 24.0b7 control file

```
## GMACS Version 2.20.20 - Nov 2025 - asymptotic selectivity for winter commercial fishery

# Block structure
# Number of blocks
2
# Block structure
1 1
# The blocks
2008 2026
2008 2026

##  ------------------------------------------------------------------------------------- ##
##  GENERAL  CONTROLS
##  ------------------------------------------------------------------------------------- ##
#
1976       # First year of recruitment estimation,rec_dev.
2025       # last year of recruitment estimation, rec_dev
   0       # Terminal molting (0 = off, 1 = on). If on, the calc_stock_recruitment_relationship() isn't called in the procedure
   2       # phase for recruitment estimation,earlier -1. rec_dev estimation phase, BBRKC uses 2
  -2       # phase for recruitment sex-ratio estimation
  0.5      # Initial value for Expected sex-ratio
   3       # Initial conditions (0 = Unfished, 1 = Steady-state fished, 2 = Free parameters, 3 = Free parameters (revised))
   1       # Reference size-class for initial conditons = 3
   1       # Lambda (proportion of mature male biomass for SPR reference points).
   0       # Stock-Recruit-Relationship (0 = none, 1 = Beverton-Holt)
   1       # Use years specified to computed average sex ratio in the calculation of average recruitment for reference points (0 = off -i.e. Rec b
  200      ### Year to compute equilibria
   5       # Devpar phase (!!)
   0       # First year of bias-correction
   0       # First full bias-correction
   0       # Last full bias-correction
   0       # Last year of bias-correction

# Expecting 23 theta parameters
# Core parameters
## Initial: Initial value for the parameter (must lie between lower and upper)
## Lower & Upper: Range for the parameter
## Phase: Set equal to a negative number not to estimate
## Prior type:
## 0: Uniform   - parameters are the range of the uniform prior
## 1: Normal    - parameters are the mean and sd
## 2: Lognormal - parameters are the mean and sd of the log
## 3: Beta      - parameters are the two beta parameters [see dbeta]
## 4: Gamma     - parameters are the two gamma parameters [see dgamma]
# Initial_value    Lower_bound    Upper_bound Phase Prior_type        Prior_1        Prior_2
     7.00000000   -15.00000000    20.00000000    -1          0   -10.00000000    20.00000000 # Log(R0)
     10.11100000   -15.00000000    20.00000000     1          0   -10.00000000    20.00000000 # Log(Rinitial)
     8.00000000   -15.00000000    20.00000000     1          0   -10.00000000    20.00000000 # Log(Rbar)
    72.50000000    65.00000000   130.00000000     3          1    72.50000000     7.25000000 # Recruitment_ra-males
     0.75000000     0.00000001     1.60000000     3          0     0.10000000     5.00000000 # Recruitment_rb-males
    -0.10000000   -15.00000000     0.75000000    -2          0   -10.00000000     0.75000000 # log(SigmaR)
     0.75000000     0.20000000     1.00000000    -4          3     3.00000000     2.00000000 # Steepness
     0.00100000     0.00000000     1.00000000    -3          3     1.01000000     1.01000000 # Rho
     0.64670000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_2
     1.00340000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_3
     1.36040000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_4
     1.40420000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_5
     1.45990000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_6
```

```
     1.26570000   -15.00000000     5.00000000     2         0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_7
     0.72280000   -15.00000000     5.00000000     2         0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_8
  -100.00000000  -101.00000000     5.00000000    -2         0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_1
  -100.00000000  -101.00000000     5.00000000    -2         0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_2
  -100.00000000  -101.00000000     5.00000000    -2         0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_3
  -100.00000000  -101.00000000     5.00000000    -2         0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_4
  -100.00000000  -101.00000000     5.00000000    -2         0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_5
  -100.00000000  -101.00000000     5.00000000    -2         0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_6
  -100.00000000  -101.00000000     5.00000000    -2         0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_7
  -100.00000000  -101.00000000     5.00000000    -2         0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_8
##Allometry
# weight-at-length input  method  (1 = allometry  [w_l = a*l^b],  2 = vector by sex; 3= matrix by sex)
2
 0.5239661 0.8202686 1.197317 1.700319 2.317965 2.988772 3.68294 4.367152 # this is from the version 2.20.14 ctl file
# 0.52420370 0.82067430 1.19824500 1.70175900 2.32125400 2.99365100 3.68849500 4.37139500
# Proportion mature by sex and size
 0.00000000 0.00000000 0.00000000 1.00000000 1.00000000 1.00000000 1.00000000 1.00000000
# Proportion legal by sex and size
 0.00000000 0.00000000 0.00000000 0.00000000 1.00000000 1.00000000 1.00000000 1.00000000

## ==================================================================================== ##
## GROWTH PARAMETER CONTROLS                                                            ##
## ==================================================================================== ##
##
# Maximum number of size-classes to which recruitment must occur
 3
# Use functional maturity for terminally molting animals (0=no; 1=Yes)?
0
# Growth transition
##Type_1: Options for the growth matrix
#  1: Pre-specified growth transition matrix (requires molt probability)
#  2: Pre-specified size transition matrix (molt probability is ignored)
#  3: Growth increment is gamma distributed (requires molt probability)
#  4: Post-molt size is gamma distributed (requires molt probability)
#  5: Von Bert.: kappa varies among individuals (requires molt probability)
#  6: Von Bert.: Linf varies among individuals (requires molt probability)
#  7: Von Bert.: kappa and Linf varies among individuals (requires molt probability)
#  8: Growth increment is normally distributed (requires molt probability)
## Type_2: Options for the growth increment model matrix
#  1: Linear
#  2: Individual
#  3: Individual (Same as 2)
#  Block: Block number for time-varying growth
## Type_1 Type_2  Block
        8      1      0
# Molt probability
# Type: Options for the molt probability function
#  0: Pre-specified
#  1: Constant at 1
#  2: Logistic
#  3: Individual
#  Block: Block number for time-varying growth
## Type Block
      2     0

## General parameter specificiations
##  Initial: Initial value for the parameter (must lie between lower and upper)
##  Lower & Upper: Range for the parameter
##  Prior type:
##   0: Uniform   - parameters are the range of the uniform prior
##   1: Normal    - parameters are the mean and sd
##   2: Lognormal - parameters are the mean and sd of the log
##   3: Beta      - parameters are the two beta parameters [see dbeta]
##   4: Gamma     - parameters are the two gamma parameters [see dgamma]
##  Phase: Set equal to a negative number not to estimate
##  Relative: 0: absolute; 1 relative
##  Block: Block number for time-varying selectivity
##  Block_fn: 0:absolute values; 1:exponential
##  Env_L: Environmental link - options are 0:none; 1:additive; 2:multiplicative; 3:exponential
##  EnvL_var: Environmental variable
##  RW: 0 for no random walk changes; 1 otherwise
##  RW_blk: Block number for random walks
```

```
##  Sigma_RW: Sigma used for the random walk

# Inputs for sex * type 1
# MAIN PARS: Initial  Lower_bound  Upper_bound Prior_type       Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           36.998620     0.000000   200.000000          0     0.000000    20.000000      2      0      0      0      0      0      0   0.3000 # A
            0.243015    -0.200000    20.000000          0     0.000000    10.000000      2      0      0      0      0      0      0   0.3000 # B
            3.773156     2.000000    10.000000          0     0.000000     3.000000      5      0      0      0      0      0      0   0.3000 # G
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve
# Inputs for sex * type 2
# MAIN PARS: Initial  Lower_bound  Upper_bound Prior_type       Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
          122.965900    50.000000   200.000000          0     0.000000   170.000000      2      0      0      0      0      0      0   0.3000 # M
            0.127616     0.000000     1.000000          0     0.000000     3.000000      2      0      0      0      0      0      0   0.3000 # M
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve


## ================================================================================= ##
## NATURAL MORTALITIY PARAMETER CONTROLS                                             ##
## ================================================================================= ##
##
# Relative: 0 - absolute values; 1+ - based on another M-at-size vector (indexed by ig)
# Type: 0 for standard; 1: Spline
#  For spline: set extra to the number of knots, the parameters are the knots (phase -1) and the log-differences from base M
# Extra: control the number of knots for splines
# Brkpts: number of changes in M by size
# Mirror: Mirror M-at-size over to that for another partition (indexed by ig)
# Block: Block number for time-varying M-at-size
# Block_fn: 0:absolute values; 1:exponential
# Env_L: Environmental link - options are 0: none; 1:additive; 2:multiplicative; 3:exponential
# EnvL_var: Environmental variable
# RW: 0 for no random walk changes; 1 otherwise
# RW_blk: Block number for random walks
# Sigma_RW: Sigma for the random walk parameters
# Mirror_RW: Should time-varying aspects be mirrored (Indexed by ig)
## Relative?   Type   Extra  Brkpts  Mirror   Block  Blk_fn Env_L   EnvL_Vr      RW  RW_blk Sigma_RW Mirr_RW
         0       0       0       1       0       0       1       0       0       0       0   0.3000       0
# MaxMbreaks
7  # sex*maturity state: male & 1

#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    0.18000000     0.00000000     0.20000000           0     0.00000000     0.20000000     -1 # M_base_male_mature
    0.50000000     0.05000000     1.00000000           1     0.00000000     0.25000000      3 # M estimated for males > 123 mm carapace length

## ================================================================================= ##
## SELECTIVITY PARAMETERS CONTROLS                                                   ##
## ================================================================================= ##
##
# ## Selectivity parameter controls
# ## Selectivity (and retention) types
# ##  <0: Mirror selectivity
# ##   0: Nonparametric selectivity (one parameter per class)
# ##   1: Nonparametric selectivity (one parameter per class, constant from last specified class)
# ##   2: Logistic selectivity (inflection point and slope)
# ##   3: Logistic selectivity (50% and 95% selection)
# ##   4: Double normal selectivity (3 parameters)
# ##   5: Flat equal to zero (1 parameter; phase must be negative)
# ##   6: Flat equal to one (1 parameter; phase must be negative)
# ##   7: Flat-topped double normal selectivity (4 parameters)
# ##   8: Declining logistic selectivity with initial values (50% and 95% selection plus extra)
# ##   9: Cubic-spline (specified with knots and values at knots)
# ##      Inputs: knots (in length units); values at knots (0-1) - at least one should have phase -1
# ##  10: One parameter logistic selectivity (inflection point and slope)
## Selectivity specifications --
# ## Extra (type 1): number of selectivity parameters to estimated
# #  Winter_Com Subsistence Summer_Com NMFS_Trawl ADFG_Trawl NBS_Trawl Winter_Pot
 0 0 0 0 0 0 0 # is selectivity sex=specific? (1=Yes; 0=No)
 10 -1 -1 10 -4 -4 8 # male selectivity type.
 0 0 0 0 0 0 0 # selectivity within another gear
 0 0 0 0 0 0 3 # male extra parameters for each pattern
 0 0 1 1 1 1 0 # male: is maximum selectivity at size forced to equal 1 (1) or not (0)
 0 0 0 0 0 0 4 # size-class at which selectivity is forced to equal 1 (ignored if the previous input is 1)
## Retention specifications --
 0 0 0 0 0 0 0 # is retention sex=specific? (1=Yes; 0=No)
```

```
 2 0 2 6 6 6 6 # male retention type
 1 1 1 0 0 0 0 # male retention flag (0 = no, 1 = yes)
 0 0 0 0 0 0 0 # male extra parameters for each pattern
 0 0 0 0 0 0 0 # male - should maximum retention be estimated for males (1=Yes; 0=No)

## General parameter specificiations
##  Initial: Initial value for the parameter (must lie between lower and upper)
##  Lower & Upper: Range for the parameter
##  Prior type:
##   0: Uniform   - parameters are the range of the uniform prior
##   1: Normal    - parameters are the mean and sd
##   2: Lognormal - parameters are the mean and sd of the log
##   3: Beta      - parameters are the two beta parameters [see dbeta]
##   4: Gamma     - parameters are the two gamma parameters [see dgamma]
##  Phase: Set equal to a negative number not to estimate
##  Relative: 0: absolute; 1 relative
##  Block: Block number for time-varying selectivity
##  Block_fn: 0:absolute values; 1:exponential
##  Env_L: Environmental link - options are 0:none; 1:additive; 2:multiplicative; 3:exponential
##  EnvL_var: Environmental variable
##  RW: 0 for no random walk changes; 1 otherwise
##  RW_blk: Block number for random walks
##  Sigma_RW: Sigma used for the random walk

# Inputs for type*sex*fleet: selectivity male Winter_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
#           128.894800    40.000000   200.000000          0    10.000000   200.000000      2      0      0      0      0      0      0   0.3000 #
#             0.154697     0.010000    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #
#             0.045586     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #
#             0.375288     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #
#             0.733787     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #
             0.143640     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S

# Inputs for type*sex*fleet: selectivity male Summer_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
#             0.143640     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #

# Inputs for type*sex*fleet: selectivity male NMFS_Trawl
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
             0.092094     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S

# Inputs for type*sex*fleet: selectivity male ADFG_Trawl
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
#             0.092094     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #

# Inputs for type*sex*fleet: selectivity male NBS_Trawl
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
#             0.092094     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #

# Inputs for type*sex*fleet: selectivity male Winter_Pot
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           128.894800    40.000000   200.000000          0    10.000000   200.000000      2      0      0      0      0      0      0   0.3000 # S
             0.154697     0.010000    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S
             0.045586     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S
             0.375288     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S
             0.733787     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S

# Inputs for type*sex*fleet: retention male Winter_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           100.49375    50.000000   200.000000          0     1.000000   900.000000     -2      2      0      0      0      0      0   0.3000 # Re
             2.48336     0.001000    20.000000          0     1.000000   900.000000     -2      2      0      0      0      0      0   0.3000 # Re
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve
           100.49375    50.000000   700.000000          0     0.100000   100.000000      2      0 # Ret_Summer_Com_male_period_2_par_1
              2.4833     1.000000    20.000000          0     0.100000   100.000000      2      0 # Ret_Summer_Com_male_period_2_par_2

# Inputs for type*sex*fleet: retention male Subsistence
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
             0.000001     0.000000     0.000002          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.000001     0.000000     0.000002          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.000001     0.000000     0.000002          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
```

```
             0.999999     0.000000     1.000000          0     1.000000  900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000  900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000  900.000000     -2      0      0      0      0      0      0   0.3000 # R

# Inputs for type*sex*fleet: retention male Summer_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           104.310600    50.000000   700.000000          0     1.000000  900.000000      2      1      0      0      0      0      0   0.3000 # R
             2.421736     1.000000    20.000000          0     1.000000  900.000000      2      1      0      0      0      0      0   0.3000 # R
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1     Prior_2  Phase Reltve
           105.150900    50.000000   700.000000          0     0.100000  100.000000      2      0 # Ret_Summer_Com_male_period_2_par_1
             1.648215     1.000000    20.000000          0     0.100000  100.000000      2      0 # Ret_Summer_Com_male_period_2_par_2

## ====================================================================================== ##
## CATCHABILITY PARAMETER CONTROLS                                                        ##
## ====================================================================================== ##
##
# Catchability (specifications)
# Analytic: should q be estimated analytically (1) or not (0)
# Lambda: the weight lambda
# Emphasis: the weighting emphasis
# Block: Block number for time-varying M-at-size
# Block_fn: 0:absolute values; 1:exponential
# Env_L: Environmental link - options are 0: none; 1:additive; 2:multiplicative; 3:exponential
# EnvL_var: Environmental variable
# RW: 0 for no random walk changes; 1 otherwise
# RW_blk: Block number for random walks
# Sigma_RW: Sigma for the random walk parameters
## Analytic  Lambda Emphass  Mirror   Block   Env_L EnvL_Vr      RW  RW_blk Sigma_RW
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
# Catchability (parameters)
#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    0.77700000     0.10000000     2.00000000           0     0.10000000     1.00000000      2 # NMFS trawl survey
    1.00000000     0.10000000     2.00000000           0     0.10000000     1.00000000     -2 # ADF&G trawl survey
    0.77700000     0.10000000     2.00000000           0     0.10000000     1.00000000      2 # NBS trawl survey
    0.00150000     0.00000000     2.00000000           0     0.00000000     1.00000000      1 # block 1 - std CPUE
    0.00150000     0.00000000     2.00000000           0     0.00000000     1.00000000      1 # block 2 - std CPUE
    0.00150000     0.00000000     2.00000000           0     0.00000000     1.00000000      1 # block 3 - std CPUE

## ====================================================================================== ##
## ADDITIONAL CV PARAMETER CONTROLS                                                       ##
## ====================================================================================== ##
##
# Catchability (specifications)
# Mirror: should additional variance be mirrored (value > 1) or not (0)?
# Block: Block number for time-varying M-at-size
# Block_fn: 0:absolute values; 1:exponential
# Env_L: Environmental link - options are 0: none; 1:additive; 2:multiplicative; 3:exponential
# EnvL_var: Environmental variable
# RW: 0 for no random walk changes; 1 otherwise
# RW_blk: Block number for random walks
# Sigma_RW: Sigma for the random walk parameters
##   Mirror   Block   Env_L EnvL_Vr     RW   RW_blk Sigma_RW
          0       0       0       0       0       0   0.3000
          0       0       0       0       0       0   0.3000
          0       0       0       0       0       0   0.3000
          0       0       0       0       0       0   0.3000
          4       0       0       0       0       0   0.3000
          4       0       0       0       0       0   0.3000
## Mirror Block Env_L EnvL_Var  RW RW_blk Sigma_RW
# Additional variance (parameters)
#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
    0.10000000     0.00000001     2.00000000           0     1.00000000   100.00000000      4
#    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
#    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
```

```
## ==================================================================================== ##
## CONTROLS ON F                                                                        ##
## ==================================================================================== ##
##
# Controls on F
#   Initial_male_F Initial_fema_F Pen_SD (early) Pen_SD (later) Phz_mean_F_mal Phz_mean_F_fem   Lower_mean_F   Upper_mean_F Low_ann_male_F  Up_ann
          0.020000       0.000000       0.500000      45.500000       1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.020000       0.000000       0.500000      45.500000       1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.120000       0.000000       0.500000      45.500000       1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10

## ==================================================================================== ##
## SIZE COMPOSITIONS OPTIONS                                                            ##
## ==================================================================================== ##
##
# Options when fitting size-composition data
## Likelihood types:
##  1:Multinomial with estimated/fixed sample size
##  2:Robust approximation to multinomial
##  3:logistic normal
##  4:multivariate-t
##  5:Dirichlet

#  Winter_Com Winter_Com Summer_Com Summer_Com Summer_Com Summer_Com Summer_Com Summer_Com NMFS_Trawl NMFS_Trawl ADFG_Trawl ADFG_Trawl NBS_Trawl N
#  male male male male male male male male male male male male male male male male
#  retained retained retained retained discard discard total total total total total total total total total total
#  newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell
#  immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature
  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Type of likelihood
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Auto tail compression
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Auto tail compression (pmin)
  1   1   2   2   3   3   4   4   5   5   6   6   7   7   8   8 # Composition aggregator codes
  1   1   1   1   1   1   1   1   2   2   2   2   2   2   2   2 # Set to 1 for catch-based predictions; 2 for survey or total catch predictions
#  -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4 # Phz for estimating effective sample size (if appl.)
  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Lambda for effective sample size
  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Lambda for overall likelihood. Or emphasis?
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Survey to set Q for this comp. Does 0 keep this as is? Ask Buck. Added in versio
#  0   0   0   0   0   0   0   0   3   4   1   2   5   6   5   6 # Survey to set Q for this comp. Does 0 keep this as is? Ask Buck. Added in versi
#  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Survey to set Q for this comp. Does 0 keep this as is? Ask Buck. Added in versi
#  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Initial value for effective sample size multiplier

# Effective sample size parameters (number matches max(Composition Aggregator code))
#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    1.00000000     0.10000000    10.00000000           0       0               999      -1 # Overdispersion_parameter_for_size_comp_1(possibly e
    1.00000000     0.10000000    10.00000000           0       0               999      -1 # Overdispersion_parameter_for_size_comp_2(possibly e
    1.00000000     0.10000000    10.00000000           0       0               999      -1 # Overdispersion_parameter_for_size_comp_3(possibly e
    1.00000000     0.10000000    10.00000000           0       0               999      -1 # Overdispersion_parameter_for_size_comp_4(possibly e
    1.00000000     0.10000000    10.00000000           0       0               999      -1 # Overdispersion_parameter_for_size_comp_5(possibly e
    1.00000000     0.10000000    10.00000000           0       0               999      -1 # Overdispersion_parameter_for_size_comp_6(possibly e
    1.00000000     0.10000000    10.00000000           0       0               999      -1 # Overdispersion_parameter_for_size_comp_7(possibly e
    1.00000000     0.10000000    10.00000000           0       0               999      -1 # Overdispersion_parameter_for_size_comp_8(possibly e

## ==================================================================================== ##
## EMPHASIS FACTORS                                                                     ##
## ==================================================================================== ##

1.0000 # Emphasis on tagging data

 1.0000 1.0000 0.0000 1.0000 # Emphasis on Catch: (by catch dataframes)

#AEP AEP AEP AEP
   1.0000   0.0000   0.0000   0.0000 # Winter_Com
   0.1000   0.0000   0.0000   0.0000 # Subsistence
   1.0000   0.0000   0.0000   0.0000 # Summer_Com
   0.0000   0.0000   0.0000   0.0000 # NMFS_Trawl
   0.0000   0.0000   0.0000   0.0000 # ADFG_Trawl
   0.0000   0.0000   0.0000   0.0000 # NBS_Trawl
   0.0000   0.0000   0.0000   0.0000 # Winter_Pot
```

```
#
## Emphasis Factors (Priors/Penalties: 13 values) ##
     1.0000 #--Log_fdevs
     0.0000 #--MeanF
     0.0000 #--Mdevs
     1.0000 #--Rec_devs
    15.0000 #--Initial_devs
     1.0000 #--Fst_dif_dev
     3.0000 #--Mean_sex_ratio
    60.0000 #--Molt_prob
     0.1000 #--free selectivity
     1.0000 #--Init_n_at_len
     0.0000 #--Fvecs
     0.0000 #--Fdovss
     1.0000 #--Random walk in selectivity

# eof_ctl
9999
```

Model 25.0a1 data file

```
#============================================================================================================
# Gmacs Main  Data  File  NSRKC 2025 - Nov 2025 - used with GMACS version 2.20.20 - combining oldshell and newshell, M for small males = 0.23
# GEAR_INDEX   DESCRIPTION
#    1        : Winter Commercial Fishery Retained catch
#    2        : Winter Subsistence Fishery Retained catch
#    3        : Winter Subsistence Fishery Total catch
#    4        : Summer Commercial Fishery Retained catch
#    5        : Summer Commercial Fishery Total catch
#    6        : ADF&G Survey
#    7        : NMFS Survey
#    8        : Pot CPUE

# Fisheries:  1 Winter Pot Fishery, 2 Winter Subsistace, 3 Summer Pot Fishery
# Surveys:    4 NMFS Trawl Survey, 5 ADFG Trawl Survey, 6 NBS Trawl Survey, 7 Winter Pot survey
#============================================================================================================

1976  # Start year
2025  # End year
#2025  # Projection year
7     # Number of seasons
7     # Number of distinct data groups (fleet, among fishing fleets and surveys)
1     # Number of sexes
#2     # Number of shell condition types
1     # Number of shell condition types
1     # Number of maturity types
8     # Number of size-classes in the model
#6     # Season recruitment occurs
7     # Season recruitment occurs
#3     # Season molting and growth occurs
4     # Season molting and growth occurs
1     # Season to calculate SSB
1     # Season for N output
# maximum size-class (males then females)
8
# size_breaks (a vector giving the break points between size intervals with dimension nclass+1)
63.5    73.5    83.5    93.5    103.5   113.5   123.5   133.5   143.5
# Natural mortality per season input type (1 = vector by season, 2 = matrix by season/year)
2
# Proportion of the total natural mortality to be applied each season (each row must add to 1)
# 1. Winter Fishery (Feb01)
# 2. Mortality between winter and summer fishery
# 3. Summer fishery
# 4. Time between summer fishery and Nov 1 (Molt and recruit)
# 5. Time to Feb 01
# 6. Feb 01 recruit

0   0   0.3452055   0.1863014   0.1351932   0.3333  0 # 1976
0   0   0.3452055   0.1863014   0.1351932   0.3333  0 # 1977
```

```
0   0   0.3452055   0.1863014   0.1351932   0.3333  0 # 1978
0   0   0.4493151   0.04109589  0.176289    0.3333  0 # 1979
0   0   0.4493151   0.04109589  0.176289    0.3333  0 # 1980
0   0   0.4493151   0.1013699   0.1160151   0.3333  0 # 1981
0   0   0.5150685   0.06027397  0.09135753  0.3333  0 # 1982
0   0   0.4931507   0.0109589   0.1625904   0.3333  0 # 1983
0   0   0.4931507   0.03835616  0.1351932   0.3333  0 # 1984
0   0   0.4931507   0.06027397  0.1132753   0.3333  0 # 1985
0   0   0.4931507   0.06575342  0.1077959   0.3333  0 # 1986
0   0   0.4931507   0.03013699  0.1434123   0.3333  0 # 1987
0   0   0.4931507   0.02739726  0.1461521   0.3333  0 # 1988
0   0   0.4931507   0.008219178 0.1653301   0.3333  0 # 1989
0   0   0.4931507   0.0109589   0.1625904   0.3333  0 # 1990
0   0   0.4931507   0.0109589   0.1625904   0.3333  0 # 1991
0   0   0.4931507   0.005479452 0.1680699   0.3333  0 # 1992
0   0   0.4109589   0.1561644   0.09957671  0.3333  0 # 1993
0   0   0.4109589   0.07945205  0.176289    0.3333  0 # 1994
0   0   0.4109589   0.1643836   0.09135753  0.3333  0 # 1995
0   0   0.4109589   0.169863    0.08587808  0.3333  0 # 1996
0   0   0.4109589   0.1150685   0.1406726   0.3333  0 # 1997
0   0   0.4109589   0.169863    0.08587808  0.3333  0 # 1998
0   0   0.4109589   0.1726027   0.08313836  0.3333  0 # 1999
0   0   0.4109589   0.2410959   0.01464521  0.3333  0 # 2000
0   0   0.4109589   0.1863014   0.06943973  0.3333  0 # 2001
0   0   0.3671233   0.2136986   0.08587808  0.3333  0 # 2002
0   0   0.3671233   0.1890411   0.1105356   0.3333  0 # 2003
0   0   0.3671233   0.1452055   0.1543712   0.3333  0 # 2004
0   0   0.3671233   0.1972603   0.1023164   0.3333  0 # 2005
0   0   0.3671233   0.1835616   0.1160151   0.3333  0 # 2006
0   0   0.3671233   0.169863    0.1297137   0.3333  0 # 2007
0   0   0.3890411   0.1917808   0.08587808  0.3333  0 # 2008
0   0   0.3671233   0.260274    0.03930274  0.3333  0 # 2009
0   0   0.4027397   0.1534247   0.1105356   0.3333  0 # 2010
0   0   0.4027397   0.08767123  0.176289    0.3333  0 # 2011
0   0   0.4054795   0.1890411   0.07217945  0.3333  0 # 2012
0   0   0.4164384   0.1945205   0.0557411   0.3333  0 # 2013
0   0   0.3945205   0.1369863   0.1351932   0.3333  0 # 2014
0   0   0.4054795   0.06849315  0.1927274   0.3333  0 # 2015
0   0   0.4000000   0.06575342  0.2009466   0.3333  0 # 2016
0   0   0.3972603   0.07945205  0.1899877   0.3333  0 # 2017
0   0   0.3917808   0.09589041  0.1790288   0.3333  0 # 2018
0   0   0.3945205   0.1643836   0.1077959   0.3333  0 # 2019
0   0   0.3945205   0.1643836   0.1077959   0.3333  0 # 2020
0   0   0.3945205   0.1643836   0.1077959   0.3333  0 # 2021
0   0   0.3671233   0.109589    0.189987    0.3333  0 # 2022
0   0   0.3835616   0.07671233  0.206426    0.3333  0 # 2023
0   0   0.3643836   0.07945205  0.2228644   0.3333  0 # 2024
0   0   0.4036036   0.097297297  0.1657658  0.333333  0 #   2025 # is this order correct?

# Fishing fleet names (delimited with : no spaces in names)
Winter_Com Subsistence Summer_Com
# Survey names (delimited with : no spaces in names)
NMFS_Trawl ADFG_Trawl NBS_Trawl Winter_Pot
# Are the seasons instantaneous (0) or continuous (1)
1 1 1 1 1 1 1
# Use Old format (0)
0
# Number  of  catch data  frames
 4
# Number  of  rows  in  each  data  frame
 47  48  42 46
##  CATCH DATA
##  Type of catch: 1 = retained, 2 = discard
##  Units of catch: 1 = biomass, 2 = numbers

##      Winter commercial retained
# year  seas    fleet   sex     obs     cv      type    units   mult    effort  discard_mortality
1978    2   1   1   9.625   0.03    1   2   1   0   0.2
1979    2   1   1   0.221   0.03    1   2   1   0   0.2
1980    2   1   1   0.022   0.03    1   2   1   0   0.2
#1981   2   1   1   0       0.03    1   2   1   0   0.2
1982    2   1   1   0.017   0.03    1   2   1   0   0.2
```

```
1983    2   1   1   0.549   0.03    1   2   1   0   0.2
1984    2   1   1   0.856   0.03    1   2   1   0   0.2
1985    2   1   1   1.168   0.03    1   2   1   0   0.2
1986    2   1   1   2.168   0.03    1   2   1   0   0.2
1987    2   1   1   1.04    0.03    1   2   1   0   0.2
1988    2   1   1   0.425   0.03    1   2   1   0   0.2
1989    2   1   1   0.403   0.03    1   2   1   0   0.2
1990    2   1   1   3.626   0.03    1   2   1   0   0.2
1991    2   1   1   3.8     0.03    1   2   1   0   0.2
1992    2   1   1   7.478   0.03    1   2   1   0   0.2
1993    2   1   1   1.788   0.03    1   2   1   0   0.2
1994    2   1   1   5.753   0.03    1   2   1   0   0.2
1995    2   1   1   7.538   0.03    1   2   1   0   0.2
1996    2   1   1   1.778   0.03    1   2   1   0   0.2
1997    2   1   1   0.083   0.03    1   2   1   0   0.2
1998    2   1   1   0.984   0.03    1   2   1   0   0.2
1999    2   1   1   2.714   0.03    1   2   1   0   0.2
2000    2   1   1   3.045   0.03    1   2   1   0   0.2
2001    2   1   1   1.098   0.03    1   2   1   0   0.2
2002    2   1   1   2.591   0.03    1   2   1   0   0.2
2003    2   1   1   6.853   0.03    1   2   1   0   0.2
2004    2   1   1   0.522   0.03    1   2   1   0   0.2
2005    2   1   1   2.121   0.03    1   2   1   0   0.2
2006    2   1   1   0.075   0.03    1   2   1   0   0.2
2007    2   1   1   3.313   0.03    1   2   1   0   0.2
2008    2   1   1   5.796   0.03    1   2   1   0   0.2
2009    2   1   1   4.951   0.03    1   2   1   0   0.2
2010    2   1   1   4.834   0.03    1   2   1   0   0.2
2011    2   1   1   3.365   0.03    1   2   1   0   0.2
2012    2   1   1   9.157   0.03    1   2   1   0   0.2
2013    2   1   1   22.639  0.03    1   2   1   0   0.2
2014    2   1   1   14.986  0.03    1   2   1   0   0.2
2015    2   1   1   41.046  0.03    1   2   1   0   0.2
2016    2   1   1   29.792  0.03    1   2   1   0   0.2
2017    2   1   1   26.008  0.03    1   2   1   0   0.2
2018    2   1   1   9.18    0.03    1   2   1   0   0.2
2019    2   1   1   1.05    0.03    1   2   1   0   0.2
2020    2   1   1   0.08    0.03    1   2   1   0   0.2
2021    2   1   1   0.32    0.03    1   2   1   0   0.2
2022    2   1   1   2.708   0.03    1   2   1   0   0.2
2023    2   1   1   3.580   0.03    1   2   1   0   0.2
2024    2   1   1   4.830   0.03    1   2   1   0   0.2
2025    2   1   1   2.657   0.03    1   2   1   0   0.2

#       Subsistence retained
1978    2   2   1   12.506  0.03    1   2   1   0   0.2
1979    2   2   1   0.224   0.03    1   2   1   0   0.2
1980    2   2   1   0.213   0.03    1   2   1   0   0.2
1981    2   2   1   0.36    0.03    1   2   1   0   0.2
1982    2   2   1   1.288   0.03    1   2   1   0   0.2
1983    2   2   1   10.432  0.03    1   2   1   0   0.2
1984    2   2   1   11.22   0.03    1   2   1   0   0.2
1985    2   2   1   8.377   0.03    1   2   1   0   0.2
1986    2   2   1   7.052   0.03    1   2   1   0   0.2
1987    2   2   1   5.772   0.03    1   2   1   0   0.2
1988    2   2   1   2.724   0.03    1   2   1   0   0.2
1989    2   2   1   6.126   0.03    1   2   1   0   0.2
1990    2   2   1   12.152  0.03    1   2   1   0   0.2
1991    2   2   1   7.366   0.03    1   2   1   0   0.2
1992    2   2   1   11.736  0.03    1   2   1   0   0.2
1993    2   2   1   1.097   0.03    1   2   1   0   0.2
1994    2   2   1   4.113   0.03    1   2   1   0   0.2
1995    2   2   1   5.426   0.03    1   2   1   0   0.2
1996    2   2   1   1.679   0.03    1   2   1   0   0.2
1997    2   2   1   0.745   0.03    1   2   1   0   0.2
1998    2   2   1   8.622   0.03    1   2   1   0   0.2
1999    2   2   1   7.533   0.03    1   2   1   0   0.2
2000    2   2   1   5.723   0.03    1   2   1   0   0.2
2001    2   2   1   0.256   0.03    1   2   1   0   0.2
2002    2   2   1   2.177   0.03    1   2   1   0   0.2
2003    2   2   1   4.14    0.03    1   2   1   0   0.2
2004    2   2   1   1.181   0.03    1   2   1   0   0.2
```

```
2005    2   2   1   3.973   0.03    1   2   1   0   0.2
2006    2   2   1   1.239   0.03    1   2   1   0   0.2
2007    2   2   1   10.69   0.03    1   2   1   0   0.2
2008    2   2   1   9.485   0.03    1   2   1   0   0.2
2009    2   2   1   4.752   0.03    1   2   1   0   0.2
2010    2   2   1   7.044   0.03    1   2   1   0   0.2
2011    2   2   1   6.64    0.03    1   2   1   0   0.2
2012    2   2   1   7.311   0.03    1   2   1   0   0.2
2013    2   2   1   7.622   0.03    1   2   1   0   0.2
2014    2   2   1   3.252   0.03    1   2   1   0   0.2
2015    2   2   1   7.651   0.03    1   2   1   0   0.2
2016    2   2   1   5.34    0.03    1   2   1   0   0.2
2017    2   2   1   6.039   0.03    1   2   1   0   0.2
2018    2   2   1   4.424   0.03    1   2   1   0   0.2
2019    2   2   1   1.54    0.03    1   2   1   0   0.2
2020    2   2   1   0.55    0.03    1   2   1   0   0.2
2021    2   2   1   2.892   0.03    1   2   1   0   0.2
2022    2   2   1   7.630   0.03    1   2   1   0   0.2
2023    2   2   1   5.407   0.03    1   2   1   0   0.2
2024    2   2   1   4.751   0.03    1   2   1   0   0.2
2025    2   2   1   1.897   0.03    1   2   1   0   0.2

# Subistence total
#1978   2   2   1   0   0.03    0   2   1   0   0.2
#1979   2   2   1   0   0.03    0   2   1   0   0.2
#1980   2   2   1   0   0.03    0   2   1   0   0.2
#1981   2   2   1   0   0.03    0   2   1   0   0.2
#1982   2   2   1   0   0.03    0   2   1   0   0.2
#1983   2   2   1   0   0.03    0   2   1   0   0.2
1984    2   2   1   15.923  0.03    0   2   1   0   0.2
1985    2   2   1   10.757  0.03    0   2   1   0   0.2
1986    2   2   1   10.751  0.03    0   2   1   0   0.2
1987    2   2   1   7.406   0.03    0   2   1   0   0.2
1988    2   2   1   3.573   0.03    0   2   1   0   0.2
1989    2   2   1   7.945   0.03    0   2   1   0   0.2
1990    2   2   1   16.635  0.03    0   2   1   0   0.2
1991    2   2   1   9.295   0.03    0   2   1   0   0.2
1992    2   2   1   15.051  0.03    0   2   1   0   0.2
1993    2   2   1   1.193   0.03    0   2   1   0   0.2
1994    2   2   1   4.894   0.03    0   2   1   0   0.2
1995    2   2   1   7.777   0.03    0   2   1   0   0.2
1996    2   2   1   2.936   0.03    0   2   1   0   0.2
1997    2   2   1   1.617   0.03    0   2   1   0   0.2
1998    2   2   1   20.327  0.03    0   2   1   0   0.2
1999    2   2   1   10.651  0.03    0   2   1   0   0.2
2000    2   2   1   9.816   0.03    0   2   1   0   0.2
2001    2   2   1   0.366   0.03    0   2   1   0   0.2
2002    2   2   1   5.119   0.03    0   2   1   0   0.2
2003    2   2   1   9.052   0.03    0   2   1   0   0.2
2004    2   2   1   1.775   0.03    0   2   1   0   0.2
2005    2   2   1   6.484   0.03    0   2   1   0   0.2
2006    2   2   1   2.083   0.03    0   2   1   0   0.2
2007    2   2   1   21.444  0.03    0   2   1   0   0.2
2008    2   2   1   18.621  0.03    0   2   1   0   0.2
2009    2   2   1   6.971   0.03    0   2   1   0   0.2
2010    2   2   1   9.004   0.03    0   2   1   0   0.2
2011    2   2   1   9.183   0.03    0   2   1   0   0.2
2012    2   2   1   11.341  0.03    0   2   1   0   0.2
2013    2   2   1   21.524  0.03    0   2   1   0   0.2
2014    2   2   1   5.421   0.03    0   2   1   0   0.2
2015    2   2   1   9.84    0.03    0   2   1   0   0.2
2016    2   2   1   6.468   0.03    0   2   1   0   0.2
2017    2   2   1   7.185   0.03    0   2   1   0   0.2
2018    2   2   1   5.767   0.03    0   2   1   0   0.2
2019    2   2   1   2.079   0.03    0   2   1   0   0.2
2020    2   2   1   0.815   0.03    0   2   1   0   0.2
2021    2   2   1   3.999   0.03    0   2   1   0   0.2
2022    2   2   1   10.041  0.03    0   2   1   0   0.2
2023    2   2   1   6.613   0.03    0   2   1   0   0.2
2024    2   2   1   5.9879  0.03    0   2   1   0   0.2
2025    2   2   1   2.239   0.03    0   2   1   0   0.2
```

```
# Summer Commercial Retain
1977    4   3   1   195.877 0.03    1   2   1   0   0.2
1978    4   3   1   660.829 0.03    1   2   1   0   0.2
1979    4   3   1   970.962 0.03    1   2   1   0   0.2
1980    4   3   1   329.778 0.03    1   2   1   0   0.2
1981    4   3   1   376.313 0.03    1   2   1   0   0.2
1982    4   3   1   63.949  0.03    1   2   1   0   0.2
1983    4   3   1   132.205 0.03    1   2   1   0   0.2
1984    4   3   1   139.759 0.03    1   2   1   0   0.2
1985    4   3   1   146.669 0.03    1   2   1   0   0.2
1986    4   3   1   162.438 0.03    1   2   1   0   0.2
1987    4   3   1   103.338 0.03    1   2   1   0   0.2
1988    4   3   1   76.148  0.03    1   2   1   0   0.2
1989    4   3   1   79.116  0.03    1   2   1   0   0.2
1990    4   3   1   59.132  0.03    1   2   1   0   0.2
#1991   4   3   1   0       0.03    1   2   1   0   0.2
1992    4   3   1   24.902  0.03    1   2   1   0   0.2
1993    4   3   1   115.913 0.03    1   2   1   0   0.2
1994    4   3   1   108.824 0.03    1   2   1   0   0.2
1995    4   3   1   105.967 0.03    1   2   1   0   0.2
1996    4   3   1   74.752  0.03    1   2   1   0   0.2
1997    4   3   1   32.606  0.03    1   2   1   0   0.2
1998    4   3   1   10.661  0.03    1   2   1   0   0.2
1999    4   3   1   8.734   0.03    1   2   1   0   0.2
2000    4   3   1   111.728 0.03    1   2   1   0   0.2
2001    4   3   1   98.321  0.03    1   2   1   0   0.2
2002    4   3   1   86.666  0.03    1   2   1   0   0.2
2003    4   3   1   93.638  0.03    1   2   1   0   0.2
2004    4   3   1   120.289 0.03    1   2   1   0   0.2
2005    4   3   1   138.926 0.03    1   2   1   0   0.2
2006    4   3   1   150.358 0.03    1   2   1   0   0.2
2007    4   3   1   110.344 0.03    1   2   1   0   0.2
2008    4   3   1   143.337 0.03    1   2   1   0   0.2
2009    4   3   1   143.485 0.03    1   2   1   0   0.2
2010    4   3   1   149.822 0.03    1   2   1   0   0.2
2011    4   3   1   141.626 0.03    1   2   1   0   0.2
2012    4   3   1   161.113 0.03    1   2   1   0   0.2
2013    4   3   1   130.603 0.03    1   2   1   0   0.2
2014    4   3   1   129.656 0.03    1   2   1   0   0.2
2015    4   3   1   144.225 0.03    1   2   1   0   0.2
2016    4   3   1   138.997 0.03    1   2   1   0   0.2
2017    4   3   1   135.322 0.03    1   2   1   0   0.2
2018    4   3   1   89.613  0.03    1   2   1   0   0.2
2019    4   3   1   23.964  0.03    1   2   1   0   0.2
#2020   4   3   1   0       0.03    1   2   1   0   0.2
#2021   4   3   1   0       0.03    1   2   1   0   0.2
2022    4   3   1   125.042 0.03    1   2   1   0   0.2
2023    4   3   1   148.062 0.03    1   2   1   0   0.2
2024    4   3   1   140.379 0.03    1   2   1   0   0.2
2025    4   3   1   100.758 0.03    1   2   1   0   0.2

##  RELATIVE  ABUNDANCE DATA
##  Units of abundance: 1 = biomass, 2 = numbers
## Use old format (0)
0
##  Number  of  relative  abundance indicies
6
# Type of ’survey’ catchability (1=Selectivity; 2=Selectivity+Retention), by data frame
1 1 1 2 2 2
##  Number  of  rows  in    index
73
# ADFG/NOAA Trawl survey
#Index  Year    Season  Fleet   Sex Maturity    Value   CV  Type    Time
1   1976    4   4   1   0   4247.462    0.311   2   1.411765
1   1979    4   4   1   0   1417.215    0.204   2   1
1   1982    4   4   1   0   2791.733    0.289   2   1.318182
1   1985    4   4   1   0   2306.321    0.254   2   2.363636
1   1988    4   4   1   0   2263.353    0.288   2   2.2
1   1991    4   4   1   0   3132.508    0.428   2   6.25

#   ADFG    Trawl survey
2   1996    4   5   1   0   1313.757    0.259   2   0.6612903
```

```
2   1999    4   5   1   0   2630.53     0.236   2   0.4920635
2   2002    4   5   1   0   1769.85     0.418   2   0.5897436
2   2006    4   5   1   0   3322.53     0.391   2   0.6865672
2   2008    4   5   1   0   2962.1      0.30    2   0.5571429
2   2011    4   5   1   0   3209.285    0.289   2   1.03125
2   2014    4   5   1   0   5949.46     0.473   2   0.58
2   2017    4   5   1   0   1762.072    0.223   2   1.241379
2   2018    4   5   1   0   1109.39     0.249   2   0.8857143
2   2019    4   5   1   0   4675.99     0.598   2   0.4666667
2   2020    4   5   1   0   1725.99     0.298   2   0.7
2   2021    4   5   1   0   2430.44     0.608   2   0.5166667
2   2023    4   5   1   0   3548.08     0.315   2   1.214286
2   2024    4   5   1   0   1407.401    0.281   2   1.413793


#   NOAA    NBS survey
3   2010    4   6   1   0   1980.079    0.436   2   0.6071429
3   2017    4   6   1   0   864.497     0.467   2   1.965517
3   2019    4   6   1   0   2071.94     0.346   2   0.5882353
3   2021    4   6   1   0   2338.06     0.441   2   0.6666667
3   2022    4   6   1   0   2103.02     0.363   2   0.6166667
3   2023    4   6   1   0   1686.34 0.391   2   1.3
3   2025    4   6   1   0   1632.63     0.636   2   1.3

#   ST  CPUE
4   1977    4   3   1   0   2.82    0.35    2   0.5
4   1978    4   3   1   0   3.41    0.23    2   0.5
4   1979    4   3   1   0   1.55    0.22    2   0.5
4   1980    4   3   1   0   1.82    0.28    2   0.5
4   1981    4   3   1   0   0.62    0.20    2   0.5
4   1982    4   3   1   0   0.18    0.27    2   0.5
4   1983    4   3   1   0   0.72    0.22    2   0.5
4   1984    4   3   1   0   1.11    0.23    2   0.5
4   1985    4   3   1   0   0.67    0.24    2   0.5
4   1986    4   3   1   0   1.63    0.52    2   0.5
4   1987    4   3   1   0   0.64    0.35    2   0.5
4   1988    4   3   1   0   1.60    0.71    2   0.5
4   1989    4   3   1   0   1.35    0.33    2   0.5
4   1990    4   3   1   0   1.06    0.45    2   0.5
4   1992    4   3   1   0   0.26    0.32    2   0.5
5   1993    4   3   1   0   1.02    0.09    2   0.5
5   1994    4   3   1   0   0.44    0.17    2   0.5
5   1995    4   3   1   0   1.09    0.13    2   0.5
5   1996    4   3   1   0   1.01    0.09    2   0.5
5   1997    4   3   1   0   1.14    0.09    2   0.5
5   1998    4   3   1   0   1.31    0.12    2   0.5
5   1999    4   3   1   0   0.97    0.10    2   0.5
5   2000    4   3   1   0   2.08    0.11    2   0.5
5   2001    4   3   1   0   0.76    0.25    2   0.5
5   2002    4   3   1   0   0.76    0.09    2   0.5
5   2003    4   3   1   0   1.65    0.08    2   0.5
5   2004    4   3   1   0   1.36    0.07    2   0.5
5   2005    4   3   1   0   0.64    0.12    2   0.5
5   2006    4   3   1   0   0.93    0.10    2   0.5
6   2007    4   3   1   0   0.88    0.22    2   0.5
6   2008    4   3   1   0   1.18    0.05    2   0.5
6   2009    4   3   1   0   0.81    0.04    2   0.5
6   2010    4   3   1   0   1.19    0.05    2   0.5
6   2011    4   3   1   0   1.36    0.05    2   0.5
6   2012    4   3   1   0   1.20    0.04    2   0.5
6   2013    4   3   1   0   0.62    0.04    2   0.5
6   2014    4   3   1   0   0.94    0.04    2   0.5
6   2015    4   3   1   0   1.17    0.05    2   0.5
6   2016    4   3   1   0   1.03    0.05    2   0.5
6   2017    4   3   1   0   0.88    0.05    2   0.5
6   2018    4   3   1   0   0.51    0.05    2   0.5
6   2019    4   3   1   0   0.24    0.06    2   0.5
6   2022    4   3   1   0   1.31    0.07    2   0.5
6   2023    4   3   1   0   2.00    0.07    2   0.5
6   2024    4   3   1   0   2.63    0.14    2   0.5
6   2025    4   3   1   0   0.90    0.10    2   0.5
```

```
## Use old format (0)
0
##  Number  of  length  frequency matrices
#16 (this was for oldshell/newshell)
8
##  Number  of  rows  in  each  matrix
#4 4 45 45 14 14 8 8 6 6 14 14 6 6 27 27 (this was for oldshell/newshell)
4 46 14 8 6 14 7 27
##  Number  of  bins  in  each  matrix  (columns  of  size  data)
8 8 8 8 8 8 8 8
##  SIZE  COMPOSITION DATA  FOR ALL FLEETS
##  SIZE  COMP  LEGEND
##  Sex:  1 = male, 2 = female, 0 = both  sexes combined
##  Type  of  composition:  1 = retained, 2 = discard,  0 = total composition
##  Maturity  state:  1 = immature, 2 = mature, 0 = both  states  combined
##  Shell condition:  1 = new shell,  2 = old shell,  0 = both  shell types combined

## Winter Com Retain
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,       Nsamp,  DataVec
2015    2   1   1   1   0   0   10  0   0   0   49  310 155 52  10
2016    2   1   1   1   0   0   10  0   0   0   37  555 360 51  13
2017    2   1   1   1   0   0   10  0   0   0   2   152 263 103 20
2018    2   1   1   1   0   0   10  0   0   0   0   58  166 146 31

## Summer Com Retain
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1977    4   3   1   1   0   0   10  0   0   0   5   747 592 129 76
1978    4   3   1   1   0   0   10  0   0   0   4   74  188 106 17
1979    4   3   1   1   0   0   10  0   0   0   42  428 637 430 123
1980    4   3   1   1   0   0   10  0   0   0   4   108 339 413 204
1981    4   3   1   1   0   0   10  0   0   0   7   139 365 709 564
1982    4   3   1   1   0   0   10  0   0   0   50  224 204 272 343
1983    4   3   1   1   0   0   10  0   0   0   34  360 295 68  45
1984    4   3   1   1   0   0   10  0   0   0   103 467 317 68  8
1985    4   3   1   1   0   0   10  0   0   1   180 930 1084    440 56
1986    4   3   1   1   0   0   10  0   0   0   35  428 491 161 23
1987    4   3   1   1   0   0   10  0   0   0   38  408 707 599 233
1988    4   3   1   1   0   0   10  0   1   0   45  403 605 381 87
1989    4   3   1   1   0   0   10  0   0   0   44  570 1141    663 177
1990    4   3   1   1   0   0   10  0   0   0   20  233 542 392 102
#1991   4   3   1   1   0   0   10  0   0   0   0   0   0   0   0
1992    4   3   1   1   0   0   10  0   0   0   51  718 1013    503 281
1993    4   3   1   1   0   0   10  0   0   0   260 4424    7791    4607    722
1994    4   3   1   1   0   0   10  0   0   0   20  114 134 109 27
1995    4   3   1   1   0   0   10  0   0   0   55  364 422 251 75
1996    4   3   1   1   0   0   10  0   0   0   36  270 295 136 50
1997    4   3   1   1   0   0   10  0   0   0   39  505 459 151 44
1998    4   3   1   1   0   0   10  0   0   0   53  364 407 171 60
1999    4   3   1   1   0   0   10  0   0   0   37  178 164 128 55
2000    4   3   1   1   0   0   10  0   0   0   382 6063    7868    2493    407
2001    4   3   1   1   0   0   10  0   0   0   504 4955    8390    4592    1589
2002    4   3   1   1   0   0   10  0   0   0   255 1369    1688    1481    426
2003    4   3   1   1   0   0   10  0   0   0   127 2037    1914    910 238
2004    4   3   1   1   0   0   10  0   0   0   88  3905    4060    1159    394
2005    4   3   1   1   0   0   10  0   0   0   12  1471    2766    962 149
2006    4   3   1   1   0   0   10  0   0   0   16  1556    3259    1632    244
2007    4   3   1   1   0   0   10  0   0   0   73  2340    2438    1028    246
2008    4   3   1   1   0   0   10  0   0   0   35  2541    2539    526 125
2009    4   3   1   1   0   0   10  0   0   0   70  2539    2464    789 164
2010    4   3   1   1   0   0   10  0   0   0   42  2597    2457    722 84
2011    4   3   1   1   0   0   10  0   0   0   16  965 1163    336 72
2012    4   3   1   1   0   0   10  0   0   0   14  1355    2550    1011    126
2013    4   3   1   1   0   0   10  0   0   0   29  1535    2509    1602    397
2014    4   3   1   1   0   0   10  0   0   0   41  1517    1510    1202    412
2015    4   3   1   1   0   0   10  0   0   0   61  2086    1314    555 157
2016    4   3   1   1   0   0   10  0   0   0   7   419 767 292 58
2017    4   3   1   1   0   0   10  0   0   0   7   702 1725    892 108
2018    4   3   1   1   0   0   10  0   0   0   9   323 1039    1041    247
2019    4   3   1   1   0   0   10  0   0   0   10  382 379 305 60
#2020   4   3   1   1   0   0   10  0   0   0   0   0   0   0   0
#2021   4   3   1   1   0   0   10  0   0   0   0   0   0   0   0
2022    4   3   1   1   0   0   10  0   0   0   76  1734    1041    120 10
```

```
2023    4   3   1   1   0   0   10  0   0   0   11  814 1236    367 30
2024    4   3   1   1   0   0   10  0   0   0   4   371 1186    929 196
2025    4   3   1   1   0   0   10  0   0   0   4   229 711 858 408


## Summer Com Discards
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1987    4   3   1   2   0   0   10  69  218 390 426 42  0   0   0
1988    4   3   1   2   0   0   10  11  37  131 413 130 0   0   0
1989    4   3   1   2   0   0   10  89  227 309 325 50  0   0   0
1990    4   3   1   2   0   0   10  48  124 147 166 22  0   0   0
1992    4   3   1   2   0   0   10  68  112 184 194 24  0   0   0
1994    4   3   1   2   0   0   10  124 113 220 331 62  0   0   0
2012    4   3   1   2   0   0   10  244 139 197 335 119 9   1   0
2013    4   3   1   2   0   0   10  847 723 391 423 115 8   2   0
2014    4   3   1   2   0   0   10  79  179 475 774 226 17  5   0
2015    4   3   1   2   0   0   10  26  120 280 733 320 43  12  5
2016    4   3   1   2   0   0   10  19  22  72  227 77  9   0   0
2017    4   3   1   2   0   0   10  55  90  76  168 144 8   0   0
2018    4   3   1   2   0   0   10  52  97  201 167 13  0   0   1
2019    4   3   1   2   0   0   10  30  13  15  33  3   0   0   0

## Summer Com total
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
2012    4   3   1   0   0   0   10  244 139 197 364 476 529 184 23
2013    4   3   1   0   0   0   10  847 723 391 489 777 850 440 80
2014    4   3   1   0   0   0   10  79  179 475 808 879 538 383 165
2015    4   3   1   0   0   0   10  26  120 280 821 1231    482 194 61
2016    4   3   1   0   0   0   10  19  22  72  261 671 822 207 40
2017    4   3   1   0   0   0   10  55  90  76  171 578 1080    582 83
2018    4   3   1   0   0   0   10  52  97  201 191 169 386 421 109
2019    4   3   1   0   0   0   10  30  13  15  39  45  45  36  13

## NMFS Trawl
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1976    4   4   1   0   0   0   20  10  23  96  110 124 100 21  10
1979    4   4   1   0   0   0   20  6   3   3   12  40  99  48  9
1982    4   4   1   0   0   0   20  71  20  46  65  58  15  7   10
1985    4   4   1   0   0   0   20  29  20  28  24  45  36  21  5
1988    4   4   1   0   0   0   20  60  66  42  37  41  46  28  10
1991    4   4   1   0   0   0   20  75  45  14  36  73  58  35  8

## ADFG Trawl
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1996    4   5   1   0   0   0   20  79  59  42  33  28  13  12  9
1999    4   5   1   0   0   0   20  9   3   30  90  88  47  14  2
2002    4   5   1   0   0   0   20  25  36  50  53  26  29  19  6
2006    4   5   1   0   0   0   20  69  98  80  48  37  28  12  1
2008    4   5   1   0   0   0   20  34  44  70  48  50  11  15  3
2011    4   5   1   0   0   0   20  42  36  31  42  83  58  20  3
2014    4   5   1   0   0   0   20  30  57  101 107 56  23  10  3
2017    4   5   1   0   0   0   20  17  16  8   13  19  33  10  0
2018    4   5   1   0   0   0   20  27  12  9   5   3   4   10  3
2019    4   5   1   0   0   0   20  170 92  14  6   5   8   10  2
2020    4   5   1   0   0   0   20  17  33  39  9   8   4   0   1
2021    4   5   1   0   0   0   20  10  27  37  35  37  8   2   2
2023    4   5   1   0   0   0   20  0   1   10  27  89  89  23  1
2024    4   5   1   0   0   0   20  3   3   2   7   12  36  26  4

##NOAA  NBS Trawl
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
2010    4   6   1   0   0   0   20  1   5   10  27  17  9   2   2
2017    4   6   1   0   0   0   20  7   6   10  6   5   14  6   4
2019    4   6   1   0   0   0   20  54  43  17  8   4   1   6   2
2021    4   6   1   0   0   0   20  5   17  26  18  13  3   0   0
2022    4   6   1   0   0   0   20  68  71  69  67  55  32  12  4 # these numbers are wrong; fix for May 2026
2023    4   6   1   0   0   0   20  1   3   6   12  26  22  7   1
2025    4   6   1   0   0   0   20  4   3   4   5   7   19  19  2

##Winter Pot Survey
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,       Nsamp,  DataVec
1982    2   7   1   0   0   0   10  0   108 246 233 79  25  26  2
```

```
1983    2   7   1   0   0   0   10  68  215.5   711.5   729 592 202.5   39.5    24.5
1984    2   7   1   0   0   0   10  23  271 434.5   408.5   356 154 20  10
1985    2   7   1   0   0   0   10  16  72  200 284.5   145 62.5    8   0.5
1986    2   7   1   0   0   0   10  25.5    72.5    104 153.5   149.5   74  14  0.5
1987    2   7   1   0   0   0   10  0   8   23  34  53  22  4   0
1989    2   7   1   0   0   0   10  8   66  74.5    67.5    121.5   128.5   33  1
1990    2   7   1   0   0   0   10  7   102.5   430 544 426.5   369 162 35
1991    2   7   1   0   0   0   10  2   16  118 371 377 272 105 22
1993    2   7   1   0   0   0   10  0   1   6   13  58  70  24  9
1995    2   7   1   0   0   0   10  8   50  68  87  247 260 114 24
1996    2   7   1   0   0   0   10  102 215 325 327 268 220 95  28
1997    2   7   1   0   0   0   10  28  85  87  44  65  55  26  8
1998    2   7   1   0   0   0   10  1   123 370 248 76  36  19  8
1999    2   7   1   0   0   0   10  6   25  152 477 498 118 25  6
2000    2   7   1   0   0   0   10  10  50  60  94  218 114 27  2
2002    2   7   1   0   0   0   10  50  248 222 143 57  64  36  8
2003    2   7   1   0   0   0   10  21  85  185 251 165 71  37  9
2004    2   7   1   0   0   0   10  0   5   51  82  100 46  10  2
2005    2   7   1   0   0   0   10  2   31  58  73  104 99  35  3
2006    2   7   1   0   0   0   10  2   76  121 116 102 66  25  4
2007    2   7   1   0   0   0   10  11  22  32  57  24  13  0   0
2008    2   7   1   0   0   0   10  72  662 1123    716 631 287 52  9
2009    2   7   1   0   0   0   10  1   37  70  185 126 96  7   3
2010    2   7   1   0   0   0   10  4   27  78  157 199 96  15  2
2011    2   7   1   0   0   0   10  12  46  87  141 168 105 36  1
2012    2   7   1   0   0   0   10  17  78  156 134 117 120 48  5

##  Growth data (increment)
# Type of growth increment (0=no growth data;1=size-at-release; 2= size-class-at-release)
3
# nobs_growth
66
# Class-at-release; Sex; Class-at-recapture;  Years-at-liberty;  number transition matrix; sample size
1 1 2 1 1 3 1993 1
1 1 3 1 1 3 1993 4
1 1 3 2 1 3 1993 1
1 1 4 2 1 3 1993 6
1 1 5 2 1 3 1993 4
1 1 5 3 1 3 1993 11
1 1 6 3 1 3 1993 11
2 1 3 1 1 3 1993 21
2 1 4 1 1 3 1993 22
2 1 4 2 1 3 1993 12
2 1 5 1 1 3 1993 4
2 1 5 2 1 3 1993 96
2 1 5 3 1 3 1993 19
2 1 6 2 1 3 1993 5
2 1 6 3 1 3 1993 48
2 1 7 3 1 3 1993 6
3 1 4 1 1 3 1993 47
3 1 4 2 1 3 1993 5
3 1 4 3 1 3 1993 2
3 1 5 1 1 3 1993 91
3 1 5 2 1 3 1993 36
3 1 5 3 1 3 1993 14
3 1 6 1 1 3 1993 7
3 1 6 2 1 3 1993 70
3 1 6 3 1 3 1993 28
3 1 7 1 1 3 1993 1
3 1 7 2 1 3 1993 3
3 1 7 3 1 3 1993 9
4 1 4 1 1 3 1993 10
4 1 4 2 1 3 1993 2
4 1 5 1 1 3 1993 196
4 1 5 2 1 3 1993 34
4 1 5 3 1 3 1993 3
4 1 6 1 1 3 1993 108
4 1 6 2 1 3 1993 39
4 1 6 3 1 3 1993 35
4 1 7 1 1 3 1993 2
4 1 7 2 1 3 1993 19
4 1 7 3 1 3 1993 14
```

```
4 1 8 1 1 3 1993 1
5 1 5 1 1 3 1993 75
5 1 5 2 1 3 1993 7
5 1 6 1 1 3 1993 143
5 1 6 2 1 3 1993 77
5 1 6 3 1 3 1993 9
5 1 7 1 1 3 1993 22
5 1 7 2 1 3 1993 24
5 1 7 3 1 3 1993 21
5 1 8 3 1 3 1993 4
6 1 6 1 1 3 1993 88
6 1 6 2 1 3 1993 11
6 1 7 1 1 3 1993 98
6 1 7 2 1 3 1993 47
6 1 7 3 1 3 1993 11
6 1 8 1 1 3 1993 24
6 1 8 2 1 3 1993 7
6 1 8 3 1 3 1993 3
7 1 7 1 1 3 1993 56
7 1 7 2 1 3 1993 9
7 1 7 3 1 3 1993 1
7 1 8 1 1 3 1993 25
7 1 8 2 1 3 1993 16
7 1 8 3 1 3 1993 9
8 1 8 1 1 3 1993 26
8 1 8 2 1 3 1993 8
8 1 8 3 1 3 1993 1

# Environmental data
## Use old format (0)
0
# Number of series
0
# Year ranges

# Indices
# Index Year Value

##  eof

## eof
9999
```

Model 25.0a1 control file

```
## GMACS Version 2.20.20 - Nov 2025: one shell type, M for small males = 0.23, prior on F for winter comm fishery taken from BBRKC

# Block structure
# Number of blocks
2
# Block structure
1 1
# The blocks
2008 2026
2008 2026

##  ------------------------------------------------------------------------------------ ##
##  GENERAL  CONTROLS
##  ------------------------------------------------------------------------------------ ##
#
1976       # First year of recruitment estimation,rec_dev.
2025       # last year of recruitment estimation, rec_dev
   0       # Terminal molting (0 = off, 1 = on). If on, the calc_stock_recruitment_relationship() isn't called in the procedure
   2       # phase for recruitment estimation,earlier -1. rec_dev estimation phase, BBRKC uses 2
  -2       # phase for recruitment sex-ratio estimation
  0.5      # Initial value for Expected sex-ratio
   3       # Initial conditions (0 = Unfished, 1 = Steady-state fished, 2 = Free parameters, 3 = Free parameters (revised))
   1       # Reference size-class for initial conditons = 3
```

```
   1       # Lambda (proportion of mature male biomass for SPR reference points).
   0       # Stock-Recruit-Relationship (0 = none, 1 = Beverton-Holt)
   1       # Use years specified to computed average sex ratio in the calculation of average recruitment for reference points (0 = off -i.e. Rec b
  200      ### Year to compute equilibria
   5       # Devpar phase (!!)
   0       # First year of bias-correction
   0       # First full bias-correction
   0       # Last full bias-correction
   0       # Last year of bias-correction

# Expecting 23 theta parameters
# Core parameters
## Initial: Initial value for the parameter (must lie between lower and upper)
## Lower & Upper: Range for the parameter
## Phase: Set equal to a negative number not to estimate
## Prior type:
## 0: Uniform   - parameters are the range of the uniform prior
## 1: Normal    - parameters are the mean and sd
## 2: Lognormal - parameters are the mean and sd of the log
## 3: Beta      - parameters are the two beta parameters [see dbeta]
## 4: Gamma     - parameters are the two gamma parameters [see dgamma]
# Initial_value    Lower_bound    Upper_bound Phase Prior_type        Prior_1        Prior_2
     7.00000000   -15.00000000    20.00000000    -1          0   -10.00000000    20.00000000 # Log(R0)
     10.11100000   -15.00000000    20.00000000     1          0   -10.00000000    20.00000000 # Log(Rinitial)
     8.00000000   -15.00000000    20.00000000     1          0   -10.00000000    20.00000000 # Log(Rbar)
    72.50000000    65.00000000   130.00000000     3          1    72.50000000     7.25000000 # Recruitment_ra-males
     0.75000000     0.00000001     1.60000000     3          0     0.10000000     5.00000000 # Recruitment_rb-males
    -0.10000000   -15.00000000     0.75000000    -2          0   -10.00000000     0.75000000 # log(SigmaR)
     0.75000000     0.20000000     1.00000000    -4          3     3.00000000     2.00000000 # Steepness
     0.00100000     0.00000000     1.00000000    -3          3     1.01000000     1.01000000 # Rho
     0.64670000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_2
     1.00340000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_3
     1.36040000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_4
     1.40420000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_5
     1.45990000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_6
     1.26570000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_7
     0.72280000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_8
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_

##Allometry
# weight-at-length input  method  (1 = allometry  [w_l = a*l^b],  2 = vector by sex; 3= matrix by sex)
2
 0.5239661 0.8202686 1.197317 1.700319 2.317965 2.988772 3.68294 4.367152 # this is from the version 2.20.14 ctl file
# 0.52420370 0.82067430 1.19824500 1.70175900 2.32125400 2.99365100 3.68849500 4.37139500
# Proportion mature by sex and size
 0.00000000 0.00000000 0.00000000 1.00000000 1.00000000 1.00000000 1.00000000 1.00000000
# Proportion legal by sex and size
 0.00000000 0.00000000 0.00000000 0.00000000 1.00000000 1.00000000 1.00000000 1.00000000

## ================================================================================= ##
## GROWTH PARAMETER CONTROLS                                                         ##
## ================================================================================= ##
##
# Maximum number of size-classes to which recruitment must occur
 3
# Use functional maturity for terminally molting animals (0=no; 1=Yes)?
0
# Growth transition
##Type_1: Options for the growth matrix
#  1: Pre-specified growth transition matrix (requires molt probability)
#  2: Pre-specified size transition matrix (molt probability is ignored)
#  3: Growth increment is gamma distributed (requires molt probability)
#  4: Post-molt size is gamma distributed (requires molt probability)
#  5: Von Bert.: kappa varies among individuals (requires molt probability)
#  6: Von Bert.: Linf varies among individuals (requires molt probability)
```

```
#  7: Von Bert.: kappa and Linf varies among individuals (requires molt probability)
#  8: Growth increment is normally distributed (requires molt probability)
## Type_2: Options for the growth increment model matrix
#  1: Linear
#  2: Individual
#  3: Individual (Same as 2)
#  Block: Block number for time-varying growth
## Type_1 Type_2  Block
        8      1      0
# Molt probability
# Type: Options for the molt probability function
#  0: Pre-specified
#  1: Constant at 1
#  2: Logistic
#  3: Individual
#  Block: Block number for time-varying growth
## Type Block
      2     0

## General parameter specificiations
##  Initial: Initial value for the parameter (must lie between lower and upper)
##  Lower & Upper: Range for the parameter
##  Prior type:
##   0: Uniform   - parameters are the range of the uniform prior
##   1: Normal    - parameters are the mean and sd
##   2: Lognormal - parameters are the mean and sd of the log
##   3: Beta      - parameters are the two beta parameters [see dbeta]
##   4: Gamma     - parameters are the two gamma parameters [see dgamma]
##  Phase: Set equal to a negative number not to estimate
##  Relative: 0: absolute; 1 relative
##  Block: Block number for time-varying selectivity
##  Block_fn: 0:absolute values; 1:exponential
##  Env_L: Environmental link - options are 0:none; 1:additive; 2:multiplicative; 3:exponential
##  EnvL_var: Environmental variable
##  RW: 0 for no random walk changes; 1 otherwise
##  RW_blk: Block number for random walks
##  Sigma_RW: Sigma used for the random walk

# Inputs for sex * type 1
# MAIN PARS: Initial  Lower_bound  Upper_bound Prior_type       Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
            36.998620     0.000000   200.000000          0     0.000000    20.000000      2      0      0      0      0      0      0   0.3000 # A
             0.243015    -0.200000    20.000000          0     0.000000    10.000000      2      0      0      0      0      0      0   0.3000 # B
             3.773156     2.000000    10.000000          0     0.000000     3.000000      5      0      0      0      0      0      0   0.3000 # G
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve
# Inputs for sex * type 2
# MAIN PARS: Initial  Lower_bound  Upper_bound Prior_type       Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           122.965900    50.000000   200.000000          0     0.000000   170.000000      2      0      0      0      0      0      0   0.3000 # M
             0.127616     0.000000     1.000000          0     0.000000     3.000000      2      0      0      0      0      0      0   0.3000 # M
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve


## ==================================================================================== ##
## NATURAL MORTALITIY PARAMETER CONTROLS                                                ##
## ==================================================================================== ##
##
# Relative: 0 - absolute values; 1+ - based on another M-at-size vector (indexed by ig)
# Type: 0 for standard; 1: Spline
#  For spline: set extra to the number of knots, the parameters are the knots (phase -1) and the log-differences from base M
# Extra: control the number of knots for splines
# Brkpts: number of changes in M by size
# Mirror: Mirror M-at-size over to that for another partition (indexed by ig)
# Block: Block number for time-varying M-at-size
# Block_fn: 0:absolute values; 1:exponential
# Env_L: Environmental link - options are 0: none; 1:additive; 2:multiplicative; 3:exponential
# EnvL_var: Environmental variable
# RW: 0 for no random walk changes; 1 otherwise
# RW_blk: Block number for random walks
# Sigma_RW: Sigma for the random walk parameters
# Mirror_RW: Should time-varying aspects be mirrored (Indexed by ig)
## Relative?   Type   Extra  Brkpts  Mirror   Block  Blk_fn Env_L   EnvL_Vr      RW  RW_blk Sigma_RW Mirr_RW
          0       0       0       1       0       0       1       0       0       0       0   0.3000       0
# MaxMbreaks
```

```
7  # sex*maturity state: male & 1

#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    0.23000000     0.01000000     1.00000000           0     0.00000000     0.20000000     -1 # M_base_male_mature
    0.50000000     0.05000000     1.00000000           1     0.00000000     0.25000000      3 # M estimated for males > 123 mm carapace length

## ================================================================================ ##
## SELECTIVITY PARAMETERS CONTROLS                                                  ##
## ================================================================================ ##
##
# ## Selectivity parameter controls
# ## Selectivity (and retention) types
# ##  <0: Mirror selectivity
# ##   0: Nonparametric selectivity (one parameter per class)
# ##   1: Nonparametric selectivity (one parameter per class, constant from last specified class)
# ##   2: Logistic selectivity (inflection point and slope)
# ##   3: Logistic selectivity (50% and 95% selection)
# ##   4: Double normal selectivity (3 parameters)
# ##   5: Flat equal to zero (1 parameter; phase must be negative)
# ##   6: Flat equal to one (1 parameter; phase must be negative)
# ##   7: Flat-topped double normal selectivity (4 parameters)
# ##   8: Declining logistic selectivity with initial values (50% and 95% selection plus extra)
# ##   9: Cubic-spline (specified with knots and values at knots)
# ##      Inputs: knots (in length units); values at knots (0-1) - at least one should have phase -1
# ##  10: One parameter logistic selectivity (inflection point and slope)
## Selectivity specifications --
# ## Extra (type 1): number of selectivity parameters to estimated
# #  Winter_Com Subsistence Summer_Com NMFS_Trawl ADFG_Trawl NBS_Trawl Winter_Pot
 0 0 0 0 0 0 0 # is selectivity sex=specific? (1=Yes; 0=No)
 8 -1 10 10 -4 -4 -1 # male selectivity type. Only NMFS_Trawl survey selectivity is being estimated. All other trawl survey selectivities are mirr
 0 0 0 0 0 0 0 # selectivity within another gear
 3 0 0 0 0 0 0 # male extra parameters for each pattern
 0 0 1 1 1 1 1 # male: is maximum selectivity at size forced to equal 1 (1) or not (0)
 0 0 0 0 0 0 0 # size-class at which selectivity is forced to equal 1 (ignored if the previous input is 1)
## Retention specifications --
 0 0 0 0 0 0 0 # is retention sex=specific? (1=Yes; 0=No)
 2 0 2 6 6 6 6 # male retention type
 1 1 1 0 0 0 0 # male retention flag (0 = no, 1 = yes)
 0 0 0 0 0 0 0 # male extra parameters for each pattern
 0 0 0 0 0 0 0 # male - should maximum retention be estimated for males (1=Yes; 0=No)

## General parameter specificiations
##  Initial: Initial value for the parameter (must lie between lower and upper)
##  Lower & Upper: Range for the parameter
##  Prior type:
##   0: Uniform   - parameters are the range of the uniform prior
##   1: Normal    - parameters are the mean and sd
##   2: Lognormal - parameters are the mean and sd of the log
##   3: Beta      - parameters are the two beta parameters [see dbeta]
##   4: Gamma     - parameters are the two gamma parameters [see dgamma]
##  Phase: Set equal to a negative number not to estimate
##  Relative: 0: absolute; 1 relative
##  Block: Block number for time-varying selectivity
##  Block_fn: 0:absolute values; 1:exponential
##  Env_L: Environmental link - options are 0:none; 1:additive; 2:multiplicative; 3:exponential
##  EnvL_var: Environmental variable
##  RW: 0 for no random walk changes; 1 otherwise
##  RW_blk: Block number for random walks
##  Sigma_RW: Sigma used for the random walk

# Inputs for type*sex*fleet: selectivity male Winter_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           128.894800    40.000000   200.000000          0    10.000000   200.000000      2      0      0      0      0      0      0   0.3000 # S
             0.154697     0.010000    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S
             0.045586     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S
             0.375288     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S
             0.733787     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S

# Inputs for type*sex*fleet: selectivity male Summer_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
             0.143640     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S
```

```
# Inputs for type*sex*fleet: selectivity male NMFS_Trawl
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
             0.092094     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S

# Inputs for type*sex*fleet: selectivity male ADFG_Trawl
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
#             0.092094     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #

# Inputs for type*sex*fleet: selectivity male NBS_Trawl
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
#             0.092094     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #

# Inputs for type*sex*fleet: retention male Winter_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           100.49375    50.000000   200.000000          0     1.000000   900.000000     -2      2      0      0      0      0      0   0.3000 # Re
             2.48336     0.001000    20.000000          0     1.000000   900.000000     -2      2      0      0      0      0      0   0.3000 # Re
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve
           100.49375    50.000000   700.000000          0     0.100000   100.000000      2      0 # Ret_Summer_Com_male_period_2_par_1
             2.4833     1.000000    20.000000          0     0.100000   100.000000      2      0 # Ret_Summer_Com_male_period_2_par_2

# Inputs for type*sex*fleet: retention male Subsistence
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
             0.000001     0.000000     0.000002          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.000001     0.000000     0.000002          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.000001     0.000000     0.000002          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R

# Inputs for type*sex*fleet: retention male Summer_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           104.310600    50.000000   700.000000          0     1.000000   900.000000      2      1      0      0      0      0      0   0.3000 # R
             2.421736     1.000000    20.000000          0     1.000000   900.000000      2      1      0      0      0      0      0   0.3000 # R
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve
           105.150900    50.000000   700.000000          0     0.100000   100.000000      2      0 # Ret_Summer_Com_male_period_2_par_1
             1.648215     1.000000    20.000000          0     0.100000   100.000000      2      0 # Ret_Summer_Com_male_period_2_par_2

## ================================================================================ ##
## CATCHABILITY PARAMETER CONTROLS                                                  ##
## ================================================================================ ##
##
# Catchability (specifications)
# Analytic: should q be estimated analytically (1) or not (0)
# Lambda: the weight lambda
# Emphasis: the weighting emphasis
# Block: Block number for time-varying M-at-size
# Block_fn: 0:absolute values; 1:exponential
# Env_L: Environmental link - options are 0: none; 1:additive; 2:multiplicative; 3:exponential
# EnvL_var: Environmental variable
# RW: 0 for no random walk changes; 1 otherwise
# RW_blk: Block number for random walks
# Sigma_RW: Sigma for the random walk parameters
## Analytic  Lambda Emphass  Mirror   Block   Env_L EnvL_Vr      RW  RW_blk Sigma_RW
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
# Catchability (parameters)
#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    0.77700000     0.10000000     2.00000000           0     0.10000000     1.00000000      2 # NMFS trawl survey
    1.00000000     0.10000000     2.00000000           0     0.10000000     1.00000000     -2 # ADF&G trawl survey
    0.77700000     0.10000000     2.00000000           0     0.10000000     1.00000000      2 # NBS trawl survey
    0.00150000     0.00000000     2.00000000           0     0.00000000     1.00000000      1 # block 1 - std CPUE
    0.00150000     0.00000000     2.00000000           0     0.00000000     1.00000000      1 # block 2 - std CPUE
    0.00150000     0.00000000     2.00000000           0     0.00000000     1.00000000      1 # block 3 - std CPUE

## ================================================================================ ##
## ADDITIONAL CV PARAMETER CONTROLS                                                 ##
```

```
## ==================================================================================== ##
##
# Catchability (specifications)
# Mirror: should additional variance be mirrored (value > 1) or not (0)?
# Block: Block number for time-varying M-at-size
# Block_fn: 0:absolute values; 1:exponential
# Env_L: Environmental link - options are 0: none; 1:additive; 2:multiplicative; 3:exponential
# EnvL_var: Environmental variable
# RW: 0 for no random walk changes; 1 otherwise
# RW_blk: Block number for random walks
# Sigma_RW: Sigma for the random walk parameters
##   Mirror   Block   Env_L EnvL_Vr     RW   RW_blk Sigma_RW
          0       0       0       0       0       0   0.3000
          0       0       0       0       0       0   0.3000
          0       0       0       0       0       0   0.3000
          0       0       0       0       0       0   0.3000
          4       0       0       0       0       0   0.3000
          4       0       0       0       0       0   0.3000
## Mirror Block Env_L EnvL_Var  RW RW_blk Sigma_RW
# Additional variance (parameters)
#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
    0.10000000     0.00000001     2.00000000           0     1.00000000   100.00000000      4
#    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
#    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4

## ==================================================================================== ##
## CONTROLS ON F                                                                        ##
## ==================================================================================== ##
##
# Controls on F
#   Initial_male_F Initial_fema_F Pen_SD (early) Pen_SD (later) Phz_mean_F_mal Phz_mean_F_fem   Lower_mean_F   Upper_mean_F Low_ann_male_F  Up_ann
          0.020000       0.000000       0.500000      45.500000       1.000000      -1.000000     -15.000000       4.000000     -10.000000       2
          0.020000       0.000000       0.500000      45.500000       1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.120000       0.000000       0.500000      45.500000       1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10

## ==================================================================================== ##
## SIZE COMPOSITIONS OPTIONS                                                            ##
## ==================================================================================== ##
##
# Options when fitting size-composition data
## Likelihood types:
##  1:Multinomial with estimated/fixed sample size
##  2:Robust approximation to multinomial
##  3:logistic normal
##  4:multivariate-t
##  5:Dirichlet

# Using oldshell and newshell
#  Winter_Com Winter_Com Summer_Com Summer_Com Summer_Com Summer_Com Summer_Com Summer_Com NMFS_Trawl NMFS_Trawl ADFG_Trawl ADFG_Trawl NBS_Trawl N
#  male male male male male male male male male male male male male male male male
#  retained retained retained retained discard discard total total total total total total total total total total
#  newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell
#  immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature
#  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Type of likelihood
#  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Auto tail compression
#  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Auto tail compression (pmin)
#  1   1   2   2   3   3   4   4   5   5   6   6   7   7   8   8 # Composition aggregator codes
#  1   1   1   1   1   1   1   1   2   2   2   2   2   2   2   2 # Set to 1 for catch-based predictions; 2 for survey or total catch predictions
#  -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4 # Phz for estimating effective sample size (if appl.)
#  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Lambda for effective sample size
#  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Lambda for overall likelihood. Or emphasis?
#  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Survey to set Q for this comp. Does 0 keep this as is? Ask Buck. Added in versi
#  0   0   0   0   0   0   0   0   3   4   1   2   5   6   5   6 # Survey to set Q for this comp. Does 0 keep this as is? Ask Buck. Added in versi
#  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Survey to set Q for this comp. Does 0 keep this as is? Ask Buck. Added in versi
#  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Initial value for effective sample size multiplier
```

```
# Using only one shell condition
#  Winter_Com      Summer_Com      Summer_Com      Summer_Com      NMFS_Trawl      ADFG_Trawl      NBS_Trawl       Winter_Pot
#  male            male            male            male            male            male            male            male
#  retained        retained        discard         total           total           total           total           total
#  immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature
  1   1   1   1   1   1   1   1 # Type of likelihood
  0   0   0   0   0   0   0   0 # Auto tail compression
  0   0   0   0   0   0   0   0 # Auto tail compression (pmin)
  1   2   3   4   5   6   7   8 # Composition aggregator codes
  1   1   1   1   2   2   2   2 # Set to 1 for catch-based predictions; 2 for survey or total catch predictions
#  -4   -4   -4   -4   -4   -4   -4   -4 # Phz for estimating effective sample size (if appl.)
  1   1   1   1   1   1   1   1  # Lambda for effective sample size
  1   1   1   1   1   1   1   1  # Lambda for overall likelihood. Or emphasis?
  0   0   0   0   0   0   0   0  # Survey to set Q for this comp.

# Effective sample size parameters (number matches max(Composition Aggregator code))
#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_1(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_2(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_3(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_4(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_5(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_6(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_7(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_8(possibly e

## ===================================================================================== ##
## EMPHASIS FACTORS                                                                      ##
## ===================================================================================== ##

1.0000 # Emphasis on tagging data

 1.0000 1.0000 0.0000 1.0000 # Emphasis on Catch: (by catch dataframes)

#AEP AEP AEP AEP
   1.0000   0.0000   0.0000   0.0000 # Winter_Com
   0.1000   0.0000   0.0000   0.0000 # Subsistence
   1.0000   0.0000   0.0000   0.0000 # Summer_Com
   0.0000   0.0000   0.0000   0.0000 # NMFS_Trawl
   0.0000   0.0000   0.0000   0.0000 # ADFG_Trawl
   0.0000   0.0000   0.0000   0.0000 # NBS_Trawl
   0.0000   0.0000   0.0000   0.0000 # Winter_Pot
#
## Emphasis Factors (Priors/Penalties: 13 values) ##
     1.0000 #--Log_fdevs
     0.0000 #--MeanF
     0.0000 #--Mdevs
     1.0000 #--Rec_devs
    15.0000 #--Initial_devs
     1.0000 #--Fst_dif_dev
     3.0000 #--Mean_sex_ratio
    60.0000 #--Molt_prob
     0.1000 #--free selectivity
     1.0000 #--Init_n_at_len
     0.0000 #--Fvecs
     0.0000 #--Fdovss
     1.0000 #--Random walk in selectivity

# eof_ctl
9999
```

Model 25.0a2 data file

```
#========================================================================================================
# Gmacs Main  Data  File  NSRKC 2025 - Nov 2025 - used with GMACS version 2.20.20 - combining oldshell and newshell, M for small males = 0.23
# GEAR_INDEX   DESCRIPTION
#    1        : Winter Commercial Fishery Retained catch
#    2        : Winter Subsistence Fishery Retained catch
```

```
#    3        : Winter Subsistence Fishery Total catch
#    4        : Summer Commercial Fishery Retained catch
#    5        : Summer Commercial Fishery Total catch
#    6        : ADF&G Survey
#    7        : NMFS Survey
#    8        : Pot CPUE

# Fisheries:  1 Winter Pot Fishery, 2 Winter Subsistace, 3 Summer Pot Fishery
# Surveys:    4 NMFS Trawl Survey, 5 ADFG Trawl Survey, 6 NBS Trawl Survey, 7 Winter Pot survey
#======================================================================================================

1976  # Start year
2025  # End year
#2025  # Projection year
7     # Number of seasons
7     # Number of distinct data groups (fleet, among fishing fleets and surveys)
1     # Number of sexes
#2     # Number of shell condition types
1     # Number of shell condition types
1     # Number of maturity types
8     # Number of size-classes in the model
#6     # Season recruitment occurs
7     # Season recruitment occurs
#3     # Season molting and growth occurs
4     # Season molting and growth occurs
1     # Season to calculate SSB
1     # Season for N output
# maximum size-class (males then females)
8
# size_breaks (a vector giving the break points between size intervals with dimension nclass+1)
63.5    73.5    83.5    93.5    103.5   113.5   123.5   133.5   143.5
# Natural mortality per season input type (1 = vector by season, 2 = matrix by season/year)
2
# Proportion of the total natural mortality to be applied each season (each row must add to 1)
# 1. Winter Fishery (Feb01)
# 2. Mortality between winter and summer fishery
# 3. Summer fishery
# 4. Time between summer fishery and Nov 1 (Molt and recruit)
# 5. Time to Feb 01
# 6. Feb 01 recruit

0   0   0.3452055   0.1863014   0.1351932   0.3333  0 # 1976
0   0   0.3452055   0.1863014   0.1351932   0.3333  0 # 1977
0   0   0.3452055   0.1863014   0.1351932   0.3333  0 # 1978
0   0   0.4493151   0.04109589  0.176289    0.3333  0 # 1979
0   0   0.4493151   0.04109589  0.176289    0.3333  0 # 1980
0   0   0.4493151   0.1013699   0.1160151   0.3333  0 # 1981
0   0   0.5150685   0.06027397  0.09135753  0.3333  0 # 1982
0   0   0.4931507   0.0109589   0.1625904   0.3333  0 # 1983
0   0   0.4931507   0.03835616  0.1351932   0.3333  0 # 1984
0   0   0.4931507   0.06027397  0.1132753   0.3333  0 # 1985
0   0   0.4931507   0.06575342  0.1077959   0.3333  0 # 1986
0   0   0.4931507   0.03013699  0.1434123   0.3333  0 # 1987
0   0   0.4931507   0.02739726  0.1461521   0.3333  0 # 1988
0   0   0.4931507   0.008219178 0.1653301   0.3333  0 # 1989
0   0   0.4931507   0.0109589   0.1625904   0.3333  0 # 1990
0   0   0.4931507   0.0109589   0.1625904   0.3333  0 # 1991
0   0   0.4931507   0.005479452 0.1680699   0.3333  0 # 1992
0   0   0.4109589   0.1561644   0.09957671  0.3333  0 # 1993
0   0   0.4109589   0.07945205  0.176289    0.3333  0 # 1994
0   0   0.4109589   0.1643836   0.09135753  0.3333  0 # 1995
0   0   0.4109589   0.169863    0.08587808  0.3333  0 # 1996
0   0   0.4109589   0.1150685   0.1406726   0.3333  0 # 1997
0   0   0.4109589   0.169863    0.08587808  0.3333  0 # 1998
0   0   0.4109589   0.1726027   0.08313836  0.3333  0 # 1999
0   0   0.4109589   0.2410959   0.01464521  0.3333  0 # 2000
0   0   0.4109589   0.1863014   0.06943973  0.3333  0 # 2001
0   0   0.3671233   0.2136986   0.08587808  0.3333  0 # 2002
0   0   0.3671233   0.1890411   0.1105356   0.3333  0 # 2003
0   0   0.3671233   0.1452055   0.1543712   0.3333  0 # 2004
0   0   0.3671233   0.1972603   0.1023164   0.3333  0 # 2005
0   0   0.3671233   0.1835616   0.1160151   0.3333  0 # 2006
```

```
0   0   0.3671233   0.169863    0.1297137   0.3333  0 # 2007
0   0   0.3890411   0.1917808   0.08587808  0.3333  0 # 2008
0   0   0.3671233   0.260274    0.03930274  0.3333  0 # 2009
0   0   0.4027397   0.1534247   0.1105356   0.3333  0 # 2010
0   0   0.4027397   0.08767123  0.176289    0.3333  0 # 2011
0   0   0.4054795   0.1890411   0.07217945  0.3333  0 # 2012
0   0   0.4164384   0.1945205   0.0557411   0.3333  0 # 2013
0   0   0.3945205   0.1369863   0.1351932   0.3333  0 # 2014
0   0   0.4054795   0.06849315  0.1927274   0.3333  0 # 2015
0   0   0.4000000   0.06575342  0.2009466   0.3333  0 # 2016
0   0   0.3972603   0.07945205  0.1899877   0.3333  0 # 2017
0   0   0.3917808   0.09589041  0.1790288   0.3333  0 # 2018
0   0   0.3945205   0.1643836   0.1077959   0.3333  0 # 2019
0   0   0.3945205   0.1643836   0.1077959   0.3333  0 # 2020
0   0   0.3945205   0.1643836   0.1077959   0.3333  0 # 2021
0   0   0.3671233   0.109589    0.189987    0.3333  0 # 2022
0   0   0.3835616   0.07671233  0.206426    0.3333  0 # 2023
0   0   0.3643836   0.07945205  0.2228644   0.3333  0 # 2024
0   0   0.4036036   0.097297297  0.1657658  0.333333  0 #   2025 # is this order correct?

# Fishing fleet names (delimited with : no spaces in names)
Winter_Com Subsistence Summer_Com
# Survey names (delimited with : no spaces in names)
NMFS_Trawl ADFG_Trawl NBS_Trawl Winter_Pot
# Are the seasons instantaneous (0) or continuous (1)
1 1 1 1 1 1 1
# Use Old format (0)
0
# Number  of  catch data  frames
 4
# Number  of  rows  in  each  data  frame
 47  48  42 46
##  CATCH DATA
##  Type of catch: 1 = retained, 2 = discard
##  Units of catch: 1 = biomass, 2 = numbers

##      Winter commercial retained
# year  seas    fleet   sex     obs     cv      type    units   mult    effort  discard_mortality
1978    2   1   1   9.625   0.03    1   2   1   0   0.2
1979    2   1   1   0.221   0.03    1   2   1   0   0.2
1980    2   1   1   0.022   0.03    1   2   1   0   0.2
#1981   2   1   1   0       0.03    1   2   1   0   0.2
1982    2   1   1   0.017   0.03    1   2   1   0   0.2
1983    2   1   1   0.549   0.03    1   2   1   0   0.2
1984    2   1   1   0.856   0.03    1   2   1   0   0.2
1985    2   1   1   1.168   0.03    1   2   1   0   0.2
1986    2   1   1   2.168   0.03    1   2   1   0   0.2
1987    2   1   1   1.04    0.03    1   2   1   0   0.2
1988    2   1   1   0.425   0.03    1   2   1   0   0.2
1989    2   1   1   0.403   0.03    1   2   1   0   0.2
1990    2   1   1   3.626   0.03    1   2   1   0   0.2
1991    2   1   1   3.8     0.03    1   2   1   0   0.2
1992    2   1   1   7.478   0.03    1   2   1   0   0.2
1993    2   1   1   1.788   0.03    1   2   1   0   0.2
1994    2   1   1   5.753   0.03    1   2   1   0   0.2
1995    2   1   1   7.538   0.03    1   2   1   0   0.2
1996    2   1   1   1.778   0.03    1   2   1   0   0.2
1997    2   1   1   0.083   0.03    1   2   1   0   0.2
1998    2   1   1   0.984   0.03    1   2   1   0   0.2
1999    2   1   1   2.714   0.03    1   2   1   0   0.2
2000    2   1   1   3.045   0.03    1   2   1   0   0.2
2001    2   1   1   1.098   0.03    1   2   1   0   0.2
2002    2   1   1   2.591   0.03    1   2   1   0   0.2
2003    2   1   1   6.853   0.03    1   2   1   0   0.2
2004    2   1   1   0.522   0.03    1   2   1   0   0.2
2005    2   1   1   2.121   0.03    1   2   1   0   0.2
2006    2   1   1   0.075   0.03    1   2   1   0   0.2
2007    2   1   1   3.313   0.03    1   2   1   0   0.2
2008    2   1   1   5.796   0.03    1   2   1   0   0.2
2009    2   1   1   4.951   0.03    1   2   1   0   0.2
2010    2   1   1   4.834   0.03    1   2   1   0   0.2
2011    2   1   1   3.365   0.03    1   2   1   0   0.2
```

```
2012    2   1   1   9.157   0.03    1   2   1   0   0.2
2013    2   1   1   22.639  0.03    1   2   1   0   0.2
2014    2   1   1   14.986  0.03    1   2   1   0   0.2
2015    2   1   1   41.046  0.03    1   2   1   0   0.2
2016    2   1   1   29.792  0.03    1   2   1   0   0.2
2017    2   1   1   26.008  0.03    1   2   1   0   0.2
2018    2   1   1   9.18    0.03    1   2   1   0   0.2
2019    2   1   1   1.05    0.03    1   2   1   0   0.2
2020    2   1   1   0.08    0.03    1   2   1   0   0.2
2021    2   1   1   0.32    0.03    1   2   1   0   0.2
2022    2   1   1   2.708   0.03    1   2   1   0   0.2
2023    2   1   1   3.580   0.03    1   2   1   0   0.2
2024    2   1   1   4.830   0.03    1   2   1   0   0.2
2025    2   1   1   2.657   0.03    1   2   1   0   0.2

#       Subsistence retained
1978    2   2   1   12.506  0.03    1   2   1   0   0.2
1979    2   2   1   0.224   0.03    1   2   1   0   0.2
1980    2   2   1   0.213   0.03    1   2   1   0   0.2
1981    2   2   1   0.36    0.03    1   2   1   0   0.2
1982    2   2   1   1.288   0.03    1   2   1   0   0.2
1983    2   2   1   10.432  0.03    1   2   1   0   0.2
1984    2   2   1   11.22   0.03    1   2   1   0   0.2
1985    2   2   1   8.377   0.03    1   2   1   0   0.2
1986    2   2   1   7.052   0.03    1   2   1   0   0.2
1987    2   2   1   5.772   0.03    1   2   1   0   0.2
1988    2   2   1   2.724   0.03    1   2   1   0   0.2
1989    2   2   1   6.126   0.03    1   2   1   0   0.2
1990    2   2   1   12.152  0.03    1   2   1   0   0.2
1991    2   2   1   7.366   0.03    1   2   1   0   0.2
1992    2   2   1   11.736  0.03    1   2   1   0   0.2
1993    2   2   1   1.097   0.03    1   2   1   0   0.2
1994    2   2   1   4.113   0.03    1   2   1   0   0.2
1995    2   2   1   5.426   0.03    1   2   1   0   0.2
1996    2   2   1   1.679   0.03    1   2   1   0   0.2
1997    2   2   1   0.745   0.03    1   2   1   0   0.2
1998    2   2   1   8.622   0.03    1   2   1   0   0.2
1999    2   2   1   7.533   0.03    1   2   1   0   0.2
2000    2   2   1   5.723   0.03    1   2   1   0   0.2
2001    2   2   1   0.256   0.03    1   2   1   0   0.2
2002    2   2   1   2.177   0.03    1   2   1   0   0.2
2003    2   2   1   4.14    0.03    1   2   1   0   0.2
2004    2   2   1   1.181   0.03    1   2   1   0   0.2
2005    2   2   1   3.973   0.03    1   2   1   0   0.2
2006    2   2   1   1.239   0.03    1   2   1   0   0.2
2007    2   2   1   10.69   0.03    1   2   1   0   0.2
2008    2   2   1   9.485   0.03    1   2   1   0   0.2
2009    2   2   1   4.752   0.03    1   2   1   0   0.2
2010    2   2   1   7.044   0.03    1   2   1   0   0.2
2011    2   2   1   6.64    0.03    1   2   1   0   0.2
2012    2   2   1   7.311   0.03    1   2   1   0   0.2
2013    2   2   1   7.622   0.03    1   2   1   0   0.2
2014    2   2   1   3.252   0.03    1   2   1   0   0.2
2015    2   2   1   7.651   0.03    1   2   1   0   0.2
2016    2   2   1   5.34    0.03    1   2   1   0   0.2
2017    2   2   1   6.039   0.03    1   2   1   0   0.2
2018    2   2   1   4.424   0.03    1   2   1   0   0.2
2019    2   2   1   1.54    0.03    1   2   1   0   0.2
2020    2   2   1   0.55    0.03    1   2   1   0   0.2
2021    2   2   1   2.892   0.03    1   2   1   0   0.2
2022    2   2   1   7.630   0.03    1   2   1   0   0.2
2023    2   2   1   5.407   0.03    1   2   1   0   0.2
2024    2   2   1   4.751   0.03    1   2   1   0   0.2
2025    2   2   1   1.897   0.03    1   2   1   0   0.2

# Subistence total
#1978   2   2   1   0   0.03    0   2   1   0   0.2
#1979   2   2   1   0   0.03    0   2   1   0   0.2
#1980   2   2   1   0   0.03    0   2   1   0   0.2
#1981   2   2   1   0   0.03    0   2   1   0   0.2
#1982   2   2   1   0   0.03    0   2   1   0   0.2
#1983   2   2   1   0   0.03    0   2   1   0   0.2
```

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1984   2   2   1   15.923  0.03    0   2   1   0   0.2
1985   2   2   1   10.757  0.03    0   2   1   0   0.2
1986   2   2   1   10.751  0.03    0   2   1   0   0.2
1987   2   2   1   7.406   0.03    0   2   1   0   0.2
1988   2   2   1   3.573   0.03    0   2   1   0   0.2
1989   2   2   1   7.945   0.03    0   2   1   0   0.2
1990   2   2   1   16.635  0.03    0   2   1   0   0.2
1991   2   2   1   9.295   0.03    0   2   1   0   0.2
1992   2   2   1   15.051  0.03    0   2   1   0   0.2
1993   2   2   1   1.193   0.03    0   2   1   0   0.2
1994   2   2   1   4.894   0.03    0   2   1   0   0.2
1995   2   2   1   7.777   0.03    0   2   1   0   0.2
1996   2   2   1   2.936   0.03    0   2   1   0   0.2
1997   2   2   1   1.617   0.03    0   2   1   0   0.2
1998   2   2   1   20.327  0.03    0   2   1   0   0.2
1999   2   2   1   10.651  0.03    0   2   1   0   0.2
2000   2   2   1   9.816   0.03    0   2   1   0   0.2
2001   2   2   1   0.366   0.03    0   2   1   0   0.2
2002   2   2   1   5.119   0.03    0   2   1   0   0.2
2003   2   2   1   9.052   0.03    0   2   1   0   0.2
2004   2   2   1   1.775   0.03    0   2   1   0   0.2
2005   2   2   1   6.484   0.03    0   2   1   0   0.2
2006   2   2   1   2.083   0.03    0   2   1   0   0.2
2007   2   2   1   21.444  0.03    0   2   1   0   0.2
2008   2   2   1   18.621  0.03    0   2   1   0   0.2
2009   2   2   1   6.971   0.03    0   2   1   0   0.2
2010   2   2   1   9.004   0.03    0   2   1   0   0.2
2011   2   2   1   9.183   0.03    0   2   1   0   0.2
2012   2   2   1   11.341  0.03    0   2   1   0   0.2
2013   2   2   1   21.524  0.03    0   2   1   0   0.2
2014   2   2   1   5.421   0.03    0   2   1   0   0.2
2015   2   2   1   9.84    0.03    0   2   1   0   0.2
2016   2   2   1   6.468   0.03    0   2   1   0   0.2
2017   2   2   1   7.185   0.03    0   2   1   0   0.2
2018   2   2   1   5.767   0.03    0   2   1   0   0.2
2019   2   2   1   2.079   0.03    0   2   1   0   0.2
2020   2   2   1   0.815   0.03    0   2   1   0   0.2
2021   2   2   1   3.999   0.03    0   2   1   0   0.2
2022   2   2   1   10.041  0.03    0   2   1   0   0.2
2023   2   2   1   6.613   0.03    0   2   1   0   0.2
2024   2   2   1   5.9879  0.03    0   2   1   0   0.2
2025   2   2   1   2.239   0.03    0   2   1   0   0.2

# Summer Commercial Retain
1977   4   3   1   195.877 0.03    1   2   1   0   0.2
1978   4   3   1   660.829 0.03    1   2   1   0   0.2
1979   4   3   1   970.962 0.03    1   2   1   0   0.2
1980   4   3   1   329.778 0.03    1   2   1   0   0.2
1981   4   3   1   376.313 0.03    1   2   1   0   0.2
1982   4   3   1   63.949  0.03    1   2   1   0   0.2
1983   4   3   1   132.205 0.03    1   2   1   0   0.2
1984   4   3   1   139.759 0.03    1   2   1   0   0.2
1985   4   3   1   146.669 0.03    1   2   1   0   0.2
1986   4   3   1   162.438 0.03    1   2   1   0   0.2
1987   4   3   1   103.338 0.03    1   2   1   0   0.2
1988   4   3   1   76.148  0.03    1   2   1   0   0.2
1989   4   3   1   79.116  0.03    1   2   1   0   0.2
1990   4   3   1   59.132  0.03    1   2   1   0   0.2
#1991  4   3   1   0       0.03    1   2   1   0   0.2
1992   4   3   1   24.902  0.03    1   2   1   0   0.2
1993   4   3   1   115.913 0.03    1   2   1   0   0.2
1994   4   3   1   108.824 0.03    1   2   1   0   0.2
1995   4   3   1   105.967 0.03    1   2   1   0   0.2
1996   4   3   1   74.752  0.03    1   2   1   0   0.2
1997   4   3   1   32.606  0.03    1   2   1   0   0.2
1998   4   3   1   10.661  0.03    1   2   1   0   0.2
1999   4   3   1   8.734   0.03    1   2   1   0   0.2
2000   4   3   1   111.728 0.03    1   2   1   0   0.2
2001   4   3   1   98.321  0.03    1   2   1   0   0.2
2002   4   3   1   86.666  0.03    1   2   1   0   0.2
2003   4   3   1   93.638  0.03    1   2   1   0   0.2
2004   4   3   1   120.289 0.03    1   2   1   0   0.2
```

```
2005    4   3   1   138.926 0.03    1   2   1   0   0.2
2006    4   3   1   150.358 0.03    1   2   1   0   0.2
2007    4   3   1   110.344 0.03    1   2   1   0   0.2
2008    4   3   1   143.337 0.03    1   2   1   0   0.2
2009    4   3   1   143.485 0.03    1   2   1   0   0.2
2010    4   3   1   149.822 0.03    1   2   1   0   0.2
2011    4   3   1   141.626 0.03    1   2   1   0   0.2
2012    4   3   1   161.113 0.03    1   2   1   0   0.2
2013    4   3   1   130.603 0.03    1   2   1   0   0.2
2014    4   3   1   129.656 0.03    1   2   1   0   0.2
2015    4   3   1   144.225 0.03    1   2   1   0   0.2
2016    4   3   1   138.997 0.03    1   2   1   0   0.2
2017    4   3   1   135.322 0.03    1   2   1   0   0.2
2018    4   3   1   89.613  0.03    1   2   1   0   0.2
2019    4   3   1   23.964  0.03    1   2   1   0   0.2
#2020   4   3   1   0       0.03    1   2   1   0   0.2
#2021   4   3   1   0       0.03    1   2   1   0   0.2
2022    4   3   1   125.042 0.03    1   2   1   0   0.2
2023    4   3   1   148.062 0.03    1   2   1   0   0.2
2024    4   3   1   140.379 0.03    1   2   1   0   0.2
2025    4   3   1   100.758 0.03    1   2   1   0   0.2

##  RELATIVE  ABUNDANCE DATA
##  Units of abundance: 1 = biomass, 2 = numbers
## Use old format (0)
0
##  Number  of  relative  abundance indicies
6
# Type of 'survey' catchability (1=Selectivity; 2=Selectivity+Retention), by data frame
1 1 1 2 2 2
##  Number  of  rows  in    index
73
# ADFG/NOAA Trawl survey
#Index  Year    Season  Fleet   Sex Maturity    Value   CV  Type    Time
1   1976    4   4   1   0   4247.462    0.311   2   1.411765
1   1979    4   4   1   0   1417.215    0.204   2   1
1   1982    4   4   1   0   2791.733    0.289   2   1.318182
1   1985    4   4   1   0   2306.321    0.254   2   2.363636
1   1988    4   4   1   0   2263.353    0.288   2   2.2
1   1991    4   4   1   0   3132.508    0.428   2   6.25

#   ADFG    Trawl survey
2   1996    4   5   1   0   1313.757    0.259   2   0.6612903
2   1999    4   5   1   0   2630.53     0.236   2   0.4920635
2   2002    4   5   1   0   1769.85     0.418   2   0.5897436
2   2006    4   5   1   0   3322.53     0.391   2   0.6865672
2   2008    4   5   1   0   2962.1      0.30    2   0.5571429
2   2011    4   5   1   0   3209.285    0.289   2   1.03125
2   2014    4   5   1   0   5949.46     0.473   2   0.58
2   2017    4   5   1   0   1762.072    0.223   2   1.241379
2   2018    4   5   1   0   1109.39     0.249   2   0.8857143
2   2019    4   5   1   0   4675.99     0.598   2   0.4666667
2   2020    4   5   1   0   1725.99     0.298   2   0.7
2   2021    4   5   1   0   2430.44     0.608   2   0.5166667
2   2023    4   5   1   0   3548.08     0.315   2   1.214286
2   2024    4   5   1   0   1407.401    0.281   2   1.413793


#   NOAA    NBS survey
3   2010    4   6   1   0   1980.079    0.436   2   0.6071429
3   2017    4   6   1   0   864.497     0.467   2   1.965517
3   2019    4   6   1   0   2071.94     0.346   2   0.5882353
3   2021    4   6   1   0   2338.06     0.441   2   0.6666667
3   2022    4   6   1   0   2103.02     0.363   2   0.6166667
3   2023    4   6   1   0   1686.34 0.391   2   1.3
3   2025    4   6   1   0   1632.63     0.636   2   1.3

#   ST  CPUE
4   1977    4   3   1   0   2.82    0.35    2   0.5
4   1978    4   3   1   0   3.41    0.23    2   0.5
4   1979    4   3   1   0   1.55    0.22    2   0.5
4   1980    4   3   1   0   1.82    0.28    2   0.5
```

```
4   1981   4   3   1   0   0.62   0.20   2   0.5
4   1982   4   3   1   0   0.18   0.27   2   0.5
4   1983   4   3   1   0   0.72   0.22   2   0.5
4   1984   4   3   1   0   1.11   0.23   2   0.5
4   1985   4   3   1   0   0.67   0.24   2   0.5
4   1986   4   3   1   0   1.63   0.52   2   0.5
4   1987   4   3   1   0   0.64   0.35   2   0.5
4   1988   4   3   1   0   1.60   0.71   2   0.5
4   1989   4   3   1   0   1.35   0.33   2   0.5
4   1990   4   3   1   0   1.06   0.45   2   0.5
4   1992   4   3   1   0   0.26   0.32   2   0.5
5   1993   4   3   1   0   1.02   0.09   2   0.5
5   1994   4   3   1   0   0.44   0.17   2   0.5
5   1995   4   3   1   0   1.09   0.13   2   0.5
5   1996   4   3   1   0   1.01   0.09   2   0.5
5   1997   4   3   1   0   1.14   0.09   2   0.5
5   1998   4   3   1   0   1.31   0.12   2   0.5
5   1999   4   3   1   0   0.97   0.10   2   0.5
5   2000   4   3   1   0   2.08   0.11   2   0.5
5   2001   4   3   1   0   0.76   0.25   2   0.5
5   2002   4   3   1   0   0.76   0.09   2   0.5
5   2003   4   3   1   0   1.65   0.08   2   0.5
5   2004   4   3   1   0   1.36   0.07   2   0.5
5   2005   4   3   1   0   0.64   0.12   2   0.5
5   2006   4   3   1   0   0.93   0.10   2   0.5
6   2007   4   3   1   0   0.88   0.22   2   0.5
6   2008   4   3   1   0   1.18   0.05   2   0.5
6   2009   4   3   1   0   0.81   0.04   2   0.5
6   2010   4   3   1   0   1.19   0.05   2   0.5
6   2011   4   3   1   0   1.36   0.05   2   0.5
6   2012   4   3   1   0   1.20   0.04   2   0.5
6   2013   4   3   1   0   0.62   0.04   2   0.5
6   2014   4   3   1   0   0.94   0.04   2   0.5
6   2015   4   3   1   0   1.17   0.05   2   0.5
6   2016   4   3   1   0   1.03   0.05   2   0.5
6   2017   4   3   1   0   0.88   0.05   2   0.5
6   2018   4   3   1   0   0.51   0.05   2   0.5
6   2019   4   3   1   0   0.24   0.06   2   0.5
6   2022   4   3   1   0   1.31   0.07   2   0.5
6   2023   4   3   1   0   2.00   0.07   2   0.5
6   2024   4   3   1   0   2.63   0.14   2   0.5
6   2025   4   3   1   0   0.90   0.10   2   0.5

## Use old format (0)
0
##  Number  of  length  frequency matrices
#16 (this was for oldshell/newshell)
8
##  Number  of  rows  in  each  matrix
#4 4 45 45 14 14 8 8 6 6 14 14 6 6 27 27 (this was for oldshell/newshell)
4 46 14 8 6 14 7 27
##  Number  of  bins  in  each  matrix  (columns  of  size  data)
8 8 8 8 8 8 8 8
##  SIZE  COMPOSITION DATA  FOR ALL FLEETS
##  SIZE  COMP  LEGEND
##  Sex:  1 = male, 2 = female, 0 = both  sexes combined
##  Type  of  composition:  1 = retained, 2 = discard,  0 = total composition
##  Maturity  state:  1 = immature, 2 = mature, 0 = both  states  combined
##  Shell condition:  1 = new shell,  2 = old shell,  0 = both  shell types combined

## Winter Com Retain
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,       Nsamp,  DataVec
2015    2   1   1   1   0   0   10  0   0   0   49   310 155 52  10
2016    2   1   1   1   0   0   10  0   0   0   37   555 360 51  13
2017    2   1   1   1   0   0   10  0   0   0   2    152 263 103 20
2018    2   1   1   1   0   0   10  0   0   0   0    58  166 146 31

## Summer Com Retain
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1977    4   3   1   1   0   0   10  0   0   0   5    747 592 129 76
1978    4   3   1   1   0   0   10  0   0   0   4    74  188 106 17
1979    4   3   1   1   0   0   10  0   0   0   42   428 637 430 123
```

```
1980    4   3   1   1   0   0   10  0   0   0   4   108 339 413 204
1981    4   3   1   1   0   0   10  0   0   0   7   139 365 709 564
1982    4   3   1   1   0   0   10  0   0   0   50  224 204 272 343
1983    4   3   1   1   0   0   10  0   0   0   34  360 295 68  45
1984    4   3   1   1   0   0   10  0   0   0   103 467 317 68  8
1985    4   3   1   1   0   0   10  0   0   1   180 930 1084    440 56
1986    4   3   1   1   0   0   10  0   0   0   35  428 491 161 23
1987    4   3   1   1   0   0   10  0   0   0   38  408 707 599 233
1988    4   3   1   1   0   0   10  0   1   0   45  403 605 381 87
1989    4   3   1   1   0   0   10  0   0   0   44  570 1141    663 177
1990    4   3   1   1   0   0   10  0   0   0   20  233 542 392 102
#1991   4   3   1   1   0   0   10  0   0   0   0   0   0   0   0
1992    4   3   1   1   0   0   10  0   0   0   51  718 1013    503 281
1993    4   3   1   1   0   0   10  0   0   0   260 4424    7791    4607    722
1994    4   3   1   1   0   0   10  0   0   0   20  114 134 109 27
1995    4   3   1   1   0   0   10  0   0   0   55  364 422 251 75
1996    4   3   1   1   0   0   10  0   0   0   36  270 295 136 50
1997    4   3   1   1   0   0   10  0   0   0   39  505 459 151 44
1998    4   3   1   1   0   0   10  0   0   0   53  364 407 171 60
1999    4   3   1   1   0   0   10  0   0   0   37  178 164 128 55
2000    4   3   1   1   0   0   10  0   0   0   382 6063    7868    2493    407
2001    4   3   1   1   0   0   10  0   0   0   504 4955    8390    4592    1589
2002    4   3   1   1   0   0   10  0   0   0   255 1369    1688    1481    426
2003    4   3   1   1   0   0   10  0   0   0   127 2037    1914    910 238
2004    4   3   1   1   0   0   10  0   0   0   88  3905    4060    1159    394
2005    4   3   1   1   0   0   10  0   0   0   12  1471    2766    962 149
2006    4   3   1   1   0   0   10  0   0   0   16  1556    3259    1632    244
2007    4   3   1   1   0   0   10  0   0   0   73  2340    2438    1028    246
2008    4   3   1   1   0   0   10  0   0   0   35  2541    2539    526 125
2009    4   3   1   1   0   0   10  0   0   0   70  2539    2464    789 164
2010    4   3   1   1   0   0   10  0   0   0   42  2597    2457    722 84
2011    4   3   1   1   0   0   10  0   0   0   16  965 1163    336 72
2012    4   3   1   1   0   0   10  0   0   0   14  1355    2550    1011    126
2013    4   3   1   1   0   0   10  0   0   0   29  1535    2509    1602    397
2014    4   3   1   1   0   0   10  0   0   0   41  1517    1510    1202    412
2015    4   3   1   1   0   0   10  0   0   0   61  2086    1314    555 157
2016    4   3   1   1   0   0   10  0   0   0   7   419 767 292 58
2017    4   3   1   1   0   0   10  0   0   0   7   702 1725    892 108
2018    4   3   1   1   0   0   10  0   0   0   9   323 1039    1041    247
2019    4   3   1   1   0   0   10  0   0   0   10  382 379 305 60
#2020   4   3   1   1   0   0   10  0   0   0   0   0   0   0   0
#2021   4   3   1   1   0   0   10  0   0   0   0   0   0   0   0
2022    4   3   1   1   0   0   10  0   0   0   76  1734    1041    120 10
2023    4   3   1   1   0   0   10  0   0   0   11  814 1236    367 30
2024    4   3   1   1   0   0   10  0   0   0   4   371 1186    929 196
2025    4   3   1   1   0   0   10  0   0   0   4   229 711 858 408


## Summer Com Discards
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1987    4   3   1   2   0   0   10  69  218 390 426 42  0   0   0
1988    4   3   1   2   0   0   10  11  37  131 413 130 0   0   0
1989    4   3   1   2   0   0   10  89  227 309 325 50  0   0   0
1990    4   3   1   2   0   0   10  48  124 147 166 22  0   0   0
1992    4   3   1   2   0   0   10  68  112 184 194 24  0   0   0
1994    4   3   1   2   0   0   10  124 113 220 331 62  0   0   0
2012    4   3   1   2   0   0   10  244 139 197 335 119 9   1   0
2013    4   3   1   2   0   0   10  847 723 391 423 115 8   2   0
2014    4   3   1   2   0   0   10  79  179 475 774 226 17  5   0
2015    4   3   1   2   0   0   10  26  120 280 733 320 43  12  5
2016    4   3   1   2   0   0   10  19  22  72  227 77  9   0   0
2017    4   3   1   2   0   0   10  55  90  76  168 144 8   0   0
2018    4   3   1   2   0   0   10  52  97  201 167 13  0   0   1
2019    4   3   1   2   0   0   10  30  13  15  33  3   0   0   0

## Summer Com total
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
2012    4   3   1   0   0   0   10  244 139 197 364 476 529 184 23
2013    4   3   1   0   0   0   10  847 723 391 489 777 850 440 80
2014    4   3   1   0   0   0   10  79  179 475 808 879 538 383 165
2015    4   3   1   0   0   0   10  26  120 280 821 1231    482 194 61
2016    4   3   1   0   0   0   10  19  22  72  261 671 822 207 40
```

```
2017    4   3   1   0   0   0   10  55  90  76  171 578 1080    582 83
2018    4   3   1   0   0   0   10  52  97  201 191 169 386 421 109
2019    4   3   1   0   0   0   10  30  13  15  39  45  45  36  13

## NMFS Trawl
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1976    4   4   1   0   0   0   20  10  23  96  110 124 100 21  10
1979    4   4   1   0   0   0   20  6   3   3   12  40  99  48  9
1982    4   4   1   0   0   0   20  71  20  46  65  58  15  7   10
1985    4   4   1   0   0   0   20  29  20  28  24  45  36  21  5
1988    4   4   1   0   0   0   20  60  66  42  37  41  46  28  10
1991    4   4   1   0   0   0   20  75  45  14  36  73  58  35  8

## ADFG Trawl
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
1996    4   5   1   0   0   0   20  79  59  42  33  28  13  12  9
1999    4   5   1   0   0   0   20  9   3   30  90  88  47  14  2
2002    4   5   1   0   0   0   20  25  36  50  53  26  29  19  6
2006    4   5   1   0   0   0   20  69  98  80  48  37  28  12  1
2008    4   5   1   0   0   0   20  34  44  70  48  50  11  15  3
2011    4   5   1   0   0   0   20  42  36  31  42  83  58  20  3
2014    4   5   1   0   0   0   20  30  57  101 107 56  23  10  3
2017    4   5   1   0   0   0   20  17  16  8   13  19  33  10  0
2018    4   5   1   0   0   0   20  27  12  9   5   3   4   10  3
2019    4   5   1   0   0   0   20  170 92  14  6   5   8   10  2
2020    4   5   1   0   0   0   20  17  33  39  9   8   4   0   1
2021    4   5   1   0   0   0   20  10  27  37  35  37  8   2   2
2023    4   5   1   0   0   0   20  0   1   10  27  89  89  23  1
2024    4   5   1   0   0   0   20  3   3   2   7   12  36  26  4

##NOAA  NBS Trawl
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,   Nsamp,  DataVec
2010    4   6   1   0   0   0   20  1   5   10  27  17  9   2   2
2017    4   6   1   0   0   0   20  7   6   10  6   5   14  6   4
2019    4   6   1   0   0   0   20  54  43  17  8   4   1   6   2
2021    4   6   1   0   0   0   20  5   17  26  18  13  3   0   0
2022    4   6   1   0   0   0   20  68  71  69  67  55  32  12  4 # these numbers are wrong; fix for May 2026
2023    4   6   1   0   0   0   20  1   3   6   12  26  22  7   1
2025    4   6   1   0   0   0   20  4   3   4   5   7   19  19  2

##Winter Pot Survey
##Year, Seas,   Fleet,  Sex,    Type,   Shell,  Maturity,       Nsamp,  DataVec
1982    2   7   1   0   0   0   10  0   108 246 233 79  25  26  2
1983    2   7   1   0   0   0   10  68  215.5   711.5   729 592 202.5   39.5    24.5
1984    2   7   1   0   0   0   10  23  271 434.5   408.5   356 154 20  10
1985    2   7   1   0   0   0   10  16  72  200 284.5   145 62.5    8   0.5
1986    2   7   1   0   0   0   10  25.5    72.5    104 153.5   149.5   74  14  0.5
1987    2   7   1   0   0   0   10  0   8   23  34  53  22  4   0
1989    2   7   1   0   0   0   10  8   66  74.5    67.5    121.5   128.5   33  1
1990    2   7   1   0   0   0   10  7   102.5   430 544 426.5   369 162 35
1991    2   7   1   0   0   0   10  2   16  118 371 377 272 105 22
1993    2   7   1   0   0   0   10  0   1   6   13  58  70  24  9
1995    2   7   1   0   0   0   10  8   50  68  87  247 260 114 24
1996    2   7   1   0   0   0   10  102 215 325 327 268 220 95  28
1997    2   7   1   0   0   0   10  28  85  87  44  65  55  26  8
1998    2   7   1   0   0   0   10  1   123 370 248 76  36  19  8
1999    2   7   1   0   0   0   10  6   25  152 477 498 118 25  6
2000    2   7   1   0   0   0   10  10  50  60  94  218 114 27  2
2002    2   7   1   0   0   0   10  50  248 222 143 57  64  36  8
2003    2   7   1   0   0   0   10  21  85  185 251 165 71  37  9
2004    2   7   1   0   0   0   10  0   5   51  82  100 46  10  2
2005    2   7   1   0   0   0   10  2   31  58  73  104 99  35  3
2006    2   7   1   0   0   0   10  2   76  121 116 102 66  25  4
2007    2   7   1   0   0   0   10  11  22  32  57  24  13  0   0
2008    2   7   1   0   0   0   10  72  662 1123    716 631 287 52  9
2009    2   7   1   0   0   0   10  1   37  70  185 126 96  7   3
2010    2   7   1   0   0   0   10  4   27  78  157 199 96  15  2
2011    2   7   1   0   0   0   10  12  46  87  141 168 105 36  1
2012    2   7   1   0   0   0   10  17  78  156 134 117 120 48  5

##  Growth data (increment)
# Type of growth increment (0=no growth data;1=size-at-release; 2= size-class-at-release)
```

```
3
# nobs_growth
66
# Class-at-release; Sex; Class-at-recapture;  Years-at-liberty;  number transition matrix; sample size
1 1 2 1 1 3 1993 1
1 1 3 1 1 3 1993 4
1 1 3 2 1 3 1993 1
1 1 4 2 1 3 1993 6
1 1 5 2 1 3 1993 4
1 1 5 3 1 3 1993 11
1 1 6 3 1 3 1993 11
2 1 3 1 1 3 1993 21
2 1 4 1 1 3 1993 22
2 1 4 2 1 3 1993 12
2 1 5 1 1 3 1993 4
2 1 5 2 1 3 1993 96
2 1 5 3 1 3 1993 19
2 1 6 2 1 3 1993 5
2 1 6 3 1 3 1993 48
2 1 7 3 1 3 1993 6
3 1 4 1 1 3 1993 47
3 1 4 2 1 3 1993 5
3 1 4 3 1 3 1993 2
3 1 5 1 1 3 1993 91
3 1 5 2 1 3 1993 36
3 1 5 3 1 3 1993 14
3 1 6 1 1 3 1993 7
3 1 6 2 1 3 1993 70
3 1 6 3 1 3 1993 28
3 1 7 1 1 3 1993 1
3 1 7 2 1 3 1993 3
3 1 7 3 1 3 1993 9
4 1 4 1 1 3 1993 10
4 1 4 2 1 3 1993 2
4 1 5 1 1 3 1993 196
4 1 5 2 1 3 1993 34
4 1 5 3 1 3 1993 3
4 1 6 1 1 3 1993 108
4 1 6 2 1 3 1993 39
4 1 6 3 1 3 1993 35
4 1 7 1 1 3 1993 2
4 1 7 2 1 3 1993 19
4 1 7 3 1 3 1993 14
4 1 8 1 1 3 1993 1
5 1 5 1 1 3 1993 75
5 1 5 2 1 3 1993 7
5 1 6 1 1 3 1993 143
5 1 6 2 1 3 1993 77
5 1 6 3 1 3 1993 9
5 1 7 1 1 3 1993 22
5 1 7 2 1 3 1993 24
5 1 7 3 1 3 1993 21
5 1 8 3 1 3 1993 4
6 1 6 1 1 3 1993 88
6 1 6 2 1 3 1993 11
6 1 7 1 1 3 1993 98
6 1 7 2 1 3 1993 47
6 1 7 3 1 3 1993 11
6 1 8 1 1 3 1993 24
6 1 8 2 1 3 1993 7
6 1 8 3 1 3 1993 3
7 1 7 1 1 3 1993 56
7 1 7 2 1 3 1993 9
7 1 7 3 1 3 1993 1
7 1 8 1 1 3 1993 25
7 1 8 2 1 3 1993 16
7 1 8 3 1 3 1993 9
8 1 8 1 1 3 1993 26
8 1 8 2 1 3 1993 8
8 1 8 3 1 3 1993 1

# Environmental data
```

```
## Use old format (0)
0
# Number of series
0
# Year ranges

# Indices
# Index Year Value

##  eof

## eof
9999
```

Model 25.0a2 control file

```
## GMACS Version 2.20.20 - Nov 2025 - one shell type, M for small males = 0.23, winter comm fishery selectivity logistic

# Block structure
# Number of blocks
2
# Block structure
1 1
# The blocks
2008 2026
2008 2026

##  ------------------------------------------------------------------------------------ ##
##  GENERAL  CONTROLS
##  ------------------------------------------------------------------------------------ ##
#
1976       # First year of recruitment estimation,rec_dev.
2025       # last year of recruitment estimation, rec_dev
   0       # Terminal molting (0 = off, 1 = on). If on, the calc_stock_recruitment_relationship() isn’t called in the procedure
   2       # phase for recruitment estimation,earlier -1. rec_dev estimation phase, BBRKC uses 2
  -2       # phase for recruitment sex-ratio estimation
  0.5      # Initial value for Expected sex-ratio
   3       # Initial conditions (0 = Unfished, 1 = Steady-state fished, 2 = Free parameters, 3 = Free parameters (revised))
   1       # Reference size-class for initial conditons = 3
   1       # Lambda (proportion of mature male biomass for SPR reference points).
   0       # Stock-Recruit-Relationship (0 = none, 1 = Beverton-Holt)
   1       # Use years specified to computed average sex ratio in the calculation of average recruitment for reference points (0 = off -i.e. Rec b
  200      ### Year to compute equilibria
   5       # Devpar phase (!!)
   0       # First year of bias-correction
   0       # First full bias-correction
   0       # Last full bias-correction
   0       # Last year of bias-correction

# Expecting 23 theta parameters
# Core parameters
## Initial: Initial value for the parameter (must lie between lower and upper)
## Lower & Upper: Range for the parameter
## Phase: Set equal to a negative number not to estimate
## Prior type:
## 0: Uniform   - parameters are the range of the uniform prior
## 1: Normal    - parameters are the mean and sd
## 2: Lognormal - parameters are the mean and sd of the log
## 3: Beta      - parameters are the two beta parameters [see dbeta]
## 4: Gamma     - parameters are the two gamma parameters [see dgamma]
# Initial_value    Lower_bound    Upper_bound Phase Prior_type        Prior_1        Prior_2
     7.00000000   -15.00000000    20.00000000    -1          0   -10.00000000    20.00000000 # Log(R0)
     10.11100000   -15.00000000    20.00000000     1          0   -10.00000000    20.00000000 # Log(Rinitial)
     8.00000000   -15.00000000    20.00000000     1          0   -10.00000000    20.00000000 # Log(Rbar)
    72.50000000    65.00000000   130.00000000     3          1    72.50000000     7.25000000 # Recruitment_ra-males
     0.75000000     0.00000001     1.60000000     3          0     0.10000000     5.00000000 # Recruitment_rb-males
    -0.10000000   -15.00000000     0.75000000    -2          0   -10.00000000     0.75000000 # log(SigmaR)
     0.75000000     0.20000000     1.00000000    -4          3     3.00000000     2.00000000 # Steepness
```

```
     0.00100000     0.00000000     1.00000000    -3          3     1.01000000     1.01000000 # Rho
     0.64670000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_2
     1.00340000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_3
     1.36040000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_4
     1.40420000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_5
     1.45990000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_6
     1.26570000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_7
     0.72280000   -15.00000000     5.00000000     2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_newshell_class_8
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_
#  -100.00000000  -101.00000000     5.00000000    -2          0    10.00000000    20.00000000 # Scaled_logN_for_male_mature_mature_oldshell_class_

##Allometry
# weight-at-length input  method  (1 = allometry  [w_l = a*l^b],  2 = vector by sex; 3= matrix by sex)
2
 0.5239661 0.8202686 1.197317 1.700319 2.317965 2.988772 3.68294 4.367152 # this is from the version 2.20.14 ctl file
# 0.52420370 0.82067430 1.19824500 1.70175900 2.32125400 2.99365100 3.68849500 4.37139500
# Proportion mature by sex and size
 0.00000000 0.00000000 0.00000000 1.00000000 1.00000000 1.00000000 1.00000000 1.00000000
# Proportion legal by sex and size
 0.00000000 0.00000000 0.00000000 0.00000000 1.00000000 1.00000000 1.00000000 1.00000000

## =================================================================================== ##
## GROWTH PARAMETER CONTROLS                                                           ##
## =================================================================================== ##
##
# Maximum number of size-classes to which recruitment must occur
 3
# Use functional maturity for terminally molting animals (0=no; 1=Yes)?
0
# Growth transition
##Type_1: Options for the growth matrix
#  1: Pre-specified growth transition matrix (requires molt probability)
#  2: Pre-specified size transition matrix (molt probability is ignored)
#  3: Growth increment is gamma distributed (requires molt probability)
#  4: Post-molt size is gamma distributed (requires molt probability)
#  5: Von Bert.: kappa varies among individuals (requires molt probability)
#  6: Von Bert.: Linf varies among individuals (requires molt probability)
#  7: Von Bert.: kappa and Linf varies among individuals (requires molt probability)
#  8: Growth increment is normally distributed (requires molt probability)
## Type_2: Options for the growth increment model matrix
#  1: Linear
#  2: Individual
#  3: Individual (Same as 2)
#  Block: Block number for time-varying growth
## Type_1 Type_2  Block
        8      1      0
# Molt probability
# Type: Options for the molt probability function
#  0: Pre-specified
#  1: Constant at 1
#  2: Logistic
#  3: Individual
#  Block: Block number for time-varying growth
## Type Block
      2     0

## General parameter specificiations
##  Initial: Initial value for the parameter (must lie between lower and upper)
##  Lower & Upper: Range for the parameter
##  Prior type:
##   0: Uniform   - parameters are the range of the uniform prior
##   1: Normal    - parameters are the mean and sd
##   2: Lognormal - parameters are the mean and sd of the log
##   3: Beta      - parameters are the two beta parameters [see dbeta]
##   4: Gamma     - parameters are the two gamma parameters [see dgamma]
##  Phase: Set equal to a negative number not to estimate
```

```
##  Relative: 0: absolute; 1 relative
##  Block: Block number for time-varying selectivity
##  Block_fn: 0:absolute values; 1:exponential
##  Env_L: Environmental link - options are 0:none; 1:additive; 2:multiplicative; 3:exponential
##  EnvL_var: Environmental variable
##  RW: 0 for no random walk changes; 1 otherwise
##  RW_blk: Block number for random walks
##  Sigma_RW: Sigma used for the random walk

# Inputs for sex * type 1
# MAIN PARS: Initial  Lower_bound  Upper_bound Prior_type       Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
            36.998620     0.000000   200.000000          0     0.000000    20.000000      2      0      0      0      0      0      0   0.3000 # A
             0.243015    -0.200000    20.000000          0     0.000000    10.000000      2      0      0      0      0      0      0   0.3000 # B
             3.773156     2.000000    10.000000          0     0.000000     3.000000      5      0      0      0      0      0      0   0.3000 # G
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve
# Inputs for sex * type 2
# MAIN PARS: Initial  Lower_bound  Upper_bound Prior_type       Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           122.965900    50.000000   200.000000          0     0.000000   170.000000      2      0      0      0      0      0      0   0.3000 # M
             0.127616     0.000000     1.000000          0     0.000000     3.000000      2      0      0      0      0      0      0   0.3000 # M
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve


## ==================================================================================== ##
## NATURAL MORTALITIY PARAMETER CONTROLS                                                ##
## ==================================================================================== ##
##
# Relative: 0 - absolute values; 1+ - based on another M-at-size vector (indexed by ig)
# Type: 0 for standard; 1: Spline
#  For spline: set extra to the number of knots, the parameters are the knots (phase -1) and the log-differences from base M
# Extra: control the number of knots for splines
# Brkpts: number of changes in M by size
# Mirror: Mirror M-at-size over to that for another partition (indexed by ig)
# Block: Block number for time-varying M-at-size
# Block_fn: 0:absolute values; 1:exponential
# Env_L: Environmental link - options are 0: none; 1:additive; 2:multiplicative; 3:exponential
# EnvL_var: Environmental variable
# RW: 0 for no random walk changes; 1 otherwise
# RW_blk: Block number for random walks
# Sigma_RW: Sigma for the random walk parameters
# Mirror_RW: Should time-varying aspects be mirrored (Indexed by ig)
## Relative?   Type   Extra  Brkpts  Mirror   Block  Blk_fn Env_L   EnvL_Vr      RW  RW_blk Sigma_RW Mirr_RW
          0       0       0       1       0       0       1       0       0       0       0   0.3000       0
# MaxMbreaks
7  # sex*maturity state: male & 1

#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    0.23000000     0.01000000     1.00000000           0     0.00000000     0.20000000     -1 # M_base_male_mature
    0.50000000     0.05000000     1.00000000           1     0.00000000     0.25000000      3 # M estimated for males > 123 mm carapace length

## ==================================================================================== ##
## SELECTIVITY PARAMETERS CONTROLS                                                      ##
## ==================================================================================== ##
##
# ## Selectivity parameter controls
# ## Selectivity (and retention) types
# ##  <0: Mirror selectivity
# ##   0: Nonparametric selectivity (one parameter per class)
# ##   1: Nonparametric selectivity (one parameter per class, constant from last specified class)
# ##   2: Logistic selectivity (inflection point and slope)
# ##   3: Logistic selectivity (50% and 95% selection)
# ##   4: Double normal selectivity (3 parameters)
# ##   5: Flat equal to zero (1 parameter; phase must be negative)
# ##   6: Flat equal to one (1 parameter; phase must be negative)
# ##   7: Flat-topped double normal selectivity (4 parameters)
# ##   8: Declining logistic selectivity with initial values (50% and 95% selection plus extra)
# ##   9: Cubic-spline (specified with knots and values at knots)
# ##      Inputs: knots (in length units); values at knots (0-1) - at least one should have phase -1
# ##  10: One parameter logistic selectivity (inflection point and slope)
## Selectivity specifications --
# ## Extra (type 1): number of selectivity parameters to estimated
# #  Winter_Com Subsistence Summer_Com NMFS_Trawl ADFG_Trawl NBS_Trawl Winter_Pot
 0 0 0 0 0 0 0 # is selectivity sex=specific? (1=Yes; 0=No)
```

```
 10 -1 -1 10 -4 -4 8 # male selectivity type.
 0 0 0 0 0 0 0 # selectivity within another gear
 0 0 0 0 0 0 3 # male extra parameters for each pattern
 0 0 1 1 1 1 0 # male: is maximum selectivity at size forced to equal 1 (1) or not (0)
 0 0 0 0 0 0 4 # size-class at which selectivity is forced to equal 1 (ignored if the previous input is 1)
## Retention specifications --
 0 0 0 0 0 0 0 # is retention sex=specific? (1=Yes; 0=No)
 2 0 2 6 6 6 6 # male retention type
 1 1 1 0 0 0 0 # male retention flag (0 = no, 1 = yes)
 0 0 0 0 0 0 0 # male extra parameters for each pattern
 0 0 0 0 0 0 0 # male - should maximum retention be estimated for males (1=Yes; 0=No)

## General parameter specificiations
##  Initial: Initial value for the parameter (must lie between lower and upper)
##  Lower & Upper: Range for the parameter
##  Prior type:
##   0: Uniform   - parameters are the range of the uniform prior
##   1: Normal    - parameters are the mean and sd
##   2: Lognormal - parameters are the mean and sd of the log
##   3: Beta      - parameters are the two beta parameters [see dbeta]
##   4: Gamma     - parameters are the two gamma parameters [see dgamma]
##  Phase: Set equal to a negative number not to estimate
##  Relative: 0: absolute; 1 relative
##  Block: Block number for time-varying selectivity
##  Block_fn: 0:absolute values; 1:exponential
##  Env_L: Environmental link - options are 0:none; 1:additive; 2:multiplicative; 3:exponential
##  EnvL_var: Environmental variable
##  RW: 0 for no random walk changes; 1 otherwise
##  RW_blk: Block number for random walks
##  Sigma_RW: Sigma used for the random walk

# Inputs for type*sex*fleet: selectivity male Winter_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
#          128.894800    40.000000   200.000000          0    10.000000   200.000000      2      0      0      0      0      0      0   0.3000 #
#            0.154697     0.010000    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #
#            0.045586     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #
#            0.375288     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #
#            0.733787     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #
            0.143640     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S

# Inputs for type*sex*fleet: selectivity male Summer_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
#            0.143640     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #

# Inputs for type*sex*fleet: selectivity male NMFS_Trawl
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
            0.092094     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S

# Inputs for type*sex*fleet: selectivity male ADFG_Trawl
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
#            0.092094     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #

# Inputs for type*sex*fleet: selectivity male NBS_Trawl
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
#            0.092094     0.000010    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 #

# Inputs for type*sex*fleet: selectivity male Winter_Pot
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
          128.894800    40.000000   200.000000          0    10.000000   200.000000      2      0      0      0      0      0      0   0.3000 # S
            0.154697     0.010000    20.000000          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S
            0.045586     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S
            0.375288     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S
            0.733787     0.000010     0.999990          0     0.100000   100.000000      2      0      0      0      0      0      0   0.3000 # S

# Inputs for type*sex*fleet: retention male Winter_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           100.49375    50.000000   200.000000          0     1.000000   900.000000     -2      2      0      0      0      0      0   0.3000 # Re
             2.48336     0.001000    20.000000          0     1.000000   900.000000     -2      2      0      0      0      0      0   0.3000 # Re
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve
           100.49375    50.000000   700.000000          0     0.100000   100.000000      2      0 # Ret_Summer_Com_male_period_2_par_1
              2.4833     1.000000    20.000000          0     0.100000   100.000000      2      0 # Ret_Summer_Com_male_period_2_par_2
```

```
# Inputs for type*sex*fleet: retention male Subsistence
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
             0.000001     0.000000     0.000002          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.000001     0.000000     0.000002          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.000001     0.000000     0.000002          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R
             0.999999     0.000000     1.000000          0     1.000000   900.000000     -2      0      0      0      0      0      0   0.3000 # R

# Inputs for type*sex*fleet: retention male Summer_Com
# MAIN PARS:  Initial  Lower_bound  Upper_bound Prior_type     Prior_1      Prior_2  Phase  Block Blk_fn  Env_L Env_vr     RW RW_Blk RW_Sigma
           104.310600    50.000000   700.000000          0     1.000000   900.000000      2      1      0      0      0      0      0   0.3000 # R
             2.421736     1.000000    20.000000          0     1.000000   900.000000      2      1      0      0      0      0      0   0.3000 # R
# EXTRA PARS: Initial  Lower_bound  Upper_bound Prior_type      Prior_1      Prior_2  Phase Reltve
           105.150900    50.000000   700.000000          0     0.100000   100.000000      2      0 # Ret_Summer_Com_male_period_2_par_1
             1.648215     1.000000    20.000000          0     0.100000   100.000000      2      0 # Ret_Summer_Com_male_period_2_par_2


## ==================================================================================== ##
## CATCHABILITY PARAMETER CONTROLS                                                      ##
## ==================================================================================== ##
##
# Catchability (specifications)
# Analytic: should q be estimated analytically (1) or not (0)
# Lambda: the weight lambda
# Emphasis: the weighting emphasis
# Block: Block number for time-varying M-at-size
# Block_fn: 0:absolute values; 1:exponential
# Env_L: Environmental link - options are 0: none; 1:additive; 2:multiplicative; 3:exponential
# EnvL_var: Environmental variable
# RW: 0 for no random walk changes; 1 otherwise
# RW_blk: Block number for random walks
# Sigma_RW: Sigma for the random walk parameters
## Analytic  Lambda Emphass  Mirror   Block   Env_L EnvL_Vr      RW  RW_blk Sigma_RW
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
          0       1       1       0       0       0       0       0       0   0.3000
# Catchability (parameters)
#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    0.77700000     0.10000000     2.00000000           0     0.10000000     1.00000000      2 # NMFS trawl survey
    1.00000000     0.10000000     2.00000000           0     0.10000000     1.00000000     -2 # ADF&G trawl survey
    0.77700000     0.10000000     2.00000000           0     0.10000000     1.00000000      2 # NBS trawl survey
    0.00150000     0.00000000     2.00000000           0     0.00000000     1.00000000      1 # block 1 - std CPUE
    0.00150000     0.00000000     2.00000000           0     0.00000000     1.00000000      1 # block 2 - std CPUE
    0.00150000     0.00000000     2.00000000           0     0.00000000     1.00000000      1 # block 3 - std CPUE

## ==================================================================================== ##
## ADDITIONAL CV PARAMETER CONTROLS                                                     ##
## ==================================================================================== ##
##
# Catchability (specifications)
# Mirror: should additional variance be mirrored (value > 1) or not (0)?
# Block: Block number for time-varying M-at-size
# Block_fn: 0:absolute values; 1:exponential
# Env_L: Environmental link - options are 0: none; 1:additive; 2:multiplicative; 3:exponential
# EnvL_var: Environmental variable
# RW: 0 for no random walk changes; 1 otherwise
# RW_blk: Block number for random walks
# Sigma_RW: Sigma for the random walk parameters
##   Mirror   Block   Env_L EnvL_Vr      RW  RW_blk Sigma_RW
          0       0       0       0       0       0   0.3000
          0       0       0       0       0       0   0.3000
          0       0       0       0       0       0   0.3000
          0       0       0       0       0       0   0.3000
          4       0       0       0       0       0   0.3000
          4       0       0       0       0       0   0.3000
## Mirror Block Env_L EnvL_Var  RW RW_blk Sigma_RW
```

```
# Additional variance (parameters)
#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
    0.10000000     0.00000001     2.00000000           0     1.00000000   100.00000000      4
#    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4
#    0.00010000     0.00000001     2.00000000           0     1.00000000   100.00000000     -4

## ================================================================================ ##
## CONTROLS ON F                                                                    ##
## ================================================================================ ##
##
# Controls on F
#   Initial_male_F Initial_fema_F Pen_SD (early) Pen_SD (later) Phz_mean_F_mal Phz_mean_F_fem   Lower_mean_F   Upper_mean_F Low_ann_male_F  Up_ann
          0.020000       0.000000       0.500000      45.500000       1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.020000       0.000000       0.500000      45.500000       1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.120000       0.000000       0.500000      45.500000       1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10
          0.000000       0.000000       2.000000      20.000000      -1.000000      -1.000000     -15.000000       4.000000     -10.000000      10

## ================================================================================ ##
## SIZE COMPOSITIONS OPTIONS                                                        ##
## ================================================================================ ##
##
# Options when fitting size-composition data
## Likelihood types:
##  1:Multinomial with estimated/fixed sample size
##  2:Robust approximation to multinomial
##  3:logistic normal
##  4:multivariate-t
##  5:Dirichlet

# Using oldshell and newshell
#  Winter_Com Winter_Com Summer_Com Summer_Com Summer_Com Summer_Com Summer_Com Summer_Com NMFS_Trawl NMFS_Trawl ADFG_Trawl ADFG_Trawl NBS_Trawl N
#  male male male male male male male male male male male male male male male male
#  retained retained retained retained discard discard total total total total total total total total total total
#  newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell newshell oldshell
#  immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature
#  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Type of likelihood
#  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Auto tail compression
#  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Auto tail compression (pmin)
#  1   1   2   2   3   3   4   4   5   5   6   6   7   7   8   8 # Composition aggregator codes
#  1   1   1   1   1   1   1   1   2   2   2   2   2   2   2   2 # Set to 1 for catch-based predictions; 2 for survey or total catch predictions
#  -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4   -4 # Phz for estimating effective sample size (if appl.)
#  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Lambda for effective sample size
#  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Lambda for overall likelihood. Or emphasis?
#  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Survey to set Q for this comp. Does 0 keep this as is? Ask Buck. Added in versi
#  0   0   0   0   0   0   0   0   3   4   1   2   5   6   5   6 # Survey to set Q for this comp. Does 0 keep this as is? Ask Buck. Added in versi
#  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 # Survey to set Q for this comp. Does 0 keep this as is? Ask Buck. Added in versi
#  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1 # Initial value for effective sample size multiplier

# Using only one shell condition
#  Winter_Com      Summer_Com      Summer_Com      Summer_Com      NMFS_Trawl      ADFG_Trawl      NBS_Trawl       Winter_Pot
#  male            male            male            male            male            male            male            male
#  retained        retained        discard         total           total           total           total           total
#  immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature immature+mature
  1   1   1   1   1   1   1   1 # Type of likelihood
  0   0   0   0   0   0   0   0 # Auto tail compression
  0   0   0   0   0   0   0   0 # Auto tail compression (pmin)
  1   2   3   4   5   6   7   8 # Composition aggregator codes
  1   1   1   1   2   2   2   2 # Set to 1 for catch-based predictions; 2 for survey or total catch predictions
#  -4   -4   -4   -4   -4   -4   -4   -4 # Phz for estimating effective sample size (if appl.)
  1   1   1   1   1   1   1   1  # Lambda for effective sample size
  1   1   1   1   1   1   1   1  # Lambda for overall likelihood. Or emphasis?
  0   0   0   0   0   0   0   0  # Survey to set Q for this comp.

# Effective sample size parameters (number matches max(Composition Aggregator code))
#      Initial    Lower_bound    Upper_bound  Prior_type        Prior_1        Prior_2  Phase
    1.00000000     0.10000000    10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_1(possibly e
```

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    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_2(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_3(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_4(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_5(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_6(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_7(possibly e
    1.00000000     0.10000000     10.00000000           0       0                999      -1 # Overdispersion_parameter_for_size_comp_8(possibly e

## ==================================================================================== ##
## EMPHASIS FACTORS                                                                     ##
## ==================================================================================== ##

1.0000 # Emphasis on tagging data

 1.0000 1.0000 0.0000 1.0000 # Emphasis on Catch: (by catch dataframes)

#AEP AEP AEP AEP
   1.0000   0.0000   0.0000   0.0000 # Winter_Com
   0.1000   0.0000   0.0000   0.0000 # Subsistence
   1.0000   0.0000   0.0000   0.0000 # Summer_Com
   0.0000   0.0000   0.0000   0.0000 # NMFS_Trawl
   0.0000   0.0000   0.0000   0.0000 # ADFG_Trawl
   0.0000   0.0000   0.0000   0.0000 # NBS_Trawl
   0.0000   0.0000   0.0000   0.0000 # Winter_Pot
#
## Emphasis Factors (Priors/Penalties: 13 values) ##
     1.0000 #--Log_fdevs
     0.0000 #--MeanF
     0.0000 #--Mdevs
     1.0000 #--Rec_devs
    15.0000 #--Initial_devs
     1.0000 #--Fst_dif_dev
     3.0000 #--Mean_sex_ratio
    60.0000 #--Molt_prob
     0.1000 #--free selectivity
     1.0000 #--Init_n_at_len
     0.0000 #--Fvecs
     0.0000 #--Fdovss
     1.0000 #--Random walk in selectivity

# eof_ctl
9999
```