Appendix A: Model Objective Function Values

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Appendix A: Model Objective Function Components

Values for data and non-data objective function components are given for each model in the following tables, which are organized by model group. A second set of tables gives the differences between these values and the "base" model for each group. The groups are organized as

- 22.03, 22.03b, 23.01, 23.01a, 23.02
- 22.03b, 23.03a, 23.03a1, 23.03b, 23.03b1
- 22.03b, 23.05, 23.05a, 23.05a1, 23.05b, 23.05b1

where the first model in each group serves as the "base" model for that group in the difference tables.

Tables

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0.1 Objective function values for 22.03, 22.03b, 23.01, 23.01a, 23.02

Table 1. Objective function data component values for models 22.03, 22.03b, 23.01, 23.01a, 23.02. Table 1 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries. Components not included in the objective function are indicated by "–".

category	fleet	catch type	data type	sex	22.03	22.03b	23.01	23.01a	23.02
			abundance	female	–	–	–	–	–
				male	–	–	–	–	–
	NMFS M		biomass	female	–	–	–	–	–
				male	70.699	70.675	68.776	68.877	149.472
			n.at.z	male	411.493	411.486	416.861	416.325	551.102
			abundance	female	–	–	–	–	–
				male	–	–	–	–	–
	NMFS F		biomass	female	163.916	163.917	160.791	160.368	669.045
				male	–	–	–	–	–
			n.at.z	female	298.183	298.154	298.632	298.801	376.711
			abundance	female	–	–	–	–	–
				male	–	–	–	–	–
surveys data		index catch	biomass	female	–	–	–	–	–
	SBS BSFRF M			male	-1.151	-1.149	-1.187	-1.174	1.778
			n.at.z	male	290.992	290.988	290.967	291.313	299.699
			abundance	female	–	–	–	–	–
				male	–	–	–	–	–
	SBS BSFRF F		biomass	female	-1.622	-1.632	-1.760	-1.853	-1.811
				male	–	–	–	–	–

Table 2. Objective function data component values for models 22.03, 22.03b, 23.01, 23.01a, 23.02. Table 2 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries. Components not included in the objective function are indicated by "–".

category	fleet	catch type	data type	sex	22.03	22.03b	23.01	23.01a	23.02
surveys data	SBS BSFRF F	index catch	n.at.z	female	231.943	231.948	232.029	232.081	239.591
			abundance	female	–	–	–	–	–
			abundance	male	–	–	–	–	–
			biomass	female	–	–	–	–	–
		retained catch	biomass	male	-143.049	-143.051	-143.088	-143.094	-132.811
			n.at.z	male	64.684	64.677	63.075	64.196	69.952
	TCF		abundance	all sexes	–	–	–	–	–
			biomass	all sexes	6.586	6.583	6.267	6.409	9.924
			n.at.z	female	89.435	89.433	88.669	88.626	88.316
			n.at.z	male	83.283	83.273	84.222	84.084	76.031
			abundance	all sexes	–	–	–	–	–
			biomass	all sexes	-52.237	-52.237	-52.235	-52.228	-51.519
fisheries data	SCF		n.at.z	female	52.316	52.317	52.391	52.383	54.506
		total catch	n.at.z	male	80.186	80.183	80.591	80.553	95.200
			abundance	all sexes	-37.835	-37.816	-38.311	-38.311	-40.291
			biomass	all sexes	-68.910	-68.893	-69.350	-69.348	-72.712
	GF All		n.at.z	female	224.001	224.038	223.047	223.131	258.014
			n.at.z	male	291.464	291.441	293.104	293.028	329.713
	RKF		abundance	all sexes	–	–	–	–	–

Table 3. Objective function data component values for models 22.03, 22.03b, 23.01, 23.01a, 23.02. Table 3 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries. Components not included in the objective function are indicated by "–".

category	fleet	catch type	data type	sex	22.03	22.03b	23.01	23.01a	23.02
			biomass	all sexes	-37.093	-37.093	-37.076	-37.086	-18.665
fisheries data	RKF	total catch	n.at.z	female	6.904	6.890	6.887	6.875	8.037
				male	31.646	31.646	31.135	31.224	31.737
growth data			EBS molt increment data	female	246.735	246.707	252.156	252.947	309.244
				male	279.870	279.849	279.668	279.838	320.446
maturity ogive data	NMFS M		EBS mature male ratios	male	211.641	211.641	209.343	211.800	207.429

Table 4. Objective function non-data component values for models 22.03, 22.03b, 23.01, 23.01a, 23.02. Table 1 of 1. Abbreviations: devsSumSq: sum of squared annual deviations ("devs"); pDevsLnC: fishery capture probablity devs; pDevsLnR: recruitment devs; pDevsM: natural mortality devs; pDevsS1: selectivity deviations; pDM1: natural mortality multiplier; pQ: survey catchability. Components not included in the objective function are indicated by "–".

category	type	element	22.03	22.03b	23.01	23.01a	23.02
penalties	devsSumSq	pDevsLnC	0.000	0.000	0.000	0.000	0.000
		pDevsLnR	0.000	0.000	0.000	0.000	0.000
		pDevsS1	0.000	0.000	0.000	0.000	0.000
	maturity	smoothness	2.066	2.066	1.406	1.491	1.957
priors	natural mortality	pDM1	37.989	38.003	39.364	39.244	165.955
	recruitment	pDevsLnR	113.192	113.191	112.790	112.767	116.429
	surveys	pQ	97.286	97.272	97.481	97.232	44.056
penalties	growth	negativeGrowth	–	–	–	–	0.000

0.2 Relative objective function values for 22.03, 22.03b, 23.01, 23.01a, 23.02

Table 5. Differences in objective function data component values between models 22.03b, 23.01, 23.01a, 23.02 and 22.03. Negative values indicate better fits. Table 1 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries.

category	fleet	catch type	data type	sex	22.03b	23.01	23.01a	23.02
			abundance	female	0.000	0.000	0.000	0.000
				male	0.000	0.000	0.000	0.000
	NMFS M		biomass	female	0.000	0.000	0.000	0.000
				male	-0.024	-1.923	-1.822	78.773
			n.at.z	male	-0.007	5.368	4.831	139.609
			abundance	female	0.000	0.000	0.000	0.000
				male	0.000	0.000	0.000	0.000
	NMFS F		biomass	female	0.001	-3.125	-3.548	505.130
				male	0.000	0.000	0.000	0.000
			n.at.z	female	-0.029	0.448	0.618	78.528
			abundance	female	0.000	0.000	0.000	0.000
surveys data		index catch		male	0.000	0.000	0.000	0.000
	SBS BSFRF M		biomass	female	0.000	0.000	0.000	0.000
				male	0.002	-0.035	-0.023	2.929
			n.at.z	male	-0.004	-0.026	0.320	8.707
			abundance	female	0.000	0.000	0.000	0.000
				male	0.000	0.000	0.000	0.000
	SBS BSFRF F		biomass	female	-0.009	-0.137	-0.231	-0.189
				male	0.000	0.000	0.000	0.000

Table 6. Differences in objective function data component values between models 22.03b, 23.01, 23.01a, 23.02 and 22.03. Negative values indicate better fits. Table 2 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries.

category	fleet	catch type	data type	sex	22.03b	23.01	23.01a	23.02
surveys data	SBS BSFRF F	index catch	n.at.z	female	0.004	0.086	0.138	7.648
			abundance	female	0.000	0.000	0.000	0.000
			abundance	male	0.000	0.000	0.000	0.000
		retained catch	biomass	female	0.000	0.000	0.000	0.000
			biomass	male	-0.002	-0.039	-0.045	10.238
	TCF		n.at.z	male	-0.007	-1.609	-0.488	5.268
			abundance	all sexes	0.000	0.000	0.000	0.000
			biomass	all sexes	-0.003	-0.319	-0.177	3.338
			n.at.z	female	-0.001	-0.765	-0.809	-1.119
			n.at.z	male	-0.010	0.940	0.801	-7.251
			abundance	all sexes	0.000	0.000	0.000	0.000
			biomass	all sexes	0.000	0.001	0.009	0.717
fisheries data	SCF		n.at.z	female	0.001	0.075	0.067	2.190
		total catch	n.at.z	male	-0.003	0.405	0.367	15.014
			abundance	all sexes	0.019	-0.476	-0.476	-2.455
			biomass	all sexes	0.017	-0.440	-0.439	-3.802
	GF All		n.at.z	female	0.037	-0.954	-0.870	34.013
			n.at.z	male	-0.023	1.641	1.564	38.249
	RKF		abundance	all sexes	0.000	0.000	0.000	0.000

Table 7. Differences in objective function data component values between models 22.03b, 23.01, 23.01a, 23.02 and 22.03. Negative values indicate better fits. Table 3 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries.

category	fleet	catch type	data type	sex	22.03b	23.01	23.01a	23.02
			biomass	all sexes	0.000	0.017	0.007	18.427
fisheries data	RKF	total catch	n.at.z	female	-0.014	-0.017	-0.030	1.133
				male	0.000	-0.511	-0.422	0.091
growth data			EBS molt increment data	female	-0.028	5.421	6.212	62.509
				male	-0.021	-0.202	-0.032	40.576
maturity ogive data	NMFS M		EBS mature male ratios	male	0.001	-2.297	0.159	-4.211

Table 8. Differences in objective function non-data component values between models 22.03b, 23.01, 23.01a, 23.02 and 22.03. Negative values indicate better fits. Table 1 of 1. Abbreviations: devsSumSq: sum of squared annual deviations ("devs"); pDevsLnC: fishery capture probablity devs; pDevsLnR: recruitment devs; pDevsM: natural mortality devs; pDevsS1: selectivity deviations; pDM1: natural mortality multiplier; pQ: survey catchability.

category	type	element	22.03b	23.01	23.01a	23.02
		pDevsLnC	0.000	0.000	0.000	0.000
	devsSumSq	pDevsLnR	0.000	0.000	0.000	0.000
penalties		pDevsS1	0.000	0.000	0.000	0.000
	maturity	smoothness	0.000	-0.659	-0.574	-0.108
	natural mortality	pDM1	0.014	1.375	1.255	127.966
priors	recruitment	pDevsLnR	0.000	-0.401	-0.425	3.237
	surveys	pQ	-0.014	0.194	-0.054	-53.230
penalties	growth	negativeGrowth	–	–	–	–

0.3 Objective function values for 22.03b, 23.03a, 23.03a1, 23.03b, 23.03b1

Table 9. Objective function data component values for models 22.03b, 23.03a, 23.03a1, 23.03b, 23.03b1. Table 1 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries. Components not included in the objective function are indicated by "–".

category	fleet	catch type	data type	sex	22.03b	23.03a	23.03a1	23.03b	23.03b1
surveys data	NMFS M	index catch	abundance	female	–	–	–	–	–
			abundance	male	–	–	–	–	–
			biomass	female	–	–	–	–	–
			biomass	male	70.675	178.203	107.347	187.185	107.941
			n.at.z	male	411.486	719.378	711.526	706.344	694.275
	NMFS F		abundance	female	–	–	–	–	–
			abundance	male	–	–	–	–	–
			biomass	female	163.917	202.520	180.272	208.100	182.769
			biomass	male	–	–	–	–	–
			n.at.z	female	298.154	441.583	438.274	438.466	433.542
	SBS BSFRF M		abundance	female	–	–	–	–	–
			abundance	male	–	–	–	–	–
			biomass	female	–	–	–	–	–
			biomass	male	-1.149	-3.604	7.176	-3.626	7.514
			n.at.z	male	290.988	287.874	282.930	288.508	283.288
	SBS BSFRF F		abundance	female	–	–	–	–	–
			abundance	male	–	–	–	–	–
			biomass	female	-1.632	11.890	37.969	9.772	37.716
			biomass	male	–	–	–	–	–

Table 10. Objective function data component values for models 22.03b, 23.03a, 23.03a1, 23.03b, 23.03b1. Table 2 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries. Components not included in the objective function are indicated by "–".

category	fleet	catch type	data type	sex	22.03b	23.03a	23.03a1	23.03b	23.03b1
surveys data	SBS BSFRF F	index catch	n.at.z	female	231.948	215.330	214.920	215.099	215.148
fisheries data	TCF	retained catch	abundance	female	–	–	–	–	–
			abundance	male	–	–	–	–	–
			biomass	female	–	–	–	–	–
			biomass	male	-143.051	-117.678	-141.267	-115.018	-141.198
			n.at.z	male	64.677	78.796	56.576	80.850	56.829
	TCF	total catch	abundance	all sexes	–	–	–	–	–
			biomass	all sexes	6.583	3.221	4.265	3.488	4.292
			n.at.z	female	89.433	91.818	95.784	91.306	95.750
			n.at.z	male	83.273	85.330	67.307	84.118	66.400
	SCF		abundance	all sexes	–	–	–	–	–
			biomass	all sexes	-52.237	-51.775	-52.304	-51.741	-52.316
			n.at.z	female	52.317	53.361	53.757	52.405	52.971
			n.at.z	male	80.183	86.825	84.628	86.935	84.710
	GF All		abundance	all sexes	-37.816	-37.387	-38.176	-37.267	-38.168
			biomass	all sexes	-68.893	-68.759	-68.494	-68.798	-68.512
			n.at.z	female	224.038	261.409	253.738	262.266	254.275
			n.at.z	male	291.441	391.881	378.152	395.155	379.673
	RKF		abundance	all sexes	–	–	–	–	–

Table 11. Objective function data component values for models 22.03b, 23.03a, 23.03a1, 23.03b, 23.03b1. Table 3 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries. Components not included in the objective function are indicated by "–".

category	fleet	catch type	data type	sex	22.03b	23.03a	23.03a1	23.03b	23.03b1
			biomass	all sexes	-37.093	-32.921	-35.884	-32.723	-35.898
fisheries data	RKF	total catch	n.at.z	female	6.890	6.456	6.956	6.334	6.890
				male	31.646	35.361	33.816	35.757	33.952
growth data			EBS molt increment data	female	246.707	216.478	216.478	216.478	216.478
				male	279.849	234.084	234.084	234.084	234.084
maturity ogive data	NMFS M		EBS mature male ratios	male	211.641	443.049	341.765	435.766	333.685

Table 12. Objective function non-data component values for models 22.03b, 23.03a, 23.03a1, 23.03b, 23.03b1. Table 1 of 1. Abbreviations: devsSumSq: sum of squared annual deviations ("devs"); pDevsLnC: fishery capture probablity devs; pDevsLnR: recruitment devs; pDevsM: natural mortality devs; pDevsS1: selectivity deviations; pDM1: natural mortality multiplier; pQ: survey catchability. Components not included in the objective function are indicated by "–".

category	type	element	22.03b	23.03a	23.03a1	23.03b	23.03b1
penalties	devsSumSq	pDevsLnC	0.000	0.000	0.000	0.000	0.000
		pDevsLnR	0.000	0.000	0.000	0.000	0.000
		pDevsS1	0.000	0.003	0.001	0.003	0.001
	maturity	smoothness	2.066	1.653	1.701	1.633	1.654
priors	natural mortality	pDM1	38.003	89.094	83.170	94.987	88.252
	recruitment	pDevsLnR	113.191	112.406	113.004	112.324	112.866
	surveys	pQ	97.272	97.906	157.371	97.906	161.355

0.4 Relative objective function values for 22.03b, 23.03a, 23.03a1, 23.03b, 23.03b1

Table 13. Differences in objective function data component values between models 23.03a, 23.03a1, 23.03b, 23.03b1 and 22.03b. Negative values indicate better fits. Table 1 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries.

category	fleet	catch type	data type	sex	23.03a	23.03a1	23.03b	23.03b1
			abundance	female	0.000	0.000	0.000	0.000
				male	0.000	0.000	0.000	0.000
	NMFS M		biomass	female	0.000	0.000	0.000	0.000
				male	107.528	36.672	116.510	37.266
			n.at.z	male	307.892	300.040	294.859	282.789
			abundance	female	0.000	0.000	0.000	0.000
				male	0.000	0.000	0.000	0.000
	NMFS F		biomass	female	38.604	16.355	44.183	18.852
				male	0.000	0.000	0.000	0.000
			n.at.z	female	143.429	140.120	140.312	135.388
			abundance	female	0.000	0.000	0.000	0.000
surveys data		index catch		male	0.000	0.000	0.000	0.000
	SBS BSFRF M		biomass	female	0.000	0.000	0.000	0.000
				male	-2.455	8.326	-2.476	8.664
			n.at.z	male	-3.114	-8.058	-2.480	-7.700
			abundance	female	0.000	0.000	0.000	0.000
				male	0.000	0.000	0.000	0.000
	SBS BSFRF F		biomass	female	13.522	39.600	11.404	39.347
				male	0.000	0.000	0.000	0.000

Table 14. Differences in objective function data component values between models 23.03a, 23.03a1, 23.03b, 23.03b1 and 22.03b. Negative values indicate better fits. Table 2 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries.

category	fleet	catch type	data type	sex	23.03a	23.03a1	23.03b	23.03b1
surveys data	SBS BSFRF F	index catch	n.at.z	female	-16.618	-17.028	-16.848	-16.799
			abundance	female	0.000	0.000	0.000	0.000
				male	0.000	0.000	0.000	0.000
		retained catch	biomass	female	0.000	0.000	0.000	0.000
				male	25.373	1.783	28.033	1.852
			n.at.z	male	14.120	-8.101	16.174	-7.848
	TCF		abundance	all sexes	0.000	0.000	0.000	0.000
			biomass	all sexes	-3.363	-2.318	-3.095	-2.292
			n.at.z	female	2.385	6.351	1.873	6.317
				male	2.057	-15.966	0.845	-16.873
			abundance	all sexes	0.000	0.000	0.000	0.000
			biomass	all sexes	0.462	-0.068	0.496	-0.080
fisheries data	SCF		n.at.z	female	1.045	1.440	0.088	0.654
				male	6.641	4.445	6.751	4.526
		total catch	abundance	all sexes	0.430	-0.359	0.550	-0.352
			biomass	all sexes	0.134	0.399	0.094	0.381
	GF All		n.at.z	female	37.371	29.700	38.228	30.237
				male	100.440	86.710	103.713	88.232
	RKF		abundance	all sexes	0.000	0.000	0.000	0.000

Table 15. Differences in objective function data component values between models 23.03a, 23.03a1, 23.03b, 23.03b1 and 22.03b. Negative values indicate better fits. Table 3 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries.

category	fleet	catch type	data type	sex	23.03a	23.03a1	23.03b	23.03b1
			biomass	all sexes	4.172	1.209	4.370	1.195
fisheries data	RKF	total catch	n.at.z	female	-0.434	0.066	-0.557	0.000
				male	3.715	2.170	4.111	2.306
growth data			EBS molt increment data	female	-30.229	-30.229	-30.229	-30.229
				male	-45.765	-45.765	-45.765	-45.765
maturity ogive data	NMFS M		EBS mature male ratios	male	231.408	130.123	224.125	122.043

Table 16. Differences in objective function non-data component values between models 23.03a, 23.03a1, 23.03b, 23.03b1 and 22.03b. Negative values indicate better fits. Table 1 of 1. Abbreviations: devsSumSq: sum of squared annual deviations ("devs"); pDevsLnC: fishery capture probablity devs; pDevsLnR: recruitment devs; pDevsM: natural mortality devs; pDevsS1: selectivity deviations; pDM1: natural mortality multiplier; pQ: survey catchability.

category	type	element	23.03a	23.03a1	23.03b	23.03b1
		pDevsLnC	0.000	0.000	0.000	0.000
	devsSumSq	pDevsLnR	0.000	0.000	0.000	0.000
penalties		pDevsS1	0.003	0.000	0.003	0.000
	maturity	smoothness	-0.413	-0.365	-0.433	-0.412
	natural mortality	pDM1	51.091	45.166	56.984	50.249
priors	recruitment	pDevsLnR	-0.785	-0.188	-0.868	-0.326
	surveys	pQ	0.634	60.099	0.634	64.082

0.5 Objective function values for 22.03b, 23.05, 23.05a, 23.05a1, 23.05b, 23.05b1

Table 17. Objective function data component values for models 22.03b, 23.05, 23.05a, 23.05a1, 23.05b, 23.05b1. Table 1 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries. Components not included in the objective function are indicated by "–".

category	fleet	catch type	data type	sex	22.03b	23.05	23.05a	23.05a1	23.05b	23.05b1
	NMFS M		abundance	female	–	–	–	–	–	–
				male	–	–	–	–	–	–
			biomass	female	–	–	–	–	–	–
				male	70.675	-87.632	-63.959	-23.115	-63.959	-23.115
			n.at.z	male	411.486	334.436	344.391	366.979	344.391	366.979
	NMFS F		abundance	female	–	–	–	–	–	–
				male	–	–	–	–	–	–
			biomass	female	163.917	-40.548	14.891	154.525	14.890	154.525
				male	–	–	–	–	–	–
			n.at.z	female	298.154	260.591	262.068	276.813	262.068	276.813
surveys data	SBS BSFRF M	index catch	abundance	female	–	–	–	–	–	–
				male	–	–	–	–	–	–
			biomass	female	–	–	–	–	–	–
				male	-1.149	-2.802	-2.258	-2.845	-2.258	-2.845
			n.at.z	male	290.988	300.550	297.227	296.017	297.228	296.017
	SBS BSFRF F		abundance	female	–	–	–	–	–	–
				male	–	–	–	–	–	–
			biomass	female	-1.632	-0.935	-2.021	-2.668	-2.021	-2.668
				male	–	–	–	–	–	–

Table 18. Objective function data component values for models 22.03b, 23.05, 23.05a, 23.05a1, 23.05b, 23.05b1. Table 2 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries. Components not included in the objective function are indicated by "–".

category	fleet	catch type	data type	sex	22.03b	23.05	23.05a	23.05a1	23.05b	23.05b1
surveys data	SBS BSFRF F	index catch	n.at.z	female	231.948	220.571	219.126	219.613	219.126	219.613
			abundance	female	–	–	–	–	–	–
				male	–	–	–	–	–	–
		retained catch	biomass	female	–	–	–	–	–	–
				male	-143.051	-144.979	-144.319	-143.801	-144.319	-143.801
			n.at.z	male	64.677	51.976	53.807	54.149	53.807	54.149
	TCF		abundance	all sexes	–	–	–	–	–	–
			biomass	all sexes	6.583	9.061	7.302	8.930	7.302	8.930
			n.at.z	female	89.433	70.739	72.407	73.721	72.407	73.721
				male	83.273	49.775	55.688	56.577	55.688	56.577
			abundance	all sexes	–	–	–	–	–	–
			biomass	all sexes	-52.237	-52.411	-52.425	-52.389	-52.425	-52.389
fisheries data	SCF		n.at.z	female	52.317	49.878	50.023	48.173	50.023	48.173
		total catch		male	80.183	85.460	82.191	81.974	82.191	81.974
			abundance	all sexes	-37.816	-40.906	-40.647	-40.422	-40.647	-40.422
			biomass	all sexes	-68.893	-70.116	-70.157	-70.116	-70.157	-70.116
	GF All		n.at.z	female	224.038	235.493	239.966	245.998	239.966	245.998
				male	291.441	264.342	277.298	273.441	277.298	273.441
	RKF		abundance	all sexes	–	–	–	–	–	–

Table 19. Objective function data component values for models 22.03b, 23.05, 23.05a, 23.05a1, 23.05b, 23.05b1. Table 3 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries. Components not included in the objective function are indicated by "–".

category	fleet	catch type	data type	sex	22.03b	23.05	23.05a	23.05a1	23.05b	23.05b1
			biomass	all sexes	-37.093	-37.499	-37.371	-37.386	-37.371	-37.386
fisheries data	RKF	total catch	n.at.z	female	6.890	7.260	7.084	7.136	7.084	7.136
				male	31.646	30.546	30.294	30.842	30.294	30.842
growth data			EBS molt increment data	female	246.707	248.552	237.738	238.885	237.738	238.885
				male	279.849	280.019	272.718	270.276	272.718	270.276
maturity ogive data	NMFS M		EBS mature male ratios	male	211.641	193.333	214.981	217.499	214.981	217.499

Table 20. Objective function non-data component values for models 22.03b, 23.05, 23.05a, 23.05a1, 23.05b, 23.05b1. Table 1 of 1. Abbreviations: devsSumSq: sum of squared annual deviations ("devs"); pDevsLnC: fishery capture probablity devs; pDevsLnR: recruitment devs; pDevsM: natural mortality devs; pDevsS1: selectivity deviations; pDM1: natural mortality multiplier; pQ: survey catchability. Components not included in the objective function are indicated by "−".

category	type	element	22.03b	23.05	23.05a	23.05a1	23.05b	23.05b1
penalties	devsSumSq	pDevsLnC	0.000	0.000	0.000	0.000	0.000	0.000
		pDevsLnR	0.000	0.000	0.000	0.000	0.000	0.000
		pDevsS1	0.000	0.000	0.000	0.000	0.000	0.000
	maturity	smoothness	2.066	1.883	1.840	1.780	1.840	1.780
priors	natural mortality	pDM1	38.003	-0.244	26.691	45.825	26.691	45.825
	recruitment	pDevsLnR	113.191	111.048	110.558	110.569	110.558	110.569
	surveys	pQ	97.272	27.832	32.911	39.728	32.911	39.728
penalties	devsSumSq	pDevsM	–	0.000	0.001	0.001	0.001	0.001
	M	smoothness	–	–	106.516	145.230	106.517	145.230

0.6 Relative objective function values for 22.03b, 23.05, 23.05a, 23.05a1, 23.05b, 23.05b1

Table 21. Differences in objective function data component values between models 23.05, 23.05a, 23.05a1, 23.05b, 23.05b1 and 22.03b. Negative values indicate better fits. Table 1 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries.

category	fleet	catch type	data type	sex	23.05	23.05a	23.05a1	23.05b	23.05b1
			abundance	female	0.000	0.000	0.000	0.000	0.000
				male	0.000	0.000	0.000	0.000	0.000
	NMFS M		biomass	female	0.000	0.000	0.000	0.000	0.000
				male	-158.307	-134.634	-93.790	-134.634	-93.790
			n.at.z	male	-77.049	-67.095	-44.507	-67.095	-44.507
			abundance	female	0.000	0.000	0.000	0.000	0.000
				male	0.000	0.000	0.000	0.000	0.000
	NMFS F		biomass	female	-204.465	-149.026	-9.392	-149.026	-9.392
				male	0.000	0.000	0.000	0.000	0.000
			n.at.z	female	-37.563	-36.086	-21.341	-36.086	-21.341
			abundance	female	0.000	0.000	0.000	0.000	0.000
				male	0.000	0.000	0.000	0.000	0.000
surveys data		index catch	biomass	female	0.000	0.000	0.000	0.000	0.000
	SBS BSFRF M			male	-1.652	-1.109	-1.695	-1.109	-1.695
			n.at.z	male	9.562	6.240	5.029	6.240	5.029
			abundance	female	0.000	0.000	0.000	0.000	0.000
				male	0.000	0.000	0.000	0.000	0.000
	SBS BSFRF F		biomass	female	0.696	-0.390	-1.036	-0.390	-1.036
				male	0.000	0.000	0.000	0.000	0.000

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Table 22. Differences in objective function data component values between models 23.05, 23.05a, 23.05a1, 23.05b, 23.05b1 and 22.03b. Negative values indicate better fits. Table 2 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries.

category	fleet	catch type	data type	sex	23.05	23.05a	23.05a1	23.05b	23.05b1
surveys data	SBS BSFRF F	index catch	n.at.z	female	-11.376	-12.821	-12.335	-12.821	-12.335
	TCF	retained catch	abundance	female	0.000	0.000	0.000	0.000	0.000
			abundance	male	0.000	0.000	0.000	0.000	0.000
			biomass	female	0.000	0.000	0.000	0.000	0.000
			biomass	male	-1.928	-1.268	-0.751	-1.268	-0.751
			n.at.z	male	-12.701	-10.869	-10.528	-10.869	-10.528
			abundance	all sexes	0.000	0.000	0.000	0.000	0.000
			biomass	all sexes	2.477	0.718	2.347	0.718	2.347
			n.at.z	female	-18.694	-17.026	-15.712	-17.026	-15.712
			n.at.z	male	-33.498	-27.585	-26.696	-27.585	-26.696
	SCF		abundance	all sexes	0.000	0.000	0.000	0.000	0.000
			biomass	all sexes	-0.174	-0.189	-0.153	-0.189	-0.153
fisheries data			n.at.z	female	-2.439	-2.293	-4.144	-2.293	-4.144
		total catch	n.at.z	male	5.277	2.007	1.791	2.007	1.791
	GF All		abundance	all sexes	-3.089	-2.830	-2.605	-2.830	-2.605
			biomass	all sexes	-1.223	-1.264	-1.223	-1.264	-1.223
			n.at.z	female	11.455	15.929	21.960	15.929	21.960
			n.at.z	male	-27.099	-14.143	-18.000	-14.143	-18.000
	RKF		abundance	all sexes	0.000	0.000	0.000	0.000	0.000

Table 23. Differences in objective function data component values between models 23.05, 23.05a, 23.05a1, 23.05b, 23.05b1 and 22.03b. Negative values indicate better fits. Table 3 of 3. Abbreviations: n.at.z: size composition data; M: males only; F: females only; NMFS: NMFS EBS shelf survey; SBS BSFRF: BSFRF side-by-side catchability study survey; TCF: directed Tanner crab fishery; SCF: snow crab fishery; RKF: BBRKC fishery; GF All: combined groundfish fisheries.

category	fleet	catch type	data type	sex	23.05	23.05a	23.05a1	23.05b	23.05b1
			biomass	all sexes	-0.406	-0.278	-0.293	-0.278	-0.293
fisheries data	RKF	total catch	n.at.z	female	0.370	0.194	0.246	0.194	0.246
			n.at.z	male	-1.100	-1.352	-0.804	-1.352	-0.804
growth data			EBS molt increment data	female	1.845	-8.969	-7.822	-8.969	-7.822
				male	0.170	-7.132	-9.573	-7.132	-9.573
maturity ogive data	NMFS M		EBS mature male ratios	male	-18.308	3.339	5.858	3.339	5.858

Table 24. Differences in objective function non-data component values between models 23.05, 23.05a, 23.05a1, 23.05b, 23.05b1 and 22.03b. Negative values indicate better fits. Table 1 of 1. Abbreviations: devsSumSq: sum of squared annual deviations ("devs"); pDevsLnC: fishery capture probablity devs; pDevsLnR: recruitment devs; pDevsM: natural mortality devs; pDevsS1: selectivity deviations; pDM1: natural mortality multiplier; pQ: survey catchability.

category	type	element	23.05	23.05a	23.05a1	23.05b	23.05b1
		pDevsLnC	0.000	0.000	0.000	0.000	0.000
	devsSumSq	pDevsLnR	0.000	0.000	0.000	0.000	0.000
penalties		pDevsS1	0.000	0.000	0.000	0.000	0.000
	maturity	smoothness	-0.183	-0.226	-0.286	-0.226	-0.286
	natural mortality	pDM1	-38.247	-11.313	7.822	-11.313	7.822
priors	recruitment	pDevsLnR	-2.143	-2.633	-2.622	-2.633	-2.622
	surveys	pQ	-69.440	-64.362	-57.544	-64.362	-57.544
	devsSumSq	pDevsM	–	–	–	–	–
penalties	M	smoothness	–	–	–	–	–