

Table S1. Sample size (n) and non-adjusted (for day of year) mean estimates and standard deviation (SD) of juvenile Chum salmon catch per unit effort (ln(CPUE), kg km⁻²) in the northern Bering Sea.

Year	n	CPUE	SD
2003	47	1.35	1.45
2004	58	0.62	1.20
2005	42	0.48	0.84
2006	49	0.38	1.31
2007	56	1.06	1.72
2009	46	0.82	1.53
2010	60	0.88	1.27
2011	57	0.70	1.49
2012	42	0.61	1.61
2013	43	0.62	1.39
2014	46	1.84	1.82
2015	37	1.63	1.52
2016	35	1.44	1.72
2017	35	0.70	1.23
2018	47	1.62	1.65
2019	44	1.71	2.01

Table S2. Sample size (n) and non-adjusted (for day of year) mean estimates and standard deviation (SD) of juvenile Chum salmon length (L, mm) and weight (W, g) in the northern Bering Sea.

Year	n	L	SD	W	SD
2003	871	189.7	32.3	74.2	33.2
2004	483	205.4	20.8	96.1	29.9
2005	256	199.5	17.6	81.6	23.7
2006	644	156.1	13.4	36.8	9.3
2007	904	192.6	24.7	79.0	31.1
2009	519	177.4	21.4	59.0	23.0
2010	564	188.4	18.9	70.6	24.1
2011	672	166.7	25.8	48.6	22.7
2012	473	166.8	16.7	47.0	15.4
2013	450	182.9	16.8	65.8	19.0
2014	1158	177.3	26.3	61.4	26.0
2015	899	179.6	25.0	64.0	28.3
2016	700	168.4	21.3	52.6	22.8
2017	506	157.8	25.5	40.7	20.5
2018	880	166.7	17.2	49.1	17.1
2019	751	167.3	17.9	48.9	18.0

Table S3. Sample size (n) and non-adjusted (for day of year) mean estimates and standard deviation (SD) of juvenile Chum salmon energy density (ED, cal g⁻¹ wet weight) in the northern Bering Sea. * ED estimates were not available for 2013.

Year	n	ED	SD
2003	46	1111.1	138.7
2004	21	1133.3	129.0
2005	47	1211.5	153.6
2006	34	1067.6	77.4
2007	72	1231.9	228.4
2009	34	1268.1	140.4
2010	70	1244.1	135.9
2011	49	1241.1	184.2
2012	28	1146.9	130.5
2013	*	*	*
2014	79	1188.9	137.0
2015	62	1228.7	154.3
2016	41	1068.6	82.4
2017	42	1121.7	130.2
2018	78	1172.1	150.3
2019	80	1048.5	88.4

Table S4. Survey day of year (DOY) including the first (FDOY), last (LDOY) and mean (MDOY) in the northern Bering Sea.

Year	FDOY	LDOY	MDOY
2003	234	282	269
2004	255	274	266
2005	260	277	271
2006	246	262	255
2007	256	275	266
2009	245	265	252
2010	253	278	264
2011	243	260	251
2012	255	269	265
2013	254	267	263
2014	247	265	257
2015	244	259	252
2016	241	256	245
2017	239	252	245
2018	243	258	253
2019	242	257	247

Table S5. Vector Autoregressive Spatio-Temporal (VAST) model parameters, coefficient estimates, standard errors of the estimates, and t-values for relative biomass ($\ln(\text{CPUE}) \text{ kg km}^{-2}$), energy density (cal g^{-1} wet weight), weight (g) and length (mm) of juvenile chum salmon sampled in the eastern Bering Sea, 2003-2019. Parameters include anisotropy (\ln_H), year effect (beta), 1st linear predictor (1), 2nd linear predictor (2), loading matrix for the spatial variation (L_omega), loading matrix for the spatio-temporal variation ($L_epsilon$), decorrelation distance ($\log \kappa$), day of year effect (λ), and error distribution ($\log \text{SigmaM}$). Summary statistics include the Akaike information criterion (AIC).

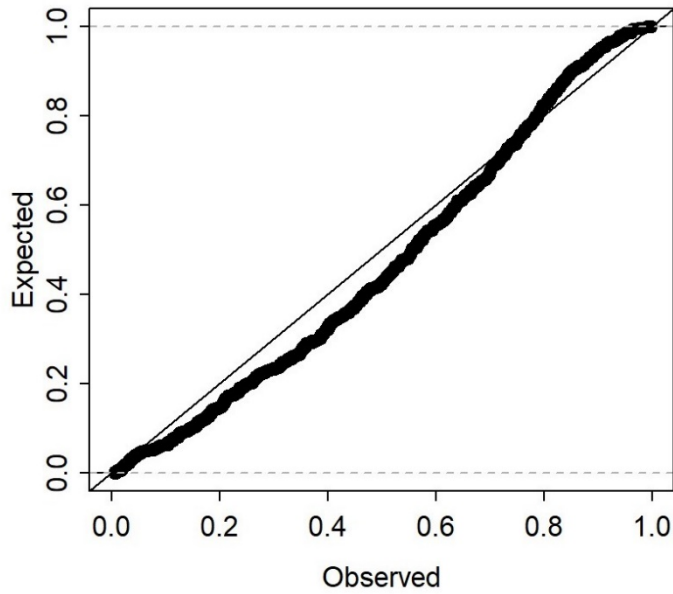
Parameter	Relative Biomass			Energy Density			Weight			Length		
	Est.	S.E.	t-val	Est.	S.E.	t-val	Est.	S.E.	t-val	Est.	S.E.	t-val
\ln_H_input	-0.12	0.21	-0.6	-0.76	0.31	-3.00	-0.37	0.15	-2.46	-0.45	0.15	-2.47
\ln_H_input	0.70	0.26	2.65	0.15	0.24	0.75	0.06	0.13	0.64	0.10	0.13	0.45
β_{1_2003}	0.61	1.16	0.52									
β_{1_2004}	1.30	1.11	1.17									
β_{1_2005}	0.27	1.19	0.22									
β_{1_2006}	0.39	1.15	0.34									
β_{1_2007}	1.96	1.13	1.73									
β_{1_2008}												
β_{1_2009}	-0.98	1.15	-0.85									
β_{1_2010}	1.00	1.12	0.89									
β_{1_2011}	-0.84	1.10	-0.77									
β_{1_2012}	-1.56	1.16	-1.34									
β_{1_2013}	-0.02	1.16	-0.02									
β_{1_2014}	1.71	1.18	1.45									
β_{1_2015}	1.90	1.27	1.50									
β_{1_2016}	0.99	1.21	0.82									
β_{1_2017}	0.68	1.22	0.56									
β_{1_2018}	1.97	1.20	1.65									
β_{1_2019}	3.47	1.40	2.48									
L_omega1_z	-1.20	0.28	-4.33									
$L_epsilon1_z$	1.45	0.27	5.43									
$\log \kappa_1$	-4.55	0.18	-25.60									
β_{2_2003}	2.12	0.47	4.51	-12.97	0.04	-384.5	-16.18	0.13	-297.8	-14.88	0.04	-125.4
β_{2_2004}	1.18	0.41	2.87	-12.95	0.05	-407.2	-15.65	0.12	-256.4	-14.74	0.04	-130.2
β_{2_2005}	0.81	0.50	1.61	-12.89	0.05	-351.2	-15.90	0.14	-279.8	-14.80	0.04	-113.4
β_{2_2006}	0.86	0.48	1.80	-12.98	0.05	-385.2	-16.31	0.13	-274.8	-14.92	0.04	-126.7
β_{2_2007}	1.65	0.40	4.07	-12.94	0.04	-431.9	-15.96	0.11	-331.3	-14.83	0.03	-140.3
β_{2_2008}												
β_{2_2009}	2.35	0.54	4.35	-12.88	0.08	-369.5	-15.82	0.13	-152.5	-14.78	0.04	-118.7
β_{2_2010}	1.72	0.41	4.15	-12.87	0.04	-412.8	-15.90	0.12	-325.0	-14.80	0.04	-133.7
β_{2_2011}	2.26	0.49	4.67	-12.89	0.04	-382.4	-16.15	0.13	-298.1	-14.87	0.04	-124.9
β_{2_2012}	1.73	0.60	2.85	-12.92	0.05	-350.7	-16.45	0.14	-265.3	-14.95	0.04	-116.0
β_{2_2013}	1.37	0.49	2.81			-376.9	-16.01	0.13		-14.84	0.04	-122.2
β_{2_2014}	2.50	0.42	5.94	-12.92	0.04	-415.9	-16.09	0.12	-321.6	-14.86	0.04	-135.8
β_{2_2015}	2.12	0.46	4.61	-12.89	0.04	-390.5	-15.84	0.13	-302.7	-14.79	0.04	-125.9
β_{2_2016}	2.14	0.49	4.40	-12.99	0.05	-366.0	-15.67	0.13	-280.2	-14.75	0.04	-117.0
β_{2_2017}	1.40	0.50	2.82	-12.94	0.04	-372.7	-15.89	0.13	-294.9	-14.79	0.04	-120.2
β_{2_2018}	2.33	0.44	5.36	-12.96	0.04	-406.1	-16.07	0.12	-319.0	-14.86	0.04	-132.3
β_{2_2019}	1.91	0.44	4.32	-13.03	0.04	-406.9	-16.00	0.12	-322.7	-14.84	0.04	-132.4
λ_{2_k}	0.06	0.07	0.87	0.01	0.01	8.34	0.26	0.03	1.29	0.08	0.01	7.93
L_omega2_z	-0.45	0.14	-3.23	-0.05	0.01	6.42	-0.12	0.02	-5.44	0.04	0.01	-6.13
$L_epsilon2_z$	-1.20	0.10	-12.04	-0.07	0.01	17.23	-0.27	0.02	-10.74	0.08	0.00	-17.47
$\log \kappa_2$	-3.69	0.18	-20.07	-4.30	0.14	-46.99	-4.12	0.09	-30.00	-4.14	0.09	-46.63
$\log \text{SigmaM}$	-0.07	0.06	-1.15	-2.50	0.03	-364.9	-1.36	0.01	-77.81	-2.55	0.01	-194.9
AIC	2631			9674			87848			87613		

Table S6. Vector Autoregressive Spatio-Temporal (VAST) model parameters, coefficient estimates, standard errors of the estimates, and t-values for Warm 1 (2003 - 2005), Cold (2006 - 2013), and Warm 2 (2014 - 2019) for relative biomass ($\ln(\text{CPUE}) \text{ kg km}^{-2}$), energy density (cal g^{-1} wet weight), weight (g) and length (mm) of juvenile chum salmon sampled in the eastern Bering Sea, 2003-2019. Parameters include anisotropy (\ln_H), stanza effect (β), 1st linear predictor (1), 2nd linear predictor (2), loading matrix for the spatial variation (L_omega), loading matrix for the spatio-temporal variation ($L_epsilon$), decorrelation distance ($\log \kappa$), day of year effect (λ), and error distribution ($\log \Sigma_M$). Summary statistics include the Akaike information criterion (AIC).

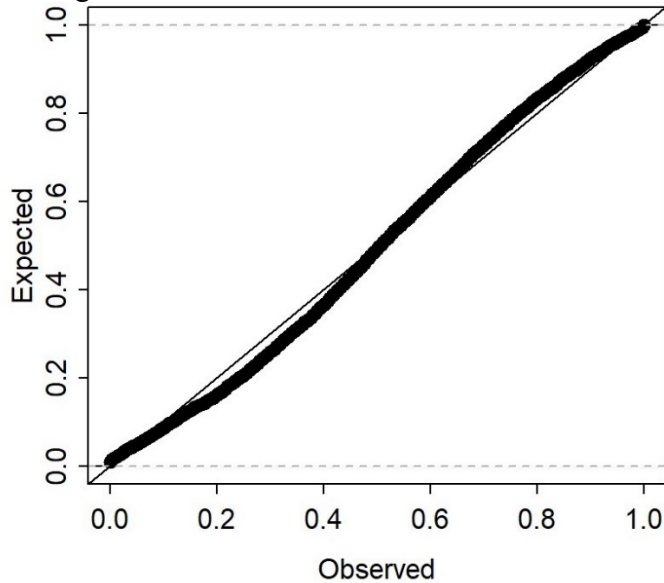
Parameter	Relative Biomass			Energy Density			Weight			Length		
	Est.	S.E.	t-val	Est.	S.E.	t-val	Est.	S.E.	t-val	Est.	S.E.	t-val
\ln_H_input	-0.19	0.38	-0.48	-0.66	0.44	-1.50	0.01	0.21	0.04	-0.02	0.19	-0.12
\ln_H_input	0.51	0.42	1.20	0.60	0.76	0.80	-0.35	0.24	-1.47	-0.33	0.24	-1.41
β_1_Warm1	0.63	0.86	0.74									
β_1_Cool	0.19	0.83	0.23									
β_1_Warm2	1.63	0.86	1.90									
L_omega1_z	0.75	0.33	2.29									
$L_epsilon1_z$	-0.78	0.21	-3.71									
$\log \kappa_1$	-4.91	0.33	-14.87									
β_2_Warm1	1.63	0.23	6.97	-12.95	0.05	-242.60	-15.89	0.08	-200.30	-14.81	0.03	-583.42
β_2_Cool	2.37	0.21	11.49	-12.90	0.05	-244.43	-15.92	0.07	-215.48	-14.82	0.02	-623.73
β_2_Warm2	2.79	0.22	12.84	-12.94	0.05	-245.08	-15.96	0.08	-201.27	-14.83	0.03	-583.21
λ_2_k	0.12	0.06	1.85	0.02	0.00	3.58	0.26	0.01	41.77	0.08	0.00	42.36
L_omega2_z	0.12	0.72	0.16	0.06	0.02	3.87	0.18	0.04	4.59	-0.06	0.01	-4.99
$L_epsilon2_z$	0.85	0.13	6.64				-0.27	0.03	-9.59	0.08	0.01	9.42
$\log \kappa_2$	-3.23	0.35	-9.18	-5.09	0.46	-11.02	-3.54	0.13	-27.14	-3.64	0.13	-28.38
$\log \Sigma_M$	0.22	0.03	7.01	-2.21	0.03	-85.44	-1.15	0.01	-166.52	-2.36	0.01	-341.45
AIC	2760			9866			91976			91378		

Figure S1. Quantile – Quantile plots illustrating the fit between the distributions of observed (non-adjusted) and predicted (VAST model estimates) juvenile Chum salmon: (A) Relative biomass ($\ln(\text{CPUE}) \text{ kg km}^{-2}$); (B) Length (mm); and (C) Weight (g); and (D) Energy Density (cal g^{-1} wet weight).

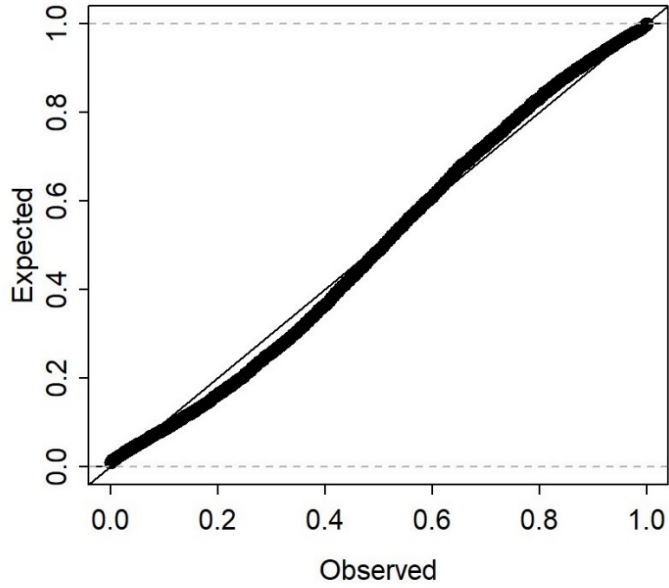
A. Relative biomass



B. Length



C. Weight



D. Energy Density

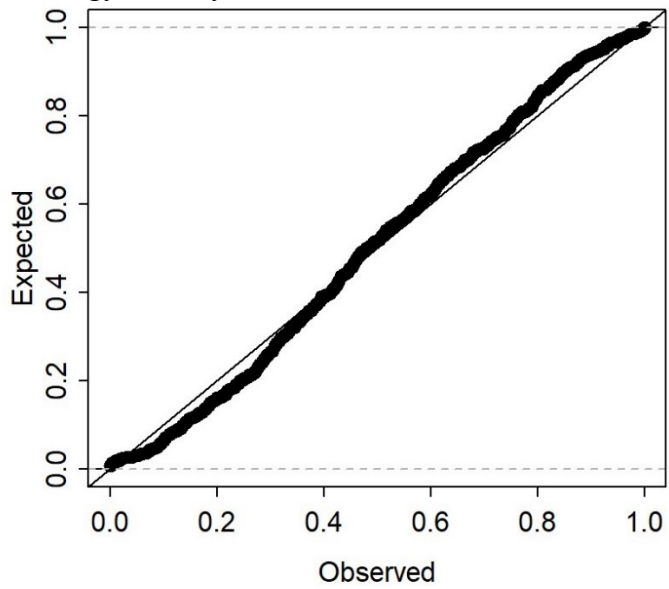
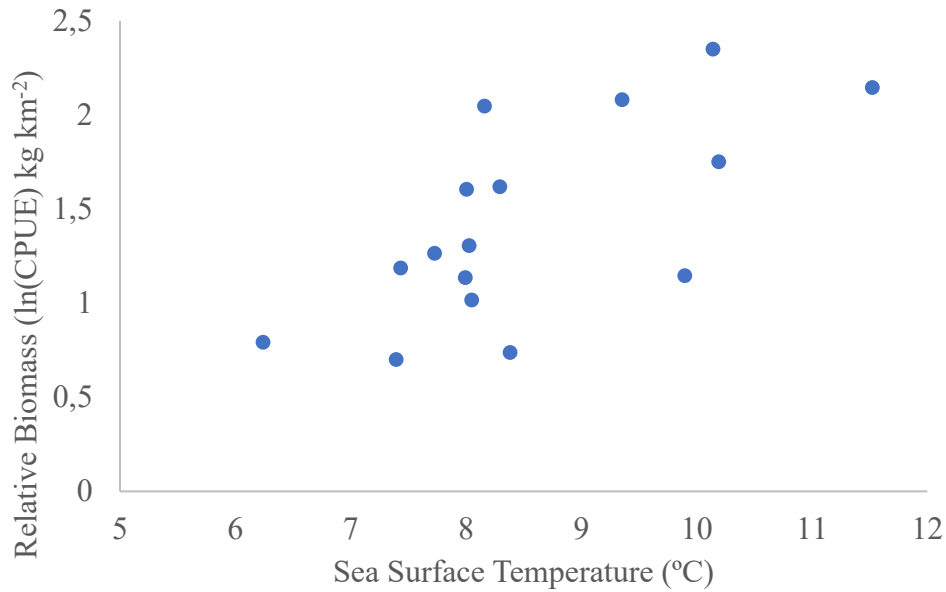
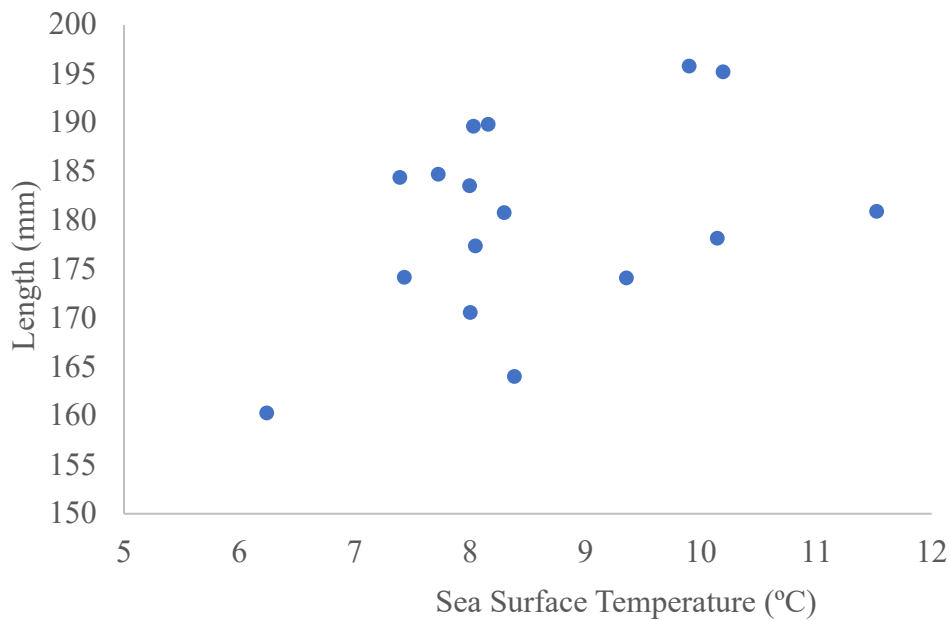


Figure S2. Scatter plots illustrating the fit between late summer sea surface temperature (°C) and predicted (VAST model estimates) juvenile Chum salmon: (A) Relative biomass ($\ln(\text{CPUE}) \text{ kg km}^{-2}$); (B) Length (mm); and (C) Weight (g); and (D) Energy Density (cal g^{-1} wet weight).

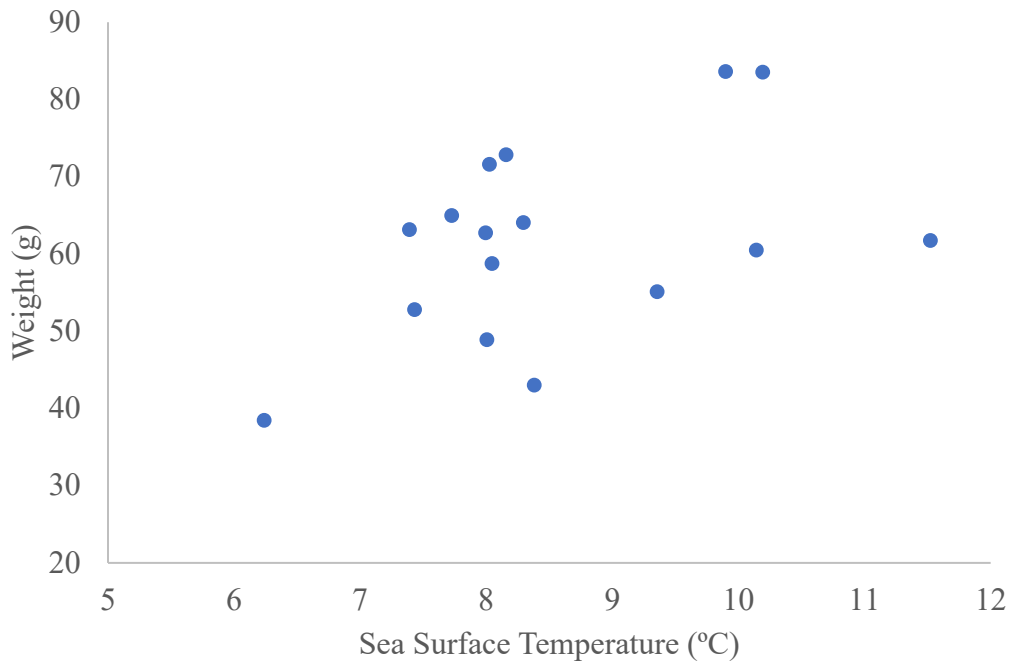
A



B



C



D

