WHAM figures and tables

WHAM Tables

	Estimate	Std. Error	95\\% CI lower	95\\% CI upper

stock 1 mean log(R) intercept 1.726950e+01 1.755689e+00 1.382841e+01 2.071059e+01 stock 1 NAA
sigma (age 1) 7.916509e-01 1.240192e-01 5.823517e-01 1.076173e+00 stock 1 NAA
sigma (ages 2-8+) 2.512873e-01 4.485659e-02 1.771026e-01 3.565464e-01 stock 1 NAA AR1
rho age 8.374695e-01 6.293944e-02 6.638001e-01 9.254471e-01 Shrimp fully selected q 1.274990e-05 2.024542e-06 9.339974e-06 1.740477e-05 Acoust fully selected q 3.496661e-05 6.130571e-06 2.479793e-05 4.930508e-05
Estimate Std. Error stock 1 mean log(R) intercept 17.270 1.756 stock 1 NAA
sigma (age 1) 0.792 0.124 stock 1 NAA
sigma (ages 2-8+) 0.251 0.045 stock 1 NAA AR1
rho age 0.837 0.063 Shrimp fully selected q 1.275
$times 10^{-5}$ 2.025
$times 10^{-6}$ Acoust fully selected q 3.497
$times 10^{-5}$ 6.131
$times 10^{-6}$ 95\% CI lower 95\% CI upper stock 1 mean log(R) intercept 13.828 20.711 stock 1 NAA
sigma (age 1) 0.582 1.076 stock 1 NAA
sigma (ages 2-8+) 0.177 0.357 stock 1 NAA AR1
rho age 0.664 0.925 Shrimp fully selected q 9.340
$times 10^{-6}$ 1.740
$times 10^{-5}$ Acoust fully selected q 2.480
$times 10^{-5}$ 4.931
$times 10^{-5}$

Table 1. Parameter estimates, standard errors, and confidence intervals. Rounded to 3 decimal places.

	Estimate	Std. Error	95% CI lower	95% CI upper
stock 1 mean log(R) intercept	17.270	1.756	13.828	20.711
stock 1 NAA σ (age 1)	0.792	0.124	0.582	1.076
stock 1 NAA σ (ages 2-8+)	0.251	0.045	0.177	0.357
stock 1 NAA AR1 ρ age	0.837	0.063	0.664	0.925
Shrimp fully selected q	1.275×10^{-5}	2.025×10^{-6}	9.340×10^{-6}	1.740×10^{-5}
Acoust fully selected q	3.497×10^{-5}	6.131×10^{-6}	2.480×10^{-5}	4.931×10^{-5}
SprAlb85 fully selected q	7.685×10^{-6}	1.195×10^{-6}	5.666×10^{-6}	1.042×10^{-5}
FallAlb85 fully selected q	1.209×10^{-5}	2.247×10^{-6}	8.396×10^{-6}	1.740×10^{-5}
SprBig fully selected q	4.480×10^{-5}	7.797×10^{-6}	3.185×10^{-5}	6.301×10^{-5}
FallBig fully selected q	7.454×10^{-5}	1.985×10^{-5}	4.423×10^{-5}	1.256×10^{-4}
Mobile Selectivity for age 1 (Block 1)	3.554×10^{-4}	9.037×10^{-5}	2.159×10^{-4}	5.850×10^{-4}
Mobile Selectivity for age 2 (Block 1)	0.089	0.016	0.062	0.126
Mobile Selectivity for age 3 (Block 1)	0.341	0.056	0.242	0.457
Mobile Selectivity for age 4 (Block 1)	0.446	0.065	0.324	0.574
Mobile Selectivity for age 5 (Block 1)	0.539	0.067	0.408	0.665
Mobile Selectivity for age 6 (Block 1)	0.717	0.067	0.571	0.828
Mobile Selectivity for age 7 (Block 1)	1.000	–	–	–
Mobile Selectivity for age 8+ (Block 1)	1.000	–	–	–
Fixed Selectivity for age 1 (Block 2)	0.038	0.007	0.027	0.054
Fixed Selectivity for age 2 (Block 2)	1.000	–	–	–
Fixed Selectivity for age 3 (Block 2)	0.237	0.038	0.170	0.321
Fixed Selectivity for age 4 (Block 2)	0.103	0.024	0.065	0.160

Table 1. Parameter estimates, standard errors, and confidence intervals. Rounded to 3 decimal places. *(continued)*

	Estimate	Std. Error	95% CI lower	95% CI upper
Fixed Selectivity for age 5 (Block 2)	0.069	0.019	0.040	0.117
Fixed Selectivity for age 6 (Block 2)	0.062	0.019	0.034	0.112
Fixed Selectivity for age 7 (Block 2)	0.059	0.020	0.030	0.112
Fixed Selectivity for age 8+ (Block 2)	0.041	0.013	0.021	0.076
Shrimp Selectivity for age 1 (Block 3)	0.000	–	–	–
Shrimp Selectivity for age 2 (Block 3)	0.000	–	–	–
Shrimp Selectivity for age 3 (Block 3)	0.059	0.026	0.024	0.136
Shrimp Selectivity for age 4 (Block 3)	1.000	–	–	–
Shrimp Selectivity for age 5 (Block 3)	1.000	–	–	–
Shrimp Selectivity for age 6 (Block 3)	1.000	–	–	–
Shrimp Selectivity for age 7 (Block 3)	1.000	–	–	–
Shrimp Selectivity for age 8+ (Block 3)	1.000	–	–	–
Acoust Selectivity for age 1 (Block 4)	0.000	–	–	–
Acoust Selectivity for age 2 (Block 4)	0.000	–	–	–
Acoust Selectivity for age 3 (Block 4)	1.000	–	–	–
Acoust Selectivity for age 4 (Block 4)	1.000	–	–	–
Acoust Selectivity for age 5 (Block 4)	1.000	–	–	–
Acoust Selectivity for age 6 (Block 4)	1.000	–	–	–
Acoust Selectivity for age 7 (Block 4)	1.000	–	–	–
Acoust Selectivity for age 8+ (Block 4)	1.000	–	–	–
SprAlb85 Selectivity for age 1 (Block 5)	0.000	–	–	–
SprAlb85 Selectivity for age 2 (Block 5)	0.341	0.051	0.249	0.446

Table 1. Parameter estimates, standard errors, and confidence intervals. Rounded to 3 decimal places. *(continued)*

	Estimate	Std. Error	95% CI lower	95% CI upper
SprAlb85 Selectivity for age 3 (Block 5)	1.000	–	–	–
SprAlb85 Selectivity for age 4 (Block 5)	1.000	–	–	–
SprAlb85 Selectivity for age 5 (Block 5)	1.000	–	–	–
SprAlb85 Selectivity for age 6 (Block 5)	1.000	–	–	–
SprAlb85 Selectivity for age 7 (Block 5)	1.000	–	–	–
SprAlb85 Selectivity for age 8+ (Block 5)	1.000	–	–	–
FallAlb85 a_{50} (Block 6)	2.751	0.141	2.482	3.034
FallAlb85 1/slope (increasing) (Block 6)	0.354	0.042	0.281	0.446
SprBig Selectivity for age 1 (Block 7)	0.000	–	–	–
SprBig Selectivity for age 2 (Block 7)	0.143	0.035	0.088	0.226
SprBig Selectivity for age 3 (Block 7)	0.599	0.102	0.395	0.774
SprBig Selectivity for age 4 (Block 7)	1.000	–	–	–
SprBig Selectivity for age 5 (Block 7)	1.000	–	–	–
SprBig Selectivity for age 6 (Block 7)	1.000	–	–	–
SprBig Selectivity for age 7 (Block 7)	1.000	–	–	–
SprBig Selectivity for age 8+ (Block 7)	1.000	–	–	–
FallBig a_{50} (Block 8)	3.820	0.295	3.249	4.398
FallBig 1/slope (increasing) (Block 8)	0.479	0.063	0.370	0.618
Mobile age comp, logistic-normal: σ	12.119	1.343	9.752	15.059
Mobile age comp, logistic-normal: ρ	0.824	0.040	0.731	0.890
Fixed age comp, logistic-normal: σ	25.922	2.452	21.536	31.201
Fixed age comp, logistic-normal: ρ	0.820	0.036	0.739	0.880

Table 1. Parameter estimates, standard errors, and confidence intervals. Rounded to 3 decimal places. *(continued)*

	Estimate	Std. Error	95% CI lower	95% CI upper
Shrimp age comp, logistic-normal: σ	22.849	5.902	13.772	37.908
Shrimp age comp, logistic-normal: ρ	0.808	0.108	0.519	0.943
SprAlb85 age comp, logistic-normal: σ	23.127	3.142	17.721	30.183
SprAlb85 age comp, logistic-normal: ρ	0.882	0.035	0.795	0.935
FallAlb85 age comp, logistic-normal: σ	23.220	3.336	17.521	30.773
FallAlb85 age comp, logistic-normal: ρ	0.935	0.020	0.882	0.966
SprBig age comp, logistic-normal: σ	15.548	2.746	10.998	21.980
SprBig age comp, logistic-normal: ρ	0.753	0.094	0.531	0.891
FallBig age comp, logistic-normal: σ	22.026	3.715	15.826	30.656
FallBig age comp, logistic-normal: ρ	0.849	0.055	0.708	0.928
Ecov Haddock Predation on Eggs: RW Ecov_1	14.555	0.212	14.140	14.970
Ecov Haddock Predation on Eggs: RW σ	0.524	0.107	0.350	0.783
stock 1 Recruitment Ecov: Haddock Predation on Eggs β_1	-0.184	0.130	-0.439	0.070
Ecov: Haddock Predation on Eggs obs. sd.	0.224	0.123	0.076	0.659

Abundance at age

Table 2. Abundance at age (1000s) for stock 1 in region 1.

	1	2	3	4	5	6	7	8+
1987	1722558	1143942	557690	647334	106651	50617	11494	5245
1988	3288365	1928454	684282	507624	582733	93983	31416	7438
1989	2756170	2282516	651361	339659	256618	329287	56217	20213
1990	2912057	2163590	865767	405073	198484	146653	196429	41768
1991	3325251	3228246	1354747	744793	280040	116536	81145	131059
1992	2540378	3366479	2558722	1009933	466811	160213	62481	102282
1993	2321520	1762961	1458406	1047718	479748	178074	58017	53125
1994	2192168	1978382	830091	920134	707391	342650	108853	56017
1995	11410903	2341824	1523801	959075	1238776	848410	344474	132416
1996	6434687	9620493	1596099	1024953	645815	737042	393427	179404
1997	3781794	3120624	4393249	718769	409962	274152	220893	138373
1998	1456916	2395822	1281517	1960438	406030	202727	129383	127032
1999	4695796	1271868	1505610	872059	1140029	259227	103896	95296
2000	2178802	4574501	763305	799931	555286	525846	113051	65199
2001	1730069	1540383	3158215	549987	552280	420695	313859	85989
2002	7684639	1582825	995629	2363579	529559	389163	224274	150223
2003	4737497	3127932	687136	489036	1128800	327919	196766	150473
2004	4087644	4746676	2947423	739164	469578	703874	207617	147863
2005	876691	1144434	1102934	871668	291153	186338	203584	89120
2006	4301458	1006530	1157355	1118844	697343	204132	100829	107042
2007	1196241	3304697	669595	622133	621819	384556	99678	76472
2008	2494738	592895	1270737	292478	223181	239185	152020	65996
2009	16913162	3752240	870574	962482	173543	120135	100068	66765
2010	2546808	16232050	2666356	450671	414203	68279	39767	38036
2011	2317371	1109910	4487631	732963	128770	94055	16473	16061
2012	7423549	1345659	605280	2015844	304623	55735	31317	9250
2013	2803402	6746653	1019611	425661	1028757	134896	21959	10357
2014	3084677	1196472	2935374	431221	228478	497639	60496	11447
2015	915247	1308708	437671	1218993	220150	150127	280912	34042
2016	370076	540980	732799	283699	621546	123834	82866	146020

Table 2. Abundance at age (1000s) for stock 1 in region 1. *(continued)*

	1	2	3	4	5	6	7	8+
2017	1726302	248964	348731	387396	171795	306354	58099	91569
2018	577463	843007	90032	91702	97250	52528	87346	42996
2019	5759616	696763	681094	52903	51070	48030	21859	31493
2020	2298226	1809221	223267	166899	11576	12903	12337	12654
2021	1362130	1016598	665776	82884	46707	3837	3584	5655
2022	1702352	795555	527684	318337	49449	27192	2120	4560
2023	3046466	1182073	545179	261622	153157	25837	13217	3067

Fishing mortality at age by region

Table 3. Total fishing mortality at age in region 1.

	1	2	3	4	5	6	7	8+
1987	0.025	0.736	0.480	0.492	0.559	0.724	0.992	0.980
1988	0.028	0.781	0.374	0.337	0.367	0.467	0.632	0.618
1989	0.030	0.856	0.420	0.384	0.420	0.535	0.724	0.709
1990	0.024	0.666	0.322	0.292	0.318	0.405	0.548	0.537
1991	0.009	0.304	0.286	0.322	0.376	0.493	0.681	0.677
1992	0.010	0.296	0.242	0.264	0.306	0.399	0.550	0.545
1993	0.016	0.468	0.283	0.282	0.318	0.411	0.561	0.554
1994	0.013	0.369	0.227	0.228	0.257	0.332	0.454	0.448
1995	0.005	0.157	0.157	0.179	0.210	0.276	0.381	0.379
1996	0.002	0.078	0.148	0.185	0.221	0.293	0.407	0.406
1997	0.004	0.149	0.205	0.246	0.292	0.385	0.534	0.532
1998	0.009	0.292	0.264	0.295	0.344	0.451	0.622	0.618
1999	0.009	0.288	0.287	0.328	0.384	0.504	0.697	0.693
2000	0.003	0.124	0.230	0.286	0.343	0.454	0.631	0.630
2001	0.007	0.224	0.226	0.259	0.303	0.398	0.550	0.547
2002	0.004	0.145	0.158	0.183	0.215	0.282	0.391	0.389
2003	0.003	0.115	0.204	0.252	0.302	0.399	0.555	0.554
2004	0.004	0.138	0.149	0.172	0.202	0.266	0.368	0.366
2005	0.009	0.300	0.319	0.369	0.433	0.570	0.788	0.784

Table 3. Total fishing mortality at age in region 1. *(continued)*

	1	2	3	4	5	6	7	8+
2006	0.007	0.238	0.267	0.311	0.366	0.482	0.668	0.665
2007	0.009	0.276	0.254	0.285	0.332	0.435	0.601	0.597
2008	0.007	0.240	0.328	0.394	0.468	0.617	0.857	0.854
2009	0.001	0.104	0.317	0.409	0.493	0.656	0.914	0.914
2010	0.001	0.062	0.153	0.195	0.234	0.311	0.433	0.432
2011	0.002	0.107	0.244	0.309	0.372	0.493	0.686	0.686
2012	0.001	0.086	0.305	0.397	0.480	0.638	0.890	0.890
2013	0.001	0.092	0.285	0.368	0.444	0.591	0.824	0.823
2014	0.001	0.076	0.214	0.275	0.331	0.439	0.612	0.612
2015	0.001	0.073	0.234	0.302	0.365	0.485	0.676	0.676
2016	0.005	0.186	0.254	0.305	0.362	0.478	0.663	0.661
2017	0.004	0.158	0.216	0.260	0.308	0.407	0.565	0.563
2018	0.016	0.551	0.692	0.822	0.972	1.282	1.777	1.770
2019	0.010	0.303	0.210	0.220	0.251	0.327	0.448	0.443
2020	0.003	0.110	0.153	0.185	0.220	0.290	0.402	0.401
2021	0.005	0.160	0.112	0.117	0.134	0.174	0.238	0.236
2022	0.003	0.087	0.056	0.057	0.065	0.084	0.115	0.114
2023	0.001	0.037	0.082	0.103	0.124	0.164	0.229	0.228

Fishing mortality at age by fleet

Table 4. Total fishing mortality at age in Mobile.

	1	2	3	4	5	6	7	8+
1987	0.000	0.085	0.325	0.425	0.514	0.684	0.954	0.954
1988	0.000	0.052	0.201	0.262	0.317	0.422	0.589	0.589
1989	0.000	0.060	0.231	0.302	0.365	0.485	0.677	0.677
1990	0.000	0.045	0.175	0.228	0.276	0.367	0.512	0.512
1991	0.000	0.059	0.227	0.297	0.359	0.478	0.667	0.667
1992	0.000	0.048	0.183	0.239	0.288	0.384	0.535	0.535
1993	0.000	0.048	0.183	0.239	0.289	0.385	0.536	0.536
1994	0.000	0.039	0.148	0.194	0.234	0.311	0.434	0.434

Table 4. Total fishing mortality at age in Mobile. *(continued)*

	1	2	3	4	5	6	7	8+
1995	0.000	0.033	0.128	0.167	0.202	0.268	0.374	0.374
1996	0.000	0.036	0.138	0.180	0.218	0.290	0.405	0.405
1997	0.000	0.047	0.180	0.235	0.285	0.379	0.528	0.528
1998	0.000	0.054	0.207	0.271	0.328	0.436	0.608	0.608
1999	0.000	0.061	0.233	0.305	0.369	0.490	0.684	0.684
2000	0.000	0.056	0.214	0.279	0.338	0.450	0.627	0.627
2001	0.000	0.048	0.184	0.241	0.291	0.387	0.540	0.540
2002	0.000	0.034	0.131	0.171	0.207	0.275	0.384	0.384
2003	0.000	0.049	0.188	0.246	0.297	0.395	0.551	0.551
2004	0.000	0.032	0.123	0.161	0.195	0.259	0.362	0.362
2005	0.000	0.069	0.264	0.345	0.417	0.555	0.775	0.775
2006	0.000	0.058	0.224	0.293	0.354	0.471	0.657	0.657
2007	0.000	0.052	0.201	0.262	0.317	0.421	0.588	0.588
2008	0.000	0.075	0.289	0.377	0.456	0.607	0.847	0.847
2009	0.000	0.081	0.311	0.407	0.492	0.654	0.913	0.913
2010	0.000	0.038	0.147	0.192	0.232	0.309	0.431	0.431
2011	0.000	0.061	0.233	0.305	0.368	0.490	0.684	0.684
2012	0.000	0.079	0.304	0.397	0.480	0.638	0.890	0.890
2013	0.000	0.073	0.281	0.367	0.443	0.590	0.823	0.823
2014	0.000	0.054	0.208	0.272	0.329	0.438	0.611	0.611
2015	0.000	0.060	0.230	0.301	0.364	0.484	0.675	0.675
2016	0.000	0.058	0.224	0.292	0.353	0.470	0.655	0.655
2017	0.000	0.050	0.191	0.249	0.301	0.400	0.558	0.558
2018	0.001	0.156	0.598	0.782	0.945	1.257	1.754	1.754
2019	0.000	0.038	0.148	0.193	0.233	0.310	0.433	0.433
2020	0.000	0.035	0.136	0.177	0.214	0.285	0.398	0.398
2021	0.000	0.020	0.078	0.103	0.124	0.165	0.230	0.230
2022	0.000	0.010	0.038	0.049	0.060	0.079	0.111	0.111
2023	0.000	0.020	0.078	0.101	0.123	0.163	0.228	0.228

Table 5. Total fishing mortality at age in Fixed.

	1	2	3	4	5	6	7	8+
1987	0.025	0.651	0.155	0.067	0.045	0.040	0.039	0.026
1988	0.028	0.729	0.173	0.075	0.050	0.045	0.043	0.030
1989	0.030	0.796	0.189	0.082	0.055	0.049	0.047	0.032
1990	0.024	0.621	0.147	0.064	0.043	0.039	0.037	0.025
1991	0.009	0.245	0.058	0.025	0.017	0.015	0.014	0.010
1992	0.009	0.249	0.059	0.026	0.017	0.015	0.015	0.010
1993	0.016	0.420	0.100	0.043	0.029	0.026	0.025	0.017
1994	0.013	0.331	0.079	0.034	0.023	0.021	0.020	0.013
1995	0.005	0.124	0.029	0.013	0.009	0.008	0.007	0.005
1996	0.002	0.042	0.010	0.004	0.003	0.003	0.003	0.002
1997	0.004	0.102	0.024	0.011	0.007	0.006	0.006	0.004
1998	0.009	0.238	0.057	0.024	0.016	0.015	0.014	0.010
1999	0.009	0.228	0.054	0.023	0.016	0.014	0.013	0.009
2000	0.003	0.068	0.016	0.007	0.005	0.004	0.004	0.003
2001	0.007	0.176	0.042	0.018	0.012	0.011	0.010	0.007
2002	0.004	0.111	0.026	0.011	0.008	0.007	0.007	0.005
2003	0.002	0.066	0.016	0.007	0.005	0.004	0.004	0.003
2004	0.004	0.106	0.025	0.011	0.007	0.007	0.006	0.004
2005	0.009	0.231	0.055	0.024	0.016	0.014	0.014	0.009
2006	0.007	0.179	0.043	0.018	0.012	0.011	0.011	0.007
2007	0.008	0.224	0.053	0.023	0.015	0.014	0.013	0.009
2008	0.006	0.165	0.039	0.017	0.011	0.010	0.010	0.007
2009	0.001	0.023	0.005	0.002	0.002	0.001	0.001	0.001
2010	0.001	0.024	0.006	0.002	0.002	0.001	0.001	0.001
2011	0.002	0.046	0.011	0.005	0.003	0.003	0.003	0.002
2012	0.000	0.006	0.002	0.001	0.000	0.000	0.000	0.000
2013	0.001	0.019	0.004	0.002	0.001	0.001	0.001	0.001
2014	0.001	0.022	0.005	0.002	0.001	0.001	0.001	0.001
2015	0.001	0.013	0.003	0.001	0.001	0.001	0.001	0.001
2016	0.005	0.128	0.030	0.013	0.009	0.008	0.008	0.005
2017	0.004	0.109	0.026	0.011	0.007	0.007	0.006	0.004

Table 5. Total fishing mortality at age in Fixed. *(continued)*

	1	2	3	4	5	6	7	8+
2018	0.015	0.395	0.094	0.041	0.027	0.025	0.023	0.016
2019	0.010	0.265	0.063	0.027	0.018	0.016	0.016	0.011
2020	0.003	0.075	0.018	0.008	0.005	0.005	0.004	0.003
2021	0.005	0.139	0.033	0.014	0.010	0.009	0.008	0.006
2022	0.003	0.077	0.018	0.008	0.005	0.005	0.005	0.003
2023	0.001	0.017	0.004	0.002	0.001	0.001	0.001	0.001