SEDAR 52 Gulf of Mexico Red Snapper Stock Assessment: Assessment Review for the SSC

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May 31-June 1, 2018

Outline

- Overview of data
- Continuity models
- Base model settings
- Base model results
- Diagnostic runs
- Comparison of base and continuity model runs
- Sensitivity runs
- Projections

TORs

SEDAR 52 Gulf of Mexico Red Snapper

Assessment Terms of Reference

April 2017

1. Update the approved SEDAR 31 Gulf of Mexico red snapper model, as modified and approved by the SSC during the 2014 update assessment, with data through 2016. Provide a model consistent with the previous assessment configuration to incorporate and evaluate any changes allowed for during this assessment.

2. Evaluate and document the following specific changes in input data or deviations from the benchmark model previous assessment model.

   - Investigate the use of Louisiana hydroacoustics/stereo camera length frequency
   - Use best available recreational catch and effort estimates (e.g. APAIS, FES)
   - Explore the effect of the IFQ program on commercial CPUE, and the sensitivity of model results to plausible alternative commercial CPUE series
   - Investigate the use of FL, MS and AL survey data collected through the NFWF Gulf Environmental Benefit Fund

3. Document any revisions or corrections made to the model and input datasets, and provide updated input data tables. Provide commercial and recreational landings and discards in numbers and weight (pounds).

4. Update model parameter estimates and their variances, model uncertainties, and estimates of stock status and management benchmarks. In addition to the base model, conduct sensitivity analysis to address uncertainty in data inputs and model configuration and consider runs that represent plausible, alternate states of nature.

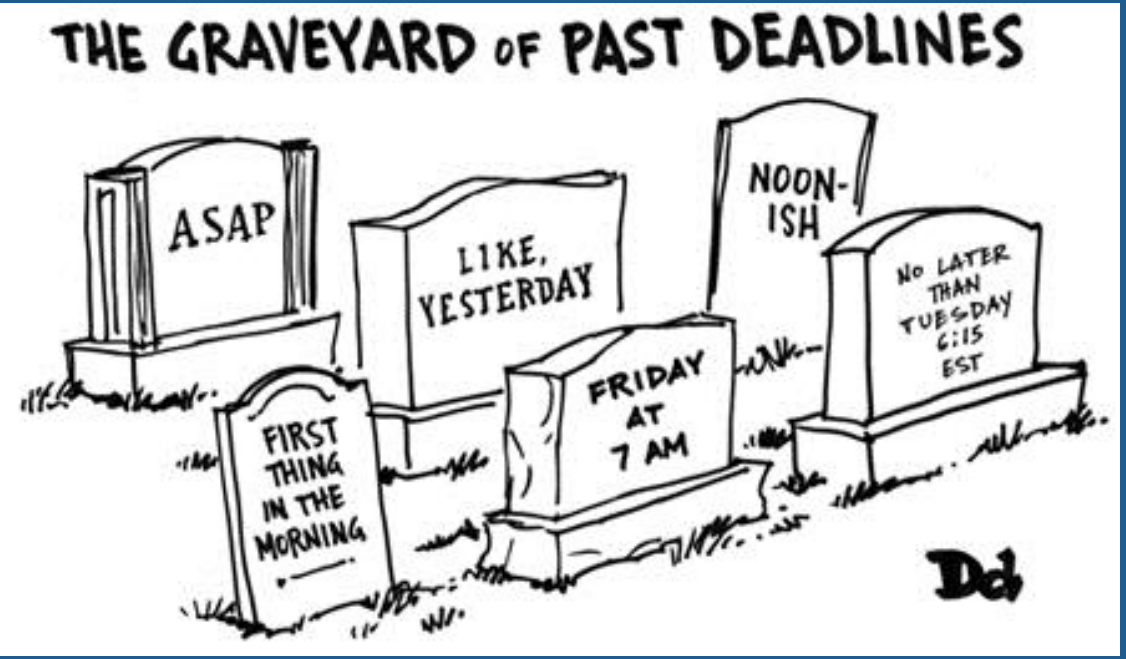
5. Project future stock conditions regardless of the status of the stock. Use provisional 2017 catch estimates if available. Develop rebuilding schedules, if warranted. Provide the estimated generation time for each unit stock. Stock projections shall be developed in accordance with the following:

   Scenarios to Evaluate (preliminary, to be modified as appropriate)
   1. Project F_{MSY} or proxy ($F_{26\%SPR}$)
   2. Project F_{OY} (75% of $F_{26\%SPR}$)
   3. Project $F_{Rebuild}$ (to SPR 26% in 2032)
   4. Project F = 0

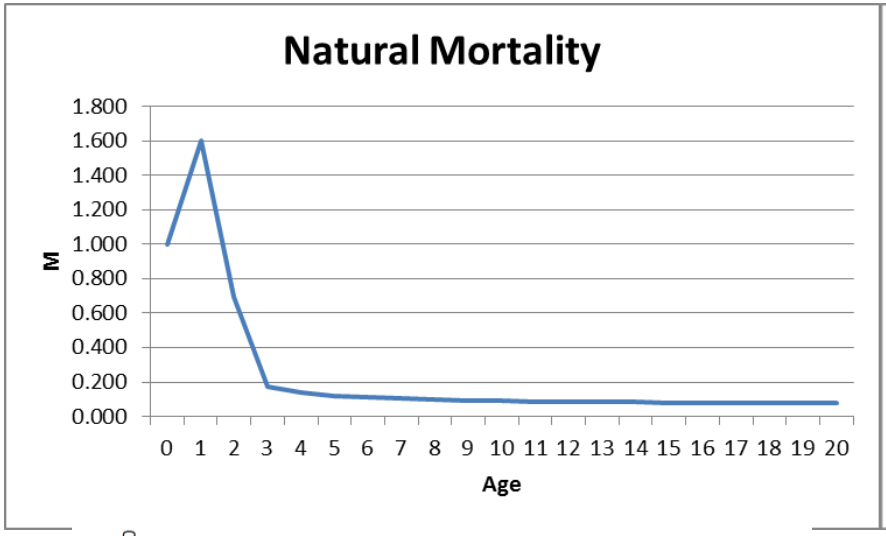
   For all scenarios (except F=0), Use current sector allocations (51% COM: 49% REC) and retain shrimp bycatch at recent levels of exploitation (as in SEDAR31 and 2014 update).

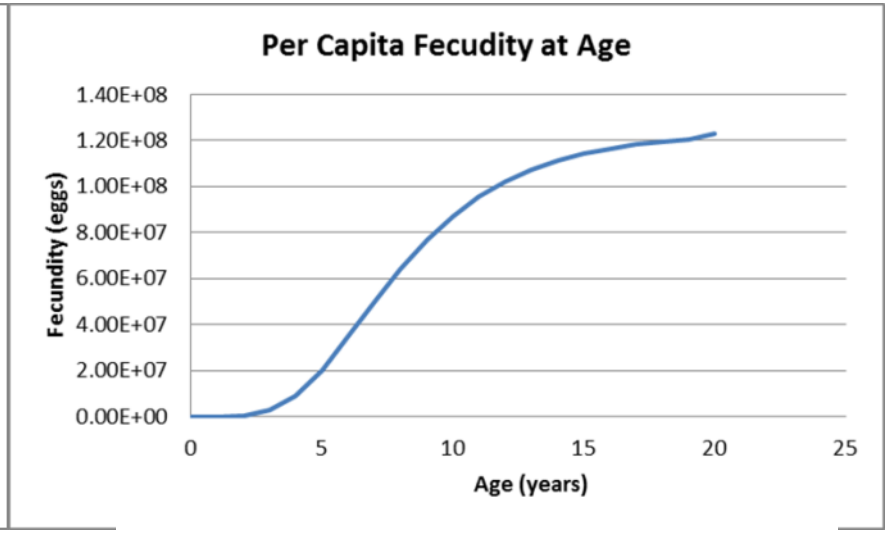
6. Develop a stock assessment report to address these TORs and fully document the input data, methods, and results.

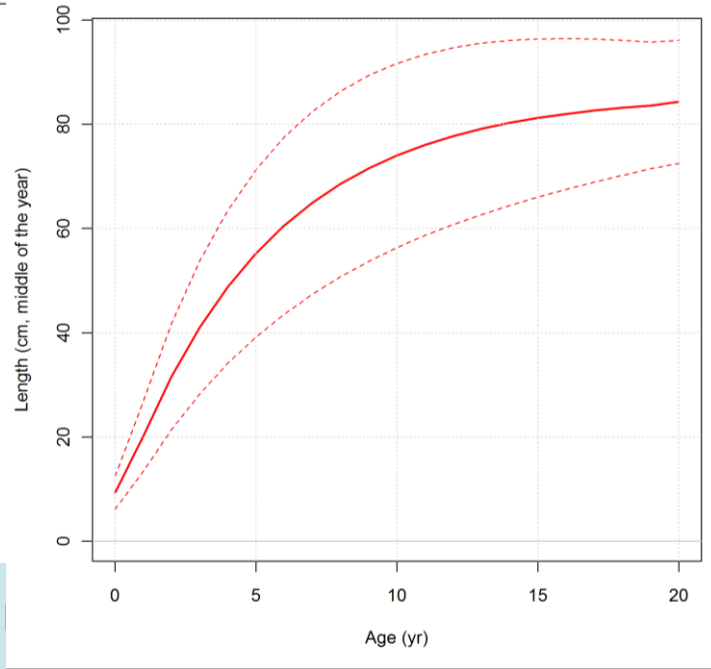
Data

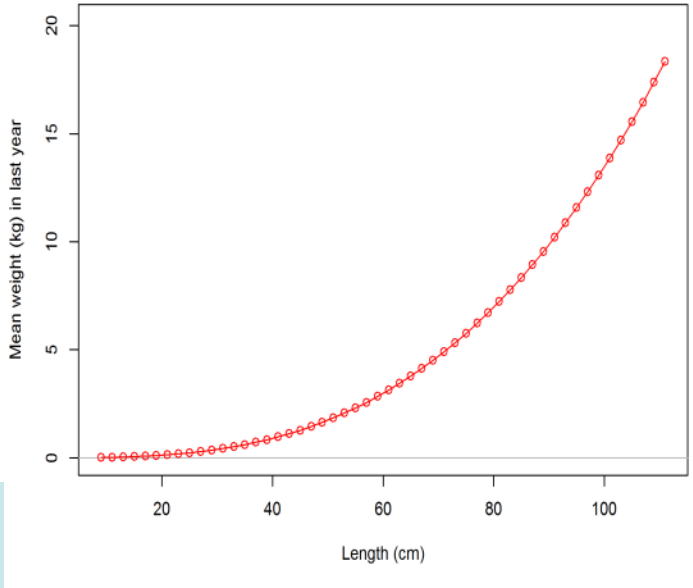

THE GRAVEYARD OF PAST DEADLINES
ASAP
LIKE, YESTERDAY
NOON-ISH
NO LATER THAN TUESDAY 6:15 EST
FIRST THING IN THE MORNING
FRIDAY AT 7 AM
Dch

Life History (unchanged)









Discard Mortality

New data and rerun of meta-analysis indicated a new recreational discard mortality, post-2008 of 11.8%. This is up from 10% in the 2014 SEDAR 31 Update Assessment.

Sector	Venting (Y/N)	Year (Pre/Post 2008)	East		West	
			Closed	Open	Closed	Open
Recreational	N	Pre	0.21	0.21	0.22	0.22
Recreational	Y	Post	0.118	0.118	0.118	0.118
Commercial vertical line	N	Pre	0.74	0.75	0.87	0.78
Commercial vertical line	Y	Post	0.55	0.56	0.74	0.6
Commercial longline	N	Pre	0.74	0.81	0.87	0.91
Commercial longline	Y	Post	0.55	0.64	0.74	0.81

Age-length Data

- Biological data from 12 data providers (n = 217,475).
- 49,000 new age-length records from 2014-2016
  - Majority of new samples from the Gulf States Marine Fisheries Commission Fisheries Information Network (GulfFIN) and the National Fish and Wildlife Foundation (NFWF) Gulf Environmental Fund survey data.

Length Type	Observed (n)	Predicted (n)
Maximum Total Length	17,797	199,406
Natural Total Length	52,870	-----
Fork Length	192,973	24,230
Standard Length	14,627	-----

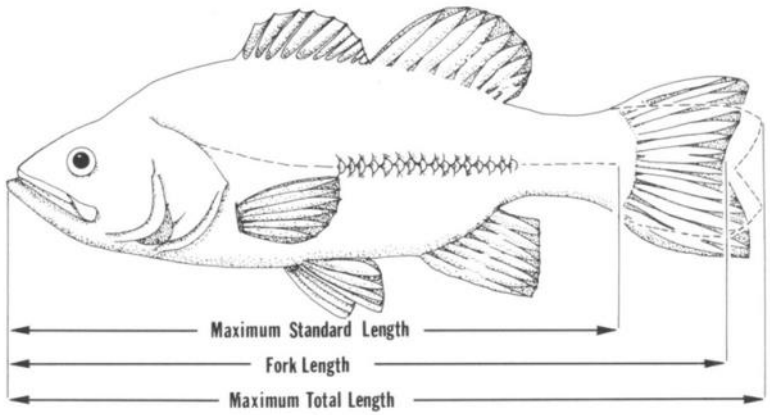


Figure 15.1 from Anderson and Gutreuter 1983)

Age-Length Key East

- Single age length key developed for each region combined across fleets and years

Length (cm)	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
24	0.81	0.14	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.38	0.51	0.09	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	0.06	0.60	0.29	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	0.01	0.40	0.47	0.10	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	0.00	0.21	0.56	0.17	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44	0.00	0.06	0.50	0.30	0.09	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48	0.00	0.02	0.29	0.41	0.16	0.06	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
52	0.00	0.01	0.13	0.43	0.24	0.09	0.05	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
56	0.00	0.00	0.05	0.34	0.32	0.15	0.07	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60	0.00	0.00	0.03	0.22	0.36	0.22	0.10	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
64	0.00	0.00	0.01	0.12	0.32	0.29	0.14	0.07	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
68	0.00	0.00	0.00	0.04	0.21	0.34	0.22	0.11	0.06	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72	0.00	0.00	0.00	0.00	0.10	0.27	0.29	0.18	0.10	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76	0.00	0.00	0.00	0.00	0.00	0.14	0.29	0.26	0.17	0.08	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.26	0.23	0.17	0.07	0.03	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.01
84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.28	0.19	0.10	0.06	0.08	0.06	0.02	0.01	0.00	0.00	0.01	0.07
88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.17	0.11	0.05	0.05	0.06	0.01	0.01	0.05	0.03	0.02	0.35
92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.10	0.12	0.04	0.06	0.06	0.02	0.54
96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.07	0.71
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.75
104	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
108	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

Age-Length Key East

- Comparison to 2014 Update [difference in number of fish; (SEDAR 52 value)-(2014 Update value)]

LengthBin	Freq.1	Freq.2	Freq.3	Freq.4	Freq.5	Freq.6	Freq.7	Freq.8	Freq.9	Freq.10	Freq.11	Freq.12	Freq.13	Freq.14	Freq.15	Freq.16	Freq.17	Freq.18	Freq.19	Freq.20
24	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	2	11	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	24	268	92	13	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	21	519	479	134	38	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	19	472	1634	656	184	89	24	0	0	0	0	0	0	0	0	0	0	0	0	0
44	4	241	1582	1193	351	179	140	53	0	0	0	0	0	0	0	0	0	0	0	0
48	0	62	763	1262	535	231	217	161	68	0	0	0	0	0	0	0	0	0	0	0
52	1	14	232	1078	596	305	257	189	120	34	0	0	0	0	0	0	0	0	0	0
56	0	8	66	694	678	300	271	218	108	51	13	5	1	0	0	0	0	0	0	0
60	0	0	31	351	532	379	294	192	115	41	14	2	1	0	0	0	0	0	0	0
64	0	0	14	100	326	353	269	218	152	38	14	4	2	0	0	0	0	0	0	0
68	0	0	0	5	159	286	319	264	184	51	21	8	6	0	0	1	0	0	0	0
72	0	0	0	0	24	129	315	316	223	105	33	6	0	0	1	1	0	0	1	0
76	0	0	0	0	0	37	167	280	246	124	35	5	6	1	1	1	0	0	0	1
80	0	0	0	0	0	0	43	107	125	100	41	11	8	0	2	1	0	1	0	-1
84	0	0	0	0	0	0	0	12	52	27	19	6	7	8	1	0	0	-1	2	-3
88	0	0	0	0	0	0	0	0	-1	8	4	-1	2	-1	-1	0	-1	2	0	1
92	0	0	0	0	0	0	0	0	0	0	2	-1	-1	4	2	0	0	1	-1	2
96	0	0	0	0	0	0	0	0	0	0	0	0	2	0	-1	0	0	0	1	1
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Age-Length Key East

- Comparison to 2014 Update [difference in proportions; (SEDAR 52 value)-(2014 Update value)]

LengthBin	Freq.1	Freq.2	Freq.3	Freq.4	Freq.5	Freq.6	Freq.7	Freq.8	Freq.9	Freq.10	Freq.11	Freq.12	Freq.13	Freq.14	Freq.15	Freq.16	Freq.17	Freq.18	Freq.19	Freq.20
24	-0.07937	0.031746	0.047619	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	-0.0647	0.046012	-0.00663	0.025316	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0.000345	0.021836	-0.01937	-0.00574	0.002929	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0.001401	0.005312	-0.01333	0.002043	0.002525	0.002051	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0.000824	-0.01159	-0.00563	0.008304	0.003597	0.003242	0.001257	0	0	0	0	0	0	0	0	0	0	0	0	0
44	7.96E-05	0.001593	-0.02386	0.005075	0.002336	0.004268	0.007228	0.00328	0	0	0	0	0	0	0	0	0	0	0	0
48	-0.00013	0.000159	-0.02464	-0.01047	-0.00053	0.00362	0.013685	0.012627	0.005681	0	0	0	0	0	0	0	0	0	0	0
52	1.14E-05	-0.00068	-0.02097	-0.02221	-0.01463	0.006261	0.019653	0.017261	0.011865	0.003429	0	0	0	0	0	0	0	0	0	0
56	0	0.000204	-0.01192	-0.02795	-0.01967	-0.01079	0.021544	0.025811	0.013636	0.006646	0.001661	0.000692	0.000138	0	0	0	0	0	0	0
60	0	-8.9E-05	-0.00501	-0.01992	-0.04332	-0.01072	0.026666	0.026023	0.017817	0.006046	0.002073	0.000347	8.47E-05	0	0	0	0	0	0	0
64	0	0	0.000579	-0.02448	-0.04948	-0.02596	0.018828	0.03878	0.030054	0.007789	0.002783	0.000779	0.000335	0	0	0	0	0	0	0
68	0	0	0	-0.01886	-0.04951	-0.06596	0.015433	0.052892	0.044865	0.012628	0.005155	0.001431	0.001648	0	0	0.000275	0	0	0	0
72	0	0	0	0	-0.05618	-0.11276	-0.01525	0.06966	0.066486	0.036703	0.01071	0.001128	-0.0008	-0.00027	9.97E-05	9.97E-05	0	0	0.000365	0
76	0	0	0	0	0	-0.11151	-0.11944	0.054207	0.109097	0.063332	0.008662	-0.00298	0.000229	-0.00138	-0.00073	0.000585	0	0	-0.00066	0.000585
80	0	0	0	0	0	0	-0.1094	-0.02677	0.076426	0.07956	0.027004	-0.00355	-0.0057	-0.00903	0.000833	-0.0059	-0.00542	-0.00229	0	-0.01577
84	0	0	0	0	0	0	0	-0.01058	0.113492	0.01746	0.039418	-0.01217	-0.02566	0.002116	-0.01349	-0.01032	-0.00344	-0.00714	0.000529	-0.09021
88	0	0	0	0	0	0	0	0	-0.02232	0.071429	0.03125	-0.01935	0.016369	-0.02083	-0.01339	-0.00149	-0.01935	0.019345	-0.00298	-0.03869
92	0	0	0	0	0	0	0	0	0	0	0.03619	-0.02381	-0.02381	0.07619	0.024762	-0.00762	-0.01143	0.012381	-0.02762	-0.05524
96	0	0	0	0	0	0	0	0	0	0	0	0	0.123377	0	-0.09091	0	0	0	0.071429	-0.1039
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-0.08333	0	0.083333
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Age-Length Key West

Length (cm)	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14	Age 15	Age 16	Age 17	Age 18	Age 19	Age 20
20	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24	0.071	0.857	0.071	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
28	0.014	0.730	0.257	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
32	0.011	0.464	0.420	0.096	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
36	0.005	0.211	0.501	0.225	0.055	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.005	0.117	0.476	0.291	0.088	0.021	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
44	0.003	0.053	0.392	0.359	0.137	0.042	0.011	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
48	0.001	0.018	0.264	0.397	0.212	0.072	0.028	0.007	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
52	0.000	0.009	0.131	0.397	0.289	0.116	0.036	0.013	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
56	0.000	0.004	0.053	0.303	0.371	0.176	0.060	0.021	0.006	0.004	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
60	0.000	0.000	0.029	0.208	0.343	0.246	0.100	0.040	0.018	0.008	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
64	0.000	0.000	0.007	0.111	0.277	0.290	0.171	0.073	0.033	0.017	0.009	0.005	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000
68	0.000	0.000	0.000	0.040	0.172	0.274	0.213	0.125	0.072	0.041	0.025	0.008	0.010	0.007	0.005	0.003	0.002	0.001	0.001	0.001
72	0.000	0.000	0.000	0.000	0.090	0.192	0.219	0.168	0.109	0.069	0.040	0.034	0.022	0.015	0.009	0.011	0.004	0.005	0.004	0.007
76	0.000	0.000	0.000	0.000	0.000	0.104	0.164	0.154	0.138	0.108	0.076	0.067	0.045	0.030	0.025	0.024	0.016	0.011	0.005	0.033
80	0.000	0.000	0.000	0.000	0.000	0.000	0.070	0.115	0.101	0.117	0.093	0.085	0.055	0.060	0.061	0.055	0.026	0.026	0.019	0.119
84	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.041	0.063	0.066	0.055	0.063	0.046	0.066	0.083	0.046	0.048	0.061	0.026	0.336
88	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.031	0.026	0.036	0.031	0.051	0.046	0.041	0.015	0.046	0.020	0.648
92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.031	0.000	0.000	0.031	0.047	0.016	0.047	0.031	0.016	0.047	0.734
96	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.111	0.000	0.000	0.000	0.000	0.000	0.889
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000

Age-Length Key West

- Comparison to 2014 Update [difference in number of fish; (SEDAR 52 value)-(2014 Update value)]

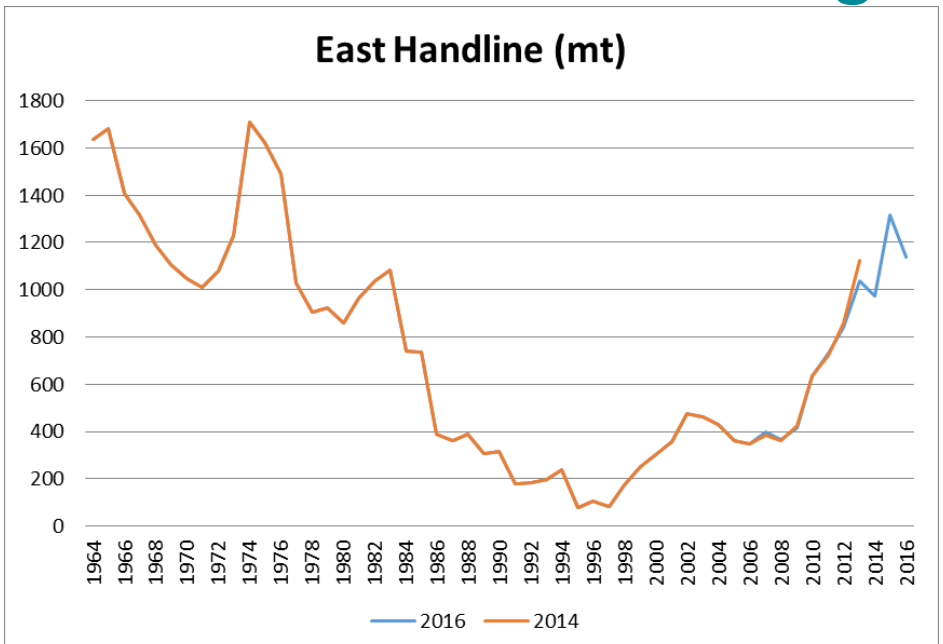
LengthBin	Freq.1	Freq.2	Freq.3	Freq.4	Freq.5	Freq.6	Freq.7	Freq.8	Freq.9	Freq.10	Freq.11	Freq.12	Freq.13	Freq.14	Freq.15	Freq.16	Freq.17	Freq.18	Freq.19	Freq.20
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	7	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	-1	11	107	38	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	3	74	430	257	85	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	1	37	410	436	196	86	18	0	0	0	0	0	0	0	0	0	0	0	0	0
44	3	-2	361	598	283	82	31	22	0	0	0	0	0	0	0	0	0	0	0	0
48	0	-4	243	681	400	117	34	6	15	0	0	0	0	0	0	0	0	0	0	0
52	0	17	114	560	533	183	56	13	3	4	1	0	0	0	0	0	0	0	0	0
56	0	0	44	354	681	311	88	35	6	5	5	3	2	0	0	0	0	0	0	0
60	0	0	24	127	423	319	129	58	32	13	5	-1	1	0	1	0	0	0	0	0
64	0	0	-2	68	270	281	214	109	51	21	8	5	-2	4	0	2	2	0	0	0
68	0	0	0	3	109	147	196	158	97	50	21	3	11	5	4	3	2	2	2	2
72	0	0	0	0	26	61	92	137	97	71	40	32	14	6	0	4	2	3	2	3
76	0	0	0	0	0	6	21	53	90	66	36	23	7	5	2	6	2	4	2	12
80	0	0	0	0	0	0	6	-6	2	24	12	6	4	7	9	8	3	7	1	6
84	0	0	0	0	0	0	0	2	-1	0	5	5	-4	-1	-6	1	1	3	3	29
88	0	0	0	0	0	0	0	0	-3	-1	2	-4	-1	0	0	-1	-1	-2	-4	12
92	0	0	0	0	0	0	0	0	0	1	0	0	-1	0	-2	0	-2	0	0	5
96	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	-2
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

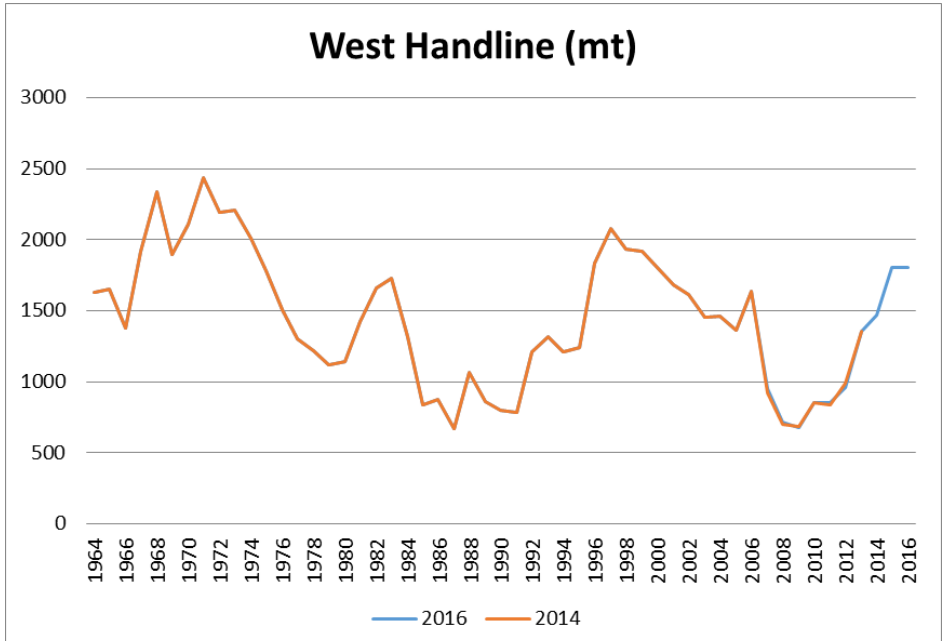
Age-Length Key West

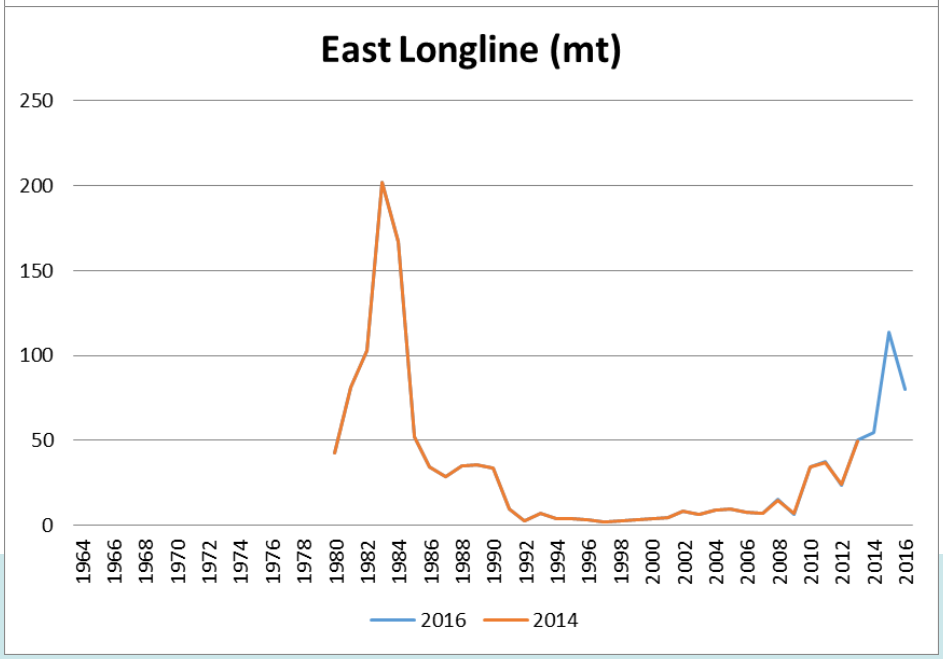
- Comparison to 2014 Update [difference in proportions; (SEDAR 52 value)-(2014 Update value)]

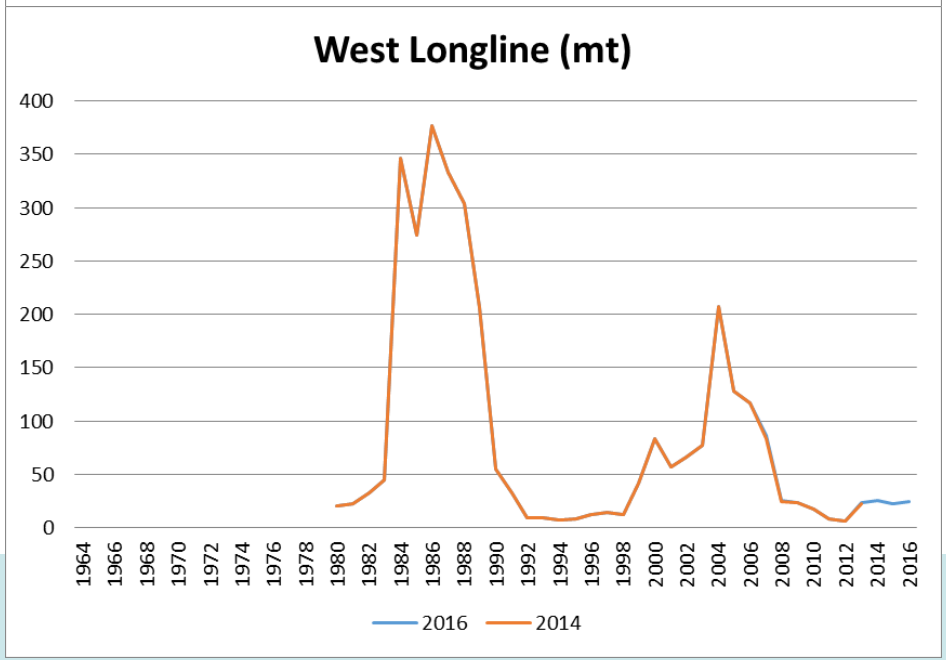
	Freq.1	Freq.2	Freq.3	Freq.4	Freq.5	Freq.6	Freq.7	Freq.8	Freq.9	Freq.10	Freq.11	Freq.12	Freq.13	Freq.14	Freq.15	Freq.16	Freq.17	Freq.18	Freq.19	Freq.20
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	-0.0119	-0.05952	0.071429	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	-0.00119	0.038553	-0.03736	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	-0.00241	-0.05781	0.032068	0.01904	0.009112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	-0.00025	-0.01938	-0.00124	0.010614	0.00659	0.003669	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	-0.00045	-0.0105	-0.0159	0.00943	0.009473	0.00629	0.001664	0	0	0	0	0	0	0	0	0	0	0	0	0
44	-0.00013	-0.00946	-0.02265	0.012983	0.011903	0.003015	0.001968	0.002368	0	0	0	0	0	0	0	0	0	0	0	0
48	-0.00016	-0.00503	-0.02466	0.014472	0.013815	0.001532	-0.00125	-0.00063	0.001911	0	0	0	0	0	0	0	0	0	0	0
52	-0.00014	0.000596	-0.01629	-0.00589	0.021109	0.002078	0.000381	-0.00132	-0.00102	0.000342	0.000155	0	0	0	0	0	0	0	0	0
56	0	-0.00134	-0.00931	-0.02709	0.027543	0.010124	-0.00107	0.000609	-0.00067	-0.00018	0.000489	0.000534	0.000356	0	0	0	0	0	0	0
60	0	-7.1E-05	-0.00263	-0.03126	0.009961	0.011753	0.004482	0.003761	0.003344	0.001197	0.000308	-0.00099	5.18E-06	-7.1E-05	0.000217	0	0	0	0	0
64	0	0	-0.00352	-0.01724	-0.00579	-0.00654	0.01416	0.01261	0.006291	0.001319	-0.00053	-9.8E-05	-0.00146	0.00056	-0.00051	0.000229	0.000537	0	0	0
68	0	0	0	-0.01307	-0.01362	-0.03335	0.00984	0.02462	0.016678	0.007385	0.000216	-0.00156	0.001362	-0.00034	-0.00021	0.000277	0.0003	0.000415	0.000645	0.000415
72	0	0	0	0	-0.01489	-0.02874	-0.02058	0.020729	0.017891	0.016681	0.009198	0.006682	0.000412	-0.0017	-0.00298	-0.00145	-0.00025	-0.00011	-0.00025	-0.00065
76	0	0	0	0	0	-0.02409	-0.02863	0.001185	0.036859	0.025002	0.008845	0.000326	-0.00666	-0.00428	-0.00532	-0.0016	-0.00274	0.000225	0.000205	0.000675
80	0	0	0	0	0	0	-0.00025	-0.02099	-0.00903	0.017557	0.004838	-0.00199	-0.0011	0.00211	0.004564	0.004072	0.000942	0.006117	-0.00084	-0.006
84	0	0	0	0	0	0	0	0.001105	-0.00794	-0.00576	0.007079	0.006312	-0.01353	-0.00813	-0.02154	-0.00165	-0.00185	0.001753	0.004823	0.039332
88	0	0	0	0	0	0	0	0	-0.01492	-0.00456	0.010435	-0.01956	-0.00456	0.000769	0.000692	-0.00441	-0.00479	-0.00936	-0.01979	0.07007
92	0	0	0	0	0	0	0	0	0	0.015377	0	0	-0.01637	-0.00074	-0.03199	-0.00074	-0.03224	-0.00025	-0.00074	0.067708
96	0	0	0	0	0	0	0	0	0	0	0	0	-0.08333	0.027778	0	0	0	0	0	0.055556
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Commercial Landings

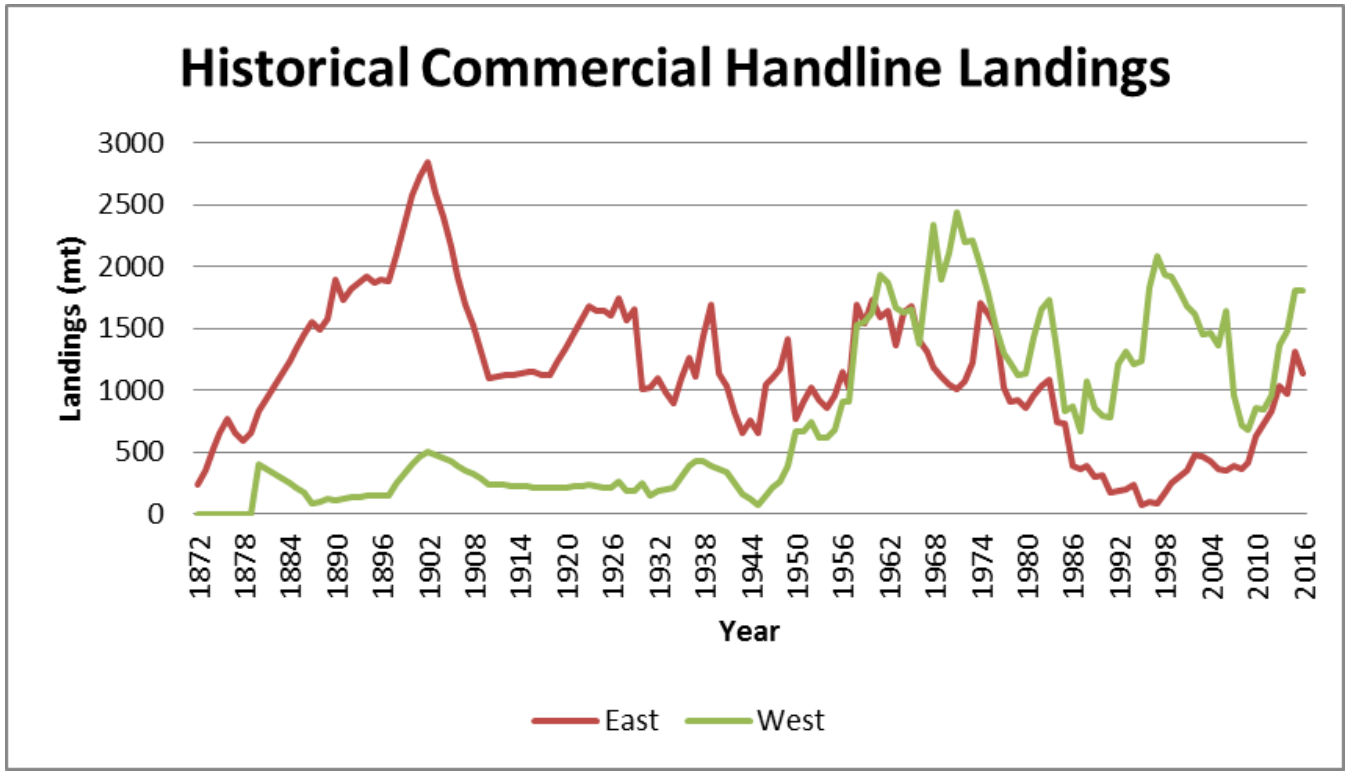




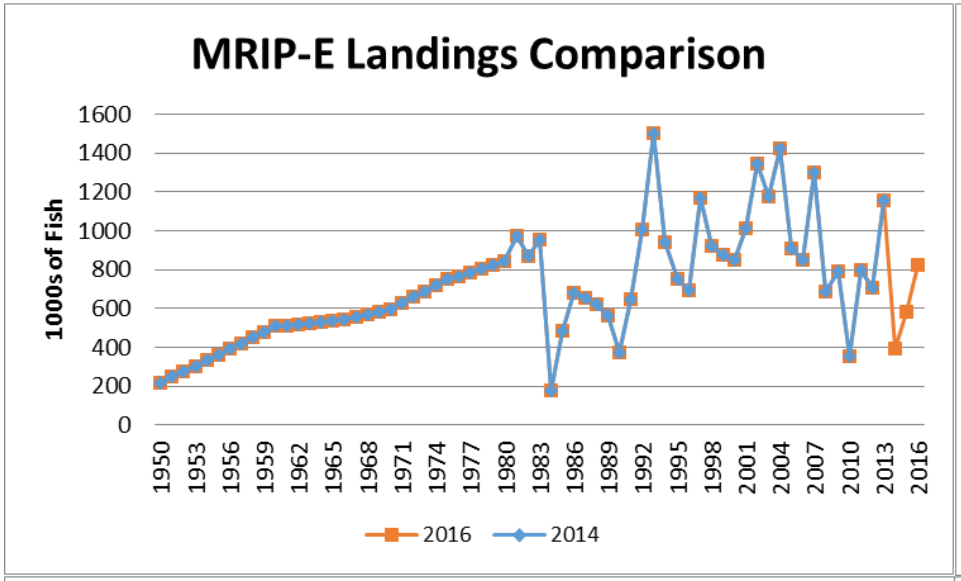


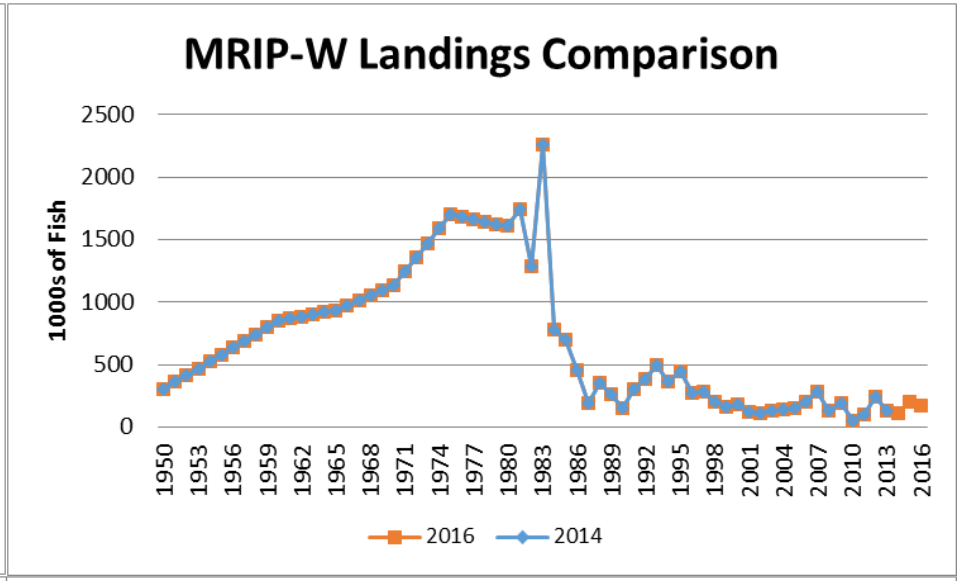


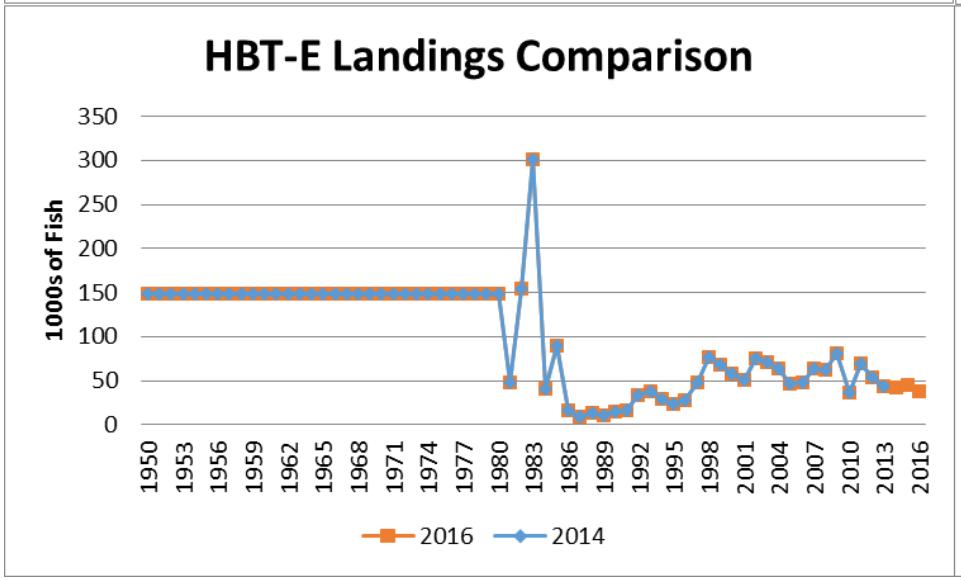
Historic Commercial Landings (unchanged)

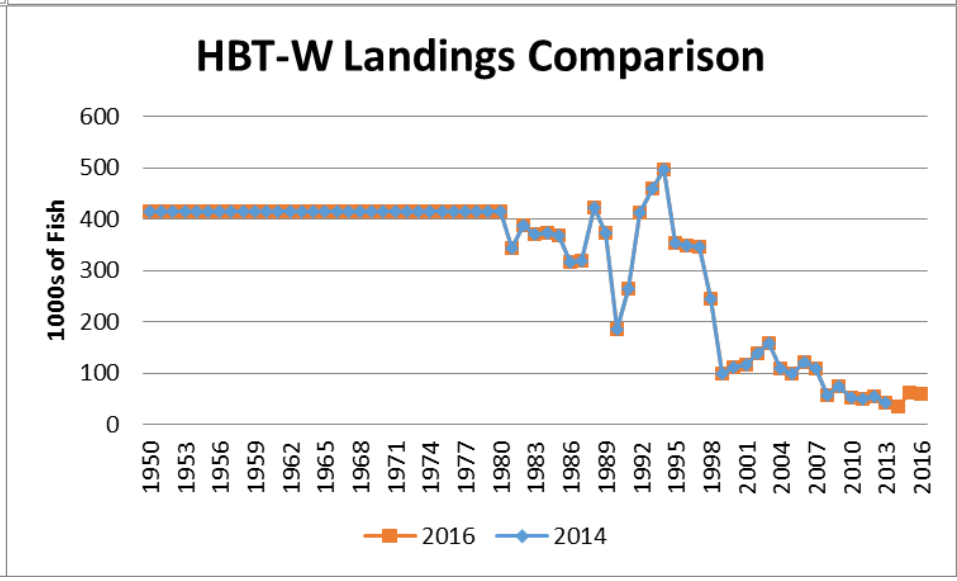


Recreational Landings

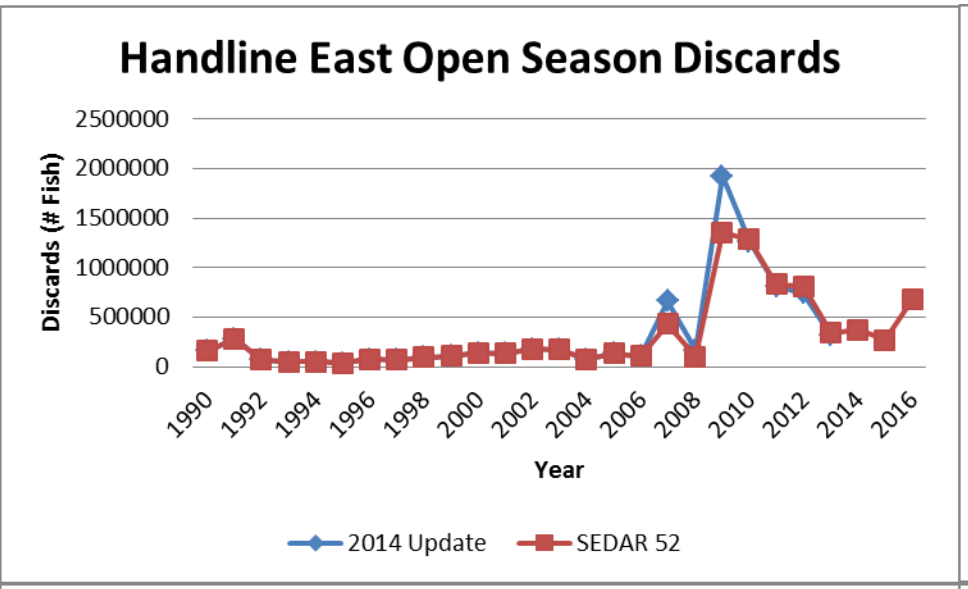


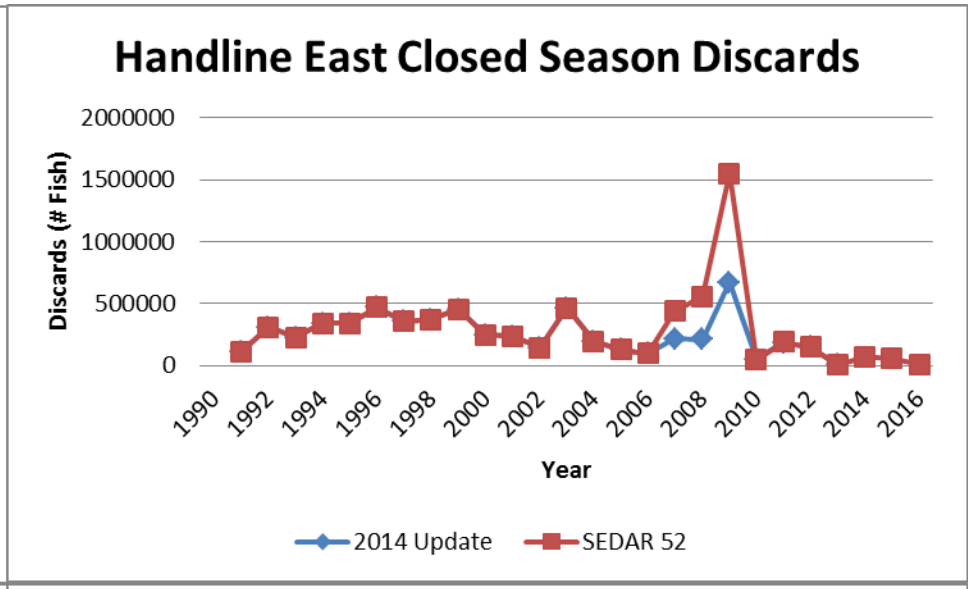


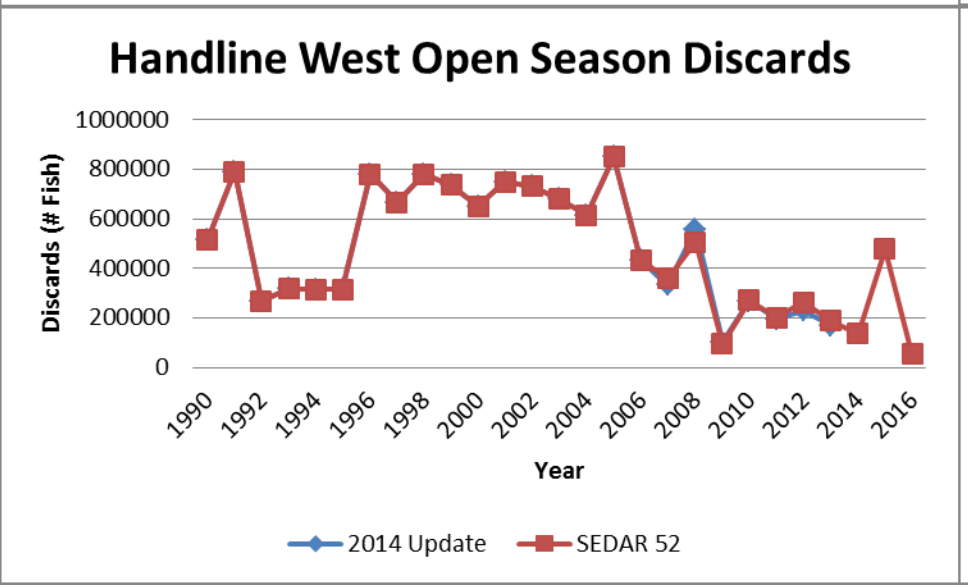


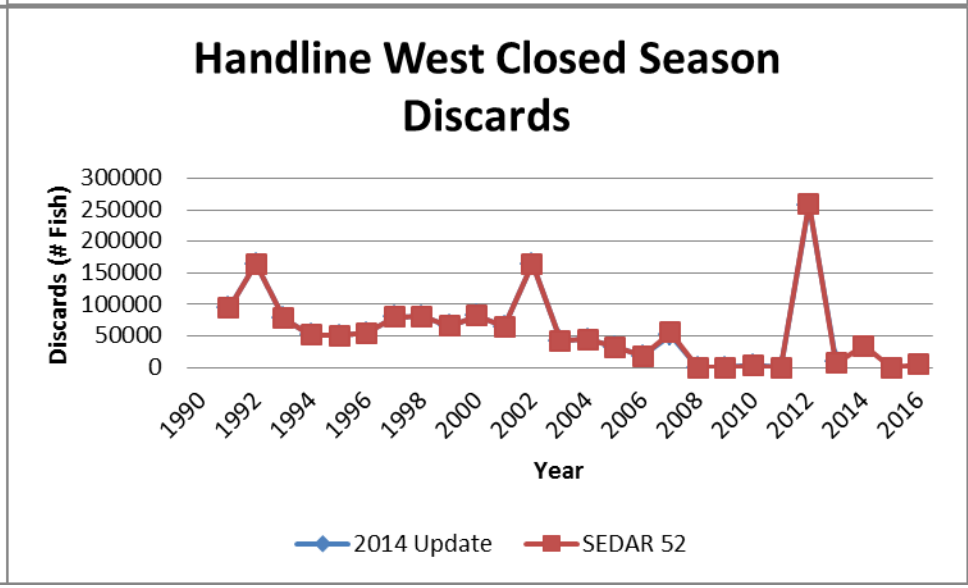


Commercial Discards--Continuity

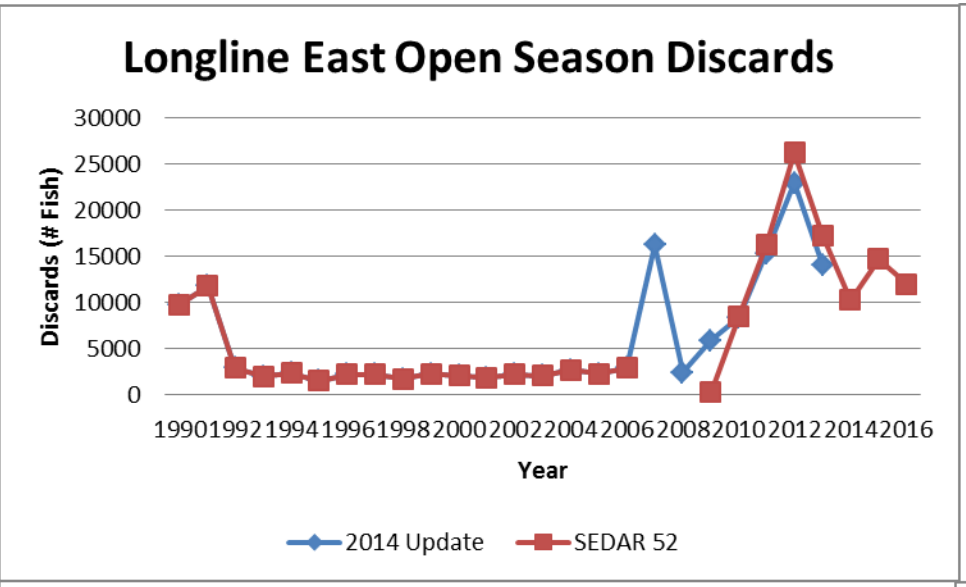


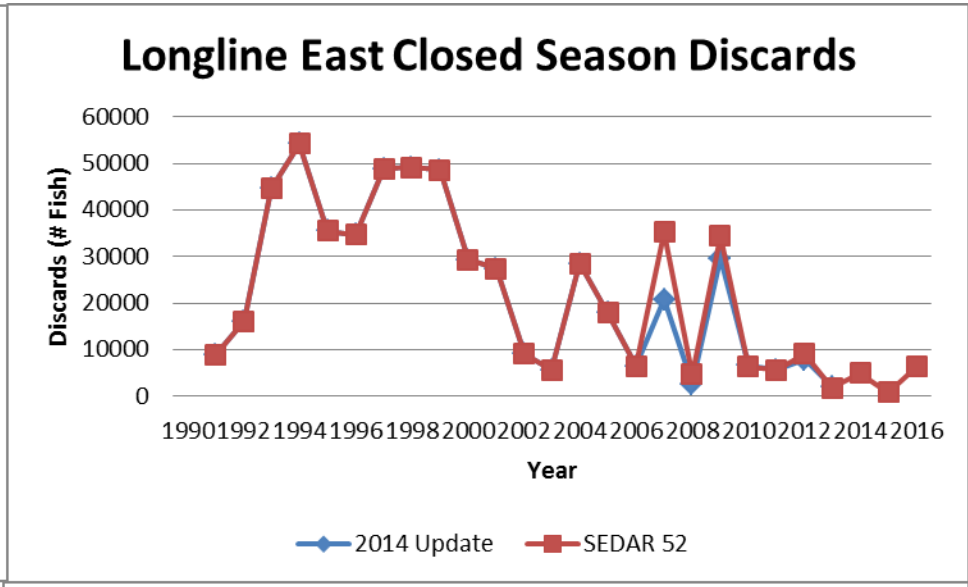


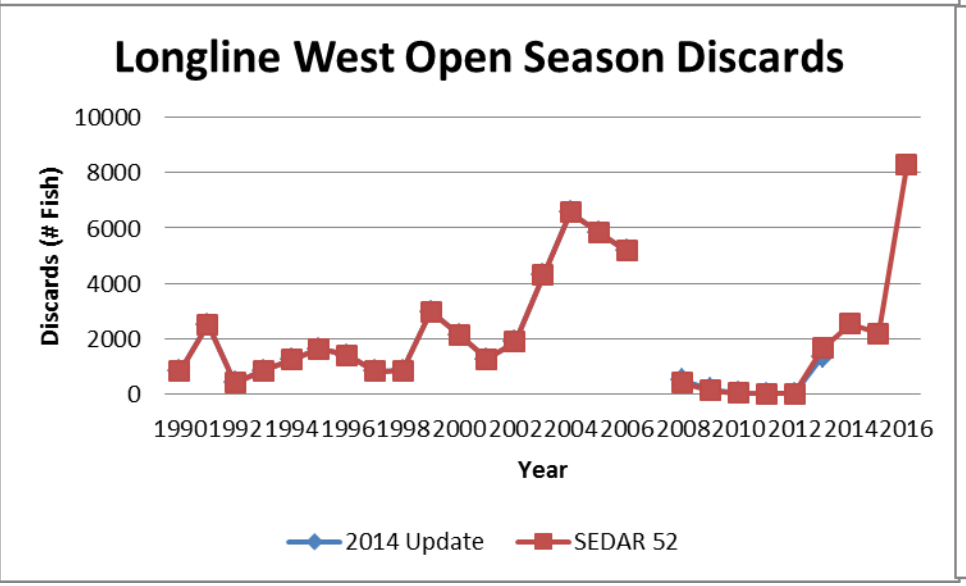


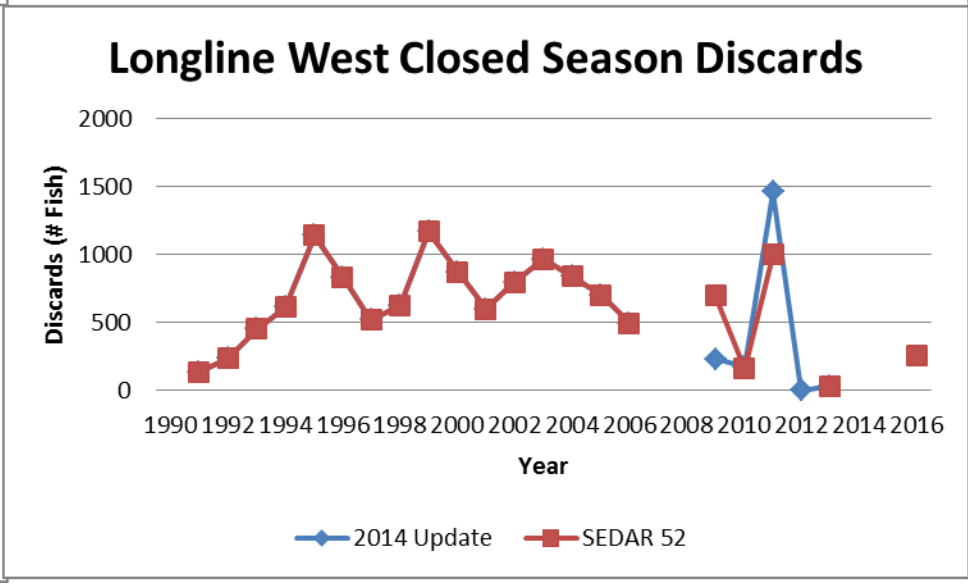


Commercial Discards--Continuity



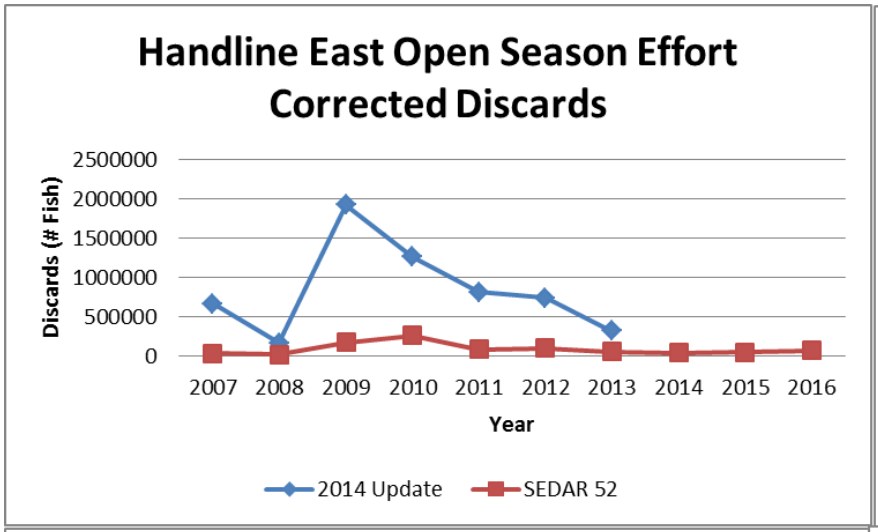


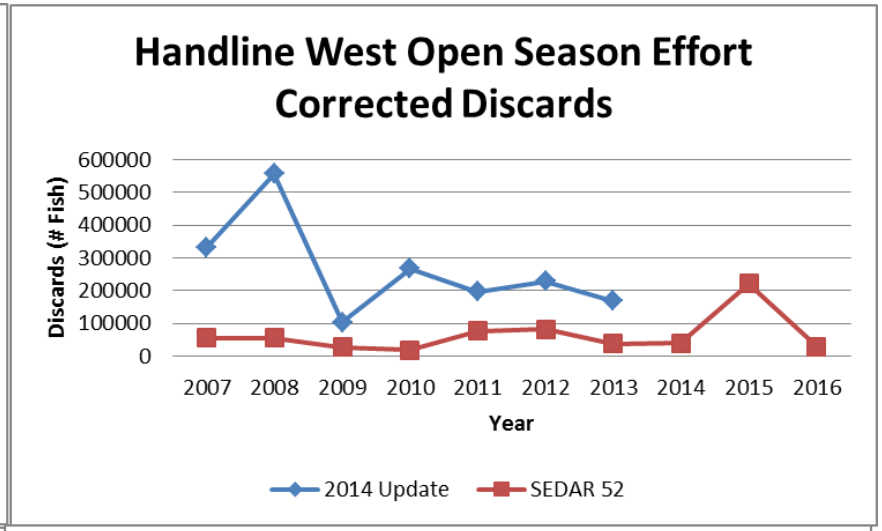


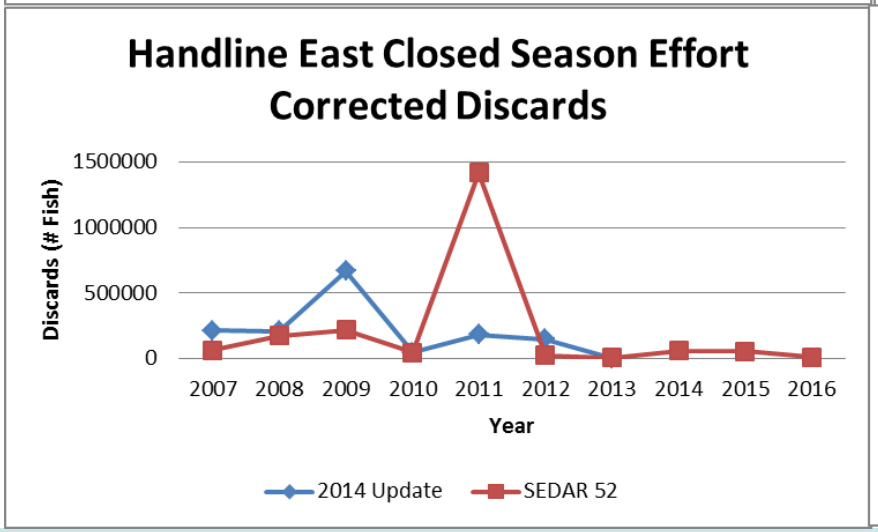


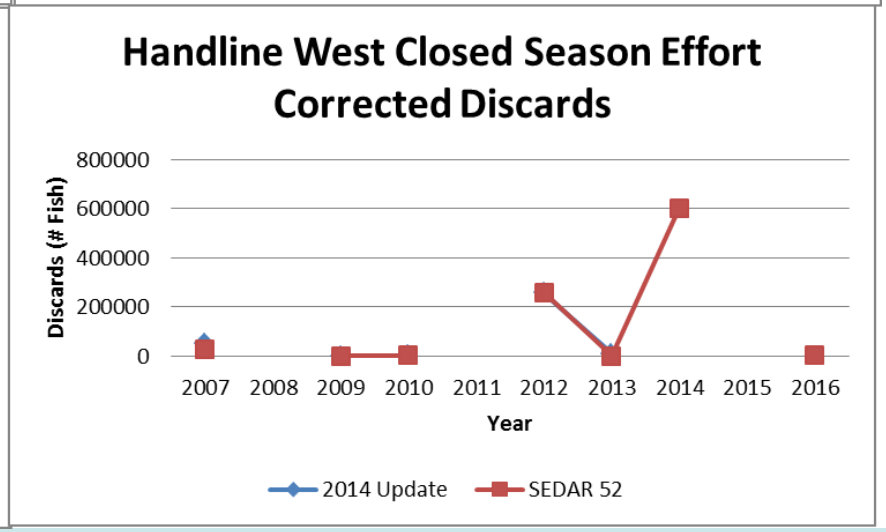
Commercial Discards--Recommended

Old method tended to inflate landings and overestimate discards
New Method: Discards = (discard rate * total effort)/landings ratio

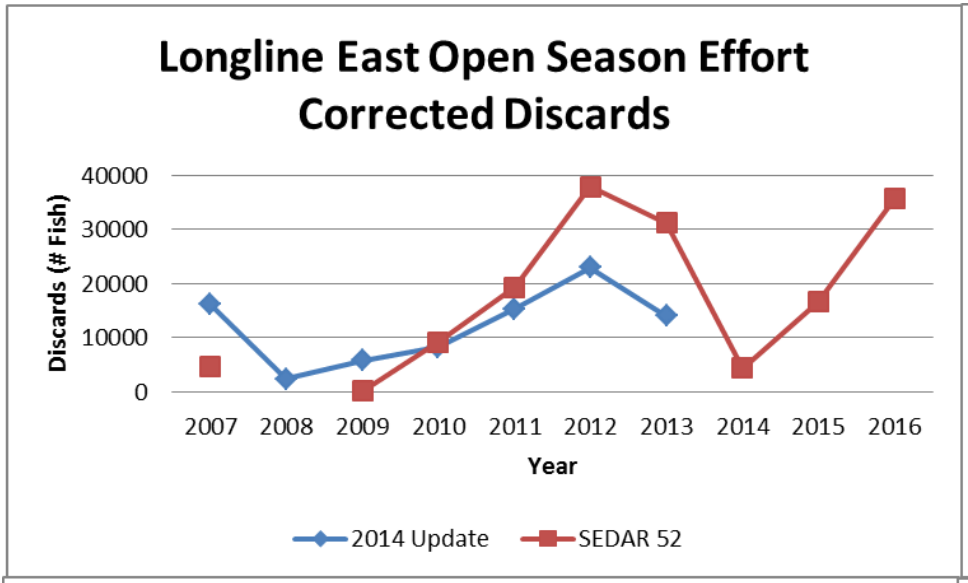


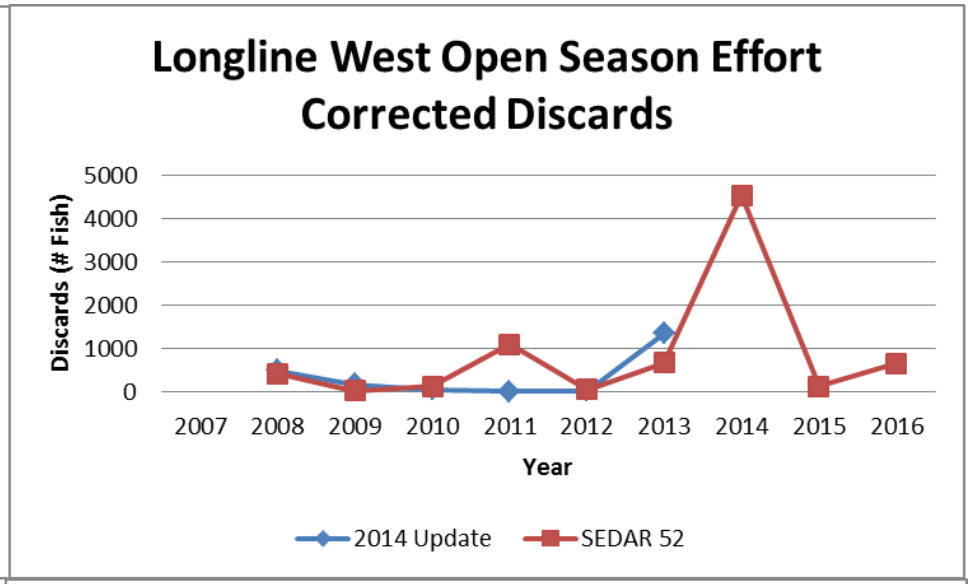


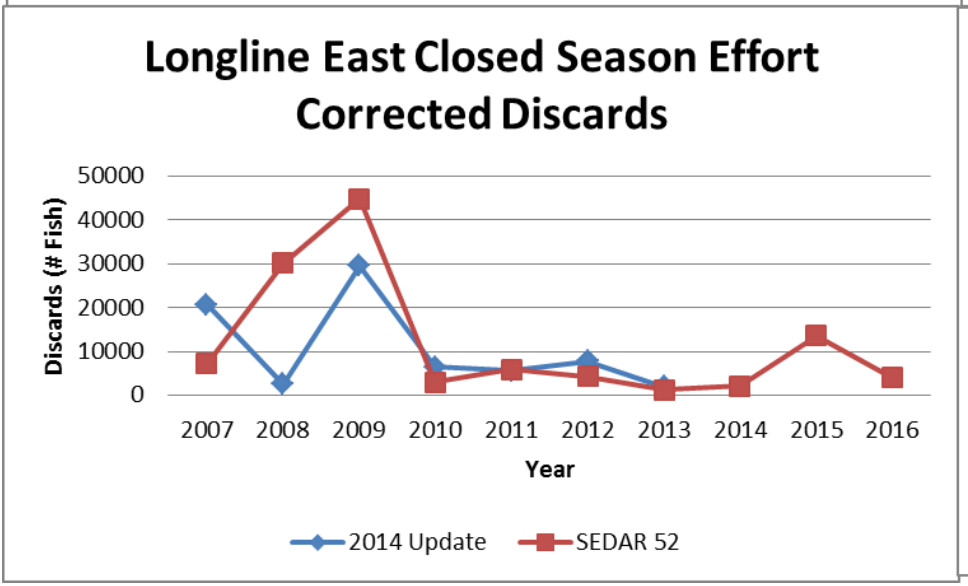


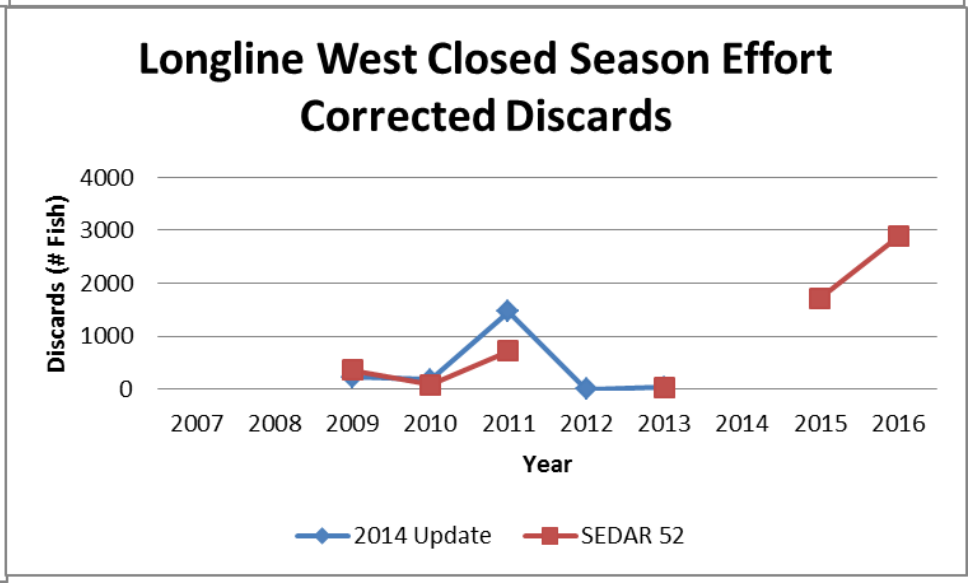


Commercial Discards-Recommended

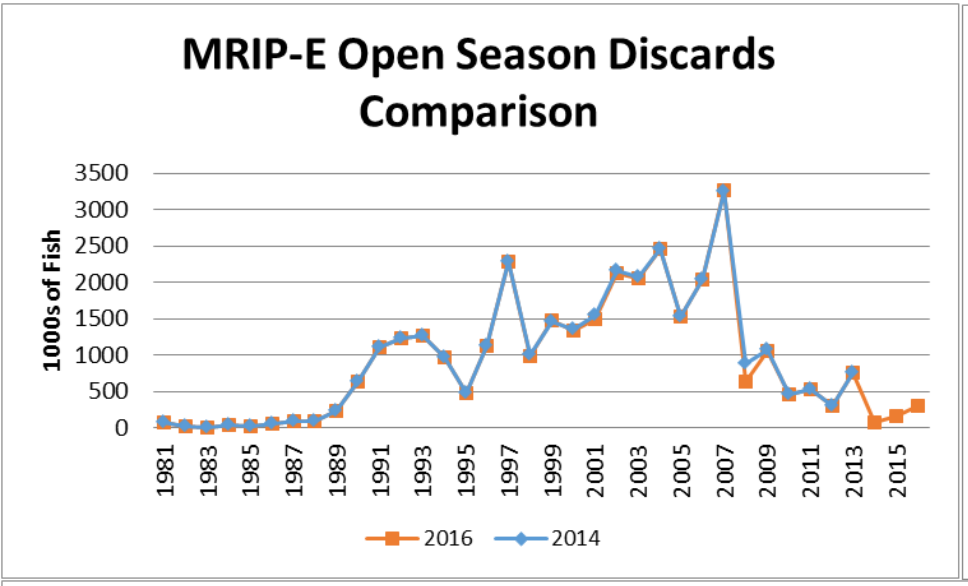


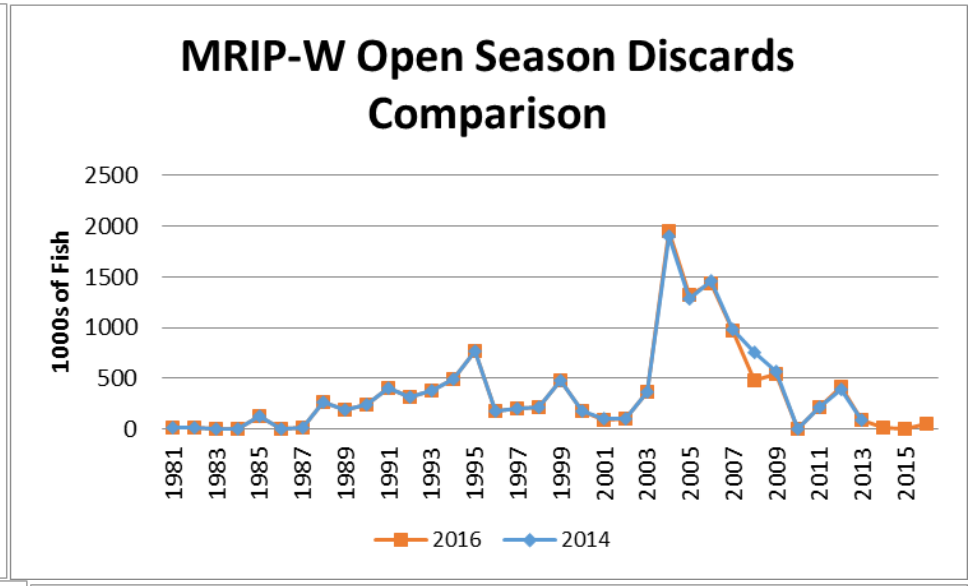


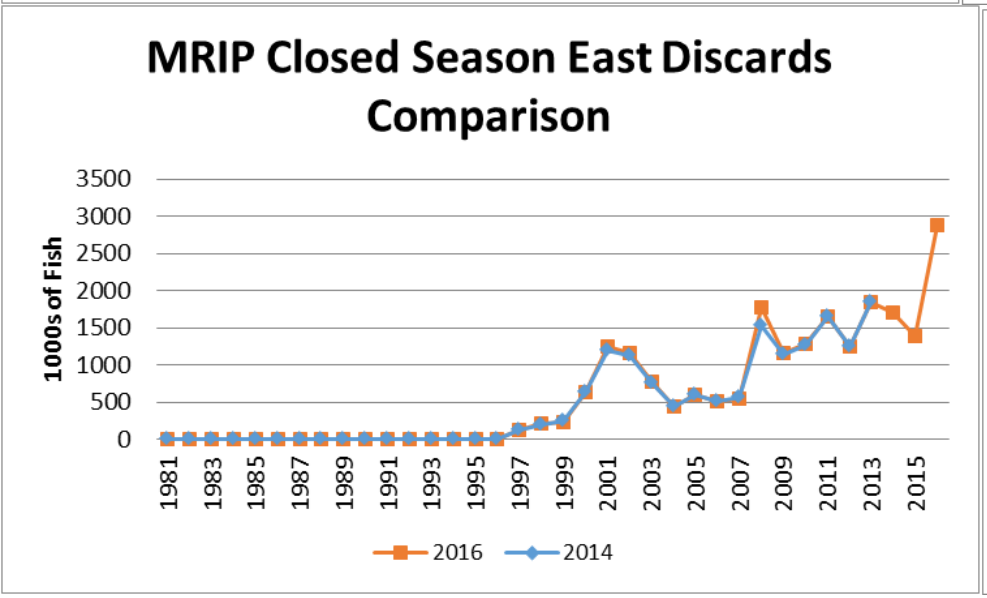


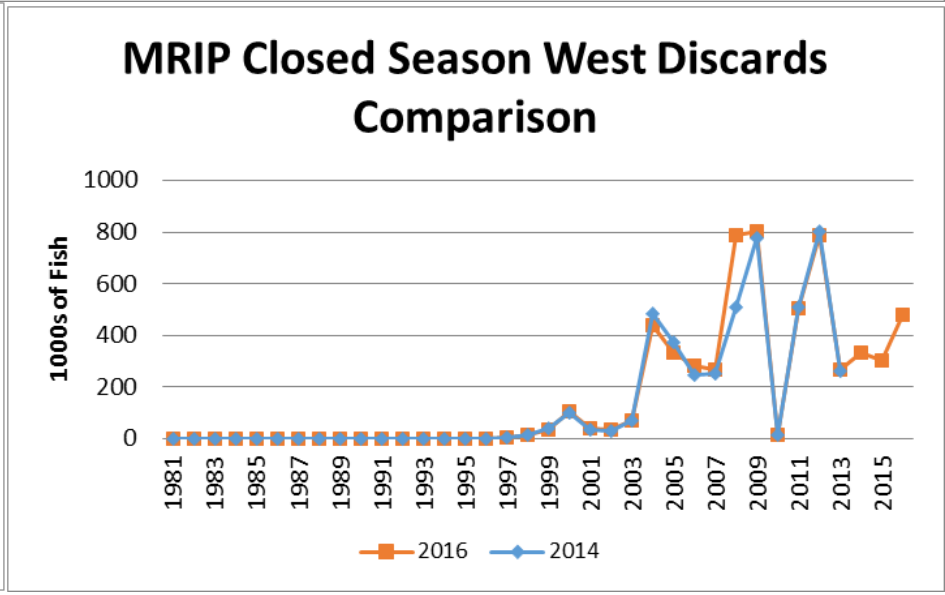


MRIP Discards



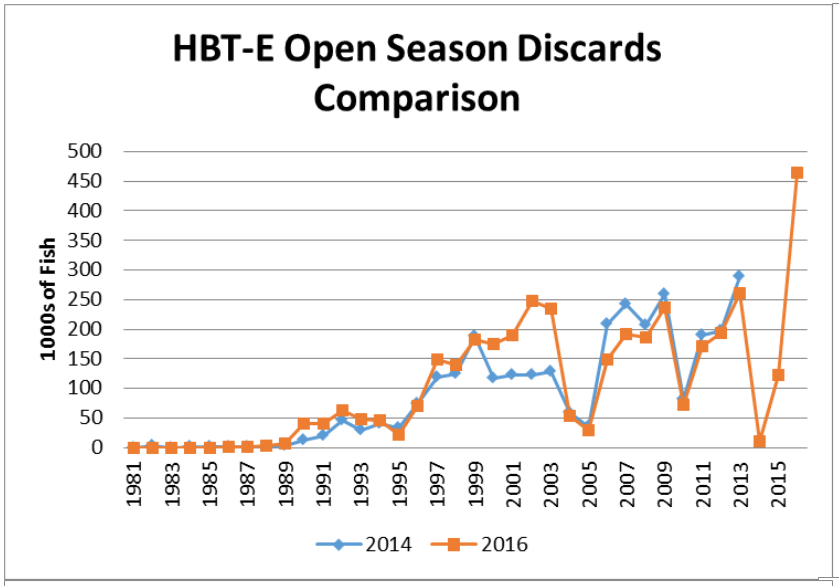


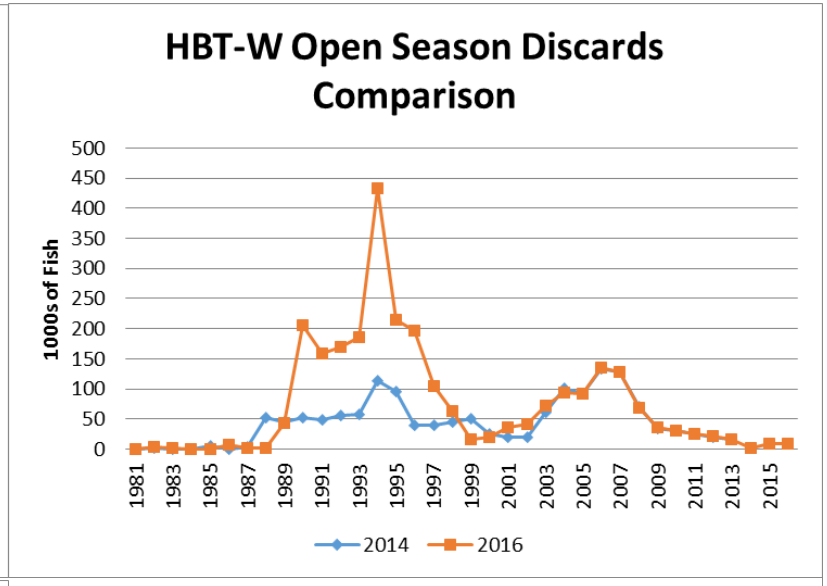


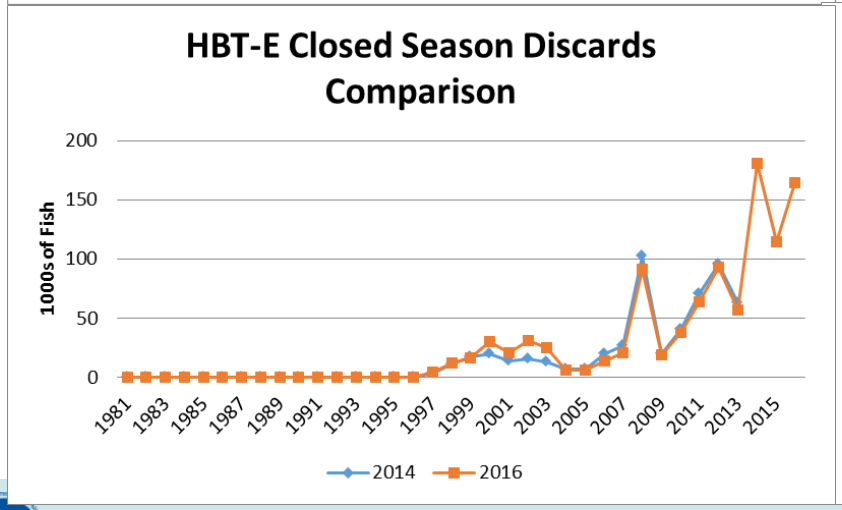


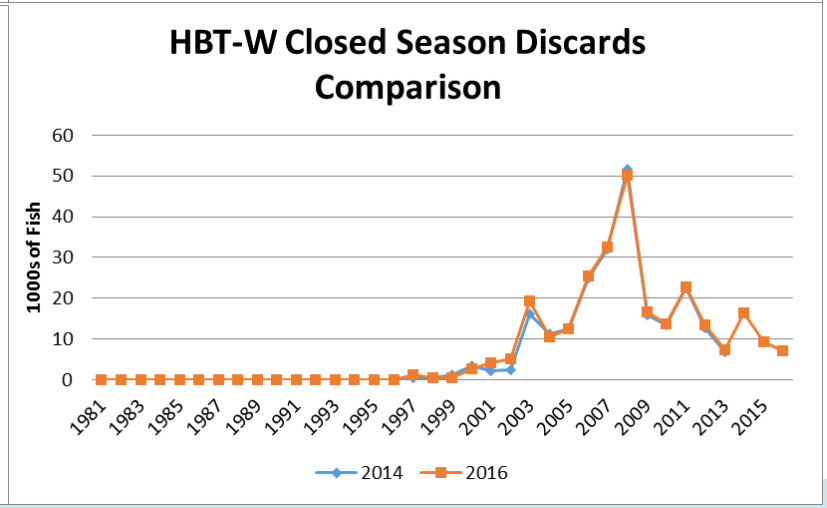
Headboat Discards--Continuity

Change in MRFSS proxy prior to 2004 due to updated data resulting in new discard ratios



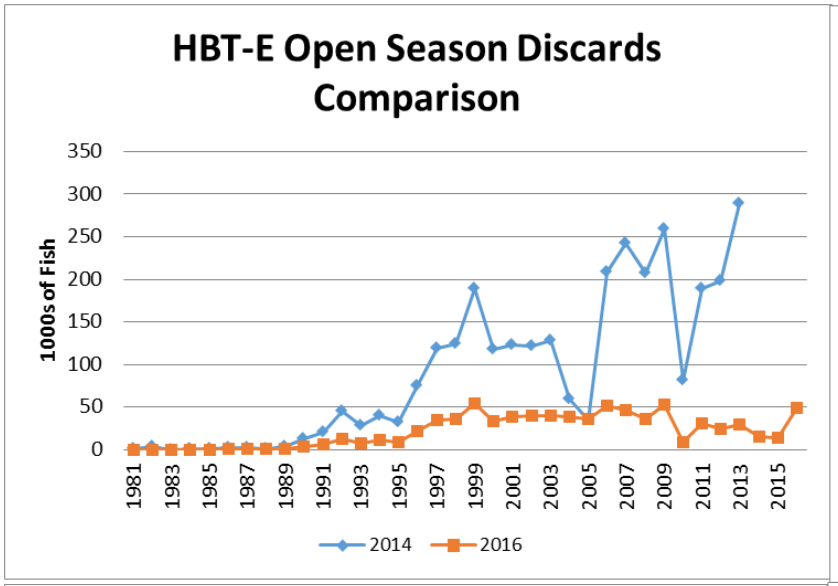


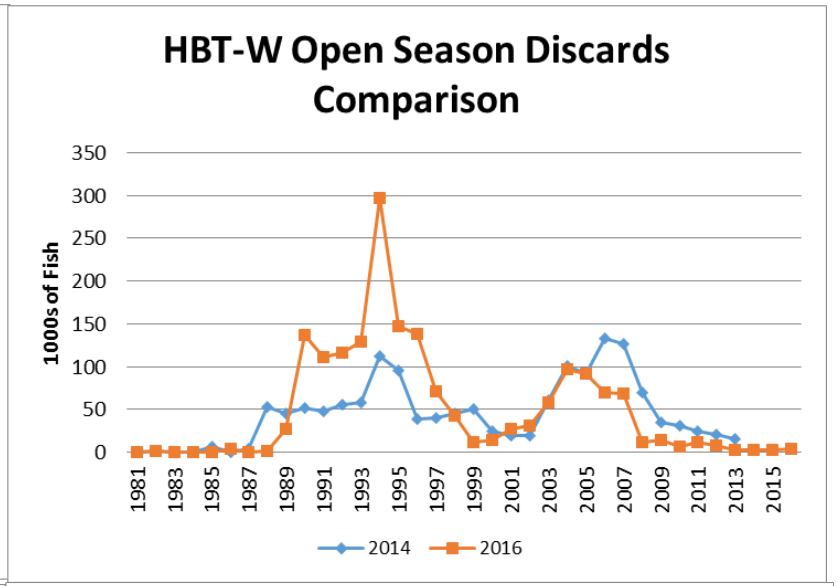


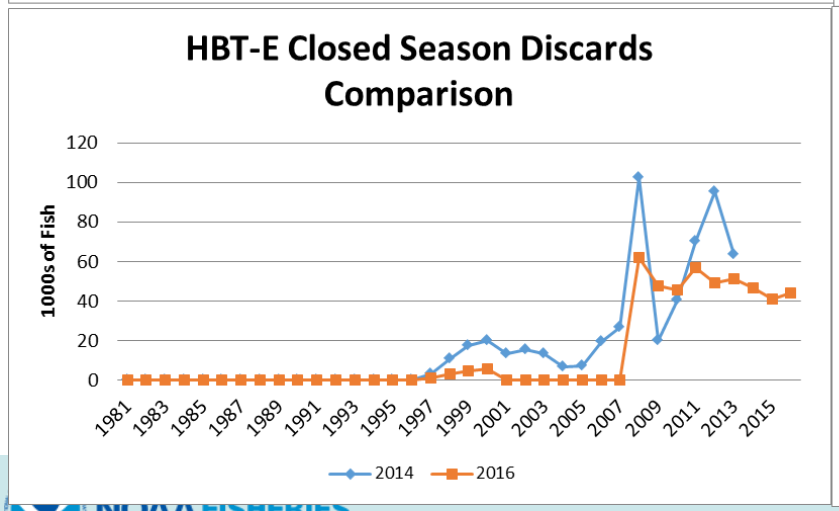


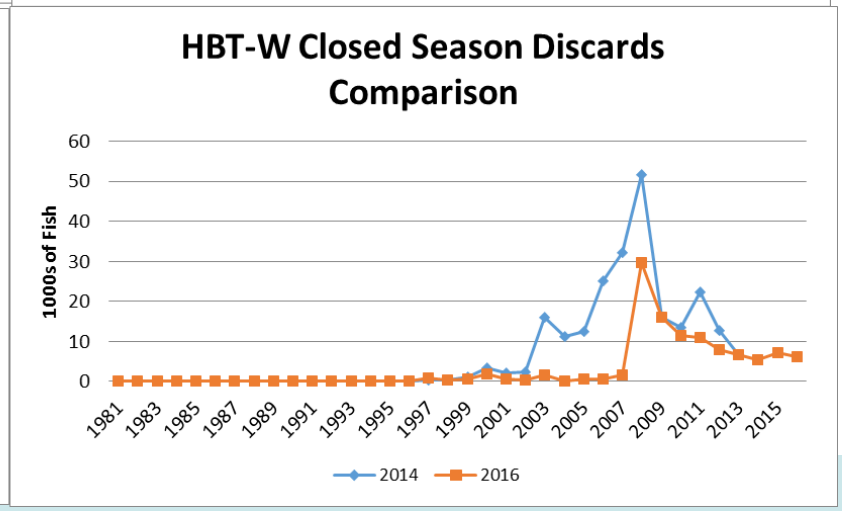
Headboat Discards--Recommended

Mean MRIP CH : SRHS discard ratio method developed in SEDAR 28

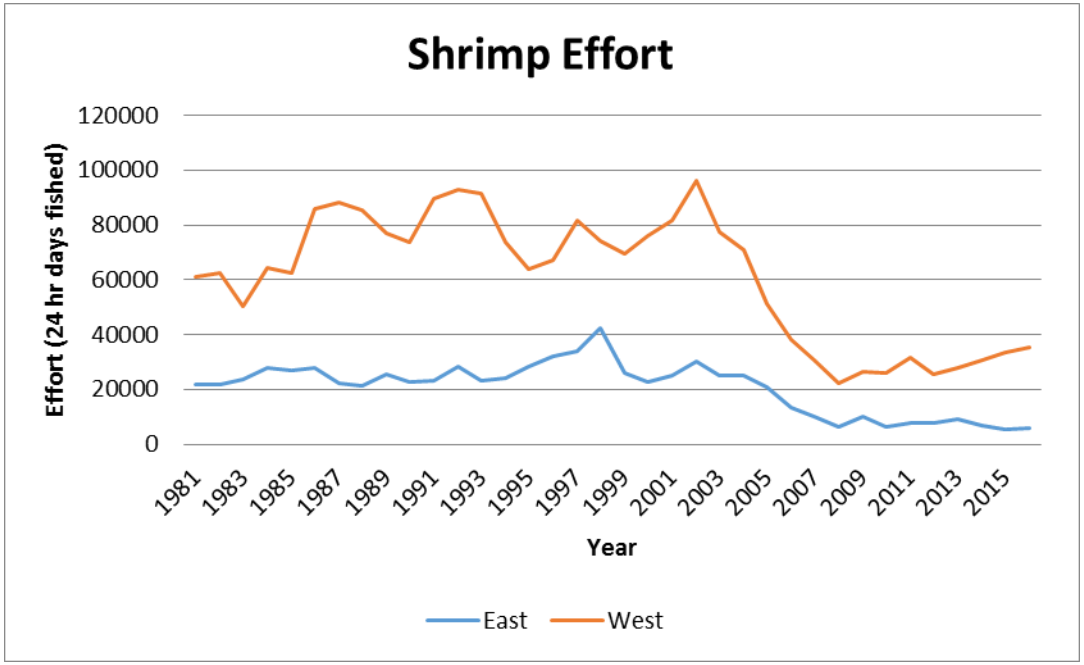


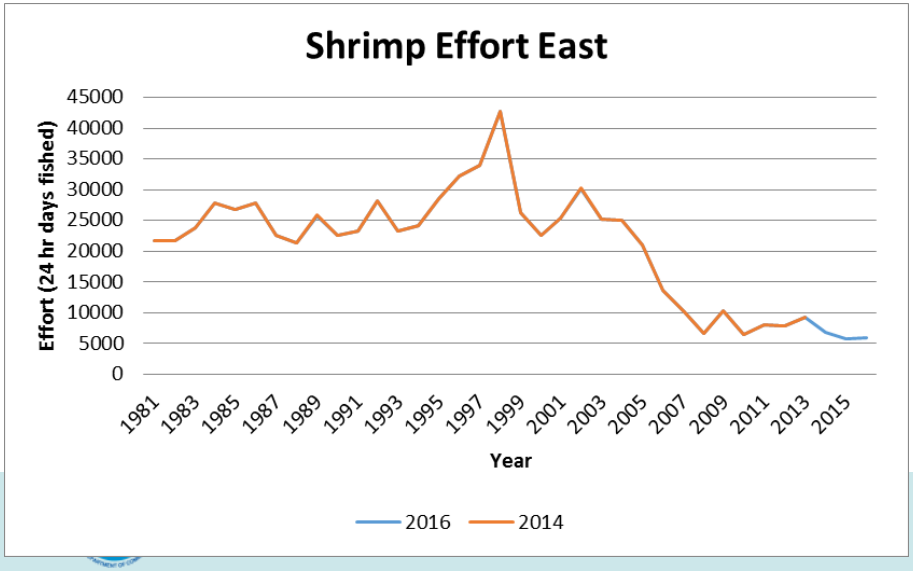


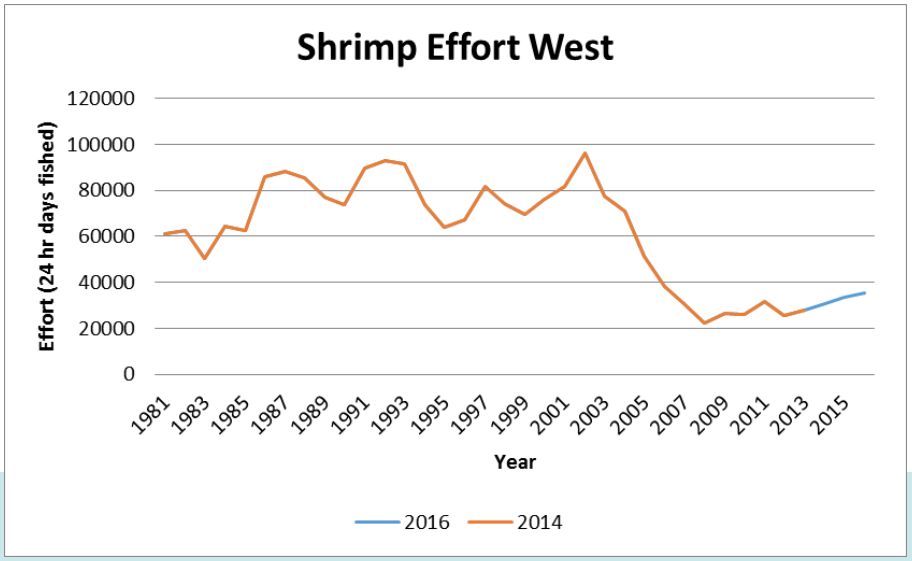




Shrimp Effort

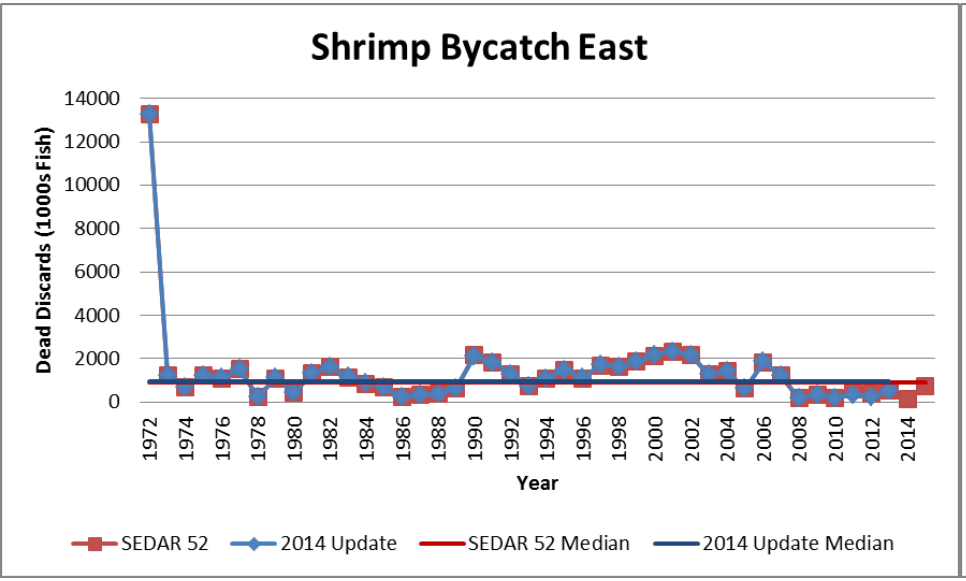


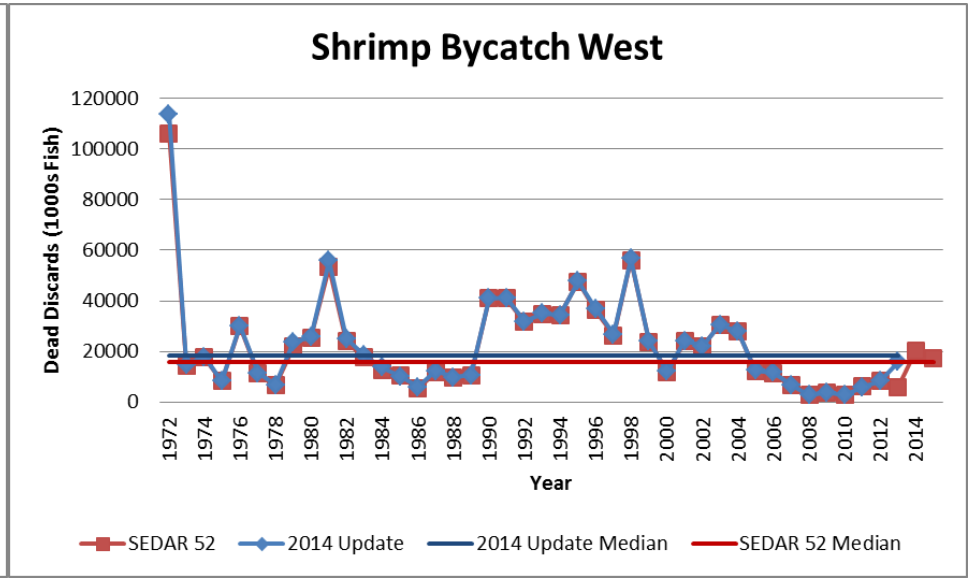




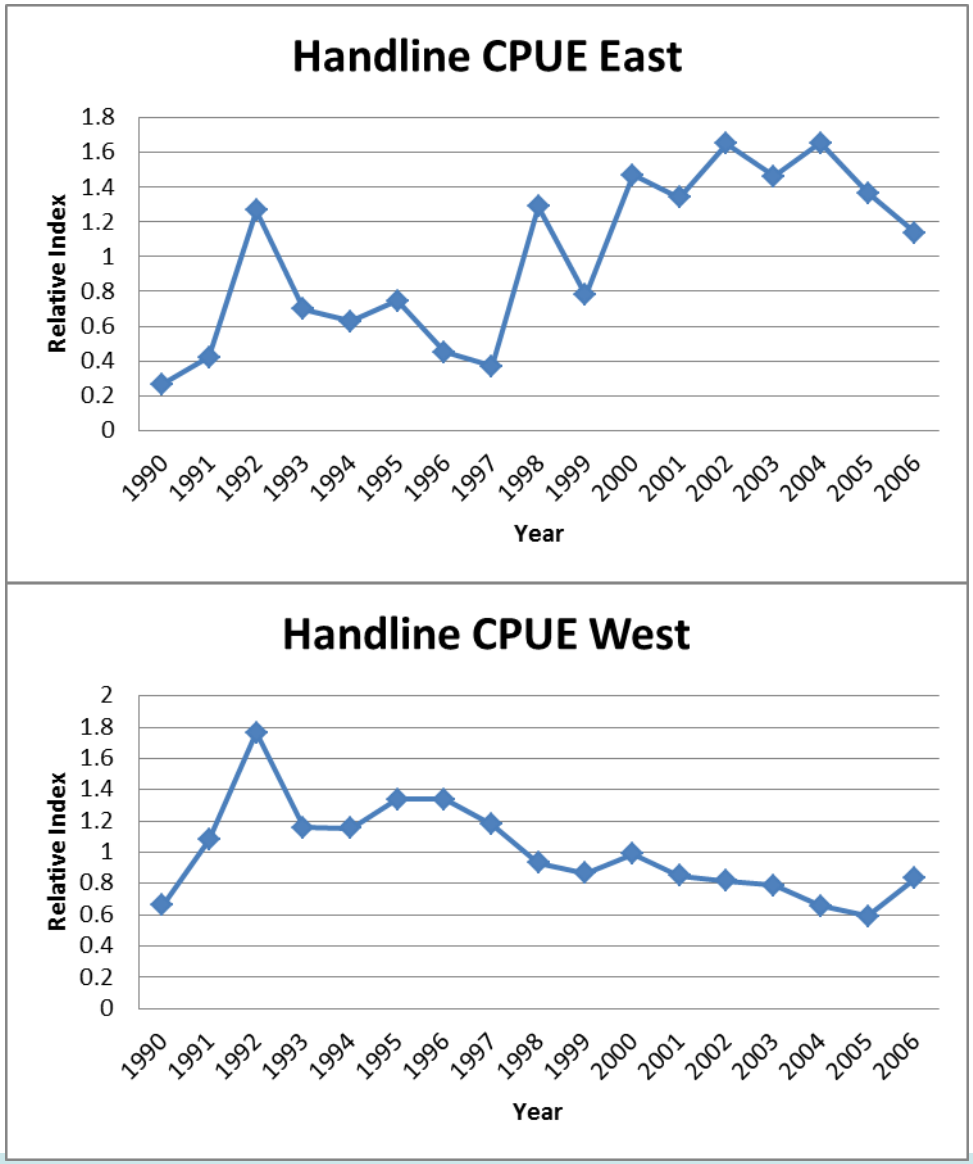
Shrimp Bycatch

- 2016 values not deemed representative and excluded from analysis
- Little impact due to superyear approach

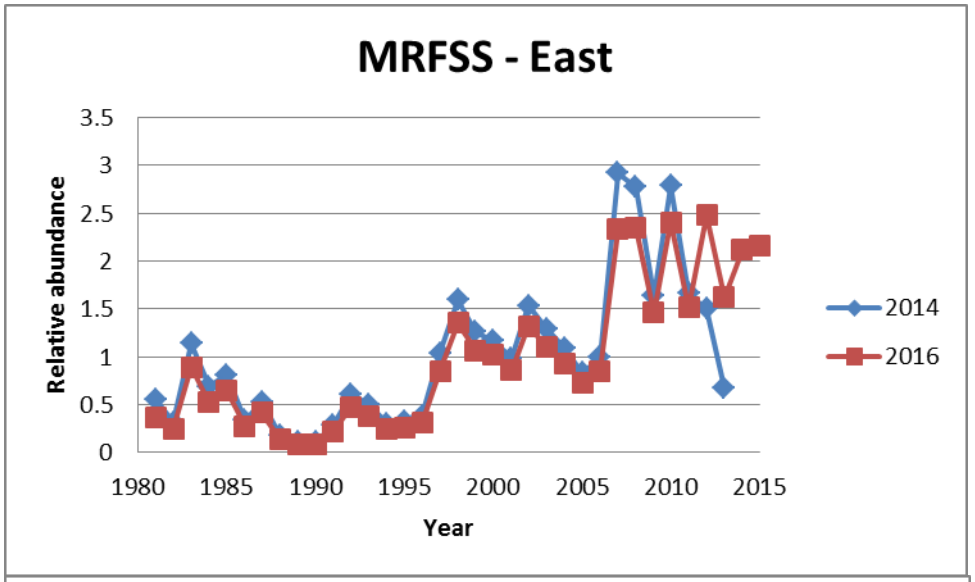


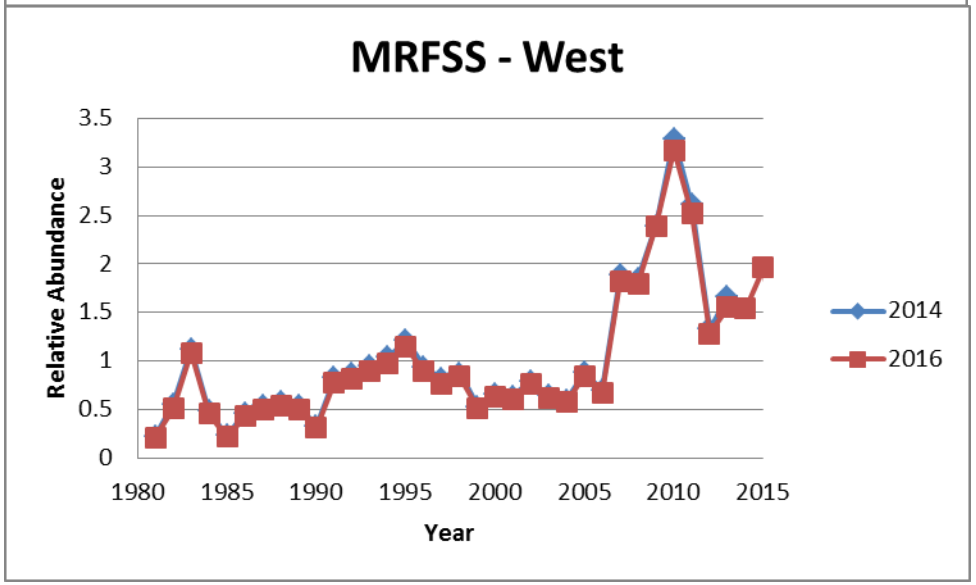


CPUE—HL (unchanged)



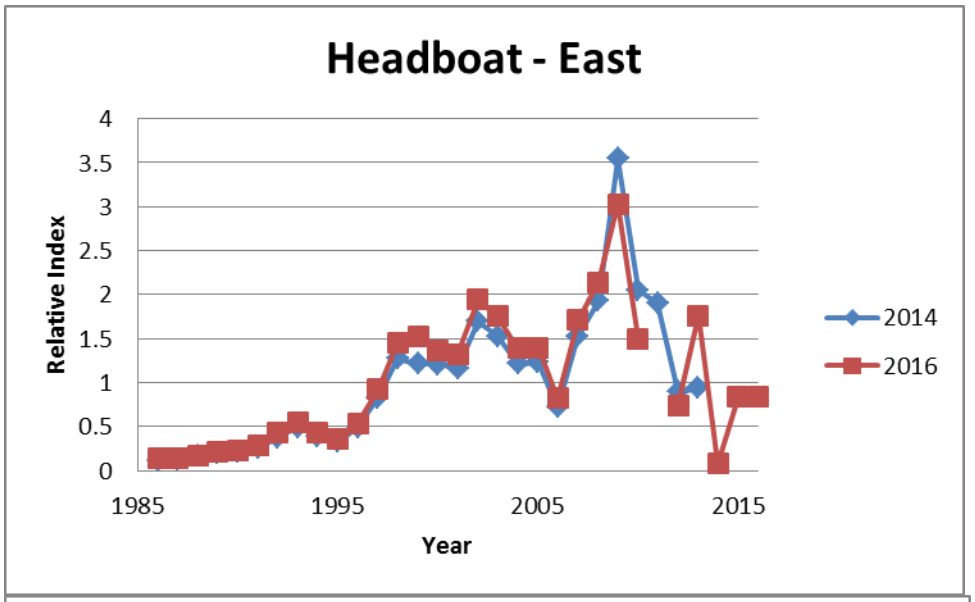
CPUE—MRFSS

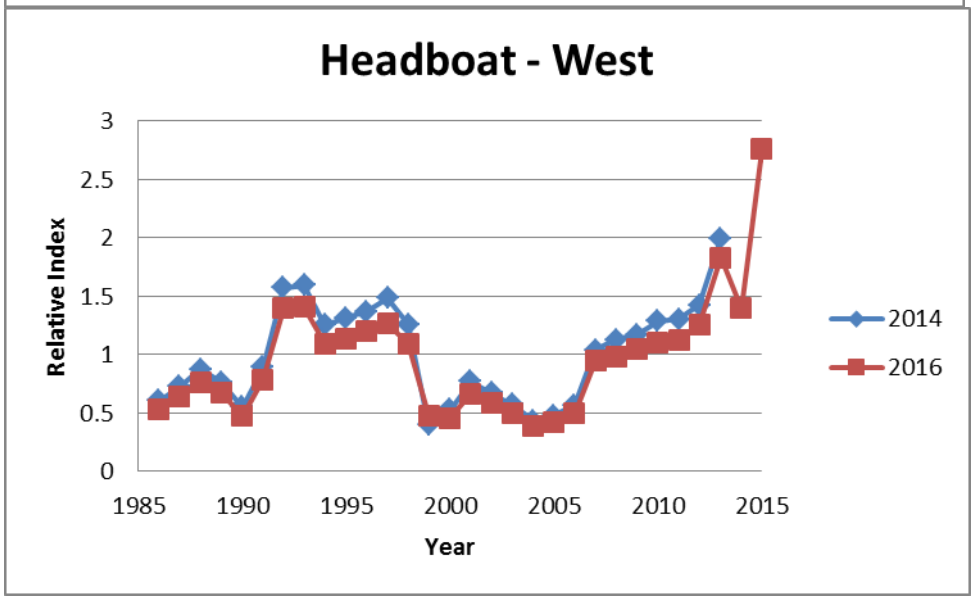




MRFSS-East: previous index did not include certain regulations in 2012-2013

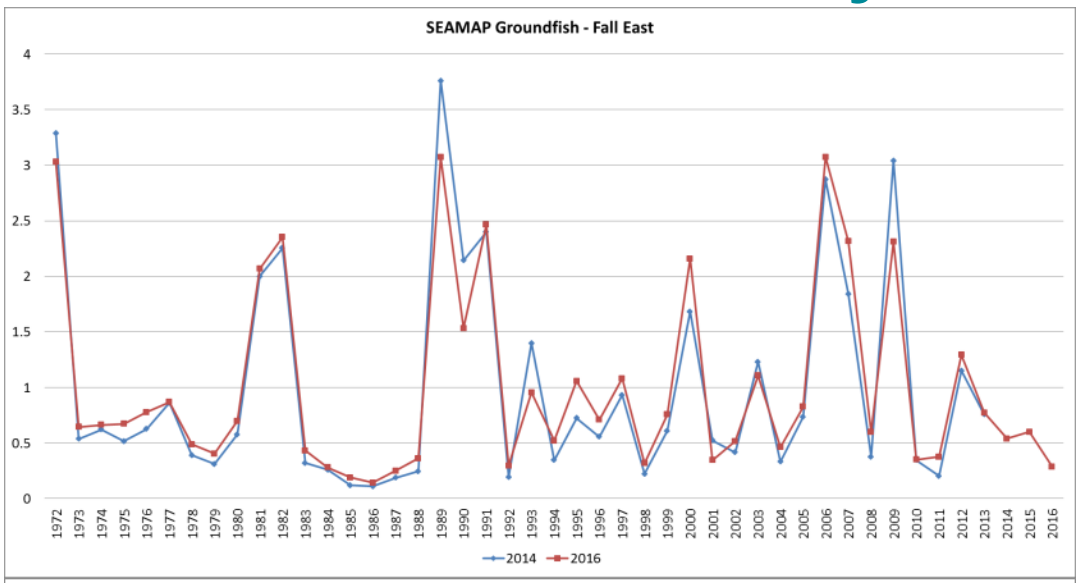
CPUE—Headboat

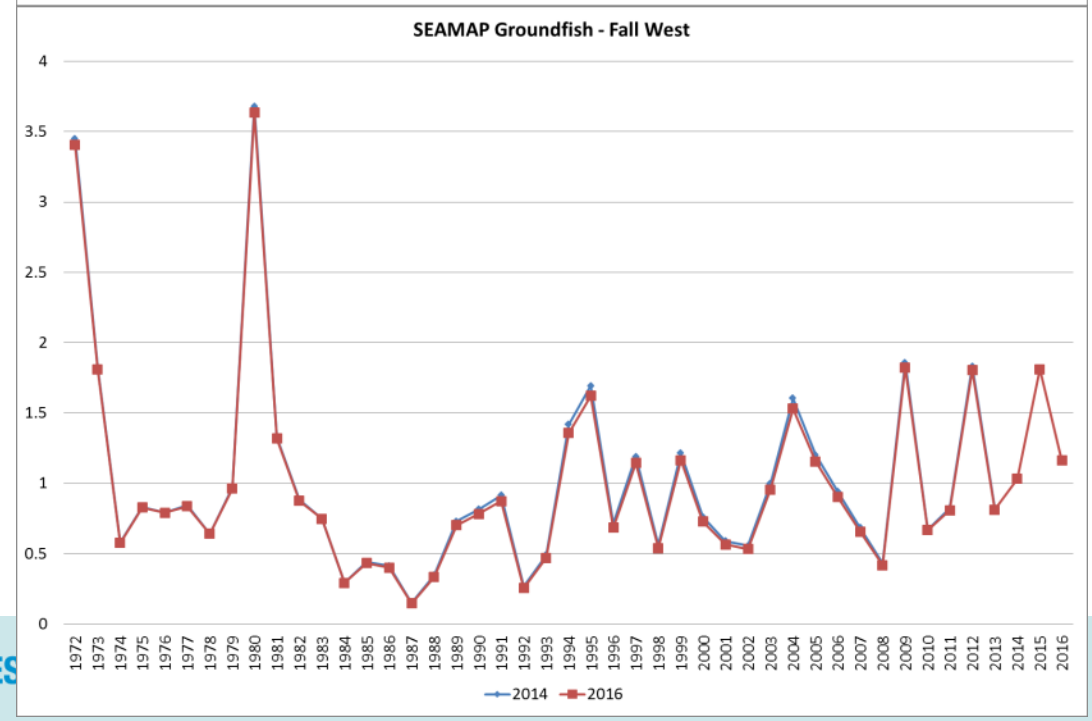




HBT-East: 2011 there are no trips with zero catch and therefore can't estimate CPUE based on the procedures recommended during SEDAR31

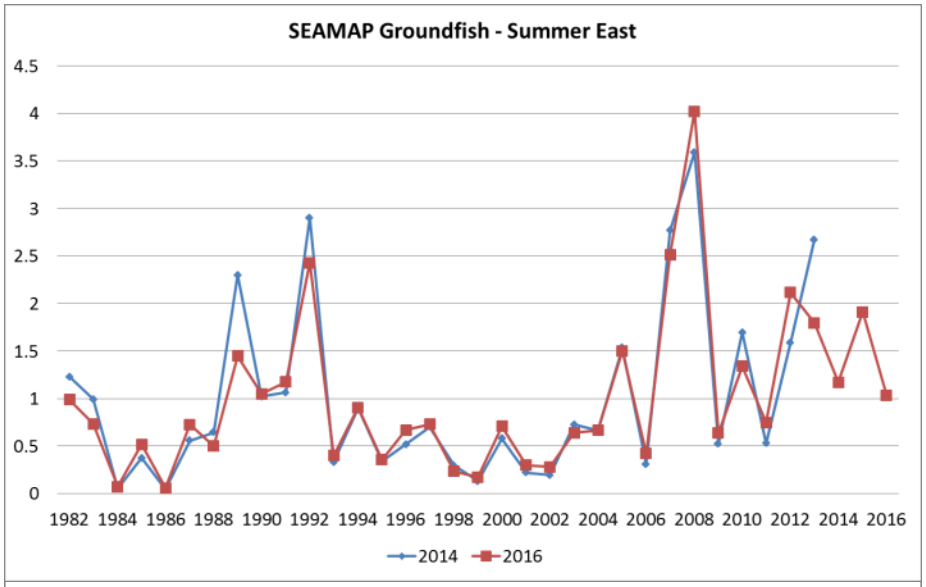
SEAMAP Fall Groundfish Survey

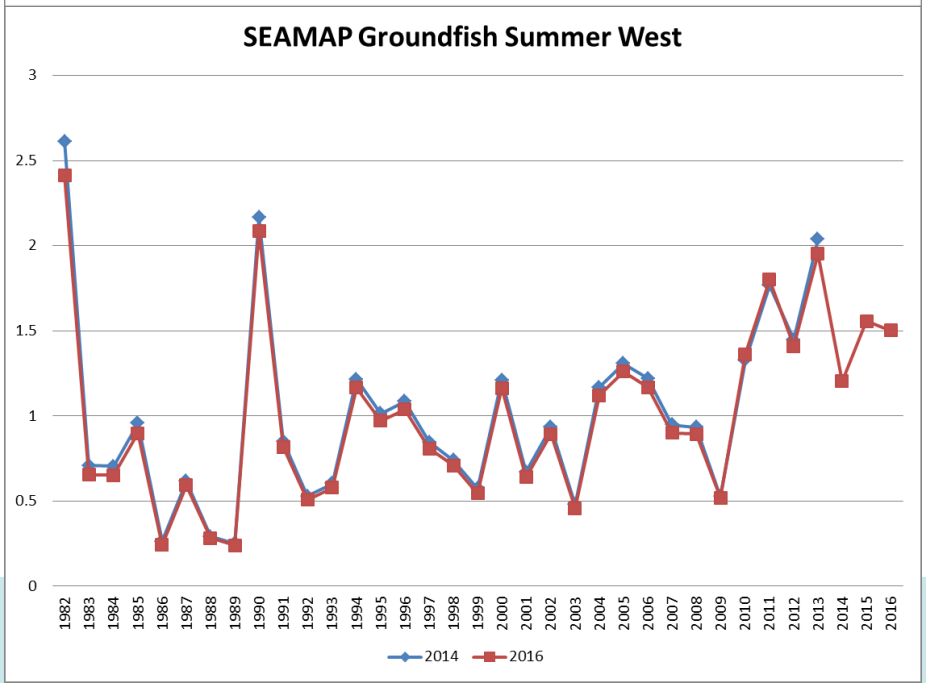




NOAA FISHERIES

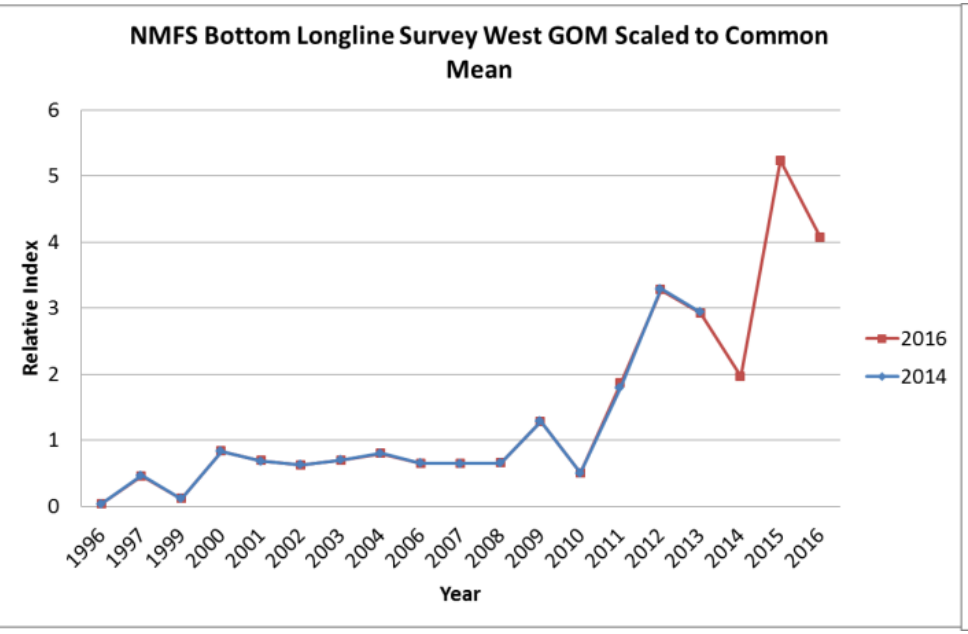
SEAMAP Summer Groundfish Survey

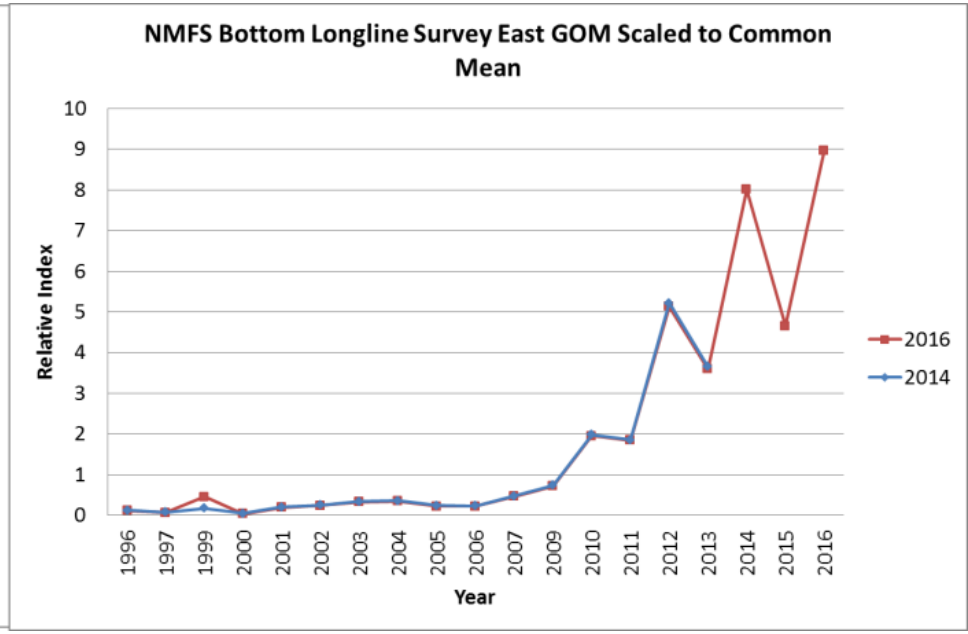




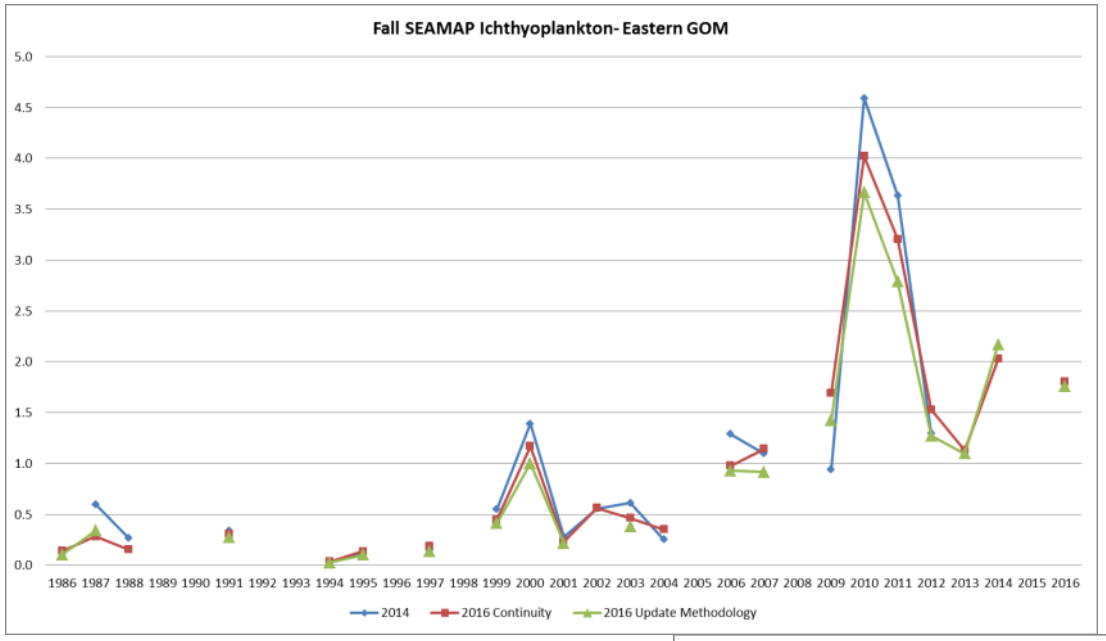
NOAA FISHERIES

NMFS Bottom LL

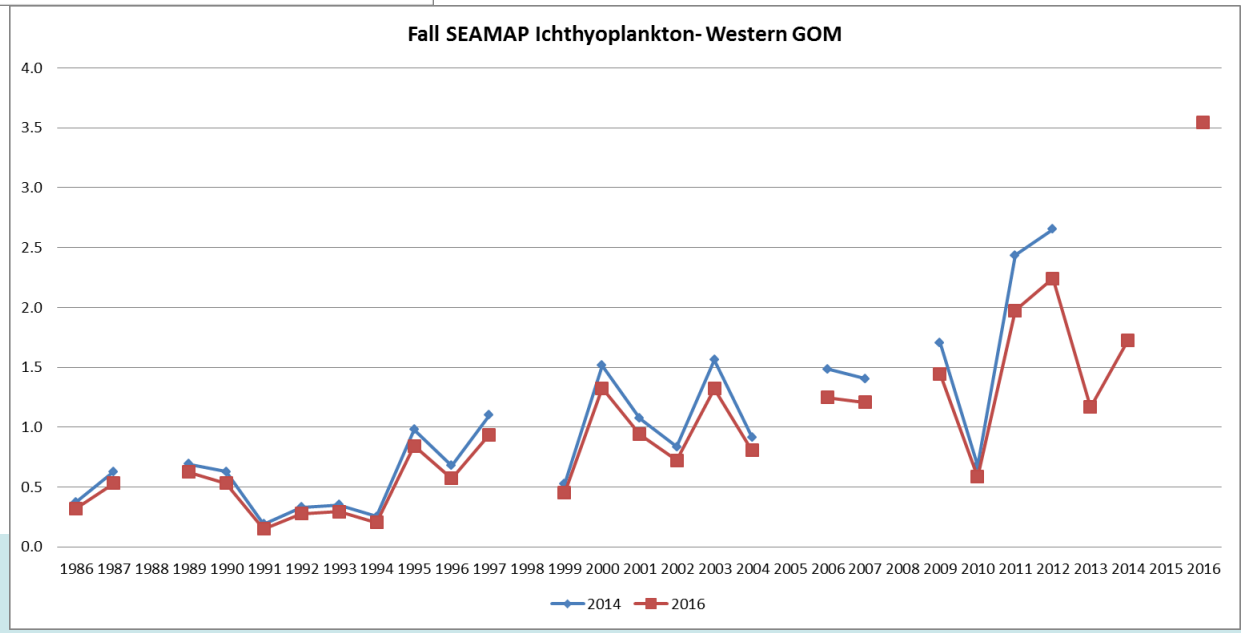




SEAMAP Larval Survey



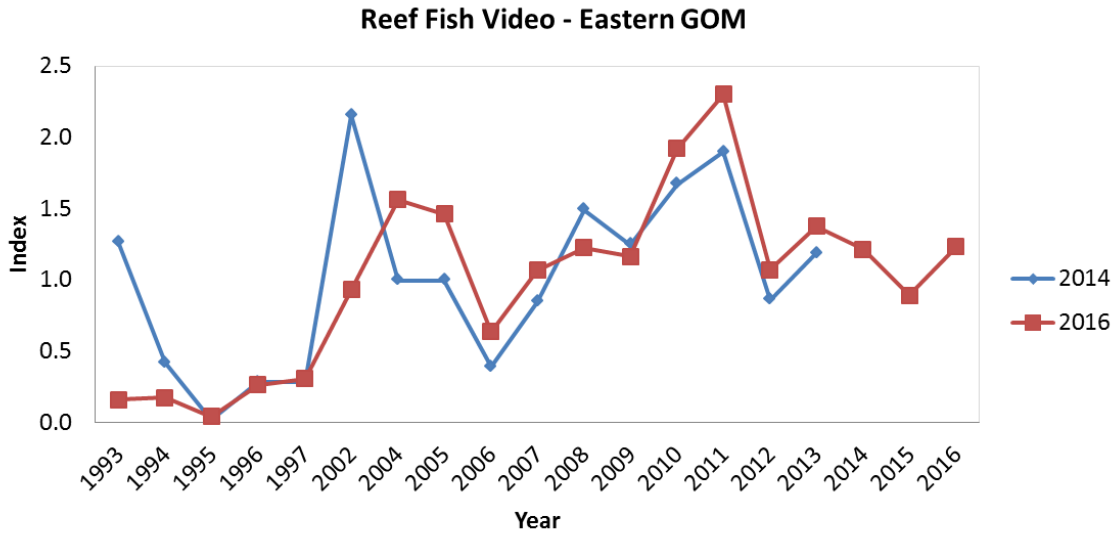
Eastern GoM Site Selection Changed in 2016

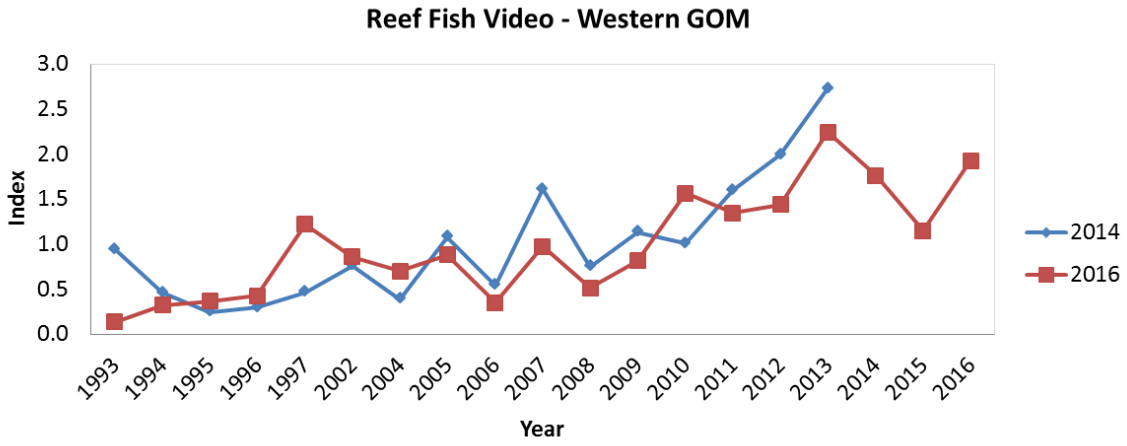


NOAA FISHERIES

Video Survey

Discrepancies in indices are largely due to updated QA/QC for SEDAR 52 assessment





Summary of Data Updates

- Don't use unusually large 2016 shrimp bycatch data
  - Not likely to impact model due to super-year approach which fits median of timeseries
- Method for HBT discards?
  - Use recommended for final and continuity
- Method for commercial discards?
  - Use landings corrected (recommended) discards for base and continuity model
- Update recreational discard mortality (11.8%) for both East and West (open+closed season) post 2008 (post-venting implementation)
- Truncate MRIP or HBT CPUE?
  - Truncate HBT-E in 2013 (use for continuity and base)
  - Truncate MRFFS in 2013 (use for continuity and base)

‘Continuity’ Model

Model Overview:

- **MODEL (SS3) AND STRUCTURE SAME AS SEDAR 31**
- Age structured model: ages 0 to 20+, 1872-2016
- 2 region model : East and West of Mississippi River
- Time-varying parameters
  - **Recruitment** – higher productivity in recent years (1984-2016); time-varying apportionment to region
  - **Selectivity** to account for implementation of IFQ program and circle hooks
  - **Retention** to account for changes in size limits and IFQ
  - **Discard mortality** to account for venting
- Shrimp bycatch treated as a 'super-year'
  - Fit median bycatch not yearly bycatch
  - Use shrimp effort to scale F

Model Review: Data Inputs

Fishing fleets

Directed fleets (landings)

- Com Handline (E: 1872-2016) (W: 1872-2016)
- Com Longline E/W (1980-2016)
- MRFSS/MRIP E/W (1950-2016)
- Headboat E/W (1950-2016)

Directed fleets (discards)

- Com Handline (1990-2016)
- Com Longline E/W (1990-2016)
- MRFSS/MRIP E/W (1981-2016)
- Headboat E/W (1990-2016)

Bycatch fleets (discards only)

- Com Closed Season E/W (1991-2016)
- Rec Closed Season E/W (1997-2016)
- Shrimp Bycatch E/W (1972-2015)

Indices of abundance (18)

Fishery dependent (8)

- Commercial Handline E/W (1990-2006)
- MRFSS/MRIP E/W (1981-2013)
- Headboat E/W (1986-2013/16)
- Shrimp Fishing Effort E/W (1950-2016)

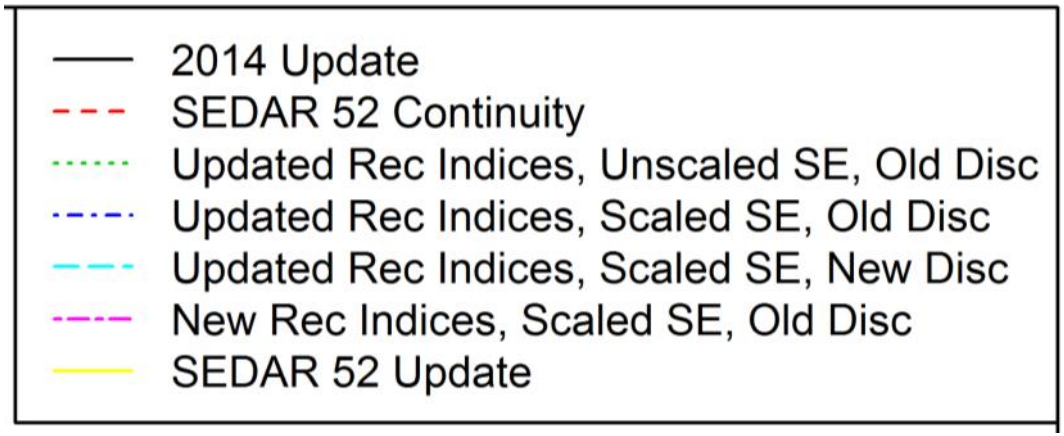
Fishery independent (10)

- SEAMAP Video E/W (1993-2016)
- SEAMAP Plankton E/W (1986-2016)
- SEAMAP Summer Groundfish E/W (1982-2016)
- SEAMAP Fall Groundfish Trawl E/W (1972-2016)
- NFMS bottom longline E/W (1996-2016)

Model Changes

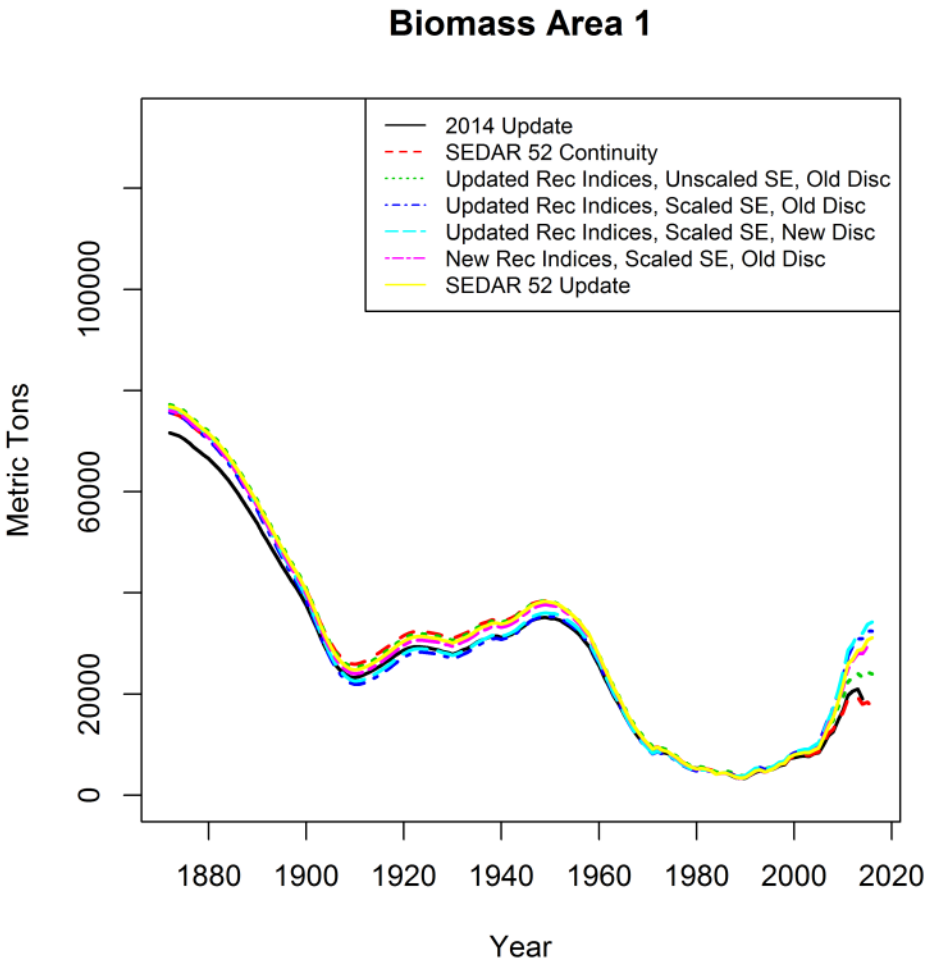
- Continuity Model Changes
  - Data:
    - Update recreational discard mortality (11.8%)
    - Update commercial discards using landings corrected method
    - Use best practices for headboat discard estimates
    - Update MRIP CPUE by truncating E+W in 2013
    - Update HBT-E by truncating in 2013
    - Use update larval index with new site selection in east
  - Assessment
    - Scale index standard errors to a common mean of 0.2

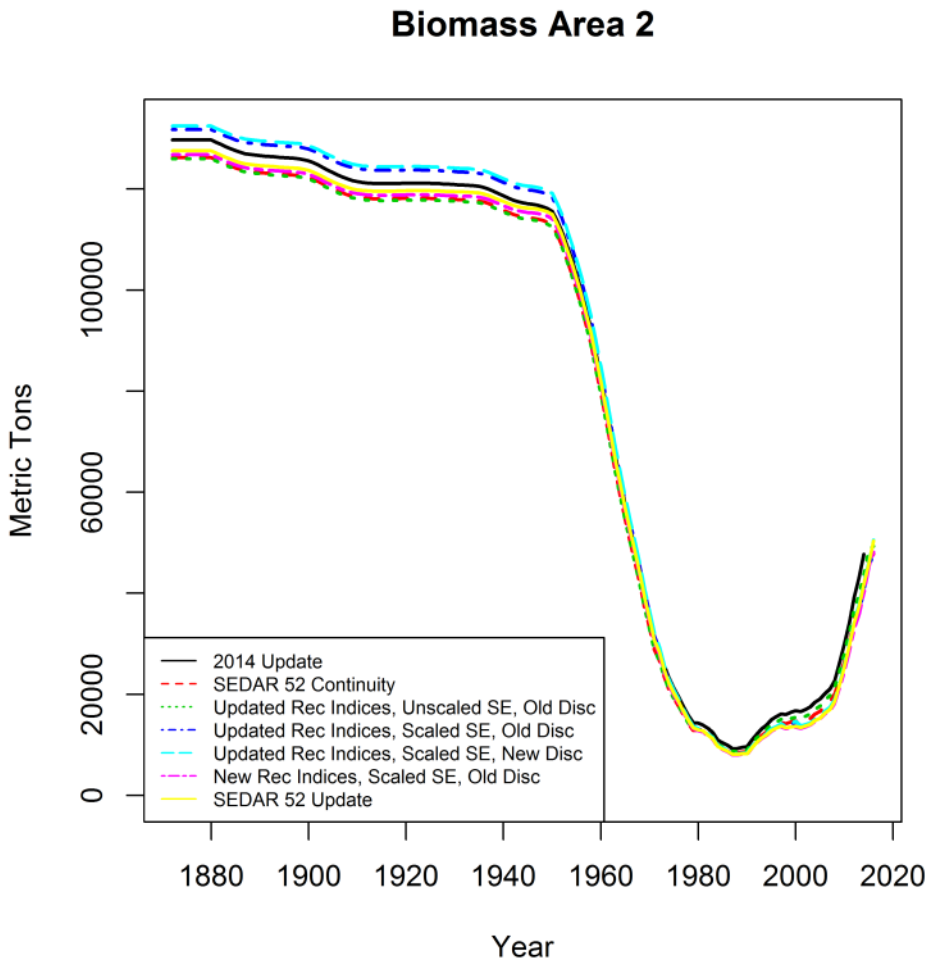
Continuity Model Runs



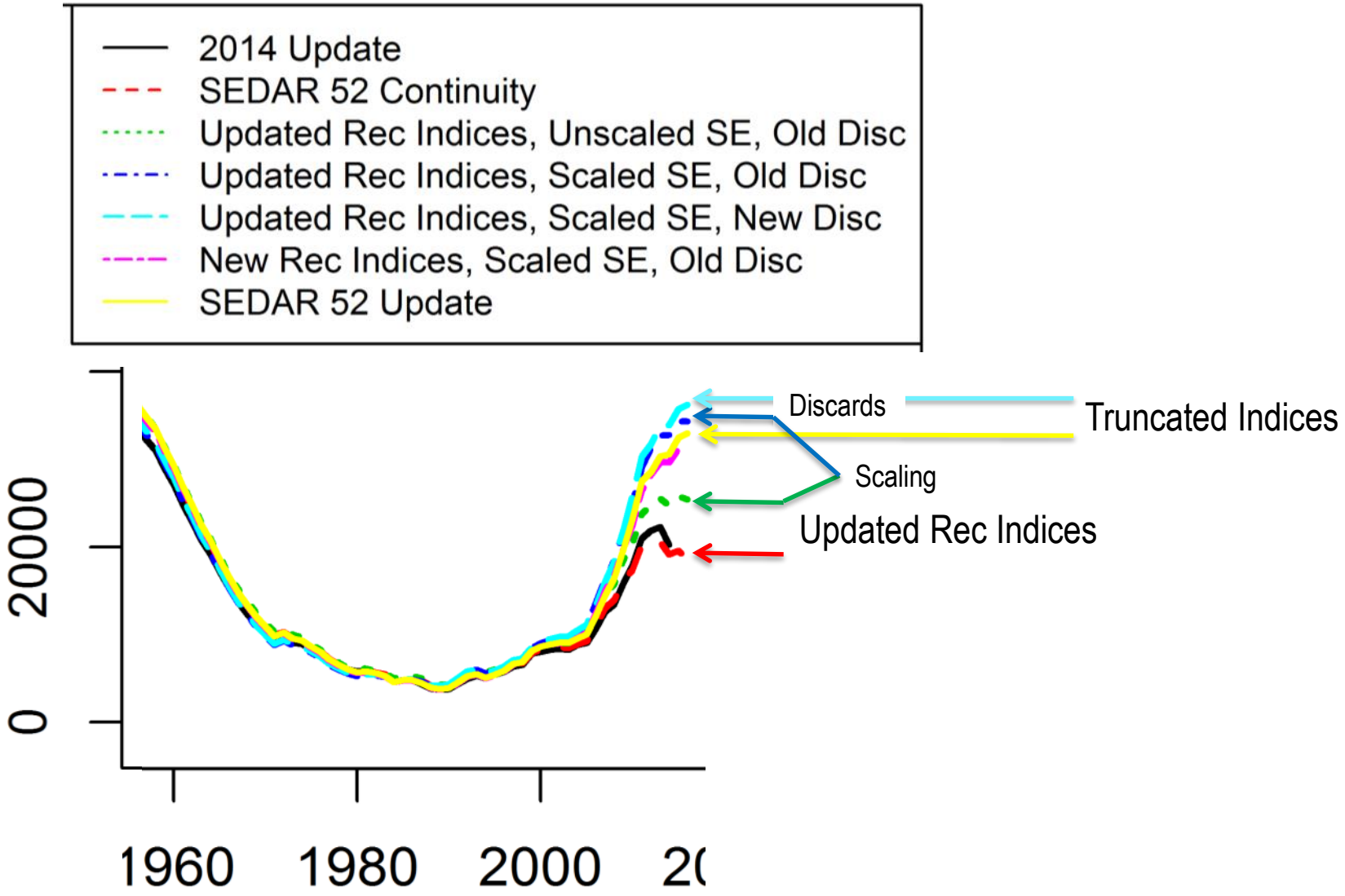
1) Final 2014 update assessment
2) Continuity run using values for recreational indices from 2014 update assessment (indices truncated in 2013), old discard methodology, and unscaled index standard errors
3) Same as 2, but with updated recreational indices
4) Updated recreational indices and old discard methodology, but with rescaled index standard errors
5) Same as 3, but with updated discard methodology
6) Same as 4, but with new (truncated) recreational index
7) SEDAR 52 best practices (updated discards, truncated indices, rescaled SEs)

Biomass Timeseries





Biomass Timeseries

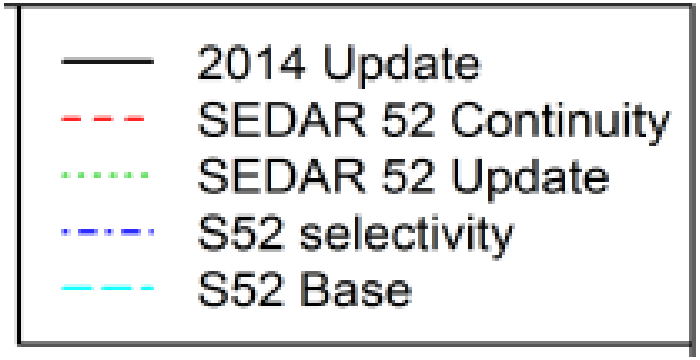


Base model results

Model Structure Changes:

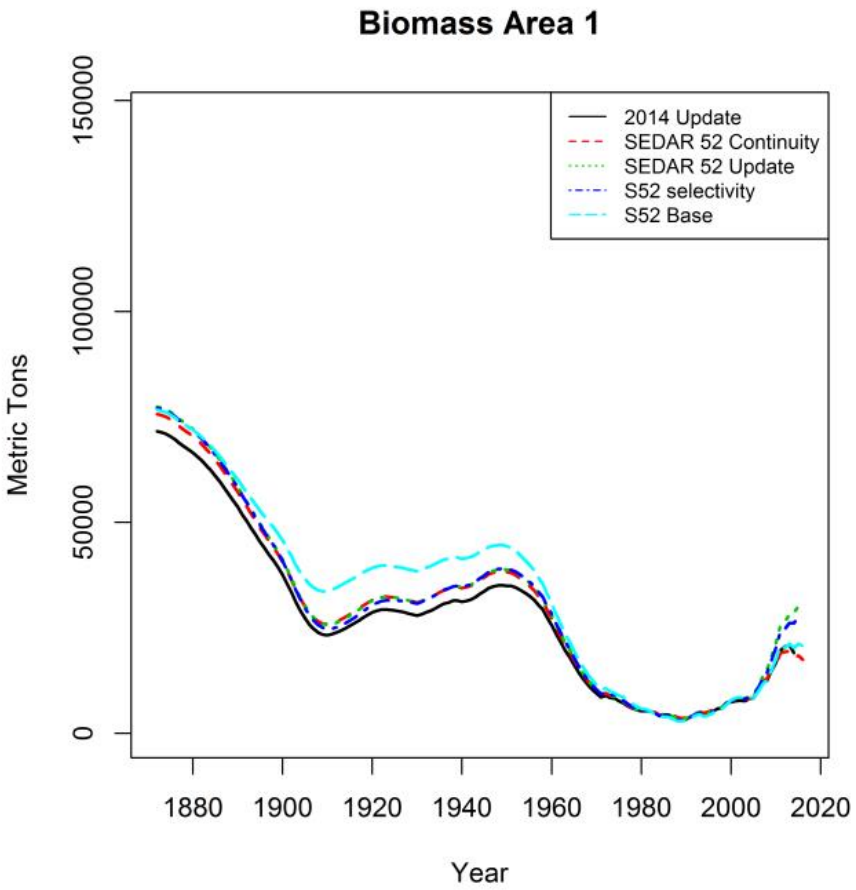
- **MODEL (SS3) AND STRUCTURE SAME AS Continuity EXCEPT:**
  - Selectivity parameters now estimated as double normal (not random walk by age)
    - EXCEPT: SEAMAP Trawl, Shrimp, and BLL same as before
    - More data available (especially at older ages) to estimate selectivity parameters
  - Reweight age composition effective sample size
    - Improved diagnostics

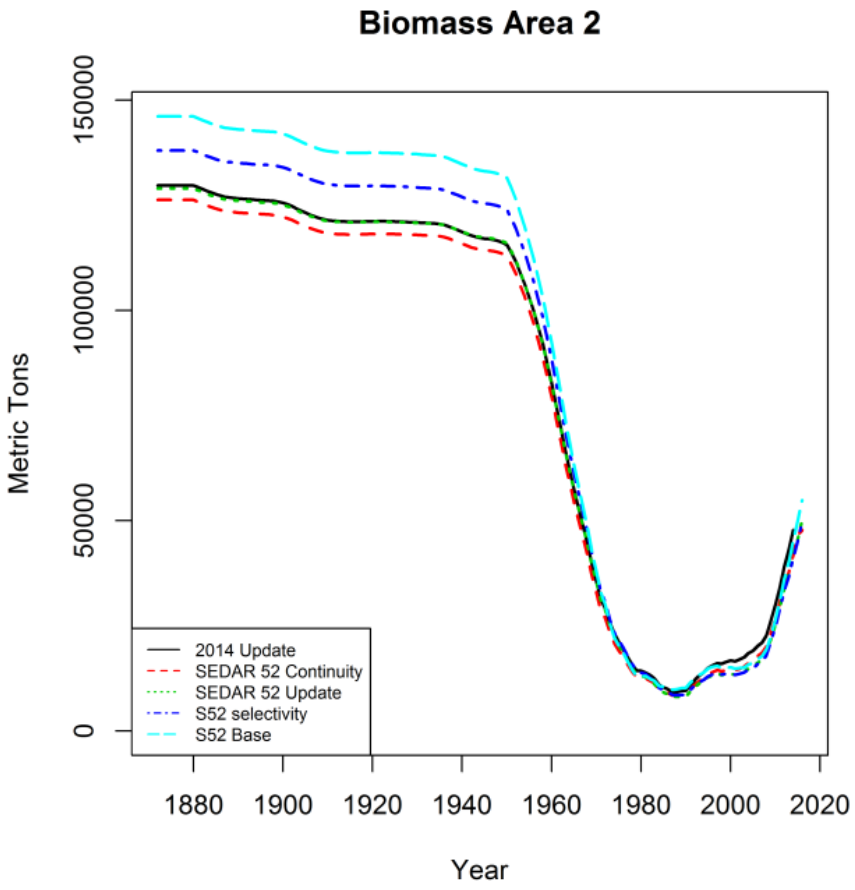
Base Model Building Runs



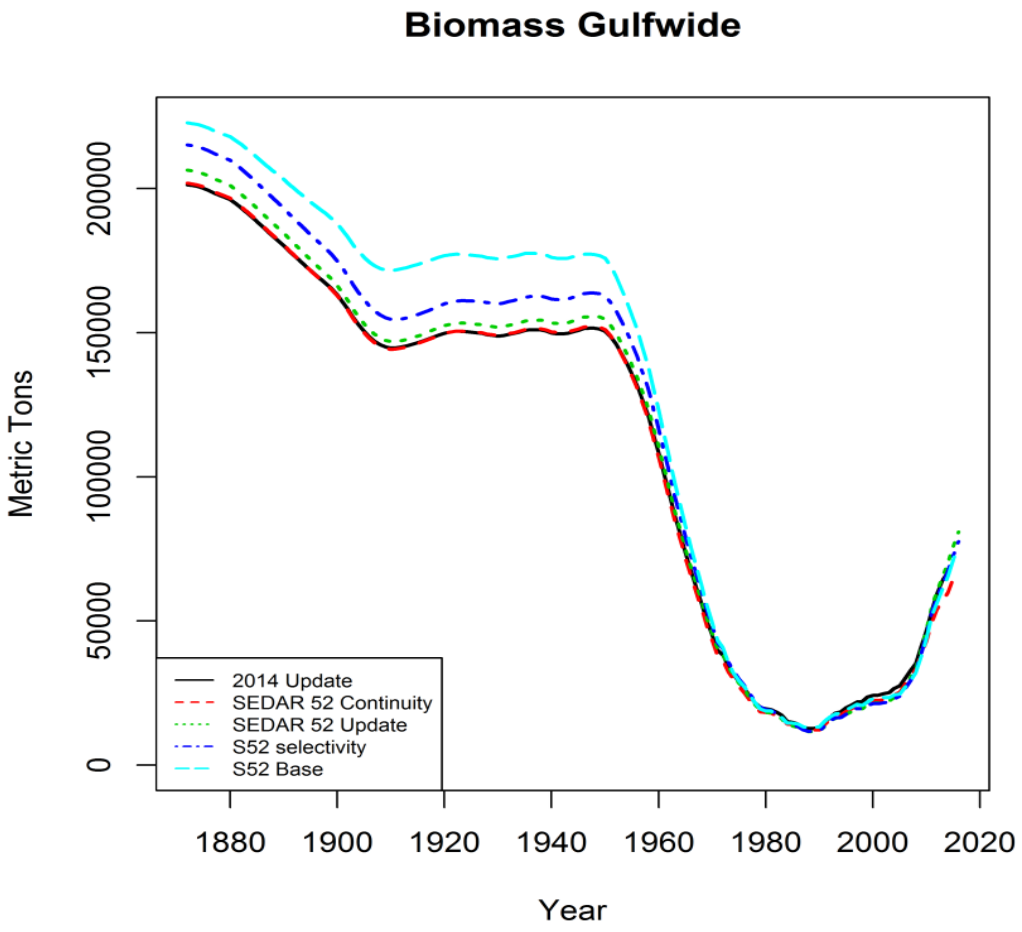
1) Final 2014 update assessment
2) SEDAR 52 Continuity
3) SEDAR 52 Update
4) SEDAR 52 with updated double normal selectivity functions
5) SEDAR 52 Base
    - Updated selectivity functions
    - Reweighted age composition effective sample sizes

Area-Specific Biomass Timeseries



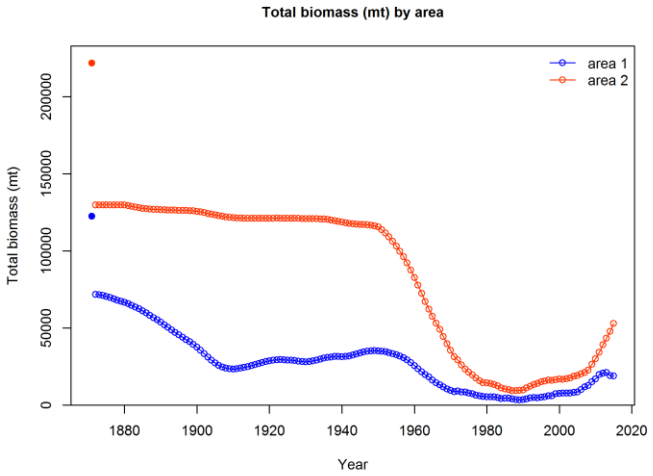


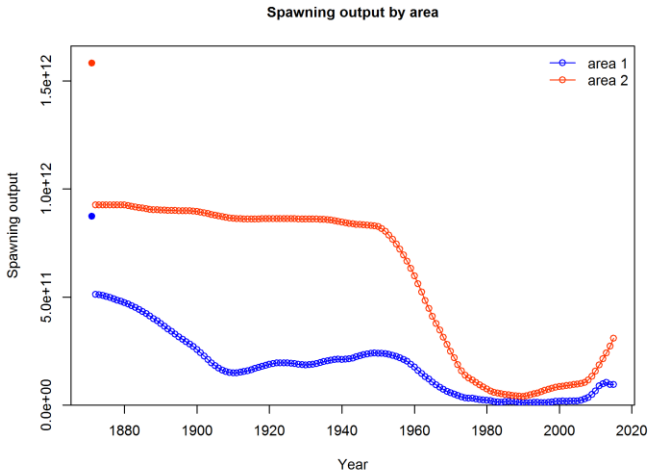
Gulfwide Biomass



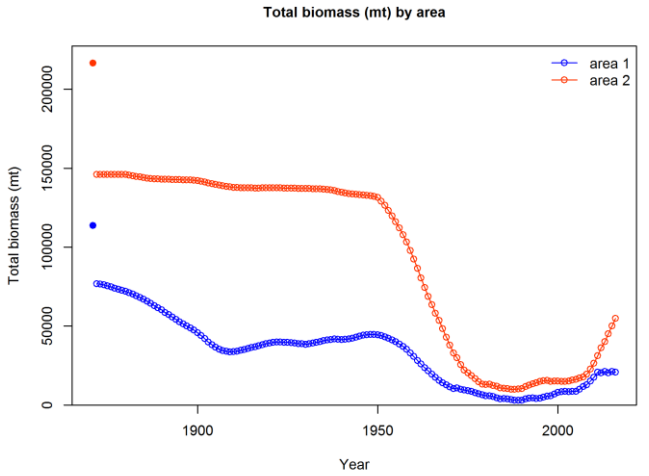
Biomass Timeseries

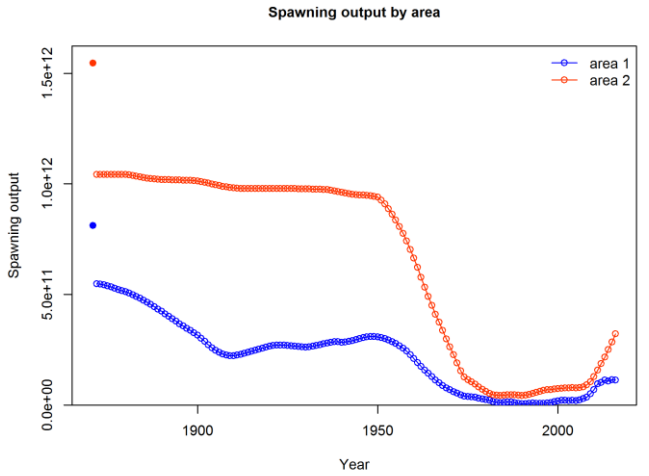
2014 SEDAR 31 Update Assessment





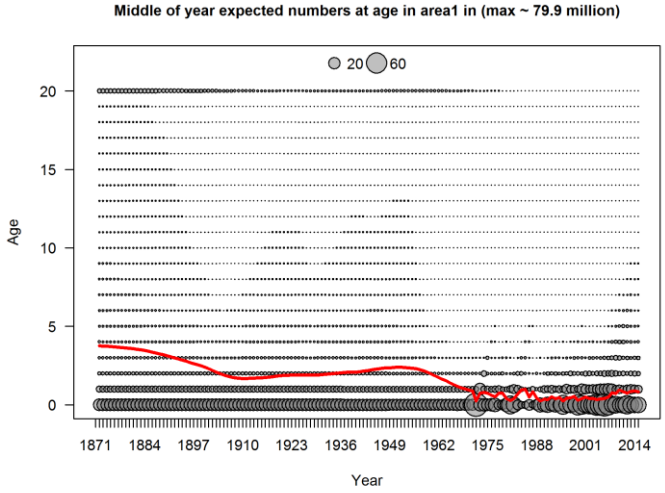
SEDAR 52

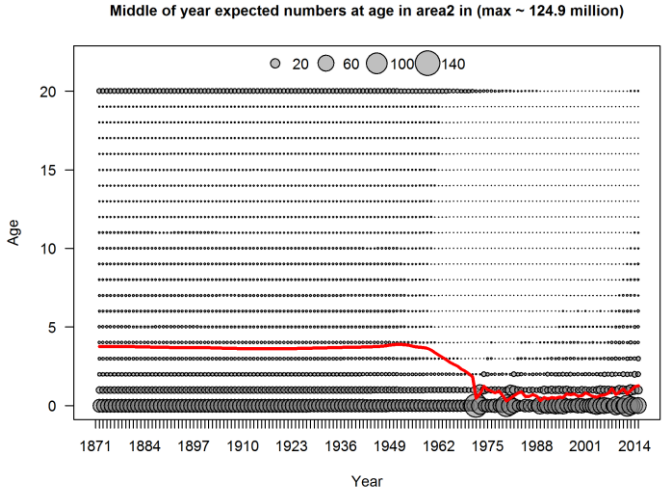




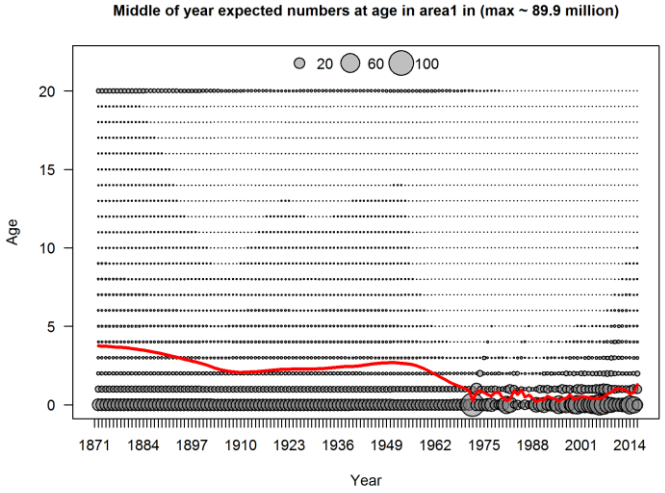
Numbers-at-Age Timeseries

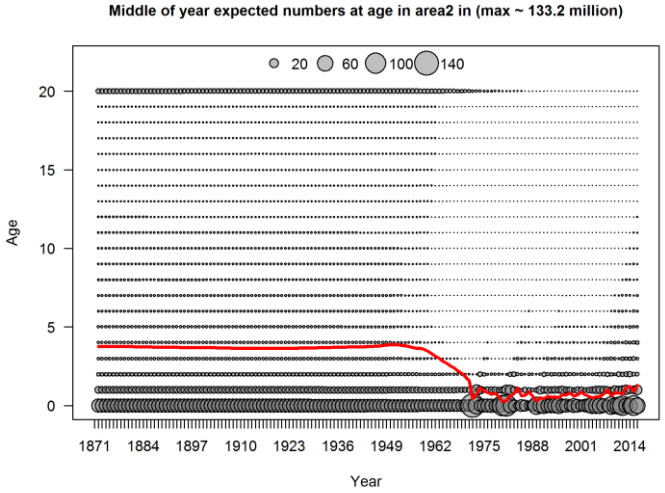
2014 SEDAR 31 Update Assessment





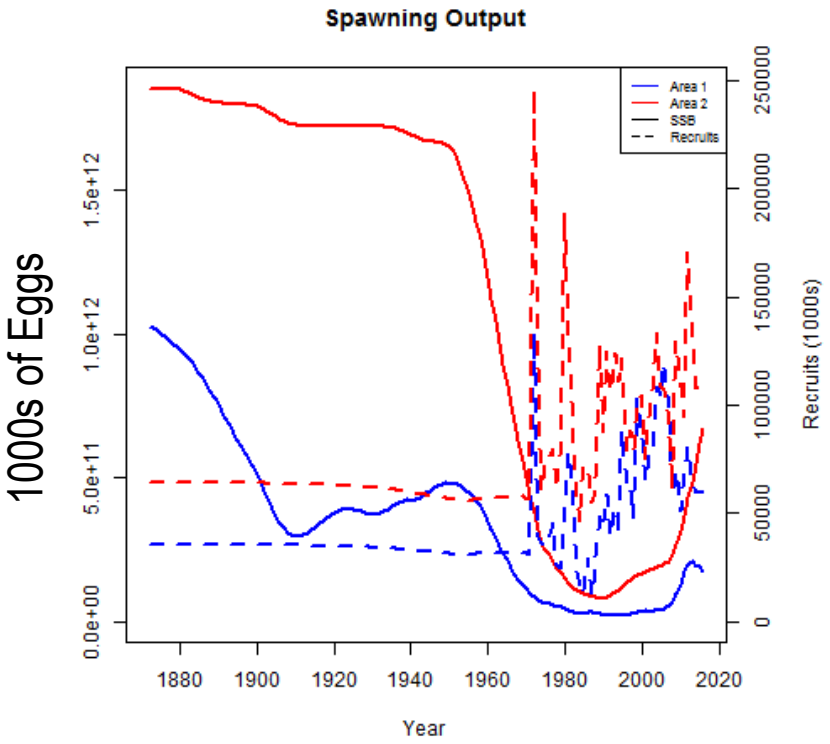
SEDAR 52



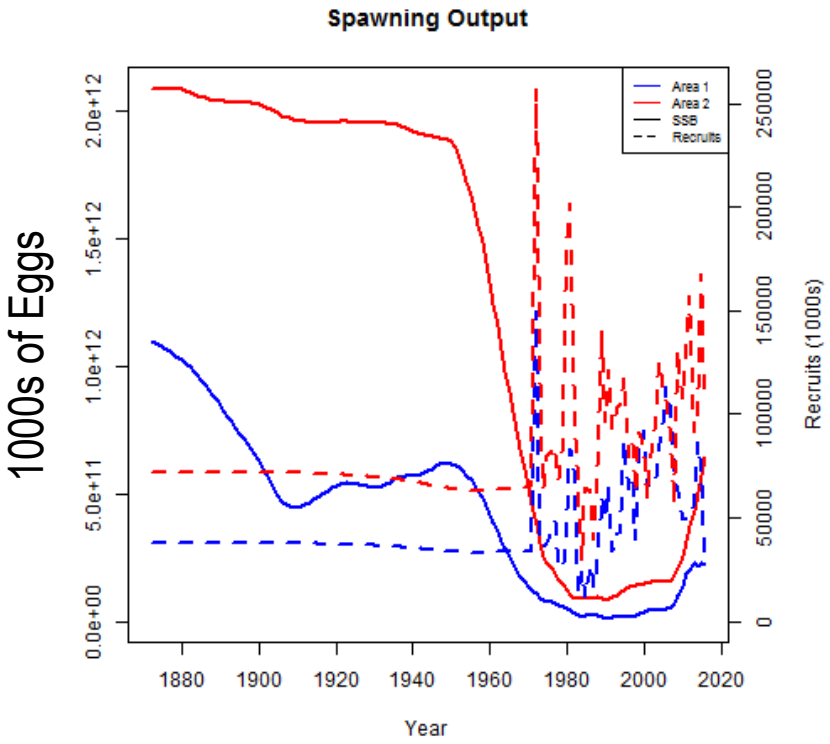


SSB and Recruitment Timeseries

2014 SEDAR 31 Update Assessment



SEDAR 52



Recruitment

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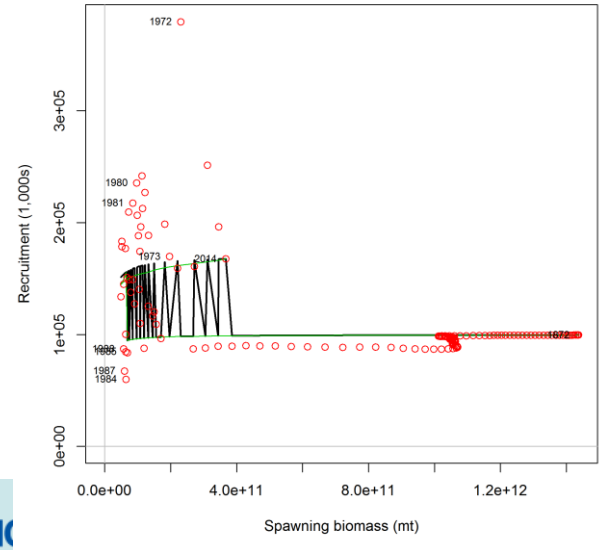

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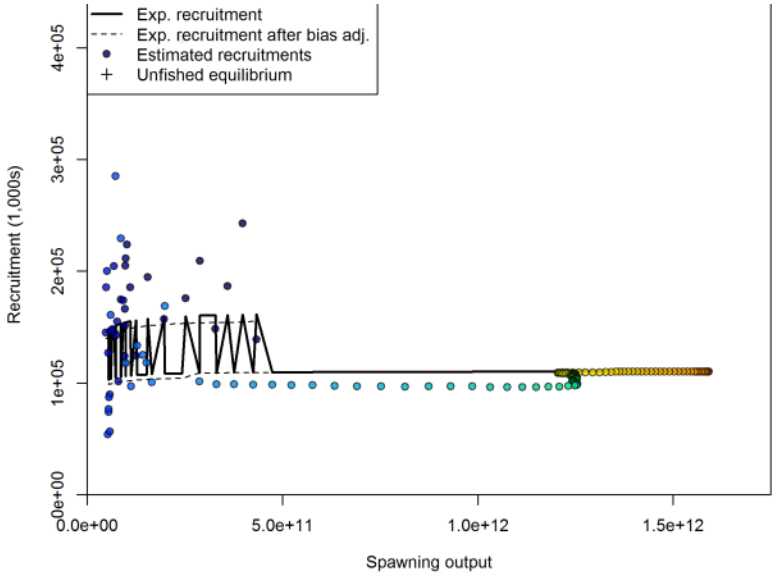
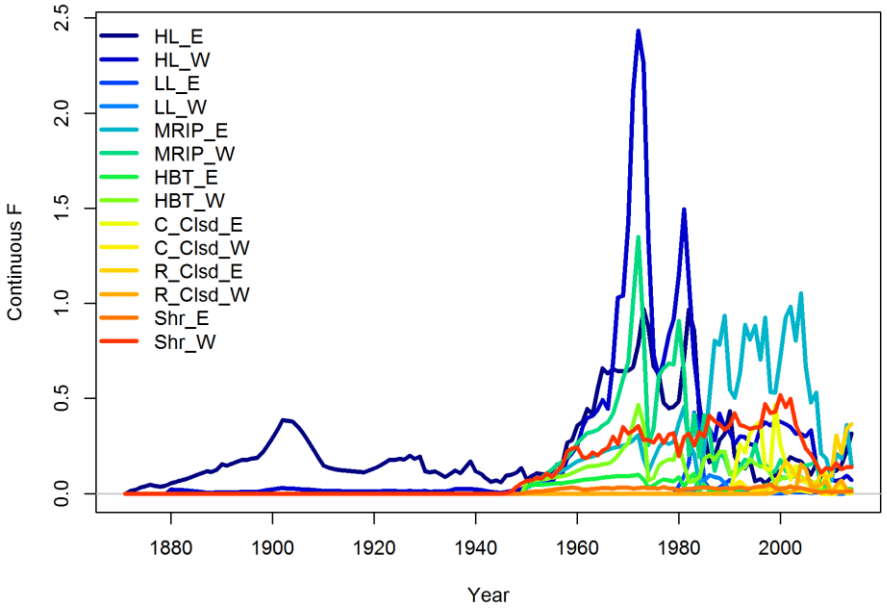


Fully Selected F

2014 SEDAR 31 Update Assessment



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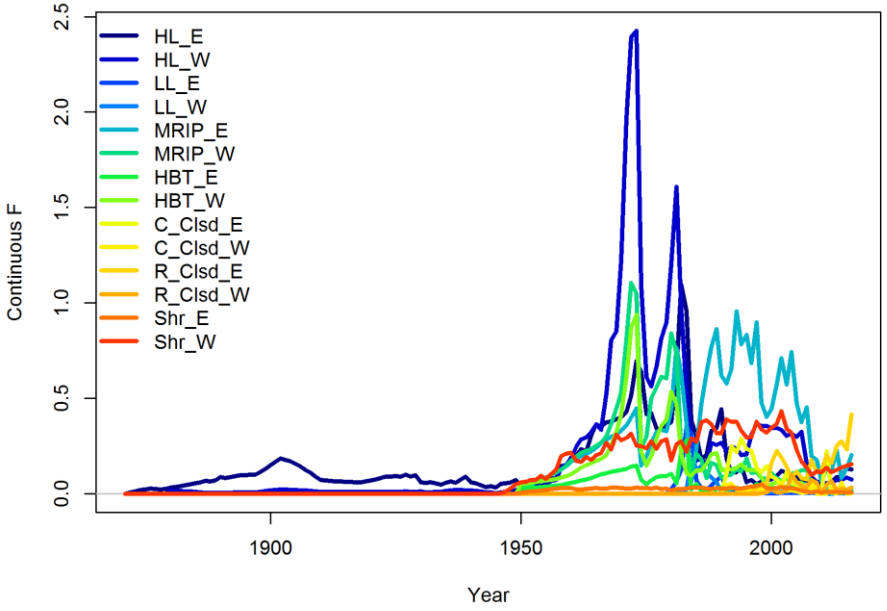
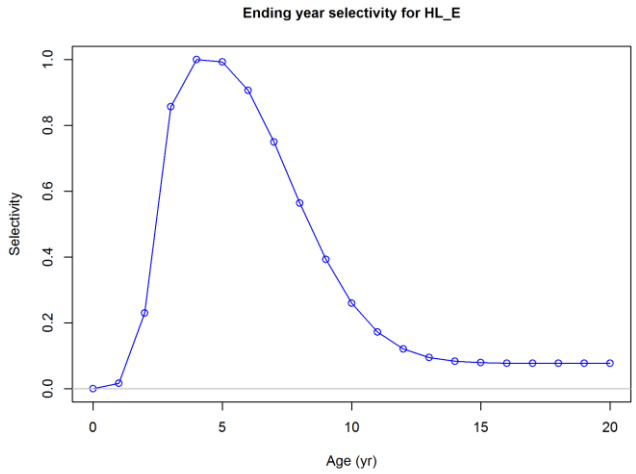
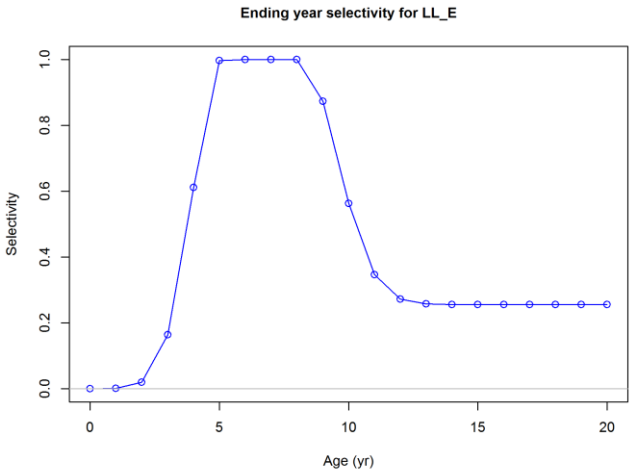
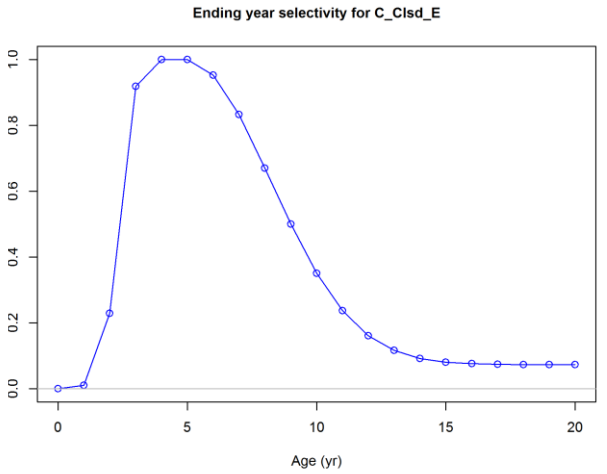
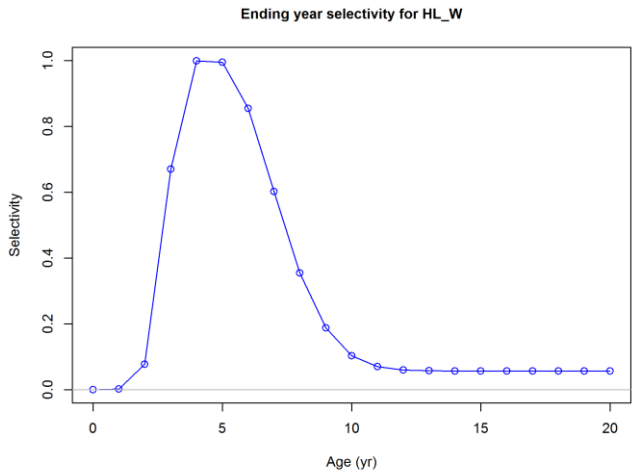


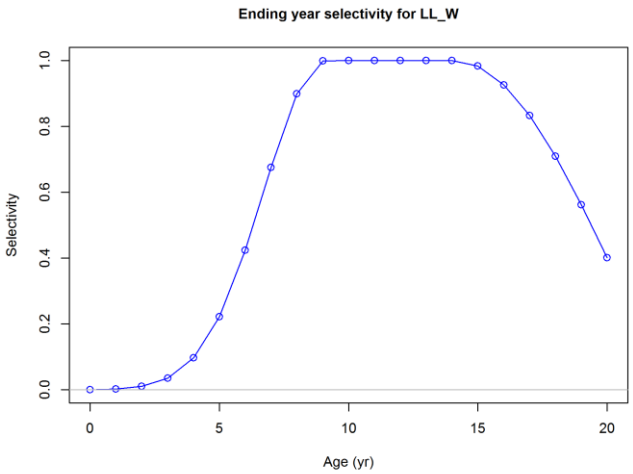
Terminal Year Selectivity by Fleet

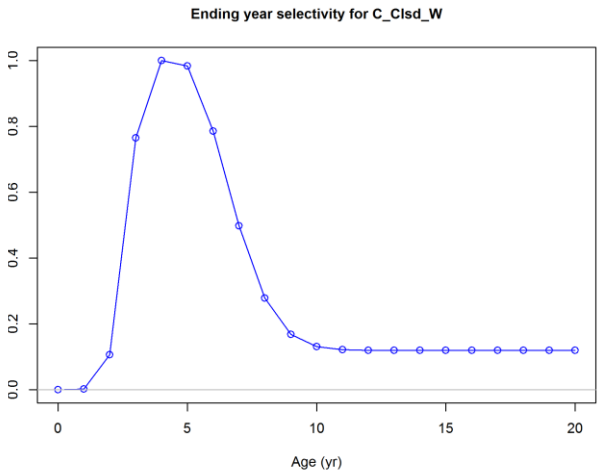




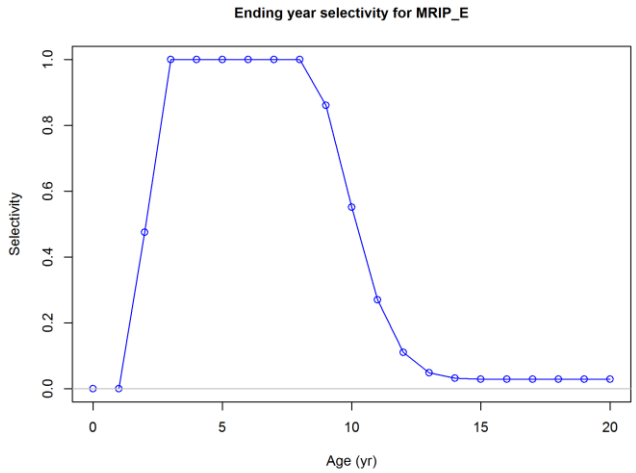


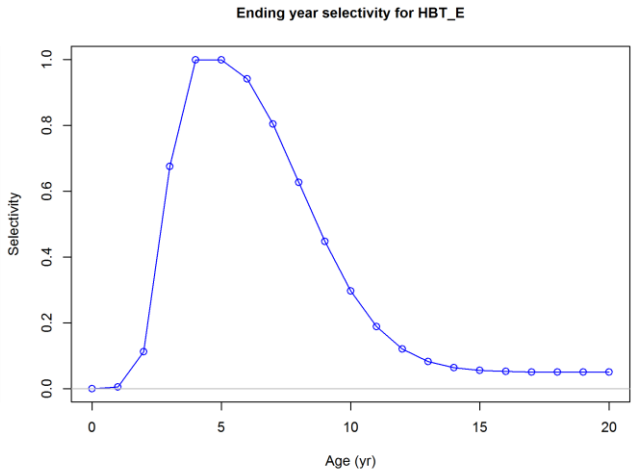


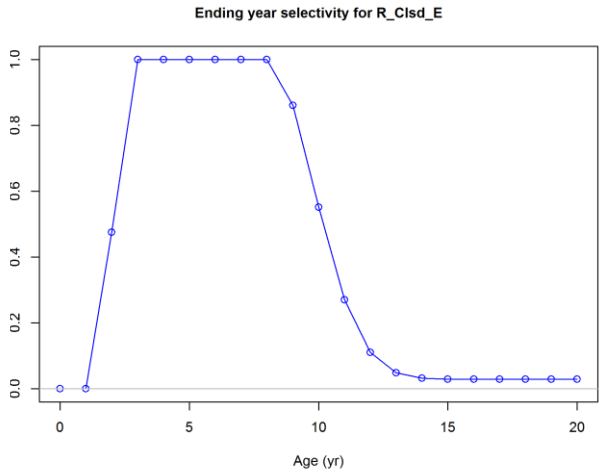


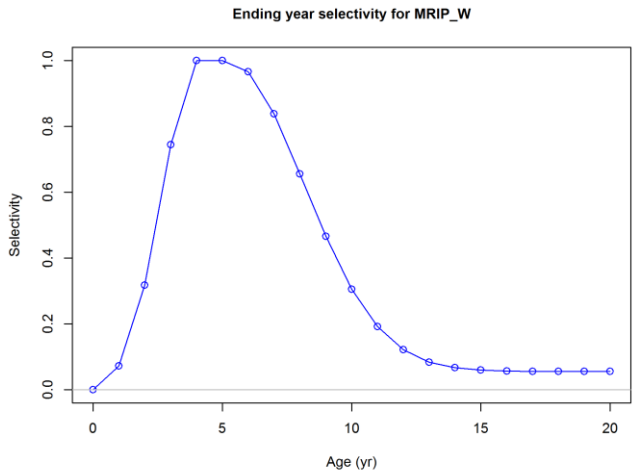


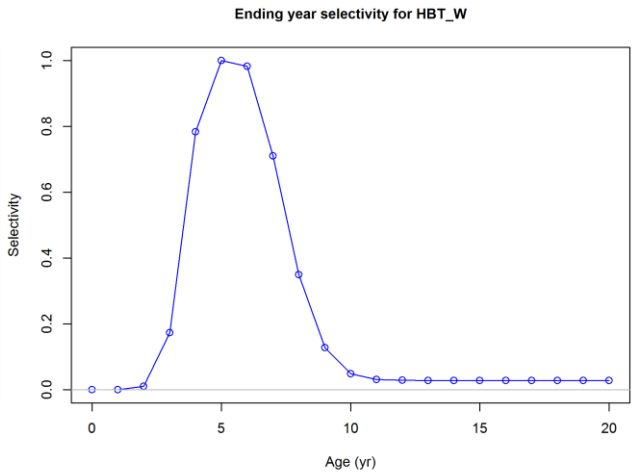
Terminal Year Selectivity by Fleet

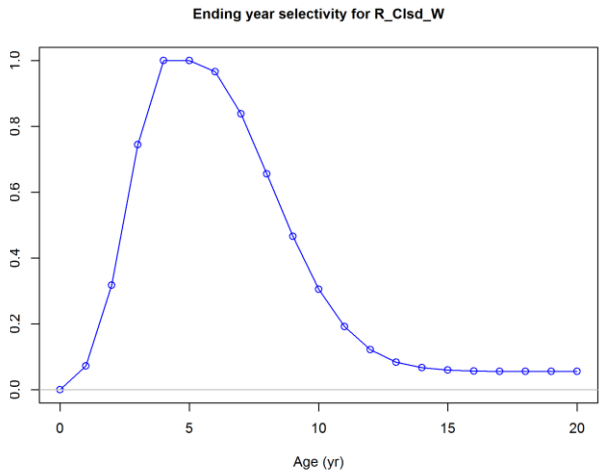




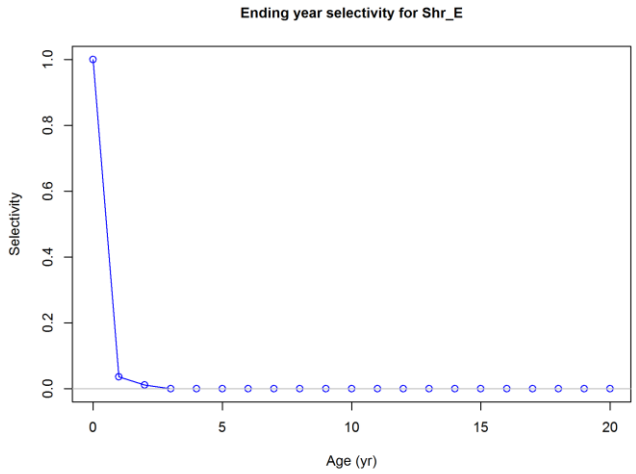


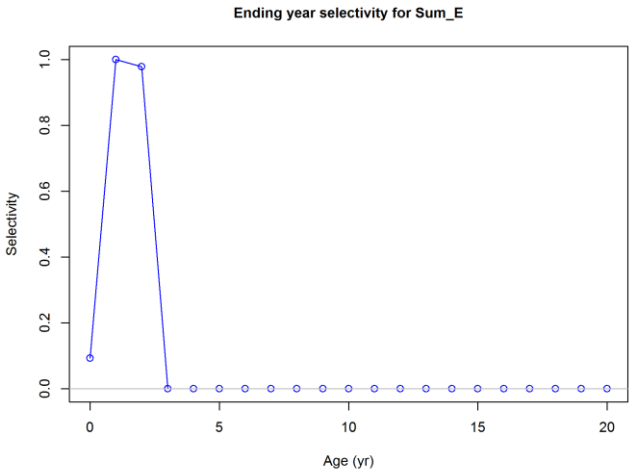


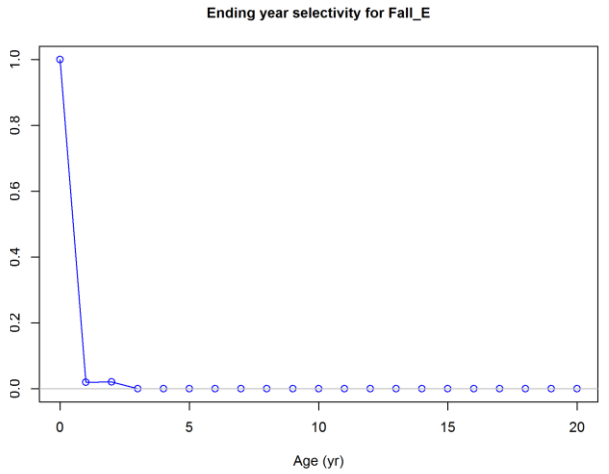


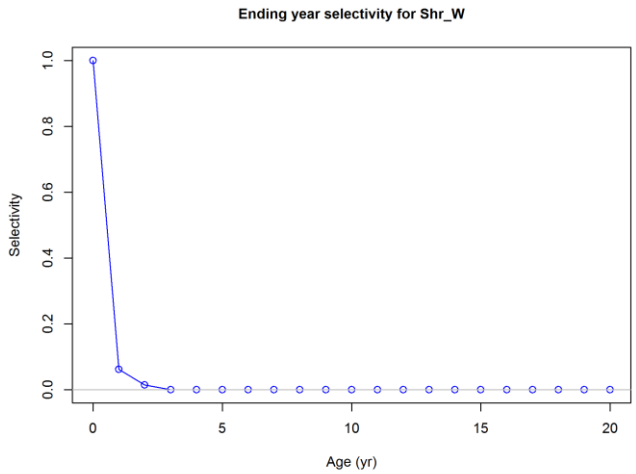


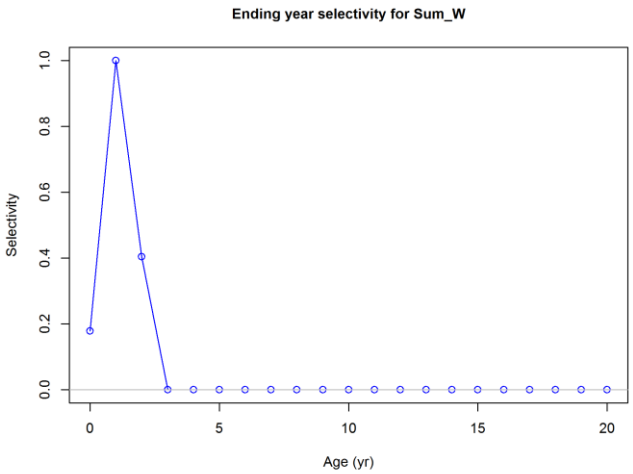
Terminal Year Selectivity by Fleet

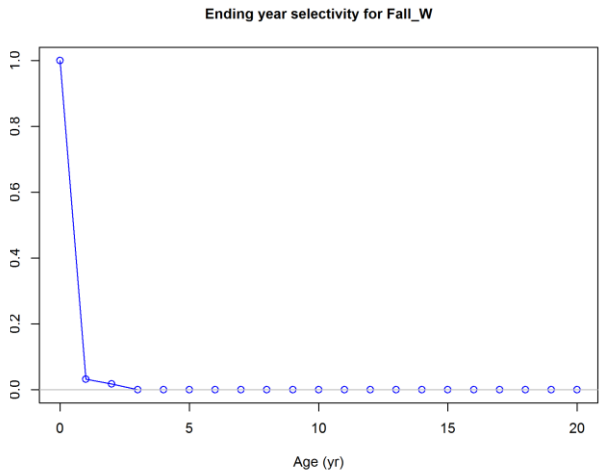




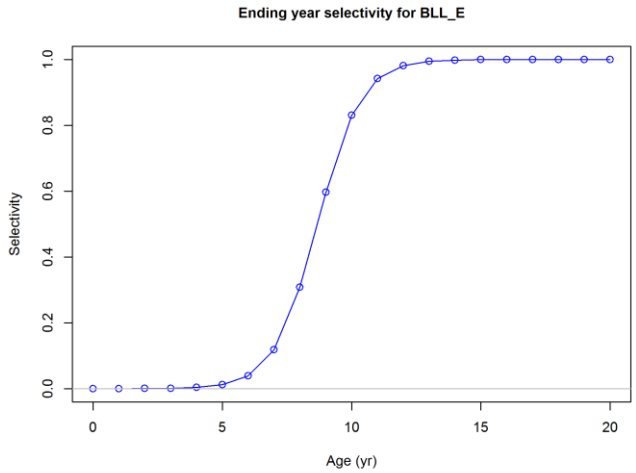


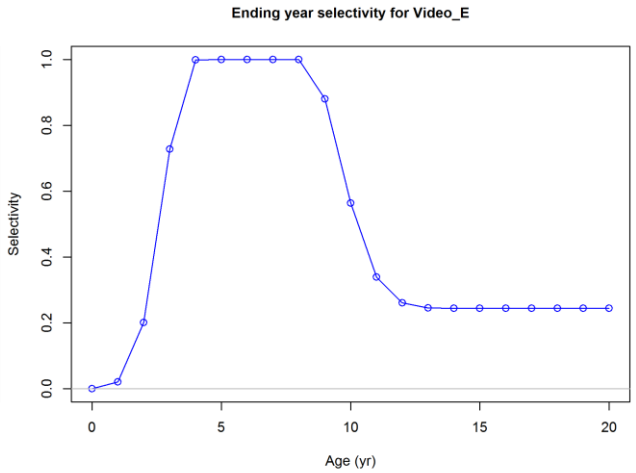


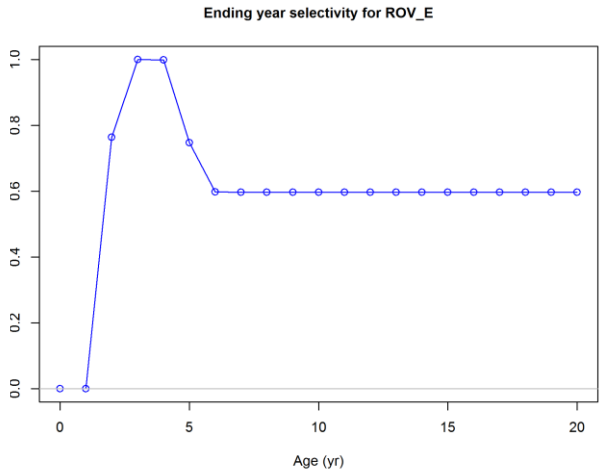


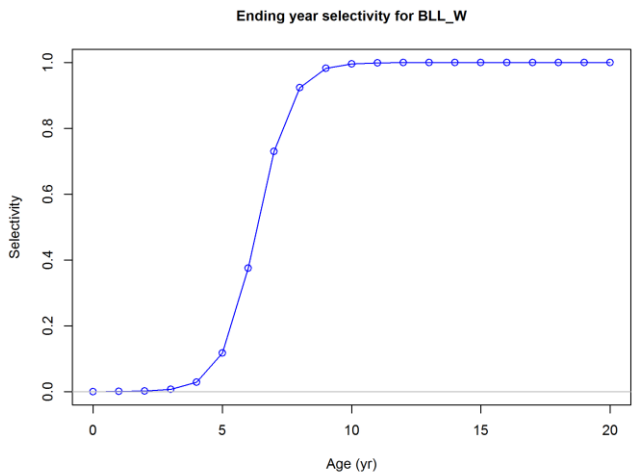


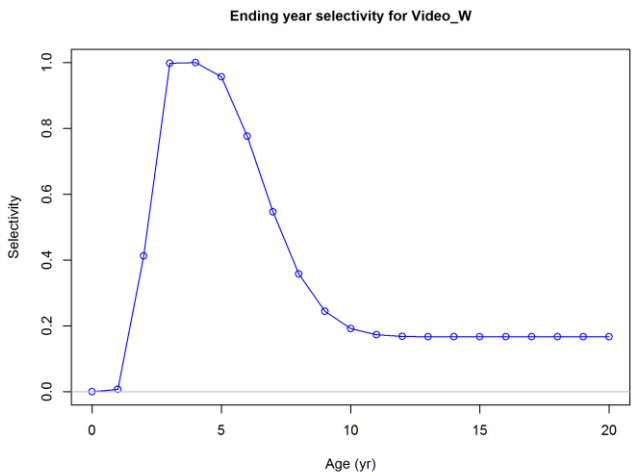
Terminal Year Selectivity by Fleet





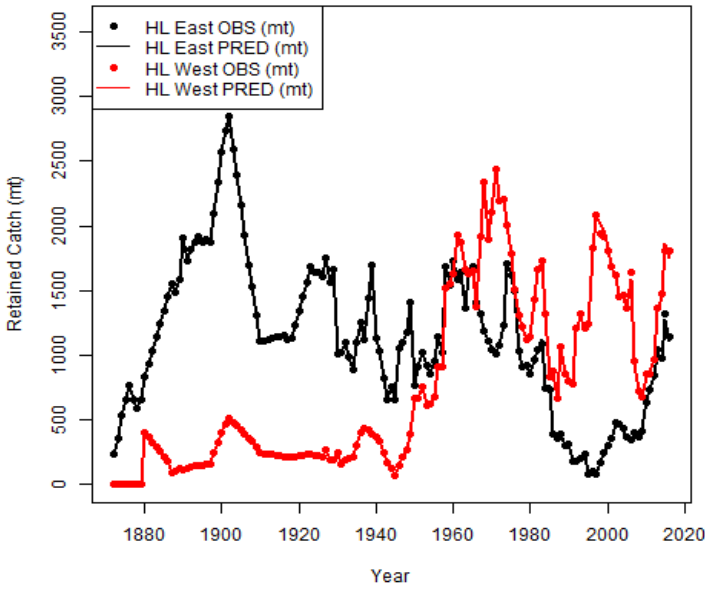


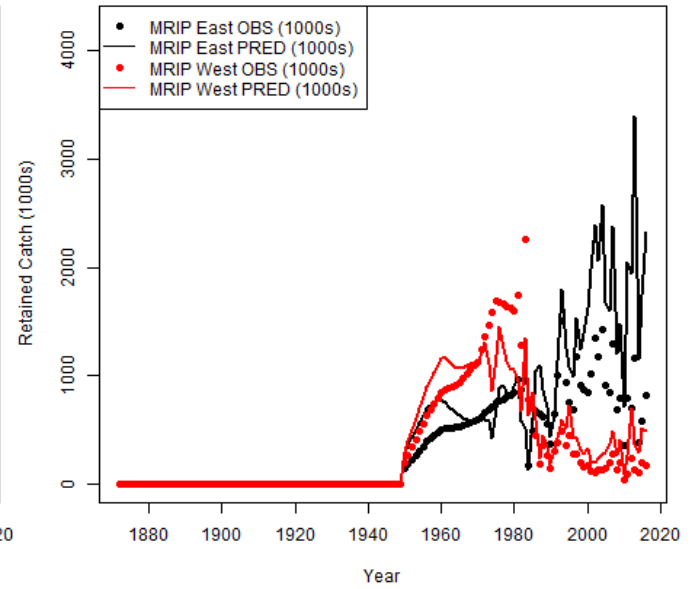


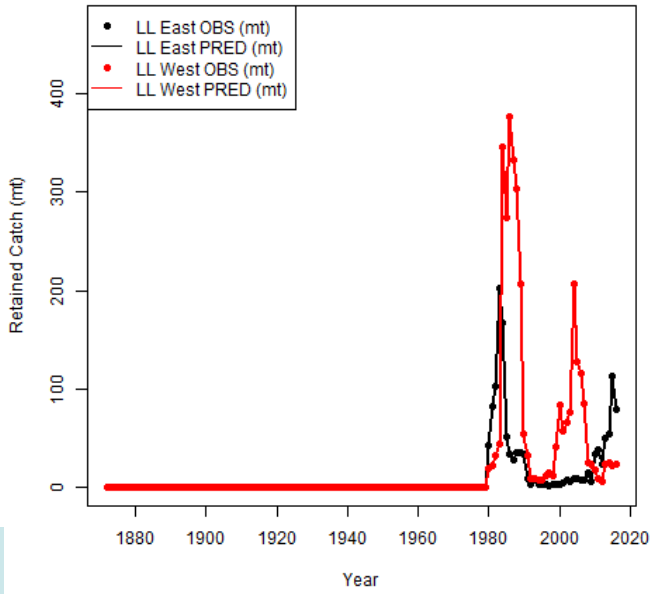


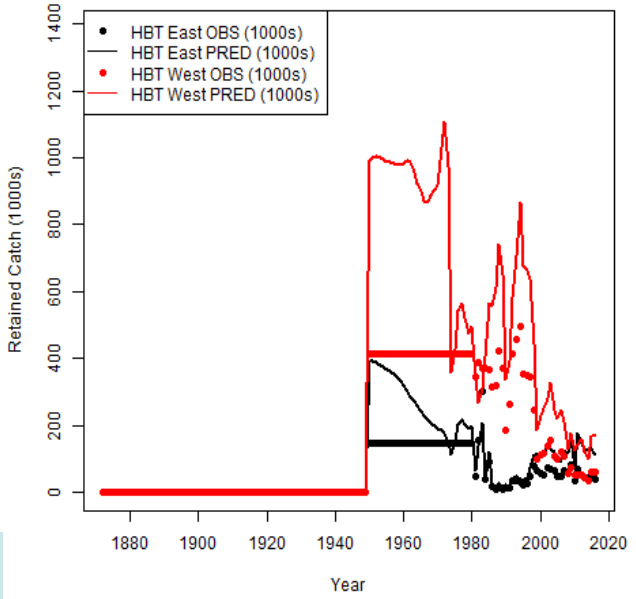
Fit to Data

- Landings



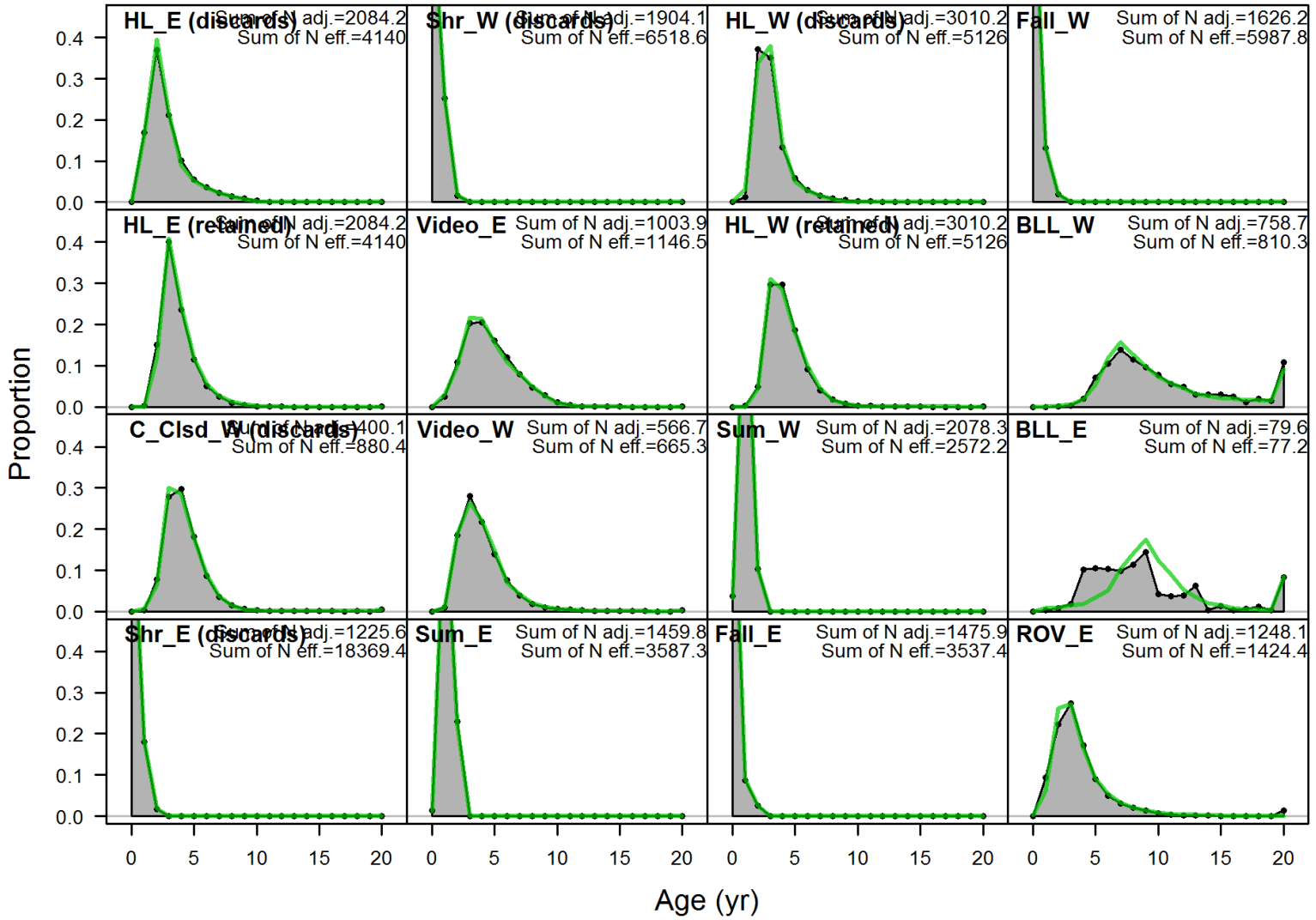






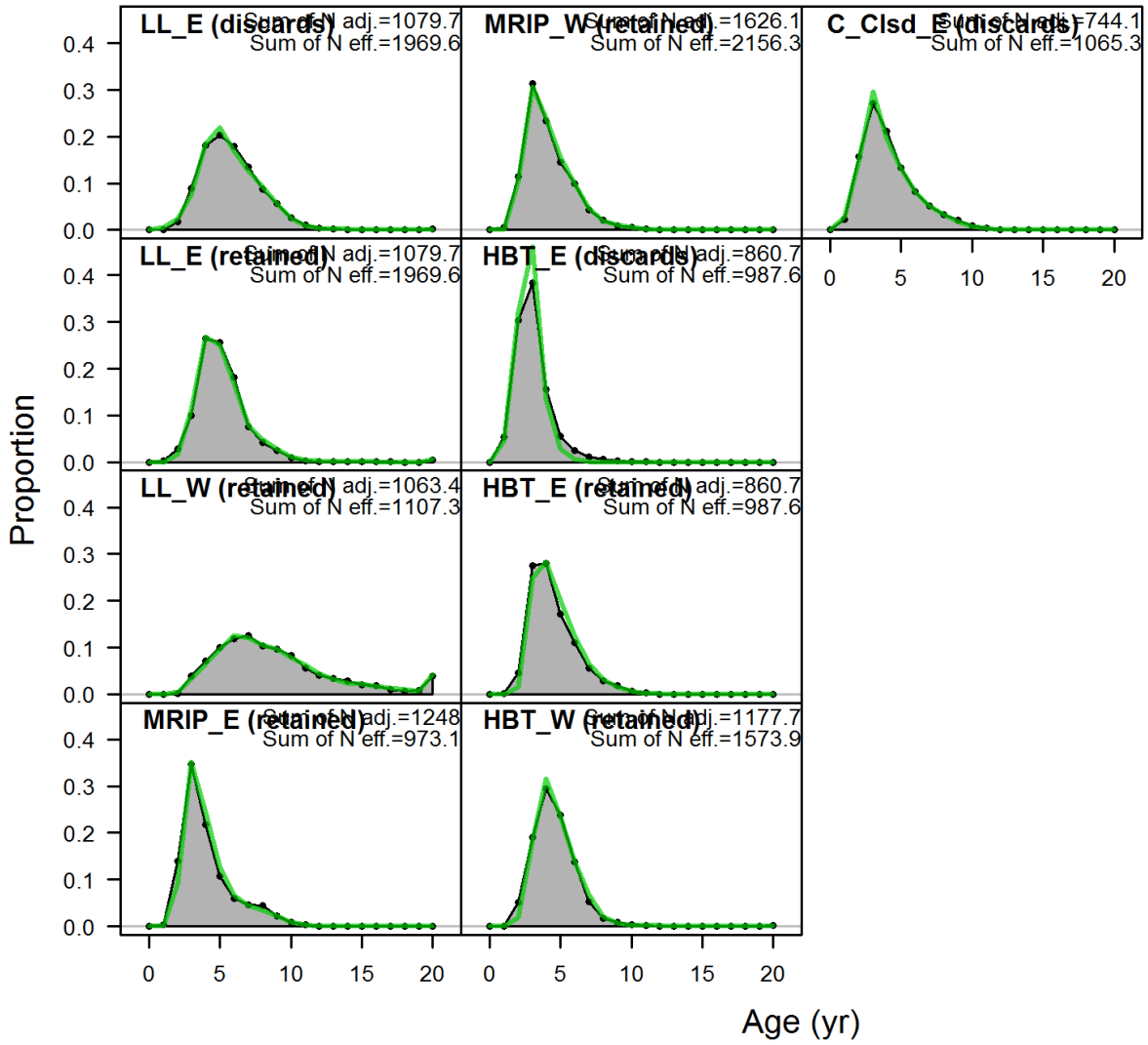
Fit to Data

- Age composition



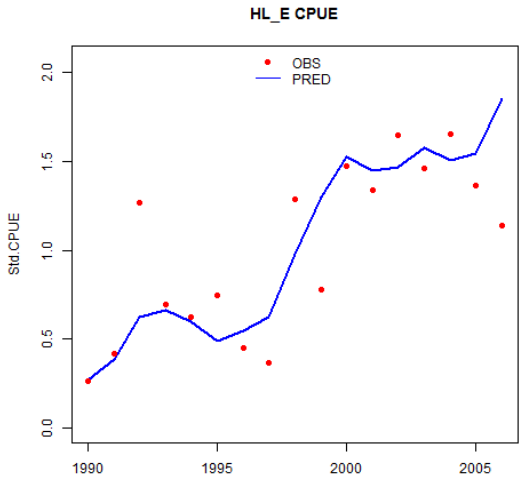
Fit to Data

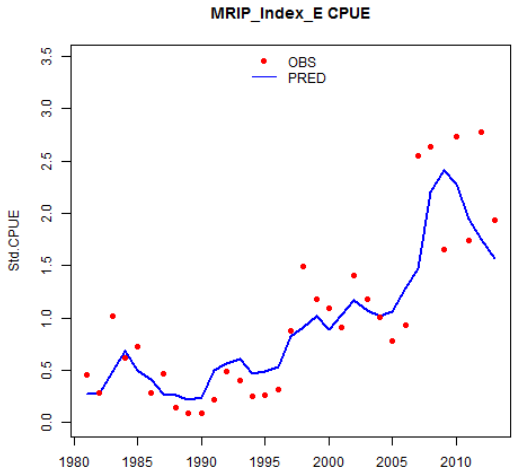
- Age composition

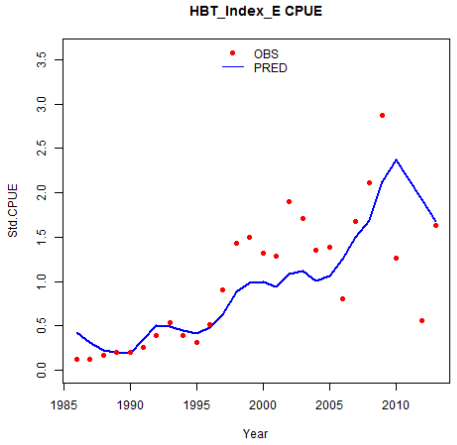


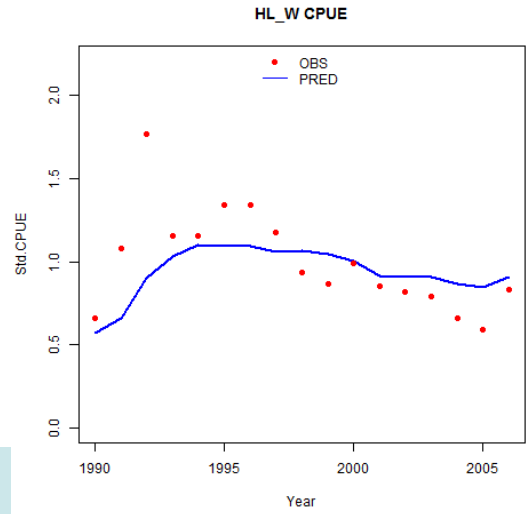
Fit to Data

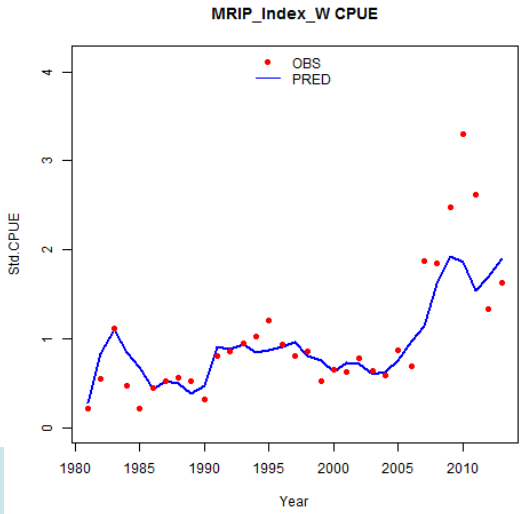
- Fishery Dependent Indices

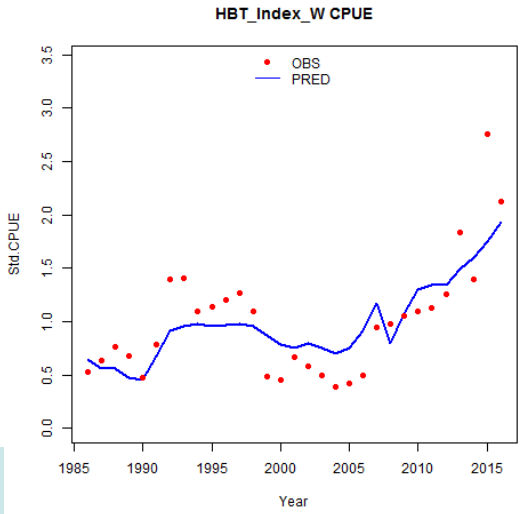






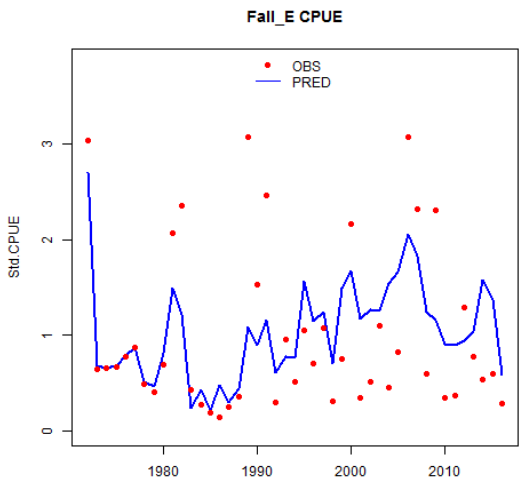


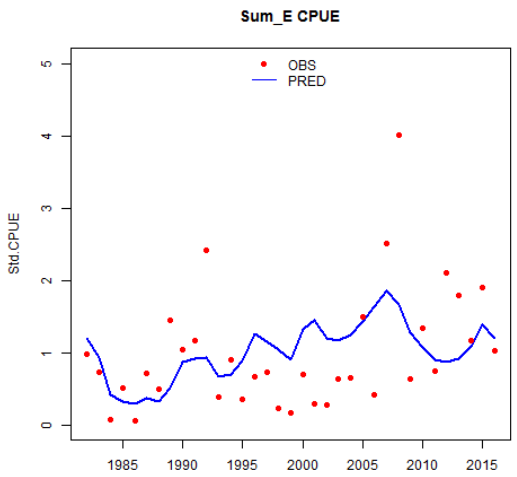


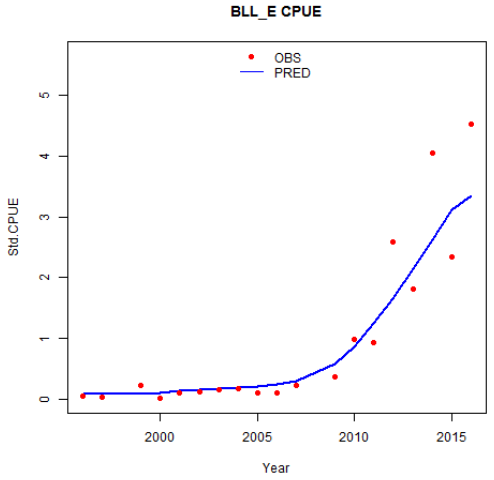


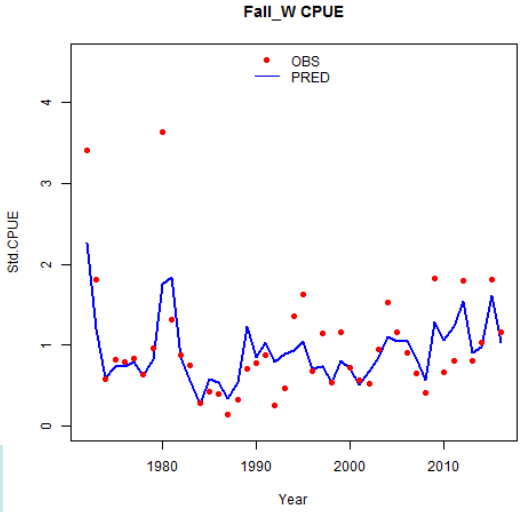
Fit to Data

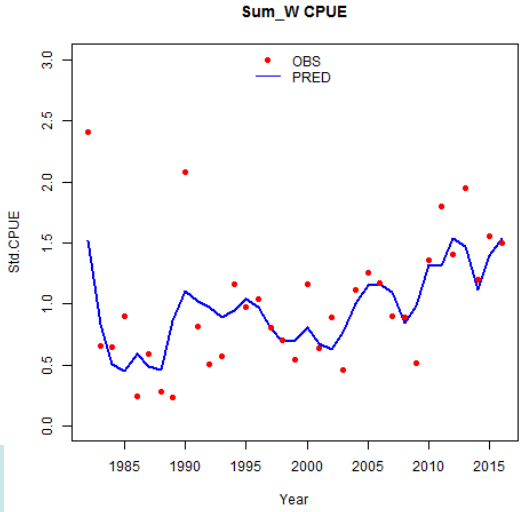
- Fishery Independent Indices

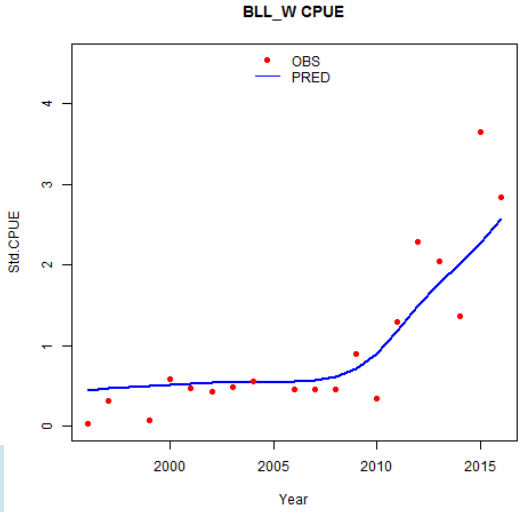






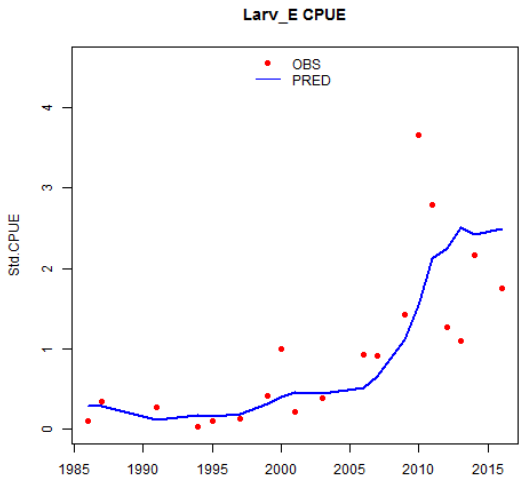


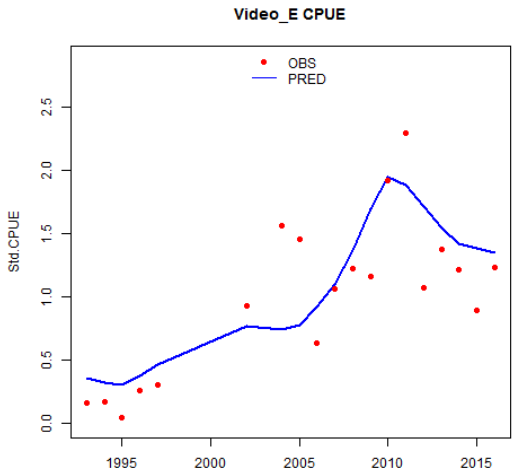




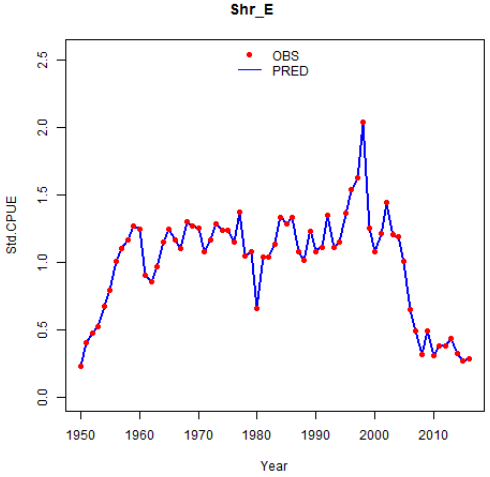
Fit to Data

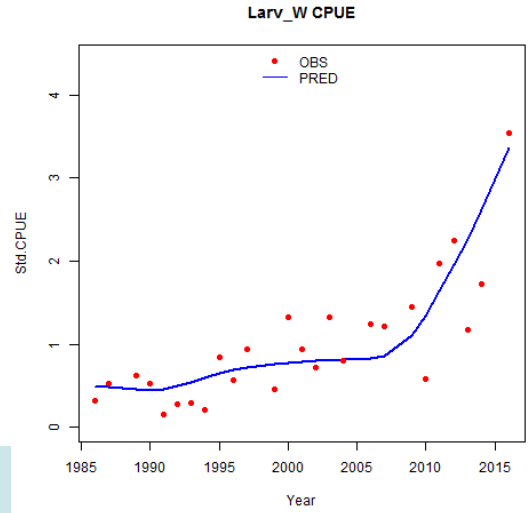
- Other Indices

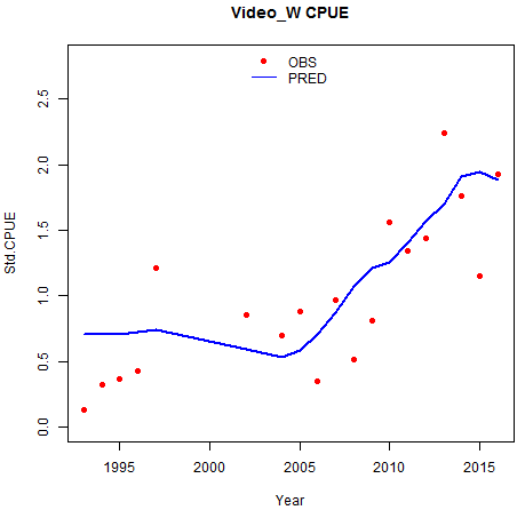


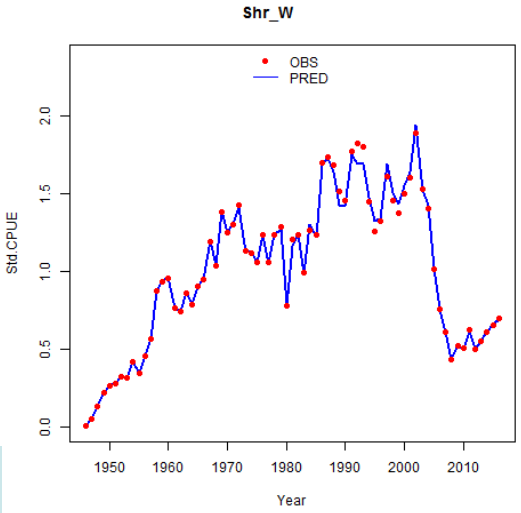


Shrimp Effort



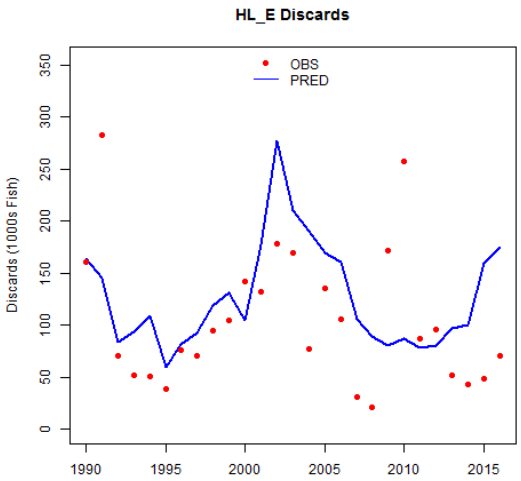


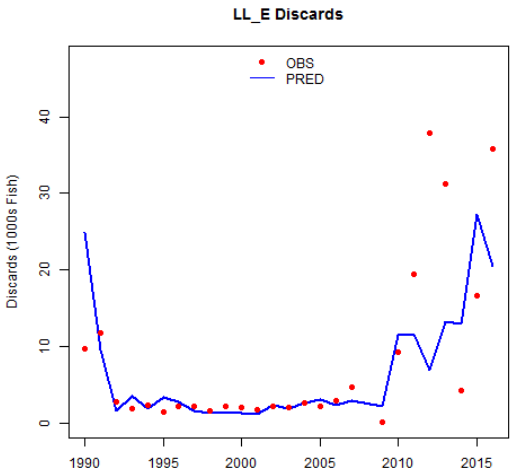


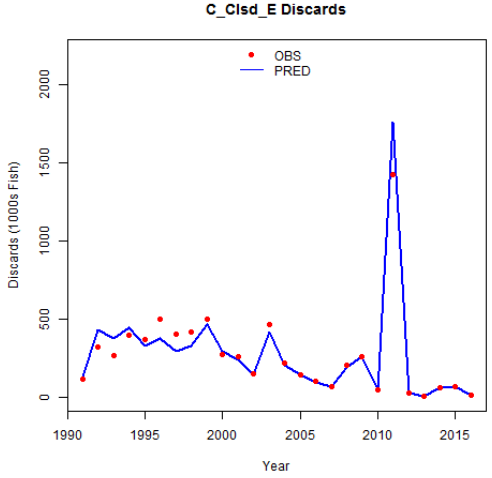


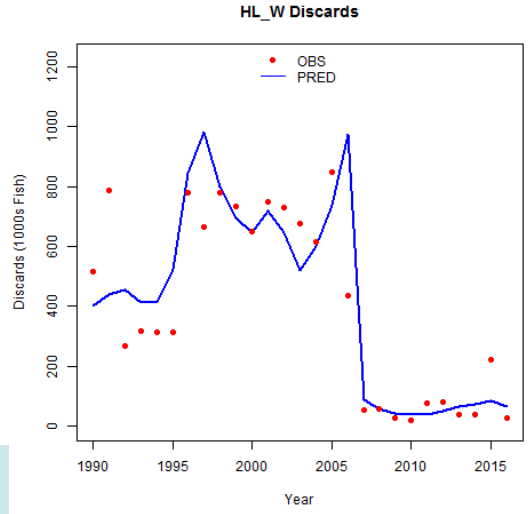
Fit to Data

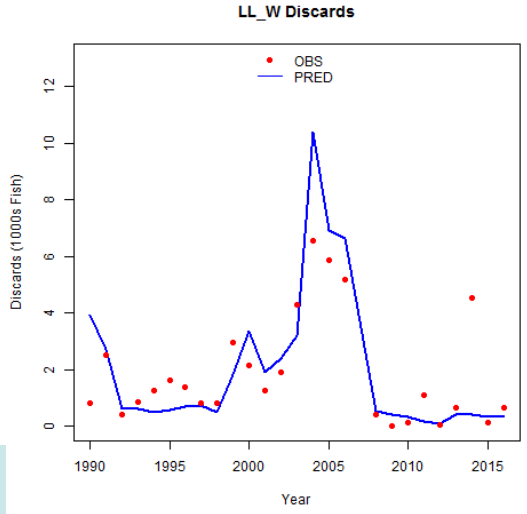
- Discards

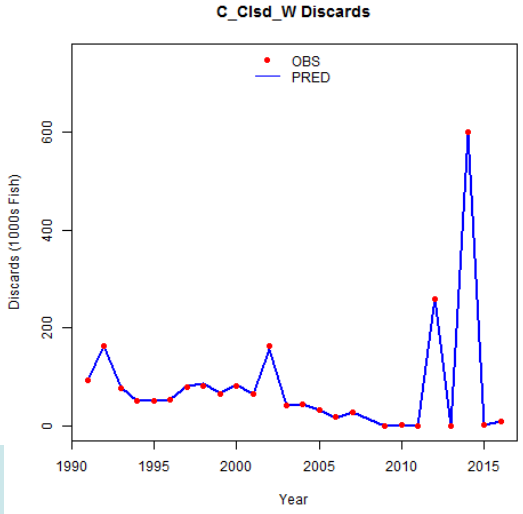






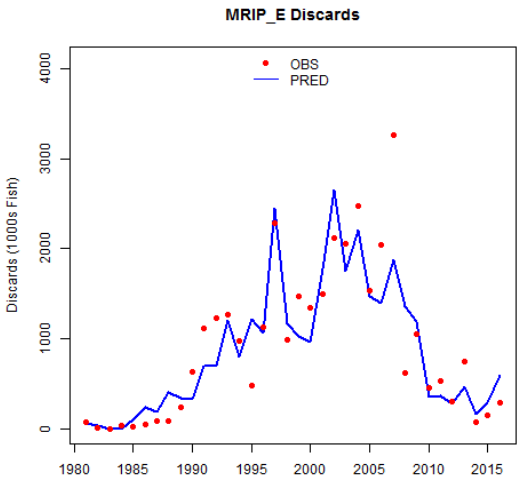


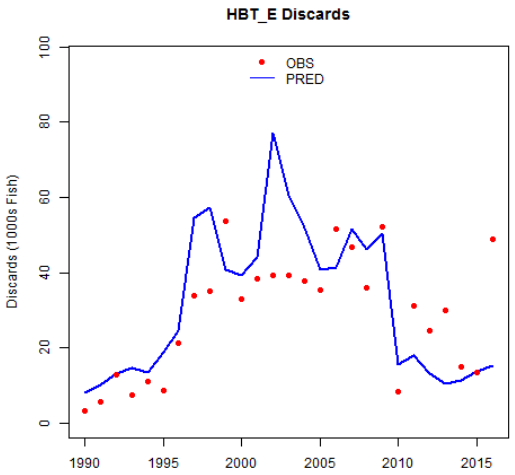


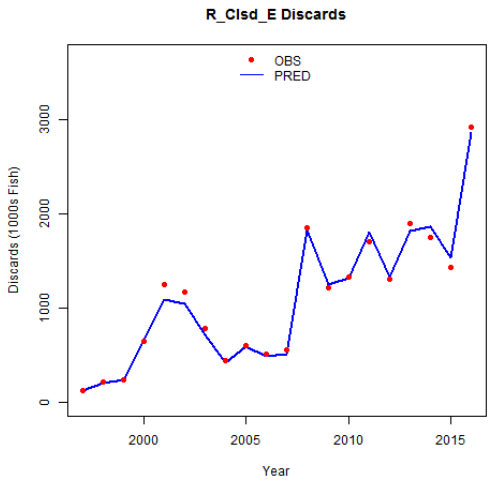


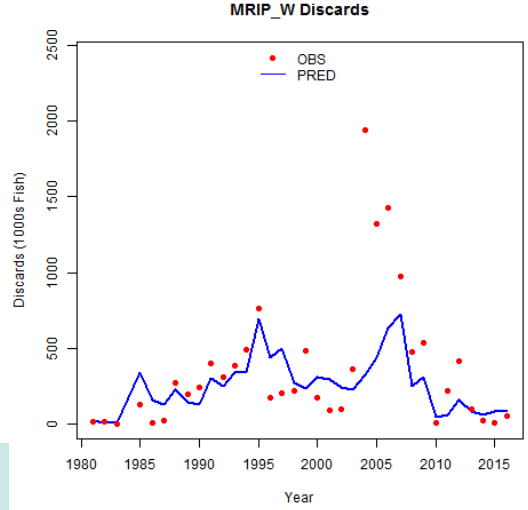
Fit to Data

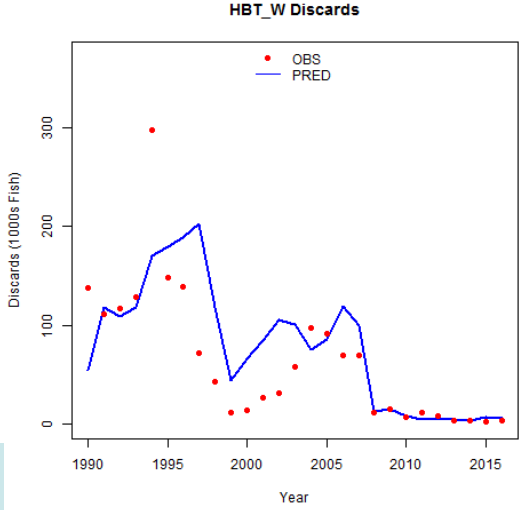
- Discards

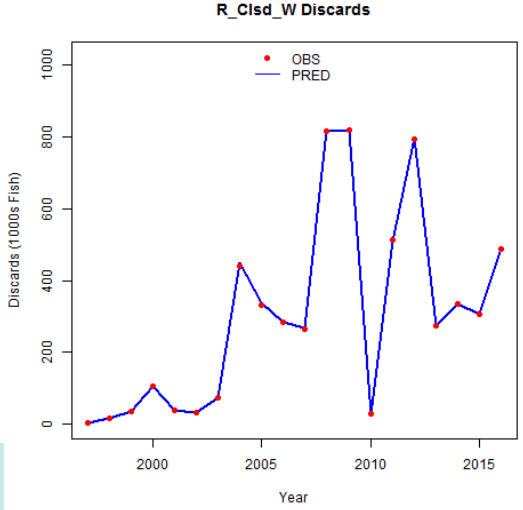






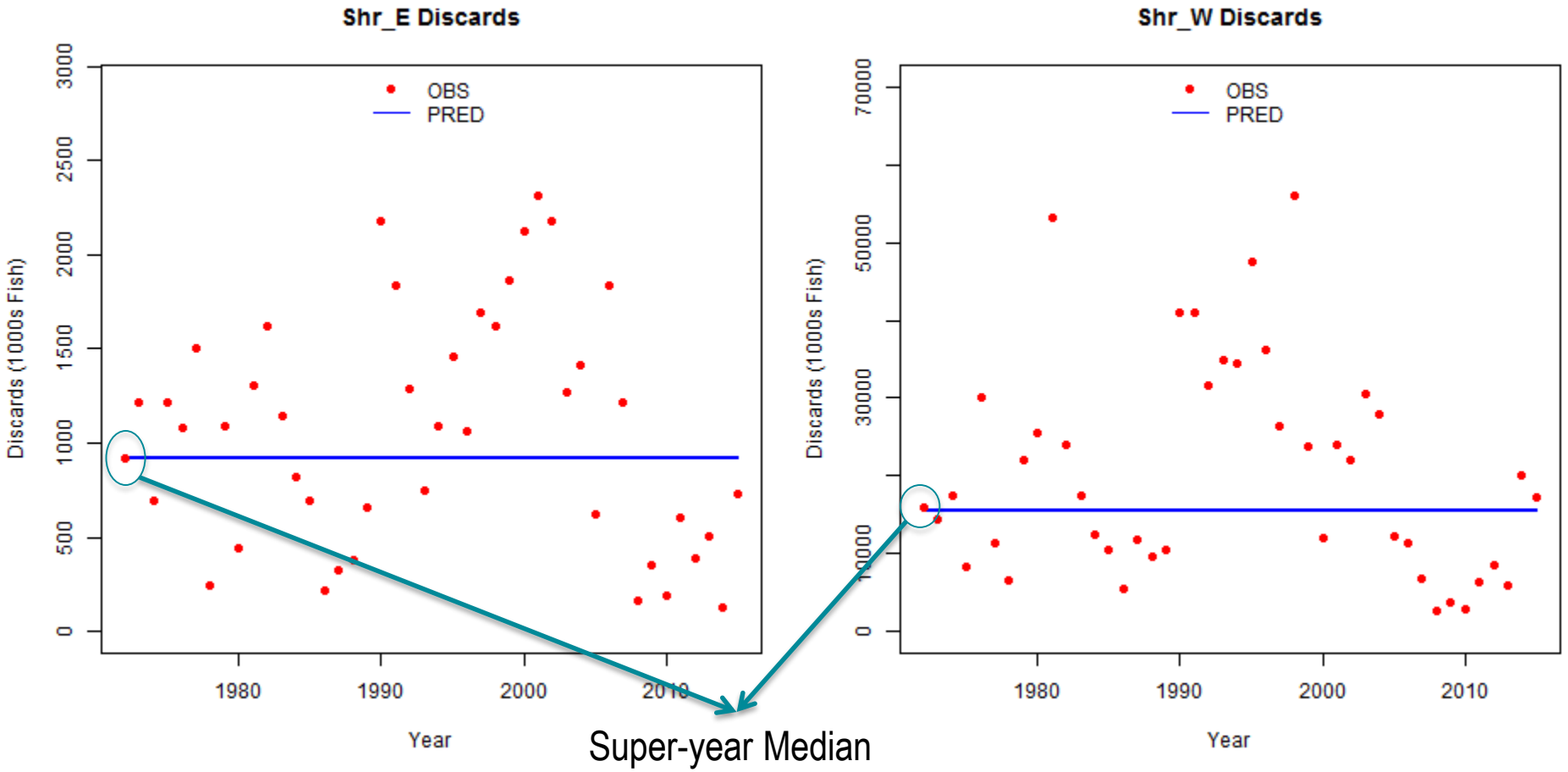






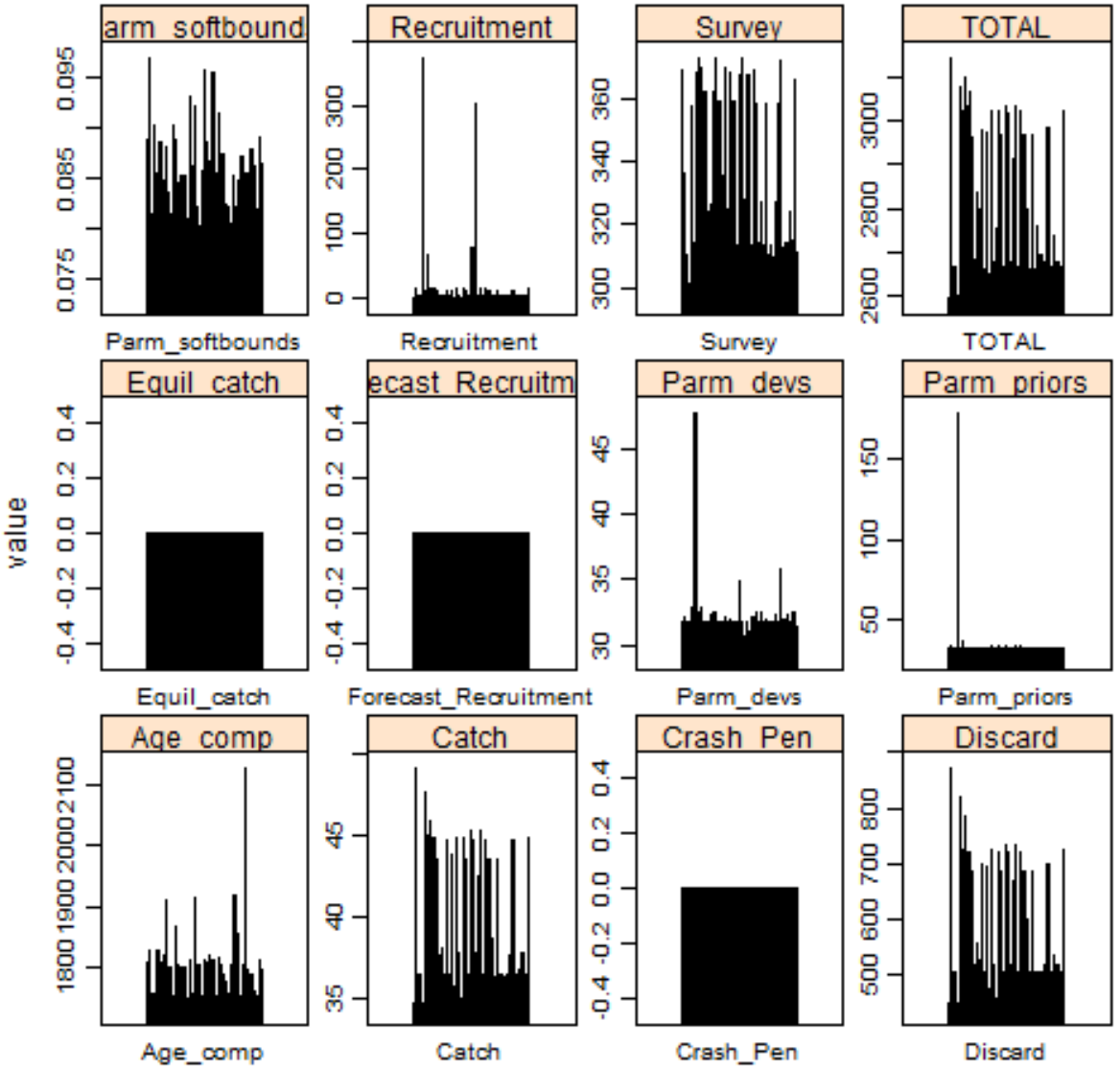
Fit to Data

- Shrimp Discards



Diagnostics

Jitter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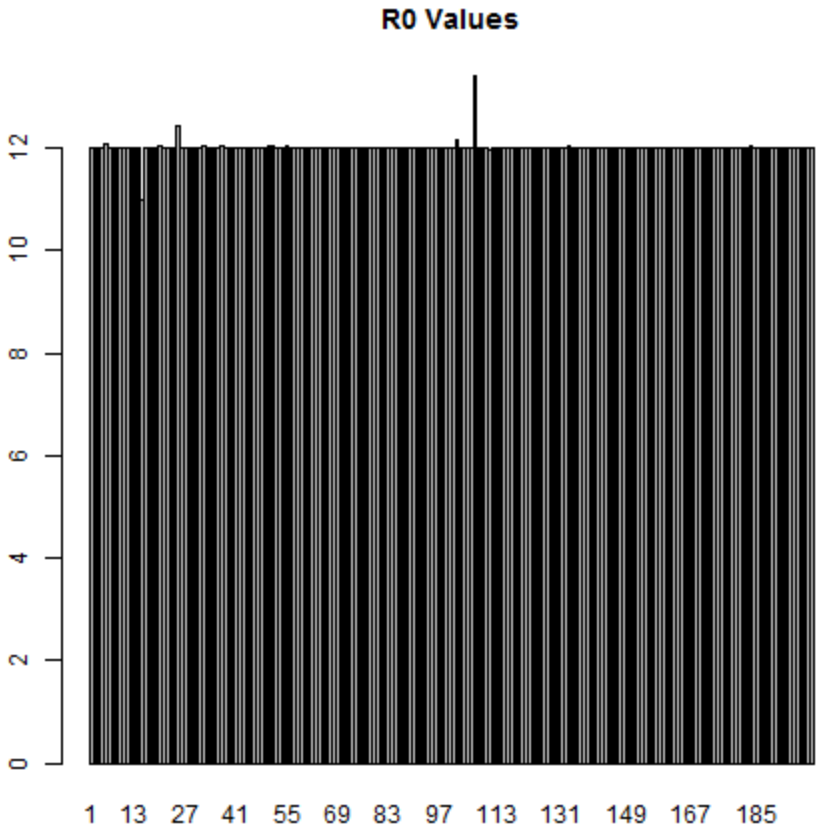
Recruitment
Survey
TOTAL
Parm_softbounds
Recruitment
Survey
TOTAL
Equil catch
ecast Recruitm
Parm devs
Parm priors
value
Equil_catch
Forecast_Recruitment
Parm_devs
Parm_priors
Age comp
Catch
Crash Pen
Discard
Age_comp
Catch
Crash_Pen
Discard

Jitter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10
12
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13
27
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83
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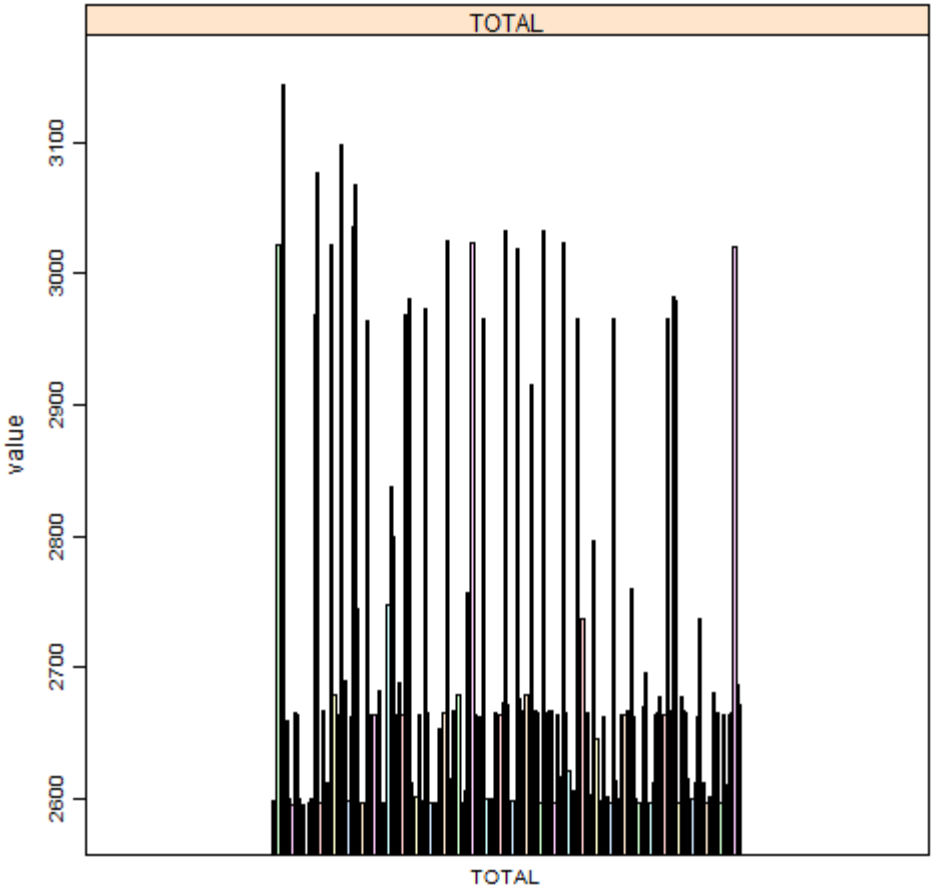
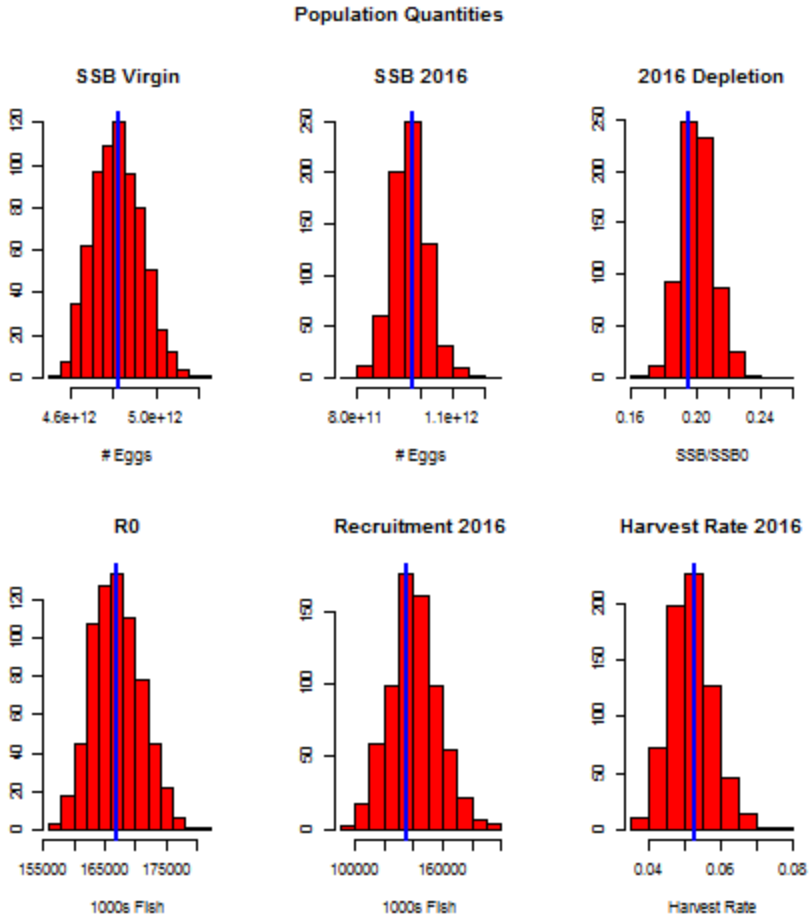
131
149
167
185

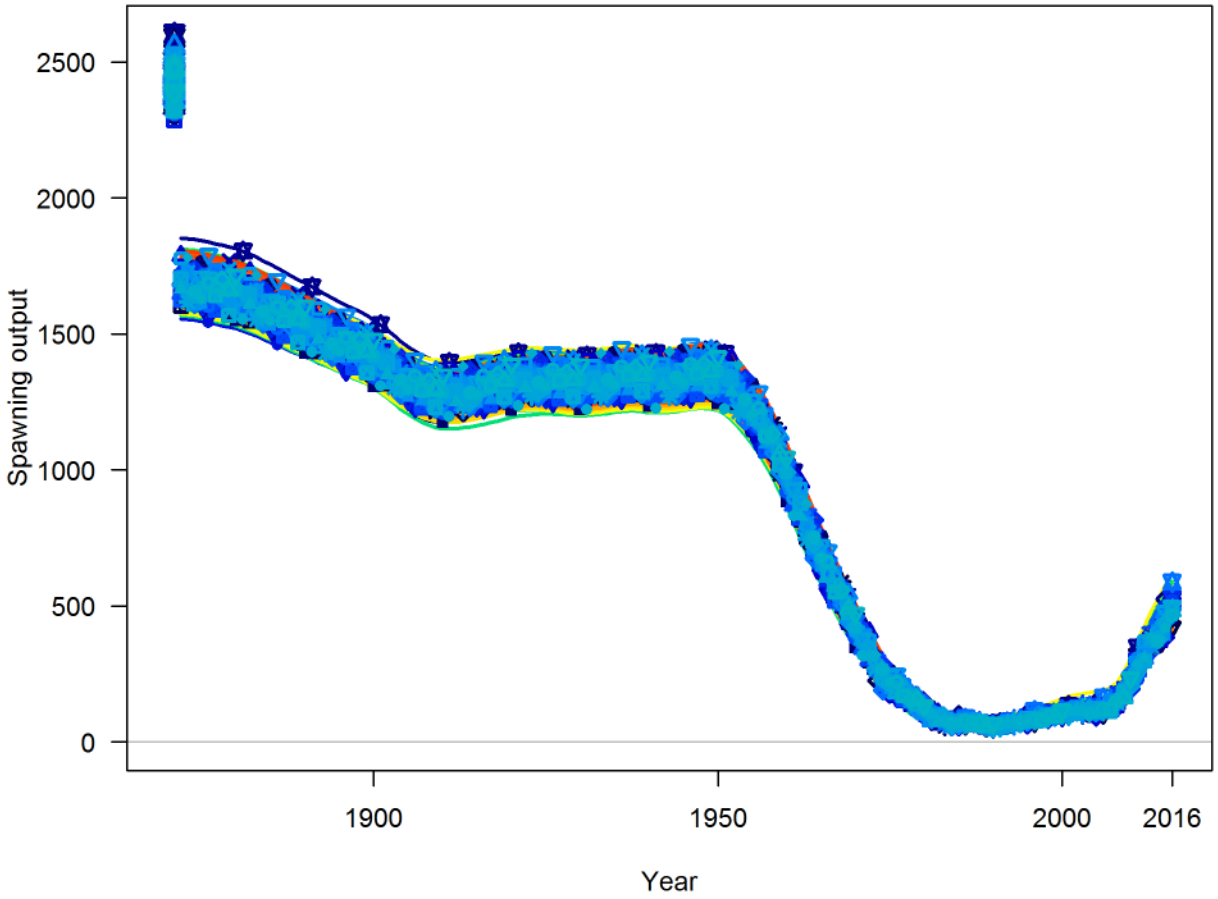

TOTAL
value
2600
2700
2800
2900
3000
3100
TOTAL

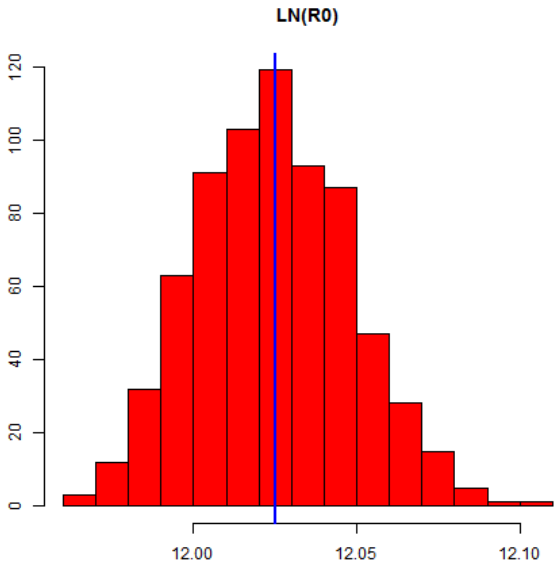
Bootstrap Runs

700 runs

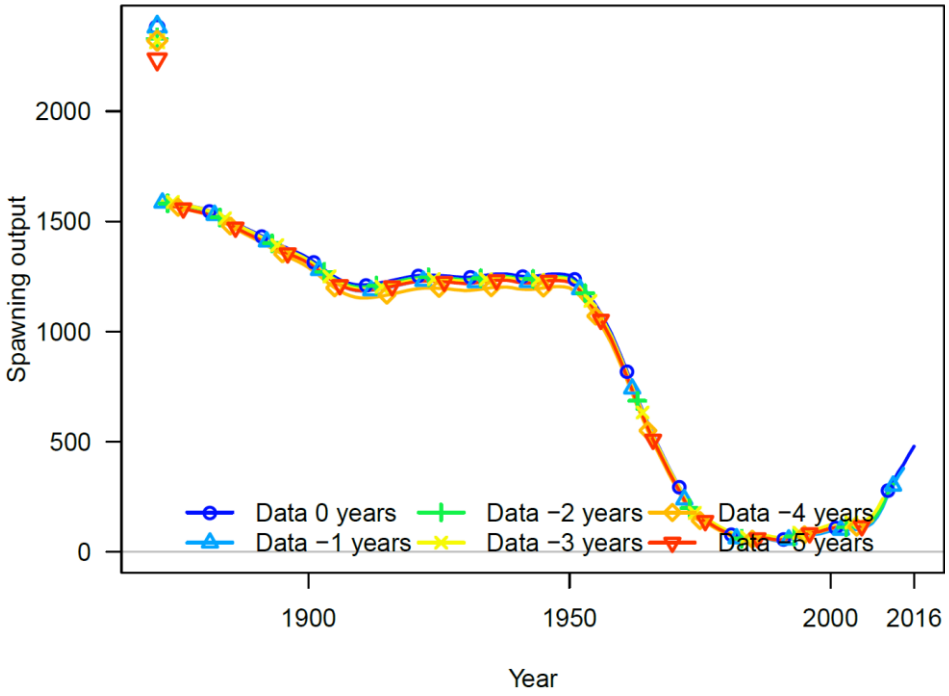


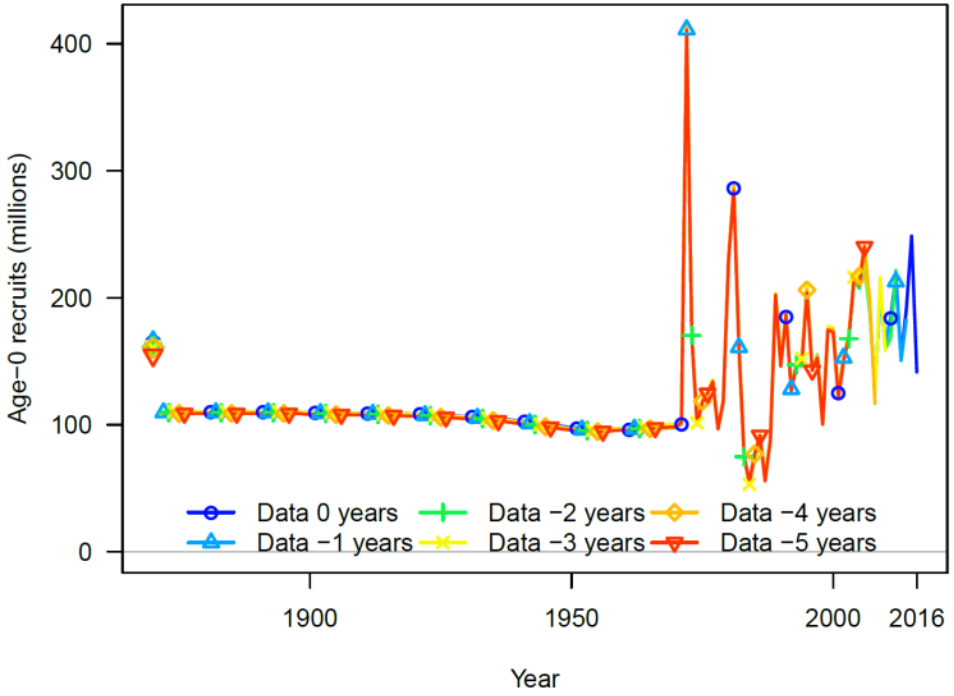
Bootstrap Runs



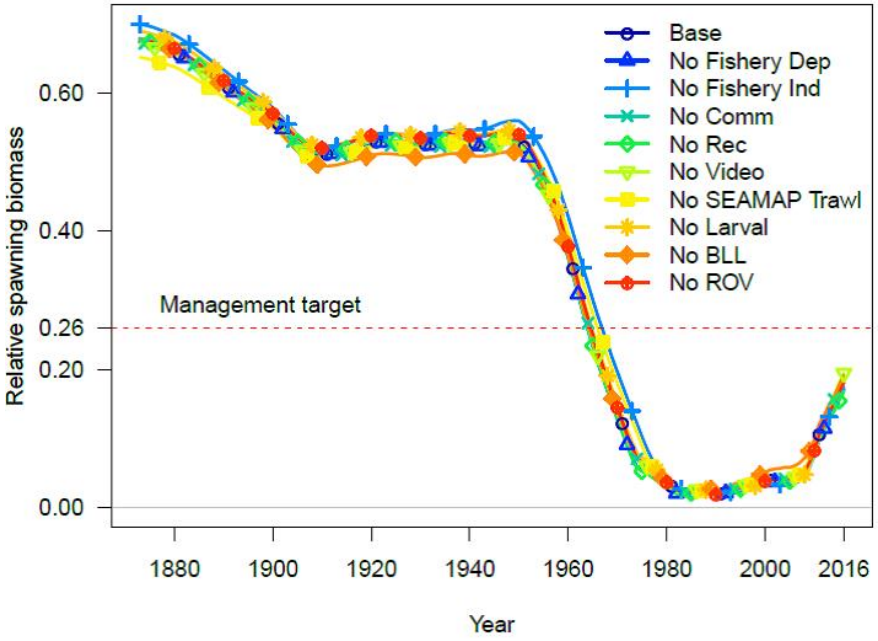


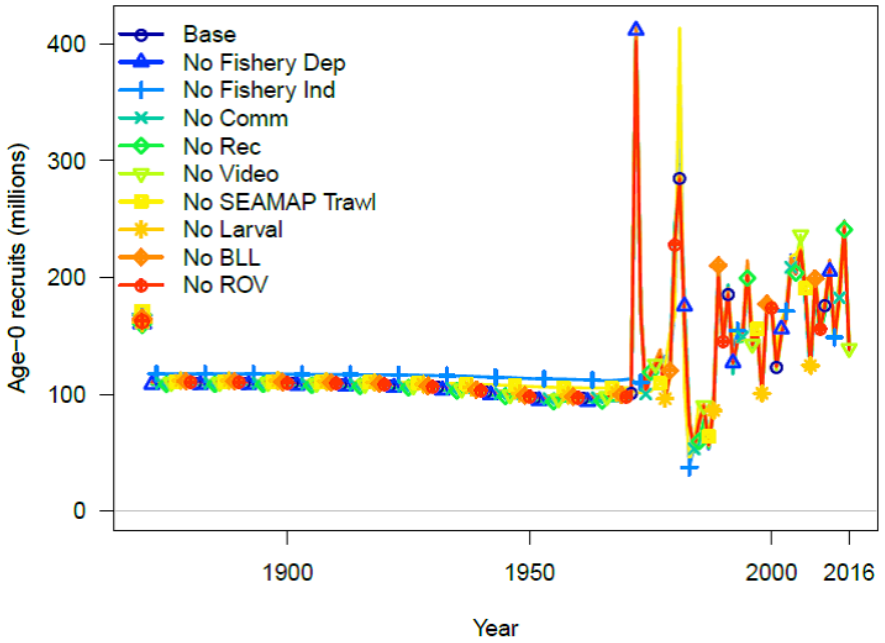
Retrospective Runs



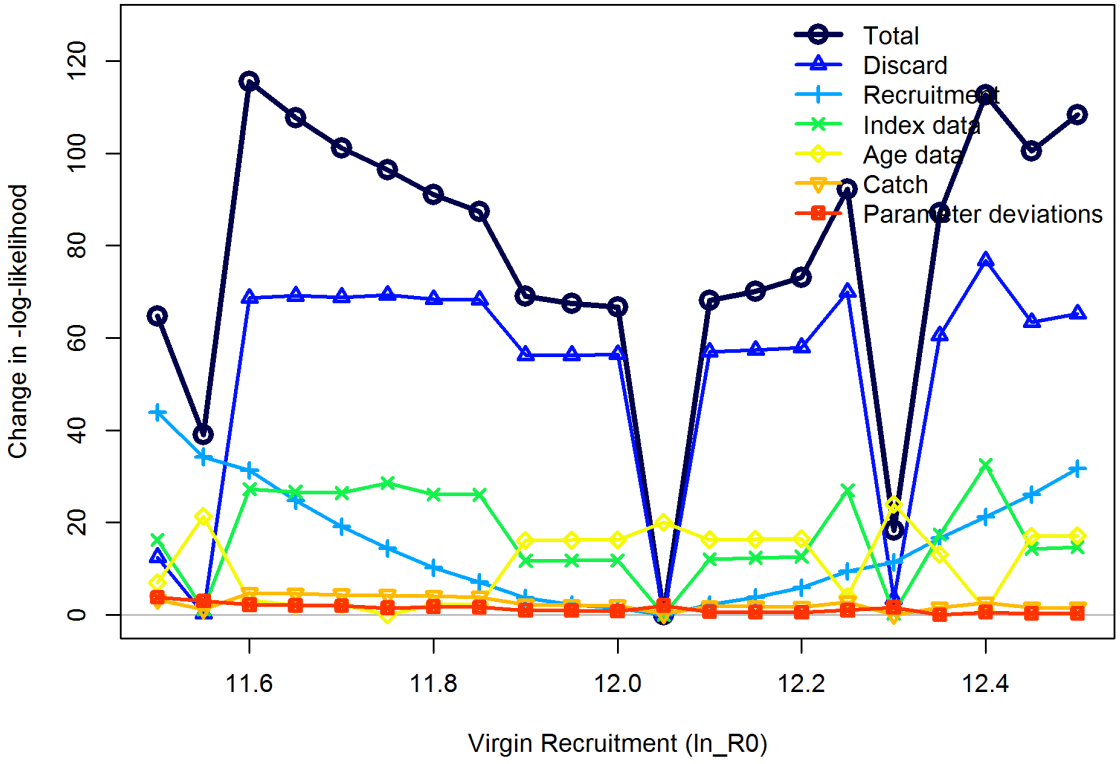


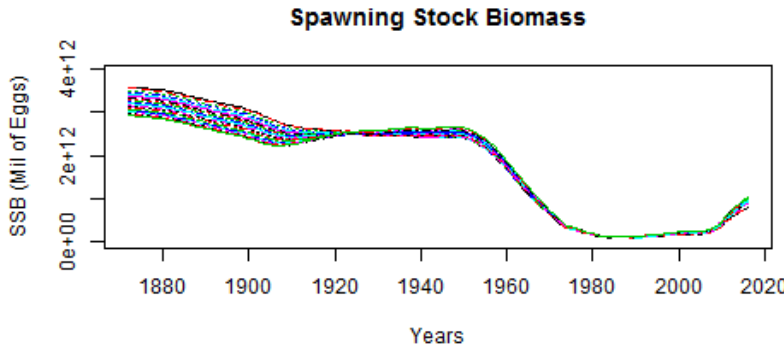
Index Jack-knife Runs

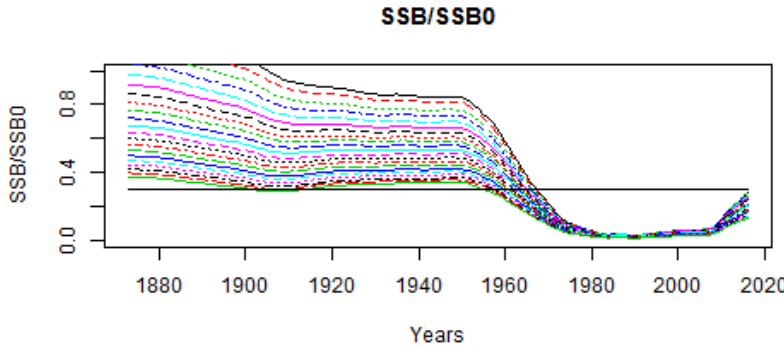




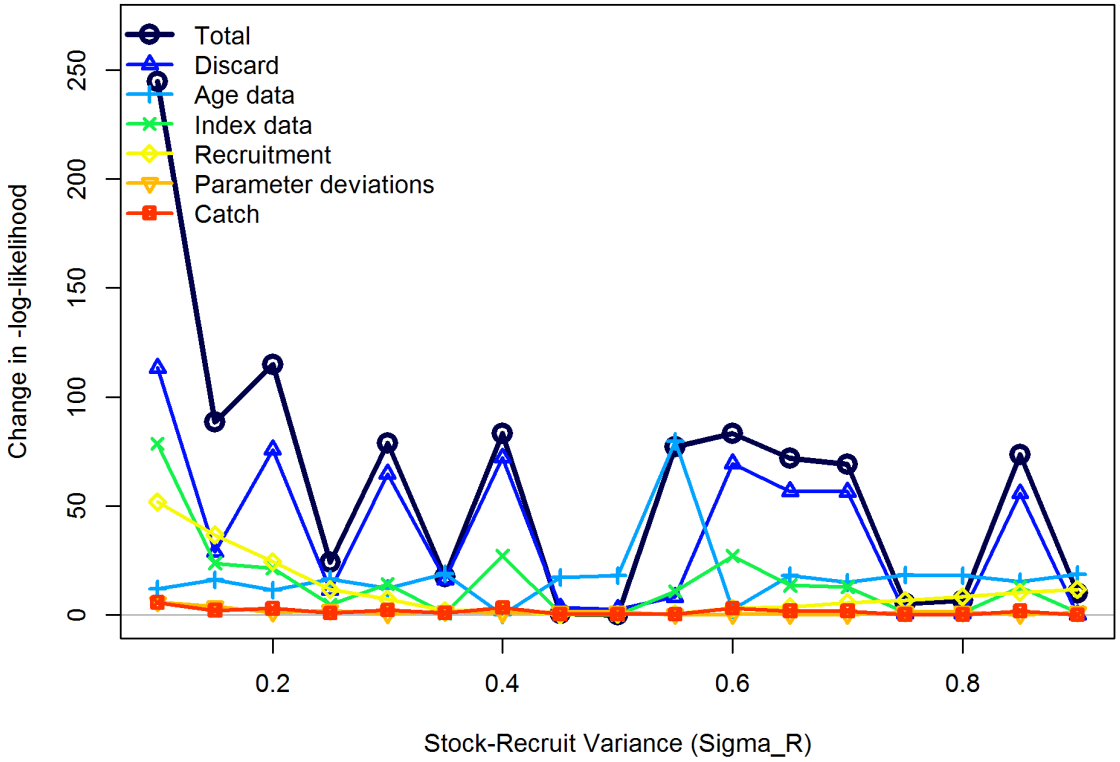
Virgin Recruitment Profile Likelihood

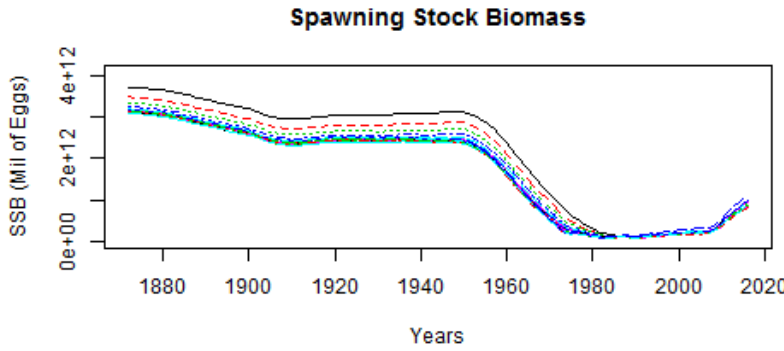


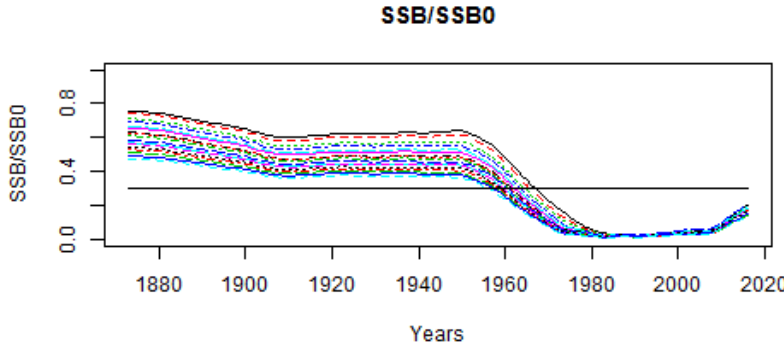




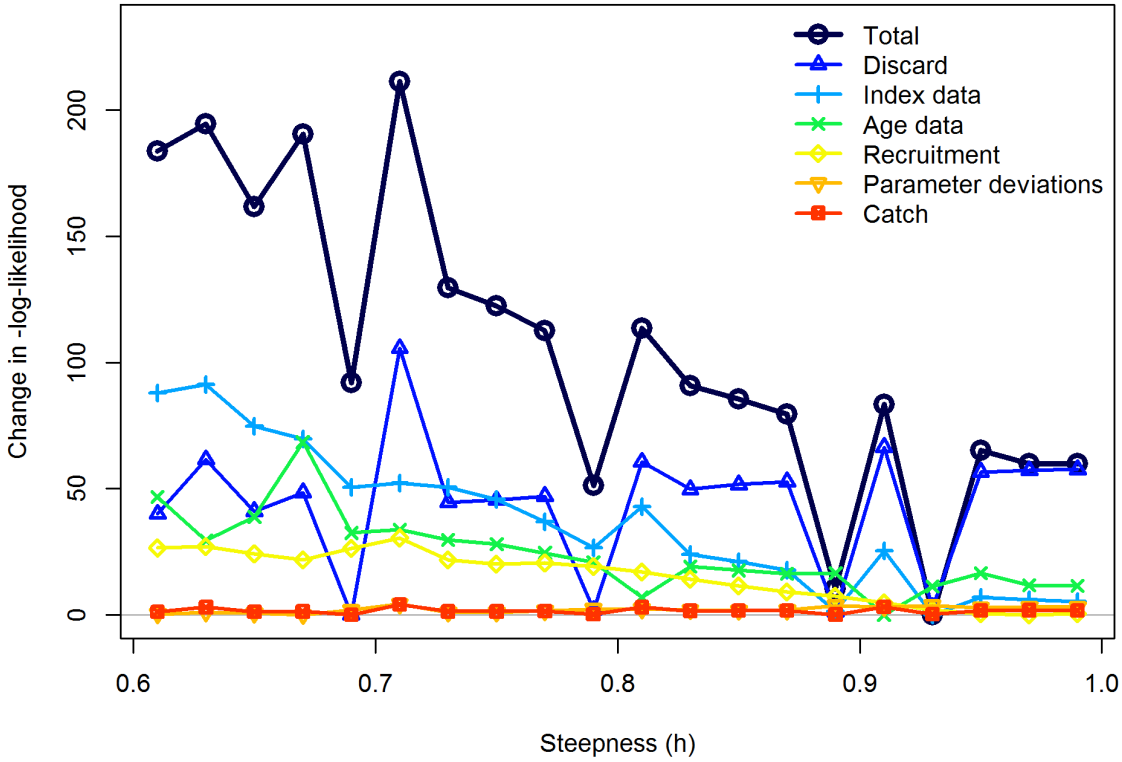
Recruitment Variance Profile Likelihood

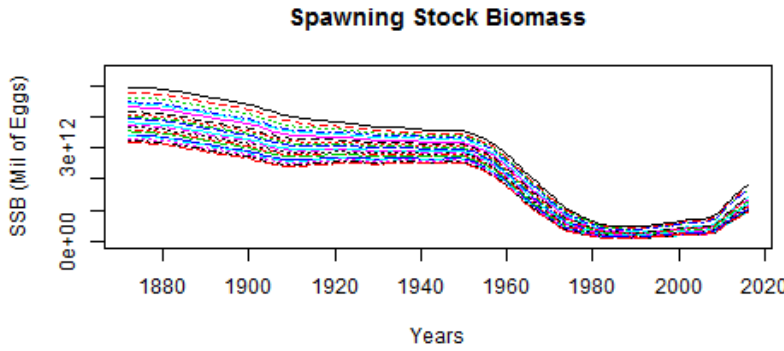


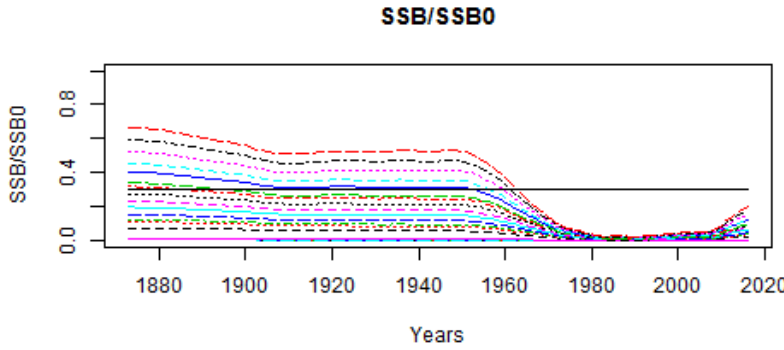




Steepness Profile Likelihood

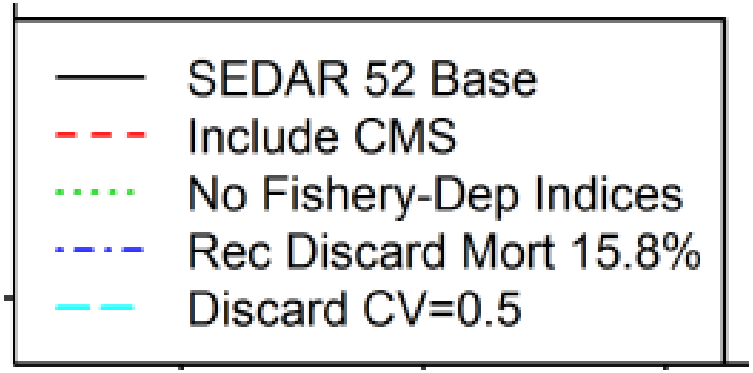






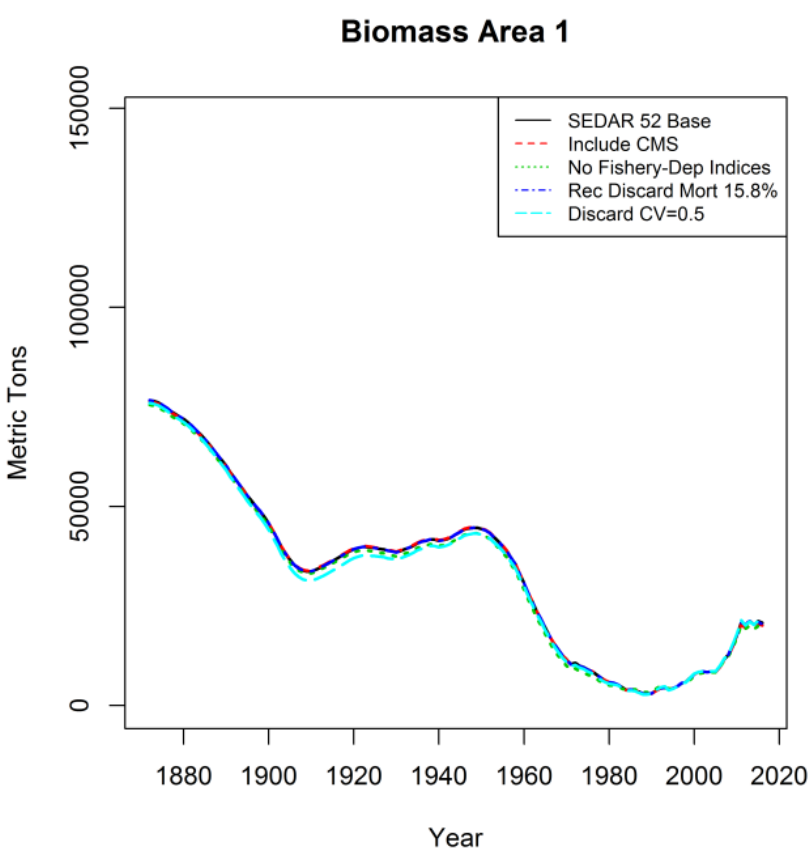
Sensitivity Runs

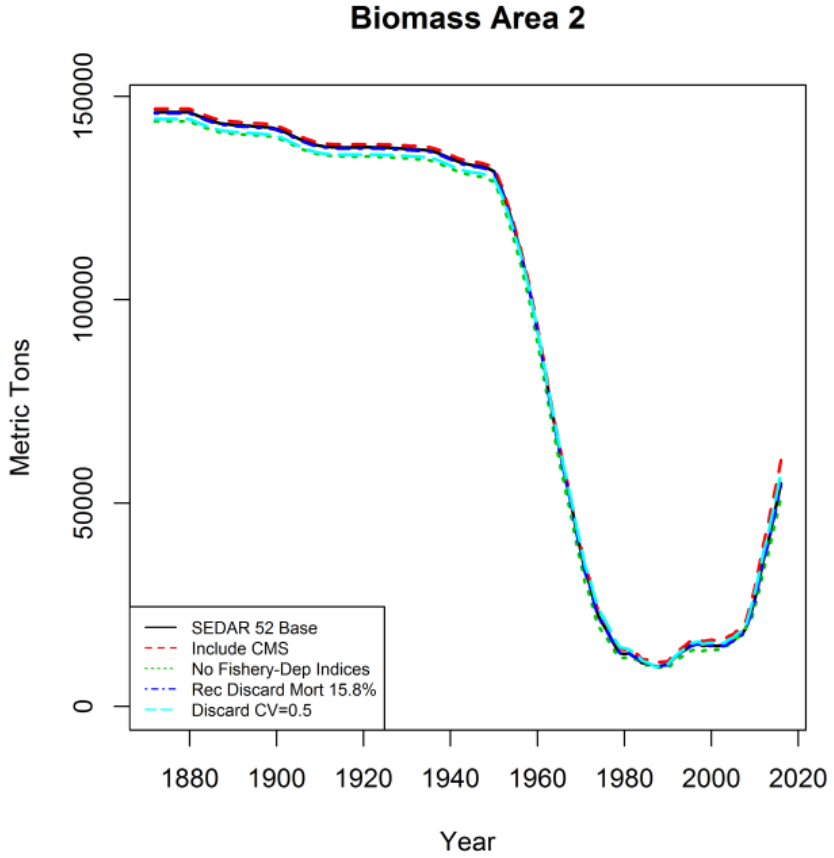
Sensitivity Model Runs



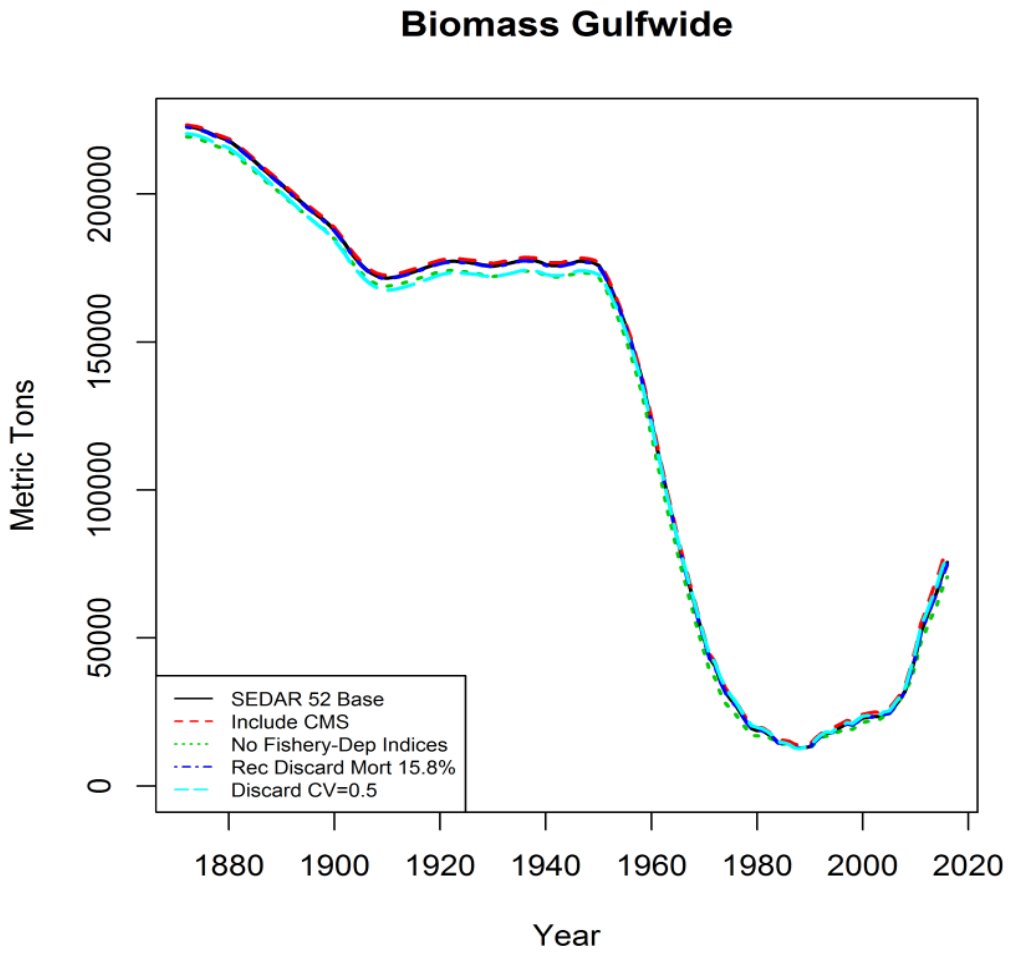
1) SEDAR 52 Base
2) Include Connectivity Modeling System (CMS) outputs as recruitment index
3) Remove Fishery Dependent CPUE Indices
4) Recreational Discard Mortality = 15.8% (post 2008)
5) Increase discard CV to 0.5 (matching 2014 Update)

Region-specific Biomass

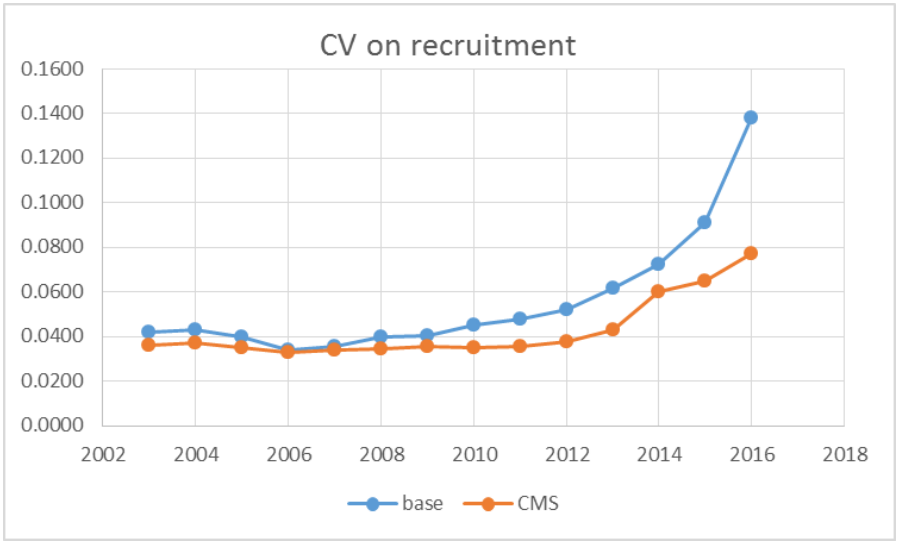


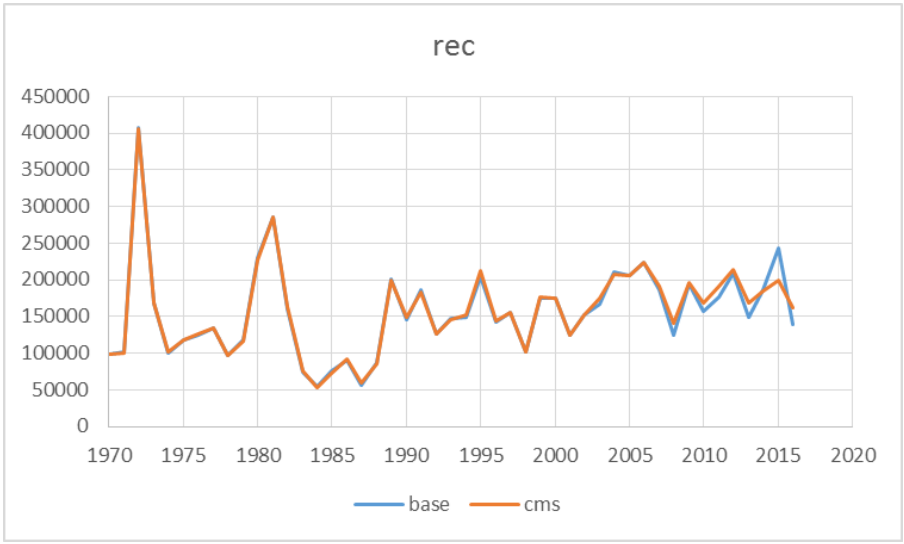


Gulfwide Biomass



CMS Recruitment Results





Projections

Projection Settings

- Constant recruitment based on recent period
- Selectivity, retention, and discard mortality taken from most recent timeblock
- Discard and bycatch fleets fishing mortality taken from terminal year and held constant
- Allocation 51:49, Comm : Rec
- Used 2017 provisional landings by fleet

HL_E	HL_W	LL_E	LL_W	MRIP_E	MRIP_W	HBT_E	HBT_W	Total
1435.63 (mt)	1585.36 (mt)	85.8 (mt)	58.69 (mt)	1151.08 (#'s)	162.67 (#'s)	58.61 (#'s)	60.07 (#'s)	15.36 mil. lbs.

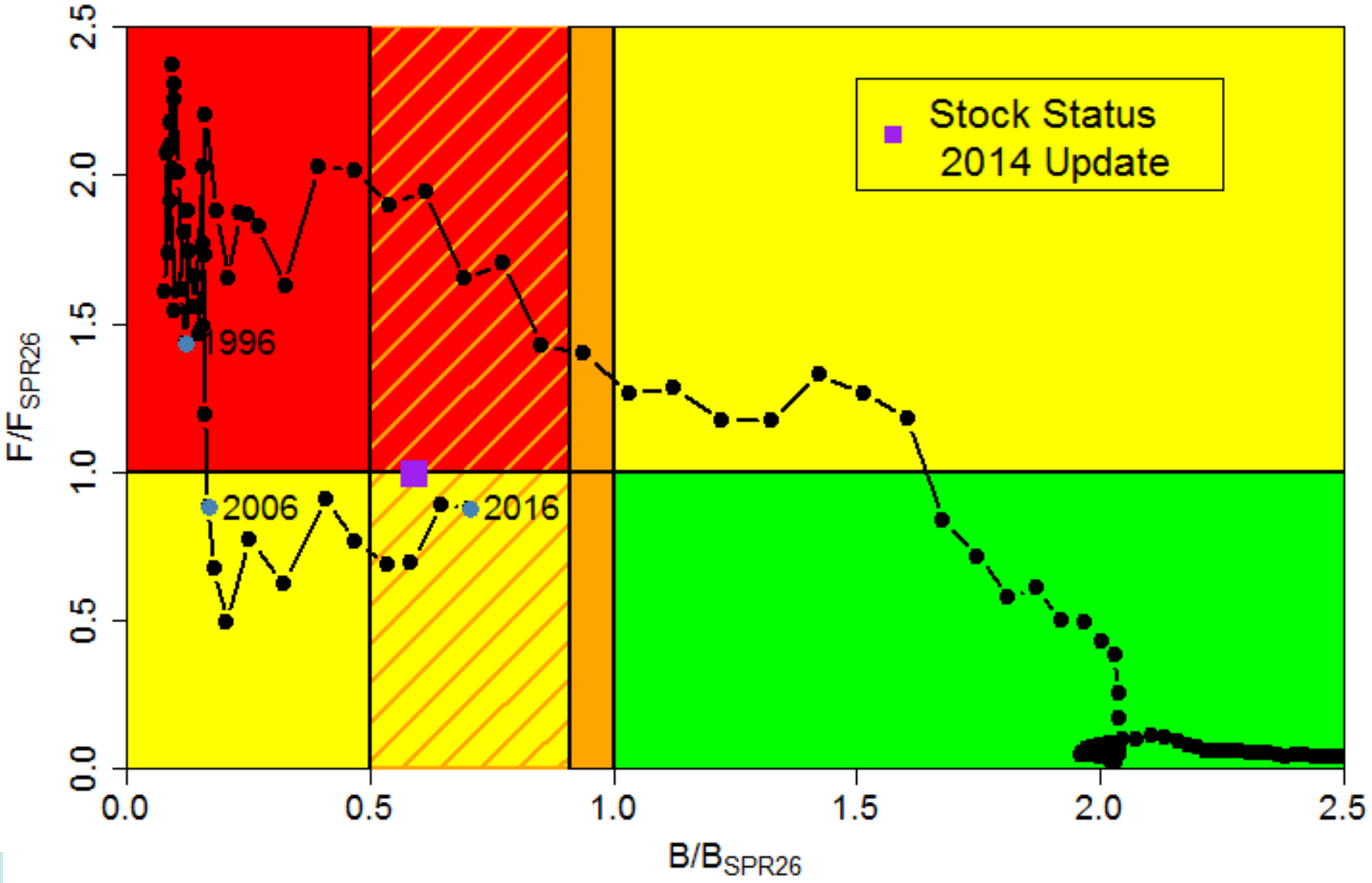
- Used ACL as landings for 2018

Comm.	Rec. for hire	Rec. private	Total
6,312,613 lbs.	2,848,000 lbs.	3,885,000 lbs.	13,045,613 lbs.

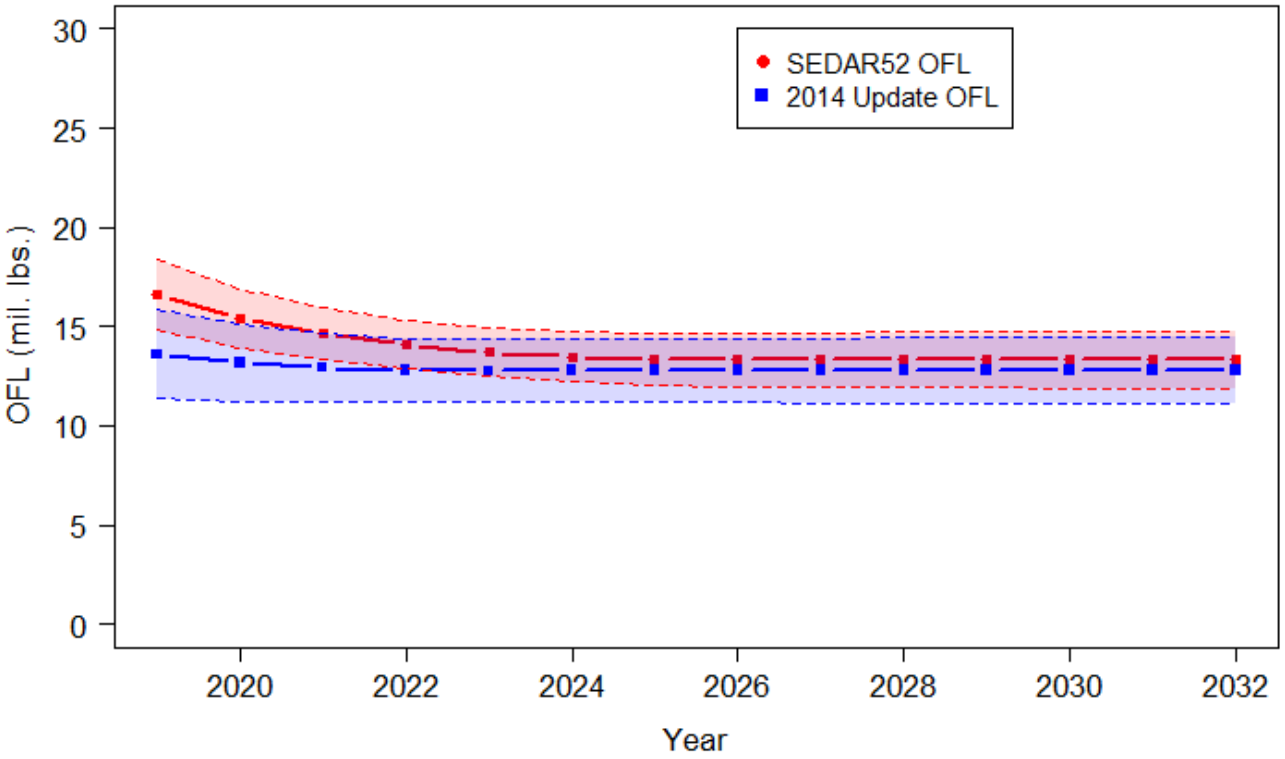
MSRA Table

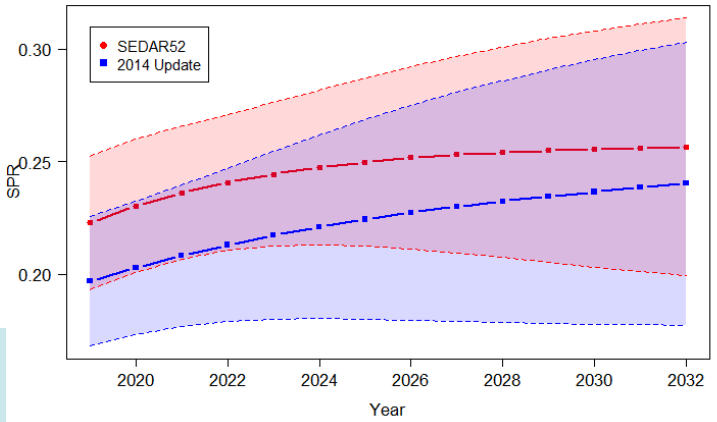
Criteria	Definition	2014 SEDAR 31 Update	SEDAR 52
Base M	Average M for Fully Selected Ages	0.09	0.09
Steepness	SR Parameter (h)	0.99	0.99
Virgin Recruitment	SR Parameter (R_0)	1.70E+08	1.63E+08
SSB Unfished (Eggs)		4.91E+15	4.72E+15
Generation Time	Fecundity-Weighted Mean Age	15	15
SPR target		0.26	0.26
Mortality Rate Criteria			
F_{MSY} or Proxy	$F_{SPR26\%}$	0.0494	0.0588
MFMT	$F_{SPR26\%}$	0.0494	0.0588
F_{OY}	0.75 * Directed F at $F_{SPR26\%}$	0.0472	0.0564
$F_{Current}$	Average F Over Terminal 3 Years of Assessment	0.0491	0.0484
$F_{Current}$/MFMT		0.994	0.823
Biomass Criteria			
SSB_{MSY} or Proxy	$SSB_{SPR26\%}$	1.28E+15	1.23E+15
$MSST_{OLD}$	(1-M) * $SSB_{SPR26\%}$	1.16E+15	1.12E+15
$MSST_{NEW}$	0.5 * $SSB_{SPR26\%}$	6.40E+14	6.15E+14
SSB_0	Virgin SSB	4.91E+15	4.72E+15
$SSB_{Current}$	Terminal Year SSB	6.90E+14	8.67E+14
$SSB_{Current}/SSB_{FSPR26\%}$		0.54	0.70
$SSB_{Current}/MSST_{OLD}$		0.59	0.77
$SSB_{Current}/MSST_{NEW}$		1.08	1.41
$SSB_{Current}/SSB_0$		0.14	0.18

Stock Status

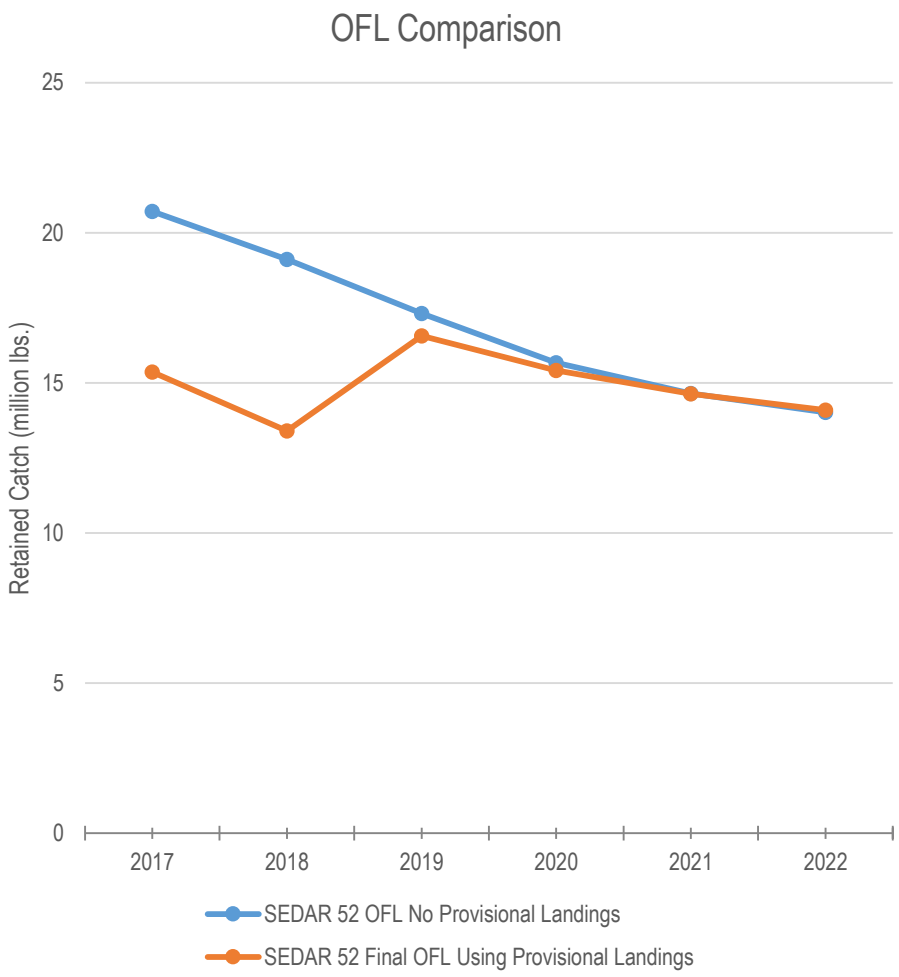


Overfishing Limit



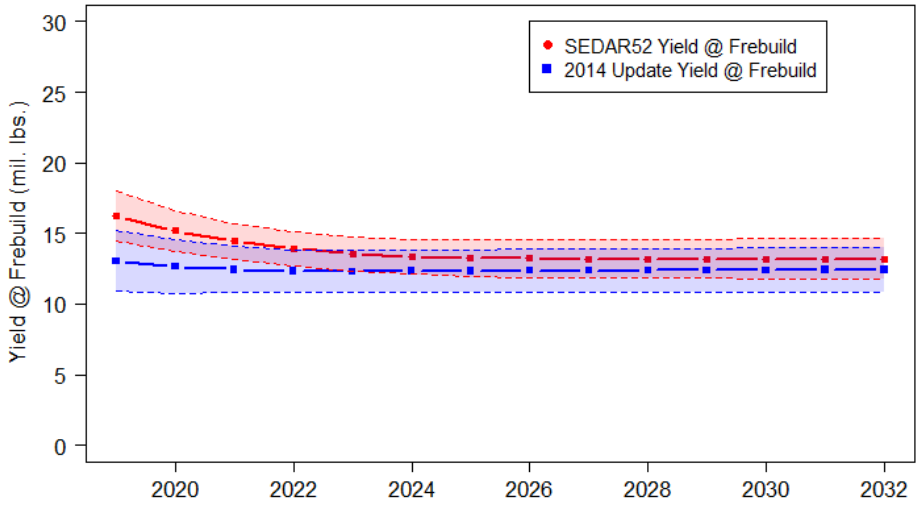


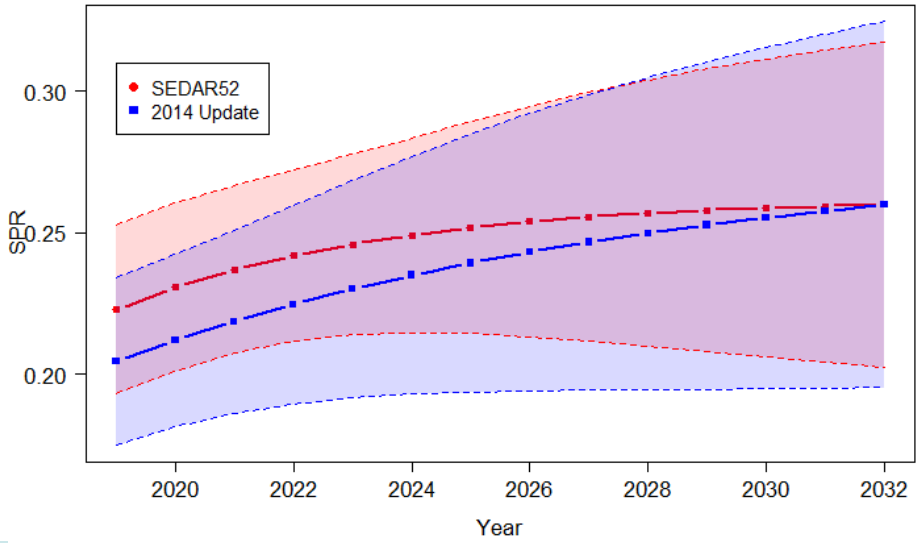
Overfishing Limit



- Why are there two OFL's?
  - SAR OFL without provisional landings for reference points
  - Projection OFL includes provisional 2017 and assumed 2018 landings for management advice

Yield and SPR from Frebuild





- Constrained to rebuild to SPR 26% by 2032
- P* = 0.427, same as used in 2014 SEDAR 31 Update Projections

Year	ABC (Mil. Lbs.)	OFL (mil. Lbs.)
2019	16.08	16.58
2020	15.04	15.42
2021	14.33	14.64
2022	13.81	14.08
2023	13.45	13.70
Equil	13.07	13.30
CC5	14.54	14.88
CC3	15.15	15.54

CC5 = average all 5 years

CC3 = average first 3 years

Did We Overfish in 2017?

2017 Landings

HL_E	HL_W	LL_E	LL_W	MRIP_E	MRIP_W	HBT_E	HBT_W	Total
1435.63 (mt)	1585.36 (mt)	85.8 (mt)	58.69 (mt)	1151.08 (#'s)	162.67 (#'s)	58.61 (#'s)	60.07 (#'s)	**15.36 mil. lbs.**

2014 Update Assessment Projections

2017 ABC	2017 OFL	2017 Provisional Removals
13.74 mil. lbs.	14.79 mil. lbs.	15.36 mil. lbs.

SEDAR 52 SAR OFL with no provisional Landings

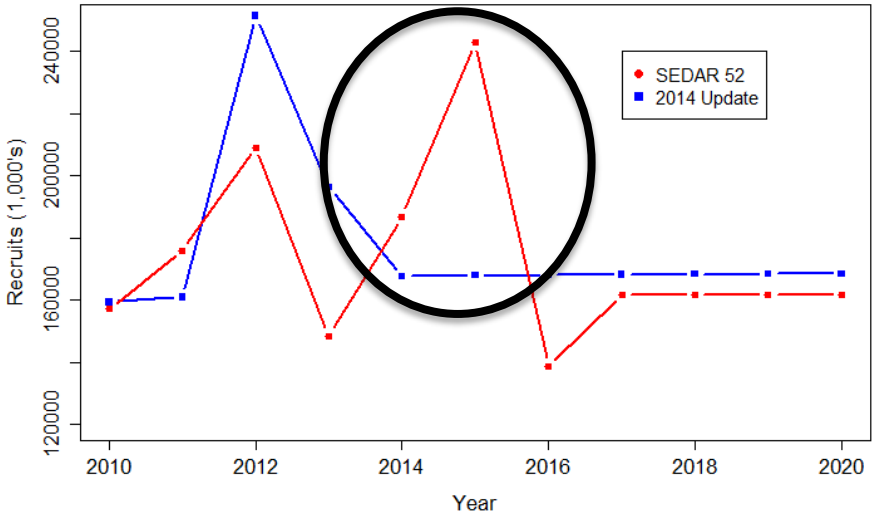
2017 OFL	2017 Provisional Removals
20.71 mil. lbs.	15.36 mil. lbs.

2017 F	MFMT (update)	MFMT (SEDAR 52)
0.0548	0.0494	0.0588

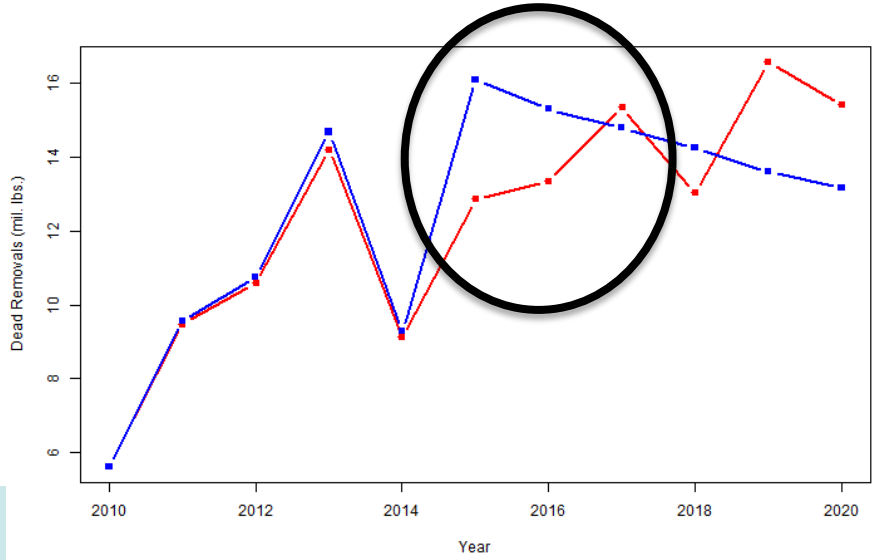
Based on SEDAR 52 overfishing did not occur in 2017

Why Didn't We Overfish in 2017?

Recruitment

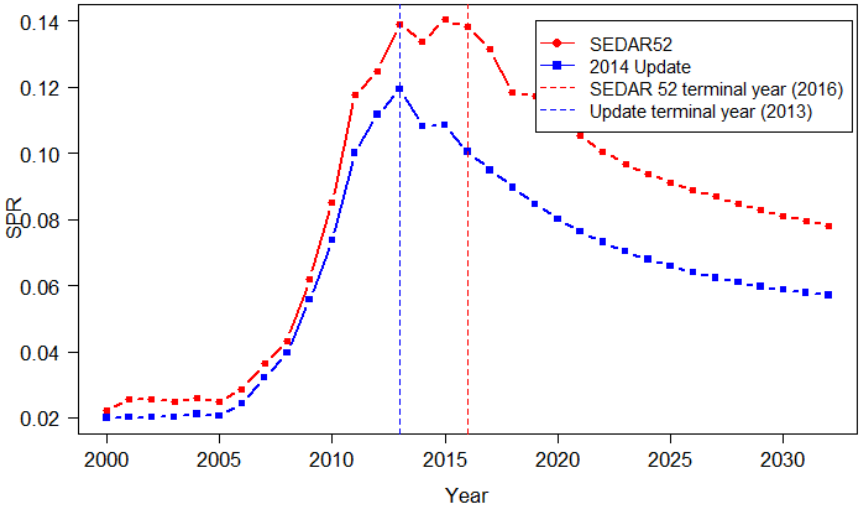


Dead Removals

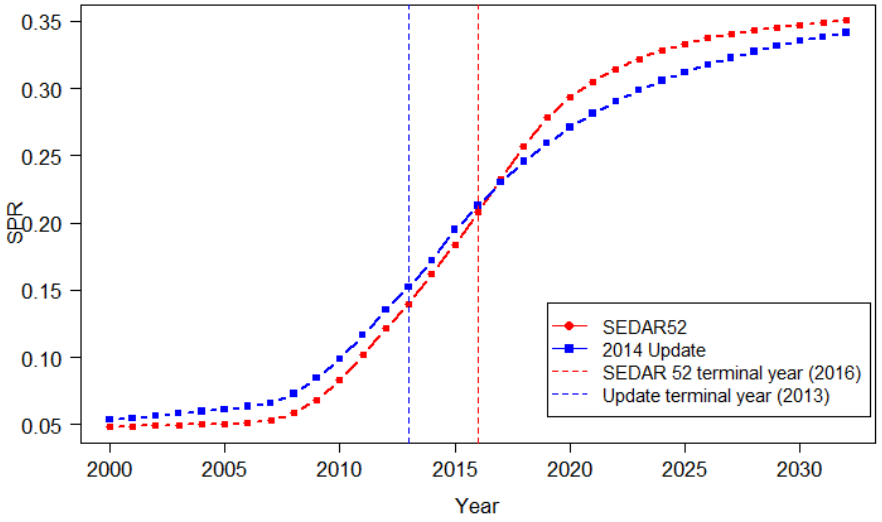


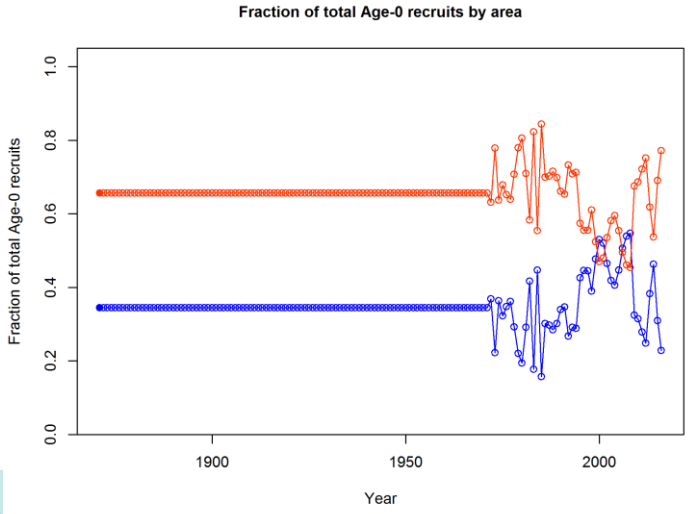
Regional SPR

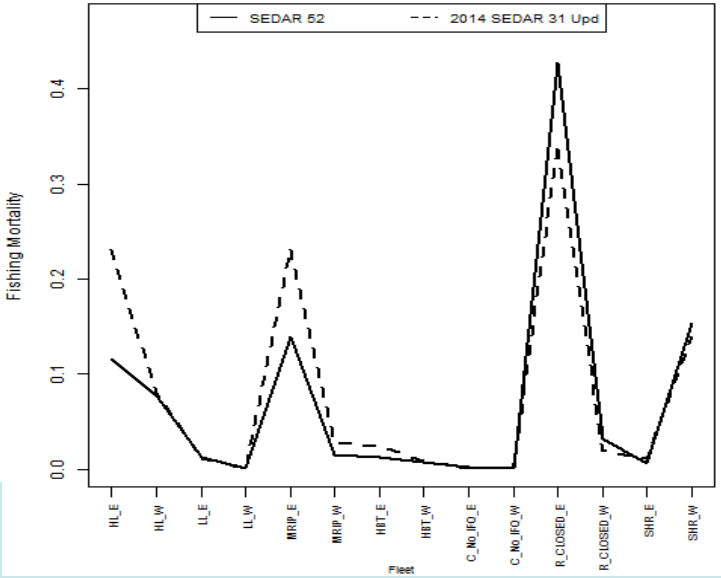
Eastern Gulf of Mexico



Western Gulf of Mexico







Questions