Revised Projections for South Atlantic
Blueline Tilefish SEDAR 32 Stock Assessment

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This document responds to an April 21, 2014 request for additional projections following the SEDAR 32 South Atlantic blueline tilefish stock assessment. The request was for (1) a constant F projection at F=75%Fmsy, (2) a constant F projection at F=Fmsy, (3) a P* analysis at P*=0.3, and (4) a P* analysis at P*=0.5. In addition, it was requested that the most recent catch data be used for the interim years (2012 and 2013) and that 2014 landings be set to 224,100 lb. The request is an update to prior requests (see December 16, 2013 and February 14, 2014 memorandums). The methodology for the current request for projections can be found in the assessment report (SEDAR 2013) and in the April 7, 2013 response to the initial request.

2012 and 2013 data

2012 and 2013 blueline tilefish landings and discards were re-computed using the most recent (week of April 21, 2014) available data supplied by the data providers. Where data were supplied in numbers, weights were computed using a mean weight of 5.0 lb, consistent with the assessment. Landings and discard estimates for 2013 are considered preliminary by the data providers.

Commercial landings for the longline, handline, and 'other' fisheries were supplied in pounds whole weight. Total commercial discards were supplied in numbers of fish for 2012 and were converted to weight using a mean weight. Discards were not supplied for 2013 and so were estimated assuming the same ratio of discards: landings (in weight) as was observed for 2012. Commercial discards were a small percentage of the total commercial harvest (< 1%).

MRIP recreational landings (A + B1) were supplied in pounds whole weight using the SEFSC estimation methodology. These landings include Monroe County as well as a proportion (0.23) of unidentified tilefish, consistent with the original assessment. Recreational discards (B2) were provided in numbers of fish. Discard mortality was assumed 100% and discard numbers were converted to discard weights using a mean weight. Headboat landings and discards for areas south of the North Carolina/Virginia border were removed from the MRIP recreational landings because this region is more effectively sampled by the Southeast Regional Headboat Survey (SRHS). A small number of headboat trips north of North Carolina were retained in the MRIP catch estimates. This is also consistent with the methodology used in the assessment.

Headboat landings and discards were provided by SRHS. Landings were provided in pounds whole weight and discards were provided in numbers of fish. Headboat discards were converted to weight using a mean weight.

The estimated landings and discards by fishery for 2012 and 2013 are shown in Table 1. Fig. 1 shows the catch (landings + discards) time series used in the assessment (1974-2011) updated with the 2012 and 2013 data.

Preliminary 2013 Recreational Catch Estimates

MRIP landings in 2013 were high (310,368 lb) compared to 2012 (70,394) and compared to recent years. Proportional standard error (PSE) in 2013 was > 0.7 indicating the estimated landings are highly uncertain. Historically, total blueline landings in the recreational fishery in the South Atlantic have been driven by landings off North Carolina (Fig. 2). In 2013, total blueline recreational landings were driven by landings off Florida. The reason for the rapid increase in blueline landings off Florida in 2013 is unknown. This rapid increase in recreational landings and the shift in spatial distribution of the harvest suggest there may be some issue with the 2013 MRIP data, which are still considered preliminary. In light of this, the requested projections were run in duplicate with the preliminary estimate of 2013 MRIP landings that were provided and with an imputed value for the 2013 MRIP landings.

The imputed value used for 2013 was the mean of the MRIP landings (A+B1) for 2010 and 2012. The 2010 and 2012 MRIP catches (landings + discards) were 65,120 lbs and 77,812 lbs, respectively. The 2011 MRIP catch was low compared to recent years (46,997 lb), probably due to the 2011 deep water closure. Therefore, the MRIP catch in 2010 and 2012 was averaged and used as an alternative estimate of 2013 MRIP landings (71,466 lb). Total landings across all fisheries in 2013 calculated with this change were 317,116 lb compared to 556,018 lb using the MRIP estimate provided, a difference of 238,902 lb (Table 1).

Projections were run in duplicate with the actual 2013 MRIP estimate and with the imputed value for 2013 (average of the 2010 and 2012 MRIP landings).

Projections

Constant F and P* projections were run for the seven years following the terminal year of the assessment (2012-2018). Catch levels for the interim period (2012 and 2013) were set to the values shown in Table 1. The first year of new management was assumed to be 2014. The catch level for 2014 was set to 224,100 lb whole wet weight, the 75% F_{MSY} level at equilibrium.

Two constant F projections were run with F set to 75% of Fmsy and F set to Fmsy. Annual catch (landings + discards) associated with these levels of fishing mortality were computed for 2015-2018. Details of the stochastic projection model can be found in SEDAR (2013).

Two P* projections were conducted with P*=0.3 and P*=0.5. Annual levels of projected landings consistent with these two probabilities of overfishing in any of the remaining years of the projection time period (2015-2018) were computed using the sequential PASCL approach of Shertzer et al. (2010).

For both constant F and P* projections, annual catch was separated into landings and discards using the ratio of total discards to total landings from the assessment.

Results of the constant F projections at 75% Fmsy and Fmsy, and with the observed and imputed MRIP landings are shown in Table 2-5 and Fig. 3-6. Similar results of the P* analysis are shown in Table 6-9 and Fig. 7-10.

Comments on Projections:

- The catch level requested to be used for 2014 (224,100 lb) is the yield associated with 75% of F_{MSY} under equilibrium conditions. The stock is not at equilibrium and, therefore, F in 2014 is higher than the equilibrium 75%Fmsy (0.226) or Fmsy (0.302).

- The difference in equilibrium yield at F=75%Fmsy (224.1 klb) and F=Fmsy (226.5 klb) is small and the difference in ABCs between these two projections is small.

- The difference between the observed and the imputed MRIP landings for 2013 has a large effect on the projections, both in terms of the estimated ABC and the uncertainty in F.

- In general, projections of fish stocks are highly uncertain, particularly in the long-term (> 3-5 years).

- Although these projections included many sources of uncertainty, they did not include structural (model) uncertainty. That is, projection results are conditional on one set of functional forms used to describe population dynamics, selectivity, recruitment, etc.

- Fisheries were assumed to continue fishing at their estimated current proportions of total fishing effort, using the estimated current selectivity patterns. New management regulations that alter those proportions or selectivities would likely affect projection results.

- These projections did not consider any error in implementing regulations (e.g., landings in excess of the ABC). If implementation error were included the projections would be altered.

- The projections assume that the estimated spawner-recruit relationship applies in the future and that past residuals reflect future uncertainty in recruitment. If future recruitment changes, due to environment or harvest effects, then stock trajectories will be altered.

References

SEDAR, 2013. SEDAR 32 Stock Assessment Report for South Atlantic Blueline Tilefish.

Shertzer, K.W., M.H. Prager, and E.H. Williams. 2010. Probabilistic approaches to setting acceptable biological catch and annual catch targets for multiple years: Reconciling methodology with National Standards Guidelines. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 2:451-458.

Table 1. 2012 and 2013 removals (pounds whole weight) of South Atlantic blueline tilefish. The "Alternative" column re-computes total 2013 landings using the average of MRIP landings in 2010 and 2012 for 2013.

Fishery	2012 Removals	2013 Removals	2013 Removals (Alternate)
Com Handline landings	32,726	46,969	46,969
Com Longline landings	309,320	157,195	157,195
Com 'Other' landings	25,197	22,195	22,195
Com Discards	197	121	121
MRIP landings	70,394	310,368	71,466
MRIP discards	7,418	6,107	6,107
Headboat landings	18,462	11,014	11,014
Headboat discards	1,260	2,049	2,049
Total:	**464,974**	**556,018**	**317,116**

Table 2. Constant F projection at F=75%F_{msy}. F = fishing mortality rate (per yr), SSB = mid-year spawning stock biomass (mature female biomass in mt), Pr(SSB > SSB_{MSY}) = proportion of replicates where SSB was above SSB_{MSY} = 246.6 mt, R = recruits (1000 age-1 fish). Annual ABCs are a single quantity while other values are medians. Assumed 224.1 klb caught in 2014. Observed MRIP estimate for 2013 (556,018 lb).

Year	F	SSB	Pr(SSB> SSB_{msy})	R	ABC landings (1000 lb)	ABC discards (1000 lb)	ABC landings (1000 fish)	ABC discards (1000 fish)
2012	1.094	199.40	0.15	106.645	NA	NA	NA	NA
2013	2.191	140.42	0.05	106.052	NA	NA	NA	NA
2014	1.312	118.55	0.04	92.977	223.858	0.242	51.010	0.127
2015	0.226	133.44	0.06	86.900	**50.011**	**0.054**	**10.980**	**0.012**
2016	0.226	161.16	0.10	90.203	**75.169**	**0.081**	**15.327**	**0.017**
2017	0.226	182.17	0.16	96.404	**98.387**	**0.106**	**19.023**	**0.021**
2018	0.226	197.51	0.23	99.568	**118.424**	**0.128**	**21.955**	**0.024**

Table 3. Constant F projection at F=75%F_{msy}. F = fishing mortality rate (per yr), SSB = mid-year spawning stock biomass (mature female biomass in mt), Pr(SSB > SSB_{MSY}) = proportion of replicates where SSB was above SSB_{MSY} = 246.6 mt, R = recruits (1000 age-1 fish). Annual ABCs are a single quantity while other values are medians. Assumed 224.1 klb landed in 2014. Imputed MRIP estimate for 2013 (317,116 lb).

Year	F	SSB	Pr(SSB> SSB_{msy})	R	ABC landings (1000 lb)	ABC discards (1000 lb)	ABC landings (1000 fish)	ABC discards (1000 fish)
2012	1.094	199.40	0.15	106.645	NA	NA	NA	NA
2013	0.903	171.64	0.09	106.052	NA	NA	NA	NA
2014	0.683	165.72	0.10	100.128	223.858	0.242	45.568	0.049
2015	0.226	177.96	0.14	98.644	**87.010**	**0.094**	**17.215**	**0.109**
2016	0.226	199.62	0.22	100.735	**110.891**	**0.120**	**21.094**	**0.023**
2017	0.226	216.36	0.30	104.348	**130.885**	**0.142**	**24.016**	**0.026**
2018	0.226	228.21	0.38	105.940	**146.476**	**0.158**	**26.169**	**0.028**

Table 4. Constant F projection at F=F_{msy}. F = fishing mortality rate (per yr), SSB = mid-year spawning stock biomass (mature female biomass in mt), Pr(SSB > SSB_{MSY}) = proportion of replicates where SSB was above SSB_{MSY} = 246.6 mt, R = recruits (1000 age-1 fish). Annual ABCs are a single quantity while other values are medians. Assumed 224.1 klb landed in 2014. Observed MRIP estimate for 2013 (556,018 lbs).

Year	F	SSB	Pr(SSB> SSB_{msy})	R	ABC landings (1000 lb)	ABC discards (1000 lb)	ABC landings (1000 fish)	ABC discards (1000 fish)
2012	1.094	199.40	0.15	106.645	NA	NA	NA	NA
2013	2.191	140.42	0.05	106.052	NA	NA	NA	NA
2014	1.312	118.55	0.04	92.977	223.858	0.242	51.082	0.055
2015	0.302	132.19	0.05	86.901	**65.341**	**0.071**	**14.392**	**0.015**
2016	0.302	156.04	0.08	89.875	**94.755**	**0.102**	**19.467**	**0.021**
2017	0.302	173.23	0.12	95.326	**119.966**	**0.130**	**23.446**	**0.025**
2018	0.302	184.14	0.15	97.915	**140.240**	**0.152**	**26.438**	**0.029**

Table 5. Constant F projection at F=F_{msy}. F = fishing mortality rate (per yr), SSB = mid-year spawning stock biomass (mature female biomass in mt), Pr(SSB > SSB_{MSY}) = proportion of replicates where SSB was above SSB_{MSY} = 246.6 mt, R = recruits (1000 age-1 fish). Annual ABCs are a single quantity while other values are medians. Assumed 224.1 klb landed in 2014. Imputed MRIP estimate for 2013 (317,116 lbs).

Year	F	SSB	Pr(SSB> SSB_{msy})	R	ABC landings (1000 lb)	ABC discards (1000 lb)	ABC landings (1000 fish)	ABC discards (1000 fish)
2012	1.094	199.40	0.15	106.645	NA	NA	NA	NA
2013	0.903	171.64	0.09	106.052	NA	NA	NA	NA
2014	0.683	165.72	0.10	100.128	**223.858**	**0.242**	**45.568**	**0.049**
2015	0.302	175.52	0.13	98.644	**113.214**	**0.122**	**22.437**	**0.024**
2016	0.302	191.98	0.18	100.311	**138.304**	**0.150**	**26.564**	**0.029**
2017	0.302	203.43	0.22	103.398	**157.251**	**0.170**	**29.241**	**0.032**
2018	0.302	210.58	0.27	104.174	**170.636**	**0.184**	**31.091**	**0.034**

Table 6. Acceptable biological catch (ABC) of blueline tilefish based on the annual probability of overfishing P* = 0.3. Landings were set to those observed for 2012 and 2013 and to 224,100 lbs for 2014, with the ABC associated with the specified probability of overfishing calculated for the remaining years (2015-2018). F = fishing mortality rate (per yr), SSB = mid-year spawning stock biomass (mature female biomass in metric tons whole weight), Pr(SSB > SSB_{MSY}) = proportion of replicates where SSB was above the point estimate of SSB_{MSY} = 246.6 mt, R = recruits (1000 age-1 fish). Annual ABCs are a single quantity while other values presented are medians. Assumed 224.1 klb landed in 2014. Observed MRIP estimate used for 2013 (556,018 lbs). L=landings, D=Discards.

Year	F	Pr(F > Fmsy)	SSB	Pr(SSB > SSBmsy)	R	ABC-L (1000 lb)	ABC-D (1000 lb)	ABC-L (1000 fish)	ABC-D (1000 fish)
2012	1.11	0.97	195.979	0.09	107.814	NA	NA	NA	NA
2013	2.33	1.00	132.292	0.02	105.751	NA	NA	NA	NA
2014	1.49	0.97	107.838	0.02	92.853	NA	NA	NA	NA
2015	0.144	0.30	123.144	0.03	85.277	**28.546**	**0.031**	**6.355**	**0.007**
2016	0.147	0.30	155.085	0.08	89.260	**46.238**	**0.050**	**9.530**	**0.010**
2017	0.148	0.30	180.977	0.17	95.148	**64.768**	**0.070**	**12.593**	**0.014**
2018	0.149	0.30	201.827	0.27	99.421	**82.189**	**0.089**	**15.249**	**0.016**

Table 7. Acceptable biological catch (ABC) of blueline tilefish based on the annual probability of overfishing P* = 0.5. Landings were set to those observed for 2012 and 2013 and to 224,100 lbs for 2014, with the ABC associated with the specified probability of overfishing calculated for the remaining years (2015-2018). F = fishing mortality rate (per yr), SSB = mid-year spawning stock biomass (mature female biomass in metric tons whole weight), Pr(SSB > SSB_{MSY}) = proportion of replicates where SSB was above the point estimate of SSB_{MSY} = 246.6 mt, R = recruits (1000 age-1 fish). Annual ABCs are a single quantity while other values presented are medians. Assumed 224.1 klb landed in 2014. Observed MRIP estimate used for 2013 (556,018 lbs). L=landings, D=Discards.

Year	F	Pr(F > Fmsy)	SSB	Pr(SSB > SSBmsy)	R	ABC-L (1000 lb)	ABC-D (1000 lb)	ABC-L (1000 fish)	ABC-D (1000 fish)
2012	1.11	0.97	195.979	0.09	107.814	NA	NA	NA	NA
2013	2.33	1.00	132.292	0.02	105.751	NA	NA	NA	NA
2014	1.49	0.97	107.838	0.02	92.853	NA	NA	NA	NA
2015	0.229	0.50	121.805	0.03	85.277	**44.271**	**0.048**	**9.885**	**0.011**
2016	0.227	0.50	150.111	0.07	88.723	**67.118**	**0.073**	**13.943**	**0.015**
2017	0.225	0.50	171.579	0.14	93.956	**89.598**	**0.097**	**17.627**	**0.019**
2018	0.224	0.50	187.246	0.22	97.496	**109.542**	**0.118**	**20.642**	**0.022**

Table 8. Acceptable biological catch (ABC) of blueline tilefish based on the annual probability of overfishing P* = 0.3. Landings were set to those observed for 2012 and 2013 and to 224,100 lbs for 2014, with the ABC associated with the specified probability of overfishing calculated for the remaining years (2015-2018). F = fishing mortality rate (per yr), SSB = mid-year spawning stock biomass (mature female biomass in metric tons whole weight), Pr(SSB > SSB$_{MSY}$) = proportion of replicates where SSB was above the point estimate of SSB$_{MSY}$ = 246.6 mt, R = recruits (1000 age-1 fish). Annual ABCs are a single quantity while other values presented are medians. Assumed 224.1 klb landed in 2014. Imputed MRIP estimate used for 2013 (317,116 lbs). L=landings, D=Discards.

Year	F	Pr(F > Fmsy)	SSB	Pr(SSB > SSBmsy)	R	ABC-L (1000 lb)	ABC-D (1000 lb)	ABC-L (1000 fish)	ABC-D (1000 fish)
2012	1.11	0.97	195.979	0.09	107.814	NA	NA	NA	NA
2013	0.935	1.00	164.447	0.02	105.751	NA	NA	NA	NA
2014	0.732	0.97	154.986	0.02	100.128	NA	NA	NA	NA
2015	0.160	0.30	168.162	0.03	97.929	**57.541**	**0.062**	**11.474**	**0.012**
2016	0.161	0.30	195.579	0.08	100.196	**77.075**	**0.083**	**14.698**	**0.016**
2017	0.160	0.30	217.639	0.17	102.753	**95.051**	**0.102**	**17.419**	**0.019**
2018	0.159	0.30	235.903	0.27	106.246	**110.317**	**0.119**	**19.576**	**0.021**

Table 9. Acceptable biological catch (ABC) of blueline tilefish based on the annual probability of overfishing P* = 0.5. Landings were set to those observed for 2012 and 2013 and to 224,100 lbs for 2014, with the ABC associated with the specified probability of overfishing calculated for the remaining years (2015-2018). F = fishing mortality rate (per yr), SSB = mid-year spawning stock biomass (mature female biomass in metric tons whole weight), Pr(SSB > SSB_{MSY}) = proportion of replicates where SSB was above the point estimate of SSB_{MSY} = 246.6 mt, R = recruits (1000 age-1 fish). Annual ABCs are a single quantity while other values presented are medians. Assumed 224.1 klb landed in 2014. Imputed MRIP estimate used for 2013 (317,116 lbs).

Year	F	Pr(F > Fmsy)	SSB	Pr(SSB > SSBmsy)	R	ABC-L (1000 lb)	ABC-D (1000 lb)	ABC-L (1000 fish)	ABC-D (1000 fish)
2012	1.11	0.97	195.979	0.09	107.814	NA	NA	NA	NA
2013	0.935	0.95	164.447	0.04	105.751	NA	NA	NA	NA
2014	0.732	0.91	154.986	0.03	100.128	NA	NA	NA	NA
2015	0.235	0.50	165.975	0.07	97.929	**82.648**	**0.089**	**16.549**	**0.018**
2016	0.234	0.50	188.270	0.15	99.785	**104.862**	**0.113**	**20.189**	**0.022**
2017	0.233	0.50	204.824	0.25	101.347	**124.378**	**0.134**	**23.161**	**0.025**
2018	0.231	0.50	217.756	0.34	104.266	**140.423**	**0.152**	**25.414**	**0.027**

Figure. 1. South Atlantic blueline tilefish landings time series by fishery updated to 2013. Black dot is the imputed value for 2013 landings (317,116 pounds wet weight).
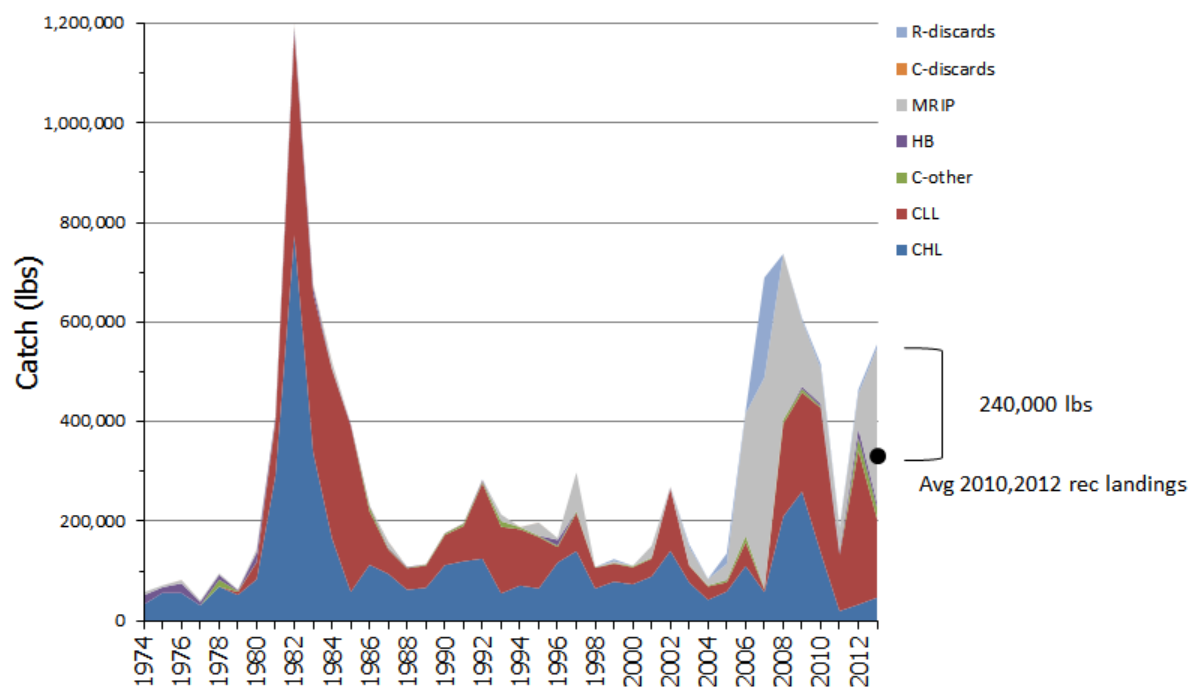
Figure 2. South Atlantic blueline tilefish general recreational (MRIP) landings for the South Atlantic (gray), the east coast of Florida, and North Carolina.
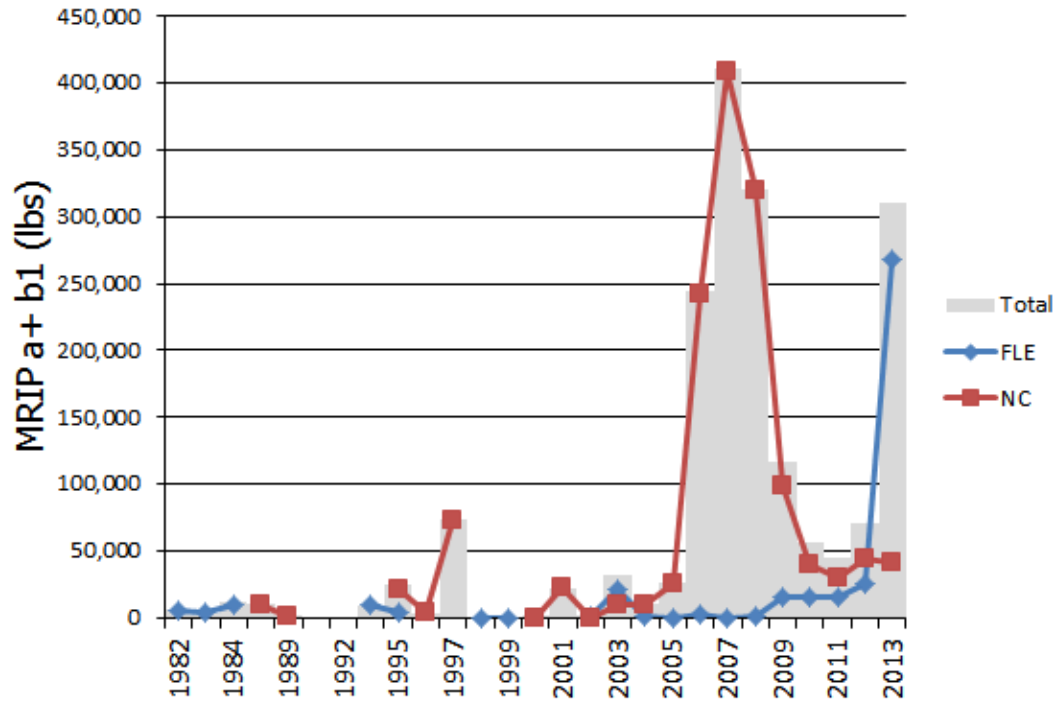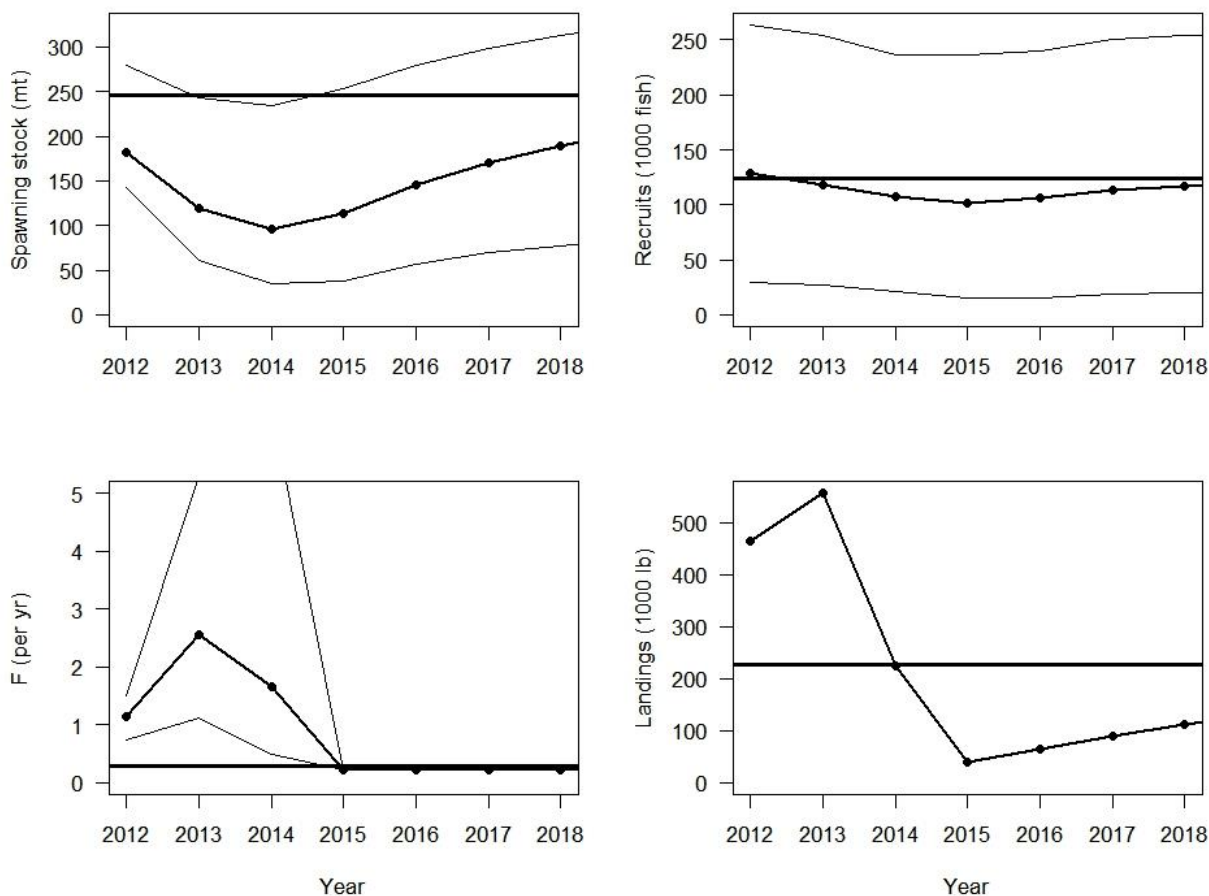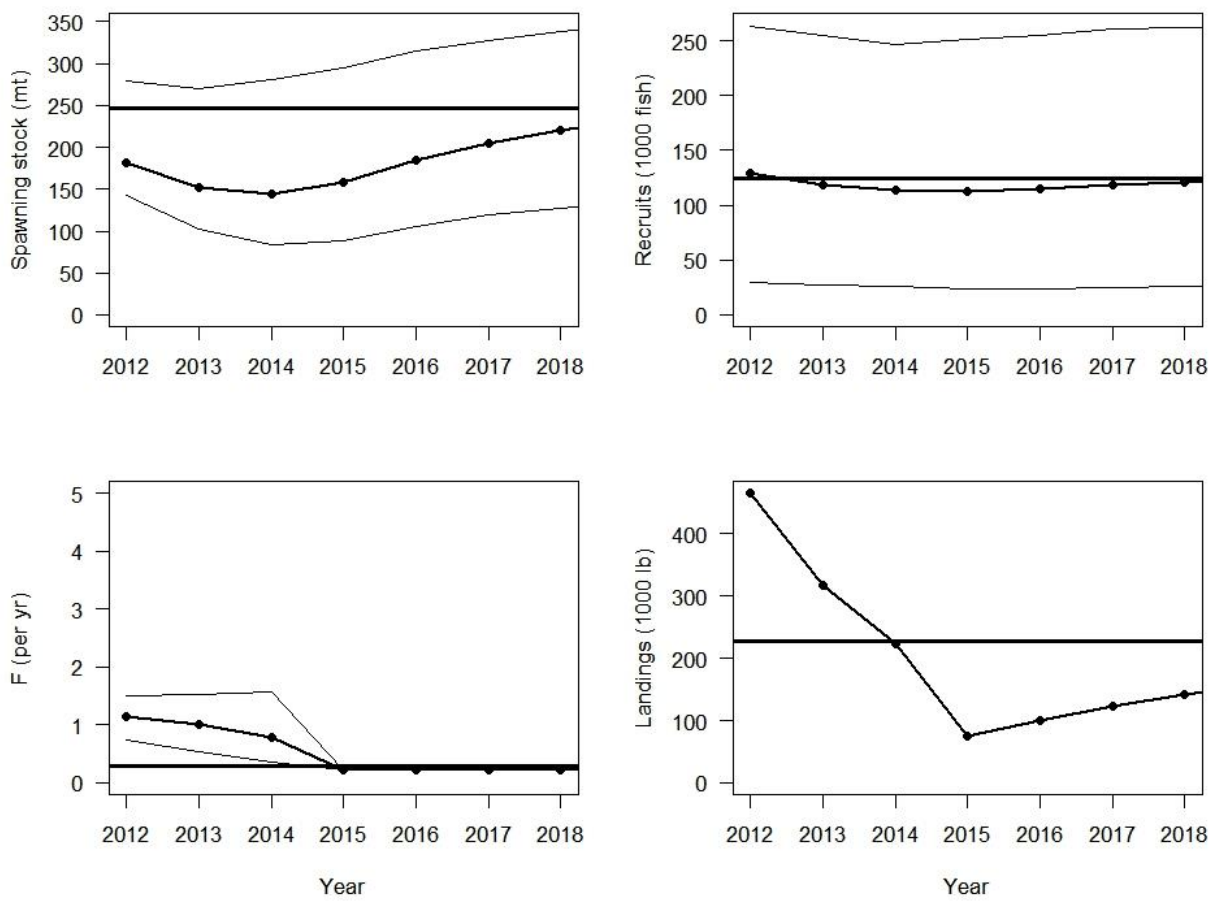
Figure 3. Constant F projection at F=75%F_{msy}. For this assessment, discards were combined with landings so the ABC reflects both landings and dead discards (landings and dead discards are separated in the associated Tables). Expected values represented by dotted solid lines and uncertainty represented by thin lines corresponding to the 5th and 95th percentiles of the 10,000 projection runs. Observed MRIP estimate used for 2013 (556,018 lbs).
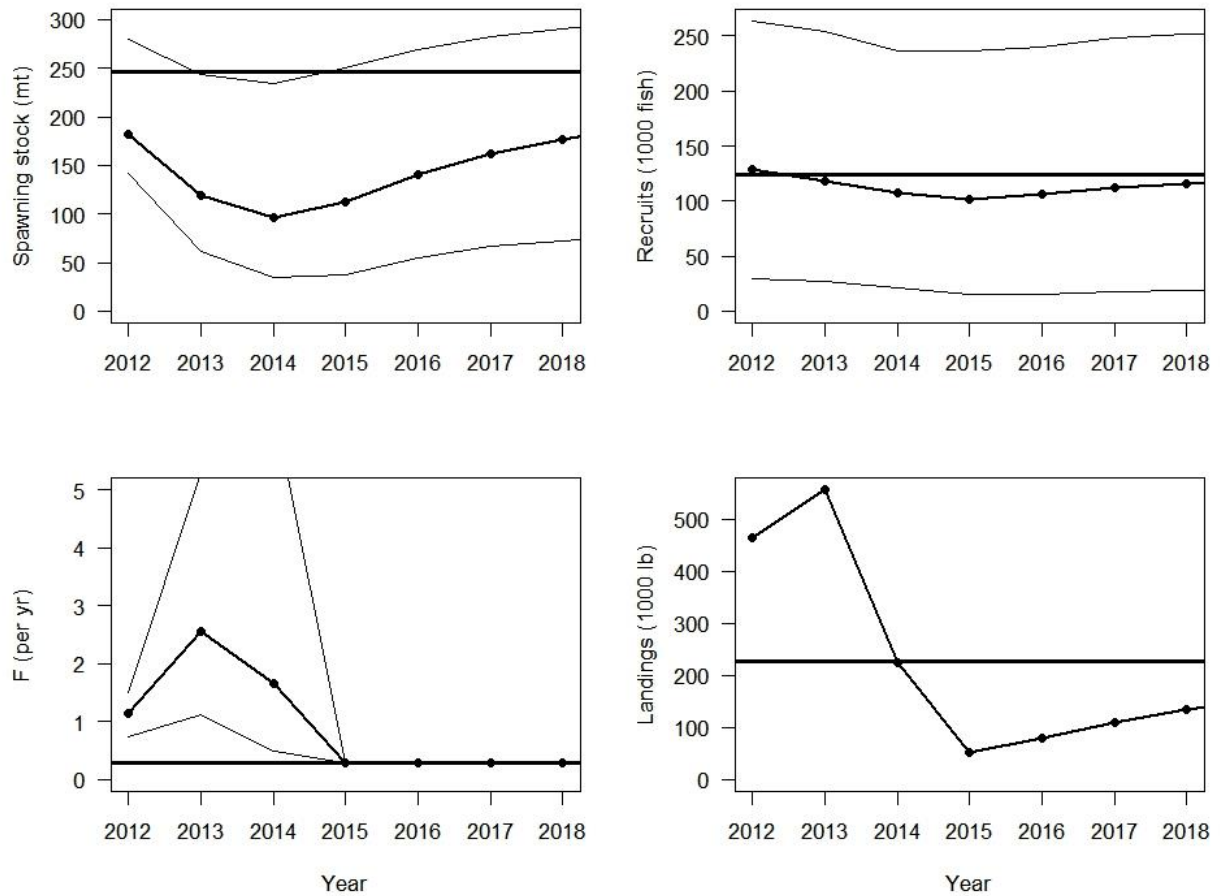
Figure 4. Constant F projection at F=75%F_{msy}. For this assessment, discards were combined with landings so the ABC reflects both landings and dead discards (landings and dead discards are separated in the associated Tables). Expected values represented by dotted solid lines and uncertainty represented by thin lines corresponding to the 5th and 95th percentiles of the 10,000 projection runs. Imputed MRIP estimate used for 2013 (317,116 lbs).
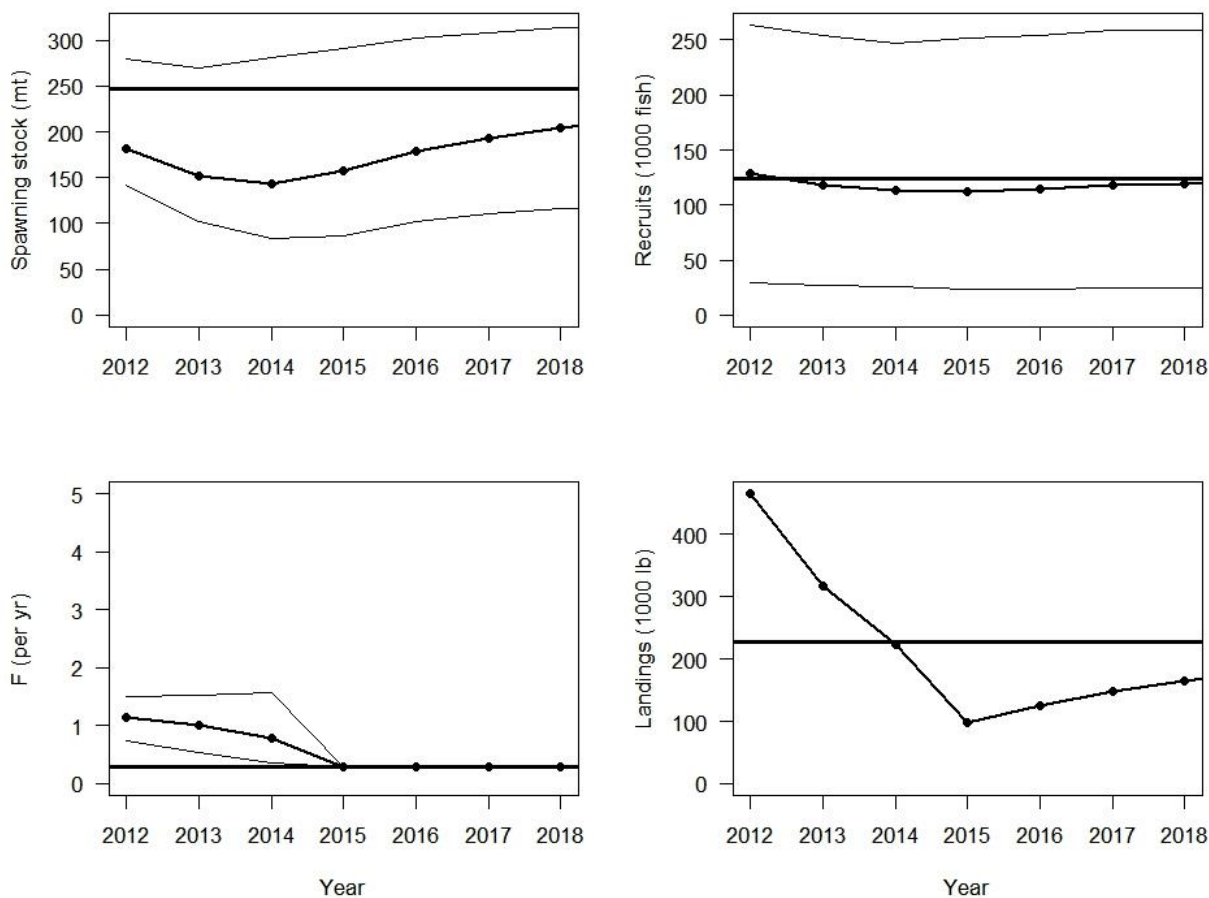
Figure 5. Constant F projection at F=F$_{msy}$. For this assessment, discards were combined with landings so the ABC reflects both landings and dead discards (landings and dead discards are separated in the associated Tables). Expected values represented by dotted solid lines and uncertainty represented by thin lines corresponding to the 5th and 95th percentiles of the 10,000 projection runs. Observed MRIP estimate used for 2013 (556,018 lbs).

Figure 6. Constant F projection at F=F$_{msy}$. For this assessment, discards were combined with landings so the ABC reflects both landings and dead discards (landings and dead discards are separated in the associated Tables). Expected values represented by dotted solid lines and uncertainty represented by thin lines corresponding to the 5th and 95th percentiles of the 10,000 projection runs. Imputed MRIP estimate used for 2013 (317,116 lbs).
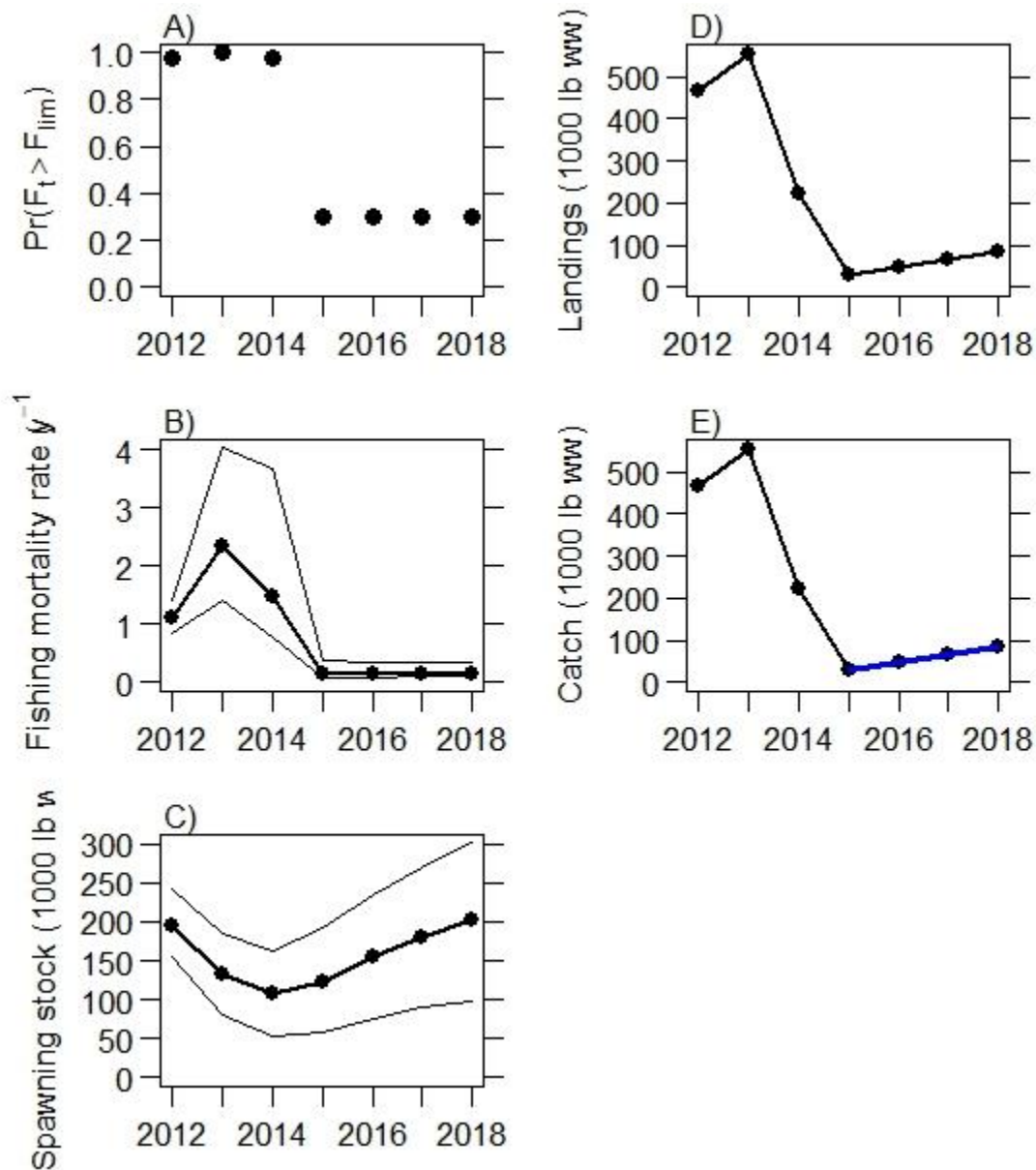
Figure 7. P* = 0.3 projection results. For this assessment, discards were combined with landings so the ABC reflects both landings and dead discards (i.e., Landings = Catch). Annual ABCs (panel E) are a single quantity while other values presented are medians. Error bars represent the 5th and 95th percentiles of the 10,000 projection runs. Observed MRIP estimate used for 2013 (556,018 lbs).
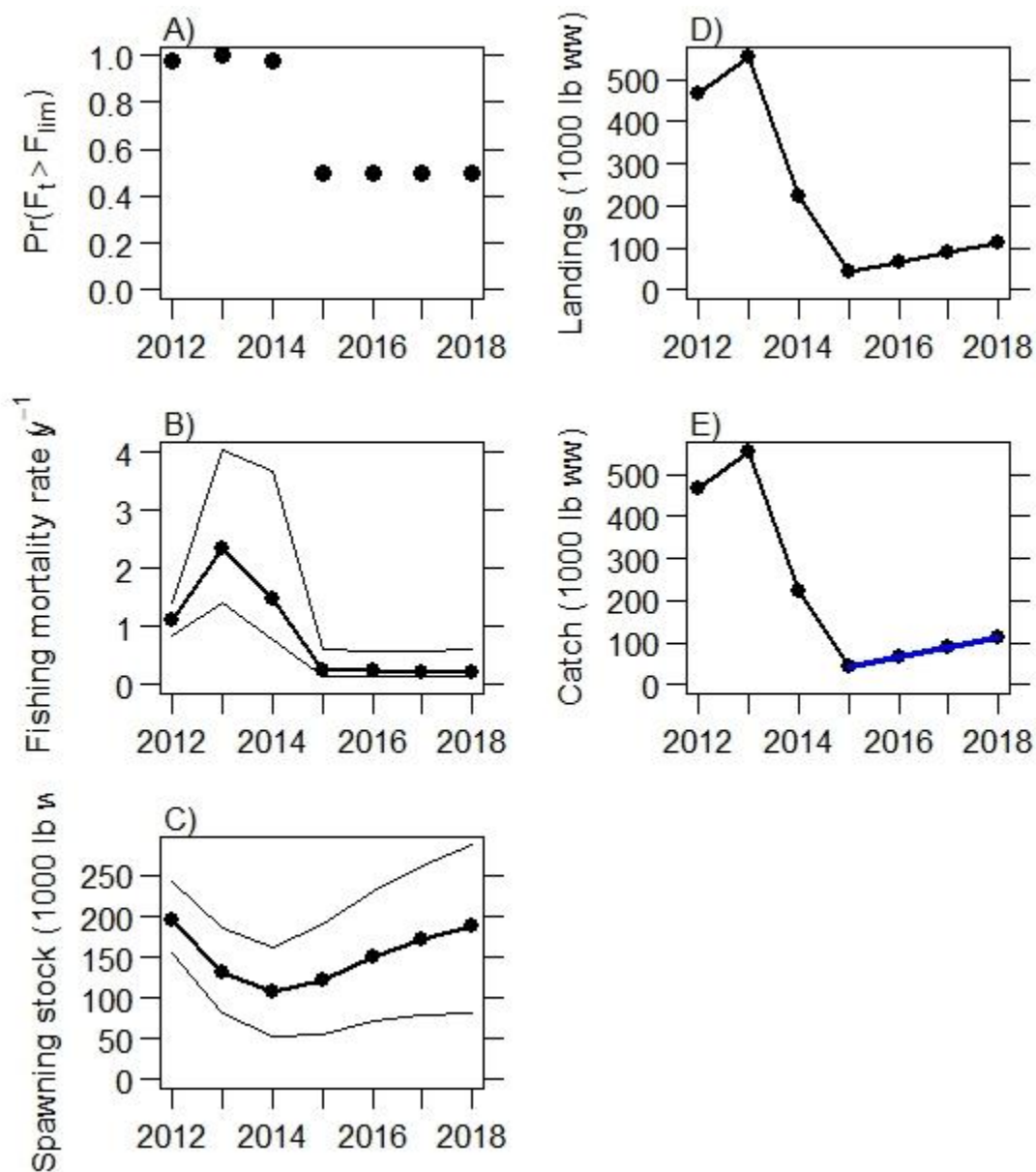
Figure 8. P* = 0.5 projection results. For this assessment, discards were combined with landings so the ABC reflects both landings and dead discards (i.e., landings = catch). Annual ABCs (panel E) are a single quantity while other values presented are medians. Error bars represent the 5th and 95th percentiles of the 10,000 projection runs. Observed MRIP estimate used for 2013 (556,018 lbs).

Figure 9. P* = 0.3 projection results. For this assessment, discards were combined with landings so the ABC reflects both landings and dead discards (i.e., landings = catch). Annual ABCs (panel E) are a single quantity while other values presented are medians. Error bars represent the 5th and 95th percentiles of the 10,000 projection runs. Imputed MRIP estimate used for 2013 (317,116 lbs).
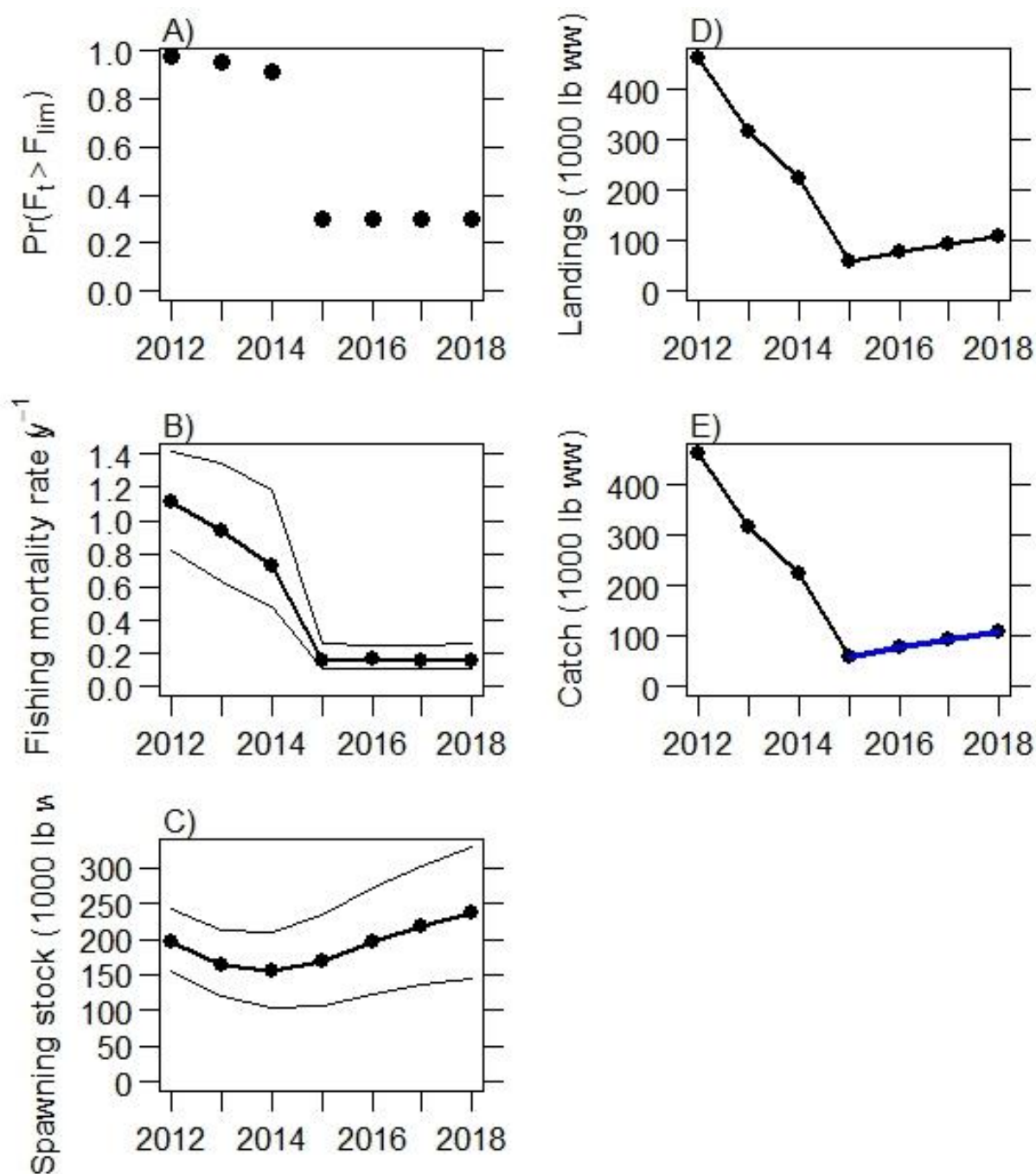
Figure 10. P* = 0.5 projection results. For this assessment, discards were combined with landings so the ABC reflects both landings and dead discards (i.e., landings = catch). Annual ABCs (panel E) are a single quantity while other values presented are medians. Error bars represent the 5th and 95th percentiles of the 10,000 projection runs. Imputed MRIP estimate used for 2013 (317,116 lbs).