Examination of the SBT operating model to inform conditioning and projection specifications

Hiroyuki Kurota[1], Osamu Sakai[1], and Doug S Butterworth[2]

[1]National Research Institute of Far Seas Fisheries, [2]University of Cape Town

Stock assessments and constant catch projections have been conducted using the Operating Model (OM) specified at the CCSBT technical meeting held in Seattle in July 2009. The current analysis shows that:

(1) for the base case, higher steepness and lower M_{10} (natural mortality at age 10) are preferred in the grid sampling based on the likelihood (in contrast to the prior-based weight for steepness), and this leads to more optimistic future projections despite lower current spawning biomass (3.7% of the unfished biomass for the likelihood-based and 4.9% for the prior-based approaches),

(2) when incomplete mixing of fish tagged is taken into consideration, the model fit, particularly to tag recaptures, is improved, and projection results are somewhat more optimistic,

(3) the low recruitment estimate in 2006 seems to be primarily a consequence of LL1 catch-at-size data from 2008,

(4) when CPUE is not adjusted for overcatch (i.e., $S = 0$), lower steepness and higher M are preferred, and higher S scenarios generally lead to more optimistic projection results despite worse fit to observed CPUE series, and

(5) several sensitivity trials which accord less reliability to the Japanese longline CPUE favour higher M values and lead to more pessimistic results.

コンディショニングと将来予測の様式を決めるためのオペレーティングモデルの解析

黒田 啓行 ・ 境 磨 ・ ダグ バタワース

2009 年 7 月のシアトル技術会合で決められたオペレーティングモデルを用いて、資源評価と漁獲量一定の条件下での将来予測を行った。結果は以下の通り。

(1) ベースケースにおいて、尤度に基づくグリッド・サンプリングをした場合、事前分布に基づくサンプリングをした場合に比べて、高いスチープネスと低い M_{10}（10 歳での自然死亡率）が選択される。またこの場合、現在の資源量の推定値はより低くなるが（尤度ベースの場合、初期資源量に対して 3.7%だが、事前分布ベースの場合、4.9%）、将来予測はより楽観的になる。

(2) 標識魚の混合が不完全な場合を考慮すると、モデルの適合度（特に標識再捕数へのフィット）は改善され、将来予測の結果は幾分楽観的になる。

(3) 2006 年の低い加入推定値は、主に 2008 年の LL1 サイズ別漁獲量データによってもたらされているようだ。

(4) 過剰漁獲に対して CPUE を補正しない場合（すなわち S が 0 の場合）、低いスチープネスと高い自然死亡率が選択される。また S が高いほど楽観的な将来予測結果が得られるが、CPUE へのフィットは悪くなる。

(5) いくつかの感度分析結果によると、日本の延縄 CPUE データへの信頼度を下げるようなシナリオでは、自然死亡率は高くなり、より悲観的な将来予測結果になる。

Introduction

The CCSBT Extended Scientific Committee (ESC) meeting held in September 2008 decided to update the conditioning for the Operating Model (OM) to provide the basis for advice on TACs in 2009 when used to provide constant-catch projections (CCSBT, 2008). The OM technical meeting held in Seattle in July 2009 determined most of the final specifications of OM to be used at ESC in September 2009 (CCSBT, 2009). However, some issues relating to finalizing the OM structure and projection specifications were not fully examined due to time constraints. In this paper, we show conditioning and projection results for the base case and sensitivity trials that were specified at the Seattle meeting, and report in particular on (1) higher steepness in the case of likelihood-based weight in the grid sampling, (2) incomplete mixing of fish tagged in the GAB (Great Australian Bight), (3) the low recruitment estimate for the 2006 cohort, and (4) several assumptions regarding Japanese longline CPUE series.

Data and model specification

In this analysis, we used several programs and input files (distributed by Ana Parma on 10 August 2009): “sbtmod22.exe” and “sbtdata2008.dat” for the conditioning, “sample_v4.exe” for the grid sampling, and “sbtprojv117.exe” for the projection. Constant catch projections were conducted over 27 years (from 2009 to 2035) under alternative six catch levels: 0t, 7810t, 9810t, 11810t (the TAC in 2009), 13810t, and 15810t. Quota allocations by fishery were based on quota allocation by country in 2009 as follows: LL1: 0.3963, LL2: 0.096, Indonesia 0.0639, Australia 0.4439. The default grid specification proposed at the Seattle meeting in July 2009 (Table 1a) and an alternative grid with likelihood-based weight for steepness (Table 1b) were applied for all scenarios. In addition, the case of prefixed weights for M_1 and M_{10} equal to the priors (Table 1c; Case 10-1 of the sensitivity trials) and a grid with a higher value of steepness and a lower value of M_{10} (Table 1d; Case 10-2) were explored.

We examined all sensitivity trials that were specified at the Seattle meeting (Cases 1-10 in Table 2; see Appendix for the all results). We also explored some additional trials mainly to examine model behavior: the issue of low recruitment in 2006 (Case 11), impacts of the change of CPUE series (from five traditional series to a new series), and exclusion of recent CPUEs in 2007 and 2008 (Case 12).

Results and Discussion

Grid weighting of steepness and natural mortalities

When the default grid specification, where steepness weight is based on the prior, is applied, the current spawning biomass is estimated to be 4.9% of the virgin unfished biomass (Table 3a). Future projections show that spawning biomass would continue to decline under the current

catch level (Fig. 1a, left panels).

On the other hand, when the grid weight of steepness is based on likelihood, higher steepness along with lower M_{10} are preferred compared to use of the default grid weights as noted at the Seattle meeting (Fig. 1a, right panels). This case gives rise to lower current biomass (3.7% of the unfished biomass; Table 3b), but shows more optimistic future projection results, because higher steepness reverses the downward trend in stock abundance with greater certainty (Fig. 2). Likelihood components for observed data sources indicate that higher steepness leads to better fits to catch-at-size of LL3 and Indonesian fisheries, but a worse fit to LL4 size composition (Table 4).

Grid sampling based on prefixed weights for M_1 and M_{10} (Case10-1) provides recruitment and stock abundance estimates with wider variances as expected. However, the general stock trend is not substantially different (slightly more pessimistic future in the case of likelihood-based weight for steepness) from that for the current base case (Table 3).

When we explored a grid specification with a higher steepness (0.9) and a lower M_{10} (0.04) (Case 10-2), the high steepness was scarcely sampled based on likelihood (Fig. 1b). However, the low M_{10} was sampled moderately. This indicates that it might be necessary to expand the M_{10} range to lower values. Interestingly though the stock trajectories were not generally different for the likelihood-based grid sampling (Table 3). This might be related to negative correlations between M_{10} and steepness and/or between M_{10} and other estimated Ms (M_4 and M_{30}) as indicated in Table 5.

Incomplete mixing of tagged fish

Incomplete mixing between fish tagged in the GAB and untagged fish was taken into account by increasing the apparent F on tagged fish caught by Australian fishery. When the degree of incomplete mixing is fixed at 1.245 (the mid-point of a default parameter range of 0.99 and 1.5) (Case 9-1), grid sampling prefers higher M_1 and projection results are somewhat more optimistic.

When the degree of incomplete mixing is directly estimated under a default condition (Case 9-2), the estimate was constrained by the upper bound of the parameter range (1.5) in all cases (therefore, this case amounts to the same as a condition that the degree of incomplete mixing is fixed at 1.5). The model fit, particularly to tag recaptures, is greatly improved (Table 5). This case leads to slightly lower steepness, higher M_1 and more optimistic projections (Fig. 1c). As an exploratory analysis, we expanded the parameter range of the incompleteness to 5.0 and re-estimated it (Case 9-3). The result showed that the degree of incompleteness is around 2.4 (median: 2.37, 10%-ile: 2.02, 90%-ile: 2.59). It is notable that the higher M_1 is sampled together with lower steepness in most cases, and recruitment estimates become much larger (Fig. 1d).

Low recruitment in 2006

Recruitment (age-0 abundance) in 2006 is estimated to be very low (relative to recruitment

estimated from spawning stock biomass) in all cases including the base case, although the estimation uncertainty is large. It is noteworthy that 2006 is the last year to estimate recruitments directly from observed data without correlation to recruitments in previous years. At first, we expected that data relating to surface fishery influenced this recruitment estimate. After some exploratory analyses, however, we found that when sample size of catch-at-length of LL1 in 2008 was reduced (Case 11-3; Fig. 1e), recruitment in 2006 became higher (i.e., the stock-recruitment residual became close to zero), while recruitment in 2005 became lower.

Future recruitments that are uncorrelated to historical estimates from the conditioning lead to higher recruitments in the near future and somewhat quicker recovery of abundance (Case 2).

Overcatch-related issues

An alternative overcatch scenario (L2; longer and larger overcatch assumed) shows somewhat different results: slightly higher steepness, a greater current spawning biomass and more optimistic future projections (Cases 1-2, 1-3, 1-5; Table 3). The model fit is not appreciably different from that for the L1 assumption.

CPUE adjustment, the so-called *S* issue, also has impacts (Cases 1-1, 1-4, 1-6). In particular, there is a relatively large difference between the C0 (S = 0%) and C1 (S = 25%) scenarios. Generally, as S is set larger, steepness becomes higher and M_{10} lower. The current biomass becomes larger and the future projections are a little more optimistic (Table 3). This summary result is different from that obtained in 2008 (Kurota and Butterworth, 2008), but shows similarity to the result in 2006 (Kurota et al., 2006). Generally, the model fits to CPUE were poor for the C2 and C3 scenarios (S = 50% and 75%).

Other CPUE-related trials

Truncation of CPUE series in 1992 (Case 4) has a substantial impact on conditioning and on projection results (Fig. 1f). Steepness is much smaller (but nevertheless larger than for the default prior), and M_1 and M_{10} become larger than those for the base case. This gives rise to a very low current spawning biomass (about 2% of the virgin biomass) and far more pessimistic future projections. When the weight of CPUE data in the likelihood was reduced by increasing the CV to 0.3 (Case 8), the recent biomass decline (indicated by B2009/B2000) is more severe and future stock abundance continues to decline slowly under the current catch level (Table 3). These two scenarios suggest that data other than Japanese longline CPUE favour a downward trend of stock abundance. When CPUE is separated into two time series changing in 1986 (Case 6), the result is not appreciably different from the base case result with likelihood-based weights for steepness.

When a low omega value (0.75; the omega value relates to the non-linearity of the CPUE vs abundance relationship) is assumed (Case 7), lower steepness and higher M_{10} are preferred.

Together with Case 4, this run leads to a further recent decline of stock abundance even after 2000 and very pessimistic future projections.

An alternative CPUE series "Run 3" with more stable behavior in 1986-2006 (Case 5-1) shows more optimistic projection results. The goodness of model fit is almost the same as for the base case (Table 5). On the other hand, a more fluctuating "Run 6" series (Case 5-2) shows about the same projection result as the base case, while the model fit to CPUE is worse in most scenarios. We also explored a lower omega value (0.75) for these two additional CPUE series along with the default series to follow a proposal at the Seattle meeting (CCSBT, 2009). However, there was little support for the lower value in all the series based on the likelihood (Fig. 3).

The traditional five CPUE series used for the previous stock assessments give rise to more optimistic projections (Case 12). In addition, CPUEs in two recent years (2007 and 2008) seem to include information to make future projections more optimistic, though the ESC decided to exclude these two-years' data as input to be used for the 2009 stock assessment (CCSBT, 2008). The change of CPUE series might be one of the reasons why stock status perception becomes more pessimistic in the current analysis.

Adding the troll survey index

Incorporating troll survey data (Case 3) increases recent recruitment estimates, particularly for 2007 and 2008 (Fig. 1g). This leads to rapid recovery of spawning stock biomass after 2017. This is related to the fact that recent trolling indices are quite high, and that at the present time (2009) there is no other information to estimate the recruitments in 2007 and 2008.

Excluding the aerial survey index

While we examined the reasons of low recruitment in 2006, we incidentally noticed that aerial survey index had somewhat large impacts on conditioning and projection results (Case 11-1). In particular, excluding these data leads to higher recruitments in the 1990s and larger spawning biomass in the future. It must be pointed out that this OM fits the time series for the aerial survey poorly (CCSBT, 2009), but this index does influence the assessment results to a certain degree.

References

CCSBT 2008. Report of the Extended Scientific Committee for the 13th Meeting of the Scientific Committee. 5 - 12 September 2008, Rotorua, New Zealand.

CCSBT 2009. Report of the Operating Model and Management Procedure Technical meeting. 13 - 17 July 2009, Seattle, USA.

Kurota, H., Butterworth, D.S., and Sakai, O. 2006. SBT stock assessment and projection under

overcatch scenarios using the operating model. CCSBT-ESC/0609/42.

Kurota, H., and Butterworth, D.S. 2008. Further examinations of the SBT operating model under overcatch scenarios to select critical uncertainty factors for the update. CCSBT-ESC/0809/35.

Table 1. Grid specifications used for this analysis (note that the shading below indicates different specifications from the default).

(a) Default

	Levels	Cumul N		Values		Prior	Simulation Weights
Steepness (*h*)	3	3	0.385	0.55	0.73	0.2, 0.6, 0.2	Prior
M_1	2	6	0.30	0.35		Uniform	Likelihood
M_{10}	3	18	0.07	0.1	0.14	Uniform	Likelihood
Omega	1	18		1		NA	NA
CPUE series	2	36		w.5	w.8	Uniform	Prior
q age-range	2	72		4-18	8-12	0.67, 0.33	Prior
Sample Size	1	72		Sqrt		NA	NA

(b) Likelihood-based weight for steepness

	Levels	Cumul N		Values		Prior	Simulation Weights
Steepness (*h*)	3	3	0.385	0.55	0.73	***Uniform***	***Likelihood***
M_1	2	6	0.30	0.35		Uniform	Likelihood
M_{10}	3	18	0.07	0.1	0.14	Uniform	Likelihood

(c) Prior-based weight for M_1 and M_{10}

	Levels	Cumul N		Values		Prior	Simulation Weights
Steepness (*h*)	3	3	0.385	0.55	0.73	0.2, 0.6, 0.2	Prior
M_1	2	6	0.30	0.35		Uniform	***Prior***
M_{10}	3	18	0.07	0.1	0.14	Uniform	***Prior***

(d) Alternative ranges of steepness and M_{10}

	Levels	Cumul N		Values		Prior	Simulation Weights
Steepness (*h*)	3	3	0.55	0.73	***0.9***	***Uniform***	***Likelihood***
M_1	2	6	0.30	0.35		Uniform	Likelihood
M_{10}	3	18	***0.04***	0.07	0.1	Uniform	Likelihood

Table 2. The list of sensitivity trials conducted in this analysis.

Case	Scenarios and assumptions
Base Case	C1S1L1 (CPUE scenario *S* = 25%, LL1 scenario based on Case1 of Japanese Market Report (JMR))
Case 1	Change the LL1 scenario or effects of overcatch on CPUE.
Case1-1	- C0S1L1 (CPUE scenario *S* = 0%)
Case1-2	- C0S1L2 (CPUE scenario *S* = 0%, LL1 scenario based on Case2 of JMR.)
Case1-3	- C1S1L2 (CPUE scenario *S* = 25%, LL1 scenario based on Case2 of JMR.)
Case1-4	- C2S1L1 (CPUE scenario *S* = 50%)
Case1-5	- C2S1L2 (CPUE scenario *S* = 50%, LL1 scenario based on Case2 of JMR.)
Case1-6	- C3S1L1 (CPUE scenario *S* = 75%)
Case1-7	- C3S1L2 (CPUE scenario *S* = 75%, LL1 scenario based on Case2 of JMR.)
Case 2	Projected recruitment deviates uncorrelated to historical estimates from conditioning.
Case 3	Include troll survey data.
Case 4	Truncate CPUE series in 1992.
Case 5	Substitute alternative CPUE series.
Case5-1	- Based on the alternative CPUE series Run3.
Case5-2	- Based on the alternative CPUE series Run6.
Case 6	Break CPUE into two time series, the second starting in 1986.
Case 7	Omega value of 0.75 (CPUE non linearity factor).
Case 8	Increase the lower bound on CPUE CV to 0.30.
Case 9	For modeling the tagging data component:
Case 9-1	- Increase the season-1 *F*'s (H) to 1.245.
Case 9-2	- Estimate the season-1 *F*'s (H) (default = increase the season-1 F's (H) to 1.5).
Case 9-3	- Estimate the season-1 *F*'s (H) (expand the parameter range).
Case 10	Change Grid specifications of steepness and *M*
Case 10-1	- Use prior for M_1 and M_{10} as the simulation weight for grid integration.
Case 10-2	- Change the grid range : steepness: (0.55, 0.73, <u>0.90</u>) and M_{10}: (<u>0.04</u>, 0.07, 0.10)
Case 11	Exploring a reason of low recruitment for the 2006 cohort:
Case 11-1	- Exclude aerial survey data.
Case 11-2	- Change the sample size of surface fishery in 2008 to zero.
Case 11-3	- Change the sample size of LL1 fishery in 2008 to zero.
Case 11-4	- Change the LL1 selectivity blocks in 2006, 2007 and 2008 to that with CV = 1.0.
Case 12	Based on old CPUE series (Nominal, Laslett, ST-windows, w0.5, w0.8):
Case 12-1	- Set the last CPUE year in fit to 2008.
Case 12-2	- Set the last CPUE year in fit to 2006.

Table3. Summary results of conditioning and projection under the current catch for the base case and sensitivity trials (note that green-shaded and grey-shaded values represent 20% more than and less than the base case results, respectively).

(a) Default grid specification

Case	note	B0 (t)	B2009 (t)	B2009 /B0	B2009 /B1980	B2009 /B2000	B2014 /B2004	B2014 /B2009	B2022 /B2004	B2022 /B2009
Base		**1101860**	**55353**	**0.049**	**0.18**	**0.84**	**0.80**	**0.83**	**0.46**	**0.47**
1-1	C0S1L1	1080820	45525	0.050	0.16	0.80	0.79	0.81	0.37	0.38
1-2	C0S1L2	1146600	52015	0.052	0.15	0.82	0.84	0.85	0.50	0.50
1-3	C1S1L2	1189540	67476	0.051	0.18	0.81	0.85	0.87	0.57	0.58
1-4	C2S1L1	1346150	74330	0.056	0.21	0.85	0.83	0.85	0.56	0.57
1-5	C2S1L2	1453970	86400	0.062	0.22	0.87	0.87	0.88	0.65	0.65
1-6	C3S1L1	1401470	90837	0.068	0.26	0.91	0.85	0.86	0.64	0.65
1-7	C3S1L2	1492710	106763	0.075	0.27	0.92	0.87	0.88	0.71	0.72
2	uncorrelated rec	1101860	55353	0.049	0.18	0.84	0.81	0.83	0.51	0.53
3	incl troll survey	1115350	58747	0.053	0.19	0.85	0.85	0.88	1.01	1.05
4	truncated CPUE	991036	17242	0.021	0.07	0.40	0.21	0.34	0.00	0.00
5-1	CPUE run3	1108570	60322	0.053	0.20	0.87	0.89	0.87	0.62	0.60
5-2	CPUE run6	1360700	68437	0.052	0.18	0.83	0.83	0.85	0.52	0.53
6	divided CPUE	1092020	49314	0.047	0.16	0.80	0.77	0.81	0.37	0.38
7	omega=0.75	1074870	33953	0.035	0.11	0.63	0.58	0.70	0.00	0.00
8	large CPUE CV	1078210	46350	0.043	0.17	0.74	0.71	0.78	0.27	0.30
9-1	tag F (1.245)	1081370	56409	0.050	0.18	0.86	0.83	0.85	0.52	0.53
9-2	tag F (1.5)	1230510	56641	0.051	0.19	0.87	0.86	0.87	0.58	0.58
9-3	tag F (est rev)	1126220	53545	0.052	0.21	0.94	0.93	0.91	0.76	0.74
10-1	M prior	1096250	55353	0.056	0.20	0.84	0.79	0.81	0.47	0.48
10-2	high h, low M10	1110510	39215	0.034	0.17	0.87	0.95	0.91	0.91	0.87
11-1	excl. aerial	1130440	60960	0.052	0.19	0.87	0.88	0.84	0.45	0.43
11-2	2008 Aus CAA	1105040	55257	0.049	0.19	0.84	0.80	0.83	0.43	0.44
11-3	2008 LL1 CAL	1107160	56801	0.050	0.19	0.84	0.80	0.83	0.52	0.54
11-4	flexible LL1 sel	1103140	55476	0.049	0.19	0.84	0.78	0.81	0.45	0.46
12-1	old CPUE (2008)	1363640	78462	0.062	0.22	0.95	0.95	0.90	0.73	0.69
12-2	old CPUE (2006)	1347250	76405	0.061	0.21	0.92	0.88	0.87	0.63	0.62
	Average	1182862	59739	0.051	0.19	0.83	0.81	0.83	0.53	0.53
	(Std Dev)	(136907)	(18053)	(0.010)	(0.04)	(0.11)	(0.14)	(0.11)	(0.22)	(0.22)
	Median	1110510	56409	0.051	0.19	0.84	0.83	0.85	0.52	0.53
	Min	991036	17242	0.021	0.07	0.40	0.21	0.34	0.00	0.00
	Max	1492710	106763	0.075	0.27	0.95	0.95	0.91	1.01	1.05

(b) Likelihood-based weight for steepness

Case	note	B0 (t)	B2009 (t)	B2009 /B0	B2009 /B1980	B2009 /B2000	B2014 /B2004	B2014 /B2009	B2022 /B2004	B2022 /B2009
Base		**1085450**	**36741**	**0.037**	**0.18**	**0.89**	**0.94**	**0.89**	**0.89**	**0.83**
1-1	C0S1L1	886468	42220	0.041	0.16	0.84	0.88	0.85	0.63	0.61
1-2	C0S1L2	1122950	47230	0.043	0.16	0.86	0.97	0.92	0.88	0.83
1-3	C1S1L2	1143020	41721	0.037	0.18	0.91	1.03	0.95	1.12	1.03
1-4	C2S1L1	1095710	42005	0.038	0.21	0.93	0.95	0.90	0.96	0.91
1-5	C2S1L2	1151440	46839	0.041	0.22	0.95	1.03	0.95	1.15	1.07
1-6	C3S1L1	1102470	48326	0.044	0.26	0.97	0.95	0.90	1.00	0.95
1-7	C3S1L2	1161030	55026	0.047	0.27	0.98	1.00	0.94	1.14	1.07
2	uncorrelated rec	1085450	36741	0.037	0.18	0.89	0.96	0.90	1.04	0.97
3	incl troll survey	1093750	39727	0.041	0.18	0.89	1.03	0.97	1.88	1.79
4	truncated CPUE	844375	15811	0.018	0.07	0.40	0.22	0.36	0.00	0.00
5-1	CPUE run3	1091710	43626	0.046	0.20	0.98	1.10	0.95	1.21	1.07
5-2	CPUE run6	1092440	40717	0.037	0.18	0.90	0.94	0.90	0.88	0.83
6	divided CPUE	1083140	37403	0.040	0.17	0.87	0.91	0.87	0.81	0.78
7	omega=0.75	1068330	31453	0.029	0.10	0.62	0.59	0.70	0.00	0.00
8	large CPUE CV	1074850	31454	0.034	0.16	0.75	0.79	0.82	0.49	0.51
9-1	tag F (1.245)	1057730	36964	0.041	0.18	0.91	0.98	0.91	1.02	0.94
9-2	tag F (1.5)	1025180	40418	0.043	0.19	0.95	1.01	0.93	1.11	1.02
9-3	tag F (est rev)	935422	48100	0.047	0.21	1.05	1.06	0.97	1.22	1.11
10-1	M prior	879494	41542	0.044	0.19	0.87	0.85	0.84	0.76	0.74
10-2	high h, low M10	1101270	39070	0.033	0.17	0.87	0.95	0.90	0.84	0.81
11-1	excl. aerial	1079990	40354	0.041	0.19	0.99	1.20	1.00	1.32	1.09
11-2	2008 Aus CAA	1084530	39286	0.040	0.18	0.89	0.96	0.90	0.85	0.80
11-3	2008 LL1 CAL	1086890	37482	0.039	0.18	0.89	0.93	0.89	0.96	0.92
11-4	flexible LL1 sel	1085410	36976	0.039	0.18	0.89	0.91	0.86	0.87	0.82
12-1	old CPUE (2008)	1107040	48050	0.048	0.22	1.02	1.14	0.97	1.32	1.13
12-2	old CPUE (2006)	1108690	49646	0.048	0.22	1.01	1.03	0.92	1.08	0.99
	Average	1064231	40553	0.040	0.18	0.89	0.94	0.88	0.94	0.87
	(Std Dev)	(81316)	(7398)	(0.006)	(0.04)	(0.13)	(0.18)	(0.12)	(0.37)	(0.34)
	Median	1085450	40418	0.041	0.18	0.89	0.96	0.90	0.96	0.92
	Min	844375	15811	0.018	0.07	0.40	0.22	0.36	0.00	0.00
	Max	1161030	55026	0.048	0.27	1.05	1.20	1.00	1.88	1.79

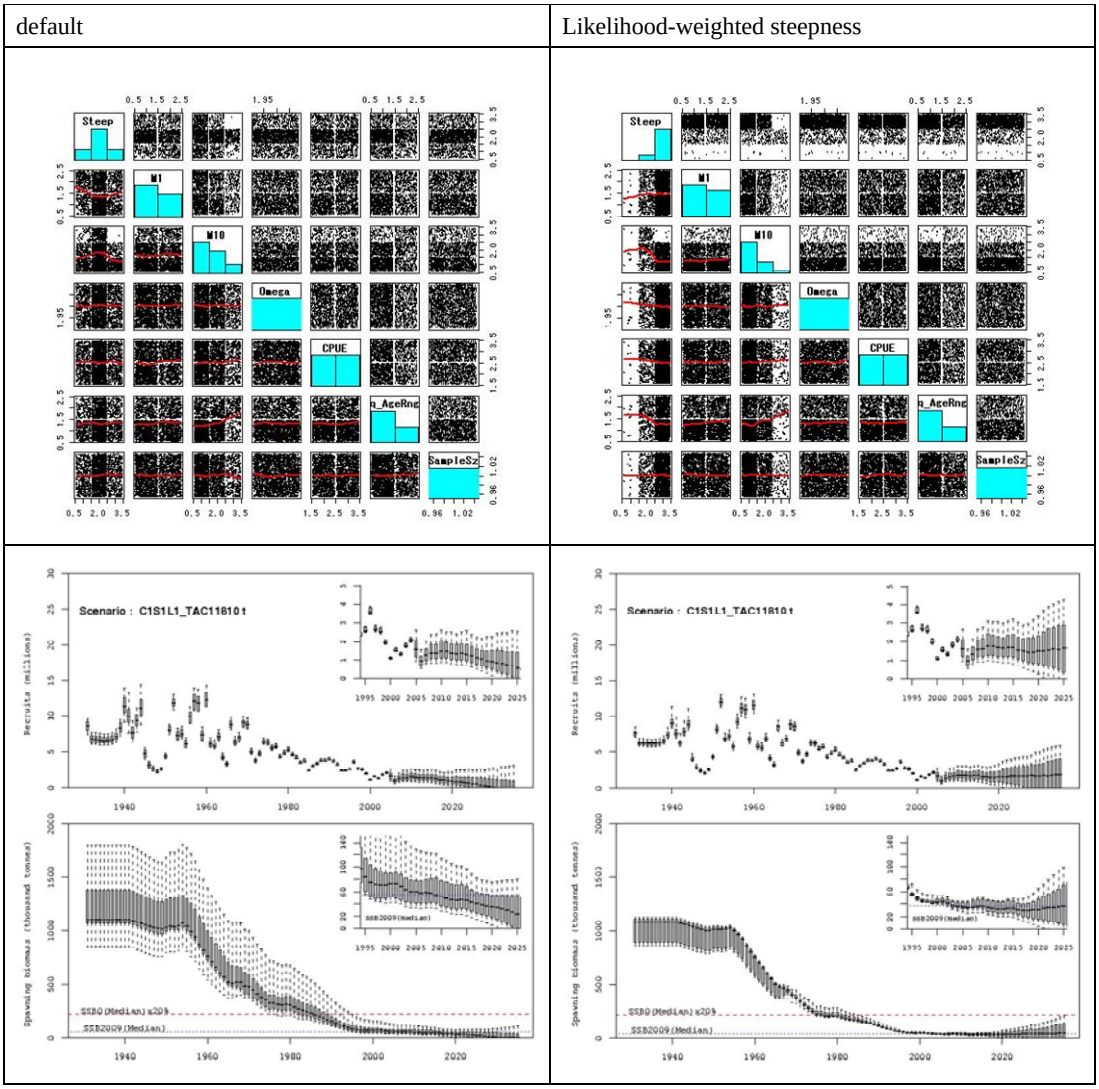
Table 4. Summary results for some scenarios in the base case.

	Name	C1S1L1sqrt_h1m1 M1O2C2a1.rep	C1S1L1sqrt_h1m1 M2O2C2a1.rep	C1S1L1sqrt_h1m1 M3O2C2a1.rep	C1S1L1sqrt_h2m1 M1O2C2a1.rep	C1S1L1sqrt_h2m1 M2O2C2a1.rep	C1S1L1sqrt_h2m1 M3O2C2a1.rep	C1S1L1sqrt_h3m1 M1O2C2a1.rep	C1S1L1sqrt_h3m1 M2O2C2a1.rep	C1S1L1sqrt_h3m1 M3O2C2a1.rep
Steepness	(0.385 or 0.55 or 0.73)	0.385	0.385	0.385	0.55	0.55	0.55	0.73	0.73	0.73
M1	(0.3 or 0.35)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
M4	Estimate	0.15	0.13	0.14	0.20	0.18	0.15	0.23	0.20	0.16
M10	(0.07 or 0.10 or 0.14)	0.07	0.10	0.14	0.07	0.10	0.14	0.07	0.10	0.14
M30	Estimate	0.46	0.43	0.39	0.45	0.42	0.36	0.42	0.37	0.33
	SSB0 (t)	1,903,720	1,538,400	1,096,250	1,382,710	1,101,860	855,923	1,101,270	872,302	673,360
	SSB 2009 (t)	156,292	132,830	82,125	79,687	68,579	64,819	46,197	48,301	57,906
	SSB 2009 / SSB0	8.2%	8.6%	7.5%	5.8%	6.2%	7.6%	4.2%	5.5%	8.6%
	SSB 2009 / SSB2000	85.0%	89.8%	90.8%	90.1%	96.0%	98.2%	100.9%	103.1%	102.8%
Rho	1931-Y	0.62	0.63	0.65	0.62	0.63	0.64	0.61	0.63	0.68
	1965-2003	0.39	0.42	0.48	0.38	0.41	0.46	0.40	0.47	0.60
SigmaR	Model SigR	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
	1931-Y	0.36	0.36	0.37	0.35	0.36	0.37	0.35	0.36	0.39
	1965-2003	0.27	0.28	0.30	0.26	0.27	0.29	0.27	0.28	0.32
CPUE	1969-Y	0.36	0.36	0.43	0.34	0.36	0.39	0.35	0.38	0.40
Autocorr.	1996-2006	0.67	0.67	0.69	0.68	0.68	0.65	0.70	0.67	0.61
Likelihood	Total	624.5	625.2	627.4	620.6	621.1	622.9	618.2	619.7	624.5
	LL1	150.1	150.3	150.8	149.8	150.0	150.9	150.4	151.1	152.1
	LL2	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8
	LL3	109.9	110.1	109.8	108.2	108.4	108.8	106.8	107.2	107.9
	LL4	37.2	37.2	37.6	38.1	38.2	38.1	39.2	38.8	38.1
	IND	44.2	43.6	42.8	43.3	42.4	41.5	41.0	40.5	41.0
	SURF	40.7	40.6	40.7	41.1	40.9	40.7	41.1	41.0	40.8
	CPUE	-49.9	-49.7	-48.6	-50.5	-50.2	-49.4	-50.4	-49.7	-49.0
	Tags	226.5	226.5	226.4	226.6	226.6	226.8	226.7	226.9	227.2
	Aerial	1.4	1.2	1.3	1.8	1.6	1.4	2.1	1.9	1.8
	Troll	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Priors	Sel.Ch	45.8	46.2	46.2	44.9	45.2	45.4	44.5	44.3	44.3
	Sel.sm	24.4	24.8	25.0	23.6	24.0	24.4	23.7	23.9	24.3
	Sg.R	-25.7	-25.5	-24.3	-26.2	-25.9	-25.6	-26.6	-26.0	-23.9
	M(0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M(10)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Steepness	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref. Pts	msy	29,022	30,200	30,531	0	37,171	38,030	42,216	41,381	40,612
	S(msy)	796,593	649,902	468,975	0	374,508	294,833	293,890	235,238	180,449
	S(msy)/Bo	0.42	0.42	0.43	0.00	0.34	0.34	0.27	0.27	0.27

Table 5. Summary results for some scenarios in the sensitivity trials.

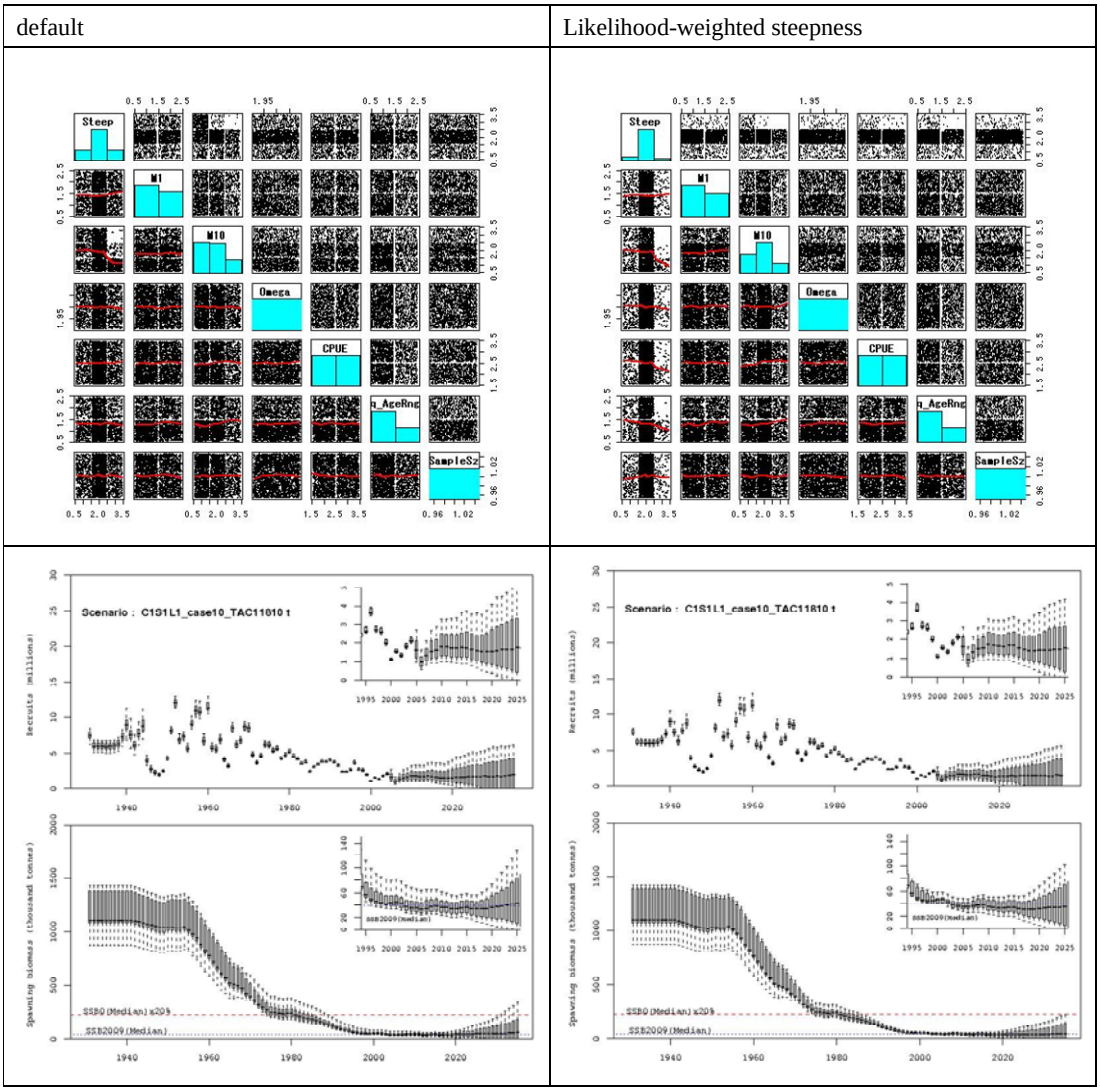
		C1S1L1 (Base Case)				Case 5-1 : Aiternative CPUE Run3				Case 10 : Value changes of h & M10				Case 9-2 : Season1 F's (H) = 1.5			
	Name	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep	C1S1L1sqrt_ h2m1M1O2C 4a1.rep	C1S1L1sqrt_ h2m1M2O2C 4a1.rep	C1S1L1sqrt_ h3m1M1O2C 4a1.rep	C1S1L1sqrt_ h3m1M2O2C 4a1.rep	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep
Steepness	(0.385 or 0.55 or 0.73)	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73	0.73	0.73	**0.9**	**0.9**	0.55	0.55	0.73	0.73
M1	(0.3 or 0.35)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
M4	Estimate	0.20	0.18	0.23	0.20	0.20	0.18	0.23	0.20	0.25	0.23	0.25	0.23	0.25	0.24	0.28	0.25
M10	(0.07 or 0.10 or 0.14)	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	**0.04**	0.07	**0.04**	0.07	0.07	0.10	0.07	0.10
M30	Estimate	0.45	0.42	0.42	0.37	0.45	0.42	0.42	0.37	0.47	0.42	0.42	0.39	0.45	0.41	0.42	0.37
	SSB0 (t)	1,382,710	1,101,860	1,101,270	872,302	1,389,940	1,107,690	1,106,460	877,328	1,422,260	1,101,270	1,141,280	869,327	1,266,690	1,009,460	1,020,660	807,202
	SSB 2009 (t)	79,687	68,579	46,197	48,301	84,159	72,620	49,838	51,818	51,206	46,192	38,248	43,055	72,622	63,658	46,266	49,454
	SSB 2009 / SSB0	5.8%	6.2%	4.2%	5.5%	6.1%	6.6%	4.5%	5.9%	3.6%	4.2%	3.4%	5.0%	5.7%	6.3%	4.5%	6.1%
	SSB 2009 / SSB2000	90.1%	96.0%	100.9%	103.1%	91.9%	99.0%	106.5%	108.9%	92.4%	100.9%	105.9%	108.6%	95.3%	103.0%	109.1%	111.9%
Rho	1931-Y	0.62	0.63	0.61	0.63	0.62	0.62	0.61	0.63	0.60	0.61	0.67	0.71	0.62	0.63	0.61	0.64
	1965-2003	0.38	0.41	0.40	0.47	0.37	0.40	0.39	0.46	0.37	0.40	0.57	0.65	0.42	0.46	0.43	0.50
SigmaR	Model SigR	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
	1931-Y	0.35	0.36	0.35	0.36	0.35	0.36	0.35	0.36	0.35	0.35	0.38	0.41	0.36	0.36	0.35	0.36
	1965-2003	0.26	0.27	0.27	0.28	0.26	0.27	0.27	0.28	0.26	0.27	0.31	0.34	0.27	0.28	0.27	0.29
CPUE	1969-Y	0.34	0.36	0.35	0.38	0.28	0.28	0.27	0.29	0.32	0.35	0.34	0.36	0.33	0.35	0.34	0.37
Autocorr.	1996-2006	0.68	0.68	0.70	0.67	0.65	0.64	0.65	0.60	0.71	0.70	0.71	0.67	0.69	0.69	0.72	0.68
Likelihood	Total	620.6	621.1	618.2	619.7	621.7	622.4	619.2	620.3	618.6	618.2	620.1	622.3	605.3	606.5	603.1	605.2
	LL1	149.8	150.0	150.4	151.1	150.3	150.7	150.9	151.6	150.0	150.4	151.3	151.7	147.9	148.4	148.8	149.7
	LL2	19.8	19.8	19.8	19.8	19.6	19.6	19.6	19.6	19.8	19.8	19.7	19.7	19.7	19.7	19.7	19.7
	LL3	108.2	108.4	106.8	107.2	108.2	108.5	106.8	107.2	106.6	106.8	105.6	106.1	107.8	108.1	106.6	107.0
	LL4	38.1	38.2	39.2	38.8	38.1	38.0	39.2	38.8	39.1	39.2	40.1	39.2	38.2	38.2	39.2	38.7
	IND	43.3	42.4	41.0	40.5	43.6	42.5	41.1	40.6	42.5	41.0	40.1	40.1	41.1	40.0	38.9	38.5
	SURF	41.1	40.9	41.1	41.0	41.1	41.0	41.2	41.0	41.2	41.1	41.0	41.0	40.6	40.5	40.6	40.6
	CPUE	-50.5	-50.2	-50.4	-49.7	-49.8	-49.7	-49.9	-49.5	-51.1	-50.4	-50.6	-50.1	-50.7	-50.4	-50.6	-49.9
	Tags	226.6	226.6	226.7	226.9	226.8	226.8	226.8	227.0	226.6	226.7	226.8	227.0	**219.2**	**219.4**	**219.1**	**219.3**
	Aerial	1.8	1.6	2.1	1.9	2.1	2.0	2.5	2.4	2.2	2.1	2.6	2.5	1.2	1.1	1.4	1.4
	Troll	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Priors	Sel.Ch	44.9	45.2	44.5	44.3	44.2	44.7	44.0	43.8	44.6	44.5	44.1	43.7	43.7	44.0	43.5	43.2
	Sel.sm	23.6	24.0	23.7	23.9	23.7	24.5	23.7	23.9	24.1	23.7	23.6	23.7	22.6	23.4	22.6	22.8
	Sg.R	-26.2	-25.9	-26.6	-26.0	-26.3	-26.2	-26.6	-26.1	-26.9	-26.6	-24.3	-22.3	-26.2	-26.0	-26.5	-25.8
	M(0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M(10)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Steepness	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref. Pts	msy	0	37,171	42,216	41,381	36,663	37,341	42,464	41,620	42,063	42,217	44,623	42,243	35,608	36,196	41,222	40,148
	S(msy)	0	374,508	293,890	235,238	468,856	376,882	296,125	237,430	373,593	293,893	223,226	169,540	426,575	343,290	273,660	218,459
	S(msy)/Bo	0.00	0.34	0.27	0.27	0.34	0.34	0.27	0.27	0.26	0.27	0.20	0.20	0.34	0.34	0.27	0.27

Figure 1a. Estimated distributions for each uncertainty axis (upper panels) and recruitment and spawning biomass trajectories (lower panels) for the base case.



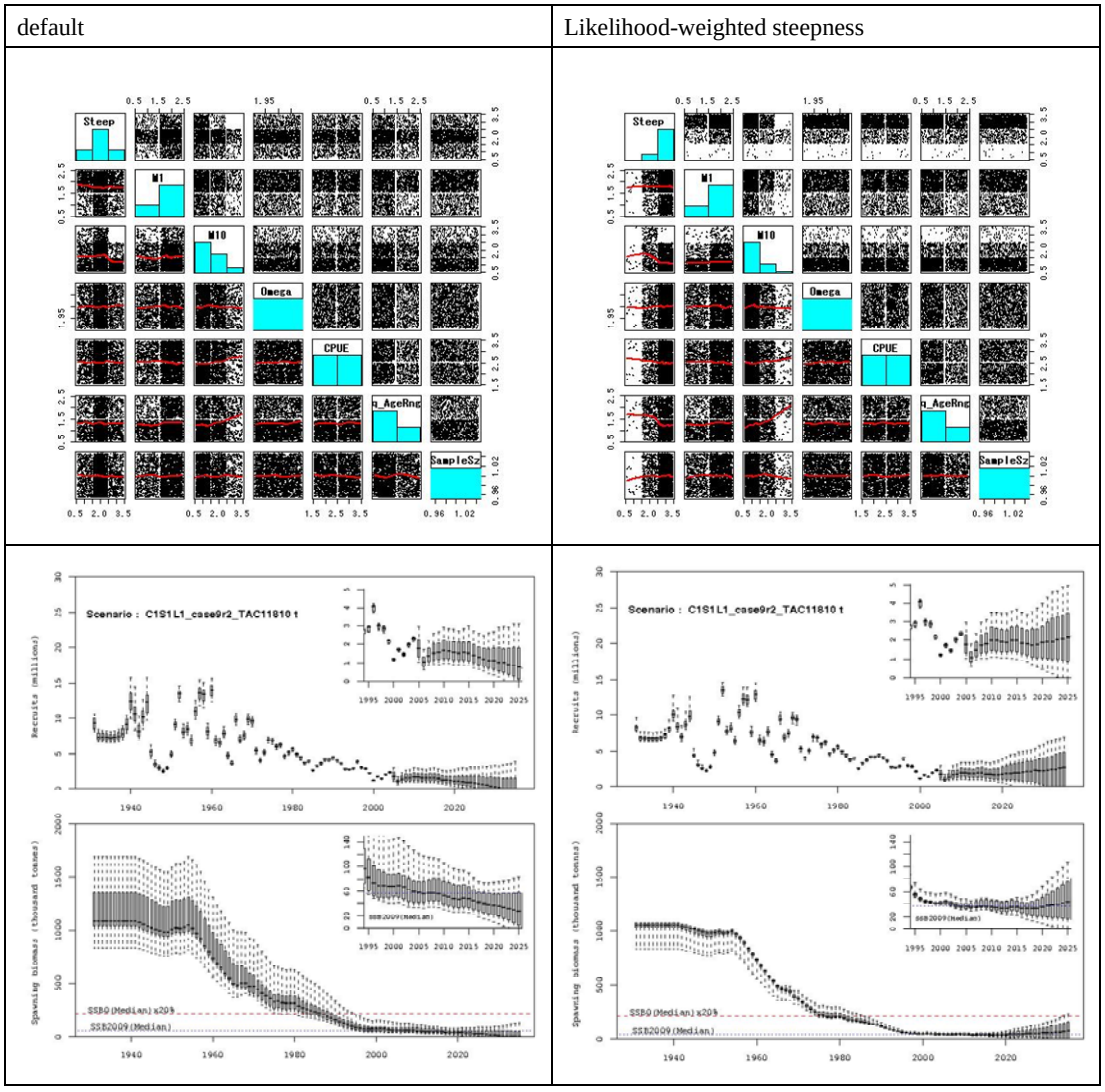
C1S1L1	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1101860	(849178, 1807940)						1085450	(859146, 1127270)					
B2009 (t)	55353	(32520, 121195)						36741	(26246, 50223)					
B2009/B0	0.049	(0.033, 0.070)						0.037	(0.027, 0.056)					
B2009/B1980	0.182	(0.120, 0.243)						0.176	(0.110, 0.236)					
B2009/B2000	0.837	(0.665, 0.960)						0.885	(0.652, 1.034)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.112	0.909	0.853	0.804	(0.618, 0.964)	0.748	0.692	1.454	1.136	1.040	0.944	(0.641, 1.118)	0.846	0.748
B2014/B2009	1.137	0.932	0.88	0.827	(0.703, 0.917)	0.775	0.714	1.357	1.057	0.973	0.887	(0.718, 0.977)	0.799	0.710
B2022/B2004	2.277	1.047	0.737	0.460	(0.000, 1.216)	0.197	0.001	4.003	1.904	1.397	0.887	(0.001, 1.946)	0.400	0.001
B2022/B2009	2.348	1.063	0.761	0.474	(0.000, 1.147)	0.203	0.001	3.770	1.803	1.305	0.832	(0.001, 1.773)	0.380	0.001

Figure 1b. Estimated distributions for each uncertainty axis (upper panels) and recruitment and spawning biomass trajectories (lower panels) for a grid with different value ranges (Steepness: 0.55, 0.73, <u>0.90</u>, M_{10}: <u>0.04</u>, 0.07, 0.10; Case 10-2).



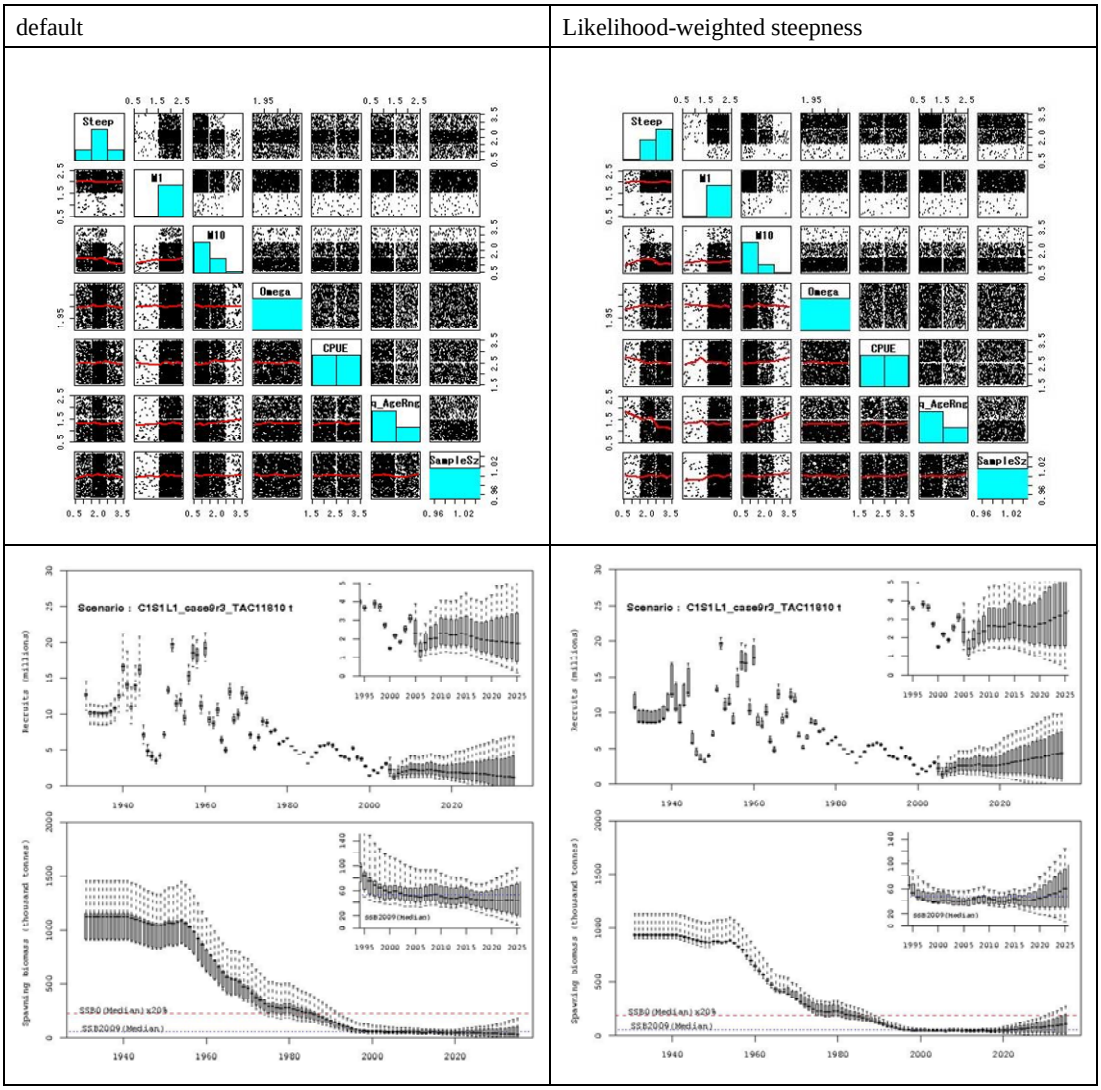
Case10	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1110510	(872295, 1431680)						1101270	(872295, 1422640)					
B2009 (t)	39215	(25928, 65050)						39070	(25928, 54514)					
B2009/B0	0.034	(0.023, 0.050)						0.033	(0.023, 0.045)					
B2009/B1980	0.174	(0.108, 0.236)						0.174	(0.097, 0.236)					
B2009/B2000	0.874	(0.636, 1.034)						0.874	(0.633, 1.034)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.491	1.138	1.04	0.947	(0.672, 1.236)	0.86	0.771	1.486	1.138	1.043	0.945	(0.656, 1.143)	0.853	0.753
B2014/B2009	1.403	1.076	0.991	0.912	(0.754, 1.072)	0.829	0.742	1.400	1.072	0.986	0.901	(0.743, 1.008)	0.812	0.721
B2022/B2004	4.053	1.944	1.415	0.908	(0.057, 2.676)	0.460	0.040	4.030	1.869	1.355	0.843	(0.001, 1.981)	0.372	0.001
B2022/B2009	3.916	1.857	1.345	0.869	(0.060, 2.338)	0.436	0.037	3.877	1.790	1.275	0.806	(0.001, 1.783)	0.355	0.000

Figure 1c. Estimated distributions for each uncertainty axis (upper panels) and recruitment and spawning biomass trajectories (lower panels) for a scenario of incomplete mixing of tagged fish (Case 9-2: increase the season-1 *F* of tagged fish to 1.5 times).



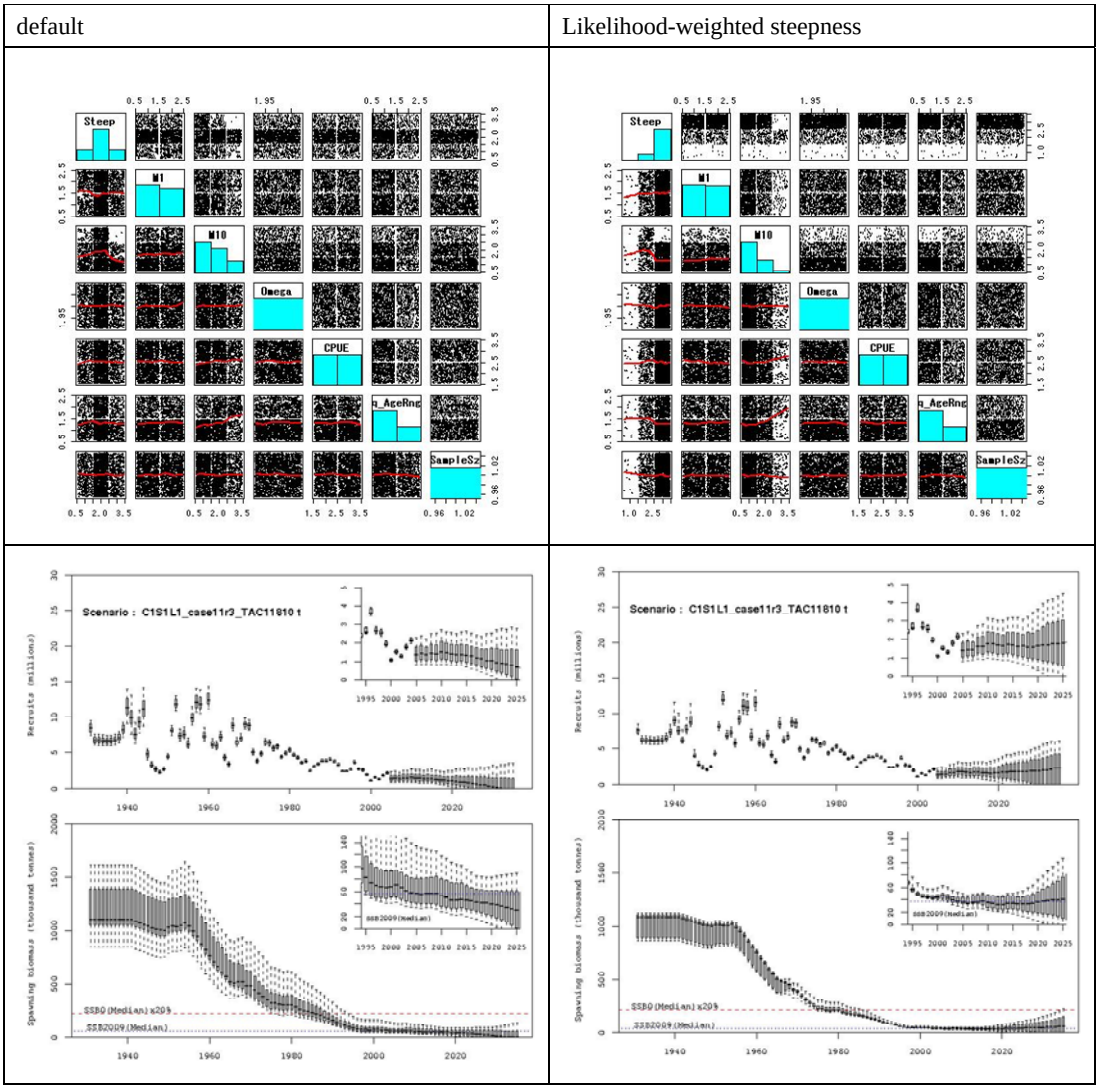
Case9r2	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1081370	(828059, 1699370)						1057730	(834107, 1081370)					
B2009 (t)	56409	(34079, 113112)						36964	(31296, 50559)					
B2009/B0	0.050	(0.034, 0.071)						0.041	(0.030, 0.051)					
B2009/B1980	0.184	(0.116, 0.244)						0.181	(0.116, 0.245)					
B2009/B2000	0.858	(0.699, 0.986)						0.914	(0.693, 1.082)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.16	0.945	0.884	0.833	(0.663, 1.004)	0.776	0.716	1.486	1.173	1.079	0.980	(0.700, 1.159)	0.889	0.794
B2014/B2009	1.164	0.957	0.901	0.846	(0.742, 0.937)	0.792	0.733	1.374	1.083	0.999	0.914	(0.767, 0.999)	0.830	0.743
B2022/B2004	2.306	1.099	0.801	0.523	(0.042, 1.314)	0.264	0.002	4.015	2.005	1.493	1.015	(0.106, 2.106)	0.541	0.094
B2022/B2009	2.356	1.111	0.813	0.530	(0.045, 1.221)	0.264	0.002	3.713	1.876	1.403	0.943	(0.116, 1.912)	0.502	0.086

Figure 1d. Estimated distributions for each uncertainty axis (upper panels) and recruitment and spawning biomass trajectories (lower panels) for a scenario of incomplete mixing of tagged fish (Case 9-3: estimate the degree of incomplete mixing of tagged fish).



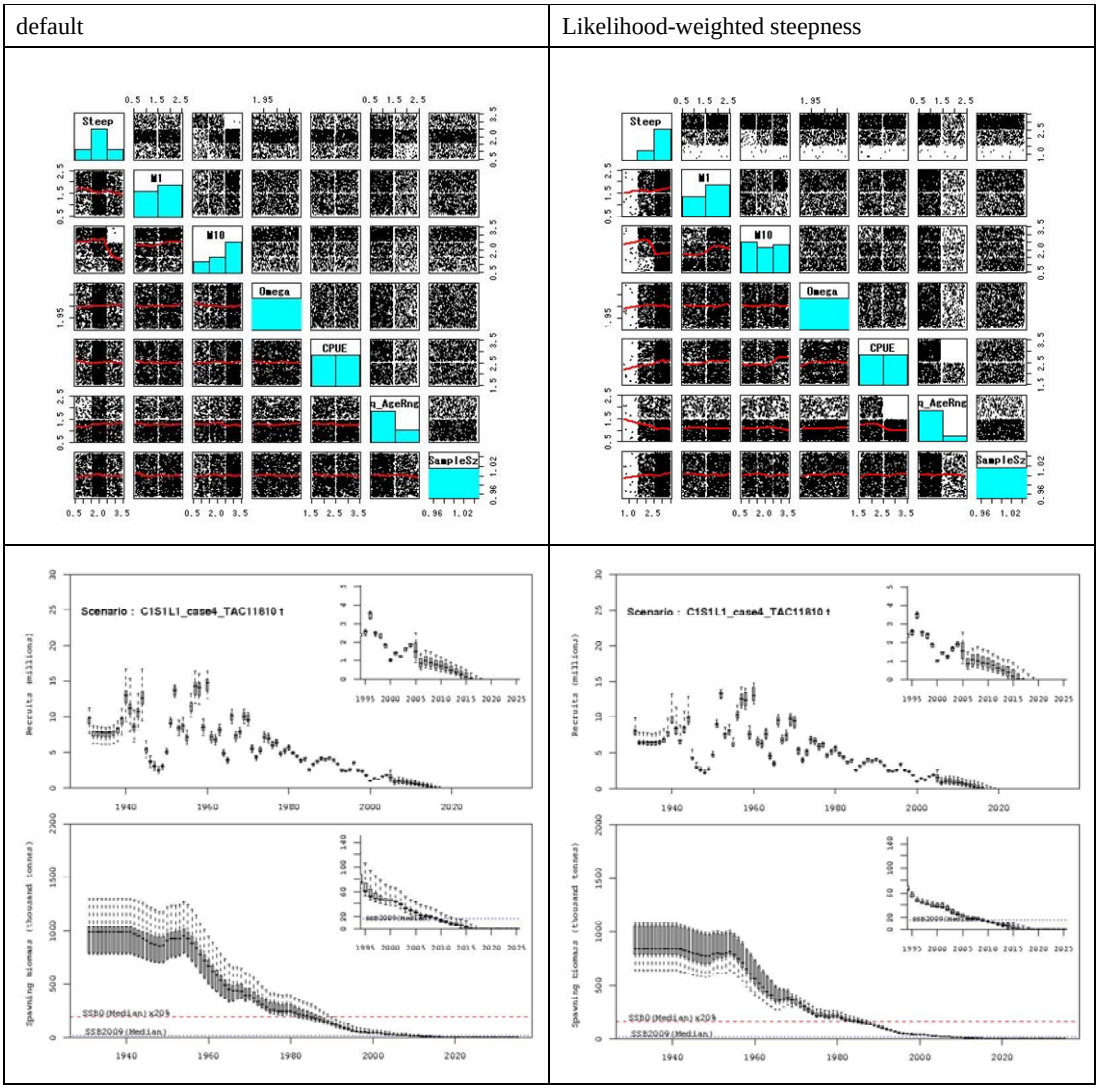
Case9r3	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1126220	(906561, 1457290)						935422	(901152, 1137610)					
B2009 (t)	53545	(35804, 93452)						48100	(35804, 62678)					
B2009/B0	0.052	(0.038, 0.068)						0.047	(0.038, 0.061)					
B2009/B1980	0.207	(0.129, 0.276)						0.207	(0.129, 0.276)					
B2009/B2000	0.939	(0.789, 1.139)						1.052	(0.789, 1.233)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.305	1.066	0.999	0.934	(0.781, 1.144)	0.877	0.815	1.574	1.242	1.151	1.064	(0.806, 1.278)	0.988	0.908
B2014/B2009	1.254	1.027	0.968	0.909	(0.827, 1.011)	0.852	0.793	1.414	1.135	1.052	0.970	(0.844, 1.059)	0.897	0.823
B2022/B2004	2.474	1.332	1.043	0.759	(0.291, 1.695)	0.500	0.254	3.627	2.006	1.608	1.217	(0.345, 2.414)	0.828	0.471
B2022/B2009	2.397	1.276	1.005	0.737	(0.302, 1.544)	0.484	0.249	3.203	1.806	1.452	1.105	(0.345, 2.096)	0.756	0.422

Figure 1e. Estimated distributions for each uncertainty axis (upper panels) and recruitment and spawning biomass trajectories (lower panels) for a scenario of uncorrelated future recruitments (Case 2).



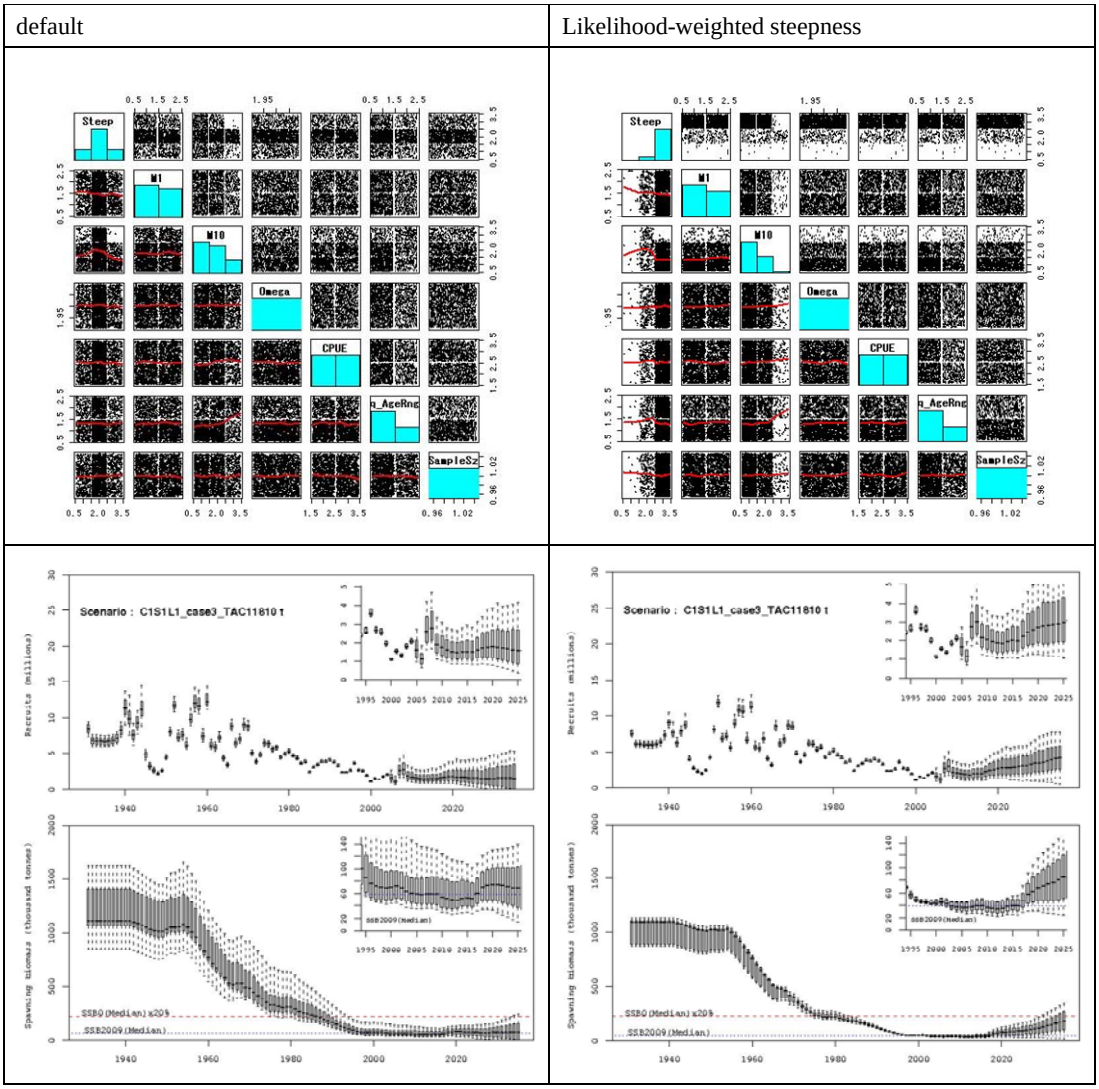
Case11r3	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1107160	(838015, 1618600)						1086890	(862981, 1129570)					
B2009 (t)	56801	(32081, 125605)						37482	(25603, 51067)					
B2009/B0	0.050	(0.034, 0.073)						0.039	(0.027, 0.057)					
B2009/B1980	0.187	(0.116, 0.246)						0.178	(0.108, 0.236)					
B2009/B2000	0.839	(0.653, 0.960)						0.889	(0.649, 1.037)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.07	0.891	0.846	0.799	(0.601, 0.963)	0.751	0.7	1.391	1.114	1.025	0.933	(0.623, 1.106)	0.854	0.765
B2014/B2009	1.106	0.925	0.878	0.828	(0.699, 0.921)	0.781	0.728	1.321	1.046	0.968	0.890	(0.718, 0.981)	0.812	0.729
B2022/B2004	2.287	1.096	0.794	0.524	(0.001, 1.305)	0.271	0.004	3.958	1.936	1.439	0.957	(0.001, 2.044)	0.502	0.057
B2022/B2009	2.389	1.134	0.823	0.544	(0.001, 1.246)	0.278	0.005	3.793	1.865	1.376	0.917	(0.002, 1.888)	0.472	0.052

Figure 1f. Estimated distributions for each uncertainty axis (upper panels) and recruitment and spawning biomass trajectories (lower panels) for the truncated CPUE scenario (Case 4).



Case4	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	991036	(778360, 1304077)						844375	(640787, 1071870)					
B2009 (t)	17242	(14929, 30486)						15811	(13737, 18419)					
B2009/B0	0.021	(0.014, 0.030)						0.018	(0.013, 0.029)					
B2009/B1980	0.071	(0.061, 0.084)						0.071	(0.064, 0.086)					
B2009/B2000	0.401	(0.382, 0.450)						0.401	(0.379, 0.440)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	0.775	0.423	0.32	0.206	(0.045, 0.360)	0.081	0.003	0.942	0.475	0.348	0.218	(0.042, 0.383)	0.082	0.003
B2014/B2009	1.286	0.69	0.52	0.338	(0.077, 0.561)	0.133	0.004	1.532	0.769	0.568	0.358	(0.068, 0.593)	0.131	0.004
B2022/B2004	1.835	0.000	0.000	0.000	(0.000, 0.000)	0.000	0.000	2.909	0.088	0.000	0.000	(0.000, 0.000)	0.000	0.000
B2022/B2009	3.025	0.000	0.000	0.000	(0.000, 0.000)	0.000	0.000	4.659	0.142	0.000	0.000	(0.000, 0.000)	0.000	0.000

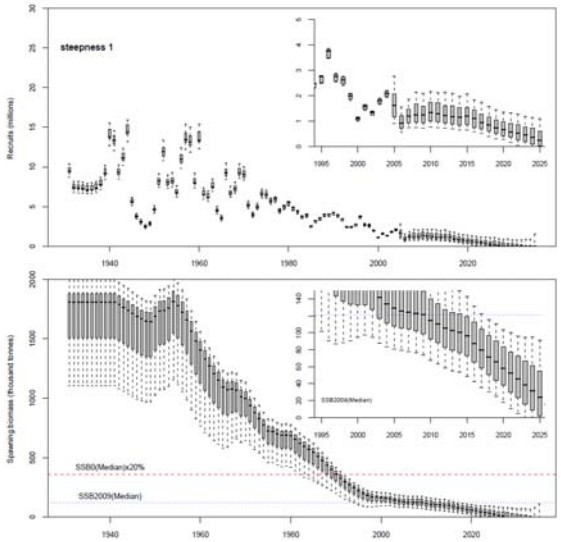
Figure 1g. Estimated distributions for each uncertainty axis (upper panels) and recruitment and spawning biomass trajectories (lower panels) for the troll survey scenario (Case 3).



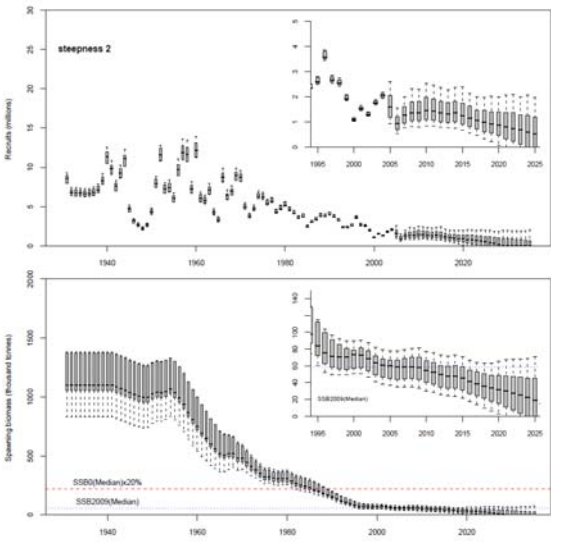
Case3	Default							Likelihood-weighted steepness						
	Median	(P10, P90)						Median	(P10, P90)					
B0 (t)	1115350	(846689, 1630570)						1093750	(868128, 1138030)					
B2009 (t)	58747	(34157, 131379)						39727	(26980, 51184)					
B2009/B0	0.053	(0.034, 0.074)						0.041	(0.029, 0.057)					
B2009/B1980	0.190	(0.123, 0.246)						0.179	(0.111, 0.246)					
B2009/B2000	0.845	(0.681, 0.955)						0.892	(0.667, 1.033)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.093	0.938	0.892	0.848	(0.706, 1.043)	0.807	0.764	1.435	1.186	1.112	1.034	(0.782, 1.176)	0.957	0.881
B2014/B2009	1.126	0.965	0.921	0.88	(0.799, 0.982)	0.837	0.795	1.356	1.112	1.043	0.973	(0.853, 1.046)	0.902	0.833
B2022/B2004	2.789	1.616	1.310	1.013	(0.442, 2.170)	0.720	0.446	4.933	2.893	2.398	1.883	(0.789, 3.234)	1.380	0.879
B2022/B2009	2.896	1.657	1.353	1.046	(0.482, 2.089)	0.750	0.463	4.707	2.755	2.275	1.785	(0.793, 3.055)	1.304	0.834

Figure 2. Conditioning and projection results under the current catch for different steepness values in the base case.

(a) steepness = 0.385



(b) steepness = 0.55



(c) steepness = 0.73

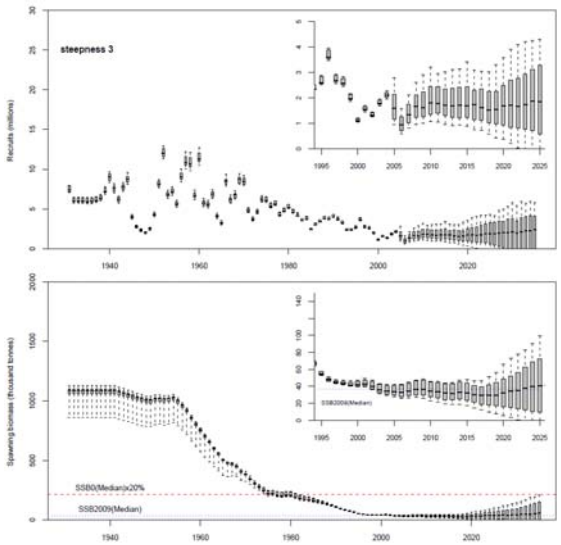
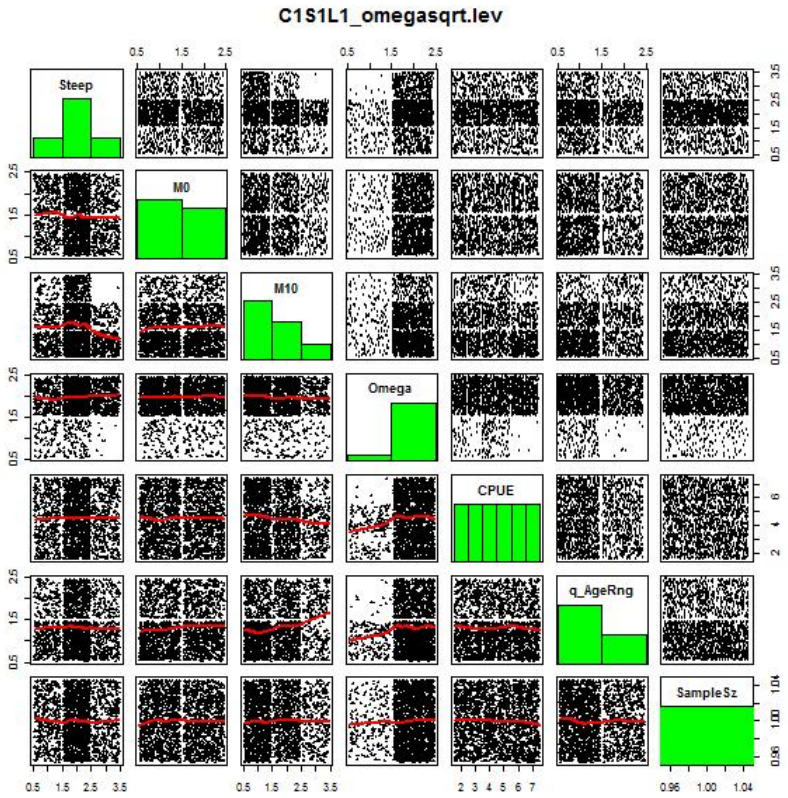


Figure 3. Estimated distributions for each uncertainty axis for six different CPUE series in the base case and Case 5: default (w0.8), default (w0.5), Run3 (w0.8), Run3 (w0.5), Run6 (w0.8), Run6 (w0.5).



Appendix: Examination of the SBT operating model to inform conditioning and projection specifications.

Table 1. The list of sensitivity trials.

Case	Scenarios and assumptions
Base Case	C1S1L1 (CPUE scenario *S* = 25%, LL1 scenario based on Case1 of Japanese Market Report (JMR))
Case 1	Change the LL1 scenario or effects of overcatch on CPUE.
Case1-1	- C0S1L1 (CPUE scenario *S* = 0%)
Case1-2	- C0S1L2 (CPUE scenario *S* = 0%, LL1 scenario based on Case2 of JMR.)
Case1-3	- C1S1L2 (CPUE scenario *S* = 25%, LL1 scenario based on Case2 of JMR.)
Case1-4	- C2S1L1 (CPUE scenario *S* = 50%)
Case1-5	- C2S1L2 (CPUE scenario *S* = 50%, LL1 scenario based on Case2 of JMR.)
Case1-6	- C3S1L1 (CPUE scenario *S* = 75%)
Case1-7	- C3S1L2 (CPUE scenario *S* = 75%, LL1 scenario based on Case2 of JMR.)
Case 2	Projected recruitment deviates uncorrelated to historical estimates from conditioning.
Case 3	Include troll survey data.
Case 4	Truncate CPUE series in 1992.
Case 5	Substitute alternative CPUE series.
Case5-1	- Based on the alternative CPUE series Run3.
Case5-2	- Based on the alternative CPUE series Run6.
Case 6	Break CPUE into two time series, the second starting in 1986.
Case 7	Omega value of 0.75 (CPUE non linearity factor).
Case 8	Increase the lower bound on CPUE CV to 0.30.
Case 9	For modeling the tagging data component:
Case 9-1	- Increase the season-1 *F*'s (H) to 1.245.
Case 9-2	- Estimate the season-1 *F*'s (H) (default = increase the season-1 F's (H) to 1.5).
Case 9-3	- Estimate the season-1 *F*'s (H) (expand the parameter range).
Case 10	Change Grid specifications of steepness and *M*
Case 10-1	- Use prior for M_1 and M_{10} as the simulation weight for grid integration.
Case 10-2	- Change the grid range : steepness: (0.55, 0.73, <u>0.90</u>) and M_{10}: (<u>0.04</u>, 0.07, 0.10)
Case 11	Exploring a reason of low recruitment for the 2006 cohort:
Case 11-1	- Exclude aerial survey data.
Case 11-2	- Change the sample size of surface fishery in 2008 to zero.
Case 11-3	- Change the sample size of LL1 fishery in 2008 to zero.
Case 11-4	- Change the LL1 selectivity blocks in 2006, 2007 and 2008 to that with CV = 1.0.
Case 12	Based on old CPUE series (Nominal, Laslett, ST-windows, w0.5, w0.8):
Case 12-1	- Set the last CPUE year in fit to 2008.
Case 12-2	- Set the last CPUE year in fit to 2006.

Table 2. Summary results for grid simulation in the base case scenario (steepness = 0.385, 0.55 or 0.73, M_1 = 0.3, M_{10} = 0.07, 0.1 or 0.14, CPUE=w0.8, q age-range=4-18)

	Name	C1S1L1sqrt_h1m1 M1O2C2a1.rep	C1S1L1sqrt_h1m1 M2O2C2a1.rep	C1S1L1sqrt_h1m1 M3O2C2a1.rep	C1S1L1sqrt_h2m1 M1O2C2a1.rep	C1S1L1sqrt_h2m1 M2O2C2a1.rep	C1S1L1sqrt_h2m1 M3O2C2a1.rep	C1S1L1sqrt_h3m1 M1O2C2a1.rep	C1S1L1sqrt_h3m1 M2O2C2a1.rep	C1S1L1sqrt_h3m1 M3O2C2a1.rep
Steepness	(0.385 or 0.55 or 0.73)	0.385	0.385	0.385	0.55	0.55	0.55	0.73	0.73	0.73
M1	(0.3 or 0.35)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
M4	Estimate	0.15	0.13	0.14	0.20	0.18	0.15	0.23	0.20	0.16
M10	(0.07 or 0.10 or 0.14)	0.07	0.10	0.14	0.07	0.10	0.14	0.07	0.10	0.14
M30	Estimate	0.46	0.43	0.39	0.45	0.42	0.36	0.42	0.37	0.33
	SSB0 (t)	1,903,720	1,538,400	1,096,250	1,382,710	1,101,860	855,923	1,101,270	872,302	673,360
	SSB 2009 (t)	156,292	132,830	82,125	79,687	68,579	64,819	46,197	48,301	57,906
	SSB 2009 / SSB0	8.2%	8.6%	7.5%	5.8%	6.2%	7.6%	4.2%	5.5%	8.6%
	SSB 2009 / SSB2000	85.0%	89.8%	90.8%	90.1%	96.0%	98.2%	100.9%	103.1%	102.8%
Rho	1931-Y	0.62	0.63	0.65	0.62	0.63	0.64	0.61	0.63	0.68
	1965-2003	0.39	0.42	0.48	0.38	0.41	0.46	0.40	0.47	0.60
SigmaR	Model SigR	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
	1931-Y	0.36	0.36	0.37	0.35	0.36	0.37	0.35	0.36	0.39
	1965-2003	0.27	0.28	0.30	0.26	0.27	0.29	0.27	0.28	0.32
CPUE	1969-Y	0.36	0.36	0.43	0.34	0.36	0.39	0.35	0.38	0.40
Autocorr.	1996-2006	0.67	0.67	0.69	0.68	0.68	0.65	0.70	0.67	0.61
Likelihood	Total	624.5	625.2	627.4	620.6	621.1	622.9	618.2	619.7	624.5
	LL1	150.1	150.3	150.8	149.8	150.0	150.9	150.4	151.1	152.1
	LL2	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8
	LL3	109.9	110.1	109.8	108.2	108.4	108.8	106.8	107.2	107.9
	LL4	37.2	37.2	37.6	38.1	38.2	38.1	39.2	38.8	38.1
	IND	44.2	43.6	42.8	43.3	42.4	41.5	41.0	40.5	41.0
	SURF	40.7	40.6	40.7	41.1	40.9	40.7	41.1	41.0	40.8
	CPUE	-49.9	-49.7	-48.6	-50.5	-50.2	-49.4	-50.4	-49.7	-49.0
	Tags	226.5	226.5	226.4	226.6	226.6	226.8	226.7	226.9	227.2
	Aerial	1.4	1.2	1.3	1.8	1.6	1.4	2.1	1.9	1.8
	Troll	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Priors	Sel.Ch	45.8	46.2	46.2	44.9	45.2	45.4	44.5	44.3	44.3
	Sel.sm	24.4	24.8	25.0	23.6	24.0	24.4	23.7	23.9	24.3
	Sg.R	-25.7	-25.5	-24.3	-26.2	-25.9	-25.6	-26.6	-26.0	-23.9
	M(0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M(10)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Steepness	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref. Pts	msy	29,022	30,200	30,531	0	37,171	38,030	42,216	41,381	40,612
	S(msy)	796,593	649,902	468,975	0	374,508	294,833	293,890	235,238	180,449
	S(msy)/Bo	0.42	0.42	0.43	0.00	0.34	0.34	0.27	0.27	0.27

Table 3-1. Summary results for grid simulation in the sensitivity trials (steepness = 0.55 or 0.73, M_1 = 0.3, M_{10} = 0.07 or 0.1, CPUE=w0.8, q age-range=4-18)

		C1S1L1 (Base Case)				C0S1L1 (Case 1-1)				C0S1L2 (Case 1-2)			
	Name	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep	C0S1L1sqrt_ h2m1M1O2C 2a1.rep	C0S1L1sqrt_ h2m1M2O2C 2a1.rep	C0S1L1sqrt_ h3m1M1O2C 2a1.rep	C0S1L1sqrt_ h3m1M2O2C 2a1.rep	C0S1L2sqrt_ h2m1M1O2C 2a1.rep	C0S1L2sqrt_ h2m1M2O2C 2a1.rep	C0S1L2sqrt_ h3m1M1O2C 2a1.rep	C0S1L2sqrt_ h3m1M2O2C 2a1.rep
Steepness	(0.385 or 0.55 or 0.73)	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73
M1	(0.3 or 0.35)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
M4	Estimate	0.20	0.18	0.23	0.20	0.21	0.20	0.22	0.21	0.19	0.17	0.21	0.19
M10	(0.07 or 0.10 or 0.14)	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10
M30	Estimate	0.45	0.42	0.42	0.37	0.47	0.44	0.42	0.40	0.48	0.45	0.47	0.42
	SSB0 (t)	1,382,710	1,101,860	1,101,270	872,302	1,354,770	1,080,820	1,062,270	865,996	1,436,870	1,146,600	1,149,460	915,634
	SSB 2009 (t)	79,687	68,579	46,197	48,301	65,888	56,536	52,973	42,484	74,489	64,348	45,880	47,245
	SSB 2009 / SSB0	5.8%	6.2%	4.2%	5.5%	4.9%	5.2%	5.0%	4.9%	5.2%	5.6%	4.0%	5.2%
	SSB 2009 / SSB2000	90.1%	96.0%	100.9%	103.1%	82.2%	91.0%	88.3%	99.2%	82.8%	92.0%	96.8%	101.6%
Rho	1931-Y	0.62	0.63	0.61	0.63	0.62	0.62	0.65	0.62	0.62	0.62	0.61	0.62
	1965-2003	0.38	0.41	0.40	0.47	0.38	0.41	0.48	0.46	0.38	0.41	0.39	0.44
SigmaR	Model SigR	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
	1931-Y	0.35	0.36	0.35	0.36	0.35	0.36	0.36	0.36	0.35	0.36	0.35	0.36
	1965-2003	0.26	0.27	0.27	0.28	0.26	0.27	0.28	0.28	0.26	0.27	0.26	0.27
CPUE	1969-Y	0.34	0.36	0.35	0.38	0.38	0.38	0.35	0.40	0.38	0.39	0.40	0.41
Autocorr.	1996-2006	0.68	0.68	0.70	0.67	0.82	0.82	0.81	0.82	0.81	0.82	0.83	0.81
Likelihood	Total	620.6	621.1	618.2	619.7	618.4	618.2	620.9	616.9	617.6	617.5	615.8	616.2
	LL1	149.8	150.0	150.4	151.1	149.9	150.1	150.5	151.5	150.1	150.3	150.8	151.6
	LL2	19.8	19.8	19.8	19.8	19.7	19.7	19.7	19.7	19.8	19.8	19.7	19.7
	LL3	108.2	108.4	106.8	107.2	108.4	108.6	108.1	107.5	108.9	109.1	107.7	108.0
	LL4	38.1	38.2	39.2	38.8	37.9	38.0	37.7	38.4	37.8	37.8	38.5	38.2
	IND	43.3	42.4	41.0	40.5	43.6	42.3	43.2	40.2	43.6	42.3	41.3	40.2
	SURF	41.1	40.9	41.1	41.0	41.0	40.9	41.8	40.9	40.7	40.6	40.7	40.6
	CPUE	-50.5	-50.2	-50.4	-49.7	-51.9	-51.9	-52.3	-51.7	-51.9	-51.9	-51.6	-51.5
	Tags	226.6	226.6	226.7	226.9	226.7	226.6	227.1	226.7	225.6	225.5	225.5	225.7
	Aerial	1.8	1.6	2.1	1.9	2.1	1.9	2.3	2.1	1.8	1.7	2.0	1.9
	Troll	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Priors	Sel.Ch	44.9	45.2	44.5	44.3	44.1	44.4	44.5	44.0	44.0	44.4	44.2	44.1
	Sel.sm	23.6	24.0	23.7	23.9	23.5	23.7	24.1	23.7	23.6	23.9	23.6	23.9
	Sg.R	-26.2	-25.9	-26.6	-26.0	-26.4	-26.1	-25.8	-26.2	-26.3	-26.0	-26.7	-26.2
	M(0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M(10)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Steepness	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref. Pts	msy	0	37,171	42,216	41,381	36,633	37,405	0	41,838	0	38,701	43,955	43,397
	S(msy)	0	374,508	293,890	235,238	456,915	368,057	0	235,338	0	390,712	307,796	248,768
	S(msy)/Bo	0.00	0.34	0.27	0.27	0.34	0.34	0.00	0.27	0.00	0.34	0.27	0.27

Table 3-2 (continued)

		C1S1L2 (Case 1-3)				C2S1L1 (Case 1-4)				C2S1L2 (Case 1-5)			
	Name	C1S1L2sqrt_ h2m1M1O2C 2a1.rep	C1S1L2sqrt_ h2m1M2O2C 2a1.rep	C1S1L2sqrt_ h3m1M1O2C 2a1.rep	C1S1L2sqrt_ h3m1M2O2C 2a1.rep	C2S1L1sqrt_ h2m1M1O2C 2a1.rep	C2S1L1sqrt_ h2m1M2O2C 2a1.rep	C2S1L1sqrt_ h3m1M1O2C 2a1.rep	C2S1L1sqrt_ h3m1M2O2C 2a1.rep	C2S1L2sqrt_ h2m1M1O2C 2a1.rep	C2S1L2sqrt_ h2m1M2O2C 2a1.rep	C2S1L2sqrt_ h3m1M1O2C 2a1.rep	C2S1L2sqrt_ h3m1M2O2C 2a1.rep
Steepness	(0.385 or 0.55 or 0.73)	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73
M1	(0.3 or 0.35)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
M4	Estimate	0.18	0.16	0.21	0.18	0.19	0.17	0.22	0.19	0.16	0.14	0.20	0.17
M10	(0.07 or 0.10 or 0.14)	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10
M30	Estimate	0.45	0.42	0.43	0.38	0.44	0.40	0.40	0.36	0.43	0.40	0.40	0.37
	SSB0 (t)	1,469,430	1,169,670	1,160,470	920,968	1,421,050	1,133,960	1,113,360	880,594	1,515,970	1,208,830	1,174,810	932,488
	SSB 2009 (t)	91,591	78,780	52,557	54,026	99,035	86,322	55,421	57,309	115,643	100,512	63,838	69,849
	SSB 2009 / SSB0	6.2%	6.7%	4.5%	5.9%	7.0%	7.6%	5.0%	6.5%	7.6%	8.3%	5.4%	7.5%
	SSB 2009 / SSB2000	91.3%	97.2%	102.4%	105.1%	96.7%	100.4%	105.4%	106.8%	97.9%	101.4%	106.6%	108.6%
Rho	1931-Y	0.62	0.63	0.62	0.63	0.63	0.64	0.63	0.65	0.63	0.64	0.64	0.64
	1965-2003	0.38	0.41	0.40	0.46	0.41	0.44	0.43	0.51	0.41	0.45	0.44	0.51
SigmaR	Model SigR	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
	1931-Y	0.35	0.36	0.35	0.36	0.36	0.36	0.36	0.37	0.36	0.37	0.36	0.37
	1965-2003	0.26	0.27	0.27	0.28	0.27	0.28	0.28	0.30	0.27	0.28	0.28	0.30
CPUE	1969-Y	0.34	0.36	0.36	0.39	0.35	0.37	0.38	0.40	0.33	0.35	0.36	0.37
Autocorr.	1996-2006	0.66	0.65	0.68	0.65	0.51	0.49	0.51	0.48	0.48	0.47	0.48	0.46
Likelihood	Total	620.9	621.2	618.0	619.5	626.1	627.7	624.0	626.8	627.6	628.9	624.9	627.9
	LL1	150.2	150.3	150.5	151.3	149.9	150.3	150.3	151.2	150.4	150.7	150.5	151.4
	LL2	19.9	19.9	19.8	19.8	19.9	19.9	19.8	19.8	20.0	20.0	19.9	19.9
	LL3	108.6	108.7	107.1	107.4	108.3	108.6	106.7	107.2	108.6	108.9	106.9	107.6
	LL4	37.9	38.1	39.0	38.7	38.3	38.1	39.4	38.9	38.0	38.0	39.3	38.6
	IND	43.3	42.4	41.2	40.6	43.4	42.7	41.5	41.2	43.4	42.8	41.7	41.6
	SURF	40.7	40.6	40.8	40.7	41.1	40.9	41.2	41.0	40.7	40.6	40.9	40.7
	CPUE	-49.8	-49.4	-49.8	-48.9	-47.0	-46.5	-46.7	-45.7	-45.6	-44.9	-45.2	-44.5
	Tags	225.5	225.5	225.6	225.8	226.6	226.7	226.8	227.1	225.4	225.5	225.7	225.9
	Aerial	1.5	1.4	1.8	1.7	1.6	1.4	1.9	1.8	1.3	1.1	1.6	1.5
	Troll	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Priors	Sel.Ch	45.1	45.3	44.6	44.4	46.2	46.6	45.4	45.3	46.5	46.8	45.5	45.6
	Sel.sm	24.4	24.1	23.8	24.1	23.8	24.7	23.9	24.6	24.6	24.9	24.0	24.9
	Sg.R	-26.3	-25.7	-26.4	-25.9	-25.8	-25.7	-26.2	-25.6	-25.8	-25.5	-25.9	-25.4
	M(0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M(10)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Steepness	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref. Pts	msy	37,646	38,357	43,355	42,725	36,420	37,092	41,570	40,854	37,562	38,273	42,590	41,887
	S(msy)	495,770	397,845	309,128	248,097	478,614	384,817	294,362	234,882	511,224	410,612	310,035	247,378
	S(msy)/Bo	0.34	0.34	0.27	0.27	0.34	0.34	0.26	0.27	0.34	0.34	0.26	0.27

Table 3-3 (continued)

		C3S1L1 (Case 1-6)				C3S1L2 (Case 1-7)				Case 3 : Include troll survey data.			
	Name	C3S1L1sqrt_ h2m1M1O2C 2a1.rep	C3S1L1sqrt_ h2m1M2O2C 2a1.rep	C3S1L1sqrt_ h3m1M1O2C 2a1.rep	C3S1L1sqrt_ h3m1M2O2C 2a1.rep	C3S1L2sqrt_ h2m1M1O2C 2a1.rep	C3S1L2sqrt_ h2m1M2O2C 2a1.rep	C3S1L2sqrt_ h3m1M1O2C 2a1.rep	C3S1L2sqrt_ h3m1M2O2C 2a1.rep	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep
Steepness	(0.385 or 0.55 or 0.73)	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73
M1	(0.3 or 0.35)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
M4	Estimate	0.17	0.15	0.21	0.18	0.14	0.12	0.19	0.16	0.20	0.18	0.23	0.20
M10	(0.07 or 0.10 or 0.14)	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10
M30	Estimate	0.43	0.39	0.39	0.35	0.42	0.39	0.38	0.34	0.45	0.42	0.42	0.38
	SSB0 (t)	1,472,860	1,176,640	1,130,160	894,006	1,570,130	1,248,120	1,189,720	939,569	1,404,840	1,119,440	1,109,990	882,697
	SSB 2009 (t)	124,938	109,459	69,568	69,253	143,721	122,911	77,430	73,840	85,309	72,824	47,974	49,173
	SSB 2009 / SSB0	8.5%	9.3%	6.2%	7.7%	9.2%	9.8%	6.5%	7.9%	6.1%	6.5%	4.3%	5.6%
	SSB 2009 / SSB2000	102.4%	104.3%	109.6%	109.4%	102.3%	103.6%	108.9%	108.8%	90.1%	95.8%	101.0%	103.1%
Rho	1931-Y	0.64	0.65	0.65	0.66	0.65	0.66	0.65	0.67	0.60	0.61	0.59	0.61
	1965-2003	0.44	0.48	0.48	0.54	0.45	0.48	0.48	0.54	0.39	0.42	0.41	0.47
SigmaR	Model SigR	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
	1931-Y	0.37	0.37	0.37	0.38	0.37	0.37	0.37	0.38	0.36	0.36	0.35	0.36
	1965-2003	0.28	0.29	0.29	0.31	0.28	0.29	0.29	0.31	0.26	0.27	0.27	0.28
CPUE	1969-Y	0.36	0.38	0.39	0.43	0.35	0.39	0.40	0.45	0.33	0.35	0.34	0.38
Autocorr.	1996-2006	0.39	0.39	0.38	0.38	0.39	0.38	0.38	0.38	0.68	0.68	0.70	0.68
Likelihood	Total	633.3	634.9	631.4	634.5	635.4	637.0	633.7	636.1	638.2	638.5	635.5	636.3
	LL1	150.3	150.6	150.5	151.1	150.5	150.7	150.5	151.0	150.4	150.6	150.8	151.5
	LL2	19.9	19.9	19.9	19.9	20.0	20.0	20.0	19.9	19.8	19.8	19.8	19.8
	LL3	108.6	108.9	106.8	107.2	108.7	108.9	106.8	107.1	108.3	108.6	106.9	107.2
	LL4	38.1	38.1	39.4	39.0	38.1	38.1	39.3	39.1	37.9	38.0	39.0	38.8
	IND	43.6	43.1	42.2	41.9	43.6	43.1	42.3	41.9	43.3	42.3	41.0	40.4
	SURF	41.0	40.9	41.2	41.0	40.7	40.5	40.8	40.7	41.0	40.9	41.1	41.0
	CPUE	-42.9	-42.2	-42.3	-40.7	-40.0	-38.8	-39.0	-37.0	-50.5	-50.3	-50.6	-49.8
	Tags	226.6	226.7	227.0	227.2	225.4	225.5	225.8	225.9	226.8	226.8	226.8	227.1
	Aerial	1.4	1.2	1.7	1.6	1.0	0.9	1.4	1.3	1.8	1.7	2.3	2.4
	Troll	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.8	15.5	15.4	15.1
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Priors	Sel.Ch	47.6	47.9	46.6	46.4	47.7	47.8	46.5	46.1	45.4	45.8	44.9	44.7
	Sel.sm	24.6	24.9	24.0	24.8	24.8	25.1	24.8	25.0	24.3	24.6	24.3	24.0
	Sg.R	-25.5	-25.2	-25.5	-24.9	-25.2	-24.9	-25.5	-24.9	-26.0	-25.8	-26.4	-25.8
	M(0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M(10)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Steepness	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref. Pts	msy	36,526	37,222	40,938	40,469	37,612	38,280	41,885	41,581	36,723	37,460	42,342	41,791
	S(msy)	496,074	399,102	296,177	236,181	529,557	423,801	311,681	248,312	473,193	380,173	295,388	237,660
	S(msy)/Bo	0.34	0.34	0.26	0.26	0.34	0.34	0.26	0.26	0.34	0.34	0.27	0.27

Table 3-4 (continued)

		Case 4 : Truncate CPUE				Case 5-1 : Aiternative CPUE Run3				Case 5-2 : Aiternative CPUE Run6			
	Name	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep	C1S1L1sqrt_ h2m1M1O2C 4a1.rep	C1S1L1sqrt_ h2m1M2O2C 4a1.rep	C1S1L1sqrt_ h3m1M1O2C 4a1.rep	C1S1L1sqrt_ h3m1M2O2C 4a1.rep	C1S1L1sqrt_ h2m1M1O2C 6a1.rep	C1S1L1sqrt_ h2m1M2O2C 6a1.rep	C1S1L1sqrt_ h3m1M1O2C 6a1.rep	C1S1L1sqrt_ h3m1M2O2C 6a1.rep
Steepness	(0.385 or 0.55 or 0.73)	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73
M1	(0.3 or 0.35)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
M4	Estimate	0.24	0.24	0.25	0.23	0.20	0.18	0.23	0.20	0.20	0.17	0.22	0.20
M10	(0.07 or 0.10 or 0.14)	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10
M30	Estimate	0.47	0.43	0.44	0.40	0.45	0.42	0.42	0.37	0.46	0.43	0.43	0.39
	SSB0 (t)	1,271,060	1,000,240	1,049,140	824,627	1,389,940	1,107,690	1,106,460	877,328	1,401,840	1,122,450	1,102,700	877,023
	SSB 2009 (t)	27,996	16,734	13,922	15,328	84,159	72,620	49,838	51,818	87,175	77,271	50,773	52,980
	SSB 2009 / SSB0	2.2%	1.7%	1.3%	1.9%	6.1%	6.6%	4.5%	5.9%	6.2%	6.9%	4.6%	6.0%
	SSB 2009 / SSB2000	48.2%	44.7%	44.7%	47.0%	91.9%	99.0%	106.5%	108.9%	93.4%	97.6%	101.8%	103.4%
Rho	1931-Y	0.61	0.62	0.60	0.62	0.62	0.62	0.61	0.63	0.63	0.63	0.62	0.64
	1965-2003	0.35	0.36	0.37	0.49	0.37	0.40	0.39	0.46	0.40	0.44	0.43	0.50
SigmaR	Model SigR	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
	1931-Y	0.35	0.36	0.34	0.35	0.35	0.36	0.35	0.36	0.36	0.36	0.35	0.37
	1965-2003	0.26	0.26	0.26	0.28	0.26	0.27	0.27	0.28	0.27	0.28	0.27	0.29
CPUE	1969-Y	0.80	0.84	0.81	0.83	0.28	0.28	0.27	0.29	0.33	0.36	0.37	0.41
Autocorr.	1996-2006	0.92	0.94	0.94	0.93	0.65	0.64	0.65	0.60	0.44	0.43	0.44	0.42
Likelihood	Total	610.6	609.2	606.5	607.2	621.7	622.4	619.2	620.3	625.2	626.7	624.0	625.9
	LL1	149.2	149.8	149.9	150.3	150.3	150.7	150.9	151.6	149.9	150.2	150.6	151.2
	LL2	20.1	20.2	20.1	20.1	19.6	19.6	19.6	19.6	19.8	19.8	19.8	19.8
	LL3	108.1	108.2	107.0	107.5	108.2	108.5	106.8	107.2	108.8	109.1	107.3	107.7
	LL4	37.9	38.1	39.0	38.4	38.1	38.0	39.2	38.8	38.0	37.8	38.8	38.5
	IND	43.1	40.6	40.0	39.8	43.6	42.5	41.1	40.6	43.3	42.4	41.3	40.9
	SURF	40.9	41.0	40.9	40.8	41.1	41.0	41.2	41.0	41.0	40.9	41.1	41.0
	CPUE	-56.6	-56.6	-56.7	-56.3	-49.8	-49.7	-49.9	-49.5	-47.4	-46.8	-46.8	-45.6
	Tags	225.7	225.5	225.5	225.7	226.8	226.8	226.8	227.0	226.7	226.7	226.9	227.1
	Aerial	0.7	0.7	0.7	0.2	2.1	2.0	2.5	2.4	1.4	1.2	1.7	1.6
	Troll	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Priors	Sel.Ch	44.3	43.7	43.8	43.4	44.2	44.7	44.0	43.8	46.2	46.6	45.5	45.3
	Sel.sm	23.9	24.1	23.3	23.5	23.7	24.5	23.7	23.9	23.8	24.7	24.4	24.1
	Sg.R	-26.7	-26.0	-27.0	-26.2	-26.3	-26.2	-26.6	-26.1	-26.1	-26.0	-26.5	-25.6
	M(0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M(10)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Steepness	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref. Pts	msy	35,507	36,725	42,366	40,980	36,663	37,341	42,464	41,620	36,675	37,391	41,905	41,314
	S(msy)	427,064	342,140	283,562	223,477	468,856	376,882	296,125	237,430	472,601	381,435	293,010	235,268
	S(msy)/Bo	0.34	0.34	0.27	0.27	0.34	0.34	0.27	0.27	0.34	0.34	0.27	0.27

Table 3-5 (continued)

		Case 6 : Break CPUE into two series				Case 7 : Omega value of 0.75				Case 8 : CPUE CV = 0.30			
	Name	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep
Steepness	(0.385 or 0.55 or 0.73)	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73
M1	(0.3 or 0.35)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
M4	Estimate	0.21	0.19	0.23	0.21	0.22	0.20	0.24	0.22	0.21	0.20	0.24	0.21
M10	(0.07 or 0.10 or 0.14)	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10
M30	Estimate	0.47	0.44	0.44	0.40	0.50	0.46	0.47	0.43	0.44	0.41	0.41	0.35
	SSB0 (t)	1,361,240	1,086,160	1,094,320	867,567	1,333,820	1,065,410	1,074,870	853,466	1,354,100	1,072,850	1,086,280	854,728
	SSB 2009 (t)	67,762	58,032	42,573	44,239	52,046	44,413	30,563	32,837	67,933	55,478	35,831	37,661
	SSB 2009 / SSB0	5.0%	5.3%	3.9%	5.1%	3.9%	4.2%	2.8%	3.8%	5.0%	5.2%	3.3%	4.4%
	SSB 2009 / SSB2000	84.7%	91.2%	96.9%	99.3%	73.8%	79.5%	78.1%	82.0%	80.0%	85.1%	86.7%	89.3%
Rho	1931-Y	0.62	0.62	0.61	0.63	0.61	0.62	0.61	0.63	0.62	0.62	0.61	0.62
	1965-2003	0.39	0.42	0.40	0.47	0.41	0.43	0.40	0.48	0.37	0.39	0.38	0.47
SigmaR	Model SigR	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
	1931-Y	0.35	0.36	0.35	0.36	0.35	0.36	0.35	0.36	0.35	0.36	0.35	0.36
	1965-2003	0.27	0.27	0.27	0.28	0.27	0.28	0.27	0.28	0.26	0.27	0.27	0.29
CPUE	1969-Y	0.33	0.34	0.35	0.38	0.45	0.48	0.50	0.52	0.50	0.53	0.54	0.58
Autocorr.	1996-2006	0.71	0.71	0.73	0.71	0.67	0.67	0.71	0.68	0.76	0.77	0.80	0.78
Likelihood	Total	619.7	619.9	617.7	619.1	622.5	622.3	620.6	622.1	629.2	629.4	626.6	628.1
	LL1	149.6	149.8	150.4	151.1	149.5	149.7	150.4	151.1	149.0	149.2	149.6	150.3
	LL2	19.8	19.8	19.8	19.8	19.9	19.9	19.9	19.9	19.8	19.8	19.8	19.8
	LL3	108.6	108.8	107.1	107.6	109.2	109.3	107.8	108.1	107.6	107.8	106.3	106.7
	LL4	37.9	37.9	38.9	38.5	37.5	37.7	38.4	38.1	38.3	38.4	39.5	39.1
	IND	43.2	42.1	40.9	40.3	43.1	41.8	40.8	40.1	43.6	42.4	40.7	40.2
	SURF	41.0	40.9	41.1	41.0	40.9	40.8	40.9	40.8	40.8	40.7	40.9	40.8
	CPUE	-50.6	-50.3	-50.5	-49.8	-47.8	-47.1	-46.6	-45.7	-39.3	-38.8	-38.8	-38.1
	Tags	226.6	226.6	226.6	226.8	226.4	226.4	226.3	226.5	226.5	226.5	226.4	226.6
	Aerial	1.8	1.6	2.0	1.9	1.3	1.1	1.4	1.2	1.3	1.2	1.6	1.4
	Troll	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Priors	Sel.Ch	44.6	44.9	44.4	44.2	44.9	45.0	44.5	44.2	44.3	44.4	43.7	43.3
	Sel.sm	23.6	23.9	23.6	23.8	24.1	23.9	23.6	23.8	23.7	24.0	23.7	24.4
	Sg.R	-26.3	-26.1	-26.7	-26.0	-26.4	-26.1	-26.7	-25.9	-26.4	-26.2	-26.8	-26.4
	M(0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M(10)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Steepness	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref. Pts	msy	36,636	37,422	42,419	41,640	36,589	37,427	42,590	41,750	35,988	36,656	42,148	40,958
	S(msy)	459,044	369,709	292,671	234,783	449,633	362,767	288,367	231,499	455,690	364,269	291,070	231,247
	S(msy)/Bo	0.34	0.34	0.27	0.27	0.34	0.34	0.27	0.27	0.34	0.34	0.27	0.27

Table 3-6 (continued)

		Case 9-1 : Season1 F's (H) =1.245				Case 9-2 : Season1 F's (H) = 1.5				Case 9-3 : Estimate season1 F's (H)			
	Name	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep	C1S1L1sqrt_ h2m1M1O2 C2a1.rep	C1S1L1sqrt_ h2m1M2O2 C2a1.rep	C1S1L1sqrt_ h3m1M1O2 C2a1.rep	C1S1L1sqrt_ h3m1M2O2 C2a1.rep
Steepness	(0.385 or 0.55 or 0.73)	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73
M1	(0.3 or 0.35)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
M4	Estimate	0.23	0.21	0.25	0.22	0.25	0.24	0.28	0.25	0.30	0.30	0.30	0.30
M10	(0.07 or 0.10 or 0.14)	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10
M30	Estimate	0.45	0.41	0.42	0.40	0.45	0.41	0.42	0.37	0.45	0.41	0.42	0.37
	SSB0 (t)	1,318,620	1,050,880	1,057,730	823,716	1,266,690	1,009,460	1,020,660	807,202	1,181,710	918,107	979,139	743,611
	SSB 2009 (t)	75,527	65,748	46,151	53,778	72,622	63,658	46,266	49,454	74,119	60,809	50,937	51,602
	SSB 2009 / SSB0	5.7%	6.3%	4.4%	6.5%	5.7%	6.3%	4.5%	6.1%	6.3%	6.6%	5.2%	6.9%
	SSB 2009 / SSB2000	92.7%	99.7%	105.2%	107.3%	95.3%	103.0%	109.1%	111.9%	102.2%	112.6%	118.5%	121.5%
Rho	1931-Y	0.62	0.62	0.61	0.63	0.62	0.63	0.61	0.64	0.62	0.63	0.62	0.65
	1965-2003	0.40	0.43	0.42	0.51	0.42	0.46	0.43	0.50	0.48	0.52	0.47	0.54
SigmaR	Model SigR	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
	1931-Y	0.35	0.36	0.35	0.37	0.36	0.36	0.35	0.36	0.36	0.36	0.36	0.37
	1965-2003	0.27	0.28	0.27	0.29	0.27	0.28	0.27	0.29	0.29	0.30	0.28	0.30
CPUE	1969-Y	0.33	0.35	0.35	0.35	0.33	0.35	0.34	0.37	0.31	0.34	0.31	0.35
Autocorr.	1996-2006	0.69	0.68	0.71	0.67	0.69	0.69	0.72	0.68	0.68	0.69	0.69	0.68
Likelihood	Total	610.9	612.0	608.6	611.5	605.3	606.5	603.1	605.2	600.0	600.5	599.2	600.8
	LL1	148.5	149.0	149.2	149.7	147.9	148.4	148.8	149.7	147.3	147.8	148.4	149.5
	LL2	19.7	19.8	19.7	19.8	19.7	19.7	19.7	19.7	19.7	19.6	19.7	19.6
	LL3	107.9	108.3	106.7	107.7	107.8	108.1	106.6	107.0	107.6	107.6	106.6	106.8
	LL4	38.2	38.1	39.2	38.4	38.2	38.2	39.2	38.7	38.2	38.4	39.0	38.6
	IND	42.0	40.9	39.7	39.9	41.1	40.0	38.9	38.5	39.9	38.4	38.0	37.4
	SURF	40.6	40.5	40.6	40.5	40.6	40.5	40.6	40.6	43.5	44.0	42.6	43.4
	CPUE	-50.6	-50.3	-50.5	-50.3	-50.7	-50.4	-50.6	-49.9	-50.8	-50.4	-50.9	-50.0
	Tags	222.0	222.1	222.0	222.3	219.2	219.4	219.1	219.3	214.9	214.9	215.7	215.0
	Aerial	1.5	1.3	1.7	1.6	1.2	1.1	1.4	1.4	0.7	0.7	1.0	1.0
	Troll	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Priors	Sel.Ch	44.1	44.5	43.8	43.5	43.7	44.0	43.5	43.2	43.7	43.8	43.6	43.1
	Sel.sm	23.1	24.0	23.1	23.7	22.6	23.4	22.6	22.8	21.3	21.3	21.7	21.4
	Sg.R	-26.2	-26.1	-26.6	-25.4	-26.2	-26.0	-26.5	-25.8	-26.0	-25.6	-26.2	-25.1
	M(0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M(10)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Steepness	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref. Pts	msy	36,001	36,633	41,699	39,799	35,608	36,196	41,222	40,148	34,858	35,222	40,488	38,785
	S(msy)	444,165	357,228	282,947	219,921	426,575	343,290	273,660	218,459	397,594	312,780	262,346	201,848
	S(msy)/Bo	0.34	0.34	0.27	0.27	0.34	0.34	0.27	0.27	0.34	0.34	0.27	0.27

Table 3-7 (continued)

		Case 10 : Value changes of h & M10				Case 11-1 : Exclude aerial survey data				Case 11-2 : Sample size change			
	Name	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep
Steepness	(0.385 or 0.55 or 0.73)	0.73	0.73	**0.9**	**0.9**	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73
M1	(0.3 or 0.35)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
M4	Estimate	0.25	0.23	0.25	0.23	0.21	0.19	0.23	0.20	0.20	0.18	0.23	0.20
M10	(0.07 or 0.10 or 0.14)	**0.04**	0.07	**0.04**	0.07	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10
M30	Estimate	0.47	0.42	0.42	0.39	0.45	0.42	0.42	0.38	0.45	0.42	0.42	0.37
	SSB0 (t)	1,422,260	1,101,270	1,141,280	869,327	1,373,480	1,129,040	1,102,690	880,681	1,385,400	1,105,040	1,103,250	874,864
	SSB 2009 (t)	51,206	46,192	38,248	43,055	82,898	67,575	52,210	56,481	80,619	69,682	46,609	48,703
	SSB 2009 / SSB0	3.6%	4.2%	3.4%	5.0%	6.0%	6.0%	4.7%	6.4%	5.8%	6.3%	4.2%	5.6%
	SSB 2009 / SSB2000	92.4%	100.9%	105.9%	108.6%	94.9%	104.9%	111.6%	117.0%	90.2%	96.2%	101.2%	103.5%
Rho	1931-Y	0.60	0.61	0.67	0.71	0.62	0.63	0.61	0.61	0.61	0.62	0.61	0.63
	1965-2003	0.37	0.40	0.57	0.65	0.39	0.43	0.39	0.44	0.38	0.41	0.40	0.47
SigmaR	Model SigR	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
	1931-Y	0.35	0.35	0.38	0.41	0.36	0.37	0.35	0.36	0.35	0.35	0.35	0.36
	1965-2003	0.26	0.27	0.31	0.34	0.27	0.28	0.27	0.28	0.26	0.27	0.27	0.28
CPUE	1969-Y	0.32	0.35	0.34	0.36	0.29	0.32	0.30	0.33	0.33	0.35	0.35	0.38
Autocorr.	1996-2006	0.71	0.70	0.71	0.67	0.57	0.56	0.58	0.53	0.68	0.67	0.70	0.67
Likelihood	Total	618.6	618.2	620.1	622.3	617.6	618.8	614.4	615.8	620.5	621.0	617.6	619.1
	LL1	150.0	150.4	151.3	151.7	148.3	148.9	148.8	149.4	149.6	149.8	150.0	150.7
	LL2	19.8	19.8	19.7	19.7	20.1	20.1	20.2	20.3	19.8	19.8	19.8	19.8
	LL3	106.6	106.8	105.6	106.1	108.4	108.2	107.0	107.4	108.3	108.6	106.9	107.2
	LL4	39.1	39.2	40.1	39.2	38.0	38.5	39.1	38.7	37.9	38.0	39.2	38.8
	IND	42.5	41.0	40.1	40.1	44.3	43.0	42.0	41.6	43.3	42.4	41.0	40.6
	SURF	41.2	41.1	41.0	41.0	41.1	41.1	41.2	41.1	40.9	40.7	40.9	40.8
	CPUE	-51.1	-50.4	-50.6	-50.1	-51.2	-50.7	-51.1	-50.4	-50.5	-50.2	-50.5	-49.8
	Tags	226.6	226.7	226.8	227.0	226.4	226.5	226.4	226.7	226.6	226.6	226.7	226.9
	Aerial	2.2	2.1	2.6	2.5	0.0	0.0	0.0	0.0	1.9	1.7	2.2	2.0
	Troll	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Priors	Sel.Ch	44.6	44.5	44.1	43.7	44.1	43.9	43.7	43.5	45.0	45.3	44.5	44.4
	Sel.sm	24.1	23.7	23.6	23.7	24.1	24.3	23.5	23.7	24.1	24.4	23.6	23.8
	Sg.R	-26.9	-26.6	-24.3	-22.3	-26.0	-25.1	-26.4	-26.2	-26.5	-26.2	-26.7	-26.1
	M(0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M(10)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Steepness	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref. Pts	msy	42,063	42,217	44,623	42,243	125	38,892	42,637	42,144	36,491	37,211	42,269	41,485
	S(msy)	373,593	293,893	223,226	169,540	221,450	385,116	295,600	238,702	466,879	375,567	294,399	235,973
	S(msy)/Bo	0.26	0.27	0.20	0.20	0.16	0.34	0.27	0.27	0.34	0.34	0.27	0.27

Table 3-8 (continued)

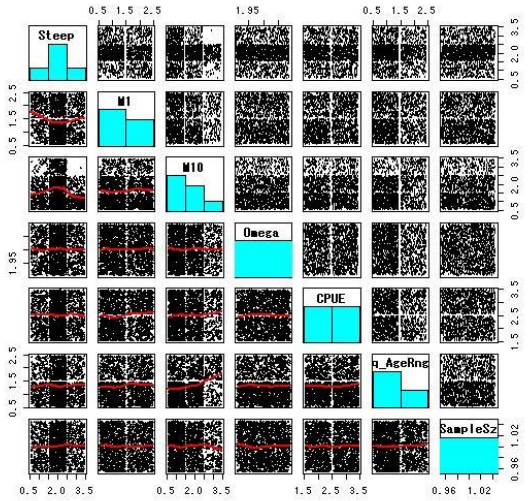
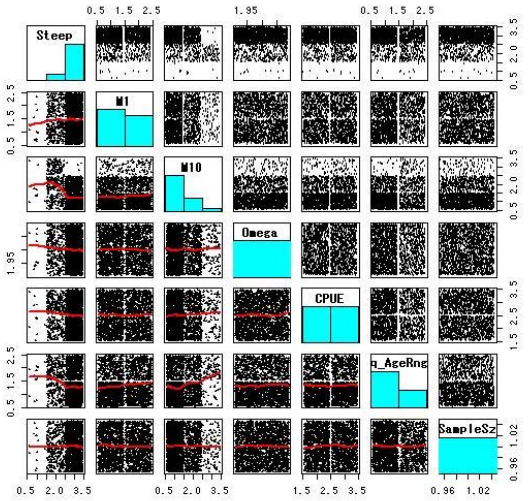
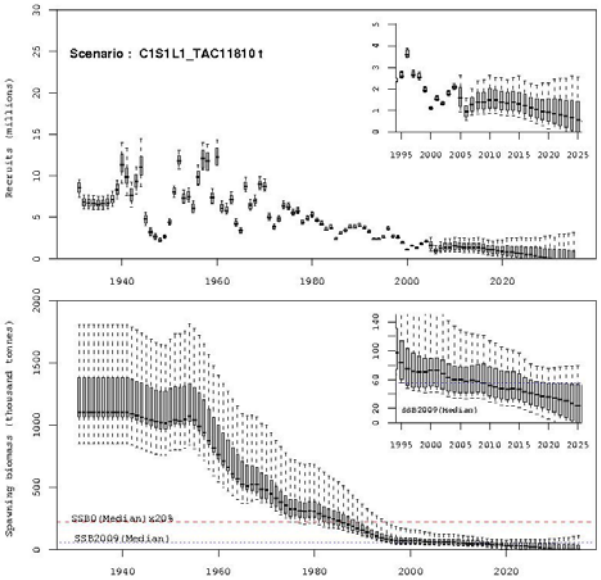
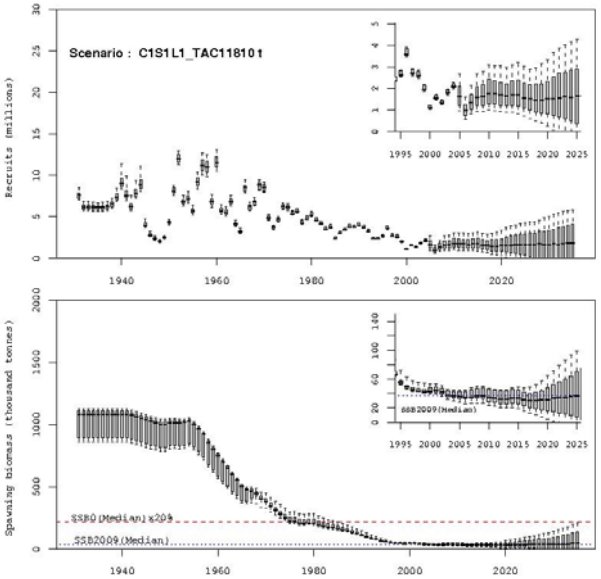
		Case 11-3 : Sample size change				Case 11-4 : LL1 selectivity change				Case 12-1 : Old CPUEs 1969-2008			
	Name	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep	C1S1L1sqrt_ h2m1M1O2C 2a1.rep	C1S1L1sqrt_ h2m1M2O2C 2a1.rep	C1S1L1sqrt_ h3m1M1O2C 2a1.rep	C1S1L1sqrt_ h3m1M2O2C 2a1.rep	C1S1L1sqrt_ h2m1M1O2C 6a1.rep	C1S1L1sqrt_ h2m1M2O2C 6a1.rep	C1S1L1sqrt_ h3m1M1O2C 6a1.rep	C1S1L1sqrt_ h3m1M2O2C 6a1.rep
Steepness	(0.385 or 0.55 or 0.73)	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73	0.55	0.55	0.73	0.73
M1	(0.3 or 0.35)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
M4	Estimate	0.20	0.18	0.23	0.20	0.20	0.18	0.23	0.20	0.19	0.17	0.22	0.20
M10	(0.07 or 0.10 or 0.14)	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10
M30	Estimate	0.45	0.42	0.42	0.37	0.45	0.42	0.42	0.37	0.45	0.42	0.42	0.38
	SSB0 (t)	1,389,960	1,107,160	1,101,520	873,215	1,383,970	1,103,140	1,101,460	872,614	1,415,460	1,129,130	1,113,700	883,415
	SSB 2009 (t)	82,269	70,289	47,214	49,212	80,436	69,225	46,607	48,829	96,990	84,506	56,350	57,620
	SSB 2009 / SSB0	5.9%	6.3%	4.3%	5.6%	5.8%	6.3%	4.2%	5.6%	6.9%	7.5%	5.1%	6.5%
	SSB 2009 / SSB2000	90.3%	96.0%	100.9%	103.1%	90.2%	96.0%	101.1%	103.2%	98.0%	104.2%	111.2%	113.0%
Rho	1931-Y	0.62	0.63	0.61	0.63	0.62	0.63	0.62	0.64	0.62	0.63	0.62	0.64
	1965-2003	0.39	0.42	0.41	0.49	0.38	0.42	0.40	0.48	0.38	0.42	0.41	0.48
SigmaR	Model SigR	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
	1931-Y	0.35	0.36	0.35	0.36	0.35	0.35	0.35	0.36	0.36	0.36	0.35	0.36
	1965-2003	0.27	0.28	0.27	0.29	0.26	0.27	0.27	0.28	0.27	0.28	0.27	0.29
CPUE	1969-Y	0.34	0.36	0.35	0.38	0.33	0.35	0.35	0.38	0.14	0.17	0.18	0.23
Autocorr.	1996-2006	0.70	0.70	0.72	0.69	0.67	0.67	0.69	0.66	-0.02	-0.01	0.00	0.02
Likelihood	Total	614.8	614.8	612.6	614.0	615.7	616.2	613.0	614.5	619.9	620.5	617.5	619.1
	LL1	146.0	146.1	146.5	147.1	146.7	146.9	147.1	147.9	149.9	150.2	150.4	151.1
	LL2	20.0	20.0	20.0	20.0	19.6	19.6	19.6	19.6	19.8	19.8	19.8	19.8
	LL3	108.3	108.5	106.9	107.3	108.2	108.4	106.7	107.1	108.3	108.6	106.9	107.2
	LL4	37.9	38.1	39.1	38.7	37.9	38.0	39.2	38.8	38.1	38.1	39.1	38.8
	IND	43.3	42.4	41.0	40.6	43.3	42.3	40.9	40.5	43.6	42.7	41.5	40.9
	SURF	41.0	40.8	41.0	40.9	41.0	40.9	41.1	41.0	41.0	40.9	41.1	41.0
	CPUE	-50.5	-50.2	-50.6	-49.9	-50.6	-50.3	-50.5	-49.8	-52.5	-52.2	-52.6	-51.8
	Tags	226.7	226.7	226.7	226.9	226.6	226.6	226.7	226.9	226.9	227.0	227.0	227.2
	Aerial	1.8	1.7	2.2	2.1	1.4	1.2	1.7	1.6	2.3	2.2	2.6	2.5
	Troll	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Priors	Sel.Ch	43.4	43.5	43.0	42.8	43.5	43.8	43.0	42.8	44.6	45.0	44.3	44.2
	Sel.sm	23.6	23.3	23.6	23.8	24.6	24.9	24.1	24.3	23.7	24.1	23.8	24.0
	Sg.R	-26.6	-26.1	-26.9	-26.2	-26.6	-26.3	-26.7	-26.1	-26.0	-25.7	-26.4	-25.8
	M(0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M(10)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Steepness	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref. Pts	msy	35,886	36,621	41,753	40,838	36,465	37,181	42,159	41,385	36,813	37,451	42,171	41,454
	S(msy)	470,995	378,537	296,920	237,605	465,602	374,152	292,590	234,412	477,903	384,231	296,532	237,689
	S(msy)/Bo	0.34	0.34	0.27	0.27	0.34	0.34	0.27	0.27	0.34	0.34	0.27	0.27

Table 3-9 (continued)

		Case 12-2 : old CPUEs 1969-2006			
	Name	C1S1L1sqrt_ h2m1M1O2C 6a1.rep	C1S1L1sqrt_ h2m1M2O2C 6a1.rep	C1S1L1sqrt_ h3m1M1O2C 6a1.rep	C1S1L1sqrt_ h3m1M2O2C 6a1.rep
Steepness	(0.385 or 0.55 or 0.73)	0.55	0.55	0.73	0.73
M1	(0.3 or 0.35)	0.30	0.30	0.30	0.30
M4	Estimate	0.19	0.17	0.22	0.20
M10	(0.07 or 0.10 or 0.14)	0.07	0.10	0.07	0.10
M30	Estimate	0.45	0.42	0.42	0.38
	SSB0 (t)	1,404,830	1,120,390	1,108,690	879,240
	SSB 2009 (t)	91,219	79,137	53,171	54,651
	SSB 2009 / SSB0	6.5%	7.1%	4.8%	6.2%
	SSB 2009 / SSB2000	94.6%	100.2%	106.1%	108.5%
Rho	1931-Y	0.62	0.63	0.62	0.64
	1965-2003	0.39	0.42	0.42	0.49
SigmaR	Model SigR	0.60	0.60	0.60	0.60
	1931-Y	0.35	0.36	0.35	0.36
	1965-2003	0.27	0.28	0.27	0.29
CPUE	1969-Y	0.17	0.20	0.20	0.24
Autocorr.	1996-2006	-0.03	-0.03	-0.06	-0.04
Likelihood	Total	617.3	617.6	614.9	616.5
	LL1	149.5	149.6	149.9	150.6
	LL2	19.8	19.8	19.8	19.8
	LL3	108.3	108.5	106.8	107.2
	LL4	38.0	38.1	39.1	38.8
	IND	43.5	42.6	41.5	40.9
	SURF	41.0	40.8	41.1	40.9
	CPUE	-54.7	-54.3	-54.5	-53.8
	Tags	226.8	226.8	226.9	227.1
	Aerial	1.9	1.8	2.3	2.1
	Troll	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0
Priors	Sel.Ch	45.3	45.5	44.8	44.6
	Sel.sm	24.3	24.1	23.8	24.0
	Sg.R	-26.3	-25.8	-26.4	-25.8
	M(0)	0.0	0.0	0.0	0.0
	M(10)	0.0	0.0	0.0	0.0
	Steepness	0.0	0.0	0.0	0.0
Ref. Pts	msy	36,561	37,244	0	41,298
	S(msy)	473,647	380,778	0	236,147
	S(msy)/Bo	0.34	0.34	0.00	0.27

[Base Case]

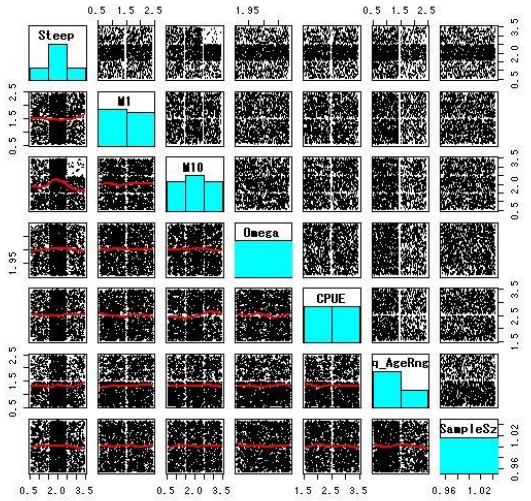
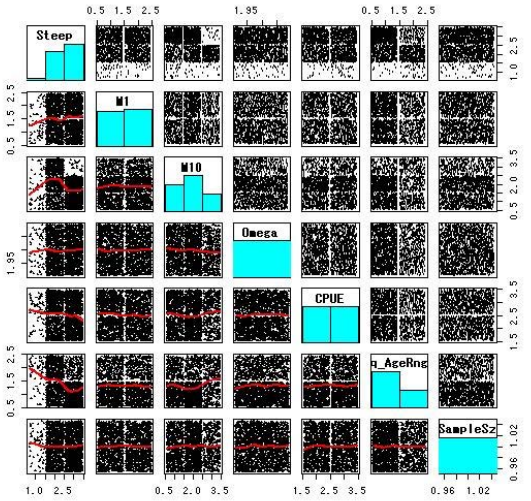
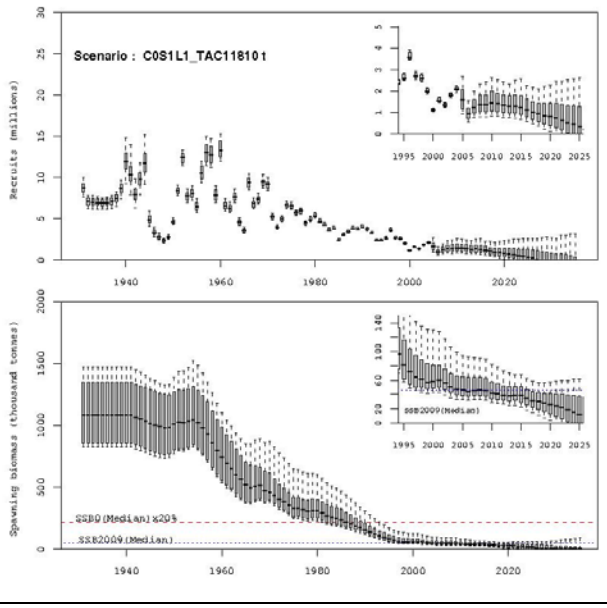
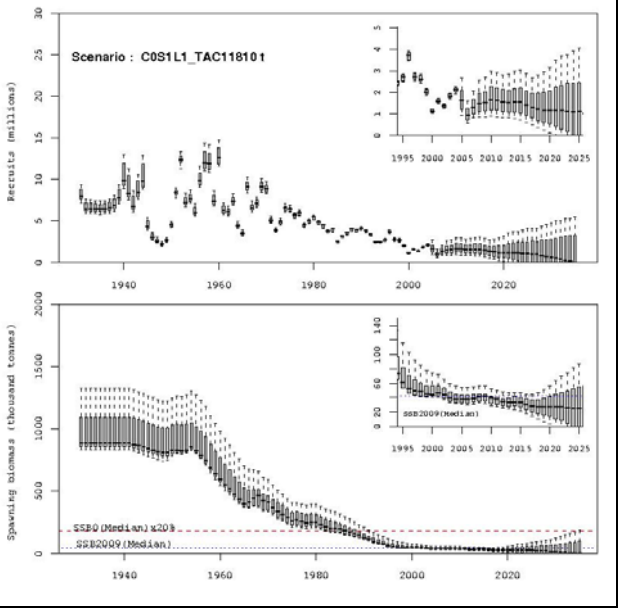
- Scenario: C1S1L1 (Effect of overcatch on CPUE: *S*=25%)

default	Likelihood-weighted steepness
	
	

C1S1L1	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1101860	(849178, 1807940)						1085450	(859146, 1127270)					
B2009 (t)	55353	(32520, 121195)						36741	(26246, 50223)					
B2009/B0	0.049	(0.033, 0.070)						0.037	(0.027, 0.056)					
B2009/B1980	0.182	(0.120, 0.243)						0.176	(0.110, 0.236)					
B2009/B2000	0.837	(0.665, 0.960)						0.885	(0.652, 1.034)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.112	0.909	0.853	0.804	(0.618, 0.964)	0.748	0.692	1.454	1.136	1.040	0.944	(0.641, 1.118)	0.846	0.748
B2014/B2009	1.137	0.932	0.88	0.827	(0.703, 0.917)	0.775	0.714	1.357	1.057	0.973	0.887	(0.718, 0.977)	0.799	0.710
B2022/B2004	2.277	1.047	0.737	0.460	(0.000, 1.216)	0.197	0.001	4.003	1.904	1.397	0.887	(0.001, 1.946)	0.400	0.001
B2022/B2009	2.348	1.063	0.761	0.474	(0.000, 1.147)	0.203	0.001	3.770	1.803	1.305	0.832	(0.001, 1.773)	0.380	0.001

[Case 1-1]

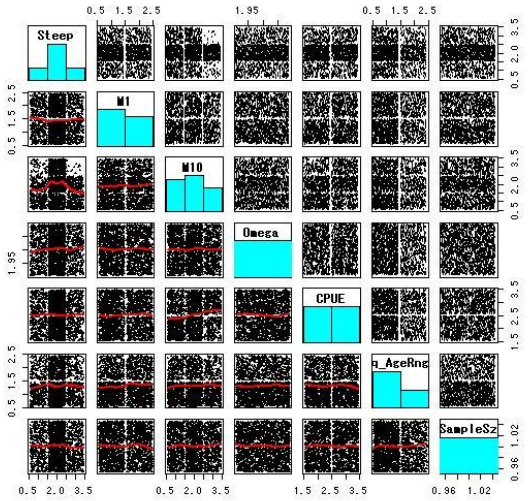
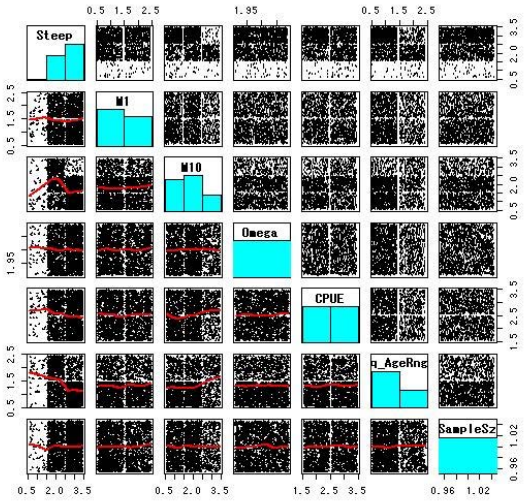
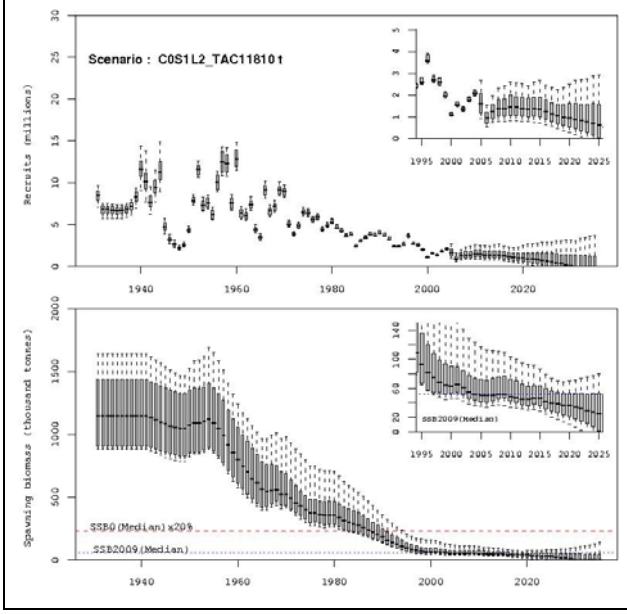
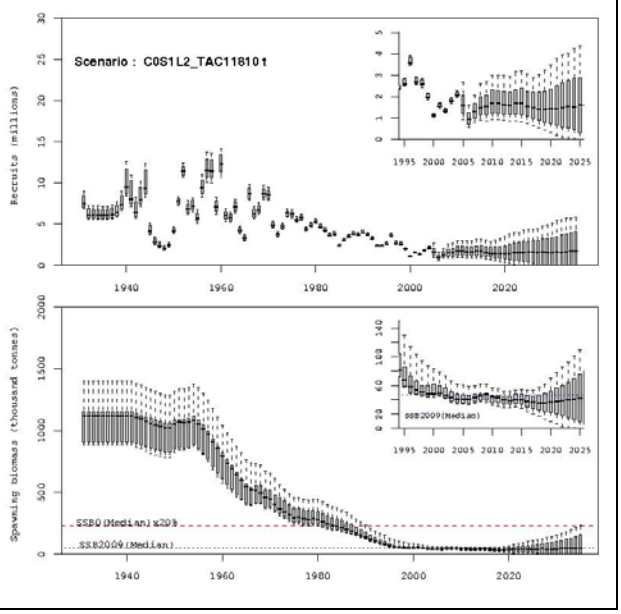
- Scenario: C0S1L1 (Effect of overcatch on CPUE: *S*=0%)

default	Likelihood-weighted steepness
	
	

C0S1L1	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1080820	(824943, 1473600)						886468	(834979, 1326280)					
B2009 (t)	45525	(31913, 89184)						42220	(31795, 56346)					
B2009/B0	0.050	(0.033, 0.065)						0.041	(0.031, 0.054)					
B2009/B1980	0.163	(0.103, 0.215)						0.163	(0.103, 0.218)					
B2009/B2000	0.800	(0.651, 0.938)						0.837	(0.661, 0.998)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.148	0.911	0.842	0.785	(0.615, 0.955)	0.719	0.649	1.345	1.020	0.954	0.882	(0.620, 1.086)	0.790	0.694
B2014/B2009	1.165	0.928	0.868	0.806	(0.701, 0.907)	0.742	0.671	1.320	1.012	0.932	0.849	(0.698, 0.956)	0.766	0.677
B2022/B2004	2.410	1.033	0.693	0.374	(0.000, 1.217)	0.070	0.000	3.464	1.561	1.089	0.630	(0.000, 1.884)	0.209	0.000
B2022/B2009	2.463	1.049	0.709	0.382	(0.000, 1.151)	0.073	0.000	3.284	1.509	1.058	0.612	(0.000, 1.684)	0.203	0.000

[Case 1-2]

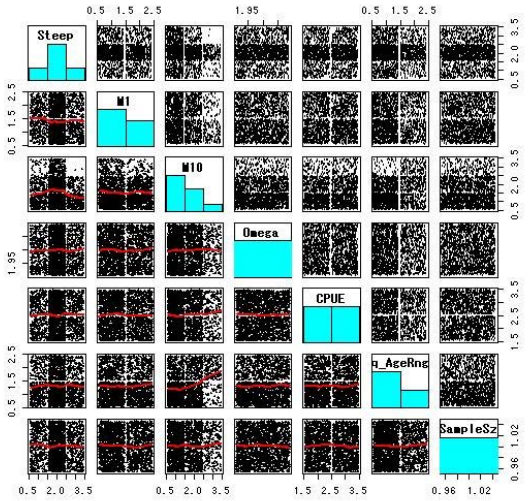
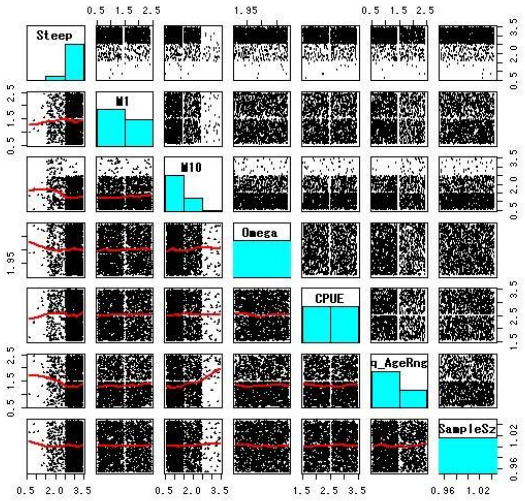
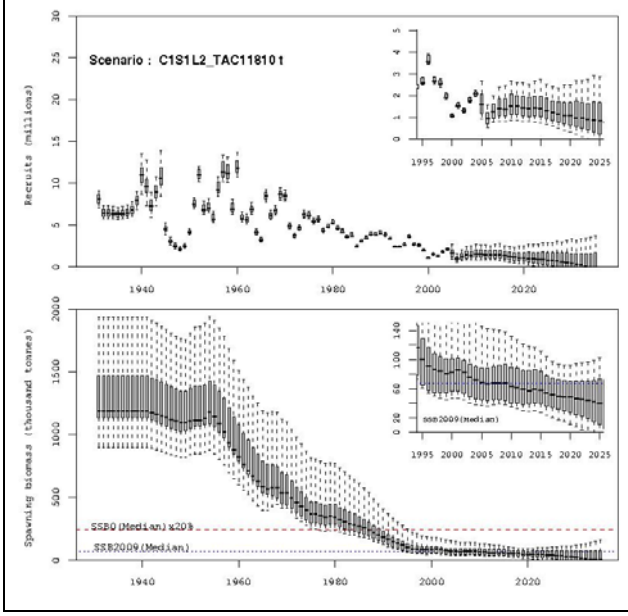
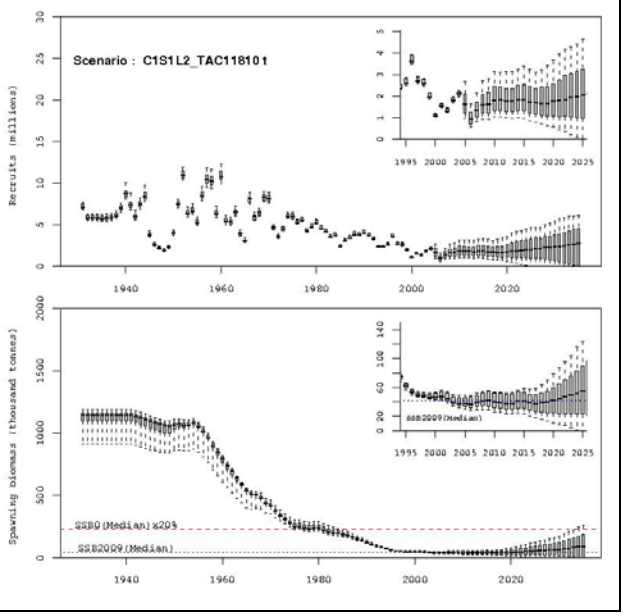
- Scenario: C0S1L2 (Effect of overcatch on CPUE: *S*=0%, and LL1 scenario based on Case 2 of JMR)

default	Likelihood-weighted steepness
	
	

C0S1L2	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1146600	(880698, 1643650)						1122950	(880698, 1398930)					
B2009 (t)	52015	(36059, 109335)						47230	(35866, 61781)					
B2009/B0	0.052	(0.036, 0.064)						0.043	(0.033, 0.055)					
B2009/B1980	0.150	(0.104, 0.191)						0.161	(0.104, 0.211)					
B2009/B2000	0.816	(0.669, 0.935)						0.860	(0.677, 1.030)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.192	0.971	0.907	0.842	(0.687, 1.051)	0.786	0.724	1.438	1.126	1.043	0.965	(0.697, 1.197)	0.893	0.802
B2014/B2009	1.177	0.964	0.909	0.853	(0.761, 0.960)	0.797	0.736	1.342	1.076	0.994	0.915	(0.765, 1.019)	0.835	0.755
B2022/B2004	2.447	1.143	0.809	0.499	(0.039, 1.409)	0.209	0.000	3.739	1.806	1.340	0.883	(0.048, 2.151)	0.464	0.045
B2022/B2009	2.452	1.144	0.822	0.502	(0.043, 1.308)	0.214	0.000	3.367	1.683	1.251	0.825	(0.051, 1.898)	0.431	0.044

[Case 1-3]

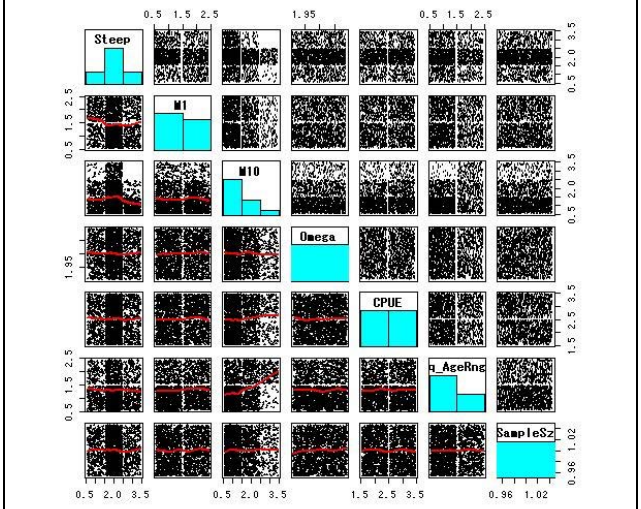
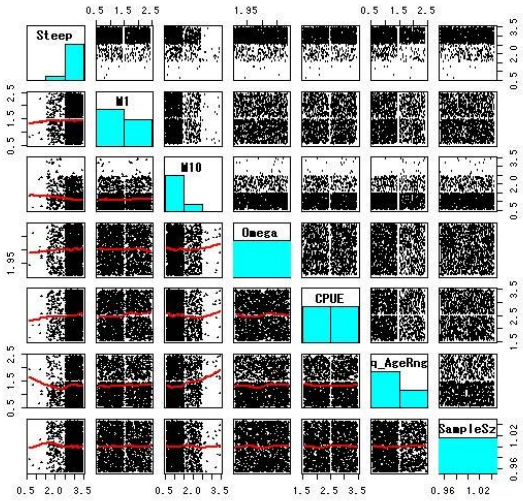
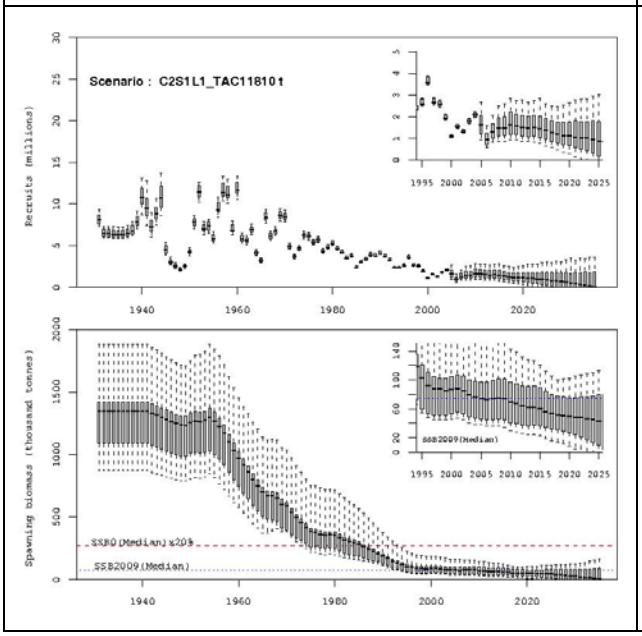
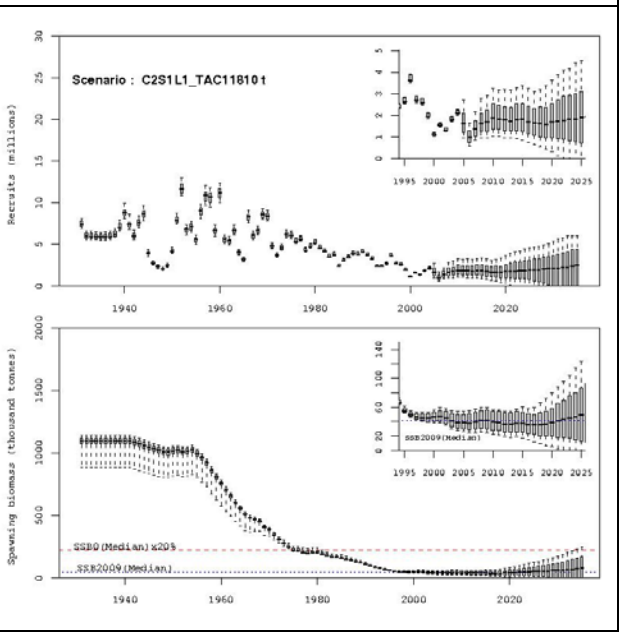
- Scenario: C1S1L2 (Effect of overcatch on CPUE: *S*=25%, and LL1 scenario based on Case 2 of JMR)

default	Likelihood-weighted steepness
	
	

C1S1L2	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1189540	(897088, 1936970)						1143020	(913711, 1189540)					
B2009 (t)	67476	(38802, 138951)						41721	(28666, 55605)					
B2009/B0	0.051	(0.036, 0.075)						0.037	(0.029, 0.054)					
B2009/B1980	0.181	(0.117, 0.243)						0.178	(0.110, 0.239)					
B2009/B2000	0.806	(0.688, 0.976)						0.912	(0.674, 1.056)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.131	0.951	0.9	0.852	(0.684, 1.049)	0.805	0.753	1.491	1.211	1.124	1.033	(0.745, 1.188)	0.942	0.851
B2014/B2009	1.142	0.964	0.914	0.869	(0.761, 0.960)	0.821	0.771	1.385	1.100	1.023	0.945	(0.807, 1.021)	0.865	0.785
B2022/B2004	2.272	1.125	0.837	0.571	(0.069, 1.358)	0.321	0.084	4.097	2.104	1.607	1.122	(0.192, 2.161)	0.649	0.197
B2022/B2009	2.311	1.134	0.850	0.578	(0.078, 1.271)	0.331	0.085	3.829	1.930	1.478	1.030	(0.199, 1.928)	0.594	0.185

[Case 1-4]

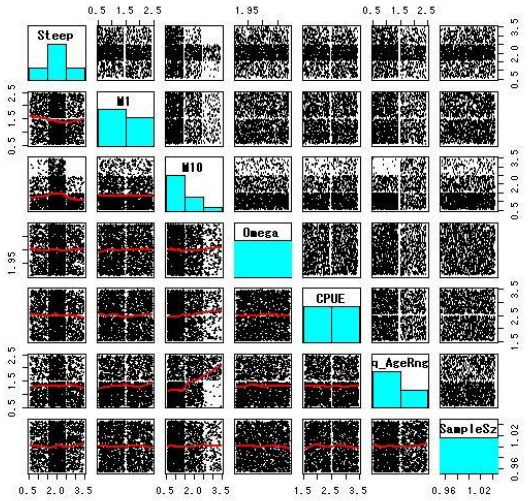
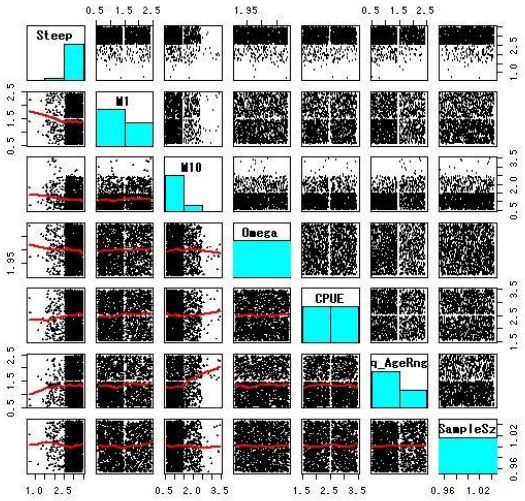
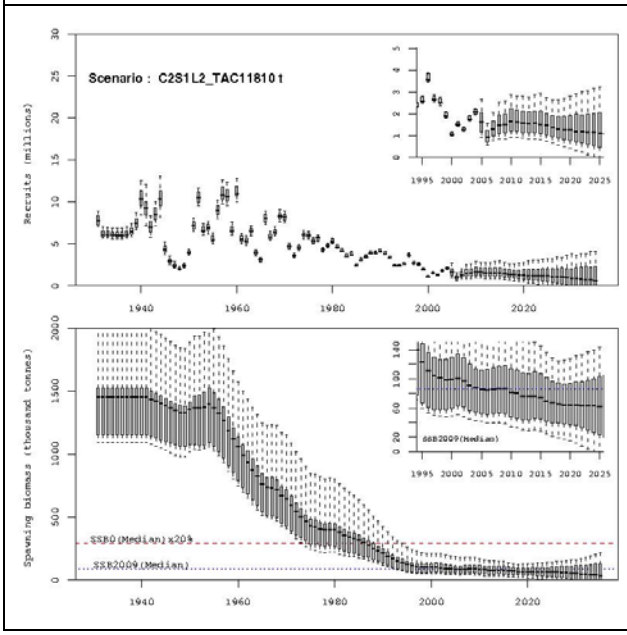
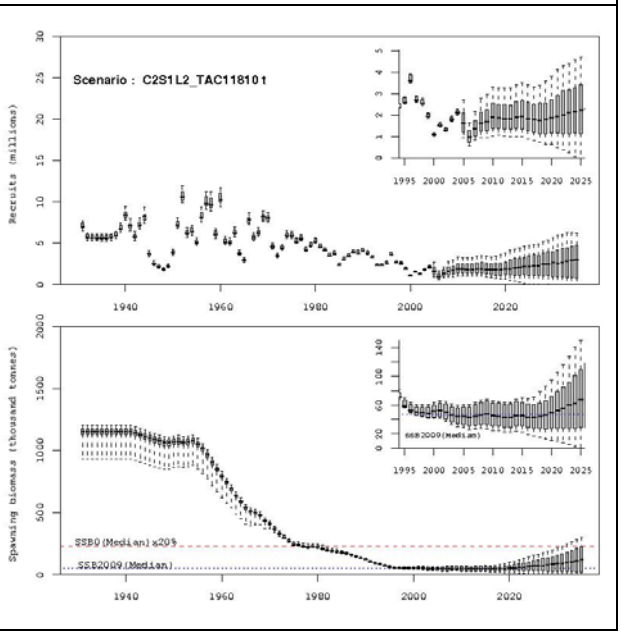
- Scenario: C2S1L1 (Effect of overcatch on CPUE: *S*=50%)

default	Likelihood-weighted steepness
	
	

C2S1L1	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1346150	(868468, 1882820)						1095710	(880594, 1139500)					
B2009 (t)	74330	(34378, 151106)						42005	(24470, 59239)					
B2009/B0	0.056	(0.036, 0.084)						0.038	(0.023, 0.056)					
B2009/B1980	0.211	(0.137, 0.286)						0.211	(0.108, 0.290)					
B2009/B2000	0.852	(0.686, 0.991)						0.929	(0.644, 1.077)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.08	0.909	0.869	0.827	(0.633, 0.974)	0.78	0.735	1.424	1.120	1.035	0.950	(0.645, 1.108)	0.871	0.784
B2014/B2009	1.094	0.933	0.888	0.846	(0.717, 0.921)	0.804	0.756	1.341	1.049	0.973	0.897	(0.728, 0.975)	0.820	0.742
B2022/B2004	2.148	1.076	0.800	0.561	(0.002, 1.260)	0.338	0.119	3.835	1.880	1.413	0.956	(0.002, 1.985)	0.535	0.130
B2022/B2009	2.204	1.086	0.817	0.569	(0.003, 1.205)	0.348	0.119	3.707	1.792	1.330	0.905	(0.002, 1.823)	0.503	0.119

[Case 1-5]

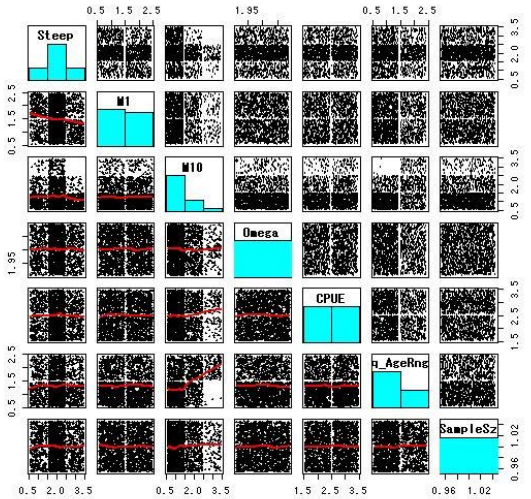
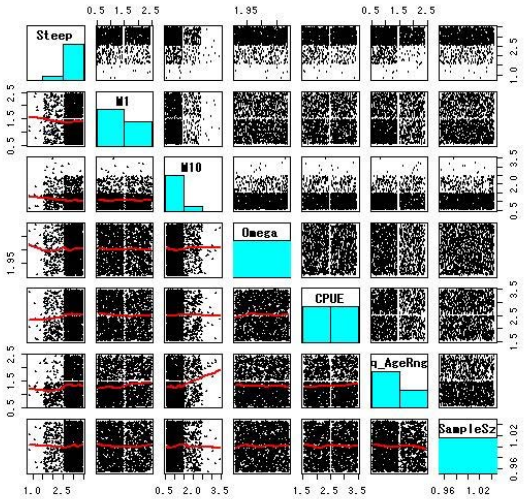
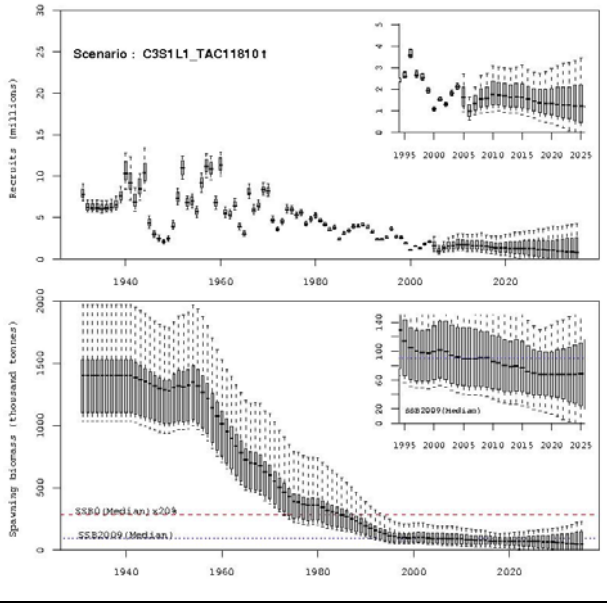
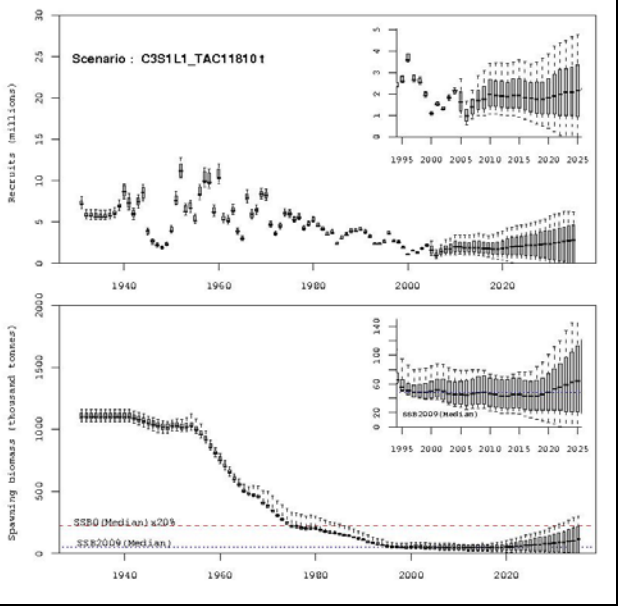
- Scenario: C2S1L2 (Effect of overcatch on CPUE: *S*=50%, and LL1 scenario based on Case 2 of JMR)

default	Likelihood-weighted steepness
	
	

C2S1L2	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1453970	(1093840, 2027350)						1151440	(932488, 1205280)					
B2009 (t)	86400	(38060, 176356)						46839	(27028, 68423)					
B2009/B0	0.062	(0.037, 0.091)						0.041	(0.024, 0.057)					
B2009/B1980	0.220	(0.141, 0.296)						0.221	(0.111, 0.301)					
B2009/B2000	0.868	(0.708, 1.004)						0.951	(0.664, 1.094)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.089	0.941	0.899	0.865	(0.694, 1.040)	0.827	0.785	1.451	1.180	1.106	1.029	(0.741, 1.157)	0.947	0.871
B2014/B2009	1.089	0.954	0.913	0.875	(0.773, 0.956)	0.839	0.8	1.347	1.086	1.017	0.946	(0.810, 1.012)	0.878	0.807
B2022/B2004	2.124	1.131	0.880	0.649	(0.148, 1.364)	0.438	0.244	3.880	2.033	1.585	1.154	(0.219, 2.154)	0.737	0.349
B2022/B2009	2.159	1.139	0.893	0.654	(0.160, 1.280)	0.442	0.246	3.671	1.898	1.471	1.066	(0.225, 1.944)	0.686	0.323

[Case 1-6]

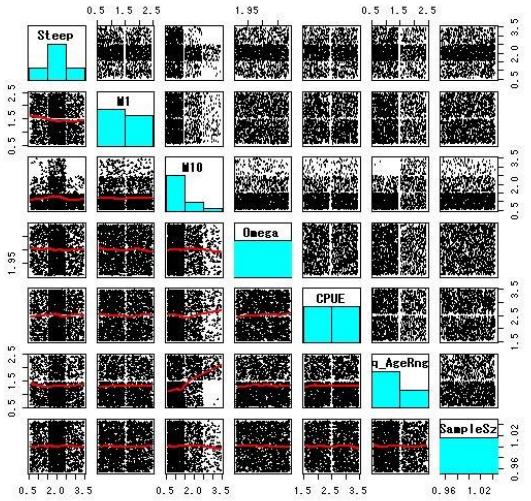
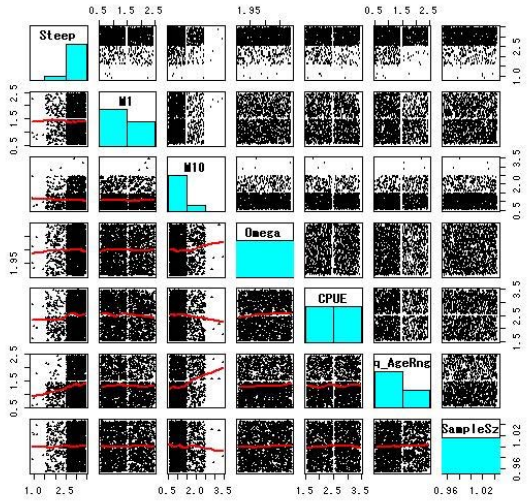
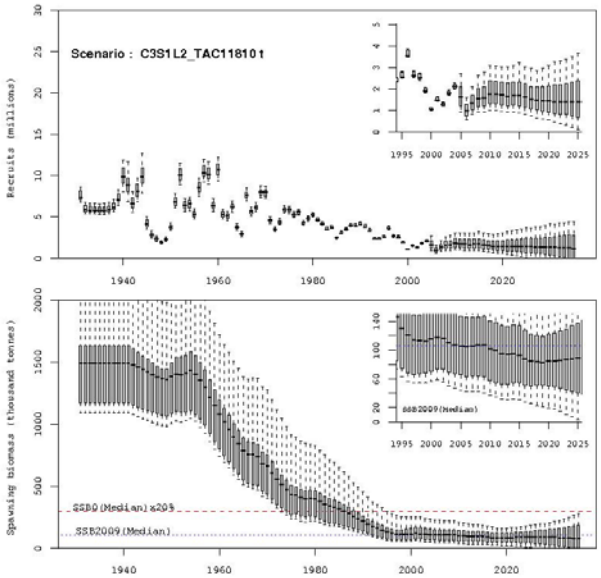
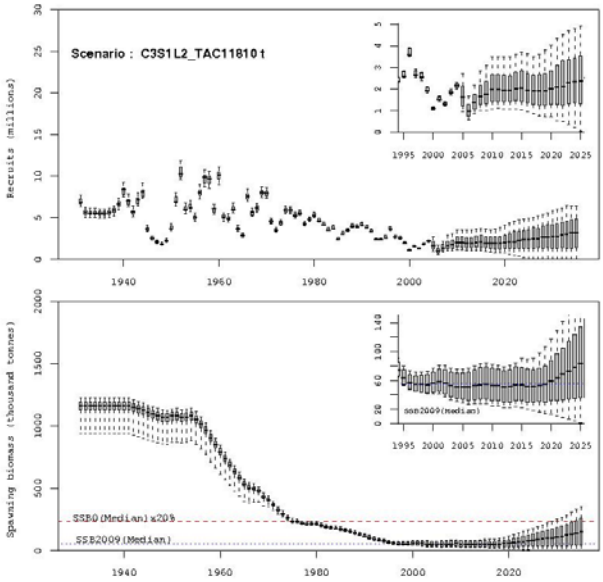
- Scenario: C3S1L1 (Effect of overcatch on CPUE: *S*=75%)

default	Likelihood-weighted steepness
	
	

C3S1L1	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1401470	(1037380, 1974610)						1102470	(1063050, 1159880)					
B2009 (t)	90837	(36996, 187222)						48326	(24963, 78692)					
B2009/B0	0.068	(0.035, 0.099)						0.044	(0.023, 0.068)					
B2009/B1980	0.256	(0.156, 0.350)						0.256	(0.118, 0.354)					
B2009/B2000	0.910	(0.706, 1.029)						0.970	(0.655, 1.115)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.054	0.914	0.884	0.851	(0.654, 0.982)	0.813	0.775	1.360	1.098	1.028	0.953	(0.654, 1.088)	0.893	0.823
B2014/B2009	1.052	0.931	0.891	0.859	(0.736, 0.923)	0.825	0.788	1.288	1.035	0.968	0.903	(0.739, 0.970)	0.842	0.778
B2022/B2004	2.014	1.089	0.848	0.643	(0.116, 1.310)	0.455	0.275	3.585	1.811	1.392	1.003	(0.040, 1.998)	0.642	0.337
B2022/B2009	2.052	1.095	0.862	0.648	(0.129, 1.246)	0.457	0.274	3.457	1.734	1.325	0.952	(0.045, 1.831)	0.607	0.314

[Case 1-7]

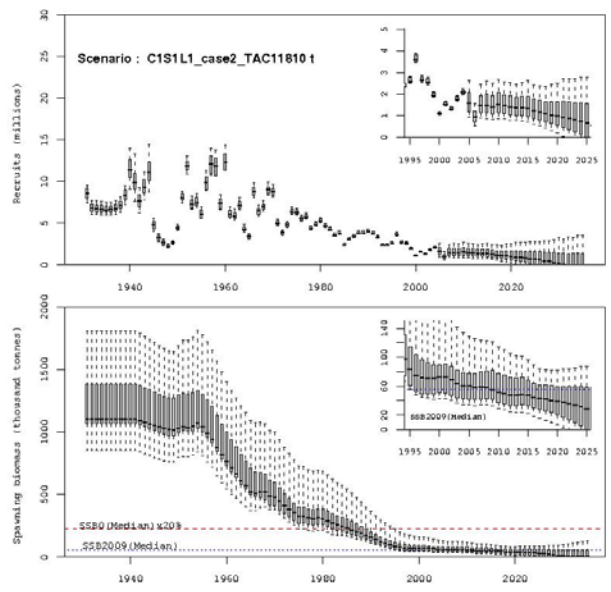
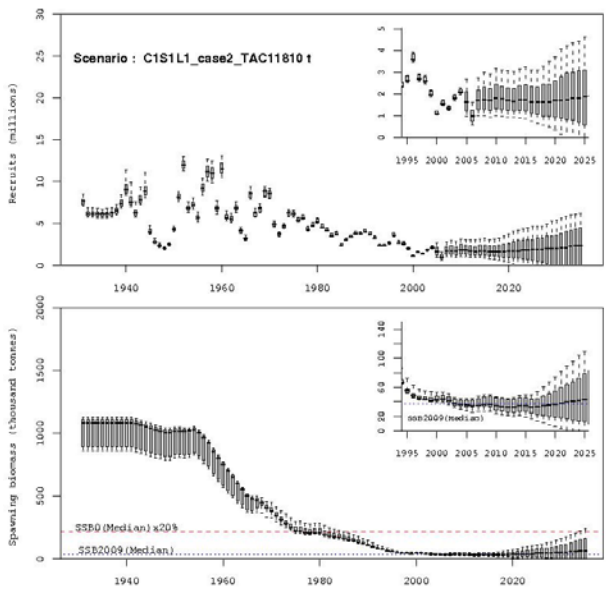
- Scenario: C3S1L2 (Effect of overcatch on CPUE: *S*=75%, and LL1 scenario based on Case 2 of JMR)

default	Likelihood-weighted steepness
	
	

C3S1L2	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1492710	(1093220, 2188470)						1161030	(939569, 1225390)					
B2009 (t)	106763	(40803, 220949)						55026	(27228, 84503)					
B2009/B0	0.075	(0.040, 0.103)						0.047	(0.024, 0.075)					
B2009/B1980	0.271	(0.163, 0.349)						0.269	(0.124, 0.362)					
B2009/B2000	0.924	(0.736, 1.029)						0.983	(0.669, 1.112)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.054	0.934	0.901	0.873	(0.713, 1.025)	0.844	0.81	1.359	1.135	1.069	1.002	(0.744, 1.112)	0.937	0.881
B2014/B2009	1.048	0.945	0.913	0.88	(0.788, 0.951)	0.85	0.82	1.277	1.062	1.002	0.939	(0.819, 0.997)	0.883	0.825
B2022/B2004	1.986	1.136	0.911	0.705	(0.245, 1.370)	0.522	0.356	3.586	1.906	1.501	1.136	(0.256, 2.069)	0.788	0.469
B2022/B2009	2.012	1.137	0.920	0.716	(0.268, 1.305)	0.527	0.362	3.429	1.809	1.428	1.071	(0.278, 1.904)	0.743	0.443

[Case 2]

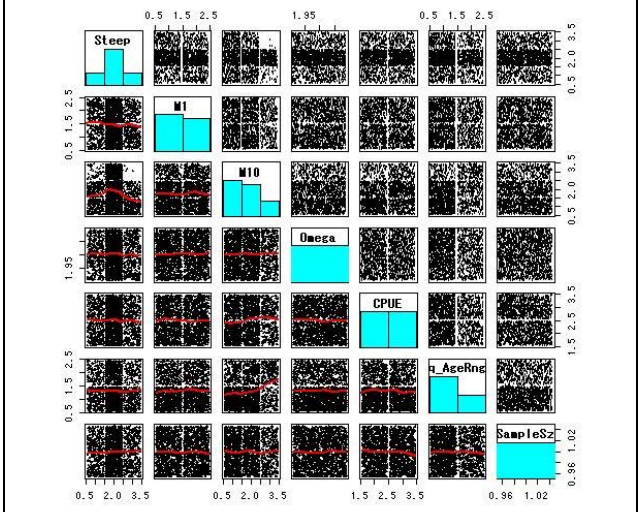
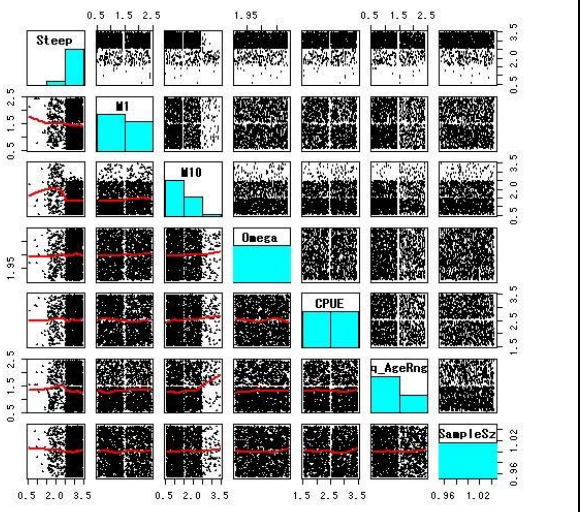
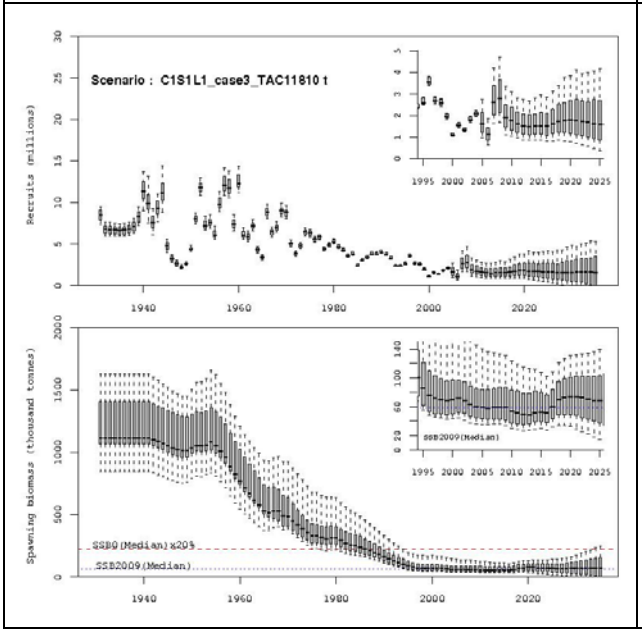
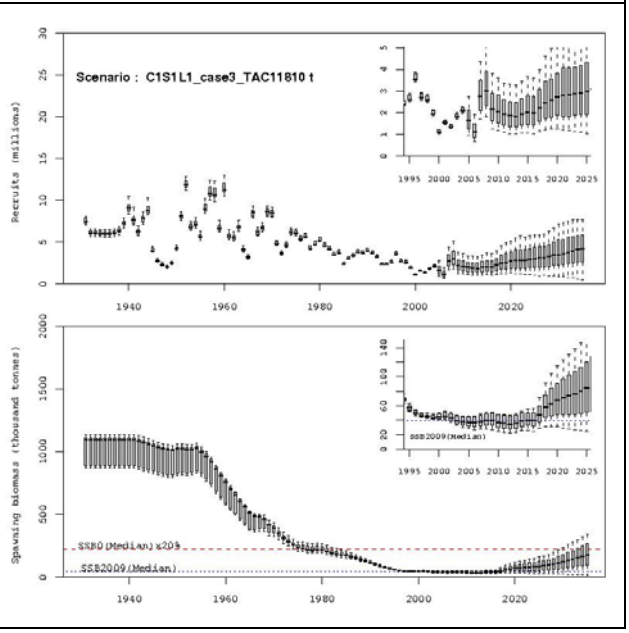
- Scenario: C1S1L1
- Projected recruitment deviates uncorrelated to historical estimates from conditioning.

default	Likelihood-weighted steepness
same as base case	same as base case
	

Case2	Default							Likelihood-weighted steepness						
	Median	(P10, P90)						Median	(P10, P90)					
B0 (t)	1101860	(849178, 1807940)						1085450	(859146, 1127270)					
B2009 (t)	55353	(32520, 121195)						36741	(26246, 50223)					
B2009/B0	0.049	(0.033, 0.070)						0.037	(0.027, 0.056)					
B2009/B1980	0.182	(0.120, 0.243)						0.176	(0.110, 0.236)					
B2009/B2000	0.837	(0.665, 0.960)						0.885	(0.652, 1.034)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.112	0.913	0.857	0.809	(0.624, 0.978)	0.757	0.701	1.456	1.148	1.056	0.961	(0.652, 1.137)	0.867	0.772
B2014/B2009	1.137	0.938	0.886	0.834	(0.711, 0.928)	0.784	0.726	1.358	1.068	0.988	0.904	(0.733, 0.992)	0.818	0.732
B2022/B2004	2.329	1.100	0.792	0.511	(0.000, 1.357)	0.243	0.001	4.167	2.066	1.556	1.040	(0.004, 2.205)	0.532	0.064
B2022/B2009	2.409	1.123	0.808	0.526	(0.000, 1.270)	0.251	0.002	3.937	1.957	1.465	0.966	(0.004, 2.002)	0.509	0.064

[Case 3]

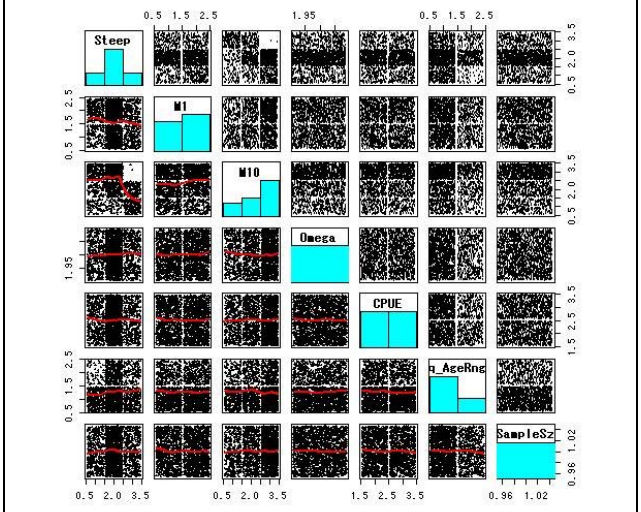
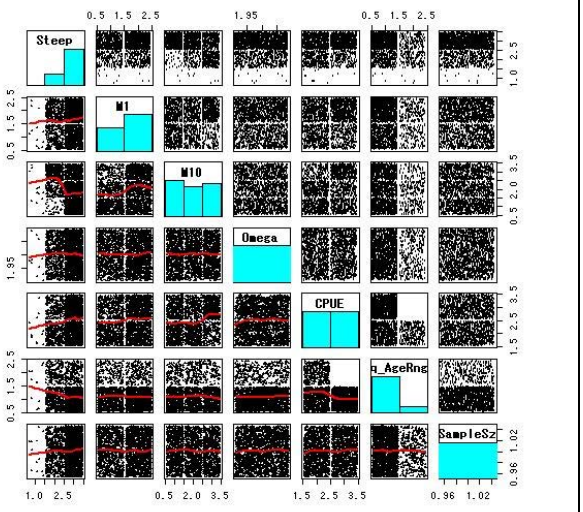
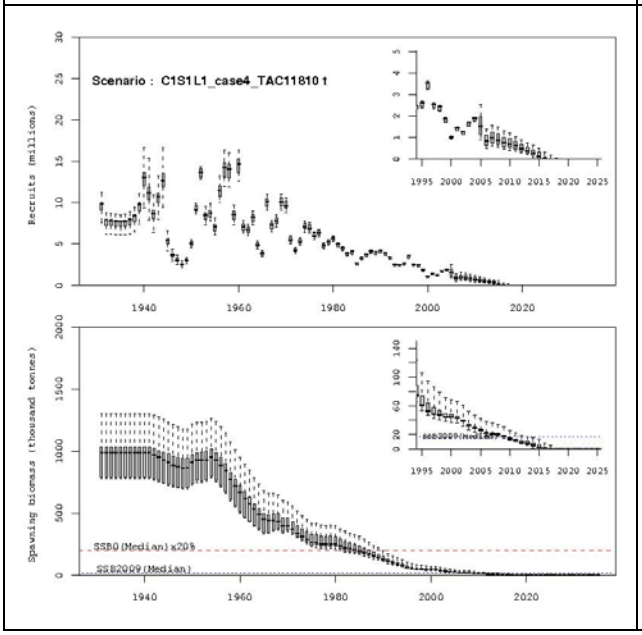
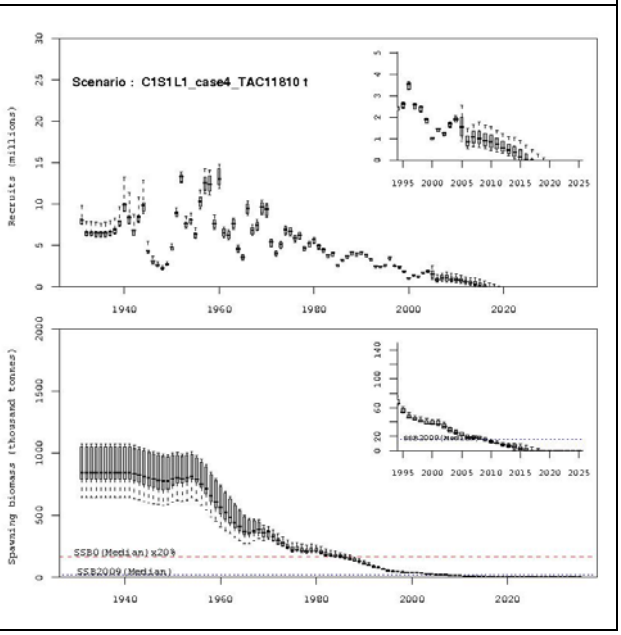
- Scenario: C1S1L1
- Include troll survey data.

default	Likelihood-weighted steepness
	
	

Case3	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1115350	(846689, 1630570)						1093750	(868128, 1138030)					
B2009 (t)	58747	(34157, 131379)						39727	(26980, 51184)					
B2009/B0	0.053	(0.034, 0.074)						0.041	(0.029, 0.057)					
B2009/B1980	0.190	(0.123, 0.246)						0.179	(0.111, 0.246)					
B2009/B2000	0.845	(0.681, 0.955)						0.892	(0.667, 1.033)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.093	0.938	0.892	0.848	(0.706, 1.043)	0.807	0.764	1.435	1.186	1.112	1.034	(0.782, 1.176)	0.957	0.881
B2014/B2009	1.126	0.965	0.921	0.88	(0.799, 0.982)	0.837	0.795	1.356	1.112	1.043	0.973	(0.853, 1.046)	0.902	0.833
B2022/B2004	2.789	1.616	1.310	1.013	(0.442, 2.170)	0.720	0.446	4.933	2.893	2.398	1.883	(0.789, 3.234)	1.380	0.879
B2022/B2009	2.896	1.657	1.353	1.046	(0.482, 2.089)	0.750	0.463	4.707	2.755	2.275	1.785	(0.793, 3.055)	1.304	0.834

[Case 4]

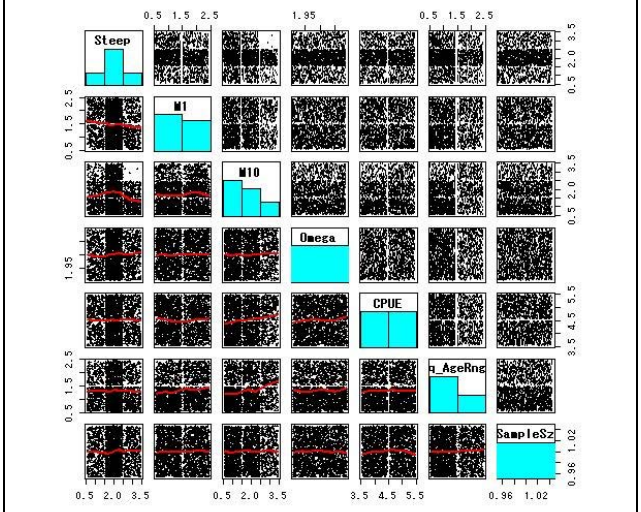
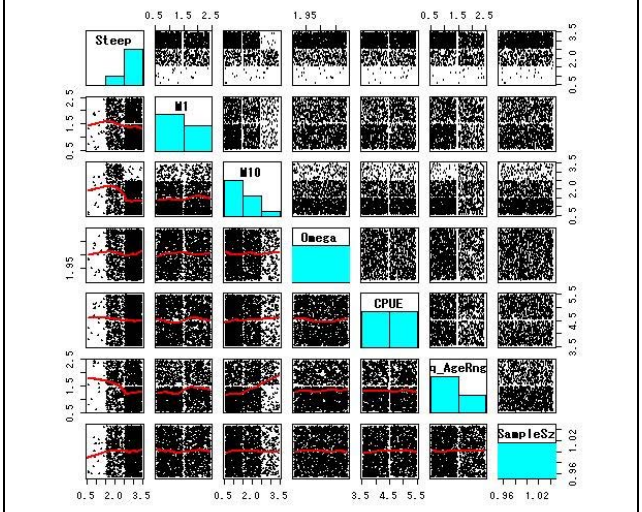
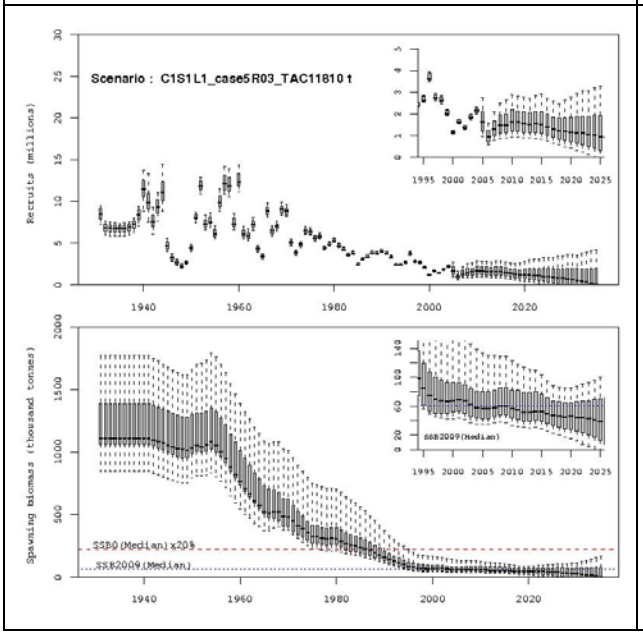
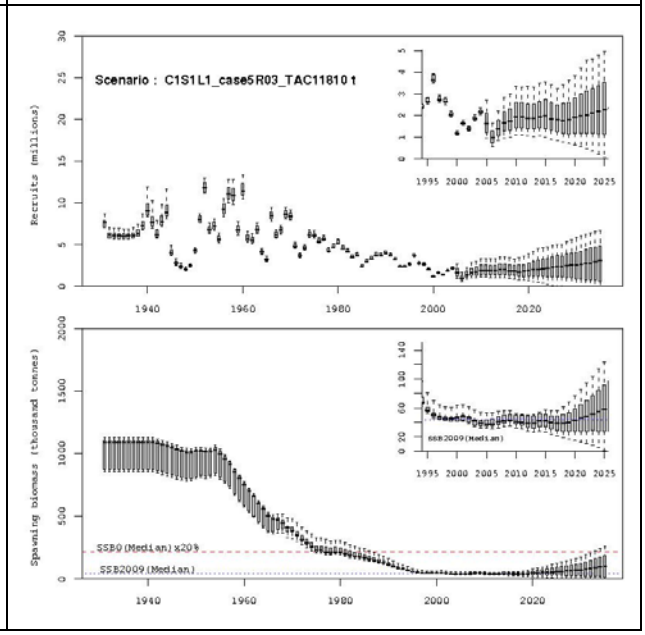
- Scenario: C1S1L1
- Truncate CPUE series in 1992.

default	Likelihood-weighted steepness
	
	

Case4	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	991036	(778360, 1304077)						844375	(640787, 1071870)					
B2009 (t)	17242	(14929, 30486)						15811	(13737, 18419)					
B2009/B0	0.021	(0.014, 0.030)						0.018	(0.013, 0.029)					
B2009/B1980	0.071	(0.061, 0.084)						0.071	(0.064, 0.086)					
B2009/B2000	0.401	(0.382, 0.450)						0.401	(0.379, 0.440)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	0.775	0.423	0.32	0.206	(0.045, 0.360)	0.081	0.003	0.942	0.475	0.348	0.218	(0.042, 0.383)	0.082	0.003
B2014/B2009	1.286	0.69	0.52	0.338	(0.077, 0.561)	0.133	0.004	1.532	0.769	0.568	0.358	(0.068, 0.593)	0.131	0.004
B2022/B2004	1.835	0.000	0.000	0.000	(0.000, 0.000)	0.000	0.000	2.909	0.088	0.000	0.000	(0.000, 0.000)	0.000	0.000
B2022/B2009	3.025	0.000	0.000	0.000	(0.000, 0.000)	0.000	0.000	4.659	0.142	0.000	0.000	(0.000, 0.000)	0.000	0.000

[Case 5-1]

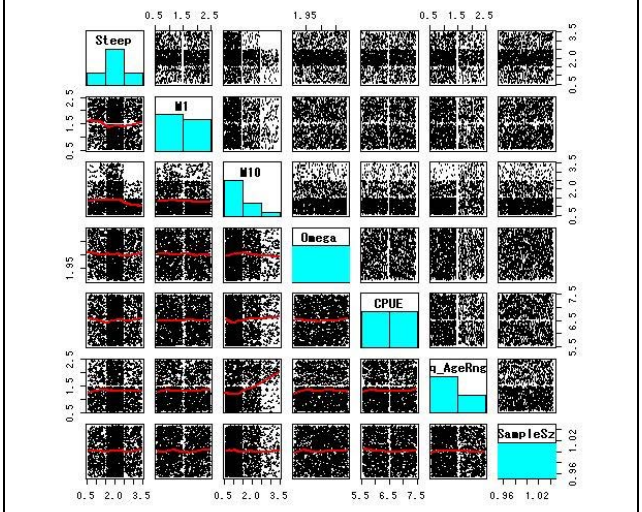
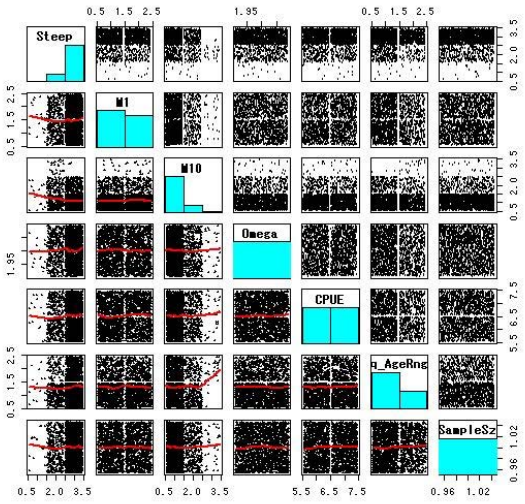
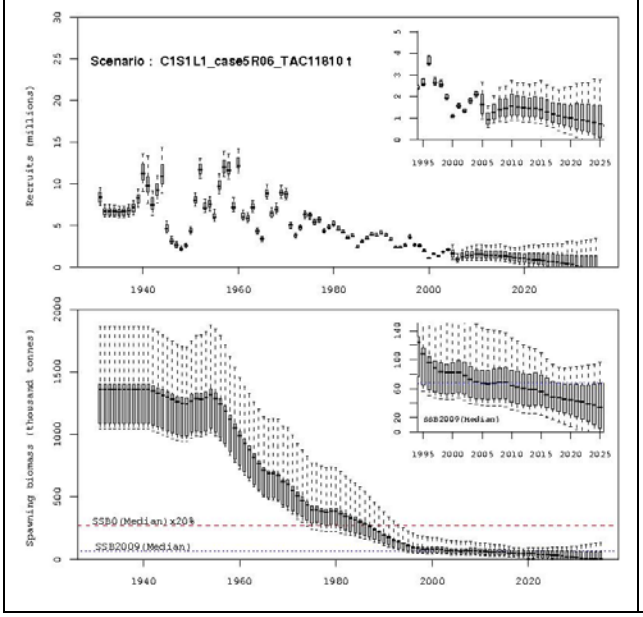
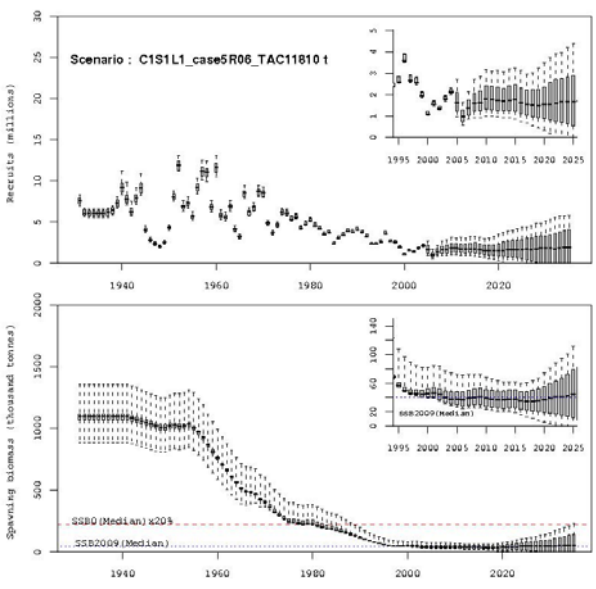
- Scenario: C1S1L1
- Substitute alternative CPUE series Run 03.

default	Likelihood-weighted steepness
	
	

Case5R03	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1108570	(843701, 1768970)						1091710	(855106, 1130760)					
B2009 (t)	60322	(37448, 128619)						43626	(34569, 56539)					
B2009/B0	0.053	(0.038, 0.076)						0.046	(0.032, 0.061)					
B2009/B1980	0.197	(0.134, 0.253)						0.195	(0.126, 0.253)					
B2009/B2000	0.866	(0.748, 1.001)						0.982	(0.749, 1.108)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.197	1.008	0.951	0.889	(0.730, 1.128)	0.836	0.781	1.572	1.279	1.192	1.099	(0.786, 1.246)	0.999	0.903
B2014/B2009	1.158	0.969	0.917	0.868	(0.770, 0.966)	0.818	0.768	1.374	1.102	1.026	0.948	(0.799, 1.028)	0.871	0.791
B2022/B2004	2.392	1.206	0.907	0.615	(0.148, 1.509)	0.356	0.102	4.195	2.188	1.679	1.206	(0.258, 2.338)	0.737	0.288
B2022/B2009	2.342	1.174	0.888	0.604	(0.154, 1.344)	0.349	0.099	3.595	1.917	1.484	1.065	(0.253, 1.991)	0.650	0.254

[Case 5-2]

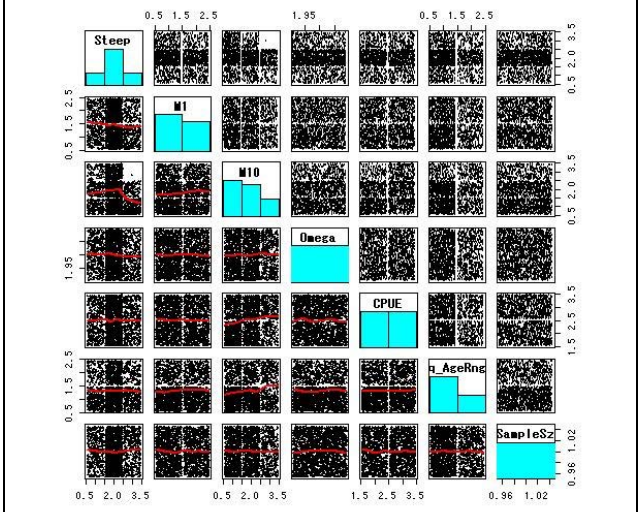
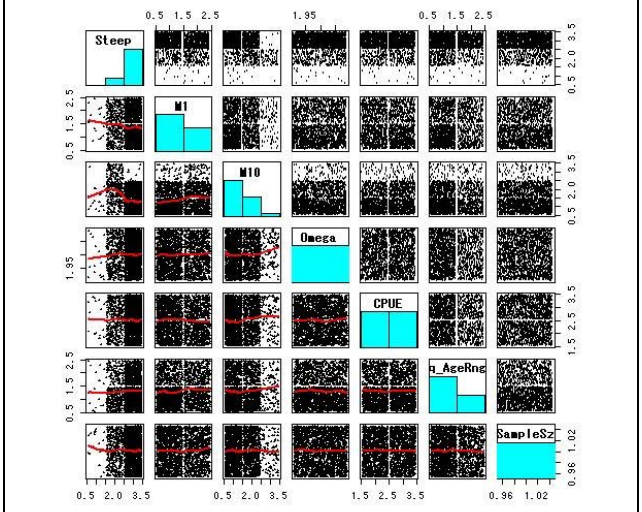
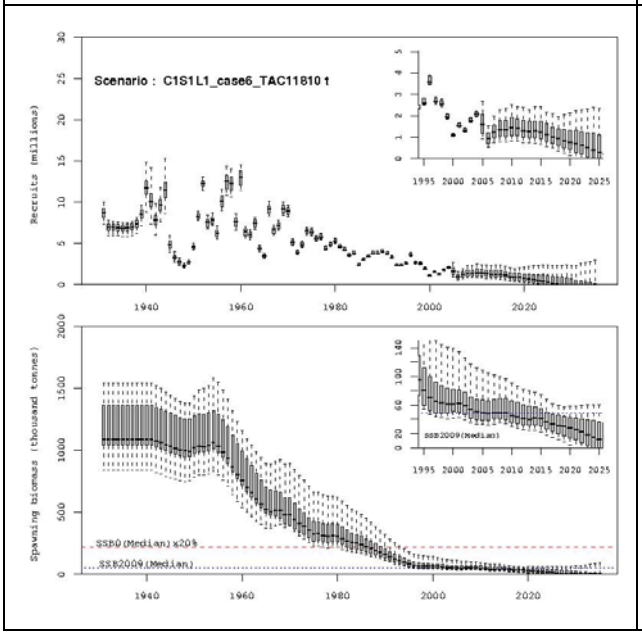
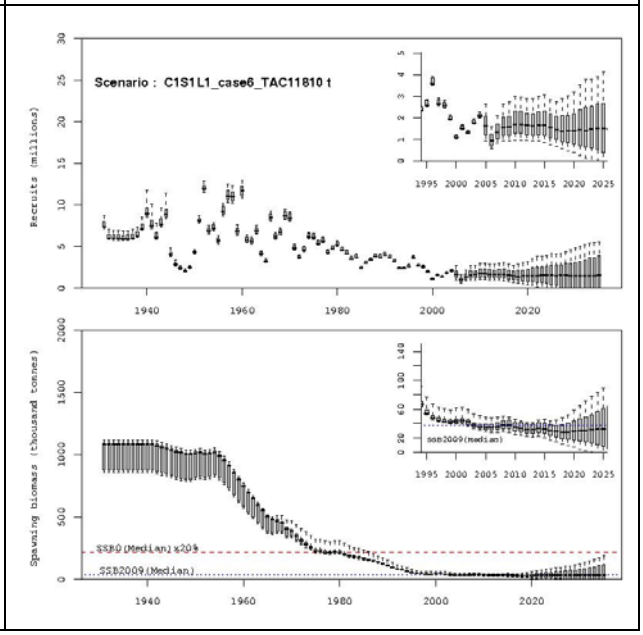
- Scenario: C1S1L1
- Substitute alternative CPUE series Run 06.

default	Likelihood-weighted steepness
	
	

Case5R06	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1360700	(1040630, 1865740)						1092440	(884176, 1360700)					
B2009 (t)	68437	(34911, 137770)						40717	(25499, 72464)					
B2009/B0	0.052	(0.034, 0.078)						0.037	(0.024, 0.062)					
B2009/B1980	0.182	(0.120, 0.237)						0.182	(0.099, 0.239)					
B2009/B2000	0.832	(0.688, 0.963)						0.901	(0.653, 1.039)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.112	0.929	0.874	0.832	(0.652, 0.989)	0.783	0.732	1.417	1.118	1.030	0.942	(0.678, 1.097)	0.869	0.786
B2014/B2009	1.126	0.949	0.897	0.852	(0.727, 0.928)	0.806	0.754	1.366	1.056	0.973	0.897	(0.740, 0.981)	0.825	0.745
B2022/B2004	2.186	1.064	0.767	0.517	(0.001, 1.216)	0.285	0.045	3.836	1.812	1.321	0.875	(0.007, 1.919)	0.452	0.064
B2022/B2009	2.257	1.072	0.788	0.529	(0.001, 1.151)	0.292	0.047	3.684	1.740	1.265	0.828	(0.008, 1.773)	0.435	0.061

[Case 6]

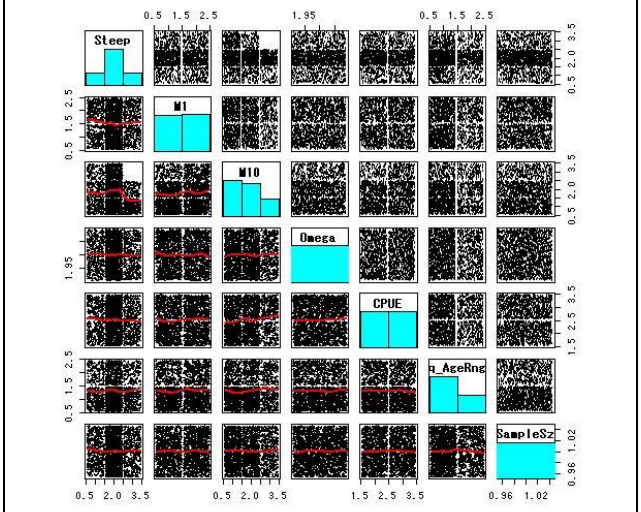
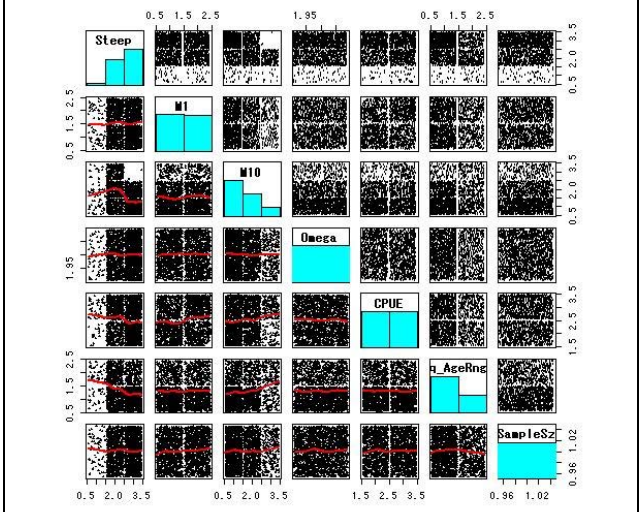
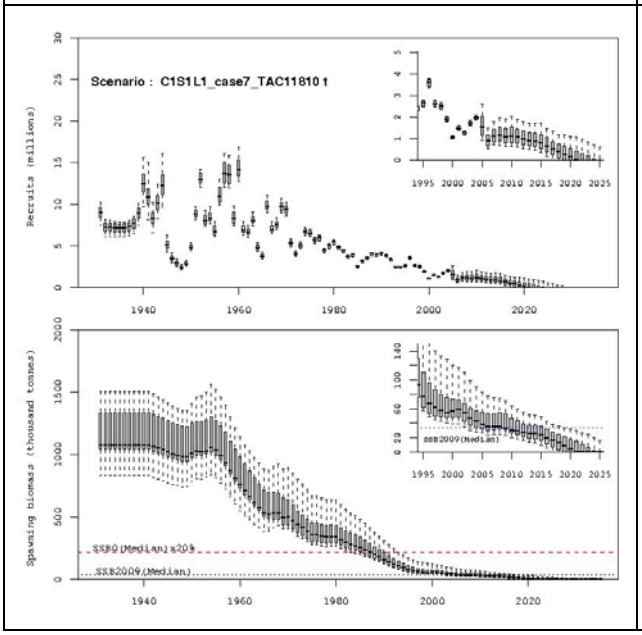
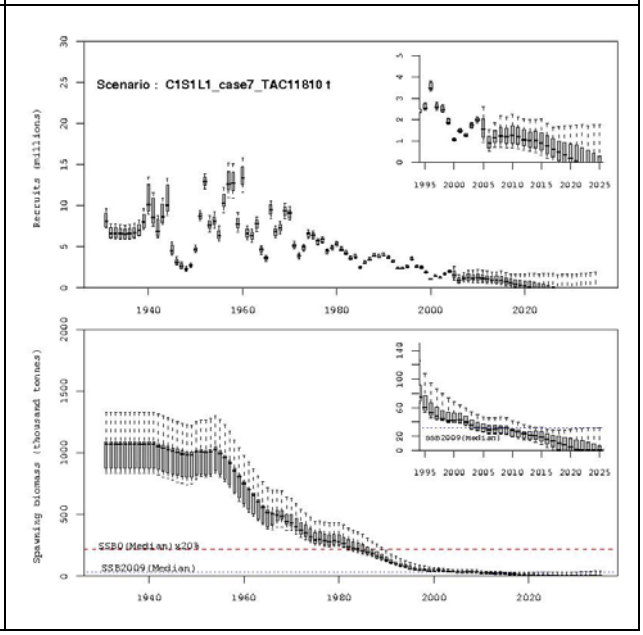
- Scenario: C1S1L1
- Break CPUE into two time series, the second starting in 1986.

default	Likelihood-weighted steepness
	
	

Case6	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1092020	(837350, 1544900)						1083140	(857468, 1119750)					
B2009 (t)	49314	(33613, 96900)						37403	(27919, 49314)					
B2009/B0	0.047	(0.033, 0.063)						0.040	(0.028, 0.052)					
B2009/B1980	0.158	(0.128, 0.195)						0.166	(0.118, 0.204)					
B2009/B2000	0.799	(0.680, 0.910)						0.869	(0.692, 0.991)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.11	0.893	0.829	0.774	(0.622, 0.946)	0.711	0.648	1.436	1.101	1.005	0.907	(0.694, 1.079)	0.813	0.717
B2014/B2009	1.15	0.925	0.866	0.807	(0.699, 0.907)	0.746	0.681	1.368	1.052	0.963	0.873	(0.744, 0.963)	0.784	0.691
B2022/B2004	2.317	1.007	0.673	0.365	(0.000, 1.147)	0.065	0.000	4.002	1.844	1.307	0.811	(0.049, 1.878)	0.326	0.000
B2022/B2009	2.411	1.036	0.702	0.377	(0.000, 1.080)	0.069	0.000	3.784	1.779	1.269	0.776	(0.051, 1.750)	0.308	0.000

[Case 7]

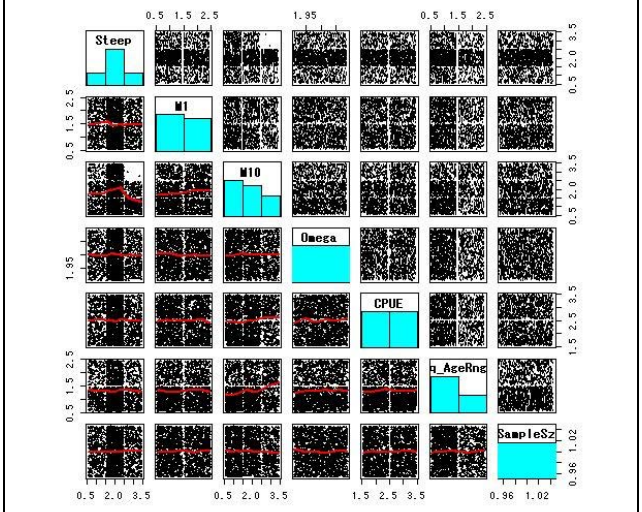
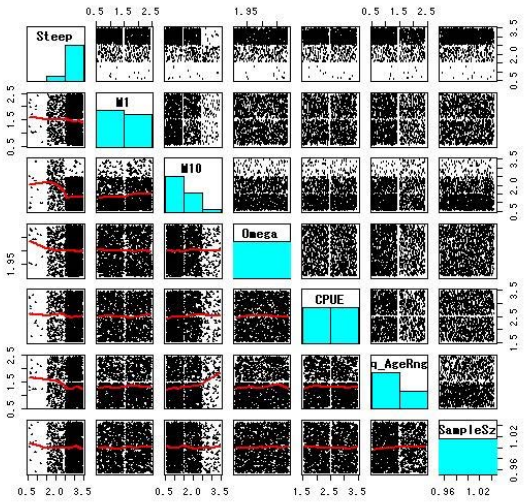
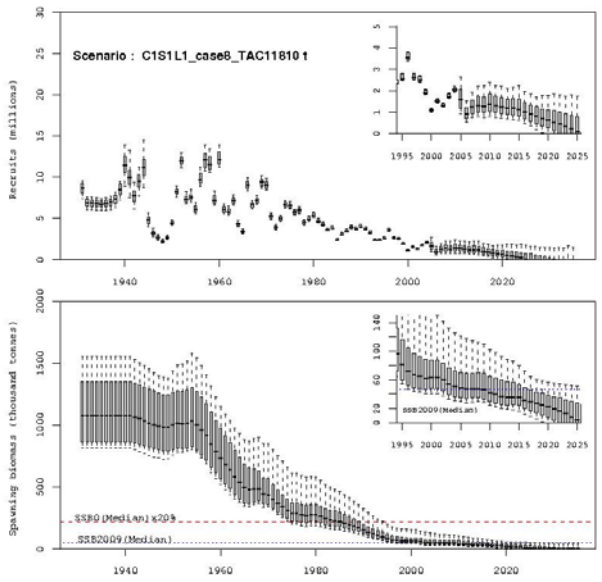
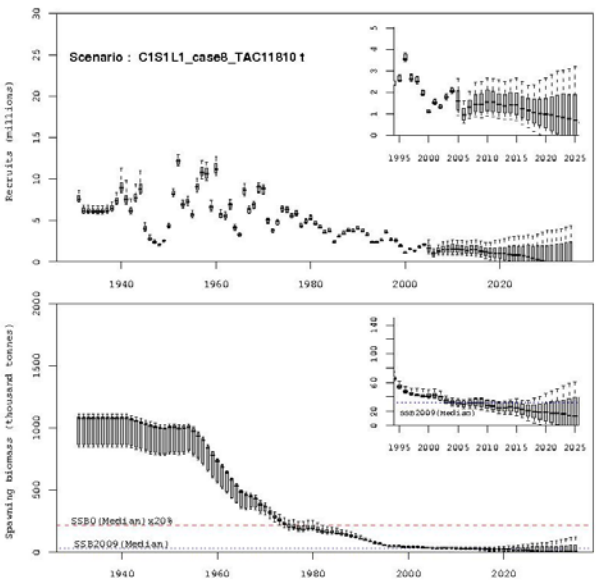
- Scenario: C1S1L1
- Omega value of 0.75 (CPUE non linearity factor).

default	Likelihood-weighted steepness
	
	

Case7	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1074870	(831716, 1508690)						1068330	(832754, 1328230)					
B2009 (t)	33953	(23285, 71363)						31453	(21937, 45610)					
B2009/B0	0.035	(0.022, 0.049)						0.029	(0.021, 0.041)					
B2009/B1980	0.105	(0.071, 0.143)						0.099	(0.067, 0.143)					
B2009/B2000	0.632	(0.504, 0.779)						0.617	(0.492, 0.779)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	0.991	0.725	0.651	0.579	(0.384, 0.757)	0.505	0.424	1.147	0.790	0.686	0.586	(0.378, 0.835)	0.487	0.383
B2014/B2009	1.172	0.866	0.783	0.698	(0.516, 0.816)	0.605	0.507	1.374	0.919	0.814	0.702	(0.506, 0.853)	0.585	0.454
B2022/B2004	2.163	0.610	0.262	0.000	(0.000, 0.511)	0.000	0.000	3.176	0.910	0.415	0.000	(0.000, 0.895)	0.000	0.000
B2022/B2009	2.565	0.713	0.305	0.000	(0.000, 0.557)	0.000	0.000	3.619	1.059	0.464	0.000	(0.000, 0.938)	0.000	0.000

[Case 8]

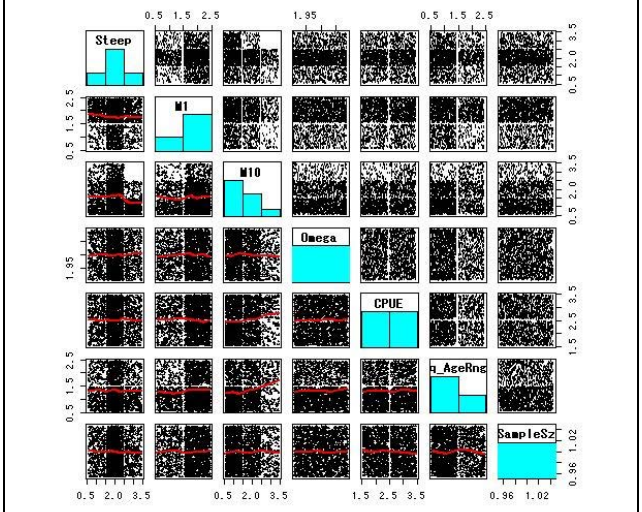
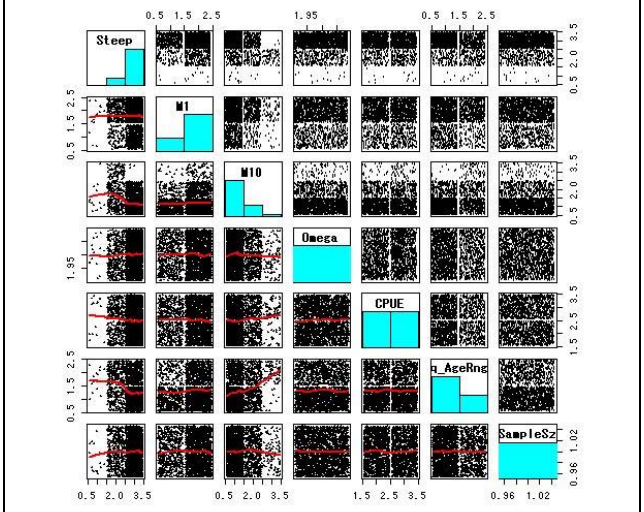
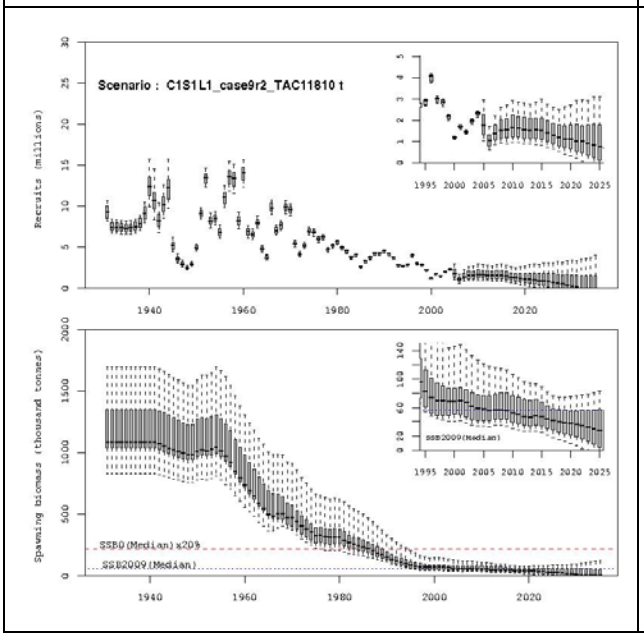
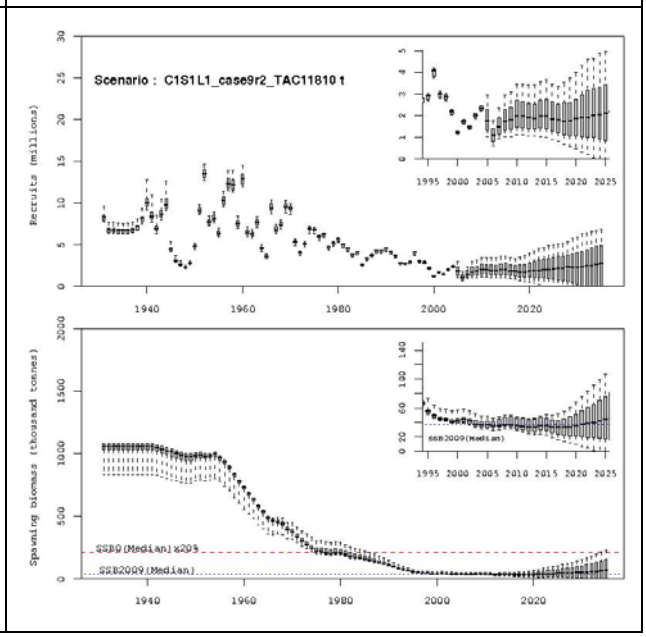
- Scenario: C1S1L1
- Increase the CV on CPUE to 0.30.

default	Likelihood-weighted steepness
	
	

Case8	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1078210	(813671, 1556420)						1074850	(846769, 1110880)					
B2009 (t)	46350	(28392, 110053)						31454	(22609, 38792)					
B2009/B0	0.043	(0.029, 0.066)						0.034	(0.023, 0.044)					
B2009/B1980	0.168	(0.114, 0.214)						0.158	(0.106, 0.215)					
B2009/B2000	0.739	(0.600, 0.843)						0.752	(0.580, 0.877)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.043	0.819	0.766	0.707	(0.532, 0.848)	0.648	0.585	1.373	0.997	0.890	0.789	(0.535, 0.969)	0.684	0.575
B2014/B2009	1.147	0.906	0.844	0.784	(0.643, 0.875)	0.717	0.64	1.411	1.030	0.924	0.818	(0.646, 0.927)	0.712	0.601
B2022/B2004	2.206	0.872	0.555	0.269	(0.000, 0.867)	0.001	0.000	3.900	1.593	1.029	0.493	(0.000, 1.472)	0.002	0.000
B2022/B2009	2.439	0.968	0.611	0.295	(0.000, 0.910)	0.002	0.000	4.037	1.644	1.062	0.510	(0.000, 1.477)	0.002	0.000

[Case 9-1]

- Scenario: C1S1L1
- For modelling the tagging data component: increase the season-1 *F*'s (H) to 1.245.

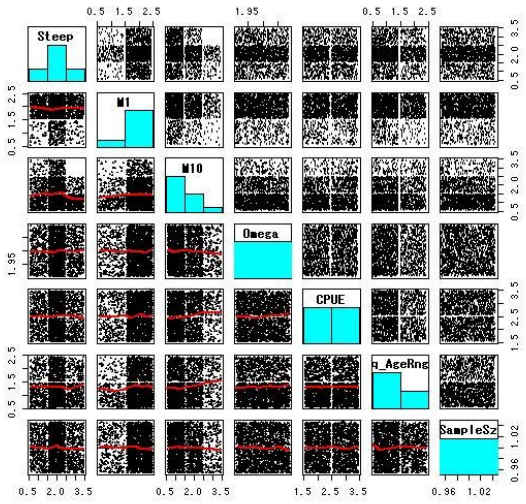
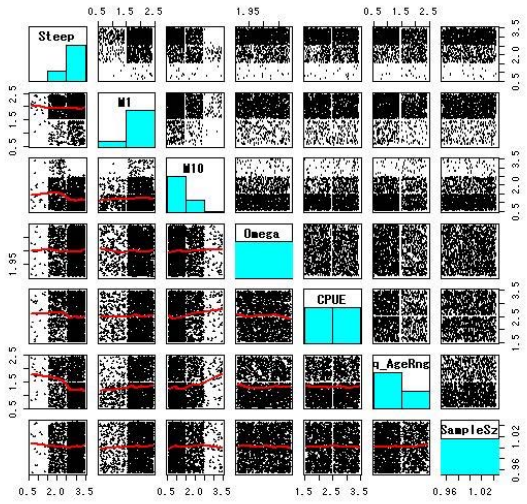
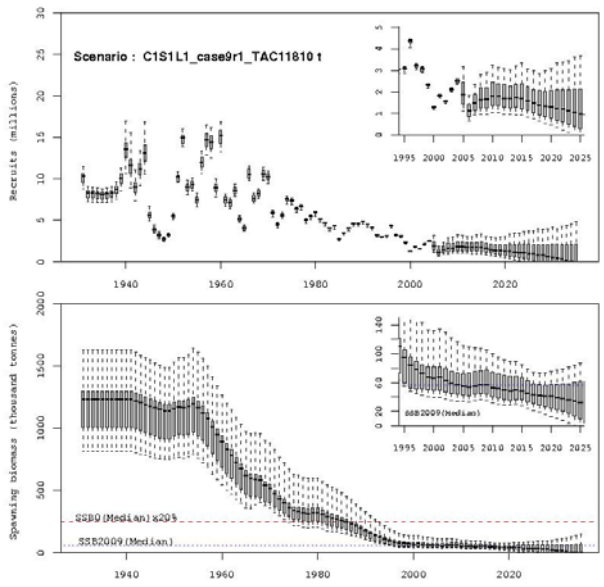
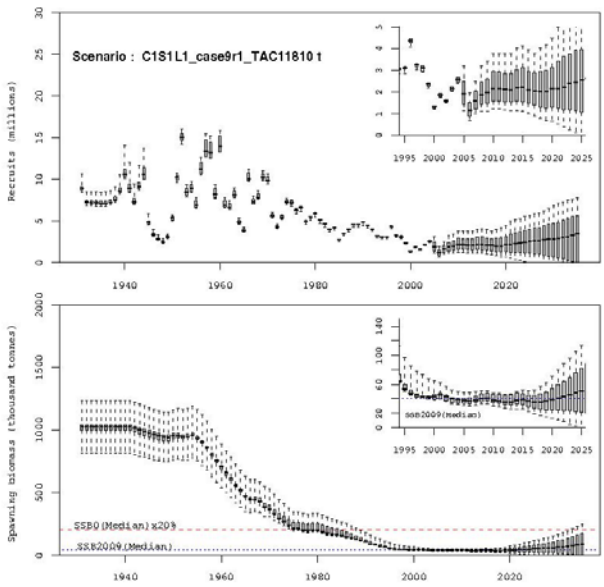
default	Likelihood-weighted steepness
	
	

Case9r2	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1081370	(828059, 1699370)						1057730	(834107, 1081370)					
B2009 (t)	56409	(34079, 113112)						36964	(31296, 50559)					
B2009/B0	0.050	(0.034, 0.071)						0.041	(0.030, 0.051)					
B2009/B1980	0.184	(0.116, 0.244)						0.181	(0.116, 0.245)					
B2009/B2000	0.858	(0.699, 0.986)						0.914	(0.693, 1.082)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.16	0.945	0.884	0.833	(0.663, 1.004)	0.776	0.716	1.486	1.173	1.079	0.980	(0.700, 1.159)	0.889	0.794
B2014/B2009	1.164	0.957	0.901	0.846	(0.742, 0.937)	0.792	0.733	1.374	1.083	0.999	0.914	(0.767, 0.999)	0.830	0.743
B2022/B2004	2.306	1.099	0.801	0.523	(0.042, 1.314)	0.264	0.002	4.015	2.005	1.493	1.015	(0.106, 2.106)	0.541	0.094
B2022/B2009	2.356	1.111	0.813	0.530	(0.045, 1.221)	0.264	0.002	3.713	1.876	1.403	0.943	(0.116, 1.912)	0.502	0.086

[Case 9-2]

- Scenario: C1S1L1

- For modeling the tagging data component: Estimate the season-1 *F*'s (H) (under a default condition = increase the season-1 *F*'s (H) to 1.5).

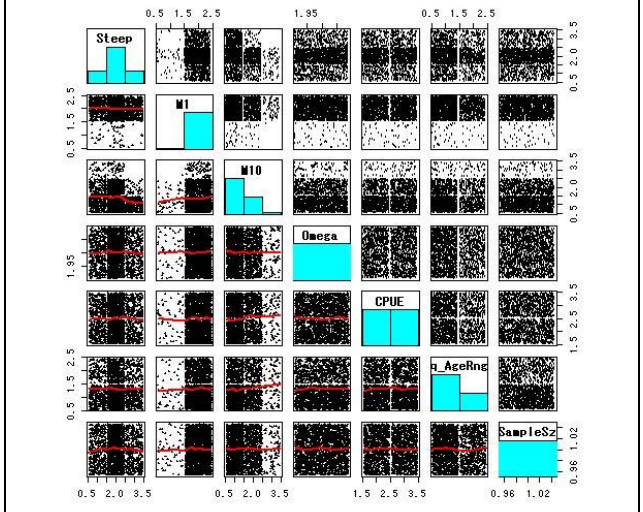
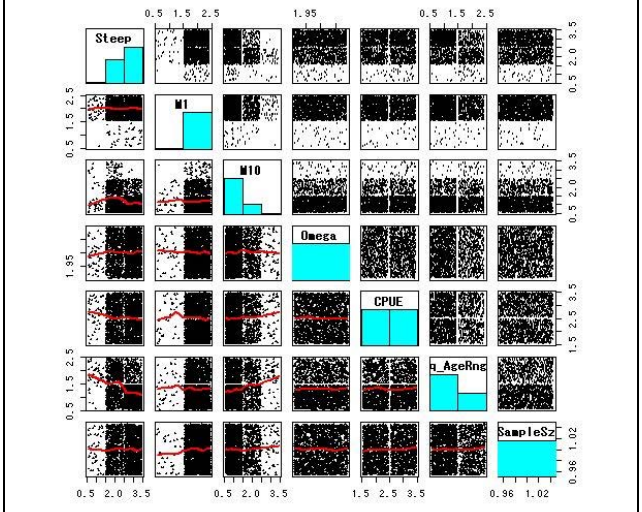
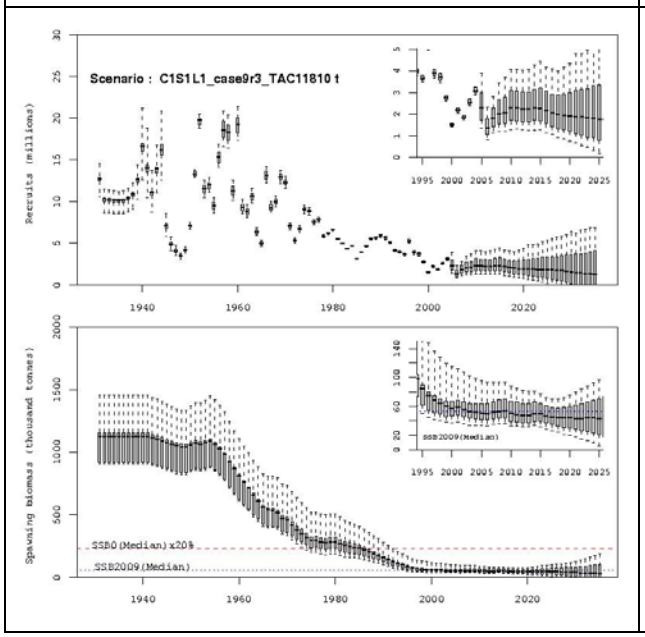
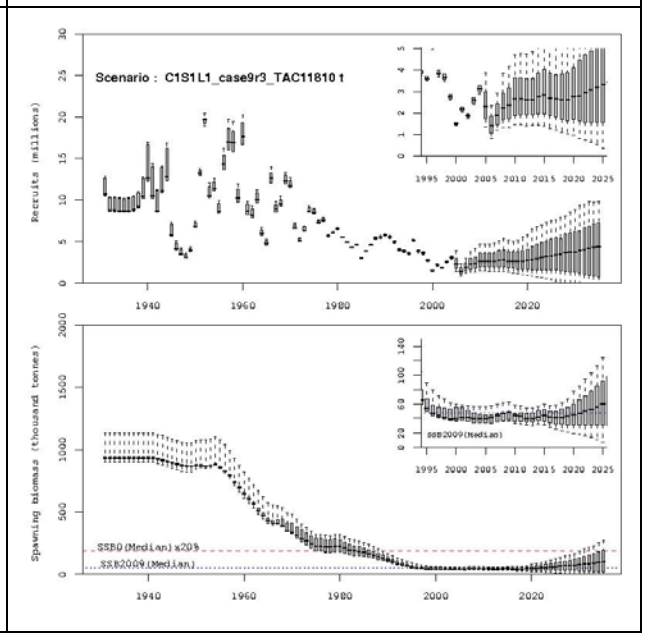
default	Likelihood-weighted steepness
	
	

Case9	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1230510	(812257, 1626830)						1025180	(812257, 1235710)					
B2009 (t)	56641	(35334, 105942)						40418	(32606, 51081)					
B2009/B0	0.051	(0.036, 0.069)						0.043	(0.032, 0.051)					
B2009/B1980	0.186	(0.123, 0.251)						0.186	(0.119, 0.251)					
B2009/B2000	0.872	(0.724, 1.023)						0.953	(0.724, 1.111)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.187	0.977	0.916	0.861	(0.700, 1.038)	0.806	0.744	1.508	1.203	1.110	1.014	(0.744, 1.197)	0.919	0.828
B2014/B2009	1.191	0.978	0.92	0.866	(0.776, 0.957)	0.809	0.751	1.383	1.102	1.019	0.933	(0.798, 1.019)	0.852	0.770
B2022/B2004	2.351	1.167	0.866	0.583	(0.136, 1.441)	0.328	0.060	3.962	2.048	1.582	1.106	(0.190, 2.242)	0.662	0.238
B2022/B2009	2.358	1.159	0.870	0.583	(0.148, 1.309)	0.328	0.061	3.570	1.882	1.449	1.022	(0.202, 2.000)	0.615	0.225

[Case 9-3]

- Scenario: C1S1L1

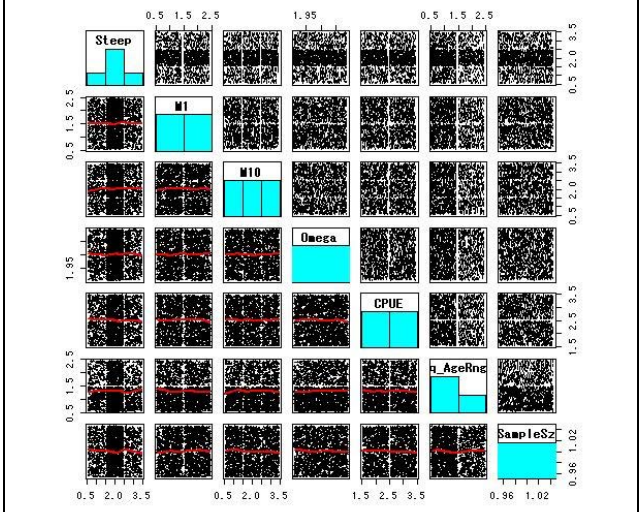
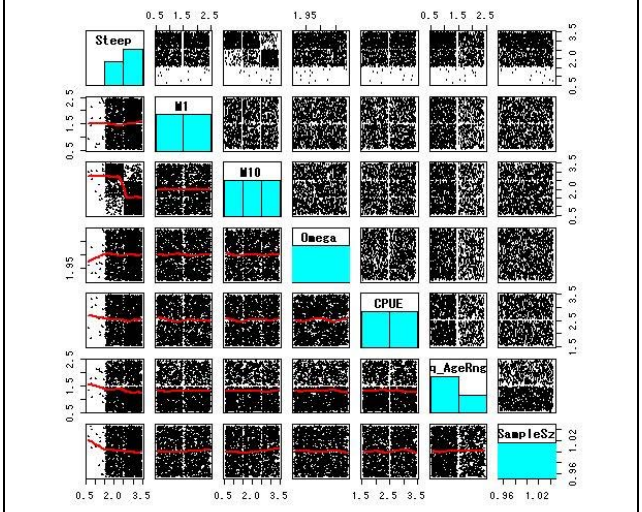
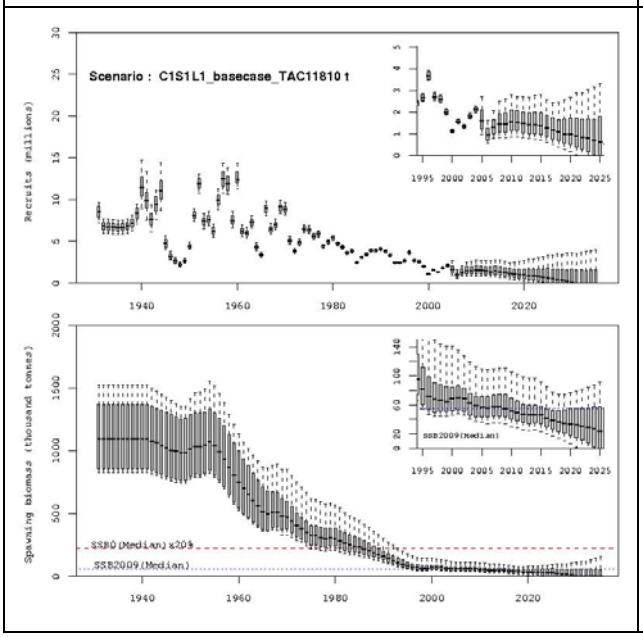
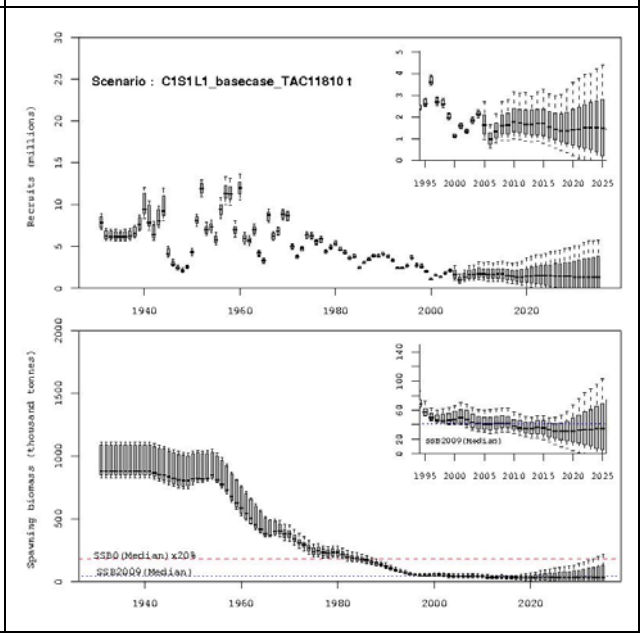
- For modeling the tagging data component: Estimate the season-1 *F*'s (H) (after expanding the parameter range).

default	Likelihood-weighted steepness
	
	

Case9r3	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1126220	(906561, 1457290)						935422	(901152, 1137610)					
B2009 (t)	53545	(35804, 93452)						48100	(35804, 62678)					
B2009/B0	0.052	(0.038, 0.068)						0.047	(0.038, 0.061)					
B2009/B1980	0.207	(0.129, 0.276)						0.207	(0.129, 0.276)					
B2009/B2000	0.939	(0.789, 1.139)						1.052	(0.789, 1.233)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.305	1.066	0.999	0.934	(0.781, 1.144)	0.877	0.815	1.574	1.242	1.151	1.064	(0.806, 1.278)	0.988	0.908
B2014/B2009	1.254	1.027	0.968	0.909	(0.827, 1.011)	0.852	0.793	1.414	1.135	1.052	0.970	(0.844, 1.059)	0.897	0.823
B2022/B2004	2.474	1.332	1.043	0.759	(0.291, 1.695)	0.500	0.254	3.627	2.006	1.608	1.217	(0.345, 2.414)	0.828	0.471
B2022/B2009	2.397	1.276	1.005	0.737	(0.302, 1.544)	0.484	0.249	3.203	1.806	1.452	1.105	(0.345, 2.096)	0.756	0.422

[Case 10-1]

- Scenario: C1S1L1 (Effect of overcatch on CPUE: *S*=25%)
- Use prior for M_1 and M_{10} as the simulation weight for grid integration.

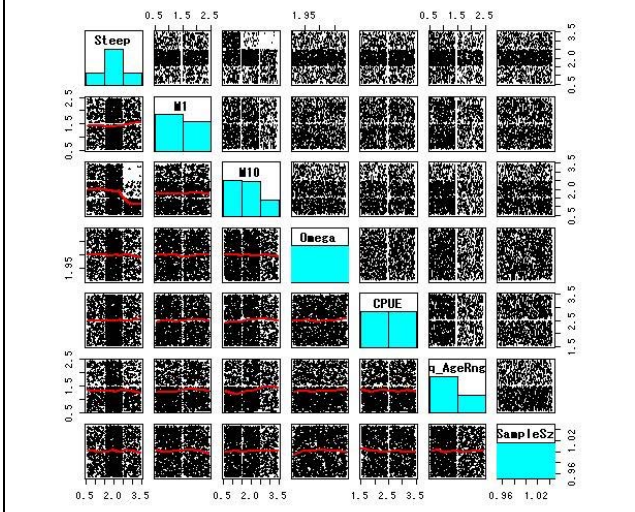
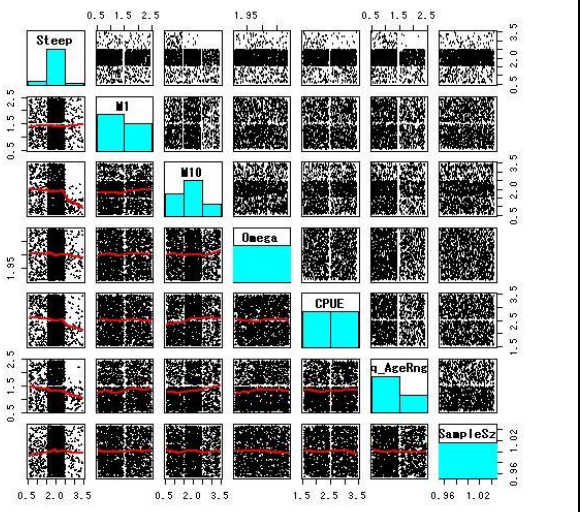
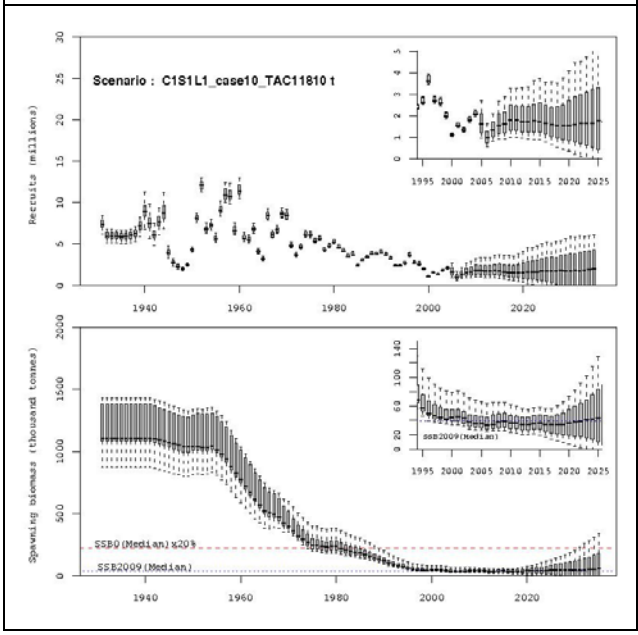
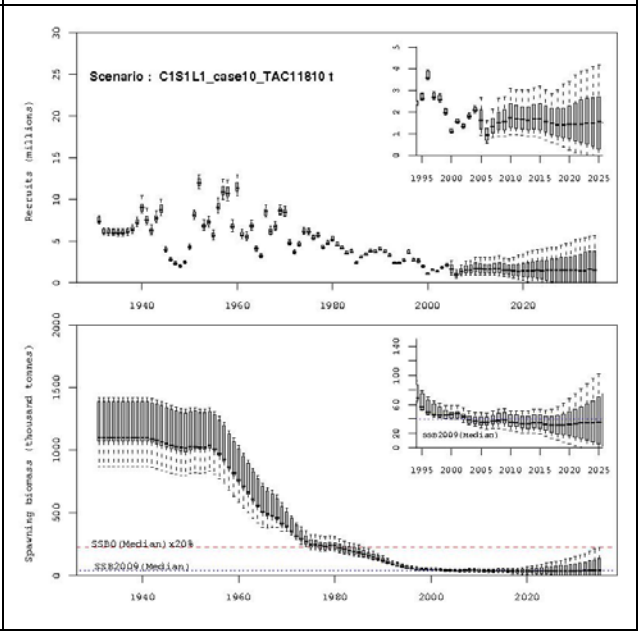
Use prior for M1 and M0	Likelihood-weighted steepness
	
	

C1S1L1	Use prior for M and M10							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1096250	(829083, 1523420)						879494	(829083, 1110510)					
B2009 (t)	55353	(33678, 110830)						41542	(29657, 62479)					
B2009/B0	0.056	(0.034, 0.079)						0.044	(0.030, 0.073)					
B2009/B1980	0.187	(0.120, 0.271)						0.202	(0.111, 0.271)					
B2009/B2000	0.844	(0.665, 0.971)						0.874	(0.665, 1.034)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.093	0.899	0.843	0.79	(0.627, 0.942)	0.732	0.678	1.311	0.984	0.910	0.850	(0.627, 1.080)	0.782	0.705
B2014/B2009	1.13	0.921	0.868	0.814	(0.707, 0.903)	0.756	0.697	1.278	1.000	0.914	0.837	(0.703, 0.953)	0.765	0.690
B2022/B2004	2.264	1.045	0.750	0.467	(0.000, 1.306)	0.204	0.000	3.473	1.622	1.185	0.759	(0.000, 1.918)	0.358	0.002
B2022/B2009	2.348	1.066	0.772	0.481	(0.000, 1.250)	0.206	0.000	3.297	1.580	1.157	0.744	(0.000, 1.755)	0.338	0.002

[Case 10-2]

- Scenario: C1S1L1
- Change the values of steepness and M_{10};

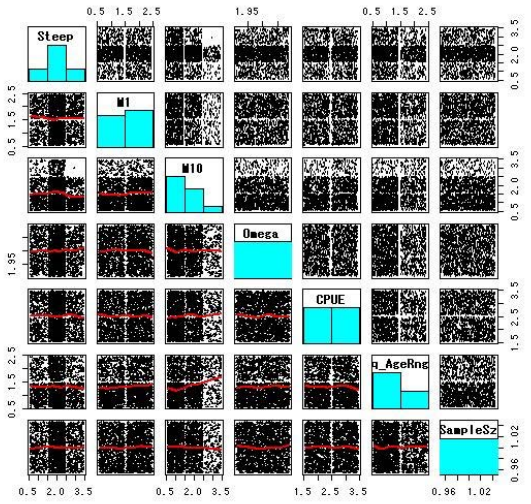
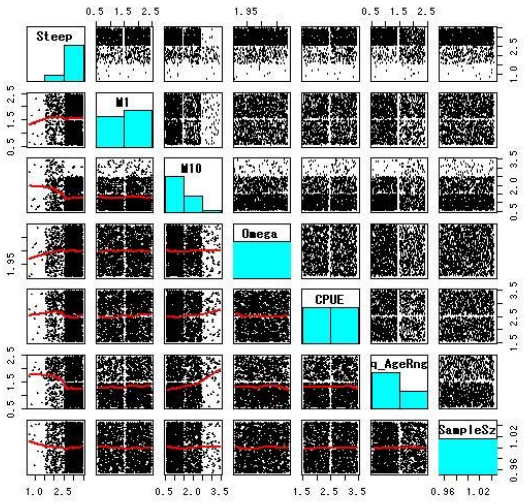
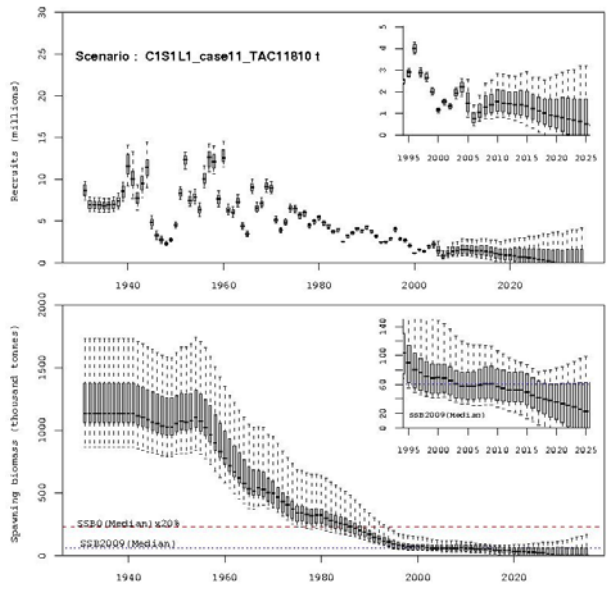
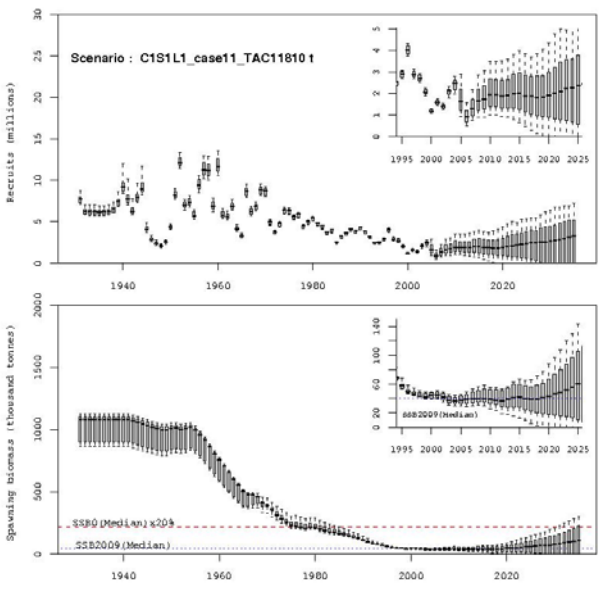
  Steepness: (0.55, 0.73, **0.90**), M_{10}: (**0.04**, 0.07, 0.10)

default	Likelihood-weighted steepness
	
	

Case10	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1110510	(872295, 1431680)						1101270	(872295, 1422640)					
B2009 (t)	39215	(25928, 65050)						39070	(25928, 54514)					
B2009/B0	0.034	(0.023, 0.050)						0.033	(0.023, 0.045)					
B2009/B1980	0.174	(0.108, 0.236)						0.174	(0.097, 0.236)					
B2009/B2000	0.874	(0.636, 1.034)						0.874	(0.633, 1.034)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.491	1.138	1.04	0.947	(0.672, 1.236)	0.86	0.771	1.486	1.138	1.043	0.945	(0.656, 1.143)	0.853	0.753
B2014/B2009	1.403	1.076	0.991	0.912	(0.754, 1.072)	0.829	0.742	1.400	1.072	0.986	0.901	(0.743, 1.008)	0.812	0.721
B2022/B2004	4.053	1.944	1.415	0.908	(0.057, 2.676)	0.460	0.040	4.030	1.869	1.355	0.843	(0.001, 1.981)	0.372	0.001
B2022/B2009	3.916	1.857	1.345	0.869	(0.060, 2.338)	0.436	0.037	3.877	1.790	1.275	0.806	(0.001, 1.783)	0.355	0.000

[Case 11-1]

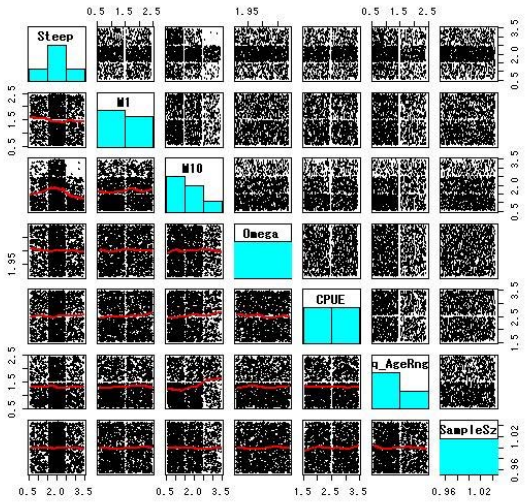
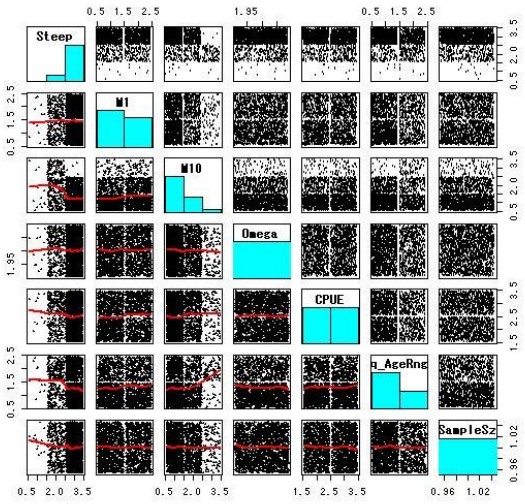
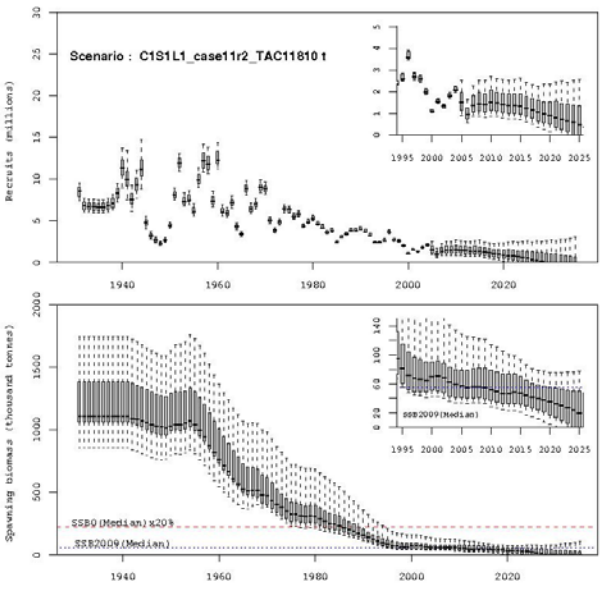
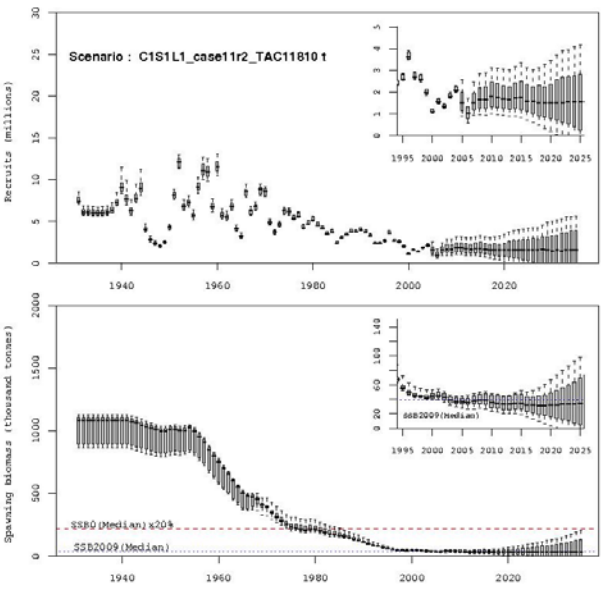
- Scenario: C1S1L1
- Exclude aerial survey data.

default	Likelihood-weighted steepness
	
	

Case11r1	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1130440	(862656, 1732180)						1079990	(862656, 1128370)					
B2009 (t)	60960	(31655, 113390)						40354	(29248, 58198)					
B2009/B0	0.052	(0.029, 0.070)						0.041	(0.029, 0.059)					
B2009/B1980	0.190	(0.103, 0.260)						0.191	(0.101, 0.262)					
B2009/B2000	0.871	(0.643, 1.045)						0.985	(0.653, 1.162)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.221	0.99	0.926	0.878	(0.489, 1.220)	0.823	0.753	1.776	1.403	1.303	1.200	(0.544, 1.479)	1.096	0.988
B2014/B2009	1.157	0.949	0.898	0.842	(0.531, 1.018)	0.788	0.729	1.456	1.167	1.085	1.000	(0.584, 1.133)	0.915	0.830
B2022/B2004	2.302	1.021	0.714	0.454	(0.000, 1.625)	0.196	0.000	4.415	2.358	1.841	1.317	(0.000, 2.662)	0.813	0.345
B2022/B2009	2.201	0.971	0.686	0.433	(0.000, 1.355)	0.191	0.000	3.684	1.934	1.508	1.091	(0.000, 2.095)	0.672	0.291

[Case 11-2]

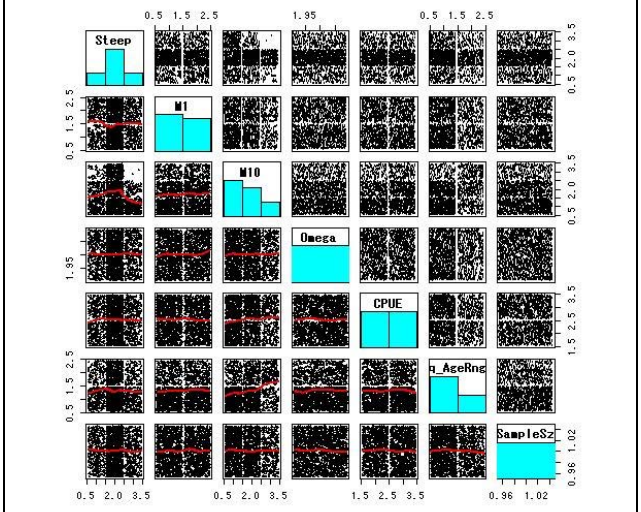
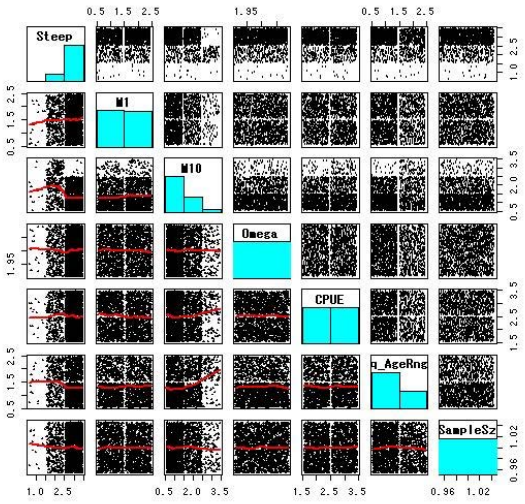
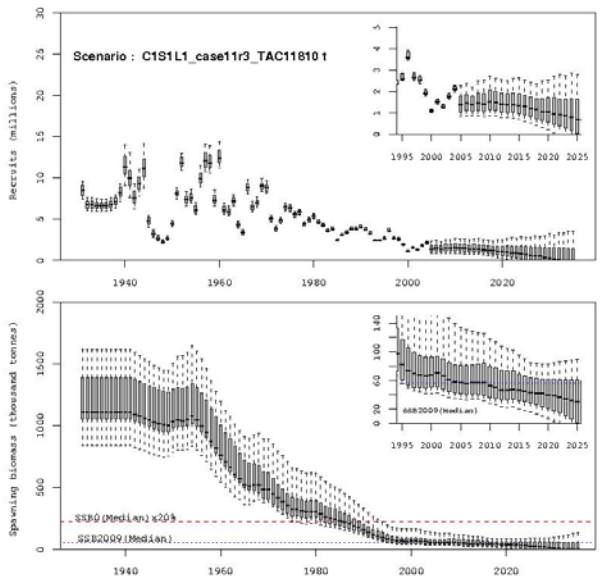
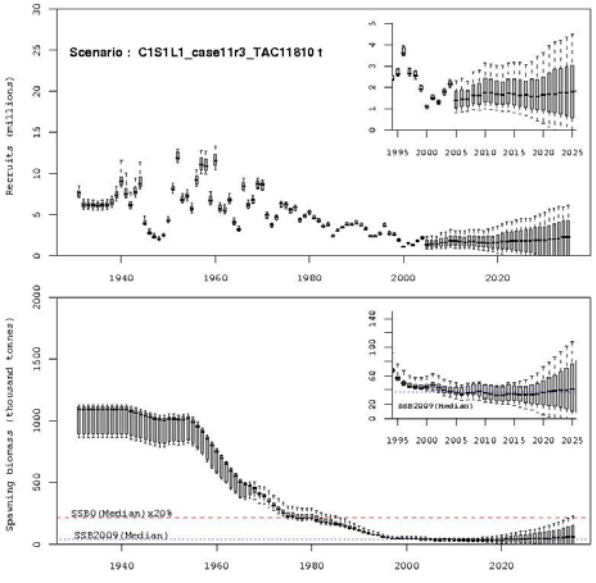
- Scenario: C1S1L1
- Change the sample size of surface fishery in 2008 to zero.

default	Likelihood-weighted steepness
	
	

Case11r2	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1105040	(855484, 1744230)						1084530	(861203, 1127500)					
B2009 (t)	55257	(32555, 121397)						39286	(26408, 50655)					
B2009/B0	0.049	(0.033, 0.073)						0.040	(0.027, 0.057)					
B2009/B1980	0.185	(0.120, 0.242)						0.175	(0.110, 0.237)					
B2009/B2000	0.837	(0.662, 0.962)						0.889	(0.654, 1.038)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.109	0.907	0.855	0.803	(0.610, 0.976)	0.751	0.694	1.474	1.148	1.055	0.958	(0.636, 1.145)	0.865	0.769
B2014/B2009	1.131	0.932	0.881	0.828	(0.698, 0.927)	0.78	0.721	1.371	1.070	0.986	0.901	(0.712, 0.997)	0.815	0.728
B2022/B2004	2.278	1.026	0.711	0.432	(0.000, 1.177)	0.159	0.000	4.030	1.896	1.385	0.853	(0.000, 1.960)	0.356	0.000
B2022/B2009	2.359	1.045	0.730	0.439	(0.000, 1.124)	0.168	0.000	3.783	1.796	1.289	0.800	(0.000, 1.773)	0.340	0.000

[Case 11-3]

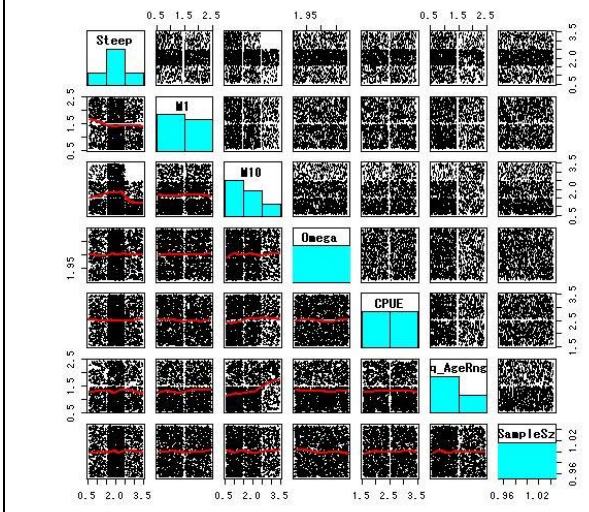
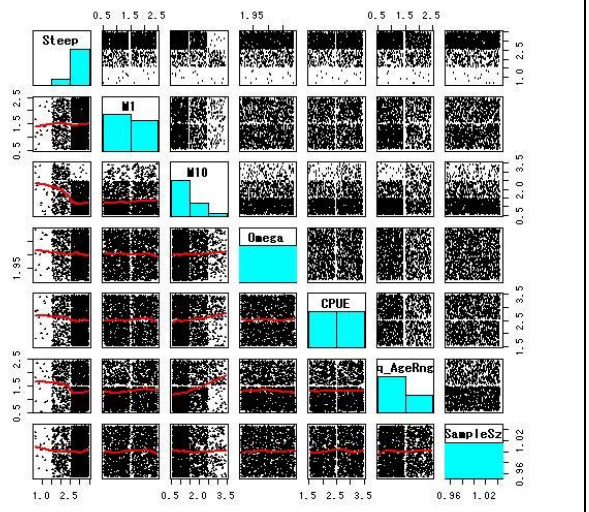
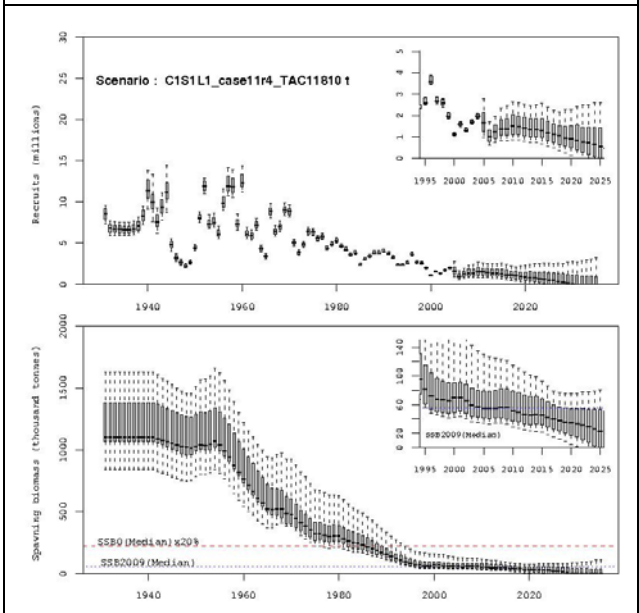
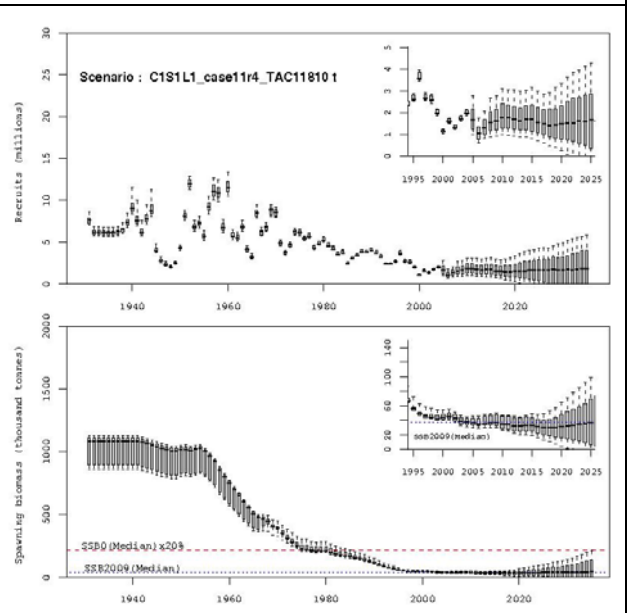
- Scenario: C1S1L1
- Change the sample size of LL1 fishery in 2008 to zero.

default	Likelihood-weighted steepness
	
	

Case11r3	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1107160	(838015, 1618600)						1086890	(862981, 1129570)					
B2009 (t)	56801	(32081, 125605)						37482	(25603, 51067)					
B2009/B0	0.050	(0.034, 0.073)						0.039	(0.027, 0.057)					
B2009/B1980	0.187	(0.116, 0.246)						0.178	(0.108, 0.236)					
B2009/B2000	0.839	(0.653, 0.960)						0.889	(0.649, 1.037)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.07	0.891	0.846	0.799	(0.601, 0.963)	0.751	0.7	1.391	1.114	1.025	0.933	(0.623, 1.106)	0.854	0.765
B2014/B2009	1.106	0.925	0.878	0.828	(0.699, 0.921)	0.781	0.728	1.321	1.046	0.968	0.890	(0.718, 0.981)	0.812	0.729
B2022/B2004	2.287	1.096	0.794	0.524	(0.001, 1.305)	0.271	0.004	3.958	1.936	1.439	0.957	(0.001, 2.044)	0.502	0.057
B2022/B2009	2.389	1.134	0.823	0.544	(0.001, 1.246)	0.278	0.005	3.793	1.865	1.376	0.917	(0.002, 1.888)	0.472	0.052

[Case 11-4]

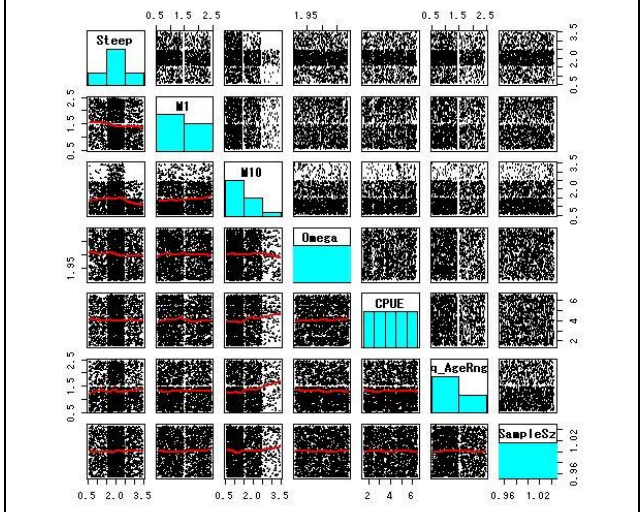
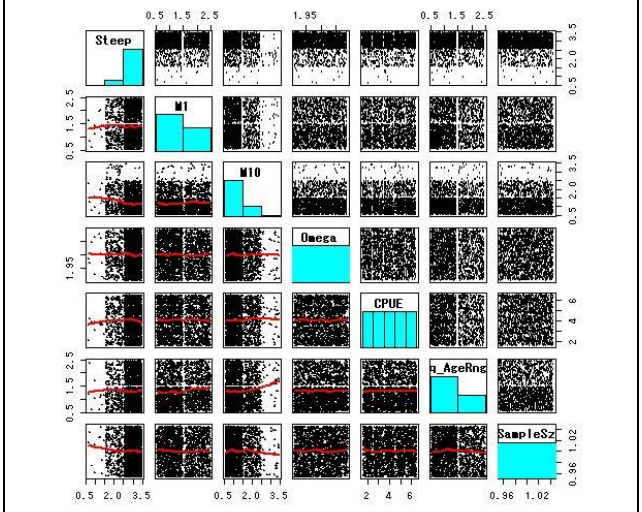
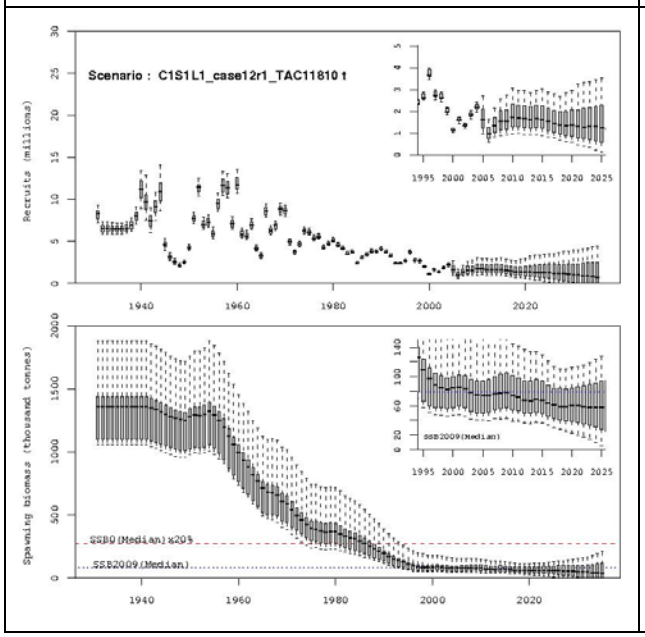
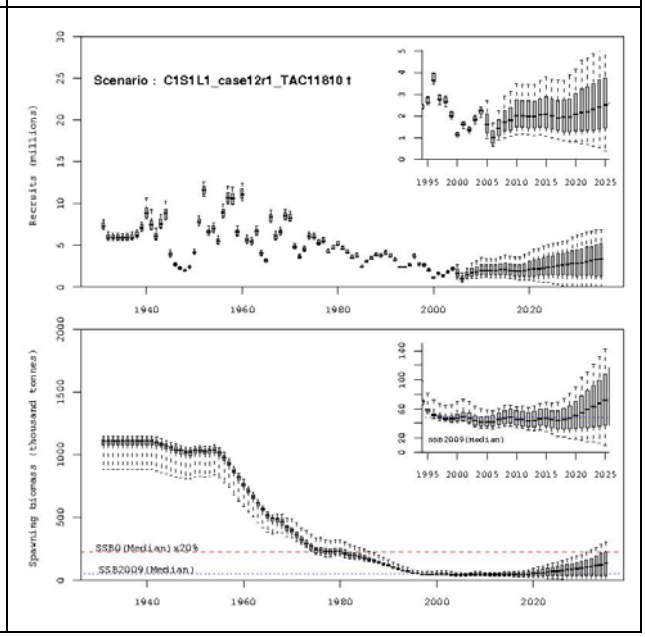
- Scenario: C1S1L1
- Change the LL1 selectivity blocks in 2006, 2007, and 2008 to that with CV = 1.0.

default	Likelihood-weighted steepness
	
	

Case11r4	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1103140	(838555, 1632668)						1085410	(859173, 1127480)					
B2009 (t)	55476	(32663, 122074)						36976	(29987, 50256)					
B2009/B0	0.049	(0.033, 0.073)						0.039	(0.027, 0.050)					
B2009/B1980	0.185	(0.119, 0.241)						0.177	(0.111, 0.238)					
B2009/B2000	0.837	(0.662, 0.961)						0.885	(0.657, 1.037)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.078	0.883	0.834	0.781	(0.595, 0.940)	0.727	0.675	1.411	1.096	1.003	0.911	(0.617, 1.091)	0.819	0.724
B2014/B2009	1.108	0.909	0.859	0.807	(0.683, 0.899)	0.754	0.695	1.318	1.028	0.946	0.863	(0.697, 0.954)	0.777	0.690
B2022/B2004	2.244	1.032	0.724	0.450	(0.000, 1.175)	0.196	0.000	3.950	1.880	1.376	0.873	(0.000, 1.921)	0.383	0.001
B2022/B2009	2.340	1.055	0.745	0.463	(0.000, 1.127)	0.199	0.000	3.719	1.783	1.294	0.822	(0.000, 1.738)	0.369	0.001

[Case 12-1]

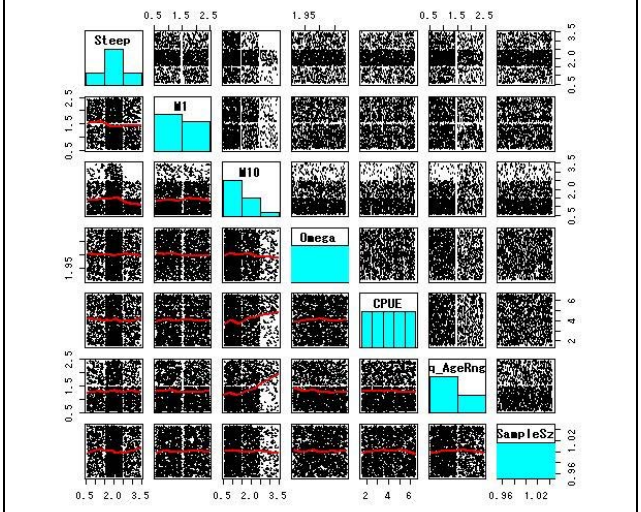
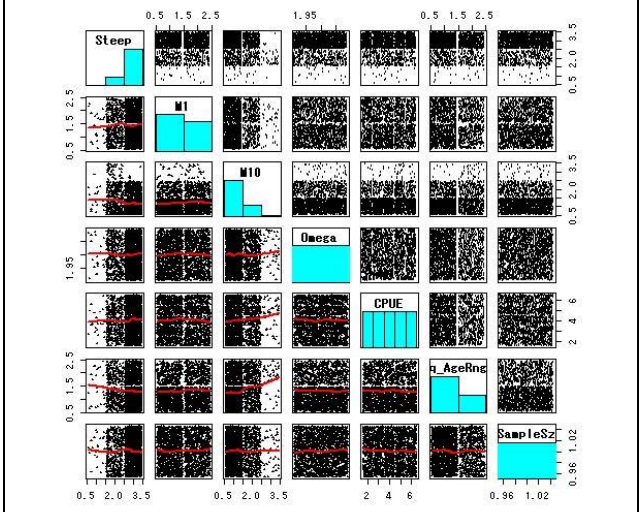
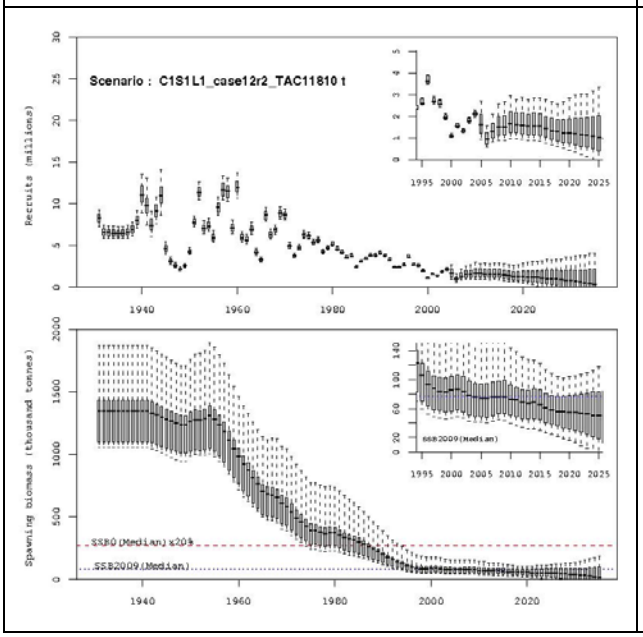
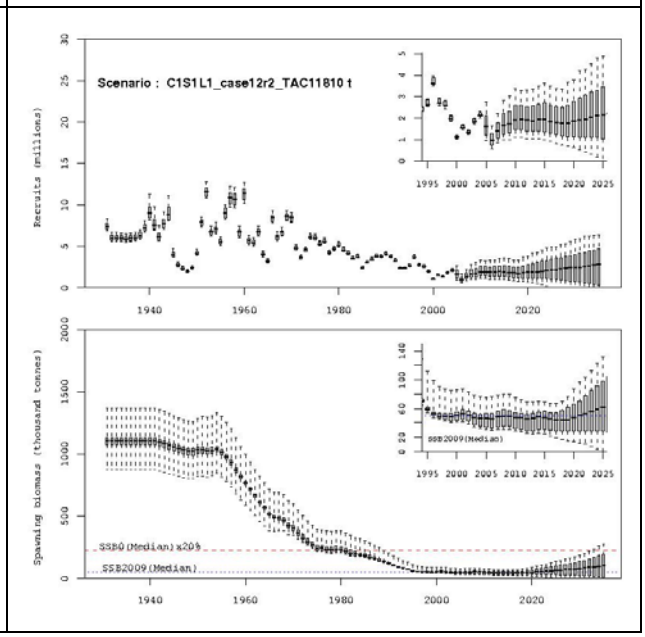
- Scenario: C1S1L1
- Based on old CPUEs (Nominal, Laslett, STwindows, w05, w08) from 1969 to 2008.

default	Likelihood-weighted steepness
	
	

Case12r1	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1363640	(1057780, 1882150)						1107040	(880629, 1150840)					
B2009 (t)	78462	(42663, 153684)						48050	(36316, 65404)					
B2009/B0	0.062	(0.040, 0.085)						0.048	(0.035, 0.063)					
B2009/B1980	0.215	(0.158, 0.276)						0.220	(0.144, 0.283)					
B2009/B2000	0.952	(0.808, 1.091)						1.021	(0.819, 1.201)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.219	1.047	1	0.951	(0.712, 1.167)	0.901	0.856	1.603	1.307	1.224	1.136	(0.736, 1.295)	1.048	0.962
B2014/B2009	1.14	0.98	0.937	0.898	(0.778, 0.984)	0.854	0.809	1.345	1.105	1.036	0.966	(0.794, 1.043)	0.896	0.826
B2022/B2004	2.302	1.249	0.986	0.729	(0.260, 1.612)	0.495	0.260	4.067	2.224	1.764	1.322	(0.366, 2.429)	0.897	0.473
B2022/B2009	2.196	1.186	0.933	0.692	(0.273, 1.411)	0.473	0.247	3.559	1.922	1.529	1.132	(0.369, 2.034)	0.764	0.409

[Case 12-2]

- Scenario: C1S1L1
- Based on old CPUEs (Nominal, Laslett, STwindows, w05, w08) from 1969 to 2006.

default	Likelihood-weighted steepness
	
	

Case12r2	Default							Likelihood-weighted steepness						
	Median	(P_{10}, P_{90})						Median	(P_{10}, P_{90})					
B0 (t)	1347250	(1057200, 1870050)						1108690	(875421, 1373040)					
B2009 (t)	76405	(43113, 153332)						49646	(30687, 80408)					
B2009/B0	0.061	(0.041, 0.085)						0.048	(0.029, 0.064)					
B2009/B1980	0.214	(0.138, 0.274)						0.215	(0.123, 0.279)					
B2009/B2000	0.916	(0.760, 1.032)						1.010	(0.753, 1.087)					
TAC	0t	7810t	9810t	11810t		13810t	15810t	0t	7810t	9810t	11810t		13810t	15810t
B2014/B2004	1.128	0.978	0.93	0.878	(0.710, 1.074)	0.84	0.802	1.439	1.172	1.100	1.026	(0.757, 1.150)	0.948	0.874
B2014/B2009	1.113	0.951	0.905	0.869	(0.760, 0.945)	0.828	0.785	1.310	1.059	0.989	0.919	(0.788, 0.994)	0.854	0.791
B2022/B2004	2.205	1.136	0.872	0.625	(0.157, 1.387)	0.401	0.181	3.785	1.954	1.511	1.080	(0.246, 2.126)	0.679	0.309
B2022/B2009	2.197	1.124	0.858	0.617	(0.172, 1.296)	0.397	0.177	3.443	1.790	1.381	0.991	(0.251, 1.886)	0.619	0.281