What's in a SAFE Chapter? (with examples)

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Executive Summary

- Summary of major changes
  - Input data
  - Methodology
  - Results
- Responses to SSC comments
  - Comments specific to this assessment
  - Comments on assessments in general

Example summary of changes

Changes in the Input Data

1) Size composition data from the 2002 and January-September 2003 commercial fisheries were incorporated into the model.

2) Catch data for 2003 were incorporated and catch data for 1991-2002 were recompiled.

3) Size composition data from the 2003 EBS bottom trawl survey were incorporated.

4) The biomass estimate from the 2003 EBS bottom trawl survey was incorporated (the 2003 estimate of 605,681 t was down about 2% from the 2002 estimate).

Changes in the Assessment Model

No changes were made to the structure of the assessment model.

Changes in Assessment Results

1) The estimated 2004 female spawning biomass for the BSAI stock is 435,000 t, up about 3% from last year's estimate for 2003 and down about 1% from last year's F_{ABC} projection for 2004.

2) The estimated 2004 total age 3+ biomass for the BSAI stock is 1,660,000 t, down about 1% from last year's estimate for 2003 and down about 3% from last year's $F_{40\%}$ projection for 2004.

3) The recommended 2004 ABC for the BSAI stock is 223,000 t, identical to both the 2002 and 2003 ABC.

4) The estimated 2004 OFL for the BSAI stock is 350,000 t, up about 8% from last year's estimate for 2003.

Example responses to SSC

SSC Comments Specific to the Pacific Cod Assessments

From the December, 2002 minutes: *"The SSC appreciates the authors attention to SSC comments from the December 2001 minutes with respect to model configuration for selectivity and retrospective analyses, and looks forward to future developments of spawner-recruit relationships for BS/AI cod."* As in the last two assessments, a provisional stock-recruitment relationship is described in the "Recruitment" subsection of the "Results" section. Additional research, not described in this assessment, has been conducted in support of a new assessment model capable of calculating a statistically valid spawner-recruit relationship for this stock.

SSC Comments on Assessments in General

There were no SSC comments on assessments in general during the last year.

Introduction

- Scientific name
- General distribution
- Management units
- Evidence of stock structure, if any
- Special life history characteristics, if any

Fishery

- Description of directed fishery
- Bycatch and discards
- Historical catch distributions
- Table showing time series of:
  - ABC
  - TAC
  - Catch
  - Relevant management/assessment changes

Example ABC table (partial)

Year	ABC	TAC	Catch	Stock Assessment Model
1980	148,000	70,700	45,947	projection of 1979 survey numbers at age
1981	160,000	78,700	63,941	projection of 1979 survey numbers at age
1982	168,000	78,700	69,501	projection of 1979 survey numbers at age
1983	298,200	120,000	103,231	projection of 1979 survey numbers at age
1984	291,300	210,000	133,084	projection of 1979 survey numbers at age
1985	347,400	220,000	150,384	projection of 1979-1985 survey numbers at age
1986	249,300	229,000	142,511	separable age-structured model
1987	400,000	280,000	163,110	separable age-structured model
1988	385,300	200,000	208,236	separable age-structured model
1989	370,600	230,681	182,865	separable age-structured model
1990	417,000	227,000	179,608	separable age-structured model
1991	229,000	229,000	219,266	separable age-structured model
1992	182,000	182,000	208,046	age-structured Synthesis model
1993	164,500	164,500	167,389	length-structured Synthesis model
1994	191,000	191,000	193,802	length-structured Synthesis model
1995	328,000	250,000	245,029	length-structured Synthesis model
1996	305,000	270,000	240,673	length-structured Synthesis model
1997	306,000	270,000	257,762	length-structured Synthesis model

Data

- Data presented as time series
  - Total catch
  - Catch at age or length
  - Survey biomass estimates
  - Survey numbers at age or length
  - Sample sizes
- Data aggregated over time
  - Length at age
  - Weight at length or weight at age

Analytic Approach

- Model structure
- Parameters estimated independently
- Parameters estimated conditionally
- Model evaluation
- Final parameter estimates
- Schedules implied by parameter estimates

Example evaluation (partial)

Size composition likelihood component	Average effective sample size	Average input sample size	Ratio (effective divided by input)
Early-season trawl fishery	273	197	1.39
Late-season trawl fishery	84	46	1.83
Longline fishery	322	192	1.68
Pot fishery	228	111	2.05
Pre-1982 survey	85	100	0.85
Post-1981 survey	165	103	1.59
All	229	137	1.67

Note: True sample sizes for the survey are available only for the years 1986-1987 and 1990-2003. For all other years, a value of 10,000 (square root = 100) was assumed.

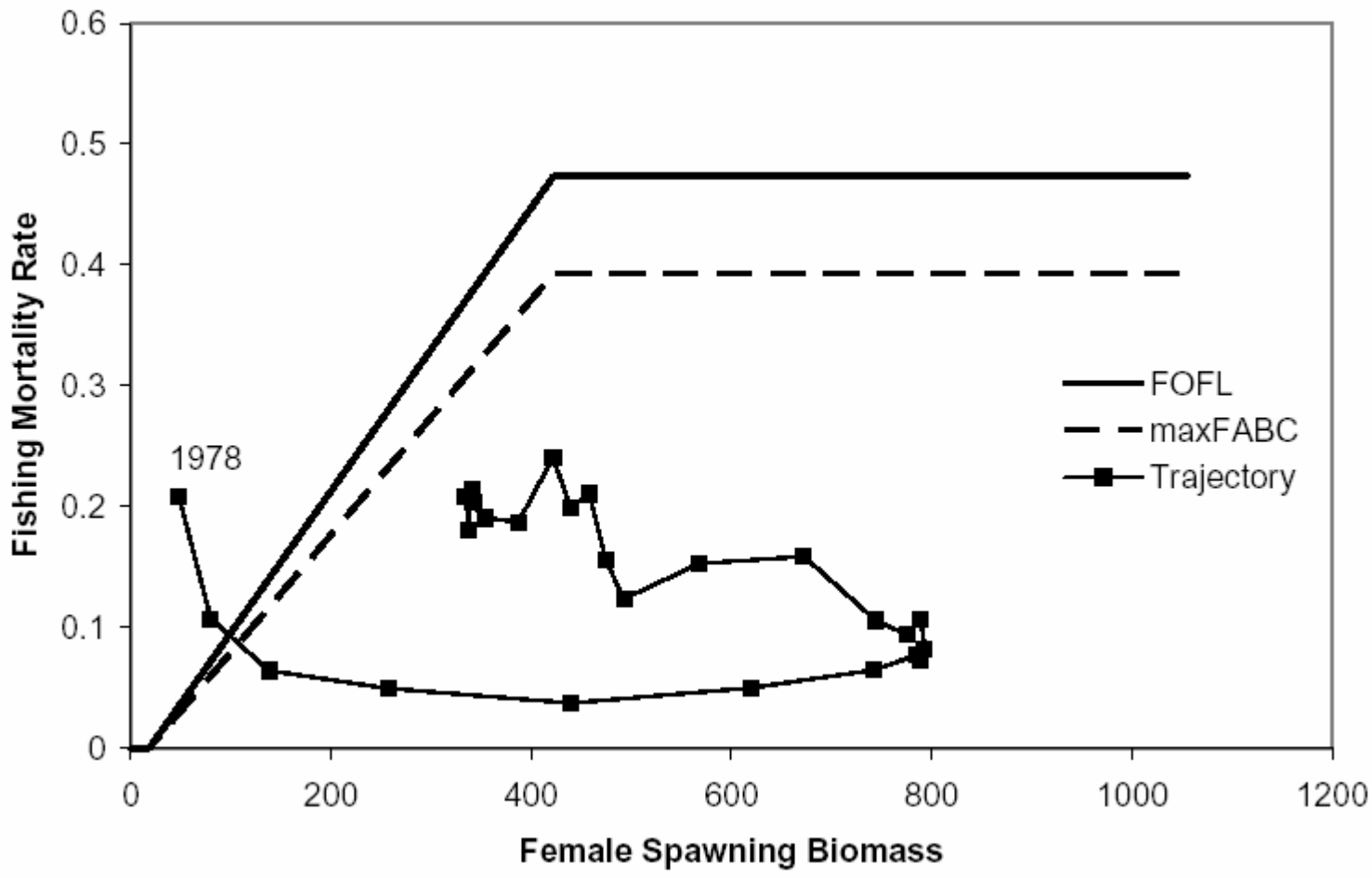
Results

- Definitions
  - Biomass
  - Recruitment
  - Fishing mortality
- Tables
  - Estimated biomass time series
  - Estimated recruitment time series
  - Estimated catch/biomass time series
- Graphs
  - Estimated biomass time series
  - Fishing mortality versus spawning biomass

Example biomass trend (partial)

Year	Age 3+ Biomass		Spawning Biomass		Survey Biomass	
	Last Year	This Year	Last Year	This Year	Last Year	This Year
1978	320	324	48	48	n/a	n/a
1979	474	480	79	80	555	558
1980	1053	1066	136	138	917	921
1981	1576	1593	254	257	1063	1062
1982	2052	2073	435	440	1206	1208
1983	2388	2410	615	620	1135	1135
1984	2429	2450	736	742	1090	1094
1985	2587	2608	780	786	1120	1122
1986	2553	2573	783	789	1105	1108
1987	2627	2647	788	793	1126	1127
1988	2621	2640	784	789	1033	1033
1989	2465	2482	770	775	866	866
1990	2209	2223	739	744	709	710
1991	1927	1938	669	672	646	648
1992	1736	1746	565	568	694	694
1993	1690	1698	490	493	730	728
1994	1669	1674	473	475	749	746
1995	1692	1694	457	458	738	732

Example F versus B plot



Projections and Harvest Alternatives

- Values of tier-specific reference points
- OFL, *max* ABC, and associated Fs
- Seven standard harvest scenarios
- 12-year projections for each scenario
  - Catch
  - Spawning biomass
  - Fishing mortality rate
- ABC recommendation
- Area allocations, if any

Example projection (partial)

Spawning Biomass Projections

Year	L90%CI	Median	Mean	U90%CI	St. Dev.
2004	435	435	435	435	0.00
2005	446	447	447	447	0.25
2006	438	441	442	449	3.86
2007	416	436	440	481	21.06
2008	392	442	452	542	49.92
2009	376	456	468	601	73.80
2010	370	468	483	643	87.88
2011	371	479	495	659	94.85
2012	373	488	503	678	97.66
2013	374	493	507	693	99.01
2014	376	497	510	693	99.78
2015	378	496	512	687	99.81
2016	382	501	514	697	98.98

Fishing Mortality Projections

Year	L90%CI	Median	Mean	U90%CI	St. Dev.
2004	0.29	0.29	0.29	0.29	0.000
2005	0.29	0.29	0.29	0.29	0.000
2006	0.29	0.29	0.29	0.29	0.000
2007	0.28	0.29	0.29	0.29	0.003
2008	0.26	0.29	0.28	0.29	0.009
2009	0.25	0.29	0.28	0.29	0.013
2010	0.25	0.29	0.28	0.29	0.014
2011	0.25	0.29	0.28	0.29	0.014
2012	0.25	0.29	0.28	0.29	0.014
2013	0.25	0.29	0.28	0.29	0.014
2014	0.25	0.29	0.28	0.29	0.013
2015	0.25	0.29	0.28	0.29	0.012
2016	0.26	0.29	0.28	0.29	0.012

Ecosystem Considerations

- Ecosystem effects on the stock
  - Prey abundance trends
  - Predator abundance trends
  - Changes in habitat quality
- Fishery effects on the ecosystem
  - Incidental catch of prohibs, forage, nontargets
  - Concentration of fishery in space and time
  - Discards and offal production
  - Effects on EFH nonliving substrate
- Data gaps and research priorities

Example bycatch table (partial)

	Bycatch in EBS Pacific cod longline fishery						Proportion of total EBS catch					
Species group	1997	1998	1999	2000	2001	2002	1997	1998	1999	2000	2001	2002
sculpin	706	931	821	801	1142	1383	0.11	0.18	0.18	0.14	0.19	0.18
skates	12961	12808	9178	11578	11932	17507	0.77	0.70	0.69	0.68	0.66	0.66
shark	27	48	18	47	17	22	0.50	0.40	0.11	0.78	0.70	0.48
salmonshk	0	1	1	0	1	10	0.00	0.05	0.04	0.01	0.05	0.22
dogfish	4	5	5	8	11	8	1.00	0.90	0.99	0.98	0.83	0.92
sleepershk	67	114	99	114	240	250	0.24	0.34	0.35	0.33	0.37	0.30
octopus	15	15	13	29	15	76	0.07	0.10	0.10	0.08	0.08	0.19
squid	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
smelts	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
gunnel	0	0	0	0	0	0		0.60	0.00	0.80	0.00	0.00
sticheidae	0	0	0	0	0	0	0.01	0.00	0.00	0.00	0.00	0.56
sandfish	0	0	0	0	0	0	0.00	0.00	0.01	0.00	0.00	0.00
lanternfish	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
sandlance	0	0	0	0	0	0	0.00		0.00	0.00	0.00	0.00
grenadier	437	604	356	364	162	336	0.15	0.12	0.08	0.09	0.07	0.06
otherfish	43	27	38	38	71	122	0.03	0.03	0.04	0.03	0.06	0.11

Summary

- Tier
- Reference mortality rates
  - M, F35%, F40%
- Equilibrium spawning biomass
  - B35%, B40%, B100%
- Projected biomass for next year
  - Spawning, summary age range
- ABC for next year
  - Maximum permissible, recommended
- Overfishing level for next year

Example summary

Tier	3a
Reference mortality rates	
M	0.37
$F_{40\%}$	0.39
$F_{35\%}$	0.47
Equilibrium spawning biomass	
$B_{35\%}$	370,000 t
$B_{40\%}$	422,000 t
$B_{100\%}$	1,060,000 t
Projected biomass for 2004	
Spawning (at $max\ F_{ABC}$)	435,000 t
Age 3+	1,660,000 t
ABC for 2004	
F_{ABC} (maximum permissible)	0.39
F_{ABC} (recommended)	0.29
ABC (maximum permissible)	297,000 t
ABC (recommended)	223,000 t
Overfishing level for 2004	
Fishing Mortality	0.47
Catch	350,000 t