The Status of Dover Sole off the U.S. West Coast in 2005

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* * * * * ***Final Version*** * * * * *

In memory of Bob Mikus,

who read countless Dover sole otoliths

and trained others in that subtle art.

EXECUTIVE SUMMARY

Stock

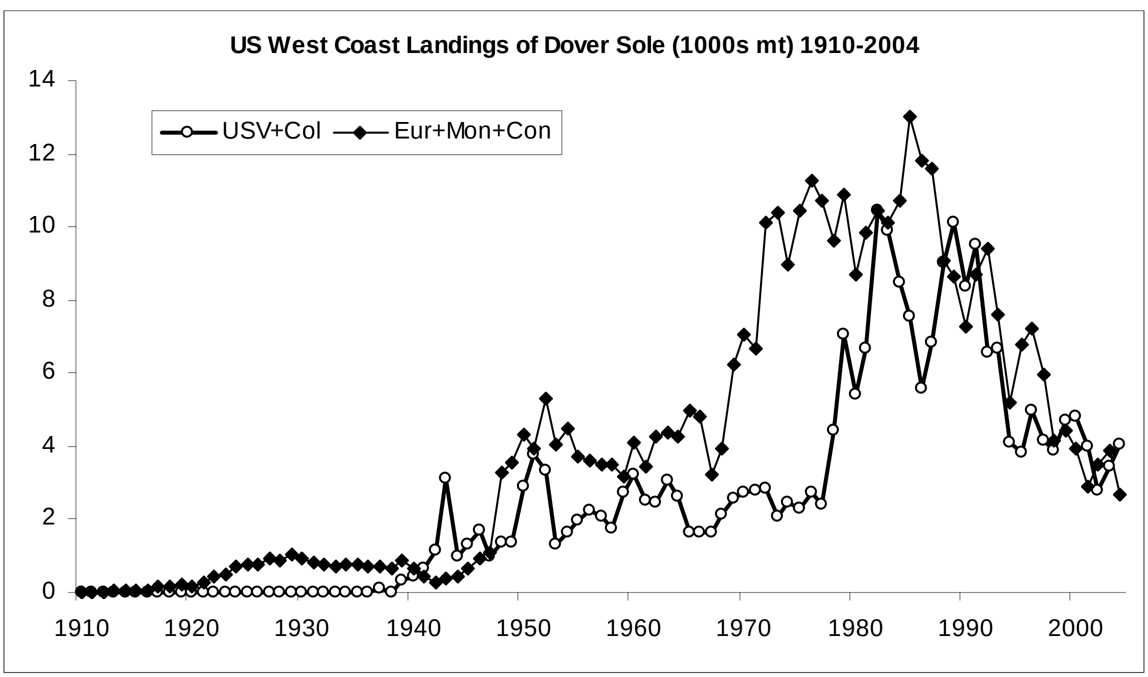
This assessment applies to the Dover sole (*Microstomus pacificus*) that reside in the waters off California, Oregon and Washington in the region bounded by the U.S. borders with Canada and Mexico. This assessment treats these fish as a unit stock. Dover sole are also harvested from the waters off British Columbia and in the Gulf of Alaska.

Catches

Dover sole have been the target of trawl operations along the west coast of North America since World War II and were almost certainly caught prior to the war as incidental take in directed fisheries for English sole and petrale sole. Almost all of the harvests have been taken by groundfish trawl. Annual landings from U.S. waters averaged 6,708 mt during the 1960s, 12,792 mt during the 1970s, 18,383 mt during the 1980s, 12,350 mt during the 1990s, and 7,213 mt since 2000. Discarding of small, unmarketable fish is an important, but poorly documented feature of the fishery.

Recent landings (mt) of Dover sole from Pacific Council waters.

INPFC Region	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
US Vancouver	1179.4	1459.3	995.8	897.5	1107.4	1261.4	1455.4	765.7	838.4	979.3
Columbia	2626.7	3514.7	3157.9	2976.0	3611.2	3553.1	2519.1	2030.6	2626.9	3079.3
Eureka	2404.9	2648.4	2113.3	2289.0	2225.9	2003.2	1498.9	1497.0	1955.4	1125.7
Monterey	3252.1	3242.0	2748.8	1276.5	1749.6	1703.7	1294.5	1719.4	1599.3	1245.8
Conception	1101.9	1322.2	1108.6	571.5	443.3	238.5	121.2	288.3	352.2	312.5
US Total	10565.1	12186.5	10124.3	8010.4	9137.4	8759.9	6889.2	6301.1	7372.2	6742.6



Data and Assessment

The U.S. west coast stock of Dover sole was last assessed in 2001. The current assessment used the new version of the Stock Synthesis program (SS2 version 1.19) and separated the length and age composition data into two fisheries: a northern fishery operating in the US Vancouver and Columbia INPFC regions and a southern fishery operating in the Eureka, Monterey and Conception regions. The period modeled in the assessment extended from 1910 to 2004 with fishing beginning in 1911. Data in the assessment model included fishery length composition data from 1966 to 2004, fishery age composition data from 1981 to 2004, a biomass index derived from trawl logbook catch rates (1978 to 1995), and biomass estimates and length and age composition data from bottom trawl research surveys of the shelf (1980 to 2004) and slope (1992 to 2004). As in previous assessments of Dover sole, retention and discarding were modeled using logistic functions of length.

Unresolved Problems and Major Uncertainties

Just before the STAR Panel review, when working up results from the preliminary base model runs with randomized starting parameter values, it became apparent that the likelihood surface was very irregular and that the model often converged to parameter estimates that were not the globally best estimates. During development of the model, while exploring alternative model configurations and fixed parameter values, problems with model convergence lead to the conclusion that small lambda values were needed on the likelihood components for the age composition and mean length-at-age observations. It appears that there are fundamental tensions among some of the different data sources that can be resolved in multiple ways, leading to numerous local extrema on the likelihood surface. After the STAR Panel review experiments were conducted using different sequences of phases in the SS2 control file and some phasing sequences produced much better model convergence. However, none of the sequences that were tried fully solved the problem of convergence to local minima on the negative log-likelihood surface.

The size and sex distributions of Dover sole are highly variable by depth and between INPFC areas and have changed over time. It is difficult to determine whether these variations are due to differences in size-related discarding or to differences in selection, related either to gear or to depth of fishing. The size-discards and size-selection effects are confounded in the fishery size-composition data. Only a few observations are available for the size-distributions of discarded fish.

The West Coast Groundfish Observer Program data indicate considerable latitudinal differences in the pattern of discarding of Dover sole caught in deep water (> 300 fa). In the south (Eureka to Conception) the discarded fish are slightly heavier on average than the retained fish, possibly due to discarding of large "jellied" fish, whereas in the north (US Vancouver and Columbia) the discarded fish are lighter. The pattern in the north is consistent with the assumption that smaller fish are discarded. The current version of Stock Synthesis cannot generate discarded fish that are heavier than the retained fish as was observed in the south.

The available Dover sole age composition data do not appear to be very informative. Plots of the age composition data do not show any obvious evidence of strong or weak year classes. This could be due to age-reading error or because Dover sole exhibit considerable variation in length-at-age with depth. In future assessments it might be worthwhile compiling the data into separate fisheries by depth (as attempted in the 2001 assessment), but this approach will be problematic because fishing trips can cover multiple depths and depth data are not always available for Dover sole market samples.

Differences in length-at-age, especially for old fish, were evident in the observed data from the AFSC versus the NWFSC slope surveys. The two surveys used different vessels and tow durations that may have resulted in differing trawl selection characteristics. It is plausible that the shorter NWFSC survey tows (15 versus 30 minutes) resulted in greater escapement of larger fish. Differences in mean length-at-age between the two surveys seemed to be a major source of the tension in the data and almost certainly contributed to the model convergence problem.

The current version of Synthesis does not have any options for selection curves in which peak selection occurs at different lengths for females versus males, and yet this seems to be a distinct feature in the Dover sole length composition data from the trawl surveys and the fisheries.

None of the numerous model configurations that were explored were able to resolve the conflicting signals that were evident in the Dover sole length composition data versus the age composition data versus the mean length-at-age data.

None of the numerous model configurations that were explored were able to fit the unusual bimodal length compositions that were observed in the female Dover sole collected during both slope surveys.

Reference Points

In June 2000 the Pacific Fishery Management Council (PFMC) endorsed the recommendation of the West Coast Groundfish Harvest Policy Workshop that F40% be used as the default target rate of fishing mortality for Council-managed flatfish species. The current assessment uses the F40% default to make harvest projections for Dover sole. Based on the Council's default harvest control rule for groundfish, the stock of Dover sole would be considered to be "overfished" whenever the spawning stock biomass (SB) was less than 25% of the unexploited level, SB(0).

The current assessment estimates that the Dover sole stock can support a maximum sustainable yield (MSY) of about 16,500 tons per year, which is considerably larger than the current OY and coastwide catches in any recent years.

Reference Points	Value	Units
Unfished Stock		
Spawning Biomass, SB(0)	299,054	mt
Spawning Biomass / Recruit	2.15	kg / fish
Annual Recruitment	138,970	1000s fish
F40% Proxy for MSY *		
Spawning Biomass / Recruit	0.926	kg / fish
Exploitation Rate	6.72%	
MSY	16,505	mt
SB(MSY)	117,281	mt
SB(MSY) / SB(0)	39.2%	

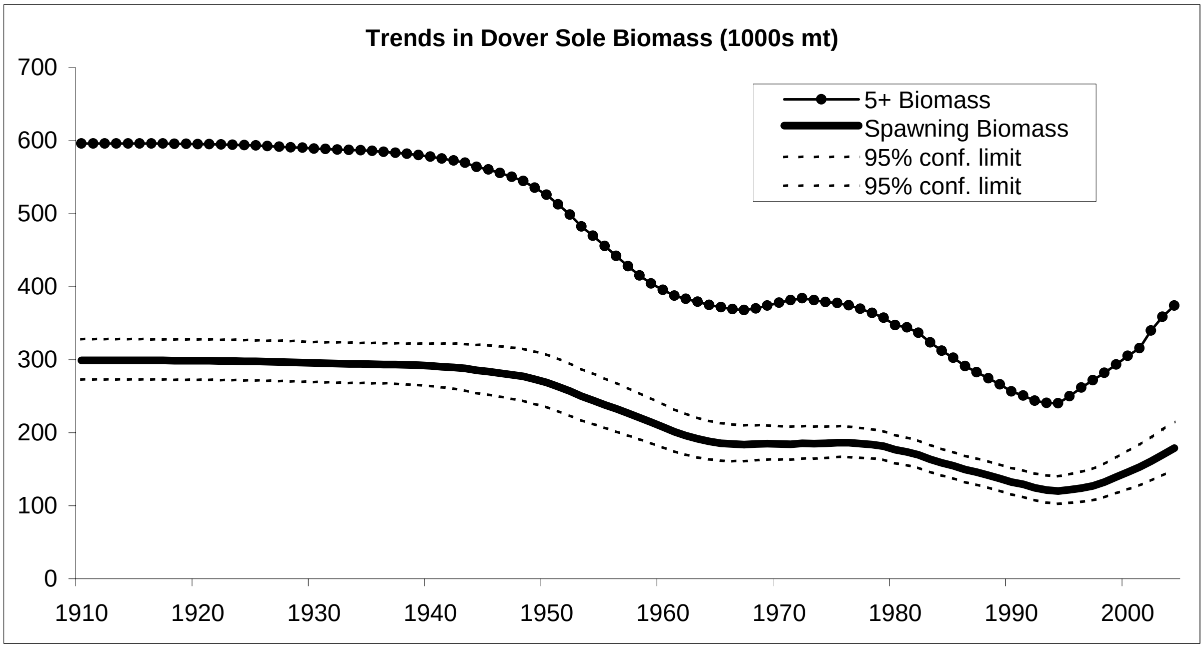
* Based on the current maturity schedule, which differs from the historic schedule.

Stock Biomass

The final base model estimated the unexploited spawning stock biomass to be slightly less than 300,000 mt and spawning biomass at the start of 2005 was estimated to be about 189,000 mt, equivalent to 63% of the unexploited level. Spawning biomass and age 5+ biomass (roughly corresponding to the exploitable biomass) were estimated to have reached their lowest points in the mid-1990s and have been rising steadily since.

Recent trends in Dover sole spawning biomass and depletion.

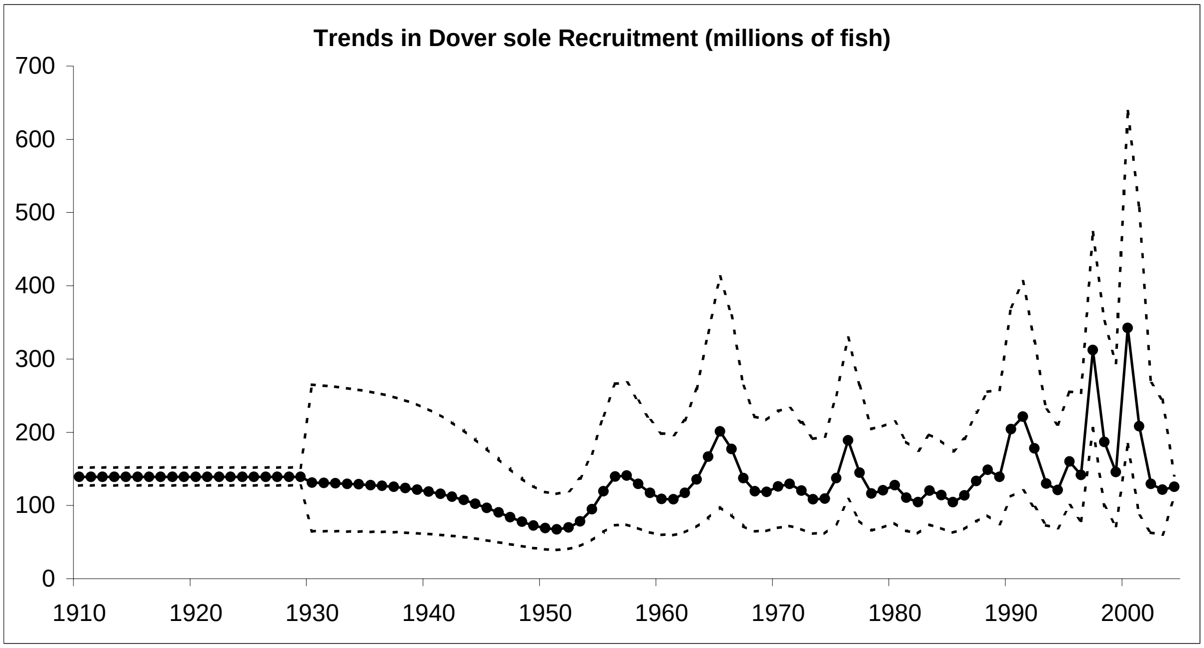
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Spawning Biomass (1000s mt)	121.8	124.3	127.1	132.3	139.4	146.1	153.1	161.0	169.8	178.8
% of Virgin	40.7%	41.5%	42.5%	44.2%	46.6%	48.9%	51.2%	53.8%	56.8%	59.8%
Age 5+ Biomass (1000s mt)	250.1	262.0	272.1	282.0	293.2	305.1	316.0	339.8	358.9	374.2



Recruitment

The estimated increases in biomass since the mid-1990s are due primarily to strong year classes in 1990 and 1991, and exceptionally strong year classes in 1997 and 2000.

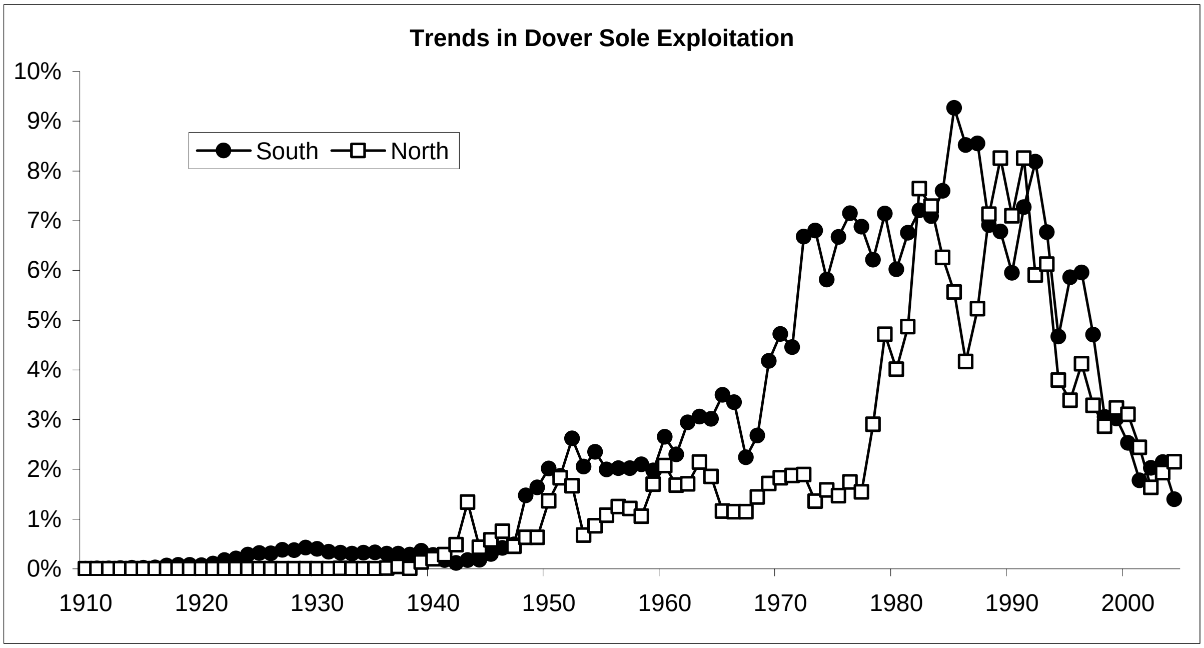
Recent trends in Dover sole recruitment.										
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Recruits (millions)	159.9	141.6	312.0	186.6	145.6	342.5	208.1	129.4	121.4	125.4



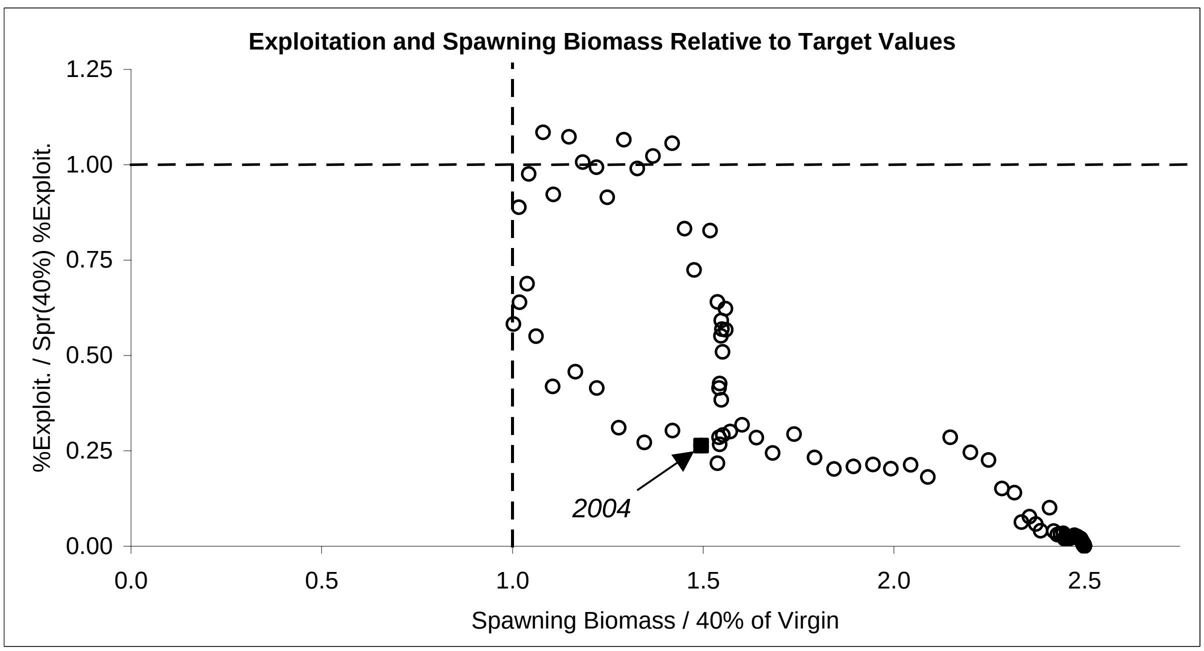
Exploitation Status

Exploitation of Dover sole was estimated to have reached a peak of 9.3% in 1985 in the southern fishery and a peak of 8.3% in 1991 in the northern fishery. In general, the exploitation rate has been relatively low.

Recent trends in Dover sole exploitation.										
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
South	5.86%	5.95%	4.71%	3.05%	3.02%	2.53%	1.78%	2.03%	2.15%	1.40%
North	3.39%	4.12%	3.28%	2.86%	3.23%	3.11%	2.44%	1.64%	1.93%	2.15%



Over the stock's history the exploitation rate has been smaller than the F40% target exploitation rate during all but six years and the spawning biomass has been well above 40% of the unexploited level, except during a few years when it approached the 40% level.



Management Performance

Based on the Dover sole landings statistics and the base model's estimates of discards, the coastwide catch of Dover sole was greater than the Acceptable Biological Catch (ABC) or Optimum Yield (OY) limits for three of ten years since 1995.

<table>
<tr><th colspan="11">Management performance: ABCs versus landings and catch (mt).</th></tr>
<tr><th></th><th>1995</th><th>1996</th><th>1997</th><th>1998</th><th>1999</th><th>2000</th><th>2001</th><th>2002</th><th>2003</th><th>2004</th></tr>
<tr><td>ABC (mt)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>US Vancouver</td><td>2400</td><td>1192 [a]</td><td>1195 [b]</td><td rowspan="4">8373</td><td rowspan="4">8373</td><td rowspan="4">8373</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Columbia</td><td>3000</td><td>3000</td><td>3000</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Eureka</td><td>2900</td><td>2900</td><td>2900</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Monterey</td><td>5000</td><td>3764 [c]</td><td>3764 [c]</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Conception</td><td>1000</td><td>1000</td><td>1000</td><td>1053</td><td>1053</td><td>1053</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Coastwide</td><td>14300</td><td>11855</td><td>11859</td><td>9426</td><td>9426</td><td>9426</td><td>8510</td><td>8510</td><td>8510</td><td>8510</td></tr>
<tr><td>Coastwide OY</td><td></td><td></td><td></td><td></td><td></td><td></td><td>7440</td><td>7440</td><td>7440</td><td>7440</td></tr>
<tr><td>Landings</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>US Vancouver</td><td>1179</td><td>1459</td><td>996</td><td>897</td><td>1107</td><td>1261</td><td>1455</td><td>766</td><td>838</td><td>979</td></tr>
<tr><td>Columbia</td><td>2627</td><td>3515</td><td>3158</td><td>2976</td><td>3611</td><td>3553</td><td>2519</td><td>2031</td><td>2627</td><td>3079</td></tr>
<tr><td>Eureka</td><td>2405</td><td>2648</td><td>2113</td><td>2289</td><td>2226</td><td>2003</td><td>1499</td><td>1497</td><td>1955</td><td>1126</td></tr>
<tr><td>Monterey</td><td>3252</td><td>3242</td><td>2749</td><td>1276</td><td>1750</td><td>1704</td><td>1295</td><td>1719</td><td>1599</td><td>1246</td></tr>
<tr><td>Conception</td><td>1102</td><td>1322</td><td>1109</td><td>571</td><td>443</td><td>239</td><td>121</td><td>288</td><td>352</td><td>312</td></tr>
<tr><td>Coastwide</td><td>10565</td><td>12186</td><td>10124</td><td>8010</td><td>9137</td><td>8760</td><td>6889</td><td>6301</td><td>7372</td><td>6743</td></tr>
<tr><td>Catch, including estimated discards</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Coastwide</td><td>11744</td><td>13043</td><td>10861</td><td>8575</td><td>9738</td><td>9295</td><td>7292</td><td>6675</td><td>7815</td><td>7145</td></tr>
</table>

[a] The ABC was specified as a range of values, 818-1565 mt.
[b] The ABC was specified as a range of values, 820-1570 mt.
[c] The ABC was specified as a range of values, 3164-4363 mt.

Forecasts

Projections of future catches were made based on an F40% rate of fishing mortality and the following assumptions: total catches during 2005 and 2006 would be at the OY levels specified by the Council (total catch each year of 7440 mt); the selection and retention curves operating in the southern and northern fisheries would continue unchanged from the curves estimated for 2004; and the proportion of the catch taken each year by the southern fishery would be 47.2%. Because the projected spawning biomass was greater than 40% of SB(0), no there were no 40:10 harvest control rule adjustments and the OY values were all equivalent to the ABC values.

Forecasts of Optimum Yield catches, biomass, and depletion.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total Catch (mt)	7440	7440	30146	29960	29453	28582	27433	26159	24903	23757
Spawning Biomass (1000s mt)	189.0	199.9	211.4	211.4	210.0	206.8	202.2	196.5	190.4	184.2
% of Virgin	63.2%	66.8%	70.7%	70.7%	70.2%	69.2%	67.6%	65.7%	63.7%	61.6%

Decision Table

The decision table was developed using a format specified by the STAR Panel. Three alternative states of nature were defined in terms of the natural mortality coefficient: M = 0.07 $^{-yr}$ for the pessimistic alternative state of nature and M = 0.11 $^{-yr}$ for the optimistic alternative state of nature, with the base model (M = 0.09 $^{-yr}$) as the intermediate alternative state of nature. Three alternative management actions were defined in terms of the stream of catches: a low catch series based on the recent average catches, a high catch series based on the projected F40% ABC values derived from the base model, and an intermediate catch series based on twice the recent average catches. The projections in the decision table were made using the same set of assumptions that were used in the harvest forecasts (above).

Decision Table for Dover sole

				State of Nature					
				M = 0.07		M = 0.09		M = 0.11	
				Less likely		*More likely*		*Less likely*	
		Landings (mt)		**Low Stock Size**		**Base Model**		**High Stock Size**	
Management		South	North	Sp. Bio.		Sp. Bio.		Sp. Bio.	
Action	Year	(47.2%)	(52.8%)	(1000s mt)	%Virgin	(1000s mt)	%Virgin	(1000s mt)	%Virgin
	2005	3298	3718	152.2	50.2%	189.0	63.2%	252.0	75.8%
	2006	3301	3719	161.7	53.4%	199.9	66.8%	264.9	79.7%
	2007	3402	3811	171.7	56.7%	211.4	70.7%	278.3	83.7%
	2008	3402	3811	181.6	59.9%	222.7	74.5%	291.5	87.7%
Low Catch	2009	3402	3811	190.7	62.9%	233.0	77.9%	303.4	91.3%
2000-2004	2010	3402	3811	198.7	65.6%	241.8	80.9%	313.2	94.2%
average	2011	3402	3811	205.4	67.8%	248.8	83.2%	320.5	96.4%
	2012	3402	3811	210.6	69.5%	254.0	84.9%	325.5	97.9%
	2013	3402	3811	214.7	70.9%	257.7	86.2%	328.6	98.8%
	2014	3402	3811	217.9	71.9%	260.2	87.0%	330.2	99.3%
	2015	3402	3811	220.2	72.7%	261.8	87.5%	330.8	99.5%
	2016	3402	3811	222.0	73.3%	262.7	87.8%	330.5	99.4%
	2005	3298	3718	152.2	50.2%	189.0	63.2%	252.0	75.8%
	2006	3301	3719	161.7	53.4%	199.9	66.8%	264.9	79.7%
	2007	6803	7623	171.7	56.7%	211.4	70.7%	278.3	83.7%
	2008	6803	7623	177.7	58.6%	218.8	73.2%	287.8	86.5%
Medium Catch	2009	6803	7623	182.7	60.3%	225.2	75.3%	295.8	88.9%
Double the	2010	6803	7623	186.4	61.5%	229.9	76.9%	301.6	90.7%
2000-2004	2011	6803	7623	188.6	62.2%	232.7	77.8%	305.0	91.7%
average	2012	6803	7623	189.4	62.5%	233.8	78.2%	306.2	92.1%
	2013	6803	7623	189.1	62.4%	233.5	78.1%	305.7	91.9%
	2014	6803	7623	187.9	62.0%	232.2	77.7%	303.9	91.4%
	2015	6803	7623	186.2	61.4%	230.2	77.0%	301.3	90.6%
	2016	6803	7623	184.0	60.7%	227.7	76.1%	298.2	89.7%
	2005	3298	3718	152.2	50.2%	189.0	63.2%	252.0	75.8%
	2006	3301	3719	161.7	53.4%	199.9	66.8%	264.9	79.7%
	2007	13572	14950	171.7	56.7%	211.4	70.7%	278.3	83.7%
	2008	13529	14913	170.1	56.1%	211.4	70.7%	280.4	84.3%
High Catch	2009	13353	14716	167.1	55.2%	210.0	70.2%	280.8	84.5%
OY for F40%	2010	13009	14318	162.6	53.7%	206.8	69.2%	279.2	84.0%
including	2011	12523	13759	156.8	51.7%	202.2	67.6%	275.7	82.9%
any 40:10	2012	11959	13120	150.1	49.5%	196.5	65.7%	270.7	81.4%
adjustment	2013	11384	12482	143.1	47.2%	190.4	63.7%	265.0	79.7%
	2014	10847	11899	136.2	44.9%	184.2	61.6%	259.1	77.9%
	2015	10372	11394	129.6	42.8%	178.3	59.6%	253.3	76.2%
	2016	9968	10970	123.3	40.7%	172.8	57.8%	248.0	74.6%

Research and Data Needs

- The problem of model convergence to local extrema created major difficulties in this assessment because small changes in parameter values did not always produce coherent changes in the model results. Strategies are needed that will help analysts navigate irregular likelihood surfaces. Modification to the phasing used in SS2 seemed to offer a possible solution, but currently there is no theory and little experience to provide guidance on how to set the phasing.
- Data are needed on the length compositions of discarded Dover sole so that the retention function can be estimated more accurately and to help disentangle changes in selection from changes in retention.
- The West Coast Groundfish Observer Program data seemed to indicate large differences in discarding practices between northern and southern fishers, particularly regarding the mean weight of discarded fish compared to the weight of retained fish. These inconsistencies need to be more fully explored so that they can be plausibly modeled.
- In all of the slope surveys the female Dover sole in the Monterey region had a bimodal distribution in length with large numbers of big fish in deep water (500-699 fa). This unusual feature should be more fully explored so that it can be plausibly modeled. Genetic studies or chemical analysis of otoliths might indicate the source of the unusual abundance of these large females, which currently are a source of spawning biomass that is not adequately accounted for by the stock assessment model.
- For Dover sole the CV of length-at-age is not a linear function of length (Fig. 7) but is approximately a linear function of age. The SS2 software should be modified to allow the CV of length-at-age to be interpolated as a function of age instead of length.
- For Dover sole the two sexes seem to have different lengths for peak selection. The SS2 software should be modified to allow greater flexibility in modeling sex differences in selection.

Rebuilding Projections

The stock of Dover sole is estimated to be well above the overfished level. No rebuilding is required.

Regional Management Concerns

There is no genetic evidence to suggest that there are separate biological stocks of Dover sole off the US West Coast. Nor are there any important latitudinal differences in growth or maturity that could result in regional differences in productivity. Further, the current assessment results show that the northern and southern fisheries have similar patterns of selection and have produced very similar rates of exploitation. While there may be legitimate economic and equity reasons for regional apportionments of the Dover sole harvest, there does not appear to be any biological basis for such an apportionment.

Summary Tables for Dover Sole.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total Catch (mt)	11744	13043	10861	8575	9738	9295	7292	6675	7815	7145	
Discards (model predicted)	1179	857	737	564	600	535	402	374	443	403	
Landings	10565	12186	10124	8010	9137	8760	6889	6301	7372	6743	
ABC	14300	11855	11859	9426	9426	9426	8510	8510	8510	8510	8510
OY							7440	7440	7440	7440	7440
SPR	49.7%	47.1%	54.3%	62.9%	61.3%	64.1%	71.3%	74.5%	72.2%	75.1%	
Exploitation Rate	4.30%	4.62%	3.70%	2.81%	3.07%	2.79%	2.09%	1.83%	2.04%	1.77%	
Age-5+ Biomass (mt)	250105	261989	272062	282032	293224	305080	315954	339828	358927	374206	402584
Spawning Biomass (mt)	121839	124256	127093	132275	139363	146141	153056	161014	169794	178801	188987
Lower 95% Conf. Limit	103763	105427	107295	111280	117005	122359	127818	134265	141438	148717	157020
Upper 95% Conf. Limit	143063	146447	150545	157232	165994	174545	183277	193092	203835	214970	227462
% of Virgin SB	40.7%	41.5%	42.5%	44.2%	46.6%	48.9%	51.2%	53.8%	56.8%	59.8%	63.2%
Recruitment (1000s fish)	159880	141640	312010	186630	145560	342480	208060	129370	121410	125400	126120
Lower 95% Conf. Limit	100168	79032	205696	99057	71950	183761	85596	62767	60266	111330	62220
Upper 95% Conf. Limit	255188	253845	473272	351624	294478	638288	505735	266645	244588	141249	255643

		95% Conf. Limits	
	Estimate	Lower	Upper
Unfished Spawning Biomass	299054	272724	327926
Unfished Age-5+ Biomass	596145		
Unfished Recruitment	138970	127149	151890
Spawning Biomass at MSY *	117281		
Basis for SB(MSY)	F(40%)		
SPR(MSY)	40%		
Exploitation for SPR(MSY) *	6.72%		
MSY *	16504.9		

* Based on the current maturity schedule, which differs from the historic schedule.

INTRODUCTION

Dover sole (*Microstomus pacificus*) is a commercially important flatfish species that has been the target of trawl operations along the west coast of North America since before World War II. They range from Baja California to the Bering Sea and eastern Aleutian Islands (Kramer et al. 1995). Dover sole are generally found on mud or muddy-sand deeper than 20 fathoms (37 m) and out to 750 fathoms (1372 m). They feed on polychaete worms, pink shrimp, brittle stars, gammarid amphipods, and small bivalves (Pearcy and Hancock 1978, Gabriel and Pearcy 1981). Stomachs from 846 Dover sole caught by coastwide trawl surveys during 1989, 1991, and 1992, indicated that the diets of Dover sole in this region are dominated by polychaete worms and brittle stars, with some variation by latitude and depth (Buckley et al. 1999). Dover sole live to a maximum age of about 50 years, with females attaining a maximum length of 55 to 60 cm, about 5 to 10 cm longer than the males. The sex ratio in the landed catch is almost 50:50, with males predominating at lengths less than about 38 cm, females predominating at greater lengths, and males being slightly dominant overall. Based on research survey tows Jacobson and Hunter (1993) found that the catches of Dover sole in a given area and depth zone were not randomly distributed by sex, with males and females tending to occur in separate patches. Furthermore, Dover sole undergo ontogenetic shifts in their distribution with fish gradually moving to deeper water as they age and grow.

Based on samples from the commercial fishery in northern California Hagerman (1952) concluded that the spawning period in Dover sole is during November to March or April with heavy spawning during December to February. Dover sole eggs and larvae are buoyant (Hagerman 1952) and this species has an extended larval phase lasting at least one year (Pearcy et al. 1977, Markle et al. 1992, Butler et al. 1996). Fecundity is related to size with a 40 cm female producing about 40,000 oocytes and a 55 cm female producing about 160,000 oocytes (Yoklavich and Pikitch 1989). Spawning occurs in relatively deep water. Westrheim and Morgan (1963) reported that in February 1954 trawlers from Oregon discovered the so-called Willapa Deep spawning ground, located in 180-280 fathoms off Willapa Bay, WA. Prior to 1954 few Dover sole were caught during winter months because the fish are generally unavailable on the shelf during winter.

Stock structure is not well understood. Given the extended larval phase and open oceanographic system along the west coast of North America, it seems likely that Dover sole larvae could be widely dispersed from the spawning grounds. Stepien (1999) used sequences of mitochondrial DNA extracted from Dover sole sampled at six sites ranging from southern California to the Gulf of Alaska. The study identified 90 unique haplotypes from the 110 fish examined. The results indicated phylogeographical structure in west coast Dover sole with spatial clustering of genetically similar individuals. However, there were several unusual clusters of specimens having apparently similar genetic make-up although they were geographically separated (e.g., fish from Alaska with similar genetics as fish from San Diego).

Results from tagging studies during 1948-79 indicated seasonal movements of Dover sole onto the shelf in the summer and off the shelf in the winter, but little evidence of north-south movement or appreciable mixing between Pacific Marine Fisheries Commission (PMFC) statistical areas (Westrheim et al. 1992). A few tagged fish moved long distances, however. For example, Westrheim and Morgan (1963) reported that a fish caught and tagged in the Willapa Deep area off Washington was subsequently recaptured off Humboldt Bay, CA, 360 nautical miles south. Barss and Demory (1988) reported having records for 13 tagged fish that were recaptured after 10 or more years at liberty. The fish at liberty the longest, for 22 years, was recaptured within 1 nautical mile of its original release location.

The Dover sole that reside in Canadian waters are treated as two distinct stocks in assessments and for management: a southern stock off Vancouver Island that was lightly fished and unregulated until 1992; and a northern stock that has been regulated with annual catch quotas since 1981 (Fargo 1999). The fishery on the northern stock operates in the northern Hecate Strait during May to October and then off the west coast of the Queen Charlotte Islands from December to April when the fish are on the spawning grounds. Canadian fishers have landed about 2000 mt of Dover sole annually since 1989. The recommended low-risk yield options for 2000 were 1000 mt for the southern stock and 800 mt for the northern stock; the high-risk yield options were 1500 mt and 1200 mt. These same levels of yield were also recommended for 1998 and 1999. The Canadian stocks have not been assessed since 1999 but an updated assessment is planned for 2006 (personal communication: Jeff Fargo, Fisheries & Oceans Canada, Nanaimo, British Columbia).

In the Gulf of Alaska the flatfish fishery has caught substantial quantities of Dover sole, with the peak of 9,740 mt in 1991, diminishing to 682 mt in 2004 (Turnock and A'mar 2004). Recent flatfish landings have been limited by the early closures of the fishery due to attainment of the by-catch quota for Pacific halibut. Triennial bottom trawl survey estimates of biomass for Dover sole in the Gulf of Alaska (GOA) declined from 96,600 mt in 1990 to 63,800 mt in 1999, but rose to 99,300 mt in 2003. Bottom trawl surveys have indicated that Dover sole are a small component of the flatfish biomass in the Aleutian Islands and are negligible in the Bering Sea. The GOA stock of Dover sole was recently assessed with an age-based model, which estimated that biomass had decreased to 102,000 mt in 2004 from about 168,000 mt in the mid-1980s. The projected $F_{40\%}$ yield for 2005 was 6,642 mt.

Management performance

Until fairly recently the annual U.S. West Coast landings of Dover sole were generally smaller than the annual Acceptable Biological Catch (ABC) limits established by the Pacific Fishery Management Council. Dover sole were included within trip limits established for a complex of deepwater species, consisting of Dover sole, thornyheads (*Sebastolobus* spp.), sablefish (*Anoplopoma fimbria*), and arrowtooth flounder (*Atheresthes stomias*). Arrowtooth flounder were dropped from deepwater complex limits beginning in 1990. Trip limits specific for Dover sole were implemented for portions of 1994 and 1996 and at the start of 1997 and years thereafter (Table 1). Catches of the deepwater species during earlier years were controlled primarily by trip limits on the landings of sablefish and thornyheads, for which the fishers received much higher prices (Fig. 1).

In studies of trawl logbook data from California (1985-91), Washington (1986-92), and Oregon (1987-93), Sampson (1996, 1997) tabulated how many trawl trips landed within 90% of the trip limits in effect at the time of each trip. Trips were sometimes constrained by the trip limits on sablefish (up to 43% of the trips landing in California, 32% of the trips landing in Oregon, and 27% of the trips landing in Washington). Trips were much less frequently constrained by the trip limits on the deepwater complex (up to 15% of the trips landing in California, 17% of the trips landing in Oregon, and 8% of the trips landing in Washington).

ABCs versus landings and catch (mt).

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
ABC (mt)										
US Vancouver	2400	1192 [a]	1195 [b]							
Columbia	3000	3000	3000	8373	8373	8373				
Eureka	2900	2900	2900							
Monterey	5000	3764 [c]	3764 [c]							
Conception	1000	1000	1000	1053	1053	1053				
Coastwide	14300	11855	11859	9426	9426	9426	8510	8510	8510	8510
Coastwide OY							7440	7440	7440	7440
Landings										
US Vancouver	1179	1459	996	897	1107	1261	1455	766	838	979
Columbia	2627	3515	3158	2976	3611	3553	2519	2031	2627	3079
Eureka	2405	2648	2113	2289	2226	2003	1499	1497	1955	1126
Monterey	3252	3242	2749	1276	1750	1704	1295	1719	1599	1246
Conception	1102	1322	1109	571	443	239	121	288	352	312
Coastwide	10565	12186	10124	8010	9137	8760	6889	6301	7372	6743
Catch, including estimated discards										
Coastwide	11744	13043	10861	8575	9738	9295	7292	6675	7815	7145

[a] The ABC was specified as a range of values, 818-1565 mt.
[b] The ABC was specified as a range of values, 820-1570 mt.
[c] The ABC was specified as a range of values, 3164-4363 mt.

ASSESSMENT DATA

Landings

Landings from 1956 to 2005

The landings data for the current assessment were from PacFIN for 1981-2004 and from Brodziak et al. (1997) for 1956-80 (Table 2). The landings of Dover sole by gear types other than groundfish-trawl have been inconsequential, averaging 0.5% of the coastwide landings during 1981-89, 0.6% during the 90s, and 0.3% since 2000 (PacFIN).

Up until 1980 small amounts of Dover sole were caught and sold as mink food. On a coastwide basis, including Canada, these landings averaged 435 tons per year during 1956-60, 179 tons per year during 1961-70, and 26 tons per year during 1971-80 (Historical Annotated Landings database). Most of these fish (76%) were taken off Oregon, from PMFC areas 2B, 2C, 2D, and 3A. No data are available regarding the age, size, and sex compositions of these catches, but it seems likely that they may have included small fish that would have been unmarketable for human consumption.

Reconstructing Landings for prior to 1956

For the years prior to 1956 the landings of Dover sole were compiled from information reported by state agencies with various adjustments to account for incomplete reporting (Table 3).

California

Landings data for California for the period 1916 to 1968 were published in Heimann and Carlisle (1970). The first landings of Dover sole reported in this document were in 1948, when over seven million pounds were landed. Best (1963) credits changes in processing technology for the rapid development of the fishery for Dover sole.

> "World War II technological advances in freezing fillets transposed Dover sole from a discarded scrap fish to California's most important flatfish. This rapid transposition took place between 1943 and 1948. Credit for developing Dover sole as an acceptable fish for the fillet trade rests with Oregon processors. The Oregon fishery began in 1941 and reached a magnitude of 6.4 million pounds by 1943."

Hagerman (1952) cautions that "trawl gear is not selective for desired species and it must be remembered that although the catch records show that Dover sole was not landed at all, nevertheless there was a constant fishing mortality exerted on the stocks within the fishing areas."

To account for the incidental catch of Dover sole by the early flatfish fisheries it seemed reasonable to assume that the bycatch of Dover sole would be proportional to the landings of English, petrale, and rex sole, which were the targets of important trawl fisheries prior to World War II. Landings of these species were reported as the species level beginning in 1934. Prior to 1931 landings of these species were combined into a single category, "sole". During the period 1934-43 English, petrale, and rex sole accounted for 96.0% of the landings of sole. To estimate the annual bycatch of Dover sole I assumed for the period 1925-47 that the bycatch rate of Dover sole was 0.2 tons of Dover sole for each landed ton of English, petrale, and rex sole. Prior to 1925 I assumed that the bycatch rate declined each year by 0.02 and was 0.18 in 1924, and 0.16 in 1923, and so on, back to 1916, which was the assumed first year of any appreciable catch of Dover sole.

The assumed bycatch rate (0.2 tons of Dover sole for each landed ton of English, petrale, and rex sole) was derived from data collected by the Oregon Department of Fish and Wildlife during flatfish surveys off Oregon and Washington during 1971-77 (Demory et al. 1976, Barss et al. 1977). The flatfish catch rates by species (kg per standard tow) were tabulated by depth categories (< 20 fa, 20-40 fa, 40-60 fa, ...) and the cumulative catches of Dover sole were compared to the cumulative catch of English, petrale, and rex sole. For tows conducted shallower than 120 fa the ratio of Dover sole to the other three soles was 0.213. The peak catch rates of English sole and petrale sole occurred much shallower than 120 fa, whereas the peak catch rate of Dover sole was not until depths of about 180 fa (Fig. 2).

Stock Synthesis assumes that the input data for fishery removals represent landed catches and the program estimates discards based on its reconstruction of the length composition of the catch coupled with a length-retention curve. For the California "landings" prior to 1948 there is a mismatch between the data that were input and how Synthesis modeled those data.

Oregon

Landings data for Oregon for the period 1928-49 were published in Cleaver (1951) and data for 1950-53 were published in Smith (1956). Data for 1954-55 were taken from the corresponding annual volumes of the *Fishery Statistics of the U.S.* Prior to 1942 the flatfish landings were not reported separately by species. The landings for 1954-55 also were not reported at the species level. During the period 1942-46 Dover sole accounted for 35.1% of the overall flatfish landings and during the period 1949-53 Dover sole accounted for 51.3%. These percentages were used to estimate the landings of Dover sole from the reported flatfish landings during each respective period.

Washington

Landings data for Washington for the period 1935-55 were published in the Washington Dept. of Fisheries 68th Annual Report, for the Year 1958. The landings of flounder and sole for the Puget Sound district were assumed to be from catches taken either in Puget Sound or from Canadian waters where much of Washington's fleet operated during this period (Alverson 1960). The landings of sole in other districts was assumed to be comprised of 35.1% Dover sole, which is the percentage of the overall flatfish landings in Oregon that Dover sole accounted for during 1942-46. The landings of West Coast sole in Washington each year during 1935-43 were assumed to be 87.5% of the reported flatfish landings in the non-Puget Sound districts. That percentage was derived from the ratio of Dover sole to flatfish landings during 1944-53.

Estimated Discards

Because it is difficult to cut fillets from small flatfish, fish buyers along the U.S. west coast generally will not purchase small flatfish, including Dover sole. As a consequence, significant but unrecorded numbers of small Dover sole are caught by the trawl fishery and discarded at sea. Based on at-sea observations aboard trawlers operating out of Astoria in 1950, Harry (1956) estimated that 17.0% by number of the Dover sole were discarded. Based on additional at-sea sampling studies (1951, 1953, 1959, 1960, and 1961) Hermann and Harry (1963) estimated total catch weights versus discarded weights of Dover sole and various other species. Averaged across all the studies 14.65% of Dover sole catches by weight were discarded at sea.

Based on sampling at sea during summer 1974, TenEyck and Demory (1975) estimated age-specific retention rates (retained catch in numbers / total catch) and reported ages at 50% retention of 7.4 years for male Dover sole and 6.9 years for females, equivalent to lengths at 50% retention of about 33 cm. Based on data from the 1974 study Methot et al. (1990) reported that the fraction discarded on a weight basis was 16.7%. Methot et al. (1990) also developed a logistic length-retention curve from unpublished data collected during the 1985-87 Pikitch mesh-size study (Pikitch et al. 1988; Wallace et al. 1996) and reported that the length at 50% retention was 30.4 cm for female Dover sole and 30.2 cm for males. On a weight basis 5.2% of the overall Dover sole catch was discarded at sea during the 1985-87 study. For the previous assessment (Sampson and Wood 2001) unpublished data from the 1985-87 Pikitch discard study were obtained from the Oregon Department of Fish and Wildlife (ODFW) and fitted with logistic length-retention curves (Table 4). The length at 50% retention was estimated to be 28.4 cm for males and 29.6 cm for females, and the fraction discarded on a weight basis was 7.0%.

For the previous assessment data sheets from the discard studies described in Hermann and Harry (1963) were located in ODFW storage archives. The data (Table 5) consisted of length frequency measurements taken at sea and comparable measurements taken at the docks, after sorting and discarding of small unmarketable fish. By assuming that the length distributions from the at-sea and dockside samples were identical for fish greater than 40 cm (because only small fish were discarded), a length-retention curve was derived for Dover sole caught in Oregon during 1959-61. The length at 50% retention (33.6 cm, sexes combined) was essentially identical to the value indicated in TenEyck and Demory (1975).

Brodziak et al. (1997) described a discard study during 1989-96 by researchers from Humboldt State University. During 28 observed trips a total of 21,950 pounds of Dover sole were discarded from a total catch of 172,737 pounds. The authors did not specify what portions of the discards were due to the small size of the fish versus due to trip limits.

During 1995-99 Oregon's Expanded Data Collection Program investigated discarding in the West Coast fishery for groundfish aboard vessels participating in that voluntary program. Observers during that study did not identify the reason for discards and collected limited data on the size distributions of discarded Dover sole (length measurements from 1,108 fish caught during 17 different observed trips). Those data suggest that some, but not all, of the discards were small unmarketable fish.

Market acceptance of small Dover sole has not been constant over the years. Peter Leipzig, Executive Director of the Fishermen's Marketing Association, provided the following information from the Association's archives. Market orders did not specify a minimum length until Dec 1, 1956, at which time it was set at 13.5" (34.3 cm). On May 1, 1957 it was set to 13" (33.0 cm) and on Oct 1, 1957 it was again set to 13.5". On May 1, 1963 it increased to 14" (35.6 cm) but on Nov 15, 1963 it dropped to 13.5". On May 1, 1964 it increased again to 14". On March 15, 1974 a split pricing scheme was introduced with a minimum length of 13.5" and a higher price for fish over 14". On Dec 13, 1974 the split pricing scheme was removed and the minimum length was set at 13.5". On Dec 5, 1984 the minimum length dropped to 13" and has remained at that size ever since.

West Coast Groundfish Observer Program

The West Coast Groundfish Observer Program (WCGOP) collected information on the quantities of Dover sole discarded at sea during 2002 and 2003, which Jim Hastie (NWFSC) used in conjunction with trawl logbook data to derive estimates of the quantities of Dover sole discarded and retained by INPFC region and depth stratum (Table 6). For some trips the observers also collected data on the mean weights of fish discarded and retained (Fig. 3). In the shallower depth strata the discarded fish were smaller than the retained fish, but in the deepest stratum (> 300 fa) the fish were the same size as the retained fish in the northern regions, and slightly larger than the retained fish in the southern regions.

The available data on discard rates of Dover sole and the sizes of fish discarded versus retained were provided to the assessment model (below).

Discard information provided to the assessment model.				
		Mean fish weight (kg)		
Year	Discard Rate	Discarded	Retained	Source
Southern Fishery				
1992	12.7%			Humboldt State University study
2002	18.3%	0.555	0.546	WCGOP
2003	11.5%	0.568	0.558	WCGOP
Northern Fishery				
1959	14.6%			Hermann and Harry (1963)
1974	16.7%			Methot et al. (1990)
1986	7.0%			Pikitch study
2002	11.7%	0.366	0.523	WCGOP
2003	13.9%	0.357	0.600	WCGOP

Biological Data and Parameters

Natural mortality

It is notoriously difficult to estimate natural mortality for wild fish populations. One accepted method is to examine the age distribution of an unexploited or lightly exploited stock. Given the long history of the fishery for Dover sole off the U.S. west coast this method cannot be readily applied. In this assessment the Stock Synthesis models used a constant instantaneous natural mortality coefficient of 0.09 yr^{-1} for both sexes, which is the value used in the two previous assessments (Brodziak et al. 1997, Sampson and Wood 2001). This level of natural mortality implies that less than 0.1% of Dover sole recruits would survive 48 years in an unexploited stock, which is consistent with the observed frequency of old Dover sole. Earlier assessments (Methot et al. 1990, Turnock and Methot 1992, Turnock et al. 1994) used a natural mortality coefficient of 0.1 yr^{-1}, based on the maximum age observed at that time, 45 years. The recent assessment for Dover sole in the Gulf of Alaska used a natural mortality coefficient of 0.085 yr^{-1} for both sexes (Turnock and A'mar 2004).

Length-weight relationship

The length-weight parameters for this assessment and the previous one were from Brodziak and Mikus (2000), which analyzed individual length-weight observations from samples of Dover sole collected on the NMFS slope surveys during 1984-93. The following pooled length-weight relationships were used in the Stock Synthesis model:

males $$weight = 0.0037064 \cdot length^{3.2736} ,$$

females $$weight = 0.0044149 \cdot length^{3.2254} ,$$

where weight is measured in g and length in cm.

Length-at-age

Length and age data from Dover sole collected during the NMFS coastwide slope surveys were input to the Stock Synthesis model so the program could internally estimate parameters for the von Bertalanffy growth equations that underlie the growth and selection dynamics in the model. The data were from fish caught by the Alaska Fisheries Science Center (AFSC) R/V *Miller Freeman* during 1997, 1999, 2000, and 2001 and by industry vessels chartered by the Northwest Fisheries Science Center (NWFSC) during 1998 to 2004. Although there was little evidence of any important differences in length-at-age among INPFC regions or between years, there were striking changes in mean length-at-age by depth (Fig. 4 and 5). For example, the age-5 female Dover sole in the 100-199 fa depth stratum averaged 27.7 cm but age-5 females observed in the 600-699 fa depth stratum averaged 38.0 cm. Also, there were some inconsistencies apparent between the two slope surveys, with the fish caught by the AFSC survey attaining larger sizes than fish caught by the NWFSC survey.

As reference curves (but not used directly in this assessment), the following growth equations for Dover sole were published in Brodziak and Mikus (2000), based on data from some of the R/V *Miller Freeman* surveys.

females: $$length = 52.166 \cdot \left\{1 - \exp\left[-0.0909 \cdot (age + 3.218)\right]\right\}$$

males: $$length = 48.164 \cdot \left\{1 - \exp\left[-0.0709 \cdot (age + 6.157)\right]\right\}$$

where length is measured in cm and age is measured in years relative to a January 1st birthday.

A long series of observations on length and age were available for Dover sole caught by the commercial fishery and landed in California, Oregon and Washington. Because commercial trawl gear is size-selective for Dover sole, and because smaller unmarketable fish are discarded at sea, length-at-age data from the commercial fishery often misrepresents growth. However, plots of average length-at-age over time can indicate changes in growth. In the case of Dover sole, the plots of average length-at-age by sex showed major inconsistencies between the three states during various portions of the time series (Fig. 6). For example, during the period 1985-91 age 9 females from California were about 37 cm on average whereas those from Oregon were only 34 cm while those from Washington were about 41 cm. From about 1997 to 2000 the age 9 females from all three states were about 37 cm but from 2001 on the Washington fish became bigger and the Oregon fish became smaller.

In the previous assessment the early years of age composition data were excluded from the Synthesis models, on the assumption that the apparent differences in length-at-age among the states was due to age-reading bias. An alternative explanation, given the changes in length-at-age with depth observed in the slope survey data, is that the differences in length-at-age reflect different fishing depths and changes over time in fishing depth.

<u>Variability in length-at-age</u>

The Synthesis program generates predicted length frequency distributions for each sex based on underlying growth models that include parameters for variability in length-at-age. There are two parameters for each sex that specify the coefficient of variation (CV) in length at a specified young-age and a specified old-age, and the program uses linear interpolation based on length to derive CV values for other ages. Length and age data from fish collected during the NMFS slope surveys were used to develop estimates of the variability in length at reference ages 1.75 and 40 years (Fig. 7). The assumption that CV in length is a linear function of length does not seem very appropriate for Dover sole because the CV in length continues to decline with older fish even though length essentially stops increasing beyond age 30 years.

In the Stock Synthesis models the assumed coefficients of variation (CV) in length for a given age were 18% for age-1.75 males and females, and 7.5% for age-40 males and females, with interpolated values for intermediate ages.

Maturity-at-length

Brodziak and Mikus (2000) estimated parameters for logistic maturity versus length relationships using data from samples collected during 1984-93 AFSC slope surveys. They found significant north-south differences in the maturity curves derived for the separate INPFC regions, with fish maturing at smaller sizes in the north. For all areas combined the estimated length at 50% maturity for females was 33.4 cm, with a slope of 0.2988 cm^{-1}. These values were used in the previous and current assessment. Brodziak and Mikus noted that their estimate of length at 50% maturity was less than the 35 cm reported by Hagerman (1952) for Dover sole landed in California and the 38 cm reported by Harry (1956) for Dover sole landed in Oregon. The apparent reduction in length at 50% maturity may be due to changing oceanographic conditions or to differing sampling methods and maturity criteria. Similar reductions in length at maturity of flatfish species off the U.S. west coast have also been noted for English sole (*Pleuronectes vetulus*) (Sampson and Al-Jufaily 1999) and petrale sole (*Eopsetta jordani*) (Sampson and Lee 1999).

Age and Length Sample Sizes

Age and length composition data from the California, Oregon, and Washington groundfish trawl fisheries were used in this assessment and applied against landings by all gear types, but the vast majority of the catches were taken by groundfish trawl. Compared to many West Coast groundfish fisheries, the Dover sole fishery has received extensive sampling for many years (Tables 7 and 8). The data were grouped into two fisheries: a southern fishery of catches from the Eureka, Monterey, and Conception INPFC regions and a northern fishery in the US portion of the Vancouver INPFC region and the Columbia region.

To estimate the length (and age) composition data for landings by the southern and northern fisheries the individual samples within each INPFC region and year were combined and then expanded to estimate the total number of fish landed in each INPFC region and year. The estimates were then summed across INPFC regions within each fishery and normalized to unity.

$$P_{length} = \left(\sum ExpansionFactor_i \cdot P_{length,i}\right) / \left(\sum ExpansionFactor_i\right)$$

$$ExpansionFactor_i = WeightLanded_i \,/\, AverageFishWeight_i$$

where the *Weight Landed* $_i$ was the weight of all landings from an INPFC-year stratum (sampled plus unsampled fishing trips) and the *Average Fish Weight i* was estimated by applying the standard length-weight relationships (above) to the length frequency distribution estimated for that stratum.

The 2001 assessment used a more elaborate algorithm that included an additional expansion of each sample to the weight of its landing. This form of expansion is not feasible if landing weights are not available for the sampled landings, which is the case for the age and length composition samples from Washington and the Oregon data prior to 1976.

Multinomial sample sizes

The Stock Synthesis analyses accounted for variations in the fishery sample sizes by specifying that the multinomial sample size for each observed age or length composition was proportional to the number of trips sampled (rather than the number of fish), with the constant of proportionality chosen so that in each fishery the length composition observation with the largest number of trips had an assumed multinomial sample size of 1000, and the age composition observation with the largest number of trips had an assumed multinomial sample size of 600.

Crone and Sampson (1998) showed that the effective sample size in multinomial age composition data can be linearly related to the number of boat trips sampled. Fournier and Archibald (1982) suggested limiting the multinomial sample size to 400 so that large samples would not unduly dominate the data fit and many recent assessments with Stock Synthesis have used a sample size limit of 200 (Methot 2000).

Preliminary attempts to fit the data with Stock Synthesis used input values of 200 as the maximum value for the multinomial sample size, but the effective sample sizes calculated by Synthesis were greater on average than the input sample sizes by a factor of five to six for the length composition data and by a factor of three to four for the age composition data.

Fishery Length Compositions

For this assessment the length composition data for the fisheries and the NMFS trawl survey were tabulated into 2-cm groups for lengths from 16 through 62 cm, with two accumulator groups, one for small fish (< 16 cm) and another for large fish (> 64 cm). The market samples from the landed catch indicated few Dover sole less than 26 cm (Tables 9 and 10). Length measurements from the Pikitch discard study, however, indicated that the trawl fishery captured Dover sole as small as 13 cm (Table 4). The smallest Dover sole measured at-sea during the 1959-61 studies was 20 cm (Table 5).

Fishery Age Compositions

The fishery age composition data available for this assessment consisted of break-and-burn age readings for market samples taken from landings in California, Oregon, and Washington (Tables 11 and 12). The age data were tabulated into 1-yr age groups for ages 1 through 29, 5-yr age group for ages 30 to 34 and 35 to 39, a 10-yr age group for ages 40 to 49 and an accumulator group for ages 50 and older. Most of the landed fish were 5-20 years old, but appreciable numbers of fish older than 20 years were also caught.

Age-reading error

The Synthesis program generates predicted distributions for the observations of age frequency based on user-supplied values for the amount of age-reading error associated with the age composition observations. The program takes the age compositions predicted by the population dynamics and "roughens" them to mimic the error associated with age reading. To do this the user must specify a standard deviation (in age) that measures the age-reading error for each true age. To develop estimates of the age-reading standard deviations I used a series of comparisons of age-readings based on 239 multiple readings of a set of 140 different Dover sole otoliths. These readings, which I obtained from staff at the age-reading laboratory in Newport, were made during the 2004 Dover sole age-reading workshop. I calculated a set of standard deviations and average ages, based on 4 to 15 readings of each otolith. The estimated standard deviations in age were quite variable but were approximately proportional to age (Fig. 8), with a constant of proportionality of 0.142, from which I derived the vector of ageing error standard deviations that I input to the Stock Synthesis model.

Estimated Population Weight-at-Age

The length-based version of Stock Synthesis does not allow the user to input information on average weight-at-age; instead the program generates estimates of average weight-at-age for each time step based on a sex-specific length-weight relationship combined with estimates of length-at-age. Weight-at-age thus changes seasonally and could also change inter-annually if the Synthesis model was configured to allow inter-annual variations in the parameters of the growth equation.

Fishery Catch-per-Unit-Effort

For the 1997 assessment Brodziak et al. included as a tuning index a fishery catch-per-unit-effort (CPUE) index derived by applying a general linear model (GLM) to trawl logbook data from California, Oregon, and Washington (Brodziak 1997). This same index was used without modification in the 2001 assessment as well as the current assessment.

Brodziak developed his CPUE index from an analysis of catch and effort data from California for 1978-92, from Oregon for 1978-95, and from Washington for 1985-1995. Excluded from the analysis were data from vessels operating less than 20% of the possible years for a given state and data from the months of July through December, when in-season changes in trip limits were likely to have influenced catch rates. Also excluded were data from the Conception INPFC region. For those tows that caught Dover sole, the catch rate (pounds/hr) data were log-transformed and fitted with main effects for year, month, depth, area, and vessel, and selected two-way interactions (month x vessel, depth x vessel, month x area, month x depth, and area x depth). The R^2 for the fitted linear model was 0.47.

Slope Survey Biomass Estimates

Helser et al. (2005) used general linear models to develop three annual indices of Dover sole biomass from the two available NMFS slope survey data series: separate indices for each survey and a combined index. The AFSC survey data (Table 13) were collected during autumn (October-November) research cruises by the R/V *Miller Freeman*, which had partial survey coverage of the U.S. west coast during 1988-96 and complete coverage (north of 35°S) during

1997, 1999, 2000, and 2001. The NWFSC survey data (Table 14) were collected during summer coastwide cruises conducted using chartered industry vessels during 1998-2004. In addition to using different vessels and sampling at different times of the year, the two surveys also use slightly different sampling protocols but cover the same range of depths.

The AFSC survey did not sample in the Conception INPFC region during 1992 and it did not sample in the Conception or Monterey regions in 1996. To fill in these missing cells and derive estimates of the coastwide biomass (and its variance) I calculated the ratio of the estimated Conception region biomass (and variance) over the estimated biomass (and variance) in the other regions for the 1997 to 2001 surveys. I multiplied this ratio times the estimated biomass (and variance) in the other regions for the 1992 survey to estimate the biomass (and its variance) for the Conception region for 1992. I used a similar procedure to estimate the biomass (and variance) for the combined Conception plus Monterey regions for 1996.

Estimates of Dover sole biomass density by INPFC region and depth (Table 15) indicate that the slope surveys probably encompass the deep extent of the stock in the northern regions but not in the southern regions. In the Monterey region in particular the biomass density in the 600-699 depth stratum (2.3 mt/km^2) is only half the average biomass density found in the shallower strata (4.6 mt/km^2).

Shelf Survey Biomass Estimates

The NMFS shelf survey of the U.S. West Coast has been conducted at three-year intervals during summer (July-October) since 1977. Haul depths during the 1977 survey ranged from 50-250 fathoms (91-457 m) and no hauls were completed in depths shallower than 50 fa. In all subsequent years, the surveys sampled depths ranging from 30 to 200 fa (55-366 m), and extended to 500 m in some years. The Conception region was not included in the survey until 1989. The current assessment used shelf survey estimates of stock biomass for the U.S. Vancouver to Monterey regions for the 30 to 200 fa depth range for 1980, 1983, 1986, 1989, 1992, 1995, 1998, 2001, and 2004 (Table 16).

In analyses of the shelf survey data Zimmerman et al. (2001) found that many tows in the early surveys caught no, or extremely few bottom dwelling organisms (e.g., flatfish, starfish). Apparently the survey trawl during these tows was not making proper contact with the bottom substrate. For the current assessment these so-called "water-hauls", which occurred primarily during the surveys in 1977, 1980, and 1983, were excluded from the calculations of biomass.

Survey Length Compositions

Prior to 1997 the slope surveys by the AFSC did not sample the entire U.S. West Coast. Because of this incomplete coverage the Dover sole length frequency data from these early AFSC surveys were not included in the current assessment, but the length frequency data from the 1997, 1999, 2000, and 2001 surveys were included, as were the length frequency data from the 1998-2004 NWFSC surveys (Table 17) and the age frequency data from the 1998-2004 NWFSC surveys (Table 18). The Dover sole length frequency data indicate some unusual spatial structure that is persistent across all the coastwide surveys (e.g., Fig. 9). In particular, the females in the Monterey region have a bimodal distribution in length with large numbers of big fish in deep water (500-699 fa) and in the Conception region large numbers of males were found in the deep strata.

Length composition data were available for the NMFS shelf surveys starting in 1986 (Table 19). Essentially no length measurements of Dover sole were taken prior to the 1986 survey and there was very limited sampling of flatfish during the 1986 survey.

The number of Dover sole length measurements associated with survey data used in the current assessment ranged from 10,498 to 12,586 fish per survey for the AFSC slope surveys (Table 20), from 10,947 to 24,583 fish per survey for the NWFSC slope surveys (Table 21), and from 1,626 to 34,471 fish per survey for the shelf surveys (Table 22). In the Synthesis models the multinomial samples sizes were fixed at 600 for all the slope survey length composition observations and the shelf survey sample sizes were scaled to the number of hauls up to a maximum of 1000.

HISTORY OF MODELING APPROACHES

The stock of Dover sole has been an important component of the deep-water fishery for several decades and has been assessed numerous times since the Council began active management of its major groundfish fisheries. The following sections highlight the approaches taken in the most recent assessments.

The 1992 Assessment by Turnock and Methot

- The length-based version of Stock Synthesis was used.
- There were separate models for the Eureka (1971-92) and Columbia (1966-92) regions.
- Fishery length by sex composition data: 1971-91 for Eureka; 1966-91 for Columbia.
- Fishery age-by-sex composition data for Eureka were based on break-and-burn age readings for 1981-89. Fishery age composition data for Columbia were based on scale age readings for 1967-80 and break-and-burn age readings for 1985-90. An ageing-error matrix was used to generate predicted observations of the scale-age reading compositions.
- In each region there was one fishery with sex-specific selection curves based on length. The selection curves were asymptotic for females and domed for males in Eureka, and domed for females and males in Columbia.
- The fishery selection curves were allowed to vary between time periods, with seven time periods for the Eureka model and five time periods for the Columbia model.
- Three sources of survey biomass estimates were used: R/V *Miller Freeman* slope survey biomass estimates for Eureka in 1990 and for Columbia in 1984, 1988, 1989, and 1991; NMFS shelf survey biomass estimates for Eureka and Columbia in 1977, 1980, 1983, 1986, and 1989; and a biomass estimate for 1975 in Columbia from the 1973-76 ODFW flatfish surveys.
- Selection curves for all the slope surveys were assumed to be asymptotic and the same for both sexes. Selection curves for the shelf survey were assumed to be domed and the same for both sexes.
- The slope survey biomass estimates were treated as absolute biomass estimates with a survey catchability coefficient (survey Q) of 1.0.

- The natural mortality coefficient (M) was 0.10 yr^{-1} for both sexes.
- The growth curve was fitted within the Synthesis models but constrained to pass through 20.5 cm at age 3.

The 1994 Assessment by Turnock et al.

- The length-based Stock Synthesis model was applied using a similar configuration as in the 1992 assessment but with data from additional years. Only break-and-burn age composition data were used.
- There were separate models for the Eureka (1971-94) and Columbia (1966-94) regions.
- In each region there was one fishery with sex-specific, domed selection curves based on length for the ascending portion of each curve and based on age for the descending portion.
- Fishery selectivity was allowed to vary between time periods, with five time periods for the Eureka model and seven time periods for the Columbia model.
- The 1975 biomass estimate from the ODFW flatfish survey in the Columbia region was separated from the series of R/V *Miller Freeman* slope survey biomass estimates.

The 1997 Assessment by Brodziak et al.

- The length-based version of Stock Synthesis was used.
- The assessment was coastwide except for the Conception INPFC region (south of 36°S).
- There was one fishery with sex-specific, domed selection curves based on length for the ascending portion of each curve and based on age for the descending portion.
- Fishery age composition data were from 1981-95. Only break-and-burn age-readings were used.
- Fishery length composition data were from 1967-96.
- Growth curves were derived from length and age data collected during R/V *Miller Freeman* slope surveys, 1984-93. Fixed growth curve parameter values were used in the Synthesis model.
- The natural mortality coefficient (M) was assumed to be 0.09 yr^{-1} for both sexes.
- Size-based discards were modeled using logistic curves estimated within the Synthesis model with the inflection lengths estimated for three periods: 1967-81, 1982-88, and 1989-96.
- The model included time variation in the fishery selection curve. The inflection length for females was estimated for three periods: 1967-72, 1978-81, and 1989-96, with linear interpolation during intervening years. The descending inflection age for females was allowed to vary between three periods: 1967-77, 1978-88, and 1989-96. The selection of males relative to females in the descending portion of the curve was allowed to vary between three periods: 1967-77, 1978-82, and 1989-96, with interpolation for 1983-88.
- The R/V *Miller Freeman* slope survey biomass estimates were used as a tuning index, coupled with length composition data for 1988, 1990-93, and 1995-96. Catch rates from sampled areas were extrapolated to estimate biomass in areas that were not sampled.

- The NMFS triennial shelf survey biomass estimates were used as a tuning index, coupled with length frequency data for 1980, 1983, 1986, 1989, 1992, and 1995.
- An index of relative abundance from commercial trawl fishery logbooks, 1978-94, was used as a tuning index. These CPUE data were matched with an asymptotic size-selection curve having a fixed L50 of 33.8 cm and a slope coefficient of 0.55 cm^{-1}.

The 2001 Assessment by Sampson and Wood

- The length-based Stock Synthesis model was used.
- The assessment was coastwide including the Conception INPFC region.
- The modeled period was from 1956-2000 and the age composition of the stock in 1956 was assumed to be in equilibrium with a constant historic level of catch.
- There were five fisheries (CA, OR-shallow, OR-deep, WA-shallow, WA-deep), most with sex-specific, domed selection curves based on length for the ascending portion of the curve and based on age for the descending portion.
- The historic equilibrium fishery was assumed to have the same selection characteristics as the California fishery.
- The fishery age composition data were from CA for 1984-99, from OR for 1991-2000, and from WA for 1996-98. Only break-and-burn age-readings were used.
- The fishery length composition data were from 1967-2000.
- Growth curves were derived from length and age data collected during coastwide NMFS slope surveys, 1997-2000. The estimated parameter values were used as constraints in the Synthesis model, which was allowed to estimate the growth parameters.
- The natural mortality coefficient (M) was assumed to be 0.09 yr^{-1} for both sexes.
- There were length-based discards based on logistic curves fixed during two periods: 1956-80 and 1986-2000 with linear transitions in the curve parameters during 1981-85.
- The model did not allow time variation in the fishery selection curves.
- The R/V *Miller Freeman* slope survey biomass estimates (GLM index E) for 1991, 1996, 1997, 1999, and 2000 were used as a tuning index, coupled with coastwide length composition data for 1997, 1999, and 2000.
- The NMFS triennial shelf survey biomass estimates (excluding "water hauls") for 1980, 1983, 1986, 1989, 1992, and 1995, and 1998 were used as a tuning index, coupled with length frequency data for 1986, 1989, 1992, and 1995, and 1998.
- Brodziak's index of relative abundance from commercial trawl fishery logbooks, 1978-94, was used as a tuning index, matched with an asymptotic size-selection curve having a fixed L50 of 33.8 cm and a slope coefficient of 0.55 cm^{-1}.

CURRENT MODELING APPROACH

The analyses in the current stock assessment were developed using the new Stock Synthesis 2 program (SS2), version 1.19 (Methot 2005). The basic modeling approach was as follows:

- The assessment was for the entire U.S. west coast from the Canadian to the Mexican borders.
- The modeled period was from 1910-2004, with the assumption that the stock initially was in equilibrium with a zero level of catch.
- There were two fisheries (south - Eureka to Conception; north – U.S. Vancouver to Columbia), with sex-specific, domed selection curves based on length.
- The southern fishery age composition data were for 1981-2004, and the southern fishery age composition data were for 1985-2004. Only break and burn age-reads were used.
- The fishery length composition data were from 1967-2004.
- Growth curves were derived by Synthesis based (in part) on average length-at-age data collected during the coastwide NMFS slope surveys, 1997-2004. None of the growth curve parameters were pre-specified, except for the coefficients of variation in length-at-age.
- The natural mortality coefficient (M) was assumed to be 0.09 yr^{-1} for both sexes.
- There were length-based discards based on logistic retention curves fixed during two periods, 1956-80, 1986-2004 with linear transitions in the curve parameters during 1981-85.
- The AFSC and NWFSC slope surveys were treated as entirely independent tuning indices.
- The AFSC coastwide biomass estimates (1992, 1996, 1997, 1999, 2000, and 2001) were coupled with coastwide length composition data for 1997, 1999, 2000, and 2001.
- The NWFSC coastwide annual biomass estimates (1998-2004) were coupled with coastwide length and age composition data (1998-2004).
- The NMFS triennial shelf survey biomass estimates (excluding "water hauls") for 1980, 1983, 1986, 1989, 1992, and 1995, and 1998 were used as a tuning index, coupled with length frequency data for 1986, 1989, 1992, and 1995, 1998, and 2001.
- Brodziak's index of relative abundance from commercial trawl fishery logbooks, 1978-94, was used as a tuning index, matched with an asymptotic size-selection curve having a fixed L50 of 33.8 cm and a slope coefficient of 0.55 cm^{-1}.

The Stock Synthesis program determines “best estimates” for unknown parameters in the model by iteratively searching for parameter values that maximize a weighted average of several independent likelihood components. In the Dover sole assessment model there were 18 or 19 components contributing to the total likelihood. For each of the two fisheries (south versus north) there was an age composition component, a length composition component, and a component for the proportion of the catch weight that was discarded versus retained. The components for discarded-versus-retained catch measured the discrepancies between the observed discard rates and the predicted discards based on the stock's size-composition, the fishery selection curves, and the logistic retention curves. The data shown in Table 5 (from the Pikitch discard study) illustrate the idea of apportioning length frequency data into discarded and retained components and converting those separate length composition data into weights.

In addition to the likelihood components for the two fisheries there were likelihood components for the two slope surveys and the shelf survey: one component for each survey biomass index, one for each survey length composition data series and one for the NWFSC slope survey age composition data series. There was also one component for the fishery logbook CPUE index. Because this is a composite coastwide index, designed to account for vessel differences and the spatial distribution of fishing effort, there are no length composition data to match with this index and the characteristics of the selection curve were fixed rather than estimated. Finally, there was a likelihood component that measured the goodness-of-fit of the recruitment estimates to the underlying stock-recruit relationship. No prior assumptions were made concerning the estimated parameters; hence there was no likelihood component to measure discrepancies between the parameter values estimated by Synthesis and values assigned *a priori*.

Most likelihood components were assigned weighting coefficients (the so-called lambda values) of 1.0, but when all components were given weights of 1.0 during preliminary modeling exercises I was unable to get the models to converge (large maximum gradient values). Explorations of the joint response of the likelihood components seemed to indicate fundamental conflicts among some of the input data. In particular, the length composition data seemed to be at odds with the age composition data and mean length-at-age data. To get models that would fully converge, I down-weighted the likelihood components for the age composition data (lambda = 0.2) and the mean length-at-age data (lambda = 0.1). Also, as mentioned above (Multinomial sample sizes), the input multinomial sample sizes were adjusted during preliminary modeling exercises, which in effect modified the lambda values for the length and age composition likelihood components.

In all model configurations I assumed that there was an underlying Beverton-Holt stock-recruit relationship and for most configurations I fixed the so-called steepness parameter, which controls the resilience of the stock dynamics, at a value of 0.8. When Synthesis was permitted to freely estimate this parameter it seemed invariably to put the parameter at its maximum feasible value (1.0), which implies constant recruitment even if spawning biomass is near zero. Such a result seemed very implausible.

For the entire modeled period I assumed that discards were related only to size, with smaller fish being discarded and larger fish being retained in accordance with logistic retention functions. I assumed that there were no discards due to trip limits. I configured the Synthesis models to apply a different logistic retention function in early years than in later years. For the early period (1956-80) the length at 50% retention for female Dover sole was assumed to be 33.3 cm, whereas for the later period this parameter was assumed to be 29.6 cm. With size-related discards one would expect to see higher rates of discarding during years with increased recruitment because of the greater relative frequency of small fish.

MODEL SELECTION AND EVALUATION

The Preliminary Base Model

Initial runs with Synthesis concentrated on finding a relatively simple preliminary base model from which I could explore alternative model configurations. During these initial runs I encountered major difficulties trying to simultaneously obtain good fits to the length and age composition data from the different fisheries and survey. Particularly problematic were the bimodal female length distributions in the slope surveys, the differing average lengths of old fish in AFSC versus NWFSC surveys, and highly variable age compositions in the fisheries. These problems led me to adjust the input multinomial samples sizes and to down-weight the likelihood components for the age composition data and the mean length-at-age data. After exploring various model configurations for fishery selection and fixing some apparently redundant selection curve parameters, I eventually settled on a preliminary base model, which formed the basis for the runs and analyses examined during the STAR Panel review.

The preliminary base model conformed to the general description provided above but had the following additional features.

- Sigma(R) was set to 0.35; steepness was fixed at 0.8.
- Recruitment deviations were permitted for the period 1910-2003.
- The length-at-age lambdas were set to 0.1; the age composition lambdas were set to 0.2; the lambda for the prior probabilities was set to zero; and all other lambdas were set to 1.
- All selection curves had the parameters for the male-to-female ratio at the initial length class fixed at zero (equivalent to a 50:50 sex ratio).
- In the fishery selection curves the ascending slope parameters were fixed at 0.1.
- In the survey selection curves the parameters for the female length at the peak were fixed: AFSC = 30, NWFSC = 32, Shelf = 30.
- In the slope survey selection curves the parameters for the female ascending slope were fixed at 0.1; the parameters for the male length-at-transition were fixed at 32; and the selection values at Lmax were forced to zero.
- Synthesis was configured to include the values of ln(sd) in the log-normal likelihood calculations.
- The scale-based age composition data were included in the input data file but excluded from the likelihood computations.
- The growth parameters were estimated, but were time-invariant.
- The parameter value for the length at 50% maturity varied in three stages. During 1910-1954 it was fixed at a value of 36.5, during 1984-2004 it was fixed at a value of 33.4, and during 1955-83 it changed incrementally to conform with a linear trend between the end-point values.
- There were year-to-year deviations in the female ascending inflection point parameters for both fisheries.

The model configuration chosen as the preliminary base model for the STAR Panel review had a total of 209 estimated parameters, of which 94 were annual recruitment deviations and 70 were annual selection parameter deviations. The deviations for the values of the female ascending inflection point in the fishery selection curves indicate a general shift towards smaller fish from 1970 to the early 1990s, followed by an abrupt shift to larger fish in 1995 in the south and in 1996 in the north (Fig. 10).

Sensitivity to the Assumed Spawner-Recruit Steepness

One important parameter determines the general resilience of a stock to perturbations. It is the so-called spawner-recruit steepness parameter. During initial explorations of various model configurations for the Dover sole assessment the SS2 program generally settled on estimates of 1.0 for the steepness parameter, which is the upper bound on the feasible range of values for this parameter. Steepness of 1.0 implies that annual recruitment is independent of spawning stock biomass and that the stock is maximally resilient. Because steepness of 1.0 seemed implausible, the value of this parameter was fixed at 0.8 in the preliminary base model. To evaluate the sensitivity of the preliminary assessment results to this assumed parameter value, I ran a series of models configured with steepness fixed in the range 0.95 to 0.7 (Table 23). In general, there was little change in the log-likelihood over this range of steepness values, which suggests that the data provide little information about the resilience of this stock.

Illustrated by the profile across the steepness parameter are some general tensions among the various data sources, with some sources being more consistent with the largest value for steepness and other sources being more consistent with the smallest value. For example, the model with steepness = 0.95 provided the best fit to the triennial shelf survey series, whereas the model with steepness = 0.7 provided the best fits to the two slope biomass series and the trawl logbook CPUE series. The model with steepness = 0.95 also provided the best fit to the northern fishery age composition data series, whereas the model with steepness = 0.7 provided the best fit to the NWFSC slope survey age composition data series; the model with steepness = 0.85 provided the best fit to the southern fishery age composition data series. Other analyses that profiled over sets of fixed values for a parameter (below) indicated similar patterns of inconsistency among the different data sources.

Sensitivity to the Assumed Spawner-Recruit Variability

Within the SS2 modeling framework the parameter called sigma(R) controls the variability in annual recruitment and the degree to which there is year-to-year variation in the underlying population dynamics. If one specifies a small value for sigma(R), then there will be a large penalty in the log-likelihood for large inter-annual variations in recruitment. If possible, one should specify an input value for sigma(R) that is roughly consistent with the recruitment variability produced by the fit of the SS2 model to the data. For the Dover sole preliminary base model the input value for sigma(R) (0.35) was not consistent with the recruitment variability estimated by the model. To find a more appropriate value for sigma(R) I ran a series of models configured with sigma(R) fixed in the range 0.5 to 0.25 (Table 24), but I would have had to specify that sigma(R) was less than 0.25 to obtain a similar degree of estimated recruitment variability. It seemed implausible that Dover sole annual recruitment would be so relatively constant.

Sensitivity to the Assumed Natural Mortality Coefficient

The natural mortality coefficient (M) is an important parameter that is very poorly known for Dover sole. To evaluate the sensitivity of the assessment results to M, and whether the assessment data might provide any information about the magnitude of M, I ran a series of models configured with M fixed in the range 0.07 $^{-yr}$ to 0.11 $^{-yr}$ (Table 25). Relative to a value of M = 0.09 $^{-yr}$ (the value assumed in the preliminary base model), when M was fixed at 0.08 $^{-yr}$ there was a slight improvement in the total log-likelihood component based on the observed data, but the overall negative log-likelihood (including components for the recruitment and parameter deviations) was minimized at M = 0.09 $^{-yr}$.

Sensitivity to the Lambda Values for the Biomass Indices

To evaluate the influence of the different biomass indices that I was using to tune the model I conducted a series of sensitivity analyses in which I systematically up-weighted and down-weighted each set of biomass index values by changing their lambda values (Table 26). The lambda values for all other likelihood components were left unchanged from the values used in the preliminary base model. The analysis indicated tensions among the data sources, similar to what was observed in earlier sensitivity analyses, but also suggested that the assessment results were very sensitive to the triennial shelf survey. The high lambda value on the triennial shelf biomass index resulted in an estimate of spawning biomass at the start of 2005 that was only 85% of the unexploited level, whereas the low lambda value resulted in an estimate of 2005 spawning biomass that was only 43% of the unexploited level. It appears that the signal for increased recruitment in recent years is coming primarily from the triennial shelf survey.

Some Alternative Model Configurations

The preliminary base model for Dover sole is quite complicated, perhaps unnecessarily so. Several variants of the preliminary base model were evaluated (Table 27). Alternative A was identical to the preliminary base model but did not have annual deviations in any of the fishery selection curve parameters. Although it had 70 fewer parameters than the preliminary base model, it provided a much worse fit to the data (the total negative log-likelihood was almost 270 units larger) and was rejected in favor of the preliminary base model. Alternative B was similar to the preliminary base model, but instead of having annual deviations in the ascending inflection parameters for the two fisheries, it had annual deviations in the parameters for the length at 50% retention. This alternative was as complex as the preliminary base model and provided a slightly worse fit to the data and therefore was rejected in favor of the preliminary base model. Alternative C was identical to the preliminary base model but the selection curves for the slope surveys were asymptotic rather than dome-shaped. It provided a worse fit to the data than the preliminary base model and was rejected in favor of the preliminary base model. Alternative D was identical to the preliminary base model but the two slope surveys shared the same dome-shaped selection curves. This saved four estimated parameters but the fit to the data degraded by almost 40 log-likelihood units; Alternative D was rejected in favor of the preliminary base model.

Retrospective Analysis

A series of runs was conducted with the preliminary base model configuration using truncated data series, with the first run stopping with data from 2003, the second run stopping with data from 2002, and so on (Table 28). This type of analysis can demonstrate how new data influence an assessment's perception of stock status. Plots of the estimates of spawning biomass from the runs had an interesting pattern; the preliminary base model, which ended with data in 2004, provided much higher estimates of spawning biomass than the runs with reduced data, and the run that ended with data in 2000 provided much lower estimates of spawning biomass (Fig. 11). The intermediate runs, which ended with data in 2001, 2002, and 2003, produced very similar estimates of spawning biomass. This pattern may be a further indication that the triennial shelf survey, which provided biomass estimates and length composition observations in 2001 and 2004, had considerable influence on the assessment results.

Monte Carlo Evaluation of the Global Maximum Likelihood

To evaluate whether the SS2 program had found a set of parameter values that produced the global maximum likelihood value I conducted a series of 60 replicate model runs in which the initial starting parameter values were perturbed from the values used to produce the preliminary base model (Fig. 12). The random "jitter" added or subtracted to the initial value of each estimated parameter was 0.01 times the range specified for the parameter. Two of the perturbed runs failed to converge. The results indicated that the preliminary base model represented a local maximum on the likelihood surface; hence the parameter estimates were not the maximum likelihood values. It appeared that the likelihood surface was very irregular with numerous local maxima (which appear as clusters of points in Fig. 12) and that the global maximum was about 0.6 log-likelihood units larger than the value from the preliminary base model. (Maximizing the likelihood is the same as minimizing the negative log-likelihood, which is why the point on Fig. 12 for the preliminary base model is above the point for the apparent global maximum.) It was not until just before the STAR Panel review that I determined that the preliminary base model had not converged to the global maximum of the likelihood surface.

Analyses Requested by the STAR Panel

The STAR Panel requested various analyses to help find a model configuration that would serve as an acceptable base model for providing management advice. The remainder of this section describes the STAR Panel requests and my responses.

(1) The starting year for the recruitment deviations probably should be sometime between 1930 and 1950 rather than 1910 (as used in the preliminary base model). To evaluate an appropriate starting year, plot the estimated recruitment standard errors versus year for the preliminary base model.

The plot showed that the estimated standard errors were equal to the assumed sigma(R) (0.35) for the first 20 years of the modeled period and did not begin varying from this value until about 1930. It was decided that 1930 would be an appropriate year for starting the recruitment deviations.

(2) In the two fishery selectivity curves it might helpful for model convergence to fix the parameter for the female length-at-the-peak. Try profiling over a range of sizes (34 to 40 by 1) to evaluate the model's sensitivity to these parameters.

The profile was conducted over the range from 34 to 40, as requested, but by increments of 2 because that is the bin width of the length composition data. The best fit to the data occurred when the value of the female length-at-the-peak parameter was 36; the likelihood for this run was only slightly different from the value obtained with the preliminary base run.

(3) Using the preliminary base model (rec-devs starting in 1910) extend the profile over spawner-recruit steepness to 0.4.

The negative log-likelihood for the preliminary base model, which had steepness = 0.8, was 1362.4 and degraded to a value of 1370.8 when steepness was 0.4, which indicates that the data do not provide much information about the value of the steepness parameter. What little information there is, however, suggests that steepness is a relatively high value.

(4) Rather than using annual deviations on the ascending inflection parameters for the fishery selection curves (as in the preliminary base model), use three time-blocks instead.

Boundaries for the time-blocks were chosen based on the patterns seen in the annual deviations (Fig. 10). The model with three time-blocks had only 121 estimated parameters (versus 209 in the preliminary base model) and produced a total negative log-likelihood value of 1492.0 (versus 1313.5 for the preliminary base model). It was decided that the preliminary base model was too complex and that the simpler model with three time-blocks should be preferred.

(5) Plot the time series for the four survey indices of biomass, where each index has been adjusted for its corresponding catchability coefficient (q).

The plot was done using the values from the preliminary base model and indicated that the model is reasonably consistent with all four biomass indices.

(6) The model configuration with recruitment deviations starting in 1930 and with three time-blocks for variation in fishery selection (Run 219) is a potential base model, but there were concerns that the run may have converged to a local minimum of the negative log-likelihood surface. Using the Run 219 configuration, conduct a profile with the spawner-recruit steepness parameter over the range 0.45 to 0.9.

The profile, which was conducted using increments of 0.25, seemed to indicate fairly large sensitivity to the steepness parameter (a change of 40 log-likelihood points when steepness changed from 0.95 to 0.425). However, the log-likelihood surface appeared to vary erratically, which suggested that some of the runs might have converged to local minima.

(7) Because of concerns that Run 219 may have converged to a local minimum, conduct some additional runs of the model using randomized starting parameter values.

Forty model runs were made using perturbed initial parameter values. One run did not converge (large maximum gradient), 15 runs converged to the same log-likelihood value as the original Run 219, and 20 runs converged to negative log-likelihood values that were almost 5 units better than the Run 219 value.

(8) Try running model 219 with all lambdas equal to 1.

This model configuration did not converge (large maximum gradient).

During the week of the STAR Panel review some errors were uncovered in the calculations of the NWFSC slope survey biomass values. The early NWFSC surveys did not cover the entire Conception INPFC area and for those years the mean densities observed in the northern portion, where densities of Dover sole, sablefish and thornyheads tended to be higher, were extrapolated to the entire region, producing biomass estimates that were probably too large. Thus all the analyses conducted up to this point had used incorrect values for the NWFSC slope survey data series. The new NWFSC slope survey biomass series was lower on average than the original data series and had a flatter time trend and smaller CVs for the starting years 1998 and 1999, but otherwise did not differ substantially from the values used in the original analyses (Fig. 13).

(9) Replace the NWFSC slope survey estimates of biomass with the new values that were provided by Tom Helser (NWFSC) during the STAR Panel review.

(10) Using the Run 219 configuration and the new data, do a profile over the steepness parameter but set lambda = 0.15 for the AFSC observations of mean length-at-age.

(11) Using the Run 219 configuration and the new data, and with lambda = 0.15 for the AFSC observations of mean length-at-age, conduct additional runs of the model using randomized starting parameter values.

During exploration of the results from the earlier profile of steepness for Run 219 it appeared that the problem of convergence to local minima might be due to the discrepancies between the two slope surveys in the observations of mean length-at-age. The runs that gave the best overall fit to the data appeared to also to favor the observations of mean length-at-age from the AFSC slope survey. I thought that giving slightly extra weight to the mean length-at-age data from the AFSC slope survey might keep the model from converging to local minima that gave better fits to the NWFSC slope survey data. The randomization test, however, did not indicate any improved model convergence from giving additional weight to the AFSC data.

(12) Using the Run 219 configuration and the new data (Run 248) and with lambda = 0.1 for the AFSC observations of mean length-at-age (as in the preliminary base model), do profiles over the steepness parameter and over the natural mortality coefficient.

The profile over the steepness parameter, which was conducted using increments of 0.05 over the range 0.4 to 0.9, indicated that the fits to the data were slightly sensitive to the steepness parameter, varying from a high of 1557.9 negative log-likelihood units when steepness was 0.4 to a low of 1546.5 when steepness was 0.9 (Fig. 14). The second worst (largest) value of the negative log-likelihood occurred for the run with steepness at 0.8 (the steepness value in the preliminary base model and Runs 219 and 248), which was rather troubling, but this was due to convergence to a local minimum (see below). The profile over the natural mortality coefficient, which was conducted using increments of 0.005 or 0.0025 over the range 0.07^{-yr} to 0.11^{-yr}, had large irregularities in the log-likelihood surface that presumably were due to convergence to local minima (Fig. 15).

(13) Using the Run 219 configuration and the new data (Run 248) and with lambda = 0.1 for the AFSC observations of mean length-at-age (as in the preliminary base model), conduct additional runs of the model using randomized starting parameter values.

Forty model runs were made with perturbed initial parameter values. One run did not converge (large maximum gradient), and the others converged to more than ten different local minima. The run that had been used in the profile of steepness (Run 248) had a negative log-likelihood value that was almost 20 units larger than the two runs that produced the best fit. Even though this run had not converged to the maximum likelihood value, its estimates of spawning biomass did not greatly differ greatly from the estimates of spawning biomass produced by the run that had converged to the best likelihood value observed among the forty random trials. For example, for Run 248 the virgin spawning biomass was estimated to be 292,522 mt and the spawning biomass at the start of 2005 was estimated to be 185,131 mt. For the run with the smallest negative log-likelihood the corresponding estimates were 299,058 mt and 189,003 mt, which are relative absolute differences of 2.2% and 2.0%.

The Final Base Model

With a few exceptions (detailed below) the final base model (Run 248) conformed to the general description provided on page 16, including the particular features of the preliminary base model described on page 18. The exceptions were as follows.

- Recruitment deviations were permitted for the period 1930-2003.
- For the fishery selection curves the parameters for the female length at the peak, which were estimated in the preliminary base model, were fixed at 36 cm.
- In both fisheries the parameter controlling the ascending inflection point, which had annual deviations in the preliminary base model, was allowed to vary between three time periods (1910-79, 1980-95, 1996-2004) but was constant within each time-block.
- The final base model used the revised NWFSC slope survey biomass estimates (provided by Tom Helser during the STAR Panel review).
- The final model run was the one with the best fit selected from a set of 40 runs that were generated with random "jitter" on the initial parameter values.

Appended to this report are the SS2 control file (Appendix 1) and data file (Appendix 2) for the final base model.

BASE MODEL RESULTS

Parameter Values

The final base model had a total of 121 estimated parameters, of which 74 were annual recruitment deviations and 36 were selection curve parameters (Table 29). None of the estimated parameters were stuck at the boundary values specified in the SS2 control file.

Fits to the Observed Data

The base model's estimates of trends in biomass did not closely follow any of the four tuning indices (Fig. 16), but the residual variation was reasonable given the level of variation that one might expect. For example, for the AFSC slope biomass index the root mean square error (RMSE), which measures the discrepancy between the model's estimates of survey biomass and observed estimates of survey biomass, was 0.1255 whereas the average coefficient of variation of the observed estimates of survey biomass was 0.1337. The corresponding values were RMSE = 0.1207 versus CV = 0.0781 for the NWFSC slope biomass index, and RMSE = 0.3806 versus CV = 0.1069 for the triennial shelf biomass index. Even with a high lambda value on the triennial shelf biomass index I was unable to obtain a good fit to the very rapid increase observed in the index in the recent surveys.

The base model's estimates of length composition provided reasonable fits to the observed length composition data for the southern fishery, although there were some patterns in the residuals in recent years that indicated systematic rather than random discrepancies (Fig. 17). For the northern fishery there was a tendency for the model to underestimate the proportions of large females and overestimate the proportions of intermediate sized males (Fig. 18). For the two slope surveys the residuals from the model's estimates of length composition by sex tended to show positive residuals for females over ranges of lengths where there were negative residuals for the males (Fig. 19 and 20), which suggests that the SS2 formulation for selection was not sufficiently flexible to capture the selection differences between the sexes. In the fit to the triennial shelf length composition data there tended to be bands of positive and negative residuals in (Fig. 21) rather than a random mix.

Although the residual patterns from the fits to the length composition data were not as random as one might have wanted, overall, the fits to the length composition data were in general agreement with expected level of variability. For the southern fishery the model's estimate of the average "effective N", which measures the sample size that would have produced the observed lack-of-fit to the data, was 821 whereas the average effective N that was input to the model for the observed length composition data was 586. The model produced a slightly better than expected fit to the southern fishery length composition data. For the northern fishery the model's estimate of the average effective N was 299 and the input average effective N was 261. For the AFSC slope survey the model's estimate of the average effective N was 886 and the input average effective N was 600. For the NWFSC slope survey the model's estimate of the average effective N was 882 and the input average effective N was 600. For the triennial shelf survey the model's estimate of the average effective N was 883 and the input average effective N was 709. For all of the sources of length composition data the model produced a slightly better fit than was expected.

The model provided much poorer fits to the age composition data than it did to the length composition data. In the southern fishery the model tended to overestimate the proportions of the oldest fish of both sexes and underestimate the proportions of females in the 20- to 30-year age range (Fig. 22). In the northern fishery the model also tended to overestimate the proportions of the older fish of both sexes (> 35 yr) and for both sexes it underestimated the proportions of fish in a band of younger ages, 10- to 20- year old fish in some years, younger fish in other years (Fig. 23). For the NWFSC slope survey (the only survey with age composition data) the model underestimated the proportions of 30- to 49-year old females and overestimated the proportions of 8- to 15-year old females (Fig. 24).

Overall, the fits to the age composition data were in general agreement with expected level of variability. For the southern fishery the model's estimate of the average effective N was 424 and the input average effective N was 283. For the northern fishery the model's estimate of the average effective N was 334 and the input average effective N was 261. For the NWFSC slope survey the model's estimate of the average effective N was 109 and the input average effective N was 100. For the two slope surveys the model produced a slightly better fit to the age composition data than was expected.

Selection Curves

The length selection curves were markedly domed for both fisheries with peak selection occurring at about 36 cm (Fig. 25). The northern fishery had higher selection coefficients than the southern fishery for large fish, but otherwise the two fisheries had very similarly shaped selection curves. The two slope surveys had similarly shaped selection curves, with considerably higher selection for males than females, but the AFSC selection curves had a broader peak with peak selection starting 2-cm smaller than the NWFSC selection curve (Fig. 26). When the two surveys were forced to share a common selection curve there was a significant degradation in the fit to the data (Table 27, scenario D). The selection curves for the triennial shelf survey were quite sharply peaked with considerably higher peak selection for males than for females

(Fig. 27). The length selection curve for the trawl logbook CPUE index, which was based on assumed parameter values, was the only selection curve that was not dome-shaped.

Estimates of Biomass, Recruitment, and Exploitation

The final base model estimated the unexploited total biomass of Dover sole to be about 615,000 mt and the unexploited spawning stock biomass, SB(0), to be slightly less than 300,000 mt (Table 30). Spawning biomass at the start of 2005 was estimated to be about 189,000 mt, equivalent to 63% of the unexploited level. Spawning biomass and age 5+ biomass (roughly corresponding to the exploitable biomass) were estimated to have reached their lowest points in the mid-1990s and to have been rising steadily since, primarily due to strong year classes in 1990 and 1991 and exceptionally strong year classes in 1997 and 2000 (Fig. 28). Exploitation was estimated to have reached a peak of 9.3% in 1985 in the southern fishery and a peak of 8.3% in 1991 in the northern fishery. Over the stock's history the exploitation rate has been smaller than the F40% target exploitation rate during all but six years and the spawning biomass has been well above 40% of the unexploited level, except during a few years when it approached the 40% level (Fig. 29).

The estimated values of recruitment loosely follow the predicted stock-recruitment relationship, but there are extended periods when the recruitment tends to be above or below the median recruitment line, which indicates the most likely estimated value for recruitment for any given level of parental spawning biomass (Fig. 30). The annual recruitment values were estimated to have been above the median recruitment line in all years since 1987, except for 2003 and 2004 when no data were available to indicate recruitment strength.

Estimated population numbers-at-age

The base model estimates of the numbers of fish alive at the start of each year by sex are in Appendix 3.

UNCERTAINTY AND SENSITIVITY ANALYSES

Sensitivity analyses of the final base model were not conducted because it would have required an inordinate number of runs with randomized starting parameter values to produce results corresponding to the maximum likelihood estimates. The sensitivity and retrospective analyses conducted with the preliminary base model (presented above) should provide an adequate indication of the sensitivity of the final base model. There were only trivial differences between the final base model and preliminary base model in their estimates of spawning biomass and recruitment (Fig. 31).

The final base model for Dover sole was fully converged and the SS2 / AD Model Builder software used the inverse of the Hessian matrix to produce approximate standard errors for the estimated parameters and for derived estimates such as the annual estimates spawning biomass. The coefficients of variation for the estimates of spawning biomass were relatively small, varying from a low of 4.6% for the estimate of SB(0) to a high of 9.3% for the estimate of SB(2005). The coefficients of variation for the estimates of annual recruitment varied from a low of 4.5% for the estimate of recruitment to the unexploited stock, R(0), to a high of 44.4% for the estimate of R(2001). The estimated standard errors based on the Hessian matrix do not include all sources of uncertainty (e.g., model specification errors and errors in the assumed values for the natural mortality coefficient and steepness parameter and the various selection curve parameters that were not estimated).

Relative to the 2001 assessment for Dover sole the current assessment paints a much more optimistic view of the stock (Fig. 32). In the new assessment the stock appears to be much larger overall and more productive. As mentioned above, in reference to the retrospective analysis with the preliminary base model, the current assessment results appear to have been greatly influenced by the large estimates of biomass produced by the triennial shelf survey in 2001 and 2004, which were data that were not available to the 2001 assessment.

REFERENCE POINTS AND REBUILDING PARAMETERS

In June 2000 the Council endorsed the recommendation of the West Coast Groundfish Harvest Policy Workshop that F40% be used as the default target rate of fishing mortality for Council-managed flatfish species. Under the Council's default groundfish harvest policy the level of spawning biomass capable of supporting the maximum sustainable yield, SB(MSY), is considered to be 40% of the unexploited spawning biomass level, SB(0), and a stock is considered to be overfished if its spawning biomass drops below 25% of SB(0).

The maximum sustainable yield (MSY) and the spawning biomass needed to support MSY were estimated within the SS2 software based on the stock-recruit relationship (with an assumed steepness parameter of 0.8). These estimates differed substantially from the F40% proxy values. In fact, if the stock of Dover sole was reduced to the level that supports MSY, the Council would consider the stock to be overfished given its current groundfish harvest policy.

The mean generation time estimated by the SS2 software for the final base model was 23.4 years.

Reference Points	Value	Units
Unfished Stock		
Spawning Biomass, SB(0)	299,054	mt
Spawning Biomass / Recruit	2.15	kg / fish
Annual Recruitment	138,970	1000s fish
F40% Proxy for MSY *		
Spawning Biomass / Recruit	0.926	kg / fish
Exploitation Rate	6.72%	
MSY	16,505	mt
SB(MSY)	117,281	mt
SB(MSY) / SB(0)	39.2%	
SR Model Values for MSY *		
Spawning Biomass / Recruit	0.634	kg / fish
Exploitation Rate	10.42%	
MSY	17,265	mt
SB(MSY)	73,607	mt
SB(MSY) / SB(0)	24.6%	

* Based on the current maturity schedule, which differs from the historic schedule.

HARVEST PROJECTIONS AND DECISION TABLE

The final base model for Dover sole was used with the forecasting portion of the SS2 software to develop projections of annual harvests through 2016 (Table 31). The projections assumed that total catches during 2005 and 2006 would be at the optimum yield (OY) levels specified by the Council (total catch each year of 7440 mt), that the selection and retention curves operating in the southern and northern fisheries would continue unchanged from the curves estimated for 2004, and that the proportion of the catch taken each year by the southern fishery would be 47.2%, which was the base model's estimate of the average proportion of the catch taken by the southern fishery during 2000 to 2004. The projected F40% ABC values are considerably larger than catches taken in recent years. Because the spawning biomass was greater than 40% of SB(0), there was no 40:10 harvest control rule adjustment and the OY values were all equivalent to the ABC values.

The STAR Panel provided an example format for a decision table, with sets of estimates of spawning biomass and depletion for each of three alternative states of nature and three alternative management actions. After reviewing results from final base model runs that profiled the effects of the steepness parameter and the natural mortality coefficient (M), the STAR Panel suggested that the alternate states of nature in the decision table should be based on M because the base model seemed to be more sensitive to this parameter than to the steepness parameter. They recommended using $M = 0.07^{-yr}$ for the pessimistic alternative state of nature and $M = 0.11^{-yr}$ for the optimistic alternative state of nature, with the base model ($M = 0.09^{-yr}$) as the intermediate alternative state of nature. The alternative management actions were a low catch series based on the recent average catches, a high catch series based on the projected F40% ABC values derived from the base model, and an intermediate catch series based on twice the recent average catches. The projections in the decision table (Table 32) were made using the same set of assumptions that were used in the harvest projections (above). To lessen the chance that the results were not based on maximum likelihood estimates, the parameter estimates for the models with $M = 0.07^{-yr}$ and $M = 0.11^{-yr}$ (as well as the base model) were from the best fit runs selected from sets of 40 runs that were generated with random "jitter" on the initial parameter values.

RESEARCH NEEDS

- The problem of model convergence to local extrema created major difficulties in this assessment because small changes in parameter values did not always produce coherent changes in the model results. Strategies are needed that will help analysts navigate irregular likelihood surfaces. Modification to the phasing used in SS2 seemed to offer a possible solution, but currently there is no theory and little experience to provide guidance on how to set the phasing.
- Data are needed on the length compositions of discarded Dover sole so that the retention function can be estimated more accurately and to help disentangle changes in selection from changes in retention.
- The West Coast Groundfish Observer Program data seemed to indicate large differences in discarding practices between northern and southern fishers, particularly regarding the mean weight of discarded fish compared to the weight of retained fish. These inconsistencies need to be more fully explored so that they can be plausibly modeled.

- In the length composition data from all the slope surveys the female Dover sole in the Monterey region had a bimodal distribution with large numbers of big fish in deep water (500-699 fa). This unusual feature should be more fully explored so that it can be plausibly modeled. Genetic studies or chemical analysis of otoliths might indicate the origins of the unusual abundance of these large females, which currently are a source of spawning biomass that is not adequately accounted for by the stock assessment model.
- For Dover sole the CV of length-at-age is not a linear function of length (Fig. 7) but is approximately a linear function of age. The SS2 software should be modified to allow the CV of length-at-age to be interpolated as a function of age instead of length.
- For Dover sole the two sexes seem to have different lengths for peak selection. The SS2 software should be modified to allow greater flexibility in modeling sex differences in selection.

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Table 1. Management regulations for the fishery for Dover sole, 1982-2004.

Effective Date	Management action taken
07/25/85	Prohibited the use of "tickler chains", which contact the sea floor ahead of the rollers, in roller and bobbin trawls.
04/26/89	Established coast-wide weekly trip limit on the deepwater complex (consisting of sablefish, Dover sole, arrowtooth flounder and thornyheads) of only 1 landing above 4,000 pounds per week, not to exceed 30,000 pounds. No limit on the number of landings of deepwater complex (DWC) less than 4,000 pounds. For each landing of the DWC, no more than 1,000 pounds or 25%, whichever is greater, may be sablefish. Biweekly and twice weekly options were also available.
10/04/89	Removed the overall trawl poundage and trip frequency limits for the deepwater complex, while retaining the separate trip limit for sablefish at 25% of the deepwater complex or 1,000 pounds, whichever is greater.
10/03/90	Established a 15,000 pound trip limit on the deepwater complex, allowed only one landing per week of the DWC above 1,000 pounds; and maintained the current sablefish trip limit of 1,000 pounds or 25% of the DWC, whichever is greater. Biweekly and twice weekly landing options are provided. Removed arrowtooth flounder from the deepwater complex.
01/01/91	Established a coastwide weekly trawl trip limit for the deepwater complex of 27,500 pounds, including no more sablefish than 1,000 pounds or 25% of the DWC, whichever is greater, and no more than 7,500 pounds of thornyheads. Only one landing above 4,000 pounds of DWC per week. Biweekly and twice weekly options available.
07/31/91	Increased the weekly trip limit for thornyheads to 12,500 pounds within the DWC trip limit. The overall DWC complex trip limit remained at 27,500 pounds.
01/01/92	For DWC established a cumulative landing limit per specified 2-week period of 55,000 pounds of which no more than 25,000 can be thornyheads. In any landing no more than 25% of the DWC may be sablefish, unless less than 1,000 pounds of sablefish are landed, in which case the percentage does not apply.
05/09/92	Increased the minimum legal codend mesh size for roller trawl gear north of Point Arena, California (40°30'N latitude) from 3.0 inches to 4.5 inches; prohibited double-walled codends; removed provisions regarding rollers and tickler chains for roller gear with codend mesh smaller than 4.5 inches.
07/29/92	Reduced the cumulative 2-week landing limit for thornyheads from 25,000 pounds to 20,000 pounds.
10/07/92	Reduced the cumulative 2-week landing limit for thornyheads from 20,000 pounds to 15,000 pounds. Reduced the cumulative 2-week landing limit for the DWC from 55,000 pounds to 50,000 pounds.
01/01/93	For DWC established a cumulative landing limit per specified 2-week period of 45,000 pounds of which no more than 20,000 pounds may be thornyheads. In any landing no more than 25% of the DWC may be sablefish, unless less than 1,000 pounds of sablefish are landed, in which case the percentage does not apply.
04/21/93	Reduced the 2-week cumulative trip limit for the deepwater complex from 45,000 pounds per 2-week period to 60,000 pounds per 4-week period, while maintaining the trawl-caught sablefish limit at 25% of the DWC per landing. Reduced the thornyhead trip limit from 20,000 pounds cumulative per 2-week period to 35,000 pounds cumulative per 4-week period.
09/08/93	Reduced the trip limit for trawl caught sablefish to the greater of 1,000 pounds or 25% of the DWC, not to exceed 3,000 pounds.
12/01/93	Reduced the cumulative trip limits for the Dover sole/thornyhead/trawl-caught sablefish (DTS) complex. No more than 5,000 pounds of species in the DTS complex can be taken, retained, processed, or landed per vessel per trip. Of this no more than 1,000 pounds can be sablefish. Only one landing of fish in the DTS complex may be made in any 1-week period.
01/01/94	Divided the commercial groundfish fishery into two components: the limited entry fishery and the open access fishery. Vessels without valid limited entry permits may participate in the open access fishery with any legal groundfish gear except groundfish trawl, subject to any open access trip limits, quotas and harvest guidelines in effect.

All further listed regulations are for the limited entry fishery unless otherwise specified.

Table 1. Management regulations for the fishery for Dover sole, 1982-2004. (continued)

Effective Date	Management action taken
01/01/94	For the DTS complex established a cumulative limit of 50,000 pounds per month of which no more than 30,000 pounds may be thornyheads and no more than 12,000 pounds may be trawl-caught sablefish. The sablefish trip limit is 1,000 pounds or 25% of the DTS complex, whichever is greater, and applies to each trip.
07/01/94	Reduced the trip limits for the DTS complex to 30,000 pounds of the DTS complex per vessel per calendar month of which no more than 8,000 pounds may be thornyheads and no more than 6,000 pounds may be trawl-caught sablefish.
12/01/94	Reduced the monthly cumulative trip limit for Dover sole to 6,000 pounds north of 36°N latitude. Prohibited all commercial sablefish fishing north of 36°N latitude. Reduced the thornyhead monthly cumulative trip limit to 1,500 pounds north of 36°N latitude.
01/01/95	Established a cumulative DTS limit of 35,000 pounds per month north of Cape Mendocino and 50,000 pounds per month south of Cape Mendocino. Within the DTS complex limit not more than 20,000 pounds may be thornyheads, of which not more than 4,000 pounds per month may be shortspine thornyhead. For trawl-caught sablefish the cumulative limit is 6,000 pounds per month including a trip limit of 1,000 pounds or 25% of the DTS complex, whichever is greater, per trip.
04/01/95	Reduced the cumulative monthly limit of the two thornyhead species to 15,000 pounds, not more than 3,000 pounds of which may be shortspine thornyhead.
05/01/95	The cumulative monthly limit for trawl-caught sablefish increased from 6,000 to 7,000 pounds.
07/14/95	Removed the trip limit that required trawl-caught sablefish to comprise no more than 1,000 pounds or one third of the Dover sole and thornyheads.
09/01/95	Reduced the thornyhead portion of the DTS complex cumulative monthly limit from 15,000 pounds, no more than 3,000 pounds of which may be shortspine thornyhead, to 8,000 pounds, no more than 1,500 pounds of which may be shortspine thornyhead.
09/08/95	The trawl minimum mesh size now applies throughout the net. Removed the legal distinction between bottom and roller trawls and the requirement for continuous riblines. Clarified the distinction between bottom and pelagic (midwater) trawls. Modified chafing gear requirements. Changed the term “double-ply mesh” to “double-bar mesh.”
11/30/95	Prohibited further landings of thornyheads and trawl-caught sablefish for the remainder of the year and reduce the cumulative monthly limit of Dover sole to 3,000 pounds per vessel.
01/01/96	Established cumulative vessel limits for specified 2-month periods rather than 1-month periods, with the target harvest level per month being 50% of the 2-month limit. However, vessels could land as much as 60% of the 2-month limit in either of the two months, so long as the total did not exceed the specified limit.
01/01/96	Established a cumulative DTS limit of 70,000 pounds per two month period north of Cape Mendocino and 100,000 pounds per month south of Cape Mendocino. Within the DTS complex not more than 20,000 pounds may be thornyheads, of which not more than 4,000 pounds per two months may be shortspine thornyhead. For trawl-caught sablefish the cumulative limit is 12,000 pounds per 2-months.
07/01/96	Reduced the cumulative 2-month limit for Dover sole north of Cape Mendocino to be 38,000 pounds.
01/01/97	Established a cumulative DTS limit of 70,000 pounds per two months period north of Cape Mendocino and 100,000 pounds per month south of Cape Mendocino. Within the DTS complex not more than 20,000 pounds may be thornyheads, of which not more than 4,000 pounds per two months may be shortspine thornyhead. For trawl-caught sablefish the cumulative limit is 12,000 pounds per 2-months. For Dover sole north of Cape Mendocino the cumulative limit is 38,000 pounds per two months.
05/01/97	Reduced the DTS complex cumulative 2-month limit for Dover sole north of Cape Mendocino to 30,000 pounds. Reduced the overall limit of thornyheads to 15,000 pounds and reduced the two-month cumulative limit on shortspines to 3,000 pounds. The cumulative limit for DTS complex was reduced to 57,000 pounds per two months north of Cape Mendocino.
09/01/97	Changed from two month cumulative limits to one month cumulative limits for Dover sole, thornyheads, and trawl-caught sablefish.

Table 1. Management regulations for the fishery for Dover sole, 1982-2004. (continued)

Effective Date	Management action taken
10/01/97	Reduced the monthly limit of DTS complex to 11,000 pounds north of Cape Mendocino and 38,500 pounds south of Cape Mendocino. Within these limits, no more than 1,500 pounds could be Dover sole north of Cape Mendocino, and 30,000 pounds south of Cape Mendocino; no more than 2,000 pounds coastwide could be trawl-caught sablefish; and no more than 7,500 pounds coastwide could be thornyheads. No more than 1,500 pounds of the thornyheads could be shortspine thornyheads.
01/01/98	Established coastwide cumulative limit of 40,000 pounds of Dover sole in the January-February period and 18,000 pounds per two-month period thereafter; not more than 5,000 pounds of sablefish, not more than 10,000 pounds of longspine thornyheads, and not more than 4,000 pounds of shortspine thornyhead.
05/01/98	Increased the 2-month cumulative limit for Dover sole to 22,000 pounds, for longspine thornyheads to 12,000 pounds, for shortspine thornyheads to 5,000 pounds, and for trawl-caught sablefish to 6,000 pounds. The overall DTS complex cumulative limit was removed.
09/01/98	All limited entry cumulative limits became monthly limits.
10/01/98	The Dover sole monthly cumulative limit increased to 18,000 pounds.
12/01/98	The Dover sole monthly limit increased to 36,000 pounds.
01/01/99	A new three-phase cumulative limit period system was introduced. Phase 1 is a single cumulative limit period that is three months long, from January 1- March 31. Phase 2 has three separate 2-month cumulative limit periods of April 1- May 31, June 1-July 31, and August 1- September 30. Phase 3 has three separate 1-month cumulative limit periods of October 1-31, November 1-30, and December 1-31. For all species except POP and bocaccio, there was no monthly limit within the cumulative landings limit periods. An option was available to apply cumulative trip limits lagged by 2 weeks (from the 16th to the 15th) to limited entry trawl vessels when their permits were renewed for 1999. Vessels authorized to operate in this “B” platoon could take and retain, but not land, groundfish during January 1-15, 1999. Dover sole coastwide landings limits were 70,000 pounds per period for Phase 1, 20,000 pounds per period for Phase 2; and 22,000 pounds per period for Phase 3.
05/01/99	(05/16/99 for “B” platoon vessels) Dover sole 2-month cumulative limit for the period April 1- May 31 increased from 20,000 pounds to 25,000 pounds. Beginning June 1, the 2-month cumulative limits for Dover sole reverted to 20,000 pounds.
01/01/00	New cumulative trip limit periods were defined as follows: A cumulative trip limit is the maximum amount that may be taken and retained, possessed, or landed per vessel in a specified period of time without a limit on the number of landings or trips, unless otherwise specified. The limits for Dover sole were 55,000 pounds per 2-month period for January-April, 20,000 pounds per 2-month period for May-October, and 20,000 pounds per month for each of November-December.
2001 final	Differential cumulative trip limits north and south of the management line at 40 deg.10' N. lat were introduced for landings of Dover sole, thornyheads, sablefish. In the northern area the limits for Dover sole were 65,000 pounds bimonthly for January-April, 20,000 pounds bimonthly for May-June, 15,000 pounds bimonthly for July-August, and 7,500 pounds for September. The fishery was closed during October-November and there was a 1,000-pound limit per trip during December. In the southern area the limits for Dover sole were 35,000 pounds bimonthly for January-June, 30,000 pounds bimonthly July-August, and 15,000 pounds for September. The fishery was closed during October-November and there was a 1,000-pound per trip limit during December.
2002 final	Differential limits were introduced this year in the northern area for large versus small footrope trawls. In the northern area the limits for Dover sole were 30,000 pounds bimonthly for January-February, 28,000 pounds bimonthly for March-April, 14,000 pounds bimonthly for May-August, and 20,000 pounds bimonthly for September-October in times and areas that were not closed. During November-December the limit was 22,000 pounds bimonthly if only large-footrope gear was used during the entire period and 12,000 pounds bimonthly if small-footrope gear was used at any time in any area (North or South). In the southern area the limits were 22,000 pounds bimonthly for the entire year.

2003 final In the northern area the limits for Dover sole during January-April were 26,000 pounds bimonthly. For Dover sole taken during May-October the limits were 31,000 pounds bimonthly during May-June and 34,000 pounds bimonthly for July-October if only large-footrope gear was used during the entire period. The limits during May-October were 12,500 pounds bimonthly if small-footrope gear was used at all during the period in any area (North or South). During November-December the Dover sole limits were 30,000 pounds bimonthly. In the southern area the limits for Dover sole were 26,000 pounds bimonthly for January-April, 31,000 pounds bimonthly for May-June, 34,000 pounds bimonthly for July-October, and 30,000 pounds bimonthly for November-December.

2004 final In the northern area the limits for Dover sole taken with large-footrope trawls were 67,500 pounds bimonthly for January-April, 32,000 pounds bimonthly for May-June, 31,000 pounds bimonthly for July-August, and 40,000 pounds bimonthly for September-December. The limits for Dover sole taken with small-footrope trawls were 10,000 pounds bimonthly for January-April, 27,000 pounds bimonthly for May-August, and 40,000 pounds bimonthly for September-December. In the southern area the limits for Dover sole were 39,000 pounds bimonthly for January-April, 49,000 pounds bimonthly for May-June, 48,000 pounds bimonthly for July-December.

Table 2. Dover sole landings (mt) by INPFC region.
Sources: Brodziak (1996) for 1956-80; PacFIN for 1981-2004.

Year	Conception	Monterey	Eureka	Columbia	U.S. Vancouver	unknown	Total
1956	0.0	1335.0	2300.0	1242.0	988.0		5865.0
1957	0.0	1076.0	2429.0	1701.0	385.0		5591.0
1958	0.0	1266.0	2247.0	1289.0	468.0		5270.0
1959	0.0	974.0	2213.0	2203.0	525.0		5915.0
1960	0.0	1225.0	2887.0	2343.0	860.0		7315.0
1961	0.0	1101.0	2332.0	1845.0	655.0		5933.0
1962	39.0	1185.0	3055.0	2005.0	470.0		6754.0
1963	0.0	1346.0	3014.0	2399.0	658.0		7417.0
1964	68.0	1690.0	2500.0	2365.0	266.0		6889.0
1965	46.0	1724.0	3184.0	1502.0	148.0		6604.0
1966	0.0	1747.0	3048.0	1417.0	225.0		6437.0
1967	0.0	1141.0	2101.0	1543.0	118.0		4903.0
1968	0.0	681.0	3264.0	1714.0	407.0		6066.0
1969	0.0	859.0	5362.0	2096.0	450.0		8767.0
1970	10.0	1778.0	5259.0	2262.0	454.0		9763.0
1971	0.0	1838.0	4837.0	2281.0	515.0		9471.0
1972	22.0	2721.0	7385.0	2516.0	340.0		12984.0
1973	13.0	3155.0	7216.0	1743.0	323.0		12450.0
1974	19.0	2660.0	6312.0	2242.0	195.0		11428.0
1975	69.0	2888.0	7499.0	2012.0	269.0		12737.0
1976	78.0	3706.0	7460.0	2095.0	627.0		13966.0
1977	63.0	4843.0	5840.0	1876.0	510.0		13132.0
1978	50.0	4850.0	4715.0	3841.0	598.0		14054.0
1979	31.0	4151.0	6683.0	5828.0	1245.0		17938.0
1980	53.0	3151.0	5472.0	4282.0	1128.0		14086.0
1981	61.3	3471.9	6289.0	5210.3	1435.0		16467.4
1982	109.3	4520.0	5830.1	8451.8	2007.3		20918.5
1983	368.9	4184.8	5562.3	6778.1	3098.3		19992.5
1984	1285.9	4346.9	5109.1	5279.4	3183.6		19204.9
1985	2831.6	4261.0	5924.3	4836.9	2682.7	0.0	20536.6
1986	1241.2	5397.9	5144.4	4028.2	1540.3	2.7	17354.6
1987	2468.1	3994.0	5095.4	5503.7	1324.3	25.3	18410.9
1988	1656.1	2608.6	4801.1	6773.9	2268.8	8.6	18117.1
1989	1611.9	2869.4	4130.9	7644.2	2483.9	3.0	18743.4
1990	1375.0	2010.6	3886.3	6150.2	2231.3	6.5	15659.9

Table 2. Dover sole landings (mt) by INPFC region. (continued)

Year	Conception	Monterey	Eureka	Columbia	U.S. Vancouver	unknown	Total
1990	1375.0	2010.6	3886.3	6150.2	2231.3	6.5	15659.9
1991	1474.0	3284.9	3914.4	7149.1	2375.6	0.2	18198.2
1992	1834.1	3598.8	3978.1	4838.5	1731.5	5.9	15986.9
1993	1217.8	2894.2	3505.5	5018.3	1658.2	1.4	14295.3
1994	967.6	2125.9	2126.9	2969.7	1150.7	1.8	9342.6
1995	1101.2	3249.8	2403.2	2624.8	1178.6	7.7	10565.1
1996	1322.2	3241.9	2648.3	3514.7	1459.2	0.1	12186.5
1997	1106.8	2744.4	2109.8	3152.8	994.2	16.4	10124.3
1998	571.0	1275.4	2287.0	2973.4	896.7	7.0	8010.4
1999	443.0	1748.5	2224.4	3608.8	1106.7	6.1	9137.4
2000	230.6	1647.2	1936.8	3435.4	1219.6	290.3	8759.9
2001	120.7	1288.9	1492.4	2508.1	1449.1	30.0	6889.2
2002	287.0	1711.8	1490.4	2021.6	762.3	27.9	6301.1
2003	352.1	1599.1	1955.2	2626.7	838.3	0.7	7372.2
2004	312.5	1245.8	1125.7	3079.3	979.3	0.0	6742.6

Table 3. Historical Dover sole landings (mt) by state. See text for details.

Year	California	Oregon	Washington	Total	Year	California	Oregon	Washington	Total
1910	0.0			0.0	1933	724.2	5.5		729.6
1911	10.0			10.0	1934	767.7	3.6	0.0	771.3
1912	20.0			20.0	1935	785.2	7.3	0.1	792.6
1913	30.0			30.0	1936	719.3	23.6	0.3	743.2
1914	40.0			40.0	1937	726.1	103.4	7.1	836.7
1915	50.0			50.0	1938	680.0	5.2	7.3	692.5
1916	55.8			55.8	1939	861.5	317.1	7.9	1186.5
1917	152.1			152.1	1940	655.5	448.2	28.5	1132.2
1918	183.7			183.7	1941	412.2	589.9	93.8	1095.9
1919	192.7			192.7	1942	273.9	1047.1	79.0	1400.1
1920	166.5			166.5	1943	408.8	2917.4	183.0	3509.2
1921	254.6			254.6	1944	417.7	722.8	268.8	1409.3
1922	429.6			429.6	1945	683.3	1226.6	91.7	2001.6
1923	493.9			493.9	1946	944.7	1450.6	243.7	2638.9
1924	692.8			692.8	1947	1104.0	921.7	89.4	2115.0
1925	763.5			763.5	1948	3281.5	1273.8	121.2	4676.5
1926	753.7			753.7	1949	3578.9	1362.4	7.3	4948.6
1927	913.1			913.1	1950	4331.1	2884.1	28.5	7243.7
1928	895.9	0.0		895.9	1951	3910.5	3755.9	44.9	7711.3
1929	1020.0	3.9		1023.9	1952	5328.9	3277.7	84.2	8690.8
1930	951.8	1.2		953.1	1953	4039.0	1296.0	20.3	5355.2
1931	820.2	1.2		821.4	1954	4504.4	1629.6	16.1	6150.1
1932	774.7	8.7		783.3	1955	3712.9	1950.7	35.4	5699.0

Table 4. Discarded and retained fish from Pikitch Discard Study, 1986-1987.

Length	----- Male -----		---- Female ----		Percent Retained		Est. Wt (kg)	
(cm)	Discarded	Total	Discarded	Total	Male	Female	Male	Female
13	1	1	0	0	0.0%		0.016	0.017
15	1	1	0	0	0.0%		0.026	0.027
18	0	0	2	2		0.0%	0.048	0.049
19	5	5	5	5	0.0%	0.0%	0.057	0.059
20	6	6	2	2	0.0%	0.0%	0.067	0.069
21	8	8	4	4	0.0%	0.0%	0.079	0.081
22	6	6	6	6	0.0%	0.0%	0.092	0.094
23	17	17	10	10	0.0%	0.0%	0.106	0.109
24	27	28	11	12	3.6%	8.3%	0.122	0.125
25	31	36	16	16	13.9%	0.0%	0.140	0.143
26	48	58	29	35	17.2%	17.1%	0.159	0.162
27	66	89	27	30	25.8%	10.0%	0.180	0.183
28	77	153	44	53	49.7%	17.0%	0.203	0.206
29	71	159	43	62	55.3%	30.6%	0.227	0.230
30	55	206	30	72	73.3%	58.3%	0.254	0.257
31	22	214	25	85	89.7%	70.6%	0.283	0.286
32	8	294	18	127	97.3%	85.8%	0.314	0.316
33	4	309	4	163	98.7%	97.5%	0.347	0.349
34	2	306	2	193	99.3%	99.0%	0.383	0.385
35	0	243	0	210	100.0%	100.0%	0.421	0.422
36	0	221	0	206	100.0%	100.0%	0.462	0.463
37	0	123	1	189	100.0%	99.5%	0.505	0.505
38	0	87	0	175	100.0%	100.0%	0.551	0.551
39	0	63	0	145	100.0%	100.0%	0.600	0.599
40	0	29	0	133	100.0%	100.0%	0.652	0.650
41	0	22	0	94	100.0%	100.0%	0.707	0.704
42	0	13	0	67	100.0%	100.0%	0.765	0.760
43	0	7	0	73	100.0%	100.0%	0.826	0.820
44	0	3	0	47	100.0%	100.0%	0.890	0.884
45	0	2	0	34	100.0%	100.0%	0.958	0.950
46	0	1	0	20	100.0%	100.0%	1.030	1.020
47	0	0	0	19		100.0%	1.105	1.093
48	0	2	0	11	100.0%	100.0%	1.184	1.170
49	0	1	0	4	100.0%	100.0%	1.266	1.250
50	0	0	0	2		100.0%	1.353	1.334
51	0	0	0	5		100.0%	1.444	1.423
54	0	0	0	2		100.0%	1.741	1.710
est tot wt =	87.5	945.8	58.0	1128.9	% wt disc		7.0%	

Table 5. Oregon at-sea and dockside samples of Dover sole. Males and females combined.

	at-sea			dockside				
N trips >>	3	5	7	2	4	3	at-sea	dockside
Length (cm)	1959	1960	1961	1959	1960	1961	1959-61	1959-61
20	0	0	2	0	0	0	0.05%	0.00%
21	0	0	1	0	0	0	0.03%	0.00%
22	0	1	1	0	0	0	0.05%	0.00%
23	0	0	3	0	0	0	0.08%	0.00%
24	0	0	3	0	0	0	0.08%	0.00%
26	2	2	3	0	0	0	0.19%	0.00%
27	0	0	4	0	0	0	0.11%	0.00%
28	8	4	8	0	0	0	0.55%	0.00%
29	6	10	9	0	0	0	0.68%	0.00%
30	5	10	22	0	0	1	1.01%	0.02%
31	19	11	19	0	4	6	1.34%	0.21%
32	23	17	29	2	5	15	1.89%	0.45%
33	32	20	30	15	12	28	2.25%	1.13%
34	54	37	43	33	25	55	3.67%	2.32%
35	52	47	44	40	57	72	3.92%	3.47%
36	95	67	58	61	90	94	6.03%	5.03%
37	103	67	88	102	147	127	7.07%	7.72%
38	87	118	59	102	190	139	7.23%	8.85%
39	84	133	93	98	193	111	8.49%	8.25%
40	74	152	89	95	200	110	8.63%	8.32%
41	64	97	87	79	207	135	6.79%	8.64%
42	47	92	60	53	165	82	5.45%	6.16%
43	38	82	54	47	163	82	4.77%	6.00%
44	34	68	58	52	125	65	4.38%	4.97%
45	24	57	58	30	147	66	3.81%	4.99%
46	26	55	46	36	115	57	3.48%	4.27%
47	19	35	36	35	96	37	2.47%	3.45%
48	14	38	27	18	79	34	2.16%	2.69%
49	17	32	25	16	69	29	2.03%	2.34%
50	8	25	17	12	54	29	1.37%	1.95%
51	17	27	30	15	38	24	2.03%	1.58%
52	18	18	17	16	48	18	1.45%	1.68%
53	12	32	17	7	34	17	1.67%	1.19%
54	9	11	10	9	19	11	0.82%	0.80%
55	9	15	14	6	23	9	1.04%	0.78%
56	15	12	7	8	24	4	0.93%	0.74%
57	8	12	6	4	24	7	0.71%	0.72%
58	3	7	7	1	12	8	0.47%	0.43%
59	5	5	3	5	8	1	0.36%	0.29%
60	5	2	0	2	5	2	0.19%	0.18%
61	1	1	2	1	2	4	0.11%	0.14%
62	1	1	2	0	2	2	0.11%	0.08%
63	0	0	2	0	3	1	0.05%	0.08%
64	0	0	0	0	1	1	0.00%	0.04%
65+	0	0	0	0	1	0	0.00%	0.02%

Table 6. West Coast Groundfish Observer Program estimates of retained and discarded Dover sole catch (mt) by area and depth interval, 2002-2003.

		Depth Interval (fa)							
	Region	1-60	61-75	76-100	100-150	151-225	226-300	> 300	All depths
Retained (expanded)									
2002	Col-Van	240.0	303.5	302.5	140.2	330.4	697.6	152.5	2,166.8
	Eureka	6.0	19.5	128.8	215.4	259.5	960.5	507.7	2,097.4
	Mon-Con	0.5	1.1	17.6	17.0	237.3	986.5	730.8	1,990.7
2003	Col-Van	157.2	204.1	109.0	53.1	456.8	1,322.4	268.9	2,571.6
	Eureka	30.1	11.6	41.5	68.1	334.6	1,629.6	645.1	2,760.6
	Mon-Con	0.4	0.0	0.0	0.0	68.9	999.4	877.4	1,946.0
Estimated discard									
2002	Col-Van	32.4	40.8	38.5	20.0	43.1	17.3	95.0	287.1
	Eureka	8.2	5.9	25.8	26.0	18.5	25.7	172.9	282.9
	Mon-Con	18.5	222.3	5.6	15.1	13.4	50.7	309.7	635.2
2003	Col-Van	52.2	116.9	77.4	3.8	55.6	51.8	57.2	414.9
	Eureka	137.3	3.3	100.5	4.3	22.2	33.3	101.5	402.4
	Mon-Con	2.4	0.0	0.0	0.0	3.6	49.4	153.5	209.0
Total catch									
2002	Col-Van	272.4	344.3	341.0	160.3	373.6	714.9	247.5	2,453.8
	Eureka	14.2	25.3	154.6	241.4	278.0	986.2	680.6	2,380.3
	Mon-Con	19.0	223.4	23.2	32.0	250.6	1,037.2	1,040.5	2,625.9
2003	Col-Van	209.5	321.0	186.4	56.9	512.4	1,374.1	326.1	2,986.5
	Eureka	167.5	14.9	142.0	72.4	356.8	1,662.9	746.6	3,163.0
	Mon-Con	2.8	0.0	0.0	0.0	72.5	1,048.8	1,030.9	2,155.0
Discard % of total catch									
2002	Col-Van	11.9%	11.8%	11.3%	12.5%	11.5%	2.4%	38.4%	11.7%
	Eureka	57.9%	23.1%	16.7%	10.8%	6.7%	2.6%	25.4%	11.9%
	Mon-Con	97.4%	99.5%	24.0%	47.0%	5.3%	4.9%	29.8%	24.2%
2003	Col-Van	24.9%	36.4%	41.5%	6.6%	10.9%	3.8%	17.5%	13.9%
	Eureka	82.0%	21.9%	70.8%	5.9%	6.2%	2.0%	13.6%	12.7%
	Mon-Con	87.3%				5.0%	4.7%	14.9%	9.7%

Table 7. Fishery sample sizes for Dover sole length compositions.

	Number of market samples with lengths						Number of fish lengths					
	Southern Region			Northern Region			Southern Region			Northern Region		
yr	CA	OR	Total	OR	WA	Total	CA	OR	Total	OR	WA	Total
1966				34	1	35				3234	80	3314
1967		1	1	25	2	27		100	100	2419	367	2786
1968				27	4	31				2549	1063	3612
1969	17		17	28		28	807		807	2799		2799
1970	14		14	27	12	39	671		671	2585	2620	5205
1971	29		29	4	6	10	725		725	349	1284	1633
1972	47	5	52	15	5	20	1173	498	1671	1460	1130	2590
1973	36	5	41	19	3	22	900	500	1400	1898	663	2561
1974	32	5	37	17	2	19	799	500	1299	1697	451	2148
1975	24	5	29	11	3	14	599	500	1099	1200	539	1739
1976	39		39	11	6	17	1475		1475	1099	1696	2795
1977	65		65	12	2	14	2425		2425	1200	576	1776
1978	63		63	5		5	1574		1574	500		500
1979	37		37	21		21	927		927	2099		2099
1980	115		115	24		24	2884		2884	2395		2395
1981	80	1	81	36		36	1973	100	2073	3597		3597
1982	67		67	34		34	2586		2586	3555		3555
1983	106	3	109	27		27	4267	475	4742	2955		2955
1984	87	5	92	32		32	3357	672	4029	3697		3697
1985	120	7	127	43		43	5058	701	5759	4217		4217
1986	100	5	105	31		31	4067	497	4564	3117		3117
1987	96		96	39		39	4099		4099	3926		3926
1988	94	4	98	48	11	59	3811	236	4047	2854	550	3404
1989	127	2	129	62	18	80	4594	99	4693	3066	899	3965
1990	101	2	103	63	16	79	4519	100	4619	3150	799	3949
1991	130	5	135	86	17	103	5564	261	5825	4426	850	5276
1992	130	8	138	80	11	91	5081	426	5507	3698	549	4247
1993	85	1	86	31	14	45	3316	60	3376	1503	700	2203
1994	69	2	71	33	11	44	2887	96	2983	1747	548	2295
1995	97	3	100	27	20	47	3507	110	3617	1561	999	2560
1996	94	2	96	23	20	43	3590	71	3661	1133	999	2132
1997	86	9	95	28	19	47	3460	412	3872	1383	944	2327
1998	90	12	102	37	19	56	3635	486	4121	1643	951	2594
1999	81	11	92	33	23	56	3263	525	3788	1592	1148	2740
2000	72	19	91	30	23	53	2754	841	3595	1435	1150	2585
2001	77	13	90	30	19	49	2767	507	3274	1209	950	2159
2002	110	15	125	35	18	53	4072	624	4696	1673	899	2572
2003	105	28	133	39	23	62	3885	1265	5150	1569	1131	2700
2004	72	17	89	43	18	61	3171	800	3971	1980	900	2880

Table 8. Fishery sample sizes for Dover sole age compositions.

	Number of market samples with ages						Number of fish that were aged					
	Southern Region [a]			Northern Region [b]			Southern Region			Northern Region		
yr	CA	OR	Total	OR	WA	Total	CA	OR	Total	OR	WA	Total
1966				34		34				3151		3151
1967		1	1	25		25		100	100	2419		2419
1968				27		27				2541		2541
1969	17		17	28		28	423		423	2707		2707
1970	13		13	27		27	324		324	2585		2585
1971	29		29	4		4	725		725	291		291
1972	47	5	52	15		15	1173	497	1670	1424		1424
1973	36	5	41	19		19	898	497	1395	1875		1875
1974	32	5	37	17		17	799	484	1283	1653		1653
1975	24	5	29	11		11	599	494	1093	1171		1171
1976	39		39	11		11	975		975	1087		1087
1977	65		65	12		12	1621		1621	1198		1198
1978	63		63	5		5	1573		1573	499		499
1979	37		37	1		1	924		924	57		57
1980	114		114				2830		2830			
1981	80		80				1956		1956			
1982	28		28				694		694			
1983	38		38				939		939			
1984	53		53	1		1	1303		1303	100		100
1985	78		78	36		36	1875		1875	3476		3476
1986	75		75	23		23	1863		1863	2193		2193
1987	72		72	39		39	1799		1799	3706		3706
1988	71	3	74	47	7	54	1772	186	1958	2804	327	3131
1989	105	1	106	61	12	73	2617	49	2666	3014	554	3568
1990	26	2	28	61	12	73	859	100	959	3049	593	3642
1991	26	5	31	86	8	94	1241	261	1502	4414	390	4804
1992	43	8	51	79	11	90	1562	414	1976	3612	544	4156
1993	29	1	30	28	13	41	1105	60	1165	1370	646	2016
1994	25	2	27	33	11	44	1083	96	1179	1739	543	2282
1995	35	3	38	26	20	46	1353	107	1460	1477	994	2471
1996	40	2	42	23	20	43	1648	71	1719	1120	992	2112
1997	42	8	50	26	8	34	1742	355	2097	1267	396	1663
1998	48	9	57	31	16	47	1979	339	2318	1236	269	1505
1999	41	9	50	29	23	52	1710	423	2133	1307	292	1599
2000	65	13	78	25	23	48	2466	452	2918	1165	300	1465
2001	57	11	68	28	12	40	2011	85	2096	218	597	815
2002	65	13	78	18	18	36	2381	141	2522	191	438	629
2003	40	6	46	17	21	38	1096	281	1377	671	629	1300
2004		14	14	22	18	40	2004	329	329	512	869	1381

[a] Break and burn age-readings began in 1981. Age-readings were based on scales prior to that.
[b] Break and burn age-readings began in 1985. Age-readings were based on scales prior to that.

Table 9. Dover sole fishery length composition data from the northern region.

	Length in cm			Females															
Year	<=22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60+
1966	0.0%	0.0%	0.0%	0.1%	0.3%	2.1%	6.4%	8.1%	10.2%	9.8%	7.7%	6.6%	4.6%	2.8%	2.2%	1.1%	1.1%	0.8%	0.4%	0.2%
1967	0.0%	0.0%	0.0%	0.0%	0.2%	0.8%	5.5%	10.6%	12.1%	10.2%	8.2%	4.5%	4.2%	2.9%	2.3%	1.1%	1.3%	0.6%	0.4%	0.3%
1968	0.0%	0.0%	0.0%	0.0%	0.1%	0.9%	3.8%	8.3%	11.5%	11.7%	10.0%	7.1%	4.7%	3.0%	2.0%	1.3%	0.7%	0.6%	0.1%	0.2%
1969	0.0%	0.0%	0.0%	0.1%	0.5%	2.1%	6.1%	10.9%	12.0%	11.6%	9.8%	6.2%	5.4%	3.3%	2.3%	1.4%	0.9%	0.4%	0.3%	0.1%
1970	0.0%	0.0%	0.0%	0.0%	0.2%	2.1%	4.2%	8.2%	10.0%	10.3%	9.3%	6.6%	4.2%	2.9%	1.7%	1.1%	0.5%	0.2%	0.3%	0.2%
1971	0.0%	0.0%	0.0%	0.0%	0.2%	0.7%	3.0%	5.2%	3.8%	4.6%	4.6%	7.1%	2.6%	1.3%	1.8%	2.6%	1.2%	0.2%	0.3%	0.3%
1972	0.0%	0.0%	0.0%	0.0%	0.1%	1.2%	3.3%	6.4%	9.2%	9.9%	7.3%	5.4%	4.1%	3.0%	2.2%	1.7%	0.7%	0.7%	0.5%	0.1%
1973	0.0%	0.0%	0.0%	0.2%	1.1%	3.8%	7.6%	9.5%	8.4%	8.1%	6.6%	5.6%	3.8%	2.5%	1.7%	1.0%	0.7%	0.3%	0.2%	0.1%
1974	0.0%	0.0%	0.0%	0.2%	1.2%	2.9%	7.5%	12.6%	11.4%	9.4%	8.0%	5.0%	4.3%	2.4%	1.5%	1.0%	0.5%	0.1%	0.1%	0.1%
1975	0.0%	0.0%	0.0%	0.0%	0.1%	1.0%	3.8%	8.6%	11.8%	10.2%	9.5%	5.6%	3.2%	1.4%	0.9%	0.5%	0.3%	0.1%	0.0%	0.0%
1976	0.0%	0.0%	0.0%	0.1%	0.5%	1.4%	3.6%	11.0%	12.1%	11.1%	7.5%	6.2%	4.0%	3.4%	2.4%	1.6%	0.5%	0.3%	0.0%	0.0%
1977	0.0%	0.0%	0.0%	0.1%	0.2%	2.4%	4.4%	7.8%	9.9%	10.4%	8.1%	6.8%	5.6%	3.9%	2.0%	1.1%	0.5%	0.4%	0.3%	0.0%
1978	0.0%	0.2%	0.2%	0.6%	2.6%	4.2%	9.8%	7.8%	7.8%	3.8%	5.2%	3.6%	2.2%	2.4%	0.8%	0.8%	0.8%	0.2%	0.0%	0.4%
1979	0.0%	0.0%	0.1%	0.0%	0.7%	3.1%	5.6%	8.3%	10.4%	8.7%	6.8%	3.9%	3.1%	2.6%	1.3%	0.7%	0.5%	0.4%	0.0%	0.1%
1980	0.0%	0.0%	0.0%	0.0%	1.3%	3.6%	8.4%	12.2%	12.5%	10.4%	8.0%	5.1%	4.0%	2.3%	1.6%	1.0%	0.7%	0.3%	0.0%	0.0%
1981	0.0%	0.0%	0.0%	0.0%	0.3%	2.2%	5.5%	8.5%	7.8%	7.0%	6.1%	5.0%	3.8%	1.8%	1.5%	1.1%	0.5%	0.3%	0.0%	0.1%
1982	0.0%	0.0%	0.0%	0.3%	0.9%	4.7%	9.4%	7.7%	6.9%	6.8%	5.8%	3.3%	2.8%	1.7%	1.0%	0.6%	0.5%	0.1%	0.1%	0.0%
1983	0.0%	0.0%	0.0%	0.1%	1.1%	5.0%	9.9%	11.8%	9.6%	8.0%	5.3%	3.3%	3.6%	2.5%	1.8%	1.1%	0.5%	0.1%	0.2%	0.1%
1984	0.0%	0.0%	0.0%	0.2%	1.3%	4.8%	9.1%	10.4%	7.9%	6.8%	4.8%	4.7%	2.6%	1.5%	1.0%	0.5%	0.4%	0.6%	0.2%	0.0%
1985	0.0%	0.0%	0.0%	0.4%	1.7%	5.0%	9.8%	9.2%	5.7%	3.3%	2.8%	3.2%	2.3%	1.4%	0.8%	0.5%	0.3%	0.2%	0.1%	0.1%
1986	0.0%	0.0%	0.1%	0.3%	1.1%	4.3%	8.4%	9.2%	7.3%	5.6%	4.4%	3.5%	2.5%	1.5%	0.7%	0.4%	0.4%	0.2%	0.1%	0.0%
1987	0.0%	0.0%	0.2%	0.6%	2.5%	6.0%	8.5%	8.2%	6.0%	4.4%	2.6%	2.0%	1.6%	1.1%	0.7%	0.4%	0.3%	0.1%	0.1%	0.0%
1988	0.0%	0.1%	0.1%	0.7%	1.9%	5.2%	8.3%	8.5%	7.2%	5.3%	4.2%	2.9%	1.8%	1.6%	0.9%	0.5%	0.5%	0.2%	0.1%	0.1%
1989	0.0%	0.0%	0.1%	0.4%	1.6%	4.2%	7.6%	7.7%	6.3%	4.9%	3.6%	3.0%	2.0%	1.8%	1.0%	0.9%	0.4%	0.3%	0.1%	0.1%
1990	0.0%	0.0%	0.1%	0.5%	1.7%	4.5%	6.3%	7.5%	7.0%	4.8%	5.0%	4.8%	3.5%	2.1%	1.3%	0.7%	0.5%	0.3%	0.1%	0.3%
1991	0.0%	0.0%	0.1%	0.4%	2.1%	5.6%	8.4%	7.7%	5.9%	4.5%	3.9%	3.2%	2.3%	1.6%	1.2%	0.7%	0.4%	0.2%	0.1%	0.1%
1992	0.0%	0.0%	0.0%	0.5%	1.2%	4.8%	7.3%	8.5%	7.9%	6.8%	4.7%	4.0%	2.4%	1.9%	1.3%	0.7%	0.6%	0.3%	0.1%	0.2%
1993	0.0%	0.0%	0.2%	1.2%	2.9%	4.3%	9.7%	9.7%	7.2%	5.6%	3.9%	3.1%	2.1%	0.9%	0.8%	0.6%	0.5%	0.3%	0.1%	0.0%
1994	0.0%	0.0%	0.2%	0.7%	2.5%	4.3%	6.2%	6.4%	5.2%	5.2%	3.6%	2.3%	2.4%	1.5%	1.2%	0.3%	0.3%	0.2%	0.2%	0.0%
1995	0.0%	0.1%	0.3%	2.1%	3.5%	5.6%	6.2%	7.5%	5.4%	3.6%	2.5%	1.7%	1.2%	1.5%	0.6%	0.2%	0.4%	0.2%	0.0%	0.0%

Table 9. Dover sole fishery length composition data from the northern region. (continued)

	Length in cm			Females																
Year	<=22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60+
1996	0.0%	0.0%	0.1%	0.5%	2.1%	6.5%	9.6%	9.5%	6.9%	4.3%	3.1%	2.7%	2.3%	2.2%	1.1%	1.0%	0.4%	0.3%	0.1%	0.2%
1997	0.0%	0.1%	0.2%	0.5%	1.6%	4.3%	9.0%	10.8%	8.8%	6.1%	4.2%	2.5%	1.4%	1.3%	0.8%	0.6%	0.4%	0.1%	0.1%	0.1%
1998	0.1%	0.0%	0.1%	0.3%	1.3%	3.9%	9.0%	10.7%	11.2%	8.2%	4.9%	4.0%	2.9%	1.7%	1.5%	0.6%	0.8%	0.4%	0.0%	0.1%
1999	0.0%	0.0%	0.0%	0.5%	1.7%	4.3%	8.5%	11.4%	9.2%	7.6%	5.2%	3.0%	2.1%	1.4%	0.8%	0.7%	0.4%	0.2%	0.1%	0.0%
2000	0.0%	0.0%	0.3%	1.0%	2.0%	3.9%	8.1%	9.0%	8.8%	6.4%	4.7%	3.2%	2.3%	1.0%	0.8%	0.6%	0.5%	0.3%	0.1%	0.1%
2001	0.0%	0.0%	0.0%	0.1%	0.5%	1.7%	5.9%	8.4%	9.2%	7.0%	6.5%	4.9%	3.1%	1.7%	1.9%	0.9%	0.7%	0.3%	0.2%	0.2%
2002	0.0%	0.0%	0.0%	0.2%	0.8%	3.4%	5.8%	9.6%	8.7%	7.4%	4.9%	2.8%	3.0%	1.1%	0.7%	0.7%	0.5%	0.2%	0.2%	0.1%
2003	0.0%	0.0%	0.0%	0.1%	0.4%	1.8%	4.3%	6.2%	7.1%	7.4%	4.8%	3.1%	2.4%	1.4%	1.4%	0.9%	0.5%	0.2%	0.1%	0.1%
2004	0.0%	0.0%	0.1%	0.2%	0.4%	1.9%	4.6%	7.1%	7.6%	6.1%	4.3%	3.9%	2.4%	1.6%	1.2%	1.0%	0.5%	0.3%	0.1%	0.1%

Table 9. Dover sole fishery length composition data from the northern region. (continued)

	Length in cm			Males																
Year	<=22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60+
1966	0.0%	0.0%	0.0%	0.1%	0.5%	2.9%	6.2%	8.6%	7.3%	5.2%	2.6%	1.4%	0.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1967	0.0%	0.0%	0.0%	0.0%	0.3%	2.0%	6.2%	10.0%	7.2%	4.5%	2.3%	1.2%	0.6%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
1968	0.0%	0.0%	0.0%	0.0%	0.2%	1.3%	3.9%	6.4%	6.2%	6.4%	4.9%	2.6%	1.3%	0.6%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%
1969	0.0%	0.0%	0.0%	0.0%	0.3%	2.1%	6.8%	6.8%	5.4%	3.0%	1.6%	0.6%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1970	0.0%	0.0%	0.0%	0.1%	0.5%	2.7%	5.3%	8.5%	8.2%	6.0%	4.0%	1.6%	0.8%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1971	0.0%	0.0%	0.0%	0.5%	0.2%	3.0%	10.0%	15.2%	13.0%	8.6%	6.8%	1.8%	0.8%	0.4%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%
1972	0.0%	0.0%	0.1%	0.0%	0.8%	3.0%	7.6%	11.5%	8.3%	6.2%	3.8%	1.6%	0.7%	0.5%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%
1973	0.0%	0.0%	0.0%	0.1%	0.9%	2.8%	6.4%	9.5%	7.9%	5.2%	2.8%	1.9%	0.8%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1974	0.0%	0.1%	0.0%	0.4%	1.4%	4.0%	6.5%	7.4%	5.9%	3.7%	1.5%	0.6%	0.3%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
1975	0.0%	0.0%	0.0%	0.0%	1.1%	2.5%	6.4%	12.2%	9.6%	5.8%	4.2%	0.9%	0.2%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%
1976	0.0%	0.0%	0.0%	0.3%	1.1%	4.2%	6.5%	7.9%	7.0%	3.4%	2.6%	0.9%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1977	0.0%	0.0%	0.0%	0.1%	0.8%	3.0%	6.2%	8.1%	7.2%	5.8%	3.1%	1.1%	0.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1978	0.0%	0.0%	0.0%	1.4%	4.4%	8.0%	9.8%	8.6%	7.2%	3.8%	2.2%	0.8%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1979	0.0%	0.0%	0.1%	0.3%	1.8%	5.6%	9.5%	9.5%	7.8%	3.9%	2.7%	1.5%	0.5%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
1980	0.0%	0.0%	0.1%	0.3%	1.7%	3.8%	6.6%	6.2%	4.8%	3.9%	0.8%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1981	0.0%	0.0%	0.0%	0.3%	1.2%	4.9%	8.7%	9.7%	9.0%	7.1%	4.6%	1.9%	0.7%	0.3%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
1982	0.0%	0.0%	0.1%	0.9%	3.3%	8.3%	10.6%	8.4%	6.4%	4.3%	3.1%	1.4%	0.6%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1983	0.0%	0.0%	0.1%	0.8%	3.9%	7.9%	9.1%	6.3%	3.4%	1.7%	1.5%	0.5%	0.5%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
1984	0.0%	0.1%	0.2%	0.9%	2.8%	8.0%	9.3%	6.7%	5.9%	5.0%	2.7%	1.5%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985	0.1%	0.1%	0.5%	2.1%	5.7%	11.1%	10.4%	7.4%	5.4%	4.2%	4.0%	1.6%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1986	0.0%	0.0%	0.1%	1.3%	5.3%	9.6%	11.2%	8.7%	5.3%	3.9%	2.5%	1.3%	0.7%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
1987	0.0%	0.1%	0.9%	4.2%	8.0%	13.9%	12.5%	7.4%	3.8%	1.9%	1.2%	0.5%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1988	0.0%	0.2%	0.4%	1.7%	5.7%	11.4%	13.0%	8.6%	4.6%	2.4%	1.2%	0.6%	0.4%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
1989	0.0%	0.1%	0.3%	1.3%	6.4%	12.8%	13.3%	9.0%	5.1%	3.0%	1.3%	1.0%	0.5%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
1990	0.0%	0.1%	0.3%	1.4%	5.0%	10.0%	10.4%	6.8%	4.6%	4.1%	3.6%	1.9%	0.6%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1991	0.0%	0.1%	0.4%	2.2%	7.9%	12.9%	12.6%	6.6%	3.8%	2.3%	1.5%	0.8%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1992	0.0%	0.0%	0.3%	1.6%	5.3%	10.6%	9.6%	7.7%	4.9%	3.0%	2.2%	0.9%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1993	0.0%	0.1%	1.0%	2.6%	7.8%	10.3%	9.1%	6.2%	4.5%	2.5%	1.5%	1.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1994	0.0%	0.1%	1.5%	4.2%	9.8%	13.2%	10.4%	7.4%	4.0%	3.0%	2.4%	0.8%	0.4%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1995	0.1%	0.1%	1.8%	4.4%	8.9%	12.4%	14.4%	7.3%	3.1%	2.5%	1.3%	0.5%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 9. Dover sole fishery length composition data from the northern region. (continued)

	Length in cm			Males																
Year	<=22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60+
1996	0.0%	0.1%	0.6%	2.9%	6.2%	9.0%	11.1%	8.3%	3.1%	2.7%	1.5%	0.8%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%
1997	0.0%	0.1%	0.5%	2.8%	6.8%	11.8%	10.6%	6.6%	4.1%	2.0%	1.2%	0.6%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
1998	0.0%	0.0%	0.2%	1.3%	3.4%	7.2%	10.0%	7.5%	4.8%	1.8%	1.4%	0.4%	0.3%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
1999	0.0%	0.1%	0.3%	2.0%	5.6%	11.7%	10.9%	6.7%	2.9%	1.6%	0.6%	0.3%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2000	0.0%	0.1%	0.2%	2.0%	6.6%	11.2%	11.6%	7.2%	3.9%	1.9%	1.0%	0.7%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2001	0.1%	0.0%	0.2%	1.1%	3.6%	8.3%	11.9%	10.1%	6.0%	2.5%	1.5%	0.7%	0.4%	0.2%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%
2002	0.0%	0.1%	0.1%	1.5%	4.8%	12.6%	14.1%	9.8%	4.2%	1.5%	0.8%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2003	0.1%	0.0%	0.1%	0.6%	2.9%	9.2%	18.3%	12.8%	6.9%	3.3%	1.6%	0.9%	0.3%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
2004	0.0%	0.1%	0.3%	1.6%	3.8%	10.2%	16.8%	13.3%	6.6%	2.3%	0.8%	0.4%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 10. Dover sole fishery length composition data from the southern region.

	Length in cm			Females																
Year	<=22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60+
1967	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	4.0%	6.0%	1.0%	2.0%	2.0%	1.0%	0.0%	1.0%	1.0%	0.0%	0.0%
1969	0.0%	0.0%	0.0%	0.0%	0.1%	0.6%	2.6%	6.7%	8.2%	8.2%	5.6%	4.1%	2.9%	1.4%	0.9%	0.5%	0.0%	0.0%	0.0%	0.0%
1970	0.3%	0.0%	0.0%	0.0%	0.7%	1.8%	5.8%	15.1%	13.7%	8.9%	6.9%	6.3%	4.5%	1.6%	0.6%	0.0%	0.1%	0.0%	0.0%	0.0%
1971	0.0%	0.0%	0.0%	0.1%	0.0%	0.3%	2.1%	6.1%	8.4%	5.9%	4.6%	4.4%	3.9%	1.5%	1.1%	1.0%	0.1%	0.0%	0.1%	0.0%
1972	0.0%	0.0%	0.0%	0.2%	0.4%	1.0%	6.3%	10.5%	10.8%	9.8%	7.7%	6.4%	3.4%	2.5%	1.3%	0.4%	0.1%	0.1%	0.0%	0.2%
1973	0.0%	0.0%	0.0%	0.1%	0.1%	1.1%	5.3%	11.2%	12.4%	8.6%	6.2%	5.3%	2.9%	1.9%	1.1%	1.1%	0.5%	0.4%	0.1%	0.0%
1974	0.0%	0.0%	0.1%	0.1%	0.7%	1.0%	5.1%	11.2%	11.1%	10.4%	6.9%	5.0%	4.2%	2.4%	1.0%	0.5%	0.5%	0.1%	0.0%	0.0%
1975	0.0%	0.0%	0.0%	0.0%	0.3%	1.6%	3.5%	8.1%	11.4%	9.6%	7.6%	5.9%	4.0%	2.4%	0.8%	1.4%	0.7%	0.4%	0.0%	0.0%
1976	0.0%	0.0%	0.0%	0.1%	0.3%	3.0%	6.1%	8.3%	8.8%	10.7%	8.0%	6.1%	3.7%	2.0%	1.1%	0.4%	0.0%	0.0%	0.1%	0.0%
1977	0.0%	0.0%	0.0%	0.2%	0.5%	1.9%	4.8%	7.3%	8.6%	7.6%	7.7%	5.1%	3.8%	2.5%	0.9%	0.4%	0.2%	0.1%	0.1%	0.0%
1978	0.0%	0.0%	0.0%	0.0%	0.4%	2.1%	2.6%	5.5%	8.3%	8.3%	8.7%	6.8%	4.9%	2.3%	1.1%	0.3%	0.3%	0.0%	0.1%	0.0%
1979	0.0%	0.1%	0.0%	0.0%	0.1%	1.2%	2.9%	7.6%	8.3%	7.8%	7.5%	6.4%	5.8%	2.2%	1.3%	0.5%	0.5%	0.2%	0.1%	0.0%
1980	0.0%	0.0%	0.0%	0.2%	0.7%	2.5%	5.4%	8.6%	9.1%	8.5%	6.7%	5.3%	3.6%	2.0%	1.1%	0.5%	0.2%	0.2%	0.0%	0.1%
1981	0.0%	0.0%	0.0%	0.3%	0.5%	1.5%	4.2%	5.6%	7.2%	7.6%	6.9%	5.7%	5.2%	2.3%	1.5%	0.7%	0.2%	0.2%	0.0%	0.0%
1982	0.0%	0.0%	0.0%	0.0%	0.8%	2.7%	3.5%	5.3%	6.1%	6.2%	7.1%	6.0%	4.5%	1.7%	0.9%	0.3%	0.1%	0.1%	0.0%	0.0%
1983	0.0%	0.0%	0.1%	0.2%	1.0%	3.8%	7.2%	7.9%	7.1%	6.3%	5.8%	5.0%	3.7%	2.0%	1.2%	0.5%	0.4%	0.1%	0.0%	0.0%
1984	0.0%	0.0%	0.0%	0.1%	1.2%	5.1%	7.2%	8.1%	7.0%	5.2%	6.4%	5.1%	4.1%	1.9%	1.1%	0.5%	0.2%	0.1%	0.1%	0.0%
1985	0.0%	0.0%	0.0%	0.2%	1.1%	3.8%	7.2%	8.4%	7.6%	6.3%	5.7%	4.2%	3.2%	1.8%	1.0%	0.3%	0.2%	0.0%	0.0%	0.0%
1986	0.0%	0.0%	0.1%	0.3%	2.1%	4.4%	7.4%	8.1%	8.1%	5.8%	5.3%	5.2%	2.7%	1.7%	0.8%	0.6%	0.3%	0.0%	0.1%	0.0%
1987	0.0%	0.0%	0.2%	0.7%	2.9%	4.9%	8.0%	6.7%	6.0%	5.9%	5.3%	3.9%	2.3%	1.6%	0.8%	0.2%	0.1%	0.1%	0.2%	0.0%
1988	0.0%	0.0%	0.1%	0.7%	2.2%	5.1%	7.5%	7.7%	7.1%	7.3%	6.3%	4.9%	3.1%	1.9%	0.4%	0.2%	0.1%	0.0%	0.0%	0.0%
1989	0.0%	0.0%	0.1%	0.9%	2.4%	4.9%	6.0%	6.5%	6.9%	6.7%	7.1%	7.0%	3.8%	1.9%	0.7%	0.3%	0.0%	0.1%	0.0%	0.0%
1990	0.0%	0.0%	0.3%	1.2%	2.4%	4.6%	6.2%	6.2%	6.9%	6.1%	6.3%	5.9%	3.5%	1.7%	0.7%	0.3%	0.1%	0.0%	0.0%	0.0%
1991	0.0%	0.0%	0.2%	0.7%	2.1%	4.8%	7.3%	7.5%	7.0%	5.7%	5.2%	3.5%	2.7%	1.1%	0.5%	0.3%	0.1%	0.0%	0.0%	0.0%
1992	0.0%	0.0%	0.1%	0.5%	2.2%	4.8%	6.5%	7.9%	6.6%	6.4%	5.6%	4.9%	3.0%	1.7%	0.9%	0.3%	0.2%	0.1%	0.0%	0.0%
1993	0.0%	0.0%	0.2%	1.0%	2.7%	4.5%	6.3%	7.6%	5.9%	6.7%	4.6%	5.3%	3.1%	1.8%	0.9%	0.4%	0.2%	0.0%	0.0%	0.0%
1994	0.0%	0.0%	0.1%	1.2%	4.3%	8.0%	8.9%	6.9%	6.4%	4.8%	3.9%	4.3%	2.1%	1.3%	0.7%	0.3%	0.2%	0.0%	0.0%	0.0%
1995	0.1%	0.0%	0.1%	0.8%	2.3%	3.9%	6.4%	5.8%	6.7%	6.0%	6.4%	5.9%	3.5%	1.8%	0.7%	0.2%	0.2%	0.1%	0.0%	0.1%

Table 10. Dover sole fishery length composition data from the southern region. (continued)

	Length in cm			Females																
Year	<=22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60+
1996	0.0%	0.0%	0.1%	0.3%	1.1%	3.5%	6.5%	7.1%	7.0%	6.1%	4.8%	5.1%	3.5%	1.6%	0.9%	0.3%	0.2%	0.0%	0.0%	0.0%
1997	0.0%	0.0%	0.1%	0.5%	1.8%	5.3%	8.0%	8.5%	7.1%	6.3%	5.0%	3.7%	2.6%	1.7%	0.7%	0.4%	0.1%	0.0%	0.0%	0.0%
1998	0.0%	0.0%	0.0%	0.6%	2.4%	5.4%	8.0%	8.6%	7.6%	6.6%	5.0%	3.4%	2.6%	1.0%	0.5%	0.4%	0.3%	0.1%	0.0%	0.0%
1999	0.0%	0.0%	0.1%	0.3%	2.3%	5.8%	8.7%	8.4%	7.2%	6.3%	4.2%	3.8%	2.3%	1.4%	0.5%	0.5%	0.3%	0.2%	0.1%	0.0%
2000	0.1%	0.1%	0.2%	0.8%	3.2%	6.3%	7.7%	7.2%	6.1%	5.7%	4.4%	3.4%	2.5%	1.2%	0.6%	0.2%	0.3%	0.0%	0.0%	0.0%
2001	0.1%	0.0%	0.0%	0.4%	1.0%	3.8%	7.1%	8.2%	8.0%	6.7%	5.8%	4.4%	3.1%	1.7%	1.2%	0.5%	0.3%	0.3%	0.1%	0.0%
2002	0.0%	0.0%	0.1%	0.3%	1.5%	4.3%	7.5%	9.8%	8.3%	7.3%	5.1%	3.7%	3.1%	1.7%	0.7%	0.4%	0.2%	0.1%	0.0%	0.0%
2003	0.0%	0.0%	0.1%	0.4%	1.2%	3.6%	6.3%	7.6%	6.9%	5.1%	4.2%	3.0%	2.4%	1.3%	0.7%	0.3%	0.3%	0.2%	0.0%	0.0%
2004	0.0%	0.1%	0.2%	1.0%	1.9%	4.6%	7.4%	7.3%	6.0%	4.9%	2.7%	2.5%	1.9%	0.7%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%

Table 10. Dover sole fishery length composition data from the southern region. (continued)

	Length in cm			Males																
Year	<=22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60+
1967	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	8.0%	26.0%	24.0%	16.0%	3.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1969	0.0%	0.0%	0.0%	0.1%	0.8%	3.3%	10.4%	14.4%	10.3%	8.9%	5.1%	3.0%	1.5%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1970	0.1%	0.0%	0.0%	0.0%	0.1%	1.5%	3.3%	10.6%	8.9%	5.8%	1.6%	1.0%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1971	0.0%	0.0%	0.0%	0.1%	0.4%	2.6%	9.0%	14.3%	14.3%	8.1%	6.3%	3.6%	1.0%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
1972	0.0%	0.0%	0.1%	0.0%	0.2%	1.9%	6.1%	8.2%	9.0%	6.2%	5.1%	1.3%	0.8%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
1973	0.1%	0.0%	0.1%	0.1%	0.5%	2.7%	6.3%	9.5%	9.8%	6.6%	4.2%	1.1%	0.4%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1974	0.0%	0.0%	0.0%	0.5%	1.4%	1.9%	6.5%	7.2%	9.2%	7.0%	3.6%	1.7%	0.8%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1975	0.0%	0.0%	0.0%	0.1%	0.7%	2.6%	6.8%	10.1%	9.0%	7.5%	3.5%	1.5%	0.3%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%
1976	0.0%	0.0%	0.0%	0.1%	1.4%	4.2%	9.2%	9.7%	6.7%	5.7%	2.7%	1.1%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1977	0.0%	0.0%	0.0%	0.1%	1.3%	4.6%	10.3%	12.0%	9.0%	5.7%	3.4%	1.4%	0.5%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
1978	0.0%	0.0%	0.0%	0.1%	0.7%	2.7%	6.0%	10.4%	11.7%	9.4%	4.6%	1.9%	0.5%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1979	0.0%	0.1%	0.0%	0.2%	0.2%	2.7%	5.5%	9.0%	11.0%	11.7%	5.6%	1.4%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1980	0.0%	0.0%	0.0%	0.2%	1.6%	4.5%	9.2%	11.3%	8.3%	6.0%	2.7%	1.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1981	0.1%	0.0%	0.0%	0.2%	1.1%	4.4%	10.2%	10.0%	10.3%	7.2%	4.3%	2.3%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1982	0.0%	0.0%	0.1%	0.2%	1.7%	5.9%	8.0%	11.9%	11.0%	8.8%	5.1%	1.6%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1983	0.0%	0.0%	0.1%	0.6%	2.2%	6.3%	10.6%	10.1%	8.0%	5.0%	2.8%	1.3%	0.3%	0.2%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
1984	0.0%	0.0%	0.0%	0.3%	1.8%	5.3%	9.7%	9.9%	7.8%	5.4%	4.0%	1.5%	0.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985	0.0%	0.0%	0.0%	0.6%	3.6%	8.3%	10.4%	9.5%	7.2%	4.7%	2.9%	1.1%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1986	0.0%	0.1%	0.2%	1.5%	4.6%	8.5%	8.9%	7.6%	7.0%	5.0%	2.5%	0.8%	0.3%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
1987	0.0%	0.0%	0.2%	1.3%	5.6%	10.5%	10.3%	7.7%	6.3%	4.7%	2.0%	1.2%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1988	0.0%	0.0%	0.3%	1.2%	4.9%	9.0%	9.6%	8.1%	5.7%	3.4%	2.2%	0.6%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1989	0.0%	0.0%	0.3%	1.0%	3.9%	7.8%	9.0%	6.9%	6.5%	5.3%	2.4%	1.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1990	0.0%	0.1%	0.5%	2.3%	5.5%	10.1%	9.3%	7.0%	5.2%	3.9%	2.4%	1.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1991	0.0%	0.1%	0.4%	1.7%	5.8%	11.5%	11.6%	8.3%	5.4%	3.5%	2.1%	0.8%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1992	0.0%	0.1%	0.4%	1.7%	5.0%	9.8%	10.7%	7.9%	5.4%	4.3%	2.0%	0.9%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1993	0.0%	0.0%	0.6%	2.0%	5.4%	8.9%	9.3%	8.1%	6.2%	4.5%	2.3%	0.9%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1994	0.0%	0.1%	0.9%	2.9%	7.9%	10.1%	7.5%	5.4%	4.7%	3.8%	2.2%	0.8%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1995	0.1%	0.0%	0.3%	1.3%	3.7%	6.8%	9.3%	8.7%	7.4%	5.8%	4.0%	1.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 10. Dover sole fishery length composition data from the southern region. (continued)

	Length in cm			Males																
Year	<=22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60+
1996	0.1%	0.1%	0.2%	1.2%	3.6%	7.3%	9.8%	10.0%	7.9%	6.4%	4.0%	0.9%	0.3%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
1997	0.0%	0.1%	0.2%	1.4%	4.1%	8.6%	10.3%	8.6%	6.9%	4.5%	2.5%	0.7%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1998	0.0%	0.0%	0.2%	1.5%	4.9%	9.7%	11.2%	8.4%	5.5%	3.3%	1.7%	0.7%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1999	0.0%	0.0%	0.4%	1.3%	4.6%	10.6%	10.8%	7.7%	4.7%	4.2%	2.0%	0.9%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2000	0.0%	0.1%	0.5%	2.1%	4.9%	10.8%	11.4%	8.4%	4.9%	4.0%	2.0%	0.6%	0.3%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
2001	0.1%	0.0%	0.1%	0.9%	2.9%	7.8%	12.5%	9.3%	6.1%	4.3%	2.0%	0.9%	0.3%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
2002	0.0%	0.0%	0.2%	0.7%	2.9%	6.8%	12.1%	10.5%	5.9%	3.9%	1.7%	0.7%	0.3%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
2003	0.1%	0.0%	0.2%	1.2%	4.2%	10.9%	15.7%	12.0%	6.5%	3.2%	1.7%	0.5%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
2004	0.0%	0.1%	0.3%	1.3%	5.7%	12.7%	14.9%	11.8%	6.6%	2.9%	1.4%	0.7%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 11. Dover sole fishery age composition data from the northern region.

Age in years. Females Scale age-readings through 1984. Break and burn otolith age-readings since 1985.

Year	<=5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20-24	25-29	30-34	35-39	40+
1966	0.2%	1.5%	5.2%	8.8%	9.4%	10.8%	7.6%	6.3%	4.6%	3.4%	1.7%	1.6%	0.7%	0.4%	0.2%	0.4%	0.0%	0.0%	0.0%	0.0%
1967	0.3%	3.8%	8.9%	10.6%	9.7%	9.0%	7.7%	5.3%	4.2%	3.0%	1.2%	1.1%	0.6%	0.3%	0.1%	0.2%	0.0%	0.0%	0.0%	0.0%
1968	0.5%	3.8%	8.0%	10.0%	9.7%	11.1%	10.1%	8.0%	5.0%	3.0%	1.4%	0.7%	0.2%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
1969	0.8%	4.3%	9.2%	14.4%	10.6%	8.0%	8.2%	6.6%	4.5%	2.6%	1.8%	1.5%	0.3%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
1970	0.4%	2.7%	5.7%	9.3%	11.0%	11.1%	8.4%	6.2%	4.1%	3.0%	1.8%	1.2%	1.3%	0.6%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%
1971	0.3%	1.4%	4.8%	5.8%	7.6%	7.2%	3.1%	3.1%	3.1%	2.4%	0.0%	1.4%	0.3%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1972	0.2%	1.3%	4.1%	6.1%	8.7%	8.2%	9.3%	5.7%	3.7%	3.5%	1.4%	1.8%	0.9%	0.9%	0.5%	1.3%	0.0%	0.0%	0.0%	0.0%
1973	1.5%	6.5%	10.4%	10.2%	9.0%	6.3%	6.0%	4.3%	3.6%	2.5%	1.5%	1.4%	0.9%	0.9%	0.4%	0.5%	0.0%	0.0%	0.0%	0.0%
1974	0.4%	2.1%	9.1%	14.3%	11.3%	8.8%	6.3%	5.7%	3.3%	3.2%	1.9%	1.2%	1.4%	0.7%	0.5%	0.4%	0.0%	0.0%	0.0%	0.0%
1975	0.1%	1.8%	5.6%	9.7%	10.9%	10.0%	7.2%	6.4%	3.2%	1.9%	1.1%	0.8%	0.3%	0.1%	0.2%	0.4%	0.0%	0.0%	0.0%	0.0%
1976	0.6%	3.4%	6.3%	12.7%	13.9%	10.3%	8.2%	5.8%	4.3%	3.5%	1.9%	1.3%	0.7%	0.6%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%
1977	0.3%	1.3%	4.3%	7.8%	10.4%	9.7%	10.3%	7.1%	3.9%	3.9%	3.1%	1.9%	1.3%	0.9%	0.7%	0.8%	0.2%	0.0%	0.0%	0.0%
1978	0.8%	5.2%	9.8%	8.6%	4.4%	4.8%	3.8%	4.2%	3.8%	2.4%	0.8%	1.2%	1.4%	0.8%	0.2%	1.0%	0.0%	0.0%	0.0%	0.0%
1979	5.3%	5.3%	24.6%	15.8%	17.5%	8.8%	5.3%	3.5%	3.5%	0.0%	5.3%	0.0%	0.0%	3.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1984	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	1.0%	1.0%	4.0%	1.0%	5.0%	0.0%	5.0%	3.0%	2.0%	10.0%	3.0%	1.0%	0.0%	1.0%
1985	0.0%	0.1%	0.3%	1.6%	3.1%	5.3%	6.2%	5.9%	4.9%	3.8%	2.8%	2.5%	1.9%	1.5%	1.0%	4.8%	1.7%	0.9%	0.2%	0.1%
1986	0.0%	0.4%	1.0%	2.4%	3.2%	3.1%	3.6%	4.2%	4.9%	4.2%	3.7%	3.3%	2.4%	1.8%	1.6%	4.7%	2.4%	0.6%	0.5%	0.1%
1987	0.0%	0.1%	0.8%	2.0%	3.0%	4.3%	5.2%	5.0%	4.9%	4.6%	3.6%	2.2%	1.9%	1.3%	0.9%	2.7%	1.2%	0.9%	0.4%	0.1%
1988	0.4%	1.2%	1.4%	2.3%	3.9%	5.1%	5.6%	6.0%	5.4%	4.3%	2.8%	1.9%	2.1%	1.3%	0.9%	2.7%	1.0%	0.4%	0.2%	0.1%
1989	0.8%	2.3%	2.7%	4.0%	5.2%	5.2%	4.5%	4.1%	2.9%	2.7%	2.4%	1.6%	1.6%	1.1%	0.7%	2.0%	1.0%	0.5%	0.3%	0.1%
1990	1.4%	2.7%	3.6%	3.9%	4.1%	3.8%	3.2%	3.9%	3.9%	2.4%	2.3%	2.6%	2.1%	1.7%	1.5%	4.8%	1.9%	0.7%	0.3%	0.3%
1991	0.5%	1.1%	2.0%	5.1%	5.6%	6.1%	5.8%	5.0%	3.6%	2.4%	1.8%	1.6%	1.4%	1.0%	0.9%	2.8%	1.2%	0.5%	0.3%	0.2%
1992	1.6%	3.6%	5.8%	6.9%	5.6%	5.0%	5.0%	3.5%	2.7%	1.8%	1.8%	1.3%	1.2%	0.9%	0.7%	2.8%	1.7%	0.7%	0.4%	0.2%
1993	1.6%	2.8%	2.8%	7.1%	7.2%	5.5%	5.4%	4.3%	3.5%	2.2%	2.0%	1.1%	0.9%	1.0%	0.7%	2.4%	1.2%	0.8%	0.2%	0.2%
1994	1.5%	5.0%	4.8%	5.0%	4.8%	4.1%	2.5%	2.4%	2.1%	1.9%	1.4%	0.8%	1.0%	0.8%	0.9%	2.2%	0.6%	0.6%	0.2%	0.0%
1995	0.7%	3.1%	6.4%	5.4%	4.5%	4.9%	4.0%	3.0%	2.5%	2.0%	1.3%	0.9%	0.6%	0.8%	0.4%	1.3%	1.0%	0.4%	0.1%	0.3%
1996	0.5%	1.8%	4.9%	5.5%	5.9%	4.4%	4.3%	4.0%	3.1%	2.7%	1.7%	1.9%	0.6%	1.5%	1.0%	3.8%	2.2%	1.2%	1.1%	0.7%
1997	0.5%	1.0%	2.3%	5.5%	8.6%	6.2%	6.2%	5.0%	4.4%	2.4%	1.9%	1.8%	1.4%	0.7%	0.4%	2.0%	0.9%	0.5%	0.1%	0.0%
1998	0.1%	2.1%	4.1%	5.1%	8.9%	9.9%	7.0%	5.6%	3.1%	1.8%	1.9%	1.7%	1.3%	1.4%	0.8%	2.3%	1.2%	0.7%	0.1%	0.3%
1999	0.5%	1.5%	3.6%	6.6%	6.9%	8.6%	8.1%	4.5%	3.9%	2.4%	2.0%	1.5%	1.1%	1.1%	0.4%	1.8%	0.4%	0.1%	0.1%	0.1%

Table 11. Dover sole fishery age composition data from the northern region. (continued)

	Age in years.		Females			Scale age-readings through 1984. Break and burn otolith age-readings since 1985.														
Year	<=5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20-24	25-29	30-34	35-39	40+
2000	0.6%	1.0%	3.3%	4.5%	8.2%	6.2%	7.7%	6.5%	3.9%	2.2%	1.0%	1.5%	1.4%	1.2%	0.7%	2.0%	0.8%	0.5%	0.1%	0.1%
2001	0.1%	0.5%	2.5%	4.5%	5.4%	6.9%	3.9%	7.0%	5.7%	2.8%	3.3%	1.9%	3.1%	1.2%	1.1%	4.1%	0.2%	0.4%	0.4%	0.4%
2002	1.1%	2.3%	2.6%	6.2%	9.4%	8.8%	5.0%	3.5%	4.8%	4.1%	2.0%	1.5%	1.0%	0.8%	0.4%	2.6%	1.1%	0.1%	0.1%	0.3%
2003	0.5%	1.8%	2.0%	2.8%	4.2%	7.0%	4.7%	4.9%	4.1%	2.9%	3.1%	1.4%	1.2%	0.7%	0.5%	2.6%	0.8%	0.2%	0.1%	0.0%
2004	0.3%	0.6%	2.7%	2.8%	3.3%	4.0%	6.1%	3.7%	5.2%	3.1%	3.4%	3.2%	1.0%	0.4%	0.2%	1.1%	0.7%	0.6%	0.5%	0.2%

Table 11. Dover sole fishery age composition data from the northern region. (continued)

	Age in years.			Males															
Year	<=5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20-24	25-29	30-34	35-39	40+
1966	0.1%	0.9%	2.3%	4.6%	6.3%	6.9%	6.0%	4.5%	3.1%	1.1%	0.8%	0.4%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1967	0.2%	1.7%	4.0%	5.3%	6.8%	5.6%	4.1%	3.3%	1.7%	0.8%	0.3%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1968	0.4%	1.7%	4.2%	4.8%	4.7%	4.2%	3.5%	2.4%	1.5%	0.6%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1969	0.2%	2.1%	5.8%	6.0%	4.5%	3.5%	2.1%	1.4%	0.7%	0.4%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1970	0.5%	1.4%	3.8%	4.9%	5.7%	5.2%	4.4%	2.8%	2.3%	1.0%	0.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1971	0.3%	0.7%	8.2%	9.3%	12.7%	9.6%	7.6%	4.5%	2.4%	3.1%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1972	0.0%	1.0%	3.7%	5.5%	7.7%	7.5%	5.9%	3.9%	3.2%	1.5%	1.0%	0.6%	0.6%	0.3%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
1973	0.2%	2.0%	3.4%	4.3%	5.4%	5.6%	4.3%	3.7%	1.8%	1.7%	0.9%	0.2%	0.2%	0.3%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
1974	0.4%	1.8%	2.8%	4.5%	6.5%	4.4%	3.1%	2.3%	1.3%	1.4%	0.5%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1975	0.3%	1.5%	3.7%	7.1%	5.2%	5.9%	5.8%	4.9%	2.3%	1.9%	0.9%	0.6%	0.2%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
1976	0.4%	1.5%	4.6%	4.9%	5.0%	3.2%	2.9%	1.5%	0.8%	0.6%	0.4%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1977	0.3%	1.1%	2.0%	5.0%	4.8%	5.3%	4.1%	3.6%	2.3%	1.6%	1.1%	0.8%	0.2%	0.2%	0.1%	0.2%	0.0%	0.0%	0.0%	0.0%
1978	1.0%	4.6%	5.4%	6.2%	5.8%	7.8%	6.4%	2.6%	3.0%	1.8%	1.2%	0.2%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1979	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1984	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	0.0%	4.0%	4.0%	3.0%	4.0%	5.0%	5.0%	3.0%	4.0%	15.0%	11.0%	2.0%	0.0%	0.0%
1985	0.0%	0.1%	0.3%	0.9%	1.7%	2.5%	4.3%	4.7%	4.9%	3.7%	3.7%	3.2%	3.6%	3.1%	2.3%	6.9%	3.4%	1.4%	0.7%	0.0%
1986	0.0%	0.2%	0.5%	1.4%	2.1%	2.7%	2.9%	4.2%	5.4%	3.2%	4.5%	3.6%	3.4%	2.9%	1.9%	7.5%	4.0%	1.2%	0.3%	0.0%
1987	0.0%	0.1%	0.2%	0.9%	2.0%	3.1%	4.9%	6.0%	7.2%	6.7%	5.3%	3.9%	3.9%	2.4%	2.0%	3.9%	1.6%	0.4%	0.1%	0.0%
1988	0.3%	0.7%	1.1%	2.0%	2.8%	5.0%	4.5%	6.2%	5.2%	5.1%	3.9%	3.2%	2.6%	1.7%	1.4%	3.3%	1.3%	0.4%	0.3%	0.0%
1989	1.7%	1.8%	2.9%	4.0%	4.6%	5.3%	4.3%	5.3%	4.5%	4.2%	3.5%	2.5%	1.8%	1.3%	1.0%	3.4%	1.2%	0.5%	0.2%	0.1%
1990	1.0%	1.9%	2.3%	2.5%	3.5%	3.4%	3.5%	3.7%	3.7%	3.9%	3.1%	2.4%	2.8%	2.0%	1.6%	5.2%	1.5%	0.6%	0.2%	0.1%
1991	0.6%	1.3%	1.8%	3.9%	5.0%	5.7%	6.8%	5.8%	4.4%	3.3%	3.0%	2.8%	1.8%	1.1%	0.8%	2.2%	0.9%	0.2%	0.1%	0.0%
1992	1.2%	2.0%	4.2%	4.9%	4.5%	3.8%	4.7%	3.7%	3.1%	2.5%	1.9%	1.7%	1.5%	1.2%	0.7%	2.8%	1.1%	0.4%	0.4%	0.1%
1993	1.1%	2.0%	4.4%	6.1%	5.9%	4.8%	4.0%	3.8%	2.5%	1.5%	2.0%	1.2%	1.1%	1.3%	0.7%	2.4%	1.4%	0.6%	0.3%	0.0%
1994	2.2%	5.8%	7.2%	7.1%	7.0%	5.0%	4.1%	3.8%	2.7%	2.4%	1.8%	1.2%	1.2%	0.9%	0.8%	2.3%	1.0%	0.3%	0.3%	0.2%
1995	0.6%	3.1%	6.6%	7.0%	6.8%	6.6%	5.7%	4.3%	3.1%	2.8%	1.6%	1.6%	1.2%	0.7%	0.4%	2.1%	0.9%	0.7%	0.2%	0.4%
1996	0.8%	2.4%	3.9%	5.3%	4.2%	4.1%	4.1%	4.2%	2.6%	2.2%	2.3%	1.2%	1.5%	1.2%	1.0%	2.8%	1.3%	0.9%	0.6%	0.4%
1997	0.6%	1.4%	2.9%	5.0%	6.8%	5.8%	5.3%	4.7%	3.3%	2.3%	1.3%	2.4%	0.9%	0.8%	0.6%	2.1%	0.8%	0.6%	0.4%	0.2%
1998	0.5%	1.3%	3.0%	4.0%	4.5%	4.8%	3.9%	3.3%	2.5%	1.9%	2.3%	1.8%	1.1%	1.2%	0.6%	2.0%	1.0%	0.4%	0.0%	0.1%
1999	0.3%	0.8%	2.9%	5.1%	6.6%	7.2%	4.8%	4.4%	3.0%	1.8%	1.5%	1.4%	0.8%	1.2%	0.7%	1.2%	0.6%	0.3%	0.1%	0.0%

Table 11. Dover sole fishery age composition data from the northern region. (continued)

	Age in years.			Males															
Year	<=5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20-24	25-29	30-34	35-39	40+
2000	0.5%	0.8%	2.0%	3.9%	4.8%	4.6%	7.1%	5.6%	3.9%	2.7%	2.9%	2.0%	1.5%	1.3%	0.6%	1.5%	0.5%	0.2%	0.1%	0.0%
2001	0.4%	0.2%	1.2%	1.9%	2.7%	4.8%	4.2%	6.9%	7.7%	4.0%	1.7%	2.2%	2.2%	1.8%	0.6%	1.9%	0.5%	0.0%	0.0%	0.0%
2002	0.8%	1.1%	2.6%	2.9%	6.6%	5.3%	5.9%	2.0%	3.1%	4.7%	3.2%	1.2%	1.2%	0.6%	0.4%	0.7%	0.0%	0.0%	0.0%	0.0%
2003	0.3%	1.8%	1.9%	3.1%	3.3%	5.1%	4.4%	7.0%	4.8%	5.6%	4.4%	2.8%	2.5%	2.0%	1.1%	2.6%	1.1%	0.6%	0.2%	0.1%
2004	0.9%	1.7%	3.0%	4.5%	3.2%	5.1%	5.0%	6.7%	6.1%	6.2%	5.0%	3.4%	2.5%	0.7%	1.1%	1.9%	0.2%	0.0%	0.0%	0.0%

Table 12. Dover sole fishery age composition data from the southern region.

	Age in years.			Females			Scale age-readings through 1980. Break and burn otolith age-readings since 1981.													
Year	<=5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20-24	25-29	30-34	35-39	40+
1967	0.0%	0.0%	0.0%	1.0%	3.0%	6.0%	4.0%	3.0%	1.0%	0.0%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1969	0.0%	0.2%	2.1%	7.3%	10.2%	8.3%	6.6%	5.0%	1.9%	1.2%	2.6%	0.2%	0.0%	0.0%	0.5%	0.2%	0.0%	0.0%	0.0%	0.0%
1970	1.2%	4.6%	10.2%	8.3%	10.2%	10.5%	7.4%	5.9%	2.8%	1.2%	1.5%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1971	0.6%	1.7%	4.3%	8.3%	6.1%	5.5%	5.1%	2.1%	2.6%	1.5%	0.6%	0.7%	0.1%	0.3%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
1972	0.7%	6.5%	8.5%	10.5%	10.4%	7.7%	6.5%	4.4%	2.9%	1.2%	0.5%	0.4%	0.2%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
1973	0.3%	4.7%	13.0%	10.9%	8.9%	7.1%	4.7%	2.7%	2.7%	1.6%	0.9%	0.3%	0.3%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
1974	0.5%	2.4%	9.4%	13.5%	10.1%	7.1%	5.1%	4.4%	3.0%	2.3%	0.9%	0.9%	0.5%	0.1%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%
1975	0.6%	3.5%	4.7%	11.6%	12.3%	6.0%	3.7%	4.0%	3.3%	3.0%	1.4%	1.4%	0.7%	0.7%	0.3%	0.5%	0.0%	0.0%	0.0%	0.1%
1976	1.2%	4.2%	8.1%	10.1%	14.5%	9.8%	4.7%	1.9%	3.0%	1.4%	1.2%	0.1%	0.0%	0.0%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%
1977	0.8%	3.5%	7.4%	10.9%	9.6%	8.5%	4.9%	3.0%	1.8%	0.8%	0.7%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1978	1.1%	3.8%	7.1%	10.2%	8.5%	7.9%	5.6%	3.5%	2.3%	0.8%	0.7%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
1979	1.1%	2.2%	6.7%	11.0%	10.8%	7.2%	5.5%	3.5%	1.7%	0.9%	0.6%	0.7%	0.0%	0.4%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
1980	2.4%	4.2%	7.7%	10.7%	9.7%	7.9%	4.4%	3.2%	1.8%	1.0%	0.5%	0.6%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
1981	1.4%	1.8%	2.9%	4.9%	4.4%	4.2%	4.6%	3.6%	3.2%	2.3%	2.2%	1.6%	2.2%	1.9%	1.2%	4.0%	1.9%	0.7%	0.1%	0.1%
1982	0.1%	0.1%	0.9%	2.6%	2.6%	2.9%	2.5%	3.5%	2.9%	2.5%	3.2%	2.3%	2.5%	1.4%	1.4%	5.6%	1.2%	0.3%	0.0%	0.1%
1983	4.3%	12.9%	7.8%	6.4%	3.7%	2.6%	3.9%	3.3%	2.7%	2.6%	2.1%	1.5%	1.0%	0.6%	0.3%	1.7%	0.1%	0.2%	0.1%	0.0%
1984	0.1%	0.6%	1.7%	3.5%	4.6%	4.6%	3.3%	4.1%	2.7%	2.3%	2.6%	3.5%	2.2%	2.4%	1.7%	10.5%	4.1%	1.8%	0.3%	0.4%
1985	0.2%	0.9%	2.4%	3.3%	5.0%	5.2%	5.0%	2.6%	3.2%	2.4%	1.8%	2.3%	2.2%	2.7%	1.8%	7.8%	3.3%	1.2%	0.3%	0.3%
1986	1.0%	2.0%	4.0%	5.0%	5.9%	6.0%	4.5%	2.5%	2.6%	1.6%	1.7%	1.3%	1.6%	1.3%	1.3%	5.5%	3.6%	1.0%	0.5%	0.1%
1987	1.5%	3.8%	4.5%	4.2%	4.3%	3.9%	3.2%	3.6%	2.1%	1.1%	1.5%	1.3%	1.7%	1.3%	1.5%	4.2%	3.0%	1.7%	0.9%	0.2%
1988	1.4%	2.2%	3.4%	5.3%	3.4%	3.2%	2.9%	2.7%	2.3%	2.2%	2.1%	1.2%	1.2%	2.0%	1.4%	7.0%	3.9%	1.8%	1.3%	0.6%
1989	0.6%	3.2%	2.9%	3.3%	4.1%	3.0%	2.5%	2.7%	1.9%	1.5%	1.5%	1.5%	1.4%	1.3%	1.5%	7.2%	5.7%	3.9%	2.6%	1.4%
1990	0.5%	1.6%	2.9%	2.5%	3.4%	3.4%	2.2%	1.8%	2.0%	1.6%	2.2%	1.7%	0.9%	1.1%	0.6%	5.1%	5.7%	3.8%	1.9%	1.3%
1991	0.0%	0.3%	1.3%	3.3%	4.4%	4.7%	4.2%	4.3%	2.6%	3.8%	3.1%	2.5%	2.0%	0.7%	0.7%	2.5%	1.4%	0.6%	0.5%	0.3%
1992	0.8%	1.9%	4.2%	5.0%	4.3%	5.6%	3.5%	3.8%	3.1%	2.6%	2.5%	1.7%	1.1%	1.4%	0.7%	3.8%	1.9%	0.7%	0.4%	0.2%
1993	1.0%	2.4%	4.8%	6.2%	3.6%	4.1%	3.4%	2.7%	2.2%	3.3%	2.4%	3.8%	1.8%	2.5%	1.7%	6.4%	3.6%	1.4%	0.8%	0.2%
1994	0.9%	1.9%	4.8%	6.6%	3.7%	4.7%	3.8%	3.3%	3.3%	2.1%	1.1%	1.4%	1.4%	1.7%	0.5%	4.4%	2.5%	1.1%	0.4%	0.2%
1995	0.1%	1.1%	2.5%	2.9%	4.2%	3.6%	3.3%	3.3%	2.8%	2.0%	2.1%	2.2%	1.8%	2.4%	1.9%	7.3%	5.4%	2.1%	1.3%	0.8%
1996	0.3%	0.5%	2.3%	4.7%	6.1%	5.2%	4.6%	3.0%	1.9%	2.0%	1.0%	1.4%	0.9%	0.8%	1.2%	5.6%	4.4%	2.2%	1.3%	0.7%
1997	1.0%	3.8%	4.5%	6.1%	5.5%	7.0%	4.5%	4.0%	2.3%	2.7%	1.8%	1.5%	0.9%	1.0%	0.6%	3.8%	2.4%	1.2%	0.3%	0.2%
1998	0.9%	3.5%	5.0%	6.2%	7.1%	5.6%	5.5%	4.0%	2.3%	2.3%	1.6%	1.3%	1.3%	1.5%	1.0%	2.4%	0.9%	0.6%	0.2%	0.1%
1999	0.5%	2.4%	4.7%	6.5%	5.3%	5.9%	5.3%	5.0%	3.4%	3.0%	2.4%	1.9%	1.0%	0.8%	1.1%	4.0%	1.7%	0.8%	0.2%	0.2%

Table 12. Dover sole fishery age composition data from the southern region. (continued)

	Age in years.		Females				Scale age-readings through 1980. Break and burn otolith age-readings since 1981.													
Year	<=5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20-24	25-29	30-34	35-39	40+
2000	1.4%	2.5%	4.0%	4.3%	5.7%	4.2%	4.4%	4.8%	3.1%	2.3%	2.0%	2.1%	1.5%	0.9%	0.9%	3.9%	2.1%	1.0%	0.5%	0.1%
2001	0.4%	1.2%	3.9%	5.7%	4.4%	4.3%	4.5%	3.3%	3.1%	3.3%	3.2%	1.9%	1.3%	1.3%	0.7%	4.2%	3.1%	1.6%	0.4%	0.6%
2002	0.6%	2.2%	4.1%	5.5%	6.3%	5.7%	5.4%	4.6%	3.7%	3.3%	2.7%	1.8%	1.7%	1.4%	1.1%	3.9%	3.2%	1.4%	0.7%	0.2%
2003	0.3%	2.7%	5.6%	6.6%	4.7%	4.3%	3.3%	4.0%	2.2%	2.2%	1.1%	1.2%	1.1%	1.4%	1.5%	3.6%	1.6%	1.1%	0.5%	0.4%
2004	0.6%	0.9%	4.3%	2.7%	3.0%	3.6%	3.3%	2.4%	2.4%	1.2%	0.3%	0.9%	0.6%	0.3%	0.6%	0.3%	1.2%	0.0%	0.0%	0.3%

Table 12. Dover sole fishery age composition data from the southern region. (continued)

	Age in years.			Males																
Year	<=5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20-24	25-29	30-34	35-39	40+
1967	0.0%	3.0%	2.0%	10.0%	16.0%	25.0%	13.0%	9.0%	1.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1969	0.0%	0.7%	4.0%	9.9%	12.3%	9.2%	8.0%	3.3%	2.6%	2.4%	0.5%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1970	0.9%	1.9%	5.9%	9.3%	5.6%	5.2%	2.2%	2.5%	0.3%	0.9%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1971	1.2%	4.4%	6.1%	11.9%	11.2%	9.0%	6.8%	4.8%	2.3%	1.5%	0.7%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
1972	0.3%	2.5%	5.0%	7.6%	8.6%	6.4%	4.4%	2.9%	1.0%	0.4%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1973	0.4%	2.7%	6.1%	7.6%	10.1%	6.2%	4.4%	2.2%	0.9%	0.5%	0.3%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1974	0.1%	1.6%	4.8%	7.6%	7.6%	7.1%	4.4%	3.0%	1.8%	0.9%	0.5%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1975	0.2%	2.5%	4.4%	8.1%	8.7%	7.1%	4.7%	2.8%	1.5%	1.1%	0.4%	0.5%	0.1%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
1976	0.8%	2.4%	7.9%	10.5%	9.0%	4.0%	2.4%	1.1%	0.8%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
1977	0.7%	3.3%	10.0%	11.7%	11.2%	5.2%	3.1%	1.7%	0.4%	0.3%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1978	0.6%	3.7%	8.5%	11.6%	10.9%	5.9%	4.0%	2.1%	0.6%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1979	1.3%	3.8%	8.3%	11.5%	9.4%	7.3%	3.8%	1.5%	0.6%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1980	1.5%	3.7%	7.1%	10.2%	9.9%	6.1%	2.3%	1.9%	1.3%	0.7%	0.3%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1981	1.0%	2.0%	3.0%	4.0%	3.9%	4.0%	4.1%	3.0%	3.3%	3.6%	2.7%	3.1%	2.1%	2.2%	1.5%	4.9%	2.0%	0.6%	0.0%	0.0%
1982	0.3%	0.9%	1.9%	3.2%	5.2%	5.0%	5.3%	6.2%	6.3%	4.0%	4.2%	2.7%	3.9%	2.3%	1.6%	6.2%	1.3%	0.7%	0.3%	0.0%
1983	0.5%	3.1%	3.7%	3.0%	3.4%	4.4%	4.3%	4.7%	3.2%	3.7%	3.0%	1.5%	1.2%	0.9%	0.7%	0.7%	0.3%	0.0%	0.0%	0.0%
1984	0.0%	0.0%	0.3%	0.9%	1.6%	2.3%	1.3%	1.9%	2.0%	3.0%	3.0%	2.8%	3.3%	2.9%	2.8%	10.0%	3.0%	1.7%	0.5%	0.1%
1985	0.1%	0.6%	1.1%	2.2%	3.0%	3.7%	3.6%	3.3%	3.8%	3.2%	2.4%	2.9%	2.6%	2.1%	1.8%	6.2%	2.2%	0.7%	0.3%	0.1%
1986	0.6%	1.6%	3.0%	3.9%	3.5%	4.0%	3.3%	3.0%	2.1%	1.4%	2.0%	2.1%	1.7%	1.7%	1.6%	6.8%	3.2%	1.2%	0.3%	0.2%
1987	1.5%	2.7%	3.7%	4.4%	4.0%	4.6%	4.1%	2.9%	2.5%	2.7%	1.9%	2.1%	1.7%	1.3%	1.5%	5.3%	2.2%	0.8%	0.4%	0.1%
1988	0.9%	1.4%	3.0%	3.6%	3.3%	3.7%	3.2%	4.2%	2.0%	2.5%	1.7%	2.2%	1.2%	1.5%	1.7%	6.2%	3.6%	1.4%	0.5%	0.5%
1989	0.4%	1.7%	2.2%	3.0%	3.0%	2.8%	2.7%	3.5%	2.3%	2.0%	1.7%	1.9%	1.5%	1.9%	1.3%	5.6%	4.3%	2.1%	1.3%	0.8%
1990	1.0%	2.7%	3.2%	4.0%	4.2%	3.8%	3.3%	3.7%	3.5%	4.3%	2.2%	2.5%	1.1%	1.9%	1.9%	5.5%	2.7%	1.0%	0.6%	0.6%
1991	0.0%	0.6%	1.8%	3.5%	4.9%	3.5%	6.4%	5.4%	5.4%	4.4%	3.9%	3.7%	1.8%	2.1%	1.4%	3.8%	2.3%	1.2%	0.2%	0.7%
1992	0.5%	0.9%	2.8%	3.7%	3.3%	4.9%	4.4%	4.3%	3.7%	3.7%	2.9%	2.4%	2.1%	1.9%	1.8%	4.4%	1.5%	0.7%	0.5%	0.1%
1993	0.5%	2.5%	3.6%	3.6%	3.1%	3.1%	1.2%	2.4%	2.1%	2.8%	2.4%	2.9%	1.9%	1.5%	1.0%	3.9%	2.0%	0.6%	0.3%	0.3%
1994	1.4%	2.9%	4.1%	6.3%	5.4%	4.6%	3.3%	2.4%	3.1%	2.7%	1.6%	2.2%	1.0%	1.9%	1.0%	3.5%	2.0%	0.5%	0.2%	0.2%
1995	0.1%	1.1%	2.8%	2.9%	3.7%	3.7%	3.6%	3.2%	4.0%	2.7%	2.4%	2.1%	1.8%	1.4%	1.1%	5.3%	2.5%	1.6%	0.5%	0.3%
1996	0.2%	1.0%	2.8%	5.1%	4.8%	4.0%	4.1%	4.0%	2.4%	1.6%	1.7%	1.9%	1.4%	1.0%	1.4%	5.9%	3.5%	1.9%	0.6%	0.5%
1997	1.0%	2.7%	4.6%	4.3%	4.8%	3.8%	4.1%	3.2%	2.5%	1.7%	1.5%	1.3%	1.3%	1.0%	0.6%	3.4%	2.0%	0.7%	0.5%	0.0%
1998	1.3%	2.2%	3.0%	4.9%	5.7%	5.1%	5.2%	4.8%	3.1%	2.6%	1.6%	1.5%	1.0%	0.9%	0.5%	1.9%	0.9%	0.5%	0.2%	0.1%
1999	1.7%	2.9%	4.3%	4.9%	4.5%	4.2%	4.5%	3.6%	2.1%	2.0%	1.4%	1.1%	1.1%	0.7%	0.7%	2.8%	0.8%	0.2%	0.1%	0.0%

Table 12. Dover sole fishery age composition data from the southern region. (continued)

Age in years.			Males																	
Year	<=5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20-24	25-29	30-34	35-39	40+
2000	0.8%	2.0%	2.7%	3.1%	3.8%	5.0%	5.1%	4.5%	3.6%	2.9%	2.8%	2.1%	1.2%	1.3%	1.0%	3.7%	1.6%	0.7%	0.3%	0.1%
2001	0.2%	0.6%	2.0%	3.7%	3.9%	4.2%	4.5%	4.7%	3.7%	3.3%	2.6%	2.6%	1.6%	1.5%	0.9%	3.2%	2.5%	0.6%	1.0%	0.0%
2002	0.5%	1.2%	2.4%	3.3%	4.8%	3.7%	3.7%	3.8%	4.0%	2.8%	1.5%	1.1%	1.4%	0.8%	0.8%	1.7%	1.5%	0.8%	0.6%	0.1%
2003	1.0%	2.2%	5.0%	5.4%	5.9%	5.0%	4.8%	4.5%	4.1%	2.3%	2.5%	1.8%	1.4%	0.9%	0.7%	2.0%	0.7%	0.1%	0.3%	0.2%
2004	1.8%	4.9%	10.6%	8.5%	4.6%	7.0%	7.3%	7.6%	5.2%	2.7%	2.7%	1.5%	2.4%	0.0%	0.6%	2.4%	0.0%	0.6%	0.0%	0.3%

Table 13. AFSC slope survey biomass estimates for Dover sole.

		Biomass (metric tons)			Coefficients of variation		
		----- Depth Strata (fa) -----			----- Depth Strata (fa) -----		
Year	Region	100-300	300-700	100-700	100-300	300-700	100-700
1992	Vancouver [1]	9970.7	1748.3	11719.0	22.1%	34.5%	19.5%
	Columbia	19252.2	4618.6	23870.8	15.3%	18.4%	12.8%
	Eureka	5560.8	13745.1	19305.9	19.8%	11.7%	10.1%
	Monterey	13859.8	16565.3	30425.1	22.5%	21.4%	15.5%
	Conception						
	Total			159239.5[2]			11.0%[2]
1996	Vancouver [1]	10452.4	926.5	11378.9	21.8%	33.6%	20.2%
	Columbia	17897.3	2484.4	20381.7	15.9%	18.5%	14.1%
	Eureka	7440.0	9933.1	17373.1	19.8%	14.8%	12.0%
	Monterey						
	Conception						
	Total			177386.4[3]			12.3%[3]
1997	Vancouver [1]	4664.7	512.3	5177.0	42.0%	54.1%	38.2%
	Columbia	21021.5	2162.2	23183.7	27.1%	28.1%	24.7%
	Eureka	10825.0	8119.1	18944.1	39.1%	26.3%	25.0%
	Monterey	12438.4	24626.5	37064.8	29.2%	23.1%	18.2%
	Conception	22670.8	61067.6	83738.4	38.4%	35.5%	27.9%
	Total	71620.5	96487.6	168108.0	16.7%	23.3%	15.2%
1999	Vancouver [1]	12223.1	638.3	12861.4	36.1%	55.6%	34.4%
	Columbia	15249.1	2850.1	18099.2	26.8%	33.0%	23.2%
	Eureka	2817.4	6475.9	9293.3	40.3%	25.9%	21.8%
	Monterey	12824.0	25637.9	38461.9	27.6%	23.1%	17.9%
	Conception	27949.6	41953.6	69903.2	39.3%	39.1%	28.3%
	Total	71063.2	77555.8	148619.0	18.4%	22.6%	14.7%
2000	Vancouver [1]	11353.5	1063.8	12417.3	36.3%	44.7%	33.4%
	Columbia	17888.9	2374.3	20263.2	25.6%	33.0%	22.9%
	Eureka	6805.2	5875.8	12681.0	39.3%	28.1%	24.8%
	Monterey	18820.6	27206.7	46027.3	25.7%	20.0%	15.8%
	Conception	40404.7	45348.1	85752.7	40.0%	40.1%	28.4%
	Total	95272.9	81868.7	177141.5	19.1%	23.3%	14.9%
2001	Vancouver [1]	18489.5	1011.6	19501.1	36.7%	42.5%	34.8%
	Columbia	22954.6	2671.5	25626.0	26.1%	31.7%	23.6%
	Eureka	14645.8	5284.1	19929.9	39.7%	26.0%	30.0%
	Monterey	30843.1	32591.6	63434.8	26.2%	19.4%	16.2%
	Conception	37552.9	54840.3	92393.3	19.4%	38.7%	24.3%
	Total	124486.0	96399.1	220885.1	12.3%	23.0%	12.2%

[1] Boundary between Vancouver and Columbia adjusted to 46° N latitude to balance sample sizes.

[2] Missing values for Conception derived by ratio estimator. See text for details.

[3] Missing values for Monterey plus Conception derived by ratio estimator. See text for details.

Table 14. NWFSC slope survey biomass estimates for Dover sole.

		Biomass (metric tons)			Coefficients of variation		
		----- Depth Strata -----			----- Depth Strata -----		
Year	INPFC	100-300	300-700	100-700	100-300	300-700	100-700
1998	Vancouver <1>	13195.0	2387.0	15582.0	26.0%	39.0%	22.8%
	Columbia	19877.0	5075.0	24952.0	17.0%	26.0%	14.5%
	Eureka	13754.0	7530.0	21284.0	19.0%	20.0%	14.2%
	Monterey	13222.0	24815.0	38037.0	16.0%	16.0%	11.8%
	Conception	2144.0	13823.0	15967.0	33.0%	28.0%	24.6%
	Total	62192.0	53630.0	115822.0	9.5%	11.1%	7.3%
1999	Vancouver <1>	10639.0	2256.0	12895.0	22.0%	35.0%	19.2%
	Columbia	16729.0	2400.0	19129.0	17.0%	25.0%	15.2%
	Eureka	9629.0	10521.0	20150.0	19.0%	18.0%	13.1%
	Monterey	20072.0	34485.0	54557.0	15.0%	17.0%	12.1%
	Conception	4756.0	11104.0	15860.0	32.0%	34.0%	25.7%
	Total	61825.0	60766.0	122591.0	8.6%	12.0%	7.4%
2000	Vancouver <1>	9041.0	4793.0	13834.0	23.0%	41.0%	20.7%
	Columbia	24587.0	3648.0	28235.0	19.0%	23.0%	16.8%
	Eureka	7294.0	10510.0	17804.0	21.0%	18.0%	13.7%
	Monterey	13701.0	26376.0	40077.0	15.0%	16.0%	11.7%
	Conception	9521.0	11075.0	20596.0	27.0%	30.0%	20.4%
	Total	64144.0	56402.0	120546.0	9.8%	10.8%	7.2%
2001	Vancouver <1>	9794.0	1430.0	11224.0	22.0%	38.0%	19.8%
	Columbia	16473.0	2423.0	18896.0	15.0%	33.0%	13.7%
	Eureka	8104.0	7693.0	15797.0	20.0%	19.0%	13.8%
	Monterey	20195.0	22657.0	42852.0	16.0%	16.0%	11.3%
	Conception	7246.0	13594.0	20840.0	15.0%	30.0%	20.3%
	Total	61812.0	47797.0	109609.0	8.1%	12.0%	6.9%
2002	Vancouver <1>	10875.0	2663.0	13538.0	22.0%	36.0%	19.0%
	Columbia	21377.0	3710.0	25087.0	16.0%	26.0%	14.2%
	Eureka	15661.0	7460.0	23121.0	19.0%	18.0%	14.1%
	Monterey	34307.0	33030.0	67337.0	15.0%	17.0%	11.3%
	Conception	10557.0	12299.0	22856.0	26.0%	24.0%	17.6%
	Total	92777.0	59162.0	151939.0	8.4%	11.2%	6.7%

Table 14. NWFSC slope survey biomass estimates for Dover sole. (continued)

		Biomass (metric tons)			Coefficients of variation		
		----- Depth Strata -----			----- Depth Strata -----		
Year	INPFC	100-300	300-700	100-700	100-300	300-700	100-700
2003	Vancouver [1]	14805.0	2233.0	17038.0	20.0%	27.0%	17.7%
	Columbia	26370.0	6123.0	32493.0	20.0%	25.0%	16.9%
	Eureka	24195.0	13743.0	37938.0	18.0%	19.0%	13.4%
	Monterey	29037.0	36421.0	65458.0	19.0%	25.0%	16.3%
	Conception	7286.0	25921.0	33207.0	22.0%	53.0%	41.7%
	Total	101693.0	84441.0	186134.0	9.3%	19.9%	10.3%
2004	Vancouver [1]	16929.0	1321.0	18250.0	30.0%	42.0%	28.0%
	Columbia	21220.0	3665.0	24885.0	16.0%	32.0%	14.4%
	Eureka	18531.0	24650.0	43181.0	29.0%	23.0%	18.1%
	Monterey	20253.0	36644.0	56897.0	27.0%	23.0%	17.7%
	Conception	9466.0	18587.0	28053.0	26.0%	24.0%	18.2%
	Total	86399.0	84867.0	171266.0	11.7%	13.2%	8.8%

[1] Boundary between Vancouver and Columbia adjusted to 46 deg N latitude to balance sample sizes.

Table 15. AFSC slope survey estimates of Dover sole biomass density (mt/km^2).

INPFC Area		Year	100-199	200-299	300-399	400-499	500-599	600-699
			Depth Strata (fathoms)					
US Vancouver		Area (km^2) >>	1180.9	412.0	517.4	611.5	668.3	528.7
	Biomass (mt)	1997	1009	88	217	17	9	0
		1999	1823	1089	408	65	0	0
		2000	1628	1777	471	45	10	0
		2001	6689	887	234	61	9	5
	Density	1997	0.854	0.214	0.419	0.028	0.013	0.000
		1999	1.544	2.643	0.789	0.106	0.000	0.000
		2000	1.379	4.314	0.910	0.074	0.015	0.000
		2001	5.664	2.153	0.452	0.100	0.013	0.009
Columbia		Area (km^2) >>	4024.9	3741.3	2609.8	2354.3	2382.6	2392.6
	Biomass (mt)	1997	4324	17335	3631	818	417	140
		1999	6361	18714	3828	1575	504	5
		2000	14161	10929	3582	1237	274	32
		2001	19835	15389	3570	1664	423	0
	Density	1997	1.074	4.633	1.391	0.347	0.175	0.059
		1999	1.580	5.002	1.467	0.669	0.212	0.002
		2000	3.518	2.921	1.373	0.525	0.115	0.013
		2001	4.928	4.113	1.368	0.707	0.178	0.000
Eureka		Area (km^2) >>	1076.0	1103.2	1670.5	1718.7	1950.6	1398.6
	Biomass (mt)	1997	1676	7608	3351	2103	2482	1035
		1999	684	1725	2859	3263	1448	296
		2000	3097	2670	2154	1891	1340	551
		2001	8104	4175	1729	1663	1704	940
	Density	1997	1.558	6.896	2.006	1.224	1.272	0.740
		1999	0.636	1.564	1.711	1.899	0.742	0.212
		2000	2.878	2.420	1.289	1.100	0.687	0.394
		2001	7.532	3.784	1.035	0.968	0.874	0.672
Monterey		Area (km^2) >>	1770.9	1727.1	2009.7	2074.1	2250.3	2358.8
	Biomass (mt)	1997	1485	9327	5950	6864	9280	5018
		1999	3660	9175	5576	8132	8420	7560
		2000	4320	15055	7086	12426	9291	3256
		2001	9418	20349	13296	10562	6604	6078
	Density	1997	0.839	5.400	2.961	3.309	4.124	2.127
		1999	2.067	5.312	2.775	3.921	3.742	3.205
		2000	2.439	8.717	3.526	5.991	4.129	1.380
		2001	5.318	11.782	6.616	5.092	2.935	2.577
Conception		Area (km^2) >>	1197.5	2288.4	2416.8	1546.9	1869.2	1278.6
	Biomass (mt)	1997	64	5507	8147	6449	1851	942
		1999	1282	6352	6939	5099	1588	240
		2000	1828	9152	6362	5023	2030	400
		2001	1481	8768	7685	4721	2445	450
	Density	1997	0.053	2.406	3.371	4.169	0.990	0.737
		1999	1.071	2.776	2.871	3.296	0.850	0.188
		2000	1.526	3.999	2.632	3.247	1.086	0.313
		2001	1.237	3.831	3.180	3.052	1.308	0.352

Table 16. Biomass and abundance from the NMFS triennial shelf survey (55-366 m), excluding "water hauls".

INPFC Region	Year	Biomass (mt)	CV(Bio)	Population (fish)	CV(Pop)	Ave. wt (kg)
US Vancouver	1980	2473.6	23.2%	4,257,710	19.1%	0.581
	1983	1759.6	20.0%	3,976,757	23.7%	0.442
	1986	1449.3	19.9%	3,605,204	23.0%	0.402
	1989	1951.3	14.0%	4,625,843	13.5%	0.422
	1992	1947.0	16.3%	5,446,219	15.9%	0.357
	1995	2529.2	13.4%	7,135,639	11.6%	0.354
	1998	3504.9	11.3%	9,836,346	11.1%	0.356
	2001	6049.5	12.9%	15,547,095	12.0%	0.389
	2004	11593.0	16.2%	27,900,736	13.2%	0.416
Columbia	1980	7753.4	12.5%	17,588,339	12.2%	0.441
	1983	9660.9	10.0%	28,337,116	11.6%	0.341
	1986	9932.1	8.8%	31,307,382	9.3%	0.317
	1989	7287.0	10.5%	23,425,197	11.5%	0.311
	1992	8383.9	10.4%	28,105,136	10.0%	0.298
	1995	8587.1	10.0%	32,857,294	9.0%	0.261
	1998	12914.1	10.6%	48,192,511	12.6%	0.268
	2001	22840.2	8.9%	79,196,652	8.8%	0.288
	2004	36262.5	9.1%	114,701,678	9.5%	0.316
Eureka	1980	1209.1	21.9%	2,850,335	23.4%	0.424
	1983	2762.8	14.7%	7,841,777	16.1%	0.352
	1986	4250.7	12.0%	14,799,533	11.3%	0.287
	1989	3367.2	21.4%	10,089,431	21.9%	0.334
	1992	1857.1	27.3%	5,742,289	23.2%	0.323
	1995	1637.6	22.4%	6,111,030	25.5%	0.268
	1998	4623.8	17.1%	18,467,261	18.4%	0.250
	2001	4737.4	17.6%	17,088,139	17.0%	0.277
	2004	15927.0	16.6%	50,686,721	14.9%	0.314
Monterey	1980	3780.5	18.4%	10,010,110	18.9%	0.378
	1983	5624.9	13.7%	21,006,894	15.6%	0.268
	1986	7930.9	12.4%	27,721,666	11.7%	0.286
	1989	4611.3	14.1%	18,687,342	13.7%	0.247
	1992	1761.5	23.1%	8,312,939	22.4%	0.212
	1995	4748.8	14.7%	23,444,801	13.4%	0.203
	1998	3779.7	20.2%	16,956,475	18.0%	0.223
	2001	7851.2	12.0%	35,956,313	11.7%	0.218
	2004	15965.4	16.3%	77,856,227	18.3%	0.205

Table 16. NMFS triennial shelf survey (55-366 m) excluding "water hauls". (continued)

INPFC Region	Year	Biomass (mt)	CV(Bio)	Population (fish)	CV(Pop)	Ave. wt (kg)
US Vancouver	1980	15216.6	8.9%	34,706,495	8.8%	0.438
to Monterey	1983	19808.3	6.8%	61,162,544	8.0%	0.324
	1986	23562.9	6.1%	77,433,784	6.1%	0.304
	1989	17216.9	7.3%	56,827,813	7.7%	0.303
	1992	13949.5	8.1%	47,606,583	7.8%	0.293
	1995	17502.7	6.9%	69,548,765	6.7%	0.252
	1998	24822.5	7.2%	93,452,593	8.2%	0.266
	2001	41478.3	6.1%	147,788,199	6.0%	0.281
	2004	79747.8	6.6%	271,145,362	7.3%	0.294

Table 17. Slope survey length composition data for Dover sole.

	Length in cm																			
Year	<=22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60+
AFSC slope survey				Females																
1997	2.1%	1.9%	3.5%	4.1%	4.4%	4.0%	3.9%	3.3%	3.5%	3.4%	3.3%	3.5%	2.7%	1.1%	0.3%	0.1%	0.1%	0.0%	0.0%	
1999	2.0%	1.6%	2.2%	3.3%	4.1%	4.6%	4.6%	3.6%	3.1%	3.6%	3.8%	3.6%	2.9%	1.4%	0.5%	0.1%	0.0%	0.0%	0.0%	0.1%
2000	1.9%	1.5%	2.1%	3.2%	3.2%	4.1%	3.5%	4.1%	3.7%	3.4%	3.3%	4.4%	2.6%	1.3%	0.6%	0.2%	0.1%	0.0%	0.0%	0.0%
2001	2.9%	1.7%	2.1%	3.4%	4.0%	3.4%	3.7%	3.2%	3.8%	3.2%	2.7%	2.7%	2.1%	1.2%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%
AFSC slope survey				Males																
1997	2.0%	3.4%	6.6%	7.9%	7.8%	5.9%	4.8%	4.8%	5.0%	3.7%	2.1%	0.6%	0.2%	0.1%	0.0%	0.0%	0.0%			
1999	2.1%	2.2%	4.5%	7.0%	8.9%	7.6%	6.1%	5.3%	3.9%	3.6%	2.3%	0.8%	0.3%	0.0%	0.0%	0.0%		0.0%		
2000	2.3%	2.0%	2.8%	5.7%	10.0%	8.9%	7.4%	5.4%	4.5%	3.7%	2.6%	1.1%	0.4%	0.1%		0.0%	0.0%		0.0%	0.0%
2001	2.7%	2.3%	3.9%	5.7%	9.1%	10.0%	8.0%	5.7%	4.0%	4.3%	2.2%	1.0%	0.3%	0.0%	0.0%	0.0%	0.0%			
NWFSC slope survey				Females																
1998	0.6%	0.8%	2.0%	2.8%	3.4%	4.1%	4.4%	4.6%	3.8%	3.6%	4.2%	4.3%	3.3%	1.7%	0.6%	0.3%	0.2%	0.0%	0.0%	0.0%
1999	0.7%	0.9%	1.8%	3.0%	4.2%	5.3%	5.3%	5.0%	4.3%	3.8%	4.0%	4.2%	3.3%	2.0%	0.6%	0.3%	0.1%	0.0%	0.0%	0.0%
2000	0.5%	0.8%	2.1%	3.1%	3.7%	4.4%	5.0%	4.9%	4.6%	3.9%	4.1%	4.3%	3.6%	1.5%	0.8%	0.2%	0.2%	0.1%	0.0%	0.0%
2001	1.3%	2.2%	2.9%	2.9%	3.7%	3.5%	3.4%	4.4%	4.4%	4.3%	3.7%	3.7%	2.9%	1.5%	0.7%	0.1%	0.1%	0.1%	0.0%	0.0%
2002	0.7%	1.2%	2.7%	2.9%	3.5%	4.6%	4.1%	3.8%	3.7%	3.8%	3.7%	4.0%	2.5%	1.3%	0.6%	0.2%	0.1%	0.1%	0.0%	0.0%
2003	0.8%	1.4%	2.3%	2.4%	3.0%	3.7%	4.4%	4.7%	4.4%	3.8%	3.5%	3.1%	2.0%	1.5%	0.9%	0.2%	0.3%	0.1%	0.1%	0.0%
2004	1.0%	1.1%	1.4%	2.3%	3.8%	3.5%	4.6%	3.8%	3.7%	3.9%	3.4%	3.0%	2.4%	1.2%	0.4%	0.2%	0.1%	0.2%	0.0%	0.0%
NWFSC slope survey				Males																
1998	0.8%	1.5%	4.2%	8.4%	9.6%	9.4%	6.6%	4.5%	3.0%	3.1%	2.5%	1.2%	0.3%	0.1%	0.0%	0.0%		0.0%		0.0%
1999	0.9%	1.8%	3.8%	6.9%	8.6%	8.4%	6.9%	4.1%	3.6%	3.3%	1.6%	0.8%	0.2%	0.0%	0.0%			0.0%		
2000	0.5%	1.3%	3.1%	5.8%	8.8%	10.3%	7.1%	5.6%	4.1%	2.5%	2.0%	0.8%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2001	1.7%	2.1%	3.1%	4.4%	7.0%	8.3%	7.9%	5.9%	5.2%	4.8%	2.3%	1.3%	0.3%	0.1%	0.0%	0.0%		0.0%		
2002	0.7%	1.5%	3.5%	5.1%	7.1%	9.4%	8.3%	7.1%	5.6%	4.3%	2.6%	1.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%		0.0%
2003	0.9%	1.9%	2.9%	4.7%	7.2%	10.0%	9.9%	7.6%	4.8%	3.4%	2.6%	0.9%	0.3%	0.2%	0.1%	0.0%	0.0%			
2004	1.5%	2.0%	3.1%	5.4%	6.6%	8.8%	9.6%	8.2%	6.1%	4.8%	2.6%	0.8%	0.4%	0.1%	0.0%	0.0%	0.0%			

Table 18. NWFSC slope survey age composition data for Dover sole.

Year	<=5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20-24	25-29	30-34	35-39	40+
	Age in years.																			
	Females																			
1998	5.9%	2.1%	2.6%	1.4%	3.8%	3.0%	3.2%	2.4%	1.5%	2.9%	2.1%	1.8%	0.9%	0.9%	0.9%	4.4%	3.3%	1.1%	0.2%	0.1%
1999	8.9%	3.3%	6.1%	1.3%	5.2%	2.8%	1.0%	3.9%	1.3%	0.9%	0.3%	1.3%	0.3%	5.4%	2.1%	8.2%	1.8%	1.5%	0.4%	1.6%
2000	7.5%	6.0%	1.2%	0.5%	3.0%	2.8%	1.2%	1.2%	1.7%	2.3%	1.8%	1.0%	0.3%	1.0%	0.2%	8.2%	1.7%	2.4%	1.2%	0.3%
2001	14.6%	2.5%	1.5%	3.2%	2.9%	0.9%	2.6%	1.5%	0.9%	0.4%	0.4%	0.4%	0.2%	1.1%	0.2%	6.1%	5.6%	2.1%	1.4%	2.4%
2002	7.6%	3.1%	6.2%	2.9%	2.6%	2.3%	2.1%	2.1%	1.3%	2.1%	0.8%	1.3%	2.0%	1.3%	0.8%	2.9%	1.9%	2.0%	1.1%	2.2%
2003	6.5%	4.4%	7.1%	1.8%	5.3%	3.2%	1.2%	0.6%	1.2%	1.1%	1.1%	0.8%	0.9%	0.4%	0.3%	2.0%	1.3%	3.4%	0.8%	1.9%
2004	4.3%	4.9%	4.4%	1.6%	3.1%	2.9%	3.3%	2.1%	2.3%	1.0%	2.2%	0.3%	0.4%	0.6%	0.6%	2.7%	1.3%	2.3%	1.4%	0.6%
	Males																			
1998	9.2%	5.5%	6.4%	4.1%	6.2%	3.5%	2.8%	3.2%	3.8%	2.2%	2.3%	1.4%	0.7%	0.8%	0.3%	1.2%	1.5%	0.2%	0.0%	0.0%
1999	7.3%	8.0%	7.8%	4.8%	2.1%	2.1%	0.2%	2.5%	0.5%	3.3%	0.9%	0.1%	0.1%	0.8%	0.2%	1.2%	0.7%	0.1%	0.0%	0.0%
2000	3.8%	1.8%	2.2%	2.5%	5.1%	4.2%	12.4%	5.3%	3.8%	2.6%	2.2%	0.2%	1.9%	2.8%	0.0%	0.9%	1.9%	0.2%	1.0%	0.0%
2001	5.3%	3.5%	3.0%	1.1%	4.5%	3.4%	2.9%	3.8%	4.0%	2.3%	1.9%	1.7%	1.3%	0.1%	0.2%	3.1%	1.0%	1.5%	1.4%	3.2%
2002	6.4%	2.9%	5.6%	3.7%	3.5%	5.5%	4.3%	3.9%	2.3%	2.7%	1.5%	1.1%	1.4%	0.6%	0.8%	2.1%	1.3%	0.5%	0.5%	1.0%
2003	5.3%	6.0%	3.8%	1.7%	2.0%	5.1%	1.8%	3.3%	2.8%	3.1%	11.4%	1.6%	0.8%	0.2%	0.4%	2.4%	1.0%	0.7%	0.8%	0.7%
2004	7.0%	5.9%	3.6%	4.3%	5.5%	4.4%	3.2%	4.6%	1.9%	0.8%	2.0%	2.1%	1.6%	1.1%	0.7%	4.0%	2.2%	1.7%	0.7%	0.3%

Table 19. Shelf survey length composition data for Dover sole.

Year	Length in cm <=22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60+
Triennial shelf survey			Females																	
1986	1.8%	1.7%	2.3%	3.8%	6.0%	6.0%	6.1%	4.3%	2.9%	1.9%	0.9%	0.9%	0.5%	0.3%	0.3%	0.1%	0.1%	0.1%	0.0%	0.0%
1989	3.3%	2.8%	4.2%	5.0%	5.8%	5.4%	4.8%	3.7%	2.3%	1.9%	1.2%	0.8%	0.4%	0.4%	0.3%	0.2%	0.1%	0.1%	0.1%	0.0%
1992	3.1%	4.1%	4.6%	4.9%	5.9%	6.2%	6.1%	4.3%	2.8%	1.8%	1.1%	0.8%	0.7%	0.5%	0.3%	0.4%	0.1%	0.1%	0.0%	0.0%
1995	6.0%	5.2%	6.5%	6.5%	6.2%	5.3%	4.7%	2.6%	1.5%	0.7%	0.6%	0.4%	0.4%	0.3%	0.2%	0.1%	0.0%	0.1%	0.0%	0.0%
1998	3.4%	3.0%	5.2%	6.4%	6.5%	6.4%	4.8%	3.2%	1.7%	1.3%	0.8%	0.5%	0.2%	0.2%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%
2001	5.6%	3.8%	4.5%	4.4%	5.1%	5.0%	4.7%	3.6%	2.3%	1.6%	1.0%	0.6%	0.5%	0.3%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%
2004	6.0%	4.2%	5.0%	5.6%	5.4%	5.0%	4.4%	3.6%	3.2%	2.0%	1.5%	0.9%	0.7%	0.3%	0.2%	0.2%	0.1%	0.0%	0.0%	0.0%
Triennial shelf survey			Males																	
1986	2.0%	2.4%	5.5%	10.7%	15.8%	13.9%	6.2%	2.2%	0.7%	0.4%	0.1%	0.1%	0.0%	0.0%	0.0%					
1989	4.8%	4.6%	6.4%	10.7%	11.7%	8.8%	5.5%	3.0%	1.0%	0.5%	0.2%	0.0%	0.0%	0.0%	0.0%		0.0%			
1992	4.9%	6.1%	7.2%	8.7%	9.1%	7.7%	4.5%	2.4%	0.9%	0.3%	0.1%	0.1%	0.0%	0.0%						
1995	9.4%	8.1%	8.7%	8.2%	7.5%	5.4%	3.4%	1.2%	0.3%	0.2%	0.1%	0.0%	0.0%	0.0%						0.0%
1998	5.5%	7.1%	11.1%	11.9%	10.3%	6.1%	2.5%	0.9%	0.3%	0.1%	0.1%	0.0%	0.0%	0.0%		0.0%				0.0%
2001	9.1%	6.7%	7.0%	8.2%	9.9%	7.9%	5.2%	1.6%	0.5%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%					0.0%
2004	6.9%	6.2%	8.3%	7.8%	7.1%	6.3%	4.8%	2.6%	1.0%	0.3%	0.1%	0.0%	0.0%	0.0%		0.0%		0.0%		

Table 20. Sample sizes for Dover sole caught during the coastwide AFSC slope surveys.

			Depth strata (fa)					
INPFC Region	Year	Sample Size	100-199	200-299	300-399	400-499	500-599	600-699
US Vancouver	1997	No. of hauls	2	1	1	1	2	0
		No. of hauls with Dover	2	1	1	1	1	0
		No. Dover lengths	122	19	33	1	1	0
	1999	No. of hauls	3	3	3	4	0	0
		No. of hauls with Dover	3	3	2	3	0	0
		No. Dover lengths	278	237	71	21	0	0
	2000	No. of hauls	3	2	3	4	3	0
		No. of hauls with Dover	3	2	3	2	1	0
		No. Dover lengths	208	140	104	12	1	0
	2001	No. of hauls	3	2	3	4	3	3
		No. of hauls with Dover	3	2	2	2	1	1
		No. Dover lengths	32	216	49	20	1	1
Columbia	1997	No. of hauls	13	12	10	10	9	11
		No. of hauls with Dover	13	12	10	10	7	3
		No. Dover lengths	651	1611	633	182	63	25
	1999	No. of hauls	13	12	11	10	11	10
		No. of hauls with Dover	12	12	11	9	5	1
		No. Dover lengths	956	1146	444	182	82	1
	2000	No. of hauls	13	12	11	10	11	10
		No. of hauls with Dover	13	12	10	10	7	1
		No. Dover lengths	1577	873	392	259	48	5
	2001	No. of hauls	13	12	11	10	11	0
		No. of hauls with Dover	13	12	11	10	7	0
		No. Dover lengths	164	914	328	246	79	0
Eureka	1997	No. of hauls	5	5	5	4	5	6
		No. of hauls with Dover	5	5	5	4	5	6
		No. Dover lengths	686	835	429	205	199	170
	1999	No. of hauls	5	5	5	5	5	6
		No. of hauls with Dover	5	5	5	5	5	6
		No. Dover lengths	429	495	358	387	80	45
	2000	No. of hauls	5	5	5	5	5	6
		No. of hauls with Dover	5	5	5	5	4	4
		No. Dover lengths	656	404	284	231	128	54
	2001	No. of hauls	5	5	5	5	5	6
		No. of hauls with Dover	5	5	5	5	5	6
		No. Dover lengths	77	409	208	203	116	98

Table 20. AFSC slope survey sample sizes for Dover sole. (continued)

INPFC Region	Year	Sample Size	Depth strata (fa) 100-199	200-299	300-399	400-499	500-599	600-699
Monterey	1997	No. of hauls	7	9	9	7	8	10
		No. of hauls with Dover	7	9	9	7	7	8
		No. Dover lengths	525	1271	954	529	418	452
	1999	No. of hauls	9	9	9	8	8	10
		No. of hauls with Dover	9	9	9	8	8	7
		No. Dover lengths	688	816	700	607	295	310
	2000	No. of hauls	11	9	10	10	10	12
		No. of hauls with Dover	11	9	10	10	10	10
		No. Dover lengths	1280	1189	846	939	500	379
	2001	No. of hauls	10	10	10	11	9	12
		No. of hauls with Dover	10	10	10	11	9	10
		No. Dover lengths	137	1127	992	779	376	467
Conception	1997	No. of hauls	4	6	5	4	5	5
		No. of hauls with Dover	3	6	5	4	5	2
		No. Dover lengths	95	492	469	259	198	118
	1999	No. of hauls	4	6	5	4	5	5
		No. of hauls with Dover	4	6	5	4	4	2
		No. Dover lengths	424	678	369	239	127	33
	2000	No. of hauls	4	6	5	4	5	5
		No. of hauls with Dover	4	6	5	4	3	3
		No. Dover lengths	262	721	335	321	142	56
	2001	No. of hauls	4	6	5	4	5	5
		No. of hauls with Dover	4	6	5	4	3	2
		No. Dover lengths	35	543	375	362	151	57

Table 21. Sample sizes for Dover sole caught during the coastwide NWFSC slope surveys.

	Vancouver [1]		Columbia		Eureka		Monterey		Conception		Total
Year	100-300	300-700	100-300	300-700	100-300	300-700	100-300	300-700	100-300	300-700	100-700
	Number of tows										
1998	17	11	42	19	21	18	33	37	8	14	220
1999	22	15	37	28	29	34	46	44	13	11	279
2000	21	12	36	26	26	36	52	48	15	14	286
2001	24	12	50	16	27	34	43	53	18	16	293
2002	22	12	46	22	30	38	58	52	46	38	364
2003	27	23	29	26	35	32	30	21	46	21	290
2004	12	9	46	14	12	23	16	21	41	41	235
	Number of fish length measurements										
1998	2187	162	3319	741	2134	547	2867	2073	272	750	15052
1999	2109	455	2912	635	3259	1441	5788	3346	825	558	21328
2000	2015	560	3291	752	2476	1199	4516	3120	1177	657	19763
2001	2616	256	3565	248	2288	886	4343	3013	969	781	18965
2002	2513	312	3428	688	3547	1082	5954	2814	2640	1605	24583
2003	1749	474	1600	997	3135	1296	2293	883	2053	510	14990
2004	502	146	2350	307	744	1069	1623	1112	1927	1167	10947
	Number of fish age-readings										
1998	90	15	157	41	84	49	151	140	32	75	834
1999	54	40	47	36	58	52	66	61	43	42	499
2000	61	33	43	50	56	56	73	60	44	35	511
2001	38	21	103	20	41	52	70	68	29	25	467
2002	133	52	348	98	195	185	333	197	124	122	1787
2003	61	34	61	61	95	79	59	44	93	48	635
2004	50	28	222	50	47	103	76	90	157	150	973

[1] Boundary between Vancouver and Columbia adjusted to 46 deg N latitude to balance sample sizes.

Table 22. Sample sizes for Dover sole caught during the triennial shelf surveys. ("Water hauls" during the 1980 - 1995 surveys were excluded from the analyses.)

Year	No. of hauls: total	with Dover	with Dover lengths	No. lengths
1980	349	287	28	1626
1983	521	447	36	3269
1986	484	450	125	7754
1989	505	466	363	15961
1992	482	400	291	11050
1995	512	481	367	23730
1998	528	495	433	27969
2001	506	494	494	34471
2004	383	376	371	33388

Table 23. Preliminary Dover sole base model – profile over spawner-recruit steepness. The negative log-likelihood values shown in bold are the minimum values for each given row.

Run ID =		175	174	173	165 base	178	180
Steepness =		0.95	0.9	0.85	0.8	0.74	0.7
Log-Likelihood Components							
	Lambda						
Total		**1311.4**	1312.0	1312.6	1313.5	1314.6	1315.6
Based on Obs. Data	[1]	**1361.7**	1361.9	1362.1	1362.4	1362.7	1363.0
Biomass / CPUE							
AFSC Slope	1	-9.7	-9.7	-9.7	-9.7	-9.8	**-9.8**
NWFSC Slope	1	-15.7	-15.7	-15.7	-15.7	-15.7	**-15.7**
Triennial Shelf	1	**38.5**	38.8	39.1	39.4	39.8	40.2
Trawl CPUE	1	-21.3	-21.4	-21.4	-21.4	-21.5	**-21.5**
Discards							
S Fishery	1	**4.6**	4.6	4.6	4.6	4.6	4.6
N Fishery	1	-2.5	-2.5	-2.5	-2.5	-2.5	**-2.5**
Length Compositions							
S Fishery	1	367.0	367.0	**366.9**	367.0	367.0	367.1
N Fishery	1	**407.0**	407.0	407.5	407.0	407.1	407.1
AFSC Slope	1	49.5	49.5	49.2	49.3	49.2	**49.1**
NWFSC Slope	1	93.3	93.2	**93.0**	93.1	93.1	93.0
Triennial Shelf	1	96.1	96.1	**96.1**	96.1	96.1	96.1
Age Compositions							
S Fishery	0.2	683.8	683.8	**683.4**	683.9	683.9	684.0
N Fishery	0.2	**446.9**	447.3	448.2	448.3	449.1	449.7
NWFSC Slope	0.2	210.4	210.3	210.1	210.1	210.0	**209.8**
Length-at-Age							
AFSC Slope	0.1	**445.3**	445.4	445.9	445.5	445.6	445.7
NWFSC Slope	0.1	491.2	491.1	**490.3**	490.9	490.7	490.6
Mean Body Weight	1	-6.9	-6.9	-6.9	-6.9	-6.9	**-6.9**
Recruitment Devs	1	**-73.3**	-72.9	-72.4	-71.9	-71.1	-70.4
Parameter Devs	1	34.5	34.5	**34.5**	34.5	34.5	34.5

[1] The sum of all the likelihood components (each times its lambda value) excluding the recruitment deviations and the selection parameters deviations.

Table 23. Preliminary base model – profile over spawner-recruit steepness. (continued)

Run ID =	175	174	173	165 base	178	180
Steepness =	0.95	0.9	0.85	0.8	0.74	0.7
Key Parameters						
Fem L@1.75	10.24	10.25	10.24	10.28	10.29	10.31
Fem L@40.0	51.31	51.31	51.29	51.31	51.31	51.31
Fem VBK	0.1161	0.1160	0.1163	0.1160	0.1159	0.1159
Mal L1 offset	0.118	0.117	0.119	0.116	0.115	0.115
Mal L2 offset	-0.153	-0.153	-0.153	-0.153	-0.153	-0.153
Mal VBK offset	-0.0391	-0.0392	-0.0405	-0.0396	-0.0399	-0.0402
R0	11.811	11.819	11.829	11.838	11.853	11.864
Steepness	0.95	0.9	0.85	0.8	0.74	0.7
Sigma_R	0.35	0.35	0.35	0.35	0.35	0.35
SR rmse (1910-2003)	0.2570	0.2591	0.2615	0.2643	0.2683	0.2715
SR rmse (1960-2003)	0.2718	0.2731	0.2749	0.2767	0.2794	0.2816
SR rmse (1970-2003)	0.2827	0.2841	0.2859	0.2876	0.2903	0.2925
AFSC Slope log Q	0.07600	0.07627	0.07384	0.07646	0.07619	0.07576
NWFSC Slope log Q	-0.01936	-0.01832	-0.01980	-0.01632	-0.01526	-0.01468
Triennial Shelf log Q	-1.3473	-1.3469	-1.3481	-1.3462	-1.3460	-1.3460
Trawl CPUE log Q	-6.5394	-6.5411	-6.5457	-6.5455	-6.5492	-6.5522
Management Variables						
SpawnBio(0)	291127	293440	296452	299175	303584	307077
SpawnBio(2005)	183903	183717	183990	183370	183201	183118
%Unexploited(2005)	63.2%	62.6%	62.1%	61.3%	60.3%	59.6%
Catch(2004)	7213.9	7213.9	7213.9	7213.7	7213.6	7213.5
Landings(2004)	6742.7	6742.7	6742.7	6742.7	6742.7	6742.7
%Discard(2004)	6.53%	6.53%	6.53%	6.53%	6.53%	6.53%

Table 24. Preliminary Dover sole base model – sensitivity to the assumed sigma(R). The negative log-likelihood values shown in bold are the minimum values for each given row.

Run ID =		170	169	168	165 base	171	172
Sigma(R) =		0.5	0.45	0.4	0.35	0.3	0.25
SR rmse (1960-2003) =		0.356	0.333	0.306	0.277	0.244	0.210
Log-Likelihood Components							
	Lambda						
Total		1333.2	1327.1	1320.4	1313.5	1305.7	**1296.7**
Based on Obs. Data [1]		**1349.2**	1352.6	1356.7	1362.4	1369.7	1379.2
Biomass / CPUE							
AFSC Slope	1	-9.4	-9.5	-9.6	-9.7	-9.9	**-10.0**
NWFSC Slope	1	-15.5	-15.5	-15.6	-15.7	-15.8	**-15.9**
Triennial Shelf	1	**31.2**	33.3	35.9	39.4	43.8	49.2
Trawl CPUE	1	-20.0	-20.4	-20.9	-21.4	-22.0	**-22.6**
Discards							
S Fishery	1	**4.5**	4.5	4.6	4.6	4.6	4.6
N Fishery	1	-2.1	-2.2	-2.3	-2.5	-2.7	**-2.8**
Length Compositions							
S Fishery	1	**365.9**	366.2	366.5	367.0	367.6	368.3
N Fishery	1	**403.5**	404.1	405.3	407.0	408.9	411.2
AFSC Slope	1	49.2	49.4	49.4	49.3	49.2	**49.1**
NWFSC Slope	1	93.3	93.4	93.4	93.1	93.0	**92.9**
Triennial Shelf	1	**93.7**	94.3	95.0	96.1	97.6	99.5
Age Compositions							
S Fishery	0.2	684.4	684.6	684.7	683.9	683.5	**683.2**
N Fishery	0.2	**444.7**	445.1	446.3	448.3	450.6	453.2
NWFSC Slope	0.2	211.7	211.4	211.0	210.1	209.3	**208.3**
Length-at-Age							
AFSC Slope	0.1	444.4	**444.4**	444.7	445.5	446.3	447.3
NWFSC Slope	0.1	490.9	491.5	491.8	490.9	490.5	**490.1**
Mean Body Weight	1	-6.9	-6.9	-6.9	-6.9	-7.0	**-7.0**
Recruitment	1	-42.6	-51.0	-60.6	-71.9	-85.4	**-101.9**
Parameter Devs	1	**34.2**	34.3	34.4	34.5	34.6	34.7

[1] The sum of all the likelihood components (each times its lambda value) excluding the recruitment deviations and the selection parameters deviations.

Table 24. Preliminary base model – sensitivity to the assumed sigma(R). (continued)

Run ID =	170	169	168	165 base	171	172
Sigma(R) =	0.5	0.45	0.4	0.35	0.3	0.25
SR rmse (1960-2003) =	0.356	0.333	0.306	0.277	0.244	0.210
Key Parameters						
Fem L@1.75	10.01	10.09	10.19	10.28	10.41	10.55
Fem L@40.0	51.26	51.29	51.32	51.31	51.32	51.34
Fem VBK	0.11716	0.11668	0.11617	0.11598	0.11546	0.11487
Mal L1 offset	0.132	0.127	0.120	0.116	0.109	0.101
Mal L2 offset	-0.153	-0.153	-0.153	-0.153	-0.153	-0.154
Mal VBK offset	-0.0430	-0.0415	-0.0391	-0.0396	-0.0381	-0.0363
R0	11.922	11.891	11.864	11.838	11.813	11.789
Steepness	0.8	0.8	0.8	0.8	0.8	0.8
Sigma_R	0.5	0.45	0.4	0.35	0.3	0.25
SR rmse (1910-2003)	0.3461	0.3217	0.2945	0.2643	0.2307	0.1944
SR rmse (1960-2003)	0.3560	0.3326	0.3063	0.2767	0.2439	0.2096
SR rmse (1970-2003)	0.3626	0.3405	0.3158	0.2876	0.2561	0.2226
AFSC Slope log Q	-0.00406	0.02093	0.04757	0.07646	0.11065	0.14901
NWFSC Slope log Q	-0.11649	-0.08648	-0.05336	-0.01632	0.02777	0.07785
Triennial Shelf log Q	-1.4083	-1.3892	-1.3697	-1.3462	-1.3199	-1.2904
Trawl CPUE log Q	-6.5731	-6.5625	-6.5542	-6.5455	-6.5363	-6.5268
Management Variables						
SpawnBio(0)	325415	315655	307291	299175	291701	284644
SpawnBio(2005)	204382	197928	191049	183370	174710	165335
%Unexploited(2005)	62.8%	62.7%	62.2%	61.3%	59.9%	58.1%
Catch(2004)	7215.69	7215.14	7214.6	7213.72	7212.68	7211.49
Landings(2004)	6742.7	6742.7	6742.7	6742.7	6742.7	6742.7
%Discard(2004)	6.56%	6.55%	6.54%	6.53%	6.52%	6.50%

Table 25. Preliminary Dover sole base model – sensitivity to the natural mortality coefficient. The negative log-likelihood values shown in bold are the minimum values for each given row.

Run ID =		184	183	165 base	185	186
Natural Mortality (M) =		0.07	0.08	0.09	0.1	0.11
Log-Likelihood Components						
	Lambda					
Total		1335.8	1327.1	**1313.5**	1327.8	1334.0
Based on Obs. Data [1]		1361.5	**1360.2**	1362.4	1367.1	1373.6
Biomass / CPUE						
AFSC Slope	1	**-9.9**	-9.8	-9.7	-9.7	-9.7
NWFSC Slope	1	-15.4	-15.6	-15.7	-15.9	**-16.0**
Triennial Shelf	1	42.1	40.4	39.4	38.9	**38.8**
Trawl CPUE	1	**-23.1**	-22.4	-21.4	-20.3	-19.0
Discards						
S Fishery	1	4.8	4.7	4.6	4.5	**4.4**
N Fishery	1	-2.1	-2.3	-2.5	-2.7	**-2.8**
Length Compositions						
S Fishery	1	**366.5**	366.8	367.0	367.2	367.4
N Fishery	1	**403.5**	405.1	407.0	409.4	412.2
AFSC Slope	1	**46.9**	48.1	49.3	50.4	51.3
NWFSC Slope	1	**88.9**	91.1	93.1	95.0	96.5
Triennial Shelf	1	**94.9**	95.5	96.1	97.0	97.8
Age Compositions						
S Fishery	0.2	702.2	689.8	683.9	**682.3**	683.8
N Fishery	0.2	479.7	462.0	448.3	437.7	**429.5**
NWFSC Slope	0.2	**204.8**	207.3	210.1	213.0	215.9
Length-at-Age						
AFSC Slope	0.1	460.2	451.8	445.5	440.8	**437.6**
NWFSC Slope	0.1	**480.7**	485.9	490.9	495.6	499.9
Mean Body Weight	1	**-7.0**	-7.0	-6.9	-6.9	-6.9
Recruitment	1	-59.1	-67.2	-71.9	-74.2	**-74.8**
Parameter Devs	1	**33.5**	34.1	34.5	34.9	35.2

[1] The sum of all the likelihood components (each times its lambda value) excluding the recruitment deviations and the selection parameters deviations.

Table 25. Preliminary base model – sensitivity to the natural mortality coefficient. (continued)

Run ID =	184	183	165 base	185	186
Natural Mortality (M) =	0.07	0.08	0.09	0.1	0.11
Key Parameters					
Fem L@1.75	10.51	10.40	10.28	10.15	10.02
Fem L@40.0	51.23	51.26	51.31	51.35	51.41
Fem VBK	0.1158	0.1159	0.1160	0.1160	0.1160
Mal L1 offset	0.102	0.109	0.116	0.124	0.132
Mal L2 offset	-0.154	-0.153	-0.153	-0.153	-0.154
Mal VBK offset	-0.0408	-0.0405	-0.0396	-0.0384	-0.0364
R0	11.321	11.578	11.838	12.108	12.398
Steepness	0.8	0.8	0.8	0.8	0.8
Sigma_R	0.35	0.35	0.35	0.35	0.35
SR rmse (1910-2003)	0.3211	0.2864	0.2643	0.2527	0.2494
SR rmse (1960-2003)	0.2780	0.2761	0.2767	0.2786	0.2813
SR rmse (1970-2003)	0.2847	0.2850	0.2876	0.2914	0.2956
AFSC Slope log Q	0.35637	0.22295	0.07646	-0.08765	-0.27773
NWFSC Slope log Q	0.25275	0.12369	-0.01632	-0.17221	-0.35245
Triennial Shelf log Q	-1.0840	-1.2086	-1.3462	-1.5018	-1.6839
Trawl CPUE log Q	-6.3774	-6.4500	-6.5455	-6.6654	-6.8174
Management Variables					
SpawnBio(0)	298922	295617	299175	310473	332812
SpawnBio(2005)	148798	163823	183370	209284	245424
%Unexploited(2005)	49.8%	55.4%	61.3%	67.4%	73.7%
Catch(2004)	7211.8	7212.8	7213.7	7214.5	7215.3
Landings(2004)	6742.7	6742.7	6742.7	6742.7	6742.7
%Discard(2004)	6.50%	6.52%	6.53%	6.54%	6.55%

Table 26. Preliminary base model – sensitivity to the lambda values for the biomass indices.

	Run ID =	165 base	188	189	190	191	192	193	194	195
		Index =	- - - AFSC - - -		- - NWFSC - -		- - - Shelf - - -		Logbook CPUE	
		Lambda =	4.0	0.2	5.0	0.2	5.0	0.2	5.0	0.2
Log-Likelihood Components										
Biomass / CPUE	Lambda	Base	- - - - - - - - - - - - - - - Change from Base Value - - - - - - - - - - - - - - -							
AFSC Slope	1	-9.75	-0.1	0.04	-0.07	0.02	2.10	-0.48	-0.33	0.14
NWFSC Slope	1	-15.72	-0.1	0.02	-0.09	0.03	2.86	-0.39	-0.09	0.03
Triennial Shelf	1	39.40	2.7	-0.86	2.65	-0.66	-34.95	48.10	10.40	-3.06
Trawl CPUE	1	-21.42	-0.4	0.11	-0.12	0.01	4.62	-3.72	-2.79	1.22
Discards										
S Fishery	1	4.58	0.0	-0.01	-0.02	0.00	0.00	0.19	0.16	-0.05
N Fishery	1	-2.50	0.0	0.00	-0.02	0.00	-0.06	0.14	0.13	-0.04
Length Compositions										
S Fishery	1	367.03	-0.5	0.08	0.11	-0.07	1.84	-2.02	-0.22	0.25
N Fishery	1	407.02	0.0	-0.23	-0.77	0.00	14.35	-4.82	0.77	-0.13
AFSC Slope	1	49.29	-0.1	0.12	-0.40	0.17	5.75	-0.83	2.07	-0.62
NWFSC Slope	1	93.14	0.0	0.15	-0.34	0.20	11.47	-3.13	0.45	0.02
Triennial Shelf	1	96.14	-0.1	-0.06	0.22	-0.13	-3.18	0.11	-0.40	0.26
Age Compositions										
S Fishery	0.2	683.89	-1.0	0.82	-0.26	0.47	12.99	-2.94	-4.50	1.76
N Fishery	0.2	448.34	1.2	-0.66	1.46	-0.54	4.07	2.29	-1.67	1.02
NWFSC Slope	0.2	210.11	-0.7	0.39	-0.35	0.21	4.73	-2.31	0.59	-0.14
Length-at-Age										
AFSC Slope	0.1	445.49	-0.7	-0.05	-0.06	-0.19	5.31	4.34	2.94	-0.87
NWFSC Slope	0.1	490.88	-0.2	0.82	0.13	0.55	4.76	-0.75	-0.22	-0.03
Mean Body Wt	1	-6.94	0.0	0.00	0.03	-0.01	-0.33	0.07	-0.08	0.03
Recruitment	1	-71.89	-1.3	0.41	-1.27	0.30	35.56	-9.82	-4.28	1.91
Parameter Devs	1	34.52	0.1	-0.06	0.07	-0.03	-0.24	0.74	-0.47	0.12
Key Parameters										
Fem L@1.75		10.28	10.34	10.28	10.41	10.27	8.73	10.75	10.05	10.35
Fem L@40.0		51.31	51.33	51.33	51.32	51.33	51.14	51.40	51.27	51.32
Fem VBK		0.1160	0.1156	0.1158	0.1155	0.1159	0.1220	0.1140	0.1170	0.1157
Mal L1 offset		0.116	0.112	0.115	0.110	0.115	0.215	0.082	0.121	0.115
Mal L2 offset		-0.153	-0.153	-0.153	-0.153	-0.153	-0.149	-0.155	-0.152	-0.153
Mal VBK offset		-0.0396	-0.0382	-0.0379	-0.0392	-0.0381	-0.0457	-0.0297	-0.0378	-0.0401
R0		11.838	11.829	11.841	11.836	11.838	11.963	11.685	11.774	11.863
SR rmse (1960-2003)		0.2767	0.2696	0.2789	0.2688	0.2785	0.4679	0.2193	0.2584	0.2848
SR rmse (1970-2003)		0.2876	0.2796	0.2902	0.2785	0.2898	0.5012	0.2069	0.2666	0.2959
AFSC Slope log Q		0.0765	0.1076	0.0682	0.0834	0.0759	-0.2274	0.4658	0.2713	0.0039
NWFSC Slope log Q		-0.0163	0.0235	-0.0273	-0.0026	-0.0185	-0.4243	0.4651	0.1979	-0.0949
Triennial Shelf log Q		-1.346	-1.324	-1.354	-1.340	-1.348	-1.585	-1.060	-1.200	-1.401
Trawl CPUE log Q		-6.546	-6.533	-6.549	-6.546	-6.545	-6.684	-6.361	-6.443	-6.586
Management Variables										
SpawnBio(0)		299175	296364	300261	298512	299485	339928	257212	280558	306827
SpawnBio(2005)		183370	176192	185535	180241	184021	290129	109595	146843	198635
%Unexploited(2005)		61.3%	59.5%	61.8%	60.4%	61.4%	85.4%	42.6%	52.3%	64.7%
Catch(2004)		7213.7	7213.5	7213.9	7214.4	7213.6	7205.1	7213.8	7212.9	7213.9
Landings(2004)		6742.7	6742.7	6742.7	6742.7	6742.7	6742.7	6742.7	6742.7	6742.7
%Discard(2004)		6.53%	6.53%	6.53%	6.54%	6.53%	6.42%	6.53%	6.52%	6.53%

Table 27. Some variants of the preliminary Dover sole base model.

			A	B	C	D
Run ID =		165b	181	166	182	187
		Preliminary base	No selection devs	Retention devs	Slope surveys w asymp. selection	Slope surveys w shared selection
N est. parameters =		209	139	209	209	205
Log-Likelihood Components						
	Lambda					
Total		1313.5	1583.3	1293.9	1352.4	1352.9
Based on Obs. Data [1]		1362.4	1656.5	1364.4	1388.2	1404.6
Biomass / CPUE						
AFSC Slope	1	-9.7	-9.6	-9.8	-9.7	-9.6
NWFSC Slope	1	-15.7	-15.9	-15.7	-15.6	-16.0
Triennial Shelf	1	39.4	42.4	39.2	36.7	42.2
Trawl CPUE	1	-21.4	-21.2	-21.1	-21.6	-20.4
Discards						
S Fishery	1	4.6	4.0	-9.5	4.6	4.6
N Fishery	1	-2.5	-8.6	-16.6	-2.4	-2.5
Length Compositions						
S Fishery	1	367.0	497.7	360.0	368.0	367.3
N Fishery	1	407.0	556.6	447.7	427.2	412.0
AFSC Slope	1	49.3	44.4	45.8	58.8	61.9
NWFSC Slope	1	93.1	88.0	88.2	97.8	105.8
Triennial Shelf	1	96.1	106.9	96.3	96.8	99.4
Age Compositions						
S Fishery	0.2	683.9	734.0	690.6	647.3	690.6
N Fishery	0.2	448.3	466.8	466.5	452.4	448.6
NWFSC Slope	0.2	210.1	213.0	206.1	193.4	205.8
Length-at-Age						
AFSC Slope	0.1	445.5	452.0	462.0	419.5	437.7
NWFSC Slope	0.1	490.9	485.7	478.6	541.6	538.9
Mean Body Weight	1	-6.9	-4.8	-6.7	-7.0	-6.9
Recruitment	1	-71.9	-73.2	-65.1	-69.6	-73.1
Parameter Devs	1	34.5	0.0	0.8	33.7	35.1

[1] The sum of all the likelihood components (each times its lambda value) excluding the recruitment deviations and the selection parameters deviations.

Table 27. Some variants of the preliminary Dover sole base model. (continued)

		A	B	C	D
Run ID =	165b	181	166	182	187
	Preliminary base	No selection devs	Retention devs	Slope surveys w asymp. selection	Slope surveys w shared selection
Key Parameters					
Fem L@1.75	10.28	9.88	9.40	10.57	9.49
Fem L@40.0	51.31	50.99	50.96	49.87	51.11
Fem VBK	0.1160	0.1203	0.1228	0.1211	0.1210
Mal L1 offset	0.116	0.177	0.185	0.067	0.119
Mal L2 offset	-0.153	-0.154	-0.148	-0.131	-0.152
Mal VBK offset	-0.0396	-0.0692	-0.0824	-0.0450	-0.0288
R0	11.838	11.858	11.923	11.803	11.861
Steepness	0.8	0.8	0.8	0.8	0.8
Sigma_R	0.35	0.35	0.35	0.35	0.35
SR rmse (1910-2003)	0.2643	0.2576	0.2960	0.2754	0.2582
SR rmse (1960-2003)	0.2767	0.2575	0.2902	0.2821	0.2667
SR rmse (1970-2003)	0.2876	0.2681	0.2935	0.2961	0.2746
AFSC Slope log Q	0.07646	0.03048	0.03786	0.07662	-0.02109
NWFSC Slope log Q	-0.01632	-0.05197	-0.04879	-0.03123	-0.16487
Triennial Shelf log Q	-1.3462	-1.3758	-1.3908	-1.3274	-1.3674
Trawl CPUE log Q	-6.5455	-6.5100	-6.6134	-6.4283	-6.6097
Management Variables					
SpawnBio(0)	299175	304751	327313	267522	308184
SpawnBio(2005)	183370	185004	197471	168976	197518
%Unexploited(2005)	61.3%	60.7%	60.3%	63.2%	64.1%
Catch(2004)	7213.72	7245.69	7939.04	7213.85	7210.57
Landings(2004)	6742.7	6742.7	6742.7	6742.7	6742.7
%Discard(2004)	6.53%	6.94%	15.07%	6.53%	6.49%

Table 28. Retrospective analysis for the preliminary base model for Dover sole. See text for details.

Run ID =		165 base	Ret-2003	Ret-2002	Ret-2001	Ret-2000
Ending Year =		2004	2003	2002	2001	2000
Log-Likelihood Components						
	Lambda					
Total		1313.5	1172.7	1081.0	1027.6	920.2
Based on Obs. Data [<1>]		1362.4	1230.4	1135.9	1082.6	981.5
Biomass / CPUE						
AFSC Slope	1	-9.7	-10.2	-10.2	-10.2	-8.8
NWFSC Slope	1	-15.7	-13.6	-11.1	-8.5	-6.5
Triennial Shelf	1	39.4	9.2	7.9	8.6	-5.8
Trawl CPUE	1	-21.4	-22.9	-22.9	-22.7	-24.7
Discards						
S Fishery	1	4.6	4.4	4.3	-0.8	-0.8
N Fishery	1	-2.5	-2.8	-8.1	-8.3	-8.3
Length Compositions						
S Fishery	1	367.0	339.6	305.5	296.1	286.8
N Fishery	1	407.0	379.8	350.1	335.9	321.3
AFSC Slope	1	49.3	47.6	47.3	46.6	41.7
NWFSC Slope	1	93.1	80.8	69.9	60.8	46.8
Triennial Shelf	1	96.1	79.0	77.4	77.9	66.0
Age Compositions						
S Fishery	0.2	683.9	667.3	652.0	632.4	607.6
N Fishery	0.2	448.3	424.1	410.6	383.9	358.5
NWFSC Slope	0.2	210.1	191.8	163.3	148.7	103.4
Length-at-Age						
AFSC Slope	0.1	445.5	447.9	449.4	452.9	371.3
NWFSC Slope	0.1	490.9	448.0	388.6	290.0	228.7
Mean Body Weight	1	-6.9	-6.8	-3.2	0.0	0.0
Recruitment	1	-71.9	-78.4	-75.4	-73.5	-79.5
Parameter Devs	1	34.5	34.4	34.2	32.2	31.8

[<1>] The sum of all the likelihood components (each times its lambda value) excluding the recruitment deviations and the selection parameters deviations.

Table 28. Retrospective analysis for the preliminary base model for Dover sole. (continued)

Run ID =	165 base	Ret-2003	Ret-2002	Ret-2001	Ret-2000
Ending Year =	2004	2003	2002	2001	2000
Key Parameters					
Fem L@1.75	10.28	10.34	10.05	10.10	10.01
Fem L@40.0	51.31	51.44	51.59	51.87	51.85
Fem VBK	0.1160	0.1149	0.1151	0.1132	0.1131
Mal L1 offset	0.116	0.128	0.154	0.138	0.157
Mal L2 offset	-0.153	-0.156	-0.161	-0.166	-0.165
Mal VBK offset	-0.0396	-0.0451	-0.0453	-0.0313	-0.0362
R0	11.838	11.752	11.760	11.749	11.672
Steepness	0.8	0.8	0.8	0.8	0.8
Sigma_R	0.35	0.35	0.35	0.35	0.35
SR rmse (1910-2003)	0.2643	0.2250	0.2374	0.2433	0.2023
SR rmse (1960-2003)	0.2767	0.2284	0.2493	0.2529	0.1973
SR rmse (1970-2003)	0.2876	0.2264	0.2555	0.2595	0.1768
AFSC Slope log Q	0.07646	0.22519	0.21450	0.22934	0.34774
NWFSC Slope log Q	-0.01632	0.15525	0.13226	0.12213	0.34257
Triennial Shelf log Q	-1.3462	-1.3236	-1.3292	-1.3210	-1.3137
Trawl CPUE log Q	-6.5455	-6.4624	-6.4648	-6.4519	-6.3513
Management Variables					
SpawnBio(0)	299175	275414	280227	279603	257864
SpawnBio(2005)	183370	143117	138822	131412	100964
%Unexploited(2005)	61.3%	52.0%	49.5%	47.0%	39.2%
Catch(2004)	7213.7	7776.7	6665.1	7146.3	9589.6
Landings(2004)	6742.7	7372.2	6301.0	6889.2	8759.9
%Discard(2004)	6.53%	5.20%	5.46%	3.60%	8.65%

Table 29. SS2 parameter estimates from the final base model for Dover sole.

	Value	Est?	Value	Est?
Biological Parameters	Females		Males	
Natural mortality coefficient	0.09		0.09	
Length at 1.75 yr	9.9280	Y	10.065	Y
Length at 40 yr	51.066	Y	43.866	Y
VB growth coefficient	0.11892	Y	0.07318	Y
CV(length) at 1.75 yr	0.18		0.18	
CV(length) at 40 yr	0.075		0.075	
Length-weight alpha	4.41E-06		3.71E-06	
Length-weight beta	3.2254		3.2736	
Length at 50% maturity - initial period	36.5			
Maturity slope coefficient - initial	-0.2988			
Eggs per gm intercept	1			
Eggs per gm slope	0			
Spawner-Recruit Model				
ln(R0)	11.842	Y		
SR steepness	0.8			
sigma_R	0.35			

Deviations

Year	Dev	Year	Dev	Year	Dev	Year	Dev
1930	0.0029	1950	-0.6329	1970	0.0013	1990	0.5225
1931	0.0001	1951	-0.6519	1971	0.0284	1991	0.6047
1932	-0.0035	1952	-0.6157	1972	-0.0461	1992	0.3918
1933	-0.0080	1953	-0.5023	1973	-0.1482	1993	0.0802
1934	-0.0137	1954	-0.3068	1974	-0.1404	1994	0.0134
1935	-0.0209	1955	-0.0738	1975	0.0857	1995	0.2884
1936	-0.0297	1956	0.0834	1976	0.4051	1996	0.1646
1937	-0.0406	1957	0.0931	1977	0.1381	1997	0.9512
1938	-0.0542	1958	0.0118	1978	-0.0794	1998	0.4320
1939	-0.0712	1959	-0.0855	1979	-0.0407	1999	0.1768
1940	-0.0925	1960	-0.1553	1980	0.0200	2000	1.0266
1941	-0.1190	1961	-0.1586	1981	-0.1220	2001	0.5228
1942	-0.1521	1962	-0.0777	1982	-0.1777	2002	0.0419
1943	-0.1927	1963	0.0710	1983	-0.0318	2003	-0.0274
1944	-0.2417	1964	0.2781	1984	-0.0822		
1945	-0.2994	1965	0.4684	1985	-0.1658		
1946	-0.3653	1966	0.3418	1986	-0.0789		
1947	-0.4373	1967	0.0869	1987	0.0837		
1948	-0.5114	1968	-0.0513	1988	0.1962		
1949	-0.5803	1969	-0.0589	1989	0.1321		

Table 29. SS2 parameter estimates from the final base model for Dover sole. (continued)

	Value	Est?	Value	Est?
Survey and Fishery Parameters				
AFSC slope survey Q	1.0538	Y		
NWFSC slope survey Q	0.70311	Y		
Triennial shelf survey Q	0.25629	Y		
Trawl logbook CPUE index Q	0.00140	Y		
Slope Survey Selection Curves				
	AFSC		NWFSC	
Length at peak	30		32	
Selection at minL	0		0	
Ascending inflection (logit)	1.4804	Y	1.6149	Y
Ascending slope	0.1		0.1	
Selection at maxL (logit)	-99		-99	
Descending inflection (logit)	0.38859	Y	0.23054	Y
Descending slope	0.57508	Y	0.53796	Y
Width of top	2		2	
Length at transition - male	32		32	
ln(male:fem selection) at minL	0		0	
ln(male:fem selection) at transition	0.48788	Y	0.47428	Y
ln(male:fem selection) at maxL	0		0	
Shelf and Trawl CPUE Selection Curves				
	Shelf		Logbook	
Length at peak	30		50	
Selection at minL	0		0	
Ascending inflection (logit)	0.62279	Y	0.40550	
Ascending slope	0.52902	Y	0.54966	
Selection at maxL (logit)	-2.0347	Y	20	
Descending inflection (logit)	-2.4283	Y	0	
Descending slope	0.30625	Y	0	
Width of top	6.0664	Y	16	
Length at transition - male	31.844	Y	44	
ln(male:fem selection) at minL	0		0	
ln(male:fem selection) at transition	0.40427	Y	0	
ln(male:fem selection) at maxL	-5.5731		0	

Table 29. SS2 parameter estimates from the final base model for Dover sole. (continued)

	Value	Est?	Value	Est?
Fishery Selection Curves	South		North	
Length at peak	36		36	
Selection at minL	0		0	
Ascending inflection (logit)	1.7595		2.4090	
Ascending slope	0.1		0.1	
Selection at maxL (logit)	-1.9707	Y	-0.97059	Y
Descending inflection (logit)	-0.51544	Y	-1.0868	Y
Descending slope	0.45387	Y	0.32716	Y
Width of top	6.14E-08	Y	9.12E-09	Y
Retention L50 - intial period	34.3		34.3	
Retention inverse slope - initial period	1.6667		1.6667	
Retention asymptote	1		1	
Male offset for L50 - initial period	-0.7		-0.7	
Length at transition - male	33.890	Y	30.506	Y
ln(male:fem selection) at minL	0		0	
ln(male:fem selection) at transition	0.45574	Y	0.77251	Y
ln(male:fem selection) at maxL	-2.2630	Y	-3.0597	Y

Ascending inflection deviations:

Time Block		South	North
1910	1979	0.4085	0.0316
1980	1995	-0.2947	-0.8823
1996	2004	0.0315	-0.3153

Table 30. Final base model results for Dover sole. Biomass in mt; recruitment in 1000s fish.

						- - - - - Southern Fishery - - - - -				- - - - - Northern Fishery - - - - -			
Year	Total Biomass	Age 5+ Biomass	Spawning Biomass	Percent of Virgin	Age-0 Recruits	Total Catch	Landings	Harvest Rate	%Discard	Total Catch	Landings	Harvest Rate	%Discard
Virgin	614545	596145	299054	100%	138969	0.0--		0.0%		0.0--		0.0%	
1910	614545	596145	299054	100%	138969	0.0	0.0	0.0%		0.0	0.0	0.0%	
1911	614545	596145	299052	100%	138969	11.3	10.0	0.0%	11.6%	0.0	0.0	0.0%	
1912	614534	596133	299046	100%	138969	22.6	20.0	0.0%	11.6%	0.0	0.0	0.0%	
1913	614511	596110	299035	100%	138968	33.9	30.0	0.0%	11.6%	0.0	0.0	0.0%	
1914	614477	596077	299019	100%	138968	45.2	40.0	0.0%	11.6%	0.0	0.0	0.0%	
1915	614434	596033	298997	100%	138967	56.5	50.0	0.0%	11.6%	0.0	0.0	0.0%	
1916	614380	595979	298970	100%	138967	63.1	55.8	0.0%	11.6%	0.0	0.0	0.0%	
1917	614321	595921	298940	100%	138966	172.0	152.1	0.1%	11.6%	0.0	0.0	0.0%	
1918	614155	595754	298858	99.9%	138963	207.7	183.7	0.1%	11.6%	0.0	0.0	0.0%	
1919	613957	595557	298759	99.9%	138960	217.9	192.7	0.1%	11.6%	0.0	0.0	0.0%	
1920	613757	595357	298657	99.9%	138957	188.3	166.5	0.1%	11.6%	0.0	0.0	0.0%	
1921	613595	595196	298571	99.8%	138955	287.9	254.6	0.1%	11.6%	0.0	0.0	0.0%	
1922	613340	594941	298439	99.8%	138951	485.8	429.6	0.2%	11.6%	0.0	0.0	0.0%	
1923	612895	594496	298215	99.7%	138945	558.5	493.9	0.2%	11.6%	0.0	0.0	0.0%	
1924	612392	593994	297959	99.6%	138937	783.5	692.8	0.3%	11.6%	0.0	0.0	0.0%	
1925	611682	593284	297599	99.5%	138927	863.5	763.5	0.3%	11.6%	0.0	0.0	0.0%	
1926	610919	592522	297207	99.4%	138915	852.5	753.7	0.3%	11.6%	0.0	0.0	0.0%	
1927	610200	591805	296829	99.3%	138904	1032.8	913.1	0.4%	11.6%	0.0	0.0	0.0%	
1928	609332	590938	296376	99.1%	138891	1013.5	895.9	0.4%	11.6%	0.0	0.0	0.0%	
1929	608525	590132	295945	99.0%	138878	1154.0	1020.0	0.4%	11.6%	4.3	3.8	0.0%	11.4%
1930	607442	589220	295460	98.8%	130989	1076.9	951.8	0.4%	11.6%	1.4	1.2	0.0%	11.4%
1931	606493	588435	295031	98.7%	130613	928.1	820.2	0.3%	11.6%	1.4	1.2	0.0%	11.4%
1932	605739	587845	294693	98.5%	130135	876.7	774.7	0.3%	11.6%	9.6	8.5	0.0%	11.4%

Table 30. Final base model results for Dover sole. (continued)

Year	Total Biomass	Age 5+ Biomass	Spawning Biomass	Percent of Virgin	Age-0 Recruits	- - - - - Southern Fishery - - - - - Total Catch	Landings	Harvest Rate	%Discard	- - - - - Northern Fishery - - - - - Total Catch	Landings	Harvest Rate	%Discard
1933	604992	587338	294397	98.4%	129538	819.6	724.2	0.3%	11.6%	6.0	5.3	0.0%	11.4%
1934	604171	586929	294148	98.4%	128795	868.9	767.7	0.3%	11.6%	4.0	3.5	0.0%	11.4%
1935	603128	585961	293885	98.3%	127874	888.6	785.2	0.3%	11.6%	8.0	7.1	0.0%	11.4%
1936	601867	584794	293595	98.2%	126741	813.8	719.3	0.3%	11.6%	26.3	23.3	0.0%	11.4%
1937	600459	583503	293284	98.1%	125354	821.2	726.1	0.3%	11.6%	121.5	107.7	0.0%	11.4%
1938	598736	581923	292835	97.9%	123650	768.6	680.0	0.3%	11.5%	13.8	12.2	0.0%	11.3%
1939	596962	580325	292359	97.8%	121555	973.2	861.5	0.4%	11.5%	357.1	316.8	0.1%	11.3%
1940	594405	577986	291481	97.5%	118975	740.1	655.5	0.3%	11.4%	523.4	464.6	0.2%	11.2%
1941	591694	575542	290509	97.1%	115831	465.2	412.2	0.2%	11.4%	750.4	666.4	0.3%	11.2%
1942	588791	572964	289437	96.8%	112039	309.0	273.9	0.1%	11.4%	1265.4	1124.2	0.5%	11.2%
1943	585252	569819	288065	96.3%	107546	461.1	408.8	0.2%	11.3%	3483.4	3095.7	1.3%	11.1%
1944	579006	564045	285342	95.4%	102344	471.0	417.7	0.2%	11.3%	1107.9	984.8	0.4%	11.1%
1945	574880	560475	283785	94.9%	96567.3	770.3	683.3	0.3%	11.3%	1480.0	1316.0	0.6%	11.1%
1946	569672	555905	281793	94.2%	90368.2	1064.6	944.7	0.4%	11.3%	1897.9	1688.1	0.8%	11.1%
1947	563294	550237	279329	93.4%	84040.8	1243.6	1104.0	0.5%	11.2%	1133.7	1008.8	0.5%	11.0%
1948	557017	544723	277060	92.6%	77995.5	3694.2	3281.5	1.5%	11.2%	1563.5	1392.0	0.6%	11.0%
1949	547226	535713	273212	91.4%	72730.8	4026.2	3578.9	1.6%	11.1%	1537.2	1369.5	0.6%	10.9%
1950	536595	525833	269025	90.0%	68937.4	4868.2	4331.1	2.0%	11.0%	3265.6	2911.9	1.4%	10.8%
1951	522820	512713	263281	88.0%	67532.4	4391.2	3910.5	1.9%	10.9%	4257.0	3799.6	1.8%	10.7%
1952	508121	498481	256990	85.9%	69901.1	5977.0	5328.9	2.6%	10.8%	3760.0	3359.8	1.7%	10.6%
1953	492035	482542	249917	83.6%	78135.1	4524.3	4039.0	2.1%	10.7%	1470.5	1315.7	0.7%	10.5%
1954	479765	469921	244507	81.8%	94856.4	5037.5	4504.4	2.4%	10.6%	1836.0	1645.3	0.9%	10.4%
1955	466744	455893	238346	79.7%	119508	4145.1	3712.9	2.0%	10.4%	2211.4	1985.2	1.1%	10.2%
1956	454536	442132	232708	77.8%	139590	4051.0	3635.0	2.0%	10.3%	2479.7	2230.0	1.2%	10.1%

Table 30. Final base model results for Dover sole. (continued)

						- - - - - Southern Fishery - - - - -				- - - - - Northern Fishery - - - - -			
Year	Total Biomass	Age 5+ Biomass	Spawning Biomass	Percent of Virgin	Age-0 Recruits	Total Catch	Landings	Harvest Rate	%Discard	Total Catch	Landings	Harvest Rate	%Discard
1957	442376	428273	226637	75.8%	140663	3900.3	3505.0	2.0%	10.1%	2315.9	2086.0	1.2%	9.9%
1958	431099	415416	220473	73.7%	129376	3905.9	3513.0	2.1%	10.1%	1948.6	1757.0	1.1%	9.8%
1959	421386	404492	214395	71.7%	117107	3545.1	3187.0	2.0%	10.1%	3025.6	2728.0	1.7%	9.8%
1960	412642	395418	208022	69.6%	108934	4585.8	4112.0	2.7%	10.3%	3559.5	3203.0	2.1%	10.0%
1961	404199	387629	201274	67.3%	108254	3849.4	3433.0	2.3%	10.8%	2791.1	2500.0	1.7%	10.4%
1962	399226	383479	196144	65.6%	117105	4836.1	4279.0	2.9%	11.5%	2783.2	2475.0	1.7%	11.1%
1963	394951	379431	191643	64.1%	135582	4972.6	4360.0	3.1%	12.3%	3467.5	3057.0	2.1%	11.8%
1964	391498	375186	187947	62.8%	166478	4896.6	4258.0	3.0%	13.0%	3008.7	2631.0	1.9%	12.6%
1965	390117	371909	185680	62.1%	201137	5730.0	4954.0	3.5%	13.5%	1898.2	1650.0	1.2%	13.1%
1966	389272	369427	184482	61.7%	177092	5562.3	4795.0	3.4%	13.8%	1895.2	1642.0	1.1%	13.4%
1967	388937	368100	183957	61.5%	137220	3764.0	3242.0	2.2%	13.9%	1919.4	1661.0	1.1%	13.5%
1968	391847	370261	184703	61.8%	119545	4580.8	3945.0	2.7%	13.9%	2451.8	2121.0	1.4%	13.5%
1969	395377	373936	185185	61.9%	118679	7232.3	6221.0	4.2%	14.0%	2946.3	2546.0	1.7%	13.6%
1970	397301	378223	184682	61.8%	126003	8222.3	7047.0	4.7%	14.3%	3153.2	2716.0	1.8%	13.9%
1971	398732	381766	184427	61.7%	129447	7832.3	6675.0	4.5%	14.8%	3263.6	2796.0	1.9%	14.3%
1972	400357	384224	185326	62.0%	120217	11947.4	10128.0	6.7%	15.2%	3352.1	2856.0	1.9%	14.8%
1973	397445	381524	185054	61.9%	108527	12288.1	10384.0	6.8%	15.5%	2433.7	2066.0	1.4%	15.1%
1974	394974	379004	185525	62.0%	109409	10636.5	8991.0	5.8%	15.5%	2871.6	2437.0	1.6%	15.1%
1975	393982	377702	186544	62.4%	137238	12334.5	10456.0	6.7%	15.2%	2681.7	2281.0	1.5%	14.9%
1976	391982	374770	186480	62.4%	188879	13217.0	11244.0	7.1%	14.9%	3189.9	2722.0	1.7%	14.7%
1977	386835	369565	185204	61.9%	144511	12592.0	10746.0	6.9%	14.7%	2788.0	2386.0	1.5%	14.4%
1978	381712	364181	183949	61.5%	116188	11236.9	9615.0	6.2%	14.4%	5174.3	4439.0	2.9%	14.2%
1979	376186	357267	181652	60.7%	120632	12672.1	10865.0	7.1%	14.3%	8228.6	7073.0	4.7%	14.0%
1980	367211	347379	176624	59.1%	127814	10830.1	8676.0	6.0%	19.9%	7031.3	5410.0	4.0%	23.1%

Table 30. Final base model results for Dover sole. (continued)

Year	Total Biomass	Age 5+ Biomass	Spawning Biomass	Percent of Virgin	Age-0 Recruits	Southern Fishery Total Catch	Southern Fishery Landings	Southern Fishery Harvest Rate	Southern Fishery %Discard	Northern Fishery Total Catch	Northern Fishery Landings	Northern Fishery Harvest Rate	Northern Fishery %Discard
1981	361027	344153	173667	58.1%	110701	11853.5	9822.1	6.8%	17.1%	8326.8	6645.3	4.9%	20.2%
1982	352386	337037	169726	56.8%	104453	12290.7	10459.4	7.2%	14.9%	12728.6	10459.1	7.6%	17.8%
1983	339254	323607	163719	54.7%	120399	11606.7	10116.1	7.1%	12.8%	11699.7	9876.4	7.3%	15.6%
1984	327689	312107	158778	53.1%	114103	12037.5	10742.0	7.6%	10.8%	9753.0	8462.9	6.3%	13.2%
1985	317209	302614	154629	51.7%	104632	14270.0	13016.9	9.3%	8.8%	8440.7	7519.7	5.6%	10.9%
1986	305815	291189	149454	50.0%	113684	12679.0	11785.3	8.5%	7.0%	6108.5	5569.3	4.2%	8.8%
1987	298712	283094	145988	48.8%	133387	12442.6	11573.4	8.6%	7.0%	7492.7	6837.4	5.2%	8.7%
1988	290621	274665	141733	47.4%	148734	9751.5	9070.1	6.9%	7.0%	9913.5	9047.0	7.1%	8.7%
1989	282444	266227	137381	45.9%	138955	9266.0	8613.7	6.8%	7.0%	11106.9	10129.7	8.3%	8.8%
1990	275168	256513	132525	44.3%	204370	7834.8	7274.9	6.0%	7.1%	9206.2	8385.0	7.1%	8.9%
1991	272155	250719	129284	43.2%	221137	9357.2	8673.5	7.3%	7.3%	10478.3	9524.8	8.3%	9.1%
1992	266179	243693	124745	41.7%	177878	10193.8	9414.5	8.2%	7.6%	7260.9	6572.4	5.9%	9.5%
1993	263053	240835	121658	40.7%	129796	8290.8	7618.2	6.8%	8.1%	7420.2	6677.1	6.1%	10.0%
1994	263903	240148	119986	40.1%	121174	5718.3	5221.5	4.7%	8.7%	4613.4	4121.2	3.8%	10.7%
1995	273254	250105	121839	40.7%	159879	7450.7	6759.0	5.9%	9.3%	4293.4	3806.1	3.4%	11.4%
1996	282066	261989	124256	41.5%	141641	7747.8	7212.5	6.0%	6.9%	5295.5	4974.0	4.1%	6.1%
1997	293709	272062	127093	42.5%	312008	6427.7	5970.6	4.7%	7.1%	4433.4	4153.7	3.3%	6.3%
1998	304633	282032	132275	44.2%	186634	4444.4	4137.0	3.1%	6.9%	4130.2	3873.4	2.9%	6.2%
1999	316927	293224	139363	46.6%	145561	4724.4	4418.8	3.0%	6.5%	5013.3	4718.6	3.2%	5.9%
2000	333609	305080	146141	48.9%	342481	4199.3	3945.4	2.5%	6.0%	5095.4	4814.5	3.1%	5.5%
2001	349204	315954	153056	51.2%	208064	3095.2	2914.7	1.8%	5.8%	4196.3	3974.5	2.4%	5.3%
2002	365506	339828	161014	53.8%	129368	3723.0	3504.7	2.0%	5.9%	2952.2	2796.3	1.6%	5.3%
2003	383789	358927	169794	56.8%	121408	4153.7	3906.8	2.1%	5.9%	3661.7	3465.4	1.9%	5.4%
2004	403031	374206	178801	59.8%	125403	2854.8	2684.0	1.4%	6.0%	4290.5	4058.7	2.1%	5.4%
2005	423049	402584	188987	63.2%	126122								

Table 31. Harvest projections for the Dover sole final base model. Because the spawning biomass is never projected to drop below 40% of the unexploited level, the OY is equal to the ABC in all years except 2005 and 2006.

						- - - Southern Fishery - - -			- - - Northern Fishery - - -			
Year	Total Biomass	Age 5+ Biomass	Spawning Biomass	Percent of Virgin	Age-0 Recruits	Total Catch	Landings	Harvest Rate	Total Catch	Landings	Harvest Rate	ABC
2005	423070	402605	188995	63.2%	126121	3509	3298	1.63%	3931	3718	1.86%	7440*
2006	441615	424722	199901	66.8%	134790	3509	3301	1.54%	3931	3719	1.76%	7440*
2007	458097	441265	211379	70.7%	135457	14379	13572	5.96%	15767	14950	6.66%	30146
2008	449882	432673	211365	70.7%	135456	14279	13529	5.96%	15682	14913	6.66%	29960
2009	439371	421888	209955	70.2%	135378	14035	13353	5.96%	15419	14716	6.66%	29453
2010	427210	409315	206845	69.2%	135201	13627	13009	5.96%	14955	14318	6.66%	28582
2011	414167	396252	202211	67.6%	134929	13092	12523	5.96%	14341	13759	6.66%	27433
2012	400983	383086	196547	65.7%	134581	12495	11959	5.96%	13665	13120	6.66%	26159
2013	388240	370372	190408	63.7%	134183	11900	11384	5.96%	13003	12482	6.66%	24903
2014	376310	358481	184240	61.6%	133759	11351	10847	5.96%	12407	11899	6.66%	23757
2015	365372	347589	178325	59.6%	133327	10870	10372	5.96%	11894	11394	6.66%	22764
2016	355470	337739	172805	57.8%	132900	10463	9968	5.96%	11465	10970	6.66%	21928

* Council specified OY values, not projected values.

Table 32. Decision table for Dover sole based on the final base model.

				State of Nature					
				M=0.07 (run 271)		M=0.09 (run 248)		M=0.11 (run 274)	
				Less likely		*More likely*		*Less likely*	
		Landings (mt)		**Low Stock Size**		**Base Model**		**High Stock Size**	
Management		South	North	Sp. Bio.		Sp. Bio.		Sp. Bio.	
Action	Year	(47.2%)	(52.8%)	(1000s mt)	%Virgin	(1000s mt)	%Virgin	(1000s mt)	%Virgin
	2005	3298	3718	152.2	50.2%	189.0	63.2%	252.0	75.8%
	2006	3301	3719	161.7	53.4%	199.9	66.8%	264.9	79.7%
	2007	3402	3811	171.7	56.7%	211.4	70.7%	278.3	83.7%
	2008	3402	3811	181.6	59.9%	222.7	74.5%	291.5	87.7%
Low Catch	2009	3402	3811	190.7	62.9%	233.0	77.9%	303.4	91.3%
2000-2004	2010	3402	3811	198.7	65.6%	241.8	80.9%	313.2	94.2%
average	2011	3402	3811	205.4	67.8%	248.8	83.2%	320.5	96.4%
	2012	3402	3811	210.6	69.5%	254.0	84.9%	325.5	97.9%
	2013	3402	3811	214.7	70.9%	257.7	86.2%	328.6	98.8%
	2014	3402	3811	217.9	71.9%	260.2	87.0%	330.2	99.3%
	2015	3402	3811	220.2	72.7%	261.8	87.5%	330.8	99.5%
	2016	3402	3811	222.0	73.3%	262.7	87.8%	330.5	99.4%
	2005	3298	3718	152.2	50.2%	189.0	63.2%	252.0	75.8%
	2006	3301	3719	161.7	53.4%	199.9	66.8%	264.9	79.7%
	2007	6803	7623	171.7	56.7%	211.4	70.7%	278.3	83.7%
	2008	6803	7623	177.7	58.6%	218.8	73.2%	287.8	86.5%
Medium Catch	2009	6803	7623	182.7	60.3%	225.2	75.3%	295.8	88.9%
Double the	2010	6803	7623	186.4	61.5%	229.9	76.9%	301.6	90.7%
2000-2004	2011	6803	7623	188.6	62.2%	232.7	77.8%	305.0	91.7%
average	2012	6803	7623	189.4	62.5%	233.8	78.2%	306.2	92.1%
	2013	6803	7623	189.1	62.4%	233.5	78.1%	305.7	91.9%
	2014	6803	7623	187.9	62.0%	232.2	77.7%	303.9	91.4%
	2015	6803	7623	186.2	61.4%	230.2	77.0%	301.3	90.6%
	2016	6803	7623	184.0	60.7%	227.7	76.1%	298.2	89.7%
	2005	3298	3718	152.2	50.2%	189.0	63.2%	252.0	75.8%
	2006	3301	3719	161.7	53.4%	199.9	66.8%	264.9	79.7%
	2007	13572	14950	171.7	56.7%	211.4	70.7%	278.3	83.7%
	2008	13529	14913	170.1	56.1%	211.4	70.7%	280.4	84.3%
High Catch	2009	13353	14716	167.1	55.2%	210.0	70.2%	280.8	84.5%
OY for F40%	2010	13009	14318	162.6	53.7%	206.8	69.2%	279.2	84.0%
including	2011	12523	13759	156.8	51.7%	202.2	67.6%	275.7	82.9%
any 40:10	2012	11959	13120	150.1	49.5%	196.5	65.7%	270.7	81.4%
adjustment	2013	11384	12482	143.1	47.2%	190.4	63.7%	265.0	79.7%
	2014	10847	11899	136.2	44.9%	184.2	61.6%	259.1	77.9%
	2015	10372	11394	129.6	42.8%	178.3	59.6%	253.3	76.2%
	2016	9968	10970	123.3	40.7%	172.8	57.8%	248.0	74.6%

Figure 1. Annual average coastwide prices for deepwater complex species, 1981-2004.

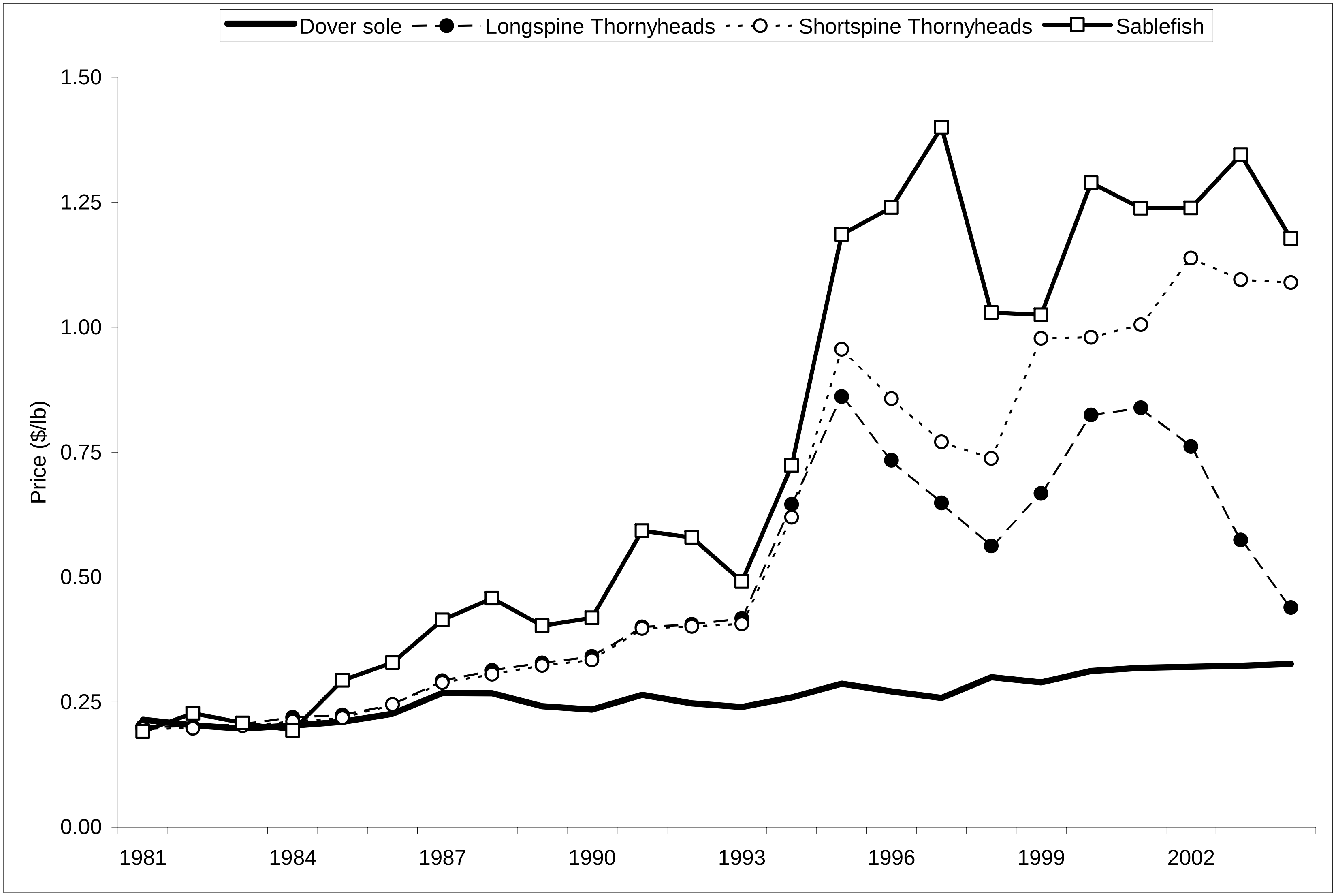


Figure 2. Catch (kg) per standard tow from ODFW flatfish surveys, 1971-77.

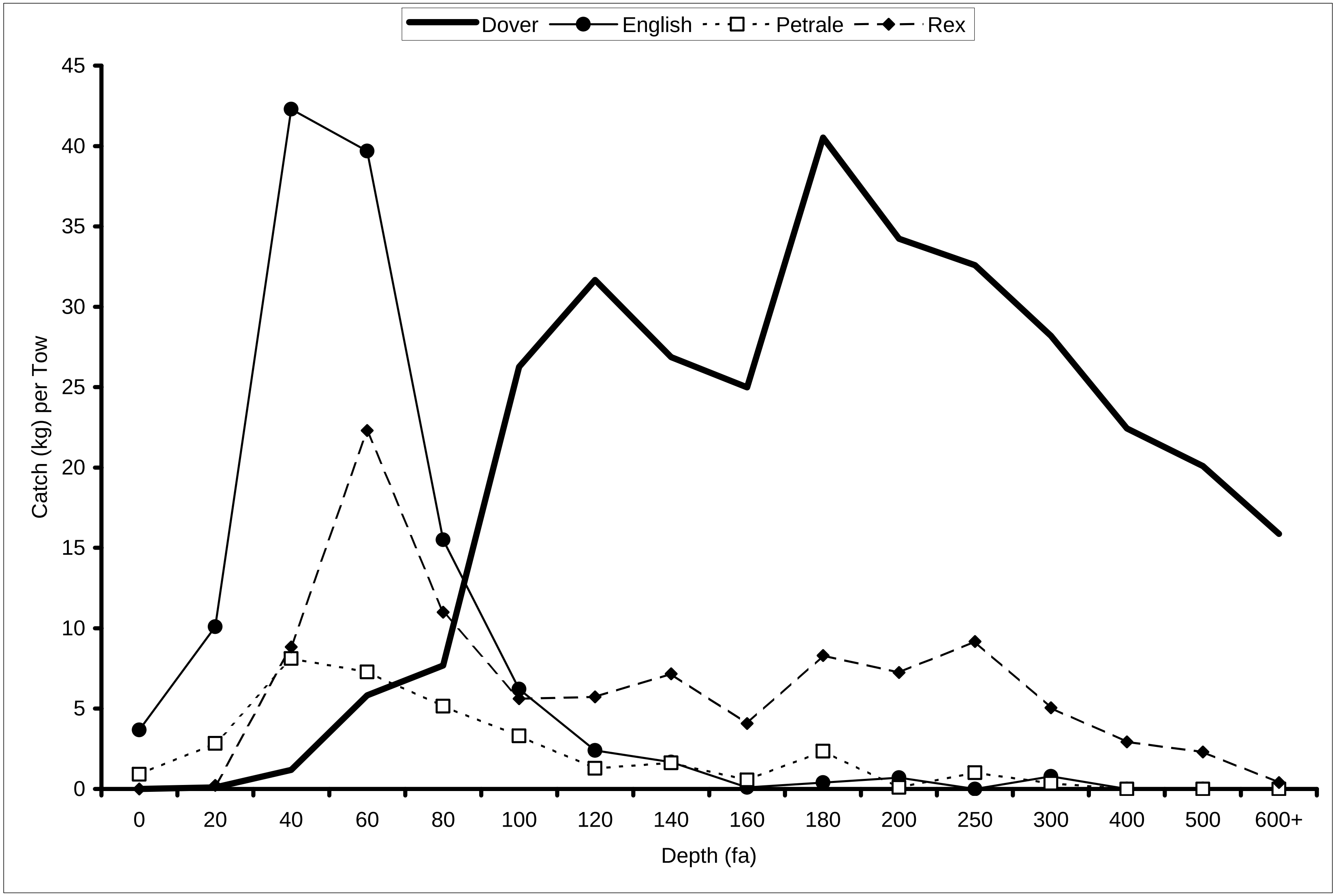


Figure 3. West Coast Groundfish Observer Program - mean weight of retained and discarded Dover sole.

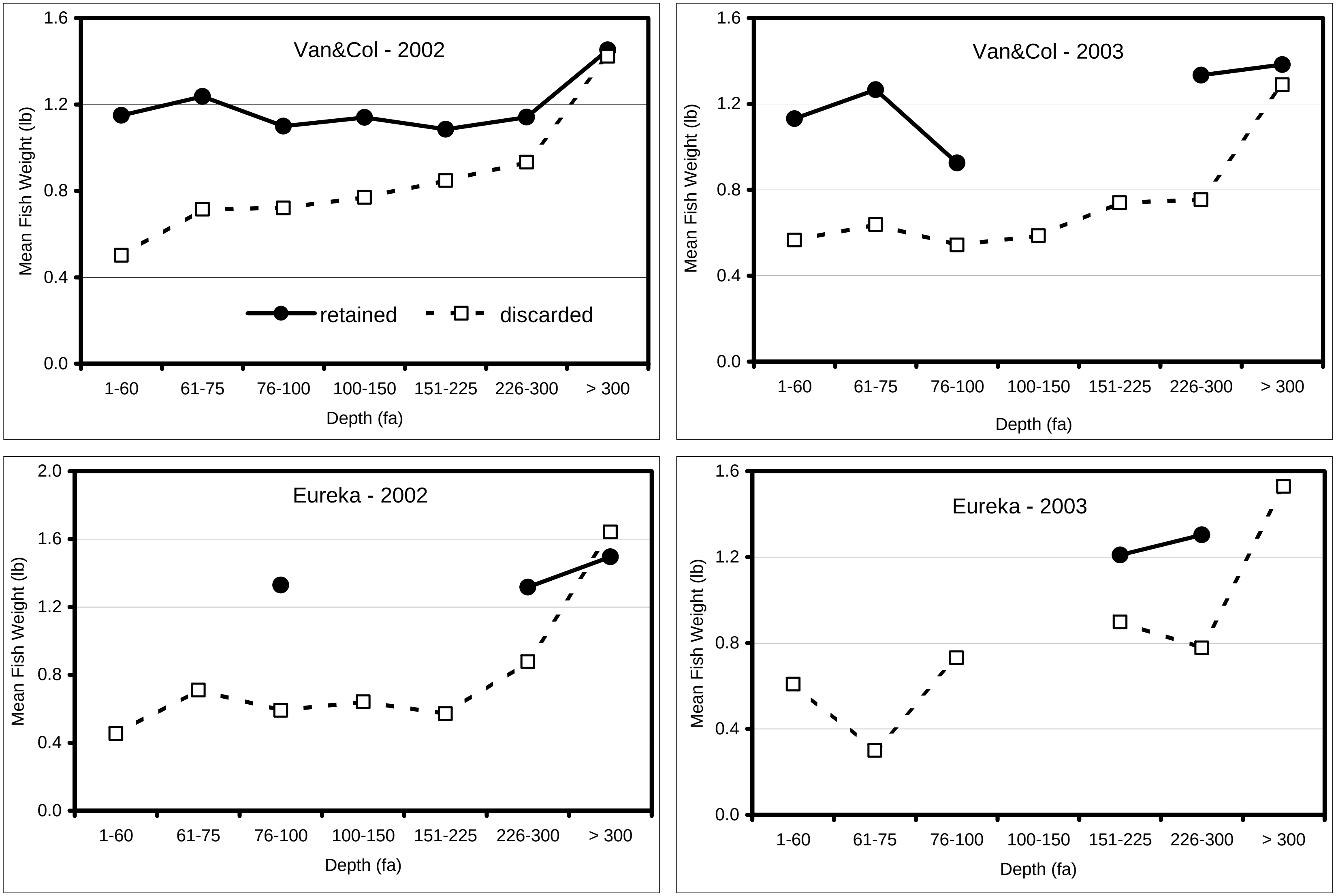
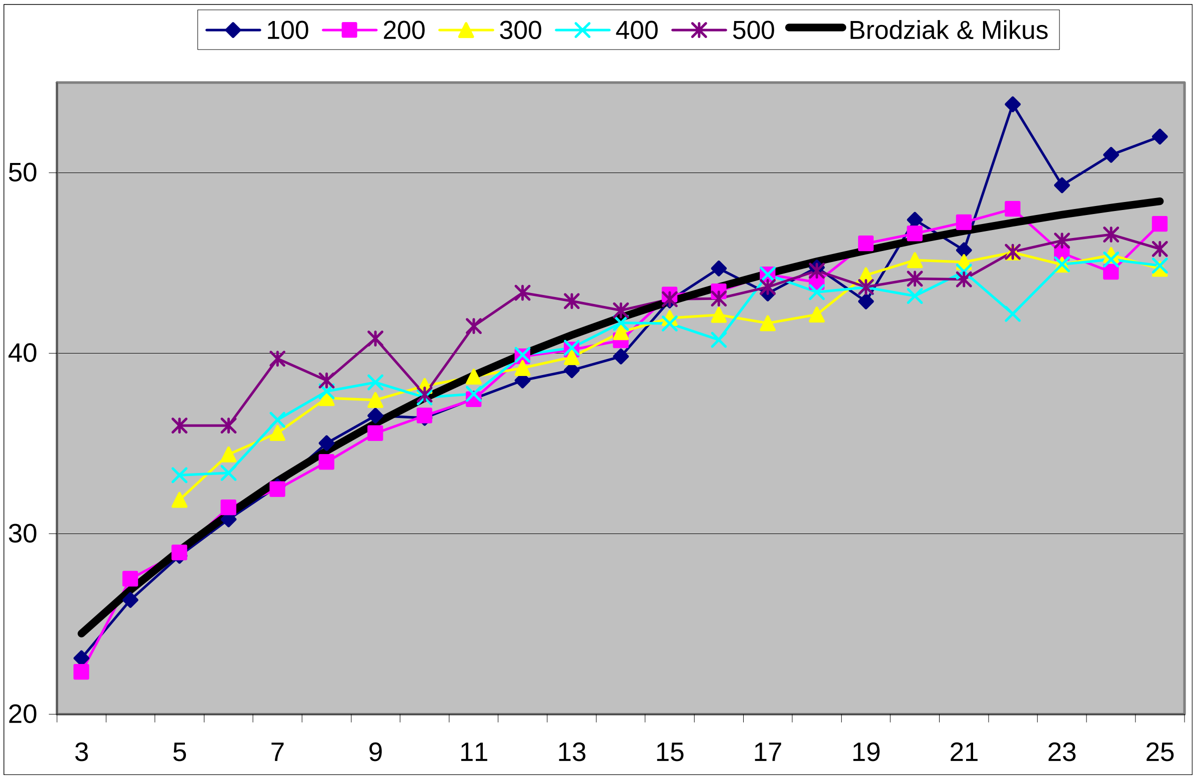


Figure 4. Average length (cm) at age by 100-fathom depth strata in the AFSC slope surveys. Females are shown in the top panel and males in the bottom panel.



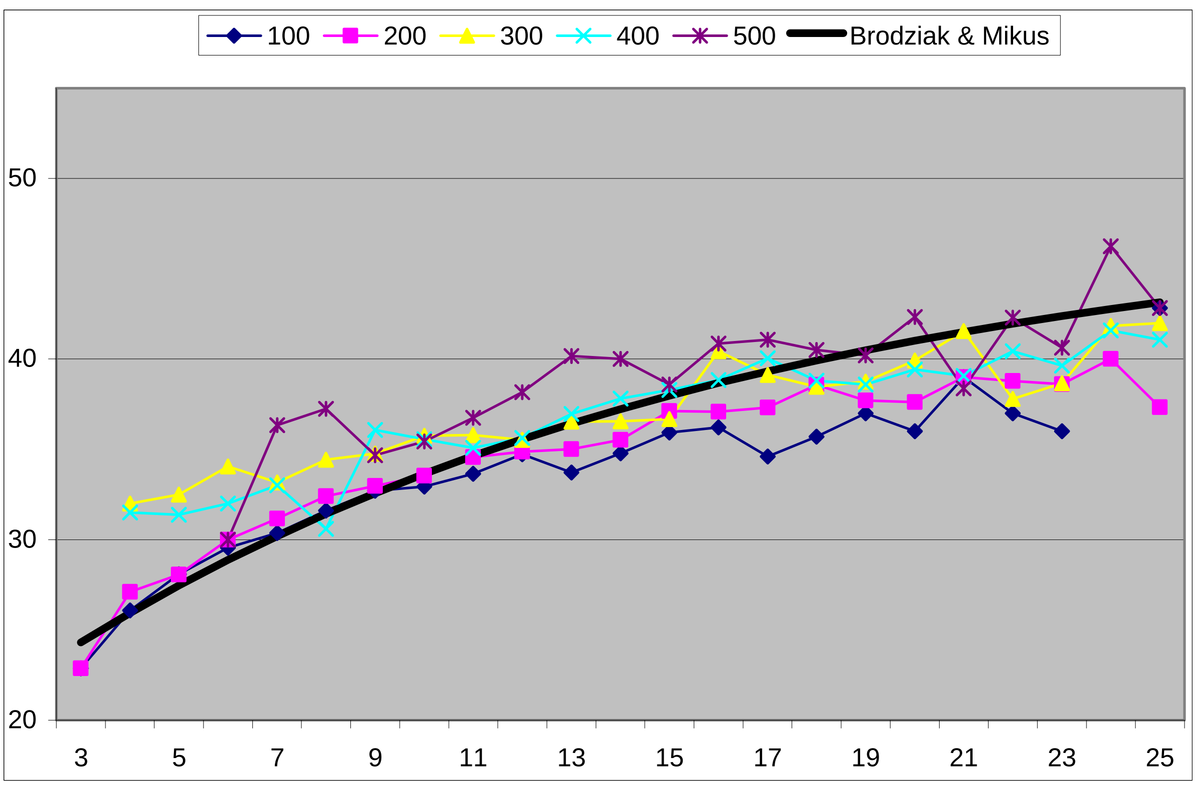
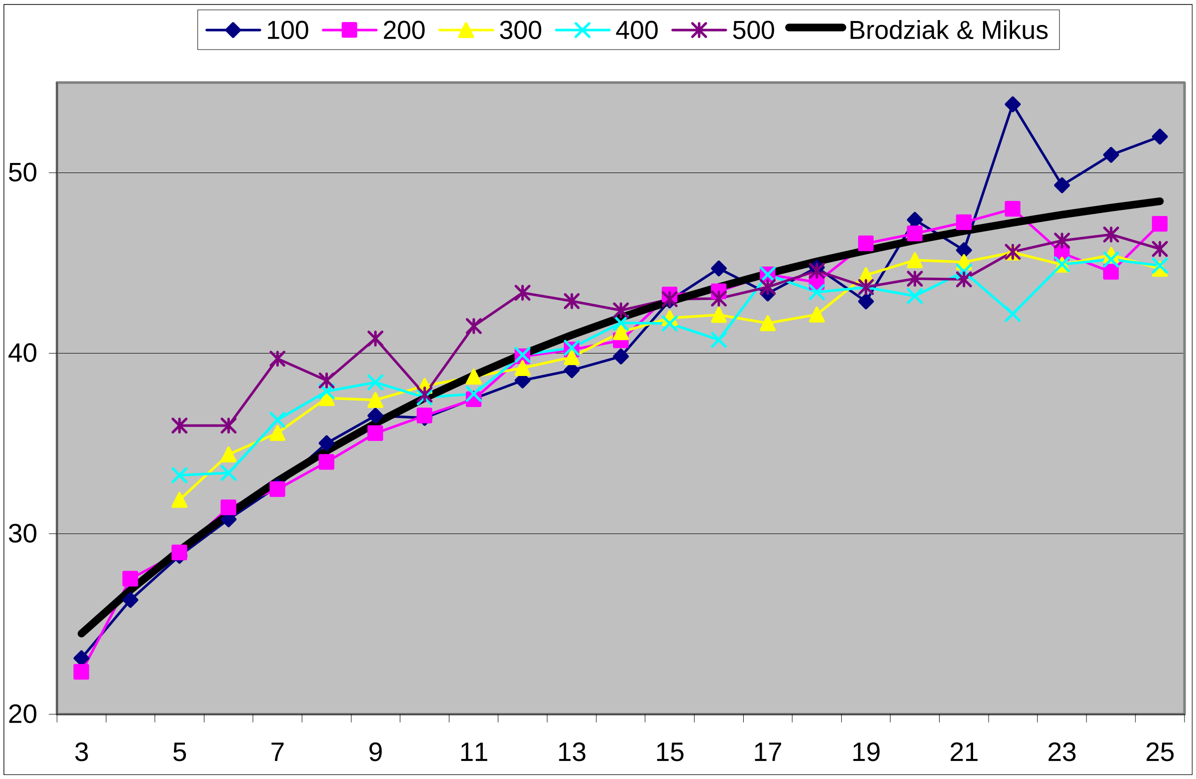


Figure 5. Average length (cm) at age by 100-fathom depth strata in the NWFSC slope surveys. Females are shown in the top panel and males in the bottom panel.



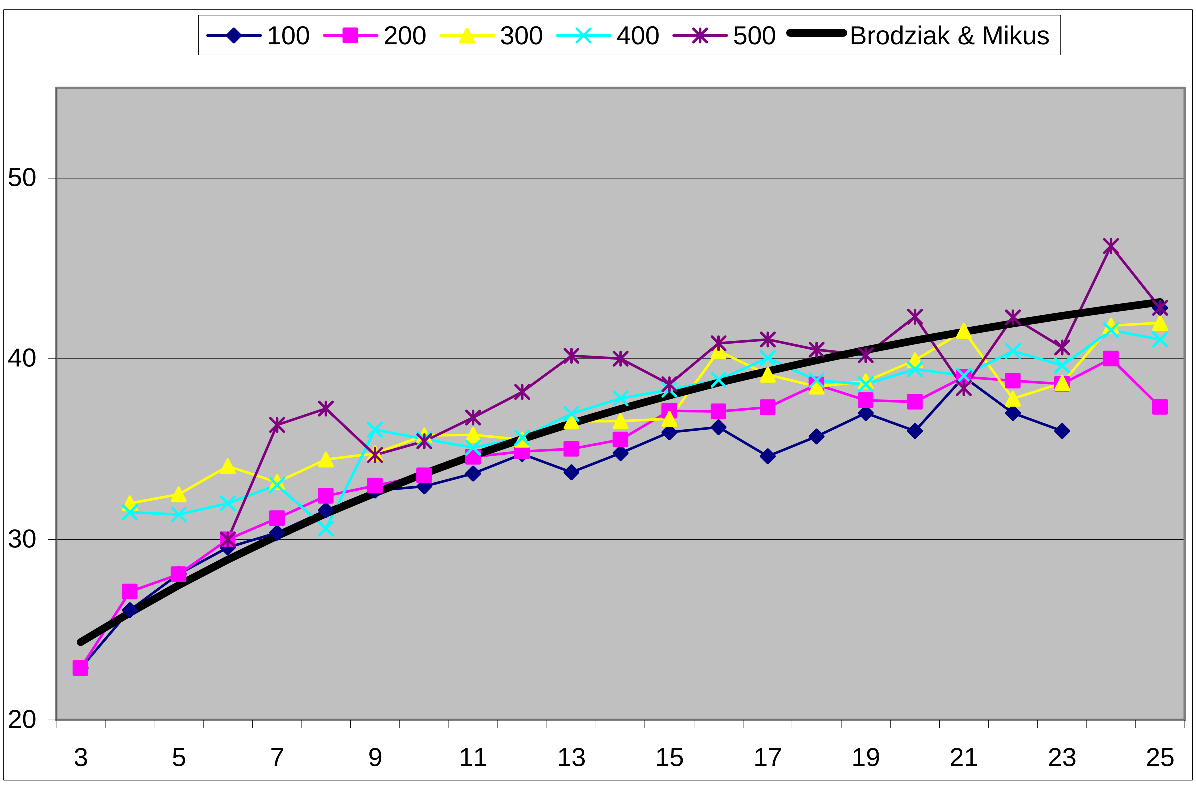


Figure 6. Dover sole length (mm) at age by year and state from fishery market samples.

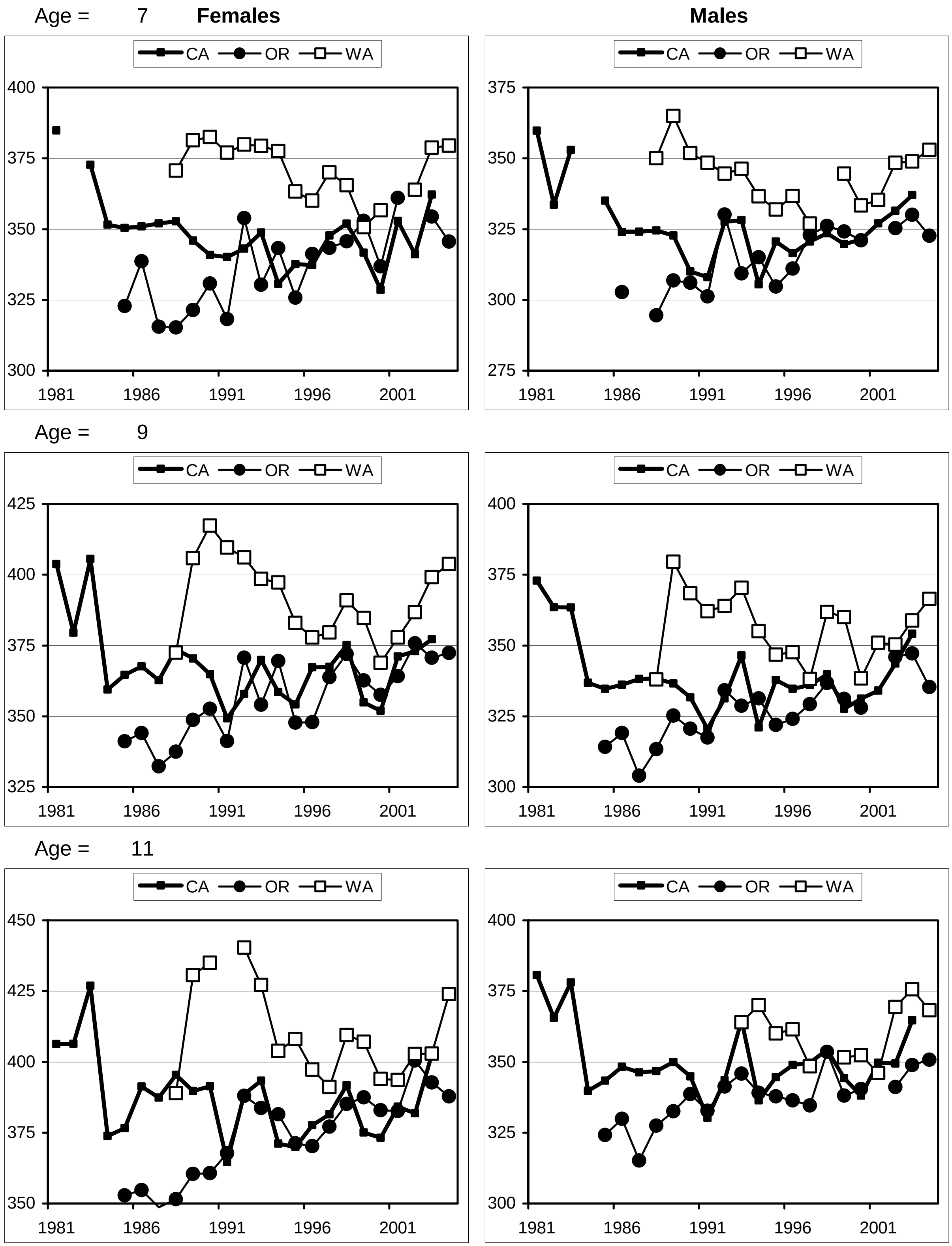


Figure 7. Variability in Dover sole length-at-age versus length observed in the NMFS slope surveys.

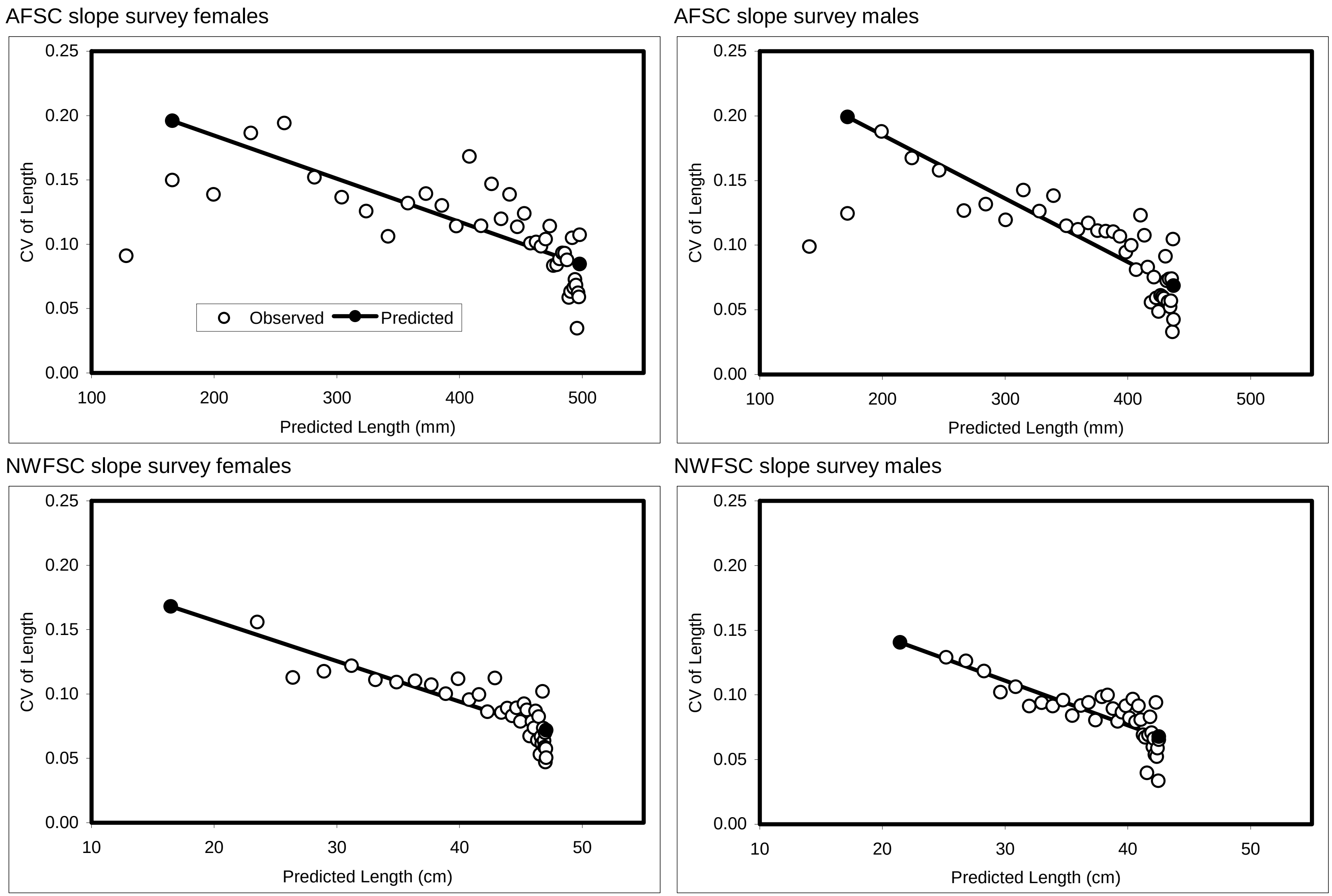


Figure 8. Age-reading variability in Dover sole based on reader-reader comparisons from the 2004 age-reading workshop.

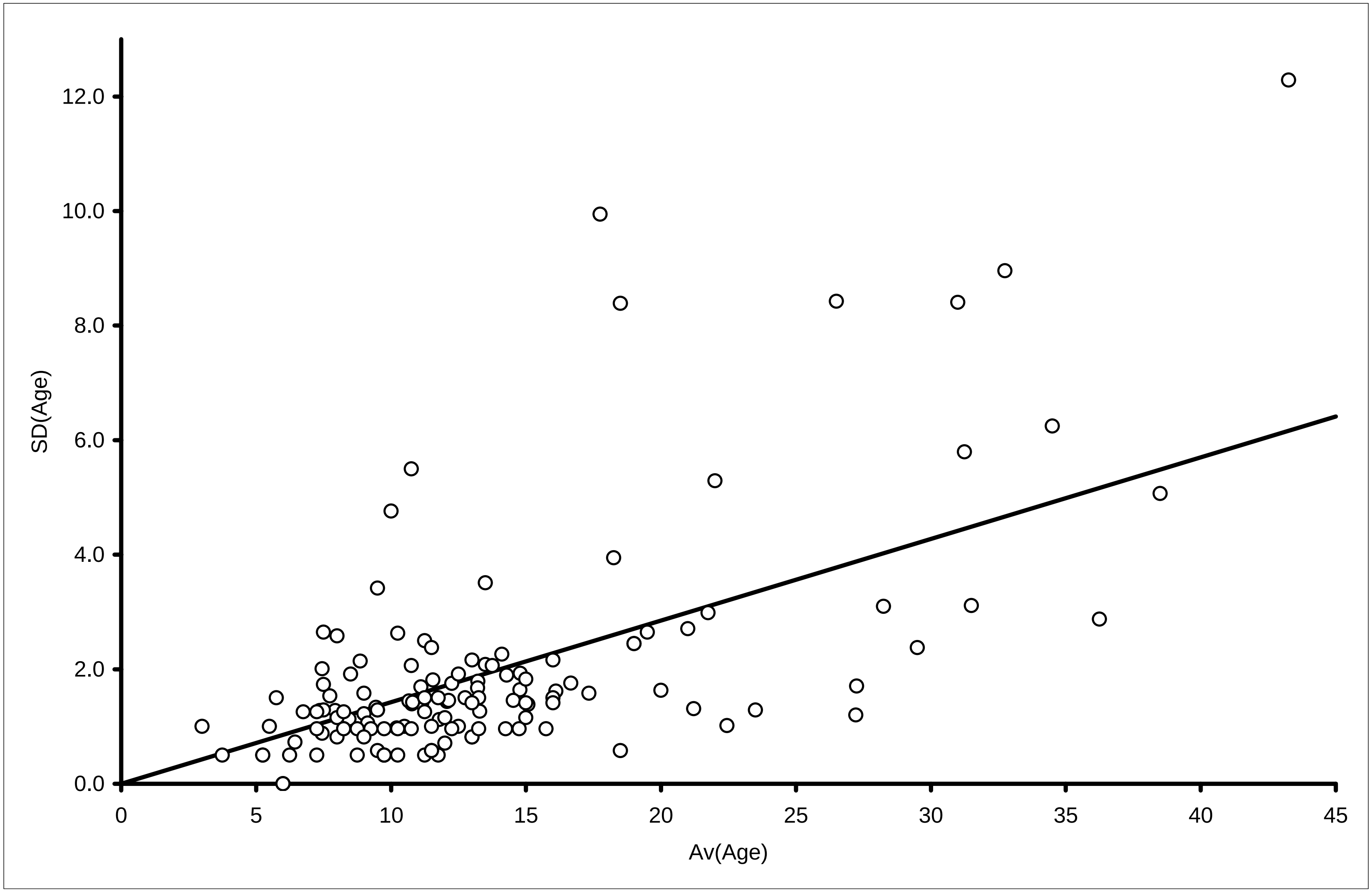


Figure 9. Estimated numbers of Dover sole at length (millions of fish) from AFSC coastwide slope surveys in 1997, 1999, and 2000.

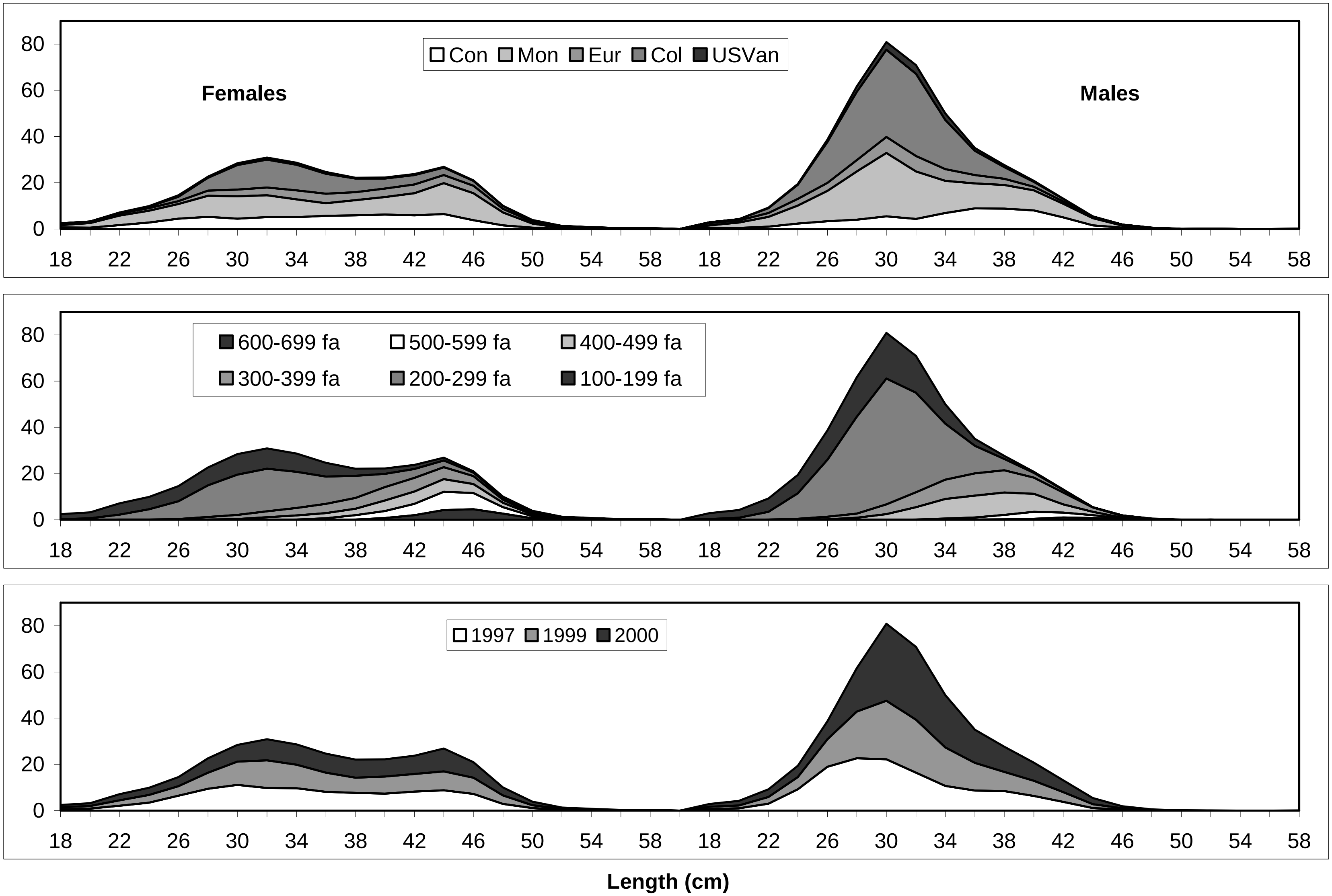


Figure 10. Preliminary base model – annual deviation values of the ascending inflection parameters for fishery selection. The vertical dashed lines represent the boundaries between the three selection curve time blocks used in the final base model. See text for details.

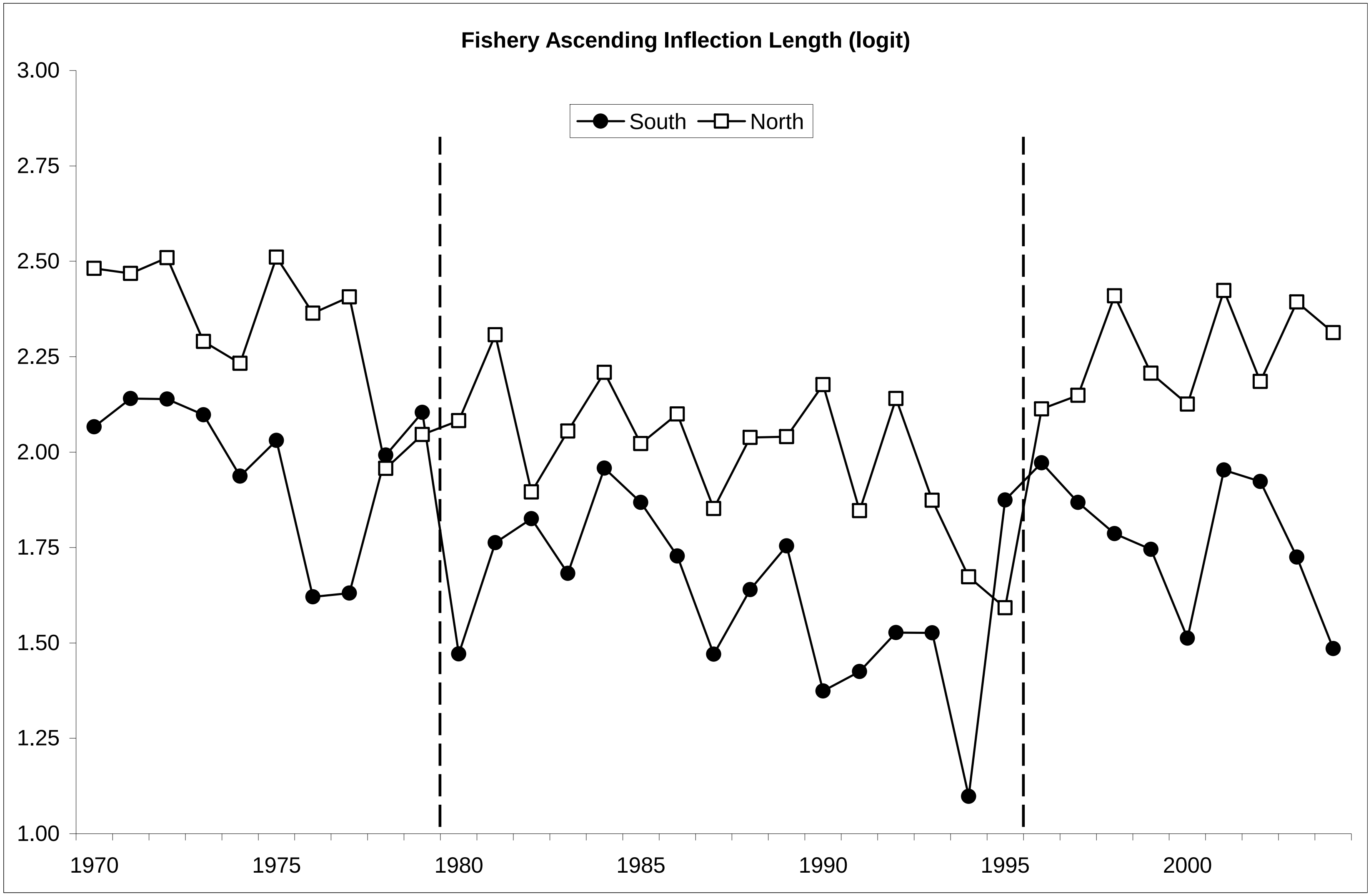


Figure 11. Preliminary base model – retrospective analysis. See text for details.

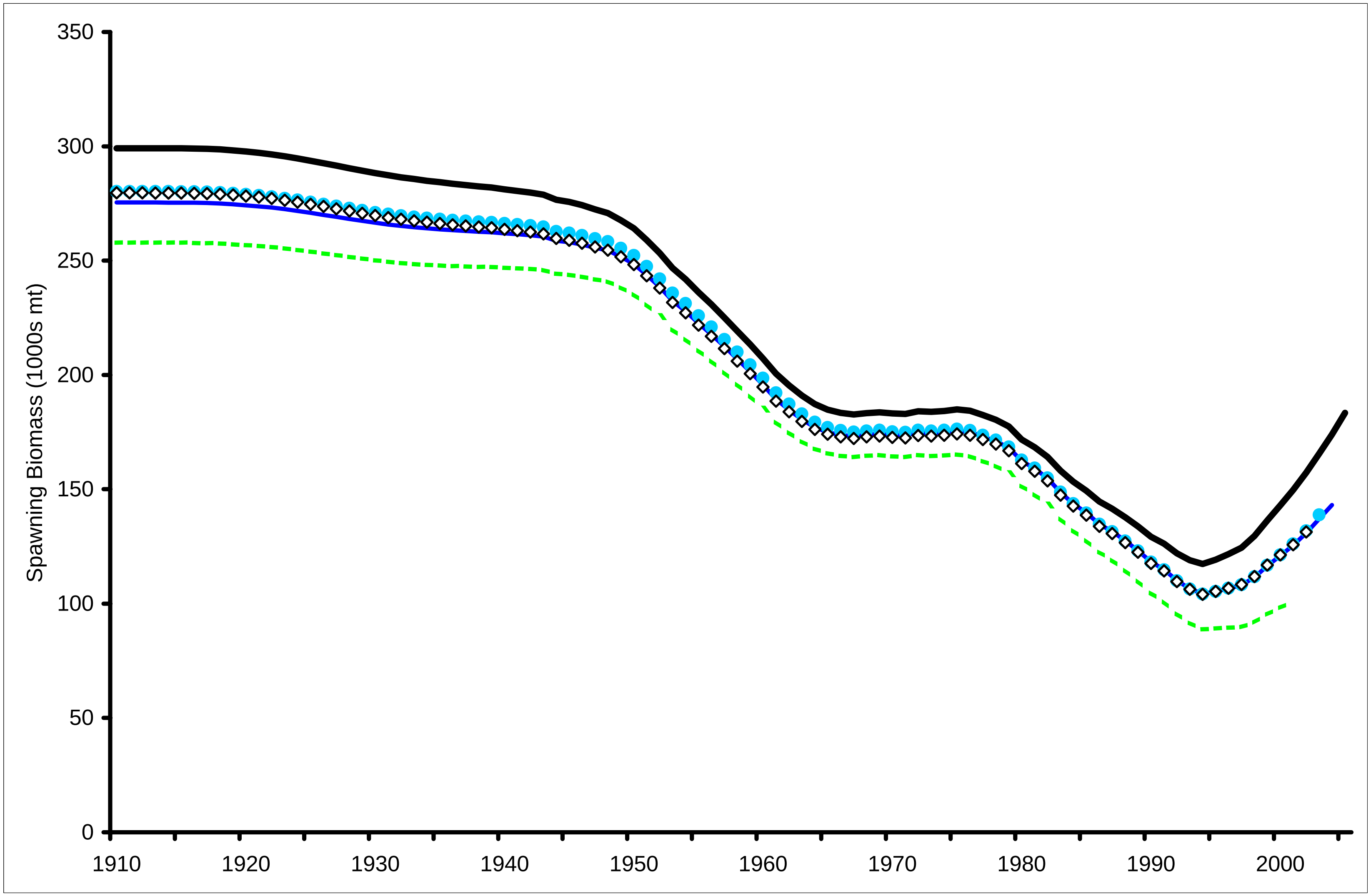


Figure 12. Preliminary base model – randomization of initial parameter values to evaluate the global maximum likelihood. See text for details.

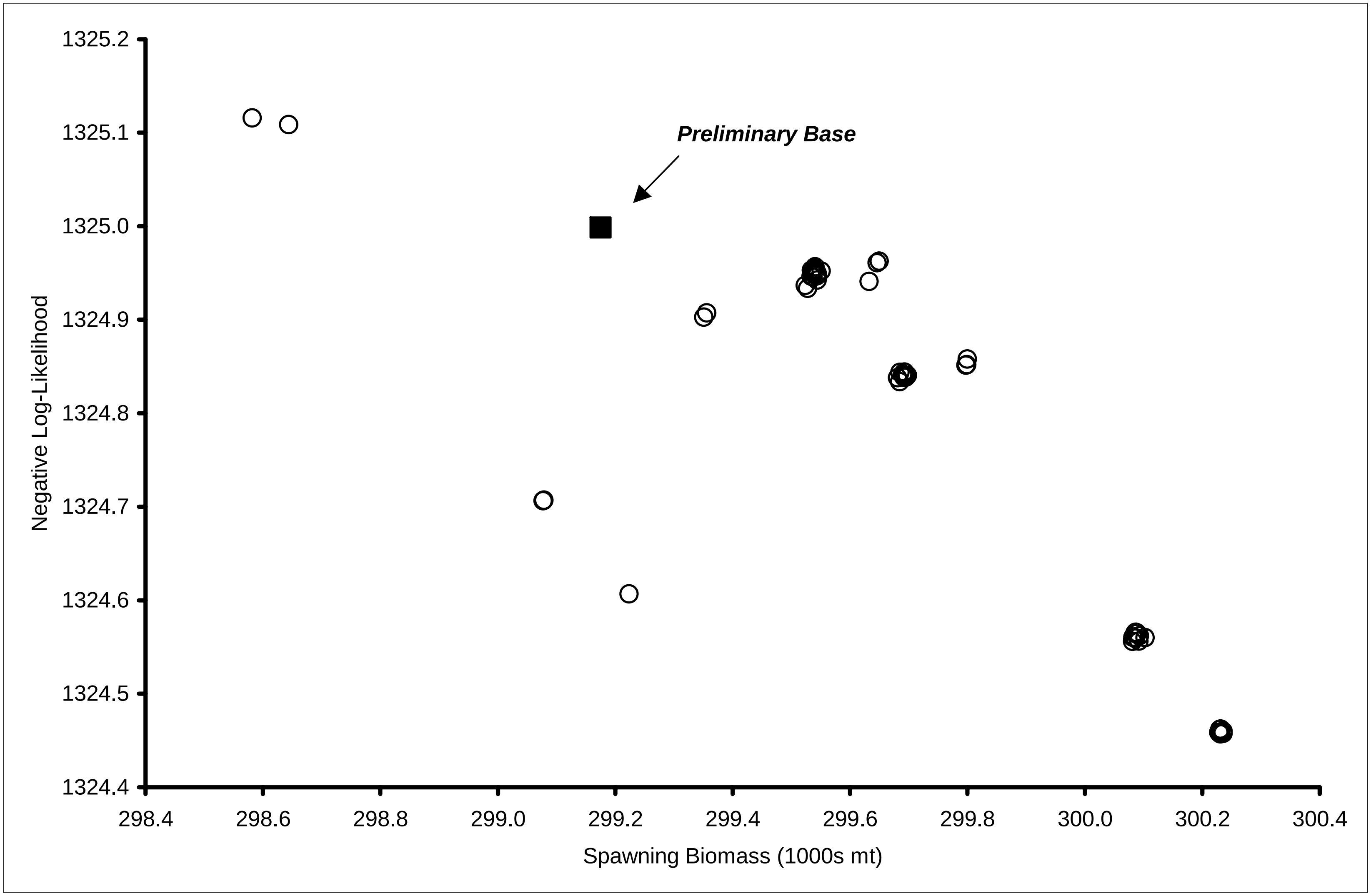
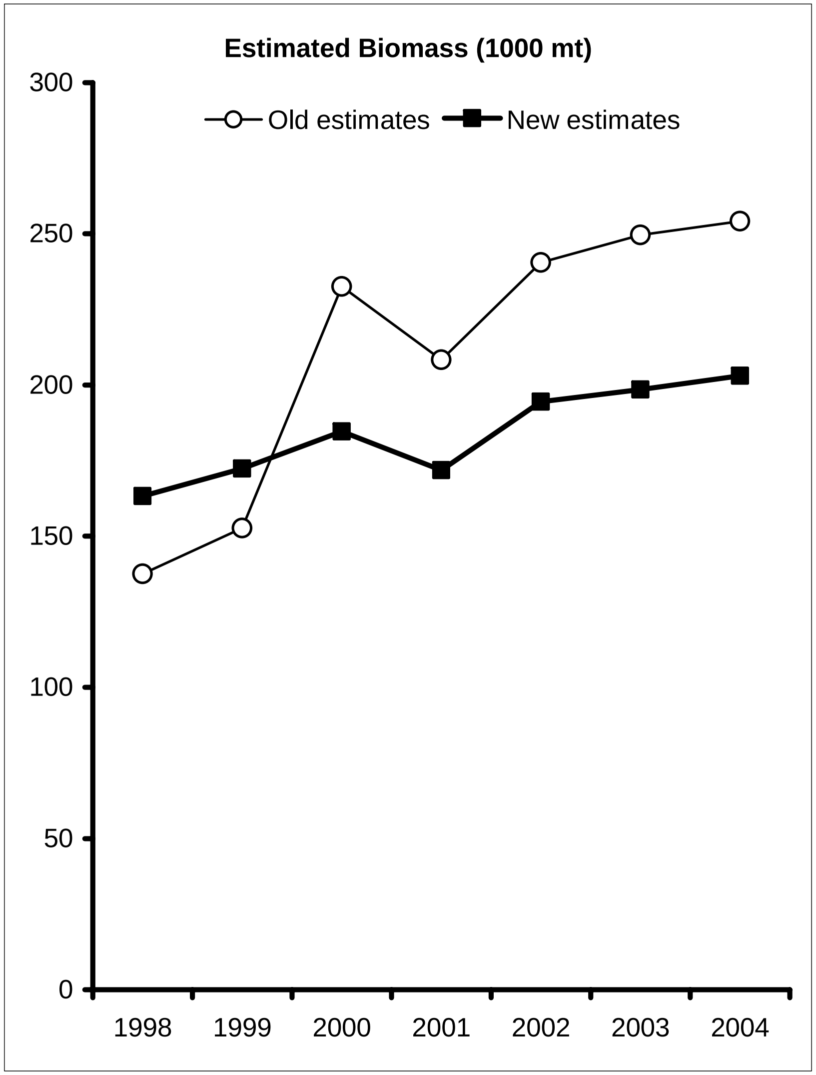


Figure 13. Comparison of the new and old NWFSC slope survey biomass estimates for Dover sole. The new estimates became available during the STAR Panel review of the assessment. The old estimates were used in developing the preliminary base model.



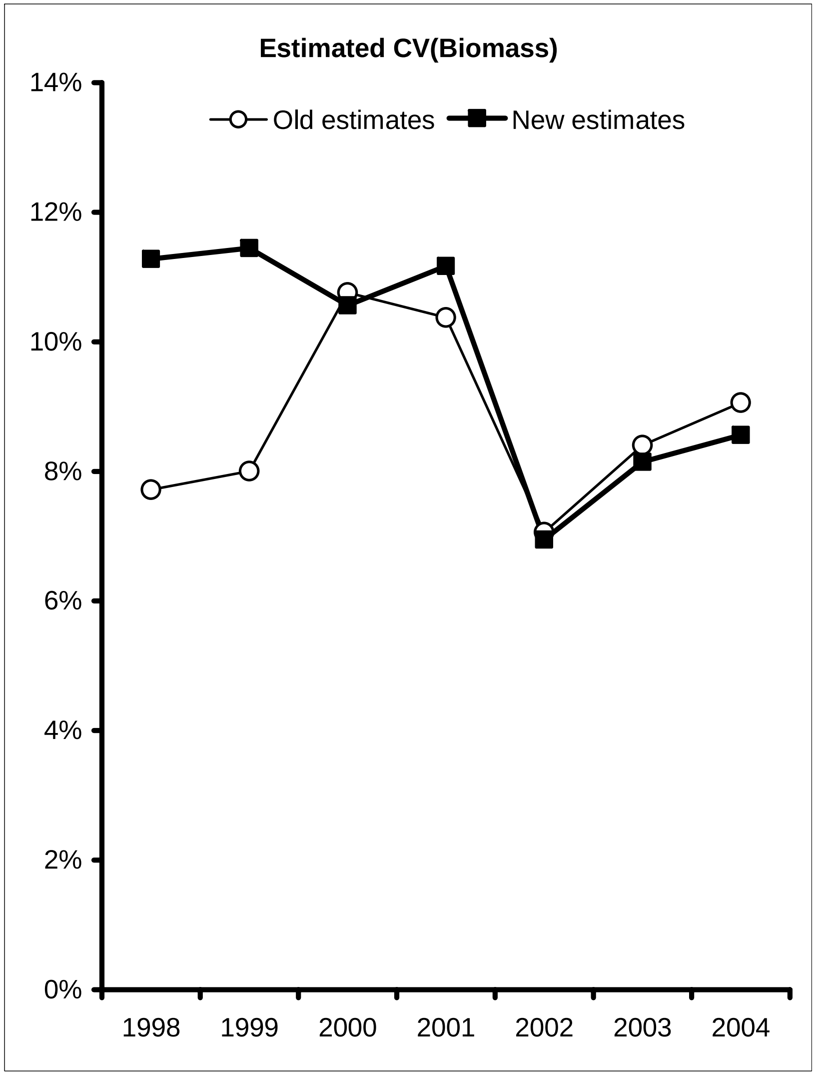


Figure 14. Profile over the steepness parameter for the final base model configuration. The large negative log-likelihood value obtained for a steepness of 0.8 was from a local minimum on the negative log-likelihood surface. See text for details.

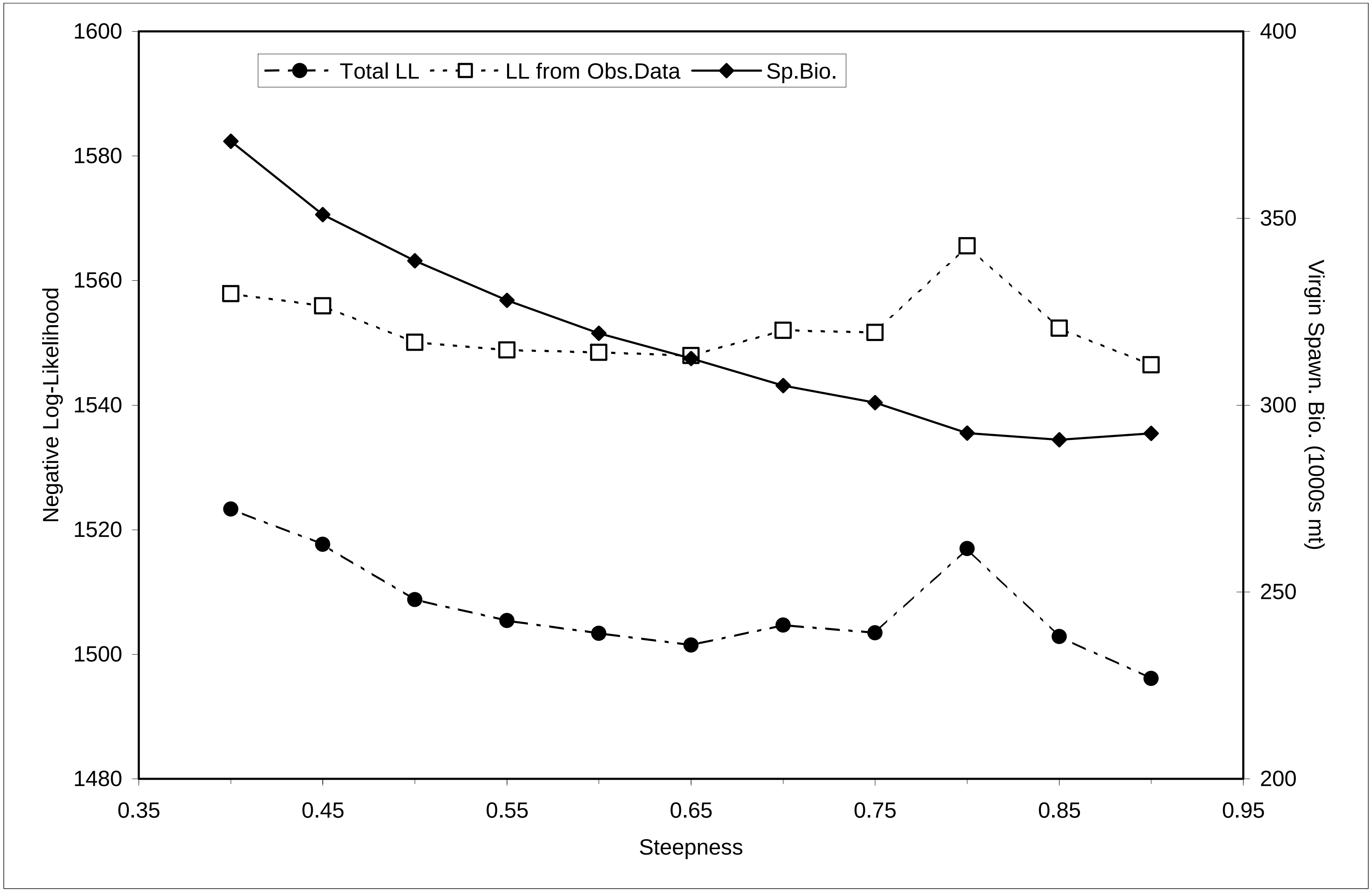


Figure 15. Profile over the natural mortality coefficient for the final base model configuration. The ragged log-likelihood "curve" is an indication that the runs had not all converged to the globally best values. The log-likelihood surface apparently has numerous local extrema.

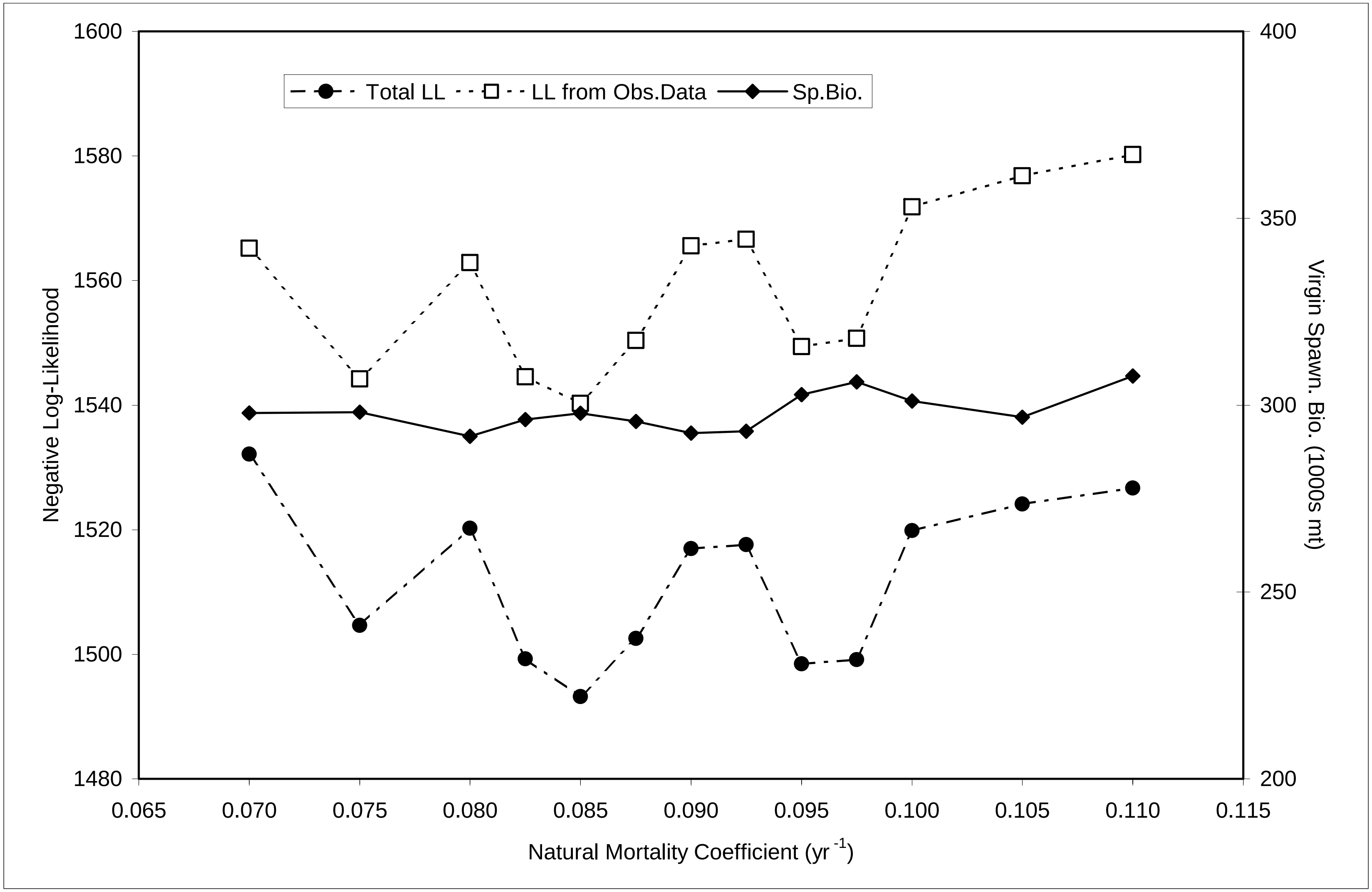


Figure 16. Base model fit to the survey biomass indices.

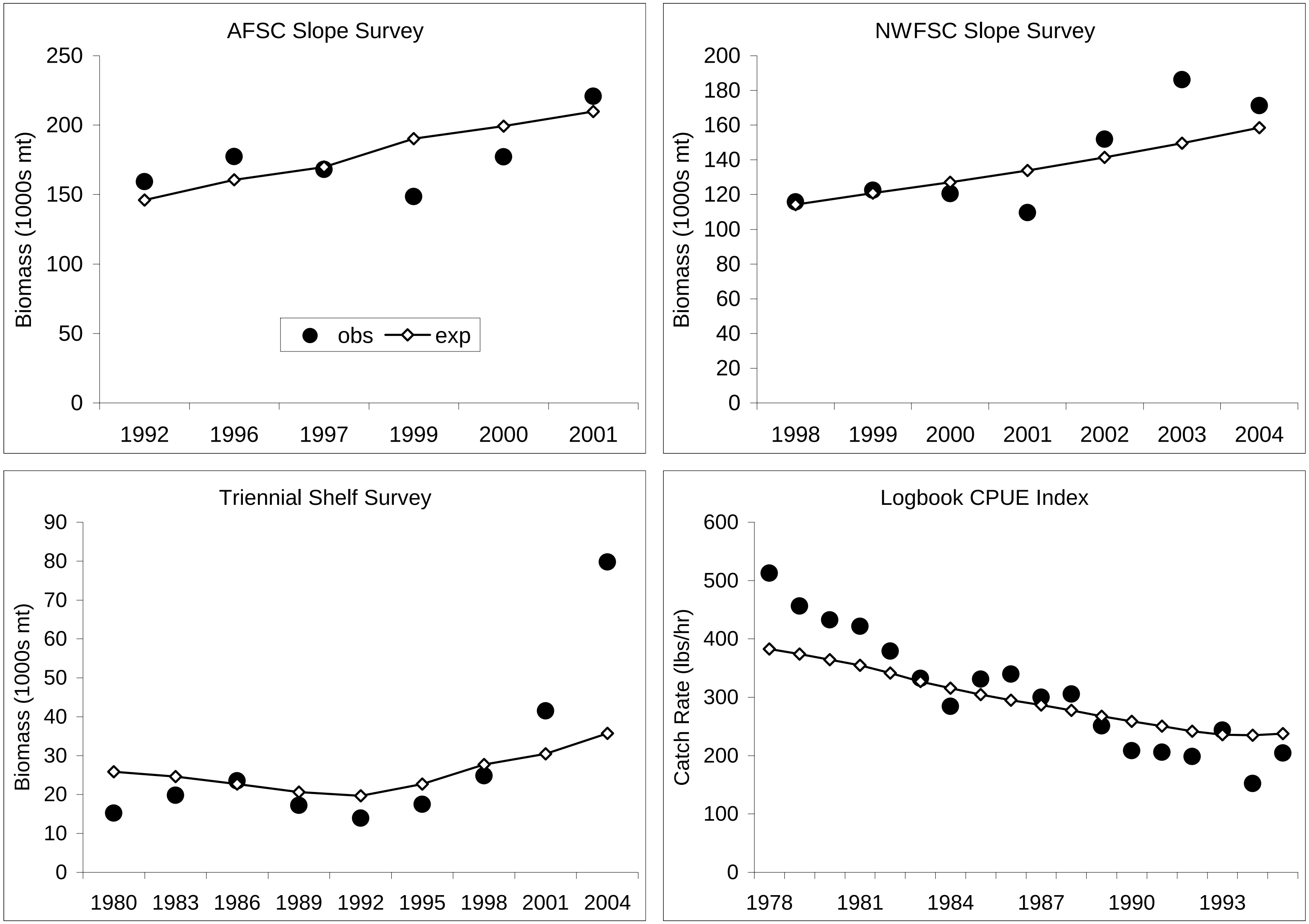
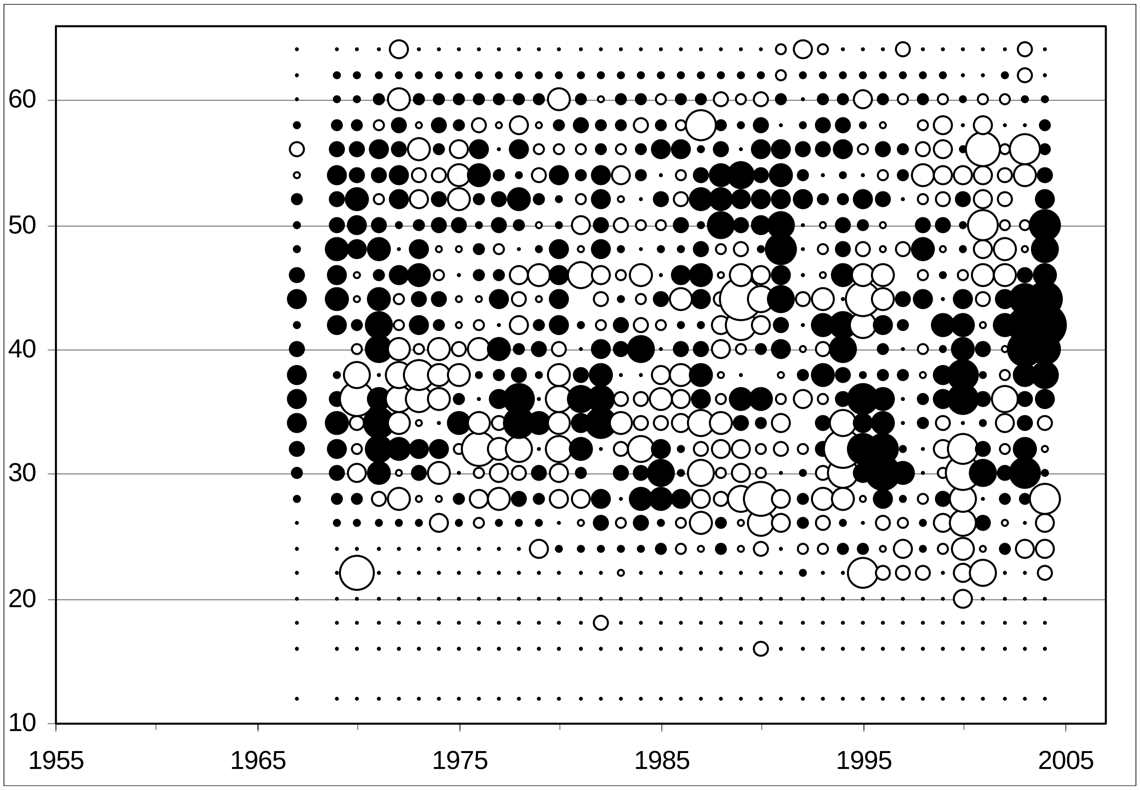


Figure 17. Base model fit to the southern fishery length composition data.

Females (black circles represent negative Pearson residuals)



Males

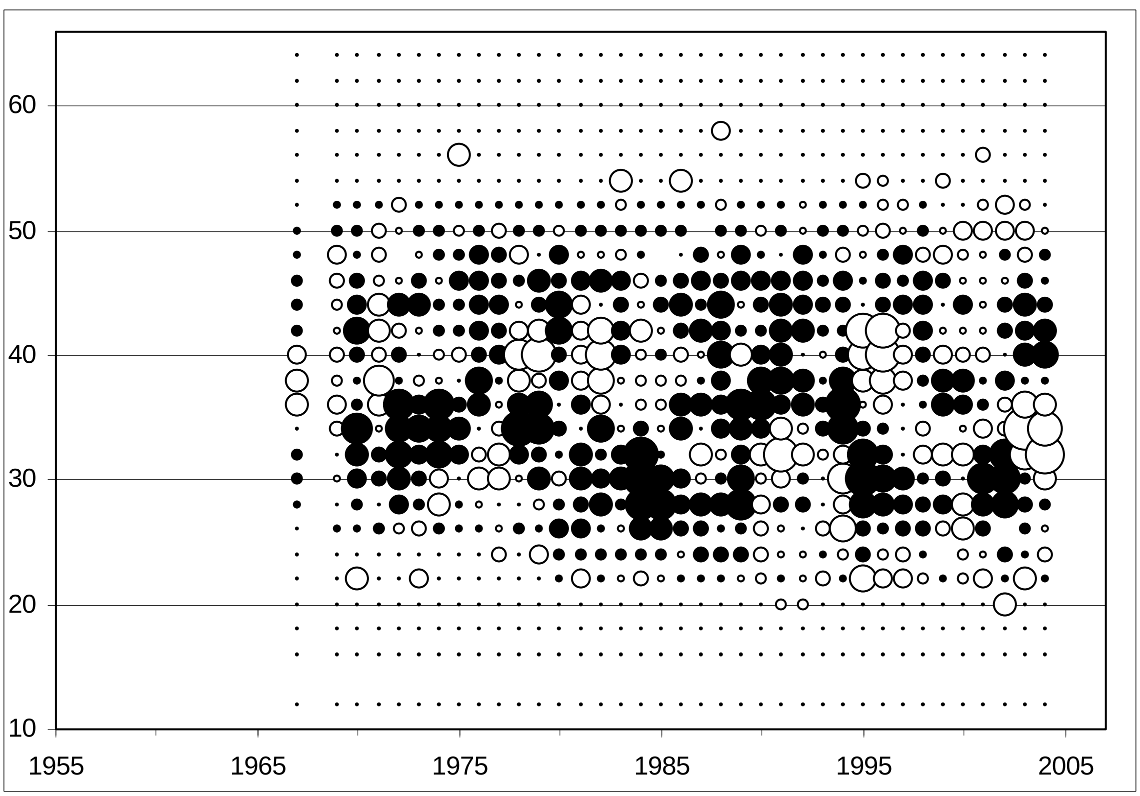
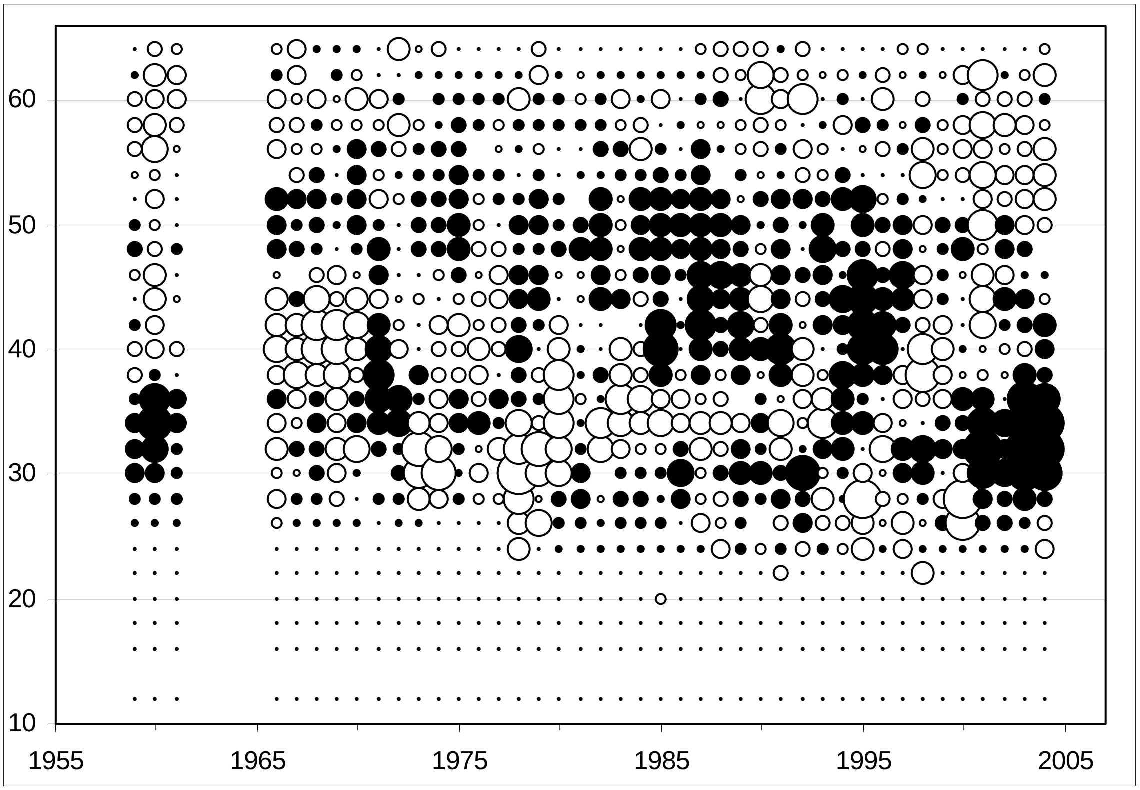


Figure 18. Base model fit to the northern fishery length composition data.

Females (sexes combined in samples for first three years)



Males (black circles represent negative Pearson residuals)

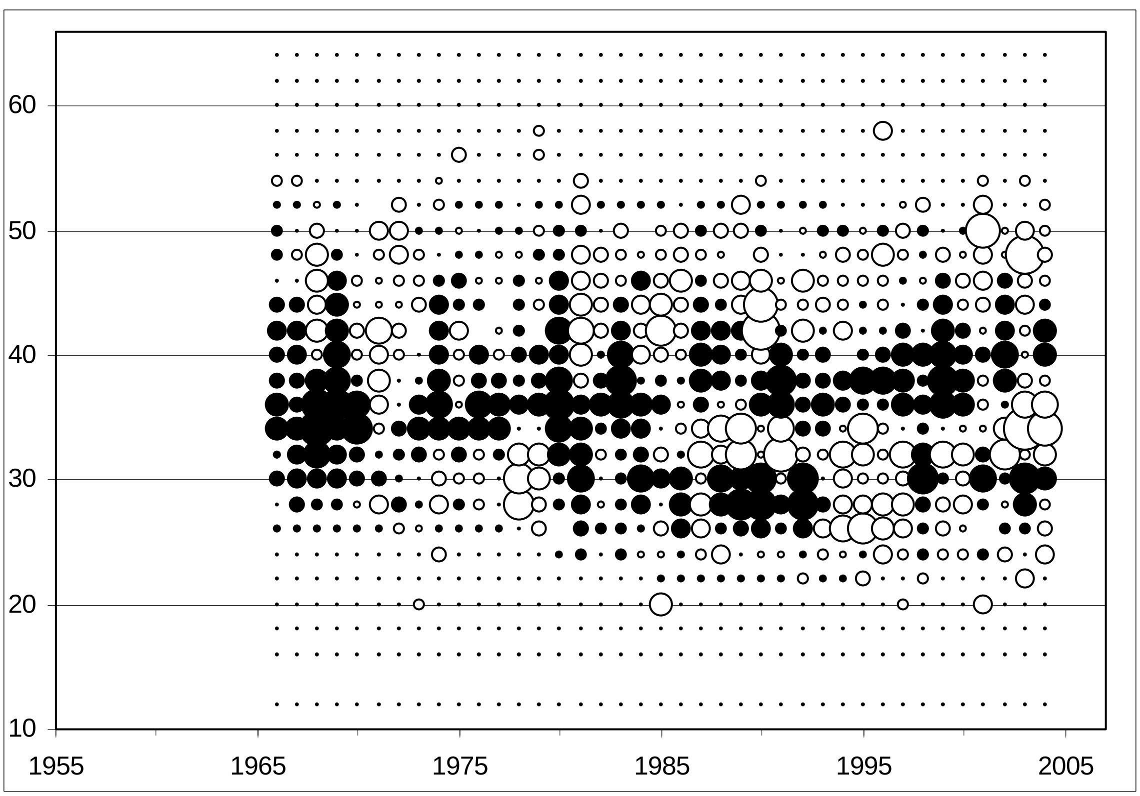
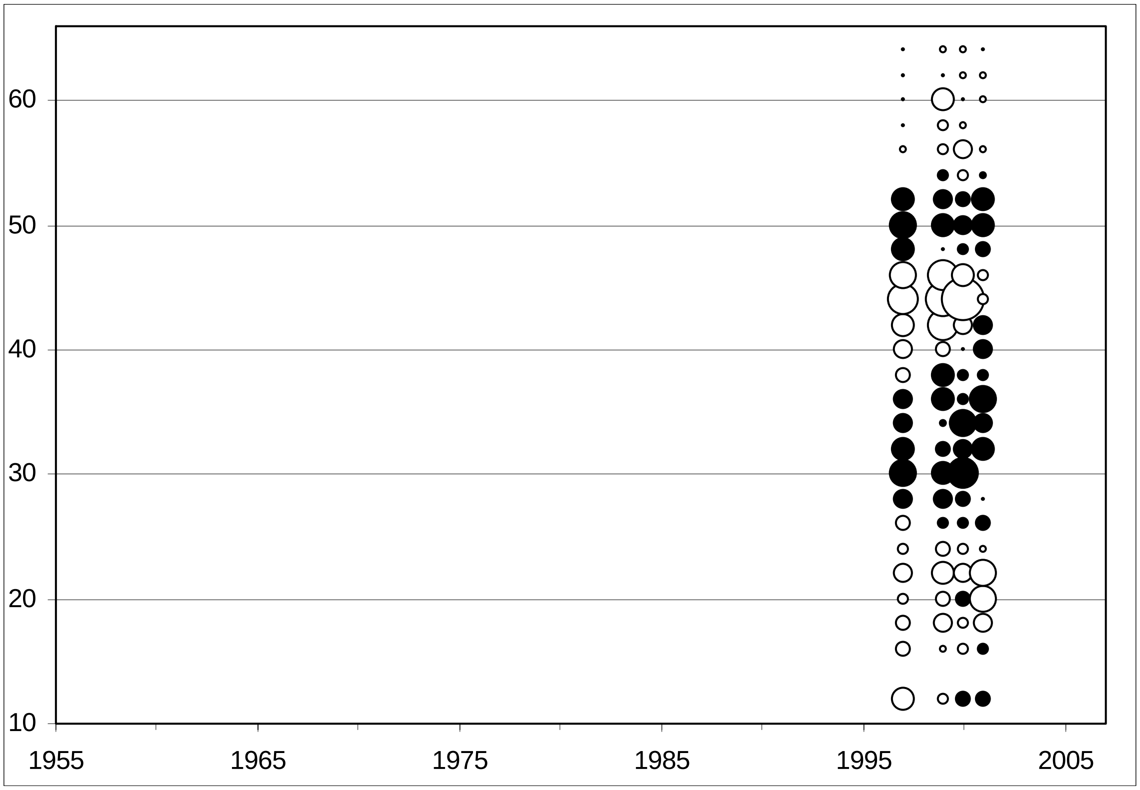


Figure 19. Base model fit to the AFSC slope survey length composition data.

Females (black circles represent negative Pearson residuals)



Males

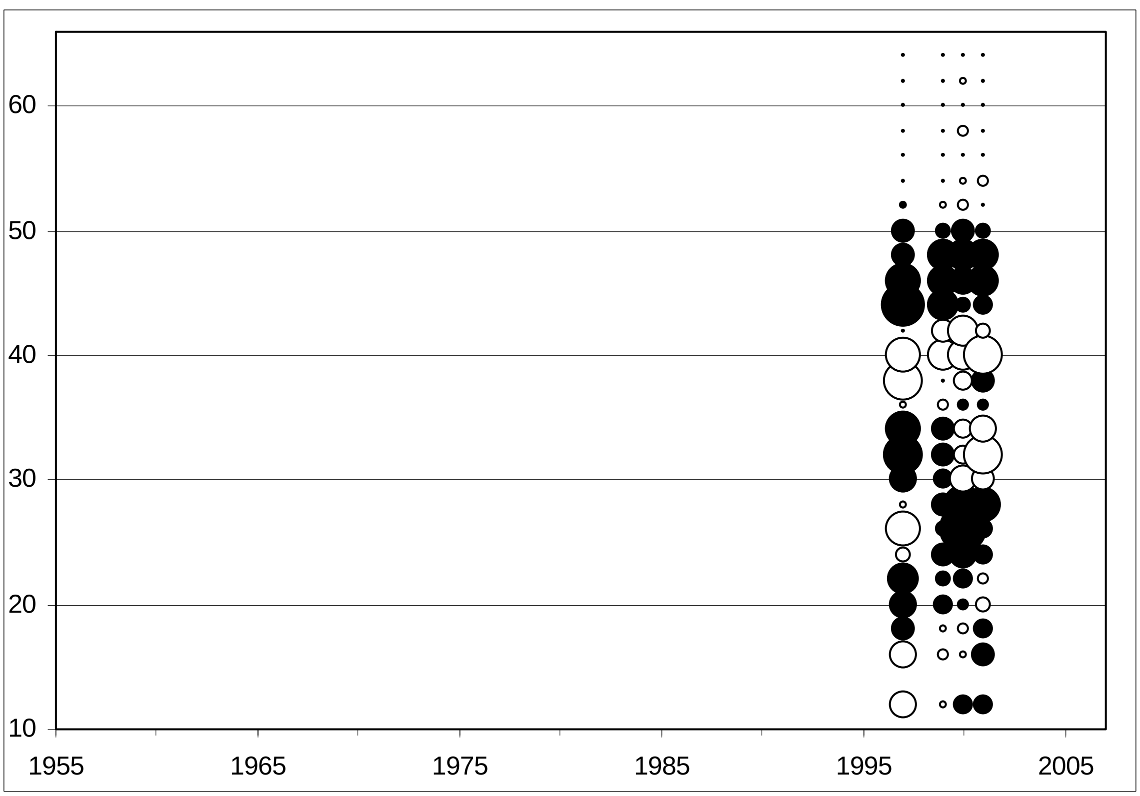


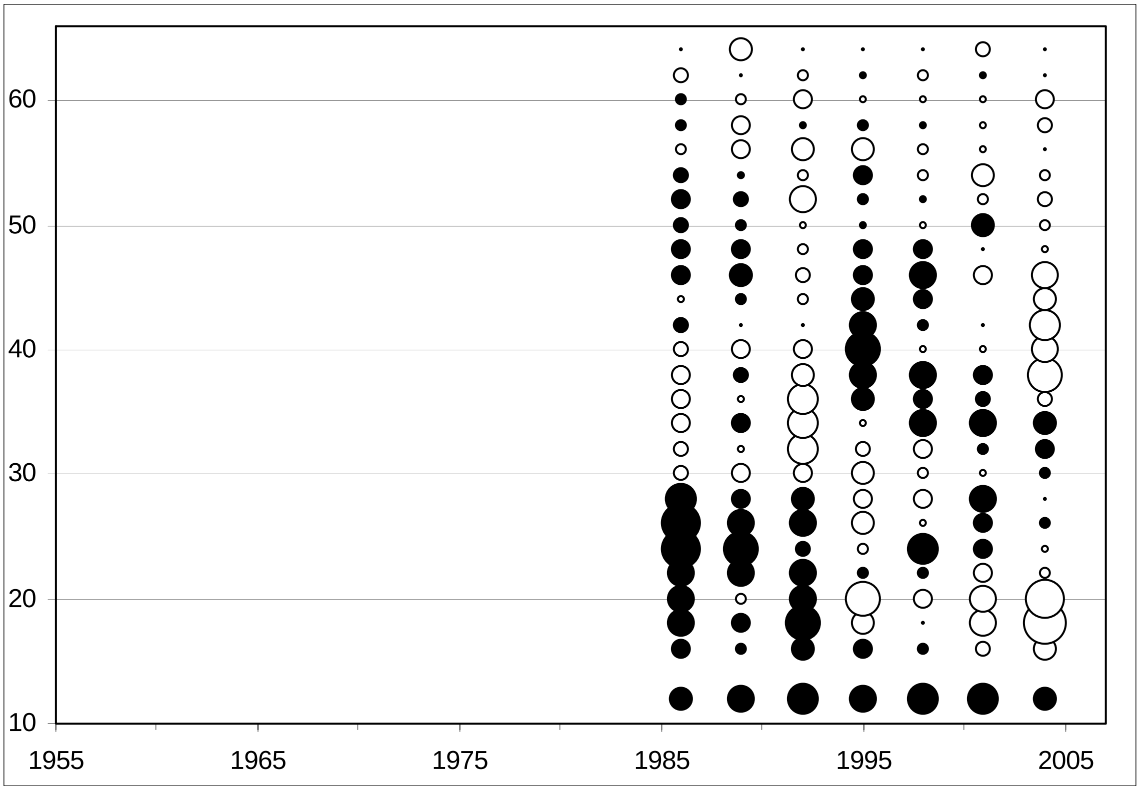
Figure 20. Base model fit to the NWFSC slope survey length composition data.

Females (black circles represent negative Pearson residuals)

Males

Figure 21. Base model fit to the triennial shelf survey length composition data.

Females (black circles represent negative Pearson residuals)



Males

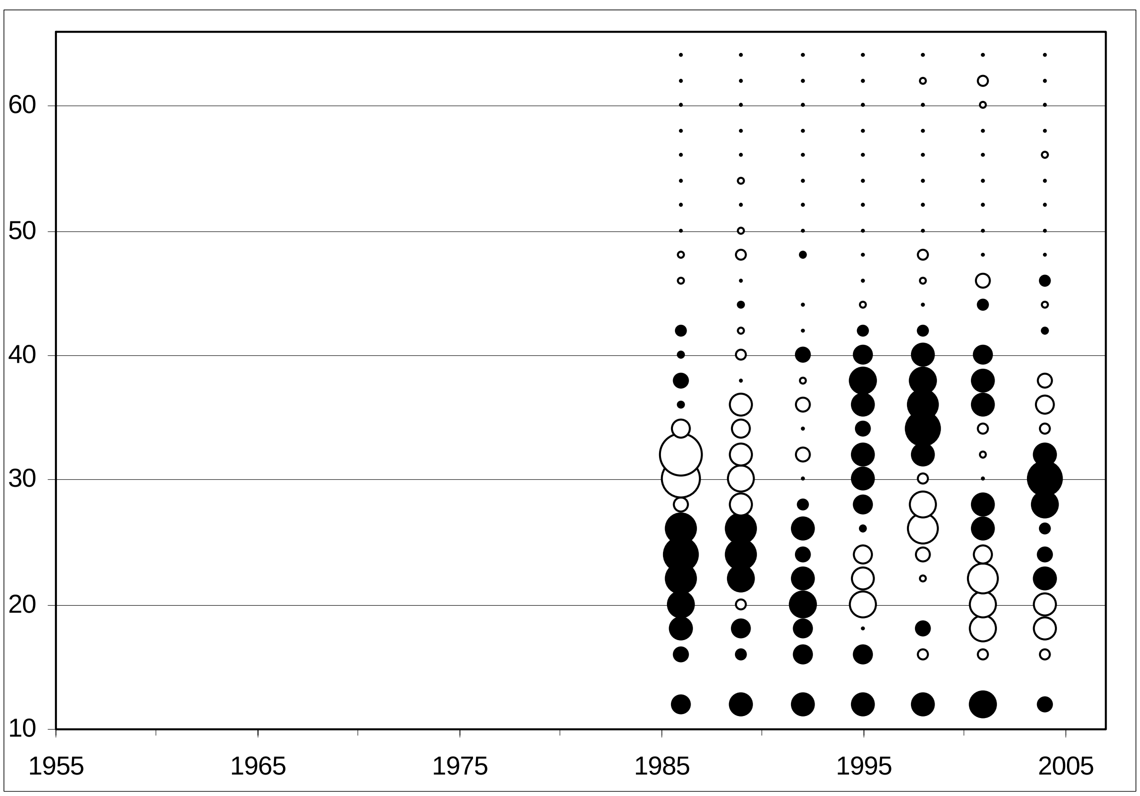
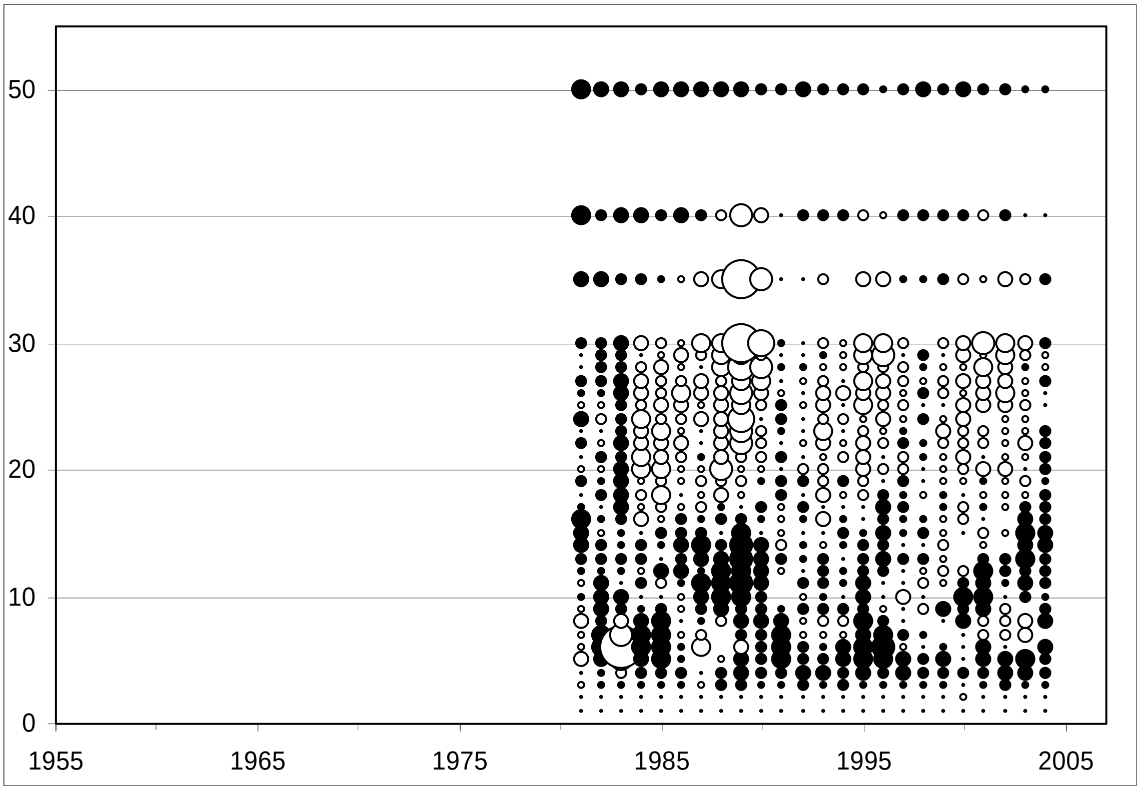


Figure 22. Base model fit to the southern fishery age composition data.

Females (black circles represent negative Pearson residuals)



Males

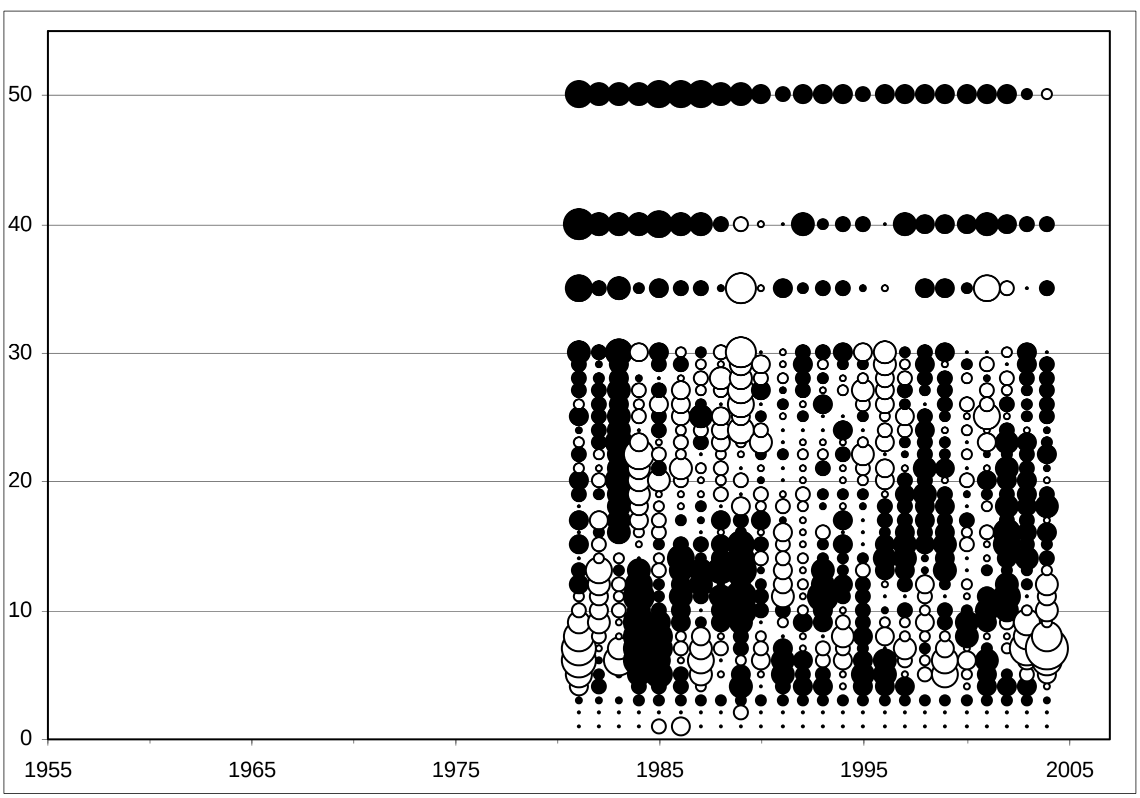
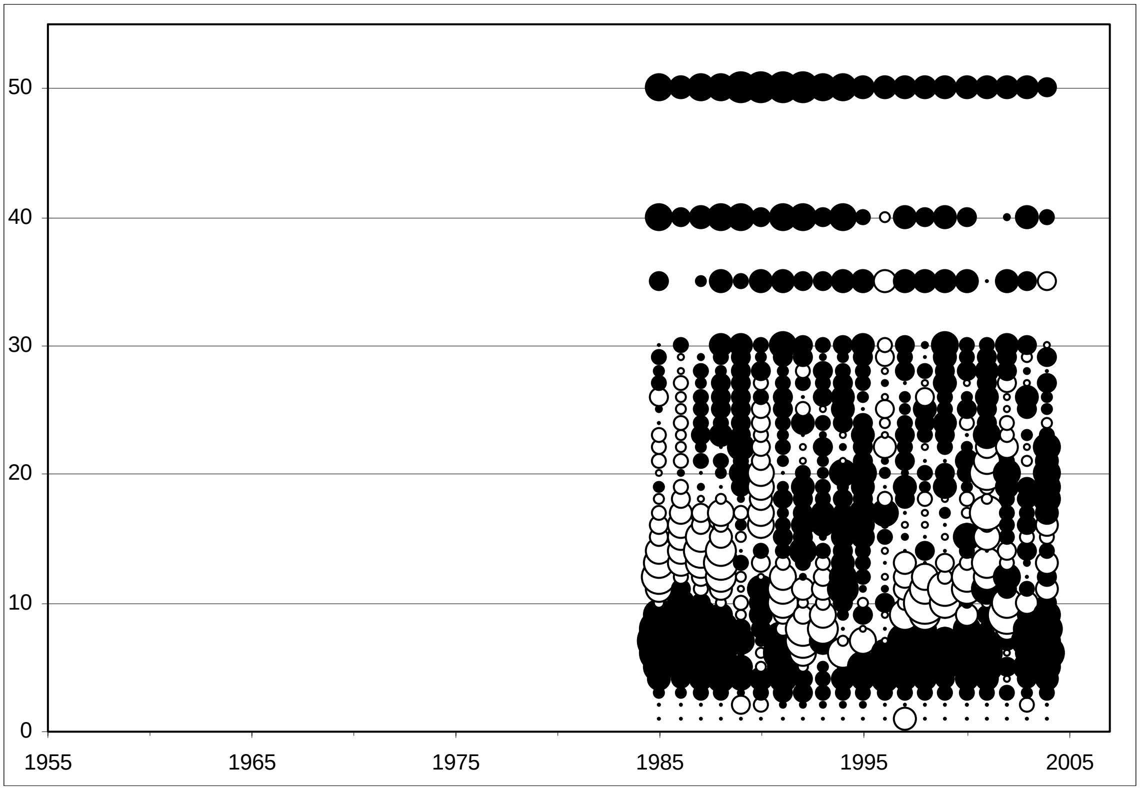


Figure 23. Base model fit to the northern fishery age composition data.

Females (black circles represent negative Pearson residuals)



Males

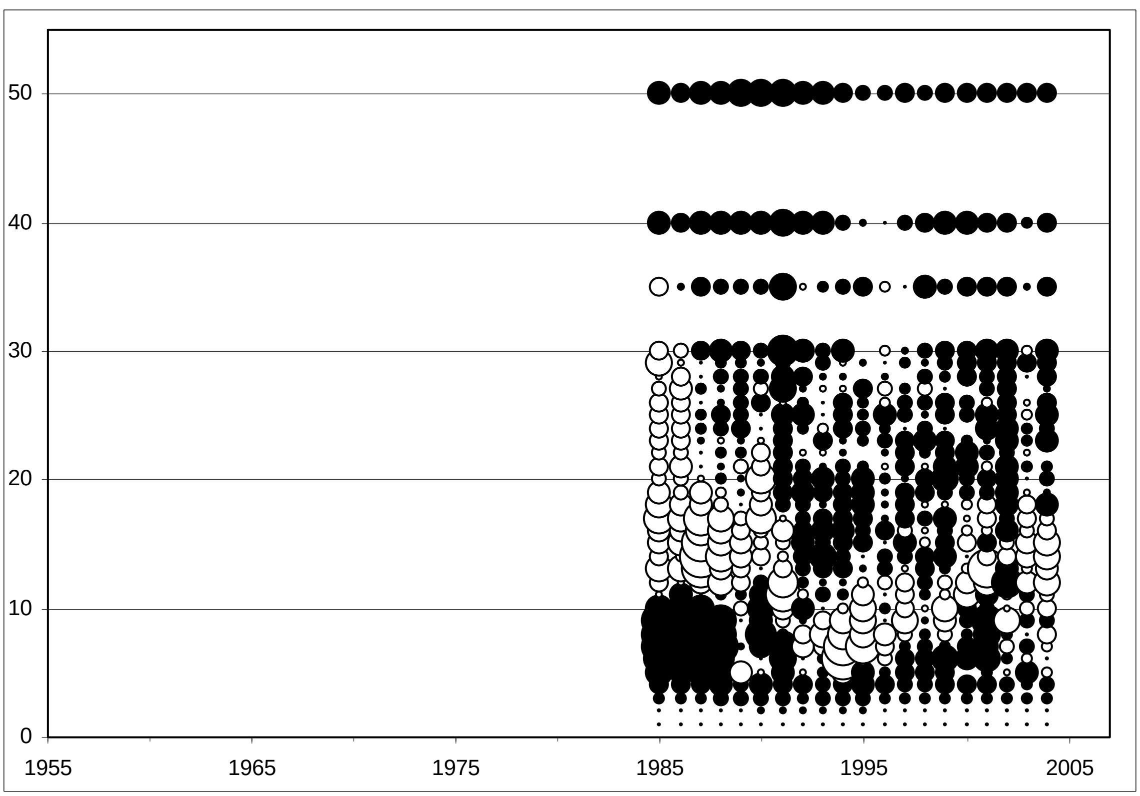
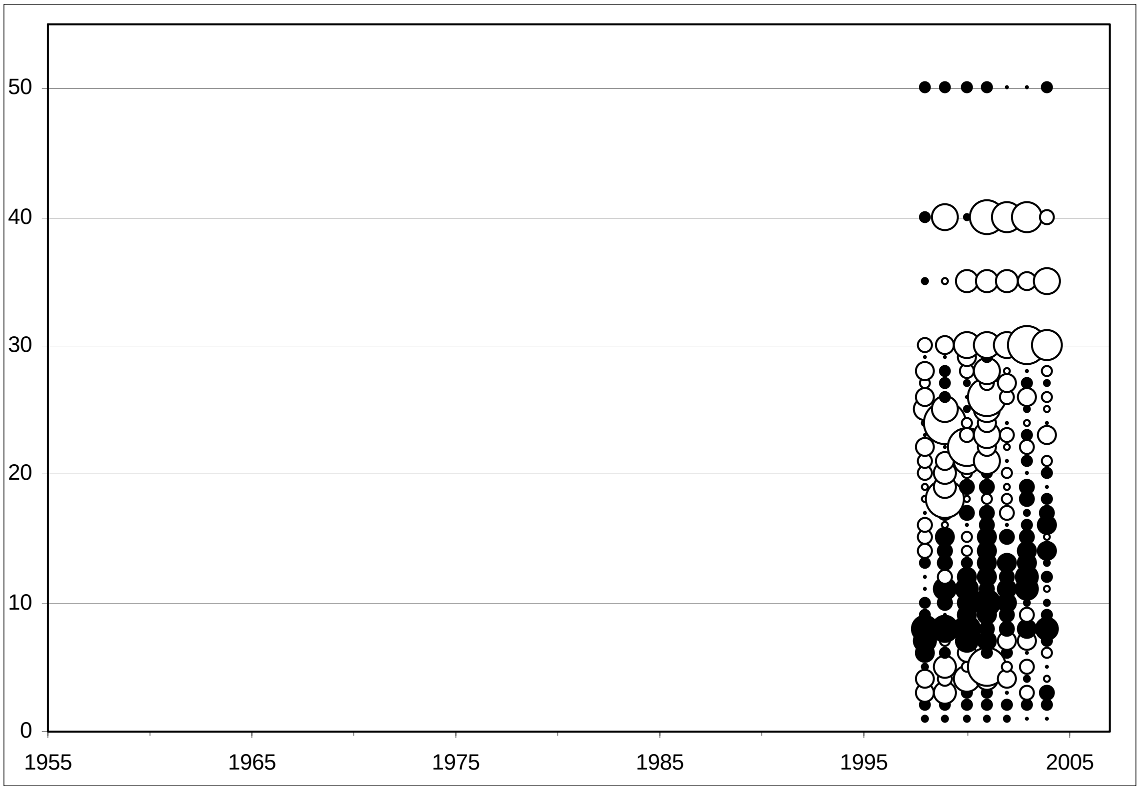


Figure 24. Base model fit to the NWFSC slope survey age composition data.

Females (black circles represent negative Pearson residuals)



Males

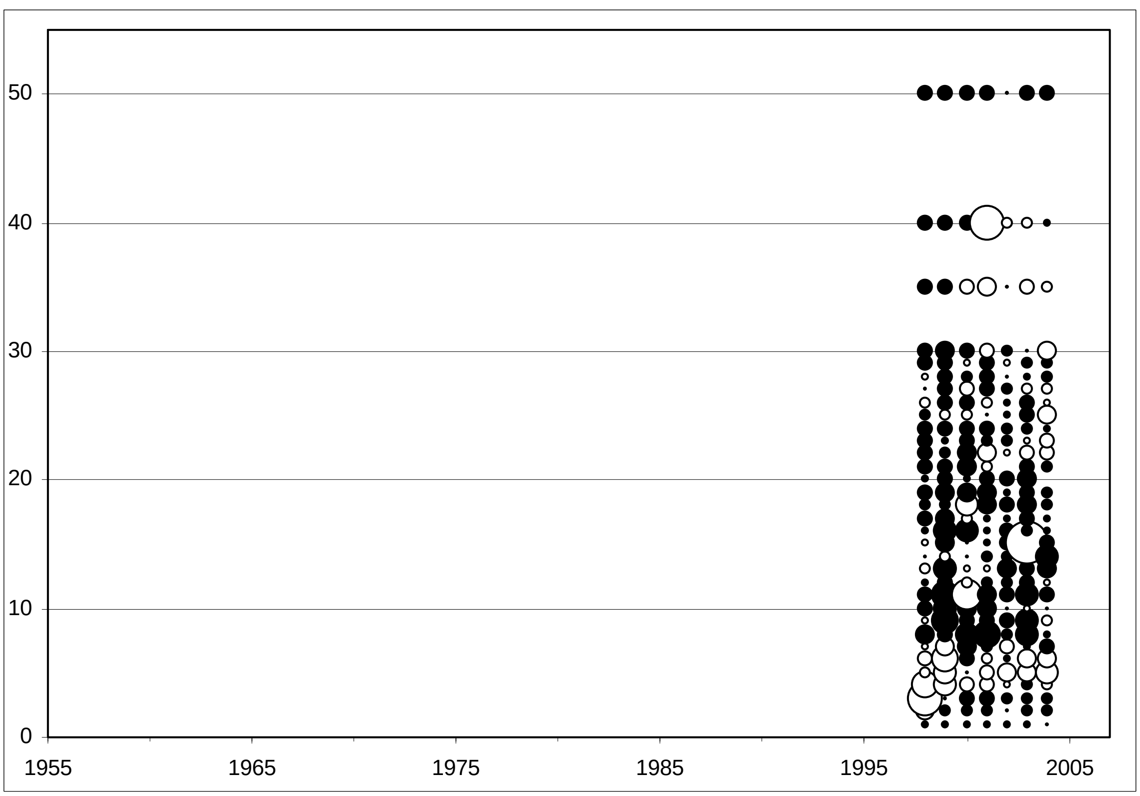


Figure 25. Base model length selection curves (length in cm).

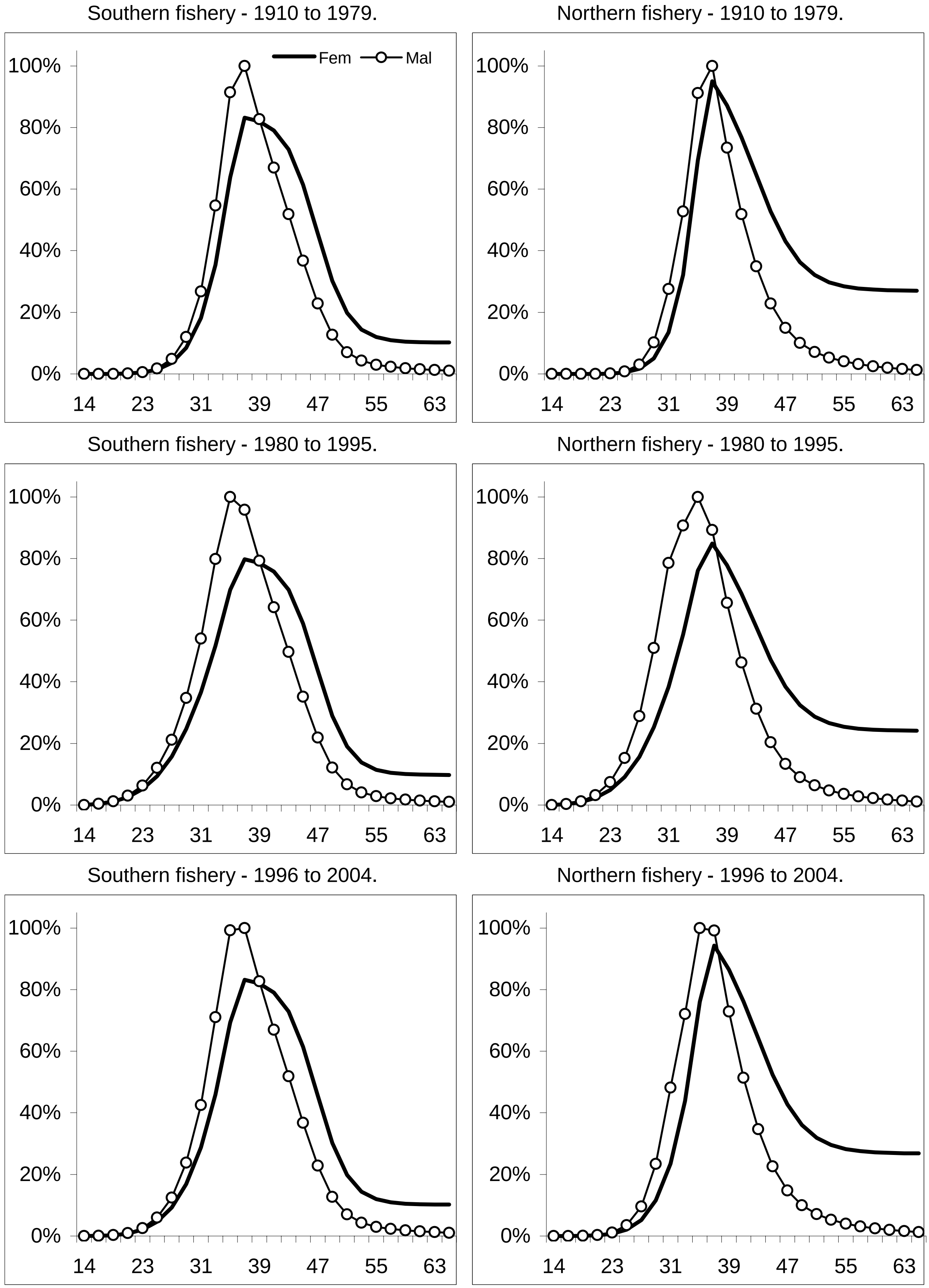
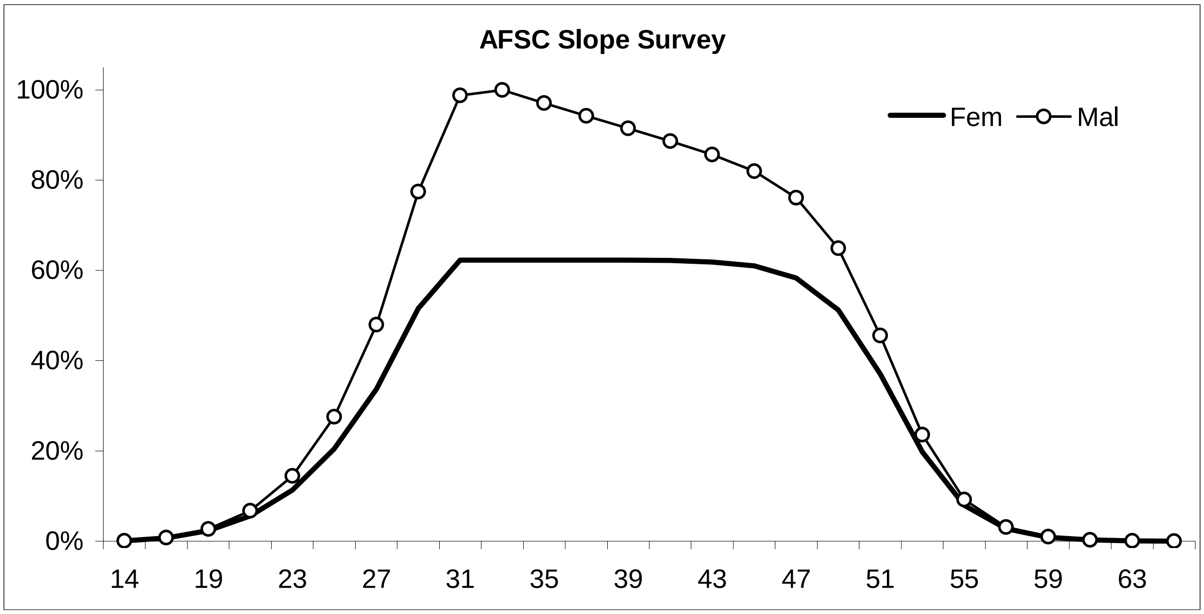


Figure 26. Base model length selection curves (length in cm). (continued)



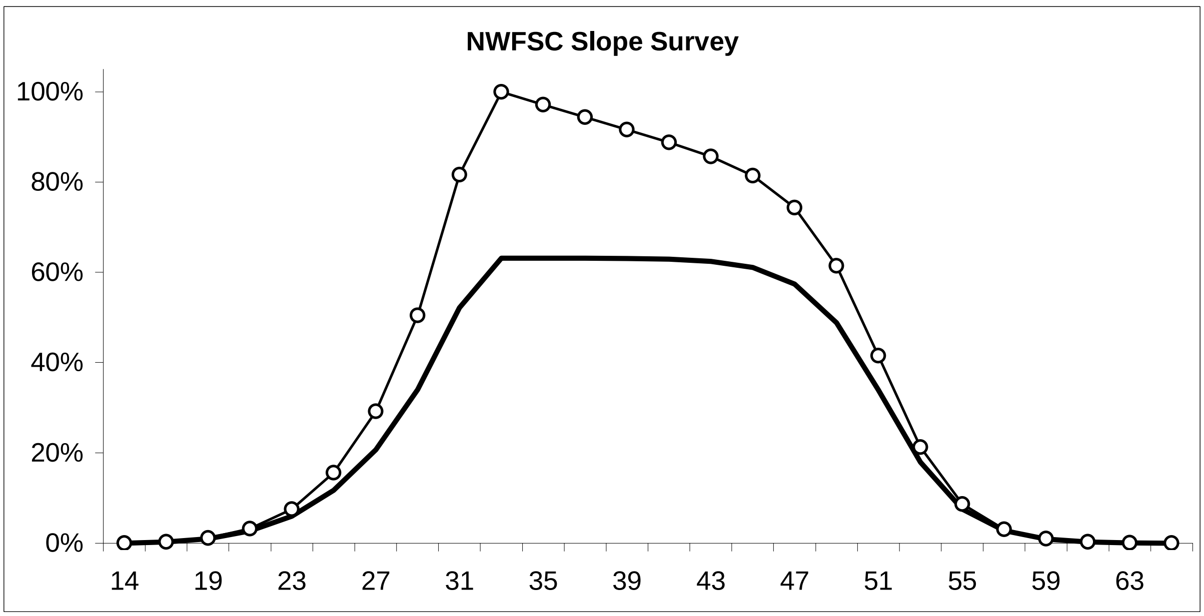
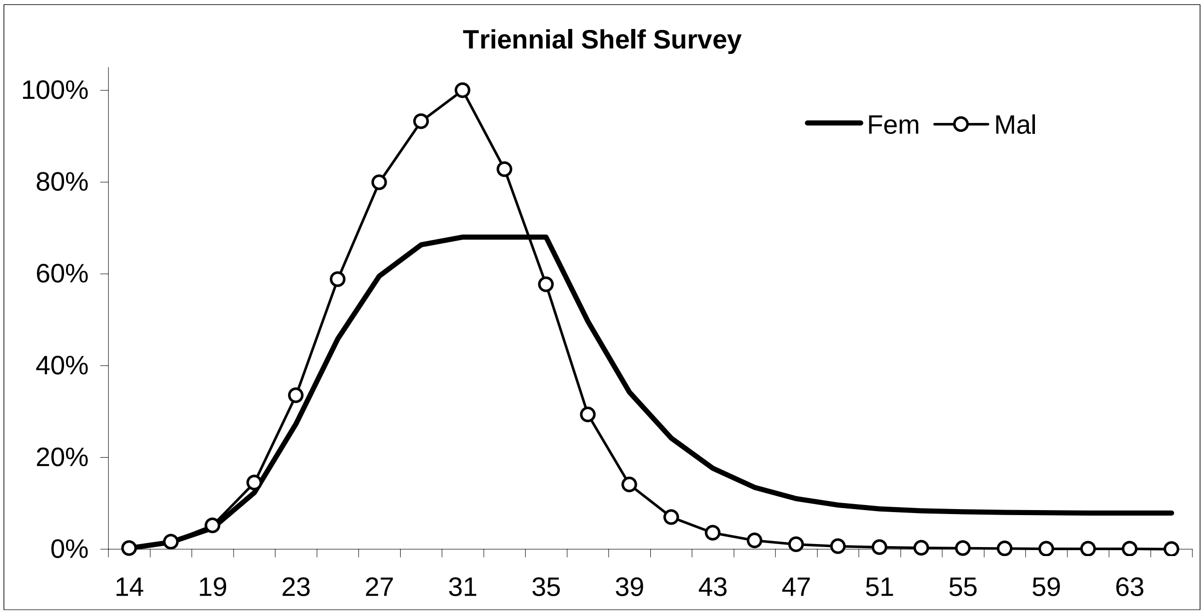


Figure 27. Base model length selection curves (length in cm). (continued)



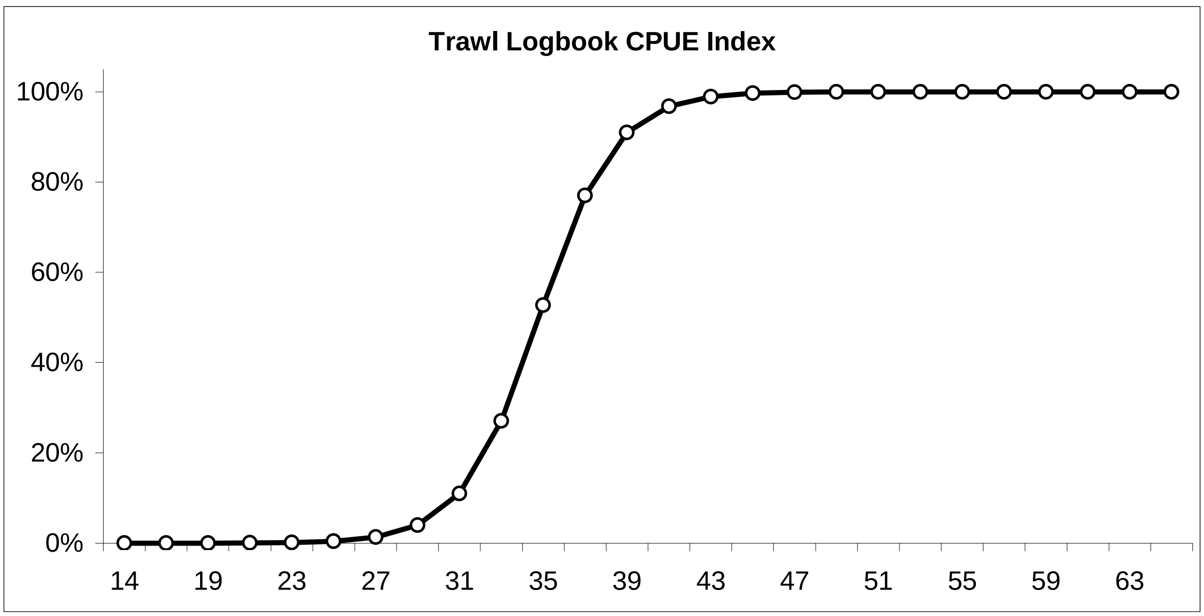
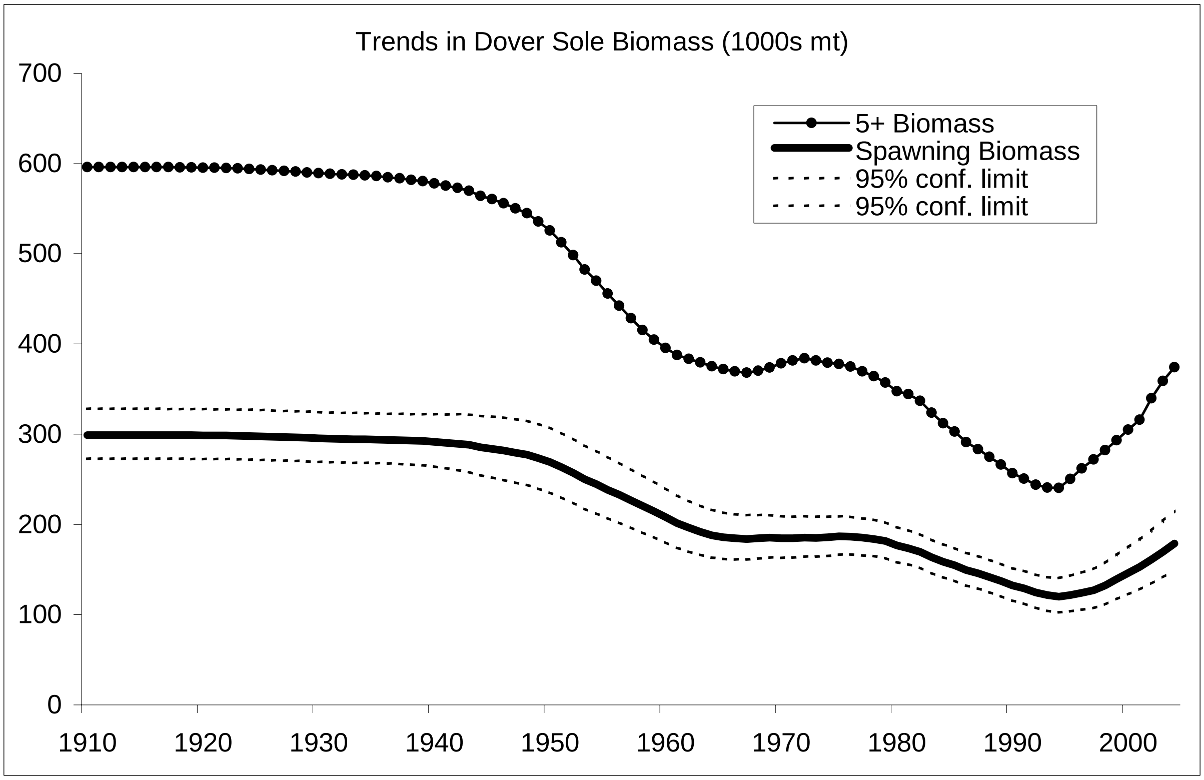


Figure 28. Dover sole base model estimates of biomass and recruitment, including approximate 95% confidence limits.



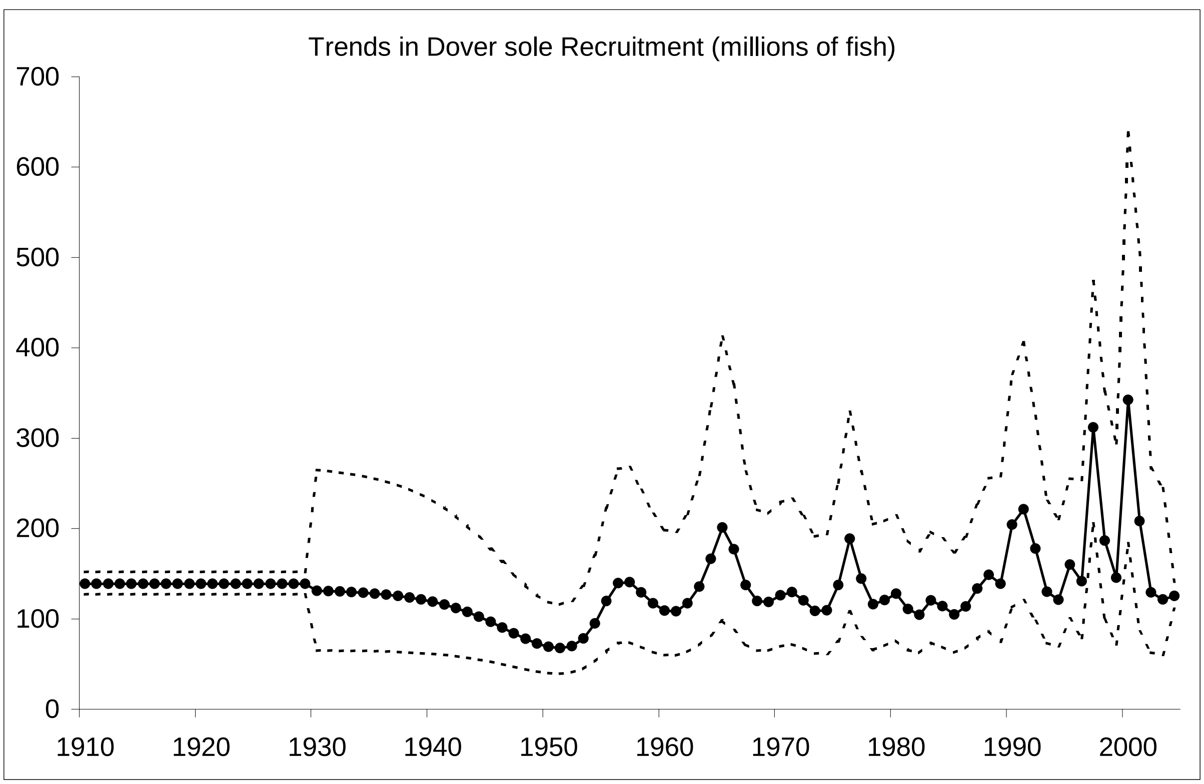


Figure 29. Base model reconstruction of the Dover sole exploitation history.

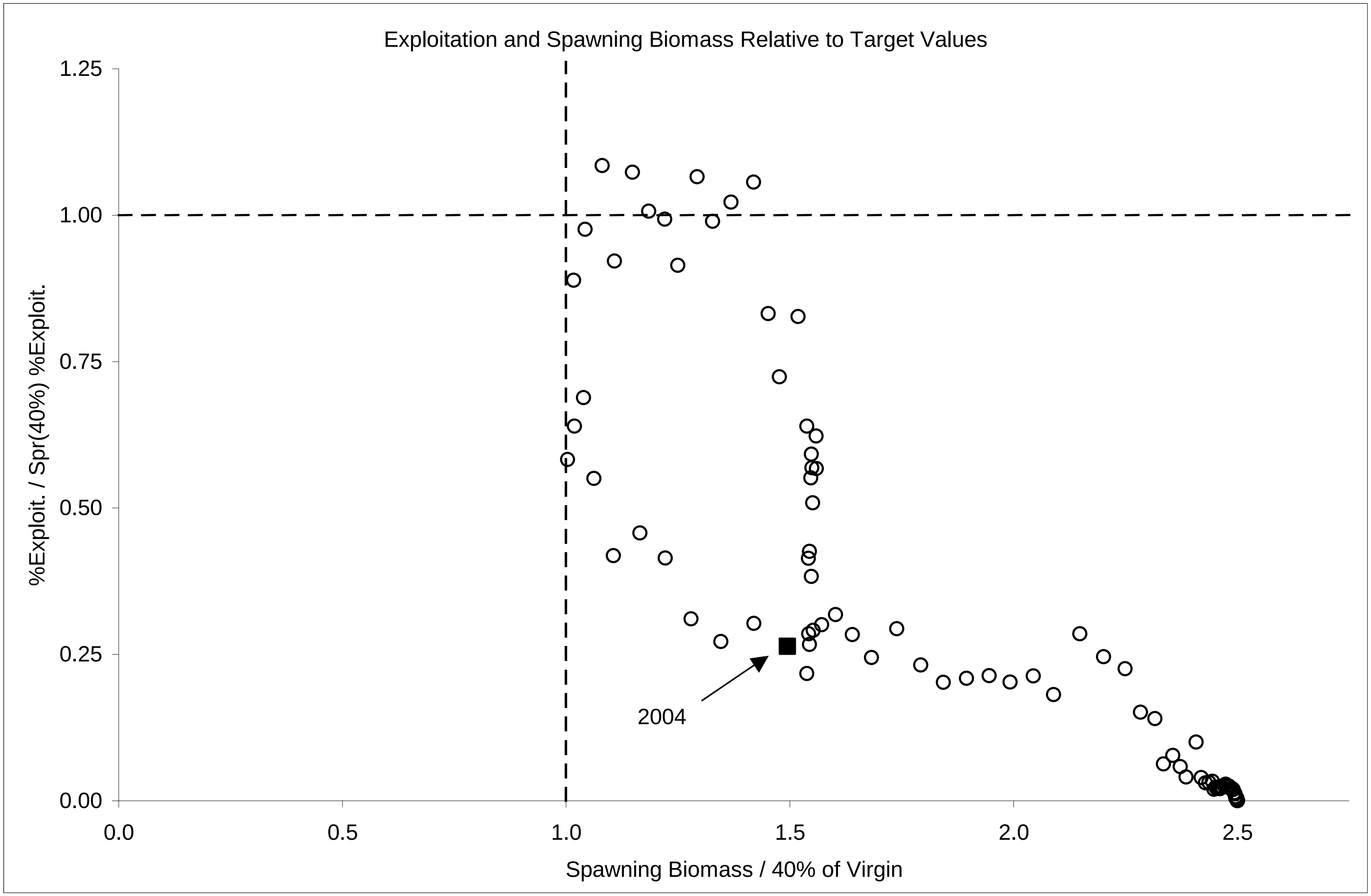


Figure 30. Dover sole base model stock-recruit relationship.

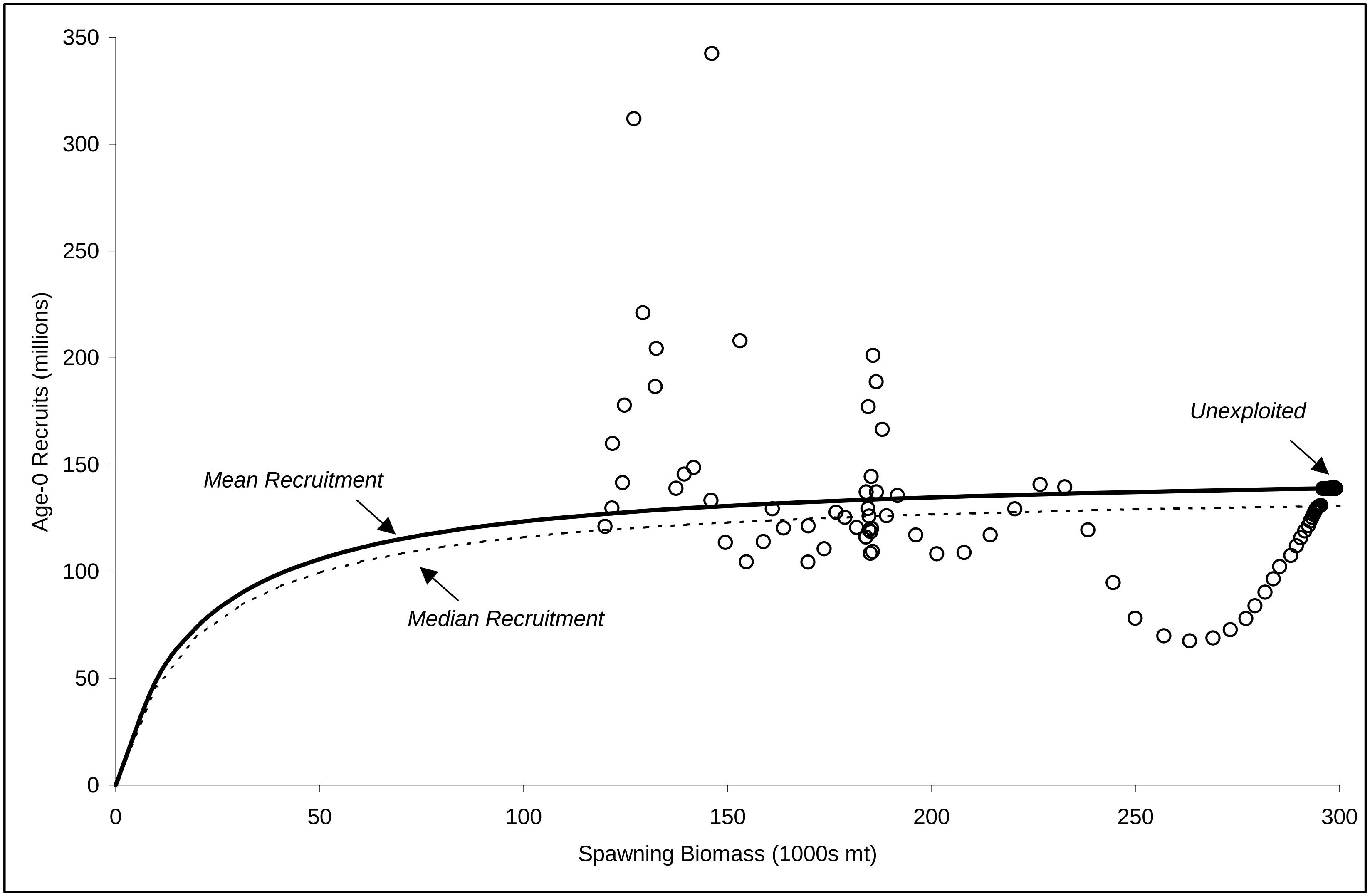


Figure 31. Comparison of results from the final versus preliminary base model for Dover sole.

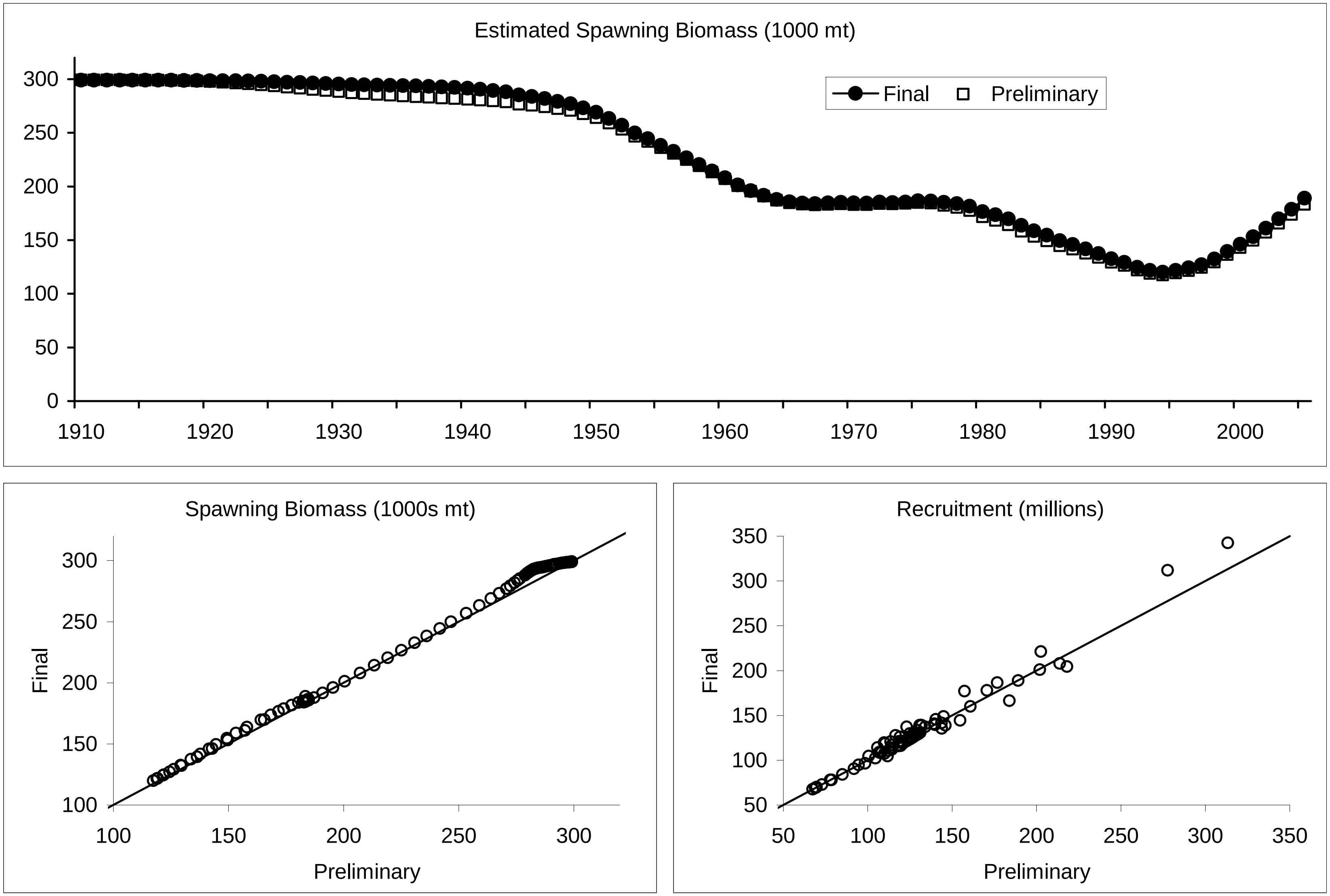
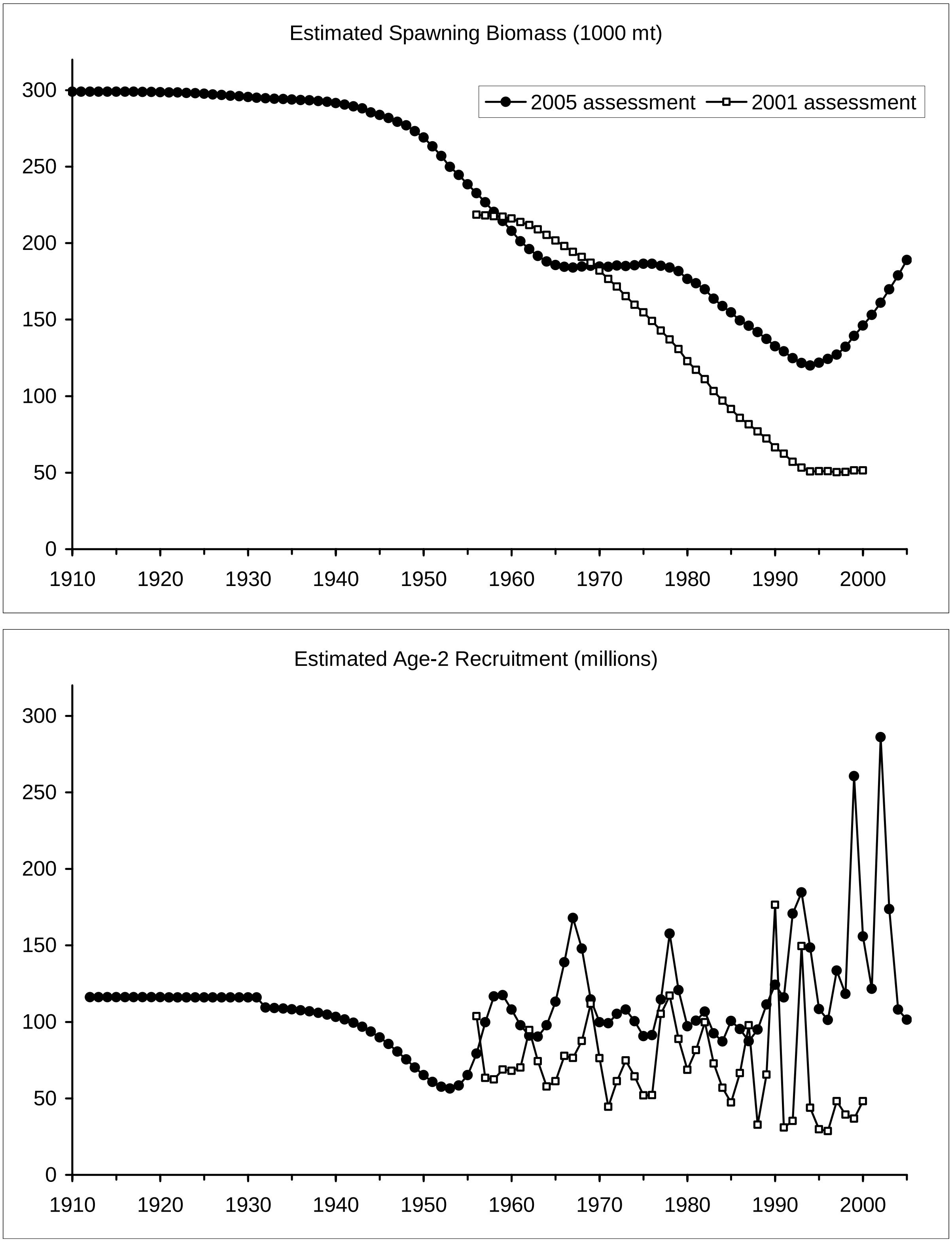


Figure 32. Final base model results compared to results from the 2001 assessment.



Appendix 1. Stock Synthesis control file for final base model.

2005 Dover sole assessment.
Initial parameter values from Run 248.MC.A05, the final base model.
Uses environment variables for trends in retention parameters and female maturity L50.

2 #_N_growth_morphs

#_assign_sex_to_each_morph_(1=female;_2=male)
1 2

1 #_N_Areas_(populations)
1 1 #_area_for_each_fleet
1 1 1 1 #_area_for_each_survey

0 # do_migration_(0/1)

2 #_N_Block_Designs - Additional lines needed if value<>0.
3 3 #_N_Blocks_for_each_Design
1910 1954 1955 1983 1984 2004 # Block design for changes in female growth K <<< Not used
1910 1979 1980 1995 1996 2004 # Block design for changes in fishery selection asc_infl

#Natural_mortality_and_growth_parameters_for_each_morph
4 #_Last_age_for_natmort_young
15 #_First_age_for_natmort_old
1.75 #_Amin:_age_for_growth_Lmin
40 #_Amax:_age_for_growth_Lmax
-4 #_MGparm_dev_phase
LO HI INIT PRIOR Pr_type SD PHASE
Female (morph 1) natural mortality and growth
0.05 0.13 0.09 0.09 0 0.04 -9 0 0 0 0 0.5 0 0 #_natM_young
-1 1 0 0 0 1 -9 0 0 0 0 0.5 0 0 #_natM_old_as_exponential_offset_(rel_young)
4 24 9.92484 9.92484 0 10 3 0 0 0 0 0.5 0 0 #_Lmin
40 60 50.9902 50.9902 0 10 3 0 0 0 0 0.5 0 0 #_Lmax
0.05 0.15 0.119106 0.119106 0 0.05 3 0 0 0 0 0.5 1 1 #_VBK
0.1 0.26 0.18 0.18 0 0.08 -9 0 0 0 0 0.5 0 0 #_CV_at_Amin
-1.9 0.1 -0.875469 -0.875469 0 1 -9 0 0 0 0 0.5 0 0 #_CV_at_Amax_as_exponential_offset_(rel_young)
Male (morph 2) natural mortality and growth
-0.8 0.8 0 0 0 0.8 -9 0 0 0 0 0.5 0 0 #_natM_young
-0.8 0.8 0 0 0 0.8 -9 0 0 0 0 0.5 0 0 #_natM_old_as_exponential_offset_(rel_young)
-0.8 0.8 0.134715 0.134715 0 0.8 3 0 0 0 0 0.5 0 0 #_Lmin
-1.15 0.85 -0.152238 -0.152238 0 1 3 0 0 0 0 0.5 0 0 #_Lmax
-1 1 -0.0391541 -0.0391541 0 1 3 0 0 0 0 0.5 0 0 #_VBK
-0.8 0.8 0 0 0 0.8 -9 0 0 0 0 0.5 0 0 #_CV-young_as_exponential_offset_(rel_morph1)
-2 0 -0.875469 -0.875469 0 1 -9 0 0 0 0 0.5 0 0 #_CV-
old_as_exponential_offset_(rel_young_this_morph)
# Female length-weight
0 0.1 4.4149E-06 4.4149E-06 0 0.2 -9 0 0 0 0 0.5 0 0 #_a
2 4 3.22542 3.22542 0 2 -9 0 0 0 0 0.5 0 0 #_b
Female maturity
20 40 36.5 33.4 0 5 -9 4 0 0 0 0.5 0 0 #_L50
-1 0 -0.2988 -0.2988 0 0.4 -9 0 0 0 0 0.5 0 0 #_slope

```
# Female fecundity - Same as biomass if intercept = 1 and slope = 0
-3  3 1 1 0 0.8 -9  0 0 0 0 0.5 0 0 #_eggs / gm intercept
-3  3 0 0 0 0.8 -9  0 0 0 0 0.5 0 0 #_eggs / gm slope
# Male length-weight
0 0.1 3.7064E-06  3.7064E-06  0 0.2 -9  0 0 0 0 0.5 0 0 #_a
2 4 3.27356 3.27356 0 2 -9  0 0 0 0 0.5 0 0 #_b

#_allocate_recruits
# pop*gmorph lines - For morph proportions in each area
0 1 0.5 0.2 0 9.8 -9  0 0 0 0 0.5 0 0 #frac to morph 1 in area 1
0 1 0.5 0.2 0 9.8 -9  0 0 0 0 0.5 0 0 #frac to morph 2 in area 1

# pop lines - For the proportion assigned to each area
0 1 1 1 0 0.8 -9  0 0 0 0 0.5 0 0 #frac to area 1

#_custom-env_read
1  #_ 1=read_a_setup_line_for_each_MGparm_with_Env-var>0
# LO  HI  INIT  PRIOR PR_type SD  PHASE
-10 10  1 1 0 4 -9  #_Fem_Maturity_L50

#_custom-block_read
1  #_ 1=read_a_setup_line_for_each_block x MGparm_with_block>0
# LO  HI  INIT  PRIOR PR_type SD  PHASE
-0.1  0.1 0 0 0 0.05  -9  #_Offset_to_Fem_VBK_1910-54
-0.1  0.1 0 0 0 0.05  -9  #_Offset_to_Fem_VBK_1955-83
-0.1  0.1 0 0 0 0.05  -9  #_Offset_to_Fem_VBK_1984-2004

#_Spawner-Recruitment_parameters
1 # SR_fxn:  1=Beverton-Holt
# LO  HI  INIT  PRIOR PR_type SD  PHASE
6 17  11.82490  11.8249 0 5 1  #_Ln(R0)
0.3 1 0.8 0.8 0 0.3 -3   #_steepness
0.15  0.55  0.35  0.35  0 0.2 -3   #_SD_recruitments
-2  2 0 0 0 2 -3   #_Env_link
-2  2 0 0 0 2 -1   #_ln(init_eq_R_multiplier)

0  #env-var_for_link

#_Recruitment_residuals
#_start_rec_year  end_rec_year  Lower_limit Upper_limit phase
1930  2003  -5  5 6

"#_init_F_setup, for each fleet"
# LO  HI  INIT  PRIOR PR_type SD  PHASE
0.000 0.25  0 0 0 0.01  -9   # South
0.000 0.25  0 0 0 0.01  -9   # North

#_Qsetup
#_add_parm_row_for_each_positive_entry_below(row_then_column)
#_Float(0/1) #Do-power(0/1) #Do-env(0/1) #Do-dev(0/1-NA) #Env-Var #0=N_1=B
0 0 0 0 0 1  # South
0 0 0 0 0 1  # North
```

1 0 0 0 0 1 # AFSC slope survey
1 0 0 0 0 1 # NWFSC slope survey
1 0 0 0 0 1 # Shelf survey
1 0 0 0 0 1 # Trawl logbook index

LO HI INIT PRIOR PR_type SD PHASE
-2 2 0.0778236 0.0778236 0 1 2 # log(AFSC slope Q)
-2 2 -0.327668 -0.327668 0 1 2 # log(NWFSC slope Q)
-4 0 -1.34198 -1.34198 0 1 2 # log(Shelf Q)
-8 -3 -6.54504 -6.54504 0 1 2 # log(Logbk Q)

#_SELEX_&_RETENTION_PARAMETERS
#_Sel_type Do_retention(0/1) Do_male(0/1) Mirrored_selex_number
#_Len selex
7 1 1 0 # South
7 1 1 0 # North
7 0 1 0 # AFSC slope survey
7 0 1 0 # NWFSC slope survey
7 0 1 0 # Shelf survey
7 0 1 0 # Trawl logbook index
#_Age selex
13 0 0 0 # South
13 0 0 0 # North
10 0 0 0 # AFSC slope survey
10 0 0 0 # NWFSC slope survey
13 0 0 0 # Shelf survey
10 0 0 0 # Trawl logbook index

LO HI INIT PRIOR PR_type SD PHASE env-variable
#1 Length selection - South   3
25 45 36 36 0 5 -9 0 0 1970 2004 0.3 0 0 # len@peak - fem
0 2 0 0 0 2 -9 0 0 0 0 0 0 0 # sel@minL
-10 10 1.75952 1.75952 0 5 -9 0 0 1970 2004 0.3 2 1 # asc_infl (logit)
0.05 2 0.1 0.1 0 2 -9 0 0 0 0 0 0 0 # asc_slope
-10 30 -1.88591 -1.88591 0 5 3 0 0 1970 2004 0.3 0 0 # sel@maxL (logit)
-10 10 -0.677693 -0.677693 0 5 3 0 0 1970 2004 0.3 0 0 # desc_infl (logit)
0 2 0.458814 0.458814 0 2 3 0 0 0 0 0 0 0 # desc_slope
0 40 1.7375 1.7375 0 5 3 0 0 0 0 0 0 0 # width_of_top <= (maxL - p1)
Length retention - South
25 40 34.3 34.3 0 99 -9 1 0 1970 2004 0.3 0 0 #_inflection_for_retention
0.1 2 1.66667 1.66667 0 99 -9 2 0 0 0 0 0 0 #_slope_for_retention
0.5 1 1 1 0 99 -9 0 0 0 0 0 0 0 #_asymptotic_retention
-2 2 -0.7 -0.7 0 99 -9 3 0 0 0 0 0 0 # male offset for L50
Length selection for males - South
10 60 33.88 33.88 0 5 3 0 0 0 0 0 0 0 # len_@transition - male
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ minL
-10 10 0.465339 0.465339 0 5 3 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ m1
-10 10 -2.19312 -2.19312 0 5 3 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ maxL

#2 Length selection - North
25 45 36 36 0 5 -9 0 0 1970 2004 0.3 0 0 # len@peak - fem
0 2 0 0 0 2 -9 0 0 0 0 0 0 0 # sel@minL

-10 10 2.40897 2.40897 0 5 -9 0 0 1970 2004 0.3 2 1 # asc_infl (logit)
0.05 2 0.1 0.1 0 2 -9 0 0 0 0 0 0 0 # asc_slope
-10 30 -1.07692 -1.07692 0 5 3 0 0 1970 2004 0.3 0 0 # sel@maxL (logit)
-10 10 -1.26449 -1.26449 0 5 3 0 0 1970 2004 0.3 0 0 # desc_infl (logit)
0 2 0.252193 0.252193 0 2 3 0 0 0 0 0 0 0 # desc_slope
0 40 3.83558E-09 3.83558E-09 0 5 3 0 0 0 0 0 0 0 # width_of_top <= (maxL - p1)
Length retention - North
25 40 34.3 34.3 0 99 -9 1 0 1970 2004 0.3 0 0 #_inflection_for_retention
0.1 2 1.66667 1.66667 0 99 -9 2 0 0 0 0 0 0 #_slope_for_retention
0.5 1 1 1 0 99 -9 0 0 0 0 0 0 0 #_asymptotic_retention
-2 2 -0.7 -0.7 0 99 -9 3 0 0 0 0 0 0 # male offset for L50
Length selection for males - North
10 60 12.5049 12.5049 0 5 3 0 0 0 0 0 0 0 # len_@transition - male
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ minL
-10 10 2.49672 2.49672 0 5 3 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ m1
-10 10 -2.73574 -2.73574 0 5 3 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ maxL

#3 AFSC slope length selection   4
25 45 30 30 0 5 -9 0 0 0 0 0 0 0 # len@peak - fem
0 2 0 0 0 2 -9 0 0 0 0 0 0 0 # sel@minL
-10 10 1.47954 1.47954 0 5 4 0 0 0 0 0 0 0 # asc_infl (logit)
0.05 2 0.1 0.1 0 2 -9 0 0 0 0 0 0 0 # asc_slope
-99 30 -99 -99 0 5 -9 0 0 0 0 0 0 0 # sel@maxL (logit)
-10 10 0.403679 0.403679 0 5 4 0 0 0 0 0 0 0 # desc_infl (logit)
0 2 0.577789 0.577789 0 2 4 0 0 0 0 0 0 0 # desc_slope
0 40 2 2 0 5 -9 0 0 0 0 0 0 0 # width_of_top <= (maxL - p1)
Length selection for males - AFSC slope survey
10 70 32 32 0 5 -9 0 0 0 0 0 0 0 # len_@transition - male
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ minL
-10 10 0.499948 0.499948 0 5 4 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ m1
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ maxL

#4 NWFSC slope length selection
25 45 32 32 0 5 -9 0 0 0 0 0 0 0 # len@peak - fem
0 2 0 0 0 2 -9 0 0 0 0 0 0 0 # sel@minL
-10 10 1.6145 1.6145 0 5 4 0 0 0 0 0 0 0 # asc_infl (logit)
0.05 2 0.1 0.1 0 2 -9 0 0 0 0 0 0 0 # asc_slope
-99 30 -99 -99 0 5 -9 0 0 0 0 0 0 0 # sel@maxL (logit)
-10 10 0.244594 0.244594 0 5 4 0 0 0 0 0 0 0 # desc_infl (logit)
0 2 0.540269 0.540269 0 2 4 0 0 0 0 0 0 0 # desc_slope
0 40 2 2 0 5 -9 0 0 0 0 0 0 0 # width_of_top <= (maxL - p1)
Length selection for males - NWFSC slope survey
10 70 32 32 0 5 -9 0 0 0 0 0 0 0 # len_@transition - male
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ minL
-10 10 0.484682 0.484682 0 5 4 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ m1
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ maxL

#5 Shelf length selection
20 40 30 30 0 5 -9 0 0 0 0 0 0 0 # len@peak - fem
0 2 0 0 0 2 -9 0 0 0 0 0 0 0 # sel@minL
-10 10 0.623619 0.623619 0 5 4 0 0 0 0 0 0 0 # asc_infl (logit)
0.1 2 0.528141 0.528141 0 2 4 0 0 0 0 0 0 0 # asc_slope

-10 30 -1.93867 -1.93867 0 5 4 0 0 0 0 0 0 0 # sel@maxL (logit)
-10 10 -2.01273 -2.01273 0 5 4 0 0 0 0 0 0 0 # desc_infl (logit)
0 2 0.356753 0.356753 0 2 4 0 0 0 0 0 0 0 # desc_slope
0 40 4.90522 4.90522 0 5 4 0 0 0 0 0 0 0 # width_of_top <= (maxL - p1)
Length selection for males - shelf survey
10 60 31.8923 31.8923 0 5 4 0 0 0 0 0 0 0 # len_@transition - male
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ minL
-10 10 0.412377 0.412377 0 5 4 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ m1
-20 10 -5.57314 -5.57314 0 5 -9 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ maxL

#6 Logbk length selection
45 55 50 50 0 5 -9 0 0 0 0 0 0 0 # len@peak - fem
0 2 0 0 0 2 -9 0 0 0 0 0 0 0 # sel@minL
-10 10 0.405495488 0.405495488 0 5 -9 0 0 0 0 0 0 0 # asc_infl (logit)
0.1 4 0.549663534 0.549663534 0 2 -9 0 0 0 0 0 0 0 # asc_slope
-10 30 20 20 0 5 -9 0 0 0 0 0 0 0 # sel@maxL (logit)
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # desc_infl (logit)
0 2 0 0 0 2 -9 0 0 0 0 0 0 0 # desc_slope
0 40 16 16 0 5 -9 0 0 0 0 0 0 0 # width_of_top <= (maxL - p1)
10 60 44 44 0 5 -9 0 0 0 0 0 0 0 # len_@transition - male
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ minL
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ m1
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # ln(mal_sel/fem_sel) @ maxL

Age selection - South
19 29 24 24 0 5 -9 0 0 0 0 0 0 0 # age@peak - fem
0 2 1 1 0 2 -9 0 0 0 0 0 0 0 # sel@minA
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # asc_infl (logit)
0.1 2 0 0 0 2 -9 0 0 0 0 0 0 0 # asc_slope
-10 30 100 100 0 5 -9 0 0 0 0 0 0 0 # sel@maxA (logit)
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # desc_infl (logit)
0 2 0 0 0 2 -9 0 0 0 0 0 0 0 # desc_slope
0 40 0 0 0 5 -9 0 0 0 0 0 0 0 # width_of_top <= (maxA - p1)

Age selection - North
-3 7 2 2 0 5 -9 0 0 0 0 0 0 0 # age@peak - fem
0 2 1 1 0 2 -9 0 0 0 0 0 0 0 # sel@minA
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # asc_infl (logit)
0.1 2 0 0 0 2 -9 0 0 0 0 0 0 0 # asc_slope
-10 30 100 100 0 5 -9 0 0 0 0 0 0 0 # sel@maxA (logit)
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # desc_infl (logit)
0 2 0 0 0 2 -9 0 0 0 0 0 0 0 # desc_slope
0 40 0 0 0 5 -9 0 0 0 0 0 0 0 # width_of_top <= (maxA - p1)

Shelf
1 11 6 6 0 5 -9 0 0 0 0 0 0 0 # age@peak - fem
0 2 1 1 0 2 -9 0 0 0 0 0 0 0 # sel@minA
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # asc_infl (logit)
0.1 2 0 0 0 2 -9 0 0 0 0 0 0 0 # asc_slope
-10 30 100 100 0 5 -9 0 0 0 0 0 0 0 # sel@maxA (logit)
-10 10 0 0 0 5 -9 0 0 0 0 0 0 0 # desc_infl (logit)
0 2 0 0 0 2 -9 0 0 0 0 0 0 0 # desc_slope

```
0 40  0 0 0 5 -9  0 0 0 0 0 0 0  # width_of_top <= ( maxA - p1 )

#_custom-env_read
1  #_ 1=read_a_setup_line_for_each_SELparm_with_Env-var>0
# LO  HI  INIT  PRIOR PR_type SD  PHASE
-10 10  1 1 0 4 -9   #_inflection_for_retention - South
-10 10  1 1 0 4 -9   #_slope_for_retention - South
-10 10  1 1 0 4 -9   #_male_L50_offset_for_retention - South
-10 10  1 1 0 4 -9   #_inflection_for_retention - North
-10 10  1 1 0 4 -9   #_slope_for_retention - North
-10 10  1 1 0 4 -9   #_male_L50_offset_for_retention - North

#_custom-block_read
1  #_ 1=read_a_setup_line_for_each_block x SELparm_with_block>0
# LO  HI  INIT  PRIOR PR_type SD  PHASE
-2  2 0 0 0 2 5 #_Offset_to_Fishery_1_asc_infl_early_period
-2  2 0 0 0 2 5 #_Offset_to_Fishery_1_asc_infl_middle_period
-2  2 0 0 0 2 5 #_Offset_to_Fishery_1_asc_infl_late_period
-2  2 0 0 0 2 5 #_Offset_to_Fishery_2_asc_infl_early_period
-2  2 0 0 0 2 5 #_Offset_to_Fishery_2_asc_infl_middle_period
-2  2 0 0 0 2 5 #_Offset_to_Fishery_2_asc_infl_late_period

-5   #_phase_for_selex_parm_devs
1  #_max_lambda_phases:
1  #_sd_offset - 1 = include Log(s) term in Like
#_survey_lambdas
1 1 1 1 1 1
#_discard_lambdas
1 1 1 1 1 1
#_meanwtlambda(one_for_all_sources)
1
#_lenfreq_lambdas
1 1 1 1 1 1
#_age_freq_lambdas
0.2 0.2 0.2 0.2 0.2 0.2
#_size@age_lambdas
0.1 0.1 0.1 0.1 0.1 0.1
#_initial_equil_catch
1
#_recruitment_lambda
1
#_parm_prior_lambda
0
#_parm_dev_timeseries_lambda
0
#_crashpen_lambda
100
#_max_F
0.9

999 #_end-of-file
```

Appendix 2. Stock Synthesis data file for the 2005 Dover sole assessment.

```
# 2005 Dover sole assessment data.
# Fishery leng & age comps revised on 9 May 05
# NWFSC slope biomass revised on 22 June 05
# 2 fisheries: South = Eur+Mon+Con, North = USVan+Col
# 4 surveys - AFSC slope, NWFSC slope, shelf survey w/o water hauls, trawl logbook CPUE

#_MODEL_DIMENSIONS
1910 # start_year
2004 # end_year
1 # N_seasons_per_year

12 #_vector_with_N_months_in_each_season

1 # spawning_season_-_spawning_will_occur_at_beginning_of_this_season

2 # N_fishing_fleets

4 # N_surveys;_data_type_numbers_below_must_be_sequential_with_the_N_fisheries

# Labels
South%North%AFSC_Slope%NWFSC_Slope%Shelf%LogBk_CPUE

"# Timing within each season, for each fishery and survey"
0.5 0.5 0.833333333 0.75 0.583333333 0.5 #_survey_timing_in_season

2 #_number_of_genders(1 / 2)
60 #_accumulator_age;_model_always_starts_with_age_0

# Catch Biomass
0 0 # Assumed Historic Equil. Catch

# Retained catch
# South North # Year CA OR WA
0.0 0.0 # 1910 0.0
10.0 0.0 # 1911 10.0
20.0 0.0 # 1912 20.0
30.0 0.0 # 1913 30.0
40.0 0.0 # 1914 40.0
50.0 0.0 # 1915 50.0
55.8 0.0 # 1916 55.8
152.1 0.0 # 1917 152.1
183.7 0.0 # 1918 183.7
192.7 0.0 # 1919 192.7
166.5 0.0 # 1920 166.5
254.6 0.0 # 1921 254.6
429.6 0.0 # 1922 429.6
493.9 0.0 # 1923 493.9
692.8 0.0 # 1924 692.8
763.5 0.0 # 1925 763.5
753.7 0.0 # 1926 753.7
```

913.1 0.0 # 1927 913.1
895.9 0.0 # 1928 895.9 0.0
1020.0 3.8 # 1929 1020.0 3.8
951.8 1.2 # 1930 951.8 1.2
820.2 1.2 # 1931 820.2 1.2
774.7 8.5 # 1932 774.7 8.5
724.2 5.3 # 1933 724.2 5.3
767.7 3.5 # 1934 767.7 3.5 0.0
785.2 7.1 # 1935 785.2 7.1 0.1
719.3 23.3 # 1936 719.3 23.0 0.3
726.1 107.7 # 1937 726.1 100.8 6.9
680.0 12.2 # 1938 680.0 5.1 7.1
861.5 316.8 # 1939 861.5 309.1 7.7
655.5 464.6 # 1940 655.5 436.9 27.8
412.2 666.4 # 1941 412.2 575.0 91.4
273.9 1124.2 # 1942 273.9 1047.1 77.0
408.8 3095.7 # 1943 408.8 2917.4 178.3
417.7 984.8 # 1944 417.7 722.8 262.0
683.3 1316.0 # 1945 683.3 1226.6 89.4
944.7 1688.1 # 1946 944.7 1450.6 237.5
1104.0 1008.8 # 1947 1104.0 921.7 87.1
3281.5 1392.0 # 1948 3281.5 1273.8 118.1
3578.9 1369.5 # 1949 3578.9 1362.4 7.1
4331.1 2911.9 # 1950 4331.1 2884.1 27.8
3910.5 3799.6 # 1951 3910.5 3755.9 43.7
5328.9 3359.8 # 1952 5328.9 3277.7 82.0
4039.0 1315.7 # 1953 4039.0 1296.0 19.7
4504.4 1645.3 # 1954 4504.4 1629.6 15.7
3712.9 1985.2 # 1955 3712.9 1950.7 34.5
South North # Year Con Mon Eur Col USV
3635.0 2230.0 # 1956 0.0 1335.0 2300.0 1242.0 988.0
3505.0 2086.0 # 1957 0.0 1076.0 2429.0 1701.0 385.0
3513.0 1757.0 # 1958 0.0 1266.0 2247.0 1289.0 468.0
3187.0 2728.0 # 1959 0.0 974.0 2213.0 2203.0 525.0
4112.0 3203.0 # 1960 0.0 1225.0 2887.0 2343.0 860.0
3433.0 2500.0 # 1961 0.0 1101.0 2332.0 1845.0 655.0
4279.0 2475.0 # 1962 39.0 1185.0 3055.0 2005.0 470.0
4360.0 3057.0 # 1963 0.0 1346.0 3014.0 2399.0 658.0
4258.0 2631.0 # 1964 68.0 1690.0 2500.0 2365.0 266.0
4954.0 1650.0 # 1965 46.0 1724.0 3184.0 1502.0 148.0
4795.0 1642.0 # 1966 0.0 1747.0 3048.0 1417.0 225.0
3242.0 1661.0 # 1967 0.0 1141.0 2101.0 1543.0 118.0
3945.0 2121.0 # 1968 0.0 681.0 3264.0 1714.0 407.0
6221.0 2546.0 # 1969 0.0 859.0 5362.0 2096.0 450.0
7047.0 2716.0 # 1970 10.0 1778.0 5259.0 2262.0 454.0
6675.0 2796.0 # 1971 0.0 1838.0 4837.0 2281.0 515.0
10128.0 2856.0 # 1972 22.0 2721.0 7385.0 2516.0 340.0
10384.0 2066.0 # 1973 13.0 3155.0 7216.0 1743.0 323.0
8991.0 2437.0 # 1974 19.0 2660.0 6312.0 2242.0 195.0
10456.0 2281.0 # 1975 69.0 2888.0 7499.0 2012.0 269.0
11244.0 2722.0 # 1976 78.0 3706.0 7460.0 2095.0 627.0
10746.0 2386.0 # 1977 63.0 4843.0 5840.0 1876.0 510.0

9615.0 4439.0 # 1978 50.0 4850.0 4715.0 3841.0 598.0
10865.0 7073.0 # 1979 31.0 4151.0 6683.0 5828.0 1245.0
8676.0 5410.0 # 1980 53.0 3151.0 5472.0 4282.0 1128.0
9822.1 6645.3 # 1981 61.3 3471.9 6289.0 5210.3 1435.0
10459.4 10459.1 # 1982 109.3 4520.0 5830.1 8451.8 2007.3
10116.1 9876.4 # 1983 368.9 4184.8 5562.3 6778.1 3098.3
10742.0 8462.9 # 1984 1285.9 4346.9 5109.1 5279.4 3183.6
13016.9 7519.7 # 1985 2831.6 4261.0 5924.3 4837.0 2682.7
11785.3 5569.3 # 1986 1241.4 5398.7 5145.2 4028.8 1540.5
11573.4 6837.4 # 1987 2471.5 3999.5 5102.4 5511.3 1326.1
9070.1 9047.0 # 1988 1656.9 2609.8 4803.4 6777.2 2269.8
8613.7 10129.7 # 1989 1612.2 2869.9 4131.6 7645.4 2484.3
7274.9 8385.0 # 1990 1375.5 2011.5 3887.9 6152.7 2232.2
8673.5 9524.8 # 1991 1474.1 3284.9 3914.4 7149.2 2375.6
9414.5 6572.4 # 1992 1834.8 3600.2 3979.6 4840.3 1732.1
7618.2 6677.1 # 1993 1217.9 2894.5 3505.8 5018.8 1658.4
5221.5 4121.2 # 1994 967.8 2126.4 2127.3 2970.2 1150.9
6759.0 3806.1 # 1995 1101.9 3252.1 2404.9 2626.7 1179.4
7212.5 4974.0 # 1996 1322.2 3242.0 2648.4 3514.7 1459.3
5970.6 4153.7 # 1997 1108.6 2748.8 2113.3 3157.9 995.8
4137.0 3873.4 # 1998 571.5 1276.5 2289.0 2976.0 897.5
4418.8 4718.6 # 1999 443.3 1749.6 2225.9 3611.2 1107.4
3945.4 4814.5 # 2000 238.5 1703.7 2003.2 3553.1 1261.4
2914.7 3974.5 # 2001 121.2 1294.5 1498.9 2519.1 1455.4
3504.7 2796.3 # 2002 288.3 1719.4 1497.0 2030.6 765.7
3906.8 3465.4 # 2003 352.2 1599.3 1955.4 2626.9 838.4
2684.0 4058.7 # 2004 312.5 1245.8 1125.7 3079.3 979.3

Biomass Indices
40 # N values
Year Seas Type Value CV
AFSC slope survey # inflator 1
1992 1 3 159240 0.1096 # 0.1096
1996 1 3 177386 0.1229 # 0.1229
1997 1 3 168108 0.1516 # 0.1516
1999 1 3 148619 0.1473 # 0.1473
2000 1 3 177142 0.1488 # 0.1488
2001 1 3 220885 0.1221 # 0.1221
NWFSC slope survey # inflator 1
1998 1 4 115822 0.0726 # 0.0726
1999 1 4 122591 0.0736 # 0.0736
2000 1 4 120546 0.0725 # 0.0725
2001 1 4 109609 0.0694 # 0.0694
2002 1 4 151939 0.0672 # 0.0672
2003 1 4 186134 0.1033 # 0.1033
2004 1 4 171266 0.0880 # 0.0880
"# Shelf survey, w/o water hauls" # inflator 1.5
1980 1 5 15216.6 0.1330 # 0.0887
1983 1 5 19808.3 0.1021 # 0.0681
1986 1 5 23562.9 0.0913 # 0.0609
1989 1 5 17216.9 0.1102 # 0.0735
1992 1 5 13949.5 0.1218 # 0.0812

1995 1 5 17502.7 0.1041 # 0.0694
1998 1 5 24822.5 0.1087 # 0.0724
2001 1 5 41478.3 0.0910 # 0.0607
2004 1 5 79747.8 0.0997 # 0.0665
Brodziak's trawl logbook biomass index # inflator 1
1978 1 6 512.7 0.1919 # -98.4
1979 1 6 456.6 0.1914 # -87.4
1980 1 6 432.6 0.1914 # -82.8
1981 1 6 421.5 0.1912 # -80.6
1982 1 6 379.1 0.1912 # -72.5
1983 1 6 332.6 0.1909 # -63.5
1984 1 6 284.3 0.1913 # -54.4
1985 1 6 331.0 0.1894 # -62.7
1986 1 6 339.7 0.1911 # -64.9
1987 1 6 300.0 0.1910 # -57.3
1988 1 6 305.5 0.1908 # -58.3
1989 1 6 251.1 0.1912 # -48.0
1990 1 6 208.5 0.1914 # -39.9
1991 1 6 205.6 0.1911 # -39.3
1992 1 6 198.3 0.1911 # -37.9
1993 1 6 243.6 0.1925 # -46.9
1994 1 6 152.1 0.1933 # -29.4
1995 1 6 204.3 0.1933 # -39.5

#_Discard_Biomass
2 #_(1=biomass;_2=fraction)
8 #_N_observations

Year Seas Type Value CV
South - size discards plus trip limits
1992 1 1 0.1271 0.2 # Humboldt State University study
2002 1 1 0.1834 0.2 # WCGOP
2003 1 1 0.1150 0.2 # WCGOP
North
1959 1 2 0.1465 0.2 # Hermann and Harry (1963)
1974 1 2 0.1670 0.2 # Methot et al (1990) based on TenEyck and Demory (1975)
1986 1 2 0.0700 0.2 # Pikitch study
2002 1 2 0.1170 0.2 # WCGOP
2003 1 2 0.1389 0.2 # WCGOP

#_Mean_BodyWt
8
Year Seas Type Mkt Value CV
South
2002 1 1 1 0.555 0.2 # discarded av wt in kg
2002 1 1 2 0.546 0.2 # retained av wt in kg
2003 1 1 1 0.568 0.2 # discarded av wt in kg
2003 1 1 2 0.558 0.2 # retained av wt in kg
North
2002 1 2 1 0.366 0.2 # discarded av wt in kg
2002 1 2 2 0.523 0.2 # retained av wt in kg
2003 1 2 1 0.357 0.2 # discarded av wt in kg

2003 1 2 2 0.600 0.2 # retained av wt in kg

-1 #_min_proportion_for_compressing_tails_of_observed_composition
0.0001 #_constant added to expected frequencies

26 #_N_length_bins
#_lower_edge_of_length_bins
12 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
102 # N size comps
Year Seas Fleet Sex Mkt Nsamp fl12 fl16 fl18 fl20 fl22 fl24 fl26 fl28 fl30 fl32 fl34 fl36 fl38 fl40 fl42
fl44 fl46 fl48 fl50 fl52 fl54 fl56 fl58 fl60 fl62 fl64p ml12 ml16 ml18 ml20 ml22 ml24 ml26 ml28 ml30
ml32 ml34 ml36 ml38 ml40 ml42 ml44 ml46 ml48 ml50 ml52 ml54 ml56 ml58 ml60 ml62 ml64p
Fishery Length Comps - South
1967 1 1 3 2 7.2 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.01000 0.01000 0.04000 0.06000 0.01000 0.02000 0.02000 0.01000 0.00000 0.01000
0.01000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.02000 0.08000 0.26000 0.24000 0.16000 0.03000 0.01000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1969 1 1 3 2 130.4 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00117 0.00583
0.02567 0.06651 0.08168 0.08168 0.05601 0.04084 0.02917 0.01400 0.00933 0.00467 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00117 0.00817 0.03267 0.10385 0.14353 0.10268 0.08868 0.05134 0.03034 0.01517
0.00583 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1970 1 1 3 2 101.4 0.00000 0.00000 0.00000 0.00000 0.00298 0.00000 0.00000 0.00000 0.00745 0.01788
0.05812 0.15052 0.13711 0.08942 0.06856 0.06259 0.04471 0.01639 0.00596 0.00000 0.00149
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00149 0.00000
0.00000 0.00000 0.00149 0.01490 0.03279 0.10581 0.08942 0.05812 0.01639 0.01043 0.00447
0.00149 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1971 1 1 3 2 210.1 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00138 0.00000 0.00276
0.02069 0.06069 0.08414 0.05931 0.04552 0.04414 0.03862 0.01517 0.01103 0.00966 0.00138
0.00000 0.00138 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00138 0.00414 0.02621 0.08965 0.14345 0.14345 0.08138 0.06345 0.03586 0.00966
0.00414 0.00138 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1972 1 1 3 2 376.8 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00239 0.00359 0.00958
0.06284 0.10533 0.10772 0.09755 0.07660 0.06403 0.03351 0.02454 0.01257 0.00419 0.00120
0.00060 0.00000 0.00120 0.00000 0.00060 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00060 0.00000 0.00239 0.01915 0.06104 0.08199 0.09036 0.06164 0.05087 0.01257 0.00838
0.00180 0.00060 0.00060 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1973 1 1 3 2 297.1 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00072 0.00143 0.01143
0.05286 0.11214 0.12357 0.08572 0.06214 0.05286 0.02929 0.01857 0.01143 0.01143 0.00500
0.00429 0.00072 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00072 0.00000
0.00072 0.00072 0.00500 0.02714 0.06286 0.09500 0.09786 0.06643 0.04214 0.01143 0.00429
0.00214 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1974 1 1 3 2 268.1 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00077 0.00077 0.00693 0.01001
0.05081 0.11239 0.11085 0.10393 0.06928 0.05004 0.04234 0.02386 0.01001 0.00462 0.00462
0.00077 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00462 0.01386 0.01924 0.06467 0.07236 0.09161 0.07005 0.03618 0.01694 0.00770
0.00077 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1975 1 1 3 2 210.1 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00273 0.01638
0.03458 0.08098 0.11374 0.09554 0.07643 0.05914 0.04004 0.02366 0.00819 0.01365 0.00728
0.00364 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000

0.00000 0.00091 0.00728 0.02639 0.06824 0.10100 0.09008 0.07461 0.03458 0.01547 0.00273
0.00091 0.00091 0.00000 0.00000 0.00091 0.00000 0.00000 0.00000 0.00000
1976 1 1 3 2 282.6 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00036 0.00142 0.00349 0.02973
0.06068 0.08308 0.08829 0.10676 0.07981 0.06105 0.03673 0.02025 0.01091 0.00449 0.00000
0.00000 0.00136 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00142 0.01439 0.04183 0.09166 0.09697 0.06658 0.05704 0.02737 0.01148 0.00285
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1977 1 1 3 2 471.0 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00153 0.00484 0.01868
0.04778 0.07284 0.08551 0.07616 0.07722 0.05130 0.03764 0.02468 0.00924 0.00402 0.00218
0.00123 0.00063 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00030
0.00030 0.00123 0.01280 0.04647 0.10284 0.11964 0.09043 0.05678 0.03392 0.01356 0.00467
0.00063 0.00093 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1978 1 1 3 2 456.5 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00372 0.02094
0.02603 0.05450 0.08265 0.08345 0.08715 0.06792 0.04924 0.02329 0.01068 0.00259 0.00259
0.00000 0.00129 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00113 0.00744 0.02749 0.05951 0.10399 0.11683 0.09403 0.04623 0.01932 0.00501
0.00299 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1979 1 1 3 2 268.1 0.00000 0.00000 0.00000 0.00000 0.00000 0.00066 0.00000 0.00000 0.00133 0.01234
0.02913 0.07577 0.08331 0.07777 0.07496 0.06439 0.05767 0.02225 0.01257 0.00503 0.00503
0.00185 0.00066 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00066
0.00000 0.00199 0.00199 0.02705 0.05543 0.08953 0.10972 0.11697 0.05589 0.01404 0.00066
0.00133 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1980 1 1 3 2 833.3 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00024 0.00236 0.00658 0.02468
0.05444 0.08580 0.09130 0.08532 0.06710 0.05339 0.03648 0.01954 0.01097 0.00518 0.00165
0.00164 0.00024 0.00071 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00235 0.01573 0.04525 0.09151 0.11292 0.08317 0.05951 0.02652 0.01031 0.00421
0.00047 0.00047 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1981 1 1 3 2 587.0 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00045 0.00285 0.00515 0.01494
0.04228 0.05570 0.07198 0.07588 0.06895 0.05665 0.05171 0.02284 0.01545 0.00672 0.00196
0.00151 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00050 0.00000
0.00000 0.00235 0.01108 0.04366 0.10160 0.10002 0.10300 0.07193 0.04326 0.02267 0.00347
0.00145 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1982 1 1 3 2 485.5 0.00000 0.00000 0.00023 0.00000 0.00000 0.00000 0.00000 0.00047 0.00820 0.02729
0.03450 0.05317 0.06098 0.06178 0.07071 0.06037 0.04450 0.01695 0.00894 0.00335 0.00102
0.00070 0.00023 0.00023 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00079 0.00181 0.01657 0.05888 0.08025 0.11944 0.11036 0.08765 0.05125 0.01601 0.00186
0.00149 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1983 1 1 3 2 789.9 0.00000 0.00000 0.00000 0.00000 0.00008 0.00000 0.00070 0.00216 0.00958 0.03814
0.07178 0.07908 0.07073 0.06257 0.05799 0.04965 0.03735 0.01985 0.01241 0.00547 0.00413
0.00149 0.00014 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00014 0.00000
0.00146 0.00607 0.02201 0.06326 0.10612 0.10118 0.07989 0.05017 0.02817 0.01268 0.00311
0.00168 0.00000 0.00022 0.00053 0.00000 0.00000 0.00000 0.00000 0.00000
1984 1 1 3 2 666.7 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00007 0.00100 0.01201 0.05148
0.07228 0.08077 0.06989 0.05238 0.06368 0.05092 0.04131 0.01946 0.01129 0.00492 0.00177
0.00060 0.00090 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00030 0.00000
0.00000 0.00254 0.01758 0.05331 0.09672 0.09937 0.07810 0.05420 0.04020 0.01515 0.00689
0.00090 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1985 1 1 3 2 920.3 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00042 0.00190 0.01065 0.03786
0.07191 0.08434 0.07647 0.06293 0.05716 0.04196 0.03172 0.01758 0.01026 0.00339 0.00208
0.00030 0.00013 0.00030 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00013 0.00013
0.00041 0.00565 0.03578 0.08284 0.10404 0.09539 0.07194 0.04683 0.02945 0.01116 0.00388
0.00101 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000

1986 1 1 3 2 760.9 0.00000 0.00000 0.00000 0.00000 0.00000 0.00023 0.00098 0.00342 0.02052 0.04354
0.07430 0.08063 0.08108 0.05773 0.05301 0.05226 0.02667 0.01706 0.00768 0.00610 0.00251
0.00000 0.00053 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00061
0.00205 0.01541 0.04565 0.08549 0.08926 0.07554 0.06971 0.05049 0.02483 0.00832 0.00296
0.00090 0.00000 0.00000 0.00053 0.00000 0.00000 0.00000 0.00000 0.00000
1987 1 1 3 2 695.7 0.00000 0.00000 0.00000 0.00000 0.00000 0.00017 0.00188 0.00717 0.02923 0.04943
0.08047 0.06722 0.06035 0.05880 0.05328 0.03852 0.02333 0.01564 0.00835 0.00153 0.00126
0.00077 0.00194 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00202 0.01311 0.05620 0.10451 0.10256 0.07721 0.06332 0.04695 0.02047 0.01157 0.00205
0.00052 0.00017 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1988 1 1 3 2 710.1 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00054 0.00670 0.02168 0.05086
0.07533 0.07701 0.07075 0.07312 0.06314 0.04930 0.03086 0.01896 0.00424 0.00220 0.00063
0.00032 0.00018 0.00047 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00299 0.01188 0.04931 0.09013 0.09569 0.08065 0.05657 0.03364 0.02217 0.00581 0.00298
0.00127 0.00000 0.00016 0.00000 0.00000 0.00047 0.00000 0.00000 0.00000
1989 1 1 3 2 934.8 0.00000 0.00000 0.00000 0.00000 0.00000 0.00016 0.00092 0.00871 0.02448 0.04855
0.06013 0.06514 0.06933 0.06689 0.07108 0.06968 0.03759 0.01946 0.00736 0.00291 0.00016
0.00093 0.00028 0.00022 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00016 0.00000
0.00258 0.00980 0.03853 0.07796 0.08992 0.06892 0.06503 0.05349 0.02430 0.01291 0.00225
0.00016 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1990 1 1 3 2 746.4 0.00000 0.00021 0.00000 0.00000 0.00000 0.00041 0.00278 0.01210 0.02352 0.04637
0.06216 0.06211 0.06851 0.06096 0.06299 0.05894 0.03537 0.01663 0.00652 0.00280 0.00119
0.00021 0.00000 0.00041 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00021 0.00103
0.00509 0.02262 0.05471 0.10117 0.09263 0.07021 0.05218 0.03905 0.02402 0.00976 0.00196
0.00082 0.00036 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1991 1 1 3 2 978.3 0.00000 0.00000 0.00000 0.00000 0.00000 0.00014 0.00151 0.00712 0.02125 0.04771
0.07250 0.07506 0.06999 0.05735 0.05192 0.03467 0.02702 0.01062 0.00508 0.00296 0.00083
0.00032 0.00028 0.00000 0.00018 0.00014 0.00000 0.00000 0.00000 0.00018 0.00000 0.00055
0.00363 0.01657 0.05780 0.11473 0.11627 0.08325 0.05354 0.03504 0.02088 0.00785 0.00214
0.00094 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1992 1 1 3 2 1000.0 0.00000 0.00000 0.00000 0.00000 0.00000 0.00026 0.00067 0.00500 0.02166
0.04775 0.06482 0.07919 0.06594 0.06380 0.05563 0.04866 0.03022 0.01716 0.00885 0.00294
0.00161 0.00053 0.00027 0.00013 0.00000 0.00026 0.00000 0.00000 0.00000 0.00013 0.00013
0.00067 0.00377 0.01669 0.05020 0.09839 0.10653 0.07854 0.05392 0.04342 0.02040 0.00904
0.00231 0.00013 0.00026 0.00013 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1993 1 1 3 2 623.2 0.00000 0.00000 0.00000 0.00000 0.00000 0.00035 0.00176 0.01045 0.02735 0.04455
0.06275 0.07622 0.05910 0.06719 0.04646 0.05270 0.03077 0.01845 0.00909 0.00360 0.00204
0.00035 0.00000 0.00000 0.00000 0.00015 0.00000 0.00000 0.00000 0.00000 0.00036 0.00036
0.00564 0.02015 0.05426 0.08940 0.09347 0.08124 0.06150 0.04453 0.02316 0.00900 0.00292
0.00069 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1994 1 1 3 2 514.5 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00095 0.01183 0.04269 0.08001
0.08944 0.06866 0.06422 0.04789 0.03901 0.04258 0.02066 0.01345 0.00676 0.00320 0.00179
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00095
0.00945 0.02901 0.07927 0.10112 0.07510 0.05406 0.04663 0.03764 0.02187 0.00833 0.00185
0.00156 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1995 1 1 3 2 724.6 0.00000 0.00000 0.00000 0.00000 0.00085 0.00000 0.00126 0.00774 0.02283 0.03850
0.06429 0.05762 0.06675 0.06033 0.06441 0.05942 0.03455 0.01845 0.00737 0.00249 0.00172
0.00107 0.00022 0.00062 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00107 0.00022
0.00329 0.01279 0.03653 0.06774 0.09331 0.08680 0.07394 0.05824 0.04013 0.01050 0.00319
0.00110 0.00040 0.00000 0.00022 0.00000 0.00000 0.00000 0.00000 0.00000
1996 1 1 3 2 695.7 0.00000 0.00000 0.00000 0.00000 0.00021 0.00021 0.00136 0.00337 0.01118 0.03513
0.06537 0.07057 0.06997 0.06059 0.04756 0.05086 0.03479 0.01642 0.00860 0.00302 0.00231

0.00021 0.00042 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00053 0.00062
0.00241 0.01203 0.03580 0.07252 0.09804 0.09992 0.07922 0.06373 0.04048 0.00862 0.00250
0.00042 0.00061 0.00021 0.00021 0.00000 0.00000 0.00000 0.00000 0.00000
1997 1 1 3 2 688.4 0.00000 0.00000 0.00000 0.00000 0.00025 0.00049 0.00099 0.00509 0.01809 0.05259
0.07981 0.08466 0.07059 0.06267 0.04968 0.03693 0.02596 0.01709 0.00729 0.00372 0.00121
0.00048 0.00025 0.00024 0.00000 0.00024 0.00000 0.00000 0.00000 0.00000 0.00048 0.00073
0.00183 0.01354 0.04148 0.08567 0.10275 0.08639 0.06938 0.04486 0.02468 0.00681 0.00260
0.00000 0.00024 0.00024 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1998 1 1 3 2 739.1 0.00000 0.00000 0.00000 0.00000 0.00022 0.00000 0.00050 0.00595 0.02387 0.05368
0.07952 0.08599 0.07615 0.06564 0.05049 0.03394 0.02601 0.00970 0.00542 0.00425 0.00316
0.00131 0.00044 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00022 0.00022
0.00170 0.01510 0.04880 0.09736 0.11200 0.08421 0.05523 0.03278 0.01673 0.00680 0.00125
0.00139 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1999 1 1 3 2 666.7 0.00000 0.00000 0.00000 0.00000 0.00000 0.00023 0.00135 0.00299 0.02299 0.05837
0.08724 0.08355 0.07232 0.06318 0.04192 0.03778 0.02278 0.01349 0.00516 0.00460 0.00255
0.00151 0.00080 0.00023 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00023
0.00393 0.01286 0.04623 0.10627 0.10764 0.07745 0.04735 0.04216 0.02007 0.00876 0.00192
0.00161 0.00023 0.00000 0.00023 0.00000 0.00000 0.00000 0.00000 0.00000
2000 1 1 3 2 659.4 0.00000 0.00000 0.00000 0.00035 0.00035 0.00070 0.00197 0.00788 0.03179 0.06349
0.07673 0.07209 0.06089 0.05710 0.04434 0.03375 0.02508 0.01187 0.00591 0.00209 0.00278
0.00046 0.00023 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00023 0.00058
0.00475 0.02104 0.04947 0.10782 0.11367 0.08366 0.04886 0.03979 0.01981 0.00598 0.00290
0.00093 0.00070 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
2001 1 1 3 2 652.2 0.00000 0.00000 0.00000 0.00000 0.00071 0.00014 0.00007 0.00372 0.01026 0.03812
0.07091 0.08152 0.07990 0.06666 0.05775 0.04372 0.03103 0.01718 0.01225 0.00454 0.00255
0.00306 0.00076 0.00025 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00051 0.00033
0.00135 0.00888 0.02918 0.07784 0.12528 0.09348 0.06093 0.04274 0.02047 0.00904 0.00282
0.00084 0.00071 0.00025 0.00000 0.00025 0.00000 0.00000 0.00000 0.00000
2002 1 1 3 2 905.8 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00068 0.00348 0.01548 0.04309
0.07518 0.09802 0.08346 0.07314 0.05089 0.03652 0.03062 0.01696 0.00704 0.00361 0.00197
0.00085 0.00020 0.00020 0.00000 0.00000 0.00000 0.00000 0.00000 0.00044 0.00000 0.00000
0.00213 0.00706 0.02855 0.06842 0.12097 0.10489 0.05913 0.03891 0.01716 0.00675 0.00277
0.00040 0.00064 0.00040 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
2003 1 1 3 2 963.8 0.00000 0.00000 0.00000 0.00000 0.00000 0.00038 0.00058 0.00374 0.01159 0.03634
0.06297 0.07555 0.06853 0.05079 0.04224 0.02960 0.02362 0.01332 0.00663 0.00272 0.00273
0.00233 0.00019 0.00000 0.00019 0.00019 0.00000 0.00000 0.00000 0.00000 0.00058 0.00019
0.00194 0.01191 0.04228 0.10859 0.15707 0.11951 0.06521 0.03243 0.01680 0.00539 0.00192
0.00116 0.00058 0.00019 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
2004 1 1 3 2 644.9 0.00000 0.00000 0.00000 0.00000 0.00023 0.00051 0.00160 0.00959 0.01879 0.04592
0.07406 0.07298 0.06007 0.04874 0.02709 0.02473 0.01946 0.00718 0.00108 0.00136 0.00051
0.00028 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00080
0.00268 0.01273 0.05704 0.12714 0.14900 0.11796 0.06601 0.02899 0.01425 0.00653 0.00220
0.00023 0.00023 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
Fishery Length Comps - North
OR study of at-sea vs landed sizes
1959 1 2 0 0 60 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00193 0.01349 0.02312 0.05299
0.10212 0.19075 0.16474 0.13295 0.08189 0.05588 0.04335 0.02987 0.02408 0.02890 0.01734
0.02216 0.00771 0.00578 0.00096 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1959 1 2 0 2 40 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.01700
0.07300 0.16300 0.20000 0.17400 0.10000 0.08200 0.07100 0.03400 0.02700 0.02300 0.01500

0.01200 0.00600 0.00300 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1960 1 2 0 0 100 0.00000 0.00000 0.00000 0.00000 0.00070 0.00000 0.00141 0.00986 0.01479 0.02606
0.05915 0.09437 0.17676 0.17535 0.12254 0.08803 0.06338 0.04930 0.03662 0.03521 0.01831
0.01690 0.00845 0.00211 0.00070 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1960 1 2 0 2 80 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00168 0.00712
0.03435 0.09929 0.16045 0.17051 0.13741 0.11395 0.08840 0.06200 0.03854 0.03435 0.01760
0.02011 0.00838 0.00293 0.00209 0.00084 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1961 1 2 0 0 140 0.00000 0.00000 0.00000 0.00251 0.00335 0.00251 0.00587 0.01425 0.03437 0.04946
0.07293 0.12238 0.12741 0.14753 0.09556 0.09723 0.06873 0.04359 0.03940 0.02850 0.02012
0.01090 0.00838 0.00168 0.00335 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1961 1 2 0 2 60 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00472 0.02900
0.08564 0.14902 0.16858 0.16521 0.11059 0.08833 0.06339 0.04248 0.03574 0.02360 0.01349
0.00742 0.00607 0.00405 0.00202 0.00067 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
Normal market sample data series
1966 1 2 3 2 253.6 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00028 0.00112 0.00306 0.02063
0.06353 0.08114 0.10178 0.09776 0.07686 0.06560 0.04570 0.02829 0.02188 0.01111 0.01055
0.00832 0.00374 0.00195 0.00000 0.00028 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00112 0.00502 0.02939 0.06217 0.08555 0.07294 0.05203 0.02560 0.01417 0.00709
0.00112 0.00000 0.00000 0.00028 0.00000 0.00000 0.00000 0.00000 0.00000
1967 1 2 3 2 195.7 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00235 0.00824
0.05494 0.10635 0.12129 0.10211 0.08201 0.04526 0.04154 0.02888 0.02323 0.01085 0.01335
0.00618 0.00392 0.00106 0.00118 0.00078 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00314 0.02002 0.06176 0.10030 0.07185 0.04471 0.02256 0.01189 0.00643
0.00289 0.00053 0.00000 0.00039 0.00000 0.00000 0.00000 0.00000 0.00000
1968 1 2 3 2 224.6 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00067 0.00900
0.03766 0.08328 0.11465 0.11745 0.10009 0.07141 0.04661 0.02988 0.01986 0.01253 0.00693
0.00565 0.00137 0.00209 0.00014 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00034 0.00200 0.01281 0.03928 0.06443 0.06225 0.06373 0.04861 0.02594 0.01310
0.00643 0.00151 0.00028 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1969 1 2 3 2 202.9 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00107 0.00501 0.02143
0.06073 0.10933 0.12004 0.11576 0.09825 0.06181 0.05359 0.03251 0.02251 0.01358 0.00929
0.00393 0.00250 0.00071 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00036 0.00250 0.02072 0.06824 0.06752 0.05430 0.03001 0.01572 0.00572 0.00179
0.00071 0.00036 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1970 1 2 3 2 282.6 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00033 0.00199 0.02125
0.04172 0.08149 0.10026 0.10254 0.09281 0.06640 0.04210 0.02914 0.01690 0.01135 0.00516
0.00176 0.00253 0.00205 0.00039 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00133 0.00475 0.02692 0.05341 0.08513 0.08201 0.06051 0.04014 0.01571 0.00759
0.00168 0.00048 0.00011 0.00006 0.00000 0.00000 0.00000 0.00000 0.00000
1971 1 2 3 2 72.5 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00243 0.00730
0.02991 0.05182 0.03842 0.04587 0.04589 0.07070 0.02603 0.01293 0.01847 0.02554 0.01161
0.00188 0.00349 0.00278 0.00011 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000

0.00000 0.00487 0.00243 0.02956 0.09971 0.15217 0.13014 0.08605 0.06805 0.01750 0.00759
0.00396 0.00267 0.00011 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1972 1 2 3 2 144.9 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00125 0.01247
0.03257 0.06382 0.09158 0.09909 0.07326 0.05410 0.04101 0.02972 0.02235 0.01667 0.00737
0.00688 0.00470 0.00016 0.00008 0.00125 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00062 0.00000 0.00756 0.02961 0.07600 0.11485 0.08268 0.06171 0.03812 0.01616 0.00682
0.00471 0.00204 0.00078 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1973 1 2 3 2 159.4 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00182 0.01093 0.03799
0.07624 0.09506 0.08371 0.08106 0.06623 0.05591 0.03831 0.02538 0.01748 0.01020 0.00654
0.00269 0.00228 0.00041 0.00000 0.00020 0.00000 0.00000 0.00000 0.00045 0.00000 0.00000
0.00045 0.00091 0.00911 0.02758 0.06429 0.09516 0.07950 0.05243 0.02791 0.01887 0.00763
0.00285 0.00020 0.00020 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1974 1 2 3 2 137.7 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00165 0.01158 0.02882
0.07474 0.12577 0.11351 0.09372 0.08020 0.04970 0.04314 0.02394 0.01523 0.00998 0.00541
0.00138 0.00110 0.00000 0.00000 0.00055 0.00000 0.00000 0.00000 0.00000 0.00000 0.00055
0.00000 0.00441 0.01449 0.03975 0.06461 0.07390 0.05880 0.03677 0.01510 0.00602 0.00293
0.00140 0.00014 0.00055 0.00014 0.00000 0.00000 0.00000 0.00000 0.00000
1975 1 2 3 2 101.4 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00149 0.01025
0.03789 0.08594 0.11783 0.10179 0.09530 0.05643 0.03167 0.01445 0.00879 0.00526 0.00263
0.00074 0.00021 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.01079 0.02504 0.06412 0.12172 0.09589 0.05775 0.04173 0.00851 0.00155
0.00074 0.00074 0.00000 0.00000 0.00074 0.00000 0.00000 0.00000 0.00000
1976 1 2 3 2 123.2 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00084 0.00478 0.01392
0.03580 0.11003 0.12053 0.11110 0.07459 0.06170 0.03997 0.03415 0.02402 0.01595 0.00490
0.00322 0.00038 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00252 0.01096 0.04157 0.06453 0.07858 0.06998 0.03426 0.02602 0.00861 0.00579
0.00102 0.00026 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1977 1 2 3 2 101.4 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00067 0.00202 0.02420
0.04436 0.07763 0.09913 0.10416 0.08098 0.06821 0.05611 0.03864 0.02016 0.01075 0.00504
0.00403 0.00269 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00134 0.00773 0.02958 0.06216 0.08132 0.07190 0.05846 0.03057 0.01143 0.00504
0.00168 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1978 1 2 3 2 36.2 0.00000 0.00000 0.00000 0.00000 0.00000 0.00200 0.00200 0.00600 0.02600 0.04200
0.09800 0.07800 0.07800 0.03800 0.05200 0.03600 0.02200 0.02400 0.00800 0.00800 0.00800
0.00200 0.00000 0.00400 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.01400 0.04400 0.08000 0.09800 0.08600 0.07200 0.03800 0.02200 0.00800 0.00200
0.00200 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1979 1 2 3 2 152.2 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00143 0.00048 0.00715 0.03144
0.05622 0.08337 0.10386 0.08718 0.06813 0.03907 0.03097 0.02573 0.01286 0.00715 0.00524
0.00429 0.00048 0.00000 0.00095 0.00048 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00095 0.00286 0.01763 0.05622 0.09481 0.09481 0.07766 0.03907 0.02716 0.01477 0.00524
0.00048 0.00095 0.00000 0.00000 0.00048 0.00048 0.00000 0.00000 0.00000
1980 1 2 3 2 173.9 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.01294 0.03591
0.08393 0.12192 0.12484 0.10397 0.08017 0.05136 0.04008 0.02255 0.01628 0.00960 0.00668
0.00292 0.00042 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00084 0.00292 0.01712 0.03758 0.06597 0.06221 0.04802 0.03883 0.00793 0.00376 0.00084
0.00042 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1981 1 2 3 2 260.9 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00024 0.00332 0.02207
0.05459 0.08489 0.07816 0.07041 0.06147 0.04954 0.03819 0.01756 0.01454 0.01074 0.00524
0.00287 0.00048 0.00071 0.00024 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00024 0.00261 0.01163 0.04948 0.08703 0.09675 0.09029 0.07056 0.04572 0.01867 0.00696
0.00338 0.00000 0.00097 0.00048 0.00000 0.00000 0.00000 0.00000 0.00000

1982 1 2 3 2 246.4 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00025 0.00250 0.00899 0.04683
0.09360 0.07691 0.06855 0.06828 0.05779 0.03334 0.02802 0.01685 0.01011 0.00556 0.00506
0.00125 0.00050 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00025
0.00050 0.00924 0.03328 0.08317 0.10556 0.08382 0.06365 0.04300 0.03106 0.01354 0.00618
0.00212 0.00025 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1983 1 2 3 2 195.7 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00110 0.01084 0.05016
0.09930 0.11835 0.09639 0.08043 0.05264 0.03296 0.03554 0.02460 0.01824 0.01096 0.00451
0.00110 0.00175 0.00120 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00110 0.00827 0.03906 0.07858 0.09078 0.06329 0.03412 0.01675 0.01492 0.00516 0.00498
0.00175 0.00120 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1984 1 2 3 2 231.9 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00020 0.00196 0.01295 0.04821
0.09117 0.10416 0.07907 0.06816 0.04829 0.04660 0.02572 0.01491 0.00961 0.00471 0.00393
0.00571 0.00177 0.00020 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00059
0.00196 0.00920 0.02819 0.07973 0.09267 0.06705 0.05946 0.04996 0.02735 0.01476 0.00039
0.00117 0.00020 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1985 1 2 3 2 311.6 0.00000 0.00000 0.00000 0.00024 0.00000 0.00000 0.00024 0.00356 0.01684 0.05027
0.09817 0.09177 0.05739 0.03296 0.02822 0.03178 0.02277 0.01447 0.00830 0.00450 0.00308
0.00166 0.00095 0.00095 0.00000 0.00000 0.00000 0.00000 0.00000 0.00095 0.00000 0.00071
0.00522 0.02063 0.05667 0.11051 0.10434 0.07422 0.05383 0.04197 0.04008 0.01589 0.00498
0.00142 0.00047 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
Pikitch discard study
1986 1 2 3 1 100 0.00000 0.00000 0.00500 0.00000 0.02000 0.03500 0.07500 0.14000 0.06500 0.03000
0.00000 0.00500 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00500 0.01500 0.10500
0.17000 0.19500 0.11500 0.02000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
Normal market sample data series continued
1986 1 2 3 2 224.6 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00064 0.00289 0.01123 0.04267
0.08373 0.09176 0.07347 0.05614 0.04363 0.03497 0.02470 0.01508 0.00738 0.00449 0.00353
0.00225 0.00064 0.00032 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00032
0.00096 0.01315 0.05262 0.09593 0.11229 0.08662 0.05294 0.03850 0.02470 0.01251 0.00706
0.00192 0.00096 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
Pikitch discard study
1987 1 2 3 1 100 0.00000 0.00000 0.01124 0.01124 0.02247 0.03745 0.07678 0.11049 0.07865 0.02996
0.00375 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00375 0.00000 0.00936 0.02434 0.03745 0.06929
0.14981 0.20412 0.10112 0.01498 0.00375 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
Normal market sample data series continued
1987 1 2 3 2 282.6 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00204 0.00611 0.02471 0.06037
0.08533 0.08151 0.06037 0.04381 0.02649 0.01987 0.01605 0.01146 0.00739 0.00433 0.00255
0.00051 0.00102 0.00000 0.00000 0.00025 0.00000 0.00000 0.00000 0.00000 0.00000 0.00102
0.00866 0.04152 0.08049 0.13882 0.12506 0.07412 0.03770 0.01910 0.01197 0.00458 0.00153
0.00127 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1988 1 2 3 2 427.5 0.00000 0.00000 0.00000 0.00000 0.00000 0.00055 0.00109 0.00684 0.01861 0.05186
0.08278 0.08471 0.07239 0.05310 0.04161 0.02888 0.01765 0.01588 0.00903 0.00547 0.00452
0.00178 0.00096 0.00000 0.00041 0.00027 0.00000 0.00000 0.00000 0.00000 0.00000 0.00164
0.00356 0.01683 0.05705 0.11356 0.12999 0.08566 0.04557 0.02422 0.01190 0.00602 0.00397
0.00096 0.00068 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1989 1 2 3 2 579.7 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00053 0.00396 0.01596 0.04153
0.07630 0.07656 0.06303 0.04898 0.03635 0.02975 0.02024 0.01760 0.01036 0.00877 0.00380
0.00259 0.00122 0.00021 0.00021 0.00021 0.00000 0.00000 0.00000 0.00000 0.00000 0.00053

0.00317 0.01268 0.06367 0.12749 0.13315 0.08988 0.05083 0.03028 0.01300 0.01046 0.00470
0.00069 0.00069 0.00063 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1990 1 2 3 2 572.5 0.00000 0.00000 0.00000 0.00000 0.00000 0.00025 0.00075 0.00453 0.01686 0.04462
0.06337 0.07482 0.07037 0.04779 0.05035 0.04841 0.03547 0.02113 0.01299 0.00710 0.00509
0.00306 0.00127 0.00180 0.00076 0.00026 0.00000 0.00000 0.00000 0.00000 0.00000 0.00075
0.00251 0.01432 0.04984 0.09995 0.10425 0.06792 0.04569 0.04101 0.03591 0.01897 0.00606
0.00152 0.00000 0.00000 0.00025 0.00000 0.00000 0.00000 0.00000 0.00000
1991 1 2 3 2 746.4 0.00000 0.00000 0.00000 0.00000 0.00020 0.00000 0.00137 0.00405 0.02086 0.05594
0.08407 0.07745 0.05948 0.04499 0.03865 0.03216 0.02299 0.01603 0.01178 0.00669 0.00431
0.00179 0.00109 0.00067 0.00036 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00078
0.00388 0.02222 0.07893 0.12904 0.12602 0.06624 0.03806 0.02326 0.01497 0.00794 0.00277
0.00078 0.00017 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1992 1 2 3 2 659.4 0.00000 0.00000 0.00000 0.00000 0.00000 0.00048 0.00024 0.00456 0.01237 0.04779
0.07339 0.08513 0.07940 0.06803 0.04749 0.03983 0.02415 0.01950 0.01269 0.00651 0.00553
0.00327 0.00070 0.00166 0.00024 0.00024 0.00000 0.00000 0.00000 0.00000 0.00024 0.00048
0.00260 0.01577 0.05306 0.10582 0.09625 0.07714 0.04856 0.02969 0.02231 0.00853 0.00541
0.00072 0.00024 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1993 1 2 3 2 326.1 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00201 0.01181 0.02851 0.04316
0.09692 0.09664 0.07183 0.05576 0.03890 0.03127 0.02114 0.00900 0.00811 0.00590 0.00531
0.00274 0.00059 0.00020 0.00020 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00134
0.01007 0.02582 0.07808 0.10325 0.09070 0.06205 0.04466 0.02525 0.01474 0.00976 0.00330
0.00098 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1994 1 2 3 2 318.8 0.00000 0.00000 0.00000 0.00000 0.00000 0.00047 0.00189 0.00650 0.02457 0.04330
0.06185 0.06404 0.05194 0.05182 0.03637 0.02277 0.02397 0.01528 0.01235 0.00293 0.00280
0.00198 0.00176 0.00000 0.00034 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00095
0.01515 0.04205 0.09817 0.13187 0.10445 0.07355 0.04046 0.02957 0.02350 0.00809 0.00361
0.00163 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1995 1 2 3 2 340.6 0.00000 0.00000 0.00000 0.00000 0.00000 0.00102 0.00305 0.02098 0.03482 0.05619
0.06210 0.07500 0.05370 0.03588 0.02549 0.01689 0.01223 0.01528 0.00637 0.00242 0.00407
0.00223 0.00024 0.00024 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00051 0.00051
0.01778 0.04380 0.08859 0.12350 0.14375 0.07321 0.03138 0.02513 0.01337 0.00539 0.00340
0.00125 0.00024 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1996 1 2 3 2 311.6 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00068 0.00543 0.02094 0.06544
0.09562 0.09468 0.06912 0.04261 0.03122 0.02674 0.02269 0.02217 0.01098 0.00973 0.00448
0.00322 0.00050 0.00136 0.00050 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00136
0.00636 0.02934 0.06229 0.09016 0.11115 0.08310 0.03100 0.02655 0.01495 0.00844 0.00338
0.00312 0.00000 0.00000 0.00000 0.00000 0.00068 0.00000 0.00000 0.00000
1997 1 2 3 2 340.6 0.00000 0.00000 0.00000 0.00000 0.00000 0.00061 0.00183 0.00507 0.01581 0.04260
0.08964 0.10773 0.08823 0.06130 0.04162 0.02476 0.01360 0.01339 0.00772 0.00609 0.00406
0.00143 0.00081 0.00020 0.00020 0.00020 0.00000 0.00000 0.00000 0.00020 0.00000 0.00061
0.00487 0.02757 0.06751 0.11804 0.10572 0.06576 0.04059 0.01968 0.01197 0.00649 0.00183
0.00122 0.00081 0.00020 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1998 1 2 3 2 405.8 0.00000 0.00000 0.00000 0.00000 0.00051 0.00000 0.00051 0.00274 0.01313 0.03849
0.08986 0.10720 0.11241 0.08197 0.04915 0.03962 0.02947 0.01684 0.01541 0.00633 0.00806
0.00359 0.00021 0.00072 0.00000 0.00021 0.00000 0.00000 0.00000 0.00000 0.00021 0.00000
0.00165 0.01322 0.03357 0.07244 0.10030 0.07477 0.04815 0.01777 0.01376 0.00426 0.00254
0.00042 0.00000 0.00051 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1999 1 2 3 2 405.8 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00515 0.01726 0.04254
0.08533 0.11354 0.09192 0.07607 0.05222 0.03035 0.02060 0.01403 0.00833 0.00650 0.00412
0.00206 0.00087 0.00016 0.00016 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00055
0.00333 0.02035 0.05568 0.11740 0.10850 0.06739 0.02941 0.01562 0.00579 0.00262 0.00064
0.00135 0.00016 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000

2000 1 2 3 2 384.1 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00273 0.01041 0.01999 0.03928
0.08095 0.08983 0.08774 0.06389 0.04737 0.03239 0.02341 0.01007 0.00833 0.00575 0.00471
0.00278 0.00149 0.00000 0.00055 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00055
0.00218 0.02043 0.06581 0.11199 0.11602 0.07178 0.03889 0.01950 0.01037 0.00709 0.00298
0.00074 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
2001 1 2 3 2 355.1 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00064 0.00508 0.01682
0.05869 0.08370 0.09225 0.06970 0.06498 0.04885 0.03141 0.01713 0.01905 0.00921 0.00729
0.00316 0.00222 0.00063 0.00127 0.00000 0.00000 0.00000 0.00000 0.00064 0.00000 0.00000
0.00159 0.01146 0.03592 0.08282 0.11887 0.10079 0.06023 0.02474 0.01464 0.00731 0.00381
0.00159 0.00254 0.00064 0.00032 0.00000 0.00000 0.00000 0.00000 0.00000
2002 1 2 3 2 384.1 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00172 0.00775 0.03410
0.05791 0.09612 0.08677 0.07444 0.04865 0.02846 0.02992 0.01105 0.00726 0.00739 0.00499
0.00188 0.00188 0.00059 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00086
0.00129 0.01487 0.04837 0.12592 0.14084 0.09774 0.04225 0.01504 0.00821 0.00231 0.00043
0.00073 0.00030 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
2003 1 2 3 2 449.3 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00018 0.00108 0.00376 0.01794
0.04342 0.06232 0.07083 0.07403 0.04840 0.03117 0.02365 0.01398 0.01363 0.00879 0.00521
0.00233 0.00126 0.00054 0.00018 0.00000 0.00000 0.00000 0.00000 0.00000 0.00054 0.00018
0.00108 0.00646 0.02912 0.09200 0.18283 0.12822 0.06914 0.03257 0.01631 0.00916 0.00340
0.00521 0.00089 0.00000 0.00018 0.00000 0.00000 0.00000 0.00000 0.00000
2004 1 2 3 2 442.0 0.00000 0.00000 0.00000 0.00000 0.00000 0.00043 0.00085 0.00190 0.00384 0.01891
0.04558 0.07090 0.07564 0.06101 0.04312 0.03948 0.02395 0.01583 0.01209 0.01011 0.00542
0.00311 0.00078 0.00000 0.00062 0.00020 0.00000 0.00000 0.00000 0.00000 0.00000 0.00085
0.00298 0.01597 0.03753 0.10218 0.16801 0.13294 0.06645 0.02301 0.00759 0.00435 0.00249
0.00125 0.00043 0.00020 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
AFSC Slope Survey Length Comps N = 600
1997 1 3 3 2 600 0.00110 0.00110 0.00233 0.00456 0.01199 0.01905 0.03500 0.04125 0.04353 0.04019
0.03865 0.03337 0.03518 0.03447 0.03272 0.03531 0.02676 0.01071 0.00336 0.00125 0.00064
0.00016 0.00003 0.00000 0.00000 0.00000 0.00091 0.00154 0.00158 0.00444 0.01171 0.03352
0.06592 0.07852 0.07804 0.05869 0.04784 0.04766 0.04954 0.03739 0.02056 0.00569 0.00240
0.00125 0.00004 0.00004 0.00002 0.00000 0.00000 0.00000 0.00000 0.00000
1999 1 3 3 2 600 0.00055 0.00081 0.00286 0.00486 0.01101 0.01645 0.02178 0.03324 0.04086 0.04598
0.04619 0.03585 0.03129 0.03592 0.03796 0.03633 0.02910 0.01371 0.00488 0.00133 0.00038
0.00026 0.00019 0.00050 0.00000 0.00008 0.00035 0.00113 0.00260 0.00501 0.01167 0.02223
0.04499 0.07041 0.08868 0.07638 0.06121 0.05337 0.03925 0.03603 0.02294 0.00800 0.00266
0.00036 0.00027 0.00008 0.00000 0.00002 0.00000 0.00000 0.00000 0.00000
2000 1 3 3 2 600 0.00008 0.00108 0.00296 0.00397 0.01063 0.01538 0.02105 0.03216 0.03189 0.04052
0.03542 0.04139 0.03716 0.03398 0.03341 0.04375 0.02551 0.01263 0.00562 0.00194 0.00094
0.00047 0.00006 0.00000 0.00005 0.00007 0.00007 0.00113 0.00356 0.00633 0.01147 0.01961
0.02789 0.05717 0.09996 0.08947 0.07395 0.05414 0.04490 0.03693 0.02604 0.01067 0.00377
0.00051 0.00000 0.00014 0.00003 0.00000 0.00009 0.00000 0.00005 0.00000
2001 1 3 3 2 600 0.00000 0.00046 0.00353 0.00936 0.01593 0.01672 0.02108 0.03420 0.04034 0.03394
0.03691 0.03180 0.03779 0.03151 0.02662 0.02728 0.02143 0.01204 0.00482 0.00103 0.00050
0.00018 0.00002 0.00008 0.00006 0.00000 0.00000 0.00024 0.00217 0.00839 0.01576 0.02348
0.03921 0.05654 0.09144 0.10011 0.08018 0.05651 0.03977 0.04266 0.02174 0.01033 0.00310
0.00041 0.00019 0.00006 0.00008 0.00000 0.00000 0.00000 0.00000 0.00000
NWFSC Slope Survey Length Comps
1998 1 4 3 2 600 0.00000 0.00000 0.00007 0.00213 0.00372 0.00794 0.01994 0.02810 0.03442 0.04066
0.04362 0.04572 0.03834 0.03617 0.04185 0.04315 0.03271 0.01709 0.00612 0.00315 0.00168
0.00034 0.00024 0.00006 0.00000 0.00000 0.00000 0.00000 0.00118 0.00251 0.00383 0.01532
0.04249 0.08418 0.09582 0.09389 0.06578 0.04538 0.02992 0.03110 0.02548 0.01186 0.00284
0.00081 0.00014 0.00016 0.00000 0.00006 0.00000 0.00000 0.00000 0.00004

1999 1 4 3 2 600 0.00026 0.00006 0.00048 0.00164 0.00488 0.00949 0.01774 0.03025 0.04225 0.05327
0.05296 0.05008 0.04315 0.03844 0.04014 0.04175 0.03336 0.02036 0.00562 0.00273 0.00115
0.00022 0.00016 0.00002 0.00000 0.00005 0.00006 0.00003 0.00085 0.00139 0.00625 0.01794
0.03799 0.06898 0.08583 0.08364 0.06892 0.04137 0.03603 0.03284 0.01632 0.00823 0.00229
0.00028 0.00020 0.00000 0.00000 0.00006 0.00000 0.00000 0.00000 0.00000
2000 1 4 3 2 600 0.00002 0.00001 0.00007 0.00110 0.00399 0.00827 0.02137 0.03131 0.03704 0.04408
0.04999 0.04880 0.04633 0.03879 0.04099 0.04330 0.03555 0.01455 0.00757 0.00190 0.00175
0.00070 0.00012 0.00011 0.00000 0.00010 0.00000 0.00000 0.00004 0.00101 0.00402 0.01281
0.03067 0.05837 0.08782 0.10300 0.07082 0.05627 0.04118 0.02549 0.01997 0.00759 0.00247
0.00014 0.00010 0.00015 0.00004 0.00004 0.00004 0.00000 0.00004 0.00011
2001 1 4 3 2 600 0.00000 0.00000 0.00034 0.00349 0.00933 0.02201 0.02872 0.02875 0.03673 0.03531
0.03396 0.04425 0.04435 0.04250 0.03654 0.03657 0.02868 0.01494 0.00669 0.00147 0.00082
0.00062 0.00011 0.00015 0.00000 0.00002 0.00009 0.00013 0.00036 0.00366 0.01253 0.02053
0.03092 0.04430 0.07008 0.08335 0.07894 0.05928 0.05179 0.04802 0.02313 0.01265 0.00258
0.00100 0.00012 0.00007 0.00000 0.00011 0.00000 0.00000 0.00000 0.00000
2002 1 4 3 2 600 0.00005 0.00009 0.00032 0.00166 0.00502 0.01244 0.02654 0.02910 0.03515 0.04623
0.04128 0.03787 0.03705 0.03789 0.03667 0.04003 0.02472 0.01301 0.00552 0.00222 0.00111
0.00050 0.00043 0.00006 0.00000 0.00000 0.00008 0.00029 0.00063 0.00132 0.00497 0.01464
0.03482 0.05065 0.07137 0.09384 0.08307 0.07065 0.05559 0.04285 0.02566 0.00971 0.00343
0.00105 0.00028 0.00005 0.00003 0.00003 0.00000 0.00000 0.00000 0.00003
2003 1 4 3 2 600 0.00004 0.00020 0.00037 0.00178 0.00536 0.01397 0.02285 0.02450 0.02980 0.03699
0.04407 0.04682 0.04415 0.03797 0.03519 0.03098 0.02014 0.01504 0.00897 0.00243 0.00285
0.00113 0.00076 0.00033 0.00002 0.00000 0.00005 0.00003 0.00106 0.00199 0.00616 0.01924
0.02867 0.04682 0.07244 0.09952 0.09874 0.07562 0.04780 0.03376 0.02595 0.00942 0.00312
0.00194 0.00060 0.00033 0.00005 0.00000 0.00000 0.00000 0.00000 0.00000
2004 1 4 3 2 600 0.00000 0.00000 0.00019 0.00206 0.00731 0.01134 0.01389 0.02288 0.03794 0.03478
0.04586 0.03778 0.03748 0.03916 0.03442 0.02995 0.02370 0.01185 0.00437 0.00236 0.00076
0.00177 0.00030 0.00010 0.00000 0.00000 0.00005 0.00052 0.00157 0.00338 0.00965 0.01994
0.03132 0.05362 0.06560 0.08810 0.09644 0.08241 0.06097 0.04755 0.02557 0.00801 0.00379
0.00068 0.00037 0.00013 0.00009 0.00000 0.00000 0.00000 0.00000 0.00000
Shelf Survey Length Comps
1986 1 5 3 2 253.0 0.00000 0.00034 0.00032 0.00411 0.01362 0.01725 0.02291 0.03808 0.06035 0.05974
0.06092 0.04348 0.02930 0.01927 0.00943 0.00881 0.00465 0.00342 0.00273 0.00105 0.00074
0.00085 0.00004 0.00000 0.00022 0.00000 0.00000 0.00068 0.00034 0.00476 0.01471 0.02392
0.05490 0.10659 0.15758 0.13867 0.06161 0.02188 0.00668 0.00377 0.00108 0.00060 0.00033
0.00022 0.00004 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1989 1 5 3 2 740.9 0.00021 0.00110 0.00283 0.01061 0.01800 0.02797 0.04226 0.05031 0.05798 0.05365
0.04842 0.03741 0.02282 0.01936 0.01163 0.00785 0.00437 0.00370 0.00312 0.00167 0.00111
0.00097 0.00058 0.00017 0.00003 0.00027 0.00008 0.00138 0.00377 0.01634 0.02654 0.04642
0.06394 0.10707 0.11677 0.08763 0.05505 0.02970 0.00959 0.00466 0.00171 0.00047 0.00018
0.00018 0.00006 0.00000 0.00005 0.00000 0.00000 0.00000 0.00000 0.00000
1992 1 5 3 2 591.1 0.00007 0.00066 0.00134 0.00839 0.02099 0.04090 0.04567 0.04944 0.05915 0.06194
0.06130 0.04284 0.02776 0.01783 0.01075 0.00849 0.00706 0.00477 0.00336 0.00380 0.00146
0.00114 0.00015 0.00032 0.00010 0.00000 0.00026 0.00090 0.00445 0.01050 0.03308 0.06144
0.07204 0.08706 0.09084 0.07686 0.04493 0.02395 0.00908 0.00281 0.00139 0.00057 0.00015
0.00001 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
1995 1 5 3 2 747.0 0.00019 0.00101 0.00717 0.02108 0.03046 0.05183 0.06525 0.06493 0.06211 0.05303
0.04652 0.02603 0.01532 0.00747 0.00602 0.00415 0.00354 0.00263 0.00222 0.00133 0.00033
0.00095 0.00006 0.00011 0.00000 0.00000 0.00014 0.00111 0.00766 0.02949 0.05600 0.08123
0.08684 0.08233 0.07523 0.05364 0.03418 0.01221 0.00316 0.00159 0.00078 0.00048 0.00014
0.00004 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00004 0.00000

1998 1 5 3 2 876.5 0.00016 0.00094 0.00326 0.01065 0.01905 0.02958 0.05170 0.06368 0.06463 0.06397 0.04828 0.03244 0.01706 0.01295 0.00767 0.00466 0.00223 0.00225 0.00210 0.00116 0.00082 0.00049 0.00009 0.00007 0.00009 0.00000 0.00020 0.00191 0.00377 0.01389 0.03528 0.07075 0.11105 0.11947 0.10280 0.06119 0.02532 0.00918 0.00291 0.00092 0.00065 0.00032 0.00017 0.00013 0.00000 0.00003 0.00000 0.00000 0.00000 0.00000 0.00008 0.00000
2001 1 5 3 2 1000.0 0.00040 0.00177 0.00693 0.01627 0.03040 0.03826 0.04492 0.04437 0.05093 0.05025 0.04651 0.03642 0.02295 0.01614 0.00996 0.00626 0.00520 0.00292 0.00124 0.00136 0.00137 0.00037 0.00015 0.00008 0.00000 0.00013 0.00012 0.00244 0.01143 0.02521 0.05172 0.06728 0.06997 0.08173 0.09898 0.07935 0.05163 0.01580 0.00541 0.00165 0.00096 0.00019 0.00040 0.00005 0.00002 0.00000 0.00000 0.00000 0.00000 0.00004 0.00010 0.00000
2004 1 5 3 2 751.0 0.00007 0.00219 0.00972 0.02015 0.02766 0.04183 0.05002 0.05581 0.05444 0.05009 0.04447 0.03637 0.03174 0.02006 0.01540 0.00930 0.00717 0.00323 0.00236 0.00150 0.00075 0.00028 0.00028 0.00026 0.00000 0.00002 0.00042 0.00241 0.00951 0.02380 0.03304 0.06182 0.08273 0.07757 0.07062 0.06314 0.04843 0.02636 0.01049 0.00302 0.00090 0.00044 0.00002 0.00004 0.00000 0.00002 0.00000 0.00008 0.00000 0.00000 0.00000 0.00000

33 #_N_age'_bins
#_lower_age_of_age'_bins
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 35 40 50

2 #_number_of_ageerr_types
#_vectors_with_ageing_bias_and_precision_for_each_AGE_and_type
Age 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Unbiased break & burn otolith ages
#_Vector_w_mean_mid-year_ages. # -1 means TRUE mid-year ages
-1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1
#_Vector_w_Std_Dev_of_aging_error SD = Beta * Age Beta = 0.142480412
0.142 0.214 0.356 0.499 0.641 0.784 0.926 1.069 1.211 1.354 1.496 1.639 1.781 1.923 2.066 2.208 2.351 2.493 2.636 2.778 2.921 3.063 3.206 3.348 3.491 3.633 3.776 3.918 4.061 4.203 4.346 4.488 4.631 4.773 4.916 5.058 5.201 5.343 5.485 5.628 5.770 5.913 6.055 6.198 6.340 6.483 6.625 6.768 6.910 7.053 7.195 7.338 7.480 7.623 7.765 7.908 8.050 8.193 8.335 8.478 8.620

Biased scale ages Hockey-stick model BreakPoint = 9.685 Slope = 0.450
-1 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.33 10.78 11.23 11.68 12.13 12.58 13.03 13.48 13.93 14.38 14.83 15.28 15.73 16.18 16.63 17.08 17.53 17.98 18.43 18.88 19.33 19.78 20.23 20.68 21.13 21.58 22.03 22.48 22.93 23.38 23.83 24.28 24.73 25.18 25.63 26.08 26.53 26.98 27.43 27.88 28.33 28.78 29.23 29.68 30.13 30.58 31.04 31.49 31.94 32.39 32.84
0.142 0.214 0.356 0.499 0.641 0.784 0.926 1.069 1.211 1.354 1.471 1.536 1.600 1.664 1.728 1.792 1.856 1.920 1.985 2.049 2.113 2.177 2.241 2.305 2.369 2.434 2.498 2.562 2.626 2.690 2.754 2.818 2.882 2.947 3.011 3.075 3.139 3.203 3.267 3.331 3.396 3.460 3.524 3.588 3.652 3.716 3.780 3.845 3.909 3.973 4.037 4.101 4.165 4.229 4.294 4.358 4.422 4.486 4.550 4.614 4.678

79 # N age comps
Year Seas Fleet Sex Mkt AgErr Lo Hi Nsamp f01 f02 f03 f04 f05 f06 f07 f08 f09 f10 f11 f12 f13 f14 f15 f16 f17 f18 f19 f20 f21 f22 f23 f24 f25 f26 f27 f28 f29 f30 f35 f40 f50p m01 m02 m03 m04 m05 m06 m07 m08 m09 m10 m11 m12 m13 m14 m15 m16 m17 m18 m19 m20 m21 m22 m23 m24 m25 m26 m27 m28 m29 m30 m35 m40 m50p
Fishery Age Comps - South -1 << 1 to include scale ages; -1 for no scale ages.
1967 1 1 3 2 2 0 0 -5.3 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.01000 0.03000 0.06000 0.04000 0.03000 0.01000 0.00000 0.00000 0.02000 0.00000 0.00000 0.00000 0.00000

0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.03000 0.02000 0.10000 0.16000
0.25000 0.13000 0.09000 0.01000 0.01000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1969 1 1 3 2 2 0 0 -89.5 0.00000 0.00000 0.00000 0.00000 0.00000 0.00236 0.02128 0.07329 0.10166
0.08274 0.06619 0.04965 0.01891 0.01182 0.02601 0.00236 0.00000 0.00000 0.00473 0.00236
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00709 0.04019 0.09929 0.12293
0.09220 0.08038 0.03310 0.02601 0.02364 0.00473 0.00709 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1970 1 1 3 2 2 0 0 -68.4 0.00000 0.00309 0.00000 0.00309 0.00617 0.04630 0.10185 0.08333 0.10185
0.10494 0.07407 0.05864 0.02778 0.01235 0.01543 0.00926 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00617 0.00309 0.01852 0.05864 0.09259 0.05556
0.05247 0.02160 0.02469 0.00309 0.00926 0.00309 0.00309 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1971 1 1 3 2 2 0 0 -152.6 0.00000 0.00000 0.00000 0.00000 0.00552 0.01655 0.04276 0.08276 0.06069
0.05517 0.05103 0.02069 0.02621 0.01517 0.00552 0.00690 0.00138 0.00276 0.00138 0.00138
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00138 0.01103 0.04414 0.06069 0.11862 0.11172
0.08965 0.06759 0.04828 0.02345 0.01517 0.00690 0.00276 0.00138 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00138
1972 1 1 3 2 2 0 0 -273.7 0.00000 0.00000 0.00000 0.00060 0.00659 0.06527 0.08503 0.10539 0.10359
0.07665 0.06527 0.04371 0.02934 0.01198 0.00539 0.00419 0.00180 0.00180 0.00060 0.00000
0.00060 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00060 0.00239 0.02515 0.05030 0.07605 0.08563
0.06407 0.04431 0.02874 0.00958 0.00419 0.00000 0.00060 0.00060 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1973 1 1 3 2 2 0 0 -215.8 0.00000 0.00000 0.00000 0.00072 0.00215 0.04731 0.12975 0.10896 0.08889
0.07097 0.04659 0.02724 0.02652 0.01577 0.00860 0.00287 0.00287 0.00430 0.00072 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00358 0.02652 0.06093 0.07599 0.10107
0.06237 0.04444 0.02222 0.00932 0.00502 0.00287 0.00072 0.00000 0.00072 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1974 1 1 3 2 2 0 0 -194.7 0.00000 0.00000 0.00000 0.00000 0.00546 0.02416 0.09353 0.13484 0.10055
0.07093 0.05066 0.04443 0.02962 0.02338 0.00857 0.00935 0.00546 0.00078 0.00156 0.00000
0.00078 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00078 0.01637 0.04832 0.07638 0.07638
0.07093 0.04365 0.03040 0.01793 0.00935 0.00468 0.00000 0.00078 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1975 1 1 3 2 2 0 0 -152.6 0.00000 0.00000 0.00000 0.00091 0.00549 0.03477 0.04666 0.11619 0.12260
0.06038 0.03660 0.04026 0.03294 0.03019 0.01372 0.01372 0.00732 0.00732 0.00274 0.00366
0.00000 0.00091 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00091 0.00000 0.00000 0.00000 0.00000 0.00183 0.02470 0.04392 0.08051 0.08692
0.07136 0.04666 0.02836 0.01464 0.01098 0.00366 0.00549 0.00091 0.00183 0.00000 0.00091

0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1976 1 1 3 2 2 0 0 -205.3 0.00000 0.00000 0.00000 0.00000 0.01244 0.04154 0.08061 0.10077 0.14535
0.09838 0.04746 0.01853 0.02954 0.01372 0.01232 0.00137 0.00000 0.00000 0.00274 0.00207
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00763 0.02366 0.07892 0.10520 0.09037
0.03997 0.02406 0.01098 0.00824 0.00274 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00137
1977 1 1 3 2 2 0 0 -342.1 0.00000 0.00000 0.00000 0.00119 0.00729 0.03482 0.07364 0.10855 0.09582
0.08492 0.04930 0.03005 0.01757 0.00823 0.00699 0.00251 0.00127 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00119 0.00609 0.03273 0.10024 0.11736 0.11167
0.05211 0.03132 0.01693 0.00437 0.00254 0.00064 0.00000 0.00064 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1978 1 1 3 2 2 0 0 -331.6 0.00000 0.00000 0.00057 0.00000 0.01010 0.03848 0.07060 0.10172 0.08465
0.07917 0.05552 0.03458 0.02324 0.00753 0.00697 0.00073 0.00113 0.00000 0.00000 0.00000
0.00073 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00226 0.00339 0.03702 0.08539 0.11609 0.10885
0.05876 0.04031 0.02088 0.00647 0.00316 0.00170 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1979 1 1 3 2 2 0 0 -194.7 0.00000 0.00000 0.00000 0.00468 0.00586 0.02211 0.06652 0.11039 0.10847
0.07180 0.05488 0.03526 0.01730 0.00924 0.00554 0.00739 0.00000 0.00370 0.00000 0.00000
0.00000 0.00067 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00335 0.00937 0.03753 0.08311 0.11465 0.09423
0.07336 0.03778 0.01478 0.00621 0.00185 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1980 1 1 3 2 2 0 0 -600.0 0.00000 0.00000 0.00144 0.00527 0.01736 0.04246 0.07708 0.10749 0.09727
0.07899 0.04393 0.03233 0.01790 0.01011 0.00543 0.00635 0.00047 0.00094 0.00000 0.00047
0.00047 0.00047 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00168 0.01286 0.03749 0.07134 0.10195 0.09948
0.06058 0.02304 0.01859 0.01316 0.00658 0.00329 0.00188 0.00141 0.00047 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1981 1 1 3 2 1 0 0 421.1 0.00000 0.00000 0.00046 0.00228 0.01159 0.01835 0.02903 0.04866 0.04437
0.04180 0.04563 0.03641 0.03193 0.02263 0.02171 0.01578 0.02180 0.01860 0.01204 0.01477
0.00985 0.00547 0.00711 0.00274 0.00711 0.00383 0.00164 0.00274 0.00328 0.00657 0.00055
0.00055 0.00000 0.00000 0.00000 0.00000 0.00228 0.00813 0.01990 0.02949 0.03991 0.03943
0.03989 0.04116 0.03038 0.03274 0.03575 0.02709 0.03137 0.02052 0.02243 0.01532 0.00985
0.01422 0.00766 0.01040 0.00711 0.00383 0.00766 0.00328 0.00274 0.00219 0.00602 0.00000
0.00000 0.00000
1982 1 1 3 2 1 0 0 147.4 0.00000 0.00000 0.00000 0.00144 0.00000 0.00144 0.00865 0.02594 0.02594
0.02882 0.02450 0.03458 0.02882 0.02450 0.03170 0.02306 0.02450 0.01441 0.01441 0.01585
0.00720 0.01297 0.00865 0.01153 0.00720 0.00288 0.00000 0.00144 0.00000 0.00288 0.00000
0.00144 0.00000 0.00000 0.00000 0.00000 0.00000 0.00288 0.00865 0.01873 0.03170 0.05187
0.05043 0.05331 0.06196 0.06340 0.04035 0.04179 0.02738 0.03890 0.02306 0.01585 0.02306
0.01441 0.01441 0.00576 0.00432 0.00288 0.00288 0.00144 0.00288 0.00288 0.00720 0.00288
0.00000 0.00000

1983 1 1 3 2 1 0 0 200.0 0.00000 0.00000 0.00000 0.00639 0.03621 0.12886 0.07774 0.06390 0.03727
0.02556 0.03940 0.03301 0.02662 0.02556 0.02130 0.01491 0.00958 0.00639 0.00319 0.00319
0.00532 0.00213 0.00426 0.00213 0.00107 0.00000 0.00000 0.00000 0.00000 0.00213 0.00107
0.00000 0.00000 0.00000 0.00000 0.00000 0.00107 0.00426 0.03088 0.03727 0.02982 0.03408
0.04366 0.04260 0.04686 0.03195 0.03727 0.02982 0.01491 0.01172 0.00852 0.00746 0.00107
0.00319 0.00213 0.00000 0.00107 0.00107 0.00107 0.00000 0.00107 0.00000 0.00000 0.00000
0.00000 0.00000
1984 1 1 3 2 1 0 0 278.9 0.00000 0.00000 0.00000 0.00000 0.00097 0.00552 0.01722 0.03477 0.04582
0.04550 0.03315 0.04095 0.02665 0.02340 0.02600 0.03510 0.02242 0.02405 0.01690 0.02958
0.02405 0.01820 0.01398 0.01885 0.00943 0.01170 0.00943 0.00715 0.00292 0.01755 0.00260
0.00195 0.00163 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00325 0.00877 0.01592
0.02275 0.01300 0.01852 0.02015 0.02990 0.02990 0.02762 0.03347 0.02893 0.02795 0.02762
0.02275 0.02698 0.01463 0.00780 0.00910 0.00715 0.00715 0.00325 0.00325 0.01722 0.00455
0.00097 0.00000
1985 1 1 3 2 1 0 0 410.5 0.00000 0.00000 0.00000 0.00077 0.00154 0.00907 0.02359 0.03284 0.05012
0.05212 0.05044 0.02603 0.03233 0.02365 0.01825 0.02288 0.02217 0.02667 0.01774 0.02127
0.01562 0.01556 0.01601 0.00977 0.01003 0.00739 0.00559 0.00675 0.00341 0.01247 0.00302
0.00264 0.00077 0.00039 0.00000 0.00000 0.00039 0.00071 0.00649 0.01138 0.02179 0.03046
0.03701 0.03637 0.03251 0.03791 0.03194 0.02352 0.02873 0.02564 0.02133 0.01787 0.02378
0.00913 0.01433 0.00964 0.00559 0.00450 0.00887 0.00302 0.00379 0.00154 0.00707 0.00302
0.00077 0.00000
1986 1 1 3 2 1 0 0 394.7 0.00000 0.00000 0.00000 0.00159 0.00801 0.01978 0.04017 0.04975 0.05934
0.05954 0.04498 0.02468 0.02569 0.01557 0.01712 0.01284 0.01611 0.01290 0.01344 0.01078
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0.00000 0.00109 0.00053 0.00000 0.00000 0.00053 0.00480 0.01552 0.02992 0.03865 0.03539
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0.03441 0.02190 0.01773 0.01981 0.01564 0.02190 0.01668 0.00939 0.01147 0.00626 0.01043
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0.00626 0.00000
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0.00533 0.00200
1992 1 1 3 2 1 0 0 268.4 0.00000 0.00000 0.00000 0.00049 0.00740 0.01927 0.04220 0.05034 0.04258
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0.00325 0.00000
1994 1 1 3 2 1 0 0 142.1 0.00000 0.00000 0.00000 0.00094 0.00826 0.01900 0.04803 0.06631 0.03679
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1995 1 1 3 2 1 0 0 200.0 0.00000 0.00000 0.00000 0.00000 0.00069 0.01096 0.02466 0.02877 0.04247
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0.00206 0.00137
1996 1 1 3 2 1 0 0 221.1 0.00000 0.00000 0.00000 0.00117 0.00175 0.00524 0.02269 0.04712 0.06050
0.05235 0.04596 0.03025 0.01920 0.02036 0.01047 0.01396 0.00931 0.00815 0.01164 0.01629
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0.00000 0.00000
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Fishery Age Comps - North

1966 1 2 3 2 2 0 0 -178.9 0.00000 0.00000 0.00000 0.00000 0.00191 0.01523 0.05237 0.08759 0.09362
0.10822 0.07617 0.06252 0.04634 0.03364 0.01682 0.01586 0.00698 0.00445 0.00222 0.00222
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1969 1 2 3 2 2 0 0 -147.4 0.00000 0.00037 0.00000 0.00074 0.00665 0.04285 0.09198 0.14444 0.10602
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0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1970 1 2 3 2 2 0 0 -142.1 0.00000 0.00000 0.00000 0.00039 0.00387 0.02708 0.05726 0.09323 0.10987
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0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1971 1 2 3 2 2 0 0 -21.1 0.00000 0.00000 0.00000 0.00000 0.00343 0.01375 0.04811 0.05842 0.07560
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0.00000 0.00000
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0.00000 0.00000
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0.00000 0.00000
1975 1 2 3 2 2 0 0 -57.9 0.00000 0.00000 0.00000 0.00000 0.00086 0.01794 0.05636 0.09650 0.10931
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0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00256 0.01451 0.03672 0.07088 0.05209
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0.00000 0.00000
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0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
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0.00000 0.00000
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0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1979 1 2 3 2 2 0 0 -5.3 0.00000 0.00000 0.00000 0.00000 0.05263 0.05263 0.24561 0.15790 0.17544
0.08772 0.05263 0.03509 0.03509 0.00000 0.05263 0.00000 0.00000 0.03509 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
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0.00000 0.00000 0.00000 0.00000 0.00000 0.01754 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
1984 1 2 3 2 2 0 0 -5.3 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.01000
0.00000 0.01000 0.01000 0.04000 0.01000 0.05000 0.00000 0.05000 0.03000 0.02000 0.04000
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0.04000 0.02000 0.03000 0.03000 0.06000 0.03000 0.00000 0.02000 0.00000 0.02000 0.00000
0.00000 0.00000
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0.00000 0.00000
1987 1 2 3 2 1 0 0 205.3 0.00000 0.00000 0.00000 0.00000 0.00000 0.00135 0.00836 0.01997 0.03022
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0.00081 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00108 0.00243 0.00944 0.02024
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0.00000 0.00000
1988 1 2 3 2 1 0 0 284.2 0.00000 0.00000 0.00000 0.00000 0.00382 0.01209 0.01363 0.02270 0.03917
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1989 1 2 3 2 1 0 0 384.2 0.00000 0.00035 0.00035 0.00070 0.00702 0.02315 0.02749 0.03993 0.05158
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1992 1 2 3 2 1 0 0 473.7 0.00000 0.00000 0.00000 0.00210 0.01435 0.03636 0.05804 0.06871 0.05623
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1995 1 2 3 2 1 0 0 242.1 0.00000 0.00000 0.00000 0.00118 0.00553 0.03136 0.06363 0.05443 0.04527
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1996 1 2 3 2 1 0 0 226.3 0.00000 0.00000 0.00000 0.00025 0.00521 0.01790 0.04862 0.05493 0.05902
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1997 1 2 3 2 1 0 0 178.9 0.00070 0.00000 0.00000 0.00000 0.00388 0.01033 0.02315 0.05464 0.08583
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1999 1 2 3 2 1 0 0 273.7 0.00000 0.00000 0.00000 0.00077 0.00453 0.01524 0.03585 0.06561 0.06904
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0.00000 0.00000
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0.00000 0.00000
2001 1 2 3 2 1 0 0 210.5 0.00000 0.00000 0.00000 0.00000 0.00058 0.00528 0.02465 0.04516 0.05394
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0.00353 0.00000 0.00000 0.00000 0.00000 0.00000 0.00411 0.00233 0.01228 0.01928 0.02684
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0.00764 0.00353 0.00353 0.00000 0.00000 0.00353 0.00058 0.00058 0.00000 0.00000 0.00000
0.00000 0.00000
2002 1 2 3 2 1 0 0 189.5 0.00000 0.00000 0.00000 0.00362 0.00762 0.02316 0.02611 0.06201 0.09448
0.08753 0.05010 0.03535 0.04772 0.04114 0.02010 0.01514 0.01019 0.00791 0.00362 0.00134
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0.00067 0.00295 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000
2003 1 2 3 2 1 0 0 200.0 0.00000 0.00032 0.00000 0.00063 0.00386 0.01752 0.01971 0.02817 0.04152
0.06978 0.04655 0.04854 0.04135 0.02864 0.03094 0.01363 0.01207 0.00651 0.00520 0.00683
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0.00131 0.00000
2004 1 2 3 2 1 0 0 210.5 0.00000 0.00000 0.00000 0.00000 0.00276 0.00573 0.02708 0.02807 0.03290
0.04044 0.06093 0.03685 0.05227 0.03071 0.03422 0.03174 0.00981 0.00358 0.00165 0.00124
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0.00173 0.00000 0.00000 0.00000 0.00000 0.00083 0.00849 0.01707 0.02980 0.04452 0.03191
0.05054 0.05046 0.06662 0.06080 0.06187 0.05033 0.03426 0.02478 0.00664 0.01059 0.00602
0.00519 0.00519 0.00041 0.00173 0.00000 0.00000 0.00173 0.00000 0.00000 0.00041 0.00021
0.00021 0.00000
NWFSC Slope Survey Age Comps Effective N rel to Len Comps = 0.17
1998 1 4 3 2 1 0 0 100.0 0.00000 0.00000 0.01097 0.02447 0.02391 0.02138 0.02570 0.01382 0.03811
0.03046 0.03200 0.02416 0.01530 0.02899 0.02126 0.01849 0.00940 0.00933 0.00927 0.01161
0.01011 0.01364 0.00413 0.00438 0.01146 0.00861 0.00388 0.00686 0.00173 0.01143 0.00232
0.00098 0.00000 0.00000 0.00405 0.02472 0.03265 0.03099 0.05507 0.06402 0.04106 0.06151
0.03452 0.02771 0.03181 0.03786 0.02220 0.02290 0.01396 0.00735 0.00757 0.00272 0.00746
0.00217 0.00135 0.00068 0.00036 0.00136 0.00563 0.00365 0.00418 0.00000 0.00232 0.00000
0.00000 0.00000
1999 1 4 3 2 1 0 0 100.0 0.00000 0.00000 0.01767 0.02307 0.04819 0.03260 0.06075 0.01344 0.05229
0.02808 0.01033 0.03895 0.01252 0.00865 0.00299 0.01291 0.00255 0.05386 0.02091 0.02115
0.01332 0.00429 0.01010 0.03274 0.01439 0.00077 0.00084 0.00029 0.00157 0.01479 0.00438
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0.02070 0.00223 0.02539 0.00496 0.03294 0.00880 0.00090 0.00073 0.00789 0.00181 0.00176

0.00183 0.00269 0.00422 0.00111 0.00712 0.00000 0.00000 0.00000 0.00000 0.00093 0.00000
0.00000 0.00000
2000 1 4 3 2 1 0 0 100.0 0.00000 0.00000 0.00350 0.04190 0.02958 0.05955 0.01228 0.00512 0.02958
0.02764 0.01215 0.01212 0.01665 0.02269 0.01798 0.01038 0.00314 0.01018 0.00158 0.00945
0.02275 0.03439 0.00939 0.00633 0.00149 0.00262 0.00095 0.00550 0.00628 0.02418 0.01211
0.00208 0.00073 0.00000 0.00000 0.00107 0.01764 0.01929 0.01788 0.02151 0.02459 0.05078
0.04152 0.12381 0.05295 0.03805 0.02619 0.02182 0.00168 0.01941 0.02805 0.00010 0.00679
0.00000 0.00000 0.00096 0.00117 0.00609 0.00010 0.00826 0.00122 0.00315 0.00165 0.00997
0.00000 0.00000
2001 1 4 3 2 1 0 0 100.0 0.00000 0.00000 0.00359 0.04294 0.09970 0.02535 0.01499 0.03241 0.02909
0.00893 0.02589 0.01470 0.00916 0.00413 0.00394 0.00354 0.00225 0.01122 0.00195 0.00210
0.01914 0.01104 0.01803 0.01086 0.01500 0.02389 0.00573 0.01116 0.00037 0.02050 0.01358
0.02429 0.00000 0.00000 0.00000 0.00167 0.02073 0.03078 0.03475 0.02996 0.01081 0.04473
0.03366 0.02894 0.03785 0.04050 0.02297 0.01943 0.01655 0.01255 0.00146 0.00181 0.00182
0.01101 0.01506 0.00240 0.00048 0.00379 0.00559 0.00028 0.00000 0.00011 0.01491 0.01425
0.03142 0.00021
2002 1 4 3 2 1 0 0 100.0 0.00000 0.00000 0.00418 0.03275 0.03918 0.03075 0.06241 0.02880 0.02574
0.02328 0.02069 0.02073 0.01340 0.02082 0.00841 0.01341 0.01952 0.01292 0.00847 0.00864
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0.00670 0.00705 0.00296 0.00154 0.00247 0.00249 0.00151 0.00297 0.00323 0.00482 0.00457
0.00721 0.00263
2003 1 4 3 2 1 0 0 100.0 0.00000 0.00000 0.01110 0.01164 0.04257 0.04384 0.07089 0.01800 0.05287
0.03223 0.01227 0.00577 0.01213 0.01056 0.01137 0.00842 0.00943 0.00382 0.00282 0.00610
0.00151 0.00803 0.00082 0.00334 0.00122 0.00716 0.00075 0.00169 0.00195 0.03441 0.00804
0.01773 0.00157 0.00000 0.00000 0.00191 0.00698 0.04402 0.05991 0.03768 0.01655 0.01953
0.05094 0.01764 0.03274 0.02770 0.03082 0.11424 0.01581 0.00805 0.00179 0.00417 0.00127
0.00275 0.01140 0.00631 0.00211 0.00065 0.00060 0.00601 0.00164 0.00094 0.00693 0.00813
0.00674 0.00000
2004 1 4 3 2 1 0 0 100.0 0.00000 0.00000 0.00150 0.01752 0.02382 0.04902 0.04353 0.01554 0.03143
0.02947 0.03316 0.02134 0.02322 0.00970 0.02247 0.00296 0.00378 0.00639 0.00618 0.00291
0.00729 0.00350 0.01090 0.00276 0.00298 0.00418 0.00083 0.00311 0.00230 0.02341 0.01389
0.00567 0.00035 0.00000 0.00000 0.00183 0.01777 0.04996 0.05893 0.03607 0.04336 0.05477
0.04399 0.03189 0.04567 0.01871 0.00784 0.01985 0.02150 0.01566 0.01103 0.00738 0.00876
0.00378 0.01316 0.01158 0.00308 0.01057 0.00487 0.00553 0.00034 0.00036 0.01657 0.00747
0.00266 0.00000

11 #_N_size@age_observations;_values_on_row1;_N_on_row2
Year Season Fleet Gender Mkt ageerr Nsamp Fem_1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30 35 40 50 Mal_1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
23 24 25 26 27 28 29 30 35 40 50
1997 1 3 3 2 1 200 16.92 20.89 24.27 27.80 31.22 31.20 35.80 35.67 37.71 38.25 37.75 44.57 47.90 43.13
47.67 49.00 46.33 48.50 44.38 45.00 46.50 48.25 47.00 47.29 46.83 48.33 47.71 51.50 52.75 50.18
52.00 51.83 54.00 17.50 20.38 23.18 25.18 29.75 32.00 32.80 30.00 34.83 32.44 35.17 36.00 41.50
39.33 42.25 40.25 40.00 43.33 42.75 40.60 40.00 41.00 42.50 0.00 46.00 46.00 44.00 41.00 45.00
41.33 41.50 44.00 0.00
12 9 11 5 9 10 5 6 7 4 4 7 10 8 6 5 9 4 8 4 6 4 7 7 6 6 7 2 4 17 6 6 1 26 8 11 11 4 11 5 4 12 9 6 4 6 3 4 4 3
3 4 5 3 4 2 0 2 1 1 1 1 6 4 1 0
1999 1 3 3 2 1 200 17.26 21.58 25.04 28.57 30.05 31.38 33.06 32.86 37.35 35.23 38.40 41.40 39.00 41.38
45.00 42.91 44.50 44.54 46.80 47.44 49.00 46.18 47.40 46.80 47.92 47.67 49.25 46.00 48.86 48.93
50.47 48.56 0.00 17.25 23.50 23.58 25.61 28.00 29.59 31.16 32.65 32.36 36.27 35.77 36.92 36.57

37.00 37.67 37.83 37.17 39.50 38.00 40.00 40.50 42.00 44.00 41.50 44.00 39.33 42.29 43.67 45.00 43.40 43.50 42.25 42.00

19 12 25 23 22 21 18 22 17 13 20 15 12 8 13 11 8 13 15 9 6 11 15 15 12 6 8 7 7 28 15 16 0 24 8 26 23 19 17 19 20 14 11 13 12 7 5 9 6 6 6 5 3 4 7 9 4 3 3 7 3 3 15 12 4 1

2000 1 3 3 2 1 200 0.00 19.00 19.84 22.63 26.33 29.79 31.79 33.25 33.15 37.87 37.33 39.00 42.36 42.63 43.56 44.60 49.20 46.11 52.75 48.38 46.88 47.20 48.00 51.29 49.60 45.75 49.00 52.50 48.17 51.73 50.78 53.00 0.00 0.00 0.00 18.76 22.64 25.08 27.00 30.29 31.70 30.55 33.25 37.11 36.36 37.13 38.00 37.33 40.00 38.33 39.00 42.50 43.50 50.00 43.00 44.33 44.00 0.00 43.50 0.00 37.00 42.00 43.75 44.50 44.00 0.00

0 1 19 30 12 19 14 16 13 15 12 10 11 8 9 5 10 9 4 8 8 5 7 7 5 4 6 4 6 15 9 5 0 0 0 21 25 13 11 14 10 11 4 9 11 8 6 3 3 3 2 2 4 2 1 3 2 0 2 0 1 2 4 2 2 0

2001 1 3 3 2 1 200 0.00 19.00 21.50 27.18 31.18 33.93 33.00 34.92 39.22 37.67 38.00 40.29 41.89 43.17 39.43 43.50 43.62 42.00 43.83 44.33 44.00 45.33 46.00 47.00 50.75 48.17 46.67 47.50 45.80 47.79 48.47 50.50 49.00 0.00 0.00 23.33 26.09 28.00 29.14 32.20 33.14 33.70 33.57 37.20 35.75 37.07 39.38 39.50 41.00 35.50 40.00 38.25 40.00 42.80 41.33 43.00 40.67 0.00 0.00 40.00 42.67 44.00 42.60 44.33 44.13 0.00

0 3 10 17 17 14 10 13 9 9 12 7 9 12 7 8 13 6 6 3 8 3 5 5 4 6 3 4 5 29 15 14 1 0 0 9 11 8 7 10 14 10 7 5 8 15 13 6 6 4 3 4 5 5 6 5 3 0 0 1 3 2 15 9 8 0

1998 1 4 3 2 1 200 0.00 0.00 22.44 27.24 29.35 31.92 33.15 35.52 36.55 36.95 38.14 41.26 40.69 43.20 44.02 45.12 45.00 44.61 44.92 44.53 44.97 45.07 45.44 47.00 45.53 46.64 45.30 46.80 47.00 48.02 44.95 49.25 0.00 0.00 19.00 22.46 27.10 28.30 29.68 31.68 32.16 32.85 33.86 35.38 35.40 36.26 35.87 38.08 41.32 39.46 39.27 38.17 39.85 42.00 36.00 45.50 41.00 41.50 45.83 42.00 41.83 0.00 42.33 46.00 0.00 0.00

0 0 16 21 31 26 37 28 43 46 40 34 24 32 28 26 22 23 18 18 16 21 9 10 15 11 5 10 4 21 10 4 0 0 1 25 29 33 51 62 45 63 46 47 40 37 27 18 14 14 11 6 17 8 2 1 3 2 3 6 6 0 6 2 0 0

1999 1 4 3 2 1 200 0.00 0.00 23.00 25.90 27.40 29.65 34.28 36.42 40.32 37.15 39.85 42.63 41.91 45.77 45.50 43.67 47.50 46.73 45.00 47.80 45.10 47.40 47.10 47.00 47.00 41.00 49.50 50.50 46.00 47.63 47.75 47.75 0.00 0.00 0.00 23.90 25.35 28.52 30.19 30.68 32.02 34.72 34.38 36.33 35.14 39.00 40.83 39.36 39.25 44.00 38.75 41.67 41.00 41.50 40.50 39.50 41.63 39.50 0.00 0.00 0.00 0.00 43.00 0.00 0.00 0.00

0 0 10 15 13 13 18 13 22 10 13 16 16 11 6 12 5 13 13 10 5 5 10 5 4 1 2 2 2 8 2 2 0 0 0 5 13 25 34 31 22 18 17 6 11 8 6 7 2 1 2 3 2 1 4 1 4 1 0 0 0 0 1 0 0 0

2000 1 4 3 2 1 200 0.00 0.00 22.00 24.28 26.56 28.73 32.10 35.50 34.69 33.42 34.69 38.17 37.53 39.13 41.50 40.28 42.90 44.57 47.00 46.11 45.78 48.50 50.33 46.50 45.91 47.00 49.33 45.14 45.33 46.54 48.65 48.67 52.00 0.00 0.00 23.75 24.28 25.33 25.78 29.21 30.32 33.22 32.97 34.45 34.21 33.97 35.84 36.13 34.75 39.30 37.44 40.50 39.25 0.00 0.00 39.33 43.50 40.17 43.00 41.83 42.00 40.50 39.25 41.93 0.00 0.00

0 0 4 9 8 13 10 7 16 13 8 9 16 12 8 9 5 7 3 9 9 6 3 6 11 4 3 7 6 26 13 3 2 0 0 2 9 18 16 17 14 30 17 20 26 19 16 8 2 5 9 1 6 0 0 3 1 3 1 3 1 1 2 7 0 0

2001 1 4 3 2 1 200 0.00 0.00 22.00 25.96 30.00 31.00 32.43 35.54 37.50 37.80 37.40 38.71 39.53 37.33 42.21 45.25 44.50 46.90 42.50 44.17 43.25 44.30 44.75 49.00 45.63 44.67 46.60 46.00 43.25 46.68 46.33 46.44 0.00 0.00 0.00 21.80 26.67 26.78 30.71 32.16 33.09 31.76 33.43 33.75 35.17 34.90 34.89 36.12 35.75 35.44 37.83 35.83 36.33 39.42 40.33 37.50 45.50 44.00 44.00 44.50 0.00 38.50 42.50 40.75 43.71 45.50

0 0 3 14 15 5 7 13 10 10 10 14 16 3 7 6 3 5 4 3 6 5 6 2 8 3 5 7 2 14 9 8 0 0 0 5 6 9 14 16 11 19 15 12 18 25 18 13 8 9 3 3 3 6 3 5 2 2 1 2 0 1 5 2 7 1

2002 1 4 3 2 1 200 0.00 0.00 25.69 27.15 29.40 32.55 33.76 35.12 35.98 37.42 38.21 39.74 40.25 40.26 41.98 41.00 42.89 41.63 43.88 43.22 44.58 47.13 45.11 44.25 45.80 46.93 44.61 46.21 45.36 45.94 46.54 46.60 47.08 0.00 32.50 26.00 26.48 28.98 30.64 31.79 33.14 33.64 33.75 34.01 35.07 34.46 36.04 37.20 38.74 38.38 38.50 38.50 41.50 39.85 39.38 38.05 39.50 38.75 40.64 37.75 40.17 41.33 41.03 40.71 45.15 42.75

0 0 8 27 45 43 51 38 40 43 55 34 36 42 23 30 35 27 17 25 20 15 19 12 10 15 14 17 7 59 37 31 6 0 1 4 30 59 50 54 63 69 91 75 68 50 56 30 25 30 16 23 9 13 13 11 7 6 7 2 6 3 15 7 10 2
2003 1 4 3 2 1 200 0.00 0.00 21.75 26.93 28.50 30.14 32.72 35.33 35.19 37.91 39.22 40.25 41.10 41.71 41.15 42.67 42.14 42.22 43.25 44.00 48.33 46.86 45.67 46.50 42.50 45.80 42.50 46.00 47.50 46.67 47.72 47.25 50.00 0.00 0.00 21.00 28.43 29.11 31.11 31.58 32.62 32.94 34.35 35.33 35.44 35.85 38.00 37.00 38.56 37.36 41.00 37.50 36.00 38.00 39.00 38.75 42.00 44.50 40.67 40.67 43.33 42.00 42.00 42.78 45.36 0.00
0 0 4 15 30 28 18 15 21 11 9 8 10 7 13 9 7 9 4 13 6 7 3 4 2 10 2 6 4 30 18 12 1 0 0 3 7 19 18 19 13 18 23 15 18 20 11 24 18 11 3 2 2 5 2 4 2 4 3 3 3 1 7 9 11 0
2004 1 4 3 2 1 200 0.00 0.00 23.00 26.14 29.90 31.63 33.42 34.16 36.95 38.00 37.47 39.31 40.74 41.79 42.55 44.38 43.27 44.00 44.67 46.67 45.13 45.83 44.25 44.00 45.78 44.40 46.29 46.00 49.00 45.98 46.56 47.11 47.00 0.00 0.00 23.17 26.29 29.19 30.37 30.56 32.16 34.28 34.29 34.44 35.79 36.15 35.57 36.33 38.42 38.76 38.75 37.38 39.29 41.00 40.88 41.00 44.67 41.43 41.00 41.00 44.00 41.00 42.00 41.75 40.67 0.00
0 0 5 22 21 41 33 19 22 26 30 16 23 14 22 8 11 11 6 9 8 6 8 6 9 5 7 2 5 41 16 9 1 0 0 6 17 31 41 45 31 47 38 36 28 27 14 21 19 17 12 8 7 1 8 6 3 7 5 5 1 2 15 8 3 0

#_environmental_data
4 # N_variables
122 # N_observations
Year Variable Value Adj
Retention L50s 1980 value = 33.3 34.3
1981 1 -0.018187722 # 32.6818 33.6818
1982 1 -0.03670935 # 32.0637 33.0637
1983 1 -0.055583596 # 31.4455 32.4455
1984 1 -0.074820942 # 30.8273 31.8273
1985 1 -0.094432431 # 30.2092 31.2092
1986 1 -0.114439506 # 29.5910 30.5910
1987 1 -0.114439506
1988 1 -0.114439506
1989 1 -0.114439506
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2001 1 -0.114439506
2002 1 -0.114439506
2003 1 -0.114439506
2004 1 -0.114439506
1 / Slope 1980 value = 1.66667
1981 2 -0.065007161 # 1.56177
1982 2 -0.125898167 # 1.46951
1983 2 -0.183432051 # 1.38735
1984 2 -0.237703703 # 1.31406
1985 2 -0.289305754 # 1.24797

1986 2 -0.338375187 # 1.18821
1987 2 -0.338375187
1988 2 -0.338375187
1989 2 -0.338375187
1990 2 -0.338375187
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2001 2 -0.338375187
2002 2 -0.338375187
2003 2 -0.338375187
2004 2 -0.338375187
Male offset for Ret L50 1980 value = -0.70000
1981 3 0.120066142 # -0.78930
1982 3 0.227363207 # -0.87870
1983 3 0.324151752 # -0.96800
1984 3 0.412393433 # -1.05730
1985 3 0.493563196 # -1.14670
1986 3 0.568555303 # -1.23600
1987 3 0.568555303 #
1988 3 0.568555303 #
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2004 3 0.568555303 #
Fem Maturity L50 1954 value = 36.5000 1984 value = 33.4 Annual Incr = 0.103333333
1955 4 -0.002835065 # 36.3967
1956 4 -0.005678191 # 36.2933
1957 4 -0.008529423 # 36.1900
1958 4 -0.011388808 # 36.0867
1959 4 -0.014256392 # 35.9833
1960 4 -0.017132223 # 35.8800
1961 4 -0.020016349 # 35.7767

1962 4 -0.022908816 # 35.6733
1963 4 -0.025809675 # 35.5700
1964 4 -0.028718972 # 35.4667
1965 4 -0.031636759 # 35.3633
1966 4 -0.034563084 # 35.2600
1967 4 -0.037497997 # 35.1567
1968 4 -0.040441549 # 35.0533
1969 4 -0.043393792 # 34.9500
1970 4 -0.046354776 # 34.8467
1971 4 -0.049324554 # 34.7433
1972 4 -0.052303177 # 34.6400
1973 4 -0.055290699 # 34.5367
1974 4 -0.058287173 # 34.4333
1975 4 -0.061292653 # 34.3300
1976 4 -0.064307193 # 34.2267
1977 4 -0.067330848 # 34.1233
1978 4 -0.070363674 # 34.0200
1979 4 -0.073405725 # 33.9167
1980 4 -0.076457059 # 33.8133
1981 4 -0.079517731 # 33.7100
1982 4 -0.082587801 # 33.6067
1983 4 -0.085667324 # 33.5033
1984 4 -0.088756361 # 33.4000
1985 4 -0.088756361
1986 4 -0.088756361
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2001 4 -0.088756361
2002 4 -0.088756361
2003 4 -0.088756361
2004 4 -0.088756361

999 # end of file

Appendix 3. Final base model estimates of numbers-at-age by sex.

Age (across)
Year 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

Females (1000s)
Virgin 69484.5 63504.1 58038.3 53043 48477.7 44305.3 40492 37006.9 33821.7 30910.7 28250.3 25818.8 23596.6 21565.7 19709.6 18013.2 16462.8 15045.9 13750.9 12567.4 11485.7 10497.2 9593.67 8767.96 8013.31 7323.61 6693.28 6117.2 5590.7 5109.51 4669.74 4267.82 3900.5 3564.79 3257.97 2977.56 2721.28 2487.07 2273.01 2077.37 1898.58 1735.17 1585.82 1449.33 1324.59 1210.59 1106.39 1011.17 924.136 844.597 771.903 705.466 644.748 589.255 538.539 492.187 449.825 411.109 375.726 343.387 3646.3
1910 69484.5 63504.1 58038.3 53043 48477.7 44305.3 40492 37006.9 33821.7 30910.7 28250.3 25818.8 23596.6 21565.7 19709.6 18013.2 16462.8 15045.9 13750.9 12567.4 11485.7 10497.2 9593.67 8767.96 8013.31 7323.61 6693.28 6117.2 5590.7 5109.51 4669.74 4267.82 3900.5 3564.79 3257.97 2977.56 2721.28 2487.07 2273.01 2077.37 1898.58 1735.17 1585.82 1449.33 1324.59 1210.59 1106.39 1011.17 924.136 844.597 771.903 705.466 644.748 589.255 538.539 492.187 449.825 411.109 375.726 343.387 3646.3
1911 69484.5 63504.1 58038.3 53043 48477.7 44305.3 40492 37006.9 33821.7 30910.7 28250.3 25818.8 23596.6 21565.7 19709.6 18013.2 16462.8 15045.9 13750.9 12567.4 11485.7 10497.2 9593.67 8767.96 8013.31 7323.61 6693.28 6117.2 5590.7 5109.51 4669.74 4267.82 3900.5 3564.79 3257.97 2977.56 2721.28 2487.07 2273.01 2077.37 1898.58 1735.17 1585.82 1449.33 1324.59 1210.59 1106.39 1011.17 924.136 844.597 771.903 705.466 644.748 589.255 538.539 492.187 449.825 411.109 375.726 343.387 3646.3
1912 69484.4 63504 58038.3 53043 48477.7 44305.3 40491.9 37006.7 33821.4 30910.2 28249.7 25818.2 23596 21565.1 19709 18012.7 16462.4 15045.5 13750.6 12567.1 11485.5 10497 9593.5 8767.81 8013.18 7323.5 6693.18 6117.11 5590.62 5109.44 4669.68 4267.77 3900.45 3564.74 3257.93 2977.52 2721.25 2487.04 2272.98 2077.35 1898.55 1735.15 1585.81 1449.32 1324.58 1210.57 1106.38 1011.16 924.126 844.588 771.895 705.459 644.741 589.249 538.533 492.182 449.821 411.105 375.722 343.384 3646.26
1913 69484.2 63504 58038.3 53043 48477.7 44305.2 40491.8 37006.4 33820.9 30909.4 28248.6 25816.9 23594.7 21563.9 19707.9 18011.7 16461.5 15044.8 13749.9 12566.5 11485 10496.5 9593.15 8767.51 8012.92 7323.27 6692.98 6116.93 5590.47 5109.31 4669.56 4267.66 3900.35 3564.66 3257.85 2977.46 2721.19 2486.98 2272.93 2077.3 1898.51 1735.11 1585.77 1449.29 1324.55 1210.55 1106.36 1011.13 924.107 844.57 771.879 705.444 644.728 589.237 538.522 492.172 449.811 411.097 375.714 343.377 3646.18
1914 69484 63503.8 58038.3 53043 48477.7 44305.2 40491.7 37006.2 33820.3 30908.4 28247.2 25815.3 23593 21562.1 19706.3 18010.2 16460.2 15043.6 13748.9 12565.7 11484.3 10495.9 9592.61 8767.04 8012.51 7322.92 6692.67 6116.66 5590.23 5109.1 4669.38 4267.5 3900.21 3564.53 3257.74 2977.35 2721.1 2486.9 2272.85 2077.23 1898.45 1735.05 1585.72 1449.24 1324.51 1210.51 1106.32 1011.1 924.078 844.544 771.855 705.422 644.708 589.218 538.505 492.157 449.797 411.084 375.702 343.366 3646.07
1915 69483.7 63503.6 58038.1 53043 48477.7 44305.2 40491.6 37005.9 33819.7 30907.3 28245.7 25813.4 23590.8 21559.9 19704.1 18008.2 16458.4 15042 13747.6 12564.5 11483.3 10495 9591.86 8766.39 8011.96 7322.44 6692.25 6116.3 5589.91 5108.81 4669.13 4267.28 3900.01 3564.35 3257.58 2977.21 2720.97 2486.78 2272.75 2077.14 1898.37 1734.98 1585.65 1449.18 1324.45 1210.46 1106.27 1011.06 924.039 844.508 771.823 705.393 644.681 589.194 538.483 492.136 449.779 411.067 375.687 343.352 3645.92
1916 69483.3 63503.3 58037.9 53042.8 48477.6 44305.2 40491.6 37005.6 33819.1 30906.3 28244.1 25811.3 23588.4 21557.3 19701.5 18005.8 16456.2 15040 13745.8 12563 11481.9 10493.9 9590.89 8765.56 8011.24 7321.82 6691.71 6115.83 5589.49 5108.45 4668.81 4266.99 3899.76 3564.13

3257.38 2977.03 2720.81 2486.64 2272.62 2077.02 1898.26 1734.88 1585.57 1449.1 1324.38 1210.39 1106.22 1011.01 923.99 844.464 771.782 705.356 644.647 589.163 538.455 492.111 449.756 411.046 375.668 343.334 3645.74
1917 69482.9 63502.9 58037.7 53042.7 48477.5 44305.1 40491.5 37005.4 33818.6 30905.4 28242.8 25809.5 23586.1 21554.8 19698.8 18003.1 16453.7 15037.8 13743.8 12561.2 11480.4 10492.6 9589.77 8764.59 8010.4 7321.1 6691.09 6115.28 5589.02 5108.04 4668.44 4266.67 3899.47 3563.87 3257.15 2976.83 2720.63 2486.48 2272.48 2076.89 1898.14 1734.77 1585.47 1449.01 1324.3 1210.32 1106.15 1010.95 923.936 844.414 771.737 705.315 644.61 589.129 538.424 492.082 449.73 411.022 375.646 343.315 3645.53
1918 69481.7 63502.5 58037.3 53042.4 48477.3 44304.8 40490.7 37003.5 33815 30900.1 28236.1 25801.9 23578.2 21546.9 19691.2 17996 16447.2 15032 13738.7 12556.8 11476.6 10489.3 9586.93 8762.14 8008.28 7319.26 6689.49 6113.88 5587.79 5106.96 4667.49 4265.82 3898.72 3563.2 3256.55 2976.29 2720.14 2486.04 2272.08 2076.54 1897.82 1734.49 1585.21 1448.77 1324.08 1210.12 1105.97 1010.78 923.788 844.28 771.614 705.203 644.508 589.036 538.339 492.005 449.659 410.958 375.587 343.261 3644.96
1919 69480.2 63501.5 58037 53042.1 48477.1 44304.6 40490.3 37002.2 33812.1 30895.2 28229.2 25793.7 23569.2 21537.7 19682.3 17987.5 16439.4 15024.9 13732.5 12551.3 11471.8 10485.2 9583.38 8759.08 8005.64 7316.96 6687.5 6112.15 5586.27 5105.62 4666.31 4264.78 3897.79 3562.38 3255.82 2975.63 2719.55 2485.51 2271.61 2076.11 1897.43 1734.13 1584.89 1448.48 1323.82 1209.88 1105.75 1010.59 923.609 844.116 771.466 705.068 644.384 588.924 538.236 491.911 449.574 410.88 375.516 343.196 3644.27
1920 69478.7 63500.1 58036 53041.8 48476.8 44304.4 40490 37001.6 33810.6 30892.1 28224.2 25786.9 23561.1 21529 19673.4 17978.9 16431.2 15017.4 13725.7 12545.4 11466.6 10480.7 9579.46 8755.7 8002.72 7314.45 6685.31 6110.25 5584.62 5104.17 4665.03 4263.66 3896.8 3561.49 3255.03 2974.93 2718.93 2484.95 2271.1 2075.65 1897.02 1733.76 1584.55 1448.18 1323.54 1209.63 1105.53 1010.38 923.42 843.945 771.31 704.925 644.255 588.805 538.128 491.813 449.484 410.798 375.441 343.128 3643.55
1921 69477.5 63498.8 58034.8 53040.9 48476.5 44304.2 40490 37001.9 33811 30892.1 28223 25784 23556.6 21523.1 19666.8 17972.1 16424.4 15011 13719.7 12539.9 11461.8 10476.4 9575.77 8752.51 7999.97 7312.07 6683.27 6108.48 5583.08 5102.83 4663.86 4262.63 3895.9 3560.7 3254.32 2974.3 2718.36 2484.44 2270.65 2075.25 1896.66 1733.43 1584.25 1447.91 1323.3 1209.41 1105.33 1010.2 923.256 843.796 771.174 704.802 644.142 588.703 538.035 491.728 449.406 410.727 375.377 343.069 3642.92
1922 69475.6 63497.6 58033.5 53039.8 48475.7 44303.8 40489.2 37000.2 33808.1 30887.9 28217.5 25777.1 23548.2 21513.6 19656.7 17961.8 16414.5 15001.6 13711 12532 11454.8 10470.2 9570.38 8747.84 7995.93 7308.58 6680.24 6105.85 5580.79 5100.84 4662.11 4261.09 3894.54 3559.49 3253.26 2973.35 2717.52 2483.69 2269.97 2074.63 1896.11 1732.94 1583.81 1447.51 1322.93 1209.08 1105.02 1009.92 923.006 843.568 770.966 704.613 643.97 588.546 537.892 491.598 449.287 410.618 375.278 342.978 3641.97
1923 69472.3 63495.9 58032.5 53038.6 48474.6 44302.7 40487.5 36996.1 33800.3 30876.3 28202.9 25760.5 23530.5 21495.3 19638.4 17944 16397.7 14986.1 13697 12519.4 11443.6 10460.4 9561.75 8740.33 7989.41 7302.92 6675.32 6101.57 5577.06 5097.57 4659.24 4258.56 3892.3 3557.51 3251.49 2971.77 2716.1 2482.42 2268.83 2073.61 1895.18 1732.1 1583.05 1446.82 1322.32 1208.52 1104.52 1009.46 922.584 843.185 770.618 704.295 643.681 588.282 537.652 491.378 449.087 410.436 375.111 342.826 3640.36
1924 69468.6 63492.9 58030.9 53037.7 48473.6 44301.7 40486.1 36993.3 33794.3 30865.8 28188.3 25742.9 23511.2 21475.2 19618.1 17924.2 16378.8 14968.4 13680.8 12504.9 11430.5 10448.9 9551.64 8731.5 7981.72 7296.24 6669.52 6096.53 5572.66 5093.72 4655.87 4255.59 3889.68 3555.19 3249.43 2969.93 2714.46 2480.95 2267.51 2072.43 1894.11 1731.14 1582.18 1446.03 1321.6 1207.87 1103.93 1008.93 922.099 842.743 770.216 703.929 643.347 587.978 537.374 491.125 448.857 410.226 374.919 342.651 3638.51

1925 69463.3 63489.5 58028.1 53036.2 48472.7 44300.4 40483.7 36988.2 33784.6 30850 28166.4 25716.4 23482.2 21445.5 19588.8 17896.1 16352.3 14943.9 13658.5 12484.8 11412.7 10433 9537.73 8719.32 7971.1 7286.99 6661.47 6089.51 5566.54 5088.36 4651.16 4251.45 3886.02 3551.94 3246.54 2967.36 2712.17 2478.89 2265.66 2070.76 1892.62 1729.79 1580.96 1444.93 1320.6 1206.96 1103.1 1008.18 921.418 842.123 769.652 703.416 642.879 587.552 536.986 490.771 448.533 409.931 374.65 342.405 3635.91

1926 69457.5 63484.7 58025 53033.7 48471.3 44299.4 40482 36984.6 33777.4 30837.6 28147.6 25691.7 23453.3 21414.6 19557.8 17865.9 16323.6 14917.1 13633.9 12462.5 11392.7 10415.3 9522.07 8705.56 7959.07 7276.49 6652.32 6081.54 5559.58 5082.28 4645.84 4246.77 3881.89 3548.29 3243.3 2964.48 2709.6 2476.59 2263.6 2068.91 1890.95 1728.29 1579.6 1443.7 1319.49 1205.96 1102.19 1007.35 920.664 841.438 769.028 702.848 642.362 587.081 536.556 490.379 448.176 409.605 374.353 342.134 3633.05

1927 69452 63479.4 58020.6 53030.9 48469 44298.2 40481.2 36983.3 33774.4 30831.4 28136.8 25675.1 23431.4 21388.9 19530.1 17837.9 16296.4 14891.3 13609.7 12440.3 11372.5 10397.2 9506.03 8691.39 7946.62 7265.6 6642.83 6073.27 5552.38 5076 4640.34 4241.95 3877.66 3544.56 3240 2961.56 2706.99 2474.27 2261.53 2067.05 1889.28 1726.78 1578.25 1442.48 1318.38 1204.95 1101.28 1006.52 919.916 840.758 768.409 702.285 641.85 586.614 536.131 489.992 447.823 409.282 374.059 341.866 3630.21

1928 69445.3 63474.3 58015.8 53026.8 48466.4 44295.9 40478.9 36979.4 33767.4 30820.5 28121.2 25654.7 23405.8 21359.1 19497.8 17805 16264.2 14860.6 13581.1 12413.9 11348.6 10375.7 9486.82 8674.39 7931.63 7252.45 6631.31 6063.21 5543.6 5068.33 4633.64 4236.08 3872.5 3540.01 3235.98 2957.99 2703.82 2471.44 2259 2064.79 1887.25 1724.95 1576.6 1440.99 1317.04 1203.74 1100.18 1005.52 919.007 839.932 767.659 701.602 641.228 586.048 535.615 489.522 447.394 408.892 373.702 341.541 3626.78

1929 69438.9 63468.2 58011.2 53022.5 48462.7 44293.5 40476.9 36977.7 33764.5 30814.9 28112.2 25641.5 23388.2 21336.7 19471.5 17776.3 16234.8 14831.8 13553.7 12388.2 11324.9 10354.1 9467.42 8657.09 7916.31 7238.95 6619.46 6052.84 5534.54 5060.43 4626.74 4230.05 3867.21 3535.37 3231.89 2954.37 2700.62 2468.59 2256.46 2062.52 1885.21 1723.13 1574.96 1439.51 1315.7 1202.53 1099.08 1004.53 918.109 839.117 766.918 700.928 640.615 585.49 535.107 489.059 446.972 408.507 373.351 341.221 3623.41

1930 65494.5 63462.4 58005.6 53018.2 48458.7 44289.9 40473.8 36973.3 33758.3 30805.5 28099.1 25624.7 23367.7 21312.8 19444.1 17746.1 16203.2 14800.3 13523.4 12359.8 11298.5 10330 9445.55 8637.49 7898.87 7223.52 6605.87 6040.9 5524.08 5051.28 4618.74 4223.05 3861.08 3529.98 3227.15 2950.19 2696.91 2465.3 2253.53 2059.9 1882.87 1721.02 1573.06 1437.81 1314.16 1201.14 1097.83 1003.39 917.077 838.181 766.068 700.156 639.912 584.85 534.525 488.528 446.489 408.066 372.949 340.854 3619.55

1931 65306.7 59857.4 58000.3 53013.1 48454.8 44286.3 40471 36971.8 33756.8 30803.4 28094.8 25617.3 23357 21298.4 19426 17724.4 16178.6 14774 13496.8 12334 11274.2 10307.3 9424.7 8618.56 7881.87 7208.38 6592.47 6029.1 5513.72 5042.21 4610.82 4216.13 3855.03 3524.69 3222.5 2946.1 2693.3 2462.11 2250.7 2057.38 1880.62 1719.01 1571.26 1436.19 1312.71 1199.83 1096.64 1002.32 916.107 837.301 765.27 699.431 639.254 584.252 533.98 488.032 446.037 407.655 372.574 340.512 3615.95

1932 65067.7 59685.8 54705.6 53008.2 48450.2 44283 40468.7 36971.8 33760.1 30808.8 28101 25622.2 23358.8 21296.5 19420.1 17714.2 16164.3 14756.3 13476.9 12313.2 11253.6 10287.6 9406.21 8601.45 7866.26 7194.32 6579.92 6017.99 5503.93 5033.63 4603.31 4209.58 3849.33 3519.72 3218.17 2942.31 2689.98 2459.19 2248.12 2055.1 1878.59 1717.21 1569.65 1434.75 1311.42 1198.67 1095.6 1001.38 915.256 836.531 764.572 698.799 638.68 583.73 533.506 487.601 445.645 407.298 372.249 340.216 3612.84

1933 64769.1 59467.4 54548.7 49997.1 48445.7 44278.8 40466 36970.4 33761.5 30813.8 28108.3 25630.3 23365.6 21300.4 19420.4 17710.6 16156.6 14744.6 13461.9 12296.1 11235.5 10269.6 9388.89 8585.11 7851.11 7180.48 6567.45 6006.85 5494.07 5024.93 4595.69 4202.92 3843.53 3514.67 3213.77 2938.47 2686.63 2456.25 2245.53 2052.82 1876.58 1715.42 1568.07 1433.33

1310.15 1197.53 1094.58 1000.46 914.428 835.784 763.897 698.187 638.126 583.227 533.049 487.186 445.268 406.954 371.937 339.931 3609.87
1934 64397.6 59194.5 54349.1 49853.8 45693.8 44274.9 40462.5 36969 33762.1 30817.8 28116.1 25640.4 23376.5 21309.9 19426.9 17713.5 16155.6 14739.6 13452.9 12283.8 11221.1 10254.2 9373.36 8570.08 7836.89 7167.24 6555.33 5995.92 5484.31 5016.29 4588.08 4196.25 3837.7 3509.6 3209.36 2934.64 2683.29 2453.34 2242.99 2050.59 1874.62 1713.69 1566.53 1431.97 1308.93 1196.45 1093.61 999.589 913.643 835.077 763.258 697.61 637.604 582.755 532.621 486.797 444.914 406.633 371.644 339.665 3607.09
1935 63936.9 58855 54099.7 49671.3 45562.8 41759.8 40458.6 36965 33759.2 30816.2 28117.1 25644.8 23383 21317.3 19433.3 17717.4 16156.4 14737.1 13447 12274.4 11208.9 10240.1 9358.53 8555.29 7822.63 7153.79 6542.85 5984.5 5474.01 5007.1 4579.93 4189.08 3831.41 3504.1 3204.57 2930.48 2679.66 2450.18 2240.23 2048.17 1872.49 1711.82 1564.87 1430.5 1307.63 1195.28 1092.56 998.656 912.805 834.323 762.579 696.997 637.049 582.253 532.166 486.384 444.539 406.292 371.334 339.383 3604.16
1936 63370.6 58434 53789.4 49443.4 45396 41640 38160.2 36961 33754.8 30812.4 28114.3 25644.3 23385.5 21321.9 19438.8 17722.1 16159.1 14737.1 13444 12268.5 11199.9 10228.6 9345.36 8541.44 7808.85 7140.54 6530.35 5972.91 5463.42 4997.54 4571.41 4181.52 3824.75 3498.26 3199.47 2926.03 2675.79 2446.8 2237.28 2045.59 1870.23 1709.83 1563.12 1428.95 1306.25 1194.06 1091.47 997.681 911.931 833.538 761.872 696.36 636.474 581.732 531.694 485.957 444.152 405.94 371.015 339.092 3601.14
1937 62677.2 57916.4 53404.6 49159.8 45187.7 41487.7 38051.1 34862.2 33753 30811 28113.9 25644.9 23388.2 21327.2 19445.7 17729.6 16165.5 14741.3 13445.5 12267.1 11195.5 10221.3 9335.66 8530.12 7796.81 7128.48 6518.7 5961.9 5453.18 4988.18 4562.96 4173.98 3818.07 3492.37 3194.31 2921.52 2671.86 2443.39 2234.31 2043 1867.97 1707.85 1561.39 1427.42 1304.9 1192.86 1090.41 996.731 911.082 832.777 761.189 695.746 635.92 581.233 531.243 485.549 443.781 405.604 370.71 338.815 3598.27
1938 61825.2 57282.6 52931.6 48808.1 44928.6 41297.2 37911.4 34761.1 31833.3 30804.4 28106.6 25638.2 23382.6 21323.9 19445.4 17731.4 16168.3 14743.8 13446.5 12266 11192.1 10215.5 9327.37 8519.81 7785.19 7116.34 6506.67 5950.35 5442.31 4978.1 4553.74 4165.66 3810.64 3485.78 3188.48 2916.4 2667.38 2439.47 2230.89 2040.01 1865.36 1705.56 1559.37 1425.64 1303.33 1191.47 1089.17 995.626 910.094 831.891 760.394 695.03 635.275 580.65 530.717 485.072 443.35 405.213 370.354 338.492 3594.93
1939 60777.7 56504 52352.4 48375.8 44607.2 41060.6 37738.1 34635.8 31745.6 29059.4 28109.6 25641.2 23385.9 21327.5 19450.2 17738 16175.9 14751.5 13453.1 12270.6 11194.4 10215.2 9324.51 8514.42 7777.7 7107.43 6497.1 5940.71 5432.97 4969.25 4545.51 4158.12 3803.83 3479.7 3183.1 2911.66 2663.23 2435.85 2227.74 2037.28 1862.99 1703.5 1557.57 1424.07 1301.95 1190.26 1088.1 994.682 909.256 831.146 759.729 694.435 634.741 580.171 530.285 484.683 442.998 404.894 370.066 338.231 3592.25
1940 59487.5 55546.7 51640.8 47846.5 44212 40766.3 37519.2 34469.4 31614.9 28955 26487.6 25610.3 23355.7 21300.1 19426.3 17718.5 16161.3 14740.6 13444.9 12263.5 11187.2 10207.4 9315.63 8504.26 7766.13 7094.72 6483.76 5927.34 5420.03 4957.01 4534.1 4147.6 3794.24 3471.05 3175.35 2904.75 2657.09 2430.42 2222.95 2033.05 1859.26 1700.21 1554.66 1421.5 1299.67 1188.22 1086.29 993.062 907.805 829.843 758.557 693.379 633.788 579.309 529.505 483.976 442.357 404.313 369.537 337.75 3587.27
1941 57915.3 54367.5 50765.8 47196.1 43728.3 40405.4 37250.9 34270.7 31465 28838.3 26395.3 24135.5 23330.8 21275.7 19404.2 17699.3 16145.8 14729.2 13436.6 12257.4 11181.9 10201.8 9309.25 8496.75 7757.34 7084.55 6472.46 5915.4 5408.01 4945.35 4523.04 4137.28 3784.71 3462.35 3167.49 2897.7 2650.8 2424.83 2218 2028.68 1855.4 1696.8 1551.66 1418.84 1297.32 1186.14 1084.43 991.404 906.322 828.514 757.363 692.305 632.821 578.436 528.716 483.262 441.71 403.726 369.004 337.266 3582.25
1942 56019.5 52930.6 49688.1 46396.5 43133.9 39963.5 36921.8 34026.8 31285 28703.1 26290.5 24053.1 21989.1 21255 19383.9 17681 16130 14716.6 13427.4 12250.8 11177 10197.4 9304.52

8491.2 7750.67 7076.63 6463.23 5905.1 5397.09 4934.33 4512.33 4127.11 3775.2 3453.56 3159.46 2890.43 2644.28 2419.01 2212.82 2024.08 1851.33 1693.21 1548.49 1416.04 1294.84 1183.94 1082.48 989.662 904.767 827.122 756.115 691.183 631.811 577.525 527.893 482.518 441.036 403.115 368.45 336.763 3577.06

1943 53773.1 51197.9 48374.9 45411.5 42403.1 39420.1 36516.7 33721.4 31051.9 28522.5 26146.8 23935.7 21892.7 20013 19346.6 17646.5 16099.4 14690.1 13405.5 12233.4 11163.1 10186.1 9294.45 8481.47 7740.77 7066.22 6452.12 5893.18 5384.53 4921.51 4499.69 4114.99 3763.79 3442.93 3149.66 2881.49 2636.18 2411.71 2206.28 2018.24 1846.12 1688.57 1544.36 1412.37 1291.57 1181.02 1079.88 987.337 902.683 825.252 754.433 689.667 630.443 576.289 526.774 481.504 440.117 402.281 367.692 336.074 3569.91

1944 51172.2 49144.9 46791.4 44211.3 41502.8 38750.6 36010.1 33318.1 30703.6 28204.1 25851.8 23664.9 21648.7 19798.4 18102.9 17507.6 15977.2 14584.1 13314 12155 11096.5 10129.2 9245.31 8438.14 7701.71 7030.39 6418.74 5861.7 5354.52 4892.85 4472.49 4089.45 3740.07 3421.05 3129.57 2863.11 2619.43 2396.51 2192.51 2005.8 1834.89 1678.44 1535.22 1404.13 1284.13 1174.31 1073.81 981.857 897.724 820.759 750.359 685.97 627.085 573.236 523.998 478.978 437.817 400.186 365.783 334.333 3551.62

1945 48283.7 46767.9 44915.1 42764.1 40406 37929.4 35408 32887.9 30404 27991.2 25690.8 23534.8 21537.8 19701.7 18019.3 16478.9 15940.3 14550 13283.9 12129.3 11075.3 10112.3 9231.87 8427.22 7692.2 7021.44 6409.86 5852.55 5344.92 4882.67 4461.86 4078.66 3729.46 3410.91 3120.05 2854.27 2611.29 2389.08 2185.79 1999.75 1829.47 1673.6 1530.91 1400.29 1280.73 1171.28 1071.12 979.457 895.582 818.844 748.644 684.431 625.7 571.99 522.874 477.962 436.898 399.353 365.028 333.648 3544.57

1946 45184.1 44127.9 42742.6 41049.3 39083.3 36926.4 34654.3 32328.1 29991.4 27688 25460.1 23348.8 21380.5 19564.6 17898.8 16374.3 14978.9 14493.7 13233.4 12085.1 11037.3 10080.3 9205.51 8405.38 7673.82 7005.35 6395.13 5838.62 5331.38 4869.27 4448.41 4065.22 3716.25 3398.21 3108.06 2843.09 2600.97 2379.61 2177.16 1991.93 1822.42 1667.26 1525.22 1395.2 1276.17 1167.21 1067.48 976.195 892.659 816.221 746.286 682.308 623.787 570.262 521.312 476.548 435.616 398.191 363.973 332.689 3534.65

1947 42020.4 41295.2 40329.9 39063.8 37516 35716.9 33734.5 31629.4 29459.6 27280.3 25144.9 23096.6 21169.8 19382.9 17739.4 16234.2 14857.2 13596.5 13161.2 12021 10981.4 10032.1 9164.55 8371 7644.81 6980.56 6373.34 5818.86 5313.04 4851.89 4431.68 4048.91 3700.35 3382.87 3093.49 2829.47 2588.34 2367.98 2166.51 1982.23 1813.62 1659.31 1518.06 1388.75 1270.38 1162.01 1062.8 971.999 888.888 812.828 743.23 679.552 621.298 568.011 519.274 474.701 433.941 396.67 362.591 331.433 3521.6

1948 38997.8 38403.8 37740.9 36858.8 35701.4 34284.8 32631.4 30796.9 28838.6 26821 24805.3 22843.8 20973.6 19221.7 17601.3 16112.8 14750.2 13503.5 12361.6 11969.3 10935.4 9992.07 9130.21 8342.16 7621.04 6960.87 6356.81 5804.45 5299.94 4839.61 4419.85 4037.29 3688.78 3371.37 3082.24 2818.67 2578.18 2358.53 2157.79 1974.23 1806.34 1652.72 1512.12 1383.42 1265.59 1157.72 1058.97 968.57 885.821 810.083 740.77 677.344 619.313 566.225 517.663 473.247 432.627 395.48 361.513 330.455 3511.55

1949 36365.4 35641.3 35098.4 34492.6 33685.9 32623.4 31308.1 29747.3 27996.3 26132 24235.7 22370.9 20580.8 18890.5 17316.5 15865.1 14533.5 13314.2 12197.8 11174 10826.3 9896.62 9047.46 8270.71 7559.76 6908.58 6311.97 5765.67 5265.84 4809.06 4392.09 4011.73 3664.96 3348.96 3061.09 2798.8 2559.66 2341.42 2142.06 1959.84 1793.21 1640.77 1501.28 1373.6 1256.72 1149.71 1051.74 962.04 879.928 804.763 735.963 672.999 615.382 562.664 514.435 470.318 429.967 393.063 359.315 328.455 3490.71

1950 34468.7 33235.5 32573.7 32077.5 31523.4 30781.2 29788.9 28535.1 27030.9 25352.1 23592.7 21835 20132.6 18516 16999.3 15591.8 14295.5 13106 12016 11016.6 10098.9 9790.58 8954.73 8190.3 7490.26 6848.89 6260.92 5721.82 5227.85 4775.63 4362.17 3984.57 3640 3325.76 3039.32 2778.32 2540.47 2323.57 2125.59 1944.71 1779.36 1628.14 1489.79 1363.18 1247.28 1141.17 1044.02 955.072 873.635 799.079 730.83 668.359 611.184 558.864 510.992 467.195 427.132 390.488 356.975 326.327 3468.55

1951 33766.2 31502 30375 29770.1 29316 28803.2 28095.9 27115.8 25856.9 24365.9 22748.3 21102.9 19498.7 17970.8 16534.3 15193.4 13951 12806.3 11754.5 10788.6 9901.19 9084.41 8813.97 8067.01 7382.76 6755.25 6179.58 5651.28 5166.41 4721.77 4314.43 3941.77 3601.26 3290.39 3006.77 2748.16 2512.45 2297.58 2101.6 1922.68 1759.19 1609.71 1472.98 1347.87 1233.36 1128.53 1032.56 944.679 864.214 790.54 723.089 661.34 604.817 553.085 505.744 462.427 422.796 386.543 353.384 323.057 3434.34
1952 34950.6 30860 28790.7 27760.6 27207.2 26786.1 26288.5 25566.6 24552 23277.2 21824.5 20305.2 18803 17366.1 16012.7 14747.3 13568 12474.7 11465.6 10536.3 9680.82 8892.9 8166.06 7928.7 7261.32 6649.03 6086.74 5570.31 5095.89 4660.1 4260.17 3893.55 3557.95 3251.17 2970.97 2715.26 2482.01 2269.35 2075.46 1898.58 1737.06 1589.45 1454.47 1330.98 1217.98 1114.55 1019.85 933.139 853.741 781.038 714.468 653.518 597.719 546.64 499.89 457.107 417.959 382.142 349.378 319.409 3396.18
1953 39067.5 31942.4 28203.9 26312.7 25370.6 24857.8 24440.8 23903.6 23113.9 22049.8 20783.8 19408.8 18019.9 16677.6 15410.8 14225.7 13120.1 12089.2 11131.7 10245.5 9427.03 8671.45 7973.64 7328.34 7120.75 6525.7 5978.86 5475.98 5013.54 4588.26 4197.24 3838.12 3508.69 3206.96 2930.99 2678.83 2448.61 2238.55 2046.98 1872.27 1712.85 1567.26 1434.16 1312.44 1201.07 1099.14 1005.84 920.405 842.175 770.536 704.935 644.865 589.863 539.507 493.41 451.218 412.604 377.271 344.945 315.372 3353.98
1954 47428.2 35705 29193.2 25776.4 24047.5 23182 22693.7 22263.4 21695.3 20891.9 19857.9 18670.8 17412.3 16160.1 14960.6 13833.6 12781.2 11799.2 10882.5 10029.5 9238.79 8507.04 7830.37 7204.43 6624.75 6439.95 5904.07 5411.14 4957.46 4539.96 4155.77 3802.34 3477.59 3179.57 2906.51 2656.7 2428.38 2219.87 2029.59 1856.03 1697.72 1553.24 1421.27 1300.62 1190.27 1089.3 996.883 912.278 834.81 763.869 698.902 639.409 584.929 535.045 489.374 447.564 409.295 374.272 342.224 312.902 3328.52
1955 59754 43346.1 32632 26680.5 23557.3 21972.3 21159.8 20659.8 20181.6 19570.4 18764.9 17783.3 16693.8 15561.7 14447.5 13385.9 12390.6 11460.9 10592.3 9779.74 9022.01 8317.98 7665.1 7060.22 6499.72 5979.85 5815.67 5333.83 4890.18 4481.51 4105.15 3758.6 3439.63 3146.4 2877.19 2630.45 2404.63 2198.2 2009.63 1837.52 1680.5 1537.25 1406.5 1287.05 1177.84 1077.94 986.529 902.856 826.25 756.103 691.863 633.031 579.153 529.814 484.635 443.271 405.404 370.743 339.021 309.993 3298.51
1956 69794.9 54611.1 39615.3 29823.3 24383.7 21524.9 20057.4 19267.6 18735.2 18215.2 17590.7 16818.8 15915.1 14934.1 13926.1 12939.2 12000.6 11120.3 10296.9 9525.99 8803.28 8127.85 7499 6914.79 6372.63 5869.54 5402.33 5255.9 4821.96 4422.09 4053.5 3713.85 3400.95 3112.82 2847.84 2604.49 2381.38 2177.15 1990.4 1819.8 1664.04 1521.93 1392.26 1273.89 1165.75 1066.87 976.405 893.623 817.847 748.468 684.936 626.752 573.463 524.661 479.969 439.045 401.576 367.273 335.874 307.137 3269.16
1957 70331.7 63787.8 49910.7 36205.7 27255.9 22279.7 19647.8 18259.8 17464.2 16896.1 16354.9 15746.3 15031.4 14217.8 13346.5 12456.2 11585.9 10757.8 9979.98 9250.81 8566.49 7923.4 7321.04 6759.11 6236.16 5750.11 5298.48 4878.58 4747.91 4357.15 3996.83 3664.47 3358.05 3075.63 2815.47 2576.12 2356.25 2154.62 1970 1801.16 1646.88 1506.01 1377.46 1260.15 1153.06 1055.2 965.726 883.864 808.945 740.364 677.57 620.066 567.399 519.164 474.988 434.531 397.485 363.565 332.511 304.086 3237.86
1958 64688.1 64278.4 58297.6 45615 33088.8 24904.2 20337 17887.7 16552.4 15752.5 15174.1 14644 14077 13432.3 12710 11941 11156.3 10388.7 9656.91 8968.03 8320.73 7711.78 7138.22 6599.9 6096.83 5627.93 5191.54 4785.58 4407.76 4290.92 3938.75 3613.8 3313.91 3037.3 2782.25 2547.22 2330.94 2132.19 1949.9 1782.96 1630.25 1490.7 1363.25 1246.94 1140.79 1043.87 955.307 874.322 800.225 732.41 670.329 613.484 561.426 513.747 470.077 430.082 393.453 359.912 329.2 301.083 3207.2
1959 58553.3 59120.4 58746 53280 41688.1 30233.8 22732.9 18516.4 16217.8 14934.6 14152.9 13593.3 13098.3 12585.9 12013.7 11376.9 10699.6 10007.6 9329.23 8681.05 8069.38 7493.25 6950.04 6437.34 5955.28 5504.07 5082.95 4690.57 4325.19 3984.85 3880.17 3562.47 3269.17 2998.37 2748.49 2518.01 2305.55 2109.99 1930.25 1765.35 1614.31 1476.13 1349.83 1234.48 1129.19 1033.1

945.357 865.176 791.849 724.755 663.347 607.129 555.652 508.507 465.327 425.777 389.554 356.38 326.001 298.184 3177.78
1960 54466.9 53513.7 54032 53689.8 48693.2 38090.4 27593.9 20686.5 16766.4 14601.2 13378.8 12635 12113.9 11667.6 11216.2 10716.7 10161 9568.51 8960.96 8363.36 7790.59 7248.53 6736.62 6252.81 5795.21 5364.17 4960.11 4582.49 4230.26 3901.94 3595.87 3502.23 3216.12 2951.86 2707.77 2482.44 2274.54 2082.84 1906.34 1744.09 1595.2 1458.82 1334.01 1219.93 1115.72 1020.6 933.773 854.489 782.034 715.768 655.133 599.634 548.824 502.296 459.684 420.653 384.904 352.161 322.174 294.712 3142.39
1961 54127.2 49779 48907.8 49381.5 49067.4 44487.5 34750.6 25078.6 18681.6 15030.4 13005.3 11863.7 11178.4 10711.1 10322.4 9935.46 9507.96 9030.03 8517.39 7988.76 7466.33 6963.56 6486.07 6033.73 5605.01 5198.54 4814.86 4454.57 4117.35 3802.4 3508.52 3234.29 3150.91 2894.17 2656.9 2437.63 2235.13 2048.21 1875.81 1717.04 1571.04 1437.05 1314.27 1201.9 1099.17 1005.32 919.648 841.441 770.021 704.747 645.046 590.415 540.408 494.625 452.699 414.3 379.127 346.911 317.403 290.377 3097.92
1962 58552.4 49468.6 45494.6 44698.4 45130.2 44831.5 40597.7 31610.2 22690.6 16798.6 13442.5 11588.2 10550.6 9936.16 9525.31 9189.22 8856.47 8487.3 8071.77 7623.32 7158.53 6697.35 6252.09 5828.06 5425.38 5042.95 4679.69 4336.28 4013.38 3710.83 3428 3163.87 2917.24 2842.58 2611.42 2397.69 2200.09 2017.56 1849.03 1693.54 1550.32 1418.6 1297.68 1186.86 1085.43 992.696 907.97 830.617 760.001 695.509 636.565 582.65 533.312 488.149 446.799 408.931 374.248 342.479 313.379 286.725 3060.85
1963 67791 53512.9 45210.9 41578.9 40850 41231.8 40900 36897.9 28550.8 20347.4 14969.2 11926.6 10257.9 9333.76 8794.91 8441.47 8156.2 7873.84 7557.9 7198.82 6808.31 6401.13 5995.3 5602.09 5226.5 4868.92 4528.56 4204.66 3897.95 3609.18 3338.3 3084.82 2847.91 2626.52 2559.84 2352.09 2159.93 1982.21 1817.97 1666.29 1526.32 1397.35 1278.71 1169.78 1069.95 978.556 894.986 818.629 748.911 685.261 627.127 573.991 525.386 480.906 440.187 402.905 368.762 337.49 308.844 282.604 3018.87
1964 83238.9 61956.3 48907.1 41319.6 37999 37320.2 37609.2 37149.7 33280.9 25544.3 18076.1 13233.4 10516.7 9039.3 8230.05 7765.58 7466.47 7227.5 6989.94 6720.83 6411.37 6071.89 5715.65 5358.94 5012.06 4679.77 4362.61 4060.08 3771.64 3498.1 3240.22 2998.05 2771.23 2559.06 2360.67 2301.19 2114.8 1942.32 1782.74 1635.22 1498.95 1373.15 1257.22 1150.55 1052.6 962.815 880.614 805.44 736.749 674.024 616.756 564.447 516.633 472.894 432.865 396.22 362.666 331.937 303.791 278.008 2971.89
1965 100568 76074.6 56623.8 44697.7 37762.1 34716.2 34044.9 34173.2 33535.7 29817.2 22734.9 16014.7 11696.2 9289.24 7988.83 7282.91 6883.03 6629.37 6428.11 6226.73 5995.68 5727.01 5429.95 5116.49 4801.35 4493.96 4198.77 3916.44 3646.65 3389.03 3144.41 2913.55 2696.55 2493.16 2302.78 2124.65 2071.46 1903.95 1748.89 1605.38 1472.69 1350.07 1236.86 1132.5 1036.47 948.28 867.428 793.4 725.695 663.824 607.324 555.736 508.612 465.536 426.13 390.065 357.048 326.815 299.127 273.765 2928.72
1966 88546.2 91912.5 69527 51750.2 40849.2 34499.3 31669.4 30939 30863.6 30072.9 26571.9 20172.7 14177 10347.3 8221.94 7079.29 6463.64 6118.89 5903.11 5732.82 5561.15 5361.67 5127.24 4866.16 4589.26 4309.88 4036.64 3773.66 3521.68 3280.51 3049.92 2830.71 2623.64 2428.85 2246.14 2075.02 1914.83 1867.17 1716.41 1576.8 1447.56 1328.03 1217.54 1115.52 1021.45 934.887 855.375 782.475 715.722 654.665 598.866 547.908 501.377 458.871 420.015 384.467 351.933 322.147 294.873 269.893 2889.55
1967 68610 80925.1 84001.7 63542.8 47294.6 37320.2 31473.7 28786.1 27954.3 27695 26823.4 23601.6 17877.8 12556.3 9168.76 7293.77 6289.41 5751.65 5453.53 5269.11 5124.15 4976.86 4803.6 4598 4367.55 4122.05 3873.58 3630.01 3395.17 3169.79 2953.8 2747.04 2550.31 2364.32 2189.25 2024.94 1870.98 1726.79 1684.02 1548.22 1422.43 1305.95 1198.19 1098.58 1006.57 921.742 843.66 771.936 706.17 645.945 590.856 540.508 494.525 452.536 414.178 379.111 347.03 317.667 290.784 266.167 2851.91
1968 59772.5 62704.8 73960 76771.8 58072.5 43213.1 34063.5 28648.3 26083.8 25198.7 24851.7 23994.1 21077.3 15958.6 11212.6 8194.67 6526.13 5634.19 5158.52 4896.56 4735.75 4609.63 4480.7

4327.74 4145.04 3939.39 3719.67 3496.86 3278.12 3066.97 2864.13 2669.58 2483.21 2305.78 2137.95 1979.9 1831.52 1692.43 1562.15 1523.57 1400.81 1287.07 1181.74 1084.28 994.172 910.942 834.196 763.551 698.653 639.144 584.646 534.794 489.23 447.615 409.613 374.897 343.159 314.123 287.546 263.214 2822.48

1969 59339.5 54627.9 57307.9 67594.3 70162.2 53058 39431.1 30978.4 25910.4 23441.5 22520.5 22125.2 21318.5 18716.9 14178 9972.2 7298.05 5820.55 5032.28 4613.64 4384.74 4245.4 4136.36 4024.09 3889.61 3727.82 3544.86 3348.77 3149.51 2953.59 2764.22 2582.12 2407.31 2239.73 2080.07 1928.98 1786.64 1652.94 1527.59 1410.12 1375.42 1264.69 1162.07 1067.03 979.072 897.746 822.619 753.338 689.56 630.967 577.236 528.027 483.011 441.866 404.286 369.967 338.614 309.951 283.727 259.724 2787.16

1970 63001.5 54232.2 49926.2 52375.4 61774 64094.4 48379.2 35781.5 27890.3 23116.4 20747.5 19822.1 19417.1 18693.9 16423.2 12459.5 8780.64 6439.61 5146.66 4458.42 4094.88 3898.01 3779.54 3687.08 3590.94 3474.25 3332.5 3171.22 2997.68 2820.84 2646.61 2477.95 2315.54 2159.45 2009.67 1866.87 1731.63 1604.14 1484.34 1371.97 1266.63 1235.59 1136.22 1044.11 958.778 879.801 806.764 739.286 677.052 619.755 567.113 518.834 474.617 434.164 397.188 363.414 332.57 304.391 278.628 255.057 2739.05

1971 64723.4 57579 49564.5 45629 47865.3 56428.6 58426.6 43865.7 32159.8 24815.1 20385.5 18183.7 17315.7 16946.3 16326.8 14367.9 10924.1 7716.82 5672.66 4543.69 3944.01 3628.97 3460.03 3359.59 3281.43 3199.28 3098.19 2974.18 2832.23 2678.87 2522.17 2367.48 2217.5 2072.89 1933.75 1800.11 1672.59 1551.74 1437.76 1330.6 1230.04 1135.74 1108.02 1019 936.465 859.988 789.196 723.72 663.219 607.414 556.031 508.818 465.516 425.853 389.566 356.395 326.096 298.424 273.142 250.027 2686.82

1972 60108.4 59152.7 52623.3 45298.5 41699.9 43724.4 51443.8 52990.6 39448.1 28639.3 21909.3 17891.2 15908.4 15135.7 14823.1 14304.8 12615.1 9613.33 6806.19 5013.87 4023.8 3498.81 3224.28 3078.32 2992.48 2925.86 2855.16 2767.09 2658.11 2532.72 2396.8 2257.6 2119.95 1986.32 1857.33 1733.11 1613.7 1499.68 1391.57 1289.55 1193.59 1103.52 1019.01 994.23 914.415 840.41 771.822 708.324 649.587 595.307 545.236 499.128 456.76 417.898 382.301 349.732 319.958 292.761 267.921 245.227 2636.75

1973 54263.4 54935 54061.5 48094 41397.1 38084.7 39823.4 46525.4 47376.9 34804.7 24974.7 18950.3 15407.2 13682.3 13029.5 12788.8 12377.3 10949.6 8370.17 5943.51 4390.21 3531.85 3077.66 2841.55 2717.42 2645.46 2589.81 2529.99 2454.27 2359.56 2249.87 2130.45 2007.82 1886.3 1768.13 1653.91 1543.79 1437.82 1336.56 1240.48 1149.75 1064.38 984.189 908.933 886.92 815.796 749.834 688.688 632.07 579.689 531.277 486.613 445.481 407.68 373.006 341.242 312.178 285.608 261.336 239.167 2572.74

1974 54704.5 49593 50206.8 49408.4 43951.8 37808.6 34690.7 36031.6 41639.3 41873.5 30424 21662.8 16368.7 13291.8 11813.4 11273.2 11095.2 10770.2 9556.31 7325.75 5215.42 3861.42 3112.92 2717.58 2513.12 2406.7 2345.83 2298.92 2247.9 2182.37 2099.62 2003.23 1897.92 1789.5 1681.88 1577.07 1475.66 1377.78 1283.52 1193.38 1107.79 1026.94 950.812 879.281 812.131 792.535 729.038 670.139 615.531 564.959 518.165 474.912 435.003 398.247 364.466 333.476 305.085 279.107 255.356 233.659 2514.17

1975 68619.2 49996.1 45324.6 45885.5 45153.4 40145 34451.5 31419.1 32312.2 36918.3 36755.7 26519.1 18811.6 14198.9 11538.7 10274.7 9829.18 9700.02 9441.13 8398.23 6452.94 4603.64 3414.78 2757.35 2410.6 2232.01 2139.81 2087.65 2047.58 2003.56 1946.36 1873.57 1788.4 1695.07 1598.82 1503.13 1409.86 1319.51 1232.25 1148.16 1067.7 991.275 919.035 850.994 787.044 726.997 709.505 652.702 600.003 551.138 505.878 463.996 425.279 389.553 356.647 326.402 298.655 273.234 249.972 228.704 2461.09

1976 94439.6 62713.2 45693 41423.5 41933.5 41239.6 36568.3 31172.6 28121.5 28561.4 32275.2 31885.7 22909.8 16231.4 12261.5 9984.98 8915.52 8554.28 8466.92 8264.13 7370.24 5676.24 4057.9 3015.45 2438.78 2135.06 1979.28 1899.51 1854.91 1820.75 1782.84 1732.99 1669.05 1593.92 1511.35 1426.03 1341.1 1258.22 1177.87 1100.21 1025.32 953.621 885.476 821.042 760.334 703.26 649.657 634.071 583.344 536.274 492.623 452.188 414.767 380.171 348.244 318.836 291.804 267.004 244.282 223.488 2404.88

1977 72255.6 86311.3 57315.6 41760.2 37855.7 38296.7 37554.4 33057.8 27846.5 24778.4 24863.1 27858.4 27396.8 19658.3 13940.6 10555.1 8621.24 7723 7434.18 7380.92 7224.49 6459.44 4986 3571.53 2658.64 2153.46 1887.76 1752.02 1683.09 1644.99 1615.92 1583.31 1539.92 1483.85 1417.67 1344.75 1269.26 1194.02 1120.52 1049.2 980.221 913.66 849.892 789.259 731.907 677.857 627.028 579.28 565.421 520.217 478.266 439.357 403.312 369.949 339.102 310.633 284.408 260.302 238.183 217.918 2344.77
1978 58094.2 66036.7 78882.6 52382.4 38163.5 34573.7 34880.7 33968.3 29566.2 24584.4 21627 21527.7 24017.2 23589.3 16940.8 12039.4 9141.47 7489.67 6729.97 6497.18 6467.91 6346.1 5686.21 4397.43 3155.12 2352.05 1907.51 1673.98 1555.09 1495.14 1462.34 1437.39 1409.16 1371.19 1321.82 1263.32 1198.72 1131.75 1064.92 999.583 936.145 874.742 815.455 758.632 704.584 653.446 605.24 559.898 517.295 504.947 464.601 427.155 392.42 360.237 330.448 302.903 277.48 254.06 232.53 212.775 2289.38
1979 60315.8 53094.1 60353 72093.2 47870.9 34854.8 31485.9 31529.7 30329.6 26025.3 21369.7 18635.1 18463.8 20572.9 20227.4 14561.7 10380.8 7908.46 6500.79 5859.46 5672.72 5661.4 5567.15 4998 3871.78 2782.09 2076.63 1686.02 1481.03 1377 1324.88 1296.65 1275.23 1250.78 1217.6 1174.19 1122.59 1065.49 1006.21 947.004 889.073 832.789 778.273 725.612 675.121 627.082 581.618 538.75 498.421 460.523 449.553 413.652 380.327 349.412 320.767 294.25 269.729 247.096 226.244 207.075 2228.3
1980 63906.8 55124.5 48524.4 55158.4 65883.3 43713.4 31711.8 28371.3 27955.9 26389.5 22269.5 18074.7 15665.9 15497.1 17292.8 17058.1 12331 8829.38 6755.52 5575.42 5043.72 4898.85 4903.05 4833.46 4348.74 3375.16 2429.2 1815.78 1476.05 1297.96 1207.91 1163.12 1139.12 1120.99 1100.08 1071.4 1033.62 988.55 938.56 886.586 834.621 783.731 734.243 686.281 639.931 595.472 553.159 513.101 475.322 439.773 406.36 396.703 365.04 335.647 308.376 283.105 259.709 238.073 218.101 199.701 2149.73
1981 55350.5 58405.2 50378.9 44343.4 50349.5 59909.5 39437.7 28268.9 24935.1 24246.2 22661.5 19013.1 15399.2 13355.3 13242.2 14825 14677.2 10649 7651.72 5873.35 4861.41 4409.11 4292.13 4304.27 4250.44 3829.86 2976.27 2144.49 1604.51 1305.4 1148.74 1069.71 1030.61 1009.83 994.178 975.993 950.847 917.579 877.787 833.579 787.569 741.532 696.413 652.517 609.958 568.815 529.341 491.762 456.18 422.616 391.029 361.335 352.762 324.618 298.489 274.244 251.776 230.974 211.736 193.977 2089.62
1982 52226.6 50585.3 53377.1 46037.4 40469.7 45747.6 53937.8 35014.6 24687 21440.8 20608 19131.4 16012.5 12978.8 11287.3 11234.8 12631.5 12559.3 9149.59 6599.01 5082.37 4219.26 3836.7 3743.42 3761.43 3720.76 3357.57 2612.59 1884.54 1411.38 1149.23 1012.05 943.019 909.054 891.156 877.71 861.975 840.038 810.877 775.907 736.992 696.447 655.84 616.02 577.261 539.668 503.314 468.425 435.203 403.74 374.056 346.115 319.847 312.271 287.367 264.245 242.788 222.903 204.491 187.462 2021.87
1983 60199.6 47730.1 46230.1 48775.7 41999.9 36711.9 41014.2 47492 30174.9 20850.2 17838.3 16998.3 15734.5 13185.6 10728.2 9377.79 9386.54 10612.2 10606.8 7763.96 5623.43 4347.19 3620.7 3301.73 3229.33 3251.72 3222.43 2912.46 2269.33 1638.86 1228.64 1001.32 882.475 822.837 793.666 778.439 767.038 753.583 734.658 709.37 678.958 645.057 609.685 574.232 539.446 505.57 472.701 440.902 410.376 381.301 353.759 327.77 303.304 280.298 273.671 251.855 231.598 212.799 195.375 179.241 1936.6
1984 57051.5 55016.6 43620.7 42245.1 44500.5 38109 32933.6 36156.5 41006.9 25552.1 17401.3 14764 14029 13001.2 10935 8940.95 7857.83 7907.45 8985.18 9022.06 6631.12 4820.31 3738.11 3121.95 2853.67 2796.82 2821.2 2800.06 2534.07 1976.75 1428.99 1072.22 874.498 771.208 719.5 694.338 681.314 671.591 660.032 643.645 621.651 595.135 565.524 534.6 503.584 473.138 443.475 414.684 386.822 360.067 334.579 310.431 287.641 266.182 246.002 240.195 221.055 203.281 186.785 171.495 1857.3
1985 52316 52139.7 50280 39860.8 38544.4 40388 34210.5 29073.6 31289.9 34830.5 21401.8 14457.1 12231.1 11633.8 10818.3 9141.65 7513.4 6637.46 6712.17 7661.25 7723.64 5696.96 4154.12 3230.2 2704.07 2476.72 2431.64 2456.55 2441.35 2211.94 1727.18 1249.64 938.351 765.81 675.741 630.747 608.954 597.758 589.425 579.45 565.21 546.021 522.827 496.893 469.789 442.59 415.877 389.843

364.564 340.096 316.595 294.202 272.982 252.953 234.092 216.353 211.252 194.425 178.796 164.291 1784.54
1986 56841.8 47811.7 47650.6 45945.5 36364.2 34964.5 36211 30129.5 25067.2 26443.1 28993.4 17657.3 11888.7 10067 9609.18 8980.05 7630.55 6306.67 5601.23 5692.15 6525.77 6604.73 4888.43 3575.25 2787.33 2338.62 2146.18 2110.69 2135.45 2124.94 1927.4 1506.44 1090.85 819.712 669.413 591.012 551.928 533.087 523.483 516.356 507.765 495.414 478.693 458.443 435.773 412.061 388.252 364.86 342.053 319.901 298.453 277.848 258.211 239.601 222.031 205.484 189.92 185.449 170.681 156.966 1710.95
1987 66693.6 51948.1 43695.4 43543.6 41925.8 33022.2 31436.4 32067.2 26206.1 21436.9 22325.8 24294.2 14753.1 9939.57 8440.96 8090.55 7596.26 6485.41 5384.62 4802.44 4898.93 5635.34 5720.45 4244.93 3111.64 2430.64 2042.82 1877.49 1848.8 1872.57 1865.14 1693.17 1324.34 959.596 721.486 589.484 520.666 486.417 469.966 461.633 455.464 447.986 437.168 422.481 404.665 384.703 363.81 342.822 322.194 302.077 282.533 263.606 245.42 228.086 211.655 196.142 181.531 167.786 163.839 150.796 1650.36
1988 74367.1 60951.6 47475.6 39929 39729.1 38052.1 29647.5 27760 27765.2 22273.9 17967.7 18559.9 20135.4 12237.6 8271.79 7056.9 6798.7 6416.42 5505.16 4591.51 4111.82 4209.62 4857.81 4944.86 3678.24 2701.87 2114.37 1779.79 1637.97 1614.84 1637.28 1632.23 1482.88 1160.64 841.48 633.005 517.425 457.2 427.275 412.95 405.737 400.41 393.911 384.464 371.602 355.979 338.457 320.108 301.669 283.54 265.855 248.671 232.025 216.028 200.779 186.322 172.672 159.814 147.717 144.246 1585.82
1989 69477.4 67964.5 55704 43383.3 36430.7 36054.6 34150.8 26158.4 24001.9 23554.9 18630.6 14907.2 15356.2 16678.9 10173 6909.34 5925.64 5738.74 5442.78 4690.78 3927.98 3530.02 3625.12 4194.5 4279.54 3189.7 2347.05 1839.45 1550.37 1428.42 1409.62 1430.4 1427.04 1297.29 1015.94 736.928 554.591 453.498 400.845 374.715 362.244 355.996 351.385 345.737 337.492 326.241 312.559 297.203 281.114 264.941 249.036 233.517 218.434 203.822 189.777 176.387 163.692 151.704 140.411 129.786 1520.11
1990 102185 63495.6 62113 50902 39577.9 33045.1 32315.9 30053.7 22523.3 20248 19570.7 15345.8 12243.8 12629.6 13771.2 8443.45 5767.31 4974.04 4842.57 4614.82 3994.16 3357.15 3026.85 3117.17 3615.56 3696.62 2760.23 2034.22 1596.43 1347.12 1242.42 1227.14 1246.18 1244.08 1131.62 886.657 643.434 484.419 396.252 350.351 327.599 316.77 311.364 307.382 302.484 295.309 285.497 273.551 260.134 246.072 231.931 218.02 204.445 191.249 178.463 166.172 154.453 143.341 132.846 122.96 1444.89
1991 110569 93387.7 58029.1 56759.7 46448.2 35935.7 29695.5 28584 26087.8 19210.4 17045.8 16353.7 12791.8 10217.7 10574.9 11582.4 7136.06 4897.82 4243.27 4148.12 3967.52 3444.98 2903.68 2624.37 2708.36 3147.09 3222.69 2409.6 1777.89 1396.68 1179.59 1088.74 1076.06 1093.39 1092.1 993.818 778.981 565.486 425.861 348.442 308.149 288.196 278.714 273.997 270.526 266.246 259.956 251.34 240.842 229.045 216.676 204.235 191.995 180.048 168.432 157.177 146.356 136.038 126.253 117.012 1381.02
1992 88939.2 101049 85347.2 53026.5 51777.8 42121 32188.9 26100.8 24563.8 21949.3 15909.9 13990.5 13382.1 10481.5 8406.05 8746.94 9636.73 5971.98 4121.31 3588.32 3523.41 3383.14 2947.54 2491.71 2257.76 2335.13 2718.54 2788.4 2087.83 1542.36 1212.93 1025.35 947.136 936.76 952.425 951.803 866.55 679.502 493.447 371.726 304.233 269.117 251.741 243.5 239.415 236.415 232.701 227.227 219.717 210.556 200.257 189.455 178.587 167.893 157.452 147.301 137.462 128.003 118.981 110.426 1310.3
1993 64898.1 81281.9 92349.1 77990.3 48379.7 46986.8 37800.9 28400.7 22568.6 20840 18357.9 13196.4 11569.7 11077 8705.67 7014.98 7337.94 8127.2 5061.81 3509.3 3068.09 3023.61 2912.54 2544.61 2156.31 1957.94 2028.72 2365.53 2429.61 1821.33 1346.86 1060.13 896.878 829.022 820.422 834.572 834.403 759.966 596.131 433.037 326.304 267.121 236.335 221.112 213.906 210.345 207.732 204.491 199.698 193.113 185.075 176.033 166.547 157.001 147.605 138.432 129.511 120.864 112.55 104.62 1249.29
1994 60587.1 59310.8 74284.1 84389.8 71166.9 43930.2 42233.1 33451.5 24672.7 19269.5 17565 15358 11011.5 9663.5 9281.46 7326.31 5931.82 6234.62 6936.44 4338.04 3018.64 2647.72 2616.78 2526.9

2212.43 1878.3 1708.25 1772.46 2069.2 2127.47 1596.27 1181.36 930.5 787.674 728.458 721.23 733.96 734.067 668.785 524.748 381.273 287.359 235.279 208.193 194.808 188.481 185.362 183.076 180.234 176.022 170.228 163.152 155.189 146.832 138.421 130.142 122.057 114.195 106.573 99.244 1193.89

1995 79939.4 55371.5 54205 67884.7 77047.5 64765.8 39713.9 37795.4 29581.4 21577 16712.8 15161.8 13234.5 9494.46 8348.87 8040.91 6366.47 5170.46 5450.19 6079.87 3811.44 2657.81 2335.55 2311.99 2235.71 1959.85 1665.62 1516.2 1574.42 1839.27 1892.19 1420.47 1051.72 828.715 701.752 649.19 642.916 654.414 654.641 596.528 468.126 340.179 256.415 209.964 185.808 173.876 168.24 165.466 163.434 160.904 157.15 151.983 145.669 138.564 131.105 123.598 116.208 108.991 101.971 95.167 1154.76

1996 70820.4 73057.7 50604.7 49535 61972 70088.9 58490.6 35473.3 33323.5 25766 18623.2 14347.9 12990.6 11345.1 8156.17 7193.41 6951.24 5522.34 4499.41 4756.99 5320.85 3343.58 2336.46 2056.93 2039.43 1974.87 1733.28 1474.59 1343.52 1396.21 1632.19 1680.14 1261.94 934.768 736.847 624.174 577.596 572.165 582.532 582.854 531.209 416.932 303.016 228.429 187.066 165.559 154.939 149.927 147.464 145.661 143.413 140.073 135.472 129.849 123.518 116.873 110.184 103.597 97.1652 90.9089 1114.35

1997 156004 64724.9 66769.6 46248.6 45257 56521.3 63588.9 52512.3 31379.7 29023.2 22157 15883.6 12190.9 11033.6 9654.05 6962.2 6163.14 5978.46 4767.06 3897.3 4133.11 4635.67 2920.02 2044.75 1803.41 1790.88 1736.57 1525.93 1299.53 1185.07 1232.5 1441.77 1485 1115.94 826.986 652.14 552.608 511.523 506.847 516.15 516.539 470.854 369.615 268.661 202.553 165.892 146.833 137.424 132.988 130.811 129.218 127.23 124.272 120.195 115.21 109.596 103.702 97.7689 91.9267 86.2207 1069.53

1998 93316.9 142577 59154 61022.1 42257.2 41294.2 51357.8 57302.2 46771.5 27609.5 25282.3 19177.5 13707 10517.3 9532.83 8361.39 6047.45 5369.41 5223.56 4176.26 3422.54 3637.41 4087.39 2578.89 1808.46 1596.99 1587.6 1540.88 1355.08 1154.82 1053.75 1096.5 1283.28 1322.28 994.007 736.854 581.22 492.628 456.097 452.009 460.379 460.791 420.085 329.794 239.738 180.761 148.055 131.052 122.662 118.708 116.769 115.352 113.581 110.943 107.306 102.858 97.8481 92.5879 87.2917 82.0767 1031.94

1999 72780.7 85285.2 130305 54062.3 55760.2 38575.6 37582.6 46457 51387.8 41565.8 24356.4 22198.7 16802.6 12007.6 9223.56 8375.33 7361.74 5336.06 4747.69 4627.64 3706.24 3042.02 3237.35 3642.11 2300.29 1614.51 1426.8 1419.35 1378.37 1212.76 1033.98 943.839 982.45 1150.12 1185.37 891.279 660.827 521.338 441.938 409.218 405.596 413.147 413.55 377.043 296.022 215.2 162.267 132.913 117.654 110.125 106.578 104.84 103.57 101.982 99.6158 96.3516 92.3586 87.8613 83.1389 78.384 1000.35

2000 171241 66516.5 77944.7 119089 49400.3 50900 35101.6 33977.9 41617.4 45593.3 36591 21334.4 19400.8 14682.5 10505 8085 7358.05 6482.5 4709.13 4198.41 4099.71 3288.72 2703.13 2880.23 3243.78 2050.6 1440.4 1273.81 1267.91 1231.94 1084.4 924.909 844.559 879.366 1029.71 1061.51 798.303 591.993 467.104 396.016 366.739 363.53 370.329 370.717 338.013 265.394 192.944 145.492 119.177 105.498 98.7503 95.5724 94.0165 92.8795 91.4568 89.3365 86.4104 82.8304 78.798 74.5635 967.485

2001 104032 156502 60791.5 71235.6 108822 45100.8 46338.4 31770.7 30499.8 37033.7 40286 32186.6 18728.8 17029.2 12901.7 9247.08 7131.32 6503.56 5741.02 4178.06 3730.98 3648.49 2930.43 2411.26 2571.66 2898.62 1833.68 1288.82 1140.36 1135.59 1103.81 971.952 829.243 757.4 788.794 923.835 952.529 716.454 531.368 419.317 355.539 329.284 326.426 332.553 332.92 303.566 238.358 173.295 130.68 107.047 94.7634 88.7041 85.8513 84.4553 83.4353 82.1585 80.2548 77.627 74.4117 70.7898 936.16

2002 64683.9 95077.9 143032 55559 65097.1 99379 41100.5 42045.7 28649.7 27325.8 33005.6 35784.7 28548 16610.2 15115.3 11466.6 8230.86 6357.35 5806.19 5132.27 3739.5 3342.88 3271.98 2630.12 2165.65 2311.09 2606.27 1649.47 1159.79 1026.54 1022.54 994.17 875.602 747.181 682.561 710.956 832.777 858.737 645.971 479.134 378.127 320.634 296.973 294.41 299.947 300.29 273.821 215.009 156.323 117.884 96.5675 85.4878 80.0228 77.4503 76.1918 75.2724 74.1212 72.4043 70.0342 67.1338 908.473

2003 60704.1 59116.6 86894.7 130721 50771.3 59450.6 90587.4 37323.1 37979 25735.7 24436.4 29431 31867.3 25419.9 14800 13482.8 10241.4 7361.22 5692.97 5205.59 4606.32 3359.48 3005.68 2944.08 2368.05 1950.93 2082.95 2349.95 1487.79 1046.43 926.448 923.059 897.632 790.718 674.851 616.571 642.296 752.431 775.958 583.748 433.012 341.75 289.803 268.428 266.122 271.137 271.455 247.535 194.373 141.323 106.574 87.3041 77.2883 72.3485 70.0234 68.8863 68.0557 67.0154 65.4636 63.321 882.099
2004 62701.6 55479.3 54028.5 79415.3 119455 46364.3 54176.9 82205.3 33669.3 34049.6 22957.4 21728.6 26131.7 28291.5 22584.5 13165.4 12011 9136.99 6576.79 5093.02 4662.54 4130.13 3014.97 2699.62 2646.15 2129.69 1755.48 1875.12 2116.32 1340.33 942.995 835.086 832.217 809.451 713.161 608.75 556.25 579.525 678.965 700.257 526.839 390.825 308.471 261.595 242.312 240.239 244.774 245.068 223.479 175.488 127.594 96.2234 78.8259 69.7838 65.3244 63.2258 62.1997 61.4502 60.5114 59.1106 853.68

Males (1000s)
Virgin 69484.5 63504.1 58038.3 53043 48477.7 44305.3 40492 37006.9 33821.7 30910.7 28250.3 25818.8 23596.6 21565.7 19709.6 18013.2 16462.8 15045.9 13750.9 12567.4 11485.7 10497.2 9593.67 8767.96 8013.31 7323.61 6693.28 6117.2 5590.7 5109.51 4669.74 4267.82 3900.5 3564.79 3257.97 2977.56 2721.28 2487.07 2273.01 2077.37 1898.58 1735.17 1585.82 1449.33 1324.59 1210.59 1106.39 1011.17 924.136 844.597 771.903 705.466 644.748 589.255 538.539 492.187 449.825 411.109 375.726 343.387 3646.3
1910 69484.5 63504.1 58038.3 53043 48477.7 44305.3 40492 37006.9 33821.7 30910.7 28250.3 25818.8 23596.6 21565.7 19709.6 18013.2 16462.8 15045.9 13750.9 12567.4 11485.7 10497.2 9593.67 8767.96 8013.31 7323.61 6693.28 6117.2 5590.7 5109.51 4669.74 4267.82 3900.5 3564.79 3257.97 2977.56 2721.28 2487.07 2273.01 2077.37 1898.58 1735.17 1585.82 1449.33 1324.59 1210.59 1106.39 1011.17 924.136 844.597 771.903 705.466 644.748 589.255 538.539 492.187 449.825 411.109 375.726 343.387 3646.3
1911 69484.5 63504.1 58038.3 53043 48477.7 44305.3 40492 37006.9 33821.7 30910.7 28250.3 25818.8 23596.6 21565.7 19709.6 18013.2 16462.8 15045.9 13750.9 12567.4 11485.7 10497.2 9593.67 8767.96 8013.31 7323.61 6693.28 6117.2 5590.7 5109.51 4669.74 4267.82 3900.5 3564.79 3257.97 2977.56 2721.28 2487.07 2273.01 2077.37 1898.58 1735.17 1585.82 1449.33 1324.59 1210.59 1106.39 1011.17 924.136 844.597 771.903 705.466 644.748 589.255 538.539 492.187 449.825 411.109 375.726 343.387 3646.3
1912 69484.4 63504 58038.3 53043 48477.7 44305.3 40491.9 37006.8 33821.6 30910.4 28249.9 25818.3 23596.1 21565.1 19709 18012.6 16462.3 15045.4 13750.5 12567 11485.4 10496.9 9593.41 8767.73 8013.11 7323.43 6693.12 6117.05 5590.57 5109.4 4669.64 4267.73 3900.41 3564.71 3257.9 2977.5 2721.23 2487.02 2272.96 2077.33 1898.54 1735.13 1585.79 1449.31 1324.57 1210.56 1106.37 1011.15 924.119 844.581 771.889 705.453 644.736 589.244 538.529 492.178 449.817 411.102 375.719 343.381 3646.23
1913 69484.2 63504 58038.3 53043 48477.7 44305.3 40491.9 37006.7 33821.3 30910 28249.2 25817.5 23595.1 21564 19707.9 18011.6 16461.3 15044.5 13749.7 12566.3 11484.7 10496.3 9592.89 8767.26 8012.69 7323.07 6692.79 6116.76 5590.31 5109.17 4669.43 4267.55 3900.25 3564.56 3257.77 2977.38 2721.12 2486.92 2272.87 2077.25 1898.47 1735.07 1585.73 1449.25 1324.52 1210.52 1106.33 1011.11 924.085 844.55 771.861 705.428 644.712 589.223 538.509 492.16 449.801 411.087 375.705 343.369 3646.1
1914 69484 63503.8 58038.3 53043 48477.7 44305.2 40491.8 37006.5 33821 30909.4 28248.4 25816.3 23593.7 21562.6 19706.4 18010.1 16459.8 15043.1 13748.4 12565.1 11483.7 10495.4 9592.09 8766.56 8012.07 7322.51 6692.3 6116.33 5589.92 5108.82 4669.12 4267.27 3900 3564.34 3257.57 2977.2 2720.96 2486.77 2272.74 2077.13 1898.36 1734.97 1585.64 1449.17 1324.44 1210.45 1106.27 1011.05 924.033 844.503 771.818 705.389 644.677 589.191 538.48 492.133 449.776 411.065 375.685 343.35 3645.9
1915 69483.7 63503.6 58038.1 53043 48477.7 44305.2 40491.8 37006.4 33820.7 30908.8 28247.4 25815.1 23592.1 21560.8 19704.4 18008.1 16457.9 15041.3 13746.7 12563.6 11482.3 10494.2

9591.01 8765.6 8011.22 7321.76 6691.63 6115.73 5589.39 5108.35 4668.7 4266.89 3899.66 3564.04 3257.29 2976.95 2720.74 2486.57 2272.56 2076.97 1898.21 1734.83 1585.52 1449.06 1324.34 1210.36 1106.19 1010.98 923.965 844.441 771.761 705.337 644.63 589.147 538.44 492.098 449.743 411.035 375.658 343.325 3645.64

1916 69483.3 63503.3 58037.9 53042.8 48477.6 44305.2 40491.8 37006.2 33820.3 30908.3 28246.5 25813.7 23590.4 21558.7 19702.2 18005.8 16455.7 15039.1 13744.7 12561.7 11480.6 10492.6 9589.64 8764.38 8010.14 7320.8 6690.78 6114.98 5588.72 5107.75 4668.17 4266.42 3899.24 3563.65 3256.95 2976.64 2720.46 2486.32 2272.33 2076.76 1898.02 1734.67 1585.37 1448.92 1324.22 1210.24 1106.08 1010.88 923.879 844.363 771.69 705.272 644.571 589.094 538.391 492.053 449.703 410.997 375.623 343.294 3645.31

1917 69482.9 63502.9 58037.7 53042.7 48477.5 44305.1 40491.7 37006.1 33820.1 30907.8 28245.7 25812.6 23588.9 21556.8 19700 18003.5 16453.3 15036.8 13742.4 12559.6 11478.7 10490.9 9588.09 8763 8008.91 7319.71 6689.82 6114.12 5587.96 5107.07 4667.57 4265.88 3898.75 3563.22 3256.56 2976.3 2720.15 2486.04 2272.08 2076.53 1897.82 1734.48 1585.2 1448.77 1324.08 1210.12 1105.97 1010.78 923.783 844.275 771.61 705.2 644.505 589.033 538.336 492.003 449.657 410.956 375.585 343.259 3644.94

1918 69481.7 63502.5 58037.3 53042.4 48477.3 44304.9 40491.3 37005.2 33818.2 30904.7 28241.4 25807.1 23582.5 21549.9 19692.9 17996.3 16446.3 15030.2 13736.3 12554 11473.7 10486.3 9584.03 8759.38 8005.7 7316.86 6687.28 6111.87 5585.95 5105.28 4665.97 4264.45 3897.47 3562.07 3255.53 2975.37 2719.31 2485.28 2271.4 2075.91 1897.25 1733.97 1584.74 1448.35 1323.7 1209.77 1105.65 1010.49 923.523 844.038 771.394 705.003 644.325 588.869 538.187 491.866 449.532 410.842 375.482 343.165 3643.94

1919 69480.2 63501.5 58037 53042.1 48477.1 44304.8 40491 37004.5 33816.7 30902 28237.2 25801.5 23575.8 21542.3 19684.8 17988 16438.2 15022.4 13729 12547.3 11467.5 10480.8 9579.05 8754.94 8001.75 7313.35 6684.17 6109.1 5583.49 5103.09 4664.01 4262.7 3895.91 3560.67 3254.27 2974.23 2718.29 2484.36 2270.56 2075.16 1896.57 1733.35 1584.18 1447.84 1323.23 1209.35 1105.27 1010.15 923.207 843.751 771.133 704.764 644.108 588.671 538.006 491.701 449.382 410.705 375.356 343.05 3642.73

1920 69478.7 63500.1 58036 53041.8 48476.8 44304.5 40490.8 37004.1 33816 30900.4 28234.4 25797.3 23570.2 21535.6 19677.3 17980.1 16430.2 15014.5 13721.5 12540.2 11461 10474.9 9573.74 8750.19 7997.51 7309.58 6680.82 6106.12 5580.85 5100.74 4661.92 4260.83 3894.24 3559.17 3252.93 2973.02 2717.2 2483.38 2269.68 2074.37 1895.85 1732.7 1583.59 1447.3 1322.75 1208.91 1104.87 1009.78 922.875 843.449 770.858 704.514 643.879 588.463 537.816 491.528 449.224 410.561 375.225 342.93 3641.46

1921 69477.5 63498.8 58034.8 53040.9 48476.5 44304.3 40490.7 37004.2 33816.1 30900.5 28234 25796 23567.8 21532 19672.7 17974.7 16424.3 15008.4 13715.4 12534.4 11455.5 10469.7 9569.04 8745.94 7993.7 7306.18 6677.79 6103.44 5578.46 5098.62 4660.03 4259.15 3892.74 3557.84 3251.73 2971.95 2716.24 2482.52 2268.9 2073.66 1895.22 1732.13 1583.07 1446.84 1322.32 1208.53 1104.52 1009.46 922.586 843.186 770.618 704.296 643.681 588.282 537.652 491.378 449.087 410.436 375.111 342.826 3640.36

1922 69475.6 63497.6 58033.5 53039.8 48475.7 44303.9 40490.1 37003.3 33814.5 30898 28230.4 25791.3 23561.7 21524.7 19664.4 17965.7 16414.9 14999 13706.2 12525.5 11447.2 10462.1 9562.06 8739.63 7988.03 7301.11 6673.27 6099.42 5574.89 5095.44 4657.2 4256.63 3890.49 3555.82 3249.93 2970.34 2714.79 2481.21 2267.72 2072.6 1894.26 1731.26 1582.28 1446.12 1321.68 1207.94 1103.99 1008.98 922.146 842.785 770.254 703.964 643.378 588.007 537.4 491.149 448.878 410.245 374.937 342.667 3638.68

1923 69472.3 63495.9 58032.5 53038.6 48474.6 44303 40489.2 37001.1 33810.4 30891.2 28221 25779.3 23547.7 21509.2 19647.9 17948.7 16397.9 14982.5 13690.4 12510.7 11433.4 10449.4 9550.56 8729.25 7978.72 7292.78 6665.85 6092.8 5568.99 5090.19 4652.52 4252.44 3886.75 3552.47 3246.93 2967.64 2712.36 2479.03 2265.75 2070.82 1892.65 1729.8 1580.96 1444.93 1320.59 1206.95 1103.09 1008.16 921.405 842.111 769.64 703.404 642.869 587.542 536.977 490.763 448.526 409.924 374.644 342.4 3635.85

1924 69468.6 63492.9 58030.9 53037.7 48473.6 44302 40488.1 36999.6 33807.2 30885.5 28212.1 25767.4 23533.2 21492.7 19630 17930.2 16379.2 14964 13672.6 12493.9 11417.7 10435 9537.35 8717.28 7967.94 7283.12 6657.21 6085.1 5562.13 5084.07 4647.06 4247.58 3882.4 3548.58 3243.44 2964.51 2709.55 2476.49 2263.47 2068.76 1890.79 1728.12 1579.44 1443.55 1319.34 1205.82 1102.06 1007.23 920.551 841.334 768.932 702.76 642.282 587.007 536.489 490.318 448.12 409.554 374.306 342.092 3632.59
1925 69463.3 63489.5 58028.1 53036.2 48472.7 44300.8 40486.4 36996.7 33802 30876.6 28198.7 25749.4 23511.4 21468.1 19603.7 17903.1 16352.3 14937.8 13647.5 12470.3 11395.8 10414.9 9519.01 8700.67 7952.97 7269.7 6645.21 6074.38 5552.57 5075.54 4639.45 4240.78 3876.32 3543.14 3238.56 2960.13 2705.61 2472.95 2260.28 2065.88 1888.19 1725.77 1577.31 1441.61 1317.58 1204.22 1100.61 1005.91 919.355 840.245 767.941 701.857 641.459 586.257 535.805 489.695 447.551 409.035 373.832 341.66 3628.03
1926 69457.5 63484.7 58025 53033.7 48471.3 44299.9 40485.1 36994.5 33798 30869.7 28187.6 25733.6 23491 21444 19577.2 17875.3 16324 14910 13620.7 12444.8 11372 10392.8 9498.82 8682.31 7936.37 7254.76 6631.82 6062.4 5541.88 5066.01 4630.95 4233.19 3869.54 3537.07 3233.13 2955.25 2701.23 2469.01 2256.73 2062.68 1885.29 1723.15 1574.94 1439.47 1315.64 1202.46 1099.01 1004.45 918.031 839.041 766.845 700.86 640.55 585.429 535.051 489.006 446.924 408.462 373.31 341.183 3622.99
1927 69452 63479.4 58020.6 53030.9 48469.1 44298.7 40484.3 36993.3 33796.2 30866.3 28181.7 25723.9 23477.1 21426 19555.7 17851.6 16299.1 14884.6 13595.7 12420.6 11349 10371.3 9478.94 8664.09 7919.8 7239.78 6618.33 6050.31 5531.06 5056.35 4622.33 4225.5 3862.68 3530.95 3227.64 2950.34 2696.83 2465.05 2253.17 2059.47 1882.4 1720.54 1572.58 1437.33 1313.71 1200.71 1097.42 1003.01 916.718 837.847 765.759 699.871 639.65 584.609 534.304 488.325 446.303 407.896 372.794 340.712 3618.02
1928 69445.3 63474.3 58015.8 53026.8 48466.4 44296.5 40482.6 36991.1 33792.1 30859.8 28172 25710.5 23459.3 21404 19530.2 17823.4 16269.4 14854.5 13566 12391.9 11321.8 10345.8 9455.23 8642.31 7899.94 7221.78 6602.1 6035.73 5518 5044.67 4611.9 4216.19 3854.36 3523.51 3220.99 2944.38 2691.48 2460.25 2248.85 2055.58 1878.89 1717.37 1569.72 1434.74 1311.36 1198.58 1095.49 1001.26 915.126 836.4 764.443 698.673 638.559 583.616 533.398 487.5 445.551 407.21 372.168 340.141 3611.99
1929 69438.9 63468.2 58011.2 53022.4 48462.7 44294.1 40480.6 36989.7 33790.4 30856.6 28166.7 25702.4 23448 21388.8 19511.1 17800.9 16244.5 14828.2 13539.2 12365.4 11296.1 10321.3 9432.3 8621.04 7880.4 7203.96 6585.94 6021.16 5504.9 5032.93 4601.4 4206.81 3845.99 3516.03 3214.31 2938.41 2686.13 2455.45 2244.54 2051.7 1875.4 1714.22 1566.88 1432.17 1309.04 1196.47 1093.58 999.526 913.554 834.972 763.144 697.492 637.484 582.637 532.507 486.688 444.81 406.535 371.552 339.579 3606.08
1930 65494.5 63462.4 58005.6 53018.2 48458.7 44290.6 40477.9 36986.6 33786.6 30851 28158.4 25691.1 23433.5 21371 19489.9 17776.6 16217.6 14799.6 13509.9 12336.3 11267.7 10294.2 9406.74 8597.22 7858.42 7183.83 6567.64 6004.6 5489.98 5019.54 4589.4 4196.07 3836.39 3507.45 3206.64 2931.55 2679.98 2449.94 2239.59 2047.26 1871.4 1710.62 1563.62 1429.23 1306.37 1194.06 1091.4 997.545 911.756 833.338 761.66 696.142 636.256 581.519 531.488 485.76 443.965 405.764 370.849 338.938 3599.32
1931 65306.7 59857.4 58000.3 53013.1 48454.8 44287 40475 36984.8 33785.1 30849.7 28156.2 25687 23427 21361.8 19477.6 17761 16198.8 14778.3 13486.7 12312.2 11243.4 10270.4 9383.79 8575.48 7838.09 7165.02 6550.39 5988.89 5475.75 5006.71 4577.87 4185.75 3827.15 3499.2 3199.27 2924.96 2674.09 2444.67 2234.87 2043.02 1867.59 1707.19 1560.53 1426.45 1303.86 1191.79 1089.34 995.68 910.066 831.804 760.267 694.876 635.105 580.472 530.535 484.893 443.174 405.044 370.193 338.339 3593.03
1932 65067.7 59685.8 54705.6 53008.2 48450.2 44283.6 40472.2 36983.4 33786 30852.3 28160.4 25691.6 23430.5 21363.4 19476.6 17756.8 16191.2 14767.1 13472.6 12295.8 11225.7 10252 9365.39 8557.51 7820.89 7148.81 6535.31 5975 5463.07 4995.2 4567.49 4176.42 3818.8 3491.73 3192.6 2919.01 2668.79 2439.93 2230.64 2039.23 1864.2 1704.14 1557.8 1423.98 1301.64 1189.79 1087.53

994.046 908.587 830.464 759.051 693.773 634.103 579.562 529.708 484.139 442.489 404.42 369.624 337.821 3587.6
1933 64769.1 59467.4 54548.7 49997.1 48445.8 44279.4 40469.2 36981.2 33785.4 30854.2 28164.4 25697.3 23436.8 21368.7 19480.2 17757.9 16189.3 14761.9 13464 12284.3 11212 10236.9 9349.61 8541.61 7805.28 7133.82 6521.13 5961.79 5450.89 4984.07 4557.39 4167.3 3810.6 3484.4 3186.05 2913.17 2663.57 2435.28 2226.49 2035.53 1860.88 1701.18 1555.14 1421.6 1299.49 1187.85 1085.79 992.471 907.162 829.175 757.884 692.715 633.143 578.69 528.915 483.419 441.834 403.823 369.081 337.327 3582.43
1934 64397.6 59194.5 54349.1 49853.8 45693.8 44275.4 40465.6 36979 33784.4 30855.3 28168.3 25703.6 23444.9 21377.5 19488.1 17764.1 16192.9 14762.6 13461.4 12278.4 11203.3 10226 9337.2 8528.41 7791.83 7120.52 6508.29 5949.6 5439.5 4973.54 4547.76 4158.55 3802.71 3477.3 3179.7 2907.5 2658.52 2430.78 2222.47 2031.95 1857.69 1698.33 1552.58 1419.31 1297.44 1186.01 1084.13 990.975 905.813 827.957 756.782 691.717 632.239 577.869 528.171 482.743 441.219 403.264 368.573 336.864 3577.6
1935 63936.9 58855 54099.7 49671.3 45562.8 41760.3 40461.7 36975.3 33781.6 30853.1 28167.6 25705.1 23448.3 21382.5 19493.7 17769 16196.4 14764 13460.3 12274.5 11196.5 10216.8 9326.14 8516.13 7778.93 7107.49 6495.48 5937.28 5427.84 4962.67 4537.73 4149.38 3794.38 3469.79 3172.95 2901.45 2653.12 2425.96 2218.18 2028.12 1854.27 1695.27 1549.85 1416.87 1295.25 1184.04 1082.36 989.382 904.376 826.659 755.609 690.656 631.278 576.998 527.381 482.025 440.567 402.672 368.033 336.373 3572.49
1936 63370.6 58434 53789.4 49443.4 45396 41640.5 38163.2 36971.6 33777.8 30849.9 28164.7 25703.3 23448.5 21384.4 19497 17772.9 16199.8 14766.2 13460.7 12272.7 11192.2 10210 9317.21 8505.56 7767.31 7095.36 6483.27 5925.3 5416.34 4951.81 4527.6 4140.05 3785.85 3462.04 3165.95 2895.16 2647.49 2420.93 2213.69 2024.11 1850.7 1692.09 1547.01 1414.32 1292.97 1182 1080.52 987.729 902.887 825.316 754.396 689.559 630.285 576.099 526.565 481.286 439.895 402.061 367.479 335.868 3567.25
1937 62677.2 57916.4 53404.6 49159.8 45187.7 41488.2 38053.9 34871.8 33775.4 30847.9 28163.8 25703.1 23449.6 21387.4 19501.5 17778.7 16206 14771.6 13464.8 12274.9 11192.3 10207.6 9312.36 8498.59 7758.71 7085.68 6473.02 5914.89 5406.07 4941.9 4518.22 4131.28 3777.75 3454.64 3159.23 2889.1 2642.03 2416.05 2209.33 2020.23 1847.24 1689 1544.26 1411.86 1290.77 1180.03 1078.76 986.15 901.468 824.039 753.245 688.52 629.347 575.25 525.797 480.589 439.263 401.488 366.958 335.395 3562.35
1938 61825.2 57282.6 52931.6 48808.1 44928.6 41297.7 37914.5 34771.2 31855.5 30843 28158.2 25697.8 23444.4 21383.2 19499.2 17778.1 16206.9 14773.3 13466.3 12275.6 11191.6 10205.3 9308.11 8492.39 7750.8 7076.47 6462.99 5904.49 5395.64 4931.7 4508.43 4122.05 3769.16 3446.72 3152 2882.53 2636.11 2410.73 2204.56 2015.96 1843.44 1685.61 1541.23 1409.16 1288.36 1177.87 1076.82 984.412 899.906 822.634 751.979 687.378 628.315 574.318 524.953 479.824 438.57 400.858 366.386 334.875 3556.98
1939 60777.7 56504 52352.4 48375.8 44607.2 41061 37740.8 34644.9 31766.1 29093.8 28159.5 25699.7 23447.3 21386.5 19503.2 17783.3 16213 14780.2 13473.2 12281.8 11196.5 10208.4 9309.25 8491.34 7747.63 7071.44 6456.52 5897.05 5387.66 4923.53 4500.33 4114.2 3761.7 3439.74 3145.55 2876.63 2630.75 2405.89 2200.22 2012.08 1839.97 1682.52 1538.48 1406.71 1286.18 1175.93 1075.09 982.861 898.518 821.389 750.861 686.373 627.41 573.501 524.215 479.157 437.967 400.312 365.89 334.425 3552.37
1940 59487.5 55546.7 51640.8 47846.5 44212 40766.9 37523.1 34482.2 31642.3 28998.3 26543.5 25676.4 23422 21361.2 19479 17761.3 16194.2 14764.5 13460.5 12271.3 11187.3 10199.8 9300.72 8482.41 7737.91 7060.83 6445.12 5885.11 5375.52 4911.49 4488.62 4103.01 3751.14 3429.89 3136.44 2868.27 2623.13 2398.98 2193.98 2006.46 1834.93 1678 1534.43 1403.08 1282.93 1173.01 1072.47 980.51 896.403 819.484 749.143 684.822 626.008 572.233 523.067 478.117 437.023 399.455 365.112 333.718 3545.04
1941 57915.3 54367.5 50765.8 47196.1 43728.3 40405.9 37254.6 34283.9 31494.8 28887 26458.6 24205.6 23404 21341.6 19459.4 17742.5 16177.3 14750.3 13449 12262.3 11180.1 10193.6 9294.86

8476.39 7731.35 7053.39 6436.73 5875.88 5365.69 4901.37 4478.5 4093.11 3741.63 3420.89 3128.02 2860.49 2615.99 2392.47 2188.07 2001.13 1830.13 1673.69 1530.57 1399.63 1279.84 1170.25 1069.99 978.29 894.411 817.694 747.533 683.372 624.7 571.052 521.999 477.151 436.147 398.661 364.392 333.064 3538.31

1942 56019.5 52930.6 49688.1 46396.5 43133.9 39963.9 36925 34039.2 31314.5 28753.6 26358.6 24130.1 22065.6 21327.7 19444.1 17727.3 16162.8 14737.4 13438.4 12254 11174 10189 9290.92 8472.62 7727.3 7048.72 6431.14 5869.31 5358.24 4893.28 4470.07 4084.61 3733.27 3412.81 3120.36 2853.3 2609.33 2386.35 2182.5 1996.08 1825.57 1669.59 1526.9 1396.34 1276.9 1167.62 1067.65 976.192 892.533 816.011 746.023 682.014 623.479 569.951 521.006 476.254 435.337 397.928 363.727 332.461 3532.15

1943 53773.1 51197.9 48374.9 45411.5 42403.1 39420.6 36520.4 33735.6 31085.7 28580.1 26224.4 24023.8 21980 20090.8 19413.7 17696.8 16133.9 14710.8 13414.9 12234.1 11157.5 10175.6 9280 8463.25 7718.85 7040.66 6423.07 5860.86 5349.31 4883.9 4460.4 4074.88 3723.69 3403.56 3111.54 2845.01 2601.61 2379.23 2175.97 1990.13 1820.18 1664.73 1522.52 1392.41 1273.38 1164.46 1064.82 973.656 890.258 813.969 744.187 680.363 621.991 568.61 519.795 475.159 434.346 397.03 362.914 331.723 3524.58

1944 51172.2 49144.9 46791.4 44211.3 41502.8 38751.5 36018.3 33349.2 30773 28312.3 25984.2 23801.5 21772.4 19898.7 18176.1 17557.9 16004.3 14593.1 13309.6 12141.4 11077 10106.2 9220.3 8411.75 7673.95 7001.08 6387.69 5828.8 5319.78 4856.39 4434.64 4050.72 3701.11 3382.55 3092.08 2827.06 2585.11 2364.12 2162.19 1977.59 1808.79 1654.4 1513.17 1383.96 1265.73 1157.55 1058.58 968.012 885.155 809.351 740.007 676.575 618.557 565.494 516.967 472.59 432.011 394.907 360.982 329.965 3506.22

1945 48283.7 46767.9 44915.1 42764.1 40406 37929.8 35412.3 32906.8 30455 28084.9 25820.7 23681 21678.9 19822.1 18111.1 16540.9 15977.8 14564.8 13281.8 12115.3 11053.6 10086 9203.37 8397.82 7662.38 6991.14 6378.83 5820.52 5311.72 4848.23 4426.23 4042.08 3692.35 3373.84 3083.58 2818.89 2577.37 2356.87 2155.45 1971.38 1803.12 1649.24 1508.5 1379.74 1261.93 1154.15 1055.52 965.272 882.698 807.149 738.031 674.801 616.962 564.058 515.673 471.422 430.956 393.953 360.118 329.183 3498.27

1946 45184.1 44127.9 42742.6 41049.3 39083.3 36927 34659.6 32348.2 30040.6 27777.6 25589.7 23503.1 21537.1 19703.7 18008.7 16450.8 15023.9 14513.4 13231.7 12068.5 11010.8 10048 9170.38 8369.53 7638.37 6970.63 6360.96 5804.65 5297.26 4834.73 4413.3 4029.52 3680.09 3361.92 3072.1 2807.95 2567.05 2347.21 2146.48 1963.11 1795.53 1642.32 1502.2 1374.03 1256.77 1149.49 1051.32 961.491 879.295 804.084 735.27 672.313 614.718 562.032 513.842 469.766 429.457 392.595 358.887 328.065 3486.8

1947 42020.4 41295.2 40329.9 39063.8 37516 35717.8 33741.5 31655.4 29519.6 27381.5 25284.3 23261.8 21340.8 19539.1 17866.1 16324.6 14911.4 13619.2 13158.9 11999.8 10947.8 9991.19 9120.09 8325.73 7600.5 6938.09 6332.85 5780.04 5275.4 4814.98 4395.15 4012.51 3663.96 3346.55 3057.47 2794.1 2554.03 2335.05 2135.19 1952.68 1785.94 1633.54 1494.2 1366.75 1250.17 1143.51 1045.91 956.608 874.885 800.104 731.676 669.066 611.783 559.379 511.44 467.591 427.485 390.806 357.263 326.59 3471.58

1948 38997.8 38403.8 37740.9 36858.8 35701.4 34285.6 32637.6 30820.3 28895.3 26919.9 24942.5 23007.3 21147.3 19387.5 17742.6 16219.5 14819 13536.9 12365.5 11949.8 10899.5 9946.19 9079.04 8289.18 7568.66 6910.61 6309.35 5759.81 5257.71 4799.25 4380.86 3999.26 3651.39 3334.47 3045.8 2782.87 2543.29 2324.88 2125.63 1943.77 1777.68 1625.94 1487.23 1360.4 1244.39 1138.27 1041.17 952.323 871.019 796.617 728.533 666.232 609.227 557.072 509.357 465.708 425.782 389.264 355.866 325.323 3458.63

1949 36365.4 35641.3 35098.4 34492.6 33685.9 32625.4 31321.2 29790.8 28089.3 26278.5 24421.7 22572.8 20777.8 19067.7 17462.3 15971.5 14597.5 13338.2 12187.6 11137.2 10767.6 9825.89 8970.67 8192.26 7482.72 6834.97 6242.95 5701.64 5206.56 4753.95 4340.45 3962.9 3618.39 3304.21 3017.88 2756.99 2519.29 2302.65 2105.11 1924.86 1760.31 1610.01 1472.66 1347.1 1232.28 1127.24 1031.15 943.22 862.756 789.119 721.73 660.06 603.626 551.987 504.74 461.513 421.969 385.797 352.712 322.452 3428.71

1950 34468.7 33235.5 32573.7 32077.5 31523.4 30783.2 29803.4 28586.3 27145.1 25535.8 23826.1 22084.5 20366.5 18714.8 17154.7 15700.5 14357 13123 11994.3 10964.1 10024 9696.27 8852.7 8086.1 7387.8 6750.78 6168.77 5636.43 5149.34 4703.56 4295.78 3923.02 3582.51 3271.67 2988.09 2729.54 2493.91 2279.15 2083.38 1904.82 1741.87 1593.08 1457.15 1332.91 1219.33 1115.45 1020.41 933.459 853.887 781.066 714.42 653.424 597.603 546.519 499.773 457.001 417.868 382.068 349.32 319.366 3396.57

1951 33766.2 31502 30375 29770.1 29316.1 28805.8 28114.8 27183.7 26010.1 24613.8 23062.6 21434.3 19800.7 18213.8 16708.4 15301.8 14000.7 12804.8 11709.8 10709.7 9797.22 8964.18 8677.82 7928.75 7247.19 6625.6 6057.85 5538.53 5063 4627.45 4228.48 3863.21 3529.08 3223.64 2944.66 2690.01 2457.73 2245.95 2052.86 1876.78 1716.14 1569.5 1435.57 1313.19 1201.32 1099.02 1005.44 919.831 841.488 769.789 704.166 644.103 589.128 538.814 492.767 450.628 412.07 376.791 344.515 314.99 3350.82

1952 34950.6 30860 28790.7 27760.6 27207.3 26788.6 26307.7 25639.5 24724.5 23568.2 22206.1 20717.8 19184.5 17673.3 16227.5 14872.1 13616.3 12461.3 11403.2 10435.8 9552.66 8746.44 8009.68 7760.23 7095.84 6490.49 5937.65 5432.02 4968.97 4544.49 4155.3 3798.47 3471.51 3172.21 2898.43 2648.22 2419.72 2211.2 2020.99 1847.52 1689.28 1544.87 1413.01 1292.55 1182.45 1081.8 989.742 905.524 828.462 757.935 693.382 634.296 580.211 530.705 485.392 443.921 405.967 371.237 339.459 310.386 3302.73

1953 39067.5 31942.4 28203.9 26312.7 25370.6 24860.7 24462 23982.3 23301.1 22371.6 21217.8 19892.2 18479.5 17056.3 15679 14379.6 13173.7 12063.9 11047.2 10117.6 9268.1 8492.19 7783.13 7134.25 6918.17 6331.03 5795.25 5305.2 4856.39 4444.83 4067.11 3720.44 3402.28 3110.51 2843.21 2598.55 2374.81 2170.37 1983.73 1813.41 1658.01 1516.21 1386.76 1268.53 1160.5 1061.74 971.435 888.829 813.246 744.076 680.765 622.812 569.76 521.196 476.739 436.046 398.8 364.712 333.518 304.974 3246.15

1954 47428.2 35705 29193.2 25776.4 24047.5 23183.9 22708.1 22319.7 21839 21159.9 20250.8 19145.8 17900.8 16594.9 15295.5 14049.6 12881.7 11802.5 10811.9 9905.55 9077.18 8320.09 7628.14 6995.28 6415.58 6224.42 5698.8 5218.72 4779.25 4376.43 4006.78 3667.3 3355.53 3069.25 2806.59 2565.86 2345.43 2143.79 1959.48 1791.17 1637.55 1497.35 1369.4 1252.57 1145.85 1048.32 959.156 877.613 803.016 734.755 672.282 615.097 562.747 514.823 470.95 430.787 394.022 360.371 329.572 301.386 3209.06

1955 59754 43346.1 32632 26680.5 23557.4 21974.4 21174.4 20713.4 20311.9 19809.5 19121 18231.3 17181 16024.4 14831.1 13657.4 12541 11499.8 10540.7 9661.66 8857.79 8122.88 7450.71 6835.77 6272.71 5756.35 5587.89 5118.58 4689.49 4296.33 3935.65 3604.4 3299.98 3020.22 2763.19 2527.25 2310.9 2112.73 1931.37 1765.56 1614.09 1475.81 1349.59 1234.36 1129.13 1032.99 945.123 864.781 791.297 724.066 662.541 606.227 554.676 507.482 464.275 424.718 388.505 355.354 325.01 297.237 3166.1

1956 69794.9 54611.1 39615.3 29823.3 24383.7 21526.7 20070.6 19316.5 18854.1 18430.9 17910.1 17226.2 16374.4 15395.2 14336.7 13257.9 12205.4 11209.2 10282.9 9430.75 8650.05 7935.91 7282.55 6684.38 6136.53 5634.33 5173.25 5024.27 4604.29 4219.95 3867.5 3543.93 3246.56 2973.09 2721.65 2490.52 2278.26 2083.56 1905.15 1741.83 1592.47 1455.99 1331.37 1217.59 1113.71 1018.83 932.132 852.883 780.416 714.128 653.476 597.967 547.156 500.641 458.054 419.063 383.365 350.683 320.764 293.377 3126.31

1957 70331.7 63787.8 49910.7 36205.7 27255.9 22281.7 19661.1 18307.5 17578.2 17100.5 16652.4 16120.8 15454.8 14654.4 13755.6 12798.4 11832.1 10894.5 10009.8 9188.37 8433.02 7740.74 7106.97 6526.52 5994.46 5506.56 5058.77 4647.17 4515.42 4139.69 3795.55 3479.7 3189.51 2922.66 2677.11 2451.21 2243.47 2052.61 1877.47 1716.93 1569.93 1435.46 1312.56 1200.31 1097.81 1004.22 918.715 840.581 769.15 703.826 644.067 589.384 539.335 493.519 451.574 413.169 378.006 345.811 316.335 289.35 3084.85

1958 64688.1 64278.4 58297.6 45614.9 33088.8 24906.4 20350.7 17934.4 16660.9 15944.8 15452.6 14991.6 14466.3 13834.9 13097.2 12283.2 11425.3 10564.3 9731.45 8946.72 8218.36 7548.35 6933.79 6370.57 5854.13 5380.17 4945.02 4545.19 4177.28 4060.52 3724 3415.54 3132.23 2871.77 2632.11 2411.47 2208.4 2021.57 1849.86 1692.24 1547.72 1415.36 1294.24 1183.53 1082.39 990.024

905.666 828.598 758.162 693.763 634.864 580.979 531.668 486.532 445.211 407.38 372.741 341.024 311.983 285.394 3044.23
1959 58553.3 59120.4 58746 53280 41688.1 30236.5 22748.1 18564.1 16322.7 15115.1 14411.7 13915.9 13458.3 12955.7 12370.5 11700.8 10970.4 10205.6 9440.45 8701.37 8005.18 7358.75 6763.63 6217.21 5715.87 5255.62 4832.74 4444.05 4086.54 3757.25 3653.54 3351.83 3075.07 2820.72 2586.76 2371.36 2172.97 1990.31 1822.19 1667.63 1525.71 1395.55 1276.32 1167.19 1067.42 976.266 893.006 816.955 747.469 683.956 625.882 572.764 524.164 479.687 438.974 401.701 367.573 336.324 307.71 281.509 3004.46
1960 54466.9 53513.7 54032 53689.8 48693.2 38093.9 27614.2 20745.3 16885 14790.8 13637.4 12947.6 12456.5 12013.6 11544.1 11012 10412.9 9764.92 9089.05 8413.8 7761.57 7146.76 6575.27 6048.45 5564.06 5118.98 4709.81 4333.36 3986.92 3667.91 3373.77 3281.87 3011.86 2763.99 2536.05 2326.25 2132.99 1954.91 1790.88 1639.85 1500.95 1373.38 1256.35 1149.11 1050.94 961.178 879.151 804.219 735.767 673.217 616.038 563.751 515.923 472.159 432.106 395.44 361.87 331.133 302.986 277.213 2960.36
1961 54127.2 49779 48907.8 49381.5 49067.4 44493 34782.8 25167.3 18842.9 15262.8 13295.5 12191.5 11520.3 11043.8 10626.1 10197.9 9724.21 9197.5 8631.08 8041.24 7451.8 6881.8 6343.66 5842.53 5379.71 4953.36 4560.91 4199.49 3866.43 3559.47 3276.43 3015.15 2934.28 2693.9 2473.05 2269.79 2082.58 1910.03 1750.95 1604.33 1469.29 1345.04 1230.88 1126.12 1030.11 942.195 861.79 788.304 721.162 659.818 603.756 552.502 505.629 462.749 423.51 387.595 354.715 324.61 297.044 271.8 2904.42
1962 58552.4 49468.6 45494.6 44698.3 45130.2 44836.3 40631.4 31714.4 22881.4 17062.1 13755.7 11927.5 10893.7 10263 9819.02 9437.63 9054.4 8635.63 8172.52 7675.22 7157.09 6638.63 6136.48 5661.6 5218.65 4808.9 4430.86 4082.36 3760.99 3464.47 3190.87 2938.33 2704.99 2633.29 2418.27 2220.58 2038.54 1870.78 1716.09 1573.41 1441.87 1320.67 1209.12 1106.61 1012.52 926.26 847.27 775.014 708.966 648.614 593.467 543.063 496.98 454.831 416.27 380.982 348.681 319.108 292.031 267.235 2857.55
1963 67791 53512.9 45210.9 41578.9 40850.1 41237.1 40938.9 37031.6 28807.8 20686 15340.5 12300.9 10616.3 9661.85 9081.1 8677.17 8336.7 7999.93 7634.82 7231.86 6798.8 6346.66 5893.2 5453 5035.84 4645.95 4284.63 3950.7 3642.37 3357.63 3094.56 2851.53 2626.96 2419.26 2355.93 2164.21 1987.83 1825.3 1675.45 1537.2 1409.63 1291.98 1183.53 1083.69 991.918 907.661 830.403 759.643 694.906 635.721 581.634 532.207 487.026 445.714 407.926 373.353 341.712 312.747 286.229 261.946 2802.96
1964 83238.9 61956.3 48907.1 41319.6 37999.1 37325.4 37649 37300.4 33614.1 26010.8 18563 13682.9 10914.6 9382.62 8516.77 7993.61 7634.72 7337.15 7045.98 6731.31 6383.52 6008.59 5615.79 5220.57 4835.85 4470.36 4128.01 3810.11 3515.77 3243.55 2991.77 2758.83 2543.38 2344.08 2159.56 2103.74 1933.12 1776.04 1631.22 1497.62 1374.31 1260.47 1155.43 1058.58 969.397 887.392 812.087 743.025 679.76 621.87 568.939 520.561 476.345 435.924 398.961 365.149 334.211 305.895 279.973 256.239 2743.86
1965 100568 76074.6 56623.8 44697.6 37762.1 34720.8 34079.6 34309.1 33872.3 30373.4 23368.3 16582.7 12163.6 9666.7 8289.48 7514.51 7049.93 6735.01 6476.9 6225.76 5954.18 5652.93 5326.89 4984.01 4637.92 4300.13 3978.5 3676.65 3395.86 3135.48 2894.32 2670.98 2464.11 2272.58 2095.24 1930.92 1881.53 1729.37 1589.2 1459.9 1340.57 1230.38 1128.62 1034.7 948.07 868.28 794.897 727.497 665.674 609.032 557.196 509.794 466.465 426.86 390.652 357.539 327.246 299.527 274.155 250.928 2688.95
1966 88546.2 91912.5 69527 51750.2 40849.3 34504.2 31701.7 31058.7 31162.8 30620.2 27306.5 20894.7 14757.8 10786.2 8551.43 7323.32 6635.55 6226.32 5951.69 5728.47 5511.81 5276.88 5015.13 4730.61 4430.29 4126.26 3828.8 3545 3278.19 3029.63 2798.81 2584.77 2386.33 2202.35 2031.85 1873.86 1727.37 1683.59 1547.77 1422.59 1307.07 1200.41 1101.89 1010.88 926.847 849.33 777.915 712.221 651.875 596.514 545.785 499.355 456.893 418.076 382.592 350.15 320.478 293.332 268.491 245.753 2635.39
1967 68610 80925.1 84001.7 63542.8 47294.7 37325.3 31505 28894.5 28216.6 28181.6 27544.2 24434.8 18612.7 13100.6 9552.79 7563.85 6474.64 5867.5 5508.77 5270.13 5077.33 4890.23 4686.51 4458.35

4209.26 3945.36 3677.45 3414.73 3163.63 2927.2 2706.63 2501.57 2311.21 2134.55 1970.63 1818.6 1677.63 1546.83 1507.95 1386.54 1274.62 1171.29 1075.85 987.659 906.169 830.92 761.487 697.508 638.645 584.566 534.948 489.477 447.856 409.787 374.984 343.168 314.076 287.468 263.124 240.845 2584.55
1968 59772.5 62704.8 73960 76771.7 58072.5 43217.3 34089.3 28735.2 26290 25585 25451.7 24778.5 21907.2 16644.6 11695.4 8520.18 6744.16 5773.85 5234.79 4917.88 4708.3 4539.55 4375.62 4196.41 3994.87 3774.07 3539.52 3300.91 3066.56 2842.28 2630.87 2433.47 2249.79 2079.16 1920.71 1773.59 1637.08 1510.44 1392.9 1358.07 1248.89 1148.2 1055.21 969.313 889.926 816.555 748.791 686.257 628.629 575.603 526.882 482.177 441.204 403.698 369.392 338.027 309.352 283.132 259.149 237.206 2547.15
1969 59339.5 54627.9 57307.9 67594.3 70162.3 53064.1 39464.7 31078.7 26119.8 23797 23046.5 22816.8 22121.9 19497.1 14782.6 10375.3 7555.71 5981.85 5124.07 4649.33 4371.81 4189.46 4043.1 3900.61 3744.02 3566.98 3372.24 3164.7 2953.08 2744.86 2545.31 2356.98 2180.95 2017 1864.59 1722.95 1591.35 1469.18 1355.78 1250.48 1219.4 1121.51 1031.21 947.801 870.724 799.476 733.616 672.779 616.629 564.876 517.252 473.489 433.33 396.521 362.824 332 303.817 278.05 254.487 232.935 2502.77
1970 63001.5 54232.2 49926.2 52375.3 61774.2 64105.5 48438.2 35940.2 28182.9 23543.6 21300.5 20486.6 20161.6 19458.5 17097.5 12941.5 9077.9 6612.42 5239.11 4492.82 4081.79 3843.34 3687.97 3563.72 3442.28 3307.79 3154.62 2985.16 2803.8 2618.29 2435.32 2259.64 2093.58 1938.15 1793.24 1658.36 1532.92 1416.27 1307.89 1207.24 1113.72 1086.24 999.211 918.895 844.681 776.081 712.653 654.006 599.822 549.801 503.691 461.253 422.25 386.455 353.643 323.602 296.12 270.99 248.014 227.002 2440.34
1971 64723.4 57579 49564.5 45629 47865.4 56439.6 58508.8 44094.5 32562.6 25363.5 21024 18874.9 18032.9 17656.5 16982.7 14894.1 11266.4 7904.84 5762.91 4571.65 3926.04 3572.22 3368.56 3237.03 3132.2 3029.24 2914.21 2782.14 2635.16 2477.15 2315 2154.68 2000.45 1854.43 1717.59 1589.85 1470.83 1360.03 1256.92 1161.06 1071.96 989.131 964.908 887.749 816.513 750.667 689.784 633.475 581.398 533.274 488.839 447.871 410.16 375.497 343.682 314.514 287.808 263.375 241.031 220.601 2372.62
1972 60108.4 59152.7 52623.3 45298.4 41700.1 43732.5 51514.8 53269.5 39962.5 29320.4 22666.9 18649.4 16635.5 15815.5 15434.6 14818.8 12988.4 9827.28 6900.93 5037.05 4001.38 3441.31 3135.71 2961.05 2849.15 2760.21 2672.43 2573.53 2459.13 2331.1 2192.92 2050.71 1909.81 1774.03 1645.31 1524.53 1411.66 1306.42 1208.36 1117.04 1032.08 953.08 879.594 858.192 789.679 726.406 667.902 613.793 563.739 517.436 474.64 435.119 398.676 365.125 334.284 305.972 280.015 256.247 234.499 214.611 2309.07
1973 54263.4 54935 54061.5 48093.9 41397.3 38094.8 39896.7 46835.9 48130.8 35790.6 25991.5 19889.7 16220.1 14370.5 13599.7 13238.3 12698.4 11133 8432.67 5931.04 4337.17 3452.17 2974.79 2715.73 2569.02 2475.99 2402.31 2329.09 2245.67 2148.23 2038.42 1919.3 1796.27 1674.05 1556.02 1443.93 1338.61 1240.07 1148.08 1062.29 982.321 907.867 838.583 774.097 755.411 695.225 639.62 588.188 540.604 496.573 455.833 418.168 383.379 351.294 321.751 294.59 269.654 246.789 225.849 206.689 2224.51
1974 54704.5 49593 50206.8 49408.4 43952 37818.6 34755.6 36280.8 42339.5 43146.8 31772.9 22851.2 17339.8 14049.2 12392.6 11698.9 11377.5 10915.9 9579.66 7266.8 5119.89 3750.88 2991 2581.96 2361.05 2236.96 2159.03 2097.49 2035.94 1965.09 1881.59 1786.93 1683.78 1576.92 1470.51 1367.57 1269.67 1177.57 1091.3 1010.69 935.448 865.266 799.874 738.988 682.289 665.931 612.966 564.016 518.724 476.811 438.017 402.114 368.916 338.247 309.958 283.906 259.952 237.958 217.789 199.317 2145.7
1975 68619.2 49996.1 45324.6 45885.4 45153.6 40154.3 34509.9 31621.4 32832.4 38025.4 38409.9 28038.2 20012.5 15097.4 12184.4 10724.2 10115.9 9840.22 9449.76 8304.29 6309.36 4452.77 3267.61 2609.84 2256.35 2066.2 1960.13 1894.06 1842.02 1789.67 1728.87 1656.68 1574.41 1484.44 1390.99 1297.76 1207.43 1121.43 1040.44 964.516 893.519 827.202 765.304 707.602 653.85 603.775 589.378 542.567 499.292 459.242 422.17 387.851 356.085 326.706 299.563 274.522 251.459 230.252 210.777 192.918 2077.33

1976 94439.6 62713.2 45693 41423.5 41933.7 41250.3 36635.1 31382.9 28586.9 29434.5 33760.1 33773.6 24447.5 17337.2 13022.2 10483.9 9219.04 8698.07 8469.54 8145.49 7170.54 5457.98 3859 2836.89 2269.61 1965.24 1802.18 1711.87 1656.1 1612.29 1567.95 1515.96 1453.76 1382.5 1304.28 1222.83 1141.41 1062.43 987.133 916.153 849.555 787.233 728.978 674.572 623.827 576.536 532.461 519.834 478.603 440.476 405.182 372.505 342.249 314.239 288.33 264.389 242.3 221.954 203.242 186.058 2004.11

1977 72255.6 86311.3 57315.6 41760.2 37855.9 38307.5 37629.2 33300.5 28342.8 25582.4 26061.8 29576.8 29317.3 21071.8 14872 11140.7 8960.24 7881.32 7444.24 7260.52 6996.12 6171.24 4706.86 3334.42 2455.77 1968.04 1706.77 1567.38 1490.75 1443.84 1407.1 1369.68 1325.36 1271.92 1210.38 1142.57 1071.78 1000.9 932.023 866.293 804.269 746.026 691.478 640.456 592.778 548.287 506.805 468.129 457.087 420.881 387.392 356.384 327.67 301.078 276.455 253.676 232.624 213.199 195.304 178.846 1927.39

1978 58094.2 66036.7 78882.6 52382.3 38163.7 34583 34948 34213.7 30093.2 25392.1 22689.2 22884 25745.1 25348.7 18137.1 12768.3 9555.73 7687.36 6768.75 6403.19 6256.43 6040.1 5338.1 4078.91 2894.58 2135.25 1713.7 1488.19 1368.3 1302.82 1263.06 1232 1200.17 1162.16 1116 1062.59 1003.56 941.803 879.862 819.607 762.044 707.683 656.596 608.719 563.914 522.025 482.919 446.443 412.424 402.74 370.876 341.395 314.093 288.806 265.384 243.694 223.625 205.076 187.959 172.189 1857.05

1979 60315.8 53094.1 60353 72093.1 47871.1 34864 31547.7 31765.6 30893.3 26919 22467 19859.1 19842.3 22163.2 21717.5 15498.2 10900.8 8161.38 6573.88 5798.63 5496.73 5382.29 5207.28 4611.5 3530.46 2509.82 1854.43 1490.5 1296.08 1193.09 1137.2 1103.55 1077.33 1050.29 1017.71 977.88 931.583 880.255 826.436 772.375 719.726 669.38 621.792 577.04 535.075 495.782 459.03 424.705 392.678 362.798 354.316 326.313 300.4 276.397 254.161 233.563 214.484 196.831 180.512 165.45 1786.34

1980 63906.8 55124.5 48524.4 55158.3 65883.5 43727.4 31787.9 28630 28580.8 27457.4 23585.3 19406.7 16943.5 16770.2 18614.9 18178.9 12959.1 9120.7 6840.65 5523.53 4885.75 4644.85 4561.21 4425.02 3928.8 3014.92 2147.94 1590.14 1280.32 1115.07 1027.9 980.988 953.027 931.314 908.751 881.258 847.365 807.754 763.676 717.342 670.715 625.242 581.704 540.514 501.747 465.371 431.289 399.394 369.591 341.772 315.809 308.462 284.114 261.577 240.696 221.35 203.424 186.819 171.452 157.244 1700.35

1981 55350.5 58405.2 50378.9 44339.8 50347 59946.1 39533 28453.3 25303.8 24920.6 23644.6 20108.5 16432.2 14291.1 14126.2 15689.1 15350.5 10972.1 7745.86 5828.04 4720.68 4188.1 3992.67 3930.77 3822.2 3400.63 2614.46 1865.72 1383.25 1115.21 972.396 897.315 857.146 833.395 814.998 795.765 772.131 742.813 708.409 670.021 629.594 588.858 549.084 510.974 474.895 440.919 409.022 379.125 351.135 324.973 300.545 277.74 271.302 249.906 230.098 211.743 194.734 178.973 164.371 150.856 1634.55

1982 52226.6 50585.3 53377 46033.1 40464 45776.6 54098.9 35263.1 25006.7 21889.3 21246.2 19924.9 16809.7 13675.3 11875.8 11747.6 13076.9 12835.4 9207.64 6524.77 4927.49 4005.29 3565.03 3408.83 3365.06 3280.08 2924.65 2252.88 1610.47 1195.84 965.423 842.808 778.567 744.421 724.405 708.945 692.675 672.501 647.306 617.614 584.389 549.332 513.952 479.373 446.213 414.799 385.199 357.396 331.325 306.907 284.076 262.751 242.838 237.23 218.539 201.231 185.19 170.324 156.546 143.78 1561.86

1983 60199.6 47730.1 46230.1 48769.8 41991.6 36733.5 41148.8 47884.1 30607 21258.4 18259.3 17459.9 16210 13602.4 11049.9 9609.74 9537.97 10664.9 10520.4 7585.69 5402.26 4098.97 3346.31 2990.26 2869.42 2841.61 2777.72 2482.98 1916.95 1373.06 1021.34 825.838 721.948 667.736 639.145 622.558 609.792 596.25 579.274 557.905 532.597 504.183 474.129 443.751 414.027 385.497 358.448 332.944 308.974 286.486 265.415 245.705 227.29 210.088 205.257 189.101 174.139 160.269 147.413 135.496 1476.42

1984 57051.5 55016.6 43620.7 42240.1 44490.7 38128.6 33038.4 36461.6 41635.5 26084.3 17788.9 15060.1 14261 13171.2 11036.6 8977.74 7832.71 7807.66 8772.22 8696.05 6300.41 4507.28 3434.23 2814.31 2523.5 2428.99 2412.04 2363.57 2117.35 1637.81 1175.11 875.422 708.795 620.363 574.382 550.299 536.461 525.846 514.503 500.144 481.942 460.29 435.904 410.062 383.908 358.291 333.682

310.336 288.311 267.601 248.163 229.942 212.892 196.957 182.068 177.897 163.908 150.949 138.935 127.797 1397.55
1985 52316 52139.7 50279.9 39856.3 38536.8 40410 34320.9 29322.3 31785.3 35607.4 21919.1 14740.3 12360 11642.7 10735.3 9004.99 7346.21 6434.65 6442.87 7272.39 7241.97 5269.46 3784.75 2894.19 2379.54 2139.94 2065.21 2055.61 2018.49 1811.56 1403.57 1008.51 752.28 609.788 534.25 495.097 474.718 463.109 454.231 444.682 432.486 416.931 398.351 377.374 355.108 332.548 310.431 289.171 268.99 249.941 232.022 215.197 199.42 184.653 170.848 157.946 154.339 142.212 130.976 120.558 1323.7
1986 56841.8 47811.7 47650.5 45940 36357.9 34990.3 36347.5 30418.7 25502.8 27088.4 29777.3 18051.9 12010.6 10010.1 9408.63 8682.17 7303.18 5981.84 5263.91 5296.17 6006.61 6008.66 4390.54 3165.67 2429.26 2003.57 1806.91 1748.2 1743.96 1715.88 1542.7 1197.13 861.378 643.321 522.04 457.817 424.632 407.467 397.774 390.386 382.385 372.077 358.843 342.978 325.023 305.934 286.572 267.575 249.301 231.945 215.555 200.13 185.641 172.051 159.327 147.429 136.307 133.204 122.745 113.054 1246.76
1987 66693.6 51948.1 43695.4 43539.2 41919.2 33045 31551.3 32372 26665.9 21976.8 22973 24926.9 14973.6 9909.68 8242.35 7750.79 7168.02 6049.1 4973.49 4394.06 4438.5 5052.93 5072.5 3718.49 2688.99 2068.94 1710.45 1545.83 1498.43 1497.32 1475.41 1328.26 1031.95 743.304 555.655 451.274 396.049 367.582 352.928 344.711 338.464 331.664 322.837 311.452 297.765 282.247 265.73 248.961 232.498 216.654 201.599 187.376 173.987 161.407 149.604 138.551 128.214 118.549 115.856 106.765 1182.87
1988 74367.1 60951.6 47475.5 39924.6 39722.7 38078.9 29756.1 28024.6 28254.9 22840.3 18497.9 19065.5 20484.7 12236.6 8082.31 6727.4 6342.6 5887.5 4989.77 4120.88 3656.84 3709.32 4239.28 4270.9 3140.99 2277.99 1757.27 1456.16 1318.74 1280.65 1281.79 1264.87 1140.19 886.844 639.432 478.436 388.872 341.526 317.178 304.705 297.759 292.493 286.726 279.19 269.425 257.655 244.286 230.039 215.564 201.343 187.65 174.634 162.333 150.75 139.863 129.647 120.077 111.125 102.755 100.427 1117.98
1989 69477.4 67964.5 55703.9 43378.4 36423.1 36074 34261.2 26385.8 24396.3 24120.1 19153.3 15295.1 15615.4 16692.9 9957.67 6585.75 5498.9 5206.1 4855.23 4134.71 3430.71 3057.85 3114.39 3572.58 3611.28 2663.85 1937.11 1497.87 1243.83 1128.56 1097.78 1100.38 1087.26 981.22 763.98 551.345 412.86 335.812 295.113 274.229 263.577 257.683 253.223 248.314 241.86 233.464 223.317 211.775 199.462 186.942 174.636 162.781 151.508 140.851 130.813 121.376 112.518 104.22 96.4564 89.1954 1057.72
1990 102185 63495.6 62112.9 50895.7 39568.7 33060.8 32415.3 30303.1 22875.1 20707.3 20083.7 15709.7 12419.6 12613.1 13466 8045.83 5340.2 4479.7 4263.11 3996.77 3421.06 2852.23 2553.51 2611.2 3006.21 3048.62 2255.3 1644.23 1274.29 1060.3 963.752 938.95 942.485 932.407 842.389 656.524 474.206 355.368 289.246 254.344 236.472 227.395 222.401 218.63 214.46 208.946 201.743 193.019 183.079 172.466 161.666 151.045 140.81 131.073 121.866 113.191 105.034 97.3756 90.2 83.4853 992.773
1991 110569 93387.7 58029.1 56753.6 46437.7 35948.9 29775.4 28797.8 26461.1 19614.7 17465.9 16722.7 12968.5 10206.3 10353.7 11069 6633.52 4420.28 3724.35 3560.23 3352.39 2881.3 2411.33 2166.23 2222.05 2565.3 2607.94 1933.54 1412.4 1096.52 913.78 831.702 811.273 815.195 807.24 729.917 569.291 411.468 308.534 251.256 221.04 205.593 197.77 193.487 190.259 186.676 181.916 175.679 168.111 159.479 150.254 140.863 131.623 122.716 114.24 106.223 98.6687 91.5638 84.8925 78.6406 938.408
1992 88939.2 101049 85347.1 53019.7 51766.2 42142.5 32287.4 26311.3 24928.5 22410.8 16285.4 14276.1 13525.7 10431.2 8197.65 8329.36 8936.9 5381.37 3604.97 3053.9 2934.73 2777.12 2397.8 2015.04 1817 1870.07 2165.4 2207.23 1640.31 1200.7 933.882 779.522 710.531 693.968 698.116 692 626.275 488.844 353.573 265.287 216.158 190.257 177.036 170.363 166.729 163.996 160.95 156.883 151.536 145.035 137.611 129.67 121.581 113.62 105.942 98.6336 91.7199 85.203 79.0729 73.3161 878.442
1993 64898.1 81281.9 92349 77981.4 48370.1 47015.2 37929.3 28649.9 22928.5 21306.3 18814.8 13477.4 11698.1 11022.1 8484.75 6674.23 6800.51 7325.24 4430.72 2981.96 2537.69 2449.25

2327.05 2016.6 1700.33 1537.81 1586.95 1841.95 1881.51 1400.88 1027.15 800.083 668.716 610.243 596.634 600.752 595.975 539.762 421.587 305.101 229.035 186.704 164.397 153.025 147.303 144.2 141.87 139.266 135.773 131.168 125.56 119.149 112.287 105.294 98.4084 91.7661 85.4426 79.4589 73.8177 68.5105 824.697

1994 60587.1 59310.8 74284 84380.9 71153 43951.5 42361.5 33726.7 25052.6 19695.9 18007.3 15697.7 11146.4 9628.91 9059.66 6981.55 5506.81 5631.87 6091.88 3700.64 2501.12 2136.99 2070.14 1973.48 1715.4 1450.32 1314.89 1359.85 1581.4 1618.13 1206.61 885.897 690.879 578.053 528.002 516.657 520.607 516.806 468.333 365.986 264.984 199.002 162.279 142.934 133.083 128.138 125.467 123.464 121.218 118.196 114.203 109.334 103.763 97.7966 91.714 85.7231 79.9426 74.4384 69.2292 64.3174 778.315

1995 79939.4 55371.5 54205 67880 77035.7 64783.7 39798.8 38033.2 29956.1 21999 17116.1 15520 13453.5 9523.45 8218.9 7737.73 5972.81 4722.02 4841.91 5251.61 3198.69 2167.34 1856.14 1801.92 1721.12 1498.65 1269.04 1152.14 1193.01 1388.9 1422.54 1061.68 780.087 608.776 509.666 465.787 455.996 459.677 456.492 413.814 323.478 234.27 175.975 143.53 126.443 117.748 113.389 111.039 109.278 107.302 104.636 101.109 96.8051 91.8778 86.6 81.2178 75.916 70.7997 65.9273 61.3157 746.35

1996 70820.4 73057.7 50604.7 49531.3 61965.5 70119.6 58624.8 35689.3 33714.1 26227.5 19041.8 14679.4 13225.5 11422.8 8075.29 6972.19 6574.79 5087.19 4032.94 4147.26 4511 2755.07 1871.48 1606.49 1562.85 1495.61 1304.5 1106.32 1005.77 1042.7 1215.21 1245.83 930.58 684.276 534.362 447.632 409.309 400.893 404.297 401.645 364.215 284.79 206.303 155.002 126.449 111.415 103.77 99.9423 97.8832 96.3425 94.609 92.2667 89.164 85.3745 81.0341 76.3835 71.6398 66.9663 62.4556 58.1595 712.545

1997 156004 64724.9 66769.6 46247.8 45254 56544.6 63769.6 52961.2 31915.2 29771.6 22857.9 16399.4 12524.2 11211.3 9647.97 6811.76 5883.9 5557.58 4310.25 3426.33 3533.53 3854.33 2360.38 1607.42 1383.03 1348.31 1292.76 1129.51 959.376 873.373 906.551 1057.68 1085.38 811.43 597.118 466.616 391.118 357.826 350.636 353.764 351.576 318.92 249.444 180.745 135.831 110.832 97.6726 90.9851 87.6418 85.8472 84.5056 82.9936 80.9462 78.2305 74.9111 71.1073 67.0302 62.8707 58.7719 54.8154 676.469

1998 93316.9 142577 59154 61021.4 42256.9 41308.4 51476.7 57748.2 47576.4 28387 26208.1 19935.4 14198 10788.5 9630.24 8279.04 5847.31 5057.26 4785.56 3719.41 2963.26 3062.73 3347.85 2054.27 1401.51 1207.85 1179.29 1132.22 990.435 842.156 767.395 797.227 930.84 955.863 715.029 526.459 411.595 345.145 315.885 309.641 312.496 310.646 281.855 220.499 159.8 120.11 98.0187 86.3916 80.4856 77.536 75.9551 74.7741 73.4415 71.6344 69.235 66.3006 62.9369 59.3307 55.6509 52.0245 647.362

1999 72780.7 85285.2 130305 54061.9 55759.7 38586.1 37646.2 46730.1 52112.1 42619.3 25236.8 23141.6 17509.1 12424.9 9422.31 8405.04 7228.03 5110.01 4425.71 4194.62 3265.54 2605.93 2697.63 2953.07 1814.46 1239.41 1069.33 1045.08 1004.25 879.181 748.083 682.099 709.009 828.245 850.884 636.749 468.986 366.775 307.645 281.632 276.125 278.725 277.121 251.475 196.758 142.611 107.201 87.4924 77.1203 71.8534 69.2246 67.8172 66.7662 65.5793 63.9683 61.828 59.2095 56.2072 52.9879 49.7027 624.657

2000 171241 66516.5 77944.7 119088 49400 50914.2 35160.3 34162.3 42138.7 46627.9 37828.1 22238.7 20277.7 15283.8 10823 8201.88 7319.03 6300.82 4461.16 3870.35 3674.79 2865.86 2290.81 2375.11 2603.73 1601.89 1095.49 946.152 925.559 890.147 779.868 664.018 605.806 630.035 736.332 756.771 566.528 417.402 326.528 273.957 250.851 245.996 248.356 246.965 224.14 175.392 127.139 95.5805 78.0147 68.7715 64.0792 61.7387 60.4868 59.5523 58.4962 57.0614 55.154 52.8199 50.1429 47.2722 601.641

2001 104032 156502 60791.5 71235.1 108821 45111.9 46408.6 31929.6 30847 37783.4 41506.5 33455.8 19569.1 17782.7 13378.4 9468.12 7177.68 6411.37 5526.95 3919.31 3405.75 3238.79 2529.66 2024.91 2102.14 2307.18 1420.94 972.661 840.776 823.095 792.134 694.41 591.568 539.961 561.791 656.818 675.272 505.665 372.657 291.592 244.696 224.099 219.796 221.936 220.72 200.343 156.786 113.662 85.4551 69.755 61.4943 57.3017 55.2114 54.0942 53.2605 52.3178 51.0361 49.3316 47.245 44.8516 580.457

2002 64683.9 95077.9 143032 55558.7 65096.6 99396.3 41147.9 42213 28919.6 27793.3 33859.8 37017.9 29726.5 17344.2 15739.5 11836.3 8379.03 6356.76 5683.89 4905.51 3482.82 3030.03 2884.73 2255.48 1807.17 1877.73 2062.5 1271.14 870.666 753.031 737.563 710.132 622.77 530.723 484.574 504.304 589.751 606.453 454.219 334.801 262.01 219.902 201.415 197.568 199.51 198.433 180.127 140.974 102.205 76.8454 62.73 55.3034 51.5347 49.6564 48.653 47.9045 47.0577 45.9058 44.3734 42.4972 562.485

2003 60704.1 59116.6 86894.6 130720 50771.2 59461 90680.5 37449.1 38277.7 26105.6 24972.2 30296.2 33013.7 26452.1 15414.6 13982.4 10516.7 7449.25 5656.08 5062.22 4373.36 3108.08 2706.58 2579.08 2018.15 1618.22 1682.53 1849.2 1140.3 781.423 676.137 662.501 638.08 559.752 477.148 435.762 453.601 530.558 545.675 408.759 301.333 235.847 197.964 181.338 177.889 179.65 178.692 162.216 126.963 92.0512 69.2138 56.5022 49.8145 46.4212 44.7305 43.8276 43.1541 42.3921 41.3551 39.9752 545.03

2004 62701.6 55479.3 54028.5 79414.9 119455 46373.3 54236.9 82491.5 33928.2 34505 23410.5 22290.2 26944.2 29288.6 23435.3 13650.2 12384.6 9321.11 6608.55 5023.16 4500.83 3892.7 2769.43 2414.07 2302.46 1803.19 1446.94 1505.45 1655.58 1021.45 700.318 606.218 594.219 572.508 502.379 428.356 391.295 407.4 476.608 490.27 367.311 270.813 211.984 177.952 163.021 159.933 161.528 160.677 145.87 114.175 82.7836 62.2479 50.8174 44.8041 41.7533 40.2335 39.4223 38.8173 38.1325 37.2003 526.246