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Document de travail 2014/26

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TRAC

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Working Paper 2014/26

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The Effect of a Higher Natural Mortality on Overfishing Reference Points for Georges Bank Yellowtail Flounder

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ABSTRACT

Recent exploratory analyses of the Georges Bank yellowtail flounder stock assessment considered increased values of assumed natural mortality rate (M). However, the effect of assumed M on the overfishing reference point (F_{ref}) was not considered in the explorations. As a demonstration, conventional reference points from yield-per-recruit ($F_{0.1}$, F_{max}), spawning biomass-per-recruit ($F_{40\%}$) and age-based production models (MSY, F_{MSY}, and B_{MSY}) were derived using the alternative assumptions of M=0.2 (as currently assumed) and M=0.45 (the value suggested from model likelihood by the 2012 TRAC). All fishing mortality reference points increased as a function of M using conventional methods. Results suggest that all candidate overfishing reference points increase as the assumed value of M increases, and the assumed value of M in the stock assessment should also be applied to overfishing reference points for appropriate stock status determination.

Introduction

The overfishing reference point for Georges Bank yellowtail flounder is F_{ref}=0.25, which is based on estimates of $F_{0.1}$ and $F_{40\%}$, assuming a natural mortality rate (M) of 0.2 (Legault et al. 2013). $F_{0.1}$ is the fishing mortality that produces one-tenth of the initial increase in yield-per-recruit from F=0, (Gulland & Boerma 1973). $F_{40\%}$ is the fishing mortality that conserves 40% of the maximum spawning biomass per recruit (*SPR*, Clark 1993).

A definitive documentation of the technical basis of F_{ref} may not exist, but $F_{0.1}$=0.25 assuming M=0.2 pre-dates the TRAC process (e.g., NEFSC 1991), the first TRAC assessment confirmed that $F_{0.1}$=0.25 (Nielson & Cadrin 1998), and $F_{40\%}$=0.25 was established as the US overfishing definition for Georges yellowtail in 2002 (NEFSC 2002). Early TRAC reports refer to F_{ref}=0.25 (Stone & Legault 2003, TMGC 2003), and the 2005 TRAC benchmark assessment for Georges yellowtail concluded that F_{ref}=0.25 should be retained, but no technical basis was provided (TRAC 2005). The Third Groundfish Assessment Review Meeting re-estimated $F_{40\%}$ to be 0.25 assuming M=0.2, used F=0.25 as the TRAC projection, and derived a proxy for SSB_{MSY} of 43,200 mt based on average recruitment when SSB exceeded 5,000 mt and *SPR* at $F_{40\%}$ (NEFSC 2008).

Alternative assumptions of M were considered by the TRAC in attempts to understand and potentially resolve the persistent retrospective pattern, in which updated estimates of stock size are revised downward and updated estimates of fishing mortality are revised upward. The 2012 TRAC assessment included sensitivity analyses that examined a range of natural mortality rates, assumed for the entire assessment time series (Legault et al. 2012). Goodness of fit from the Virtual Population Analysis (VPA) was similar over a wide range of M (0.1-0.6), and was best when M=0.45. Assuming greater M for the entire assessment time series reduced the magnitude of retrospective inconsistency but did not remove the retrospective pattern. Another sensitivity analysis that assumed M increased to 0.9 in 2005 removed the retrospective pattern. Catch and associated probability of overfishing was projected from several alternative model configurations, including two that assumed M increased during the assessment period, but F_{ref} was maintained at 0.25 for each alternative.

Legault & Palmer (2013) offer two possible approaches to revising F_{ref} when M is assumed to increase within an assessment time series. The first approach is to increase F_{ref} based on yield per recruit considerations, so that foregone yield from natural mortality is minimized. This approach is based on Beverton & Holt's (1957) finding that optimal fishing mortalities are determined by the ratio of M to growth rate. The second option for revising F_{ref} when M is assumed to increase within an assessment time series is to maintain biological productivity by decreasing F_{ref} to offset the increase in M. The 2013 TRAC recommended catch based on F<Fref for eastern Georges Bank cod and recommended re-evaluation of Fref (TMGC 2013).

The objective of this analysis is to demonstrate the effect of M on reference points, including $F_{0.1}$, $F_{40\%}$, and F_{MSY} for consideration in explorations of alternative modeling approaches for Georges Bank yellowtail flounder and other stocks. These analyses are intended to explore the relative changes and sensitivity to M rather than to provide new values of F_{ref}.

Methods and Results

Weight and maturity at age were derived from the last five years (2008-2012) of the assessment series reported by the 2013 TRAC (Legault et al. 2013). Results from the 'single-series' VPA provided estimates of partial recruitment at age (i.e., selectivity, Table 1) for the last five years, and time series of spawning biomass and age-1 recruitment. The VPA was also revised using the NOAA Fisheries Toolbox (VPA v.3.4.4. Gavaris 1988) assuming M=0.45 for the entire assessment time series to derive revised estimates of spawning biomass, age-1 recruitment, and partial recruitment (Table 2, Appendix 1).

The NOAA Fisheries Toolbox Yield per Recruit Analysis (YPR v3.3, Thompson and Bell 1934, Gabriel et al. 1989) was applied with alternative assumptions of M=0.2 and M=0.45 and associated partial recruitment (Tables 1 and 2). The analysis that assumed M=0.2 confirmed $F_{40\%}$=0.25, but calculated $F_{0.1}$=0.28, which was slightly greater than previous estimates. Estimates of $F_{40\%}$ and $F_{0.1}$ based on M=0.45 were greater ($F_{40\%}$=0.63 and $F_{0.1}$=0.69). A sensitivity analysis using a range of M from 0.1 to 0.8 (assuming the selectivity from the 2013 TRAC) showed the positive relationship between M and $F_{0.1}$ as well as M and $F_{40\%}$ (i.e., as M increased, the F reference point increased; Figure 1).

The NOAA Fisheries Toolbox Stock Recruit Fitting Model (SRFIT v.7.0.1, Brodziak & Legault 2010) was used to fit Beverton and Holt (1957) stock-recruitment functions to estimates of spawning stock biomass (*S*) and recruitment (*R*) from both VPAs:

$$1) \quad R = \frac{\alpha S}{\beta + S}$$

Beverton-Holt relationships were considered to be appropriate models for Georges yellowtail in several previous studies (e.g., Overholtz 1999, NEFSC 2002). Model fits assumed lognormal error with no priors on estimated parameter values and excluded the last five years of data to avoid non-converged estimates. MSY reference points were derived using equilibrium expectations of recruitment (R_F), spawning stock biomass (S_F) and yield (Y_F), as a function of *S-R* parameters, spawning stock biomass per recruit (*SPR*) and yield per recruit (*YPR*) over a range of fishing mortality values:

$$2) \quad \begin{aligned} R_F &= \alpha - \frac{\beta}{SPR_F} \\ S_F &= R_F SPR_F \\ Y_F &= R_F YPR_F \end{aligned}$$

The models fit both sets of stock-recruitment estimates relatively well. The relationship based on VPA results assuming M=0.2 had a run of negative residuals at the end of the time series, and the relationship based on VPA results assuming M=0.45 had an improved fit at the end of the time series (Figures 2 and 3). Estimates of F_{MSY} increased from 0.41 (assuming M=0.2) to 0.88 (assuming M=0.45), estimates of SSB_{MSY} decreased from 18,581 mt (assuming M=0.2) to 7,360 mt (assuming M=0.45), and estimates of MSY decreased from 6,907 mt (assuming M=0.2) to 5,050 mt (assuming M=0.45; Figures 4 and 5).

Discussion and Conclusions

The effect of increased M on all overfishing reference points (e.g., $F_{0.1}$, $F_{40\%}$, F_{MSY}) was positive from all conventional estimation methods (Tables 1 and 2). These results are consistent with theoretical and empirical investigations of the relationship between M and overfishing reference points. The relationship of M and per-recruit reference points is relative simple (e.g., $F_{0.1}$, $F_{40\%}$), because all of the vital rates (i.e., M, growth, maturity) are assumed to be constant. By contrast, the relationship of M and MSY reference points is more complicated, because the reproductive rate (*R*/*S*) is typically assumed to be nonlinear and compensatory.

Values of F_{max}, $F_{0.1}$ and $F_{\%MSP}$ are all expected to be positively related to M over a wide range of life histories (i.e., as M increases, the F reference point increases; Deriso 1987, Mace 1994, Beddington & Kirkwood 2005). The sensitivity analysis for Georges yellowtail showed that the relationships between M and $F_{0.1}$ and $F_{40\%}$ are nonlinear, but in the range of M being considered, $F_{0.1}$ was approximately 1.4xM, and $F_{40\%}$ was approximately 1.3xM.

The value of M has been considered as a crude approximation of F_{MSY} for data-limited stocks (e.g., Clark 1991), and Francis (1974) showed that F_{MSY}=M if recruitment is constant (i.e., not related to stock size). However, the relationship between F_{MSY} and M gets more complicated when recruitment is assumed to be compensatory. Theoretical investigations suggest that F_{MSY} is positively related to M and can be less than or greater than M (Deriso 1982, Thompson 1992, Kirkwood et al. 1994, Siddeek 2003, Brooks et al. 2010). Beddington & Kirkwood (2005) found that the ratio of F_{MSY} to M increases with greater steepness. The positive relationship of F_{MSY} and M is largely a result of the positive relationships between M and *SPR*, and M and *YPR*. Empirical information supports the theoretical expectations. In a meta-analysis of 245 stocks, Zhou et al. (2012) found that natural mortality is the most important life history parameter that influences F reference points, and F reference points are positively related to M.

The estimates of F_{MSY} for Georges yellowtail suggested that F_{MSY} is approximately 2xM. The result of F_{MSY}>M is reasonable for Georges yellowtail, because recruitment to the fishery is older than the age of maturity. Nearly all females are mature by age 3, but age-3 are only 65% vulnerable to the fishery, allowing approximately 1.5 expected spawnings per recruit at F_{MSY} and M=0.2, and 0.6 expected spawnings per recruit at F_{MSY} and M=0.45 (Tables 1 and 2). Recruitment to the fishery also occurs after much of the growth potential has been achieved. Yellowtail are not fully vulnerable until age 4, when they are at 56% of their maximum size (Tables 1 and 2). These explorations applied deterministic calculations of MSY reference points, which should be refined using long-term stochastic projection if considered as candidate reference points for management (Mace 2001).

If the objective is to estimate MSY reference points that are consistent with U.S. National Standard 1 Guidelines (NOAA 2009), they should represent the prevailing ecological and environmental conditions. Therefore, MSY reference points would need to be revised regardless of whether M was revised for the entire time series (as demonstrated by the SAW52 assessment of winter flounder, NEFSC 2011; or the SAW54 assessment of southern New England yellowtail flounder, NEFSC 2012) or only the recent period of the time series (as demonstrated by the SAW54 assessment of New England herring, NEFSC 2012).

The U.S. guidance to represent prevailing conditions in the estimation of MSY reference points (NOAA 2009) recognizes that vital rates change over time. Components of biological production (growth, survival and reproduction) interact to support viable life history strategies, and some vital rates have energetic tradeoffs (e.g., growth and maturity). However, each component of production is typically assumed to vary independently in stock assessment and age-based production models. For example, growth and maturity are typically allowed to vary over time according to empirical information on weight-at-age and maturity-at-age, and recruitment typically varies over time as a model estimate. Similarly, the *S*-*R* relationship can be modeled independently of *SPR* and *YPR* using the original form of the Beverton-Holt model (equation 1). This approach was applied in the SAW54 assessment of New England herring, using a single *S*-*R* function with time-varying *SPR* and *YPR* resulting from temporal changes in M and growth (NEFSC 2012).

If M changed during the assessment time series, the estimates of stock and recruitment from the entire series can be used to derive a *S*-*R* relationship, and the recent observations of vital rates (M, growth, maturity) can be used to model *SPR* and *YPR* for the determination of current F_{MSY}. This approach assumes that the processes determining reproductive rate (i.e., *R*/*S*) are not influenced by the factors associated with increased M. The SAW54 assessment of southern New England yellowtail flounder recognized that recruitment processes may have changed over time, independent of the other components of production (e.g., growth, maturity or M; NEFSC 2012). Although the demonstration of two scenarios of assumed M for Georges yellowtail reported here assumed a constant M throughout the assessment time series, the same approach could be used for an increase in M within the time series.

Legault & Palmer (2013) developed a method to approximate F_{MSY} when M is assumed to increase during the assessment time series. They derived an implied *S*-*R* relationship that produces $F_{MSY}=F_{40\%}$ to impute the change in value of F_{MSY} when M increases. An informative diagnostic for evaluating consistency of the F_{MSY} approximation with the stock assessment is a comparison of the implied stock-recruitment relationship with estimated time series of stock and recruitment from the assessment (e.g., Figure 2) as well as comparison of the implied equilibrium expectations with historical productivity (e.g., Figures 4 and 5). These diagnostics would help to determine if the method described by Legault & Palmer (2013) is valid for application to Georges yellowtail.

The suggestion by Legault and Palmer (2013) that F_{MSY} decreases with increasing M contradicts the theoretical expectations as well as the practice of applying $F_{\%SPR}$ as a proxy reference point. Clark (1993) found that $F_{40\%}$ is expected to produce at least 75% of MSY over a wide range of life histories, including some with low M and some with high M (Figure 6). Meta-analyses of *Sebastes* species are used to justify overfishing reference points associated with greater %SPR because of low M and slow growth (Dorn 2002, Forrest et al. 2010). For example $F_{50\%}$ is the overfishing definition for New England redfish (NEFSC 2002). Conversely, a lower %SPR (i.e., greater F) would be more appropriate F_{MSY} proxies for stocks with high M and relatively rapid growth. Therefore, decreasing the overfishing limit as a response to revised assumptions about M for Georges yellowtail or other stocks for which M is assumed to increase contradicts the objective of achieving optimum yield. Reducing F_{ref} to offset an increase in M may maintain the previous

biological productivity of the stock, but would not achieve optimal yield under the current prevailing conditions.

In conclusion, results from conventional analyses showed that fishing mortality reference points were positively related to the assumed value of M for Georges Bank yellowtail flounder. These results are consistent with theoretical expectations and empirical trends. The value of assumed M should be consistent between the method used to estimate fishing mortality and the method used to derive reference points.

Acknowledgments

Thanks to Chris Legault for providing the VPA input file and clarifications on the method used to deriving F_{MSY} when M increases, to Heath Stone for confirming the technical basis of F_{ref}, and to Dan Goethel for constructive feedback on a draft of the working paper.

Literature Cited

Beddington, J.R. and G.P. Kirkwood. 2005. The estimation of potential yield and stock status using life-history parameters. Philos. Trans. R. Soc. Lond. B Biol. Sci. 360: 163–170.

Beverton, R.J.H., and S.J. Holt. 1957. On the Dynamics of Exploited Fish Populations. London: Chapman and Hall, 1957.

Brodziak, J. and C. Legault. 2010. Reference Manual for SRFIT Version 7. NOAA Fisheries. (unpublished).

Brooks, E.N., J.E. Powers and E. Cortes. 2010. Analytical reference points for age-structured models: application to data-poor fisheries. ICES J. Mar. Sci. 67: 165–175.

Clark, W.G. 1991. Groundfish exploitation rates based on life history parameters. Can. J. Fish. Aquat. Sci. 48: 734–750.

Clark, W. 1993. The effect of recruitment variability on the choice of a target level of spawning biomass per recruit. pp 233–246 in Proceedings of the International Symposium on Management Strategies for Exploited Fish Populations. G. Kruse, D. M. Eggers, R. J. Marasco, C. Pautzke and T. J. Quinn, eds. Alaska Sea Grant College Program, Report 93-02.

Deriso, R.B. 1982. Relationship of fishing mortality to natural mortality and growth at the level of maximum sustainable yield. Can. J. Fish. Aquat. Sci. 39(7): 1054–1058.

Deriso, R.B. 1987. Optimal $F_{0.1}$ criteria and their relationship to maximum sustainable yield. Can. J. Fish. Aquat. Sci. 44(S2): 339–348.

Dorn, M.W. 2002. Advice on West Coast rockfish harvest rates from Bayesian meta-analysis of stock-recruit relationships. N. Am. J. Fisheries Management 21:280-300.

Forrest, R.E., McAllister, M.K., Dorn, M.W., Martell, S.J.D., and Stanley, R.D. 2010. Hierarchical Bayesian estimation of recruitment parameters and reference points for Pacific rockfishes (*Sebastes* spp.) under alternative assumptions about the stock-recruit function. Can. J. Fish. Aquat. Sci. 67: 1611–1634.

Francis, R.C. 1974. Relationship of fishing mortality to natural mortality at the level of maximum sustainable yield under the logistic stock production model. J. Fish. Res. Board Can. 31: 1539–1542.

Gavaris, S. 1988. An Adaptive framework for the estimation of population size. CAFSAC Res. Doc. 88/29.

Gabriel, W.L., M.P. Sissenwine, and W.J. Overholtz. 1989. Analysis of spawning stock biomass per recruit: and example for Georges Bank haddock. N. Am. J. Fish. Management 9: 383-391.

Gulland, J. and L. Boerma, L. 1973. Scientific advice on catch levels. Fish. Bull. 71: 325–335.

Kirkwood, G.P., J.R. Beddington and J.R. Rossouw. 1994. Harvesting species of different lifespans. pp. 199–227 in Large-scale Ecology and Conservation Biology. P.J. Edwards, R. May and N.R. Webb, eds. Blackwell Scientific, Oxford, UK.

Legault, C.M., L. Alade, H.H. Stone and W.E. Gross. 2012. Stock Assessment of Georges Bank Yellowtail Flounder for 2012. TRAC Reference Document 2012/02.

Legault, C.M., L. Alade, W.E. Gross, and H.H. Stone. 2013. Stock Assessment of Georges Bank Yellowtail Flounder for 2013. TRAC Reference Document 2013/01.

Legault, C.M. and M.C. Palmer. 2013. What direction should the fishing mortality target change when natural mortality increases within an assessment? TRAC WP 013/?

Mace, P.M. 1994. Relationships between common biological reference points used as thresholds and targets of fisheries management strategies. Can. J. Fish. Aquat. Sci. 51: 110–122.

Mace, P.M. 2001. A new role for MSY in single-species and ecosystem approaches to fisheries stock assessment and management. Fish and Fisheries 2: 2-32.

Mangel, M., A.D. MacCall, J. Brodziak, E.J. Dick, R.E. Forrest, R. Pourzand and S. Ralston. 2013. A perspective on steepness, reference points, and stock assessment. Can. J. Fish. Aquat. Sci. 70: 930–940.

Myers, R., K. Bowen, and N. Barrowman. 1999. Maximum reproductive rate of fish at low population sizes. Can. J. Fish. Aquat. Sci. 56:2404-2419.

Neilson, J.D. and S.X. Cadrin. 1998. 1998 Assessment of Georges Bank (5Zjmnh) Yellowtail Flounder. CSAS Res. Doc. 98/67.

National Oceanographic and Atmospheric Administration (NOAA). 2009. Magnuson-Stevens Act Provisions; Annual Catch Limits; National Standard Guidelines; Final Rule. Federal Register 74 (11): 3178-3213.

Northeast Fisheries Science Center (NEFSC). 1991. Report of the Twelfth Northeast Regional Stock Assessment Workshop (SAW). NEFSC Ref. Doc. 91-03.

Northeast Fisheries Science Center (NEFSC). 2002. Re-evaluation of biological reference points for New England groundfish. NEFSC Ref. Doc. 02-04.

Northeast Fisheries Science Center (NEFSC). 2008. Assessment of 19 Northeast Groundfish Stocks through 2007: Report of the 3rd Groundfish Assessment Review Meeting (GARM III). NEFSC Ref Doc. 08-15.

Northeast Fisheries Science Center (NEFSC). 2011. 52nd Northeast Regional Stock Assessment Workshop (52nd SAW) Assessment Report. NEFSC Ref Doc. 11-17.

Northeast Fisheries Science Center (NEFSC). 2012. 54th Northeast Regional Stock Assessment Workshop (54th SAW) Assessment Report. NEFSC Ref Doc. 12-18.

Overholtz, W.J. 1999. Precision and uses of biological reference points calculated from stock recruitment data. N. Am. J. Fish. Management 19: 643-657.

Siddeek, M.S.M. 2003. Determination of biological reference points for Bristol Bay red king crab. Fish. Res. 65(1–3): 427–451.

Stone H.H. and C.M. Legault. 2003. Stock Assessment of Georges Bank (5Zhjmn) Yellowtail Flounder for 2003. CSAS Res. Doc. 2003/55.

Thompson, G.G. 1992. Management advice form a simple dynamic pool model. Fish Bull. 90: 552–560.

Thompson, W.F. and F.H. Bell. 1934. Effect of changes in intensity upon total yield and yield per unit of gear. Report of the International Fisheries Commission 8:7-49.

TMGC. 2003. Transboundary Management Guidance Committee. Guidance Document 2003/1

TMGC. 2013. Transboundary Management Guidance Committee. Guidance Document 2013/1

TRAC 2005. Proceedings of the Transboundary Resources Assessment Committee (TRAC) Benchmark Review of Stock Assessment Models for the Georges Bank Yellowtail Flounder Stock. TRAC Proceedings 2005/01.

Zhou, S., S. Yin, J.T. Thorson, A.D.M. Smith, and M.Fuller. 2012. Linking fishing mortality reference points to life history traits: an empirical study. Can. J. Fish. Aquat. Sci. 69: 1292–1301.

Tables

Table 1. Yield and spawning biomass per recruit analysis assuming M=0.2.

```
Age Based Yield per Recruit Version 3.3
Georges_Bank_Yellowtail_Flounder
First Age in Data:              1
Last Age in Data:               6
Maximum Age in Cohort Calc:   100
Run Mode:            Deterministic
```

Age	F-Selectivity	Natural Mortality	Stock Weight	Catch Weight	Spawn Stock Weight	Maturity
1	0.010832	0.200000	0.098640	0.137800	0.098640	0.000000
2	0.155866	0.200000	0.202840	0.325800	0.202840	0.462000
3	0.654181	0.200000	0.372300	0.438800	0.372300	0.967000
4	1.000000	0.200000	0.481720	0.539600	0.481720	1.000000
5	1.000000	0.200000	0.599940	0.670400	0.599940	1.000000
6	1.000000	0.200000	0.850400	0.850400	0.850400	1.000000

```
Proportion Fishing Mortality Prior to Spawning:    0.416700
Proportion Natural Mortality Prior to Spawning:    0.416700

Fishing Mortality Upper Limit:            2.000000
Fishing Mortality Calculation Interval:   0.000100
Fishing Mortality Reporting Interval:     0.010000
```

Reference Point	F	YPR	SSB/R	TSB/R	Mean Age	Mean GT	Exp Spawn
F-Zero	0.000000	0.000000	2.371721	2.774072	5.516655	7.026582	3.729888
F-01	0.279500	0.228677	0.876009	1.247962	3.052980	4.174734	1.806139
FMax	1.029300	0.265290	0.313917	0.652270	2.136235	2.955939	0.900987
F at 40% MSP	0.247200	0.220326	0.948782	1.323432	3.169950	4.320045	1.907787

F	CatchN	YPR	StockN	TSBR	SpawnN	SSBR	%MSP	MeanAge	MeanGenT	Exp Spawn
0.000000	0.000000	0.000000	5.516656	2.774072	3.729888	2.371721	100.000000	5.516655	7.026582	3.729888
0.100000	0.218846	0.144402	4.427684	1.888563	2.637500	1.499138	63.208872	4.063344	5.387193	2.637500
0.200000	0.329780	0.204270	3.877935	1.457145	2.084735	1.078227	45.461787	3.378529	4.575376	2.084735
0.300000	0.397483	0.233123	3.544035	1.205442	1.748188	0.835115	35.211341	2.987307	4.092402	1.748188
0.400000	0.443519	0.248140	3.318191	1.042310	1.520036	0.679056	28.631368	2.736654	3.772538	1.520036
0.500000	0.477131	0.256276	3.154202	0.928907	1.354048	0.571521	24.097309	2.563198	3.545056	1.354048
0.600000	0.502947	0.260753	3.028962	0.845965	1.227095	0.493488	20.807186	2.436284	3.374780	1.227095
0.700000	0.523536	0.263197	2.929635	0.782888	1.126314	0.434559	18.322531	2.339413	3.242285	1.126314
0.800000	0.540443	0.264478	2.848514	0.733400	1.043977	0.388611	16.385191	2.262971	3.135998	1.043977
0.900000	0.554654	0.265080	2.780692	0.693564	0.975159	0.351829	14.834341	2.201012	3.048607	0.975159
1.000000	0.566825	0.265281	2.722897	0.660800	0.916567	0.321729	13.565217	2.149669	2.975273	0.916567

```
Stock Recruitment Equilibrium Calculation Summary
Model: Beverton Holt
Alpha      33.975500
Beta        4.169990
FMSY        0.407500
MSY         6.907450
SMSY       18.580712
```

Table 2. Yield and spawning biomass per recruit analysis assuming M=0.45.

```
Age Based Yield per Recruit Version 3.3
Georges_Bank_Yellowtail_Flounder
First Age in Data:              1
Last Age in Data:               6
Maximum Age in Cohort Calc:   100
Run Mode:            Deterministic
```

Age	F-Selectivity	Natural Mortality	Stock Weight	Catch Weight	Spawn Stock Weight	Maturity
1	0.007955	0.450000	0.098640	0.137800	0.098640	0.000000
2	0.139522	0.450000	0.202840	0.325800	0.202840	0.462000
3	0.647854	0.450000	0.372300	0.438800	0.372300	0.967000
4	1.000000	0.450000	0.481720	0.539600	0.481720	1.000000
5	1.000000	0.450000	0.599940	0.670400	0.599940	1.000000
6	1.000000	0.450000	0.850400	0.850400	0.850400	1.000000

```
Proportion Fishing Mortality Prior to Spawning:    0.416700
Proportion Natural Mortality Prior to Spawning:    0.416700

Fishing Mortality Upper Limit:             2.000000
Fishing Mortality Calculation Interval:    0.000100
Fishing Mortality Reporting Interval:      0.010000
```

Reference Point	F	YPR	SSB/R	TSB/R	Mean Age	Mean GT	Exp Spawn
F-Zero	0.000000	0.000000	0.561677	0.850740	2.759596	4.197052	1.163223
F-01	0.687100	0.117709	0.213461	0.484572	1.961163	2.949929	0.615613
FMax	*** Not Found in Grid Range ***						
F at 40% MSP	0.628200	0.114456	0.224683	0.496647	1.986773	2.994153	0.637152

F	CatchN	YPR	StockN	TSBR	SpawnN	SSBR	%MSP	MeanAge	MeanGenT	Exp Spawn
0.000000	0.000000	0.000000	2.759596	0.850740	1.163223	0.561677	100.000000	2.759596	4.197052	1.163223
0.100000	0.071570	0.040690	2.603678	0.735432	1.005236	0.450593	80.222747	2.500951	3.816878	1.005236
0.200000	0.122257	0.066506	2.493998	0.657726	0.893693	0.376354	67.005416	2.330924	3.556416	0.893693
0.300000	0.160365	0.083975	2.412115	0.602167	0.810139	0.323661	57.624085	2.211239	3.366882	0.810139
0.400000	0.190293	0.096411	2.348264	0.560644	0.744792	0.284527	50.656796	2.122608	3.222658	0.744792
0.500000	0.214592	0.105643	2.296789	0.528515	0.691985	0.254407	45.294255	2.054350	3.109050	0.691985
0.600000	0.234842	0.112742	2.254191	0.502941	0.648203	0.230542	41.045235	2.000119	3.017047	0.648203
0.700000	0.252074	0.118368	2.218182	0.482102	0.611151	0.211170	37.596278	1.955924	2.940834	0.611151
0.800000	0.266992	0.122944	2.187210	0.464780	0.579261	0.195122	34.739147	1.919143	2.876495	0.579261
0.900000	0.280094	0.126747	2.160177	0.450132	0.551430	0.181595	32.330829	1.887985	2.821305	0.551430
1.000000	0.291738	0.129970	2.136292	0.437562	0.526854	0.170021	30.270295	1.861191	2.773310	0.526854
1.100000	0.302194	0.132743	2.114962	0.426633	0.504935	0.159990	28.484424	1.837851	2.731074	0.504935
1.200000	0.311665	0.135163	2.095742	0.417023	0.485218	0.151199	26.919152	1.817289	2.693521	0.485218
1.300000	0.320311	0.137299	2.078284	0.408489	0.467349	0.143417	25.533740	1.798997	2.659828	0.467349
1.400000	0.328255	0.139203	2.062316	0.400842	0.451050	0.136470	24.296967	1.782585	2.629357	0.451050
1.500000	0.335597	0.140915	2.047622	0.393936	0.436099	0.130222	23.184533	1.767748	2.601602	0.436099
1.600000	0.342417	0.142465	2.034026	0.387656	0.422314	0.124564	22.177257	1.754244	2.576162	0.422314
1.700000	0.348783	0.143877	2.021385	0.381910	0.409549	0.119411	21.259808	1.741879	2.552712	0.409549
1.800000	0.354748	0.145171	2.009580	0.376622	0.397680	0.114693	20.419781	1.730497	2.530987	0.397680
1.900000	0.360359	0.146362	1.998514	0.371731	0.386605	0.110353	19.647034	1.719968	2.510766	0.386605
2.000000	0.365653	0.147462	1.988102	0.367188	0.376237	0.106343	18.933190	1.710186	2.491869	0.376237

```
Stock Recruitment Equilibrium Calculation Summary
Model: Beverton Holt
Alpha      56.356500
Beta        3.001350
FMSY        0.882800
MSY         5.048624
SMSY        7.355219
```

Figures

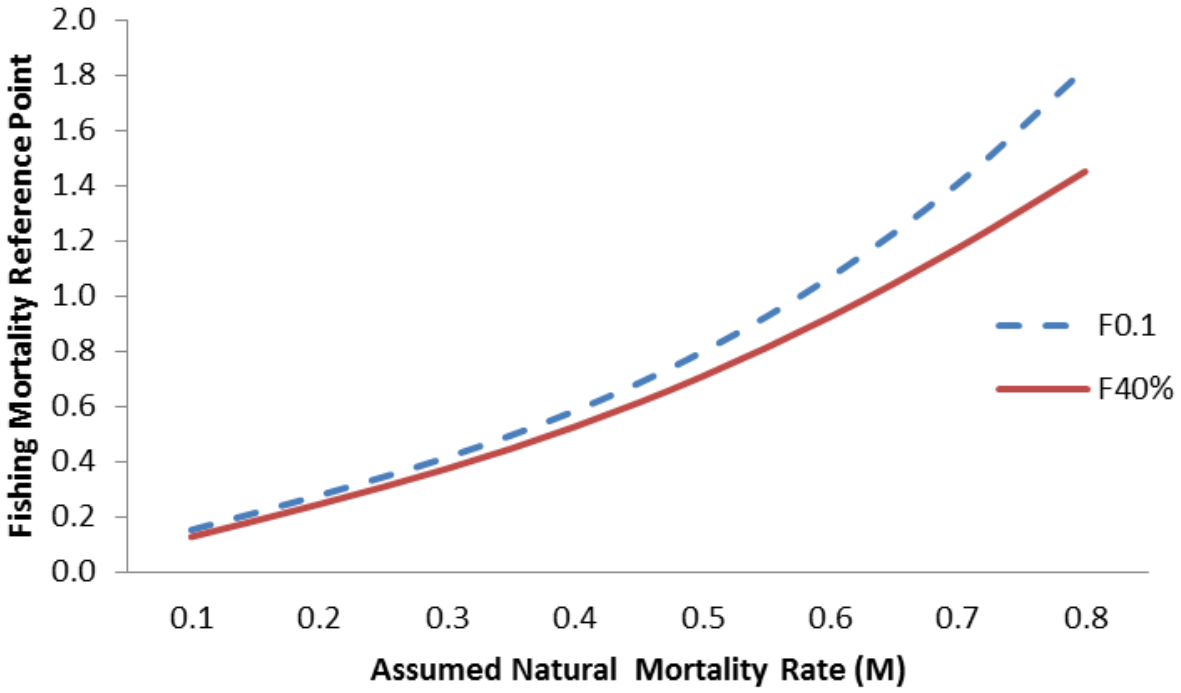


Figure 1. Sensitivity analysis of $F_{0.1}$ and $F_{40\%}$ as a function of assumed M.

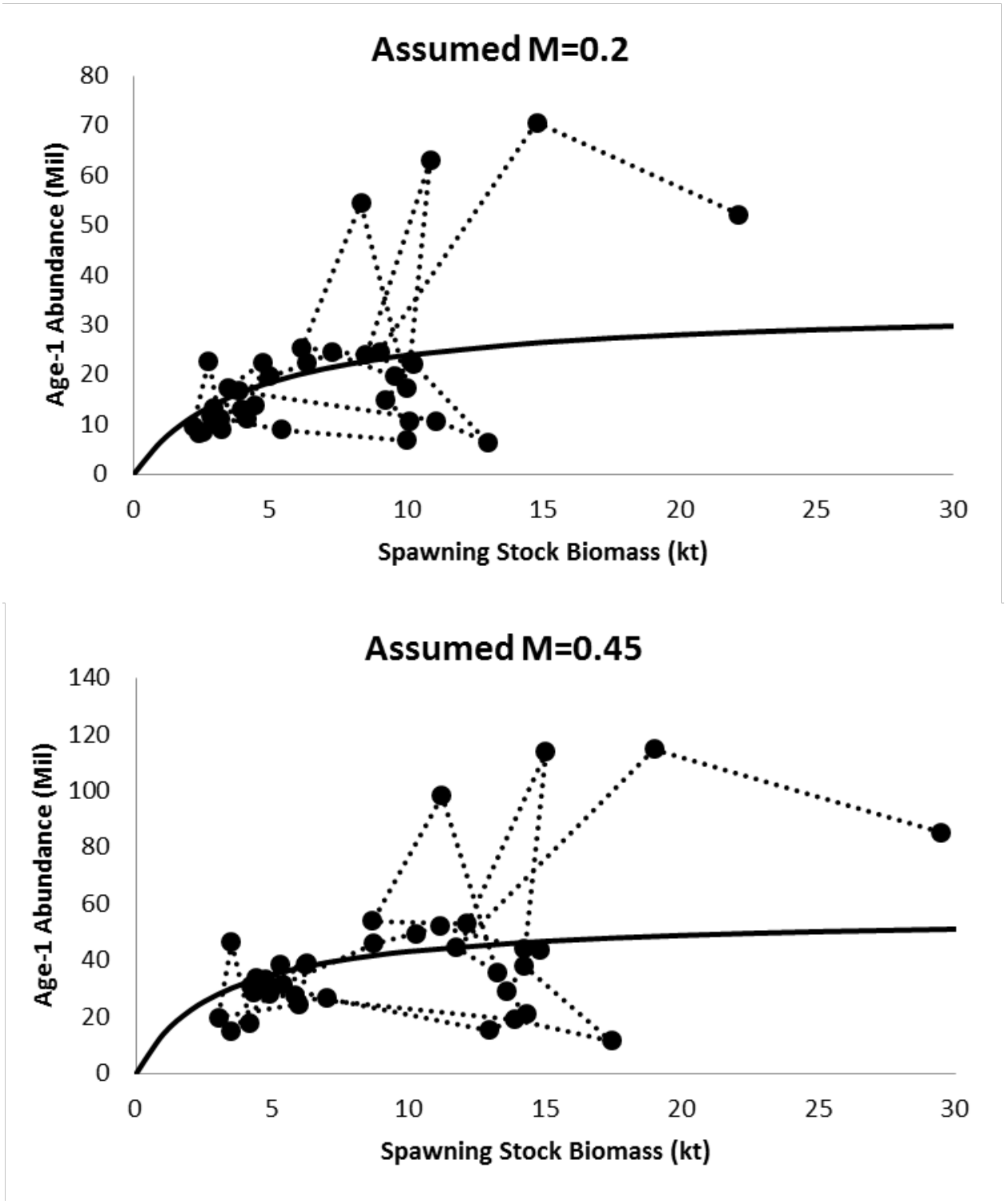


Figure 2. Stock and recruitment estimates from VPAs assuming M=0.2 (above) and M=0.45 (below) with Beverton-Holt relationships fit to the series of stock and recruitment.

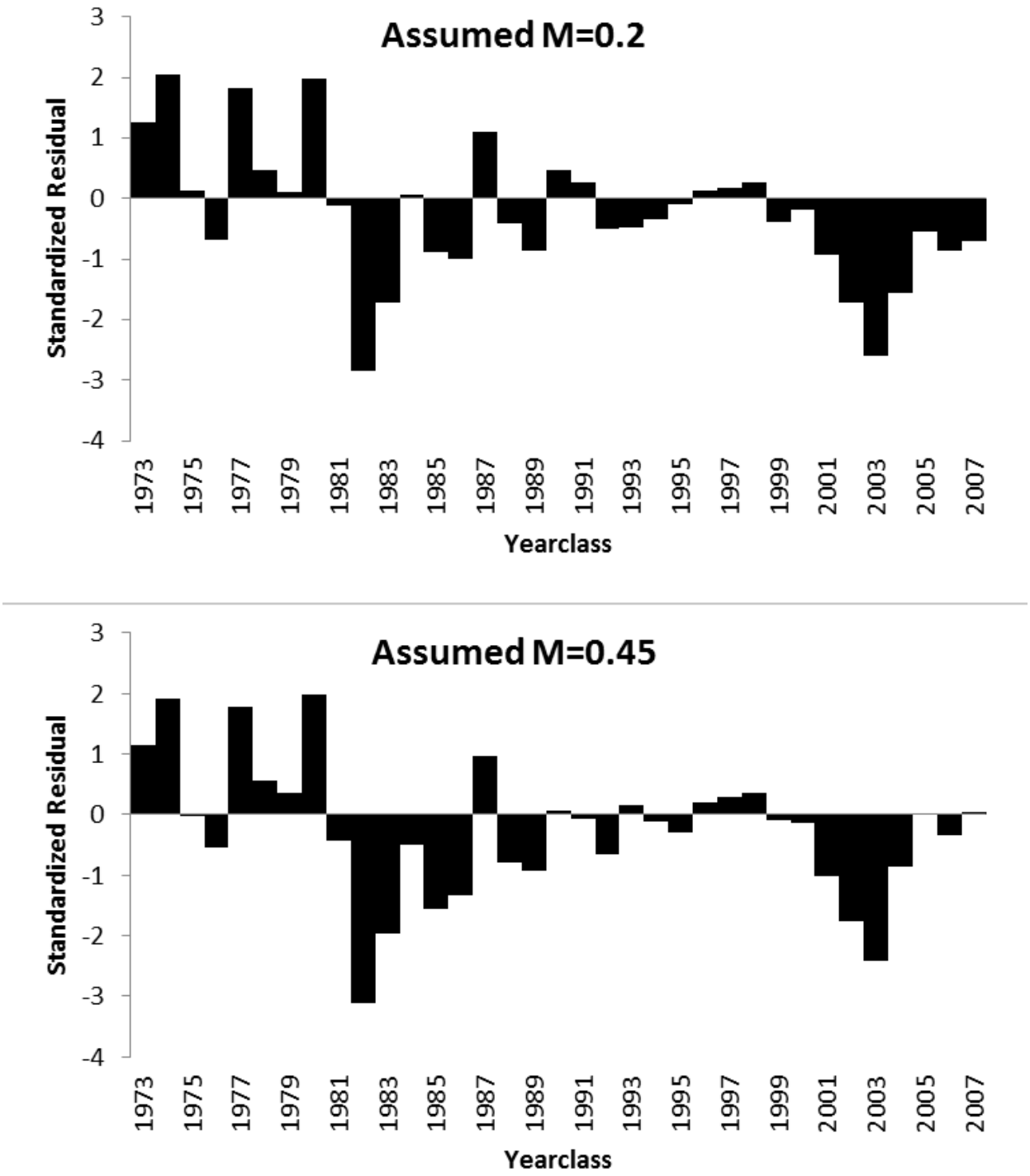
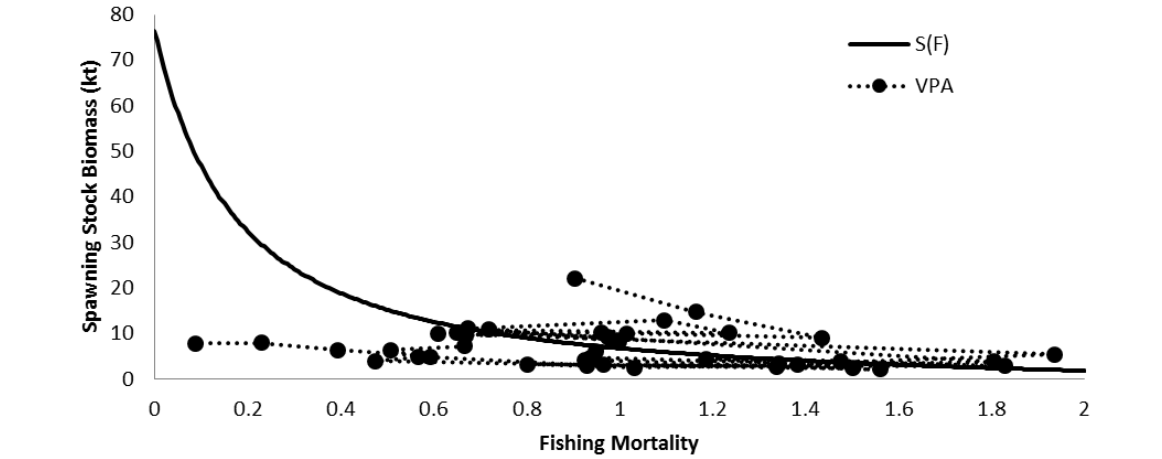
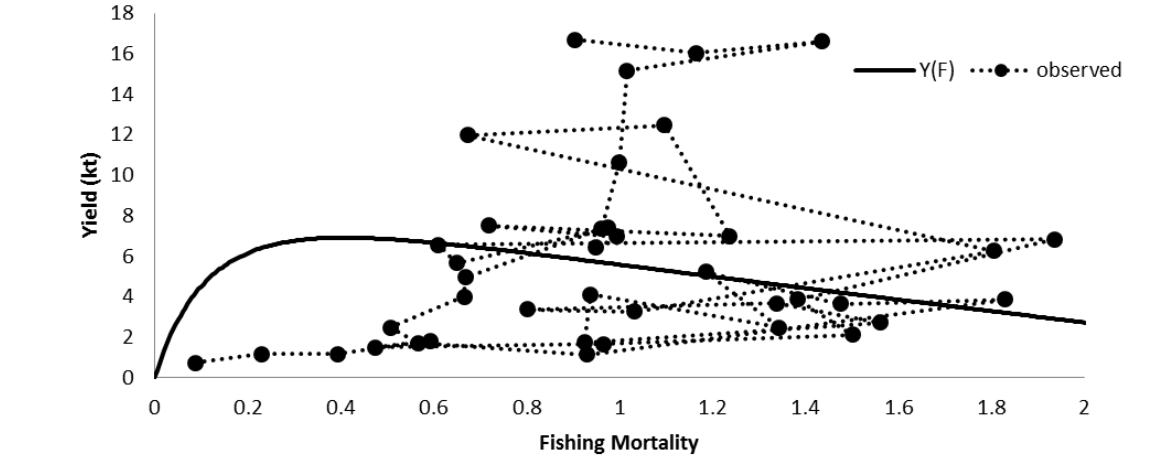


Figure 3. Standardized residuals from Beverton-Holt stock-recruitment relationships fit to the series of stock and recruitment estimates from VPAs assuming M=0.2 (above) and M=0.45 (below).





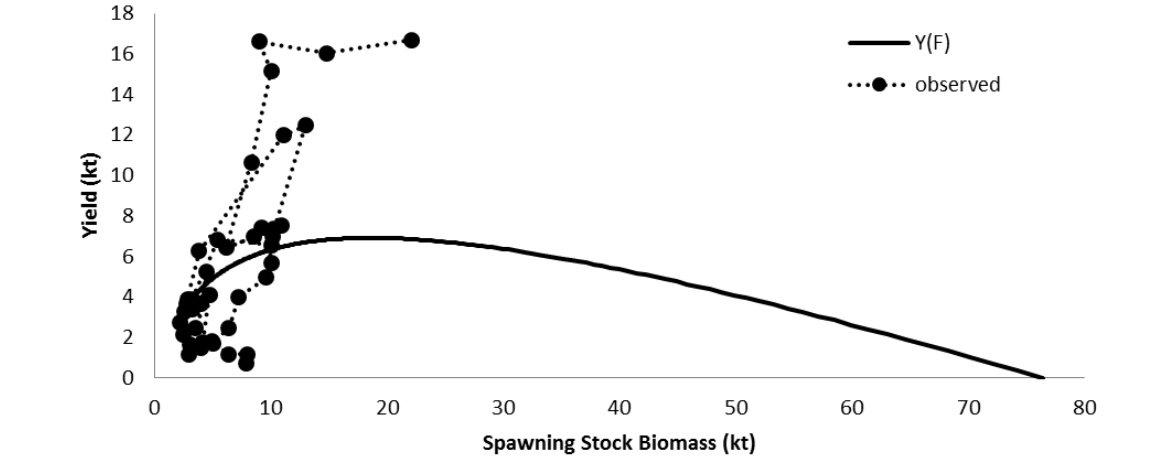


Figure 4. Equilibrium expectations of spawning stock biomass, S(F), and Yield, Y(F) as a function of fishing mortality, a Beverton-Holt stock-recruit relationship, and yield-per-recruit and spawning biomass per recruit assuming M=0.2. Estimates of spawning biomass and fishing mortality from VPA assuming M=0.2 and observed catch are graphically overlaid for comparison, but were not directly used to derive equilibrium expectations.

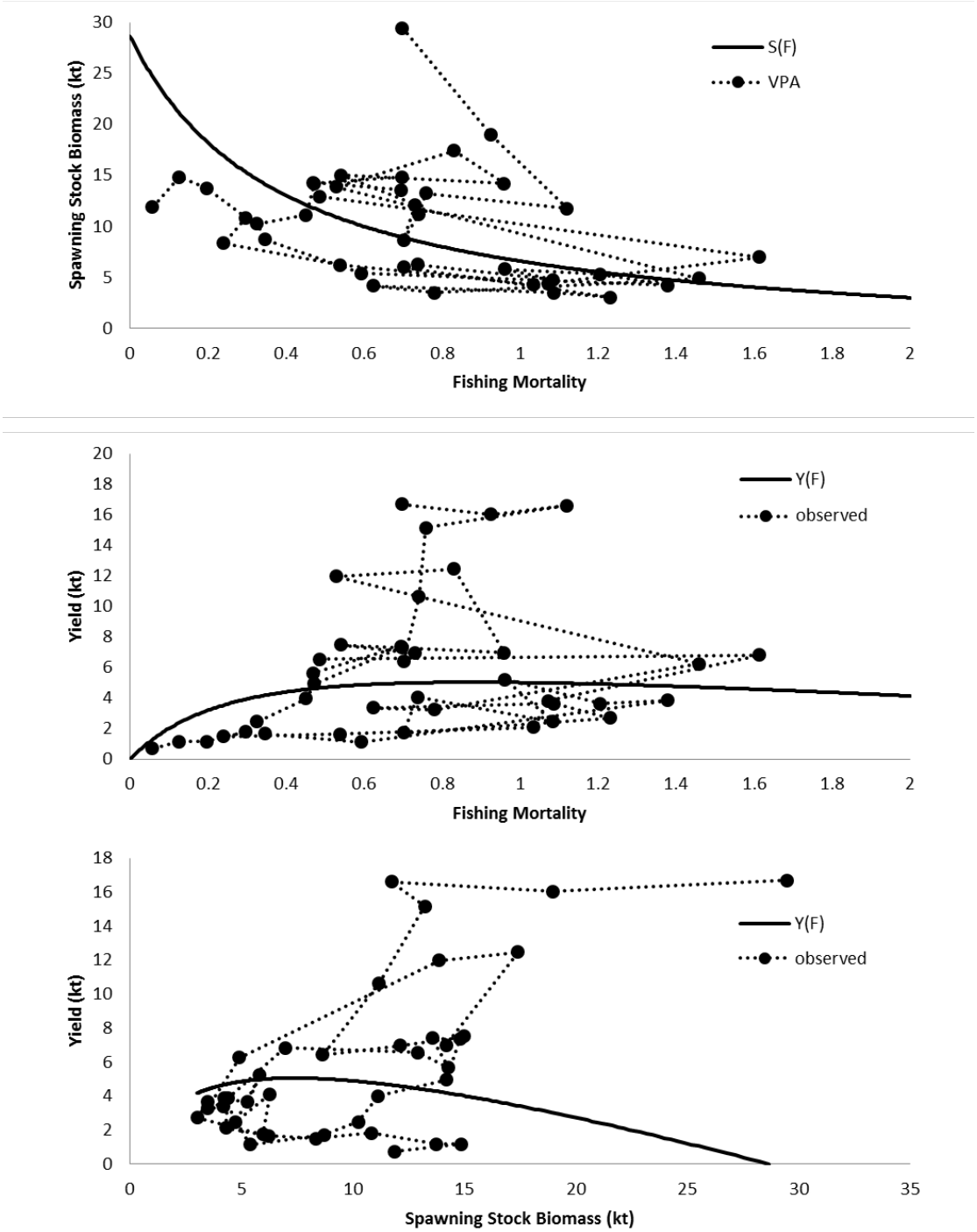


Figure 5. Equilibrium expectations of spawning stock biomass, S(F), and Yield, Y(F) as a function of fishing mortality, a Beverton-Holt stock-recruit relationship, and yield-per-recruit and spawning biomass per recruit assuming M=0.45. Estimates of spawning biomass and fishing mortality from VPA assuming M=0.45 and observed catch are graphically overlaid for comparison, but were not directly used to derive equilibrium expectations.

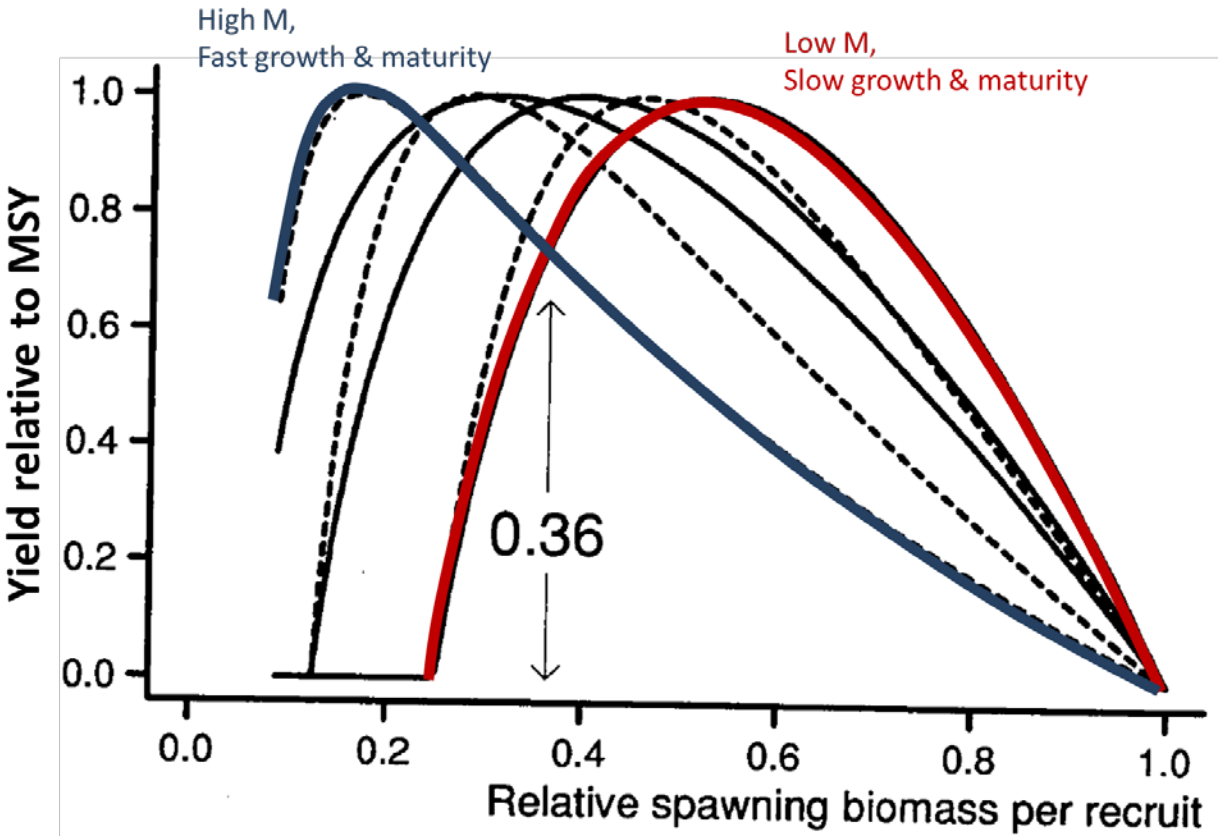


Figure 6. Relative yield (proportion of deterministic MSY) as a function of relative spawning biomass per recruit (proportion of unfished level), for a range of life histories. Production curves assuming Beverton-Holt relationships are shown as solid lines, those assuming Ricker relationships are shown as broken lines. The red line depicts a stock with low productivity and the blue line depicts a stock with high productivity (modified from Clark 1993).

Appendix 1. Exploratory VPA assuming M=0.45

```
VPA Version 3.3.0
 Model ID: single series
 Input File: C:\NFT\VPA\EXAMPLE\SINGLESERIESM045.DAT
 Date of Run: 20-MAR-2014                          Time of Run: 15:42
 Levenburg-Marquardt Algorithm Completed     9 Iterations
 Residual Sum of Squares =     538.521
 Number of Residuals     =    559
 Number of Parameters    =      4
 Degrees of Freedom      =    555
 Mean Squared Residual   =     0.970308
 Standard Deviation      =     0.985042
 Number of Years =    40
 Number of Ages  =     6
 First Year      =  1973
 Youngest Age    =     1
 Oldest True Age =     5
 Number of Survey Indices Available        =    78
 Number of Survey Indices Used in Estimate =    18
 VPA Classic Method - Auto Estimated Q's

 Stock Numbers Predicted in Terminal Year Plus One (2013)
 Age    Stock Predicted     Std. Error      CV
   2           5228.944   0.262734E+04   0.502460E+00
   3           3921.632   0.150913E+04   0.384822E+00
   4           3062.976   0.100531E+04   0.328215E+00
   5           7651.340   0.127318E+04   0.166400E+00

 Catchability Values for Each Survey Used in Estimate
 INDEX     Catchability    Std. Error      CV

  55       0.259366E-02   0.525081E-03   0.202448E+00
  56       0.531759E-01   0.947450E-02   0.178173E+00
  57       0.192457E+00   0.345414E-01   0.179476E+00
  58       0.279414E+00   0.446790E-01   0.159902E+00
  59       0.280193E+00   0.411917E-01   0.147012E+00
  60       0.317532E+00   0.424696E-01   0.133749E+00
  61       0.259293E-01   0.463652E-02   0.178814E+00
  62       0.985905E-01   0.180045E-01   0.182619E+00
  63       0.215675E+00   0.331175E-01   0.153552E+00
  64       0.189548E+00   0.257876E-01   0.136048E+00
  65       0.219189E+00   0.377104E-01   0.172045E+00
  66       0.214226E+00   0.477902E-01   0.223084E+00
  68       0.128419E+00   0.293240E-01   0.228346E+00
  69       0.564125E+00   0.134304E+00   0.238074E+00
  70       0.885103E+00   0.187543E+00   0.211889E+00
  71       0.740957E+00   0.162970E+00   0.219945E+00
  72       0.485277E+00   0.113183E+00   0.233233E+00
  73       0.187703E-04   0.328430E-05   0.174973E+00
```

```
-- Non-Linear Least Squares Fit --
Default Tolerances Used
Scaled Gradient Tolerance      =    6.055454E-06
Scaled Step Tolerance          =    3.666853E-11
Relative Function Tolerance    =    3.666853E-11
Absolute Function Tolerance    =    4.930381E-32
Reported Machine Precision     =    2.220446E-16

VPA Method Options
- Catchability Values Estimated as an Analytic Function of N
- Catch Equation Used in Cohort Solution
- Plus Group Backward Calculation Method Used
- Rivard Weights Used for JAN-1 Biomass
- Rivard Weights Calculation Used  3 Years for Terminal Year Plus One

- Heincke Rule Used in F-Oldest Calculation
- F-Oldest Calculation in Years Prior to Terminal Year
  Uses Stock Sizes in Ages  4 to  5
- Calculation of Population of Age 1 In Year 2013
  =  Geometric Mean of First Age Populations
     Year Range Applied =  2003 to  2012
- Survey Weight Factors Were Used

Stock Estimates
Age   2
Age   3
Age   4
Age   5
Full F in Terminal Year               =   0.0578
F in Oldest True Age in Terminal Year =   0.0578
Full F Calculated Using Classic Method

Age  Input Partial  Calc Partial   Fishing     Used In
     Recruitment    Recruitment    Mortality   Full F    Comments

  1      0.000          0.020       0.0018      NO      Stock Estimate in T+1
  2      0.030          0.236       0.0214      NO      Stock Estimate in T+1
  3      0.630          1.000       0.0905      NO      Stock Estimate in T+1
  4      1.000          0.639       0.0578      YES     Stock Estimate in T+1
  5      1.000          0.639       0.0578              Input PR * Full F
```

Catch At Age - Input Data

AGE	1973	1974	1975	1976	1977
1	359.3	2367.5	4636.2	635.1	377.9
2	5175.0	9500.0	26393.9	31938.1	9094.2
3	13565.3	8294.2	7375.1	5501.9	10567.1
4	9473.0	7657.9	3540.2	1425.7	1846.2
5	3814.6	3642.6	2175.2	574.2	418.6
6	1649.7	1519.6	1207.2	918.1	495.0

AGE	1978	1979	1980	1981	1982
1	9962.0	320.6	317.8	107.4	2163.5
2	3542.1	10516.6	3994.4	1097.1	18091.3
3	4579.7	3789.4	9685.3	5963.4	7480.3
4	1913.8	1432.1	1538.4	4920.2	3400.5
5	539.5	623.0	351.9	854.4	1095.2
6	210.8	324.6	112.6	145.3	95.8

AGE	1983	1984	1985	1986	1987
1	702.8	514.3	970.3	178.8	156.4
2	7998.1	2017.7	4373.6	6402.1	3284.2
3	16660.9	4534.6	1057.6	1127.5	3136.7
4	2475.9	5043.0	818.4	388.8	983.3
5	679.6	1796.3	516.6	203.6	192.3
6	154.6	379.5	80.7	113.4	137.3

AGE	1988	1989	1990	1991	1992
1	499.0	189.8	230.6	663.3	2413.9
2	3002.6	2175.4	2114.4	147.3	9167.4
3	1544.1	1120.6	6995.7	1491.2	2971.5
4	846.1	428.2	978.3	3011.1	1473.0
5	227.0	110.1	140.2	383.2	603.1
6	53.3	30.4	26.1	71.2	42.0

AGE	1993	1994	1995	1996	1997
1	5233.5	71.2	46.9	100.6	81.8
2	1385.8	1336.3	312.7	680.9	1132.3
3	3326.9	6302.4	1435.3	2064.3	1832.4
4	2325.5	1819.3	878.6	885.0	1856.8
5	411.0	476.7	170.1	201.2	378.2
6	90.5	143.9	36.9	27.6	89.6

Catch At Age - Input Data

AGE	1998	1999	2000	2001	2002
1	168.5	60.1	131.8	175.9	211.9
2	1991.4	2752.9	3863.5	2883.5	4168.9
3	3387.8	4195.0	5713.9	6956.4	3446.3
4	1884.9	1547.6	3173.0	2893.2	1915.8
5	1121.3	793.5	826.3	1003.9	683.0
6	146.2	301.4	528.5	525.1	485.3

AGE	2003	2004	2005	2006	2007
1	159.7	60.8	59.8	151.9	50.8
2	3919.1	1152.3	1579.2	1292.7	1491.2
3	4710.0	3183.6	4031.1	1626.0	1705.1
4	2319.9	3824.3	1706.9	946.8	662.3
5	782.4	1969.8	392.0	364.0	136.4
6	693.5	1469.7	185.0	214.2	55.5

AGE	2008	2009	2010	2011	2012
1	28.9	17.4	2.0	11.0	11.8
2	493.1	283.5	138.5	164.8	107.2
3	1903.3	1266.3	643.2	772.6	367.8
4	855.1	1360.7	890.0	902.0	576.5
5	125.3	516.0	445.2	309.4	239.7
6	24.5	73.5	99.2	75.5	45.9

Weight At Age - Input Data

AGE	1973	1974	1975	1976	1977
1	0.1010	0.1150	0.1130	0.1080	0.1160
2	0.3480	0.3440	0.3160	0.3120	0.3420
3	0.4620	0.4960	0.4890	0.5440	0.5240
4	0.5270	0.6070	0.5540	0.6350	0.6330
5	0.6030	0.6780	0.6190	0.7440	0.7800
6	0.7780	0.8320	0.6950	0.8610	0.9310

AGE	1978	1979	1980	1981	1982
1	0.1020	0.1140	0.1010	0.1220	0.1150
2	0.3140	0.3290	0.3220	0.3350	0.3010
3	0.5100	0.4620	0.4930	0.4890	0.4850
4	0.6900	0.6560	0.6560	0.6040	0.6500
5	0.8030	0.7360	0.8160	0.7070	0.7540
6	0.9700	0.9500	1.0720	0.8400	1.0820

AGE	1983	1984	1985	1986	1987
1	0.1400	0.1620	0.1810	0.1810	0.1210
2	0.2960	0.2390	0.3610	0.3410	0.3240
3	0.4410	0.3790	0.5050	0.5400	0.5240
4	0.6070	0.5000	0.6420	0.6740	0.6800
5	0.7400	0.6470	0.7290	0.8540	0.7840
6	1.0100	0.7970	0.8000	1.0150	0.8750

AGE	1988	1989	1990	1991	1992
1	0.1030	0.1000	0.1050	0.1210	0.1010
2	0.3280	0.3270	0.2900	0.2370	0.2930
3	0.5570	0.5200	0.3950	0.3690	0.3650
4	0.6960	0.7200	0.5850	0.4860	0.5260
5	0.8440	0.8660	0.6930	0.7230	0.6510
6	0.9750	1.0530	0.8450	0.8770	1.1100

AGE	1993	1994	1995	1996	1997
1	0.1000	0.1930	0.1740	0.1190	0.2140
2	0.2850	0.2600	0.2750	0.2760	0.3020
3	0.3790	0.3530	0.3470	0.4070	0.4080
4	0.5010	0.4720	0.4650	0.5520	0.5380
5	0.5640	0.6210	0.6070	0.7070	0.7180
6	0.8630	0.7750	0.7680	1.0120	0.9470

Weight At Age - Input Data

AGE	1998	1999	2000	2001	2002
1	0.1780	0.2020	0.2290	0.2510	0.2820
2	0.3050	0.3680	0.3830	0.3620	0.3810
3	0.4280	0.4950	0.4800	0.4600	0.4800
4	0.5460	0.6400	0.6150	0.6120	0.6650
5	0.6490	0.7550	0.7660	0.8120	0.8330
6	0.9660	0.9010	0.9540	1.0270	1.0680

AGE	2003	2004	2005	2006	2007
1	0.2280	0.2110	0.1190	0.1000	0.1540
2	0.3590	0.2920	0.3410	0.3100	0.2900
3	0.4740	0.4380	0.4470	0.4150	0.4090
4	0.6530	0.5850	0.5970	0.5570	0.5420
5	0.8240	0.7260	0.7630	0.7610	0.7840
6	1.0480	0.9560	0.9910	0.9960	1.0230

AGE	2008	2009	2010	2011	2012
1	0.0470	0.1550	0.1740	0.1280	0.1850
2	0.3020	0.3280	0.3230	0.3370	0.3390
3	0.4150	0.4340	0.4320	0.4610	0.4520
4	0.5330	0.5380	0.5190	0.5530	0.5550
5	0.6750	0.6990	0.6610	0.6460	0.6710
6	0.9620	0.9290	0.8080	0.7470	0.8060

JAN-1 Weights at Age - Input Data

AGE	1973	1974	1975	1976	1977
1	0.0547	0.0694	0.0680	0.0607	0.0705
2	0.2915	0.1864	0.1906	0.1878	0.1922
3	0.4031	0.4155	0.4101	0.4146	0.4043
4	0.4646	0.5296	0.5242	0.5572	0.5868
5	0.5637	0.5978	0.6130	0.6420	0.7038
6	0.7780	0.8320	0.6950	0.8610	0.9310

AGE	1978	1979	1980	1981	1982
1	0.0568	0.0678	0.0555	0.0777	0.0717
2	0.1909	0.1832	0.1916	0.1839	0.1916
3	0.4176	0.3809	0.4027	0.3968	0.4031
4	0.6013	0.5784	0.5505	0.5457	0.5638
5	0.7130	0.7126	0.7316	0.6810	0.6748
6	0.9700	0.9500	1.0720	0.8400	1.0820

AGE	1983	1984	1985	1986	1987
1	0.1072	0.1085	0.1319	0.1353	0.0735
2	0.1845	0.1829	0.2418	0.2484	0.2422
3	0.3643	0.3349	0.3474	0.4415	0.4227
4	0.5426	0.4696	0.4933	0.5834	0.6060
5	0.6935	0.6267	0.6037	0.7405	0.7269
6	1.0100	0.7970	0.8000	1.0150	0.8750

AGE	1988	1989	1990	1991	1992
1	0.0578	0.0587	0.0699	0.0778	0.0601
2	0.1992	0.1835	0.1703	0.1577	0.1883
3	0.4248	0.4130	0.3594	0.3271	0.2941
4	0.6039	0.6333	0.5515	0.4381	0.4406
5	0.7576	0.7764	0.7064	0.6503	0.5625
6	0.9750	1.0530	0.8450	0.8770	1.1100

AGE	1993	1994	1995	1996	1997
1	0.0620	0.1617	0.1382	0.0747	0.1793
2	0.1697	0.1612	0.2304	0.2191	0.1896
3	0.3332	0.3172	0.3004	0.3346	0.3356
4	0.4276	0.4230	0.4051	0.4377	0.4679
5	0.5447	0.5578	0.5353	0.5734	0.6296
6	0.8630	0.7750	0.7680	1.0120	0.9470

JAN-1 Weights at Age - Input Data

AGE	1998	1999	2000	2001	2002
1	0.1238	0.1467	0.1821	0.2037	0.2499
2	0.2555	0.2559	0.2781	0.2879	0.3092
3	0.3595	0.3886	0.4203	0.4197	0.4168
4	0.4720	0.5234	0.5517	0.5420	0.5531
5	0.5909	0.6421	0.7002	0.7067	0.7140
6	0.9660	0.9010	0.9540	1.0270	1.0680

AGE	2003	2004	2005	2006	2007
1	0.2015	0.1660	0.0737	0.0587	0.1100
2	0.3182	0.2580	0.2682	0.1921	0.1703
3	0.4250	0.3965	0.3613	0.3762	0.3561
4	0.5599	0.5266	0.5114	0.4990	0.4743
5	0.7402	0.6885	0.6681	0.6740	0.6608
6	1.0480	0.9560	0.9910	0.9960	1.0230

AGE	2008	2009	2010	2011	2012
1	0.0178	0.1074	0.1250	0.0787	0.1643
2	0.2157	0.1242	0.2238	0.2422	0.2083
3	0.3469	0.3620	0.3764	0.3859	0.3903
4	0.4669	0.4725	0.4746	0.4888	0.5058
5	0.6049	0.6104	0.5963	0.5790	0.6091
6	0.9620	0.9290	0.8080	0.7470	0.8060

AGE	2013
1	0.1227
2	0.2247
3	0.3842
4	0.4897
5	0.5948
6	0.7870

SSB Weight At Age - Input Data

AGE	1973	1974	1975	1976	1977
1	0.1010	0.1150	0.1130	0.1080	0.1160
2	0.3480	0.3440	0.3160	0.3120	0.3420
3	0.4620	0.4960	0.4890	0.5440	0.5240
4	0.5270	0.6070	0.5540	0.6350	0.6330
5	0.6030	0.6780	0.6190	0.7440	0.7800
6	0.7780	0.8320	0.6950	0.8610	0.9310

AGE	1978	1979	1980	1981	1982
1	0.1020	0.1140	0.1010	0.1220	0.1150
2	0.3140	0.3290	0.3220	0.3350	0.3010
3	0.5100	0.4620	0.4930	0.4890	0.4850
4	0.6900	0.6560	0.6560	0.6040	0.6500
5	0.8030	0.7360	0.8160	0.7070	0.7540
6	0.9700	0.9500	1.0720	0.8400	1.0820

AGE	1983	1984	1985	1986	1987
1	0.1400	0.1620	0.1810	0.1810	0.1210
2	0.2960	0.2390	0.3610	0.3410	0.3240
3	0.4410	0.3790	0.5050	0.5400	0.5240
4	0.6070	0.5000	0.6420	0.6740	0.6800
5	0.7400	0.6470	0.7290	0.8540	0.7840
6	1.0100	0.7970	0.8000	1.0150	0.8750

AGE	1988	1989	1990	1991	1992
1	0.1030	0.1000	0.1050	0.1210	0.1010
2	0.3280	0.3270	0.2900	0.2370	0.2930
3	0.5570	0.5200	0.3950	0.3690	0.3650
4	0.6960	0.7200	0.5850	0.4860	0.5260
5	0.8440	0.8660	0.6930	0.7230	0.6510
6	0.9750	1.0530	0.8450	0.8770	1.1100

AGE	1993	1994	1995	1996	1997
1	0.1000	0.1930	0.1740	0.1190	0.2140
2	0.2850	0.2600	0.2750	0.2760	0.3020
3	0.3790	0.3530	0.3470	0.4070	0.4080
4	0.5010	0.4720	0.4650	0.5520	0.5380
5	0.5640	0.6210	0.6070	0.7070	0.7180
6	0.8630	0.7750	0.7680	1.0120	0.9470

SSB Weight At Age - Input Data

AGE	1998	1999	2000	2001	2002
1	0.1780	0.2020	0.2290	0.2510	0.2820
2	0.3050	0.3680	0.3830	0.3620	0.3810
3	0.4280	0.4950	0.4800	0.4600	0.4800
4	0.5460	0.6400	0.6150	0.6120	0.6650
5	0.6490	0.7550	0.7660	0.8120	0.8330
6	0.9660	0.9010	0.9540	1.0270	1.0680

AGE	2003	2004	2005	2006	2007
1	0.2280	0.2110	0.1190	0.1000	0.1540
2	0.3590	0.2920	0.3410	0.3100	0.2900
3	0.4740	0.4380	0.4470	0.4150	0.4090
4	0.6530	0.5850	0.5970	0.5570	0.5420
5	0.8240	0.7260	0.7630	0.7610	0.7840
6	1.0480	0.9560	0.9910	0.9960	1.0230

AGE	2008	2009	2010	2011	2012
1	0.0470	0.1550	0.1740	0.1280	0.1850
2	0.3020	0.3280	0.3230	0.3370	0.3390
3	0.4150	0.4340	0.4320	0.4610	0.4520
4	0.5330	0.5380	0.5190	0.5530	0.5550
5	0.6750	0.6990	0.6610	0.6460	0.6710
6	0.9620	0.9290	0.8080	0.7470	0.8060

Natural Mortality - Input Data

AGE	1973	1974	1975	1976	1977
1	0.4500	0.4500	0.4500	0.4500	0.4500
2	0.4500	0.4500	0.4500	0.4500	0.4500
3	0.4500	0.4500	0.4500	0.4500	0.4500
4	0.4500	0.4500	0.4500	0.4500	0.4500
5	0.4500	0.4500	0.4500	0.4500	0.4500
6	0.4500	0.4500	0.4500	0.4500	0.4500

AGE	1978	1979	1980	1981	1982
1	0.4500	0.4500	0.4500	0.4500	0.4500
2	0.4500	0.4500	0.4500	0.4500	0.4500
3	0.4500	0.4500	0.4500	0.4500	0.4500
4	0.4500	0.4500	0.4500	0.4500	0.4500
5	0.4500	0.4500	0.4500	0.4500	0.4500
6	0.4500	0.4500	0.4500	0.4500	0.4500

AGE	1983	1984	1985	1986	1987
1	0.4500	0.4500	0.4500	0.4500	0.4500
2	0.4500	0.4500	0.4500	0.4500	0.4500
3	0.4500	0.4500	0.4500	0.4500	0.4500
4	0.4500	0.4500	0.4500	0.4500	0.4500
5	0.4500	0.4500	0.4500	0.4500	0.4500
6	0.4500	0.4500	0.4500	0.4500	0.4500

AGE	1988	1989	1990	1991	1992
1	0.4500	0.4500	0.4500	0.4500	0.4500
2	0.4500	0.4500	0.4500	0.4500	0.4500
3	0.4500	0.4500	0.4500	0.4500	0.4500
4	0.4500	0.4500	0.4500	0.4500	0.4500
5	0.4500	0.4500	0.4500	0.4500	0.4500
6	0.4500	0.4500	0.4500	0.4500	0.4500

AGE	1993	1994	1995	1996	1997
1	0.4500	0.4500	0.4500	0.4500	0.4500
2	0.4500	0.4500	0.4500	0.4500	0.4500
3	0.4500	0.4500	0.4500	0.4500	0.4500
4	0.4500	0.4500	0.4500	0.4500	0.4500
5	0.4500	0.4500	0.4500	0.4500	0.4500
6	0.4500	0.4500	0.4500	0.4500	0.4500

Natural Mortality - Input Data

AGE	1998	1999	2000	2001	2002
1	0.4500	0.4500	0.4500	0.4500	0.4500
2	0.4500	0.4500	0.4500	0.4500	0.4500
3	0.4500	0.4500	0.4500	0.4500	0.4500
4	0.4500	0.4500	0.4500	0.4500	0.4500
5	0.4500	0.4500	0.4500	0.4500	0.4500
6	0.4500	0.4500	0.4500	0.4500	0.4500

AGE	2003	2004	2005	2006	2007
1	0.4500	0.4500	0.4500	0.4500	0.4500
2	0.4500	0.4500	0.4500	0.4500	0.4500
3	0.4500	0.4500	0.4500	0.4500	0.4500
4	0.4500	0.4500	0.4500	0.4500	0.4500
5	0.4500	0.4500	0.4500	0.4500	0.4500
6	0.4500	0.4500	0.4500	0.4500	0.4500

AGE	2008	2009	2010	2011	2012
1	0.4500	0.4500	0.4500	0.4500	0.4500
2	0.4500	0.4500	0.4500	0.4500	0.4500
3	0.4500	0.4500	0.4500	0.4500	0.4500
4	0.4500	0.4500	0.4500	0.4500	0.4500
5	0.4500	0.4500	0.4500	0.4500	0.4500
6	0.4500	0.4500	0.4500	0.4500	0.4500

Proportion of Natural Mortality Before Spawning = 0.4167
Proportion of Fishing Mortality Before Spawning = 0.4167

Maturity - Input Data

AGE	1973	1974	1975	1976	1977
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.4620	0.4620	0.4620	0.4620	0.4620
3	0.9670	0.9670	0.9670	0.9670	0.9670
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000

AGE	1978	1979	1980	1981	1982
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.4620	0.4620	0.4620	0.4620	0.4620
3	0.9670	0.9670	0.9670	0.9670	0.9670
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000

AGE	1983	1984	1985	1986	1987
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.4620	0.4620	0.4620	0.4620	0.4620
3	0.9670	0.9670	0.9670	0.9670	0.9670
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000

AGE	1988	1989	1990	1991	1992
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.4620	0.4620	0.4620	0.4620	0.4620
3	0.9670	0.9670	0.9670	0.9670	0.9670
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000

AGE	1993	1994	1995	1996	1997
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.4620	0.4620	0.4620	0.4620	0.4620
3	0.9670	0.9670	0.9670	0.9670	0.9670
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000

Maturity - Input Data

AGE	1998	1999	2000	2001	2002
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.4620	0.4620	0.4620	0.4620	0.4620
3	0.9670	0.9670	0.9670	0.9670	0.9670
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000

AGE	2003	2004	2005	2006	2007
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.4620	0.4620	0.4620	0.4620	0.4620
3	0.9670	0.9670	0.9670	0.9670	0.9670
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000

AGE	2008	2009	2010	2011	2012
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.4620	0.4620	0.4620	0.4620	0.4620
3	0.9670	0.9670	0.9670	0.9670	0.9670
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000

Input Partial Recruitment

AGE	
1	0.0000
2	0.0300
3	0.6300
4	1.0000
5	1.0000

Input F-Plus Ratio

YEAR	
1973	1.0000
1974	1.0000
1975	1.0000
1976	1.0000
1977	1.0000
1978	1.0000
1979	1.0000
1980	1.0000
1981	1.0000
1982	1.0000
1983	1.0000
1984	1.0000
1985	1.0000
1986	1.0000
1987	1.0000
1988	1.0000
1989	1.0000
1990	1.0000
1991	1.0000
1992	1.0000
1993	1.0000
1994	1.0000
1995	1.0000
1996	1.0000
1997	1.0000
1998	1.0000
1999	1.0000
2000	1.0000
2001	1.0000
2002	1.0000
2003	1.0000
2004	1.0000
2005	1.0000
2006	1.0000
2007	1.0000
2008	1.0000
2009	1.0000
2010	1.0000
2011	1.0000
2012	1.0000

SURVEY - INPUT DATA

INDEX	1	2	3
SURVEY TAG	USsearly	USsearly	USsearly
AGE	1	2	3
TIME	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	1882.9150	3184.3290	2309.4080
1974	308.1730	2168.4730	1795.4620
1975	409.2160	2917.9900	809.1130
1976	1008.3820	4259.0050	1215.9990
1977	0.0000	654.0070	1097.6800
1978	912.1930	778.4410	494.4360
1979	393.9770	1956.7800	395.2390
1980	55.3260	4528.6450	5617.2010
1981	11.3560	995.8610	1724.2180
1982	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000
1987	0.0000	0.0000	0.0000
1988	0.0000	0.0000	0.0000
1989	0.0000	0.0000	0.0000
1990	0.0000	0.0000	0.0000
1991	0.0000	0.0000	0.0000
1992	0.0000	0.0000	0.0000
1993	0.0000	0.0000	0.0000
1994	0.0000	0.0000	0.0000
1995	0.0000	0.0000	0.0000
1996	0.0000	0.0000	0.0000
1997	0.0000	0.0000	0.0000
1998	0.0000	0.0000	0.0000
1999	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000
2001	0.0000	0.0000	0.0000
2002	0.0000	0.0000	0.0000
2003	0.0000	0.0000	0.0000
2004	0.0000	0.0000	0.0000
2005	0.0000	0.0000	0.0000
2006	0.0000	0.0000	0.0000
2007	0.0000	0.0000	0.0000
2008	0.0000	0.0000	0.0000
2009	0.0000	0.0000	0.0000
2010	0.0000	0.0000	0.0000
2011	0.0000	0.0000	0.0000
2012	0.0000	0.0000	0.0000
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	4	5	6
SURVEY TAG	USsearly	USsearly	USsearly
AGE	4	5	6
TIME	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	1036.7250	399.4120	210.2370
1974	1225.0260	336.9040	273.8130
1975	262.5540	201.5020	86.2890
1976	302.4470	191.2130	108.4190
1977	363.6930	81.9210	12.8120
1978	213.9260	25.7220	7.6680
1979	328.2650	58.7230	88.7150
1980	460.5620	55.0340	35.3310
1981	698.8500	206.9370	56.8790
1982	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000
1987	0.0000	0.0000	0.0000
1988	0.0000	0.0000	0.0000
1989	0.0000	0.0000	0.0000
1990	0.0000	0.0000	0.0000
1991	0.0000	0.0000	0.0000
1992	0.0000	0.0000	0.0000
1993	0.0000	0.0000	0.0000
1994	0.0000	0.0000	0.0000
1995	0.0000	0.0000	0.0000
1996	0.0000	0.0000	0.0000
1997	0.0000	0.0000	0.0000
1998	0.0000	0.0000	0.0000
1999	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000
2001	0.0000	0.0000	0.0000
2002	0.0000	0.0000	0.0000
2003	0.0000	0.0000	0.0000
2004	0.0000	0.0000	0.0000
2005	0.0000	0.0000	0.0000
2006	0.0000	0.0000	0.0000
2007	0.0000	0.0000	0.0000
2008	0.0000	0.0000	0.0000
2009	0.0000	0.0000	0.0000
2010	0.0000	0.0000	0.0000
2011	0.0000	0.0000	0.0000
2012	0.0000	0.0000	0.0000
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	7	8	9
SURVEY TAG	USspr	USspr	USspr
AGE	1	2	3
TIME	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	44.0660	3656.5390	1096.5150
1983	0.0000	1810.0220	2647.7680
1984	0.0000	90.2680	806.0070
1985	106.3810	2134.2100	254.4010
1986	26.5950	1753.0460	282.6460
1987	26.5950	73.2820	132.9760
1988	75.5150	266.9220	355.2490
1989	45.2310	391.2590	737.6750
1990	0.0000	63.6730	1074.6760
1991	422.5130	0.0000	246.9270
1992	0.0000	1987.7430	1840.6930
1993	44.7460	281.0930	485.7980
1994	0.0000	602.2730	614.6970
1995	0.0000	0.0000	0.0000
1996	0.0000	0.0000	0.0000
1997	0.0000	0.0000	0.0000
1998	0.0000	0.0000	0.0000
1999	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000
2001	0.0000	0.0000	0.0000
2002	0.0000	0.0000	0.0000
2003	0.0000	0.0000	0.0000
2004	0.0000	0.0000	0.0000
2005	0.0000	0.0000	0.0000
2006	0.0000	0.0000	0.0000
2007	0.0000	0.0000	0.0000
2008	0.0000	0.0000	0.0000
2009	0.0000	0.0000	0.0000
2010	0.0000	0.0000	0.0000
2011	0.0000	0.0000	0.0000
2012	0.0000	0.0000	0.0000
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	10	11	12
SURVEY TAG	USspr	USspr	USspr
AGE	4	5	6
TIME	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	992.4640	444.5460	88.3270
1983	514.4310	119.5810	237.3180
1984	837.9410	810.3750	236.5410
1985	273.4250	143.3610	0.0000
1986	54.6460	132.8790	53.1900
1987	129.2870	50.9580	53.1900
1988	234.6970	193.1540	26.5950
1989	280.9960	59.3050	43.4840
1990	358.3550	112.2040	100.7510
1991	665.0720	255.4690	19.9950
1992	621.7820	159.9590	16.6950
1993	307.8820	26.0130	0.0000
1994	343.6010	140.4490	38.7280
1995	0.0000	0.0000	0.0000
1996	0.0000	0.0000	0.0000
1997	0.0000	0.0000	0.0000
1998	0.0000	0.0000	0.0000
1999	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000
2001	0.0000	0.0000	0.0000
2002	0.0000	0.0000	0.0000
2003	0.0000	0.0000	0.0000
2004	0.0000	0.0000	0.0000
2005	0.0000	0.0000	0.0000
2006	0.0000	0.0000	0.0000
2007	0.0000	0.0000	0.0000
2008	0.0000	0.0000	0.0000
2009	0.0000	0.0000	0.0000
2010	0.0000	0.0000	0.0000
2011	0.0000	0.0000	0.0000
2012	0.0000	0.0000	0.0000
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	13	14	15
SURVEY TAG	USspr95	USspr95	USspr95
AGE	1	2	3
TIME	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000
1987	0.0000	0.0000	0.0000
1988	0.0000	0.0000	0.0000
1989	0.0000	0.0000	0.0000
1990	0.0000	0.0000	0.0000
1991	0.0000	0.0000	0.0000
1992	0.0000	0.0000	0.0000
1993	0.0000	0.0000	0.0000
1994	0.0000	0.0000	0.0000
1995	39.0190	1144.5610	4670.3560
1996	24.3630	958.1040	2548.5700
1997	18.1510	1134.4670	3623.0520
1998	0.0000	2020.0650	1022.1650
1999	48.7250	4606.2950	10501.6770
2000	177.3330	4677.6360	7440.5200
2001	0.0000	2246.7060	6370.5030
2002	182.3800	2341.5360	11971.1060
2003	196.0660	4241.4370	6564.9190
2004	47.0750	957.3270	2114.4100
2005	0.0000	1953.4800	4930.9690
2006	493.4660	907.8260	3419.2210
2007	87.0650	4899.7150	6079.1210
2008	0.0000	2206.7110	4921.4560
2009	218.7820	546.4010	6978.7360
2010	16.4870	662.7570	5181.0300
2011	26.8770	236.5950	3115.9690
2012	92.6950	530.0580	3476.8760
2013	46.4150	441.9520	927.9930

SURVEY - INPUT DATA

INDEX	16	17	18
SURVEY TAG	USspr95	USspr95	USspr95
AGE	4	5	6
TIME	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000
1987	0.0000	0.0000	0.0000
1988	0.0000	0.0000	0.0000
1989	0.0000	0.0000	0.0000
1990	0.0000	0.0000	0.0000
1991	0.0000	0.0000	0.0000
1992	0.0000	0.0000	0.0000
1993	0.0000	0.0000	0.0000
1994	0.0000	0.0000	0.0000
1995	1441.6690	621.4910	9.5120
1996	2621.7550	591.5960	56.1990
1997	3960.7320	682.3490	129.6760
1998	1123.4010	737.0930	339.6220
1999	2640.4880	1575.2270	756.3110
2000	2828.4980	789.2150	508.4130
2001	2339.9830	469.2000	439.6930
2002	3958.4030	1690.3430	845.4140
2003	2791.9060	428.6280	836.8730
2004	659.9280	247.7040	263.8160
2005	2332.7030	261.7780	111.4280
2006	2112.6620	307.6880	79.7850
2007	2762.3020	539.9590	125.2110
2008	1681.1040	300.3020	26.6070
2009	4456.8300	964.1050	186.3310
2010	8057.1590	2583.9590	613.9260
2011	3512.8910	914.1320	100.6020
2012	6141.4360	1563.5800	180.3420
2013	1103.9440	725.7830	258.5050

SURVEY - INPUT DATA

INDEX	19	20	21
SURVEY TAG	USfall	USfall	USfall
AGE	1	2	3
TIME	MEAN	MEAN	MEAN
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	2420.4480	5336.0110	4954.4580
1974	4486.7140	2779.4820	1471.5650
1975	4548.6400	2437.3360	851.7230
1976	333.5070	1863.8910	460.2700
1977	906.6610	2147.1200	1572.8010
1978	4620.5630	1243.2740	757.1850
1979	1282.0020	2008.5140	253.7210
1980	743.5960	4969.9880	5911.9800
1981	1548.2440	2279.4160	1592.7960
1982	2353.2800	2120.3300	1543.3910
1983	105.7010	2216.4220	1858.4560
1984	641.5830	388.0560	296.7200
1985	1310.2470	527.5350	165.8800
1986	273.4250	1075.0640	338.6510
1987	98.7130	388.8320	384.5620
1988	18.1510	206.7430	103.9540
1989	241.0060	1934.0670	750.3900
1990	0.0000	359.2280	1429.9250
1991	2038.7980	267.0190	426.2010
1992	146.7590	383.8820	690.9880
1993	814.6460	135.2080	568.7860
1994	1159.8000	214.6050	954.1240
1995	0.0000	0.0000	0.0000
1996	0.0000	0.0000	0.0000
1997	0.0000	0.0000	0.0000
1998	0.0000	0.0000	0.0000
1999	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000
2001	0.0000	0.0000	0.0000
2002	0.0000	0.0000	0.0000
2003	0.0000	0.0000	0.0000
2004	0.0000	0.0000	0.0000
2005	0.0000	0.0000	0.0000
2006	0.0000	0.0000	0.0000
2007	0.0000	0.0000	0.0000
2008	0.0000	0.0000	0.0000
2009	0.0000	0.0000	0.0000
2010	0.0000	0.0000	0.0000
2011	0.0000	0.0000	0.0000
2012	0.0000	0.0000	0.0000
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	22	23	24
SURVEY TAG	USfall	USfall	USfall
AGE	4	5	6
TIME	MEAN	MEAN	MEAN
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	2857.4230	1181.1540	599.9430
1974	1029.0570	444.2550	368.0610
1975	555.1980	324.3830	61.1490
1976	113.5630	118.5130	97.2570
1977	615.3760	102.3040	105.7010
1978	399.2180	131.6170	34.9430
1979	116.6690	134.3350	108.6130
1980	661.9660	212.2760	250.9070
1981	570.5330	76.3880	52.8020
1982	410.3800	86.5800	0.0000
1983	495.6980	29.8950	47.6580
1984	235.9590	72.7000	60.6640
1985	49.1140	78.3290	0.0000
1986	71.9230	0.0000	0.0000
1987	51.4430	77.0680	0.0000
1988	26.5950	0.0000	0.0000
1989	76.5820	53.9670	0.0000
1990	285.8490	0.0000	0.0000
1991	347.1930	0.0000	0.0000
1992	157.1440	139.3820	26.5950
1993	520.3520	0.0000	21.3540
1994	692.1530	254.8860	54.8400
1995	0.0000	0.0000	0.0000
1996	0.0000	0.0000	0.0000
1997	0.0000	0.0000	0.0000
1998	0.0000	0.0000	0.0000
1999	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000
2001	0.0000	0.0000	0.0000
2002	0.0000	0.0000	0.0000
2003	0.0000	0.0000	0.0000
2004	0.0000	0.0000	0.0000
2005	0.0000	0.0000	0.0000
2006	0.0000	0.0000	0.0000
2007	0.0000	0.0000	0.0000
2008	0.0000	0.0000	0.0000
2009	0.0000	0.0000	0.0000
2010	0.0000	0.0000	0.0000
2011	0.0000	0.0000	0.0000
2012	0.0000	0.0000	0.0000
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	25	26	27
SURVEY TAG	USfall95	USfall95	USfall95
AGE	1	2	3
TIME	MEAN	MEAN	MEAN
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000
1987	0.0000	0.0000	0.0000
1988	0.0000	0.0000	0.0000
1989	0.0000	0.0000	0.0000
1990	0.0000	0.0000	0.0000
1991	0.0000	0.0000	0.0000
1992	0.0000	0.0000	0.0000
1993	0.0000	0.0000	0.0000
1994	0.0000	0.0000	0.0000
1995	267.6980	115.4070	335.1570
1996	144.3320	341.2720	1813.8070
1997	1351.7890	517.7310	3340.9880
1998	1844.3820	4675.3070	4078.8570
1999	2998.7460	8175.8660	5558.8660
2000	610.8140	1647.5390	4672.4920
2001	3414.1730	6083.5860	7853.7150
2002	2031.4210	5581.7730	2064.5190
2003	1045.2660	4882.8260	2725.9030
2004	850.2680	5346.1050	4862.4430
2005	304.0000	2033.5560	3652.0740
2006	6012.0510	6067.1830	3556.6610
2007	1026.5330	11110.9390	7634.7420
2008	162.7740	6963.1670	9592.6870
2009	445.7780	4169.3600	11531.4840
2010	115.4150	2661.6320	4205.3380
2011	234.4060	2795.0120	3756.5130
2012	189.3460	1431.9880	3550.4660
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	28	29	30
SURVEY TAG	USfall95	USfall95	USfall95
AGE	4	5	6
TIME	MEAN	MEAN	MEAN
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000
1987	0.0000	0.0000	0.0000
1988	0.0000	0.0000	0.0000
1989	0.0000	0.0000	0.0000
1990	0.0000	0.0000	0.0000
1991	0.0000	0.0000	0.0000
1992	0.0000	0.0000	0.0000
1993	0.0000	0.0000	0.0000
1994	0.0000	0.0000	0.0000
1995	267.2130	44.6490	12.1330
1996	433.4810	72.7000	0.0000
1997	2028.5090	1039.8310	79.7850
1998	1154.5580	289.5370	71.7290
1999	1390.3230	1394.2060	252.7510
2000	2350.2710	919.6670	802.6100
2001	2524.7900	1667.8250	1988.2280
2002	576.0660	295.5550	26.5950
2003	548.0150	96.9650	185.6810
2004	2044.4270	897.0520	170.7330
2005	595.8670	179.2740	0.0000
2006	1132.9140	247.7040	44.3580
2007	1939.6000	371.2640	90.8510
2008	1002.7530	0.0000	0.0000
2009	2071.9780	588.3490	57.9190
2010	719.7310	272.6790	0.0000
2011	1079.7230	141.8080	9.6090
2012	1538.9530	428.0370	13.8410
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	31	32	33
SURVEY TAG	Canada	Canada	Canada
AGE	1	2	3
TIME	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000
1987	75.2180	751.1130	1238.5400
1988	0.0000	1116.5280	801.8600
1989	71.7690	645.8310	383.1930
1990	0.0000	1500.8560	2281.1420
1991	15.4000	539.6420	745.8260
1992	34.8160	6942.0740	2312.0040
1993	49.4180	1528.8280	2568.7600
1994	0.0000	3808.3700	2178.5670
1995	0.0000	0.0000	0.0000
1996	0.0000	0.0000	0.0000
1997	0.0000	0.0000	0.0000
1998	0.0000	0.0000	0.0000
1999	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000
2001	0.0000	0.0000	0.0000
2002	0.0000	0.0000	0.0000
2003	0.0000	0.0000	0.0000
2004	0.0000	0.0000	0.0000
2005	0.0000	0.0000	0.0000
2006	0.0000	0.0000	0.0000
2007	0.0000	0.0000	0.0000
2008	0.0000	0.0000	0.0000
2009	0.0000	0.0000	0.0000
2010	0.0000	0.0000	0.0000
2011	0.0000	0.0000	0.0000
2012	0.0000	0.0000	0.0000
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	34	35	36
SURVEY TAG	Canada	Canada	Canada
AGE	4	5	6
TIME	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000
1987	309.6770	54.8890	30.9490
1988	383.5700	174.9190	14.7910
1989	185.1830	41.7680	14.1230
1990	575.0330	131.2760	8.6070
1991	2364.1370	330.3460	9.1140
1992	622.3690	219.8050	18.7680
1993	2562.8960	557.4920	81.7920
1994	1890.1200	491.3930	129.9550
1995	0.0000	0.0000	0.0000
1996	0.0000	0.0000	0.0000
1997	0.0000	0.0000	0.0000
1998	0.0000	0.0000	0.0000
1999	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000
2001	0.0000	0.0000	0.0000
2002	0.0000	0.0000	0.0000
2003	0.0000	0.0000	0.0000
2004	0.0000	0.0000	0.0000
2005	0.0000	0.0000	0.0000
2006	0.0000	0.0000	0.0000
2007	0.0000	0.0000	0.0000
2008	0.0000	0.0000	0.0000
2009	0.0000	0.0000	0.0000
2010	0.0000	0.0000	0.0000
2011	0.0000	0.0000	0.0000
2012	0.0000	0.0000	0.0000
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	37	38	39
SURVEY TAG	Can95	Can95	Can95
AGE	1	2	3
TIME	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000
1987	0.0000	0.0000	0.0000
1988	0.0000	0.0000	0.0000
1989	0.0000	0.0000	0.0000
1990	0.0000	0.0000	0.0000
1991	0.0000	0.0000	0.0000
1992	0.0000	0.0000	0.0000
1993	0.0000	0.0000	0.0000
1994	0.0000	0.0000	0.0000
1995	132.0440	786.4830	2737.4500
1996	280.5130	4490.9900	5769.1640
1997	13.5840	7849.2320	8742.1450
1998	561.7170	2094.3110	3085.9330
1999	99.8150	13118.4910	13101.1520
2000	6.7750	8655.7590	17256.5420
2001	183.2760	12511.6030	26489.3630
2002	55.5150	7522.3250	19503.3260
2003	56.2760	7476.3700	15480.6530
2004	20.5560	2263.4600	10225.3230
2005	377.3270	1007.5040	17581.8650
2006	391.4750	3076.8130	11696.4110
2007	108.9140	7646.4280	17423.7340
2008	0.0000	30382.5120	107131.6720
2009	13.3970	5370.4190	86753.5850
2010	0.0000	307.5830	5906.1380
2011	13.8910	409.2980	3831.4600
2012	27.8620	405.1900	5183.7430
2013	51.0160	80.8950	522.5120

SURVEY - INPUT DATA

INDEX	40	41	42
SURVEY TAG	Can95	Can95	Can95
AGE	4	5	6
TIME	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000
1987	0.0000	0.0000	0.0000
1988	0.0000	0.0000	0.0000
1989	0.0000	0.0000	0.0000
1990	0.0000	0.0000	0.0000
1991	0.0000	0.0000	0.0000
1992	0.0000	0.0000	0.0000
1993	0.0000	0.0000	0.0000
1994	0.0000	0.0000	0.0000
1995	1600.7640	406.6070	63.5630
1996	3399.7980	726.5000	77.1950
1997	10293.5680	2543.2130	421.4880
1998	2725.5810	1250.3780	351.1510
1999	4822.9210	3364.4520	1383.4680
2000	12100.9090	3187.5860	2319.7870
2001	8368.0450	2881.0360	1507.1650
2002	7693.5610	3491.6760	1781.3660
2003	6971.0890	2150.9820	1249.8670
2004	5788.7320	1429.1530	890.5360
2005	12931.4450	3581.9030	983.8350
2006	4132.7340	515.4000	149.4430
2007	8048.5340	1439.0950	156.2100
2008	35919.2620	5067.8240	34.4810
2009	73553.7880	12513.9200	2996.0600
2010	13170.2060	2221.7060	804.5000
2011	5159.9350	1069.5290	205.7940
2012	7183.4200	1946.9060	284.9450
2013	788.6040	380.0590	88.1770

SURVEY - INPUT DATA

INDEX	43	44	45
SURVEY TAG	Scall	Scall	Scall
AGE	1	2	3
TIME	MEAN	MEAN	MEAN
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.3505	0.5851	0.2863
1983	0.1389	0.5693	0.5811
1984	0.2021	0.2606	0.0935
1985	0.2717	0.4373	0.0131
1986	0.0000	0.0000	0.0000
1987	0.1031	0.0776	0.1154
1988	0.1175	0.0172	0.0324
1989	0.0000	0.0000	0.0000
1990	0.1020	0.0257	0.3312
1991	1.9094	0.0000	0.1248
1992	0.3032	0.1281	0.3407
1993	1.1636	0.1966	0.2860
1994	1.4197	0.3308	0.4193
1995	0.0000	0.0000	0.0000
1996	0.0000	0.0000	0.0000
1997	0.0000	0.0000	0.0000
1998	0.0000	0.0000	0.0000
1999	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000
2001	0.0000	0.0000	0.0000
2002	0.0000	0.0000	0.0000
2003	0.0000	0.0000	0.0000
2004	0.0000	0.0000	0.0000
2005	0.0000	0.0000	0.0000
2006	0.0000	0.0000	0.0000
2007	0.0000	0.0000	0.0000
2008	0.0000	0.0000	0.0000
2009	0.0000	0.0000	0.0000
2010	0.0000	0.0000	0.0000
2011	0.0000	0.0000	0.0000
2012	0.0000	0.0000	0.0000
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	46	47	48
SURVEY TAG	Scall	Scall	Scall
AGE	4	5	6
TIME	MEAN	MEAN	MEAN
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.1768	0.0541	0.0000
1983	0.0828	0.0176	0.0339
1984	0.0813	0.0765	0.0089
1985	0.0158	0.0295	0.0000
1986	0.0000	0.0000	0.0000
1987	0.0541	0.0069	0.0029
1988	0.0475	0.0401	0.0000
1989	0.0000	0.0000	0.0000
1990	0.0861	0.0356	0.0126
1991	0.1383	0.0296	0.0000
1992	0.2285	0.0482	0.0030
1993	0.1457	0.0081	0.0000
1994	0.2807	0.0614	0.0246
1995	0.0000	0.0000	0.0000
1996	0.0000	0.0000	0.0000
1997	0.0000	0.0000	0.0000
1998	0.0000	0.0000	0.0000
1999	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000
2001	0.0000	0.0000	0.0000
2002	0.0000	0.0000	0.0000
2003	0.0000	0.0000	0.0000
2004	0.0000	0.0000	0.0000
2005	0.0000	0.0000	0.0000
2006	0.0000	0.0000	0.0000
2007	0.0000	0.0000	0.0000
2008	0.0000	0.0000	0.0000
2009	0.0000	0.0000	0.0000
2010	0.0000	0.0000	0.0000
2011	0.0000	0.0000	0.0000
2012	0.0000	0.0000	0.0000
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	49	50	51
SURVEY TAG	Scall95	Scall95	Scall95
AGE	1	2	3
TIME	MEAN	MEAN	MEAN
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000
1987	0.0000	0.0000	0.0000
1988	0.0000	0.0000	0.0000
1989	0.0000	0.0000	0.0000
1990	0.0000	0.0000	0.0000
1991	0.0000	0.0000	0.0000
1992	0.0000	0.0000	0.0000
1993	0.0000	0.0000	0.0000
1994	0.0000	0.0000	0.0000
1995	0.5183	0.4546	0.7705
1996	0.3673	0.3037	0.8574
1997	0.9682	0.3956	1.2006
1998	1.7583	0.8858	0.7353
1999	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000
2001	0.8943	0.4727	1.0595
2002	0.9561	0.2885	0.8333
2003	0.7469	0.6047	0.9887
2004	0.3459	0.4124	0.7100
2005	0.4657	0.3523	0.5743
2006	1.9150	0.9652	0.6833
2007	0.5074	1.6374	1.1764
2008	0.0000	0.0000	0.0000
2009	0.2021	0.0775	0.7519
2010	0.0862	0.2131	0.5783
2011	0.0000	0.0000	0.0000
2012	0.0000	0.0000	0.0000
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	52	53	54
SURVEY TAG	Scall95	Scall95	Scall95
AGE	4	5	6
TIME	MEAN	MEAN	MEAN
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000
1987	0.0000	0.0000	0.0000
1988	0.0000	0.0000	0.0000
1989	0.0000	0.0000	0.0000
1990	0.0000	0.0000	0.0000
1991	0.0000	0.0000	0.0000
1992	0.0000	0.0000	0.0000
1993	0.0000	0.0000	0.0000
1994	0.0000	0.0000	0.0000
1995	0.5047	0.1627	0.0091
1996	0.7357	0.3089	0.0188
1997	0.9694	0.2008	0.0362
1998	0.9479	0.5744	0.1074
1999	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000
2001	0.5453	0.1249	0.1669
2002	0.3803	0.2290	0.1358
2003	0.6538	0.1330	0.1980
2004	0.1994	0.0415	0.0175
2005	0.2279	0.0842	0.0090
2006	0.3202	0.0429	0.0247
2007	0.3705	0.0592	0.0040
2008	0.0000	0.0000	0.0000
2009	0.6516	0.1352	0.0162
2010	0.9095	0.2878	0.0581
2011	0.0000	0.0000	0.0000
2012	0.0000	0.0000	0.0000
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	55	56	57
SURVEY TAG	Spring_single	Spring_single	Spring_single
AGE	1	2	3
TIME	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	44.0660	3656.5390	1096.5150
1983	0.0000	1810.0220	2647.7680
1984	0.0000	90.2680	806.0070
1985	106.3810	2134.2100	254.4010
1986	26.5950	1753.0460	282.6460
1987	26.5950	73.2820	132.9760
1988	75.5150	266.9220	355.2490
1989	45.2310	391.2590	737.6750
1990	0.0000	63.6730	1074.6760
1991	422.5130	0.0000	246.9270
1992	0.0000	1987.7430	1840.6930
1993	44.7460	281.0930	485.7980
1994	0.0000	602.2730	614.6970
1995	39.0190	1144.5610	4670.3560
1996	24.3630	958.1040	2548.5700
1997	18.1510	1134.4670	3623.0520
1998	0.0000	2020.0650	1022.1650
1999	48.7250	4606.2950	10501.6770
2000	177.3330	4677.6360	7440.5200
2001	0.0000	2246.7060	6370.5030
2002	182.3800	2341.5360	11971.1060
2003	196.0660	4241.4370	6564.9190
2004	47.0750	957.3270	2114.4100
2005	0.0000	1953.4800	4930.9690
2006	493.4660	907.8260	3419.2210
2007	87.0650	4899.7150	6079.1210
2008	0.0000	2206.7110	4921.4560
2009	218.7820	546.4010	6978.7360
2010	16.4870	662.7570	5181.0300
2011	26.8770	236.5950	3115.9690
2012	92.6950	530.0580	3476.8760
2013	46.4150	441.9520	927.9930

SURVEY - INPUT DATA

INDEX	58	59	60
SURVEY TAG	Spring_single	Spring_single	Spring_single
AGE	4	5	6
TIME	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	992.4640	444.5460	88.3270
1983	514.4310	119.5810	237.3180
1984	837.9410	810.3750	236.5410
1985	273.4250	143.3610	0.0000
1986	54.6460	132.8790	53.1900
1987	129.2870	50.9580	53.1900
1988	234.6970	193.1540	26.5950
1989	280.9960	59.3050	43.4840
1990	358.3550	112.2040	100.7510
1991	665.0720	255.4690	19.9950
1992	621.7820	159.9590	16.6950
1993	307.8820	26.0130	0.0000
1994	343.6010	140.4490	38.7280
1995	1441.6690	621.4910	9.5120
1996	2621.7550	591.5960	56.1990
1997	3960.7320	682.3490	129.6760
1998	1123.4010	737.0930	339.6220
1999	2640.4880	1575.2270	756.3110
2000	2828.4980	789.2150	508.4130
2001	2339.9830	469.2000	439.6930
2002	3958.4030	1690.3430	845.4140
2003	2791.9060	428.6280	836.8730
2004	659.9280	247.7040	263.8160
2005	2332.7030	261.7780	111.4280
2006	2112.6620	307.6880	79.7850
2007	2762.3020	539.9590	125.2110
2008	1681.1040	300.3020	26.6070
2009	4456.8300	964.1050	186.3310
2010	8057.1590	2583.9590	613.9260
2011	3512.8910	914.1320	100.6020
2012	6141.4360	1563.5800	180.3420
2013	1103.9440	725.7830	258.5050

SURVEY - INPUT DATA

INDEX	61	62	63
SURVEY TAG	Fall_single	Fall_single	Fall_single
AGE	1	2	3
TIME	MEAN	MEAN	MEAN
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	2420.4480	5336.0110	4954.4580
1974	4486.7140	2779.4820	1471.5650
1975	4548.6400	2437.3360	851.7230
1976	333.5070	1863.8910	460.2700
1977	906.6610	2147.1200	1572.8010
1978	4620.5630	1243.2740	757.1850
1979	1282.0020	2008.5140	253.7210
1980	743.5960	4969.9880	5911.9800
1981	1548.2440	2279.4160	1592.7960
1982	2353.2800	2120.3300	1543.3910
1983	105.7010	2216.4220	1858.4560
1984	641.5830	388.0560	296.7200
1985	1310.2470	527.5350	165.8800
1986	273.4250	1075.0640	338.6510
1987	98.7130	388.8320	384.5620
1988	18.1510	206.7430	103.9540
1989	241.0060	1934.0670	750.3900
1990	0.0000	359.2280	1429.9250
1991	2038.7980	267.0190	426.2010
1992	146.7590	383.8820	690.9880
1993	814.6460	135.2080	568.7860
1994	1159.8000	214.6050	954.1240
1995	267.6980	115.4070	335.1570
1996	144.3320	341.2720	1813.8070
1997	1351.7890	517.7310	3340.9880
1998	1844.3820	4675.3070	4078.8570
1999	2998.7460	8175.8660	5558.8660
2000	610.8140	1647.5390	4672.4920
2001	3414.1730	6083.5860	7853.7150
2002	2031.4210	5581.7730	2064.5190
2003	1045.2660	4882.8260	2725.9030
2004	850.2680	5346.1050	4862.4430
2005	304.0000	2033.5560	3652.0740
2006	6012.0510	6067.1830	3556.6610
2007	1026.5330	11110.9390	7634.7420
2008	162.7740	6963.1670	9592.6870
2009	445.7780	4169.3600	11531.4840
2010	115.4150	2661.6320	4205.3380
2011	234.4060	2795.0120	3756.5130
2012	189.3460	1431.9880	3550.4660
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	64	65	66
SURVEY TAG	Fall_single	Fall_single	Fall_single
AGE	4	5	6
TIME	MEAN	MEAN	MEAN
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	2857.4230	1181.1540	599.9430
1974	1029.0570	444.2550	368.0610
1975	555.1980	324.3830	61.1490
1976	113.5630	118.5130	97.2570
1977	615.3760	102.3040	105.7010
1978	399.2180	131.6170	34.9430
1979	116.6690	134.3350	108.6130
1980	661.9660	212.2760	250.9070
1981	570.5330	76.3880	52.8020
1982	410.3800	86.5800	0.0000
1983	495.6980	29.8950	47.6580
1984	235.9590	72.7000	60.6640
1985	49.1140	78.3290	0.0000
1986	71.9230	0.0000	0.0000
1987	51.4430	77.0680	0.0000
1988	26.5950	0.0000	0.0000
1989	76.5820	53.9670	0.0000
1990	285.8490	0.0000	0.0000
1991	347.1930	0.0000	0.0000
1992	157.1440	139.3820	26.5950
1993	520.3520	0.0000	21.3540
1994	692.1530	254.8860	54.8400
1995	267.2130	44.6490	12.1330
1996	433.4810	72.7000	0.0000
1997	2028.5090	1039.8310	79.7850
1998	1154.5580	289.5370	71.7290
1999	1390.3230	1394.2060	252.7510
2000	2350.2710	919.6670	802.6100
2001	2524.7900	1667.8250	1988.2280
2002	576.0660	295.5550	26.5950
2003	548.0150	96.9650	185.6810
2004	2044.4270	897.0520	170.7330
2005	595.8670	179.2740	0.0000
2006	1132.9140	247.7040	44.3580
2007	1939.6000	371.2640	90.8510
2008	1002.7530	0.0000	0.0000
2009	2071.9780	588.3490	57.9190
2010	719.7310	272.6790	0.0000
2011	1079.7230	141.8080	9.6090
2012	1538.9530	428.0370	13.8410
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	67	68	69
SURVEY TAG	DFO_single	DFO_single	DFO_single
AGE	1	2	3
TIME	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000
1987	75.2180	751.1130	1238.5400
1988	0.0000	1116.5280	801.8600
1989	71.7690	645.8310	383.1930
1990	0.0000	1500.8560	2281.1420
1991	15.4000	539.6420	745.8260
1992	34.8160	6942.0740	2312.0040
1993	49.4180	1528.8280	2568.7600
1994	0.0000	3808.3700	2178.5670
1995	132.0440	786.4830	2737.4500
1996	280.5130	4490.9900	5769.1640
1997	13.5840	7849.2320	8742.1450
1998	561.7170	2094.3110	3085.9330
1999	99.8150	13118.4910	13101.1520
2000	6.7750	8655.7590	17256.5420
2001	183.2760	12511.6030	26489.3630
2002	55.5150	7522.3250	19503.3260
2003	56.2760	7476.3700	15480.6530
2004	20.5560	2263.4600	10225.3230
2005	377.3270	1007.5040	17581.8650
2006	391.4750	3076.8130	11696.4110
2007	108.9140	7646.4280	17423.7340
2008	0.0000	30382.5120	107131.6720
2009	13.3970	5370.4190	86753.5850
2010	0.0000	307.5830	5906.1380
2011	13.8910	409.2980	3831.4600
2012	27.8620	405.1900	5183.7430
2013	51.0160	80.8950	522.5120

SURVEY - INPUT DATA

INDEX	70	71	72
SURVEY TAG	DFO_single	DFO_single	DFO_single
AGE	4	5	6
TIME	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000
1987	309.6770	54.8890	30.9490
1988	383.5700	174.9190	14.7910
1989	185.1830	41.7680	14.1230
1990	575.0330	131.2760	8.6070
1991	2364.1370	330.3460	9.1140
1992	622.3690	219.8050	18.7680
1993	2562.8960	557.4920	81.7920
1994	1890.1200	491.3930	129.9550
1995	1600.7640	406.6070	63.5630
1996	3399.7980	726.5000	77.1950
1997	10293.5680	2543.2130	421.4880
1998	2725.5810	1250.3780	351.1510
1999	4822.9210	3364.4520	1383.4680
2000	12100.9090	3187.5860	2319.7870
2001	8368.0450	2881.0360	1507.1650
2002	7693.5610	3491.6760	1781.3660
2003	6971.0890	2150.9820	1249.8670
2004	5788.7320	1429.1530	890.5360
2005	12931.4450	3581.9030	983.8350
2006	4132.7340	515.4000	149.4430
2007	8048.5340	1439.0950	156.2100
2008	35919.2620	5067.8240	34.4810
2009	73553.7880	12513.9200	2996.0600
2010	13170.2060	2221.7060	804.5000
2011	5159.9350	1069.5290	205.7940
2012	7183.4200	1946.9060	284.9450
2013	788.6040	380.0590	88.1770

SURVEY - INPUT DATA

INDEX	73	74	75
SURVEY TAG	scallop_single	scallop_single	scallop_single
AGE	1	2	3
TIME	MEAN	MEAN	MEAN
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.3505	0.5851	0.2863
1983	0.1389	0.5693	0.5811
1984	0.2021	0.2606	0.0935
1985	0.2717	0.4373	0.0131
1986	0.0000	0.0000	0.0000
1987	0.1031	0.0776	0.1154
1988	0.1175	0.0172	0.0324
1989	0.0000	0.0000	0.0000
1990	0.1020	0.0257	0.3312
1991	1.9094	0.0000	0.1248
1992	0.3032	0.1281	0.3407
1993	1.1636	0.1966	0.2860
1994	1.4197	0.3308	0.4193
1995	0.5183	0.4546	0.7705
1996	0.3673	0.3037	0.8574
1997	0.9682	0.3956	1.2006
1998	1.7583	0.8858	0.7353
1999	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000
2001	0.8943	0.4727	1.0595
2002	0.9561	0.2885	0.8333
2003	0.7469	0.6047	0.9887
2004	0.3459	0.4124	0.7100
2005	0.4657	0.3523	0.5743
2006	1.9150	0.9652	0.6833
2007	0.5074	1.6374	1.1764
2008	0.0000	0.0000	0.0000
2009	0.2021	0.0775	0.7519
2010	0.0862	0.2131	0.5783
2011	0.0000	0.0000	0.0000
2012	0.0000	0.0000	0.0000
2013	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	76	77	78
SURVEY TAG	scallop_single	scallop_single	scallop_single
AGE	4	5	6
TIME	MEAN	MEAN	MEAN
TYPE	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0
1973	0.0000	0.0000	0.0000
1974	0.0000	0.0000	0.0000
1975	0.0000	0.0000	0.0000
1976	0.0000	0.0000	0.0000
1977	0.0000	0.0000	0.0000
1978	0.0000	0.0000	0.0000
1979	0.0000	0.0000	0.0000
1980	0.0000	0.0000	0.0000
1981	0.0000	0.0000	0.0000
1982	0.1768	0.0541	0.0000
1983	0.0828	0.0176	0.0339
1984	0.0813	0.0765	0.0089
1985	0.0158	0.0295	0.0000
1986	0.0000	0.0000	0.0000
1987	0.0541	0.0069	0.0029
1988	0.0475	0.0401	0.0000
1989	0.0000	0.0000	0.0000
1990	0.0861	0.0356	0.0126
1991	0.1383	0.0296	0.0000
1992	0.2285	0.0482	0.0030
1993	0.1457	0.0081	0.0000
1994	0.2807	0.0614	0.0246
1995	0.5047	0.1627	0.0091
1996	0.7357	0.3089	0.0188
1997	0.9694	0.2008	0.0362
1998	0.9479	0.5744	0.1074
1999	0.0000	0.0000	0.0000
2000	0.0000	0.0000	0.0000
2001	0.5453	0.1249	0.1669
2002	0.3803	0.2290	0.1358
2003	0.6538	0.1330	0.1980
2004	0.1994	0.0415	0.0175
2005	0.2279	0.0842	0.0090
2006	0.3202	0.0429	0.0247
2007	0.3705	0.0592	0.0040
2008	0.0000	0.0000	0.0000
2009	0.6516	0.1352	0.0162
2010	0.9095	0.2878	0.0581
2011	0.0000	0.0000	0.0000
2012	0.0000	0.0000	0.0000
2013	0.0000	0.0000	0.0000

Additional Output Files

Population File C:\NFT\VPA\EXAMPLE\SINGLESERIESM045.PP2
Auxilliary File C:\NFT\VPA\EXAMPLE\SINGLESERIESM045.AUX
Covariance File C:\NFT\VPA\EXAMPLE\SINGLESERIESM045.CV
Residuals File C:\NFT\VPA\EXAMPLE\SINGLESERIESM045.RSD
Log File   C:\NFT\VPA\EXAMPLE\SINGLESERIESM045.LOG

Estimation Results

JAN-1 Population Numbers

AGE	1973	1974	1975	1976	1977
1	52861.	85461.	114965.	44669.	35945.
2	37536.	33421.	52620.	69641.	27979.
3	40411.	19864.	13906.	13344.	19851.
4	22829.	15233.	6266.	3237.	4262.
5	9193.	7246.	3850.	1304.	966.
6	3976.	3023.	2137.	2085.	1143.
Total	166804.	164248.	193745.	134280.	90146.

AGE	1978	1979	1980	1981	1982
1	98444.	54012.	53218.	113903.	38289.
2	22620.	54922.	34186.	33682.	72543.
3	10773.	11641.	26775.	18653.	20609.
4	4593.	3338.	4478.	9566.	7258.
5	1295.	1452.	1024.	1661.	2337.
6	506.	757.	328.	282.	204.
Total	138231.	126122.	120010.	177749.	141241.

AGE	1983	1984	1985	1986	1987
1	11813.	19195.	28115.	15038.	18082.
2	22706.	6977.	11833.	17160.	9447.
3	32123.	8274.	2877.	4157.	5984.
4	7344.	7749.	1821.	1015.	1771.
5	2016.	2760.	1150.	532.	346.
6	459.	583.	180.	296.	247.
Total	76460.	45539.	45975.	38198.	35878.

AGE	1988	1989	1990	1991	1992
1	46625.	19848.	24719.	39299.	33379.
2	11406.	29335.	12505.	15579.	24533.
3	3476.	4929.	16988.	6314.	9817.
4	1420.	1028.	2267.	5432.	2860.
5	381.	264.	325.	691.	1171.
6	89.	73.	60.	128.	82.
Total	63397.	55477.	56864.	67444.	71842.

AGE	1993	1994	1995	1996	1997
1	27635.	38527.	31353.	31833.	46087.
2	19379.	13517.	24510.	19955.	20218.
3	8545.	11263.	7566.	15381.	12185.
4	3947.	2875.	2386.	3699.	8184.
5	698.	753.	462.	841.	1667.
6	154.	227.	100.	115.	395.
Total	60356.	67163.	66377.	71824.	88735.

JAN-1 Population Numbers

AGE	1998	1999	2000	2001	2002
1	49627.	52346.	44529.	44009.	29280.
2	29321.	31510.	33330.	28288.	27922.
3	11997.	17124.	17921.	18210.	15766.
4	6330.	5009.	7641.	6984.	6228.
5	3766.	2568.	1990.	2423.	2220.
6	491.	976.	1273.	1268.	1578.
Total	101532.	109534.	106683.	101183.	82994.

AGE	2003	2004	2005	2006	2007
1	21082.	15471.	26719.	33930.	28618.
2	18502.	13316.	9817.	16989.	21515.
3	14528.	8729.	7582.	5019.	9813.
4	7355.	5603.	3099.	1758.	1937.
5	2481.	2886.	712.	676.	399.
6	2199.	2153.	336.	398.	162.
Total	66147.	48158.	48264.	58770.	62443.

AGE	2008	2009	2010	2011	2012
1	38829.	51690.	13258.	9868.	8215.
2	18207.	24736.	32946.	8452.	6283.
3	12541.	11220.	15548.	20897.	5259.
4	4919.	6501.	6157.	9405.	12714.
5	721.	2465.	3080.	3226.	5286.
6	141.	351.	686.	787.	1012.
Total	75359.	96964.	71674.	52636.	38770.

AGE	2013
1	21190.
2	5229.
3	3922.
4	3063.
5	7651.
6	3790.
Total	44846.

Fishing Mortality Calculated

AGE	1973	1974	1975	1976	1977
1	0.0085	0.0350	0.0513	0.0178	0.0131
2	0.1864	0.4269	0.9220	0.8051	0.5045
3	0.5257	0.7037	1.0076	0.6914	1.0137
4	0.6976	0.9253	1.1199	0.7590	0.7413
5	0.6976	0.9253	1.1199	0.7590	0.7413
6	0.6976	0.9253	1.1199	0.7590	0.7413

AGE	1978	1979	1980	1981	1982
1	0.1336	0.0074	0.0074	0.0012	0.0725
2	0.2143	0.2684	0.1558	0.0412	0.3646
3	0.7218	0.5054	0.5793	0.4940	0.5819
4	0.7017	0.7313	0.5416	0.9592	0.8310
5	0.7017	0.7313	0.5416	0.9592	0.8310
6	0.7017	0.7313	0.5416	0.9592	0.8310

AGE	1983	1984	1985	1986	1987
1	0.0765	0.0338	0.0437	0.0149	0.0108
2	0.5595	0.4360	0.5960	0.6035	0.5499
3	0.9720	1.0636	0.5918	0.4032	0.9887
4	0.5286	1.4581	0.7815	0.6251	1.0870
5	0.5286	1.4581	0.7815	0.6251	1.0870
6	0.5286	1.4581	0.7815	0.6251	1.0870

AGE	1988	1989	1990	1991	1992
1	0.0134	0.0119	0.0116	0.0212	0.0938
2	0.3889	0.0962	0.2334	0.0118	0.6047
3	0.7686	0.3270	0.6903	0.3419	0.4613
4	1.2313	0.7017	0.7375	1.0844	0.9611
5	1.2313	0.7017	0.7375	1.0844	0.9611
6	1.2313	0.7017	0.7375	1.0844	0.9611

AGE	1993	1994	1995	1996	1997
1	0.2651	0.0023	0.0019	0.0039	0.0022
2	0.0927	0.1303	0.0160	0.0432	0.0719
3	0.6391	1.1018	0.2656	0.1810	0.2050
4	1.2060	1.3783	0.5930	0.3471	0.3262
5	1.2060	1.3783	0.5930	0.3471	0.3262
6	1.2060	1.3783	0.5930	0.3471	0.3262

Fishing Mortality Calculated

AGE	1998	1999	2000	2001	2002
1	0.0042	0.0014	0.0037	0.0050	0.0090
2	0.0878	0.1143	0.1545	0.1346	0.2034
3	0.4234	0.3570	0.4923	0.6229	0.3124
4	0.4520	0.4732	0.6983	0.6960	0.4706
5	0.4520	0.4732	0.6983	0.6960	0.4706
6	0.4520	0.4732	0.6983	0.6960	0.4706

AGE	2003	2004	2005	2006	2007
1	0.0094	0.0049	0.0028	0.0056	0.0022
2	0.3013	0.1132	0.2208	0.0989	0.0897
3	0.5028	0.5856	1.0116	0.5023	0.2406
4	0.4856	1.6134	1.0728	1.0333	0.5384
5	0.4856	1.6134	1.0728	1.0333	0.5384
6	0.4856	1.6134	1.0728	1.0333	0.5384

AGE	2008	2009	2010	2011	2012
1	0.0009	0.0004	0.0002	0.0014	0.0018
2	0.0342	0.0143	0.0052	0.0245	0.0214
3	0.2070	0.1501	0.0526	0.0469	0.0905
4	0.2407	0.2971	0.1963	0.1262	0.0578
5	0.2407	0.2971	0.1963	0.1262	0.0578
6	0.2407	0.2971	0.1963	0.1262	0.0578

Average Fishing Mortality For Ages 4- 5

Year	Average F	N Weighted	Biomass Wtd	Catch Wtd
1973	0.6976	0.6976	0.6976	0.6976
1974	0.9253	0.9253	0.9253	0.9253
1975	1.1199	1.1199	1.1199	1.1199
1976	0.7590	0.7590	0.7590	0.7590
1977	0.7413	0.7413	0.7413	0.7413
1978	0.7017	0.7017	0.7017	0.7017
1979	0.7313	0.7313	0.7313	0.7313
1980	0.5416	0.5416	0.5416	0.5416
1981	0.9592	0.9592	0.9592	0.9592
1982	0.8310	0.8310	0.8310	0.8310
1983	0.5286	0.5286	0.5286	0.5286
1984	1.4581	1.4581	1.4581	1.4581
1985	0.7815	0.7815	0.7815	0.7815
1986	0.6251	0.6251	0.6251	0.6251
1987	1.0870	1.0870	1.0870	1.0870
1988	1.2313	1.2313	1.2313	1.2313
1989	0.7017	0.7017	0.7017	0.7017
1990	0.7375	0.7375	0.7375	0.7375
1991	1.0844	1.0844	1.0844	1.0844
1992	0.9611	0.9611	0.9611	0.9611
1993	1.2060	1.2060	1.2060	1.2060
1994	1.3783	1.3783	1.3783	1.3783
1995	0.5930	0.5930	0.5930	0.5930
1996	0.3471	0.3471	0.3471	0.3471
1997	0.3262	0.3262	0.3262	0.3262
1998	0.4520	0.4520	0.4520	0.4520
1999	0.4732	0.4732	0.4732	0.4732
2000	0.6983	0.6983	0.6983	0.6983
2001	0.6960	0.6960	0.6960	0.6960
2002	0.4706	0.4706	0.4706	0.4706
2003	0.4856	0.4856	0.4856	0.4856
2004	1.6134	1.6134	1.6134	1.6134
2005	1.0728	1.0728	1.0728	1.0728
2006	1.0333	1.0333	1.0333	1.0333
2007	0.5384	0.5384	0.5384	0.5384
2008	0.2407	0.2407	0.2407	0.2407
2009	0.2971	0.2971	0.2971	0.2971
2010	0.1963	0.1963	0.1963	0.1963
2011	0.1262	0.1262	0.1262	0.1262
2012	0.0578	0.0578	0.0578	0.0578

Back Calculated Partial Recruitment

AGE	1973	1974	1975	1976	1977
1	0.0121	0.0378	0.0458	0.0221	0.0130
2	0.2671	0.4613	0.8233	1.0000	0.4976
3	0.7535	0.7605	0.8997	0.8588	1.0000
4	1.0000	1.0000	1.0000	0.9428	0.7313
5	1.0000	1.0000	1.0000	0.9428	0.7313
6	1.0000	1.0000	1.0000	0.9428	0.7313

AGE	1978	1979	1980	1981	1982
1	0.1851	0.0101	0.0128	0.0012	0.0873
2	0.2969	0.3671	0.2689	0.0430	0.4387
3	1.0000	0.6911	1.0000	0.5150	0.7002
4	0.9722	1.0000	0.9350	1.0000	1.0000
5	0.9722	1.0000	0.9350	1.0000	1.0000
6	0.9722	1.0000	0.9350	1.0000	1.0000

AGE	1983	1984	1985	1986	1987
1	0.0787	0.0232	0.0560	0.0238	0.0099
2	0.5756	0.2990	0.7627	0.9654	0.5059
3	1.0000	0.7295	0.7573	0.6449	0.9096
4	0.5438	1.0000	1.0000	1.0000	1.0000
5	0.5438	1.0000	1.0000	1.0000	1.0000
6	0.5438	1.0000	1.0000	1.0000	1.0000

AGE	1988	1989	1990	1991	1992
1	0.0109	0.0170	0.0158	0.0195	0.0975
2	0.3159	0.1372	0.3165	0.0109	0.6292
3	0.6242	0.4659	0.9360	0.3153	0.4799
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000

AGE	1993	1994	1995	1996	1997
1	0.2198	0.0017	0.0031	0.0113	0.0068
2	0.0768	0.0945	0.0269	0.1245	0.2203
3	0.5300	0.7993	0.4479	0.5213	0.6283
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000

Back Calculated Partial Recruitment

AGE	1998	1999	2000	2001	2002
1	0.0093	0.0030	0.0053	0.0071	0.0192
2	0.1943	0.2416	0.2212	0.1934	0.4321
3	0.9368	0.7544	0.7050	0.8950	0.6639
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000

AGE	2003	2004	2005	2006	2007
1	0.0188	0.0030	0.0026	0.0054	0.0041
2	0.5991	0.0701	0.2058	0.0957	0.1666
3	1.0000	0.3630	0.9430	0.4861	0.4469
4	0.9658	1.0000	1.0000	1.0000	1.0000
5	0.9658	1.0000	1.0000	1.0000	1.0000
6	0.9658	1.0000	1.0000	1.0000	1.0000

AGE	2008	2009	2010	2011	2012
1	0.0038	0.0014	0.0010	0.0110	0.0197
2	0.1419	0.0482	0.0267	0.1941	0.2363
3	0.8600	0.5052	0.2682	0.3718	1.0000
4	1.0000	1.0000	1.0000	1.0000	0.6387
5	1.0000	1.0000	1.0000	1.0000	0.6387
6	1.0000	1.0000	1.0000	1.0000	0.6387

JAN-1 Biomass

AGE	1973	1974	1975	1976	1977
1	2891.	5931.	7818.	2711.	2534.
2	10942.	6230.	10029.	13079.	5378.
3	16290.	8254.	5703.	5533.	8026.
4	10606.	8067.	3285.	1804.	2501.
5	5182.	4331.	2360.	837.	680.
6	3093.	2515.	1485.	1795.	1064.
Total	49004.	35328.	30680.	25758.	20182.

AGE	1978	1979	1980	1981	1982
1	5592.	3662.	2954.	8850.	2745.
2	4318.	10062.	6550.	6194.	13899.
3	4499.	4434.	10782.	7402.	8308.
4	2762.	1930.	2465.	5220.	4092.
5	923.	1035.	749.	1131.	1577.
6	491.	719.	351.	237.	221.
Total	18584.	21842.	23852.	29035.	30843.

AGE	1983	1984	1985	1986	1987
1	1266.	2083.	3708.	2035.	1329.
2	4189.	1276.	2861.	4262.	2288.
3	11702.	2771.	999.	1835.	2529.
4	3985.	3639.	898.	592.	1073.
5	1398.	1730.	694.	394.	252.
6	463.	465.	144.	301.	216.
Total	23004.	11963.	9305.	9419.	7688.

AGE	1988	1989	1990	1991	1992
1	2695.	1165.	1728.	3057.	2006.
2	2272.	5383.	2130.	2457.	4620.
3	1477.	2036.	6106.	2065.	2887.
4	857.	651.	1250.	2380.	1260.
5	289.	205.	229.	450.	659.
6	87.	77.	51.	113.	91.
Total	7676.	9517.	11494.	10521.	11522.

AGE	1993	1994	1995	1996	1997
1	1713.	6230.	4333.	2378.	8263.
2	3289.	2179.	5647.	4372.	3833.
3	2847.	3573.	2273.	5146.	4089.
4	1688.	1216.	967.	1619.	3829.
5	380.	420.	247.	482.	1049.
6	133.	176.	77.	117.	374.
Total	10049.	13794.	13544.	14114.	21439.

JAN-1 Biomass

AGE	1998	1999	2000	2001	2002
1	6144.	7679.	8109.	8965.	7317.
2	7492.	8063.	9269.	8144.	8633.
3	4313.	6655.	7532.	7643.	6571.
4	2988.	2622.	4216.	3786.	3445.
5	2225.	1649.	1393.	1713.	1585.
6	474.	879.	1214.	1302.	1685.
Total	23635.	27547.	31733.	31552.	29237.

AGE	2003	2004	2005	2006	2007
1	4248.	2568.	1969.	1992.	3148.
2	5887.	3436.	2633.	3264.	3664.
3	6174.	3461.	2739.	1888.	3494.
4	4118.	2950.	1585.	877.	919.
5	1836.	1987.	475.	456.	264.
6	2304.	2058.	333.	396.	166.
Total	24568.	16460.	9734.	8872.	11654.

AGE	2008	2009	2010	2011	2012
1	691.	5552.	1657.	777.	1350.
2	3927.	3072.	7373.	2047.	1309.
3	4351.	4062.	5852.	8064.	2053.
4	2297.	3072.	2922.	4597.	6431.
5	436.	1505.	1836.	1868.	3220.
6	136.	326.	554.	588.	816.
Total	11837.	17588.	20196.	17941.	15178.

AGE	2013
1	2600.
2	1175.
3	1507.
4	1500.
5	4551.
6	2983.
Total	14316.

Mean Biomass

AGE	1973	1974	1975	1976	1977
1	4282.	7788.	10217.	3853.	3337.
2	9664.	7656.	9046.	12377.	6165.
3	11922.	5846.	3579.	4329.	5462.
4	7156.	5024.	1751.	1193.	1576.
5	3297.	2669.	1202.	563.	440.
6	1840.	1366.	749.	1041.	622.
Total	38161.	30349.	26545.	23356.	17604.

AGE	1978	1979	1980	1981	1982
1	7607.	4941.	4314.	11184.	3430.
2	5190.	12890.	8256.	8915.	14935.
3	3236.	3464.	8243.	5903.	6235.
4	1882.	1285.	1863.	3098.	2660.
5	617.	627.	530.	630.	994.
6	291.	422.	223.	127.	125.
Total	18824.	23628.	23429.	29858.	28378.

AGE	1983	1984	1985	1986	1987
1	1286.	2465.	4016.	2177.	1753.
2	4232.	1106.	2649.	3617.	1935.
3	7559.	1616.	903.	1510.	1662.
4	2843.	1729.	672.	419.	615.
5	951.	797.	482.	278.	139.
6	295.	207.	83.	184.	111.
Total	17166.	7921.	8804.	8186.	6215.

AGE	1988	1989	1990	1991	1992
1	3843.	1590.	2079.	3792.	2601.
2	2532.	7391.	2627.	2957.	4442.
3	1119.	1782.	4003.	1609.	2351.
4	478.	439.	776.	1350.	806.
5	156.	136.	132.	256.	408.
6	42.	46.	30.	58.	49.
Total	8171.	11383.	9647.	10021.	10657.

AGE	1993	1994	1995	1996	1997
1	1974.	5981.	4389.	3045.	7934.
2	4262.	2666.	5388.	4348.	4757.
3	1973.	2019.	1875.	4642.	3648.
4	966.	623.	689.	1407.	3062.
5	192.	215.	174.	410.	832.
6	65.	81.	48.	80.	260.
Total	9432.	11586.	12563.	13932.	20493.

Mean Biomass

AGE	1998	1999	2000	2001	2002
1	7100.	8509.	8197.	8875.	6621.
2	6917.	8861.	9580.	7754.	7811.
3	3424.	5817.	5571.	5137.	5295.
4	2277.	2093.	2794.	2544.	2707.
5	1610.	1266.	906.	1171.	1209.
6	312.	574.	722.	775.	1101.
Total	21640.	27121.	27771.	26257.	24745.

AGE	2003	2004	2005	2006	2007
1	3854.	2623.	2557.	2725.	3545.
2	4670.	2973.	2439.	4053.	4822.
3	4440.	2381.	1781.	1343.	2898.
4	3119.	1387.	950.	510.	667.
5	1328.	886.	279.	268.	199.
6	1497.	871.	171.	206.	105.
Total	18908.	11121.	8177.	9107.	12236.

AGE	2008	2009	2010	2011	2012
1	1469.	6451.	1858.	1016.	1223.
2	4359.	6490.	8549.	2268.	1698.
3	3815.	3661.	5279.	7592.	1836.
4	1893.	2464.	2354.	3954.	5533.
5	351.	1214.	1499.	1584.	2781.
6	98.	230.	408.	447.	640.
Total	11985.	20510.	19947.	16861.	13712.

Spawning Stock Biomass

AGE	1973	1974	1975	1976	1977
1	0.	0.	0.	0.	0.
2	4629.	3686.	4337.	5950.	2970.
3	12023.	5891.	3582.	4363.	5466.
4	7458.	5213.	1805.	1242.	1642.
5	3436.	2770.	1239.	586.	459.
6	1917.	1418.	772.	1085.	648.
Total	29463.	18977.	11735.	13226.	11184.

AGE	1978	1979	1980	1981	1982
1	0.	0.	0.	0.	0.
2	2488.	6188.	3951.	4248.	7184.
3	3260.	3493.	8313.	5952.	6288.
4	1961.	1338.	1943.	3212.	2766.
5	643.	653.	553.	653.	1033.
6	304.	439.	232.	132.	130.
Total	8657.	12112.	14992.	14197.	17401.

AGE	1983	1984	1985	1986	1987
1	0.	0.	0.	0.	0.
2	2039.	533.	1276.	1743.	932.
3	7574.	1614.	910.	1521.	1665.
4	2965.	1749.	700.	437.	635.
5	992.	806.	502.	290.	143.
6	308.	210.	86.	192.	114.
Total	13878.	4912.	3474.	4183.	3489.

AGE	1988	1989	1990	1991	1992
1	0.	0.	0.	0.	0.
2	1219.	3530.	1260.	1407.	2140.
3	1127.	1793.	4035.	1620.	2370.
4	490.	458.	808.	1393.	836.
5	160.	142.	137.	264.	423.
6	43.	48.	31.	59.	50.
Total	3038.	5970.	6272.	4743.	5819.

AGE	1993	1994	1995	1996	1997
1	0.	0.	0.	0.	0.
2	2035.	1275.	2564.	2072.	2270.
3	1989.	2014.	1884.	4654.	3659.
4	992.	633.	719.	1465.	3186.
5	197.	218.	182.	427.	866.
6	66.	82.	50.	84.	271.
Total	5280.	4223.	5399.	8701.	10252.

Spawning Stock Biomass

AGE	1998	1999	2000	2001	2002
1	0.	0.	0.	0.	0.
2	3302.	4235.	4584.	3708.	3743.
3	3451.	5856.	5617.	5180.	5326.
4	2373.	2182.	2912.	2652.	2822.
5	1678.	1320.	945.	1221.	1260.
6	326.	598.	752.	808.	1148.
Total	11130.	14191.	14811.	13568.	14300.

AGE	2003	2004	2005	2006	2007
1	0.	0.	0.	0.	0.
2	2244.	1421.	1169.	1936.	2302.
3	4477.	2401.	1782.	1354.	2911.
4	3252.	1387.	981.	528.	695.
5	1384.	887.	288.	277.	207.
6	1560.	871.	176.	213.	110.
Total	12917.	6967.	4397.	4309.	6225.

AGE	2008	2009	2010	2011	2012
1	0.	0.	0.	0.	0.
2	2076.	3089.	4067.	1080.	809.
3	3828.	3667.	5268.	7573.	1835.
4	1966.	2562.	2441.	4091.	5711.
5	365.	1262.	1555.	1639.	2871.
6	102.	239.	424.	463.	660.
Total	8336.	10819.	13754.	14846.	11885.

Catch Biomass

AGE	1973	1974	1975	1976	1977
1	36.	272.	524.	69.	44.
2	1801.	3268.	8340.	9965.	3110.
3	6267.	4114.	3606.	2993.	5537.
4	4992.	4648.	1961.	905.	1169.
5	2300.	2470.	1346.	427.	327.
6	1283.	1264.	839.	790.	461.
Total	16680.	16037.	16618.	15149.	10647.

AGE	1978	1979	1980	1981	1982
1	1016.	37.	32.	13.	249.
2	1112.	3460.	1286.	368.	5445.
3	2336.	1751.	4775.	2916.	3628.
4	1321.	939.	1009.	2972.	2210.
5	433.	459.	287.	604.	826.
6	204.	308.	121.	122.	104.
Total	6422.	6954.	7510.	6995.	12462.

AGE	1983	1984	1985	1986	1987
1	98.	83.	176.	32.	19.
2	2367.	482.	1579.	2183.	1064.
3	7347.	1719.	534.	609.	1644.
4	1503.	2522.	525.	262.	669.
5	503.	1162.	377.	174.	151.
6	156.	302.	65.	115.	120.
Total	11975.	6270.	3255.	3375.	3666.

AGE	1988	1989	1990	1991	1992
1	51.	19.	24.	80.	244.
2	985.	711.	613.	35.	2686.
3	860.	583.	2763.	550.	1085.
4	589.	308.	572.	1463.	775.
5	192.	95.	97.	277.	393.
6	52.	32.	22.	62.	47.
Total	2729.	1749.	4092.	2468.	5228.

AGE	1993	1994	1995	1996	1997
1	523.	14.	8.	12.	18.
2	395.	347.	86.	188.	342.
3	1261.	2225.	498.	840.	748.
4	1165.	859.	409.	489.	999.
5	232.	296.	103.	142.	272.
6	78.	112.	28.	28.	85.
Total	3654.	3852.	1132.	1699.	2462.

Catch Biomass

AGE	1998	1999	2000	2001	2002
1	30.	12.	30.	44.	60.
2	607.	1013.	1480.	1044.	1588.
3	1450.	2077.	2743.	3200.	1654.
4	1029.	990.	1951.	1771.	1274.
5	728.	599.	633.	815.	569.
6	141.	272.	504.	539.	518.
Total	3985.	4963.	7341.	7413.	5664.

AGE	2003	2004	2005	2006	2007
1	36.	13.	7.	15.	8.
2	1407.	336.	539.	401.	432.
3	2233.	1394.	1802.	675.	697.
4	1515.	2237.	1019.	527.	359.
5	645.	1430.	299.	277.	107.
6	727.	1405.	183.	213.	57.
Total	6562.	6816.	3849.	2108.	1660.

AGE	2008	2009	2010	2011	2012
1	1.	3.	0.	1.	2.
2	149.	93.	45.	56.	36.
3	790.	550.	278.	356.	166.
4	456.	732.	462.	499.	320.
5	85.	361.	294.	200.	161.
6	24.	68.	80.	56.	37.
Total	1504.	1806.	1159.	1168.	723.

Catch Numbers

AGE	1973	1974	1975	1976	1977
1	359.3	2367.5	4636.2	635.1	377.9
2	5175.0	9500.0	26393.9	31938.1	9094.2
3	13565.3	8294.2	7375.1	5501.9	10567.1
4	9473.0	7657.9	3540.2	1425.7	1846.2
5	3814.6	3642.6	2175.2	574.2	418.6
6	1649.7	1519.6	1207.2	918.1	495.0
Total	34036.9	32981.8	45327.8	40993.1	22799.0

AGE	1978	1979	1980	1981	1982
1	9962.0	320.6	317.8	107.4	2163.5
2	3542.1	10516.6	3994.4	1097.1	18091.3
3	4579.7	3789.4	9685.3	5963.4	7480.3
4	1913.8	1432.1	1538.4	4920.2	3400.5
5	539.5	623.0	351.9	854.4	1095.2
6	210.8	324.6	112.6	145.3	95.8
Total	20747.9	17006.3	16000.4	13087.8	32326.6

AGE	1983	1984	1985	1986	1987
1	702.8	514.3	970.3	178.8	156.4
2	7998.1	2017.7	4373.6	6402.1	3284.2
3	16660.9	4534.6	1057.6	1127.5	3136.7
4	2475.9	5043.0	818.4	388.8	983.3
5	679.6	1796.3	516.6	203.6	192.3
6	154.6	379.5	80.7	113.4	137.3
Total	28671.9	14285.4	7817.2	8414.2	7890.2

AGE	1988	1989	1990	1991	1992
1	499.0	189.8	230.6	663.3	2413.9
2	3002.6	2175.4	2114.4	147.3	9167.4
3	1544.1	1120.6	6995.7	1491.2	2971.5
4	846.1	428.2	978.3	3011.1	1473.0
5	227.0	110.1	140.2	383.2	603.1
6	53.3	30.4	26.1	71.2	42.0
Total	6172.1	4054.5	10485.3	5767.3	16670.9

AGE	1993	1994	1995	1996	1997
1	5233.5	71.2	46.9	100.6	81.8
2	1385.8	1336.3	312.7	680.9	1132.3
3	3326.9	6302.4	1435.3	2064.3	1832.4
4	2325.5	1819.3	878.6	885.0	1856.8
5	411.0	476.7	170.1	201.2	378.2
6	90.5	143.9	36.9	27.6	89.6
Total	12773.2	10149.8	2880.5	3959.6	5371.1

Catch Numbers

AGE	1998	1999	2000	2001	2002
1	168.5	60.1	131.8	175.9	211.9
2	1991.4	2752.9	3863.5	2883.5	4168.9
3	3387.8	4195.0	5713.9	6956.4	3446.3
4	1884.9	1547.6	3173.0	2893.2	1915.8
5	1121.3	793.5	826.3	1003.9	683.0
6	146.2	301.4	528.5	525.1	485.3
Total	8700.1	9650.5	14237.0	14438.0	10911.2

AGE	2003	2004	2005	2006	2007
1	159.7	60.8	59.8	151.9	50.8
2	3919.1	1152.3	1579.2	1292.7	1491.2
3	4710.0	3183.6	4031.1	1626.0	1705.1
4	2319.9	3824.3	1706.9	946.8	662.3
5	782.4	1969.8	392.0	364.0	136.4
6	693.5	1469.7	185.0	214.2	55.5
Total	12584.6	11660.5	7954.0	4595.6	4101.3

AGE	2008	2009	2010	2011	2012
1	28.9	17.4	2.0	11.0	11.8
2	493.1	283.5	138.5	164.8	107.2
3	1903.3	1266.3	643.2	772.6	367.8
4	855.1	1360.7	890.0	902.0	576.5
5	125.3	516.0	445.2	309.4	239.7
6	24.5	73.5	99.2	75.5	45.9
Total	3430.2	3517.4	2218.1	2235.3	1348.9

Surplus Production

Average Adjustment Factor (Delta) = 1.0000

Year	Biomass	Delta Biomass	Catch Biomass	Surplus Production
1973	49004.022	-13676.196	16680.299	3004.104
1974	35327.827	-4647.657	16036.521	11388.864
1975	30680.170	-4921.919	16617.511	11695.592
1976	25758.251	-5576.026	15149.320	9573.294
1977	20182.224	-1597.878	10647.211	9049.333
1978	18584.347	3257.302	6422.207	9679.509
1979	21841.649	2010.154	6953.568	8963.722
1980	23851.802	5183.042	7510.196	12693.238
1981	29034.845	1807.668	6994.648	8802.316
1982	30842.513	-7838.656	12461.991	4623.334
1983	23003.856	-11040.504	11975.208	934.703
1984	11963.352	-2658.328	6270.328	3612.000
1985	9305.024	113.823	3255.156	3368.979
1986	9418.847	-1730.720	3375.356	1644.635
1987	7688.127	-11.643	3666.181	3654.538
1988	7676.484	1840.037	2728.755	4568.791
1989	9516.521	1977.067	1748.710	3725.776

1990	11493.587	-972.160	4092.209	3120.049
1991	10521.427	1000.924	2468.313	3469.237
1992	11522.351	-1473.354	5228.486	3755.132
1993	10048.998	3745.161	3654.179	7399.340
1994	13794.158	-250.292	3852.190	3601.898
1995	13543.866	570.473	1132.341	1702.814
1996	14114.340	7324.205	1698.769	9022.975
1997	21438.545	2196.915	2462.436	4659.351
1998	23635.460	3911.625	3985.457	7897.082
1999	27547.086	4185.945	4962.850	9148.795
2000	31733.030	-181.259	7341.104	7159.846
2001	31551.771	-2314.795	7413.005	5098.210
2002	29236.976	-4668.617	5663.577	994.960
2003	24568.359	-8108.074	6562.289	-1545.786
2004	16460.285	-6725.826	6816.041	90.214
2005	9734.459	-862.018	3848.975	2986.958
2006	8872.441	2781.990	2108.432	4890.422
2007	11654.431	182.925	1660.338	1843.263
2008	11837.356	5750.871	1504.059	7254.930
2009	17588.227	2607.477	1806.281	4413.758
2010	20195.704	-2254.273	1159.287	-1094.987
2011	17941.431	-2763.737	1168.191	-1595.546
2012	15177.694	-861.929	722.561	-139.368
2013	14315.765			

Summary of Survey Indices Used in the Estimate

INDEX	Survey Tag	Age	Time	Type	Catchability	Std. Error	CV
55	Spring_single	1	JAN-1	NUMBER	0.2594E-02	0.5251E-03	0.2024E+00
56	Spring_single	2	JAN-1	NUMBER	0.5318E-01	0.9474E-02	0.1782E+00
57	Spring_single	3	JAN-1	NUMBER	0.1925E+00	0.3454E-01	0.1795E+00
58	Spring_single	4	JAN-1	NUMBER	0.2794E+00	0.4468E-01	0.1599E+00
59	Spring_single	5	JAN-1	NUMBER	0.2802E+00	0.4119E-01	0.1470E+00
60	Spring_single	6	JAN-1	NUMBER	0.3175E+00	0.4247E-01	0.1337E+00
61	Fall_single	1	MEAN	NUMBER	0.2593E-01	0.4637E-02	0.1788E+00
62	Fall_single	2	MEAN	NUMBER	0.9859E-01	0.1800E-01	0.1826E+00
63	Fall_single	3	MEAN	NUMBER	0.2157E+00	0.3312E-01	0.1536E+00
64	Fall_single	4	MEAN	NUMBER	0.1895E+00	0.2579E-01	0.1360E+00
65	Fall_single	5	MEAN	NUMBER	0.2192E+00	0.3771E-01	0.1720E+00
66	Fall_single	6	MEAN	NUMBER	0.2142E+00	0.4779E-01	0.2231E+00
68	DFO_single	2	JAN-1	NUMBER	0.1284E+00	0.2932E-01	0.2283E+00
69	DFO_single	3	JAN-1	NUMBER	0.5641E+00	0.1343E+00	0.2381E+00
70	DFO_single	4	JAN-1	NUMBER	0.8851E+00	0.1875E+00	0.2119E+00
71	DFO_single	5	JAN-1	NUMBER	0.7410E+00	0.1630E+00	0.2199E+00
72	DFO_single	6	JAN-1	NUMBER	0.4853E+00	0.1132E+00	0.2332E+00
73	scallop_single	1	MEAN	NUMBER	0.1877E-04	0.3284E-05	0.1750E+00

Survey Index: 55 Tag: Spring_single AGE = 1
Time = JAN-1 Type = NUMBER
Catchability = 0.259366E-02 % Variance Contribution = 3.5161
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	N/A	0.137103E+03	N/A	N/A
1974	N/A	0.221657E+03	N/A	N/A
1975	N/A	0.298180E+03	N/A	N/A
1976	N/A	0.115855E+03	N/A	N/A
1977	N/A	0.932291E+02	N/A	N/A
1978	N/A	0.255331E+03	N/A	N/A
1979	N/A	0.140090E+03	N/A	N/A
1980	N/A	0.138030E+03	N/A	N/A
1981	N/A	0.295426E+03	N/A	N/A
1982	0.440660E+02	0.993083E+02	-0.812541E+00	-0.812541E+00
1983	N/A	0.306385E+02	N/A	N/A
1984	N/A	0.497861E+02	N/A	N/A
1985	0.106381E+03	0.729199E+02	0.377666E+00	0.377666E+00
1986	0.265950E+02	0.390044E+02	-0.382951E+00	-0.382951E+00
1987	0.265950E+02	0.468993E+02	-0.567280E+00	-0.567280E+00
1988	0.755150E+02	0.120929E+03	-0.470875E+00	-0.470875E+00
1989	0.452310E+02	0.514787E+02	-0.129386E+00	-0.129386E+00
1990	N/A	0.641125E+02	N/A	N/A
1991	0.422513E+03	0.101929E+03	0.142195E+01	0.142195E+01
1992	N/A	0.865736E+02	N/A	N/A
1993	0.447460E+02	0.716752E+02	-0.471143E+00	-0.471143E+00
1994	N/A	0.999260E+02	N/A	N/A
1995	0.390190E+02	0.813194E+02	-0.734336E+00	-0.734336E+00
1996	0.243630E+02	0.825643E+02	-0.122051E+01	-0.122051E+01
1997	0.181510E+02	0.119533E+03	-0.188487E+01	-0.188487E+01
1998	N/A	0.128715E+03	N/A	N/A
1999	0.487250E+02	0.135768E+03	-0.102476E+01	-0.102476E+01
2000	0.177333E+03	0.115492E+03	0.428828E+00	0.428828E+00
2001	N/A	0.114144E+03	N/A	N/A
2002	0.182380E+03	0.759418E+02	0.876125E+00	0.876125E+00
2003	0.196066E+03	0.546798E+02	0.127696E+01	0.127696E+01
2004	0.470750E+02	0.401273E+02	0.159685E+00	0.159685E+00
2005	N/A	0.692986E+02	N/A	N/A
2006	0.493466E+03	0.880029E+02	0.172408E+01	0.172408E+01
2007	0.870650E+02	0.742254E+02	0.159549E+00	0.159549E+00
2008	N/A	0.100710E+03	N/A	N/A
2009	0.218782E+03	0.134067E+03	0.489733E+00	0.489733E+00
2010	0.164870E+02	0.343866E+02	-0.735094E+00	-0.735094E+00
2011	0.268770E+02	0.255940E+02	0.489125E-01	0.489125E-01
2012	0.926950E+02	0.213076E+02	0.147025E+01	0.147025E+01
2013	N/A	0.000000E+00	N/A	N/A

Survey Index: 56 Tag: Spring_single AGE = 2
Time = JAN-1 Type = NUMBER
Catchability = 0.531759E-01 % Variance Contribution = 5.4823
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	N/A	0.199599E+04	N/A	N/A
1974	N/A	0.177720E+04	N/A	N/A
1975	N/A	0.279813E+04	N/A	N/A
1976	N/A	0.370322E+04	N/A	N/A

1977	N/A	0.148783E+04	N/A	N/A
1978	N/A	0.120287E+04	N/A	N/A
1979	N/A	0.292053E+04	N/A	N/A
1980	N/A	0.181788E+04	N/A	N/A
1981	N/A	0.179107E+04	N/A	N/A
1982	0.365654E+04	0.385754E+04	-0.535126E-01	-0.535126E-01
1983	0.181002E+04	0.120739E+04	0.404875E+00	0.404875E+00
1984	0.902680E+02	0.371025E+03	-0.141349E+01	-0.141349E+01
1985	0.213421E+04	0.629219E+03	0.122137E+01	0.122137E+01
1986	0.175305E+04	0.912482E+03	0.652942E+00	0.652942E+00
1987	0.732820E+02	0.502374E+03	-0.192503E+01	-0.192503E+01
1988	0.266922E+03	0.606525E+03	-0.820789E+00	-0.820789E+00
1989	0.391259E+03	0.155989E+04	-0.138300E+01	-0.138300E+01
1990	0.636730E+02	0.664986E+03	-0.234601E+01	-0.234601E+01
1991	N/A	0.828428E+03	N/A	N/A
1992	0.198774E+04	0.130459E+04	0.421110E+00	0.421110E+00
1993	0.281093E+03	0.103048E+04	-0.129909E+01	-0.129909E+01
1994	0.602273E+03	0.718803E+03	-0.176877E+00	-0.176877E+00
1995	0.114456E+04	0.130332E+04	-0.129894E+00	-0.129894E+00
1996	0.958104E+03	0.106110E+04	-0.102107E+00	-0.102107E+00
1997	0.113447E+04	0.107512E+04	0.537350E-01	0.537350E-01
1998	0.202007E+04	0.155919E+04	0.258962E+00	0.258962E+00
1999	0.460630E+04	0.167557E+04	0.101127E+01	0.101127E+01
2000	0.467764E+04	0.177234E+04	0.970490E+00	0.970490E+00
2001	0.224671E+04	0.150426E+04	0.401164E+00	0.401164E+00
2002	0.234154E+04	0.148478E+04	0.455542E+00	0.455542E+00
2003	0.424144E+04	0.983857E+03	0.146118E+01	0.146118E+01
2004	0.957327E+03	0.708099E+03	0.301561E+00	0.301561E+00
2005	0.195348E+04	0.522019E+03	0.131966E+01	0.131966E+01
2006	0.907826E+03	0.903413E+03	0.487332E-02	0.487332E-02
2007	0.489972E+04	0.114405E+04	0.145460E+01	0.145460E+01
2008	0.220671E+04	0.968198E+03	0.823821E+00	0.823821E+00
2009	0.546401E+03	0.131535E+04	-0.878502E+00	-0.878502E+00
2010	0.662757E+03	0.175191E+04	-0.972053E+00	-0.972053E+00
2011	0.236595E+03	0.449447E+03	-0.641667E+00	-0.641667E+00
2012	0.530058E+03	0.334124E+03	0.461476E+00	0.461476E+00
2013	0.441952E+03	0.278054E+03	0.463386E+00	0.463386E+00

Survey Index: 57 Tag: Spring_single AGE = 3
Time = JAN-1 Type = NUMBER
Catchability = 0.192457E+00 % Variance Contribution = 5.9336
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	N/A	0.777733E+04	N/A	N/A
1974	N/A	0.382307E+04	N/A	N/A
1975	N/A	0.267633E+04	N/A	N/A
1976	N/A	0.256823E+04	N/A	N/A
1977	N/A	0.382051E+04	N/A	N/A
1978	N/A	0.207328E+04	N/A	N/A
1979	N/A	0.224041E+04	N/A	N/A
1980	N/A	0.515312E+04	N/A	N/A
1981	N/A	0.359000E+04	N/A	N/A
1982	0.109652E+04	0.396639E+04	-0.128572E+01	-0.128572E+01
1983	0.264777E+04	0.618233E+04	-0.847978E+00	-0.847978E+00
1984	0.806007E+03	0.159245E+04	-0.680935E+00	-0.680935E+00
1985	0.254401E+03	0.553681E+03	-0.777677E+00	-0.777677E+00
1986	0.282646E+03	0.800079E+03	-0.104051E+01	-0.104051E+01
1987	0.132976E+03	0.115164E+04	-0.215877E+01	-0.215877E+01
1988	0.355249E+03	0.668936E+03	-0.632869E+00	-0.632869E+00
1989	0.737675E+03	0.948691E+03	-0.251579E+00	-0.251579E+00

1990	0.107468E+04	0.326950E+04	-0.111262E+01	-0.111262E+01
1991	0.246927E+03	0.121519E+04	-0.159356E+01	-0.159356E+01
1992	0.184069E+04	0.188936E+04	-0.260958E-01	-0.260958E-01
1993	0.485798E+03	0.164446E+04	-0.121937E+01	-0.121937E+01
1994	0.614697E+03	0.216762E+04	-0.126026E+01	-0.126026E+01
1995	0.467036E+04	0.145616E+04	0.116543E+01	0.116543E+01
1996	0.254857E+04	0.296010E+04	-0.149691E+00	-0.149691E+00
1997	0.362305E+04	0.234515E+04	0.434967E+00	0.434967E+00
1998	0.102216E+04	0.230900E+04	-0.814891E+00	-0.814891E+00
1999	0.105017E+05	0.329573E+04	0.115891E+01	0.115891E+01
2000	0.744052E+04	0.344906E+04	0.768839E+00	0.768839E+00
2001	0.637050E+04	0.350473E+04	0.597565E+00	0.597565E+00
2002	0.119711E+05	0.303422E+04	0.137254E+01	0.137254E+01
2003	0.656492E+04	0.279597E+04	0.853560E+00	0.853560E+00
2004	0.211441E+04	0.167990E+04	0.230039E+00	0.230039E+00
2005	0.493097E+04	0.145925E+04	0.121761E+01	0.121761E+01
2006	0.341922E+04	0.965999E+03	0.126401E+01	0.126401E+01
2007	0.607912E+04	0.188857E+04	0.116904E+01	0.116904E+01
2008	0.492146E+04	0.241369E+04	0.712446E+00	0.712446E+00
2009	0.697874E+04	0.215930E+04	0.117308E+01	0.117308E+01
2010	0.518103E+04	0.299230E+04	0.548962E+00	0.548962E+00
2011	0.311597E+04	0.402185E+04	-0.255202E+00	-0.255202E+00
2012	0.347688E+04	0.101212E+04	0.123409E+01	0.123409E+01
2013	0.927993E+03	0.754747E+03	0.206641E+00	0.206641E+00

Survey Index: 58 Tag: Spring_single AGE = 4
Time = JAN-1 Type = NUMBER
Catchability = 0.279414E+00 % Variance Contribution = 4.7100
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	N/A	0.637875E+04	N/A	N/A
1974	N/A	0.425619E+04	N/A	N/A
1975	N/A	0.175094E+04	N/A	N/A
1976	N/A	0.904531E+03	N/A	N/A
1977	N/A	0.119078E+04	N/A	N/A
1978	N/A	0.128339E+04	N/A	N/A
1979	N/A	0.932576E+03	N/A	N/A
1980	N/A	0.125115E+04	N/A	N/A
1981	N/A	0.267289E+04	N/A	N/A
1982	0.992464E+03	0.202788E+04	-0.714557E+00	-0.714557E+00
1983	0.514431E+03	0.205198E+04	-0.138350E+01	-0.138350E+01
1984	0.837941E+03	0.216517E+04	-0.949305E+00	-0.949305E+00
1985	0.273425E+03	0.508874E+03	-0.621174E+00	-0.621174E+00
1986	0.546460E+02	0.283622E+03	-0.164677E+01	-0.164677E+01
1987	0.129287E+03	0.494902E+03	-0.134232E+01	-0.134232E+01
1988	0.234697E+03	0.396640E+03	-0.524733E+00	-0.524733E+00
1989	0.280996E+03	0.287127E+03	-0.215830E-01	-0.215830E-01
1990	0.358355E+03	0.633293E+03	-0.569409E+00	-0.569409E+00
1991	0.665072E+03	0.151771E+04	-0.825060E+00	-0.825060E+00
1992	0.621782E+03	0.799171E+03	-0.250986E+00	-0.250986E+00
1993	0.307882E+03	0.110273E+04	-0.127583E+01	-0.127583E+01
1994	0.343601E+03	0.803391E+03	-0.849361E+00	-0.849361E+00
1995	0.144167E+04	0.666774E+03	0.771105E+00	0.771105E+00
1996	0.262176E+04	0.103357E+04	0.930825E+00	0.930825E+00
1997	0.396073E+04	0.228659E+04	0.549368E+00	0.549368E+00
1998	0.112340E+04	0.176864E+04	-0.453848E+00	-0.453848E+00
1999	0.264049E+04	0.139964E+04	0.634751E+00	0.634751E+00
2000	0.282850E+04	0.213504E+04	0.281262E+00	0.281262E+00
2001	0.233998E+04	0.195153E+04	0.181528E+00	0.181528E+00
2002	0.395840E+04	0.174029E+04	0.821788E+00	0.821788E+00

2003	0.279191E+04	0.205518E+04	0.306361E+00	0.306361E+00
2004	0.659928E+03	0.156545E+04	-0.863795E+00	-0.863795E+00
2005	0.233270E+04	0.865837E+03	0.991087E+00	0.991087E+00
2006	0.211266E+04	0.491202E+03	0.145885E+01	0.145885E+01
2007	0.276230E+04	0.541129E+03	0.163016E+01	0.163016E+01
2008	0.168110E+04	0.137441E+04	0.201423E+00	0.201423E+00
2009	0.445683E+04	0.181655E+04	0.897497E+00	0.897497E+00
2010	0.805716E+04	0.172032E+04	0.154405E+01	0.154405E+01
2011	0.351289E+04	0.262802E+04	0.290210E+00	0.290210E+00
2012	0.614144E+04	0.355249E+04	0.547410E+00	0.547410E+00
2013	0.110394E+04	0.855839E+03	0.254562E+00	0.254562E+00

Survey Index: 59 Tag: Spring_single AGE = 5
Time = JAN-1 Type = NUMBER
Catchability = 0.280193E+00 % Variance Contribution = 3.9812
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	N/A	0.257576E+04	N/A	N/A
1974	N/A	0.203017E+04	N/A	N/A
1975	N/A	0.107883E+04	N/A	N/A
1976	N/A	0.365315E+03	N/A	N/A
1977	N/A	0.270746E+03	N/A	N/A
1978	N/A	0.362795E+03	N/A	N/A
1979	N/A	0.406825E+03	N/A	N/A
1980	N/A	0.286991E+03	N/A	N/A
1981	N/A	0.465445E+03	N/A	N/A
1982	0.444546E+03	0.654942E+03	-0.387492E+00	-0.387492E+00
1983	0.119581E+03	0.564810E+03	-0.155250E+01	-0.155250E+01
1984	0.810375E+03	0.773375E+03	0.467332E-01	0.467332E-01
1985	0.143361E+03	0.322113E+03	-0.809536E+00	-0.809536E+00
1986	0.132879E+03	0.148936E+03	-0.114081E+00	-0.114081E+00
1987	0.509580E+02	0.970557E+02	-0.644283E+00	-0.644283E+00
1988	0.193154E+03	0.106711E+03	0.593363E+00	0.593363E+00
1989	0.593050E+02	0.740326E+02	-0.221812E+00	-0.221812E+00
1990	0.112204E+03	0.910100E+02	0.209349E+00	0.209349E+00
1991	0.255469E+03	0.193685E+03	0.276866E+00	0.276866E+00
1992	0.159959E+03	0.328122E+03	-0.718468E+00	-0.718468E+00
1993	0.260130E+02	0.195436E+03	-0.201664E+01	-0.201664E+01
1994	0.140449E+03	0.211094E+03	-0.407461E+00	-0.407461E+00
1995	0.621491E+03	0.129450E+03	0.156883E+01	0.156883E+01
1996	0.591596E+03	0.235632E+03	0.920554E+00	0.920554E+00
1997	0.682349E+03	0.467039E+03	0.379128E+00	0.379128E+00
1998	0.737093E+03	0.105507E+04	-0.358648E+00	-0.358648E+00
1999	0.157523E+04	0.719635E+03	0.783410E+00	0.783410E+00
2000	0.789215E+03	0.557548E+03	0.347491E+00	0.347491E+00
2001	0.469200E+03	0.679043E+03	-0.369655E+00	-0.369655E+00
2002	0.169034E+04	0.622159E+03	0.999491E+00	0.999491E+00
2003	0.428628E+03	0.695054E+03	-0.483400E+00	-0.483400E+00
2004	0.247704E+03	0.808569E+03	-0.118303E+01	-0.118303E+01
2005	0.261778E+03	0.199399E+03	0.272189E+00	0.272189E+00
2006	0.307688E+03	0.189371E+03	0.485381E+00	0.485381E+00
2007	0.539959E+03	0.111756E+03	0.157518E+01	0.157518E+01
2008	0.300302E+03	0.201958E+03	0.396729E+00	0.396729E+00
2009	0.964105E+03	0.690787E+03	0.333368E+00	0.333368E+00
2010	0.258396E+04	0.862944E+03	0.109673E+01	0.109673E+01
2011	0.914132E+03	0.903963E+03	0.111868E-01	0.111868E-01
2012	0.156358E+04	0.148119E+04	0.541337E-01	0.541337E-01
2013	0.725783E+03	0.214385E+04	-0.108311E+01	-0.108311E+01

Survey Index: 60 Tag: Spring_single AGE = 6

Time = JAN-1 Type = NUMBER
Catchability = 0.317532E+00 % Variance Contribution = 2.8900
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	N/A	0.126238E+04	N/A	N/A
1974	N/A	0.959796E+03	N/A	N/A
1975	N/A	0.678519E+03	N/A	N/A
1976	N/A	0.661947E+03	N/A	N/A
1977	N/A	0.362825E+03	N/A	N/A
1978	N/A	0.160646E+03	N/A	N/A
1979	N/A	0.240214E+03	N/A	N/A
1980	N/A	0.104068E+03	N/A	N/A
1981	N/A	0.897020E+02	N/A	N/A
1982	0.883270E+02	0.649238E+02	0.307831E+00	0.307831E+00
1983	0.237318E+03	0.145609E+03	0.488476E+00	0.488476E+00
1984	0.236541E+03	0.185162E+03	0.244889E+00	0.244889E+00
1985	N/A	0.570239E+02	N/A	N/A
1986	0.531900E+02	0.940082E+02	-0.569512E+00	-0.569512E+00
1987	0.531900E+02	0.785311E+02	-0.389624E+00	-0.389624E+00
1988	0.265950E+02	0.283949E+02	-0.654858E-01	-0.654858E-01
1989	0.434840E+02	0.231653E+02	0.629736E+00	0.629736E+00
1990	0.100751E+03	0.192004E+02	0.165772E+01	0.165772E+01
1991	0.199950E+02	0.407832E+02	-0.712787E+00	-0.712787E+00
1992	0.166950E+02	0.258955E+02	-0.438961E+00	-0.438961E+00
1993	N/A	0.487687E+02	N/A	N/A
1994	0.387280E+02	0.722141E+02	-0.623072E+00	-0.623072E+00
1995	0.951200E+01	0.318238E+02	-0.120766E+01	-0.120766E+01
1996	0.561990E+02	0.366306E+02	0.428014E+00	0.428014E+00
1997	0.129676E+03	0.125392E+03	0.335956E-01	0.335956E-01
1998	0.339622E+03	0.155896E+03	0.778642E+00	0.778642E+00
1999	0.756311E+03	0.309769E+03	0.892625E+00	0.892625E+00
2000	0.508413E+03	0.404128E+03	0.229563E+00	0.229563E+00
2001	0.439693E+03	0.402511E+03	0.883534E-01	0.883534E-01
2002	0.845414E+03	0.500980E+03	0.523260E+00	0.523260E+00
2003	0.836873E+03	0.698177E+03	0.181200E+00	0.181200E+00
2004	0.263816E+03	0.683680E+03	-0.952239E+00	-0.952239E+00
2005	0.111428E+03	0.106644E+03	0.438790E-01	0.438790E-01
2006	0.797850E+02	0.126287E+03	-0.459225E+00	-0.459225E+00
2007	0.125211E+03	0.515321E+02	0.887796E+00	0.887796E+00
2008	0.266070E+02	0.447513E+02	-0.519945E+00	-0.519945E+00
2009	0.186331E+03	0.111509E+03	0.513416E+00	0.513416E+00
2010	0.613926E+03	0.217906E+03	0.103581E+01	0.103581E+01
2011	0.100602E+03	0.249981E+03	-0.910212E+00	-0.910212E+00
2012	0.180342E+03	0.321428E+03	-0.577920E+00	-0.577920E+00
2013	0.258505E+03	0.120360E+04	-0.153816E+01	-0.153816E+01

Survey Index: 61 Tag: Fall_single AGE = 1
Time = MEAN Type = NUMBER
Catchability = 0.259293E-01 % Variance Contribution = 8.7993
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	0.242045E+04	0.109942E+04	0.789170E+00	0.789170E+00
1974	0.448671E+04	0.175590E+04	0.938141E+00	0.938141E+00
1975	0.454864E+04	0.234446E+04	0.662774E+00	0.662774E+00
1976	0.333507E+03	0.925044E+03	-0.102018E+01	-0.102018E+01
1977	0.906661E+03	0.745993E+03	0.195052E+00	0.195052E+00
1978	0.462056E+04	0.193377E+04	0.871047E+00	0.871047E+00

1979	0.128200E+04	0.112393E+04	0.131588E+00	0.131588E+00
1980	0.743596E+03	0.110739E+04	-0.398260E+00	-0.398260E+00
1981	0.154824E+04	0.237702E+04	-0.428727E+00	-0.428727E+00
1982	0.235328E+04	0.773256E+03	0.111296E+01	0.111296E+01
1983	0.105701E+03	0.238132E+03	-0.812210E+00	-0.812210E+00
1984	0.641583E+03	0.394601E+03	0.486063E+00	0.486063E+00
1985	0.131025E+04	0.575325E+03	0.823035E+00	0.823035E+00
1986	0.273425E+03	0.311853E+03	-0.131505E+00	-0.131505E+00
1987	0.987130E+02	0.375681E+03	-0.133652E+01	-0.133652E+01
1988	0.181510E+02	0.967537E+03	-0.397603E+01	-0.397603E+01
1989	0.241006E+03	0.412146E+03	-0.536556E+00	-0.536556E+00
1990	N/A	0.513363E+03	N/A	N/A
1991	0.203880E+04	0.812590E+03	0.919889E+00	0.919889E+00
1992	0.146759E+03	0.667614E+03	-0.151492E+01	-0.151492E+01
1993	0.814646E+03	0.511894E+03	0.464636E+00	0.464636E+00
1994	0.115980E+04	0.803594E+03	0.366909E+00	0.366909E+00
1995	0.267698E+03	0.654094E+03	-0.893392E+00	-0.893392E+00
1996	0.144332E+03	0.663471E+03	-0.152537E+01	-0.152537E+01
1997	0.135179E+04	0.961311E+03	0.340886E+00	0.340886E+00
1998	0.184438E+04	0.103419E+04	0.578528E+00	0.578528E+00
1999	0.299875E+04	0.109227E+04	0.100994E+01	0.100994E+01
2000	0.610814E+03	0.928179E+03	-0.418432E+00	-0.418432E+00
2001	0.341417E+04	0.916795E+03	0.131481E+01	0.131481E+01
2002	0.203142E+04	0.608820E+03	0.120497E+01	0.120497E+01
2003	0.104527E+04	0.438278E+03	0.869172E+00	0.869172E+00
2004	0.850268E+03	0.322313E+03	0.970030E+00	0.970030E+00
2005	0.304000E+03	0.557167E+03	-0.605837E+00	-0.605837E+00
2006	0.601205E+04	0.706638E+03	0.214100E+01	0.214100E+01
2007	0.102653E+04	0.596937E+03	0.542130E+00	0.542130E+00
2008	0.162774E+03	0.810411E+03	-0.160518E+01	-0.160518E+01
2009	0.445778E+03	0.107909E+04	-0.884055E+00	-0.884055E+00
2010	0.115415E+03	0.276803E+03	-0.874772E+00	-0.874772E+00
2011	0.234406E+03	0.205911E+03	0.129610E+00	0.129610E+00
2012	0.189346E+03	0.171394E+03	0.996122E-01	0.996122E-01
2013	N/A	0.000000E+00	N/A	N/A

Survey Index: 62 Tag: Fall_single AGE = 2
Time = MEAN Type = NUMBER
Catchability = 0.985905E-01 % Variance Contribution = 9.6608
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	0.533601E+04	0.273778E+04	0.667330E+00	0.667330E+00
1974	0.277948E+04	0.219418E+04	0.236455E+00	0.236455E+00
1975	0.243734E+04	0.282231E+04	-0.146652E+00	-0.146652E+00
1976	0.186389E+04	0.391111E+04	-0.741155E+00	-0.741155E+00
1977	0.214712E+04	0.177737E+04	0.188995E+00	0.188995E+00
1978	0.124327E+04	0.162944E+04	-0.270490E+00	-0.270490E+00
1979	0.200851E+04	0.386257E+04	-0.653937E+00	-0.653937E+00
1980	0.496999E+04	0.252790E+04	0.676028E+00	0.676028E+00
1981	0.227942E+04	0.262375E+04	-0.140684E+00	-0.140684E+00
1982	0.212033E+04	0.489197E+04	-0.836023E+00	-0.836023E+00
1983	0.221642E+04	0.140946E+04	0.452688E+00	0.452688E+00
1984	0.388056E+03	0.456303E+03	-0.162007E+00	-0.162007E+00
1985	0.527535E+03	0.723436E+03	-0.315797E+00	-0.315797E+00
1986	0.107506E+04	0.104588E+04	0.275239E-01	0.275239E-01
1987	0.388832E+03	0.588790E+03	-0.414922E+00	-0.414922E+00
1988	0.206743E+03	0.761130E+03	-0.130333E+01	-0.130333E+01
1989	0.193407E+04	0.222835E+04	-0.141637E+00	-0.141637E+00
1990	0.359228E+03	0.893215E+03	-0.910870E+00	-0.910870E+00
1991	0.267019E+03	0.123012E+04	-0.152755E+01	-0.152755E+01

1992	0.383882E+03	0.149454E+04	-0.135924E+01	-0.135924E+01
1993	0.135208E+03	0.147448E+04	-0.238924E+01	-0.238924E+01
1994	0.214605E+03	0.101110E+04	-0.155000E+01	-0.155000E+01
1995	0.115407E+03	0.193157E+04	-0.281762E+01	-0.281762E+01
1996	0.341272E+03	0.155299E+04	-0.151525E+01	-0.151525E+01
1997	0.517731E+03	0.155298E+04	-0.109848E+01	-0.109848E+01
1998	0.467531E+04	0.223592E+04	0.737640E+00	0.737640E+00
1999	0.817587E+04	0.237405E+04	0.123659E+01	0.123659E+01
2000	0.164754E+04	0.246606E+04	-0.403337E+00	-0.403337E+00
2001	0.608359E+04	0.211185E+04	0.105803E+01	0.105803E+01
2002	0.558177E+04	0.202118E+04	0.101583E+01	0.101583E+01
2003	0.488283E+04	0.128258E+04	0.133685E+01	0.133685E+01
2004	0.534610E+04	0.100380E+04	0.167258E+01	0.167258E+01
2005	0.203356E+04	0.705105E+03	0.105919E+01	0.105919E+01
2006	0.606718E+04	0.128901E+04	0.154902E+01	0.154902E+01
2007	0.111109E+05	0.163920E+04	0.191372E+01	0.191372E+01
2008	0.696317E+04	0.142293E+04	0.158792E+01	0.158792E+01
2009	0.416936E+04	0.195086E+04	0.759490E+00	0.759490E+00
2010	0.266163E+04	0.260929E+04	0.198607E-01	0.198607E-01
2011	0.279501E+04	0.663484E+03	0.143809E+01	0.143809E+01
2012	0.143199E+04	0.493944E+03	0.106440E+01	0.106440E+01
2013	N/A	0.000000E+00	N/A	N/A

Survey Index: 63 Tag: Fall_single AGE = 3
Time = MEAN Type = NUMBER
Catchability = 0.215675E+00 % Variance Contribution = 6.8302
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	0.495446E+04	0.556577E+04	-0.116348E+00	-0.116348E+00
1974	0.147157E+04	0.254200E+04	-0.546626E+00	-0.546626E+00
1975	0.851723E+03	0.157862E+04	-0.617046E+00	-0.617046E+00
1976	0.460270E+03	0.171620E+04	-0.131605E+01	-0.131605E+01
1977	0.157280E+04	0.224826E+04	-0.357300E+00	-0.357300E+00
1978	0.757185E+03	0.136851E+04	-0.591868E+00	-0.591868E+00
1979	0.253721E+03	0.161704E+04	-0.185212E+01	-0.185212E+01
1980	0.591198E+04	0.360610E+04	0.494353E+00	0.494353E+00
1981	0.159280E+04	0.260366E+04	-0.491428E+00	-0.491428E+00
1982	0.154339E+04	0.277264E+04	-0.585817E+00	-0.585817E+00
1983	0.185846E+04	0.369679E+04	-0.687719E+00	-0.687719E+00
1984	0.296720E+03	0.919480E+03	-0.113102E+01	-0.113102E+01
1985	0.165880E+03	0.385454E+03	-0.843158E+00	-0.843158E+00
1986	0.338651E+03	0.603153E+03	-0.577201E+00	-0.577201E+00
1987	0.384562E+03	0.684220E+03	-0.576175E+00	-0.576175E+00
1988	0.103954E+03	0.433295E+03	-0.142747E+01	-0.142747E+01
1989	0.750390E+03	0.739168E+03	0.150679E-01	0.150679E-01
1990	0.142992E+04	0.218585E+04	-0.424385E+00	-0.424385E+00
1991	0.426201E+03	0.940675E+03	-0.791687E+00	-0.791687E+00
1992	0.690988E+03	0.138940E+04	-0.698501E+00	-0.698501E+00
1993	0.568786E+03	0.112264E+04	-0.679936E+00	-0.679936E+00
1994	0.954124E+03	0.123373E+04	-0.257006E+00	-0.257006E+00
1995	0.335157E+03	0.116550E+04	-0.124630E+01	-0.124630E+01
1996	0.181381E+04	0.246001E+04	-0.304738E+00	-0.304738E+00
1997	0.334099E+04	0.192819E+04	0.549687E+00	0.549687E+00
1998	0.407886E+04	0.172562E+04	0.860228E+00	0.860228E+00
1999	0.555887E+04	0.253459E+04	0.785362E+00	0.785362E+00
2000	0.467249E+04	0.250321E+04	0.624117E+00	0.624117E+00
2001	0.785372E+04	0.240869E+04	0.118191E+01	0.118191E+01
2002	0.206452E+04	0.237917E+04	-0.141855E+00	-0.141855E+00
2003	0.272590E+04	0.202023E+04	0.299589E+00	0.299589E+00
2004	0.486244E+04	0.117248E+04	0.142242E+01	0.142242E+01

2005	0.365207E+04	0.859404E+03	0.144681E+01	0.144681E+01
2006	0.355666E+04	0.698131E+03	0.162817E+01	0.162817E+01
2007	0.763474E+04	0.152838E+04	0.160850E+01	0.160850E+01
2008	0.959269E+04	0.198270E+04	0.157654E+01	0.157654E+01
2009	0.115315E+05	0.181956E+04	0.184648E+01	0.184648E+01
2010	0.420534E+04	0.263565E+04	0.467225E+00	0.467225E+00
2011	0.375651E+04	0.355179E+04	0.560392E-01	0.560392E-01
2012	0.355047E+04	0.876182E+03	0.139926E+01	0.139926E+01
2013	N/A	0.000000E+00	N/A	N/A

Survey Index: 64 Tag: Fall_single AGE = 4
Time = MEAN Type = NUMBER
Catchability = 0.189548E+00 % Variance Contribution = 5.3617
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	0.285742E+04	0.257382E+04	0.104530E+00	0.104530E+00
1974	0.102906E+04	0.156876E+04	-0.421641E+00	-0.421641E+00
1975	0.555198E+03	0.599177E+03	-0.762323E-01	-0.762323E-01
1976	0.113563E+03	0.356037E+03	-0.114268E+01	-0.114268E+01
1977	0.615376E+03	0.472062E+03	0.265124E+00	0.265124E+00
1978	0.399218E+03	0.517000E+03	-0.258536E+00	-0.258536E+00
1979	0.116669E+03	0.371199E+03	-0.115740E+01	-0.115740E+01
1980	0.661966E+03	0.538400E+03	0.206612E+00	0.206612E+00
1981	0.570533E+03	0.972333E+03	-0.533127E+00	-0.533127E+00
1982	0.410380E+03	0.775604E+03	-0.636559E+00	-0.636559E+00
1983	0.495698E+03	0.887854E+03	-0.582840E+00	-0.582840E+00
1984	0.235959E+03	0.655559E+03	-0.102183E+01	-0.102183E+01
1985	0.491140E+02	0.198507E+03	-0.139668E+01	-0.139668E+01
1986	0.719230E+02	0.117887E+03	-0.494134E+00	-0.494134E+00
1987	0.514430E+02	0.171463E+03	-0.120389E+01	-0.120389E+01
1988	0.265950E+02	0.130249E+03	-0.158873E+01	-0.158873E+01
1989	0.765820E+02	0.115662E+03	-0.412314E+00	-0.412314E+00
1990	0.285849E+03	0.251444E+03	0.128243E+00	0.128243E+00
1991	0.347193E+03	0.526350E+03	-0.416085E+00	-0.416085E+00
1992	0.157144E+03	0.290498E+03	-0.614435E+00	-0.614435E+00
1993	0.520352E+03	0.365493E+03	0.353257E+00	0.353257E+00
1994	0.692153E+03	0.250190E+03	0.101759E+01	0.101759E+01
1995	0.267213E+03	0.280855E+03	-0.497921E-01	-0.497921E-01
1996	0.433481E+03	0.483228E+03	-0.108641E+00	-0.108641E+00
1997	0.202851E+04	0.107882E+04	0.631429E+00	0.631429E+00
1998	0.115456E+04	0.790436E+03	0.378888E+00	0.378888E+00
1999	0.139032E+04	0.619913E+03	0.807712E+00	0.807712E+00
2000	0.235027E+04	0.861239E+03	0.100391E+01	0.100391E+01
2001	0.252479E+04	0.787979E+03	0.116444E+01	0.116444E+01
2002	0.576066E+03	0.771643E+03	-0.292300E+00	-0.292300E+00
2003	0.548015E+03	0.905478E+03	-0.502160E+00	-0.502160E+00
2004	0.204443E+04	0.449293E+03	0.151520E+01	0.151520E+01
2005	0.595867E+03	0.301592E+03	0.680942E+00	0.680942E+00
2006	0.113291E+04	0.173677E+03	0.187535E+01	0.187535E+01
2007	0.193960E+04	0.233176E+03	0.211844E+01	0.211844E+01
2008	0.100275E+04	0.673283E+03	0.398338E+00	0.398338E+00
2009	0.207198E+04	0.868035E+03	0.870027E+00	0.870027E+00
2010	0.719731E+03	0.859564E+03	-0.177548E+00	-0.177548E+00
2011	0.107972E+04	0.135512E+04	-0.227183E+00	-0.227183E+00
2012	0.153895E+04	0.188968E+04	-0.205304E+00	-0.205304E+00
2013	N/A	0.000000E+00	N/A	N/A

Survey Index: 65 Tag: Fall_single AGE = 5
Time = MEAN Type = NUMBER
Catchability = 0.219189E+00 % Variance Contribution = 6.1670

Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	0.118115E+04	0.119850E+04	-0.145795E-01	-0.145795E-01
1974	0.444255E+03	0.862893E+03	-0.663892E+00	-0.663892E+00
1975	0.324383E+03	0.425722E+03	-0.271861E+00	-0.271861E+00
1976	0.118513E+03	0.165817E+03	-0.335864E+00	-0.335864E+00
1977	0.102304E+03	0.123771E+03	-0.190484E+00	-0.190484E+00
1978	0.131617E+03	0.168533E+03	-0.247235E+00	-0.247235E+00
1979	0.134335E+03	0.186733E+03	-0.329343E+00	-0.329343E+00
1980	0.212276E+03	0.142415E+03	0.399145E+00	0.399145E+00
1981	0.763880E+02	0.195251E+03	-0.938459E+00	-0.938459E+00
1982	0.865800E+02	0.288862E+03	-0.120488E+01	-0.120488E+01
1983	0.298950E+02	0.281813E+03	-0.224355E+01	-0.224355E+01
1984	0.727000E+02	0.270023E+03	-0.131217E+01	-0.131217E+01
1985	0.783290E+02	0.144899E+03	-0.615117E+00	-0.615117E+00
1986	N/A	0.713868E+02	N/A	N/A
1987	0.770680E+02	0.387759E+02	0.686889E+00	0.686889E+00
1988	N/A	0.404091E+02	N/A	N/A
1989	0.539670E+02	0.343900E+02	0.450606E+00	0.450606E+00
1990	N/A	0.416693E+02	N/A	N/A
1991	N/A	0.774594E+02	N/A	N/A
1992	0.139382E+03	0.137540E+03	0.133031E-01	0.133031E-01
1993	N/A	0.746972E+02	N/A	N/A
1994	0.254886E+03	0.758072E+02	0.121262E+01	0.121262E+01
1995	0.446490E+02	0.628774E+02	-0.342355E+00	-0.342355E+00
1996	0.727000E+02	0.127039E+03	-0.558151E+00	-0.558151E+00
1997	0.103983E+04	0.254101E+03	0.140908E+01	0.140908E+01
1998	0.289537E+03	0.543751E+03	-0.630208E+00	-0.630208E+00
1999	0.139421E+04	0.367552E+03	0.133322E+01	0.133322E+01
2000	0.919667E+03	0.259353E+03	0.126582E+01	0.126582E+01
2001	0.166783E+04	0.316174E+03	0.166298E+01	0.166298E+01
2002	0.295555E+03	0.318117E+03	-0.735634E-01	-0.735634E-01
2003	0.969650E+02	0.353132E+03	-0.129249E+01	-0.129249E+01
2004	0.897052E+03	0.267608E+03	0.120959E+01	0.120959E+01
2005	0.179274E+03	0.800935E+02	0.805721E+00	0.805721E+00
2006	0.247704E+03	0.772118E+02	0.116568E+01	0.116568E+01
2007	0.371264E+03	0.555319E+02	0.189995E+01	0.189995E+01
2008	N/A	0.114086E+03	N/A	N/A
2009	0.588349E+03	0.380648E+03	0.435445E+00	0.435445E+00
2010	0.272679E+03	0.497213E+03	-0.600724E+00	-0.600724E+00
2011	0.141808E+03	0.537514E+03	-0.133248E+01	-0.133248E+01
2012	0.428037E+03	0.908564E+03	-0.752656E+00	-0.752656E+00
2013	N/A	0.000000E+00	N/A	N/A

Survey Index: 66 Tag: Fall_single AGE = 6
Time = MEAN Type = NUMBER
Catchability = 0.214226E+00 % Variance Contribution = 6.9864
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	0.599943E+03	0.506578E+03	0.169156E+00	0.169156E+00
1974	0.368061E+03	0.351825E+03	0.451144E-01	0.451144E-01
1975	0.611490E+02	0.230918E+03	-0.132875E+01	-0.132875E+01
1976	0.972570E+02	0.259125E+03	-0.979952E+00	-0.979952E+00
1977	0.105701E+03	0.143046E+03	-0.302554E+00	-0.302554E+00
1978	0.349430E+02	0.643600E+02	-0.610774E+00	-0.610774E+00
1979	0.108613E+03	0.950897E+02	0.132970E+00	0.132970E+00
1980	0.250907E+03	0.445375E+02	0.172875E+01	0.172875E+01

1981	0.528020E+02	0.324526E+02	0.486769E+00	0.486769E+00
1982	N/A	0.246953E+02	N/A	N/A
1983	0.476580E+02	0.626569E+02	-0.273624E+00	-0.273624E+00
1984	0.606640E+02	0.557552E+02	0.843789E-01	0.843789E-01
1985	N/A	0.221226E+02	N/A	N/A
1986	N/A	0.388602E+02	N/A	N/A
1987	N/A	0.270586E+02	N/A	N/A
1988	N/A	0.927326E+01	N/A	N/A
1989	N/A	0.928049E+01	N/A	N/A
1990	N/A	0.758161E+01	N/A	N/A
1991	N/A	0.140663E+02	N/A	N/A
1992	0.265950E+02	0.936141E+01	0.104413E+01	0.104413E+01
1993	0.213540E+02	0.160755E+02	0.283946E+00	0.283946E+00
1994	0.548400E+02	0.223655E+02	0.896902E+00	0.896902E+00
1995	0.121330E+02	0.133312E+02	-0.941764E-01	-0.941764E-01
1996	N/A	0.170321E+02	N/A	N/A
1997	0.797850E+02	0.588363E+02	0.304577E+00	0.304577E+00
1998	0.717290E+02	0.692911E+02	0.345790E-01	0.345790E-01
1999	0.252751E+03	0.136448E+03	0.616463E+00	0.616463E+00
2000	0.802610E+03	0.162125E+03	0.159950E+01	0.159950E+01
2001	0.198823E+04	0.161633E+03	0.250967E+01	0.250967E+01
2002	0.265950E+02	0.220916E+03	-0.211706E+01	-0.211706E+01
2003	0.185681E+03	0.305919E+03	-0.499290E+00	-0.499290E+00
2004	0.170733E+03	0.195145E+03	-0.133642E+00	-0.133642E+00
2005	N/A	0.369432E+02	N/A	N/A
2006	0.443580E+02	0.444073E+02	-0.110998E-02	-0.110998E-02
2007	0.908510E+02	0.220838E+02	0.141438E+01	0.141438E+01
2008	N/A	0.218021E+02	N/A	N/A
2009	0.579190E+02	0.529924E+02	0.888976E-01	0.888976E-01
2010	N/A	0.108281E+03	N/A	N/A
2011	0.960900E+01	0.128194E+03	-0.259085E+01	-0.259085E+01
2012	0.138410E+02	0.170040E+03	-0.250840E+01	-0.250840E+01
2013	N/A	0.000000E+00	N/A	N/A

Survey Index: 68 Tag: DFO_single AGE = 2
Time = JAN-1 Type = NUMBER
Catchability = 0.128419E+00 % Variance Contribution = 5.8428
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	N/A	0.482029E+04	N/A	N/A
1974	N/A	0.429190E+04	N/A	N/A
1975	N/A	0.675744E+04	N/A	N/A
1976	N/A	0.894320E+04	N/A	N/A
1977	N/A	0.359308E+04	N/A	N/A
1978	N/A	0.290490E+04	N/A	N/A
1979	N/A	0.705302E+04	N/A	N/A
1980	N/A	0.439014E+04	N/A	N/A
1981	N/A	0.432540E+04	N/A	N/A
1982	N/A	0.931589E+04	N/A	N/A
1983	N/A	0.291583E+04	N/A	N/A
1984	N/A	0.896019E+03	N/A	N/A
1985	N/A	0.151955E+04	N/A	N/A
1986	N/A	0.220363E+04	N/A	N/A
1987	0.751113E+03	0.121322E+04	-0.479480E+00	-0.479480E+00
1988	0.111653E+04	0.146475E+04	-0.271458E+00	-0.271458E+00
1989	0.645831E+03	0.376710E+04	-0.176352E+01	-0.176352E+01
1990	0.150086E+04	0.160593E+04	-0.676661E-01	-0.676661E-01
1991	0.539642E+03	0.200064E+04	-0.131032E+01	-0.131032E+01
1992	0.694207E+04	0.315056E+04	0.790019E+00	0.790019E+00
1993	0.152883E+04	0.248859E+04	-0.487214E+00	-0.487214E+00

1994	0.380837E+04	0.173590E+04	0.785678E+00	0.785678E+00
1995	0.786483E+03	0.314749E+04	-0.138679E+01	-0.138679E+01
1996	0.449099E+04	0.256254E+04	0.561074E+00	0.561074E+00
1997	0.784923E+04	0.259638E+04	0.110630E+01	0.110630E+01
1998	0.209431E+04	0.376542E+04	-0.586634E+00	-0.586634E+00
1999	0.131185E+05	0.404648E+04	0.117618E+01	0.117618E+01
2000	0.865576E+04	0.428018E+04	0.704231E+00	0.704231E+00
2001	0.125116E+05	0.363276E+04	0.123666E+01	0.123666E+01
2002	0.752232E+04	0.358571E+04	0.740919E+00	0.740919E+00
2003	0.747637E+04	0.237600E+04	0.114633E+01	0.114633E+01
2004	0.226346E+04	0.171005E+04	0.280374E+00	0.280374E+00
2005	0.100750E+04	0.126066E+04	-0.224163E+00	-0.224163E+00
2006	0.307681E+04	0.218172E+04	0.343779E+00	0.343779E+00
2007	0.764643E+04	0.276287E+04	0.101797E+01	0.101797E+01
2008	0.303825E+05	0.233818E+04	0.128225E+01	0.256449E+01
2009	0.537042E+04	0.317654E+04	0.262557E+00	0.525115E+00
2010	0.307583E+03	0.423083E+04	-0.262141E+01	-0.262141E+01
2011	0.409298E+03	0.108540E+04	-0.975265E+00	-0.975265E+00
2012	0.405190E+03	0.806902E+03	-0.688846E+00	-0.688846E+00
2013	0.808950E+02	0.671495E+03	-0.211635E+01	-0.211635E+01

Survey Index: 69 Tag: DFO_single AGE = 3
Time = JAN-1 Type = NUMBER
Catchability = 0.564125E+00 % Variance Contribution = 5.4056
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	N/A	0.227967E+05	N/A	N/A
1974	N/A	0.112061E+05	N/A	N/A
1975	N/A	0.784477E+04	N/A	N/A
1976	N/A	0.752791E+04	N/A	N/A
1977	N/A	0.111985E+05	N/A	N/A
1978	N/A	0.607713E+04	N/A	N/A
1979	N/A	0.656701E+04	N/A	N/A
1980	N/A	0.151047E+05	N/A	N/A
1981	N/A	0.105229E+05	N/A	N/A
1982	N/A	0.116262E+05	N/A	N/A
1983	N/A	0.181214E+05	N/A	N/A
1984	N/A	0.466773E+04	N/A	N/A
1985	N/A	0.162293E+04	N/A	N/A
1986	N/A	0.234516E+04	N/A	N/A
1987	0.123854E+04	0.337564E+04	-0.100265E+01	-0.100265E+01
1988	0.801860E+03	0.196076E+04	-0.894155E+00	-0.894155E+00
1989	0.383193E+03	0.278077E+04	-0.198194E+01	-0.198194E+01
1990	0.228114E+04	0.958345E+04	-0.143536E+01	-0.143536E+01
1991	0.745826E+03	0.356192E+04	-0.156356E+01	-0.156356E+01
1992	0.231200E+04	0.553803E+04	-0.873524E+00	-0.873524E+00
1993	0.256876E+04	0.482018E+04	-0.629388E+00	-0.629388E+00
1994	0.217857E+04	0.635367E+04	-0.107037E+01	-0.107037E+01
1995	0.273745E+04	0.426824E+04	-0.444176E+00	-0.444176E+00
1996	0.576916E+04	0.867655E+04	-0.408097E+00	-0.408097E+00
1997	0.874215E+04	0.687403E+04	0.240405E+00	0.240405E+00
1998	0.308593E+04	0.676806E+04	-0.785360E+00	-0.785360E+00
1999	0.131012E+05	0.966034E+04	0.304671E+00	0.304671E+00
2000	0.172565E+05	0.101098E+05	0.534689E+00	0.534689E+00
2001	0.264894E+05	0.102729E+05	0.947230E+00	0.947230E+00
2002	0.195033E+05	0.889382E+04	0.785229E+00	0.785229E+00
2003	0.154807E+05	0.819546E+04	0.636010E+00	0.636010E+00
2004	0.102253E+05	0.492408E+04	0.730730E+00	0.730730E+00
2005	0.175819E+05	0.427730E+04	0.141355E+01	0.141355E+01
2006	0.116964E+05	0.283150E+04	0.141847E+01	0.141847E+01

2007	0.174237E+05	0.553572E+04	0.114661E+01	0.114661E+01
2008	0.107132E+06	0.707494E+04	0.135875E+01	0.271750E+01
2009	0.867536E+05	0.632928E+04	0.130894E+01	0.261789E+01
2010	0.590614E+04	0.877093E+04	-0.395450E+00	-0.395450E+00
2011	0.383146E+04	0.117887E+05	-0.112390E+01	-0.112390E+01
2012	0.518374E+04	0.296668E+04	0.558085E+00	0.558085E+00
2013	0.522512E+03	0.221229E+04	-0.144314E+01	-0.144314E+01

Survey Index: 70 Tag: DFO_single AGE = 4
Time = JAN-1 Type = NUMBER
Catchability = 0.885103E+00 % Variance Contribution = 4.3282
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	N/A	0.202060E+05	N/A	N/A
1974	N/A	0.134824E+05	N/A	N/A
1975	N/A	0.554648E+04	N/A	N/A
1976	N/A	0.286529E+04	N/A	N/A
1977	N/A	0.377205E+04	N/A	N/A
1978	N/A	0.406540E+04	N/A	N/A
1979	N/A	0.295413E+04	N/A	N/A
1980	N/A	0.396327E+04	N/A	N/A
1981	N/A	0.846694E+04	N/A	N/A
1982	N/A	0.642375E+04	N/A	N/A
1983	N/A	0.650008E+04	N/A	N/A
1984	N/A	0.685862E+04	N/A	N/A
1985	N/A	0.161197E+04	N/A	N/A
1986	N/A	0.898433E+03	N/A	N/A
1987	0.309677E+03	0.156770E+04	-0.162184E+01	-0.162184E+01
1988	0.383570E+03	0.125644E+04	-0.118651E+01	-0.118651E+01
1989	0.185183E+03	0.909534E+03	-0.159159E+01	-0.159159E+01
1990	0.575033E+03	0.200609E+04	-0.124951E+01	-0.124951E+01
1991	0.236414E+04	0.480765E+04	-0.709796E+00	-0.709796E+00
1992	0.622369E+03	0.253154E+04	-0.140305E+01	-0.140305E+01
1993	0.256290E+04	0.349314E+04	-0.309664E+00	-0.309664E+00
1994	0.189012E+04	0.254491E+04	-0.297455E+00	-0.297455E+00
1995	0.160076E+04	0.211215E+04	-0.277224E+00	-0.277224E+00
1996	0.339980E+04	0.327405E+04	0.376881E-01	0.376881E-01
1997	0.102936E+05	0.724325E+04	0.351450E+00	0.351450E+00
1998	0.272558E+04	0.560253E+04	-0.720536E+00	-0.720536E+00
1999	0.482292E+04	0.443364E+04	0.841583E-01	0.841583E-01
2000	0.121009E+05	0.676318E+04	0.581788E+00	0.581788E+00
2001	0.836805E+04	0.618189E+04	0.302796E+00	0.302796E+00
2002	0.769356E+04	0.551274E+04	0.333323E+00	0.333323E+00
2003	0.697109E+04	0.651021E+04	0.683991E-01	0.683991E-01
2004	0.578873E+04	0.495888E+04	0.154734E+00	0.154734E+00
2005	0.129314E+05	0.274272E+04	0.155071E+01	0.155071E+01
2006	0.413273E+04	0.155599E+04	0.976830E+00	0.976830E+00
2007	0.804853E+04	0.171414E+04	0.154658E+01	0.154658E+01
2008	0.359193E+05	0.435375E+04	0.105512E+01	0.211024E+01
2009	0.735538E+05	0.575431E+04	0.127403E+01	0.254807E+01
2010	0.131702E+05	0.544947E+04	0.882439E+00	0.882439E+00
2011	0.515994E+04	0.832479E+04	-0.478314E+00	-0.478314E+00
2012	0.718342E+04	0.112532E+05	-0.448881E+00	-0.448881E+00
2013	0.788604E+03	0.271105E+04	-0.123483E+01	-0.123483E+01

Survey Index: 71 Tag: DFO_single AGE = 5
Time = JAN-1 Type = NUMBER
Catchability = 0.740957E+00 % Variance Contribution = 5.0852
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	N/A	0.681148E+04	N/A	N/A
1974	N/A	0.536868E+04	N/A	N/A
1975	N/A	0.285291E+04	N/A	N/A
1976	N/A	0.966058E+03	N/A	N/A
1977	N/A	0.715975E+03	N/A	N/A
1978	N/A	0.959395E+03	N/A	N/A
1979	N/A	0.107583E+04	N/A	N/A
1980	N/A	0.758933E+03	N/A	N/A
1981	N/A	0.123085E+04	N/A	N/A
1982	N/A	0.173196E+04	N/A	N/A
1983	N/A	0.149362E+04	N/A	N/A
1984	N/A	0.204515E+04	N/A	N/A
1985	N/A	0.851813E+03	N/A	N/A
1986	N/A	0.393855E+03	N/A	N/A
1987	0.548890E+02	0.256659E+03	-0.154244E+01	-0.154244E+01
1988	0.174919E+03	0.282192E+03	-0.478266E+00	-0.478266E+00
1989	0.417680E+02	0.195776E+03	-0.154484E+01	-0.154484E+01
1990	0.131276E+03	0.240672E+03	-0.606132E+00	-0.606132E+00
1991	0.330346E+03	0.512192E+03	-0.438559E+00	-0.438559E+00
1992	0.219805E+03	0.867703E+03	-0.137311E+01	-0.137311E+01
1993	0.557492E+03	0.516822E+03	0.757491E-01	0.757491E-01
1994	0.491393E+03	0.558229E+03	-0.127526E+00	-0.127526E+00
1995	0.406607E+03	0.342324E+03	0.172091E+00	0.172091E+00
1996	0.726500E+03	0.623117E+03	0.153504E+00	0.153504E+00
1997	0.254321E+04	0.123506E+04	0.722306E+00	0.722306E+00
1998	0.125038E+04	0.279008E+04	-0.802625E+00	-0.802625E+00
1999	0.336445E+04	0.190304E+04	0.569811E+00	0.569811E+00
2000	0.318759E+04	0.147441E+04	0.771007E+00	0.771007E+00
2001	0.288104E+04	0.179570E+04	0.472757E+00	0.472757E+00
2002	0.349168E+04	0.164527E+04	0.752477E+00	0.752477E+00
2003	0.215098E+04	0.183804E+04	0.157226E+00	0.157226E+00
2004	0.142915E+04	0.213822E+04	-0.402893E+00	-0.402893E+00
2005	0.358190E+04	0.527301E+03	0.191588E+01	0.191588E+01
2006	0.515400E+03	0.500782E+03	0.287733E-01	0.287733E-01
2007	0.143910E+04	0.295533E+03	0.158299E+01	0.158299E+01
2008	0.506782E+04	0.534068E+03	0.112507E+01	0.225014E+01
2009	0.125139E+05	0.182675E+04	0.962150E+00	0.192430E+01
2010	0.222171E+04	0.228202E+04	-0.267841E-01	-0.267841E-01
2011	0.106953E+04	0.239049E+04	-0.804279E+00	-0.804279E+00
2012	0.194691E+04	0.391693E+04	-0.699067E+00	-0.699067E+00
2013	0.380059E+03	0.566932E+04	-0.270250E+01	-0.270250E+01

Survey Index: 72 Tag: DFO_single AGE = 6
Time = JAN-1 Type = NUMBER
Catchability = 0.485277E+00 % Variance Contribution = 5.8812
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	N/A	0.192927E+04	N/A	N/A
1974	N/A	0.146684E+04	N/A	N/A
1975	N/A	0.103697E+04	N/A	N/A
1976	N/A	0.101164E+04	N/A	N/A
1977	N/A	0.554498E+03	N/A	N/A
1978	N/A	0.245512E+03	N/A	N/A
1979	N/A	0.367114E+03	N/A	N/A
1980	N/A	0.159045E+03	N/A	N/A
1981	N/A	0.137090E+03	N/A	N/A
1982	N/A	0.992217E+02	N/A	N/A

1983	N/A	0.222531E+03	N/A	N/A
1984	N/A	0.282980E+03	N/A	N/A
1985	N/A	0.871484E+02	N/A	N/A
1986	N/A	0.143671E+03	N/A	N/A
1987	0.309490E+02	0.120017E+03	-0.135530E+01	-0.135530E+01
1988	0.147910E+02	0.433953E+02	-0.107633E+01	-0.107633E+01
1989	0.141230E+02	0.354031E+02	-0.918995E+00	-0.918995E+00
1990	0.860700E+01	0.293436E+02	-0.122650E+01	-0.122650E+01
1991	0.911400E+01	0.623281E+02	-0.192260E+01	-0.192260E+01
1992	0.187680E+02	0.395756E+02	-0.746059E+00	-0.746059E+00
1993	0.817920E+02	0.745322E+02	0.929475E-01	0.929475E-01
1994	0.129955E+03	0.110363E+03	0.163411E+00	0.163411E+00
1995	0.635630E+02	0.486357E+02	0.267674E+00	0.267674E+00
1996	0.771950E+02	0.559818E+02	0.321308E+00	0.321308E+00
1997	0.421488E+03	0.191634E+03	0.788206E+00	0.788206E+00
1998	0.351151E+03	0.238253E+03	0.387882E+00	0.387882E+00
1999	0.138347E+04	0.473414E+03	0.107238E+01	0.107238E+01
2000	0.231979E+04	0.617620E+03	0.132336E+01	0.132336E+01
2001	0.150716E+04	0.615150E+03	0.896120E+00	0.896120E+00
2002	0.178137E+04	0.765637E+03	0.844427E+00	0.844427E+00
2003	0.124987E+04	0.106701E+04	0.158177E+00	0.158177E+00
2004	0.890536E+03	0.104485E+04	-0.159809E+00	-0.159809E+00
2005	0.983835E+03	0.162982E+03	0.179782E+01	0.179782E+01
2006	0.149443E+03	0.193002E+03	-0.255787E+00	-0.255787E+00
2007	0.156210E+03	0.787554E+02	0.684855E+00	0.684855E+00
2008	0.344810E+02	0.683924E+02	-0.342427E+00	-0.684854E+00
2009	0.299606E+04	0.170417E+03	0.143340E+01	0.286680E+01
2010	0.804500E+03	0.333021E+03	0.882016E+00	0.882016E+00
2011	0.205794E+03	0.382040E+03	-0.618651E+00	-0.618651E+00
2012	0.284945E+03	0.491232E+03	-0.544621E+00	-0.544621E+00
2013	0.881770E+02	0.183944E+04	-0.303787E+01	-0.303787E+01

Survey Index: 73 Tag: scallop_single AGE = 1
Time = MEAN Type = NUMBER
Catchability = 0.187703E-04 % Variance Contribution = 3.1382
Unweighted Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual	Unweighted Resid
1973	N/A	0.795874E+00	N/A	N/A
1974	N/A	0.127110E+01	N/A	N/A
1975	N/A	0.169716E+01	N/A	N/A
1976	N/A	0.669643E+00	N/A	N/A
1977	N/A	0.540027E+00	N/A	N/A
1978	N/A	0.139986E+01	N/A	N/A
1979	N/A	0.813620E+00	N/A	N/A
1980	N/A	0.801641E+00	N/A	N/A
1981	N/A	0.172073E+01	N/A	N/A
1982	0.350500E+00	0.559763E+00	-0.468152E+00	-0.468152E+00
1983	0.138900E+00	0.172384E+00	-0.215972E+00	-0.215972E+00
1984	0.202100E+00	0.285653E+00	-0.346016E+00	-0.346016E+00
1985	0.271700E+00	0.416480E+00	-0.427140E+00	-0.427140E+00
1986	N/A	0.225752E+00	N/A	N/A
1987	0.103100E+00	0.271957E+00	-0.969944E+00	-0.969944E+00
1988	0.117500E+00	0.700403E+00	-0.178522E+01	-0.178522E+01
1989	N/A	0.298354E+00	N/A	N/A
1990	0.102000E+00	0.371625E+00	-0.129291E+01	-0.129291E+01
1991	0.190940E+01	0.588237E+00	0.117741E+01	0.117741E+01
1992	0.303200E+00	0.483288E+00	-0.466221E+00	-0.466221E+00
1993	0.116360E+01	0.370562E+00	0.114425E+01	0.114425E+01
1994	0.141970E+01	0.581724E+00	0.892204E+00	0.892204E+00
1995	0.518300E+00	0.473501E+00	0.904001E-01	0.904001E-01

1996	0.367300E+00	0.480289E+00	-0.268210E+00	-0.268210E+00
1997	0.968200E+00	0.695896E+00	0.330238E+00	0.330238E+00
1998	0.175830E+01	0.748652E+00	0.853828E+00	0.853828E+00
1999	N/A	0.790699E+00	N/A	N/A
2000	N/A	0.671912E+00	N/A	N/A
2001	0.894300E+00	0.663671E+00	0.298255E+00	0.298255E+00
2002	0.956100E+00	0.440727E+00	0.774437E+00	0.774437E+00
2003	0.746900E+00	0.317271E+00	0.856174E+00	0.856174E+00
2004	0.345900E+00	0.233323E+00	0.393725E+00	0.393725E+00
2005	0.465700E+00	0.403335E+00	0.143774E+00	0.143774E+00
2006	0.191500E+01	0.511538E+00	0.132005E+01	0.132005E+01
2007	0.507400E+00	0.432125E+00	0.160585E+00	0.160585E+00
2008	N/A	0.586659E+00	N/A	N/A
2009	0.202100E+00	0.781159E+00	-0.135202E+01	-0.135202E+01
2010	0.862000E-01	0.200379E+00	-0.843539E+00	-0.843539E+00
2011	N/A	0.149060E+00	N/A	N/A
2012	N/A	0.124073E+00	N/A	N/A
2013	N/A	0.000000E+00	N/A	N/A

Plus Group Diagnostic Report

Calculation Method Selected = Backward

Year	Population Backward	Population Forward	F Forward	F Backward	Ratio
1973	3976.	3976.	0.697638	0.697638	1.000000
1974	3023.	4179.	0.583197	0.925281	1.586568
1975	2137.	3319.	0.583535	1.119935	1.919225
1976	2085.	1982.	0.817213	0.759019	0.928790
1977	1143.	947.	0.983757	0.741310	0.753550
1978	506.	519.	0.676453	0.701659	1.037261
1979	757.	578.	1.109581	0.731285	0.659064
1980	328.	567.	0.279777	0.541607	1.935855
1981	282.	653.	0.318747	0.959153	3.009138
1982	204.	709.	0.182376	0.831041	4.556745
1983	459.	1026.	0.205457	0.528581	2.572703
1984	583.	1290.	0.445167	1.458134	3.275474
1985	180.	937.	0.112665	0.781465	6.936198
1986	296.	869.	0.175515	0.625142	3.561754
1987	247.	646.	0.302246	1.087018	3.596463
1988	89.	379.	0.190382	1.231306	6.467565
1989	73.	271.	0.149286	0.701737	4.700616
1990	60.	232.	0.149443	0.737481	4.934853
1991	128.	227.	0.483419	1.084354	2.243095
1992	82.	238.	0.244684	0.961124	3.928017
1993	154.	404.	0.320986	1.206026	3.757257
1994	227.	320.	0.781426	1.378333	1.763869
1995	100.	215.	0.237899	0.592965	2.492504
1996	115.	271.	0.134682	0.347145	2.577510
1997	395.	530.	0.233458	0.326238	1.397416
1998	491.	1034.	0.191477	0.452003	2.360611
1999	976.	2073.	0.197558	0.473204	2.395270
2000	1273.	2105.	0.367555	0.698339	1.899956
2001	1268.	1560.	0.527315	0.695959	1.319816
2002	1578.	1358.	0.570272	0.470602	0.825224
2003	2199.	1374.	0.931235	0.485637	0.521497
2004	2153.	2305.	1.399394	1.613402	1.152929
2005	336.	376.	0.893234	1.072774	1.201000
2006	398.	253.	3.049312	1.033325	0.338871
2007	162.	161.	0.543968	0.538382	0.989732
2008	141.	208.	0.157117	0.240735	1.532204

2009	351.	475.	0.211705	0.297129	1.403507
2010	686.	1413.	0.090908	0.196260	2.158881
2011	787.	2436.	0.039183	0.126168	3.219940
2012	1012.	3307.	0.017374	0.057827	3.328330
2013	3790.	5254.	N/A	N/A	