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Evaluating Total Allowable Catch Projections for Yellowtail Flounder (*Limanda ferruginea*) on the Grand Bank Using Multiple Indices and Surplus Production Analysis.

by

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Abstract

The recommendation of TACs for yellowtail flounder fishery on the Grand Bank, following their introduction as a management measure in 1973, have been based on 1) target fishing mortality from a yield-per-recruit analysis (1973-84), 2) a non-analytical comparison of the trends in biomass and recruitment from trawl surveys and landings with historical trends (1985-94) and, more recently, 3) the product of simple exploitation rates and estimates of fully recruited survey biomass (1997-1999). Because age data were found to be unreliable to carry out age structured projections , the resource is presently assessed from the results of bottom trawl surveys. We use a non-equilibrium surplus production model as an analytical method to combine multiple survey indices for determination of stock status. The surplus production model (ASPIC) was applied to catch, effort, and survey biomass indices of Grand Bank yellowtail flounder. Conditional non-parametric bootstrap estimates indicate that parameters were relatively well estimated. The bootstrap model's output was then used in a retrospective evaluation of the risk of depleting the stock at the current and alternate TACs on relative target biomass levels for the current 2000 fishery and also for projections for the 2001 fishery.

Introduction

Yellowtail flounder (*Limanda ferruginea*) is a small mouth right-eyed flounder whose most northward distribution in commercial quantities is found on the Grand Bank off the coast of Newfoundland (Walsh 1992). Because the stock straddles Canada's 200-mile limit it is managed by the Northwest Atlantic Fisheries Organization (NAFO). NAFO's Scientific Council meets annually to assess the size of this resource and several other finfish and shellfish species. An international fishery for yellowtail flounder on the Grand Bank developed in the 1960s and grew to yield a peak of 39,000 t in 1972 (Table 1). Although the earlier fishery was prosecuted by many Canadian and non-Canadian trawler fleets, the present day fishery is prosecuted mainly by Canada inside the 200 mile zone and by European Union fleets in NAFO Regulatory Area of Division 3N, known as the Tail of the Bank (Walsh et al. 1999).

Since 1973, the stock has been managed by regulating a total allowable catch (TAC), ranging from 7000 tons to 50,000 tons. Over the past three decades the stock had shown large fluctuations in biomass levels. After a continuous decline in survey biomass and poor recruitment during the late-1980s and early-1990s, a fishery moratorium was imposed by the NAFO Fishery Commission in 1994 (NAFO 1994). The fishery re-opened in 1998 with a precautionary TAC of 4,000 tons (NAFO 1997).

Throughout the management history of yellowtail flounder a variety of methods have been used to assess the stock and the recommended TACs. From 1973-1984, TACs were estimated using a yield per recruit analysis considering ages up to 11 years to derive an $F_{0.1}$ of 0.52 assuming an M of 0.3 (Brodie 1985). Although Sequential Population Analysis (SPA) was attempted several times to estimate absolute biomass of this stock during the 1970s and into the mid 1980s, unexplained high levels of mortality at older ages gave unrealistic results (Brodie and Walsh 1989). From 1985 to 1994, the stock was assessed and the TAC projection made for the fishery in the subsequent year based largely upon results from annual bottom trawl surveys, perceived strength of incoming year-class and nominal landings in the year prior to the assessment. These surveys were conducted by Canada since 1971 and by Russia from 1972-92.

During the 1994-1997 moratorium, stock size began to recover and when it approached the high of the mid-1980s, the fishery was reopened in 1998 (NAFO 1997). During the moratorium, Spain began conducting annual stratified random trawl surveys in the Regulatory Area of Div. 3N in 1995 and these surveys have provided further information to confirm the optimistic recovery of the resource. At the 1997 NAFO Scientific Council meeting, a simple method consisting of taking the lowest value of the catch/survey biomass ratio (6%) and use it as a proxy for an exploitation rate. For the 1998 and 1999 fisheries, this exploitation rate was applied to an averaged of the age 7+ (fully recruited) biomass from the previous year's Canadian spring and fall bottom trawl surveys to derive a TAC for the fishery in the following year (NAFO 1997; 1998). In 1999, a precautionary approach fishery buffer level, B_{buf}, which corresponded to an exploitation rate of 11% was derived from a surplus production analysis (Cadrin and Walsh 1999). Similarly, it was applied to an average of the 1998 spring and fall estimates of age 7+ biomass derived from the area-swept analysis of Canadian surveys to estimate a TAC for the 2000 fishery (NAFO 1999). During the history of TAC regulation, there has never been an opportunity to evaluate the effect of these TACs in reaching a managed target biomass threshold. The present approach of using age 7+ biomass with an exploitation rate may be unreliable given the recent identified problem with ageing yellowtail flounder on the Grand Bank (Walsh and Morgan 1999a).

The current method of assessing the Grand Bank yellowtail flounder stock involves using the biomass estimated from annual Canadian surveys. However, this method does not incorporate additional data that are available from the current Spanish surveys, and the historical time series of Canadian CPUE, landings, former USSR/Russia surveys and Canadian surveys prior to 1984. Surplus production models can permit the incorporation of all these indices to provide guidance on stock status, MSY reference points, and associated uncertainties (NRC 1998). Production models can also be useful in situations where information on age structure is unavailable or unreliable, and provide an alternative perspective for stock assessment. Additionally, surplus production analysis may extend back to historical times when catch at age is not available for long-term perspectives of biomass and fishing mortality. In this paper we will examine how surplus production analysis can also be used to determine stock status and to evaluate the risk of TACs on relative target biomass levels for the 2001 fishery and a retrospective look at the current and alternate TACs for the present 2000 fisheries.

Methods

Input Data

Potential input data for surplus production modeling are listed in Table 1. Estimated landings were used as nominal catch, but do not include discards or unreported landings. A substantial portion of total nominal catch from the mid 1980s and early 1990s were from Canadian surveillance reports or prorated from unspecified flounder catches by South Korea. Nominal catch increased from negligible levels in the 1960s to a peak of 39,000 t in 1972. Annual landings decreased to an annual average of 13,000 t from 1976 to 1984, increased to approximately 30,000 t in 1985 and 1986, decreased to an average of 14,000 t from 1987 to 1993, and were less than 1,000 t (bycatch) from 1995 to 1997, during the moratorium. Since the moratorium was lifted, the catches have averaged 5,000 t (Figure 1).

Standardized Canadian CPUE and six time series of survey biomass indices are plotted in Figures 2 and 3 (survey indices are plotted individually in Appendix A, and CPUE is plotted separately in Appendix B). Canadian CPUE generally decreased in the 1960s and 1970s, increased slightly in the 1980s, and again began declining from the mid-1980s to the early-1990s. Since the re-opening of the fishery in 1998, CPUE has reached levels comparable to mid to late-1960s (Walsh et al. 1999). However, Canadian CPUE may be a misleading index of biomass, because major shifts have occurred in the directivity of effort on yellowtail (e.g., during 1991-1993 a substantial amount of 'directed' effort was targeting American plaice; Brodie et al. 1994 and during 1998-1999 the fishery has been restricted to a small area mainly in Div 3N because of the 5% bycatch restriction for cod and plaice (Walsh et al. 1999)), and the relative proportion of Canadian catch to total catch has varied extensively.

The Canadian spring survey used a 'Yankee' otter trawl from 1971 to 1982, an 'Engel' otter trawl from 1984 to 1995, and a 'Campelen' shrimp trawl since 1995 (McCallum and Walsh 1996). Comparative tows of the Yankee and Engel trawls were used to derive a conversion factor of 1.4 for the Yankee catches by number but not by weight. The unconverted Yankee survey biomass is used here. Comparative tows of the Engel and Campelen trawls were used to derive a size based conversion function (Warren et al. 1997). Methods to link the 1971-1982 Yankee series to the 1984-1999 Campelen series have not been developed. Therefore the 1971-1982 and 1984-1999 series were considered to be separate biomass indices. The Canadian Yankee biomass index decreased sharply in the early 1970s and slightly increased in the late-1970s. The 1984-1999 Campelen biomass index (Walsh et al. 1999) decreased to low levels in the late 1980s and early 1990s and then began to increase in the mid 1990s to a present level similar to the mid-1980s (Fig. 3).

The biomass index from the Canadian fall Campelen trawl surveys increased from low levels in the early 1990s to a high index in 1999 (Fig. 3). The biomass index from the fall 1986-94 Canadian juvenile groundfish surveys (Walsh et al. 1995) was not used because of a reported negative correlation with most indices (e.g., the fall index increased during the early 1990s when most other indices were decreasing, Cadrin and Walsh 1999).

The biomass index from the 1972-1991 Russian bottom trawl survey sharply declined from relatively high levels in the 1970s and early-1980s to low levels in the late-1980s and early-1990s (Brodie and Walsh 1992). The 1995-1999 biomass index from the Spanish survey has generally shown a strong upward trend (Fig 3).

Results from SPA have not been used for annual catch projections, because high levels of mortality at older ages may be unrealistic. More recent studies on age and growth suggest that historical age determinations were biased (Morgan and Walsh 1999a). Therefore, estimates of absolute biomass levels from SPA may be unreliable (Walsh et al. 1998). However, SPA estimates of biomass may be useful as an index of relative stock biomass, as measured with error. In previous assessments SPA results were only used for 'illustrative' purposes. SPA biomass estimates decreased from values greater than 100,000t in 1970 to less than 50,000t in the mid-1970s, increased to 90,000t in the early-1980s, then decreased to 20,000t in 1987 (Fig. 3) (Brodie and Walsh 1988).

Correlations among biomass indices varied widely (Table 2). The CPUE index was initially excluded from the surplus production analysis because of the potential problems using CPUE as an index of biomass (noted above), but it was included in a sensitivity analysis. Of the six pair-wise correlations among the remaining five series of biomass indices included in the production analysis, six were strong ($r>0.8$), and two were weak to moderate ($r=0.2$ and 0.4; in Appendix A, Page 14). Five alternative combinations of biomass indices were examined in the sensitivity analysis: 1) using the Canadian Yankee, Canadian Campelen spring, Canadian Campelen fall, Russian, Spanish, and SPA series, 2) also including Canadian CPUE, 3) removing the Russian index, 4) removing the Spanish index and 5) removing the SPA index.

Surplus Production Model

A non-equilibrium surplus production model incorporating co-variates (ASPIC; Prager 1994, 1995) was applied to nominal catch and biomass indices. The production model assumes logistic population growth, in which the change in stock biomass over time (dB_t/dt) is a quadratic function of biomass (B):

$$dB_t/dt = rB_t - (r/K)B^2_t \quad (1)$$

where r is the intrinsic rate of population growth, and K is carrying capacity. For a fished stock, the rate of change is also a function of catch biomass (C):

$$dB_t/dt = rB_t - (r/K)B_t^2 - C_t \quad (2)$$

Biological reference points can be calculated from the production model parameters:

$$MSY = Kr/4 \quad (3)$$
$$B_{msy} = K/2 \quad (4)$$
$$F_{msy} = r/2 \quad (5)$$

Initial biomass (expressed as a ratio to B_{msy}: $B1R$), r, MSY, and catchability coefficients for each biomass index (q_i) were estimated using nonlinear least squares of survey residuals. Survey residuals were randomly re-sampled 500 times to derive bias-corrected probability distributions for parameter estimates, calculated variables, a retrospective look at the 2000 TAC of 10,000 and an evaluation of the risk of alternate TAC projections for the 2001 fishery.

Results

The model fit the data relatively well. The majority of variance in survey indices was explained by the model, but fit varied among indices (r^2 ranged from 0.2 to 0.8; in Appendix A, Page 14). Residuals appeared to be randomly distributed for all survey indices, except the Russian series, which had a strong pattern of positive residuals during the 1970s and early 1980s and negative residuals for subsequent years. The Russian survey index showed the stocked decreased more rapidly than the Canadian spring survey index in the mid 1980s. The model suggests that a maximum sustainable yield (MSY) of 17,000 t can be produced by a total stock biomass of 84,000 t (B_{msy}) at a fishing mortality rate on total biomass of 0.21 (F_{msy}) (Table 3 and Page 14 in Appendix A).

Sensitivity analyses show that estimates of MSY, B_{msy}, F_{msy}, B_{2000}/B_{msy} and F_{1999}/F_{msy} are relatively robust to excluding the SPA and Russian series, including the CPUE series and iteratively reweighting or removing the penalty term (constraints on the starting biomass B_1; Prager 1995) (Table 3). The model estimated a catchability coefficient (q) of 0.009 for the CPUE series. The pattern of positive residuals in earlier years and the more or less negative residuals in later years may be reflective of whether the Canadian CPUE is tracking major shifts which have occurred in the fishery for yellowtail (Page 32 in Appendix B). In the 1980s and early-1990s a relative large proportion of Canadian catch to total catch varied extensively and their were major shifts in the directivity of Canadian effort in the early and late1990s. In addition, there was some difficulty in getting the model to converge and the trajectory of relative biomass indices never exceeded the level at which MSY could be obtained (Page 41 in Appendix B). It was felt that Canadian CPUE may be a misleading index of biomass and it was dropped from the final run.

The final model run output is in Appendix A. Estimates of MSY and F_{msy} appear to be sensitive to excluding the Spanish survey (run 3 estimated MSY at 16,000 t and F_{msy} as 0.17. Conditional bootstrap results indicate that model parameters and derived estimates were relatively well estimated (Page 25 in Appendix A).

Because of differences in selectivity of survey gears and the commercial gears (mainly otter trawl) used in the production model, estimates of absolute stock biomass and fishing mortality in a given year (t) are usually estimated less precisely than MSY and F_{msy} . To remove the effects of these difference in catchabilities, we use the ratios to MSY reference points (e.g., B_t/B_{msy} and F_t/F_{msy}) as relative indices. The relative levels of biomass B_t/B_{msy} describes whether a population is above or below the level at which MSY can be obtained, and the relative level of fishing mortality rate F_t/F_{msy} suggests whether an increase or decrease in fishing effort might provide a higher sustainable yield (Prager 1994). Estimates of relative biomass and fishing mortality rates are shown in Figure 4 (output table Page 15 in AppendixA;). Biomass showed a continuous decline from the late-1960s to the mid-1970s, stablized through till the mid-1980s before further declining till about 1994. Since 1994 the stock status has increased to a point where B_t/B_{msy} is at the level which MSY can be obtained in the year 2000, i.e. $B_{2000} = B_{msy}$. The relative fishing mortality rate was high during most of the history of the fishery, in particular during the mid- to late-1980s when landings were often doubled the TAC. Since the fishery opened in 1998, the fishing mortality rate has been gradually increasing to a level of being 37% of F_{msy} in 1999. The estimated yield trajectory indicated that since

1994 the yield has remained well below sustainable production (Fig 4). This is due to a turnaround in stock decline during and after the moratorium and low Fs since the fishery opened in 1998.

Risk analysis of the 2000 and 2001 TACs

The production model was used to compute biomass trajectories based upon specific TACs for the fishery in the subsequent year following the assessment. We use computed bias-corrected point estimates and associated bootstrap confidence intervals (80%) for a retrospective look at the impact of a TAC of 10,000 t adopted by NAFO Scientific Council in 1999 for the 2000 fishery (Pages 34-40 in Appendix C) and to evaluate a suite of candidate TACs for the 2001 fishery (Pages 26-31 in Appendix A)

For a retrospective look at the 2000 TAC, we used the data from 1965 to 1998, i.e. the data available to the 1999 assessment (NAFO 1999), and assumed the 1999 TAC would be taken. Bootstrap output for this run of the model is found on page 34. The projection of 10,000 t and alternate TACs of 12,000 and 14,000 t are shown in Figure 5 (Trajectories on Pages 34 to 40 in Appendix C). Using a TAC of 10,000 t, relative biomass reach the level at which MSY can be obtained in 2001 with $F_{2000}= 1/3\ F_{msy}$. Alternate TAC of 12,000 t gives similar results with $B = B_{msy}$ in 2001 but with $F_{2000}= 3/4\ F_{msy}$. A TAC of 14,000 t would result in B_{2001}<Bmsy and F_{2000} approaching 90%F_{msy}.

For the current NAFO 2000 assessment, stochastic projections were performed to evaluate the risk of depleting the stock at various TACs for the 2001 fishery. TACs of 12,000, 14,000t and 16,000 t were evaluated in the projections assuming the TAC of 10,000 t was taken in 2000 fishery (Pages 26-31 in Appendix A). All three TACs show that relative biomass exceeds the level at which MSY can be obtained in 2002 (Fig. 6). Relative fishing mortality increases such that F_{2001} is 61%, 71% and 83% of F_{msy} ,respectively, as TACs increase (Trajectories on Pages 27, 29 & 31, respectively). Selection of an appropriate TAC will depend on whether the management objective is related to maintaining stock status at or above B_{msy} or keep fishing mortality at some level below F_{msy}. If the strategy is the former then all three TACs should result in the estimated yield remaining below sustainable production in 2001.

Discussion

Results from the sensitivity analysis which excluded the Spanish survey may not be reasonable, because a estimate of r=0.48 is not consistent with the life history of Grand Bank yellowtail flounder. The same production model performs well in assessments of other stocks of yellowtail flounder and estimates *r* to be 0.62 for Georges Bank yellowtail and 0.46 for southern New England (NEFSC 1998). The Grand Bank yellowtail stock grows slower than southern stocks (Scott 1954, Pitt 1974) and matures at approximately age-5 (Walsh and Morgan 1999b), whereas southern stocks of yellowtail mature at approximately age-2 (NEFSC 1998). Therefore, including the Spanish survey data produces an estimate of *r* for the Grand Bank stock which is much more parsimonious with its life history information (*r*=0.41). In addition it provides another estimate of biomass in the terminal year.

Estimates of absolute stock biomass and fishing mortality in a given year (t) are not generally as reliable as ratios to MSY reference points (e.g., B_t/B_{msy} and F_t/F_{msy}). Biomass reference points and current stock status were expressed as survey biomass indices. The present model appears to be an appropriate method to combine and smooth multiple survey indices for status determination. The stock has rebuilt since the moratorium to the level at which MSY can be obtained.

Evaluating TAC advice with analytical models has several advantages over the approach based on area-swept survey biomass. One feature of models, like ASPIC, is that many sources of information on the stock and fishery (e.g., catch, cpue, survey data) can be combined to obtain a single perspective of current and historical stock size and fishing mortality, as well as relevant reference points. Another advantage is that observation error is assumed in most models. For example, our application of ASPIC to Grand Bank yellowtail flounder allows for observation errors in biomass indices. The two features are related, because ASPIC fits a population trajectory to the various sources of information by minimizing differences between the observations and the modeled population. As a result, interpretations from models tend to be less sensitive to any one observation than area-swept survey approaches. For example, the Canadian spring survey index increased by 81% from 1998 to 1999, but based on historical productivity of the stock, harvest levels, and other biomass indices in those years, ASPIC estimates of biomass increased by only 17%. Therefore the current approach of setting a TAC based on the Canadian spring

survey value would be substantially more optimistic than the approach based on ASPIC results. In addition, the uncertainty in aging yellowtail flounder and the use of estimates of age 7+ biomass may be misleading to derivation of a TAC. Most analytical models also provide some estimates of uncertainty and are capable of supporting risk assessment. For example, the probability of attaining B_{msy} for a range of TAC options can be assessed with ASPIC.

The retrospective evaluation of the 2000 TAC and the evaluation of risk in TAC projections for the 2001 fishery demonstrates the need for an explicit management objective and acceptable levels of risk when setting TACs. For example, an objective when biomass is less than B_{msy} would be attaining B_{msy} in year 2 with neutral risk. So, a TAC should be selected that allowed the bias corrected estimate of Bt/Bmsy to equal 1.0 in year 2. At high stock size, we might have an objective of being 75% or 90% sure of F being less than Fmsy. In that case you would pick a TAC that had the upper 50% CI of F/Fmsy = 1.0

Analytical models, like ASPIC, have formally stated assumptions (e.g., the stock conforms to logistic growth). The implications of the assumed growth model should be considered in the interpretation of model results. For example, model projections assume that recruitment will be strong in the next two years, because the stock biomass is estimated to be near B_{MSY}. Therefore, a precautionary harvest target, such as 2/3 F_{MSY} may be prudent to account for model uncertainty. By comparison, area-swept survey approaches also have implicit assumptions. For example using area-swept biomass estimates from the Canadian surveys to advise on a TAC assumes complete sampling efficiency of the survey gear (i.e., q=1.0). Observation error in surveys can be reduced by averaging over several years, but this implicitly assumes that stock size has not changed over that period. In summary, conclusions about stock status and TAC evaluation are generally more reliable from an analytical approach than from an approach based on area-swept survey biomass, because many sources of information are combined using a theoretical model with explicit assumptions.

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Table 1 Nominal catch, CPUE, survey biomass indices and provisional SPA biomass estimates of Grand Bank Yellowtail flounder

Year	Landings (kt)	Canadian CPUE*	Canadian Yankee Spring Survey Biomass (kt)	Canadian Campelen Spring Survey Biomass (kt)	Canadian Campelen Fall Survey Biomass (kt)	USSR/Russia Spring Survey Biomass (kt)	Spanish Spring Survey Biomass (kt)	SPA Biomass (kt)
1965	3.13	1.171						
1966	7.026	1.109						
1967	8.878	1.089						
1968	13.34	0.935						97.2
1969	15.708	0.818						101.8
1970	26.426	0.800						104.0
1971	37.342	0.774	98.9					94.6
1972	39.259	0.689	79.2			106.0		79.6
1973	32.815	0.780	51.7			217.0		67.8
1974	24.313	0.516	40.3			129.0		51.9
1975	22.894	0.512	37.4			126.0		41.9
1976	8.057	0.465	41.7			131.0		47.0
1977	11.638	0.565	65.0			188.0		50.1
1978	15.466	0.581	44.3			110.0		56.4
1979	18.351	0.596	38.5			98.0		42.8
1980	12.377	0.666	51.4			164.0		53.6
1981	14.68	0.668	45.0			158.0		56.5
1982	13.319	0.605	43.1			125.0		70.8
1983	10.473	0.688						93.2
1984	16.735	0.688		217.7		132.0		90.4
1985	28.963	0.689		146.8		85.0		70.2
1986	30.176	0.507		138.2		42.0		38.6
1987	16.314	0.529		124.6		30.0		20.0
1988	16.158	0.491		81.0		23.0		
1989	10.207	0.478		103.8		44.0		
1990	13.986	0.566		103.1	33.1	27.0		
1991	16.203	0.284		93.4	38.8	26.5		
1992	10.762	0.330		61.4	30.8			
1993	13.565	0.543		93.3	54.2			
1994	2.069			55.6	54.6			
1995	0.067			70.6	129.8		27.7	
1996	0.287			175.6	134.3		129.6	
1997	0.800			174.9	222.9		115.7	
1998	4.348	0.883		202.2	228.2		425.4	
1999	6,000**	0.942		365.7	249.9		589.2	
Average	15.357	0.699	57.46	146.6	247.1	109.0	257.5	68.7

* not used in final model run

** assumes the TAC is taken in 1999 fishery

Table 2. Pearson correlation coefficients among biomass indices of Grand Bank yellowtail flounder.

	CPUE	Campelen spring	Yankee	Campelen fall	Russian	Spanish	SPA
CPUE	1.00						
Campelen spring	0.85	1.00					
Yankee	0.63	0.00	1.00				
Campelen fall	0.92	0.84	0.00	1.00			
Russian	0.61	0.93	0.20	1.00	1.00		
Spanish	1.00	0.90	0.00	0.83	0.00	1.00	
SPA	0.79	0.87	0.82	0.00	0.41	0.00	1.00

Table 3. Results from alternative ASPIC production model configurations (MSY, K, and B_{msy}, and in thousand t units) using the 1965-1999 data series. B_t & F_t = 2000

Model run	B1R	MSY	r	K	Bmsy	Fmsy	B_t/B_{msy}	F_t/F_{msy}	MSE	Comment
1	1.3	18.6	0.47	159.7	79.9	0.23	1.19	0.29	0.095	Exclude Russian
2	2.3	17.0	0.41	168.2	84.1	0.21	1.02	0.37	0.172	Exclude SPA
3	2.2	16.2	0.35	185.0	92.5	0.17	1.00	0.41	0.148	Exclude Spanish
4	2.1	17.2	0.41	168.1	84.1	0.21	1.02	0.37	0.190	Appendix A
4i	1.2	18.2	0.41	176.8	88.4	0.21	1.12	0.31	0.077	Iteratively reweighted
4ii	3.6	16.7	0.41	163.5	81.7	0.21	1.03	0.37	0.190	Penalty term removed
5	0.4	24.6	0.32	305.3	152.7	0.16	0.71	0.37	0.201	Including CPUE

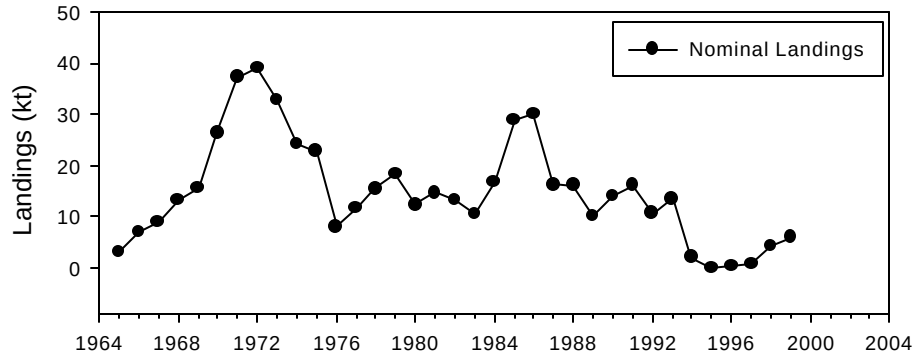


Fig. 1 Landings of Grand Bank yellowtail flounder

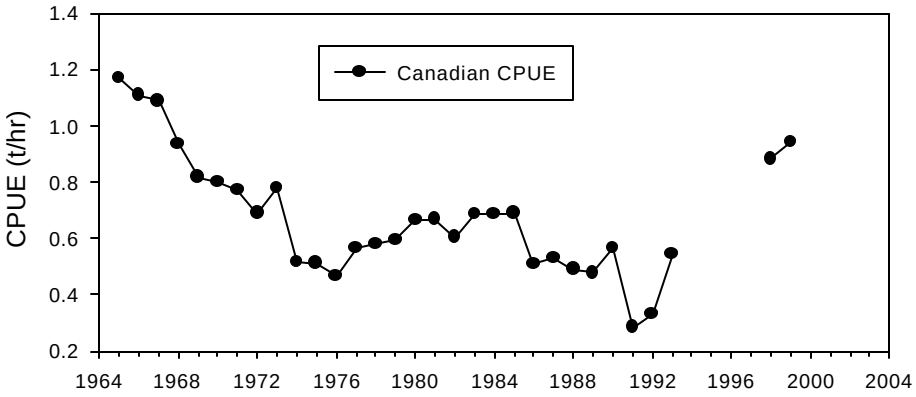


Fig. 2 Canadian catch per unit effort for Grand Bank yellowtail flounder

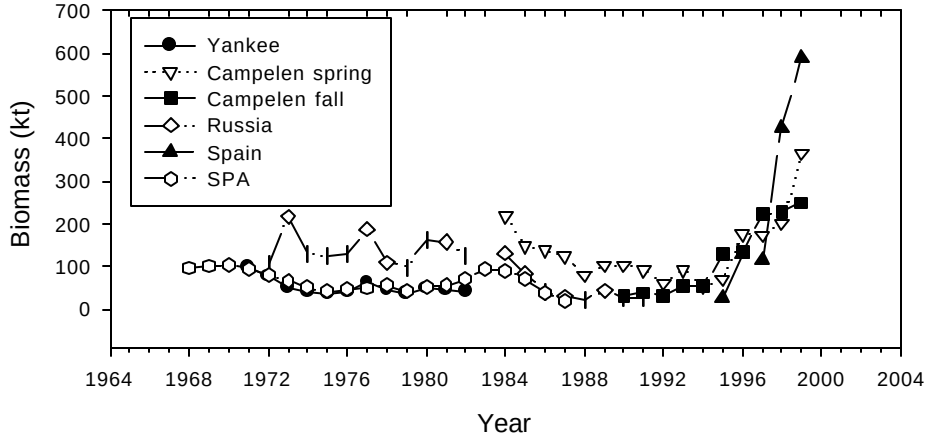


Fig. 3. Biomass indices of Grand Bank yellowtail flounder.

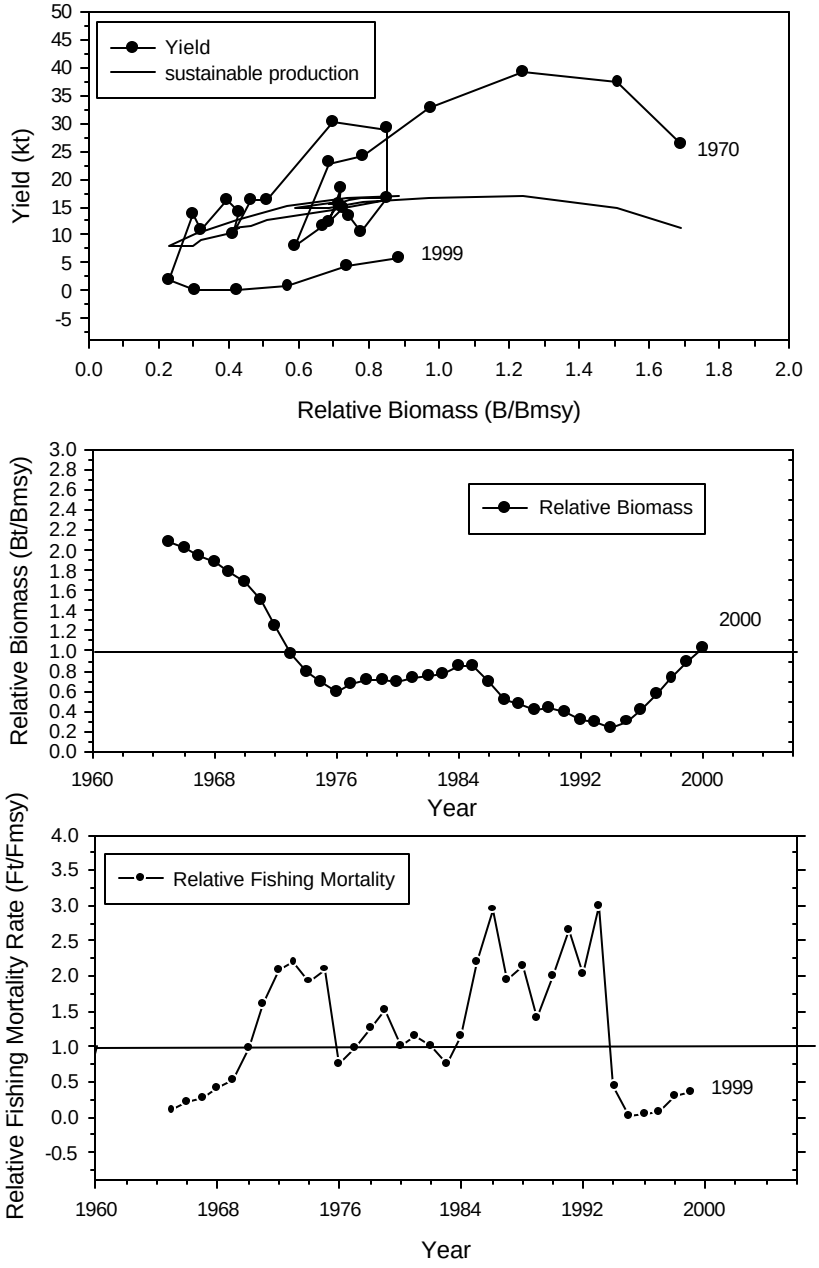


Fig. 4. Yield trajectory, relative biomass indices and relative fishing mortailty rates from surplus production analysis of Div. 3LNO yellowtail flounder using the 1965-99 index.

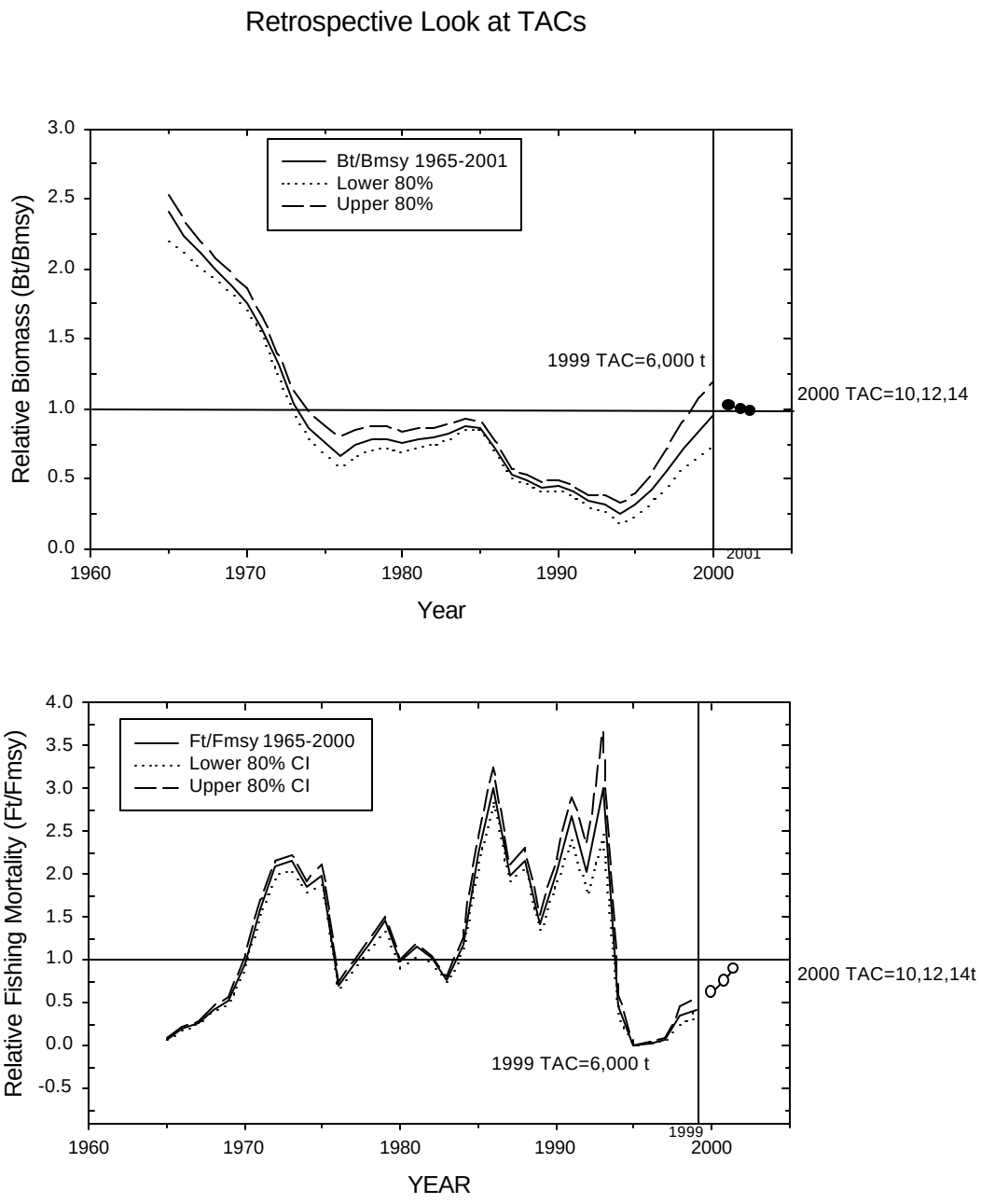


Fig. 5. Retrospective look at stochastic projections to assess the impact of current TACs (i,e, 6,000 t in 1999 and 10,000t in 2000) and alternate TACs for 2000 using the data series 1965-1998.

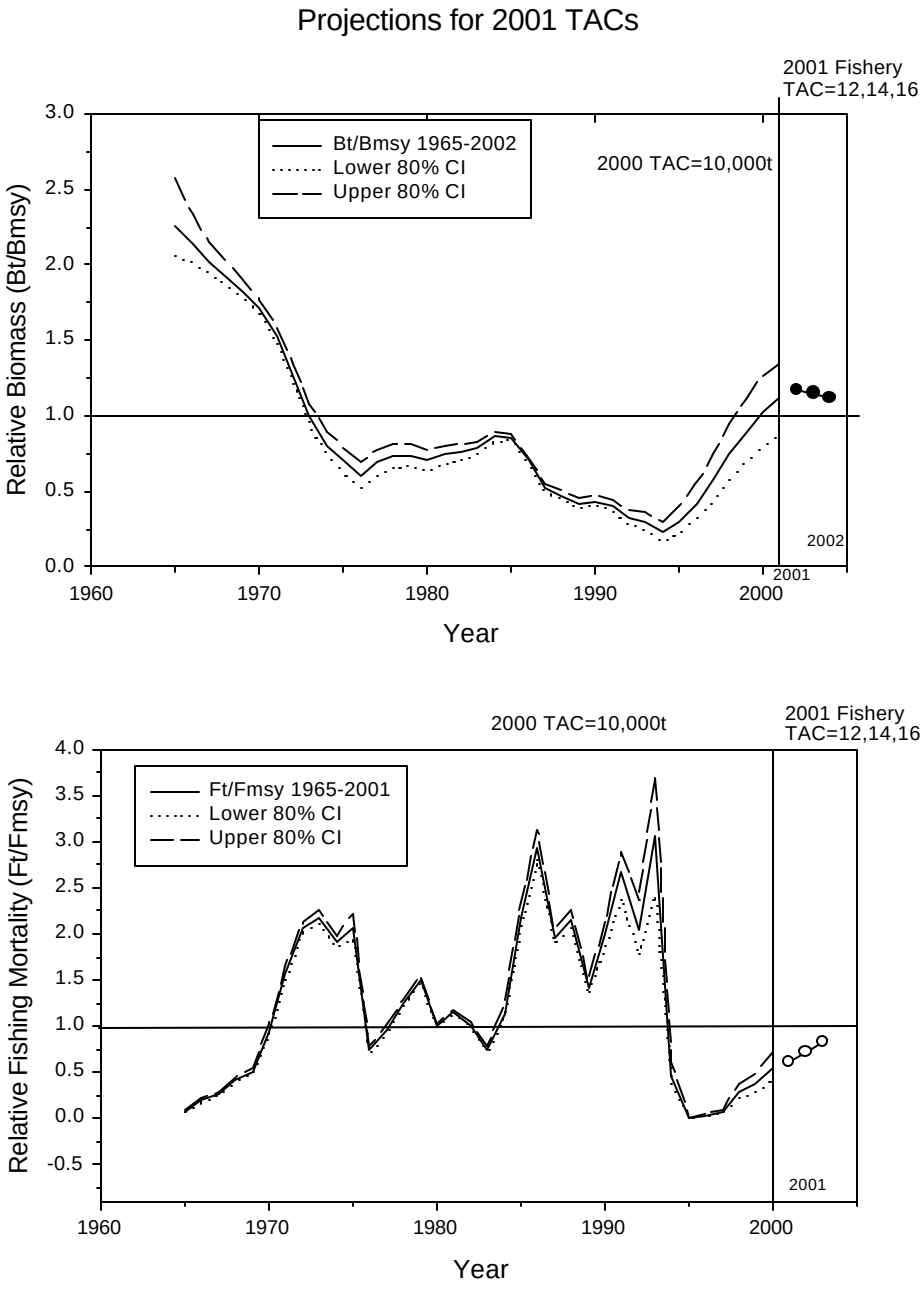


Fig. 6. Projected relative biomass and fishing mortality trajectories for alternate TACs of 12,000, 14000 and 16,000 t for the 2001 yellowtail flounder fishery on the Grand Bank.

APPENDIX A

```
3LNO yellowtail flounder (biomass in kt) `Page 1
                                                                                                                    06 Jun 2000 at 00:15.11

ASPIC -- A Surplus-Production Model Including Covariates (Ver. 3.74)                                                                FIT Mode

Author: Michael H. Prager
        National Marine Fisheries Service                                                                          ASPIC User's Manual
        Southwest Fisheries Science Center                                                                         is available gratis
        3150 Paradise Drive                                                                                            from the author
        Tiburon, California 94920  USA


CONTROL PARAMETERS USED (FROM INPUT FILE)
-------------------------------------------------------------------------------------------------------------------------------
Number of years analyzed:                      35          Number of bootstrap trials:                                    0
Number of data series:                          6          Lower bound on MSY:                                 1.000E+00
Objective function computed:           in effort          Upper bound on MSY:                                 5.000E+01
Relative conv. criterion (simplex):    1.000E-06          Lower bound on r:                                   1.000E-01
Relative conv. criterion (restart):    3.000E-06          Upper bound on r:                                   5.000E+00
Relative conv. criterion (effort):     1.000E-02          Random number seed:                                       911
Maximum F allowed in fitting:              5.000          Monte Carlo search trials:                              50000

PROGRAM STATUS INFORMATION (NON-BOOTSTRAPPED ANALYSIS)                                                                 code  0
-------------------------------------------------------------------------------------------------------------------------------
Normal convergence.

CORRELATION AMONG INPUT SERIES EXPRESSED AS CPUE (NUMBER OF PAIRWISE OBSERVATIONS BELOW)
-------------------------------------------------------------------------------------------------------------------------------
                                    |
 1  Canadian Campelen Survey        |   1.000
                                    |     16
                                    |
 2  Canadian Yankee Survey          |   0.000   1.000
                                    |      0      12
                                    |
 3  Canadian Fall Survey            |   0.839   0.000   1.000
                                    |     10       0      10
                                    |
 4  Russian Survey                  |   0.933   0.198   1.000   1.000
                                    |      8      11       2      19
                                    |
 5  Spanish Survey                  |   0.903   0.000   0.828   0.000   1.000
                                    |      5       0       5       0       5
                                    |
 6  SPA BIOMASS                     |   0.874   0.821   0.000   0.408   0.000   1.000
                                    |      4      12       0      15       0      20
                                    ---------------------------------------------------
                                           1       2       3       4       5       6

GOODNESS-OF-FIT AND WEIGHTING FOR NON-BOOTSTRAPPED ANALYSIS
-------------------------------------------------------------------------------------------------------------------------------
                                                Weighted            Weighted      Current    Suggested    R-squared
Loss component number and title                      SSE    N            MSE       weight       weight      in CPUE

Loss(-1)  SSE in yield                        0.000E+00
Loss( 0)  Penalty for B1R > 2                 1.670E-03    1            N/A    1.000E+00          N/A
Loss( 1)  Canadian Campelen Survey            7.527E-01   16     5.376E-02    1.000E+00    1.190E+00        0.741
Loss( 2)  Canadian Yankee Survey              2.655E-01   12     2.655E-02    1.000E+00    2.410E+00        0.794
Loss( 3)  Canadian Fall Survey                7.608E-01   10     9.510E-02    1.000E+00    6.729E-01        0.841
Loss( 4)  Russian Survey                      4.811E+00   19     2.830E-01    1.000E+00    2.261E-01        0.313
Loss( 5)  Spanish Survey                      2.866E+00    5     9.554E-01    1.000E+00    6.698E-02        0.250
Loss( 6)  SPA BIOMASS                         1.016E+00   20     5.644E-02    1.000E+00    1.134E+00        0.572
TOTAL OBJECTIVE FUNCTION:                  1.04737807E+01

NOTE: B1-ratio constraint term contributing to loss. Sensitivity analysis advised.

Number of restarts required for convergence:              21
Est. B-ratio coverage index (0 worst, 2 best):          1.7680              < These two measures are defined in Prager
Est. B-ratio nearness index (0 worst, 1 best):          1.0000              <     et al. (1996), Trans. A.F.S. 125:729


MODEL PARAMETER ESTIMATES (NON-BOOTSTRAPPED)
-------------------------------------------------------------------------------------------------------------------------------
Parameter                                          Estimate     Starting guess    Estimated   User guess

B1R       Starting biomass ratio, year 1965     2.083E+00          2.000E+00            1            1
MSY       Maximum sustainable yield             1.719E+01          1.300E+01            1            1
r         Intrinsic rate of increase            4.091E-01          5.000E-01            1            1
........  Catchability coefficients by fishery:
q( 1)     Canadian Campelen Survey              2.975E+00          3.000E+00            1            1
q( 2)     Canadian Yankee Survey                7.683E-01          1.000E+00            1            1
q( 3)     Canadian Fall Survey                  3.232E+00          3.000E+00            1            1
q( 4)     Russian Survey                        1.562E+00          1.000E+00            1            1
q( 5)     Spanish Survey                        3.088E+00          3.000E+00            1            1
q( 6)     SPA BIOMASS                           8.621E-01          1.000E+00            1            1


MANAGEMENT PARAMETER ESTIMATES (NON-BOOTSTRAPPED)
-------------------------------------------------------------------------------------------------------------------------------
Parameter                                          Estimate           Formula         Related quantity

MSY       Maximum sustainable yield             1.719E+01              Kr/4
K         Maximum stock biomass                 1.681E+02
Bmsy      Stock biomass at MSY                  8.404E+01               K/2
Fmsy      Fishing mortality at MSY              2.045E-01               r/2

F(0.1)    Management benchmark                  1.841E-01          0.9*Fmsy
Y(0.1)    Equilibrium yield at F(0.1)           1.702E+01          0.99*MSY

B-ratio   Ratio of B(2000) to Bmsy              1.016E+00
F-ratio   Ratio of F(1999) to Fmsy              3.672E-01
F01-mult  Ratio of F(0.1) to F(1999)            2.451E+00
Y-ratio   Proportion of MSY avail in 2000       9.997E-01          2*Br-Br^2     Ye(2000) = 1.719E+01

........  Fishing effort at MSY in units of each fishery:
fmsy( 1)  Canadian Campelen Survey                    6.876E-02            r/2q( 1)       f(0.1) = 6.188E-02
```

3LNO yellowtail flounder (biomass in kt) Page 2

ESTIMATED POPULATION TRAJECTORY (NON-BOOTSTRAPPED)

Obs	Year or ID	Estimated total F mort	Estimated starting biomass	Estimated average biomass	Observed total yield	Model total yield	Estimated surplus production	Ratio of F mort to Fmsy	Ratio of biomass to Bmsy
1	1965	0.018	1.751E+02	1.724E+02	3.130E+00	3.130E+00	-1.829E+00	8.875E-02	2.083E+00
2	1966	0.042	1.701E+02	1.667E+02	7.026E+00	7.026E+00	5.664E-01	2.061E-01	2.024E+00
3	1967	0.055	1.637E+02	1.605E+02	8.878E+00	8.878E+00	2.954E+00	2.704E-01	1.948E+00
4	1968	0.087	1.577E+02	1.535E+02	1.334E+01	1.334E+01	5.430E+00	4.249E-01	1.877E+00
5	1969	0.108	1.498E+02	1.457E+02	1.571E+01	1.571E+01	7.928E+00	5.272E-01	1.783E+00
6	1970	0.198	1.421E+02	1.338E+02	2.643E+01	2.643E+01	1.110E+01	9.656E-01	1.690E+00
7	1971	0.326	1.267E+02	1.145E+02	3.734E+01	3.734E+01	1.481E+01	1.594E+00	1.508E+00
8	1972	0.426	1.042E+02	9.211E+01	3.926E+01	3.926E+01	1.691E+01	2.084E+00	1.240E+00
9	1973	0.448	8.185E+01	7.328E+01	3.281E+01	3.281E+01	1.684E+01	2.189E+00	9.739E-01
10	1974	0.396	6.587E+01	6.145E+01	2.431E+01	2.431E+01	1.593E+01	1.934E+00	7.838E-01
11	1975	0.430	5.748E+01	5.324E+01	2.289E+01	2.289E+01	1.486E+01	2.102E+00	6.840E-01
12	1976	0.153	4.944E+01	5.282E+01	8.057E+00	8.057E+00	1.481E+01	7.458E-01	5.883E-01
13	1977	0.200	5.620E+01	5.817E+01	1.164E+01	1.164E+01	1.556E+01	9.782E-01	6.687E-01
14	1978	0.257	6.011E+01	6.026E+01	1.547E+01	1.547E+01	1.581E+01	1.255E+00	7.153E-01
15	1979	0.311	6.046E+01	5.901E+01	1.835E+01	1.835E+01	1.565E+01	1.520E+00	7.194E-01
16	1980	0.208	5.776E+01	5.944E+01	1.238E+01	1.238E+01	1.571E+01	1.018E+00	6.873E-01
17	1981	0.238	6.109E+01	6.173E+01	1.468E+01	1.468E+01	1.598E+01	1.163E+00	7.270E-01
18	1982	0.209	6.239E+01	6.384E+01	1.332E+01	1.332E+01	1.619E+01	1.020E+00	7.424E-01
19	1983	0.153	6.526E+01	6.835E+01	1.047E+01	1.047E+01	1.658E+01	7.492E-01	7.766E-01
20	1984	0.234	7.137E+01	7.139E+01	1.673E+01	1.673E+01	1.680E+01	1.146E+00	8.493E-01
21	1985	0.448	7.144E+01	6.466E+01	2.896E+01	2.896E+01	1.623E+01	2.190E+00	8.500E-01
22	1986	0.603	5.870E+01	5.008E+01	3.018E+01	3.018E+01	1.429E+01	2.946E+00	6.985E-01
23	1987	0.399	4.282E+01	4.084E+01	1.631E+01	1.631E+01	1.263E+01	1.953E+00	5.095E-01
24	1988	0.439	3.913E+01	3.679E+01	1.616E+01	1.616E+01	1.174E+01	2.147E+00	4.657E-01
25	1989	0.289	3.472E+01	3.531E+01	1.021E+01	1.021E+01	1.141E+01	1.413E+00	4.131E-01
26	1990	0.406	3.592E+01	3.445E+01	1.399E+01	1.399E+01	1.120E+01	1.985E+00	4.274E-01
27	1991	0.542	3.313E+01	2.988E+01	1.620E+01	1.620E+01	1.003E+01	2.651E+00	3.942E-01
28	1992	0.413	2.696E+01	2.604E+01	1.076E+01	1.076E+01	9.000E+00	2.020E+00	3.208E-01
29	1993	0.612	2.520E+01	2.218E+01	1.356E+01	1.356E+01	7.863E+00	2.990E+00	2.999E-01
30	1994	0.093	1.950E+01	2.231E+01	2.069E+00	2.069E+00	7.910E+00	4.534E-01	2.320E-01
31	1995	0.002	2.534E+01	3.014E+01	6.700E-02	6.700E-02	1.010E+01	1.087E-02	3.015E-01
32	1996	0.007	3.537E+01	4.138E+01	2.870E-01	2.870E-01	1.273E+01	3.391E-02	4.209E-01
33	1997	0.015	4.781E+01	5.479E+01	8.000E-01	8.000E-01	1.507E+01	7.138E-02	5.689E-01
34	1998	0.064	6.208E+01	6.816E+01	4.348E+00	4.348E+00	1.655E+01	3.119E-01	7.387E-01
35	1999	0.075	7.428E+01	7.987E+01	6.000E+00	6.000E+00	1.712E+01	3.672E-01	8.838E-01
36	2000		8.540E+01						1.016E+00

3LNO yellowtail flounder (biomass in kt) Page 3

RESULTS FOR DATA SERIES # 1 (NON-BOOTSTRAPPED) Canadian Campelen Survey

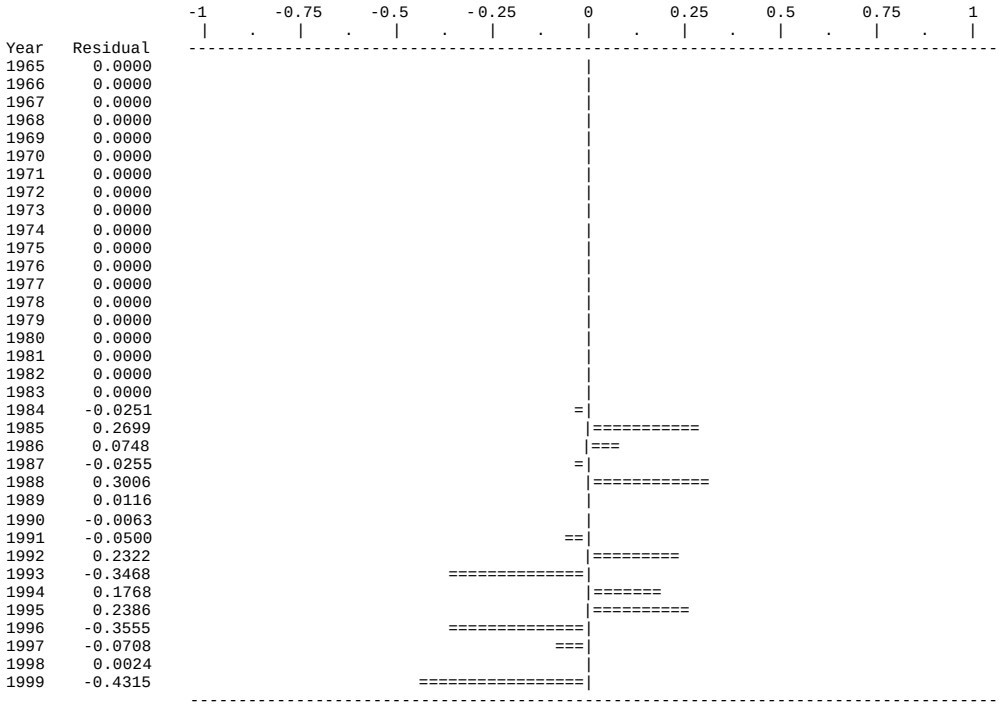
Data type CC: CPUE-catch series Series weight: 1.000

Obs	Year	Observed CPUE	Estimated CPUE	Estim F	Observed yield	Model yield	Resid in log scale	Resid in yield
1	1965	*	5.128E+02	0.0182	3.130E+00	3.130E+00	0.00000	0.000E+00
2	1966	*	4.956E+02	0.0422	7.026E+00	7.026E+00	0.00000	0.000E+00
3	1967	*	4.773E+02	0.0553	8.878E+00	8.878E+00	0.00000	0.000E+00
4	1968	*	4.565E+02	0.0869	1.334E+01	1.334E+01	0.00000	0.000E+00
5	1969	*	4.332E+02	0.1078	1.571E+01	1.571E+01	0.00000	0.000E+00
6	1970	*	3.979E+02	0.1975	2.643E+01	2.643E+01	0.00000	0.000E+00
7	1971	*	3.406E+02	0.3260	3.734E+01	3.734E+01	0.00000	0.000E+00
8	1972	*	2.739E+02	0.4262	3.926E+01	3.926E+01	0.00000	0.000E+00
9	1973	*	2.179E+02	0.4478	3.281E+01	3.281E+01	0.00000	0.000E+00
10	1974	*	1.827E+02	0.3957	2.431E+01	2.431E+01	0.00000	0.000E+00
11	1975	*	1.583E+02	0.4300	2.289E+01	2.289E+01	0.00000	0.000E+00
12	1976	*	1.571E+02	0.1525	8.057E+00	8.057E+00	0.00000	0.000E+00
13	1977	*	1.730E+02	0.2001	1.164E+01	1.164E+01	0.00000	0.000E+00
14	1978	*	1.792E+02	0.2567	1.547E+01	1.547E+01	0.00000	0.000E+00
15	1979	*	1.755E+02	0.3110	1.835E+01	1.835E+01	0.00000	0.000E+00
16	1980	*	1.768E+02	0.2082	1.238E+01	1.238E+01	0.00000	0.000E+00
17	1981	*	1.836E+02	0.2378	1.468E+01	1.468E+01	0.00000	0.000E+00
18	1982	*	1.898E+02	0.2086	1.332E+01	1.332E+01	0.00000	0.000E+00
19	1983	*	2.032E+02	0.1532	1.047E+01	1.047E+01	0.00000	0.000E+00
20	1984	2.177E+02	2.123E+02	0.2344	1.673E+01	1.673E+01	-0.02513	0.000E+00
21	1985	1.468E+02	1.923E+02	0.4479	2.896E+01	2.896E+01	0.26990	0.000E+00
22	1986	1.382E+02	1.489E+02	0.6025	3.018E+01	3.018E+01	0.07480	0.000E+00
23	1987	1.246E+02	1.215E+02	0.3994	1.631E+01	1.631E+01	-0.02555	0.000E+00
24	1988	8.100E+01	1.094E+02	0.4392	1.616E+01	1.616E+01	0.30060	0.000E+00
25	1989	1.038E+02	1.050E+02	0.2891	1.021E+01	1.021E+01	0.01155	0.000E+00
26	1990	1.031E+02	1.025E+02	0.4059	1.399E+01	1.399E+01	-0.00627	0.000E+00
27	1991	9.340E+01	8.885E+01	0.5423	1.620E+01	1.620E+01	-0.04997	0.000E+00
28	1992	6.140E+01	7.745E+01	0.4132	1.076E+01	1.076E+01	0.23220	0.000E+00
29	1993	9.330E+01	6.596E+01	0.6116	1.356E+01	1.356E+01	-0.34677	0.000E+00
30	1994	5.560E+01	6.635E+01	0.0927	2.069E+00	2.069E+00	0.17679	0.000E+00
31	1995	7.060E+01	8.962E+01	0.0022	6.700E-02	6.700E-02	0.23858	0.000E+00
32	1996	1.756E+02	1.231E+02	0.0069	2.870E-01	2.870E-01	-0.35547	0.000E+00
33	1997	1.749E+02	1.629E+02	0.0146	8.000E-01	8.000E-01	-0.07078	0.000E+00
34	1998	2.022E+02	2.027E+02	0.0638	4.348E+00	4.348E+00	0.00240	0.000E+00
35	1999	3.657E+02	2.375E+02	0.0751	6.000E+00	6.000E+00	-0.43151	0.000E+00

* Asterisk indicates missing value(s).

3LNO yellowtail flounder (biomass in kt) Page 4

UNWEIGHTED LOG RESIDUAL PLOT FOR DATA SERIES # 1



3LNO yellowtail flounder (biomass in kt) Page 5

RESULTS FOR DATA SERIES # 2 (NON-BOOTSTRAPPED) Canadian Yankee Survey

Data type I1: Year-average biomass index Series weight: 1.000

Obs	Year	Observed effort	Estimated effort	Estim F	Observed index	Model index	Resid in log index	Resid in index
1	1965	0.000E+00	0.000E+00	0.0	*	1.325E+02	0.00000	0.0
2	1966	0.000E+00	0.000E+00	0.0	*	1.280E+02	0.00000	0.0
3	1967	0.000E+00	0.000E+00	0.0	*	1.233E+02	0.00000	0.0
4	1968	0.000E+00	0.000E+00	0.0	*	1.179E+02	0.00000	0.0
5	1969	0.000E+00	0.000E+00	0.0	*	1.119E+02	0.00000	0.0
6	1970	0.000E+00	0.000E+00	0.0	*	1.028E+02	0.00000	0.0
7	1971	1.000E+00	1.000E+00	0.0	9.690E+01	8.800E+01	0.09637	8.903E+00
8	1972	1.000E+00	1.000E+00	0.0	7.920E+01	7.077E+01	0.11256	8.431E+00
9	1973	1.000E+00	1.000E+00	0.0	5.170E+01	5.630E+01	-0.08527	-4.602E+00
10	1974	1.000E+00	1.000E+00	0.0	4.030E+01	4.721E+01	-0.15827	-6.911E+00
11	1975	1.000E+00	1.000E+00	0.0	3.740E+01	4.090E+01	-0.08957	-3.504E+00
12	1976	1.000E+00	1.000E+00	0.0	4.170E+01	4.058E+01	0.02725	1.121E+00
13	1977	1.000E+00	1.000E+00	0.0	6.500E+01	4.469E+01	0.37463	2.031E+01
14	1978	1.000E+00	1.000E+00	0.0	4.430E+01	4.630E+01	-0.04411	-1.998E+00
15	1979	1.000E+00	1.000E+00	0.0	3.850E+01	4.533E+01	-0.16341	-6.834E+00
16	1980	1.000E+00	1.000E+00	0.0	5.140E+01	4.567E+01	0.11829	5.734E+00
17	1981	1.000E+00	1.000E+00	0.0	4.500E+01	4.743E+01	-0.05259	-2.430E+00
18	1982	1.000E+00	1.000E+00	0.0	4.310E+01	4.905E+01	-0.12927	-5.948E+00
19	1983	0.000E+00	0.000E+00	0.0	*	5.251E+01	0.00000	0.0
20	1984	0.000E+00	0.000E+00	0.0	*	5.485E+01	0.00000	0.0
21	1985	0.000E+00	0.000E+00	0.0	*	4.968E+01	0.00000	0.0
22	1986	0.000E+00	0.000E+00	0.0	*	3.848E+01	0.00000	0.0
23	1987	0.000E+00	0.000E+00	0.0	*	3.138E+01	0.00000	0.0
24	1988	0.000E+00	0.000E+00	0.0	*	2.827E+01	0.00000	0.0
25	1989	0.000E+00	0.000E+00	0.0	*	2.713E+01	0.00000	0.0
26	1990	0.000E+00	0.000E+00	0.0	*	2.647E+01	0.00000	0.0
27	1991	0.000E+00	0.000E+00	0.0	*	2.295E+01	0.00000	0.0
28	1992	0.000E+00	0.000E+00	0.0	*	2.001E+01	0.00000	0.0
29	1993	0.000E+00	0.000E+00	0.0	*	1.704E+01	0.00000	0.0
30	1994	0.000E+00	0.000E+00	0.0	*	1.714E+01	0.00000	0.0
31	1995	0.000E+00	0.000E+00	0.0	*	2.315E+01	0.00000	0.0
32	1996	0.000E+00	0.000E+00	0.0	*	3.180E+01	0.00000	0.0
33	1997	0.000E+00	0.000E+00	0.0	*	4.210E+01	0.00000	0.0
34	1998	0.000E+00	0.000E+00	0.0	*	5.237E+01	0.00000	0.0
35	1999	0.000E+00	0.000E+00	0.0	*	6.137E+01	0.00000	0.0

* Asterisk indicates missing value(s).

3LNO yellowtail flounder (biomass in kt) Page 6

UNWEIGHTED LOG RESIDUAL PLOT FOR DATA SERIES # 2

Year	Residual	-1 -0.75 -0.5 -0.25 0 0.25 0.5 0.75 1
1965	0.0000	|
1966	0.0000	|
1967	0.0000	|
1968	0.0000	|
1969	0.0000	|
1970	0.0000	|
1971	0.0964	|====
1972	0.1126	|=====
1973	-0.0853	===|
1974	-0.1583	======|
1975	-0.0896	====|
1976	0.0272	|=
1977	0.3746	|===============
1978	-0.0441	==|
1979	-0.1634	=======|
1980	0.1183	|=====
1981	-0.0526	==|
1982	-0.1293	=====|
1983	0.0000	|
1984	0.0000	|
1985	0.0000	|
1986	0.0000	|
1987	0.0000	|
1988	0.0000	|
1989	0.0000	|
1990	0.0000	|
1991	0.0000	|
1992	0.0000	|
1993	0.0000	|
1994	0.0000	|
1995	0.0000	|
1996	0.0000	|
1997	0.0000	|
1998	0.0000	|
1999	0.0000	|

3LNO yellowtail flounder (biomass in kt) Page 7

RESULTS FOR DATA SERIES # 3 (NON-BOOTSTRAPPED) Canadian Fall Survey

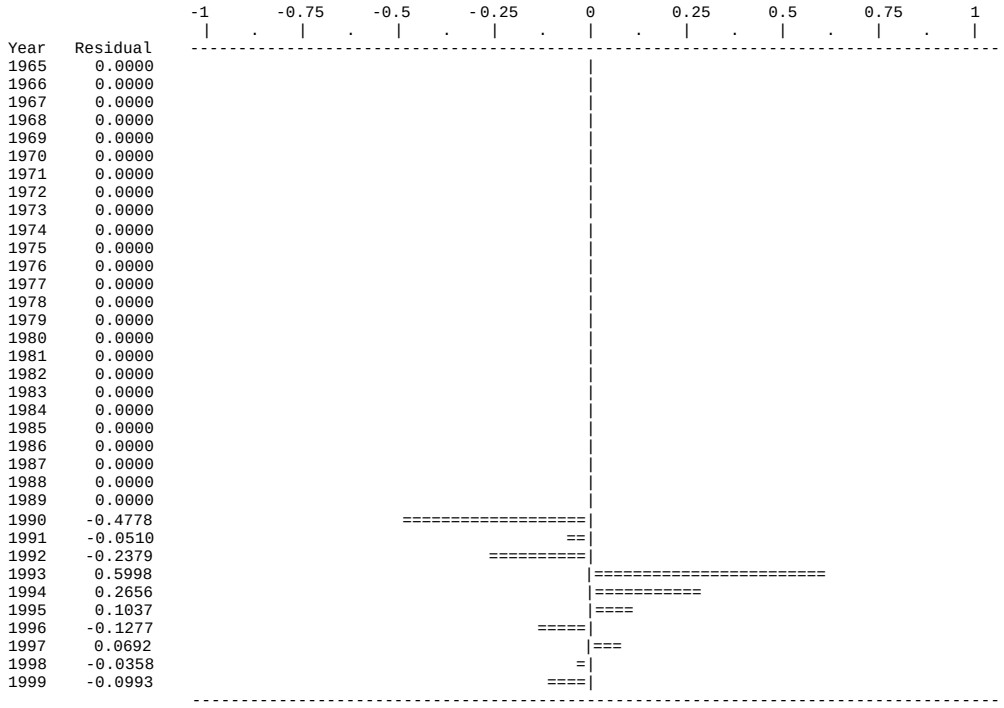
Data type I2: End-of-year biomass index Series weight: 1.000

Obs	Year	Observed effort	Estimated effort	Estim F	Observed index	Model index	Resid in log index	Resid in index
1	1965	0.000E+00	0.000E+00	0.0	*	5.498E+02	0.00000	0.0
2	1966	0.000E+00	0.000E+00	0.0	*	5.290E+02	0.00000	0.0
3	1967	0.000E+00	0.000E+00	0.0	*	5.098E+02	0.00000	0.0
4	1968	0.000E+00	0.000E+00	0.0	*	4.842E+02	0.00000	0.0
5	1969	0.000E+00	0.000E+00	0.0	*	4.591E+02	0.00000	0.0
6	1970	0.000E+00	0.000E+00	0.0	*	4.096E+02	0.00000	0.0
7	1971	0.000E+00	0.000E+00	0.0	*	3.367E+02	0.00000	0.0
8	1972	0.000E+00	0.000E+00	0.0	*	2.645E+02	0.00000	0.0
9	1973	0.000E+00	0.000E+00	0.0	*	2.129E+02	0.00000	0.0
10	1974	0.000E+00	0.000E+00	0.0	*	1.858E+02	0.00000	0.0
11	1975	0.000E+00	0.000E+00	0.0	*	1.598E+02	0.00000	0.0
12	1976	0.000E+00	0.000E+00	0.0	*	1.816E+02	0.00000	0.0
13	1977	0.000E+00	0.000E+00	0.0	*	1.943E+02	0.00000	0.0
14	1978	0.000E+00	0.000E+00	0.0	*	1.954E+02	0.00000	0.0
15	1979	0.000E+00	0.000E+00	0.0	*	1.867E+02	0.00000	0.0
16	1980	0.000E+00	0.000E+00	0.0	*	1.974E+02	0.00000	0.0
17	1981	0.000E+00	0.000E+00	0.0	*	2.016E+02	0.00000	0.0
18	1982	0.000E+00	0.000E+00	0.0	*	2.109E+02	0.00000	0.0
19	1983	0.000E+00	0.000E+00	0.0	*	2.307E+02	0.00000	0.0
20	1984	0.000E+00	0.000E+00	0.0	*	2.309E+02	0.00000	0.0
21	1985	0.000E+00	0.000E+00	0.0	*	1.897E+02	0.00000	0.0
22	1986	0.000E+00	0.000E+00	0.0	*	1.384E+02	0.00000	0.0
23	1987	0.000E+00	0.000E+00	0.0	*	1.265E+02	0.00000	0.0
24	1988	0.000E+00	0.000E+00	0.0	*	1.122E+02	0.00000	0.0
25	1989	0.000E+00	0.000E+00	0.0	*	1.161E+02	0.00000	0.0
26	1990	1.000E+00	1.000E+00	0.0	6.640E+01	1.071E+02	-0.47778	-4.067E+01
27	1991	1.000E+00	1.000E+00	0.0	8.280E+01	8.714E+01	-0.05103	-4.335E+00
28	1992	1.000E+00	1.000E+00	0.0	6.420E+01	8.144E+01	-0.23788	-1.724E+01
29	1993	1.000E+00	1.000E+00	0.0	1.148E+02	6.301E+01	0.59983	5.179E+01
30	1994	1.000E+00	1.000E+00	0.0	1.068E+02	8.189E+01	0.26556	2.491E+01
31	1995	1.000E+00	1.000E+00	0.0	1.268E+02	1.143E+02	0.10370	1.249E+01
32	1996	1.000E+00	1.000E+00	0.0	1.360E+02	1.545E+02	-0.12769	-1.852E+01
33	1997	1.000E+00	1.000E+00	0.0	2.150E+02	2.006E+02	0.06917	1.437E+01
34	1998	1.000E+00	1.000E+00	0.0	2.316E+02	2.401E+02	-0.03584	-8.452E+00
35	1999	1.000E+00	1.000E+00	0.0	2.499E+02	2.760E+02	-0.09932	-2.610E+01

* Asterisk indicates missing value(s).

3LNO yellowtail flounder (biomass in kt) Page 8

UNWEIGHTED LOG RESIDUAL PLOT FOR DATA SERIES # 3



3LNO yellowtail flounder (biomass in kt) Page 9

RESULTS FOR DATA SERIES # 4 (NON-BOOTSTRAPPED) Russian Survey

Data type I1: Year-average biomass index Series weight: 1.000

Obs	Year	Observed effort	Estimated effort	Estim F	Observed index	Model index	Resid in log index	Resid in index
1	1965	0.000E+00	0.000E+00	0.0	*	2.694E+02	0.00000	0.0
2	1966	0.000E+00	0.000E+00	0.0	*	2.604E+02	0.00000	0.0
3	1967	0.000E+00	0.000E+00	0.0	*	2.508E+02	0.00000	0.0
4	1968	0.000E+00	0.000E+00	0.0	*	2.399E+02	0.00000	0.0
5	1969	0.000E+00	0.000E+00	0.0	*	2.276E+02	0.00000	0.0
6	1970	0.000E+00	0.000E+00	0.0	*	2.091E+02	0.00000	0.0
7	1971	0.000E+00	0.000E+00	0.0	*	1.790E+02	0.00000	0.0
8	1972	1.000E+00	1.000E+00	0.0	1.060E+02	1.439E+02	-0.30588	-3.793E+01
9	1973	1.000E+00	1.000E+00	0.0	2.170E+02	1.145E+02	0.63926	1.025E+02
10	1974	1.000E+00	1.000E+00	0.0	1.290E+02	9.602E+01	0.29529	3.298E+01
11	1975	1.000E+00	1.000E+00	0.0	1.260E+02	8.319E+01	0.41514	4.281E+01
12	1976	1.000E+00	1.000E+00	0.0	1.310E+02	8.253E+01	0.46204	4.847E+01
13	1977	1.000E+00	1.000E+00	0.0	1.880E+02	9.089E+01	0.72678	9.711E+01
14	1978	1.000E+00	1.000E+00	0.0	1.100E+02	9.416E+01	0.15548	1.584E+01
15	1979	1.000E+00	1.000E+00	0.0	9.800E+01	9.220E+01	0.06100	5.799E+00
16	1980	1.000E+00	1.000E+00	0.0	1.640E+02	9.288E+01	0.56861	7.112E+01
17	1981	1.000E+00	1.000E+00	0.0	1.580E+02	9.646E+01	0.49344	6.154E+01
18	1982	1.000E+00	1.000E+00	0.0	1.250E+02	9.975E+01	0.22561	2.525E+01
19	1983	0.000E+00	0.000E+00	0.0	*	1.068E+02	0.00000	0.0
20	1984	1.000E+00	1.000E+00	0.0	1.320E+02	1.116E+02	0.16832	2.045E+01
21	1985	1.000E+00	1.000E+00	0.0	8.500E+01	1.010E+02	-0.17282	-1.604E+01
22	1986	1.000E+00	1.000E+00	0.0	4.200E+01	7.826E+01	-0.62233	-3.626E+01
23	1987	1.000E+00	1.000E+00	0.0	3.000E+01	6.382E+01	-0.75486	-3.382E+01
24	1988	1.000E+00	1.000E+00	0.0	2.300E+01	5.749E+01	-0.91605	-3.449E+01
25	1989	1.000E+00	1.000E+00	0.0	4.400E+01	5.518E+01	-0.22632	-1.118E+01
26	1990	1.000E+00	1.000E+00	0.0	2.700E+01	5.384E+01	-0.69009	-2.684E+01
27	1991	1.000E+00	1.000E+00	0.0	2.750E+01	4.668E+01	-0.52923	-1.918E+01
28	1992	0.000E+00	0.000E+00	0.0	*	4.070E+01	0.00000	0.0
29	1993	0.000E+00	0.000E+00	0.0	*	3.466E+01	0.00000	0.0
30	1994	0.000E+00	0.000E+00	0.0	*	3.486E+01	0.00000	0.0
31	1995	0.000E+00	0.000E+00	0.0	*	4.709E+01	0.00000	0.0
32	1996	0.000E+00	0.000E+00	0.0	*	6.467E+01	0.00000	0.0
33	1997	0.000E+00	0.000E+00	0.0	*	8.562E+01	0.00000	0.0
34	1998	0.000E+00	0.000E+00	0.0	*	1.065E+02	0.00000	0.0
35	1999	0.000E+00	0.000E+00	0.0	*	1.248E+02	0.00000	0.0

* Asterisk indicates missing value(s).

3LNO yellowtail flounder (biomass in kt) Page10

UNWEIGHTED LOG RESIDUAL PLOT FOR DATA SERIES # 4

```
                -1       -0.75     -0.5      -0.25       0        0.25      0.5       0.75       1
                 |    .    |    .    |    .    |    .    |    .    |    .    |    .    |    .    |
Year   Residual   ----------------------------------------------------------------------------------
1965     0.0000                                        |
1966     0.0000                                        |
1967     0.0000                                        |
1968     0.0000                                        |
1969     0.0000                                        |
1970     0.0000                                        |
1971     0.0000                                        |
1972    -0.3059                                 ======|
1973     0.6393                                        |=========================
1974     0.2953                                        |============
1975     0.4151                                        |=================
1976     0.4620                                        |==================
1977     0.7268                                        |============================
1978     0.1555                                        |======
1979     0.0610                                        |==
1980     0.5686                                        |======================
1981     0.4934                                        |====================
1982     0.2256                                        |=========
1983     0.0000                                        |
1984     0.1683                                        |=======
1985    -0.1728                                 =======|
1986    -0.6223                          ==============|
1987    -0.7549                      ==================|
1988    -0.9160        ==============================|
1989    -0.2263                                 ======|
1990    -0.6901                    ==================|
1991    -0.5292                           ============|
1992     0.0000                                        |
1993     0.0000                                        |
1994     0.0000                                        |
1995     0.0000                                        |
1996     0.0000                                        |
1997     0.0000                                        |
1998     0.0000                                        |
1999     0.0000                                        |
                ----------------------------------------------------------------------------------
```

3LNO yellowtail flounder (biomass in kt) Page11

RESULTS FOR DATA SERIES # 5 (NON-BOOTSTRAPPED) Spanish Survey

Data type I1: Year-average biomass index Series weight: 1.000

Obs	Year	Observed effort	Estimated effort	Estim F	Observed index	Model index	Resid in log index	Resid in index
1	1965	0.000E+00	0.000E+00	0.0	*	5.325E+02	0.00000	0.0
2	1966	0.000E+00	0.000E+00	0.0	*	5.147E+02	0.00000	0.0
3	1967	0.000E+00	0.000E+00	0.0	*	4.957E+02	0.00000	0.0
4	1968	0.000E+00	0.000E+00	0.0	*	4.741E+02	0.00000	0.0
5	1969	0.000E+00	0.000E+00	0.0	*	4.499E+02	0.00000	0.0
6	1970	0.000E+00	0.000E+00	0.0	*	4.132E+02	0.00000	0.0
7	1971	0.000E+00	0.000E+00	0.0	*	3.537E+02	0.00000	0.0
8	1972	0.000E+00	0.000E+00	0.0	*	2.845E+02	0.00000	0.0
9	1973	0.000E+00	0.000E+00	0.0	*	2.263E+02	0.00000	0.0
10	1974	0.000E+00	0.000E+00	0.0	*	1.898E+02	0.00000	0.0
11	1975	0.000E+00	0.000E+00	0.0	*	1.644E+02	0.00000	0.0
12	1976	0.000E+00	0.000E+00	0.0	*	1.631E+02	0.00000	0.0
13	1977	0.000E+00	0.000E+00	0.0	*	1.796E+02	0.00000	0.0
14	1978	0.000E+00	0.000E+00	0.0	*	1.861E+02	0.00000	0.0
15	1979	0.000E+00	0.000E+00	0.0	*	1.822E+02	0.00000	0.0
16	1980	0.000E+00	0.000E+00	0.0	*	1.836E+02	0.00000	0.0
17	1981	0.000E+00	0.000E+00	0.0	*	1.906E+02	0.00000	0.0
18	1982	0.000E+00	0.000E+00	0.0	*	1.972E+02	0.00000	0.0
19	1983	0.000E+00	0.000E+00	0.0	*	2.111E+02	0.00000	0.0
20	1984	0.000E+00	0.000E+00	0.0	*	2.205E+02	0.00000	0.0
21	1985	0.000E+00	0.000E+00	0.0	*	1.997E+02	0.00000	0.0
22	1986	0.000E+00	0.000E+00	0.0	*	1.547E+02	0.00000	0.0
23	1987	0.000E+00	0.000E+00	0.0	*	1.261E+02	0.00000	0.0
24	1988	0.000E+00	0.000E+00	0.0	*	1.136E+02	0.00000	0.0
25	1989	0.000E+00	0.000E+00	0.0	*	1.090E+02	0.00000	0.0
26	1990	0.000E+00	0.000E+00	0.0	*	1.064E+02	0.00000	0.0
27	1991	0.000E+00	0.000E+00	0.0	*	9.227E+01	0.00000	0.0
28	1992	0.000E+00	0.000E+00	0.0	*	8.043E+01	0.00000	0.0
29	1993	0.000E+00	0.000E+00	0.0	*	6.850E+01	0.00000	0.0
30	1994	0.000E+00	0.000E+00	0.0	*	6.891E+01	0.00000	0.0
31	1995	1.000E+00	1.000E+00	0.0	2.770E+01	9.307E+01	-1.21180	-6.537E+01
32	1996	1.000E+00	1.000E+00	0.0	1.296E+02	1.278E+02	0.01428	1.838E+00
33	1997	1.000E+00	1.000E+00	0.0	1.157E+02	1.692E+02	-0.37996	-5.349E+01
34	1998	1.000E+00	1.000E+00	0.0	4.254E+02	2.105E+02	0.70355	2.149E+02
35	1999	1.000E+00	1.000E+00	0.0	5.892E+02	2.467E+02	0.87070	3.425E+02

* Asterisk indicates missing value(s).

3LNO yellowtail flounder (biomass in kt) Page12

UNWEIGHTED LOG RESIDUAL PLOT FOR DATA SERIES # 5

```
                -2      -1.5      -1      -0.5       0       0.5       1       1.5       2
                 |    .    |    .    |    .    |    .    |    .    |    .    |    .    |    .    |
Year   Residual  ----------------------------------------------------------------------------------
1965     0.0000                                        |
1966     0.0000                                        |
1967     0.0000                                        |
1968     0.0000                                        |
1969     0.0000                                        |
1970     0.0000                                        |
1971     0.0000                                        |
1972     0.0000                                        |
1973     0.0000                                        |
1974     0.0000                                        |
1975     0.0000                                        |
1976     0.0000                                        |
1977     0.0000                                        |
1978     0.0000                                        |
1979     0.0000                                        |
1980     0.0000                                        |
1981     0.0000                                        |
1982     0.0000                                        |
1983     0.0000                                        |
1984     0.0000                                        |
1985     0.0000                                        |
1986     0.0000                                        |
1987     0.0000                                        |
1988     0.0000                                        |
1989     0.0000                                        |
1990     0.0000                                        |
1991     0.0000                                        |
1992     0.0000                                        |
1993     0.0000                                        |
1994     0.0000                                        |
1995    -1.2118                    ========================|
1996     0.0143                                        |
1997    -0.3800                                 ========|
1998     0.7035                                        |==============
1999     0.8707                                        |================
                ----------------------------------------------------------------------------------
```

3LNO yellowtail flounder (biomass in kt) Page13

RESULTS FOR DATA SERIES # 6 (NON-BOOTSTRAPPED) SPA BIOMASS

Data type I1: Year-average biomass index Series weight: 1.000

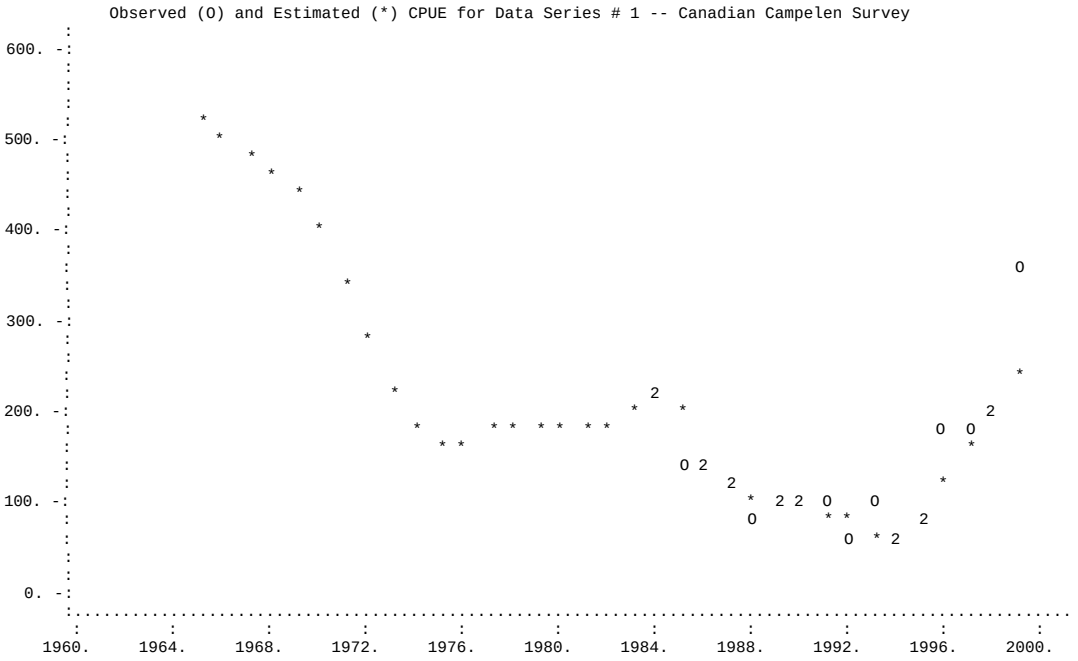
Obs	Year	Observed effort	Estimated effort	Estim F	Observed index	Model index	Resid in log index	Resid in index
1	1965	0.000E+00	0.000E+00	0.0	*	1.486E+02	0.00000	0.0
2	1966	0.000E+00	0.000E+00	0.0	*	1.436E+02	0.00000	0.0
3	1967	0.000E+00	0.000E+00	0.0	*	1.383E+02	0.00000	0.0
4	1968	1.000E+00	1.000E+00	0.0	9.720E+01	1.323E+02	-0.30816	-3.508E+01
5	1969	1.000E+00	1.000E+00	0.0	1.018E+02	1.255E+02	-0.20956	-2.373E+01
6	1970	1.000E+00	1.000E+00	0.0	1.040E+02	1.153E+02	-0.10313	-1.130E+01
7	1971	1.000E+00	1.000E+00	0.0	9.460E+01	9.870E+01	-0.04240	-4.097E+00
8	1972	1.000E+00	1.000E+00	0.0	7.960E+01	7.937E+01	0.00285	2.263E-01
9	1973	1.000E+00	1.000E+00	0.0	6.780E+01	6.315E+01	0.07109	4.652E+00
10	1974	1.000E+00	1.000E+00	0.0	5.190E+01	5.295E+01	-0.02005	-1.051E+00
11	1975	1.000E+00	1.000E+00	0.0	4.190E+01	4.588E+01	-0.09070	-3.978E+00
12	1976	1.000E+00	1.000E+00	0.0	4.700E+01	4.551E+01	0.03215	1.487E+00
13	1977	1.000E+00	1.000E+00	0.0	5.010E+01	5.012E+01	-0.00048	-2.414E-02
14	1978	1.000E+00	1.000E+00	0.0	5.640E+01	5.193E+01	0.08262	4.473E+00
15	1979	1.000E+00	1.000E+00	0.0	4.280E+01	5.085E+01	-0.17228	-8.047E+00
16	1980	1.000E+00	1.000E+00	0.0	5.360E+01	5.122E+01	0.04545	2.382E+00
17	1981	1.000E+00	1.000E+00	0.0	5.650E+01	5.320E+01	0.06024	3.303E+00
18	1982	1.000E+00	1.000E+00	0.0	7.080E+01	5.501E+01	0.25232	1.579E+01
19	1983	1.000E+00	1.000E+00	0.0	9.320E+01	5.890E+01	0.45898	3.430E+01
20	1984	1.000E+00	1.000E+00	0.0	9.040E+01	6.152E+01	0.38492	2.888E+01
21	1985	1.000E+00	1.000E+00	0.0	7.020E+01	5.572E+01	0.23103	1.448E+01
22	1986	1.000E+00	1.000E+00	0.0	3.860E+01	4.316E+01	-0.11159	-4.557E+00
23	1987	1.000E+00	1.000E+00	0.0	2.000E+01	3.519E+01	-0.56517	-1.519E+01
24	1988	0.000E+00	0.000E+00	0.0	*	3.170E+01	0.00000	0.0
25	1989	0.000E+00	0.000E+00	0.0	*	3.043E+01	0.00000	0.0
26	1990	0.000E+00	0.000E+00	0.0	*	2.969E+01	0.00000	0.0
27	1991	0.000E+00	0.000E+00	0.0	*	2.575E+01	0.00000	0.0
28	1992	0.000E+00	0.000E+00	0.0	*	2.244E+01	0.00000	0.0
29	1993	0.000E+00	0.000E+00	0.0	*	1.911E+01	0.00000	0.0
30	1994	0.000E+00	0.000E+00	0.0	*	1.923E+01	0.00000	0.0
31	1995	0.000E+00	0.000E+00	0.0	*	2.597E+01	0.00000	0.0
32	1996	0.000E+00	0.000E+00	0.0	*	3.566E+01	0.00000	0.0
33	1997	0.000E+00	0.000E+00	0.0	*	4.722E+01	0.00000	0.0
34	1998	0.000E+00	0.000E+00	0.0	*	5.873E+01	0.00000	0.0
35	1999	0.000E+00	0.000E+00	0.0	*	6.883E+01	0.00000	0.0

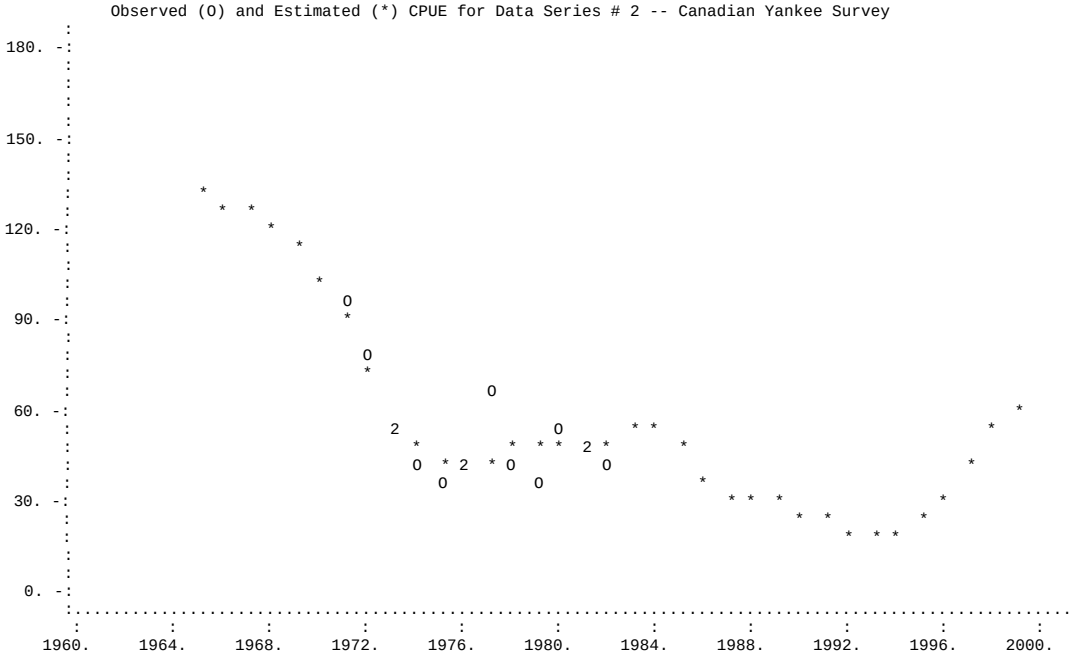
* Asterisk indicates missing value(s).

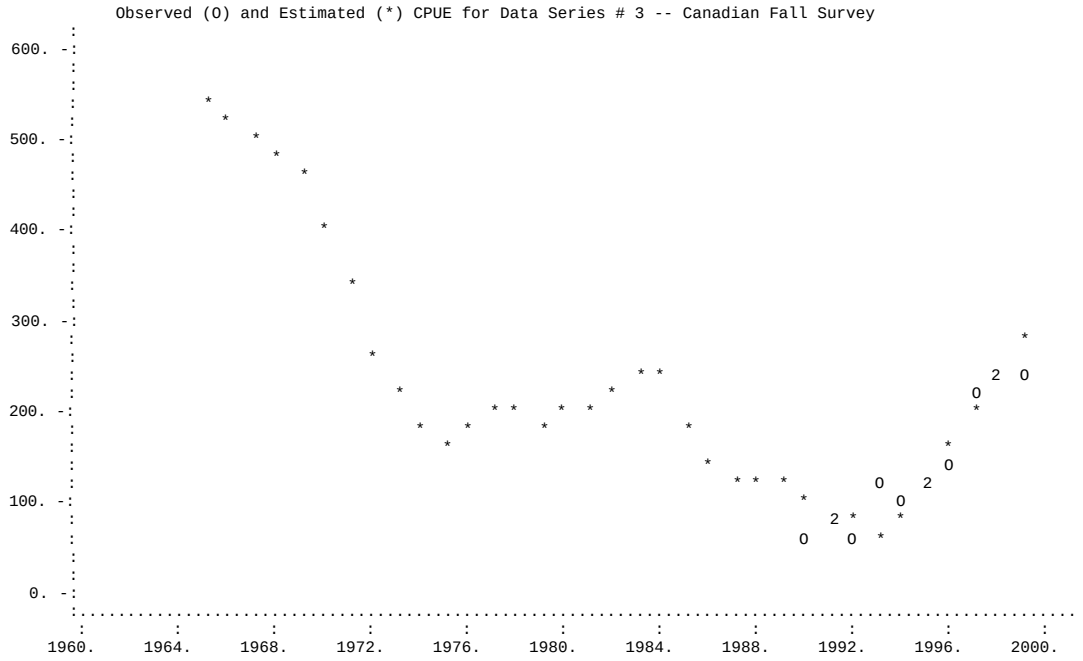
3LNO yellowtail flounder (biomass in kt) Page14

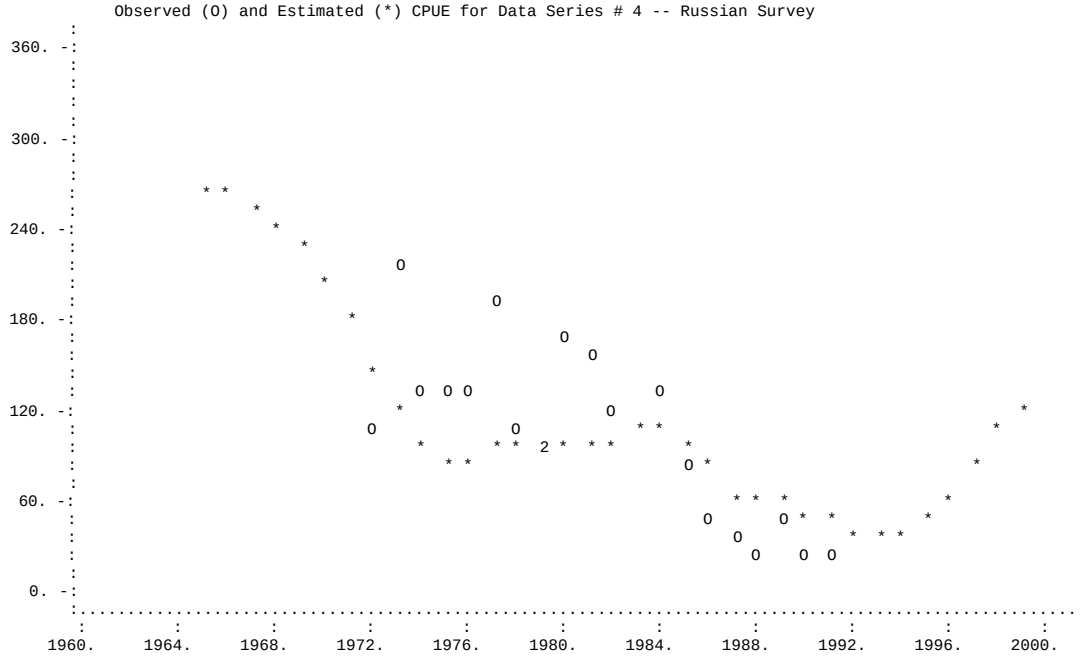
UNWEIGHTED LOG RESIDUAL PLOT FOR DATA SERIES # 6

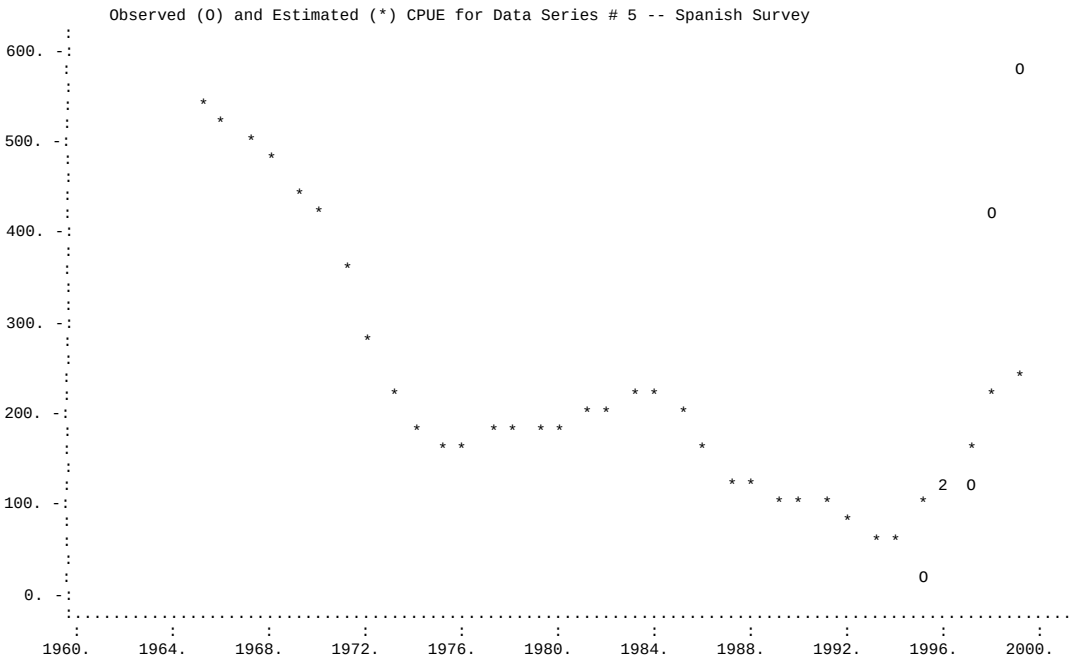
Year	Residual	-1 -0.75 -0.5 -0.25 0 0.25 0.5 0.75 1
1965	0.0000	|
1966	0.0000	|
1967	0.0000	|
1968	-0.3082	============|
1969	-0.2096	========|
1970	-0.1031	====|
1971	-0.0424	==|
1972	0.0028	|
1973	0.0711	|===
1974	-0.0200	=|
1975	-0.0907	====|
1976	0.0321	|=
1977	-0.0005	|
1978	0.0826	|===
1979	-0.1723	=======|
1980	0.0455	|==
1981	0.0602	|==
1982	0.2523	|==========
1983	0.4590	|==================
1984	0.3849	|===============
1985	0.2310	|=========
1986	-0.1116	====|
1987	-0.5652	======================|
1988	0.0000	|
1989	0.0000	|
1990	0.0000	|
1991	0.0000	|
1992	0.0000	|
1993	0.0000	|
1994	0.0000	|
1995	0.0000	|
1996	0.0000	|
1997	0.0000	|
1998	0.0000	|
1999	0.0000	|

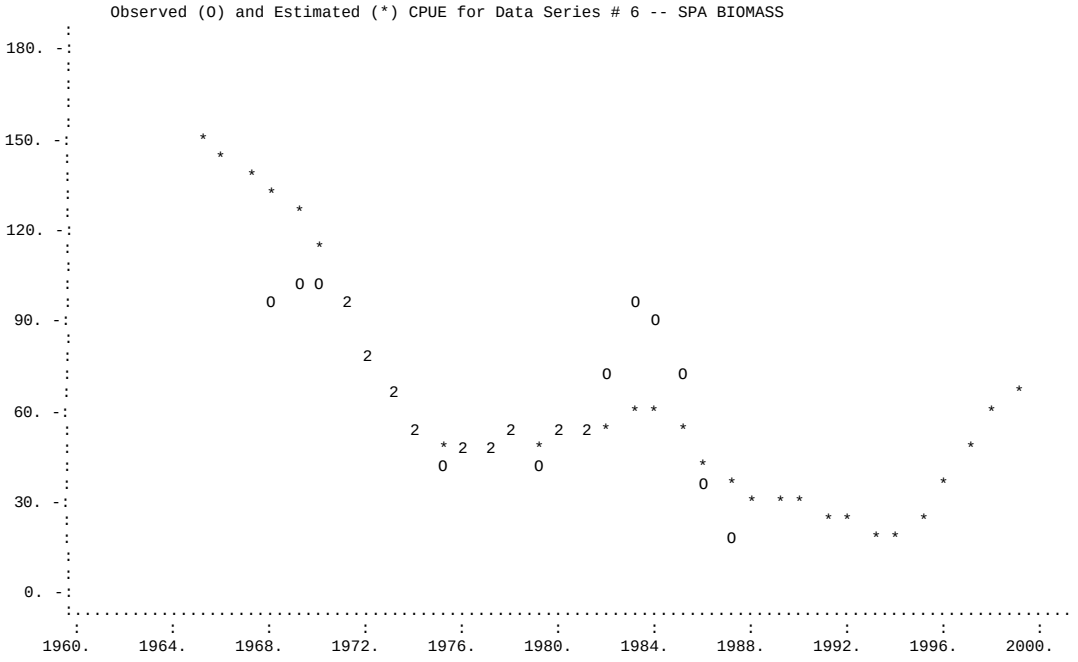

Observed (O) and Estimated (*) CPUE for Data Series # 1 -- Canadian Campelen Survey
600.
500.
400.
300.
200.
100.
0.
1960.
1964.
1968.
1972.
1976.
1980.
1984.
1988.
1992.
1996.
2000.


Observed (O) and Estimated (*) CPUE for Data Series # 2 -- Canadian Yankee Survey
180.
150.
120.
90.
60.
30.
0.
1960.
1964.
1968.
1972.
1976.
1980.
1984.
1988.
1992.
1996.
2000.


Observed (O) and Estimated (*) CPUE for Data Series # 3 -- Canadian Fall Survey
600.
500.
400.
300.
200.
100.
0.
1960.
1964.
1968.
1972.
1976.
1980.
1984.
1988.
1992.
1996.
2000.


Observed (O) and Estimated (*) CPUE for Data Series # 4 -- Russian Survey
360.
300.
240.
180.
120.
60.
0.
1960.
1964.
1968.
1972.
1976.
1980.
1984.
1988.
1992.
1996.
2000.


Observed (O) and Estimated (*) CPUE for Data Series # 5 -- Spanish Survey
600.
500.
400.
300.
200.
100.
0.
1960.
1964.
1968.
1972.
1976.
1980.
1984.
1988.
1992.
1996.
2000.


Observed (O) and Estimated (*) CPUE for Data Series # 6 -- SPA BIOMASS
180.
150.
120.
90.
60.
30.
0.
1960.
1964.
1968.
1972.
1976.
1980.
1984.
1988.
1992.
1996.
2000.

RESULTS OF BOOTSTRAPPED ANALYSIS

Param name	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
B1ratio	2.143E+00	2.083E+00	-2.77%	1.773E+00	2.377E+00	2.044E+00	2.276E+00	2.313E-01	0.108
K	1.632E+02	1.681E+02	3.01%	1.467E+02	1.910E+02	1.520E+02	1.759E+02	2.390E+01	0.146
r	4.166E-01	4.091E-01	-1.81%	3.386E-01	4.978E-01	3.788E-01	4.691E-01	9.021E-02	0.217
q(1)	3.009E+00	2.975E+00	-1.12%	2.438E+00	3.758E+00	2.679E+00	3.401E+00	7.220E-01	0.240
q(2)	7.654E-01	7.683E-01	0.38%	6.084E-01	9.525E-01	6.749E-01	8.576E-01	1.827E-01	0.239
q(3)	3.170E+00	3.232E+00	1.95%	2.279E+00	4.076E+00	2.702E+00	3.677E+00	9.752E-01	0.308
q(4)	1.564E+00	1.562E+00	-0.15%	1.222E+00	1.933E+00	1.379E+00	1.773E+00	3.931E-01	0.251
q(5)	3.106E+00	3.088E+00	-0.58%	2.272E+00	4.296E+00	2.656E+00	3.734E+00	1.078E+00	0.347
q(6)	8.645E-01	8.621E-01	-0.28%	6.918E-01	1.074E+00	7.753E-01	9.648E-01	1.895E-01	0.219
MSY	1.691E+01	1.719E+01	1.67%	1.556E+01	1.834E+01	1.634E+01	1.778E+01	1.441E+00	0.085
Ye(2000)	1.739E+01	1.719E+01	-1.18%	1.607E+01	1.868E+01	1.674E+01	1.804E+01	1.298E+00	0.075
Bmsy	8.158E+01	8.404E+01	3.01%	7.333E+01	9.551E+01	7.599E+01	8.795E+01	1.195E+01	0.146
Fmsy	2.083E-01	2.045E-01	-1.81%	1.693E-01	2.489E-01	1.894E-01	2.345E-01	4.510E-02	0.217
fmsy(1)	6.916E-02	6.876E-02	-0.58%	5.627E-02	8.172E-02	6.225E-02	7.581E-02	1.356E-02	0.196
fmsy(2)	2.721E-01	2.662E-01	-2.14%	2.350E-01	3.128E-01	2.511E-01	2.923E-01	4.123E-02	0.152
fmsy(3)	6.445E-02	6.329E-02	-1.80%	5.008E-02	8.421E-02	5.653E-02	7.363E-02	1.710E-02	0.265
fmsy(4)	1.325E-01	1.309E-01	-1.14%	1.173E-01	1.464E-01	1.243E-01	1.399E-01	1.566E-02	0.118
fmsy(5)	6.804E-02	6.624E-02	-2.64%	4.803E-02	9.314E-02	5.714E-02	8.238E-02	2.525E-02	0.371
fmsy(6)	2.415E-01	2.373E-01	-1.77%	2.132E-01	2.716E-01	2.263E-01	2.561E-01	2.973E-02	0.123
F(0.1)	1.875E-01	1.841E-01	-1.63%	1.524E-01	2.240E-01	1.705E-01	2.111E-01	4.059E-02	0.217
Y(0.1)	1.674E+01	1.702E+01	1.65%	1.541E+01	1.816E+01	1.618E+01	1.760E+01	1.427E+00	0.085
B-ratio	1.046E+00	1.016E+00	-2.82%	8.058E-01	1.260E+00	9.199E-01	1.165E+00	2.449E-01	0.234
F-ratio	3.593E-01	3.672E-01	2.23%	2.811E-01	4.760E-01	3.110E-01	4.158E-01	1.048E-01	0.292
Y-ratio	1.014E+00	9.997E-01	-1.44%	9.999E-01	1.000E+00	1.000E+00	1.000E+00	4.700E-06	0.000
f0.1(1)	6.225E-02	6.188E-02	-0.53%	* * * * *	0.196				
f0.1(2)	2.449E-01	2.396E-01	-1.93%	* * * * *	0.152				
f0.1(3)	5.800E-02	5.696E-02	-1.62%	* * * * *	0.265				
f0.1(4)	1.192E-01	1.179E-01	-1.02%	* * * * *	0.118				
f0.1(5)	6.124E-02	5.962E-02	-2.38%	* * * * *	0.371				
f0.1(6)	2.174E-01	2.135E-01	-1.59%	* * * * *	0.123				
q2/q1	2.553E-01	2.583E-01	1.17%	1.995E-01	3.181E-01	2.293E-01	2.836E-01	5.429E-02	0.213
q3/q1	1.072E+00	1.086E+00	1.37%	8.578E-01	1.323E+00	9.575E-01	1.199E+00	2.413E-01	0.225
q4/q1	5.206E-01	5.251E-01	0.85%	4.173E-01	6.308E-01	4.677E-01	5.827E-01	1.150E-01	0.221
q5/q1	1.011E+00	1.038E+00	2.70%	7.766E-01	1.334E+00	8.818E-01	1.172E+00	2.899E-01	0.287
q6/q1	2.887E-01	2.898E-01	0.36%	2.297E-01	3.539E-01	2.567E-01	3.218E-01	6.510E-02	0.225

NOTES ON BOOTSTRAPPED ESTIMATES:

- The bootstrapped results shown were computed from 500 trials.
- These results are conditional on the constraints placed upon MSY and r in the input file (ASPIC.INP).
- All bootstrapped intervals are approximate. The statistical literature recommends using at least 1000 trials for accurate 95% intervals. The 80% intervals used by ASPIC should require fewer trials for equivalent accuracy. Using at least 500 trials is recommended.
- The bias corrections used here are based on medians. This is an accepted statistical procedure, but may estimate nonzero bias for unbiased, skewed estimators.

Trials replaced for lack of convergence: 16
Trials replaced for MSY out-of-bounds: 0
Trials replaced for r out-of-bounds: 0
Residual-adjustment factor: 1.0599

Results from ASPICP.EXE, version 2.31 07 Jun 2000 at 15:04.15
3LNO yellowtail flounder (biomass in kt) Page 1
2000 TAC = 10,000;2001 TAC=12,000

USER CONTROL INFORMATION (FROM INPUT FILE)

Name of biomass (BIO) file	aspic.bio
Name of output file (this file)	run99n2.prj
Number of years of projections	2

Year	Input data	User data type
2000	1.000E+01	TAC
2001	1.200E+01	TAC

TRAJECTORY OF RELATIVE BIOMASS (BOOTSTRAPPED)

Year	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
1965	2.143E+00	2.083E+00	-2.77%	1.772E+00	2.377E+00	2.045E+00	2.276E+00	2.309E-01	0.108
1966	2.062E+00	2.024E+00	-1.83%	1.814E+00	2.222E+00	2.000E+00	2.154E+00	1.543E-01	0.075
1967	1.975E+00	1.948E+00	-1.38%	1.814E+00	2.099E+00	1.935E+00	2.047E+00	1.117E-01	0.057
1968	1.896E+00	1.877E+00	-1.01%	1.799E+00	1.998E+00	1.870E+00	1.950E+00	8.011E-02	0.042
1969	1.798E+00	1.783E+00	-0.85%	1.740E+00	1.872E+00	1.776E+00	1.838E+00	6.152E-02	0.034
1970	1.703E+00	1.690E+00	-0.72%	1.667E+00	1.768E+00	1.686E+00	1.739E+00	5.230E-02	0.031
1971	1.523E+00	1.508E+00	-0.99%	1.473E+00	1.591E+00	1.497E+00	1.564E+00	6.024E-02	0.040
1972	1.262E+00	1.240E+00	-1.76%	1.199E+00	1.338E+00	1.224E+00	1.305E+00	7.538E-02	0.060
1973	9.987E-01	9.739E-01	-2.48%	9.229E-01	1.084E+00	9.506E-01	1.039E+00	8.852E-02	0.089
1974	8.076E-01	7.838E-01	-2.96%	7.226E-01	9.007E-01	7.562E-01	8.449E-01	8.875E-02	0.110
1975	7.058E-01	6.840E-01	-3.09%	6.173E-01	8.015E-01	6.542E-01	7.462E-01	9.202E-02	0.130
1976	6.085E-01	5.883E-01	-3.32%	5.103E-01	7.178E-01	5.498E-01	6.524E-01	1.026E-01	0.169
1977	6.914E-01	6.687E-01	-3.28%	5.953E-01	7.851E-01	6.373E-01	7.290E-01	9.168E-02	0.133
1978	7.386E-01	7.153E-01	-3.16%	6.489E-01	8.250E-01	6.873E-01	7.779E-01	9.060E-02	0.123
1979	7.430E-01	7.194E-01	-3.17%	6.562E-01	8.204E-01	6.932E-01	7.820E-01	8.878E-02	0.119
1980	7.094E-01	6.873E-01	-3.12%	6.238E-01	7.840E-01	6.608E-01	7.441E-01	8.322E-02	0.117
1981	7.488E-01	7.270E-01	-2.92%	6.737E-01	8.137E-01	7.061E-01	7.795E-01	7.339E-02	0.098
1982	7.630E-01	7.424E-01	-2.71%	6.958E-01	8.174E-01	7.235E-01	7.909E-01	6.741E-02	0.088
1983	7.952E-01	7.766E-01	-2.34%	7.414E-01	8.381E-01	7.636E-01	8.147E-01	5.106E-02	0.064
1984	8.605E-01	8.493E-01	-1.30%	8.249E-01	8.953E-01	8.401E-01	8.754E-01	2.644E-02	0.031
1985	8.556E-01	8.500E-01	-0.65%	8.328E-01	8.786E-01	8.433E-01	8.703E-01	1.534E-02	0.018
1986	7.052E-01	6.985E-01	-0.95%	6.812E-01	7.441E-01	6.928E-01	7.255E-01	2.292E-02	0.032
1987	5.195E-01	5.095E-01	-1.92%	4.918E-01	5.627E-01	5.051E-01	5.439E-01	3.884E-02	0.075
1988	4.748E-01	4.657E-01	-1.92%	4.473E-01	5.209E-01	4.599E-01	4.999E-01	3.999E-02	0.084
1989	4.223E-01	4.131E-01	-2.18%	3.925E-01	4.736E-01	4.043E-01	4.472E-01	4.288E-02	0.102
1990	4.364E-01	4.274E-01	-2.07%	4.091E-01	4.910E-01	4.202E-01	4.644E-01	4.415E-02	0.101
1991	4.033E-01	3.942E-01	-2.25%	3.717E-01	4.581E-01	3.844E-01	4.304E-01	4.598E-02	0.114
1992	3.304E-01	3.208E-01	-2.89%	2.925E-01	3.948E-01	3.075E-01	3.569E-01	4.938E-02	0.149
1993	3.090E-01	2.999E-01	-2.95%	2.613E-01	4.008E-01	2.816E-01	3.478E-01	5.806E-02	0.188
1994	2.406E-01	2.320E-01	-3.58%	1.822E-01	3.367E-01	2.065E-01	2.818E-01	7.523E-02	0.313
1995	3.134E-01	3.015E-01	-3.80%	2.325E-01	4.194E-01	2.691E-01	3.646E-01	9.553E-02	0.305
1996	4.350E-01	4.209E-01	-3.25%	3.315E-01	5.619E-01	3.810E-01	5.023E-01	1.213E-01	0.279
1997	5.900E-01	5.689E-01	-3.57%	4.484E-01	7.430E-01	5.067E-01	6.651E-01	1.584E-01	0.268
1998	7.600E-01	7.387E-01	-2.80%	5.827E-01	9.449E-01	6.592E-01	8.546E-01	1.954E-01	0.257
1999	9.101E-01	8.838E-01	-2.88%	6.969E-01	1.113E+00	7.917E-01	1.010E+00	2.183E-01	0.240
2000	1.046E+00	1.016E+00	-2.82%	8.058E-01	1.260E+00	9.199E-01	1.165E+00	2.449E-01	0.234
2001	1.129E+00	1.101E+00	-2.47%	8.832E-01	1.346E+00	1.004E+00	1.256E+00	2.528E-01	0.224
2002	1.188E+00	1.159E+00	-2.42%	9.362E-01	1.392E+00	1.060E+00	1.308E+00	2.480E-01	0.209

NOTE: Printed BC confidence intervals are always approximate.
At least 500 trials are recommended when estimating confidence intervals.

Results from ASPICP.EXE, version 2.31 07 Jun 2000 at 15:04.15
3LNO yellowtail flounder (biomass in kt) Page 2
2000 TAC = 10,000;2001 TAC=12,000

TRAJECTORY OF RELATIVE FISHING MORTALITY RATE (BOOTSTRAPPED)

Year	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
1965	8.535E-02	8.875E-02	3.99%	7.867E-02	1.065E-01	8.209E-02	9.227E-02	1.018E-02	0.119
1966	1.997E-01	2.061E-01	3.19%	1.876E-01	2.337E-01	1.929E-01	2.123E-01	1.934E-02	0.097
1967	2.634E-01	2.704E-01	2.66%	2.482E-01	2.948E-01	2.538E-01	2.757E-01	2.191E-02	0.083
1968	4.163E-01	4.249E-01	2.06%	3.908E-01	4.587E-01	4.007E-01	4.328E-01	3.213E-02	0.077
1969	5.176E-01	5.272E-01	1.85%	4.878E-01	5.658E-01	4.991E-01	5.388E-01	3.969E-02	0.077
1970	9.505E-01	9.656E-01	1.59%	8.997E-01	1.027E+00	9.174E-01	9.821E-01	6.467E-02	0.068
1971	1.575E+00	1.594E+00	1.17%	1.507E+00	1.669E+00	1.530E+00	1.615E+00	8.544E-02	0.054
1972	2.069E+00	2.084E+00	0.71%	2.005E+00	2.145E+00	2.030E+00	2.101E+00	6.364E-02	0.031
1973	2.181E+00	2.189E+00	0.36%	2.115E+00	2.272E+00	2.144E+00	2.229E+00	2.931E-02	0.013
1974	1.906E+00	1.934E+00	1.48%	1.826E+00	1.992E+00	1.869E+00	1.960E+00	9.075E-02	0.048
1975	2.064E+00	2.102E+00	1.85%	1.929E+00	2.234E+00	2.000E+00	2.155E+00	1.554E-01	0.075
1976	7.314E-01	7.458E-01	1.97%	6.852E-01	7.958E-01	7.084E-01	7.658E-01	5.738E-02	0.078
1977	9.603E-01	9.782E-01	1.86%	9.195E-01	1.020E+00	9.411E-01	9.930E-01	4.833E-02	0.050
1978	1.235E+00	1.255E+00	1.61%	1.208E+00	1.294E+00	1.220E+00	1.267E+00	4.285E-02	0.035
1979	1.497E+00	1.520E+00	1.59%	1.468E+00	1.563E+00	1.485E+00	1.532E+00	4.717E-02	0.032
1980	1.003E+00	1.018E+00	1.53%	9.818E-01	1.035E+00	9.920E-01	1.019E+00	2.156E-02	0.021
1981	1.150E+00	1.163E+00	1.12%	1.119E+00	1.181E+00	1.134E+00	1.164E+00	2.617E-02	0.023
1982	1.013E+00	1.020E+00	0.71%	9.857E-01	1.052E+00	9.973E-01	1.031E+00	1.359E-02	0.013
1983	7.413E-01	7.492E-01	1.06%	7.195E-01	7.851E-01	7.285E-01	7.610E-01	3.241E-02	0.044
1984	1.130E+00	1.146E+00	1.41%	1.076E+00	1.218E+00	1.095E+00	1.172E+00	7.666E-02	0.068
1985	2.161E+00	2.190E+00	1.34%	2.047E+00	2.335E+00	2.089E+00	2.245E+00	1.562E-01	0.072
1986	2.925E+00	2.946E+00	0.70%	2.807E+00	3.087E+00	2.849E+00	2.998E+00	1.490E-01	0.051
1987	1.946E+00	1.953E+00	0.33%	1.885E+00	2.048E+00	1.912E+00	1.993E+00	8.081E-02	0.042
1988	2.141E+00	2.147E+00	0.31%	2.058E+00	2.253E+00	2.100E+00	2.193E+00	9.306E-02	0.043
1989	1.409E+00	1.413E+00	0.31%	1.338E+00	1.500E+00	1.378E+00	1.455E+00	7.668E-02	0.054
1990	1.979E+00	1.985E+00	0.28%	1.846E+00	2.136E+00	1.918E+00	2.060E+00	1.413E-01	0.071
1991	2.639E+00	2.651E+00	0.46%	2.400E+00	2.890E+00	2.501E+00	2.780E+00	2.506E-01	0.095
1992	2.002E+00	2.020E+00	0.89%	1.733E+00	2.261E+00	1.854E+00	2.139E+00	2.856E-01	0.143
1993	2.948E+00	2.990E+00	1.43%	2.342E+00	3.566E+00	2.612E+00	3.260E+00	6.476E-01	0.220
1994	4.452E-01	4.534E-01	1.82%	3.346E-01	5.763E-01	3.803E-01	5.117E-01	1.314E-01	0.295
1995	1.068E-02	1.087E-02	1.79%	8.080E-03	1.411E-02	9.301E-03	1.239E-02	3.089E-03	0.289
1996	3.334E-02	3.391E-02	1.70%	2.571E-02	4.360E-02	2.921E-02	3.892E-02	9.707E-03	0.291
1997	7.013E-02	7.138E-02	1.79%	5.389E-02	9.149E-02	6.130E-02	8.158E-02	2.028E-02	0.289
1998	3.048E-01	3.119E-01	2.33%	2.355E-01	3.988E-01	2.623E-01	3.525E-01	9.021E-02	0.296
1999	3.593E-01	3.672E-01	2.23%	2.811E-01	4.760E-01	3.110E-01	4.158E-01	1.048E-01	0.292
2000	5.391E-01	5.491E-01	1.86%	4.211E-01	7.136E-01	4.652E-01	6.185E-01	1.534E-01	0.285
2001	6.072E-01	6.173E-01	1.66%	4.806E-01	8.121E-01	5.318E-01	6.992E-01	1.674E-01	0.276

Note: no yield(s) were estimated in the projection.

NOTE: Printed BC confidence intervals are always approximate.
At least 500 trials are recommended when estimating confidence intervals.

Results from ASPICP.EXE, version 2.31 07 Jun 2000 at 15:05.20
3LNO yellowtail flounder (biomass in kt) Page 1
2000 TAC = 10,000;2001 TAC=14,000

USER CONTROL INFORMATION (FROM INPUT FILE)

Name of biomass (BIO) file	aspic.bio
Name of output file (this file)	run99n3.prj
Number of years of projections	2

Year	Input data	User data type
2000	1.000E+01	TAC
2001	1.400E+01	TAC

TRAJECTORY OF RELATIVE BIOMASS (BOOTSTRAPPED)

Year	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
1965	2.143E+00	2.083E+00	-2.77%	1.772E+00	2.377E+00	2.045E+00	2.276E+00	2.309E-01	0.108
1966	2.062E+00	2.024E+00	-1.83%	1.814E+00	2.222E+00	2.000E+00	2.154E+00	1.543E-01	0.075
1967	1.975E+00	1.948E+00	-1.38%	1.814E+00	2.099E+00	1.935E+00	2.047E+00	1.117E-01	0.057
1968	1.896E+00	1.877E+00	-1.01%	1.799E+00	1.998E+00	1.870E+00	1.950E+00	8.011E-02	0.042
1969	1.798E+00	1.783E+00	-0.85%	1.740E+00	1.872E+00	1.776E+00	1.838E+00	6.152E-02	0.034
1970	1.703E+00	1.690E+00	-0.72%	1.667E+00	1.768E+00	1.686E+00	1.739E+00	5.230E-02	0.031
1971	1.523E+00	1.508E+00	-0.99%	1.473E+00	1.591E+00	1.497E+00	1.564E+00	6.024E-02	0.040
1972	1.262E+00	1.240E+00	-1.76%	1.199E+00	1.338E+00	1.224E+00	1.305E+00	7.538E-02	0.060
1973	9.987E-01	9.739E-01	-2.48%	9.229E-01	1.084E+00	9.506E-01	1.039E+00	8.852E-02	0.089
1974	8.076E-01	7.838E-01	-2.96%	7.226E-01	9.007E-01	7.562E-01	8.449E-01	8.875E-02	0.110
1975	7.058E-01	6.840E-01	-3.09%	6.173E-01	8.015E-01	6.542E-01	7.462E-01	9.202E-02	0.130
1976	6.085E-01	5.883E-01	-3.32%	5.103E-01	7.178E-01	5.498E-01	6.524E-01	1.026E-01	0.169
1977	6.914E-01	6.687E-01	-3.28%	5.953E-01	7.851E-01	6.373E-01	7.290E-01	9.168E-02	0.133
1978	7.386E-01	7.153E-01	-3.16%	6.489E-01	8.250E-01	6.873E-01	7.779E-01	9.060E-02	0.123
1979	7.430E-01	7.194E-01	-3.17%	6.562E-01	8.204E-01	6.932E-01	7.820E-01	8.878E-02	0.119
1980	7.094E-01	6.873E-01	-3.12%	6.238E-01	7.840E-01	6.608E-01	7.441E-01	8.322E-02	0.117
1981	7.488E-01	7.270E-01	-2.92%	6.737E-01	8.137E-01	7.061E-01	7.795E-01	7.339E-02	0.098
1982	7.630E-01	7.424E-01	-2.71%	6.958E-01	8.174E-01	7.235E-01	7.909E-01	6.741E-02	0.088
1983	7.952E-01	7.766E-01	-2.34%	7.414E-01	8.381E-01	7.636E-01	8.147E-01	5.106E-02	0.064
1984	8.605E-01	8.493E-01	-1.30%	8.249E-01	8.953E-01	8.401E-01	8.754E-01	2.644E-02	0.031
1985	8.556E-01	8.500E-01	-0.65%	8.328E-01	8.786E-01	8.433E-01	8.703E-01	1.534E-02	0.018
1986	7.052E-01	6.985E-01	-0.95%	6.812E-01	7.441E-01	6.928E-01	7.255E-01	2.292E-02	0.032
1987	5.195E-01	5.095E-01	-1.92%	4.918E-01	5.627E-01	5.051E-01	5.439E-01	3.884E-02	0.075
1988	4.748E-01	4.657E-01	-1.92%	4.473E-01	5.209E-01	4.599E-01	4.999E-01	3.999E-02	0.084
1989	4.223E-01	4.131E-01	-2.18%	3.925E-01	4.736E-01	4.043E-01	4.472E-01	4.288E-02	0.102
1990	4.364E-01	4.274E-01	-2.07%	4.091E-01	4.910E-01	4.202E-01	4.644E-01	4.415E-02	0.101
1991	4.033E-01	3.942E-01	-2.25%	3.717E-01	4.581E-01	3.844E-01	4.304E-01	4.598E-02	0.114
1992	3.304E-01	3.208E-01	-2.89%	2.925E-01	3.948E-01	3.075E-01	3.569E-01	4.938E-02	0.149
1993	3.090E-01	2.999E-01	-2.95%	2.613E-01	4.008E-01	2.816E-01	3.478E-01	5.806E-02	0.188
1994	2.406E-01	2.320E-01	-3.58%	1.822E-01	3.367E-01	2.065E-01	2.818E-01	7.523E-02	0.313
1995	3.134E-01	3.015E-01	-3.80%	2.325E-01	4.194E-01	2.691E-01	3.646E-01	9.553E-02	0.305
1996	4.350E-01	4.209E-01	-3.25%	3.315E-01	5.619E-01	3.810E-01	5.023E-01	1.213E-01	0.279
1997	5.900E-01	5.689E-01	-3.57%	4.484E-01	7.430E-01	5.067E-01	6.651E-01	1.584E-01	0.268
1998	7.600E-01	7.387E-01	-2.80%	5.827E-01	9.449E-01	6.592E-01	8.546E-01	1.954E-01	0.257
1999	9.101E-01	8.838E-01	-2.88%	6.969E-01	1.113E+00	7.917E-01	1.010E+00	2.183E-01	0.240
2000	1.046E+00	1.016E+00	-2.82%	8.058E-01	1.260E+00	9.199E-01	1.165E+00	2.449E-01	0.234
2001	1.129E+00	1.101E+00	-2.47%	8.832E-01	1.346E+00	1.004E+00	1.256E+00	2.528E-01	0.224
2002	1.164E+00	1.136E+00	-2.39%	9.081E-01	1.367E+00	1.034E+00	1.280E+00	2.460E-01	0.211

NOTE: Printed BC confidence intervals are always approximate.
At least 500 trials are recommended when estimating confidence intervals.

Results from ASPICP.EXE, version 2.31 07 Jun 2000 at 15:05.20
3LNO yellowtail flounder (biomass in kt) Page 2
2000 TAC = 10,000;2001 TAC=14,000

TRAJECTORY OF RELATIVE FISHING MORTALITY RATE (BOOTSTRAPPED)

Year	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
1965	8.535E-02	8.875E-02	3.99%	7.867E-02	1.065E-01	8.209E-02	9.227E-02	1.018E-02	0.119
1966	1.997E-01	2.061E-01	3.19%	1.876E-01	2.337E-01	1.929E-01	2.123E-01	1.934E-02	0.097
1967	2.634E-01	2.704E-01	2.66%	2.482E-01	2.948E-01	2.538E-01	2.757E-01	2.191E-02	0.083
1968	4.163E-01	4.249E-01	2.06%	3.908E-01	4.587E-01	4.007E-01	4.328E-01	3.213E-02	0.077
1969	5.176E-01	5.272E-01	1.85%	4.878E-01	5.658E-01	4.991E-01	5.388E-01	3.969E-02	0.077
1970	9.505E-01	9.656E-01	1.59%	8.997E-01	1.027E+00	9.174E-01	9.821E-01	6.467E-02	0.068
1971	1.575E+00	1.594E+00	1.17%	1.507E+00	1.669E+00	1.530E+00	1.615E+00	8.544E-02	0.054
1972	2.069E+00	2.084E+00	0.71%	2.005E+00	2.145E+00	2.030E+00	2.101E+00	6.364E-02	0.031
1973	2.181E+00	2.189E+00	0.36%	2.115E+00	2.272E+00	2.144E+00	2.229E+00	2.931E-02	0.013
1974	1.906E+00	1.934E+00	1.48%	1.826E+00	1.992E+00	1.869E+00	1.960E+00	9.075E-02	0.048
1975	2.064E+00	2.102E+00	1.85%	1.929E+00	2.234E+00	2.000E+00	2.155E+00	1.554E-01	0.075
1976	7.314E-01	7.458E-01	1.97%	6.852E-01	7.958E-01	7.084E-01	7.658E-01	5.738E-02	0.078
1977	9.603E-01	9.782E-01	1.86%	9.195E-01	1.020E+00	9.411E-01	9.930E-01	4.833E-02	0.050
1978	1.235E+00	1.255E+00	1.61%	1.208E+00	1.294E+00	1.220E+00	1.267E+00	4.285E-02	0.035
1979	1.497E+00	1.520E+00	1.59%	1.468E+00	1.563E+00	1.485E+00	1.532E+00	4.717E-02	0.032
1980	1.003E+00	1.018E+00	1.53%	9.818E-01	1.035E+00	9.920E-01	1.019E+00	2.156E-02	0.021
1981	1.150E+00	1.163E+00	1.12%	1.119E+00	1.181E+00	1.134E+00	1.164E+00	2.617E-02	0.023
1982	1.013E+00	1.020E+00	0.71%	9.857E-01	1.052E+00	9.973E-01	1.031E+00	1.359E-02	0.013
1983	7.413E-01	7.492E-01	1.06%	7.195E-01	7.851E-01	7.285E-01	7.610E-01	3.241E-02	0.044
1984	1.130E+00	1.146E+00	1.41%	1.076E+00	1.218E+00	1.095E+00	1.172E+00	7.666E-02	0.068
1985	2.161E+00	2.190E+00	1.34%	2.047E+00	2.335E+00	2.089E+00	2.245E+00	1.562E-01	0.072
1986	2.925E+00	2.946E+00	0.70%	2.807E+00	3.087E+00	2.849E+00	2.998E+00	1.490E-01	0.051
1987	1.946E+00	1.953E+00	0.33%	1.885E+00	2.048E+00	1.912E+00	1.993E+00	8.081E-02	0.042
1988	2.141E+00	2.147E+00	0.31%	2.058E+00	2.253E+00	2.100E+00	2.193E+00	9.306E-02	0.043
1989	1.409E+00	1.413E+00	0.31%	1.338E+00	1.500E+00	1.378E+00	1.455E+00	7.668E-02	0.054
1990	1.979E+00	1.985E+00	0.28%	1.846E+00	2.136E+00	1.918E+00	2.060E+00	1.413E-01	0.071
1991	2.639E+00	2.651E+00	0.46%	2.400E+00	2.890E+00	2.501E+00	2.780E+00	2.506E-01	0.095
1992	2.002E+00	2.020E+00	0.89%	1.733E+00	2.261E+00	1.854E+00	2.139E+00	2.856E-01	0.143
1993	2.948E+00	2.990E+00	1.43%	2.342E+00	3.566E+00	2.612E+00	3.260E+00	6.476E-01	0.220
1994	4.452E-01	4.534E-01	1.82%	3.346E-01	5.763E-01	3.803E-01	5.117E-01	1.314E-01	0.295
1995	1.068E-02	1.087E-02	1.79%	8.080E-03	1.411E-02	9.301E-03	1.239E-02	3.089E-03	0.289
1996	3.334E-02	3.391E-02	1.70%	2.571E-02	4.360E-02	2.921E-02	3.892E-02	9.707E-03	0.291
1997	7.013E-02	7.138E-02	1.79%	5.389E-02	9.149E-02	6.130E-02	8.158E-02	2.028E-02	0.289
1998	3.048E-01	3.119E-01	2.33%	2.355E-01	3.988E-01	2.623E-01	3.525E-01	9.021E-02	0.296
1999	3.593E-01	3.672E-01	2.23%	2.811E-01	4.760E-01	3.110E-01	4.158E-01	1.048E-01	0.292
2000	5.391E-01	5.491E-01	1.86%	4.211E-01	7.136E-01	4.652E-01	6.185E-01	1.534E-01	0.285
2001	7.162E-01	7.278E-01	1.63%	5.656E-01	9.601E-01	6.268E-01	8.254E-01	1.986E-01	0.277

Note: no yield(s) were estimated in the projection.

NOTE: Printed BC confidence intervals are always approximate.
At least 500 trials are recommended when estimating confidence intervals.

Results from ASPICP.EXE, version 2.31 07 Jun 2000 at 15:06.04
3LNO yellowtail flounder (biomass in kt) Page 1
2000 TAC = 10,000;2001 TAC=16,000

USER CONTROL INFORMATION (FROM INPUT FILE)

Name of biomass (BIO) file	aspic.bio
Name of output file (this file)	run99n4.prj
Number of years of projections	2

Year	Input data	User data type
2000	1.000E+01	TAC
2001	1.600E+01	TAC

TRAJECTORY OF RELATIVE BIOMASS (BOOTSTRAPPED)

Year	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
1965	2.143E+00	2.083E+00	-2.77%	1.772E+00	2.377E+00	2.045E+00	2.276E+00	2.309E-01	0.108
1966	2.062E+00	2.024E+00	-1.83%	1.814E+00	2.222E+00	2.000E+00	2.154E+00	1.543E-01	0.075
1967	1.975E+00	1.948E+00	-1.38%	1.814E+00	2.099E+00	1.935E+00	2.047E+00	1.117E-01	0.057
1968	1.896E+00	1.877E+00	-1.01%	1.799E+00	1.998E+00	1.870E+00	1.950E+00	8.011E-02	0.042
1969	1.798E+00	1.783E+00	-0.85%	1.740E+00	1.872E+00	1.776E+00	1.838E+00	6.152E-02	0.034
1970	1.703E+00	1.690E+00	-0.72%	1.667E+00	1.768E+00	1.686E+00	1.739E+00	5.230E-02	0.031
1971	1.523E+00	1.508E+00	-0.99%	1.473E+00	1.591E+00	1.497E+00	1.564E+00	6.024E-02	0.040
1972	1.262E+00	1.240E+00	-1.76%	1.199E+00	1.338E+00	1.224E+00	1.305E+00	7.538E-02	0.060
1973	9.987E-01	9.739E-01	-2.48%	9.229E-01	1.084E+00	9.506E-01	1.039E+00	8.852E-02	0.089
1974	8.076E-01	7.838E-01	-2.96%	7.226E-01	9.007E-01	7.562E-01	8.449E-01	8.875E-02	0.110
1975	7.058E-01	6.840E-01	-3.09%	6.173E-01	8.015E-01	6.542E-01	7.462E-01	9.202E-02	0.130
1976	6.085E-01	5.883E-01	-3.32%	5.103E-01	7.178E-01	5.498E-01	6.524E-01	1.026E-01	0.169
1977	6.914E-01	6.687E-01	-3.28%	5.953E-01	7.851E-01	6.373E-01	7.290E-01	9.168E-02	0.133
1978	7.386E-01	7.153E-01	-3.16%	6.489E-01	8.250E-01	6.873E-01	7.779E-01	9.060E-02	0.123
1979	7.430E-01	7.194E-01	-3.17%	6.562E-01	8.204E-01	6.932E-01	7.820E-01	8.878E-02	0.119
1980	7.094E-01	6.873E-01	-3.12%	6.238E-01	7.840E-01	6.608E-01	7.441E-01	8.322E-02	0.117
1981	7.488E-01	7.270E-01	-2.92%	6.737E-01	8.137E-01	7.061E-01	7.795E-01	7.339E-02	0.098
1982	7.630E-01	7.424E-01	-2.71%	6.958E-01	8.174E-01	7.235E-01	7.909E-01	6.741E-02	0.088
1983	7.952E-01	7.766E-01	-2.34%	7.414E-01	8.381E-01	7.636E-01	8.147E-01	5.106E-02	0.064
1984	8.605E-01	8.493E-01	-1.30%	8.249E-01	8.953E-01	8.401E-01	8.754E-01	2.644E-02	0.031
1985	8.556E-01	8.500E-01	-0.65%	8.328E-01	8.786E-01	8.433E-01	8.703E-01	1.534E-02	0.018
1986	7.052E-01	6.985E-01	-0.95%	6.812E-01	7.441E-01	6.928E-01	7.255E-01	2.292E-02	0.032
1987	5.195E-01	5.095E-01	-1.92%	4.918E-01	5.627E-01	5.051E-01	5.439E-01	3.884E-02	0.075
1988	4.748E-01	4.657E-01	-1.92%	4.473E-01	5.209E-01	4.599E-01	4.999E-01	3.999E-02	0.084
1989	4.223E-01	4.131E-01	-2.18%	3.925E-01	4.736E-01	4.043E-01	4.472E-01	4.288E-02	0.102
1990	4.364E-01	4.274E-01	-2.07%	4.091E-01	4.910E-01	4.202E-01	4.644E-01	4.415E-02	0.101
1991	4.033E-01	3.942E-01	-2.25%	3.717E-01	4.581E-01	3.844E-01	4.304E-01	4.598E-02	0.114
1992	3.304E-01	3.208E-01	-2.89%	2.925E-01	3.948E-01	3.075E-01	3.569E-01	4.938E-02	0.149
1993	3.090E-01	2.999E-01	-2.95%	2.613E-01	4.008E-01	2.816E-01	3.478E-01	5.806E-02	0.188
1994	2.406E-01	2.320E-01	-3.58%	1.822E-01	3.367E-01	2.065E-01	2.818E-01	7.523E-02	0.313
1995	3.134E-01	3.015E-01	-3.80%	2.325E-01	4.194E-01	2.691E-01	3.646E-01	9.553E-02	0.305
1996	4.350E-01	4.209E-01	-3.25%	3.315E-01	5.619E-01	3.810E-01	5.023E-01	1.213E-01	0.279
1997	5.900E-01	5.689E-01	-3.57%	4.484E-01	7.430E-01	5.067E-01	6.651E-01	1.584E-01	0.268
1998	7.600E-01	7.387E-01	-2.80%	5.827E-01	9.449E-01	6.592E-01	8.546E-01	1.954E-01	0.257
1999	9.101E-01	8.838E-01	-2.88%	6.969E-01	1.113E+00	7.917E-01	1.010E+00	2.183E-01	0.240
2000	1.046E+00	1.016E+00	-2.82%	8.058E-01	1.260E+00	9.199E-01	1.165E+00	2.449E-01	0.234
2001	1.129E+00	1.101E+00	-2.47%	8.832E-01	1.346E+00	1.004E+00	1.256E+00	2.528E-01	0.224
2002	1.140E+00	1.113E+00	-2.40%	8.893E-01	1.343E+00	1.011E+00	1.257E+00	2.466E-01	0.216

NOTE: Printed BC confidence intervals are always approximate.
At least 500 trials are recommended when estimating confidence intervals.

Results from ASPICP.EXE, version 2.31 07 Jun 2000 at 15:06.04
3LNO yellowtail flounder (biomass in kt) Page 2
2000 TAC = 10,000;2001 TAC=16,000

TRAJECTORY OF RELATIVE FISHING MORTALITY RATE (BOOTSTRAPPED)

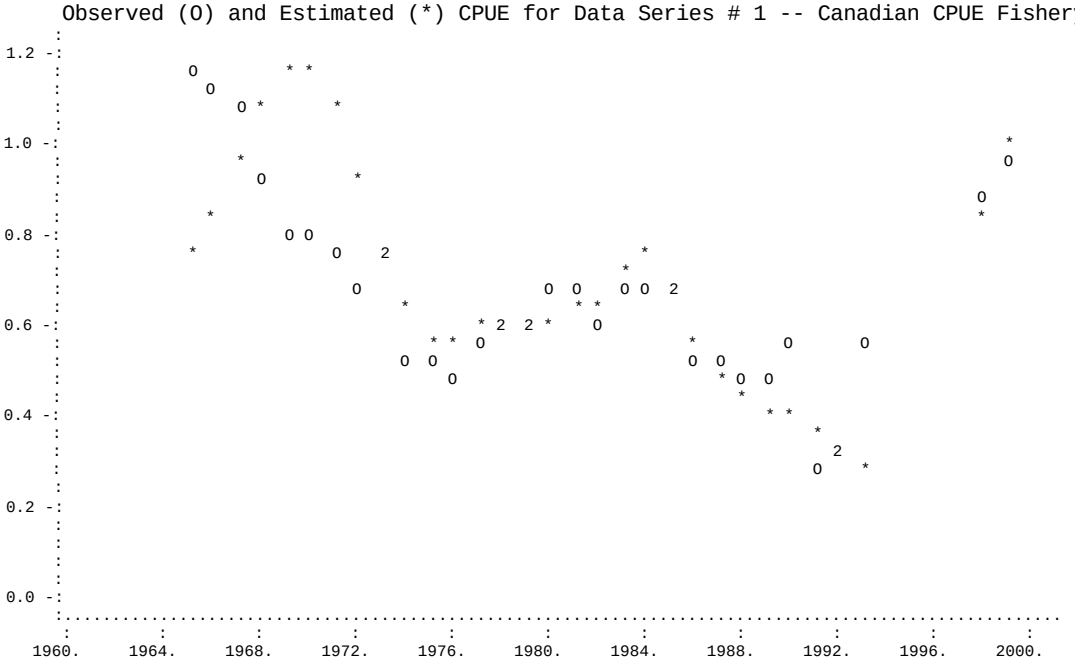
Year	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
1965	8.535E-02	8.875E-02	3.99%	7.867E-02	1.065E-01	8.209E-02	9.227E-02	1.018E-02	0.119
1966	1.997E-01	2.061E-01	3.19%	1.876E-01	2.337E-01	1.929E-01	2.123E-01	1.934E-02	0.097
1967	2.634E-01	2.704E-01	2.66%	2.482E-01	2.948E-01	2.538E-01	2.757E-01	2.191E-02	0.083
1968	4.163E-01	4.249E-01	2.06%	3.908E-01	4.587E-01	4.007E-01	4.328E-01	3.213E-02	0.077
1969	5.176E-01	5.272E-01	1.85%	4.878E-01	5.658E-01	4.991E-01	5.388E-01	3.969E-02	0.077
1970	9.505E-01	9.656E-01	1.59%	8.997E-01	1.027E+00	9.174E-01	9.821E-01	6.467E-02	0.068
1971	1.575E+00	1.594E+00	1.17%	1.507E+00	1.669E+00	1.530E+00	1.615E+00	8.544E-02	0.054
1972	2.069E+00	2.084E+00	0.71%	2.005E+00	2.145E+00	2.030E+00	2.101E+00	6.364E-02	0.031
1973	2.181E+00	2.189E+00	0.36%	2.115E+00	2.272E+00	2.144E+00	2.229E+00	2.931E-02	0.013
1974	1.906E+00	1.934E+00	1.48%	1.826E+00	1.992E+00	1.869E+00	1.960E+00	9.075E-02	0.048
1975	2.064E+00	2.102E+00	1.85%	1.929E+00	2.234E+00	2.000E+00	2.155E+00	1.554E-01	0.075
1976	7.314E-01	7.458E-01	1.97%	6.852E-01	7.958E-01	7.084E-01	7.658E-01	5.738E-02	0.078
1977	9.603E-01	9.782E-01	1.86%	9.195E-01	1.020E+00	9.411E-01	9.930E-01	4.833E-02	0.050
1978	1.235E+00	1.255E+00	1.61%	1.208E+00	1.294E+00	1.220E+00	1.267E+00	4.285E-02	0.035
1979	1.497E+00	1.520E+00	1.59%	1.468E+00	1.563E+00	1.485E+00	1.532E+00	4.717E-02	0.032
1980	1.003E+00	1.018E+00	1.53%	9.818E-01	1.035E+00	9.920E-01	1.019E+00	2.156E-02	0.021
1981	1.150E+00	1.163E+00	1.12%	1.119E+00	1.181E+00	1.134E+00	1.164E+00	2.617E-02	0.023
1982	1.013E+00	1.020E+00	0.71%	9.857E-01	1.052E+00	9.973E-01	1.031E+00	1.359E-02	0.013
1983	7.413E-01	7.492E-01	1.06%	7.195E-01	7.851E-01	7.285E-01	7.610E-01	3.241E-02	0.044
1984	1.130E+00	1.146E+00	1.41%	1.076E+00	1.218E+00	1.095E+00	1.172E+00	7.666E-02	0.068
1985	2.161E+00	2.190E+00	1.34%	2.047E+00	2.335E+00	2.089E+00	2.245E+00	1.562E-01	0.072
1986	2.925E+00	2.946E+00	0.70%	2.807E+00	3.087E+00	2.849E+00	2.998E+00	1.490E-01	0.051
1987	1.946E+00	1.953E+00	0.33%	1.885E+00	2.048E+00	1.912E+00	1.993E+00	8.081E-02	0.042
1988	2.141E+00	2.147E+00	0.31%	2.058E+00	2.253E+00	2.100E+00	2.193E+00	9.306E-02	0.043
1989	1.409E+00	1.413E+00	0.31%	1.338E+00	1.500E+00	1.378E+00	1.455E+00	7.668E-02	0.054
1990	1.979E+00	1.985E+00	0.28%	1.846E+00	2.136E+00	1.918E+00	2.060E+00	1.413E-01	0.071
1991	2.639E+00	2.651E+00	0.46%	2.400E+00	2.890E+00	2.501E+00	2.780E+00	2.506E-01	0.095
1992	2.002E+00	2.020E+00	0.89%	1.733E+00	2.261E+00	1.854E+00	2.139E+00	2.856E-01	0.143
1993	2.948E+00	2.990E+00	1.43%	2.342E+00	3.566E+00	2.612E+00	3.260E+00	6.476E-01	0.220
1994	4.452E-01	4.534E-01	1.82%	3.346E-01	5.763E-01	3.803E-01	5.117E-01	1.314E-01	0.295
1995	1.068E-02	1.087E-02	1.79%	8.080E-03	1.411E-02	9.301E-03	1.239E-02	3.089E-03	0.289
1996	3.334E-02	3.391E-02	1.70%	2.571E-02	4.360E-02	2.921E-02	3.892E-02	9.707E-03	0.291
1997	7.013E-02	7.138E-02	1.79%	5.389E-02	9.149E-02	6.130E-02	8.158E-02	2.028E-02	0.289
1998	3.048E-01	3.119E-01	2.33%	2.355E-01	3.988E-01	2.623E-01	3.525E-01	9.021E-02	0.296
1999	3.593E-01	3.672E-01	2.23%	2.811E-01	4.760E-01	3.110E-01	4.158E-01	1.048E-01	0.292
2000	5.391E-01	5.491E-01	1.86%	4.211E-01	7.136E-01	4.652E-01	6.185E-01	1.534E-01	0.285
2001	8.276E-01	8.408E-01	1.59%	6.542E-01	1.112E+00	7.240E-01	9.556E-01	2.317E-01	0.280

Note: no yield(s) were estimated in the projection.

NOTE: Printed BC confidence intervals are always approximate.
At least 500 trials are recommended when estimating confidence intervals.

APPENDIX B

Observed (O) and Estimated (*) CPUE for Data Series # 1 -- Canadian CPUE Fishery

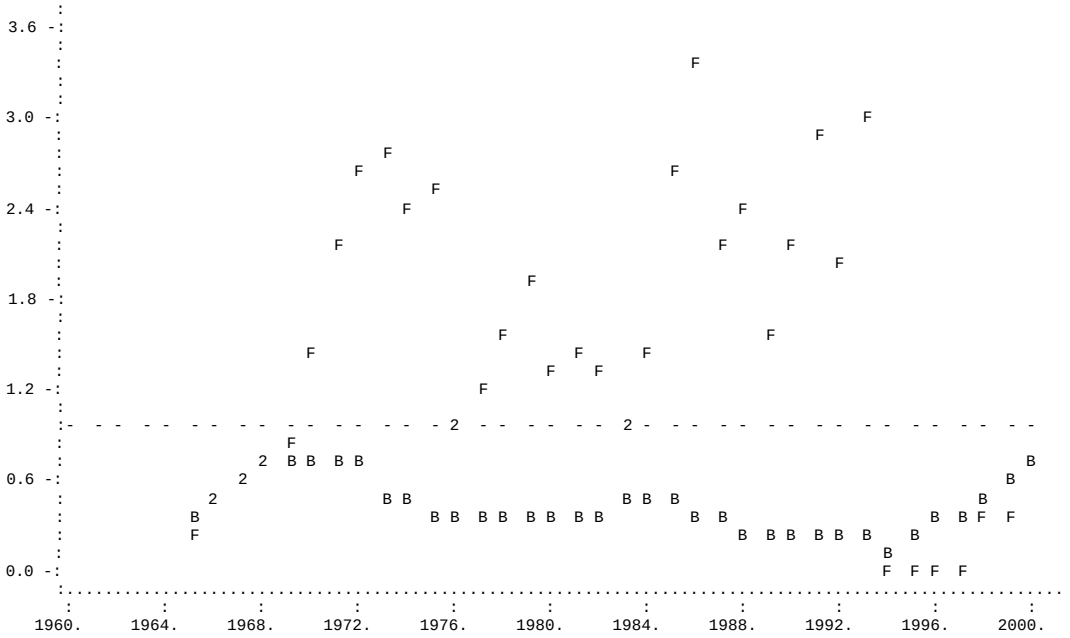


RESIDUAL PLOT OF CANADIAN CPUE

UNWEIGHTED LOG RESIDUAL PLOT FOR DATA SERIES # 1

Year	Residual	-1 -0.75 -0.5 -0.25 0 0.25 0.5 0.75 1
1965	-0.4588	==========|
1966	-0.2834	========|
1967	-0.1261	=====|
1968	0.1322	|=====
1969	0.3401	|==========
1970	0.3797	|==========
1971	0.3304	|==========
1972	0.2764	|==========
1973	-0.0478	==|
1974	0.2035	|========
1975	0.0723	|===
1976	0.1533	|======
1977	0.0482	|==
1978	0.0547	|==
1979	0.0089	|
1980	-0.0963	====|
1981	-0.0610	==|
1982	0.0749	|===
1983	0.0217	|=
1984	0.1095	|====
1985	0.0082	|
1986	0.0890	|====
1987	-0.1334	=====|
1988	-0.1493	======|
1989	-0.1592	======|
1990	-0.3475	==========|
1991	0.2223	|=========
1992	-0.0368	=|
1993	-0.6522	==========|
1994	0.0000	|
1995	0.0000	|
1996	0.0000	|
1997	0.0000	|
1998	-0.0484	==|
1999	0.0558	|==

Time Plot of Estimated F-Ratio and B-Ratio with CPUE in the model



APPENDIX C RETROSPECTIVE LOOK AT 2000 TAC

3LNO yellowtail flounder (biomass in kt) for Retrospective look at 2000 TAC of 10,000 t and alternate TACs Page C1

RESULTS OF BOOTSTRAPPED ANALYSIS

Param name	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
B1ratio	2.412E+00	2.227E+00	-7.64%	2.206E+00	2.528E+00	2.272E+00	2.506E+00	2.334E-01	0.097
K	1.746E+02	1.775E+02	1.69%	1.522E+02	2.076E+02	1.593E+02	1.865E+02	2.715E+01	0.156
r	3.749E-01	3.729E-01	-0.54%	2.952E-01	4.664E-01	3.400E-01	4.263E-01	8.633E-02	0.230
q(1)	2.711E+00	2.654E+00	-2.12%	2.137E+00	3.497E+00	2.417E+00	3.098E+00	6.810E-01	0.251
q(2)	6.813E-01	6.926E-01	1.66%	5.222E-01	8.940E-01	6.056E-01	7.837E-01	1.780E-01	0.261
q(3)	3.086E+00	3.122E+00	1.18%	2.270E+00	4.050E+00	2.613E+00	3.591E+00	9.778E-01	0.317
q(4)	1.411E+00	1.426E+00	1.04%	1.095E+00	1.742E+00	1.246E+00	1.572E+00	3.254E-01	0.231
q(5)	2.431E+00	2.440E+00	0.34%	1.673E+00	3.321E+00	2.021E+00	2.855E+00	8.337E-01	0.343
q(6)	7.861E-01	7.859E-01	-0.03%	6.386E-01	9.865E-01	7.024E-01	8.896E-01	1.872E-01	0.238
MSY	1.621E+01	1.655E+01	2.08%	1.451E+01	1.748E+01	1.551E+01	1.680E+01	1.288E+00	0.079
Ye(1999)	1.592E+01	1.603E+01	0.71%	1.331E+01	1.766E+01	1.468E+01	1.685E+01	2.176E+00	0.137
Bmsy	8.728E+01	8.876E+01	1.69%	7.612E+01	1.038E+02	7.966E+01	9.324E+01	1.357E+01	0.156
Fmsy	1.875E-01	1.864E-01	-0.54%	1.476E-01	2.332E-01	1.700E-01	2.131E-01	4.317E-02	0.230
fmsy(1)	7.032E-02	7.026E-02	-0.09%	5.796E-02	8.473E-02	6.384E-02	7.730E-02	1.346E-02	0.191
fmsy(2)	2.768E-01	2.692E-01	-2.74%	2.406E-01	3.129E-01	2.565E-01	2.944E-01	3.792E-02	0.137
fmsy(3)	6.092E-02	5.972E-02	-1.98%	4.680E-02	8.129E-02	5.368E-02	6.994E-02	1.625E-02	0.267
fmsy(4)	1.328E-01	1.307E-01	-1.54%	1.197E-01	1.482E-01	1.259E-01	1.413E-01	1.539E-02	0.116
fmsy(5)	7.664E-02	7.642E-02	-0.28%	5.305E-02	1.056E-01	6.344E-02	8.935E-02	2.591E-02	0.338
fmsy(6)	2.401E-01	2.372E-01	-1.17%	2.144E-01	2.662E-01	2.259E-01	2.538E-01	2.793E-02	0.116
F(0.1)	1.687E-01	1.678E-01	-0.49%	1.329E-01	2.099E-01	1.530E-01	1.918E-01	3.885E-02	0.230
Y(0.1)	1.605E+01	1.638E+01	2.06%	1.437E+01	1.731E+01	1.536E+01	1.663E+01	1.275E+00	0.079
B-ratio	8.384E-01	8.233E-01	-1.80%	6.626E-01	1.069E+00	7.437E-01	9.714E-01	2.277E-01	0.272
F-ratio	3.441E-01	3.458E-01	0.51%	2.583E-01	4.531E-01	2.980E-01	4.008E-01	1.028E-01	0.299
Y-ratio	9.757E-01	9.688E-01	-0.71%	8.867E-01	9.996E-01	9.353E-01	9.957E-01	6.037E-02	0.062
f0.1(1)	6.329E-02	6.323E-02	-0.08%	* * * * *	0.191				
f0.1(2)	2.491E-01	2.423E-01	-2.46%	* * * * *	0.137				
f0.1(3)	5.483E-02	5.375E-02	-1.78%	* * * * *	0.267				
f0.1(4)	1.195E-01	1.177E-01	-1.39%	* * * * *	0.116				
f0.1(5)	6.898E-02	6.878E-02	-0.26%	* * * * *	0.338				
f0.1(6)	2.161E-01	2.135E-01	-1.06%	* * * * *	0.116				
q2/q1	2.532E-01	2.610E-01	3.09%	1.933E-01	3.084E-01	2.175E-01	2.781E-01	6.061E-02	0.239
q3/q1	1.164E+00	1.176E+00	1.05%	9.111E-01	1.422E+00	1.042E+00	1.298E+00	2.552E-01	0.219
q4/q1	5.346E-01	5.374E-01	0.52%	4.404E-01	6.598E-01	4.885E-01	5.950E-01	1.065E-01	0.199
q5/q1	9.140E-01	9.193E-01	0.59%	6.747E-01	1.215E+00	7.974E-01	1.061E+00	2.632E-01	0.288
q6/q1	2.918E-01	2.961E-01	1.49%	2.354E-01	3.487E-01	2.605E-01	3.212E-01	6.076E-02	0.208

NOTES ON BOOTSTRAPPED ESTIMATES:

- The bootstrapped results shown were computed from 500 trials.
- These results are conditional on the constraints placed upon MSY and r in the input file (ASPIC.INP).
- All bootstrapped intervals are approximate. The statistical literature recommends using at least 1000 trials for accurate 95% intervals. The 80% intervals used by ASPIC should require fewer trials for equivalent accuracy. Using at least 500 trials is recommended.
- The bias corrections used here are based on medians. This is an accepted statistical procedure, but may estimate nonzero bias for unbiased, skewed estimators.

Trials replaced for lack of convergence: 18
Trials replaced for MSY out-of-bounds: 0
Trials replaced for r out-of-bounds: 0
Residual-adjustment factor: 1.0623

Results from ASPICP.EXE, version 2.31 02 Jun 2000 at 10:11.31
3LNO yellowtail flounder (biomass in kt) 1998 Assessment Page C2
1999 TAC = 6,000; 2000 TAC=10,000 RETOPECTIVE PROJECTIONS

USER CONTROL INFORMATION (FROM INPUT FILE)

Name of biomass (BIO) file	aspic.bio
Name of output file (this file)	run98v1.prj
Number of years of projections	2

Year	Input data	User data type
1999	6.000E+00	TAC
2000	1.000E+01	TAC

TRAJECTORY OF RELATIVE BIOMASS (BOOTSTRAPPED)

Year	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
1965	2.410E+00	2.226E+00	-7.61%	2.192E+00	2.528E+00	2.271E+00	2.504E+00	2.326E-01	0.097
1966	2.244E+00	2.122E+00	-5.46%	2.108E+00	2.337E+00	2.156E+00	2.331E+00	1.753E-01	0.078
1967	2.105E+00	2.017E+00	-4.18%	2.003E+00	2.199E+00	2.042E+00	2.183E+00	1.415E-01	0.067
1968	1.990E+00	1.928E+00	-3.10%	1.917E+00	2.083E+00	1.947E+00	2.081E+00	1.340E-01	0.067
1969	1.870E+00	1.822E+00	-2.55%	1.815E+00	1.968E+00	1.836E+00	1.959E+00	1.224E-01	0.065
1970	1.758E+00	1.721E+00	-2.07%	1.714E+00	1.859E+00	1.733E+00	1.816E+00	8.321E-02	0.047
1971	1.571E+00	1.537E+00	-2.14%	1.522E+00	1.661E+00	1.542E+00	1.629E+00	8.666E-02	0.055
1972	1.309E+00	1.273E+00	-2.75%	1.242E+00	1.404E+00	1.273E+00	1.368E+00	7.614E-02	0.058
1973	1.044E+00	1.012E+00	-3.13%	9.683E-01	1.136E+00	1.006E+00	1.100E+00	9.431E-02	0.090
1974	8.569E-01	8.263E-01	-3.57%	7.777E-01	9.706E-01	8.182E-01	9.249E-01	1.067E-01	0.125
1975	7.577E-01	7.290E-01	-3.79%	6.764E-01	8.807E-01	7.194E-01	8.300E-01	1.106E-01	0.146
1976	6.649E-01	6.380E-01	-4.04%	5.755E-01	7.957E-01	6.232E-01	7.336E-01	1.104E-01	0.166
1977	7.426E-01	7.140E-01	-3.84%	6.593E-01	8.550E-01	7.046E-01	8.086E-01	1.039E-01	0.140
1978	7.849E-01	7.563E-01	-3.64%	7.067E-01	8.768E-01	7.479E-01	8.355E-01	8.761E-02	0.112
1979	7.847E-01	7.575E-01	-3.47%	7.149E-01	8.760E-01	7.505E-01	8.342E-01	8.370E-02	0.107
1980	7.509E-01	7.245E-01	-3.52%	6.819E-01	8.362E-01	7.176E-01	7.982E-01	8.057E-02	0.107
1981	7.848E-01	7.591E-01	-3.28%	7.250E-01	8.591E-01	7.561E-01	8.249E-01	6.874E-02	0.088
1982	7.932E-01	7.698E-01	-2.95%	7.432E-01	8.577E-01	7.681E-01	8.244E-01	5.632E-02	0.071
1983	8.193E-01	7.975E-01	-2.67%	7.787E-01	8.916E-01	7.975E-01	8.492E-01	4.070E-02	0.050
1984	8.745E-01	8.604E-01	-1.60%	8.463E-01	9.236E-01	8.590E-01	9.038E-01	4.058E-02	0.046
1985	8.635E-01	8.546E-01	-1.04%	8.506E-01	9.221E-01	8.561E-01	8.837E-01	2.761E-02	0.032
1986	7.132E-01	7.044E-01	-1.24%	6.890E-01	7.698E-01	7.006E-01	7.334E-01	2.693E-02	0.038
1987	5.325E-01	5.210E-01	-2.15%	5.043E-01	5.680E-01	5.182E-01	5.509E-01	3.264E-02	0.061
1988	4.874E-01	4.765E-01	-2.23%	4.592E-01	5.247E-01	4.729E-01	5.043E-01	3.146E-02	0.065
1989	4.350E-01	4.242E-01	-2.50%	4.027E-01	4.775E-01	4.181E-01	4.536E-01	3.559E-02	0.082
1990	4.446E-01	4.350E-01	-2.16%	4.154E-01	4.955E-01	4.301E-01	4.662E-01	3.613E-02	0.081
1991	4.090E-01	4.004E-01	-2.10%	3.746E-01	4.526E-01	3.916E-01	4.291E-01	3.753E-02	0.092
1992	3.373E-01	3.285E-01	-2.62%	2.956E-01	3.882E-01	3.151E-01	3.630E-01	4.790E-02	0.142
1993	3.151E-01	3.068E-01	-2.63%	2.637E-01	3.884E-01	2.850E-01	3.511E-01	5.814E-02	0.185
1994	2.464E-01	2.413E-01	-2.08%	1.812E-01	3.240E-01	2.092E-01	2.840E-01	7.482E-02	0.304
1995	3.131E-01	3.057E-01	-2.35%	2.290E-01	3.982E-01	2.620E-01	3.564E-01	9.446E-02	0.302
1996	4.252E-01	4.144E-01	-2.55%	3.278E-01	5.408E-01	3.654E-01	4.878E-01	1.225E-01	0.288
1997	5.633E-01	5.466E-01	-2.95%	4.413E-01	7.180E-01	4.902E-01	6.510E-01	1.608E-01	0.285
1998	7.192E-01	6.969E-01	-3.10%	5.718E-01	9.075E-01	6.339E-01	8.324E-01	1.985E-01	0.276
1999	8.384E-01	8.233E-01	-1.80%	6.626E-01	1.069E+00	7.437E-01	9.714E-01	2.277E-01	0.272
2000	9.556E-01	9.394E-01	-1.70%	7.317E-01	1.195E+00	8.343E-01	1.089E+00	2.552E-01	0.267
2001	1.023E+00	1.013E+00	-1.00%	7.702E-01	1.265E+00	8.877E-01	1.155E+00	2.677E-01	0.262

NOTE: Printed BC confidence intervals are always approximate.
At least 500 trials are recommended when estimating confidence intervals.

Results from ASPICP.EXE, version 2.31 02 Jun 2000 at 10:11.31
3LNO yellowtail flounder (biomass in kt) 1998 Assessment Page C3
1999 TAC = 6,000; 2000 TAC=10,000 RETROSPECTIVE PROJECTIONS

TRAJECTORY OF RELATIVE FISHING MORTALITY RATE (BOOTSTRAPPED)

Year	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
1965	8.151E-02	8.716E-02	6.93%	7.250E-02	9.054E-02	7.987E-02	8.646E-02	6.598E-03	0.081
1966	1.961E-01	2.055E-01	4.79%	1.808E-01	2.154E-01	1.918E-01	2.064E-01	1.460E-02	0.074
1967	2.640E-01	2.724E-01	3.18%	2.518E-01	2.880E-01	2.559E-01	2.755E-01	1.954E-02	0.074
1968	4.204E-01	4.307E-01	2.45%	3.989E-01	4.600E-01	4.049E-01	4.358E-01	3.091E-02	0.074
1969	5.270E-01	5.367E-01	1.84%	4.973E-01	5.743E-01	5.068E-01	5.436E-01	3.680E-02	0.070
1970	9.719E-01	9.842E-01	1.27%	9.169E-01	1.051E+00	9.348E-01	9.987E-01	6.391E-02	0.066
1971	1.603E+00	1.618E+00	0.94%	1.529E+00	1.704E+00	1.553E+00	1.637E+00	8.350E-02	0.052
1972	2.086E+00	2.098E+00	0.59%	1.989E+00	2.165E+00	2.005E+00	2.115E+00	5.667E-02	0.027
1973	2.152E+00	2.172E+00	0.94%	2.051E+00	2.232E+00	2.051E+00	2.185E+00	1.149E-01	0.053
1974	1.864E+00	1.897E+00	1.77%	1.776E+00	1.934E+00	1.795E+00	1.899E+00	6.869E-02	0.037
1975	1.991E+00	2.034E+00	2.13%	1.879E+00	2.120E+00	1.936E+00	2.047E+00	1.104E-01	0.055
1976	7.042E-01	7.205E-01	2.32%	6.698E-01	7.486E-01	6.851E-01	7.248E-01	3.963E-02	0.056
1977	9.376E-01	9.564E-01	2.01%	8.763E-01	9.764E-01	9.222E-01	9.574E-01	2.861E-02	0.031
1978	1.214E+00	1.235E+00	1.77%	1.114E+00	1.245E+00	1.195E+00	1.233E+00	2.591E-02	0.021
1979	1.471E+00	1.498E+00	1.86%	1.344E+00	1.505E+00	1.402E+00	1.493E+00	5.288E-02	0.036
1980	9.918E-01	1.008E+00	1.64%	9.037E-01	1.010E+00	9.037E-01	1.002E+00	9.841E-02	0.099
1981	1.147E+00	1.161E+00	1.22%	1.047E+00	1.182E+00	1.092E+00	1.158E+00	2.773E-02	0.024
1982	1.020E+00	1.027E+00	0.70%	9.567E-01	1.064E+00	9.989E-01	1.035E+00	2.220E-02	0.022
1983	7.577E-01	7.632E-01	0.72%	7.288E-01	8.092E-01	7.371E-01	7.767E-01	3.961E-02	0.052
1984	1.171E+00	1.180E+00	0.71%	1.095E+00	1.272E+00	1.119E+00	1.211E+00	9.168E-02	0.078
1985	2.250E+00	2.262E+00	0.52%	2.088E+00	2.454E+00	2.151E+00	2.328E+00	1.768E-01	0.079
1986	3.001E+00	3.011E+00	0.33%	2.858E+00	3.235E+00	2.909E+00	3.092E+00	1.830E-01	0.061
1987	1.980E+00	1.982E+00	0.07%	1.905E+00	2.106E+00	1.931E+00	2.040E+00	1.093E-01	0.055
1988	2.170E+00	2.175E+00	0.20%	2.077E+00	2.306E+00	2.121E+00	2.235E+00	1.138E-01	0.052
1989	1.433E+00	1.436E+00	0.19%	1.354E+00	1.529E+00	1.389E+00	1.480E+00	9.134E-02	0.064
1990	2.026E+00	2.027E+00	0.03%	1.877E+00	2.191E+00	1.949E+00	2.115E+00	1.657E-01	0.082
1991	2.682E+00	2.700E+00	0.69%	2.411E+00	2.912E+00	2.526E+00	2.803E+00	2.761E-01	0.103
1992	2.036E+00	2.050E+00	0.66%	1.758E+00	2.346E+00	1.881E+00	2.216E+00	3.021E-01	0.148
1993	3.012E+00	3.016E+00	0.14%	2.462E+00	3.669E+00	2.697E+00	3.406E+00	7.098E-01	0.236
1994	4.575E-01	4.589E-01	0.30%	3.535E-01	5.929E-01	3.975E-01	5.369E-01	1.393E-01	0.305
1995	1.114E-02	1.131E-02	1.53%	8.567E-03	1.457E-02	9.643E-03	1.288E-02	3.238E-03	0.291
1996	3.542E-02	3.625E-02	2.35%	2.673E-02	4.495E-02	2.990E-02	4.018E-02	1.028E-02	0.290
1997	7.708E-02	7.795E-02	1.13%	5.734E-02	9.826E-02	6.567E-02	8.838E-02	2.272E-02	0.295
1998	3.441E-01	3.458E-01	0.51%	2.583E-01	4.531E-01	2.980E-01	4.008E-01	1.028E-01	0.299
1999	4.124E-01	4.112E-01	-0.29%	3.116E-01	5.666E-01	3.581E-01	4.867E-01	1.286E-01	0.312
2000	6.251E-01	6.186E-01	-1.03%	4.770E-01	8.758E-01	5.437E-01	7.450E-01	2.013E-01	0.322

Note: no yield(s) were estimated in the projection.

NOTE: Printed BC confidence intervals are always approximate.
At least 500 trials are recommended when estimating confidence intervals.

Results from ASPICP.EXE, version 2.31 02 Jun 2000 at 10:13.39
3LNO yellowtail flounder (biomass in kt) 1998 Assessment Page C4
1999 TAC = 6,000; 2000 TAC=12,000 RETROSPECTIVE PROJECTIONS

USER CONTROL INFORMATION (FROM INPUT FILE)

Name of biomass (BIO) file	aspic.bio
Name of output file (this file)	run98v2.prj
Number of years of projections	2

Year	Input data	User data type
1999	6.000E+00	TAC
2000	1.200E+01	TAC

TRAJECTORY OF RELATIVE BIOMASS (BOOTSTRAPPED)

Year	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
1965	2.410E+00	2.226E+00	-7.61%	2.192E+00	2.528E+00	2.271E+00	2.504E+00	2.326E-01	0.097
1966	2.244E+00	2.122E+00	-5.46%	2.108E+00	2.337E+00	2.156E+00	2.331E+00	1.753E-01	0.078
1967	2.105E+00	2.017E+00	-4.18%	2.003E+00	2.199E+00	2.042E+00	2.183E+00	1.415E-01	0.067
1968	1.990E+00	1.928E+00	-3.10%	1.917E+00	2.083E+00	1.947E+00	2.081E+00	1.340E-01	0.067
1969	1.870E+00	1.822E+00	-2.55%	1.815E+00	1.968E+00	1.836E+00	1.959E+00	1.224E-01	0.065
1970	1.758E+00	1.721E+00	-2.07%	1.714E+00	1.859E+00	1.733E+00	1.816E+00	8.321E-02	0.047
1971	1.571E+00	1.537E+00	-2.14%	1.522E+00	1.661E+00	1.542E+00	1.629E+00	8.666E-02	0.055
1972	1.309E+00	1.273E+00	-2.75%	1.242E+00	1.404E+00	1.273E+00	1.368E+00	7.614E-02	0.058
1973	1.044E+00	1.012E+00	-3.13%	9.683E-01	1.136E+00	1.006E+00	1.100E+00	9.431E-02	0.090
1974	8.569E-01	8.263E-01	-3.57%	7.777E-01	9.706E-01	8.182E-01	9.249E-01	1.067E-01	0.125
1975	7.577E-01	7.290E-01	-3.79%	6.764E-01	8.807E-01	7.194E-01	8.300E-01	1.106E-01	0.146
1976	6.649E-01	6.380E-01	-4.04%	5.755E-01	7.957E-01	6.232E-01	7.336E-01	1.104E-01	0.166
1977	7.426E-01	7.140E-01	-3.84%	6.593E-01	8.550E-01	7.046E-01	8.086E-01	1.039E-01	0.140
1978	7.849E-01	7.563E-01	-3.64%	7.067E-01	8.768E-01	7.479E-01	8.355E-01	8.761E-02	0.112
1979	7.847E-01	7.575E-01	-3.47%	7.149E-01	8.760E-01	7.505E-01	8.342E-01	8.370E-02	0.107
1980	7.509E-01	7.245E-01	-3.52%	6.819E-01	8.362E-01	7.176E-01	7.982E-01	8.057E-02	0.107
1981	7.848E-01	7.591E-01	-3.28%	7.250E-01	8.591E-01	7.561E-01	8.249E-01	6.874E-02	0.088
1982	7.932E-01	7.698E-01	-2.95%	7.432E-01	8.577E-01	7.681E-01	8.244E-01	5.632E-02	0.071
1983	8.193E-01	7.975E-01	-2.67%	7.787E-01	8.916E-01	7.975E-01	8.492E-01	4.070E-02	0.050
1984	8.745E-01	8.604E-01	-1.60%	8.463E-01	9.236E-01	8.590E-01	9.038E-01	4.058E-02	0.046
1985	8.635E-01	8.546E-01	-1.04%	8.506E-01	9.221E-01	8.561E-01	8.837E-01	2.761E-02	0.032
1986	7.132E-01	7.044E-01	-1.24%	6.890E-01	7.698E-01	7.006E-01	7.334E-01	2.693E-02	0.038
1987	5.325E-01	5.210E-01	-2.15%	5.043E-01	5.680E-01	5.182E-01	5.509E-01	3.264E-02	0.061
1988	4.874E-01	4.765E-01	-2.23%	4.592E-01	5.247E-01	4.729E-01	5.043E-01	3.146E-02	0.065
1989	4.350E-01	4.242E-01	-2.50%	4.027E-01	4.775E-01	4.181E-01	4.536E-01	3.559E-02	0.082
1990	4.446E-01	4.350E-01	-2.16%	4.154E-01	4.955E-01	4.301E-01	4.662E-01	3.613E-02	0.081
1991	4.090E-01	4.004E-01	-2.10%	3.746E-01	4.526E-01	3.916E-01	4.291E-01	3.753E-02	0.092
1992	3.373E-01	3.285E-01	-2.62%	2.956E-01	3.882E-01	3.151E-01	3.630E-01	4.790E-02	0.142
1993	3.151E-01	3.068E-01	-2.63%	2.637E-01	3.884E-01	2.850E-01	3.511E-01	5.814E-02	0.185
1994	2.464E-01	2.413E-01	-2.08%	1.812E-01	3.240E-01	2.092E-01	2.840E-01	7.482E-02	0.304
1995	3.131E-01	3.057E-01	-2.35%	2.290E-01	3.982E-01	2.620E-01	3.564E-01	9.446E-02	0.302
1996	4.252E-01	4.144E-01	-2.55%	3.278E-01	5.408E-01	3.654E-01	4.878E-01	1.225E-01	0.288
1997	5.633E-01	5.466E-01	-2.95%	4.413E-01	7.180E-01	4.902E-01	6.510E-01	1.608E-01	0.285
1998	7.192E-01	6.969E-01	-3.10%	5.718E-01	9.075E-01	6.339E-01	8.324E-01	1.985E-01	0.276
1999	8.384E-01	8.233E-01	-1.80%	6.626E-01	1.069E+00	7.437E-01	9.714E-01	2.277E-01	0.272
2000	9.556E-01	9.394E-01	-1.70%	7.317E-01	1.195E+00	8.343E-01	1.089E+00	2.552E-01	0.267
2001	1.000E+00	9.903E-01	-1.00%	7.558E-01	1.244E+00	8.735E-01	1.144E+00	2.704E-01	0.270

NOTE: Printed BC confidence intervals are always approximate.
At least 500 trials are recommended when estimating confidence intervals.

Results from ASPICP.EXE, version 2.31 02 Jun 2000 at 10:13.39
3LNO yellowtail flounder (biomass in kt) 1998 Assessment Page C5
1999 TAC = 6,000; 2000 TAC=12,000 Retrospective PROJECTIONS

TRAJECTORY OF RELATIVE FISHING MORTALITY RATE (BOOTSTRAPPED)

Year	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
1965	8.151E-02	8.716E-02	6.93%	7.250E-02	9.054E-02	7.987E-02	8.646E-02	6.598E-03	0.081
1966	1.961E-01	2.055E-01	4.79%	1.808E-01	2.154E-01	1.918E-01	2.064E-01	1.460E-02	0.074
1967	2.640E-01	2.724E-01	3.18%	2.518E-01	2.880E-01	2.559E-01	2.755E-01	1.954E-02	0.074
1968	4.204E-01	4.307E-01	2.45%	3.989E-01	4.600E-01	4.049E-01	4.358E-01	3.091E-02	0.074
1969	5.270E-01	5.367E-01	1.84%	4.973E-01	5.743E-01	5.068E-01	5.436E-01	3.680E-02	0.070
1970	9.719E-01	9.842E-01	1.27%	9.169E-01	1.051E+00	9.348E-01	9.987E-01	6.391E-02	0.066
1971	1.603E+00	1.618E+00	0.94%	1.529E+00	1.704E+00	1.553E+00	1.637E+00	8.350E-02	0.052
1972	2.086E+00	2.098E+00	0.59%	1.989E+00	2.165E+00	2.005E+00	2.115E+00	5.667E-02	0.027
1973	2.152E+00	2.172E+00	0.94%	2.051E+00	2.232E+00	2.051E+00	2.185E+00	1.149E-01	0.053
1974	1.864E+00	1.897E+00	1.77%	1.776E+00	1.934E+00	1.795E+00	1.899E+00	6.869E-02	0.037
1975	1.991E+00	2.034E+00	2.13%	1.879E+00	2.120E+00	1.936E+00	2.047E+00	1.104E-01	0.055
1976	7.042E-01	7.205E-01	2.32%	6.698E-01	7.486E-01	6.851E-01	7.248E-01	3.963E-02	0.056
1977	9.376E-01	9.564E-01	2.01%	8.763E-01	9.764E-01	9.222E-01	9.574E-01	2.861E-02	0.031
1978	1.214E+00	1.235E+00	1.77%	1.114E+00	1.245E+00	1.195E+00	1.233E+00	2.591E-02	0.021
1979	1.471E+00	1.498E+00	1.86%	1.344E+00	1.505E+00	1.402E+00	1.493E+00	5.288E-02	0.036
1980	9.918E-01	1.008E+00	1.64%	9.037E-01	1.010E+00	9.037E-01	1.002E+00	9.841E-02	0.099
1981	1.147E+00	1.161E+00	1.22%	1.047E+00	1.182E+00	1.092E+00	1.158E+00	2.773E-02	0.024
1982	1.020E+00	1.027E+00	0.70%	9.567E-01	1.064E+00	9.989E-01	1.035E+00	2.220E-02	0.022
1983	7.577E-01	7.632E-01	0.72%	7.288E-01	8.092E-01	7.371E-01	7.767E-01	3.961E-02	0.052
1984	1.171E+00	1.180E+00	0.71%	1.095E+00	1.272E+00	1.119E+00	1.211E+00	9.168E-02	0.078
1985	2.250E+00	2.262E+00	0.52%	2.088E+00	2.454E+00	2.151E+00	2.328E+00	1.768E-01	0.079
1986	3.001E+00	3.011E+00	0.33%	2.858E+00	3.235E+00	2.909E+00	3.092E+00	1.830E-01	0.061
1987	1.980E+00	1.982E+00	0.07%	1.905E+00	2.106E+00	1.931E+00	2.040E+00	1.093E-01	0.055
1988	2.170E+00	2.175E+00	0.20%	2.077E+00	2.306E+00	2.121E+00	2.235E+00	1.138E-01	0.052
1989	1.433E+00	1.436E+00	0.19%	1.354E+00	1.529E+00	1.389E+00	1.480E+00	9.134E-02	0.064
1990	2.026E+00	2.027E+00	0.03%	1.877E+00	2.191E+00	1.949E+00	2.115E+00	1.657E-01	0.082
1991	2.682E+00	2.700E+00	0.69%	2.411E+00	2.912E+00	2.526E+00	2.803E+00	2.761E-01	0.103
1992	2.036E+00	2.050E+00	0.66%	1.758E+00	2.346E+00	1.881E+00	2.216E+00	3.021E-01	0.148
1993	3.012E+00	3.016E+00	0.14%	2.462E+00	3.669E+00	2.697E+00	3.406E+00	7.098E-01	0.236
1994	4.575E-01	4.589E-01	0.30%	3.535E-01	5.929E-01	3.975E-01	5.369E-01	1.393E-01	0.305
1995	1.114E-02	1.131E-02	1.53%	8.567E-03	1.457E-02	9.643E-03	1.288E-02	3.238E-03	0.291
1996	3.542E-02	3.625E-02	2.35%	2.673E-02	4.495E-02	2.990E-02	4.018E-02	1.028E-02	0.290
1997	7.708E-02	7.795E-02	1.13%	5.734E-02	9.826E-02	6.567E-02	8.838E-02	2.272E-02	0.295
1998	3.441E-01	3.458E-01	0.51%	2.583E-01	4.531E-01	2.980E-01	4.008E-01	1.028E-01	0.299
1999	4.124E-01	4.112E-01	-0.29%	3.116E-01	5.666E-01	3.581E-01	4.867E-01	1.286E-01	0.312
2000	7.586E-01	7.511E-01	-0.98%	5.774E-01	1.064E+00	6.589E-01	9.054E-01	2.465E-01	0.325

Note: no yield(s) were estimated in the projection.

NOTE: Printed BC confidence intervals are always approximate.
At least 500 trials are recommended when estimating confidence intervals.

Results from ASPICP.EXE, version 2.31 02 Jun 2000 at 10:15.17
3LNO yellowtail flounder (biomass in kt) 1998 Assessment Page C6
1999 TAC = 6,000; 2000 TAC=14,000 RETROSPECTIVE PROJECTIONS

USER CONTROL INFORMATION (FROM INPUT FILE)

Name of biomass (BIO) file	aspic.bio
Name of output file (this file)	run98v3.prj
Number of years of projections	2

Year	Input data	User data type
1999	6.000E+00	TAC
2000	1.400E+01	TAC

TRAJECTORY OF RELATIVE BIOMASS (BOOTSTRAPPED)

Year	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
1965	2.410E+00	2.226E+00	-7.61%	2.192E+00	2.528E+00	2.271E+00	2.504E+00	2.326E-01	0.097
1966	2.244E+00	2.122E+00	-5.46%	2.108E+00	2.337E+00	2.156E+00	2.331E+00	1.753E-01	0.078
1967	2.105E+00	2.017E+00	-4.18%	2.003E+00	2.199E+00	2.042E+00	2.183E+00	1.415E-01	0.067
1968	1.990E+00	1.928E+00	-3.10%	1.917E+00	2.083E+00	1.947E+00	2.081E+00	1.340E-01	0.067
1969	1.870E+00	1.822E+00	-2.55%	1.815E+00	1.968E+00	1.836E+00	1.959E+00	1.224E-01	0.065
1970	1.758E+00	1.721E+00	-2.07%	1.714E+00	1.859E+00	1.733E+00	1.816E+00	8.321E-02	0.047
1971	1.571E+00	1.537E+00	-2.14%	1.522E+00	1.661E+00	1.542E+00	1.629E+00	8.666E-02	0.055
1972	1.309E+00	1.273E+00	-2.75%	1.242E+00	1.404E+00	1.273E+00	1.368E+00	7.614E-02	0.058
1973	1.044E+00	1.012E+00	-3.13%	9.683E-01	1.136E+00	1.006E+00	1.100E+00	9.431E-02	0.090
1974	8.569E-01	8.263E-01	-3.57%	7.777E-01	9.706E-01	8.182E-01	9.249E-01	1.067E-01	0.125
1975	7.577E-01	7.290E-01	-3.79%	6.764E-01	8.807E-01	7.194E-01	8.300E-01	1.106E-01	0.146
1976	6.649E-01	6.380E-01	-4.04%	5.755E-01	7.957E-01	6.232E-01	7.336E-01	1.104E-01	0.166
1977	7.426E-01	7.140E-01	-3.84%	6.593E-01	8.550E-01	7.046E-01	8.086E-01	1.039E-01	0.140
1978	7.849E-01	7.563E-01	-3.64%	7.067E-01	8.768E-01	7.479E-01	8.355E-01	8.761E-02	0.112
1979	7.847E-01	7.575E-01	-3.47%	7.149E-01	8.760E-01	7.505E-01	8.342E-01	8.370E-02	0.107
1980	7.509E-01	7.245E-01	-3.52%	6.819E-01	8.362E-01	7.176E-01	7.982E-01	8.057E-02	0.107
1981	7.848E-01	7.591E-01	-3.28%	7.250E-01	8.591E-01	7.561E-01	8.249E-01	6.874E-02	0.088
1982	7.932E-01	7.698E-01	-2.95%	7.432E-01	8.577E-01	7.681E-01	8.244E-01	5.632E-02	0.071
1983	8.193E-01	7.975E-01	-2.67%	7.787E-01	8.916E-01	7.975E-01	8.492E-01	4.070E-02	0.050
1984	8.745E-01	8.604E-01	-1.60%	8.463E-01	9.236E-01	8.590E-01	9.038E-01	4.058E-02	0.046
1985	8.635E-01	8.546E-01	-1.04%	8.506E-01	9.221E-01	8.561E-01	8.837E-01	2.761E-02	0.032
1986	7.132E-01	7.044E-01	-1.24%	6.890E-01	7.698E-01	7.006E-01	7.334E-01	2.693E-02	0.038
1987	5.325E-01	5.210E-01	-2.15%	5.043E-01	5.680E-01	5.182E-01	5.509E-01	3.264E-02	0.061
1988	4.874E-01	4.765E-01	-2.23%	4.592E-01	5.247E-01	4.729E-01	5.043E-01	3.146E-02	0.065
1989	4.350E-01	4.242E-01	-2.50%	4.027E-01	4.775E-01	4.181E-01	4.536E-01	3.559E-02	0.082
1990	4.446E-01	4.350E-01	-2.16%	4.154E-01	4.955E-01	4.301E-01	4.662E-01	3.613E-02	0.081
1991	4.090E-01	4.004E-01	-2.10%	3.746E-01	4.526E-01	3.916E-01	4.291E-01	3.753E-02	0.092
1992	3.373E-01	3.285E-01	-2.62%	2.956E-01	3.882E-01	3.151E-01	3.630E-01	4.790E-02	0.142
1993	3.151E-01	3.068E-01	-2.63%	2.637E-01	3.884E-01	2.850E-01	3.511E-01	5.814E-02	0.185
1994	2.464E-01	2.413E-01	-2.08%	1.812E-01	3.240E-01	2.092E-01	2.840E-01	7.482E-02	0.304
1995	3.131E-01	3.057E-01	-2.35%	2.290E-01	3.982E-01	2.620E-01	3.564E-01	9.446E-02	0.302
1996	4.252E-01	4.144E-01	-2.55%	3.278E-01	5.408E-01	3.654E-01	4.878E-01	1.225E-01	0.288
1997	5.633E-01	5.466E-01	-2.95%	4.413E-01	7.180E-01	4.902E-01	6.510E-01	1.608E-01	0.285
1998	7.192E-01	6.969E-01	-3.10%	5.718E-01	9.075E-01	6.339E-01	8.324E-01	1.985E-01	0.276
1999	8.384E-01	8.233E-01	-1.80%	6.626E-01	1.069E+00	7.437E-01	9.714E-01	2.277E-01	0.272
2000	9.556E-01	9.394E-01	-1.70%	7.317E-01	1.195E+00	8.343E-01	1.089E+00	2.552E-01	0.267
2001	9.792E-01	9.677E-01	-1.18%	7.389E-01	1.221E+00	8.519E-01	1.121E+00	2.692E-01	0.275

NOTE: Printed BC confidence intervals are always approximate.
At least 500 trials are recommended when estimating confidence intervals.

Results from ASPICP.EXE, version 2.31 02 Jun 2000 at 10:15.17
3LNO yellowtail flounder (biomass in kt) 1998 Assessment Page C7
1999 TAC = 6,000; 2000 TAC=14,000 RETROSPECTIVE PROJECTIONS

TRAJECTORY OF RELATIVE FISHING MORTALITY RATE (BOOTSTRAPPED)

Year	Bias-corrected estimate	Ordinary estimate	Relative bias	Approx 80% lower CL	Approx 80% upper CL	Approx 50% lower CL	Approx 50% upper CL	Inter-quartile range	Relative IQ range
1965	8.151E-02	8.716E-02	6.93%	7.250E-02	9.054E-02	7.987E-02	8.646E-02	6.598E-03	0.081
1966	1.961E-01	2.055E-01	4.79%	1.808E-01	2.154E-01	1.918E-01	2.064E-01	1.460E-02	0.074
1967	2.640E-01	2.724E-01	3.18%	2.518E-01	2.880E-01	2.559E-01	2.755E-01	1.954E-02	0.074
1968	4.204E-01	4.307E-01	2.45%	3.989E-01	4.600E-01	4.049E-01	4.358E-01	3.091E-02	0.074
1969	5.270E-01	5.367E-01	1.84%	4.973E-01	5.743E-01	5.068E-01	5.436E-01	3.680E-02	0.070
1970	9.719E-01	9.842E-01	1.27%	9.169E-01	1.051E+00	9.348E-01	9.987E-01	6.391E-02	0.066
1971	1.603E+00	1.618E+00	0.94%	1.529E+00	1.704E+00	1.553E+00	1.637E+00	8.350E-02	0.052
1972	2.086E+00	2.098E+00	0.59%	1.989E+00	2.165E+00	2.005E+00	2.115E+00	5.667E-02	0.027
1973	2.152E+00	2.172E+00	0.94%	2.051E+00	2.232E+00	2.051E+00	2.185E+00	1.149E-01	0.053
1974	1.864E+00	1.897E+00	1.77%	1.776E+00	1.934E+00	1.795E+00	1.899E+00	6.869E-02	0.037
1975	1.991E+00	2.034E+00	2.13%	1.879E+00	2.120E+00	1.936E+00	2.047E+00	1.104E-01	0.055
1976	7.042E-01	7.205E-01	2.32%	6.698E-01	7.486E-01	6.851E-01	7.248E-01	3.963E-02	0.056
1977	9.376E-01	9.564E-01	2.01%	8.763E-01	9.764E-01	9.222E-01	9.574E-01	2.861E-02	0.031
1978	1.214E+00	1.235E+00	1.77%	1.114E+00	1.245E+00	1.195E+00	1.233E+00	2.591E-02	0.021
1979	1.471E+00	1.498E+00	1.86%	1.344E+00	1.505E+00	1.402E+00	1.493E+00	5.288E-02	0.036
1980	9.918E-01	1.008E+00	1.64%	9.037E-01	1.010E+00	9.037E-01	1.002E+00	9.841E-02	0.099
1981	1.147E+00	1.161E+00	1.22%	1.047E+00	1.182E+00	1.092E+00	1.158E+00	2.773E-02	0.024
1982	1.020E+00	1.027E+00	0.70%	9.567E-01	1.064E+00	9.989E-01	1.035E+00	2.220E-02	0.022
1983	7.577E-01	7.632E-01	0.72%	7.288E-01	8.092E-01	7.371E-01	7.767E-01	3.961E-02	0.052
1984	1.171E+00	1.180E+00	0.71%	1.095E+00	1.272E+00	1.119E+00	1.211E+00	9.168E-02	0.078
1985	2.250E+00	2.262E+00	0.52%	2.088E+00	2.454E+00	2.151E+00	2.328E+00	1.768E-01	0.079
1986	3.001E+00	3.011E+00	0.33%	2.858E+00	3.235E+00	2.909E+00	3.092E+00	1.830E-01	0.061
1987	1.980E+00	1.982E+00	0.07%	1.905E+00	2.106E+00	1.931E+00	2.040E+00	1.093E-01	0.055
1988	2.170E+00	2.175E+00	0.20%	2.077E+00	2.306E+00	2.121E+00	2.235E+00	1.138E-01	0.052
1989	1.433E+00	1.436E+00	0.19%	1.354E+00	1.529E+00	1.389E+00	1.480E+00	9.134E-02	0.064
1990	2.026E+00	2.027E+00	0.03%	1.877E+00	2.191E+00	1.949E+00	2.115E+00	1.657E-01	0.082
1991	2.682E+00	2.700E+00	0.69%	2.411E+00	2.912E+00	2.526E+00	2.803E+00	2.761E-01	0.103
1992	2.036E+00	2.050E+00	0.66%	1.758E+00	2.346E+00	1.881E+00	2.216E+00	3.021E-01	0.148
1993	3.012E+00	3.016E+00	0.14%	2.462E+00	3.669E+00	2.697E+00	3.406E+00	7.098E-01	0.236
1994	4.575E-01	4.589E-01	0.30%	3.535E-01	5.929E-01	3.975E-01	5.369E-01	1.393E-01	0.305
1995	1.114E-02	1.131E-02	1.53%	8.567E-03	1.457E-02	9.643E-03	1.288E-02	3.238E-03	0.291
1996	3.542E-02	3.625E-02	2.35%	2.673E-02	4.495E-02	2.990E-02	4.018E-02	1.028E-02	0.290
1997	7.708E-02	7.795E-02	1.13%	5.734E-02	9.826E-02	6.567E-02	8.838E-02	2.272E-02	0.295
1998	3.441E-01	3.458E-01	0.51%	2.583E-01	4.531E-01	2.980E-01	4.008E-01	1.028E-01	0.299
1999	4.124E-01	4.112E-01	-0.29%	3.116E-01	5.666E-01	3.581E-01	4.867E-01	1.286E-01	0.312
2000	8.956E-01	8.869E-01	-0.97%	6.796E-01	1.258E+00	7.731E-01	1.065E+00	2.916E-01	0.326

Note: no yield(s) were estimated in the projection.

NOTE: Printed BC confidence intervals are always approximate.
At least 500 trials are recommended when estimating confidence intervals.