# Indian Ocean Kawakawa Tuna Stock Assessment 1950–2013 (Stock Synthesis)

**PREPARED BY: IOTC SECRETARIAT[1], 20TH MAY 2015**

## Summary

An Indian Ocean kawakawa stock assessment using *Stock Synthesis 3* (SS3) software is described. The approach uses a highly disaggregated model to integrate several sources of fisheries data and biological research into a unified framework. The model is a first attempt to use different sources of abundance data (derived from the Maldivian PL fleet) to assess the health of the stock incorporating key growth, and life history parameters (M, steepness, maturation) for the Indian ocean by estimating selectivity, and catchability for four different fleets (I.R. Iran GN, Sri Lanka GN and PL, Maldives pole-and-Line and all other fisheries).

Alternative assumptions to a base model are tested (slow and fast growth, high and low steepness, and different values of M, and weights to CPUE data and size based data), and the current estimates of stock size and target yield levels are estimated. Stock specific trajectories are presented for the alternative model runs, and advantages of this approach over the simpler catch reduction based approaches are discussed. Core assumptions in the aggregate Indian Ocean analysis included:

- Total recruitment follows a Beverton-Holt relationship, with annual log-normal deviates (in most models).
- The objective function includes lognormal observation errors on the Maldivian CPUE-based relative abundance indices, robust multinomial terms for length composition data (4 fleets), and lognormal recruitment deviations.
- Estimated parameters included virgin recruitment, selectivity functions, recruitment deviations, and catchability coefficients.
- Fixed parameters included: stock recruit steepness, variances on recruitment and CPUE errors, life history parameters describing growth, M, maturity schedule. While these values were fixed for each individual model, alternative combinations of fixed parameters were examined as described below.

There are a large number of uncertainties in this fishery, and we attempted to quantify the implications of i) key assumptions that are difficult to justify, ii) parameters that are difficult to estimate, and iii) interactions among them in various permutations. In total, 8 models are discussed for the Indian Ocean assessment:

- Growth rates, M and maturity:
    - Intermediate growth and fast growth (Johnsons and Tamatamah 2013)
    - Slow growth (Silas et. al. 1985)
    - M of 0.6, 0.8 and 1.0
- Stock recruit steepness: h=0.7, 0.8, 0.9

Results indicate **that the stock is '*not overfished*', and '*not subject to overfishing*'**. Key reference points are shown below that indicate the stock is in a good state.

| Management Quantity | Estimates |
|---|---|
| Most recent catch estimate (2013) | 170 Kt |
| Mean catch over last 5 years (2009–2013) | 155 Kt |
| MSY (1000 t) | 186 (101–271) t |
| Current Data Period | 1950-2013 |
| $F_{2013}/F_{MSY}$ | 0.52(0.17-0.88) |
| $B_{2013}/B_{MSY}$ | Na |
| $SB_{2013}/SB_{MSY}$ | 2.08 (0.6-3.6) |
| $B_{2013}/B_0$ | Na |
| $SB_{2013}/SB_0$ | 0.58 (0.16-0.99) |

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## Contents

# Introduction

Most fisheries in the world have limited information for management (Pauly et. al. 2009, Hilborn and Ovando 2014). In the case of the Indian Ocean, artisanal fisheries operating on the vast coastlines of Asia and Africa bordering the Indian Ocean are of primary concern as artisanal catches comprise >50% of total Indian ocean catches and are increasing year on year. Limited information is available from these fisheries for estimating abundance and productivity trends (Parma et. al. 2003) through traditional assessment approaches. The trend in Asia and other lesser developed economies with limited data (Parma et. al. 2003) was to use equilibrium assumptions and simplified approaches like those proposed in the 1980s (Pauly 1983). This was then made accessible to multiple users through user friendly software (Sparre and Venema 1992), and lead to misleading results that could be overly optimistic/pessimistic on stock status without much information on abundance or dynamic catch trends (Parma et. al. 2003).

The species examined in this paper is Indian Ocean kawakawa (*Euthynnus affinis*), which has shown an alarming trend of increasing catches since 2006 (IOTC 2013). Kawakawa is widely distributed in coastal waters of the Indian Ocean along with other neritics species (Figure 1). Kawakawa occurs in open waters but always remains close to the shoreline. They tend to form multi-species schools by size with other scombrid species comprising from 100 to over 5,000 individuals (Collette and Nauen 1983). They are a highly opportunistic predator feeding indiscriminately on small fishes, especially on clupeoids and atherinids; also on squids, crustaceans and zooplankton (Collette 2001, Fish Base). Although primarily distributed in the central Pacific, it is an important fishery for numerous countries in the Indian Ocean region, namely I.R. Iran, Indonesia, India, Malaysia and Thailand. Numerous other countries also catch the species. The species is primarily caught by Purse Seine and gillnets, but other gears are also used to catch the species. The countries that are the primary users of the resource are India, Indonesia and I.R. Iran. An attempt to re-estimate the catches across the eastern Indian Ocean region is being, and so it is likely that some of the current reported catch estimates will be revised in the future.

Previous attempts to do assessments used data poor approaches (Zhou and Sharma 2013 IOTC–2013–WPNT03–25, Zhou and Sharma 2014, IOTC–2014–WPNT04–26) or surplus production based assessments (Sharma and Zhou 2013, IOTC-2013-WPNT-3-24). This is the 1st attempt to do an integrated assessment.

# Software

The model was implemented with the 32 bit MS Windows version of Stock Synthesis V3.24a (SS3). Technical details are (mostly) described in Methot (2000, 2009). This is a powerful and flexible stock assessment package with efficient function minimization, implemented with AD Model Builder (http://admb-project.org/). For the models explored here, function minimization generally required ~6 minutes on a 3.0 GHz PC (not including inverse Hessian calculations).

# Data and Model Assumptions

For continuity of the arguments, related data and model assumptions are described together. The SS3 template control file is appended (attachment 1) to resolve incomplete or ambiguous descriptions of the models. Note, that while the model is sensitive to a number of the assumptions shown (Sharma et al. 2014), the data used here examines some data weighting issues and possible different growth curves similar to Eveson et. al. (2012) approach.

## Spatial Structure

A single area covering the entire Indian Ocean was used in the assessments: The model examined was similar in spatial structure to Skipjack model analyzed in WPTT-15 & WPTT 17 (Kolody et. al. 2011, Sharma et. al. 2012, Sharma et. al. 2014). This model examined the entire Indian Ocean area as one unit, with the different fisheries operating in this one area.

## Temporal units

Data were disaggregated by quarter (quarter 1 = Jan-Mar), and the model was iterated on quarterly time-steps, to represent the rapid dynamics of this population, over the period 1952-2013 (plus 10 years of projections).

## Age Structure

The SKJ population was represented with an annual/four season configuration. SS3 can resolve many population features on a seasonal basis (e.g. recruitment, fishery removals, $M_{age}$). However, the tags can only be assigned to annual age classes (discussed below).

The age structure in 1950 was assumed to be in unfished equilibrium (ignoring the small artisanal catches that were taken previously).

### Sex Structure

The model was sex-aggregated (and reported spawning biomass is the summed mass of all mature fish).

### Fishery definitions

Four fleets were defined on the basis of gear type and area of operation (Figure 1):

1. Maldivian –Pole-and-Line fleet (PL)
2. I.R. Iran – Gillnet Fishery (GN).
3. Sri Lanka – Gillnet and Line fishery (GN-LL).
4. Other – includes all other fleets, primarily gillnet fleets from India, Indonesia and Pakistan, but also Purse seine (PS) fleets, and small coastal fleets (including non-PL fisheries from the Maldives), and a trivial catch from longliners.

The *Other* fleet is a heterogeneous mix of fisheries. However, further partitioning this fleet is not expected to make much difference to the analysis because the size composition data are poor for most of these fleets. None of these fleets are considered to be informative with respect to catch rates or tag recoveries, and we would not expect that the relative year-class strength information derived from the stationary selectivity assumption to be reliable.

### Total catch

The total catches were calculated by the IOTC Secretariat (IOTC-2015-WPNT05-07). This process requires a number of approximations and substitutions for fleets with poor data (including those discussed below under size composition data). The catch time series for the 4 fleets is shown in Figure 1. The model uses the standard difference form of the Baranov catch equations to describe the population dynamics. Catch in mass was used in the model for all fleets, and was assumed to be known without error and extracted precisely to within the numerical tolerance in the iterative solving of the (SS3 ‘hybrid’) catch equations.

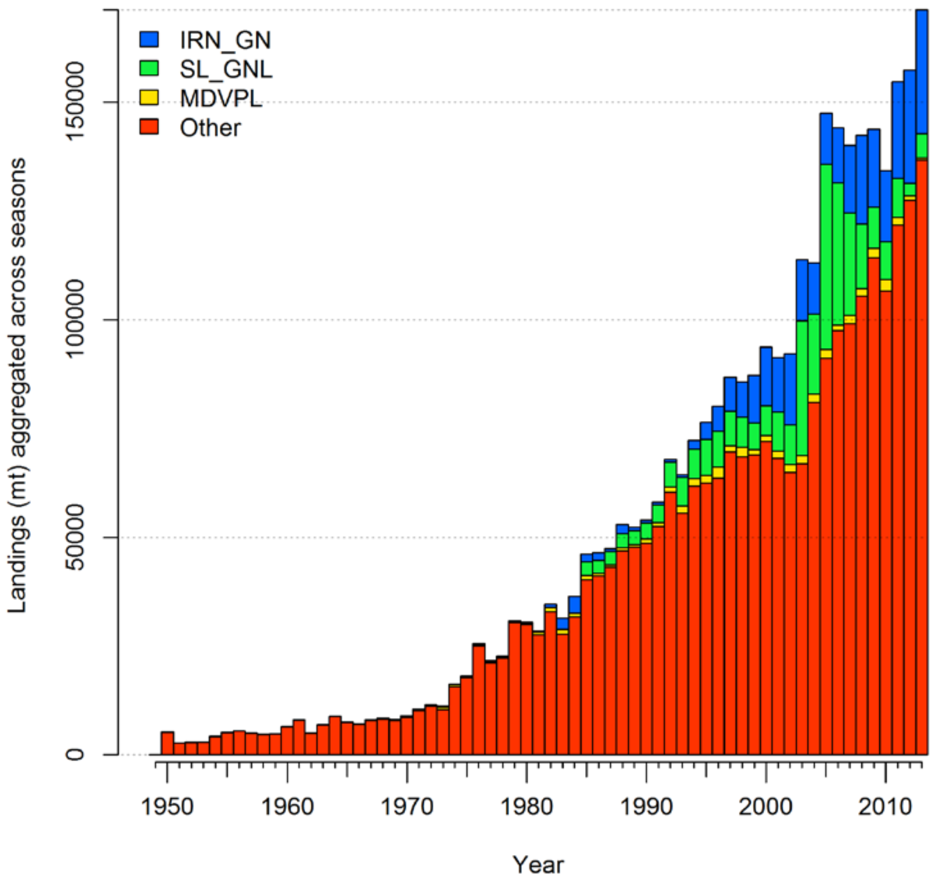


**Figure 1.** The major fisheries that catch kawawaka in the Indian Ocean

### CPUE as a relative abundance index and catchability assumptions

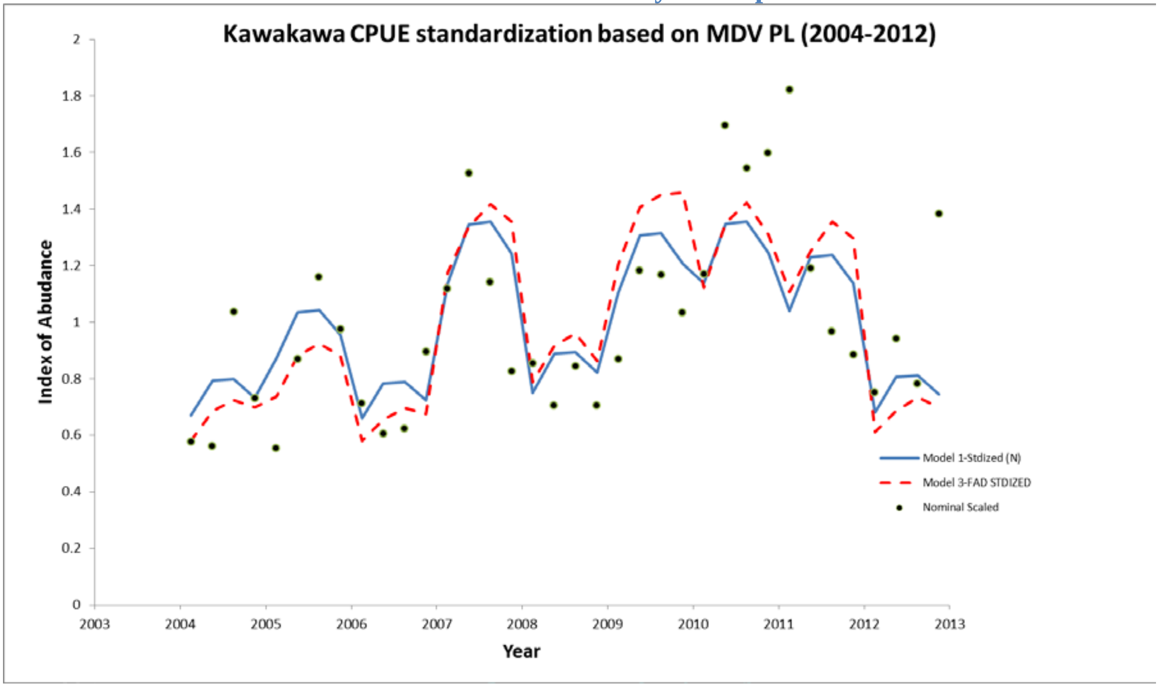


**Figure 2**. CPUE indicator for the Maldivian Pole and Line fishery

GLM-based standardization of the Maldivian kawakawa pole and line fishery catch rate data were examined for the period 2004-12 (Figure 2). The raw data consists of around 124,000 records of catch (numbers) and effort (fishing days) by month, atoll and vessel; vessel characteristics were added to the CPUE dataset based on information from the registry of vessels. A subset of 25,762 records were extracted from the dataset, identified as records of fishing activity targeting kawakawa. Information on Fish Aggregating Devices (FAD) was also incorporated into the analysis as a covariate based on the number of active FADS associated with the atoll of the landing site. Techniques similar to those used in the standardization of skipjack tuna were used (Sharma et. al. 2014 IOTC WPTT-16-42). The distribution of FADs was split into three regions incorporating the North Atolls, Middle Atoll and South Atolls. Vessel specific data including hull-type effects, length of the boat (as a vessel size class) and horse. GLM based models using a log response on CPUE were examined. The final model presented estimated log(CPUE) from independent variables Year, Month, Area (N, S, or M), number of FADs used in the area, and Length of vessel, and interaction effects between the last 3 variables. The data was analysed at a monthly resolution before being was collapsed into quarterly signals for 2004-2012. For further details see Sharma et. al. 2013, IOTC-2013-WPNT-3-23.

### Size Composition Data

Data for the main fleets developed are shown below; note the Sri Lankan fleet is split into two periods, i) prior to 1992 when the Indo-Pacific Tuna Tagging Programme was going on, and one after that. Coverage after 1993 decline substantially, in the other fleets, like Iran data cam available after 2003, and Maldives PL have had a fairly consistent sampling plan between 1983 and 2012 (Figure 3).

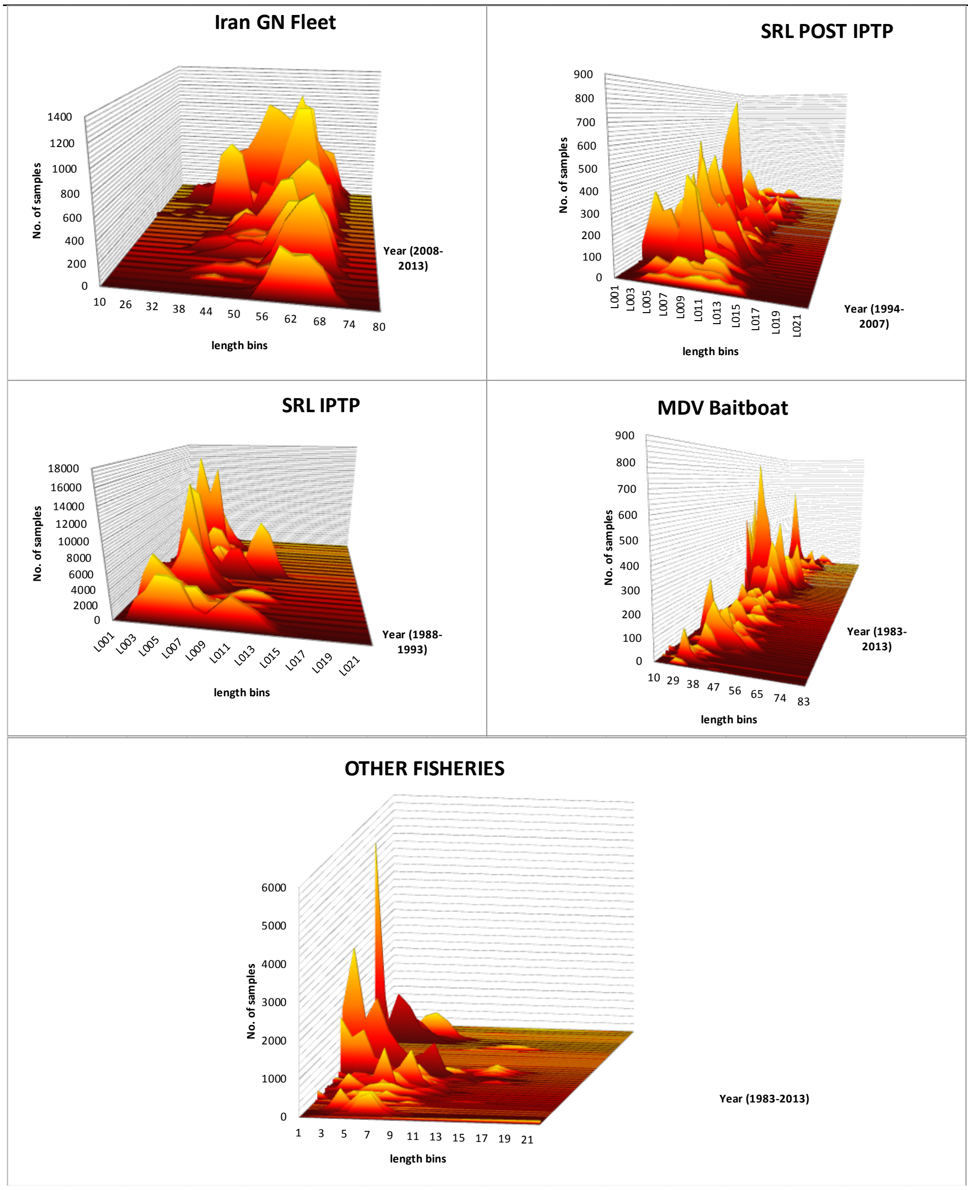


**Figure 3.** Length composition data that was used to stratify fisheries.

There is no obvious pattern to indicate strong seasonal recruitment. Catch-at-length sample sizes are often very large, however, in these sorts of models, it is generally a bad idea to allow the size composition data to be weighted too highly. The size composition data influence these models in two main ways: i) ensuring that the correct age distribution is removed from the population by the fishery, and ii) providing information about relative year class strength through the stationary selectivity assumption.

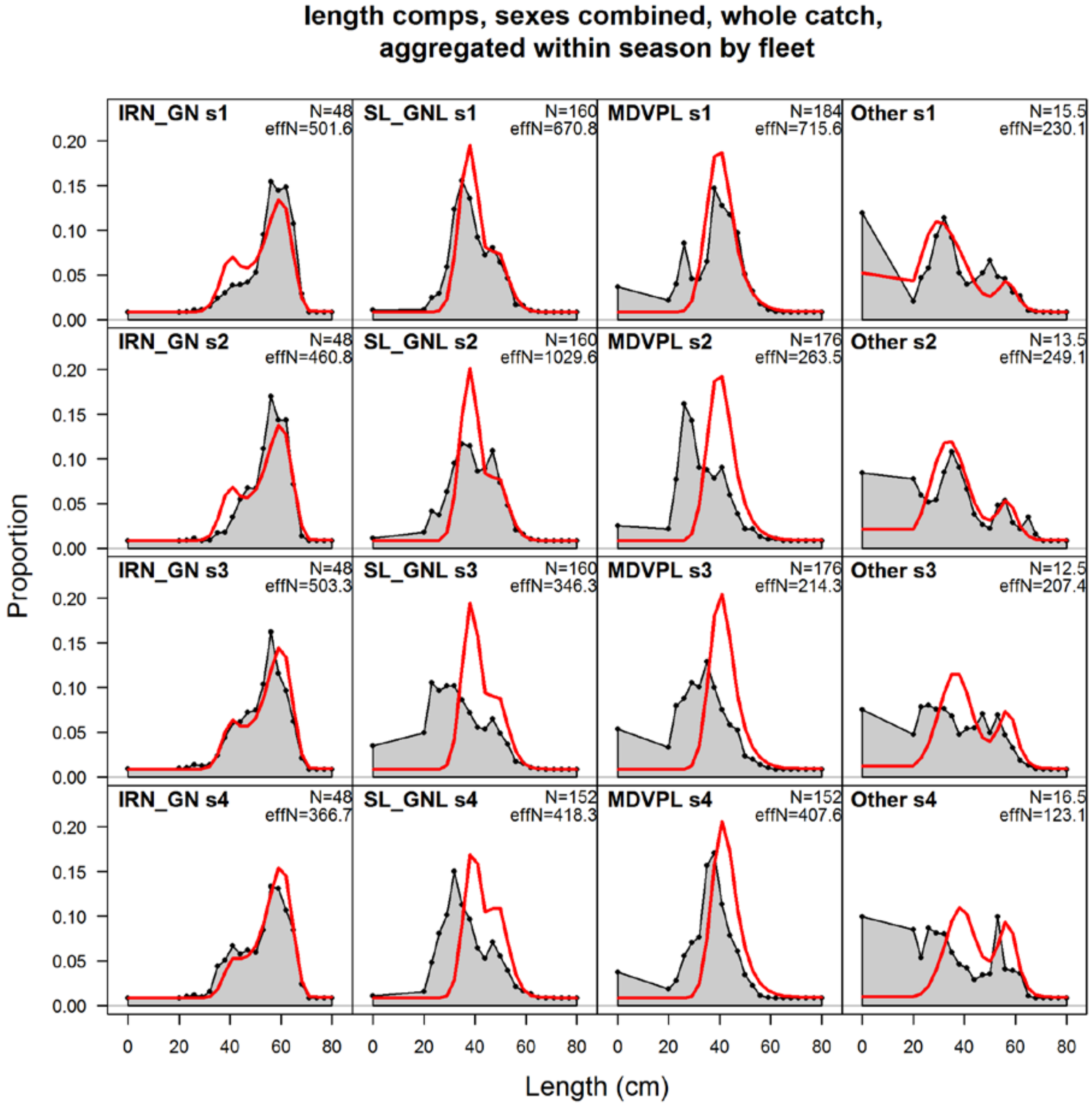


**Figure 4.** Length composition over all years by season and fleet.

In this assessment, all length composition samples were down-weighted to a considerable degree, and a range of options were explored to test if the model was sensitive to these assumptions. The *Other* fleet was further down weighted, because it represents a heterogeneous mix of fisheries, many of which are poorly and/or inconsistently sampled. The catch-at-size distributions are aggregated in 22 bins of length 3 cm (≤20 to >80 cm). The multinomial likelihood was used in the model, with an additional 1% added to each length bin (predicted and observed) to make the term more robust to outliers.

### Selectivity

A non-parametric, pseudo-length-based function was estimated independently for the selectivity of the 4 fleets. Selectivity parameters were estimated for a series of length-class nodes, with cubic spline interpolation between nodes (the default specification was adopted in which the node spacing and initial parameter values were calculated within SS3). The length-based concept is applied in the calculation of the predicted catch-at-length distribution. However, the length-based selectivity is converted to an age-based selectivity for purposes of removing the appropriate portion of the population in the catch (i.e. cumulative effects of length-based selectivity on the length-at-age distribution are not described in the model). The function is flexible enough to represent dome-shaped, monotonically increasing (e.g. logistic), and polymodal functions (and was motivated by the clear bimodal distribution of the PL fleet). Seven nodes were estimated for the PL fleet, and 5 nodes for the Gillnet Sri Lanka, Iran and Other fleets. Stationary selectivity was used in the final analysis due to problems in convergence in time-varying selectivity as a number of parameters were hitting the boundary conditions for the time varying component.

### Size-at-Age

Many relationships for mean length-at-age were examined (Figure 4, Table 1) though only one is presented in the results (Figure 5). Sensitivity to this assumption were examined in the results section. If the absolute age is wrong because of error in the Length (a=0) assumption, this would manifest itself primarily as an incorrect lag between the timing of spawning and recruitment. Since the stock recruitment relationship is highly uncertain, and the lag error is likely to be short for this species, this is expected to have a negligible impact on the assessment (furthermore, in the current configuration, SS3 only calculates spawning biomass once annually, even with quarterly recruitment). The growth curve options were:

A number of studies were done showing a range of growth across areas (Table 1 below)

**Table 1.** Estimated growth parameters for *E. affinis*

| Region | L at 1st Mat (cm) | $L_\infty$ (cm) FL | $L_{max}$ (cm) | K(year$^{-1}$) | $t_0$ (years) | Length at age (cm) | | | | Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Yr 1 | Yr 2 | Yr 3 | Yr 4 | |
| South Africa | | 82 | 100 | 0.51 | | | | | | Fishbase |
| Seychelles | | **90** | 61.5 | **0.45** | | | | | | **Fishbase**[2] |
| Northwest Sumatra | | 64.58 | 88 | 1 | -0.129 | | | | | (Sulistyaningsih et al. 2014) |
| Persian Gulf & Sea of Oman | | 95.06 | 85 | 0.67 | | | | | | (Kaymaram & Darvishi 2012) |
| Tanzania | | 89.25 | | 0.78 | | | | | | (Johnson & Tamatamah 2013) |
| Persian Gulf & Sea of Oman | | 87.66 | | 0.51 | -0.23 | 40.3 | 58.9 | 70.2 | 77.1 | (Taghavi-Motlagh et al. 2010) |
| India | 37.7 | | | 0.56 | -0.032 | 42.7 | 59.5 | | | (Abdussamad, Rohit, et al. 2012) |
| India | | 81.7 | | 0.79 | -0.023 | 44.6 | 64.9 | 77.4 | - | (Khan 2004) |
| Iran | | 87 - 89 | 86 | 0.5 - 0.53 | 0.18 | | | | | (Reza et al. 2008) |
| Indonesia | | 63.53 | 60 | 0.63 | -0.21 | | | | | (Jatmiko et al. 2013) |
| Pakistan | 37.7 | | | | | | | | | (Ahmed et al. 2014) |
| Indian waters | 37.7 | 81.92 | 80 | 0.56 | -0.0317 | 42.7 | 59.5 | 69.1 | - | (Rohit et al. 2012) |
| Gulf of Thailand | | 79 | | 0.96 | | | | | | (Yesaki, 1989)[3] |
| Java Sea, Indonesia | | 59.63 | | 0.91 | | | | | | (Chodrijah et al 2013) |
| Sri Lanka | | 63 | | 0.61 | | | | | | (Joseph et al 1987) |
| India | | 81 | | 0.365 | -0.343 | 31.43 | 46.6 | 57.14 | 64.44 | (Silas et al. 1985)[4] |
| India | | 83.5 | | 0.42 | -0.044 | 29.6 | 48.1 | 60.2 | 68.2 | (James et al. 1993) |
| India, East coast | | 87.5 | | 1.5 | -0.003 | 68.1 | 83.2 | - | - | (Kasim and Abdussamad, 2003) |
| Veraval India | | 72.5 | | 0.56 | 0.033 | 31.84 | 49.27 | 29.23 | 64.92 | (Ghosh et al. 2010) |

Table 2: Estimated natural mortality (M) for Kawakawa

| Region | M (year$^{-1}$) | Z (year$^{-1}$) | a | b | Reference |
|---|---|---|---|---|---|
| South Africa | 0.68 | | 0.02 | 2.9 | **Fishbase**[5] |
| Seychelles | 1.44 | 6.47 | | | (Sulistyaningsih et al. 2014) |
| Persian Gulf and Sea of Oman | 0.76 | 2.58 | 1.86E-05 | 2.87 | (Kaymaram & Darvishi 2012) |
| Tanzania | 1.09 | 1.78 | | | (Johnson & Tamatamah 2013) |
| Persian Gulf and Sea of Oman | 0.65 | 2.37 | | | (Taghavi-Motlagh et al. 2010) |
| India | 0.93 | 1.68 | 0.0254 | 2.89 | (Abdussamad, Rohit, et al. |

[2] used in 2014 assessment

[3] As cited in Sulistyaningsih et al 2014)

[4] As cited in rohit et al 2012

[5] used in 2014 assessment

| | | | | | |
|---|---|---|---|---|---|
| | | | | | 2012) |
| India | 0.928 | 2.24 | | | (Khan 2004) |
| Iran | 0.64 – 0.75 | 1.78 - 2.72 | | | (Reza et al. 2008) |
| Indonesia | 1.07 | 2.4 | | | (Jatmiko et al. 2013) |
| Pakistan | | | 0.0254 | 2.89 | (Ahmed et al. 2014) |
| India | 0.93 | 1.68 | 0.0254 | 2.89 | (Rohit et al. 2012) |
| India | 0.76 | 2.57 | 0.019 | 2.95 | (James et al. 1993) |
| India, East coast | 1.76 | 9.79 | | | (Kasim and Abdussamad, 2003) |
| Veraval, India | 0.94 | 1.69 | -1.931 | 3.056 | (Ghosh et al. 2010) |

The final Growth model used had a VB, k of 0.37, Linf of 81 and t0 of 20 cms (similar to (Silas et al. 1985, Figure 5). The range of models that one could possibly use are shown below (Figure 4 from IOTC-2015-WPNT05-DATA12). Weight at age was described by the allometric relationship of 0.0254 (a) and 2.89 (b) respectively.

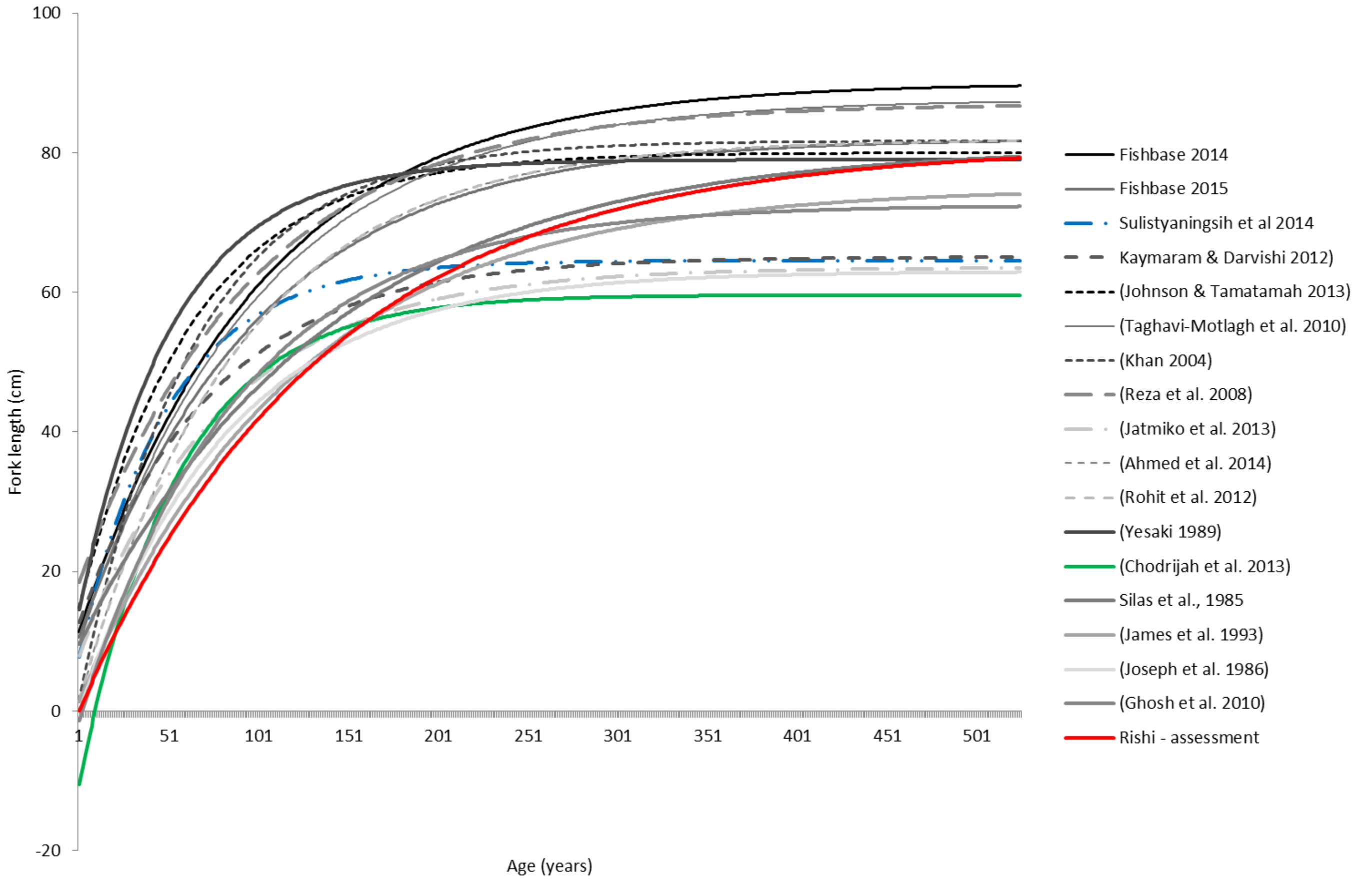


**Figure 5.** VB growth curves shown in Table 1, above., The one used in the base assessment is a slow growth, similar to Silas et. al. 1985 with 1st age being measured at 20cms.

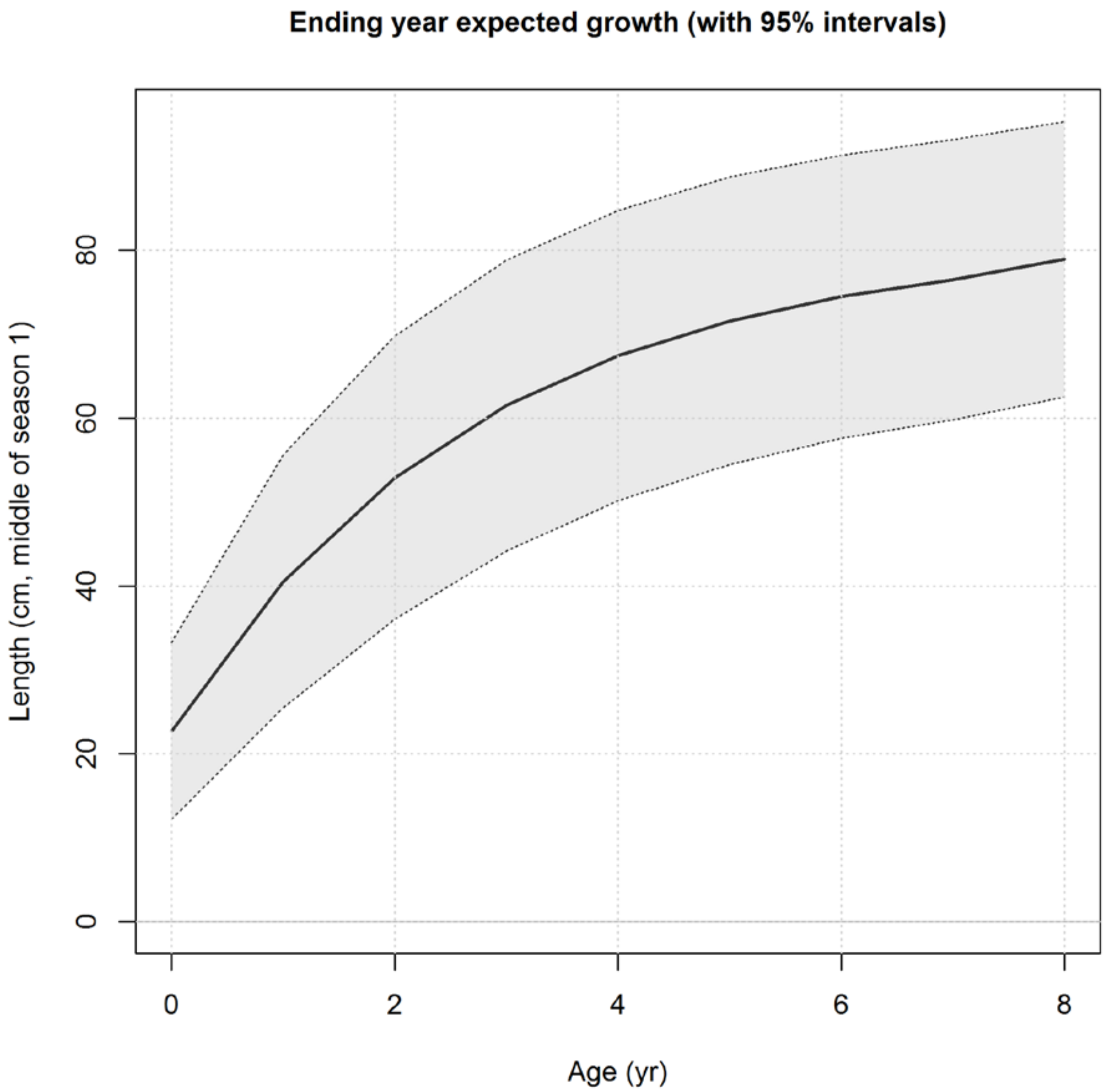


**Figure 6**. Growth for Kawakawa used in the model Stock Synthesis based on lit-review.

### Maturity

Maturity estimates similar to those used by skipjack tuna, Grande et al. (2010) were adopted: invariant over time, with 50% maturity at length 38 cm.

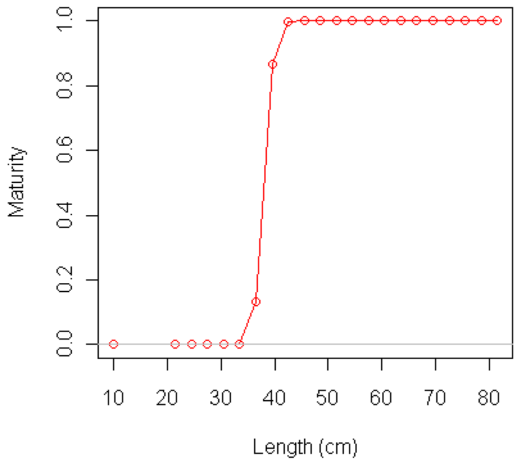


**Figure 7.** Assumed KAW maturity-at-length (proportion).

### Stock Recruitment

A Beverton-Holt stock recruit relationship was assumed (the SS3 'flat-top' version in which $R_t$ does not increase beyond $R_0$ if $SB_t$ happens to exceed $SB_0$). It was assumed that spawning biomass is equal to the mass of the mature population. In recognition of the difficulty in estimating steepness (*h*), different fixed values were examined. Values of 0.7, 0.8 and 0.9 (Figure 7) were examined for kawakawa which is a highly resilient fecund species that spawns multiple times over a year. The value of 0.9 was used in the base case assessment.

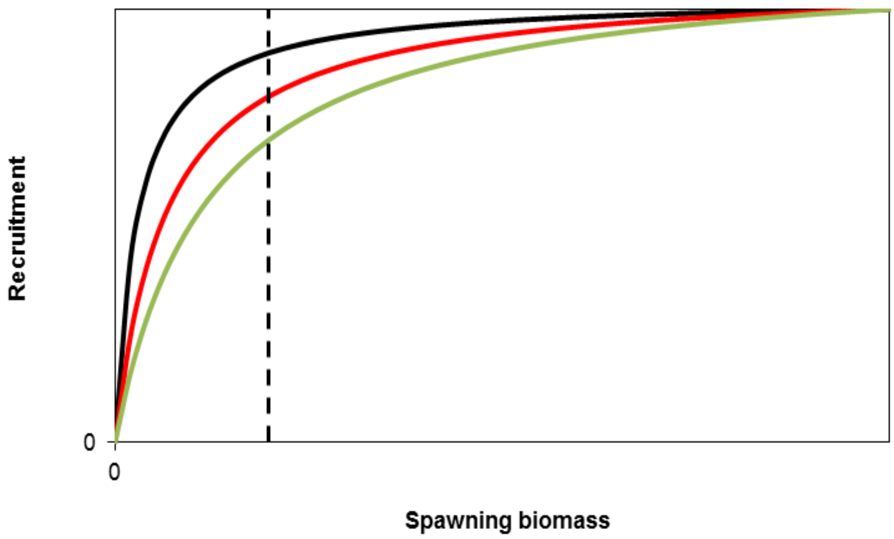


**Figure 8.** Steepness values used in assessments, the steepest one is 0.9 (black), followed by 0.8 (red) and 0.7 (green).

Deviations from the stock-recruitment relationship were assumed to follow a lognormal distribution, with constant recruitment until we have more informative data on age structure, i.e. annual deviates from 2004-2010 ($\sigma_{R,\ annual}=0.6$), with some flexibility in quarterly deviates from 2004-2010 ($\sigma_{R,season} < \sigma_{R,\ annual}=0.6$). The lognormal bias correction (-$0.5\sigma^2$) for the mean of the stock recruit relationship was applied during the period 2004-2010. Deviates were not applied in 2011 and 2012 primarily due to non-informative CPUE data (no PL CPUE available after 2012. For 2011 and 2012, constant recruitment assumption was used.

### Natural Mortality

Natural mortality was fixed at M=0.8 for all ages. This is in the realm of what we see given the growth, and life history characteristics of kawakawa (Table 2, low M=0.65 to high M=1.44).

## Sensitivities Examined

With respect to the assessment, sensitivities were examined related to selectivity of the PL fleet (if the represent the GN fisheries in Iran versus they represent the PL fishery selectivity), steepness (0.7, and 0.8), natural mortality (0.6, and 1), and growth (slower growth). These are the key structural uncertainties in the assessment and results are presented that discuss these elements.

## Results

Base case assessment are shown in Figures 9-15. Biomass trajectories are shown (Figure 9), with fits to the abundance index (Figure 10), length-composition (Figure 11), fishery selectivity (Figure 12) and residual pattern to length composition used for different fisheries (Figure 13). Fishing mortality levels relative to optimal levels are also shown (Figure 14)

Key reference parameters are shown in Table 3. These relate to optimal yield, estimates of current SSB, and ratios of current fishing mortality to optimal levels of fishing mortality, as well as current SSB to optimal levels of SSB. Phase plots on the base case stock trajectories are shown below (Figure 1).

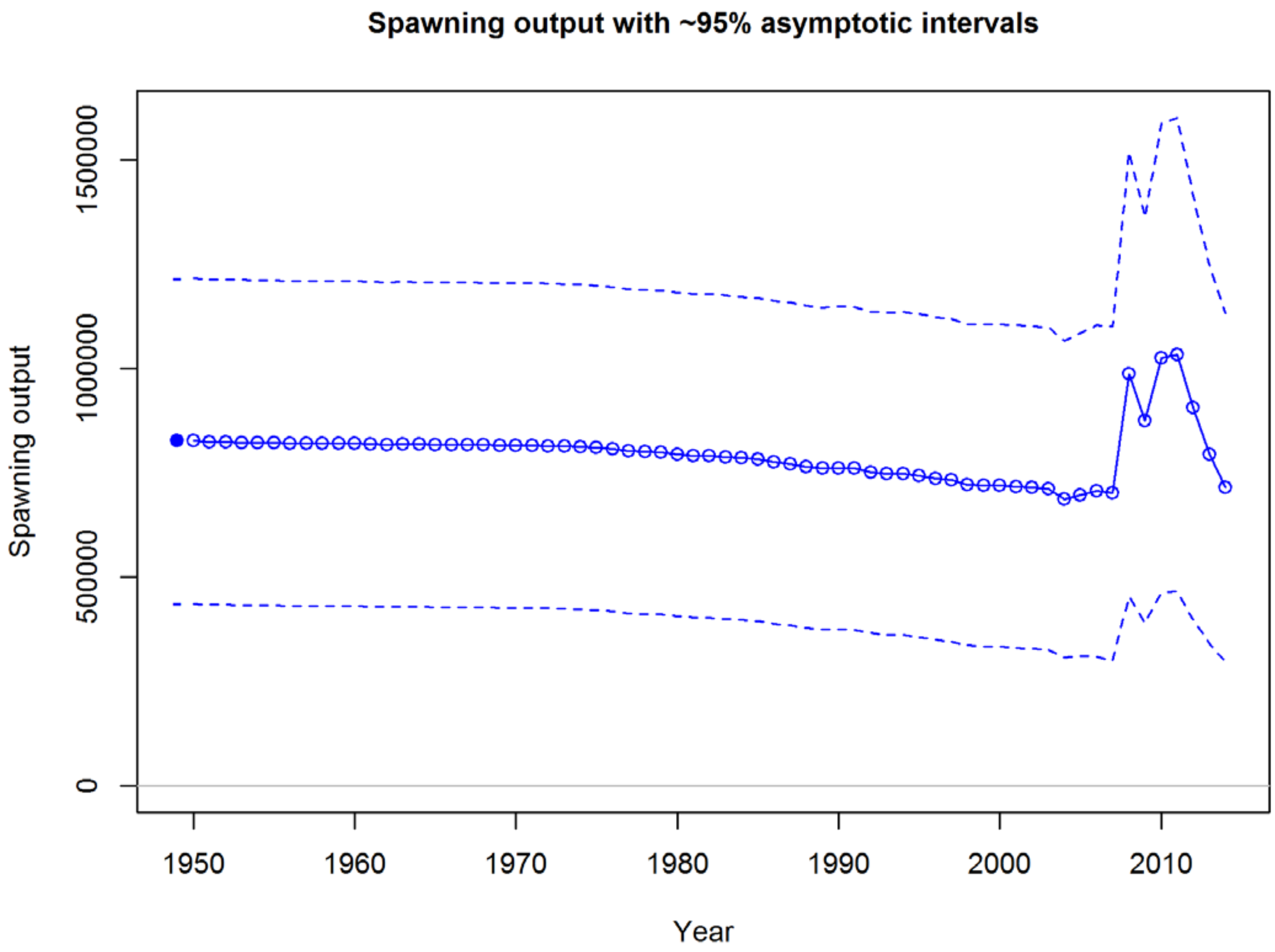


**Figure 9.** Spawning Biomass trajectories for kawakawa from a base model.

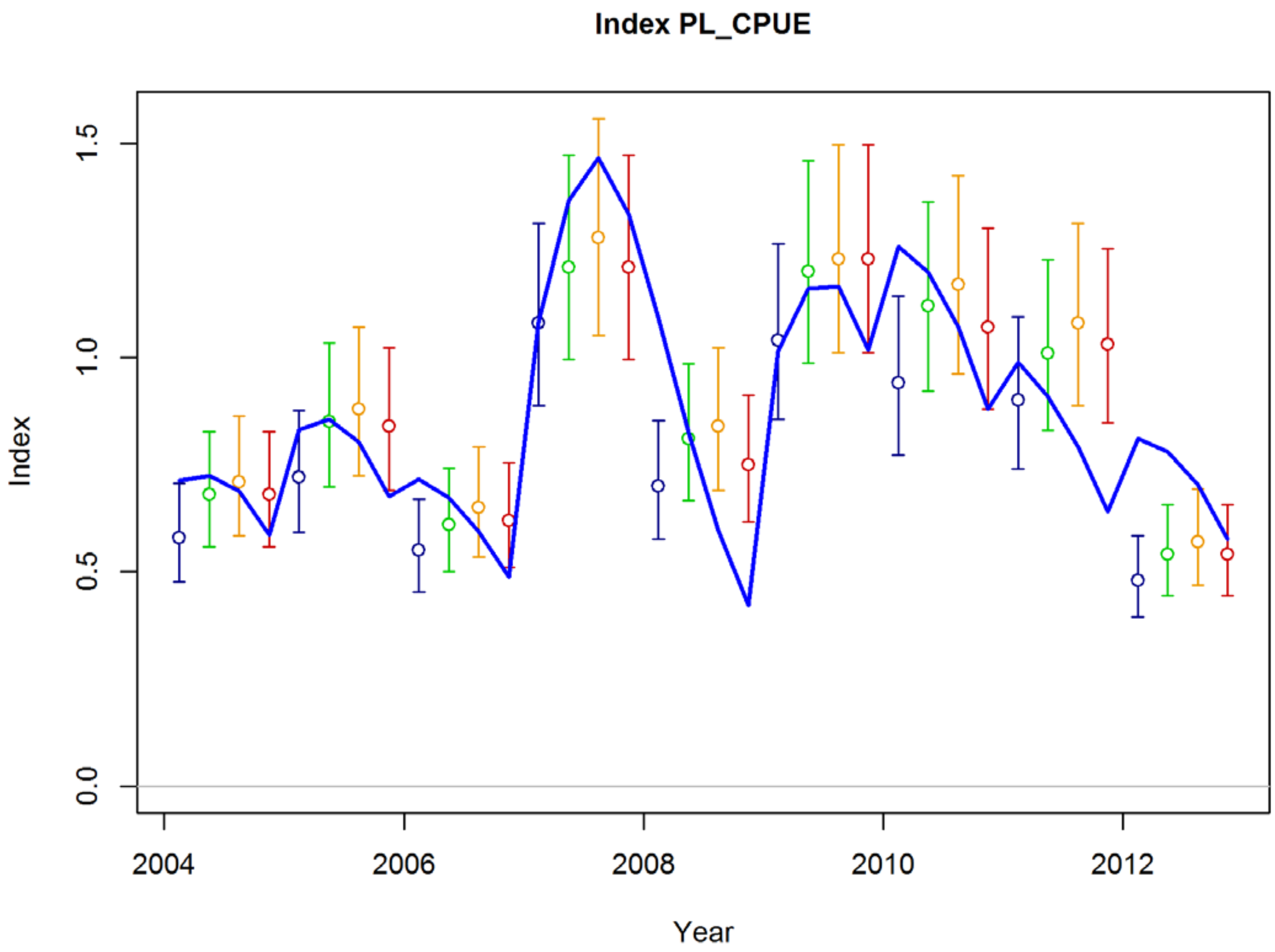


**Figure 10.** Model fits to abundance index

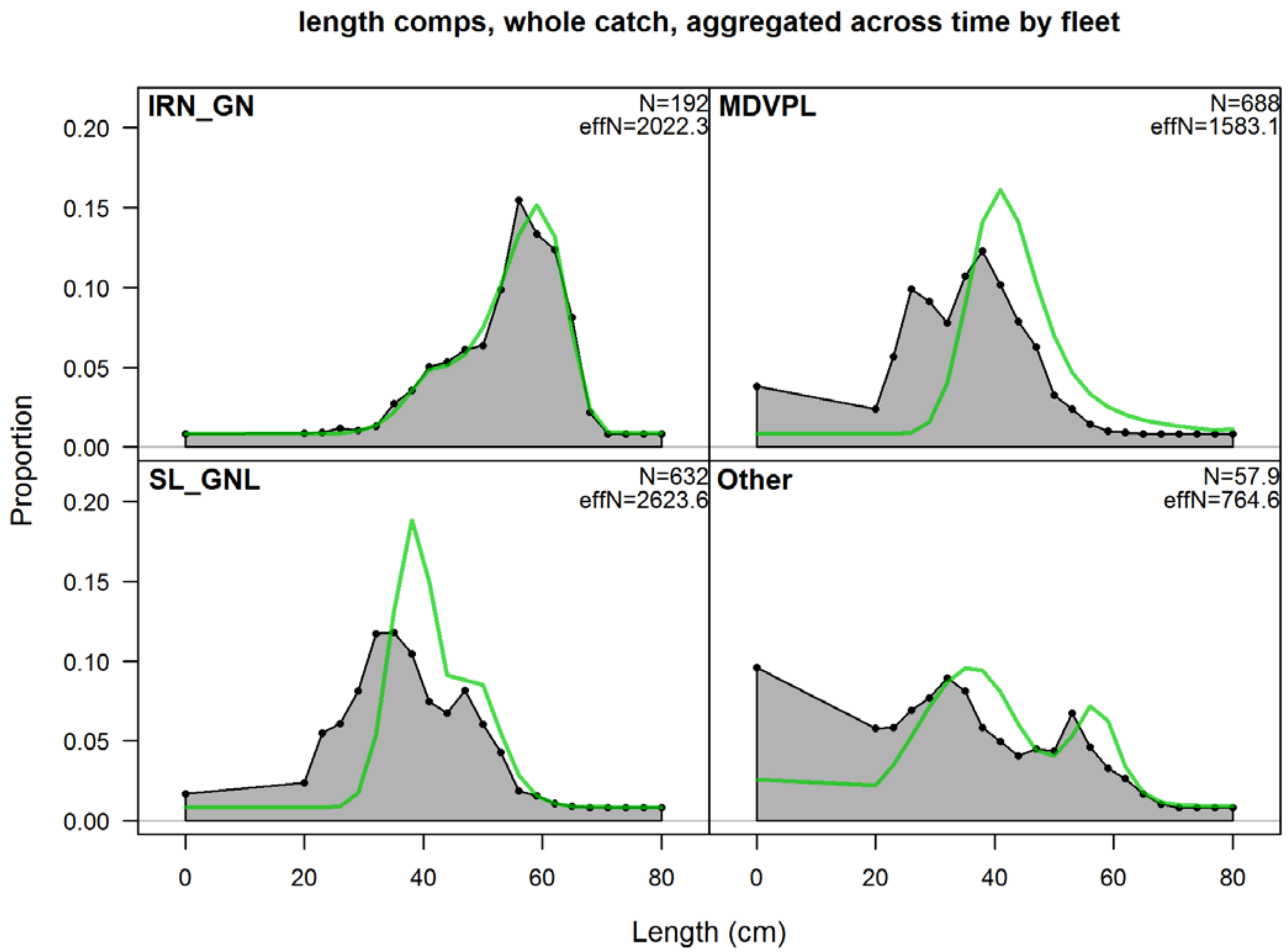


**Figure 11.** Model fits to length composition over all years available

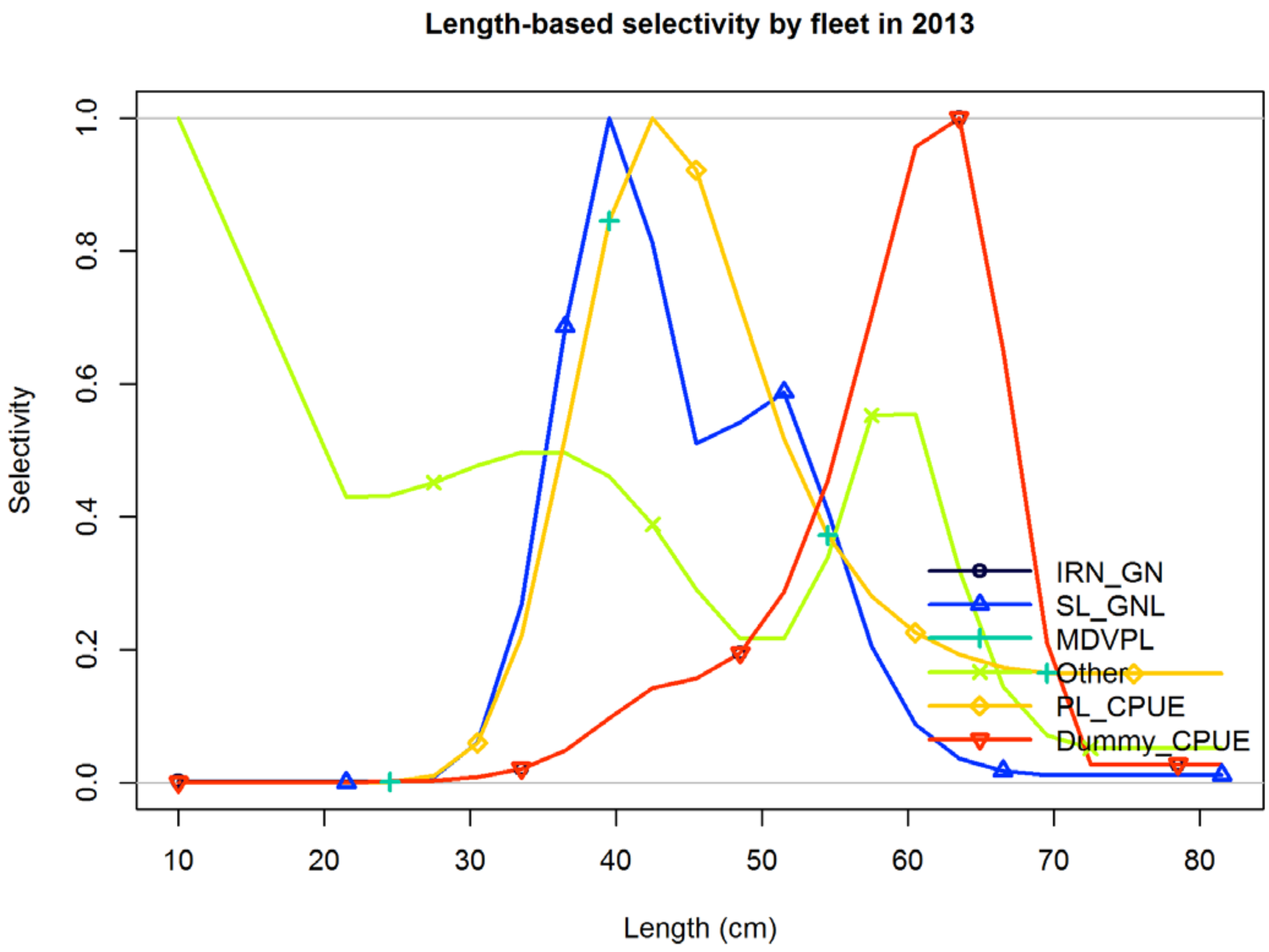


**Figure 12.** Fishery selectivity estimated

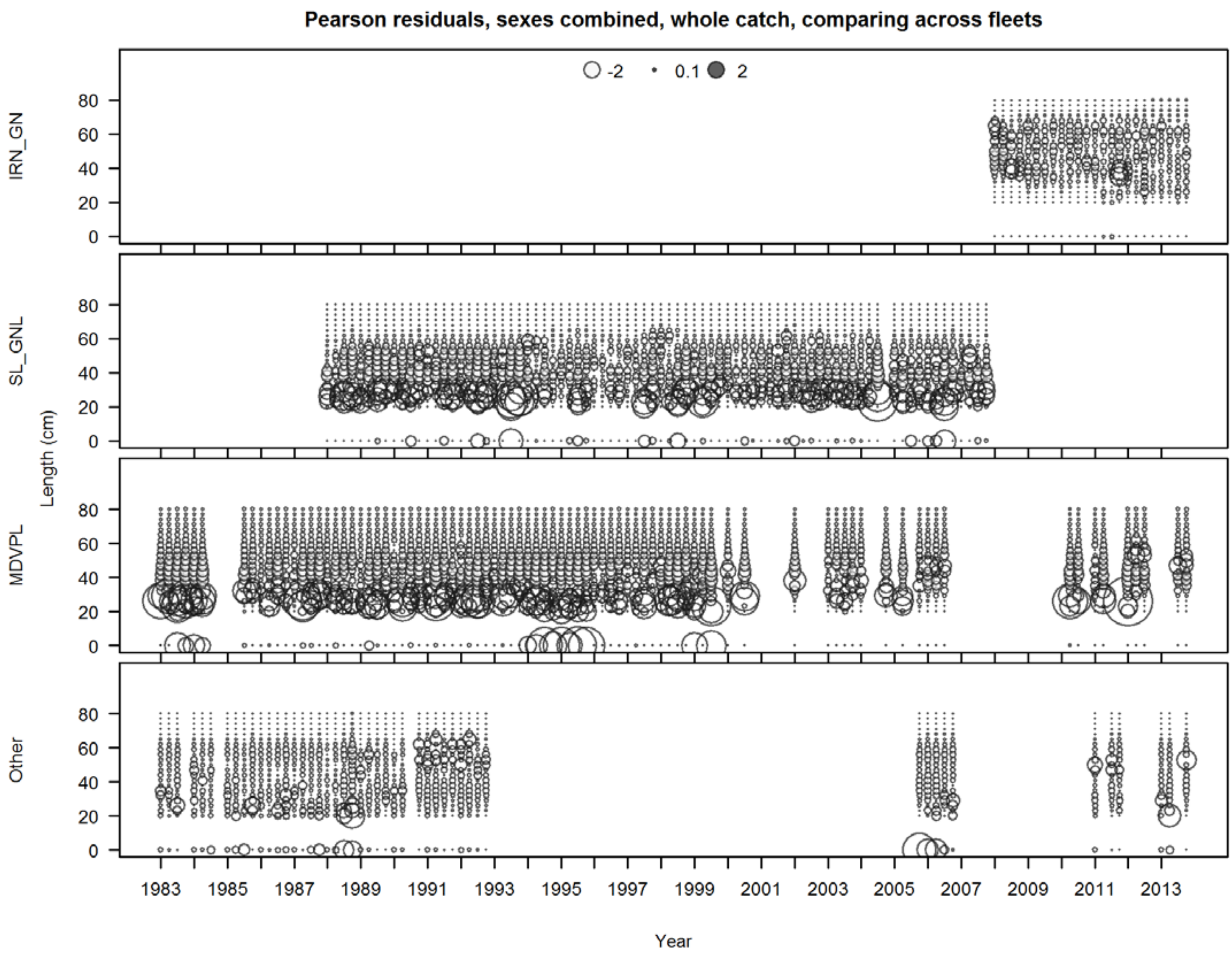


**Figure 13**. Residual patterns in model fits to length composition over time.

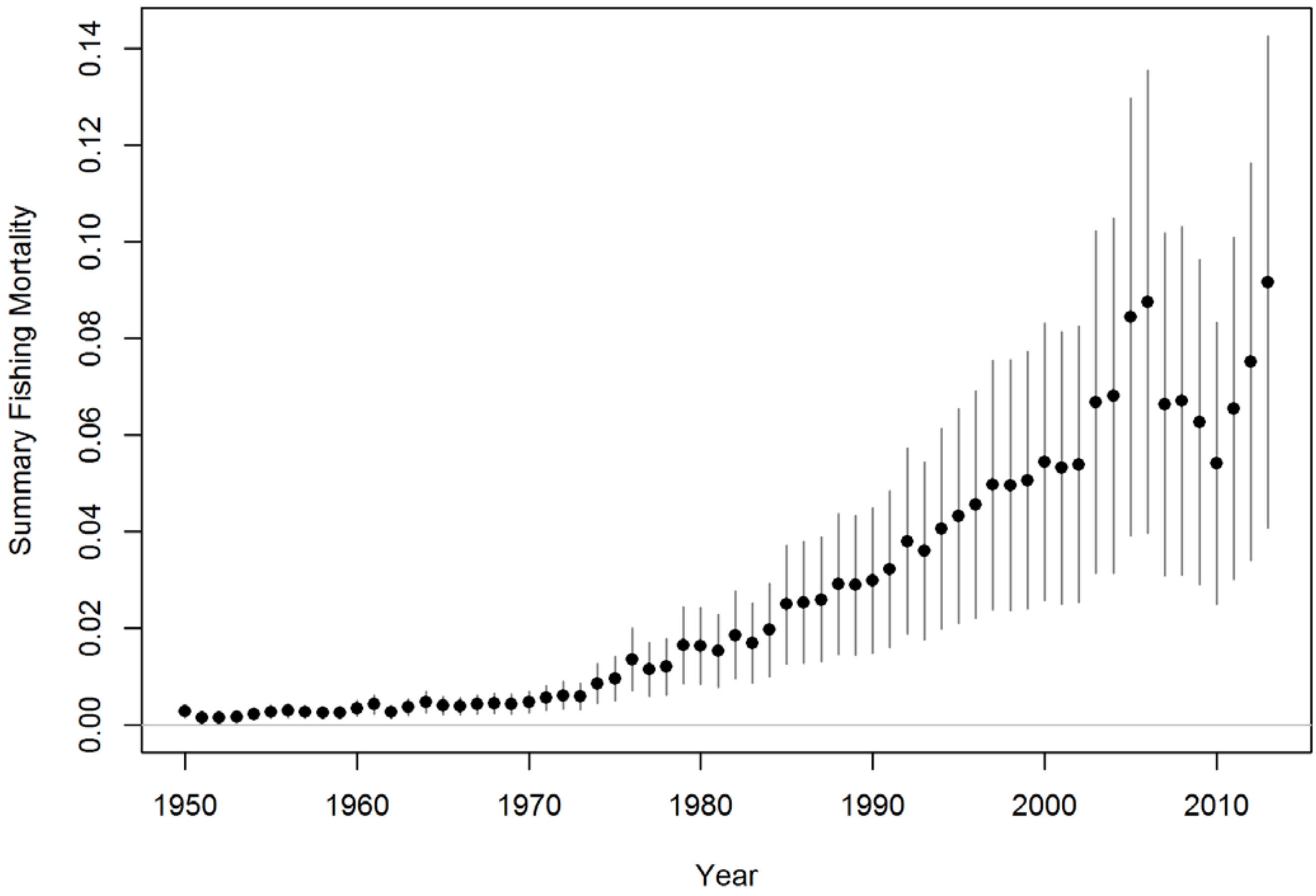


**Figure 14**. Fishing mortality levels for the base model

**Table 3**. Key reference points on yield and optimal spawning biomass using PL selectivity for index of abundance selectivity

| **Management Quantity** | h=0.9 |
|---|---|
| LIKELIHOOD | 1065.75 |
| Most recent catch estimate (2013) | 170 Kt |
| Mean catch over last 5 years (2009–2013) | 155 Kt |
| MSY (1000 t) | 399K (218K-580K)t |
| Current Data Period | 1950-2013 |
| $F_{2013}/F_{MSY}$ | 0.14 (0.06-0.22) |
| $B_{2013}/B_{MSY}$ | Na |
| $SB_{2013}/SB_{MSY}$ | 4.12 (1.77-6.77) |
| $B_{2013}/B_{0}$ | Na |
| $SB_{2013}/SB_{0}$ | 0.96 (0.41-1.0) |

Table 4: Effect of selectivity of PL fleet, assumed to be similar to Pl fleet or Gillnet fleet

| **Management Quantity** | h=0.9 (selectivity similar to PL fleet) | h=0.9 (Selectivity of index similar to Gillnet fleets) |
|---|---|---|
| LIKELIHOOD | 1065.75 | 992.485 |
| Most recent catch estimate (2013) | 170 Kt | 170 Kt |
| Mean catch over last 5 years (2009–2013) | 155 Kt | 155 Kt |

| | | |
|---|---|---|
| MSY (1000 t) | 399K (218K-580K)t | 186K (101K-271K)t |
| Current Data Period | 1950-2013 | 1950-2013 |
| $F_{2013}/F_{MSY}$ | 0.14 (0.06-0.22) | 0.52(0.17-0.88) |
| $B_{2013}/B_{MSY}$ | Na | Na |
| $SB_{2013}/SB_{MSY}$ | 4.12 (1.77-6.77) | 2.08 (0.6-3.6) |
| $B_{2013}/B_0$ | Na | Na |
| $SB_{2013}/SB_0$ | 0.96 (0.41-1.0) | 0.58 (0.16-0.99) |

The Iranian GN fleets account for close to 15% of the catch in recent years. The Maldivian PL catch accounts for less than 1% of the catch in recent years. When using the Iranian GN selectivity the catchability increased from q=1.76e-0.6 to q=9.33e-06 (a 5 fold increase), As such abundance estimated changed by a large magnitude, although the relative signals are quiet similar (Figure 15). In addition the effect on R0 was significant (Figure 16). Based on the comparisons shown in Table 4, the estimates of depletion, $SB_{2013}/SB_0$ after a fishery has operated for 70 years, seem more to be in line of the GN selectivity (0.58) rather than the the PL selectivity (0.96), which seems highly unlikely given the fishery is catching 170K T in recent years, and has a fishing history for 70 years. Hence for all subsequent analysis, we used the GN selectivity to model the abundance index, and report all results relative to that.

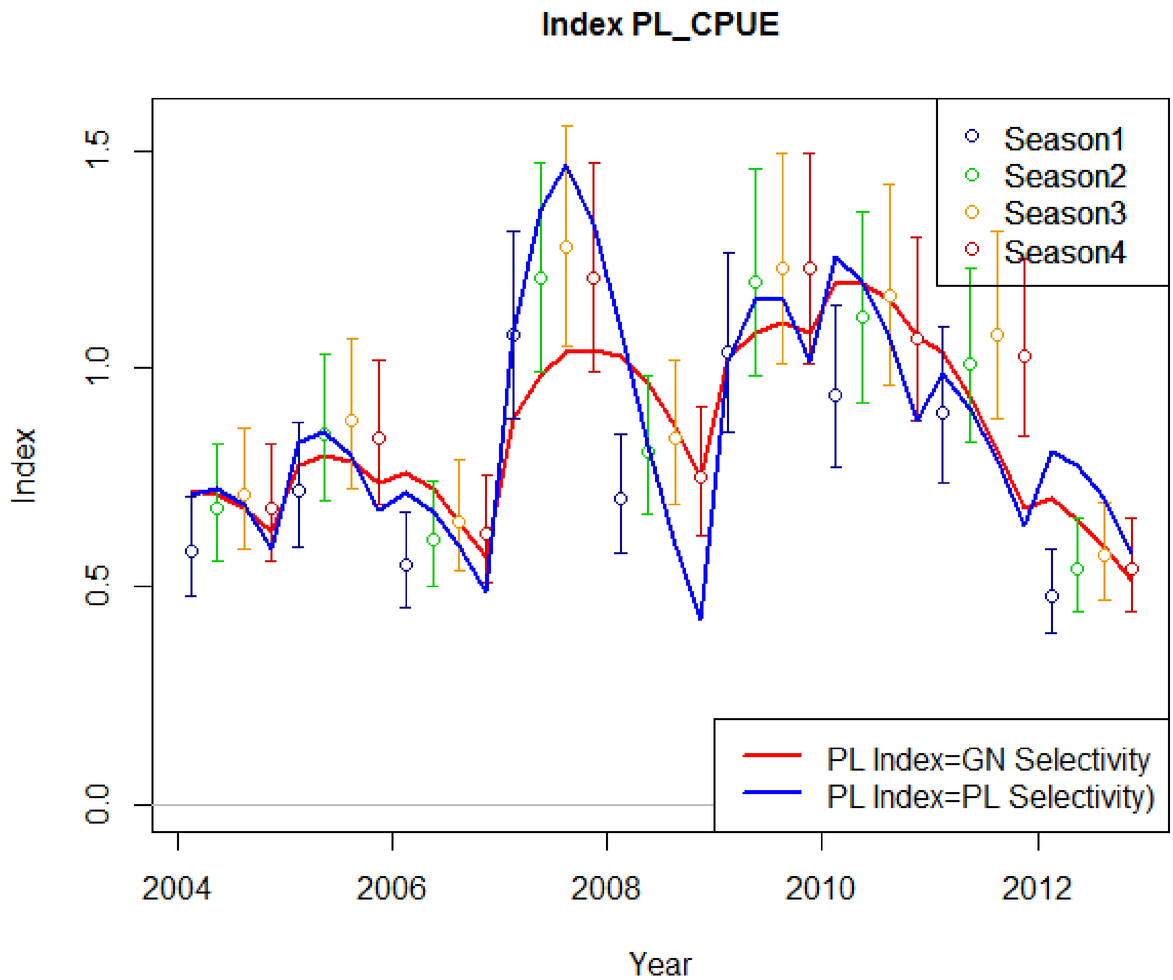


Figure 15: Abundance index and model fits for different selectivity curves used.

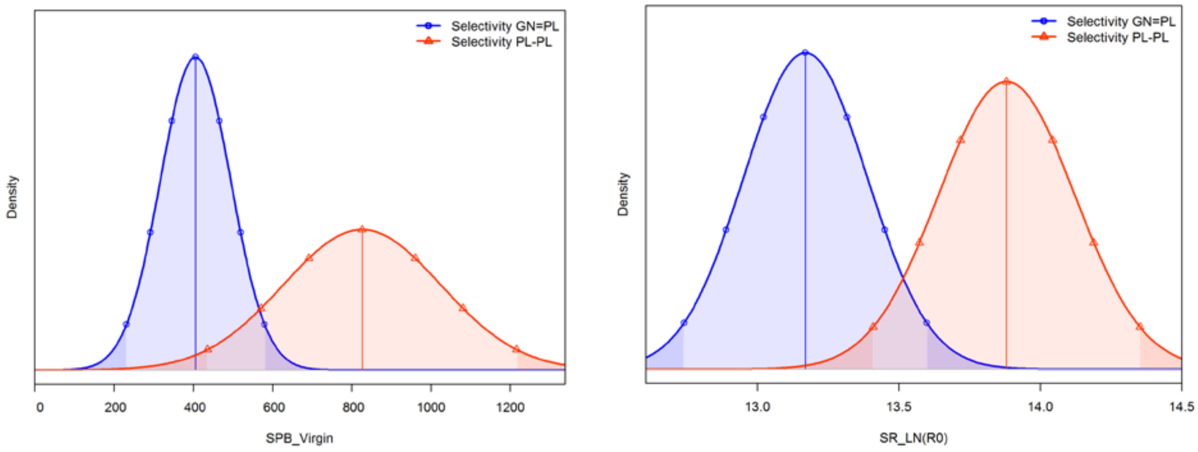


Figure 16: Effect on B0 as a function of R0 changes due to change in assumed selectivity of the PL fleet.

The new base case assessment are shown in Figures 17-22 (biomass, fits to abundance index, length-composition, selectivity, residual patterns to length compositions across fisheries, and final fishing mortalities).

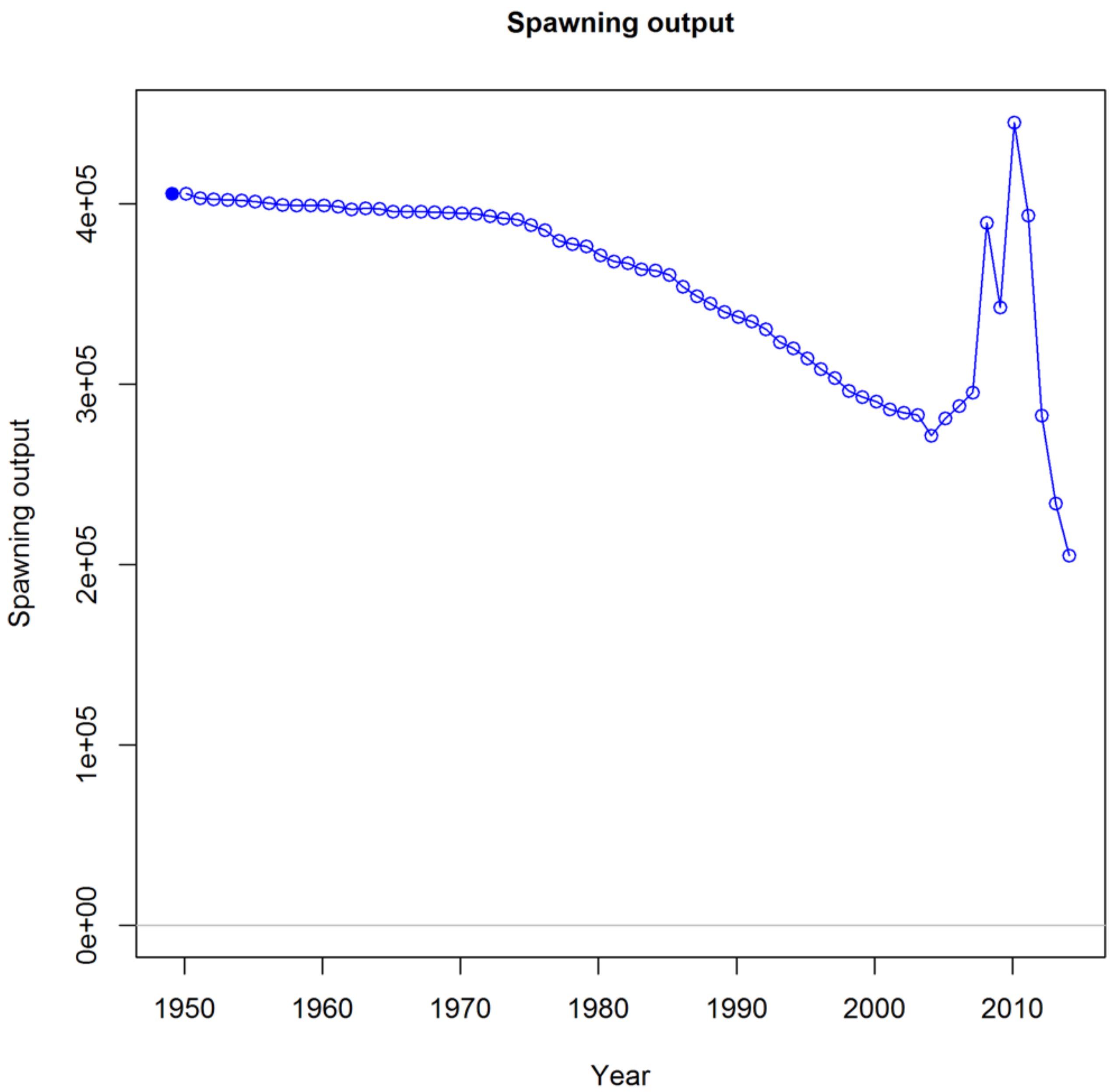


**Figure 17.** Spawning Biomass trajectories for kawakawa from the new base model-using GN selectivity to model index of abundance.

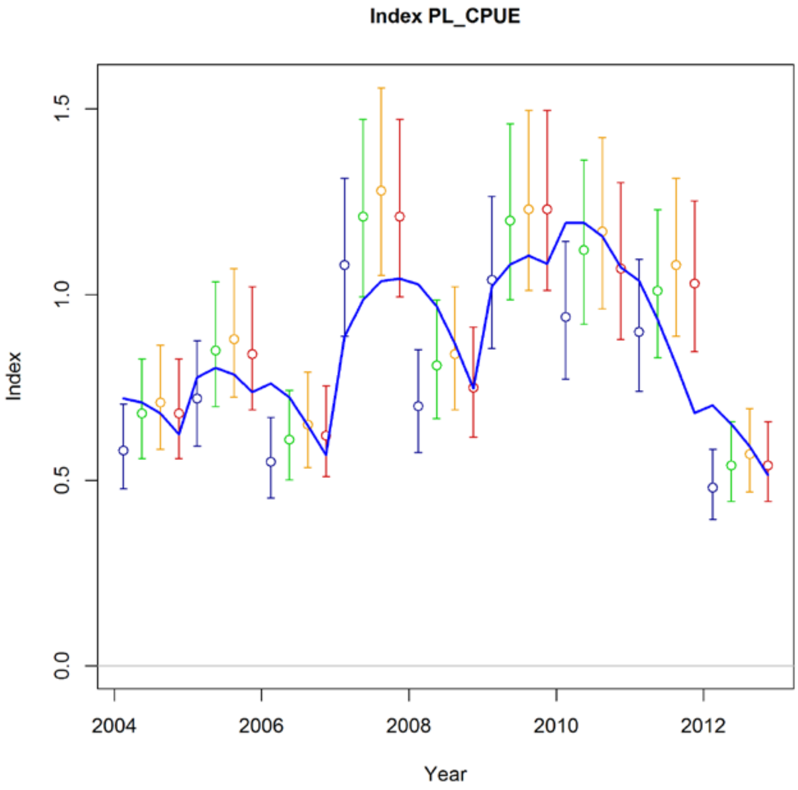


**Figure 18.** Model fits to abundance index using new base assessment

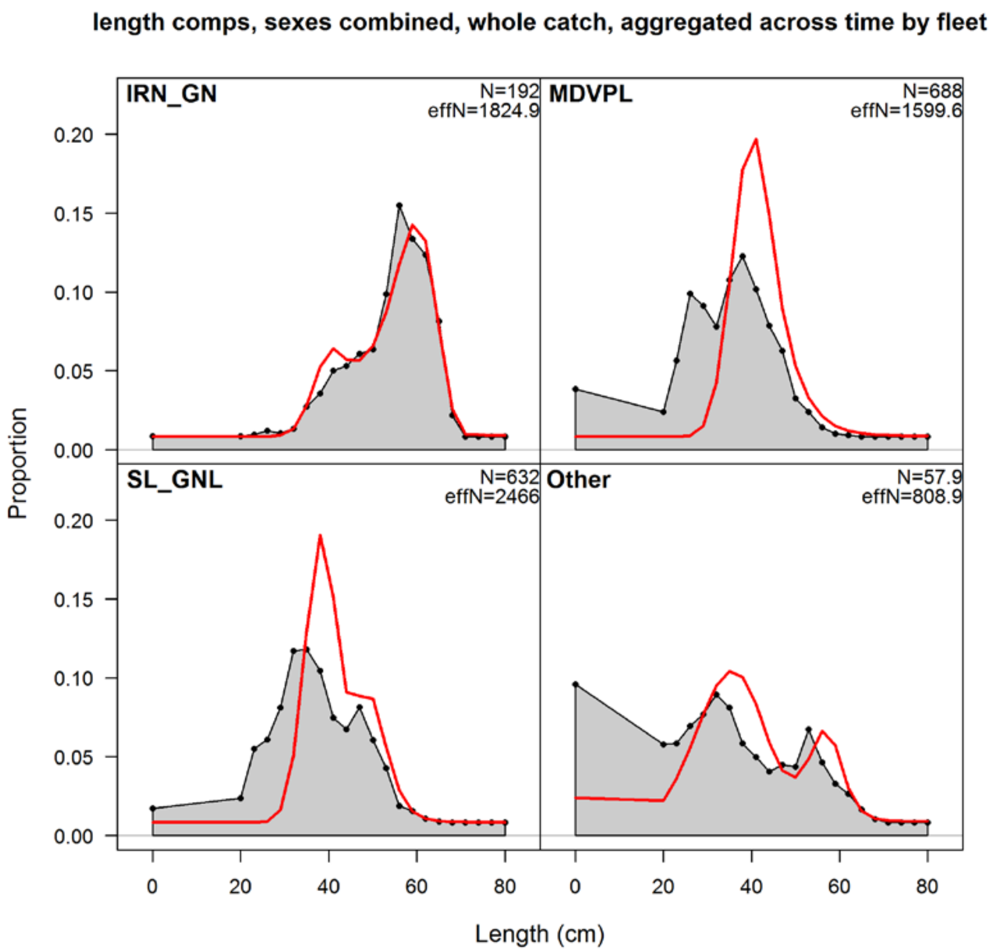


**Figure 19.** Model fits to length composition over all years available

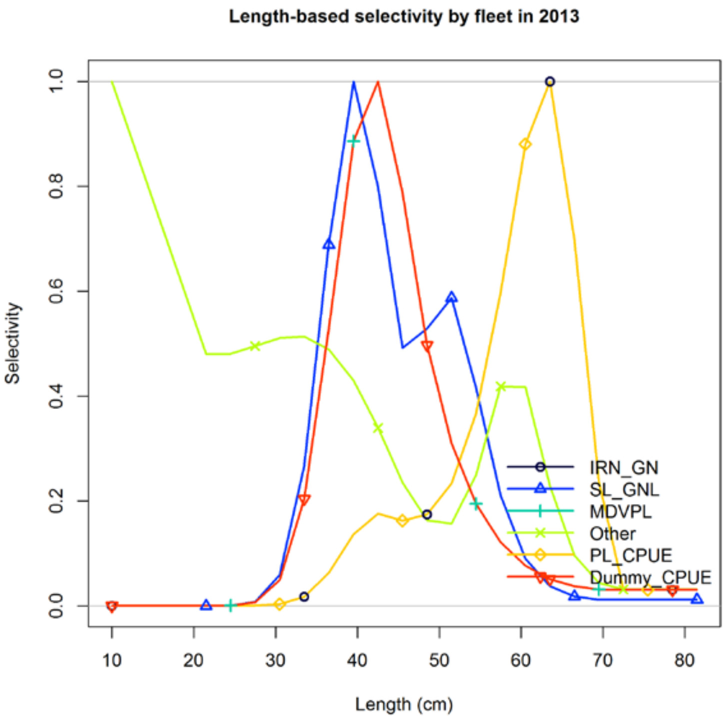


**Figure 20.** Fishery selectivity estimated

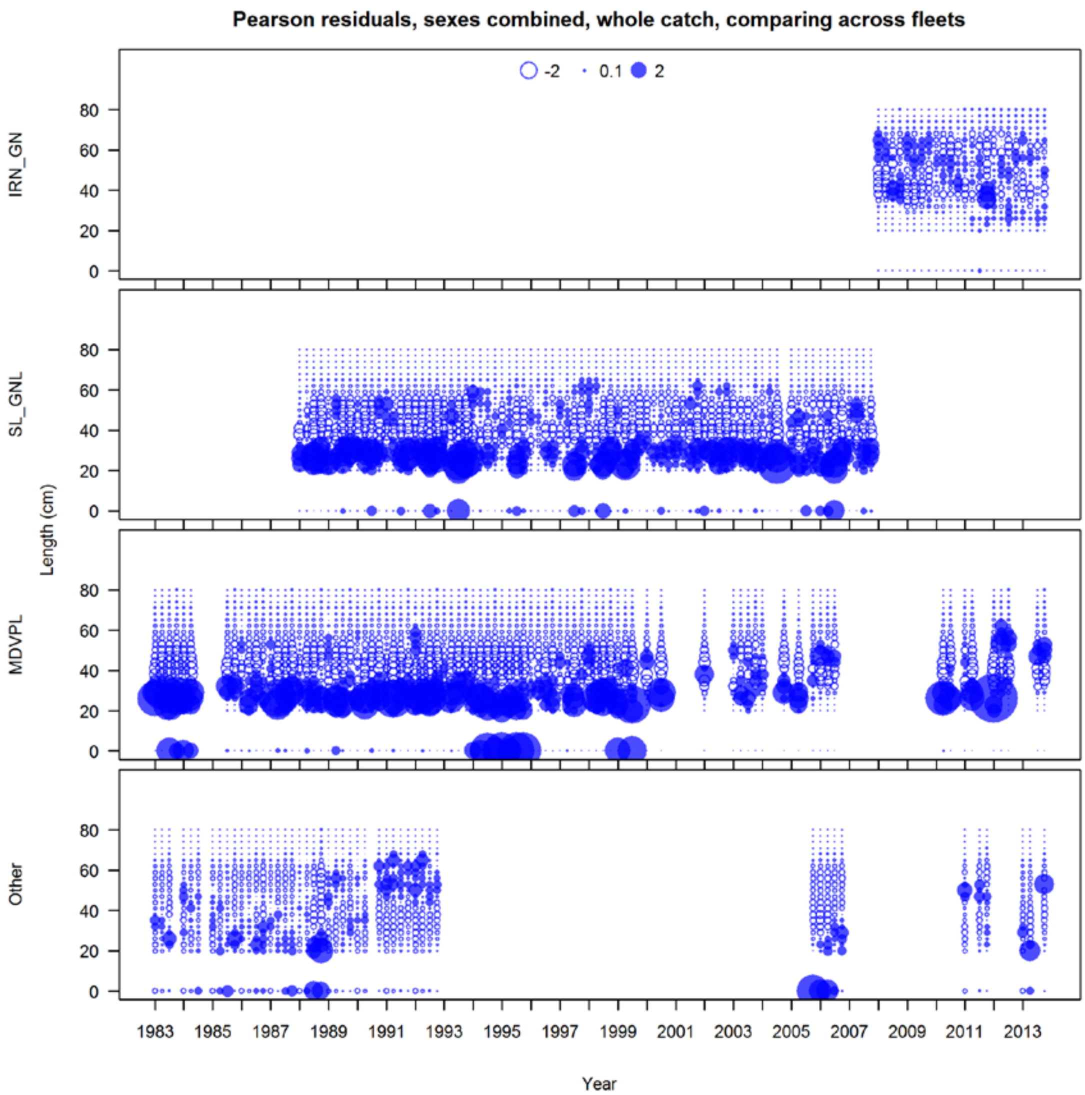


**Figure 21**. Residual patterns in model fits to length composition over time.

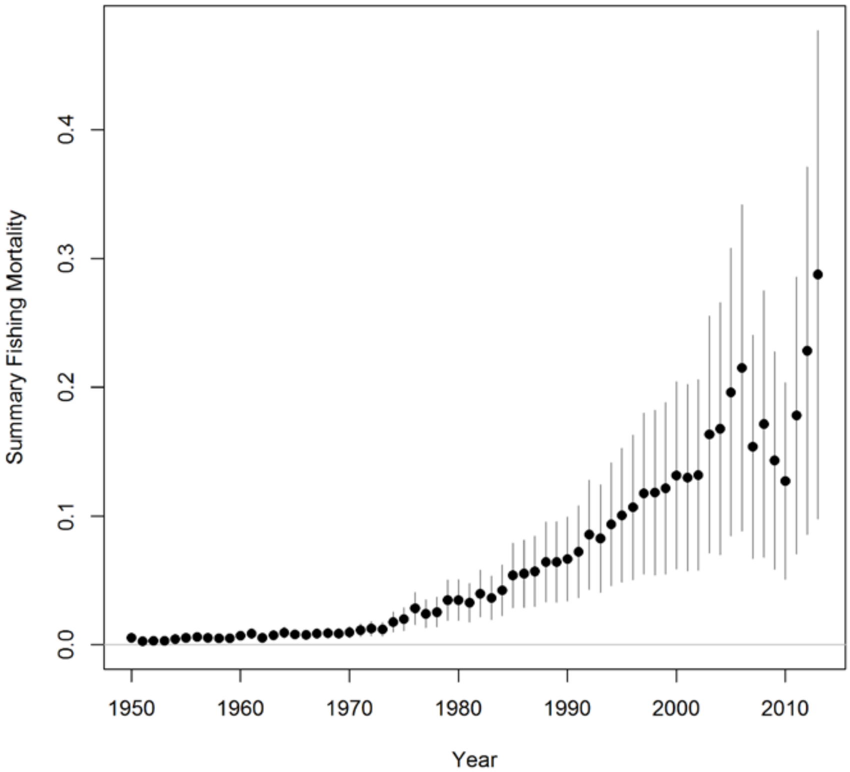


**Figure 22**. Fishing mortality levels for the base model

Key reference parameters are shown in Table 4 above. These relate to optimal yield, estimates of current SSB, and ratios of current fishing mortality to optimal levels of fishing mortality, as well as current SSB to optimal levels of SSB. Stock trajectories form abundance and fishing mortality for this base case assessment are shown below (Figure 30).

**Table 5**. Key reference points on yield and optimal spawning biomass and current levels relative to steepness

| **Management Quantity** | h=0.9 | h=0.8 | h=0.7 |
|---|---|---|---|
| LIKELIHOOD | 992.485 | 992.57 | 992.71 |
| Most recent catch estimate (2013) | 170 Kt | 170 Kt | 170 Kt |
| Mean catch over last 5 years (2009–2013) | 155 Kt | 155 Kt | 155 Kt |
| MSY (1000 t) | 186K (101K-271K)t | 169.7(107-233) | 150.8 (97.6-204.1)t |
| Current Data Period | 1950-2013 | 1950-2013 | 1950-2013 |
| $F_{2013}/F_{MSY}$ | 0.52(0.17-0.88) | 0.52 (0.17-0.87) | 0.64(0.21-1.07) |
| $B_{2013}/B_{MSY}$ | Na | Na | na |
| $SB_{2013}/SB_{MSY}$ | 2.08 (0.6-3.6) | 2.28 (0.65-3.9) | 1.99 (0.58-3.4) |
| $B_{2013}/B_0$ | Na | Na | na |
| $SB_{2013}/SB_0$ | 0.58 (0.16-0.99) | 0.57 (0.15-0.98) | 0.56 (0.16-0.96) |

**Table 6:** Key reference points on yield and optimal spawning biomass and current levels relative to natural mortality estimates

| **Management Quantity** | m=0.8 | m=0.6 | m=1 |
|---|---|---|---|
| LIKELIHOOD | 992.485 | 999.21 | 987.35 |
| Most recent catch estimate | 170 Kt | 170 Kt | 170 Kt |
| Mean catch over last 5 years | 155 Kt | 155 Kt | 155 Kt |
| MSY ( 1000t) | 186K (101K-271K)t | 159.6(98.5-220.8) | 212.4 (108.4-316.4) |

| | | | |
|---|---|---|---|
| Current Data Period | 1950-2013 | 1950-2013 | 1950-2013 |
| F(Current)/F(MSY) | 0.52(0.17-0.88) | 0.54 (0.15-0.93) | 0.52 (0.2-0.82) |
| B(Current)/B(MSY) | Na | Na | Na |
| SB(Current)/SB(MSY) | 2.08 (0.6-3.6) | 2.33 (0.54-4.07) | 1.89 (0.68-3.09) |
| B(Current)/B(0) | Na | Na | Na |
| SB(Current)/SB(0) | 0.58 (0.16-0.99) | 0.55 (0.13-0.97) | 0.60 (0.22-0.99) |

**Table 7**. Key reference points on yield and optimal spawning biomass and current levels relative to growth

| **Management Quantity** | Slow growth (base) | Fast growth |
|---|---|---|
| LIKELIHOOD | 992.485 | 1273.89 |
| Most recent catch estimate | 170 Kt | 170 Kt |
| Mean catch over last 5 years | 155 Kt | 155 Kt |
| MSY ( 1000t) | 186K (101K-271K)t | 165K(0-383.2K)t |
| Current Data Period | 1950-2013 | 1950-2013 |
| F(Current)/F(MSY) | 0.52(0.17-0.88) | 0.97 (0.44-1.48) |
| B(Current)/B(MSY) | Na | Na |
| SB(Current)/SB(MSY) | 2.08 (0.6-3.6) | 1.11(0.42-1.71) |
| B(Current)/B(0) | Na | Na |
| SB(Current)/SB(0) | 0.58 (0.16-0.99) | 0.95(0.43-1.0) |

## Effect of steepness and M on assessment

Steepness had minimal effects on trajectories, or fits though the derived yield and targets changed significantly. In general lower values of steepness gave a lower yield target, and a higher fishing mortality relative to base fishing mortality, as well as lower spawning stock sizes (Table 5, Figures 23-25). M values had a larger effect on stock trajectories, changes in R0 (and correspondingly B0) and the overall estimates of q as well.

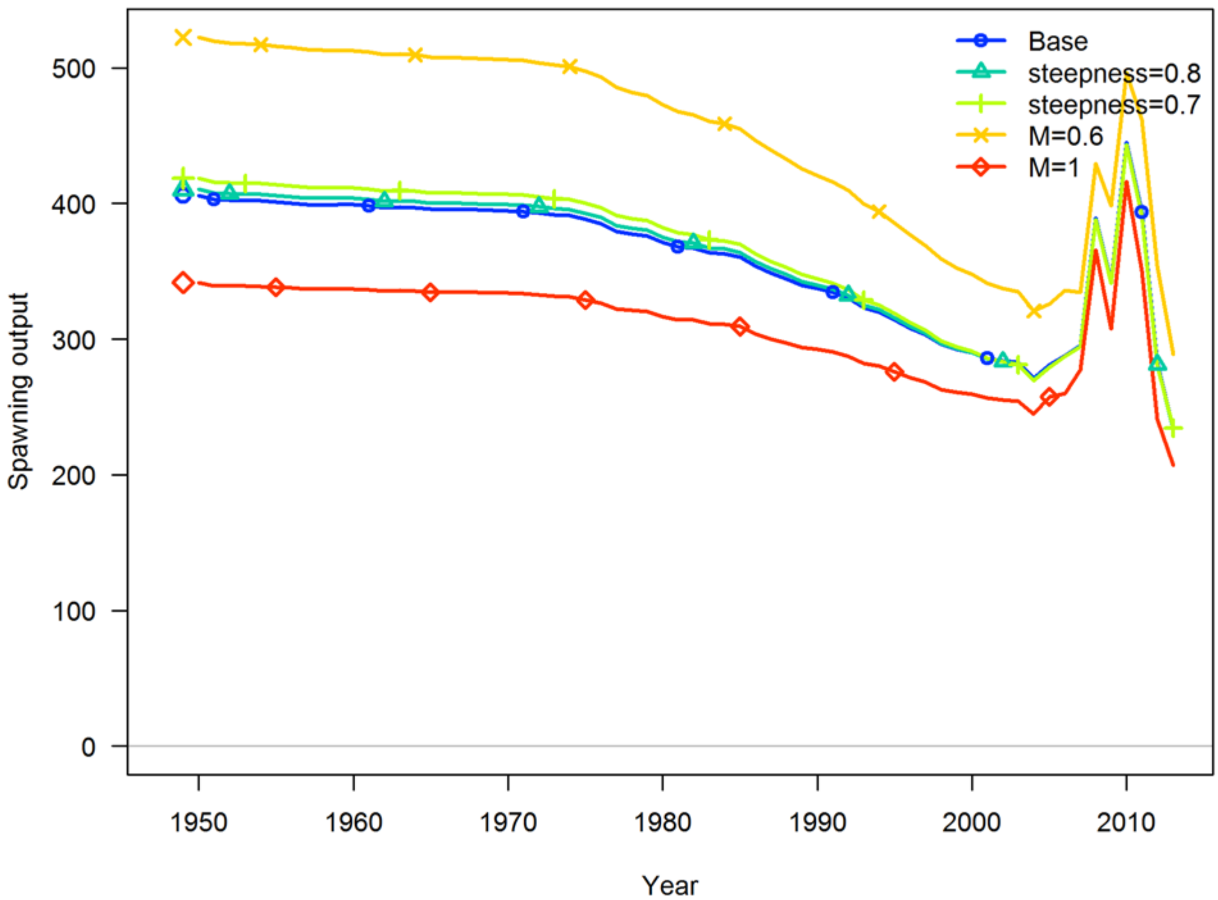

**Figure 23:** Comparisons of Spawning Biomass (only females) with different runs with steepness and M changes, but with same growth

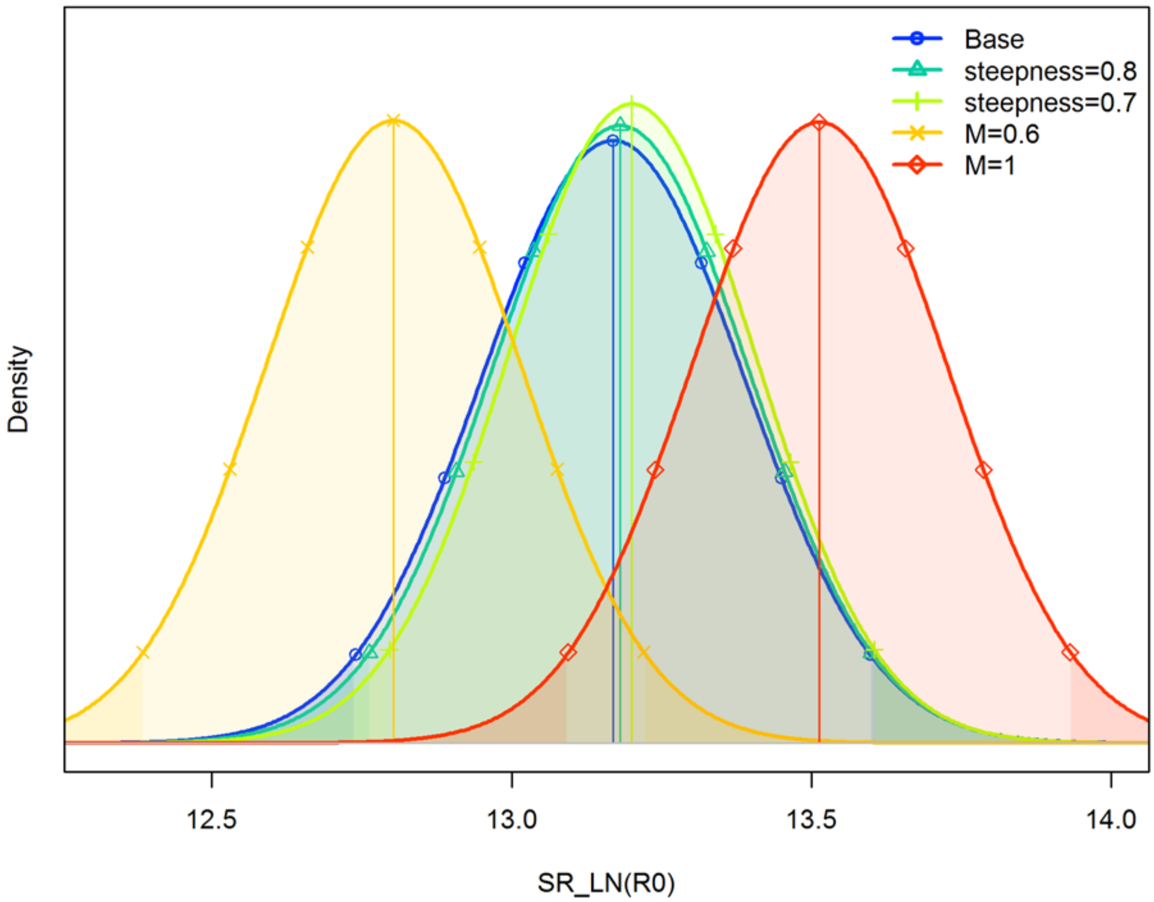


Figure 24: Comparisons of R0 with different runs with steepness and M changes, but with same growth

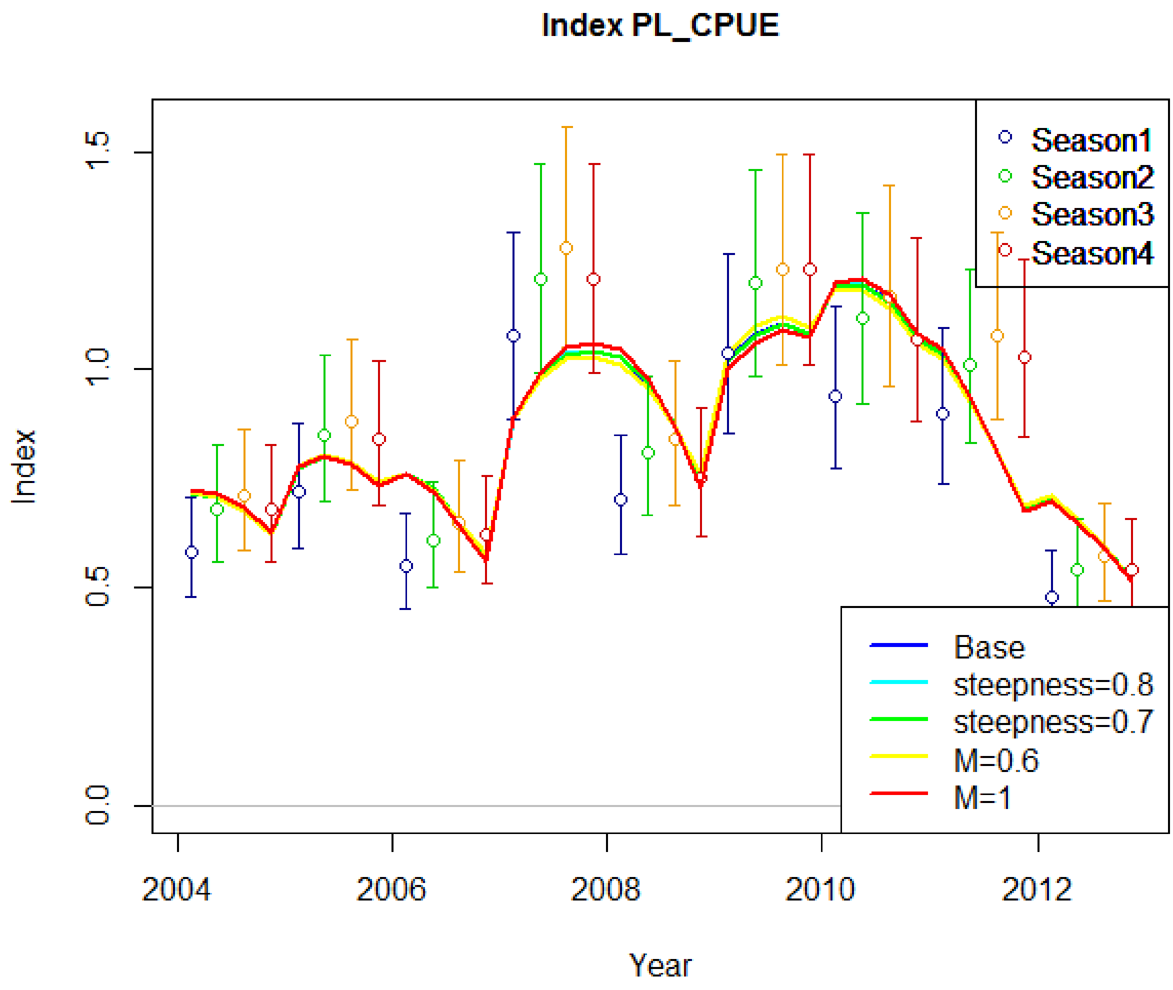


Figure 25: Comparisons of fits to CPUE indices with the different runs

## Effect of growth on assessment

Johnson and Tamatamah (2013) growth was contrasted with the Silas et. al study (1985) though length at first age was assumed to be 20 cms (Figure 26). Note, the growth models gave results that were very different for R0 and B0. Catchability was again increased by a magnitude of 4.9 from 1.919 to 9.327) similar to what we saw with the q when we modelled the PL fishery selectivity with the abundance index. However, yield targets were not that different, and lower, as fish could not reach the sizes needed to be harvested, and the fits to the length composition deteriorated. Trajectories and effects on B0 and R0 are shown in Figures 27-29.

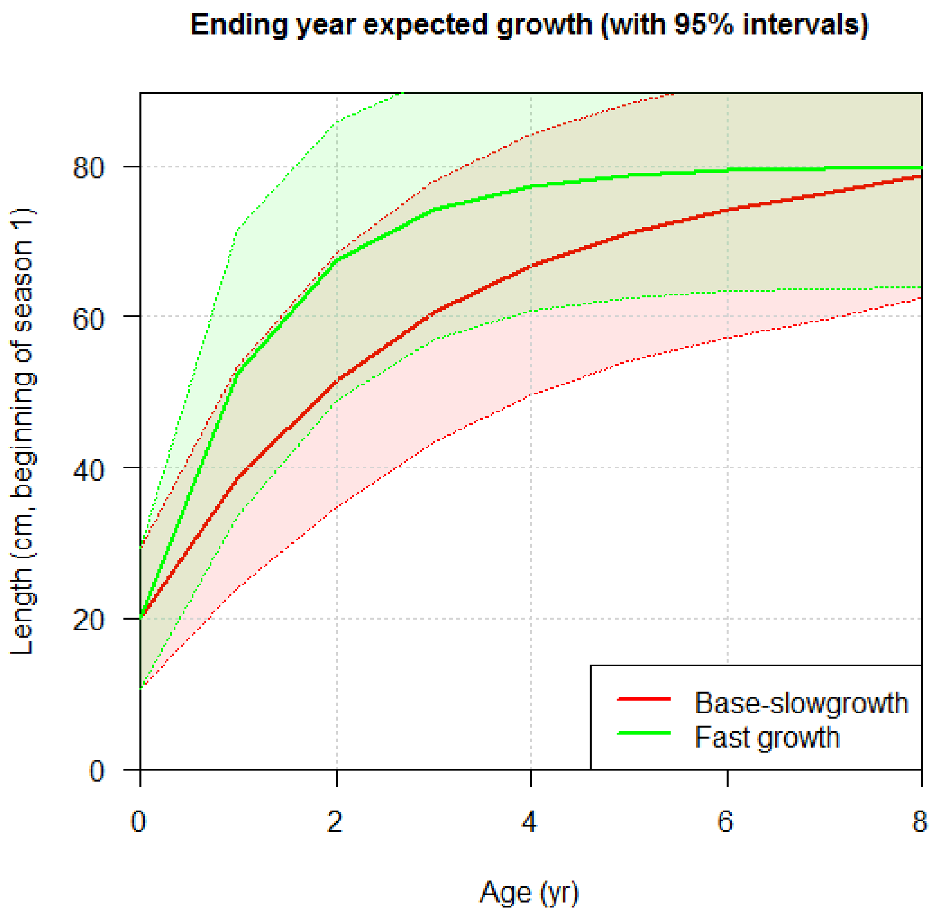


**Figure 26: Different growth curves used**

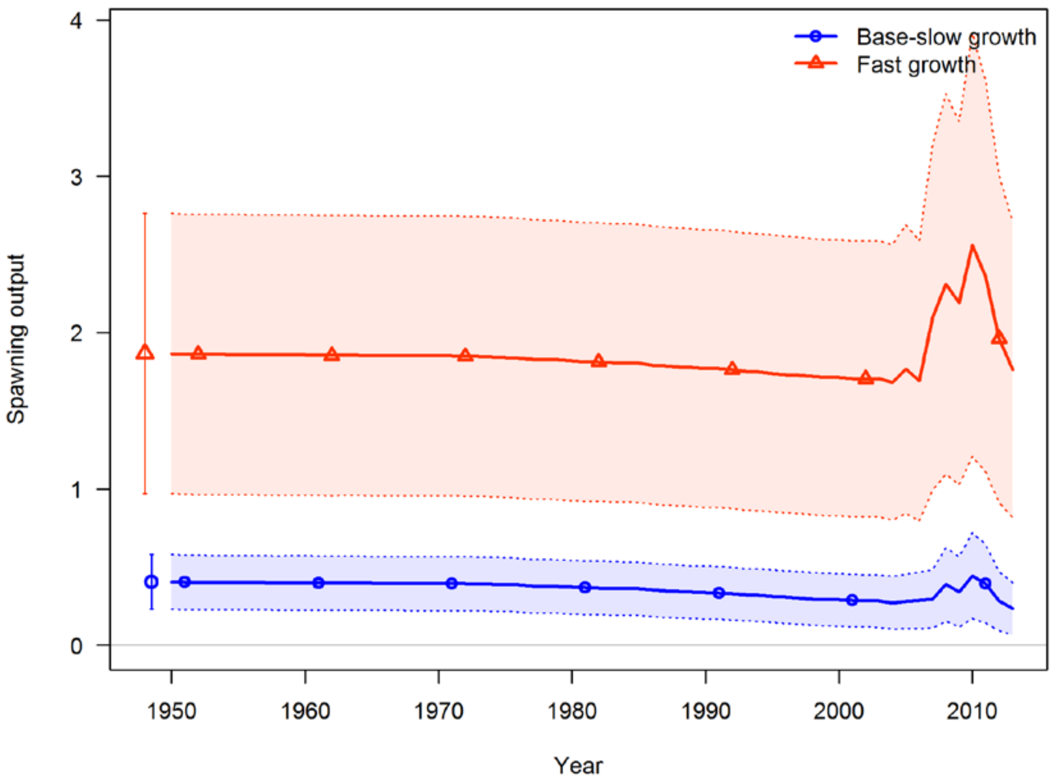


**Figure 27: Biomass estimates from different growth curves in Million tons for Spawning females only**

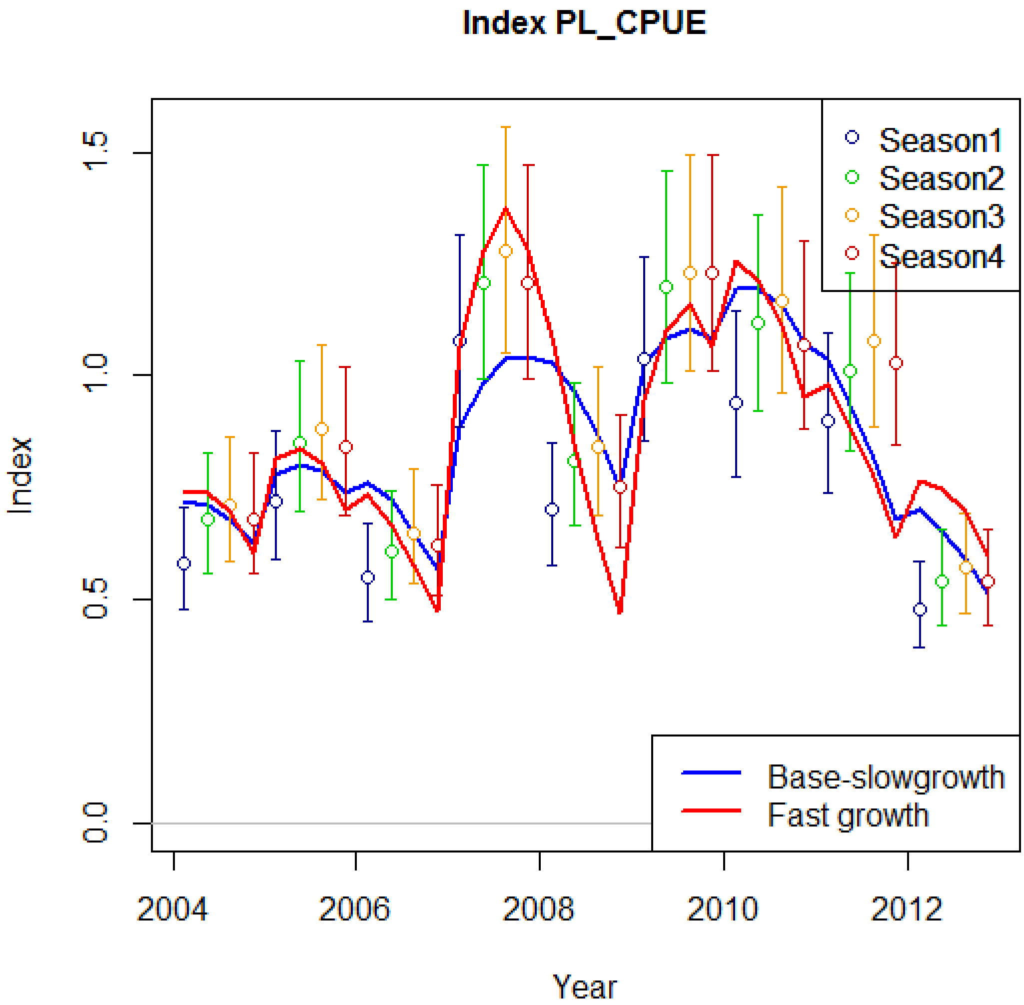


**Figure 28: Fits to indices from different growth curves**

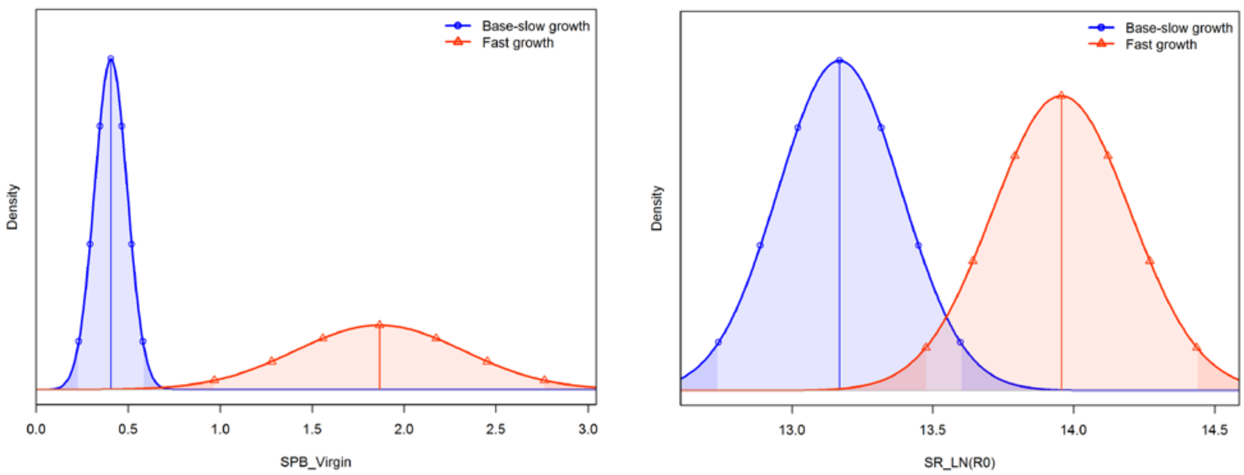


**Figure 29: Estimates of B0 & R0 changes as growth curves change**

## Overall Base Kobe Plot Trajectory

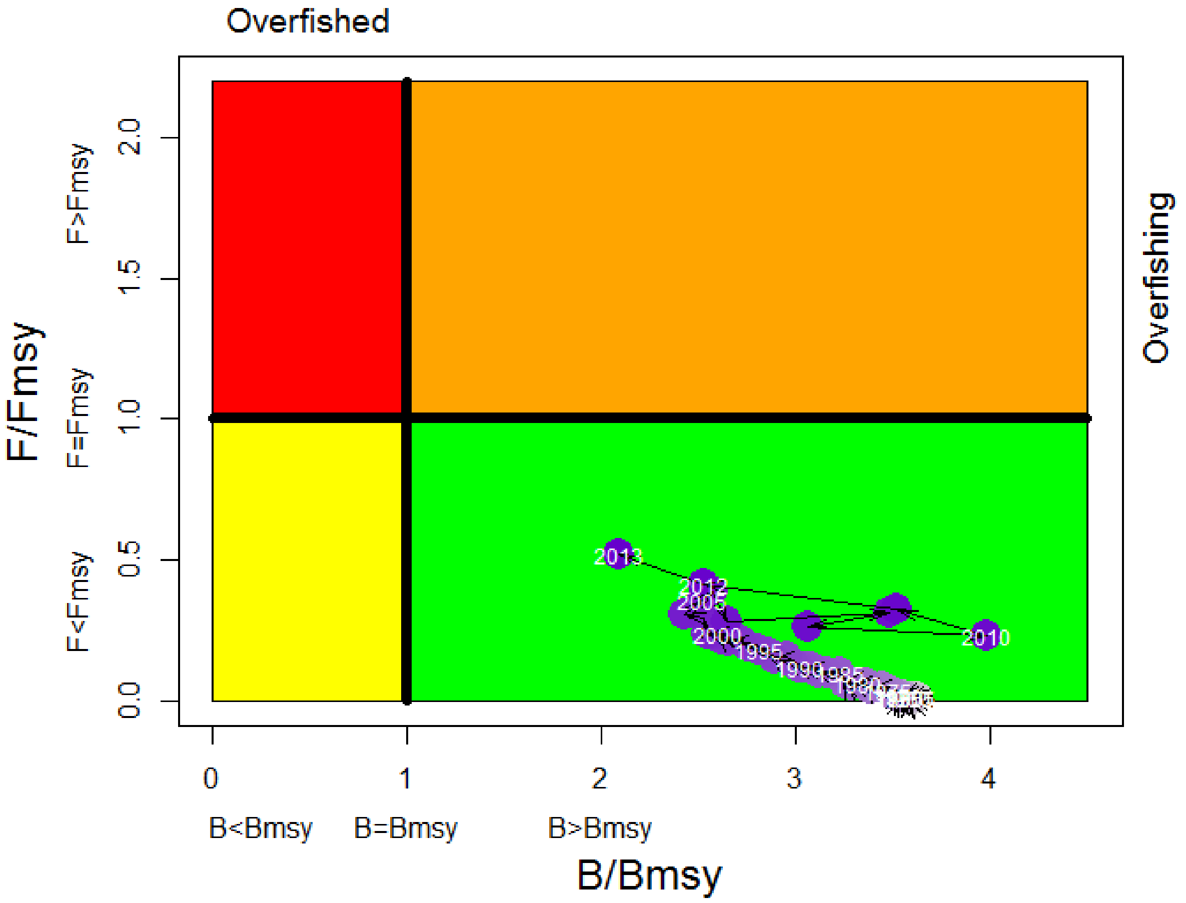


**Figure 30.** Phase plot of biomass and fishing mortality relative to optimal levels over time for the base run.

## Discussion

This is the 1st integrated assessment and will only be as good as the data that goes into the assessment. For reasons discussed in previous WPNT, the issues with the CPUE still stand. In addition, the length composition data is not uniformly collected, and if model fits to this information can be misleading as we would be following noise, rather than a true signal. As such, the authors suggest using these results with caution. That being said, these approaches are more realistic as they actually capture biological processes, and fit to the available information in statistical sense, and as such should be a useful approach to pursue in future years if issues with the data are sorted out. The model results are very sensitive to assumptions on growth, natural mortality and steepness. The authors recommend using these approaches rather than stock reduction approaches in subsequent years, with a grid based approach on key life=history parameters, and data weightings to the different components of the likelihood (Francis 2011). This may provide a range of plausible estimates of the conditions to the stock, but as evidenced in this paper the uncertainty can be large. Finally, other CPUE series like those from Sri-Lanka, Indonesia, Iran and India should be developed so the model fits to a better/multiple indices of abundance and then provides a better assessment overall.

## Acknowledgements

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# Appendix I: SS-III Control & Data file used

```
# Indian Ocean KAW asst
1 #_N_Growth_Patterns
1 #_N_Morphs_Within_GrowthPattern
# 1 #_Morph_between/within_stdev_ratio (no read if N_morphs=1)
# 1 #vector_Morphdist_(-1_in_first_val_gives_normal_approx)
# 1 #   number of recruitment designs
4 #  number of recruitment designs
0 # recruitment interaction requested
#GP seas pop
 1 1 1
 1 2 1
 1 3 1
 1 4 1
# 1 2 1
# 1 3 1
# 1 4 1
# 0 # N_movement_definitions goes here if pop > 1
# 1.0 # first age that moves (real age at begin of season, not integer)
# 1 1 1 2 4 10 # example move definition for seas=1, morph=1, source=1 dest=2, age1=4, age2=10
2 #_Nblock_Designs
5 5 # N_Blocks_per design
1960 1988 1989 1993 1994 1998 1999 2003 2004 2009
1960 1976 1977 1984 1985 1992 1993 2000 2001 2009
0.5 #_fracfemale
1 #_natM_type:_0=1Parm; 1=N_breakpoints;_2=Lorenzen;_3=agespecific;_4=agespec_withseasinterpolate
#5 #_N_breakpoints
#.75  1.25  1.75 2.25 3.75  # age(real) at M breakpoints
 5 #_N_breakpoints
 0 1 2 3 4 # age(real) at M breakpoints
# xxx MeA1 4 #_N_breakpoints
# xxx MeA1 1 2 3 4 # age(real) at M breakpoints
# xxx MeAs 5 #_N_breakpoints
# xxx MeAs 0 1 2 3 4 # age(real) at M breakpoints
# xxx MB 6 #_N_breakpoints
# xxx MB 1.99 2 2.99 3 3.99 4 # age(real) at M breakpoints
1 # GrowthModel: 1=vonBert with L1&L2; 2=Richards with L1&L2; 3=not implemented; 4=not implemented
0 #_Growth_Age_for_L1 #mid-season used for calculations
999 #_Growth_Age_for_L2 (999 to use as Linf)
0.1 #_SD_add_to_LAA (set to 0.1 for SS2 V1.x compatibility)
#Should see if alternate t0 0 is better to admit growth effects of younger ages inflating CV
0 #_CV_Growth_Pattern:  0 CV=f(LAA); 1 CV=F(A); 2 SD=F(LAA); 3 SD=F(A)
1 #_maturity_option:  1=length logistic; 2=age logistic; 3=read age-maturity matrix by growth_pattern
#_placeholder for empirical age-maturity by growth pattern
1 #_First_Mature_Age
1 #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b
0 ### Hermaphroditism season ###
3 #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
1 #_env/block/dev_adjust_method (1=standard; 2=with logistic trans to keep within base parm bounds)
#_growth_parms
#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
# WCPFC fixed
# flat M
 0.075 2 0.8 0.8 0 1 -5 0 0 0 0 0.5 0 0 # NatM_p_1_Fem_GP:1_
 -3 3 0 0  0 1 -7 0 0 0 0 0.5 0 0 # NatM_p_2_Fem_GP:1_
 -3 3 0 0 0 1 -7 0 0 0 0 0.5 0 0 # NatM_p_2_Fem_GP:1_
 -3 3 0 0 0 1 -6 0 0 0 0 0.5 0 0 # NatM_p_2_Fem_GP:1_
 -3 3 0 0 0 1 -6 0 0 0 0 0.5 0 0 # NatM_p_2_Fem_GP:1_
# flat M initial
# small-scale
# Brownie (but not BP) L83 alt fixed
# Linf=83, Brownie: a(1:4)=   0.68      0.50      0.13      0.82
  -30 30   20  20 0 100 -5 0 0 0 0 0.5 0 0 # L_at_Amin_Fem_GP_1
# xxx L83  50 100  83   83 0 100 -5 0 0 0 0 0.5 0 0 # L_at_Amax_Fem_GP_1 Used India Study
# xxx L83  -3 3  0.22 0.22 0 100 -1 0 0 0 0 0.5 0 0 # VonBert_K_Fem_GP_1
  50 100  81  81 0 100 -5 0 0 0 0 0.5 0 0 # L_at_Amax_Fem_GP_1
  -3 3  0.365 0.365 0 100 -1 0 0 0 0 0.5 0 0 # VonBert_K_Fem_GP_1
# start with CV20%, decrease to 10% at older ages
   0.01 60 0.2 0.2 0 100 -5 0 0 0 0 0.5 0 0 # CV_young_Fem_GP_1_ #try alternates to account for growth
   -3 3 -0.69 -0.69 0 100 -5 0 0 0 0 0.5 0 0  # CV_old_Fem_GP_1_ #try alternates to account for growth
 -3 3 2.54e-005 2.54e-005 0 100 -1 0 0 0 0 0.5 0 0 # Wtlen1_Fem
 2 4 2.89 2.89 0 100 -1 0 0 0 0 0.5 0 0 # Wtlen2_Fem

 1 150 38 38 0 100 -1 0 0 0 0 0.5 0 0 # Mat50_Fem
#m58 1 150 58 58 0 100 -1 0 0 0 0 0.5 0 0 # Mat50_Fem
#m38 1 150 38 38 0 100 -1 0 0 0 0 0.5 0 0 # Mat50_Fem
## xxx MeA1m58 1 150 58 58 0 100 -1 0 0 0 0 0.5 0 0 # Mat50_Fem
## xxx MeA1m38 1 150 38 38 0 100 -1 0 0 0 0 0.5 0 0 # Mat50_Fem
## xxx MeA.1m58 1 150 58 58 0 100 -1 0 0 0 0 0.5 0 0 # Mat50_Fem
## xxx MeA.1m38 1 150 38 38 0 100 -1 0 0 0 0 0.5 0 0 # Mat50_Fem
```

```
## xxx MBm58 1 150 58 58 0 100 -1 0 0 0 0 0.5 0 0 # Mat50_Fem
## xxx MBm38 1 150 38 38 0 100 -1 0 0 0 0 0.5 0 0 # Mat50_Fem
# xxx check maturity slope sensible...
 -8 1 -1.25 -1.25 0 100 -1 0 0 0 0 0.5 0 0 # Mat_slope_Fem
 0 2 1 1 0 100 -1 0 0 0 0 0.5 0 0 # Eggs1_Fem
 -1 1 0 0 0 100 -1 0 0 0 0 0.5 0 0 # Eggs2_Fem
 -4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 # RecrDist_GP_1_
 -4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 # RecrDist_Area_1_
 -4 4 0 0 -1 99 -3 0 0 0 0 0.5 0 0 # RecrDist_Seas_1_
 -4 4 0 0 0 0.1 5 0 1 1983 2008 0.3 0 0 # RecrDist_Seas_2_
 -4 4 0 0 0 0.1 5 0 1 1983 2008 0.3 0 0 # RecrDist_Seas_3_
 -4 4 0 0 0 0.1 5 0 1 1983 2008 0.3 0 0 # RecrDist_Seas_4_
 1 1 1 1 -1 99 -3 0 0 0 0 0.5 0 0 # CohortGrowDev
# 0  #custom_MG-env_setup (0/1)
# -2 2 0 0 -1 99 -2 #_placeholder for no MG-environ parameters
# 0  #custom_MG-block_setup (0/1)
# -2 2 0 0 -1 99 -2 #_placeholder for no MG-block parameters
#_seasonal_effects_on_biology_parms
 0 0 0 0 0 0 0 0 0 0 #_femwtlen1,femwtlen2,mat1,mat2,fec1,fec2,Malewtlen1,malewtlen2,L1,K
# -2 2 0 0 -1 99 -2 #_placeholder for no seasonal MG parameters
# -2 2 0 0 -1 99 -2 #_placeholder for no MG dev parameters
5 # placeholder for #_MGparm_Dev_Phase
#_Spawner-Recruitment
6 #_SR_function: 1=null; 2=Ricker; 3=std_B-H; 4=SCAA; 5=Hockey; 6=B-H_flattop; 7=Survival_3Parm
#_LO HI INIT PRIOR PR_type SD PHASE
 0 15 6 6 1 10 1 # SR_R0 ##
 0.201 0.99 0.9 0.9 0 10 -2 # SR_steepness
  0 2 0.6 0.6 0 10 -6 # SR_sigmaR
 -5 5 0 0 0 1 -3 # SR_envlink
 -5 5 0 0 0 1 -4 # SR_R1_offset ## changed from -4 (fixed) to 1 (estimated) ##
 0 0.5 0 0 -1 99 -2 # SR_autocorr
0 #_SR_env_link
0 #_SR_env_target_0=none;1=devs;_2=R0;_3=steepness
# xxx r0   0 #do_recdev:  0=none; 1=devvector; 2=simple deviations
  1 #do_recdev:  0=none; 1=devvector; 2=simple deviations
2004 # change_rec first year of main recr_devs; early devs can preceed this era
2010 # last year of main recr_devs; forecast devs start in following year
4 #_recdev phase
1 #0 # (0/1) to read 11 advanced options
0 #_recdev_early_start (0=none; neg value makes relative to recdev_start)
-4 #_recdev_early_phase
-10 #_forecast_recruitment phase (incl. late recr) (0 value resets to maxphase+1)
1 #_lambda for prior_fore_recr occurring before endyr+1
960 #_last_early_yr_nobias_adj_in_MPD
1983 #_first_yr_fullbias_adj_in_MPD
2008 #_last_yr_fullbias_adj_in_MPD
2009 #_first_recent_yr_nobias_adj_in_MPD
1 #_max_bias_adj_in_MPD
0 # period of cycle in recruitment
-15 #min rec_dev
15 #max rec_dev
0 #_read_recdevs
#_end of advanced SR options
#Fishing Mortality info
0.15 # F ballpark for tuning early phases
2000 # F ballpark year(neg value to disable)
3 # F_Method:  1=Pope; 2=instan. F; 3=hybrid (hybrid is recommended)
7 # max F or harvest rate, depends on F_Method ## We can changed from 0.99 to 4 if F_method is hyblid(3) ##
# no additional F input needed for Fmethod 1
# read overall start F value; overall phase; N detailed inputs to read for Fmethod 2
5 # read N iterations for tuning for Fmethod 3 (recommend 3 to 7)
# Fleet Year Seas F_value se phase (for detailed setup of F_Method=2)
#_initial_F_parms
#_LO HI INIT PRIOR PR_type SD PHASE ## changed the following maximum values from 0.9 to 3.99 ##
 0 3.99 0.0 0.0   0 100  -1 # InitF_1_LL (longline)
 0 3.99 0.0 0.0   0 100  -1 # InitF_2_PSFS
 0 3.99 0.0 0.0   0 100  -1 # InitF_3_PSLS
 0 3.99 0.0 0.0   0 100  -1 # InitF_4_Other

#_Q_setup
 # A=do power, B=env-var, C=extra SD, D=devtype(<0=mirror, 0/1=none, 2=cons, 3=rand, 4=randwalk);
E=0=num/1=bio, F=err_type
 #_A  B  C  D  E  F ## change the following values of error-type from 0 to 30 for the future ##
 0 0 0 0
 0 0 0 0
 0 0 0 0
 0 0 0 0
 0 0 0 0
 0 0 0 0
 # 0 #_0=read one parm for each fleet with random q; 1=read a parm for each year of index
#_Q_parms(if_any)
# # Double normal size selectivity option
# # Start Size Sel Block
```

```
# #_size_selex_types
# #_Pattern Discard Male Special
# 24 0 0 0 # 1
# 24 0 0 0 # 2
# 24 0 0 0 # 3
# 24 0 0 0 # 4
# 5  0 0 1 # 1
#_size_selex_types
#_Pattern Discard Male Special
# piecewise size selex
# 6 0 0 9 # 1
# 6 0 0 7 # 2
# 6 0 0 7 # 3
# 6 0 0 7 # 4
# 5 0 0 1 # 5
# cubic spline size selex
 27 0 0 7 # 1
 27 0 0 5 # 2
 27 0 0 5 # 3
 27 0 0 5 # 4
 5 0 0 1 # CPUE mirror 1
 5 0 0 3 # CPUE mirror 3
#_age_selex_types = none
10 0 0 0 # f1
10 0 0 0 # f2
10 0 0 0 # f3
10 0 0 0 # f4
10 0 0 0 # cpue1
10 0 0 0 # cpue FSLS
#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
## 1. LL (longline)
#
# fishery 1 #max age 15
# LO HI INIT PRIOR PR_type SD PHASE
#len bounds
#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
 0 0 0 0 -1 0 -99 0 0 0 0 0.5 0 0 # SizeSpline_Code_PL_1
 -0.001 1 0.247221 0 1 0.001 3 0 0 0 0 0.5 0 0 # SizeSpline_GradLo_PL_1
 -1 0.001 -0.658209 0 1 0.001 3 0 0 0 0 0.5 0 0 # SizeSpline_GradHi_PL_1
 1 1 22.6447 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_1_PL_1
 1 1 37.5977 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_2_PL_1
 1 1 42.0377 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_3_PL_1
 1 1 45.702 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_4_PL_1
 1 1 51.7386 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_5_PL_1
 1 1 59.9904 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_6_PL_1
 1 1 71.3145 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_7_PL_1
 -9 7 -4.42509 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_1_PL_1
 -9 7 -2.2233 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_2_PL_1
 -9 7 -1.56912 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_3_PL_1
 -9 7 -1 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_4_PL_1
 -9 7 -1.26099 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_5_PL_1
 -9 7 -0.55179 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_6_PL_1
 -9 7 -0.579285 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_7_PL_1
 0 0 0 0 -1 0 -99 0 0 0 0 0.5 0 0 # SizeSpline_Code_PSLS_2
 -0.001 1 0.622317 0 1 0.001 3 0 0 0 0 0.5 0 0 # SizeSpline_GradLo_PSLS_2
 -1 0.001 -0.110388 0 1 0.001 3 0 0 0 0 0.5 0 0 # SizeSpline_GradHi_PSLS_2
 1 1 23.125 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_1_PSLS_2
 1 1 41.9035 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_2_PSLS_2
 1 1 45.6322 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_3_PSLS_2
 1 1 50.2975 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_4_PSLS_2
 1 1 70.9228 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_5_PSLS_2
 -9 7 -8.9974 0 1 0.001 -2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_1_PSLS_2
 -9 7 -2.05844 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_2_PSLS_2
 -9 7 -1 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_3_PSLS_2
 -9 7 -0.954789 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_4_PSLS_2
 -9 7 -2.24451 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_5_PSLS_2
 0 0 0 0 -1 0 -99 0 0 0 0 0.5 0 0 # SizeSpline_Code_PSFS_3
 -0.001 1 0.0149309 0 1 0.001 3 0 0 0 0 0.5 0 0 # SizeSpline_GradLo_PSFS_3
 -1 0.001 -0.245826 0 1 0.001 3 0 0 0 0 0.5 0 0 # SizeSpline_GradHi_PSFS_3
 1 1 23.1313 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_1_PSFS_3
 1 1 44.1442 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_2_PSFS_3
 1 1 48.4634 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_3_PSFS_3
 1 1 54.7779 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_4_PSFS_3
 1 1 71.2972 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_5_PSFS_3
 -9 7 -8.99994 0 1 0.001 -2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_1_PSFS_3
 -9 7 -2.04755 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_2_PSFS_3
 -9 7 -1 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_3_PSFS_3
 -9 7 -1.02858 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_4_PSFS_3
 -9 7 -1.20735 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_5_PSFS_3
 0 0 0 0 -1 0 -99 0 0 0 0 0.5 0 0 # SizeSpline_Code_Other_4
 -0.001 1 0.0655165 0 1 0.001 3 0 0 0 0 0.5 0 0 # SizeSpline_GradLo_Other_4
 -1 0.001 -0.202624 0 1 0.001 3 0 0 0 0 0.5 0 0 # SizeSpline_GradHi_Other_4
 1 1 22.5552 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_1_Other_4
```

```
 1 1 44.2844 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_2_Other_4
 1 1 51.4468 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_3_Other_4
 1 1 58.8149 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_4_Other_4
 1 1 72.4351 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Knot_5_Other_4
 -9 7 -4.41096 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_1_Other_4
 -9 7 -1.92167 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_2_Other_4
 -9 7 -1 0 -1 0 -99 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_3_Other_4
 -9 7 -0.364211 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_4_Other_4
 -9 7 0.286711 0 1 0.001 2 0 1 2004 2008 0.05 0 0 # SizeSpline_Val_5_Other_4
 1 1 1 1 1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_5P_1_PL_CPUE
 22 22 22 22 1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_5P_2_PL_CPUE
 3 3 3 3 3 99 -3 0 0 0 0 0.5 0 0 # SizeSel_5P_1_PSFS_CPUE
 22 22 22 22 1 99 -3 0 0 0 0 0.5 0 0 # SizeSel_5P_2_PSFS_CPUE
# xxx sa 4 # selparm_Dev_Phase
# xxx sa 1 # selparm_adjust_method 1=direct, 2=logistic transform
 -4 # selparm_Dev_Phase
 1 # selparm_adjust_method 1=direct, 2=logistic transform
0 # TG_custom:  0=no read; 1=read
#tag loss parameter - for each tag grp
# -10 10 9 9 1 0.001 -4 0 0 0 0 0 0 0 # TG_loss_init_1_
# chronic tag loss - for each tag group
# -10 10 9 9 1 0.001 -4 0 0 0 0 0 0 0 # TG_loss_chronic_1_
# Overdispersion  for the negative binomial for each tag group
# 1 10 200 200 1 0.001 -4 0 0 0 0 0 0 0 # TG_overdispersion_1_
#tag loss parameter - for each tag grp
# -10 10 9 9 1 0.001 -4 0 0 0 0 0 0 0 # TG_loss_init_1_
#set to negligible value
# Initial tag reporting rate for each fleet, tansformation = rep rate = exp(p)/(1+exp(p)) (apparently if so
upper bound 0 = 100%, -1 = about 50%)
# check transformation; if correct, suggests that if RR=100% p= -0.6935
# This suggests that BET assessment (p=0) was probably wrong!
# But should have failed with INF error; what is going on here?  must be 1/(1+exp(-p))...
# this would still mean BET 2010 was wrong
#PS recoveries already inflated by RR (PSLS and PSFS), estimate PL, force zero for others
#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
# LO HI INIT PRIOR PR_type SD PHASE
# Exponential decay rate in reporting rate for each fleet (default=0, negative value to get decay)
1 #_Variance_adjustments_to_input_values
#_1 2 3
  0 0 0 0 0 0 #_add_to_survey_CV
  0 0 0 0 0 0 #_add_to_discard_CV
  0 0 0 0 0 0 #_add_to_bodywt_CV
# xxx CL1   1.0 1.0 1.0 1.0 1 1 #_mult_by_lencomp_N
# xxx CL5   0.5 0.5 0.5 0.5 1 1 #_mult_by_lencomp_N
# xxx CL2   0.2 0.2 0.2 0.2 1 1 #_mult_by_lencomp_N
   0.04 0.04 0.04 0.04 1 1 #_mult_by_lencomp_N
  1 1 1 1 1 1 #_mult_by_agecomp_N
  1 1 1 1 1 1 #_mult_by_size-at-age_N
# 30 #_DF_for_discard_like
# 30 #_DF_for_meanbodywt_like
4 #_maxlambdaphase
1 #_sd_offset
6 # number of changes to make to default Lambdas (default value is 1.0)
# Like_comp codes:  1=survey; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch;
# 9=init_equ_catch; 10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp; 15=Tag-comp; 16=Tag-
negbin
#like_comp fleet/survey  phase  value  sizefreq_method
#CPUE
#keep or drop PSFS coupled with PL series
 1 5 1 1  1
 1 6 1 0  1 #Change_PS
# xxx U1 1 6 1 1.  1
#size
  4 1 1 1 1
  4 2 1 1 1
  4 3 1 1 1
  4 4 1 1 1
# tags...not clear on assignment definitions
# 15 tag-comp does not seem to do anything?
#
# lambdas (for info only; columns are phases)
#  0 #_CPUE/survey:_1
#  0 #_CPUE/survey:_2
#  1 #_CPUE/survey:_3
#  1 #_lencomp:_1
#  1 #_lencomp:_2
#  0 #_lencomp:_3
#  1 #_init_equ_catch
#  1 #_recruitments
#  1 #_parameter-priors
#  0 #_parameter-dev-vectors
#  100 #_crashPenLambda
0 # (0/1) read specs for extra stddev reporting
```

```
 # 0 1 -1 5 1 5 1 -1 5 # placeholder for selex type, len/age, year, N selex bins, Growth pattern, N growth ages, NatAge_area(-1 for all), NatAge_yr, N Natages
 # -1 1 1 1 1 # placeholder for vector of selex bins to be reported
 # -1 1 1 1 1 # placeholder for vector of growth ages to be reported
 # -1 1 1 1 1 # placeholder for vector of NatAges ages to be reported
999
```

## DATA FILE USED

```
# KAW DATA FILE
1950 # Start Year
2013 # End Year
4    # Number Seasons/Year
3  3  3  3  # Months per Season
1    # Spawning Season
4    # Number of Fleets
2    # Number of Surveys
1    # Number of Areas
# Fleet & Survey Names
IRN_GN%SL_GNL%MDVPL%Other%PL_CPUE%Dummy_CPUE
# Fleet & Survey CPUE
0.5
0.5
0.5
0.5
0.1
0.5
1  1  1 1 1 1 # Area Assignment
1  1  1 1  # Catch Units
0.01  0.01 0.01  0.01  # Catch Log(SE)
1 # Number of Sexes
8 # Last Age in Plus Group
0 0 0 0 #  11220  0  # Initial Equilibrium Catch (per-Year)
256 # Number of Catch Observations
16      0       0       1288    1950    1
16      0       0       1288    1950    2
16      0       0       1288    1950    3
16      0       0       1288    1950    4
16      0       0       663     1951    1
16      0       0       663     1951    2
16      0       0       663     1951    3
16      0       0       663     1951    4
16      0       0       701     1952    1
16      0       0       701     1952    2
16      0       0       701     1952    3
16      0       0       701     1952    4
16      0       0       720     1953    1
16      0       0       720     1953    2
16      0       0       720     1953    3
16      0       0       720     1953    4
16      0       0       1038    1954    1
16      0       0       1038    1954    2
16      0       0       1038    1954    3
16      0       0       1038    1954    4
16      0       0       1264    1955    1
16      0       0       1264    1955    2
16      0       0       1264    1955    3
16      0       0       1264    1955    4
15      0       0       1365    1956    1
15      0       0       1365    1956    2
15      0       0       1365    1956    3
15      0       0       1365    1956    4
15      0       0       1247    1957    1
15      0       0       1247    1957    2
15      0       0       1247    1957    3
15      0       0       1247    1957    4
15      0       0       1158    1958    1
15      0       0       1158    1958    2
15      0       0       1158    1958    3
15      0       0       1158    1958    4
15      0       0       1201    1959    1
15      0       0       1201    1959    2
15      0       0       1201    1959    3
15      0       0       1201    1959    4
15      0       0       1596    1960    1
15      0       0       1596    1960    2
15      0       0       1596    1960    3
15      0       0       1596    1960    4
15      0       0       1992    1961    1
15      0       0       1992    1961    2
15      0       0       1992    1961    3
```

| | | | | | |
|---|---|---|---|---|---|
| 15 | 0 | 0 | 1992 | 1961 | 4 |
| 15 | 0 | 0 | 1236 | 1962 | 1 |
| 15 | 0 | 0 | 1236 | 1962 | 2 |
| 15 | 0 | 0 | 1236 | 1962 | 3 |
| 15 | 0 | 0 | 1236 | 1962 | 4 |
| 15 | 0 | 0 | 1721 | 1963 | 1 |
| 15 | 0 | 0 | 1721 | 1963 | 2 |
| 15 | 0 | 0 | 1721 | 1963 | 3 |
| 15 | 0 | 0 | 1721 | 1963 | 4 |
| 13 | 0 | 0 | 2206 | 1964 | 1 |
| 13 | 0 | 0 | 2206 | 1964 | 2 |
| 13 | 0 | 0 | 2206 | 1964 | 3 |
| 13 | 0 | 0 | 2206 | 1964 | 4 |
| 14 | 0 | 0 | 1872 | 1965 | 1 |
| 14 | 0 | 0 | 1872 | 1965 | 2 |
| 14 | 0 | 0 | 1872 | 1965 | 3 |
| 14 | 0 | 0 | 1872 | 1965 | 4 |
| 14 | 0 | 0 | 1777 | 1966 | 1 |
| 14 | 0 | 0 | 1777 | 1966 | 2 |
| 14 | 0 | 0 | 1777 | 1966 | 3 |
| 14 | 0 | 0 | 1777 | 1966 | 4 |
| 15 | 0 | 37 | 1952 | 1967 | 1 |
| 15 | 0 | 34 | 1952 | 1967 | 2 |
| 15 | 0 | 60 | 1952 | 1967 | 3 |
| 15 | 0 | 57 | 1952 | 1967 | 4 |
| 18 | 0 | 37 | 2042 | 1968 | 1 |
| 18 | 0 | 34 | 2042 | 1968 | 2 |
| 18 | 0 | 60 | 2042 | 1968 | 3 |
| 18 | 0 | 57 | 2042 | 1968 | 4 |
| 16 | 0 | 44 | 1964 | 1969 | 1 |
| 16 | 0 | 41 | 1964 | 1969 | 2 |
| 16 | 0 | 72 | 1964 | 1969 | 3 |
| 16 | 0 | 68 | 1964 | 1969 | 4 |
| 28 | 0 | 52 | 2148 | 1970 | 1 |
| 28 | 0 | 58 | 2148 | 1970 | 2 |
| 28 | 0 | 79 | 2148 | 1970 | 3 |
| 28 | 0 | 76 | 2148 | 1970 | 4 |
| 6 | 0 | 41 | 2554 | 1971 | 1 |
| 38 | 0 | 13 | 2554 | 1971 | 2 |
| 14 | 0 | 66 | 2554 | 1971 | 3 |
| 21 | 0 | 122 | 2554 | 1971 | 4 |
| 9 | 0 | 89 | 2798 | 1972 | 1 |
| 51 | 0 | 70 | 2798 | 1972 | 2 |
| 19 | 0 | 57 | 2798 | 1972 | 3 |
| 29 | 0 | 61 | 2798 | 1972 | 4 |
| 14 | 0 | 38 | 2588 | 1973 | 1 |
| 84 | 0 | 63 | 2588 | 1973 | 2 |
| 32 | 0 | 310 | 2588 | 1973 | 3 |
| 47 | 0 | 220 | 2588 | 1973 | 4 |
| 13 | 0 | 123 | 3906 | 1974 | 1 |
| 80 | 0 | 113 | 3906 | 1974 | 2 |
| 30 | 0 | 99 | 3906 | 1974 | 3 |
| 44 | 0 | 100 | 3906 | 1974 | 4 |
| 15 | 0 | 53 | 4453 | 1975 | 1 |
| 87 | 0 | 47 | 4453 | 1975 | 2 |
| 33 | 0 | 33 | 4453 | 1975 | 3 |
| 48 | 0 | 28 | 4453 | 1975 | 4 |
| 24 | 0 | 38 | 6266 | 1976 | 1 |
| 146 | 0 | 119 | 6266 | 1976 | 2 |
| 55 | 0 | 35 | 6266 | 1976 | 3 |
| 81 | 0 | 24 | 6266 | 1976 | 4 |
| 25 | 0 | 62 | 5283 | 1977 | 1 |
| 152 | 0 | 64 | 5283 | 1977 | 2 |
| 57 | 0 | 44 | 5283 | 1977 | 3 |
| 84 | 0 | 15 | 5283 | 1977 | 4 |
| 16 | 0 | 46 | 5573 | 1978 | 1 |
| 97 | 0 | 54 | 5573 | 1978 | 2 |
| 36 | 0 | 18 | 5573 | 1978 | 3 |
| 54 | 0 | 34 | 5573 | 1978 | 4 |
| 16 | 0 | 40 | 7614 | 1979 | 1 |
| 94 | 0 | 74 | 7614 | 1979 | 2 |
| 36 | 0 | 30 | 7614 | 1979 | 3 |
| 52 | 0 | 55 | 7614 | 1979 | 4 |
| 19 | 0 | 76 | 7494 | 1980 | 1 |
| 115 | 0 | 129 | 7494 | 1980 | 2 |
| 43 | 0 | 31 | 7494 | 1980 | 3 |
| 64 | 0 | 105 | 7494 | 1980 | 4 |
| 34 | 0 | 93 | 6912 | 1981 | 1 |
| 204 | 0 | 226 | 6912 | 1981 | 2 |
| 77 | 0 | 50 | 6912 | 1981 | 3 |
| 114 | 0 | 96 | 6912 | 1981 | 4 |
| 57 | 0 | 183 | 8229 | 1982 | 1 |
| 341 | 0 | 497 | 8229 | 1982 | 2 |

| | | | | | |
|---|---|---|---|---|---|
| 128 | 0 | 148 | 8229 | 1982 | 3 |
| 189 | 0 | 146 | 8229 | 1982 | 4 |
| 197 | 0 | 201 | 6935 | 1983 | 1 |
| 1186 | 0 | 486 | 6935 | 1983 | 2 |
| 447 | 0 | 175 | 6935 | 1983 | 3 |
| 659 | 0 | 262 | 6935 | 1983 | 4 |
| 312 | 0 | 259 | 7937 | 1984 | 1 |
| 1872 | 0 | 198 | 7937 | 1984 | 2 |
| 705 | 0 | 129 | 7937 | 1984 | 3 |
| 1039 | 0 | 210 | 7937 | 1984 | 4 |
| 135 | 106 | 151 | 10071 | 1985 | 1 |
| 814 | 489 | 423 | 10071 | 1985 | 2 |
| 306 | 1891 | 198 | 10071 | 1985 | 3 |
| 452 | 680 | 177 | 10071 | 1985 | 4 |
| 148 | 268 | 188 | 10279 | 1986 | 1 |
| 891 | 165 | 146 | 10279 | 1986 | 2 |
| 336 | 2255 | 135 | 10279 | 1986 | 3 |
| 495 | 278 | 99 | 10279 | 1986 | 4 |
| 51 | 254 | 89 | 10796 | 1987 | 1 |
| 308 | 1141 | 193 | 10796 | 1987 | 2 |
| 116 | 1315 | 107 | 10796 | 1987 | 3 |
| 171 | 364 | 111 | 10796 | 1987 | 4 |
| 172 | 1463 | 105 | 11746 | 1988 | 1 |
| 1032 | 629 | 242 | 11746 | 1988 | 2 |
| 388 | 807 | 154 | 11746 | 1988 | 3 |
| 573 | 299 | 106 | 11746 | 1988 | 4 |
| 61 | 255 | 101 | 11919 | 1989 | 1 |
| 365 | 763 | 222 | 11919 | 1989 | 2 |
| 137 | 1826 | 136 | 11919 | 1989 | 3 |
| 203 | 456 | 103 | 11919 | 1989 | 4 |
| 55 | 301 | 180 | 12151 | 1990 | 1 |
| 332 | 188 | 310 | 12151 | 1990 | 2 |
| 125 | 2438 | 252 | 12151 | 1990 | 3 |
| 184 | 756 | 239 | 12151 | 1990 | 4 |
| 52 | 973 | 155 | 13138 | 1991 | 1 |
| 315 | 1355 | 282 | 13138 | 1991 | 2 |
| 118 | 1027 | 171 | 13138 | 1991 | 3 |
| 175 | 730 | 211 | 13138 | 1991 | 4 |
| 57 | 1443 | 337 | 15090 | 1992 | 1 |
| 344 | 2064 | 425 | 15090 | 1992 | 2 |
| 130 | 1321 | 280 | 15090 | 1992 | 3 |
| 191 | 766 | 218 | 15090 | 1992 | 4 |
| 41 | 427 | 284 | 13890 | 1993 | 1 |
| 247 | 1832 | 699 | 13890 | 1993 | 2 |
| 93 | 2076 | 365 | 13890 | 1993 | 3 |
| 137 | 2249 | 303 | 13890 | 1993 | 4 |
| 165 | 835 | 343 | 15439 | 1994 | 1 |
| 993 | 2530 | 521 | 15439 | 1994 | 2 |
| 374 | 1936 | 477 | 15439 | 1994 | 3 |
| 552 | 1478 | 371 | 15439 | 1994 | 4 |
| 310 | 1324 | 344 | 15620 | 1995 | 1 |
| 1864 | 2156 | 522 | 15620 | 1995 | 2 |
| 702 | 3242 | 478 | 15620 | 1995 | 3 |
| 1035 | 1617 | 372 | 15620 | 1995 | 4 |
| 449 | 2194 | 520 | 15894 | 1996 | 1 |
| 2700 | 3188 | 790 | 15894 | 1996 | 2 |
| 1016 | 2381 | 723 | 15894 | 1996 | 3 |
| 1499 | 459 | 563 | 15894 | 1996 | 4 |
| 620 | 786 | 296 | 17391 | 1997 | 1 |
| 3728 | 1887 | 450 | 17391 | 1997 | 2 |
| 1403 | 4166 | 412 | 17391 | 1997 | 3 |
| 2070 | 1116 | 320 | 17391 | 1997 | 4 |
| 630 | 485 | 445 | 17113 | 1998 | 1 |
| 3788 | 1891 | 676 | 17113 | 1998 | 2 |
| 1426 | 2231 | 619 | 17113 | 1998 | 3 |
| 2103 | 2425 | 482 | 17113 | 1998 | 4 |
| 861 | 3042 | 247 | 17225 | 1999 | 1 |
| 5175 | 1277 | 375 | 17225 | 1999 | 2 |
| 1948 | 587 | 343 | 17225 | 1999 | 3 |
| 2873 | 1313 | 267 | 17225 | 1999 | 4 |
| 4747 | 449 | 276 | 18020 | 2000 | 1 |
| 2031 | 801 | 419 | 18020 | 2000 | 2 |
| 3597 | 2078 | 384 | 18020 | 2000 | 3 |
| 3126 | 3480 | 299 | 18020 | 2000 | 4 |
| 4386 | 685 | 347 | 17033 | 2001 | 1 |
| 1877 | 2789 | 527 | 17033 | 2001 | 2 |
| 3323 | 2604 | 482 | 17033 | 2001 | 3 |
| 2888 | 2860 | 375 | 17033 | 2001 | 4 |
| 5753 | 715 | 362 | 16218 | 2002 | 1 |
| 2462 | 2861 | 550 | 16218 | 2002 | 2 |
| 4359 | 2679 | 503 | 16218 | 2002 | 3 |
| 3788 | 2927 | 392 | 16218 | 2002 | 4 |
| 5739 | 9869 | 387 | 16726 | 2003 | 1 |

```
2875    4781    588     16726   2003    2
3336    4794    538     16726   2003    3
2116    11531   419     16726   2003    4
3674    6248    434     20265   2004    1
1952    3590    334     20265   2004    2
4253    2889    655     20265   2004    3
1765    5798    378     20265   2004    4
2362    6368    315     22806   2005    1
1300    17364   540     22806   2005    2
5871    7756    646     22806   2005    3
2269    10988   495     22806   2005    4
4125    4265    363     24391   2006    1
1790    19819   259     24391   2006    2
4179    3366    272     24391   2006    3
2502    5234    345     24391   2006    4
4562    4837    470     24775   2007    1
2673    12439   617     24775   2007    2
4874    3410    380     24775   2007    3
3447    2881    382     24775   2007    4
5717    3485    458     26375   2008    1
3465    8194    428     26375   2008    2
7602    949     374     26375   2008    3
3656    2236    412     26375   2008    4
4104    4149    403     28586   2009    1
1814    2525    618     28586   2009    2
6206    1427    588     28586   2009    3
5703    1397    490     28586   2009    4
8344    3462    476     26633   2010    1
1833    3042    790     26633   2010    2
2973    378     661     26633   2010    3
3185    1826    830     26633   2010    4
5288    2592    764     30440   2011    1
3652    3896    470     30440   2011    2
6450    673     339     30440   2011    3
6818    1769    243     30440   2011    4
6413    1395    231     31871   2012    1
4994    586     265     31871   2012    2
8473    398     198     31871   2012    3
6106    544     318     31871   2012    4
10101   1034    119     34192   2013    1
3810    2179    96      34192   2013    2
7389    1145    95      34192   2013    3
7078    1268    124     34192   2013    4
65 # 36 + 29 # Number of Survey Observations
#Units:  0=numbers; 1=biomass; 2=F
#Errtype:  -1=normal; 0=lognormal; >0=T
#Fleet Units Err_Type
 1 1 0
 2 1 0
 3 1 0
 4 1 0
 5 0 0
 6 1 0
#U0 and U1 are same series now, but refer to presence/abseance of PS fishery
# Year Qtr Survey CPUE(lm5)  log(SD) model 11
2004    1       5       0.58    0.1
2004    2       5       0.68    0.1
2004    3       5       0.71    0.1
2004    4       5       0.68    0.1
2005    1       5       0.72    0.1
2005    2       5       0.85    0.1
2005    3       5       0.88    0.1
2005    4       5       0.84    0.1
2006    1       5       0.55    0.1
2006    2       5       0.61    0.1
2006    3       5       0.65    0.1
2006    4       5       0.62    0.1
2007    1       5       1.08    0.1
2007    2       5       1.21    0.1
2007    3       5       1.28    0.1
2007    4       5       1.21    0.1
2008    1       5       0.70    0.1
2008    2       5       0.81    0.1
2008    3       5       0.84    0.1
2008    4       5       0.75    0.1
2009    1       5       1.04    0.1
2009    2       5       1.20    0.1
2009    3       5       1.23    0.1
2009    4       5       1.23    0.1
2010    1       5       0.94    0.1
2010    2       5       1.12    0.1
2010    3       5       1.17    0.1
2010    4       5       1.07    0.1
```

```
2011    1       5       0.90    0.1
2011    2       5       1.01    0.1
2011    3       5       1.08    0.1
2011    4       5       1.03    0.1
2012    1       5       0.48    0.1
2012    2       5       0.54    0.1
2012    3       5       0.57    0.1
2012    4       5       0.54    0.1
# Dummy for placeholder else model structure needs serious time and change CLEAN UP NEXT YEAR
# Year  Qtr  Survey  PSFS_CPUE  CV
1982    2       6       0.52    0.4
1983    2       6       0.48    0.4
1984    2       6       0.56    0.4
1985    2       6       0.58    0.4
1986    2       6       0.75    0.4
1987    2       6       0.65    0.4
1988    2       6       0.92    0.4
1989    2       6       0.56    0.4
1990    2       6       0.64    0.4
1991    2       6       0.66    0.4
1992    2       6       0.67    0.4
1993    2       6       0.66    0.4
1994    2       6       0.72    0.4
1995    2       6       0.55    0.4
1996    2       6       0.55    0.4
1997    2       6       0.43    0.4
1998    2       6       0.5     0.4
1999    2       6       0.62    0.4
2000    2       6       0.83    0.4
2001    2       6       0.7     0.4
2002    2       6       1       0.4
2003    2       6       0.71    0.4
2004    2       6       0.7     0.4
2005    2       6       0.67    0.4
2006    2       6       0.64    0.4
2007    2       6       0.42    0.4
2008    2       6       0.47    0.4
2009    2       6       0.62    0.4
2010    2       6       0.62    0.4
#
0 # 2 # Discard Units
#
0 # Number of Discard Observations
0 # Number of Mean Body Weight Observations
# Population Length Structure
30 # sampling distn bit...
1 # Population Length Bin Option
-0.0001 # Compress Tails of composition (negative values cause no compressions and advise using no
compressions if data are very sparse)
0.01 # Compress added to observed and expected proportions
0 # Combine Males int Females Below Bin
22 # Number of Observed Length Bins
0 20 23 26 29 32 35 38 41 44 47 50 53 56 59 62 65 68 71 74 77 80
 237  #  Number  of  Length  Observations
2008    1       1       0       0       200     1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-
10      1E-10   1E-10   1E-10   183     457     386     403     300     79      1E-10   1E-10   1E-10   1E-10
2008    2       1       0       0       200     1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-
10      1E-10   1E-10   18      130     323     338     258     122     13      1E-10   1E-10   1E-10   1E-10
2008    3       1       0       0       200     1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   4       33      53
        21      21      14      12      80      30      44      22      4       1E-10   1E-10   1E-10   1E-10
2008    4       1       0       0       200     1E-10   1E-10   1E-10   1       1E-10   1       41      68      104
        103     133     90      139     239     245     244     120     18      1E-10   1E-10   1E-10   1E-10
2009    1       1       0       0       200     1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   5       10      41
        70      102     69      208     492     665     741     503     106     1E-10   1E-10   1E-10   1E-10
2009    2       1       0       0       200     1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-
10      23      63      64      111     132     103     140     64      1       1E-10   1E-10   1E-10   1E-10
2009    3       1       0       0       200     1E-10   1E-10   1E-10   1E-10   1E-10   2       39      67      101
        169     180     156     384     581     587     608     329     71      1E-10   1E-10   1E-10   1E-10
2009    4       1       0       0       200     1E-10   1E-10   1E-10   1       1       40      126     149     170
        131     138     101     202     415     563     574     425     113     1E-10   1E-10   1E-10   1E-10
2010    1       1       0       0       200     1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   51      61      86
        136     128     151     252     269     170     148     59      4       1E-10   1E-10   1E-10   1E-10
2010    2       1       0       0       200     1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   23      16      87
        130     157     134     201     273     112     109     21      1E-10   1E-10   1E-10   1E-10   1E-10
2010    3       1       0       0       200     1E-10   1E-10   1E-10   1E-10   1E-10   2       59      57      142
        269     245     407     613     643     261     196     72      20      1E-10   1E-10   1E-10   1E-10
2010    4       1       0       0       200     1E-10   1E-10   1E-10   1E-10   1E-10   1       13      16      199
        270     179     186     291     299     220     163     134     45      1E-10   1E-10   1E-10   1E-10
2011    1       1       0       0       200     1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-
10      1E-10   180     330     510     640     760     680     462     70      1E-10   1E-10   1E-10   1E-10
2011    2       1       0       0       200     4       4       8       16      1       5       10      6       74
        112     92      81      108     251     337     364     118     1E-10   1E-10   1E-10   1E-10   1E-10
```

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2011 | 3 | 1 | 0 | 0 | 200 | 34 | 32 | 1E-10 | 34 | 6 | 14 | 1E-10 | 24 | 39 |
| | 149 | 446 | 403 | 822 | 1190 | 1194 | 624 | 360 | 110 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2011 | 4 | 1 | 0 | 0 | 200 | 1E-10 | 1E-10 | 48 | 40 | 1E-10 | 72 | 664 | 786 | 674 |
| | 146 | 24 | 74 | 90 | 540 | 454 | 418 | 410 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2012 | 1 | 1 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 24 | 24 | 92 | 157 | 286 | 294 |
| | 236 | 146 | 187 | 218 | 364 | 288 | 425 | 201 | 24 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2012 | 2 | 1 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 14 | 1E-10 | 1E-10 | 48 | 66 | 92 |
| | 146 | 179 | 204 | 287 | 327 | 149 | 342 | 211 | 5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2012 | 3 | 1 | 0 | 0 | 200 | 1E-10 | 30 | 60 | 220 | 191 | 273 | 413 | 613 | 652 |
| | 853 | 1127 | 1070 | 980 | 1229 | 877 | 691 | 522 | 171 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2012 | 4 | 1 | 0 | 0 | 200 | 1E-10 | 3 | 1 | 38 | 24 | 41 | 113 | 110 | 189 |
| | 175 | 233 | 174 | 636 | 1128 | 1072 | 457 | 386 | 118 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2013 | 1 | 1 | 0 | 0 | 200 | 1E-10 | 1E-10 | 8 | 21 | 36 | 40 | 70 | 51 | 126 |
| | 79 | 71 | 126 | 210 | 422 | 346 | 303 | 383 | 97 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2013 | 2 | 1 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 28 | 4 | 1E-10 | 78 | 90 | 141 |
| | 254 | 285 | 253 | 473 | 753 | 735 | 368 | 311 | 96 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2013 | 3 | 1 | 0 | 0 | 200 | 1E-10 | 10 | 24 | 43 | 40 | 31 | 110 | 200 | 257 |
| | 252 | 263 | 277 | 324 | 538 | 428 | 273 | 297 | 58 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2013 | 4 | 1 | 0 | 0 | 200 | 1E-10 | 1E-10 | 13 | 52 | 18 | 77 | 67 | 49 | 88 |
| | 234 | 560 | 651 | 502 | 586 | 598 | 527 | 488 | 106 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1988 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 117 | 2891 | 4155 | 6185 | 6103 | 5471 | 2403 | 1643 |
| | 3026 | 4265 | 3378 | 2623 | 1134 | 220 | 165 | 13 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1988 | 2 | 2 | 0 | 0 | 200 | 1E-10 | 21 | 974 | 1114 | 1731 | 2213 | 4269 | 4339 | 2622 |
| | 2678 | 3082 | 1217 | 1751 | 667 | 125 | 59 | 24 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1988 | 3 | 2 | 0 | 0 | 200 | 2 | 606 | 4870 | 7551 | 6041 | 4472 | 3591 | 1882 | 1121 |
| | 1324 | 462 | 872 | 248 | 228 | 21 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1988 | 4 | 2 | 0 | 0 | 200 | 2 | 179 | 1608 | 1992 | 1827 | 3601 | 2110 | 1955 | 1399 |
| | 263 | 110 | 144 | 33 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1989 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 110 | 937 | 539 | 390 | 586 | 693 | 665 | 739 |
| | 206 | 380 | 395 | 353 | 45 | 7 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1989 | 2 | 2 | 0 | 0 | 200 | 1E-10 | 3 | 396 | 490 | 599 | 642 | 523 | 436 | 687 |
| | 923 | 1571 | 1807 | 1447 | 663 | 18 | 20 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1989 | 3 | 2 | 0 | 0 | 200 | 351 | 233 | 3866 | 3270 | 5536 | 9422 | 6978 | 2530 | 831 |
| | 208 | 256 | 150 | 70 | 244 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1989 | 4 | 2 | 0 | 0 | 200 | 1E-10 | 91 | 654 | 2267 | 8884 | 14898 | 6103 | 3408 | 1701 |
| | 527 | 654 | 226 | 224 | 203 | 160 | 1E-10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1990 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 78 | 562 | 948 | 859 | 216 | 63 |
| | 18 | 53 | 344 | 285 | 16 | 5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1990 | 2 | 2 | 0 | 0 | 200 | 1E-10 | 71 | 337 | 298 | 631 | 952 | 1132 | 855 | 403 |
| | 109 | 19 | 14 | 13 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1990 | 3 | 2 | 0 | 0 | 200 | 1900 | 1821 | 2264 | 6409 | 13802 | 12691 | 4454 | 2389 | 4779 |
| | 4933 | 2364 | 613 | 448 | 106 | 61 | 32 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1990 | 4 | 2 | 0 | 0 | 200 | 3 | 123 | 440 | 1939 | 4156 | 2861 | 999 | 414 | 302 |
| | 721 | 5538 | 8569 | 6718 | 2561 | 253 | 27 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1991 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1 | 40 | 144 | 138 | 119 | 126 | 104 |
| | 253 | 287 | 189 | 322 | 22 | 40 | 7 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1991 | 2 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 339 | 516 | 2472 | 3749 | 1164 | 1050 |
| | 2902 | 2863 | 897 | 757 | 62 | 9 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1991 | 3 | 2 | 0 | 0 | 200 | 370 | 165 | 1110 | 1843 | 1700 | 2159 | 3126 | 2247 | 1337 |
| | 895 | 1294 | 498 | 222 | 78 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1991 | 4 | 2 | 0 | 0 | 200 | 1E-10 | 886 | 1905 | 6200 | 3775 | 5864 | 5349 | 2584 | 1244 |
| | 1139 | 2360 | 344 | 256 | 32 | 45 | 1E-10 | 8 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1992 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 5 | 64 | 252 | 528 | 636 | 485 | 268 |
| | 114 | 166 | 34 | 6 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1992 | 2 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 39 | 832 | 2331 | 3681 | 2172 | 1898 | 271 |
| | 321 | 493 | 120 | 17 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1992 | 3 | 2 | 0 | 0 | 200 | 3658 | 3660 | 8781 | 16448 | 10594 | 14648 | 1549 | 511 | 160 |
| | 275 | 1002 | 391 | 99 | 13 | 1 | 13 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1992 | 4 | 2 | 0 | 0 | 200 | 403 | 23 | 2270 | 4997 | 5019 | 8208 | 4641 | 2343 | 910 |
| | 335 | 804 | 14 | 14 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1993 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1 | 2 | 6 | 16 | 50 | 137 | 145 | 38 |
| | 26 | 6 | 12 | 7 | 2 | 2 | 1E-10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1993 | 2 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 15 | 37 | 32 | 103 | 336 | 156 | 32 |
| | 257 | 598 | 142 | 214 | 11 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1993 | 3 | 2 | 0 | 0 | 200 | 374 | 512 | 702 | 559 | 36 | 9 | 8 | 12 | 10 |
| | 8 | 14 | 1 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1993 | 4 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 2163 | 3833 | 1849 | 274 | 565 | 92 | 23 |
| | 30 | 50 | 18 | 17 | 1 | 1 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1994 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 3 | 12 | 38 | 39 | 48 | 37 | 38 |
| | 55 | 61 | 48 | 56 | 39 | 40 | 4 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1994 | 2 | 2 | 0 | 0 | 200 | 2 | 2 | 3 | 9 | 18 | 43 | 70 | 118 | 113 |
| | 73 | 72 | 75 | 66 | 28 | 30 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1994 | 3 | 2 | 0 | 0 | 200 | 1E-10 | 1 | 21 | 52 | 91 | 72 | 58 | 80 | 70 |
| | 44 | 108 | 120 | 99 | 31 | 27 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1994 | 4 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 2 | 7 | 9 | 27 | 33 | 58 | 75 |
| | 62 | 87 | 56 | 39 | 18 | 7 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1995 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1 | 16 | 33 | 61 | 202 | 465 | 410 |
| | 88 | 51 | 50 | 42 | 26 | 18 | 1 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1995 | 2 | 2 | 0 | 0 | 200 | 8 | 3 | 7 | 12 | 12 | 29 | 67 | 82 | 109 |
| | 104 | 91 | 77 | 51 | 32 | 13 | 1 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1995 | 3 | 2 | 0 | 0 | 200 | 84 | 213 | 361 | 267 | 281 | 181 | 260 | 275 | 280 |
| | 210 | 109 | 109 | 86 | 24 | 36 | 32 | 18 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1995 | 4 | 2 | 0 | 0 | 200 | 14 | 44 | 56 | 55 | 142 | 208 | 284 | 384 | 203 |
| | 129 | 109 | 85 | 50 | 22 | 17 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1996 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 2 | 2 | 7 | 48 | 128 | 230 | 174 |
| | 167 | 167 | 119 | 37 | 9 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1996 | 2 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 8 | 30 | 128 | 352 | 521 | 343 |
| | 277 | 311 | 233 | 131 | 53 | 14 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1996 | 3 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 8 | 23 | 103 | 226 | 240 | 231 | 139 |
| | 141 | 166 | 152 | 149 | 59 | 34 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1996 | 4 | 2 | 0 | 0 | 200 | 1 | 3 | 23 | 56 | 89 | 148 | 178 | 205 | 133 |
| | 136 | 179 | 196 | 89 | 15 | 13 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1997 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1 | 1E-10 | 18 | 53 | 79 | 105 | 65 |
| | 67 | 97 | 97 | 77 | 8 | 9 | 2 | 1 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1997 | 2 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 3 | 15 | 56 | 76 | 119 | 107 |
| | 105 | 82 | 88 | 40 | 6 | 10 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1997 | 3 | 2 | 0 | 0 | 200 | 61 | 212 | 266 | 76 | 53 | 62 | 103 | 111 | 83 |
| | 76 | 105 | 86 | 58 | 30 | 41 | 16 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1997 | 4 | 2 | 0 | 0 | 200 | 23 | 41 | 73 | 26 | 117 | 150 | 233 | 242 | 93 |
| | 37 | 69 | 52 | 49 | 28 | 50 | 36 | 15 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1998 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 2 | 17 | 32 | 55 | 71 | 50 |
| | 37 | 51 | 66 | 54 | 19 | 20 | 13 | 5 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1998 | 2 | 2 | 0 | 0 | 200 | 5 | 19 | 67 | 17 | 54 | 109 | 88 | 137 | 115 |
| | 63 | 76 | 70 | 49 | 19 | 21 | 22 | 8 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1998 | 3 | 2 | 0 | 0 | 200 | 138 | 217 | 387 | 120 | 122 | 141 | 147 | 153 | 97 |
| | 85 | 154 | 90 | 49 | 18 | 17 | 10 | 11 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1998 | 4 | 2 | 0 | 0 | 200 | 4 | 19 | 105 | 191 | 406 | 495 | 294 | 201 | 69 |
| | 36 | 46 | 8 | 3 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1999 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 3 | 10 | 64 | 78 | 82 | 26 |
| | 48 | 58 | 70 | 20 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1999 | 2 | 2 | 0 | 0 | 200 | 17 | 173 | 572 | 184 | 87 | 135 | 240 | 257 | 103 |
| | 56 | 71 | 35 | 9 | 3 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1999 | 3 | 2 | 0 | 0 | 200 | 1 | 19 | 92 | 135 | 348 | 407 | 296 | 191 | 140 |
| | 168 | 223 | 190 | 96 | 5 | 1E-10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1999 | 4 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1 | 9 | 96 | 538 | 692 | 807 | 281 |
| | 124 | 152 | 128 | 43 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2000 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 12 | 119 | 241 | 260 | 76 |
| | 36 | 43 | 35 | 4 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2000 | 2 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 10 | 40 | 108 | 137 | 213 | 227 | 113 |
| | 123 | 117 | 112 | 46 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2000 | 3 | 2 | 0 | 0 | 200 | 17 | 1 | 10 | 37 | 63 | 87 | 125 | 140 | 89 |
| | 71 | 120 | 77 | 32 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2000 | 4 | 2 | 0 | 0 | 200 | 1 | 4 | 12 | 5 | 35 | 71 | 58 | 78 | 62 |
| | 42 | 59 | 37 | 34 | 4 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2001 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 4 | 7 | 22 | 53 | 91 | 41 | 17 |
| | 12 | 5 | 1E-10 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2001 | 2 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 8 | 6 | 38 | 126 | 167 | 162 | 105 |
| | 114 | 52 | 51 | 19 | 4 | 9 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2001 | 3 | 2 | 0 | 0 | 200 | 3 | 5 | 35 | 38 | 59 | 56 | 45 | 80 | 81 |
| | 156 | 48 | 91 | 156 | 39 | 10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2001 | 4 | 2 | 0 | 0 | 200 | 5 | 5 | 17 | 17 | 43 | 102 | 71 | 37 | 15 |
| | 21 | 27 | 24 | 47 | 25 | 24 | 21 | 4 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2002 | 1 | 2 | 0 | 0 | 200 | 14 | 1E-10 | 1 | 3 | 48 | 99 | 84 | 67 | 42 |
| | 18 | 45 | 19 | 3 | 1E-10 | 1E-10 | 1E-10 | 1 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2002 | 2 | 2 | 0 | 0 | 200 | 3 | 1 | 12 | 53 | 258 | 186 | 116 | 74 | 76 |
| | 43 | 49 | 37 | 22 | 10 | 14 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2002 | 3 | 2 | 0 | 0 | 200 | 11 | 14 | 194 | 161 | 208 | 174 | 130 | 113 | 58 |
| | 49 | 96 | 81 | 52 | 33 | 50 | 11 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2002 | 4 | 2 | 0 | 0 | 200 | 1E-10 | 11 | 78 | 56 | 118 | 193 | 141 | 105 | 37 |
| | 28 | 43 | 34 | 7 | 13 | 35 | 22 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2003 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 6 | 9 | 23 | 73 | 79 | 38 | 27 |
| | 20 | 24 | 8 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2003 | 2 | 2 | 0 | 0 | 200 | 4 | 1E-10 | 7 | 36 | 164 | 148 | 113 | 79 | 54 |
| | 32 | 53 | 29 | 7 | 8 | 7 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2003 | 3 | 2 | 0 | 0 | 200 | 1E-10 | 3 | 69 | 143 | 218 | 317 | 242 | 122 | 113 |
| | 69 | 115 | 55 | 24 | 19 | 15 | 9 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2003 | 4 | 2 | 0 | 0 | 200 | 4 | 6 | 36 | 69 | 52 | 52 | 34 | 27 | 28 |
| | 28 | 74 | 43 | 23 | 10 | 9 | 7 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2004 | 1 | 2 | 0 | 0 | 200 | 1 | 4 | 15 | 9 | 25 | 59 | 42 | 44 | 42 |
| | 39 | 46 | 24 | 12 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2004 | 2 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 27 | 57 | 37 | 76 | 138 | 134 | 76 |
| | 72 | 106 | 50 | 18 | 25 | 29 | 10 | 4 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2004 | 3 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 5 | 3 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E- |
| 10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2005 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1 | 3 | 5 | 11 | 3 | 4 |
| | 7 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2005 | 2 | 2 | 0 | 0 | 200 | 1E-10 | 5 | 12 | 5 | 1 | 1 | 1E-10 | 10 | 13 |
| | 18 | 22 | 10 | 5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2005 | 3 | 2 | 0 | 0 | 200 | 14 | 13 | 14 | 12 | 11 | 13 | 35 | 62 | 41 |
| | 45 | 61 | 31 | 10 | 4 | 1E-10 | 1E-10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2005 | 4 | 2 | 0 | 0 | 200 | 1E-10 | 3 | 4 | 9 | 15 | 46 | 16 | 21 | 24 |
| | 36 | 37 | 25 | 5 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2006 | 1 | 2 | 0 | 0 | 200 | 4 | 5 | 11 | 7 | 3 | 11 | 15 | 17 | 13 |
| | 8 | 17 | 10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2006 | 2 | 2 | 0 | 0 | 200 | 3 | 5 | 5 | 4 | 1E-10 | 6 | 8 | 6 | 5 |
| | 13 | 19 | 9 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2006 | 3 | 2 | 0 | 0 | 200 | 23 | 38 | 38 | 19 | 10 | 2 | 1 | 1 | 3 |
| | 4 | 19 | 5 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2006 | 4 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 2 | 4 | 6 | 3 | 2 | 3 |
| | 3 | 1E-10 | 1 | 1 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2007 | 1 | 2 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 2 | 1 | 14 | 6 | 7 | 10 |
| | 3 | 4 | 3 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2007 | 2 | 2 | 0 | 0 | 200 | 1E-10 | 1 | 8 | 1E-10 | 1 | 11 | 27 | 26 | 42 |
| | 32 | 78 | 70 | 36 | 1 | 1E-10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2007 | 3 | 2 | 0 | 0 | 200 | 5 | 9 | 12 | 21 | 47 | 70 | 74 | 32 | 25 |
| | 26 | 42 | 23 | 11 | 2 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2007 | 4 | 2 | 0 | 0 | 200 | 1 | 1 | 5 | 20 | 28 | 50 | 35 | 12 | 17 |
| | 18 | 39 | 13 | 3 | 1 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1983 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 26.5 | 20.5 | 0.5 | 1.5 | 2.5 | 3.5 |
| | 4.5 | 2.5 | 1.5 | 0.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1983 | 2 | 3 | 0 | 0 | 200 | 1E-10 | 1.5 | 3.5 | 33.5 | 142.5 | 51 | 22 | 13.5 | 7.5 |
| | 1.5 | 0.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1983 | 3 | 3 | 0 | 0 | 200 | 5 | 2.5 | 7.5 | 6.5 | 3.5 | 1E-10 | 1E-10 | 1E-10 | 1E- |
| 10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1983 | 4 | 3 | 0 | 0 | 200 | 11 | 1 | 9 | 51 | 51 | 12.5 | 13.5 | 1E-10 | 1E- |
| 10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1984 | 1 | 3 | 0 | 0 | 200 | 24 | 3.5 | 20.5 | 41.5 | 28.5 | 14.5 | 24.5 | 11 | 6 |
| | 1.5 | 0.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1984 | 2 | 3 | 0 | 0 | 200 | 7 | 0.5 | 12.5 | 20.5 | 32.5 | 21.5 | 5.5 | 1E-10 | 1E- |
| 10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1985 | 3 | 3 | 0 | 0 | 200 | 2 | 1 | 0.5 | 3.5 | 38 | 126 | 91 | 29 | 13 |
| | 17 | 23.5 | 12.5 | 5.5 | 1.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1985 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1 | 12 | 56.5 | 159.5 | 219.5 | 155.5 | 119 |
| | 94 | 68 | 32 | 6 | 4 | 0.5 | 1.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1986 | 1 | 3 | 0 | 0 | 200 | 1 | 3 | 1 | 3 | 17.5 | 80.5 | 121.5 | 103.5 | 95 |
| | 83 | 63 | 69 | 44.5 | 16.5 | 2.5 | 3.5 | 1.5 | 0.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1986 | 2 | 3 | 0 | 0 | 200 | 0.5 | 6.5 | 27 | 27 | 8 | 7 | 48 | 44 | 21 |
| | 10 | 8 | 6 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1986 | 3 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 11 | 55.5 | 68.5 | 150.5 | 171.5 | 65.5 |
| | 6.5 | 1E-10 | 1E-10 | 1E-10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1986 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 4 | 11 | 2 | 2 | 27.5 | 33.5 | 49 |
| | 34 | 13.5 | 9.5 | 5 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1987 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 0.5 | 1.5 | 9 | 9 | 9 | 50 | 93.5 |
| | 57.5 | 21 | 15 | 24 | 7 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1987 | 2 | 3 | 0 | 0 | 200 | 5 | 14 | 166.5 | 268.5 | 52 | 19 | 20 | 19 | 16 |
| | 9 | 2.5 | 0.5 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1987 | 3 | 3 | 0 | 0 | 200 | 2 | 6 | 25.5 | 50.5 | 53.5 | 72.5 | 56.5 | 51.5 | 27 |
| | 20 | 10 | 5 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1987 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 9 | 36 | 87.5 | 102.5 | 93 | 41 | 24 |
| | 11 | 2.5 | 1.5 | 1.5 | 1.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1988 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 0.5 | 0.5 | 8 | 19 | 33.5 | 43.5 | 22.5 |
| | 21.5 | 13 | 10 | 4 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1988 | 2 | 3 | 0 | 0 | 200 | 6.5 | 5.5 | 29.5 | 89.5 | 90.5 | 112.5 | 154 | 123 | 61.5 |
| | 31.5 | 12.5 | 1.5 | 1 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1988 | 3 | 3 | 0 | 0 | 200 | 1E-10 | 2 | 27.5 | 31.5 | 42.5 | 49.5 | 81 | 59 | 46 |
| | 22 | 4.5 | 2.5 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1988 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 2 | 22.5 | 50.5 | 20.5 | 9.5 | 19.5 | 59.5 | 64.5 |
| | 32.5 | 13.5 | 0.5 | 2 | 2 | 0.5 | 0.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1989 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 7 | 13 | 8.5 | 9.5 | 18 | 42 | 47.5 |
| | 53.5 | 53 | 28 | 17.5 | 13.5 | 2.5 | 0.5 | 1 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1989 | 2 | 3 | 0 | 0 | 200 | 6.5 | 13.5 | 44 | 57 | 21.5 | 23.5 | 30.5 | 13.5 | 9 |
| | 12 | 6 | 3 | 3.5 | 0.5 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1989 | 3 | 3 | 0 | 0 | 200 | 0.5 | 12.5 | 32 | 22 | 9.5 | 21.5 | 29 | 21 | 12 |
| | 8 | 5 | 1E-10 | 1E-10 | 1E-10 | 0.5 | 0.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1989 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1 | 2 | 21.5 | 29.5 | 26 |
| | 19 | 8.5 | 2.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1990 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 15.5 | 35.5 | 28 | 4 | 10.5 | 64.5 | 74 |
| | 24 | 10 | 12 | 4.5 | 8.5 | 6 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1990 | 2 | 3 | 0 | 0 | 200 | 1E-10 | 1 | 38.5 | 45.5 | 1 | 1 | 6.5 | 16.5 | 18 |
| | 13 | 4.5 | 5.5 | 1E-10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1990 | 3 | 3 | 0 | 0 | 200 | 4.5 | 4.5 | 17.5 | 51.5 | 74 | 100 | 94.5 | 69.5 | |
| | 117.5 | 26.5 | 14.5 | 5.5 | 2.5 | 0.5 | 0.5 | 0.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E- |
| 10 | | | | | | | | | | | | | | |
| 1990 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 8 | 13 | 21 | 19 | 39 | 37 | 10.5 |
| | 4.5 | 3 | 3 | 1E-10 | 1E-10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1991 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1 | 2 | 3.5 | 11.5 | 9 | 22 | 12 |
| | 11 | 5 | 5 | 1.5 | 0.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1991 | 2 | 3 | 0 | 0 | 200 | 1.5 | 13.5 | 43 | 149 | 89.5 | 14.5 | 6 | 2 | 2 |
| | 1E-10 | 0.5 | 0.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1991 | 3 | 3 | 0 | 0 | 200 | 1E-10 | 1 | 10.5 | 26.5 | 53 | 64 | 54.5 | 36.5 | 39.5 |
| | 23.5 | 2 | 3 | 2.5 | 0.5 | 1E-10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1991 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 2 | 6 | 25 | 35 | 66 | 63 | 32.5 |
| | 18.5 | 22.5 | 15.5 | 13.5 | 5.5 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1992 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 6 | 50 | 65 | 5 | 1 | 2.5 | 12.5 | 13 |
| | 32 | 36.5 | 44.5 | 28 | 29 | 16.5 | 4.5 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1992 | 2 | 3 | 0 | 0 | 200 | 1 | 1E-10 | 16 | 74 | 89.5 | 25.5 | 5.5 | 4.5 | 9.5 |
| | 6.5 | 4 | 1 | 4 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1992 | 3 | 3 | 0 | 0 | 200 | 1E-10 | 1 | 31 | 61 | 65.5 | 21.5 | 1E-10 | 1E-10 | 1E- |
| 10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1992 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 1 | 3.5 | 8.5 | 12.5 | 29.5 | 55.5 | 76.5 | 29 |
| | 13 | 3 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1993 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 5 | 14 | 16.5 |
| | 9.5 | 3 | 1 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1993 | 2 | 3 | 0 | 0 | 200 | 0.5 | 1.5 | 8 | 65 | 70 | 26 | 10.5 | 13.5 | 12.5 |
| | 12.5 | 10.5 | 2.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1993 | 3 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 9.5 | 3.5 | 17.5 | 11.5 | 1 |
| | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1993 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 2 | 19.5 | 72.5 | 203 | 144 | 19.5 |
| | 14.5 | 3.5 | 2.5 | 1E-10 | 1E-10 | 2 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1994 | 1 | 3 | 0 | 0 | 200 | 173 | 43 | 178.5 | 195.5 | 176.5 | 194.5 | 355.5 | 293.5 | |
| | 160.5 | 110.5 | 35.5 | 13.5 | 2.5 | 2.5 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E- |
| 10 | | | | | | | | | | | | | | |
| 1994 | 2 | 3 | 0 | 0 | 200 | 477 | 193 | 338.5 | 822.5 | 584 | 464 | 233.5 | 85.5 | 49 |
| | 29 | 10 | 4 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1994 | 3 | 3 | 0 | 0 | 200 | 420 | 152 | 98 | 128 | 76.5 | 118.5 | 92 | 39 | 20.5 |
| | 6.5 | 2 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1994 | 4 | 3 | 0 | 0 | 200 | 460 | 182 | 87 | 81 | 57.5 | 90.5 | 312.5 | 460.5 | 251 |
| | 107 | 20.5 | 6.5 | 4 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1995 | 1 | 3 | 0 | 0 | 200 | 396 | 185 | 148 | 113 | 16 | 18 | 34.5 | 49.5 | 31.5 |
| | 15.5 | 5.5 | 10.5 | 8.5 | 3.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1995 | 2 | 3 | 0 | 0 | 200 | 459.5 | 200.5 | 392.5 | 368.5 | 292 | 200 | 284.5 | 179.5 | 60 |
| | 21 | 3 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1995 | 3 | 3 | 0 | 0 | 200 | 512.5 | 163.5 | 131 | 71 | 99 | 156 | 139.5 | 44.5 | 7 |
| | 2 | 0.5 | 0.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1995 | 4 | 3 | 0 | 0 | 200 | 595 | 173 | 95 | 58 | 64.5 | 112.5 | 185.5 | 123.5 | 77 |
| | 49 | 10.5 | 10.5 | 1.5 | 0.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1996 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 3.5 | 5.5 | 54.5 | 158.5 | 177.5 | 201.5 | |
| | 207.5 | 155.5 | 39 | 8 | 2.5 | 1.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E- |
| 10 | | | | | | | | | | | | | | |
| 1996 | 2 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 0.5 | 12.5 | 124.5 | 227.5 | 265 | 195 | |
| | 204.5 | 192.5 | 50 | 21 | 2.5 | 1.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E- |
| 10 | | | | | | | | | | | | | | |
| 1996 | 3 | 3 | 0 | 0 | 200 | 1E-10 | 1 | 25.5 | 15.5 | 49 | 87 | 147 | 147 | 41.5 |
| | 20.5 | 16 | 25 | 7 | 4 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1996 | 4 | 3 | 0 | 0 | 200 | 1 | 15 | 72.5 | 106.5 | 40.5 | 56.5 | 210 | 215 | 179 |
| | 143 | 32.5 | 16.5 | 18.5 | 6.5 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1997 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1 | 1 | 13 | 25 | 39 | 184 | 198 |
| | 299 | 151 | 27 | 16 | 1 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1997 | 2 | 3 | 0 | 0 | 200 | 1 | 6 | 4 | 17 | 34 | 12 | 22 | 71 | 98 |
| | 83 | 37 | 10 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1997 | 3 | 3 | 0 | 0 | 200 | 1E-10 | 6 | 54 | 46 | 42 | 19 | 50 | 27 | 18 |
| | 10 | 12 | 3 | 2 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1997 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 6 | 39 | 27 |
| | 18 | 14 | 3 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1998 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 2 | 1 | 1E-10 | 2 | 3 | 3 | 2 |
| | 24 | 25 | 11 | 4 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1998 | 2 | 3 | 0 | 0 | 200 | 1E-10 | 12 | 71 | 199 | 153 | 128 | 105 | 41 | 17 |
| | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1998 | 3 | 3 | 0 | 0 | 200 | 1E-10 | 1 | 20 | 16 | 33 | 22 | 20 | 9 | 2 |
| | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1998 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 9 | 17 | 55 | 65 | 113 | 110 | 114 | 101 |
| | 24 | 7 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1999 | 1 | 3 | 0 | 0 | 200 | 30 | 13 | 24 | 21 | 8 | 6 | 7 | 12 | 13 |
| | 6 | 6 | 5 | 1 | 1 | 1E-10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1999 | 2 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 2 | 6 |
| | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1999 | 3 | 3 | 0 | 0 | 200 | 60 | 37 | 103 | 7 | 11 | 19 | 1 | 1E-10 | 1E- |
| 10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2000 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 2 | 9 |
| | 18 | 10 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2000 | 3 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 2 | 58 | 84 | 48 | 38 | 23 | 2 |
| | 1 | 1E-10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2002 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 8 | 3 |
| | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2003 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 4 | 9 | 9 |
| | 6 | 6 | 5 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2003 | 2 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 4 | 7 | 3 | 16 | 9 | 12 |
| | 9 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2003 | 3 | 3 | 0 | 0 | 200 | 1E-10 | 1 | 3 | 8 | 2 | 9 | 10 | 9 | 23 |
| | 30 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2003 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 2 | 1E-10 | 14 | 21 | 8 |
| | 3 | 11 | 4 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2004 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 8 | 5 | 23 | 9 |
| | 3 | 7 | 2 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2004 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1 | 9 | 7 | 12 | 11 | 7 |
| | 2 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2005 | 2 | 3 | 0 | 0 | 200 | 1E-10 | 3 | 47 | 68 | 89 | 57 | 38 | 61 | 50 |
| | 23 | 10 | 5 | 3 | 1 | 1E-10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2005 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1 | 3 | 2 | 7 | 85 | 71 | 47 |
| | 96 | 51 | 17 | 9 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2006 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1 | 1 | 1 | 1E-10 | 3 |
| | 5 | 28 | 7 | 4 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2006 | 2 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 2 | 2 | 9 | 18 |
| | 31 | 34 | 16 | 4 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2006 | 3 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 5 | 7 | 10 |
| | 23 | 20 | 5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2010 | 2 | 3 | 0 | 0 | 200 | 3 | 1E-10 | 201 | 623 | 365 | 147 | 62 | 64 | 68 |
| | 26 | 80 | 28 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2010 | 3 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 72 | 20 | 2 | 30 | 92 | 138 |
| | 26 | 16 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2011 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1 | 19 | 20 |
| | 25 | 13 | 2 | 6 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2011 | 2 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1 | 74 | 82 | 69 | 65 | 20 | 13 |
| | 23 | 15 | 4 | 1 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2012 | 1 | 3 | 0 | 0 | 200 | 1E-10 | 2 | 4 | 28 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E- |
| 10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2012 | 2 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 2 | 7 | 5 | 1 | 2 |
| | 1 | 3 | 2 | 12 | 5 | 2 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2012 | 3 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1 | 24 | 9 | 7 |
| | 6 | 20 | 7 | 22 | 15 | 6 | 1E-10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2013 | 3 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1 | 1 | 1 |
| | 2 | 6 | 2 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 2013 | 4 | 3 | 0 | 0 | 200 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 6 | 18 |
| | 26 | 72 | 56 | 38 | 4 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1983 | 1 | 4 | 0 | 0 | 16.02 | 1E-10 | 1E-10 | 1E-10 | 101 | 114 | 509 | 617 | 206 | 55 |
| | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1983 | 2 | 4 | 0 | 0 | 21.41 | 1E-10 | 1E-10 | 55 | 68 | 338 | 614 | 612 | 270 | 107 |
| | 77 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1983 | 3 | 4 | 0 | 0 | 15.03 | 1E-10 | 15 | 176 | 614 | 244 | 207 | 212 | 35 | 1E- |
| 10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1984 | 1 | 4 | 0 | 0 | 0.71 | 1E-10 | 1E-10 | 1E-10 | 7 | 21 | 5 | 1E-10 | 1E-10 | 1 |
| | 8 | 12 | 8 | 7 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1984 | 2 | 4 | 0 | 0 | 0.82 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1 | 14 | 18 | 9 | 25 |
| | 9 | 2 | 1E-10 | 2 | 1 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1984 | 3 | 4 | 0 | 0 | 1.77 | 13 | 6 | 1E-10 | 1E-10 | 21 | 14 | 14 | 16 | 25 |
| | 21 | 26 | 11 | 6 | 4 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1985 | 1 | 4 | 0 | 0 | 4.16 | 1E-10 | 1E-10 | 1E-10 | 1 | 12 | 125 | 94 | 70 | 39 |
| | 35 | 23 | 10 | 7 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1985 | 2 | 4 | 0 | 0 | 3.2 | 28 | 40 | 24 | 51 | 17 | 20 | 10 | 18 | 72 |
| | 36 | 4 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1985 | 3 | 4 | 0 | 0 | 15.43 | 216 | 22 | 109 | 90 | 63 | 137 | 282 | 142 | 138 |
| | 45 | 27 | 39 | 58 | 75 | 61 | 24 | 12 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1985 | 4 | 4 | 0 | 0 | 6.01 | 1E-10 | 12 | 63 | 211 | 88 | 69 | 72 | 40 | 28 |
| | 11 | 6 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1986 | 1 | 4 | 0 | 0 | 6.52 | 1E-10 | 3 | 55 | 153 | 126 | 140 | 106 | 40 | 16 |
| | 9 | 4 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1986 | 2 | 4 | 0 | 0 | 16.25 | 1 | 53 | 82 | 115 | 273 | 327 | 315 | 202 | 151 |
| | 65 | 26 | 9 | 1 | 3 | 1 | 1E-10 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1986 | 3 | 4 | 0 | 0 | 21.64 | 88 | 122 | 496 | 268 | 84 | 375 | 188 | 87 | 167 |
| | 172 | 97 | 13 | 6 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1986 | 4 | 4 | 0 | 0 | 32 | 99 | 118 | 190 | 367 | 396 | 1140 | 259 | 49 | 43 |
| | 187 | 278 | 49 | 25 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1987 | 1 | 4 | 0 | 0 | 17.17 | 2.5 | 46.5 | 72.5 | 69.5 | 171 | 522 | 446.5 | 180.5 | 105 |
| | 65 | 29 | 5 | 1 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1987 | 2 | 4 | 0 | 0 | 34.08 | 43 | 157 | 378 | 356 | 229 | 366 | 573.5 | 1007.5 | 266 |
| | 17 | 9 | 3 | 1 | 1 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1987 | 3 | 4 | 0 | 0 | 20.84 | 127.5 | 89.5 | 185.5 | 266.5 | 267 | 206 | 179 | 376 | 287 |
| | 56 | 30 | 13 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 0.5 | 0.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1987 | 4 | 4 | 0 | 0 | 10.32 | 121.5 | 71.5 | 64.5 | 73.5 | 108.5 | 99.5 | 128 | 74 | 154 |
| | 62 | 22 | 16 | 18.5 | 10.5 | 4.5 | 2.5 | 1 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1988 | 1 | 4 | 0 | 0 | 17.16 | 10 | 35 | 38 | 86 | 271 | 292 | 172 | 173 | 191 |
| | 94 | 38.5 | 17.5 | 27 | 86 | 111.5 | 57.5 | 13 | 3 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1988 | 2 | 4 | 0 | 0 | 19.37 | 166 | 69 | 47 | 73 | 110 | 218 | 379 | 429 | |
| | 119.5 | 71.5 | 98 | 67 | 18.5 | 36.5 | 9.5 | 7.5 | 14 | 4 | 1E-10 | 1E-10 | 1E-10 | 1E- |
| 10 | | | | | | | | | | | | | | |
| 1988 | 3 | 4 | 0 | 0 | 60.89 | 1541 | 1038 | 1244.5 | 522.5 | 411 | 233 | 170.5 | 150.5 | 104 |
| | 74 | 163.5 | 173.5 | 84 | 62 | 51.5 | 33.5 | 26 | 6 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1988 | 4 | 4 | 0 | 0 | 129.87 | 1742 | 3324 | 1479.5 | 2027.5 | 1196.5 | 771.5 | 499 | 619 | |
| | 902.5 | 207.5 | 59 | 41 | 48.5 | 35.5 | 18.5 | 10.5 | 5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 1E- |
| 10 | | | | | | | | | | | | | | |
| 1989 | 1 | 4 | 0 | 0 | 11.1 | 8 | 1E-10 | 1E-10 | 3 | 21 | 45 | 72 | 95 | |
| | 127.5 | 222.5 | 173 | 42 | 82 | 122 | 67 | 21 | 7 | 2 | 1E-10 | 1E-10 | 1E-10 | 1E- |
| 10 | | | | | | | | | | | | | | |
| 1989 | 2 | 4 | 0 | 0 | 6.64 | 1E-10 | 1E-10 | 1E-10 | 2 | 5 | 10 | 21 | 32 | 35 |
| | 37 | 39 | 42 | 107.5 | 196.5 | 89.5 | 29.5 | 13.5 | 4.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1989 | 3 | 4 | 0 | 0 | 12.15 | 3.5 | 26.5 | 65.5 | 76.5 | 145.5 | 80.5 | 39 | 23 | 11.5 |
| | 27.5 | 74 | 98 | 117.5 | 219.5 | 115.5 | 53.5 | 31.5 | 6.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1989 | 4 | 4 | 0 | 0 | 11.32 | 1E-10 | 1E-10 | 3 | 29 | 170.5 | 234.5 | 274.5 | 201.5 | 34.5 |
| | 5.5 | 20.5 | 22.5 | 36.5 | 51.5 | 29 | 13 | 4.5 | 1.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1990 | 1 | 4 | 0 | 0 | 3.03 | 1E-10 | 1E-10 | 1E-10 | 2 | 15.5 | 47.5 | 77 | 39 | 25 |
| | 7 | 10 | 5 | 21.5 | 32.5 | 13.5 | 5.5 | 1.5 | 0.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |
| 1990 | 2 | 4 | 0 | 0 | 1.79 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | 3 | 36 | 63 | 44 | 4 |
| | 3 | 2 | 4 | 8 | 4 | 3 | 1 | 3.5 | 0.5 | 1E-10 | 1E-10 | 1E-10 | 1E-10 | |

```
1990    4       4       0       0       0.09    1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-
10      1E-10   1E-10   1       2.5     1.5     1.5     2.5     1E-10   1E-10   1E-10   1E-10   1E-10   1E-10
1991    1       4       0       0       0.68    1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1
        1E-10   7.5     13.5    18.5    12.5    6       7       1.5     0.5     1E-10   1E-10   1E-10   1E-10
1991    2       4       0       0       0.5     1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1       1E-10   1E-
10      1E-10   3.5     2.5     13.5    11.5    3       3       9       3       1E-10   1E-10   1E-10   1E-10
1991    3       4       0       0       0.38    1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1.5
        2.5     5       4       8.5     5.5     7       3       1       1E-10   1E-10   1E-10   1E-10   1E-10
1991    4       4       0       0       0.28    1E-10   1E-10   1E-10   1E-10   0.5     0.5     1E-10   1E-10   1E-
10      1E-10   0.5     2.5     6       4       6.5     6.5     1       1E-10   1E-10   1E-10   1E-10   1E-10
1992    1       4       0       0       0.15    1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-
10      2       1       4       1       2       2.5     2.5     1E-10   1E-10   1E-10   1E-10   1E-10   1E-10
1992    2       4       0       0       0.46    1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1       1E-10   1.5
        3.5     2       2       6.5     7.5     5       5       9.5     2.5     1E-10   1E-10   1E-10   1E-10
1992    3       4       0       0       2.21    1E-10   1E-10   1E-10   1E-10   0.5     2.5     7       8       19
        48      36.5    33.5    33      23      7.5     1.5     0.5     0.5     1E-10   1E-10   1E-10   1E-10
1992    4       4       0       0       4.86    1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   2       1
        9       45      92      119     120     75.5    17.5    4.5     0.5     1E-10   1E-10   1E-10   1E-10
2005    4       4       0       0       5.09    493     2       1       1E-10   1E-10   1E-10   1       7       5
        1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10
2006    1       4       0       0       87.82   5213    440     1278    955     414     291     109     29      6
        17      24      6       1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10
2006    2       4       0       0       52.9    2400    512     787     667     469     172     144     43      20
        6       18      25      13      3       1E-10   3       8       1E-10   1E-10   1E-10   1E-10   1E-10
2006    3       4       0       0       25.56   214     6       22      263     624     715     501     144     48
        9       5       5       1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10
2006    4       4       0       0       5.52    4       42      17      78      175     69      83      62      17
        4       1       1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10
2011    1       4       0       0       0.21    1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1       1       1
        1E-10   4       9       3       2       1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10
2011    3       4       0       0       0.17    1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1
        2       5       2       6       1       1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10
2011    4       4       0       0       1.47    1E-10   1E-10   6       4       15      17      13      8       6
        22      34      12      2       4       4       1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10
2013    1       4       0       0       1.25    1E-10   1E-10   9       7       66      38      5       1E-10   1E-
10      1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10
2013    2       4       0       0       3.42    36      233     71      2       1E-10   1E-10   1E-10   1E-10   1E-
10      1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10
2013    4       4       0       0       0.01    1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-
10      1E-10   1E-10   1E-10   1       1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10   1E-10
1 #_N_age_bins...if bug fixed these two entries can be replaced by single 0
1 # age bin vector
0 #_N_ageerror_definitions
0 #_N_Agecomp_obs
2 #_Lbin_method: 1=poplenbins; 2=datalenbins; 3=lengths
-1 #_combine males into females at or below this bin number
0 #_N_MeanSize-at-Age_obs
0 #_N_environ_variables
0 #_N_environ_obs
0 # no wtfreq data
0 # no tag data
0  # do tags   If this value is 0, then omit all entries below
#"rttp","rtss" and two growth curves...L83, L70
# xxx rttp # xxx L83 40  # N tag groups
 # xxx L83 79  # N tag groups
# xxx rttp  45  # N tag groups
# xxx rttp # xxx L83 470  # N recap events
 # xxx L83 676  # N recap events
# xxx rttp  487  # N recap events
999
ENDDATA
```