REPORT OF THE 2007 ICCAT ALBACORE STOCK ASSESSMENT SESSION
(Madrid, Spain - July 5 to 12, 2007)

1. Opening, adoption of agenda and meeting arrangements

The meeting was held at the ICCAT Secretariat in Madrid July 5 to 12, 2007. Mr. Driss Meski, ICCAT Executive Secretary, opened the meeting and welcomed participants ("the Group").

Ms. Victoria Ortiz de Zárate (EC-Spain), meeting Chairperson, welcomed meeting participants and thanked the Secretariat for the efforts made to prepare the meeting. Ms. Ortiz de Zárate proceeded to review the Agenda which was adopted with minor changes (**Appendix 1**).

The List of Participants is included in **Appendix 2**. The List of Documents presented at the meeting is attached as **Appendix 3**. The following participants served as rapporteurs:

P. Pallarés	Items 1, 10 and 11
V. Ortiz de Zárate	Item 2
P. Kebe, G. Scott	Item 3
C. Palma, G. Scott	Item 4
J.M. Ortiz de Urbina, V. Ortiz de Zárate	Item 5.1
V. Ortiz de Zárate, T. Frédou-K. Uosaki	Items 5.2 and 5.3
G. Scott, G. Díaz	Items 6.1, 7.1 and 8.1
V. Restrepo, M. Ortiz	Items 6.2, 7.2 and 8.2
C. Kirchner, S. Yeh	Items 6.3, 7.3 and 8.3
V. Ortiz de Zárate	Item 9

2. Biological data, including tagging information

No new information was presented to the Group at this meeting. Therefore, the hypothesis of two separate stocks, a northern and a southern stock separated at 5ºN latitude, has been maintained for the assessments purposes.

With regard to the biology of Atlantic albacore, no new studies were presented to the Group. All information concerning parameters used in both stocks area included in **Table 1**.

For the North Atlantic stock no changes have been presented. Therefore, the growth parameters estimated by Bard (1981) were applied.

New growth estimates were available for the South stock (Lee and Yeh, 2007) and were presented at the 2006 ICCAT Data Preparatory Meeting for Atlantic Albacore (Anon. 2007). This new estimates were based on revised reading of the South albacore sample. The new growth equation was adopted by the Group for the South stock and was used in the assessment of this stock.

As concerns conversion factors for length-weight relationships, no new information has been provided. Thus, the parameters applied in the assessment were those found in the Chapter 2 of the *ICCAT Manual* for Atlantic albacore. Natural mortality was assumed to be constant and equal to 0.3 for all age classes, for both the North and the South stocks (Anon. 2004). The maturity vector for North and South albacore was assumed as being 50% mature at age 5 and completely mature onwards.

A paper on preliminary results from an inter-laboratory exchange of ageing material was presented in document SCRS/2007/102. Age estimates were obtained using spines, scales and otoliths of Mediterranean and Atlantic albacore. Moderate levels of precision were observed in one pair of readers (experienced reader and inexperienced reader who they had trained). However, the wider comparison across laboratories yielded poor precision, particularly for otoliths. Bias was detected between readers for all structures. Inter-reader precision was higher for Mediterranean than for Atlantic albacore. Agreement of age estimates derived using different structures from the same fish was low and scales appeared to provide lower estimates of age than spines. The results need greater standardization of ageing methodologies across laboratories through further exchange of material and consultation between readers.

The available tagging information which has been revised by national scientist and updated by the Secretariat was not considered for assessment purposes at this time. Future analyses could incorporate this information on the modeling of North Atlantic albacore.

3. Catch data, including size frequencies and fisheries trends

3.1 Catch data

Task I data were reviewed in detail during the *Ad Hoc* Meeting to Prepare Multifan-CL Inputs for the 2007 Albacore Assessment, held in March 2007. At this meeting, the Secretariat again presented the total nominal catch by gear, year and flag for the period 1950 up to 2005. As only a few countries had reported catch information for 2006, the Group agreed to use catch information available up to 2005. The Group noticed the high increase (more than 300%) in the French reported catch in 2005. One possible explanation for this increase could be related to the strong management measures applied to the anchovy fishery in the Bay of Biscay and the consequential shift in effort to albacore. In addition, the Group was informed that this high catch was reported as unclassified. During the meeting, a Japanese scientist presented revised catch information for Japanese longline for the period 2003-2005. The revisions mainly involved reassigning catch to the north or south stocks based on updated data. The Group accepted this new revision and decided to incorporate it in the catch table. As no information was reported for St Vincent & Grenadines for 2005 for the northern stock, the Group decided to use the average catch during the latest five years (2000-2004) to fill the gap noted for 2005. All the above changes and the complete revision made during the Data Preparatory Meeting held in 2006 and the *Ad Hoc* Meeting to Prepare Multifan-CL Input (March 2007) were included in the Secretariat database and these data are shown in **Table 2** and **Figure 1**.

According to this latest revision and the reclassification of catch by main fleets and gear, the geographic distribution of the catch is plotted in **Figure 2**.

3.2 Size frequencies

The March 2007 *Ad Hoc* Meeting to Prepare Multifan-CL Inputs for the 2007 Albacore Assessment initiated a review of the Task II size samples available in the Secretariat database for use in analysis at the 2007 albacore assessment. Intersessionally, work continued on the screening of these data and the results of this work are summarized in Section 5 of this report.

4. Catch-at-size (CAS) and Catch-at-Age (CAA)

4.1 CAS estimates for the northern and southern stocks

Since the last albacore assessment (Anon. 2004), national scientists have invested significant efforts into the revision and updating of historical size data, especially aimed to fill the needs for the Multifan-CL modeling approach. A breakdown of samples by fleet (Portuguese baitboat from Madeira and Azores Islands, and Spanish baitboat from Canary Islands and Cantabrian Sea) allowed for separation of the catch-at-size series by fishery. Historical revisions of South African baitboats (1979-2001), Japanese longliners (1992-2005), Brazil home-based longliners (1978-1985, 1992-2005) with a more detailed and homogeneous structure, were also made. Several identified gaps on some time series (Canada longline, 1999; Spanish Cantabrian baitboat and troll, 1979, 1981, 1992), or doubtful datasets (Chinese Taipei 1986) were also corrected.

In order to incorporate all the size revisions made, the Secretariat recreated the entire albacore (**Tables 3** and **4**) estimates for the period 1975-2005, for both North and South stocks. Details about the methodology used are presented in document SCRS/2007/104. The substitution rules adopted were basically the same ones used in past CAS estimations.

The overall CAS matrix of both northern and southern stocks has no large differences when compared to those used in the last assessment (SCRS/2003/017). More important differences could appear when comparing CAS matrices of single fisheries. Nevertheless, the Group decided to adopt the new CAS estimations due to improvements made in size data and gains in detail (fisheries breakdown and/or gear breakdown). Another important feature of the new estimates is that CAS and Multifan-CL base datasets were built with the same source information.

The substitution ratios of total Task I catch for the North (around 10% in recent years) and South Atlantic (around 20% in recent years) stocks are shown in **Figures 3** and **4**, respectively. These substitution ratios do not include those made by national scientists who submitted catch-at-size data and are thus conservative estimates. The above figures also show that the CAS reported by national scientists is much higher for the northern stock (mainly Spanish baitboat and troll fisheries, and, Japanese longline) than for the southern stock (lack of the some of the major longline fisheries).

4.2 CAA estimates for the northern and southern stocks

The July 2006 Data Preparatory Meeting for the Albacore Assessment recommended to the Secretariat the responsibility to produce the catch-at-age (CAA) estimates for the northern stock, applying the Kimura-Chikuni algorithm (Kimura *et al.* 1987). During this assessment, the Group decided to expand this methodology to the southern stock, by adopting the same coefficient of variation by age and quarter of used in the North, and, using new von Bertalanffy growth parameters estimates (SCRS/2006/110) for the South to estimate the mean length at age. Normal probability matrices of length-at-age were calculated (one for each quarter), with November 15 as the birth date. The CAA estimates were made using as input the new CAS matrices.

4.2.1 Northern stock

The CAA matrices for the northern stock (total and by major fishery) are shown in **Table 5** and **Figure 5** shows bubble plots of relative number of fish by year and age (1 to 8) of the major fisheries. For the surface fisheries (Spain BB and TR, France TR) the first three age groups are those most represented in the catches. In the longline fisheries, Japan shows a predominance of ages 3, 4 and 5, the United States a predominance of ages 4 to 7. Chinese Taipei longline shows three distinct periods: before 1987 with large dispersion between ages 3 to 8; dominance of ages 3 and 4 between 1993 and 2001; dominance of age 6 from 2002 onwards. Overall there are few fish assigned age 7 in the catch at age, compared to age 6 and the plus group, indicating that the length data alone may be insufficient to resolve ages above 6.

4.2.2 Southern stock

The CAA matrices for the southern stock (total and by major fishery) are shown in **Table 5** and **Figure 6** shows bubble plots of relative number of fish by year and age (1 to 8) of the major fisheries. The major surface fisheries (South Africa BB and Namibia BB) show a predominance of ages 3 to 5, with the exception of Namibia in 2002-2003 with a majority of the fish in ages 7 and 8. The longline fisheries show, in general, a very heterogeneous dispersion, but with the domination of large ages. Japan has fish spread between ages 2 and 8 with an insignificant predominance of ages 3 to 5. Exception is shown in 2001 and 2002 where age 1 is prevalent. In the Chinese Taipei fishery, a large quantity of fish in age 8 (the plus group) in all series was noted.

5. Relative abundance indices

5.1 Indices by age for VPA-2BOX model fit

5.1.1 North Atlantic

Relative abundance indices by age group of albacore caught by the Spanish troll fleet in the northeastern Atlantic were estimated using catch rate data in number of fish by fishing day (CPUE) from 6,254 individual trips collected for the period 1981-2005 (SCRS/2007/099). Standardized CPUEs for age groups 1 to 4 were estimated through a general linear modeling (GLM) approach by assuming a log-normal error distribution model. Since this fleet does not target age 1 and the availability of age 4 varies on an annual basis, the Group decided, as in previous assessments, to use only the CPUE indices for ages 2 and 3 as relative abundance indices.

Nominal catch per unit effort (number of fish caught per thousand hooks) of north Atlantic albacore recorded from Chinese Taipei longliners from 1967 to 2005 was used to estimate standardized CPUEs by means of a generalized linear model (GLM) approach (SCRS/2007/093) assuming a log-normal error distribution. Three sub-areas were identified and used for the standardization. The standardized yearly CPUE series showed a continuous decline from mid-1980s up to 2002, with a pronounced increase in the last three years of the series, which is probably related to changes in the composition of the fleet (less efficient boats are being removed) or in the way catch rates are reported (only include records from efficient boats). The Group decided to adjust this series before using it in the VPA. The original standardized CPUE values for the last three years were divided by an index, which was defined as the ratio between the average for years 2003-2005 and the average for 2000-2002 (Chinese Taipei LL adjusted).
Japanese longline catch rates were standardized for three separate periods (1959-69, 1969-75 and 1975-2005)

using two models: one with a log-normal (LN) error structure and the other with a negative binominal (NB) error structure (SCRS/2007/103). Both standardized series showed a notable decline during the 1960s and early 1970s, a moderate decline during the 1980s, and became near constant during the 1990s; finally, the series showed a slight upward trend during the late 1990s and the 2000s. It was attempted to clarify which model error assumption was more appropriate using information criteria. Results showed that the LN model was better than the NB for the periods 1959-69 and 1969-75 while the NB model was better for the period 1975-2005. However, since model selection by means of information criteria seems not appropriate to discriminate between models fitted to different data, the Group, based on the inherently better statistical properties of the negative binomial error model for this kind of data, decided to use the NB standardized CPUEs for the three periods as indices of relative abundance for the VPA.

The U.S. albacore non-target nominal catch per unit of effort, in number of fish caught per thousand hooks (CPUE) from the longline fleet, was used to obtain the relative catch rate indices estimated by a GLMM (Generalized Linear Mixed Model) approach assuming a delta-lognormal model distribution. Results were presented in SCRS/2007/151.

For the French troll earlier fishery from 1967 to 1986 years time series, the catch per unit of effort (CPUE) of age 2 and 3 was estimated with a GLM model with log-normal error structure to standardize daily CPUE (Goujon *et al.* 1996). Since then no updated information of the French fleet has been available to the Group.

Data used from final models for each given fishery are presented in **Table 6** and **Figure 7** shows the scaled time series of CPUE for surface and longline main fisheries used in the assessment.

5.2 Indices by age for Multifan-CL

5.2.1 North

As was required in preparation for Multifan-CL modeling of Atlantic albacore stocks, extensive work was carried out in preparation of several CPUE time series, which were analyzed for this modeling purpose by year and quarter. More detailed information on the methods and model assumption area are included as Appendix 4 of the Report of the A*d Hoc* Meeting to Prepare Multifan-CL Inputs for the 2007 Albacore Assessment held in March 2007. A list of documents is included in this report as well as some CPUE analyses done by the Group at that meeting in Appendix 5 are presented in that report.

New nominal catch per unit effort (number of fish caught per thousand hooks) on quarterly *year strata of north Atlantic albacore recorded from Chinese Taipei longliners from 1967 to 2005 was used to estimate standardized CPUEs by means of a generalized linear model (GLM) approach assuming a log-normal error distribution was presented to the Group (SCRS/2007/093). As was done in the case of the annual standardized CPUEs, the quarterly*year standardized CPUEs were adjusted.

New model analyses were presented for the Japanese longline catch rates on year*quarter strata as required for the Multifan model fit. Those CPUEs were standardized for three separate periods (1959-69, 1969-75 and 1975-2005) using a negative binominal (NB) error structure (SCRS/2007/103).

5.2.2 South

As was required in preparation for Multifan-CL modeling of Atlantic albacore stocks, extensive work was carried out on in preparation of several CPUE time series, which were analyzed for this modeling purpose by year and quarter. More detail information about methods and model assumption area included as Appendix 4 to the Report of the A*d Hoc* Meeting to Prepare Multifan-CL Inputs for the 2007 Albacore Assessment held in March 2007. A list of documents is included in that report as well as some CPUE analyses done by the Group at that meeting that were included in Appendix 5 of the March report.

New data on the Brazilian fleet were presented to the Group (SCRS/2007/105). The catch and effort data from 67,335 sets of the Brazilian tuna longline fleet in the southwestern Atlantic Ocean, from 1978 to 2006 (29 years), were standardized using GLM. The negative binomial error structure was selected as it was considered the most suitable for the Brazilian dataset (which has a high number of no catch sets). The factors considered in the final model were year, area, target specie (defined through K-means cluster analysis), quarter and year*quarter.

Nominal catch per unit effort (number of fish caught per thousand hooks) on quarterly*year strata of South Atlantic albacore recorded from Chinese Taipei longliners from 1967 to 2005 used to estimate standardized CPUEs by means of a generalized linear model (GLM) approach assuming a log-normal error distribution was presented to the Group (SCRS/2007/094). As was done in the case of the annual standardized CPUEs these quarterly*year standardized CPUEs were adjusted following the same procedure as described in the ASPM indices section (5.3 Indices of abundance).

Also, a new model analyses was presented for the Japanese longline catch rates on year*quarter strata as required for the Multifan-CL model fit. Those CPUEs were standardized for three separate periods (1959-69, 1969-75 and 1975-2005) using a negative binominal (NB) error structure (SCRS/2007/103).

5.3 Indices by age group for Age Structured Production models (ASPM) fit

New data on the Brazilian fleet was presented to the meeting (SCRS/2007/105). The catch and effort data from 67,335 sets of the Brazilian tuna longline fleet in the southwestern Atlantic Ocean, from 1978 to 2006 (29 years), were standardized using GLM. The negative binomial error structure was selected as it was considered the more suitable for the Brazilian dataset (with a high number of no catch sets). The considered factors on the final model were year, area, target species (defined through K-means cluster analysis), quarter and year*quarter.

The Japanese longline CPUE was separately standardized into three periods (1959-69, 1969-75 and 1975-2005) using two models; one with a log-normal (LN) error structure, while the other used a negative binominal (NB) error structure (SCRS/2007/103). Both standardized CPUEs declined during the 1960s and the early 1970s; after that the CPUEs fluctuated and showed no clear trend. An attempt was made to clarify which model was more appropriate using information criteria. Results showed that the LN model was better than the NB model for the periods 1959-69 and 1969-75, while the NB model was better for the 1975-2005 period. However, the Group decided to use the standardized CPUEs for the NB model for three periods for the south stock as indices of abundance since the calculation of information criteria was not necessarily appropriate.

The Chinese Taipei longline catch and effort statistics of 1967-2005 South Atlantic albacore were standardized by using Generalized Liner Model with log normal residual assumption. Factors such as year, quarter, sub area, by-catch effects of bigeye tuna, yellowfin tuna, and swordfish were used to obtain the yearly standardized CPUE trend from 1967 to 2005. The annual CPUE trends indicated that the abundance in number of South Atlantic albacore declined from the late-1960s to 1990, leveled off up to 2003, and showed an upward trend in 2004 and 2005. The Group decided to adjust this series before using it in the age-structured production model ASPM. The original standardized CPUE values for the last three years were divided by an index, which was defined as the ratio between the average for years 2003-2005 and the average for years 2000-2002 (Chinese Taipei LL adjusted).

South Atlantic albacore catch rates (weight by fishing days) per quarter from the South African baitboat fishery were standardized (SCRS/2007/040) and split into two series, from 1985 to 1998 and from 1999 to 2005. The reason for the split series was that more detailed information was available in the latter time period to allow for more appropriate vessel classification and catch verification processes. The Generalized Liner Model with log normal residual distribution assumption was used. Factors such as year, area, quarter and year*quarter interaction effects were included in the first period time series (1985-1998) analysis adding to these factors the by-catch effect in the most recent period (1999-2005) to account for the targeting away from albacore in favor of other species. Analyses were performed on the positive observations. The Group decided to average the year quarterly standardized CPUE to obtain annual standardized CPUEs for this fleet.

Data used from final models for each given fishery is presented in **Table 7** and **Figure 8** show the scaled time series of CPUE for the baitboat surface fishery and main longline fisheries used in the assessment of the southern albacore stock.

6. Methods and other data relevant to the assessment

6.1 VPA-2BOX

The Group decided to apply a VPA-2BOX model repeating the Base Case scenario from the 2000 northern albacore stock assessment using the revised catch-at-age and catch per effort data. The Group was concerned about the quality of the new catch-at-age data for the reasons outlined in section 3.7, but wished to examine the potential implications of the changes on the assessment advice. The analysis was conducted using updated versions of the Spanish, U.S., Chinese Taipei, Japanese and French fisheries indices (same fisheries used in the 2000 and 2003 assessments) (**Table 6)**. A lognormal error structure was assumed for all indices within the VPA model. The selectivity at age for each index was estimated from the partial catches using the method proposed by Butterworth and Geromont (equation 4, Geromont and Butterworth, 1997), except, of course, for the two Spanish troll indices, which reflect only one age class. The terminal (2005) fishing mortality rates for ages 2-7 were estimated and the 2005 fishing mortality rate on age 1 was set to 20% of that on age 2. Initially, the F-ratio (F on the oldest age divided by the F on the next younger age) was fixed to 1.0 for all years. The natural mortality rate was fixed at 0.3.

It was found that the weight-at-age matrix provided an average weight for the age 8+ group corresponding to a fish of age 7.7. Therefore, it was decided to use a constant annual weight-at-age estimated from the growth and L-W equations (mid-year weight in kg).

Age 1	*Age 2*	*Age 3*	*Age 4*	*Age 5*	*Age 6*	*Age 7*	*Age 8+*
3.30	6.90	11.07	15.47	19.08	23.59	27.02	36.13

6.2 Multifan-CL

Basic data

The data sets used for the Multifan-CL analyses were initially compiled during the March 2007 inter-sessional meeting. The fisheries included in the model are given in **Table 8**. For the July assessment, the data sets were modified as follows:

- The catch information was updated to reflect updates to the Task I data.
- The CPUE (fishing effort) data were changed to reflect updates presented by national scientists for the following indices: Japan (North and South), Chinese Taipei (North and South), and Brazil (South).
- The size data set was modified according to the following rules which were adopted as a result of inter-sessional discussions between interested scientists: (a) Delete records with fewer than 50 fish measured in all size bins; (b) delete records with measured fish in less than 10 bins (out of 61 bins); (c) delete records with a skewness parameter greater than 5.0; (d) within each fishery, downweight all of the size samples such that the (year/quarter/fishery) with largest sample size had 1000 measured fish. These changes resulted in the removal of 119 and 62 size records for the northern and southern stocks, respectively.

Table 9 shows the catch data by fishery and **Table 10** gives effort data by fishery. **Figure 9** summarizes the size distributions.

Model options

Table 11 shows the basic modeling options made by the Group for various fisheries. These were based on knowledge of the fisheries and a cursory examination of the data. The longline fisheries were assumed to have non-decreasing selectivity.

The Group then conducted eight preliminary runs for each stock (**Table 12**). These included various combinations of options that included fixing or estimating natural mortality, fixing or estimating some of the growth parameters, estimating or not random walks in catchability for some fisheries, and the number of years used for estimating initial stock size based on equilibrium total mortality.

The number of age groups was set at 15, and the growth equations used were those of Bard (1981) for the North and Lee and Yeh (2007) for the South. For MSY calculations, a stock-recruitment relationship was fitted with a very weak penalty so as to not affect the results, with a prior of 0.9 for the steepness parameter.

6.3 ASPM

6.3.1 ASPM

The age-structured production model described in Rademeyer *et al.* (2004) was used to assess the southern albacore tuna stock. This age-structured production model replaced the previously used production model (Punt *et al*. 1997) since this newer version uses catch-at-age data to estimate multiple selectivities. The model code was available in a back up of the 2003 assessment. However, the by-catch transitions that were previously estimated by the model have been removed and only different selectivity for the various CPUE indices (**Table 7**) have been estimated by using the updated catch-at-age matrix (**Table 5**). For the Chinese Taipei and the Brazilian CPUE index, a single logistic selectivity was estimated. It was further assumed that the first two time-series (1956-1968 and 1969-1974) of the Japanese CPUE index fished with the same selectivity as the Chinese Taipei fleet. Selectivity for the latest time-series (1975-2005) of the Japanese index was assumed to be logistic with a slight decrease in the older ages (domed-shaped). For South Africa and Namibia a dome-shaped selectivity was estimated over the whole time period.

Catches were split into five fleets mainly following Rademeyer *et al.* (2004) as described in **Table 13** and the catches by fleet are given in **Table 14**. Further additional model specifications are given in **Table 15.** Initial model runs were all made with a constant natural mortality of 0.3 and a constant steepness parameter of 0.7. Management quantities of sensitivity tests were compared in cases were either natural mortality or steepness parameters or both were estimated.

6.3.2 ASPM_2

The age-structured production model (ASPM), which was proposed by Punt *et al*. (1997) and modified by Legault and Restrepo (1999), was applied at this session mainly for the purpose of comparison because most of the assessment in the past decade for South Atlantic albacore relied on this model. Additionally, this model does not explicitly use the catch-at-age matrix in fitting, although the age-structure matrix is updated within the model, based on externally specified, fleet-specific selectivity. Not directly incorporating the catch-at-age matrix may not be a weak point for the model if: (1) the input catch-at-age matrix is not explanatory; or (2) the specified selectivity already has its good reasoning. The selectivity curve of most fleets used information available during the previous two assessments. Only the Chinese Taipei fleet changed from a dome shaped to a sigmoid curve, mainly due to the fact that most Chinese Taipei longline catch in size are around 100 cm fork length, which is about age 7 based on the Lee and Yeh (2007) von Bertalanffy (vB) growth equation. Therefore, a sigmoid selectivity curve setting age 7 as 100% was adopted by the Group.

Removal by fisheries of South Atlantic albacore can be categorized by two types of gears, i.e., the longline (LL) fleets and the surface (baitboat or BB) fleets (**Table 16**). Seven CPUE indices series (JapanLL 1959-1969, JapanLL 1969-1975, JapanLL 1975-2005, Chinese Taipei LL 1968-2005, BrazilLL 1978-2005, South AfricaBB 1985-1998, and South AfricaBB 1999-2005) from the two fleets were provided (**Tables 7** and **17**) for the modeling of this stock. Yearly total removals by the two fleets were also provided for the model (**Table 18**). Further specifications, such as selection of parental-recruitment pattern, vB growth equation, length-weight conversion pattern, natural mortality, and plus age number were also provided (**Table 19**).

7. Stock status results

7.1 VPA-2BOX

In an initial run, before defining the base case, the fits to the indices were poor (**Figure 10**). Improvements in the indices fit were attempted by making model runs using the combination of indices as follows:

1) Spain + France + Japan + Chinese Taipei
2) Spain + France + Japan + US
3) Spain + France + US + Chinese Taipei
4) Spain + France + Japan
5) Spain + France + US
6) Spain + France + Chinese Taipei

None of the runs with the different combinations of indices improved the fit to the indices. Another attempt was made to improve the fits to the indices by changing the F-ratio of the initial year (1975) to values of 0.25, 0.5 and 1.0, and for the period 1976-2004, F-ratios were modeled with a random walk, and for the final year 2005 it was kept fixed to a value of 1.0. In all cases, a lognormal prior with a mean of 1 and a log-scale standard error of 0.1 was used.

Changes to the F ratios resulted in some improvement of the fits to the indices (see **Figure 11** for case of F ratio=0.5). An additional comparison of the F8/F7 ratios with the ratio of the catch of the longline fisheries to the catch of the surface fisheries (**Figure 12)** guided the Group to choose the case of the F-ratio of the initial year=0.5 as the base case. Sensitivities were run for the following cases (F ratio for the initial year):

1) F-ratio=0.25,
2) F-ratio=1.0
3) F-ratio=0.5 without the last three years (2003-2005) of the Chinese Taipei index of abundance.

No substantial differences between the base case and the sensitivities were observed with respect to the estimated trajectories of relative F (F/F_{MSY}), relative SSB (SSB/SSB_{MSY}), and the current status of the stock. The VPA indicated that overfishing occurred during the entire period analyzed (1975-2005), but the stock did not become over fished until 1992 (**Figure 13**). By 2005, the stock remained over fished (SSB_{2005}/SSB_{MSY} = 0.86) and experiencing overfishing conditions (F_{2005}/F_{MSY} = 4.6). The stock trajectories with respect to relative F and relative SSB are presented in **Figure 13.** Fishing mortality rate at age and stock size at age for the base case are shown in **Tables 20** and **21,** respectively.

A retrospective analysis was conducted back to 1999. Estimated F for Age 1, Age 2-4, Age 5-7 and Age 8+ for each retrospective scenario are presented in **Figure 14.** There are retrospective patterns evident in the analysis which suggested that with new information, terminal year estimates of F on Age 1 and on the Age 8+ group increases, and tends to converge after several years of data accumulated. The same pattern can be seen for the older age groups (Ages 5 to 7), but there is a less obvious pattern in the Ages 2 to 4 category. The Group decided not to apply any retrospective pattern adjustments to the estimates, following the procedures applied in the 2000 and 2003 assessments.

Given the patterns of fishing mortality at age from the base VPA run, an additional sensitivity analysis was run with an age-structure with a 6+ group instead of an 8+ group. Catch-at age and the age(s) index-coverage were properly adjusted, and the VPA was run for the same time period (1975-2005). Two runs were considered: (a) fixing the F ratios for Age 5 and Age 6+ to 1.0 for all years, and (b) allowing a random walk (estimated F ratios with a correlated process error) for all years except 1975 where it was freely estimated.

Figure 15 shows the trends of biomass, fishing mortality, recruits, and ratios of SSB against SSBmsy and SSB20%SPR. Fits to the indices of abundance of each run are shown in **Figure 16.** The VPA runs show a different historic trend of the northern albacore stock. Fixing the F ratios of the plus group resulted in a larger estimated biomass through the series and also implies a different trend, with a decrease in the first years up to 1985, followed by an increase of SSB reaching a peak in 1992, and follow for a decline since then. Instead, allowing estimation of F ratios for the plus group (Age 6+) with a restricted random walk, estimated a smaller stock that declined more or less continuously since 1975. Estimates of recruits were comparable except for 1987 when a large recruitment entered the fishery, producing the increase of biomass most likely in response to the large value for the Chinese Taipei index of abundance value in 1988. In the case of random walk estimation for the plus-group, the VPA fit indicated a continuous increase in the ratio of F Age6+/5, reaching a value of 5 in the last year.

For purposes of characterizing stock status with the VPA, the Group decided to utilize the Base Case identified above and conducted bootstrap (500) analysis to characterize uncertainty and several sets of stochastic projections identified below. Estimated benchmarks are presented in **Table 22**, while **Figure 17** shows the stock trajectory as a plot of relative SSB versus relative F and the scatter plot of the 500 bootstrap estimated values for year 2005 together with the deterministic value.

7.2 Multifan-CL

The Group examined initially the results of the eight model runs made for the North and South. Since the relative effects of changing one of the modeling options were similar for the two stocks, a more detailed graphic summary is provided here for the North only.

North

Figures 18, 19 and **20** show the estimated trends in SSB relative to the MSY level, F relative to the MSY level and absolute recruitment. All of the runs gave similar results in terms of fit diagnostics and estimated trends.

The Group examined the runs in which M was estimated and considered that either the patterns or the magnitudes were not very reasonable. In addition, for comparison purposes since M was fixed in all of the other analyses, the Group decided that the runs with M=0.3 would be preferable. In addition, the Group considered that the Japanese longline fisheries in the transition and by catch periods could have dome-shaped selectivity and asked that a new run be conducted modifying this assumption. Also, in this new run ("Base Case"), the steepness prior was changed to a mode of 0.75.

The eight preliminary runs specified month 6 as the month of recruitment. This had an effect in the way the model keeps track of time, which resulted in the first time period corresponding to the first half of 1930, and the last time period corresponding to the second half of 2005. Therefore, the Group decided to change the month of recruitment to 1 which would result in annual time steps comparable to those in the VPA.

Figure 21 shows the results for the base case. They are similar to, but somewhat more optimistic, than those of Run 8. **Figure 22** shows the estimated selectivity patterns.

In terms of diagnostics, **Figure 23** shows the spread of estimated effort deviations for the different series. Some time series patterns are evident, especially for the longline fisheries. In addition, there is a noticeable change in the spread for fishery 2 (composite troll series), which is not unexpected since the data set was composed of different time series. Nevertheless, the fits seem reasonable.

The estimated MSY for the base case is 30,230 t (s.d. = 2,850). The 2005 spawning stock is estimated to be 0.814 times the corresponding MSY level and the fishing mortality is estimated to be at 1.491 times the MSY level[1]. Therefore, the stock is estimated to be below the target level established by the ICCAT Convention.

The Group noted that the MSY levels can be affected by changes in selectivity, among other things. Since the MFCL application allowed for a long-term view of the resource starting in 1930, the Group calculated changes in MSY benchmarks over time. The estimated trend in MSY is shown in **Figure 24**. A gradual increase in MSY between the mid-1950s until the mid 1960s is evident, concurrent with the increase in fishing by longline fisheries which caught larger fish than the troll fisheries did.

Figure 25 shows the track of (Relative F, Relative SSB) pairs from 1930 to 2005. **Figure 26** shows the same tracks, divided by decade. The decade corresponding to the 1950s had the largest decline in SSB, due to increased fishing on mature (ages 5+) albacore. The most apparent incursions into the overfished (SSB ratio < 1) and overfishing (F ratio > 1) quadrant were in the 1960s and since the 1990s (**Figure 26**).

Figure 27 shows the scatter plot of SSB and recruitment estimates and the fitted relationship.

South

The results of the preliminary MFCL runs made for the southern stock (**Figure 28**) were viewed as unsatisfactory. The estimates of recruitment showed a strong increasing for most of the observed time period trend which is probably being driven by the combination of (a) increasing catch and (b) lack of catch-effort observations for small fish before the mid 1980s. The Group attempted to correct this problem by imposing different penalties on the model parameters being estimated, but the different trials did not improve the situation greatly. The Group recommended that the input dataset be analyzed more exhaustively in the future.

7.3 Other methods

7.3.1 ASPM

Considering that the CPUE index data are somewhat more reliable than the catch-at-age data the model was run by down-weighting the catch-at-age data in order to fit the high CPUE values in the early years of the Chinese Taipei and Japan CPUE series. Various weightings were considered and the management quantities for those are shown in **Table 23**. The lower the weighting the better the data is fitted as can be seen from the improvements of the negative log-likelihoods. For further evaluations of the model results the weighting of 0.125 was used. It was estimated that it is likely that the stock is currently below the maximum sustainable yield (MSY) level. The spawning biomass is estimated to be 74% of the MSY level, whereas the biomass of albacore tuna that are 2 years and older are estimated to be 86% of the MSY level. The MSY was estimated to be around 30,000 tons, whereas the replacement yield (RY), averaged over the last 10 years, is calculated to be approximately 27,000 tons. The model fits to the CPUE series are reasonable (**Figure 29**) with the exception of the very early years of the Chinese Taipei and Japanese CPUE series. The residuals of the catch-at-age matrix (**Figure 30**) are large in some instances and also some patterns are obvious. It is however generally accepted that the catch-at-age matrix for the southern albacore tuna stock has a high level of substitutions and therefore highly uncertain (**Figure 6)**. No distinct pattern is shown in the recruitment residuals and a reasonable fit of the estimated stock-recruitment curve is illustrated in **Figure 31**. The selectivities estimated for the different fleets are sensible (**Figure 32**). A biomass trajectory relative to the maximum sustainable yield biomass is shown in **Figure 33.** Only the results of

[1] For later work: The respective standard deviations for the SSB and F ratios are 0.112 and 0.137, and their correlation is -0.392.

the base case are presented in this report. Detailed results for all the sensitivity tests are available in the ICCAT secretariat.

In **Table 24**, the 95% percentiles of some of the benchmarks and management quantities are presented. It must be noted that these intervals are conservative as in the base case model the steepness parameter as well as natural mortality are fixed.

Past management strategies in terms of catch taken relative to replacement yield and resulting stock status in terms of current spawning biomass relative to the spawning biomass at MSY are shown in **Figure 34.** The snail track is the result of the base case and the individual circular points indicate the current position of all the sensitivity runs. It is clear that for all but one sensitivity run, the stock is estimated to be below the MSY level.

7.3.2 ASPM_2 model

As compared to the results presented to the Group in document SCRS/2007/95, which also used ASPM_2 model, some specifications have been modified following new information obtained during the meeting, such as: (1) yearly total catch follows updated Task I data; (2) adopting revised Japanese and Chinese Taipei standardized CPUE trends; and (3) revised selectivity patterns (**Figure 35**) as discussed and agreed to modify selectivity from dome shape to sigmoid for the Chinese Taipei longline by the Group. Two cases of (1) constant steepness at 0.7 (deterministic) and (2) optimized steepness (stochastic) were implemented. **Figures 36 to 38** indicated the predicted CPUE trends by the model (**Figure 36**), parental recruitment pattern (**Figure 37**), and long-term recruitment trend (**Figure 38**) obtained from the stochastic case. **Figures 39-41**, indicated the predicted CPUE trends by the model (**Figure 39**), parental recruitment pattern (**Figure 40**), and long-term recruitment trend (**Figure 41**) obtained from the deterministic case. In general, these fittings are acceptable, although plots revealed by stochastic case are often better fitted than those from deterministic case. Benchmarks estimated by the model are shown in **Table 25.** The values obtained in both cases are quite similar, although the stochastic version appeared to be more comparable to those resultants obtained in previous assessments. The lower MSY estimation and poor stock conditions obtained in this assessment may have stemmed from huge yields of South Atlantic albacore in early 2000s.

8. Projections

8.1 VPA-2BOX

Projections of the Base Case were conducted using 500 bootstraps. Projections were run by keeping the current catch level (36,000 t) for years 2006 and 2007 and projecting for years 2008-2020 for a constant catch of 38,000 t, 34,500 t (TAC), 36,000 t (2005 catch), 32,000 t, 30,000 t, 26,000 t, 25,000 t, 20,000 t, and also for F values of $F_{CURRENT}$, F_{MSY}, F_{MAX}, $F_{20\%SPR}$, $F_{30\%SPR}$, and $F_{40\%SPR}$. Future recruitment was assumed to follow a Beverton-Holt SRR estimated from the VPA bootstrap-specific outcomes, using the spawning stock and recruitment estimates from the VPA.

Two assumptions were used regarding the last three years of recruitment estimates from the VPA. Normally the estimates of year-class strength for the most recent period in the CAA data are considered too unreliable for use in future projections (see, for example, the retrospective patterning in **Figure 14**) and are replaced with values derived from the SRR used for projections. This was also done in this case. However, as the recent fishery catch rates of young (age 2) fish indicate a relatively strong year-class entering the fishery, the Group also decided to project all of the VPA estimated year class abundance estimates to compare and contrast implications resulting from an estimated strong year-class entering the fishery in the recent past.

Results of the projections which assumed the recent year class strengths were average (on the order of 9,000,000 age 1 fish) and future year classes followed the SRR indicated that catch levels corresponding to the present TAC (34,500 t) or higher catches will result in further decline in stock status (**Figures 42 and 43**). Constant catches on the order of 30,000 t or lower would promote improvement in stock status. Similarly, these projections indicate current F levels or higher would result in further decline in stock status. Other F scenarios tested, which are all lower than the current F are projected to result in improved stock status.

Results of the projections which assumed the 2003 year class (fish of Age 1 in 2004) was strong (on the order of 12,000,000 Age 1 fish) the recent year class strengths were above average and future year classes followed the SRR indicated that catch levels corresponding to the present TAC (34,500 t) or higher catches will result in some near-term increase in SSB, but a slow decline in stock status (**Figure 44**) after the year-class passes through the fisheries. Constant catches on the order of 32,000 t or lower would promote sustained improvement in stock status. Similarly, these projections indicate current F levels or higher would result in further decline in stock status. Other F scenarios tested, which are all lower than the current F are projected to result in improved stock status.

Estimates of yield-per-recruit (YPR) and spawner-per-recruit (S/R) for different values of F are shown in **Figure 45**.

8.3 ASPM

From ASPM_2 model, projections regarding the biomass of the southern albacore tuna were made under various constant catch assumptions (viz. 18, 21, 24, 27, 30, 33 thousand tons). The stock is estimated to be somewhat below the maximum sustainable yield level. Previously, a TAC of 31,000 tons was allowed. However, from **Figure 46** it is obvious the constant catch of this magnitude will further deplete the stock. The replacement yield was estimated to be around 27,000 tons, so catches taken from the stock should be lower than this value in order to increase the stock. **Figure 47** shows the biomass trajectory with the 95 percentiles of a constant TAC of 25,000 tons. Considering the lower percentile there remains a possibility of the stock remaining below the maximum sustainable yield (MSY) level over the next 10 years. Note that these percentiles are conservative, as both steepness parameter and natural mortality are fixed inputs in the base case scenario.

9. Recommendations

Greater standardization of ageing methodologies across laboratories and readers is needed and the Group proposed that an ageing activities network be created, as has been done in the case of bluefin.

The Group recommended that the revised vB growth equation for South Atlantic albacore, adopted by the Group, be incorporated into the *ICCAT Manual* and web page.

It is recommended to continue to investigate the conversion of catch-at-size (CAS) into catch-at-age (CAA) for the assessments for both North and South Atlantic albacore stocks (i.e. length slicing methods, age-length keys derived from aging methods).

Studies on fecundity and maturity for both North and South albacore are needed to better estimate the potential spawning stock biomass.

Tagging programs for Atlantic albacore stocks should be initiated and promoted.

It is recommended that Task I data reported for EC-France be disaggregated by species, gear, area and flag, as is the required standard format from ICCAT. Most of the analyses done on albacore required disaggregated catch.

The Group recommended finding ways to incorporate the historical catches of French troll catches into the ICCAT database.

The Group reemphasized the need for biological size sample data (Task II), especially from longline fisheries in the North and South stocks as a result of examination of size sample data available at Secretariat. The scarce sample size of adult albacore limits the precision of the analyses the Group can conduct. The Group recommended that biological size sampling data (Task II) from all fisheries be reported as stratified as possible, by 1x1 degrees squares for surface fisheries and by 5x5 degrees squares for longline fisheries.

The tagging data for albacore should be incorporated into the assessment model to the degree possible, with an aim to improve the scientific advice to the Commission on albacore productivity potentials.

The Group recommended the development of standardized CPUE series for all the main fleets exploiting the North and South Atlantic albacore stocks.

The Group recommended continuing the investigation of modeling of the North and South albacore stocks with statistical models for use in future assessments.

10. Other matters

No other matters were discussed.

11. Adoption of the report and closure

The report was adopted and the meeting adjourned.

Literature cited

ANON. 2004. 2003 ICCAT Albacore Stock Assessment Session (Madrid, Spain, 15-20 September 2004). Col. Vol. Sci. Pap. ICCAT, 56(4): 1223-1311. (SCRS/2003/017)

ANON. 2007. Report of the 2006 ICCAT Data Preparatory Meeting for Atlantic Albacore (Madrid, Spain, July 2-7, 2006). Col. Vol. Sci. Pap. ICCAT, 60(2): 351-403. (SCRS/2006/014).

BARD, F.X. 1981. Le thon germon (*Thunnus alalunga*) de l'Océan Atlantique. Ph.D. Thesis presented at the University of Paris, 333 p.

GEROMONT, H.F. and D.S. Butterworth. 1997. Specifications for the Adapt VPA Code, September 1996 (Revised). Col. Vol. Sci. Pap. ICCAT, 46(2): 321-324.

GOUJON, M., L. Antoine and D. Gascuel. 1996. Trends of abundance indices of albacore tuna *(Thunnus alalunga)* obtained by GLM fitting of the French troll and baitboat catch per unit of effort data for the period 1967 to 1986. Col.Vol. Sci. Pap. ICCAT, 43: 295-300.

KIMURA, D.K. and S. Chikuni. 1987. Mixtures of empirical distributions: an iterative application of the age-length key. *Biometrics* 43: 23-35.

LEE, L.K. and S-Y. Yeh. 1993. Studies on the age and growth of south Atlantic albacore (*Thunnus alalunga*) specimens collected from Taiwanese longliners. Col. Vol. Sci. Pap. ICCAT, 40(2): 354-360.

LEE, L.K. and S-Y. Yeh. 2007. Age and growth of South Atlantic albacore – a revision after the revelation of otolith daily ring counts. Col. Vol. Sci. Pap. ICCAT, 60(2): 443-456. (SCRS/2006/110)

LEGAULT, C.M. and V.R. Restrepo. 1999. A flexible forward ae-structured assessment program. Col. Vol. Sci. Pap. ICCAT, 49(2): 246-253.

PUNT, A.E., D.S. Butterworth, A.J. Penney and R.W. Leslie. 1997. Further development of stock assessment and risk analysis methods for the South Atlantic population of albacore *(Thunnus alalunga)*. Col. Vol. Sci. Pap. ICCAT, 46(3): 138-147.

RADEMEYER, R.A., D.S. Butterworth and A.J. Penney. 2004. A Bayesian Assessment of the South Atlantic population of albacore which explicitly models changes in targeting. Col. Vol. Sci. Pap. ICCAT, 56(4): 1360-1390.

Table 1. Biological parameters and conversion factors for North and South albacore stocks.

North Stock	Parameters	Source
Growth	$L\infty$ = 124.74 cm; k = 0.23 per year; and t_0 = - 0.9	Bard, 1981, ICCAT Manual
Length-weight relation	a=1.339 10-5 b=3.107	Santiago (1982)
Maturity	50% of mature fish at 90 cm (age5)	Bard (1981)
Assumed birth month	May	
Assumed month @ 30cm	November	
South Stock		
Growth	$L\infty$ = 147.5 cm; k = 0.126 per year; and t_0 = - 1.89	new Lee and Yeh, SCRS/2006/110
Length-weight relation	a=1.3718 10-5 b=3.0973	Penney (1993)
Maturity	50% of mature fish at 90 cm (age5)	Bard (1981)
Assumed birth month	November	
Assumed month @ 30 cm	May	

Table 2. Estimated catches (t) of albacore *(Thunnus alalunga)* by major area, gear and flag.

			1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
TOTAL			39623	34149	32397	30117	39979	31424	40921	42847	53495	54627	63344	53495	77758	77725	90633	91003	75159	75525	71408	75923	70048	82206	82671	74386	69797	59995	77171	76099	73806	74826	62137	60071	73617	67643	59850	76052	88554	82738	67229	63342	67167	56343	69598	73078	71613	67512	60353	59560	58888	67345	71458	70259	60039	61394	52941	58308	39638
	AT.N		39623	34149	32397	30117	39979	31424	40900	42122	52448	49912	52869	42730	58787	60340	64634	60658	47363	59142	45220	46730	45895	56821	48791	45673	49594	41888	57151	53821	50047	51365	38707	34531	42673	51490	41800	40826	47554	38115	33059	32070	36557	27949	30861	38135	35149	38376	28803	28997	25595	34852	34500	26592	22685	25505	25586	35919	27337
	AT.S		0	0	0	0	0	0	21	725	1047	4715	10475	10765	18971	17385	25999	29845	27296	15883	25688	28493	23653	24885	33179	28213	19703	17607	19459	21665	23169	22628	22930	24040	29672	14918	14599	31097	37288	40630	30107	27212	28714	26016	36533	32813	35115	27549	28426	28022	30595	27642	31380	38801	31746	27995	22481	18859	12301
	MEDI		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	500	500	500	700	500	500	701	500	500	500	561	613	590	833	500	1500	1272	1235	3451	4129	3712	3993	4063	4060	1896	2378	2203	2130	1349	1587	3125	2541	2698	4851	5577	4866	5608	7893	4874	3529	0
Landings	AT.N	Bait boat	0	0	0	3875	7250	3125	5500	11959	17558	18517	18139	21120	21469	20739	20428	20112	16757	18349	13936	14569	14388	15677	8196	8833	13986	19687	20227	15559	11958	15764	16177	13412	15857	21108	8313	12589	15202	18756	15933	15374	18625	8985	12448	15646	11967	16411	11338	9821	7562	8780	12148	6099	6638	7918	8128	10458	13859
		Longline	0	0	0	0	0	0	2	135	945	599	1658	703	6375	14976	16148	15002	7815	10124	7291	14238	15801	17115	14068	18128	14637	12710	23006	20869	14157	12207	9451	9819	13206	16863	19709	17413	21232	7296	3013	2228	2683	5315	3152	7093	7308	4857	4641	4051	3884	6634	7317	7344	6164	7287	6371	6359	2665
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	13	0	0	0	1	62	3	521	694	367	2194	108	213	343	994	1662	3865	3999	5172	7279	7506	3555	3337	4378	6846	7646	6119	3089	427	1006	2163	8567	15
		Purse seine	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	0	2	0	0	16	0	84	364	555	59	60	1	97	12	1	222	139	229	278	278	263	0	91	55	191	263	118	211	348	63	0
		Trawl	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	0	0	0	0	0	1	0	0	0	2	0	262	1693	2240	1033	469	2603	1779	2131	3049	2571	2877	1318	4892	3703	5485	5331	3675	1089	260	505
		Troll	39623	34149	32397	26242	32729	28299	35398	30028	33945	30796	33072	20907	30943	24625	28058	25544	22791	30669	23993	17923	15706	24029	26517	18712	20958	9491	13918	17391	23931	23332	13059	10778	12831	12788	11029	10654	10847	11457	11329	10554	10350	8959	7348	6109	5959	10226	6652	7870	5894	6845	5023	4312	4007	5410	7487	10213	10293
	AT.S	Bait boat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	38	0	0	0	0	1	97	46	0	66	43	53	1346	1721	2575	1794	4166	7909	6829	8181	7696	7393	5981	3454	6490	7379	8947	7091	6960	8110	10353	6709	6873	10360	9712	6973	7475	5084	
		Longline	0	0	0	0	0	0	21	725	1047	4715	10475	10365	17171	17385	25977	29845	27296	15883	25650	28493	23653	24885	33079	28113	19553	17456	19262	21194	22806	21843	20671	20426	25255	11941	9834	22672	29815	30964	21828	19407	21590	22008	27133	23947	24607	20036	21000	19547	19799	20626	24398	28039	21672	20619	14689	12954	12301
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	400	1800	0	0	0	0	0	0	0	0	0	100	96	53	104	150	293	201	544	449	89	493	484	234	334	400	537	398	411	1139	137	393	39	483	10	209	127	0	73	58	377	323	82	299	288	
		Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	47	112	119	188	464	1804	1349	699	365	182	244	948	185	0	4	416	2517	1448	1078	412	257	117	434	183	51	25	39	309	0	533	
		Trawl	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120	9	52	0	0	0	12	18	0	
	MEDI	Bait boat	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	0	0	0	0	0	900	539	535	1331	243	0	0	0	0	83	499	171	231	81	163	205	0	33	96	88	77	29	0	0	0	
		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	41	130	150	0	0	0	0	0	226	375	150	161	168	165	624	523	442	402	350	87	366	348	194	417	2800	2597	3706	4248	2345	2012	0
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	500	500	500	500	500	500	700	500	500	500	520	483	440	833	500	600	700	700	1753	2973	3552	3782	3879	3879	1098	1198	1534	879	766	1031	2435	1991	2426	4265	2689	2193	1755	3166	2176	1200	
		Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	141	274	10	50	16	16	91	110	6	559	23	0	0	0	0	0	0	0	1	478	353	317	
		Troll	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	0	0	0	0	0	0	33	0	0	264	0	0	0	0	0	48	50	59	129	306	119	202	45	73	0	0	117	0	0	0	
Landings	AT.N	Barbados	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	2	5	5	0	0	
		Brasil	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	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	4	0	0	0	0	
		Canada	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	0	0	0	0	0	0	0	0	0	0	1	21	47	22	6	5	1	9	32	12	24	31	23	38	122	51	113	56	27	52	27
		Cape Verde	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	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	0	0	0	0	
		China P.R.	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	8	20	0	21	16	57	196	155	32	112	
		Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	17	18	103	114	204	761	1907	2352	4675	2871	4410	9501	9538	8130	14837	13723	9324	6973	7090	6584	10500	14254	14923	14899	19646	6636	2117	1294	3005	4318	2209	6300	6409	3977	3905	3330	3098	5785	5299	4399	4330	4557	4278	2540	2357
		Cuba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	118	151	91	345	81	0	36	0	0	87	85	83	89	0	31	48	82	38	69	20	31	15	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
		Dominican Republic	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	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	0	0	0	0	
		EC.España	24943	19446	18177	16925	26341	16804	24148	21923	33924	29822	31014	24335	31499	28155	28500	29278	25795	32745	24580	22607	23731	30196	25121	19799	25290	22601	26735	25155	25404	29630	25202	20819	25478	29557	15656	20672	24847	28206	26738	25424	25792	17233	18174	18380	16998	20197	16324	17295	13285	15363	16000	9177	8952	12530	15379	20447	24133
		EC.France	14680	14703	14220	13192	13638	14620	16750	20064	17279	18921	19597	17092	20293	16239	19486	15548	13413	15533	13239	9385	6163	9210	9158	6859	8425	5666	6800	7733	10400	9320	3955	2929	2855	2391	2797	1860	1200	1921	2805	4050	3300	4123	6924	6293	5934	5304	4694	4618	3711	7189	6019	6344	4289	3641	2537	8170	
		EC.Ireland	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	60	451	1946	2534	918	874	1913	3750	4858	3464	2093	1100	755	175	306	521
		EC.Portugal	0	0	0	0	0	0	0	0	300	570	600	600	620	970	500	830	340	740	110	500	200	300	434	887	1229	911	610	62	85	149	79	442	321	1778	775	657	498	433	184	169	3185	709	1638	3385	974	6470	1634	395	91	324	278	1175	1953	553	513	556	101
		EC.United Kingdom	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	499	613	196	49	33	117	343	15	0	0	0	0	6	
		FR.St Pierre et Miquelon	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	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	4	0	7	2	
		Grenada	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	6	7	6	12	21	23	46	25	29	
		Iceland	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	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	0	0	0	0	
		Japan	0	0	0	0	0	0	2	135	945	599	1131	380	5716	14633	15713	14325	5860	4771	3306	4717	5875	6472	1319	1467	2059	1331	1345	825	531	1219	1036	1740	781	1156	576	844	470	494	723	764	737	691	466	485	505	386	466	414	446	425	688	1126	711	681	874	1481	
		Korea, Republic of	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52	174	1471	3926	1588	6844	5011	7707	7922	4794	2823	2843	5379	5579	3048	2997	797	938	1326	478	967	390	373	18	16	53	34	1	0	8	0	0	2	1	0	0	0	0	0	0	0	59	
		Maroc	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	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	55	81	120	178	
		Mexico	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	0	0	0	0	2	0	0	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NEI (Flag related)	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	19	13	10	8	11	3	8	12	0	0	0	0	0	0	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	240	2366	217	226	1227	557	768	425	193	177	494	357	2551	601	525	44	0	0	0	0	29	60	103	73	11	5	0	0	0	0	0	0	0	0	197
		Philippines	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	
		Sierra Leone	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	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	91	0	0	0	
		St. Vincent and Grenadines	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	704	1370	300	1555	89	802	
		Sta. Lucia	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	1	3	2	10	0	2	
		Trinidad and Tobago	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	0	0	0	0	0	0	268	194	318	0	0	0	0	0	4	0	247	0	0	0	0	2	1	1	2	11	9	12	12	9	
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	13	0	0	2	1	0	22	472	699	347	2206	98	251	301	288	243	357	479	438	509	741	545	472	577	829	315	406	322	480	444	646	487	
		U.S.S.R.	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	0	0	0	59	0	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Bermuda	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	2	2	0	0	1	1	
		Vanuatu	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	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	0	0	414	507	
		Venezuela	0	0	0	0	0	0	0	0	0	0	527	323	642	325	280	271	129	575	145	244	240	65	141	0	0	93	133	102	397	593	300	331	137	823	1076	467	172	26	137	41	95	319	205	246	282	279	315	49	107	91	1374	349	162	424	457	175	
	AT.S	Argentina	0	0	0	0	0	0	0	0	0	1700	1802	1472	749	1547	1493	1100	800	710	1229	400	500	281	100	44	13	97	48	80	8	0	4	2	7	55	209	153	356	469	344	354	151	60	306	0	2	0	0	120	9	52	0	0	0	12	18	0	
		Belize (foreign obs.)	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	8	2	0	0	0	0	0	
		Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	63	16	60	169	170	296	688	494	515	476	276	800	731	732	382	520	395	421	435	514	1113	2710	3613	1227	923	819	652	3418	1872	4411	6862	3228	2647	522	556	
		Cambodia	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	
		China P.R.	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	89	26	30	26	112	95	
		Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1059	6792	12546	12225	17491	24985	22157	16686	13384	14600	16092	20467	20340	18710	18187	22800	9502	7889	19643	27592	28790	20746	18386	21369	19883	23063	19400	22573	18351	18956	18165	16106	17377	17221	15833	17321	17351	13288	10730	12293
		Cuba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	81	106	42	75	30	0	0	64	0	0	13	15	17	11	0	27	53	29	36	67	27	24	10	2	1	2	17	5	3	0	0	0	0	0	0	0	0	0	0	0	0	
		EC.España	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	0	0	0	0	889	106	295	307	155	200	807	185	0	0	0	280	1943	783	831	457	184	256	193	1027	282	573	836	376	81	285	
		EC.France	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	47	112	40	172	457	912	947	372	7	18	35	100	0	0	0	50	449	564	129	82	190	38	40	13	23	16	18	63	0	478	
		EC.Portugal	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	0	0	0	0	0	0	0	0	741	1357	1029	899	1153	557	732	81	184	483	1185	655	494	256	124	232	486	41	433	415	9	43	8
		Honduras (foreign obs.)	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	7	1	6	0	0	0	0	0	
		Japan	0	0	0	0	0	0	21	725	1047	3015	8673	8893	16422	15104	23760	28309	21023	7719	11895	6331	5898	3218	2087	280	109	306	73	107	135	105	333	558	569	188	224	623	739	357	405	450	587	654	583	467	651	389	435	424	418	601	554	341	231	315	463	342	
		Korea, Republic of	0	0	0	0	0	0	0	0	0	0	0	0	0	0	115	346	5275	6353	5697	9186	5030	3832	5655	3731	2393	3230	3376	3829	1413	878	803	682	563	599	348	511	321	383	180	54	19	31	5	20	0	0	18	4	7	0	18	1	0	5	37	42	
		Maroc	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	0	0	2	0	0	0	113	0	0	0	0	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NEI (ETRO)	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8	122	68	55	63	41	5	27	0	0	10	14	53	0	15	
		NEI (Flag related)	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	149	262	146	123	102	169	47	42	38	0	0	0	0	0	0	
		Namibia	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	915	950	982	1199	1429	1162	2418	3419	2962	3152	3328	2344	
		Netherlands Antilles	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	192	0	2	0	0	0	0	0	0	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	172	1841	183	256	770	377	354	125	167	129	210	0	0	0	280	924	0	0	0	240	482	318	472	228	380	53	60	14	0	0	0	0	0	17	
		Philippines	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0	0	0	
		Seychelles	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	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	0	0	0	0	
		South Africa	0	0	0	0	0	0	0	0	0	0	0	400	1800	734	631	9	92	0	0	0	0	0	100	100	150	150	150	150	150	480	1850	2320	3180	2760	3540	6697	5930	7275	6570	6890	5280	3410	6360	6881	6931	5214	5634	6708	8412	5101	3610	7236	6507	3469	4502	3198	
		St. Vincent and Grenadines	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2116	4292	44	0	0	0	
		U.S.A.	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	1	0	0	9	11	0	2	102	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	1	1	1	2	8	2	1	0	
		U.S.S.R.	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	84	212	74	0	99	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	
		UK.Sta Helena	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	0	1	12	2	4	7	11	7	9	0	0	2	1	1	1	5	28	38	5	82	47	18	1	1	58	12	2	0	0	0	
		Uruguay	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	0	0	0	0	0	23	235	373	526	1531	262	178	100	83	55	34	31	28	16	49	75	56	110	90	90	135	111	108	120	32	
		Vanuatu	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	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	0	0	0	684	
	MEDI	EC.Cyprus	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	12	30	255	425	
		EC.España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200	0	0	0	0	0	0	0	0	900	572	535	1368	531	0	0	3	0	84	547	228	290	218	475	404	380	126	284	152	200	209	1	138	189	
		EC.France	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	0	0	0	0	0	0	0	0	141	250	20	60	31	31	121	140	11	64	23	3	0	5	5	0	0	0	1	0	0	0	
		EC.Greece	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	0	0	0	0	0	0	0	0	0	0	484	500	500	500	500	500	500	1	1	0	952	741	1152	2005	1786	1840	1352	950	773	623	
		EC.Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	500	500	500	500	500	500	500	500	500	500	560	613	590	833	500	600	700	700	1942	3348	3208	3433	3529	3529	1191	1191	1464	1275	1107	1109	1769	1414	1414	2561	3630	2826	4032	6912	3671	2248	
		EC.Malta	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	4	0	2	0	10	15	
		EC.Portugal	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	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	0	0	0	0	0
		Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	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	0	0	0	
		NEI-2	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	0	0	0	0	0	0	0	0	0	0	0	0	
		Turkey	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	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	0	0	27	30	
		Yugoslavia Fed.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200	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	0	0	0	0	0	0	0	0	0	0	

Table 3. Total albacore catch-at-size composition (fork length 2cm lower limit) for the North Atlantic stock.

Li	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
40	1962	1712		19	13955	4461	1453	2875	12857	16018	3784	991	116	2005	323	38	4689	3004	1307	1420	621	16	10340	1490	605	1331	2009	2500	718	1695	2836
42	2820	8913		1542	5277	257	3575		33	310	124	991	13	189	108	3465	374	216	814	75	2520	1098	16878	1230	9849	3695	2075	3645	3675	2187	3703
44	10777	26691	1562	7813	28009	2893	7956	3724	10302	14036	5122	5001	64	3540	749	19438	9243	4927	4354	954	9262	6933	25841	2425	16439	4547	4920	7068	7057	8358	8776
46	24501	89033	18298	37038	19039	39488	25724	4602	12099	21859	11410	16683	650	6144	3225	20912	36791	13009	7802	3853	30003	22397	54204	17863	18042	6650	17406	31658	100596	33087	43672
48	20678	84377	33020	317929	56687	156630	84497	27255	50640	69461	53105	51504	1614	22867	12728	68732	136373	74444	23775	6194	69021	63032	147246	194902	203725	95046	96223	158382	395414	117962	144080
50	27101	87144	75846	691414	59515	322838	223801	25205	144448	73482	210861	187938	12720	245390	79318	235332	249929	248325	118451	50349	237641	169415	357054	558734	392834	210185	175294	279852	577039	171545	240585
52	78461	138136	105910	399413	119199	308367	195491	34632	241768	145106	254303	182873	46989	421252	187002	320893	309990	342847	282986	123503	338054	252280	374973	493421	416182	223751	113868	189773	390132	123700	263038
54	129251	243156	55963	230131	173392	269656	165789	46575	215768	133452	277114	147807	102584	392845	284972	244730	265991	236456	307347	160791	349057	339616	245431	224607	289902	195321	45230	87512	145955	70843	239503
56	94207	208094	85800	136811	122356	201411	215295	59155	191110	136329	192248	137174	94527	358656	325729	140201	140365	177752	188856	176812	145332	243228	235466	172868	217623	142968	30083	53215	44414	80033	155474
58	108587	294365	198306	293522	197344	316480	248295	77801	153423	80572	70506	130135	83627	124586	197574	105272	171050	162683	176679	240101	133735	307372	267683	251101	248559	125680	29479	69687	87288	184962	218371
60	140464	488136	441350	842569	514276	411705	276923	221338	148806	209331	179149	344732	251119	250652	230004	265671	437795	321687	265688	381566	285763	554142	462733	516084	289544	255548	53129	110512	201344	403383	405820
62	200762	596658	612245	849410	638942	257798	193378	266735	209937	281901	228244	380458	452449	427316	309267	498607	534882	447206	369400	527157	472457	670334	407299	528841	300251	316451	108092	111424	218928	411869	437567
64	262449	451849	415831	382693	468211	179578	188339	286230	287827	277107	273524	281142	432309	468316	357834	551804	498116	386344	450198	521915	557079	596130	320266	331808	230727	320738	172485	81394	139210	301988	316105
66	237382	224486	308415	198885	256681	152403	231043	237152	258344	149994	224666	190922	381253	376566	286031	424300	264852	266753	302065	331113	362469	260523	199751	163472	203247	262830	183379	48346	46702	113816	197001
68	200608	140019	205284	99825	171759	191179	265111	259424	293942	94155	195538	160470	387447	277576	237745	308333	156593	184257	209692	231098	208827	107164	130091	116210	205487	248957	163172	39355	25360	57284	142503
70	287782	101814	184830	138077	182480	306461	302041	330751	335979	127623	226659	152909	370131	241102	224519	243859	113869	185055	250311	212632	170200	83791	136450	114808	248052	223942	152450	20778	38801	86715	163785
72	416963	134996	272967	202473	241160	360366	237839	273130	276447	181868	198161	205091	327283	207978	233564	206377	109433	183212	288237	168425	214552	104480	166847	125504	213076	231308	148309	20564	55020	117850	202718
74	389921	173662	250769	274710	425769	325390	193778	308811	287685	195391	228124	236176	366120	191028	254948	182821	127204	168958	287353	165721	219293	81167	164033	84894	232607	213034	170316	29112	71717	145439	222397
76	280436	212967	290620	226397	454234	259959	160068	230401	304880	204212	200035	248590	307257	206712	267356	155195	110802	160862	246032	139956	239943	85184	155297	90195	176060	185983	158480	45789	79302	121626	241658
78	243107	220589	255065	212511	336734	189495	162832	251269	258115	198242	184434	267758	295549	237118	262118	128359	98293	151945	181845	144930	159066	61527	133292	73224	150456	176402	157757	63760	86177	109231	213402
80	171457	226858	217453	192066	232678	142307	153825	255253	270839	117544	141562	189465	111564	136028	193881	117941	79133	112758	194610	133142	107129	49538	95341	81509	136239	152349	184243	83364	98185	89485	186716
82	131470	211104	157356	131874	152647	102115	114773	223949	232952	108349	98833	166140	83073	93509	132320	103418	70017	87502	116363	88944	64609	46914	64035	70002	125917	91060	146719	94637	88008	61573	142579
84	113279	198688	109275	106228	118462	99941	103606	166923	192716	96250	82354	129208	119660	62808	77303	88409	51912	50234	99232	61384	51346	50706	56061	43045	108350	58302	149729	85535	74082	46777	87605
86	107736	184950	104965	60203	175280	75801	69708	109945	144448	63307	60522	81719	42599	26151	40625	67413	56336	24712	51988	48030	38826	31104	45820	47218	108849	51102	124947	68453	49277	36797	45751
88	95779	164702	69256	74024	135351	54838	48516	67613	111286	58784	55446	59750	37611	19600	24936	47149	33038	16272	45809	33449	34936	26278	27106	20756	63927	44034	87842	60627	42949	25006	29683
90	72642	154985	99637	83820	123669	74285	39351	55323	113829	90512	66908	84760	26744	21471	26837	49660	43161	23037	45369	20773	32993	19780	26122	22713	56307	59820	32266	54375	47836	32884	32120
92	52846	151483	118033	94852	70024	32362	34733	41750	94804	72981	75615	80604	16176	18632	23764	44528	62872	13884	33284	26221	34518	17350	19323	10800	32708	13148	30831	48159	40438	31102	33851
94	49824	133828	136418	60804	100188	57242	27405	40453	78972	87460	80571	74369	21042	14369	22464	51133	43290	12178	33097	34683	58535	18177	16799	11206	25868	15426	30826	57255	37441	30973	42561
96	40653	123920	120209	65889	44278	25513	31149	35571	76713	86009	76488	67802	20598	12356	20796	43631	30278	13142	16589	24845	47536	25587	17047	8515	21137	30164	26597	72934	51068	47677	66495
98	46036	118154	120184	95867	49539	22965	25819	36590	59392	74415	65839	62806	16943	13136	11322	30766	22275	16911	21745	20449	45414	17085	15849	9183	22728	38571	26447	64781	55426	32573	66717
100	44719	92659	97957	73295	39801	50429	29613	39518	71746	73339	61059	78426	15880	10348	7744	29310	9255	45109	61981	31044	38126	15996	25434	10790	24868	115949	27344	62829	65085	50343	51625
102	50733	85336	95833	61994	28783	35367	31743	37803	50297	84311	56000	76594	19861	10335	6013	22166	7236	34661	29224	17871	39523	13664	17048	9571	18069	78702	15504	46318	52846	46285	43050
104	38543	59490	68619	53676	28634	34885	31289	36484	39119	79022	50934	68911	24822	11444	5807	19269	3674	12046	33243	22158	40351	11831	21224	13207	21083	34438	17590	39373	33156	27735	12520
106	32104	46932	45281	29492	12997	7160	19871	31088	29243	53681	29884	37816	16780	8565	3958	17124	2890	16074	18433	14323	40165	10794	15536	9862	16423	10376	9075	28518	23376	20554	6249
108	29093	32197	29498	17238	11320	8364	17285	30731	37892	41307	26803	31111	10502	7113	4733	15798	3293	20052	16009	22616	31762	7783	13978	10184	15330	5523	7790	17190	14885	12155	5665
110	23461	24055	22542	10042	13731	6899	14796	16645	17428	23895	21879	37407	12826	5846	2654	10571	2861	27630	9367	17339	21496	7318	7811	6825	10784	3764	4002	8819	6549	3747	2782
112	10372	9183	9388	7708	10878	5359	8746	14919	14581	19791	24547	56052	9417	5757	3348	7926	1719	21226	6707	6193	16071	5256	4886	4905	7926	1825	1399	5000	6029	2748	2518
114	10049	6716	7737	4211	7564	4784	13564	12305	10000	17888	26813	33343	15342	6020	2034	3212	520	10824	5473	3220	6483	3221	3130	2616	5180	804	1345	2192	3191	1945	1569
116	5037	4135	2887	1995	5249	1618	4146	10773	8963	10770	14769	10018	7584	3054	999	1104	368	770	5129	3131	2809	7527	1023	429	500	388	787	1309	911	1266	1012
118	4303	3009	1494	1651	3505	1376	3896	9690	5738	7221	7980	5104	4611	1555	326	1382	596	111	1581	1566	732	9232	753	403	447	433	1029	1006	644	1085	846
120	1579	572	1285	1221	3726	3427	9969	8966	4109	8354	6534	5694	1720	589	68	1968	307	42	2439	8748	1298	12709	685	516	322	517	199	894	355	860	333
122	697	260	21	1101	1653	178	1104	5632	1253	3980	1288	141	125	56	11	779		10	107	17521	39	5253	192	138	49	67	111	299	203	376	420
124	468	9	913	431	964	779	3179	3641	1174	5287	1833	484	573	207	16	779			399	15004	4	4	71	226	37	469	45	293	121	295	283
126		173	417	200	313	6	441	2303	346	3864	739	185	26	13	5	100		98	565	8857	1	747	142	76	40	101	90	269	110	140	164
128	417		5	430	313	6	175	640	72	1316	105	104	13	13		68		50	7	4170	2	6	72	4	26	50	53	92	49	153	20
130+	966	165	154		1298	197	3029	2716	692	4878	663	1125	67	110				31	604	9533	755	6131	506	407	86	102	121	732	111	640	248

Table 4. Total albacore catch-at-size composition (fork length 2cm lower limit) for the South Atlantic stock.

Li	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
40			206		2117	38284	1765	3319	1981	359	4750	5778	7240	2		55		604	402	300	89	411	469	4	7099			886	226	415	287
42	6		206		1059	15444	272	953	283	52	3877	1781	1218	408					121	200	201	771	1140	26	442			1424	356	312	215
44	10	2		340		12534	472	511	660	130	5554	3772	2351	407	75					367	205	4523	1378	27	424			2718	655		
46			412		423	14653	629	885	906	26	5816	3788	3483	205	487	1212			603	1125	659	5089	1959	27	689			4385	1096	597	376
48	16	129	206	719	212	7443	1765	1794	711	470	7386	7657	3080	406	1460	3086	155	179	3781	983	2926	12850	2131	55	561	17		3318	844	103	116
50	6	381	702	1362		17909	5331	1306	1100	202	7064	10168	4846	1	8650	3692	312	23	1922	8397	28330	11794	3998	929	1918		40	5195	1518		13
52		254		1021	423	11211	6775	1896	1119	607	5361	6878	3579	203	8613	2645	936	179	4505	12665	12712	11411	3429	330	732	33		2600	658	9	38
54	380	383	1030	1416	635	10839	11749	4375	2710	718	5378	12610	5941	204	4980	1819	626	90	2030	37615	47091	37831	4566	5036	5387	70	393	3695	1268	368	270
56	20	385	1854	3405	1270	10280	9762	4445	1377	1244	6636	11216	9163	206	6715	497	778	179	8296	50826	39300	48620	6390	7219	7012	168	56	3885	2557	2157	1245
58	515	1679	1442	3853	705	11211	7390	7820	1578	3763	11868	19287	13118	1160	3613	1874	1090	179	13347	65815	58622	43113	9322	10479	10105	789	2236	2155	9627	3321	3997
60	1211	4084	5562	12258	847	24056	8207	8175	1365	6646	22480	27900	30634	6045	11403	3751	2339	2114	25110	84716	85696	74155	15069	15661	17712	6065	5787	39263	12277	8801	3901
62	2314	7641	8034	14695	3176	22350	8162	9378	2195	10449	31451	28256	50277	7574	9700	5019	7460	3990	55212	91877	89756	61568	16574	10854	14339	2185	10691	36310	10370	14956	9886
64	1667	7521	14382	17079	4304	32723	11294	11103	5433	12714	47890	46766	51195	14022	16145	7721	16166	4291	42094	72657	39063	62532	13980	16433	20154	7823	13248	65569	7368	18835	13800
66	5530	8664	15450	18046	6346	25231	12607	14586	11189	10184	38587	35796	40275	20893	15384	9209	15278	5556	43365	43507	28253	49164	15374	11419	21835	13862	18567	46852	3565	33883	11812
68	4929	11008	14529	23208	11350	34562	22724	33957	20242	14325	48858	50995	50263	18244	28135	35887	68329	9856	55277	77139	44864	60973	33651	18213	30153	23680	22352	24616	3834	37089	14460
70	6928	12693	19036	51202	9308	49487	48463	75029	25888	26076	76308	70949	72165	19668	25758	31882	125861	22234	63371	109223	48733	64925	56647	33337	48013	38039	42822	27154	4255	35603	35485
72	18001	26788	33345	57331	22862	46768	53507	87386	30297	36820	89179	63434	64186	26736	37845	43514	91883	48307	73060	125482	60895	73297	60250	33262	46125	45753	62707	19230	6901	22123	52157
74	33229	37093	45862	63675	17748	41803	60526	103245	42276	37242	110384	110098	71396	46710	65696	93047	77423	66350	96624	132080	75792	96489	64732	57872	62529	47110	83343	26396	5082	22643	68545
76	34687	42900	61074	50853	63744	56514	47059	85085	45614	35979	108898	90553	72650	77653	54926	92857	49624	77258	106331	117938	72008	63355	58828	59067	61045	86240	93168	51158	11086	20425	78224
78	53167	47978	63598	60135	54372	76449	67054	130489	54016	40752	121754	122537	95689	101495	106322	126021	55682	85213	157276	142616	66205	88591	75289	89187	83941	77424	109898	51517	23031	32695	92717
80	55175	51189	71201	88501	88718	89741	82270	150848	68839	49606	158995	170749	170322	135533	144355	135692	86843	155158	180106	147922	90068	124816	102318	117419	93967	82781	141597	80197	63521	55588	89231
82	89439	71672	94968	102024	56914	67139	73861	126947	59996	61024	148880	143407	215143	134739	140982	153587	84618	177331	171563	137974	87712	110508	105686	135120	95669	80271	130218	124580	81023	85418	86748
84	117486	88709	118411	101381	70207	92517	91176	134491	74501	69905	171135	190006	228193	117619	141068	159462	101100	171025	185182	131022	116227	166688	104959	144769	80924	77855	112827	104086	82148	88599	66070
86	111231	81540	132035	75906	63802	104606	82487	118552	59110	52539	149845	149859	252746	162559	165388	138892	176066	226135	163609	155991	129124	138942	100634	109152	69573	62214	86453	109350	61212	85064	49355
88	75348	67486	100709	69414	126651	85165	65415	84257	46084	38043	114588	116477	176159	159685	101822	140871	69597	133096	101705	102483	103255	118246	104379	90287	61297	48534	55692	87240	55857	72993	40508
90	50030	61521	106376	58145	57691	71300	64149	68963	32420	32747	126639	123252	198613	126772	145189	194560	32529	117039	92973	85795	85506	104928	90788	77878	62686	66525	26589	77203	55479	59325	34904
92	40109	47396	72642	58704	46374	53792	53021	61754	29271	23448	94084	96945	141827	100235	106977	144433	25675	113871	108448	95940	62449	97193	65650	65388	55865	53935	21873	64774	64498	49146	37734
94	37729	40508	61873	45252	52620	44762	49068	53119	31177	28154	75845	93027	114398	67468	80825	80575	15492	85835	82237	62811	58256	76891	68385	61717	61225	39362	18077	57409	72251	45835	39631
96	33359	46066	59167	61496	45633	58242	42417	50125	30058	24402	57589	66190	80978	64419	52113	46645	7294	88131	68150	60347	42458	26487	53158	50830	51487	41932	69854	82363	99018	56213	49694
98	39988	41517	63487	75549	36043	53925	42795	47224	28747	26150	46341	61062	60716	50908	42725	41829	5077	82149	48370	46166	36055	15672	50624	61613	61502	44335	120530	101140	71288	37870	45499
100	32829	47739	52377	93571	58199	48149	63098	59370	33117	31920	53880	63309	63437	34241	43623	34033	8694	76651	49557	31740	47937	31640	34204	73825	71472	30708	146486	81851	57713	32426	34338
102	38344	50995	52412	87265	35371	50169	49244	66741	29596	27737	43556	47579	48737	37785	45632	39716	7274	89052	55577	48481	34722	31160	42003	97461	93975	43681	59988	49610	80014	38373	48457
104	35033	49619	39045	66760	50369	50772	51837	72479	28415	27508	45556	51924	54285	43444	68152	24329	7125	61029	63135	53260	52852	70645	47272	53001	54774	79442	68760	58203	114475	43529	43281
106	28826	45246	25910	26940	65454	35219	41848	57659	19187	20532	36626	42198	44298	42475	48889	12046	22987	57272	57817	72427	30255	38642	47464	51620	51095	66702	66848	57179	57662	47040	38990
108	26772	38020	22244	24744	54240	32716	36569	42894	19120	17138	33824	51965	43763	46123	43148	16046	83340	54841	45697	74491	39231	44977	62879	34506	32500	80102	69635	61968	43651	42903	30768
110	28976	35771	16062	25858	61535	20248	41723	33236	17374	15408	27734	54980	46669	20096	19574	7912	92913	56591	25554	64175	49092	36726	29757	47755	44786	61547	103139	51959	48823	30207	18188
112	20204	20331	8334	10826	24389	21042	34111	28407	15483	9646	16882	33945	33522	19224	10014	53442	61485	51794	18199	19754	39557	17170	36507	39809	37663	77469	97416	41858	39427	36756	16913
114	12009	18244	7574	5839	13282	12723	33267	21285	10158	9313	18442	33626	22076	28045	4226	29425	59527	31579	13733	17381	28961	10041	31117	30220	28664	82581	73391	35619	51983	73399	11378
116	9150	9126	2352	2473	13364	12867	15522	15554	12693	7058	14676	26766	20843	49138	1080	4737	72772	12018	10148	19736	17869	6839	22124	25556	25410	61897	46584	12268	42055	17643	9798
118	5584	4764	924	1981	6379	5713	9188	11534	7677	5185	10570	25464	12944	26461	1011	1264	21933	4376	3633	10343	13254	6777	15539	20802	20570	42271	35946	11859	27461	5455	7160
120	2607	1365	918	3038	13534	12969	11954	10496	9154	5683	7042	25835	9759	8880	382	612	1439	2892	4076	7231	7114	3773	8500	23523	23192	13171	26739	16061	6036	4728	3939
122	419	66	168	948	2316	805	5057	3632	3280	3987	1136	7200	4246	2332	28	240	730	486	383	1017	2043	2056	9245	2931	2875	7201	1604	5643	951	2889	2673
124	140	66		1175	1789	2107	4458	2685	2051	6744	809	4026	4768	1513	111	166	34	968	685	729	382	1388	3288	629	628	3507	2779	10980	887	2012	1419
126		66		408	837	565	1674	1150	1466	6608	245	2589	1509	378		55	5	449	402	245	138	1285	1505	1335	1369	264	2603	11161	449	1383	994
128			206	433	837	186	1494	517	786	6151	136	703	1099		138	55			123	129	201	771	4617	372	316	226	765	3042	638	449	698
130+	280	132	374	681	572	1163	1551	1496	2660	16692	145	4595	1415	252	187	1547	224	635	1086	367	2293	1935	6842	978	651	296	2735	11219	1006	1122	1697

Table 5. Albacore catch-at-age matrices (total and by fishery) for the North Atlantic stock.

Fishery	Age	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
TOTAL	1	418825	929837	370992	2003685	676426	1556500	1027053	203573	1023260	640531	1093186	798850	305503	1627149	1040286	1100506	1240968	1213415	1057502	632876	1262490	1384544	1688278	1875835	1767071	934081	503659	890217	1806006	755765	1278885
	2	1443288	2316903	2477494	2809198	2467965	1673832	1690133	1740841	1606879	1252076	1424375	1689789	2510651	2134611	1820508	2478341	2176280	1915229	1971530	2458542	2244896	2404554	1785736	1906621	1569634	1788810	829850	413287	635757	1506361	1797126
	3	1598340	1013650	1382859	1025477	1722563	1302732	915648	1450687	1602264	961316	968611	1241157	1369441	950165	1297267	775498	564030	820638	1230372	718235	878391	335375	751169	476183	1073347	972922	936415	222915	418352	547655	1156457
	4	395975	842917	292725	362034	550008	239240	293101	420583	486761	247963	212352	315657	156353	116405	84805	232693	123184	89081	252558	177916	107572	115001	87871	86794	242214	213302	444387	372563	259427	136402	146334
	5	121206	382791	462393	174987	239202	147127	70720	108047	270508	282616	258572	185383	44557	42069	77088	129324	135928	19504	77060	56744	139997	47086	62350	33817	91255	16101	69124	118276	73042	106600	58587
	6	103280	252748	283588	275887	82277	75000	77395	94002	167176	159430	161342	217923	54305	28133	21430	107624	46330	111671	120509	75823	150462	47530	50836	18555	47930	148824	85813	234146	223368	111511	261638
	7	81202	123175	73310	54523	22750	61247	8791	21575	29837	113959	7448	17115	10595	7989	4507	7637	2902	14733	30792	9929	55891	18390	32401	20758	32101	163694	24524	61364	54177	72648	7059
	8	130365	98338	105537	67708	96675	49343	142117	204981	176329	247073	227194	302609	98575	44402	21187	68319	12042	95037	72226	153713	120653	77340	48528	40227	62916	14116	17315	46811	37049	31806	20291
BB_ESPct	1	142941	221221	88717	890148	299277	762271	542733	49132	788846	209617	557287	389840	97612	1081628	655016	749776	650899	534404	594866	359808	486290	523013	748028	1202826	905905	675955	153170	294362	1014384	295289	156685
	2	405706	378872	352917	251625	731031	336929	458156	681585	509348	118883	500358	507724	1340231	1003094	616367	935027	641958	486966	549187	677395	592880	951722	150591	377480	222796	449710	149601	19406	201215	606662	248954
	3	497970	428767	439073	321643	823727	917838	535449	886288	870886	418007	450869	772200	861553	498873	727294	385837	139445	385870	381499	307030	355731	111883	451380	114791	157941	520967	177937	88603	87934	237015	618149
	4	72896	308460	32062	157663	58914	104944	112405	102678	205629	45461	39916	97690	33484	13670	50772	130612	25405	46786	3167	13693	1023	9842	16319	5420	46821	32311	387	104490	62857	29950	70395
	5	25	28665	40828	9007	6412	37	656	4	7661	637	2287	5083	78	1098	11225	3935	0	101	38	2	0	8	3202	1156	9181	185	10977	6044	3043	63	2101
	6	1479	2384	31376	8618	3098	8	1	678	3467	1451	2510	989	0	1502	132	5346	0	4	260	0	0	64	9592	29	2186	1714	4131	6829	8542	1904	1090
	7	1	1	5840	0	661	3706	0	72	0	0	0	135	0	1996	856	437	3	282	1	0	0	1	8	7	0	0	1	2	0	562	0
	8	0	0	8048	0	0	42	0	0	0	0	0	0	0	1341	723	161	44	5	0	0	0	0	3341	64	77	0	909	232	9	258	0
TR_ESPct	1	101724	286692	136232	859078	273057	579607	332630	71760	33651	135610	396734	346814	139814	449327	317571	248148	436482	414509	281496	203586	699687	451595	516707	382115	428108	121462	115182	396699	597331	429451	672383
	2	300684	894078	1123107	1161164	1561933	803220	800257	944155	863008	790039	713708	999326	925937	815853	778649	1079445	1012944	622201	569511	663316	975008	792687	811134	463020	464849	284163	295745	310407	356823	803790	1127176
	3	213065	160972	327327	439813	450905	284671	241015	411972	480633	316064	308892	301334	349963	343109	449661	260155	177749	229336	181778	132859	230492	61973	159418	167292	226229	225758	192094	61074	83384	126303	158562
	4	22969	45952	23944	35107	8264	2610	5604	2188	19025	5744	5527	4841	36913	59608	5215	21952	2629	4697	1424	1823	4433	2254	5686	18371	30347	38872	4696	20602	12261	12363	4543
	5	1406	87	0	954	1991	1355	231	0	4	605	2464	933	3	5917	353	2668	1033	1052	59	2	5	131	252	139	6869	7433	4895	2652	7717	4477	3596
	6	0	671	0	2467	533	190	630	0	0	0	1468	2378	0	2738	269	722	215	138	3	87	13	70	227	0	2005	2373	242	3725	11614	1450	372
	7	0	4	0	0	1296	15	0	0	0	0	11	344	0	706	110	295	0	0	0	15	6	9	10	0	29	268	3787	440	349	872	460
	8	0	0	0	0	0	0	0	0	0	0	2	1	0	1670	166	647	0	0	0	196	75	0	26	0	0	477	792	367	289	176	217
TR_FRA	1	39611	300170	93990	200666	84501	193323	89286	32654	6961	45856	78508	37994	20127																		
	2	337894	814612	774858	1377587	120679	495479	328983	47785	178531	267149	141233	109479	133294																		
	3	299981	70955	225830	177574	351225	9319	30211	1021	99429	106876	61125	33012	50379																		
	4	948	2480	16520	0	252361	0	0	179148	3936	1942	1094	530	5314																		
	5	0	0	0	0	59022	0	0	0	1	205	488	102	1																		
	6	0	0	0	0	2	0	0	0	0	0	291	261	0																		
	7	0	0	0	0	0	0	0	0	0	0	2	38	0																		
	8	0	0	0	0	0	0	0	0	0	0	0	0	0																		
LL_JPN	1	28	402	263	299	392	395	1574	597	753	1185	44	34	15	23	11	0	1291	1406	23954	14217	3316	0	204	249	269	431	948	0	63	2464	2178
	2	1572	1646	2145	2725	3721	2609	11435	651	3867	4060	479	479	364	1433	2749	1684	3386	4674	3244	56	46	38	1016	1401	3162	3648	4844	1503	1130	3219	9749
	3	9860	10353	12829	10245	19856	18580	24264	8430	30200	4647	6526	3544	4562	7792	10706	8197	11273	3518	1086	4250	3214	4119	3145	4132	8902	5282	18065	11157	6436	10902	18550
	4	23004	27451	15560	10341	31514	23645	36225	20041	20603	4476	14742	8213	4141	12511	8638	12267	15612	6462	14323	13449	9934	14308	5516	4815	10962	9237	21168	11781	9562	13042	6908
	5	24463	25642	14540	5597	10782	10289	12778	6171	11073	8942	7400	3378	7802	9382	13300	12041	3319	8380	837	1853	1381	829	823	1537	1406	4150	9618	3931	3989	5843	11292
	6	7526	9419	4597	3466	11680	9386	19397	8063	7956	4943	13642	6378	1823	5884	2939	5900	6780	1198	2641	3787	3158	2782	4438	4107	2278	8713	5670	5040	6583	7314	35085
	7	756	1590	194	312	500	36	252	676	871	112	771	10	4596	3146	715	1501	476	1421	780	1332	1280	895	197	255	781	1270	5567	3756	4841	5116	1102
	8	7887	2274	900	1445	831	2293	6699	2425	1311	4935	2520	3053	2228	1083	4602	899	1855	2050	2129	2008	2002	3450	5262	5803	1341	5196	3416	3338	3405	3259	846
LL_TAI	1	0	2378	1092	651	2316	2886	5807	4229	6016	17363	4214	4959	42497	13557	759	0	0	0	1220	3204	7249	94625	40	12	22	0	147	0	136	0	0
	2	6788	22943	22220	1043	12267	21369	16639	49694	29638	43023	19707	35289	63286	20189	0	0	0	0	2667	22683	1864	7343	0	0	0	0	400	40	924	1032	0
	3	80720	93753	108555	44667	64780	30920	40222	103330	103146	102087	89694	122557	76587	24433	7045	5364	82568	0	89482	33015	66020	42031	82779	87236	162906	3093	146877	12344	5179	9196	0
	4	131295	220341	139315	75196	161212	75968	86690	70072	166300	130992	123487	189058	72525	23137	15716	21621	23243	2932	103718	22340	76484	41063	48932	30814	57539	2137	193938	12000	48119	31929	270
	5	55143	208035	193556	102006	101961	113489	28420	90335	173810	156590	198673	161599	21565	6880	41142	54616	126444	684	64323	48462	58017	24332	11686	20661	38583	1	0	39908	36401	49818	0
	6	58759	129146	158859	174022	28956	52194	33592	54403	120172	136196	102454	180423	42250	13478	11682	7733	24580	0	53876	18748	34969	1150	22059	7356	13748	86525	0	101557	93285	62002	120859
	7	32766	85570	53740	53940	20258	53529	3811	210	232	96	29	145	88	28	0	0	3	3414	21838	4	13241	0	15292	14274	26646	141124	142	33107	38913	55579	4
	8	70728	44114	57709	19618	22712	31240	111922	166925	160746	186178	200083	279858	89386	28516	0	3758	3930	68746	32983	109436	5240	46597	17194	22635	42263	0	1321	8023	2600	2415	153
LL_USA	1						0	0	1	1	1	1	2	0	0	0	0	3	3	0	2	3	2	1	0	8	0	0	0	0	1	0
	2						0	0	0	0	0	0	0	16	0	0	0	1	0	12	48	13	8	5	3	28	4	13	1	1	4	4
	3						2	0	7	6	11	5	17	193	27	5	31	307	32	9	136	25	95	74	0	20	37	105	93	5	6	27
	4						76	19	304	247	476	229	718	232	368	137	31	1988	83	4192	3427	842	542	802	2174	1515	4122	2535	732	398	614	1150
	5						3	1	12	10	19	9	28	403	611	1152	2418	2066	1206	1092	3042	4823	682	1177	1129	2182	855	4281	3146	1627	1473	1086
	6						91	23	366	297	572	275	863	749	501	321	2037	3077	1050	187	377	2808	1876	1945	1098	353	1073	811	1303	2157	1539	1072
	7						25	6	101	82	158	76	239	405	932	495	469	1758	2121	3289	3365	3531	1435	3213	3009	4093	1291	967	715	129	1279	1277
	8						2	0	8	6	12	6	19	50	120	621	1539	535	488	697	931	4112	803	863	814	537	446	1051	951	551	520	474
Others	1	134521	118973	50698	52843	16884	18017	55022	45200	187031	230899	56398	19207	5439	82614	66929	102582	152293	263092	155965	52059	65944	315309	423298	290632	432759	136232	234213	199155	194091	28560	447638
	2	390644	204751	202246	15054	38334	14226	74664	16971	22488	28922	48889	37493	47522	294043	422744	462184	517990	801387	846909	1095044	675085	652755	822990	1064717	878798	1051286	379247	81930	75664	91654	411244
	3	496745	248849	269245	31533	12070	41402	44487	39639	17964	13622	51499	8493	26204	75931	102556	115915	152689	201882	576518	240944	222909	115275	54373	102731	517350	217785	401337	49644	235414	164233	361170
	4	144863	238234	65325	83726	37743	31996	52158	46151	71021	58871	27358	14608	3744	7113	4327	46210	54308	28121	125734	123184	14855	46992	10616	25200	95030	126624	221663	222959	126230	48503	63068
	5	40169	120361	213469	57422	59033	21953	28634	11525	77950	115618	47251	14260	14704	18181	9917	53646	3066	8082	10710	3382	75772	21104	45211	9194	33035	3477	39353	62595	20265	44927	40511
	6	35517	111127	88757	87314	38009	13130	23751	30492	35283	16268	40701	26632	9483	4030	6088	85886	11678	109280	63542	52824	109514	41588	12575	5965	27360	48425	74959	115693	101187	37301	103160
	7	47680	36011	13536	271	34	3936	4721	20516	28651	113592	6559	16205	5506	1182	2331	4935	662	7494	4884	5213	37833	16050	13682	3213	552	19741	14061	23344	9945	9240	4216
	8	51750	51949	38880	46646	73132	15765	23495	35624	14266	55947	24582	19680	6912	11673	15075	61316	5678	23748	36417	41142	109225	26491	21842	10912	18699	7996	9825	33901	30195	25178	18602

Table 5. (cont.) Albacore catch-at-age matrices (total and by fishery) for the South Atlantic stock.

Fishery	Age	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
TOTAL	1	288	1107	3430	6076	4025	150817	34166	19760	9674	2802	55490	59790	34701	1847	32132	12638	630	990	33754	56535	172942	114918	24363	4873	16231	69	239	29750	28629	4668	4029
	2	11132	32089	49090	71499	6529	123518	57452	51035	17771	47421	156136	169973	193570	51011	66376	20961	46813	10652	158590	435777	294096	329153	73429	75253	86393	21267	42941	216973	26442	79294	14069
	3	103239	125025	167207	219253	43897	254779	222259	407505	150799	152484	424218	355226	291058	121436	144697	305965	448184	178405	269207	442935	242352	317645	240556	108504	164116	245463	245337	66559	17383	125207	193911
	4	409471	308092	363026	396403	352141	317738	328065	569525	301484	260562	717629	683140	720155	616965	636995	636963	260457	650911	790060	680645	323771	505230	374953	612599	421458	344597	538495	458394	192152	188232	483121
	5	201948	225724	435849	238989	304291	292927	261980	285747	140514	104559	390302	505182	879053	555133	481559	629120	343287	595324	476146	387038	435996	506109	411889	304804	258210	224640	215009	273717	274669	330773	79038
	6	94213	104820	141083	116525	165256	159219	143938	175139	97769	88882	169481	189947	201332	111028	171885	79720	19975	260604	223513	199099	155963	86226	182189	219746	235875	110967	216383	264707	281076	159038	185883
	7	21140	93269	121157	280464	27330	105795	14791	113342	48160	35863	105177	74061	73983	73068	78250	106119	13671	100650	87880	73206	12476	16265	20765	80057	78228	24031	104641	93900	166250	27504	64262
	8	212251	238610	115859	140702	344552	183558	372114	289099	157190	169515	196246	380578	311363	292080	201650	134474	425701	379471	265728	348249	340817	282112	366478	382096	363837	627033	691391	423150	399501	355985	173298
BB_NAM	1																				0	84	87	105	0	0	0	0	0	0	0	90
	2																				740	4332	4477	5435	1587	1196	3603	1052	0	0	4507	2594
	3																				67014	3599	3721	4516	5629	4243	43105	15492	0	0	11959	16470
	4																				26458	7171	7412	8997	88417	66655	89958	70646	1345	1144	113186	58885
	5																				3753	53238	55031	66799	19763	14899	46097	108993	5348	4551	73480	26269
	6																				937	1613	1668	2024	0	0	5602	9945	27227	23169	14102	21807
	7																				0	2	2	2	0	0	845	889	60274	51291	4385	1384
	8																				0	500	517	628	0	0	0	5811	29346	24972	5806	11157
BB_ZAF	1	0		0		0	0	807	1184	817	342	695	569	0	1519	1007	9949	0	0	127	264	2955	93	207	0	0	0	9	0	0	0	0
	2	0		0		0	0	1	1	1	25244	51240	23119	3950	33583	38545	5179	7946	4195	52617	44557	36662	14574	47283	18889	24285	4099	31632	176166	0	46325	5181
	3	0		0		0	0	29184	42784	29523	71236	144598	52273	17820	35157	96174	56339	69326	41382	68389	206500	43396	40754	100646	65243	107267	76942	191172	32013	0	43353	137161
	4	130		3		149	3476	77801	114058	78706	111055	225423	153607	150078	131316	342012	204981	193128	261119	374485	310165	158514	251431	240053	448772	223410	114953	337787	299953	93176	24467	162037
	5	1792		39		2065	48036	33847	49620	34241	36114	73305	186631	323070	265571	115102	142325	25190	209627	127344	84911	173072	139863	135310	149447	97459	29615	70081	69269	107565	156904	3349
	6	254		6		292	6802	1796	2633	1817	7732	15695	8087	12528	15020	11518	27	2507	0	2171	12913	15415	5660	20324	13274	7632	17287	5406	131	29179	29824	390
	7	468		10		539	12537	1671	2449	1690	11866	24086	15103	13062	9364	915	12166	4720	455	767	1680	2835	2885	13482	185	3519	20708	517	6891	1076	16139	263
	8	82		2		94	2194	0	0	0	2195	4456	2205	98	21	0	0	5	967	913	529	1773	111	5510	2254	1928	2555	1509	150	4846	4004	0
LL_BRA	1	0	0	67	29	0	0	0	0	0	0	0	0	70	0	103	6	26	0	4820	1593	5038	4552	601	663	324	3	10	26	3	0	5
	2	0	0	986	151	553	0	0	92	0	0	54	0	421	55	94	89	1616	38	14532	11109	7484	12185	406	7866	3854	1865	400	108	1701	188	131
	3	0	23	3332	17	2268	35	23	101	0	0	1	0	542	234	837	1986	15855	616	28338	4875	5751	10525	3200	4721	2334	14827	1181	3576	1423	692	236
	4	80	3	7240	16999	9714	290	682	166	2030	1293	2381	16	1589	2179	2111	4654	2560	861	56242	9661	4941	7890	2399	6519	2787	8753	3464	7202	3607	536	809
	5	902	4321	12956	10302	6009	119	3279	2968	7913	6755	5506	9118	2430	2128	2762	5392	13950	996	50932	8840	6535	11218	4832	19592	9469	22600	2954	28229	10967	2011	339
	6	2921	3293	3758	1957	4997	10643	5649	14798	14629	11606	4907	12486	8738	11215	1858	3709	3236	1999	33555	6880	6813	2816	5098	32840	16736	10474	41922	31431	18543	4428	4363
	7	3965	6519	4797	713	1995	6502	2966	12887	8848	4068	1411	3661	2495	3107	6611	3908	1957	44991	10733	2259	149	6	1196	11283	5092	4	25011	3449	10415	179	898
	8	0	0	954	70	46	198	224	2153	431	139	1235	202	766	1135	5937	5769	19727	59679	34758	10327	10994	10961	11172	55387	27330	98405	159309	52813	33610	5104	7661
LL_JPN	1	44	0	0	11	0	27	0	1851	0	0	258	0	0	0	0	0	0	0	2	276	4	229	312	528	0	0	22	19587	20593	3685	3599
	2	430	0	0	56	263	36	0	604	77	0	939	0	0	0	0	0	24	350	6	3133	576	1231	1068	1407	1812	0	1749	4016	4725	6396	4453
	3	1197	23	33	6	1142	1873	6296	10684	113	267	1369	530	0	47	890	802	1034	5658	954	9645	1012	2011	1645	2114	5193	3733	2871	1679	758	9595	8444
	4	6241	655	941	6395	4359	12252	9775	7521	97	2753	6499	2091	0	3409	1638	3985	745	5528	4836	12039	4965	3417	2798	3387	8914	12369	9951	4165	5908	9086	5710
	5	4122	1580	2273	2878	2322	8883	17456	6936	813	593	4787	5082	709	8056	1730	4446	1705	7164	8201	6095	11982	8541	3271	2538	9044	2440	4712	4494	6472	7743	5241
	6	2414	772	1110	0	317	463	3529	4837	1697	4503	4433	770	0	882	1785	4852	10605	7039	5967	5742	2809	3188	3965	3971	6127	3254	1518	850	1486	4070	2788
	7	3917	806	1159	54	45	97	1702	2385	4917	3501	8037	24496	7268	1304	7729	6868	6993	747	488	428	1027	3059	6005	5432	6397	2433	446	21	92	670	260
	8	580	127	183	8	0	19	233	3924	0	136	6270	1237	6546	6612	6444	7598	8025	6747	5060	6485	1347	3503	3228	3148	429	7106	2456	134	177	94	40
LL_TAI	1	236	1097	3276	6030	4025	150574	32116	15812	7990	2261	54336	59076	34014	0	30956	1002	593	429	28358	53592	161740	106913	22985	3666	4094	14	25	165	0	0	0
	2	10329	31843	47960	71181	5714	122836	56354	50257	17668	8782	89321	141081	188127	10137	23960	14411	36298	5697	85600	361560	236127	286221	15642	43724	48826	8545	1015	660	17682	13102	0
	3	101582	124300	162943	218698	40337	251292	142021	321014	90539	43180	238100	288355	267754	78417	32759	226082	351864	124476	163492	114001	181188	247237	122129	26267	29335	67941	2996	22771	14645	49178	8323
	4	396878	302486	337321	367285	333930	296341	127766	363635	139504	83453	407144	488502	528325	444275	255185	370980	54461	359296	316699	257682	130875	185330	89434	31909	35630	40109	8789	39686	38226	27708	192039
	5	182669	203357	360082	202886	264729	184249	151656	184642	54541	30530	255122	249570	454235	200789	349083	426756	295013	353447	271955	258813	137053	263509	190179	100891	112674	103560	7494	157860	98229	65357	40052
	6	78237	78249	89917	96144	141083	126770	126779	149389	65969	39991	99614	166624	126525	80902	149020	69250	18	239625	172233	156813	114896	66151	141256	163715	182827	47994	106372	178255	165455	93483	132254
	7	2679	79173	71039	268007	18341	73185	2314	76434	11604	438	45756	17	36400	50966	59200	76187	0	29928	57584	58369	1024	144	69	63147	62608	20	63462	22030	93901	5951	61250
	8	103192	109530	45820	104490	319963	154493	353646	258573	149480	157743	172300	359903	282559	283140	184948	114463	376566	229876	186026	286101	313780	257460	337248	305045	324566	450918	404227	334295	321896	331327	118253
Others	1	8	9	87	6	0	216	1243	913	867	199	201	144	617	328	67	1681	11	560	447	810	3122	3046	154	16	11813	52	173	9972	8034	983	335
	2	372	246	144	111	0	647	1097	81	25	13395	14582	5773	1073	7237	3778	1282	928	371	5835	14677	8915	10464	3596	1781	6420	3155	7092	36023	2334	8777	1710
	3	460	679	899	532	150	1579	44735	32923	30625	37801	40150	14067	4942	7581	14037	20756	10105	6273	8034	40900	7405	13396	8420	4530	15743	38915	31626	6520	557	10430	23276
	4	6142	4949	17520	5725	3988	5379	112040	84146	81148	62008	76182	38924	40163	35786	36048	52362	9564	24107	37798	64642	17305	49749	31272	33596	84063	78455	107859	106043	50091	13248	63641
	5	12464	16466	60499	22923	29167	51641	55742	41581	43006	30568	51583	54783	98609	78590	12882	50201	7428	24089	17713	24627	54116	27947	11498	12572	14664	20328	20776	8516	46884	25277	3789
	6	10387	22506	46293	18425	18567	14541	6184	3482	13657	25050	44831	1980	53541	3009	7705	1882	3609	11941	9588	15815	14417	6744	9522	5946	22553	26357	51220	26812	43244	13130	24280
	7	10112	6771	44152	11690	6410	13473	6139	19186	21101	15990	25887	30784	14757	8327	3795	6990	0	24529	18307	10470	7440	10170	10	10	612	22	14316	1235	9474	179	205
	8	108396	128952	68901	36133	24448	26654	18011	24449	7279	9302	11986	17032	21394	1172	4321	6645	21377	82202	38970	44807	12422	9560	8692	16262	9585	68049	118078	6412	14001	9650	36187

Table 6. Standardized annual CPUEs for North Atlantic albacore used to fit the VPA-ADAPT model to assess the North stock.

	Japan NB	*Japan NB*	*Japan NB*	*Spain TR Age 2*	*Spain TR Age 3*	*USA Numb*	*France TR*	*France TR*	*Taiwan LL* adjusted(WG)
Age Range	3-8+	3-8+	3-8+	2	3	3 - 8	2-3	2-3	2-8+
Catch Units	Number	Number	Number	Number	Number	Number	Number	Number	Number
Effort Units	1000 hooks	1000 hooks	1000 hooks	fishing days	fishing days	1000 hooks	fishing days	fishing days	1000 hooks
Selectivity	Partial cath	Partial cath	Partial cath	Partial cath	Partial cath	Partial cath	Partial catch	Partial catch	Partial Catch
Model	Neg. Binomial	Neg. Binomial	Neg. Binomial	LogNormal	LogNormal	Delta log-normal	LogNormal	LogNormal	LogNormal
Used in assess	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year									
1959	27.46								
1960	23.33								
1961	19.19								
1962	28.38								
1963	14.99								
1964	14.92								
1965	11.04								
1966	10.36								
1967	10.92								9.79
1968	11.14						0.69		12.54
1969	9.14	10.66					1.11		11.92
1970		10.50					1.12		9.72
1971		5.95					0.63		6.14
1972		3.00					1.25		6.81
1973		4.14					1.33		8.51
1974		3.60					1.31		8.34
1975		3.08	2.56				1.36		6.45
1976			2.14				0.95		8.74
1977			1.41				1.23		7.74
1978			1.18				1.46		8.10
1979			1.40				1.27		7.96
1980			1.32					1.46	8.94
1981			1.44	23.63	9.32			1.57	8.23
1982			1.26	31.13	18.04			1.55	8.84
1983			1.14	22.09	18.70			0.86	9.14
1984			1.00	18.21	13.24			0.47	7.85
1985			1.10	13.79	9.76			1.70	6.91

1986	0.61	22.16	13.87	1.072	0.37	5.50
1987	0.47	24.13	11.86	0.635	0.62	5.28
1988	0.75	24.30	14.56	0.633		11.57
1989	0.71	12.98	10.16	0.743		8.62
1990	0.54	22.21	7.87	1.188		5.42
1991	0.64	32.61	8.59	0.98		7.24
1992	0.51	27.78	11.00	0.678		5.60
1993	0.50	24.58	11.90	1.044		6.72
1994	0.64	40.13	8.11	1.148		4.64
1995	0.43	29.66	9.16	1.176		4.70
1996	0.37	34.74	3.53	0.752		3.09
1997	0.50	21.36	6.28	0.986		3.61
1998	0.82	19.63	8.18	1.025		4.09
1999	0.48	15.87	7.91	1.014		2.63
2000	0.79	7.97	8.70	1.079		2.52
2001	1.07	12.04	9.65	1.461		2.49
2002	1.13	11.05	4.01	1.336		2.58
2003	0.82	12.25	4.84	0.894		3.10
2004	0.62	27.64	8.23	1.01		2.52
2005	0.84	37.79	8.29	1.145		1.96

Table 7. Standardized annual CPUE s for South Atlantic albacore used to fit ASPM models used in the assessment.

	Taiwan LL Adjusted (WG)	*Brazil*	*Japan*	*Japan early*	*Japan Transiction*	*Japan Bycatch*	*South Africa 1*	*South Africa 2*
Age range	3-8+	3-8+	3-8+	3-8+	3-8+	3-8+	2-4	2-4
Catch Units	Number	Number	Number	Number	Number	Number	Number	Number
Effort Units	1000 hooks		1000 hooks	1000 hooks	1000 hooks	1000 hooks	fishing days	fishing days
Selectivity	Partial catch	Partial catch	Partial catch	Partial catch	Partial catch	Partial catch	Partial catch	Partial catch
Model	Log Normal Model	NB model	NB model	NB model	NB model	NB model	LogNormal	LogNormal
Used in assess	Y	Y	Y	Y	Y	Y	Y	Y
Year								
1959			40.39	40.39				
1960			38.09	38.09				
1961			30.60	30.60				
1962			21.93	21.93				
1963			21.23	21.23				
1964			21.31	21.31				
1965			14.36	14.36				
1966			13.05	13.05				
1967	20.74		13.87	13.87				
1968	18.49		12.80	12.80				
1969	19.72		7.74	7.74	8.53			
1970	14.80		4.10		4.10			
1971	14.90		6.49		6.49			
1972	10.34		3.48		3.48			
1973	9.02		2.34		2.34			
1974	10.19		1.38		1.38			
1975	11.91		0.83		0.83	0.80		
1976	12.60		1.02			1.02		
1977	13.75		0.62			0.62		
1978	12.28	1.17	1.18			1.18		
1979	11.43	3.32	0.47			0.47		
1980	10.51	0.98	0.70			0.70		
1981	8.38	1.26	1.34			1.34		
1982	8.39	0.23	1.10			1.10		

1983	8.23	0.74	0.86	0.86		
1984	9.29	1.17	0.87	0.87		
1985	8.88	0.52	1.43	1.43	735.42	
1986	8.78	0.93	1.72	1.72	661.58	
1987	7.76	2.19	0.66	0.66	799.78	
1988	5.60	1.48	0.53	0.53	636.29	
1989	5.05	2.11	0.62	0.62	584.27	
1990	5.24	2.00	0.83	0.83	576.40	
1991	6.06	2.71	0.94	0.94	542.31	
1992	7.19	1.36	0.53	0.53	655.47	
1993	6.13	0.74	0.47	0.47	602.80	
1994	7.79	1.59	0.69	0.69	632.83	
1995	7.75	1.10	0.45	0.45	652.88	
1996	8.17	2.16	0.50	0.50	681.66	
1997	7.67	1.98	0.68	0.68	826.70	
1998	6.66	1.78	0.65	0.65	841.63	
1999	5.55	1.50	0.73	0.73		1332.21
2000	5.10	1.39	1.24	1.24		1202.45
2001	6.18	0.98	1.15	1.15		1484.22
2002	5.00	0.67	0.77	0.77		1400.92
2003	4.64	0.32	0.77	0.77		1356.71
2004	5.11	0.45	1.02	1.02		1185.47
2005	4.53	0.40	0.78	0.78		1207.26

Table 8a. Summary of fisheries for the MFCL analyses (North).

NORTH ATLANTIC			
Fish.	*Name*	*Years*	*Gears/Flags*
1	ESP BB Recent	1981-2005	a- ESP BB b- MWTD all flags c- FR BB 1981- 2004
2	ESP FR TR all	1930-2005	a- ESP and FR TR 1930- 1980 b- ESP TR 1981- 2005 b- GIL all flags 1989- 2002
3	FR+SP BB early	1948-1980	a- ESP+FR BB
4	PRT BB	1958-2005	a- PRT BB b- Canary Islands BB and BB Cadiz
5	JPN target LL	1956-1969	a- JPN LL
6	JPN Trans LL	1970-1975	a- JPN LL
7	JPN Byc LL	1976-2005	a- JPN LL
8	CHTAI LL	1962-2005	a- Chinese Taipei LL b- all other LL 1960- 2005
9	KOR+PAN+CUB LL	1964-1993	a- KOR+PAN+CUB LL
10	OTH SURF	1950-2005	a- BB from Cap Verde and Venezuela and Cadiz b- TR from Ireland, Portugal, Grenada, SVG, St Lucia,USA c- All other catches except those mentioned above 1972- 2005

Table 8b. Summary of fisheries for the MFCL analyses (South).

SOUTH ATLANTIC			
Fish.	*Name*	*Years*	*Gears/Flags*
1	JPN target LL	1956-1969	a- JPN LL
2	JPN Trans LL	1970-1975	a- JPN LL
3	JPN Byc LL	1976-2005	a- JPN LL
4	CHTAI LL	1962-2005	a- Chinese Taipei LL b- LL for all others
5	BRA LL	1971-2005	a- Brazil LL
6	SA-NA BB early	1964-1998	a- RSA-Namibia BB early b- BB for Brazil, France, Portugal, Japan, Korea, St Helena
7	SA-NA BB late	1999-2005	a- RSA-Namibia BB late b- BB for Brazil, France, Portugal, Japan, Korea, St Helena
8	Other Surf	1961-2005	a- Surface gears other than BB

Table 9a. Catch (tons) by fishery used for MFCL.

YEAR	MONTH	1	2	3	4	5	6	7	8	9	10	Total
1930	5		2137.5									2138
	8		8437.5									8438
	11		675.0									675
1931	5		2964.0									2964
	8		11700.0									11700
	11		936.0									936
1932	5		2441.5									2442
	8		9637.5									9638
	11		771.0									771
1933	5		2175.5									2176
	8		8587.5									8588
	11		687.0									687
1934	5		3587.2									3587
	8		14160.0									14160
	11		1132.8									1133
1935	5		3942.5									3943
	8		15562.5									15563
	11		1245.0									1245
1936	5		3192.0									3192
	8		12600.0									12600
	11		1008.0									1008
1937	5		2565.0									2565
	8		10125.0									10125
	11		810.0									810
1938	5		2778.2									2778
	8		10966.5									10967
	11		877.3									877
1939	5		3244.8									3245
	8		12808.5									12809
	11		1024.7									1025
1940	5		2182.7									2183
	8		8616.0									8616
	11		689.3									689
1941	5		2516.4									2516
	8		9933.0									9933
	11		794.6									795
1942	5		3188.2									3188
	8		12585.0									12585
	11		1006.8									1007
1943	5		3185.2									3185
	8		12573.0									12573
	11		1005.8									1006
1944	5		3223.0									3223
	8		12722.3									12722
	11		1017.8									1018
1945	5		5241.3									5241
	8		20689.5									20690
	11		1655.2									1655
1946	5		4420.5									4421
	8		17449.5									17450
	11		1396.0									1396
1947	5		3850.9									3851
	8		15201.0									15201
	11		1216.1									1216
1948	5		4579.2									4579
	8		18075.8									18076
	11		1446.1									1446
1949	5		5294.4									5294
	8		20898.8									20899
	11		1671.9									1672
1950	5		15442.8									15443
	8		22739.1									22739
	11		1442.0									1442
1951	5		12598.2									12598
	8		20193.8									20194
	11		1357.5									1357
1952	5		11858.1									11858
	8		19236.9									19237
	11		1302.7									1303
1953	5		9025.1									9025
	8		16068.5	3423.6								19492
	11		1148.7	451.5								1600
1954	5		12231.9									12232
	8		19222.1	6405.6								25628
	11		1275.7	844.8								2120
1955	5		9596.0									9596
	8		17442.7	2761.0								20204
	11		1260.7	364.1								1625
1956	5		12536.1			0.8						12537
	8		21371.3	4859.4		0.9						26232
	11		1491.2	640.9		0.2						2132
1957	5		11016.7			4.7						11021

	8	17808.4	10629.9		86.7						28525
	11	1203.3	1329.5		43.6						2576
1958	2				9.1						9
	5	14591.7			153.6						14745
	8	18338.5	15326.6	300.0	263.0						34228
	11	1015.7	1931.6		519.3						3467
1959	2				75.8						76
	5	13107.0			129.3						13236
	8	16747.3	15953.7	570.0	79.4						33350
	11	942.9	1993.1		314.8						3251
1960	2				57.7			232.6			290
	5	13607.1			170.5			294.1			14072
	8	18378.1	15582.0	600.0	349.5						34910
	11	1087.8	1957.1		553.2						3598
1961	2				54.8			142.4			197
	5	7656.4			55.9			181.0			7893
	8	12411.1	18201.9	600.0	130.5						31344
	11	840.3	2318.2		138.8						3297
1962	2				15.5			285.4			301
	5	11670.1			790.7			363.9			12825
	8	18084.8	18490.6	620.0	4738.4			5.3			41939
	11	1188.9	2358.7		170.7			4.2			3722
1963	2				34.4			147.3			182
	5	9361.9			8955.1			186.2			18503
	8	14329.8	17524.6	970.0	4890.2			5.5			37720
	11	934.2	2244.2		753.3			4.4			3936
1964	2				406.3			143.1	17.5		567
	5	10127.4			9480.5			183.2	13.5		19805
	8	16779.9	17668.6	500.0	3941.8			32.2	9.7		38932
	11	1151.4	2259.9		1883.8			24.5	10.7		5330
1965	2			83.6	2832.9			141.0	83.1		3141
	5	9296.9		123.3	7517.8			180.9	90.3		17209
	8	15212.0	16850.6	853.6	2272.7			35.8	79.6		35304
	11	1036.0	2178.7	22.6	1701.5			27.2	38.5		5004
1966	2			94.8	483.4			94.7	30.5		703
	5	8355.2		139.8	2436.3			125.4	85.4		11142
	8	13518.7	14280.0	366.7	886.4			64.3	111.6		29228
	11	913.8	1847.3	25.7	2053.6			48.8	1381.6		6271
1967	2			104.3	1177.0			254.6	1357.4		2893
	5	11855.4		154.1	1640.3			320.3	1050.0		15020
	8	17680.1	15312.6	714.8	1118.7			315.1	778.5		35920
	11	1131.5	1979.0	82.8	835.5			445.9	829.2		5304
1968	2			114.5	695.4			399.2	611.9		1821
	5	8609.4		168.7	1033.7			479.6	543.2		10835
	8	14391.5	11928.2	134.2	1171.5			854.0	438.0		28917
	11	992.8	1550.2	39.1	405.0			319.6	339.6		3646
1969	2			125.2	1524.8			619.8	2349.7		4619
	5	6627.7		184.7	1601.0			432.1	1800.3		10646
	8	10587.9	12113.4	498.4	1249.0			616.4	1331.0		26396
	11	710.2	1579.8	70.7	341.5			928.1	1443.8		5074
1970	2			82.6		987.7		967.1	1709.5		3747
	5	6592.9		121.8		1834.9		2005.6	1296.0		11851
	8	8616.8	12328.1	194.0		1409.3		1184.7	947.9		24681
	11	495.0	1608.1	51.6		1642.3		757.6	1056.9		5612
1971	2			132.0		2155.7		1120.9	2629.0		6038
	5	9772.5		194.7		1589.7		823.3	1993.6		14374
	8	13448.0	13246.4	87.9		1525.6		325.7	1458.7		30092
	11	808.9	1731.4	285.0		1201.5		665.8	1625.7		6318
1972	2			237.5		750.9		1981.8	2792.0		5762
	5	10806.1		353.9		149.4		301.3	2124.8	1.0	13737
	8	14953.6	6269.2	103.3		279.8		626.6	1558.7	9.0	23800
	11	903.5	821.6	458.4		138.7		1641.0	1722.0		5685
1973	2					525.2		4374.8	2442.1		7342
	5	7688.6		5.1		161.0		1219.8	1851.7		10926
	8	10403.5	6607.9	977.5		193.8		2278.4	1354.2		21815
	11	616.4	860.3	382.4		585.1		1627.9	1510.6		5583
1974	2					774.3		2690.1	431.5		3896
	5	3844.6	13.2	37.8		329.2		2551.1	488.5	1.3	7266
	8	16406.7	10356.4	2078.7		476.7		1363.8	1187.6	11.7	31882
	11	706.9	1337.4	162.5		478.9		2933.0	932.0		6551
1975	2			440.0		476.7		2902.9	812.4		4632
	5	1360.2		654.1		355.8		1218.5	929.3		4518
	8	7624.4	5409.4	4427.7		110.6		1022.0	450.5		19045
	11	511.7	4284.5	4471.2		387.5		3079.6	963.9		13698
1976	2			152.8			444.4	6165.8	1786.2		8549
	5	1288.7		238.4			154.0	1286.3	2240.8		5208
	8	11930.7	10292.4	4570.7			349.4	1851.5	1690.6		30685
	11	698.1	3168.3	1804.5			397.4	5666.4	973.2		12708
1977	2			429.9			384.7	4819.5	2456.1		8090
	5	3355.5		387.0			42.9	2045.5	2095.9		7927
	8	13446.0	6222.3	2861.4			28.9	1811.6	1048.5	2.0	25421
	11	590.3	3655.6	2002.8			368.3	5148.3	618.5		12384
1978	2			179.0			171.1	4713.6	1308.3		6372
	5	1694.6	5.5	967.3			14.1	1991.9	954.9	0.1	5628
	8	21441.2	8219.3	13.3			64.8	1183.5	978.9	0.9	31902

	11		793.6	2489.5	85.1	281.2	1832.0	662.1		6143
1979	2				43.8	326.4	2969.5	1397.1	2.6	4739
	5		1881.1		572.8	141.2	1474.1	1296.4		5366
	8		20993.3	12698.6	131.1	98.1	957.2	372.6	40.0	35291
	11		469.5	2302.5	2.3	653.8	2165.3	356.1	19.4	5969
1980	2				3.0	339.2	2451.0	538.9	10.5	3342
	5		1088.7		369.9	56.1	1505.9	140.5	4.8	3166
	8		11836.0	13205.7	63.7	138.5	1119.0	233.7	5.9	26603
	11		133.0	2374.2	153.0	501.6	2318.1	108.6	5.4	5594
1981	2				950.0	477.2	1532.5	247.5	2.0	3209
	5		881.3		193.8	157.2	1663.1	207.2	47.1	3150
	8	10154.5	9764.6		305.1	366.9	1940.3	401.0	424.0	23356
	11	1806.9	128.5			738.2	1780.0	307.3	51.0	4812
1982	2				309.8	115.6	2206.7	634.6	22.6	3289
	5		328.0		434.7	104.1	2870.9	594.2	130.4	4462
	8	14396.3	12345.1		73.5	93.8	2136.2	500.5	657.0	30202
	11	587.2	155.4		5.1	466.9	3309.1	172.0	18.7	4714
1983	2				91.2	867.6	3347.2	264.1	335.2	4905
	5	104.4	4.0		823.5	58.4	4167.6	248.6	90.2	5497
	8	12747.6	12534.7		1577.0	27.8	2979.8	220.0	375.5	30462
	11	5536.7	248.6		54.6	202.4	4339.8	140.6	103.0	10626
1984	2				849.1	198.0	5051.2	958.2	530.1	7587
	5	29.1	215.4		424.3	87.4	4034.8	1146.4	254.9	6192
	8	6027.4	10641.4		206.3	14.8	2882.0	866.9	2001.1	22640
	11	395.9	191.1		266.3	275.8	3576.8	615.4	92.4	5414
1985	2				450.2	506.7	4528.6	261.2	39.4	5786
	5		222.6		949.6	50.2	3662.3	333.0	44.0	5262
	8	8799.8	9122.5		511.3	73.9	2785.4	268.3	153.1	21714
	11	1596.8	1300.3		186.1	214.3	4582.6	148.8	12.2	8041
1986	2				304.0	145.4	7219.3	340.3	4.9	8014
	5	8.2	1280.6		124.7	10.5	5165.0	264.5	52.6	6906
	8	9127.1	8613.0		149.3	71.6	3604.9	189.4	226.1	21981
	11	5170.9	943.8		314.0	243.4	3843.6	135.4	1.5	10652
1987	2				75.0	188.0	4135.1	31.3	0.5	4430
	5	45.4	1327.9		113.5	7.8	1280.4	14.0	17.3	2806
	8	15186.0	8847.9		5.1	65.5	1016.0	19.1	242.0	25382
	11	3175.7	1362.3		417.1	233.1	293.8	12.6	2.3	5497
1988	2				212.7	292.1	462.7	0.8	13.0	981
	5	296.8	852.9		130.9	12.0	921.1	11.6	7.5	2233
	8	11628.3	9145.0		6.8	35.7	605.7	7.7	303.2	21732
	11	5244.7	2082.3		101.8	383.5	280.5		18.4	8111
1989	2				150.9	437.1	396.3	0.6	12.2	997
	5	388.9	994.1		4.4	48.9	383.8	38.0	10.8	1869
	8	11014.5	8483.4		15.2	29.9	298.1	13.5	176.9	20032
	11	5914.7	2510.7		136.8	248.5	332.7	0.9	29.0	9173
1990	2				114.4	405.7	655.9	12.7	1.0	1190
	5	328.0	1589.6		80.0	4.0	433.8	18.1	400.1	2854
	8	11401.3	9914.2		2246.3	20.8	382.0	4.2	158.1	24127
	11	3316.6	1154.9		2160.6	307.2	437.9	1.1	1008.8	8387
1991	2				158.1	299.7	1456.7		33.0	1948
	5	145.4	2418.2		65.8	10.3	1465.2	1.0	60.1	4166
	8	7060.9	9346.2		5.3	16.9	912.4		244.7	17586
	11	805.3	917.9		1177.8	363.9	829.9		191.3	4286
1992	2				52.7	179.5	486.9	29.4	20.9	769
	5	473.6	2100.2		317.0	11.2	749.1		139.9	3791
	8	9327.1	9059.7		422.5	14.0	1135.9		142.6	20102
	11	2014.0	1128.4		2322.0	261.3	300.1		189.4	6215
1993	2				109.2	186.6	104.0	67.7	26.7	494
	5	235.1	1760.5		39.1	11.7	2486.5		63.0	4596
	8	10348.6	10893.9		198.4	14.2	1771.0		323.9	23550
	11	281.2	477.7		6121.3	272.4	2179.8		151.4	9484
1994	2				325.7	211.0	989.5		210.5	1737
	5	372.0	2749.3		231.5	4.3	1076.6		209.4	4643
	8	9077.6	8972.6		276.0	26.4	3148.8		211.1	21712
	11	1125.9	1344.1		2510.8	263.4	1588.9		209.8	7043
1995	2				22.5	161.2	584.1		31.8	800
	5	554.5	1845.4		252.4	13.4	928.9		76.4	3671
	8	10416.9	10682.3		2847.6	26.4	1482.9		173.0	25629
	11	702.8	1193.3		4532.9	185.1	1473.6		184.2	8272
1996	2				342.2	79.4	2728.9		30.1	3181
	5	502.1	1341.4		188.0	41.2	501.3		158.7	2733
	8	10137.3	7692.2		397.9	27.5	404.6		270.8	18930
	11	364.1	568.4		1988.7	317.9	540.5		175.9	3955
1997	2				601.1	122.9	1529.4		81.5	2335
	5	552.1	1947.2		512.3	26.6	1490.3		81.1	4610
	8	8787.8	8491.2		184.1	7.6	508.2		464.1	18443
	11	1897.7	1070.3		147.9	256.9	110.3		96.9	3580
1998	2				174.9	253.2	1268.8		133.5	1830
	5	351.1	3204.3		73.8	35.9	873.6		52.6	4591
	8	7762.0	7489.8		9.9	13.8	919.3		648.5	16843
	11	269.3	1264.7		180.2	143.1	375.9		96.8	2330
1999	2				344.1	130.5	2176.6		79.0	2730
	5	990.2	4121.3		326.0	43.3	911.9		32.5	6425
	8	9537.3	8932.6		725.4	7.9	1259.7		134.7	20598
	11	543.2	1513.1		898.5	243.3	1860.7		40.0	5099

2000	2				112.1			138.7	2515.6		97.6	2864
	5	163.0	950.1		91.1			32.5	2160.9		38.9	3437
	8	13178.2	9408.2		209.1			72.8	1171.2		278.2	24318
	11	845.9	453.7		117.6			444.0	781.1		1239.7	3882
2001	2				355.3			392.2	1904.9		171.0	2823
	5	266.7	867.5		1162.4			99.3	1802.6		11.3	4210
	8	7628.7	6014.9		838.4			30.0	1379.4		168.5	16060
	11	986.3	309.1		289.3			604.5	1131.6		177.0	3498
2002	2				90.0			414.6	2541.8		102.5	3149
	5	124.6	395.0		1339.5			92.0	1862.3		45.8	3859
	8	6150.1	4531.7		1230.9			14.8	695.5		345.2	12968
	11	1235.3	494.6		374.0			189.7	353.0		62.4	2709
2003	2				538.0			362.7	1541.5		159.3	2602
	5	691.8	259.7		626.9			95.1	1818.7		88.4	3581
	8	9076.4	4561.3		389.4			26.1	2077.6		432.9	16564
	11	635.0	371.8		278.8			198.0	1141.6		109.4	2735
2004	2				399.4			422.7	209.2		110.5	1142
	5	563.1	450.7		172.3			62.8	1876.3		295.9	3421
	8	8493.2	6516.4		297.5			38.5	2061.7		508.8	17916
	11	701.3	509.6		100.4			343.7	1371.6		89.9	3116
2005	2				131.8			850.9	3287.1		48.5	4318
	5	1552.3	950.6		380.2			66.0	606.8		20.7	3577
	8	14795.3	8493.0		479.0			54.7	685.3		389.3	24897
	11	1405.9	726.0		141.7			751.7	299.2		82.4	3407

Table 9b. Catch (tons) by fishery used for MFCL (South).

YEAR	MONTH	1	2	3	4	5	6	7	8	Grand Total
1956	5	5.7								5.7
	8	10.6								10.6
	11	4.6								4.6
1957	2	15.9								15.9
	5	194.5								194.5
	8	134.0								134.0
	11	380.7								380.7
1958	2	447.3								447.3
	5	368.0								368.0
	8	24.9								24.9
	11	206.9								206.9
1959	2	631.7			526.2					1157.9
	5	294.8			524.6					819.4
	8	15.2			548.9					564.1
	11	2073.0			100.3					2173.3
1960	2	2087.0			557.7					2644.7
	5	553.7			556.1					1109.8
	8	77.6			581.8					659.4
	11	5955.1			106.4					6061.5
1961	2	2670.5			761.8					3432.3
	5	1290.8			318.8					1609.6
	8	796.2			192.6				99.2	1088.0
	11	4135.9			198.8				300.8	4635.5
1962	2	4999.8			108.5					5108.3
	5	492.8			163.2					656.0
	8	1893.9			236.3				446.3	2576.4
	11	9035.2			241.1				1353.7	10630.0
1963	2	9120.6			298.9					9419.5
	5	577.0			1008.8					1585.8
	8	2231.6			562.6					2794.2
	11	3174.8			410.7					3585.5
1964	2	5383.5			462.5		5.5			5851.5
	5	704.4			879.5		5.5			1589.4
	8	7390.8			499.5		5.5			7895.8
	11	10258.8			398.1		5.5			10662.4
1965	2	5264.0			443.7					5707.7
	5	7541.8			288.6					7830.4
	8	9839.9			409.6					10249.5
	11	5663.3			394.6					6057.9
1966	2	4006.7			166.4					4173.1
	5	9413.6			1290.9					10704.5
	8	4960.4			1672.1					6632.5
	11	2642.6			3156.4					5799.0
1967	2	2037.2			611.1					2648.3
	5	1638.0			1626.8					3264.8
	8	2165.9			3540.9					5706.8
	11	1877.6			2387.1					4264.7
1968	2	1181.4			1243.8		9.5			2434.7
	5	5785.2			4734.4		9.5			10529.1
	8	3386.0			4326.0		9.5			7721.5
	11	1504.5			3489.1		9.5			5003.1
1969	2	1532.6			5061.8					6594.4
	5	2289.6			5030.3					7319.9
	8	1545.2			5212.6					6757.8

	11	963.8		6857.5				7821.3
1970	2	2045.9		2666.4				4712.3
	5	3434.5		4712.0				8146.5
	8	275.4		4791.5				5067.0
	11	143.0		5585.7				5728.7
1971	2	549.3		2309.0	20.1			2878.4
	5	1665.2		5972.4	16.9			7654.5
	8	785.1		8734.3	21.3			9540.7
	11	217.5		4588.2	4.7			4810.4
1972	2	387.7		5219.8	5.1			5612.6
	5	1346.0		10882.4	4.3			12232.7
	8	160.6		9673.3	5.4		24.8	9864.1
	11	193.1		5201.0	1.2		75.2	5470.5
1973	2	89.9		4157.1		0.5	0.7	4248.2
	5	120.5		9677.0	60.0		0.7	9858.3
	8	38.4		7810.0		0.1	24.5	7873.1
	11	29.3		6133.3		0.4	72.9	6235.8
1974	2	26.3		2782.9	1.5	48.8	12.1	2871.6
	5	48.1		5793.3	75.9	1.4	1.2	5919.9
	8	20.3		6746.1	88.6	12.8	14.8	6882.6
	11	14.2		3953.0	3.0	34.0	25.0	4029.2
1975	2	4.9		2614.5	7.3	31.3	66.1	2724.1
	5	30.0		6054.0	58.3	2.0	6.8	6151.1
	8	178.4		4616.9	91.8		1.0	4888.1
	11	93.2		3694.4	12.6	12.7	31.1	3844.0
1976	2		28.1	2127.0	6.0		48.3	2209.4
	5		15.6	5995.5	74.5		124.5	6210.0
	8		10.0	6283.8	83.8			6377.6
	11		19.6	4487.0	131.7		24.4	4662.6
1977	2		14.1	3246.5	88.6	2.3	182.8	3534.3
	5		45.5	8447.9	181.7	0.3	111.1	8786.5
	8		36.3	5174.5	148.8	20.6	38.3	5418.4
	11		9.1	3674.9	125.8	43.5	73.1	3926.4
1978	2		26.3	4224.7	37.1		44.1	4332.3
	5		18.7	9064.4	201.1		47.2	9331.4
	8		77.6	5952.3	191.7	13.7	20.4	6255.8
	11		12.1	2975.3	25.2	29.4	208.1	3250.2
1979	2		13.8	5493.7	16.9		215.5	5739.9
	5		14.6	8539.5	102.9	47.9	318.2	9023.1
	8		27.9	4163.5	228.4		79.9	4499.7
	11		48.2	3160.2	32.7	5.2	119.8	3366.1
1980	2		63.2	3990.2	12.9	415.4	286.2	4767.9
	5		171.5	7692.6	73.4	601.7	381.8	8921.0
	8		80.5	4308.8	282.9	36.7	46.3	4755.2
	11		18.5	3957.9	20.8	291.8	201.4	4490.4
1981	2		137.4	5033.9	0.9	749.0	317.5	6238.8
	5		293.8	6051.6	61.2	324.0	1049.9	7780.6
	8		76.4	3701.7	164.2	2.0	12.0	3956.4
	11		50.9	4824.7	29.6	646.0	517.2	6068.3
1982	2		198.6	5613.7	7.2	1255.3	390.6	7465.4
	5		264.6	9111.5	259.2	636.1	1063.4	11334.9
	8		45.2	5619.9	404.7	0.6	35.7	6106.2
	11		61.2	3612.7	57.9	683.0	354.8	4769.6
1983	2		67.9	3424.9	14.8	595.8	330.6	4434.0
	5		25.5	3530.3	185.7	405.9	518.1	4665.5
	8		21.1	2113.1	418.8	49.8	13.1	2615.9
	11		47.2	2032.5	58.7	742.5	322.7	3203.5
1984	2		56.8	1698.4	31.9	1885.4	130.1	3802.6
	5		55.0	2852.4	167.8	673.5	297.7	4046.4
	8		33.3	2000.5	246.5	937.7	55.1	3273.0
	11		78.8	2589.7	22.8	669.4	117.2	3477.9
1985	2		162.0	3851.6	18.6	2220.5	121.7	6374.5
	5		203.5	9021.7	169.0	3326.5	285.9	13006.5
	8		209.5	4798.8	81.7	1541.1	37.3	6668.4
	11		47.0	4083.3	23.7	820.5	71.6	5046.1
1986	2		126.1	7128.1	41.0	2730.3	121.1	10146.5
	5		259.4	11358.2	208.8	2567.0	322.4	14715.7
	8		284.3	6286.4	203.4	1083.7	104.1	7961.9
	11		68.5	3801.9	48.2	446.7	96.7	4462.0
1987	2		60.3	9060.2	17.7	1147.8	250.0	10536.0
	5		138.4	10344.7	172.6	3113.2	794.1	14562.9
	8		135.5	6356.6	112.3	1284.1	132.9	8021.3
	11		22.4	4524.0	19.4	2636.3	309.9	7512.0
1988	2		52.2	5876.0	16.1	2338.2	96.2	8378.7
	5		168.2	7685.5	212.4	2728.2	296.8	11091.1
	8		114.4	3884.7	144.9	1231.9	87.1	5463.1
	11		69.9	3581.7	22.1	1397.4	103.2	5174.2
1989	2		82.7	5818.6	28.6	2602.5	88.1	8620.5
	5		68.2	4767.7	211.1	2236.7	198.2	7482.0
	8		126.9	4060.2	173.5	611.3	84.3	5056.1
	11		171.8	3877.4	20.4	1943.4	40.5	6053.6
1990	2		76.8	4820.2	21.7	2916.4	964.5	8799.5
	5		172.2	7229.8	256.0	1834.3	122.2	9614.4
	8		265.4	5909.0	191.5	746.9	37.1	7149.9
	11		71.8	2559.0	15.7	483.4	19.3	3149.1

1991	2	108.2	4957.1	16.1	1115.7		122.6	6319.8
	5	175.0	5382.8	154.8	1138.1		314.3	7164.9
	8	235.4	4591.7	295.6	95.0		19.2	5236.9
	11	135.6	5286.2	628.5	1105.1		97.2	7252.6
1992	2	58.8	5329.5	626.5	2503.5		218.6	8737.0
	5	161.3	8248.4	571.0	2725.7		2286.2	13992.6
	8	228.7	6988.5	381.8	215.2		113.3	7927.5
	11	134.2	3258.2	1130.5	1045.6		292.5	5861.0
1993	2	46.9	3422.2	791.7	2647.4		220.0	7128.1
	5	128.8	4678.4	719.7	1601.1		1246.1	8374.0
	8	183.5	3954.7	599.6	515.8		9.4	5263.0
	11	107.9	7824.5	1488.7	2611.7		13.1	12045.9
1994	2	72.0	7358.3	168.1	2170.9		847.9	10617.2
	5	194.1	9172.9	113.8	980.4		257.0	10718.2
	8	236.7	4364.7	362.1	2231.4		213.4	7408.3
	11	148.3	2225.3	189.6	3562.3		241.3	6366.8
1995	2	42.4	1381.7	14.4	6128.2		105.5	7672.2
	5	85.6	5367.7	297.3	91.8		7.1	5849.5
	8	217.4	5519.7	322.7	734.5		245.3	7039.6
	11	43.6	6655.1	86.2	136.4		64.2	6985.5
1996	2	57.8	5931.3	32.5	1329.9		47.8	7399.3
	5	174.5	5537.2	323.4	1388.1			7423.2
	8	126.7	4391.9	398.1	788.2		224.3	5929.2
	11	76.0	3897.2	52.0	3451.2		194.5	7671.0
1997	2	83.1	3768.3	68.2	1709.8		92.0	5721.4
	5	132.0	7408.6	182.1	1533.2		30.0	9286.0
	8	175.6	4983.3	163.0	770.8		65.0	6157.7
	11	33.3	2374.0	175.6	4096.0		177.4	6856.4
1998	2	13.8	3208.5	469.4	2534.8		341.2	6567.6
	5	101.8	6314.6	762.1	2788.5		80.3	10047.2
	8	261.0	4542.7	802.9	2528.3		9.4	8144.4
	11	41.4	2302.1	978.6	2501.4		12.2	5835.7
1999	2	35.2	4696.3	257.5	1270.3		32.3	6291.5
	5	211.3	5745.7	445.9	1847.4		166.4	8416.8
	8	273.1	3766.0	378.7		101.6	77.8	4597.2
	11	81.4	4338.5	396.1		3489.7	31.3	8337.0
2000	2	18.6	4832.9	577.1		1977.5	47.8	7453.9
	5	185.2	6651.3	1081.4		3088.7	30.9	11037.5
	8	251.3	4226.3	894.2		459.6	12.2	5843.5
	11	99.0	4371.9	1205.5		1347.6	20.4	7044.5
2001	2	61.9	6136.2	1595.9		3058.4	112.0	10964.4
	5	76.4	4917.5	943.2		4702.3	173.8	10813.3
	8	146.1	6184.7	651.6		447.2	24.3	7453.9
	11	56.6	4216.6	3047.7		2152.0	91.8	9564.7
2002	2	69.4	5352.2	2429.7		4351.0	139.6	12341.9
	5	33.2	6061.0	171.0		1916.1	66.5	8247.8
	8	117.3	5503.2	204.4		271.1	0.1	6096.2
	11	11.1	1658.5	59.6		3173.8	155.7	5058.7
2003	2	50.1	6388.5	89.1		2197.6	19.0	8744.2
	5	59.1	5776.7	73.9		2619.9	186.9	8716.5
	8	158.9	3687.3	145.7		35.4	187.1	4214.4
	11	46.9	2648.6	1535.4		2120.5	9.1	6360.6
2004	2	35.1	2985.4	27.3		3488.3	60.3	6596.4
	5	82.3	3584.4	52.3		2312.4	73.8	6105.2
	8	272.5	3765.2	85.7		241.3	24.4	4389.2
	11	109.9	3605.5	120.2		1433.3	157.6	5426.6
2005	2	6.6	9054.1	67.6		1857.6	315.5	11301.3
	5	4.5	2232.3	97.6		1223.4	90.1	3647.9
	8	376.0	535.2	95.8		10.9	236.2	1254.0
	11		432.2	98.0		1992.0	177.7	2699.9

Table 10a. Effort data used in MFCL (North). (negative values indicate missing effort).

YEAR	MONTH	1	2	3	4	5	6	7	8	9	10
1930	5		-1.0								
	8		-1.0								
	11		-1.0								
1931	5		-1.0								
	8		8521.5								
	11		-1.0								
1932	5		-1.0								
	8		9012.9								
	11		-1.0								
1933	5		-1.0								
	8		9751.9								
	11		-1.0								
1934	5		-1.0								
	8		-1.0								
	11		-1.0								
1935	5		-1.0								
	8		-1.0								
	11		-1.0								
1936	5		-1.0								
	8		-1.0								
	11		-1.0								
1937	5		-1.0								
	8		-1.0								
	11		-1.0								
1938	5		-1.0								
	8		-1.0								
	11		-1.0								
1939	5		-1.0								
	8		-1.0								
	11		-1.0								
1940	5		-1.0								
	8		8202.8								
	11		-1.0								
1941	5		-1.0								
	8		6405.1								
	11		-1.0								
1942	5		-1.0								
	8		6755.7								
	11		-1.0								
1943	5		-1.0								
	8		-1.0								
	11		-1.0								
1944	5		-1.0								
	8		-1.0								
	11		-1.0								
1945	5		-1.0								
	8		13020.0								
	11		-1.0								
1946	5		-1.0								
	8		14359.8								
	11		-1.0								
1947	5		-1.0								
	8		16081.6								
	11		-1.0								
1948	5		-1.0								
	8		13033.5								
	11		-1.0								
1949	5		-1.0								
	8		21973.4								
	11		-1.0								
1950	5		-1.0								
	8		22430.2								
	11		-1.0								
1951	5		-1.0								
	8		19740.4								
	11		-1.0								
1952	5		-1.0								
	8		-1.0								
	11		-1.0								
1953	5		-1.0								
	8		-1.0	-1.0							
	11		-1.0	-1.0							
1954	5		-1.0								
	8		-1.0	-1.0							
	11		-1.0	-1.0							
1955	5		-1.0								
	8		-1.0	-1.0							
	11		-1.0	-1.0							
1956	5		-1.0			-1.0					
	8		-1.0	-1.0		-1.0					
	11		-1.0	-1.0		-1.0					
1957	5		-1.0			-1.0					

	8	12272.3	12233.8		-1.0					
	11	-1.0	1530.1		-1.0					
1958	2				-1.0					
	5	-1.0			-1.0					
	8	15218.6	18118.9	-1.0	-1.0					
	11	-1.0	2283.5		-1.0					
1959	2				45.9					
	5	-1.0			56.1					
	8	13962.6	13425.4	-1.0	160.8					
	11	-1.0	1677.2		196.7					
1960	2				40.8			-1.0		
	5	-1.0			263.2			-1.0		
	8	12531.3	13533.5	-1.0	527.6					
	11	-1.0	1699.8		214.6					
1961	2				14.8			-1.0		
	5	-1.0			243.2			-1.0		
	8	9598.5	17054.0	-1.0	274.6					
	11	-1.0	2172.0		78.3					
1962	2				2.1			-1.0		
	5	-1.0			923.1			-1.0		
	8	12805.4	15175.3	-1.0	6622.1			-1.0		
	11	-1.0	1935.8		224.0			-1.0		
1963	2				37.4			-1.0		
	5	-1.0			14527.3			-1.0		
	8	14637.9	14536.1	-1.0	9343.1			-1.0		
	11	-1.0	1861.5		837.5			-1.0		
1964	2				370.0			-1.0	-1.0	
	5	-1.0			20447.2			-1.0	-1.0	
	8	14274.0	14064.2	-1.0	8610.2			-1.0	-1.0	
	11	-1.0	1798.9		1677.7			-1.0	-1.0	
1965	2			-1.0	2408.0			-1.0	-1.0	
	5	-1.0		-1.0	20896.5			-1.0	-1.0	
	8	11094.2	18855.8	-1.0	7400.7			-1.0	-1.0	
	11	-1.0	2438.0	-1.0	2814.0			-1.0	-1.0	
1966	2			-1.0	545.4			-1.0	-1.0	
	5	-1.0		-1.0	7241.2			-1.0	-1.0	
	8	16426.8	14151.8	-1.0	2636.2			-1.0	-1.0	
	11	-1.0	1830.7	-1.0	3384.2			-1.0	-1.0	
1967	2			-1.0	2004.7			-1.0	-1.0	
	5	8103.3		-1.0	3709.8			-1.0	-1.0	
	8	16148.1	27778.5	-1.0	2589.0			344.3	-1.0	
	11	1035.2	3590.1	-1.0	1246.2			270.7	-1.0	
1968	2			-1.0	1134.2			200.0	-1.0	
	5	9858.9		-1.0	2441.6			274.3	-1.0	
	8	16113.5	14312.6	-1.0	2489.5			490.5	-1.0	
	11	992.7	1860.0	-1.0	607.0			180.4	-1.0	
1969	2			-1.0	2710.3			311.5	-1.0	
	5	9765.9		-1.0	4015.8			406.0	-1.0	
	8	10087.7	17250.1	-1.0	3396.9			351.3	-1.0	
	11	-1.0	2249.7	-1.0	764.8			393.0	-1.0	
1970	2			-1.0		412.8		516.7	-1.0	
	5	5150.3		715.6		778.7		1451.3	-1.0	
	8	8352.9	12687.1	603.5		1291.7		835.5	-1.0	
	11	434.2	1655.0	39.0		692.7		673.7	-1.0	
1971	2			-1.0		1310.4		807.1	-1.0	
	5	4980.3		2573.9		1269.0		905.6	-1.0	
	8	10444.0	17613.6	664.0		2127.8		532.4	-1.0	
	11	595.8	2302.2	486.1		1183.8		866.3	-1.0	
1972	2			-1.0		714.1		1297.7	-1.0	
	5	3866.6		1336.7		233.9		445.1	-1.0	-1.0
	8	11281.5	8205.7	195.1		845.0		876.8	-1.0	-1.0
	11	1355.9	1075.4	209.0		318.1		1142.0	-1.0	
1973	2					436.5		2396.8	-1.0	
	5	4438.3		13.5		182.5		1300.3	-1.0	
	8	8754.2	8797.0	1360.2		434.0		2056.7	-1.0	
	11	329.8	1145.3	125.6		790.6		1171.5	-1.0	
1974	2					633.1		1676.0	-1.0	
	5	3612.8	8.3	80.0		413.6		2247.2	-1.0	-1.0
	8	16548.5	6557.8	2338.7		1361.8		1504.5	-1.0	-1.0
	11	483.5	846.9	43.6		808.3		1935.9	-1.0	
1975	2			-1.0		521.3		2205.7	776.7	
	5	3607.3		4941.3		508.6		1797.4	870.9	
	8	8608.7	4915.3	16723.8		360.4		1284.6	507.1	
	11	762.8	3893.2	3940.5		707.8		2081.3	423.1	
1976	2			-1.0			132.2	2921.1	579.9	
	5	877.4		3151.5			98.5	1089.5	1154.8	
	8	3548.3	-1.0	30211.6			180.1	2906.5	1940.5	
	11	284.9	-1.0	2891.6			215.9	3608.1	503.1	
1977	2			-1.0			217.5	3530.5	1674.4	
	5	2924.1		20464.1			32.9	1446.4	1160.9	
	8	9067.1	-1.0	75652.9			28.9	1855.7	958.2	-1.0
	11	1035.0	-1.0	11767.0			240.7	4947.8	721.5	
1978	2			-1.0			130.3	2616.2	1611.1	
	5	3291.2	-1.0	-1.0			12.2	2257.7	1076.1	-1.0
	8	11997.4	-1.0	702.6			97.4	1179.8	1327.6	-1.0

	11		900.9	-1.0	1124.5	162.5	1419.3	586.7	
1979	2				-1.0	338.7	1403.0	1142.9	-1.0
	5		1197.7		3365.6	71.2	1518.9	1961.4	
	8		10111.2	-1.0	407.7	90.6	1407.8	851.4	-1.0
	11		453.6	-1.0	1.7	397.5	1477.3	594.4	-1.0
1980	2				-1.0	248.8	1013.6	654.4	-1.0
	5		975.6		19562.0	15.7	1506.0	202.4	-1.0
	8		7580.9	-1.0	3369.2	271.2	1255.2	372.1	-1.0
	11		-1.0	-1.0	1618.1	456.7	1644.5	125.4	-1.0
1981	2				-1.0	261.4	1011.3	392.0	-1.0
	5		688.4		539.4	110.0	1486.0	270.7	-1.0
	8	10467.9	10957.0		436.0	360.0	1866.4	601.2	-1.0
	11	2156.3	-1.0			511.8	1347.1	485.1	-1.0
1982	2				-1.0	64.1	1447.8	1355.2	-1.0
	5		569.3		1915.6	49.6	2181.3	290.9	-1.0
	8	14890.0	15456.4		162.0	141.4	2154.0	779.3	-1.0
	11	604.5	-1.0		2.7	519.6	2078.8	416.2	-1.0
1983	2				-1.0	390.5	2556.5	886.0	34.8
	5	122.0	9.5		531.0	46.3	3236.9	873.5	378.0
	8	12246.3	16527.2		531.1	62.4	2393.7	463.8	257.0
	11	5518.4	754.6		4.4	166.5	2118.0	110.7	133.9
1984	2				-1.0	184.8	2945.6	1001.3	-1.0
	5	-1.0	153.7		747.9	63.6	3634.0	404.6	217.6
	8	6524.4	12409.8		191.4	30.4	3080.8	1089.7	114.7
	11	-1.0	213.4		59.4	222.1	3313.3	454.8	23.4
1985	2				-1.0	298.5	3487.2	1162.9	11.4
	5		311.4		2642.9	48.8	3289.0	579.2	357.9
	8	8790.3	17802.2		751.1	88.8	4006.3	850.5	1255.9
	11	1578.2	1474.1		64.3	240.6	3805.3	281.9	18.1
1986	2				-1.0	182.4	6945.7	-1.0	2.4
	5	-1.0	907.5		824.4	26.2	6970.1	-1.0	5815.9
	8	9386.8	12442.4		526.3	99.3	4705.1	-1.0	2434.6
	11	5254.2	1337.5		272.2	442.3	5052.5	-1.0	1.5
1987	2				-1.0	142.0	4829.6	-1.0	-1.0
	5	-1.0	-1.0		428.6	27.7	1930.8	-1.0	463.8
	8	14062.5	17720.9		10.4	137.1	1103.6	-1.0	1598.1
	11	3249.6	1505.2		204.2	974.0	305.8	-1.0	-1.0
1988	2				-1.0	338.6	241.1	-1.0	45.2
	5	-1.0	1703.1		-1.0	10.7	556.1	-1.0	39.0
	8	11141.6	14663.4		359.5	108.1	336.5	-1.0	1584.4
	11	4966.5	2673.4		1793.9	432.5	167.0		-1.0
1989	2				-1.0	361.2	205.9	-1.0	3.6
	5	-1.0	2140.0		-1.0	87.0	348.2	-1.0	409.5
	8	10871.3	19739.0		803.8	74.4	221.3	-1.0	1630.5
	11	6083.7	5971.2		1808.5	306.0	288.1	-1.0	99.8
1990	2				-1.0	426.2	493.9	-1.0	-1.0
	5	-1.0	3657.4		128.2	13.4	496.9	-1.0	781.8
	8	9902.2	16355.5		1855.9	55.3	705.7	-1.0	1065.0
	11	3439.5	1868.1		427.9	425.1	579.4	-1.0	8552.0
1991	2				-1.0	322.7	1257.2		12.2
	5	-1.0	1401.3		-1.0	20.4	1217.0	-1.0	1637.4
	8	6518.0	9992.2		-1.0	44.7	1033.0		1839.3
	11	854.7	711.1		62279.9	427.2	771.7		400.4
1992	2				-1.0	313.4	553.3	-1.0	42.7
	5	-1.0	1383.2		838.2	24.3	767.7		488.0
	8	8707.5	11630.4		587.9	44.1	1858.9		3118.6
	11	2759.7	787.9		762.6	375.1	389.9		1350.7
1993	2				-1.0	315.1	178.5	-1.0	14.8
	5	-1.0	2775.2		76.6	34.8	2474.6		650.0
	8	9465.1	13305.7		201.7	34.7	1531.6		2087.2
	11	280.8	512.9		1484.8	390.4	2655.6		51.9
1994	2				-1.0	475.3	1526.8		700.8
	5	-1.0	6187.9		720.1	17.0	2121.5		734.2
	8	8210.0	9815.7		456.0	48.3	3743.0		1716.8
	11	1094.9	3261.9		998.3	109.3	2188.4		448.7
1995	2				-1.0	199.8	823.8		228.7
	5	-1.0	1815.8		230.1	138.0	1547.6		1130.6
	8	9559.9	11565.6		1344.5	56.5	1411.1		1858.7
	11	717.9	663.9		512.2	222.8	2580.9		601.6
1996	2				-1.0	190.3	4250.9		-1.0
	5	395.1	2692.8		1420.2	135.0	1162.3		3666.9
	8	9289.0	8287.8		1503.0	186.5	947.6		8501.3
	11	-1.0	501.5		1813.1	357.9	1560.6		-1.0
1997	2				-1.0	66.8	2104.0		-1.0
	5	-1.0	2576.9		6772.5	118.9	2675.6		-1.0
	8	7954.0	9035.5		1391.0	62.9	1311.7		8008.1
	11	2023.7	557.1		279.2	233.9	224.6		342.8
1998	2				-1.0	67.7	2169.1		51.2
	5	254.8	3818.3		1300.0	52.2	1528.4		1456.2
	8	6868.4	10498.2		87.7	30.9	1448.2		17697.4
	11	253.9	3415.9		381.2	419.8	603.1		249.0
1999	2				-1.0	141.8	3086.2		81346.0
	5	-1.0	4160.8		1014.1	77.7	2887.8		111.3
	8	8578.2	11727.6		1162.3	53.6	4542.7		1639.3
	11	787.2	4378.0		344.3	402.4	5230.7		212.4

2000	2			-1.0	164.3	4275.4	177.7
	5	-1.0	2813.1	803.1	83.6	5312.2	272.1
	8	11234.3	25126.2	921.3	161.9	4668.9	1985.6
	11	1191.0	3561.4	124.4	193.0	3485.5	1050.9
2001	2			-1.0	161.0	4264.7	204.4
	5	-1.0	1580.6	30733.6	140.3	5291.3	147.2
	8	7879.1	12724.3	11083.4	53.6	4277.2	1950.0
	11	1189.8	4808.5	805.2	504.8	2671.5	162.2
2002	2			-1.0	198.1	4492.9	21.1
	5	-1.0	1182.4	-1.0	47.5	6009.5	328.7
	8	6389.6	8567.4	65088.4	43.5	2149.9	1658.1
	11	1652.7	1437.9	4944.8	178.7	939.5	32.8
2003	2			-1.0	227.3	2950.0	96.6
	5	-1.0	1121.2	-1.0	86.0	4077.9	144.9
	8	8185.5	6284.1	-1.0	82.0	5391.2	1156.0
	11	755.3	1034.8	14740.6	278.8	2258.6	112.7
2004	2			-1.0	262.8	398.2	167888.8
	5	546.7	766.2	-1.0	178.7	4245.4	2452.7
	8	7780.1	8010.9	15730.6	136.1	9056.8	73662.1
	11	799.6	934.3	1769.7	419.5	4309.5	68.7
2005	2			-1.0	457.7	6176.0	-1.0
	5	-1.0	1059.7	5026.3	222.9	1855.8	121.6
	8	13513.2	7860.0	3165.9	94.0	6707.4	670.9
	11	1614.9	806.7	234.2	536.7	1224.3	35.5

Table 10b. Effort data used in MFCL (South). (negative values indicate missing effort).

YEAR	MONTH	1	2	3	4	5	6	7	8
1956	5	-1.0							
	8	-1.0							
	11	-1.0							
1957	2	-1.0							
	5	-1.0							
	8	-1.0							
	11	-1.0							
1958	2	-1.0							
	5	-1.0							
	8	-1.0							
	11	-1.0							
1959	2	259.4			-1.0				
	5	98.6			-1.0				
	8	14.8			-1.0				
	11	1356.2			-1.0				
1960	2	1355.0			-1.0				
	5	293.9			-1.0				
	8	39.6			-1.0				
	11	3743.5			-1.0				
1961	2	1643.2			-1.0				
	5	675.3			-1.0				
	8	796.7			-1.0				-1.0
	11	3409.5			-1.0				-1.0
1962	2	4815.2			-1.0				
	5	627.9			-1.0				
	8	1702.9			-1.0				-1.0
	11	8249.9			-1.0				-1.0
1963	2	9852.3			-1.0				
	5	665.3			-1.0				
	8	2079.4			-1.0				
	11	3137.8			-1.0				
1964	2	5981.2			-1.0		-1.0		
	5	860.4			-1.0		-1.0		
	8	6192.3			-1.0		-1.0		
	11	10191.1			-1.0		-1.0		
1965	2	7448.9			-1.0				
	5	13192.3			-1.0				
	8	15183.7			-1.0				
	11	8128.5			-1.0				
1966	2	6060.2			-1.0				
	5	22694.7			-1.0				
	8	7566.0			-1.0				
	11	3815.8			-1.0				
1967	2	3060.4			-1.0				
	5	3602.2			-1.0				
	8	2395.3			961.6				
	11	3232.9			1679.0				
1968	2	2169.0			963.3		-1.0		
	5	11744.4			1651.8		-1.0		
	8	4567.8			1083.9		-1.0		
	11	2599.8			2884.8		-1.0		
1969	2	2940.1			3038.2				
	5	6129.7			3021.3				

	8	5693.5			2184.3			
	11	3296.6			2642.7			
1970	2		986.6		1726.3			
	5		1813.5		3087.2			
	8		295.3		2287.3			
	11		312.6		4510.6			
1971	2		206.2		1713.4	-1.0		
	5		630.0		3317.3	-1.0		
	8		530.9		3572.0	-1.0		
	11		215.5		3749.3	-1.0		
1972	2		325.3		4312.6	-1.0		
	5		730.6		9220.8	-1.0		
	8		196.3		7910.1	-1.0		-1.0
	11		399.8		5902.3	-1.0		-1.0
1973	2		81.5		5607.4		-1.0	-1.0
	5		80.0		5973.0	-1.0		-1.0
	8		79.7		6437.3		-1.0	-1.0
	11		132.0		9172.9		-1.0	-1.0
1974	2		139.8		3379.8	-1.0	-1.0	-1.0
	5		61.2		4745.1	-1.0	-1.0	-1.0
	8		31.9		4816.9	-1.0	-1.0	-1.0
	11		61.4		4025.8	-1.0	-1.0	-1.0
1975	2		123.2		2152.7	-1.0	-1.0	-1.0
	5		111.5		3679.4	-1.0	-1.0	-1.0
	8		275.3		3208.5	-1.0		-1.0
	11		233.6		4047.6	-1.0	-1.0	-1.0
1976	2			44.8	1980.5	-1.0		-1.0
	5			7.3	3385.6	-1.0		-1.0
	8			8.7	3529.2	-1.0		
	11			21.8	4807.4	-1.0		-1.0
1977	2			46.5	2410.1	-1.0	-1.0	-1.0
	5			35.8	4480.2	-1.0	-1.0	-1.0
	8			20.9	3223.5	-1.0	-1.0	-1.0
	11			31.8	3079.1	-1.0	-1.0	-1.0
1978	2			36.9	3639.9	43.0		-1.0
	5			13.2	6115.4	192.8		32.2
	8			28.9	4512.8	171.4	-1.0	33.1
	11			13.4	2130.3	50.4	-1.0	-1.0
1979	2			46.9	4670.8	6.9		-1.0
	5			68.4	6785.1	83.8	-1.0	1851.5
	8			17.9	3350.5	214.7		464.7
	11			76.8	2578.0	56.0	-1.0	86.8
1980	2			182.4	3576.7	17.9	-1.0	492.1
	5			154.0	5423.2	152.5	-1.0	1497.2
	8			56.8	4097.1	317.0	-1.0	-1.0
	11			33.6	3801.2	44.4	-1.0	-1.0
1981	2			117.4	5918.4	1.0	-1.0	-1.0
	5			142.3	5159.0	178.2	-1.0	-1.0
	8			50.9	4072.3	438.5	-1.0	-1.0
	11			44.9	6646.1	25.1	-1.0	-1.0
1982	2			90.9	5134.0	43.3	-1.0	127.1
	5			138.2	8212.5	491.0	-1.0	22932.9
	8			58.6	6552.6	1038.6	-1.0	164.7
	11			104.8	6994.0	80.0	-1.0	-1.0
1983	2			30.8	4559.4	27.0	-1.0	681.3
	5			31.7	3425.7	300.2	-1.0	464.9
	8			23.8	2076.3	491.9	-1.0	48.5
	11			105.1	2303.5	93.9	-1.0	1870.7
1984	2			42.1	1675.2	37.1	-1.0	1109.1
	5			77.9	1857.3	178.3	-1.0	1102.4
	8			32.3	2194.5	379.1	-1.0	89.0
	11			107.5	3545.4	26.9	-1.0	111.8
1985	2			41.5	4326.4	49.2	2665.1	1799.2
	5			118.4	6828.0	221.1	3051.7	1629.2
	8			184.7	5045.1	153.3	-1.0	143.3
	11			66.5	5497.8	44.5	606.8	365.7
1986	2			84.6	7556.8	60.0	3446.8	156.1
	5			148.0	9982.3	225.7	2489.1	931.3
	8			116.5	6180.4	327.4	-1.0	1138.6
	11			39.1	5544.9	23.8	397.7	1176.3
1987	2			46.9	11105.3	11.0	1421.9	-1.0
	5			224.7	10405.4	119.8	2136.0	2178.3
	8			137.8	7961.7	94.5	-1.0	27.5
	11			72.4	6180.2	12.3	2032.0	480.9
1988	2			62.6	12370.1	14.8	2656.9	225.8
	5			615.1	9286.3	278.2	2479.6	4499.9
	8			213.8	6170.0	182.2	-1.0	-1.0
	11			88.0	4242.8	13.0	1636.9	-1.0
1989	2			105.3	11036.3	18.5	3520.2	-1.0
	5			136.7	9569.4	255.9	2525.1	5709.4
	8			138.6	5506.3	148.7	-1.0	-1.0
	11			332.7	8615.2	10.7	1988.8	111.8
1990	2			133.0	8528.9	14.7	4327.3	931.5
	5			257.9	10538.2	247.8	2501.0	479.6
	8			173.7	10553.4	127.1	-1.0	37.4

	11		71.3	7036.8	18.5	416.8		0.9
1991	2		132.9	7751.8	8.1	1838.7		365.0
	5		345.0	10242.6	170.9	1338.6		600.6
	8		228.9	6392.6	427.6	-1.0		164.8
	11		58.5	7282.2	632.5	1153.1		-1.0
1992	2		74.2	7823.8	627.5	2896.3		-1.0
	5		338.0	8426.0	516.5	2844.7		6584.4
	8		299.6	8128.6	322.9	-1.0		239.0
	11		384.8	6176.6	2424.4	953.3		667.6
1993	2		112.5	10741.7	1456.4	3033.6		145.2
	5		299.2	4743.8	307.6	2114.5		1859.2
	8		253.7	5297.7	522.2	-1.0		3.0
	11		227.8	13172.8	432.9	2475.7		-1.0
1994	2		147.8	8346.0	143.7	2619.5		1756.4
	5		237.0	10128.8	42.1	1106.2		1162.5
	8		241.0	5125.8	207.9	-1.0		228.2
	11		197.3	3242.6	159.6	3228.2		706.5
1995	2		56.4	1658.8	17.8	6585.9		549.6
	5		268.5	5390.0	339.0	102.4		18.6
	8		336.3	7320.6	341.8	-1.0		454.6
	11		133.3	8572.0	71.2	126.2		591.4
1996	2		127.3	6957.7	20.5	1294.8		37.1
	5		327.7	5999.7	152.4	1758.2		
	8		209.2	4998.1	357.8	-1.0		239.1
	11		137.7	4790.2	29.3	2830.3		176.0
1997	2		143.9	4512.3	46.9	1296.3		264.4
	5		166.2	8962.5	141.4	1421.7		67.1
	8		115.6	5879.6	98.2	-1.0		66.9
	11		86.4	3201.2	106.1	3188.5		3165.5
1998	2		28.6	4475.3	358.4	1875.3		329.8
	5		138.9	7986.3	599.9	2406.1		475.1
	8		290.5	6066.3	572.4	-1.0		38.8
	11		57.2	3966.7	769.5	2020.7		10.2
1999	2		79.2	8889.7	233.8	-1.0		-1.0
	5		211.6	10167.2	394.1	-1.0		358.9
	8		354.5	5760.9	484.8		-1.0	13.3
	11		77.0	7316.3	389.8		2948.7	-1.0
2000	2		12.9	9247.7	565.8		2528.3	481.8
	5		222.6	12294.7	997.8		3937.8	14.6
	8		173.4	7284.4	846.9		-1.0	4.9
	11		57.1	8320.8	1230.1		1134.9	5.9
2001	2		39.5	8373.3	2207.9		3139.6	156.5
	5		105.8	8392.2	1162.8		3835.5	214.6
	8		178.6	8847.1	670.5		-1.0	81.2
	11		23.7	7369.5	3843.8		1794.7	861.8
2002	2		40.6	8652.3	4962.6		5676.2	1147.1
	5		59.1	12304.7	287.0		2267.6	176.3
	8		226.1	10801.3	292.7		-1.0	0.3
	11		12.6	3137.8	277.4		1987.4	493.9
2003	2		23.3	11447.0	384.5		2740.7	13.4
	5		130.2	11261.7	117.4		2420.1	72.2
	8		220.3	7466.8	450.2		-1.0	95.4
	11		75.4	6810.9	2073.4		1734.1	8.7
2004	2		15.5	5104.7	83.3		3283.8	-1.0
	5		89.5	6781.2	140.0		2412.9	-1.0
	8		335.5	7158.3	181.1		-1.0	337.7
	11		133.7	6994.8	189.9		2064.0	-1.0
2005	2		5.2	18107.3	228.4		2336.5	1731.9
	5		11.1	4679.5	209.3		2002.2	2422.1
	8		187.0	1303.1	256.4		-1.0	5596.4
	11			771.3	250.0		1465.9	282.1

Table 11a. Fishery options for MFCL

North Atlantic			
Fishery	*CV effort deviations*	*sel. group*	*size sample reduced by*
1	0.22	1	10
2	0.22	2	10
3	0.22	1	10
4	0.22	3	10
5	0.22	4	10
6	0.22	5	10
7	0.22	5	10
8	0.22	6	20
9	0.32	6	20
10	0.32	3	30

Table 11b. Fishery options for MFCL (southern albacore)

South Atlantic			
Fishery	*CV effort deviations*	*sel. group*	*size sample reduced by*
1	0.22	1	10
2	0.22	2	10
3	0.22	2	10
4	0.22	3	10
5	0.22	4	10
6	0.22	5	10
7	0.22	5	10
8	0.32	5	30

Table 12. Model options used in the initial MFCL runs.

	Run1	*Run2*	*Run3*	*Run4*	*Run5*	*Run6*	*Run7*	*Run8*
$M = 0.3$	✓							✓
$\hat{M}$ constant		✓					✓	
$\hat{M}$ by age			✓	✓	✓	✓		
Init. Pop $\bar{Z}$ short [1]					✓			
Initi Pop $\bar{Z}$ long [2]	✓	✓	✓	✓		✓	✓	✓
$\hat{\sigma}$ growth						✓	✓	✓
$\hat{l}_1$ age 1						✓	✓	✓
$\hat{q}$ Random walks [3]				✓	✓	✓	✓	✓

[1] Five years for the North and 2 years for the South
[2] Ten years for the North and 5 years for the South
[3] For the North: Fisheries 1, 2, 3, 4, 8, 9, 10. For the South, fisheries 4, 5, 6, 7, 8.

Table 13. Catches were divided by country and gear into five fleets.

Fleet 1	*Fleet 2*	*Fleet 3*	*Fleet 4*	*Fleet 5*
Chinese Taipei (LL)	China LL	Brazil (LL, SU)	Brazil (BB, GN, HL, PS)	Namibia (BB)
Korea (LL)	E.C. Espana (LL)	Panama (LL)	E.C. Espana (PS)	
	E.C Portugal (LL)	South Africa (LL, UN)	E.C Portugal (BB, PS)	
	Japan (LL)	Argentina (LL, TW, UN)	Japan (BB, PS)	
	Philippines (LL)	Belize (LL)	Korea (BB)	
	St Vicent and Grenadier (LL)	Cambodia (LL)	Maroc (PS)	
	USA (LL)	Cuba (LL, UN)	Panama (PS)	
	USSR (LL, UN)		South Africa (BB, HL, PS, RR, SP)	
	Uruguay (LL)		USA (PS)	
	Vanuatu (LL)		USSR (PS)	
	Honduras (LL)		UK St Helena (BB, RR)	
	Nei (LL)		Chinese Taipei (GN)	
			Nei (PS)	
			Netherlands (PS)	

Table 14. Catches for the 5 fleets.

	Fleet 1	*Fleet 2*	*Fleet 3*	*Fleet 4*	*Fleet 5*
1956	0	21	0	0	0
1957	0	725	0	0	0
1958	0	1047	0	0	0
1959	0	3015	1700	0	0
1960	0	8673	1802	0	0
1961	0	9293	1472	0	0
1962	0	18222	749	0	0
1963	0	15838	1547	0	0
1964	115	24369	1493	22	0
1965	346	28318	1181	0	0
1966	5275	21115	906	0	0
1967	7412	7719	752	0	0
1968	12489	11857	1304	38	0
1969	21732	6331	430	0	0
1970	17255	5898	500	0	0
1971	21323	3218	344	0	0
1972	30640	2087	352	100	0
1973	25888	280	1945	100	0
1974	19079	109	365	150	0
1975	16614	306	536	151	0
1976	18060	73	1129	197	0
1977	20070	105	1162	328	0
1978	21843	135	867	324	0
1979	21218	119	640	651	0
1980	19400	683	674	2173	0
1981	18869	1117	460	3594	0
1982	23363	924	1046	4339	0
1983	10101	1126	822	2869	0

1984	8237	1061	1008	4293	0
1985	20154	2198	562	8183	0
1986	27913	1097	1180	7098	0
1987	29173	535	1798	9124	0
1988	20926	505	767	7909	0
1989	18440	533	790	7448	0
1990	20461	642	638	6973	0
1991	19914	838	1333	3930	0
1992	23068	1003	3374	9089	0
1993	19420	776	3753	8863	0
1994	22573	939	1489	9199	915
1995	18351	744	941	6563	950
1996	18974	860	1165	6444	982
1997	18169	736	762	7162	1192
1998	16113	615	3080	9365	1422
1999	17377	1763	1538	5893	1072
2000	17239	3398	3760	4743	2240
2001	15834	5965	6240	7793	2969
2002	17321	1485	2866	7216	2858
2003	17356	1419	1856	4932	2432
2004	13325	1107	305	4694	3079
2005	10772	1868	359	3873	2031

Table 15. Model specifications.

Age-at-50% maturity	5
Constant natural mortality	0.3
Steepness parameter	0.7
Plus-group	8
Minus-age-group	2 for all fleets
Age-at-which selectivity starts decline	SA and Nam = 3, Japan = 5, Taiwan and Brazil = 8
Phases of estimation:	K = 1, selectivity parameters = 2, recruitment residuals = 3.

Table 16. Categorization, based on type of gears, of the two fishing fleets (longline fisheries and surface fisheries) that utilized the South Atlantic albacore resource.

Fleet 1	Japan LL (1959 ~ 2005) ; Chinese Taipei LL (1968 ~ 2005) ; Brazil LL (1978 ~ 2005)
Fleet 2	South Africa BB (1985 ~ 2005)

Table 17. Periods of adopted seven CPUE Indices series.

Index series 1	Japan LL (1959 ~ 1969)
Index series 2	Japan LL (1969 ~ 1975)
Index series 3	Japan LL (1975 ~ 2005)
Index series 4	Chinese Taipei LL (1968 ~ 2005)
Index series 5	Brazil LL (1978 ~ 2005)
Index series 6	South Africa BB (1985 ~ 1998)
Index series 7	South Africa BB (1999 ~ 2005)

Table 18. Yearly catch (in t) of South Atlantic albacore, by fleet.

Year	Fleet 1	Fleet 2
1959	4715	
1960	10475	
1961	10365	400
1962	17171	1800
1963	17385	
1964	25977	22
1965	29845	
1966	27296	
1967	15883	
1968	25650	38
1969	28493	
1970	23653	
1971	24885	
1972	33079	100
1973	28113	100
1974	19553	150
1975	17456	151
1976	19262	197
1977	21194	471
1978	22806	363
1979	21843	785
1980	20671	2259
1981	20426	3614
1982	25255	4417
1983	11941	2977
1984	9834	4765
1985	22672	8425
1986	29815	7473
1987	30964	9666
1988	21828	8279
1989	19407	7804
1990	21590	7124
1991	22008	4007
1992	27133	9400
1993	23947	8866
1994	24607	10508
1995	20036	7513
1996	21000	7426
1997	19547	8474
1998	19799	10796
1999	20626	7017
2000	24398	6982
2001	28039	10762
2002	21672	10074
2003	20619	7376
2004	14717	7792
2005	12999	5905

Table 19. Specifications selected and values provided to the ASPM_2 model.

Specification	*Stochastic*	*Deterministic*
Plus-group	13+	13+
Nature Mortality	0.3	0.3
Steepness parameter	>0.9	0.7
SRR type	Beverton-Holt	Beverton-Holt
Growth equation	Lee and Yeh (2006)	Lee and Yeh (2006)
Length/Weight conversion	Penney (1994)	Penney (1994)

Table 20. Fishing mortality rate at age estimates for the VPA base case.

	Age 1	*Age 2*	*Age 3*	*Age 4*	*Age 5*	*Age 6*	*Age 7*	*Age 8*
1975	0.039	0.079	0.454	0.135	0.048	0.054	0.122	0.061
1976	0.119	0.358	0.081	0.518	0.211	0.157	0.082	0.051
1977	0.043	0.599	0.417	0.036	0.672	0.281	0.058	0.046
1978	0.150	0.571	0.656	0.196	0.025	1.944	0.033	0.033
1979	0.101	0.297	1.078	0.948	0.244	0.018	0.039	0.049
1980	0.170	0.413	0.289	0.436	0.841	0.116	0.019	0.030
1981	0.105	0.300	0.491	0.107	0.223	3.305	0.020	0.040
1982	0.035	0.278	0.551	0.486	0.030	1.164	0.032	0.076
1983	0.155	0.459	0.500	0.450	0.565	0.162	0.034	0.098
1984	0.111	0.322	0.631	0.155	0.454	2.753	0.064	0.223
1985	0.165	0.423	0.519	0.278	0.268	0.647	0.046	0.179
1986	0.110	0.455	0.940	0.296	0.414	0.351	0.081	0.344
1987	0.036	0.650	1.000	0.298	0.086	0.257	0.042	0.194
1988	0.290	0.427	0.641	0.187	0.180	0.069	0.018	0.088
1989	0.146	0.689	0.587	0.094	0.256	0.130	0.009	0.045
1990	0.164	0.689	0.839	0.227	0.231	0.875	0.027	0.133
1991	0.171	0.630	0.360	0.364	0.221	0.162	0.006	0.027
1992	0.224	0.482	0.592	0.112	0.033	0.332	0.063	0.297
1993	0.171	0.773	0.796	0.404	0.106	2.033	0.059	0.254
1994	0.102	0.866	0.890	0.262	0.171	0.181	0.150	0.587
1995	0.181	0.696	1.137	0.256	0.477	0.789	0.341	1.192
1996	0.234	0.685	0.233	0.470	0.258	0.268	0.192	0.591
1997	0.222	0.592	0.520	0.103	0.468	0.744	0.207	0.563
1998	0.191	0.445	0.348	0.126	0.044	0.615	0.195	0.471
1999	0.273	0.258	0.575	0.342	0.185	0.148	0.806	1.727
2000	0.223	0.532	0.291	0.222	0.021	0.802	0.691	1.314
2001	0.174	0.334	0.741	0.228	0.059	0.384	0.145	0.253
2002	0.197	0.228	0.159	0.868	0.084	0.861	0.343	0.557
2003	0.262	0.228	0.445	0.328	0.267	0.343	0.264	0.409
2004	0.075	0.407	0.374	0.233	0.251	2.194	0.173	0.259
2005	0.028	0.284	0.742	0.189	0.123	1.477	0.065	0.065

Table 21. Stock size at age estimates for the VPA base case.

	Age 1	*Age 2*	*Age 3*	*Age 4*	*Age 5*	*Age 6*	*Age 7*
1975	12403791	21822577	5069760	3510231	2970951	2346955	661214
1976	9610969	8833684	14931850	2386138	2271269	2098147	1647667
1977	9973945	6323749	4572736	10196107	1053288	1362277	1329019
1978	17169888	7076165	2573792	2233270	7289421	398474	761754
1979	8308918	10943552	2962002	989264	1359321	5268165	42268
1980	11740652	5565540	6021927	746710	283959	788966	3831795
1981	12280740	7340520	2728681	3342922	357608	90702	520646
1982	6999957	8193139	4028548	1237010	2225828	212033	2467
1983	8162851	5008909	4597749	1720348	563672	1600140	49024
1984	7104451	5177083	2344803	2066772	812635	237264	1008191
1985	8320716	4707857	2778651	924340	1311296	382207	11203
1986	9032457	5228726	2285110	1224658	518568	743200	148262
1987	9778992	5996135	2456456	661332	674647	253834	387773
1988	7481880	6985331	2319713	669273	363564	458522	145418
1989	8846099	4146803	3375863	905571	411403	224906	317165
1990	8407551	5663827	1542208	1390744	610932	236031	146277
1991	9145148	5285811	2107544	493623	820945	359136	72905
1992	6991683	5709081	2086111	1089102	254095	487546	226167
1993	7674933	4138676	2611312	855153	721637	182124	259047
1994	7548929	4793072	1414895	872827	422918	480643	17660
1995	8891837	5050707	1493639	430643	497664	263982	297104
1996	7675338	5498755	1866420	355006	246975	228721	88883
1997	10019900	4499244	2053416	1095809	164376	141306	129663
1998	12727620	5944548	1844359	904220	732638	76244	49729
1999	8598678	7790732	2822143	964551	590705	519180	30544
2000	5588041	4846470	4458383	1176051	507530	363584	331871
2001	3643842	3313529	2108203	2469016	697544	368318	120737
2002	5797198	2268572	1757883	744599	1456007	487090	185772
2003	9047055	3528356	1337907	1111117	231658	992177	152619
2004	12016485	5156400	2081511	635083	592851	131461	521543
2005	52996850	8257613	2542474	1060499	372824	341643	10856

Table 22. Estimated benchmarks by the VPA model and approximate 80% condifent intervals (upper CL and lower CL) using 500 bootstrpas.

Measure	*Lower CL*	*Median*	*Upper CL*	*Average*	*Run 0*
F at MSY	3.76E-01	4.31E-01	5.33E-01	4.42E-01	4.15E-01
MSY	3.12E+04	3.22E+04	3.32E+04	3.21E+04	3.23E+04
Y/R at MSY	3.72E+00	3.81E+00	3.90E+00	3.81E+00	3.81E+00
S/R at MSY	3.98E+00	4.66E+00	5.25E+00	4.61E+00	4.88E+00
SPR AT MSY	1.37E-01	1.61E-01	1.81E-01	1.59E-01	1.68E-01
SSB AT MSY	3.37E+04	3.93E+04	4.40E+04	3.89E+04	4.14E+04
F at max. Y/R	5.40E-01	6.15E-01	7.58E-01	6.32E-01	6.23E-01
Y/R maximum	3.81E+00	3.91E+00	4.00E+00	3.91E+00	3.93E+00
S/R at Fmax	2.23E+00	2.43E+00	2.61E+00	2.43E+00	2.35E+00
SPR at Fmax	7.69E-02	8.37E-02	9.01E-02	8.36E-02	8.10E-02
SSB at Fmax	1.69E+04	1.88E+04	2.07E+04	1.88E+04	1.77E+04
F 0.1	2.77E-01	3.04E-01	3.43E-01	3.08E-01	3.18E-01
Y/R at F0.1	3.48E+00	3.55E+00	3.62E+00	3.55E+00	3.60E+00
S/R at F0.1	6.78E+00	7.42E+00	8.12E+00	7.43E+00	7.04E+00
SPR at F0.1	2.34E-01	2.56E-01	2.80E-01	2.56E-01	2.43E-01
SSB at F0.1	5.86E+04	6.46E+04	7.14E+04	6.46E+04	6.15E+04
F 20% SPR	3.21E-01	3.63E-01	4.54E-01	3.75E-01	3.67E-01
Y/R at F20	3.63E+00	3.71E+00	3.80E+00	3.71E+00	3.73E+00
S/R at F20	5.83E+00	5.84E+00	5.85E+00	5.84E+00	5.84E+00
SSB at F20	4.95E+04	5.01E+04	5.07E+04	5.01E+04	5.03E+04
F 30% SPR	2.32E-01	2.59E-01	3.17E-01	2.66E-01	2.63E-01
Y/R at F30	3.32E+00	3.39E+00	3.48E+00	3.40E+00	3.40E+00
S/R at F30	8.74E+00	8.75E+00	8.76E+00	8.75E+00	8.75E+00
SSB at F30	7.61E+04	7.68E+04	7.73E+04	7.67E+04	7.74E+04
F 40% SPR	1.71E-01	1.89E-01	2.29E-01	1.95E-01	1.93E-01
Y/R at F40	2.93E+00	3.01E+00	3.09E+00	3.01E+00	3.00E+00
S/R at F40	1.16E+01	1.17E+01	1.17E+01	1.17E+01	1.17E+01
SSB at F40	1.02E+05	1.03E+05	1.04E+05	1.03E+05	1.05E+05
F 90% max Y/R	2.61E-01	2.91E-01	3.46E-01	2.97E-01	2.98E-01
Y 90% max Y/R	2.97E+04	3.06E+04	3.16E+04	3.06E+04	3.11E+04
Y/R 90% max Y/R	3.43E+00	3.51E+00	3.60E+00	3.51E+00	3.54E+00
S/R 90% max Y/R	7.46E+00	7.76E+00	8.03E+00	7.75E+00	7.61E+00
SSB 90% max Y/R	6.49E+04	6.76E+04	7.03E+04	6.76E+04	6.68E+04
F 75% of Fmax	4.05E-01	4.61E-01	5.69E-01	4.74E-01	4.67E-01
Y 75% of Fmax	3.10E+04	3.20E+04	3.30E+04	3.20E+04	3.21E+04
Y/R at 75% Fmax	3.75E+00	3.85E+00	3.95E+00	3.85E+00	3.87E+00
S/R at 75% Fmax	3.90E+00	4.12E+00	4.34E+00	4.12E+00	4.04E+00
SSB at 75% Fmax	3.22E+04	3.43E+04	3.64E+04	3.43E+04	3.34E+04

Table 23. Management benchmarks and other quantities estimated by the various model specifications.

Model specifications		*Base case*			*h=est*	*M est*	*M & h est*
Weighting of CAA data	0.5	0.125	0.05	0.025	0.125	0.125	0.125
-lnL:overall	101.95	-73.39	-110.16	-124.97	-74.99	-74.11	-75.61
No of parameters	78	78	78	78	79	79	80
Ksp	320307	267134	224479	237173	521287	307600	560044
K2+	498101	415411	349078	368819	810646	437219	973650
Bsp(2005)	88396	60290	49901	47451	122798	59072	139486
B2+(2005)	220917	163439	135413	128507	246254	142936	307222
Bsp(MSY)	87903	74497	67603	67373	218348	86676	246441
B2+(MSY)	207458	175948	157201	159578	164323	173059	475055
MSY	35547	30380	27594	27728	28869	27982.3	21917
aveRy	24298	27393	28607	28499	24138	26997	23717
Bsp(2005)/Ksp	0.28	0.23	0.22	0.20	0.24	0.19	0.25
B2+(2005)/K2+	0.44	0.39	0.39	0.35	0.30	0.33	0.32
Bsp(2005)/Bsp(msy)	1.01	0.81	0.74	0.70	0.56	0.68	0.57
B2+(2005)/B2+(msy)	1.06	0.93	0.86	0.81	0.64	0.83	0.65
MSYL/Ksp	0.27	0.28	0.30	0.28	0.42	0.28	0.44
MSYL/K2+	0.42	0.42	0.45	0.43	0.47	0.40	0.49
Fmsy	0.25	0.27	0.65	0.35	0.09	0.22	0.07
F(2005)/Fmsy	0.54	0.72	0.92	0.92	1.33	0.88	1.37
M	0.3	0.3	0.3	0.3	0.3	0.24	0.36
h	0.7	0.7	0.7	0.7	0.34	0.7	0.30

Table 24. Management quantities and benchmarks with 95 percentiles obtained using the MCMC procedure with the base case.

	50 percentile	*95 percentile*	*5 percentile*
Bsp(2005)/Ksp	0.26	0.35	0.18
B2+(2005)/K2+	0.41	0.52	0.34
Bsp(MSY)	81486	99178	70437
MSY	33265	40437	28882
Ry (average over last 10 years)	28042	30615	25196

Table 25. Management quantities and benchmarks derived from results of stochastic and deterministic ASPM-2 applicable to South Atlantic albacore.

Quantity	stochastic ASPM	deterministic ASPM
B^{mat}_{2005}	10777	58174
B^{mat}_{MSY}	12933	75205
B^{mat}_{2005} / B^{mat}_{MSY}	0.833	0.774
Virgin *(K)*	226260	341174
B_{2005}/K	0.152	0.257
MSY	27220	25233
F_{2005}	0.551	0.216
F_{MSY}	0.721	0.253
F_{2005}/F_{MSY}	0.764	0.854

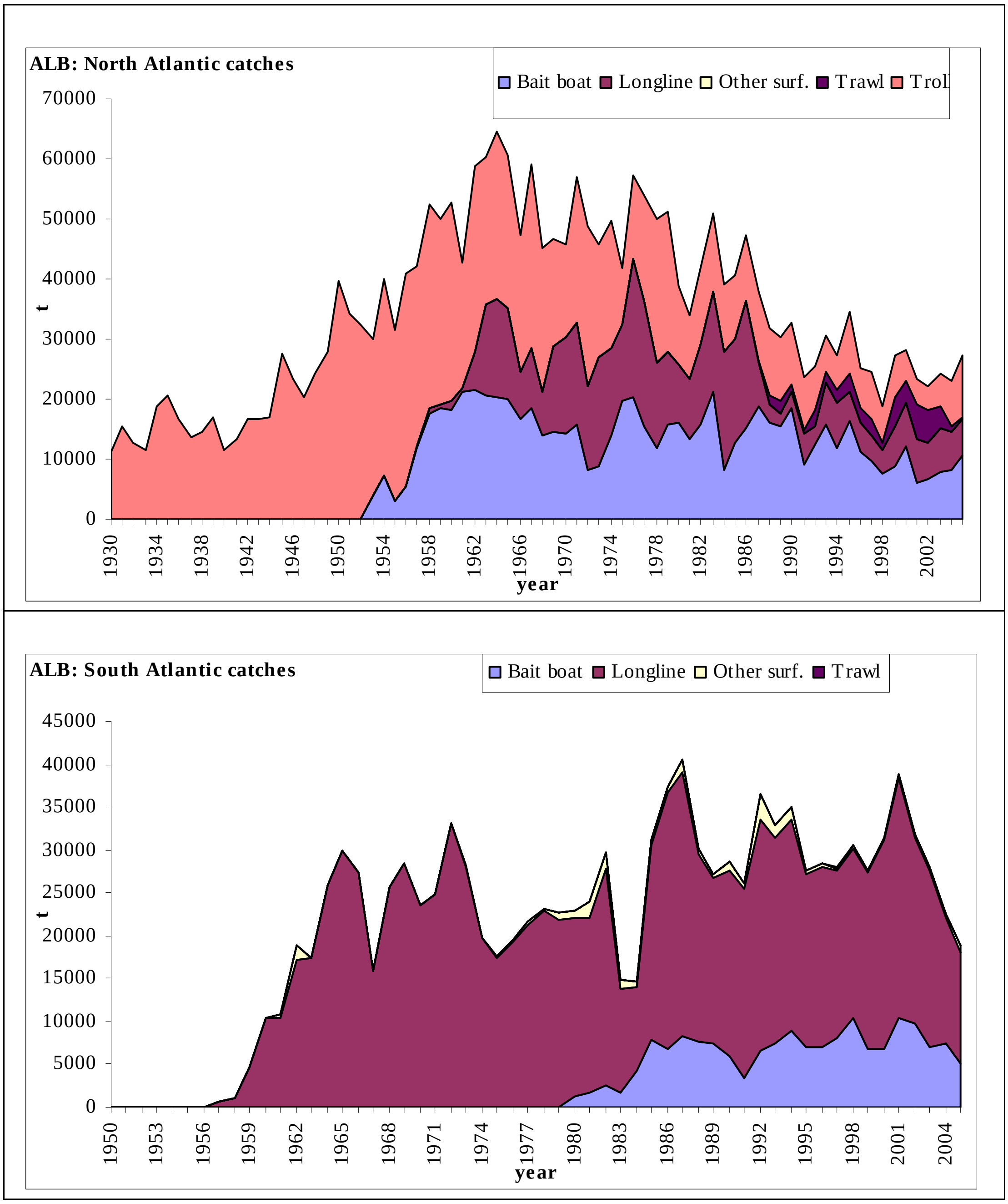


Figure 1. Total albacore catches reported to ICCAT (Task I) by gear for the northern and southern stocks.

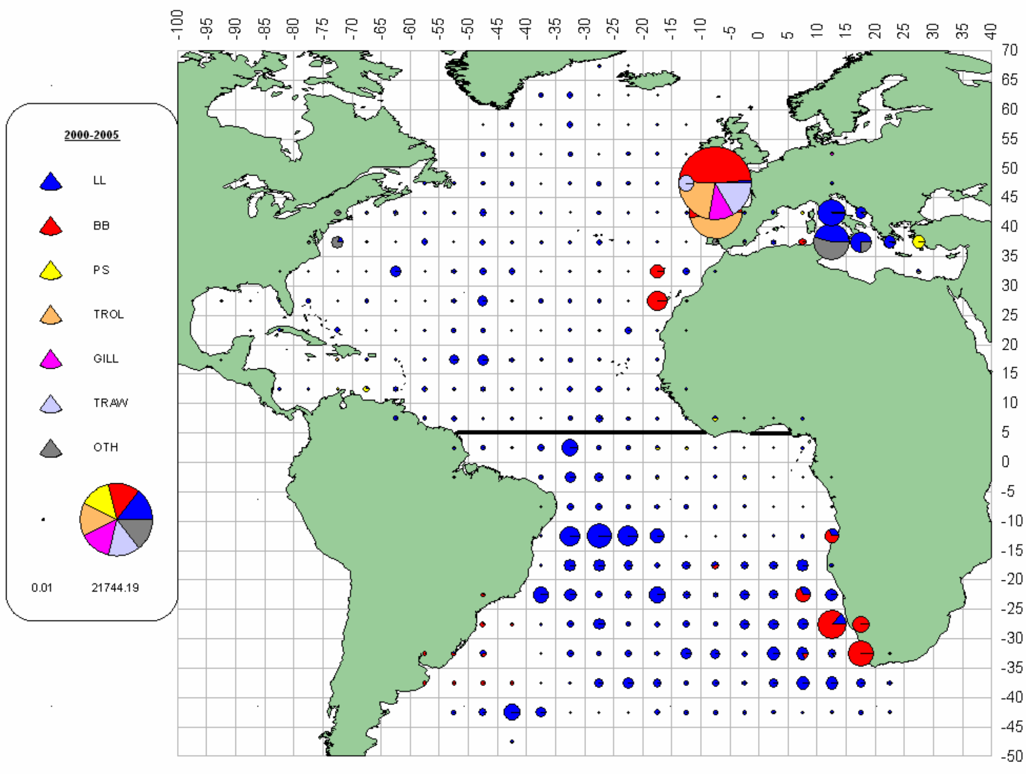


Figure 2. Spatial distribution of average 2000-2005 albacore catches by gear.

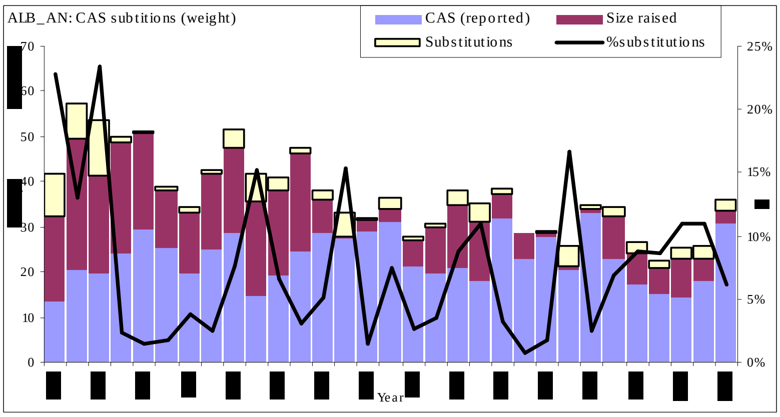


Figure 3. Level of substitutions in weight and % applied to obtain the catch at size for North Atlantic albacore.

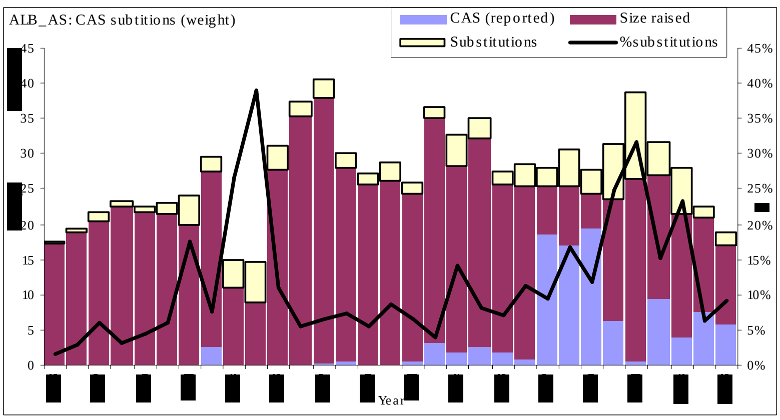


Figure 4. Level of substitutions in weight and % applied to obtain the catch at size for SouthAtlantic albacore.

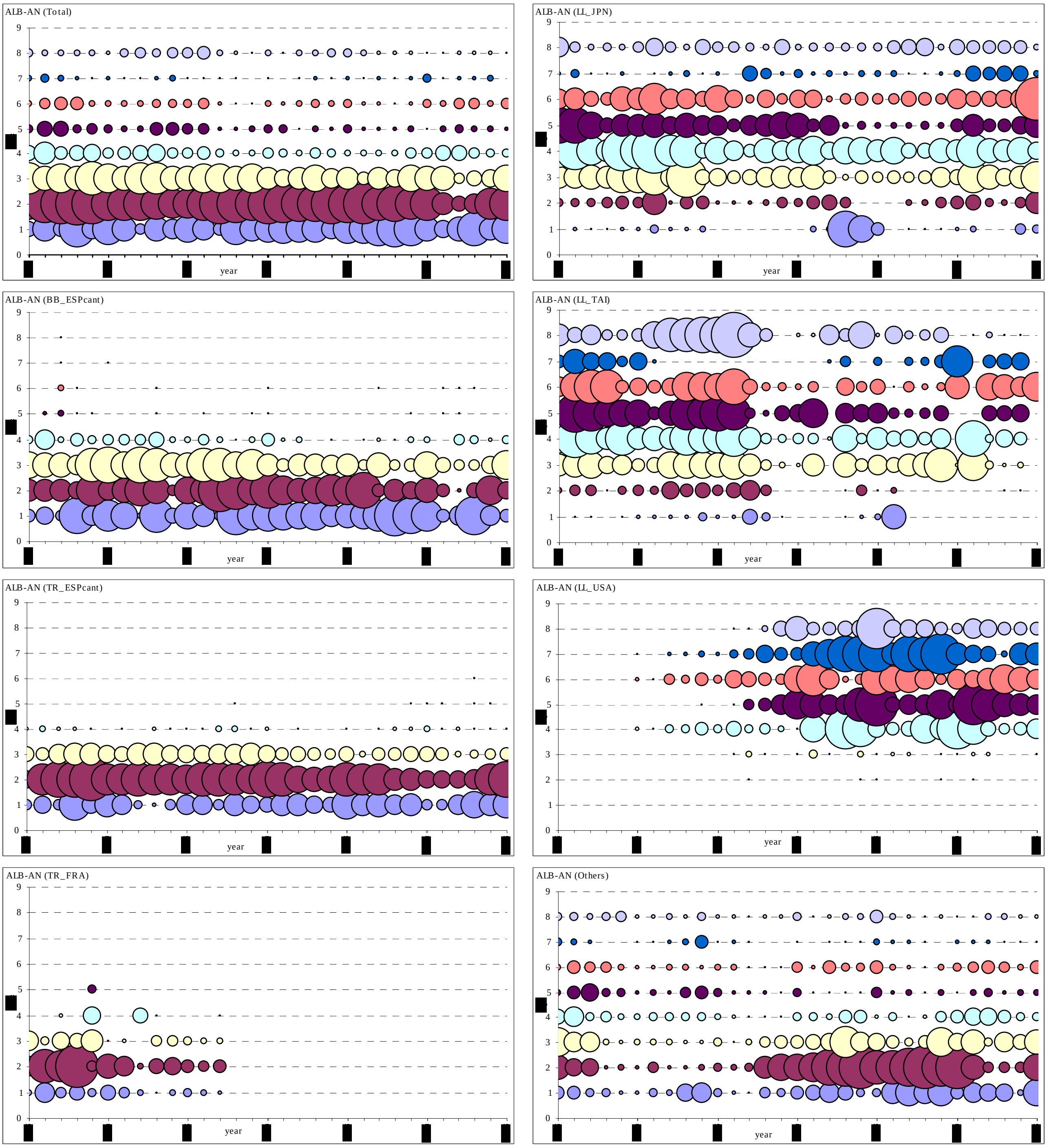


Figure 5. "Bubble plots" of Albacore catch-at-age composition of the catches (total and by fishery, in number) for the North Atlantic stock. Bubble sizes are proportional to number of fish, and independent in each figure.

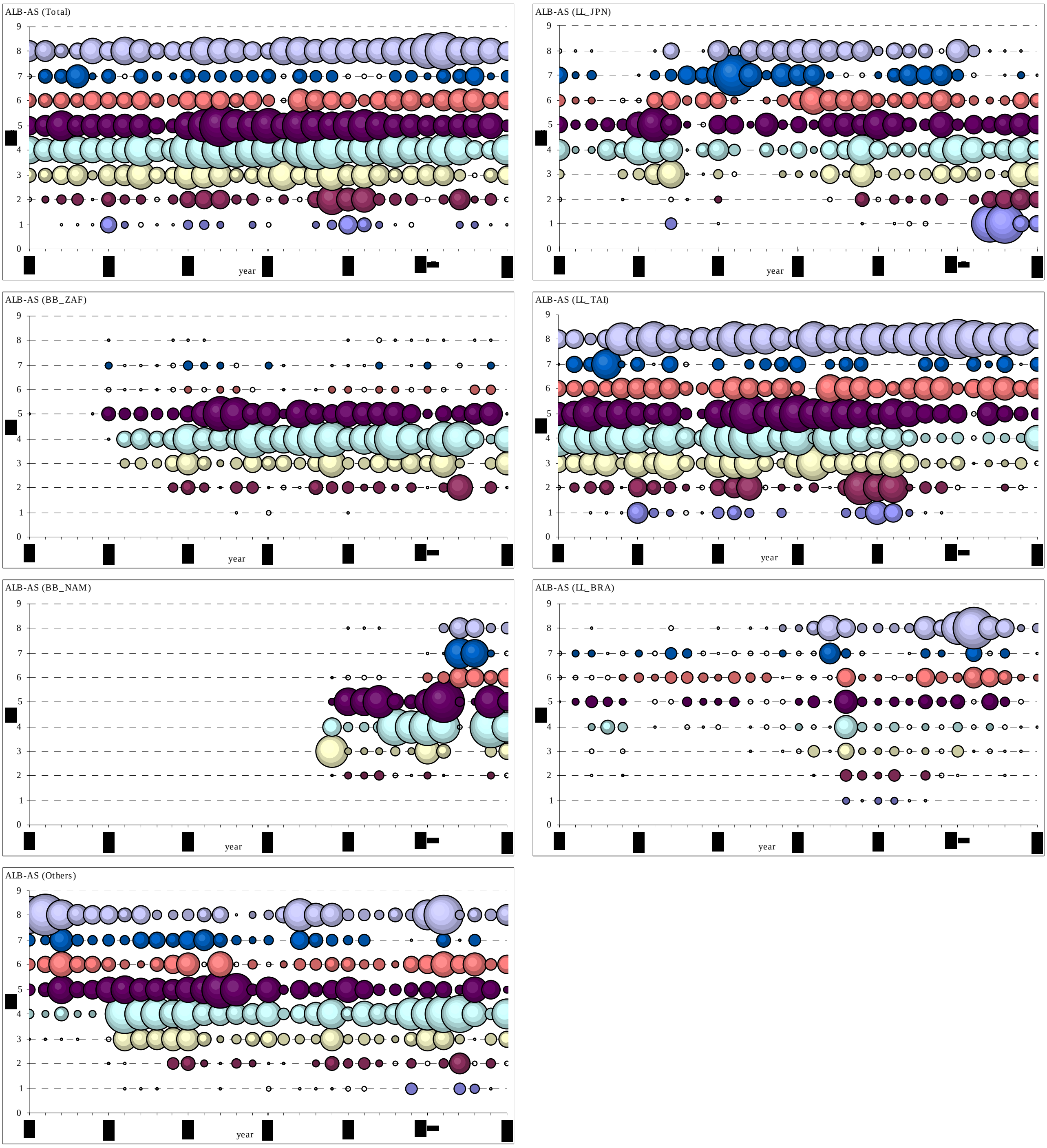


Figure 6. "Bubble plots" of Albacore catch-at-age composition of the catches (total and by fishery, in number) for the South Atlantic stock. Bubble sizes are proportional to number of fish, and independent in each figure.

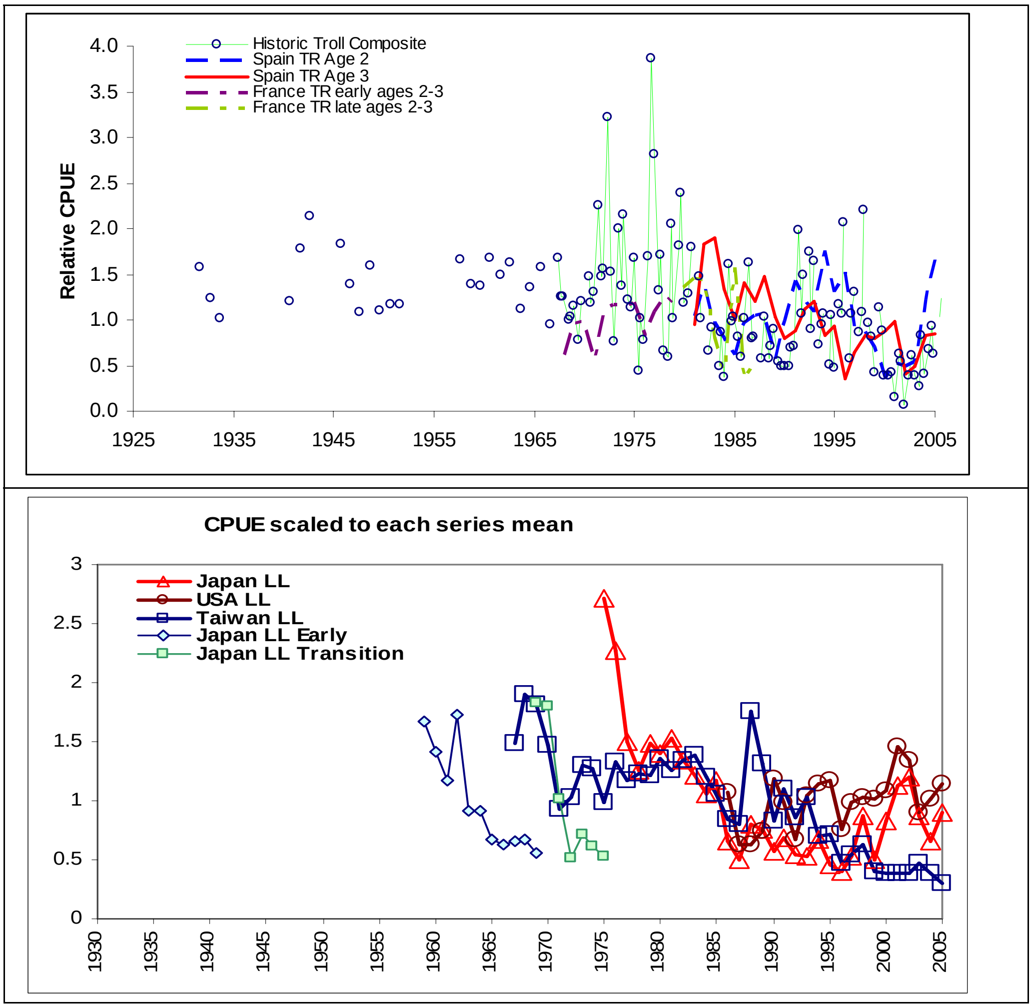


Figure 7. Set of standardized CPUE´s relative abundance indices from the surface fisheries (upper), which take mostly juvenile fish, and from the longline fisheries (lower), which take mostly mature fish used in the 2007 northern albacore stock assessment to fit the VPA-ADAPT model (1975-2005 years) and Multifan-CL model (1930-2005 years surface fishery and 1956-2005 longline fishery).

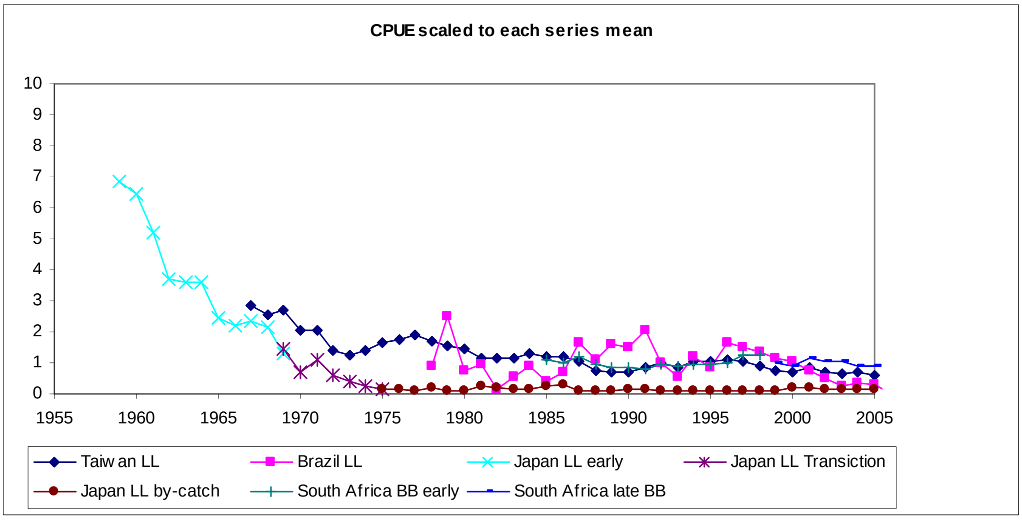


Figure 8. Set of standardized CPUE´s relative abundance indices used in the 2007 southern albacore stock assessment from the surface (South Africa baitboat) and longline (LL) fleets.

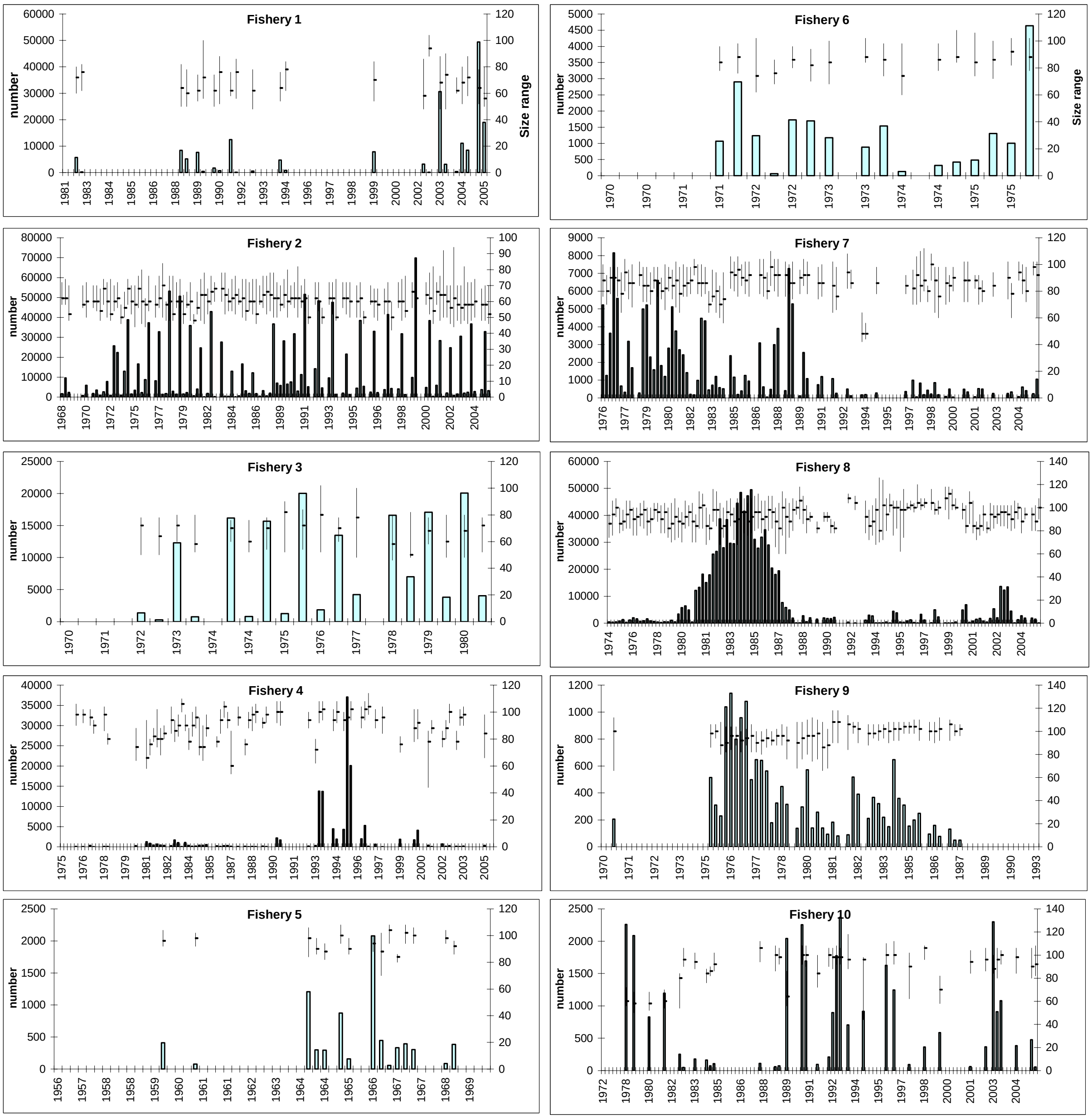


Figure 9a. Summary of the size data used for MFCL. The bars that start at the origin are indicative of relative sample size (number) over time. The high-low-close bars denote the 10th, 90th and 50th percentiles of the size distributions.

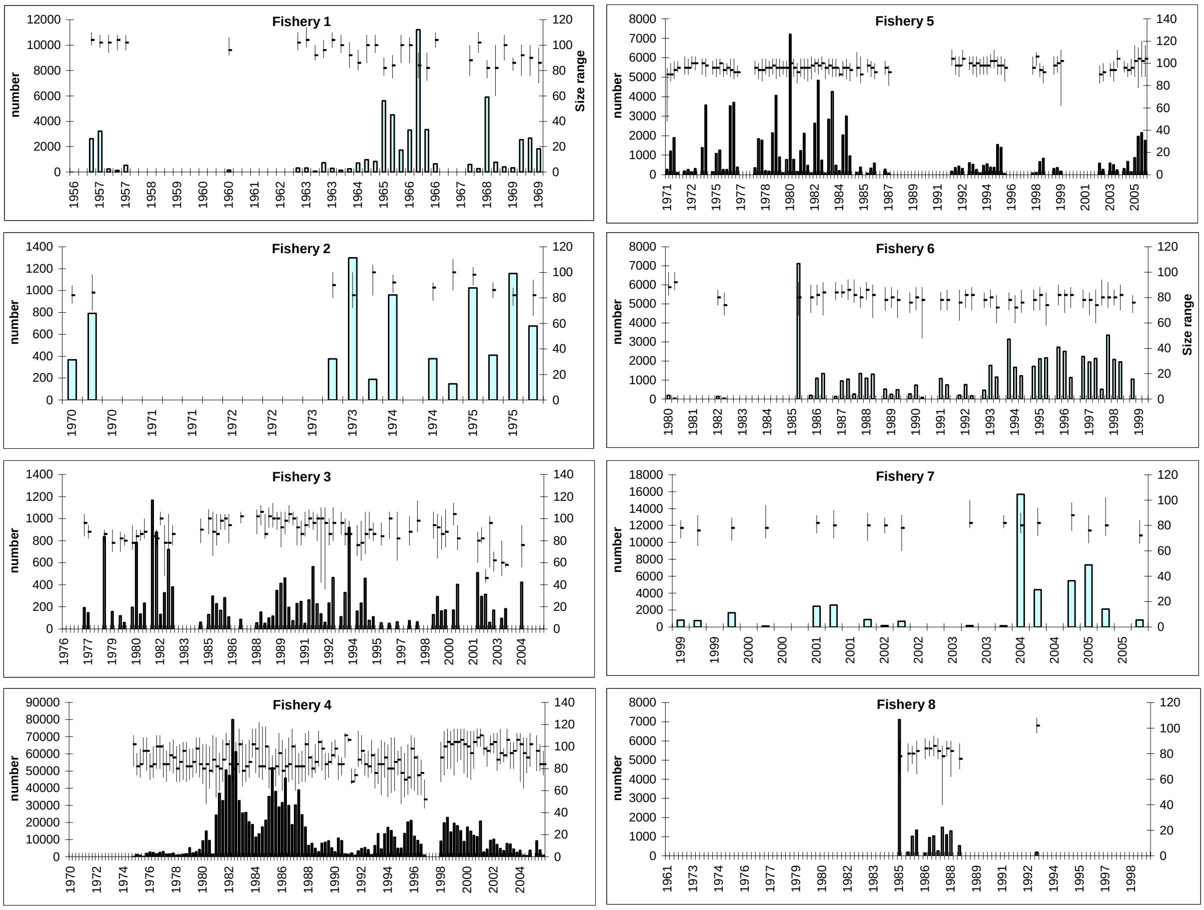


Figure 9b. Summary of the size data used for MFCL. The bars that start at the origin are indicative of relative sample size (number) over time. The high-low-close bars denote the 10th, 90th and 50th percentiles of the size distributions.

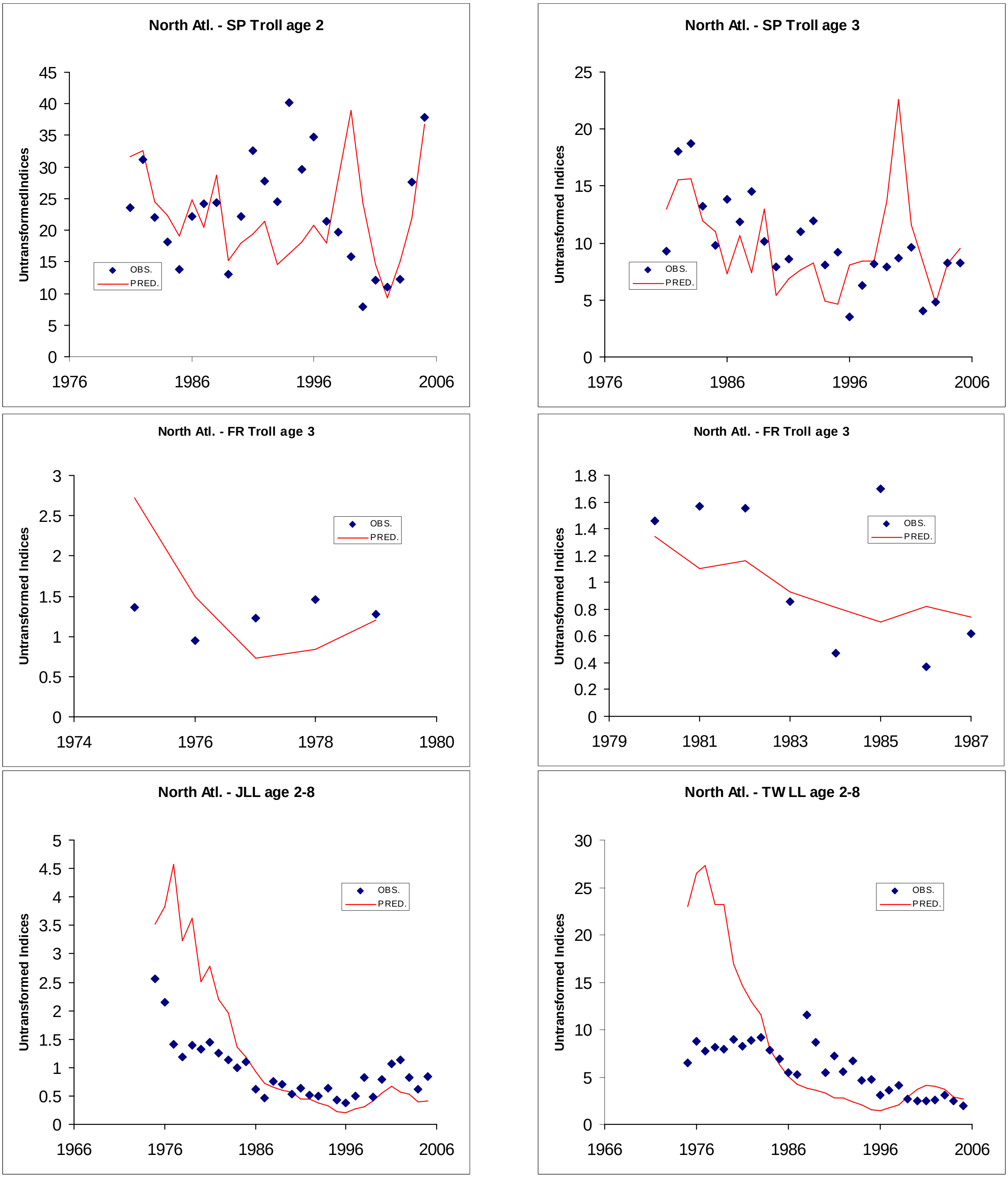
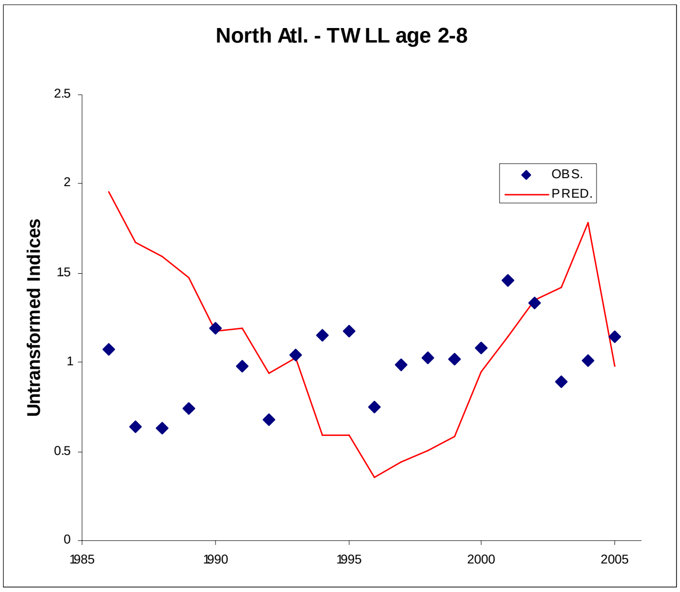


Figure 10. VPA fits to the indices of abundance of preliminary run before defining the base case.

Figure 10 (continued)



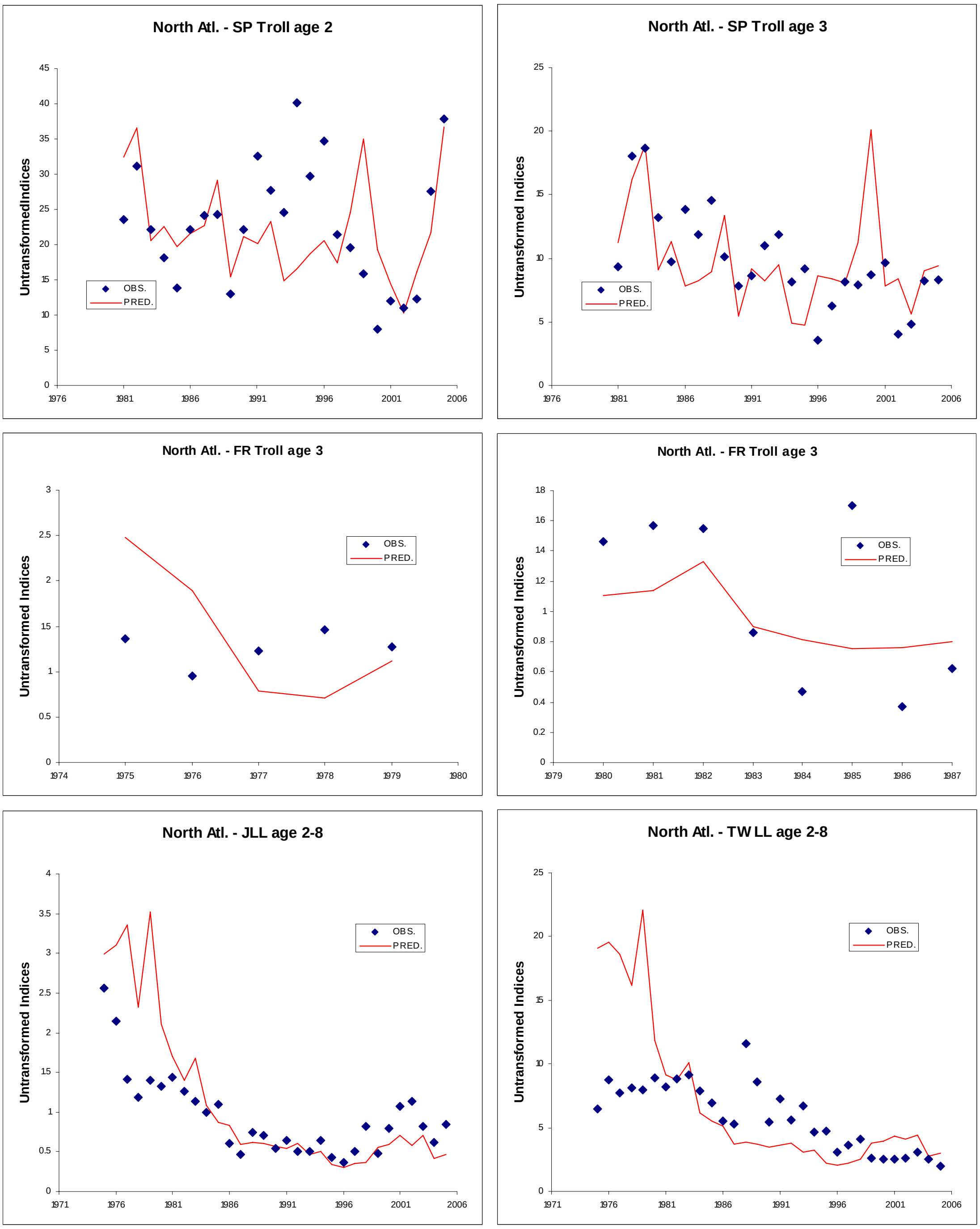
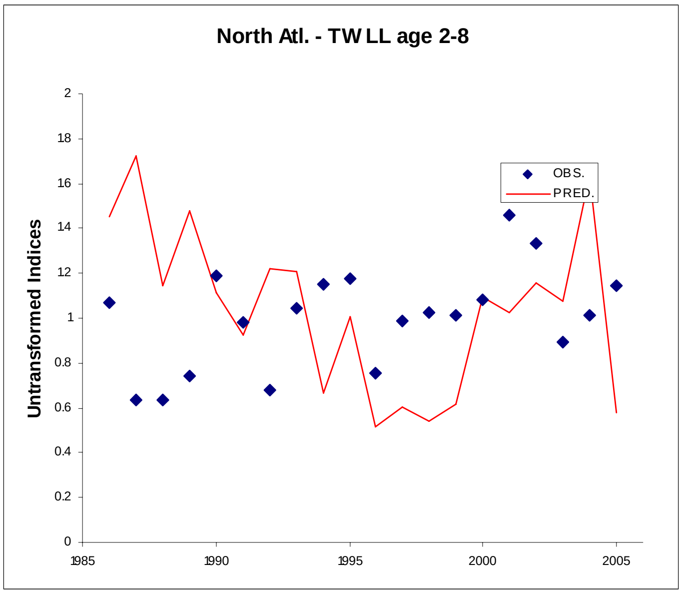


Figure 11. VPA model fits to the indices of abundance for the case of a fixed F ratio for the initial year 1975 of 0.5 (Base case) (see text of details of the run).

Figure 11 (continued)



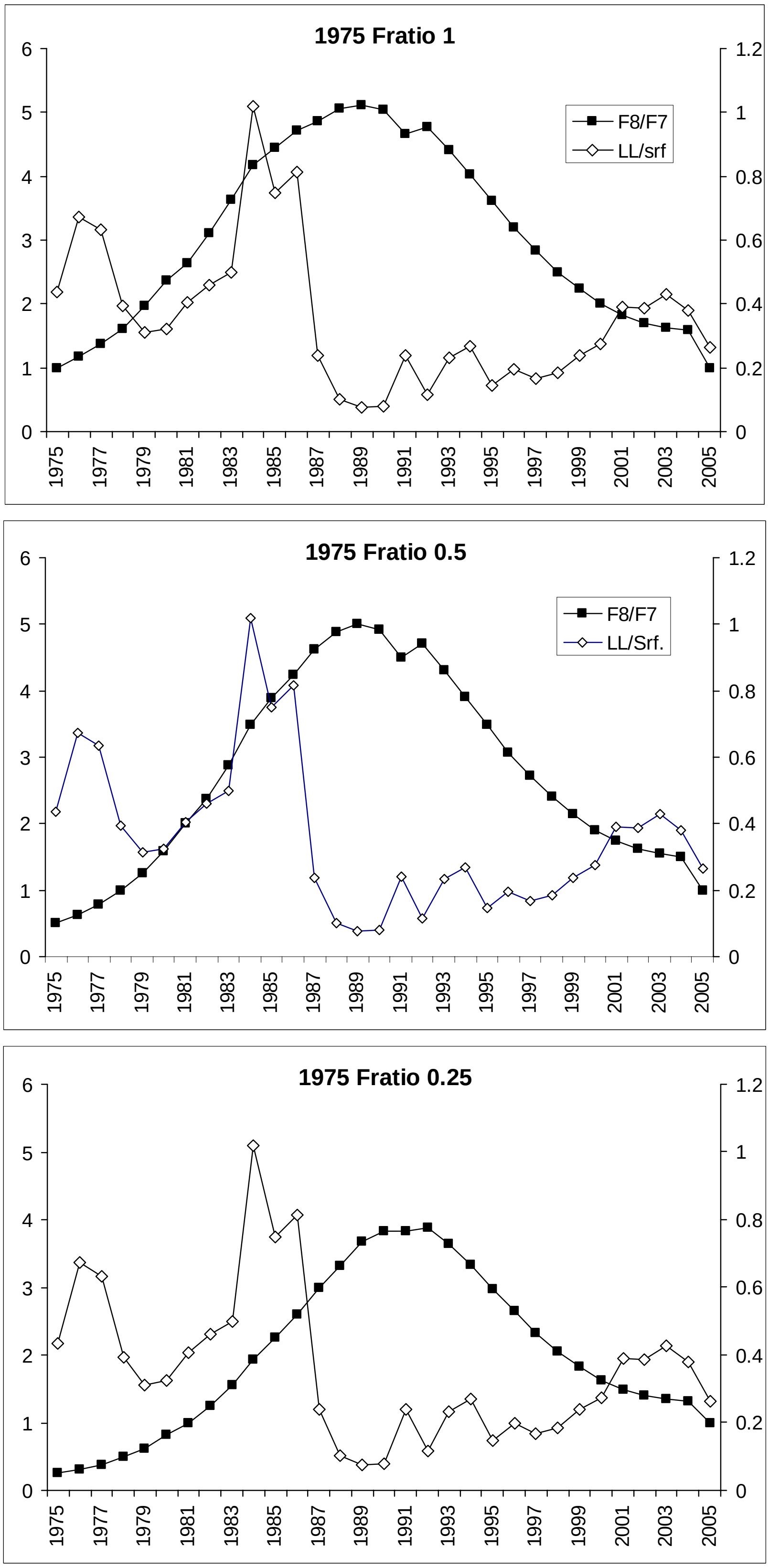
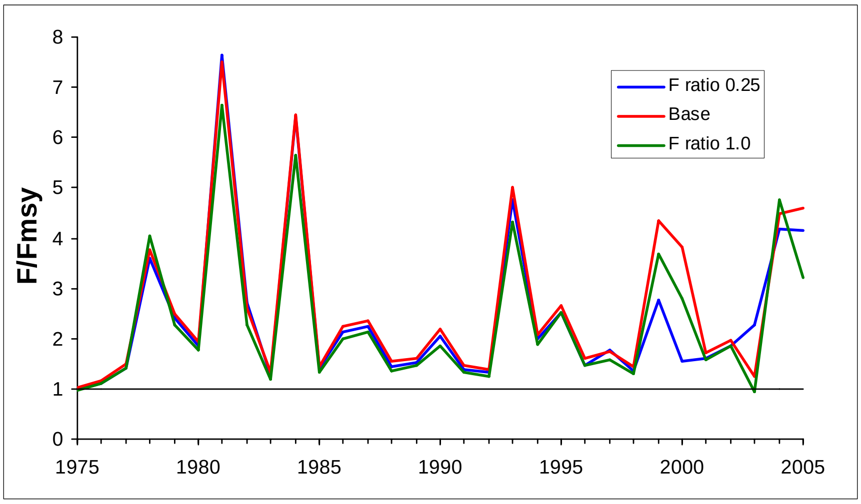


Figure 12. Estimated F ratio for ages 7 and 8+ (black squares) and ratio of the catch of the longline fisheries to the catch of the surface fisheries (open diamonds) for 3 cases of fixed F ratio for the initial year 1975.

a)



b)

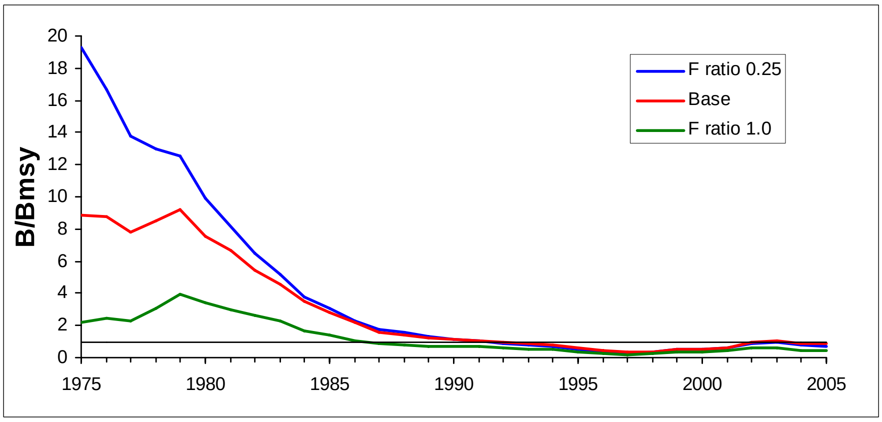


Figure 13. Estimated a) relative F and b) relative SSB trajectories for the VPA base case and sensitivity runs. See text for details of runs.

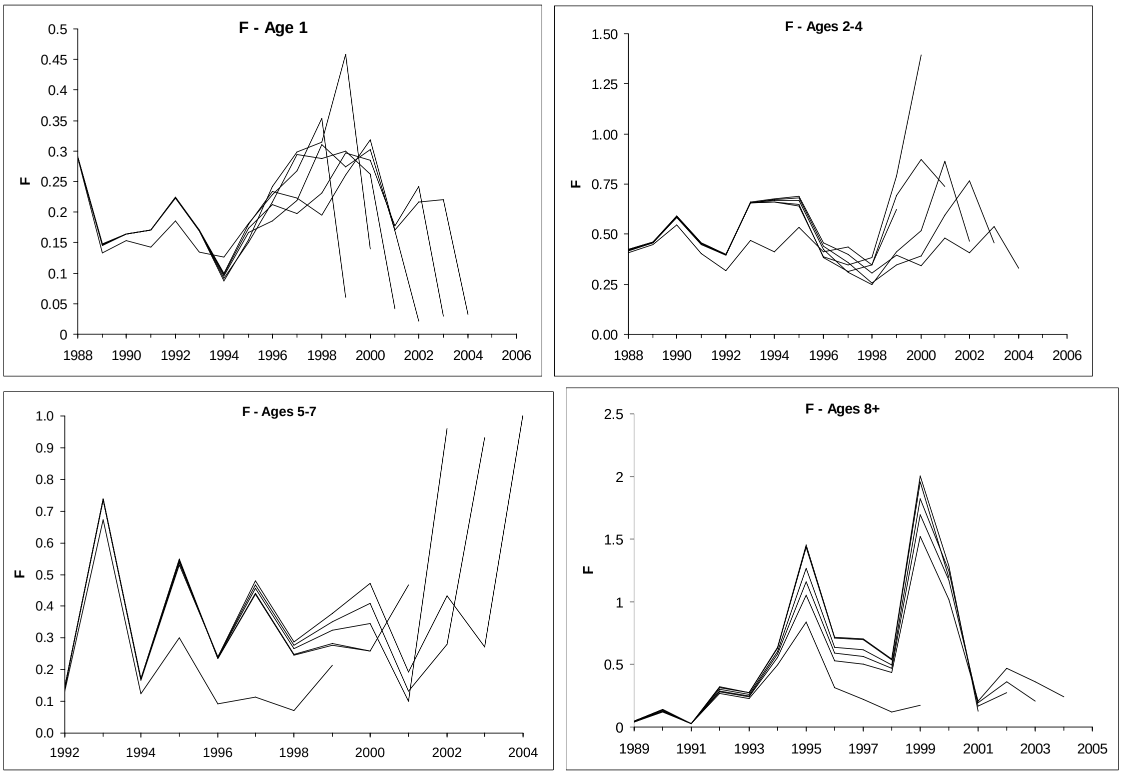


Figure 14. Retrospective analysis of VPA base case for age groups 1, 2-4, 5-7, and 8+.

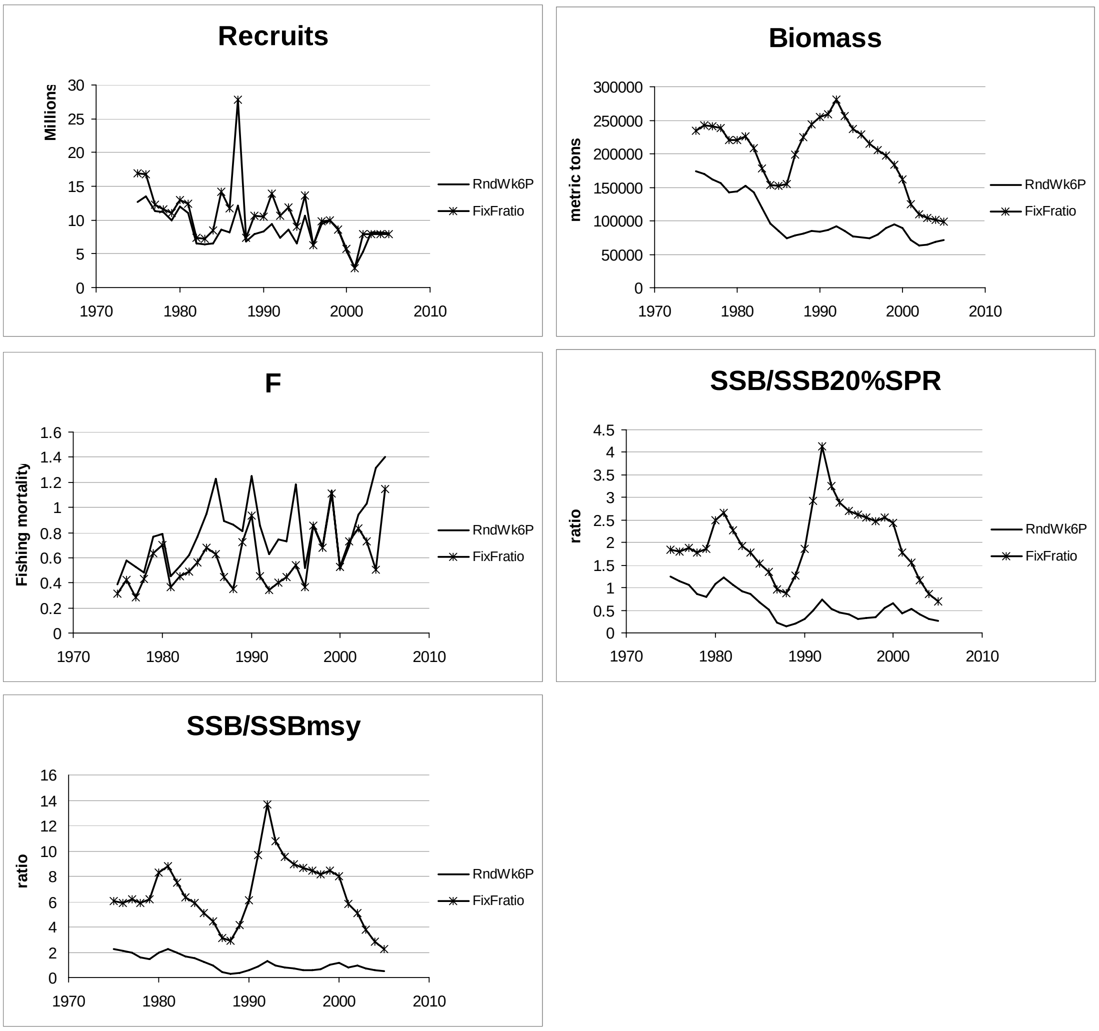


Figure 15. Estimated trajectories of biomass, fishing mortality, recruits, and ratios of SSB against SSBmsy and SSB20%SPR for the VPA sensitivity case using an Age 6+ group for the cases of fixed F ratio and random walk estimation of F ratios (see text for details).

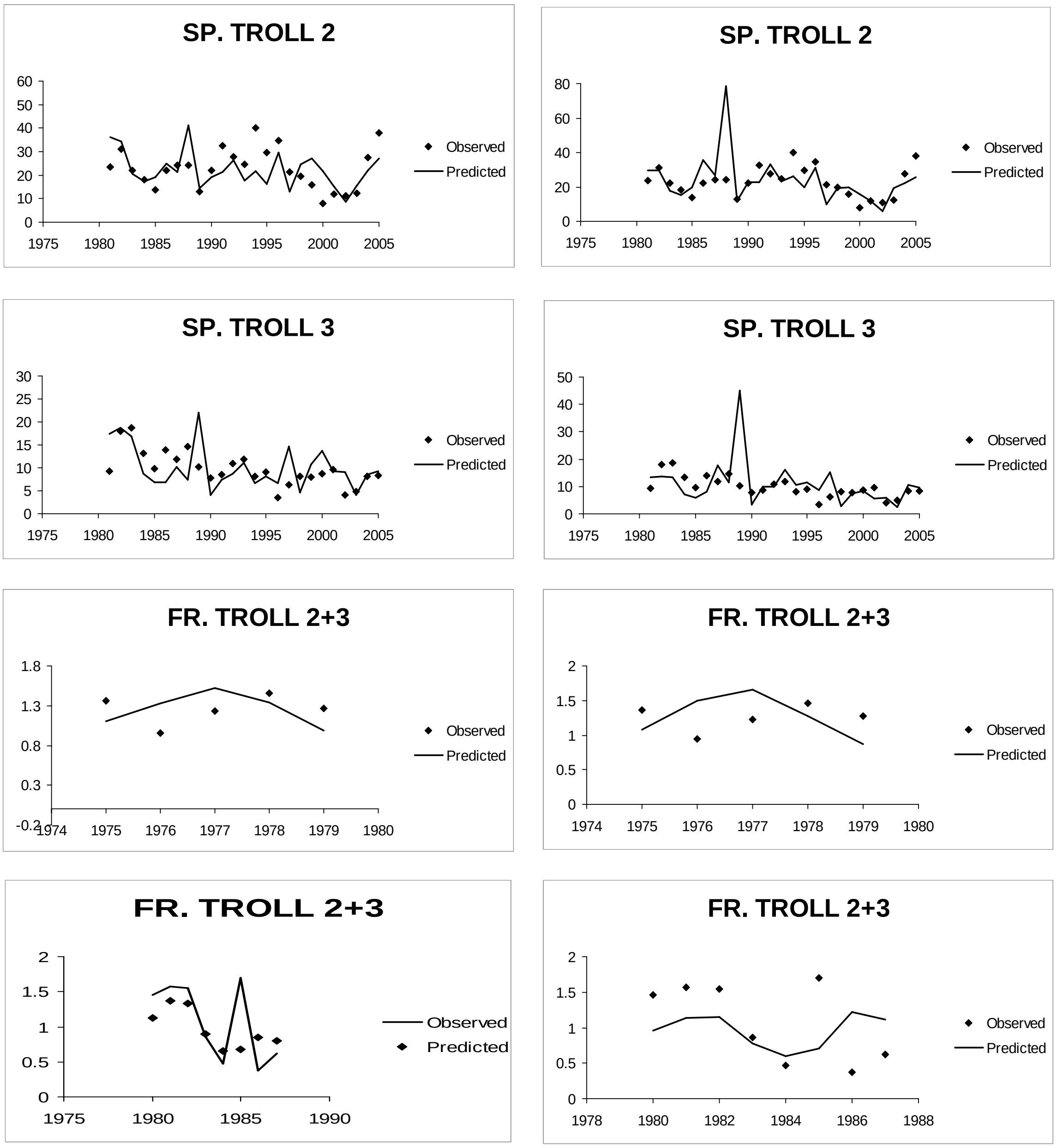
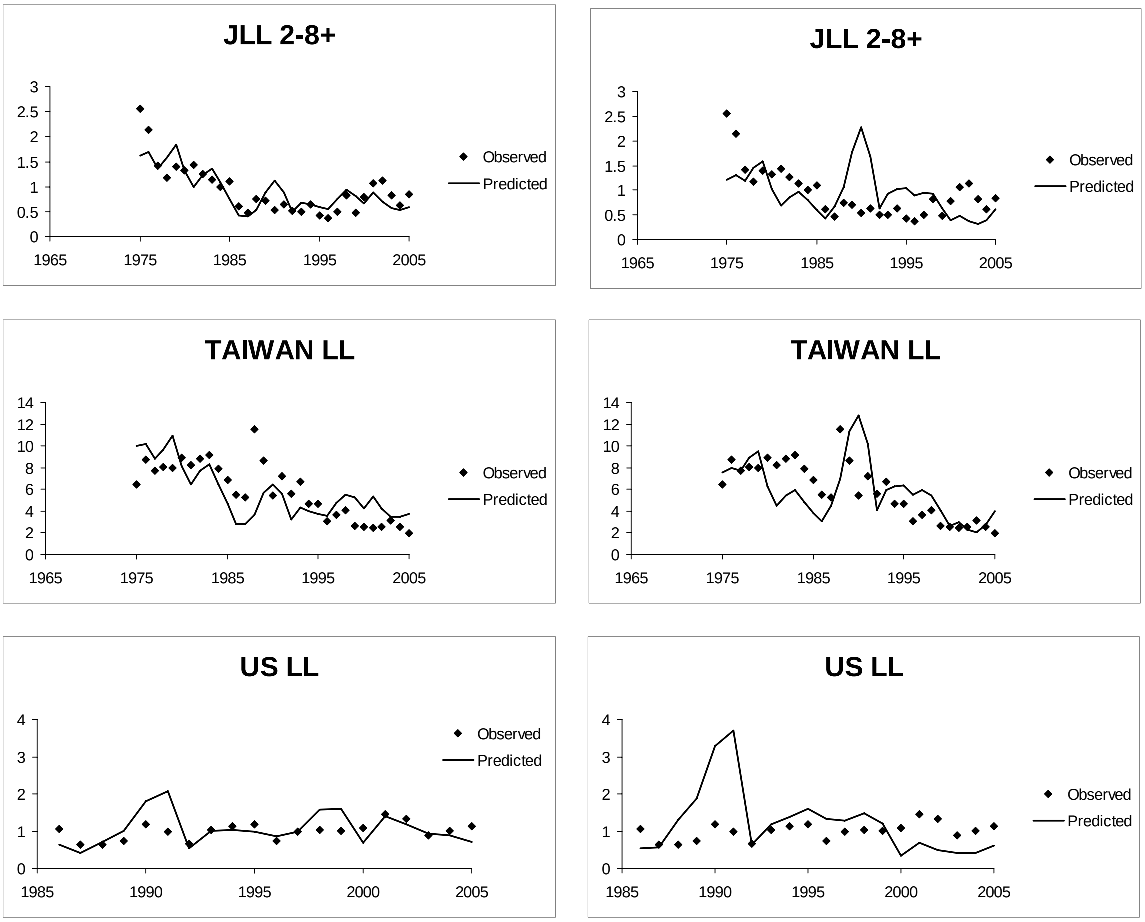


Figure 16. VPA fits to the indices for the sensitivity case of an Age 6+ group. Left panels correspond to the case of a fixed F ratios;L right panels for the estimation of F ratios using random walk (see text for full details).

Figure 16 (continued)



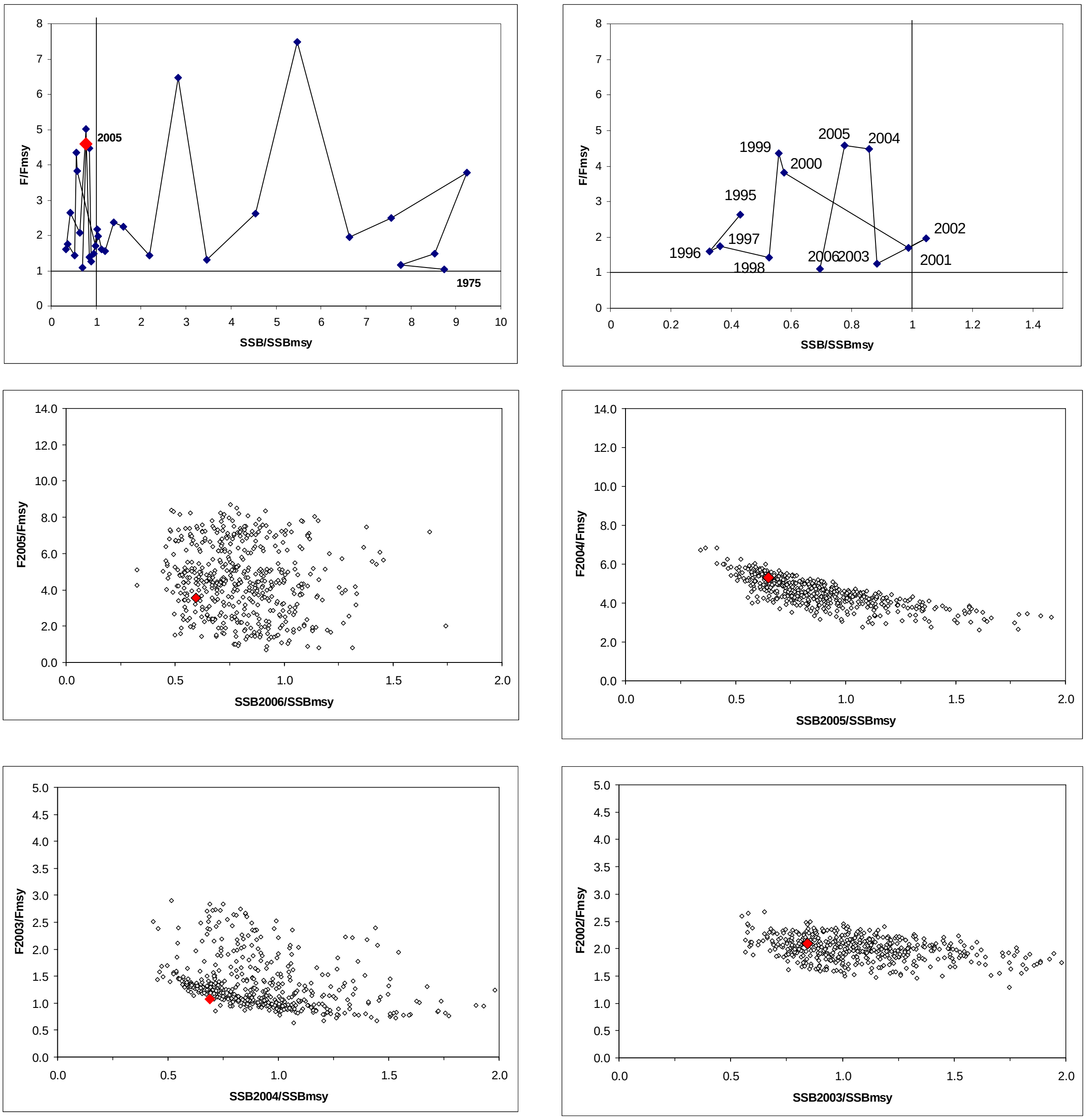


Figure 17. Estimated stock trajectory of relative SSB vs. relative F (top panels) and estimated 500 bootstrap values for relative F and relative SSB (open diamonds) and deterministic estimate (red diamond) (middle and lower panels) from VPA model of North Atlantic stock.

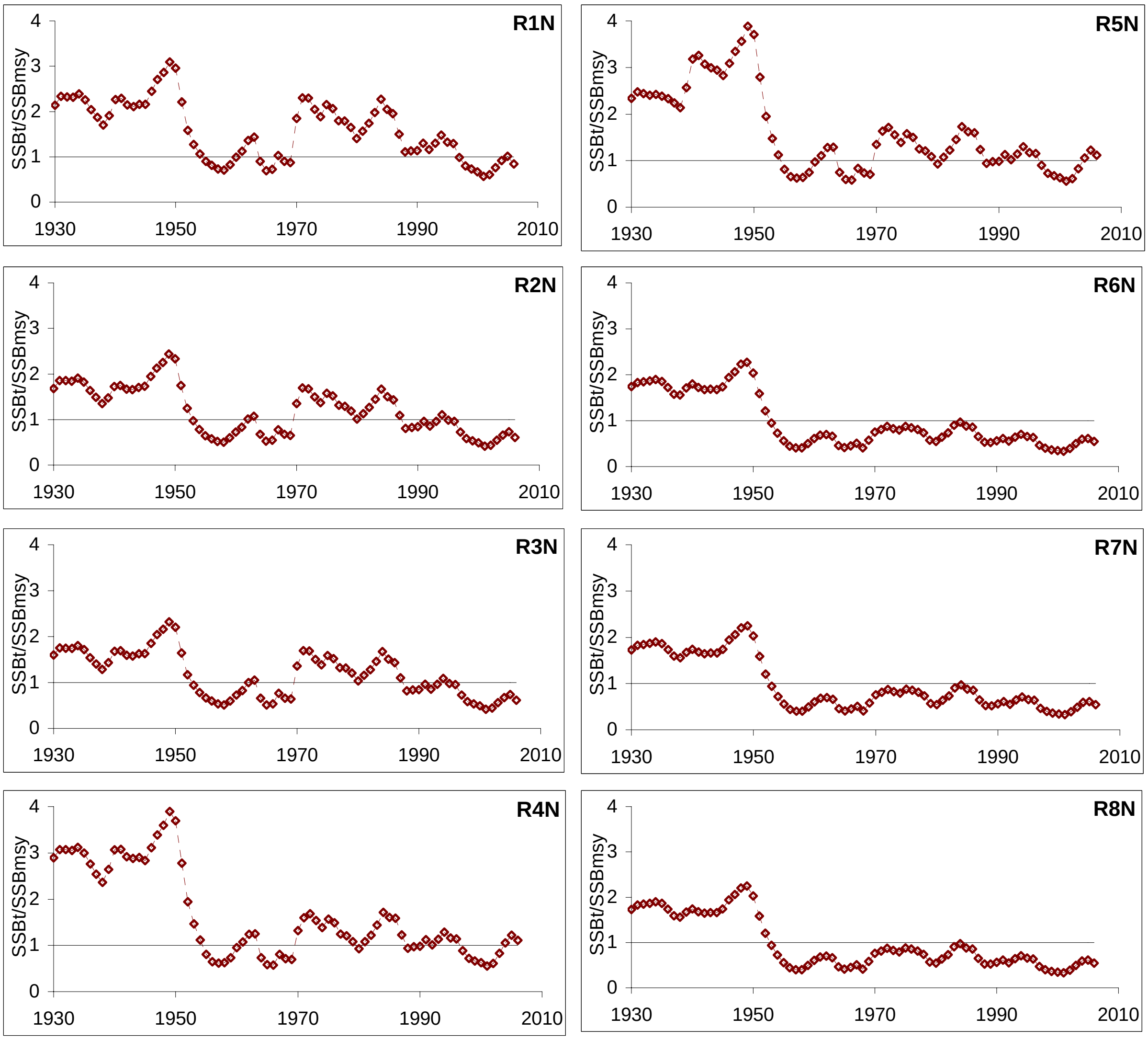


Figure 18. Estimates of relative spawning biomass obtained in 8 different runs of Multifan-CL model for the North Atlantic albacore stock.

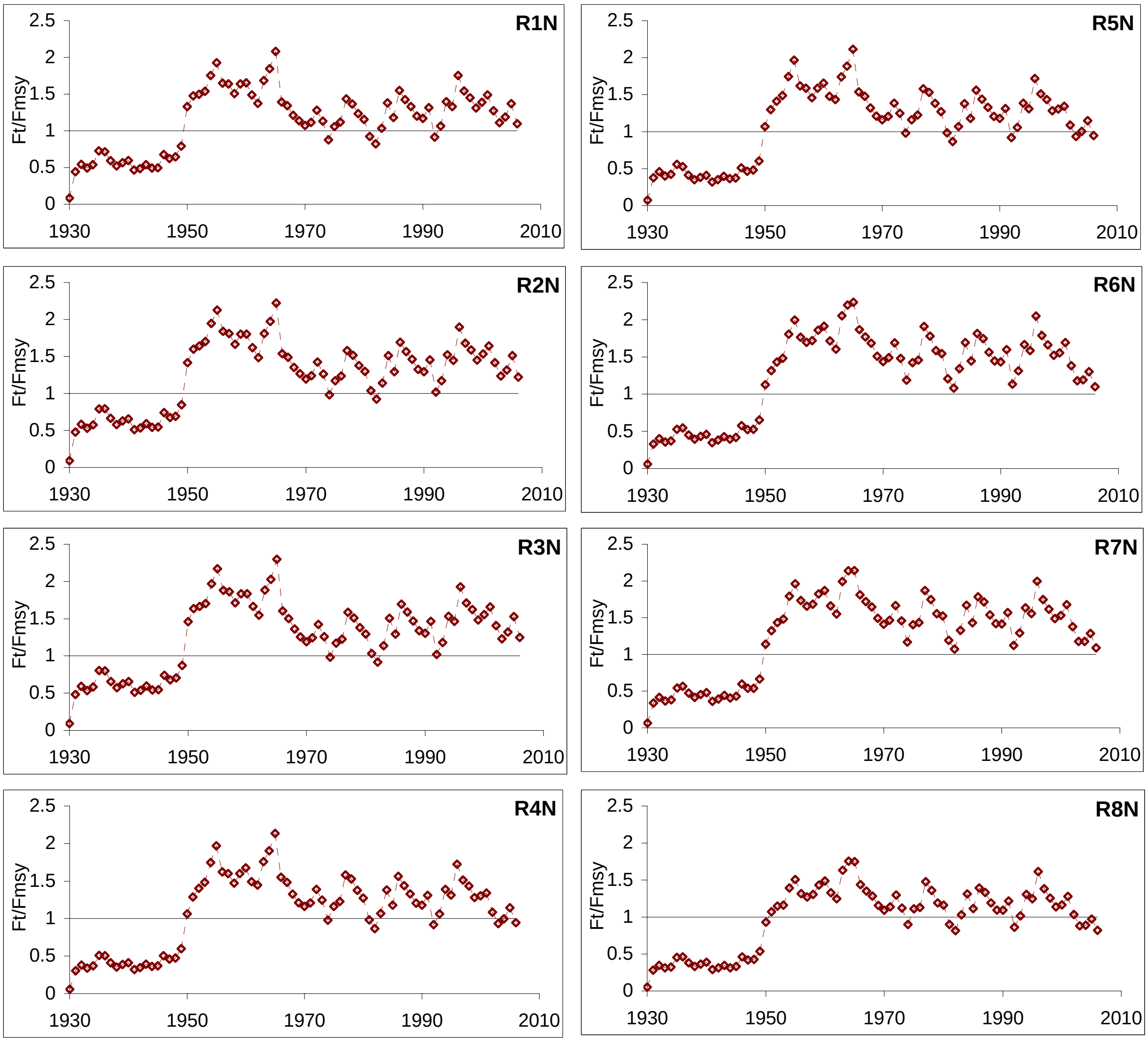


Figure 19. Estimates of relative fishing mortality obtained with different Multifan-CL modeling options of the North Atlantic albacore stock.

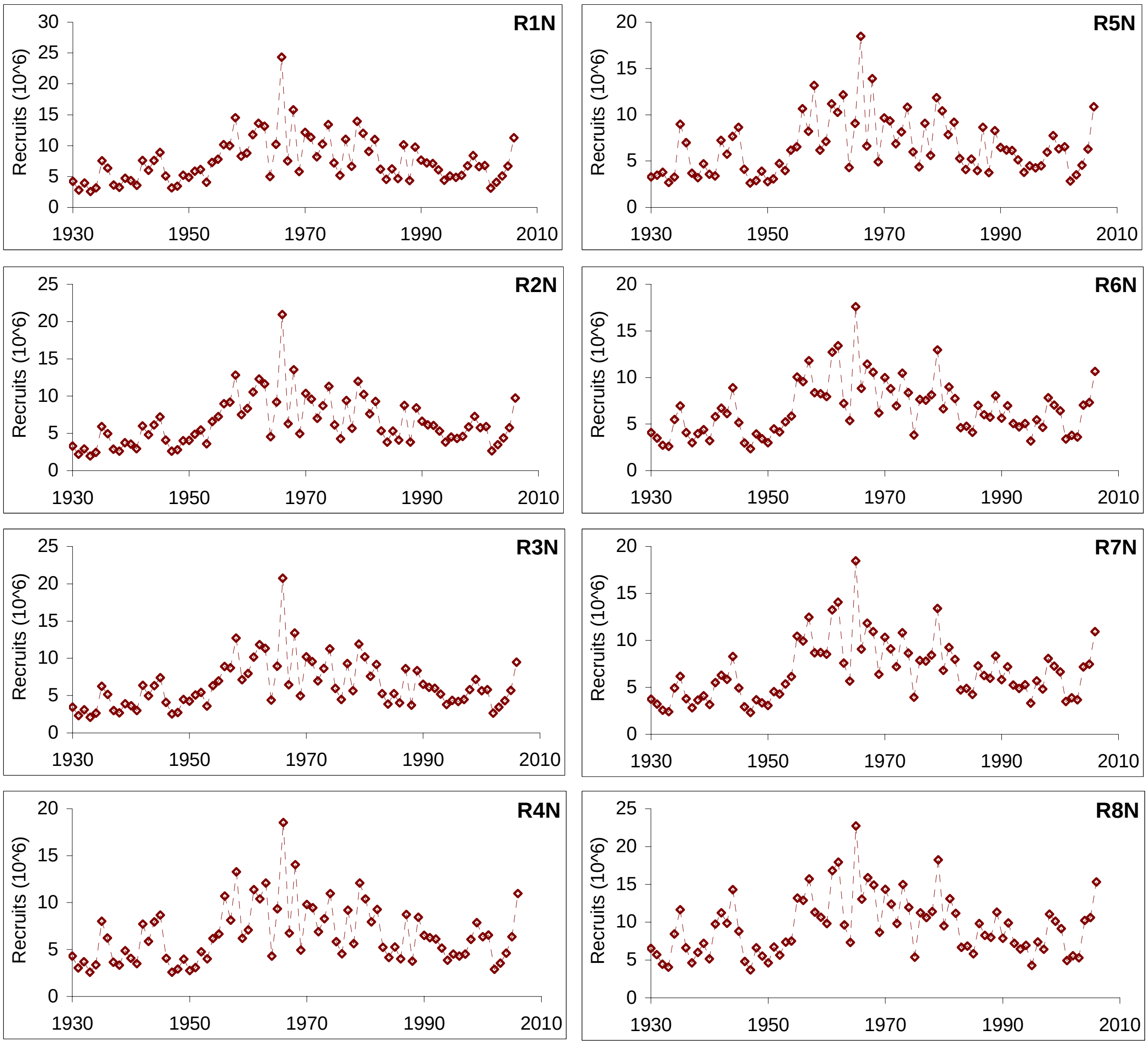


Figure 20. Estimates of recruitment obtained with 8 different model runs of Multifan-CL model of the North Atlantic albacore stock.

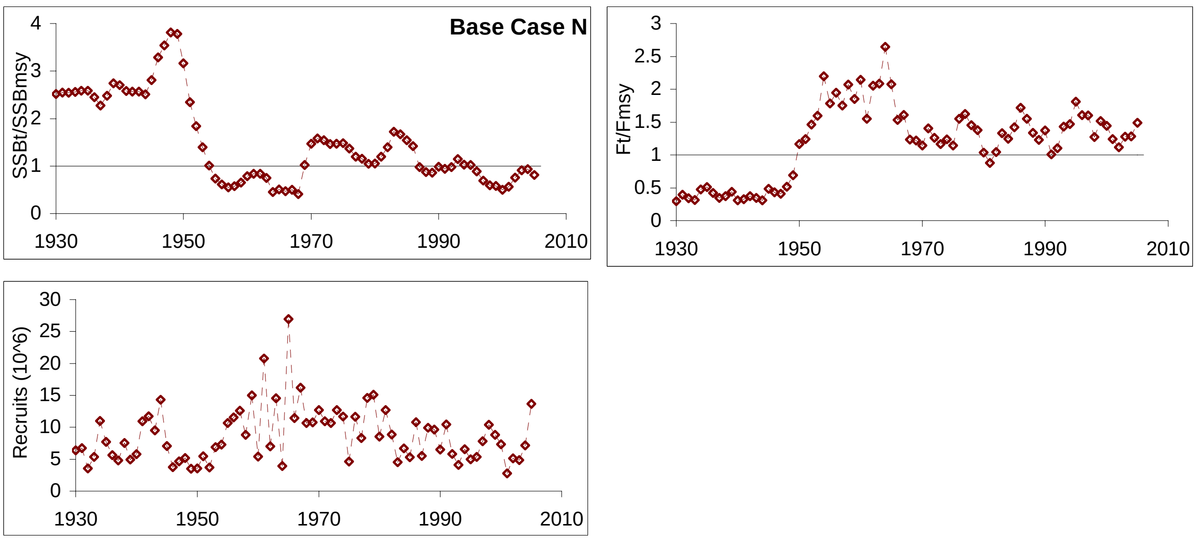


Figure 21. Estimates of relative biomass, relative fishing mortality and recruitment for the North Atlantic albacore stock from Multifan-CL model analyses.

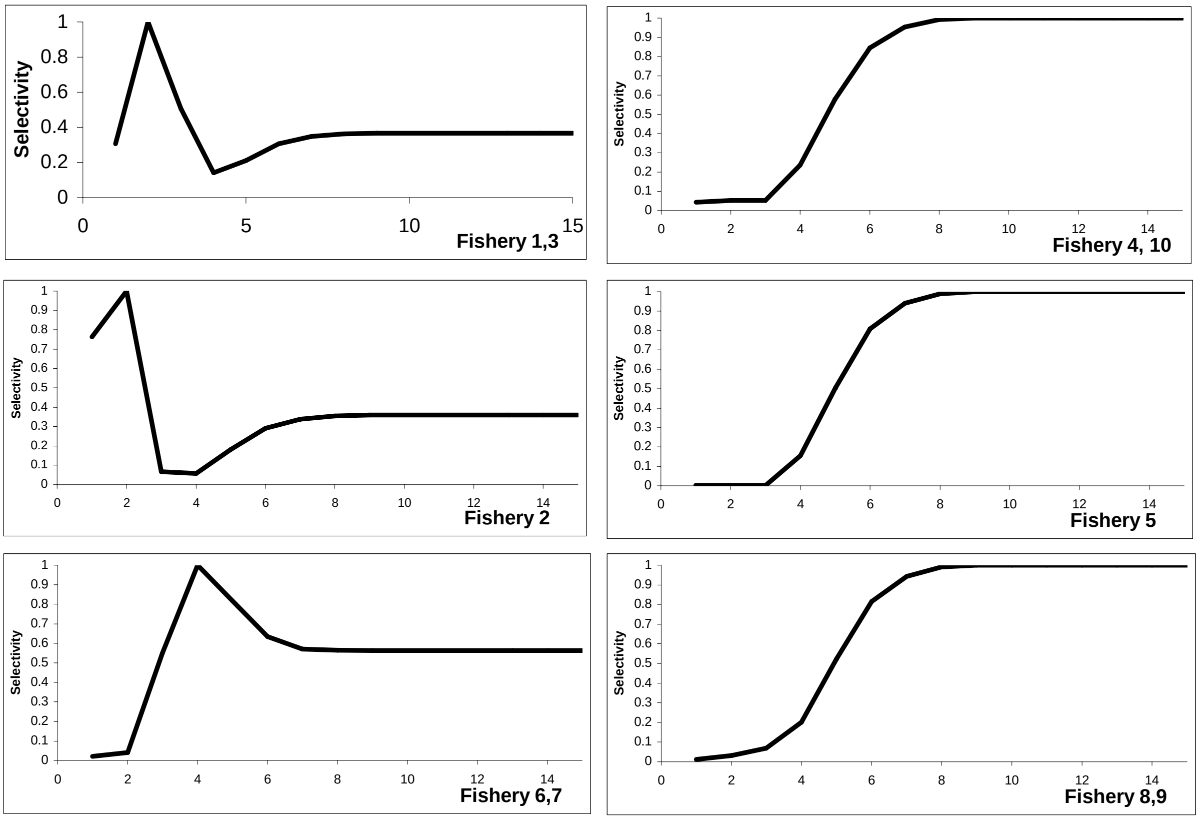
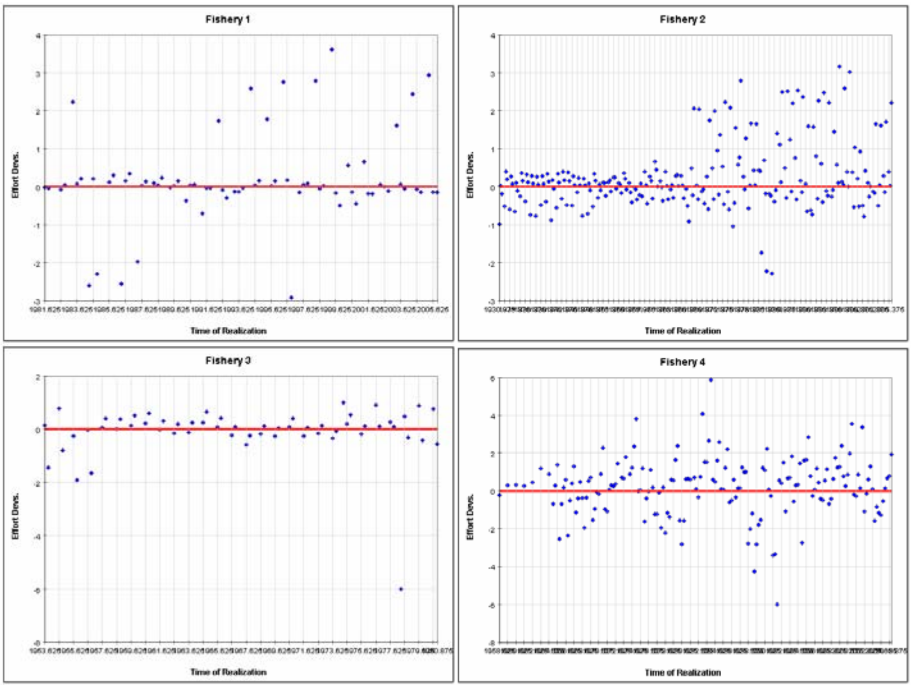


Figure 22. Estimated selectivity patterns for the 10 fisheries used in Multifan-CL model analyses for the North Atlantic albacore stock.



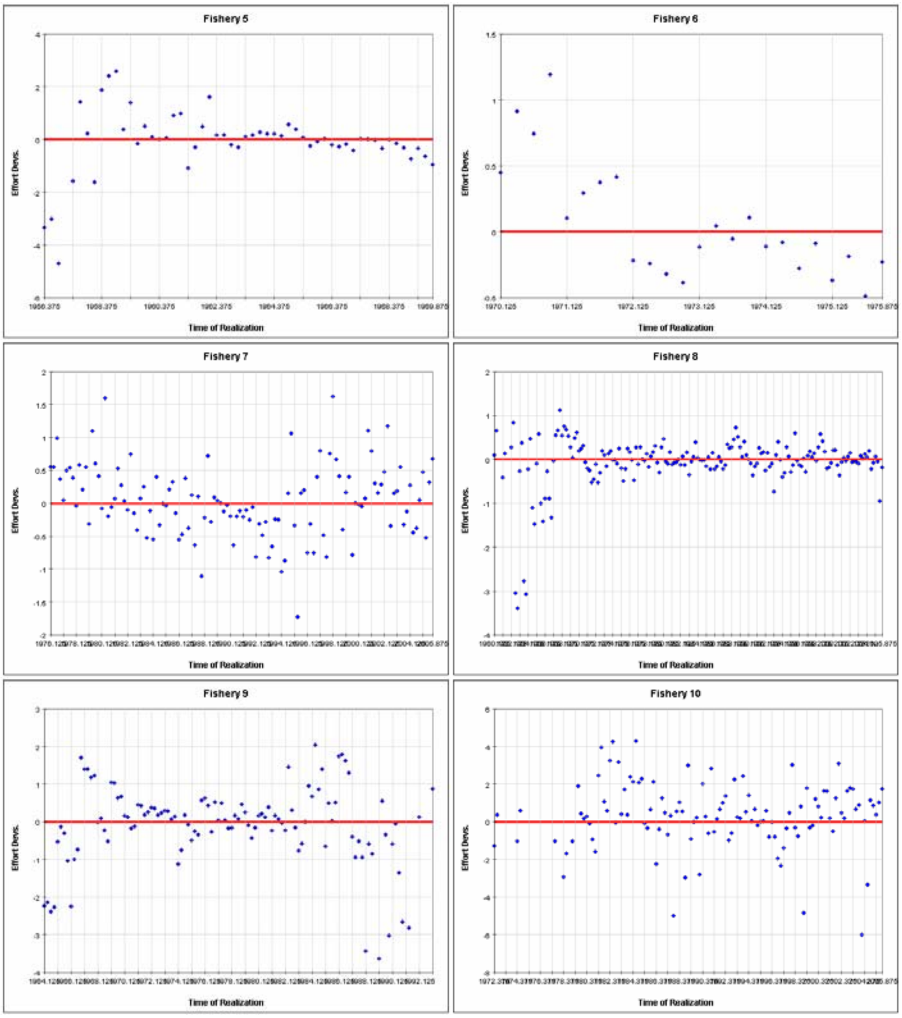


Figure 23. Effort deviations for the various fisheries modeled by Multifan-CL in the North Atlantic albacore stock.

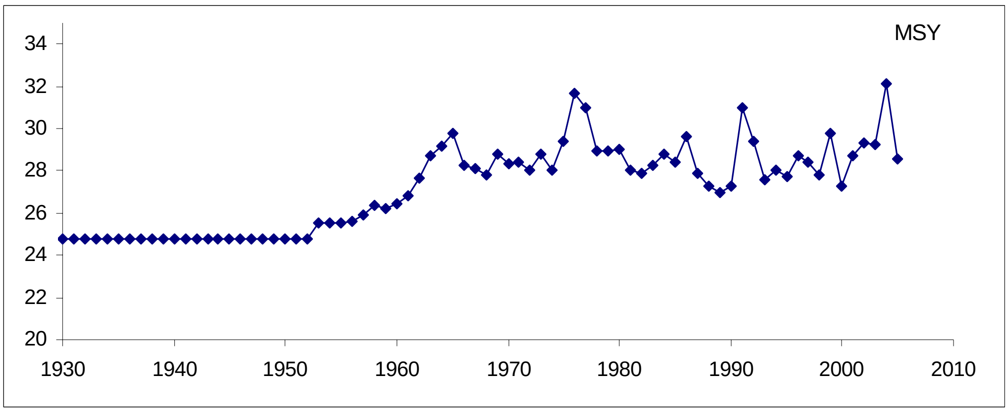


Figure 24. Estimated changes in MSY (thousand tons) for northern albacore, based on changes in total selectivity.

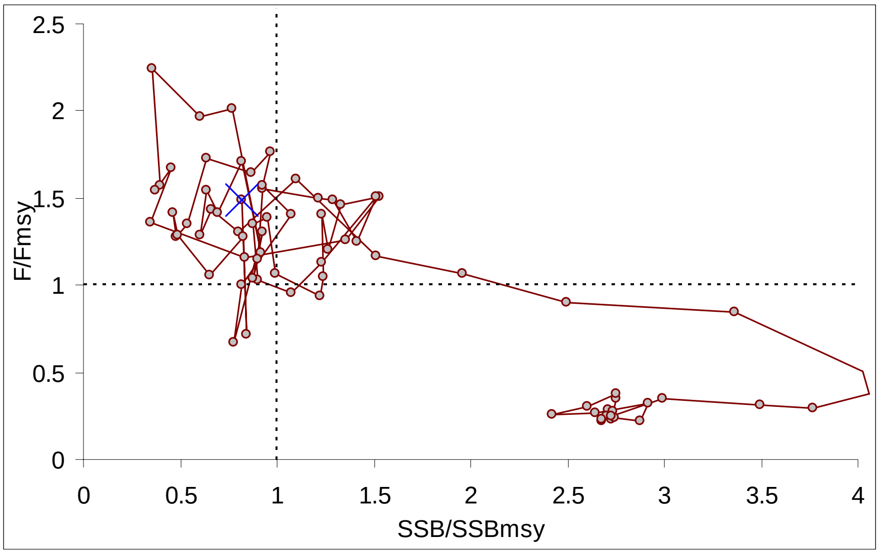


Figure 25. Trajectory of relative Fishing mortality and relative SSB for Northen albacore, 1930-2005. The blue X marks the 2005 point.

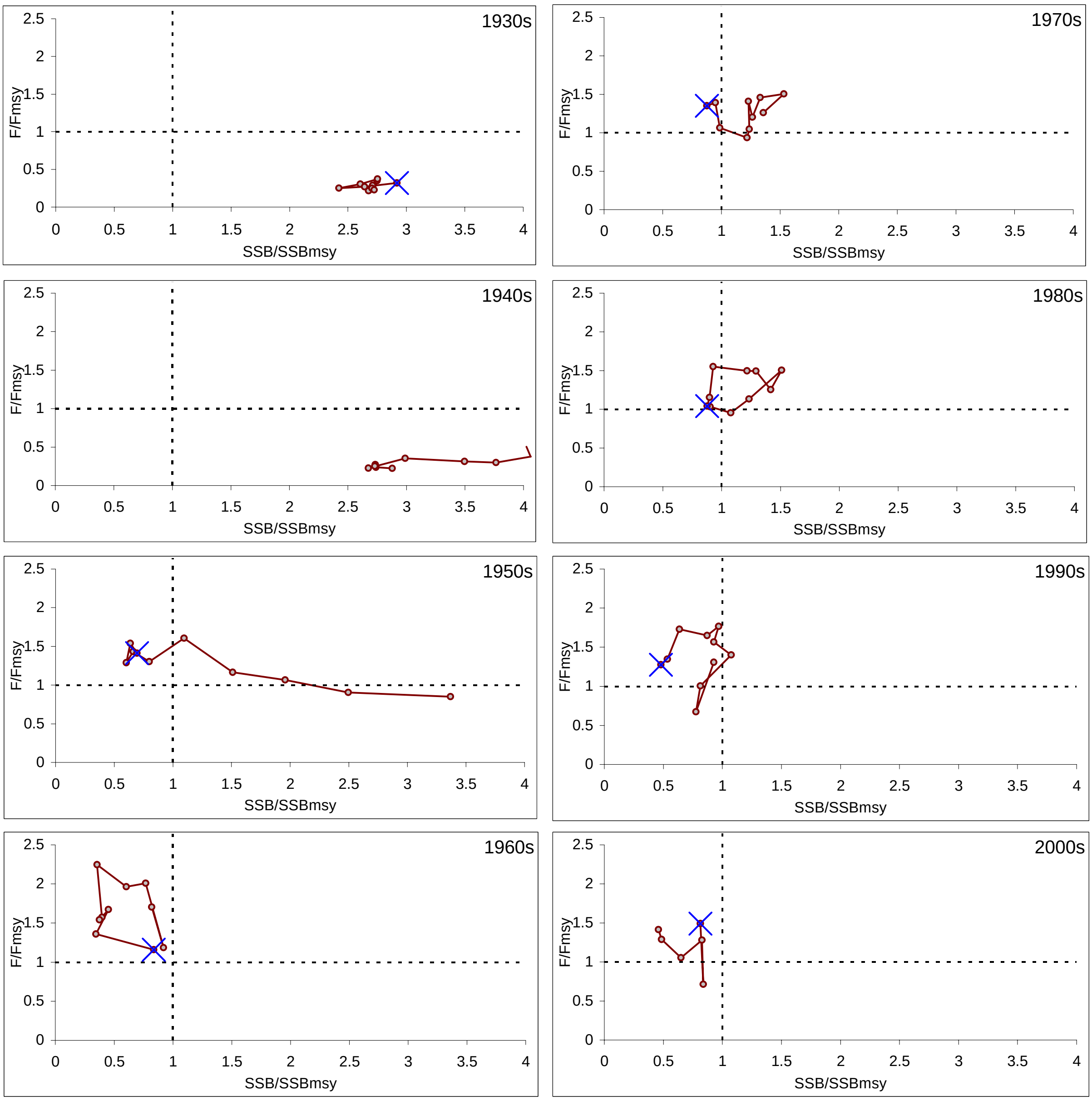


Figure 26. Trajectory of relative fishing mortality and relative SSB, by decade. The **X** marks the last point in each decade (1939, 1949, 1959 ... 2005) for the North Atlantic stock.

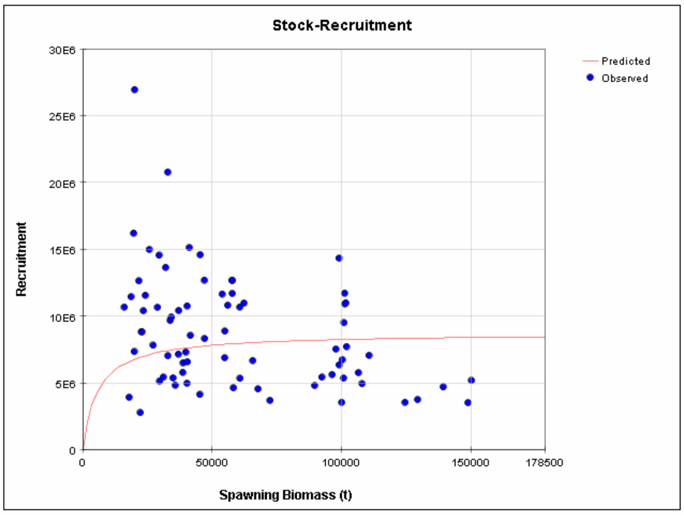


Figure 27. Estimated stock-recruitment relationship for northern albacore.

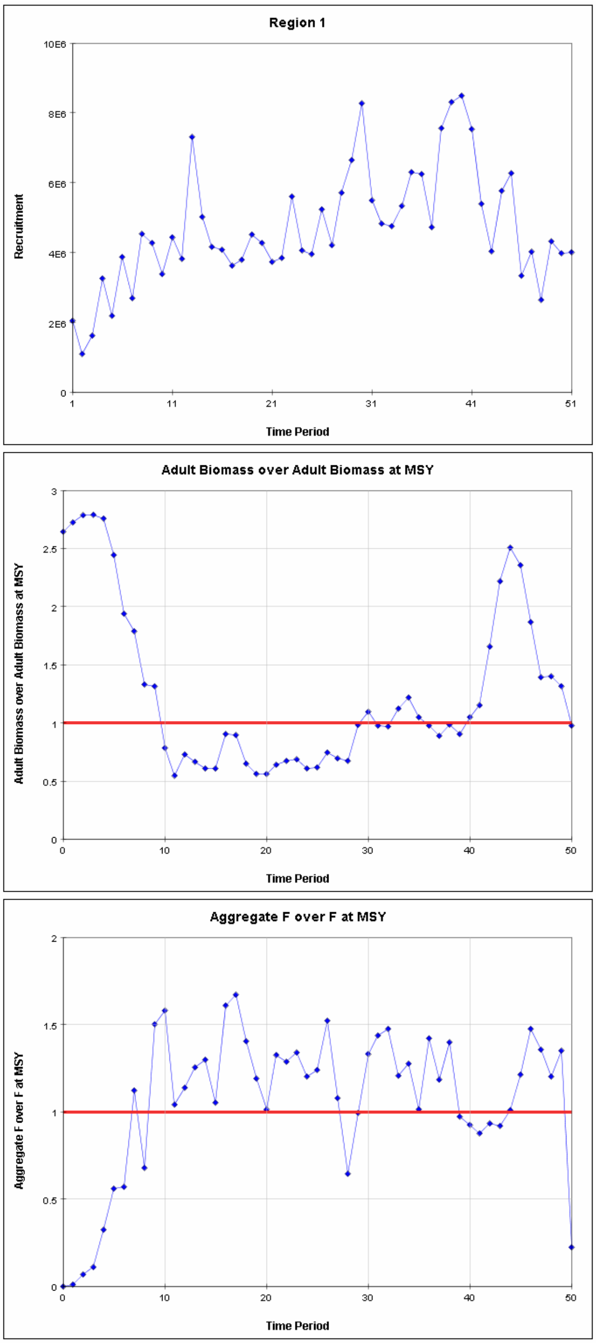


Figure 28. Estimates of recruitment, relative SSB and relative F for southern albacore (Run 8).

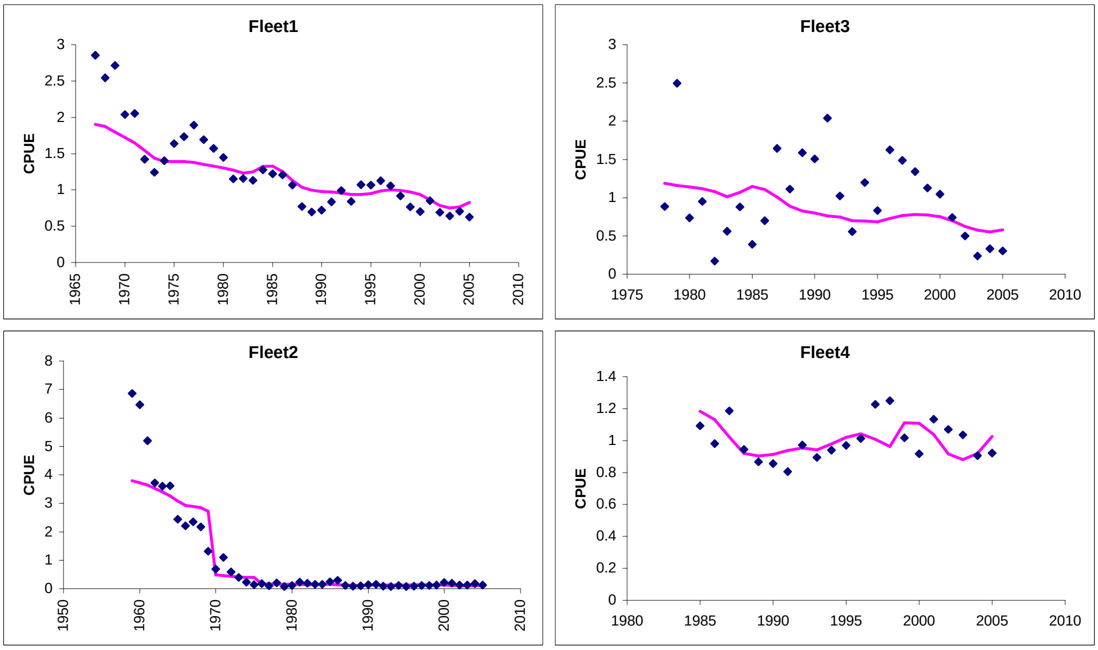


Figure 29. ASPM model fit of the observed CPUE data of the four different fleets using the base case in the South Atlantic albacore stock.

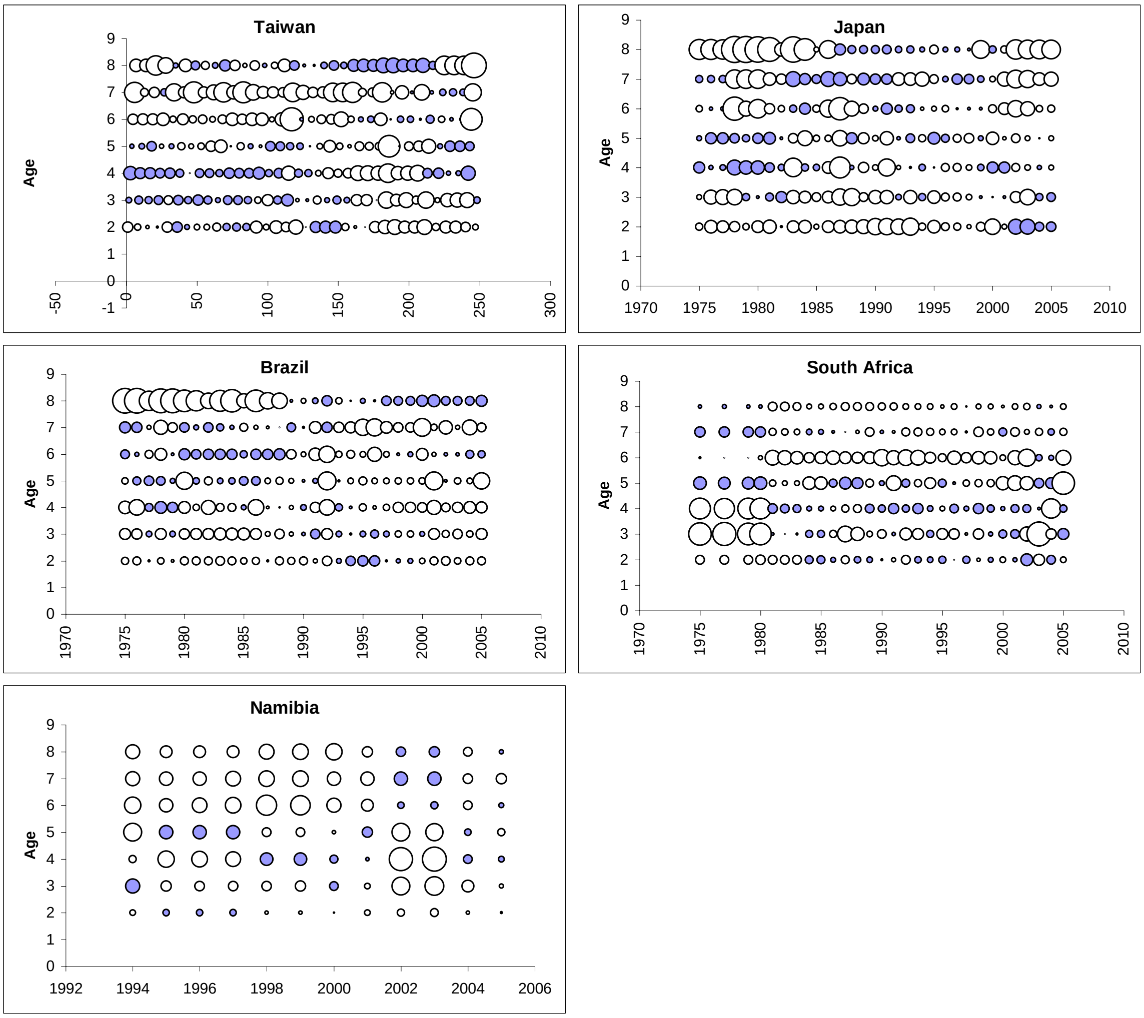
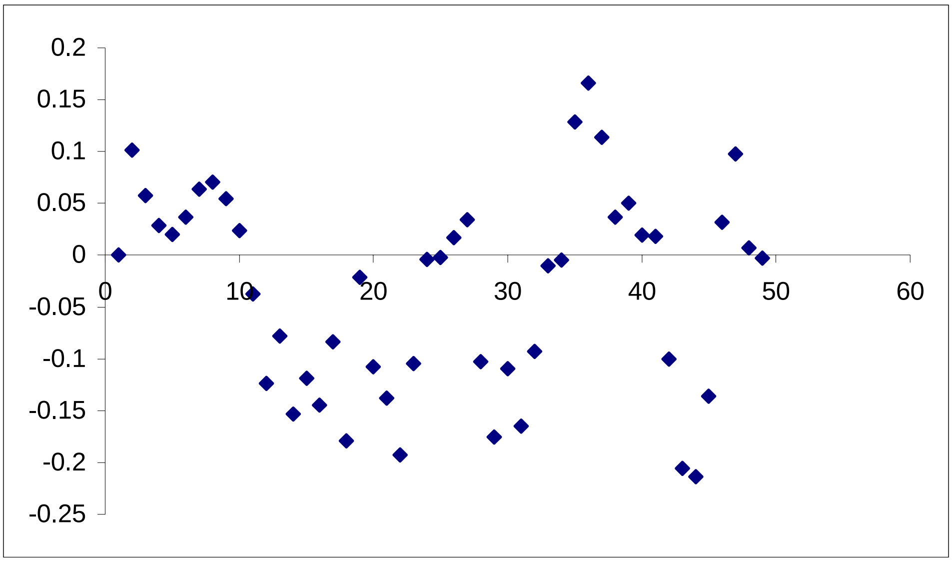


Figure 30. ASPM model.Residual plots of the catch-at-age data for the five different fleets using the base case in the South Atlantic stock.



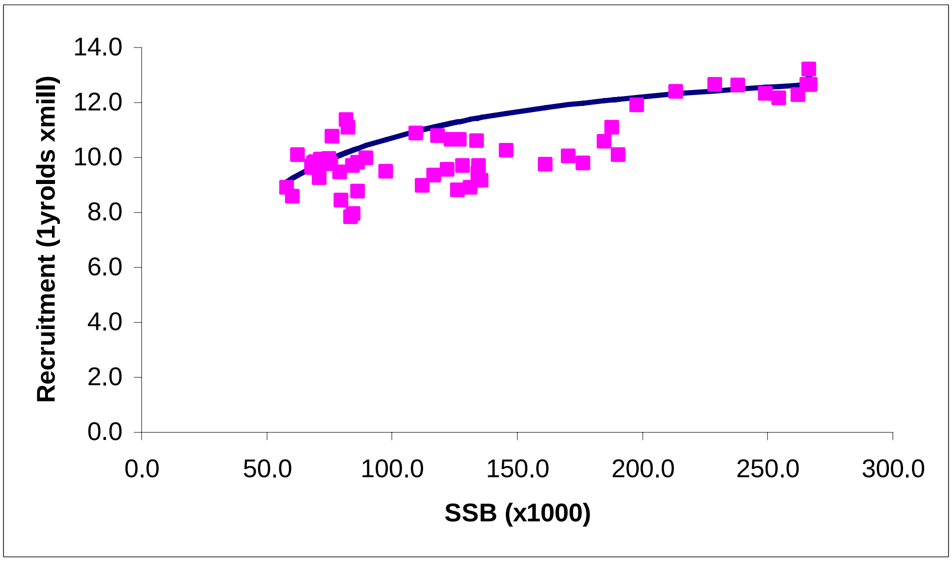


Figure 31. ASPM model. Recruitment residuals and an estimated Spawner-Recruit relationship for the base case in the South Atlantic albacore stock.

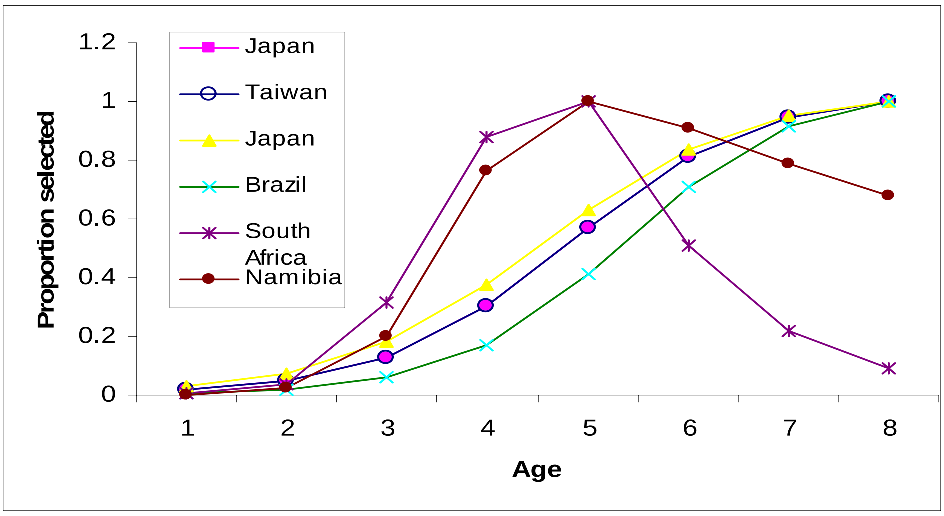


Figure 32. ASPM model.Estimated selectivity by fleet for the different fleets in the ASPM base case analysis of the South Atlantic stock.

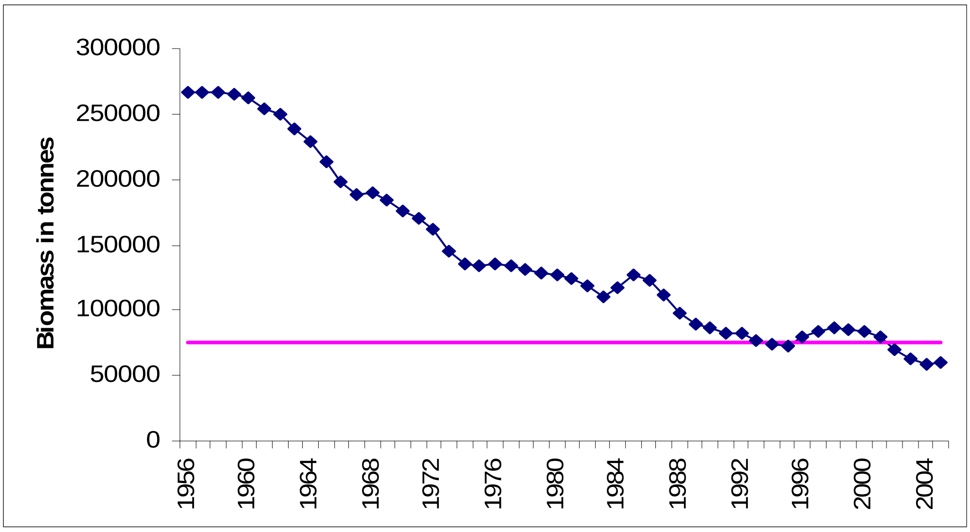


Figure 33. ASPM model. Biomass trajectory relative to the maximum sustainable yield (MSY) level for the base case analysis with ASPM model in the South Atlantic stock .

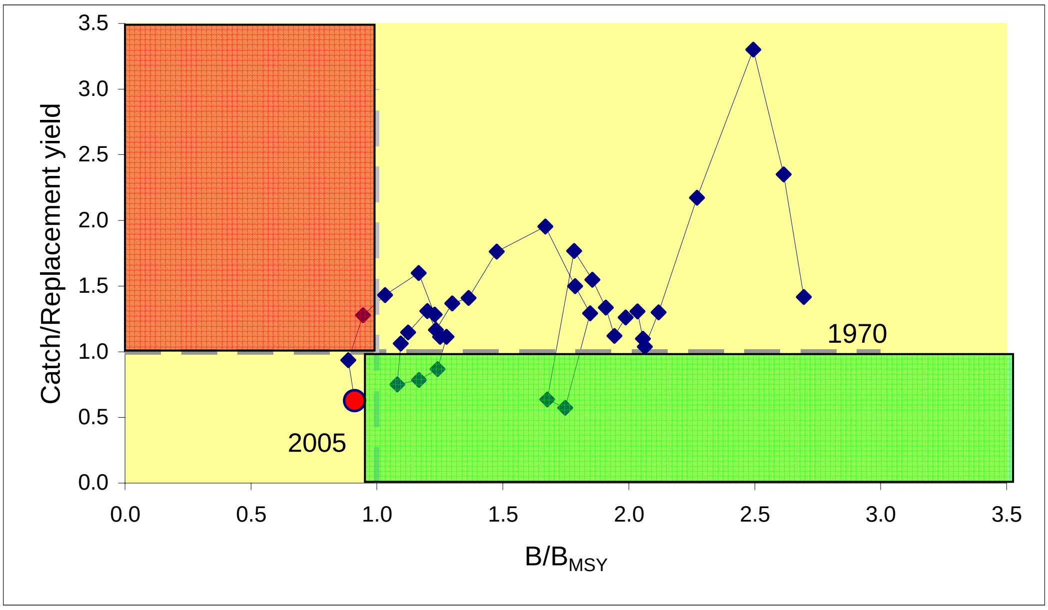


Figure 34. ASPM model. Catch relative to replacement yield versus current biomass relative to the biomass at MSY. The circles are the current state of the stock for all the sensitivity runs for the South Atlantic stock.

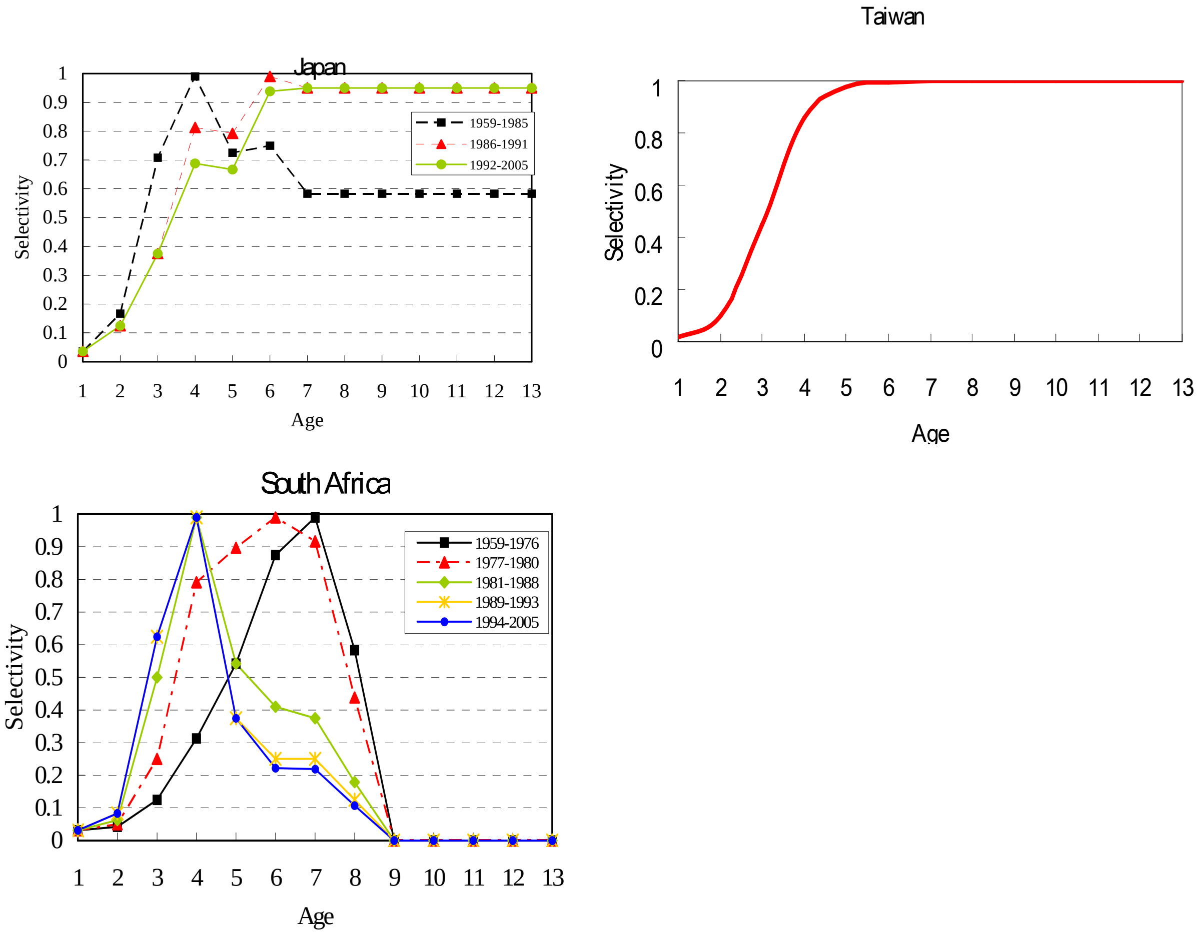


Figure 35. Selectivity patterns of Japanese (upper), Chinese Taipei (middle), and South African (below) fleets used for ASPM_2 model analyses in the South Atlantic stock.

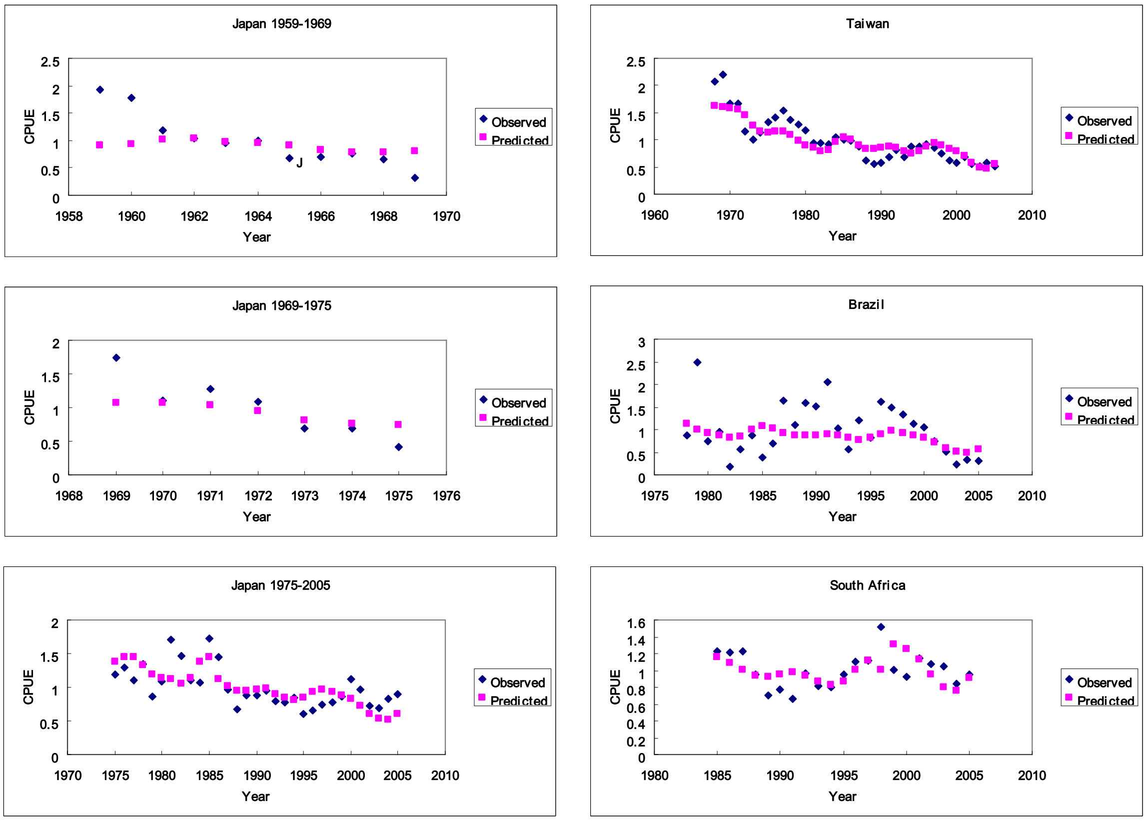


Figure 36. Plots of observed CPUE versus its respective predicted CPUE for the seven different indices series, based on stochastic model ASPM_2. (Note: two series of indices of South African baitboat fisheries were plotted in one figure).

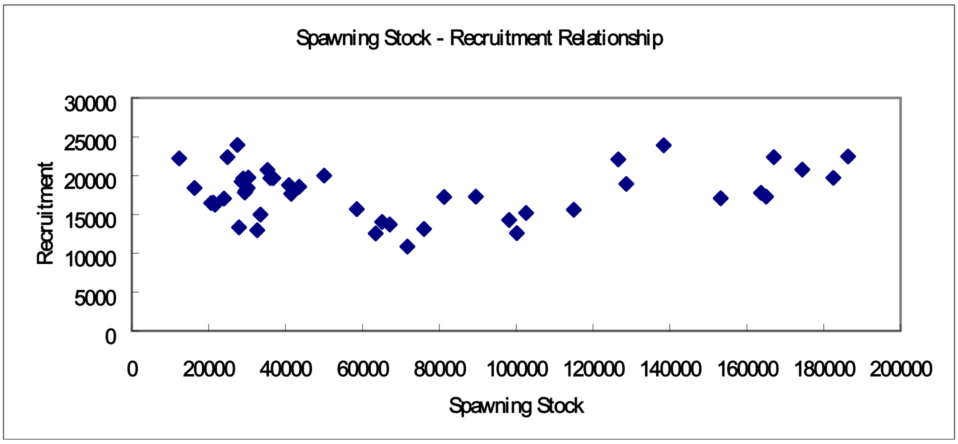


Figure 37. Plot of Spawner-recruitment pattern obtained from deterministic ASPM_2 model applied in the South albacore stock.

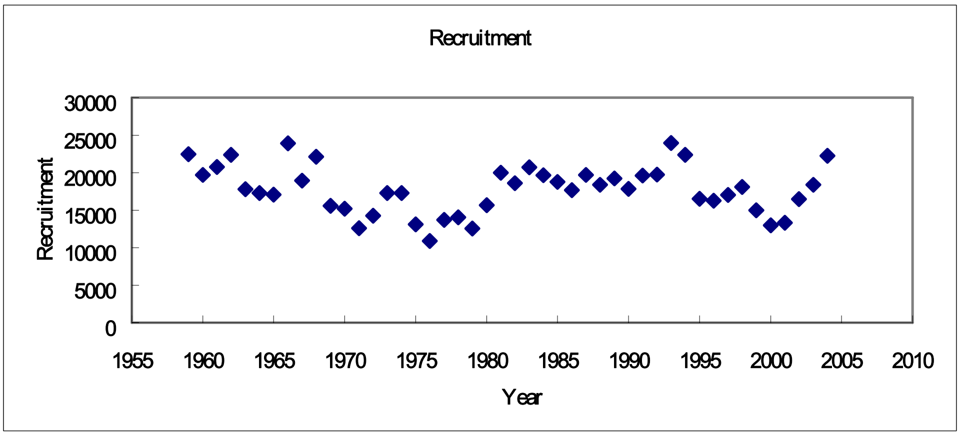


Figure 38. Estimated recruitment trend, based on stochastic ASPM_2 model applied in the South albacore stock.

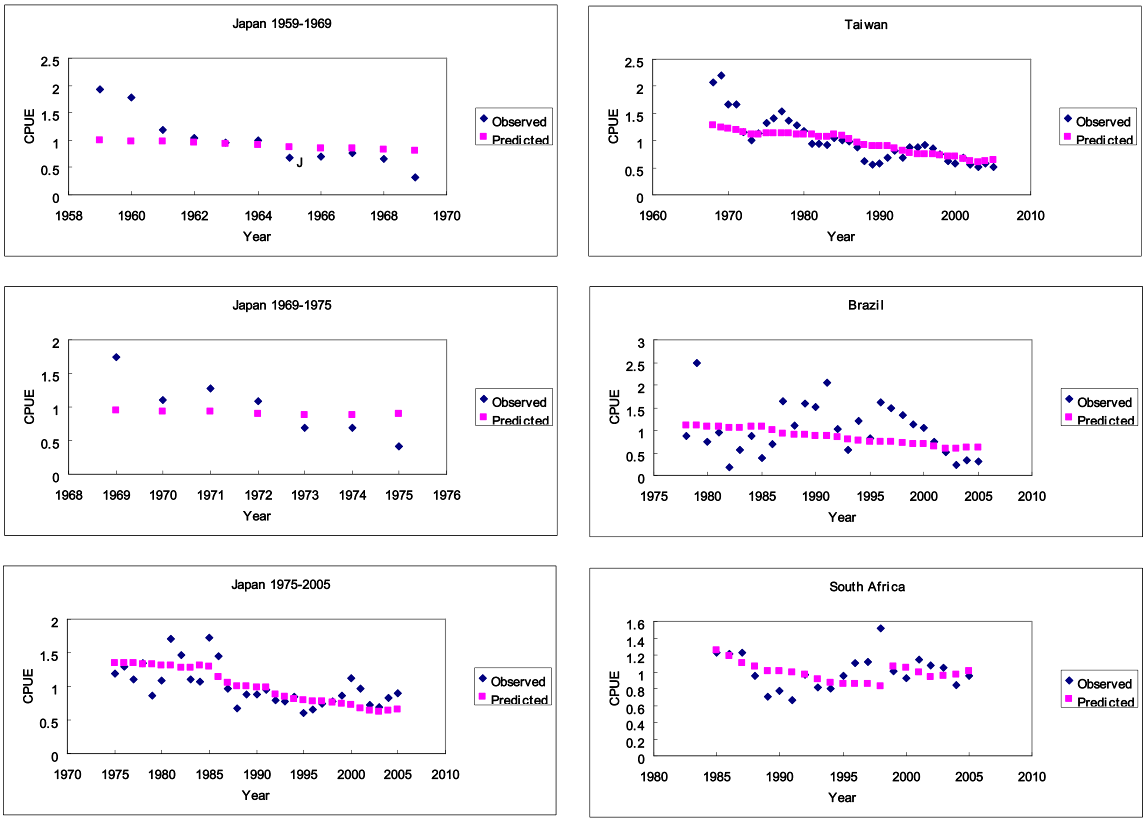


Figure 39. Plots of observed CPUE versus its respective predicted CPUE for the seven different indices series, based on deterministic ASPM_2. (Note: two series of indices of South African baitboat fisheries were plotted in one figure.)

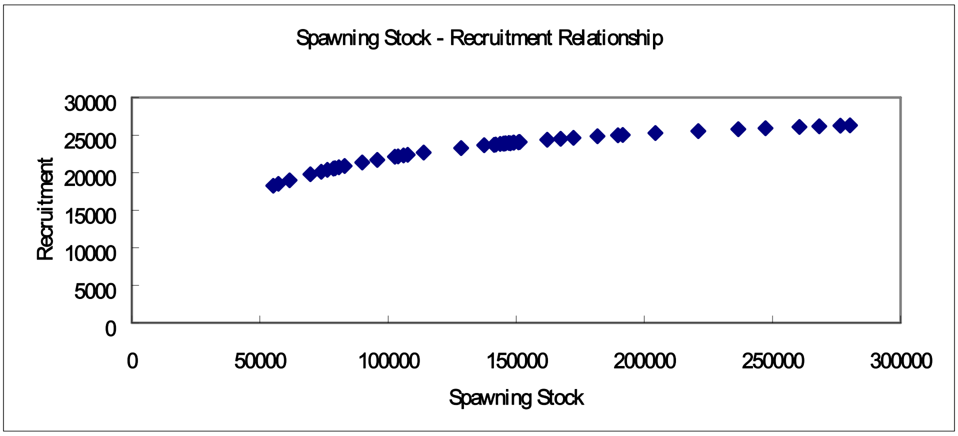


Figure 40. Plot of spawner-recruitment pattern, based on deterministic ASPM_2.

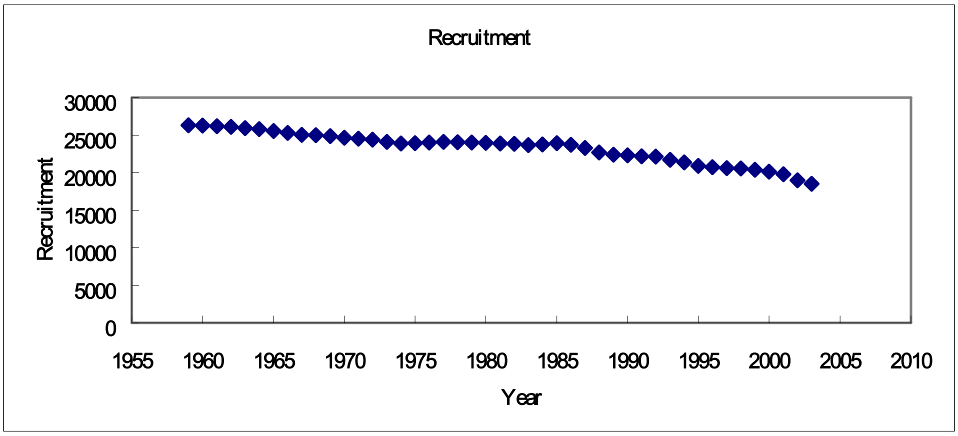


Figure 41. Estimated recruitment trend, based on deterministic ASPM_2.

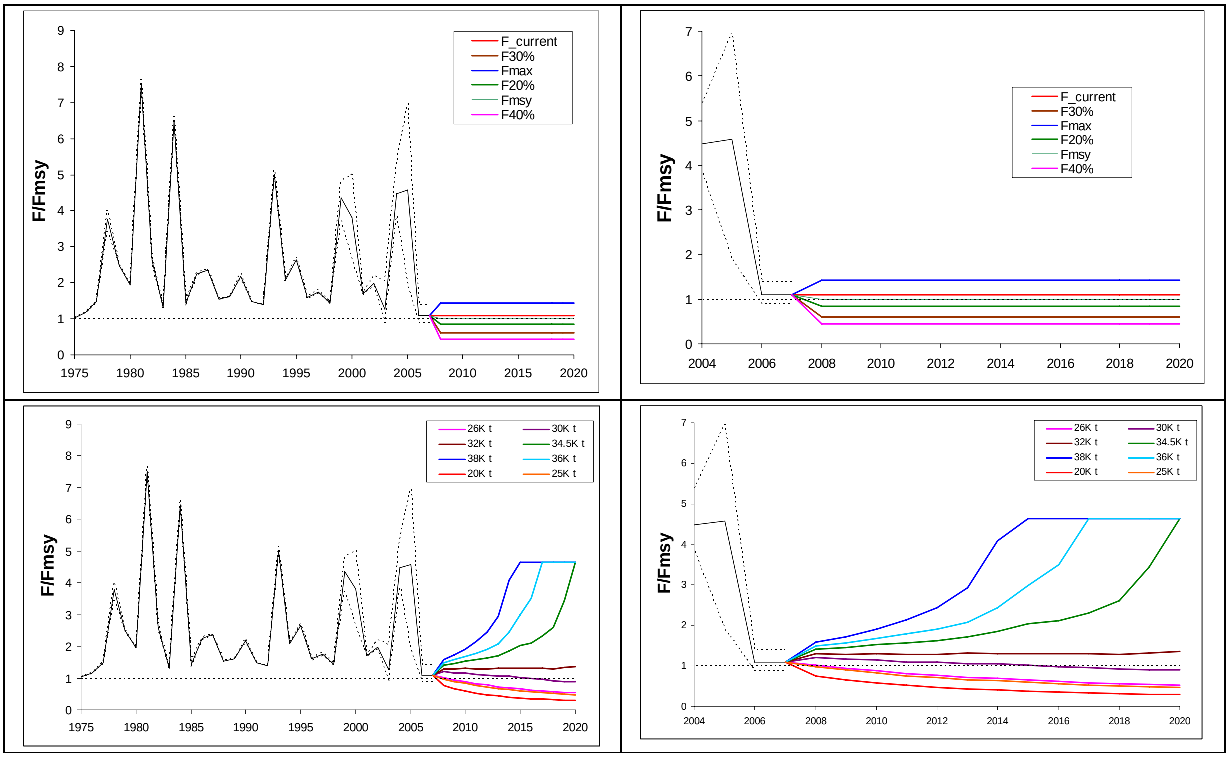


Figure 42. Estimated VPA projections of relative F (F/F_{MSY}) for different scenarios of constant catch and constant F assuming average recent year-class strengths for the North Atlantic albacore stock.

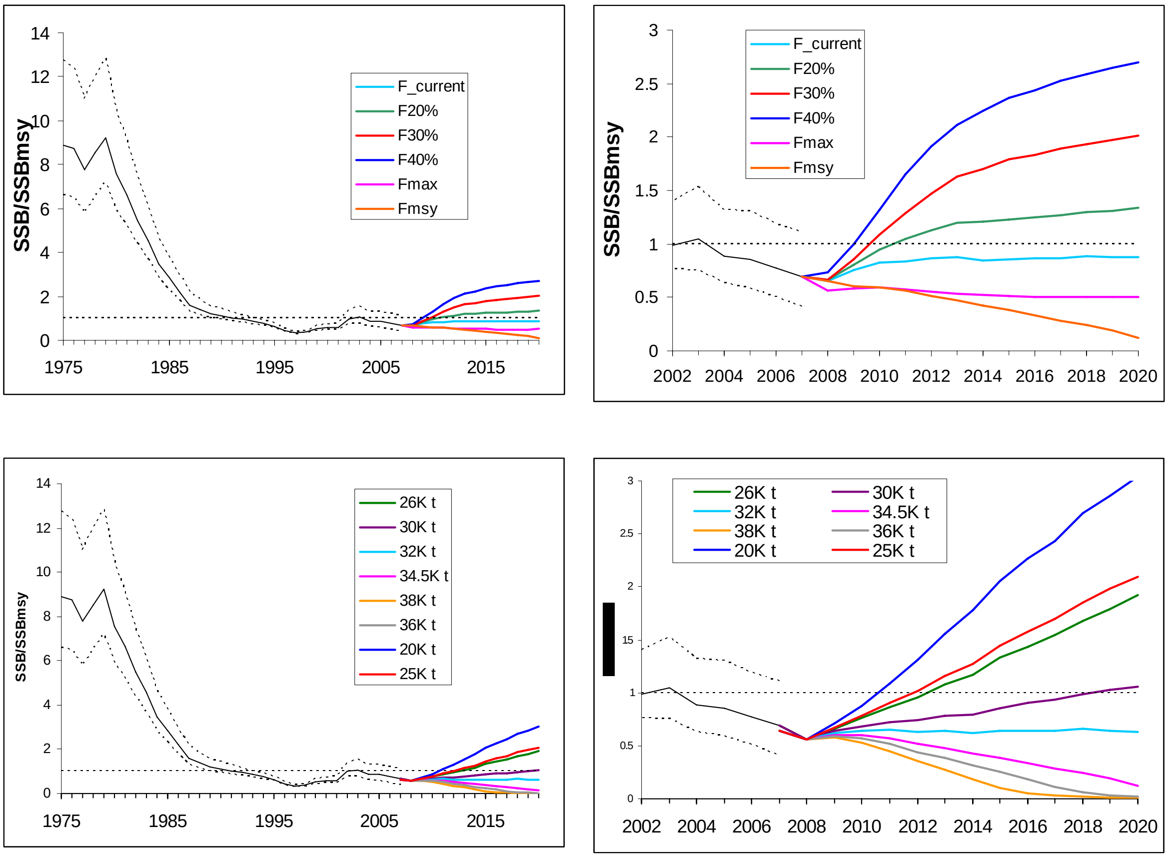


Figure 43. Estimated VPA projections of relative SSB (SSB/SSB_{MSY}) for different scenarios of constant catch and constant F assuming average recent year-class strengths for the North Atlantic albacore stock.

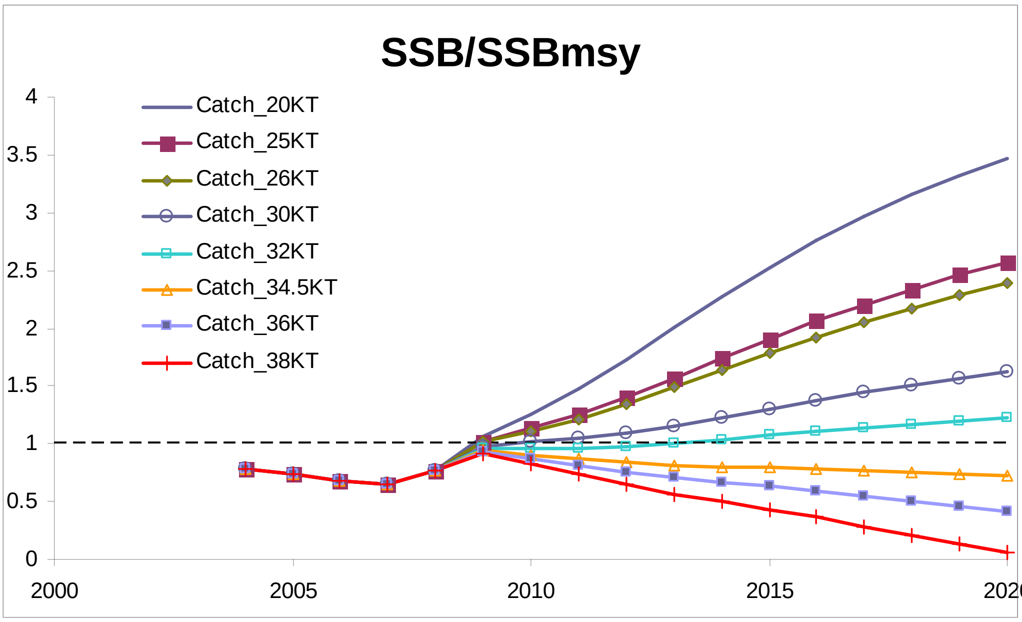


Figure 44. Estimated VPA projections of relative SSB (SSB/SSB_{MSY}) for different scenarios of constant catch under the assumption of a strong incoming year-class as estimated by the VPA for North Atlantic albacore.

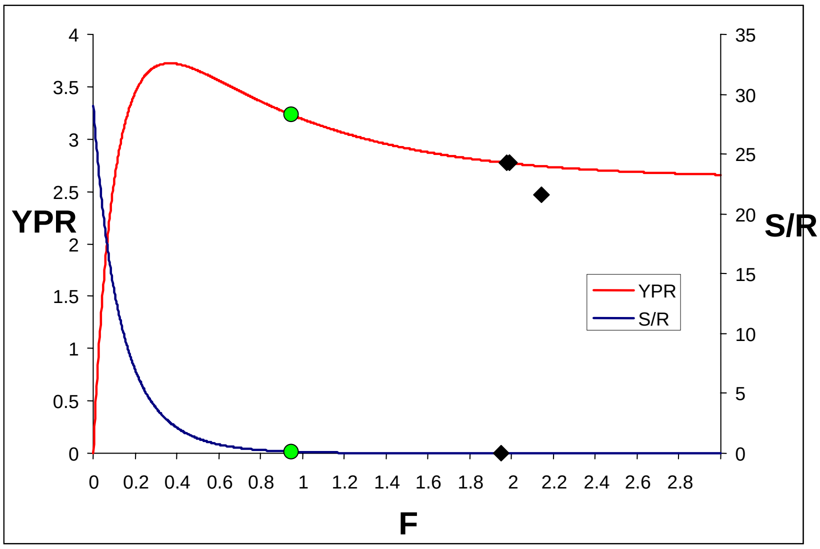


Figure 45. VPA estimated yield-per-recruit (YPR) and spawner-per-recruit (S/R) for different values of F. The diamond indicates estimated F_{2005} = 1.974. The circle shows estimated geometric mean of F for years 2002-2004 (F=0.952). North Atlantic albacore stock.

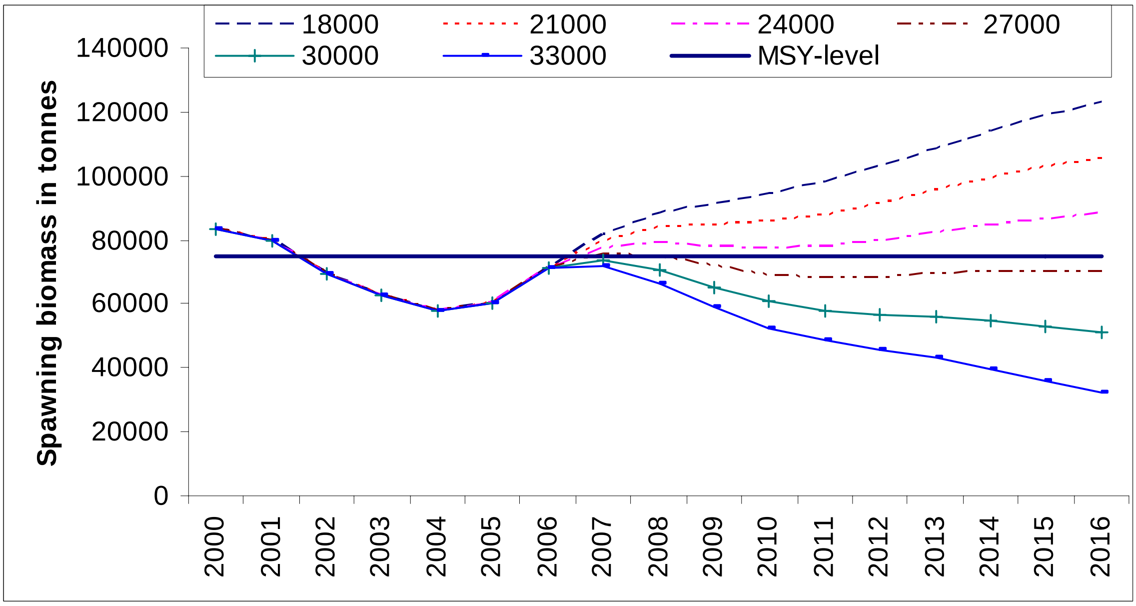


Figure 46. ASPM_2 biomass trajectories for various constant catch strategies using the base case in the South Atlantic albacore stock.

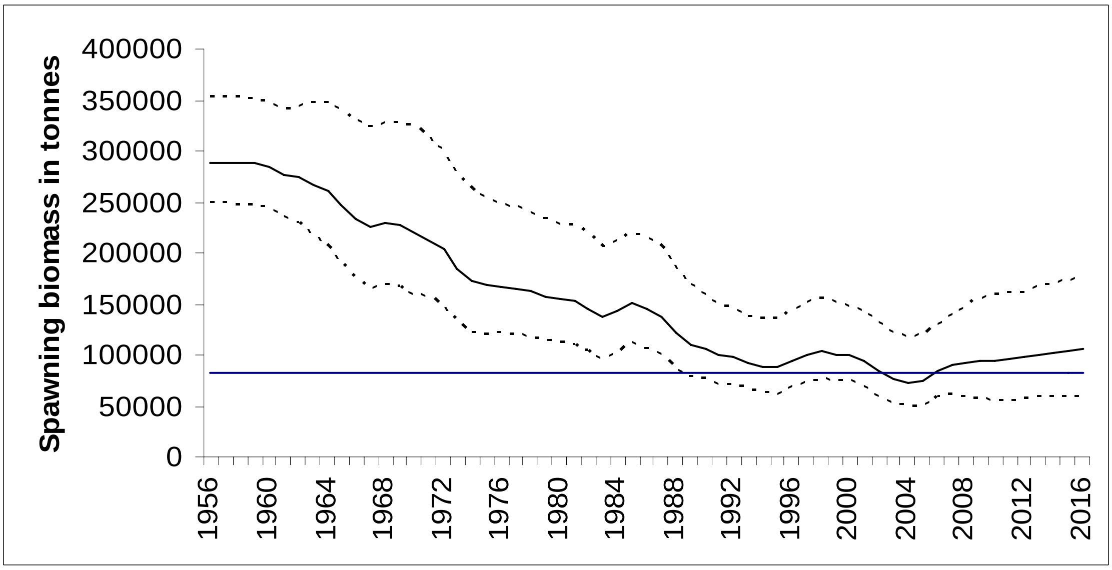


Figure 47. Biomass trajectory with 95 percentiles with a constant catch of 25,000 tones over the next 10 years for the base case scenario in the Southh Atlantic albacore stock.

Appendix 1

AGENDA

1. Opening, adoption of the Agenda and meeting arrangements.
2. Biological data, including tagging information
3. Catch data, including size frequencies and fisheries trends
4. Catch-at-size (CAS) and catch-at-age (CAA)
5. Relative abundance indices
   5.1 Indices by age for VPA-2BOX model fit
   5.2 Indices by fleet for MULTIFAN-CL model fit
   5.3 Indices for Age Structured Production Model fit
6. Methods and other data relevant to the assessment
7. Stock status results
   7.1 VPA-2BOX
   7.2 MULTIFAN-CL
   7.3 Other methods
8. Projections and yield per pecruit analysis
9. Recommendations
   9.1 Research and statistics
   9.2 Management
10. Other matters
11. Adoption of the report and closure

Appendix 2

LIST OF PARTICIPANTS

CONTRACTING PARTIES

BRAZIL
Frédou, Thierry
Universidade Federal do Pará Campus do Guamá, Depto. de Oceanografía Centro de Geociências, C.P. 8617, CEP 66093-110, Belém, PA
Tel: +55 91 3201 7983, Fax: +55 91 3201 7109, E-Mail: tfredou@ufpa.br

Hazin, Humberto
UFRPE/DEPAq, , Rua Dom Manuel de Medeiros, s/n, , Dois Irmaos, Recife-PE
Tel: +55 81 3320 6500, Fax: +55 81 3320 6501, E-Mail: hghazin@hotmail.com

EUROPEAN COMMUNITY
Brophy, Deirdre
Commercial Fisheries Research Group, GMIT, Dublin Rd, Galway, Ireland
Tel: +353 91 742484, Fax: , E-Mail: deirdre.drophy@gmit.ie

Cosgrove, Ronan
An Bord Iascaigh Mhara (BIM), New Docks, Co. Galway, Ireland
Tel: +353 91 564 318, Fax: +353 91 568 569, E-Mail: cosgrove@bim.ie

Ortiz de Urbina, Jose Maria
Instituto Español de Oceanografía, C.O de Málaga, Apartado 285, Puerto Pesquero s/n, 29640 Fuengirola, Málaga, Spain
Tel: +34 952 476 955, Fax: +34 952 463 808, E-Mail: urbina@ma.ieo.es

Ortiz de Zárate Vidal, Victoria
Ministerio de Educación y Ciencia, Instituto Español de Oceanografía, Promontorio de San Martín s/n, 39012 Santander, Cantabria, Spain
Tel: +34 942 29 10 60, Fax: +34 942 27 50 72, E-Mail: victoria.zarate@st.ieo.es

Pereira, Joao Gil
Universidade dos Açores, Departamento de Oceanografia e Pescas, 9900 Horta, Portugal
Tel: +351 292 200 431, Fax: +351 292 200 411, E-Mail: pereira@notes.horta.uac.pt

Taquet, Marc
IFREMER HMT, B.P. 171, Rue Jean Monet, 34203 Sète Cedex, France
Tel: , Fax: , E-Mail: marc.taquet@ifremer.fr

JAPAN
Uosaki, ***Koji***
National Research Institute of Far Seas Fisheries, Fisheries Research Agency of Japan, 7-1, 5 Chome Orido, Shizuoka-shi, Shimizu-ku 424-8633
Tel: +81 543 36 3036, Fax: +81 543 35 9642, E-Mail: uosaki@affrc.go.jp

NAMIBIA
Kirchner, Carola
Ministry of Fisheries and Marine Resources, Strand Str., Box 912, Swaropmund
Tel: +264 64 410 1133, Fax: , E-Mail: ckirchner@mfmr.gov.na

UNITED STATES
Díaz, Guillermo
NOAA Fisheries, Southeast Fisheries Center, Sustainable Fisheries Division, 75 Virginia Beach Drive, Miami, Florida 33149
Tel: +1 305 361 4466, Fax: +1 305 361 4562, E-Mail: guillermo.diaz@noaa.gov

Ortiz, Mauricio
NOAA Fisheries, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida 33149-1099
Tel: +1 305 361 4288, Fax: +1 305 361 4562, E-Mail: mauricio.ortiz@noaa.gov

Scott, Gerald P.
SCRS Chairman, NOAA Fisheries, Southeast Fisheries Science Center Sustainable Fisheries Division, 75 Virginia Beach Drive, Miami, Florida 33149-1099
Tel: +1 305 361 4220, Fax: +1 305 361 4219, E-Mail: gerry.scott@noaa.gov

OBSERVERS FROM COOPERATING NON-CONTRACTING PARTIES

CHINESE TAIPEI
Chang, Feng-Chen
Overseas Fisheries Development Council, , 19 Lane 113, Roosevelt Road Sect. 4, Taipei 106
Tel: +886 2 2738 1522, Fax: +886 2 2738 4329, E-Mail: fengchen@ofdc.org.tw; d93241008@ntu.edu.tw

Chen, Chiee-Young
National Kaohsiung Marine Universtiy, Department of Fishereis productor and Management, P.O. Box 23-13; Nº 142, Hai-Chuan Rd, Kaohsiung, Narzih Districk, 811
Tel: +88 6 7 365 1481, Fax: +886 7 368 1210, E-Mail: chency@mail.nkmu.edu.tw

Lee, Liang-Kang
National Kaohsiung Marine Universtiy, Department of Fishereis productor and Management, P.O. Box 23-13; Nº 142, Hai-Chuan Rd., Kaohsiung, Narzih Districk 811
Tel: +886 7 3617 141; ext 3515, Fax: +886 7 3644 190, E-Mail: Leelk@mail.nkmu.edu.tw

Yeh, Shean-Ya
Professor, Institute of Oceanography National Taiwan University, P.O. Box 23-13, Taipei
Tel: +886 2 2363 7753, Fax: +886 2 2366 1197, E-Mail: sheanya@ntu.edu.tw

****

ICCAT SECRETARIAT
C/ Corazón de María, 8 - 6 Planta, 28002 Madrid, Spain
Tel: + 34 91 416 5600, Fax: +34 91 415 2612, E-Mail: info@iccat.int

Restrepo, Victor
Kebe, Papa
Pallarés, Pilar
Palma, Carlos

Appendix 3

LIST OF DOCUMENTS

SCRS/2007/093	Standardized northern Atlantic albacore (*Thunnus alalunga*) CPUE, from 1967 to 2005, based on Taiwanese longline catch and effort statistics. HSIEH, Chi-Heng, Feng-Chen Chang and Shean-Ya Yeh.
SCRS/2007/094	Standardized CPUE of South Atlantic albacore (*Thunnus alalunga*) based on Taiwanese longline catch and effort statistics dating from 1967 to 2005. CHANG, Feng-Chen and Shean-Ya Yeh.
SCRS/2007/095	Assessment of the South Atlantic albacore resource based on 1959-2005 catch and effort statistics from ICCAT. LEE, Liang-Kang and Shean-Ya Yeh.
SCRS/2007/096	Factors, predicted by GAM procedures, dominating South Atlantic albacore (*Thunnus alalunga*) distribution revealed by 1982-2005 Taiwanese longline catch and effort data. CHANG, Feng-Chen and Shean-Ya Yeh.
SCRS/2007/098	Spanish albacore *(Thunnus alalunga)* surface fishery statistics in the northeastern Atlantic in 2006. ORTIZ DE ZÁRATE, Victoria, Santiago Barreiro, Cristina Rodriguez-Cabello.
SCRS/2007/099	Standardized age-specific catch rates of albacore, *Thunnus alalunga*, from the Spanish troll fishery in the northeast Atlantic, from 1981 to 2006. ORTIZ DE ZÁRATE, V. and J.M. Ortiz de Urbina.
SCRS/2007/102	Age estimation in albacore tuna, *Thunnus alalunga* (Bonn. 1788) using three different calcareous structures; preliminary findings of an inter-laboratory comparison. DAVIES, C.A., D. Brophy, P. Megalofonou, E. Gosling, N. Griffin, B. Leroy and N. Clear.
SCRS/2007/103	Standardized cpue for albacore using log-normal and negative binominal models for the Japanese longline in the Atlantic Ocean. UOSAKI, Koji and Hiroshi Shono.
SCRS/2007/104	Integral revision of the albacore (*Thunnus alalunga*) catch-at-size composition for the northern and southern stocks, between 1975 and 2005. PALMA, C., P. Kebe.
SCRS/2007/105	Standardization CPUE series of albacore, *Thunnus alalunga*, caught by Brazilian longliners in the Atlantic Ocean. HAZIN, H., T. Frédou, P. Travassos, F. Hazin, and F. Carvalho.