REPORT OF THE 2009 ATLANTIC SWORDFISH STOCK ASSESSMENT SESSION

(Madrid, September 7 to 11, 2009)

1. Opening, adoption of the Agenda and meeting arrangements

The meeting was held at the ICCAT Secretariat in Madrid. Dr. John Neilson (Canada), meeting Chairman, welcomed meeting participants ("the Group") and presented the general arrangements of the meeting. Dr Neilson proceeded to review the Agenda which was adopted without changes (**Appendix 1**). In reviewing the Agenda, Dr. Neilson reminded participants that it had been prepared to address the objectives presented in the Swordfish Work Plan for 2009 (**Appendix 2**).

A list of meeting participants is attached as **Appendix 3** and the list of scientific documents presented at the meeting is attached as **Appendix 4**.

Drs. Travassos (Brazil) and Neilson chaired the sessions for the southern and northern Atlantic stocks, respectively. The following participants served as Rapporteurs for various sections of the report:

Section	*Rapporteurs*
1, 9, 10	P. Pallarés
2	P. Travassos, J. Neilson
3	B. García-Cortés, P. Kebe
4	S. Cass-Calay, P. Travassos, C. Minte-Vera
5, 6	M. Ortiz, C. Brown, C. Minte-Vera, P. Travassos, G. Diaz
7	M. Ortiz, P. Travassos, C. Minte-Vera, G. Diaz
8	J. Neilson, P. Travassos, G. Scott

2. Biological data, including tagging information

Two papers were presented that provided new information concerning the biology of Atlantic swordfish.

Document SCRS/2009/111 is a preliminary report of a study regarding the population structure and admixture of swordfish in the Mediterranean and Atlantic Ocean. Four nuclear genetic markers were developed and used to assign individuals to inferred ancestral populations. This analysis confirmed the current ICCAT assumption of three distinct populations. Despite small sample sizes and minimal (4) nuclear markers, an average individual assignment > 93% was observed. Increasing the number of loci as well and/or the number of individuals sampled is likely to improve the ability to assign individuals to the appropriate ancestral population. However, the results of SCRS/2009/111 also indicate that data sets with fewer samples or the use of fewer nuclear DNA markers could still be used for population assignment.

With additional temporal and spatial sampling, the method described in SCRS/2009/111 has strong potential to quantify population admixture for Atlantic swordfish. This would be of great use for mixed-stock analyses. However, to take full advantage of this research, it is also recommended an effort be undertaken to quantify the amount of gene-flow that occurs within mixing areas (or across management boundaries).

SCRS/2009/115 provided an update on the ongoing Canadian research program using pop-up satellite archival tags (PSAT). A three-year collaboration with the swordfish harpoon fleet and the University of New Hampshire, began in 2005 and concentrated tagging effort on fish in the Georges Bank area. More recently, tagging effort has shifted to the Grand Banks off Newfoundland. Results of tag deployments to date suggest a more complex stock structure than was previously understood. Swordfish also appear to exhibit fidelity to their feeding sites. A newly initiated collaborative study will examine swordfish population structure in the north-western Atlantic using pooled data from swordfish satellite tagging programs in Canada and the United States. During discussions, it was noted that the information on dial vertical distributions could be useful in helping to understand availability to longline gear. It was asked if the differences in vertical migrations noted between tagged fish in 2006 and 2007 could be attributed to fish size, but as the fish were not brought onboard to be tagged, only estimates of size are available. It was observed that the results from the PSAT studies to date are consistent with the results from conventional tagging, which show few movements of swordfish tagged in the Northwest Atlantic into the Northeast Atlantic.

3. Catch data, including catch at size and fisheries trends

3.1 Overview

Directed surface longline fisheries from Canada, EC-Spain and the United States have operated since the late 1950s or early 1960s in the North Atlantic. The harpoon fisheries have existed at least since the late 1800s in the NW Atlantic. Other directed swordfish fisheries include longline fleets from Brazil, Morocco, Namibia, ECPortugal, South Africa, Uruguay, and Venezuela, among others. Additionally, some driftnet activities occur around the Strait of Gibraltar area and in other Atlantic areas (e.g., off the coast of West Africa). The primary by-catch or opportunistic fisheries that take swordfish are tuna fleets from Chinese Taipei, Japan, Korea and EC-France. The tuna longline fishery started in 1956 and has operated throughout the Atlantic since then, with substantial catches of swordfish in some years that are produced as a by-catch in their fisheries targeting different tuna species. **Figure 2** shows the geographical distribution of swordfish catches in the Atlantic.

The SCRS scientists believe that ICCAT Task I landings data provide minimum estimates because of unreported catch.

Total Atlantic

The total Atlantic estimated catch of swordfish (North and South, including reported dead discards) in 2008 (21,859 t) represented a significant decline from that in 2007 (27,941 t), due to socio-economic factors as well as changes in the target species for some fleets. As a number of countries have not yet reported their 2008 catches and because of unknown IUU catches, this value should be considered provisional and subject to further revision.

North Atlantic

For the past decade, the North Atlantic estimated catch has averaged about 11,332 t per year (**Table 1** and **Figure 1**). The catch in 2008 (10,752 t) represents a 53% decrease since the 1987 peak in North Atlantic landings (20,236 t). These reduced landings have been attributed to ICCAT regulatory recommendations and shifts in fleet distributions, including the movement of some vessels to the South Atlantic or out of the Atlantic. In addition, some fleets, including at least the United States, EC-Spain, EC-Portugal and Canada, have changed operating procedures to opportunistically target tuna and/or sharks, taking advantage of market conditions and higher relative catch rates of theses species previously considered as by-catch in some fleets. Recently, socio-economic factors may have contributed to the decline in catch.

South Atlantic

The historical trend of catch can be divided in two periods: before and after 1980. The first period is characterized by relatively low catches, generally less than 5,000 t (with an average value of 2,300 t). After 1980, landings increased continuously up to a peak of 21,780 t in 1995, levels that match the peak of North Atlantic harvest (20,236 t). This increase of landings was, in part, due to progressive shifts of fishing effort to the South Atlantic, primarily from the North Atlantic, as well as other waters. Expansion of fishing activities by southern coastal countries, such as Brazil and Uruguay, also contributed to this increase in catches. The reduction in catch following the peak in 1995 resulted from regulations and partly due to a shift to other oceans and target species. In 2008, the 11,108 t reported catches were about 51% lower than the 1995 reported level.

3.2 Catch data (Task I nominal catches)

The Secretariat presented the nominal catches (Task I) for the period 1950-2008. The data were published in the ICCAT webpage prior to the meeting according to the work plan. The Group reviewed in detail the catch distribution by country, gear and year and noted the good coverage of data reported to the Secretariat for 2008. For a few countries, Task I data were not reported and the Group agreed to carry over catch reported in 2007 to fill the information for 2008 (Sao Tomé & Principe Vanuatu and Senegal). A revised table including changes (carry over) and latest data submitted (Korea, Cote d'Ivoire) was accepted by the Group. The summary catch table is shown in **Table 1** and **Figure 1** and geographical distribution of the catch for the entire Atlantic by main gears is show in **Figure 2**. The reduced catch in 2008 (21,859 t) compared to 2007 (27,941 t) could be the result of some socio-economic effects or change in the species targeted.

Some concerns were raised about the significant quantity of live discard reported by Japan and not included in the catch table. The Group suggested making an investigation about the survival mortality of live discard in the longline swordfish fisheries.

3.3 Exploration of possible under-reported catches

Some concerns related to possible unreported catches were raised by the Group. According to the swordfish catch data base, it was noted that no estimation of unreported catches were included to the ICCAT data base, but at the same time the Group was informed that the main sources of information to estimate under reported catches were the information derived from the Statistical document of swordfish, and the customs data base from United States and Japan. As no trade data was available in the time of the meeting, the Group decided to explore to use the ICCAT Statistical Document data base to estimate unreported catch. The use of this information was not so easy because of the lack of conversions factors, from loin, filet, gilled and gutted to live weight on swordfish fish.

Table 2 summarizes the swordfish Statistical Document System data (s.SDS) through 2007 and contrasts the information with the reported Task I by flag. As the s.SDS data are recorded in product weight while Task I data are in live weight, several conversions were applied based on information from scientists attending the meeting and based on information for other species (mainly bluefin) and are shown in **Table 3** for the product types listed. These assumptions should be tested through observations, if further analysis of this type is attempted. This comparison indicates that Task I might not represent the total landed catch of Convention Area swordfish, although the amount that Task I could underrepresent actual landings is not well estimated. s.SDS data recorded for exports from various fishing flags with an unknown area of capture leads to the largest discrepancy between Task 1 and the scaled s.SDS data. Considering only the s.SDS data classified as coming from the Convention Area, the discrepancy amounts to an estimate of less than 1,000 t over the period of comparison (2003-2007). Considering the total s.SDS data, the discrepancy amounts to nearly 21,000 t for the period of comparison. It is noteworthy that the s.SDS data implies that international trade of Convention Area landed swordfish might represent less than 13% of the landed catch recorded in Task I and that a surprisingly low number of Contracting Parties engage in export of Convention Area SWO. Confusion among Contracting Parties about the need for s.SDS reports, especially for chartering arrangements; likely contribute to the low volume of international trade of Convention Area SWO documented in the s.SDS to date.

Trade data have been used to tentatively estimate unreported catches for other species (e.g. bluefin, bigeye) and have been found to provide some evidence of unreporting of potentially substantial volumes (tens of thousands of tons), but these volumes are not well estimated and the estimates are subject to high levels of uncertainty. Trade data at the level of detail available to SCRS are thus useful only for identifying gross levels of unreported catch, but are insufficient to assure high a degree of certainty in the estimates or a high degree of certainty that unreported catch does not occur.

3.4 Size frequencies and catch & effort data

The catalog and the data itself of swordfish size frequencies and catch & effort available in the Secretariat and published in ICCAT Webpage were presented by the Secretariat.

Document SCRS/2009/112 presents the monthly and annual size frequency distributions of swordfish reconstructed from 10,094 individual weights collected in the fish market of Dakhla (Southern Morocco) covering the period 2004-2008. The average size of the fish was 133cm lower jaw-fork length with a mean round weight of 33 kg. This document reported interannual differences in the size distribution.

Spanish scientists presented in document SCRS/2009/055 updated data on Spanish surface longline fleet targeting swordfish for the years 2006 and 2007 where 64,071 t and 49,473 t fish where sampled in the Atlantic areas, respectively. The paper also summarize 5ºx5º plots of Task I and II about landings in number and weight, effort and nominal CPUEs by size groups and aggregated.

3.5. Catch at Size (CAS) and catch at age (CAA)

As recommended by the work plan, the Secretariat prepared and published the catch at size for North and South Atlantic for the period 1978 to 2008 prior to the meeting. Following revisions made in Task I, a revised version was developed. A summary size distribution is shown in **Table 4**. The process used to update this catch at size data base was described in SCRS/2009/120**.**

An overview of the expanded CAS is shown in **Figures 4** and **5** for the north and south stock respectively. It was noted that CAS include many substitutions due to size sampling gaps in both time space, and also that it represents the size distribution of the catch and not necessarily of the population. Changes in fishery patterns, selectivity and management regulations can greatly influence the retained size fish fraction. It was however suggested that size frequency trends be presented by fleet-gear combinations for which direct size observations are currently being provided. The United States scientist presented an example of the deviations on mean size for swordfish by year and area using size data collected by an observer program (**Figure 6**).

Based on the unisex Gompertz growth curve, the Secretariat converted the catch at size data to catch at age using the AGEIT.FOR software developed since 1989. The summary result is shown is **Table 5** and **Figure 7**.

As a result of the updates to the Task I and catch-at-size data bases, the North Atlantic catch-at-age matrix for 1978-2005 differed somewhat from what was available for the previous assessment. These differences are shown in **Table 6** and **Figure 8.**

3.5 Fisheries trends

During the meeting national scientists presented short descriptions of recent developments in the swordfish fisheries in their countries.

Brazil; Brazilian swordfish catches decreased from 4,153 t in 2007 to 3,407 t in 2008, representing a decline of about 18%. This is primarily related to a reduction of fishing effort, due to a decrease of foreign chartered boats operating in the fishery. In addition, some changes in target species from swordfish to tunas for the national tuna boats were observed in 2008. There are two main fishing grounds which are exploited by the Brazilian fleet: an equatorial area, between 5^{o}N and 5^{o}S, and another one, in the southern coast, around Trinidad Island (~20^{o}S). There was no change in fishing distribution in the recent period, and no change in fish size (range in LJFL was 90 to 260 cm).

Canada: Canadian swordfish are caught by harpoon (10% of national quota) and longline (90% of national quota) from Georges Bank to east of the Grand Banks of Newfoundland from May through November. Over the past decade, total landings (including dead discards) peaked at 1,664 t in 2005. The landings in 2008 (1,373 t) represent a decline of about 17% since that time. The distribution of longline catches has changed since the last stock assessment. There were fewer trips east of the Grand Banks due to unfavourable water conditions as well as economic considerations such as fuel costs. Since 2002 the fishery has been managed under an Individual Transferable Quotas (ITQ) system, which has eliminated the competitive nature of the fishery. Swordfish are caught primarily on the edge of the Scotian Shelf and Grand Banks while tunas (albacore, bigeye and yellowfin) are generally caught south of the shelf edge, in warmer water. According to the Canadian fishing industry, the longline fishery now principally directs for tunas.

Chinese Taipei: The Chinese Taipei tuna longline fishery started its operation in the Atlantic Ocean in the early 1960s, and has operated widely throughout the entire ocean since the 1990s, targeting mostly albacore (*Thunnus alalunga*), bigeye (*Thunnus obesus*) and yellowfin (*Thunnus albacares*) tunas. Swordfish was mainly a by-catch of the fishery. Despite that more swordfish were caught in the South Atlantic, the annual catches of swordfish in the northern stock were less than 500 t before 1990, but increased to about 500 t in the early 1990s as a result of the development of deep longline operation in the tropical area for bigeye and yellowfin tunas. However, the annual catch in the North Atlantic has decreased since 1998 most probably due to the enhanced catch regulation on this species. The annual catch was 172 t and 82 t in 2007 and 2008, respectively. In the South Atlantic, the annual catch was about 200-800 t in the 1980s, increased to 850-2,900 t in the 1990s accompanied by an increase in deep longline operation for tunas in the tropical area. Due to the enhanced catch regulation of ICCAT, the catch was reduced to around 1,100 t in 1998. The catch has been stable at the level around 700 t since 2004 except for 2006 when the catch further decreased to 377 t. The catch in 2007 and 2008 was 671 and 727 t, respectively.

EC-Spain: An extensive description of the recent fishery, catch, effort and nominal CPUEs, is found in SCRS/2009/055 with special reference to the years 2006 and 2007, including North and South nominal catch per effort information for the period 1986-2007. Landings in the total Atlantic during 2006 and 2007 were 10,746 t and 10,847 t, respectively. Total Atlantic landing for 2008 were 8,409 t. In the North and South Atlantic reported catches for 2008 were 4,336 t and 4,073 t, a 38% and 64% decline from the catches in 1995, respectively. There were some changes in the Spanish fisheries in most recent years, additionally to those produced by regulations. As it was already reported over the past few years, the North Atlantic fleet has kept a multi-species fishery due to changes in the market (increases in the price of other species) and to a shift of some vessels out of the Atlantic. Additionally, most of the vessels have already gone from the traditional multifilament to monofilament gear. It has also attempted to obtain equivalences between the efficiency or catchability of the two longline gear types used by the Spanish longline fishery, taking advantage of the observations carried out in overlapping areas where two longliners were operating with the same strategy on a trial done in South Pacific areas. The monofilamente longline showed higher catch rates per hook than the traditional longline style, with an estimated mean efficiency of 2.6, 1.9, 1.3 and 2.0 greater than the traditional longline for *Xiphias gladius, Prionace glauca, Isurus oxyrinchus* and billfishes, respectively (SCRS/2009/098).

Morocco: The Moroccan longline fishery targeting swordfish in the North Atlantic Ocean is relatively recent compared with other tuna fisheries in particular the gillnet and the tuna traps fisheries. This fishery has been operating since the beginning of the last decade and involved about 15 vessels. The fishing occurs along the year, with higher catches during the third and the fourth quarter. In terms of catches, this fishery has contributed with 300 tones on average during the last five years, which represent 17% of the total catches of this species at the national level. The sizes of fish caught by this fishery range from 58 to 269 cm lower jaw-fork length, with an average size of 133 cm, corresponding to an average round weight of about 33kg. The mean weight of swordfish showed a decreasing trend during the 2004-2008 periods. However, the relative abundance index in weight for swordfish shows an increasing trend over the same period.

Uruguay: During the last 5 years, the swordfish captures have decreased from 1105 tons in 2004 to 370 tons in 2008. This decrease has been caused by a change in the target species of the fishery, together with a reduction in the fishing effort. The recession in the US market, main buyer of fresh Uruguayan swordfish, together with the occurrence of fishermen labor conflicts produced a decrease in the fishing effort, with some boats even stopping their fishing activities during 2006-2008. At the same time, during this period there was an increase in the captures of blue shark and yellowfin tuna, coinciding with an increase in the prices of these products, mainly in the Brazilian market. It is expected that this situation will revert starting at the end of 2009, due to the reactivation of some boats, and the incorporation to the fleet of new fishing boats targeting swordfish.

United States: United States catches (landings+dead discards) of swordfish peaked in 1990 with a total of 5,519 t. Since then, United States catches followed a declining trend with the lowest catches reported in 2006 (2,057 t). In 2008 the United States reported 2,530 t of total swordfish catches, a decrease of about 5% with respect to the previous year. In 2008, 93% of all United States swordfish catches were from pelagic longline vessels. United States longline vessels operate throughout the western Atlantic including the Gulf of Mexico and Caribbean Sea. The main targets of the United States pelagic longline vessels are yellowfin tuna and swordfish. In the mid 1990s, the United States pelagic longline fleet consisted of about 400 active vessels. The number of active vessels has decreased since then and only about 120 vessels were active in the pelagic longline fishery in 2008. Management regulations, market conditions, and fuel prices are some of the reasons for the reduction of the fleet. In 2001, a number of time/area closures came into effect for the pelagic longline vessels operating within the United States EEZ. Two permanent closures, one in the Gulf of Mexico and the other in the Florida East Coast, were established to reduce the by-catch of undersize swordfish. Three other areas have temporal closures and they were established to reduce the by-catch of undersize bluefin tuna. In addition, following an ecosystem management approach circle hooks became mandatory for the United States pelagic longline fleet in 2004 with the aim of reducing sea turtle and other by-catch mortality. The United States also has a recreational swordfish fishery. Although recreational swordfish landings are a very small proportion of the total United States landings (75 t in 2008), this fishery has expanded in the last few years and is projected to continue growing.

Other countries not included in the report have not presented descriptions on their respective fisheries.

The catch reported by countries attending the meeting (**Figure 3**) which presented their fisheries description, represents a 78% of the total Atlantic swordfish landings for recent years.

4. Relative abundance indices

4.1 Relative abundance indices – North

Five documents describing catch per unit effort (CPUE) series were submitted to the Working Group. The indices below were standardized using various analytical approaches.

Document SCRS/2009/109 describes sex and age-specific indices of abundance constructed using data from the United States pelagic longline fleet operating in the Western North Atlantic including the Gulf of Mexico and the Caribbean. Annual trends in catch rates varied by sex and age. The Group recognized that the indices generally appear flat while expectation, from other sources of information, is that abundance has increased. The Working Group discussed the possible influence of changes in management regulations, and recommends that these possible influences on CPUE be examined in the future (to the extent possible).

Document SCRS/2009/110 summarizes the construction of combined biomass indices constructed for use in the production model runs. These indices reflect the combined standardized CPUE from the longline fleets of the United States, Spain, Canada, Japan, Morocco and Portugal. The Group noted the strong influence of the U.S. longline observations on the combined CPUE series, which was caused by the high proportion of observations from that fishery, especially in recent years (since 2000 the U.S. samples represent >70% of the data since the data are on a trip basis). The Working Group agreed that a filtering criterion be applied to reduce the number of U.S. observations to those vessels that had landed swordfish during at least ten years of the time series **(Figure 9)**. The combined index was then recalculated. The Group also recognized that no new observations were available for the Japanese longline after 2006. Although the Japanese longline does not target swordfish, there may be recent changes in the operation of that fishery. Therefore, the Working Group recommends that this information be updated in future analyses.

Document SCRS/2009/113 gives a description of an index of abundance in weight developed for the Moroccan longline fishery targeting swordfish in the north Atlantic. This document analyzes the data for 377 trips carried out by this fleet during the period 2004-2008. The index represents a new source of information and constitutes an important contribution. The Moroccan CPUE information was used during the construction of the combined CPUE series produced for the production models. Since no age-specific indices are available to date, the index was not used during VPA runs.

Document SCRS/2009/114 details the construction of sex- and age-specific indices of relative abundance for North Atlantic swordfish caught by the Canadian pelagic longline fishery. The generally increasing trend in catch rates since the historic low in 1996 is indicative of an increase in the relative abundance of swordfish since that time. The authors noted that Canadian fishermen do not believe that the index appropriately accounts for the changes in management strategy and targeting in recent years. The Working Group recommends that an examination of the influence of changes in management strategy and targeting be undertaken in the near future.

Document SCRS/2009/118 describes the development of indices of abundance from the longline fishery of Chinese Taipei. This index is also a new source of information for the N-ATL swordfish and a valuable contribution. Although the indices described in SCRS/2009/118 were not used for the 2009 assessment models run for North Atlantic swordfish, the Group recommended that work be done to include this information in the combined biomass index developed for future assessments.

The available indices are summarized in **Table 7.** The usage of the index (not used, production models, VPA) is also noted in **Table 7**. The indices are illustrated in **Figures 10** and **11**. To facilitate visual comparison of the annual trends, the indices were scaled to the mean of the overlapping years.

For VPA runs, it was necessary to calculate combined sex indices, by age. These were calculated by adding the standardized male and female CPUEs (raw values before scaling to the mean), for each age to create the "Unisex" indices.

Numerous other indices appear in the SCRS documents, but were not considered for use for the 2009 VPA or production models formulations (e.g. because they were constructed for males and females separately, or for ages that were not considered for the VPA). These indices are described in documents SCRS/2009/109 and SCRS/2009/114.

4.2 Relative abundance indices – South

Five documents presenting standardized CPUE indices were provided to the Group. The indices were standardized using various analytical approaches.

Document SCRS/2009/119 describes standardized CPUE index from Brazilian tuna fleet (targeted and non-targeted) operating in the Western Southern Atlantic using catch and fishing effort data from 1978-2008 (~68,000 individual sets). The CPUE series (fish/1000 hooks) was standardized using the same methodologies described in SCRS/ 2006/127. The results obtained in the present document are similar to those presented during the last swordfish stock assessment (2006), confirming the optimistic scenario of a continuing trend of increase in the index of abundance for the species in the southwestern Atlantic, in recent years. However, the index also showed great interannual variability. It was recognized by the Group again that one potential bias of that method is that the cluster analysis will not consider a set as targeting swordfish if swordfish catches are null or if its proportion is considerably lower than those obtained for other fish species in the same set, resulting in artificially higher CPUEs. The analysis excluding the factor target concentrated the explanation of the deviance in the year effect and produced even more optimistic values for recent year. Both models showed the same overall trend. As discussed at the last SWO assessment meeting, the Group believes that the increase in the abundance index for the species may be an overly optimistic representation of the recent trend in southern Atlantic swordfish biomass. The Group also discussed that given the high interannual variability of the index, this might not reflect the true trends of biomass, particularly when considering the swordfish life history characteristics.

SCRS/2009/121 provided standardized catch rates in number and weight for the directed South Atlantic swordfish using General Linear Modeling from 5,541 observations carried out by the Spanish surface longline fleet fishing the South Atlantic swordfish stock during a period 1989-2008. The criteria used to define models were similar to those used in previous standardized analyses, but in this case new factors such as gear and bait were also incorporated. The final model explained 66% and 71% of the CPUE variability in number and weight, respectively. Trends of CPUE in number and weight are almost identical, showing stable trends over time with small fluctuations probably linked to the multiannual phases of abundance in number of fish. Phases in the oceanographic conditions in the studied areas were suggested by the authors to be studied in relation to such CPUE fluctuations. The Group requested details concerning the variability among areas over time. However because the progressive geographical expansion of the Spanish fleet during the history of this fishery it was not possible to have a good contrast among areas for the complete time series to make comparisons. In any case, the authors will study when possible other approaches to achieve this overview.

Document SCRS/2009/127 presents the standardized CPUE of swordfish from Uruguayan tuna fleet operating in the Western Southern Atlantic for the period 1982 – 2008. For the standardization, Generalized Linear Models with a Delta Lognormal approximation were used. The standardized CPUE shows similar trends to the nominal CPUE, with a decreasing trend in the last 8 years. In the first ten years of the study, 1982 – 1992, the CPUE showed much lower values than the next period (1993 – 2008), due to the fact that the fleet targeted bigeye tuna and occasionally albacore during this time period. Since 1992 the fishery targets swordfish. In exploratory analysis, the same procedure was conducted using the CPUE in number of individuals, finding the same trend in both series. For the analysis, the abundance index was broken down in two series.

Document SCRS/2009/116 describes indices of abundance of the south Atlantic swordfish caught by non-targeted Japanese longliners from 1975 to 2007. The standardization of CPUE was conducted by the GLM method. Because the main gear configurations used by Japanese longliners have been changed drastically since 1975 and the traditional GLM method cannot fully standardize the effect of this change of the gear configuration, the data were split into two time series: from 1975 to 1989 and from 1990 to 2007. The estimated abundance index from 1975 to 1989 showed a general increasing trend after the early 1980s. Differently, CPUE index observed in the later period (1989 – 2007), shows a decreasing trend up to 2003, and increased thereafter, reversing the downward trend observed in the last meeting. The Group noted that drastic changes in gear configurations and fishing zones occurred during the period analyzed were not fully standardized by the model used in this study. The Group decided to use CPUE series presented in the last assessment meeting.

Document SCRS/2009/117 describes standardized swordfish catch rates of the Chinese Taipei non-targeted longline fleet in the South Atlantic Ocean. The standardization of abundance index was conducted by applying two alternative modeling approaches (GLM and GAM) to datasets of fishery data (ICCAT Task II, from 1968 to 2008, and daily logbook dataset from 1995 to 2008). In contrast to a continuously decreasing standardized CPUE pattern of the previous study, the standardized catch-rates derived from different datasets and approaches in this study showed a smooth decreasing trend since 1968 through 1986. After that, an increasing trend to a relatively higher level during the period 1990-1997 was observed. After a significant drop, the CPUE index observed in the later period (1998 – 2008) exhibited a stable pattern, with a slight tendency to increase at the end of the period. The Group noted that the abundance indices showed a different trend from the CPUE presented in the last meeting. The Group noted that this difference may be due to the method used (GLM vs. GLMM).The Group recommended that the abundance index presented in the last assessment meeting would be used for the 2009 assessment and recommended that the CPUE series of SCRS/2009/117 would be considered for sensitivity analyses. Although these indices were not used for the 2009 assessment models run for South Atlantic swordfish, the Group recommended to include this information in future assessments.

The standardized CPUE series presented show different trends and high variability which indicates that at least some are not depicting trends in the abundances of the stock. The available indices are summarized in **Table 8** and illustrated in **Figures 12** and **13** to facilitate comparison of the annual trends, including the series presented in the last assessment meeting.

5. Methods and other data relevant to the assessment

5.1 Methods – North

5.1.1 Production model

In applying production models to North Atlantic swordfish, the Group used the dynamic (non-equilibrium) model (ASPIC v5.05) adopted previously by the SCRS for several species including swordfish. This version of ASPIC is parameterized in terms of MSY, K, and B(first year)/K, the model was formulated as in the 1994, 1996, 1999, 2002 and 2006 assessments, as follows: i) 1950 (B_0) biomass constrained to equal 0.875*K (equivalent to 1.75*B_{MSY}), ii) logistic production model assumption, and iii) optimize model conditioned on catch. Least squares minimization was used. At prior assessments, sensitivity analyses were conducted to evaluate sensitivity to this and other factors.

The data used in ASPIC production modeling and in the sensitivity analyses were the total North Atlantic reported catch from 1950 to 2008 including estimated dead discards (**Table 9**) and the CPUE combined biomass index as described in section 4.1 (**Figure 14**). At this assessment, sensitivity analyses were conducted to evaluate the effect on the model of the different data filtering performed in the construction of the combined CPUE index. In order to incorporate uncertainty from the CPUE index into the ASPIC model, it was decided to use the point estimates and the 10% and 90% quartiles of CPUE index to construct the base case scenario for the production model. This was accomplished by running three ASPIC models in each case with the same catch series and the point estimate, low (10% quartile), and high (90% quartile) CPUE series. Results of central tendency and uncertainty were estimated from the pooled results of all three runs.

As for further sensitivity analyses, the Group also applied the Bayesian statistical approach for stock assessment with a surplus production function described in SCRS/1999/085. These models were discrete time step models with harvesting occurring at the beginning of each year. The prior distribution for parameter *r* from SCRS/1999/085 was applied as the baseline prior for the North stock with a median value for *r* of 0.42 and CVs of 0.49. The baseline prior for the starting biomass in the North stock run had the same mean value as was assumed in the baseline ASPIC runs (0.875), and a CV of 0.25. The same catch and catch rate (point estimate) data used in the ASPIC runs was applied in the Bayesian estimation.

It should be emphasized that the lumped biomass production models assume that the input CPUE series are proportional to biomass with some degree of random variation and both can give misleading results when this assumption is violated. The indices of biomass were assumed to be lognormally distributed.

5.1.2 Virtual population analyses

Virtual population analyses were conducted for the North Atlantic stock using program VPA-2BOX (see ICCAT catalog). Catch-at-age data were derived for 1978-2008 from catch-at-size using the unisex Gompertz growth equation (see **Table 5**). Only 5 age groups (age 1 to 5+) were used owing to the inability to reliably age older male fish. The VPA was calibrated using 17 age-specific, unisex catch rate indices (**Table 7, Figure 11**) developed for Canada (ages 2-5+), Japan (ages 3-5+), Spain (ages 1-5+) and United States (ages 1-5+). Only the Canadian and United States indices were updated since the 2006 stock assessment and included values for 2006-2008; the Japanese and Spanish indices were carried over from the 2006 stock assessment. The indices were assumed to be lognormally distributed with identical coefficients of variation (equally weighted). The natural mortality rate was fixed at 0.2 yr-1. The fishing mortality rates in the last year were estimated for every age except the last (which is modeled by the F-ratio). The F-ratio (ratio of the fishing mortality rate on the oldest age to that of the next younger age) was estimated for two blocks of years (1978-1982 and 1983-1987) and fixed to 1.0 for the remaining years as was done in the previous two assessments to account for changes in the transition of the fishery from coastal to oceanic waters. Runs were conducted both with and without constraints on the vulnerability and recruitment estimates (penalty standard deviations of 0.4 and 0.1, respectively) for the last 3 years.

In order to evaluate the variability of the fit to the indices to the catch at age through the VPA model, bootstrapping analyses was performed in which the deviations of the log-transformed index data points and their predictions were randomly selected to generate 500 sets of new index points. The VPA was then applied to each of the 500 new data sets and the median values with their 80% confidence intervals computed.

5.2 Methods – South

5.2.1 Production model

The Group used an updated version of the non-equilibrium surplus production model ASPIC (version 5.05) adopted by the SCRS for several species including swordfish. Data from 1956 to 2008 were used as input for the model. The fleets included in the analysis were Brazil, Chinese-Taipei, Japan, Spain, Taiwan, and Uruguay as two separate indices (Section 4.2). The index of abundance for the Brazilian fleet was converted from number of fish into weight by using average weight from the catch-at-size files (Task II). The landings for those fleets for which indices of abundances were not estimated were added to the landings of the Japanese longline fleet. The model runs followed the same settings used for the 2006 assessment, B1/K parameter was fixed at the value 0.875, final values of MSY and K were model estimated. During the 2006 stock assessment, the Group decided to estimate a combined index to use as input for the ASPIC model. However, the indices available for the Group showed conflicting trends and after discussion it was agreed to use the six individual indices as inputs instead of estimating a combined index in an attempt to better characterize the uncertainty.

The base cased included the fleets listed above and their associated indices of abundance as described in Section 4.2. A sensitivity run was performed by replacing the Chinese-Taipei index of abundance used in the 2006 assessment with a revised series. This revised series was in number of fish and was converted into weight using average weights provided that Chinese-Taipei National Scientists. Additional runs were performed using only one index at the time with the total South Atlantic catch assigned to that particular fleet.

5.2.2 Catch only Model

Due to the conflicting trends shown by the standardized CPUE indices (Sections 4.2 and 5.2.1), the Group decided to explore the information contained in the catches. For this, the catch-only model, as described in Anon, 2009a, was used. Half a million parameter vectors were randomly sampled from the joint prior distribution; of those 2,000 samples were taken using the SIR algorithm. Priors for K were set as uniform on log scale for a wide range ($\ln(K) \sim U(\ln(3058),\ln(7647000))$). The priors for a were set as uniform on its range $a \sim U(0,1)$. Priors on x were set as $x \sim U(0,1)$. Explorations on combinations of plausible values for a and x were made using a series of longline effort for the Southern Hemisphere in the Report of the 2008 meeting of the Sub-committee on Ecosystems (Anon., 2009b). RUN 1 used an informative prior for r that was obtained from a joint prior on r and n (the shape parameter of the Schaefer-Fletcher model) derived by McAllister *et al.*, 2000 conditioning on n=1 (Schaefer). RUN 2 used, as an informative prior for r, the posterior for this parameter obtained from the base case run of the BSP model for SWO-N.

6. Stock status results

6.1 Stock status – North

6.1.1 Production models

Results from the North Atlantic Base Case ASPIC model, which the Group considered to be the best estimate, are shown in **Table 10** and **Figure 15**. The estimated relative biomass trend shows a consistent increase since 2000. **Table 11** shows the deterministic biomass, fishing mortality and relative values estimated from the ASPIC base model for the north Atlantic swordfish stock 1950-2008. Biomass values represent estimates at the beginning of the year. The bias corrected deterministic outcome indicates that the stock is at or above B_{MSY} (**Figure 15**). The relative trend in fishing mortality shows that the level of fishing peak in 1995, followed by a decrease until 2002, followed by small increase in the 2003-05 period and downward trend since then (**Figure 15)**. Fishing mortality has been below F_{MSY} since 2005. The estimate of stock status in 2005 is relative similar to the estimated status from the 2006 assessment, and suggests that there is greater than 50% probability that the stock is at or above BMSY, and thus the Commission's rebuilding objective [99-2] has been achieved. However, it is important to note that the catches since 2003 have been below the TAC's, increasing the chances for a fast recovery (**Figure 16**). Overall the stock was estimated to be somewhat less productive than the previous assessment, with the intrinsic rate of increase, *r*, estimated at 0.44 compared to 0.49 in 2006. The combined biomass index shows a consistent upturn from the predicted 2001 value, and the index values for the most recent years are near the level estimated in the early 1980s (**Figure 17**). The high value in 1963 is not well fit.

Sensitivity runs included a retrospective evaluation of the base ASPIC model (**Table 12**). As the catch and CPUE information was removed from the latest years, the model predicted higher stock productivity (larger *r* values), and consequently higher MSY (**Figure 18**). The retrospective results indicated that consistently biomass has been above B_{MSY}, and fishing mortality below F_{MSY} for the last 5 years. However confidence intervals overlap during the time period evaluated. A sensitive run was done using a combined biomass index of abundance that included all the observations from the US pelagic fisheries (**Figure 19**). The overall trends of the biomass and fishing mortality ratios were similar to the base model in the early years (**Figure 20**), however trends differ since 2000 showing a lower biomass and higher fishing mortality ratios compare to the base case. In absolute values, the sensitivity run indicated a lower productivity stock with higher fishing mortality.

The estimated stock status results from applying the BSP model sensitivity are shown in **Table 13**, and they are similar to the base ASPIC estimates. The stock is estimated to be above B_{MSY}, and current fishing mortality is estimated to be less than F_{MSY}. The posterior distributions for MSY and B_{2009}/B_{MSY} are also similar to the ASPIC bootstrap distribution, while the mode of the distribution of F_{2008}/F_{2MSY} is slightly less than the ASPIC bootstrap distribution (**Figure 23**). As in 2006, the posterior distribution for *r* is less than the ASPIC bootstrap distribution (**Figure 23**), however the distributions from both models are closer to each other than in 2006. The fit to the combined index, and the residuals, are shown in **Figure 24**. As in ASPIC, the predicted CPUE in 1963 is not well fit.

Figure 23 shows histograms and scatter plots of bootstrapped estimates of the biomass and F ratios for 2008. The spread of the logistic fits suggest that current biomass is slight above B_{MSY}. However the uncertainty around B_{MSY} is considerable. In contrast, the F ratio uncertainty indicates a higher probability of fishing mortality being below F_{MSY}. Comparing with 2006 ASPIC base model, the trajectory of biomass and F ratios are similar until 1990, thereafter the current model predicted lower fishing mortality rates and higher biomass particularly in the most recent years (**Figure 24**).

6.1.2 Virtual population analyses

Estimates of numbers and fishing mortality at age can be highly uncertain for the most recent years when using backwards recursive models such as VPA, particularly for those ages for which there is little or no catch history and no abundance indices. This was evident in VPA runs which did not impose constraints on vulnerability or recruitment; these produced spurious estimates of recruitment (age 1) in the last 3 years due to the lack of information for the younger age classes (i.e. no Age 1 indices were available after 2001). The run which imposed constraints on both vulnerability and recruitment in the last 3 years was therefore selected as the Base Case. The Base Case estimates of abundance and fishing mortality are given by age in **Tables 14** and **15**, respectively. In general, the estimates are similar to the results for the 2006 base case. The estimates of recruitment (age 1) fluctuate between about 420,000 and 670,000 fish, with fluctuations in a narrower range of about 460,000 to 570,000 during the most recent 15 years (**Figure 26**). The estimates of the abundance of age 2 follow a pattern similar to that exhibited by age 1 with a 1-year lag (**Figure 27**). The estimates of spawning biomass (age 5+) indicate a strong decreasing trend with a recent upswing since 1999. Although somewhat variable, the estimated fishing mortality rates for all ages show an increasing trend until about 1996, after which they decrease substantially (**Figure 27**).

The VPA fits to the indices of abundance are given in **Figure 28.** In general, the VPA results appear to be adequately averaging the variations in the indices (given the relatively low contrast in each of the CPUE time series). The median estimates of the bootstrap analysis were very similar to the original maximum likelihood predictions. Therefore, it does not appear that the model output is seriously biased with respect to the data. It is important to note however that the bootstrap analyses only account for the imprecision of the indices of abundance and do not account for uncertainties in the natural mortality rate, non-reporting of catches and other potential biases.

6.2 Stock status – South

6.2.1 Production models

The results of the base case indicated that there was a conflicting signal for several of the indices used. The model estimated overall index was relatively stable until the early 80s when it started declining until the late 90's and it reversed that trend about 2003. The overall index estimated by ASPIC showed a relatively good fit to the Spanish index and it poorly fit the Brazilian index (**Figure 29**). Estimated relative fishing mortality (F_{2008}/F_{MSY}) was 0.75 indicating that the stock is not ongoing overfishing (**Figure 30**). Similarly, estimated relative biomass (B_{2009}/B_{MSY}) was 1.04, therefore indicating that the stock is not overfished (**Figure 30**). The time series of relative Biomass showed that the stock became overfished in 1997 and remained in that condition until 2009 when $B>B_{MSY}$. Similarly, the stock underwent overfishing from 1994 through 2006. The sensitivity case provided a slightly more optimistic status of the stock with F_{2008}/F_{MSY}=0.716 and B_{2009}/B_{MSY}=1.1. **Table 16** shows all estimated benchmarks.

Great disparity was observed on the results of the runs made on the individual fleets as the result of the conflicting information provided by the different indices. While some fleets showed an optimistic status of the stock (i.e., Spain and Brazil), the Uruguayan fleet showed a stock that is overfished and under overfishing conditions. In contrast, the declining trend of the Japanese fleet CPUE resulted in an estimated MSY of only 2,287 t; while for the Chinese-Taipei fleet the model was unable to converge to a solution as it reached the MSY lower boundary with a value of 1.0. In the case of these two fleets and considering the known catch history and other fishery indicators the result are not considered plausible. **Figure 31** shows the estimated relative F and B for each run.

A total of 500 bootstrap runs were performed to assess the level of uncertainty associated to the results of the base case (**Figure 32**). **Figure 33** presents the outcome of the bootstrap runs as frequency distributions of the estimated fishing mortality F and stock biomass.

However, because the runs with individual fleets (**Figure 28** and **Table 16)** resulted in very different trajectories and terminal year estimates (**Figure 34**) none of which was similar to the base case, the Group concurred that the bootstraps under-represented the true and unquantifiable uncertainty of the results. Therefore, the Group agreed that it is not advisable to draw conclusion on the status of the South Atlantic swordfish stock based on the benchmarks estimated solely by the ASPIC model.

6.2.2 Catch only model results

As expected, the posterior for *r* was not influenced by the data. However, the posterior distributions for *K* and *a* were considerably narrower than the priors for both runs (**Figure 35**). For management benchmarks, the posteriors were narrower than the implied prior distributions, indicating that the catches only, given the model assumptions, are informative. The posterior of relative fishing mortality (F_{2008}/F_{MSY}) ranged from 0.33 to 1.41 (10 and 90% percentiles, RUN1), with $P(F_{2008}/F_{MSY} <1)$=0.77, indicating that taking only the catches into consideration the stock is not likely to be ongoing overfishing (**Table 17)**. The posterior relative biomass (B_{2009}/B_{MSY}) ranged from 0.84 to 1.69 (10 and 90% percentiles, RUN1), with $P(B_{2009}/B_{MSY} >1)$=0.82 indicating that the stock seems not to be overfished. The distribution for MSY was skewed for both runs (**Figure 36)**. The median of MSY estimated for RUN 1 was 18,130 t and for RUN 2 was 17,934 t (**Table 17**). The trajectories of F and the total effort in hooks for South Atlantic level off in later years, which indicates that the assumptions for the harvest dynamics of the COM are reasonable, despite some discrepancy in the early years, when the effort was not directed to swordfish (**Figure 37**). The biomass trajectories are shown in **Figure 38**. The level of uncertainty on the knowledge of the state of the stock is depicted in **Figure 39**, conditioned only on the catches**,** the model estimated a probability of 0.77 that the stock is not overfished and it is not ongoing overfishing.

7. Projections

7.1 Projections – North

7.1.1 Production models

The ASPIC base model was projected to the year 2018 under constant TAC scenarios of 10, 11, 12, 13, 14 and 15 thousand tones. Catch in year 2009 was assumed to be the average of the last three years (2006-008) (11,515 t). Median trajectories for biomass and fishing mortality rate for all of the future TAC scenarios are plotted in **Figure 40**.

Results from the 2009 assessment indicated that there is greater than 50% probability that the northern swordfish stock has rebuilt to or above B_{MSY} (**Figure 21** and **22**) and thus the Commission's rebuilding plan goal has been achieved. While there is some uncertainty associated with this conclusion, 56% of the bootstrap estimates of current biomass were greater than or equal to B_{MSY}, while >90% of the bootstrap estimates of current F were less than F_{MSY}. Successful rebuilding was achieved in spite of allowable catch levels agreed in [Rec. 06-02 and Rec. 08-02] which exceeded scientific recommendations, but which were not realized. The Group noted that rebuilding could have been compromised if recent catches had been higher than reported. The 2007 and 2008 catches were 10% and 22% below the estimated MSY level, respectively, thus allowing the stock to grow in biomass. If the realized catches had been at the level of catch limits allowed by Rec. [06-02] (15,345 t, i.e. 12% above the MSY estimate), the stock biomass would have declined instead.

For the above reason, the Group is concerned about management decisions that carry forward unused portions of quotas as in paragraph 3.a of Rec. [06-02], in such a way that the sum of allowable catch limits exceeds the recommended TAC.

Future TACs above MSY are projected to result in 50% or lower probabilities of the stock biomass remaining above B_{MSY} over the next decade (**Table 18 Figure 41**) as the resulting probability of F exceeding F_{MSY} for these scenarios would trend above 50% over time. A TAC of 13,000 t would provide approximately a 75% probability of maintaining the stock at a level consistent with the Convention Objective over the next decade.

7.2 Projections – South

7.2.1 Production models

Because the Group considered that the uncertainty associated to the ASPIC estimated benchmarks was unquantifiable and under-represented by the model, projections were made only to reflect changes in biomass instead of relative biomass (i.e., B/B_{MSY}). Projections for the base case were performed for catch levels from 10,000 t to 16,000 t by increments of 1,000 t for years 2010-2020. For year 2009, all projection scenarios assumed a catch equal to the average catch for 2006-2008 (13,658 t). **Figure 42** shows the results of the projections. In general, catches of 14,000 t or less will result in increases in the biomass of the stock, catches in the order of 15,000 t will maintain the biomass of the stock at approximately stable levels during the period projected. Catches in the order of 16,000 t or more will result in biomass decrease. The Group noted that the current TAC is 17,000 t.

7.2.2 Catch only model

Because of the uncertainty associated to the ASPIC estimates the Group decided to explore the projections given the information contained only in the catches using the results for the two runs of the catch-only model combined. The projections were made by fixing the catches 10,000 t to 17,000 t by increments of 1,000 t for ten years. For year 2009, all projection scenarios assumed a catch equal to the average catch for 2006-2008 (13,658 t). In general, catches of 15,000 t will result in the biomasses being higher than B_{MSY} 80% of the time. Catches in the order of 17,000 will result in a probability of 0.67 of being above B_{MSY} in ten years **(Table 19)**. **Figure 43** summarizes the probability of $B>B_{MSY}$ and $F<F_{MSY}$ for the constant catch scenarios indicated over time.

8. Recommendations

8.1 Research and statistics

Data Preparatory and Methods Meeting. Due to time constraints, recent sessions of the swordfish Working Group have provided assessments that have updated past results using methods and approaches available at the time. The Group recognizes that newer stock assessment approaches are now available which more fully incorporate biological data and provide more complete representations of uncertainties in stock status. To allow the Group time to explore the new approaches and to assemble the data in advance of the stock assessment session, it is recommended that a working session of five days duration be convened prior to the next assessment. The meeting should be convened in the year before the next assessment (possibly 2011).

Effect of CPUE Aggregation Levels on Biomass Index. As part of the meeting described above, National scientists should provide data for standardization of CPUE series at the lowest level of aggregation as possible.

Recruitment Indices. The Group's ability to forecast stock status within the VPA is contingent on the availability of reliable indices of abundance at the youngest ages. For example, age-1 indices of abundance are only available up to 2001. Countries that have traditionally provided such indices should update their time series, as a matter of high priority. This research should be supported at the Contracting Party level.

Stock structure. The Draft Report of the Swordfish Stock Structure workshop (Heraklion, March 2006) recommended intensified collaborative and multi-disciplinary research. In particular, the classification of swordfish caught near the boundaries to their stock of origin is subject to uncertainty and cannot be made accurately without intensified collaborative and multi-disciplinary research taking into account fine-scale (e.g., 1º squares) and quarterly sampling strata.

Catch. All countries catching swordfish (directed or by-catch) should report catch, catch-at-size (by sex) and effort statistics by a small an area as possible, and by month. These data must be reported by the ICCAT deadlines, even when no analytical stock assessment is scheduled. Historical data should also be provided.

Discards. Information on the number of undersized fish caught, and the numbers discarded dead and released alive should be reported so that the effect of discarding and releasing can be fully included in the stock assessment. Observer sampling should be sufficient to quantify discarding in all months and areas in both the swordfish directed fisheries and the tuna fisheries that take swordfish as by-catch. Studies should be conducted to improve estimation of discards and to identify methods that would reduce discard mortality of swordfish. Studies should also be conducted to estimate the subsequent mortality of swordfish discarded alive; these are particularly important given the level of discarding due to the minimum size regulatory recommendation.

Unreported Catches. The Group noted that the summarized form in which the s.SDS information is currently reported to ICCAT (bi-annual summaries of direct imports and re-exports) does not give the sufficient detail for improving estimates of potential NEI and volume of Atlantic swordfish in international trade largely due to uncertainty about the year and area of capture for swordfish products in trade, the general lack of product to live weight conversions, , and the potential for double counting catches submitted on the re-export certificates. These estimates could be greatly improved if the corresponding ***individual*** statistical documents and re-export certificates were made available. These detailed data exist at National levels (with identification numbers) and an effort should be made to recover this important information, if the Commission wishes to improve the utility of the s.SDS for validating Task I data. SCRS has reiterated this advice over the past decade (see General Recommendations to the Commission, on the SCRS Reports of 2000, 2001, 2002, 2003 and 2004) , but as of yet none of the detailed swordfish s.SDS information has been received by the Secretariat**.**

Target species. All fleets should record detailed information on log records to quantify which species or species-group is being targeted. Compilation of detailed gear characteristics and fishing strategy information (including time of set) are very strongly recommended in order to improve CPUE standardization. The recommendations made by the 2002 Methods Working Group meeting for looking at diagnostics in this context should be followed. The Group recommended the investigation of alternative forms of analyses in the south that deal with both the By-catch and Target patterns, such as age- and spatially-structured models.

Further, at-sea Observers should collect detailed information on fishing strategy and target species. Finally, the Group recommended an investigation into the cluster analysis approach used to determine targeting in the Brazilian CPUE series through simulation to permit evaluating the potential sources of bias in the approach. It was also recommended to revise the standardization procedures for the Santos Brazil, catch and effort series to deal with the transition from multifilament to monofilament longline gear. Further research into methods to control for this feature was recommended.

Tagging. The Group recommended development of an experimental design for specific tagging applications such as estimating fishing mortality rates and/or migration patterns. An experimental design could be especially useful in evaluating the potential of applying traditional and pop-up tags to evaluate the exchange rates in areas of the Atlantic where there is thought to be high rates of mixing. In addition, the continuation of industry tagging on board commercial vessels should also be encouraged as the sample sizes are considerable, and there are clear benefits in terms of reporting rates and quality of recaptured tags

CPUE. The Group is concerned that many of the age-specific indices of abundance show strong year-effects. It has been recommended that future CPUE analyses should focus on developing additional methods to explicitly incorporate environmental variability into the model. Consideration should be given to aggregating the CPUE trends by sex ratio-at-size area (rather than the current method of aggregating by nation). Investigations of the appropriateness of obtaining age-specific indices of abundance from independent analyses should be conducted, CVs should be presented with the analyses, and model outputs should be made comparable (e.g., from random and fixed effects models). Some attempt should be made to use stock assessment methods that can reconcile the contradictory trends in the target and by-catch CPUE series for the south (e.g., age/spatially-structured models). For the biomass indices, the influence of the level of aggregation of data should be examined

More specifically, the Group recommended that given the similarity between part of the Brazilian and Uruguayan swordfish fishing fleets and taking into account that the CPUE standardization studies of both fleets submitted at the meeting differ in their methods and results it would be convenient that scientists from Brazil and Uruguay held inter-sessional meetings to deal with the standardization of CPUE series and processing of data from their respective fleets

Working Group Participation. The Group expressed concern that one of the longest CPUE time series was submitted by correspondence, without the author or another scientist familiar with the analyses being present at the meeting. This made it difficult to evaluate the suitability of the time series. The Group recommends that CPCs that can make valuable contributions to the assessments make the necessary arrangements to ensure the presence of their National scientists at those meetings.

8.2 Management

North Atlantic

Consistent with the goal of the Commission's swordfish rebuilding plan [Rec.96-02], in order to maintain the northern Atlantic swordfish stock at a level that could produce MSY, with greater than 50% probability, the Committee recommends reducing catch limits allowed by Rec. [06-02] (15,345t) to no more than 13,700t, which reflects the current best estimate of maximum yield that could be harvested from the population under existing environmental and fishery conditions. Should the Commission wish to have greater assurance that future biomass would be at or above B_{MSY} while maintaining F at or below F_{MSY}, the Commission should select a lower annual TAC, depending on the degree of precaution the Commission chooses to apply in management. For example, a TAC of 13,000 t would provide approximately a 75% probability of maintaining the stock at a level consistent with the Convention Objective over the next decade and would also be consistent with a Precautionary Fishery Management approach (**Figures 44 and 45**)

South Atlantic

Until sufficiently more research has been conducted to reduce the high uncertainty in stock status evaluations for the southern Atlantic swordfish stock, the Committee emphasizes that annual catch should not exceed the provisionally estimated MSY. Considering the unquantified uncertainties and the conflicting indications for the stock, the Committee recommends a more precautionary Fishery Management approach, to limit catches to the recent average level (~15,000 t) which are expected to maintain the catch rates at about their current level.

9. Other matters

Following the *ICCAT Supplemental Recommendation to amend the rebuilding program for North Atlantic swordfish* [Rec. 06-02] the next Atlantic swordfish assessment will be conducted in 2012.

10. Adoption of the report and closure

The Group thanked Drs Travassos and Neilson for the excellent work done during the meeting. The Group also recognized the helpful work of the Secretariat. A complete review of the report was made during the meeting and substantive issues dealt with in plenary. The detailed report was adopted during the SCRS Species Group meeting.

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Appendix 1

AGENDA

1. Opening, adoption of the Agenda and meeting arrangements
2. Biological data, including tagging information
3. Catch data, including catch at size and fisheries trends
4. Relative abundance indices
    4.1 Relative abundance indices – North
    4.2 Relative abundance indices – South
5. Methods and other data relevant to the assessment
    5.1 Methods – North
    5.2 Methods – South
6. Stock status results
    6.1 Stock status – North
    6.2 Stock status – South
7. Projections
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8. Recommendations
    8.1 Research and Statistics
    8.2 Management
10. Other matters
11. Adoption of the report and closure

Appendix 2

ATLANTIC SWORDFISH WORK PLAN

North and South Atlantic

Assessment. In conformity with Recommendation [06-02], it is recommended that the next North and South Atlantic swordfish stock assessment be conducted in September 2009. The priority for the north stock assessment is to monitor the status of the stock relative to B_{MSY}.

The Atlantic assessment will be completed in five days. Given this timeframe, it is envisaged that the 2009 assessment will update the approaches used in the 2006 assessment. To accomplish this, the lumped biomass production model analyses will be updated using data to the end of 2007, or 2008 where available, and include 5-year projections Action: National Scientists

Catch and effort data and reporting deadlines. The deadline for submission of Task I and II data is July 31, 2009.

Combined biomass index. It is recommended that scientists from Japan, Canada, Portugal and the United States coordinate their work before the meeting (possibly using videoconference), with the goal of updating the index prior to the start of the assessment. Action: National Scientists.

Catch-at-size data. Catch at size is desirable to evaluate the effects of regulations. Catch at size should be available at the beginning of the meeting. Action: Secretariat.

Appendix 3

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SCRS/2009/055	A summary on the activity of the spanish surface longline fleet catching swordfish (Xiphias gladius) during the years 2006-2007. García-Cortés , B., Mejuto, J., de la Serna, J.M. and Ramos-Cartelle, A.
SCRS/2009/098	Differences in efficiency between the traditional multifilament and monofilament surface longline styles used by the Spanish fleet targeting swordfish (Xiphias gladius). Mejuto, J., Ortiz de Urbina, J.M., Ramos-Cartelle, A. and García-Cortés, B.
SCRS/2009/109	Update of standardized catch rates by sex and age for swordfish (Xiphias gladius) from the U.S. longline fleet 1981-2008. Ortiz, M.
SCRS/2009/110	An updated biomass index of abundance for North Atlantic swordfish 1963-2008. Ortiz, M., Mejuto, J., Paul, S., Yokawa, K. and Neves, M.
SCRS/2009/111	Inferring population admixture in Atlantic swordfish (Xiphias gladius) using bayesian clustering of multiple nuclear dna markers. Smith, B. and Alvarado Bremer, J.
SCRS/2009/112	Preliminary analysis of the size data of swordfish (Xiphias gladius) caught by the Moroccan longline fleet in the North Atlantic ocean during the period 2004-2008. Abid, N., Idrissi, M. and Omrani, F.
SCRS/2009/113	Preliminary analysis of the catch rate of swordfish (Xiphias gladius) caught by the Moroccan longline fleet in the North Atlantic ocean during the period 2004-2008. Abid, N., Idrissi, M. and Omrani, F.
SCRS/2009/114	Updated sex- and age-specific CPUE from the Canadian swordfish longline fishery, 1988-2008. Paul, S. and Neilson, J.
SCRS/2009/115	Update on the Canadian Program for Pop-up Satellite Archival Tagging of Swordfish. Neilson, J. and Smith, S.
SCRS/2009/116	CPUE standardization of the south Atlantic swordfish caught by Japanese longliners in 1975 – 2007. Yokawa, K.
SCRS/2009/117	Standardizing catch and effort data for South Atlantic swordfish of the Taiwanese longline fishery. Sun,C., Chang,Y., Yeh, S. and Wu,W.
SCRS/2009/118	Standardized catch-rates of swordfish (Xiphias gladius) for the Taiwanese tuna longline fleet in the North Atlantic Ocean. Sun,C., Su,N. and Yeh, S.
SCRS/2009/119	Standardized CPUE series of swordfish, Xiphias gladius, caught by Brazilian tuna fisheries in the southwestern Atlantic Ocean. Hazin, H.G., Minte-Vera, C.V., Hazin, F., Travassos, P., Carvalho, F. and Mourato, B.
SCRS/2009/120	Update of the Atlantic Swordfish (Northern and Soutern stocks) for the period 1978 to 2008. Palma, C. and Kebe, P.
SCRS/2009/121	Standardized catch rates for South Atlantic stock of swordfish (Xiphias gladius) from the Spanish longline fleet for the period 1989-2008. Mejuto, J., García-Cortés, B. and Ramos-Cartelle, A.M.
SCRS/2009/127	Estandarización de la CPUE del pez espada (Xiphias gladius) capturado por la flota de palangre pelágico de Uruguay en el Atlantico sur occidental. Pons, M. and Domingo, A.

Table 1. Estimated Catches (t) of Atlantic Swordfish (*Xiphias gladius*) 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
TOTAL			3746	2781	3193	3503	3134	3602	3359	4802	4996	6403	4287	5397	6111	11608	13288	11230	11301	10684	11620	13684	14921	7432	7346	9152	9115	11901	9508	9264	14593	15231
	ATN		3646	2581	2993	3303	3034	3502	3358	4578	4904	6232	3828	4381	5342	10190	11258	8652	9349	9107	9172	9203	9495	5266	4766	6074	6362	8839	6696	6409	11827	11937
	ATS		100	200	200	200	100	100	1	224	92	171	459	1016	769	1418	2030	2578	1952	1577	2448	4481	5426	2166	2580	3078	2753	3062	2812	2855	2766	3294
Landings	ATN	Longline	1445	966	966	1203	305	619	374	1010	875	1428	1042	2060	3202	9193	10833	7759	8503	8679	8985	9003	9197	5208	4469	5519	5139	7078	5234	5458	11123	11177
		Other surf.	2201	1615	2027	2100	2729	2883	2984	3568	4029	4804	2786	2321	2140	997	425	893	846	428	187	200	298	58	297	555	1223	1761	1462	951	704	760
	ATS	Longline	0	0	0	0	0	0	1	124	92	71	359	816	769	1418	2030	2578	1952	1577	2348	4281	5426	2164	2580	3078	2753	3062	2812	2840	2749	3265
		Other surf.	100	200	200	200	100	100	0	100	0	100	100	200	0	0	0	0	0	0	100	200	0	2	0	0	0	0	0	15	17	29
Discards	ATN	Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ATS	Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landings	ATN	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
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0
		Canada	1290	1523	1890	1990	2573	2722	2761	3102	3219	4014	2328	1913	2092	7482	7099	4674	4433	4794	4393	4257	4800	0	0	0	2	21	15	113	2314	2970
		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
		Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1	48	99	150	283	304	294	168	316	265	272	471	246	164	338
		Cuba	0	0	0	0	0	0	0	0	0	300	300	300	400	125	134	171	175	336	224	97	134	160	75	248	572	280	283	398	281	128
		Dominica	0	0	0	0	0	0	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.Denmark	0	0	0	0	0	0	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	1445	966	966	1203	305	619	374	1000	832	1100	722	1700	2300	1000	1800	1433	2999	2690	3551	3502	3160	3384	3210	3833	2893	3747	2816	3309	3622	2582
		EC.France	0	0	0	0	0	0	0	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		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	3	1	0	0	0
		EC.Netherlands	0	0	0	0	0	0	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.Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	6	0
		EC.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	6	15	11	12	11	8	11	21	37	92	58	32	38	17	29
		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
		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
		Faroe Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		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
		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
		Japan	0	0	0	0	0	0	0	10	43	28	20	54	106	311	700	1025	658	280	262	130	298	914	784	518	1178	2462	1149	793	946	542
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	27	46	24	22	40	159	155	374	152	172	335	541	634	303
		Liberia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Libya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Maroc	0	0	0	0	0	0	0	0	0	0	0	6	12	6	118	100	61	34	43	20	17	33	43	18	15	15	12	7	11	208
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	3	0	0	0	2	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
		NEI (MED)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Norway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	300	300	200	600	400	200	0	0	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	7	171	24	25	91	22	76	26
		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
		Rumania	0	0	0	0	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
		Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
		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
		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
		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
		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
		U.S.A.	911	92	137	110	156	161	223	366	710	690	458	408	424	1250	1384	1227	614	474	274	170	287	35	246	406	1125	1700	1429	912	3684	4619
		U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	8	22	21	11	24	24	28	26	17	32	19	15	23	10
		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
		UK.British Virgin Islands	0	0	0	0	0	0	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.Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		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
		Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	8	13	12	8	11	21	18	100	23	52	27	23	24	52	43	15	46	182
	ATS	Angola	100	200	200	200	100	100	0	100	0	100	100	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Argentina	0	0	0	0	0	0	0	0	0	0	281	111	196	400	508	400	200	79	259	500	400	63	100	48	10	10	111	132	4	0
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Benin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Brasil	0	0	0	0	0	0	0	0	0	0	0	440	251	125	125	125	125	62	100	181	162	154	121	161	465	514	365	396	372	521
		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
		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
		Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	1	5	3	1	95	166	488	828	1281	779	807	1104	802	935	745	675	625	1292
		Cuba	0	0	0	0	0	0	0	0	0	0	0	0	0	63	101	164	122	559	410	170	148	74	66	221	509	248	317	302	319	272
		Côte D'Ivoire	0	0	0	0	0	0	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.Bulgaria	0	0	0	0	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	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
		EC.Lithuania	0	0	0	0	0	0	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.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
		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
		Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Ghana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	200	0	0	0	0	0	0	0	0	0	0
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Honduras	0	0	0	0	0	0	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	1	124	92	71	78	265	321	825	1288	1845	1300	474	859	2143	2877	664	1023	480	191	805	105	514	503	782
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	54	79	77	370	382	256	249	602	563	279	812	699	699	303
		Mixed flags (FR+ES)	0	0	0	0	0	0	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 (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
		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
		Nigeria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	12	274	90	40	219	28	83	26
		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
		S. Tomé e Príncipe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
		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
		Togo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0
		U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	39	56	158	155	89	176	176	202	188	123	231	138	106	161	70
		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	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
		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
Discards	ATN	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
		Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		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
		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	0	0	0	0	0
	ATS	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
		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	0	0	0	0	0

Table 1 (cont.)

			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	2007	2008
TOTAL			18881	15155	19662	19929	21953	23969	24380	26266	32685	34305	32976	28826	29207	32868	34459	38803	33511	31567	26251	27123	27180	25139	23758	24064	25237	25609	25718	27941	21859
	ATN		13558	11180	13215	14527	12791	14383	18486	20236	19513	17250	15672	14934	15394	16738	15501	16872	15222	13025	12223	11622	11453	10011	9654	11431	12160	12446	11473	12320	10752
	ATS		5323	3975	6447	5402	9162	9586	5894	6030	13172	17055	17304	13893	13813	16130	18958	21930	18289	18542	14027	15502	15728	15128	14104	12633	13077	13162	14245	15621	11108
Landings	ATN	Longline	12831	10549	13019	14023	12664	14240	18269	20022	18927	15348	14026	14208	14288	15641	14309	15764	13808	12181	10778	10449	9642	8425	8664	9988	11393	11498	10840	11499	10052
		Other surf.	727	631	196	504	127	143	217	214	586	1902	1646	511	723	689	484	582	826	393	961	643	672	685	374	820	447	615	409	540	461
	ATS	Longline	5179	3938	6344	5307	8920	8863	4951	5446	12404	16398	16705	13287	13176	15547	17387	20806	17799	18239	13748	14823	15448	14302	13576	11712	12485	12915	13723	14958	10684
		Other surf.	144	37	103	95	242	723	943	584	768	657	599	606	637	583	1571	1124	489	282	269	672	278	825	527	920	591	248	522	572	418
Discards	ATN	Longline	0	0	0	0	0	0	0	0	0	0	0	215	383	408	708	526	562	439	476	525	1137	896	607	618	313	323	215	273	229
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	12	9	4	1	6	8	5	7	10	8	8	9
	ATS	Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	21	10	6	1	0	0	0	1	0	0	91	6
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Landings	ATN	Barbados	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	16	16	12	13	19	10	10	10	10	39	27	39
		Belize	0	0	0	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	1
		Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	117	0	0	0	0	0	0	0	
		Canada	1885	561	554	1088	499	585	1059	954	898	1247	911	1026	1547	2234	1676	1610	739	1089	1115	1119	968	1079	959	1285	1203	1558	1404	1348	1334
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	73	86	104	132	40	337	304	22	102	90	316	56	108	72	85	92
		Chinese Taipei	134	182	260	272	164	152	157	52	23	17	270	577	441	127	507	489	521	509	286	285	347	299	310	257	30	140	172	103	82
		Cuba	278	227	254	410	206	162	636	910	832	87	47	23	27	16	50	86	7	7	7	7	0	0	10	3	3	2	2	0	
		Dominica	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	0	0	0	0
		EC.Denmark	0	0	0	0	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	3810	4014	4554	7100	6315	7441	9719	11135	9799	6648	6386	6633	6672	6598	6185	6953	5547	5140	4079	3996	4595	3968	3957	4586	5376	5521	5448	5564	4366
		EC.France	5	4	0	0	1	4	4	0	0	0	75	75	75	95	46	84	97	164	110	104	122	0	74	169	102	178	92	46	14
		EC.Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	15	15	132	81	35	17	5	12	1	1	3	2	2
		EC.Netherlands	0	0	0	0	0	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.Poland	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	
		EC.Portugal	15	13	11	9	14	22	468	994	617	300	475	773	542	1961	1599	1617	1703	903	773	777	732	735	766	1032	1320	900	949	778	747
		EC.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	1	5	11	0	2	1	0	0	0	0	0	0	0	
		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	10	3	36	48	0	82	48
		Faroe Islands	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	0	
		Grenada	0	0	0	0	0	0	0	0	56	5	1	2	3	13	0	1	4	15	15	42	84	0	54	88	73	56	30	26	43
		Iceland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
		Japan	1167	1315	1755	537	665	921	807	413	621	1572	1051	992	1064	1126	933	1043	1494	1218	1391	1089	161	0	0	0	575	705	656	907	661
		Korea Rep.	284	136	198	53	32	160	68	60	30	320	51	3	3	19	16	16	19	15	0	0	0	0	0	0	0	51	65	175	157
		Liberia	5	38	34	53	0	24	16	30	19	35	3	0	7	14	26	28	28	28	28	28	0	0	0	0	0	0	0	0	
		Libya	0	0	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	
		Maroc	136	124	91	129	81	137	181	197	196	222	91	110	69	39	36	79	462	267	191	119	114	523	223	329	335	334	341	237	430
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	6	14	0	22	14	28	24	37	27	34	32	44	41	31	35	34
		NEI (ETRO)	0	0	0	0	0	0	0	0	76	112	529	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NEI (MED)	0	12	0	0	0	0	14	3	131	190	185	43	35	111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Norway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	17	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	44	5	0	8	0	22
		Rumania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Russian Federation	0	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	
		Senegal	0	0	0	0	0	0	0	0	0	1	0	6	6	0	0	0	0	0	0	0	0	0	0	0	108	108	0	38	38
		Seychelles	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	
		Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	3	0	3	23	0	4	3	1	0	1	0	22	22	7	7	7	0	51	7
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	3	0	0	2
		Trinidad and Tobago	0	0	0	21	26	6	45	151	42	79	66	71	562	11	180	150	158	110	130	138	41	75	92	78	83	91	19	29	48
		U.S.A.	5625	4530	5410	4820	4749	4705	5210	5247	6171	6411	5519	4310	3852	3783	3366	4026	3559	2987	3058	2908	2863	2217	2384	2513	2380	2160	1873	2463	2331
		U.S.S.R.	21	0	69	0	16	13	18	4	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	1	1	5	5	3	3	2	0	0	1	1	0	3	4
		UK.British Virgin Islands	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	4	7	0	3
		UK.Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		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	35	29	14	0	
		Venezuela	192	24	25	35	23	51	84	86	2	4	9	75	103	73	69	54	85	20	37	30	44	21	34	45	53	55	22	30	11
	ATS	Angola	0	0	0	0	26	228	815	84	84	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	
		Argentina	0	0	20	0	0	361	31	351	198	175	230	88	88	14	24	0	0	0	0	38	0	5	10	8	0	0	0	0	
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	17	8	0	0	0	0	0	0	120	32
		Benin	0	18	24	0	86	90	39	13	19	26	28	28	26	28	25	24	24	10	0	3	0	0	0	0	0	0	0	0	
		Brasil	1582	655	1019	781	468	562	753	947	1162	1168	1696	1312	2609	2013	1571	1975	1892	4100	3847	4721	4579	4082	2910	2920	2998	3785	4430	4153	3407
		Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	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	29	534	344	200	423	353	278	91	300	473	470
		Chinese Taipei	702	528	520	261	199	280	216	338	798	610	900	1453	1686	846	2829	2876	2873	2562	1147	1168	1303	1149	1164	1254	745	744	377	671	727
		Cuba	316	147	432	818	1161	1301	95	173	159	830	448	209	246	192	452	778	60	60	0	0	0	0	0	0	0	0	0	0	
		Côte D'Ivoire	0	0	0	0	10	10	10	10	12	7	8	18	13	14	20	19	26	18	25	26	20	19	19	43	29	31	39	17	20
		EC.Bulgaria	0	0	0	0	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	0	0	0	0	0	0	66	0	4393	7725	6166	5760	5651	6974	7937	11290	9622	8461	5832	5758	6388	5789	5741	4527	5483	5402	5300	5283	4073
		EC.Lithuania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	794	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EC.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	380	389	441	384	381	392	393	380	354	345	493	440	428	271
		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	49	0	
		Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	
		Ghana	110	5	55	5	15	25	13	123	235	156	146	73	69	121	51	103	140	44	106	121	117	531	372	734	343	55	32	65	
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	
		Honduras	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	6	4	5	2	8	0	0	0	0	0	0	0	0	
		Japan	2029	2170	3287	1908	4395	4613	2913	2620	4453	4019	6708	4459	2870	5256	4699	3619	2197	1494	1186	775	790	685	833	924	686	480	1090	2223	658
		Korea Rep.	399	311	486	409	625	917	369	666	1012	776	50	147	147	198	164	164	7	18	7	5	10	0	2	24	70	36	94	176	223
		Mixed flags (FR+ES)	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	0	0	
		NEI (ETRO)	0	0	0	0	0	0	0	0	0	856	439	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Namibia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	730	469	751	504	191	549	832	1118	1038	518
		Nigeria	0	0	0	83	69	0	0	0	0	0	0	0	3	0	0	0	9	0	0	0	0	0	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	29	105	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1	8	1	1	4	58	41
		S. Tomé e Príncipe	0	0	0	0	0	0	0	0	216	207	181	179	177	202	190	178	166	148	135	129	120	120	120	120	126	147	138	138	138
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	
		South Africa	31	9	3	7	23	8	5	5	4	0	0	5	9	4	1	4	1	1	240	143	328	547	649	293	295	199	186	207	142
		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	10	7
		Togo	0	0	0	0	0	6	32	1	0	2	3	5	5	8	14	14	64	0	0	0	0	0	0	0	9	10	2	0	
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	171	396	160	179	142	43	200	21	15	0	0	0	0
		U.S.S.R.	154	40	26	46	158	60	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	20	4	0	0	0	0	0	
		Uruguay	0	92	575	1084	1927	1125	537	699	427	414	302	156	210	260	165	499	644	760	889	650	713	789	768	850	1105	843	620	464	370
		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	11	26	6	6
Discards	ATN	Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	52	35	50	26	33	79	45	106	38	61	39
		Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	598	567	319	263	0	0	0	0	
		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
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	215	383	408	708	526	588	446	433	494	490	308	263	282	275	227	185	220	199
	ATS	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	91	6
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	21	10	6	1	0	0	0	1	0	0	0	

Table 2. Comparison of the Task I reports with the data recorded in the swordfish statistical documentation data held at the ICCAT Secretariat. The statistical documentation data were converted to estimated whole weight using conversions indicated in **Table 3**.

	t1					Statistical Documentation Data											
	T1					Imported from Flag Indicated					Reexported						
Flag of Landed SWO	2003	2004	2005	2006	2007	2003	2004	2005	2006	2007	2004	2005	2006			Discrepancy (t)	
Philippines	52.1	5.5	5.5	12.0		33.8	41.1	1.3	11.3	50.1				-83.3%	100.0%	62.5	Imports from Exceed T1
Côte D'Ivoire	43.0	28.6	31.0	39.5	17.4			74.0	169.2	10.8				-59.3%	100.0%	94.5	
Venezuela	44.7	53.4	54.6	21.6	30.3			230.7	56.8	5.7				-43.3%	100.0%	88.6	
Korea Rep.	24.0	70.0	87.0	159.0		82.2	30.9		99.9	195.7				-20.2%	100.0%	68.6	
Bolivia								16.7						0.0%	0.0%	16.7	
Costa Rica	No Task 1									0.5				0.0%	0.0%	0.5	
Ecuador										19.9				0.0%	0.0%	19.9	No Task I, but Imports from
Honduras									59.2					0.0%	0.0%	59.2	
Indonesia										0.9		359.2		0.0%	0.0%	359.2	
Israel						0.2								0.0%	0.0%	0.2	
New Zealand						0.9								0.0%	0.0%	0.9	
Panama								0.7	5.7					0.0%	0.0%	6.4	
Seychelles										32.6				0.0%	0.0%	32.6	
(unknown)								19.1	38.4	0.4	0.1			0.0%	0.0%	57.9	
China P.R.	669.1	333.6	199.2	372.0	558.0	22.8	30.5	268.7	684.0	920.8		5.5		9.6%	99.7%		
Angola			3.0				2.1							28.5%	100.0%		
Namibia	191.5	549.2	831.6	1118.0	1037.6			90.3	1372.8	1150.0				29.9%	100.0%		
St. Vincent and Grenadines	7.1	7.1	7.1		61.6					32.3				61.1%	100.0%		
Maroc	3629.0	3588.0	2857.0	2399.0	1959.0			1118.2	2290.2	1709.2				64.5%	100.0%		
Canada	1284.9	1203.3	1557.9	1403.6	1348.2			1221.2	603.4	580.9				64.6%	100.0%		
Chinese Taipei	1511.0	775.0	884.0	549.0	774.0	231.2	517.7	233.0	478.2	97.7		6.2		65.3%	99.9%		
Uruguay	850.0	1105.0	843.0	619.9	463.9	4.8		405.3	412.7	161.7				74.6%	100.0%		
Senegal		107.7	107.7		38.0			39.2	9.6	11.5				76.2%	100.0%		
Trinidad and Tobago	77.7	82.7	90.8	19.3	28.5			57.2	12.9	0.3				76.5%	100.0%		
Brasil	2920.0	2998.1	3785.5	4430.2	4152.5			1010.5	1855.7	694.8				80.5%	100.0%		
Libya	10.1	2.4		15.9					4.8					82.9%	100.0%		
Grenada	88.0	73.1	55.5	30.3	26.5			14.4						94.7%	100.0%		
South Africa	293.0	294.5	199.3	185.6	206.8	20.2	0.6	0.3	2.5	14.2				96.8%	100.0%		
Tunisie	287.6	791.0	791.0	949.0	1024.0			25.9	27.5	23.6				98.0%	100.0%		
Algerie	665.0	564.0	635.0	702.0	601.2			10.5	24.4					98.9%	100.0%		
EC.España	10338.3	11810.3	11832.9	12210.3	12544.4	114.9	18.3		0.5	149.5				99.5%	100.0%		
Barbados	10.0	10.0	10.0	39.4	26.6				0.2					99.8%	100.0%		
Turkey	350.0	386.0	425.0	410.0	423.0			3.0						99.9%	100.0%		
Mexico	32.0	44.0	41.4	31.4	34.6					0.1				99.9%	100.0%		
Ghana	734.3	342.6	54.7	31.9						0.6				99.9%	100.0%		
Argentina	7.7	0.1												100.0%	100.0%		No Exports Indicated
Belize					128.5	No Trade Data								100.0%	100.0%		
Cuba	2.5	3.3	2.3	1.5										100.0%	100.0%		
Dominica		0.1	0.2	0.4	0.3									100.0%	100.0%		
EC.Cyprus	47.4	49.1	52.8	42.7	67.4									100.0%	100.0%		
EC.France	169.0	120.7	177.8	92.3	60.1									100.0%	100.0%		
EC.Greece	1230.0	1120.3	1310.7	1358.3	1887.5									100.0%	100.0%		
EC.Ireland	12.0	1.5	1.3	2.6	1.8									100.0%	100.0%		
EC.Italy	8395.1	6942.4	7459.9	7626.4	6518.3									100.0%	100.0%		
EC.Malta	162.5	195.3	362.1	239.2	213.5									100.0%	100.0%		
EC.Portugal	1386.5	1785.1	1406.9	1404.1	1206.3									100.0%	100.0%		
EC.United Kingdom				49.0	0.2									100.0%	100.0%		
FR.St Pierre et Miquelon	2.8	35.7	48.4											100.0%	100.0%		
Gabon	8.6													100.0%	100.0%		
Japan	924.1	1263.0	1188.7	1812.5	3263.8									100.0%	100.0%		
Russian Federation			1.0											100.0%	100.0%		
S. Tomé e Príncipe	119.5	125.9	146.6	138.3										100.0%	100.0%		
Sta. Lucia	0.2	1.6	2.6	0.1	0.4									100.0%	100.0%		
U.S.A.	2533.5	2394.7	2160.5	1873.1	2453.9									100.0%	100.0%		
UK.Bermuda	0.5	0.5	0.5		3.1									100.0%	100.0%		
UK.British Virgin Islands		4.2	4.2	7.0										100.0%	100.0%		
UK.Turks and Caicos					0.2									100.0%	100.0%		
Vanuatu		34.6	40.5	39.9										100.0%	100.0%		
Totals classified as Convention Area	39114.2	39303.2	39756.7	40436.1	41161.3	510.8	641.2	4840.2	8219.9	5863.9	0.1	370.9	0.0	90.0%	99.8%	~10% of Atlantic&Med Landings Enter International Trade	

Unknown Area of fishing																
Australia						109.9	55.5	10.9						0.0%	0.0%	176.3
Brasil								17.8	5.1				3.7	0.0%	0.0%	22.9
Canada								3.2						0.0%	0.0%	3.2
Chile								27.2		411.6				0.0%	0.0%	438.8
China P.R.										667.0	29.3	14.2		0.0%	0.0%	667.0
Chinese Taipei								56.8		359.0	7171.4	6850.3		0.0%	0.0%	14021.7
Ecuador								0.9		0.5				0.0%	0.0%	1.3
Egypt								0.5		0.5				0.0%	0.0%	1.0
Fiji Islands										0.9			0.7	0.0%	0.0%	0.9
Ghana								0.1		8.0				0.0%	0.0%	8.1
Indonesia								27.1	0.9		758.0	938.2	3.7	0.0%	0.0%	1699.9
Japan												197.3		0.0%	0.0%	197.3
Korea Rep.										24.5				0.0%	0.0%	24.5
Malaysia										314.4			0.3	0.0%	0.0%	314.4
Maldives								0.1				7.5		0.0%	0.0%	7.5
Namibia								34.9		68.8				0.0%	0.0%	103.7
New Zealand								6.5						0.0%	0.0%	6.5
Panama													9.0	0.0%	0.0%	9.0
Perú										1.7				0.0%	0.0%	1.7
Philippines										1.6				0.0%	0.0%	1.6
Senegal								99.2		1.0				0.0%	0.0%	100.2
Seychelles											49.9	321.4		0.0%	0.0%	371.3
Singapore									173.6	1273.0				0.0%	0.0%	1446.6
South Africa									0.4	0.8				0.0%	0.0%	1.2
Sri Lanka								10.1		12.1			0.9	0.0%	0.0%	22.2
Thailand										54.7				0.0%	0.0%	54.7
Tunisie								4.9		22.6				0.0%	0.0%	27.5
Uruguay													0.7	0.0%	0.0%	0.7
Venezuela									17.7					0.0%	0.0%	17.7
Viet Nam								40.2		546.3				0.0%	0.0%	586.6
(unknown)								13.8	12.4	12.1			0.2	0.0%	0.0%	38.3
Overall Total	39114.2	39303.2	39756.7	40436.1	41161.3	620.7	696.7	5194.5	8429.9	9645.0	8008.7	8699.8	19.1	87.7%	91.6%	21242.2

Table 3. Conversion factors applied to scale the SWO product weight back to round weight.

	Prod Shape	Frequency	Factor
Dressed weight	DR	184	1.3
Fillet	FL	39	1.67
Gilled & gutted	GG	152	1.15
Headless	HD	2	1.15
Head & gutted	HG	4	1.3
Kebobs	KB	1	10
Loins	LO	7	1.67
Other	OT	82	2
Rounded weight	RD	46	1
Steak	ST	12	10
Unknown	UN	70	1.3

Table 4. Northern (a) and southern (b) Atlantic swordfish catch at size in number of fish.

a)

ATN																															
Li5cm																															
	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	2007	2008
5																		9													
10																	12				11			13							
20									0												15										
25														18	107	8															
30														13	107		22														
35																		1			4	25	25								
40										6		3		27		43	40		9				25	4		2					
45								2	12	1		0	0	32		38	75		22	50	21										
50					18		5	8	140	7			2	56		66	92	22	22				25	15					1		
55					0	21		15	8	2	33		0	20	197	92	105	353	299	43	2			7	27	10		24			3
60		3	8	2	33	6	26	65	43	10	30	2	25	251	433	692	393	197	177	195	502	219	490	66	406	21		40	7	7	6
65		30	42	18	70	65	74	54	109	39	147	143	105	425	757	1237	594	998	1745	1587	774	643	728	35	52	3	2	1	45	5	10
70	2	57	233	56	209	89	227	183	238	297	596	253	355	693	1272	978	1250	1978	3597	3733	726	1316	2004	144	611	26	18	50	47	36	14
75	100	200	456	436	458	423	590	504	1105	905	1685	741	973	1135	1208	2351	3184	2434	4218	4184	1282	2797	1731	324	1476	139	53	174	34	54	75
80	431	359	649	651	867	732	988	1041	2903	3389	4550	1638	3009	1653	3799	4503	4060	3274	6855	5837	3336	3507	4219	1795	4090	906	1710	2915	4750	1644	2515
85	186	593	1054	1016	1120	1563	1923	1844	6030	9301	10302	4258	6636	2697	2954	4023	6151	6280	11249	10624	3070	2595	2977	3628	2381	1573	1414	4251	1080	800	1328
90	671	747	1994	1628	1720	2216	2396	2501	5187	9427	10540	5597	7106	3685	4421	5784	6947	4901	10319	9799	5243	5329	7590	4328	4027	2464	3287	6500	4365	3462	1510
95	767	1357	2734	2348	1774	3269	2915	3065	5792	10813	12093	8081	7425	6518	5273	8971	8349	7257	11351	14080	8890	10215	10377	7184	5675	4561	7520	7051	4087	8185	3853
100	839	1807	4797	2921	4025	4656	5298	5983	8903	12346	21211	15266	9460	8901	8583	11861	13046	11480	10630	13254	8733	8238	7134	4695	4533	4595	3712	4055	4720	6342	2532
105	1991	3109	6674	3698	6418	7962	7663	9326	13094	19501	22900	21686	13108	10884	9436	15172	13301	13604	10377	13453	11432	11235	8388	4988	5478	5506	5024	5080	8156	9525	4917
110	1855	2855	6485	3560	5136	8194	7265	9331	12705	17961	21794	19408	13492	10884	12294	16193	15392	14015	12581	14884	12598	10931	12517	8888	8071	8328	9473	10263	11068	10395	11617
115	2156	4212	7643	4948	6196	11470	9207	10287	17193	21036	31624	24353	20008	13381	14139	17929	21356	19271	18833	16482	19499	15984	18012	11925	12151	14441	14218	15160	16585	18425	16163
120	3366	5797	9077	7154	6986	10834	10962	12399	21115	24451	26090	24328	24300	15964	18276	20891	23534	23595	20996	19501	25545	21790	22943	17086	17463	19689	19521	22619	23562	25007	22515
125	3859	6224	9487	8477	6570	11463	10809	12504	20854	23921	26388	22827	24760	16926	19812	21923	22635	26217	22931	19116	25207	21972	20735	18617	15657	20736	19111	20996	23377	24964	23624
130	4199	5759	10621	8058	7276	11414	11815	13152	19824	25015	32305	24722	26591	20277	22522	25179	25295	32270	27278	19911	25541	24758	25438	20737	18659	23437	23305	23161	25075	26510	22548
135	5486	6889	12016	9444	9701	12031	12949	15014	20801	26014	27217	24185	24596	21841	22154	24593	22915	28769	25403	18055	22553	21027	18050	15743	14719	19453	21052	20598	21039	22127	19413
140	7136	6960	11543	10205	10155	12535	13807	16416	21753	26957	28585	23272	24573	22893	22363	26129	21399	25914	24479	18331	19847	22038	20994	17513	16331	20208	19187	19883	20994	19818	16116
145	8666	7839	11976	10091	11448	13080	13675	16130	21337	24880	25752	22182	22351	22061	20144	22471	19914	24893	22453	16068	16042	17594	16927	13748	13547	17011	17124	16523	15398	17405	14396
150	8219	8736	10702	9470	10454	13735	13977	16943	21165	25872	24783	21875	20096	28898	20973	23281	19414	22853	22147	15741	15700	17473	16393	13625	14253	18039	17363	17754	14517	16020	13470
155	10027	8751	12008	9819	11764	15838	14653	17476	22499	25243	23196	21108	19699	21881	19535	20417	18324	21201	19994	14699	14249	14163	13358	10747	10839	14079	14334	14350	12135	12949	11081
160	9691	8892	11950	9925	11792	15056	14010	16977	21080	22355	19388	17917	17245	17757	17525	17684	16528	18936	18523	13353	12056	11936	12547	10172	10492	12445	13446	13804	11665	11814	9291
165	11162	8619	10678	9080	11763	12985	12147	15007	18961	20727	18745	15968	14667	13800	14417	15468	14203	16142	14499	10979	10176	9721	9692	8309	7895	10173	11734	10600	9222	9511	8825
170	10218	10642	12042	10394	13162	15655	13033	14373	18094	20219	14722	15070	13648	12935	14794	13851	12087	12656	12601	10062	9084	8014	7828	7451	7661	8254	9588	10137	8236	8957	6645
175	9028	8905	10063	9047	11233	12118	11100	11826	14922	16283	18953	16038	10968	10409	10577	11578	10735	10638	9879	7653	6963	6550	6842	6058	6328	7571	8635	8080	6205	7017	5608
180	8719	8084	9459	8123	11224	12124	9168	10116	12834	12452	11775	10217	9722	9457	10308	9713	9027	9482	8069	7014	5896	4986	5576	5619	5097	5688	6212	6886	5798	6267	5287
185	9603	8293	9268	6827	8803	10334	8418	9200	10891	11559	8627	8211	7647	7277	8176	9390	7478	7723	5886	6027	5035	4367	4365	4384	3802	4582	5331	5381	4059	5158	4126
190	7829	7295	7327	5785	7622	8128	7100	7266	9171	9153	6545	6692	5936	6414	7088	7534	6109	5991	5074	5530	4550	4034	3688	4700	3156	4041	4417	4687	3899	4813	4017
195	6221	6557	6772	5222	5860	6509	5206	5610	6855	6959	6394	5254	4607	4488	4872	5391	5007	4743	3983	3788	3209	2990	3018	3107	2455	3262	3699	4008	3277	3698	3393
200	6050	5859	6519	4806	5267	5612	4553	4681	5941	5855	4419	4202	3875	3756	4372	4176	4128	3854	3711	3248	2542	2273	2690	2251	2276	2465	2864	3032	2481	3098	2797
205	4951	5264	4898	4143	4248	4514	3514	3937	4129	3384	4726	3958	2993	2695	3464	3307	3191	2958	2534	2214	2013	2080	1706	2060	1583	1891	2378	2441	2391	2717	2608
210	4353	4318	4408	3446	4477	3591	2694	3261	3274	3215	3091	2821	2169	2265	2337	2742	2565	2298	2064	1989	1888	1676	1800	1376	1603	1959	2055	1953	2020	2305	2149
215	2497	3609	3161	2743	3497	2765	2226	2573	2861	2226	2126	2011	1836	1614	1848	1922	1897	1935	1633	1290	1245	1374	1175	1157	1111	1339	1481	1772	1431	1700	1493
220	3398	3355	3173	2357	2599	2157	1616	1966	2473	2179	1776	1714	1471	1348	1797	1723	1573	1700	1187	1481	1086	846	962	1003	1190	1200	1263	1231	1179	1214	1353
225	2182	2619	2028	1742	1760	1577	1316	1239	1726	1771	1253	1387	984	910	1190	1125	1232	1169	1001	1196	819	834	763	774	701	838	986	918	990	852	862
230	1939	2284	1548	1417	1513	1310	1038	986	1304	1080	1020	822	766	700	775	952	858	823	731	739	672	686	669	687	1059	723	654	661	836	831	967
235	1392	1699	1478	1335	1223	1095	850	725	951	764	659	718	590	596	583	824	725	728	569	921	529	419	376	391	463	506	505	750	635	461	542
240	1247	1189	1102	905	844	801	664	595	668	654	481	485	399	490	569	620	524	635	442	707	396	374	368	378	513	433	466	434	460	449	579
245	676	982	844	653	750	504	371	399	585	391	318	452	363	302	354	327	399	445	328	331	357	259	250	300	282	313	362	362	351	235	319
250	625	719	491	478	525	411	412	285	415	483	221	291	211	220	225	238	301	286	288	269	322	313	209	182	220	230	243	327	267	267	298
255	278	476	377	316	505	252	200	208	305	223	171	195	191	147	229	194	201	258	204	318	189	152	198	113	183	185	236	184	200	167	141
260	241	215	154	164	267	193	112	149	181	195	94	166	119	103	142	180	128	223	104	264	104	88	85	127	161	111	163	216	162	132	224
265	131	111	136	177	235	91	67	125	129	125	69	182	104	51	113	108	327	170	83	166	58	69	69	63	129	88	109	75	99	83	112
270	112	84	109	77	139	53	37	63	123	90	67	132	90	104	107	69	73	157	64	215	85	29	66	64	55	61	77	51	67	42	41
275	96	11	86	59	110	18	23	40	73	69	61	59	30	45	36	84	43	122	35	115	32	26	34	36	49	50	35	29	42	35	74
280	110	8	15	3	33	14	23	47	66	35	44	29	53	40	36	27	26	85	35	28	21	18	11	34	27	14	54	34	22	40	53
285	22	20	2	11	82	1	15	34	34	41	16	30	19	22	11	30	27	75	10	7	14	6	9	12	10	7	16	8	24	24	32
290	20	13	0	7	65	8	9	13	18	37	22	58	23	11	32	30	13	55	4	9	8	8	7	19	7	3	15	7	4	8	8
295	2	14		14	24	1	19	2	20	10	7	8	4	10	14	40	8	43	4	10	2	6	1	2	3	1	11	3	4	1	2
300	30	17		0	23	0	4	0	10	7	10	6	3	7	2	3	18	25	2	20	1	0	1	7	6	5	3	1	4	13	1
305	37			3	20		12		3	8	12	13	27	5		41	2	18	5	0			2		1	1	3		2		
310	0		13	23	11	0	1	2	0	0	5	3	20	2	4	32	1	14	2	2			3			1			4		
315			4	2	2						2			4		2	0	12	1			3	0			1				1	
320				26	2							0		1	4		0	4	1					3			1		2		9
325			0	7	12	16						4												1						1	
330			2	5	12	16				3		14					1					1	1						1		
335																	1							11		1	1				
340							0				1																	1			
345																	1	1									1		2		
350											1			1				1		4		2	3	2	3	3				1	
355				21													0														
370			1																												
TOT	162811	172437	228306	183345	212106	259504	241180	275951	380910	449949	477639	401055	369449	330005	336764	384229	367237	396188	381517	329575	310172	297991	296091	236709	228969	263671	274473	289521	277082	295594	249563

b)

ATS																															
Li5cm																															
	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	2007	2008
35																													1		
40																												270	9	7	5
45					2																							439	1	2	
50					0					8						25	3		11			0				2		177	4	2	1
55					20			7	22				26				2		3		13	4	5	7	6	2		197	18		
60			2	9	8	1	3	11	5	8	52	25	16	42	57	51	29	25	7		26	3	198	18	1		4	498	4	8	11
65			7	6	9	4		5			2	75	16	41	75	25	38		8		57	40	240	68	54	20	37	2375	39	154	28
70			10	54	51		4	10		1	57	155	97	207	240	43	156	81	67	58	130	130	1360	122	129	55	140	2697	290	183	115
75	11		20	33	30	24	27	47	8	4	16	241	423	240	331	144	202	828	92	207	202	225	1911	289	175	119	240	6251	261	220	220
80	18	8	20	200	83	61	124	116	17	9	1142	255	1088	422	1452	1539	1509	3459	577	567	415	628	2127	299	1983	229	961	7625	2168	1938	879
85	20	12	35	154	54	63	217	205	65	38	913	2056	971	1110	900	2553	2818	2199	1421	532	485	673	3577	1188	1426	531	1426	7740	1392	1277	1722
90	46	78	82	331	142	197	778	467	376	116	1004	1750	1391	527	744	1108	2539	1994	1337	534	376	1079	1811	873	626	291	2078	10693	2046	2216	2485
95	37	58	22	243	101	62	527	339	289	224	1770	1357	822	416	1323	2692	2962	4391	7756	7474	4911	6877	8778	6468	6097	4940	2887	25097	9023	7247	6480
100	78	55	184	604	1230	529	1338	1600	1328	554	1418	9126	1754	718	829	1524	2194	3243	1467	2460	1804	2711	3957	3143	1794	2171	2218	23529	4508	3216	4500
105	99	74	171	1578	1110	359	1474	1505	995	632	4852	5365	2774	3014	1788	2975	4455	6911	752	3855	1653	2481	4298	2569	3031	3143	5429	14209	6065	4895	5983
110	161	297	280	923	1571	700	1934	2059	1491	998	2416	8137	3234	2428	1759	2680	3539	4965	2459	3494	3682	4606	7538	5058	3745	3048	4896	14240	6558	7972	5953
115	188	142	220	437	1500	914	2043	2727	1529	1417	7445	13428	5373	5166	4134	4672	8601	7200	5122	9933	6071	7166	10699	7106	8564	3397	6645	12648	7285	17476	5279
120	376	277	600	1414	2909	2385	4806	4376	1993	2190	2362	6968	5325	3893	5387	5298	10454	15228	11405	9863	9660	12305	13497	12533	11435	6420	8551	14614	13210	21252	10859
125	21	284	811	1133	2322	1500	1812	5617	3774	3015	4556	8533	6115	6968	5214	5704	11259	13688	15343	10766	13013	15193	17425	13325	11756	8416	9719	15415	11092	14742	9479
130	326	542	673	1288	3113	2968	4889	5428	3095	2741	11248	15963	9016	11900	9244	7470	17018	22362	25381	19646	16492	19194	23308	20401	22062	16918	19365	14499	16618	19887	15842
135	326	867	1015	1491	4390	3291	6297	6410	3810	3079	6785	19615	11623	9173	9244	9184	17106	19539	20677	14168	16805	18712	23485	16057	16784	13064	13098	14569	14211	17225	12470
140	280	1181	1214	1545	3593	3486	6730	6075	4362	3041	10110	19641	16379	11652	12615	11349	21505	26713	28821	23172	23174	26718	29594	22267	25174	17973	22345	16246	21712	20184	17464
145	360	1508	1936	1705	6369	4967	8450	8164	4700	4277	15015	20954	22350	19662	17882	17940	24836	29260	20693	22734	21776	23511	25754	19581	20701	17725	17837	16000	16027	19889	14783
150	293	2867	2093	2232	4578	4643	7568	6977	4056	4233	11349	25259	17511	15836	23142	18657	20036	27000	23863	20968	22392	26591	31358	22215	21371	19772	19168	17694	23491	21209	18501
155	345	1895	2047	1574	7395	4911	7962	7708	3707	3217	16639	18200	23014	22264	29889	22365	27589	25229	18730	22624	24060	20487	21705	17089	19250	18565	18345	14396	15698	26916	12690
160	560	1818	2835	1976	5760	4378	7307	10953	5054	4432	17007	20555	20250	21668	29332	18381	23906	29973	23626	23866	20397	19796	22432	18932	17103	20809	19928	15666	18415	21188	14563
165	521	2019	3855	2377	5756	4013	9855	11037	5716	5278	12135	21624	18689	20274	20940	15690	23936	26381	18269	21569	16773	20273	15643	14957	13920	14747	15150	11139	14458	17015	10816
170	493	1622	4257	2067	5033	3470	8377	10997	5318	4779	7379	12734	17484	14282	12959	12300	13167	20880	21273	20535	16448	13634	13914	13969	14206	12627	11495	11276	14508	16441	11087
175	825	1366	4148	2511	5331	5317	7720	10658	5202	5554	16821	31850	24895	15931	11681	14589	17421	18774	14156	18530	11651	13489	11754	10464	11521	11665	10524	9801	11409	11999	8607
180	1016	2392	2938	2812	4989	4750	7116	9185	4762	5296	9368	13511	17912	11666	10563	12284	14929	17675	17942	16630	10181	11804	10463	11806	11553	11067	9734	9690	9821	11910	8927
185	1208	2082	4540	2707	5324	4870	7121	8745	5265	6770	11927	11881	12915	9383	8713	11277	13089	12709	9365	12754	9002	8394	7834	7639	7727	7125	7051	7111	6845	7234	5423
190	1731	1620	5231	2213	5268	5673	7198	7212	4335	5485	8916	8653	9317	7444	7569	10224	10648	13264	12619	10636	6320	8485	7759	9026	7127	5973	6585	6269	7544	7636	5551
195	2618	2377	6132	2459	4393	5056	5624	5197	3834	6072	9016	7774	8238	6761	6553	9509	9120	9207	7484	8578	4608	5926	5096	5580	5482	4653	5494	5397	5510	4850	3893
200	2669	2216	5422	2192	3438	3457	5183	3848	3171	4575	6120	5491	9154	4733	4418	9379	7166	7824	7946	6289	3847	4776	4620	5168	4133	3412	3890	3640	5588	5104	3587
205	1469	1277	4041	1712	2711	2224	4305	2683	3509	2640	4039	4462	3245	2454	3959	6466	4597	4706	3881	4356	2819	3658	3669	4234	3433	3503	2307	2721	2517	3237	1861
210	1599	1749	2869	1307	2304	2151	2996	2647	1634	1524	4578	3528	4073	2823	3005	5680	5194	6149	4868	4570	2372	2665	3225	3264	3097	2419	2445	2118	3405	2642	2357
215	580	1304	1552	1930	1475	868	2318	1958	1746	799	3069	1462	1755	1880	2128	4135	4232	2341	1674	3006	1909	2554	2320	2368	2071	1755	1602	1722	2273	2074	1505
220	1734	2234	1542	1532	1517	1224	2295	1460	1672	1327	2233	1429	2548	1386	1561	5276	3425	4386	2627	2679	1542	2207	2085	2431	2099	1717	1670	1449	2148	1805	1395
225	972	1756	716	1174	920	389	1554	889	1142	953	1154	700	656	877	1458	1307	1759	4233	2300	2198	1201	1350	1383	1738	1157	1071	1386	1155	1064	1130	924
230	1020	672	798	788	796	570	899	822	561	697	1380	574	1044	669	795	1805	1461	2162	1318	2084	1121	1161	1414	1331	1003	936	1031	1146	1768	889	913
235	652	348	438	896	472	294	615	497	657	599	433	255	673	644	575	1042	1100	2198	918	1598	644	645	723	813	513	471	708	498	577	783	677
240	587	115	244	586	229	120	455	295	200	361	311	295	1072	549	208	1277	1066	749	870	1275	493	564	617	728	769	508	819	654	747	715	474
245	379	18	172	467	172	72	285	240	77	100	379	189	820	365	171	562	679	921	807	744	209	511	407	888	739	392	680	314	699	274	396
250	167	126	57	382	245	101	251	206	68	154	193	63	678	197	187	426	560	466	456	589	278	493	362	576	657	274	536	365	528	539	463
255	185	282	56	201	122	106	248	269	70	131	159	84	635	53	142	365	585	772	174	329	357	141	162	250	282	108	276	298	292	468	107
260	105	17	23	210	123	56	58	166	41	175	80	38	245	42	177	210	365	337	354	144	176	134	117	645	425	176	207	142	366	149	85
265	238	7	12	83	23	74	21	48	38	114	26	39	432	81	93	156	398	222	69	39	125	72	61	85	73	46	62	303	114	154	100
270	297	5	15	200	22	13	40	126	30	2	2	32	167	77	110	40	332	28	118	247	75	54	67	171	60	118	215	84	277	250	57
275	5	4	36	37	40		64	235	2	7	8	47	192	48	86	99	116	96	34	35	36	54	62	119	125	19	71	50	322	89	63
280	5	1	5	8	27	19	11	16	5	2	24	16	29	48	8	3	53	408	81	63	8	36	9	265	18	16	125	100	79	69	55
285	9	1	14	3	1		9	183	3		3	8	233	75	5	69	67	62	41	13	3	15	15	60	25	44	90	57	16	18	21
290		4	8	4	17		0	34	3	9	3	2	85	160	2	5	28	2	44	2	2	93	10	122	9	6	57	25	80	91	35
295	2		1	1	4			97	10	2	1	18	51	244	2	5	11	48	61	2	15	17	7	25	3	5	21	14	16	5	7
300		2	1	2	2		8	51	8	3		10	19	315	2	1	32	1	8	22	126	33	21	104	22	26	45	25	18	14	8
305			1	7	3		6	3	4	2		3	49	247	1	1	27	49	2	34	28	30	21	23	23	80	9	7	18	1	2
310	2	1		6	4		5	5					50	213	1	1	14				0	5		29	7	1	3	2	1	4	4
315	2			1	0			7					11	259		1	33				0	7	3	120			2		1		1
320		1			2			4					19	127		1	26	4	4		0	13	1	24			3	6	1		
325	1				3		4	6	1				7	16			5	5	1		0	4		24		2	5		3		2
330	4				17		26		2				23			1	32	55		1	0	6		24			4	2			
335																			2	1	0	4		48		42		1	1		
340																4	33		2			3			101						1
345																2	5	5	1	1		1									
350																2	52	24			0	3		120			6	15	3		
355																2	55	47				1									
360																1	20				0	1		48				0	1		
365																						1									
370																					0	1		48					1		
380																						1									
385																						1									
410																						1									
435																						0									
TOT	24640	37581	63404	49806	97122	80327	138958	150632	89763	87643	215913	324434	286981	241671	253650	260574	338594	401478	339390	336476	279964	312456	348899	288941	285647	242613	259628	345381	283164	326898	229718

Table 5. Catch at age in number of fish for the northern (a) and southern (b) Atlantic swordfish stocks.

a)

Age	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
0	863	1213	3381	3173	3911	4324	5600	5237	14572	21887	23983	7912
1	6410	10373	25393	14980	21102	29274	29365	33254	47452	73238	90059	74899
2	19017	27533	45113	34958	33106	54401	51850	58952	93092	111215	136584	112417
3	35775	34465	48645	41292	45152	55854	55566	67316	87277	102234	103170	89690
4	34803	32404	38612	34352	41791	47411	43441	52182	65856	69235	63125	58342
5	65952	66457	67167	54601	67060	68248	55363	59023	72638	72145	60676	57848
Total	**162821**	**172445**	**228312**	**183354**	**212122**	**259512**	**241186**	**275962**	**380889**	**449954**	**477596**	**401107**

Age	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
0	17946	8280	13549	16386	18268	16353	33716	28966	12141	10603	13329	6494
1	48576	42361	41062	62853	65103	52496	57508	68722	50740	44246	45318	30159
2	113629	83003	91759	101923	105546	119985	99396	84019	109937	104332	101889	78279
3	89514	97126	82181	93126	79423	101739	94518	65904	66572	74206	69836	59809
4	49244	51265	53018	52988	47350	53738	51516	39168	35386	33151	33651	29279
5	50557	48011	55231	56982	51628	51934	44833	42880	35390	31456	31979	32597
Total	**369466**	**330047**	**336799**	**384258**	**367318**	**396245**	**381486**	**329658**	**310166**	**297994**	**296003**	**236617**

Age	2002	2003	2004	2005	2006	2007	2008
0	8037	3872	6427	9652	7612	5970	3520
1	32505	26994	34672	37524	38186	43732	33157
2	72141	88883	82956	91338	100826	103884	91412
3	56012	74067	71881	71590	64930	70217	58013
4	29757	35775	40019	39033	31579	34018	28657
5	30443	34012	38479	40283	33873	37743	34780
Total	**228895**	**263604**	**274435**	**289419**	**277005**	**295564**	**249539**

b)

Age	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**
0	58	54	132	474	308	72	1299	826	246	158	3917	3217
1	401	464	933	3542	4117	1964	6847	8161	4679	3205	16822	29765
2	1286	3411	3686	5631	14257	11130	21110	23723	13148	12203	30636	55239
3	1215	7481	8714	6795	20980	16738	30004	27429	17283	15293	58780	83037
4	2082	5690	13098	7498	17898	14846	27661	36632	16437	16607	41042	75467
5	19602	20480	36836	25865	39562	35575	52039	53861	37969	40177	64716	77701
total	**24645**	**37581**	**63402**	**49808**	**97121**	**80327**	**138959**	**150630**	**89763**	**87644**	**215913**	**324426**
Age	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
0	2573	1990	2694	4474	5174	6553	2046	1752	1955	2132	6975	2403
1	11429	10254	9299	14087	19674	26134	17748	22511	13517	21889	29326	19562
2	35868	34909	29576	29342	57440	75123	62863	56899	54982	65283	72706	63161
3	78286	71367	83517	68769	91663	110009	96975	82900	87637	94630	113060	81740
4	73394	59372	70811	54040	74195	84449	70636	76314	64707	63685	64789	53869
5	85461	63784	57740	89897	90424	99149	89091	96077	57144	64854	62033	68206
total	**287011**	**241677**	**253636**	**260611**	**338570**	**401416**	**339362**	**336453**	**279942**	**312473**	**348890**	**288941**
Age	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**					
0	3649	1730	3862	28349	4017	4372	3630					
1	21540	14372	17679	85420	31248	32478	20682					
2	64047	50885	53537	70574	55064	79847	55378					
3	84323	73748	74969	65327	77487	91323	63639					
4	51575	49923	54285	43733	53442	59020	42483					
5	60506	51966	55300	51978	61948	59862	43864					
total	**285638**	**242623**	**259632**	**345383**	**283204**	**326903**	**229676**					

Table 6. Percent change in catch-at-age (number of fish) for the northern Atlantic swordfish stocks from the matrix produced during the 2006 assessment.

YEAR	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5+
1978	-3.84%	-0.88%	-0.88%	-1.03%	-0.79%
1979	-0.06%	-0.11%	0.04%	0.20%	0.54%
1980	-1.77%	-1.87%	-1.98%	-1.64%	-1.66%
1981	-0.15%	-0.94%	-1.07%	-0.96%	-0.50%
1982	-0.88%	-0.57%	-0.35%	-0.07%	0.22%
1983	-0.72%	-0.73%	-0.84%	-0.75%	-0.58%
1984	-1.83%	-1.80%	-1.42%	-1.17%	-0.52%
1985	-0.26%	-0.09%	0.01%	0.31%	0.06%
1986	-1.73%	-1.85%	-1.63%	-1.28%	-0.50%
1987	-5.15%	-5.57%	-5.81%	-5.75%	-5.28%
1988	6.15%	3.78%	4.60%	4.08%	1.42%
1989	-2.42%	-2.40%	-2.31%	-2.07%	-2.21%
1990	0.32%	-2.70%	-2.62%	-2.72%	-3.17%
1991	-10.22%	-1.20%	-1.38%	-2.48%	-3.40%
1992	-6.98%	-3.95%	-1.84%	-1.20%	-0.55%
1993	11.66%	-0.21%	-2.04%	-5.06%	-5.96%
1994	4.86%	-0.93%	0.00%	-2.05%	-2.14%
1995	-0.68%	2.57%	1.15%	-0.15%	-1.50%
1996	-1.78%	-2.15%	-4.67%	-5.88%	-10.09%
1997	1.98%	0.67%	-0.02%	-0.67%	-3.69%
1998	0.19%	-3.28%	-4.14%	-4.85%	-6.11%
1999	-5.68%	-4.64%	-5.24%	-6.33%	-5.69%
2000	-5.67%	-6.52%	-7.34%	-12.39%	-11.64%
2001	-5.41%	-2.81%	-5.05%	-8.20%	-10.27%
2002	-6.98%	-5.00%	-2.57%	-3.07%	-7.85%
2003	-7.84%	-3.09%	-2.25%	-3.71%	-4.54%
2004	-13.21%	-4.41%	-4.92%	-6.32%	-9.21%
2005	-4.01%	9.90%	1.11%	-3.18%	3.53%

Table 7. Indices of abundance developed for the 2009 Northern Atlantic SWO assessment. The ages the index was applied to, and the model for which the index was used are also indicated. The index variability is listed as either coefficient of variation (CV) or standard error (SE).

A) Canadian Longline indices

*** Unisex indices were calculated as the sum of the unscaled CPUE estimates for male and female SWO.

*** The SE of the unisex index was estimated as sqrt(SEmale + SEfemale)

	Canadian Longline Indices - Doc SCRS/2009/114																							
	Males Age 2		Females Age 2		Unisex Age 2		Males Age 3		Females Age 3		Unisex Age 3		Males Age 4		Females Age 4		Unisex Age 4		Males Age 5+		Females Age 5+		Unisex Age 5+	
Units	Numbers		Numbers		Numbers		Numbers		Numbers		Numbers		Numbers		Numbers		Numbers		Numbers		Numbers		Numbers	
Applied to Ages	2		2		2		3		3		3		4		4		4		5+		5+		5+	
Used?	Not Used		Not Used		**USED - VPA**		Not Used		Not Used		**USED - VPA**		Not Used		Not Used		**USED - VPA**		Not Used		Not Used		**USED - VPA**	
Year	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE
1978																								
1979																								
1980																								
1981																								
1982																								
1983																								
1984																								
1985																								
1986																								
1987																								
1988	0.854	0.109	1.507	0.198	2.361	0.554	0.569	0.067	1.415	0.164	1.984	0.481	0.363	0.042	1.444	0.167	1.807	0.457	1.104	0.127	1.910	0.224	3.014	0.592
1989	0.874	0.101	1.505	0.178	2.379	0.528	0.582	0.061	1.467	0.153	2.049	0.463	0.367	0.038	1.079	0.113	1.446	0.389	0.976	0.101	2.020	0.213	2.996	0.560
1990	1.393	0.159	2.326	0.272	3.719	0.657	0.781	0.082	1.930	0.199	2.711	0.530	0.446	0.046	1.782	0.184	2.228	0.480	1.726	0.176	3.995	0.417	5.721	0.770
1991	0.559	0.041	1.106	0.083	1.665	0.352	0.586	0.039	1.707	0.112	2.293	0.389	0.424	0.028	1.473	0.097	1.897	0.354	1.325	0.086	2.827	0.188	4.152	0.523
1992	1.233	0.095	2.022	0.160	3.255	0.505	0.578	0.041	1.524	0.106	2.102	0.383	0.371	0.026	1.382	0.096	1.753	0.349	1.216	0.084	2.653	0.187	3.869	0.521
1993	0.799	0.044	1.464	0.083	2.263	0.356	0.628	0.032	1.610	0.081	2.238	0.336	0.391	0.020	1.076	0.054	1.467	0.272	0.997	0.049	2.228	0.113	3.225	0.402
1994	0.558	0.024	0.964	0.042	1.522	0.257	0.340	0.013	0.850	0.033	1.190	0.214	0.204	0.008	0.723	0.028	0.927	0.190	0.759	0.029	1.925	0.075	2.684	0.322
1995	0.625	0.027	1.101	0.049	1.726	0.276	0.432	0.017	1.073	0.042	1.505	0.243	0.253	0.010	0.765	0.030	1.018	0.200	0.771	0.030	1.898	0.076	2.669	0.326
1996	0.311	0.015	0.574	0.028	0.885	0.207	0.254	0.011	0.678	0.029	0.932	0.200	0.155	0.007	0.563	0.024	0.718	0.176	0.574	0.024	1.420	0.061	1.994	0.292
1997	0.413	0.021	0.792	0.041	1.205	0.249	0.389	0.018	1.119	0.051	1.508	0.263	0.276	0.013	1.034	0.048	1.310	0.247	0.906	0.041	1.860	0.086	2.766	0.356
1998	0.874	0.049	1.527	0.088	2.401	0.370	0.546	0.028	1.463	0.074	2.009	0.319	0.352	0.018	1.262	0.064	1.614	0.286	1.157	0.058	2.533	0.130	3.690	0.434
1999	1.126	0.064	2.162	0.126	3.288	0.436	0.981	0.051	2.362	0.121	3.343	0.415	0.561	0.029	1.461	0.075	2.022	0.322	1.343	0.068	2.908	0.151	4.251	0.468
2000	0.700	0.041	1.359	0.082	2.059	0.351	0.662	0.036	1.844	0.099	2.506	0.367	0.458	0.025	1.427	0.076	1.885	0.318	1.193	0.063	2.319	0.125	3.512	0.434
2001	0.524	0.028	1.069	0.058	1.593	0.293	0.570	0.028	1.600	0.077	2.170	0.324	0.396	0.019	1.525	0.073	1.921	0.303	1.479	0.070	3.533	0.172	5.012	0.492
2002	0.657	0.037	1.150	0.067	1.807	0.322	0.671	0.035	1.926	0.098	2.597	0.365	0.459	0.024	1.822	0.093	2.281	0.342	1.707	0.086	4.072	0.210	5.779	0.544
2003	0.700	0.042	1.424	0.087	2.124	0.359	0.792	0.043	2.191	0.118	2.983	0.401	0.554	0.030	1.630	0.088	2.184	0.344	1.407	0.075	2.813	0.153	4.220	0.477
2004	0.540	0.030	1.145	0.064	1.685	0.307	0.675	0.034	2.056	0.102	2.731	0.369	0.515	0.026	1.911	0.095	2.426	0.348	1.693	0.083	3.522	0.176	5.215	0.509
2005	0.501	0.027	1.110	0.061	1.611	0.297	0.741	0.036	2.539	0.123	3.280	0.399	0.667	0.032	2.449	0.119	3.116	0.389	2.082	0.100	4.151	0.203	6.233	0.550
2006	0.367	0.019	0.747	0.040	1.114	0.243	0.435	0.021	1.296	0.061	1.731	0.286	0.316	0.015	1.265	0.060	1.581	0.274	1.320	0.062	3.218	0.153	4.538	0.464
2007	0.318	0.019	0.715	0.043	1.033	0.249	0.470	0.025	1.579	0.083	2.049	0.329	0.410	0.022	1.599	0.084	2.009	0.326	1.556	0.081	3.644	0.194	5.200	0.524
2008	0.336	0.023	0.776	0.054	1.112	0.277	0.551	0.034	2.061	0.126	2.612	0.400	0.536	0.033	2.555	0.156	3.091	0.435	2.450	0.148	5.626	0.347	8.076	0.704

Table 7 continued

B) U.S. Pelagic Longline Indices

	United States Longline Indices											
	Unisex Age 0		Unisex Age 1		Unisex Age 2		Unisex Age 3		Unisex Age 4		Unisex Age 5+	
Units	Numbers		Numbers		Numbers		Numbers		Numbers		Numbers	
Applied to Ages	0		1		2		3		4		5+	
Used?	**USED - VPA**		**USED - VPA**		**USED - VPA**		**USED - VPA**		**USED - VPA**		**USED - VPA**	
Year	Index	CV	Index	CV	Index	CV	Index	CV	Index	CV	Index	CV
1978												
1979												
1980												
1981	1.265	0.248	1.084	0.207	1.561	0.205	1.849	0.197	1.891	0.221	2.581	0.190
1982	1.193	0.209	0.828	0.188	0.78	0.182	1.01	0.183	1.212	0.208	1.785	0.170
1983	0.976	0.171	0.811	0.151	0.741	0.150	0.518	0.171	0.591	0.195	1.113	0.153
1984	0.561	0.189	0.825	0.143	0.857	0.146	0.878	0.151	0.876	0.173	1.181	0.149
1985	0.668	0.159	0.609	0.138	0.786	0.137	0.825	0.148	0.902	0.155	1.219	0.138
1986	1.595	0.129	1.224	0.127	1.009	0.128	0.823	0.136	0.898	0.145	0.75	0.136
1987	1.035	0.126	1.098	0.120	1.071	0.121	0.879	0.124	0.823	0.130	0.746	0.125
1988	0.969	0.124	1.238	0.118	1.17	0.119	0.986	0.121	0.896	0.126	0.773	0.121
1989	0.886	0.123	1.199	0.118	0.968	0.119	0.874	0.122	0.791	0.128	0.801	0.121
1990	0.853	0.126	1.084	0.119	1.058	0.119	0.835	0.123	0.728	0.131	0.728	0.122
1991							1.083	0.121	0.987	0.125	0.963	0.120
1992							0.921	0.118	0.888	0.122	0.833	0.118
1993							0.861	0.118	0.795	0.122	0.747	0.118
1994							0.827	0.119	0.772	0.123	0.683	0.118
1995							0.919	0.118	0.862	0.121	0.73	0.118
1996							0.838	0.119	0.795	0.122	0.61	0.119
1997							1.001	0.118	0.979	0.121	0.775	0.118
1998							0.955	0.118	0.888	0.123	0.774	0.119
1999							1.18	0.119	1.184	0.121	1.056	0.118
2000							1.173	0.118	1.129	0.121	1.094	0.118
2001							1.071	0.118	1.14	0.121	0.991	0.118
2002							1.091	0.119	1.193	0.121	1.123	0.118
2003							1.156	0.119	1.068	0.122	0.919	0.119
2004							1.181	0.119	1.231	0.121	0.998	0.119
2005							1.168	0.120	1.216	0.122	1.093	0.120
2006							1.055	0.121	1.085	0.124	0.97	0.121
2007							1.207	0.121	1.286	0.122	1.099	0.120
2008							0.836	0.121	0.893	0.124	0.868	0.120

Table 7 continued

C) EU-Spain Longline Indices

	EC-Spain Longline									
	Unisex Age 1		Unisex Age 2		Unisex Age 3		Unisex Age 4		Unisex Age 5+	
Units	Numbers		Numbers		Numbers		Numbers		Numbers	
Applied to Ages	1		2		3		4		5+	
Used?	**USED - VPA**		**USED - VPA**		**USED - VPA**		**USED - VPA**		**USED - VPA**	
Year	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE
1978										
1979										
1980										
1981										
1982										
1983	0.27	-0.096	0.633	-0.067	1.044	-0.062	1.038	-0.06	1.054	-0.064
1984	0.266	-0.095	0.523	-0.064	1.037	-0.057	1.06	-0.055	1.116	-0.059
1985	0.264	-0.077	0.718	-0.054	1.086	-0.049	1.042	-0.048	1.009	-0.051
1986	0.424	-0.054	0.743	-0.039	0.964	-0.036	0.801	-0.035	0.824	-0.038
1987	0.549	-0.061	0.976	-0.046	1.067	-0.043	0.785	-0.042	0.721	-0.045
1988	0.626	-0.05	0.916	-0.039	0.976	-0.036	0.705	-0.035	0.643	-0.038
1989	0.546	-0.051	1.07	-0.039	0.863	-0.036	0.631	-0.036	0.553	-0.038
1990	0.325	-0.053	1.247	-0.04	1.213	-0.037	0.681	-0.036	0.559	-0.039
1991	0.3	-0.049	0.95	-0.037	1.306	-0.034	0.816	-0.034	0.634	-0.036
1992	0.329	-0.045	0.92	-0.035	1.174	-0.032	0.828	-0.031	0.71	-0.034
1993	0.381	-0.045	0.849	-0.034	0.951	-0.032	0.634	-0.032	0.574	-0.034
1994	0.363	-0.042	0.884	-0.032	0.776	-0.03	0.515	-0.029	0.46	-0.031
1995	0.378	-0.04	1.08	-0.03	1.013	-0.028	0.562	-0.028	0.467	-0.03
1996	0.371	-0.041	0.669	-0.031	0.709	-0.029	0.423	-0.029	0.357	-0.032
1997	0.788	-0.041	0.782	-0.032	0.568	-0.03	0.349	-0.03	0.285	-0.033
1998	0.683	-0.042	1.105	-0.032	0.603	-0.03	0.326	-0.031	0.293	-0.034
1999	0.782	-0.055	1.266	-0.042	0.826	-0.039	0.356	-0.039	0.236	-0.043
2000	0.752	-0.096	1.601	-0.068	1.252	-0.063	0.593	-0.061	0.448	-0.065
2001	0.569	-0.164	1.166	-0.11	1.247	-0.102	0.786	-0.105	0.6	-0.106
2002										
2003										
2004										
2005										
2006										
2007										
2008										

D) Japanese Longline Indices

	Japan LL					
	Unisex Age 3		Unisex Age 4		Unisex Age 5+	
Units	Numbers		Numbers		Numbers	
Applied to Ages	3		4		5+	
Used?	**USED - VPA**		**USED - VPA**		**USED - VPA**	
Year	Index	SE	Index	SE	Index	SE
1978	0.801		0.871		1.282	
1979	1.696		0.965		0.735	
1980	1.116		1.261		1.082	
1981	1.396		1.375		1.403	
1982	1.317		1.187		1.336	
1983	0.772		0.872		0.741	
1984	1.131		0.901		0.959	
1985	1.861		1.349		1.215	
1986	1.149		0.973		1.088	
1987	0.595		0.755		0.735	
1988	0.649		1.17		1.267	
1989	1.963		1.752		1.189	
1990	0.668		1.275		1.077	
1991	0.547		0.781		1.042	
1992	0.231		0.398		0.662	
1993	0.446		0.586		1.071	
1994	1.135		1.068		0.669	
1995	1.557		0.854		0.61	
1996	0.88		0.928		0.603	
1997	0.477		0.636		0.524	
1998	0.815		0.71		0.446	
1999	0.582		0.703		0.423	
2000						
2001						
2002						
2003						
2004	0.407		0.351		0.294	
2005	0.765		0.484		0.311	
2006						
2007						
2008						

Table 7 continued.

E) Chinese Taipei Longline Indices F) Moroccan LL

F)

	Chinese Taipei Longline								Moroccon LL	
	Model A		Model B		Model C		Model D		Moroccon LL	
Units	Numbers		Numbers		Numbers		Numbers		Biomass	
Applied to Ages	Age 1-5+		Age 1-5+		Age 1-5+		Age 1-5+		Age 1-5+	
Used?	Not Used		Not Used		Not Used		Not Used		Not used ***	
Year	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE
1967	0.296	0.379	0.256	0.363	0.345	0.376	0.263	0.361		
1968	0.337	0.105	0.282	0.102	0.376	0.104	0.252	0.105		
1969	0.434	0.085	0.322	0.084	0.431	0.084	0.269	0.085		
1970	0.304	0.070	0.244	0.069	0.310	0.069	0.229	0.067		
1971	0.393	0.079	0.350	0.076	0.381	0.078	0.344	0.075		
1972	0.481	0.111	0.485	0.106	0.458	0.109	0.468	0.105		
1973	0.480	0.106	0.452	0.102	0.441	0.105	0.435	0.101		
1974	0.400	0.080	0.372	0.076	0.427	0.079	0.401	0.076		
1975	0.254	0.086	0.264	0.082	0.258	0.085	0.275	0.081		
1976	0.123	0.080	0.124	0.077	0.119	0.079	0.130	0.077		
1977	0.117	0.075	0.119	0.072	0.121	0.074	0.130	0.071		
1978	0.147	0.087	0.147	0.084	0.147	0.086	0.152	0.083		
1979	0.147	0.113	0.160	0.108	0.161	0.112	0.166	0.107		
1980	0.278	0.095	0.249	0.091	0.298	0.094	0.275	0.090		
1981	0.300	0.086	0.303	0.083	0.302	0.085	0.324	0.082		
1982	0.238	0.080	0.241	0.077	0.240	0.079	0.257	0.077		
1983	0.243	0.076	0.242	0.075	0.232	0.076	0.263	0.073		
1984	0.184	0.069	0.199	0.067	0.181	0.068	0.214	0.066		
1985	0.156	0.067	0.172	0.066	0.158	0.067	0.193	0.064		
1986	0.179	0.066	0.200	0.064	0.181	0.066	0.223	0.063		
1987	0.174	0.093	0.188	0.089	0.177	0.092	0.206	0.088		
1988	0.134	0.192	0.201	0.186	0.127	0.191	0.161	0.183		
1989	0.115	0.223	0.190	0.215	0.119	0.221	0.152	0.212		
1990	0.332	0.139	0.300	0.135	0.295	0.137	0.268	0.131		
1991	0.239	0.091	0.270	0.088	0.226	0.090	0.241	0.086		
1992	0.514	0.129	0.445	0.124	0.501	0.127	0.429	0.123		
1993	0.303	0.111	0.324	0.106	0.278	0.109	0.327	0.105		
1994	0.245	0.081	0.273	0.078	0.238	0.080	0.260	0.077		
1995	0.288	0.087	0.334	0.084	0.292	0.086	0.305	0.082		
1996	0.444	0.075	0.429	0.073	0.461	0.074	0.430	0.071		
1997	0.250	0.075	0.276	0.073	0.251	0.074	0.259	0.071		
1998	0.158	0.098	0.182	0.094	0.155	0.097	0.179	0.093		
1999	0.135	0.055	0.137	0.054	0.136	0.055	0.159	0.053		
2000	0.125	0.062	0.132	0.060	0.124	0.061	0.144	0.059		
2001	0.114	0.064	0.133	0.063	0.115	0.063	0.153	0.061		
2002	0.130	0.065	0.132	0.064	0.136	0.065	0.157	0.063		
2003	0.117	0.072	0.124	0.070	0.117	0.072	0.132	0.069		
2004	0.078	0.064	0.081	0.062	0.077	0.063	0.087	0.061	144.47	0.084
2005	0.121	0.061	0.112	0.060	0.117	0.061	0.113	0.059	375.61	0.039
2006	0.245	0.072	0.274	0.070	0.243	0.072	0.289	0.069	405.27	0.026
2007	0.116	0.082	0.124	0.079	0.115	0.081	0.129	0.078	296.31	0.040
2008	0.063	0.088	0.082	0.086	0.065	0.087	0.084	0.084	343.1	0.042

*** The Moroccan index was not used as such, but the data was used in the construction of the Combined CPUE indices for ASPIC and BSP (SCRS/2009/110).

Table 7 continued.

G) Combined Biomass Indices

Combined Biomass Indices				
Index Name	Base	Lower 80% CI	Upper 80% CI	Sens. All U.S. LL Obs
Units	Biomass	Biomass	Biomass	Biomass
Ages applied to	N/A	N/A	N/A	N/A
Used?	Production Models	Production Models	Production Models	Production Models
Year	Index	Index	Index	Index
1963	1116.70	926.53	1345.90	1256.78
1964	406.35	353.16	467.56	454.59
1965	256.98	221.23	298.51	286.56
1966	245.67	211.71	285.08	273.12
1967	299.12	258.27	346.42	332.16
1968	233.88	204.21	267.86	262.90
1969	211.04	183.76	242.37	235.62
1970	236.28	202.93	275.10	262.16
1971	-	-	-	-
1972	-	-	-	-
1973	-	-	-	-
1974	-	-	-	-
1975	378.74	337.41	425.13	425.34
1976	330.47	291.31	374.89	369.13
1977	369.69	323.88	421.97	410.76
1978	496.52	418.29	589.39	547.66
1979	342.24	299.44	391.17	398.70
1980	313.19	274.08	357.88	312.45
1981	231.79	201.09	267.18	279.26
1982	273.32	239.40	312.05	332.49
1983	217.43	193.53	244.29	268.81
1984	216.63	194.93	240.76	256.35
1985	208.13	188.16	230.21	243.09
1986	203.49	184.45	224.50	235.46
1987	186.60	168.56	206.58	213.42
1988	186.35	169.61	204.75	216.99
1989	180.56	164.40	198.31	206.33
1990	180.24	164.31	197.71	202.46
1991	185.73	169.58	203.40	211.13
1992	163.86	149.08	180.12	184.04
1993	147.51	134.85	161.35	168.27
1994	134.83	123.07	147.72	150.17
1995	146.66	133.56	161.04	163.45
1996	116.11	104.92	128.50	131.41
1997	123.44	112.10	135.93	140.21
1998	128.02	116.38	140.82	146.25
1999	151.13	137.39	166.25	171.68
2000	174.00	158.89	190.54	193.60
2001	160.56	146.80	175.61	174.83
2002	170.64	155.89	186.79	189.18
2003	159.60	145.60	174.94	169.21
2004	168.51	153.85	184.56	183.55
2005	179.00	163.21	196.33	191.31
2006	167.16	152.41	183.33	175.58
2007	188.60	171.75	207.12	185.45
2008	155.17	141.09	170.66	151.45

Table 8 Inputs (standardized CPUE) used as relative abundance indices in the population dynamics model (ASPIC) for characterizing the status of southern Atlantic swordfish (Scaled relative to mean of overlap). The series for Uruguay was partitioned in two: 1982-1992 and 1983-2008.

	2009 ASSESSMENT					
Series used =>	2006	2006	2009	2009	2009	2009
YEAR	JAPAN	C.TAIPEI	BRAZIL	SPAIN	URUGUAY	C.TAIPEI (sensitivity analysis)
1967	1,11					
1968	1,50	2,83				1,55
1969	2,22	2,43				1,34
1970	2,27	3,22				1,78
1971	1,54	2,57				1,47
1972	1,68	2,37				1,26
1973	1,78	2,49				1,24
1974	1,55	2,05				1,12
1975	1,58	2,07				1,07
1976	1,94	0,60				0,71
1977	2,13	0,86				0,85
1978	1,70	1,05	1,20			0,95
1979	1,96	2,05	1,03			1,34
1980	2,17	1,46	1,53			1,06
1981	2,13	1,57	0,30			1,19
1982	2,10	1,45	2,21		0,98	1,04
1983	2,04	1,48	1,59		0,53	1,11
1984	2,68	1,75	0,47		0,39	1,39
1985	2,97	1,48	1,35		0,18	1,18
1986	2,36	1,30	0,96		0,26	0,88
1987	2,10	1,17	0,78		0,51	0,99
1988	2,06	1,35	1,47		0,38	0,98
1989	1,69	1,15	0,82	1,43	0,46	0,96
1990	2,15	1,01	2,10	1,08	0,40	0,89
1991	1,31	1,16	0,75	1,04	0,30	1,53
1992	1,21	1,70	0,29	0,95	0,19	1,76
1993	1,22	1,25	0,25	0,83	1,51	1,17
1994	1,11	1,40	0,27	0,95	1,22	1,50
1995	0,96	1,15	0,41	1,08	1,85	1,26
1996	0,98	1,38	0,74	0,98	1,46	1,41
1997	0,83	0,93	1,03	0,91	1,92	1,06
1998	0,71	0,64	1,18	0,89	1,19	0,77
1999	0,65	0,54	0,65	0,95	1,32	0,80
2000	0,51	0,61	0,53	1,15	1,32	0,79
2001	0,43	0,68	1,67	1,03	1,19	0,79
2002	0,46	0,56	0,50	0,98	0,90	0,77
2003	0,36	0,48	0,76	0,86	0,75	0,76
2004	0,35		1,53	0,87	1,08	0,63
2005	0,31		0,72	1,03	0,80	0,61
2006			1,81	1,04	0,81	0,94
2007			1,95	0,99	0,77	0,77
2008			2,03	0,96	0,56	0,80

Table 9. ASPIC base case inputs for the North Atlantic swordfish stock.

Year	*CPUE point estimate*	*Catch*	*Year*	*10% quantile of CPUE index*	*Catch*	*Year*	*90% quantile of CPUE index*	*Catch*
1950		3646	1950		3646	1950		3646
1951		2581	1951		2581	1951		2581
1952		2993	1952		2993	1952		2993
1953		3303	1953		3303	1953		3303
1954		3034	1954		3034	1954		3034
1955		3502	1955		3502	1955		3502

1956		3358	1956		3358	1956		3358
1957		4578	1957		4578	1957		4578
1958		4904	1958		4904	1958		4904
1959		6232	1959		6232	1959		6232
1960		3828	1960		3828	1960		3828
1961		4381	1961		4381	1961		4381
1962		5342	1962		5342	1962		5342
1963	1116.70	10190	1963	926.53	10190	1963	1345.90	10190
1964	406.35	11258	1964	353.16	11258	1964	467.56	11258
1965	256.98	8652	1965	221.23	8652	1965	298.51	8652
1966	245.67	9349	1966	211.71	9349	1966	285.08	9349
1967	299.12	9107	1967	258.27	9107	1967	346.42	9107
1968	233.88	9172	1968	204.21	9172	1968	267.86	9172
1969	211.04	9203	1969	183.76	9203	1969	242.37	9203
1970	236.28	9495	1970	202.93	9495	1970	275.10	9495
1971		5266	1971		5266	1971		5266
1972		4766	1972		4766	1972		4766
1973		6074	1973		6074	1973		6074
1974		6362	1974		6362	1974		6362
1975	378.74	8839	1975	337.41	8839	1975	425.13	8839
1976	330.47	6696	1976	291.31	6696	1976	374.89	6696
1977	369.69	6409	1977	323.88	6409	1977	421.97	6409
1978	496.52	11827	1978	418.29	11827	1978	589.39	11827
1979	342.24	11937	1979	299.44	11937	1979	391.17	11937
1980	313.19	13558	1980	274.08	13558	1980	357.88	13558
1981	231.79	11180	1981	201.09	11180	1981	267.18	11180
1982	273.32	13215	1982	239.40	13215	1982	312.05	13215
1983	217.43	14527	1983	193.53	14527	1983	244.29	14527
1984	216.63	12791	1984	194.93	12791	1984	240.76	12791
1985	208.13	14383	1985	188.16	14383	1985	230.21	14383
1986	203.49	18486.4	1986	184.45	18486.4	1986	224.50	18486.4
1987	186.60	20236	1987	168.56	20236	1987	206.58	20236
1988	186.35	19513.4	1988	169.61	19513.4	1988	204.75	19513.4
1989	180.56	17250.111	1989	164.40	17250.111	1989	198.31	17250.111
1990	180.24	15672.132	1990	164.31	15672.132	1990	197.71	15672.132
1991	185.73	14933.71	1991	169.58	14933.71	1991	203.40	14933.71
1992	163.86	15394	1992	149.08	15394	1992	180.12	15394
1993	147.51	16737.831	1993	134.85	16737.831	1993	161.35	16737.831
1994	134.83	15501.26	1994	123.07	15501.26	1994	147.72	15501.26
1995	146.66	16872.222	1995	133.56	16872.222	1995	161.04	16872.222
1996	116.11	15221.72	1996	104.92	15221.72	1996	128.50	15221.72
1997	123.44	13024.67	1997	112.10	13024.67	1997	135.93	13024.67
1998	128.02	12223.331	1998	116.38	12223.331	1998	140.82	12223.331
1999	151.13	11621.667	1999	137.39	11621.667	1999	166.25	11621.667
2000	174.00	11452.515	2000	158.89	11452.515	2000	190.54	11452.515
2001	160.56	10010.788	2001	146.80	10010.788	2001	175.61	10010.788
2002	170.64	9654.023	2002	155.89	9654.023	2002	186.79	9654.023
2003	159.60	11431.025	2003	145.60	11431.025	2003	174.94	11431.025

2004	168.51	12160.061	2004	153.85	12160.061	2004	184.56	12160.061
2005	179.00	12446.36	2005	163.21	12446.36	2005	196.33	12446.36
2006	167.16	11472.538	2006	152.41	11472.538	2006	183.33	11472.538
2007	188.60	12320.224	2007	171.75	12320.224	2007	207.12	12320.224
2008	155.17	10751.658	2008	141.09	10751.658	2008	170.66	10751.658

Table 10. North Atlantic swordfish ASPIC Base case results. Intervals are based on 3000 bootstraps from the ASPIC run with the point estimate, 10%, 90% quartiles of the biomass index.

	Point estimate	median	Low (10%)	Upp (90%)
B1/K	0.875			
K	123700			
q(1)	0.002999			
MSY	13730		12990	14180
Ye(2009)	13700			
Y.@Fmsy	14400			
Bmsy	61860	64033.9	53280.31	91627.06
Fmsy	0.222	0.21325	0.139955	0.26513
fmsy(1)	74.02			
B./Bmsy	1.048	1.018318	0.882479	1.166115
F./Fmsy	0.7639	0.793732	0.674563	0.959391
Ye./MSY	0.9977			
r	0.443977			

Table 11. Estimated deterministic biomass, fishing mortality and relative values from the ASPIC base model for the north Atlantic swordfish stock 1950-2008. Biomass values represent estimates at the beginning of the year.

Year	**F mort**	**Start Biomass**	**F / F_{MSY}**	**B / B_{MSY}**
1950	0.033	108,200	0.150	1.750
1951	0.023	110,300	0.104	1.782
1952	0.026	112,600	0.119	1.820
1953	0.029	113,800	0.130	1.840
1954	0.026	114,400	0.119	1.850
1955	0.030	115,100	0.137	1.861
1956	0.029	115,100	0.131	1.861
1957	0.040	115,300	0.180	1.864
1958	0.043	114,400	0.194	1.849
1959	0.055	113,500	0.249	1.835
1960	0.034	111,800	0.154	1.807
1961	0.039	112,600	0.175	1.820
1962	0.048	112,700	0.214	1.822
1963	0.093	111,900	0.419	1.810
1964	0.107	107,300	0.483	1.735

1965	0.084	103,100	0.380	1.667
1966	0.092	102,200	0.415	1.652
1967	0.091	100,900	0.408	1.632
1968	0.092	100,200	0.414	1.620
1969	0.093	99,570	0.417	1.610
1970	0.096	99,070	0.433	1.602
1971	0.053	98,430	0.237	1.591
1972	0.046	101,600	0.208	1.643
1973	0.058	104,500	0.261	1.689
1974	0.060	105,500	0.271	1.705
1975	0.084	105,900	0.379	1.712
1976	0.064	104,100	0.289	1.684
1977	0.061	104,700	0.275	1.692
1978	0.115	105,300	0.517	1.703
1979	0.120	101,100	0.541	1.635
1980	0.142	97,860	0.638	1.582
1981	0.120	93,900	0.539	1.518
1982	0.144	92,890	0.651	1.502
1983	0.164	90,260	0.740	1.459
1984	0.148	86,910	0.668	1.405
1985	0.170	85,710	0.768	1.386
1986	0.231	83,240	1.040	1.346
1987	0.275	77,280	1.239	1.249
1988	0.291	70,270	1.309	1.136
1989	0.276	64,380	1.243	1.041
1990	0.262	60,860	1.180	0.984
1991	0.256	58,900	1.155	0.952
1992	0.271	57,650	1.222	0.932
1993	0.309	55,900	1.391	0.904
1994	0.301	52,680	1.354	0.852
1995	0.347	50,530	1.565	0.817
1996	0.335	46,750	1.508	0.756
1997	0.296	44,300	1.331	0.716
1998	0.277	43,870	1.250	0.709
1999	0.260	44,240	1.169	0.715
2000	0.249	45,310	1.121	0.732
2001	0.208	46,680	0.935	0.755
2002	0.187	49,740	0.842	0.804
2003	0.210	53,430	0.945	0.864
2004	0.216	55,540	0.973	0.898
2005	0.216	57,000	0.973	0.922
2006	0.193	58,230	0.870	0.941
2007	0.201	60,460	0.907	0.977
2008	0.170	61,870	0.764	1.000
2009		64,840		1.048

Table 12. North Atlantic swordfish results of the retrospective analysis of ASPIC Base case.

Year	K	MSY	Fmsy	B./Bmsy	F./Fmsy	*r*
2008	123,700	13,730	0.222	1.048	0.764	0.444
2007	115,100	13,950	0.242	1.056	0.848	0.485
2006	113,900	13,980	0.245	1.031	0.809	0.491
2005	108,000	14,130	0.262	1.031	0.867	0.523
2004	105,000	14,210	0.271	1.020	0.855	0.541

Table 13. North Atlantic swordfish estimated stock status results from the BSP model.

Parameter	Estimate	CV
K	137722	17%
r	0.411	21%
MSY	13645	4%
Bcurr(2009)	84913	13%
Bcurr(2009)/K	0.63	13%
B1950	118718	21%
Bcurr(2009)/B1950	0.74	19%
Catch2008/MSY	0.84	4%
Fcurr(2008)/Fmsy	0.69	17%
Bcurr(2009)/Bmsy	1.25	13%
Bmsy	68861	17%
Replacement Yld	13358	3%

Table 14. Base Case VPA estimates of the abundance of North Atlantic swordfish at the beginning of the year. The abundance of age 1 at the beginning of 2009 is not estimated by the VPA and therefore is not shown.

	Age				
Year	*1*	*2*	*3*	*4*	*5+*
1978	437935	304182	214269	157482	230645
1979	483131	352763	231884	143220	227273
1980	421225	386190	263984	158810	214552
1981	426376	321957	275528	172354	210730
1982	488719	335565	232084	188395	233685
1983	518792	381082	244889	149391	247793
1984	542605	398336	263000	150285	221375
1985	625222	417746	279411	165351	215550
1986	646560	481880	288917	168263	212046

1987	664819	486555	310771	158229	187320
1988	673487	478290	298376	162767	156452
1989	659887	470267	268977	151823	150537
1990	549069	472761	283984	139807	143535
1991	546608	405733	284940	152211	142549
1992	542806	409315	257522	146228	152332
1993	606528	407373	252618	137132	147469
1994	564317	439921	241947	123418	134569
1995	470018	403345	265316	126872	122612
1996	458924	337500	222552	126140	109777
1997	525611	323913	187113	97703	106962
1998	473762	368415	189722	94141	94151
1999	461889	342145	202974	95675	90784
2000	454873	338267	186511	99711	94757
2001	478577	331562	185519	90164	100382
2002	502183	364615	201100	98251	100516
2003	493418	381824	233619	114354	108719
2004	530313	379616	232712	124835	120031
2005	569359	402903	236206	126040	130076
2006	490072	432296	247751	129151	138533
2007	470308	366794	263301	144517	160342
2008	462525	345624	207041	152506	185092
2009		348773	200866	117424	219317

Table 15. Base Case VPA estimates of the fishing mortality rates on North Atlantic swordfish.

			Age		
Year	*1*	*2*	*3*	*4*	*5+*
1978	0.016	0.071	0.203	0.278	0.376
1979	0.024	0.090	0.179	0.286	0.386
1980	0.069	0.138	0.226	0.310	0.420

1981	0.040	0.127	0.180	0.247	0.334
1982	0.049	0.115	0.241	0.279	0.378
1983	0.064	0.171	0.288	0.427	0.360
1984	0.062	0.155	0.264	0.381	0.321
1985	0.060	0.169	0.307	0.424	0.357
1986	0.084	0.239	0.402	0.558	0.470
1987	0.129	0.289	0.447	0.649	0.547
1988	0.159	0.376	0.476	0.552	0.552
1989	0.133	0.304	0.454	0.545	0.545
1990	0.103	0.306	0.424	0.487	0.487
1991	0.089	0.255	0.467	0.460	0.460
1992	0.087	0.283	0.430	0.505	0.505
1993	0.121	0.321	0.516	0.549	0.549
1994	0.136	0.306	0.446	0.544	0.544
1995	0.131	0.395	0.544	0.621	0.621
1996	0.148	0.390	0.623	0.591	0.591
1997	0.155	0.335	0.487	0.576	0.576
1998	0.125	0.396	0.485	0.530	0.530
1999	0.111	0.407	0.511	0.477	0.477
2000	0.116	0.401	0.527	0.461	0.461
2001	0.072	0.300	0.436	0.440	0.440
2002	0.074	0.245	0.365	0.403	0.403
2003	0.062	0.295	0.427	0.420	0.420
2004	0.075	0.274	0.413	0.433	0.433
2005	0.075	0.286	0.404	0.415	0.415
2006	0.090	0.296	0.339	0.312	0.312
2007	0.108	0.372	0.346	0.299	0.299
2008	0.082	0.343	0.367	0.231	0.231

Table 16. Benchmarks estimated by ASPIC for the base and sensitivity cases and for each run with an individual fleet for South Atlantic swordfish.

	Base (boots)	***sensitivity***	***Brazil***	***Japan***	***Spain***	***Taiwan***	***Uruguay***
MSY	14,870	14,340	19,710	2,287	20,360	<1	11,040
B_{msy}	47,700	77,240	26,440	200,500	124,100		95,970
F_{msy}	0.312	0.186	0.746	0.0114	0.164		0.115
K	95,410	154,500	52,880	401,000	248,100		191,900
r	0.623	0.371	1.491	0.023	0.328		0.230
Rel B (2009)	1.04	1.1	1.59	0.000018	1.557		0.414
Rel F (2008)	0.75	0.716	0.362	701.3	0.353		2.326

Table 17. Percentiles of the catch only model posterior distributions, South Atlantic stock.

	RUN 1					**RUN 2**				
Parameter / Management Benchmarks	10%	25%	50%	75%	90%	10%	25%	50%	75%	90%
R	0.43	0.48	0.53	0.58	0.62	0.29	0.34	0.39	0.48	0.55
K	97439	110678	141153	182004	219997	115830	145084	183102	253761	317487
A	0.43	0.58	0.72	0.81	0.84	0.47	0.58	0.73	0.82	0.85
X	0.12	0.22	0.41	0.68	0.86	0.14	0.22	0.43	0.71	0.88
MSY	13494	14826	18131	23590	28008	13034	14517	17934	24208	28090
B_{MSY}	48719	55339	70577	91002	109999	57915	72542	91551	126881	158743
B_{2009}/B_{MSY}	0.84	1.16	1.44	1.61	1.69	0.91	1.15	1.45	1.63	1.69
F_{2008}/F_{MSY}	0.33	0.41	0.61	0.96	1.41	0.32	0.39	0.58	0.94	1.28

Table 18. Estimated probability of $B \geq B_{MSY}$, $F \leq F_{MSY,}$ and maintaining the stock in the condition consistent with the Convention objective ($B \geq B_{MSY}$ and $F \leq F_{MSY}$) for the constant catches listed and the times indicated from the ASPIC base case model for the North Atlantic stock.

$B \geq B_{MSY}$

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
10000	66%	80%	86%	91%	94%	95%	96%	97%	98%	98%
11000	66%	76%	83%	87%	90%	92%	93%	94%	95%	96%
12000	66%	72%	77%	81%	83%	85%	86%	88%	89%	90%
13000	66%	68%	70%	72%	73%	74%	75%	76%	77%	77%
14000	66%	64%	62%	61%	59%	56%	55%	53%	52%	50%
15000	66%	60%	53%	46%	39%	32%	27%	23%	18%	14%

$F \leq F_{MSY}$

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
10000	98%	98%	99%	99%	99%	99%	99%	99%	99%	99%
11000	95%	96%	96%	97%	97%	97%	97%	97%	98%	98%
12000	87%	89%	90%	90%	91%	92%	92%	93%	93%	93%
13000	74%	75%	76%	77%	77%	78%	78%	78%	79%	79%
14000	55%	54%	52%	50%	50%	48%	47%	46%	45%	43%
15000	32%	27%	23%	19%	15%	12%	9%	7%	5%	4%

$B \geq B_{MSY}$ and $F \leq F_{MSY}$

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
10000	66%	80%	86%	91%	94%	95%	96%	97%	98%	98%
11000	66%	76%	83%	87%	90%	92%	93%	94%	95%	96%
12000	66%	72%	77%	81%	83%	85%	86%	88%	89%	90%
13000	65%	67%	69%	71%	72%	73%	74%	75%	76%	77%
14000	55%	54%	52%	50%	49%	48%	47%	46%	45%	43%
15000	32%	27%	23%	19%	15%	12%	9%	7%	5%	4%

Table 19. Estimated probability of B>B_{MSY}, F<$_{FMSY}$, and maintaining the stock in the condition consistent with the Convention objective (B>B_{MSY} and F<F_{MSY}) for the constant catches listed and the times indicated from the catch-only model for the South Atlantic swordfish stock.

SSB>B_{MSY}

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
10000	83%	86%	89%	92%	93%	94%	95%	96%	96%	96%
11000	83%	86%	88%	90%	92%	93%	94%	94%	94%	95%
12000	83%	85%	86%	87%	89%	90%	91%	92%	92%	92%
13000	83%	84%	84%	84%	85%	85%	85%	86%	86%	87%
14000	83%	83%	82%	82%	82%	82%	82%	82%	81%	81%
15000	83%	82%	82%	81%	81%	80%	79%	78%	76%	76%
16000	83%	82%	81%	79%	77%	76%	74%	74%	72%	71%
17000	83%	81%	79%	76%	73%	72%	70%	68%	68%	67%

F<F_{MSY}

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
10000	91%	93%	94%	95%	96%	96%	97%	98%	98%	98%
11000	87%	89%	91%	93%	94%	95%	95%	96%	96%	97%
12000	83%	85%	86%	87%	89%	91%	91%	92%	94%	94%
13000	81%	81%	81%	82%	83%	84%	85%	86%	86%	87%
14000	78%	78%	78%	78%	79%	79%	80%	80%	80%	81%
15000	74%	74%	73%	73%	74%	74%	75%	76%	76%	78%
16000	70%	69%	69%	70%	69%	70%	71%	71%	73%	75%
17000	67%	66%	65%	65%	66%	66%	67%	70%	71%	73%

SSB>B_{MSY} and F<F_{MSY}

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
10000	83%	86%	89%	92%	93%	94%	95%	96%	96%	96%
11000	83%	86%	88%	90%	92%	93%	94%	94%	94%	95%
12000	82%	83%	85%	86%	87%	89%	90%	90%	91%	91%
13000	81%	81%	81%	82%	82%	82%	83%	83%	83%	84%
14000	78%	78%	77%	77%	77%	77%	77%	76%	77%	77%
15000	74%	74%	73%	73%	72%	72%	71%	72%	71%	71%
16000	70%	69%	68%	68%	67%	67%	66%	65%	65%	65%
17000	67%	66%	65%	64%	63%	61%	61%	61%	60%	60%

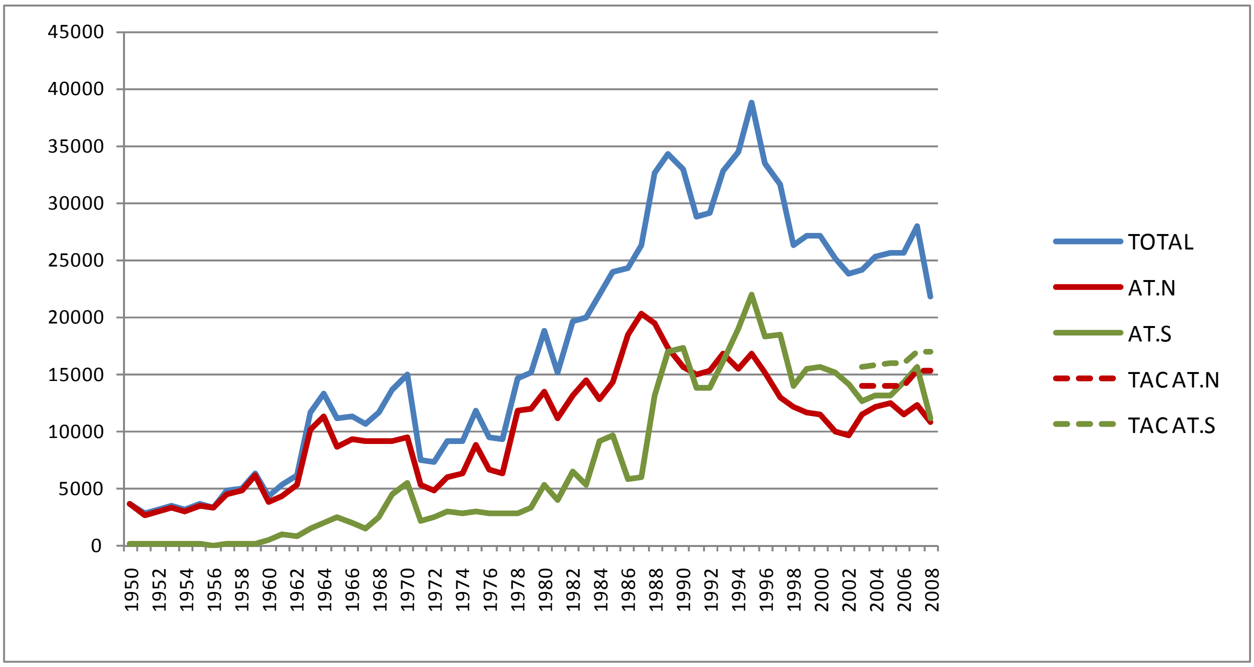
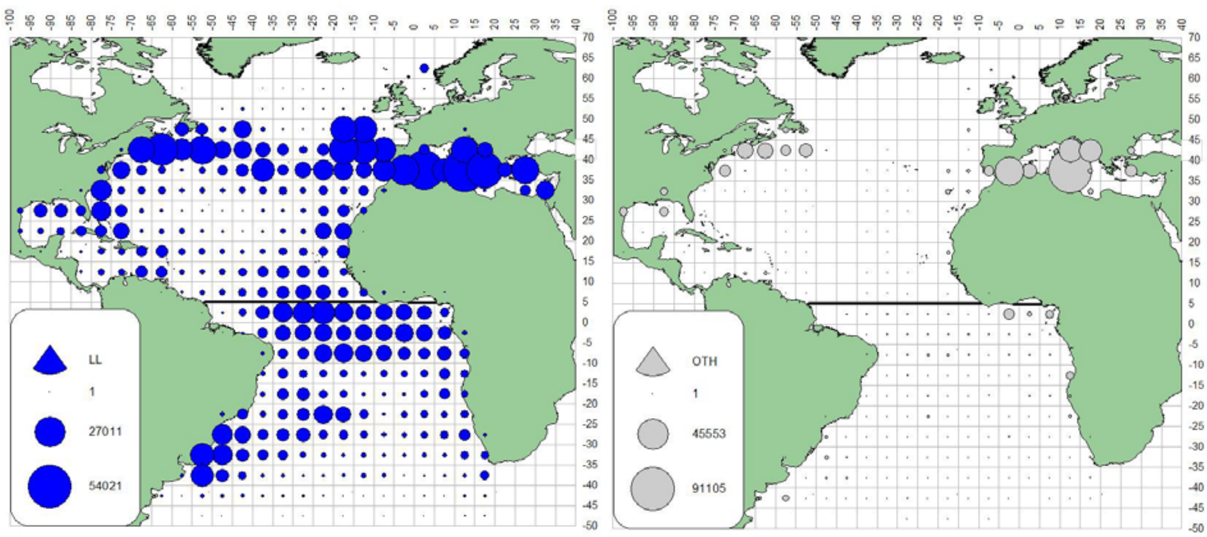


Figure 1. Total catch (Task I) and TAC of Atlantic swordfish by stock.

Geographical distribution of swordfish catch (SWO, *Xiphias gladius*)	Distribution géographique des captures d'espadon (SWO, *Xiphias gladius*)	Distribución geográfica de las capturas de pez espada (SWO, *Xiphias gladius*)



a. SWO (LL)

b. SWO (OTH)

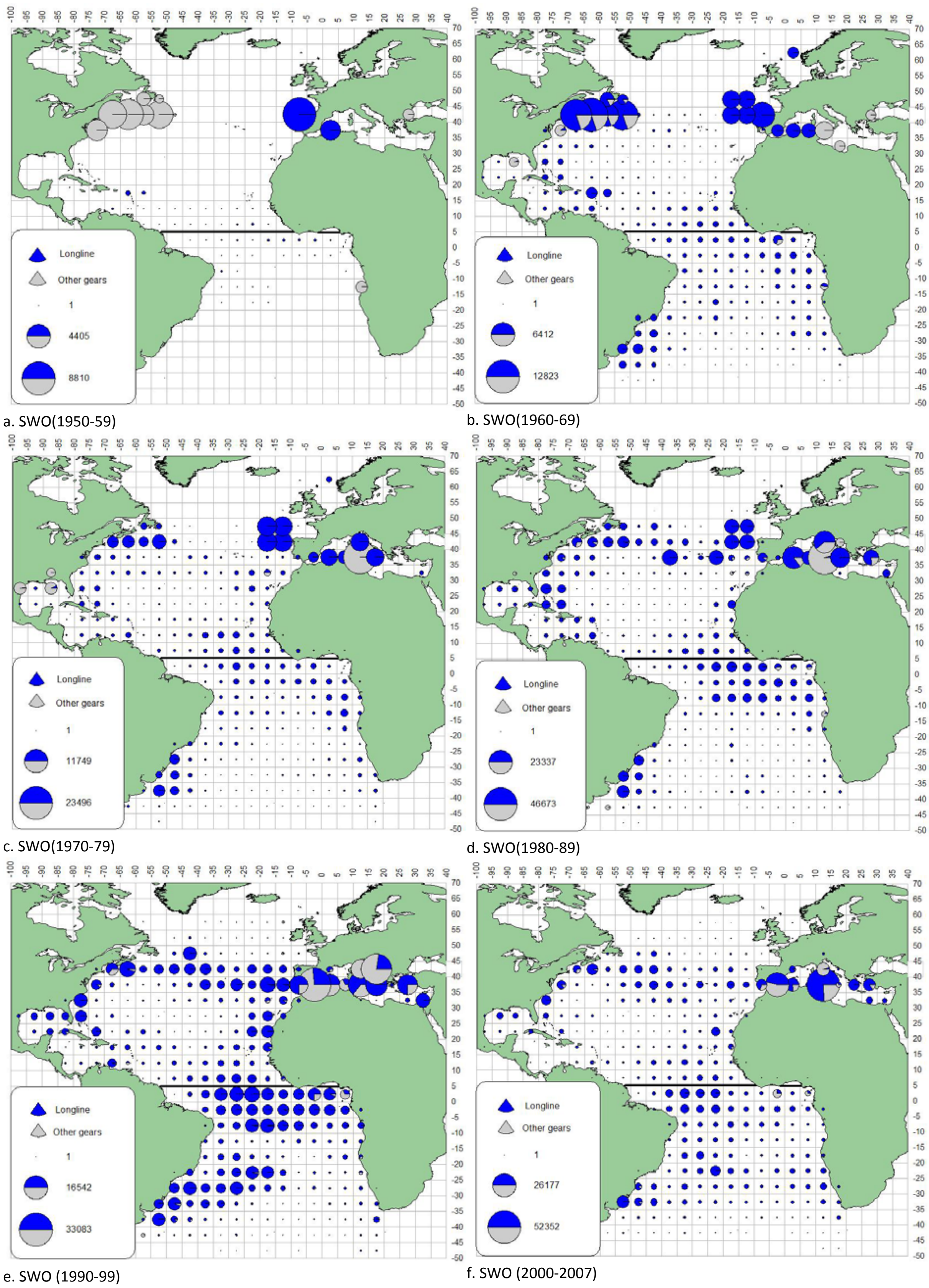


Figure 2. Geographical distribution of Atlantic swordfish (1950-2007) by major gears (a) and decades (b).

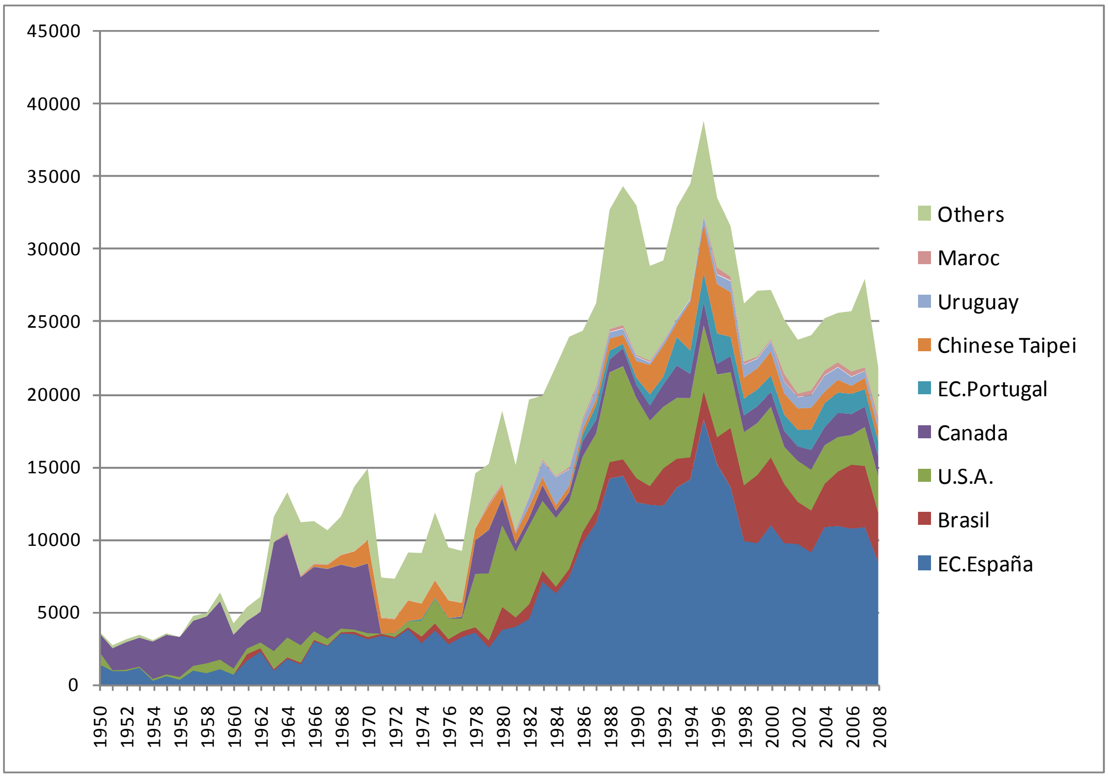


Figure 3. Atlantic Swordfish catch by flag.

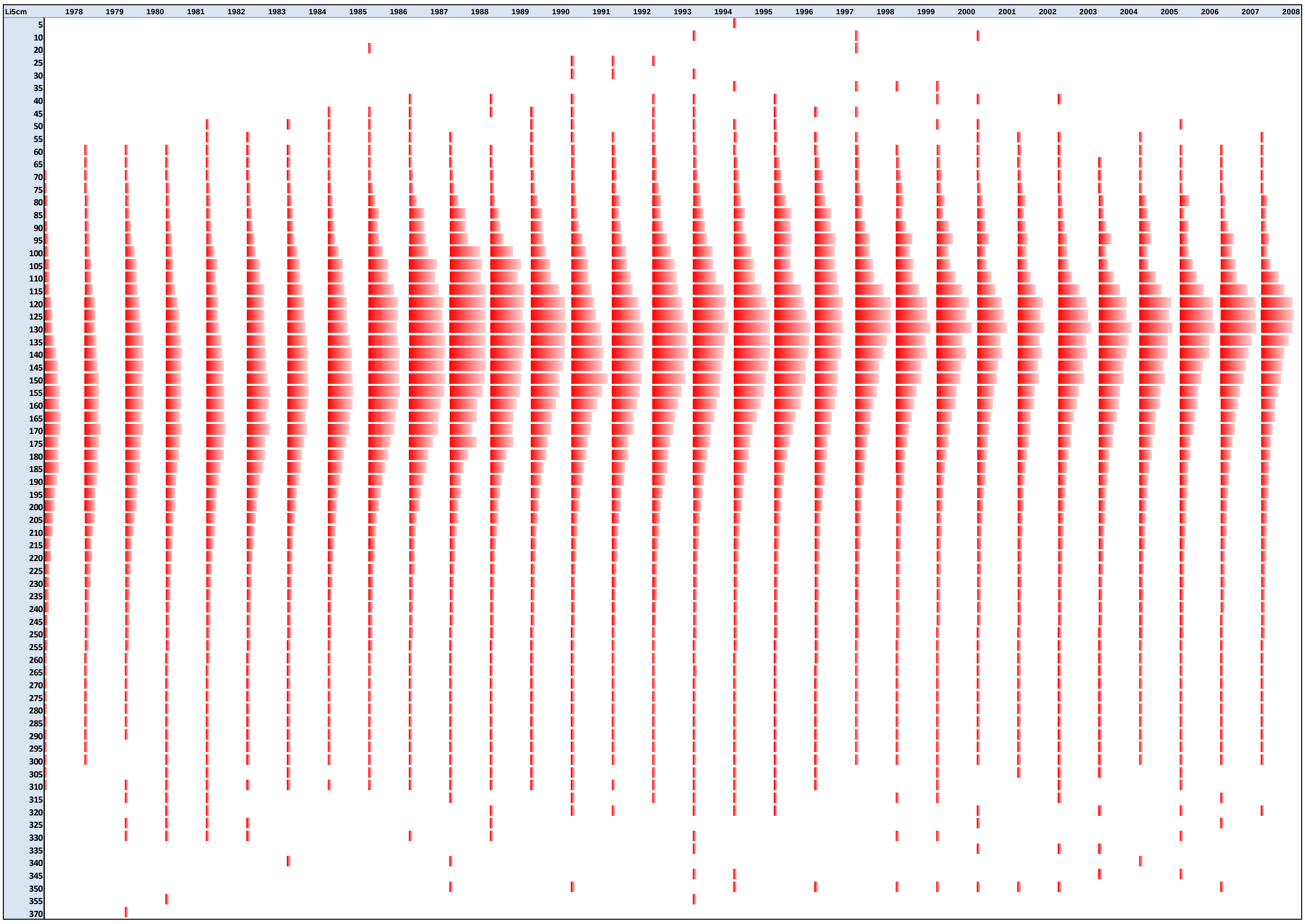


Figure 4. Catch at size for northern Atlantic swordfish (1978-2008).

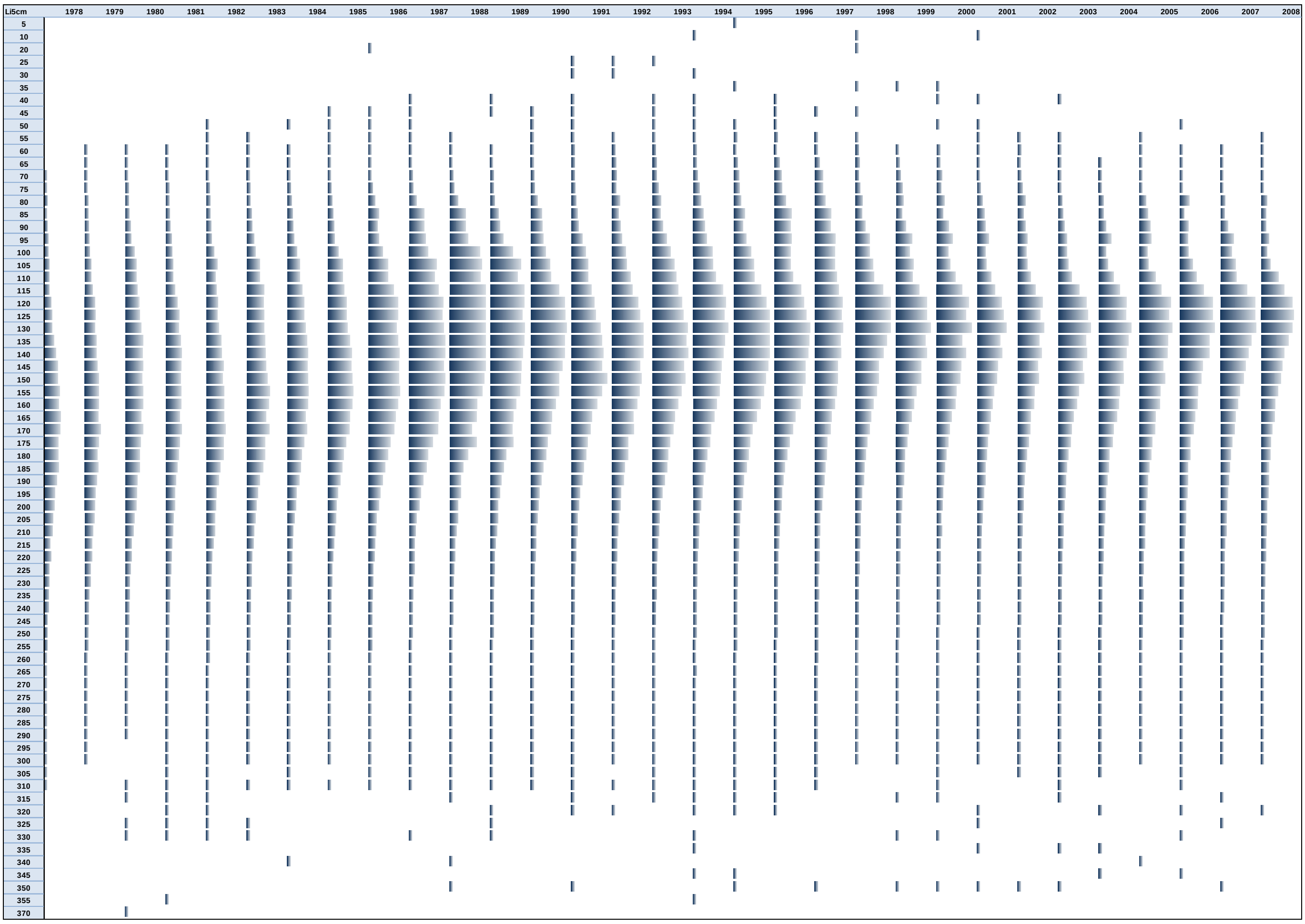


Figure 5. Catch at size for southern Atlantic swordfish (1978-2008).

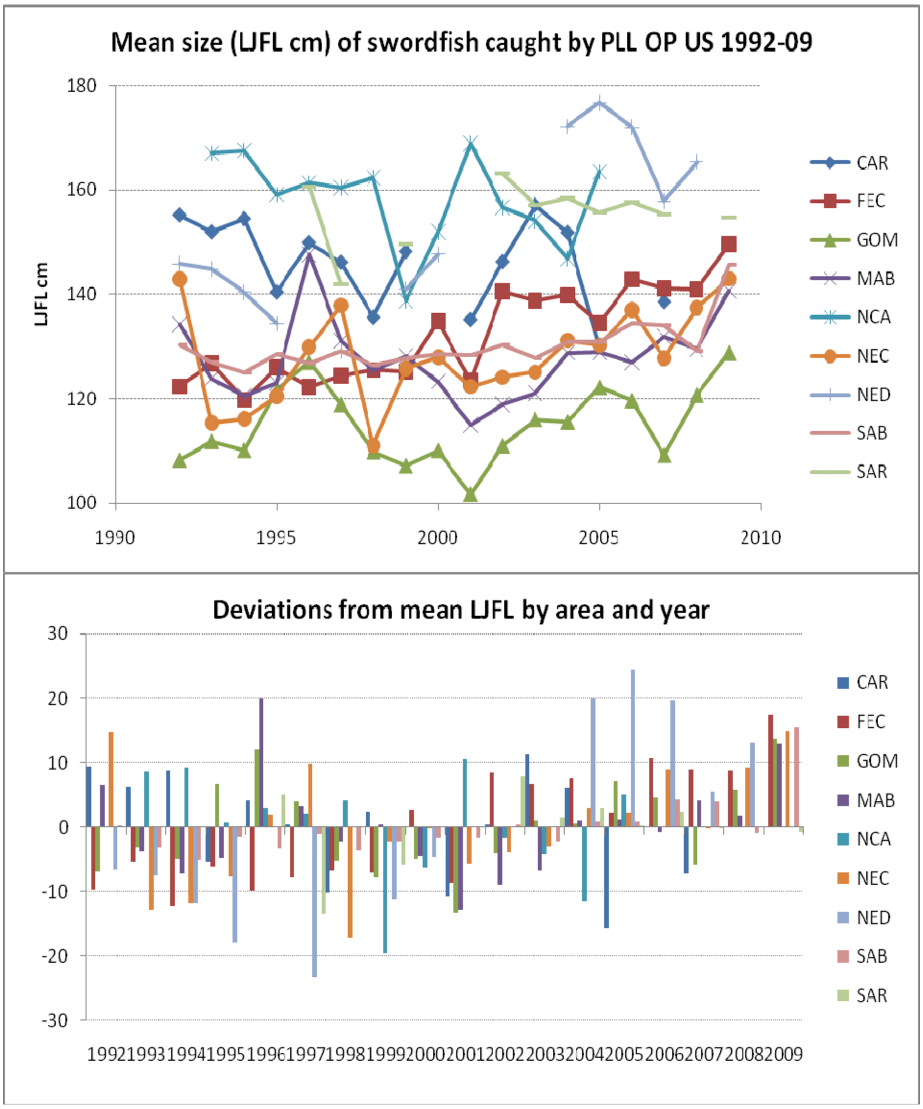


Figure 6. North-SWO: Annual trends of mean size of landed swordfish measure by scientific observers from the US Pelagic longline fleet by geographical areas in the Western North Atlantic (FEC, MAB, NCA, NEC, NED, SAB, SAR), the Gulf of Mexico (GOM) and Caribbean Sea (CAR). The bottom plot shows the same information measure as annual deviations (in cm) from the mean size for each area (1990-2008). Positive trends indicates increase in mean size by year, negative trend indicates decrease in mean size by year.

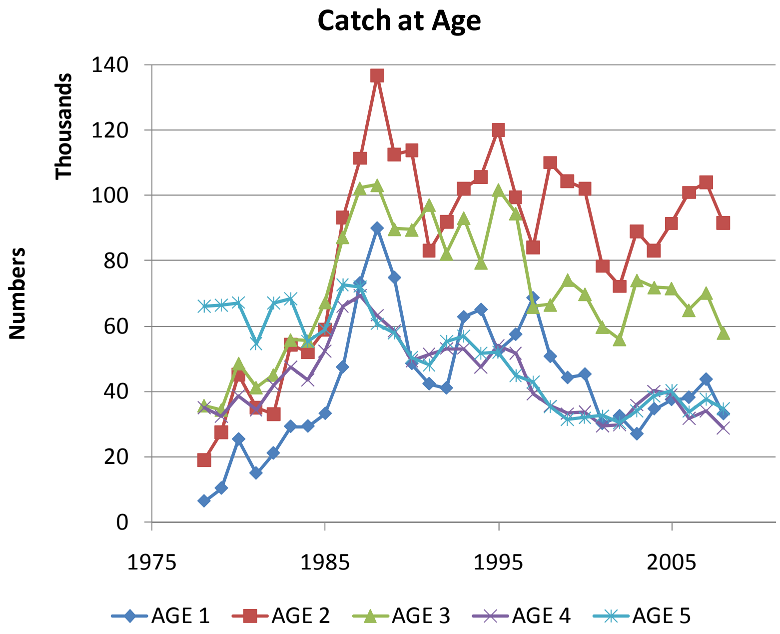


Figure 7. Catch at age for northern Atlantic swordfish converted from catch at size based on the unisex Gompertz growth curve.

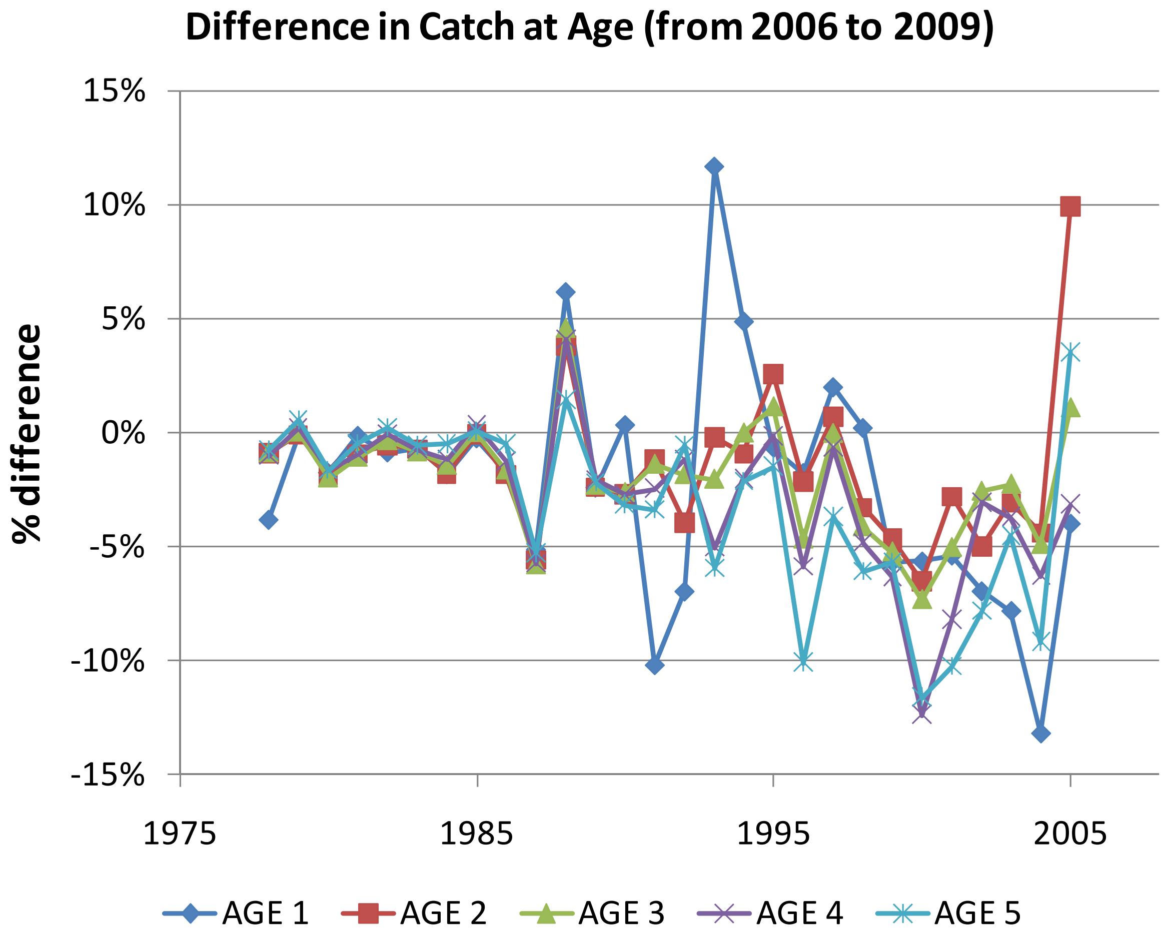
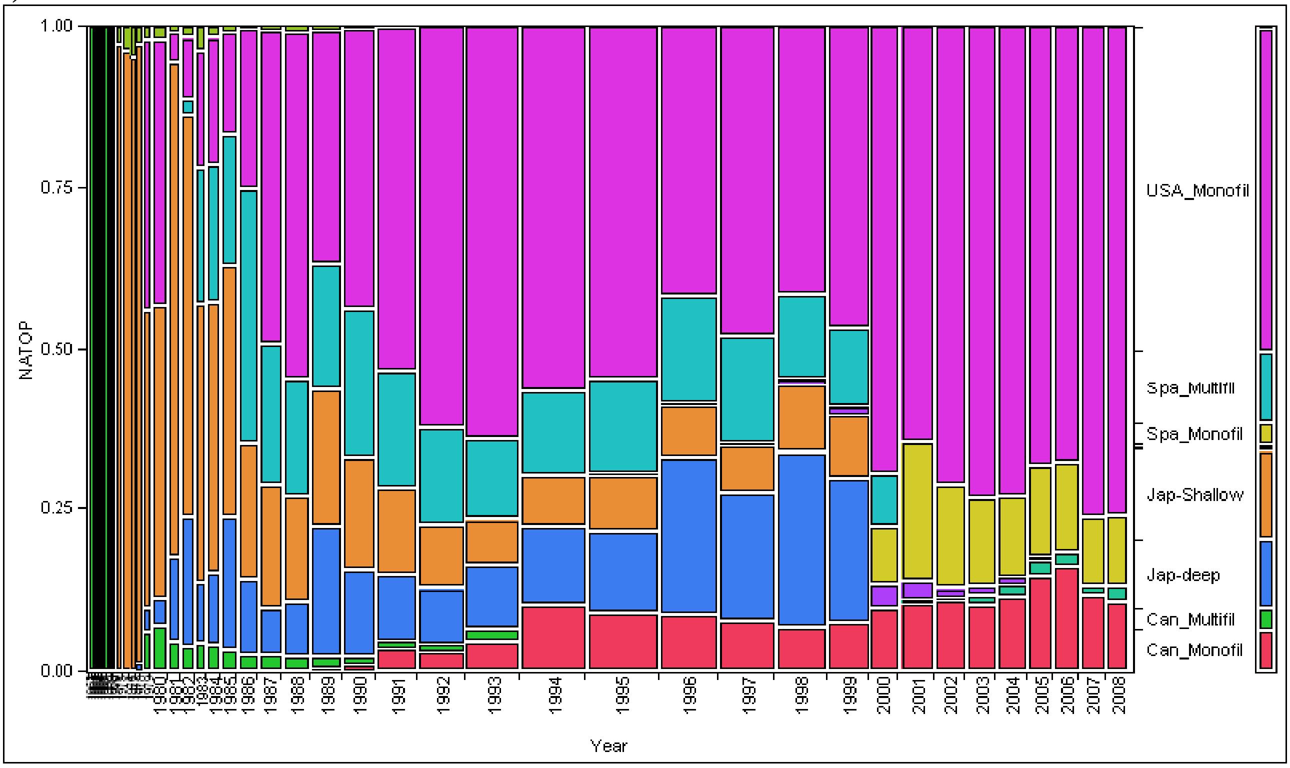


Figure 8. Differences in catch at age for northern Atlantic swordfish (1978-2005) produced in 2009 from the matrix produced in 2006. These differences are the result of updates to the catch at size data base since the prior assessment. Negative values appear in the bubble plot (lower) as uncolored spheres.

a)



b)

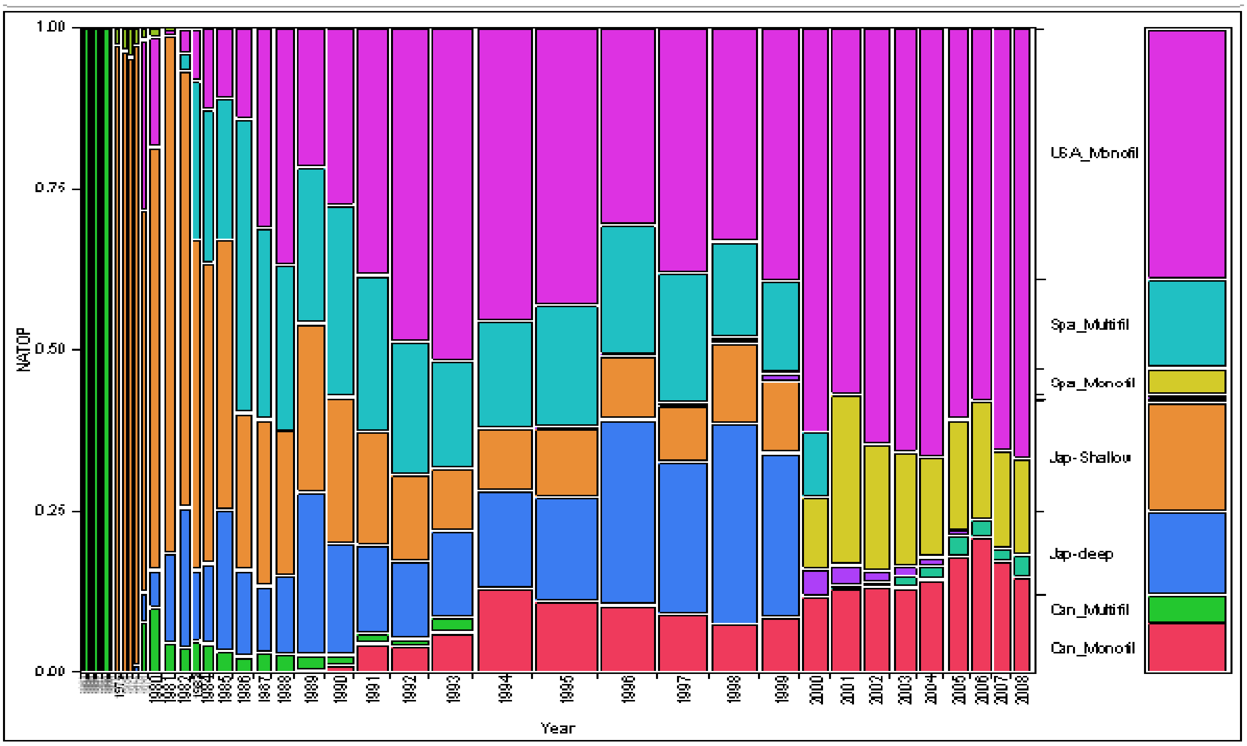


Figure 9. North SWO: Mosaic plot showing comparison of sampling fraction when all U.S. LL observations are used (**A**) to sampling fraction after filtering U.S. data (**B**). The x-axis shows the year from the 1970s to 2008. The y-axis shows the sampling fraction from 0-100%. U.S. samples (monofilament) are shown in pink, EU-Spain (multifilament) in aqua, EU-Spain (monofilament) in tan, Japan (shallow) in orange, Japan (deep) in blue, Canada (multifilament) in green, Canada (monofilament) in red.

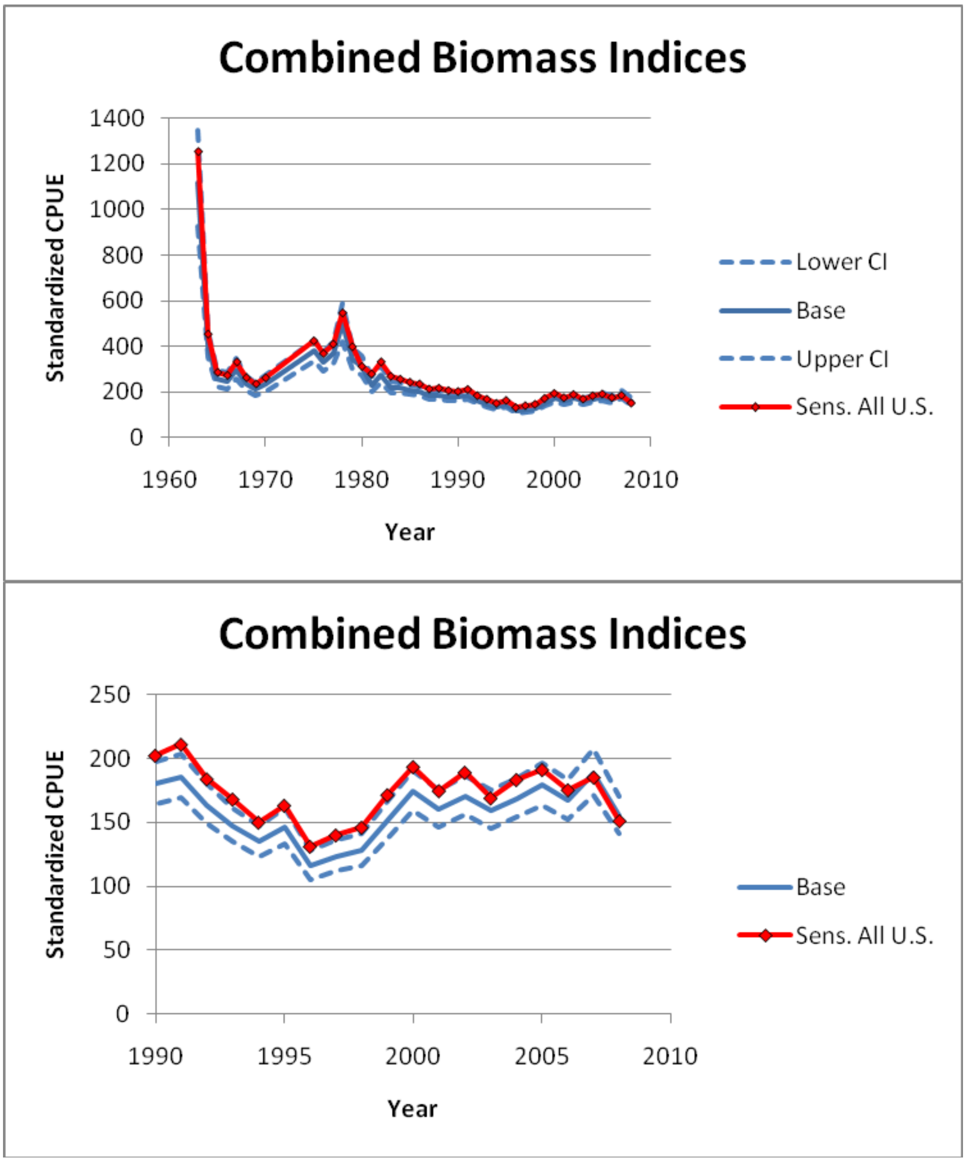


Figure 10. Top Panel: Combined biomass indices of abundance used for ASPIC and BSP models runs for N-ATL SWO. The base index (blue) was constructed with selected data from the U.S. pelagic longline. The sensitivity index (red) contains all the U.S. pelagic longline data. The dashed blue lines are the upper and lower 80% confidence intervals of the base index. Bottom panel: a detailed expansion of the recent time period (1990-2008).

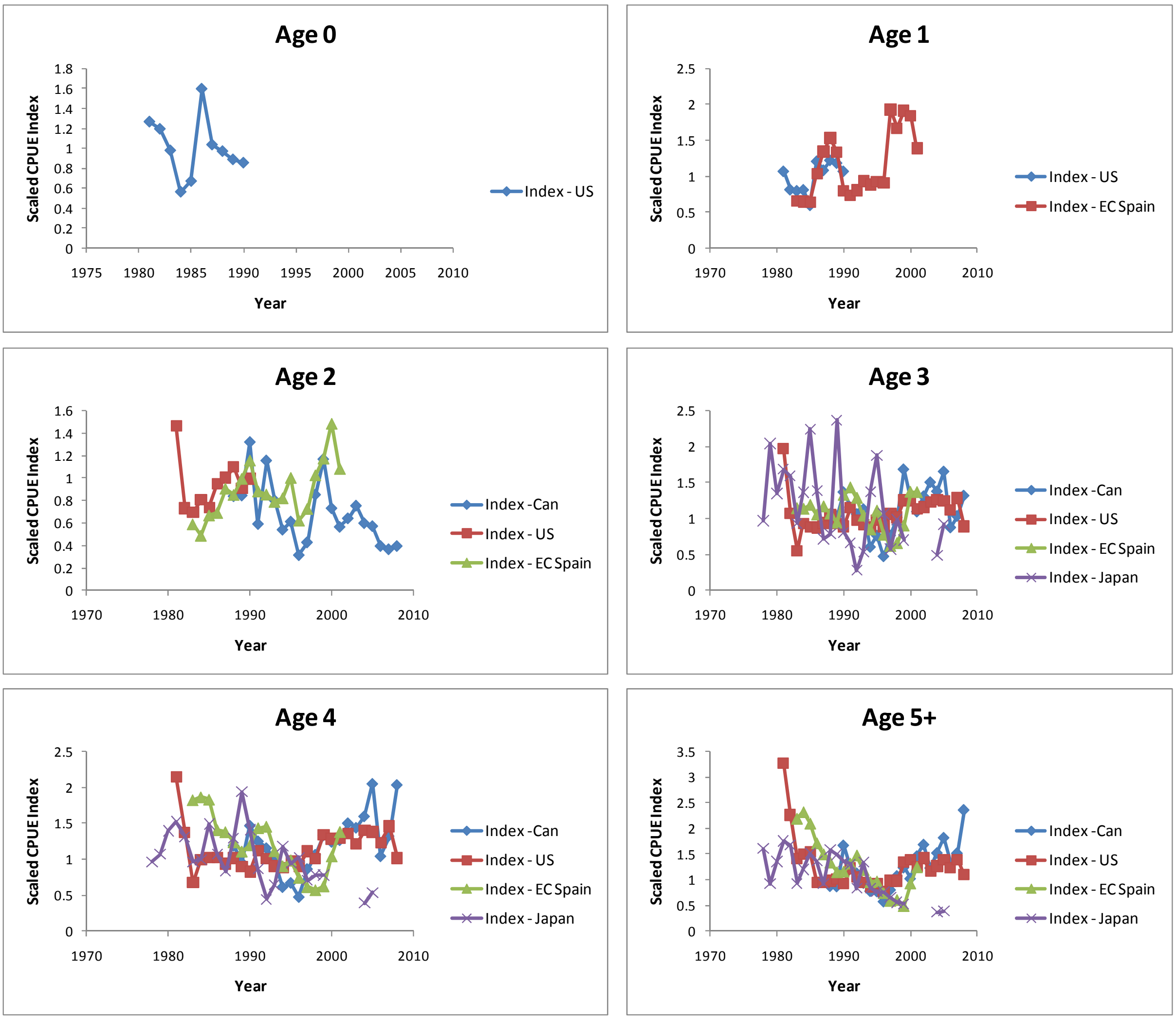


Figure 11. North swordfish: Available age-specific "unisex" indices for the VPA model. The age-0 index was not used since the VPA was run on ages 1-5+.

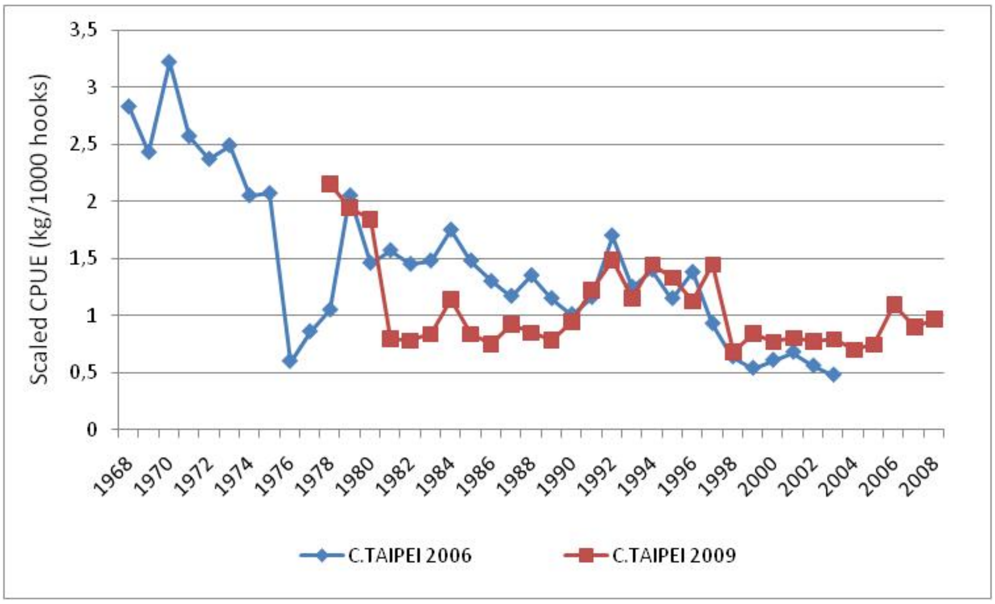


Figure 12. The patterns in standardized catch rates for southern Atlantic swordfish across time from two by-catch fisheries (CPUE series are scaled to their mean for the overlapping years).

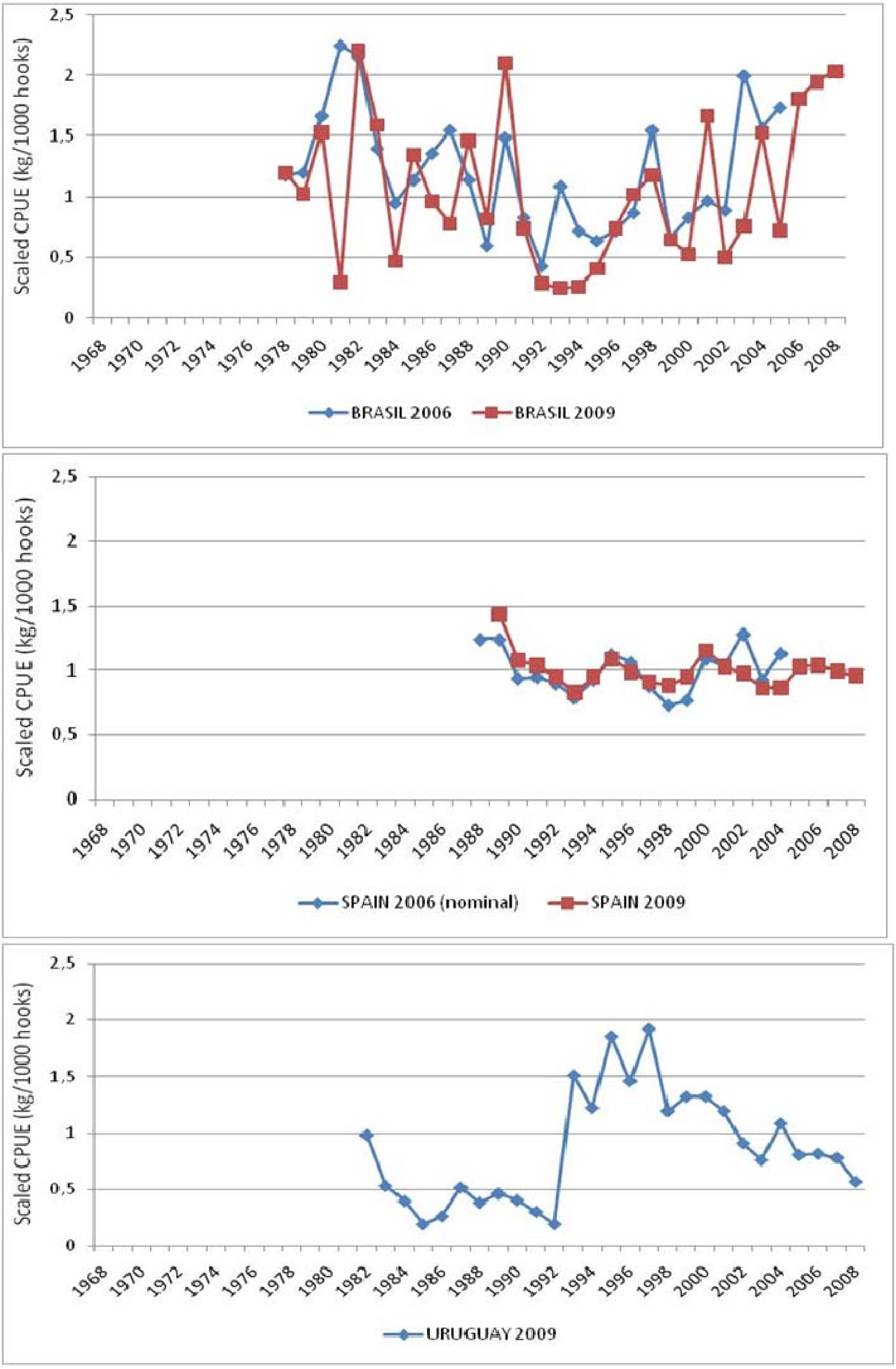


Figure 13. The patterns in standardized catch rates for southern Atlantic swordfish across time from three targeting fisheries (CPUE series are scaled to their mean for the overlapping years).

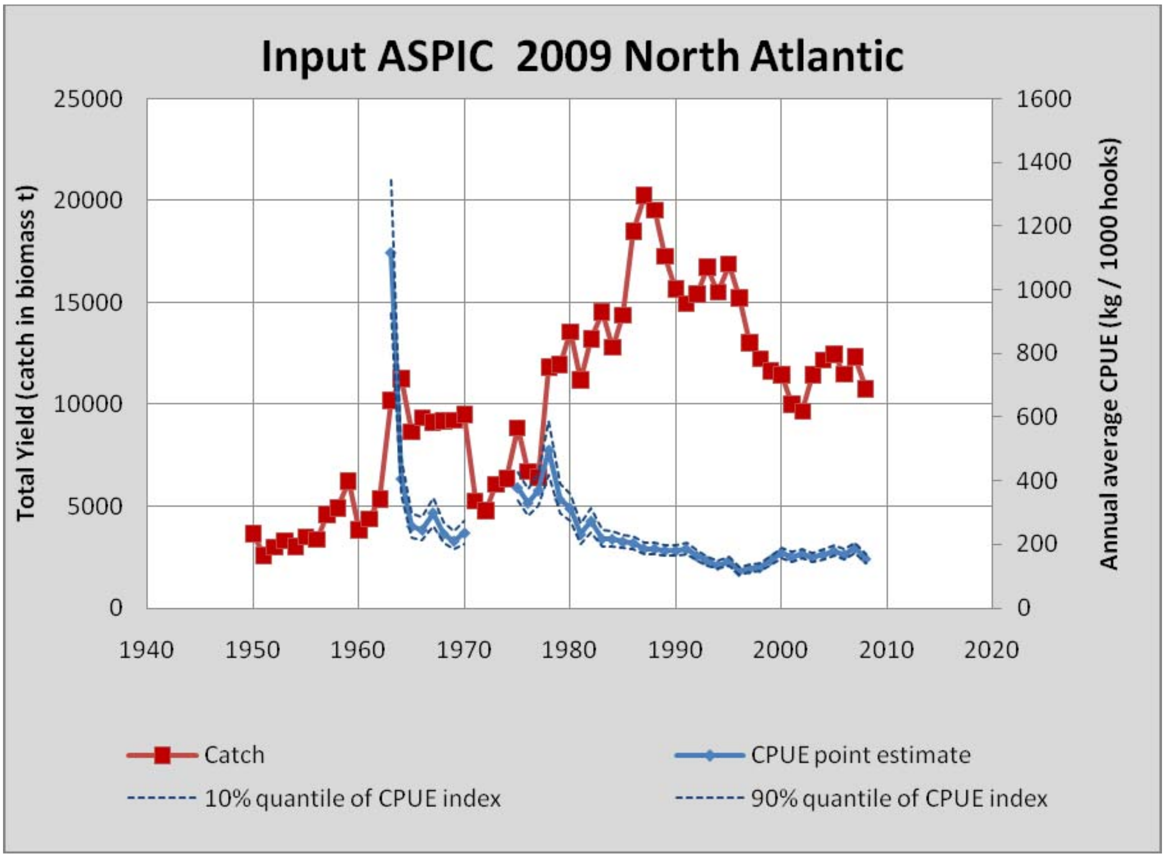


Figure 14. North Atlantic swordfish data used as input in ASPIC.

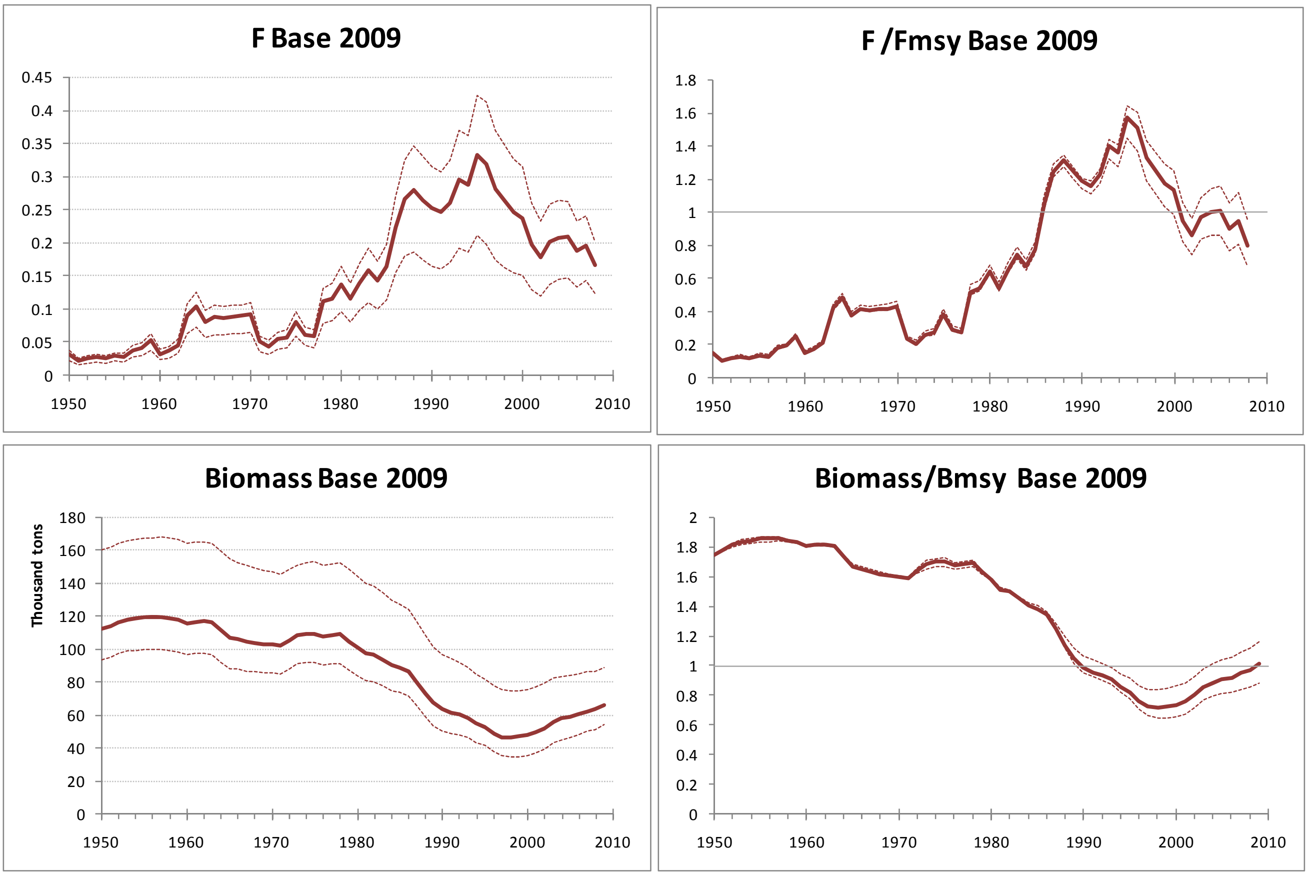


Figure 15. North Atlantic swordfish absolute and relative biomass and fishing mortality estimated by ASPIC base case.

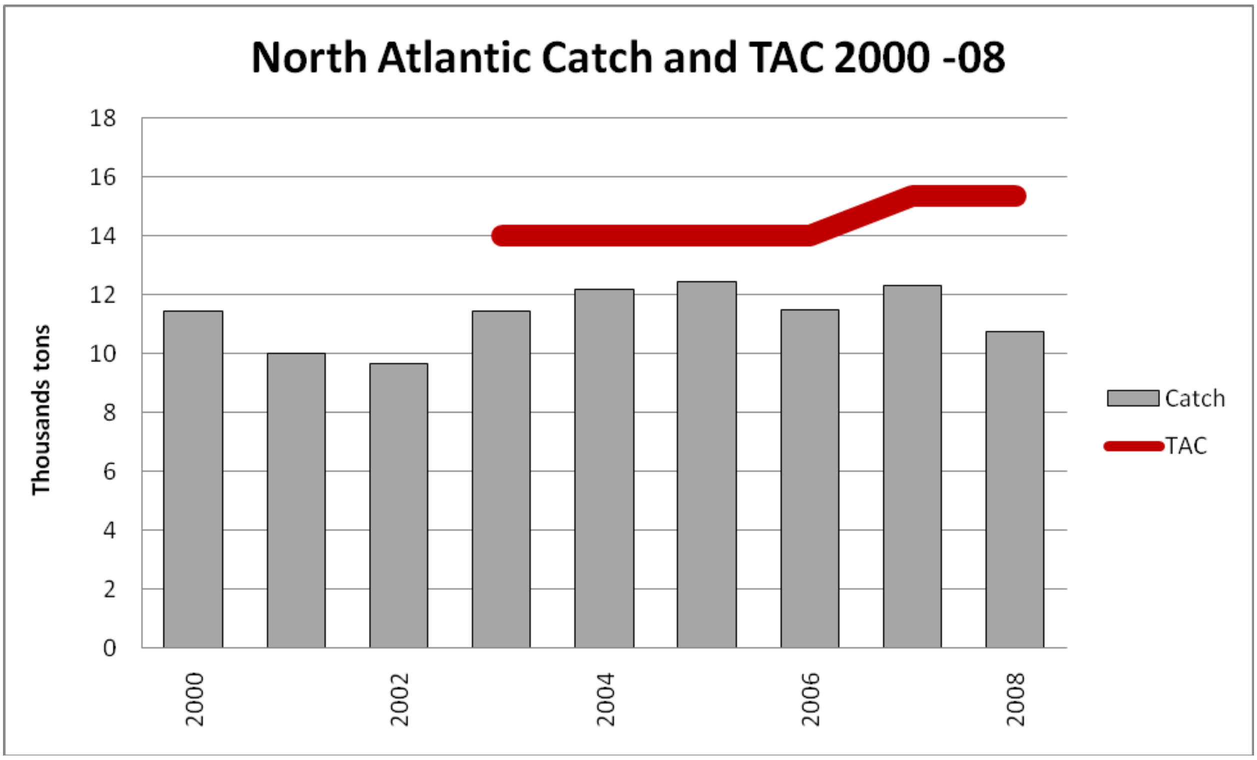


Figure 16. Comparison of North Atlantic swordfish catches and TAC in the recent period.

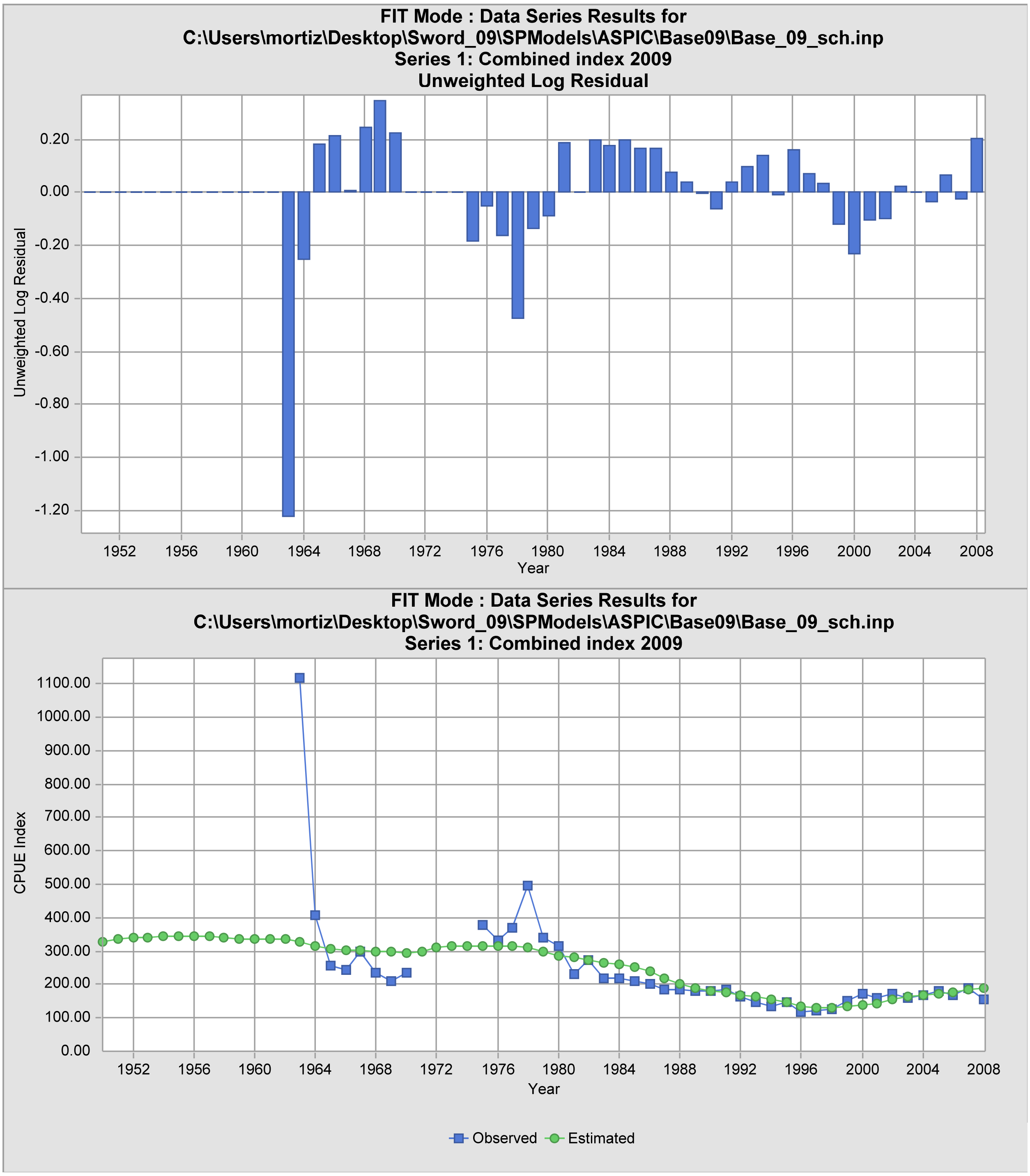


Figure 17. North Atlantic swordfish ASPIC Base case abundance indices fit.

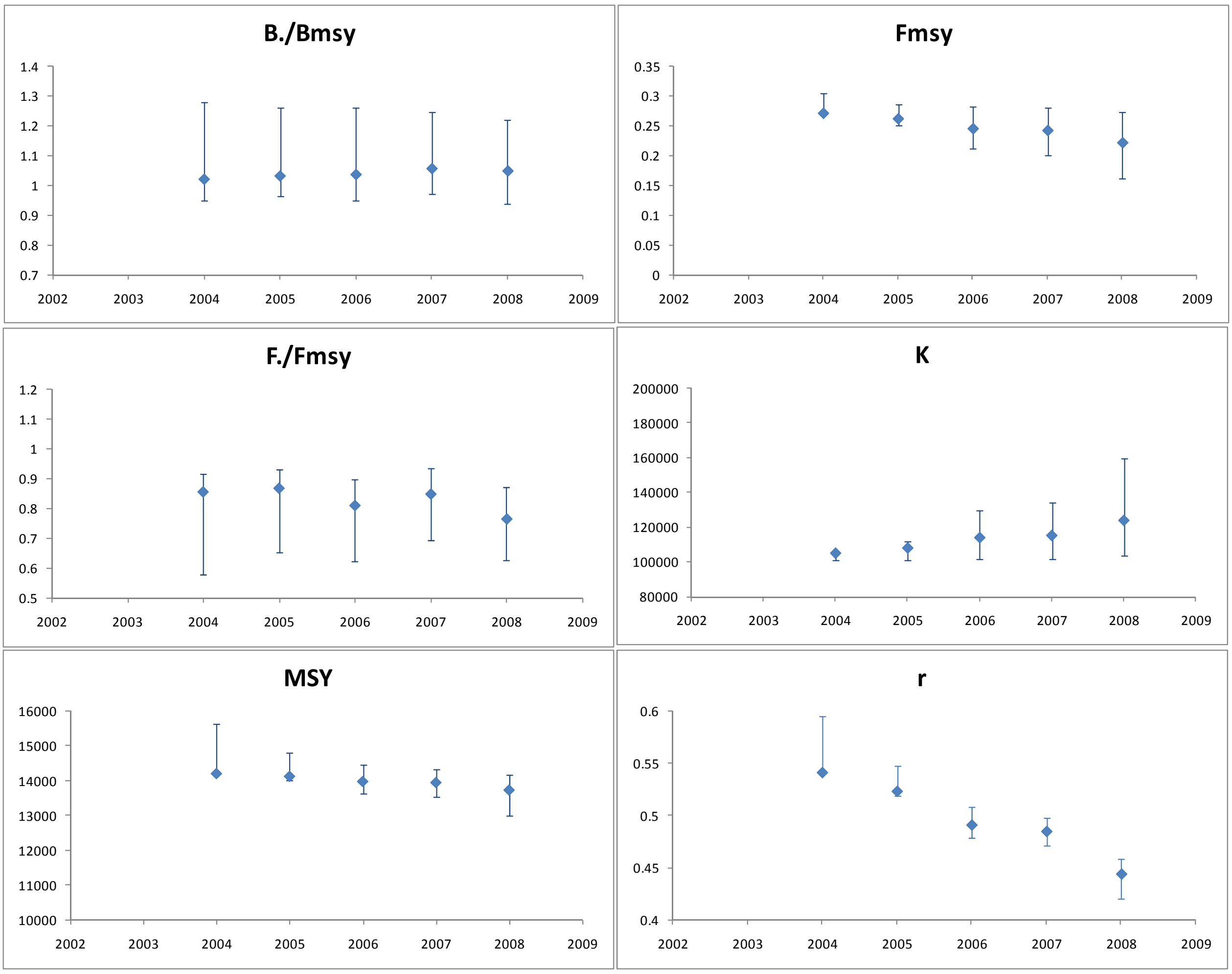


Figure 18. Sensitivity run North Atlantic swordfish ASPIC Base case retrospective estimates benchmarks with estimated 80% confidence intervals.

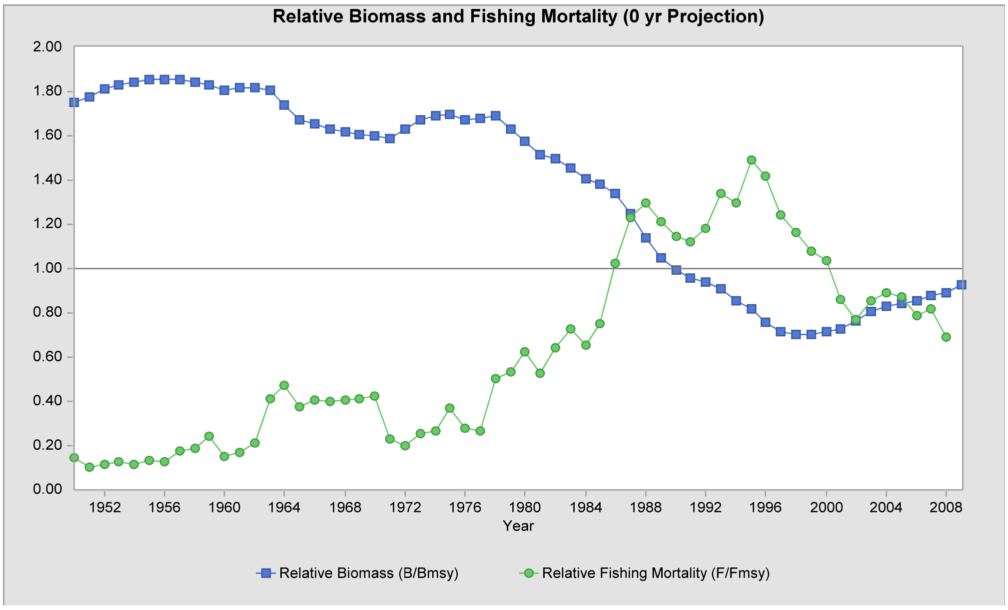
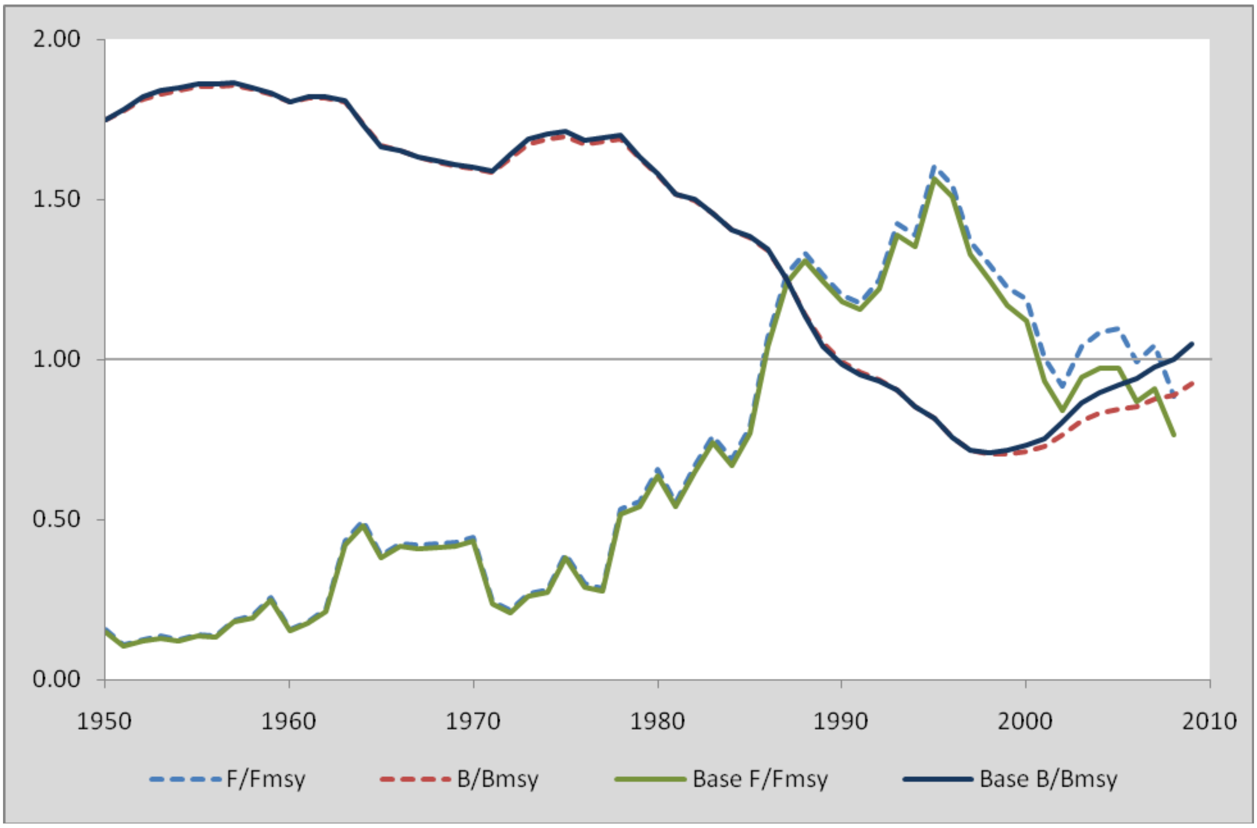


Figure 19. Sensitivity run: North Atlantic swordfish relative biomass and fishing mortality estimated by sensitive run of ASPIC using a combined biomass index of abundance that included all the observations from the United States pelagic fisheries.



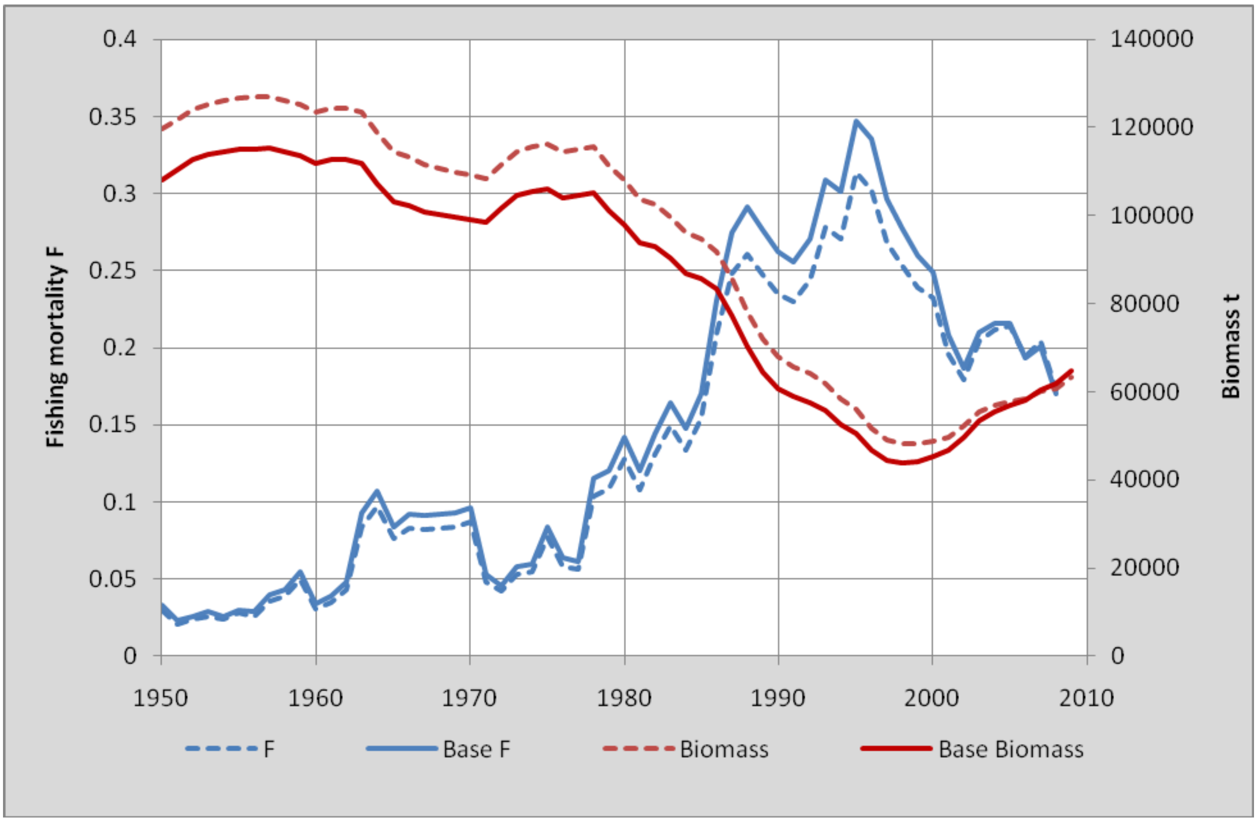
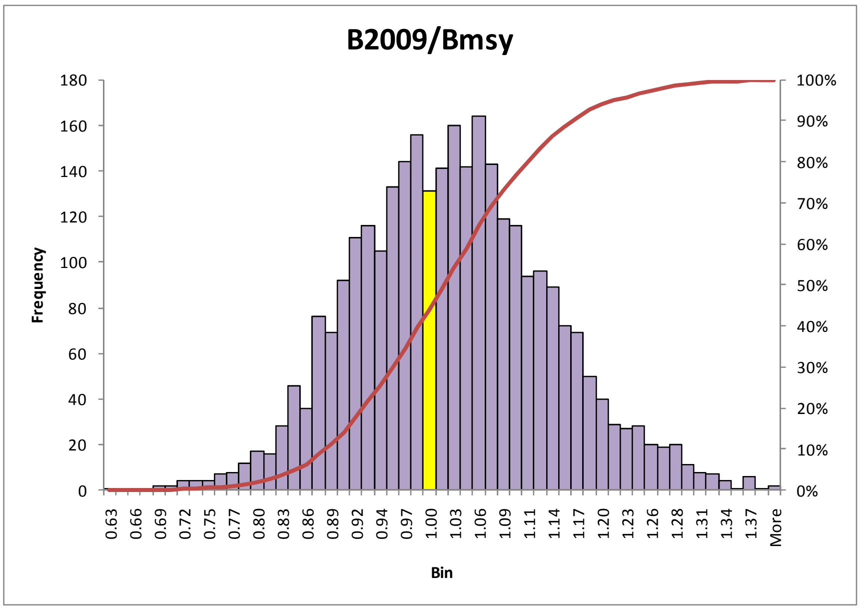


Figure 20 Sensitivity run: comparison of North Atlantic swordfish relative biomass and fishing mortality trends estimated by the base case (solid line) and a sensitivity run (broken line) that included all the observations from the United States pelagic fisheries.



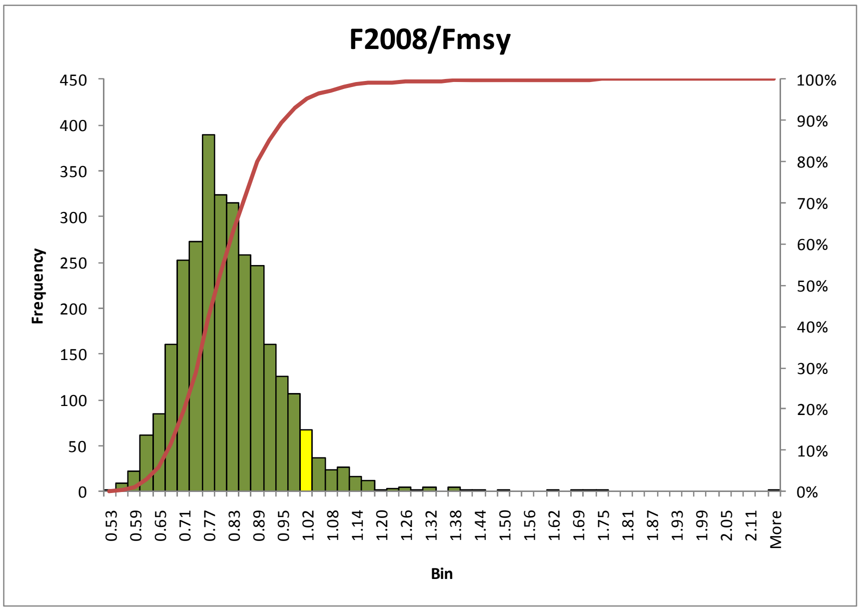


Figure 21. Histograms and cumulative frequency distributions of estimated B2009/B_{MSY} and F2008/F_{MSY} for N-ATL SWO base case 2009. The region highlighted in yellow contains the estimate at reference point of one (B_{MSY}, F_{MSY}).

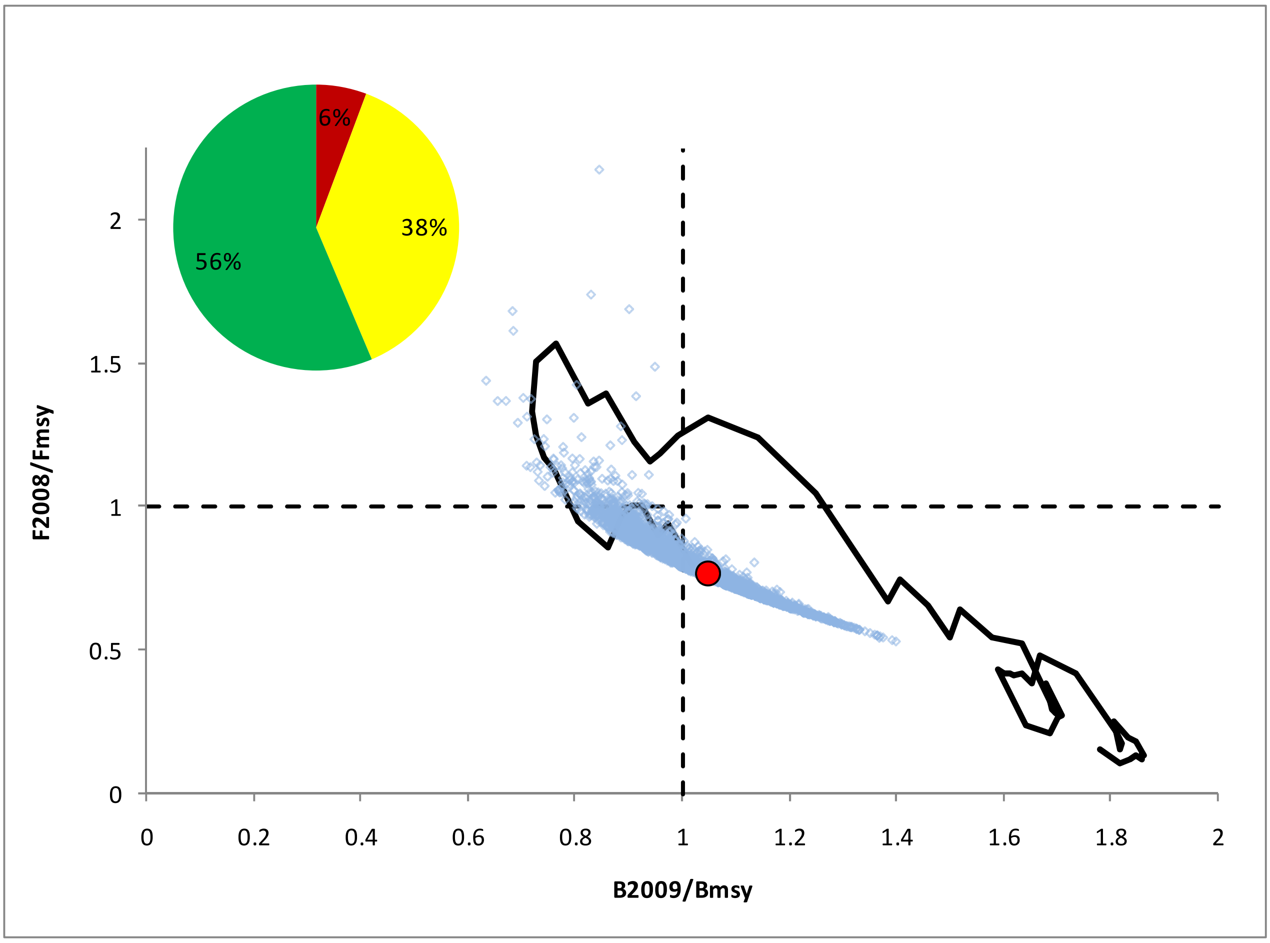


Figure 22. North-SWO: Summary figure of the current northern Atlantic swordfish stock status which includes different representation of the bootstraps results of the base ASPIC base model: percentage, phase-plots (red dot corresponds to the deterministic result) and stock status trajectories for the period 1950-2008.

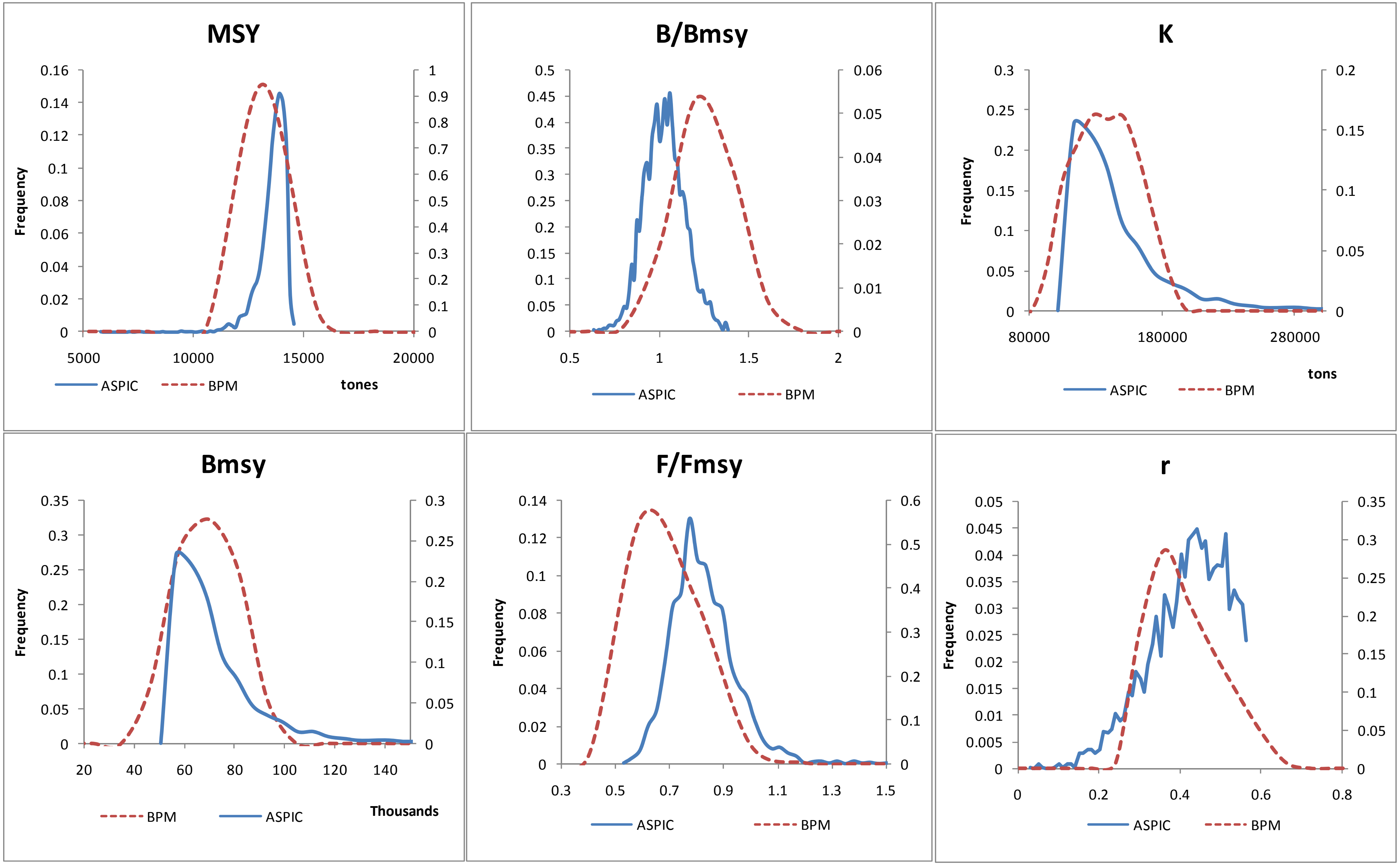


Figure 23. North-SWO: Comparison of the bootstrap estimates from ASPIC base run (solid line) and the posterior distribution from the Bayesian production model (BPM, broken line) of benchmarks estimates for the swordfish northern stock.

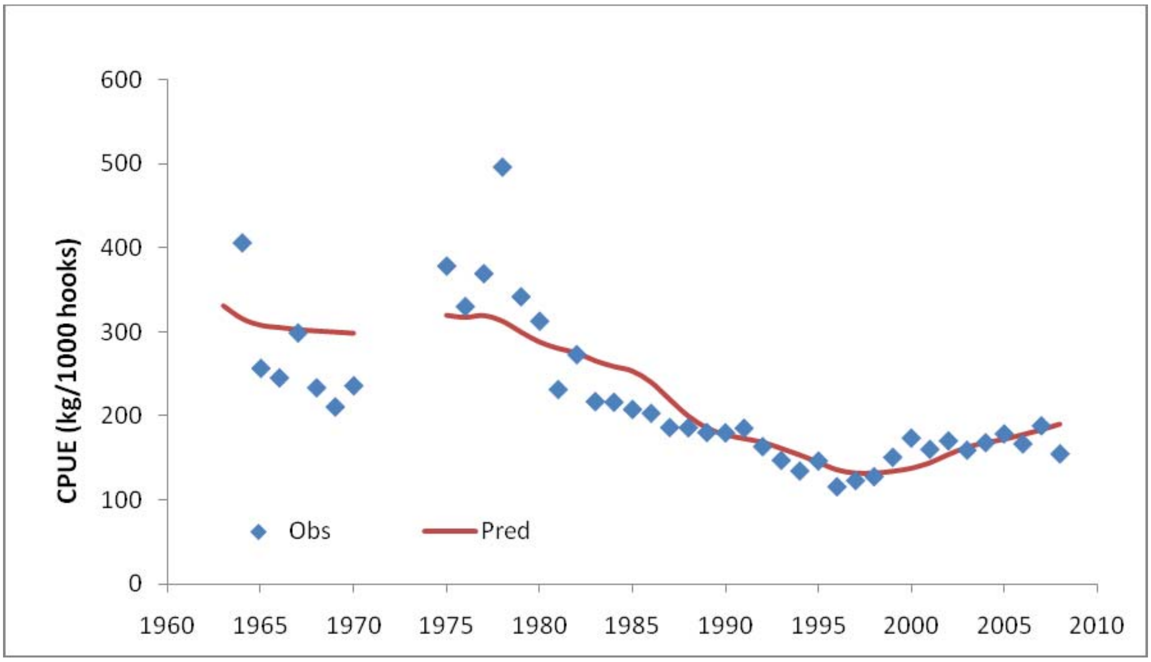


Figure 24. North swordfish: CPUE fit for the Bayesian production model (BPM) for the swordfish northern Atlantic stock.

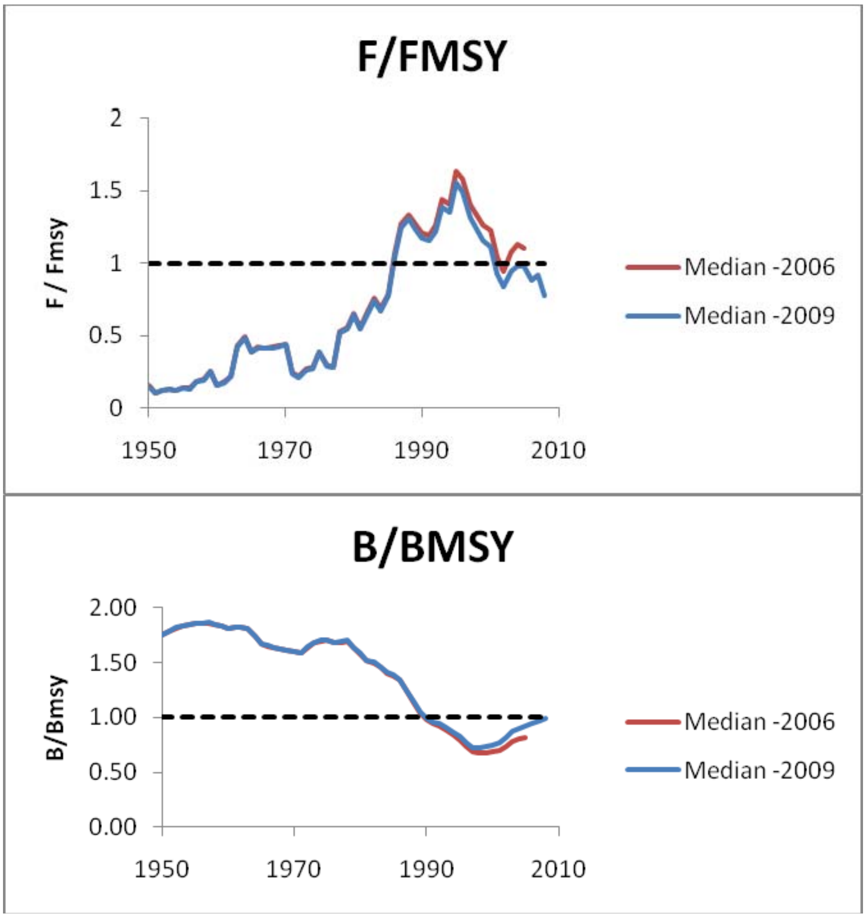


Figure 25. North swordfish: Comparison of biomass and F ratios trends from the ASPIC base models of 2006 and 2009.

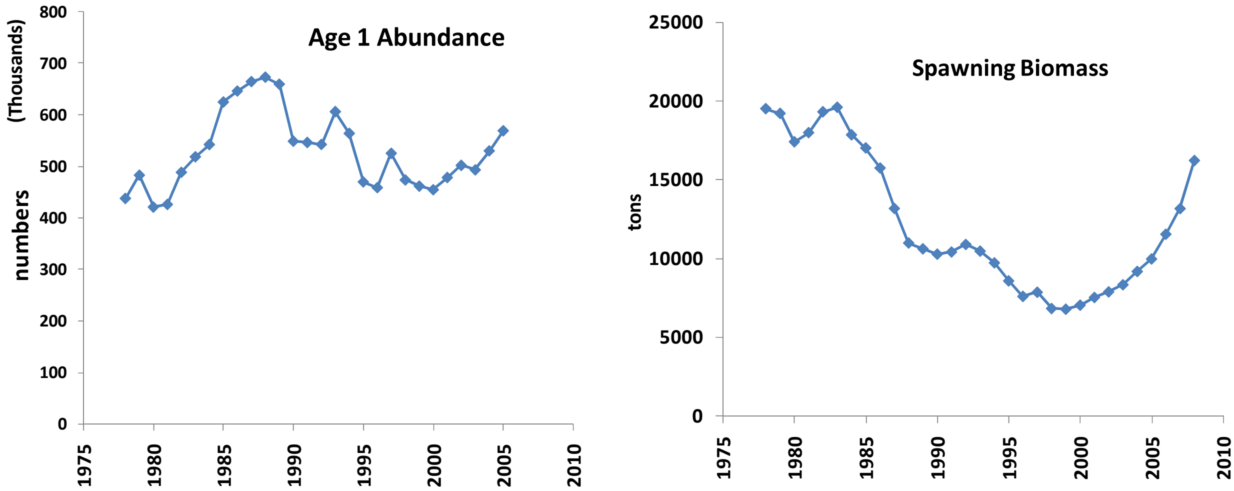


Figure 26. Base VPA estimates of North Atlantic swordfish recruitment and mid-year spawning.

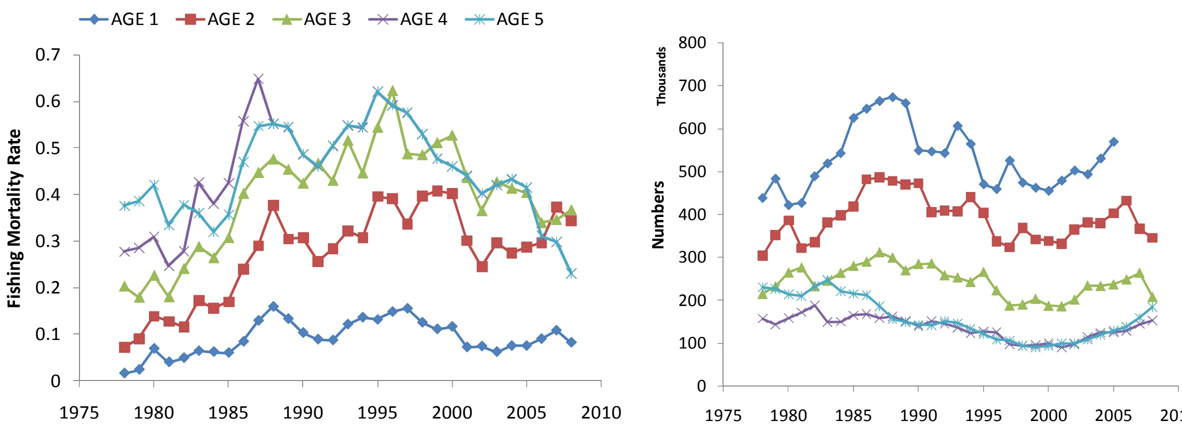


Figure 27. North-SWO: Estimates of fishing mortality rate and abundance of North Atlantic swordfish ages 1-5+ from base VPA.

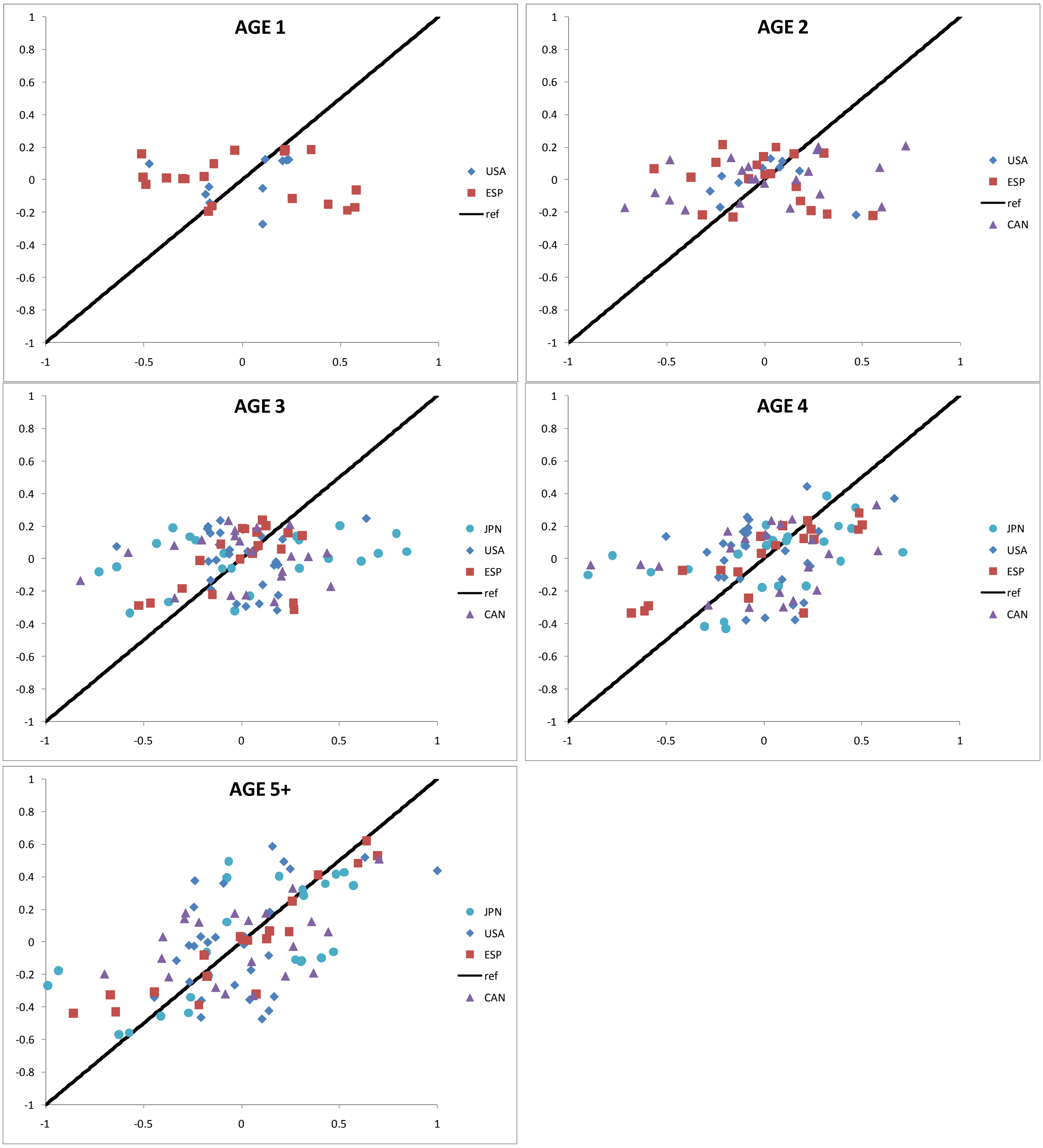


Figure 28. North swordfish: Predicted versus observed values of indices (divided by their respective series means) on logarithmic scale. Squares, triangles, circles and diamonds represent indices from Spain, Canada, Japan and the United States.

Figure 29. South swordfish: Observed indices of abundance (blue line) and estimated index (red line) by the surplus production model (ASPIC) for South Atlantic swordfish.

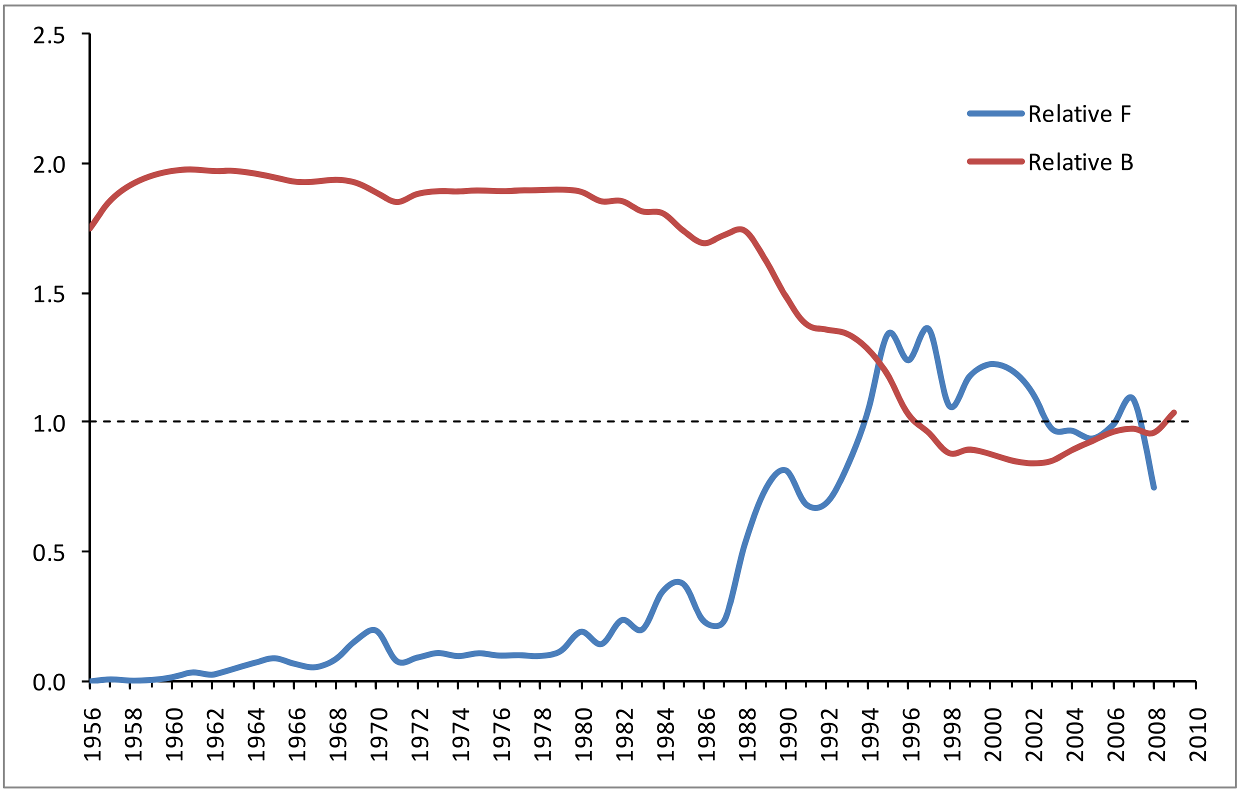


Figure 30. Relative biomass (B/B_{MSY}) and relative fishing mortality (F/F_{MSY}) trajectories estimated by ASPIC for the base case for South Atlantic swordfish.

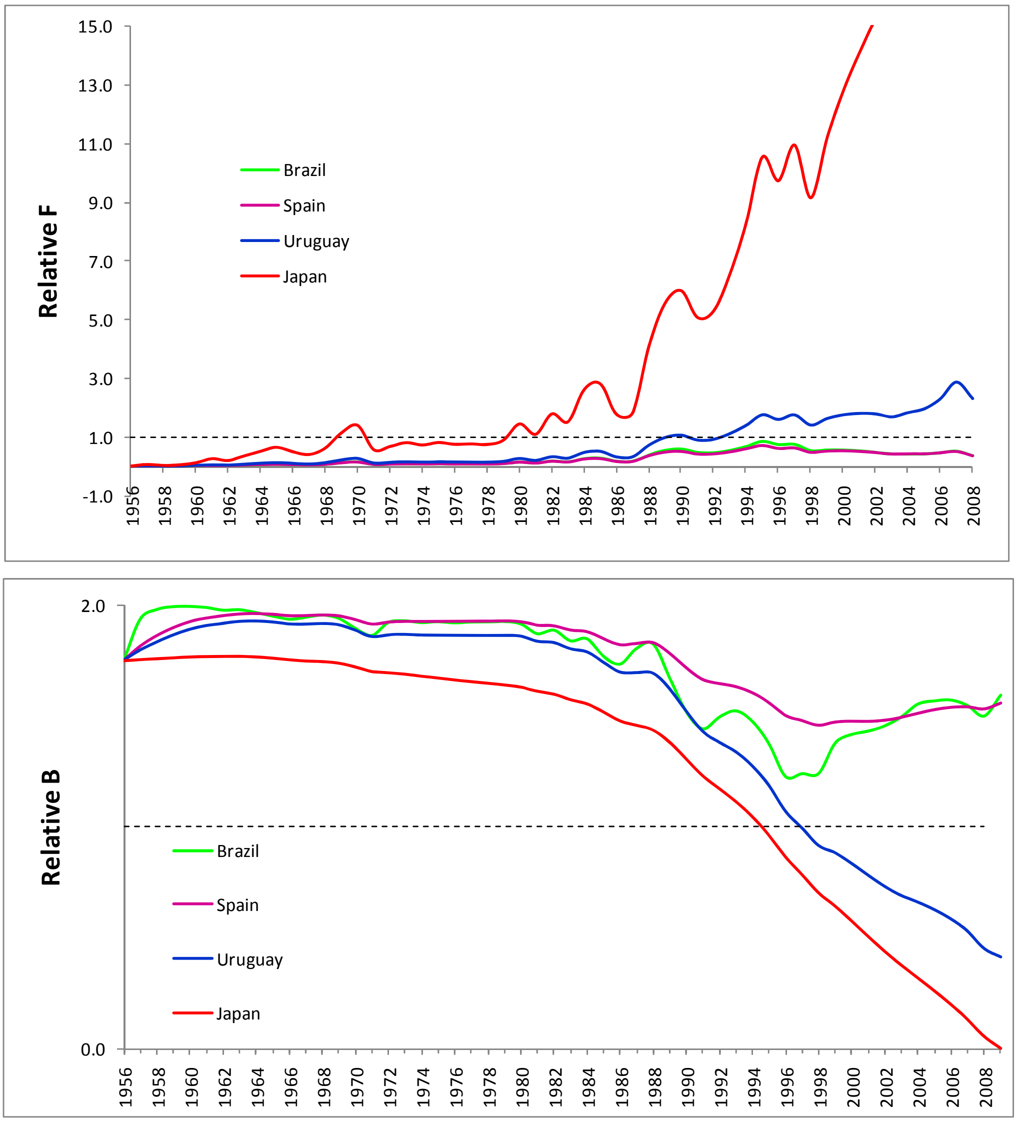


Figure 31. South swordfish sensitivity runs: Relative fishing mortality (F/F_{MSY}) (upper panel) and relative biomass (B/B_{MSY}) (lower panel) trajectories estimated by ASPIC for each individual fleet run for South Atlantic swordfish. Note that there are no trajectories plotted for the Chinese-Taipei fleet as the model failed to converge.

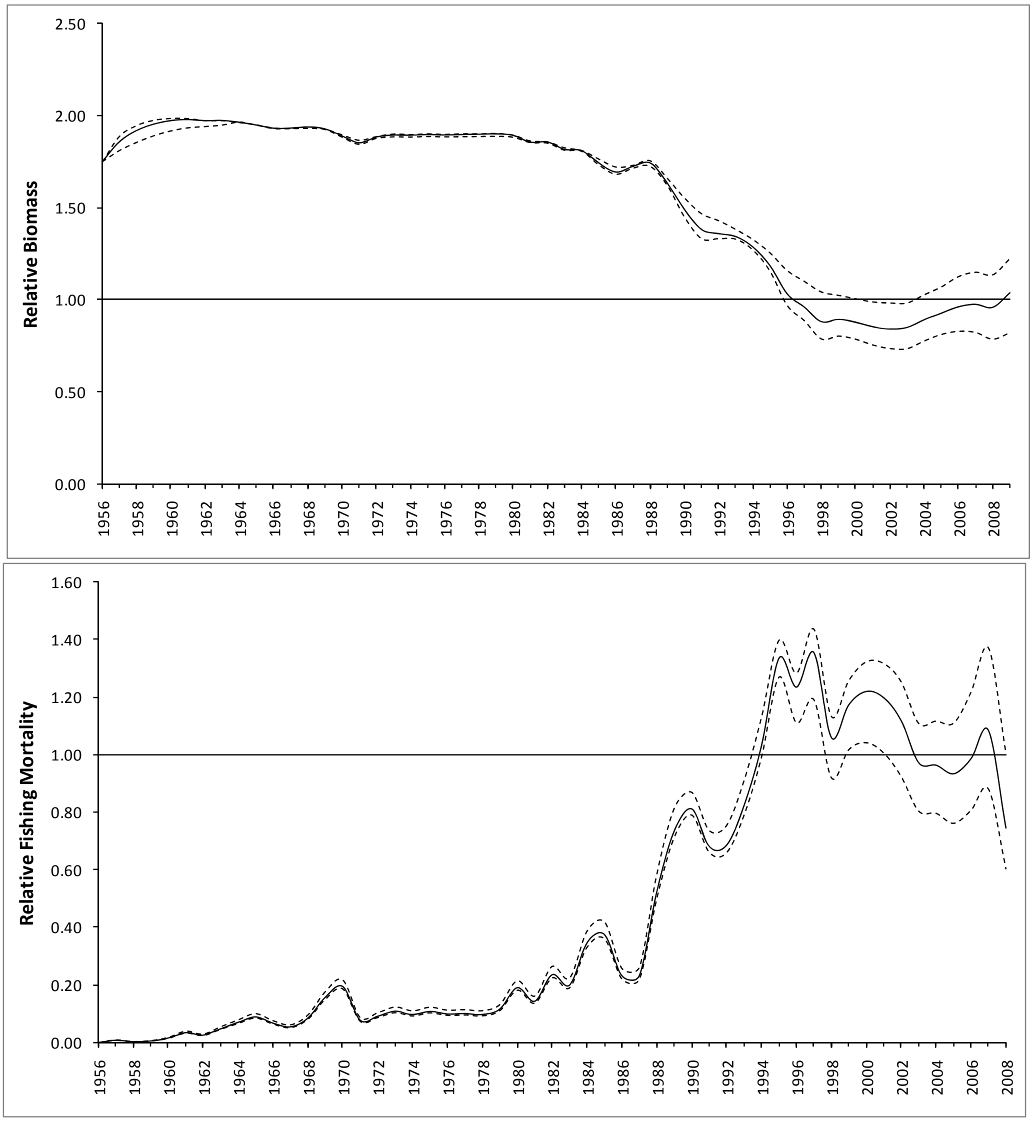


Figure 32. South swordfish: Relative biomass (B/B_{MSY}) (upper panel) and relative fishing mortality (F/F_{MSY}) (lower panel) trajectories estimated by 500 bootstraps of the base case for South Atlantic swordfish. Dashed lines correspond to the 80% confidence interval.

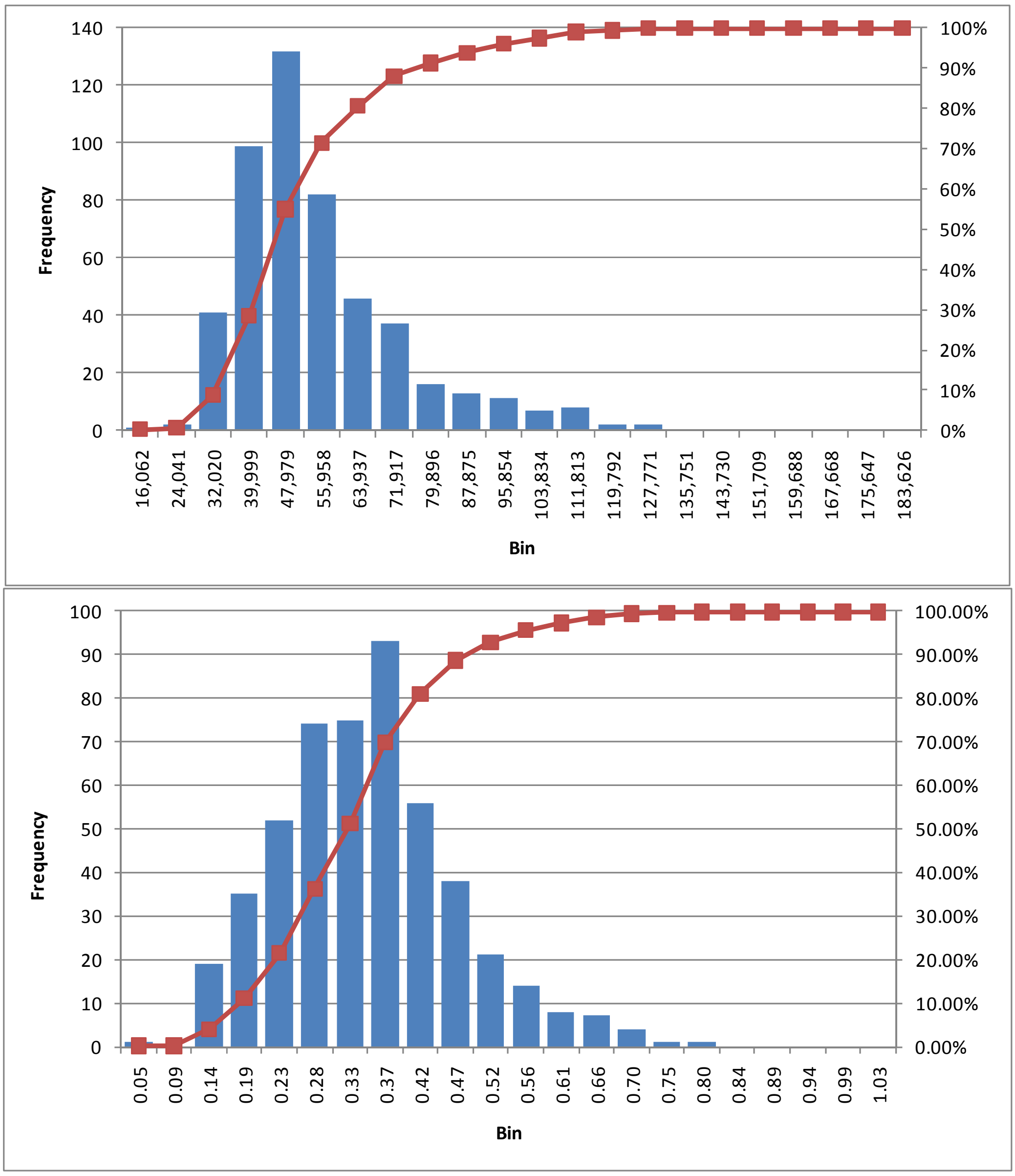


Figure 33. Size frequency distribution of 500 bootstraps of stock biomass (top panel) and fishing mortality F (lower panel) for the base case for South Atlantic swordfish.

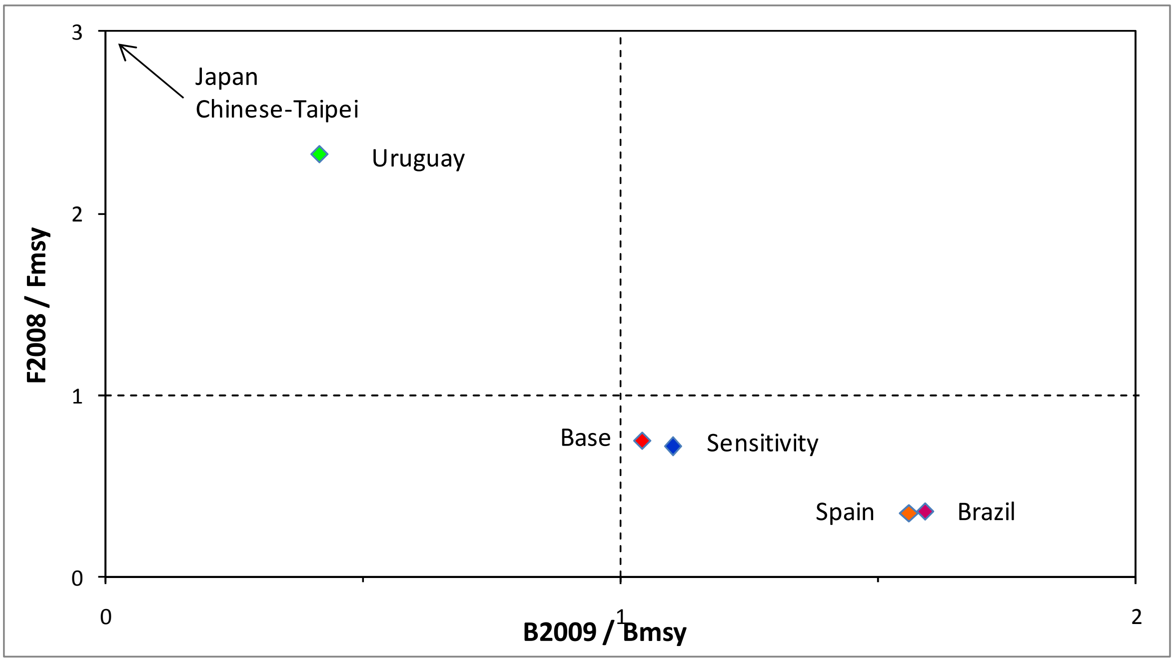


Figure 34. South-SWO: Phase plot of deterministic results for the terminal year for the base case and each of the runs with individual fleets for South Atlantic swordfish. The arrow at the upper left corner indicates that the B_{2009}/B_{MSY} and F_{2008}/F_{MSY} values for the Japanese and Chinese-Taipei are much higher than the range covered by the graph.

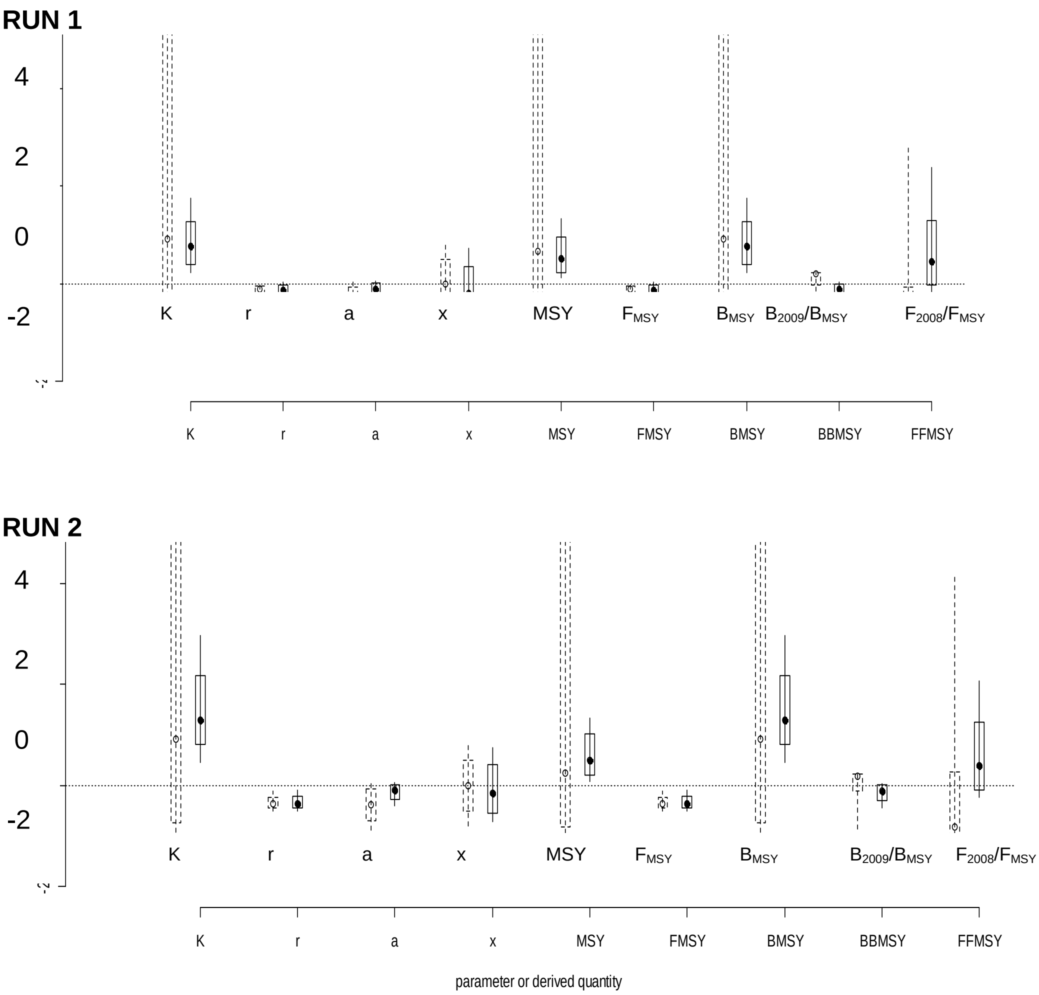


Figure 35. South-SWO: Relative values for priors and posteriors (bottom row) for the COM fitted to catch data from 1950 to 2009 SWO-S. The priors (dashed boxes) and posteriors (solid boxes) were relativised to be in the same scale. The dashed boxes for management benchmarks are the implied priors obtained by running the model only with the priors.

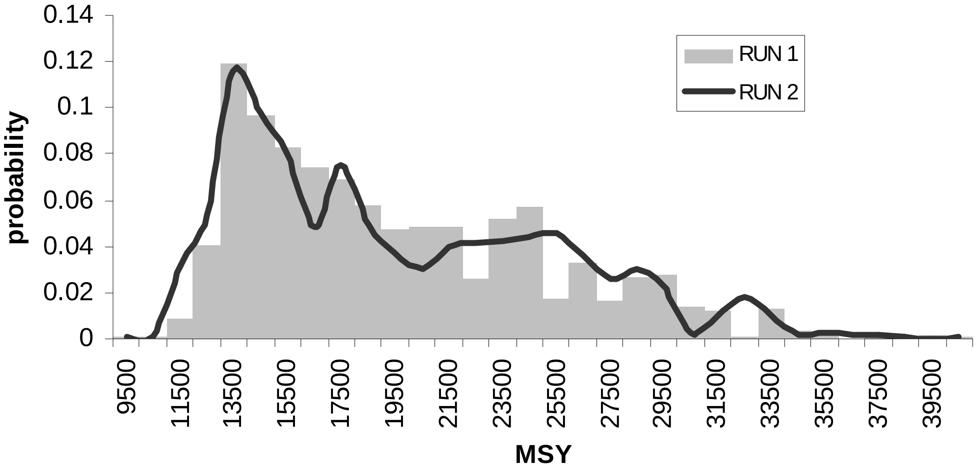
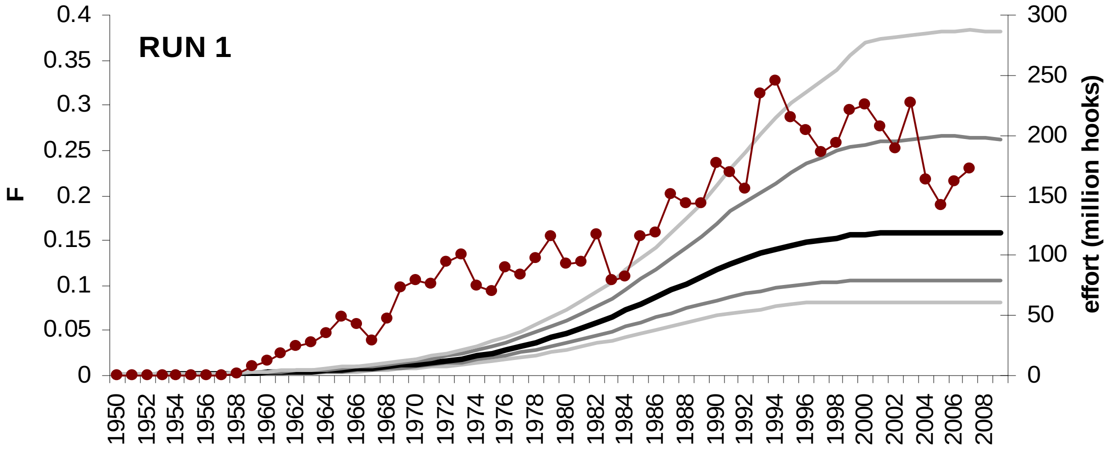


Figure 36. South-SWO: Posterior distributions for MSY from the catch-only model fitted to catch data from 1950 to 2009 for SWO-S. Runs 1 and 2 refer to analyses made with different assumptions for r, the intrinsic rate of population increase.



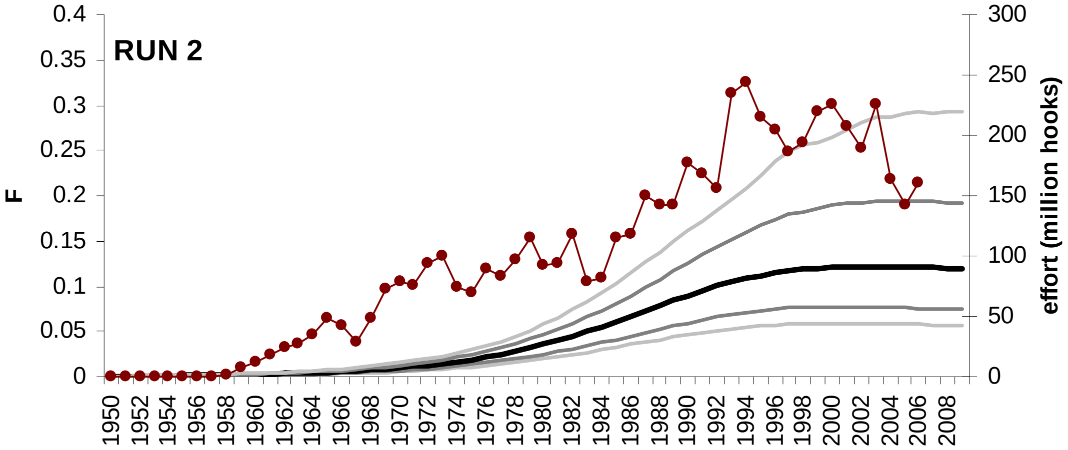
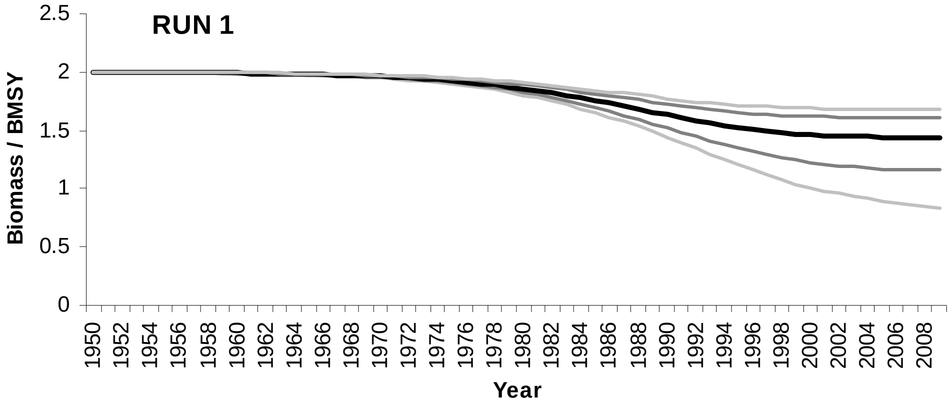


Figure 37. South-SWO: Trajectories for F from the catch-only model for SWO-S, the lines are 10%, 25%, 50%, 75% and 90% percentiles of the posterior distribution, and total longline effort for the South Atlantic (dots).



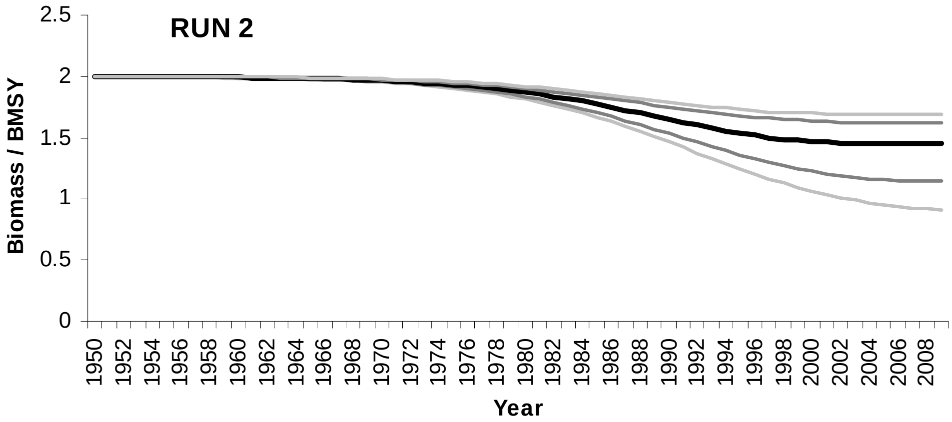


Figure 38. South-SWO: Trajectories for the ratio of biomass over B_{MSY} from the catch-only model for SWO-S, the lines are 10%, 25%, 50%, 75% and 90% percentiles of the posterior distribution.

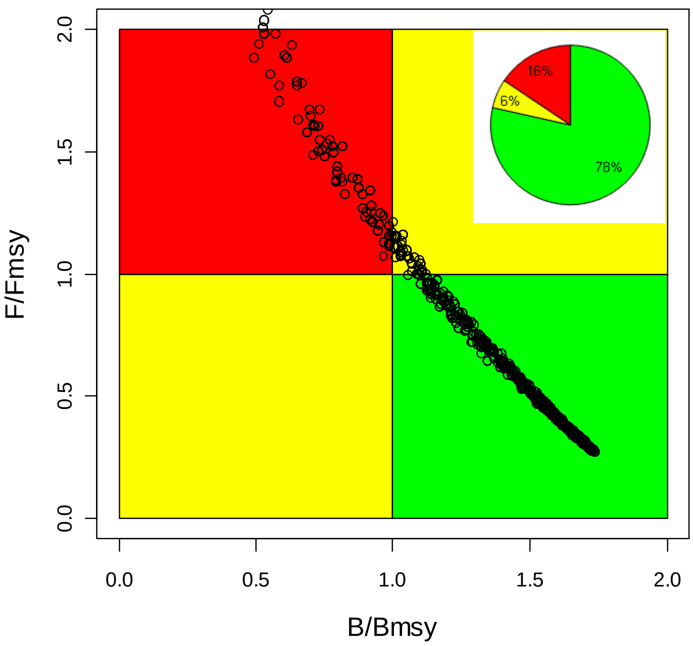
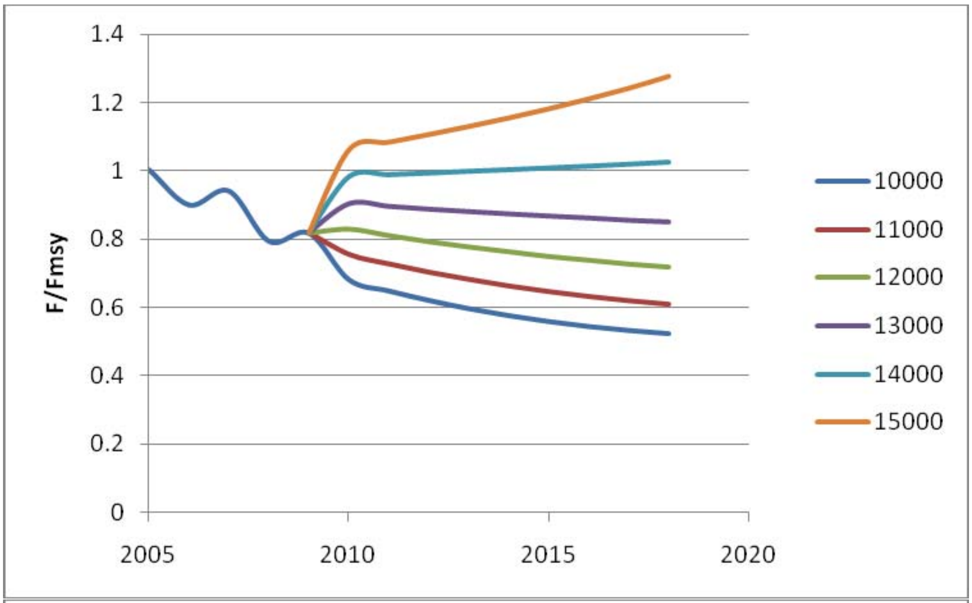


Figure 39. South-SWO: Summary figure of the current southern Atlantic swordfish stock status which includes the level of uncertainty on the knowledge of the state of the stock. Conditioned only on the catches**,** the model estimated a probability of 0.77 that the stock is not overfished and it is not ongoing overfishing.



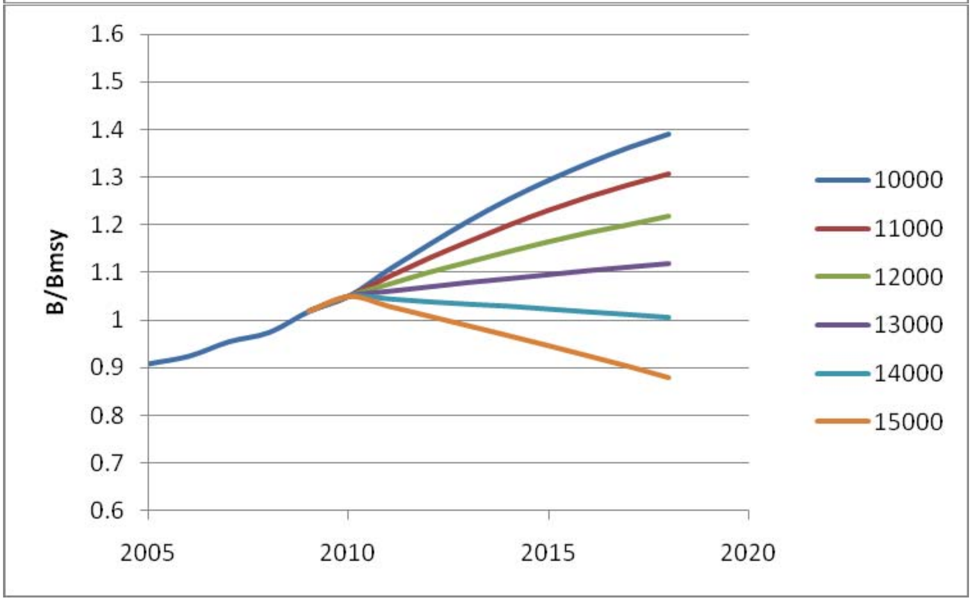


Figure 40. North-SWO: Projections of median relative stock biomass and F from the base ASPICmodel under different constant catch scenarios (10\15 thousand tons) North Atlantic swordfish stock. For 2009, a catch equal to average catches from 2006-08 (11 515 t.) was assumed.

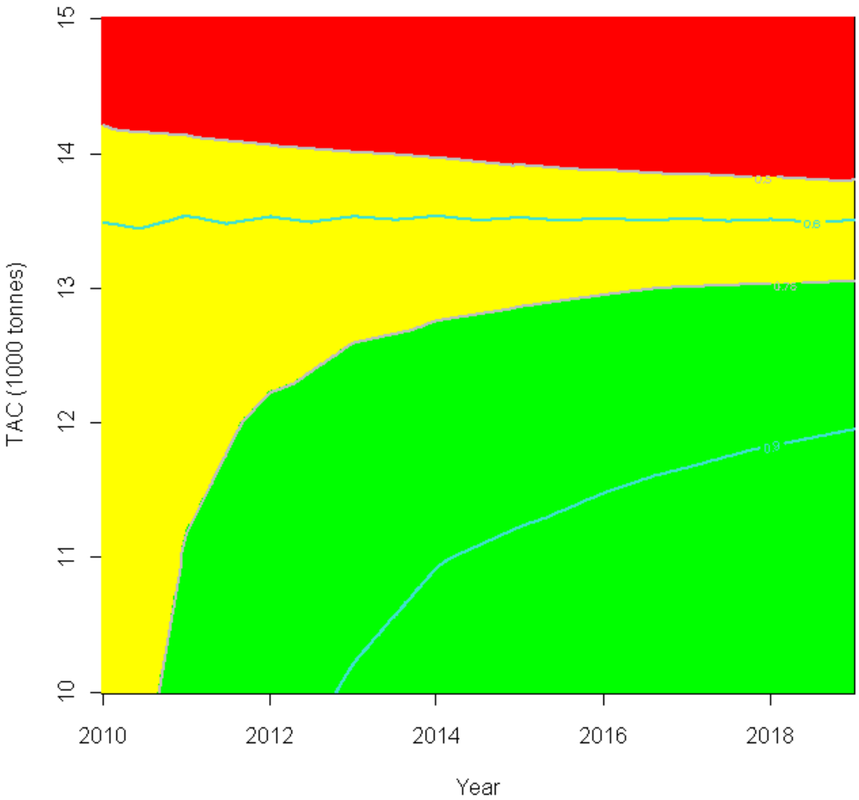


Figure 41. North-SWO: Probability contours of B$\geq$B$_{MSY}$ and F$\leq$F$_{MSY}$ for the constant catch scenarios indicated over time. Red areas represent probabilities less than 50%, yellow from 50-75%, and green above 75%. The 90th, 75th, 60th, and 50th probability contours are also depicted.

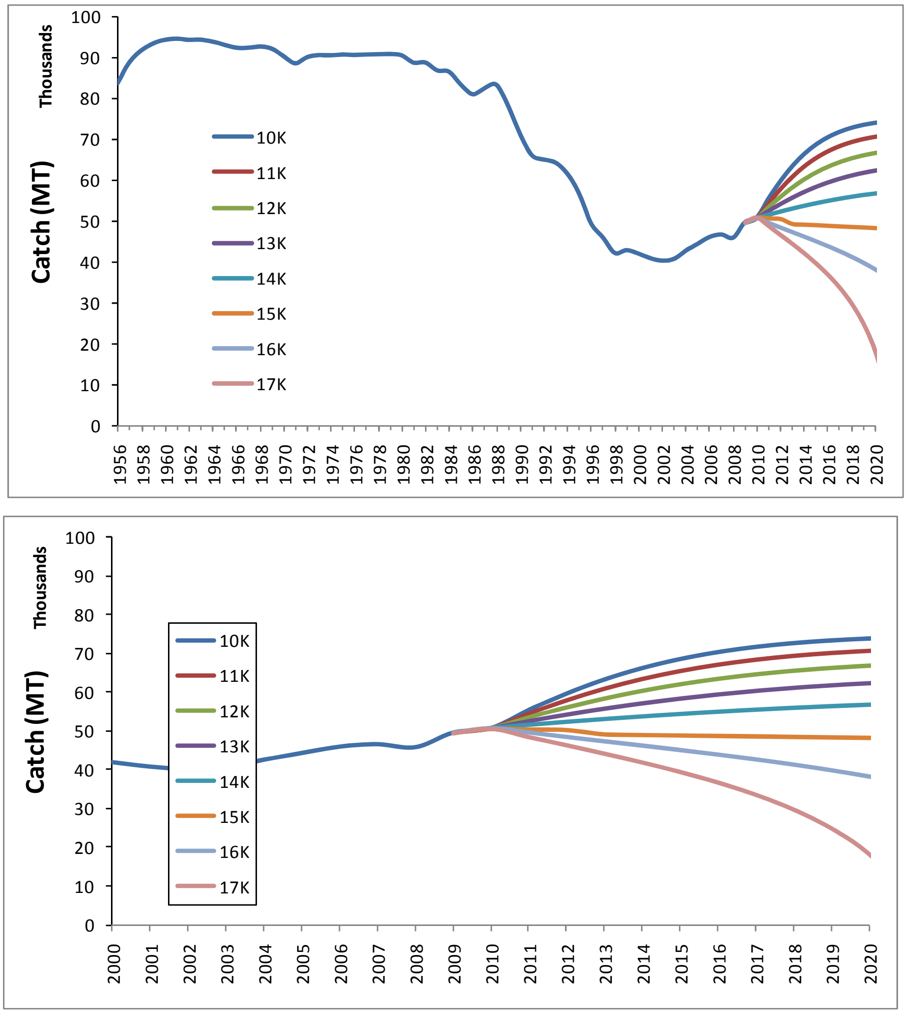


Figure 42. South-SWO: Projected biomass for different levels of catch.

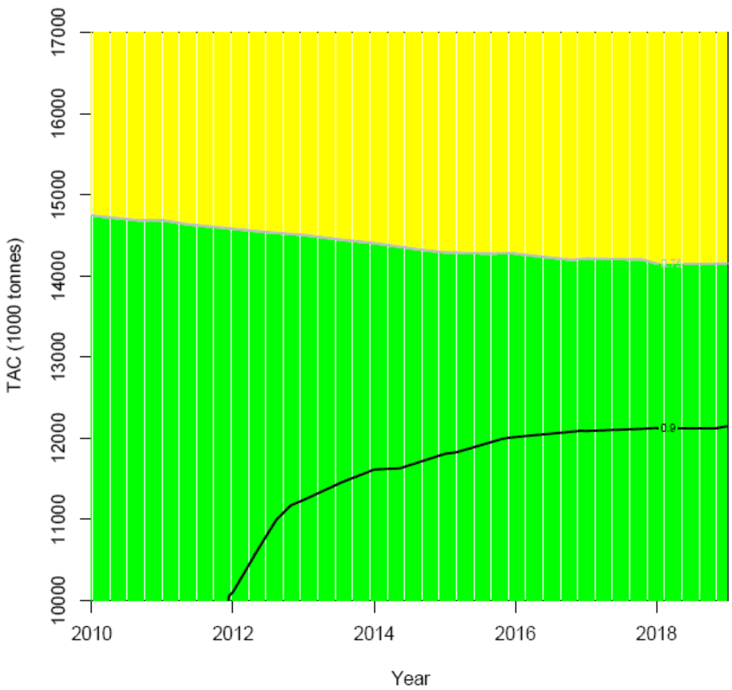


Figure 43. South-SWO: Probability contours of B>B_{MSY} and F<F_{MSY} for the constant catch scenarios indicated over time. Yellow areas represent probabilities from 50-75%, and green above 75%. The 90th, 75th, probability contours are also depicted No probabilities were below 50%.

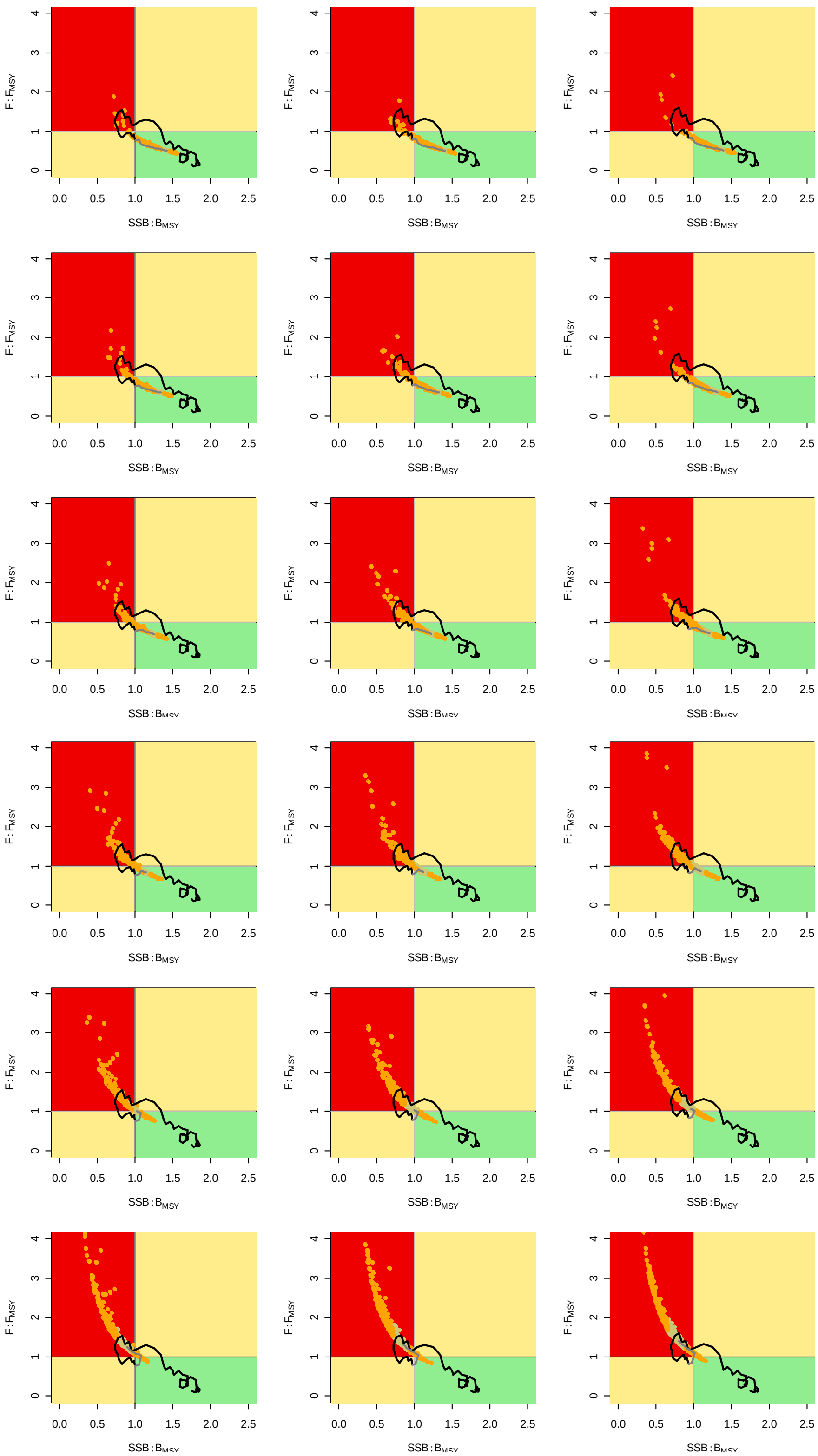


Figure 44. Kobe plots for North Atlantic swordfish showing probability of being in one of the Kobe plot quadrants. Rows correspond to scenarios (low, 09 and high) and rows to TAC (10,000, 11,000, 12,000, 13,000, 14,000 and 15,000 tonnes).

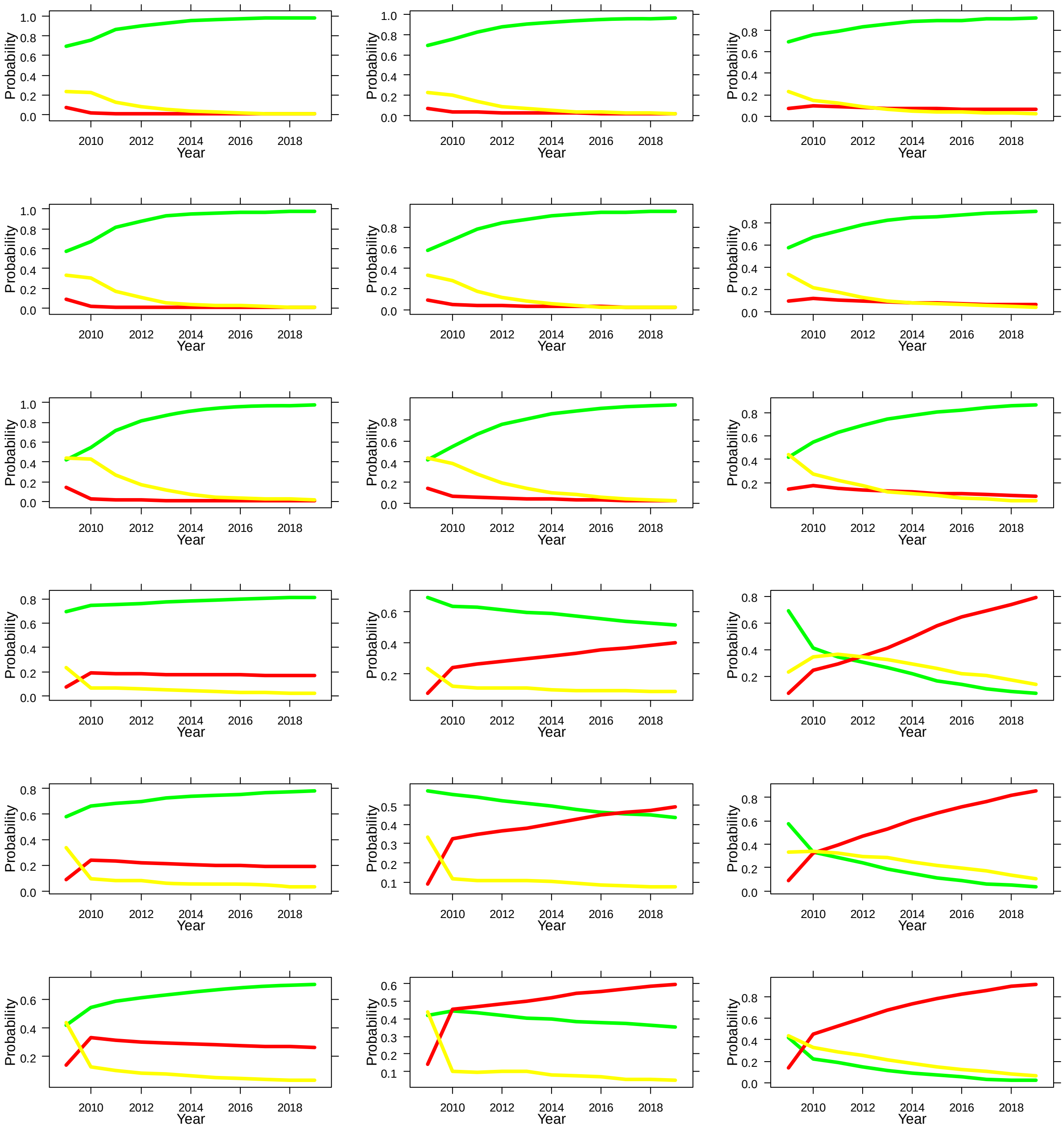


Figure 45. Kobe plots for North Atlantic swordfish showing median historic stock (black line) and projected (grey line) trajectories, points correspond to individual realisations in 2019. Rows correspond to scenarios (low, 09 and high) and rows to TAC (10,000, 11,000, 12,000, 13,000, 14,000 and 15,000 t).