REPORT OF THE 2013 ATLANTIC SWORDFISH DATA PREARATORY MEETING

(Madrid, June 3 to 10, 2013)

1. Opening, adoption of the Agenda and meeting arrangements

The meeting was held at the ICCAT Secretariat in Madrid from April 22 to 26, 2013. Dr. Pilar Pallarés, on behalf of the ICCAT Executive Secretary, opened the meeting and welcomed participants ("the Group").

Dr. John Neilson, swordfish Coordinator, chaired the meeting. Dr. Neilson welcomed meeting participants ("the Group") and presented the general arrangements of the meeting. Dr Neilson proceeded to review the Agenda which was adopted with some changes (**Appendix 1**).

A list of meeting participants is attached as **Appendix 2** and the list of scientific documents presented at the meeting is attached as **Appendix 3**.

The following participants served as Rapporteurs for various sections of the report:

Section	*Rapporteurs*
1, 13	P. Pallarés
2	I. Andrushchenko
3, 4, 5, 6, 7	M. Neves dos Santos, R. Forselledo, C. Palma, M- Ortiz
8	G. Díaz, L. Kell, J. Walter, M. Schirripa
9	C. Brown, T. Frédou
10	L. Kell
11, 12	J. Neilson

2. Review of historical and new information on biology

No new documents on biology were submitted to the Group. However, two recently published papers pertaining to biology of swordfish were made available to the Group for consideration.

The Group considered revisions to length weight relationships for Atlantic swordfish, based on information presented by the Secretariat. At the present, the SCRS uses several weight - size relationships for the north (N-SWO) and south(S-SWO) stock units. These include particular weight - size relationships for sub-stocks units, as follows: Northwest Atlantic (NWA-SWO), North central Atlantic (NCA-SWO), and North East Atlantic (NEA-SWO) for the N-SWO, and Southeast Atlantic (SEA-SWO) and Southwest Atlantic (SWA-SWO) for the S-SWO. **Table 1** summarizes the relationships currently in use. It was noted that the relationships rely on different types of weight (gutted, dressed or round) and length (lower jaw fork length – LJFL, eye fork length EYFL) measurements. Plots of the predicted weight at size show very similar trends for all power functions, except for the SW-ATL (Amorin et al. 1979) which departs substantially from all other relationships by estimating larger weights for a given length. In some cases, differences in predicted weight could be from 34% to 75% higher (LJFL 50 - 200 cm) (See **Figure 1**). A detailed review of the SW-ATL equation (Amorin et al. 1979) showed that the estimated parameters do not match the plot presented in this document or the authors' conclusions. Furthermore, in consultation with Brazilian scientists, an updated document was presented in 2001 (Hazin et al., 2001) for the SW-ATL weight size relationship of swordfish (**Table 1**).

When the SW-ATL relationship (Amorim et al. 1979) is excluded, the rest of the Atlantic weight-at-size relationships are in close agreement for fish in the 50-250 cm LJFL size range. Although the relationships are sub-stock and area specific, limitations in information on geographical distribution of the historic catches results in a level of uncertainty in these stratifications. In addition, catch and effort data for the main swordfish fisheries between 1960 and 2011 are reported in overlapping strata, making appropriate sub-stock area-specific division of catch-at-size very difficult. Finally, the mix of different types of weight and length measurements contributes to the difficulty of generating appropriate catch-at-size. Given the issues described above, the Secretariat Statistical Group proposed the following:

1-. Consolidate to weight - size relationship for each stock unit and generate one relationship for the north (N-SWO) and one for the south (S-SWO) Atlantic stock, all based on LJFL generated from reliable round weight data.

2-. Exclude the SW Atlantic (Amorim et al. 1979) relationship, until it can be verified and updated. The revised relationship for SW Atlantic in Hazin et al. (2002) could be included.
3-. Continue to use Atlantic-wide conversion factors for size from Eye-Fork (EYFL) to LJFL (Rey Gonzales-Garces 1978), and Opercula-Fork (OPFL) to LJFL (Rey Gonzales-Garces 1978)
4. Continue to use stock conversion factors for weight (dress or gutted) to (round) for the North (Turner 1987, Mejuto et al. 1988) and South (Mejuto et al. 1988).
5. The proposals above will be considered interim solutions and it is recommended that these morphometric relationships be supplemented with original data and updated with new, more recent data. It is also recommended that estimates of variance for the estimated parameters be provided (see Recommendation section).

Appendix 4 summarizes the actual methods, inputs and output of the above proposal. Briefly, the combined size weight relationship in Item 2 were estimated as the geometric mean of the corresponding available functions N-SWO (Turner 1987 - NWA-SWO; Mejuto et al. 1988 - NCA-SWO; Mejuto et al. 1988 NEA_SWO), and for the south-SWO (Mejuto et al. 1988 - SEA-SWO and Hazin et al. 2001 - SWA-SWO) all in common units of weight and size (round weight kg, LJFL cm). **Figure 2** compares the proposed combined weight size relationships against the individual, sub-stock specific relationships. The proposed combined weight conversion factors (**Table 2)** were averaged from the sub-stock specific weight conversion factors.

3. Review of Task I data

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 1800's in the NW Atlantic. Other directed swordfish fisheries include longline fleets from Brazil, Morocco, Namibia, EC-Portugal, South Africa, Uruguay, and Venezuela, among others. Additionally, some driftnet activities occurred 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. However, in recent years some of the fleets that traditionally caught swordfish as a by-catch, have opportunistically target it.

3.1.1 Total Atlantic

The Atlantic wide total catch of swordfish (North and South, including reported dead discards) estimated for 2011 (23,888 t) represented a slight decline from that in 2010 (24,209 t). 2011 catches should be considered provisional and subject to further revision. **Figure 3** shows the evolution of swordfish overall catches in the Atlantic Ocean, the catches in the Northern and Southern stocks and the respective TACs.

3.1.2 North Atlantic

For the past decade, the North Atlantic estimated catch has averaged about 11,704 t per year (**Table 3** and **Figure 3**). The catch in 2011 (12,834 t) represents a 37% 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, reduction in fishing effort, 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 these species previously considered as by-catch in some fleets. Recently, socio-economic factors may have contributed to the decline in catch.

3.1.3 South Atlantic

The historical trend of catch can be divided in two periods: before and after 1980. The first period was 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 21,930 t in 1995, levels that match the 1987 peak of North Atlantic harvest (20,236 t) (**Table 3** and **Figure 3**). 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 2011, the 11,055 t reported catches were about 50% lower than the 1995 reported level.

3.2 Fisheries description

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

Brazil: From 2008 to 2011, the Brazilian swordfish catches were: 3407 t (2008), 3386 t (2009), 2926 t (2010), 3033 t (2011). In 2009 catches were kept at the same level as 2008, but decreased slightly (around 400 t) in 2010 and 2011, mainly due to a significant reduction of the fishing activity from the Port of Santos. There are two main fishing grounds which are exploited by the Brazilian fleet: an equatorial area, between 5ºN and 5ºS, and another one, in the southern coast, around Trinidad Island (~20ºS). 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 2012 (1,488 t) represent a decline since that time, but this total does not yet account for dead discards. The distribution of longline catches has changed since the last stock assessment in 2009. There were fewer trips east of the Grand Banks due to a lack of persistent warm core rings and sharp horizontal temperature gradients indicative of productive fishing, the high cost of fuel and an abundance of swordfish closer to shore. 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.

EU-Spain: An extensive description of the recent changes in the North and South Atlantic fisheries is included in several paper submitted to the Group (SCRS/105, 106, 107, 108) including North and South nominal catch per effort information for the period 1986-2011. No relevant changes have occurred since the last assessment in the case of the North Atlantic Spanish fleet. Landings in the total Atlantic during the recent period 2010 and 2011 were 9948 t and 9589 t. There were also consolidated changes in the Spanish fisheries operations in most recent period in additon to those produced by regulations. As previously reported, the North Atlantic fleet has kept a multi-species fishery due to changes in quotas and the market (increases in the price of other species). Additionally, most of the vessels have already been using the monofilament gear. Recent studies indicate that the monofilament longline regularly show 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.

EU.Portugal: The Portuguese pelagic longline fishery started in the late 1980's in the North-eastern Atlantic, and gradually expanded to other Atlantic areas (first catches in the Southern Atlantic occurred in 1995). Currently, the fleet catches swordfish over a wide geographic area throughout the Atlantic Ocean. Most of the fishing effort is concentrated in the North-eastern Atlantic, between the Portugal mainland and the Azores. Other important fishing grounds include the North-eastern tropical, the Equator and the southern Atlantic areas. The Portuguese swordfish catches reached a peak of 2092 t in 1996. The landings in 2012 (1,447 t, of which 1,167 were caught above 5ºN) represent a decline since that time. The average landings for the last decade (2003-2012) have been of 1352 t. There were some changes in the Portuguese swordfish fisheries since the late 1990's, as reported over the past decade. The fleet has kept a multi-species fishery due to changes in the market (increases in the price of other species, e.g. sharks and tropical tuna) and management regulation. On the other hand, a shift of some vessels out of the Atlantic occurred between 2001-2007, particularly to the Indian Ocean. Additionally, all vessels have witched from the traditional multifilament to monofilament gear since mid-2000's. The fishery has been managed with Individual Quotas for a number of years, but since 2013 an Individual Transferable Quotas system has been implemented.

Japan: In the North Atlantic Japanese longliners primarily target bigeye and bluefin tuna, whereas swordfish is caught as by-catch (being an important component of it). The amount of fishing effort has decreased largely in the 1990s, was and has leveled off since 2000. In the northern region of the north Atlantic (north of 20ºN) there is a notable decreasing tendency since 2005. In 2011fishing effort amounted to only 10% of the 2005 level. In the tropical north Atlantic (south of 20º N), the fishing effort shows a general increasing trend. The fishing effort was exerted in a wide area of the north Atlantic from the south of Iceland to the central tropical waters off Africa. There was a tendency of higher concentration of fishing effort in the temperate north Atlantic between 25ºN and 35ºN. The seasonal distribution clearly indicated a high concentration of fishing effort in areas such as the south of Iceland, off east coast of North America, as well as tropical areas (south of 20ºN). In the previous two areas, fishing takes place from the 3rd quarter to the 1st quarter, while the tropical fishing grounds are fished all year round. Catches of swordfish show a decreasing trend in recent years. In 2012 the catches amounted to about half of that in 2007, primarily due to the decrease of effort in the western temperate Atlantic where relatively higher CPUE of swordfish is obtained. In the South Atlantic Japanese longliners primarily target bigeye and southern bluefin tuna, with swordfish beings caught as by-catch. In the tropical Atlantic fishing effort has demonstrated an upward trend during the mid-2000s. The fishing effort was exerted in a wide area of the south eastern Atlantic, from tropical waters to off South America. In 2010 and 2011, fishing effort was observed in the waters off Uruguay. The amount of effort peaked in the mid-1990s and showed a sharp decreasing trend to 2000, when it leveled off. The average amount of effort in the 2000s has been about half of the mid 1990s level. Followed by decreasing effort, catch of swordfish also decreased from about 5,000 t in 1993 to 700–800 tons in the first half of the 2000s. These lower catches during the first half of the 2000s were affected by the discards and released activities of the northern stock, as many of the Japanese longliners operated in the stock boundary area. The reported catch increased to 2,150 t in 2007 and then decreased to 900 t in 2011.

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 (2003), off southern Morocco Atlantic coast between the latitudes 20° and 26° N. This swordfish fishery is conducted by freezer longliners that are equipped with drifting longlines (marrajera). These fishing units primarily target swordfish, but they also capture yellowfin and bigeye tunas, and sharks. The annual average size of swordfish ranged between 126 and 152 cm, with a slight overall decreasing trend during the period 2003-2010. This fishery is relatively recent compared with other traditional tuna and tuna like species fisheries. This fishery has known a remarkable development in recent years in terms of catches. It occurs throughout the year, with higher catches during the third and the fourth quarters. In terms of catches, this fishery has contributed in most recent years with 400 t on average.

Uruguay: After a recent five years period of decreasing catches (2004: 1105 t to 2008: 370 t), the Uruguayan captures of swordfish increasedto 501 t in 2009, followed again by a decreased in 2010 (222 t) and 2011 (179 t). The increase in 2009 was due to the reactivation of some boats and the incorporation to the fleet of a new fishing boat targeting swordfish. The decrease in captures after 2009 has been caused by a change in the target species of some boats, together with a reduction in the fishing effort. Decline in the U.S. market demand, the main buyer of fresh Uruguayan swordfish, together with the occurrence of fishermen labor conflicts produced a decrease in the fishing effort, with some boats ceasing their fishing activities after 2009. At the same time, during this period there was an increase in the captures of blue shark, coinciding with an increase in the price of this product, mainly in the Brazilian market. It is expected that this situation will revert starting at the end of 2013, with the incorporation of the new licenses for targeting swordfish and tuna species.

United States: U.S. catches (landings+dead discards) of swordfish peaked in 1989 with a total of 6,411 t. Since then, United States catches followed a declining trend until 2006, when U.S. catches (2,058 t) were at the lowest level since 1977. After 2006, U.S. catches have fluctuated around somewhat higher levels. In 2011, the United States reported 2,888 t of total swordfish catches, an increase of about 20% with respect to the previous year. In 2011, 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 U.S. pelagic longline vessels are yellowfin tuna and swordfish. In the mid-1990s, the U.S. pelagic longline fleet consisted of about 400 active vessels. The number of active vessels has decreased since then and only about 112 vessels were active in the pelagic longline fishery in 2011. 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 year-round closures, one in the Gulf of Mexico and the other in the Florida east coast, were established to reduce longline bycatch including that of undersize swordfish. Three other areas have seasonal closures and they were also established to reduce longline bycatch including that of undersize bluefin tuna. During 2001-2003, areas around the Grand Banks were closed in order to avoid sea turtle bycatch, with the exception of vessels participating in experiments exploring approaches for reducing such bycatch. The area was reopened to all U.S. vessels in 2004 when circle hooks became mandatory for the U.S. pelagic longline fleet, with the aim of reducing sea turtle bycatch mortality. Beginning in 2011, the use of a thinner "weak" hook (designed to straighten when a large fish is hooked) was required for all U.S. pelagic longline vessels operating in the Gulf of Mexico in order to reduce the bycatch of bluefin tuna. These new hook types do not affect the catch rates of swordfish (SCRS/2013/114). The Deep Water Horizon oil spill had a major impact in the Gulf of Mexico, resulting in substantial reductions in longline effort and swordfish catches beginning in 2010 and continuing into the third quarter of 2011. The United States also has a recreational swordfish fishery. Although recreational swordfish landings are very small compared to the total United States landings (54 t in 2011), this fishery has expanded during the last decade and is projected to continue growing.

3.3 Task I (nominal catches)

The Secretariat presented the nominal catches (Task I) for the period 1950-2011 **(Figure 4).** The Group reviewed in detail the catch distribution by stock, fleet, gear and year and noted the good coverage of the data reported to the Secretariat for 2011. Minor revisions (Argentina, Chinese Taipei, EU.España, Senegal and Trinidad and Tobago) were applied to the 2011 Task I data approved by the SCRS during the 2012 SCRS plenary meeting. There are, however, some uncertainties related to the catch allocation per stock of Senegal and South Korea (Korea only reported dead discards for 2011). The Secretariat will contact the respective statistical correspondents in order to solve thesematters. In addition, the Group also agreed to merge the Portuguese (mainland longline fleet only) surface unclassified catches with the "LLHB" into to "LL-surf" (as it was proposed by the Portuguese national scientist). Both series (old and final) are presented in **Table 4**. A revised Task-I table with all these revisions was approved by the Group. The Task-I summary catch table is shown in **Table 4**. The cumulative catches of the major fishing countries per stock are presented in **Figures 4** and **5**. The geographical catch distribution of the swordfish catch for the entire Atlantic (CATDIS estimations, in 5 by 5 degree squares) by major fishing gears and by decade are shown in **Figure 6**. The lower catches in 2011 (23,888 t) compared to 2010 (24,209 t) could be due in part to some socio-economic conditions and/or a change in the targeted species, as discussed in section 3.2.

The Group noted that there were a considerable number of live discards reported by the Japanese fleet over the period 2000 – 2005. These live discards were made to meet a quota overrun situation, which was resolved in 2006. The live discards could be a significant source of uncounted mortality, given the scale of the live discards (**Table 5**), and the unknown post-release survival.

SCRS/2013/102 reported first estimates of the proportion of captured swordfish (*Xiphias gladius*) retained and discarded iby the Uruguayan swordfish fishery. The results were based on data obtained by the Uruguayan Observer Program on board of national and Japanese flagged vessels operating in Uruguayan and international adjacent waters. Proportions of the different catch components (retained, retained bitten, discarded dead, discarded bitten, released alive and lost) in relation to the total swordfish capture were presented. The preliminary results suggest that the retained bitten and the non-retained catch of swordfish (most of which is discarded dead) may represent a considerable proportion of the total catch, and the exclusion of this discarded catch from stock assessments could result in underestimations of total fishing mortality. The Group agreed that the inclusion of size data for the non-retained capture can be useful information. The Group requested Uruguay, with the agreement of Japan, to report the CAS for the Japanese fleet that operated in Uruguayan waters during the period 2009–2011. Uruguay agreed to present such information, prior to the 2013 swordfish Stock Assessment Meeting.

3.4 Data submission

The Secretariat highlighted the fact that some important data (including historic time series of size information) were submitted after the deadline established by Circular 1542/13. This deadline was established according to the swordfish work plan and in agreement with the SCRS recommendation on data submission, with the objective of allowing the Secretariat sufficient time to compile the information received and to prepare all the required datasets (CATDIS, CAS, CAA, etc...) in advance of the meeting. **Table 6** shows the Task-II size information received (including reported CAS), processed and merged into ICCAT-DB Overall, about 18% of the whole records of Task 2 size information (219,195 out of 1.1 million registers) for swordfish (1950-2011) had to be updated during the data preparatory meeting. Task-II catch and effort reviews were also presented. For the Secretariat, the only way to comply with the SCRS requirements on statistics is to develop a work plan tied to the deadlines established, particularly if the calendar of meetings is so heavy such as is the case this year. For this reason, any delay in receiving data implies an overload of work for the Secretariat as well as delays in future works or, in its worst case, the impossibility of preparing the datasets requested by the Group.

4. Task II catch/effort

The available Task II catch and effort (T2CE) data =(per stock, year, major gear and flag) for the major fisheries are identified on the respective catalogues (SWO-N: **Table 7**, SWO-S: **Table 8**) with the "a" character within each Task II row (DS="t2"). Fisheries are ranked according to its overall importance (total weight of the 1980-2011 catches) in Task I.

4.1 North Atlantic

The SWO-N catalogue shows that the 6 most important SWO-N fisheries (EU.España, U.S.A., Canada, Japan, EU.Portugal, Chinese Taipei) have their T2CE data series almost complete in the last twenty years. Some datasets that were recently reported to the Secretariat completed the series above. There are however, some missing T2CE datasets for the earlier years. These missing datasets should be taken into account by National scientists present at the meeting and be recovered and reported to the Secretariat as soon as possible.

The Group noted that the T2CE reported should contain both landings and discards (dead and/or alive) as indicated in the last T2CE electronic forms approved by the SCRS (form ST03-T2CE). Another important issue raised by the Secretariat is related to the inconsistencies found the in Korean T2CE series in the last two/three years. The geographical classification (5 by 5 squares) of the entire sets reported seems to be inconsistent. The Group supported the Secretariat proposal to request a complete revision the T2CE Korean series. This attempt for clarification of the Korean T2CE statistics is recurrent (made several times in the past without any response) and various years have pending clarifications.

4.2 South Atlantic

The SWO-S catalogue shows that, the 6 most important SWO-S fisheries (EU.España, Japan, Brazil, Chinese Taipei, Uruguay, Korea Rep.) are not as complete as the northern stock in the last twenty years. In particular for the Korea Republic who did not report 2010 and 2011 data for the Southern stock. The earlier (prior to 1990) series do have some missing T2CE data. These missing datasets should be taken into account by National scientists present at the meeting and be recovered and reported to the Secretariat as soon as possible.

5. Task II size data

The ICCAT database includes over one half million records of size frequency data of swordfish stocks submitted by CPCs since 1970 (**Figure 7**). However, most of the data was reported after 1980. For SWO-N the size frequency data comprises reports from 19 CPCs, representing over 30 flag-fleet codifications. The main reported gear is longline, 91%, followed bysurface gears (harpoon, hand lines, rod & reel, sport and trawl) (5%), gillnets (1%), and others (including Baitboat, mid-water trawls, and unknown) (**Figure 8**). For the south-SWO, the size data comprises reports from 17 CPCs representing over 50 flag-fleets notably the complex Brazilian-other CPCs fleets. Also, almost all size data is from the longline gear (98%) and very few observations from gillnet (**Figure 8**). Maps of the 5°x5° spatial annual distributions of size samples are presented in **Figure 9**. Overall, the spatial coverage of size sampling after 1980 is wide and sufficient for the Atlantic stocks.

Most of the data are reported as length measurements, mainly lower jaw fork length (LJFL), but also eye-fork length and opercula fork length. However, a significant component has also been reported in weight (headed wgt) categories For analyses, only size measurements were included and all sizes were standardized to LJFL cm using the size conversion factors proposed in Section 2. Separate analyses are presented for the weight frequency data. Preliminary review of size data excludes sizes less than 30 cm and greater than 300 cm. **Figure 10** shows the overall size distribution of swordfish by stock. Overall, the size distribution of swordfish is similar between the north and south stocks, with the majority of the size samples between 75 and 250 cm and a mode around 150 cm. The size distribution by main gear is shown in **Figure 11**. Smaller swordfish were typically caught by gillnet, and for the north-SWO stock larger swordfish were caught by surface gears. However, in the north there is wide overlapping of size distribution among gears, except for the surface gear.

A Review of the size distribution by year (**Figure 12**) showed some trends, particularly in early years. Forexample, in 1974 there is a noticeable unusual occurrence of small size fish in the north stock which is unexplined. For the north and south stocks, the median size ranged from 150 to 175 cm for most of the time series. There were not clear differences in size distribution by quarter; only to note that in quarter 3 (Aug-Oct) there is a reduction of the smaller size fish distribution in the north-SWO (**Figure 13**).

The review of the weight size distribution data was restricted to the U.S. longline fishery (**Figure 14**). The weight distributions are mainly for the north stock (1978–2011), with few observations from the south (1998-2005). The heavier fish were recorded in the earlier years of the time series, followed by rather stable weight distribution with mean weights about 30-35 kg.

The Group noted an unexplained decline from 1981 to 1982 in the weigh frequencies distributions reported bu the U.S. The Group requested that National scientists to investigate this decline.

After a review of the size samples for 1974 (See **Figure 11**) , the Group noted that the unusual pattern of swordfish between 80 and 100 cm corresponded to size samples from EU-Spain that were originally reported in EYFL measures that likely corresponded to samples from the Mediterranean gillnet fisheries. The Group recommended to exclude these size samples until clear information on the origin of these data is available.

6. Catch-at-size (CAS), Catch-at-age (CAA) and Weight-at-age (WAA)

6.1 Catch-at-size (CAS)

The Secretariat updated the entire catch-at-size (CAS) estimations (from 1978 to 2011) for both stocks taking into account the significant revisions of size frequencies reported by Japan for both stocks, EU-Portugal (SWO-S), Chinese Tapei (both stocks), Ghana (SWO-S), Canada (SWO-N), Morocco (SWO-N), Uruguay (SWO-S), and Venezuela (SWO-N). The revised weight/length relationships (see section 2) were used to adjust the CAS weight equivalent (of the number in the catch composition) catches to Task-I catches. The overall CAS matrices by year and 5 cm lower-jaw fork length are shown in **Tables 9** (SWO-N) and **10** (SWO-S). The mean weights series estimated from the CAS are presented in **Figures 15** (by stock) and **16** (by major flag).

The overall CAS estimations for both stocks utilises two types of size information reported to ICCAT. The first and most important one (in terms of overall weight) is the CAS estimated by National scientists using their own substitution rules. These reported CAS datasets are often adjusted to the Task-I equivalent catch. The second one is the size frequencies samples information. Those samples are directly raised to the equivalent Task-I catch. Whenever, for a given fishery period (fleet/gear/year/stock combination), there is not one of the two types of size data described above, a substitution rule is applied. **Figures 17** (SWO-N) and **18** (SWO-S) show, for the 2001 to 2011 period, the importance (in weight equivalent Task-I catch) of each type of size information reported ("CAS (adjusted)": CAS reported with possible adjustments to Task-I; "T2SZ(raised)": size frequency samples raised to Task I) as also as the ratio of the substitutions used by the Secretariat in the CAS estimations. The level of CAS reported is higher in SWO-N (73% on average) than it is in SWO-S (43% on average). The substitution ratio (whether using CAS or T2SZ) is also lower in SWO-N (19% on average, with large variations from 7% to 39%) than it is in SWO-S (25% on average, with large variations from 5% to 39%). These levels of substitutions are considered low, when compared to the majority other ICCAT managed species. But, they can be further improved if the missing size information (see SWO catalogues: **Tables 7** and **8**) is duly recovered and reported to ICCAT.

The Group noted that, the SWO-S catch-at-size has an unusual peak around the 95 cm class bin (1996 to 2007) which could require a future analysis.

SCRS/2013/111 described the catch-at-size of swordfish caught by the Moroccan pelagic longline fishery between 2003-2011. The analysis was based on port sampling data and it showed a decreasing trend of fish mean size until from the beginning of the time series to 2008, followed by a slight increase. Moreover, mean size tended to decrease throughout the year. The Group noted a sharp decrease in the mean size in the early years of the time series,which was attributed to low sampling coverage. It was suggested to gather the data by quarter (instead of month) and the use of box plots, to better display the variance and central tendency of the information.

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6.2 Catch-at-age (CAA)

No catch at age estimations were obtained from CAS.

7. Tagging data

The Secretariat presented to the Group the SWO conventional tagging information, noting that no major updates were made since 2012 (only a few recoveries reported by Portuguese scientists). The summary of the tagging (releases/recoveries) is presented in **Table 11**. Maps of overall (all years combined) releases and recoveries density plots and apparent displacement (straight lines from release position to recovery position) are presented in **Figure 19**. The Group identified and discarded some erroneous Northern-to-Southern hemisphere movements (reported by USA and Canada). The Group considers that the continuous revision process of the conventional tagging information be maintained (a SCRS recommendation) and suggested an increasing participation of National scientists in the revision process.

8. Available modeling approaches

8.1 Surplus Production Models (ASPIC)

Model assumptions:

Catchability is constant; therefore, any changes in catchability have to be modeled within the CPUE series. Recruitment and M are constant over time. There is an immediate response of the stock to F.
All ages are fully selected. All fish in the population are mature.

Model Inputs: Catch and CPUE series.

Model outputs: Trajectories of F and B. Trajectories of relative F and B. Catchability q for each CPUE series. Confidence intervals. Carrying capacity K, B_1/K, r. Projections

Diagnostics: Sum of Squares. Residual plots of fits to CPUEs. Retrospective patterns.

Key parameters: B1/K, r.

Uncertainties:

The Group discussed how uncertainty is handled within ASPIC. It was agreed that this assessment model does not allow for the inclusion of uncertainty of the model inputs (e.g., CV of the CPUE series). In prior assessments, uncertainty in the CPUE series were incorporated by making separate runs using the median and upper and lower 95% confidence intervals, bootstrapping the results, and combining the bootstrap outputs. New approaches to deal with uncertainties within ASPIC have been developed and will be presented to the Group in the near future.

The Group noted that other approaches to deal with uncertainty was by fixing some of the input parameters at different values and assessing the sensitivity of the model results to the different initial condition (e.g., fixing B1/K at 0.3, 0.4, 0.5, and 0.6). Running the model using different production functions was also deemed as being a way to assess uncertainty.

Model strengths and weaknesses

Because of the limited data requirements, this model is easier to be supported by the Secretariat. ASPIC is easy to use and many national scientists are familiar with its use. It is considered to be useful for data limited situations. ASPIC is Fast to run and facilitatessimulation testing. Because of the limited data requirements, it allows the use of longer time series where data from earlier periods are usually poor. It only estimates few parameters but these are tycally the ones needed to provide management advice. ASPIC quickly produces diagnostics, bootstrap results, and projections. However,ASPIC does not necessarily reflect the true dynamics of the stock/fishery and it can’t take into consideration any variability in recruitment or changes in catchability. The model can’t accommodate changes in management regulations, like changes in minimum size, so this needs to be taken into account in the CPUE series. ASPIC often cannot resolve indexes of abundance with conflicting trends.

It was acknowledged by the Group that the surplus production model ASPIC has been used to assess SWO for the past 20 years. One of the reasons was the need for continuity in the assessment methodology after ICCAT implemented the SWO rebuilding plan in 1996 [Rec. 95-11]. The Group discussed the need to apply some caution when using this modeling approach. In particular when considering the assumption of constant catchability at different levels of biomass, and the possibility of hyperstability and hyperdepletion. However, it was pointed out that hyperstability is more related to purse seine fisheries and, therefore, less applicable to the Atlantic swordfish case. The Group also discussed what in the literature is known as a ‘One way trip’, in other words, when the data used for input in the model only includes the time period when increases in effort resulted in decreases in CPUE. The Group highlighted the simple data requirements that allow the use of relatively long time series of catch which is unusual in stock assessments conducted by the SCRS. The Group recognized the problems that arise when the available CPUEs have conflicting trends. Although this problem can be alleviated by estimating a combined CPUE (as it was done in previous assessments with ASPIC), this approach can potentially create biased results. Thus, the Group engaged in an extensive discussion on the potential methods that can be used to estimate the combined index, and some of the potential benefits and shortcomings of this type of index. It was pointed out that since all indexes most probably do not have the same selectivity, a combined index could represent the entire stock and be more appropriate for a biomass model. It was acknowledged by the Group that many fleets have operatedover a reduced area and fishing season, and that these changes can create problems when trying to estimate a combined index. In addition, the Group agreed that problems with CPUE series, like known changes in catchability over time, have to be dealt outside the model as the model does not have the flexibility to accommodate this type of problems. It was proposed that, as an exploratory tool, ASPIC can be run with a combined index and then one CPUE series at the time to learn what information is provided by each index and how influential to the final results each index is. With regard to weighting of the indexes of applying different weights to different years in the time series, it was pointed out that ASPIC does not allow for different weighting by year, but it does allow to apply different weights to different CPUE series.

The Group agreed that it would be important to use ASPIC in the upcoming assessment, particularly given the need to have a continuity case and, therefore, it recommended its use for both the North and South Atlantic SWO stocks.

8.2 Virtual Population Analysis (VPA)

Model assumptions:

The model assumes that the assessed stock corresponds to one closed population or two intermixing populations. Rapid mixing is assumed throughout the home range of each population or random fishing. The natural mortality rate on each age group is considered to beconstant through time. The catch of each age group is assumeb to be known with no error. The abundance, mortality, and tagging data, however imprecise, accurately represent the population The growth curve is known exactly

*Inputs:*Catch series, CPUE, Catch-at-age.

Model outputs:

Trajectories of F and B. Trajectories of relative F and B. Catchability *q* for each CPUE series. Confidence intervals. Projections, F_{MSY} and $F_{0.1}$ related benchmarks can be obtained using additional projection software.

Diagnostics: Plot of fit to indices. Retrospective patterns.

Uncertainties:

Estimated within model by bootstrapping.
Input CVs on the CPUE series.

Key Parameters:

F ratio (ratio of the fishing mortality rate on the oldest age to that of the next younger age) and blocks for estimating, terminal year Fs (usually constrained assuming similar vulnerability in last *n* years).
Any benchmarks (status considerations) require using a SRR or proxies.

Strength and weaknesses:

he VPA method has been commonly used by the SCRS for stock assessment purposes, simulation tested, it provides a variety of diagnostic. Fewer assumptions than Statistical Catch at Age (SCA) approaches, *arguably* fewer than biomass dynamics approaches. VPA can handle varying selectivity and, in general, projections can accommodate some of the management issues (size limits, etc). It can accommodate multiple CPUE indices with different selectivities (partial catches).

The method does not explicitly impose productivity estimates on the population like BSP or, as is often the case, SCA when steepness values are fixed or input with restrictive values. It can only estimate uncertainty within the model through bootstrapping. Assumes CAA is known without error. Requires substantial support from the ICCAT to prepare the CAS and CAA matrices.

VPA has been used in previous SWO assessments (e.g., 2002, 2006, 2009), but not to provide management advice. The Group agreed that because of the high uncertainty of the SWO CAA, VPA is likely not to be the most suitable model to assess SWO. However, the Group also recognized that not using age-specific indexes might help to reduce this particular limitation of VPA. The Group noted that recent revisions to the CAS might affect the performance of VPA for this species. However, the Group did not evaluate this newly available CAS. In the particular case of SWO, other difficulties to apply VPA include that fish are aged only to 5 owing to the inability to reliably age older fish and the year round spawning observed in this species. Thus, VPA uses a 5+ age group that in turn masks much of the dynamics of the stock. This particular issue also results on the VPA being highly sensitive to the F ratios.

The Group deliberated about the need to continue using VPA given the model assumptions that require knowing CAA without error, that this model has not been used to formulate management advice in the past, and that it requires substantial resources from the ICCAT Secretariat. However, it was pointed out that VPA can still be used as an exploratory tool to better understand changes in selectivity or the influence of the different inputs.

After weighting all the strength and weaknesses of the VPA, the Group agreed not to recommend its use in the upcoming assessment.

8.3 Bayesian Surplus Production model 2 (BSP2)

Document SCRS/213/100 presented an update (BSP2) to ICCAT's Bayesian surplus production stock assessment software (BSP). BSP2 offers a new implementation that models process error in the dynamics equations and observation error in predicted states (i.e., a state-space model). The software can accommodate a variety of different priors for key parameters including carrying capacity (K), the maximum rate of population increase (r), and the ratio of stock biomass in the initial year to carrying capacity (Binit/K). The software enables Bayesian integration for computation of marginal posterior probability distributions for parameters and management variables and outputs for inclusion in Kobe plots. Bayes factors can be computed to evaluate the relative credibility of different production functions and different model runs (e.g., different priors and catch history scenarios) when different model variants are fitted to the same abundance index data. The software has been simulation tested and found to recover with reasonable accuracy (within plus or minus 20%) the underlying "true" parameters and "true" population states, even when data have been simulated with high imprecision and high process error in state dynamics.

Model assumptions:

A one year lag adequately characterizes the influence of annual stock biomass on future surplus production as in any production model including ASPIC. Abundance indices are related to stock biomass via a constant of proportionality whereby there is no hyperdepletion or hyperstability in the index. Surplus production can be described by either the Schaefer model or the Fletcher generalized production function.

Model inputs:

Catch series. CPUE. Priors for K, r, B_0/K, process error deviates. A fixed value for the prior standard deviation in process error deviates. A CV for each abundance index that is constant over time, and if judged appropriate an additive CV by year for each abundance index. A fixed value for the autocorrelation in process error deviates for years following the last year of data. Specification for the type of surplus production function (Schaefer, Fletcher-Schaefer) and the parameter value for the inflection point.

Model outputs:

Posterior distributions for estimated parameters (r, K, b0/K, sigma (index)), stock biomass, MSY, annual F, F/F_{MSY}, B, B/B_{MSY}, replacement yield, ln(average weight).

Diagnostics

Plots of posterior median process error deviates by year, together with probability intervals by year. Plots of the fit of the posterior median stock biomass to abundance index data. Plots of post model pre-data distributions, priors, and posteriors. Graphical and numerical diagnostics for importance sampling, as importance sampling is running

Uncertainties:

Uncertainties in estimated parameters, model variables, show in posterior distributions, standard deviations, coefficients of variation, probability intervals. Bayes factors can be computed from the average importance ratio by run and can be used to weight output distributions from different runs to show the uncertainty in stock status and variables of interest resulting from uncertainty in model structure.

Key parameters: r, K, B_0/K, B_{MSY}/K.

Strength and weaknesses:

The model makes no assumptions about vulnerability at age. It uses available life history data to develop a prior distribution for r. BSP2 is highly flexible approach to fit data. Rigorous theoretically consistent methodology to account for uncertainties in data and uncertainty between model forms. State-space production models found to perform acceptably well in estimation of stock biomass and in management procedure evaluations for a recovering stock/ noisy data. Under certain configurations the model is difficult to simulation test. As with any Bayesian method, training is required to run the software proficiently. As with other surplus production models, it may be biologically inaccurate and thereforemight not reflect the true dynamics of the stock.

The Group recognized that BSP2 is in essence a surplus production model and as such, it has all the restrictions and advantages of other production models like ASPIC. The Group discussed some of the advantages of using Bayesian modeling approaches, one of them being the capability of obtaining probability statements for outputs of interest in the form of 'posteriors'. In addition, Bayesian estimation methods enable additional information and data to be brought to bear to form prior distributions for model parameters, and these priors can help to constrain the estimation to enable more useful and biologically accurate results to be obtained. The Group was provided with a presentation that showed that the BSP2 model provides good fits to data, runs fast, and is numerically reliable. The model uses a prior for r that incorporates key biological information. One important factor of BSP2 that the Group identified is that it allows evaluation of the influence of priors and catch inputs on the model outputs. In addition, BSP2 results more rigorously accounts for parameter and structural uncertainties in the evaluation of stock productivity.

The Group acknowledged that the BSP2 model showed a lot of flexibility and it inquired if the model used for the SWO example had the same formulation as the original BSP model or if considerable additional coding had been incorporated. The Group also inquired if the BSP2 model in its SWO formulation has been simulated tested. It was indicated to the Group that the updated state-space model version of BSP2 has been peer-reviewed in recent stock assessments in Canada and it has also been simulation test. BSP2 was found to perform satisfactorily in estimating stock biomass, stock status, and in achieving stock rebuilding from depleted and overfished conditions in situations when there was fairly high autocorrelated stochastic variation in stock biomass and the available abundance indices had quite high CVs, i.e., mostly larger than 0.3.

The Group was concerned about the lack of an updated manual for BSP2 and noted that national scientists are not familiar with its use yet. The Group recommended that a training course be made available for national scientists interested in this particular model approach. The Group agreed that the BSP2 model offers more flexibility and more options than ASPIC and it was recommended to run both models in parallel to compare model behavior and better understand its differences. The Group also asked how the prior for r was developed. Even though this particular prior has been used in the past, the Group recommended that the prior for r be updated using more recently developed methodology for this and recent updates in estimates of swordfish life history parameters.

The Group recommended the use of the BSP2 model in the upcoming assessment for both the North and South Atlantic SWO stocks, and to explore options to incorporate this model to the models already in use for the SCRS.

8.4 Stock Synthesis (SS)

Model assumptions:

The structure of Stock Synthesis (SS) allows for building of simple to complex models depending upon the data available. As a result, the SS modeling framework is designed to allow the user to control the majority of the assumptions that go into the model. SS assumes that the observational data is a random and unbiased sample of the fishery and/or survey it is intended to represent. The overall model contains subcomponents which simulate the population dynamics of the stock and fisheries, derive the expected values for the various observed data, and quantify the magnitude of difference between observed and expected data.

Model inputs:

Stock Synthesis provides a statistical framework for calibration of a population dynamics model using a diversity of fishery and survey data. SS is most flexible in its ability to utilize a wide diversity of age, size, and aggregate data from fisheries and surveys. It is designed to accommodate both age and size structure in the population and with multiple stock sub-areas. Selectivity can be cast as age specific only, size-specific in the observations only, or size-specific with the ability to capture the major effect of size-specific survivorship. While SS can accommodate a multitude of data types two are required, those being a catch time series and an index of abundance. Conversely, a model can be built that incorporates multiple areas, seasons, sexes, growth and growth morphs, as well as tagging data. Environmental data can also be used to modulate most any parameter within the model. Size and age structure, size-at-age, ageing error and bias, and sex ratio can also be incorporated.

Model outputs:

The SS model output is commensurate with the complexity of the model configuration and observational data. All estimated parameters are output with standard deviations. Derived quantities include typical management benchmarks such as MSY, Fmsy and Bmsy, and SPR. Typical matrices of numbers-at-age, growth, age-length keys are also provided.

Diagnostics

Diagnostics are routinely examined through either the graphical and numeric r4SS R package or the accompanying spreadsheet, also graphical as well as numeric. Diagnostics are generally a display of residuals of the fit to the observational data and derived quantities. Numerical output is also available in the form of the Hessian matrix, correlation matrix, and a parameter trace output. When run in the MCMC mode the posteriors are also output.

Uncertainty

Uncertainty can be captured in at least three ways: parameter standard deviation, the creation of bootstrap data files, or through MCMC techniques. The ADMB C++ software in which SS is written searches for the set of parameter values that maximize the goodness-of-fit, then calculates the variance of these parameters using inverse Hessian and MCMC methods. A management layer is also included in the model allowing uncertainty in estimated parameters to be propagated to the management quantities, thus facilitating a description of the risk of various possible management scenarios, including forecasts of possible annual catch limits.

Key parameters:

Key parameters of SS are dependent upon the model configuration created. However, since it is age-structured the rate of natural mortality is most critical. The steepness parameter is also critical as it dictates the rate of compensatory population growth.

Strength and weaknesses:

SS can utilize a great number of different types of data sources to build a custom model within a consistent framework. This is its greatest strength as it allows the user to build a model with flexibility equal to that of the data. Pre-processing of data is less than some other frameworks as it is fully integrated within the model structure. Similar to a BSPM, SS has full Bayesian capability. Unlike VPA, it can be run without a catch-age-matrix by using only lengths or without lengths entirely. Consequently, no age slicing needed. It allows for ways to explain changes in observations data that are due to changes in management or environment. Nearly all parameters can be made time varying in several ways. Forecasting is done within the integrated framework of the model construction. Some of the limitations of SS include a limited number of proficient users within the SCRS. Furthermore, because of its ability to create very complex models it can be slow to run relative to ASPIC or VPA, but only if it highly parameterized (i.e. run time depends on model complexity). The framework is capable of many options, so the user must stay aware of model parsimony.

The Group considered that the SS model was probably the most flexible of all models reviewed during the meeting. Perhaps the most useful feature of the SS framework is that it "brings the model to the data" rather than vice versa (i.e., it can be made as simple or complex as the data allows). SS can be configured to run from a simple surplus production model to a fully integrated model. Therefore, data inputs and output are dependent on the model configuration. This model might also allow SCRS to estimate and evaluate the robustness of Limit Reference Points. The Group discussed the need to improve the way that fleets are defined taking advantage of the flexibility of the model. For example, one approach could be to use size samples from the different fleets to grouped fleets that have similar selectivities. It was also discussed that the migration pattern of SWO might deem necessary to split a fleet from a given flag into two or more fleets (e.g., a fleet that fishes on the spawning grounds and also on the feeding grounds where large females are more abundant).

The Group agreed to recommend that SS be used as one of the models in the upcoming assessment for the North Atlantic stock and dependent on available resources for the Southern stock as well.

8.5 State-Space Model

Inputs: Same as VPA. CAA, indexes of abundance, maturity, growth parameters.

Outputs:

Same as VPA, estimates SRR, reference point, uncertainty without bootstrapping. Variance-covariance matrix. Probability distributions and SE of parameters of interest.

Key Parameters: SRR and F

Diagnostics:
Same as VPA, including residual plots. Uses same software package for diagnostics as ADAPT-VPA. Likelihoods, Hessian matrix, variance-covariance matrix. Statistical tests for parameters different from particular values

Strength and weaknesses:

This modeling approach runs quickly. The approach is flexible, and can incorporate of time varying selectivity. It can incorporate the observation error in the catch. Requires less adjustments than VPA, all calculations are integrated. It provides relative F and B with confidence informal. Requires knowledge of how selectivity varies over time. It requires CAA. However, it requires checking too many diagnostics to ensure that the model is properly working. The Group noted that the SCRS is not familiar with this model and does not have the experience to run it. It was not considered to be a simple approach.

The Group indicated that since the VPA was not chosen in part based on the need to use CAA as an input, this model should not be used either. The Group agreed that this particular model approach has potential, but that the SCRS needs time to fully evaluate it in the upcoming years. Therefore, the Group did not recommend the use of this state-space model in the upcoming assessment.

8.6 Discussion on diagnostics

The Group agreed that regardless of the modeling approach used in the upcoming assessment, diagnostics from the different models should include some common elements and be standardized to the extent possible.= The Working Group on Stock Assessment Method (WGSAM) recommended that appropriate diagnostics be developed for all assessment models. While it was recognized that these may vary between assessment models, it was also recognized that even though different models and methods may have slightly different diagnostics many diagnostics will be common to all methods. The group discussed the types of diagnostic that are used for stock assessments and considered that they fell into five main categories: 1) exploratory data analyses, 2) fits to data (e.g. residual plots), 3) likelihoods tests, 4) sensitivity tests, and 5) simulations such as retrospective/cross-validation analyses.

1) Exploratory data analysis

Data input for stock assessments are mainly fisheries dependent indices of catch per unit effort. Such indices may be affected by a variety of factors which the standardization procedures are intended to remove. However, calculation of indices such as that of Gulland (Ref.) could be informative to identify patterns in targeting (e.g., in the Pacific Ocean this approach was extremely useful in confirming targeting shifts towards and away from billfish in the first 25 years of the Japanese longline fishery).

Traditional methods of stock assessment often involve the inclusion of weighted averages of contradictory data, and this generally produces parameter estimates intermediate to those obtained from the data sets individually. Schnute (1993) demonstrated that, when model or data errors are considered, the most likely parameter values are not intermediary to conflicting values; instead, they occur at one of the apparent extremes. Therefore, a comparison of indices (e. g., by correlation analysis) may be useful in helping to developed hypotheses for deciding upon what stock assessment scenarios to run.

2) Fits to data

Inspection of residual plots (e.g. from indices used to calibrate stock trends, or from length composition data) are important in order to check model fits. SCRS/2013/36 presented a variety of methods for residual analysis that can be used within a variety of assessment frameworks (e.g. ASPIC, BSP, VPA, SS, Multifan-CL, SCRS/2013/56, 57, and 58). The intention was not to provide guidelines, but a simple summary of methods that can be used for a range of stock assessment models. The software is available as an R package.

3) Likelihoods tests

Likelihood ratios can be used to compare stock assessment scenarios or to weight multiple runs. Hobbs and Hilborn (2006) discussed ways of evaluating the weight of evidence for multiple hypotheses, multi-model inference, and use of prior information in ecology, such approaches could be used to weight multiple assessment scenarios within the Kobe framework. Also, likelihood profiling by data components (ISC/11/BILLWG-3/01, SCRS/2013/119) is a promising technique that allows assessing the impact of different data sets on key parameters (e.g. r, B_0).

4) Sensitivity tests

As part of a stock assessment it is common practice to run alternative scenarios as sensitivity tests. In CCSBT and WCPFC a grid is used to choose key parameters or options for which there may not be convincing information in data. For example, for two factors corresponding to i) there is no direct data on natural mortality to define its level or shape, but it is known that the parameter is vital both for stock assessment estimates and reference points, or ii) the quality of size data by fishery: what are the relative effective sample sizes. In such a case, there may be several potential levels for each factor and using a grid (i.e., levels of factor i times levels of factor ii) would allow for all main effects and interactions to be explored. However, if many factors are to be considered then this will result in a large number of trials. Therefore, it may be more appropriate to first specify a base case and then factors with levels that represent the main uncertainties. During stock assessment sessions, the main effects can be evaluated by varying one factor at a time. Hopefully, this will allow the stock assessment to bracket the main uncertainty and act as a simple screening experiment to determine the factors that have the greatest influence on the perception of stock dynamics. Based on the identification of the most important factors, a multi-level designed experiment can then be developed for the MSE that includes interactions between factors.

5) Simulations

Simulation techniques are very valuable tools, these include from retrospective analyses to cross-validation since when learning about a method it is convenient to predict outcomes that have already occurred (Gelman and Hill, 2007). It can also be used to see if key parameters such as the steepness of the stock-recruitment relationship can actually be estimated in fishery stock assessment models (Lee et al. 2012).

9. Relative abundance indices

9.1 Relative abundance indices – North

Nine documents describing catch per unit effort (CPUE) series for the north Atlantic were reviewed by the Group. The indices below were standardized using various analytical approaches.
The table developed by the Methods Working Group in 2012 to evaluate the presented CPUE series (Anon 2013) was completed for each CPUE series by the rapporteur and presented to the WG. The Group then revised and modified the values (**Table 12**). It was acknowledged that this work is rather subjective and that it is only an indication as to the nature of the CPUE series how it could be effectively used in the assessments.
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Canadian indices of abundance for the north Atlantic swordfish stock were estimated with data from the Canadian pelagic longline fishery (SCRS/2013/059). Nominal and standardized age-aggregated catch time series were developed for round weight and number of swordfish caught per hook (1963 to 2012). Age and gender-specific nominal series of swordfish number per hook are provided for 1999 to 2012, showing a steady increase for ages 3+, though it was noted that age and sex ratios may be outdated. The standardization involved a mixed effects model with effects due to bait, hook type, quarter, shark and tuna caught, trip length and area. The standardized age-aggregated index continues to show an upward trend seen throughout the 2000s, reaching a new high in 2010.

The Group discussed the effects of changes in management structure throughout the history of the fishery and noted that a break in the series in 2002 may be necessary to properly account for the switch from a competitive to an individual transferable quota (ITQ) system; the author agreed to explore this further.
The Group also questioned the tendency for trends based on bait type to deviate rather than track each other and the authors agreed to investigate the source of the deviations.

The standardized CPUE for 1968-2011 from the Chinese Taipei distant-water longline fishery in the North Atlantic Ocean were presented in SCRS/2013/097. Information on operation type (the number of hooks per basket) was included in the models beginning in 1995, when available. Two alternative approaches (generalized linear models, GLMs, and generalized additive models, GAMs) were used to standardize the CPUE. The abundance indices derived from the two modeling approaches were very similar and fairly robust to the inclusion of gear configuration, but somewhat sensitive to the inclusion of target tuna species in the models as explanatory variables. The standardized CPUE of swordfish showed a continuous decreasing trend from 1968 through the late 1980s, but suddenly increased to a higher level during 1990-1997 and sharply dropped in the late 1990s, and then relatively stabilized from 1999 with two higher values in 2006 and 2011.

The evaluation of the Chinese Taipei working paper by the Group was hampered by the fact that the author was not present to answer questions or provide clarification on issues raised by the Group. For instance, there was some concern that the estimated indices may not have been based on a balanced prediction grid equivalent to the SAS lsmeans. If the indices were instead calculated as the yearly averages of the model predicted values for each observation, then it does not accurately standardize for factors in the model. It was also noted that a previous analysis of this data base (Hsu 2012, SCRS/2011/129) identified substantial changes in data collection, selection and levels of aggregations over time, such as changing from 5x5 degree aggregations to daily logbooks and with set type (surface or deep) of daily logbooks only being identified during the most recent period (after 2003). Hsu (2012), therefore developed separate indices for each of four periods to address these substantial differences, and it is unclear how these changes were addressed in the current analysis. Information on gear configuration, which might help account for changes in fishing strategy, was not available before 1995. Given the major changes in fishing strategy know to have taken place in this fishery and in the data, and considering the relatively small catch levels taken by this fleet in the north Atlantic, the Group did not recommend the use of this index for the stock assessment.

Catch and effort data from the Moroccan swordfish longline fleet operating in the north Atlantic Ocean during the period from 2004 to 2008 were analyzed using a GLM modeling approach that assumed a log-normal distribution error (SCRS/2013/099). The standardization considered only the effects of year and quarter. The relative biomass index of abundance exhibited modest fluctuations with a slightly increasing trend.

The inclusion of a year*quarter interaction as a fixed effect is a concern, as this can affect the estimation of the year effect (which is the proxy for the relative abundance). The Group recommended that the author explore modeling the interaction as a random effect. The Group noted that this index was not used for analyses during the 2009 stock assessment due to the brevity of the series, and decided that it now may be of sufficient length for inclusion. It was unclear whether or not the index represents a distinct spatial coverage, as there is limited description of the fishing area (only that the fleet operates between the latitudes 20 and 26 N°), and there may be considerable effort by the Spanish longline fleet in the same area.

SCRS/2013/104 reported standardized CPUE for swordfish caught by the Portuguese pelagic longline fishery in the North Atlantic during the period 1997-2012. Generalized Linear Mixed Modeling (GLMM) procedures were used to standardize swordfish catch (biomass) and nominal effort (number of hooks) data. As in past analyses, main effects included: year, area, quarter, a nation-operation variable accounting for gear and operational differences thought to influence swordfish catchability, a target variable (categories based on the proportion of swordfish in the catch relative to the combined catches of swordfish and blue sharks) to account for trips where sharks were predominant in the catch or potentially also targeted, and interaction terms for year*area. There is a general increasing trend of both the nominal and standardized index over the time series. Sensitivity analyses were used to test using a constant of 1 instead of 10% mean (response variable become CPUE+1); using a different ratio categorization (10% percentiles instead of 25%), and removing the Year:GearType interaction that is only marginally significant. In general the estimated model parameters were very similar to the original final model.

The Group noted that the approach of adding a constant value to the catch to include unsuccessful trips (trips with no SWO catches) in the analysis that assumed a lognormal error distribution has proved problematic in the past(including issues related to peaked or skewed error distributions) and it has largely been abandoned in SCRS analyses in favor of approaches such as the delta-lognormal. The Group recommended that the authors consider such alternative approaches in the future.

There was also considerable discussion on the appropriateness of the inclusion of an explanatory variable (in this case, the targeting variable of proportion of swordfish relative to combined swordfish and blue sharks) that is derived from (or directly related to) the dependent variable. The concern is that the model will calculate that changes in catch rates are *caused* by changes in level of target category, when in fact changes in abundance may be reflected in catch levels that in turn change the target category, independent of any changes in fishing strategy. As a consequence, the standardization model would tend to adjust high catch rates down, and low catch rates up, masking underlying trends. The alternative point of view was expressed that, in the absence of detailed information on changes in fishing strategy (such as gear configuration and bait), the ratio of swordfish in the catch was the best way to discriminate between effort directed at different species. The Group was unable to reach consensus on this point, noting that various SCRS working groups have followed different practices, and it was recommended that the Methods Working Group take up the question of the appropriateness of using targeting variables that are directly linked to the dependent variable.

In the case of the Portuguese longline index, in response to the Group's concerns related to the use of a catch ratio (SWO/SWO+BSH), as a proxy to account for target species on the fishery, the authors ran a new sensitivity analysis including the removal of this explanatory variable. The analysis showed that the removal of the ratio variable did not produce substantial changes to the general trend of the index for the time series (**Figure 20**).

The standardized catch rates both in weight and number of swordfish for the Spanish surface longline fleet for 1986-2011 in the north Atlantic were reported in SCRS/2013/105. Factors such as area, quarter, gear, and bait were used as explanatory factors in the standardization, as well as a characterization of the fishing strategy/targeting calculated in the same manner as was done for the Portuguese longline indices (SWO/SWO+BSH). The standardized catch rates in number of fish by age (ages 1 to 5+) for the period 1983-2011 are reported in (SCRS/2013/107). The standardization model considered the same explanatory factors as for the index covering all ages.

The Group noted that the standardization procedure for the Spanish longline indices used the same approach to define targeting as was done for the Portuguese longline indices. There were no new sensitivity analyses presented to the Group examining the impact on results if the target variable were not considered. With respect to the age-specific indices presented, the Group noted that there appear to be some patterns consistent with the indices tracking cohorts (some peaks and/or valleys visible in indices for successive ages in successive years). The Group concluded that these age-specific indices may be considered for use in stock assessment models.

Age specific abundance indices and a total biomass index of swordfish caught by Japanese longliners in the north Atlantic were estimated for 1975 – 2012 (SCRS/2013/110). They indicated an apparent increase of the stock in recent years. Japanese longliners discarded/ released swordfish in 2000 – 2006 (live release only in the later period). However, when that information was included in the analysis of CPUE, implausibly large drops of indices were observed. This would indicate that the information about discards and releases using in this study were insufficient to estimate population trends.

The Working Group agreed not to use the indices in 2000 – 2005 for stock analysis following the explanation of the authors that estimates for these years were flawed due to the problems with the discard/release data. The Group discussed the estimated steady decreasing trend during the 1990s, and it was noted that this could be due to insufficient standardization of gear effect, particularly for the tropical areas. In the tropical areas, Japanese longliners changed their gear configuration frequently in the 1990s due to the rapid improvement of gear materials. It was suggested that the indices in area 5 (temperate area of the northwest Atlantic) would not reflect such large influences as gear configuration has not changed greatly in that area; the use of area 5 indices may also permit starting the indices earlier; however, the full series for area 5 was not available for review during the meeting. The Group requests that the authors provide this full area 5 series, beginning with the earliest year possible. The Group noted that patterns in the age-specific indices generally appeared simultaneously across all ages, and suggested that this may be the result of influential factors not accounted for in the standardization (the effects of which overwhelm any cohort abundance trends) and/or major difficulties in the assigned of ages to the catches used for the indices. Therefore it was recommended that these age-specific indices not be used.

Two papers presented treatments of data from the U.S. Pelagic longline fishery. The first paper (SCRS/2013/114) analyses data from the Pelagic Observer Program and provided indices in weight and numbers of fish for 1987-2003 and 2004-2011 with a break to account for a fleet-wide change in gear configuration in response to regulatory requirements for the use of circle hooks beginning August 2004. This index uses only swordfish targeted trips as determined by the observer program, based upon detailed gear configuration independent of catch composition. For this index, the proportion of positive sets was greater than 0.95 for all years, therefore zero trips were excluded and only a lognormal GLM was used with significant factors of year, region, season, bait type, and lightsticks for CPUE in number and year, bait type, and lightsticks for CPUE in weight.

The Group noted that younger fish constituted a component of the catches tracked by this U.S. longline index. This may to some extent explain the variability in the estimated trends. The Group expressed the potential importance of this index with respect to the prevalence of younger fish over time. However, it was noted that careful consideration should be given to the size distribution tracked by the index when considering how to incorporate it in the models. It was noted during the data preparatory meeting that, due to the sub-setting of the data to SWO targeted trips, the length composition that applies to this index should be for the SWO-targeted trips only. The authors suggested that it may be possible to join the indices if an estimate of the circle hook effect can be calculated and applied. There are some data indicating that circle hooks reduce catch rates of swordfish when squid bait is used, but increase catch rates with mackerel bait (Foster et al 2012) The authors will attempt to make this correction in advance of the assessment meeting.

The second paper (SCRS/2013/116) uses data from the Dealer Landings System which is available for a longer time period (1982-2011) but suffers from an imprecise accounting for the effects of differential targeting on SWO CPUE. A strict update of the index used in the 2009 stock assessment used a categorical variable derived from the fraction of SWO to the total catch to index targeting and was presented to the group. It showed some very high values in the early time series during a period of incomplete reporting of catch and effort and a relatively constant level for much of the time period with some signs of increase in the most recent years. A second index was proposed that was started in 1986 due to the incomplete reporting pre 1986 and which uses the catch rates of YFT, BFT and BET as a categorical variable to determine targeting. This index showed more similarity to the high nominal CPUE in the early part of the time series but divergence above the low nominal values in the most recent years.

The authors were not confident that either method of accounting for targeting was appropriate, and suggested that further analyses or simulation modeling was necessary. The authors instead recommended the use of the observer-based indices for the assessment models, and the Group agreed.

The indices considered suitable for use in the assessment models are summarized in **Table 13.** The indices are illustrated in **Figures 21** and **22**. To facilitate visual comparison of the annual trends, the indices were scaled to the mean of the overlapping years.

9.2 Relative abundance indices – South

Six documents presenting standardized CPUE indices were provided to the Group. The indices were standardized using various analytical approaches. As was the case for the review of the North Atlantic indices, a table developed by the Methods Working Group in 2012 to evaluate the presented CPUE series (Anon 2013) was completed for each CPUE series by the rapporteur and presented to the Group-. The Group then revised and modified the scores (**Table 12**).

Document SCRS/2013/098 presented a standardized CPUE index for the Brazilian tuna fleet in the Southwestern Atlantic Ocean using catch and fishing effort data from 1978 to 2012 that contained information from 88,423 sets. The CPUE series (fish/1000 hooks) was standardized using a Generalized Linear Mixed Models (GLMM) with a Delta Lognormal approach. The factors used in the model were: quarter, year, area, and fishing strategy. The standardized CPUE series showed a significant oscillation over time with a general increasing trend from the end of the 80s to 2007, then a sharp decrease from that year onward possibly due to the removal of over 50% of the Japanese chartered fleet.

The Group acknowledged that using the fleet strategy was an improvement compared the last CPUE index that used a target strategy only (SCRS/2009/119) and would overestimate the CPUE although this method would require some validation for a definitive approval. The interannual variability was reduced in the new index but still remained. This pattern might reflect for the very heterogeneous fleet composition of Brazil instead of the true trend of biomass.

Document SCRS/2013/109 updated the CPUE of the South Atlantic swordfish caught by Japanese longliners for the period 1990-2012 using a similar GLM method to the previous 2009 analysis except for the new area stratification method: GLM-tree. The standardized CPUE sharply decreased in the early 1990s, reaching to a historically low level in the early 2000s, and increasing thereafter.

The Group discussed the bimodal patterns of the CPUE residual which, according to the authors, might be caused by the unexplained effects of the target shift and bycatch. It was also highlighted that the discarded catch was not included in the analysis, but that was not of a concern as the discard levels were minors. The Group noted that drastic changes in gear configurations and fishing zones occurred during the analyzed period were not fully standardized by the model used in this study. The Japanese scientists suggested that the time series should be broken in two separate series 1975-1989 and 1990-2012, since there have been clear operational changes.

The Japanese CPUE presented started at very high level and decreased rapidly. The Japanese scientists informed the Group that the first two years in the time series may not be well represented and should be removed from the series. Additionally, the Group was informed that another time series starting from 1975 was available in the previous stock assessment and should be included.The Group reuested that the CPUE time series be re-analyzed in the light of this decision.

Document SCRS/2013/098 contained information on the catch rates of the Chinese Taipei fleet for South Atlantic swordfish. The paper was presented the WG chair of the Group as the authors did not attend this meeting. The CPUE time series was standardized by applying two alternative methods GLM and GAM on two datasets covering the period1968-2011 (Task II) and 1995-2011 (log-books that included gear configuration information). The factors significant were time, space, gear configuration (i.e. Hooks-per-baskets), interaction terms, and the impact of target species.

As was the case for the North Atlantic analyses presented for the Chinese Taipei fleet, there was a concern noted by the group that the predictions based on the standardizations may not have been made on a balanced prediction grid equivalent to the SAS LSmeans. If the indices were calculated as the average of the predicted values for each observation, then it does not accurately standardize for the effect of the changing fishing areas of the fleet, hence a potential reason why the standardized index shows clear correlation with the four stanzas of spatial fishing effort. The group also noted that during the 2012 ALN data preparatory meeting the CPUE time series of the Chinese Taipei fleet was split into 3 time periods (50-86, 87-96, and 97-2011). It is not clear why the periods considered in the present study were different. Due to the inconsistencies between the previous assessments and now, the group decided not to include this series in the stock assessment models. Given these concerns the group decided to include the Chinese Taipei indices as a sensitivity analysis.

Document SCRS/2013/101 presented an update of the standardized catch rate of swordfish caught by the Uruguayan longline fleet in the Southwestern Atlantic Ocean between 1982 and 2012. As it was suggested and used during the previous swordfish stock assessment, the CPUE series was split into two periods due to a change in the target species in 1992. The standardized index for the first period showed a decrease in the CPUE in the first four years and then an increase with a relative stabilized tendency up to 1992. For the second period a marked decrease in the CPUE index was observed from 1993 to 2012.

The Group found that the time series might have been affected by the changes in fleet dynamics that occurred after 2010 due to labor conflicts and changes in market demands that resulted in a sharp reduction in the fishing effort. After further discussion, the Group agreed not to include the years 2010 to 2011 and requested the authors to estimate a new CPUE series without those 2 years. The group was concerned that the Uruguayan CPUE trend was in conflict with the other CPUEs from the South Atlantic. The Group suggested that the authors explore the evolution of the ratio SWO/total catch as a way to account for changes in targeting, and to produce the LS mean by area to further explore the area effect in the model.

Documents SCRS/2013/106 and SCRS/2013/108 provided standardized Spanish longline fleet catch rates in number and weight for the directed South Atlantic swordfish using GLM from for a 23 years period (1989-2011). SCRS/2013/106 reports standardized catch rates both in weight and number of fish for the Spanish surface longline fleet in the South Atlantic. The standardized series showed a flat trend for the period. SCRS/2013/108 reports standardized catch rates in number of fish by age from the Spanish surface longline fleet in the South Atlantic. For ages ranging from 1 to 5+, assuming the Gompertz's sex-combined growth model of the North Atlantic swordfish for ageing size data per trip. Standardized series showed fairly stable trends over time. The group decided to include this series in to stock assessment modelling process.

The indices are illustrated in **Figure 23**. To facilitate visual comparison of the annual trends, the indices were scaled to the mean of the overlapping years. After the inspection of the different time series some issues were raised by the group:

10. Limit Reference Points – identification and evaluation

The Group reviewed the work being conducted in other tRFMOs on developing limit reference points (LRPs). IOTC is starting to evaluate reference points using MSE with feedback; initially they have defined interim reference points which will then be evaluated (and modified as appropriate) using MSE. WCPFC have also evaluated reference points using MSE (based on Multifan-CL without feedback) and have recommended the use of a three tier approach i.e.

- FMSY and BMSY, but only when there are reliable and precise estimates of steepness
- FSPR and 20%SSB0 when steepness is uncertain, but M, maturity, selectivity are well known
- 20%SSB0 (and no F based reference point) when key fishery and biological variables are uncertain

In the case of CCSBT, MSE has been used to develop a full Management Procedure rather than reference points alone. Where a management procedure is the combination of pre-defined data, together with an algorithm (which may combine a stock assessment, estimation of reference points and a harvest control rule) to which such data are input to provide a value for a TAC or effort control measure.

IATTC is not using MSE and is considering using the IOTC interim approach to define limit reference points based on percentages of BMSY and FMSY.

In ICCAT, MSE is being used to develop a LRP for North Atlantic Albacore (SCRS/2013/33, 34, 35) and under the GBYP an MSE is being considered to develop a management framework for Bluefin Tuna.

For SWO, it is proposed to first define an interim reference point as a multiple B_0 , e.g. 20% of B_0 as proposed by WCFPC or B_0 times M (Kell et al., 2012) and then to evaluate it using MSE (e.g. SCRS2011/195). This requires a full consideration of sources of uncertainty that affect perception of stock status. One way to do this will be to use a grid (e.g. CCSBT and SPC) where factors correspond to sources of uncertainty and levels reflect the alternative hypotheses.

A potential problem is if scenarios considered within the stock assessment and the MSE differ, i.e. a reference point that appears to be robust based on a stock assessment alone, may later be shown to have undesirable properties.

Therefore, it is proposed to specify a base case and then factors with levels that represent the main uncertainties. In the stock assessment WG, the main effects can be evaluated by varying one factor at a time. Hopefully this will allow the stock assessment to bracket the main uncertainties and act as a simple screening experiment, i.e. to determine the factors have the greatest influence on the perception of stock dynamics. Based on the identification of the most important factors, a multi-level designed experiment can then be developed for the MSE that includes interactions between factors. This approach will be considered by the Albacore WG this year.

11. Recommendations

Participation in the Data Preparatory/Methods Meeting. Of the CPCs that fish North and South Atlantic swordfish, relatively few sent participants to the meeting. In consequence, the Working Group did not have the full advantage of the experience and insight of the experts that could have attended. The Commission needs to reaffirm its obligation and commitment (Rec 11-17) to support the SCRS in this regard, to ensure the best possible scientific products.

Timely submission of Task 1 and 2 data. Considering that a substantial amount of data, (including revisions of many years of historic size information) was received after the deadline and taking into account the time that the Secretariat needs to incorporate, validate and compile to generate the datasets requested, the Group strongly reiterates the need for respecting deadlines and providing the data in the ICCAT standard formats. This recommendation is particularly important as the SCRS moves to incorporate more complex methods than those normally used and for which the request of data is much higher.

Weight-length relationships. The Group recognized that the newly-adopted length-weight relationships for swordfish require validation with new field information. National scientists are requested to collect and submit observed values of length (LJFL) and round weight data to the Secretariat to facilitate this task.

Uncertainty and Limit Reference Points. Development of LRPs require a consideration of uncertainty including that due to the data used in stock assessment models, e.g. in the CPUE series, size measurements and raising procedures involved in creating catch-at-size and catch-at-age for the stock. For example in VPA the CAS and the CAA derived from them are assumed to be known without error. In statistical catch-at-size and catch-at-age models such as SS, SAM, ISCAM and Multifan-CL error in these data is implicit. In contrast, biomass-based methods such as ASPIC and BSP do not require CAS or CAA data. It is recommended that the data requirements for the different methods used in by the WG are evaluated by simulation, i.e. how uncertainty is related to the risk of exceeding limit reference points or not achieving MSY.

BSP2. The Group expressed considerable interest in using the BSP2 modeling approach. However, it was recognized that having an expert available to help guide the work would greatly facilitate progress. Therefore, it is recommended that the Secretariat retain an expert to assist the Group with its modeling work using BSP2.

Targetting Considering that targeting is an important component influencing stock status evaluations, and that accepted practices for identifying targeting have varied within the SCRS, the Methods Working Group should evaluate the appropriateness of incorporating explanatory factors in CPUE standardization models that are derived using the dependent variable (e.g. the proportion of SWO in the catch to identify SWO targeted trips). As recommended by the Methods Working Group in 2009, such an evaluation should be conducted using simulated data.

Sharing of Interim Results To help develop preliminary stock assessment runs between the Data Preparatory and Stock Assessment meetings, it is recommended that electronic tools for inter sessional collaboration are used. This will enable members of the WG to compare different assessment model runs and formulations in advance of the stock assessment. A variety of tools are available, e.g. SharePoint and version control systems such as Git or SVN and the cloud computing cluster set up by the Secretariat, the use of these is encouraged. National scientists who are leading the development of the three main modeling approaches should keep members of the group aware of work being conducted.

12. Other matters

In preparation for September 2013 stock assessment meeting, the Group considered that the following tasks should be completed:

BSP2

BSP2 model runs can be carried out for the 2013 stock assessment of the North and South Atlantic stocks of swordfish. To facilitate having these runs carried out it is proposed that the following actions be taken out prior to the 2013 stock assessment meeting in September 2013.

1) It was recommended at the data preparation meeting that the prior for the maximum rate of increase (r) for Atlantic swordfish be reformulated using the more recent peer reviewed information.

1. the means and CVs for the von Bertalanffy growth parameters, K, L_{inf}, t_0,
2. the means and CVs for the rate of natural mortality (M) at age for recruited animals (e.g., either a constant value M for recruited animals or a Lorenzen schedule for M at age),
3. the mean and CV for the length-weight conversion parameters (a,b) (together with units),
4. the means and CVs for parameters for the fraction mature at age (e.g., for the logistic function),
5. a prior mean and CV for the Beverton-Holt steepness parameter that could be applicable for North and South Atlantic swordfish.

These values should be used in a consistent fashion among the three modeling approach. For this reason, it is requested that estimates of these parameters be provided for the North and South Atlantic stocks as soon as possible to the participating scientists so that they can run their software to compute an updated prior for *r*, which should be prepared as a separate paper. If only point estimates are available for these parameters, it is proposed that default uncertainty CVs for them be considered. These would be CVs of 10% for the growth parameters, 20% for the age at maturity parameters, 10% for the length-weight parameters, 25% for the natural mortality rates, and 20% for steepness. It is recommended that the same values for the above list be used by the three modeling approaches adopted by the working group. The modelers should communicate among themselves to ensure a consistent approach (see **Table 1**).

2) It is recommended that estimates of total catch biomass for both stocks be compiled going back to the year 1950, if possible for both the North and South Atlantic stocks. The catch biomass series (if different to these ones) that are to be applied in the ASPIC runs are also requested to be provided for the BSP2 runs. A secretariat staff person is recommended to assist in providing the compiled catch biomass time series.

3) It is recommended that the standardized catch per unit effort (cpue) abundance indices that are approved for application for stock assessments of the North and South Atlantic swordfish stocks be provided separately by each index time series with the GLM standard error or CV (please indicate which) provided by year for each abundance index estimate in each standardized cpue time series. It is recommended also that where it is agreed that a standardized time series is to be broken due to for example a major change in management (e.g., implementation of ITQ) or a change in gear (e.g., going from J to circle hooks) that these years where the breaks occur are noted for each time series so that they may be implemented in the BSP2 model. It is also recommended that the Atlantic swordfish working group`s assessment of the relative reliability of the abundance index as an index for tracking the trends in abundance of the stock also be provided with each abundance index time series. It is recommended that the abundance index time series that is to be inputted into ASPIC also be provided for input for a BSP2 model run that will serve as a comparison run with ASPIC.

Stock Synthesis

A presentation was given to the group that proposed the basic configuration of the SS model. It included a proposed configuration for the fleet structure, pairing of the fishery fleets to the available CPUE time series, and how the selectivities of the proposed fleets would be shared amongst the fleets. The proposed configuration was a one area, one season, eight fleets (seven longline and one “surface other”). Unless future exploration of the data and model suggest otherwise, it is the recommendation of the Group that this be the level of aggregation for the initial model. It is recommended that the Secretariat make the inputs at this level of aggregation available to the modelers.

Such data will include a field for a quarterly time step in the event that time allows for the exploration of such a model configuration. At this stage it seems likely that the data request will include the following fields for landings and discards: species, stock, flag name, SS_fleet, season, gear, retained/discarded/both designation, north/south of the Tropic of Cancer designation. The request for size data will likely include the following fields: species, stock, year, season, SS_fleet, gender, retained/discarded/both designation, and length bin in 5 cm increments, north/south of the Tropic of Cancer designation. If sample of mean weight are available from any of the fleets this will be requested as well. If direct observations of size-at-age from any of the areas are available these could be very helpful. There are several swordfish scientists with particular biological expertise that may be able to provide assistance with this.

The presentation also provided some preliminary evidence for the hypothesis that the increase Canadian CPUE and a decrease in the southernmost CPUE (as presented by the US) may be due to a pole ward shift and/or expansion of the stock. The SS practitioner would like some guidance as to whether the group wishes to pursue this hypothesis via the SS model. If so, then the SS practitioner would perhaps request to collaborate with the Canadian delegate providing the CPUE data on obtaining the appropriate environmental data at the correct spatial scale to support the hypothesis testing. This might likely be area specific SST data either from buoys or satellites.
It would very beneficial to have a time table of management regulations for each of the fleets. Perhaps the representatives from the fleets or the ICCAT secretariat could help provide these.

ASPIC

The Group recommended updating the biomass combined index to run the continuity scenario from 2009 stock assessment. The Chair will coordinate with the scientific group and reiterate the conditions, and methodologies for use of the data provided by the CPCs. It is requested that the index will be available prior to the stock assessment meeting.

The production model runs should compare the results using the software available for the 2009 stock assessment (ASPIC), with an update software version recently developed (R-version ASPIC, Ref L Kell). The Group also recommends evaluating the selection of the shape parameter of the surplus production function by doing sensitivity analyses with different alternatives. Data catch input data for the SPM models will be the same as for the other assessment models, as well the general biological parameters required as input.

13. Adoption of the report and closure

The Group thanked Dr. Neilson for the excellent work done in preparing and during the meeting. The Group also recognized the work of the Secretariat. The report was revised and adopted and the meeting adjourned.

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Table 1 Summary of the current length-weight, weight-weight and age-at-length relationships for Atlantic swordfish.

Current Size-Weight relationship

Weight = alpha * Size^{beta}

Stock	alpha	beta	Weight (kg)	Size (cm)	Size Range (cm)	Reference
NW-ATL	4.59E-06	3.137	Dress	LJFL		Turner 1987
CN-ATL	4.20E-06	3.2133	Round	LJFL	80 - 253	Mejuto et al. 1988
NE-ATL	3.43E-06	3.2623	Round	LJFL	93 - 251	Mejuto et al. 1988
SW-ATL	1.24E-05	3.04	Gutted	**EYFL**		Amorin et al. 1979
SE-ATL	4.35E-06	3.188	Gutted	LJFL	89 - 266	Mejuto et al. 1988
S-ATL	5.17E-06	3.16	Gutted	LJFL		Rey Gonzales-Garces 1978
SW-ATL	8.00E-07	3.4966	Gutted	LJFL	75 - 255	Hazin et al. 2001

Current Weight to Weight relationships

Weight_pred = alpha*Weight_inp

Stock	alpha	beta	function	Weight_pred	Weight_inp	Reference
NW-ATL	1.33			Round	Dress	Turner 1987
CE-ATL	1.3158			Round	Dress	Mejuto et al. 1988
SW-ATL	0.8009	1.015	ln(GWT/alpha)/beta	Round	Gutted	Amorin et al. 1979
SE-ATL	1.14			Round	Gutted	Mejuto et al. 1988
Med	1.12			Round	Gutted	Anon 2004
N-ATL	0.75	1.04	ln(GWT/alpha)/beta	Round	Gutted	Rey Gonzales-Garces 1978

Current Size to Size relationships

Size_pred = alpha * Size_inp

Stock	alpha	beta	function	Size_pred	Size_inp	Reference
N-ATL	7.821534	1.089696	alpha+beta*Szinp	LJFL	EFL	Rey Gonzales-Garces 1978
N-ATL	10.30726	1.255833	alpha+beta*Szinp	LJFL	OPFL	Rey Gonzales-Garces 1979

Current Age at length

Gender	Stock	Relationship	Reference
Male	N ATL	$L_t = \left[300^{3.921} - (300^{3.921} - 0.0001^{3.2678})e^{-0.00465(3.921)t}\right]^{1/3.921}$	Arocha et al. (2003)
Female	N ATL	$L_t = \left[375.49^{2.976} - (375.49^{2.976} - 0.0001^{2.976})e^{-0.00734(2.976)t}\right]^{1/2.976}$	Arocha et al. (2003)
Combined	N ATL	$L_t = \left[464.54^{3.2678} - (464.54^{3.2678} - 0.0001^{3.2678})e^{-0.023(3.2678)t}\right]^{1/3.2678}$	Arocha et al. (2003)
	S ATL	$W_t = 305.56 \times \exp[-4.6335 \times \exp(-0.3058\,t)]$ $L_t = 44.2237 \times W_t^{0.29257}$	Anon. (1989)

	N-S ATL	$W_t = 305.56 \times \exp[-4.6335 \times \exp(-0.3058\, t)]$ $L_t = 44.2237 \times W_t^{0.29257}$	Anon. (1989)
Current Biological Parameters			
	Stock	Relationship	Reference
Maturity	N ATL	50% of females are mature at 179 cm (5 yrs)	Arocha et al. (1996)
	N ATL	50% of females are mature at 156 cm	Mejuto and Garcia-Cortes (2007)
	S ATL	50% of the females are mature at 156 cm	**Hazin et al. (2001)**
Natural Mortality	N ATL S ATL	0.2 for all ages	
Fecundity	N ATL	3.9 x 10^6 eggs per female	Arocha et al. (1996)

Table 2 Atlantic Swordfish conversion factors proposed by the Secretariat (2013).

Weight-size relationship RWT(kg) alpha * Size(LJFL cm)^{beta}						
Stock	alpha	beta	Weight (kg)	Size	Size Range (cm)	Reference
N-ATL	4.45373E-06	3.203784011	Round	LJFL	80-253	
S-ATL	2.46E-06	3.313974115	Round	LJFL	89-266	Mejuto et al. 1988 & Hazin et al. 2001

Size to size conversion factors alpha+beta*Size_inp					
Stock	alpha	beta	size pred (cm)	size inp (cm)	Reference
ATL	7.821534	1.089696	LJFL	EFL	Rey Gonzales-Garces 1978
ATL	10.307257	1.255833	LJFL	OPFL	Rey Gonzales-Garces 1979

Weight to Weight conversion factors Weight_pred = alpha* Weight_inp				
Stock	alpha	Weight pred (kgs)	Weight inp (kgs)	Reference
N-ATL	1.324565	Round	Dress	Turner 1987 & Mejuto et al 1988
S-ATL	1.14	Round	Gutted	Mejuto et al 1988

Table 3 Estimated Catches (t) of Atlantic swordfish (*Xiphias gladius*) by Stock, , gear and flag.

			1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
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	18881	15155	19662	19929	21953	23969	24380	26266	32685	34305	32976	28826	29207	32868	34459	38803	33511	31567	26251	27123	27180	25139	23758	24075	25252	25643	25718	27932	23596	24761	24209	23888
	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	13558	11180	13215	14527	12791	14383	18486	20236	19513	17250	15672	14934	15394	16738	15501	16872	15222	13025	12223	11622	11453	10011	9654	11442	12175	12480	11473	12302	11050	12081	11553	12834
	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	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	15630	12546	12679	12655	11055
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	12831	10549	13019	14023	12664	14240	18269	20022	18927	15348	14026	14208	14288	15641	14309	15764	13808	12181	10939	10666	9837	8676	8799	10333	11406	11527	10840	11475	10341	11439	10964	12004
		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	727	631	196	504	127	143	217	214	586	1902	1646	511	723	689	484	582	826	393	800	426	478	433	240	487	449	620	409	546	465	485	437	516
	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	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	14967	11761	12106	11920	10497
		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	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	779	574	587	488
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	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	235	151	148	305
		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	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	7	5	9
	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	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	0	147	70
		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	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	16	16	12	13	19	10	21	25	44	39	27	39	20	13	23
		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	0	0	0	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	112	106	184
		Brasil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	117	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	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	1300	1346	1551
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73	86	104	132	40	337	304	22	102	90	316	56	108	72	85	92	92	73	75
		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	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	89	88	192
		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	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	0	0	0	
		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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	30	
		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	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	1	0	0
		EU.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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.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	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	4949	4147	4889
		EU.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	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	15	35	16
		EU.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	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	1	1	2
		EU.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	0	0	0	0	0	0	0	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
		EU.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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.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	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	898	1054	1203
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	1	5	11	0	2	1	0	0	0	0	0	0	0	0	2	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	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	17	90	1
		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	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	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	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	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	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	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	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	889	935	778	1062	723
		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	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	3	0	
		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	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	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	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	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	724	963	782
		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	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	32	35	38
		NEI (ETRO)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76	112	529	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	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	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	0	0	0	0	0	0	0	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	7	171	24	25	91	22	76	26	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	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	0	0	0	0	0	0	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	4	44	5	0	8	0	22	28	0	17
		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	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	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	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	0	28	11	1
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	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	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	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	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	34	13	11
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	3	0	0	2	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	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	30	21	13
		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	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	2387	2730	2274	2752
		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	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	0	0	0	
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	5	5	3	3	2	0	0	1	1	0	3	4	3	3	3
		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	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	0	0	4
		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	0	0	0	0	0	0	0	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	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	0	0	10	23
		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	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	13	24	18
	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	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	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	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	0	0	1	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	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	111	121	207
		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	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	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	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	3386	2926	3033
		Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	
		China P.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	534	344	200	423	353	278	91	300	473	470	291	296	248
		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	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	612	410	424
		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	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	0	0	0	
		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	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	159	100	114	145
		EU.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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.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	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	5183	5801	4700
		EU.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	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	0	0	0	
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	380	389	441	384	381	392	393	380	354	345	493	440	428	271	367	232	263
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	0	0	3	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	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	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	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	177	132	116	60
		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	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	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	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	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	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	2155	1600	1340	1314	912
		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	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	10	0	
		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	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	0	0	0	
		NEI (ETRO)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	856	439	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	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	25	417	414
		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	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	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	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	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1	8	1	1	4	58	41	49	14	35
		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	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	183	188	193	
		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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	77	138	195	180	264
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	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	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	170	145	97
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	7	16	4	3
		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	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	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	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	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	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	0	0	0	
		UK.Sta Helena	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	
		Uruguay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	501	222	179
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	26	6	3	0	3	1
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	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	9	15	8
		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	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	0	0	0	
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	170
		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	0	0	0	0	0	0	0	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
		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	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	205	148	138	135
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	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	0	0	
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	147	70
		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	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	0	0	0	0

Table 4 Task-I catch series of EU-Portugal (mainland fleet) reclassification of "SURF" unclassified into "LL-surf", from 1994 to 2011. The entire LLHB catches series (SWO-N and SWO-S) was similarly reclassified into "LL-surf".

			old series				new
Year	**Stock**	**Area**	**LLHB**	**LL-surf**	**SURF**	**UNCL**	**LL-surf**
1994	ATN	NE	960			6	966
1995	ATN	NE	1115				1115
1996	ATN	NE	998				998
1997	ATN	NE	467				467
1998	ATN	NE	229		161		390
1999	ATN	NE	286		217		503
2000	ATN	NE	250		194		444
2001	ATN	NE	158		252		410
2002	ATN	NE	127		134		262
2003	ATN	NE	315		335		650
2004	ATN	NE	672				672
2006	ATN	NE	303	190			493
2007	ATN	NE	3	211			214
2008	ATN	NE	387		6		393
2009	ATN	NE	218		293		511
2010	ATN	NE	522		0		522
2011	ATN	NE	555		303		858

Table 5 Swordfish live discards reported in Task I (quantities not included in the Task-I nominal catches).

Species	YearC	Status	Flag	Fleet	Stock	Area	GearCode	DataType	Qty(t)
SWO	2000	CP	Japan	JPN	ATN	NORT	LLHB	DL	331
SWO	2001	CP	Japan	JPN	ATN	NORT	LLHB	DL	329
SWO	2002	CP	Japan	JPN	ATN	NORT	LLHB	DL	224
SWO	2003	CP	Japan	JPN	ATN	NORT	LLHB	DL	133
SWO	2004	CP	Japan	JPN	ATN	NORT	LLHB	DL	339
SWO	2005	CP	Japan	JPN	ATN	NORT	LLHB	DL	123
SWO	2006	CP	Mexico	MEX	ATN	GOFM	LL	DL	0.653
SWO	2007	CP	Brasil	BRA-BRA-SANTOS	ATS	SW	LL	DL	45.578
SWO	2007	CP	Brasil	BRA-ESP-CABDELO	ATS	SW	LL	DL	1.383
SWO	2007	CP	Brasil	BRA-ESP-NATAL	ATS	SW	LL	DL	2.874
SWO	2007	CP	Brasil	BRA-GBR-NATAL	ATS	SW	LL	DL	0.125
SWO	2007	CP	Brasil	BRA-MAR-NATAL	ATS	SW	LL	DL	4.453
SWO	2007	CP	Mexico	MEX	ATN	GOFM	LL	DL	0.344
SWO	2008	CP	Brasil	BRA-BRA-NATAL	ATS	SW	LL	DL	0.52
SWO	2008	CP	Brasil	BRA-ESP-CABDELO	ATS	SW	LL	DL	0.18
SWO	2008	CP	Brasil	BRA-ESP-NATAL	ATS	SW	LL	DL	0.3
SWO	2008	CP	Brasil	BRA-HND-NATAL	ATS	SW	LL	DL	0.33
SWO	2008	CP	Brasil	BRA-MAR-NATAL	ATS	SW	LL	DL	1.17
SWO	2008	CP	Mexico	MEX	ATN	GOFM	LL	DL	0.46
SWO	2009	CP	Mexico	MEX	ATN	GOFM	LL	DL	0.339
SWO	2010	CP	Korea Rep.	KOR	ATS	SOUT	LL	DL	10.019
SWO	2010	CP	Mexico	MEX	ATN	GOFM	LL	DL	0.542
SWO	2011	CP	Mexico	MEX	ATN	GOFM	LL	DL	0.323
SWO	2011	CP	UK.Bermuda	UK.BMU	ATN	NW	LLSWO	DL	0.12

Table 6 Details of (new and updated) Task-II size data received by the ICCAT Secretariat after May 25 2013 for the Swordfish data preparatory meeting. Table details the type and source of data incorporated (values represent the number of records modified, a total of 219,195).

SpeciesCode	SWO																				
Sum of recs	SizeInfoID	Flag	GearGrpCode																		
	siz									CAS											
	Canada		Chinese Taipei	EU.Portugal	Japan	Maroc	Uruguay	Venezuela		Canada				Japan	Maroc	U.S.A.					
DateRef	HP	LL	LL	LL	LL	LL	LL	GN	LL	HP	LL	RR	TW	LL	LL	HL	HP	LL	TP	TW	UN
2013-05-27	331	2045								333	2306	2	6								
2013-05-29	562	3014			130924									35133							
2013-05-30							3409									689	6	5592	4	90	7
2013-05-31			11320	12551				2726	7897												
2013-06-04						35									213						
TOTAL	**893**	**5059**	**11320**	**12551**	**130924**	**35**	**3409**	**2726**	**7897**	**333**	**2306**	**2**	**6**	**35133**	**213**	**689**	**6**	**5592**	**4**	**90**	**7**

Table 7 Catalogue of SWO-N statistics available by fishery (flag/gear combination, ranked in descending by order of importance) and year, from 1980 to 2011. Only the 30 most important fisheries (representing 99% of Task-I catch) are shown. For each data series, Task I (DSet= "t1", in tonnes) is visualised against its equivalent Task II availability (DSet= "t2") scheme. The Task-II colour scheme, combined with a concatenation of characters ("a"= T2CE exists; "b"= T2SZ exists; "c"= CAS exists) represents the Task-II data availability (in ICCAT-DB). The colour scheme pattern, starts with red ("-1" = no Task II available) and ends with dark green ("abc"= all Task II datasets available).

Species	Stock	Status	FlagName	GearGrp	DSet	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	2009	2010	2011	Rank	%	%cum
SWO	ATN	CP	EU.España	LL	t1	3810	4013	4554	7100	6315	7431	9712	11134	9600	5696	5736	6506	6351	6392	6027	6948	5519	5133	4079	3993	4581	3967	3954	4585	5373	5511	5446	5564	4366	4949	4147	4885	1	41.60%	41.6%
SWO	ATN	CP	EU.España	LL	t2	abc	ac	ac	ac	abc	abc	ac	a	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	1		
SWO	ATN	CP	U.S.A.	LL	t1	5015	3986	5271	4510	4666	4642	5143	5164	6020	5855	4967	4399	4124	4044	3960	4452	4015	3399	3433	3364	3316	2498	2598	2757	2591	2273	1961	2474	2405	2691	2204	2681	2	27.42%	69.0%
SWO	ATN	CP	U.S.A.	LL	t2	b	b	b	b	b	b	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	2		
SWO	ATN	CP	Canada	LL	t1	1794	542	542	960	465	550	973	876	874	1097	819	953	1487	2206	1654	1421	646	1005	927	1136	923	984	954	1216	1161	1470	1238	1142	1115	1061	1182	1351	3	7.88%	76.9%
SWO	ATN	CP	Canada	LL	t2	a	-1	-1	-1	-1	-1	-1	b	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	3		
SWO	ATN	CP	Japan	LL	t1	1167	1315	1755	537	665	921	807	413	621	1572	1051	992	1064	1126	933	1043	1494	1218	1391	1089	759	567	319	263	575	705	656	889	935	778	1062	723	4	6.67%	83.6%
SWO	ATN	CP	Japan	LL	t2	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	bc	bc	bc	abc	abc	abc	abc	abc	abc	abc	abc	4		
SWO	ATN	CP	EU.Portugal	LL	t1					7	15	448	984	612	292	463	757	497	1950	1579	1593	1702	902	772	776	731	731	765	1032	1319	900	949	778	747	898	1054	1202	5	5.55%	89.1%
SWO	ATN	CP	EU.Portugal	LL	t2				b	a	ab	ab	b	ab	ab	ab	abc	ac	ab	ab	ab	ab	ab	ab	ab	abc	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	5		
SWO	ATN	NCC	Chinese Taipei	LL	t1	134	182	260	272	164	152	157	52	23	17	269	577	441	127	507	489	521	509	286	285	347	299	310	257	30	140	172	103	82	89	88	192	6	1.71%	90.8%
SWO	ATN	NCC	Chinese Taipei	LL	t2	ab	abc	abc	abc	abc	abc	abc	abc	ac	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	ab	ab	ab	ab	ab	ab	ab	6		
SWO	ATN	CP	Maroc	LL	t1	136	124	91	125	79	137	178	192	195	219	24	92	41	27	7	28	35	239		35	38	264	154	223	255	325	333	229	428	720	963	700	7	1.51%	92.3%
SWO	ATN	CP	Maroc	LL	t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		-1	-1	-1	-1	bc	abc	abc	abc	abc	abc	c	abc	a	7		
SWO	ATN	NCO	Cuba	LL	t1	278	227	254	410	206	162	636	910	832	87	47												10	3	3	2	2						8	0.92%	93.2%
SWO	ATN	NCO	Cuba	LL	t2	a	a	a	a	ab	ab	a	a	a	a	a												ab	-1	-1	-1	-1						8		
SWO	ATN	CP	Canada	HP	t1			12	128	34	35	86	78	24	150	92	73	60	28	22	189	93	89	240	18	95	121	38	147	87	193	203	267	258	248	176	208	9	0.79%	94.0%
SWO	ATN	CP	Canada	HP	t2			-1	-1	-1	-1	-1	-1	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	9		
SWO	ATN	CP	Trinidad and Tobago	LL	t1				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	30	21	13	10	0.58%	94.6%
SWO	ATN	CP	Trinidad and Tobago	LL	t2				-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	a	a	a	a	a	a	a	a	a	10		
SWO	ATN	CP	China P.R.	LL	t1														73	86	104	132	40	337	304	22	102	90	316	56	108	72	85	92	92	73	75	11	0.51%	95.1%
SWO	ATN	CP	China P.R.	LL	t2														-1	-1	-1	-1	-1	a	a	a	a	a	a	a	a	ab	a	ab	ab	ab	ab	11		
SWO	ATN	CP	Korea Rep.	LL	t1	284	136	198	53	32	160	68	60	30	320	51	3	3	19	16	16	19	15								51	65	175	157	3		170	12	0.48%	95.6%
SWO	ATN	CP	Korea Rep.	LL	t2	a	a	ab	ab	a	ab	ab	a	ab	ab	ab	a	ab	a	a	a	a	a				a				a	a	a	a	a		-1	12		
SWO	ATN	CP	EU.España	GN	t1						4	3		194	949	646	124																					13	0.44%	96.0%
SWO	ATN	CP	EU.España	GN	t2						-1	ab		ac	ac	ac	ab																					13		
SWO	ATN	CP	U.S.A.	GN	t1							49	54	120	524	535	82	86	92	88	74	78	0	36		0		0		0			0		0			14	0.41%	96.5%
SWO	ATN	CP	U.S.A.	GN	t2	b	b					b	b	b	b	ab	ab	ab	ab	ab	ab	ab	ab	ab		-1		-1		-1			-1		bc			14		
SWO	ATN	CP	U.S.A.	HP	t1	585	532	136	293	60	41	18	29	31	32	8	2	1	0	2	1	1	1	1		1	7	3		1		0			0	1	1	15	0.41%	96.9%
SWO	ATN	CP	U.S.A.	HP	t2	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b		bc	bc	bc		bc		bc			bc	bc	bc	15		
SWO	ATN	CP	Maroc	GN	t1											19	9	4	2	13	32	322	13	179	60	51	243	64	98	76	9						80	16	0.29%	97.2%
SWO	ATN	CP	Maroc	GN	t2											-1	-1	-1	-1	-1	-1	-1	-1	c	ac	ac	ac	-1	b	b	b						-1	16		
SWO	ATN	CP	Venezuela	LL	t1	192	24	25	35	23	51	84	86	2	2	4	73	101	68	60	45	74	11	7	9	30	12	25	29	46	48	15	19	5	8	16	13	17	0.28%	97.4%
SWO	ATN	CP	Venezuela	LL	t2	-1	-1	-1	-1	-1	-1	-1	b	b	b	b	b	b	b	b	b	b	b	b	ab	ab	b	b	ab	ab	ab	ab	ab	ab	ab	ab	ab	17		
SWO	ATN	CP	EU.France	UN	t1	5	4			1	4	4				75	75	75	95		38	97	164						32	102	178	0	46	14	3	1	0	18	0.23%	97.7%
SWO	ATN	CP	EU.France	UN	t2	-1	-1			-1	-1	-1				-1	-1	c	c		-1	-1	-1						-1	-1	-1	-1	-1	-1	-1	-1	-1	18		
SWO	ATN	CP	U.S.A.	HL	t1														38			0	1		5	9	9	12	21	23	35	33	125	94	125	129	125	19	0.18%	97.8%
SWO	ATN	CP	U.S.A.	HL	t2														-1			-1	b	b	c	bc	bc	c	bc	bc	bc	bc	bc	bc	bc	bc	bc	19		
SWO	ATN	NCO	NEI (MED)	UN	t1		12					14	3	131	190	185	43	35	111																			20	0.16%	98.0%
SWO	ATN	NCO	NEI (MED)	UN	t2		-1					-1	-1	-1	-1	-1	-1	-1	-1																			20		
SWO	ATN	NCO	NEI (ETRO)	LL	t1									76	112	529																						21	0.16%	98.2%
SWO	ATN	NCO	NEI (ETRO)	LL	t2									-1	-1	-1																						21		
SWO	ATN	CP	EU.España	UN	t1													316	202	150		20																22	0.16%	98.3%
SWO	ATN	CP	EU.España	UN	t2													ab	ab	ac		ac													a			22		
SWO	ATN	CP	Mexico	LL	t1														6	14		22	14	28	24	37	27	34	32	44	41	31	35	34	32	35	38	23	0.12%	98.4%
SWO	ATN	CP	Mexico	LL	t2														a	a		a	a	a	a	a	c	-1	a	a	a	a	a	a	a	a	a	23		
SWO	ATN	CP	U.S.A.	RR	t1																	6	11	5	21	16	2	22	6	25	61	53	68	76	32	49	54	24	0.11%	98.6%
SWO	ATN	CP	U.S.A.	RR	t2	a	a	a	a	a	a	a	ab	a	a	a	a	a	ab	ab	a	a	ab	ab	ab	ab	ab	ab	ab	a	a	a	a	ab	ab	abc	bc	24		
SWO	ATN	CP	EU.France	TW	t1															13	13					60		74	138			91			12	32	15	25	0.10%	98.7%
SWO	ATN	CP	EU.France	TW	t2															a	-1					-1		-1	-1			-1			-1	-1	-1	25		
SWO	ATN	NCO	Liberia	UN	t1	5	38	34	53		24	16	30	19	35	3		7	14	26	28	28	28	28	28													26	0.10%	98.8%
SWO	ATN	NCO	Liberia	UN	t2	-1	-1	-1	-1		-1	-1	-1	-1	-1	-1		-1	-1	-1	-1	-1	-1	-1	-1													26		
SWO	ATN	CP	Belize	LL	t1																												9	1	112	106	184	27	0.09%	98.9%
SWO	ATN	CP	Belize	LL	t2																												a	a	ab	ab	ab	27		
SWO	ATN	NCO	Grenada	LL	t1																1							54	88	73	56	30	26	43				28	0.08%	98.9%
SWO	ATN	NCO	Grenada	LL	t2																-1							-1	a	a	a	a	a	a				28		
SWO	ATN	CP	Barbados	LL	t1																	33	16	16	12	13	19	10	19	24	39	34	23	36	17	13	23	29	0.08%	99.0%
SWO	ATN	CP	Barbados	LL	t2																	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	a	a	a	29		

Table 8 Catalogue of SWO-S statistics available by fishery (flag/gear combination, ranked in descending by order of importance) and year, from 1980 to 2011. Only the 20 most important fisheries (representing 99% of Task-I catch) are shown. For each data series, Task I (DSet= "t1", in tonnes) is visualised against its equivalent Task II availability (DSet= "t2") scheme. The Task-II colour scheme, combined with a concatenation of characters ("a"= T2CE exists; "b"= T2SZ exists; "c"= CAS exists) represents the Task-II data availability (in ICCAT-DB). The colour scheme pattern, starts with red ("-1" = no Task II available) and ends with dark green ("abc"= all Task II datasets available).

Species	Stock	Status	FlagName	GearGrp	DSet	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	2009	2010	2011	Rank	%	%cum
SWO	ATS	CP	EU.España	LL	t1							66		4393	7725	6166	5760	5651	6974	7937	11290	9622	8461	5832	5758	6388	5789	5741	4527	5483	5402	5300	5283	4073	5183	5801	4700	1	36.14%	36.1%
SWO	ATS	CP	EU.España	LL	t2						b	ac	a	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	1		
SWO	ATS	CP	Japan	LL	t1	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	2155	1600	1340	1314	912	2	19.00%	55.1%
SWO	ATS	CP	Japan	LL	t2	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	2		
SWO	ATS	CP	Brasil	LL	t1	1579	654	1018	781	467	562	752	947	1162	1168	1696	1312	2609	2013	1571	1970	1892	4100	3844	4721	4579	4075	2903	2917	2914	3780	4120	3892	3152	3132	2657	2800	3	18.34%	73.5%
SWO	ATS	CP	Brasil	LL	t2	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	3		
SWO	ATS	NCC	Chinese Taipei	LL	t1	702	528	520	261	199	280	216	338	798	610	896	1453	1686	846	2829	2876	2873	2562	1147	1168	1303	1149	1164	1254	745	744	377	671	727	612	410	424	4	7.84%	81.3%
SWO	ATS	NCC	Chinese Taipei	LL	t2	ab	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	ab	ab	ab	ab	ab	ab	ab	4		
SWO	ATS	CP	Uruguay	LL	t1		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	501	222	179	5	4.56%	85.9%
SWO	ATS	CP	Uruguay	LL	t2		a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	5		
SWO	ATS	CP	Korea Rep.	LL	t1	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	10	147	70	6	1.87%	87.7%
SWO	ATS	CP	Korea Rep.	LL	t2	a	a	ab	ab	ab	ab	ab	a	ab	ab	ab	ab	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	-1	-1	6		
SWO	ATS	CP	Namibia	LL	t1															22					374	452	607	504	187	549	832	1118	1038	518	25	408	366	7	1.69%	89.4%
SWO	ATS	CP	Namibia	LL	t2															a					a	-1	ab	a	-1	a	ab	ab	ab	ab	ab	ab	ab	7		
SWO	ATS	CP	EU.Portugal	LL	t1																380	389	441	384	381	392	393	380	354	345	493	440	428	271	367	232	263	8	1.53%	91.0%
SWO	ATS	CP	EU.Portugal	LL	t2																a	a	ab	ab	ab	a	ab	ab	a	ab	ab	ab	ab	ab	ab	ab	ab	8		
SWO	ATS	NCO	Cuba	LL	t1	316	147	432	818	1161	1301	95	173	159	830	448																						9	1.42%	92.4%
SWO	ATS	NCO	Cuba	LL	t2	a	a	a	a	a	a	a	a	a	a	a																						9		
SWO	ATS	CP	Ghana	GN	t1	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	177	132	116	60	10	1.08%	93.5%
SWO	ATS	CP	Ghana	GN	t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	ab	b	ab	b	ab	ab	ab	ab	ab	ab	ab	ab	a	ab	a	a	10		
SWO	ATS	CP	China P.R.	LL	t1																			29	534	344	200	423	353	278	91	300	473	470	291	296	248	11	1.05%	94.5%
SWO	ATS	CP	China P.R.	LL	t2																			a	a	a	a	a	a	a	a	a	a	ab	ab	ab	ab	11		
SWO	ATS	CP	South Africa	LL	t1						5	3	3								1			240	143	327	547	649	293	295	199	186	207	142	170	145	97	12	0.88%	95.4%
SWO	ATS	CP	South Africa	LL	t2						-1	-1	-1								-1			ab	ab	ab	ac	abc	ab	ab	ab	ab	ab	ab	ab	ab	a	12		
SWO	ATS	CP	S. Tomé e Príncipe	UN	t1									216	207	181	179	177	202	190	178	166	148	135	129	120	120	120	120	126								13	0.66%	96.1%
SWO	ATS	CP	S. Tomé e Príncipe	UN	t2									-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								13		
SWO	ATS	NCO	Cuba	UN	t1												209	246	192	452	778	60	60															14	0.48%	96.5%
SWO	ATS	NCO	Cuba	UN	t2												-1	-1	-1	-1	-1	-1	-1															14		
SWO	ATS	CP	Brasil	UN	t1																			3			7					310	351	260	253	269	184	15	0.40%	96.9%
SWO	ATS	CP	Brasil	UN	t2																			-1			-1					b	-1	-1	a	-1	-1	15		
SWO	ATS	NCO	Argentina	UN	t1			20			361	31	351	198	175	230	88	88	14	24										0								16	0.38%	97.3%
SWO	ATS	NCO	Argentina	UN	t2			-1			-1	-1	-1	-1	-1	-1	-1	-1	-1	-1										-1						a		16		
SWO	ATS	CP	U.S.A.	LL	t1																	172	417	170	185	144	43	200	21	16						0		17	0.33%	97.7%
SWO	ATS	CP	U.S.A.	LL	t2									a	a	a	a	a		a		a	a	ab	abc	abc	abc	abc	abc	abc						bc		17		
SWO	ATS	CP	Angola	SU	t1					26	228	815	84	84	84																							18	0.32%	98.0%
SWO	ATS	CP	Angola	SU	t2					-1	-1	-1	-1	-1	-1																							18		
SWO	ATS	NCO	NEI (ETRO)	LL	t1										856	439																						19	0.31%	98.3%
SWO	ATS	NCO	NEI (ETRO)	LL	t2										-1	-1																						19		
SWO	ATS	CP	S. Tomé e Príncipe	TR	t1																										147	138	138	172	179	176		20	0.23%	98.5%
SWO	ATS	CP	S. Tomé e Príncipe	TR	t2																										-1	-1	-1	-1	-1	-1		20		
SWO	ATS	CP	Senegal	LL	t1																												77	138	195	180	264	21	0.21%	98.7%
SWO	ATS	CP	Senegal	LL	t2																												-1	a	-1	a	a	21		
SWO	ATS	CP	EU.Lithuania	UN	t1															794																		22	0.19%	98.9%
SWO	ATS	CP	EU.Lithuania	UN	t2															-1																		22		
SWO	ATS	CP	Côte D'Ivoire	GN	t1									12	7	8	18	13	14	20	19	26	18	25	26	20	19	19	43	29	31	39	17	159			145	23	0.18%	99.1%
SWO	ATS	CP	Côte D'Ivoire	GN	t2									ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	-1	-1	a	-1			a	23		
SWO	ATS	CP	Belize	LL	t1																1				17	8							120	32	111	121	207	24	0.15%	99.2%
SWO	ATS	CP	Belize	LL	t2																a				-1	a							a	a	ab	ab	ab	24		

Table . 9 SWO-N catch-at-size matrix by year and 5 cm length classes (first and last classes plus groups)

Σ_Nt YearC

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	2009	2010	2011
40	0	0	0	0	0	0	0	0	0	6	0	3	0	58	214	51	63	1	9	0	5	25	51	4	0	2	0	0	0	0	0	8	6	0
45	0	0	0	0	0	0	0	2	12	2	0	0	0	32	0	38	75	0	23	50	21	0	0	0	0	0	0	0	0	0	0	120	0	0
50	0	0	0	0	19	0	4	8	146	7	0	0	2	42	0	66	92	22	23	0	0	0	25	15	0	0	1	0	1	1	0	336	34	48
55	0	0	0	0	0	22	0	15	8	2	34	0	0	20	196	92	105	351	299	44	2	0	1	7	27	10	0	25	0	0	3	213	3	0
60	0	3	8	2	34	6	26	65	43	10	29	2	26	251	432	697	393	197	178	195	510	219	492	66	401	22	0	40	8	7	22	252	388	510
65	0	30	42	18	70	65	74	54	110	38	147	146	112	425	760	1253	596	1007	1786	1642	789	644	730	35	51	13	1	1	2	5	11	142	71	82
70	2	58	234	57	209	89	227	184	240	302	600	256	366	694	1281	983	1256	1998	3660	3849	709	1314	2009	146	607	25	19	60	10	37	15	92	260	258
75	103	201	452	438	451	418	589	501	1110	903	1683	743	987	1137	1216	2380	3211	2472	4290	4273	1225	2813	1745	330	1465	137	59	176	35	56	56	199	489	242
80	430	360	644	650	863	729	986	1039	2920	3428	4576	1645	3059	1670	3878	4573	4108	3334	6998	5960	3368	3549	4273	1831	4129	903	1714	2916	4689	1648	2485	353	4183	2727
85	191	593	1048	1017	1106	1568	1927	1849	6090	9477	10414	4290	6742	2711	2998	4090	6255	6414	11500	10847	3107	2627	3012	3705	2396	1517	1423	4254	1050	801	1195	397	2539	1268
90	696	750	1993	1642	1718	2221	2405	2504	5223	9602	10662	5609	7195	3700	4493	5874	7011	4965	10512	9998	4927	5383	7678	4402	4049	2416	3319	6526	4299	2826	1482	1920	2408	2399
95	792	1372	2744	2373	1757	3284	2919	3064	5820	10978	12221	8092	7500	6598	5350	9144	8477	7378	11583	14391	8932	10318	10469	7288	5668	4296	7551	7073	4008	8034	3753	3751	4957	7154
100	852	1820	4797	2937	3972	4631	5290	5976	8914	12404	21435	15284	9492	8959	8744	12090	13228	11676	10806	13513	8198	8327	7120	4780	4543	4435	3767	4113	4706	5140	2274	2128	4006	6533
105	2003	3105	6616	3714	6346	7946	7629	9301	13077	19505	23032	21636	13130	10949	9614	15466	13511	13785	10566	13682	10189	11327	8394	5045	5435	5329	5087	5137	8104	9663	4746	5659	9022	14753
110	1872	2846	6462	3589	5099	8263	7271	9384	12731	18018	21959	19422	13578	10951	12484	16441	15553	14172	12771	15104	12362	10912	12588	8973	8005	7960	9525	10405	10976	10132	11158	8863	13256	17770
115	2173	4170	7604	4965	6156	11584	9191	10318	17202	21143	31859	24378	20129	13492	14325	18205	21690	19568	19149	16754	19099	16011	18147	12053	12152	14380	14343	15400	16503	18040	15801	13243	16384	25172
120	3395	5754	9015	7192	6945	10861	10950	12471	21139	24599	26075	24302	24421	16086	18435	21151	23819	23899	21298	19683	25374	21833	23115	17231	17466	19768	19530	22724	23200	23804	21207	23117	18925	23126
125	3879	6196	9442	8507	6541	11564	10805	12581	20906	24102	26435	22813	24914	17065	19915	22131	22883	26528	23176	19236	25464	21994	20854	18758	15692	21241	19197	21146	22741	22654	22845	25617	19907	22273
130	4226	5733	10601	8088	7262	11559	11857	13260	19896	25247	32521	24762	26806	20463	22640	25368	25572	32695	27628	20078	25769	24729	25536	20856	18683	23929	23387	23327	24373	25084	21736	29176	30034	27079
135	5498	6854	11976	9436	9691	12159	13005	15129	20864	26223	27341	24189	24709	21986	22242	24728	23129	28804	25686	18162	22859	21103	18145	15842	14755	19920	21136	20744	19569	20663	19555	21605	17454	17278
140	7153	6927	11508	10245	10141	12678	13892	16530	21828	27190	28755	23264	24685	23053	22505	26261	21538	26086	24723	18440	20003	22089	21021	17603	16377	20119	19233	20010	19343	19753	16407	17738	17034	17130
145	8657	7809	12002	10120	11448	13256	13797	16248	21405	25076	25914	22216	22469	22227	20276	22623	20113	25246	22720	16165	16125	17624	16966	13829	13619	17245	17190	16536	14678	17443	14297	16402	14397	13042
150	8199	8702	10709	9536	10484	13971	14160	17119	21269	26176	25008	21964	20237	29098	21180	23491	19629	23070	22465	15876	15717	17357	16391	13701	14343	18005	17404	17783	14099	15908	13752	14263	11943	14676
155	9982	8699	11994	9848	11800	16097	14835	17642	22567	25488	23357	21185	19829	22061	19704	20581	18481	21461	20259	14802	14354	14255	13433	10787	10886	13992	14340	14341	12471	13352	11483	11623	11410	13226
160	9706	8865	11983	10016	11889	15341	14221	17180	21183	22623	19534	17998	17380	17913	17701	17847	16697	19139	18827	13473	12384	11937	12576	10242	10589	12175	13414	13776	12000	11572	9618	11487	11223	11394
165	11228	8603	10726	9183	11904	13225	12340	15198	19061	20992	18920	16061	14784	13926	14548	15630	14366	16371	14767	11081	10046	9657	9685	8335	7935	10112	11679	10558	9204	9605	8938	8646	7824	9850
170	10250	10606	12067	10504	13311	15948	13229	14530	18166	20471	14819	15136	13734	13044	14931	13969	12194	12785	12794	10159	9304	8055	7914	7472	7696	8159	9577	10118	8231	8384	7426	7243	8064	8609
175	9051	8881	10093	9140	11377	12319	11270	11962	15006	16482	19195	16172	11044	10498	10669	11685	10845	10776	10039	7710	7074	6511	6863	6056	6332	7679	8657	8025	6256	7247	5995	6753	7263	7836
180	8749	8055	9504	8208	11405	12356	9306	10235	12900	12604	11888	10275	9795	9552	10400	9812	9116	9607	8209	7078	5937	5074	5592	5617	5117	5624	6178	6851	5911	6801	5666	5670	5823	7597
185	9687	8283	9304	6870	8898	10471	8517	9299	10949	11705	8701	8233	7678	7326	8235	9484	7548	7799	5968	6078	5061	4357	4364	4363	3791	4583	5322	5352	4360	5332	4514	4719	5080	6070
190	7872	7247	7339	5808	7712	8216	7181	7339	9215	9259	6590	6695	5948	6463	7140	7592	6157	6038	5152	5601	4639	4087	3671	4695	3139	4046	4383	4637	4084	4895	4318	4152	4173	4904
195	6267	6526	6789	5242	5918	6560	5256	5669	6890	7036	6454	5257	4619	4509	4892	5418	5027	4794	4037	3833	3300	2989	2992	3099	2436	3289	3682	4005	3313	3929	3710	3896	3461	4099
200	6095	5840	6544	4829	5324	5656	4594	4728	5968	5910	4445	4200	3883	3774	4395	4187	4166	3838	3769	3275	2561	2305	2715	2242	2267	2431	2844	3001	2664	3115	2947	3542	3482	3735
205	4981	5216	4917	4145	4287	4536	3538	3974	4144	3414	4773	3957	2991	2699	3474	3311	3205	2955	2561	2234	2015	2065	1698	2048	1567	1864	2369	2445	2453	2667	2477	2699	2776	3211
210	4384	4292	4423	3455	4521	3594	2721	3289	3288	3240	3116	2817	2161	2272	2339	2751	2581	2291	2092	2008	1901	1714	1848	1372	1596	1943	2045	1940	2092	2285	2106	2335	2308	2604
215	2507	3583	3162	2740	3524	2763	2243	2588	2865	2241	2140	2001	1829	1611	1844	1919	1900	1901	1652	1300	1278	1415	1166	1146	1091	1312	1473	1766	1532	1664	1630	2128	1728	2125
220	3420	3331	3189	2348	2617	2149	1627	1975	2481	2194	1787	1707	1466	1349	1791	1726	1574	1663	1198	1504	1101	865	943	995	1171	1179	1255	1213	1276	1198	1310	2242	1501	1918
225	2185	2578	2015	1732	1768	1568	1323	1239	1727	1788	1259	1376	975	905	1185	1122	1230	1182	1010	1224	878	835	764	768	696	827	983	914	875	939	856	1054	1132	1052
230	1938	2258	1548	1407	1515	1305	1047	989	1302	1083	1027	818	758	695	771	947	857	836	735	749	691	712	665	684	1073	723	653	651	881	847	1124	982	935	980
235	1382	1675	1476	1327	1221	1092	851	726	952	766	661	712	585	594	581	825	726	737	571	948	571	436	368	388	459	511	502	753	612	554	783	1241	852	711
240	1245	1171	1100	893	841	793	660	595	669	654	483	481	395	487	565	622	523	633	445	726	402	380	360	376	509	427	460	429	478	594	629	579	647	551
245	672	968	846	643	749	499	371	398	587	390	319	448	359	301	352	325	401	435	326	335	350	263	250	300	279	317	364	371	305	380	350	467	378	549
250	623	709	492	473	523	406	410	285	415	485	221	286	208	219	223	236	300	296	290	273	322	322	205	181	217	225	247	329	320	265	290	327	282	351
255	277	474	379	312	505	250	198	207	304	223	172	192	189	146	226	192	202	269	204	327	173	153	199	111	181	180	253	191	244	166	239	254	251	169
260	239	212	153	161	264	192	111	147	179	195	94	164	117	101	140	179	126	225	104	272	104	90	86	127	158	108	162	214	183	131	239	195	129	124
265	130	109	135	175	234	90	66	125	128	125	69	179	102	50	112	106	334	169	79	170	58	73	70	63	129	86	113	74	143	107	114	122	157	49
270	113	83	110	76	140	53	38	63	123	90	67	131	89	103	105	68	72	144	63	223	86	31	67	64	54	59	76	51	66	42	58	101	47	35
275	98	11	87	58	111	18	23	40	72	68	61	59	30	44	36	84	43	110	35	119	31	28	34	35	45	44	34	28	86	33	76	69	40	24
280	112	8	14	3	33	14	22	47	66	35	45	29	53	39	35	26	25	76	34	29	18	21	10	34	26	14	54	42	22	41	72	24	30	25
285	22	20	2	11	84	1	15	35	34	41	17	29	18	22	11	29	26	76	10	7	9	6	9	12	10	17	16	8	23	48	29	32	7	22
290	20	13	0	7	66	8	9	13	18	37	22	58	23	11	32	29	13	51	4	9	6	7	7	19	7	3	15	7	4	8	8	9	17	13
295	2	14	0	14	24	1	19	2	20	10	7	8	4	10	14	41	8	39	3	10	2	6	1	2	3	1	10	3	5	1	2	0	9	0
300	30	17	0	0	23	0	4	0	10	7	10	7	3	7	2	3	17	20	2	20	2	1	1	7	6	5	3	1	4	37	1	1	0	9
305	38	0	0	3	21	0	12	0	3	8	12	13	28	5	0	42	2	17	6	0	0	0	2	0	1	1	3	0	2	0	0	8	0	15
310	0	0	21	84	41	32	1	2	0	3	8	22	20	9	8	35	6	30	4	6	0	7	7	18	3	5	2	1	9	5	10	4	10	0

Table . 10 SWO-S catch-at-size matrix by year and 5 cm length classes (first and last classes plus groups)

Σ_Nt YearC 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	2009	2010	2011
40	0	0	0	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	9	5	0	16	0	3
45	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	11	2	0	0	0	3
50	0	0	0	0	19	0	0	0	0	8	0	0	26	0	0	24	2	0	10	0	0	0	0	0	0	2	0	90	12	2	1	0	0	0
55	0	0	0	0	40	0	0	2	22	0	0	0	0	0	0	0	2	0	3	0	12	5	6	8	6	2	4	114	27	0	0	0	0	3
60	0	0	2	8	2	1	3	22	5	8	55	24	16	41	56	47	27	23	7	0	25	12	187	17	1	0	4	99	32	28	13	47	56	16
65	0	0	6	5	3	4	0	2	0	0	2	58	4	40	74	24	36	0	7	0	56	42	230	72	57	21	15	58	42	17	24	17	31	62
70	0	0	9	53	79	0	4	32	0	1	59	134	108	203	235	41	150	77	44	53	124	128	1291	144	147	80	177	226	313	226	159	115	189	329
75	10	0	18	31	14	13	25	53	7	4	15	216	421	235	323	138	194	789	92	190	197	180	1757	241	177	103	234	295	262	248	213	77	722	274
80	17	8	18	194	182	52	115	126	16	8	1194	145	1089	413	1415	1479	1471	3313	553	518	413	534	1932	286	1831	186	1003	649	2161	1932	956	241	673	782
85	19	11	32	165	61	55	201	192	63	35	935	2123	958	1087	874	2456	2707	2107	1419	467	548	614	3343	1203	1430	578	1383	964	1395	709	1860	384	422	1101
90	43	87	76	320	168	171	719	440	380	108	1005	1752	1381	514	717	1063	2434	1912	1303	438	378	995	1680	955	686	325	1623	1446	2062	1879	2225	477	299	775
95	34	68	20	235	95	57	498	326	275	212	1804	1373	809	405	1299	2586	2876	4239	7731	6758	4862	6269	8293	5903	5894	4803	4122	10436	8875	6318	6198	3143	1647	6344
100	74	50	172	584	1269	511	1265	1499	1322	519	1384	9491	1711	697	771	1435	2110	3171	1433	2264	1800	2470	3966	2306	1381	1608	2603	2538	4254	2707	4406	2655	1244	1639
105	93	68	161	1499	1072	325	1368	1360	985	597	4880	5499	2710	2893	1708	2842	4430	6624	841	3553	1899	2255	4095	2260	2843	2678	6100	2977	6374	4614	6397	5240	1973	3878
110	147	275	249	902	1395	598	1777	1935	1473	967	2315	8261	3118	2311	1607	2547	3413	4866	2486	5096	4338	4727	6968	4863	3103	2298	5258	4759	6576	6686	5584	5077	3697	4524
115	182	149	218	431	2064	960	2016	2565	1496	1323	7701	13835	5371	5089	4060	4522	8481	7032	5151	9970	6011	6682	10256	5905	7554	3102	5804	6833	6981	10959	5285	6388	5870	7163
120	350	271	521	1344	2800	2180	4150	4097	1926	2032	2131	6837	5110	3684	5197	4829	10126	14849	10482	10184	10149	12380	12794	12823	10353	6775	6379	12796	12553	17019	11406	12671	8231	8561
125	27	272	738	1137	2758	1546	2249	5404	3698	2905	4399	8821	6071	6839	5061	5835	10937	13159	14184	10797	12755	14736	16989	11736	10690	8241	6919	15043	11153	11913	10591	12237	9498	11853
130	305	470	634	1233	2305	2881	4398	4868	3003	2454	10884	16050	8535	11263	8629	7163	17093	22248	24694	19249	16613	18491	22292	19334	20273	15170	18081	13971	16319	17819	15869	18994	18159	14911
135	305	923	907	1449	6164	3534	6734	6544	3845	3062	6611	20309	11985	9561	9060	9334	17592	20622	20207	14621	16718	17774	22451	14506	15359	12268	12011	14637	13698	17560	13594	17338	12263	18198
140	267	994	1091	1402	2997	3118	5816	5660	4228	2913	9436	19337	16120	11606	11917	10817	21103	26591	27637	22681	22278	26029	28140	20812	22903	17424	20787	16619	20387	19999	18225	21119	14772	15286
145	337	1442	1840	1572	8150	5345	8949	8425	4551	4744	15146	21304	24363	19650	17297	17578	24257	29702	20988	22642	21009	22296	25132	16645	18350	16533	17305	16821	15270	18915	15908	21544	12773	16862
150	280	2585	1672	2121	4711	4234	6973	6821	4024	3910	11176	24985	18079	15312	21851	18002	20655	27927	24121	20900	21564	25228	29867	20850	18881	19314	18328	19058	22585	20551	19534	17934	14709	14818
155	338	1760	1643	1449	10001	4871	8384	8005	3916	3673	16014	18085	25904	22057	28578	22138	28750	27366	20731	22673	22596	19368	20694	15582	17741	17071	17894	15261	14958	18997	13320	15022	12582	14163
160	562	1826	2299	1954	6260	4465	7798	11374	5015	4490	17391	20332	21674	21145	27779	18374	23249	29292	23176	23292	19051	19216	21472	18889	15702	18781	19660	16858	18546	17490	14552	14532	19387	12066
165	491	1951	2974	2006	4106	3245	6784	9687	4934	4622	10329	20058	16666	17361	18566	13424	24651	27844	18488	21739	17012	19873	15240	14597	13415	14615	14730	12294	15171	16050	11853	12109	10609	10770
170	488	1869	3282	2387	5913	4107	10305	12357	5752	5233	8493	13563	19155	14753	13233	13590	13779	21299	20515	18914	15622	13082	13249	12454	13620	11599	11049	12135	14286	15852	11882	11128	9645	9477
175	858	1355	3379	2178	4297	4790	6261	10277	4638	4733	16610	32030	20853	14356	10606	13806	18224	19376	14571	17808	11600	13490	11399	9348	11453	10425	10100	10992	11612	14199	10031	8640	8835	8231
180	982	2559	2314	2756	5747	5518	8592	10029	4769	5971	9668	14729	20834	11924	11762	13890	14967	17573	17658	15481	9439	11208	9922	10769	10933	9953	9466	9882	9543	13029	9414	8124	7934	7302
185	1243	2119	3787	2775	5017	4823	6587	9225	5289	6205	12886	12354	12075	8419	8539	11824	12387	12637	9269	12090	7846	7944	7223	6759	7074	6363	6680	7664	6722	8054	6122	5835	5500	5940
190	1692	1635	5740	2395	5145	5390	7500	6530	3755	5570	9141	8628	8772	7617	7927	10724	10987	12604	12335	10203	6299	8274	7840	9044	7724	6030	6907	7057	7634	8748	6536	4890	7971	4798
195	2849	2402	7305	2307	4080	4910	5296	5337	3390	6004	9622	7865	6925	6622	6876	9357	9662	9679	7345	8279	4724	5751	5343	5161	5260	4678	5151	5535	5030	6057	4671	4420	4172	4041
200	2771	2360	5845	2132	3087	3510	5533	3807	3116	4714	6535	5837	9529	4880	4346	8809	7303	7200	7693	6273	3885	4725	4628	6360	5513	6532	3935	4159	4905	5961	4577	3848	4629	3202
205	1460	1553	4704	2140	2610	2429	4192	2779	3465	2061	4334	4880	3059	2517	4100	5976	4646	4680	3887	4320	2934	3529	3313	3588	3275	2559	2410	2939	2921	3764	2153	2432	2233	1996
210	1596	1875	2727	1385	2256	1999	3376	2520	1496	2000	4345	3770	3825	2945	3013	5519	4831	5649	4778	4613	2402	2646	3269	3140	3002	2367	2465	2435	3536	3221	2602	3061	2373	1984
215	586	1320	1662	1723	1289	873	2298	1780	1925	525	3094	1526	1731	1793	1938	3454	3997	3441	2235	3250	2095	2492	1929	2188	1926	1694	1812	1955	2048	2288	1753	2276	1510	1597
220	1772	2310	1748	1711	1505	1203	2223	1898	1657	1322	2118	1581	2679	1562	1462	5021	2840	3710	2731	2277	1413	2129	1964	2888	2208	2411	2077	1823	2123	2012	1888	2059	2993	1573
225	848	1598	617	950	671	285	1252	686	945	640	930	576	371	731	1097	689	1812	2295	1810	1934	1132	1452	1517	1969	1141	1584	1310	1321	1218	1360	1078	1254	865	1173
230	990	556	837	836	740	501	793	815	407	549	1186	488	485	641	653	1029	1313	1601	1229	1979	1117	1182	1374	1338	946	818	1013	1274	1721	1226	1382	1056	891	1070
235	755	459	478	947	523	371	992	519	805	770	539	400	1022	648	605	1515	879	1552	842	1463	774	707	668	1125	691	521	643	549	669	941	846	861	616	681
240	536	101	263	485	178	109	450	431	270	247	496	325	598	483	180	1153	817	782	873	1113	579	553	564	899	768	587	731	755	856	872	754	649	1682	800
245	447	34	135	638	245	115	389	247	139	74	299	298	1183	397	133	675	515	561	721	781	292	532	374	890	719	425	540	441	544	363	403	546	317	468
250	153	121	48	280	189	75	182	156	181	115	184	34	309	169	184	234	437	409	486	487	414	453	305	838	695	251	866	407	552	648	534	227	1258	406
255	224	251	102	235	156	122	212	300	140	218	287	116	777	40	60	306	260	457	156	386	195	155	170	256	259	111	222	405	349	371	160	172	345	242
260	94	15	18	191	84	45	50	128	60	111	27	28	162	60	138	179	205	286	356	171	153	136	108	737	562	200	219	172	394	150	126	174	596	163
265	213	6	11	91	22	62	65	32	109	114	40	55	451	81	65	130	221	191	89	46	113	84	57	124	102	60	92	308	139	198	105	114	82	243
270	248	5	14	133	38	12	36	102	91	2	2	31	143	71	109	39	158	63	125	236	81	68	64	214	64	126	197	90	293	132	55	221	1010	134
275	5	4	32	33	18	0	69	201	2	6	7	63	208	34	31	94	57	191	42	37	47	51	59	108	117	26	85	71	335	134	103	79	58	39
280	5	1	4	6	36	17	8	7	30	2	23	13	34	56	4	3	43	107	58	59	13	38	8	237	30	17	125	112	95	93	51	48	355	146
285	9	1	13	3	0	0	8	74	28	0	0	2	48	55	4	66	51	22	10	12	5	15	15	54	35	46	107	83	16	17	54	23	3	30
290	0	4	7	4	16	0	0	75	3	8	22	13	196	141	2	5	24	12	49	2	2	87	9	110	28	20	40	29	78	101	35	5	256	28
295	2	0	1	1	3	0	0	46	35	2	1	11	36	349	2	5	10	9	29	2	14	17	6	23	18	5	20	19	15	5	6	6	20	10
300	0	2	1	2	2	0	8	57	8	3	0	18	27	228	2	1	13	7	8	20	40	34	0	72	6	3	43	24	18	15	88	34	332	48
305	0	0	1	3	2	0	20	3	4	2	0	2	11	233	1	1	5	21	2	31	26	11	0	0	1	53	8	17	18	2	13	41	22	6
310+	7	2	0	25	29	0	26	27	3	0	19	0	143	569	1	14	102	81	15	3	1	53	4	435	110	43	19	31	12	4	7	4	84	50

Table 11 Number of SWO conventional tagging information (released and recovered fish) available in ICCAT.

Number of tag Swordfish (*Xiphias gladius*)												
			Years at liberty									
Year	Releases	Recaptures	< 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 10	10+	15+	Unk	% recapt*
1961	2	0										
1962	1	0										
1963	2	0										
1964	58	2		2								3.4%
1965	49	1				1						2.0%
1966	34	1				1						2.9%
1967	25	1								1		4.0%
1968	28	8	1	2	2	1		1	1			28.6%
1969	30	2		1				1				6.7%
1970	91	11	6		1		1	3				12.1%
1971	12	0										
1972	7	0										
1973	1	0										
1974	32	2		1		1						6.3%
1975	25	2			1			1				8.0%
1976	10	0										
1977	55	2		1	1							3.6%
1978	178	13	1	3	3	2	4					7.3%
1979	118	5	2	1			1	1				4.2%
1980	490	26	4	6	7	1		7	1			5.3%
1981	267	27	8	10	5	2		2				10.1%
1982	166	4	2	2								2.4%
1983	162	6	2	2	1			1				3.7%
1984	168	5		2				3				3.0%
1985	204	10	2	2	1	1	3	1				4.9%
1986	404	17	3	3	5	2		4				4.2%
1987	411	18	5	6	4	1		2				4.4%
1988	475	15	5	4	1		2	3				3.2%
1989	217	3		1			1	1				1.4%
1990	531	11	3	2	2	4						2.1%
1991	1604	53	12	8	14	12	2	3	2			3.3%
1992	1697	56	12	24	11	3	3	3				3.3%
1993	1542	61	21	11	7	7	4	8	3			4.0%
1994	1919	53	15	7	10	5	6	9			1	2.8%
1995	1174	37	9	5	9	3	8	2			1	3.2%
1996	680	25	10	3	7	2	2	1				3.7%
1997	769	27	11	6	1	3	3	3				3.5%
1998	397	21	6	4	5	1	2	2			1	5.3%
1999	258	8	1	2	1	1	1	2				3.1%
2000	193	12	5	5	1			1				6.2%
2001	159	2		1							1	1.3%
2002	282	11	4	3							4	3.9%
2003	253	9	3	1	2		1				2	3.6%
2004	284	19	5	2	3	1		2			6	6.7%
2005	344	11	2	3	1	1					4	3.2%
2006	776	17	3	3	1						10	2.2%
2007	352	12	4	2	4						2	3.4%
2008	95	5	2	1							2	5.3%
2009	37	1		1								2.7%
2010	11	0										
2011	9	0										
2012	5	0										
TOTAL	17093	632	169	143	111	56	44	67	7	1	34	3.7%

Table 12. Summary table with an evaluation of the indices based on standard criteria defined by the Stock Assessment Methods WG.

	Paper	**SUFFICIENCY SCORE EXPLANATION (higher is better)**		**SCRS/2013/059**	**SCRS/2013/104**	**SCRS/2013/110**	**SCRS/2013/111**	**SCRS/2013/097**	**SCRS/2013/105**	**SCRS/2013/114**
	Index	**1**	**5**	**CAN LL**	**PORTUGAL LL**	**JPN LL**	**Mor LL**	**TAIPEI LL**	**EU-ESP LL**	**USA LL**
1	Diagnostics	No Diagnostics or assumptions clearly violated	Full Diagnostics and assumptions fully met.	5	4	3	3	3	4	5
2	Appropriateness of data exclusions and classifications (e.g. to identify targeted trips).	Not appropriate	Fully appropriate	4	3[uses SWO/(SWO*BSH), see text]	4	3	2	3[uses SWO/(SWO*BSH), see text]	5
3	Geographical Coverage	Small localized fishery/survey	Represents geographic range of population	3	4	5 (may be reduced if only Area 5 included)	2	5	5	4
4	Catch Fraction	Small	Large	3	3	2	2	1	5	4
5	Length of Time Series relative to the history of exploitation.	Short	Long	5	2	4(5 if based upon long term series developed from Area 5, not presented in paper)	1	5	3	3
6	Are other indices available for the same time period?	Many	It is the only available index	4	1	4(5 if based upon long term series developed from Area 5, not presented in paper)	1	4	3	3 (4, if considering that it is the only index of covering the Gulf of Mexico)
7	Does the index standardization account for Known factors that influence catchability/selectivity?	No	Fully	4 (Recommendation to split after introduction of individual quotas)	4	4	2	4	3	5

9	Is the interannual variability within plausible bounds (e.g. SCRS/2012/039)	Frequently	Seldom	4	5	5	5	4	5	3(only relevant if used in surplus production models to reflect total biomass, may be a result of changes in availability by size)
10	Are biologically implausible interannual deviations severe? (e.g. SCRS/2012/039)	Very Severe	Minimal	4	5	5(3, after recommendation to eliminate 2001-2006 values, see text)	5	4	5	3(comments as above)
11	Assessment of data quality and adequacy of data for standardization purpose (e.g. sampling design, sample size, factors considered)	Low	High	4	3	3	2	2	4	4 (sampling fraction typically 5-8%, high coverage in Gulf of Mexico for some periods)
12	Is this CPUE time series continuous?	Very Discontinuous	Completely	4		3	3	5	5	4
13	Were all catches (retained and discarded) considered in the calcluation of CPUE	No	Discards (live and dead) accounted for	4(no, but discards are considered to have been minor and without trend)	4(no, but discards are considered to have been minor and without trend)	3 (partially accounted for, depending on time period, see text)	1	1	4(no, but discards are considered to have been minor and without trend)	5
14	author present?	No	Yes	5	5	5	5	1	5	5
additional comments						Age-specific indices show similar, simultaneous patterns, without evident cohort progression			Age-specific indices do not appear to show simultaneous patterns, some apparent indications of cohort progression SCRS/2013/105	The size frequency distribution of this index should be taken into account when considering it's application in models. May provide important information on smaller size classes.

South Atlantic Stock					
Paper Index	SCRS/2013/098 Taiwan LL	SCRS/2013/101 Uruguay LL	SCRS/2013/106 &SCRS/2013/108 Spain biomass & number	SCRS/2013/109 Japan LL	SCRS/2013/115 Brazil LL number
Diagnostics	3 (residual Trends)	4	4	3 (residual presented bimodal distribution) QQ plot resiudals and residuals by factors should be provided	5
Appropriateness of data exclusions and classifications (e.g. to identify targeted trips).	2 issue on periods chosen: during the ALB meeting different period of time series were defined (50-86 87-96 97-2011). It was not clear why the period changed in this study	5	3 Relevant factors may not have taken into account	4	3 Fleet strategy considered an improvement to the target strategy. The fleet is very heterogeneous.
Geographical Coverage	5 but after 2000 almost no activity in the southern area	5	5	3	4
Catch Fraction	3		5	3	4
Length of Time Series relative to the history of exploitation.	4 (1968-2011)	5 (1982-2012)	3 (1989-2011)	3 (1990-2012)	4 (1978-2012)
Are other indices available for the same time period?	3	5	4	5	3
Does the index standardization account for Known factors that influence catchability/selectivity?	3	4	3	3 issue about changes over time that were not accounted for	4
Is the interannual variability within plausible bounds (e.g. SCRS/2012/039)	4	4	5	4	2 high variations due to the complex fleet dynamic
Are biologically implausible interannual deviations severe? (e.g. SCRS/2012/039)	4	4	5	4	1 but the trend presented here is plausible
Assessment of data quality and adequacy of data for standardization purpose (e.g. sampling design, sample size, factors considered)	3 GLM & GAM present a unexpected identical pattern	4	4	3	3
Is this CPUE time series continuous?	5 continous but with a break: in 1995 began a series with HPB information	5 continous but with a break	5	5 the authors are sugesting considering breaking it due to regulation and fleet dynamics changes	5
Discards recorded?	1	1	4 but authors don't consider it as a problem (minor)	2 discard minor no but it´s not a problem	4 partial can have some discontinuity although it should be considered negligible
Authors are there?	1	5	5	5	5

Table 13 North Atlantic stock CPUE indices in biomass considered suitable for use in the assessment models.

North Atlantic stock								
Year	**Canada1**	**Canada2**	**Japan**	**Morocco**	**Portugal**	**Spain**	**US1**	**US2**

1963	2,341021					
1964	1,088847					
1965	0,794455					
1966	0,732955					
1967	0,889225					
1968	0,730939					
1969	0,638185					
1970	0,784373					
1975			1,305901			
1976			0,984153			
1977			1,425979			
1978			1,133155			
1979		0,841148	1,289097			
1980		0,804082	1,204634			
1981		0,660005	1,121641			
1982		0,584081	1,097991			
1983		0,452558	1,122549			
1984		0,337774	1,073632			
1985		0,4962	1,234123			
1986		0,567939	1,070554		1,164693	
1987		0,368862	0,932393		1,172511	
1988		0,386796	1,284151		0,9967	
1989		0,350927	1,180926		1,00846	
1990		0,588863	1,087146		1,009188	
1991		0,432829	1,290073		1,026628	
1992		0,514732	0,85206		1,00906	1,07
1993		0,370655	0,804327		0,893408	1,03
1994		0,2481	0,648097		0,857012	0,96
1995		0,292339	0,564716		0,947046	1,13
1996		0,166197	0,446683		0,799405	1,08
1997		0,266633	0,37994	0,593054	0,790054	0,95
1998		0,407123	0,383973	0,615767	0,851189	1,28
1999		0,481254	0,405571	0,557162	0,952231	1,56
2000		0,439406		0,873738	1,196848	0,86
2001		0,404731		0,913275	1,044386	0,76
2002		0,517124		0,720918	0,897776	0,69
2003		0,657016		0,848221	1,027488	0,63

2004	0,71381				1,058524	0,934086		0,84432
2005	0,799898			1,065365	0,821583	0,921388		0,991585
2006	0,7993		0,392835	0,934314	0,877103	0,856559		1,021038
2007	0,839354		0,673684	0,810937	0,90991	0,984185		1,197756
2008	1,142455		0,860124	0,874319	0,947484	1,135806		1,237027
2009	1,062345		1,135086	1,223322	1,246114	1,043368		1,01122
2010	1,274575		1,099165	1,055109	1,167321	1,014706		0,697055
2011	1,082074		1,231941	1,036634	1,030484	1,043988		0,84432
2012	1,056965		1,243057	1,326424	1,280884			

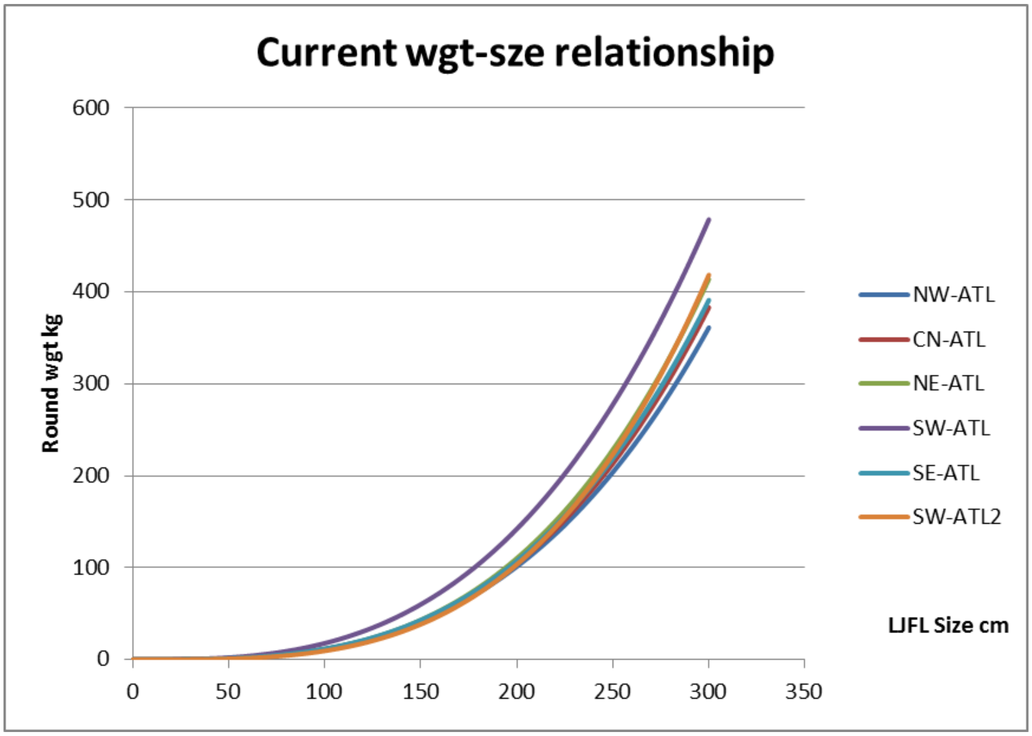


Figure 1 The size-weight relationships for Atlantic swordfish currently employed by the SCRS (prior to the 2013 Data Preparatory meeting). Northwest Atlantic (NW-ATL), central Atlantic (CN_ATL), northeast Atlantic (NE-ATL), southwest Atlantic (SW-ATL, SW-ATL2) (Amorin et al and Hazin et al), and southeast Atlantic (SE-ATL).

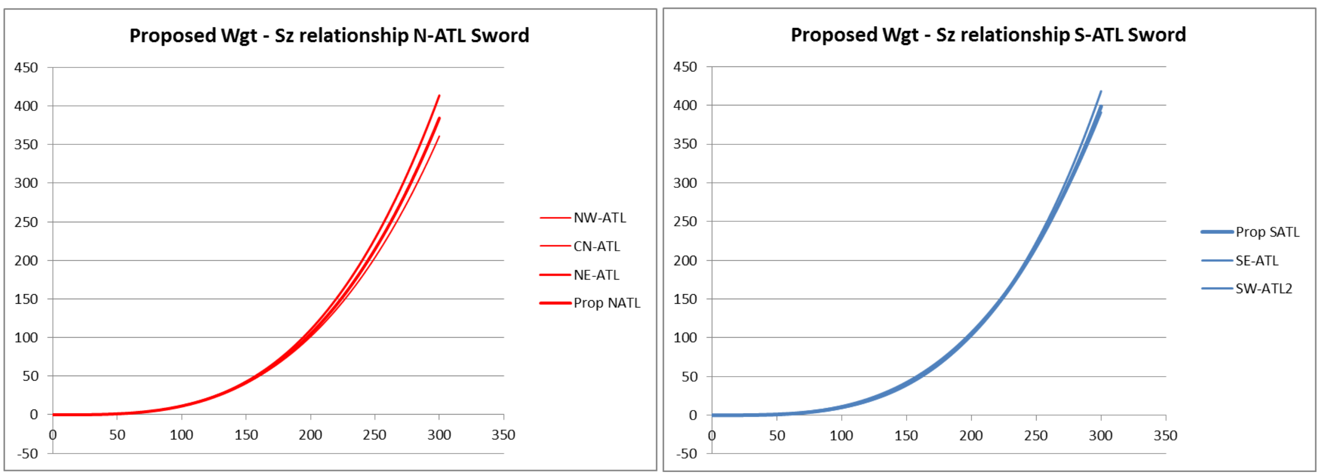


Figure 2. Proposed length - wgt relationship for north and south Atlantic swordfish stock units compared with those adopted by the Group and shownin Figure 2.1.

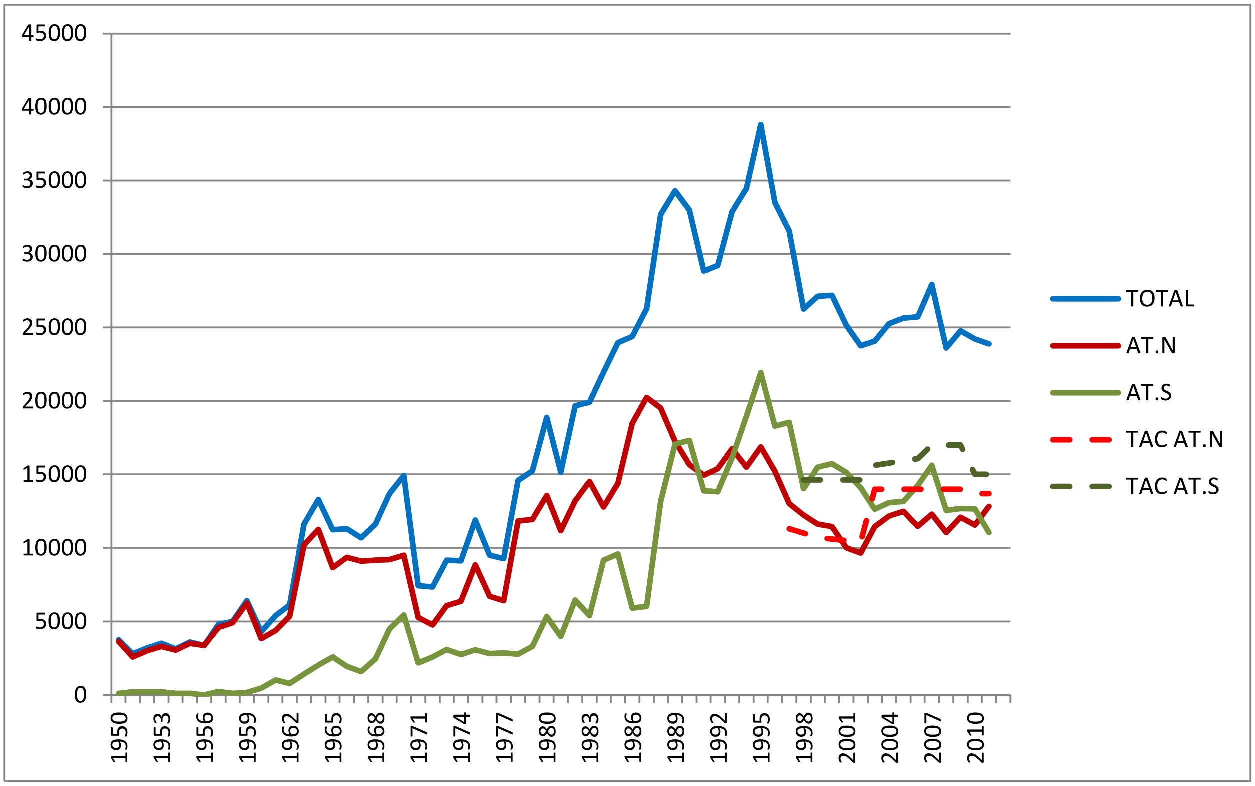


Figure 3 Total catch (Task I) and Total Allowable Catches of Atlantic swordfish by stock (1950 - 2011).

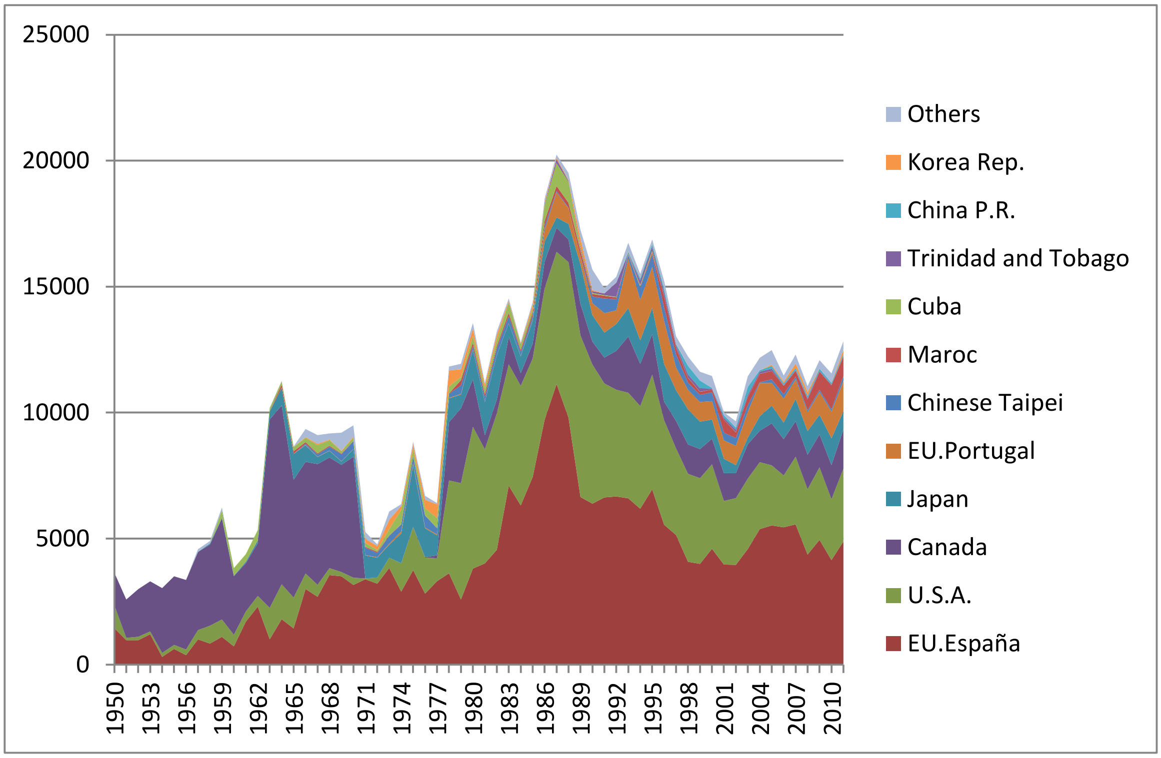


Figure 4 North Atlantic swordfish catch by main flags (1950 - 2011).

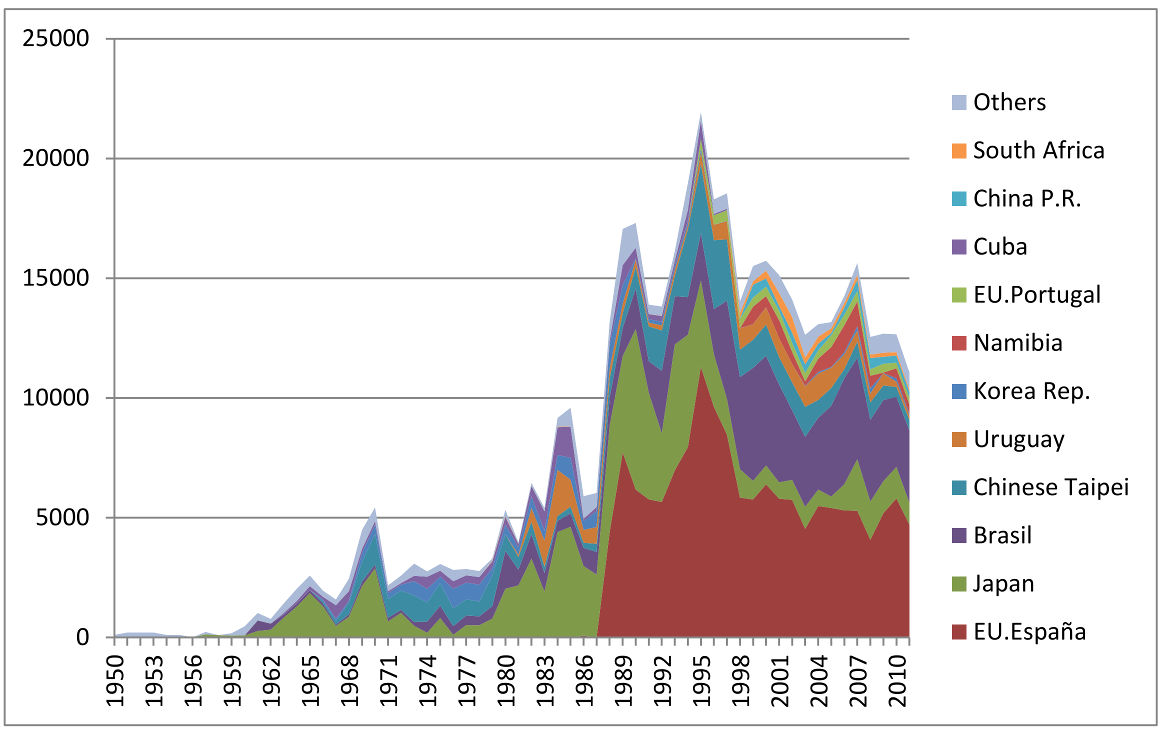


Figure 5 South Atlantic swordfish catch by main flags (1950 - 2011).

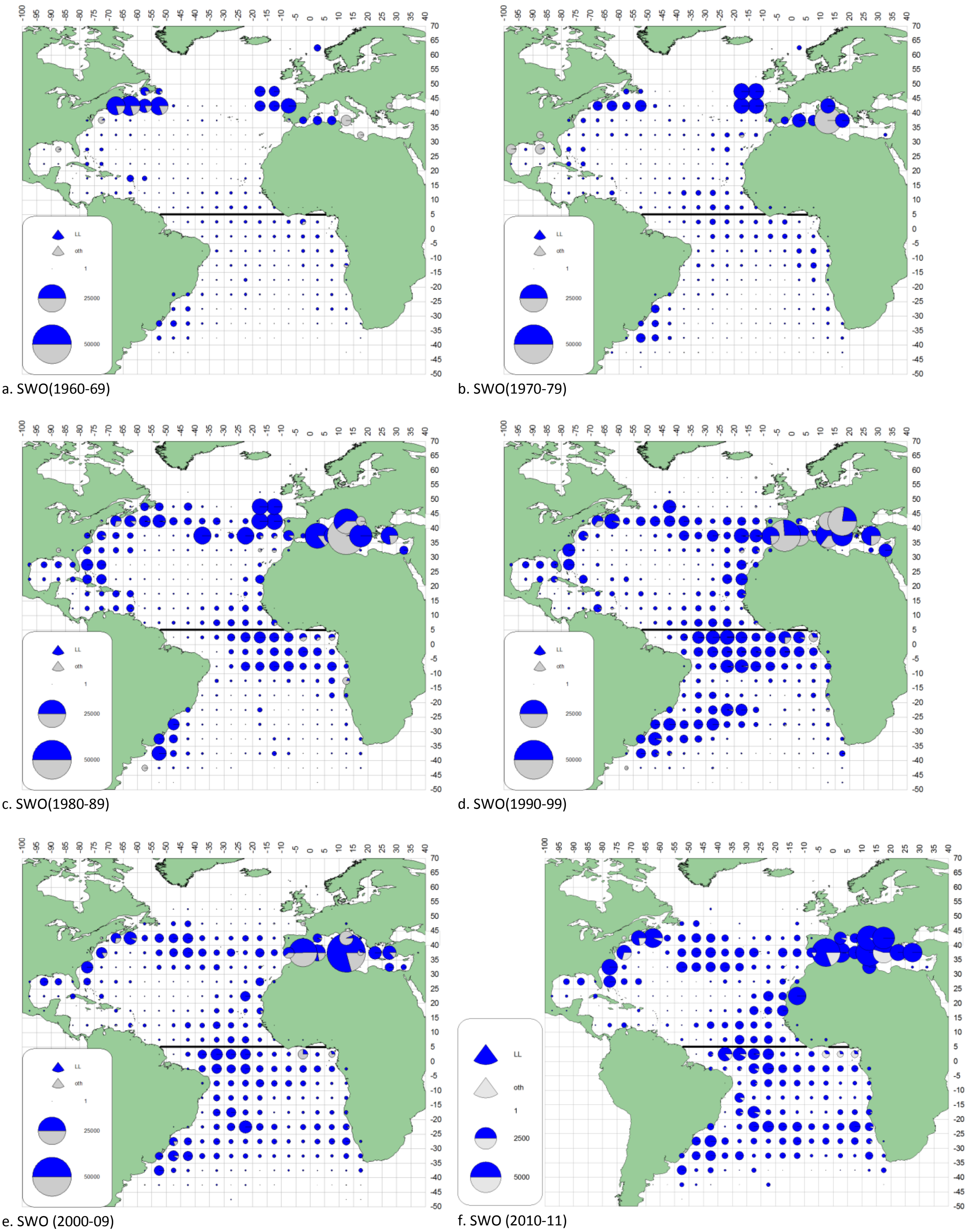


Figure 6 Geographical distribution of Atlantic swordfish (1950-2011) by major gears and decades.

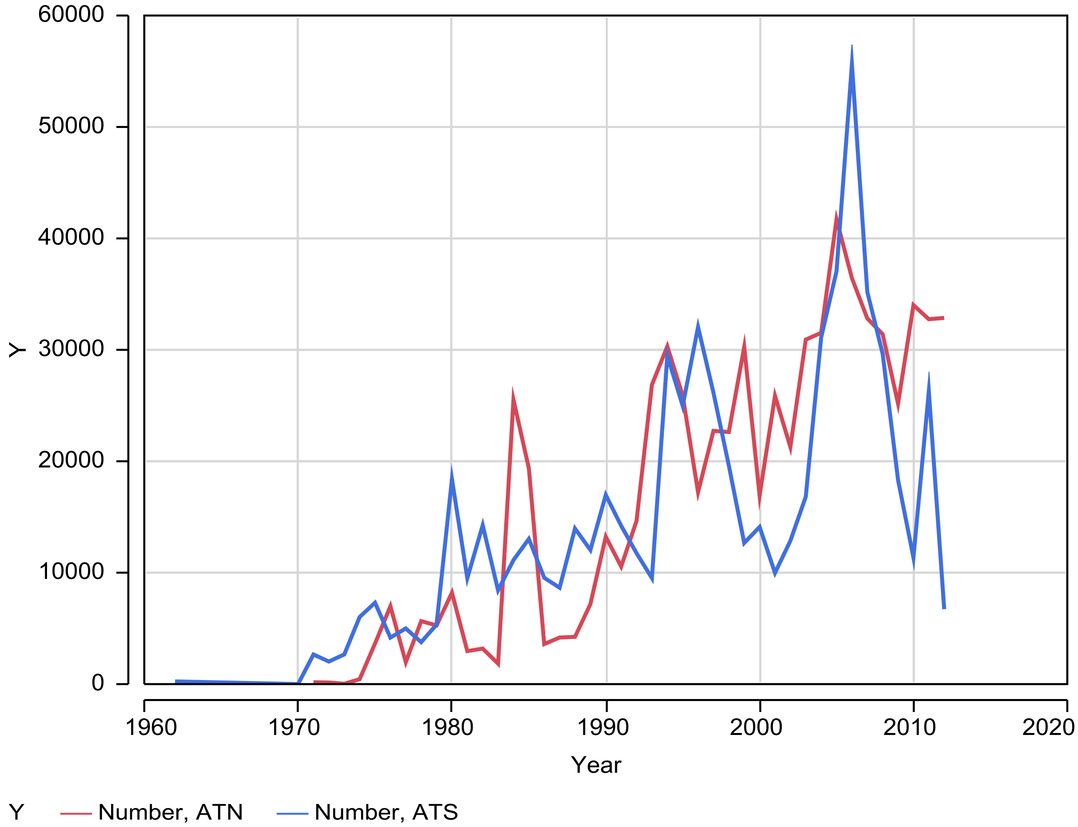


Figure 7 Total number of size measurements of swordfish reported by stock since 1970.

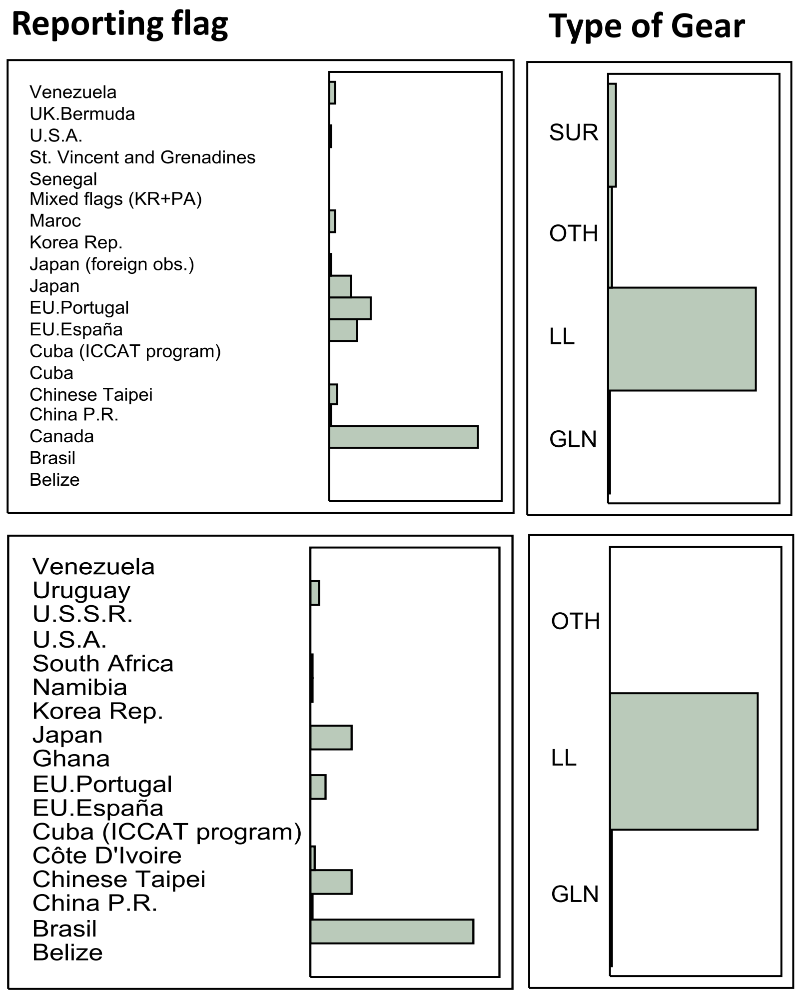


Figure 8 Distributions of swordfish size sample numbers reported by Flag CPCs and type of gear for each stock (on top: North Atlantic stock; on the bottom: South Atlantic stock). Gear type: LL: longline; SUR: surface gears (harpoon, hand lines, rod & reel, sport and trawl); GLN: gillnets; OTH: others (baitboat, mid-water trawls and unknown).

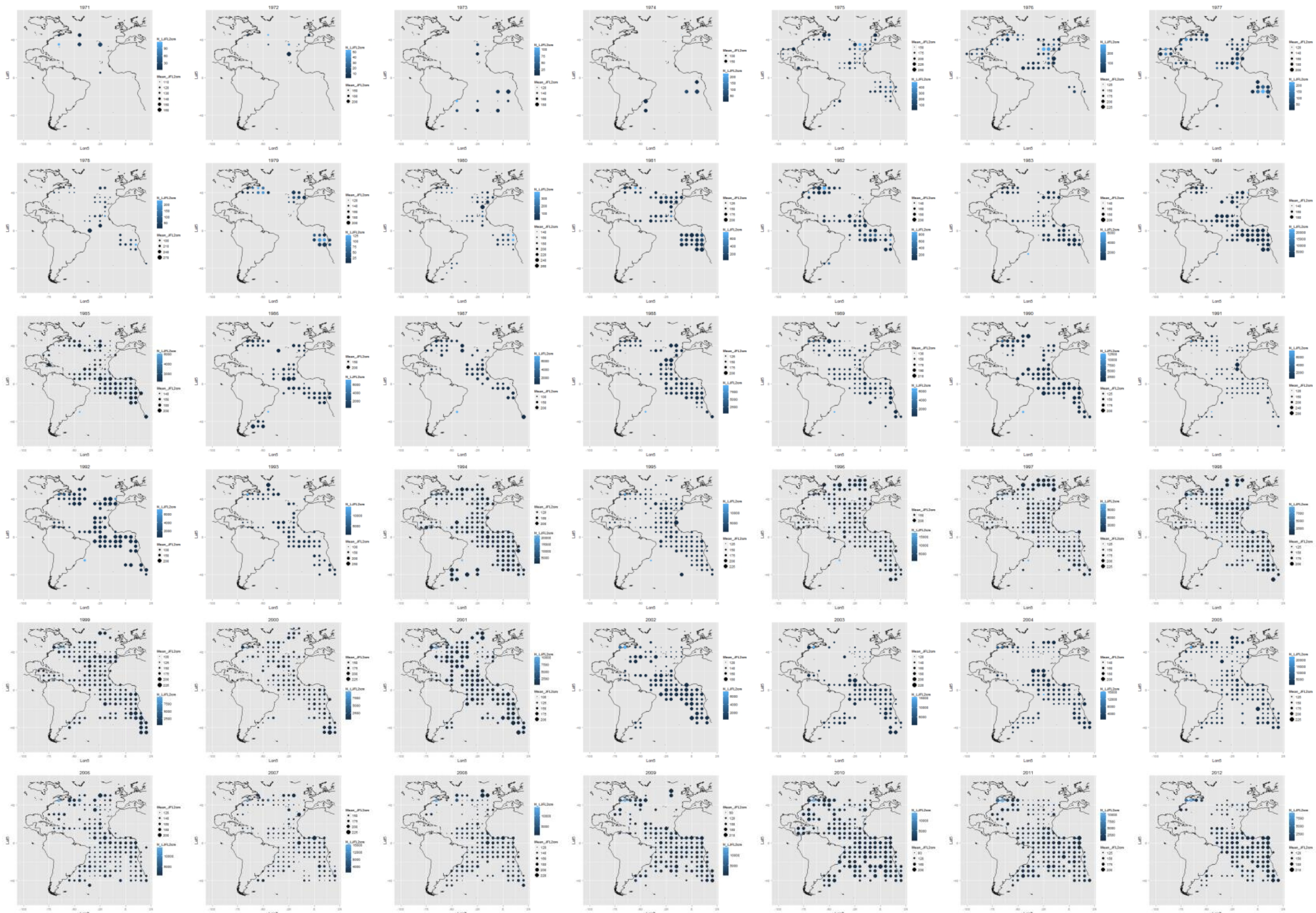


Figure 9 Annual spatial distribution of 5 x 5 degrees of size samples of swordfish from 1971 (top left) to 2011 (increase year by row). Size of the marker is proportional to mean size of the size sample, color shade of the marker is proportional to the number of fish samples by year.

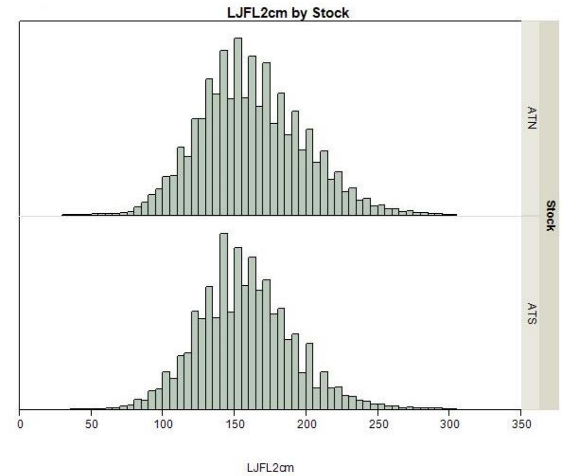


Figure 10 Size (LJFL in cm) frequency distribution of swordfish by stock

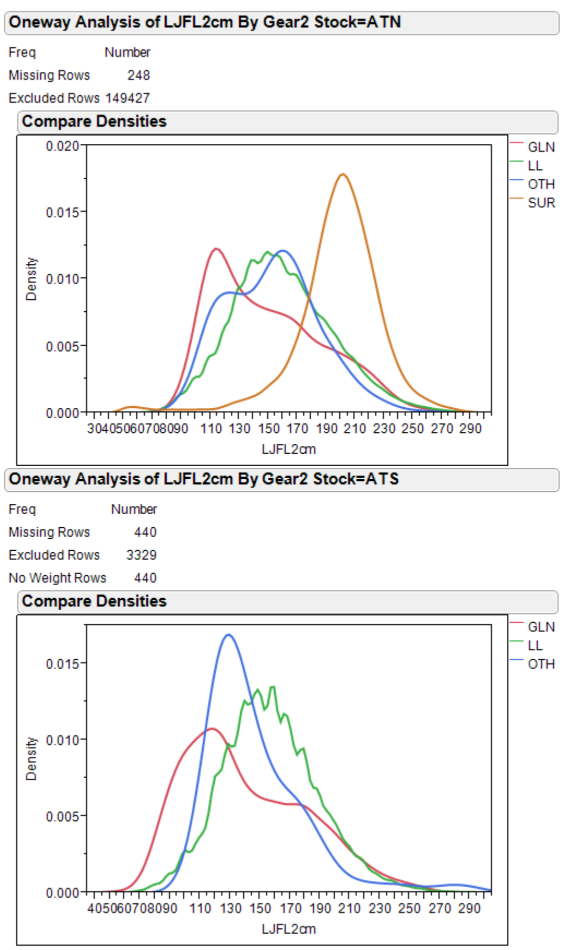


Figure 11 Size (LJFL in cm) density distribution of swordfish by stock and by gear (LL: longline; SUR: surface gears; GLN: gillnets; OTH: others).

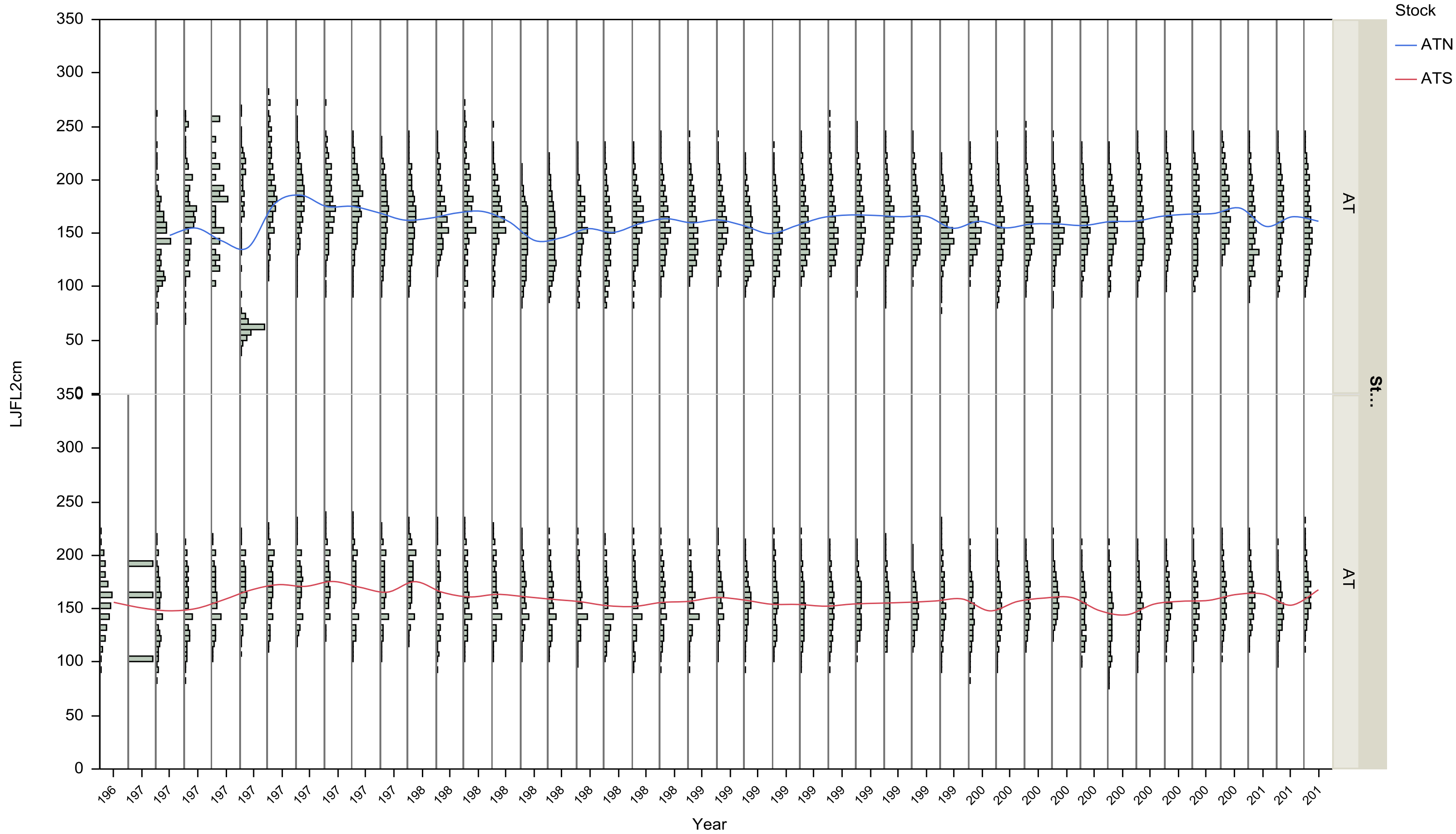


Figure 12 Annual size (LJFL in cm) distribution of Atlantic swordfish by stock. Solid lines represent smoother trends of the data.

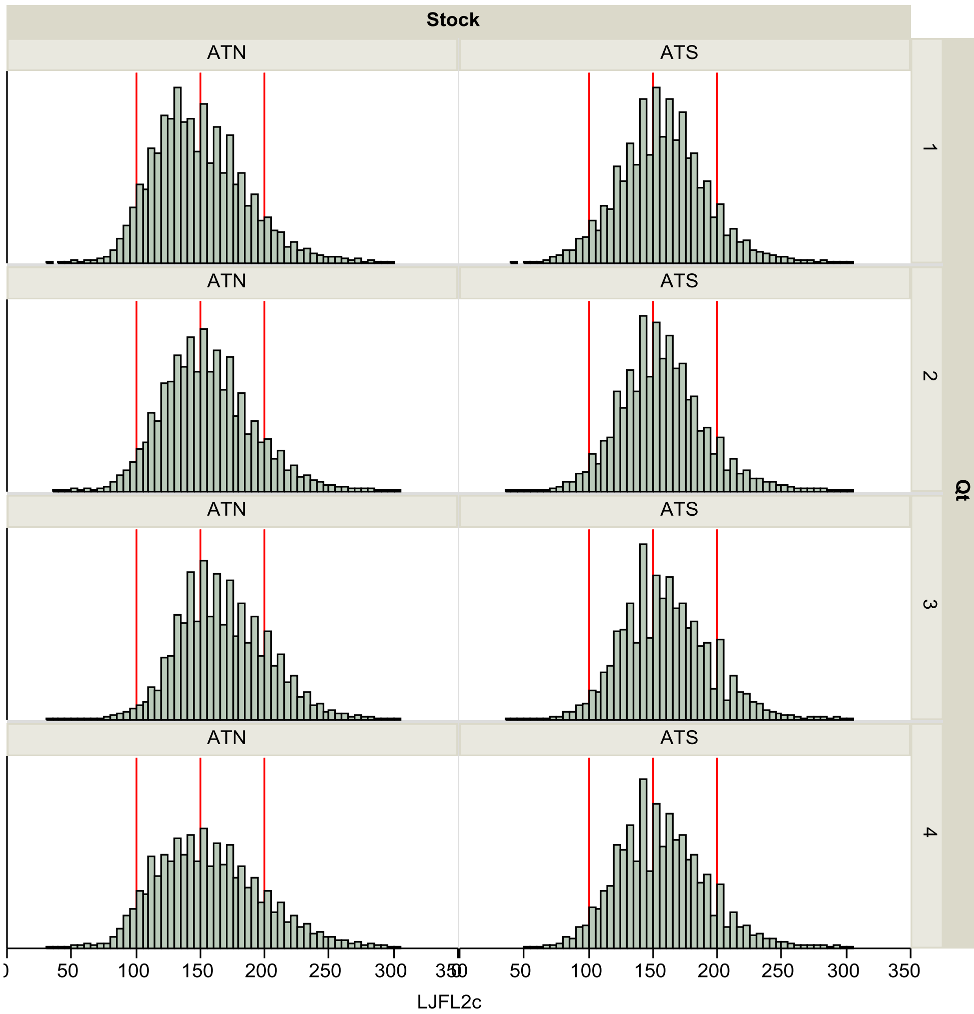
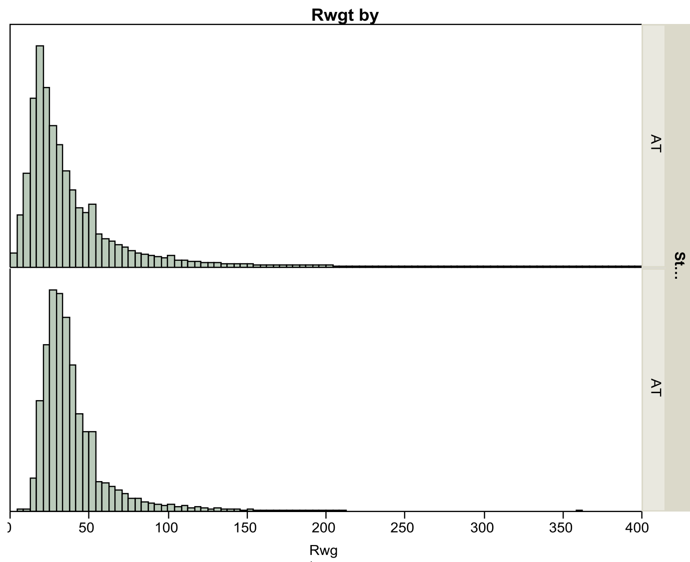


Figure 13 Size frequency distributions of swordfish by stock and calendar quarter.



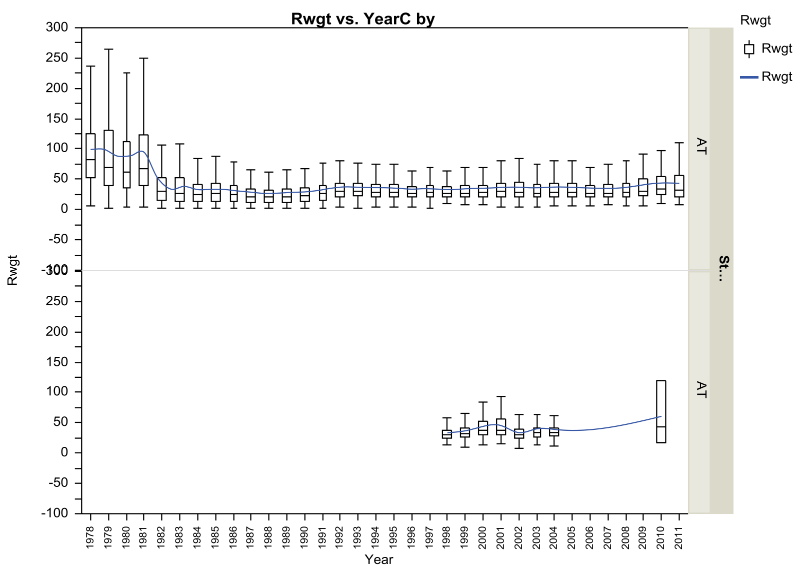
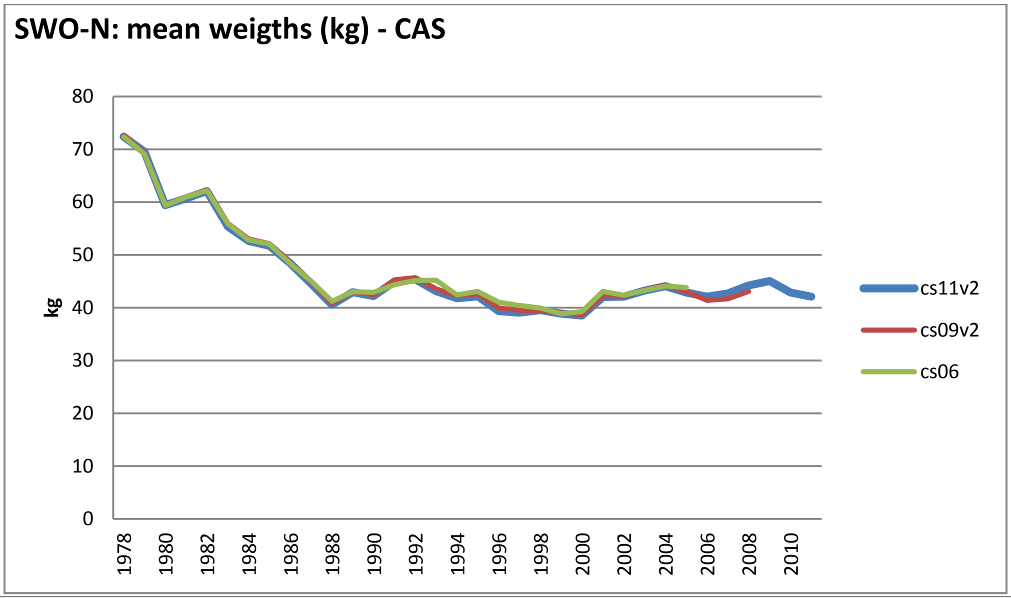


Figure 14 Weight frequency distributions for swordfish from the US-LL fisheries for Atlantic swordfish. Solid line on boxplot shows the smoothed trend of the data.



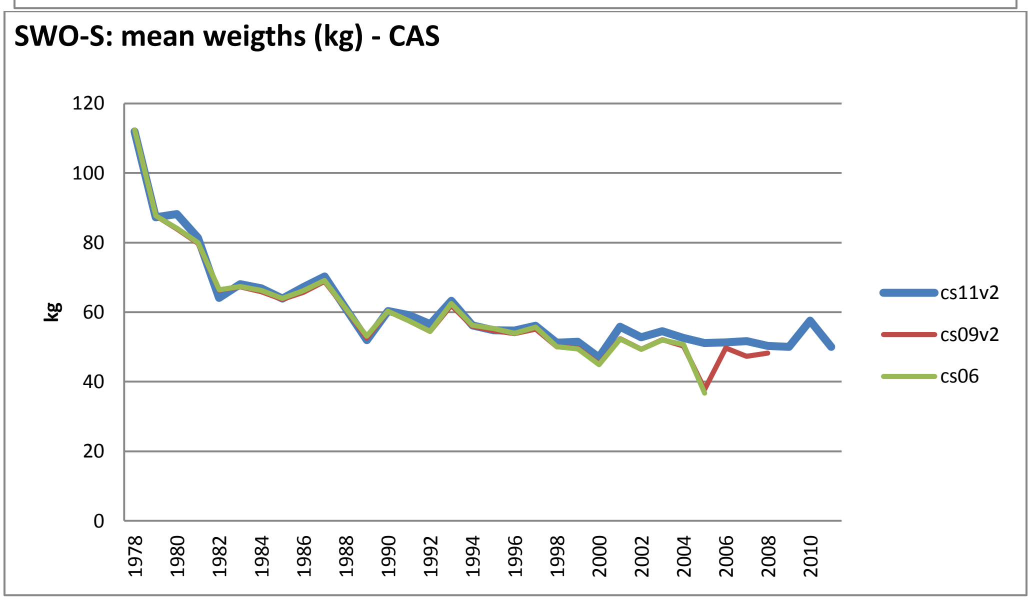
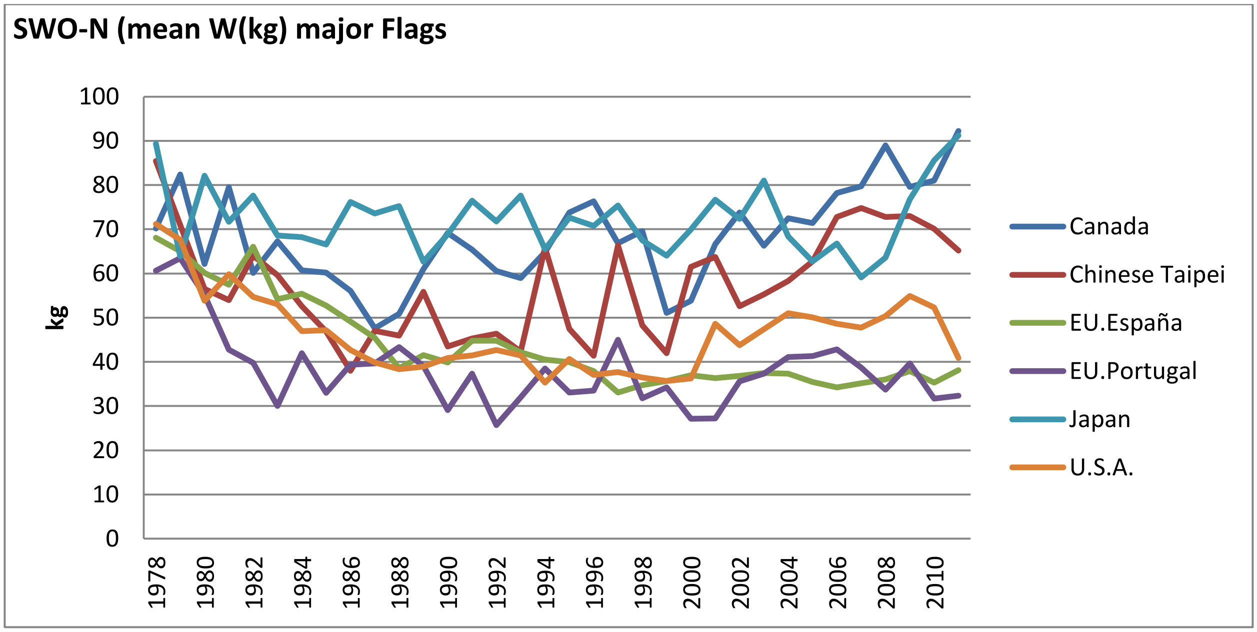


Figure 15 Overall swordfish mean weights (SWO-N: upper; SWO-S: lower) by year obtained from the CAS.



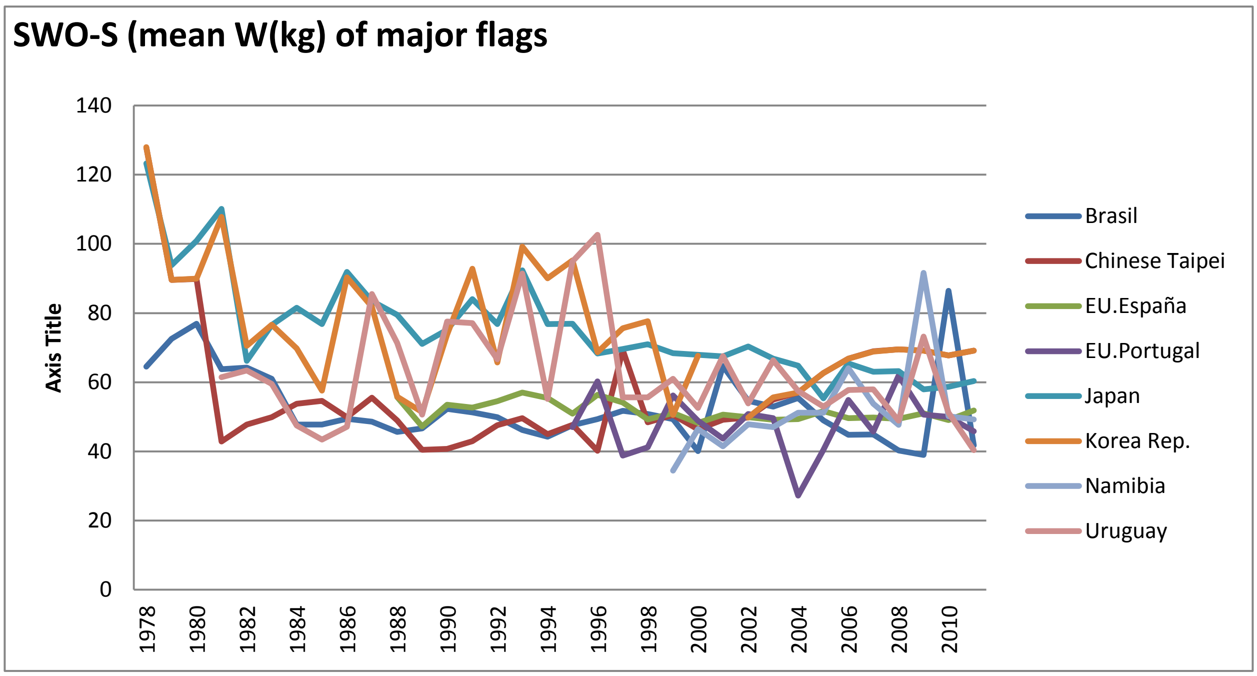


Figure 16 Swordfish mean weights by major flag (SWO-N: upper; SWO-S: lower) and year obtained from the CAS.

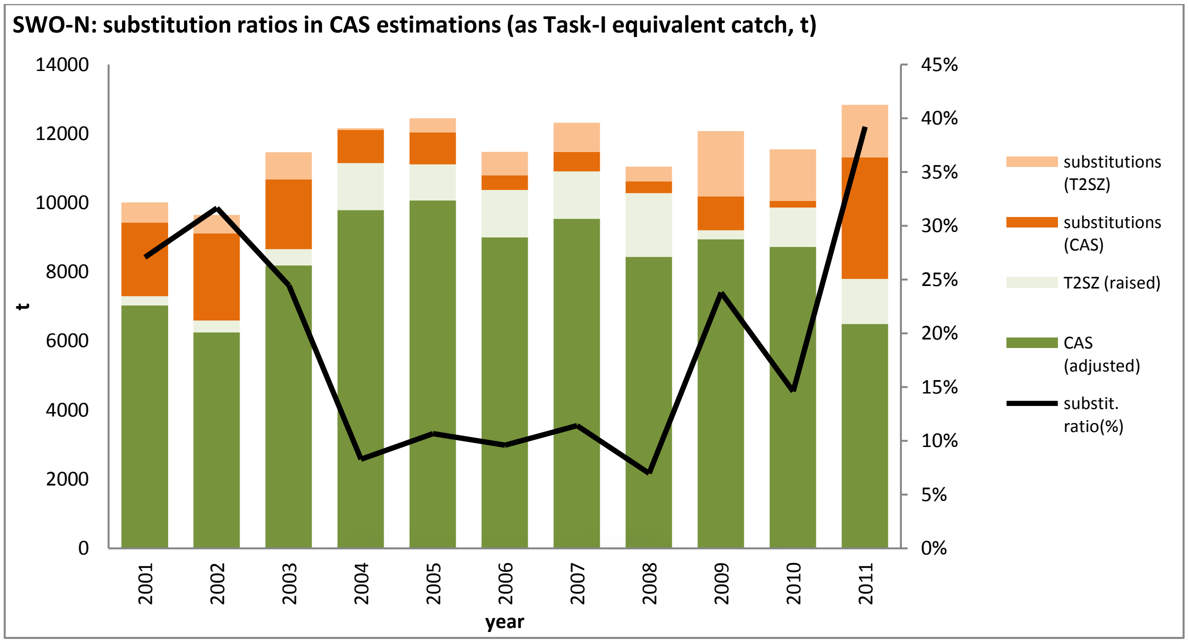


Figure 17 SWO-N CAS: cumulative weight (t, equivalent Task-I catch) of "CAS (adjusted)" (CAS reported with possible adjustments) , "T2SZ(raised)" (size frequency samples raised to Task I), and, substitutions made (using CAS or T2SZ). The ratio of the substitutions made is also shown. (Source: CAS substitution tables used to create CAS matrices during 2006, 2009 and current SWO meetings).

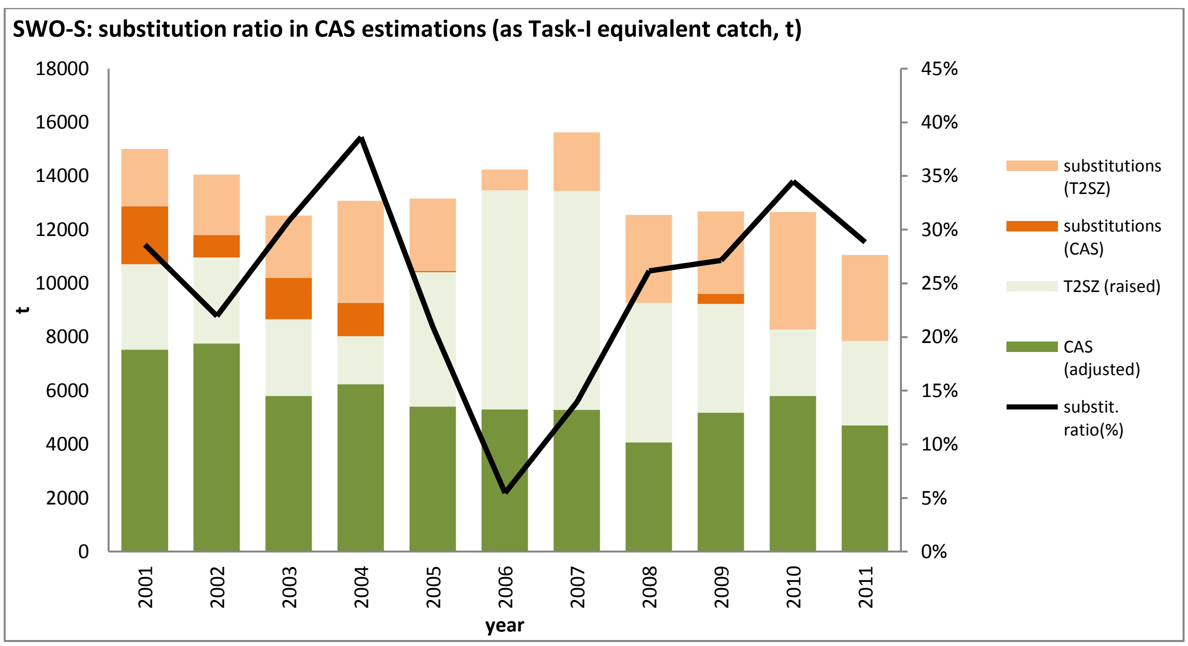
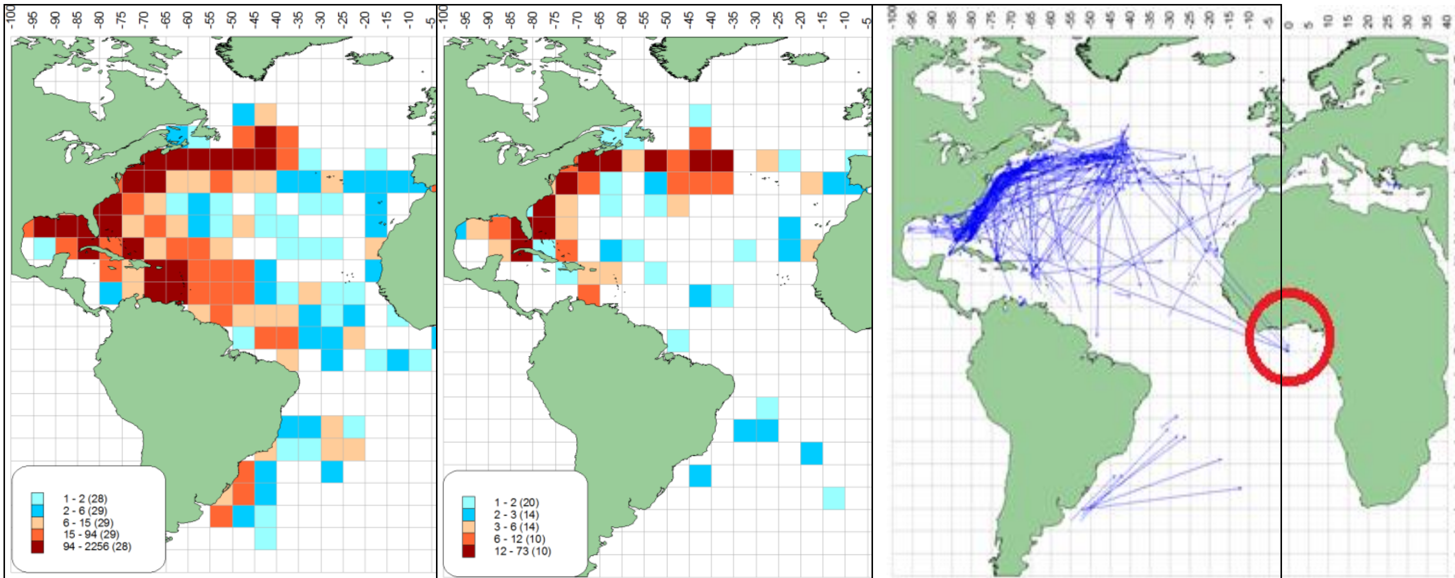


Figure 18 SWO-S CAS: CAS: cumulative weight (t, equivalent Task-I catch) of "CAS (adjusted)" (CAS reported with possible adjustments) , "T2SZ(raised)" (size frequency samples raised to Task I), and, substitutions made (using CAS or T2SZ). The ratio of the substitutions made is also shown. (Source: CAS substitution tables used to create CAS matrices during 2006, 2009 and current SWO meetings).

a



a) releases density

b) Recoveries density

c) release/recovery strait displacement

Figure 19 SWO conventional tagging maps (a)-Density of releases; b)-Density of recoveries; c)- Straight displacement between release and recovery locations.

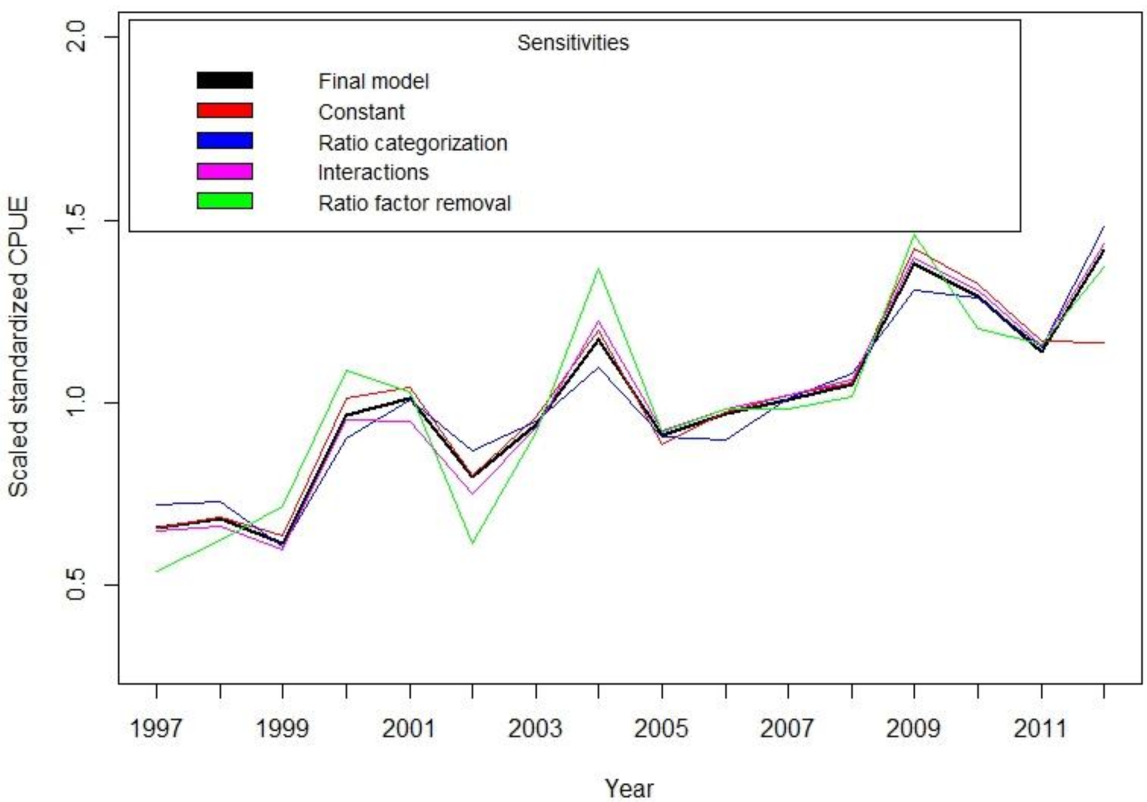


Figure 20 Sensitivities of the estimated model parameters for the standardized CPUE biomass index for the Portuguese longline fishery in the N Atlantic, to some of the model specifications: 1) Constant added to the CPUE, using 1 instead of 10% of the mean (red line); 2) Ratio factor, categorizing by the 10% percentiles instead of the 25% (blue line); 3) Removing the Year:Gear type interaction and the corresponding simple effect of Gear Type (pink line); 4) Removing Ratio factor (green line).

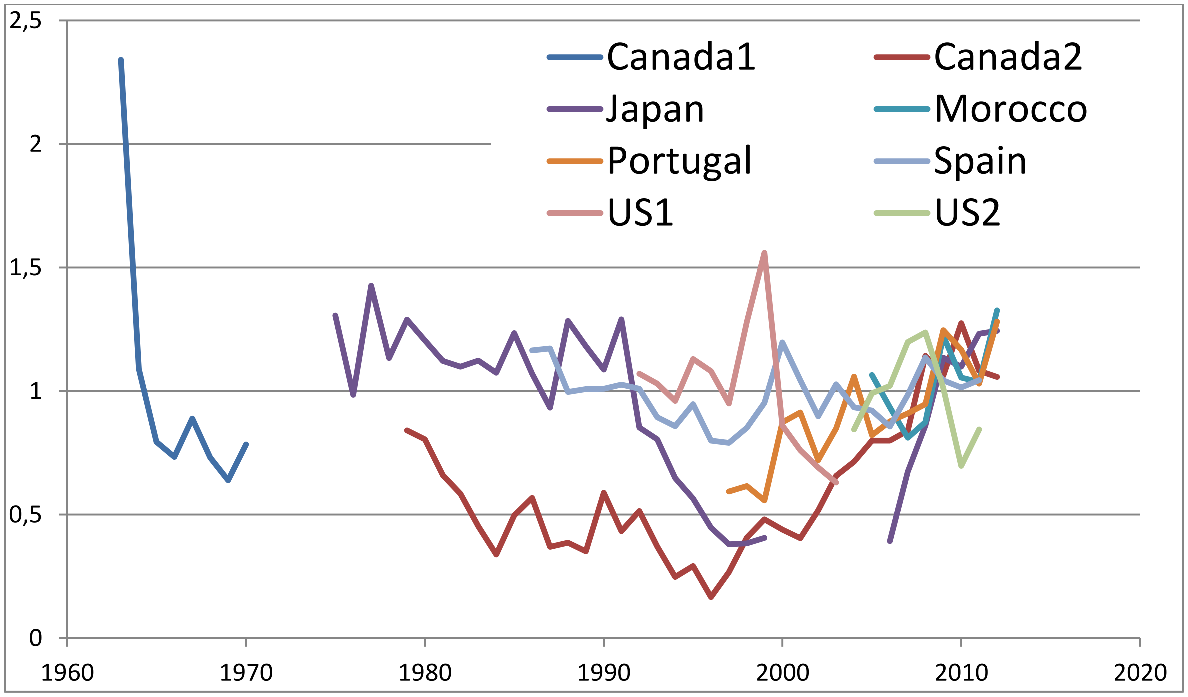


Figure 21 North Atlantic stock CPUE indices in biomass considered suitable for use in the assessment models.

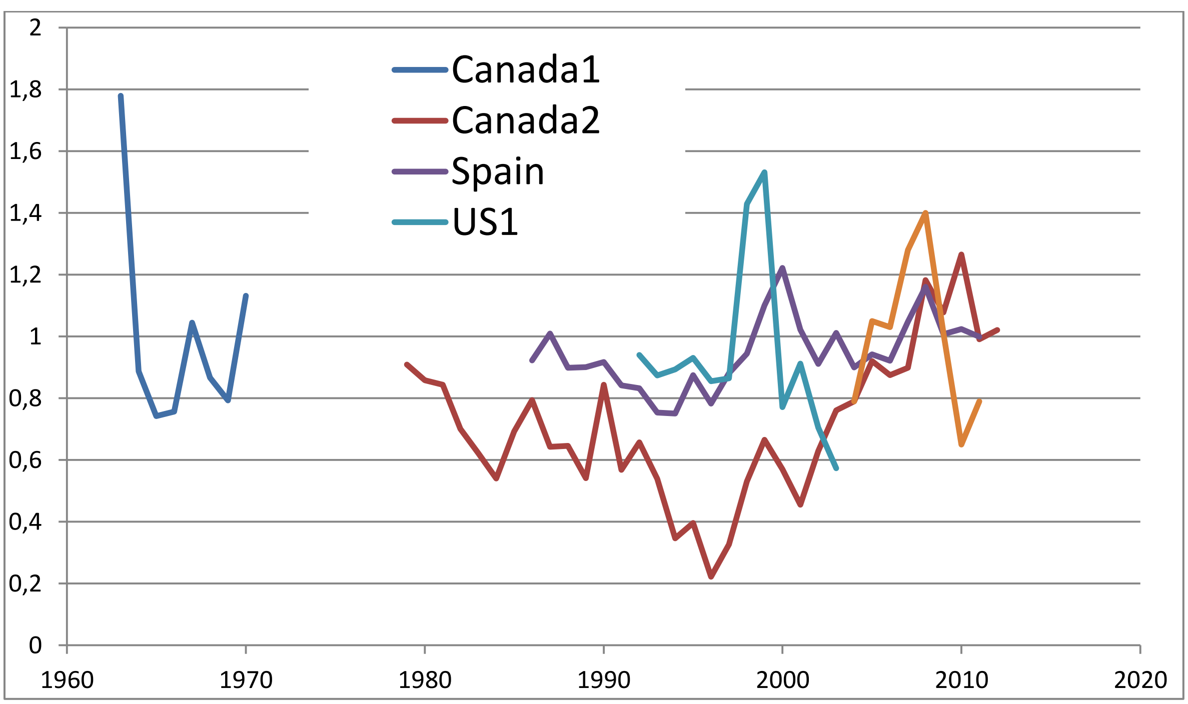


Figure 22 North Atlantic stock CPUE indices in number considered suitable for use in the assessment models. Canada 1 and Canada 2 refer to early and late period indices, US1 and US2 refer to the early and late period of the USA longline.

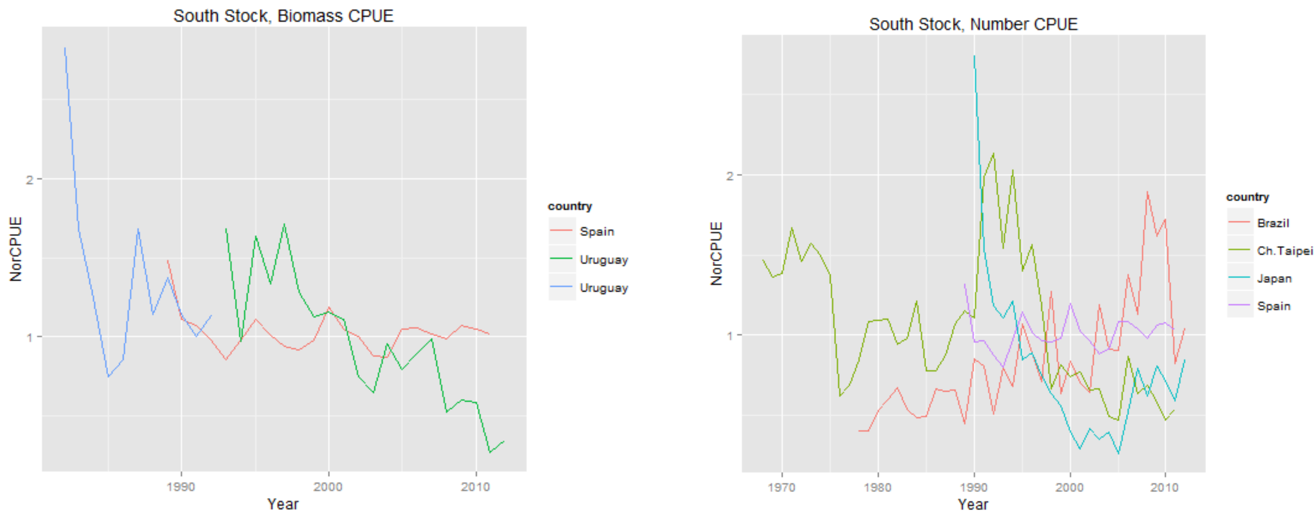


Figure 23 Normalized series of standardized CPUE series for the South Atlantic swordfish in Biomass (left) and number of fish. The series included are those recommended by the Group (see text for further details).

Appendix 1

Tentative Agenda

1. Opening, adoption of the Agenda and meeting arrangements.
2. Review of historical and new information on biology
3. Review of Task I data
4. Review of Task II catch/effort
5. Review of Task II size data
6. Review of CAS, CAA and WAA
7. Review of tagging data.
8. Available modeling approaches
   - ASPIC
   - Bayesian Biomass Dynamics
   - Virtual population Dynamics (VPA)
   - State-space Models
   - Stock Synthesis Model (SS3)
9. Review of available indices of relative abundance by fleet and estimation of combined indices
10. Limit Reference Points – identification and evaluation
11. Recommendations
12. Other matters
13. Adoption of the report and closure

Appendix 2

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Ortiz, Mauricio
Kell, Laurence
Palma, Carlos

Appendix 3

List of Documents

SCRS/2013/059 A Description of the Canadian swordfish fisheries from 1988 to 2012, and candidate abundance indices for use in the 2013 stock assessment. Andrushchenko I.,Hanke A., Whelan, C.,Neilson J.D and Atkinson, T.

SCRS/2013/097 Updated standardized CPUE of swordfish (*Xiphias gladius*) for the Taiwanese longline fishery in the North Atlantic ocean, 1968-2011. Sun C., Su N., and Yeh S.

SCRS/2013/098 Standardizing catch and effort data of the Taiwanese distant water longline fishery in the South Atlantic ocean for swordfish (*Xiphias gladius*). Sun C., Su N., and Yeh S.

SCRS/2013/099 Updated catch rates of swordfish from the Moroccan swordfish longline fishery in the North Atlantic, 2005 – 2012. Abid N., Ayoub M. and El Omrani F.

SCRS/2013/100 A generalized Bayesian Surplus Production stock assessment software (BSP2). McAllister M.K

SCRS/2013/101 Standardized CPUE of swordfish, Xiphias gladius, caught by Uruguayan longliners in the Southwestern Atlantic Ocean (1982-212). Pons M., Forselledo R. and Domingo A.

SCRS/2013/102 Estimations of non-retained capture of swordfish, Xiphias gladius, in the Southwestern Atlantic Ocean. Forselledo R., Mas F., Pons M. and Domingo A.

SCRS/2013/104 Standardized CPUE for swordfish (Xiphias gladius) caught by the Portuguese pelagic longline fishery in the North Atlantic. Santos M.N., Coelho R. and Lino P.

SCRS/2013/105 Standardized catch rates in biomass for North Atlantic stock of swordfish (*Xiphias gladius*) from the Spanish surface longline fleet for the period 1986-2011. García-Cortés B., Ramos-Cartelle A. and Mejuto J.

SCRS/2013/106 Standardized catch rates in biomass for South Atlantic stock of swordfish (*Xiphias gladius*) from the Spanish longline fleet for the period 1989-2011. Ramos-Cartelle A., García-Cortés B. and Mejuto J.

SCRS/2013/107 Standardized catch rates in number of fish by age for the North Atlantic swordfish (*Xiphias gladius*) of the Spanish longline fleet, for the period 1983-2011. Mejuto J., García-Cortés B.and Ramos-Cartelle A.

SCRS/2013/108 Preliminary standardized catch rates in number of fish by age for the South Atlantic swordfish (*Xiphias gladius*) of the Spanish longline fleet, for the period 1989-2011 assuming a tentative growth model. J. Mejuto, A. Ramos-Cartelle and B. García-Cortés

SCRS/2013/109 CPUE standardization of the south Atlantic swordfish caught by Japanese longliners for 1990 – 2012. Kai M. and Yokawa K.

SCRS/2013/110 Standardization of CPUE of swordfish caught by Japanese longliners in the north Atlantic. Yokawa, K. and Kai, M.

SCRS/2013/111 Updated catch rates of swordfish from the Moroccan swordfish longline fishery in the North Atlantic, 2005 – 2012. Abid N., Ayoub M. and El Omrani F.

SCRS/2013/116 Standardized catch rates of swordfish from the U.S. dealer landing system with a preliminary consideration of a combined U.S.-CANADA pelagic longline fleet dataset. Walter J., Lauretta M., Hanke A., Andrushchenko I. and Brown C.

Appendix 4

Estimation of length – weight relationship for north and south swordfish stock based on the current available functions adopted by the SCRS

The following relationships length – weight were used in the statistical estimation of single function for the north and south Atlantic SWO. Because the original data was not available, all estimations are based in the expected function values.

Current wgt-sze relationship			wgt = alpha*SZ^beta							
Stock		alpha	beta	wgt	units	size	units	Range		Ref
North										
	NW-ATL	4.59E-06	3.137	Dress	kg	LJFL	cm			Turner 1987
	CN-ATL	4.20E-06	3.2133	Round	kg	LJFL	cm	80	253	Mejuto et al 1988
	NE-ATL	3.43E-06	3.2623	Round	kg	LJFL	cm	93	251	Mejuto et al 1988
South										
	SE-ATL	4.35E-06	3.188	Gutted	kg	LJFL	cm	89	266	Mejuto et al 1988
	SW-ATL	8.00E-07	3.4966	Gutted	kg	LJFL	cm	75	255	Hazin et al 2001

An initial step was to standardized all functions to the same measure units, size in cm for low jaw fork length (LJFL) and weight in kg round weight. For this the following conversion factors were used

Size to size conversion factors						
stock	alpha	beta	function	sze pred	sze inp	Ref
ATL	7.821534	1.089696	alpha+beta*Szinp	LJFL	EFL	Rey Gonzales-Garces 1978
ATL	10.307257	1.255833	alpha+beta*Szinp	LJFL	OPFL	Rey Gonzales-Garces 1979
Wgt to wgt conversion factors						
stock	alpha	beta	function	wgt pred	wgt inp	Ref
N-ATL	1.324565		^wgt = alpha*wgt	Round	Dress	Tuner 1987 & Mejuto et al 1988
S-ATL	1.14		^wgt = alpha*wgt	Round	Gutted	Mejuto et al 1988

Once standardized to the same units, the functions parameters (alpha, beta) of the length – weight were re-estimated. The beta parameter is the same independent of the size measurement. Finally, for estimating a single length – weight function, the parameters alpha and beta were calculated as the geometric mean of the standardized functions. For north SWO, the combined function included the NW-ATL, CN-ATL and NE-ATL. For south SWO, the combined function included the SE-ATL and SW-ATL. The resulted parameter functions are given in the table below.

Wgt - Sze relationship wgt(kg) = alpha*Size(LJFL cm)^beta

stock	alpha	beta	wgt	units	size	units	Range		Ref
N-ATL	4.45373E-06	3.203784011	Round	kg	LJFL	cm	80	253	
S-ATL	4.96E-06	3.188	Round	kg	LJFL	cm	89	266	Mejuto et al 1988 – Hazin et al 2001