SCRS/2014/119

ANALYSIS OF ICCAT REPORTED CATCHES OF TUNAS AND SWORDFISH IN THE SARGASSO SEA (1992-2011)

Brian E. Luckhurst[1]

SUMMARY

This paper provides an analysis of the catch data in the ICCAT database (CATDIS) for the principal tuna species namely, yellowfin tuna, albacore tuna, bigeye tuna, bluefin tuna and skipjack tuna as well as swordfish taken in the Sargasso Sea for a 20 year period (1992-2011). These data have been compiled from a total of eleven ICCAT 5x5 degree reporting squares within the Sargasso Sea Alliance (SSA) study area; all of these squares are exclusively in international waters with the exception of Bermuda's EEZ. Relatively low catch levels were reported in the 1990s for almost all of the above species but there was a generally increasing catch trend during the last decade of the analysis. The results of this analysis indicate that the Sargasso Sea (SSA Area) was not a significant fishing area for any of the six species presented here as average annual catch levels for the reference period are under 3% of the respective species stock totals for all of these species. Amongst the five tuna species, the reported catch of skipjack tuna in the area is insignificant.

KEYWORDS

Sargasso Sea, catch analysis, tunas, swordfish

[1] *Consultant* - brian.luckhurst@gmail.com
2-4 Via della Chiesa, 05023 Acqualoreto (TR), Umbria, Italy

Retired, Senior Marine Resources Officer, Government of Bermuda.
Study commissioned by Sargasso Sea Alliance, led by the Government of Bermuda

Introduction

The Sargasso Sea plays an important role in the ecology and life history of a variety of pelagic fish species, many of which are large, apex predators such as tunas, swordfish and billfishes (Luckhurst, 2014). These apex predators are highly migratory and form the basis of major fisheries which are of both commercial and recreational importance in many countries. The importance of the Sargasso Sea as an Ecologically or Biologically Significant Marine Area (EBSA) was recognized in 2012 by the 11th Conference of the Parties to the Convention on Biological Diversity (UNEP/CBD, 2012). The International Commission for the Conservation of Atlantic Tunas (ICCAT) has fisheries management responsibility for many of these apex species throughout the Atlantic Ocean. The six principal commercial species targeted by ICCAT are: yellowfin tuna (*Thunnus albacares*), albacore tuna (*Thunnus alalunga)*, bigeye tuna (*Thunnus obesus*) , bluefin tuna (*Thunnus thynnus*) skipjack tuna *(Katsuwonus pelamis)* and swordfish (*Xiphius gladius*). In the central and western Atlantic these fisheries are conducted almost exclusively by longline fleets (www.iccat.int). The billfishes are very important in

recreational fisheries but are also taken as a significant component of the by-catch of longliners (ICCAT, 2010b; ICCAT, 2013).

In recent recognition of the importance of *Sargassum* (ICCAT, 2012), the Standing Committee on Research and Statistics (SCRS) of ICCAT has been requested to examine the available data and information concerning the Sargasso Sea and its ecological importance to tuna and tuna-like species and ecologically associated species. In this regard, Luckhurst (2014) documented elements of the ecology and movement patterns of many of the highly migratory species of interest to ICCAT in the Sargasso Sea. To assess the importance of the Sargasso Sea to ICCAT longline fisheries, an analysis of catch data from the ICCAT CATDIS database (www.iccat.int) was conducted. The Sargasso Sea Alliance (SSA) has defined a large portion of the Sargasso Sea as its study area. This area extends from 22°–38°N and from 76°–43°W, centred on 30°N and 60°W (Fig. 1). This comprises an area of ~ 4,163,499 km^2 (Laffoley *et al*., 2011).

The analysis presented here provides insight into the importance of the Sargasso Sea for the many longline fleets which operate under ICCAT management. Its principal objective was to determine what proportion of a given species catch was taken in the Sargasso Sea in relation to the total catch of the relevant stock of the species. The analysis also examined which countries or fishing entities are directing fishing effort in the Sargasso Sea as well as any apparent changes in fishing effort over the 20 year period of the analysis.

Catch data analysis

The ICCAT CATDIS database provides estimates of nominal catches for the nine major tuna and tuna-like species managed by ICCAT. The data are stratified in time (trimester) and space (5x5 degree squares) and all longliner catch data are reported on this spatial scale. Data extractions were made for each of the six principal commercial species targeted by ICCAT, namely, yellowfin tuna, albacore tuna, bigeye tuna, bluefin tuna, skipjack tuna and swordfish using a recent 20 year period of data, i.e. 1992-2011. Within the Sargasso Sea Alliance (SSA) study area, there are a total of eleven ICCAT reporting squares which are exclusively in international waters with the exception of Bermuda's EEZ (Fig. 2).

The analysis of these catch data was conducted in two stages. Firstly, data extractions were made by quarter and year from the 11 reporting squares in the SSA Area over the 20 year period for each of the six species. The annual catch data were summarized by species by combining the records from the 11 reporting squares (Fig. 2) in each year. Annual reported landings (1992-2011) from the corresponding stock, e.g. western Atlantic bluefin, for each of the six species were extracted from the 2012 SCRS Report. For each species, the proportion of the annual catch taken from the SSA Area was then calculated and expressed as a percentage of the relevant stock total.

The second stage of analysis consisted of data extractions by country or fishing entity and trimester (quarter) from the 11 ICCAT reporting squares over the 20 year period for each species. The annual catch data for each species were summarized by fishing entity, trimester and by reporting squares. For each species, the total catch by country or fishing entity and the corresponding proportion of the annual catch taken from the SSA Area was then calculated and expressed as a percentage. Any country or fishing entity with a minimum of 5% of the annual SSA Area catch was included in the analysis and all countries or entities with a minimum of 10% of the annual catch were further broken down by trimester and reporting square. The ICCAT reporting entity NEI (Not Elsewhere Included) is problematic in that these catches are not associated with a specific country or entity but many different fishing entities. As a result, only the proportion of the total SSA Area catch attributed to NEI is calculated.

Results and Discussion

The results of the catch analysis are presented by species with brief summaries of the main findings and trends over the period of the analysis.

Yellowfin tuna

The proportion of the catch of yellowfin tuna from the SSA Area with respect to the western Atlantic stock has been small ranging from 0.23 to 3.57 % per year. Only four years in the 20 year period had catches over 2%. The overall average annual catch was 1.24 % of the western Atlantic stock (Table 1). Annual catches in the SSA Area have been highly variable ranging from 90.82 metric tons (mt) in 1993 (Bermuda contributing almost 64% of the total) to almost 1,097 mt in 1999 with over 50% contributed by NEI (Table 1). However, in most years Japan has been a major contributor to the catch with up to 74% of the annual total. Until recently, Chinese Taipei has made a consistent and significant contribution to the catch generally ranging between 20-40% of the annual catch while St. Vincent has become a significant contributor since 2007 with catch contributions up to 84%. Bermuda's contribution to catch totals has been consistent and is generally in the 15-25% range but has reached above 60% as noted above. The catches by the USA are generally low but have ranged up to 32%. Other countries fishing in the SSA Area are Belize, Barbados and Vanuatu. The highest catches by the major fishing fleets (Japan, Chinese Taipei) are taken in the first and second trimesters and although the entire SSA Area is fished by these fleets, the majority of the catch appears to be from the more southerly portion of the SSA Area.

Albacore tuna

Albacore catches have varied widely from 17mt to 2,020 mt per year over the analysis period (Table 2). The proportion of catch from the SSA Area has also varied ranging up to over 8% per

year of the stock total but the average for the analysis period is 2.98% per year (Table 2). Since 1993 Chinese Taipei has dominated the albacore fishery in the SSA Area contributing between 51% and 99% of the annual catch. From 1994 to 1999, they contributed an average of 96% of the annual catch. This is a directed fishery conducted mainly during the first and second trimesters although some substantial catches were reported from the fourth trimester during the 1990s. The oceanographic conditions in the Sargasso Sea during the first trimester (i.e. 18° C SST) are in the preferred thermal range of albacore and thus the fishery seems to direct most effort in the Sargasso Sea- during this quarter. Japan started reporting albacore catches in the early 2000s and reached its largest annual catch contribution (almost 36%) in 2006 although it has since tapered off. In recent years, Belize and St. Vincent have made contributions to the catches while the USA has reported catches in only a few of the 20 years. Although albacore are caught in all of the reporting squares of the SSA Area, there appears to be a preponderance of catches in the more southerly portion of the area.

Bigeye tuna

The reported catches from the SSA Area have varied considerably from 20.6 mt in 1995 to 2,046 mt in 2004 (Table 3). The proportion of catch derived from the SSA Area is very small (less than 1% in most years) and averaged 0.89% per year over the analysis period (Table 3). Overall, Japan has largely dominated the bigeye catch in the SSA Area with catch figures ranging from 59% to 99% of annual totals. From 1999 to 2006, Japan reported catches between 877 – 2,023 mt (Table 3) which represents 92% of the average annual catch. Since 2006 Japan's participation appears to have declined while other countries (USA, St. Vincent and Vanuatu) have contributed larger proportions of catch in recent years. With a lesser contribution from Japan, catch levels from 2007-2011 declined and ranged from 22-35 mt per year (Table 3). This catch reduction may also represent a shift in fishing effort by Japan to areas outside the SSA Area.

In almost all years, the largest proportion of catch has occurred in the first trimester with lesser amounts in the second trimester. As with the other species reported here, bigeye are caught throughout the Sargasso Sea but larger catches seem to occur in the southern portion of the area.

Bluefin tuna

Bluefin catch levels have been highly variable over the period of the analysis ranging from just over 1 mt to almost 153 mt per year (Table 4). The proportion of the western bluefin stock taken from the SSA Area has been generally small (less than 1% per year) but reached a high of over 8% in 2006 (Table 4). The two major contributors to bluefin catches are Japan and the USA. From 1992 to 1996, the USA caught most of the bluefin (61-96%) but at modest annual catch levels (5–32 mt). Following several years of very low catches in the SSA Area, Japan came to

largely dominate catches from 2002 – 2010 (21-147 mt) which comprised 82-98% of the annual catch except for one year (2008).
By far the largest proportion of catch has been in the first trimester by both countries with secondary quantities in the second trimester. There have only been a small number of fish taken in the fourth trimester. Most of the bluefin catch is taken in the southwest portion of the Sargasso Sea Area, east of the Gulf Stream. The other main catch area is in the northwest of the SSA Area. However, given the complex behavior and migratory patterns of bluefin (ICCAT, 2010a) these catch patterns should not be considered definitive as to area but only an indication of where bluefin have been encountered by the fishing fleets.

Skipjack tuna

There are very low catches recorded for skipjack in the Sargasso Sea (Table 5) as it is principally a tropical species and is taken mainly by purse seiners. In most years, the catches of skipjack are insignificant and the percentage contribution to the western stock catch is close to zero (Table 5). As a consequence, this paucity of catch data has not allowed any detailed analysis.

Swordfish

Annual catches of swordfish in the SSA Area have varied from 14.5 mt in 1996 to almost 790 mt in 2011 (Table 6). Catches were generally low from 1992-2001 not often exceeding 100 mt and the average percentage contribution from the SSA Area for this period was 0.69% per year (Table 6). However, catches increased markedly from 2003 onwards. The average annual catch during the period 2002-2011 was 468 mt averaging 3.73 % of the total catch (Table 6). From 1992 to 1997, the USA was the major contributor to swordfish catches averaging about 88% of the annual catch. Starting in 1998, Spain started its contribution to the annual catch and rapidly became the major fishing entity for swordfish in the SSA Area. Its contribution to the annual catch from the SSA Area from 1999 to 2011 ranged from about 30% to 88%. During this same period, the USA has contributed 9-32% to annual catches while Japan's contribution to annual catches averaged about 20% until 2006 when it stopped reporting swordfish catches in the SSA Area. In general, the highest catches are reported in the second trimester while the first trimester also makes substantial contributions. Spain appears to concentrate its fishing along the eastern portion of the SSA Area closer to the mid-Atlantic, while the USA does most of its fishing in the southwest portion.

Summary

Overall, the analysis indicates that the SSA Area is not a significant fishing area for any of the six principal commercial species presented here. There have been some substantial changes in longline fishing effort in the SSA Area over the 20 year period encompassed by this analysis but

average annual catch levels for this period for all six species are under 3% of the respective species stock totals (Table 7). This represents a very minor contribution of annual catches from the Sargasso Sea for any of the species analyzed. The largest percentage contribution for fish caught in the SSA Area in any given year is for albacore tuna and bluefin tuna at just over 8% (Table 7) but annual values are generally much lower. Relatively low catch levels were reported in the 1990s in almost all species and there has been a generally increasing catch trend during the last decade of the analysis. However, the reported catch of Skipjack tuna has remained insignificant.

Japan has a significant influence on the catches of the tunas and swordfish reported here depending on which species they are targeting. The other important fishing countries which operate in the SSA Area are the USA, Chinese Taipei and Spain. In recent years, St. Vincent has become a significant fishing entity in the SSA Area. Species quotas set by ICCAT and market conditions may change fishing patterns in the SSA Area in the future but it is not possible to predict what those changes might be at this time.

References

ICCAT. 2010a. ICCAT Manual, chapter 2.1.5 bluefin tuna, 19 p.

ICCAT. 2010b. ICCAT Manual, chapter 2.1.6 blue marlin, 15 p.

ICCAT, 2012. Resolution (12-12) by ICCAT on the Sargasso Sea.

ICCAT. 2013.. ICCAT Manual, chapter 2.1.7 white marlin, 15 p.

Laffoley, D., H.S.J. Roe et al.. 2011. The protection and management of the Sargasso Sea: The golden floating rainforest of the Atlantic Ocean. Summary science and supporting evidence case. Sargasso Sea Alliance, pp. 71.

Luckhurst, B.E. 2014. Elements of the ecology and movement patterns of highly migratory fish species of interest to ICCAT in the Sargasso Sea. SCRS/2013/132, 23 p.

UNEP/CBD. 2012. Decision adopted by the conference of the parties to the Convention of Biological Diversity, 11th Meeting, Hyderabad, India, 8-19 October 2012, reference p. 23.

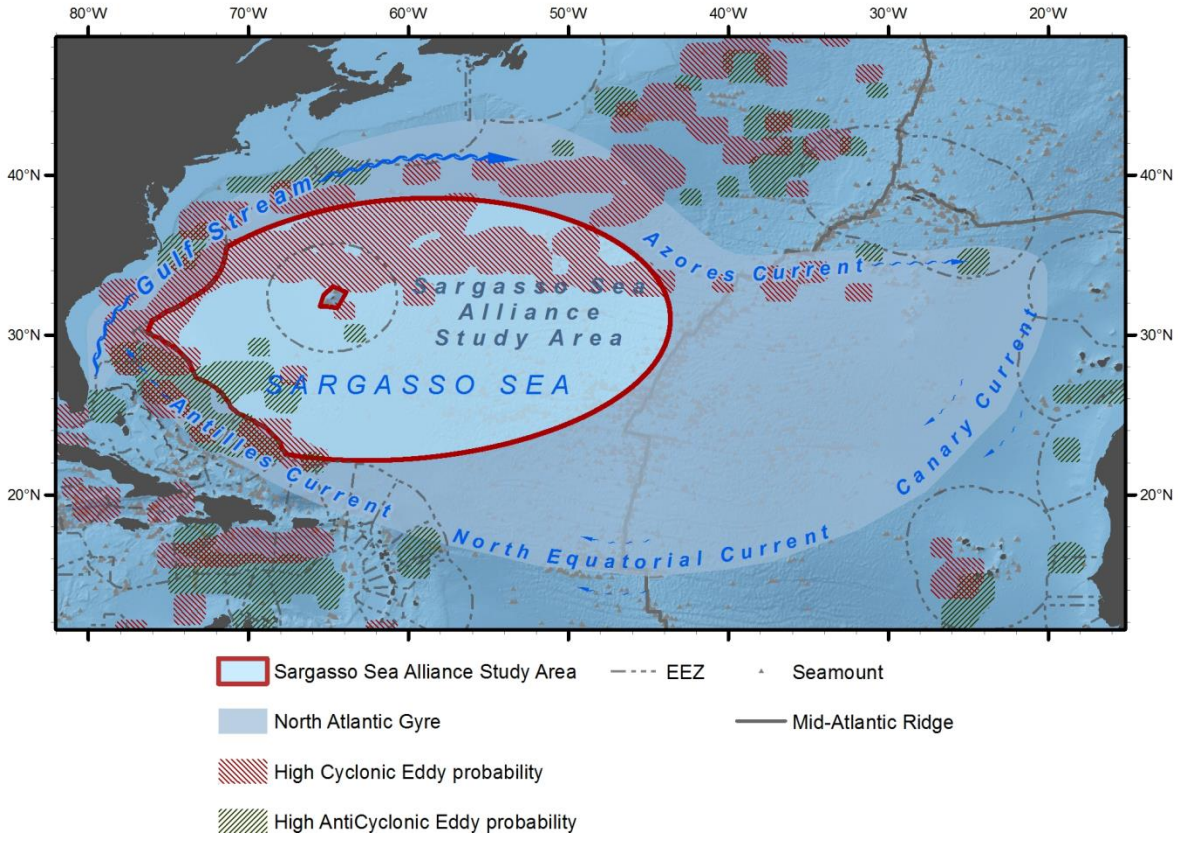

Figure 1 – Map of the Sargasso Sea Alliance Study Area, including some of the major features that influence overall boundary definition and location (from Laffoley *et al*., 2011).

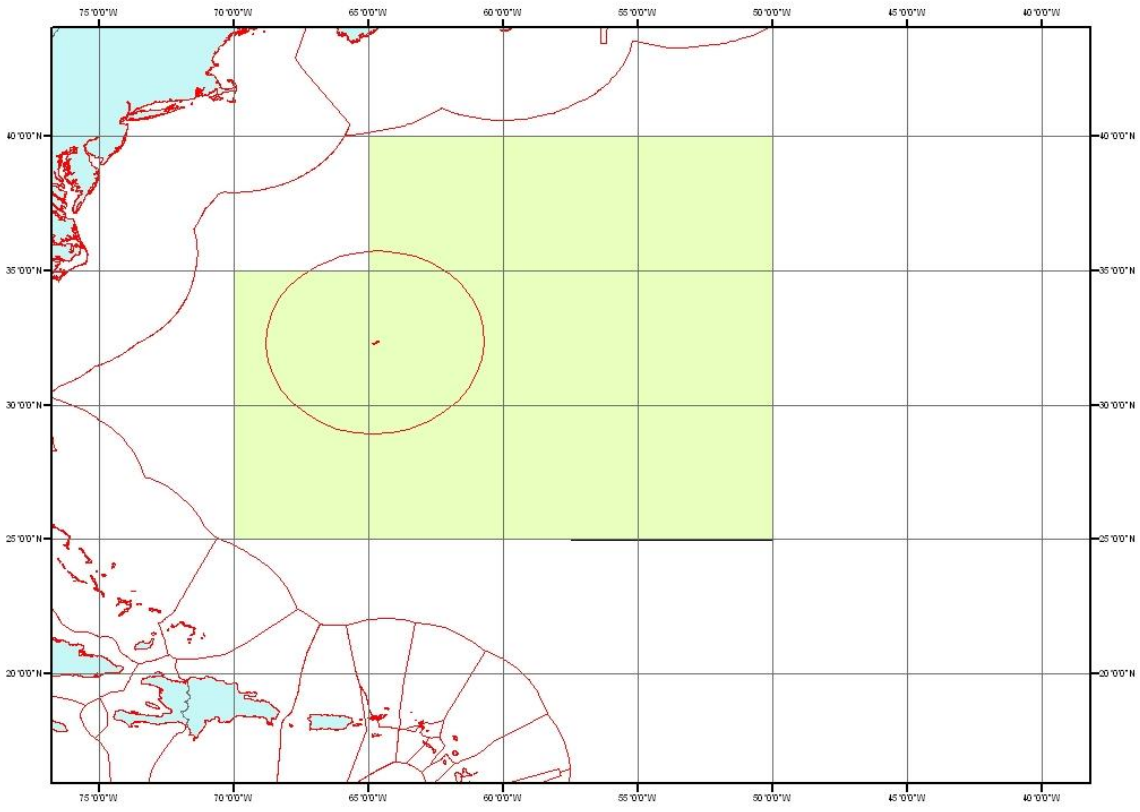

Fig. 2 - Sargasso Sea with ICCAT 5x5 degree reporting squares used for extracting data from the ICCAT CATDIS database. The circle around Bermuda delineates the Exclusive Economic Zone (EEZ).

Table 1 - Catch summary of yellowfin tuna from the Sargasso Sea Alliance Area (SSA) and the western Atlantic stock (AT-W). Catch in metric tons (mt).

Year	SSA	AT- W	% of total	Average
1992	166.59	37712	0.44%	1992-2001
1993	90.82	38745	0.23%	1.32%
1994	191.68	48215	0.40%	
1995	198.58	35274	0.56%	
1996	311.49	33056	0.94%	
1997	257.9	32341	0.80%	
1998	801.76	30919	2.59%	
1999	1096.71	30710	3.57%	
2000	454.48	35623	1.28%	
2001	944.93	40323	2.34%	
2002	251.23	29660	0.85%	2002-2011
2003	276.01	24982	1.10%	1.16%
2004	503.42	31238	1.61%	
2005	333.26	26068	1.28%	
2006	205.69	28272	0.73%	
2007	167.26	24167	0.69%	
2008	364.98	18123	2.01%	
2009	226.21	19008	1.19%	
2010	281.72	21912	1.29%	1992-2011
2011	165.08	19408	0.85%	1.24%

Table 2 - Catch summary of albacore tuna from the Sargasso Sea Alliance Area (SSA) and the north Atlantic stock (AT-N). Catch in metric tons (mt).

Year	SSA	AT - N	% of total	Average
1992	17.41	30851	0.06%	1992-2001
1993	69.45	38135	0.18%	3.41%
1994	625.57	35163	1.78%	
1995	806.49	38377	2.10%	
1996	2019.91	28803	7.01%	
1997	1362.85	29023	4.70%	
1998	755.02	25746	2.93%	
1999	1756.06	34551	5.08%	
2000	1256.61	33124	3.79%	
2001	1688.19	26253	6.43%	
2002	1871.89	22741	8.23%	2002-2011
2003	1073.92	25567	4.20%	2.56%
2004	1010.84	25960	3.89%	
2005	763.59	35318	2.16%	
2006	484.6	36989	1.31%	
2007	67.86	21991	0.31%	
2008	259.56	20483	1.27%	
2009	124.71	15381	0.81%	
2010	329.01	19647	1.67%	1992-2011
2011	348.06	19995	1.74%	2.98%

Table 3 - Catch summary of bigeye tuna from the Sargasso Sea Alliance Area (SSA) and the Atlantic stock (AT). Catch in metric tons (mt).

Year	SSA	AT	% of total	Average
1992	81.26	99374	0.08%	1992-2001
1993	26.65	112572	0.02%	0.41%
1994	132.17	133630	0.10%	
1995	20.61	126778	0.02%	
1996	130.09	121689	0.11%	
1997	81.36	109289	0.07%	
1998	85.71	110438	0.08%	
1999	1078.53	128304	0.84%	
2000	1164.63	103646	1.12%	
2001	1568.84	94291	1.66%	
2002	1630.82	77225	2.11%	2002-2011
2003	1351.19	92106	1.47%	0.89%
2004	2045.96	87054	2.35%	
2005	1086.91	72348	1.50%	
2006	865.33	65888	1.31%	
2007	32.16	79664	0.04%	
2008	29.17	69342	0.04%	
2009	22.66	81539	0.03%	
2010	35.35	75710	0.05%	1992-2011
2011	23.12	77795	0.03%	0.65%

Table 4 - Catch summary of bluefin tuna from the Sargasso Sea Alliance Area (SSA) and the western Atlantic stock (AT-W). Catch in metric tons (mt).

Year	SSA	AT - W	% of total	Average
1992	10.95	2282	0.48%	1992-2001
1993	27.16	2368	1.15%	0.58%
1994	48.86	2113	2.31%	
1995	11.21	2423	0.46%	
1996	8.39	2514	0.33%	
1997	15.75	2334	0.67%	
1998	2	2657	0.08%	
1999	4.2	2772	0.15%	
2000	1.26	2775	0.05%	
2001	2.08	2784	0.07%	
2002	84.81	3319	2.56%	2002-2011
2003	9.39	2306	0.41%	2.20%
2004	58.93	2125	2.77%	
2005	26.48	1756	1.51%	
2006	152.77	1811	8.44%	
2007	23.32	1638	1.42%	
2008	4.89	2000	0.24%	
2009	48.21	1980	2.43%	
2010	37.28	1857	2.01%	1992-2011
2011	4.14	1986	0.21%	1.39%

Table 5- Catch summary of skipjack tuna from the Sargasso Sea Alliance Area (SSA) and the western Atlantic stock (AT-W). Catch in metric tons (mt).

Year	SSA	AT-W	% of total	
1992	0	30155	0.00%	
1993	0.21	33221	0.00%	
1994	0.11	29949	0.00%	
1995	0.04	21860	0.00%	
1996	0.24	27562	0.00%	
1997	2.52	31712	0.01%	
1998	0	29087	0.00%	
1999	0.88	27356	0.00%	
2000	1.33	29193	0.00%	
2001	0.41	31486	0.00%	
2002	15.92	21600	0.07%	
2003	2.84	24749	0.01%	
2004	7.65	27461	0.03%	
2005	1.84	28517	0.01%	
2006	1.38	26453	0.01%	
2007	1.79	25443	0.01%	
2008	1.69	22022	0.01%	
2009	0.75	25771	0.00%	
2010	0.35	25175	0.00%	1992-2011
2011	0.14	39324	0.00%	0.01%

Table 6- Catch summary of swordfish from the Sargasso Sea Alliance Area (SSA) and the north Atlantic stock (AT-N). Catch in metric tons (mt).

Year	SSA	AT-N	% of total	Average
1992	53.51	15394	0.35%	1992-2001
1993	119.48	16738	0.71%	0.69%
1994	137.69	15501	0.89%	
1995	22.69	16872	0.13%	
1996	14.49	15222	0.10%	
1997	44.15	13025	0.34%	
1998	115.85	12223	0.95%	
1999	75.23	11622	0.65%	
2000	114.11	11453	1.00%	
2001	175.65	10011	1.75%	
2002	186.1	9654	1.93%	2002-2011
2003	400.59	11442	3.50%	3.73%
2004	311.62	12175	2.56%	
2005	240.55	12480	1.93%	
2006	488.44	11473	4.26%	
2007	488.32	12302	3.97%	
2008	583	11050	5.28%	
2009	445.61	12081	3.69%	
2010	471.67	11553	4.08%	1992-2011
2011	789.59	12836	6.15%	2.21%

Table 7 - Range and average annual catch values of six commercially important ICCAT species taken in the Sargasso Sea (SSA Area) expressed as a percentage of the total stock catch for the period 1992-2011.

Species	SSA catch range	20 year average
Yellowfin tuna	0.23 - 3.57%	1.24%
Albacore tuna	0.06 - 8.23%	2.98%
Bigeye tuna	0.02 - 2.35%	0.65%
Bluefin tuna	0.05 - 8.44%	1.39%
Skipjack tuna	0.00 - 0.07%	0.01%
Swordfish	0.10 - 6.15%	2.21%