# REPORT OF THE 2017 ICCAT BLUEFIN TUNA DATA PREPARATORY MEETING

*(Madrid, Spain 6-11 March, 2017)*

## 1. Opening, adoption of agenda and meeting arrangements

The meeting was held at the ICCAT Secretariat in Madrid March 6 to 11, 2017. Dr Clay Porch (USA), the Species Group ("the Group") Coordinator and meeting Chairman, opened the meeting and welcomed participants. Drs Gary Melvin (Canada) and Ana Gordoa (EU-Spain), Rapporteurs for the western Atlantic and eastern Atlantic and Mediterranean stocks, respectively, served as co-Chairs. Dr Miguel Neves dos Santos (ICCAT Scientific Coordinator) adressed the Group on behalf of the ICCAT Executive Secretary, welcomed the participants and highlighted the importance of the meeting due to the high Commission expections as regards the improvements on the available data and the July stock assessment session outputs. The Chairmen proceeded to review the Agenda which was adopted with minor changes (**Appendix 1**).

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

| *Sections* | *Rapporteur* |
|---|---|
| Items 1, and 9 | M. Neves dos Santos and M. Ortiz |
| Item 2.1 | L. Ailloud and E. Rodriguez-Marin |
| Item 2.2 | H. Arrizabalaga and A. Hanke |
| Item 2.3 | J.J. Maguire, A. Boustany and A. Gordoa |
| Item 2.4 | T. Carruthers and M. Lauretta |
| Item 3 | G. Diaz, C. Palma, and J.L. Cort |
| Item 4 | T. Rouyer, A. Kimoto and W. Ingram |
| Items 5.1 and 5.2 | J.J. Maguire, C. Porch and M. Lauretta |
| Item 5.3 | L. Kell |
| Item 5.4 | T. Carruthers and D. Butterworth |
| Item 6 | A. Kimoto and G. Diaz |
| Item 7 | C. Porch, G. Melvin and A. Gordoa |
| Item 8 | A. Boustany, A. Gordoa, and J.J. Maguire |

The Coordinator noted that more than 32 documents and 4 presentations had been submitted for review, respectively.

## 2. Review of historical and new data on bluefin biology and distribution

### *2.1 Review and finalize age-length keys and other methods for converting CAS to CAA*

Three documents and one presentation were submitted to this section. Two documents were presented concerning YOY bluefin tuna sampled by GBYP in the Mediterranean in 2016 (SCRS/2017/040 and 041). The documents described anomalies in the monthly mean sizes (unusually large) and geographical distributions (early shift towards deeper offshore waters) of several cohorts. These findings coincided with warmer than normal oceanographic conditions, however, no clear correlation was found between environmental factors and YOY distributions. Authors raised concern that variability in size at age between cohorts might negatively affect age readings and ALKs.

It was suggested that the abnormally large YOYs could have come from early spawners in the Levantine Sea. The Group recommended that the otoliths collected from these YOYs be aged using daily rings to confirm the timing of spawning.

*$L_{max}$ vs. $L_{inf}$*

Document SCRS/2017/22 described a set of indirect methods for validating the growth curves used in the 2014 assessment based on several approaches, one being $L_{max}$, an estimate of maximum size for the population obtained from literature review. The authors questioned the new growth model presented for the western stock (Ailloud *et al*., 2017; SCRS/2016/147) arguing that Ailloud *et al*.'s estimate of $L_{inf}$ ($\mu$=270cm FL, $\sigma$=22 cm) was too low compared to their estimate of $L_{max}$ ($\mu$=320cm FL, $\sigma$=11 cm).

The Group concluded that the two studies are not in conflict because $L_{inf}$ and $L_{max}$ measure different aspects of growth: $L_{inf}$ is a measure of the mean size of fish at the maximum age while $L_{max}$ is a measure of the maximum size in the population, which is expected to be higher than $L_{inf}$ since it relates to growth extremes. It was suggested that the most appropriate $L_{inf}$ be decided on the grounds of which model best fit the available age data.

Ailloud *et al*., 2017 estimated the standard deviation of length at the oldest age group to be 22 cm; thus, under the assumption of normality, we expect 99.7% of fish to lie within 3 standard deviations of the mean (i.e. below 335 cm FL). This approximation is in agreement with the $L_{max}$ described by Cort *et al*. (SCRS/2017/22 of 319.93 cm FL +/- 11.3cm). The Group decided that, based on this result, the current cutoff of 350cm FL used by the ICCAT Secretariat to identify outliers in the databases seems appropriate.

*Western Atlantic bluefin tuna growth curve*

The Group compared the von Bertalanffy and Richards model fits to the western BFT age data (**Figure 1**) and concluded that the Richards model was a better fit to the data. The Group noted the large variability in length at age in the aged samples of the West and East (**Figures 2** and **3**) and raised concern about the impact these outliers may have on the growth estimation process. Ailloud *et al*., 2017 did test the influence of these potential outliers on the fit and found that the outliers did not affect the resulting parameter estimates. The Group decided to adopt the Ailloud *et al*., 2017 growth function using the Richards model for the western stock.

*Eastern Atlantic bluefin tuna growth curve*

The Group compared the Cort (1991) growth curve to the western otolith data (**Figure 2**) and noted that beyond age 20 the majority of data points fall below the growth curve. The Cort (1991) analysis had very few samples available from old/large animals which means, there were very little data to inform the estimation of $L_{inf}$. The Group therefore recommended that the growth curve for the eastern stock be re-estimated using the methodology outlined in Ailloud *et al*., 2017. Preliminary available age-length and tagging data for the east is presented in **Figure 3** where it is seen that the Cort (1991) curve fits data better at younger ages, while the Ailloud *et al*., 2017 fits data better at older ages. Overall, Ailloud *et al*., 2017 for the western Atlantic fits the data from the eastern Atlantic reasonably well so the Group concluded that a refitting of the eastern growth curve is warranted.

Noting the lack of old fish, the Group requested that any additional historical ageing data not already made available in the biological database be added to the database for use in growth estimation and ALKs. The Group recommended that samples of fish caught in the West that have been assigned an eastern origin be used to help estimate a new growth curve for the East and determine if there are any differences in growth between the two stocks. The Group also recommended to increase sampling effort targeted at larger fish for both ageing and natal origin studies.

*Catch-at-age estimation*

Document SCRS/P/2017/003 presented a simulation testing of the relative performance of three different methods for generating catch at age estimates: cohort slicing, the Hybrid key (SCRS/P/2016/049; a combination of cohort slicing and forward age length keys) and the Hoenig *et al*., 2002 method (a combination of forward ALKs and inverse ALKs). The Hoenig method performed best across scenarios. Both the Hoenig method (which assumes probability of size at age is constant over time) and cohort slicing are highly sensitive to changes in growth over time. For the Hoenig method, this is mainly an issue in years for which no age data are available.

The Group noted that although the Hoenig method appeared superior to cohort slicing in assigning ages to smaller individuals, like cohort slicing, it performed poorly at older ages. This was raised as a concern since getting accurate estimates of catch in the plus Group is critical to the outcome of the assessment, especially for the most recent years in the model. The authors acknowledged the concern and noted that the Hoenig method mainly uses forward keys in recent years when age data are available and that, therefore, the size of the plus Group should be better estimated in recent years compared to historical years.

Though the simulation (SCRS/P/2017/003) was set up to mimic properties of the western stock, one of the scenarios tested the sensitivity of the results to: A) age-length data contains predominantly small fish (mimicking data availability for the eastern stock) and B) age-length data contain predominantly large fish (mimicking data availability for the western stock). The Group noted that results did not appear to be sensitive to whether predominantly small or large fish were present in the available data (**Figure 4**).

The Group further requested that retrospective analyses be run to check for any alarming pattern (as was observed with the merged key at the July 2016 data preparatory meeting). Cohort slicing and the Hybrid method both showed a pattern of upward revision of previous estimates for SSB. The Group concluded that as the Hoenig method did not show any systematic trends (**Figure 5**), it recommended that this method be used for both the eastern and western stocks. To that end, the Group recommended using separate keys for the East and the West based on area rather than stock origin since the ALKs must reflect the age composition of the catch but cautioned that stock specific keys may be needed if the catch is divided up based on stock origin rather than geographic delimitation.

The protocol for determining age classes is described in **Appendix 4**.

The Group requested that the code and technical documents pertaining to the Hoenig *et al*., 2002 method be included in the ICCAT catalog and recommended that the method be accompanied by an approach to provide some measure of uncertainty (i.e., Hessian-based variance-covariance matrices or bootstrapping).

Timeline of completion

1. Re-estimate the growth curve for the Eastern stock by April 15.
2. Provide ICCAT with the code and technical documents concerning the Hoenig *et al*., 2002 method by April 15, 2017 to produce the CAA.
3. Have the complete (up until 2015) biological databases for the eastern and western stock available by April 15, 2017 for use in ALKs.

### *2.2 Review and finalize stock composition keys (otolith microchemistry, shape, genetics, etc.) and evaluate possible biases in stock assignment procedures*

Document SCRS/2017/021 and presentation SCRS/P/2017/04 provided stock mixing rates of bluefin tuna from Canadian landings during 1975-2015 using otolith stable isotope chemistry and genetic methods.

It was noted that the stock origin assignments estimated using SNPs were different from those using stable isotope ratios and discrepancies in the amount of agreement depended on the exact SNP template or stable isotope baseline used. Consequently it was recommended that experts cooperate with each other in order to provide more consistent results. The Group noted that the origin of some Bluefin tuna was poorly determined and encouraged further work in resolving the factors that affect the assignment. The increasing trend in the number of eastern fish in the western catch prompted discussion as to whether we could resolve the difference between eastern fish using western foraging areas as young adults only or consistently throughout their life. The distinction between these two alternatives would be resolved if the older adult eastern migrants did not move north of the fishery and thus escape our detection.

Document SCRS/2017/027 presented the development of a new genetic methodology to assign origin to individuals of unknown origin. Using this SNP panel, the author's assigned origin to individuals throughout the Atlantic Ocean between 2011 and 2016, providing new information on locations not analyzed previously (e.g. Norway and Mauritania). Overall, the results suggest a longitudinal gradient of the mixing proportions, with a relatively high proportion (~50%) of eastern origin fish in the Gulf of St. Lawrence.

The Group requested that the assignment scores be viewed in relation to characteristics of the fish in order to determine if there were trends related to season, year class or fish size that could affect the application of mixing rates in the stock assessment. The authors clarified that these analyses are ongoing, and that the bulk of the analysis was based on large fish (>100 kg).

Document SCRS/2017/026 presented updated information on the mixing proportions in the Canary Islands, Morocco, Central North Atlantic and Western North Atlantic, estimated through otolith stable isotope chemistry analyses. The interannual variability of these proportions was shown for the period 2010-2016.

The Group noted that annual mixing rate estimates for an area are based on a limited number of samples and may not be representative of the mixing that occurs throughout the entire year. Consequently, use of mixing estimates in the assessment should be considerate of potential sampling bias; furthermore these should include confidence intervals for the estimates. The Group observed that the most recent (2016) mixing estimates from the Moroccan traps was absent and was informed that these estimates will be available as soon as the analysis is completed. Lastly, the Group noted that otolith stable isotope chemistry results suggest important variability within the Moroccan sample, with 2011 and 2014 years presenting important western contributions, while the genetic results (SCRS/2017/027) suggest less variability and very modest western contributions. Further analyses are ongoing in order to clarify whether this discrepancy is due to disagreement between methods or due to the fact that different individuals were used in the different analyses.

Presentation SCRS/P/2017/01 showed progress on an otolith chemistry tool (based on trace element analysis) to assign origin at the level of within Mediterranean spawning areas. Given the substantial interannual variation in the concentration of trace elements by region, it was suggested that annual baselines are required. In addition, incorporation of stable isotope data as well as larger sample sizes was recommended to improve the tool.

Finally, document SCRS/2017/028 presented an integrated analysis for Atlantic bluefin tuna origin assignment. Using a baseline based on adults, this study showed a higher discrimination accuracy using otolith chemistry than in Rooker *et al*., 2014 that used yearling fish.

This was a potentially promising result, but the Group noted that more years and areas of sampling were needed before it was fully comparable to other baselines. Combining otolith stable isotope signatures and genetic markers further improved estimation of natal origin, which makes the approach interesting especially to resolve the origin of samples with low assignment probability.

During the 2016 Data Preparatory Meeting, the available stock origin data from the GBYP, Canada, USA and the EU was compiled into a common database as outlined in SCRS/2016/15. This stock origin database was reviewed and was considered to contain the appropriate factors and level of detail for use in stock assessment models and furthermore could provide the necessary confidence intervals on the estimates. It includes the information at an individual level for over 6500 records and allows analysts to aggregate stock origin data on the spatiotemporal scales required to fit the range of model structures that are being considered. The updated version of the database is now available for inclusion in the stock assessment and resides in the Analysis folder of the OwnCloud.

The criteria used to create the mixing data base in 2016 continued to be used with a slight modification. According to this, whenever multiple techniques were applied to the same individual, stable isotope data were used, then genetic data, and finally otolith shape data. However based on the results of SCRS/2017/028, assignment based on shape were not considered as the shape seems to reflect where the fish spent its life rather than where it hatched.

New approaches such as the integrated assignment using both stable isotopes and genetics or variations within each method (e.g. adult vs yearling baselines, or improved SNP panels) were not included in the data filtering criteria. A group of experts needs to conduct a comparative evaluation of the methods and variants to determine the best course of action.

2015 data from Canada and the GBYP were included in order for the database to be up to date. It was recognized that some records did not have gear type (~300 of 6500). An attempt will be made to recover these missing values. Where no direct ages were given, size info was available for conversion to age (via an ALK or growth model).

In the case of the VPA, it would be possible to provide mixing estimates by age, year, region and gear to adjust the catch at age. Using this approach, the indices would also need to be prorated so that they indexed the appropriate stock. The complication of projections that involve mixing was considered and it was noted that models could be used to estimate mixing in future years though some assumptions will need to be made with respect to the rates for year classes not yet recruited to the fishery.

Thought was given to the possibility of including the fish with stock origin in the VPA as tagged fish with known release and recapture sites, fleet and age. It was thought that this formulation would be able to inform movement rates but it cannot inform mortality rates as every released fish is recaptured.

### *2.3 Review and finalize fecundity schedules and natural mortality rate*

*Fecundity*

The Group endorsed the decisions made at the 2013 and 2016 Data Preparatory Meetings in Tenerife and Madrid. The Group suggested that while fecundity is important to investigate stock and recruitment relationships, there is insufficient information to reach conclusions on the fecundity – age relationships for the two stock components. The Group recommended that a workshop of experts be convened to examine the best scientific information available, provide advice on fecundity and productivity by age/length to be used in stock assessment, and make research recommendations to fill the main gaps in knowledge. This is however unlikely to happen before the assessment meeting.

*Spawning fraction*

The Group agreed to use two alternative vectors for the proportion of fish contributing to the spawning output of the population as a function of age for the two stocks (**Table 1** and **Figure 6**). Vector 1 assumes that maturity alone determines contribution to the spawning stock and is similar to the vector currently used for the East Atlantic and Mediterranean (Corriero *et al*., 2005). Vector 2 is based on Diaz, 2011 and assumes that only fish actually on the main spawning grounds in the western Atlantic in the Gulf of Mexico contribute to the spawning stock. These two vectors are expected to bracket the extremes of the possible ranges of percent spawning by age. The Group notes that vector 2 corresponding to high age of contribution to the spawning stock is different from the similar vector used in the MSE exercise. The Group recommends that vector 2 be used in the MSE exercise instead of the SBT related vector that was agreed in November 2016 (Anon. in press, option 2, Table LH1, Appendix 4). The Group acknowledged that new age estimates for fish used in Diaz, 2011 are available. The Group recommends that vector 2 be updated using those new ages and that the results be made available by the April 30 deadline. If vector 2 is not updated by the deadline, the existing vector 2 (**Table 1**) will be used.

Given similarities in growth, the Group expects that if a single spawning fraction is chosen in the future, the same one will be used for both stocks.

*Natural mortality*

The Group initially supported the recommendation of the 2013 and 2016 Data Preparatory meetings to replace the currently assumed natural mortality for each stock with a Lorenzen mortality function ($M=3.0*W^{-0.288}$) rescaled so that the average mortality on the ages 4+, the ages making the largest contribution to the catch, equals the value inferred from the maximum age using the relationship in Then *et al*., 2015. For the purpose of estimating the Lorenzen mortality function, the Group recommended to use a maximum age of 35 yr for both the western and eastern stocks, based on the maximum age observed in the Canadian bluefin tuna age-length data, the growth curves currently used for each stock, and the observed maximum lengths of fish landed in the fisheries (on average 300 cm FL). Cort *et al*., 2014 reported a bluefin tuna of 725 kg and 320 cm FL, but the age of this fish was not estimated. This implies M = 0.19 for ages 4+. The Group then agreed to test two other vectors assuming +/- 0.05 applied to the Lorenzen derived vector in sensitivity cases (roughly equivalent to the mean average difference between the observed and predicted values in Then *et al*., 2015, see **Figure 7**).

Near the end of the meeting the proposed new vector was plotted relative to the assumptions used in previous assessments (**Figure 8**). The Group observed that the lower confidence interval of the M vector proposed for a sensitivity run (Lorenzen with average M on age 4+ = 0.14) was generally higher than the SBT vector used in previous assessments for the Eastern and Mediterranean assessment. The Group questioned if this was reasonable and requested further analyses to be completed by April 15 (see the workplan in Section 7).

### *2.4 Review of available tagging data and derived movement matrices*

The electronic tagging data has been updated to include data recovered by GBYP and is posted on the server. The final electronic tagging dataset is expected to be available by April 15, to include the GBYP Phase 6 tags processed to the summary format. The conventional tagging data has been updated by the Secretariat and is currently available for download from the ICCAT website and was made available to the Group. The catalogue of electronic tagging was also updated and made available to the Group in addition to the summarized track data.

## 3. Review of fishery statistics

The Secretariat presented to the Group the most up-to-date bluefin tuna (*Thunnus thynnus*) statistical (Task I and Task II) information. The Group was also informed that the ICCAT database system (ICCAT-DB) already contains all the statistical information (yearly catches, catch-and effort, and, actual size) recovered by the GBYP Program during phases 1 to 5 (historical data recovery). All these datasets were already reviewed and approved by the Group during 2016.

### *3.1 Task I (catches) data*

The Task I (T1NC) yearly catch includes, for the first time, all the historical catches (before 1950 and back in time until the 1500s) recovered under the GBYP (**Figure 9**).

Following the 2016 work plan of the Group (Anon. in press), the bluefin tuna T1NC went through a complete and complex revision process with the participation of a significant number of the ICCAT CPC scientists. Some of this revision included catch series harmonization, proper allocation of unclassified gears, gap recovery/completion, removal of duplicated records, reallocation of some catches to the proper stocks/areas, trap fisheries updates based on the information recovered by the GBYP, etc. The revision covered the catch series of both stocks between 1950 and 2015 and resulted in changes in the order of 15% (900 records) of the T1NC information related to bluefin tuna. The details of this revision are fully described in **Appendix 5**. The revised T1NC catches are presented in **Table 2** and **Figure 10** (one panel per stock: BFT-E (ATE, MED), and BFT-W).

The overall results show that, the T1NC revision was mostly related to better defining and completing gear based fisheries series, and resulted in only slight changes to the total catches by stock (although it had a larger impact in the eastern stock than in the western stock). The high ratios of “unclassified” gears (codes: UNCL. SURF, SPOR, SPHL) identified in the early period (1950 to 1989) of the bluefin tuna catch series (reaching about 35% of the total catches in some years, particularly in the Mediterranean), were significantly reduced (comparisons in **Table 3**). The T1NC adopted now does not exceed 8% of unclassified gears in any year for the two stocks after 1950.

The Group reviewed in detail the historical catches (1950 to 1965) from Germany, Denmark, and Sweden that were originally included in T1NC without gear allocation. The Secretariat informed that various documents (SCRS/1973/060, SCRS/1974/052, SCRS/1974/048) indicated that these German, Danish and Swedish catches corresponded to handline (possibly having two major fleet components: commercial and recreational/sport). Therefore, the Group agreed to assign these three catch series (1952-1969) to “handline”. The Group recommended that this decision will stand unless the National Scientists provide different information on the gear for these catches.

The Group reviewed the proposal presented by the Secretariat and Moroccan scientists of splitting the UNCL bluefin tuna catches by Morocco (1950-1957) into TRAP and PS components, using the GBYP recovered TRAP data. However, new information made available to the Group during the meeting (Lozano, 1958) seemed to indicate that the Moroccan PS fishery did not start until the late 50s. Hence, the Group decided adopt the split using the new TRAP series from Lozano (1958) and keep the remaining catches as UNCL (smaller quantities possibly linked to artisanal fisheries) until new information is made available.

The T1NC revision, despite being considered by the Group a successful improvement, is not complete yet. It is known that, several catch series are still incomplete across the entire time series (1950-2015) in both stocks. Thus, these revisions will continue in the future as new information is made available. The Group also acknowledged the GBYP contribution to the improvements of the T1NC, and recommended that the bluefin tuna historical data recovery efforts continue into the future.

The Group also discussed if there was a need to continue conducting the assessments for the eastern stock using both the reported and the ‘inflated’ T1NC. It was agreed that the so called ‘inflated’ catches represent the SCRS ‘best estimate’ for the period 2000-2007 and, therefore, only this catch series should be used in the base case. If during the assessment the Group decides to make alternative runs using the reported catches, these should be only part of sensitivity runs.

Various documents dealing with fisheries statistics and biological data were presented to the Group.

Document SCRS/2017/013 presented a study based on bluefin detailed market data (daily Japanese auction sales recovered under the GBYP). It aimed at obtaining independent estimates of total catches (live weight) by year between 2001 and 2013 and compare the results with the official Task I statistics. The results produced catches lower than the official Task I statistics before 2008, but very close to Task I afterwards. The Group acknowledged this work and the importance of using independent estimates to validate the official statistics. In addition, because this dataset has a large portion of individual fish size (whole tuna fresh/frozen) information, the Group considered the possibility/feasibility of using the data prior to 2008 to obtain size information to complement the poor size structure of the catches of the purse seine fishery in the Mediterranean. However, it was informed to the Group that many of the records in the marketing data have no information about gear which limits their utility as well as some issues related to the conversion factors used that need to be resolved. At the same time, it was also recognized that the proposed work requires a significant amount of time and it may not be possible to have it ready for inclusion in the stock assessment.

Document SCRS/2017/039 describes the data recovered by GBYP for the Bulgarian bluefin tuna fishery in the Black Sea for the period 1950-1971. The Group acknowledged the importance of the recovered data even though no size information from those catches is available. The gear used by this fishery was described as small scale purse seiners fishing for small pelagic fisheries. The catch series was adopted by the Group for inclusion in the T1NC.

Document SCRS/2017/031 describes the bluefin tuna catches recovered from records of the traps operating in the Kingdom of Aragon during the XVI and XVII centuries. The Group inquired if there were records of total catch in weight from these traps given that the data presented only provided the number of barrels produced by the different traps. It was discussed that the data recovered has some information on the size of the bluefin tuna caught and, therefore, catches have been already transformed into weight for their future inclusion into the TINC DB after revision by the SC-STAT.

### *3.2 Task II (catch-effort and size samples) data*

In relation to the Task II catch and effort data (T1CE), improvements were made for Canada and U.S.A for the last two years and a full revision of the Japanese LL was completed and adopted in 2016. In consequence, with the exception of some T2CE series obtained by the GBYP (Norway PS, various TRAP and longline fisheries in the Eastern stock with effort and better time-space resolution), no major improvements are expected in the CATDIS (Task I equivalent catches by trimester and 5 by 5 geographical squares) estimations for the assessment.

In terms of bluefin tuna Task II size data (T2SZ: actual size; T2CS: catch-at-size reported), there is a large list of dataset revisions/recoveries (details in **Table 4**) that will significantly contribute to better estimations of the overall catch-at-size (CAS) and catch-at-age (CAA) matrices. The major changes included the Japanese complete revision (T2SZ and T2CS), the Canadian update (T2SZ, T2CS, all gears between 1999 and 2007, and some additional size information for 1974-1985 that was provided during the meeting), the Algerian longline recovery (T2SZ, between 2000 and 2009), and the Italian TRAP fishery of Sardinia (1993-2010). In addition to this, the Group also has available all the GBYP new size information recovered (already incorporated into ICCAT-DB), and the bluefin tuna stereoscopic-camera measurements obtained during the cage transfer operations (2014 and 2015, PS Mediterranean fisheries).

The Group noted that the T2SZ submitted to ICCAT over the years, included some very large fish over 350 cm in size, as shown in **Table 5** excluding the largest numbers, linked to very old PS series (not on **Table 5** but already stored as historical, as proper replacements exists) for Norway and Germany in the 1950s, by considering only the size samples that were submitted as FL, CFL, or WGT-FL (weight converted into FL by the Secretariat), only a small amount (161 individuals, less than 0.01% of the total T2SZ) is left to be reviewed on a case by case basis by the Secretariat and the National Scientists. The Group agreed that the proportion of these large fish to the total catch was so small that they would not have an impact on the assessment. The Group considered that, the weight frequencies reported and converted (by the Secretariat in the past) into FL using the old L-W relationships, should be recalculated (Secretariat) using the newly adopted L-W equations.

The Secretariat indicated that in the ICCAT database, some of the submitted T2SZ datasets have a poor time resolution (year or quarter) and are not stratified by month. This creates problems for the assignment of ages. The Secretariat indicated that, yearly based size samples should split and/or assigned to 1 or 2 trimesters so they can be properly aged. The exception is the yearly based TRAP T2SZ datasets of Spain, Portugal, and Morocco in the 50s. These fisheries are known to have the majority of the catches in the second trimester (April to June). If no better time resolution is obtained, all the samples can be directly allocated to the second semester. In addition, some size samples were submitted in 10 cm bins. After considering different options of how to treat these data, the Group decided not to use them in the estimation of the CAS.

The Group decided that those CAS series submitted by the CPCs that have a relatively large discrepancy (e.g. more than 3% in weight) with the T1NC will be adjusted using the newly adopted L-W relationships.

Document SCRS/2017/023 described an updated CAA for the Spain and France baitboat fisheries in the Bay of Biscay based on the updated CAS of this fishery as presented in document SCRS/2016/179. The Group noted that the proportion of each age in the catch in the newly proposed CAA was constant for the period 1950-1965. That was because the average proportion of each age in the catch for the period 1976-1985 was applied to the catch of the earlier period. The Group discussed the appropriateness of this approach and recommended to exclude these average proportions as they may lead to a false perception of historical fishery trends.

Document SCRS/2017/024 estimated the size at the time of catch and the potential growth of farmed eastern bluefin tuna using 2014-2016 data collected at the time of harvest. The back calculated size at the time of catch was compared with size data collected by the stereoscopic cameras. The Group noted that in some cases, the back calculated size frequency matched the size frequency obtained from the cameras; while in other cases it did not. It was explained to the Group that when the available size samples are limited, then a mismatch between the back calculated size frequency and the camera data is expected. In addition, it is recognized that intrinsic growth rates of farmed fish has not yet been quantified, especially for fish kept in farms for longer periods of time (e.g. 2+ years). Finally, the Group acknowledged the shortcoming of not completely knowing, in both data types, the fishing CPC and the fishing area of the fish that are harvested in (or transferred to) a particular farm. As such, this information cannot always be associated to the specific fleet. The Group discussed that incorporating data from the BCDs and VMS could help to provide some of the missing information. However, this task is very labor intensive and cannot be completed for the 2017 assessment.

Document SCRS/2017/029 provides newly recovered size information for bluefin tuna catches by 2 Spanish purse seiners that operated in the Mediterranean Sea during 1985-2000. The Group noted that the size information provided consisted of the average weight and number of fish caught in each set/fishing operation and the original size frequency of these catches was not available. The Group discussed that in the Gulf of Lion (some of the area fished by these 2 purse seiners), the size of the fish caught by the French purse seine fleet varies by season; while the data from the Spanish purse seiners showed this trend towards the end of the time series. The Group further discussed that management regulations for this fishery were not adopted until 2004 (Rec. 04-07) and that, therefore, other aspects of the fishery, like the use of freezer vessels and sonars, and the development of farming in the Mediterranean Sea, had a much larger impact.

Document SCRS/2017/046 presented data on catch, size, and sex ratio of bluefin tuna caught by Algerian traps for the period 2000-2009.

The Group discussed if the newly reported size samples data for the Spanish PS fleet (SCRS/2017/029) resulted in a significant improvement of the already available PS size samples for the Mediterranean. The Group noted that the new data provided correspond to the mean weight and number of fish caught in each set/fishing operation. Therefore, like the already available size samples from the French PS fleet, the data corresponded to a distribution of average weights and not to a size frequency distribution of the catch. The Group decided to use the frequency of means for the estimation of size frequency representative of the PS catch and to combine the data of both fleets (document in preparation). For the period 2008-2015 the Group decided to use the size data from the stereoscopic cameras and the back calculations of size, prior to 2008 the frequency of means will be used. However, it was noted that market data (see discussion of SCRS/2017/013) could provide some information that would allow obtaining or confirming the original size frequency of the catch.

### *3.3 Update of CAS - Validate and integrate the catch at size statistics with new information from farms, harvesting and stereoscopic cameras, and other sources of information*

All the size information available (new, revised, corrected) obtained by various sources (CPCs, GBYP, back-calculation of farmed tuna, stereoscopic cameras, etc.) should be used to estimate CAS/CAA overall matrices.

As guidance to decide when models that required a full CAA (e.g. VPA) should start in the assessment of each stock, the Group took into consideration the available size information (both T2SZ and T2CS), and weight equivalent coverage ratio of the total catches (T1NC) for both stocks (**Figure 11**).

- For the Eastern Atlantic and Mediterranean stock, the Group discussed that a relatively high proportion of the catches for the period 1950-1960 had size samples in the Eastern Atlantic (outside the Mediterranean), but most of them were from the Norwegian PS fishery and no size samples were available from the German and Danish catches for the same period. In the case of the Mediterranean fisheries, size samples for 1950-1960 only covered a very small proportion of the total catches and all of them were only from TRAP fisheries. Size samples in the Mediterranean did not increase until covering 60% of the Task I landings until 1968; the same year where the first size samples from the PS fisheries were obtained. Therefore, to avoid having to use large proportion of substitutions (90-70%) using size samples from just one gear type, the Group recommended that the VPA for the Eastern stock should start not earlier than 1968.

- For the Western stock, size samples available in the ICCAT-DB are very limited prior to 1970. For the period 1970-1973, the available size samples are only from the TRAP gear and, for example, in 1970 only covered 10% of the Task I catch. Given the available size samples, the Group recommended that the VPA for the Western stock should not start before 1974.

Despite these range limits in the models that required a full CAA (e.g. VPA) (and thus, in the CAS/CAA estimations), the Group recommended the Secretariat to obtain CAS estimations further back in time as possible taking into account the poor availability of sufficient size data. Outside of those range limits, the CAS/CAA estimations should "only" be used with care and only for specific purposes (e.g. mean weights trends by gear) due to its poor degree of size completeness. The Group emphasized that limiting the year when the VPAs should start does not preclude other statistical models that do not require a CAA to start before 1974 and 1968 for the western and eastern stocks, respectively.

The Group agree that the CAS for the upcoming assessment must be estimated incorporating all the newly available size samples and using the same methodology (same substitution criteria, and raising to Task I) used in the 2014 assessment. CAS will be raised to the 'best estimate' of total removals using the same approach and assumptions used in the 2014 assessment that raised catches in an equal proportion for all gears because underreporting was deemed to occur not only by PS, but by other gear types as well (WWF, 2006).

Like all the other input data to be used in the assessment, the final version of the both CAS/CAA should be completed and made available by April 30, 2017.

### *3.4 Other information*

The Secretariat informed the Group that the CATDIS will be updated (1950-2015) after the estimates of the CAS are finalized to take into account all the revisions made to T1NC and the use of GBYP T2CE information.

## 4. Review of fisheries indicators

### *4.1 Review Task I statistics to be used for the 2016 update projections*

This section presents the overview of studies of indices presented to the Group. The BFT-E indices are presented in **Table 6** (**Figure 12**) and BFT-W indices are presented in **Table 7** (**Figure 13**). Section 4.3 details the discussions related to the selection of indices.

*Updated indices*

For eastern Atlantic bluefin tuna, three updated series were presented to the Group. SCRS/2017/030 presented a preliminary CPUE standardization of the bluefin tuna catches from the trap fishery off southern Portugal between 1998 and 2016**.** The series displayed an increase from 2009 by an order of magnitude of 20. The Group underlined that such an increase was a common feature found in other series as well. It was noted that after 2007, the introduction of fish releases may be linked to changes in size structure.

SCRS/2017/038 presented the standardized CPUE for Moroccan traps over 1986-2016 to the Group, which displayed an increase from 2011 onwards. The Group noted that the series was affected by the number of fish released, which are also self-reported by each trap since 2009. It was noted that the fishing season is concentrated in May for the recent years. The Group suggested accounting for a month effect in the standardization for a revised version of the index, due to the reduction in the length of the fishing season after 2012.

SCRS/2017/025 presented the updated CPUE series of the Japanese longline fishery in the West and Northeast Atlantic extending to the 2017 fishing year. The index in the Northeast Atlantic in particular has remained at a high level since 2010. Some modeling aspects were discussed to capture the recent spatial contraction of the fisheries. The Group noted that the fishery seemed to display a change in effectiveness as starting in 2010 a very high proportion of positive catch was achieved every year in the Northeast Atlantic. The Group questioned whether this related to the selection of better skippers. The response was that it was possibly partially related to that; however, the number of vessels gradually decreased before this change in effectiveness, which means the good skippers had already been selected. Given the fact that notable changes did not happen around 2010, the high positive catch might rather be attributed to higher occurrence and density.

For western Atlantic bluefin tuna, SCRS/2017/020 presented the standardized CPUE indices for the Canadian fisheries (1984-2016), including new modeling work and displayed an increase since the 2000s. The Group discussed aspects of the modeling work related to effort and noted a drift in the size-structure towards younger ages.

SCRS/2017/032 presented to the Group a standardization of the annual indices of WBFT spawning biomass based on larval surveys in the GOM (1977-2016). Aspects of the standardization were discussed in relationship to the introduction of a more efficient gear.

*New indices*

For eastern Atlantic bluefin tuna, four new indices of potential use for the stock assessment were presented. SCRS/2017/033 presented an update of the western Mediterranean larval index which displayed an increase since the 2000s. The Group discussed potential spatial changes in spawning areas over the years accounted for by the approach that used a spawning habitat model to weight the different areas. SCRS/2017/034 presented the index for potential larval survival over 1990-2016, which displayed a high inter-annual variability. It was noted that the survival covered early life stages and that other sources of mortality should be factored in to reflect recruitment. SCRS/2017/040 presented the index of abundance from the French aerial surveys including new methodological aspects. Variations in total effort between the peer-reviewed publication and the papers presented since 2010 were noted, as well as the fact that this index reflected the number of detected school numbers rather than direct abundance. The approach for the automatic detection of eastern Atlantic bluefin tuna schools from commercial sonars in the Bay of Biscay was considered to have a strong potential to monitor abundance (SCRS/P/2017/002, Uranga *et al*., 2017).

For western Atlantic bluefin tuna, two potential new indices were presented to the Group. SCRS/2017/016 presented the fishery independent index of abundance for Atlantic bluefin tuna in the Gulf of St. Lawrence from herring acoustic surveys, which displayed an increase over the studied period. The Group noted the usefulness of this index and that it could be used for a better understanding of the CPUE from the same area. SCRS/2017/032 presented to the Group a standardization of the annual indices of WBFT spawning biomass based on ichthyoplankton surveys in the GOM (1977-2016). Aspects of the standardization were discussed in relationship to the introduction of a more efficient gear. SCRS/2017/035 presented the work done during the Working Group for a multi-national pelagic longline index for WBFT, which did not present an index to be considered for the 2017 assessment. The Group discussed some methodological aspects that could be further included in this work.

### *4.2 Update the index criteria table developed during the 2016 data preparatory intersessional workshop*

The Group reviewed and updated the index criteria tables (BFT-E in **Table 8**, BFT-W in **Table 9**) from the 2016 data preparatory meeting.

### *4.3 Determine indices to be used in the next assessment for the base-case and sensitivity runs*

*Eastern stock*

For the eastern stock, the Group decided to use 5 CPUE and 2 survey series. The Group decided to continue to use the baitboat index from the Bay of Biscay over the 1952-2014 period, with a split in 2006. Although this index was split into 3 (1952-1962, 1963-2006, 2007 afterwards) in the 2014 assessment, the two early periods were combined based on the revised CAA (see CAA section). The historical part of the series (1952-2006) corresponds to ages 2-3, whereas the most recent part (2007-2014) represents ages 5-6. The series could not be updated until the most recent year for the 2017 assessment, 2015, essentially because the quota was transferred from this fleet to other fleets operating in the Mediterranean.

The combined Moroccan/Spanish traps fishery changed in 2009, when the self-reporting of fish released from the trap was introduced, and then in 2012 as the fishing season became limited. The Group agreed to truncate the Spanish and Moroccan combined index which was used in the 2014 assessment and use the period between 1981 and 2011. The Group also agreed to try to combine the Moroccan and the Portuguese trap indices from 2012 onwards. If such an attempt (by April 15) does not yield a convincing index, the Group agreed that only the standardized Moroccan trap series will be used. It was also noted that the standardization of the Moroccan trap index has been improved by including a month effect fitted to the series (1998-2016), but the Group remains concerned with the uncertainty of the index in the most recent years.

The Group decided to consider the use of the historical Norwegian purse seine nominal index for the Northeast Atlantic area estimated from Task II catch and effort data in 1955-1980 only in spatially disaggregated models. The Group noted that this fishery was relatively similar throughout the period with a contraction of the fishing area throughout, with some development, compared to the current purse seine fishery in the Mediterranean.

For the Japanese longline indices, the Group decided to keep the Japanese longline index in the Mediterranean and below 40° N in the Northeast Atlantic in 1975-2009 for the ages 6-10. For the Northeast Atlantic north of 40° N, after reviewing additional calculations incorporating random-effect year*area and year*month terms with area*month as fixed factors, the Group decided to use the Northeast Atlantic data for 40°-60° N without area 33 (40°-50° N and 10°-30° W) because of a systematic trend in the year*area values. The Group also decided to split the series after the 2010 fishing year (see below: western stock index).

In addition to the fisheries dependent indices above, the Group agreed to use the French aerial survey for juvenile fish (ages 2-4) in the Northwest Mediterranean and the larval survey in the Western Mediterranean, two new fisheries-independent indices. The French aerial survey covers the periods 2000-2003 and 2009-2015 (except for 2013). The Group discussed several aspects related to the inclusion of factors affecting the detectability of tuna schools from the plane, and related to the fact that the index was for tuna schools and not tunas. The Group noted that the DISTANCE software for line transects is capable of accounting for school size in both the detection function and the estimates of density. The author was requested to review the approach to ensure that this was being done. The larval survey covers the periods 2001-2005 and 2012-2015 and displayed good correlations with the spawning stock biomass from past assessments. It will be used to index the spawning stock biomass.

The Group also reviewed other potential abundance indices listed in the 2016 data preparatory meeting that will not be used for the assessment. One of these was the potential larval survival index in the entire Mediterranean. As this index does not directly represent the stock abundance, the Group decided not to use it directly as an abundance index but to consider it as an explanatory variable for the stock-recruitment relationship. The Group encouraged the authors to pursue their efforts with this study.

The index provided by the GBYP aerial survey on spawning aggregations only covered four years (2010, 2011, 2013 and 2015), notwithstanding the four main spawning areas in the Mediterranean Sea (Balearic Sea, southern Tyrrhenian Sea, central-southern Mediterranean and Levantine Sea) were surveyed. In 2011, the Levantine Sea was not surveyed and absolute abundance was not available for two areas in 2010. The survey design was constant and the abundance indices (densities of schools, mean weight, total weight and total abundance in number) were standardized, taking into account the effect of environmental variables. This index provides only a short time series at this stage; it merits revisiting for the next assessment.

The Group agreed that the CPUE series of the two purse seine fisheries in the Mediterranean (Spain and Tunisia) were informative as fisheries indicators. The Group continued to express concern regarding the definition of the unit of effort and the difficulty to take into account in the standardization process the changes in management measures (e.g. shortening of fishing season, reduction of quotas, adoption of individual vessels quotas, etc.) that were adopted for this fishery. The Group decided not to use these indices for the stock assessment, but to use them as fisheries indicators and to compare their trends with other trends from other fishery indicators. The Group encouraged that these indices continue to be updated on a regular basis while the SCRS explores ways to improve the methodology to estimate indices of abundance for purse seine fisheries. It was noted that developing indices of abundance from purse seiners has been generally problematic due to their typically hyperstable behaviour, and that the ISSF was developing work on that topic (ISSF 2012).

The index for the Sardinian trap in 1993-2011 was reviewed by the Group. Concern was expressed that this fishery may represent only a small fraction of fish/stock in a small area. It was also noted that no data were available for the recent years. The Group further noted that the Japanese longline fisheries in the Atlantic and Mediterranean covered a wider area and a longer period for a similar range of ages. The Group noted that this index could be used in a model with a higher spatial resolution. For future assessments, the Group suggested exploring a combined analysis with the Spanish, Moroccan and Portuguese trap series to investigate if the Sardinian index reflects similar trends than the other indices.

*Western stock*

For the western stock, the Group decided to use 9 CPUE series and 3 surveys. The U.S. longline pelagic index in the Gulf of Mexico that covers ages 9-16+ was kept by the Group. The Group kept the three U.S. rod and reel indices (1993-2015) for the three different size ranges, which track the strong cohorts and will be used for the ages 2-3, 4-5, 8-16. The two rod and reel indices 66-145 cm and >195 cm from the eastern coast were also selected by the Group as well as the Japanese longline fishery index from the Gulf of Mexico, as it is the only series that covers the historical part (1974-1981) of period to be covered by the assessment. The combined SWNS and GSL Canadian rod and reel index (1984-2016) was selected by the Group to be used in the next assessment, but the catch in 2010 related to the GSL was excluded owing to the very short season. The Group considered splitting the combined Canadian RR index due to the implementation of an ITQ like system in the PEI GSL fishery at beginning of 2011. Prior to the change the fleet was limited to a single fish per trip and the timing and number of harvest windows was dictated by the fishing association. After the change the fleet was limited to a single fish per season to be harvested according to the fisherman's discretion. The effect of the change was to distribute the effort over a larger fraction of the season. However, this regulation did not apply to the larger quota per licences (SWNS) so that the Group agreed that splitting the combined SWNS/GSL series in 2011 for the sake of the smaller GSL fishery and quota per licence was unnecessary.

The Group agreed to continue to use the total mortality index estimated from time-at-large in tagging deployments from the 1970s and 1980s in the stock assessment. This index could be used as a relative mortality rate index to constrain the total mortality or the fishing mortality. In addition, the Group decided to include the newly developed Canadian fishery independent index of abundance for the period 1994-2015 obtained from a herring acoustic survey in the Gulf of St. Lawrence (GSL). The Group agreed that this index, for ages 8-16, was an improvement over the fishery-dependent rod and reel index available for this area, which will be used for the continuity run and in a combined CAN RR index with the SWNS. The Group further agreed to maintain the larval survey index in the Gulf of Mexico over 1977-1978 and 1981-2015 without 1985, to index the spawning stock biomass.

The Japanese longline index will be used, and covers 1976-2017 for ages 2-16. Based on the additional analyses for the northeast Atlantic Japanese longline index, similar analyses were made. The additional analyses were conducted by incorporating random-effect year*area and year*month terms with area*month as fixed factor. It was noted there was a systematic trend in year*area term, thus the model only using the current fishing area (off Canada, north of 50° N and east of 55° W) with same model specification was further explored as those areas accounted for virtually all recent fishing. The series obtained from the additional standardizations reduced the extent of the increase in relative abundance in the 2010s fishing years. The Group asked if any attempt has been made to model areas based on coordinates and not with area blocks. Such work has been attempted, but it did not yield any convincing results. However, no attempt had been made to use Generalized Additive Models with a smoother on longitude-latitude. The Group recognized the effort that has been made, and the fact that opposite trends could be detected in the southern and northern areas suggested that the spatio-temporal dynamics were at least partly accounted for by the model. However it was also noted that a missing covariate could explain the trend. The Group noted that reducing the area considered in the model might favour hyperstability as we concentrate the analysis to the area the most favourable. It was recommended to try including in the analysis other covariates to reflect the changes in dynamics besides the spatial component such as the Vessel ID, as this would be an alternative approach that would avoid this caveat. It was noted that the incorporation of Vessel ID might take time, and this is not possible to provide for the 2017 stock assessment. The Group encouraged the analysis for the future study. The Group also noted that one of the concerns remaining is the high proportion of successful sets, which could drive the trend of the newly standardized series. It was clarified that that problem has occurred only in the Northeast Atlantic, except for the 2017 fishing year in the West Atlantic.

The Group agreed, for the 2017 stock assessment, to use the model only using the current fishing area (off Canada, north of 50 N and east of 55 W) with random-effect year*area and year*month terms, and area*month as fixed factor. The Group then discussed the issue of splitting the series after 2010 fishing year for both eastern and western indices given management regulations (individual vessel quota), changes in size composition in the NE Atlantic.

Besides the above indices, the Group also reviewed other series that were not selected for the stock assessment. As the Gulf of Mexico Oceanographic index does not directly represent the stock abundance, it will not be used directly as an abundance index; but it could be considered as an explanatory variable in the stock-recruitment relationship. As in the case of the potential larval survival index in the Mediterranean, the Group encouraged the authors to pursue their effort with this study and consider performing the analyses for the western stock in the Gulf of Mexico in order to possibly provide an index of recruitment for both areas. The Group did not recommend including the joint USA/CAN indices for the 2017 assessment; this must await further evaluation to determine the extent of year*fleet interactions. The Group did not select the Canadian GSL rod and reel index because of the decision to use the combined GSL and SWNS series.

### *4.4 Discuss relative weights to be assigned to selected indices*

The Group discussed this issue briefly under item 5.2.

## 5. Review progress on new modelling frameworks

### *5.1 Review current models and proposed enhancements*

The Group discussed this issue under item 5.2.

### *5.2 Discuss new models under consideration for 2017 assessment and projections*

The Group expects that the VPA assessment method used in previous assessments is likely to remain the basis for advice in the 2017 assessment unless one or more of the new modelling approaches used in July 2017 are demonstrably superior. The catch at age and stock size indices will be recalculated for use in all assessment methods considered in 2017, including an updated VPA assessment. The effect of the new catch at age and stock size indices on the VPA assessment will be assessed by comparing the retrospective run from the updated VPA assessment corresponding to the 2014 assessment. As of this March 2017 Data Preparatory meeting, it is expected that at least four other assessment approaches are planned to be used:

- i) Stock Synthesis 3 (SS3 http://nft.nefsc.noaa.gov/SS3.html ),
- ii) Statistical Catch at Length (SCAL SCRS/2016/152)
- iii) Stock Assessment Model (SAM https://www.stockassessment.org ),
- iv) Age Structure Assessment Program (ASAP http://nft.nefsc.noaa.gov/ASAP.html )

The Group agreed that initial model runs, with input and output files, must be made accessible on the meeting server owncloud (https://meetings.iccat.int/BFT_dataPreparatory) by July 7, 2017 prior to the assessment workshop and that initial as well as subsequent agreed model runs should be posted to server.

Progress is expected on mixing models, but it cannot be guaranteed that they will serve as the primary basis for management advice. The 2008 assessment made a good initial start and data collected since then may make it possible to arrive at a more consistent and reliable model.

*Characteristics of the assessment approaches*

The Group reviewed SCRS/2017/036 to select characteristics of the assessment approaches should have, initial fleet structure to be tested, and sensitivity runs to be made.

Several characteristics considered essential for base case candidates are desirable/optional for other assessment approaches.

| *Essential* | *Optional* |
|---|---|
| Report steps taken to ensure convergence to global best solution, e.g. jitter starting values - test that different starting values achieve same minimum negative log-likelihood. | Sensitivity to starting conditions (e.g. if assumed to be virgin at some time, initial fishing mortality rates). |
| Likelihood profiling of key estimated parameters (h, sigmaR, R0, Fratio for VPA), (e.g. Kell *et al*., 2014, Lee *et al*., 2014, Wang *et al*., 2014). In some cases the Hessian standard errors may be a sufficient diagnostic but it does not diagnose data conflicts and model mis-specification (Lee *et al*., 2014). | Cross-validation/ retrospective forecasting (Kell *et al*., 2016). This can be done by performing a retrospective and then projecting for the known catches and comparing the projections with the assessment using data for all years. |
| Report parameters with standard errors for base case. | |
| Report steps taken to examine possible bias (e.g. Bootstrapping/MCMC). | |
| Retrospective analyses. | |
| Plot fits to indices, and residuals. | |
| Annual/seasonal/overall fits to composition data. Bubble plots of Pearson residuals should be sufficient. For VPA show the implied selectivity over time. | |
| Models should be able to propagate uncertainties in projections to a Kobe matrix. | |
| Report reference points and basis of calculation. | |

*Fleet structure*

The 14 fleets below for the East and West were initially identified for use in the MSE. They should be used by analysts when beginning their analyses and adjusted as needed as the analyses proceed. The Secretariat will provide the data necessary to set up these fleets by quarter for the assessment.

1) Japanese longline
2) Other longlines
3) Baitboat before 2009
4) Baitboats from 2009 onwards
5) Purse Seine (PS) Mediterranean from 2009 onwards
6) PS Mediterranean Large fish before 2009 (Season 2),
7) PS Mediterranean Small fish before 2009 (Seasons 1,3,4)
8) PS Western before 1987
9) PS Western from 1987 onwards
10) Traps before 2009
11) Traps from 2009 onwards
12) Rod and reel Canada
13) Rod and Reel US (only use comp data from 1988 on due to missing data from some fleets prior to this year)
14) All other fleets

Several fleets are split at 2009 due to the impacts of Recommendation 08-05 that affected fleet operations.

As indicated above, depending upon the model type, how it incorporates indices, and more complete examination of model diagnostics, fleet structure may require some adjustment from this initial proposal.

*Sensitivity evaluations*

The Group agreed that the following sensitivity analyses must be included in the documents submitted in advance of the July 2017 assessment meeting.

- Examine sensitivity to the assumed the natural mortality rate. Possible alternatives (e.g. +/- 0.05 for ages 4+, scaled following Lorenzen) were proposed but further analysis were requested to be completed for its final adoption (see the work plan in section 7).
- Test the influence of each index by e.g. removing them from the assessment one at a time "jackknife" removal.
- The Group considers that what was called the "Inflated catch" for the East Atlantic and Mediterranean is in fact the SCRS best estimates. These should be used in the assessment for Eastern Atlantic and Mediterranean and for mixing. Reported catch can be done as a sensitivity case. A further sensitivity increasing the SCRS best estimates of the undeclared catches by an arbitrary 25% is considered optional.
- Explore relative weighting of composition and indices for integrated statistical models (e.g. Francis, 2011).
- For mixing models, evaluate the effects of using different sources (conventional tags, electronic, composition) to quantify mixing.
- For the VPA approaches, evaluate the effects of different age composition construction (for VPA) using various forms of age-slicing or ALKs.
- Optionally, test for time varying selectivity/catchability.

*Projections*

The Group agreed that projections should be included in the assessment documents submitted one week prior to the July 2017 assessment meeting. Analysts should assume for initial runs that catches in 2016 and 2017 equalled the TAC. Deterministic projections should be calculated through at least 2035 to extend beyond transient effects. Projections could be made at constant current TACs and/or at status quo F (average of the most recent 3 years by age). Projections should use recent selectivity (GM of last 3 years), mean recruitment of years -6 to -15 from the most recent year. Although only deterministic projections are required prior to the workshop, assessment approaches should be capable of propagating the uncertainties through the projection years to generate Kobe matrices.

***5.3 Review status of the ICCAT Software Catalogue***

Under the 2015-2020 Science Strategic Plan it was agreed to consolidate the Stock Assessment Software Catalogue and to ensure the best use of stock assessment models that should be fully documented.

To do this, three strategies were agreed in the Strategic Plan:

1.3.1 Update the current stock assessment software catalogue, by removing outdated software and updating the software versions that are currently being used.
1.3.2 Ensure that all software used in the most recent assessments are matched up with the versions in the catalogue.
1.3.3 Ensure that software is well documented and have an accompanying user's manual and code.

The new software catalogue is hosted on a github repository https://github.com/ICCAT/software/wiki/New-Catalogue. As an example of using a version control system for software development a git repository has also been created for the VPA2Box software https://github.com/ICCAT/software/wiki/3.1-VPA2Box. This will allow developers to work on the code and also ensuring that all changes are tracked and can be rolled back if required.

The assessment software used to provide advice for bluefin tuna in 2017 should be catalogued by the end of April 2017.

***5.4 Review Progress on MSE and any outstanding issues***

The Core Modelling Group members present met in the margins of the meeting to hear progress and develop further plans for the bluefin MSE work. The meeting heard a brief presentation of the outcomes from their deliberations.

## 6. Evaluate evidence for the existence of the extraordinary 2004-2007 recruitment years estimated for the eastern Atlantic and Mediterranean population

The 2014 E-BFT stock assessment estimated that recruitments for 2004-2007 were even higher than the 2003 recruitment. Since then, the Group has discussed if these estimates of large recruitments were the result of the limited available CPUE series on juvenile fish and/or the parameterization of the F-ratio of 10 to 9 year old fish in the terminal years of the VPA. Because of these concerns, the Group has been searching for empirical evidence to confirm if the estimated 2004-2007 are the result of the limited available data and model specifications, or if in fact high recruitment occurred. Document SCRS/2017/025 (See Section 4.1 of this report) presented the CAA of the Japanese longline fishery in the NE Atlantic estimated from CAS by cohort slicing. These data indicated that catches from this fishery after 2010 consisted mostly of the 2003 year class with contributions from the 2004-2007 year classes in the most recent years. The Group concluded that the results of this CPUE series indicated that recruitments during 2004-2007 were not as high as the 2003 recruitment. This issue will be reviewed based on the results of the new 2017 assessment.

## 7. Recommendations

***Recommended 2017 bluefin tuna stock assessment Workplan***

Deadlines for data and input submissions presented in this work plan have been designed by the Working Group to provide the Working Group with the most up to date data to be considered during the July 2017 assessment. The deadlines consider the time needed to prepare the data in the format required by the SCRS to conduct the preliminary analysis to process the data so that they can become inputs to the stock assessment models. These deadlines may represent earlier dates than the data compliance deadlines established by ICCAT. All necessary input data, model runs, and executable code will be provided in folders on the meeting server owncloud (https://meetings.iccat.int/BFT dataPreparatory) site for the Group by the deadlines identified below.

| Deadline | Task |
|---|---|
| March 17, 2017 | Corrections to Task 1 and 2 through 2015. *Action: National Scientists* |
| April 15, 2017 | Combined Morocco/Portugal trap index circulated to SCRS BFT WG for review. *Action: National Scientists* |
| | Update French aerial survey index. *Action: National Scientists* |
| | East Atlantic and Mediterranean BFT Richards Growth curve incorporating additional age-length data, including fish of Eastern origin caught in the west and tagging data (if available), circulated to BFT WG for review. *Action: National Scientists* |
| | Examine the relative plausibility of candidate natural mortality rate vectors for bluefin tuna, including the current SBT vector and Lorenzen natural mortality rate vector rescaled by the natural mortality rate estimates based on maximum age (Then *et al*., 2015, Hoenig, 1983). *Action: National Scientists* |
| | Updated spawning fraction oogive, applying method of Diaz *et al*., 2011 to observed age composition of longline catches in the Gulf of Mexico, circulated to BFT WG. *Action: National Scientists* |
| | Aging code and additional age data provided to Secretariat for use in converting CAS. *Action: National Scientists and Secretariat* |
| April 30, 2017 | Final Task I, Task II CAS and CAA available to SCRS BFT WG through 2015. *Action: Secretariat* |
| | Final decisions on updated natural mortality rate vectors. If no agreement is reached, the Group will adopt the southern bluefin tuna vector used by past assessments. |
| | Final decisions on Morocco/Portugal trap index. *Action: SCRS BFT WG, National Scientists* |
| | Final decisions on updated East Atlantic and Mediterranean Growth curve. *Action: SCRS BFT WG, National Scientists* |
| | Final decisions on updated Gulf of Mexico spawning fraction oogive. *Action: SCRS BFT WG, National Scientists* |
| | All Stock assessment and ALK software intended as the basis for management advice should be included in the ICCAT Software Catalog (including at a minimum the computer code, executable, and annotated input/output files to facilitate implementation by ICCAT SCRS scientists). *Action: National Scientists, Secretariat* |
| June 20, 2017 | CPCs requested to submit 2016 Task I and Task II data. *Action: CPCs* |

| | |
|---|---|
| June 30, 2017 | Final 2016 Task I statistics available to the SCRS BFT WG. *Action: Secretariat* |
| July 7, 2017 | Preliminary results, input files and executable code from stock assessment models (applied to catch statistics and indices of abundance updated through 2015) made available to the SCRS BFT WG. This should include tables that establish naming conventions that identify the unique specifications associated with each run. *Action: National Scientists* |
| | – VPA through 2015 using new CAA and new indices of abundance |
| | – VPA through 2013 using new CAA and new indices of abundance compared to 2014 base assessment (examining effect of new data) |
| | – VPA with two intermixing stocks |
| | – Other candidate base models with diagnostics and deterministic projections as discussed in section 5 |
| | – Sensitivity runs of VPA and other base candidates |
| July 14, 2017 | SCRS Documents describing above |
| July 20-28, 2017 | BFT Stock Assessment Meeting |
| | Agree on and run candidate base models and, if multiple models are chosen, relative weight assigned to each model |
| | – Agree on and run sensitivity runs |
| | – Agree on choice of reference points and specifications for projections |
| | – Develop Kobe Matrices |
| | – Write and adopt detailed report of the meeting |
| | – Write and adopt initial draft of Executive Summary |
| | – Ensure all base model inputs, outputs and executables are placed in the appropriate owncloud folders |
| Sept 25-29, 2017 | BFT Species Group Meeting |
| | – Review fishery indicators through 2016 |
| | – Responses to Commission |
| | – Report on MSE progress |
| | – Write and adopt final draft of Executive Summary |

***Other recommendations***

A group of experts is required to address the discrepancies in assignment using genetics, radioisotopes and integrated analyses to evaluate the suitability of the baselines available for stock assignment using each technique. Consideration should also be given to accounting for the Suess effect (i.e. choice of reference year and amount of correction in eastern and western samples). This work is intended to establish standard practices for the estimation of stock origin.

In addition, the Group made some more specific recommendations as follow:

- The protocols and guidance developed by the Bluefin Tuna Species Group (see section 5) be reviewed by the SCRS Methods Working Group with a view towards adopting a standard approach for analysts providing stock assessment models to future SCRS assessments.

- Improve the eBCD system by adding geo-spatial location (Lat/Lon) of the fishing operation.

- CPC scientists from Germany, Sweden, and Denmark revise their historical Task I catch series (50s and 60s) and provide whenever possible the respective Task II (catch and effort, and size samples) information.

- Efforts to recover catch/size/effort data from documents/reports from ICES and other sources be continued. This size information should be reviewed by the Group for its adoption and inclusion into the ICCAT-DB.

- Larval studies and surveys in the Western Mediterranean continue, as the larval index on spawning stock biomass, based on this research, is now included in the stock assessment model. Also, research into the potential larval survival index in the Mediterranean, should continue to be pursued, with efforts being extended to the western stock in the Gulf of Mexico in order to possibly provide an index of recruitment for both areas in future assessments.

- Pursue work related to bluefin tuna habitat-suitability models.

## 8. Other matters

In section 2.3, the Group recommended that a workshop be held to agree a process to resolve issues about the reproductive biology of bluefin tuna. Draft terms of reference for such a workshop are provided in **Appendix 6**.

## 9. Adoption of the report and closure

The report was adopted by the Group and the meeting was adjourned. The terms of reference for the fecundity workshop in **Appendix 6** were developed by a small subgroup and were not formally adopted as part of this report.

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**Table 1.** Alternative vectors of the proportion of fish contributing to the spawning output of the Atlantic bluefin tuna (East and West stocks) as a function of age (please see section 2.3 Spawning fraction for further details).

| Age | Vector 1 | Vector 2 |
|---|---|---|
| 1 | 0 | 0 |
| 2 | 0 | 0 |
| 3 | 0.25 | 0.0001435 |
| 4 | 0.5 | 0.0008742 |
| 5 | 1 | 0.003 |
| 6 | 1 | 0.005 |
| 7 | 1 | 0.006 |
| 8 | 1 | 0.008 |
| 9 | 1 | 0.012 |
| 10 | 1 | 0.019 |
| 11 | 1 | 0.039 |
| 12 | 1 | 0.078 |
| 13 | 1 | 0.149 |
| 14 | 1 | 0.27 |
| 15 | 1 | 0.436 |
| 16 | 1 | 0.621 |
| 17 | 1 | 0.773 |
| 18 | 1 | 0.878 |
| 19 | 1 | 0.939 |
| 20 | 1 | 0.97 |
| 21 | 1 | 0.988 |
| 22 | 1 | 0.993 |
| 23 | 1 | 0.998 |
| 24 | 1 | 1 |
| 25 | 1 | 1 |

**Table 2.** Estimated catches (t) of Atlantic bluefin tuna (*Thunnus thynnus*) by stock/area, gear and flag, between 1950 and 2015 (Caveat: gear group "Sport (HL+RR)" still provisional and will change in the future, since it still contains some commercial fisheries series).

| | | | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TOTAL** | | | 27829 | 31334 | 39701 | 40359 | 37980 | 44636 | 30433 | 36419 | 34560 | 27983 | 27145 | 29703 | 35256 | 30195 | 35816 | 31262 | 23164 | 25674 | 16721 | 18036 | 16274 | 17776 | 14778 | 14883 | 24675 | 26537 | 28248 | 25675 | 20880 | 18690 | 19843 | 19875 | 24081 |
| | **BFT-E** | | 26812 | 30211 | 39007 | 39275 | 37157 | 44092 | 30186 | 35873 | 33353 | 26334 | 26113 | 28083 | 29457 | 16357 | 17208 | 17095 | 15084 | 19734 | 13545 | 15024 | 10808 | 11185 | 10830 | 11012 | 19285 | 21465 | 22368 | 18980 | 15115 | 12435 | 14059 | 14105 | 22426 |
| | | ATE | 20169 | 23021 | 32646 | 31275 | 29284 | 36783 | 24608 | 28470 | 26415 | 20338 | 19842 | 21657 | 24079 | 9314 | 10863 | 11046 | 9649 | 10819 | 5079 | 6253 | 6007 | 4811 | 4831 | 4862 | 6168 | 10180 | 5278 | 7153 | 6203 | 4855 | 4003 | 3580 | 6694 |
| | | MED | 6643 | 7190 | 6361 | 8000 | 7873 | 7309 | 5578 | 7402 | 6938 | 5997 | 6272 | 6426 | 5378 | 7043 | 6345 | 6049 | 5435 | 8915 | 8466 | 8771 | 4802 | 6374 | 6000 | 6150 | 13117 | 11285 | 17090 | 11827 | 8912 | 7580 | 10056 | 10525 | 15732 |
| | **BFT-W** | ATW | 1017 | 1123 | 694 | 1084 | 823 | 544 | 247 | 546 | 1207 | 1649 | 1032 | 1620 | 5799 | 13838 | 18608 | 14167 | 8080 | 5940 | 3176 | 3012 | 5466 | 6591 | 3948 | 3871 | 5390 | 5072 | 5880 | 6695 | 5765 | 6255 | 5784 | 5770 | 1655 |
| Landings | ATE | Bait boat | 2975 | 3872 | 4685 | 4135 | 5500 | 6559 | 3409 | 4017 | 4241 | 3800 | 1374 | 1597 | 1702 | 1554 | 1263 | 1984 | 3557 | 2018 | 1585 | 2056 | 3017 | 3055 | 3032 | 3316 | 2385 | 3193 | 1868 | 3055 | 4126 | 2216 | 1707 | 1479 | 987 |
| | | Longline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33 | 2 | 56 | 481 | 223 | 2484 | 1618 | 645 | 438 | 91 | 141 | 208 | 201 | 274 | 254 | 261 | 91 | 2243 | 2923 | 2048 | 1806 | 733 | 748 | 1002 | 575 | 2715 |
| | | Other surf. | 452 | 1790 | 1004 | 2202 | 312 | 1921 | 55 | 1004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 105 | 101 | 14 | 4 | 4 | 12 | 5 | 2 | 1 | 2 | 2 | 0 |
| | | Purse seine | 2200 | 6728 | 14752 | 10217 | 12145 | 13394 | 5313 | 6437 | 6399 | 6727 | 6501 | 11547 | 10358 | 1586 | 3520 | 3412 | 2778 | 4063 | 1206 | 1520 | 876 | 683 | 961 | 933 | 1459 | 3612 | 860 | 1426 | 257 | 266 | 437 | 266 | 655 |
| | | Sport (HL+RR) | 1142 | 1724 | 2734 | 1167 | 1658 | 2316 | 1046 | 2030 | 623 | 1828 | 536 | 454 | 370 | 3 | 44 | 23 | 2 | 15 | 8 | 1 | 14 | 1 | 6 | 2 | 0 | 0 | 0 | 300 | 451 | 1024 | 38 | 72 | 27 |
| | | Traps | 13400 | 8906 | 9471 | 13553 | 9669 | 12593 | 14784 | 14949 | 15150 | 7927 | 10951 | 7835 | 9165 | 4553 | 5391 | 5189 | 3221 | 4582 | 2072 | 2475 | 1820 | 713 | 469 | 506 | 78 | 448 | 490 | 561 | 633 | 600 | 817 | 1186 | 2309 |
| | MED | Bait boat | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 53 |
| | | Longline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 800 | 300 | 400 | 500 | 300 | 600 | 400 | 69 | 129 | 236 | 520 | 2408 | 1400 | 1243 | 639 | 179 | 222 | 253 | 390 | 1587 |
| | | Other surf. | 607 | 916 | 1066 | 999 | 900 | 889 | 474 | 721 | 433 | 487 | 501 | 699 | 323 | 814 | 1058 | 507 | 100 | 100 | 100 | 0 | 20 | 2 | 4 | 56 | 14 | 39 | 21 | 64 | 24 | 11 | 4 | 66 | 45 |
| | | Purse seine | 1390 | 1191 | 1667 | 1796 | 2283 | 1583 | 1215 | 1097 | 1032 | 755 | 674 | 816 | 595 | 1605 | 1306 | 470 | 1897 | 2937 | 3355 | 3638 | 2396 | 3906 | 4084 | 4324 | 8119 | 8065 | 13970 | 9563 | 7299 | 6103 | 8541 | 8529 | 12131 |
| | | Sport (HL+RR) | 400 | 400 | 400 | 800 | 600 | 1200 | 900 | 500 | 700 | 700 | 900 | 1100 | 1000 | 1200 | 600 | 700 | 500 | 600 | 500 | 500 | 100 | 100 | 100 | 100 | 100 | 114 | 100 | 188 | 191 | 204 | 60 | 52 | 122 |
| | | Traps | 4246 | 4684 | 3228 | 4405 | 4090 | 3637 | 2988 | 5084 | 4773 | 4054 | 4197 | 3811 | 3460 | 2624 | 3081 | 3972 | 2438 | 4978 | 3911 | 4233 | 2216 | 2237 | 1575 | 1149 | 2476 | 1666 | 1756 | 1373 | 1219 | 1040 | 1198 | 1388 | 1794 |
| | ATW | Longline | 0 | 0 | 7 | 1 | 0 | 5 | 0 | 46 | 72 | 283 | 340 | 373 | 1351 | 6558 | 12347 | 9465 | 3075 | 3126 | 1665 | 593 | 268 | 1390 | 362 | 1156 | 985 | 1586 | 3185 | 3790 | 3252 | 3744 | 3983 | 3898 | 374 |
| | | Other surf. | 468 | 270 | 334 | 198 | 130 | 135 | 47 | 58 | 61 | 125 | 119 | 78 | 44 | 22 | 24 | 58 | 47 | 58 | 63 | 32 | 83 | 182 | 163 | 86 | 214 | 0 | 189 | 157 | 158 | 143 | 103 | 113 | 299 |
| | | Purse seine | 1 | 100 | 0 | 0 | 55 | 0 | 0 | 0 | 138 | 781 | 277 | 903 | 3768 | 5770 | 5150 | 3331 | 1006 | 2082 | 687 | 1118 | 4288 | 3769 | 2011 | 1656 | 960 | 2320 | 1582 | 1502 | 1230 | 1381 | 758 | 910 | 232 |
| | | Sport (HL+RR) | 192 | 235 | 153 | 119 | 107 | 27 | 19 | 38 | 67 | 79 | 60 | 108 | 412 | 1185 | 608 | 1066 | 3731 | 361 | 635 | 1038 | 644 | 1144 | 1354 | 816 | 2955 | 1022 | 752 | 874 | 904 | 956 | 893 | 808 | 682 |
| | | Traps | 356 | 518 | 200 | 766 | 531 | 377 | 181 | 404 | 869 | 381 | 236 | 158 | 224 | 303 | 479 | 247 | 221 | 313 | 126 | 231 | 183 | 106 | 58 | 157 | 276 | 144 | 172 | 372 | 221 | 31 | 47 | 41 | 68 |
| Discards | MED | 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 |
| | | Purse seine | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ATW | 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 |
| | | 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 |
| | | Purse seine | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Sport (HL+RR) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | ATE | Cape Verde | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | China PR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 138 | 114 | 46 | 12 | 2 | 1 | 12 | 5 | 3 | 2 | 0 | 3 | 5 | 6 | 16 |
| | | EU.Denmark | 818 | 1267 | 2113 | 800 | 898 | 1127 | 465 | 615 | 227 | 792 | 48 | 148 | 156 | 3 | 44 | 23 | 2 | 15 | 8 | 1 | 1 | 2 | 1 | 3 | 1 | 2 | 1 | 3 | 0 | 1 | 2 | 1 | 0 |
| | | EU.España | 8416 | 5487 | 7181 | 9521 | 8446 | 11766 | 10854 | 11667 | 11860 | 6713 | 6521 | 5390 | 5437 | 2811 | 3360 | 4563 | 3333 | 4158 | 2564 | 3422 | 3785 | 2975 | 2542 | 3280 | 1685 | 2649 | 2067 | 3088 | 4430 | 3629 | 2272 | 2499 | 2854 |
| | | EU.France | 1869 | 2893 | 2362 | 2364 | 3451 | 3031 | 1453 | 1550 | 1303 | 2031 | 553 | 907 | 965 | 543 | 400 | 621 | 1624 | 860 | 390 | 534 | 732 | 680 | 740 | 551 | 522 | 692 | 267 | 592 | 723 | 275 | 260 | 153 | 150 |
| | | EU.Germany | 230 | 235 | 306 | 315 | 665 | 1096 | 569 | 1319 | 390 | 1002 | 445 | 293 | 199 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 1 | 6 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 0 |
| | | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.Poland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.Portugal | 1770 | 1571 | 2377 | 3130 | 1387 | 1485 | 2631 | 1052 | 806 | 1091 | 1537 | 1758 | 817 | 435 | 635 | 107 | 220 | 251 | 68 | 419 | 34 | 0 | 97 | 0 | 191 | 303 | 24 | 14 | 56 | 35 | 24 | 17 | 41 |
| | | EU.Sweden | 94 | 222 | 316 | 52 | 95 | 94 | 12 | 96 | 6 | 34 | 42 | 13 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 3 | 0 | 0 | 0 | 2 | 8 | 2 | 2 | 0 | 0 | 1 | 0 |
| | | 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 |
| | | 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 |
| | | 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 |
| | | Guinée 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 |
| | | ICCAT (RMA) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Iceland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Japan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33 | 2 | 56 | 481 | 204 | 2484 | 1618 | 585 | 404 | 50 | 100 | 13 | 2 | 21 | 157 | 240 | 44 | 2195 | 2900 | 1973 | 1594 | 577 | 630 | 880 | 515 | 2573 |
| | | Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 43 | 36 | 15 | 3 | 2 | 0 | 1 | 0 | 0 | 0 |
| | | Maroc | 4773 | 4617 | 3240 | 4876 | 2198 | 4792 | 3311 | 5702 | 7961 | 5378 | 6000 | 4371 | 5276 | 3737 | 4315 | 2788 | 3379 | 3379 | 1088 | 835 | 692 | 143 | 653 | 514 | 655 | 2624 | 331 | 884 | 36 | 206 | 161 | 177 | 993 |
| | | 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 |
| | | NEI (Flag related) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Norway | 2200 | 6728 | 14752 | 10217 | 12145 | 13394 | 5313 | 6437 | 3860 | 3241 | 4215 | 8572 | 8730 | 167 | 1524 | 2540 | 1041 | 2056 | 810 | 927 | 677 | 738 | 430 | 421 | 869 | 988 | 529 | 764 | 221 | 60 | 282 | 161 | 50 |
| | | Panama | 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 | 69 | 208 | 156 | 14 | 117 | 48 | 12 |
| | | 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 |
| | | 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 |
| | | 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 |
| | | 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 | 5 |
| | MED | Albania | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Algerie | 100 | 100 | 100 | 98 | 62 | 98 | 56 | 52 | 78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 150 | 150 | 150 | 150 | 100 | 100 | 1 | 0 | 33 | 66 | 49 | 40 | 20 | 150 | 190 | 220 | 250 |
| | | China PR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.Bulgaria | 733 | 660 | 666 | 732 | 1037 | 682 | 596 | 476 | 427 | 367 | 449 | 344 | 176 | 72 | 45 | 35 | 21 | 18 | 14 | 9 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.Croatia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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.Cyprus | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 10 | 10 |
| | | EU.España | 168 | 273 | 553 | 54 | 597 | 60 | 136 | 345 | 282 | 374 | 561 | 620 | 377 | 1642 | 953 | 1635 | 651 | 481 | 611 | 617 | 349 | 182 | 212 | 420 | 203 | 120 | 253 | 158 | 165 | 139 | 133 | 354 | 989 |
| | | EU.France | 507 | 816 | 966 | 899 | 798 | 783 | 329 | 615 | 294 | 384 | 400 | 599 | 214 | 668 | 953 | 390 | 1000 | 1500 | 2500 | 1500 | 1100 | 2200 | 1100 | 1400 | 1800 | 1600 | 3800 | 3182 | 1597 | 1578 | 1701 | 2350 | 4878 |
| | | EU.Greece | 400 | 400 | 400 | 800 | 600 | 1200 | 900 | 500 | 700 | 700 | 900 | 1100 | 1000 | 1200 | 600 | 700 | 500 | 600 | 500 | 500 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| | | EU.Italy | 2229 | 2298 | 1766 | 2483 | 2344 | 2194 | 1926 | 2810 | 2953 | 1987 | 1740 | 1772 | 1956 | 2483 | 2642 | 1565 | 1591 | 3037 | 2888 | 3152 | 2264 | 2576 | 3718 | 3167 | 6868 | 7083 | 10369 | 6263 | 5047 | 4075 | 6285 | 6017 | 6658 |
| | | EU.Malta | 100 | 100 | 100 | 100 | 102 | 106 | 145 | 106 | 139 | 103 | 101 | 100 | 109 | 146 | 105 | 117 | 100 | 100 | 100 | 0 | 20 | 2 | 4 | 56 | 35 | 76 | 34 | 77 | 28 | 34 | 28 | 42 | 61 |
| | | 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 |
| | | Egypt | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | ICCAT (RMA) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Iceland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Israel | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Japan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 112 | 246 | 2195 | 1260 | 968 | 520 | 61 | 99 | 119 | 100 | 961 |
| | | 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 |
| | | Libya | 1000 | 1100 | 900 | 1700 | 1200 | 1200 | 1200 | 1200 | 1200 | 1100 | 1100 | 1000 | 800 | 100 | 400 | 600 | 700 | 800 | 1000 | 2000 | 500 | 600 | 449 | 475 | 1469 | 780 | 799 | 336 | 677 | 424 | 398 | 271 | 310 |
| | | Maroc | 27 | 183 | 160 | 24 | 102 | 8 | 36 | 82 | 77 | 107 | 174 | 47 | 55 | 95 | 0 | 172 | 11 | 27 | 5 | 0 | 0 | 79 | 37 | 1 | 9 | 40 | 1 | 7 | 0 | 2 | 0 | 2 | 0 |
| | | NEI (Flag related) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | NEI (combined) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 |
| | | Panama | 0 | 0 | 0 | 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 |
| | | Serbia & Montenegro | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Syria | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Tunisie | 722 | 729 | 470 | 522 | 377 | 632 | 0 | 34 | 0 | 151 | 438 | 420 | 404 | 260 | 376 | 601 | 365 | 383 | 237 | 149 | 237 | 285 | 98 | 94 | 153 | 87 | 74 | 131 | 141 | 296 | 228 | 218 | 298 |
| | | Turkey | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 800 | 400 | 500 | 300 | 300 | 200 | 100 | 0 | 100 | 100 | 1488 | 310 | 393 | 138 | 22 | 68 | 66 | 34 | 17 | 181 | 177 | 127 | 27 | 391 | 565 | 825 |
| | | Yugoslavia Fed. | 657 | 531 | 279 | 588 | 654 | 346 | 253 | 382 | 388 | 224 | 109 | 123 | 87 | 277 | 271 | 134 | 246 | 331 | 150 | 301 | 90 | 326 | 200 | 224 | 317 | 155 | 562 | 932 | 1049 | 756 | 573 | 376 | 486 |
| | ATW | Argentina | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 106 | 271 | 204 | 100 | 100 | 60 | 21 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 10 | 2 | 3 | 1 |
| | | Canada | 442 | 326 | 433 | 201 | 175 | 133 | 40 | 47 | 38 | 172 | 37 | 120 | 177 | 642 | 996 | 636 | 198 | 230 | 281 | 363 | 1442 | 1082 | 477 | 1018 | 768 | 641 | 846 | 972 | 670 | 245 | 306 | 425 | 504 |
| | | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 7 | 2 | 13 | 7 | 2 | 20 | 1 | 0 | 1 | 1 | 49 | 15 | 7 | 11 |
| | | Cuba | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 139 | 465 | 2352 | 1351 | 468 | 200 | 0 | 0 | 0 | 0 | 40 | 0 | 1 | 2 | 0 | 1 | 0 | 0 |
| | | 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 |
| | | 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 |
| | | ICCAT (RMA) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Japan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 32 | 200 | 339 | 373 | 1219 | 6191 | 12044 | 9147 | 2471 | 694 | 272 | 116 | 66 | 1375 | 321 | 1097 | 905 | 1513 | 2902 | 3658 | 3144 | 3621 | 3936 | 3771 | 292 |
| | | Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 23 | 20 | 8 | 7 | 1 | 0 | 1 | 0 | 0 | 0 |
| | | Mexico | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 29 | 39 | 24 | 37 | 14 | 28 | 22 | 10 | 20 | 14 |
| | | 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 | 14 |
| | | NEI (Flag related) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Panama | 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 | 157 | 92 | 58 | 10 | 9 | 14 | 12 |
| | | 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 |
| | | 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 |
| | | U.S.A. | 575 | 797 | 261 | 883 | 648 | 411 | 207 | 469 | 1137 | 1277 | 656 | 1127 | 4297 | 6734 | 5364 | 4145 | 4846 | 2604 | 1239 | 2058 | 3756 | 4119 | 3109 | 1698 | 3638 | 2845 | 1931 | 1956 | 1848 | 2297 | 1505 | 1530 | 807 |
| | | 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 |
| | | 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 |
| | | 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 |
| Discards | MED | Albania | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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.Croatia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 |
| | | 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 |
| | | Tunisie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Turkey | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ATW | 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 |
| | | 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 |
| | | 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 |
| | | 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 |

**Table 2.** (continued).

| | | | 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 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TOTAL** | | | 24253 | 26774 | 24743 | 21589 | 20775 | 27031 | 23926 | 26381 | 29318 | 34128 | 36642 | 48881 | 49545 | 54009 | 53545 | 43186 | 35878 | 36316 | 37487 | 37439 | 33432 | 33749 | 37592 | 33468 | 34404 | 26460 | 21798 | 13195 | 11781 | 12688 | 14726 | 14887 | 18042 |
| | **BFT-E** | | 21699 | 24473 | 22063 | 19260 | 18271 | 24129 | 21161 | 23599 | 26389 | 31831 | 34258 | 46769 | 47097 | 51497 | 51211 | 40529 | 33107 | 33542 | 34702 | 34120 | 31127 | 31624 | 35836 | 31657 | 32766 | 24460 | 19818 | 11338 | 9774 | 10934 | 13244 | 13261 | 16201 |
| | | ATE | 8059 | 7427 | 4806 | 4687 | 4453 | 6951 | 5448 | 6313 | 6543 | 7396 | 9317 | 7054 | 9780 | 12098 | 16379 | 11630 | 10247 | 10061 | 10086 | 10347 | 7396 | 7410 | 9039 | 7802 | 8441 | 8243 | 6684 | 4379 | 3984 | 3834 | 4163 | 3918 | 4841 |
| | | MED | 13640 | 17046 | 17257 | 14572 | 13818 | 17178 | 15713 | 17286 | 19846 | 24435 | 24941 | 39715 | 37317 | 39399 | 34831 | 28899 | 22860 | 23481 | 24616 | 23774 | 23730 | 24214 | 26796 | 23855 | 24325 | 16217 | 13133 | 6959 | 5790 | 7100 | 9081 | 9343 | 11360 |
| | **BFT-W** | ATW | 2554 | 2301 | 2680 | 2329 | 2504 | 2902 | 2766 | 2782 | 2929 | 2296 | 2384 | 2113 | 2448 | 2512 | 2334 | 2657 | 2772 | 2775 | 2784 | 3319 | 2305 | 2125 | 1756 | 1811 | 1638 | 2000 | 1980 | 1857 | 2007 | 1754 | 1482 | 1626 | 1842 |
| Landings | ATE | Bait boat | 3128 | 2949 | 2364 | 2253 | 2129 | 2682 | 2685 | 1993 | 1653 | 1422 | 3884 | 2284 | 3093 | 5369 | 7215 | 3139 | 1554 | 2032 | 2426 | 2635 | 1409 | 1902 | 2282 | 1263 | 2436 | 2393 | 1260 | 725 | 636 | 283 | 243 | 95 | 172 |
| | | Longline | 2626 | 1557 | 576 | 1008 | 1026 | 1187 | 962 | 1510 | 3196 | 3618 | 2802 | 2311 | 4522 | 4212 | 4057 | 3789 | 3570 | 3736 | 3303 | 2896 | 2750 | 2072 | 2717 | 2306 | 1705 | 2491 | 1951 | 1194 | 1125 | 1139 | 1167 | 1194 | 1467 |
| | | Other surf. | 85 | 88 | 150 | 80 | 0 | 255 | 160 | 252 | 126 | 523 | 976 | 590 | 555 | 273 | 60 | 387 | 404 | 509 | 558 | 631 | 521 | 290 | 424 | 831 | 502 | 181 | 297 | 124 | 35 | 49 | 141 | 210 | 193 |
| | | Purse seine | 262 | 373 | 86 | 276 | 255 | 202 | 147 | 54 | 46 | 462 | 24 | 213 | 458 | 323 | 828 | 700 | 726 | 661 | 153 | 887 | 490 | 1078 | 1197 | 408 | 0 | 0 | 2 | 1 | 0 | 0 | 2 | 0 | |
| | | Sport (HL+RR) | 2 | 158 | 1 | 13 | 3 | 1 | 2 | 1 | 0 | 7 | 0 | 25 | 0 | 0 | 237 | 28 | 33 | 126 | 61 | 63 | 109 | 89 | 11 | 99 | 11 | 12 | 11 | 44 | 51 | 53 | 46 | 43 | 104 |
| | | Traps | 1956 | 2302 | 1630 | 1057 | 1040 | 2624 | 1492 | 2504 | 1522 | 1365 | 1631 | 1630 | 1152 | 1921 | 3982 | 3586 | 3960 | 2996 | 3585 | 3235 | 2116 | 1978 | 2408 | 2895 | 3788 | 3166 | 3164 | 2292 | 2137 | 2311 | 2564 | 2376 | 2905 |
| | MED | Bait boat | 391 | 1699 | 278 | 0 | 0 | 0 | 0 | 25 | 148 | 158 | 48 | 0 | 0 | 5 | 4 | 11 | 4 | 38 | 28 | 1 | 9 | 17 | 5 | 0 | 0 | 0 | 38 | 1 | 0 | 2 | 11 | 9 | 25 |
| | | Longline | 980 | 1380 | 1396 | 966 | 974 | 1435 | 1364 | 1178 | 3057 | 3145 | 2470 | 6993 | 8469 | 9856 | 7313 | 4117 | 3338 | 3424 | 4144 | 3234 | 3482 | 3028 | 3411 | 3135 | 3269 | 2376 | 1344 | 1242 | 962 | 587 | 605 | 588 | 776 |
| | | Other surf. | 10 | 250 | 795 | 527 | 620 | 431 | 926 | 344 | 356 | 447 | 371 | 776 | 545 | 417 | 282 | 284 | 228 | 728 | 354 | 340 | 198 | 197 | 175 | 81 | 85 | 0 | 0 | 1 | 1 | 1 | 21 | 29 | 3 |
| | | Purse seine | 10485 | 10624 | 12460 | 11116 | 10032 | 12566 | 10883 | 11797 | 13805 | 18580 | 20065 | 27948 | 23799 | 26021 | 24279 | 22321 | 16905 | 16779 | 17745 | 18164 | 18417 | 19494 | 22475 | 20020 | 20761 | 13540 | 11448 | 4986 | 4293 | 6172 | 7974 | 8184 | 9993 |
| | | Sport (HL+RR) | 224 | 603 | 1007 | 811 | 810 | 1210 | 826 | 1559 | 769 | 952 | 1238 | 2307 | 3562 | 2149 | 2340 | 1092 | 1533 | 1773 | 1167 | 1520 | 1404 | 1325 | 619 | 494 | 117 | 149 | 160 | 448 | 356 | 202 | 240 | 289 | 361 |
| | | Traps | 1550 | 2490 | 1320 | 1153 | 1382 | 1537 | 1714 | 2382 | 1711 | 1152 | 749 | 1691 | 942 | 951 | 613 | 1074 | 852 | 739 | 1177 | 515 | 221 | 154 | 112 | 125 | 93 | 152 | 144 | 281 | 165 | 125 | 222 | 232 | 192 |
| | ATW | Longline | 841 | 844 | 1240 | 771 | 1138 | 1377 | 705 | 741 | 903 | 689 | 712 | 539 | 491 | 545 | 382 | 764 | 915 | 858 | 610 | 729 | 186 | 644 | 425 | 565 | 420 | 606 | 366 | 529 | 743 | 478 | 470 | 497 | 553 |
| | | Other surf. | 514 | 377 | 293 | 166 | 156 | 425 | 755 | 536 | 578 | 509 | 406 | 307 | 384 | 429 | 293 | 342 | 279 | 283 | 201 | 107 | 139 | 97 | 89 | 85 | 63 | 78 | 121 | 107 | 147 | 117 | 121 | 119 | 138 |
| | | Purse seine | 384 | 401 | 377 | 360 | 367 | 383 | 385 | 384 | 237 | 300 | 295 | 301 | 249 | 245 | 250 | 249 | 248 | 275 | 196 | 208 | 265 | 32 | 178 | 4 | 28 | 0 | 11 | 0 | 0 | 2 | 29 | 38 | 34 |
| | | Sport (HL+RR) | 808 | 676 | 750 | 518 | 726 | 601 | 786 | 1004 | 1083 | 586 | 854 | 804 | 1114 | 1032 | 1181 | 1108 | 1125 | 1121 | 1650 | 2036 | 1399 | 1139 | 924 | 1005 | 1023 | 1134 | 1251 | 1009 | 888 | 917 | 692 | 810 | 1085 |
| | | Traps | 7 | 3 | 20 | 0 | 17 | 14 | 1 | 2 | 0 | 1 | 29 | 79 | 72 | 90 | 59 | 68 | 44 | 16 | 16 | 28 | 84 | 32 | 8 | 3 | 4 | 23 | 23 | 39 | 26 | 17 | 11 | 20 | 6 |
| Discards | MED | 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 | 9 |
| | | Purse seine | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 12 | 9 | 11 | 2 |
| | ATW | Longline | 0 | 0 | 0 | 514 | 99 | 102 | 119 | 115 | 128 | 211 | 88 | 83 | 138 | 167 | 155 | 123 | 160 | 222 | 105 | 211 | 232 | 181 | 131 | 149 | 100 | 159 | 207 | 174 | 202 | 224 | 145 | 139 | 19 |
| | | Other surf. | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | | Purse seine | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 4 | 5 |
| | | Sport (HL+RR) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 3 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Landings | ATE | Cape Verde | 10 | 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 | |
| | | China PR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 85 | 103 | 80 | 68 | 39 | 19 | 41 | 24 | 42 | 72 | 119 | 42 | 38 | 36 | 36 | 38 | 37 | 45 |
| | | Chinese Taipei | 2 | 3 | 16 | 197 | 20 | 0 | 109 | 0 | 0 | 0 | 6 | 20 | 4 | 61 | 226 | 350 | 222 | 144 | 304 | 158 | 0 | 0 | 10 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.Denmark | 0 | 0 | 37 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 37 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.España | 4540 | 4805 | 3627 | 2876 | 2477 | 4567 | 3567 | 3830 | 2273 | 2318 | 4962 | 3137 | 3819 | 6186 | 9519 | 4565 | 4429 | 3493 | 3633 | 4089 | 2172 | 2801 | 3102 | 2339 | 3680 | 3536 | 2409 | 1550 | 1483 | 1329 | 1553 | 1282 | 1655 |
| | | EU.France | 400 | 602 | 490 | 348 | 533 | 724 | 460 | 510 | 565 | 894 | 1099 | 336 | 725 | 563 | 269 | 613 | 588 | 542 | 629 | 755 | 648 | 561 | 818 | 1218 | 629 | 253 | 366 | 228 | 135 | 148 | 223 | 212 | 254 |
| | | EU.Germany | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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.Ireland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 21 | 52 | 22 | 8 | 15 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 4 | 10 | 13 | 19 | 14 |
| | | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.Portugal | 128 | 34 | 29 | 193 | 163 | 48 | 3 | 27 | 103 | 128 | 91 | 363 | 169 | 199 | 712 | 323 | 411 | 441 | 404 | 186 | 61 | 27 | 82 | 104 | 29 | 36 | 53 | 58 | 180 | 223 | 235 | 243 | 263 |
| | | EU.Sweden | 1 | 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 | |
| | | EU.United Kingdom | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | |
| | | Faroe Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 67 | 104 | 118 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Guinea Ecuatorial | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | | Guinée Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 330 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | ICCAT (RMA) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| | | Iceland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 27 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 5 | 4 | 30 | 37 |
| | | Japan | 2609 | 1514 | 420 | 739 | 900 | 1169 | 838 | 1464 | 2981 | 3350 | 2484 | 2075 | 3971 | 3341 | 2905 | 3195 | 2690 | 2895 | 2425 | 2536 | 2695 | 2015 | 2598 | 1896 | 1612 | 2351 | 1904 | 1155 | 1089 | 1093 | 1129 | 1134 | 1386 |
| | | Korea Rep. | 3 | 0 | 77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 205 | 92 | 203 | 0 | 0 | 6 | 1 | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Maroc | 365 | 202 | 86 | 288 | 356 | 437 | 465 | 408 | 531 | 562 | 415 | 720 | 678 | 1035 | 2068 | 2341 | 1591 | 2228 | 2497 | 2565 | 1797 | 1961 | 2405 | 2196 | 2418 | 1947 | 1909 | 1348 | 1055 | 990 | 960 | 959 | 1176 |
| | | NEI (ETRO) | 0 | 6 | 3 | 4 | 0 | 5 | 6 | 74 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | NEI (Flag related) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 85 | 144 | 223 | 68 | 189 | 71 | 208 | 66 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Norway | 1 | 243 | 0 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| | | Panama | 0 | 17 | 22 | 11 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 19 | 550 | 255 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Senegal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | |
| | | Seychelles | 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 | |
| | | Sierra Leone | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 93 | 118 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | MED | Albania | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 9 | 34 | 40 |
| | | Algerie | 252 | 254 | 260 | 566 | 420 | 677 | 820 | 782 | 800 | 1104 | 1097 | 1560 | 156 | 638 | 829 | 1674 | 1760 | 2083 | 2098 | 2056 | 1504 | 1440 | 1500 | 1673 | 1489 | 1311 | 0 | 0 | 0 | 69 | 244 | 244 | 370 |
| | | China PR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 97 | 137 | 93 | 49 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 328 | 709 | 494 | 411 | 278 | 106 | 27 | 169 | 329 | 508 | 445 | 51 | 267 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | 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 | 0 | 0 | 0 | 0 | 0 | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EU.Croatia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1418 | 1076 | 1058 | 1410 | 1220 | 1360 | 1105 | 906 | 970 | 930 | 903 | 977 | 1139 | 828 | 1017 | 1022 | 825 | 834 | 619 | 389 | 371 | 369 | 384 | 385 | 456 |
| | | EU.Cyprus | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 14 | 10 | 10 | 10 | 10 | 21 | 31 | 61 | 85 | 91 | 79 | 105 | 149 | 110 | 1 | 132 | 2 | 3 | 10 | 18 | 17 | 18 | 22 |
| | | EU.España | 812 | 2743 | 1460 | 701 | 1178 | 1428 | 1645 | 1822 | 1392 | 2165 | 2018 | 2741 | 4401 | 2588 | 2209 | 2000 | 2003 | 2772 | 2234 | 2215 | 2512 | 2353 | 2758 | 2689 | 2414 | 2465 | 1769 | 1056 | 942 | 1064 | 948 | 1164 | 1238 |
| | | EU.France | 3660 | 3600 | 5430 | 3490 | 4330 | 5780 | 4434 | 4713 | 4620 | 7376 | 6995 | 11843 | 9604 | 9171 | 8235 | 7122 | 6156 | 6794 | 6167 | 5832 | 5859 | 6471 | 8638 | 7663 | 10200 | 2670 | 3087 | 1755 | 805 | 791 | 2191 | 2216 | 2565 |
| | | EU.Greece | 0 | 0 | 11 | 131 | 156 | 159 | 182 | 201 | 175 | 447 | 439 | 886 | 1004 | 874 | 1217 | 286 | 248 | 622 | 361 | 438 | 422 | 389 | 318 | 255 | 285 | 350 | 373 | 224 | 172 | 176 | 178 | 161 | 195 |
| | | EU.Italy | 5865 | 7140 | 7199 | 7576 | 4607 | 4207 | 4320 | 4122 | 3787 | 5006 | 5379 | 6901 | 7076 | 10200 | 9619 | 4441 | 3283 | 3847 | 4383 | 4628 | 4981 | 4697 | 4853 | 4708 | 4638 | 2247 | 2749 | 1061 | 1783 | 1788 | 1938 | 1946 | 2273 |
| | | EU.Malta | 41 | 35 | 75 | 53 | 47 | 30 | 38 | 85 | 113 | 81 | 259 | 580 | 590 | 402 | 396 | 409 | 449 | 378 | 224 | 244 | 258 | 264 | 350 | 270 | 334 | 296 | 316 | 136 | 142 | 137 | 155 | 160 | 182 |
| | | EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 62 | 240 | 211 | 164 | 306 | 313 | 274 | 37 | 54 | 76 | 61 | 64 | 0 | 2 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Egypt | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 77 | 77 | 155 |
| | | ICCAT (RMA) | 0 | 0 | 0 | 0 | 0 | 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 | 1 | 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 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Israel | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Japan | 677 | 1036 | 1006 | 341 | 280 | 258 | 127 | 172 | 85 | 123 | 793 | 536 | 813 | 765 | 185 | 361 | 381 | 136 | 152 | 390 | 316 | 638 | 378 | 556 | 466 | 80 | 18 | 0 | 0 | 0 | 0 | 0 | |
| | | Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 684 | 458 | 591 | 410 | 66 | 0 | 0 | 0 | 0 | 0 | 700 | 1145 | 26 | 276 | 335 | 102 | 0 | 0 | 77 | 80 | 81 | |
| | | Libya | 270 | 274 | 300 | 300 | 300 | 300 | 84 | 328 | 370 | 737 | 635 | 1422 | 1540 | 1388 | 1029 | 1331 | 1195 | 1549 | 1941 | 638 | 752 | 1300 | 1091 | 1327 | 1358 | 1318 | 1082 | 645 | 0 | 756 | 929 | 933 | 1153 |
| | | Maroc | 1 | 4 | 12 | 56 | 159 | 140 | 368 | 1149 | 925 | 205 | 79 | 1092 | 1035 | 586 | 535 | 687 | 636 | 695 | 511 | 421 | 760 | 819 | 92 | 190 | 641 | 531 | 369 | 205 | 182 | 223 | 309 | 310 | 322 |
| | | NEI (Flag related) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 427 | 639 | 171 | 1058 | 761 | 78 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | NEI (combined) | 0 | 19 | 0 | 168 | 183 | 633 | 757 | 360 | 1799 | 1398 | 0 | 773 | 211 | 0 | 101 | 1030 | 1995 | 109 | 571 | 508 | 610 | 709 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Panama | 0 | 0 | 0 | 0 | 72 | 67 | 0 | 74 | 287 | 484 | 467 | 1499 | 1498 | 2850 | 236 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Serbia & Montenegro | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Syria | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 41 | 0 | 34 | 0 | 0 | 0 | 0 | 40 |
| | | Tunisie | 293 | 307 | 369 | 315 | 456 | 624 | 661 | 406 | 1366 | 1195 | 2132 | 2773 | 1897 | 2393 | 2200 | 1745 | 2352 | 2184 | 2493 | 2528 | 791 | 2376 | 3249 | 2545 | 431 | 2679 | 1932 | 1042 | 852 | 1017 | 1057 | 1047 | 1248 |
| | | Turkey | 537 | 869 | 41 | 69 | 972 | 1343 | 1707 | 2059 | 2459 | 2817 | 3084 | 3466 | 4219 | 4616 | 5093 | 5899 | 1200 | 1070 | 2100 | 2300 | 3300 | 1075 | 990 | 806 | 918 | 879 | 665 | 409 | 519 | 536 | 551 | 555 | 1091 |
| | | Yugoslavia Fed. | 1222 | 755 | 1084 | 796 | 648 | 1523 | 560 | 940 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | ATW | Argentina | 0 | 0 | 6 | 0 | 2 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Brazil | 1 | 0 | 1 | 0 | 2 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | |
| | | Canada | 433 | 264 | 142 | 73 | 83 | 393 | 619 | 438 | 485 | 443 | 459 | 392 | 576 | 597 | 503 | 595 | 576 | 549 | 524 | 604 | 557 | 537 | 600 | 733 | 491 | 575 | 530 | 505 | 474 | 477 | 480 | 463 | 531 |
| | | Chinese Taipei | 2 | 0 | 3 | 3 | 4 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Cuba | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 74 | 11 | 19 | 27 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | 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 | |
| | | FR.St Pierre et Miquelon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 1 | 10 | 5 | 0 | 4 | 3 | 2 | 8 | 0 | 0 | 0 | 0 | 9 |
| | | ICCAT (RMA) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Japan | 711 | 696 | 1092 | 584 | 960 | 1109 | 468 | 550 | 688 | 512 | 581 | 427 | 387 | 436 | 322 | 691 | 365 | 492 | 506 | 575 | 57 | 470 | 265 | 376 | 277 | 492 | 162 | 353 | 578 | 289 | 317 | 302 | 347 |
| | | Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Mexico | 12 | 21 | 11 | 13 | 1 | 6 | 7 | 2 | 9 | 15 | 17 | 4 | 23 | 19 | 2 | 8 | 14 | 29 | 10 | 12 | 22 | 9 | 10 | 14 | 7 | 7 | 10 | 14 | 14 | 51 | 23 | 51 | 53 |
| | | NEI (ETRO) | 1 | 0 | 0 | 0 | 0 | 0 | 30 | 24 | 23 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | NEI (Flag related) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 429 | 270 | 49 | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Sta. Lucia | 0 | 0 | 0 | 0 | 1 | 3 | 2 | 14 | 14 | 14 | 2 | 43 | 9 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Trinidad and Tobago | 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 | |
| | | U.S.A. | 1394 | 1320 | 1424 | 1142 | 1352 | 1289 | 1483 | 1636 | 1582 | 1085 | 1237 | 1163 | 1311 | 1285 | 1334 | 1235 | 1213 | 1212 | 1583 | 1840 | 1426 | 899 | 717 | 468 | 758 | 764 | 1068 | 803 | 738 | 713 | 502 | 667 | 877 |
| | | UK.Bermuda | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| | | UK.British Virgin Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | UK.Turks and Caicos | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Discards | MED | Albania | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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.Croatia | 0 | 0 | 0 | 0 | 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 | 5 | 5 | 2 | 2 |
| | | 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 | 9 |
| | | 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 | 7 | 4 | 0 | |
| | | Tunisie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | |
| | | Turkey | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | |
| | ATW | Canada | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 16 | 11 | 46 | 13 | 37 | 14 | 15 | 0 | 2 | 0 | 1 | 3 | 25 | 36 | 17 | 0 | 0 | 3 |
| | | Japan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Mexico | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | | U.S.A. | 0 | 0 | 0 | 514 | 99 | 102 | 119 | 115 | 128 | 211 | 88 | 83 | 138 | 171 | 155 | 110 | 149 | 176 | 98 | 174 | 218 | 167 | 131 | 147 | 100 | 158 | 204 | 150 | 166 | 206 | 159 | 143 | 22 |

**Table 3.** Improvements in the overall Task I nominal catches (T1NC) in relation to the gear differentiation. The "old" (as of July/2016) and "new" (as of 2017-03-17) T1NC datasets are compared by stock/area and gear availability where the ratios (%) of UNCL gears are shown for both cases "T1(new)" and "T1(old)".

| | T1NC new (t) | | | | | | T1NC old (t) | | | | | | ratios (%) of gears UNCL | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BFT-E | | | | BFT-W | | BFT-E | | | | BFT-W | | | | | | | |
| | ATE | | MED | | ATW | | ATE | | MED | | ATW | | T1(new) | | | T1(old) | | |
| Year | By gear | UNCL gear | By gear | UNCL gear | By gear | UNCL gear | By gear | UNCL gear | By gear | UNCL gear | By gear | UNCL gear | ATE | MED | ATW | ATE | MED | ATW |
| 1950 | 19717 | 452 | 6543 | 100 | 1017 | | 13440 | 5942 | 4590 | 1007 | 612 | 395 | 2 | 2 | 0 | 31 | 18 | 39 |
| 1951 | 21230 | 1790 | 7090 | 100 | 1123 | | 16456 | 6524 | 4392 | 1316 | 882 | 214 | 8 | 1 | 0 | 28 | 23 | 20 |
| 1952 | 31642 | 1004 | 6261 | 100 | 694 | | 26381 | 6134 | 3888 | 1466 | 330 | 299 | 3 | 2 | 0 | 19 | 27 | 48 |
| 1953 | 29073 | 2202 | 7900 | 100 | 1084 | | 24799 | 6067 | 5243 | 1799 | 907 | 177 | 7 | 1 | 0 | 20 | 26 | 16 |
| 1954 | 28972 | 312 | 7773 | 100 | 823 | | 25255 | 3958 | 5214 | 1498 | 684 | 139 | 1 | 1 | 0 | 14 | 22 | 17 |
| 1955 | 34862 | 1921 | 7209 | 100 | 544 | | 28376 | 7116 | 4155 | 2083 | 416 | 128 | 5 | 1 | 0 | 20 | 33 | 24 |
| 1956 | 24553 | 55 | 5478 | 100 | 247 | | 22093 | 1046 | 3616 | 1329 | 208 | 39 | 0 | 2 | 0 | 5 | 27 | 16 |
| 1957 | 27466 | 1004 | 7302 | 100 | 546 | | 26311 | 2030 | 4829 | 2015 | 488 | 58 | 4 | 1 | 0 | 7 | 29 | 11 |
| 1958 | 26415 | | 6838 | 100 | 1207 | | 27264 | 623 | 4940 | 1494 | 1166 | 41 | 0 | 1 | 0 | 2 | 23 | 3 |
| 1959 | 20338 | | 5897 | 100 | 1649 | | 18158 | 1828 | 3773 | 1684 | 1484 | 86 | 0 | 2 | 0 | 9 | 31 | 5 |
| 1960 | 19842 | | 6172 | 100 | 1032 | | 18786 | 536 | 3516 | 1300 | 1032 | | 0 | 2 | 0 | 3 | 27 | 0 |
| 1961 | 21657 | | 6326 | 100 | 1620 | | 20943 | 454 | 4114 | 1500 | 1620 | | 0 | 2 | 0 | 2 | 27 | 0 |
| 1962 | 24079 | | 5278 | 100 | 5799 | | 23558 | 370 | 3503 | 1300 | 5799 | | 0 | 2 | 0 | 2 | 27 | 0 |
| 1963 | 9314 | | 6943 | 100 | 13838 | | 9057 | 176 | 5106 | 1400 | 13838 | | 0 | 1 | 0 | 2 | 22 | 0 |
| 1964 | 10863 | | 6245 | 100 | 18608 | | 10424 | 44 | 5600 | 700 | 18671 | | 0 | 2 | 0 | 0 | 11 | 0 |
| 1965 | 11046 | | 5949 | 100 | 14167 | | 11001 | 23 | 5114 | 900 | 14171 | | 0 | 2 | 0 | 0 | 15 | 0 |
| 1966 | 9649 | | 5335 | 100 | 8080 | | 9539 | 2 | 4626 | 700 | 8090 | | 0 | 2 | 0 | 0 | 13 | 0 |
| 1967 | 10819 | | 8815 | 100 | 5940 | | 10762 | 15 | 6556 | 2188 | 5940 | | 0 | 1 | 0 | 0 | 25 | 0 |
| 1968 | 5079 | | 8366 | 100 | 3176 | | 4789 | 8 | 7023 | 910 | 3176 | | 0 | 1 | 0 | 0 | 11 | 0 |
| 1969 | 6253 | | 8771 | 0 | 3012 | | 5997 | 1 | 7797 | 893 | 3012 | | 0 | 0 | 0 | 0 | 10 | 0 |
| 1970 | 6002 | 5 | 4802 | 0 | 5466 | | 5967 | 5 | 3976 | 738 | 5466 | | 0 | 0 | 0 | 0 | 16 | 0 |
| 1971 | 4706 | 105 | 6374 | 0 | 6591 | | 4656 | 105 | 5683 | 514 | 6591 | | 2 | 0 | 0 | 2 | 8 | 0 |
| 1972 | 4730 | 101 | 6000 | 0 | 3948 | | 4632 | 101 | 5889 | 69 | 3925 | 23 | 2 | 0 | 0 | 2 | 1 | 1 |
| 1973 | 4859 | 3 | 6150 | 0 | 3871 | | 4859 | 3 | 6041 | 66 | 3842 | 29 | 0 | 0 | 0 | 0 | 1 | 1 |
| 1974 | 6164 | 4 | 13117 | | 5390 | | 6107 | 1 | 13003 | 67 | 5351 | 42 | 0 | 0 | 0 | 0 | 1 | 1 |
| 1975 | 10176 | 4 | 11285 | | 5072 | | 10176 | 4 | 11183 | 97 | 5048 | 24 | 0 | 0 | 0 | 0 | 1 | 0 |
| 1976 | 5266 | 12 | 17090 | | 5880 | | 5266 | 9 | 16852 | 230 | 5761 | 122 | 0 | 0 | 0 | 0 | 1 | 2 |
| 1977 | 7148 | 5 | 11827 | | 6695 | | 7148 | 5 | 11522 | 305 | 6658 | 37 | 0 | 0 | 0 | 0 | 3 | 1 |
| 1978 | 6201 | 2 | 8912 | | 5765 | | 6017 | 2 | 8598 | 250 | 5760 | 5 | 0 | 0 | 0 | 0 | 3 | 0 |
| 1979 | 4854 | 1 | 7580 | | 6255 | | 4854 | 1 | 7224 | 243 | 6224 | 31 | 0 | 0 | 0 | 0 | 3 | 0 |
| 1980 | 4001 | 2 | 10056 | | 5783 | 1 | 3890 | 2 | 9761 | 282 | 5783 | 19 | 0 | 0 | 0 | 0 | 3 | 0 |
| 1981 | 3578 | 2 | 10525 | | 5766 | 4 | 3251 | 2 | 10190 | 335 | 5766 | 4 | 0 | 0 | 0 | 0 | 3 | 0 |
| 1982 | 6693 | 0 | 15732 | | 1655 | | 6673 | 25 | 15145 | 582 | 1432 | 10 | 0 | 0 | 0 | 0 | 4 | 1 |
| 1983 | 8058 | 1 | 13640 | | 2554 | | 7971 | 134 | 12936 | 704 | 2542 | | 0 | 0 | 0 | 2 | 5 | 0 |
| 1984 | 7421 | 6 | 17046 | | 2299 | 2 | 7172 | 224 | 15371 | 1675 | 2278 | 2 | 0 | 0 | 0 | 3 | 10 | 0 |
| 1985 | 4766 | 40 | 16842 | 415 | 2680 | | 4741 | 65 | 14068 | 3189 | 2663 | 6 | 1 | 2 | 0 | 1 | 18 | 0 |
| 1986 | 4683 | 4 | 14352 | 220 | 2329 | 0 | 4630 | 57 | 10993 | 3579 | 2316 | 0 | 0 | 2 | 0 | 1 | 25 | 0 |
| 1987 | 4453 | 0 | 13414 | 404 | 2504 | 0 | 4096 | 357 | 10975 | 2800 | 2501 | 2 | 0 | 3 | 0 | 8 | 20 | 0 |
| 1988 | 6945 | 6 | 16953 | 225 | 2896 | 6 | 6725 | 226 | 14272 | 2906 | 2890 | 6 | 0 | 1 | 0 | 3 | 17 | 0 |
| 1989 | 5442 | 6 | 14999 | 714 | 2764 | 2 | 5180 | 254 | 12315 | 3325 | 2756 | 3 | 0 | 5 | 0 | 5 | 21 | 0 |
| 1990 | 6239 | 74 | 17039 | 247 | 2781 | 1 | 5952 | 88 | 15607 | 1611 | 2777 | 3 | 1 | 1 | 0 | 1 | 9 | 0 |
| 1991 | 6538 | 5 | 19720 | 126 | 2927 | 2 | 6533 | 23 | 18303 | 1581 | 2918 | 2 | 0 | 1 | 0 | 0 | 8 | 0 |
| 1992 | 7396 | 0 | 24186 | 249 | 2295 | 1 | 7583 | 36 | 22137 | 2095 | 2281 | 1 | 0 | 1 | 0 | 0 | 9 | 0 |
| 1993 | 9280 | 37 | 24795 | 146 | 2383 | 1 | 9195 | 56 | 23080 | 1830 | 2366 | 1 | 0 | 1 | 0 | 1 | 7 | 0 |
| 1994 | 6724 | 330 | 39050 | 665 | 2111 | 2 | 6561 | 369 | 36183 | 3635 | 2111 | 2 | 5 | 2 | 0 | 5 | 9 | 0 |
| 1995 | 9780 | 0 | 36995 | 322 | 2447 | 1 | 9646 | 0 | 36279 | 1363 | 2424 | 1 | 0 | 1 | 0 | 0 | 4 | 0 |
| 1996 | 12098 | 0 | 39157 | 241 | 2509 | 3 | 12674 | 0 | 36643 | 1504 | 2508 | 6 | 0 | 1 | 0 | 0 | 4 | 0 |
| 1997 | 16379 | | 34743 | 88 | 2332 | 2 | 16781 | 75 | 32389 | 1230 | 2332 | 2 | 0 | 0 | 0 | 0 | 4 | 0 |
| 1998 | 11629 | 1 | 28844 | 55 | 2656 | 1 | 11730 | 9 | 27120 | 1605 | 2656 | 1 | 0 | 0 | 0 | 0 | 6 | 0 |
| 1999 | 10244 | 3 | 22821 | 39 | 2772 | 0 | 9593 | 3 | 19793 | 3041 | 2770 | 2 | 0 | 0 | 0 | 0 | 13 | 0 |
| 2000 | 10053 | 8 | 22993 | 488 | 2775 | 0 | 10538 | 9 | 22094 | 1147 | 2774 | 1 | 0 | 2 | 0 | 0 | 5 | 0 |
| 2001 | 10077 | 9 | 24616 | | 2784 | 0 | 10074 | 12 | 23322 | 1207 | 2783 | 1 | 0 | 0 | 0 | 0 | 5 | 0 |
| 2002 | 10347 | | 23752 | 22 | 3319 | | 10344 | 3 | 22120 | 1308 | 3318 | 1 | 0 | 0 | 0 | 0 | 6 | 0 |
| 2003 | 7396 | 0 | 23730 | | 2305 | | 7362 | 0 | 20777 | 3036 | 2305 | 0 | 0 | 0 | 0 | 0 | 13 | 0 |
| 2004 | 7410 | 0 | 24214 | | 2125 | | 7147 | 263 | 22550 | 1433 | 2125 | 0 | 0 | 0 | 0 | 4 | 6 | 0 |
| 2005 | 9039 | | 26796 | | 1756 | | 8218 | 818 | 25992 | 834 | 1756 | | 0 | 0 | 0 | 9 | 3 | 0 |
| 2006 | 7802 | | 23855 | | 1811 | | 7347 | 189 | 22662 | 511 | 1811 | | 0 | 0 | 0 | 3 | 2 | 0 |
| 2007 | 8441 | 0 | 24325 | 0 | 1638 | | 8037 | 0 | 25862 | 634 | 1638 | | 0 | 0 | 0 | 0 | 2 | 0 |
| 2008 | 8243 | 0 | 16217 | 0 | 1999 | 0 | 7639 | 5 | 16058 | 159 | 1995 | 4 | 0 | 0 | 0 | 0 | 1 | 0 |
| 2009 | 6684 | 0 | 13133 | 0 | 1980 | | 6683 | 1 | 13014 | 66 | 1980 | | 0 | 0 | 0 | 0 | 1 | 0 |
| 2010 | 4379 | 0 | 6959 | 0 | 1857 | | 4290 | 23 | 6373 | 469 | 1876 | | 0 | 0 | 0 | 1 | 7 | 0 |
| 2011 | 3984 | 0 | 5790 | 0 | 2007 | | 3984 | 0 | 5477 | 313 | 2006 | 0 | 0 | 0 | 0 | 0 | 5 | 0 |
| 2012 | 3834 | 0 | 7100 | 0 | 1754 | | 3832 | 2 | 7063 | 37 | 1754 | | 0 | 0 | 0 | 0 | 1 | 0 |
| 2013 | 4163 | | 9081 | 0 | 1482 | | 4163 | 0 | 9013 | 68 | 1482 | | 0 | 0 | 0 | 0 | 1 | 0 |
| 2014 | 3918 | | 9343 | 0 | 1626 | | 3918 | 0 | 9263 | 70 | 1626 | | 0 | 0 | 0 | 0 | 1 | 0 |
| 2015 | 4841 | | 11359 | 0 | 1842 | | 4724 | 18 | 10839 | 92 | 943 | 897 | 0 | 0 | 0 | 0 | 1 | 49 |

**Table 4.** Bluefin tuna catalogue with all (period 1950-2015) the new datasets (in number of fish) recovered/revised since October/2014 (thus, never used in any catch-at-size estimations), by stock/area, data source, gear group, flag and frequency type. It contains Official revisions (Off-REP), GBYP recoveries (GBYP), PS size samples from farmed tuna back-calculated to reduce growth (szFarmBack), size frequencies obtained from mean weights (szMeanW) for France and Spain (under preparation), and, size from stereoscopic-cameras (StereoCams).

**Period (1950-1989)**

| | | | | | | | 1950 | | | | | | 1960 | | | | 1970 | | | | | | | | 1980 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stock/area | DSource | GearGrp | Flag | TimeST | GeoST | FreqType | 1950 | 1951 | 1952 | 1953 | 1954 | 1956 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
| ATW | OF-REP | LL | Japan | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | 5382 | 6808 | 4746 | 4902 | 4062 | 2260 | 197 | 944 | 793 | 2040 | 2704 | 2644 | 3357 | 1536 |
| ATE | GBYP | BB | EU.España | mm | 5x5 | SFL (1 cm) | | | | 1585 | | 2190 | 7175 | 4766 | 5648 | 959 | 1198 | 1772 | 1790 | 2757 | 1274 | | | | | | | | | | | | | | |
| | | PS | Norway | mm | 1x1 | SFL (1 cm) | 243 | 177 | 2800 | 8239 | 3380 | | | | | | | | | | | | | | 155 | | | | | 734 | | | | | |
| | OF-REP | LL | Japan | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | 1775 | 1934 | 52 | 700 | 820 | 897 | 56 | 2295 | 909 | 605 | 1042 | 1409 | 1462 | 1451 |
| MED | GBYP | HP | EU.Italy | mm | 1x1 | SFL (1 cm) | | | | | | | | | | | | | | | | 29 | 53 | 9 | 16 | 12 | 8 | 6 | 8 | 4 | 14 | 3 | 5 | 5 | 5 |
| | | PS | EU.Italy | mm | 1x1 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | 3184 | | 3550 | 2458 | 1513 | 851 | 524 | 395 |
| | OF-REP | LL | Japan | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | 318 | 368 | 5 | 121 | 362 | 124 | 122 | 290 | 756 | 2487 | 667 | 332 | 374 | 404 |

**Period (1990-2015)**

| | | | | | | | 1990 | | | | | | | | | | 2000 | | | | | | | | | | 2010 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stock/area | DSource | GearGrp | Flag | TimeST | GeoST | FreqType | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| ATW | OF-REP | HL | Canada | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | | 5 |
| | | HP | Canada | mm | 5x5 | SFL (1 cm) | | | | | | | | | | 211 | 57 | 143 | 76 | 46 | 41 | 49 | 78 | 74 | | | | | | | 50 | 95 |
| | | | U.S.A. | mm | ICCAT | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | 326 | 366 | 490 |
| | | LL | Canada | mm | 5x5 | SFL (1 cm) | | | | | | | | | | 94 | 2 | 22 | 148 | 9 | 231 | 265 | 361 | 452 | | | | | | | 346 | 377 |
| | | | Japan | mm | 5x5 | SFL (1 cm) | 721 | 830 | 1406 | 1367 | 1352 | 119 | 1221 | 528 | 1070 | 599 | 460 | 50 | 255 | 148 | 540 | | | | 3200 | 1082 | 2090 | 4889 | 1805 | 1505 | 1356 | 1481 |
| | | | Mexico | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | 92 | 204 | 232 |
| | | | U.S.A. | mm | ICCAT | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | 432 | 700 | 421 |
| | | PS | U.S.A. | mm | ICCAT | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | 192 | 270 | 313 |
| | | RR | Canada | mm | 5x5 | SFL (1 cm) | | | | | | | | | | 1377 | 1303 | 1540 | 2162 | 1946 | 1605 | 2044 | 2622 | 1535 | | | | | | | 1238 | 1461 |
| | | | U.S.A. | mm | ICCAT | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | 1965 | 2098 | 3077 |
| | | TL | Canada | mm | 5x5 | SFL (1 cm) | | | | | | | | | | 624 | 360 | 504 | 241 | 234 | 297 | 147 | 146 | 85 | | | | | | | 130 | 134 |
| | | TP | Canada | mm | 5x5 | SFL (1 cm) | | | | | | | | | | 139 | 48 | 51 | 100 | 250 | 123 | 35 | 14 | 5 | | | | | | | 65 | 29 |
| ATE | GBYP | BB | EU.España | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | Senegal | mm | 1x1 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | 17 | | | | | |
| | | PS | Norway | mm | 1x1 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | OF-REP | BB | EU.España | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | 863 | 692 | 236 |
| | | | EU.France | mm | 1x1 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | 134 | 380 | 73 |
| | | HL | EU.España | mm | 5x5 | SFL (5 cm) | | | | | | | | | | | | | | | | | | | | | | | | 133 | 184 | 505 |
| | | LL | China PR | mm | 5x5 | SFL (2 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 67 | 250 |
| | | | EU.France | mm | 1x1 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 74 | |
| | | | EU.Portugal | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | | 57 |
| | | | Iceland | mm | 1x1 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 122 | |
| | | | Japan | mm | 5x5 | SFL (1 cm) | 1666 | 1313 | 2326 | 1042 | 883 | 1709 | 1212 | 1448 | 1282 | 706 | 655 | 914 | 1380 | 1916 | 1695 | | | | 19079 | 16604 | 9594 | 7679 | 6887 | 7039 | 6337 | 7854 |
| | | TP | EU.España | mm | 5x5 | SFL (5 cm) | | | | | | | | | | | | | | | | | | | | | | | | 1037 | 39 | 1040 |
| | | | EU.Portugal | mm | 1x1 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 1271 | 1384 |
| | | | Maroc | mm | 1x1 | SFL (5 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 271 | 393 |
| | | TW | EU.France | mm | 1x1 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | 24 | 158 | 98 |
| | szFarmsBack | PS | EU.España | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | | 2867 | 5365 | 854 | 4012 | | 13052 | 2774 | | | |
| MED | GBYP | GN | EU.Italy | mm | 1x1 | SFL (1 cm) | | | | | | | 309 | | | | | | | | | | | | 4384 | | | | | | | |
| | | HL | EU.Italy | mm | 1x1 | SFL (1 cm) | | 30 | 103 | | 367 | 296 | | | 59 | 143 | | | | | 49 | | | | | | | | | | | |
| | | | Maroc | mm | 1x1 | SFL (1 cm) | | | | | | | | | | 341 | 466 | 217 | 229 | 312 | 193 | 5 | 23 | 8 | | 12 | | | | | | |
| | | HP | EU.Italy | mm | 1x1 | SFL (1 cm) | 15 | 4 | 11 | 12 | 11 | 11 | 7 | 8 | 13 | 4 | 15 | 9 | 8 | 24 | | | | | | | | | | | | |
| | | LL | EU.Italy | mm | 1x1 | SFL (1 cm) | | | | | 312 | 240 | 2 | | 8851 | | | | | 719 | 806 | 441 | 578 | 1077 | 492 | 1013 | 1327 | | | | | |
| | | PS | EU.Italy | mm | 1x1 | SFL (1 cm) | | | | | | | | | 5026 | 2394 | 1997 | | 354 | 1384 | 1060 | | | | | | | | | | | |
| | | TP | EU.Italy | mm | 1x1 | SFL (1 cm) | | | | 598 | 784 | 615 | 713 | 359 | 1819 | 2641 | 2178 | 1753 | 1577 | 1825 | 1077 | 759 | 948 | 1787 | 3404 | 2050 | 4437 | | | | | |
| | OF-REP | HL | EU.Croatia | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | 141 | 155 | | |
| | | LL | EU.Croatia | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | 15 | 27 | | |
| | | HL | EU.España | mm | 5x5 | SFL (5 cm) | | | | | | | | | | | | | | 30 | | | | | | | | | | 8 | | |
| | | | Maroc | mm | 1x1 | SFL (5 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 728 | 523 |
| | | LL | EU.Cyprus | qu | 10x10 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | 19 | 38 | 26 |
| | | | EU.España | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | 1201 | 816 | | | | | | | | | 628 | 910 | 559 |
| | | | EU.France | mm | 1x1 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | | 112 |
| | | | EU.Italy | mm | 1x1 | SFL (5 cm) | | | | | | | | | | | | | | | | | | | | | | | | 537 | | 495 |
| | | | EU.Malta | mm | 5x5 | CFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | 463 | 496 | 254 |
| | | | Japan | mm | 5x5 | SFL (1 cm) | 583 | 15 | 243 | 358 | 123 | 64 | 202 | | 62 | | | | | | | | | | | 108 | | | | | | |
| | | | Turkey | mm | 1x1 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 2 | |
| | | PS | Algerie | mm | 5x5 | SFL (5 cm) | | | | | | | | | | | 3053 | 783 | 681 | 1458 | 523 | | 632 | 743 | 312 | 691 | | | | | 44 | 49 |
| | | | Tunisie | mm | 1x1 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 1657 | |
| | | | Turkey | mm | 1x1 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 18 | 302 |
| | | RR | EU.Malta | mm | 5x5 | CFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | 6 | 21 | 32 |
| | szMeanW | PS | MIX.FR+ES | mm | 1x1 | SFL (1 cm) | | | | | ongoing work (ESP * FRA, size freqs from mean weights) | | | | | | | | | | | | | | | | | | | | | |
| | StereoCams | | Algerie | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 288 | 1010 |
| | | | EU.Croatia | mm | 5x6 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 3978 | 8568 |
| | | | MIX-FR+ES | mm | 5x7 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 4963 | 6240 |
| | | | EU.Italy | mm | 5x8 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 3456 | 3531 |
| | | | Libya | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 1007 | 898 |
| | | | NEI-COMB | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 2057 | 1138 |
| | | | Tunisie | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 536 | 942 |
| | | | Turkey | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | | | | | | | | | | 1700 | |
| | szFarmsBack | PS | EU.Croatia | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | 89 | | 3232 | 3803 | 2198 | 2745 | 6911 | 1549 | 10449 | 2330 | | | | |
| | | | EU.Cyprus | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | 1207 | 683 | 1089 | 759 | | | | | | | |
| | | | EU.España | mm | 5x5 | SFL (1 cm) | | | | | | 19 | 110 | | 551 | 187 | 72 | 149 | 75 | 82 | 1103 | 14632 | 20150 | 26767 | 3172 | 10431 | 15129 | 12614 | 3650 | 3701 | | |
| | | | EU.Greece | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | 507 | | 733 | | 119 | 1445 | 214 | 1272 | 388 | | | |
| | | | EU.Italy | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | 1924 | 3758 | 3132 | | | 280 | | 770 | | | | |
| | | | EU.Malta | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | 3997 | | 2626 | 4028 | 2607 | 5144 | 316 | 1544 | 4813 | | | |
| | | | Tunisie | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | | | | | 2238 | 3749 | | 3730 | 935 | 2347 | 3586 | 1366 | | |
| | | | Turkey | mm | 5x5 | SFL (1 cm) | | | | | | | | | | | | | 101 | 7880 | 3397 | 3128 | 7131 | 1261 | 11259 | 5837 | 9894 | 8757 | 943 | | | |

**Table 5.** Number of very large bluefin (SFL/CFL >= 350 cm) identified in the Task II actual size (T2SZ) dataset held in ICCAT-DB. The total number (161) represents less than 0.01% of the total fish available. This information will be validated by the CPCs and the Secretariat.

| | | | | | | | Size class (cm) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Flag | Stock | GearGrp | FleetCode | GearCode | FreqType | 350 | 352 | 353 | 354 | 355 | 357 | 358 | 359 | 360 | 361 | 362 | 364 | 365 | 366 | 368 | 370 | 371 | 373 | 374 | 375 | 377 | 380 | 381 | 383 | 385 | 392 | 395 | 398 | 401 | 415 | 416 | 420 | 425 | 434 | 435 | 438 | 440 | 444 | 465 | 470 | 475 | 485 | 490 | 495 | total |
| 1982 | U.S.A. | ATW | RR | USA | RR | CFL (1cm) | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | 1 |
| 1989 | Japan | MED | LL | JPN | LLHB | SFL (1cm) | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| 1993 | Japan | MED | LL | JPN | LLHB | SFL (1cm) | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| 1995 | Chinese Taipei | MED | LL | TAI | LL | SFL (1cm) | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | 1 |
| 1996 | Chinese Taipei | MED | LL | TAI | LL | SFL (1cm) | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| 1999 | EU.España | MED | HL | EU.ESP | HAND | SFL (5cm) | | | | | | | | | | | | | | | | 6 | | | | | | 72 | | | 3 | | | | | | | 1 | 1 | | 1 | | 1 | | | | 1 | 1 | | | 87 |
| | Mexico | ATW | LL | MEX | LL | SFL (1cm) | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| 2000 | Mexico | ATW | LL | MEX | LL | SFL (1cm) | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| 2003 | EU.Italy | MED | PS | EU.ITA | PS | SFL (1cm) | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | 1 |
| | | | TP | EU.ITA | TRAPM | SFL (1cm) | | 1 | | | | 1 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 |
| | Mexico | ATW | LL | MEX | LL | SFL (1cm) | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| 2004 | EU.Malta | MED | PS | EU.MLT | PS | SFL (1cm) | | | 1 | | | | | | 1 | 1 | 1 | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | 7 |
| | Mexico | ATW | LL | MEX | LL | SFL (1cm) | 1 | | | | | | | 1 | | | | | 1 | | | 1 | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | 5 |
| 2005 | EU.Portugal | ATE | TP | EU.PRT-PT-MAINLND | TRAP | SFL (5cm) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | 1 | 1 | | | 1 | | 4 |
| 2006 | Mexico | ATW | LL | MEX | LL | SFL (1cm) | | | | | | | | | | 1 | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| 2007 | EU.España | MED | PS | EU.ESP | PS | SFL (1cm) | | | | 1 | | | | | | | 1 | | | | 1 | | | | | | | | | | | 1 | | | 2 | | 1 | | | 1 | | 1 | | | | | | | | | 9 |
| | EU.Malta | MED | PS | EU.MLT | PS | SFL (1cm) | | | | | | | 1 | | 1 | | 1 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 |
| | Mexico | ATW | LL | MEX | LL | SFL (1cm) | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| 2008 | Mexico | ATW | LL | MEX | LL | SFL (1cm) | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| | Turkey | MED | PS | TUR | PS | SFL (1cm) | | | | | | | | | 1 | | | | | | | | | | 2 | 1 | | | 1 | | | | | | | | | | | | | | | | | | | | | | 5 |
| 2009 | EU.España | ATE | PS | EU.ESP | PS | SFL (1cm) | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| | | MED | PS | EU.ESP | PS | SFL (1cm) | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | 1 |
| | EU.Malta | MED | PS | EU.MLT | PS | SFL (1cm) | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| | Mexico | ATW | LL | MEX | LL | SFL (1cm) | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| 2010 | Mexico | ATW | LL | MEX | LL | SFL (1cm) | | | | | | | | | | | 1 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| 2011 | FR.St Pierre et Miquelon | ATW | LL | FR.SPM-CAN | LL | SFL (5cm) | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| | Mexico | ATW | LL | MEX | LL | SFL (1cm) | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6 |
| | Turkey | MED | PS | TUR | PS | SFL (1cm) | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| 2012 | Mexico | ATW | LL | MEX | LL | SFL (1cm) | 1 | | | | | | | | 1 | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | 3 |
| | Turkey | MED | PS | TUR | PS | SFL (1cm) | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| 2013 | Mexico | ATW | LL | MEX | LL | SFL (1cm) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| 2014 | Mexico | ATW | LL | MEX | LL | SFL (1cm) | | 1 | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | 2 |
| | U.S.A. | ATW | LL | USA-Com | LLD | SFL (1cm) | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| 2015 | Mexico | ATW | LL | MEX | LL | SFL (1cm) | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| total | | | | | | | 15 | 2 | 3 | 1 | 1 | 1 | 2 | 1 | 6 | 2 | 4 | 2 | 2 | 2 | 1 | 7 | 1 | 1 | 2 | 3 | 2 | 73 | 1 | 3 | 3 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 161 |

**Table 6.** Available abundance indices for the East Atlantic in 2017 (some indices will be updated by the end of April, 2017).

| Series | SP BB1 | | SP BB2 | | MOR TRAP | | MOR-SPN TRAP | | JPN LL | | JPN LL1 | | JPN LL2 | | Norway PS from Task II | | | Sardinian TRAP | | Portugal TRAP | | Balfegó PS | | Tunisian PS | | French Aerial survey | | GBYP Aerial Survey | | Larval Survey | | Potential larval survival |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Use in 2017 stock assessment | Yes | | Yes | | Yes (since 2012) | | Yes (up to 2011) | | Yes | | Yes | | Yes | | Yes (onlyin spatially disaggregated model) | | | No | | Yes (combine index with MOR trap) | | No | | No | | Yes | | No | | Yes | | No |
| age | 2-3 | | 3-6 | | 10+ | | 6+ | | 6 - 10 | | 4 - 10 | | 4 - 10 | | 10 + | | | 100-200cm | | 150-250cm | | 50-150kg | | | | 2-4 | | Spawners | | Spawners | | |
| indexing | Weight | | Weight | | Number | | Number | | Number | | Number | | Number | | Weight | | | Number | | Weight | | Weight | | Weight | | Number of schools | | | | | | |
| area | East Atlantic | | East Atlantic | | East Atl and Med | | East Atl and Med | | East Atl and Med | | NEast Atl | | NEast Atl | | East Atlantic | | | West Med | | East Atl and Med | | West Med | | West Med | | West Med | | Med | | West Med | | West Med |
| method | Delta lognormal RE | | Delta lognormal RE | | Neg. Binom. (log) no. | | Neg. Binom. (log) no. | | Delta Lognormal RE | | Delta Lognormal RE | | Delta Lognormal RE | | Nominal | | | | | Nominal | | | | | | | | | | | | |
| time of the year | Mid-year | | Mid-year | | Mid-year | | Mid-year | | Mid-year | | Begin-year | | Begin-year | | Unknown | | | | | Mid-year | | Mid-year | | Mid-year | | Mid-year | | | | | | |
| source | SCRS/2014/054 | | SCRS/2015/169 | | SCRS/2017/038 | | SCRS/2014/060 | | SCRS/2012/131 | | SCRS/2017/025 | | SCRS/2017/025 | | Task II | | | SCRS/2011/075 | | SCRS/2017/030 | | SCRS/2016/132 | | SCRS/2016/148 | | SCRS/2016/153 | | SCRS/2015/144 | | SCRS/P/2017/033 | | SCRS/P/2016/043 |
| Year | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Task I | Effort | CPUE | Std. CPUE | SE | Std. CPUE | CV | Std. CP UE | CV | Std. CPU E | Std Error | Index | CV | Index | CV | Index | CV | Index |
| 1952 | 179.22 | 0.43 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1953 | 184.74 | 0.53 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1954 | 226.46 | 0.41 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1955 | 187.01 | 0.42 | | | | | | | | | | | | | 13393.56 | 370.00 | 36.20 | | | | | | | | | | | | | | | |
| 1956 | 470.53 | 0.43 | | | | | | | | | | | | | 5313.48 | 250.00 | 21.25 | | | | | | | | | | | | | | | |
| 1957 | 315.05 | 0.41 | | | | | | | | | | | | | 6436.57 | 225.00 | 28.61 | | | | | | | | | | | | | | | |
| 1958 | 252.25 | 0.41 | | | | | | | | | | | | | 3860.14 | 160.00 | 24.13 | | | | | | | | | | | | | | | |
| 1959 | 506.79 | 0.41 | | | | | | | | | | | | | 3240.77 | 100.00 | 32.41 | | | | | | | | | | | | | | | |
| 1960 | 485.16 | 0.43 | | | | | | | | | | | | | 4214.80 | 90.00 | 46.83 | | | | | | | | | | | | | | | |
| 1961 | 327.29 | 0.41 | | | | | | | | | | | | | 8552.96 | 165.00 | 51.84 | | | | | | | | | | | | | | | |
| 1962 | 180.12 | 0.46 | | | | | | | | | | | | | 8730.29 | 135.00 | 64.67 | | | | | | | | | | | | | | | |
| 1963 | 312.09 | 0.49 | | | | | | | | | | | | | 167.05 | 100.00 | 1.67 | | | | | | | | | | | | | | | |
| 1964 | 457.40 | 0.42 | | | | | | | | | | | | | 1461.05 | 43.00 | 33.98 | | | | | | | | | | | | | | | |
| 1965 | 228.91 | 0.41 | | | | | | | | | | | | | 2505.75 | 36.00 | 69.60 | | | | | | | | | | | | | | | |
| 1966 | 349.10 | 0.42 | | | | | | | | | | | | | 999.73 | 28.00 | 35.70 | | | | | | | | | | | | | | | |
| 1967 | 345.89 | 0.41 | | | | | | | | | | | | | 2014.88 | 33.00 | 61.06 | | | | | | | | | | | | | | | |
| 1968 | 447.00 | 0.42 | | | | | | | | | | | | | 753.01 | 32.00 | 23.53 | | | | | | | | | | | | | | | |
| 1969 | 610.62 | 0.40 | | | | | | | | | | | | | 841.68 | 30.00 | 28.06 | | | | | | | | | | | | | | | |
| 1970 | 594.66 | 0.43 | | | | | | | | | | | | | 470.31 | 11.00 | 42.76 | | | | | | | | | | | | | | | |
| 1971 | 744.71 | 0.40 | | | | | | | | | | | | | 652.78 | 15.00 | 43.52 | | | | | | | | | | | | | | | |
| 1972 | 525.63 | 0.41 | | | | | | | | | | | | | 430.48 | 10.00 | 43.05 | | | | | | | | | | | | | | | |
| 1973 | 535.63 | 0.40 | | | | | | | | | | | | | 421.48 | 10.00 | 42.15 | | | | | | | | | | | | | | | |
| 1974 | 245.39 | 0.44 | | | | | | | | | | | | | 868.66 | 19.00 | 45.72 | | | | | | | | | | | | | | | |
| 1975 | 484.22 | 0.41 | | | | | | | 1.90 | 0.15 | | | | | 988.00 | 26.00 | 38.00 | | | | | | | | | | | | | | | |
| 1976 | 483.96 | 0.41 | | | | | | | 2.15 | 0.12 | | | | | 529.00 | 25.00 | 21.16 | | | | | | | | | | | | | | | |
| 1977 | 547.56 | 0.41 | | | | | | | 3.53 | 0.14 | | | | | 764.00 | 18.00 | 42.44 | | | | | | | | | | | | | | | |
| 1978 | 705.26 | 0.41 | | | | | | | 1.50 | 0.15 | | | | | 221.00 | 18.00 | 12.28 | | | | | | | | | | | | | | | |
| 1979 | 623.01 | 0.41 | | | | | | | 2.70 | 0.14 | | | | | 60.00 | 16.00 | 3.75 | | | | | | | | | | | | | | | |
| 1980 | 634.81 | 0.45 | | | | | | | 1.69 | 0.16 | | | | | 282.00 | 14.00 | 20.14 | | | | | | | | | | | | | | | |
| 1981 | 510.66 | 0.42 | | | | | 768.36 | 0.57 | 1.63 | 0.17 | | | | | | | | | | | | | | | | | | | | | | |
| 1982 | 503.78 | 0.42 | | | | | 1038.12 | 0.35 | 3.32 | 0.13 | | | | | | | | | | | | | | | | | | | | | | |
| 1983 | 625.14 | 0.43 | | | | | 1092.05 | 0.35 | 2.12 | 0.13 | | | | | | | | | | | | | | | | | | | | | | |
| 1984 | 331.71 | 0.45 | | | | | 1200.27 | 0.35 | 1.62 | 0.12 | | | | | | | | | | | | | | | | | | | | | | |
| 1985 | 1125.74 | 0.41 | | | | | 814.46 | 0.35 | 1.75 | 0.15 | | | | | | | | | | | | | | | | | | | | | | |
| 1986 | 751.21 | 0.42 | | | | | 394.33 | 0.28 | 1.32 | 0.14 | | | | | | | | | | | | | | | | | | | | | | |
| 1987 | 1008.43 | 0.42 | | | | | 433.53 | 0.28 | 2.16 | 0.13 | | | | | | | | | | | | | | | | | | | | | | |
| 1988 | 1394.68 | 0.42 | | | | | 1014.56 | 0.28 | 1.35 | 0.14 | | | | | | | | | | | | | | | | | | | | | | |
| 1989 | 1285.60 | 0.40 | | | | | 531.45 | 0.26 | 1.05 | 0.16 | | | | | | | | | | | | | | | | | | | | | | |
| 1990 | 986.51 | 0.41 | | | | | 614.37 | 0.23 | 1.41 | 0.14 | 0.47 | 0.35 | | | | | | | | | | | | | | | | | | | | 0.38 |
| 1991 | 901.20 | 0.42 | | | | | 727.86 | 0.23 | 1.21 | 0.13 | 0.53 | 0.31 | | | | | | | | | | | | | | | | | | | | 0.26 |
| 1992 | 695.16 | 0.43 | | | | | 313.95 | 0.23 | 1.03 | 0.14 | 0.87 | 0.24 | | | | | | | | | | | | | | | | | | | | 0.23 |
| 1993 | 2093.55 | 0.40 | | | | | 325.36 | 0.23 | 1.04 | 0.14 | 0.74 | 0.22 | | | | | | 1.17 | 0.33 | | | | | | | | | | | | | 0.33 |
| 1994 | 1007.03 | 0.42 | | | | | 341.90 | 0.23 | 1.12 | 0.16 | 0.93 | 0.23 | | | | | | 1.04 | 0.47 | | | | | | | | | | | | | 0.34 |
| 1995 | 1235.91 | 0.41 | | | | | 223.43 | 0.23 | 1.42 | 0.15 | 0.97 | 0.22 | | | | | | 1.44 | 0.33 | | | | | | | | | | | | | 0.32 |
| 1996 | 1739.29 | 0.40 | | | | | 375.22 | 0.25 | 0.50 | 0.22 | 2.84 | 0.22 | | | | | | 1.56 | 0.38 | | | | | | | | | | | | | 0.34 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997 | 2246.41 | 0.40 | | | | | 992.41 | 0.25 | 0.53 | 0.21 | 1.51 | 0.24 | | | 1.08 | 0.47 | | | | | | | | | | | 0.35 |
| 1998 | 879.51 | 0.41 | | | 18.99 | 0.13 | 925.14 | 0.25 | 0.71 | 0.17 | 0.87 | 0.25 | | | 2.18 | 0.38 | 0.66 | | | | | | | | | | 0.34 |
| 1999 | 339.77 | 0.44 | | | 17.54 | 0.14 | 1137.45 | 0.25 | 0.64 | 0.22 | 1.25 | 0.22 | | | 2.49 | 0.33 | 0.06 | | | | | | | | | | 0.36 |
| 2000 | 960.44 | 0.40 | | | 20.90 | 0.14 | 739.23 | 0.23 | 0.74 | 0.20 | 0.98 | 0.22 | | | 1.90 | 0.47 | 0.64 | 9.13 | | | 0.01 | 0.38 | | | | | 0.37 |
| 2001 | 704.49 | 0.45 | | | 24.96 | 0.10 | 1284.62 | 0.23 | 0.96 | 0.17 | 1.83 | 0.21 | | | 2.81 | 0.47 | 0.37 | 9.10 | | | 0.01 | 0.45 | | | 5.50 | 0.18 | 0.37 |
| 2002 | 687.42 | 0.42 | | | 25.79 | 0.11 | 1130.42 | 0.23 | 2.05 | 0.15 | 0.82 | 0.22 | | | 2.52 | 0.47 | 0.27 | 9.51 | | | 0.01 | 0.46 | | | 2.76 | 0.26 | 0.32 |
| 2003 | 444.91 | 0.48 | | | 13.53 | 0.15 | 662.66 | 0.24 | 1.70 | 0.13 | 1.10 | 0.24 | | | 1.65 | 0.28 | 0.24 | 9.12 | | | 0.00 | 0.26 | | | 13.40 | 0.25 | 0.39 |
| 2004 | 1210.46 | 0.42 | | | 4.25 | 0.30 | 332.36 | 0.23 | 0.82 | 0.18 | 0.84 | 0.22 | | | 1.75 | 0.28 | 0.48 | 9.39 | | | | | | | 9.03 | 0.20 | 0.29 |
| 2005 | 2383.57 | 0.40 | | | 15.55 | 0.13 | 677.39 | 0.23 | 0.88 | 0.15 | 0.75 | 0.21 | | | 1.00 | 0.47 | 0.29 | 9.12 | | | | | | | 3.56 | 0.17 | 0.38 |
| 2006 | 850.09 | 0.48 | | | 42.46 | 0.11 | 633.94 | 0.23 | 1.91 | 0.15 | 0.83 | 0.22 | | | 2.31 | 0.47 | 0.46 | 9.21 | | | | | | | | | 0.35 |
| 2007 | | | 2179.98 | 0.31 | 60.24 | 0.10 | 1000.60 | 0.23 | 0.94 | 0.19 | 0.84 | 0.22 | | | 2.32 | 0.38 | 0.25 | 9.16 | | | | | | | | | 0.38 |
| 2008 | | | 2154.01 | 0.30 | 15.40 | 0.16 | 634.18 | 0.23 | 1.22 | 0.17 | 1.17 | 0.21 | | | 2.18 | 0.29 | 0.16 | 9.44 | | | | | | | | | 0.33 |
| 2009 | | | 955.38 | 0.30 | 16.05 | 0.14 | 876.71 | 0.23 | 1.04 | 0.24 | 1.50 | 0.21 | | | 2.50 | 0.38 | 0.32 | 9.38 | 4.09 | 0.10 | 0.01 | 0.33 | | | | | 0.37 |
| 2010 | | | 2126.20 | 0.31 | 22.63 | 0.19 | 1042.24 | 0.24 | | | | | 2.22 | 0.22 | 3.31 | 0.33 | 2.15 | 9.55 | 3.22 | 0.13 | 0.01 | 0.36 | | | | | 0.31 |
| 2011 | | | 2785.47 | 0.30 | 19.78 | 0.16 | 674.97 | 0.23 | | | | | 4.45 | 0.26 | | | 5.62 | 9.39 | 1.44 | 0.36 | 0.02 | 0.24 | 593968 | 45.50 | | | 0.41 |
| 2012 | | | 2306.99 | 0.39 | 35.57 | 0.16 | 1187.75 | 0.24 | | | | | 7.70 | 0.31 | | | 3.43 | 10.47 | 4.34 | 0.12 | 0.04 | 0.26 | | | 41.05 | 0.07 | 0.36 |
| 2013 | | | 1569.13 | 0.44 | 96.42 | 0.12 | | | | | | | 6.11 | 0.26 | | | 7.19 | 10.64 | 4.31 | 0.13 | | | 209486 | 44.50 | 21.83 | 0.08 | 0.27 |
| 2014 | | | 678.29 | 0.41 | 69.73 | 0.13 | | | | | | | 9.70 | 0.30 | | | 3.54 | 12.46 | 6.55 | 0.08 | 0.05 | 0.23 | | | 25.41 | 0.10 | 0.37 |
| 2015 | | | | | 58.37 | 0.13 | | | | | | | 5.91 | 0.30 | | | 5.99 | 10.97 | 4.56 | 0.11 | 0.03 | 0.30 | 413410 | 44.70 | 54.29 | 0.07 | 0.39 |
| 2016 | | | | | 47.11 | 0.15 | | | | | | | 5.47 | 0.28 | | | 6.37 | 11.36 | | | 0.07 | 0.24 | | | | | 0.35 |
| 2017 | | | | | | | | | | | | | 7.19 | 0.30 | | | | | | | | | | | | | |

**Table 7.** Available abundance indices for the West Atlantic in 2017 (some indices will be updated by the end of April, 2017).

| Series | US RR 66-114cm | | US RR 115-144cm | | US RR >177cm | | US RR<145cm | | US RR>195cm | | US GOM PLL1 | | US GOM PLL2 | | Larval Survey | | JPN LL1 | | JPN LL2 | | JPN LL GOM | | CAN GSL | | CAN SWNS | | CAN combined RR | | Oceanographic index | | Acoustic survey | | Tagging | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Use in 2017 stock assessment | Yes | | Yes | | Yes | | No | | No | | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | | No | | No | | Yes | | No | | Yes | | Yes (index of relative mortality rates) | |
| age | 66-114cm | | 115-144cm | | >177cm | | <145cm | | >195cm | | | | | | | | 4 - 10 | | 4 - 10 | | 9-16 | | 8-16 | | 5-16 | | 5-16 | | | | 5-16 | | 1-3 | |
| indexing | Number | | Number | | Number | | Number | | Number | | | | | | | | Number | | Number | | Number | | | | | | | | | | | | Relative mortality | |
| area | | | | | | | | | | | GOM | | GOM | | GOM | | West Atl | | West Atl | | GOM | | Gulf of St. Lawrence | | SW Nova Scotia | | GSL & SWNS | | GOM | | off PEI | | West Atl | |
| method | GLMM | | GLMM | | GLMM | | GLMM | | GLMM | | | | | | | | Delta Lognormal RE | | Delta Lognormal RE | | Delta Lognormal RE | | | | | | | | | | | | time at large | |
| time of the year | | | | | | | | | | | | | | | | | | | Begin-year | | Begin-year | | | | | | | | | | | | average of year | |
| source | SCRS/2016/198 | | SCRS/2016/198 | | SCRS/2016/198 | | SCRS/1993/067 | | SCRS/1993/067 | | SCRS/2015/199 | | SCRS/2015/199 | | SCRS/2014/057 | | SCRS/2016/122 | | SCRS/2016/122 | | SCRS/1991/071 | | SCRS/2017/020 | | SCRS/2017/020 | | SCRS/2017/020 | | SCRS/P/2016/037 | | SCRS/2017/016 | | SCRS/2000/99 | |
| Year | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Std. CPUE | CV | Index | CV |
| 1970 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.65 | 0.21 |
| 1971 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.69 | 0.21 |
| 1972 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.43 | 0.23 |
| 1973 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.00 | 0.28 |
| 1974 | | | | | | | | | | | | | | | | | | | | | 0.97 | 0.27 | | | | | | | | | | | 0.64 | 0.21 |
| 1975 | | | | | | | | | | | | | | | | | | | | | 0.53 | 0.21 | | | | | | | | | | | 0.52 | 0.22 |
| 1976 | | | | | | | | | | | | | | | | | 0.39 | 0.40 | | | 0.67 | 0.21 | | | | | | | | | | | 0.48 | 0.23 |
| 1977 | | | | | | | | | | | | | | | 2.42 | 0.48 | 0.89 | 0.31 | | | 0.91 | 0.22 | | | | | | | | | | | 0.86 | 0.20 |
| 1978 | | | | | | | | | | | | | | | 4.63 | 0.23 | 0.73 | 0.33 | | | 0.88 | 0.23 | | | | | | | | | | | 0.62 | 0.22 |
| 1979 | | | | | | | | | | | | | | | | | 0.82 | 0.28 | | | 1.29 | 0.28 | | | | | | | | | | | 0.62 | 0.22 |
| 1980 | | | | | | | 0.80 | 0.43 | | | | | | | | | 1.40 | 0.28 | | | 1.16 | 0.27 | | | | | | | | | | | 0.82 | 0.20 |
| 1981 | | | | | | | 0.40 | 0.52 | | | | | | | 1.15 | 0.81 | 1.11 | 0.26 | | | 0.55 | 0.24 | | | | | | | | | | | 0.90 | 0.20 |
| 1982 | | | | | | | 2.10 | 0.33 | | | | | | | 1.36 | 1.20 | 0.78 | 0.27 | | | | | | | | | | | | | | | | |
| 1983 | | | | | | | 1.11 | 0.26 | 2.81 | 0.10 | | | | | 0.90 | 1.02 | 0.46 | 0.34 | | | | | | | | | | | | | | | | |
| 1984 | | | | | | | | | 1.25 | 0.19 | | | | | 0.31 | 0.32 | 0.67 | 0.29 | | | | | 0.35 | 0.10 | | | 0.42 | 0.14 | | | | | | |
| 1985 | | | | | | | 0.63 | 0.64 | 0.86 | 0.30 | | | | | | | 0.83 | 0.27 | | | | | 0.22 | 0.10 | | | 0.49 | 0.12 | | | | | | |
| 1986 | | | | | | | 0.78 | 0.43 | 0.50 | 1.10 | | | | | 0.34 | 0.42 | 0.01 | 1.55 | | | | | 0.15 | 0.11 | | | 0.54 | 0.12 | | | | | | |
| 1987 | | | | | | | 1.22 | 0.40 | 0.53 | 0.48 | 1.31 | 0.29 | | | 0.31 | 0.46 | 0.37 | 0.33 | | | | | 0.13 | 0.13 | | | 0.52 | 0.12 | | | | | | |
| 1988 | | | | | | | 0.99 | 0.38 | 0.94 | 0.36 | 0.64 | 0.32 | | | 1.13 | 0.32 | 0.35 | 0.37 | | | | | 0.13 | 0.12 | 1.60 | 0.21 | 0.45 | 0.11 | | | | | | |
| 1989 | | | | | | | 0.99 | 0.43 | 0.76 | 0.36 | 0.99 | 0.31 | | | 0.70 | 0.36 | 0.69 | 0.30 | | | | | 0.16 | 0.11 | 0.98 | 0.20 | 0.35 | 0.11 | | | | | | |
| 1990 | | | | | | | 0.90 | 0.34 | 0.63 | 0.34 | 0.77 | 0.32 | | | 0.34 | 0.35 | 0.48 | 0.32 | | | | | 0.23 | 0.10 | 0.67 | 0.20 | 0.28 | 0.10 | | | | | | |
| 1991 | | | | | | | 1.26 | 0.35 | 0.82 | 0.28 | 1.29 | 0.30 | | | 0.31 | 0.57 | 0.60 | 0.30 | | | | | 0.31 | 0.10 | 0.56 | 0.20 | 0.24 | 0.10 | | | | | | |
| 1992 | | | | | | | 0.82 | 0.42 | 0.91 | 0.28 | | | 1.14 | 0.35 | 0.43 | 0.34 | 1.09 | 0.26 | | | | | 0.36 | 0.09 | 0.55 | 0.20 | 0.23 | 0.10 | | | | | | |
| 1993 | 1.16 | 0.36 | 1.10 | 0.21 | 0.66 | 0.30 | | | | | | | 0.64 | 0.36 | 0.47 | 0.66 | 0.98 | 0.27 | | | | | 0.34 | 0.08 | 0.57 | 0.20 | 0.24 | 0.10 | 0.22 | | | | | |
| 1994 | 0.27 | 0.44 | 0.28 | 0.38 | 0.89 | 0.28 | | | | | | | 0.47 | 0.39 | 0.53 | 0.34 | 0.90 | 0.27 | | | | | 0.26 | 0.07 | 0.57 | 0.20 | 0.27 | 0.10 | 0.26 | | 0.03 | 0.28 | | |
| 1995 | 1.15 | 0.34 | 0.61 | 0.22 | 1.09 | 0.26 | | | | | | | 0.44 | 0.39 | 0.23 | 0.54 | 0.59 | 0.34 | | | | | 0.18 | 0.07 | 0.52 | 0.20 | 0.28 | 0.10 | 0.25 | | 0.03 | 0.14 | | |
| 1996 | 1.71 | 0.37 | 0.73 | 0.22 | 3.57 | 0.25 | | | | | | | 0.26 | 0.40 | 0.78 | 0.49 | 2.24 | 0.27 | | | | | 0.13 | 0.07 | 0.45 | 0.20 | 0.29 | 0.10 | 0.20 | | 0.07 | 0.10 | | |
| 1997 | 2.47 | 0.32 | 0.21 | 0.35 | 1.42 | 0.37 | | | | | | | 0.46 | 0.36 | 0.34 | 0.38 | 1.64 | 0.26 | | | | | 0.11 | 0.07 | 0.41 | 0.20 | 0.30 | 0.10 | 0.27 | | 0.04 | 0.12 | | |
| 1998 | 1.44 | 0.36 | 0.77 | 0.17 | 1.56 | 0.25 | | | | | | | 0.50 | 0.37 | 0.11 | 0.54 | 0.76 | 0.29 | | | | | 0.11 | 0.07 | 0.43 | 0.20 | 0.32 | 0.10 | 0.21 | | 0.04 | 0.21 | | |
| 1999 | 1.39 | 0.42 | 0.85 | 0.31 | 1.99 | 0.28 | | | | | | | 0.85 | 0.33 | 0.46 | 0.51 | 1.14 | 0.26 | | | | | 0.13 | 0.07 | 0.50 | 0.20 | 0.36 | 0.10 | 0.23 | | 0.04 | 0.12 | | |
| 2000 | 0.99 | 0.50 | 1.33 | 0.39 | 0.60 | 0.27 | | | | | | | 1.24 | 0.33 | 0.24 | 0.51 | 1.13 | 0.27 | | | | | 0.18 | 0.06 | 0.62 | 0.20 | 0.44 | 0.10 | 0.25 | | 0.02 | 0.14 | | |
| 2001 | 0.48 | 0.34 | 1.59 | 0.20 | 1.51 | 0.29 | | | | | | | 0.71 | 0.38 | 0.44 | 0.32 | 0.92 | 0.27 | | | | | 0.23 | 0.06 | 0.76 | 0.20 | 0.56 | 0.10 | 0.30 | | 0.04 | 0.15 | | |
| 2002 | 1.54 | 0.39 | 2.55 | 0.26 | 1.85 | 0.23 | | | | | | | 0.66 | 0.39 | 0.24 | 0.62 | 0.78 | 0.28 | | | | | 0.28 | 0.07 | 0.88 | 0.20 | 0.71 | 0.10 | 0.38 | | 0.02 | 0.19 | | |
| 2003 | 0.42 | 0.33 | 0.63 | 0.15 | 0.47 | 0.27 | | | | | | | 1.19 | 0.32 | 0.77 | 0.39 | 1.23 | 0.29 | | | | | 0.32 | 0.07 | 0.97 | 0.20 | 0.87 | 0.10 | 0.24 | | 0.04 | 0.14 | | |
| 2004 | 2.31 | 0.31 | 0.61 | 0.19 | 0.74 | 0.27 | | | | | | | 1.08 | 0.32 | 0.50 | 0.67 | 1.11 | 0.30 | | | | | 0.33 | 0.07 | 1.06 | 0.20 | 0.99 | 0.10 | 0.19 | | 0.04 | 0.07 | | |
| 2005 | 2.26 | 0.30 | 0.57 | 0.18 | 0.62 | 0.27 | | | | | | | 0.82 | 0.34 | 0.18 | 0.29 | 0.99 | 0.26 | | | | | 0.35 | 0.07 | 1.17 | 0.20 | 1.09 | 0.10 | 0.22 | | 0.05 | 0.05 | | |
| 2006 | 0.61 | 0.33 | 1.45 | 0.19 | 0.49 | 0.35 | | | | | | | 0.58 | 0.39 | 0.50 | 0.35 | 1.53 | 0.29 | | | | | 0.40 | 0.07 | 1.31 | 0.20 | 1.18 | 0.10 | 0.27 | | 0.06 | 0.07 | | |
| 2007 | 0.46 | 0.30 | 1.65 | 0.13 | 0.31 | 0.37 | | | | | | | 0.78 | 0.38 | 0.46 | 0.38 | 0.99 | 0.40 | | | | | 0.51 | 0.06 | 1.47 | 0.20 | 1.30 | 0.10 | 0.29 | | 0.04 | 0.13 | | |
| 2008 | 0.36 | 0.32 | 1.14 | 0.16 | 0.38 | 0.35 | | | | | | | 1.78 | 0.33 | 0.32 | 0.38 | 1.36 | 0.45 | | | | | 0.69 | 0.06 | 1.58 | 0.20 | 1.44 | 0.10 | 0.22 | | 0.03 | 0.08 | | |
| 2009 | 0.36 | 0.31 | 0.50 | 0.20 | 0.27 | 0.40 | | | | | | | 1.46 | 0.35 | 0.59 | 0.32 | 2.34 | 0.35 | | | | | 0.95 | 0.06 | 1.62 | 0.20 | 1.61 | 0.10 | 0.25 | | 0.06 | 0.09 | | |
| 2010 | 0.63 | 0.32 | 1.20 | 0.17 | 1.03 | 0.26 | | | | | | | 1.22 | 0.34 | 0.34 | 0.51 | | | 0.60 | 0.37 | | | 1.23 | 0.06 | 1.60 | 0.20 | 1.75 | 0.10 | 0.14 | | 0.07 | 0.04 | | |
| 2011 | 0.82 | 0.34 | 1.06 | 0.21 | 0.63 | 0.28 | | | | | | | 1.09 | 0.48 | 1.04 | 0.39 | | | 2.04 | 0.26 | | | 1.45 | 0.05 | 1.55 | 0.20 | 1.83 | 0.10 | 0.31 | | 0.05 | 0.08 | | |
| 2012 | 0.41 | 0.40 | 1.12 | 0.23 | 0.72 | 0.25 | | | | | | | 3.39 | 0.37 | 0.28 | 0.47 | | | 2.54 | 0.27 | | | 1.54 | 0.05 | 1.49 | 0.20 | 1.85 | 0.10 | | | 0.10 | 0.07 | | |
| 2013 | 0.57 | 0.35 | 1.77 | 0.20 | 0.47 | 0.29 | | | | | | | 1.23 | 0.42 | 0.99 | 0.34 | | | 1.91 | 0.26 | | | 1.54 | 0.05 | 1.43 | 0.20 | 1.84 | 0.10 | | | 0.06 | 0.06 | | |
| 2014 | 0.70 | 0.37 | 0.94 | 0.26 | 0.64 | 0.27 | | | | | | | 1.02 | 0.44 | 0.26 | 0.37 | | | 2.38 | 0.28 | | | 1.49 | 0.05 | 1.37 | 0.20 | 1.83 | 0.10 | | | 0.08 | 0.06 | | |
| 2015 | 0.45 | 0.39 | 0.35 | 0.33 | 1.09 | 0.23 | | | | | | | 1.02 | 0.47 | 0.39 | 0.31 | | | 1.46 | 0.27 | | | 1.45 | 0.05 | 1.31 | 0.21 | 1.85 | 0.10 | | | 0.08 | 0.10 | | |
| 2016 | | | | | | | | | | | | | 1.14 | 0.47 | 2.47 | 0.26 | | | 3.67 | 0.29 | | | 1.42 | 0.06 | | | 1.89 | 0.11 | | | | | | |
| 2017 | | | | | | | | | | | | | | | | | | | 3.64 | 0.31 | | | | | | | | | | | | | | |

**Table 8.** Criteria table for available abundance indices in East Atlantic for the 2017 stock assessment.

| Use in 2017 stock assessment | Yes | Yes | Yes | Yes (up to 2011) | Yes (since 2012) | Yes (combine index with MOR trap) | No | Yes | No | Yes | No | Yes (only in spatially disaggregated model) | No | No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paper | SCRS/2015/169 | SCRS/2012/131 | SCRS/2017/025 | SCRS/2014/060 | SCRS/2017/038 | SCRS/2017/030 | SCRS/2011/075 | SCRS/2017/044 | SCRS/2015/144 | SCRS/P/2017/033 | SCRS/P/2017/034 | TASK II | SCRS/2016/148 | SCRS/2016/132 |
| **Index** | **Bay of Biscay Baitboat** | **Japanese East Atl &Med LL** | **Japanese NEAtl LL** | **Morocco and Spanish traps** | **Moroccan trap** | **Portugal tuna Trap** | **Sardinian Traps** | **French Aerial survey** | **GBYP Aerial Survey** | **WMed larval index** | **Potential larval survival** | **Norway PS from Task II** | **Tunsian PS** | **Balfegó PS** |
| Diagnostics | 4 Most of the ap-propriate diagnostics are included | 4 (Most of the appropriate diagnostics appear to be included) | 4 (Most of the appropriate diagnostics appear to be included) | Most of the appropriate diagnostics appear to be included | 4 | No diagnostics | Appropriate diagnostics are included | NA (4) – Different methodologies applied to compute indices have been published in peer-reviewed journals | 5 - appropriate diagnostics are included for the four main spawning areas | 4-5 (QQ , residuals, tables of consistency provided in various documents) | 1 (no variance) | | 4 (Available and can be provided by authors) | No diagnostics |
| Appropriateness of data exclusions and classifications (e.g. to identify targeted trips) | 4 Data exclusions/class-ifications are listed and justified, specific targeting factors included in standardization | 5 (Data exclusions are covered and included only main BFT target months) | 5 (Data exclusions are covered and included only main BFT target months) | Data exclusions not discussed, targetting not an issue | 4 (All data used, no exclusion was made, BFT is the only target species for traps) | No data excluded but time series is short | Data are listed, detailed and standardised, methods are explained | 2 (raw data have been checked. Year 2013 was removed due to low effort. Corrections still remain to be implemented) | Data are fully listed and detailed, but the strategy was different for the two series of years - standardisation was done for the four main areas | 5 (sampling designed for the purpose, strong documented data selection) | N/A (Fishery independent index) | | 4 (All data used, no exclusion was made) | No data excluded |
| Geographical Coverage (East or west Atlantic? Or Med) | 3 Geographical coverage is limited to bay of Biscay, maps are provided | 5 (Northeast Atlantic, north of 40N, Distribution maps are provided) | 5 (Central and West Mediterranean and Northeast Atlanic 30-40N, Distribution maps are provided) | Coverage limited to the Straits of Gibraltar | 2 (Traps covered a relatively limited geographical area, but this applies to all other traps) | 5 (only trap area) | Geographical coverage is limited to the SW part of Sardinia | 4 The whole Gulf of Lions is covered and the area surveyed is constant over time. However two main improvements could be implemented in the future (i) survey coastal area to follow the extension of the fish repartition towards the coast (ii) other nursery areas have to be followed | 52% of the Mediterranean for the extended surveys, 10.7% of the Med for main areas | 3 (covering the hall Balearic spawning ground in half of the sampling years, 3/4 in the other half), not covering other spawning grounds in the Mediterranean | 5 (covers all spawning areas in Mediterranean) | | (Tunisian water) | 3-4 Balearic spawning ground (Western Med). One of the main spawning regions |
| Catch Fraction to the total catch weight (East or West) | 2 Catch fraction is roughly 5% | 10% | 8% | Unknown | Less than 5% | 4 (over 95% of BFT) | Catch fraction is roughly 1% of the EBFT | N/A | N/A | Fisheries independent | N/A (Fishery independent index) | | Less than 5% | Less than 5% |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of Time Series relative to the history of exploitation | 4 (1952-2006,2007-2014) | 5 (yes, 1975-2009) | 5 (yes, 1990-2009,2010-2017) | Time series starts at beginning of the 1980s | 4 (series runs from 1986 up to 2016) | 2 (series only runs from 1998) | Since 1993 to 2010 | 3 – Survey started in 2000 and 11 years of data available in 2016. 2004-2008 data gap. 2013 to low an effort | 2010, 2011, 2013, 2015 | 2 (2001 - to 2016) | 3-4 (Series runs from 1990-2016 and can be updated yearly) | | 2009-2016 | 2000-2016 |
| Are other indices available for the same time period? | 3 Yes, although not for juveniles | 5 (Yes) | 5 (Yes) | 3 | 1 (No other indices available, only traps are active in the study area) | 1 | No because there are not other Mediterranean traps | 5 only time series (I) fishery independent, (ii) for young fish and (iii) in the Mediterranean | Not for spawners | 4 (traps and purse seiners) unique fishery independent | 1 (all others) | | 3 (serie runs from 2009) | yes |
| Does the index standardization account for known factors that influence catchability /selectivity? | 4 The analysis includes many factors that could affect fishing efficiency/ selectivity. Multiple interactions included | 5 (gear type is included as is a selectivity proxy. Area*month interaction was considered as random effect) | 5 (gear type is included as is a selectivity proxy. Area*month interaction was considered as random effect) | Factors included in the model, table 1, are not explained in the text and impossible to understand for those not immediately familiar with the fishery. It would appear only one factor was included that could influence catchability - trap | 3 (standardised, with only 2 factors, including trap factor, catchability would not change significantly among traps as their technical caracteristics have not changed over time) | 1 (not standardized) | The standardisation was made with a constant system | 4 – Fishery independent index from scientific survey that does not have catchability-related caveats. Still some work to account for detectability of fish in relationship to vertical and horizontal behaviour linked to environmental fluctuations | Yes, all factors were considered for the four main areas | 4 (factors affecting catchability included, also environmental) | 5 (model based on experimental data, factors of variability controlled) | | No | 2-3 factors month vessel were not significant and area NA |
| Are there conflicts between the catch history and the CPUE response? | 3 No conflict noted | 5 (No conflict noted) | 5 (No conflict noted) | No conflict noted | 5 (No conflict noted) | | After the adoption of the quota the fishery was limited | 5 (No conflict noted) | N/A | 5 (good agreement ) 0.9 correlation with last assessment | 5 (No conflict noted) | | 5 (No) | 5 (No) |
| Is interannual CV high, and is there potential evidence of unaccounted process error (trends in deviations from production model dynamics, high peaks, multiple stanzas, increasing or decreasing catchability) | CV=0.48, 0.363 Variability increases over the latter years of the series | CV=0.49 %Devs 0.53 | CV=1.12 %Devs 0.64 northeast CPUE has trend in deviations in recent years and very high interannual CV | CV=1.25 %Devs 0.62 high interannual CV, very high spike in 2013 (no Spanish traps then) | CV=1.25 %Devs 0.62 high CV, positve trend to recent deviations | No values | CV=0.34 %Devs 0.47 Variability decreases over the latter years of the series, due to the quota | CV=0.71 %Devs 0.67 juvenile survey so could expect high CV, devs | No values | CV=0.155; 2017 update improved interannual CV | CV=0.19 %Devs 0.57 devs not as applicable age 0 recruitment proxy (make index on rec devs) | | CV=0.38 %Devs 0.5 high CV | CV=0.1 %Devs 0 very low CV, possible hyperstable |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assessment of data quality and adequacy of data for standardization purpose (e.g. sampling design, sample size, factors considered) | 3 Multiple factors and interactions included. Model design takes into account effort distribution. Discussions of data quality touched on. Since 2012, Bay of Biscay quota transferred, affecting seriously the quality of the data that could be used. Management regulations affected data quality but these effects are partially addressed | 5 (factors included. Sample design and sensitivity runs investigate effort distribution as well as data assumptions/ concerns and effort is presented) | 5 (information includes length frequencies of catches. Multiple factors included. Sample design and sensitivity runs investigate effort distribution as well as data assumptions/ concerns and effort is presented) | Document states LF data were recorded, but they are not presented. Document states series applied to spawners 10+, model is extremely low on factors | 3 (The assessment of catch data quality was carried out, interaction term was not included because of some gaps in data) | 1 (not standardized) | | NA – scientific index | Standardisation was possible for the four main areas, not for the extended areas | (Improving assessment for gear change effect approached) | 5 (controlled variables in experiment) | | 4 | 2 (standardisation was provided and rejected because the natural logarith of the nominal CPUE is more reliable) |
| Is this CPUE time series continuous? | 4 Yes | 5 (Yes) | 5 (Yes) | Yes | 5 Yes | 5 | Yes | 3- No. Gap in 2004-2008 and 2013 cannot be used | No | No (from the 2001-2016) data there is a gap from 2006 to 2011 | Yes | | 5 | 5 |
| Other comment | | This index will not be updated because of no operation in the Med for bluefin | | | | | Fisheries Research 127–128 (2012) 133–141 | This is a series for number of schools and not direct fish abundance | Power Analysis Report | | Extend to the western stock in Gulf of Mexico to possibly provide an index of recruitment for both areas for future assessments. Use to improve stock-recruitment relationships | | | The catch in the Gulf of Lion was not considered |

**Table 9.** Criteria table for available abundance indices in West Atlantic for the 2017 stock assessment.

| Use in 2017 stock assessment | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes | No | No | Yes | Yes | Yes | No | No | No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paper | SCRS/2017/025 | SCRS/1991 /071 | SCRS/2014 /058 | SCRS/2014 /055 | SCRS/2014 /055 | SCRS/2014 /055 | SCRS/1993 /067 | SCRS/1993 /067 | SCRS/2017 /020 | SCRS/2017 /020 | SCRS/2017 /020 | SCRS/2014 /057 | SCRS/2017/ 016 | SCRS/2000/99 | SCRS/P/ 2016/037 | SCRS/2015 /178 | SCRS/2015 /171 |
| **Index** | **Japanese West Atl LL** | **Japanese GOM LL** | **US Pelagic LL GOM** | **US Rod and Reel, 66-114** | **US Rod and Reel, 115-145** | **US Rod and Reel, >177** | **US Rod and Reel, <145** | **US Rod and Reel, >195** | **Combined CAN rod and reel** | **Southern Gulf of St. Lawrence RR** | **Southwest Nova Scotia RR** | **Larval survey** | **Canadian Acoustics** | **Tagging** | **Gulf of Mexico, Oceanog raphic index** | **Joint USA/CAN rod and reel** | **Joint USA/CAN PLL** |
| Diagnostics | 4 (Most of the appropriate diagnostics appear to be included) | 4 (Most of the appropriate diagnostics appear to be included) | 4 | N/A | N/A | N/A | N/A | N/A | All the appropriate diagnostics were included | All the appropriate diagnostics were included | All the appropriate diagnostics were included | Most of the appropriate diagnostics appear to be included | None. Perhaps compare with CPUE | N/A | 1 (no variance) | All the appropriate diagnostics were included | All the appropriate diagnostics were included |
| Appropriateness of data exclusions and classifications (e.g. to identify targeted trips) | 5 (Data exclusions are covered and included only main BFT target months) | 5 (Data exclusions are covered and included only main BFT target months) | 5 (uses vessel as a repeated measure) | 4 (Data exclusions are covered and included only trip that targeted bluefin tuna during the main fishing season) | 4 (Data exclusions are covered and included only trip that targeted bluefin tuna during the main fishing season) | 4 (Data exclusions are covered and included only trip that targeted bluefin tuna during the main fishing season) | 4 (Data exclusions are covered and included only trip that targeted bluefin tuna during the main fishing season) | 4 (Data exclusions are covered and included only trip that targeted bluefin tuna during the main fishing season) | Data exclusions are indicated, classifica-tions appropriate. | No Exclusions | No Exclusions | Data collection method clearly explained, as is a survey, presumably few data exclusions | Fairly certain that the targets are bluefin tuna. TS within acceptable bounds | N/A | N/A | Data exclusions are indicated, classifica-tions appropriate. Limited to bluefin tuna above 110 kgs or 177 cm in straight fork length | Data exclusions are indicated, classifica-tions appropriate |
| Geographical Coverage (East or west Atlantic? Or Med) | 5 (West Atlantic. Distribution maps are provided) | 5 (GOM, West Atlantic) | 3 (covers entire Northern Gulf of Mexico) | 3 (moderate coverage of the stock foraging grounds in the West Atlantic during the summer and early fall) | 3 (moderate coverage of the stock foraging grounds in the West Atlantic during the summer and early fall) | 3 (moderate coverage of the stock foraging grounds in the West Atlantic during the summer and early fall) | 3 (moderate coverage of the stock foraging grounds in the West Atlantic during the summer and early fall) | 3 (moderate coverage of the stock foraging grounds in the West Atlantic during the summer and early fall) | Gulf of St. Lawrence and north east Scotian Shelf areas | Scotian Shelf | Gulf of St Lawrence where fishery occurs | Coverage limited to Med. No maps of surveys provided | Coverage is limited. Major fishery occurs off PEI which is not covered. Yet fishing occurs where most of the licences are. Fish may be there but catches low due to fishing in other areas. | West Atl. | 5 (covers entire Gulf of Mexico) | Mid-Atlantic, Maine, Gulf of St. Lawrence and north east Scotian Shelf areas | Atlantic north of 15°N latitude and west of 45°W longitude |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Catch Fraction to the total catch weight (East or West) | 20% | | 2 (100% of US longline in GOM, but only a discard fishery) | 3 (represents a moderate portion of the landings of the stock by the U.S. | 3 (represents a moderate portion of the landings of the stock by the U.S. | 3 (represents a moderate portion of the landings of the stock by the U.S. | 3 (represents a moderate portion of the landings of the stock by the U.S. | 3 (represents a moderate portion of the landings of the stock by the U.S. | 15% | 0.14 | 0.05 | No direct catch | N/A | N/A | N/A | 15% | 10% |
| Length of Time Series relative to the history of exploitation. | 5 (yes, 1976-2009,2010-2017) | 3 (1974-1981) | 2 (1987-1991,1992-2016) | 3 (series runs from 1993 to present) | 3 (series runs from 1993 to present) | 3 (series runs from 1993 to present) | 2 (series runs from 1980 to 1992) | 2 (series runs from 1983 to 1992) | 1984-2016 | Since 1981; exploitation began in 1972-73 | Since 1988 | since 2001 | 1994-2015 | 1970-1981 | 2 (1993-2011, will be updated to 2016) | 1984-2014 | 1992 to 2014 |
| Are other indices available for the same time period? | 5 (yes) | Yes | 3 (yes but no GOMEX spawners) | 2 (yes, but no overlap with the main U.S. fishery, and none derived from effort directed on these ages) | 2 (yes, but no overlap with the main U.S. fishery, and none derived from effort directed on these ages) | 2 (yes, but no overlap with the main U.S. fishery) | 2 (yes, but no overlap with the main U.S. fishery, and none derived from effort directed on these ages) | 2 (yes, but no overlap with the main U.S. fishery) | This index is a derivative | Perhaps fishery independen t index | No | Yes | Yes, but not fishery independent | Yes | 3 (yes) | This index is a derivative | Yes but not same area |
| Does the index standardization account for Known factors that influence catchability/selectivity? | 5 (gear type is included as is a selectivity proxy. area*month interaction was considered as random effect) | 5 (gear type is included as is a selectivity proxy. area*month interaction was considered as random effect) | 3 (standardis-ed, but few factors, accounts for change to weak hooks) | 4 (index for bluefin trips by sizeclass targeted and standardiz-ed for year, area, fishing method and regulatory effects) | 4 (index for bluefin trips by sizeclass targeted and standardiz-ed for year, area, fishing method and regulatory effects) | 4 (index for bluefin trips by sizeclass targeted and standardiz-ed for year, area, fishing method and regulatory effects) | 4 (index for bluefin trips by sizeclass targeted and standardiz-ed for year, area, fishing method and regulatory effects) | 4 (index for bluefin trips by sizeclass targeted and standardiz-ed for year, area, fishing method and regulatory effects) | Yes | Factors are month, fleet, gear and hours fished | Factors are month, fleet, gear and hours fished | Method-ology for standardis-ation of the series appears to be appropriate for a survey | Index has not been standardized as most factors constant over time | Index of relative mortality rates, not abundance | Fishery independ-ent | Yes | Yes |
| Are there conflicts between the catch history and the CPUE response? | 5 (No conflict noted) | 5 (No conflict noted) | 5 (No conflict noted) | NA | | | NA | NA | No | No, no detectable departures | No, no detectable departures | No conflict noted | N/A | N/A | 5 | No | No |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Is interannual CV high, and is there potential evidence of unaccounted process error (trends in deviations from production model dynamics, high peaks, multiple stanzas, increasing or decreasing catchability) | CV=0.61 %Devs 0.56 | | CV=0.45 %Devs 0.5 | CV=0.65 %Devs 0.62 interannual CV increases for larger fish, would expect small fish indices to be more variable | | | | | | CV=1.15 %Devs 0.58 High CV even with 2010 which has been removed, positive trend in recent deviations | CV=0.31 %Devs 0.32 | CV=1.14 %Devs 0.79 high interannual variability | CV=0.59 %Devs 0.68 | N/A | CV=0.22 %Devs 0.17 devs not as applicable age 0 recruitment proxy (make index on rec devs) | CV=0.92 %Devs 0.5 high cv, positive trends in devs in recent years | CV=0.53 %Devs 0.46 Yes |
| Assessment of data quality and adequacy of data for standardization purpose (e.g. sampling design, sample size, factors considered) | 5 (information includes length frequencies of catches. Multiple factors included. Sample design and sensitivity runs investigate effort distribution as well as data assumptions/ concerns and effort is presented) | | 3 (index has been used for a long time and reviewed many times. However recent (2015) changes in the fishery in 2015 may require breaking the index after this) | 3 (the sampling design and the relevant factors available for consideration in the standardization are very good. The sample size is not always good, after all the data exclusions related to targeting and fishing method are applied) | 3 (the sampling design and the relevant factors available for consideration in the standardization are very good. The sample size is not always good, after all the data exclusions related to targeting and fishing method are applied) | 3 (the sampling design and the relevant factors available for consideration in the standardization are very good. The sample size is not always good, after all the data exclusions related to targeting and fishing method are applied) | 3 (the sampling design and the relevant factors available for consideration in the standardization are very good. The sample size is not always good, after all the data exclusions related to targeting and fishing method are applied) | 3 (the sampling design and the relevant factors available for consideration in the standardization are very good. The sample size is not always good, after all the data exclusions related to targeting and fishing method are applied) | | Includes trends in forage fish and recent changes in environmental variables. Shows weight frequencies, trends in condition and describes a potential shift in the distribution of size components of the population to other areas | Some issues related to effort | Data are presented and methodolgy for standardisation explicitly presented. Factors appear to be appropriate for a survey | Yes, but not likely necessary except for vessel/equipment change in 2015 | N/A | ? Environmental index | A derivative CAN and USA rod and reel. Spans a larger spatial domain | Includes environmental covariates. Large spatial domain |
| Is this CPUE time series continuous? | 5 (Yes) | 5 (Yes) | 2 (no break in 1992, and see above about potential break in 2016) | 4 | | | Yes | Yes | | Yes | Yes | Yes | Yes for series | Yes | 5 | Yes | Yes |
| Other comment | | | | | | | | | | | | | | Index of relative mortality rates, not abundance | Inclusion of environmental index?? | Overcomes issues related to the redistribution of the stock | Overcomes issues related to the redistribution of the stock |

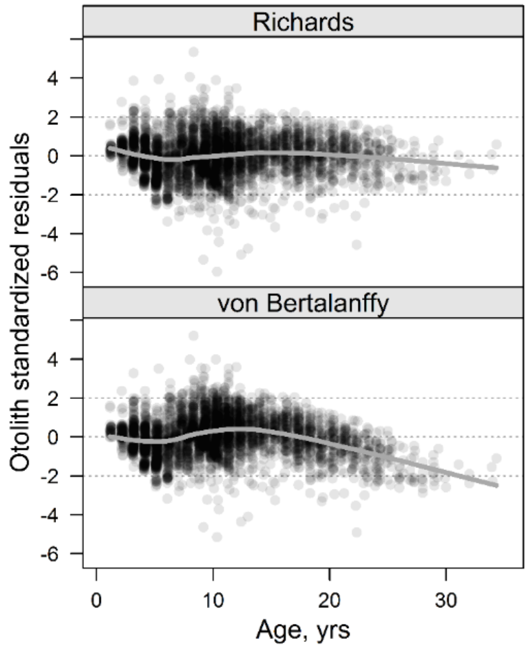


**Figure 1.** Scatterplot of otolith standardized residuals resulting from the Richards and von Bertalanffy model fits to western stock age data. A loess line (grey solid line) was fitted to the residuals in each panel to investigate trends. For reference, horizontal dotted lines are drawn at 0 and ±2 standardized residuals (From Ailloud *et al*., 2017).

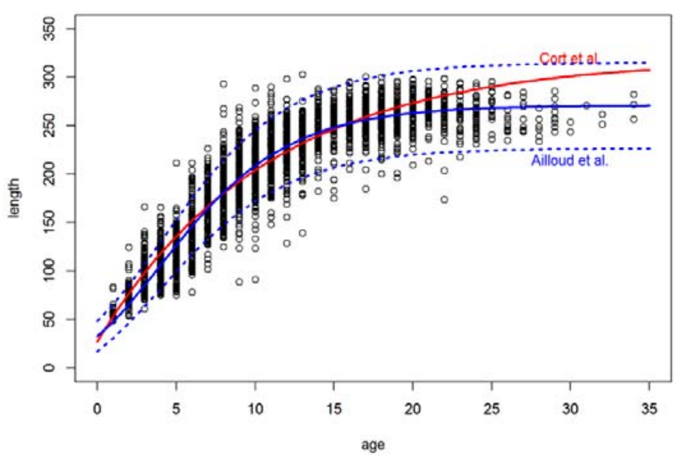


**Figure 2.** Western otolith data plotted against the growth curves from the Ailloud *et al*., 2017 analysis (solid blue) and the Cort 1991 analysis (solid red). The dashed blue lines represent the 2.5 and 97.5 percentiles of the distribution of the fitted length at age from the Ailloud et al. (2017) analysis.

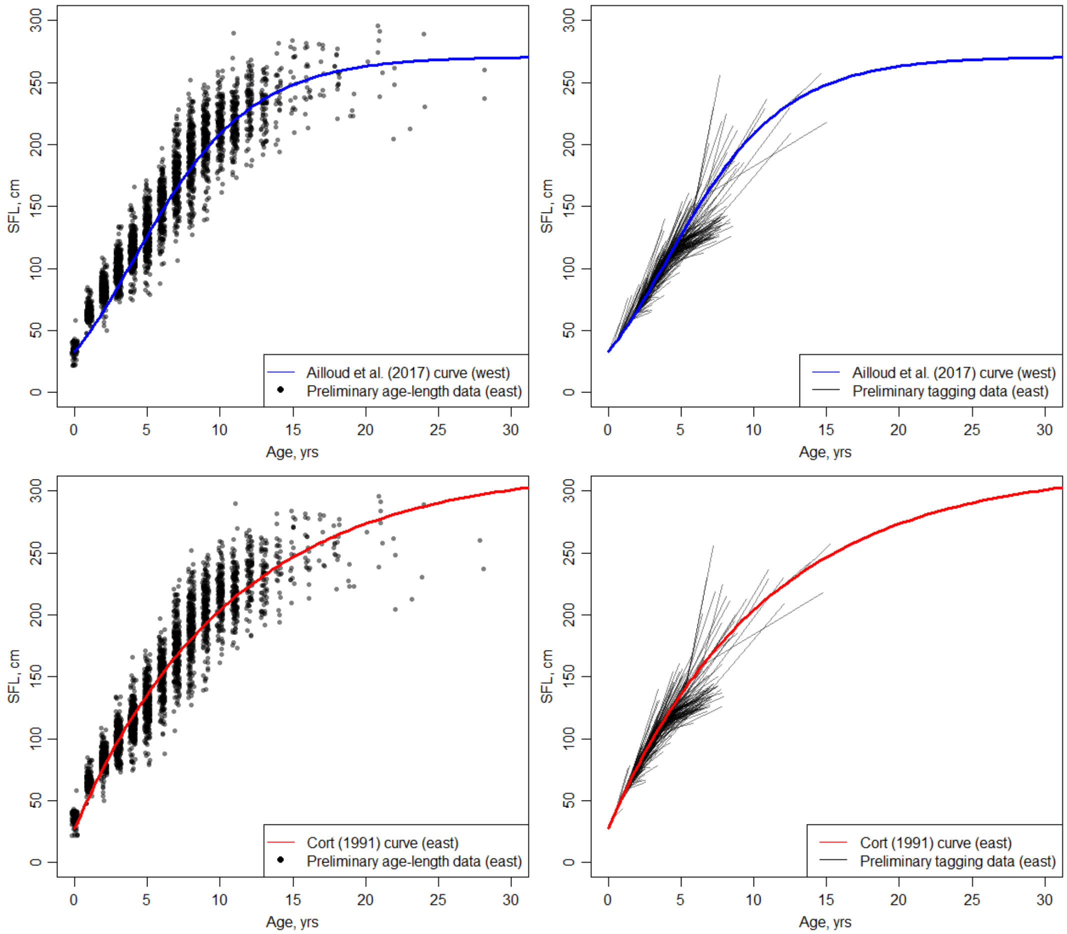


**Figure 3.** Preliminary availability of East age-length and tagging data for curve fitting plotted with the Ailloud *et al*., 2017 curve of the western stock (top, blue) and the Cort, 1991 curve of the eastern stock (bottom, red). The age data shown in the left panels combines otolith and spines (<13 years) data of fish captured in the East Atlantic and Mediterranean and otolith data of fish captured in the west Atlantic that have been assigned an eastern origin based on isotope analysis. The right panels are vector plots of the growth increments from ICCAT conventional tagging database of fish release and recaptured in the East. The relative age of each fish at the time of tagging is estimated from the length at tagging by inverting the Ailloud *et al*. (top) and Cort (bottom) growth equations, respectively. The age at recapture is then taken to be the age at tagging plus the time at liberty. Each growth trajectory starts on the respective growth curves.

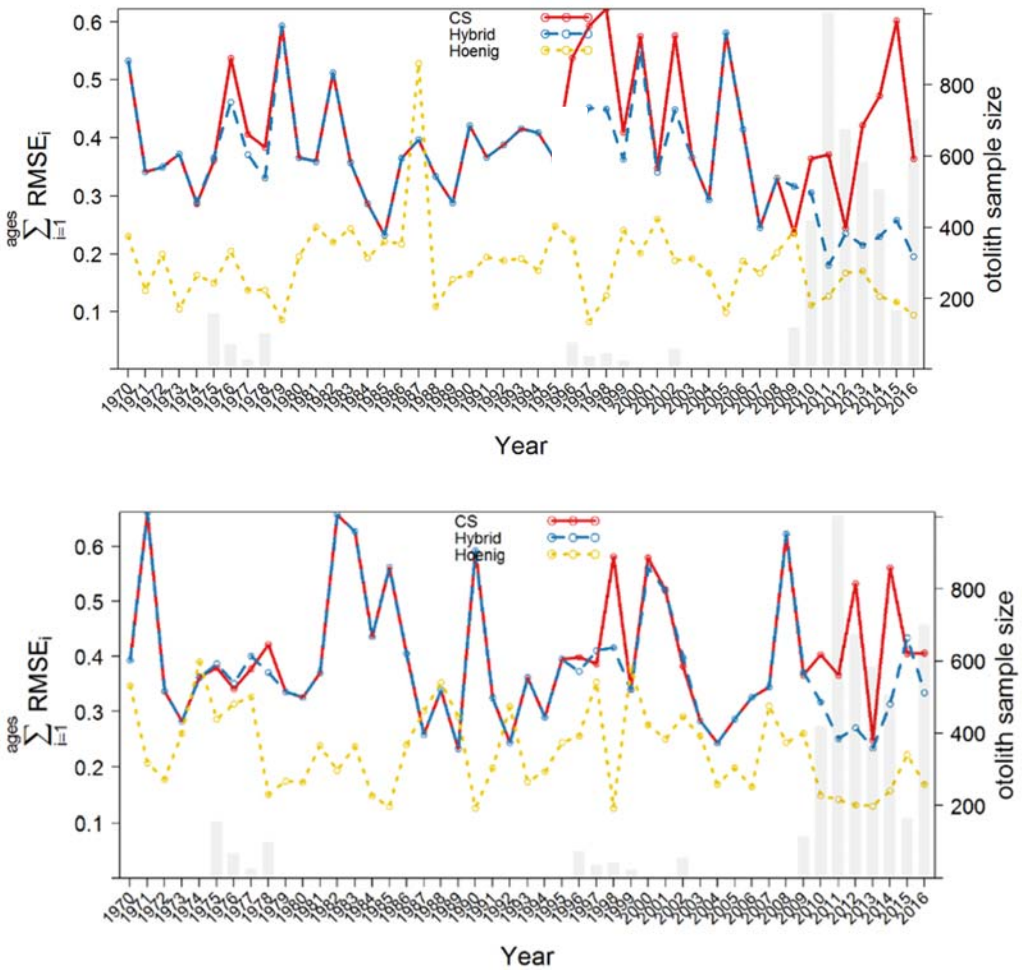


**Figure 4.** Mean squared error of the estimated proportions of catch at age in each year summed across ages (by method) assuming otolith samples contain A (top) predominantly small fish and B (bottom) predominantly large fish.

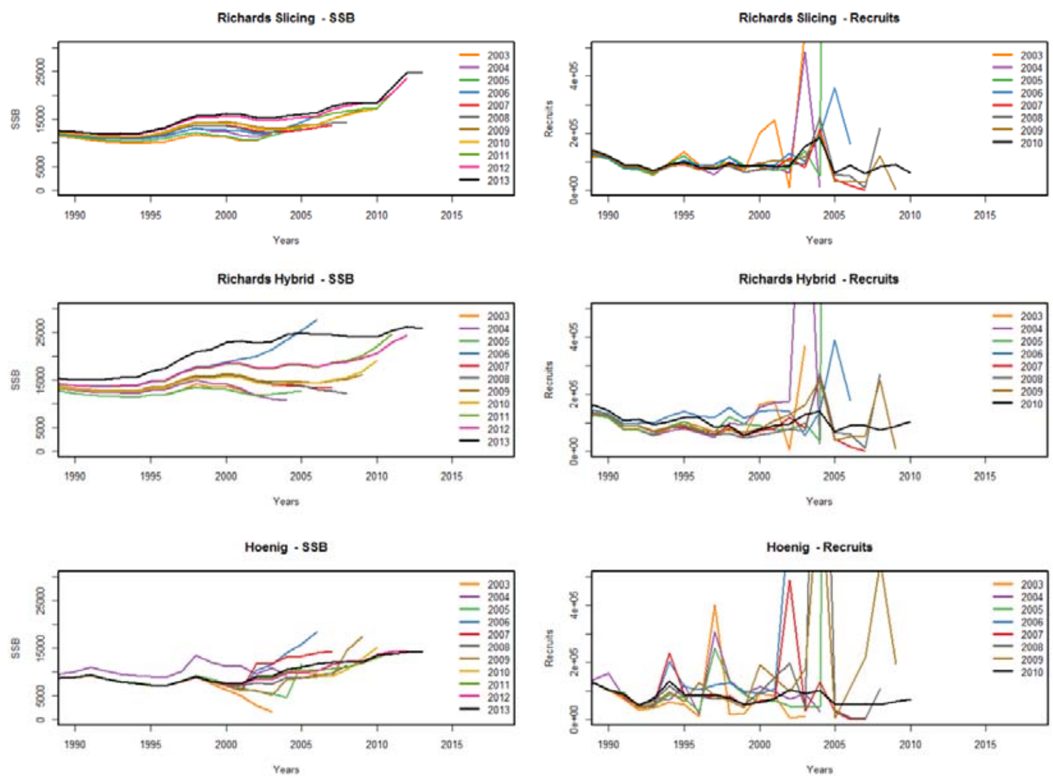


**Figure 5.** Retrospective VPA results (west) between the three methods of obtaining CAA for WBFT (10 year peel): cohort slicing using the Richards growth curve (top), Hybrid key (middle) and Hoenig method (bottom). Caveat: due to time restrictions, mean weight at age (by year) estimated using the Hybrid method was used as input in the Hoenig CAA VPA runs.

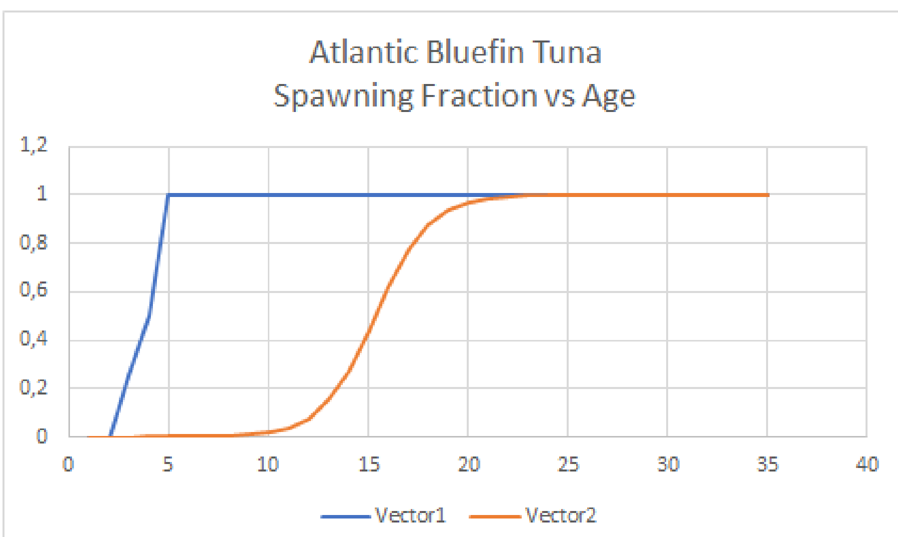


**Figure 6.** Alternative vectors of the proportion of fish contributing to the spawning output of the Atlantic bluefin tuna (East and West stocks) as a function of age (please see section 2.3 Spawning fraction for further details).

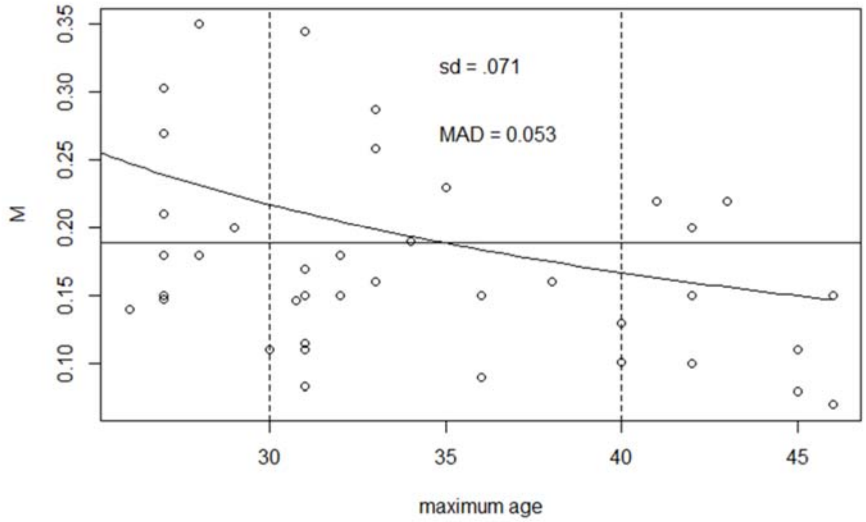


**Figure 7.** Natural mortality rates, M, in the literature and as predicted by Then *et al*., 2015 as a function of maximum age. The horizontal line gives the prediction of Then *et al*., 2015 for a maximum age of 35; the curved line shows how the Then estimates vary as a function of maximum age. Over the range of ages from 30 to 40, the mean absolute difference (MAD) between the literature value and the Then predictions is 0.053; the standard deviation of the differences is 0.071. If the literature values are considered correct (without error) then these differences show the error in using the Then estimator. On the other hand, if the Then estimator is correct (without error) then these differences show the measurement error in field studies estimating natural mortality rate. In reality, both the literature values and the Then estimates have error so the observed differences in estimates overstate the error in the Then estimates.

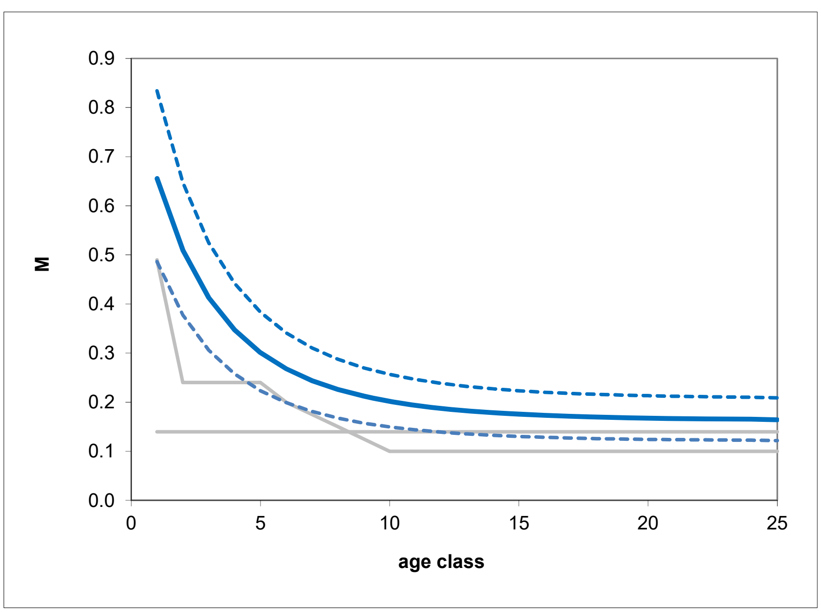


**Figure 8.** Comparison between the mortality vectors used in the 2015 update (gray lines) with the proposed Lorenzen mortality function with +/- 0.05 also plotted (blue lines).

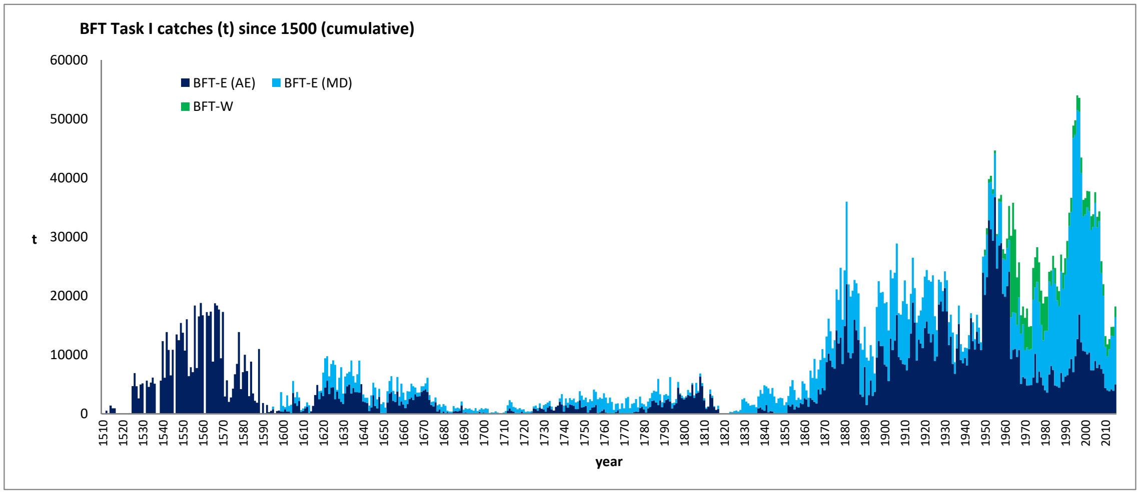


**Figure 9.** Bluefin tuna Task I overall cumulative (BFT-E (AE), BFT-E (MD), BFT-W) catches (t) with all the information recovered under GBYP (between 1510 and 2015).

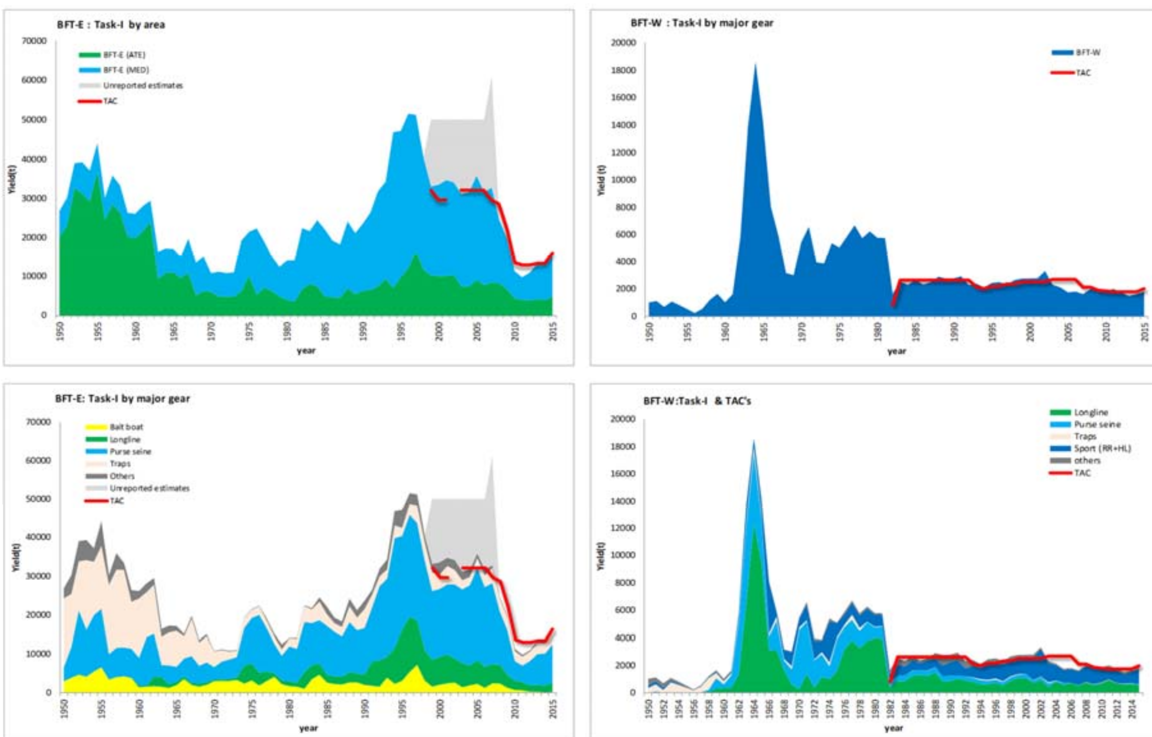


**Figure 10.** Bluefin tuna estimated Task I catches (t) by stock/area (BFT-E upper left; BFT-W upper right) and also by major gear (BFT-E lower left; BFT-W lower right). The red line shows the TAC level (four panels) over time in both stocks.

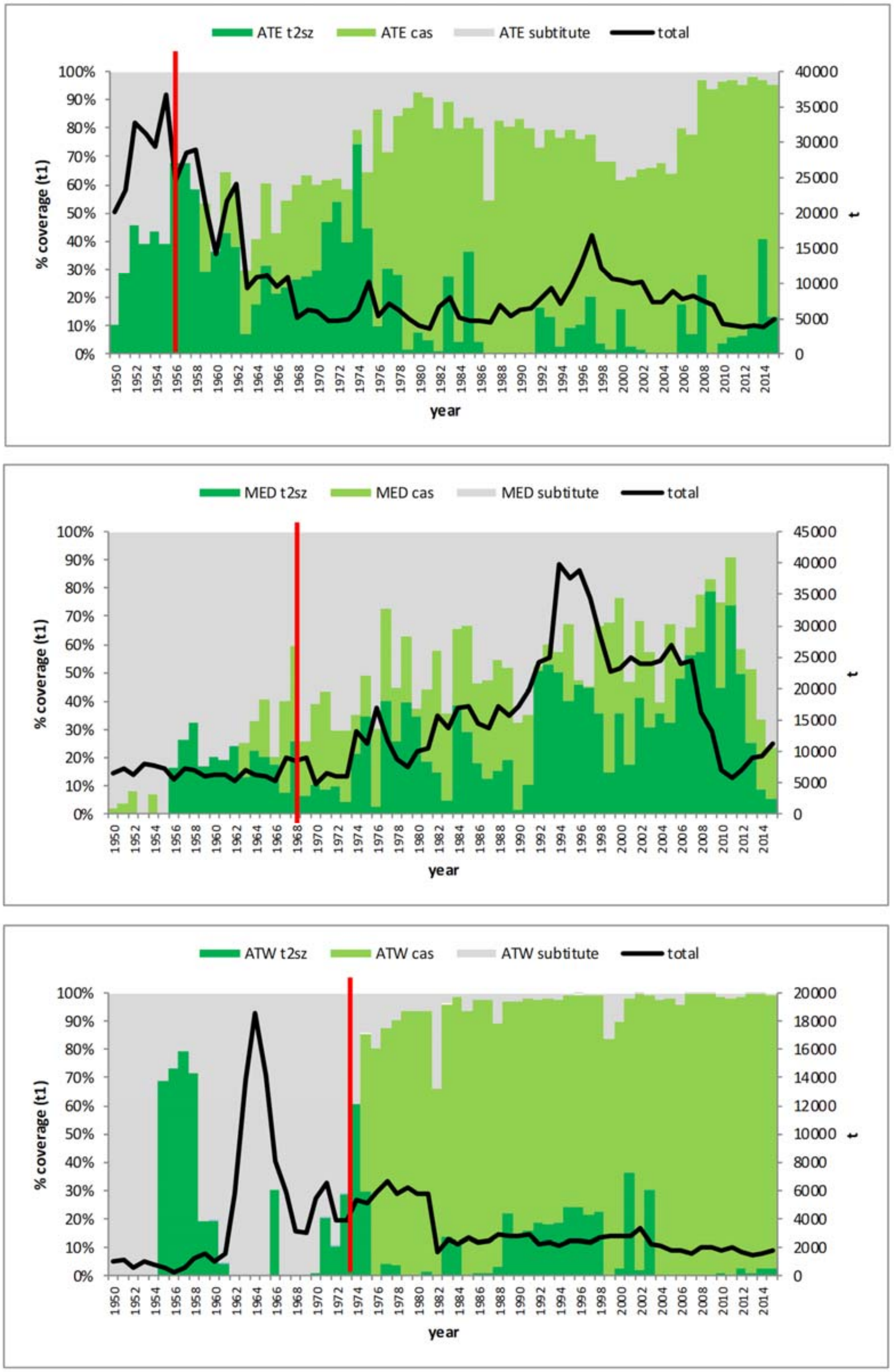


**Figure 11.** Levels of Task I (t) coverage ratios (%) in each stock/area (BFT-E: ATE, MED; BFT-W: ATW) by both types of chosen (to be used in the CAS/CAA estimations) size information (T2SZ: weight of observed size frequencies; CAS: weight of size frequencies extrapolated to total catches by CPC scientists) by year. Series in grey (no size available) indicates that a substitution will be made. The red line indicates the threshold coverage (at least 60%) adopted as a reference for the VPA runs (BFT-E: 1968-2015, BFT-W: 1974-2015). These figures are preliminary and will change with the "pending" (under treatment) size information (in particular BFT-E).

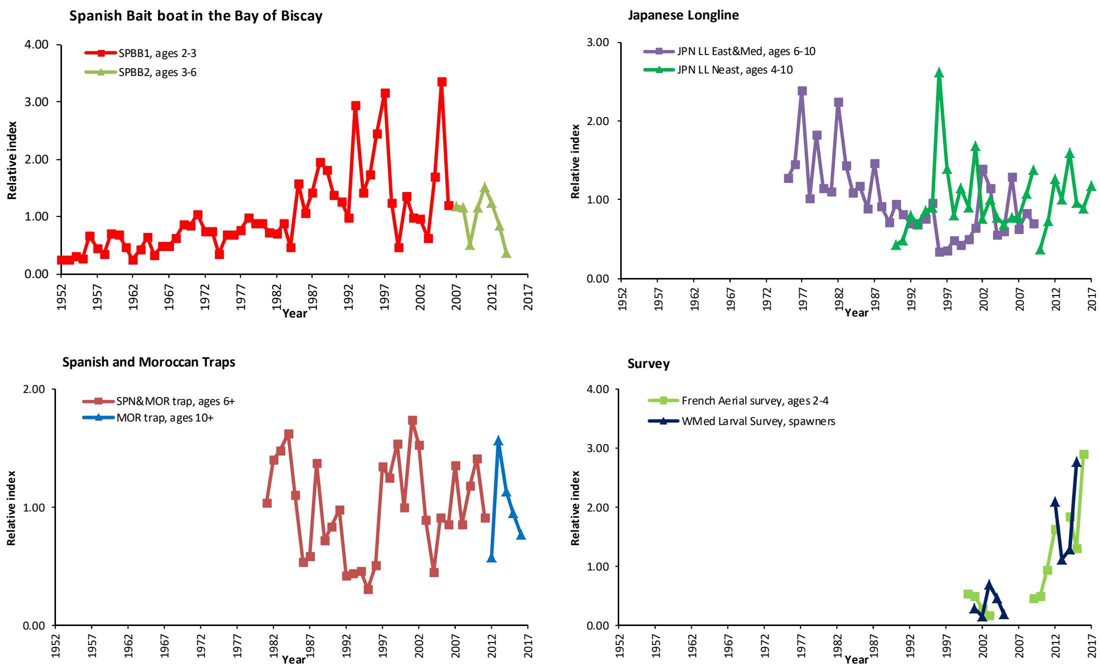


**Figure 12.** Abundance indices for 2017 stock assessment in the eastern Atlantic stock (BFT-E).

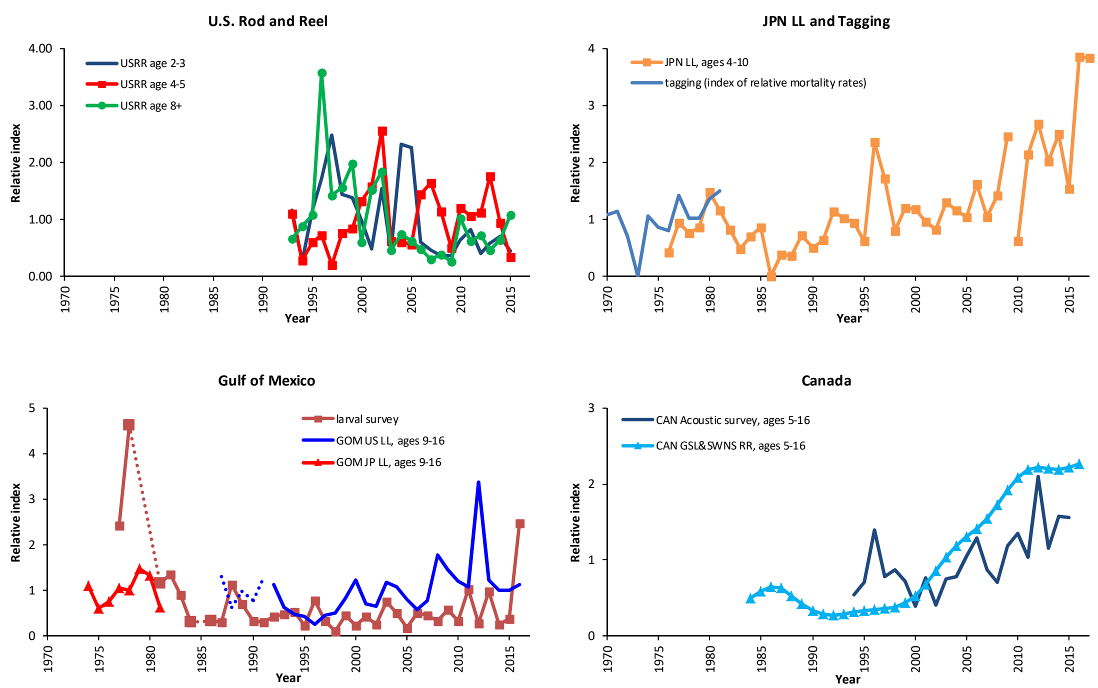


**Figure 13.** Abundance indices for 2017 stock assessment in the western Atlantic stock (BFT-W).

**Appendix 1**

**Agenda**

1. Opening, adoption of Agenda and meeting arrangements

2. Review of historical and new data on bluefin biology and distribution

   2.1 Review and finalize age-length keys and other methods for converting CAS to CAA
   2.2 Review and finalize stock composition keys (otolith microchemistry, shape, genetics, etc.) and evaluate possible biases in stock assignment procedures
   2.3 Review and finalize fecundity schedules and natural mortality rate
   2.4 Review of available tagging data and derived movement matrices

3. Review of fishery statistics

   3.1 Task I (catches) data
   3.2 Task II (catch-effort and size samples) data
   3.3 Update of CAS - Validate and integrate the catch at size statistics with new information from farms, harvesting and stereoscopic cameras, and other sources of information

4. Review of fisheries indicators

   4.1 Review new and updated indices of relative abundance
   4.2 Update the index criteria table developed during the 2016 data preparatory intersessional workshop
   4.3 Determine indices to be used in the next assessment for the base-case and sensitivity runs
   4.4 Discuss relative weights to be assigned to selected indices

5. Review progress on new modelling frameworks

   5.1 Review current models and proposed enhancements
   5.2 Discuss new models under consideration for 2017 assessment and projections
   5.3 Review status of the ICCAT Software Catalogue
   5.4 Review Progress on MSE and any outstanding issues

6. Evaluate evidence for the existence of the extraordinary 2004-2007 recruitment years estimated for the eastern Atlantic and Mediterranean population

7. Recommendations

8. Other matters

9. Adoption of the report and closure

**Appendix 2**

## List of Participants

### *CONTRACTING PARTIES*

**ALGERIA**
**Kouadri-Krim,** Assia
Chef de Bureau, Ministre de l'Agriculture du Développement rural et de la Pêche, Rue des Quatre Canons, 16000 Algiers
Tel: +213 21 43 31 97, Fax: +213 21 43 31 97, E-Mail: dpmo@mpeche.gov.dz; assiakrim63@gmail.com

**CANADA**
**Carruthers,** Thomas
335 Fisheries Centre, University of British Columbia, Vancouver Columbia V2P T29
Tel: +1 604 805 6627, E-Mail: t.carruthers@oceans.ubc.ca

**Hanke,** Alexander
Scientific, St. Andrews Biological Station/ Biological Station, Fisheries and Oceans Canada, 531 Brandy Cove Road, St. Andrews New Brunswick E5B 2L9
Tel: +1 506 529 5912, Fax: +1 506 529 5862, E-Mail: alex.hanke@dfo-mpo.gc.ca

**Maguire,** Jean-Jacques
1450 Godefroy, Québec G1T 2E4
Tel: +1 418 688 3027, E-Mail: jeanjacquesmaguire@gmail.com

**Melvin,** Gary
Biological Station - Fisheries and Oceans Canada, Department of Fisheries and Oceans, 531 Brandy Cove Road, St. Andrews, New Brunswick E5B 2L9
Tel: +1 506 529 5874, Fax: +1 506 529 5862, E-Mail: gary.melvin@dfo-mpo.gc.ca

**EGYPT**
**Abdelmessih,** Magdy Kamal Mikhail
14 Aly Abn Aby Taalep, Abo qir, Alexandria
Tel: +203 5625700, Fax: +203 5626070, E-Mail: info@elkamoush.com; m.mahmoud@elkamoush.com

**EUROPEAN UNION**
**Álvarez Berastegui,** Diego
SOCIB - Sistema de Observación Costera de las Islas Baleares, Parc Bit, Naorte, Bloc A 2ºp. pta. 3, 07121 Palma de Mallorca, Spain
Tel: +34 971 43 99 98, Fax: +34 971 43 99 79, E-Mail: dalvarez@socib.es

**Arrizabalaga,** Haritz
AZTI - Tecnalia /Itsas Ikerketa Saila, Herrera Kaia Portualde z/g, 20110 Pasaia Gipuzkoa, Spain
Tel: +34 94 657 40 00, Fax: +34 94 300 48 01, E-Mail: harri@azti.es

**Brophy,** Deirdre
Marine and Freshwater Research Center, Department of Natural Sciences, GMIT, Galway Mayo Institute of Technology Dublin Rd, Galway, H91 T8NW, Ireland
Tel: +353 91 742484, Fax: E-Mail: deirdre.drophy@gmit.ie

**Camilleri,** Tristan Charles
Malta Aquaculture Research Centre, Fort Sant Lucjan, Ghammieri, Ngiered Road, BBG1283 Marsaxlokk, Malta
Tel: +356 229 26900, E-Mail: tristan-charles.camilleri@gov.mt

**Cort,** José Luis
Ministerio de Economía y Competitividad, Instituto Español de Oceanografía, C.O. de Santander Apartado 240; Promontorio de San Martín S/N, 39080; 39004 Santander Cantabria, Spain
Tel: +34 942 291 716, Fax: +34 942 27 5072, E-Mail: jose.cort@st.ieo.es

**Fraile,** Igratza
AZTI-TECNALIA, Herrera Kaia Portualdea z/g, 20110 Pasaia, Spain
Tel: +34 946 574000, E-Mail: ifraile@azti.es

**Garibaldi,** Fulvio
Laboratorio di Biologia Marina e Ecologia Animale Univ. Degli Studi di Genova, Dipartimento si Scienze della Terra, dell'Ambiente e della Vita (DISTAV), Corso Europa, 26, 16132 Genoa, Italy
Tel: +39 010 353 8576, Fax: +39 010 357 888, E-Mail: largepel@unige.it; garibaldi.f@libero.it

**Gordoa,** Ana
Centro de Estudios Avanzados (CEAB - CSIC), Acc. Cala St. Francesc, 14, 17300 Blanes Girona, Spain
Tel: +34 972 336101, E-Mail: gordoa@ceab.csic.es

**Lino,** Pedro Gil
Instituto Português do Mar e da Atmosfera - I.P./IPMA, Avenida 5 Outubro s/n, 8700-305 Olhão, Portugal
Tel: +351 289 700504, E-Mail: plino@ipma.pt

**Maradonna,** Francesca
Dipartimento di Scienze della Vita e dell'Ambiente, Università Poltecnica delle Marche, Italy
Tel: +39 071 220 4643, Fax: +39 071 220 4650, E-Mail: f.maradonna@staff.univpm.it

**Peyronnet,** Arnaud
Directorate-General, European Commission _ DG MARE D2, Conservation and Control in the Mediterranean and the Black Sea, Rue Joseph II - 99 06/56, B-1049 Brussels, Belgium
Tel: +32 2 2991 342, E-Mail: arnaud.peyronnet@ec.europa.eu

**Reglero,** Patricia
Centro Oceanográfico de las Islas Baleares, Instituto Español de Oceanografía, Muelle de Poniente s/n, 07015 Palma de Mallorca Islas Baleares, Spain
Tel: +34 971 13 37 20, E-Mail: patricia.reglero@ba.ieo.es

**Rodriguez Ezpeleta,** Naiara
AZTI - Tecnalia /Itsas Ikerketa Saila, Herrera Kaia Portualde z/g, 20110 Pasaia Gipuzkoa, Spain
E-Mail: nrodriguez@azti.es

**Rodríguez-Marín,** Enrique
Ministerio de Economía, Industria y Competitividad, Instituto Español de Oceanografía, C.O. de Santander, Promontorio de San Martín s/n, 39004 Santander Cantabria, Spain
Tel: +34 942 291 716, Fax: +34 942 27 50 72, E-Mail: rodriguez.marin@st.ieo.es

**Rouyer,** Tristan
Ifremer - Dept Recherche Halieutique, B.P. 171 - Bd. Jean Monnet, 34200 Sète, France
Tel: +33 (0)4 42 57 32 37; +33 (0)7 82 99 52 37, Fax: E-Mail: tristan.rouyer@ifremer.fr

**JAPAN**

**Butterworth,** Douglas S.
Emeritus Professor, Department of Mathematics and Applied Mathematics, University of Cape Town, Rondebosch, 7701 Cape Town, South Africa
Tel: +27 21 650 2343, E-Mail: doug.butterworth@uct.ac.za

**Itoh,** Tomoyuki
Chief of Temperate Tuna Group, Bluefin Tuna Resources Division, National Research Institute of Far Seas Fisheries, Japan Fisheries Research and Education Agency, 5-7-1 Orido, Shizuoka Shimizu 424-8633
Tel: +81 54 336 6000, Fax: +81 54 335 9642, E-Mail: itou@fra.affrc.go.jp

**Kimoto,** Ai
Researcher, Bluefin Tuna Resources Division, National Research Institute of Far Seas Fisheries, Japan Fisheries Research and Education Agency, 5-7-1 Orido, Shizuoka Shimizu 424-8633
Tel: +81 54 336 6000, Fax: +81 54 335 9642, E-Mail: aikimoto@affrc.go.jp

**Kitakado,** Toshihide
Associate Professor, Faculty of Marine Science, Tokyo University of Marine Science and Technology, Department of Marine Biosciences, 4-5-7 Konan, Minato, Tokyo 108-8477
Tel: +81 3 5463 0568, Fax: +81 3 5463 0568, E-Mail: kitakado@kaiyodai.ac.jp; toshihide.kitakado@gmail.com

**Nakatsuka,** Shuya
Research Coordinator, National Research Institute of Far Seas Fisheries, Japan Fisheries Research and Education Agency, 5-7-1 Orido, Shizuoka Shimizu 424-8633
Tel: +81 54 336 6000, Fax: +81 54 335 9642, E-Mail: snakatsuka@affrc.go.jp

**Rademeyer,** Rebecca
Marine Resource Assessment and Management Group, Department of Mathematics and Applied Mathematic - University of Cape Town, Private Bag, 7700 Rondebosch, South Africa
E-Mail: rebecca.rademeyer@gmail.com

**Uozumi,** Yuji
Visiting Scientist, National Research Institute of Far Seas Fisheries, Japan Fisheries Research and Education Agency, 5-7-1 Orido, Shizuoka Shimizu 424-8633
Tel: +81 54 336 6000, E-Mail: uozumi@affrc.go.jp

**MOROCCO**
**Abid,** Noureddine
Responsable du programme de suivi et d'étude des ressources des grands pélagiques, Center Régional de L'INRH á Tanger/M'dig, B.P. 5268, 90000 Drabed Tangiers
Tel: +212 53932 5134, Fax: +212 53932 5139, E-Mail: abid.n@menara.ma; noureddine.abid65@gmail.com

**NORWAY**
**Nottestad,** Leif
Principal Scientist, Institute of Marine Research, P.O. Box 1870 Nordnesgaten, 33, 5005 Bergen
Tel: +47 99 22 70 25, Fax: +47 55 23 86 87, E-Mail: leif.nottestad@imr.no

**TUNISIA**
**Zarrad,** Rafik
Institut National des Sciences et Technologies de la Mer (INSTM), BP 138 Mahdia 5199
Tel: +216 73 688 604, Fax: +216 73688602, E-Mail: rafik.zarrad@instm.rnrt.tn; rafik.zarrad@gmail.com

**UNITED STATES**
**Ailloud,** Lisa
Virginia Institute of Marine Science, College of William & Mary, PO Box 1346 Gloucester Point, VA 23062
Tel: +1 240 253 3958, E-Mail: lailloud@vims.edu

**Brown,** Craig A.
Chief, Highly Migratory Species Branch, Sustainable Fisheries Division, NOAA Fisheries Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami Florida 33149
Tel: +1 305 586 6589, Fax: +1 305 361 4562, E-Mail: craig.brown@noaa.gov

**Díaz,** Guillermo
NOAA-Fisheries, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami Florida 33149
Tel: +1 305 898 4035, E-Mail: guillermo.diaz@noaa.gov

**Hoenig,** John
Professor of Marine Science, Department of Fisheries Science, Virginia Institute of Marine Science, PO Box 1346 (1375 Greate Rd), Gloucester Pt. VA 23185
E-Mail: hoenig@vims.edu

**Ingram,** Walter
NOAA Fisheries, 3209 Frederic Street, Pascagoula MS 39567
Tel: +1 228 549 1686; 329 4465, Fax: +1 228 769 9600, E-Mail: walter.Ingram@noaa.gov

**Lauretta,** Matthew
NOAA Fisheries Southeast Fisheries Center, 75 Virginia Beach Drive, Miami Florida 33149
Tel: +1 305 361 4481, E-Mail: matthew.lauretta@noaa.gov

**Porch,** Clarence E.
Chief, Sustainable Fisheries Division, Southeast Fisheries Science Center, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami Florida 33149
Tel: +1 305 361 4232, Fax: +1 305 361 4219, E-Mail: clay.porch@noaa.gov

***OBSERVERS FROM NON-GOVERNMENTAL ORGANIZATIONS***

**FEDERATION OF MALTESE AQUACULTURE PRODUCERS – FMAP**

**Deguara,** Simeon
Research and Development Coordinator, Federation of Maltese Aquaculture Producers - FMAP, 61, St. Paul Street, VLT 1212 Valletta, Malta
Tel: +356 21223515 /21226268, Fax: +356 21241170, E-Mail: simeon.deguara@um.edu.mt; dsd@aquabt.com

**THE OCEAN FOUNDATION**

**Boustany,** Andre M.
Duke University, Nicholas School of the Environment Box 90328, Durham NC 27708, United States
Tel: +1 831 402 1364, Fax: +1 919 613 8062, E-Mail: andre.boustany@duke.edu

**WORLD WILDLIFE FUND – WWF**

**García Rodríguez,** Raúl
WWF Mediterranean, Gran Vía de San Francisco, 8, 28005 Madrid, Spain
Tel: +34 630 834 267, Fax: +34 913 656 336, E-Mail: pesca@wwf.es

***SCRS CHAIRMAN***

**Die,** David
SCRS Chairman, Cooperative Institute of Marine and Atmospheric Studies, University of Miami, 4600 Rickenbacker Causeway, Miami Florida 33149, United States
Tel: +1 673 985 817, Fax: +1 305 421 4221, E-Mail: ddie@rsmas.miami.edu

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**ICCAT Secretariat/ Secrétariat de l'ICCAT/ Secretaría de ICCAT**

C/ Corazón de María 8 – 6th floor, 28002 Madrid – Spain
Tel: +34 91 416 56 00; Fax: +34 91 415 26 12; E-mail: info@iccat.int

**Neves dos Santos,** Miguel
**De Bruyn,** Paul
**Kell,** Laurence
**Palma,** Carlos
**Ortiz,** Mauricio

**GBYP/ICCAT**

**Di Natale,** Antonio
**Tensek,** Stasa
**Pagá,** Alfonso

**GBYP/ICCAT EXPERT**

**Vidal Bonavila,** Judit
GBYP Expert, Avenida Països Catalans, 162, 3º 3ª, 43205 Reus, Tarragona, Spain
Tel: +34 699 252 912, E-Mail: juditvb88@gmail.com

**Appendix 3**

**List of documents and presentations**

| Reference | Title | Authors |
|---|---|---|
| SCRS/2017/013 | Alternative catch estimates from market and third party data | Apostolaki P., Pearce J., Barbari A. and Beddington J. |
| SCRS/2017/014 | First report on cannibalistic feeding behaviour in post-flexion bluefin larvae (*Thunnus thynnus*) of the Balearic Sea (NW Mediterranean) | Uriarte A., Johnstone C., Laiz-Carrión R., García A., Quintanilla J.M., Reglero P., and Alemany F. |
| SCRS/2017/015 | Estimation of conversion factor from curved fork length to straight fork length for farmed eastern bluefin tuna (*Thunnus thynnus*) | Drakard V.F., Gatt M. and Camilleri T. |
| SCRS/2017/016 | Development of a fishery independent index of abundance for Atlantic bluefin tuna in the Gulf of St Lawrence | Melvin G.D., Munden J. and Finley M. |
| SCRS/2017/019 | Calculating population-wide spatial and seasonal relative abundance indices for Atlantic bluefin tuna for use in operational modelling | Carruthers T. |
| SCRS/2017/020 | Standardized CPUE indices for Canadian bluefin tuna fisheries: 1981-2016 | Hanke A.R. and Cheverie A. |
| SCRS/2017/021 | Stock mixing rates of bluefin tuna from Canadian landings: 1975-2015 | Puncher G. and Hanke A.R. |
| SCRS/2017/022 | Validation of the growth equations applicable to the Atlantic bluefin tuna, *Thunnus thynnus* (L.), using Lmax, tag-recapture, length-weight relationships, condition factor and first dorsal spine analysis | Cort J.L., Estruch V.D. and Deguara S. |
| SCRS/2017/023 | Review and update of the Catch at Age (CAA) for the Spain Bay of Biscay bluefin tuna fisheries for 1950 – 2000 | Cort J.L., Santiago J., Arrizabalaga H., Palma C. and Ortiz M. |
| SCRS/2017/024 | Estimation of size at catch and potential growth of farmed eastern bluefin tuna (*Thunnus thynnus*) from farm harvest database | Ortiz M. |
| SCRS/2017/025 | The standardized bluefin CPUE of Japanese longline fishery in the Atlantic up to 2017 fishing year | Kimoto A. and Itoh T. |
| SCRS/2017/026 | Estimating the contribution of Atlantic bluefin tuna sub-populations in the North Atlantic Ocean over the last 6 years | Fraile I., Arrizabalaga H., Kimoto A., Itoh T., Abid N., Rodriguez-Marín E. and Rooker J. |
| SCRS/2017/027 | Genetic assignment of Atlantic bluefin tuna feeding aggregations to spawning grounds | Rodríguez-Ezpeleta N., Díaz-Arce N., Addis P., Abid N., Alemany F., Deguara S., Fraile I., Franks J., Hanke A., Itoh T., Karakulak S., Kimoto A., Lawretta M., Lino P., Lutcavage M., Macías D., Ngom Sow F., Notestad L., Oray I., Pascual P., Quattro J., Richardson D.D., Rooker J.R., Valastro M., Varela J.L., Walter J., Irigoien X., and Arrizabalaga H. |

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|---|---|---|
| SCRS/2017/028 | Integrated analysis for Atlantic bluefin tuna origin assignment | Brophy D., Duncan R., Hickey A., Abid N., Addis P., Allman R., Coelho R., Deguara S., Rodriguez Ezpeleta N., Fraile I., Karakulak S. and Arrizabalaga H. |
| SCRS/2017/029 | Historical size structure of bluefin tuna purse seiner's catch: data recovered from Balfegó logbooks data (1985-2000) | Gordoa A., Balfegó M., Balfegó P.V. and Navarro J. |
| SCRS/2017/030 | Update on the bluefin tuna catches from the tuna trap fishery off southern Portugal (NE Atlantic) between 1998 and 2016 | Lino P.G., Rosa D. and Coelho R. |
| SCRS/2017/031 | Las almadrabas de la corona de Aragon en los siglos XVI y XVII | Vidal-Bonavila J. |
| SCRS/2017/032 | Annual indices of bluefin tuna (*Thunnus thynnus*) spawning biomass in the Gulf of Mexico (1977-2016) | Ingram G.W. |
| SCRS/2017/033 | Changes of bluefin tuna (*Thunnus thynnus*) larvae fishing methods over time in the western Mediterranean, calibration and larval indices updating | Alvarez-Berastegui D., Ingram Jr G.W., Reglero P., Ferrà C. and Alemany F. |
| SCRS/2017/034 | A potential larval survival index for bluefin tuna (*Thunnus thynnus*) during 1990-2016 | Reglero P., Balbín R., Alvarez-Berastegui D., Rasmuson L., Ortega A., Abascal F., Blanco E., Medina A., de la Gándara F., Mourre B., and Alemany F. |
| SCRS/2017/035 | Report of the working group on multi-national pelagic longline index for western Atlantic bluefin tuna | Walter J., Lauretta M., Kimoto A., Hanke A., Ramirez K. and Melvin G. |
| SCRS/2017/036 | Proposals for Atlantic bluefin tuna stock assessment models for 2017 | Walter J. |
| SCRS/2017/037 | VPA-2BOX model diagnostics used in the 2014 assessment of eastern Atlantic bluefin tuna | Zarrad R., Walter J. and Lauretta M. |
| SCRS/2017/038 | Standardized CPUE of bluefin tuna (*Tunnus thynnus*) caught by Moroccan Atlantic traps for the period 1986- 2016 | Abid N., Malouli M. and Mhamed A.B. |
| SCRS/2017/039 | Tentative recovery of historical bluefin tuna catches in the black sea: the Bulgarian catches 1950-1971 | Di Natale A. |
| SCRS/2017/040 | A peculiar situation for YOY of bluefin tuna (*Thunnus thynnus*) in the Mediterranean sea in 2015 | Di Natale A., Tensek S., Celona A., Garibaldi F., Macias Lopez D.A., Oray I., Ortega García A., Pagá García A., Potoschi A. and Tinti F. |
| SCRS/2017/041 | The disappearance of young-of-the year bluefin tuna from the Mediterranean coast in 2016: is it an effect of the climate change? | Di Natale A., Tensek S. and Pagá García A. |
| SCRS/2017/042 | ICCAT GBYP tagging activities in phase 6 | Tensek S., Pagá García A. and Di Natale A. |
| SCRS/2017/043 | Historical and recent data of Sicilian traps: the complexity in data recovery and interpretation | Pagá García A., Di Natale A. and Tensek S. |
| SCRS/2017/044 | Update of the abundance index for juvenile fish derived from aerial surveys of bluefin tuna in the western Mediterranean Sea | Rouyer T., Brisset B., Bonhommeau S. and Fromentin J-M. |
| SCRS/2017/045 | Atlantic bluefin tuna area transition matrices estimated from electronic tagging and SATTAGSIM | Galuardi B., Cadrin S.X., Arregi I., Arrizabalaga H., Di Natale A., Brown C., Lauretta M. and Lutcavage M. |

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| SCRS/2017/046 | Captures, fréquences de taille et sex-ratio thon rouge de la côte Algérienne | Krim A.K., Djerbal M. and Daoud N.A. |
| SCRS/P/2017/001 | First insights into the Atlantic bluefin tuna stock structure within the Mediterranean Sea | Fraile I., Arrizabalaga H., Macías D., Vallastro M., Addis P., Oray I. and Rooker J. |
| SCRS/P/2017/002 | Automatic detection of bluefin schools on commercial sonars and its usefulness in monitoring abundance in the Bay of Biscay | Uranga J., Arrizabalaga H., Boyra G., Hernandez M.C., Goñi N., Arregui I., Fernandes J.A., Yurramendi Y. and Santiago J. |
| SCRS/P/2017/003 | Estimating catch-at-age of western Atlantic bluefin tuna: Can we do better than cohort slicing? | Ailloud L., Lauretta M., Walter J. and Hoenig J. |
| SCRS/P/2017/004 | Genetic Identification of Stock Origin and Estimation of Mixing Rates of Bluefin Tuna from Canadian Landings 2013-2015 | Puncher G.N., Hanke A., Hamilton L. and Pavey S. |

**Appendix 4**

**Otolith and fin spine age estimation protocols take into account band formation timing and calendar year**

Otoliths age estimates area adjusted by adding a plus correction following a criterion described in Rodriguez-Marin *et al*., 2016:
"*in order to correctly track cohorts, it was necessary to assign the fish correctly to the year it was born. To do so, a criterion was established in the 2015 Bluefin Data Preparatory Meeting (Anon. 2015 (in press)), based on the timing of opaque band formation inferred from monthly formation of edge type in bluefin tuna fin spines (Luque et al., 2014) and band formation from chemical tagging in SBT (Clear et al., 2000). Both sources coincide in opaque bands forming annually in summer (Figure 3). The adopted rule for otoliths is that when counting opaque bands: if the fish is caught between January 1 and the assumed time of the opaque band formation (June 1), then 1 year is added to the age. When counting translucent bands: if the fish is caught between June 1 and 31 of December, then 1 year is subtracted to the age*"
Thus, a bluefin tuna aged by counting opaque bands in otoliths and caught at the beginning of the year is interpreted as being 1 year older, despite being 5 or 6 months prior to the assumed date of birth, which occurs mid-year (May to June for western Atlantic and eastern Mediterranean or June to July for western Mediterranean spawning areas, Rooker *et al*., 2007. Consequently, when the fish is caught in autumn, age is the same as number of bands, although this fish has 5 or 6 months more of life after his birth date.

The criterion to adjust the number of bands counted in dorsal fin spine sections is described in Luque *et al*., 2014:
"*A scheme of edge type interpretation was as follow: translucent, first semester age=n and second semester age=n-1; opaque, first semester age=n* and second semester age=n, where n represents number of translucent bands including those estimated due to vascularization (*, unusual edge type)*". Translucent bans are formed in fall- winter (cold months).

Thus, a bluefin tuna with a translucent band formed at the edge and caught at the beginning of the year was interpreted as being 1 year older, despite being 5 or 6 months prior to the assumed date of birth, which occurs mid-year (June to July), considering 1 July as the birth date for western Mediterranean (Rooker *et al*., 2007). Consequently, when the peripheral translucent band is present and the fish was caught in autumn, this band was not counted as +1 year.

To calculate decimal age, the same formula has been applied for both stocks:
In Ailloud *et al*., 2017 for western stock: "*The estimated age was then assigned a decimal age (afinal) that accounted for the time elapsed between birth month (b)and month of capture (c) using the following equation: afinal =aadj + (c−b) /12*"
In Luque *et al*., 2014 for eastern stock: "*takes into account the sampling month and the assumed date of birth of 1 July [i.e. fractional age=estimated age+(sampling month per months of the year) – 0·5], as spawning in the western Mediterranean Sea occurs from mid-June to mid-July (Rooker et al., 2007)*".

Month of birth differs for each stock, as follows: 1 June for the western and 1 July for the eastern stock, respectively.

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**Appendix 5**

## Full revision of Task I nominal catches (T1NC) between 1950 and 2015

During the July 2016 bluefin data preparatory meeting (Anon. in press), the Group recognised the need for an entire revision of T1NC. This revision took about five weeks and involved the participation of the Secretariat, CPC scientists involved in the fishery, and, the GBYP team. The details are here described (includes all the revisions discussed and adopted by the Group, i.e. all which have arrived before the deadline of 2017-03-17). All the changes (updates, corrections, gaps recovered) adopted by the Group were included in the T1NC database with a reference to this meeting. The revision, was split into two periods (1950 to 1989 and 1990 to 2015), and was made by stock (BFT-E [ATE, MED], BFT-W) and involved a flag by flag analyses (with consultation to SCRS scientific papers whenever necessary).

Main goals: eliminate as much as possible catches from unclassified gears (UNCL, SURF, SPOR, SPHL), improve the internal consistency of each one of the series in T1NC, eliminate duplicates, complete as much as possible data gaps identified in the past. Overall, this exercise affected approximately 17% (~950 records) of the total T1NC information. The overall results were recognised by the Group as a great improvement to T1NC noting however that, this revision/validation work must continue in the future.

**Early period (1950 to 1989)**
The early period had the largest ratio of unclassified gears.

**BFT-W**
Canada: UNCL gear catches (1950-58) allocated to HARPE (a gap between 1959 and 1974 still exists and is under recovery); LL/LLHB series renamed as LL-surf; various gaps completed ("0" for PS gaps, TRAP catches recovered between 1950 and 1959, 223 t added to RRFB in 1982); RR renamed as RRFB between 1982 and 1989; UNCL gear catches of 1980 (18 t) eliminated once no evidence was found.

USA: Unclassified gear (SPHL) catches from 1956 to 1959 allocated to RRFS (recreational fishery); UNCL catches (1976-1979) allocated to LL (commercial fishery); catches of RR in 1975 (816 t) split into RRFB (694 t) and RRFS (122 t) as reported to ICCAT in the eighties; some series simplification at the fleet code level (USA-Com: Commercial fisheries; USA-Rec: recreational/sport fisheries).

Mexico: Series with gear UNCL (1950-1977) assigned to LL; LL gap (1983-1989) completed using a ratio of YFT of 2% ("steady" average ratio during the period 1996-1999).

Others: Argentina (1985-1989) UNCL gear catch series (low values) reclassified as TRAW; EU-Poland western catches (1974: 3 t; 1976: 3 t) moved to BFT-E; Norway LL catches (1964: 63 t; 1965: 4 t; 1966: 10 t) moved to BFT-E series (gap completion, and, confirmed by T2CE geographical distribution).

**BFT-E**
***Atlantic***
EU.España: unclassified (SURF) catches in 1963 allocated to Canary BB fleet (gap); remainder unclassified (SURF) catches (1982-1984, 1986) merged with HAND artisanal fleet (gaps); TRAP fisheries updated (1950-1989) with GBYP information using a two criteria approach (T1NC total (ATE+MED) < GBYP total (ATE+MED) AND GBYP(ATE) > T1NC(ATE)) in order to account for the T1NC joint (ATE+MED) reports (affected years: 1950, 1955-1956, 1958-1959, 1968, 1978, 1980-1981).

EU.France: UNCL catches of 1989 (101 t) assigned to TROL (gap); all TRAW/TRAWP/TRAWPP (since 1987) merged in a unique pelagic trawl (TRAWP) series.

EU.Portugal: TRAP (1950-1989) updated with GBYP recovery (criteria: MAX(T1NC,GBYP)); SURF 1983 (47 t) reallocated to Madeira BB fleet; Mainland fleet UNCL catches (1983-1989) merged into LL-surf series (gaps).

Japan: reclassified in a unique LL series all the various gears (LLFB: 1957-1961; LLHB: 1962-1989) to match Task II series (will likely change to deep longline in the future).

Morocco: Using Lozano (1958) estimations, the UNCL gear catch series (1950-1955) was split into TRAP (ATE), and, the remainder of the series (after discounting the MED TRAP catches from GBYP) remained as UNCL (note: it could possibly contain a combination of artisanal fisheries in both ATE and MED); eliminated the PS duplication found in 1958 (2539 t in both PS and TRAP/UNCL series); PS gap in 1959 completed using the GBYP TRAP catches (1892 t) which splits the 1959 current T1NC (5378 t) into PS (3486 t) and TRAP (1892 t); SURF catches (1983-1984) moved to GILL (gaps); SURF unclassified (1987-1989) catches allocated to PS series (complete PS gap).

Others: UNCL gears series of Denmark (1950-1969), Sweden (1950-1962) and Germany (1950-1962) were assigned to HAND (noting that two fleet components can exist: Commercial and recreational fleets); USA unique catch (5 t) value in 1982 (PS) in BFT-E merged in BFT-W series.

***Mediterranean***

Algerie: UNCL gear catches (1970-85) moved to TRAP (small traps) series (could contain minor by-catch of pelagic PS and other artisanal fisheries); remainder UNCL catches (1986-1989) split into the PSS (70%, small scale purse seine) and TRAP (30%, small traps).

EU.España: unification of LL (LLHB) catches (Mediterranean fleet) (1963-1979); unclassified SURF catch in 1983 (383 t) reclassified as BB (can have some PS catch); unclassified (SPOR) catches (1975-1982) moved to Spanish Mediterranean recreational/sport fishery; unclassified (UNCL) catches (1984-1989) identified as two longline Spanish fisheries (LLJAP and LLALB) and temporary reclassified as LL (until a better gear differentiation is obtained); allocated to GILL (1989) a portion (3 t) of the UNCL catches (714 + 3); TRAP fisheries updated (1950-1989) with GBYP information using a two criteria approach (T1NC total (ATE+MED) < GBYP total (ATE+MED) AND GBYP(MED) > T1NC(MED)) in order to account for the T1NC joint (ATE+MED) reports (affected years: 1963, 1967- 1968, 1979, 1980).

EU.France: UNCL catches (1950-1959) reclassified as GILL (completing gap of unique series); UNCL catches (SPORT, UNCL) reclassified as RR in a new French fleet (EU.FRA-FR-rec) for recreational/sport fleet differentiation.

EU-Italy: after a joint work (National Scientist, Secretariat, GBYP) aiming to simplify the Italian complex fleet/fishery structure, nearly 25 major fleet components were identified for Italy (6 of which were recreational/sport fisheries). That structure was the basis of all the gear/fleet reallocation/revision work: Italian overall PSFS catches (1953-1969) was split in two series (10% for Adriatic PSFS fleet, 90% for Ligurian PSFS fleet); PSFB catches (1952-1969) allocated to Tyrrhenian PSFB fleet; overall TRAP catches (1950-1989) were entirely updated taking into account the GBYP catch series (separated by Sardinia, Sicily, Tyrrhenian) with Sardinia being fully replaced by GBYP series, Sicily using a combination of the GBYP plus 85% of the positive difference between TRAP totals (T1 and GBYP), with the remainder 15% of that difference added to the GBYP Tyrrhenian TRAP series; also recovered Sardinia TRAP catches in some years (1974, 1978, 1979); reallocated various SPOR/SPHL/HAND into the respective recreational/sport fleets (Adriatic RR: 1984-1989; Ligurian RR: 1984-1989); UNCL gear catches in Tyrrhenian (1984-1989) containing all gears was split (using 90-92 proportions) into GILL (11%), HAND commercial (17%), HAND recreational (10%), HARP (1%), LLBFT (4%) and PSFB (59%); UNCL Tyrrhenian catches in 1981 and 1982 allocated to LL (gap).

EU-Greece: UNCL gear catches (1950-1969) allocated to HAND series; TROL catches (1982, 5 t) in ATE allocated as HAND to the MED (gap).

Libya: UNCL catches (1970-1971, 1980-1982, 1985-1989) merged into TRAP series (mostly for completing gaps); longine catches (1992, 1996-1999, 2006) in ATE merged with LL series in the MED (area error); purse seine catches (2000) in ATE merged with PS series in the MED (area error).

Morocco: Unclassified SURF (1983-1989) allocated to PS series (gaps completed); TRAP update (1950-1963) with GBYP series (quantities discounted from old UNCL series in ATE).

Tunisie: TRAP (1950-1989) updated with GBYP series recovered (criteria: MAX(T1NC,GBYP)) with various gaps completed.

Turkey: UNCL catches (1957-1979) allocated to TRAP (confirmed unique fishery at that time).

**Recent period (1990 to 2015)**

***BFT-W***

Canada: UNCL catches (2008, 2012) merged with RR series; three longline series (LL, LLHB, LL-surf) merged into a unique LL-surf series (1990-2015); two harpoon series (HARP, HARPE) merged into a unique HARPE series (1993-2015).

Japan: reclassified in a unique LL series (1990-2012) all the longline gears (LL, LLHB) to match Task II series (will likely change to deep longline in the future).

Mexico: NEI-031(MX) catch (2 t) in 1996 eliminated (official data exists: 19 t); LL gap (1990-1993, 1995) completed using a "steady" ratio of YFT of 2% (from average 1996-1999).

USA: RR catches (2001-2003) reclassified as RRFS (recreational); series simplification at the fleet code (USA-Com: Commercial fisheries in HAND/HARP/LL/PS/RRFB between 1990 and 2004; USA-Rec: recreational/sport fisheries in RRFS).

Others: Argentina UNCL gear catches (1990-1992) moved to TRAW (noting it could be SFB); Brazil multi fleets (1990,1999, 2012) merged into only one (BRA-JPN); Sta. Lucia UNCL gear catches of 1996 allocated to HAND (gap); UK-Bermuda UNCL gear catches (1999-2004) allocated to RR (gaps); UNCL gear catches of France SPM (1999) allocated to LL (gap).

**BFT-E**

***Atlantic***

EU-España: recovered GILL catch series (1990-1996, ongoing recovery process) and removal of UNCL (identified as GILL) catches in 1992 (2 t) and 1994 (2 t); catches from BB Cantabrian fleet targeting BFT (25 t) moved to BB fishery in Golf of Cadiz (correction); TROL Cantabrian catches catching BFT as by-catch (2001-2015) reclassified as BB (with two corrections in 2007 and 2008, where data were wrongly reported as kilograms but were in fact tonnes: 2007 changed to 404 t, 2008 changed to 599 t); TRAP fisheries updated (1990-2007 only) with GBYP information using a two criteria approach (T1NC total (ATE+MED) < GBYP total (ATE+MED) AND GBYP(ATE) >T1NC(ATE)) in order to account for the T1NC joint (ATE+MED) reports (changed years: 1990, 1998-1999, 2003, 2006).

EU-France: unification of multiple TRAW series (TRAWP, TRAW, TRAWPP) into TRAWP (1990-2015); completed RR recreational/sport French fishery using UNCL catches (1994, 1997, 2007, 2008, 2010) with the possibly inexistent LL catches (1992, 2004, 2006, 2007, 2012-2015); UNCL gear catch (2004) reclassified as TRAWP; UNCL gear catches of 2005 and 2006 split into BB (2004 BB ratio: 8%), PS (2004 PS ratio: 40%) and, TRAW (2004 TW ratio: 52%).

EU-Ireland: unification of multiple TRAW series (TRAWP, TRAW, TRAWPP) into TRAWPP (1998-2015).

EU-Portugal: recovered some data gaps related to Madeira BB fleet (1991, 1992, 2006); full revision of LL Madeira fleet between 1991 and 2006 (reallocation from Mainland fleet, split into ATE and MED areas); unclassified (SURF) series (1990-2011) allocated to the mainland PS fleet (1998-2002, 2008-2011) to complete gaps; Mainland fleet UNCL gear catches (1990-1994) merged into LL-surf series (gaps).

EU.UK: unified TRAW multiple series (TRAW, TRAWP, TRAWPP) into a unique TRAWP (1998-2009).

Iceland: UNCL catch (2012) moved to TRAWP (gap).

Japan: reclassified in a unique LL series all the various gears (LLHB: 1990-2012) to match Task II series (will likely change to deep longline in the future).

Libya: LL catches (1992, 1996-1999, 2006) in ATE merged with MED catches (partial gaps); PS catch (2000) in ATE moved to MED (gap).

***Mediterranean***

Algerie: Revision of LL series (1996-2006) with various years recovered/completed; error correction in GILL (2008, with 888 t) merged with PS (972 t = 888 + 84); UNCL gear catches (1990-1994) split into the PSS (70%, small scale purse seine) and TRAP (30%, small traps); UNCL gear catches (1995-1997) allocated to TRAP (gap); UNCL gear catch of 2003 (1586 t) split (using 2004 ratios) into GILL (17%), LL (15%), PS (68%); discarded entirely two series (HAND: 1998-2007; TL: 1998-2004) after confirmation from Algerie that those fisheries do not exist (the majority of the HAND and TL catches were contained in the LL series revision).

EU-Croatia: unclassified (SPOR, SPHL) gear catches (mostly HAND) reclassified as HAND (2010-2015) but with a new fleet identifier (EU.HRV-Spor) to separate it from commercial HAND fisheries; PS catches of 2000 (930 t, having the catch of three gears: PS, HAND, LL) split by Croatia into the three gears (HAND: 9 t, LL: 6 t; PS: 914 t); the historical PS catch series from Yugoslavia FR (1950-1990, known to be in its majority associated to Croatia) could be allocated to EU-Croatia if an official confirmation arrives.

EU.España: unclassified (UNCL) gear catches (1990-1996) split (using average ratios of 97-98) into LLALB (17%, 1990-1996) and LLJAP (83%, 1990-1993) series being the remainder of the 1994-1996 catches (discounted 17%) allocated to other gears (GILL, SURF, HAND, etc.); unclassified (SURF) catches (2000-2001) allocated to BB series; TRAP fisheries updated (1990-2007, with no changes afterwards) with GBYP information using a two criteria approach (T1NC total (ATE+MED) < GBYP total (ATE+MED) AND GBYP(MED) > T1NC(MED)) in order to account for the T1NC joint (ATE+MED) reports (changed years: 1990, 2006).

EU.France: unified various TRAW (TRAW, TRAWP) catch series (2010-2014) into TRAWP; UNCL catches (1995-1998, 2003-2008) allocated to LL series (gaps); unified recreational/sport catches (SPOR, SPHL, RR) into a unique series (EU.FRA-FRrec, RR); UNCL gear catches (2010-2011) merged with LL series (gap); unified various PS catches (PS, PSFB, PSS) in the MED (1990-2015) within a unique PS (EU-FRA-FR-MED) series.

EU-Greece: NEI-010(GR) catches (1998-1999, HAND) eliminated (official data exists); harmonized into LL-deri series various longline catches (LL, LLBFT, LL-deri) between 1999 and 2015; PS and PSFB (2011-2013) merged into a unique PS series; UNCL gear catches (2014-2015) merged with LL-deri series.

EU.Italy: the same methodology of the early period was used. Tyrrhenian TRAP catches (1990-1997) allocated to Sardinia; Italian TRAP catches (1998-2009) split (using the average ratios 1995-1997) into Sardinia (56%) and Sicily (44%); both TRAP series (Sardinia and Sicily) were afterwards completed with GBYP data (chosen MAX(T1, GBYP)); Adriatic recreational/sport catches (HAND, RR, SPOR) combined in a unique RR series (1990-1997, 2003-2005, 2010); Ionian recreational/sport catches (HAND, SPOR) combined in a unique RR series (1990-1997, 2003-2005, 2010); Ligurian recreational/sport catches (SPOR, UNCL) combined in a unique RR series (1990-1997, 2003-2005, 2010); Tyrrhenian recreational/sport catches (SPOR, UNCL) combined in a unique RR series (1990-1997, 2003-2005, 2010); overall Italian recreational/sport (without fleet separation) between 1998 and 2002 split (using average ratios 2003-2005) into Sicily (2%), Tyrrhenian (42%), Adriatic (19%), Ionian (19%), Ligurian (5%), and, Sardinia (12%); Italian grouped longline catches (1998-2009) allocated to Sicily (LLBFT); unified the catches of various fleet based LL gears (LL, LLHB, LLBFT) between 1990 and 2012 to LLBFT (Adriatic, Ionian, Sardinia, Tyrrhenian) and LL-surf (Ligurian only); unified the catches of various fleet based PS gears (PS, PSFB, PSFS, PSS) to PSFB (Adriatic, Ionian, Sicily, Tyrrhenian) and PSFS (Adriatic, Ligurian).

EU.Malta: SPOR catches (2014) allocated to recreational/sport series (EU.MLT-Rec, RR); PS catches corrected in 2008 (131 t) and 2009 (53 t).

EU.Portugal: revision of LL catches (previously linked with Mainland fleet) as belonging to Madeira LL fleet (1990-2001) with splits (1991-1995) into areas ATE and MED.

Morocco: LL catches of 2008 (528 t) split into PS (517 t) and LL (11 t) using BCD information.

Others: Albania PS catches (PS, PSFB) unified in a unique (PS) series (2009-2015); unified two NEI codes fleet codes (NEI-MED, NEI-COMB) with the same meaning (combined unreported catches obtained from bluefin statistical documents) related to LL (1982-1992) and PS (1990-2004) into a unique fleet code "NEI-COMB"; eliminated NEI-118(CH) LL duplicated catches (1997, 1999) due to official data availability; Serbia & Montenegro 2006 catches allocated to unique PS series.

**Results and discussion**

Overall, the integral revision of bluefin T1NC (Task I catches) has only affected slightly the total catches (t) in any of the three stock/areas (**Figure 1**). The changes are more pronounced in the Mediterranean in the early period (50s and 60s) mostly due to the GBYP recovery (including the new PS series from EU.Bulgaria). The rest of the changes are majorly linked with gap completion and error correction processes.

The major improvement was observed in terms T1NC internal consistency in any of the three stock/areas (BFT-E(ATE), BFT-E(MED), BFT-W). The improvements are evident at the fisheries time series discrimination and completeness. Unclassified gears (UNCL, SURF, SPOR, and, SPHL) were drastically reduced from more than 35% in some years (early period) to reasonable ratios (less than 8% in any year). The improvement registered in the BFT Task I overall catch statistics is not complete (various catches series still missing or are incomplete) and should continue in the future.

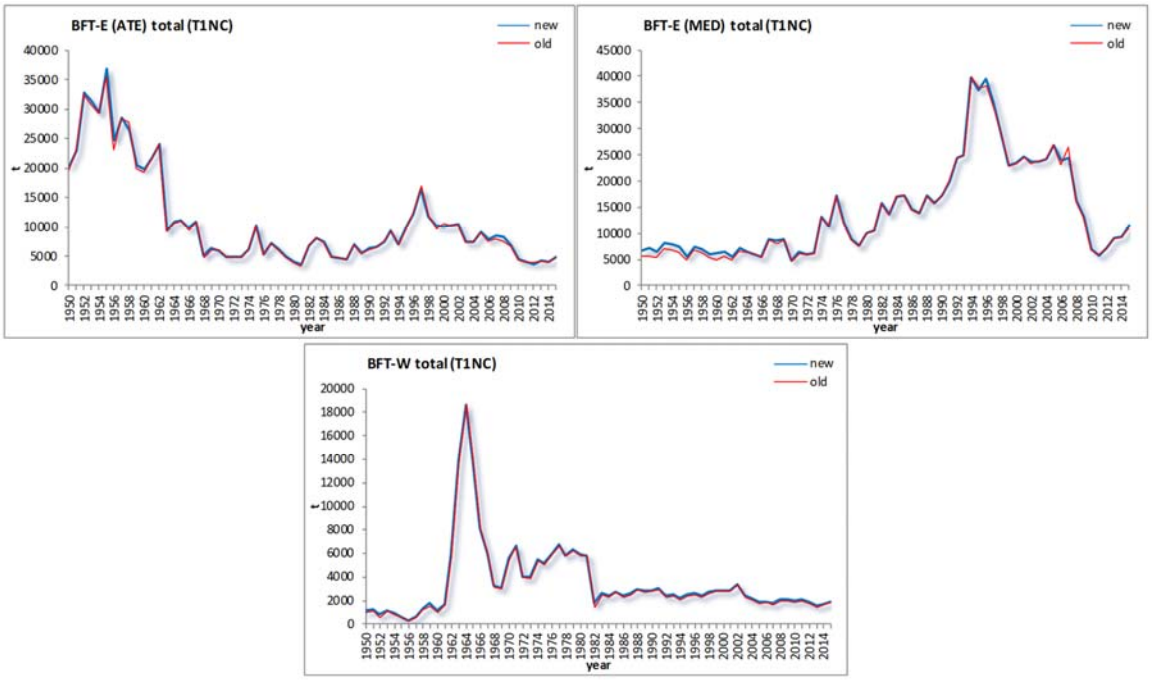


**Figure 1** Comparison of T1NC overall catches in both stocks (BFT-E (ATE and MED), and BFT-W), before (old) and after (new) the full revision made.

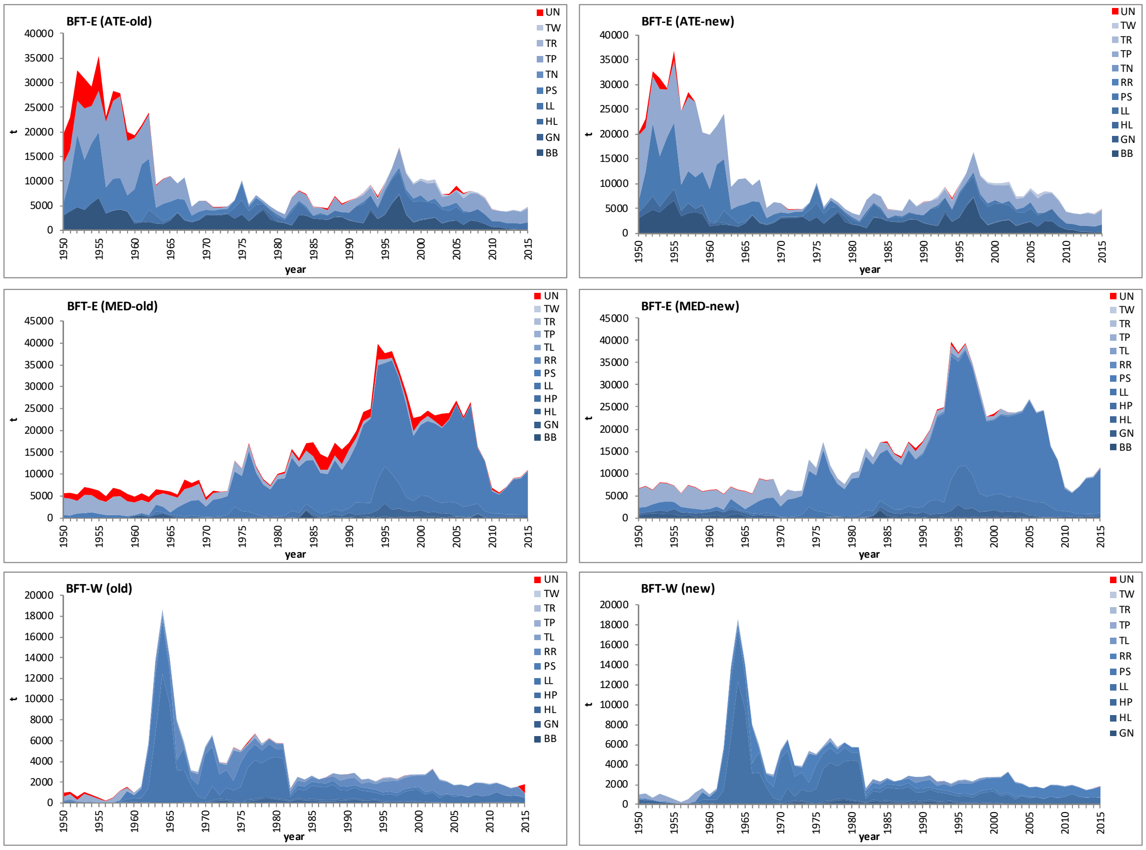


**Figure 2** Comparison of T1NC catches by gear (cumulative) in both stocks (BFT-E (ATE and MED), and BFT-W), before ("old" in left panels), and, after (new, in right panels) the full revision made. The series in "red" (UN) in all six figures denotes the unclassified gears group (UNCL, SURF, SPOR, SPHL), which almost disappears in the "new" T1NC.

**Appendix 6**

## Terms of Reference for a Workshop on Spawning Fraction by Age in Atlantic Bluefin Tuna to Inform the Stock Assessment Process

Proportional spawning output by age (spawning fraction), is used to estimate spawning stock biomass and study the spawner-recruit relationship. In Atlantic bluefin tuna, spawning fraction by age is currently estimated to differ between the two populations, with a greater contribution to spawning output of younger age classes in the eastern Atlantic population than in the western population. Given similarities in the overall biology, particularly growth rate, between the two populations, the 2017 Atlantic bluefin tuna data preparatory group found these large differences in spawning output by age between populations to be unrealistic. Examining the data and methodologies used to estimate spawning fraction in the eastern and western populations, shows that the estimates had been measured in many different ways and were measuring different aspects of bluefin tuna reproductive biology, making direct comparisons between the stocks difficult if not impossible.

The Group recommends that a workshop of experts on the topics of bluefin tuna reproduction, life history and ecology, be convened with the expressed goal of harmonizing definitions and analyses for estimating spawning fraction. Spawning fraction for a population is made up of a number of components that should be examined, including:

- The age structure of the population
- The age/weight relationship, which provides a measure of biomass for each age class
- The proportion of fish in each age class that are capable of spawning (maturity)
- The proportion of fish in each age class that is on a spawning ground during the spawning season
- The proportion of fish in each age class that is actually spawning
- The batch fecundity by age/weight/length
- Spawning frequency by age/weight/length
- Spawning duration by age/weight/length

There are many tools available to study these parameters, including but not limited to; histology, endocrinology, sampling of larvae, size composition of fish on the spawning ground, close kin genetics, and electronic tracking data. Each of these tools can provide insight into one or more of the parameters listed above, but multiple sources of information are needed to arrive at an estimation of spawning fraction. The workshop should bring together several experts from each of these fields to agree one vector of spawning fraction by age for each population, including uncertainty estimates around the vector. The workshop will also make recommendations for additional research to reduce the uncertainties in the vector of spawning fraction by age.