REPORT OF THE 2018 ICCAT BIGEYE TUNA DATA PREPARATORY MEETING

(Madrid, Spain 23-27 April, 2018)

1. Opening, adoption of agenda and meeting arrangements

The meeting was held at the ICCAT Secretariat in Madrid from 23-27 April 2018. Hilario Murua (EU-Spain), the Species Group ("the Group") rapporteur and meeting Chairman, opened the meeting and welcomed participants. Mr. Driss Meski (ICCAT Executive Secretary) adressed the Group and welcomed the participants. The Chair proceeded to review the Agenda, which was adopted with a few 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 abstracts of all SCRS documents presented at the meeting are included in **Appendix 4**. The following served as rapporteurs:

Sections	*Rapporteur*
Items 1, 11	M. Neves dos Santos
Item 2	D. Gaertner, C. Brown, G. Merino
Item 3	C. Palma, M. Ortiz
Item 4	M. Ortiz, C. Palma
Item 5	G. Merino
Item 6	S. Calay, S. Hoyle, G. Merino
Item 7	J. Walter, G. Merino
Item 8	D. Beare
Item 9	H. Murua, D. Die
Item 10	D. Die, M. Neves Santos

2. Review of historical and new data on bigeye biology

Six documents were presented in this section bigeye tuna (BET, *Thunnus obesus*), 1 related to age and growth studies, 1 to reproduction, 1 to length-weight relationship and 3 related to the biogeography of small bigeye catch in FADs.

2.1 Age and growth

Tag-recapture data, combining historic data and ICCAT AOTTP data, were used to assess if the growth curve of bigeye is supported by a two-stanza growth model or by the conventional Von Bertalanffy growth equation (SCRS/2018/046). This paper analyzed tagging data from both the historical ICCAT database and the newer ICCAT AOTTP tags. After plotting the growth rate observed from tag and recapture data vs the length of fish at release, the authors concluded that in contrast to that has been described in other oceans, there is no evidence to adjust the growth curve of bigeye with a two-stanza model. A growth curve fit to the data was similar to the Hallier *et al.* (2005) growth curve currently used for ICCAT bigeye stock assessments, although Linf was poorly estimated due to a lack of large recaptures. The small difference observed for the parameter K between this study and the estimate currently used for the previous bigeye stock assessment might be due to the fact that the present work is based on tag-recapture data only whereas Hallier *et al.* (2005) was based on both tag-recapture and otolith reading data. It should be stressed that the Von Bertalanffy parameter estimates obtained in the present study are in agreement with a K-Linf bioenergetic curve fitted with VB parameters obtained in several previous studies (Murua *et al*., 2018).

The Group noted that there may be some differences if the analysis data set were restricted to ICCAT AOTTP data, although the time at liberty to be used in the analysis is limited at this time.

2.2 Natural mortality

No papers were presented under this item. However, SCRS/P/2018/022 presented a preliminary estimation of M based on tagging data using the Brownie-Peterson method (see section 8 of this report).

2.3 Reproduction and sex-ratio

The document SCRS/2018/61 depicts an analysis of bigeye sex ratio from the size of the individuals caught by East Atlantic purse seine fleets. Large males are observed to be predominant at larger sizes but the trend by fork length was not found to be significant (in contrast to what is observed for yellowfin). There is also no significant trend by season or by area. It was suggested that fitting to a spline function may make it easier to detect differences by size, season and/or by area.

It was noted by the Group that these results are consistent with previous studies on this topic. However, the fact that the majority of samples are conducted in canneries may bias the estimates for the large fishes. The spatial pattern and length pattern of sex ratio of bigeye are apparent as well, although again less evident than for yellowfin in the Pacific Ocean. It is recommended to not model length as a categorical factor but as a continuous variable. It was discussed the fact that females appear overall to be distributed at larger sizes than males, but not when separating by fishing mode. It was postulated that this could be result of comparing medians; to confirm why this occurs would require examination of the actual size distributions, rather than the box and whiskers plots.

2.4 Length weight relationship and its variability

Document SCRS/2018/050 provided length-length, weight-weight, and length-weight relationships for bigeye tuna caught by longliners in the Southwestern Atlantic Ocean.

The Group contrasted the estimated relationship between dressed and round weight in the study with the currently adopted by the SCRS, noting that the slope of the relationship was somewhat different from the current adopted value, and that the new equation includes an intercept. It was suggested to refit the new equation to force it through zero (no intercept), reporting on the effect on the fitting statistics.

The Group highlighted the need to clarify the definition of round and dressed weight in the fishery. Furthermore, it was noted that in the lack of standard deviation information is not easy to compare between model fits. Bearing in mind the specific gear and small area used to collect the samples in this study, it was recommended to take into account seasonal and spatial effects, and expand the analysis to include information from other CPCs. The Group also identified the need for calculating the relationship between curved and straight fork lengths.

The Group did not recommend replacing the current adopted weight-weight relationship, but did recommend to review the weight-weight relationship used by ICCAT, including how it was derived. If the data on which is was based can be recovered, the performance should be compared with the analysis using more recent data. The same recommendation has been done for the other biometric relations.

2.5 Spatial distribution of small BET FAD catches

Document SCRS/2018/038 presented a preliminary study attempting to detect hotspots for small bigeye tuna. The analysis is based on the ICCAT Task II catch/effort by 1° by 1° and month by fishing mode for the 2007-2016 period. Ghana catch data for 2015-2016 had not yet been reported at the time of the analysis; these catches were estimated by assuming that the 2014 CPUE did not change and calculating catch with effort data available from the ICCAT Secretariat for 2015 and 2016. Considering that the spatio-temporal strata used to correct the species composition of the European purse seine fleet might be too large to accurately reflect the proportion of small bigeye caught under drifting FADs (dFADs) at a finer scale, the species composition by 1°* month from European (and associated fleets) landing samples was used in this study. Because not all the 1°square*month strata were covered by sampling, a spatio-temporal variogram analysis has been performed to explore the effect of different spatial-temporal strata on the substitution scheme for the estimating of species composition of catches. The conclusion of the analysis is that the substitution of strata without any dFAD species composition samples of small bigeye proportions is justified within the range of boundaries defined from 1 to 2 months (before and after t) and 1 until 5 degrees. These boundaries are reinforced with the averaged distance travelled for one month lag by juveniles' bigeye, calculated with tagging data from ICCAT AOTTP (Atlantic Ocean Tropical Tuna Tagging Programme (AOTTP). This method allowed to reconstitute the species compostion of catches, when necessary, 99% of the 1° by 1° month strata. This study focused on the detection of small bigeye hotspots is preliminary as environmental factors will be added to better discriminate potential differences in habitat between small bigeye and other life-stage tuna species.

The Group appreciated the effort done for analyzing the size of the optimum strata and recommends considering such approach for estimating the species composition in European purse seiner logbooks. However, the Group underlined that the samples used in the analysis were only monoset (i.e., large catch from a unique set which fill entirely a well and for which the date and location of the set are perfectly known). These monosets represented 23% of the total dFAD sets for the 2007-2016 period. The Group also suggested that the "juvenile" category by considering the size at first maturity (100 cm FL) instead of 52 cm (or 3.2 kg). With regards to the preliminary analysis of habitat, the logistic regression could disentangle the catch rates based on differential effort/bigeye presence. In conclusion, it was recognized that for evaluating potential time-area closures on dFAD activities, samples which provide species composition information at a fine scale resolution in respect to set locations should be considered.

The document SCRS/2018/044 shows the geographical variability in the amount of bigeye caught under FADs by purse seiners in the eastern Atlantic. The study combines the multispecies samples and the ICCAT statistics. One of the major results is the evidence of a strong increasing gradient from the coast to the offshore waters in terms of proportion of bigeye caught under dFADs. Some differences were also reported between this study and the previous one on the hotspot detection, but it was remembered that here the subset of data used contains about 80% of the samples (i.e., not only monosets) which could result in a loss of the precision of the sample location. The large variability observed in the different strata suggested that it is very important changing the stratification of the EU purse seiner statistics estimation in T3 software and taking into account smaller strata to correct for species composition. In general, bigeye proportions in the catch increase as fishing locations move further off the coast and, hence, plotting of bigeye catches and proportions by distance from the coast within the eastern tropical Atlantic was considered useful.

SCRS/2018/045 provides an overview of statistical issues identified in the estimation of EU purse seiner statistics. This document discussed the length weight (L/W) used in the T3 data processing of the EU purse seiner and Ghanian estimation of catches. It was noted that the species composition of these catches, and then their BET catches, are based on the length-weight relationship used. As a consequence, any significant error in any of the three species L/W used will introduce errors in the total estimated catches of each of the 3 species. It was also noted that each of the L/W relationship of yellowfin, skipjack and bigeye used in the T3 data processing are based on very old data that have been collected before the expansion of the fishery and the use of FAD. Furthermore, it was noted that the bigeye L/W relationship proposed by Parks *et al.* (1982) was predominantly based on large individuals caught by LL with very few samples from surface fisheries (only 437 individuals, probably of much larger that in current FAD catches). It was also noted that the present bigeye fishing zones of purse seiners covers much wider areas than in the past, most of small bigeye being caught by purse seine under FADs in offshore areas. These potential changes in the L/W relationship may have a large impact on the catch estimation by species of the purse seiners. The paper recommended that length/weight sampling should urgently be conducted for 3 species of tropical tunas landed by purse seiners to update their L/W relationships.

During the discussion, the Group agreed the importance of biological sampling from each fishery to address several biological questions. The authors recommended continuous intensive size-weight samples of the purse seiner catches.

3. Review of fishery statistics

The Secretariat presented to the Group up-to-date fisheries statistics available (T1NC: Task I nominal catches; T2CE: Task II catch and effort; T2SZ Task II size frequencies; T2CS: Task II catch-at-size) on bigeye tuna in the ICCAT database system (ICCAT-DB) covering the period 1950 to 2017. This information includes all the revisions and new data reported until the beginning of the meeting. Only 6 CPCs (EU-France, Japan, Morocco, Ghana, Senegal, and Chinese Taipei) have reported in time data for 2017. The largest majority of the 2017 information was obtained from CPC scientists, evaluated, and adopted during the meeting. All the datasets compiled during the meeting were registered in ICCAT-DB as non-official preliminary statistics obtained by this Group. For all the data not yet available, the Group established a deadline (15 May) from which no more changes will be accepted for the stock assessment.

Several documents were presented to the Group with various updates on fisheries statistics. Document SCRS/2018/053 presented a full revision of the Brazilian catches for the period 2010 to 2016, whereas document SCRS/2018/048 provided a description and trends of a recent tuna fishery on "associated schools" in Brazil. EU-Spain presented an update (2015-2017) on BET by-catch landed by the Spanish surface fleets targeting albacore (*Thunnus alalunga*) in the Bay of Biscay (SCRS/2018/037), and an update to the fishery statistics (1991-2017) of the Spanish tropical purse seine fleet (SCRS/2018/057). EU-Portugal (SCRS/2018/062) presented an update (2010-2018) of the fishery statistics of tuna species caught off Madeira archipelago. The statistics of the European associated purse-seine and baitboat fleets (1991-2017) was also revised in document SCRS/2018/056. Finally, two additional documents (SCRS/2018/044 and SCRS/2018/045) presented an exhaustive study of the current deficiencies found in the ICCAT Task II databases with a major focus on T2CE and the tropical tuna species.

3.1 Task I (catches) data

After a full revision of T1NC (updates, species/gears corrections, addition of new catch series, gap completion, duplicate catches elimination, etc.) for the period 1950 to 2016, the Group also obtained preliminary estimations of 2017 nominal catches (landings and dead discards). **Table 1** presents the BET nominal catches adopted at the meeting by flag and major gear (**Figure 1** shows the cumulative catches by gear between 1950 and 2017).

The last three years (2015-2017) of T1NC still lack the "faux poissons" purse seine catch component (an average of about 9,000 t in total for the 3 tropical tuna species, between 2010 and 2014) that will be included (ongoing work of EU scientists) in the stock assessment. The Group also identified the need to correct the species catch composition of the Ghana official T1NC for the recent period (2015 to 2017, with a possible revision for the years 2006 to 2014). This work will be made by the Secretariat (using the methodology described in Ortiz and Palma 2017) aiming its inclusion in the stock assessment.

Other major improvements to T1NC includes, the elimination of the Angola longline catch series between 2009 and 2014 (duplicate catches, already included in the Japanese catches), the elimination of Ghana unclassified gear catches between 1973 and 1993 (duplicated and already included in the baitboat and purse seine catch series until 1987, and, incorrect carry over estimations after 1988), the differentiation of the Ghana purse seine catches into three fleet components (National A-fleet, P-fleet since 2003, and, European associated between 1997 to 2004), the reclassification of the Brazilian unclassified gear (SURF) as surface longline (LL-surf), the simplification of the Brazilian fleet structure (85 different fleet associated catches merged into less than 20 fleets), and, the reclassification of all the EU associated NEI-ETRO based fleets into the proper CPC fleet codes (e.g.: NEI-001-CUW reclassified as CUW-ETRO for the Curaçao purse seine tropical fleet) using by default the "ETRO" suffix in all the fleets.

About 10% of the 2017 overall catch estimations were based on carry overs (average of the three previous years) due to the absence of official T1NC data. The Secretariat will contact the respective CPCs in order to replace, whenever possible, those preliminary carry over estimations by official statistics before 15 May.

Despite the improvements made to the T1NC statistics, the Group still have concerns in relation to the completeness of some longline fleet catch series (Belize and Panama), and also uncertainties in relation to the catch series (1983 to 2002) of the large list of fleets identified under the flag "NEI (Flag related)". These catches were obtained using the trade (imports) statistics and, thus, they should be further evaluated in the future. Foreseeing this objective, the Group proposed that (in line with the rest of NEI fleets reclassification), these fleet code identifiers (now with numbers indicating the fishing flag) have included the corresponding ISO-3166 alfa code (e.g.: NEI-071 for Honduras, could be renamed as NEI-HND) in order to facilitate the identification of the fishing flag.

The recent Brazilian "school association" multi-gear (but mainly hand-line) fishery was for the first time presented to the tropical tuna Group, and deserved a deeper explanation from the Brazilian scientists who also presented some videos with fishing operations and fleet behaviour (SCRS/2018/048). This fishery started in 2010 with only a few vessels catching less than 100 t of tuna species in total, reaching in 2017 a total of about 6,500 t of bigeye (with a fleet of nearly 220 fishing vessels, with a 12-16 meter length overall). Task I statistics for this fishery for the period 2010-2016 were submitted for the first time this year to ICCAT Secretariat.

Finally, the Secretariat presented a brief comparison between T1NC and the bigeye statistical document programme (SDP) of ICCAT. The comparison is presented in **Table 2**. The Group reiterated its past observations that the BET-SDP information, with its current aggregation level (biannual reports on trade), cannot be used to validate Task I catch series. This is due to the impossibility of obtaining accurate fishing dates (with time lags varying from a few months to more than one year). In addition, the level of SDP coverage is unknown given that not all the bigeye trade among countries is reported under the ICCAT SDP.

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

The SCRS catalogue for BET (1988 to 2017) is presented in **Table 3.** For the 25 most important fisheries (covering 95% of the total catches in that period) the availability of Task II (T2CE, T2SZ, T2CS) has improved slightly since the last stock assessment. However, important gaps still exists in some important fisheries. For 2017 only a few CPCs have reported Task II information.

T2CE: catch and effort

The Working Group reviewed the available T2CE time series of bigeye tuna catch. Various datasets related the European purse seine and baitboat tropical fleets were replaced (EU-France in 2009, 2010, 2011, and 2012) and all the missing datasets of the EU associated purse sein fleets (Cabo Verde, Curaçao, Guatemala, Panama, etc.) from 1991 onwards, totally recovered. The Group also adopted the Ghanaian T2CE estimations (1996 to 2005) obtained during the ICCAT 2013 Tropical Tuna Species Working Group meeting (Tenerife, Spain) (Anon. 2014). China PR also updated its T2CE for 2016 (now with effort).

For 2017, the low amount of T2CE datasets available will weaken the CATDIS estimations (input for Stock Synthesis (SS3) modelling work, as a replacement of Task I catches) in that particular year since many substitutions (using 2016 T2CE) are expected.

T2SZ: size frequencies

The T2SZ datasets available for SS3 have improved slightly with the recovery of some missing size frequencies datasets from the EU tropical fisheries (France, Spain and associated fleets) for the period 2014 to 2017. Year 2017 is still incomplete, but the Group expects to receive the majority of the missing datasets (2017 and before) before the deadline of 15 May.

It was also confirmed a major revision of the Chinese Taipei bigeye T2SZ dataset (currently, highly aggregated and with a heterogeneous structure before 2008) that will be provided to the SCRS by month and with a 5x5 grid geographical resolution. The Group appreciated this improvement from Chinese Taipei (in line with the SCRS general recommendation to improve the level of resolution/harmonisation of Task II information) and reiterated its support to this type of revisions.

3.3 Improvements to Ghanaian statistics (Task I and II, 2006-2017)

The tropical tuna species Group elaborated in 2011 a work plan, starting in 2012, to improve the Ghanaian Task II (T2CE and T2CS) statistics. The plan included technical support in port sampling and data analysis as well as the development of the software needed to obtain accurate Task II estimations. This work has yet to be finalised.

The plan also included the historical Task II estimations (1996 to 2005 already adopted by the Group). The Task II estimations for the period 2006 to 2014 (made by the Secretariat during 2016, Ortiz and Palma, 2017) have to be updated in order to include the last three years (2015 to 2017) using the same methodology as in 2016.

3.4 Improvements to "faux poissons" estimations (Task I)

The Group revisited the "faux poissons" (FP) estimations (and the methodology used during the last stock assessment) for the period 1982 to 2014. That evaluation clearly identified that, all the present landing statistics of major tunas sold in the faux poissons market are solely based on the Abidjan landings, but that large quantities of tunas are also landed in other ports (Dakar, Tema and others). The yearly ratio between the Abidjan and total landings by the EU and associated PS fleet are shown by **Figure 2**.

It can be hypothesized, based on sampling done in other ports, that significant landings of undersized major tunas (that cannot be sold to canneries) have been also occurring in all or most landing ports (and potentially sold to local markets or to the Abidjan market by freezers in containers).

The current Task I FP estimations have two differentiated series. The FP catches between 1981 and 2004 (obtained from TUX, tuna-like species *nei* only samples, with no species differentiation) could have an over estimation of bigeye, yellowfin and skipjack because small tuna was not discounted before the split between the three tropical species. This over-estimation should compensate somehow the FP quantities of the two major missing ports (Dakar and Tema). The estimation of FP catches, between 2005 and 2014, with the species identification for Abidjan are considered correct. Obtaining FP catch estimations for Dakar and Tema (limited FP samples at landing) could be a complex task. The Group agreed to keep the current FP catch series until better estimations are available (which would need further studies by the concerned scientists).

3.5 Progress made on Task II FIS "break down"

The Group has worked during the meeting in the FIS breakdown for the T2CE dataset from 1980 onwards. The result (T2CE separated for Côte d'Ivoire, EU-France, and Senegal) will soon replace the old FIS T2CE dataset in ICCAT-DB. Further work is required for estimated the catch-at-size (T2CS) by flag for the same period which will be available for the CAS/CAA deadline.

The breakdown of the FIS Task II datasets (T2CE, T2SZ, and T2CS) for the period prior to 1980 (1969 to 1979) will require a more complex data treatment process, and can only be made in the future.

3.6 Other information (tagging)

As of today, the current conventional tagging database contains 27,728 valid records with bigeye tagging release/recapture events (11,235 records compiled by ICCAT, and, 16,493 records obtained from the ICCAT Atlantic Ocean Tropical Tuna Tagging Programme (ICCAT AOTTP). The ICCAT AOTTP represents about 60% of the total of biegeye tagging records.

Following the bigeye work plan for 2018, the Secretariat made available to the Tropical Working Group (owncloud) both the ICCAT and AOTTP conventional tagging dataset for their analysis exclusively related to the 2018 Bigeye stock assessment. The data included a variable "Source" to identify the source of information.

From the total amount of 27,728 registers, there are 20,922 releases without recovery and 6,806 recoveries identified. The recoveries represent almost a 25% from the total.

Summary information was presented in **Table 4** and 5 maps (**Figure 3**) following standard formats normally presented to SCRS:

- **Table 4** shows the percentage of recoveries and the years at liberty of the recovered specimens by year.

- **Figure 3** shows a map of the release positions (A), a map which shows the density of the release positions at 5x5 lat lon grids (B), a map showing the recovery positions (C), a map which shows the density of the recovery positions at 5x5 degree strata (D), and a map with the straight displacement from the release to the recovery position of the recaptured specimens (E), respectively.

4. Review and update CAS/CAA

4.1 Preliminary estimations

The Secretariat reported that because the lack of data submission on time from several important fleets for tropical tuna it was not possible to update the CAS for this meeting. Data was submitted just before or during the meeting for T1NC, T2SZ and T2CS for majority of the fleets. It was also agreed to a work plan including the following deadlines for the completion of data submission (May 15) and the creation of the input files for assessments models by the Secretariat (8 June 2018), giving priority to inputs for Stock Synthesis.

Hence, the CAA was not updated as CAS is not yet available. The Group agreed to create the CAA following the same assumptions as used in 2015 ICCAT Bigeye Tuna Stock Assessment (Anon. 2016), and the growth parameters using the Richards growth model of Hallier *et al.* (2015) which will be used in the current stock assessment.

4.2 Improvements needed for a final CAS estimation

Due to the relatively large changes made to the bigeye total catches and the large amounts of revisions made to the size data (T2SZ and T2CS) a fully revised bigeye CAS matrix will be done by 8 June 2018.

5. Review of fishery indicators

The Group reviewed document SCRS/2018/053 which presents a review of the Brazilian catches of tunas and tuna-like fishes from 2010 to 2016 submitted to ICCAT at the end of March 2018. The Group asked for clarification on the causes of the large amount of bigeye catch from handline fleets. The authors noted that the information was collected at fishermen level. It was clarified that there was no correction or extrapolation in the information.

The Group reviewed document SCRS/2018/048 that described the catch information from the fishing fleet operating on "associated schools" of tunas, off the Brazilian northeast coast, in the western Atlantic, from 2010 to 2017. The document reviewed the catch composition and other technical features of the fleet and concluded that the associated school' fisheries catch mainly juveniles of both yellowfin (93% of total yellowfin) and bigeye (97%) tunas.

The Group reviewed document SCRS/2018/057 that describes the activity of the Spanish purse seines operating in the tropical area of the Atlantic Ocean. The paper shows information about fishing strategies, fishing areas, target species catch and effort, CPUEs, sample coverage and size distribution of target and secondary species of the baitboat and purse seine fleets.

The Group reviewed document SCRS/2018/056 that presented the statistics of the European purse seine and baitboat fleets operating in the tropical areas of the Atlantic Ocean. It was clarified that the catch from Gabon corresponds to European fleets operating under different flags.

The Group reviewed document SCRS/2018/062 with the updated fishery statistics of tuna species caught in the Madeira archipelago, for which bigeye is the most important species. The study focuses on Madeiran and Azorean baitboat fleets operating in the region. The Group asked about the availability of the Azorean index for use in the assessment but this was not guaranteed.

6. Review of available indices of relative abundances by fleet and estimation of combined indices

The Working Group reviewed several documents regarding catch per unit effort (CPUE). These documents and the Group discussion that followed are summarized below. The relative abundance indices are summarized in a series of tables, and the assessment methods that they may be used for are identified. Quarterly and annual indices were prepared in each case (**Table 5 and 6**).

Bigeye tuna are part of a multi-species fishery, and in many cases fishing operations are confined (e.g. areas fished, gear configuration) to target certain species. The previous bigeye tuna data preparatory report described the Group's recommendations to address changes in targeting and remove these effects from standardized indices. This is essential since indices are assumed to be proportional to relative abundance of the sizes/ages observed, and changes in targeting confound this relationship (e.g. alter catchability and selectivity). The authors used a variety of techniques to reduce the impact of changes in targeting.

In addition, the Group considered an approach to develop a joint longline index across several major fleets (Japan, Korea, United States and Chinese Taipei) that used detail operational data. This index will be described later in this section.

The proposed use of indices in stock assessment models is described **Sections 6.1-6.3**, and detailed in **Table 7.**

6.1 Longline indices

Document SCRS/2018/032 describes the development of standardized CPUE indices of bigeye tuna for the Japanese tuna longline fisheries operating in the Atlantic Ocean during 1961-2017. Generalized Linear Models assuming either a lognormal or negative binomial error distribution were used to produce indices for three areas as well as for the whole Atlantic and the main fishing grounds.

Regarding the standardization, the Group recommended further exploration of the constant applied to sets with zero catch when the lognormal error distribution was used. In some cases, the addition of the constant produced negative values in Area 1. The Group inquired whether the use of a smaller constant could improve the model diagnostics. The Group also noted that in Area 2, the two models presented were quite divergent in early years. The author responded that at this time, new information became available that improved the ability of the model to infer targeting. There is a possibility that the interaction between clustering and the areas chosen for the analysis may exclude some observations. However, it may be that the contribution of these samples is small because they represent small removals or small amounts of the standing biomass. The Group noted that SST was chosen as an environmental factor, but that depth or depth of the thermocline, if available, might be a more informative variable.

Document SCRS/2018/049 presents the standardized catch rate of bigeye tuna caught by the Uruguayan longline fleet in the southwestern Atlantic using information from the national onboard observer program between 2003 and 2012. The indices were developed using Generalized Linear Mixed Models (GLMMs) and delta-lognormal approach.

Regarding the standardization, the Group noted that the index was often located near the lower confidence interval and requested that the authors check the standardization code to ensure that the confidence intervals were correctly calculated. There were also some concerns about the distribution of logCPUE which indicated some departure from the assumptions of the log-normal error distribution.

Finally, the Group discussed the suite of environmental factors examined and noted that this study had access to a greater number of environmental covariates than some others. This is not unexpected since this study used data collected by a scientific observer programme.

This index shows an increasing trend that is in contrast with other longline indices. With respect to the use of this index in stock assessment models, the Group noted that this index represents a relatively small amount of the biomass (<10%) and references similar age classes as other longline indices. Therefore, the Group recommended not to use the Uruguay LL index in the stock assessment "reference case" models. However, the Group also discussed that this index represents the South Atlantic, an area which is under-represented. Therefore, the Group recommended that this index could be useful in sensitivity runs. The Group made identical recommendations regarding the use of the historic Uruguayan longline index, which was used in the previous assessment and did not require revision.

Document SCRS/2018/051 describes indices developed for bigeye tuna captured by the tuna longline vessels of Chinese-Taipei operating in the Atlantic Ocean from 1967-2017. Generalized linear models (GLM) with a lognormal error assumption were applied to standardize the CPUE.

The Group noted that in the early years of the series, the apparent decrease in the Japanese index does not occur in the Chinese-Taipei CPUE series. This is likely due to the differences in the areas fished by each fleet and species targeted (e.g. gear configuration). The Group also requested further information about the size composition of this fleet which would be applied to estimate the selectivity of the fleet/index. The author responded that before 2004, there were no regulations to limit vessel's fishing ground. In this period, some vessels that targeted albacore caught smaller bigeye. Between 2004 and 2005, because of the reduced bigeye tuna quota, many old large-scale vessels were scrapped while newer, larger vessels continued to operate. The catchability of the newer, larger vessels could be higher. On the other hand, the bigeye tuna quota of albacore vessels was reduced, which could lead to increased discards of small bigeye tuna due to quota limitations. The author recommends that different catchabilities be applied for these two periods.

Model 3.1 (1993-2016) was built as the Chinese Taipei CPUE used in 2015 ASPIC stock assessment used as part of the management advice.

Document SCRS/2018/052 summarizes the development of a standardized index catch from the Brazilian tuna longline fleet, including both national and chartered vessels, in the equatorial and southwestern Atlantic Ocean from 1978 to 2016. The index was standardized by a Generalized Linear Mixed Model (GLMM) using a delta-lognormal approach.

During the meeting the CVs were revised. As has been noted in the past, this Brazilian longline index is not showing any trend and is highly variable mainly because the data are derived from a complex "fleet" that uses a variety of fishing strategies. The Group considered the efficacy of methods to standardize across fishing strategies and agreed that while the methods attempted appeared rational and state-of-the-art, the results still indicated strong influence of changes in fleet efficiency/*q* during the time series (e.g. 5 fold changes in CPUE in certain years). Therefore, the Group recommended not to use the Brazilian longline index for the stock assessment "reference case" models. However, the Group discussed that this index is from an under-represented area and could be used in sensitivity runs.

Document SCRS/2018/054 presents an update of three indices of abundance of bigeye tuna from the United States pelagic longline fishery logbooks in the Atlantic Ocean for years 1986-2017. Standardized indices were estimated using Generalized Linear Mixed Models with a delta binomial-lognormal approach. This fishery represents a small proportion of the area of distribution and biomass of bigeye tuna.

The Group proposed that the fleet-specific index from the United States longline be used only for the continuity surplus production model(s).

Document SCRS/2018/058 describes the development of joint longline indices for bigeye tuna using fisheries data from the Japanese, Chinese Taipei, Korean and United States longline fisheries from 1959-2017. The research was motivated to reduce data conflicts that arise when CPUE trends differ for different fleets in the same period. This can occur when available data are sparse, when the fishery occurs at the extremes of the spatial distribution of the stock and/or does not represent a meaningful proportion of the stock biomass, or when the index references only a small portion of the age or size distribution. This can also occur when there are important changes in fisheries operations (e.g. targeting, regulations, spatial distribution) that cannot be addressed in the standardization process. The overall approach was to (1) prepare, review and characterize the data for each fleet, (2) plot and summarize to identify unique characteristics of datasets, and any issues that should be addressed, (3) conduct a cluster analysis to identify fishing strategies/targeting (fleet x region) and (4) develop a standardized CPUE index using a GLM approach.

The Group noted the value of the influence plots that appear in SCRS/P/2018/023. These greatly facilitate the ability to evaluate the effect of model factor on catch rates over time. In particular, the Group noted the large influence of vessel ID on catch rates in region 1 (north of 25ºN). It was noted that vessel ID can be considered a proxy for the shift from Japanese vessels to U.S. vessels representing most of the records, particularly in the North West Atlantic. This is an important factor because the two fisheries use distinct fishing strategies (e.g. U.S. vessels fish ~700 hooks and Japanese with 2000+).

The Group reviewed the weighting applied to the model strata. During the development of the joint indices, equal weight was applied to each model stratum although some strata contained only a single observation (**Figure 6**). This weighting scheme was intended to allow spatial expansions/contractions to be accommodated. However, the Group expressed concern that this weighting scheme could also apply undue weight to strata with high variance (e.g. at the edge of the distribution of the stock) at the expense of strata with lower variance (near the center of distribution). The Group considered alternative weighting strategies (e.g. by catch, by spatial coverage) but noted that this is generally done when combining relative indices (not when the operational data is combined). Ultimately, the Group agreed to eliminate strata that contained <5 sets. Trends and residual patterns appeared very similar, but the residual plots indicated lower variability (e.g. smoother contouring).

To evaluate the effect of expansion/contraction of fishing areas on the joint CPUE standardization, the Group reviewed plots of residuals trends by area (**Figure 7**). The plots indicated that in some areas the catch rate trend is declining faster/slower than the model can account for. Possible explanations include: localized depletion, oceanography, changes in catchability or fishing strategy.

The Group concluded that the joint index was an improvement over fleet-specific indices because of the integrated temporal and spatial coverage it afforded to index stock biomass, and because it minimizes data conflicts in the stock assessment models. However, this approach requires the assumptions that the selectivity patterns of the component fleets were similar. After further explanation, there was evidence that since 2003, the size composition of the Chinese Taipei fleet (**Figure 8**) has been significantly larger than the other fleets. For that reason, the Group agreed to use the index as described above, but to exclude the Chinese Taipei size composition data to estimate the selectivity of the fleet representing this index.

6.2 Purse seine indices

No indices from purse seine fleets were presented.

6.3 Baitboat indices

Document SCRS/2018/060 summarizes the development of a standardized index of bigeye tuna from the EU-Spanish baitboat fisheries operating off Dakar (Senegal). The index was developed using a GLM delta-lognormal approach for the period 2005-2017. This is a fishery that in general lands bigeye tuna(40-130 cm), therefore this series could be useful to index the abundance of young bigeye.

The Group noted that a change in fishing strategy has occurred. In the early part of the series, vessels were used as FADs, but during the series, there has been increased use of FADs – rather than vessels to aggregate fish; which may have affected the selectivity of the fishery with a larger quantity of smaller fishes than in the past. There has also been a shift from coastal fishing, to a much larger fishing area in the later period. It is not known how these changes may affect catchability, plus the switch to FADs could have reduced search times. The Group noted that this shift could be evident in the year*vessel interaction terms noted in this model. The Group recommended that this interaction term be explored using repeated measures (rather than a random effect) in the future. The Group was also interested in the potential influence of large-scale oceanographic influences on this index.

Given that the model does not currently account for possible changes in catchability, the Group did not recommend this index for the stock assessment "reference case" models, however it could be appropriate to use (if possible) for age structured sensitivity models. It should not be used in surplus production because it represents only small fish.

Azores baitboat index

This index was used in previous assessment, but an updated index was not available in time for the meeting. This fishery is subject to strong environmental variations that influence the availability of fish and in the previous SS models this environmental influence was accounted for by the use of index of the Atlantic Multidecadal Oscillation (AMO) a proxy for Sea Surface Temperature changes. The VPA and production models cannot account for this change. The use of this index requires a model that is spatial and allows mixing. The Group recommended to use the Azores baitboat index in the SS sensitivity run with three areas. Thus, the series should be updated for the bigeye stock assessment meeting.

6.4 CPUE index diagnostics

Appropriate model diagnostics were made available for all indices and appear in the various SCRS documents listed above. Except where noted above, the Group had no concerns about the model diagnostics.

6.5 Criteria for inclusion of indices

The Group reviewed a table characterizing each index with regard to criteria for inclusion developed by the ICCAT SCRS (**Table 7**). These qualities were considered as part of the basis for inclusion of indices in the stock assessment models. The decisions of the Group regarding index usage are summarized in **Sections 6.1-6.3**, and in **Table 7**.

7. Stock Assessment Modeling

The Group reviewed document SCRS/2018/042 that describes a potential path for the development of the integrated stock assessment model for the upcoming ICCAT bigeye tuna stock assessment in July 2018. The authors have investigated the treatment of the sensitivity analysis for the management advice. They also reviewed the model specification and the weighting methodology for the multiple scenarios (sensitivity analyses) of the recent bigeye tuna stock assessments in the t-RFMOs. The treatments for the weighting methodology can be classified in two groups, that is, the uncertainty grid analysis type and the base case type. The former used the results of multiple scenarios, and the latter one used only one base case for the management advice. For the former, the result can be readily changed according to the ensemble methodology for the multiple scenario, thus the weighting methodology should be discussed ideally in advance. The modifications for the previous stock assessment model was also discussed, including sub-area definition, movement parameters, selectivity parameters and the treatments for the abundance indices, and the tentative list for the sensitivity analysis was presented.

7.1 General considerations

The Group agreed to conduct surplus production models, Stock Synthesis model and virtual population analysis (VPA), similar to previous bigeye assessments. Fleet structure, model set ups and specifications will mostly remain the same as in 2015 unless specific changes are warranted. These changes will be documented, below. The Group outlined a systematic series of steps for developing models to be used for 2018 assessment advice. These steps mostly pertain to Stock Synthesis but many of the diagnostic criteria may also apply to the production models or VPA.

For surplus production models, the biomass dynamic model MPD (Kell, 2016) and JABBA model (Winker *et al.*, 2018) will be used instead of the ASPIC software.

The Group agreed that the joint index would be used in all "reference case" assessment models and would replace the fleet-specific indices whose data were included in the development of the joint index (i.e. Japan, Korea, United States and Chinese Taipei).

Overall for all modeling platforms the time frame will be 1950-2017, assuming near virgin conditions in 1950. The VPA will likely start when reliable age composition can be obtained (1970). The models chosen by the Group to be run will be surplus production models, virtual population analysis (VPA 2 Box) and stock synthesis. While this section outlines general recommendations and specifications, we maintain the prerogative of analysts to make necessary decisions to alter certain specifications according to the model performance and more detailed consideration of input data. The modeling will be conducted by teams as the intention of the Group is to make the modeling process transparent (by routinely posting model input and data files to the Owncloud) and inclusive (any interested Parties should contact model leads to participate). Leads, as of the data preparatory meeting have been identified as follows: SPM (Gorka Merino), and JABBA (Henning Winker), SS (John Walter, Hiroki Yokoi, Keisuke Satoh, Takayuki Matsumoto, Agurtzane, Toshi Kitakado), and VPA (Matt Lauretta). The Group requests that leads post the reference case input files for each model to allow cross-checking of data files, control files, etc. in the Owncloud. At least one week prior to the assessment meeting (18 July 2018) all input, data files, code and executables for all model runs will be made available to the Group and each model should have an associated paper provided for the assessment workshop that describes the inputs, model and results as of that date so that the Group can fully evaluate each stock assessment platform.

All models that do not include the full suite of requirements outlined in **Table 8** may be considered as additional information but will not be considered for the development of management advice. The Group prioritizes completion of the SPM and SS modeling due to their inclusion in the 2015 advice.

The Group notes that many essential modeling inputs are still in preparation and that all missing data inputs (primarily Task I and size composition) be provided by 8 June 2018; prioritizing input files for SS.

7.2 Process for building the uncertainty grid starting from a reference case

All models (SS, VPA and production models) will stick to the following process to develop the reference grid or base case for management advice. This will consist of building a reference case, a series of one-off sensitivity analyses, a culling process of sensitivities based on diagnostic performance, then selecting from the sensitivities based on model diagnostics and finally building a base case or uncertainty grid from the most influential sources of uncertainty (SCRS/2018/042). In all models, the reference case is merely the starting point for the subsequent analysis.

7.3 Stock synthesis

Similar to the 2015 stock assessment the integrated assessment modeling platform of Stock Synthesis will be used. The reference case for the 2018 models will be similar to the model of 2015 in basic structure but will be based on a steepness of 0.8, a weight for the size data of 1.0 (with an initial input sample size equal to the log(N) and then reweighted according to Francis (2011)) and using the fleet structure of the 2015 assessment. The primary changes to the reference case will be to only model one area and not to model movement. This was based on recommendations from the expert review (Sharma 2015) and the result that movement occurred mainly from the areas 1 (north) and 3 (south) towards area 2 (equatorial), which reached up to 95% of total movement, while the opposite movements were only few, indicating that there was not enough magnitude of movement as indicated in the data used in the 2015 model to recommend the complexity of a 3-area model. It is anticipated that further progression of the ICCAT AOTTP tagging programme will better inform in future assessment the magnitude of movement. As the Group proposed that a single area model be developed, annual indices for longline fleets will be used. For other fleets, seasonal indices could be considered, as they may give some signal on seasonal recruitment. The rationale for using annual indices was that going to single area model without movement did not need seasonal indices to reflect seasonal movement of fish. For the 3 region SS3 model structure, seasonal indices will be used.

The other change is to use the Hallier-Richards growth model that was best supported by the likelihood fits across the 12 models used in 2015.

The reference case will have the following changes and guidelines:

1. Model will be condensed to one area, fleets will be defined as in 2015 with some slight changes (see below), so as to reflect their individual area.
2. Movement will not be estimated.
3. Annual indices will be used, though the model retains quarterly time step for length composition and recruitment partitioning.
4. Reevaluate selectivities for baitboat and purse seine fleets, as outlined in SCRS/2018/042.
5. The longline fleets used for the size data associated with the joint CPUE index (Fleet 11) will be composed of Japan, Korea, US and not Chinese Taipei data. Selectivity for Fleet 11 (Joint index fleet) in area 2 will be estimated but not fixed as asymptotic. Selectivity will be estimated as double normal for areas 1 and 3, based on larger average sizes from longline caught fish in area 2 (SCRS/2018/042).
6. Separation of the Chinese Taipei fleet (Fleet 14) will be maintained and length composition will be used to estimate selectivity with a time block modeled starting in 2003. Selectivity for this fleet, in the second time period will likely be logistic. Final decisions may be subject to evaluating the most recent revisions to the length composition dataset.
7. A time block on selectivity for the Japan, Korea and US longline fleet selectivity will be applied starting in 1979.
8. Bins for length composition data will be increased to 4 cm.
9. Hallier-Richards growth model will be used.
10. Estimate initial Fs for several fleets.
11. Attempt to estimate sigmaR (using the bias correction ramping of Methot and Taylor).
12. Size composition data weighting should be considered.
13. The M vector will be recalculated with the Hallier (Richards) growth curve.
14. Time-varying q based on the ratio of yellowfin in the catch will not be used, as the joint modeling process was considered to be an improvement to account for targeting.
15. Brazil handline fleet landings assigned to baitboat Dakar fleet.
16. Indices: Joint index for area 2 with two time periods 1959-1978 without vessel ID and 1979-2017 with vessel ID.
17. Remove Azores BB area 3 index, (give lambda of 0).
18. Remove URULL1 and URULL2 (both area 3 indices).
19. Remove CHTAI area 2 index.

One-off sensitivity analyses

Based on the reference case, a list of the model specification for the sensitivity analysis is included below:

1. Reference model but using the continuous version of the joint index with no vessel ID from 1959-2017.
2. Original 3-area, movement model, Hallier (Richards) growth, steepness 0.8, weight on lengths of 1.0, new index treatment, with area-specific, seasonal indices. Remove URLL1 and URLL2. Use AZ BB index for area 1, and joint index (split) indices for area 1, 2 and 3. For the joint index length composition Chinese Taipei LL data can be used for areas 1 and 3, as long as there are no major differences between the fleets used for the joint index. We leave it to the assessment authors to check this result.
3. Best-fit M value, on the basis of profiling M in the reference case, above.
4. Steepness 0.7.
5. Steepness 0.9.
6. Reduce weights on length composition weights (0.5) on reference case from above.
7. Reference case but with Dakar BB index with some flexibility to use other indices that have been recommended by the Working Group.
8. Try to estimate growth using growth data with otolith and spine data.

Note that these sensitivity analyses may not all get accomplished nor may get the full diagnostic evaluation in the available time.

7.3 Conducting diagnostics

Diagnostic evaluation will occur in two phases.

Phase 1 will be to develop the reference case

In recent years, diagnostic methodology for the integrated stock assessment model has been developed including the ASPM diagnostic (Minte-Vera *et al.* 2017) and R0 profile (Wang *et al.* 2014), which were applied for the tuna species stock assessment. The retrospective analysis and residual plots are useful tools for the diagnosis. Using these tools, an initial reference case should be screened for potential model mis-specification. In particular, it is requested that these methods be applied to the *reference case* model with the new indices, even before the final length composition input data is available as these diagnostics are designed to determine model misspecification, which if identified requires reconfiguration of the reference case model. Full diagnostics, including jitter analysis, retrospective analyses, likelihood profiling of R0, steepness, Linf and M; bootstrapping and simple projections will be conducted on the reference case model. Model diagnostics outlined in Cass-Calay *et al.* 2014 will be applied.

Phase 2. Screening of sensitivities

Time permitting, further screening of selected sensitivity runs based on diagnostics using these tools outlined above will be assessed for their potential for model mis-specification, and some scenarios may be excluded from further analysis, if they do not pass diagnostic tests. Another screening diagnostic that will be applied is that each model considered for the grid analysis should have a positive definite Hessian matrix. Another criterion for model convergence is the maximum gradient component for which the standard criterion of 0.0001 may need to be relaxed. For the production models the approach of Kell and Merino (2016) serves as general screening of sensitivities to different indices. For the VPA, the jackknife of indices often also serves as a screening.

Phase 3. Developing uncertainty grid

The impact of each parameter alternation will be assessed comparing the difference of the stock status indicators (F/F_{MSY} and B/B_{MSY}) between the reference case and the one-off sensitivity tests. The sensitivity runs with the largest differences have the greatest potential to influence the assessment results and are likely the most important to consider to encompass the range of uncertainty. For instance, in the WCPFC, the top five most influential sensitivity analyses were used for developing the uncertainty grid analysis. The number selected depends on the results of the comparison of how sensitive results are, but by excluding model scenarios with little impact it reduces the grid to the most critical uncertainties. Development of the uncertainty grid will also be based on balance across potential hypotheses; for instance using steepness of 0.7, 0.8, 0.9.

Phase 4. Grid analysis

After the selection of the previous process, the grid analysis will be conducted using these selected setting items. As an example, if three items (steepness, region structure and start year) are selected to form the sensitivity analysis, the total number of scenarios for the grid analysis is the product of the three items (12 = 3 x 2 x 2). Such grid would then be constructed for each model platform.

Phase 5. Ensemble the results of multiple scenarios

An ensemble of the uncertainty grid will be used for developing the management advice, however objective methodology for combining models has not developed for the tropical tuna species assessment. The equal weight for each scenario has usually been used in ICCAT including the previous cases of the tropical tuna species and will likely be done, unless certain combinations of grid scenarios are clearly problematic, such as lack of positive-definite hessian, unrealistic management benchmarks, etc.

Attempts will be made to apply the hindcasting methodology (Kell *et al.* 2016) to provide advice on how to select or weight candidate model constuctions for the uncertainty grid. As management advice in ICCAT is based on future predictions using Kobe 2 matrix, model constructions that show good predictive performance are desirable. Therefore a scenario, which shows good performance for future prediction, may be a better candidate for a larger weighting in the grid during the ensemble process.

Models to be included in the grid analyses will then be projected for development of management advice. Projection specifications will follow general advice by using 2018 TAC for 2018 catch values using a range of TACs ranging from 0, 40, 45, 50, 65, 70, 75, 80, 85, 90, 95, 100 thousand t for development of Kobe 2 Strategic Matrix. Uncertainty will be quantified by either use of the Hessian-based standard errors accounting for correlation between F_{MSY} and B_{MSY} for SS and bootstrapping for surplus production models and VPA. For projection advice to be available by the end of the meeting the uncertainty grid must be finalized by the second day of the meeting.

7.4 Surplus production model set up

The SPM/JABBA model requires total landings and at least one index of abundance. One of the key assumptions with a surplus production model is that all fish are fully selected. In previous ASPIC models single indices were used in isolation and full diagnostics similar to Kell and Merino (2016) will be applied to screen models in a process similar to that outlined above. These include evaluating the correlation of indices to determine if there are similarities, profiling of r, K and the shape parameter, retrospective analyses of estimates of r, K, and stock status and evaluation of sensitivity to starting conditions and starting values.

Runs for production models will consist first of a reference case which will use the joint longline index for area 2 (Joint index for area 2 with two time periods 1959-1978 and 1979-2017 with vessel ID) and also continuity runs (with JLL area 2, USLL CPUE in number and CH-TAI LL area 2 Model 3.1 1993-2017 as separate indices). The following indices will be also evaluated (joint index region 2 with no vessel ID 1959-2017, URU_LL1,2 combined, Brazil LL) as sensitivity runs.

After screening of models, a base case or an uncertainty grid will be developed for projections.

7.5 VPA

Index inclusions should match the SS reference case (joint LL index in area 2, split in two time periods) with possible consideration of additional indices subject to analytical decisions. These could include, Dakar BB, URULL1 and URULL2, and Azores BB. Catch at age will use single growth curve (Hallier -Richards) and M vector according to SS reference case. The catchability coefficients for each index will be assumed constant over the duration of that index and estimated by the corresponding concentrated likelihood formula. A suite of diagnostics are available for VPA2Box and will be conducted as similar to proposals outlined in the 2017 Yellowfin data preparatory report (Anon, 2017).

Sensitivity runs should include jackknifes on the indices and potential evaluation of alternative index usage. For projections a stock-recruitment relationship will be estimated externally, and likely will need to consider fixed steepness values of 0.7, 0.8 and 0.9 for the uncertainty grid.

8. Review of the progress of ICCAT AOTTP

Progress on the ICCAT AOTTP was presented by the project Coordinator, (SCRS/P/2018/022). So far, 16,661 bigeye have been tagged in the Atlantic and 3,861 have been recovered. Tagging of bigeye is currently ongoing off Brazil, around Madeira, and in the Gulf of Guinea off Côte d'Ivoire. Mean time at liberty for a conventional tag is 95 days, so far, with a maximum of nearly 2 years being recorded (600 days). Maximum distance recorded between release and recovery of a bigeye is 1,837NM with a mean distance covered of 216NM. ICCAT AOTTP is targeting 8,000 bigeye tag realease with double-taggs in order to estimate Tag Shedding rates which preliminary analysis indicated to be around 3% for bigeye in the region. Tag-reporting ("seeding") experiments are also ongoing across the Atlantic, so far, 56 bigeye tuna have been implanted with 'false' tags, of which 41 have been recovered giving a tentative Reporting Rate of 73%, for all gears pooled, which is lower than the target of 80%. 914 bigeye were tagged inside the FAD moratorium area in January and February and the patterns of recovery should be investigated to assess its efficacy as a management measure. With regards to biological sampling, an otolith reference set is being created by ICCAT AOTTP with a Senegalese team contracted to age fish from the East Atlantic, and a Brazilian team those from the West. No calibrated and aged otoliths are yet available for bigeye.

ICCAT AOTTP recently organised three capacity building workshops to explore: (i) the tag-recapture databases (Madrid, December 2017); (ii) estimate growth and mortality (Abidjan, January 2018); and (iii) calculate geographic positions from data collected by electronic tags (Madrid, April 2018). Preliminary estimates of Z, F and M from Brownie Models, calculated at the Abidjan workshop, were presented (SCRS/P/2018/22). Movement patterns for bigeye inferred from electronic tags from the North West Atlantic are presented in **Figure 9**. The Group noted that the estimates of mortality from the Brownie Model could be biased since it assumed a fully mixing of tagged fish in the population, which is unlikely to be the case. It was also noted that immediate post-release mortality rate was not included nor estimated in any of the analyses.

The Group suggested that objectives, progress and achievements of the initial project should be reviewed and evaluated, to define a work plan of priorities until the end of the project. The Group also, enquired about the data and their availability. At present and following the Tropicals Tuna Species Group work plan for 2018, the ICCAT AOTTP data (conventional tag release and recoveries) were made available for the participants of the current meeting. Hence, the data cannot be used outside the meeting. The plan for data dissemination on whether the data should be made available for all interested scientists, when and under what conditions, etc., including the electronic tagging data was further discussed. A proposal will be presented at the upcoming SCRS plenary meeting.

The ICCAT AOTTP has 2 main goals: (i) improve the stock assessment models and ultimately tropical tuna management; and (ii) capacity building among the SCRS and CPCs. ICCAT AOTTP data for bigeye only were made available to participants at the capacity-building workshops. The ICCAT Secretariat noted that until the SCRS makes a recommendation and agrees on a procedure, then the ICCAT AOTTP data cannot be made publicly available. The Group recommended that quality control procedures be finalized and then, after the SCRS approval, the data be made publicly available with a timeline schedule for updates (i.e. a new data version should be released every six months). The SCRS Chair agreed to present a recommendation with respect to ICCAT AOTTP data for conventional and electronic tagging data. With regards to electronic tagging data, it was noted that in other programmes only summary data are made available. The Secretariat and ICCAT AOTTP are working in an electronic tag database to be set up prior to the dissemination of the data. The eventual use of the age data from the hard part analysis was also discussed. It was suggested that a clear separation should be made between: (i) conventional and (ii) biological data. The biological data should be made available based on research priorities identified by the Tropical Tuna Species Group. Then based on those priorities ICCAT AOTTP Steering Committee can develop a work plan launching specific Call for tenders to address those research priorities.

Document SCRS/2018/039 presented the probability of recapture (selectivity) of bigeye modeled as a function of recapture length for three fleets (Azorian baitboats, Canary Island baitboats and tropical purse-seiners; Brazilian baitboats were not included as few recaptures were available at the time of the analysis), using two forms of logistic regression (GLM and GAM) and only short term (≤ 1month) recaptures. The Group noted that there was substantial variation in the selectivity curves. Off West Africa where baitboats and purse-seiners overlap the selectivity patterns were different. A peak in the Senegalese baitboat selectivity curve at 90cms was probably due to a specific recapture event when many rather unusually large bigeye were tagged at the Sierra Leone seamounts. The Group noted that for stock assessment models, results must integrate the selectivities across the entire Atlantic, avoiding local trends. It was also noted that these analyses assumed constant Reporting Rates by size. Finally, it was suggested that selectivities from AOTTP data should be compared with those estimated using stock assessment models.

Document SCRS/2018/040 described the application of a constant rate model to estimate tag-shedding. The rates estimated (L = 0.989 & *alpha* = 0.044 per year) are comparable with other large-scale oceanic tagging programmes. The Group noted that the tag-shedding rate, while low, accumulates over time. The number estimated here was different (3%) to that estimated above (SCRS/P/2018/022) due, probably, to the different methods used (model versus simple calculation) and the fact that the data set used during SCRS/P/2018/022 was more up-to-date. The estimates presented are for Type II (long-term) tag-loss only; though Type I (immediate tag-shedding) could be estimated using variation in tag-recovery rates by the specific tagger. This has been done with similar tag-recapture data from the Pacific and Indian Oceans where the impact of chemical tagging (injection of oxytetracyline) was also found to lead to increased mortality. Also, the experience of the tagger can be an important factor, thus it was suggested that Tagger ID be recorded by the ICCAT AOTTP.

9. Recommendations

To the SCRS:

- Consider establishing a database of raw data used to establish conversion factors used in stock assessments: length-weight, length–length, weight–weight and age–length, to facilitate the improvement and re-estimation of such relationships as new data becomes available. If the SCRS were to agree it should:
  - Develop a template so that such data could be stored at the Secretariat.
  - Engage in a data recovery project by either:
    - hiring an expert to compile all possible historical data for all ICCAT species or
    - asking each Working Group to compile the historical information for their respective species.
  - Request that all subsequent papers presented to the SCRS regarding conversion factors and age-length relationships provide the raw data for incorporation in the ICCAT biological databases.
  - Request that data used to calculate conversion factors is regularly reviewed, especially when the fishery evolves and the spatio-temporal distribution or the operation of the fleet changes significantly.
  - Consider whether some of these measurements should be part of the list of requirements for data provision issued by the Commission.

- Recommendations regarding use and access to ICCAT AOTTP data:
  - All data use and publications derived from ICCAT AOTTP data will have to follow the publication policy included in the ICCAT AOTTP webpage.
  - ICCAT AOTTP conventional tagging data should be shared according to the following conditions:
    - raw data (not yet quality controlled) can be released to ICCAT AOTTP capacity building Working Groups and tropical tuna Working Group meetings.
    - raw data will be periodically updated (every six months) and quality controlled before widely released.
    - quality controlled data will be made available publically through the ICCAT webpage. The process of quality control will be described in the webpage and data sets made available will have information on individual fish data quality that can facilitate a broad set of analyses.

  - o users of data will be encouraged to try to involve scientists from developing countries in their analysis of the ICCAT AOTTP data. This will be facilitated by providing, in the ICCAT AOTTP webpage, a list of interested scientists from developing countries that have requested to participate in these analyses and by listing all scientists that have participated in the ICCAT AOTTP training workshops.
- Access to other data collected by AOTTP (otolith reference sets, electronic tagging data) will have to be requested directly to the ICCAT AOTTP Coordinator and access and use of these data will be governed by the following rules:
  - o the ICCAT AOTTP Steering Committee will decide on the release of such data considering, first the objectives of the ICCAT AOTTP programme, second the priority research needs established by the tropical tuna Working Group in their work plan and third the state of progress in the collection of these data sets.
  - o requesters of such data should make sure their request for use of such data is consistent with ICCAT AOTTP objectives and research needs. The ICCAT AOTTP webpage provides the list of research objectives for the programme. The annual work plan of the Group in the annual SCRS report provides the list of research priorities for the tropical tuna Working Group.
  - o requests for data analysis that do not fulfill such priorities and objectives will only be considered if the use of the data does not compromise, in any way, the ability of the iccat AOTTP to fulfill its objectives.

To the SCRS and CPCs:

- The Group recommended that biological monitoring programmes are established to collect size and weight measures (including different metrics) to update the length-length, weight-weigth and length-weigth relationships currently used by ICCAT.
- The Group concerned that fish size by the Chinese Taipei longline fishery abruptly become larger after around early 2000s, which is also larger than that for other longline fleets in the same area. This is also observed for another species (yellowfin) and tunas in the Indian Ocean. The Group recommended that a review of the possible reasons for an abrupt change in the apparent selectivity of the Chinese Taipei longline fishery catching bigeye in the early 2000s be provided by Chinese Taipei scientists, including size information from observers.
- The Group recommended a close monitoring of the new school association Brazilian fishery by the CPC ensuring the complete data collection of fleet and fisheries statistics, as well as a proper sampling of size and biological samples to better assess the impact of this fishery on the overall stock.
- Ask all CPCs to commit to develop a joined longline index for tropical tunas based on combining set by set data as it was attempted for the first time during the data preparatory meeting. This would require:
  - finding a mechanism for sharing the data prior to the data preparatory meetings so as to produce an SCRS paper with the combined index.
  - agreeing on a procedure to protect the confidentiality of the national data.
  - agreeing on a methodology for the combination of data.
  - ensuring that the tropical group scientists have the ability to conduct the analysis (during the current meeting an external scientists led the analysis).

To the Stock Assessment Methods Working Group (WGSAM):

- To add to the diagnostic section on the guidelines for development of relative abundance indices the production of influence plots for each factor in the model.

- To review the following methodological issues associated with combining longline set by set data from different longline fleets for the purposes of standardizing CPUE:
  - the use of clustering of longline sets based on species composition within a longline set.
  - the use of fishing effort (number of hooks per longline set) as an explanatory variable in standardization models.
  - investigate the assumptions (explicit and implicit) related to weights assigned to individual longline sets according to the cell such longline set belongs to (e.g. assigning more or equal weight to longline sets from areas commonly sampled and rarely sampled).

- investigate the appropriateness of the procedure aimed at improving estimation time by purely random subsampling of cells with large numbers of longline sets vs stratified random sampling of such longline sets (e.g. stratified by fleet).
- provide guidance on when to use aggregated fleet index, based on selected clusters of longline sets, as an index of the ensemble of longlines when the ensemble also includes longline sets not included in the groups of clusters.

10. Other matters

The SCSR Chair informed the Group of the responses to the Commission that are pending, and that should be prepared before the SCRS plenary meeting. These are as follows:

- Ghana's comprehensive and detailed capacity management plan on the level of catches. Rec. 16-01, paragraph 12c.

This will be addressed during the species Working Group.

- Evaluate the efficacy of the area/time closure referred to in paragraph 13 in relation with the protection of juveniles of tropical tunas. Rec. 16-01, paragraph 15.

The Group discussed that the response will be limited since a major fleet component fishery data (eg. Ghana PS) is missing. Moreover, the issues discussed above (SCRS/2018/038, 044, and 045) in relation to the species composition identification of purse seiner fleets should be taken into account when Task II data of the purse seiners are used for the evaluation of the efficacy of the time/area closures. The Group expected that some data from ICCAT AOTTP will be available to carry out this analysis before the Species Group.

- Recommendations made by the FAD Working Group (Annex 8) and develop a work plan. Rec. 16-01, paragraph 49 (a).

SCRS Chair will lead this response with the contribution of rapporteurs and interested scientist to be presented a draft response to the Species Group meeting.

- Develop a table that quantifies the expected impact on MSY, B_{MSY}, and relative stock status for both bigeye and yellowfin resulting from reductions of the individual proportional contributions of major fisheries to the total catch. Rec. 16-01, paragraph 49 (c).

US scientists indicated that they are working on a document using the existing yellowfin SS3 models and preliminary bigeye SS3 models to be discussed during the bigeye stock assessment meeting and, if agreed to by the Group, presented afterwards to the Panel 1 meeting. Although the analysis will not be based on final stock assessment results adopted by SCRS, this will allow fostering discussion on Panel 1. The Group is concerned, that considering the busy agenda, there would be limited time to throughouly discuss this paper during the bigeye stock assessment meeting so as to develop/provide a preliminary response from the Tropicals working Group to the Commission on the matter. The Group suggested to open the analysis to interested participants so as this could be considered a collaborative work from the Tropicals Working Group rather than a CPC initiative.

11. Adoption of the report and closure

Due to the limited time, text report regarding agenda item 8 (Review of the progress of AOTTP) and item 10 (Other matters) could not be reviewed prior to the closure of the meeting, and therefore were adopted by correspondence. The remainder of the report was adopted during the meeting by the Group and the meeting was adjourned.

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Table 1. Estimated catches (landings + dead discards, t) of bigeye tuna (*Thunnus obesus*) by area, gear and flag.

			1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
TOTAL (A+M)			808	1651	2018	2951	2932	4808	2779	8720	4290	7732	9113	17060	23132	26039	23631	39394	25386	25252	23911	36889	42433	55866	47287	56991	64093	61301	45302	54880	52693	45975	63597	67869	73682	59586
Landings		Bait boat	808	1651	2018	2951	2932	4808	2769	8266	3837	6254	6127	5805	7112	10927	5698	9822	5320	11434	3792	9770	10518	11846	9304	13620	17922	14636	9939	12758	14629	9591	12350	10124	6950	9853
		Longline	0	0	0	0	0	0	10	454	453	1478	2986	11255	16020	15112	17928	29572	20046	13726	19683	24149	28526	39904	33293	38453	39535	41347	27847	29531	28796	27560	41677	41608	51803	33757
		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	449	716	174	481	366	365	292	163
		Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	20	92	436	2970	3389	4116	4690	4918	6636	5318	7067	11875	9094	8343	9204	15656	14476	15654
Landings(FP)		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	116	161	158
Discards		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		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	0
Landings	CP	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Barbados	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	28	70	197	181	678	1183	812	782	698	505	776	521
		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	23	0	0	0	0	0	0	0
		Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	111	95	146	142	131	115	50	47	464	45	27	72	200	293
		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	0
		Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	130	0	339	721	0	6	1640	1129	1295	628	1425	1308	1041
		EU.España	0	0	0	0	0	0	0	0	0	0	0	0	98	491	144	1017	1145	1272	1399	1810	4072	7418	4015	5681	4515	8882	7436	9736	6849	5419	8430	10010	9332	8794
		EU.France	0	0	0	0	0	0	0	0	0	0	0	0	400	2400	840	10	60	1740	155	3346	3088	2828	3624	3224	4007	4079	5821	7076	7407	5775	5612	6456	5601	6923
		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	0
		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	4	0
		EU.Portugal	808	1651	2018	2951	2932	4808	2769	8266	3837	6254	6127	5805	6588	8021	4684	8670	4133	8051	1597	5620	5133	2892	3962	5855	10945	6813	2929	4522	5350	3483	3706	3086	1861	4075
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		El Salvador	0	0	0	0	0	0	0	0	0	0	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	0
		Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
		Ghana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	73	84	170	237	124	238	332	780	791	491
		Guatemala	0	0	0	0	0	0	0	0	0	0	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	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	0
		Honduras	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Iceland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Japan	0	0	0	0	0	0	10	454	453	1478	2904	11044	15746	14505	17366	28663	17578	9012	11345	11783	9504	21299	19665	22014	22946	17548	8170	10144	9863	12150	20922	22091	33513	15212
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	289	320	263	1857	4079	7353	5730	6018	7831	10493	6923	8090	9716	8022	10235	12274	10809	9383
		Liberia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Libya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	170	324	394	414	387	622	625	552
		Mauritania	0	0	0	0	0	0	0	0	0	0	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	0
		Namibia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Nigeria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Norway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	182	2710	2081	2091	2135	1493	2127	513	4518	2500	3182	3930
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		S. Tomé e Príncipe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	299	794	1014	330	879	473	822	658	254	449	238	43	139	165	160
		Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	286	214	0	0	0	0	0	0	0	0	1	0	0	0	0	0	19	422	381	137	187
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		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	191
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	18	148	195	544	212	113	865	67	28	331	248	212	202	158	422	315
		U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	385	680	1820	1677	2200	2580	2729	1637	2961	3367	3652	4907	4086	2202	2229	2813	2832	635	352
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		UK.Sta Helena	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	22	8	9	14	23	14
		UK.Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Uruguay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86	397	605
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Venezuela	0	0	0	0	0	0	0	0	0	0	26	48	67	54	137	160	329	224	185	143	136	92	117	15	24	0	21	464	244	347	661	1684	1027	4284
	NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	20	47	54	0	672	2521	6039	8456	8538	6191	5639	4314	3499	4464	3701	3364	2970	2486	2561	1887	2147	1623
		Guyana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NCO	Argentina	0	0	0	0	0	0	0	0	0	0	56	163	213	235	187	400	200	75	347	200	100	44	0	25	18	95	176	84	23	0	0	0	0	0
		Benin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	45	0
		Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Congo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
		Cuba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	89	300	217	886	1027	4100	3200	2000	2600	2400	1900	1300	1800	2300	2300	1385	711	521	421
		Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Faroe Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Grenada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		NEI (ETRO)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		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	46
		Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	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	0
		Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Togo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
Landings(FP)	CP	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		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	7
		EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	93
		Guatemala	0	0	0	0	0	0	0	0	0	0	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	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	0	0
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NCO	Mixed flags (EU tropical)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	116	65	58
Discards	CP	Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NCC	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	0

Table 1. (continued)

			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	2016	2017
TOTAL (A+M)			71129	78262	65445	57416	66410	78720	85264	97197	100117	113862	134936	128018	120751	110261	107804	121643	103680	91201	75726	87702	90534	67964	58875	75070	67720	79995	80132	82675	76260	75023	80787	84776	77438	74967
Landings		Bait boat	11439	17651	15618	13458	9710	12672	18280	17740	16248	16467	20361	25576	18300	21276	18999	22301	12365	14540	8523	11450	20812	13058	10636	11833	7761	13476	9506	14267	12576	11390	9999	10081	6773	8369
		Longline	43303	52595	39942	35570	47766	58420	56537	61590	62459	62871	78898	74852	74930	68310	71856	77227	71963	56122	47351	55356	49325	38036	34182	46232	41063	43533	42520	37899	34930	32245	36769	40869	36272	33541
		Other surf.	247	415	550	626	469	605	287	400	548	648	977	561	353	531	428	673	451	766	221	447	361	716	552	448	220	257	477	1003	1152	2761	4917	5706	6341	7305
		Purse seine	16063	7554	9286	7148	7864	6379	9413	15527	19227	31586	32668	25361	26628	19152	15531	20258	17537	19516	19418	19582	19016	15128	12962	15865	17904	21648	26636	28229	26766	27996	28492	28082	28051	25753
Landings(FP)		Purse seine	77	46	48	613	600	644	747	1941	1636	2290	2032	1667	540	993	989	1184	1363	257	214	867	1019	1026	542	692	772	1082	994	1277	823	632	609	0	0	0
Discards		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	14	0	0	2	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	36	0	0
Landings	CP	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	476	75	0	0	0	0	0	0	0	0	0	0	0	
		Barbados	0	0	0	0	0	0	0	0	0	0	0	0	0	24	17	18	18	6	11	16	19	27	18	14	14	7	12	7	15	11	26	30	19	24
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	195	0	87	96	0	0	0	0	4	60	70	234	249	1218	1242	1336	1502	1877	1764	1262
		Brazil	656	419	873	756	946	512	591	350	790	1256	601	1935	1707	1237	644	2024	2768	2659	2582	2455	1496	1081	1479	1593	958	1189	1173	1841	2120	3623	6456	8255	7660	7694
		Canada	0	0	11	144	95	31	10	26	67	124	111	148	144	166	120	263	327	241	279	182	143	187	196	144	130	111	103	137	166	197	218	257	171	205
		Cape Verde	167	112	86	60	117	100	52	151	305	319	385	271	299	228	140	9	2	0	1	1	1	1077	1406	1247	444	545	554	1037	713	1333	2271	2764	1679	1053
		China PR	0	0	0	0	0	0	0	0	0	70	428	476	520	427	1503	7347	6564	7210	5840	7890	6555	6200	7200	7399	5686	4973	5489	3720	3231	2371	2232	4942	5852	5514
		Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	1893	2890	2919	4016	3098	3757	2221	3203	3526	27	416	252	1721	2348	2688	3441	2890	1964	2315	2573	3598	2705
		Côte d'Ivoire	450	76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	790	576	47	507	635	441	12	544	342
		EU.España	13617	10340	10884	9702	8475	8263	10355	14705	14656	16782	22096	17849	15393	12513	7110	13739	11250	10133	10572	11120	8365	7618	7454	6675	7494	11966	11272	13100	10914	10082	10736	10058	11469	11446
		EU.France	3585	4226	4122	3435	4024	3261	5023	5576	6888	12719	12263	8363	9171	5980	5624	5529	5949	4948	4293	3940	2926	2816	2984	1629	1130	2313	3329	3507	3756	3222	3549	2548	4566	3792
		EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	10	0	0	0	33	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	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	4354	6457	7428	5036	2818	5295	6233	5718	5796	5616	3099	9662	5810	5437	6334	3314	1498	1605	2590	1655	3204	4146	5071	5505	3422	5605	3682	6920	6128	5345	3869	3135	2187	2782
		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	3	0	0	32	0	0	0	0	0	0	0	
		El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	992	1450	1726
		FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	21	0	28	6	0	2	3	0	2	0	0	0	0	0	0	
		Gabon	0	0	0	0	0	0	0	0	0	1	87	10	0	0	0	184	150	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ghana	2162	1887	1720	1178	1214	2158	5031	4090	2866	3577	4738	5517	4751	10174	10647	11704	5632	9864	6480	9061	17888	8860	2041	8119	7727	8186	10455	9850	9477	10992	9974	11902	4813	4083
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	736	831	998	949	836	998	913	1011	282	262	163	993	340	1103	1528
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	50	0	58	0	3	10	17	4	11
		Guinée Rep.	0	0	0	0	0	0	0	0	0	0	0	334	2394	885	0	0	0	0	0	0	0	0	0	0	0	0	328	322	1516	1429	902	0	0	
		Honduras	0	0	0	0	0	0	0	0	44	0	0	61	28	59	20	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Japan	24870	32103	23081	18961	32064	39540	35231	30356	34722	35053	38503	35477	33171	26490	24330	21833	24605	18087	15306	19572	18509	14026	15735	17993	16684	16395	15205	12306	15390	13397	13603	12391	10316	10977
		Korea Rep.	8989	10704	6084	4438	4919	7896	2690	802	866	377	386	423	1250	796	163	124	43	1	87	143	629	770	2067	2136	2599	2134	2646	2762	1908	1151	1039	675	562	432
		Liberia	0	0	0	0	0	206	16	13	42	65	53	57	57	57	57	57	57	57	57	57	0	0	0	0	0	0	0	0	0	0	0	0	27	
		Libya	0	0	0	0	0	0	0	0	508	1085	500	400	400	400	400	400	400	31	593	593	0	0	4	0	0	0	0	0	0	0	0	0	0	
		Maroc	120	30	0	8	2	8	68	206	81	774	977	553	654	255	336	1444	1160	1181	1154	1399	1145	786	929	700	802	795	276	300	300	308	300	309	350	411
		Mauritania	0	0	0	0	0	0	0	0	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	
		Mexico	0	0	0	0	0	0	0	0	0	1	4	0	2	6	8	6	2	2	7	4	5	4	3	3	1	1	3	1	1	2	1	2	2	2
		Namibia	0	0	0	0	0	0	0	0	0	0	715	29	7	46	16	423	589	640	274	215	177	307	283	41	146	108	181	289	376	135	240	465	359	355
		Nigeria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	
		Norway	0	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Panama	3322	4461	5173	5701	3865	3242	6150	7446	9991	10138	13234	9927	4777	2098	1252	580	952	562	211	0	1521	2310	2415	2922	2263	2405	3047	3462	1694	2774	2315	1289	2337	1590
		Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1154	2113	975	377	837	855	1854	1743	1816	2368	1874	1880	1399	1267	532	1323	1964	0	0	
		Russian Federation	0	0	0	0	0	0	0	0	5	0	0	0	13	38	4	8	91	0	0	0	0	1	1	26	73	43	0	0	0	0	0	0	0	
		S. Tomé e Príncipe	0	0	0	0	5	8	6	3	4	4	3	6	4	5	6	5	4	4	4	4	11	6	4	0	92	94	97	100	103	107	110	633	421	388
		Senegal	219	313	144	470	137	0	0	10	5	9	126	237	138	258	730	1473	1131	1308	565	541	574	721	1267	805	926	1042	858	239	230	646	371	1031	1500	3020
		Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		South Africa	60	102	168	200	561	367	296	72	43	88	79	27	7	10	53	55	249	239	341	113	270	221	84	171	226	159	145	153	47	435	332	193	121	215
		St. Vincent and Grenadines	0	0	0	0	0	0	0	154	818	1740	812	519	596	545	1937	2940	1921	1143	130	103	18	0	114	567	171	292	396	38	25	16	30	496	622	383
		Trinidad and Tobago	41	22	0	0	1	19	57	263	0	3	29	27	37	36	24	19	5	11	30	6	5	9	12	27	69	56	40	33	33	37	59	77	37	58
		U.S.A.	539	639	1085	1074	1127	847	623	975	813	1090	1402	1209	882	1138	929	1263	574	1085	601	482	416	484	991	527	508	515	571	722	867	881	859	831	525	736
		U.S.S.R.	1233	870	1071	1887	1077	424	95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	
		UK.Sta Helena	19	0	0	5	1	1	3	3	10	6	6	10	10	12	17	6	8	5	5	0	0	0	25	18	28	17	11	190	51	19	17	44	77	44
		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	4	2	0	0	
		Uruguay	714	597	177	204	120	55	38	20	56	48	37	80	124	69	59	28	25	51	67	59	40	62	83	22	27	201	23	15	2	30	0	0	0	
		Vanuatu	0	0	0	0	0	0	0	470	676	1807	2713	2610	2016	828	0	314	0	0	0	0	104	109	52	132	91	34	42	39	23	9	4	0	0	
		Venezuela	4142	2918	1136	349	332	115	161	476	270	809	457	457	189	274	222	140	221	708	1241	847	1060	243	261	318	122	229	85	264	98	94	169	132	156	152
	NCC	Chinese Taipei	925	1220	1125	1488	1469	940	5755	13850	11546	13426	19680	18023	21850	19242	16314	16837	16795	16429	18483	21563	17717	11984	2965	12116	10418	13252	13189	13732	10805	10316	13272	16453	13115	12028
		Guyana	0	0	0	0	0	0	0	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	25	10
	NCO	Argentina	0	100	41	72	50	17	78	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Benin	0	0	15	6	7	8	10	10	7	8	9	9	9	30	13	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cambodia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Congo	0	8	19	10	10	14	15	12	12	14	9	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cuba	447	239	171	190	151	87	62	34	56	36	7	7	5	0	0	0	0	0	16	16	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Dominica	0	0	0	0	0	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	
		Faroe Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Grenada	0	0	0	0	0	0	0	65	25	20	10	10	0	1	0	0	0	0	0	0	0	0	0	10	31	0	0	0	0	0	0	0	0	
		NEI (ETRO)	0	0	0	0	0	0	0	392	364	42	356	915	0	7	0	0	0	362	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NEI (Flag related)	369	354	758	1406	2155	4650	5856	8982	6146	4378	8964	10697	11862	16565	23484	22190	15092	7907	383	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Saint Kitts and Nevis	0	0	0	0	0	0	0	0	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	
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	0	162	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Sta. Lucia	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2	2	0	2	0	0	0	0	0	0	0	0	0	6	0	
		Togo	52	18	24	22	7	12	12	6	2	86	23	6	33	33	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Landings(FP)	CP	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	46	42	16	41	23	0	0	
		Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	75	28	37	38	61	102	40	22	45	97	0	0	
		Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	25	20	13	117	59	46	60	34	42	0	0	
		Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	95	45	0	0	0	
		EU.España	41	24	34	355	204	192	242	625	571	764	605	371	58	255	328	487	474	0	0	223	244	143	88	49	190	250	211	216	98	80	143	0	0	
		EU.France	14	3	8	154	233	281	352	653	686	1032	970	713	314	437	467	553	607	229	205	446	397	222	79	26	51	150	122	394	192	56	54	0	0	
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56	28	15	26	9	18	6	11	5	15	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	72	0	60	20	22	74	203	288	245	209	0	0	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	151	106	135	97	85	38	70	41	80	27	0	0	
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
	NCO	Mixed flags (EU tropical)	23	20	7	103	164	172	153	663	379	494	457	582	169	301	193	143	281	28	8	198	378	294	189	348	337	375	324	257	0	0	0	0	0	
Discards	CP	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	
		EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0	
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	NCC	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	14	0	0	0	0	

Table 2. BET (*Thunnus obesus*) Task I nominal catches (T1NC, live weight in tonnes) versus trade (ICCAT BET SDP: statistical document programme, product weight in tomes). Comparison presented by year and flag, between 2003 and 2017. Only direct imports (SD's) were considered.

			T1NC															Trade (BET-SD)															Difference (T1-SD)														
Stock	Status	Fishing Flag	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
A+M	CP	Angola		476	75														20														0	456	75	0	0	0	0	0	0	0	0	0	0	0	0
		Barbados	16	19	27	18	14	14	7	12	7	15	11	26	30	19	24																16	19	27	18	14	14	7	12	7	15	11	26	30	19	24
		Belize				4	60	70	246	294	1260	1257	1377	1524	1877	1764	1262							13	26	462	635	631	108	215	462	749	0	0	0	4	60	70	234	269	799	622	746	1417	1662	1302	513
		Brazil	2455	1496	1081	1479	1593	958	1189	1173	1841	2120	3623	6456	8255	7660	7694		1	79	127	30	20	53	92	17	1	8	9		5		2455	1494	1002	1353	1564	938	1136	1081	1824	2119	3615	6447	8255	7655	7694
		Canada	182	143	187	196	144	130	111	103	137	166	197	218	258	171	205																182	143	187	196	144	130	111	103	137	166	197	218	258	171	205
		Cape Verde	1	1	1152	1434	1284	482	606	656	1077	735	1378	2368	2764	1679	1053							16	32	90	269	244			1		1	1	1152	1434	1284	482	590	625	986	467	1134	2368	2764	1678	1053
		China PR	7890	6555	6200	7200	7399	5686	4973	5489	3720	3231	2371	2232	4942	5852	5514	7917	5518	4615	7613	8271	6332	4559	5092	3289	2343	2214	2169	2586	6076	5027	-27	1037	1585	-413	-872	-646	414	398	431	889	158	63	2356	-224	487
		Côte d'Ivoire							790	576	49	602	681	441	12	544	342										72	60			374	444	0	0	0	0	0	0	790	576	49	530	621	441	12	170	-102
		Curaçao	3203	3526	40	441	272	1734	2465	2747	3488	2950	1998	2357	2573	3598	2705							263	32								3203	3526	40	441	272	1734	2201	2716	3488	2950	1998	2357	2573	3598	2705
		El Salvador													992	1450	1726																0	0	0	0	0	0	0	0	0	0	0	0	992	1450	1726
		EU.Belgium																												39			0	0	0	0	0	0	0	0	0	0	0	0	-39	0	0
		EU.Cyprus																								0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU.España	11343	8610	7762	7542	6724	7684	12216	11483	13316	11012	10162	10878	10058	11469	11446	10					0	1016	1252	851	656	622	1495	548	1272	2271	11333	8610	7762	7542	6724	7684	11199	10232	12466	10356	9540	9384	9510	10197	9176
		EU.France	4386	3323	3038	3063	1655	1180	2463	3450	3901	3948	3278	3602	2583	4566	3792							388	603	721	1763	470	1177	386	840	551	4386	3323	3038	3063	1655	1180	2075	2847	3180	2185	2808	2425	2198	3726	3241
		EU.Germany																									0						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU.Greece																							0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU.Hungary																									518	602		259	857	751	0	0	0	0	0	0	0	0	0	-518	-602	0	-259	-857	-751
		EU.Ireland		0	33											0																	0	0	33	0	0	0	0	0	0	0	0	0	0	0	0
		EU.Italy																									0	0		44			0	0	0	0	0	0	0	0	0	0	0	0	-44	0	0
		EU.Malta																				0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU.Netherlands																														138	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-138
		EU.Portugal	1655	3204	4146	5071	5505	3422	5605	3682	6920	6128	5345	3869	3135	2187	2782								1		61	77	150	121			1655	3204	4146	5071	5505	3422	5605	3681	6920	6067	5267	3718	3014	2187	2782
		EU.United Kingdom				3			32	0																	0						0	0	0	3	0	0	32	0	0	0	0	0	0	0	0
		FR.St Pierre et Miquelon	0	28	6		2	3		2			0	0																			0	28	6	0	2	3	0	2	0	0	0	0	0	0	0
		Ghana	9061	17888	8860	2041	8119	7727	8186	10455	9850	9477	10992	9974	11902	4813	4083					383	96	1149	2119	1892	5198	2476	893	197	433	670	9061	17888	8860	2041	7736	7632	7036	8336	7958	4279	8516	9081	11706	4379	3413
		Guatemala	736	831	1054	977	851	1024	922	1029	288	273	168	1007	340	1103	1528										68	3					736	831	1054	977	851	1024	922	1029	288	205	165	1007	340	1103	1528
		Guinea Ecuatorial							50		58		3	10	17	4	11																0	0	0	0	0	0	50	0	58	0	3	10	17	4	11
		Guinée Rep.			72		60	20	22	402	525	1804	1674	1111										571	72								0	0	72	0	60	20	-549	330	525	1804	1674	1111	0	0	0
		Japan	19572	18509	14026	15735	17993	16684	16395	15205	12306	15390	13397	13603	12391	10316	10977	5	1	0	5	4	29	18	7	48	40	110	76		92	26	19568	18508	14025	15730	17989	16655	16377	15198	12258	15351	13288	13528	12391	10224	10951
		Korea Rep.	143	629	770	2067	2136	2599	2134	2646	2762	1908	1151	1039	677	562	432	122	534	237	1136	1542	1262	1965	2398	1616	1267	1935	528	531	296	560	21	95	533	931	594	1337	169	248	1146	641	-784	511	146	266	-128
		Liberia	57													27																	57	0	0	0	0	0	0	0	0	0	0	0	0	27	0
		Libya	593			4															4		39										593	0	0	0	0	-39	0	0	0	0	0	0	0	0	0
		Maroc	1399	1145	786	929	700	802	795	276	300	300	308	300	309	350	411			13		52				0	4		2		0		1399	1145	773	929	648	802	795	276	300	296	308	298	309	350	411
		Mauritania														1																	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
		Mexico	4	5	4	3	3	1	1	3	1	1	2	1	2	2	2																4	5	4	3	3	1	1	3	1	1	2	1	2	2	2
		Namibia	215	177	307	283	41	146	108	181	289	376	135	240	465	359	355		8	4	0	156	0	9	3	125	194	36		12	3		215	169	303	283	-115	146	99	177	163	183	99	240	454	356	355
		Nigeria								3	1	0																					0	0	0	0	0	0	0	3	1	0	0	0	0	0	0
		Panama		1521	2461	2521	3057	2360	2490	3085	3531	1736	2853	2341	1289	2337	1590										673	169				136	0	1521	2461	2521	3057	2360	2490	3085	3531	1062	2685	2341	1289	2337	1454
		Philippines	855	1854	1743	1816	2368	1874	1880	1399	1267	532	1323	1964				649	2060	1710	1790	2009	1868	1775	1650	1357	810	746	2108	434			206	-206	33	26	359	7	105	-251	-90	-278	577	-144	-434	0	0
		Russian Federation			1	1	26	73	43																								0	0	1	1	26	73	43	0	0	0	0	0	0	0	0
		S. Tomé e Príncipe	4	11	6	4		92	94	97	100	103	107	110	633	421	388																4	11	6	4	0	92	94	97	100	103	107	110	633	421	388
		Senegal	541	574	721	1267	805	926	1042	858	239	230	646	371	1031	1500	3020				38	539	930	640	382	58	271	493	299	6	474	237	541	574	721	1229	266	-4	402	476	181	-41	153	72	1025	1026	2783
		South Africa	113	270	221	84	171	226	159	145	153	47	435	332	193	121	215					5					0	98	4		36		113	270	221	84	167	226	159	145	153	47	337	327	193	85	215
		St. Vincent and Grenadines	103	18		114	567	171	293	396	38	25	16	30	496	622	383													349	682	359	103	18	0	114	567	171	293	396	38	25	16	30	148	-60	24
		Trinidad and Tobago	6	5	9	12	27	69	56	40	33	33	37	59	77	37	58										0	0	0				6	5	9	12	27	69	56	40	33	33	36	59	77	37	58
		Tunisie																									3						0	0	0	0	0	0	0	0	0	-3	0	0	0	0	0
		Turkey																										1					0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0
		U.S.A.	482	416	484	991	527	508	515	571	722	867	881	859	831	525	736								18	21	108	11	8	2		2	482	416	484	991	527	508	515	553	702	759	869	851	830	525	734
		UK.Bermuda	0	1	1		0	0	0	0	0	0	0	0	0																		0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
		UK.Sta Helena				25	18	28	17	11	190	51	19	17	44	77	44				6	10		6		17	67	8			42		0	0	0	19	8	28	11	11	173	-16	11	17	44	35	44
		UK.Turks and Caicos											4	2																			0	0	0	0	0	0	0	0	0	0	4	2	0	0	0
		Uruguay	59	40	62	83	22	27	201	23	15	2	30								3	3		4									59	40	62	80	20	27	197	23	15	2	30	0	0	0	0
		Vanuatu		104	109	52	132	91	34	42	39	23	9	4																			0	104	109	52	132	91	34	42	39	23	9	4	0	0	0
		Venezuela	847	1060	243	261	318	122	229	85	264	98	94	169	132	156	152															249	847	1060	243	261	318	122	229	85	264	98	94	169	132	156	-97
	NCC	Chinese Taipei	21563	17717	11984	2965	12116	10418	13252	13189	13732	10819	10316	13272	16453	13115	12028	18081	15585	11844	4855	7197	10225	9717	11681	11276	9548	9571	10725	12330	13612	9464	3482	2132	140	-1890	4919	193	3535	1508	2457	1271	745	2547	4123	-497	2564
		Guyana													6	25	10																0	0	0	0	0	0	0	0	0	0	0	0	6	25	10
	NCO	Congo																										27					0	0	0	0	0	0	0	0	0	0	-27	0	0	0	0
		Cuba	16																														16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Dominica		0										0	0	0																	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Ecuador																		46					44						19		0	0	-46	0	0	0	0	-44	0	0	0	0	0	-19	0
		Grenada					10	31																								0	0	0	0	0	10	31	0	0	0	0	0	0	0	0	0
		Lebanon																									0	1					0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0
		Madagascar																									0						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Mixed flags (EU tropical)	198	378	294	189	348	337	375	324	257																						198	378	294	189	348	337	375	324	257	0	0	0	0	0	0
		Other (unclassifed)																									94	0	432		620	499	0	0	0	0	0	0	0	0	0	-94	0	-432	0	-620	-499
		Saint Kitts and Nevis													0	4																	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
		Sta. Lucia	2	0	2			0		0	0	0			6																		2	0	2	0	0	0	0	0	0	0	0	0	6	0	0
		Vietnam																										23					0	0	0	0	0	0	0	0	0	0	-23	0	0	0	0
Unknown area (ocean)																				3	42	82	149	14	97		94	441	58	81	263	32															
TOTAL			87702	90534	67964	58875	75070	67720	79995	80132	82675	76260	75023	80787	84776	77438	74967	26783	23728	18550	15619	20282	20951	22179	25600	21840	24756	21077	20240	18138	26461	22164															

Table 3. Standard SCRS catalogue on statistics (Task I and Task II) of BET (*Thunnus obesus*) by stock, major fishery (flag/gear combinations ranked by order of importance) and year (1988 to 2017). Only the most important fisheries (representing ~95.5% of Task-I total catch) are shown. For each Task I series (DSet= “t1”, in tonnes) its equivalent Task II availability (DSet= “t2”) scheme is shown below. Each Task-II cell has a concatenation of characters (“a”= T2CE exists; “b”= T2SZ exists; “c”= T2CS exists) that represents the Task-II data availability in the ICCAT-DB. Red (-1) means that no Task II data is available while green ("abc") means that all the Task II data are available.

Species	Stock	Status	FlagName	GearGrp	DSet	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	2016	2017	Rank	%	%cum
					T1 Total	66410	78720	85264	97197	100117	113862	134936	128018	120751	110261	107804	121643	103680	91201	75726	87702	90534	67964	58875	75070	67720	79995	80132	82675	76260	75023	80787	84776	77438	74967			
BET	A+M	CP	Japan	LL	t1	31664	39419	35024	29488	34128	35053	38503	35477	33171	26490	24330	21833	24605	18087	15306	19572	18509	14026	15735	17993	16684	16395	15205	12306	15390	13397	13603	12391	10316	10977	1	24.7%	25%
BET	A+M	CP	Japan	LL	t2	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	ab	ab	ab	1		
BET	A+M	NCC	Chinese Taipei	LL	t1	1469	940	5744	13850	11546	13426	19680	18023	21850	19242	16314	16837	16795	16429	18483	21563	17717	11984	2965	12116	10418	13252	13189	13732	10819	10316	13272	16453	13115	12028	2	15.0%	40%
BET	A+M	NCC	Chinese Taipei	LL	t2	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	2		
BET	A+M	CP	EU.España	PS	t1	5600	5091	6302	9395	9362	12495	12700	9971	8970	6240	4863	5508	6901	5923	7038	6595	4187	3155	3416	3359	5456	8019	7910	8050	7485	6849	6464	5574	6808	5761	3	7.6%	47%
BET	A+M	CP	EU.España	PS	t2	ac	ac	ac	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	ac	ac	-1	3		
BET	A+M	NCO	NEI (Flag related)	LL	t1	2155	4650	5856	8982	6146	4378	8964	10697	11862	16565	23484	22190	15092	7907	383																4	5.5%	53%
BET	A+M	NCO	NEI (Flag related)	LL	t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1																4		
BET	A+M	CP	EU.España	BB	t1	2588	2761	3814	5484	5518	4901	9848	8073	6248	6260	2165	8563	4084	3897	3164	4158	3838	4417	3783	3007	1959	3868	2819	4506	2913	2389	3463	3508	3835	4811	5	4.8%	58%
BET	A+M	CP	EU.España	BB	t2	ac	ac	ac	ac	ac	ac	ac	ac	ac	abc	ac	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	-1	5		
BET	A+M	CP	EU.Portugal	BB	t1	2724	5279	6159	5598	5639	5493	3036	9629	5810	5437	6334	3314	1498	1605	2420	1572	3161	3721	4626	4872	2738	5121	2872	6470	5986	5240	3737	3012	1677	2527	6	4.7%	62%
BET	A+M	CP	EU.Portugal	BB	t2	ab	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	-1	6		
BET	A+M	CP	Ghana	PS	t1									1328	2970	3138	6648	3468	5621	5606	5330	6201	5444	1788	5923	5962	5199	7797	7491	6796	8378	7901	9258	4489	3761	7	4.5%	67%
BET	A+M	CP	Ghana	PS	t2									ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	abc	ab	abc	abc	ac	a	a	a	a	a	a	-1	7		
BET	A+M	CP	EU.France	PS	t1	1754	1502	2636	3971	5682	11733	11046	7076	7128	4671	4149	4056	4620	3584	3668	3628	2736	2135	2481	1157	1039	2193	3294	3663	3766	3253	3528	2531	4184	3582	8	4.5%	71%
BET	A+M	CP	EU.France	PS	t2	-1	-1	b	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	ac	-1	8		
BET	A+M	CP	China PR	LL	t1						70	428	476	520	427	1503	7347	6564	7210	5840	7890	6555	6200	7200	7399	5686	4973	5489	3720	3231	2371	2232	4942	5852	5514	9	4.1%	75%
BET	A+M	CP	China PR	LL	t2						-1	b	b	b	-1	a	a	a	ab	ab	a	ab	ab	ab	a	ab	ab	ab	ab	ab	ab	abc	ab	abc	-1	9		
BET	A+M	CP	Ghana	BB	t1	1214	2158	5031	4090	2866	3577	4738	5517	3423	7204	7509	5056	2164	4242	873	3731	11687	3416	253	2196	1766	2986	2658	2358	2681	2615	2073	2643	324	322	10	3.8%	79%
BET	A+M	CP	Ghana	BB	t2	abc	abc	ac	abc	abc	abc	abc	abc	abc	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	a	a	a	a	a	a	a	-1	10		
BET	A+M	CP	Panama	PS	t1	18	85	717	1013	2517	4113	5378	4304	1934	431	175	319	378	89	63		1521	2461	2521	3057	2360	2490	3085	3531	1736	2853	2341	1289	2022	1485	11	2.0%	81%
BET	A+M	CP	Panama	PS	t2	-1	-1	-1	ab	a	ab	ab	ab	ab	ab	ab	a	ab	ab	ab		ab	ab	ab	abc	abc	abc	abc	abc	abc	abc	abc	ac	abc	-1	11		
BET	A+M	CP	Panama	LL	t1	3847	3157	5258	6320	7474	5998	7709	5623	2843	1667	1077		484	473	148														315	105	12	1.9%	83%
BET	A+M	CP	Panama	LL	t2	-1	-1	-1	-1	a	-1	-1	-1	-1	-1	-1		a	-1	-1														-1	-1	12		
BET	A+M	CP	Curaçao	PS	t1									1893	2890	2919	3428	2359	2803	1879	2758	3343	13	441	272	1734	2465	2747	3488	2950	1998	2357	2573	3598	2705	13	1.9%	85%
BET	A+M	CP	Curaçao	PS	t2									ab	ab	ab	a	ab	ab	ab	ab	ab	b	ab	abc	abc	abc	abc	abc	abc	abc	abc	ac	ac	-1	13		
BET	A+M	CP	Brazil	LL	t1	946	512	591	350	790	1256	596	1935	1707	1237	644	2024	2762	2534	2582	2374	1379	1014	1423	927	785	1009	1055	1452	1165	1377	1966	3111	2322	1044	14	1.6%	87%
BET	A+M	CP	Brazil	LL	t2	ab	ab	ab	ab	ab	ab	ab	ab	a	a	a	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	a	a	a	a	-1	14		
BET	A+M	CP	Korea Rep.	LL	t1	4919	7896	2690	802	866	377	386	423	1250	796	163	124	43	1	87	143	629	770	2067	2136	2599	2134	2646	2762	1908	1151	1039	677	562	432	15	1.6%	88%
BET	A+M	CP	Korea Rep.	LL	t2	ab	ab	ab	ab	ab	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	ab	b	abc	abc	abc	abc	abc	-1	15		
BET	A+M	CP	EU.France	BB	t1	2503	2040	2739	2258	1892	2018	2187	2000	2357	1746	1942	1998	1921	1593	786	758	587	597	571	261	141	269	156	238	175	25	74	51	135	127	16	1.3%	89%
BET	A+M	CP	EU.France	BB	t2	-1	-1	b	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	ac	-1	16		
BET	A+M	CP	Philippines	LL	t1											1154	2113	975	377	837	855	1854	1743	1816	2368	1874	1880	1399	1267	532	1323	1964				17	0.9%	90%
BET	A+M	CP	Philippines	LL	t2											a	a	a	-1	-1	a	a	a	a	a	a	ab	ab	abc	abc	abc	abc				17		
BET	A+M	CP	Brazil	HL	t1																			3	7	0	69	22	210	555	2012	4332	4967	5336	6538	18	0.9%	91%
BET	A+M	CP	Brazil	HL	t2																			-1	-1	-1	-1	a	-1	-1	-1	a	-1	-1	-1	18		
BET	A+M	CP	U.S.A.	LL	t1	710	600	559	855	564	836	943	982	713	795	696	930	532	682	536	284	310	312	521	381	428	430	443	603	582	509	584	574	386	515	19	0.7%	92%
BET	A+M	CP	U.S.A.	LL	t2	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	abc	-1	19		
BET	A+M	CP	Cape Verde	PS	t1																		1151	1433	1283	482	605	655	1076	734	1377	2361	2757	1679	1048	20	0.6%	93%
BET	A+M	CP	Cape Verde	PS	t2																	b	ab	ab	abc	abc	abc	abc	abc	abc	abc	abc	ac	a	-1	20		
BET	A+M	CP	Senegal	BB	t1	4			5		5	11	60	84	204	676	1473	1131	1308	565	541	574	721	1267	804	926	1041	843	215	226	639	361	501	577	287	21	0.6%	93%
BET	A+M	CP	Senegal	BB	t2	-1			a		a	a	a	ac	a	a	a	a	a	a	a	a	ac	ac	ac	ac	ac	ac	ac	ac	ac	ac	ac	ac	-1	21		
BET	A+M	CP	EU.España	LL	t1	491	603	481	451	347	150	153	176	233	268	385	116	598	211	333	427	417	104	337	346	268	327	751	700	585	865	928	868	604	800	22	0.5%	94%
BET	A+M	CP	EU.España	LL	t2	ab	ab	ab	ab	ab	ab	ab	ab	ab	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	b	b	-1	-1	22		
BET	A+M	CP	Guatemala	PS	t1																736	831	1054	977	851	1024	922	1029	288	273	168	1007	340	1103	1528	23	0.5%	94%
BET	A+M	CP	Guatemala	PS	t2																ab	ab	ab	ab	abc	abc	abc	abc	abc	abc	abc	abc	ac	ac	-1	23		
BET	A+M	CP	Vanuatu	PS	t1				470	676	1807	2713	2610	2016	828		314																			24	0.4%	94%
BET	A+M	CP	Vanuatu	PS	t2				a	a	a	a	a	a	a		a																			24		
BET	A+M	CP	Maroc	LL	t1												700	770	857	913	889	929	519	887	700	802	795	276	99	90	88	80	100	100	123	25	0.4%	95%
BET	A+M	CP	Maroc	LL	t2												-1	-1	-1	-1	b	abc	abc	abc	abc	ab	ab	-1	-1	-1	-1	b	ab	a	ab	25		

Table 4. Summary of BET (*Thunnus obesus*) conventional tag releases and recaptures by year in the ICCAT database. Information for 2016-18 includes data from the ICCAT AOTTP programme. Note that not all releases has been reported for a given year.

Number of tag Bigeye tuna (*Thunnus obesus*)										
			Years at liberty							
Year	Releases	Recaptures	< 1	1 - 2	2 - 3	3 - 4	4 - 5	5-6	Unk	ERROR
1960	2	0								
1962	9	0								
1963	47	0								
1964	34	0								
1965	4	0								
1966	21	0								
1967	3	0								
1969	2	0								
1971	4	4	2	2						
1972	17	17	14						3	
1973	126	125	124	1						
1974	17	16	11	1					4	
1975	16	16	14	1					1	
1977	9	9	9							
1978	108	107	101	5		1				
1979	11	0								
1980	939	92	72	10					10	
1981	690	208	189	8	1				10	
1982	7	0								
1983	5	3	3							
1984	23	5	3	1					1	
1985	5	0								
1986	96	90	87						3	
1987	23	0								
1988	10	0								
1989	28	2	1	1						
1990	69	0								
1991	215	1		1						
1992	255	1	1							
1993	222	3		2	1					
1994	280	32	27	4					1	
1995	157	12	10	1				1		
1996	119	21	18	3						
1997	609	243	233	8	2					
1998	45	7	6	1						
1999	3659	1464	1381	58	9	1			15	
2000	1414	192	171	14	2	1			1	3
2001	356	14	9	4					1	
2002	1212	138	129	6	1				2	
2003	272	46	42	3						1
2004	4	0								
2005	24	1							1	
2006	11	0								
2007	3	0								
2008	1	1				1				
2009	8	0								
2011	8	2	1				1			
2013	18	0								
2014	1	1	1							
2016	9139	2377	2325	50					2	
2017	7065	1548	1537						3	8
2018	298	0								
Grand Total	27720	6798	6521	185	16	4	1	1	58	12

Table 5. Annual indices of abundances of bigeye tuna reviewed by the Working Group.

INDEX	BRA_LL		URU_LL		JP_LL		ESP_DK_BB		US_LL		CHI_TAI_LL		Joint_regB_R2_dellog_novess_527							
UNITS					Number		Weight						Late_vessid		Early no vess_id		Long_term_no_vessi		Linked	
MODEL					Lognormal		D-Lognormal						2		2		2		2	
AREA					All Atlantic		2													
year	cpue	cv	cpue	cv	cpue	cv	cpue	cv	cpue	cv	cpue	cv	cpue	cv	cpue	cv	cpue	cv	cpue	cv
1950	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1951	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1952	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1953	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1954	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1955	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1956	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1957	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1958	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1959	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.84239	-	0.933663	-	1.258729	-
1960	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.924895	-	1.031503	-	1.38201	-
1961	-	-	-	-	2.2519	0.0179	-	-	-	-	-	-	-	-	1.1712	-	1.393082	-	1.750049	-
1962	-	-	-	-	1.8768	0.0176	-	-	-	-	-	-	-	-	1.003366	-	1.199521	-	1.499264	-
1963	-	-	-	-	2.2736	0.0173	-	-	-	-	-	-	-	-	1.151746	-	1.335207	-	1.72098	-
1964	-	-	-	-	2.0118	0.0169	-	-	-	-	-	-	-	-	1.16873	-	1.361182	-	1.746358	-
1965	-	-	-	-	2.4335	0.0166	-	-	-	-	-	-	-	-	1.229212	-	1.458848	-	1.836731	-
1966	-	-	-	-	2.1515	0.0172	-	-	-	-	-	-	-	-	1.077173	-	1.213345	-	1.609549	-
1967	-	-	-	-	1.9690	0.0173	-	-	-	-	-	-	-	-	1.042464	-	1.220423	-	1.557686	-
1968	-	-	-	-	2.1854	0.0177	-	-	-	-	-	-	-	-	1.192957	-	1.405468	-	1.782558	-
1969	-	-	-	-	2.6983	0.0177	-	-	-	-	-	-	-	-	1.073523	-	1.259968	-	1.604096	-
1970	-	-	-	-	2.3767	0.0170	-	-	-	-	-	-	-	-	0.938194	-	1.121327	-	1.401883	-
1971	-	-	-	-	2.6493	0.0168	-	-	-	-	-	-	-	-	0.841309	-	1.088812	-	1.257114	-
1972	-	-	-	-	2.7237	0.0172	-	-	-	-	-	-	-	-	0.851691	-	1.299814	-	1.272626	-
1973	-	-	-	-	3.7531	0.0175	-	-	-	-	-	-	-	-	0.877861	-	1.380684	-	1.311731	-
1974	-	-	-	-	4.2248	0.0171	-	-	-	-	-	-	-	-	0.817915	-	1.25032	-	1.222157	-
1975	-	-	-	-	2.6355	0.0168	-	-	-	-	-	-	-	-	0.658736	-	1.003572	-	0.984306	-
1976	-	-	-	-	2.6133	0.0172	-	-	-	-	-	-	-	-	0.714294	-	1.07305	-	1.067323	-
1977			-	-	3.2510	0.0172	-	-	-	-	-	-	-	-	1.041728	-	1.642748	-	1.556586	-
1978	3.457835	0.140699	-	-	2.8745	0.0169	-	-	-	-	-	-	-	-	0.866912	-	1.348874	-	1.29537	-
1979	2.8636	0.194205	-	-	2.7449	0.0167	-	-	-	-	-	-	1.811156	-	-	-	1.59377	-	1.460645	-
1980	2.227047	0.223767	-	-	2.9805	0.0165	-	-	-	-	-	-	1.718295	-	-	-	1.392025	-	1.385756	-
1981	2.113185	0.314226	-	-	2.1837	0.0164	-	-	-	-	-	-	1.736565	-	-	-	1.349577	-	1.40049	-
1982	3.01083	0.184033	-	-	2.2990	0.0164	-	-	-	-	-	-	1.399386	-	-	-	1.110566	-	1.128565	-
1983	4.83921	0.143844	-	-	2.3080	0.0168	-	-	-	-	-	-	1.474842	-	-	-	1.201467	-	1.189418	-
1984	1.814371	0.17535	-	-	2.4965	0.0164	-	-	-	-	-	-	1.549553	-	-	-	1.299027	-	1.249671	-
1985	2.451337	0.146291	-	-	2.6134	0.0163	-	-	-	-	-	-	1.54707	-	-	-	1.301783	-	1.247668	-
1986	3.628936	0.123956	-	-	2.4037	0.0166	-	-	1.506592	0.21419642	-	-	1.66247	-	-	-	1.407311	-	1.340735	-
1987	3.790057	0.111884	-	-	2.5517	0.0168	-	-	2.163771	0.138405593	-	-	1.869171	-	-	-	1.481332	-	1.507433	-
1988	2.299591	0.182405	-	-	2.4868	0.0164	-	-	1.607587	0.141136067	-	-	1.83522	-	-	-	1.556691	-	1.480053	-
1989	2.248587	0.192279	-	-	1.9339	0.0162	-	-	1.683742	0.137606957	-	-	1.422128	-	-	-	1.20584	-	1.146906	-
1990	1.619593	0.324716	-	-	1.9353	0.0162	-	-	1.501447	0.139432896	-	-	1.143517	-	-	-	1.010683	-	0.922214	-
1991	2.920753	0.149101	-	-	1.7843	0.0162	-	-	1.567976	0.139492531	-	-	1.139376	-	-	-	0.96854	-	0.918874	-
1992	0.795731	0.306346	-	-	1.6543	0.0163	-	-	1.293387	0.141199593	-	-	1.074277	-	-	-	0.865429	-	0.866374	-
1993	1.242877	0.369323	-	-	1.7013	0.0161	-	-	1.02962	0.14129147	-	-	1.06102	-	-	-	0.88615	-	0.855682	-
1994	2.847912	0.151196	-	-	1.4100	0.0161	-	-	0.939024	0.141822536	-	-	0.90311	-	-	-	0.751244	-	0.728332	-
1995	3.39962	0.122612	-	-	1.4012	0.0161	-	-	0.93634	0.14116595	2.114	0.040	0.949885	-	-	-	0.787865	-	0.766055	-
1996	4.195423	0.118001	-	-	1.2009	0.0161	-	-	0.9854	0.137052028	1.736	0.038	0.752069	-	-	-	0.633642	-	0.606522	-
1997	5.339897	0.081636	-	-	1.0551	0.0161	-	-	0.866579	0.13820478	1.746	0.039	0.665302	-	-	-	0.543845	-	0.536547	-
1998	2.650156	0.145076	-	-	1.1567	0.0162	-	-	0.959297	0.137250931	1.494	0.040	0.717918	-	-	-	0.592209	-	0.57898	-
1999	3.285614	0.123716	-	-	1.2023	0.0164	-	-	1.4187	0.137648086	1.246	0.038	0.681287	-	-	-	0.553395	-	0.549438	-
2000	3.681263	0.112655	-	-	1.1250	0.0163	-	-	1.019946	0.141531868	1.356	0.038	0.74362	-	-	-	0.63771	-	0.599708	-
2001	1.214811	0.238515	-	-	0.9342	0.0166	-	-	1.076526	0.140271064	1.482	0.038	0.599078	-	-	-	0.540451	-	0.48314	-
2002	1.099841	0.209861	8.62	2.00	0.8759	0.0167	-	-	0.727417	0.13986333	1.470	0.037	0.568458	-	-	-	0.525165	-	0.458445	-
2003	1.482347	0.164147	1.69	2.28	0.9724	0.0163	-	-	0.53435	0.147690523	1.375	0.038	0.554235	-	-	-	0.496736	-	0.446975	-
2004	1.546141	0.214338	2.00	2.91	0.5916	0.0164	-	-	0.530629	0.158481215	1.021	0.037	0.479006	-	-	-	0.452418	-	0.386305	-
2005	0.885895	0.396769	8.84	1.27	0.6570	0.0164	57.5	37.7	0.821008	0.154559894	1.071	0.037	0.49499	-	-	-	0.482165	-	0.399195	-
2006	1.164748	0.365864	8.97	0.94	0.6507	0.0165	121.5	114.5	0.901306	0.152546832	0.915	0.038	0.583637	-	-	-	0.528571	-	0.470687	-
2007	1.533787	0.222437	14.20	1.18	0.6240	0.0166	178.5	167.2	0.735989	0.15755322	1.431	0.037	0.611168	-	-	-	0.513907	-	0.49289	-
2008	1.103153	0.350884	19.70	0.90	0.5241	0.0164	8.2	8	0.78393	0.151883736	1.170	0.038	0.486874	-	-	-	0.41283	-	0.39265	-
2009	1.192224	0.2743	4.06	2.40	0.5290	0.0165	23.1	21.7	0.673206	0.152314977	1.157	0.037	0.457271	-	-	-	0.381936	-	0.368776	-
2010	0.938115	0.269594	25.52	1.40	0.4492	0.0164	93.2	86.1	0.594064	0.15065489	1.244	0.037	0.444522	-	-	-	0.378833	-	0.358494	-
2011	0.591876	0.523541	16.87	1.16	0.4384	0.0165	53.6	49.7	0.618653	0.153824217	1.073	0.037	0.416777	-	-	-	0.377212	-	0.336119	-
2012	1.355895	0.261618	-	-	0.7722	0.0165	22.7	21.4	0.638473	0.148060184	0.945	0.037	0.439457	-	-	-	0.397617	-	0.354409	-
2013	1.135731	0.296555	-	-	0.7878	0.0167	17	16.3	0.691024	0.147931502	1.486	0.037	0.625638	-	-	-	0.587204	-	0.504559	-
2014	1.660018	0.191116	-	-	0.7802	0.0168	8.9	8.5	0.844503	0.144850603	1.414	0.037	0.608173	-	-	-	0.522544	-	0.490474	-
2015	3.150283	0.149237	-	-	0.7230	0.0170	18.2	17.1	0.905616	0.14290569	1.720	0.037	0.682794	-	-	-	0.569034	-	0.550654	-
2016	2.180237	0.177903	-	-	0.6702	0.0170	52.5	48.7	0.638533	0.148679693	1.359	0.037	0.579743	-	-	-	0.485706	-	0.467547	-
2017	-	-	-	-	0.6074	0.0169	53.7	50.1	0.805364	0.147360964	1.487	0.037	0.564821	-	-	-	0.468784	-	0.455512	-

Table 6. Year-Quarter Indices of abundance of bigeye tuna evaluated by the Working Group.

INDEX		BRA_LL		ESP_DK_BB		TAW_LL		US_LL		JP_LL		Joint																							
UNITS				Weight						Number		Number																							
MODEL				D-Lognormal						Lognormal		delta lognormal																							
AREA				2						All Atlantic		1		1		1		1		2		2		2		2		3		3		3		3	
year	quarter	BRA_LL	BRA_LL_c	ESP_BB	ESP_BB_c	TAW_LL	TAW_LL_c	US_LL	US_LL_cv	JP_LL	JP_LL_cv	early no vessid	cv	late vessic	cv	allyrs no vessic	cv	allyrs vessic	cv	early no vessic	cv	late vessic	cv	allyrs no vessic	cv	allyrs vessic	cv	early no vessic	cv	late vessic	cv	allyrs no vessic	cv	allyrs vessic	cv
1959	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5018	0.0575	-	-	0.5147	0.0559	0.4014	0.3317	-	-	-	-	-	-	-	-
1959	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8661	0.0387	-	-	0.9172	0.0383	0.7213	0.3293	-	-	-	-	-	-	-	-
1959	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8524	0.0418	-	-	1.1254	0.0413	0.8830	0.3297	-	-	-	-	-	-	-	-
1959	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2521	0.0330	-	-	1.3622	0.0334	1.0626	0.3288	1.1619	0.0955	-	-	1.2037	0.1344	1.3293	0.1451
1960	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7447	0.0369	-	-	0.7482	0.0367	0.5824	0.3292	-	-	-	-	-	-	-	-
1960	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.9190	0.0304	-	-	1.0638	0.0308	0.8223	0.3286	-	-	-	-	-	-	-	-
1960	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.9340	0.0344	-	-	1.1167	0.0345	0.8816	0.3289	-	-	-	-	-	-	-	-
1960	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2046	0.0269	-	-	1.3823	0.0275	1.0721	0.3283	-	-	-	-	-	-	-	-
1961	1	-	-	-	-	-	-	-	-	0.7958	0.0224	-	-	-	-	-	-	-	-	0.7852	0.0369	-	-	0.8709	0.0367	0.6560	0.3292	-	-	-	-	-	-	-	-
1961	2	-	-	-	-	-	-	-	-	2.2430	0.0212	-	-	-	-	-	-	-	-	1.2122	0.0262	-	-	1.4378	0.0271	1.1037	0.3283	6.5909	0.0991	-	-	10.1463	0.1355	10.1425	0.1453
1961	3	-	-	-	-	-	-	-	-	5.1319	0.0228	-	-	-	-	-	-	-	-	1.6092	0.0277	-	-	2.0154	0.0282	1.5438	0.3283	5.6360	0.0616	-	-	8.8630	0.0873	8.7254	0.1051
1961	4	-	-	-	-	-	-	-	-	2.2623	0.0233	-	-	-	-	-	-	-	-	1.1809	0.0262	-	-	1.4331	0.0269	1.0906	0.3283	2.2540	0.0477	-	-	3.1749	0.0685	3.1450	0.0920
1962	1	-	-	-	-	-	-	-	-	1.3041	0.0223	-	-	-	-	-	-	-	-	0.7499	0.0332	-	-	0.8038	0.0333	0.6103	0.3288	1.7259	0.0672	-	-	2.3198	0.0959	2.3540	0.1125
1962	2	-	-	-	-	-	-	-	-	2.3790	0.0213	-	-	-	-	-	-	-	-	1.0550	0.0234	-	-	1.2716	0.0247	0.9869	0.3281	-	-	-	-	-	-	-	-
1962	3	-	-	-	-	-	-	-	-	2.4512	0.0212	1.1492	0.1507	-	-	0.4960	0.1555	0.6289	0.1592	1.1040	0.0282	-	-	1.3777	0.0290	1.0732	0.3284	-	-	-	-	-	-	-	-
1962	4	-	-	-	-	-	-	-	-	1.5678	0.0210	-	-	-	-	-	-	-	-	1.2073	0.0280	-	-	1.5299	0.0287	1.1558	0.3284	1.7566	0.0424	-	-	2.2909	0.0613	2.2139	0.0876
1963	1	-	-	-	-	-	-	-	-	1.3950	0.0204	-	-	-	-	-	-	-	-	0.8091	0.0269	-	-	0.9585	0.0277	0.7260	0.3283	0.5418	0.0428	-	-	0.5986	0.0622	0.6124	0.0877
1963	2	-	-	-	-	-	-	-	-	2.7091	0.0206	0.8639	0.1073	-	-	0.3418	0.1100	0.4419	0.1187	1.3394	0.0236	-	-	1.4850	0.0249	1.1676	0.3281	-	-	-	-	-	-	-	-
1963	3	-	-	-	-	-	-	-	-	3.0572	0.0204	0.6697	0.0654	-	-	0.3814	0.0667	0.4925	0.0835	1.3800	0.0251	-	-	1.7045	0.0262	1.3381	0.3282	1.8402	0.0660	-	-	2.6941	0.0924	2.5325	0.1104
1963	4	-	-	-	-	-	-	-	-	2.2146	0.0204	0.6953	0.1472	-	-	0.9344	0.1558	1.1242	0.1613	1.1812	0.0219	-	-	1.3778	0.0234	1.0694	0.3280	0.8434	0.0393	-	-	1.1007	0.0569	1.0765	0.0850
1964	1	-	-	-	-	-	-	-	-	2.1927	0.0197	-	-	-	-	-	-	-	-	1.0744	0.0227	-	-	1.2359	0.0239	0.9664	0.3280	0.4306	0.0352	-	-	0.5379	0.0507	0.5293	0.0808
1964	2	-	-	-	-	-	-	-	-	1.8323	0.0201	0.4768	0.0532	-	-	0.2827	0.0555	0.3749	0.0756	1.4747	0.0235	-	-	1.6297	0.0247	1.2746	0.3281	0.5103	0.0935	-	-	0.8526	0.1289	0.7619	0.1410
1964	3	-	-	-	-	-	-	-	-	1.7539	0.0189	0.4886	0.0440	-	-	0.4043	0.0463	0.5087	0.0696	0.9696	0.0219	-	-	1.1435	0.0227	0.8960	0.3279	1.3578	0.0352	-	-	1.7919	0.0515	1.6595	0.0822
1964	4	-	-	-	-	-	-	-	-	2.3085	0.0184	1.8921	0.0707	-	-	2.7078	0.0730	3.0703	0.0882	1.2590	0.0219	-	-	1.6205	0.0232	1.2311	0.3280	1.0414	0.0243	-	-	1.3413	0.0372	1.2989	0.0739
1965	1	-	-	-	-	-	-	-	-	2.1316	0.0182	1.9462	0.0629	-	-	2.2288	0.0666	2.6934	0.0836	1.3443	0.0226	-	-	1.6272	0.0238	1.2399	0.3280	0.7189	0.0373	-	-	0.9097	0.0540	0.9022	0.0830
1965	2	-	-	-	-	-	-	-	-	2.4259	0.0184	1.0566	0.0416	-	-	0.7710	0.0433	0.9763	0.0676	1.2581	0.0208	-	-	1.4320	0.0214	1.1076	0.3278	0.8005	0.0434	-	-	1.2595	0.0619	1.1495	0.0890
1965	3	-	-	-	-	-	-	-	-	2.4412	0.0180	0.6300	0.0527	-	-	0.5927	0.0548	0.7118	0.0751	1.2008	0.0193	-	-	1.3915	0.0205	1.0953	0.3278	0.9768	0.0272	-	-	1.3700	0.0411	1.2644	0.0767
1965	4	-	-	-	-	-	-	-	-	2.7677	0.0184	1.9128	0.0601	-	-	3.3490	0.0636	3.7655	0.0813	1.2164	0.0197	-	-	1.5695	0.0208	1.2179	0.3278	0.9801	0.0261	-	-	1.3111	0.0372	1.2231	0.0749
1966	1	-	-	-	-	-	-	-	-	2.2336	0.0192	1.1281	0.0806	-	-	0.8789	0.0834	1.0921	0.0965	1.1356	0.0232	-	-	1.3686	0.0236	1.0534	0.3280	0.3987	0.0364	-	-	0.5439	0.0519	0.5272	0.0815
1966	2	-	-	-	-	-	-	-	-	1.5333	0.0196	1.0301	0.0497	-	-	0.7083	0.0521	0.9056	0.0732	0.9799	0.0255	-	-	1.1683	0.0259	0.9011	0.3281	0.4392	0.0520	-	-	0.6928	0.0749	0.6233	0.0982
1966	3	-	-	-	-	-	-	-	-	2.1844	0.0206	1.4345	0.0927	-	-	2.1240	0.0982	2.4117	0.1086	1.1462	0.0318	-	-	1.1652	0.0316	0.9511	0.3286	0.7429	0.0306	-	-	1.0346	0.0424	0.9270	0.0782
1966	4	-	-	-	-	-	-	-	-	2.7993	0.0221	1.3390	0.0638	-	-	2.4049	0.0665	2.7297	0.0834	1.1497	0.0300	-	-	1.3363	0.0301	1.0490	0.3285	0.9419	0.0336	-	-	1.2040	0.0462	1.1302	0.0801
1967	1	-	-	-	-	-	-	-	-	2.2787	0.0196	1.0933	0.0572	-	-	0.7292	0.0598	0.9258	0.0786	1.2045	0.0281	-	-	1.4109	0.0288	1.0842	0.3284	0.4188	0.0429	-	-	0.5510	0.0622	0.5361	0.0878
1967	2	-	-	-	-	-	-	-	-	1.5582	0.0211	0.6578	0.0534	-	-	0.4091	0.0558	0.5274	0.0758	1.0749	0.0278	-	-	1.2080	0.0286	0.9419	0.3284	0.6077	0.0536	-	-	1.0766	0.0712	1.0081	0.0944
1967	3	-	-	-	-	-	-	-	-	1.6283	0.0215	0.5734	0.0853	-	-	1.0642	0.0894	1.2300	0.1015	0.7681	0.0314	-	-	0.9546	0.0318	0.7536	0.3287	0.8778	0.0354	-	-	1.2900	0.0503	1.2096	0.0805
1967	4	-	-	-	-	-	-	-	-	2.5409	0.0205	1.4478	0.0721	-	-	2.8150	0.0737	3.2438	0.0889	1.2251	0.0241	-	-	1.4931	0.0253	1.1507	0.3281	1.0438	0.0298	-	-	1.4110	0.0452	1.3790	0.0775
1968	1	-	-	-	-	-	-	-	-	1.7617	0.0218	1.4626	0.0680	-	-	0.9073	0.0703	1.1598	0.0864	1.1879	0.0318	-	-	1.4753	0.0322	1.1354	0.3287	0.3634	0.0543	-	-	0.5521	0.0778	0.5297	0.0987
1968	2	-	-	-	-	-	-	-	-	1.6477	0.0210	1.3021	0.0540	-	-	1.2408	0.0574	1.5348	0.0769	1.1616	0.0294	-	-	1.3227	0.0300	1.0353	0.3285	0.6328	0.0353	-	-	0.9384	0.0509	0.8827	0.0808
1968	3	-	-	-	-	-	-	-	-	3.1102	0.0206	1.7801	0.1181	-	-	4.3819	0.1256	4.6792	0.1323	1.2243	0.0279	-	-	1.4213	0.0285	1.1292	0.3284	0.9201	0.0291	-	-	1.2700	0.0435	1.2075	0.0764
1968	4	-	-	-	-	-	-	-	-	2.4484	0.0242	0.8560	0.0941	-	-	1.2914	0.0983	1.5150	0.1088	1.3007	0.0319	-	-	1.5874	0.0322	1.2360	0.3287	0.6781	0.0344	-	-	0.9107	0.0506	0.8947	0.0801
1969	1	-	-	-	-	-	-	-	-	2.1323	0.0236	1.2420	0.0595	-	-	0.7505	0.0620	0.9711	0.0803	1.1516	0.0374	-	-	1.4572	0.0372	1.1074	0.3292	0.6712	0.0420	-	-	1.0066	0.0603	0.9777	0.0860
1969	2	-	-	-	-	-	-	-	-	2.7230	0.0205	1.0358	0.0798	-	-	0.6429	0.0835	0.8157	0.0966	1.0340	0.0277	-	-	1.2259	0.0284	0.9695	0.3284	0.9178	0.0418	-	-	1.5398	0.0600	1.4679	0.0856
1969	3	-	-	-	-	-	-	-	-	3.2187	0.0208	0.5649	0.0850	-	-	1.0129	0.0893	1.2162	0.1013	1.0658	0.0291	-	-	1.2054	0.0297	0.9594	0.3285	1.3675	0.0439	-	-	1.9896	0.0601	1.9194	0.0854
1969	4	-	-	-	-	-	-	-	-	2.8106	0.0240	-	-	-	-	-	-	-	-	1.1454	0.0303	-	-	1.3363	0.0308	1.0491	0.3286	1.2466	0.0596	-	-	2.2466	0.0835	2.2670	0.1015
1970	1	-	-	-	-	-	-	-	-	2.3165	0.0189	1.3637	0.0550	-	-	1.1092	0.0577	1.3851	0.0772	1.0918	0.0313	-	-	1.3760	0.0316	1.0453	0.3287	0.4071	0.0363	-	-	0.6025	0.0525	0.5909	0.0807
1970	2	-	-	-	-	-	-	-	-	2.0531	0.0194	1.5680	0.0509	-	-	1.5171	0.0541	1.8501	0.0746	0.9018	0.0267	-	-	1.0619	0.0279	0.8342	0.3283	0.4143	0.0543	-	-	0.6924	0.0762	0.6710	0.0962
1970	3	-	-	-	-	-	-	-	-	1.9943	0.0204	0.8337	0.0464	-	-	1.4013	0.0498	1.5859	0.0719	0.8609	0.0281	-	-	0.9752	0.0283	0.7737	0.3284	0.5222	0.0595	-	-	1.0535	0.0829	1.0252	0.1009
1970	4	-	-	-	-	-	-	-	-	3.3054	0.0217	0.9419	0.0483	-	-	1.4033	0.0522	1.6145	0.0734	1.0011	0.0397	-	-	1.2571	0.0391	0.9924	0.3294	1.1512	0.0469	-	-	1.8681	0.0671	1.7830	0.0908
1971	1	-	-	-	-	-	-	-	-	2.9466	0.0201	1.3348	0.0413	-	-	1.5641	0.0448	1.8653	0.0686	0.9610	0.0314	-	-	1.4484	0.0310	1.1278	0.3286	0.3771	0.0659	-	-	0.5783	0.0934	0.5503	0.1107
1971	2	-	-	-	-	-	-	-	-	2.6897	0.0187	0.8669	0.0354	-	-	1.1677	0.0389	1.3966	0.0653	0.8760	0.0276	-	-	1.0643	0.0281	0.8433	0.3283	0.4440	0.0418	-	-	0.7179	0.0606	0.6683	0.0871
1971	3	-	-	-	-	-	-	-	-	1.9373	0.0190	0.5777	0.0532	-	-	0.9574	0.0572	1.0787	0.0769	0.7788	0.0293	-	-	0.9253	0.0296	0.7417	0.3285	0.7602	0.0368	-	-	1.3359	0.0532	1.2678	0.0814
1971	4	-	-	-	-	-	-	-	-	3.1607	0.0188	0.9157	0.0350	-	-	1.5506	0.0389	1.7697	0.0652	0.8522	0.0326	-	-	1.1022	0.0321	0.8853	0.3287	0.6094	0.0424	-	-	1.0012	0.0617	0.9708	0.0875
1972	1	-	-	-	-	-	-	-	-	2.5995	0.0185	0.9793	0.0485	-	-	1.1399	0.0522	1.3905	0.0734	0.8903	0.0333	-	-	1.3232	0.0331	1.0382	0.3288	0.2401	0.0445	-	-	0.4083	0.0634	0.3915	0.0880
1972	2	-	-	-	-	-	-	-	-	2.1380	0.0203	0.5564	0.0572	-	-	1.0560	0.0610	1.2340	0.0795	0.7549	0.0384	-	-	1.0977	0.0380	0.8548	0.3293	0.3867	0.0548	-	-	0.6663	0.0763	0.6443	0.0963
1972	3	-	-	-	-	-	-	-	-	2.5938	0.0220	0.5729	0.0574	-	-	0.9452	0.0614	1.1000	0.0798	0.9318	0.0432	-	-	1.4134	0.0423	1.1072	0.3298	0.5805	0.0670	-	-	1.1186	0.0925	1.1148	0.1081
1972	4	-	-	-	-	-	-	-	-	3.7555	0.0216	0.8206	0.0593	-	-	1.4962	0.0635	1.7131	0.0811	0.9325	0.0551	-	-	1.5498	0.0531	1.1731	0.3313	0.6091	0.0436	-	-	1.0864	0.0609	1.0506	0.0863
1973	1	-	-	-	-	-	-	-	-	3.2997	0.0192	0.9463	0.0574	-	-	1.3605	0.0614	1.6259	0.0796	1.1362	0.0417	-	-	1.8212	0.0399	1.3888	0.3295	-	-	-	-	-	-	-	-
1973	2	-	-	-	-	-	-	-	-	3.7673	0.0238	1.2766	0.0689	-	-	2.5357	0.0731	2.9345	0.0886	0.7557	0.0518	-	-	1.2364	0.0505	0.9452	0.3309	0.6063	0.0653	-	-	1.2040	0.0926	1.1308	0.1102
1973	3	-	-	-	-	-	-	-	-	3.1296	0.0218	0.6628	0.0548	-	-	1.1434	0.0591	1.2884	0.0782	0.9272	0.0485	-	-	1.4066	0.0473	1.1017	0.3304	0.8179	0.0596	-	-	1.6686	0.0835	1.5832	0.1031
1973	4	-	-	-	-	-	-	-	-	5.0471	0.0204	1.5564	0.0446	-	-	2.7857	0.0482	3.1615	0.0707	0.7951	0.0446	-	-	1.2435	0.0435	0.9691	0.3299	0.5487	0.0472	-	-	1.1871	0.0636	1.1084	0.0892
1974	1	-	-	-	-	-	-	-	-	5.9130	0.0196	1.2748	0.0548	-	-	2.7044	0.0588	3.0889	0.0779	1.0543	0.0610	-	-	1.8322	0.0590	1.3706	0.3322	-	-	-	-	-	-	-	-
1974	2	-	-	-	-	-	-	-	-	4.1820	0.0211	1.5844	0.0618	-	-	2.6036	0.0639	2.9821	0.0818	0.7235	0.1025	-	-	1.1638	0.0991	0.8664	0.3411	0.8005	0.0762	-	-	1.8912	0.1067	1.7967	0.1214
1974	3	-	-	-	-	-	-	-	-	2.0279	0.0209	0.7119	0.0509	-	-	1.2968	0.0550	1.4719	0.0753	0.6622	0.0385	-	-	0.9192	0.0382	0.7287	0.3293	0.6919	0.0658	-	-	1.5279	0.0925	1.4317	0.1101
1974	4	-	-	-	-	-	-	-	-	5.9833	0.0200	1.0803	0.0459	-	-	1.9895	0.0492	2.2635	0.0714	0.9344	0.0462	-	-	1.2710	0.0452	1.0206	0.3301	0.5855	0.0552	-	-	1.1803	0.0765	1.1164	0.0982
1975	1	-	-	-	-	-	-	-	-	3.3502	0.0185	0.9755	0.0532	-	-	1.4878	0.0550	1.7790	0.0754	0.7082	0.0425	-	-	1.1388	0.0408	0.9132	0.3296	-	-	-	-	-	-	-	-
1975	2	-	-	-	-	-	-	-	-	1.9441	0.0189	0.7687	0.0465	-	-	1.2042	0.0478	1.4199	0.0708	0.7005	0.0446	-	-	0.9762	0.0435	0.7633	0.3299	0.4070	0.1308	-	-	0.7764	0.1816	0.7472	0.1873
1975	3	-	-	-	-	-	-	-	-	1.8609	0.0191	0.4089	0.0508	-	-	0.6385	0.0544	0.7248	0.0750	0.7012	0.0304	-	-	0.9813	0.0299	0.7653	0.3285	1.2098	0.0582	-	-	2.4073	0.0821	2.1966	0.1028
1975	4	-	-	-	-	-	-	-	-	3.8150	0.0202	0.8639	0.0486	-	-	1.6539	0.0518	1.8422	0.0731	0.6277	0.0548	-	-	1.1028	0.0527	0.8256	0.3312	0.6637	0.0464	-	-	1.3411	0.0656	1.2284	0.0911
1976	1	-	-	-	-	-	-	-	-	2.4340	0.0197	1.1124	0.0545	-	-	1.8792	0.0588	2.2704	0.0782	0.7171	0.0524	-	-	1.1442	0.0508	0.8694	0.3309	-	-	-	-	-	-	-	-
1976	2	-	-	-	-	-	-	-	-	1.7385	0.0193	0.7352	0.0619	-	-	1.0327	0.0630	1.1763	0.0811	0.6672	0.0422	-	-	0.8789	0.0411	0.7130	0.3296	-	-	-	-	-	-	-	-
1976	3	-	-	-	-	-	-	-	-	1.8851	0.0213	0.5182	0.0485	-	-	0.9216	0.0521	1.0285	0.0733	0.6128	0.0361	-	-	0.8644	0.0357	0.6867	0.3290	-	-	-	-	-	-	-	-
1976	4	-	-	-	-	-	-	-	-	5.4048	0.0216	0.9000	0.0594	-	-	1.6969	0.0634	1.8943	0.0811	0.9627	0.0555	-	-	1.5897	0.0529	1.2840	0.3312	1.1221	0.0614	-	-	2.4032	0.0828	2.2034	0.1032
1977	1	-	-	-	-	-	-	-	-	2.5397	0.0199	0.8047	0.0579	-	-	1.3523	0.0610	1.5827	0.0797	1.3057	0.0709	-	-	2.2026	0.0677	1.7335	0.3337	-	-	-	-	NA	NA	NA	NA
1977	2	-	-	-	-	-	-	-	-	2.5080	0.0191	0.8656	0.0626	-	-	1.6020	0.0660	1.8224	0.0835	0.9570	0.0654	-	-	1.6620	0.0626	1.2955	0.3327	-	-	-	-	NA	NA	NA	NA
1977	3	-	-	-	-	-	-	-	-	3.6303	0.0227	0.4886	0.0662	-	-	0.8597	0.0693	0.9637	0.0856	0.8505	0.0465	-	-	1.2488	0.0447	0.9853	0.3300	-	-	-	-	NA	NA	NA	NA
1977	4	-	-	-	-	-	-	-	-	4.7157	0.0209	0.7826	0.0588	-	-	1.5228	0.0631	1.7022	0.0809	1.1565	0.0437	-	-	1.6424	0.0421	1.3466	0.3297	0.7012	0.0924	-	-	1.6632	0.1290	1.5201	0.1405
1978	1	3.390305	0.1415	-	-	-	-	-	-	2.4725	0.0195	0.8851	0.0585	-	-	1.4188	0.0604	1.6561	0.0792	1.1715	0.0720	-	-	1.4698	0.0675	1.2018	0.3337	-	-	-	-	-	-	-	-
1978	2	3.581025	0.138678	-	-	-	-	-	-	2.1985	0.0182	0.8518	0.0763	-	-	1.2726	0.0705	1.4898	0.0865	0.7746	0.0620	-	-	1.2727	0.0586	1.0139	0.3320	-	-	-	-	-	-	-	-
1978	3	3.813312	0.132194	-	-	-	-	-	-	2.7244	0.0205	0.7640	0.0685	-	-	1.2860	0.0729	1.4342	0.0883	0.9744	0.0490	-	-	1.6852	0.0461	1.2971	0.3302	1.0316	0.0657	-	-	1.8656	0.0920	1.7360	0.1092
1978	4	3.070086	0.155138	-	-	-	-	-	-	4.4861	0.0203	1.1208	0.0573	-	-	1.8913	0.0607	2.1274	0.0791	0.6498	0.0622	-	-	1.5127	0.0585	0.8919	0.3320	0.8767	0.0749	-	-	1.7869	0.1053	1.6678	0.1211
1979	1	2.823539	0.195074	-	-	-	-	-	-	2.4262	0.0189	-	-	1.9644	0.0766	1.3898	0.0583	1.5768	0.0676	-	-	2.1795	0.0645	2.0069	0.0503	2.1287	0.1147	-	-	-	-	-	-	-	-
1979	2	2.953264	0.191589	-	-	-	-	-	-	2.2111	0.0179	-	-	1.1360	0.0900	0.6995	0.0636	0.8382	0.0734	-	-	1.5771	0.0416	1.4257	0.0373	1.5647	0.1051	-	-	-	-	-	-	-	-
1979	3	3.130859	0.182827	-	-	-	-	-	-	2.9353	0.0208	-	-	1.7571	0.0832	1.0814	0.0692	1.1654	0.0753	-	-	1.6896	0.0351	1.4084	0.0312	1.5449	0.1027	-	-	-	-	-	-	-	-
1979	4	2.562352	0.213362	-	-	-	-	-	-	3.5575	0.0189	-	-	2.7170	0.0669	2.2280	0.0563	1.8349	0.0634	-	-	1.9980	0.0390	1.7190	0.0358	1.8387	0.1041	-	-	2.4446	0.0812	1.4899	0.0823	1.4829	0.1091
1980	1	2.17414	0.225122	-	-	-	-	-	-	3.3984	0.0190	-	-	3.2128	0.0670	2.1639	0.0534	2.1976	0.0645	-	-	1.9570	0.0400	1.7418	0.0380	1.8448	0.1049	-	-	-	-	-	-	-	-
1980	2	2.314118	0.22027	-	-	-	-	-	-	2.9013	0.0182	-	-	3.8218	0.0853	2.5029	0.0693	2.3475	0.0867	-	-	1.8981	0.0347	1.4920	0.0320	1.7072	0.1027	-	-	-	-	-	-	-	-
1980	3	2.472926	0.209731	-	-	-	-	-	-	2.5020	0.0187	-	-	1.9365	0.0710	1.2035	0.0630	1.3298	0.0714	-	-	1.5272	0.0315	1.2297	0.0287	1.4801	0.1015	-	-	-	-	-	-	-	-
1980	4	1.965522	0.247059	-	-	-	-	-	-	3.1831	0.0179	-	-	2.2734	0.0699	1.5240	0.0658	1.5297	0.0710	-	-	1.6904	0.0297	1.2895	0.0275	1.5961	0.1011	-	-	1.0746	0.0838	0.7898	0.0696	0.7338	0.0933
1981	1	2.050251	0.316334	-	-	-	-	-	-	2.4228	0.0180	-	-	1.6888	0.0579	1.1113	0.0468	1.1842	0.0569	-	-	2.3419	0.0293	1.6599	0.0269	2.1796	0.1010	-	-	1.2990	0.1087	1.1913	0.1052	0.9857	0.1214
1981	2	2.206319	0.308434	-	-	-	-	-	-	2.2756	0.0182	-	-	1.4325	0.0629	1.0212	0.0517	0.9455	0.0620	-	-	1.7118	0.0282	1.4463	0.0251	1.7069	0.1005	-	-	-	-	-	-	-	-
1981	3	2.369812	0.2933	-	-	-	-	-	-	1.8109	0.0189	-	-	1.2679	0.0641	0.8667	0.0582	0.7914	0.0653	-	-	1.5194	0.0274	1.2487	0.0254	1.4294	0.1003	-	-	1.0216	0.1055	1.0334	0.0821	0.9767	0.1314
1981	4	1.84917	0.346511	-	-	-	-	-	-	2.2641	0.0176	-	-	1.4355	0.0579	0.9205	0.0529	0.9526	0.0595	-	-	1.5727	0.0247	1.2283	0.0228	1.5303	0.0995	-	-	1.5889	0.0841	1.0140	0.0743	1.0586	0.0958
1982	1	2.931661	0.185178	-	-	-	-	-	-	2.9743	0.0176	-	-	2.3721	0.0744	1.8470	0.0655	1.5937	0.0780	-	-	1.7611	0.0266	1.3613	0.0248	1.6681	0.1001	-	-	1.0498	0.1282	1.5209	0.1061	1.4824	0.1245
1982	2	3.134498	0.180947	-	-	-	-	-	-	2.1500	0.0185	-	-	2.0265	0.0720	1.4786	0.0665	1.3618	0.0751	-	-	1.2921	0.0265	1.0439	0.0236	1.1887	0.1000	-	-	1.0776	0.1109	1.1686	0.1059	1.0656	0.1222
1982	3	3.356612	0.172179	-	-	-	-	-	-	1.7421	0.0186	-	-	1.5022	0.0696	0.8948	0.0658	0.9090	0.0723	-	-	1.2583	0.0280	1.0508	0.0258	1.2174	0.1005	-	-	1.2937	0.0984	0.8763	0.0911	0.9533	0.1225
1982	4	2.647789	0.203104	-	-	-	-	-	-	2.4638	0.0177	-	-	2.0562	0.0725	1.4998	0.0687	1.4270	0.0753	-	-	1.4856	0.0252	1.1711	0.0228	1.4074	0.0997	-	-	1.2865	0.0765	0.8454	0.0690	0.9261	0.0873
1983	1	4.784417	0.144148	-	-	-	-	-	-	2.4659	0.0186	-	-	2.2144	0.0641	1.5615	0.0603	1.4283	0.0670	-	-	1.5447	0.0326	1.2495	0.0315	1.4423	0.1021	-	-	-	-	-	-	-	-
1983	2	4.981297	0.141809	-	-	-	-	-	-	2.0265	0.0203	-	-	1.5082	0.0613	1.0529	0.0558	0.9877	0.0644	-	-	1.4429	0.0498	1.0904	0.0498	1.2286	0.1094	-	-	-	-	-	-	-	-
1983	3	5.269961	0.135445	-	-	-	-	-	-	2.2427	0.0215	-	-	2.1273	0.0716	1.5491	0.0705	1.3954	0.0754	-	-	1.3982	0.0346	1.2075	0.0327	1.3391	0.1028	-	-	1.1804	0.0992	0.9424	0.0912	0.8743	0.1091
1983	4	4.34625	0.157786	-	-	-	-	-	-	2.5229	0.0186	-	-	1.5124	0.0699	1.3630	0.0686	1.0189	0.0727	-	-	1.7131	0.0273	1.4434	0.0250	1.6282	0.1003	-	-	2.3621	0.0947	1.6317	0.0816	1.6557	0.1017
1984	1	1.741666	0.177054	-	-	-	-	-	-	2.8470	0.0184	-	-	1.7104	0.0573	1.4157	0.0511	1.1358	0.0601	-	-	1.7196	0.0280	1.4596	0.0272	1.6815	0.1005	-	-	-	-	-	-	-	-
1984	2	1.909987	0.172503	-	-	-	-	-	-	1.8970	0.0183	-	-	1.2166	0.0689	1.0821	0.0640	0.7931	0.0707	-	-	1.5919	0.0335	1.2667	0.0333	1.4584	0.1024	-	-	-	-	-	-	-	-
1984	3	2.070069	0.163908	-	-	-	-	-	-	2.2489	0.0192	-	-	1.9495	0.0903	1.6381	0.0890	1.3786	0.0943	-	-	1.4460	0.0286	1.2270	0.0279	1.2977	0.1008	-	-	1.6883	0.0871	0.8898	0.0908	0.9143	0.1052
1984	4	1.564618	0.194262	-	-	-	-	-	-	3.1437	0.0179	-	-	2.0280	0.0722	1.5377	0.0723	1.2543	0.0753	-	-	1.6403	0.0271	1.4277	0.0256	1.6135	0.1003	-	-	1.6041	0.0844	1.0877	0.0814	1.0634	0.0940
1985	1	2.354435	0.147625	-	-	-	-	-	-	3.1506	0.0180	-	-	1.8123	0.0825	1.5609	0.0822	1.3672	0.0861	-	-	1.8728	0.0268	1.5111	0.0267	1.8550	0.1002	-	-	-	-	-	-	-	-
1985	2	2.578959	0.14387	-	-	-	-	-	-	2.2962	0.0182	-	-	1.0751	0.0658	0.9689	0.0628	0.7517	0.0691	-	-	1.4975	0.0254	1.2007	0.0246	1.4523	0.0998	-	-	2.7322	0.0877	2.7319	0.0822	2.7911	0.0957
1985	3	2.793534	0.136642	-	-	-	-	-	-	2.3454	0.0188	-	-	1.7785	0.0881	1.4872	0.0844	1.0866	0.0882	-	-	1.5057	0.0231	1.3280	0.0215	1.4926	0.0991	-	-	1.4439	0.0654	1.1691	0.0692	1.3490	0.0847
1985	4	2.115611	0.161946	-	-	-	-	-	-	2.7310	0.0178	-	-	1.7948	0.0587	1.3748	0.0584	1.1966	0.0626	-	-	1.5119	0.0223	1.3522	0.0213	1.5804	0.0989	-	-	1.0967	0.0679	1.1620	0.0615	1.1729	0.0826
1986	1	3.530351	0.124917	-	-	-	-	-	-	3.0890	0.0180	-	-	1.5072	0.0619	1.0952	0.0602	0.9671	0.0656	-	-	1.9562	0.0288	1.7706	0.0290	2.0117	0.1008	-	-	1.3391	0.0959	0.8525	0.0918	1.0081	0.1053
1986	2	3.780901	0.121946	-	-	-	-	-	-	2.0432	0.0190	-	-	0.7201	0.0693	0.6392	0.0668	0.6001	0.0731	-	-	1.6438	0.0379	1.3144	0.0379	1.5383	0.1040	-	-	2.2372	0.1063	1.8352	0.1067	2.0566	0.1171
1986	3	4.051963	0.116089	-	-	-	-	2.418828	0.355563	2.3838	0.0207	-	-	2.1430	0.0859	1.5907	0.0887	1.2844	0.0901	-	-	1.5329	0.0285	1.2723	0.0272	1.5079	0.1007	-	-	1.4326	0.0655	1.1221	0.0578	1.3202	0.0740
1986	4	3.18737	0.136952	-	-	-	-	2.294573	0.067682	2.1952	0.0185	-	-	1.6126	0.0615	1.1825	0.0628	1.0386	0.0657	-	-	1.7166	0.0271	1.4568	0.0258	1.6345	0.1003	-	-	1.0554	0.0657	0.7164	0.0651	0.8609	0.0778
1987	1	3.710537	0.112722	-	-	-	-	1.379251	0.060373	3.4052	0.0192	-	-	1.8259	0.0513	1.4594	0.0464	1.3838	0.0555	-	-	1.8186	0.0289	1.4311	0.0281	1.8258	0.1008	-	-	1.0076	0.1091	1.4701	0.0838	1.2418	0.1016
1987	2	3.930067	0.110329	-	-	-	-	1.298112	0.059936	2.2981	0.0193	-	-	1.5562	0.0735	1.5757	0.0727	1.4562	0.0779	-	-	1.7743	0.0293	1.4083	0.0290	1.7034	0.1009	-	-	2.4550	0.1039	1.8689	0.1051	1.9092	0.1138
1987	3	4.190272	0.105096	-	-	-	-	1.523975	0.043374	2.4920	0.0219	-	-	1.3421	0.0583	1.0200	0.0562	1.0436	0.0628	-	-	1.9854	0.0297	1.5214	0.0285	1.8521	0.1011	-	-	2.2106	0.0773	1.6646	0.0744	1.9631	0.0880
1987	4	3.358064	0.123506	-	-	-	-	2.469888	0.046598	2.1462	0.0187	-	-	0.9113	0.0567	0.6566	0.0561	0.6812	0.0613	-	-	2.0980	0.0290	1.7494	0.0270	2.0507	0.1009	-	-	1.5276	0.0770	1.2661	0.0815	1.3110	0.0944
1988	1	2.213545	0.183924	-	-	-	-	1.463469	0.053422	2.7975	0.0183	-	-	1.0094	0.0489	0.8552	0.0475	0.7911	0.0535	-	-	2.0804	0.0277	1.7477	0.0285	2.0226	0.1005	-	-	1.1223	0.1019	0.7118	0.1050	0.8111	0.1125
1988	2	2.415409	0.179234	-	-	-	-	1.405145	0.057932	2.2311	0.0183	-	-	0.5511	0.0653	0.5391	0.0633	0.5324	0.0696	-	-	1.7963	0.0282	1.5729	0.0283	1.7784	0.1006	-	-	1.6293	0.0743	1.1740	0.0741	1.1648	0.0848

Table 6. (continued)

1988	3	2.611584	0.170346	-	-	-	-	1.036494	0.04712	2.5842	0.0196	-	-
1988	4	1.990596	0.201703	-	-	-	-	2.151377	0.04044	2.3634	0.0176	-	-
1989	1	2.172736	0.193898	-	-	-	-	1.41228	0.046857	2.4475	0.0175	-	-
1989	2	2.355032	0.18901	-	-	-	-	0.9077	0.059084	1.9198	0.0177	-	-
1989	3	2.538168	0.179676	-	-	-	-	1.384147	0.039227	2.0197	0.0185	-	-
1989	4	1.956652	0.212576	-	-	-	-	1.821927	0.039818	1.4462	0.0174	-	-
1990	1	1.549954	0.327006	-	-	-	-	1.242836	0.049366	2.0667	0.0173	-	-
1990	2	1.708937	0.318575	-	-	-	-	0.630061	0.07378	1.9131	0.0175	-	-
1990	3	1.857019	0.302609	-	-	-	-	0.863613	0.045313	1.8146	0.0184	-	-
1990	4	1.390838	0.358372	-	-	-	-	2.235193	0.038632	1.9532	0.0175	-	-
1991	1	2.838656	0.150327	-	-	-	-	0.968788	0.061557	1.9788	0.0177	-	-
1991	2	3.045443	0.14675	-	-	-	-	0.658827	0.081423	2.0055	0.0176	-	-
1991	3	3.266449	0.139614	-	-	-	-	1.460672	0.036092	1.6890	0.0188	-	-
1991	4	2.561915	0.164682	-	-	-	-	1.611998	0.039256	1.5001	0.0174	-	-
1992	1	0.754274	0.308725	-	-	-	-	0.858951	0.0584	1.9482	0.0176	-	-
1992	2	0.845996	0.301701	-	-	-	-	0.513902	0.081363	1.3789	0.0184	-	-
1992	3	0.927097	0.286882	-	-	-	-	0.860662	0.046946	1.6028	0.0192	-	-
1992	4	0.674476	0.338267	-	-	-	-	1.213226	0.047777	1.7235	0.0177	-	-
1993	1	1.198026	0.372277	-	-	-	-	0.770424	0.066308	1.7000	0.0172	-	-
1993	2	1.303974	0.362875	-	-	-	-	0.517479	0.08715	1.8062	0.0174	-	-
1993	3	1.408173	0.345017	-	-	-	-	1.286842	0.037491	1.7369	0.0184	-	-
1993	4	1.077932	0.40791	-	-	-	-	1.658049	0.040839	1.5685	0.0175	-	-
1994	1	2.765658	0.152369	-	-	-	-	0.635245	0.069726	1.8139	0.0175	-	-
1994	2	2.971212	0.14878	-	-	-	-	0.466946	0.076874	1.4484	0.0177	-	-
1994	3	3.188884	0.141543	-	-	-	-	0.990868	0.041287	1.2326	0.0181	-	-
1994	4	2.495301	0.167152	-	-	-	-	1.659203	0.035805	1.1993	0.0174	-	-
1995	1	3.292198	0.123667	-	-	-	-	0.756858	0.057013	2.0655	0.0176	-	-
1995	2	3.554541	0.120578	-	-	-	-	0.529549	0.065282	1.5065	0.0173	-	-
1995	3	3.823893	0.114647	-	-	-	-	0.951622	0.035999	1.3076	0.0182	-	-
1995	4	2.967226	0.135617	-	-	-	-	1.598076	0.038865	0.8918	0.0174	-	-
1996	1	4.123506	0.118637	-	-	-	-	0.830685	0.061103	1.7411	0.0173	-	-
1996	2	4.337687	0.116387	-	-	-	-	0.625527	0.064742	1.2384	0.0171	-	-
1996	3	4.610449	0.110919	-	-	-	-	0.832846	0.042078	1.0879	0.0177	-	-
1996	4	3.737373	0.130002	-	-	-	-	1.361374	0.051751	0.8436	0.0171	-	-
1997	1	5.263996	0.082109	-	-	-	-	0.754439	0.062686	1.2733	0.0172	-	-
1997	2	5.508017	0.080633	-	-	-	-	0.565514	0.079238	1.0317	0.0174	-	-
1997	3	5.840281	0.076954	-	-	-	-	0.931541	0.045813	1.0061	0.0183	-	-
1997	4	4.776642	0.089936	-	-	-	-	1.426295	0.04357	0.9275	0.0176	-	-
1998	1	2.580265	0.146352	-	-	-	-	0.758715	0.070794	1.5326	0.0177	-	-
1998	2	2.759192	0.14295	-	-	-	-	0.514429	0.088504	1.2495	0.0176	-	-
1998	3	2.954912	0.136066	-	-	-	-	0.826381	0.04941	1.1476	0.0187	-	-
1998	4	2.330346	0.160486	-	-	-	-	1.939072	0.037964	0.7782	0.0176	-	-
1999	1	3.217115	0.124667	-	-	-	-	1.276044	0.06037	1.2269	0.0176	-	-
1999	2	3.406255	0.122031	-	-	-	-	1.090844	0.065555	1.2772	0.0178	-	-
1999	3	3.631193	0.116274	-	-	-	-	1.55265	0.047693	1.1707	0.0197	-	-
1999	4	2.911736	0.136651	-	-	-	-	2.035497	0.040214	1.1375	0.0183	-	-
2000	1	3.611906	0.113466	-	-	-	-	1.058476	0.074915	1.9846	0.0177	-	-
2000	2	3.810468	0.111173	-	-	-	-	0.715411	0.075899	1.2958	0.0175	-	-
2000	3	4.055392	0.105974	-	-	-	-	0.743056	0.057112	0.9243	0.0190	-	-
2000	4	3.271621	0.12435	-	-	-	-	1.312602	0.042247	0.5756	0.0184	-	-
2001	1	1.162865	0.240906	-	-	-	-	0.837764	0.080741	1.2763	0.0176	-	-
2001	2	1.28148	0.234757	-	-	-	-	0.849247	0.066702	1.1750	0.0185	-	-
2001	3	1.392173	0.223076	-	-	-	-	0.727096	0.059227	0.7821	0.0217	-	-
2001	4	1.043598	0.264259	-	-	-	-	1.589882	0.046748	0.5992	0.0185	-	-
2002	1	1.043486	0.211645	-	-	-	-	0.863658	0.069327	0.7665	0.0179	-	-
2002	2	1.168445	0.206705	-	-	-	-	0.446589	0.084301	0.9536	0.0192	-	-
2002	3	1.279401	0.196556	-	-	-	-	0.670468	0.062897	0.8953	0.0220	-	-
2002	4	0.933404	0.232101	-	-	-	-	1.55129	0.043492	0.8942	0.0190	-	-
2003	1	1.408768	0.165641	-	-	-	-	0.708281	0.068548	1.3352	0.0181	-	-
2003	2	1.572764	0.161634	-	-	-	-	0.221323	0.127007	1.1638	0.0178	-	-
2003	3	1.719558	0.153662	-	-	-	-	0.251193	0.098336	0.9635	0.0191	-	-
2003	4	1.260916	0.181595	-	-	-	-	1.073974	0.057836	0.5404	0.0183	-	-
2004	1	1.490202	0.216477	-	-	-	-	0.412683	0.103565	0.7256	0.0175	-	-
2004	2	1.622295	0.210981	-	-	-	-	0.145247	0.158487	0.6448	0.0187	-	-
2004	3	1.752087	0.200532	-	-	-	-	0.291821	0.111026	0.4689	0.0195	-	-
2004	4	1.340767	0.237495	-	-	-	-	1.875286	0.046341	0.5419	0.0179	-	-
2005	1	0.853877	0.400577	90.330491	45.73553	-	-	0.736661	0.065827	0.7329	0.0176	-	-
2005	2	0.929511	0.390356	73.5677468	67.47325	-	-	0.368309	0.117192	0.8140	0.0185	-	-
2005	3	1.00385	0.37106	1193.10229	1025.937	-	-	0.752534	0.082717	0.5499	0.0198	-	-
2005	4	0.768261	0.439435	485.871127	417.6576	-	-	1.741535	0.057144	0.5506	0.0185	-	-
2006	1	1.130917	0.368854	135.088074	137.3241	2.229	0.0409	0.948755	0.080838	0.6673	0.0179	-	-
2006	2	1.215274	0.359992	857.470339	740.2291	1.83	0.04	0.502208	0.096145	0.8898	0.0190	-	-
2006	3	1.304458	0.34245	1109.96547	946.605	1.32	0.0394	1.173464	0.059719	0.5617	0.0192	-	-
2006	4	1.02031	0.404564	703.439784	599.5814	1.57	0.0393	1.98767	0.041268	0.5139	0.0189	-	-
2007	1	1.472703	0.224484	420.254143	398.7331	1.921	0.0376	1.056523	0.070092	0.8817	0.0185	-	-
2007	2	1.61423	0.21875	1483.76623	1296.44	1.928	0.0372	0.388609	0.109844	0.7829	0.0187	-	-
2007	3	1.749105	0.207861	1530.12538	1309.958	1.582	0.0371	0.675213	0.06458	0.4584	0.0200	-	-
2007	4	1.323133	0.246282	733.327972	637.1536	1.835	0.0368	0.997964	0.056469	0.4314	0.0189	-	-
2008	1	1.063638	0.353857	20.6058206	23.97159	1.583	0.037	0.533642	0.082997	0.6863	0.0183	-	-
2008	2	1.157246	0.344889	3.16412131	4.281271	1.559	0.0377	0.301126	0.097865	0.5080	0.0180	-	-
2008	3	1.249485	0.327924	264.792005	219.5038	1.564	0.04	0.683287	0.068017	0.5493	0.0190	-	-
2008	4	0.957095	0.388492	84.0058311	73.76514	1.72	0.0369	1.203585	0.047544	0.3733	0.0183	-	-
2009	1	1.13927	0.276613	8.32409092	8.271624	1.881	0.0369	0.454278	0.098909	0.7102	0.0179	-	-
2009	2	1.259395	0.269617	790.833012	644.991	1.597	0.037	0.341169	0.094113	0.4979	0.0186	-	-
2009	3	1.37026	0.256234	655.426392	532.3853	1.263	0.0371	0.637204	0.0626	0.3993	0.0204	-	-
2009	4	1.021767	0.30367	45.722359	40.92597	1.716	0.0366	0.942856	0.05597	0.5286	0.0189	-	-
2010	1	0.890666	0.271668	315.786537	258.1655	1.617	0.0366	0.505136	0.084334	0.6092	0.0181	-	-
2010	2	0.995979	0.265134	635.749872	516.2215	1.831	0.0368	0.233016	0.096272	0.3992	0.0188	-	-
2010	3	1.089824	0.2521	437.952109	357.9349	1.796	0.0371	0.8988	0.048098	0.4509	0.0190	-	-
2010	4	0.796924	0.298806	164.961315	136.0138	1.747	0.0365	0.926266	0.058206	0.3531	0.0183	-	-
2011	1	0.565568	0.52742	146.853891	121.5243	1.502	0.0365	0.386147	0.094761	0.5919	0.0183	-	-
2011	2	0.625262	0.514025	282.797893	231.2877	1.66	0.0367	0.465545	0.079027	0.4437	0.0188	-	-
2011	3	0.680336	0.488662	869.335005	707.1825	1.542	0.0367	0.991916	0.049956	0.4699	0.0193	-	-
2011	4	0.507226	0.582086	292.374482	239.7954	1.628	0.0365	1.30571	0.045637	0.2719	0.0185	-	-
2012	1	1.312263	0.264116	40.7636156	39.93374	1.412	0.0366	0.418502	0.075748	0.5837	0.0184	-	-
2012	2	1.418223	0.257544	327.721269	270.9386	1.363	0.0375	0.41972	0.074323	0.6224	0.0188	-	-
2012	3	1.526399	0.244904	568.957826	466.8628	1.4	0.0376	1.044711	0.039982	1.0990	0.0199	-	-
2012	4	1.182484	0.289802	29.350175	27.93342	1.544	0.0367	0.749143	0.051606	0.8384	0.0185	-	-
2013	1	1.086696	0.299162	39.1110531	44.39027	1.608	0.0371	0.706679	0.06839	0.7293	0.0185	-	-
2013	2	1.198594	0.291419	78.5162462	72.97498	2.03	0.0371	0.33783	0.083011	0.6306	0.0195	-	-
2013	3	1.302684	0.277043	134.554999	113.458	1.781	0.0381	0.957669	0.043816	0.8632	0.0200	-	-
2013	4	0.975065	0.32816	71.4542097	63.45856	1.769	0.0371	0.961436	0.050283	0.9483	0.0203	-	-
2014	1	1.594097	0.193026	20.288535	18.69168	1.78	0.0372	0.673456	0.07107	1.0230	0.0192	-	-
2014	2	1.74671	0.188058	80.1727749	73.40997	1.639	0.0374	0.428725	0.075353	0.8017	0.0196	-	-
2014	3	1.892351	0.1787	344.352711	285.3567	1.792	0.0378	1.407006	0.038217	0.6002	0.0201	-	-
2014	4	1.432297	0.211731	82.8171986	76.62335	1.663	0.0371	0.952518	0.05043	0.7272	0.0206	-	-
2015	1	3.088468	0.150138	37.9903092	35.57977	1.893	0.0369	0.735992	0.065123	1.1251	0.0198	-	-
2015	2	3.263173	0.147052	91.3259286	79.24486	1.848	0.0373	0.37781	0.091086	0.8201	0.0205	-	-
2015	3	3.475311	0.140192	123.759911	105.5868	1.846	0.0373	1.586316	0.036339	0.4378	0.0206	-	-
2015	4	2.796579	0.164668	106.077045	89.3627	1.963	0.0368	1.323843	0.046251	0.5994	0.0205	-	-
2016	1	2.122198	0.179473	206.783662	175.2814	1.592	0.0369	0.717446	0.075487	0.7417	0.0200	-	-
2016	2	2.270453	0.175256	257.51842	214.0641	1.626	0.0377	0.408811	0.099094	0.7252	0.0212	-	-
2016	3	2.43205	0.166792	474.551449	387.8665	1.846	0.0374	1.081628	0.055607	0.5609	0.0204	-	-
2016	4	1.916448	0.196805	109.304614	91.66161	1.84	0.0368	1.615087	0.055129	0.6604	0.0204	-	-
2017	1	-	-	96.0667543	80.86358	1.711	0.0373	0.721599	0.074714	0.6789	0.0192	-	-
2017	2	-	-	508.375748	419.529	1.826	0.0379	0.319425	0.101731	0.8114	0.0204	-	-
2017	3	-	-	218.900888	183.0943	1.809	0.0372	1.308254	0.053496	0.4010	0.0208	-	-
2017	4	-	-	283.909166	237.8863	2.03	0.0369	3.033006	0.084301	0.5736	0.0209	-	-

1988	3	1.1351	0.0649	1.0424	0.0658	0.8578	0.0692	-	-	1.8013	0.0255	1.4982	0.0255	1.7524	0.0998	-	-	1.3973	0.0651	0.9784	0.0644	1.0304	0.0753
1988	4	1.1311	0.0524	0.9225	0.0513	0.8129	0.0572	-	-	1.8625	0.0250	1.5927	0.0251	1.9123	0.0997	-	-	1.4431	0.0633	0.8305	0.0646	1.0200	0.0744
1989	1	1.0895	0.0434	0.8358	0.0418	0.8475	0.0484	-	-	1.7120	0.0262	1.4708	0.0269	1.7769	0.1000	-	-	0.7742	0.1022	0.5835	0.1056	0.5899	0.1118
1989	2	1.1236	0.0783	0.8835	0.0771	0.9253	0.0828	-	-	1.4051	0.0240	1.2050	0.0245	1.4470	0.0994	-	-	1.5053	0.0754	1.0228	0.0690	1.0749	0.0840
1989	3	1.1642	0.0663	0.9130	0.0660	0.7135	0.0714	-	-	1.4383	0.0227	1.1755	0.0230	1.3962	0.0991	-	-	1.4788	0.0658	1.2602	0.0608	1.2709	0.0737
1989	4	1.0474	0.0512	0.8179	0.0496	0.7378	0.0566	-	-	1.3327	0.0223	1.1569	0.0228	1.3686	0.0990	-	-	0.8855	0.0643	0.5946	0.0642	0.6509	0.0752
1990	1	1.4369	0.0426	1.2110	0.0409	1.1695	0.0479	-	-	1.5287	0.0257	1.3471	0.0265	1.6363	0.0998	-	-	1.2198	0.0845	0.6930	0.0818	0.8902	0.0943
1990	2	1.1584	0.0717	0.8471	0.0725	0.8824	0.0760	-	-	1.1447	0.0247	1.0436	0.0255	1.2013	0.0996	-	-	1.0456	0.0695	0.8146	0.0642	0.8538	0.0731
1990	3	1.2832	0.0665	1.2930	0.0660	0.9595	0.0721	-	-	1.0289	0.0227	0.8973	0.0236	1.0460	0.0990	-	-	1.0549	0.0604	0.7610	0.0574	0.8852	0.0680
1990	4	1.5657	0.0622	1.2561	0.0626	1.0523	0.0670	-	-	1.0714	0.0229	0.9395	0.0236	1.0609	0.0991	-	-	1.5615	0.0604	1.1121	0.0608	1.1754	0.0708
1991	1	1.0269	0.0457	0.9126	0.0451	0.7532	0.0514	-	-	1.3526	0.0261	1.1313	0.0268	1.3510	0.1000	-	-	0.6004	0.0548	0.3656	0.0548	0.4480	0.0624
1991	2	1.0609	0.0701	0.7941	0.0694	0.7909	0.0746	-	-	1.1016	0.0250	0.9699	0.0259	1.1233	0.0997	-	-	0.7444	0.0462	0.5885	0.0430	0.6542	0.0522
1991	3	0.9999	0.0630	0.9697	0.0605	0.7857	0.0678	-	-	1.0981	0.0219	0.9652	0.0230	1.1151	0.0989	-	-	0.9717	0.0500	0.7458	0.0443	0.8003	0.0534
1991	4	1.2558	0.0619	0.9000	0.0655	0.8318	0.0694	-	-	1.2048	0.0236	0.9927	0.0239	1.2453	0.0993	-	-	1.2701	0.0702	0.8769	0.0743	0.9839	0.0808
1992	1	0.9290	0.0435	0.8173	0.0434	0.7087	0.0493	-	-	1.3786	0.0248	1.0715	0.0262	1.3454	0.0996	-	-	0.6422	0.0658	0.5062	0.0613	0.5279	0.0722
1992	2	0.7143	0.0599	0.5851	0.0605	0.5470	0.0653	-	-	0.9308	0.0311	0.7572	0.0312	0.9263	0.1015	-	-	0.6915	0.0554	0.5493	0.0527	0.6091	0.0656
1992	3	0.8375	0.0522	0.6961	0.0530	0.5837	0.0601	-	-	1.0503	0.0245	0.8951	0.0251	1.0263	0.0995	-	-	1.2089	0.0621	0.9076	0.0605	1.0188	0.0716
1992	4	1.2225	0.0595	0.9996	0.0605	0.8315	0.0647	-	-	1.1371	0.0262	0.9228	0.0268	1.1401	0.1000	-	-	1.5302	0.0657	1.1510	0.0690	1.1013	0.0768
1993	1	0.7600	0.0452	0.5501	0.0455	0.5348	0.0518	-	-	1.2118	0.0257	0.9476	0.0272	1.2112	0.0999	-	-	-	-	-	-	-	-
1993	2	0.8474	0.0598	0.5951	0.0604	0.5714	0.0656	-	-	1.0102	0.0257	0.9068	0.0272	1.0128	0.0999	-	-	0.9850	0.0566	0.7206	0.0530	0.8161	0.0683
1993	3	1.0940	0.0644	0.8420	0.0661	0.6906	0.0699	-	-	1.1551	0.0235	0.9696	0.0246	1.1446	0.0993	-	-	1.3006	0.0505	0.8845	0.0506	0.9864	0.0626
1993	4	1.0681	0.0605	0.8878	0.0603	0.8231	0.0665	-	-	1.0666	0.0248	0.9055	0.0256	1.0774	0.0996	-	-	1.3218	0.0616	0.9098	0.0646	1.0202	0.0724
1994	1	0.6192	0.0548	0.4464	0.0562	0.4315	0.0606	-	-	1.1611	0.0260	0.9583	0.0276	1.1562	0.1000	-	-	0.7414	0.0573	0.3866	0.0555	0.5144	0.0664
1994	2	0.7899	0.0667	0.4770	0.0631	0.5424	0.0752	-	-	0.9266	0.0245	0.8072	0.0259	0.9008	0.0996	-	-	1.2299	0.0470	0.7510	0.0437	0.9011	0.0572
1994	3	0.7749	0.0747	0.6049	0.0729	0.5752	0.0809	-	-	0.8175	0.0223	0.7041	0.0235	0.8117	0.0990	-	-	1.0541	0.0434	0.6758	0.0406	0.7764	0.0543
1994	4	1.4827	0.0576	1.0301	0.0587	1.1320	0.0652	-	-	0.9068	0.0238	0.7202	0.0253	0.9012	0.0994	-	-	0.8985	0.0617	0.6424	0.0647	0.6076	0.0730
1995	1	1.1191	0.0493	0.8340	0.0490	0.7816	0.0552	-	-	1.1750	0.0253	0.9775	0.0270	1.1500	0.0998	-	-	1.3989	0.0682	0.9457	0.0693	0.9937	0.0795
1995	2	0.8991	0.0560	0.7011	0.0564	0.7324	0.0624	-	-	0.9829	0.0249	0.8551	0.0264	0.9973	0.0997	-	-	1.0096	0.0459	0.7753	0.0451	0.8055	0.0580
1995	3	0.5927	0.0531	0.5685	0.0531	0.4183	0.0597	-	-	0.9686	0.0229	0.7813	0.0242	0.9456	0.0992	-	-	1.0609	0.0414	0.6896	0.0417	0.8130	0.0536
1995	4	0.7318	0.0485	0.6762	0.0476	0.5152	0.0560	-	-	0.8726	0.0226	0.7224	0.0237	0.8703	0.0991	-	-	1.0419	0.0610	0.6135	0.0648	0.6954	0.0728
1996	1	0.9711	0.0556	0.8506	0.0545	0.7324	0.0615	-	-	0.9847	0.0244	0.8341	0.0259	0.9901	0.0996	-	-	0.9116	0.0542	0.6818	0.0554	0.6715	0.0655
1996	2	0.7130	0.0563	0.5598	0.0581	0.5348	0.0623	-	-	0.7845	0.0248	0.6398	0.0258	0.7551	0.0997	-	-	0.6791	0.0478	0.4386	0.0510	0.5243	0.0599
1996	3	0.8437	0.0516	0.6630	0.0518	0.5903	0.0581	-	-	0.7227	0.0219	0.6318	0.0226	0.7143	0.0989	-	-	1.0879	0.0537	0.8420	0.0552	0.8062	0.0657
1996	4	1.0905	0.0476	0.8751	0.0478	0.7809	0.0542	-	-	0.7160	0.0217	0.6136	0.0221	0.7402	0.0988	-	-	0.9671	0.0603	0.7346	0.0648	0.6698	0.0721
1997	1	1.0786	0.0487	0.8244	0.0490	0.7894	0.0552	-	-	0.9033	0.0240	0.7218	0.0251	0.8718	0.0994	-	-	0.5756	0.0631	0.4761	0.0646	0.4421	0.0750
1997	2	0.7554	0.0478	0.6317	0.0467	0.5806	0.0534	-	-	0.6538	0.0231	0.5504	0.0245	0.6275	0.0992	-	-	0.6858	0.0548	0.4748	0.0555	0.5075	0.0664
1997	3	0.6298	0.0685	0.5283	0.0728	0.4444	0.0765	-	-	0.6361	0.0214	0.5417	0.0222	0.6300	0.0988	-	-	0.8713	0.0581	0.6709	0.0611	0.6143	0.0702
1997	4	1.0717	0.0467	0.9622	0.0476	0.8135	0.0536	-	-	0.6677	0.0222	0.5464	0.0226	0.6692	0.0990	-	-	0.6984	0.0637	0.6161	0.0648	0.5293	0.0754
1998	1	0.9097	0.0395	0.7579	0.0398	0.6788	0.0472	-	-	0.8529	0.0259	0.6729	0.0273	0.8679	0.1000	-	-	-	-	-	-	-	-
1998	2	0.8043	0.0472	0.7009	0.0468	0.6482	0.0538	-	-	0.8084	0.0253	0.6847	0.0262	0.8186	0.0998	-	-	0.5488	0.0508	0.4386	0.0510	0.4577	0.0621
1998	3	0.6673	0.0588	0.5953	0.0607	0.4914	0.0668	-	-	0.7211	0.0232	0.6253	0.0240	0.7503	0.0992	-	-	1.3781	0.0585	1.0024	0.0610	1.0454	0.0706
1998	4	0.9230	0.0461	0.7136	0.0467	0.6383	0.0529	-	-	0.6889	0.0211	0.5708	0.0220	0.6817	0.0987	-	-	0.5825	0.0557	0.3635	0.0583	0.3983	0.0683
1999	1	1.1549	0.0409	1.1088	0.0411	0.9744	0.0482	-	-	0.7730	0.0239	0.6294	0.0253	0.7791	0.0994	-	-	0.5126	0.0743	0.3095	0.0747	0.3660	0.0857
1999	2	1.2668	0.0461	1.2587	0.0488	1.1411	0.0547	-	-	0.7308	0.0239	0.5967	0.0250	0.7342	0.0994	-	-	0.6729	0.0575	0.5462	0.0611	0.4846	0.0696
1999	3	0.5853	0.0619	0.5061	0.0660	0.4197	0.0701	-	-	0.6114	0.0241	0.5017	0.0250	0.6134	0.0994	-	-	1.1948	0.0555	0.9123	0.0580	0.8935	0.0667
1999	4	1.1900	0.0501	1.1377	0.0528	0.9333	0.0581	-	-	0.8097	0.0255	0.6707	0.0263	0.8039	0.0998	-	-	0.8287	0.0507	0.5177	0.0532	0.5713	0.0626
2000	1	1.1542	0.0432	1.0434	0.0436	0.9133	0.0504	-	-	0.9908	0.0225	0.8706	0.0234	1.0290	0.0978	-	-	0.7358	0.0952	0.5999	0.0913	0.4945	0.1070
2000	2	1.2247	0.0411	1.1594	0.0413	1.0323	0.0486	-	-	0.8172	0.0231	0.7472	0.0242	0.8550	0.0991	-	-	0.7715	0.0525	0.5385	0.0554	0.5549	0.0649
2000	3	0.4835	0.0514	0.5026	0.0529	0.4133	0.0580	-	-	0.7289	0.0231	0.5973	0.0243	0.7294	0.0992	-	-	0.7144	0.0500	0.5363	0.0510	0.5494	0.0622
2000	4	0.6625	0.0441	0.6710	0.0446	0.5461	0.0509	-	-	0.6372	0.0221	0.5207	0.0233	0.6576	0.0989	-	-	0.5218	0.0608	0.3811	0.0611	0.3953	0.0720
2001	1	1.4021	0.0393	1.3724	0.0400	1.2917	0.0471	-	-	0.8417	0.0215	0.7616	0.0223	0.9460	0.0987	-	-	-	-	-	-	-	-
2001	2	1.1839	0.0390	1.0261	0.0390	0.9802	0.0465	-	-	0.7050	0.0233	0.6034	0.0242	0.7493	0.0992	-	-	0.4511	0.0655	0.3138	0.0691	0.3428	0.0773
2001	3	0.5788	0.0514	0.5083	0.0503	0.4764	0.0577	-	-	0.5506	0.0252	0.5342	0.0262	0.6134	0.0997	-	-	1.1941	0.0657	0.8822	0.0691	0.9117	0.0774
2001	4	0.6522	0.0434	0.5601	0.0428	0.5351	0.0506	-	-	0.4985	0.0239	0.4475	0.0250	0.5273	0.0994	-	-	0.7764	0.0645	0.5349	0.0648	0.5412	0.0769
2002	1	0.7296	0.0393	0.6599	0.0380	0.6657	0.0467	-	-	0.5775	0.0224	0.5498	0.0231	0.6250	0.0989	-	-	-	-	-	-	-	-
2002	2	0.5532	0.0419	0.5758	0.0421	0.5032	0.0492	-	-	0.6582	0.0254	0.6297	0.0260	0.6940	0.0998	-	-	1.0371	0.0894	0.6722	0.0927	0.6874	0.1011
2002	3	0.6849	0.0917	0.6723	0.0982	0.4630	0.1010	-	-	0.6367	0.0286	0.5642	0.0298	0.6458	0.1008	-	-	1.1913	0.0795	0.8632	0.0816	0.9068	0.0907
2002	4	0.6510	0.0420	0.5748	0.0421	0.5623	0.0494	-	-	0.6011	0.0240	0.5419	0.0250	0.6201	0.0994	-	-	1.0582	0.0831	0.7636	0.0839	0.7169	0.0947
2003	1	0.7329	0.0450	0.7457	0.0455	0.6955	0.0522	-	-	0.7461	0.0241	0.6167	0.0253	0.7364	0.0995	-	-	-	-	-	-	-	-
2003	2	0.9363	0.0440	0.9850	0.0429	0.8030	0.0512	-	-	0.6502	0.0232	0.5885	0.0243	0.6682	0.0992	-	-	0.6125	0.0634	0.4777	0.0653	0.4608	0.0758
2003	3	0.2825	0.0647	0.2446	0.0637	0.2001	0.0707	-	-	0.5574	0.0238	0.5414	0.0245	0.5670	0.0994	-	-	1.2975	0.0582	0.9007	0.0610	1.0021	0.0697
2003	4	0.6541	0.0500	0.6900	0.0490	0.5977	0.0568	-	-	0.4628	0.0234	0.4253	0.0242	0.4970	0.0993	-	-	0.7091	0.0772	0.4588	0.0814	0.5078	0.0893
2004	1	0.8406	0.0395	0.8204	0.0398	0.7400	0.0472	-	-	0.6433	0.0224	0.6105	0.0234	0.7385	0.0990	-	-	-	-	-	-	-	-
2004	2	0.6519	0.0462	0.7005	0.0466	0.6007	0.0533	-	-	0.5127	0.0227	0.4964	0.0237	0.5576	0.0991	-	-	0.3022	0.0624	0.2371	0.0648	0.2539	0.0757
2004	3	0.5640	0.0752	0.4813	0.0773	0.4439	0.0814	-	-	0.4459	0.0247	0.4138	0.0256	0.4510	0.0997	-	-	1.4377	0.0587	0.9368	0.0613	1.0627	0.0706
2004	4	0.4126	0.0510	0.4152	0.0490	0.3506	0.0574	-	-	0.5137	0.0233	0.4738	0.0242	0.5334	0.0992	-	-	0.9199	0.0584	0.6676	0.0582	0.6844	0.0700
2005	1	0.6477	0.0354	0.6251	0.0345	0.6036	0.0436	-	-	0.6376	0.0201	0.6745	0.0209	0.7572	0.0985	-	-	-	-	-	-	-	-
2005	2	0.7442	0.0466	0.7090	0.0468	0.6719	0.0536	-	-	0.5322	0.0203	0.5249	0.0212	0.5970	0.0985	-	-	-	-	-	-	-	-
2005	3	0.4902	0.0733	0.4687	0.0731	0.3847	0.0791	-	-	0.4752	0.0211	0.4317	0.0217	0.4898	0.0987	-	-	0.7045	0.0592	0.6056	0.0614	0.5296	0.0710
2005	4	0.6829	0.0489	0.6641	0.0468	0.5683	0.0557	-	-	0.5346	0.0217	0.4824	0.0226	0.5692	0.0989	-	-	0.9058	0.0840	0.6715	0.0908	0.6657	0.0954
2006	1	0.6422	0.0390	0.6410	0.0386	0.5591	0.0467	-	-	0.7525	0.0231	0.7339	0.0245	0.8312	0.0992	-	-	-	-	-	-	-	-
2006	2	0.6855	0.0585	0.6225	0.0583	0.5227	0.0644	-	-	0.5958	0.0230	0.5458	0.0242	0.6383	0.0992	-	-	0.8619	0.0981	0.5500	0.1054	0.5753	0.1103
2006	3	0.6889	0.1048	0.6811	0.1089	0.5361	0.1122	-	-	0.5778	0.0234	0.5031	0.0245	0.5865	0.0993	-	-	0.8393	0.0654	0.5849	0.0695	0.5919	0.0772
2006	4	0.5613	0.0773	0.5109	0.0771	0.4595	0.0829	-	-	0.6081	0.0251	0.5164	0.0262	0.6327	0.0997	-	-	0.7887	0.0782	0.4926	0.0816	0.5437	0.0904
2007	1	0.5949	0.0623	0.5428	0.0585	0.4954	0.0682	-	-	0.7678	0.0251	0.6521	0.0262	0.7949	0.0998	-	-	-	-	-	-	-	-
2007	2	0.5879	0.0946	0.6185	0.0973	0.4957	0.1007	-	-	0.6777	0.0243	0.5845	0.0257	0.6931	0.0995	-	-	-	-	-	-	-	-
2007	3	0.6114	0.1084	0.6941	0.1088	0.5272	0.1123	-	-	0.5795	0.0220	0.4786	0.0231	0.5667	0.0989	-	-	0.9369	0.0696	0.6497	0.0746	0.6837	0.0816
2007	4	0.5765	0.0943	0.5358	0.0974	0.4912	0.1001	-	-	0.6192	0.0234	0.5252	0.0245	0.6308	0.0993	-	-	0.7673	0.0691	0.4731	0.0750	0.5499	0.0808
2008	1	0.5841	0.0724	0.4003	0.0727	0.3984	0.0794	-	-	0.5727	0.0246	0.4669	0.0260	0.5937	0.0996	-	-	0.6724	0.1646	0.3935	0.1814	0.3459	0.1796
2008	2	0.3615	0.0777	0.3418	0.0772	0.2395	0.0885	-	-	0.5298	0.0212	0.4708	0.0225	0.5557	0.0987	-	-	0.3225	0.0922	0.2293	0.0915	0.2565	0.1035
2008	3	0.5289	0.0813	0.9563	0.0892	0.7343	0.0958	-	-	0.4807	0.0207	0.4191	0.0215	0.4967	0.0986	-	-	0.9450	0.0530	0.6690	0.0557	0.7566	0.0652
2008	4	0.6917	0.0870	0.6833	0.0889	0.5861	0.0928	-	-	0.5638	0.0229	0.4795	0.0238	0.5679	0.0992	-	-	1.0887	0.0552	0.6412	0.0557	0.7126	0.0656
2009	1	0.4393	0.0817	0.3393	0.0823	0.3746	0.0871	-	-	0.5817	0.0240	0.4676	0.0253	0.5980	0.0995	-	-	0.4616	0.1052	0.2628	0.1058	0.3176	0.1166
2009	2	0.4360	0.0853	0.4670	0.0890	0.3868	0.0922	-	-	0.4878	0.0212	0.4156	0.0225	0.5129	0.0988	-	-	-	-	-	-	-	-
2009	3	0.4302	0.0766	0.3802	0.0771	0.3533	0.0828	-	-	0.3955	0.0207	0.3424	0.0218	0.4115	0.0986	-	-	0.8675	0.0675	0.5196	0.0693	0.5720	0.0786
2009	4	0.6614	0.0577	0.5013	0.0562	0.5897	0.0634	-	-	0.5637	0.0219	0.4871	0.0231	0.5828	0.0989	-	-	0.5509	0.0667	0.3900	0.0723	0.3590	0.0794
2010	1	0.4234	0.0811	0.4272	0.0825	0.4561	0.0867	-	-	0.5202	0.0228	0.4361	0.0242	0.5379	0.0992	-	-	-	-	-	-	-	-
2010	2	0.5120	0.0830	0.6168	0.0894	0.5330	0.0935	-	-	0.4281	0.0219	0.3763	0.0231	0.4456	0.0989	-	-	0.3978	0.0702	0.3171	0.0753	0.3057	0.0847
2010	3	0.4699	0.0818	0.4181	0.0825	0.3895	0.0879	-	-	0.5203	0.0213	0.4544	0.0223	0.5477	0.0988	-	-	0.6764	0.0530	0.5149	0.0511	0.5280	0.0638
2010	4	0.4920	0.0720	0.4429	0.0726	0.4232	0.0781	-	-	0.5090	0.0223	0.4335	0.0236	0.5155	0.0990	-	-	0.6531	0.0841	0.3418	0.0911	0.3878	0.0958
2011	1	0.4185	0.0792	0.3872	0.0825	0.3690	0.0881	-	-	0.5371	0.0229	0.4609	0.0241	0.5554	0.0992	-	-	0.4708	0.0874	0.3597	0.0918	0.3193	0.0993
2011	2	0.4429	0.0887	0.4212	0.0892	0.3659	0.0931	-	-	0.4271	0.0213	0.3943	0.0224	0.4638	0.0988	-	-	0.6173	0.0626	0.4114	0.0518	0.4112	0.0671
2011	3	0.4453	0.0809	0.4407	0.0824	0.3629	0.0866	-	-	0.4097	0.0202	0.3823	0.0211	0.4328	0.0985	-	-	1.1663	0.0601	0.6266	0.0552	0.7795	0.0703
2011	4	0.7429	0.0853	0.5520	0.0888	0.5462	0.0913	-	-	0.4928	0.0203	0.4563	0.0211	0.5276	0.0985	-	-	0.4799	0.1212	0.3729	0.1285	0.3242	0.1337
2012	1	0.4797	0.0811	0.4841	0.0829	0.4483	0.0868	-	-	0.4556	0.0220	0.3916	0.0231	0.4772	0.0989	-	-	0.7198	0.0797	0.5450	0.0821	0.5182	0.0913
2012	2	0.4691	0.1201	0.5047	0.1256	0.4221	0.1267	-	-	0.4305	0.0210	0.4068	0.0220	0.4613	0.0987	-	-	0.4442	0.0676	0.2936	0.0697	0.3394	0.0794
2012	3	0.5477	0.0765	0.5014	0.0771	0.4177	0.0827	-	-	0.4182	0.0229	0.3848	0.0241	0.4412	0.0992	-	-	1.3591	0.0524	0.8909	0.0537	1.0772	0.0647
2012	4	0.4476	0.0759	0.3978	0.0772	0.3549	0.0820	-	-	0.6532	0.0223	0.5922	0.0235	0.6742	0.0990	-	-	1.1711	0.0580	0.8924	0.0617	0.8346	0.0701
2013	1	0.5928	0.0935	0.6072	0.0978	0.5184	0.0996	-	-	0.7113	0.0236	0.6587	0.0248	0.7478	0.0993	-	-	1.1095	0.1173	0.8784	0.1285	0.7496	0.1299
2013	2	0.4198	0.0814	0.4264	0.0829	0.3257	0.0875	-	-	0.6102	0.0247	0.5806	0.0260	0.6401	0.0996	-	-	0.5563	0.0537	0.3805	0.0542	0.4244	0.0658
2013	3	0.4419	0.0815	0.5496	0.0826	0.3884	0.0866	-	-	0.5606	0.0259	0.5617	0.0268	0.5996	0.1000	-	-	1.2243	0.0571	0.9670	0.0588	0.9706	0.0689
2013	4	0.5580	0.0713	0.6022	0.0731	0.4829	0.0777	-	-	0.8200	0.0242	0.7326	0.0257	0.8390	0.0995	-	-	0.9367	0.0700	0.6622	0.0749	0.6383	0.0821
2014	1	0.5956	0.0813	0.6353	0.0833	0.5245	0.0872	-	-	0.7827	0.0265	0.6717	0.0280	0.7930	0.1002	-	-	-	-	-	-	-	-
2014	2	0.5852	0.0996	0.4810	0.0976	0.3818	0.1062	-	-	0.5407	0.0242	0.4992	0.0254	0.5487	0.0995	-	-	0.3921	0.0580	0.3376	0.0588	0.2974	0.0699
2014	3	0.5072	0.0808	0.5989	0.0825	0.4208	0.0870	-	-	0.6043	0.0251	0.5228	0.0264	0.5852	0.0998	-	-	0.7806	0.0670	0.5928	0.0693	0.5386	0.0789
2014	4	0.7591	0.0726	0.6045	0.0692	0.5299	0.0747	-	-	0.7045	0.0270	0.5815	0.0284	0.6860	0.1003	-	-	0.4071	0.0764	0.3049	0.0819	0.2617	0.0876
2015	1	0.4631	0.0952	0.5752	0.0981	0.4369	0.1014	-	-	0.8081	0.0283	0.6402	0.0298	0.8056	0.1008	-	-	0.7669	0.0977	0.5522	0.1051	0.5095	0.1095
2015	2	0.4434	0.0888	0.5148	0.0894	0.4031	0.0957	-	-	0.6739	0.0250	0.6040	0.0261	0.6971	0.0998	-	-	0.4021	0.0623	0.3117	0.0656	0.2924	0.0737
2015	3	0.6766	0.0822	0.6566	0.0828	0.4884	0.0876	-	-	0.6610	0.0283	0.5699	0.0295	0.6420	0.1007	-	-	0.5228	0.0537	0.4498	0.0541	0.3907	0.0653
2015	4	0.6188	0.0780	0.7334	0.0776	0.4969	0.0838	-	-	0.7877	0.0257	0.6469	0.0269	0.7994	0.1000	-	-	0.7057	0.0667	0.4959	0.0697	0.4670	0.0783
2016	1	0.4917	0.0910	0.5564	0.0896	0.4081	0.0967	-	-	0.6818	0.0271	0.5744	0.0285	0.7054	0.1003	-	-	-	-	-	-	-	-
2016	2	0.3819	0.0960	0.4951	0.0978	0.3547	0.1024	-	-	0.4992	0.0262	0.4393	0.0270	0.4913	0.1001	-	-	0.4691	0.0736	0.3226	0.0703	0.3661	0.0849
2016	3	0.5181	0.0939	0.4704	0.0974	0.4087	0.0995	-	-	0.6014	0.0253	0.5097	0.0264	0.6021	0.0998	-	-	0.7605	0.0547	0.5454	0.0546	0.5393	0.0648
2016	4	0.9225	0.0817	0.9951	0.0826	0.8056	0.0875	-	-	0.7362	0.0263	0.6044	0.0276	0.7234	0.1001	-	-	0.7758	0.0775	0.5905	0.0821	0.5519	0.0890
2017	1	0.5527	0.0910	0.6205	0.0841	0.4428	0.0906	-	-	0.6301	0.0270	0.5056	0.0284	0.6203	0.1003	-	-	0.5274	0.0888	0.3238	0.0917	0.3117	0.0998
2017	2	0.3225	0.1000	0.5248	0.0979	0.3120	0.1040	-	-	0.5724	0.0271	0.5117	0.0281	0.5894	0.1003	-	-	0.3428	0.0623	0.3010	0.0620	0.2669	0.0730
2017	3	0.9358	0.0879	0.9537	0.0891	0.7292	0.0935	-	-	0.5482	0.0250	0.4536	0.0260	0.5295	0.0997	-	-	0.5643	0.0586	0.4257	0.0591	0.4116	0.0699
2017	4	0.5173	0.1572	0.4911	0.1534	0.5106	0.1624	-	-	0.7082	0.0246	0.5892	0.0257	0.7242	0.0996	-	-	0.6326	0.0785	0.4508	0.0821	0.4228	0.0897

Table 7. Bigeye tuna Indices of abundance evaluation table and recommendations for the assessment evaluation.

Paper	SCRS/18/32	SCRS/18/52	SCRS/18/54	SCRS/18/57	SCRS/18/49	SCRS/18/60	SCRS/18/58
Index	**Japanese LL (All atilantic, area specific, main fishing ground)**	**Brazilian LL (1978-2016)**	**USA LL**	**Taiwanese LL (1967-2016)**	**Uruguay LL (2003-2012)**	**Dakar BB 2005-2017**	**Joint LL analysis**
Diagnostics	5 (Comprehensive diagnostics provided)	4 (diagnostics provided)	5 (Comprehensive diagnostics provided)	4 (diagnostic plots provided)	4 (Comprehensive diagnostics provided)	4 (Comprehensive diagnostics provided)	5 (Comprehensive diagnostics provided)
Appropriateness of data exclusions and classifications (e.g. to identify targeted trips).	3 (Effect of fishing gear (NHF) is proxy of targetting)	3 (Effect of fishing gear (NHF) is proxy of targetting)	4 (Data exclusions are discussed and justified and classifications appear appropriate. Targetting is included as a factor, although the targeting proxy is not without its limitations)	4 (Data exclusions are explicitly addressed and justified. Targetting factor is included)	4 (Data exclusions are explicitly addressed and justified. Targetting factor is included)	3 (No data exclusions mentioned)	5 (Data exclusions are explicitly addressed and justified. Targetting factor is included)
Geographical Coverage	5 (Main fishing ground, area specific and entire Atlantic)	3 (Mainly in the western Atlantic)	3 (fairly wide distribution. Covers Western North Atlantic)	5 (Wide coverage over most of Atlantic)	3 (Fairly wide distribution in Southwestern Atlantic, but mainly concentrated in smaller area near Uruguay)	2 (Limited to small region in West Africa)	5 (Almost entire Atlantic)
Catch Fraction	5 (Largest proportion of total catches in number: 49% in Atl (2017))	2 (Catches are relatively small: 1% - BET bycatch)	2 (Catches not amongst the top 10 fleets: 0.87%)	4 (second largest catches in Atl: 16.7%)	1 (Catches are small: 0.1%)	3 (around 10 % in some years)	See the information on each fleet (JP, US, TW)
Length of Time Series relative to the history of exploitation.	5 (Series runs from 1961)	4 (Series runs from 1978)	4 (Series run from 1986)	5 (series is divided into time periods, but data is available since 1967)	2 (Series runs from 2003)	2 (Series runs from 2005)	5 (Series runs from 1958)
Are other indices available for the same time period?	5 (none other available over entire length of dataset)	4 (Conparatively long series)	2 (Almost all other series are longer)	4 (Few other series are longer)	3 (Japanese series and Taiwanese time series are longer)	3 (Many of other CPUE's time series are longer)	5 (none other available over entire length of dataset)
Does the index standardization account for Known factors that influence catchability/selectivity?	4 (Quarter, area, branchline and SST information are all included.)	4(Year, quarter, area, strategy, LOA, HBF, set time are used)	2 (model uses targeting as a fraction of SWO/total catch and operations code, other gear characteristics not significant)	4 (month, area and fleet information are all included.)	4 (SST and Gearare included. Quarter and Area were also considered as factors)	4(Year, month, vessel, area, environental factors are used)	4 (Gear or Target depending on the fleet is included. Quarter and Area were also considered as factors. Vessel ID is also included). SST no included
Are there conflicts between the catch history and the CPUE response?	3 (For most of the time series CPUE tracks catches, but that's because catches were derived from CPUE)	3 (No noticebale conflicts)	4(no severe conflicts noted)	3 (for most of the time series CPUE tracks catches)	3 (No noticebale conflicts)	3 (No noticebale conflicts)	3 (No noticebale conflicts)
Is the interannual variability within plausible bounds (e.g. SCRS/2012/039)	4 (CPUE in All atlantic show seasonal oscillations)	4 (No major variability)	4 (CPUE shows seasonal oscillations)	5 (no major fluctuations noted)	4 (No major variability)	3 (There is variability in the first part of the period)	3 (There is variability in the first part of the period)
Are biologically implausible interannual deviations severe? (e.g. SCRS/2012/039)	2 (relatively severe during the timeframe mentioned above)	2 (relatively severe during the timeframe mentioned above)	2 (relatively severe during the timeframe mentioned above)	2 (relatively severe during the timeframe mentioned above)	2 (relatively severe during the timeframe mentioned above)	3	3
Assessment of data quality and adequacy of data for standardization purpose (e.g. sampling design, sample size, factors considered)	4 (descriptions of the different data sources used have been provided and explained)	2 (Data incorporated into the model is very limited with very few factors considered)	4 (descriptions of the different data sources used have been provided as well as caveats regarding the different input data sets are mentioned)	4 (descriptions of the different data sources used have been provided as well as caveats regarding the different input data sets are mentioned)	4 (Descriptions of the different data sources used have been provided and explained)	4 (Descriptions of the different data sources used have been provided and explained)	4 (Descriptions of the different data sources used have been provided and explained)
Is this CPUE time series continuous?	5 (Series is continuous)	5 (Series is continuous)	5 (Series is continuous)	5 (Series is continuous)	5 (Series is continuous)	5 (Series is continuous)	5 (Series is continuous)

Table 8. Table of reference, continuity and sensitivity run specifications for each model. Order of sensitivities represents a general suggested order to be considered by the analysts.

	SS	ASPIC/SPM	VPA
Reference	Joint LL index split steepness 0.8 growth: Richard (fix) area: one area M: Lorenzen size data weight: Francis (2011) stock assessment period: 1950-2017 tag data: not used	Joint LL index split	Joint LL index split
continuity 1		USLL region2	
continuity 2		JLL region2	
continuity 3		CH_TAI LL region 2	
sensitivity 1	Joint LL 1959-2017 no id index	Joint LL 1959-2017 no id index	Joint LL 1959-2017 no id index
sensitivity 2	3-area model, joint split index region 1,2,3, AZ BB	URU LL1/URULL2	Dakar BB
sensitivity 3	best fit M profile	Brazil LL	Azores BB
sensitivity 4	Stp 0.7		
sensitivity 5	Stp 0.9		
sensitivity 6	Ref+Dakar BB		
sensitivity 7	0.5 Length comps		
sensitivity 8	Est growth		

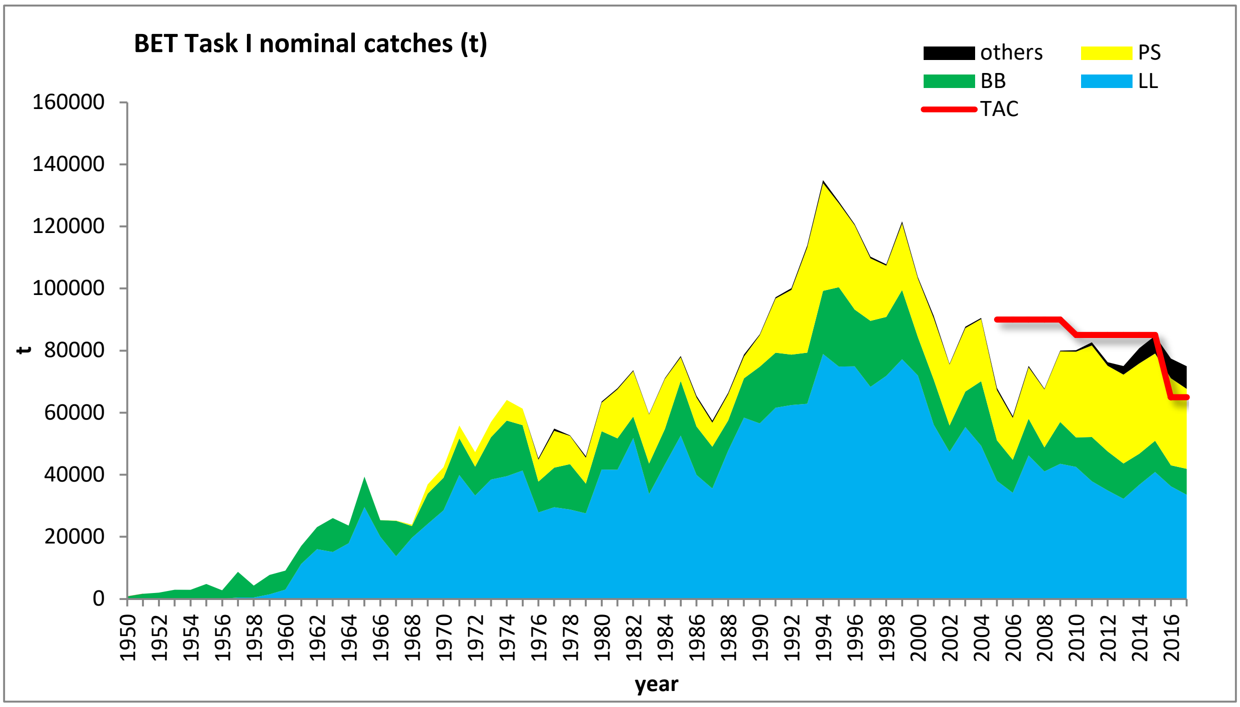

Figure 1. BET Task I cumulative catches (t) by gear between 1950 and 2017.

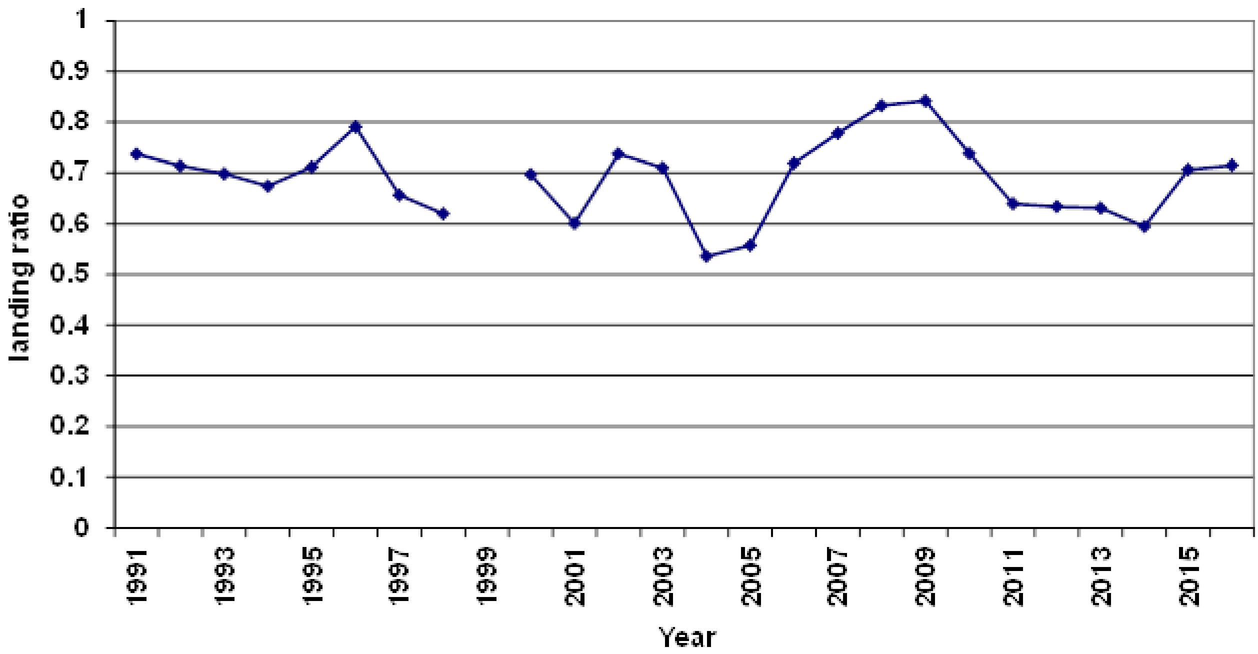

Figure 2. Annual ratio between the landings (t) on Abidjan and the total tuna tropical landings by the EU and associated PS fleet on other ports based on logbook data. Since "faux poisson" estimates are based on Abidjan sampling only, this ratio may indicate potential underestimation of total "faux poisson" catches.

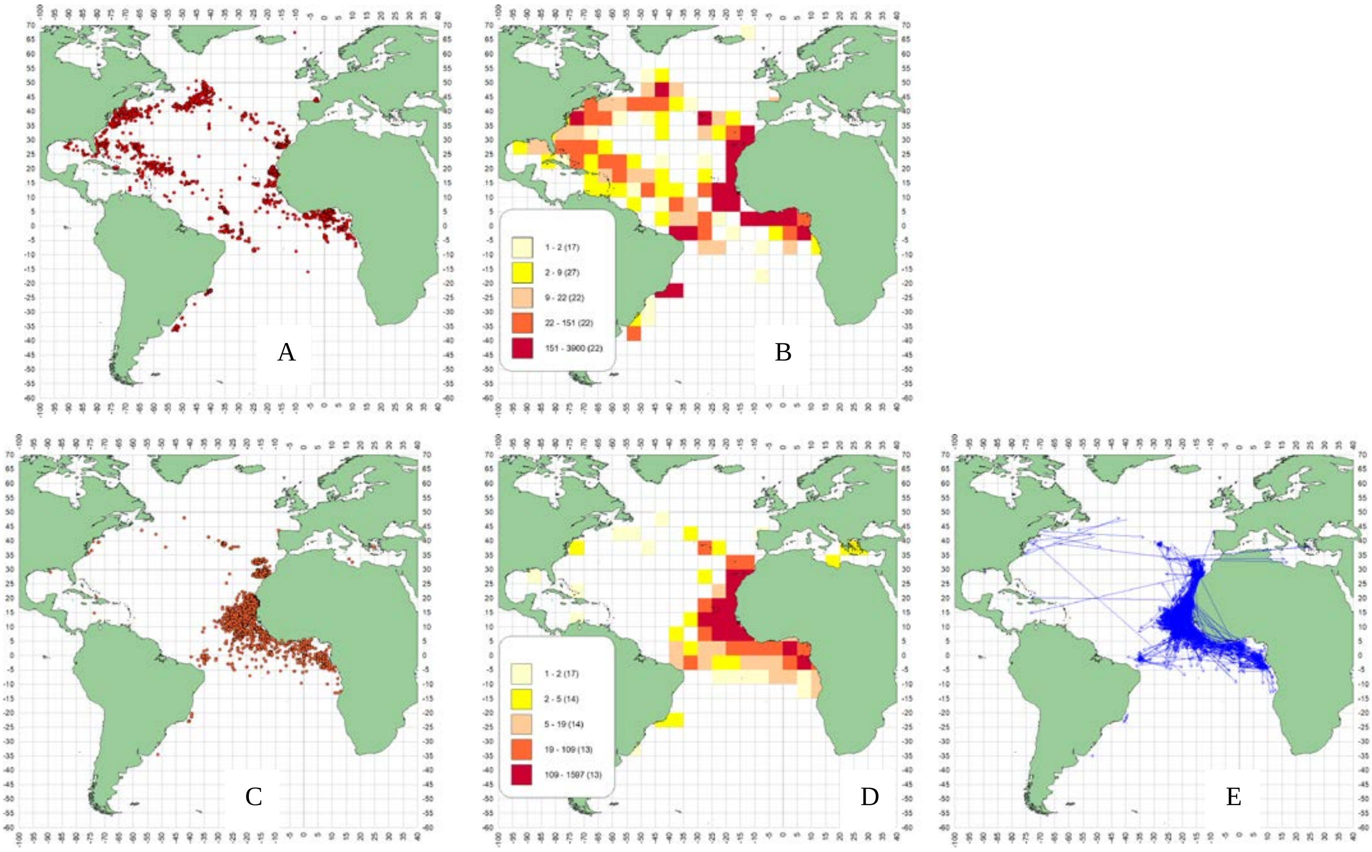

Figure 3. BET conventional tagging maps: A release points, B density of releases by 5x5 lat lon grids. C Recaptures points, D density of recaptures by 5x5 lat lon grids. E Straight line displacement between points of release and recapture for BET.

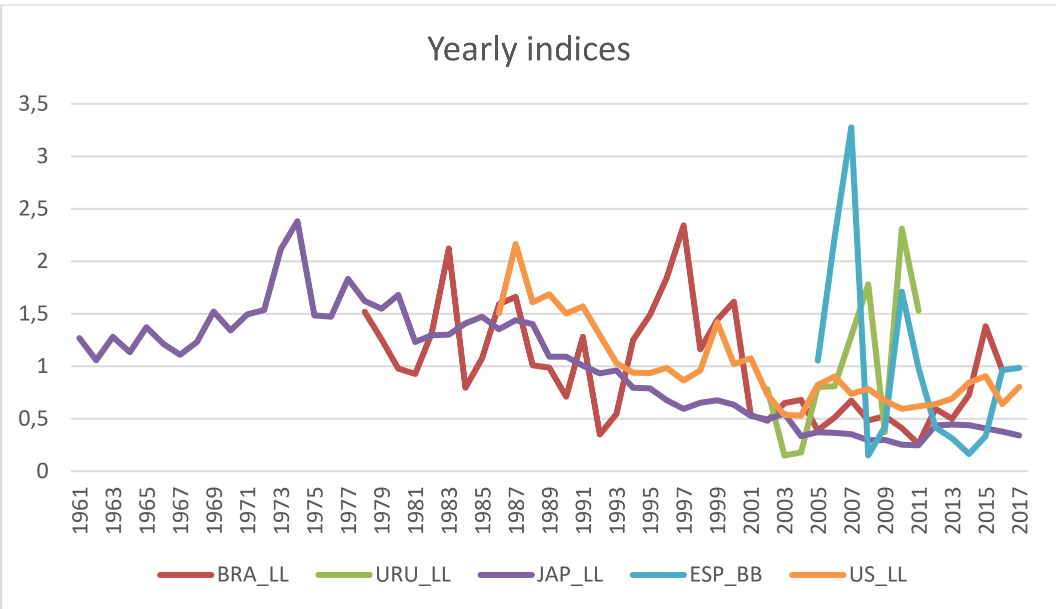

Figure 4. Annual relative indices of abundance for bigeye tuna.

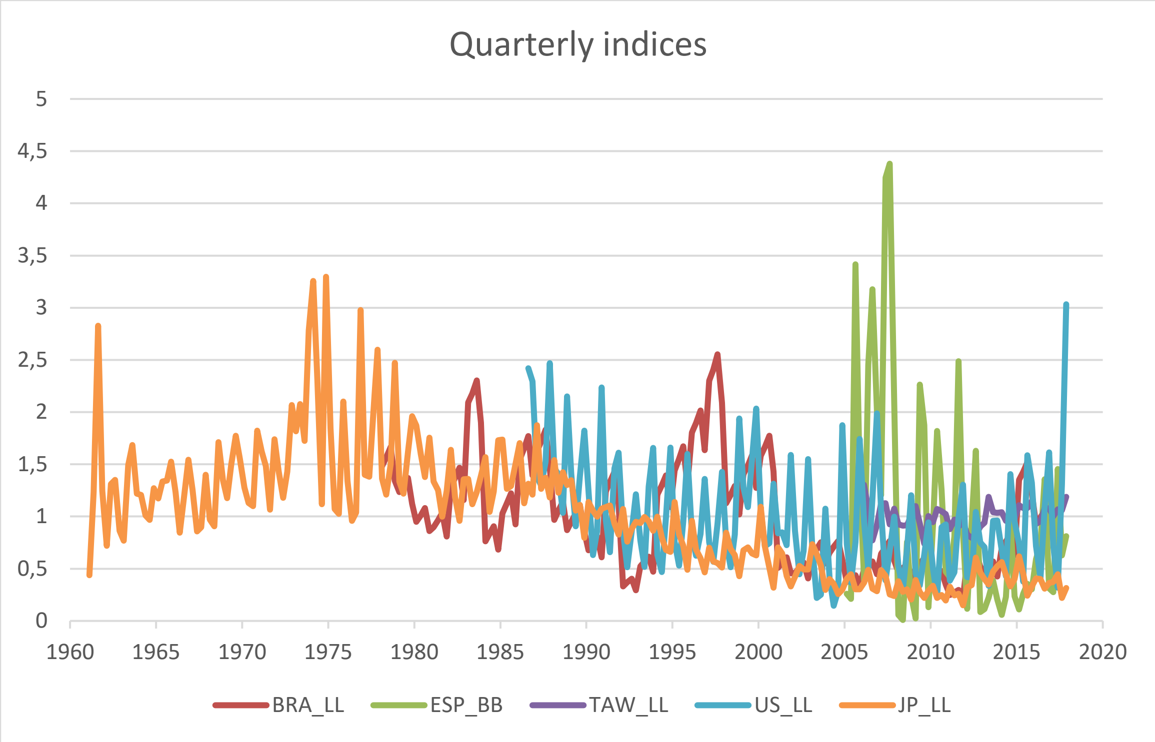

Figure 5. Quaterly relative indices of abunces for bigeye tuna.

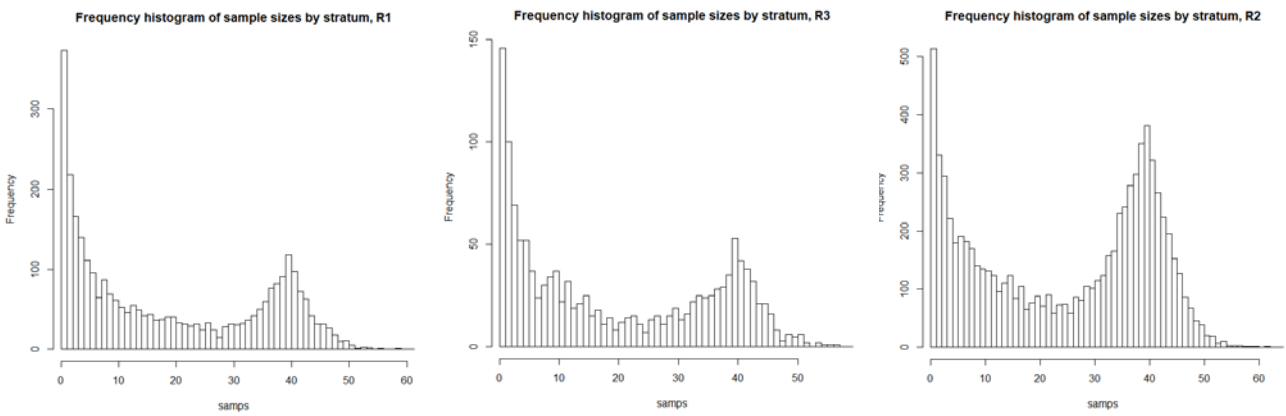

Figure 6. Histogram of the number of observations per strata and area (R1-3) for the input data of the combined CPUE index bigeye tuna pelagic longline fleets.

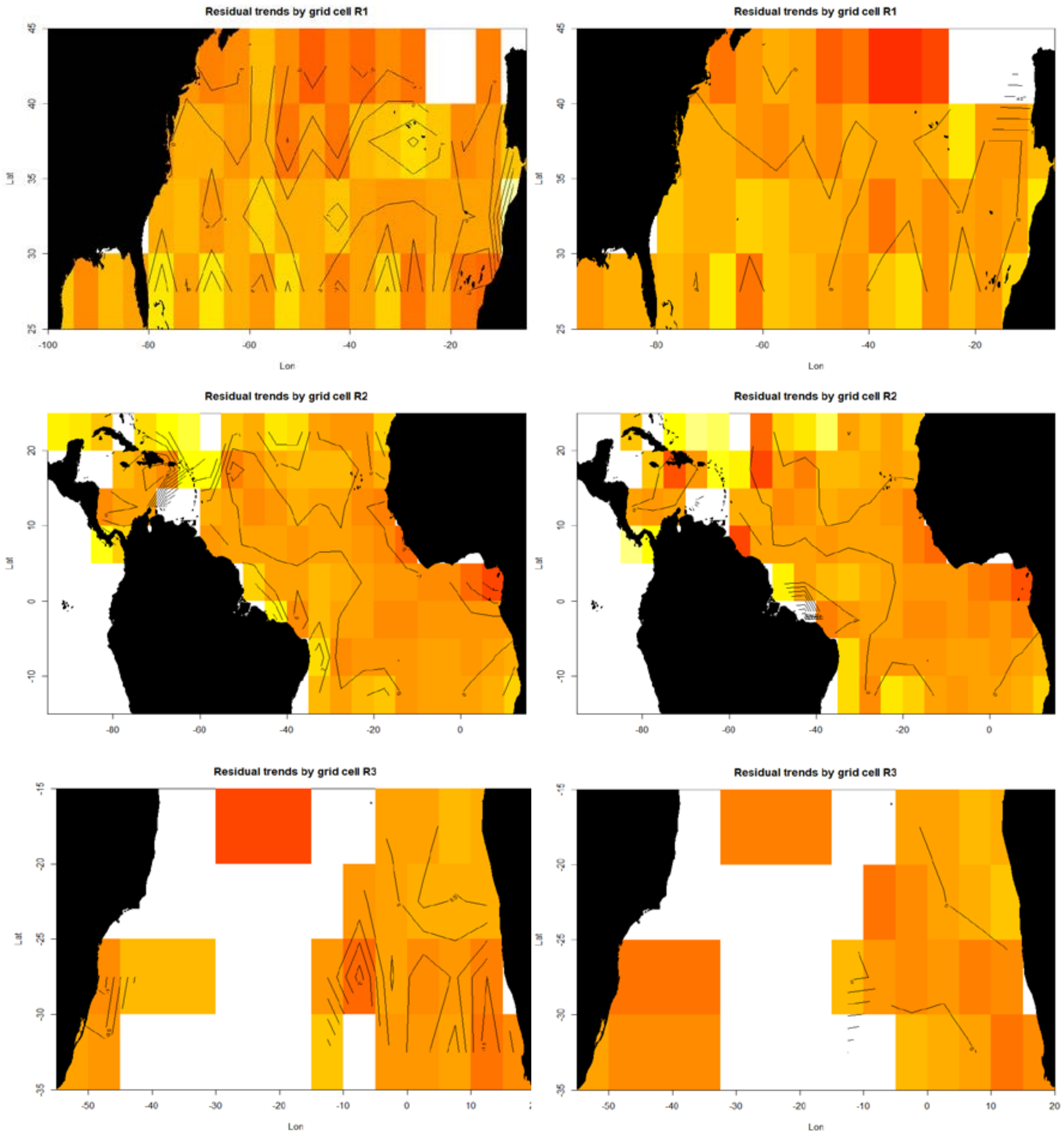

Figure 7. Residual trends by area (R1-3) for the combined CPUE index bigeye tuna longline data.

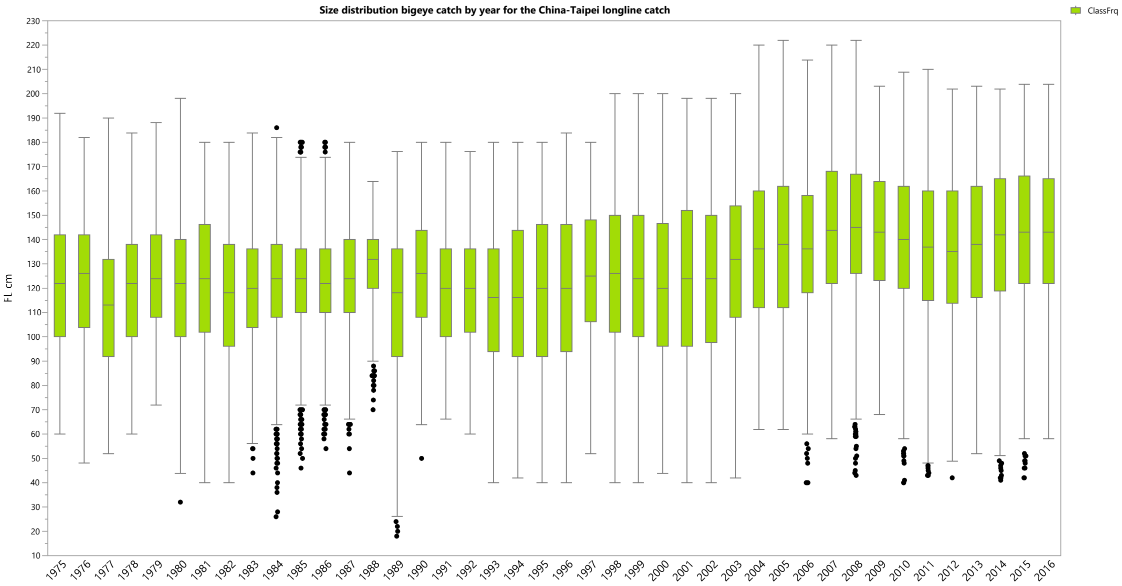

Figure 8. Size distribution of bigeye tuna from the Chinese Taipei catches by year.

Figure 9. Movement trajectories inferred from electronic tags on bigeye tuna released in the North western Atlantic Ocean.

Appendix 1

Agenda

1. Opening, adoption of Agenda and meeting arrangements
2. Review of historical and new data on bigeye biology
   - 2.1 Age and growth
   - 2.2 Natural mortality
   - 2.3 Reproduction and sex-ratio
   - 2.4 Length-weight relationship and its variability
   - 2.5 Spatial distribution of small BET FAD catches
3. Review of fishery statistics
   - 3.1 Task I (catches) data
   - 3.2 Task II (catch-effort and size samples) data; review of pending problems.
   - 3.3 Improvements and updating to Ghana statistics (Task I and II, 2006-2017)
   - 3.4 Improvements and updating to "*faux poissons*" estimations (Task I and II, 2006-2017)
   - 3.5 Progress made on Task II FIS "break down"
   - 3.6 Other information (tagging)
4. Review and update of CAS/CAA
   - 4.1 Preliminary estimations
   - 4.2 Improvements needed for a final CAS estimation
5. Review of fishery indicators
6. Review of available indices of relative abundances by fleet and estimation of combined indices
7. Identification of data inputs and specifications for the different assessment models and advice framework (ASPIC, VPA2-Box, BSP, SS3, Others)
8. Review of the progress of AOTTP
   - 8.1 AOTTP data usage by SCRS
9. Recommendations
10. Other matters
    - 10.1 Responses to Commission Request
    - 10.2 ICCAT Dialogue Meeting - MSE tropical tunas
11. Adoption of the report and closure

Appendix 2

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Appendix 3

List of Papers and Presentations

Reference	Title	Authors
SCRS/2018/032	Standardization of bigeye tuna CPUE in the Atlantic Ocean by the Japanese longline fishery	Matsumoto *et al.*
SCRS/2018/037	Bigeye (*Thunnus obesus*) bycatch estimates from the Albacore Spanish surface fishery in the North East Atlantic from 2015 to 2017	Ortiz de Zárate V., and Pérez B.
SCRS/2018/038	Combining dFAD catch data and ecological factors for detecting hotspots of juveniles of bigeye tuna: First results	Deledda G., Gaertner D., and Demarcq H.
SCRS/2018/039	Using AOTTP conventional tags to inform selectivity for bigeye tuna in the Eastern Atlantic Ocean	Gaertner D., Pascual Alayon P., Amande J., Goni N., N'Gom F., Pereira J., Addi E., and Beare D.
SCRS/2018/040	First estimate of tag-shedding for bigeye tuna in the Atlantic ocean from AOTTP data	Gaertner D., Goni N., Amande J., Pascual Alayon P., N'Gom F., Pereira J., Addi E., and Beare D.
SCRS/2018/042	Propose of stock assessment model specification of bigeye tuna in the Atlantic Ocean	Satoh K., Yokoi H., Takayuki M., and Kitakado T.
SCRS/2018/044	Geographical variability in the amount of BET caught under FADs by purse seiners in the Eastern Atlantic: from the multispecies samples and the ICCAT statistics	Fonteneau A. and Pascual-Alayón P.J.
SCRS/2018/045	An overview of statistical problems identified for bigeye in the ICCAT statistics of purse seine fisheries	Fonteneau A. and Pascual-Alayón P.J.
SCRS/2018/046	Do Atlantic bigeye tuna tag-recapture data support a two-stanza growth model? An exploration incorporating recent data from ICCAT/AOTTP	Arregui I., Goñi N., Ngom-Sow F., Addi E., Amandè M.J., Pereira J.G., Pascual P.J., Gaertner D., and Murua H.
SCRS/2018/048	The tuna fisheries on 'associated school' in Brazil: description and trends	Silva G.B., Hazin H.G., Hazin F.H.V., and Travassos P.
SCRS/2018/049	Standardized CPUE of bigeye tuna, *Thunnus obesus*, based on data gathered by the National Observer program on board the Uruguayan longline fleet (2003-2012)	Forselledo R., Mas F., Pons M., and Domingo A.
SCRS/2018/050	Length-length and length-weight relationships for bigeye tuna, Thunnus obesus, caught by longliners in the Southwestern Atlantic Ocean	Mas F., Forselledo R., Ortiz M., and Domingo A.
SCRS/2018/051	Standardized CPUE of bigeye tuna (*Thunnus obesus*) of the Taiwanese longline fisheries operated in the Atlantic Ocean (1967-2016)	Hsiang-Wen H.
SCRS/2018/052	Catch rate standardization for bigeye tuna caught by the Brazilian pelagic longline fleet (1978-2016)	Hazin H., Sant´Ana R., Mourato B.L., Travassos P., Silva G., and Hazin F.
SCRS/2018/053	Brazilian tuna fisheries: an review (2010 – 2016)	Hazin H., Hazin F., and Travassos P.
SCRS/2018/054	Standardized catch rates of bigeye tuna (*Thunnus obesus*) from the United States pelagic longline fishery	Walter J., and Lauretta M.

Reference	Title	Authors
SCRS/2018/056	Statistics of the European and associated purse seine and baitboat fleets, in the Atlantic Ocean (1991-2017)	Pascual-Alayón P., Floch L., Dewals P., Irié D., Amatcha A.H., Amandè M-J., and N'Gom F.
SCRS/2018/057	Estadística de las pesquerías Españolas atuneras, en el Océano Atlántico tropical, período 1990 a 2017	Pascual-Alayón P., Rojo V., Amatcha H.,N' Sow F., Ramos M.L., and Abascal F.J.
SCRS/2018/058	Collaborative study of bigeye tuna CPUE from multiple Atlantic Ocean longline fleets in 2018	Hoyle S.D., Hsiang-wen J.H., Kim D.N., Lee M.K., Matsumoto T., and Walter J.
SCRS/2018/060	Standardized bigeye tuna CPUE index of the baitboat fishery based in Dakar (2005-2017)	Santiago J., Merino G., Murua H., and Pascual-Alayón P.
SCRS/2018/061	Caractérisation du sexe ratio du patudo (*Thunnus obesus*) dans l'Atlantique Est à partir des débarquements des thoniers senneurs	Amandè M.J., Diaha N.C., Guillou A., Sabarros P., Pascual P., Floch L., Dewals P., N'Guessan Y., Hervé A, Irié B. Y., Cauquil P., and Bach P.
SCRS/2018/062	Updated fishery statistics of tuna species caught off Madeira archipelago	Gouveia L., Amorim A., Alves A., and Hermida M.

SCRS/P/2018/022	Tag-recapture data for Bigeye tuna from the Atlantic Ocean Tropical Tuna Tagging Programme (AOTTP)	AOTTP coordination team
SCRS/P/2018/023	Atlantic bigeye tuna longline CPUE analysis	Hoyle S.D., Hsiang-wen J.H., Kim D.N., Lee M.K., Matsumoto T., and Walter J.
SCRS/P/2018/024	A simple & efficient way to synthesize the growth of tagged tunas: 1) estimating the monthly growth rate between tagging & recoverv 2) Assigning this growth rate to the average size between tag & recovery	Fonteneau A.
SCRS/P/2018/025	Ghanaian statistical problems in 2018?	Fonteneau A.
SCRS/P/2018/026	Geographical variability in the amount of bigeye caught under FADs by purse seiners in the eastern Atlantic	Fonteneau A., and Pascual-Alayón P.J.
SCRS/P/2018/027	Uncertainties/errors in the Length-Weight relationship of tropical tunas in the Atlantic Ocean & their potential consequences on the species composition and CAS of YFT, SKJ & BET caught by the EU *et al.* PS	Fonteneau A.
SCRS/P/2018/028	An overview of statistical problems identified for bigeye in the ICCAT statistics of purse seine fisheries	Fonteneau A., and Pascual-Alayón P.J.
SCRS/P/2018/029	Indian Ocean ET: catch at size of PS and LL	Fonteneau A.
SCRS/P/2018/030	Bigeye tuna stock assessment modeling	Walter J.

Appendix 4

SCRS Document Abstracts as provided by the authors

SCRS/2018/032 - Japanese longline CPUE on bigeye tuna in the Atlantic Ocean was standardized with GLM applying log-normal or negative binomial error assumption using the latest catch and effort data from 1961 up to 2017. As area definitions, all Atlantic area, three areas divided from all Atlantic, and main fishing ground were applied. Annual and quarterly CPUEs in number and weight bases were calculated, with the similar or revised methods as previous analyses. As for the environmental factors, sea surface temperature (SST) was applied. The CPUE in number for all Atlantic area definition, which showed increasing trend from 1961 to 1974, kept relatively constant during 1975-1988, has steadily declined after that, increased in 2012, and kept constant or slightly declined after that. CPUE trend in main fishing ground was basically similar to that of all Atlantic. In both area definitions, trends of number and weight based CPUEs were quite similar.

SCRS/2018/037 – Data on by-catch of bigeye tuna (*Thunnus obesus*) landed by the Spanish surface fleets targeting albacore (*Thunnus alalunga*) in the Gulf of Biscay and North eastern Atlantic fishing grounds are presented. Annual catch statistics and length distribution of sampled fish were collected in the main fishing ports along the North Spanish coast during the summer albacore fishery in the period from 2015 to 2017. Based on the monitoring of the albacore fishing activity estimates of Task I and Task II-size data were obtained and are presented. Likewise information of geographical distribution of by-catches in this period.

SCRS/2018/038 – The dFADs catch of juveniles' bigeye tuna (≤ 3.2 kg) under dFADs by the purse seine fishery are re-estimated by spatio-temporal strata in the Eastern Atlantic Ocean for the 2007-2016 period The dFADs catch of juvenile's bigeye in each strata is estimated using the total dFAD catch in the strata and the proportion of juvenile bigeye derived from size frequency samples obtained during the landings of the EU purse seine fleet. On the basis of a spatio-temporal similarity index, we propose a multi-scale substitution rule in case of strata not sampled. This method preserves the sampling information at a much finer and appropriate spatial and temporal scales than that provided by the stratification scheme currently used to correct the species composition of the logbooks and consequently offers new opportunities for studying bigeye tuna catch hot spots in the Eastern Atlantic. As an exploratory step environmental data have been combined with the new juveniles' bigeye catch estimates in third degree polynomial regression model and results can't be exploited for the total area study and that will start moving this work to a new study area segmentation (Tropical versus Subtropical areas).

SCRS/2018/039 – Short-term recoveries (less than one month at sea) from the Atlantic Ocean tropical tuna tagging program (AOTTP) were used to inform length selectivity for bigeye tuna by surface fisheries in the Eastern Atlantic Ocean. With the notable exception of baitboats operating off Senegal, for which selectivity might be bimodal, the selectivity pattern observed for the Azorean and Canarian baitboats, as well as for the tropical purse seiners, is clearly dome-shaped and can be described by twofold or threefold polynomial curves fitted by binomial GLM. In addition, a preliminary analysis was conducted to detect whether 3 different fleets of purse seiners are homogeneous in terms of selectivity. It is unclear however if the weak differences in the length-based selectivity curves of the different fleets reflect different fishing strategies and/or different areas or are due to the limited number of observations.

SCRS/2018/040 – A key objective of the Atlantic Ocean Regional Tuna Tagging Project (AOTTP) was to estimate tag-shedding rates, Type-I (immediate tag shedding) and Type-II (long-term tag shedding) for bigeye tuna. To assess this, a series of double-tagging experiments (3,099 double tags released with 885 recoveries) were conducted as part of the broader tagging program. We used a constant-rate model for characterizing tag-shedding rates of bigeyes, as follows: $Q(t) = \alpha e^{-(L t)}$. While the observed percentage in tag loss shows minor differences between the insertion point of the tag according to the body side of the fish, introducing a tag-location effect in Type-1 and in Type-2 tag-shedding does not improve significantly the fit. The estimates of α and L (0.989 and 0.044 (per year), respectively) agree with estimates obtained by other large-scale tropical tuna tagging projects (e.g., α = 0.990 and L (per year) = 0.021). This suggests that tag loss has a moderate impact on the underestimation of the exploitation rate, at least in comparison with other sources of uncertainty such as the return rate.

SCRS/2018/042 – The development of the integrated stock assessment model for the upcoming ICCAT bigeye tuna stock assessment at July 2018 was investigated especially for the treatment of the sensitivity analysis for the management advice. We reviewed the model specification and the weighting methodology for the multiple scenarios (sensitivity analyses) of the recent bigeye tuna stock assessments in the t-RFMOs. The treatments for the weighting methodology can be classified into the two group, that is, the uncertainty grid analysis type and the base case type. The former used the results of multiple scenarios, and the latter one used only one base case for the management advice. For the former, the result can be readily changed according to the ensemble methodology for the multiple scenario, thus the weighting methodology should be discussed ideally in advance. The modifications for the previous stock assessment model was also discussed, including sub-area definition, movement parameters, selectivity parameters and the treatments for the abundance indices, and presented the tentative list for the sensitivity analysis.

SCRS/2018/044 – This paper makes an analysis of the geographical distribution of the BET FAD catches by PS based on the results of the multispecies sampling of the EU *et al.* PS FAD catches during the 1991-2016 period. This analysis shows that there are marked geographical gradients in the geographical distribution of the BET FAD catches, these catches being rare in all coastal areas and increasingly abundant at increasing distances from the shore. The opposite changes are observed for YFT relative abundance, while SKJ relative abundance tends to be very similar in most areas. Yearly changes in the relative abundances of BET and SKJ are also examined in selected areas. These observed species compositions are widely in contradiction with the species composition in the present ICCAT Task II data. This statistical problem in the BET fine scale geographical distribution is a source of potential errors in the choice and analysis of FAD moratoria. It is also a source of serious errors in the Task I BET catches estimated at present. Based on fine scale sampled catches, it appears that the BET catches by the Ghanaian fleet could be widely overestimated today because of its improper data processing. Our study makes the recommendation that improved Task II statistics should be prepared for the EU *et al.* PS and for the Ghanaian fleet before the incoming BET stock assessment WG.

SCRS/2018/045 – This document makes an analysis of the BET data on catches that are presently available in the ICCAT Task I and Task II data bases. This paper identifies and discuss several potential problems identified in the BET catch statistics of the Atlantic PS fleets during the 1970-2016 period. These problems are discussed. It is concluded that several of them could be solved before the next BET stock assessment WG, at least as an improved working hypothesis, while some of them would need more work and more time, for instance on Ghanaian statistics or on the length weight relationships of the 3 species of tropical tunas that have been used to estimate all the BET catches of purse seiners. These length-weight relationships are widely questionable today.

SCRS/2018/046 – Growing evidences are suggesting a two-stanza growth of bigeye tuna (*Thunnus obesus*) in the Indian and Pacific Oceans, as well as of yellowfin tuna in the three oceans. However, for the Atlantic a single growth curve is still being used in the stock assessment. Using both historical and AOTTP tag-recapture data, we explore here the possibility of a two-stanza growth curve for Atlantic bigeye tuna. The implications for stock assessment are discussed.

SCRS/2018/048 – The present work is based on catch data from the fishing fleet operating on “associated schools” of tunas, off Brazilian northeast coast, in the western Atlantic, from 2010 to 2017. The fork length (FL) of tunas was measured on board during commercial cruises and during the tagging cruises of the AOTTP/ICCAT Program. The fleet is composed actually by 227 wooden boats, ranging from 12 to 16m. The miscellaneous fishing gears are all made of polyamide monofilament and use natural or artificial baits, namely: pole and line, hand lines, and trolling. The catches are composed mainly by yellowfin tuna (67%), bigeye tuna (25%), skipjack (7%), and other species, like dolphinfish and rainbow-runner (1%). Recently this fishery became the main technique to catch tunas in Brazil, accounting for 78% of the landings. Taking into account the size at first maturity considered by ICCAT (YFT: L50= 110 cm CF; BET: L50= 105 cm CF), the ‘associated school’ fisheries catch mainly juveniles of both yellowfin (93%) and bigeye (97%) tunas.

SCRS/2018/049 – his study presents the standardized catch rate of bigeye tuna, *Thunnus obesus*, caught by the Uruguayan longline fleet in the Southwestern Atlantic using information from national onboard observed program between 2003 and 2012. Because 74.8% of sets had zero bigeye tuna catches the CPUE (catch per unit of effort) was standardized by Generalized Linear Mixed Models (GLMMs) using a Delta Lognormal approach. The independent variables included in the final models as main factors and first-order interactions were: Year, Quarter, Area, Sea Surface Temperature and Gear. A total of 1,746 sets were analyzed. Standardized CPUE showed an increasing trend between 2004 and 2009 with a decrease in 2010 and the last years of the series variation between increasing and decreasing.

SCRS/2018/050 – This study reports length-length, length-weight and weight-weight relationships for bigeye tuna (*Thunnus obesus*) caught in the Southwestern Atlantic Ocean. Data used was gathered by the Uruguay National Observer Program on board the Uruguayan pelagic longline fleet between 1998 and 2012, on board Japanese longline fishing vessels operating in Uruguayan jurisdictional waters in the period 2009-2011 and 2013, and on board DINARA´s R/V during 2009-2017. Size and weight measurements considered were curved fork (CFL) and pre-dorsal (LD1) length, and Round (RWT) and gilled and gutted weight (GWT), respectively. Relationships for all combinations of these variables are presented. Conversion factors are given for sexes combined for each case, and also for each sex separately, when sample sizes were large enough. The relationships provided in this contribution covers an extended portion of the reported full-size spectrum of bigeye tuna.

SCRS/2018/051 – Taiwan tuna longline fleets operated in the Atlantic Ocean since late 1960s. The bigeye tuna became the target of deep-longline vessels since early 1990s. The generalized linear model (GLM) with lognormal error assumption was applied to standardize the catch number per unit effort of bigeye tuna for Taiwanese longline fleet during 1967 to 2017. The task 2 dataset from 1967 to 2017 and logbook data from 1981 to 2017 were used. The variables used included year and quarter, area (five degree square) for Task2 data. In addition, the cluster by catch composition and vessel ID was added to the model for logbook. The results showed the bigeye CPUE was decreasing from 1967 to 1989. It decreased after early 1990s and remained stable after 2014.

SCRS/2018/052 – In the present paper, catch and effort data from 99,376 sets done by the Brazilian tuna longline fleet, including both national and chartered vessels, in the equatorial and southwestern Atlantic Ocean, from 1978 to 2016, were analyzed. The fished area was distributed along a wide area of the equatorial and South Atlantic Ocean, ranging from 3ºW to 52oW of longitude, and from 011ºN to 50ºS of latitude. The CPUE of the bigeye tuna was standardized by a Generalized Linear Mixed Model (GLMM) using a Delta Lognormal approach. The factors used in the model were: year, quarter, strategy, HPB, LOA, HIL and area (A1 > 10ºS; A2 ≤ 10°S & ≥ 25°S; and A3 ≤ 25°S). The standardized CPUE series shows a rather stable trend until 1991, decreasing in 1992 and then increasing continuously until 1997, when it reached its highest value. After that year, the CPUE again started a decreasing trend until 2001, remaining rather low for 10 years, when it started to increase again until 2015, decreasing a little in 2016.

SCRS/2018/053 – The present work presents a review of the Brazilian catches of tunas and tuna-like fishes from 2010 to 2016, submitted to ICCAT at the end of March of this year. This review includes the evaluation of new landing data obtained from fishing companies, boat owners and suppliers for the period in question, as well as the reanalysis of the data already sent to ICCAT for the purpose of identifying errors in filling in the statistical forms, mainly Task I/ NC. In that case, species codes and misleading statements of catches of some species in some fishing modalities were duly corrected (e.g. SWO catches by BB fishing when it was actually LL fishing). In 2010 and 2011, the total revised landings were lower than the reported values by 3,424 t and 1,019 t, respectively. From 2012 on, however, the revised landings were higher than previously reported, with that difference increasing from 2,823t, in 2012, to a maximum of 19,413 t, in 2016, when the catches were estimated by ICCAT, based on the average of the past 3 years. These differences were mainly derived from the increasing in catches of yellowfin (YFT) and bigeye tuna (BET) resulting from the development of a new fishing modality, known as "fishing on associated schools", using hand-line as the main fishing gear, from small wooden boats (~ 12m to 16m), based on small harbors along the northeast coast of Brazil. As a consequence, YFT production increased considerably from 2,340 t, in 2012, the majority of which was caught by LL, to 16,500 t, in 2016, with 78% coming from this new fishing modality (HL). The same trend was observed for BET catches, which rose from 2,120 t, in 2012, to 7,760 t, in 2016, both in live weight.

SCRS/2018/054 – This paper presents an update of three indices of abundance (annual CPUE series in both numbers and biomass as well as quarterly series in number) of bigeye tuna from the United States pelagic longline fishery logbooks in the Atlantic Ocean for years 1986-2017. The standardization model included the following variables; year, area, season, gear characteristics (light sticks) and fishing characteristics (operations procedure, and target species calculated as the fraction of swordfish caught to the total catch which is used to identify sets that primarily target and catch swordfish. Spatial strata were defined by an adaptive area stratification methodology and observations that clearly were affected by fishing regulations (closed areas or bait restrictions) were excluded when these factors could not be accounted for in the modeling. Standardized indices were estimated using Generalized Linear Mixed Models with a delta binomial-lognormal approach. Both indices indicate an overall decline since the mid-1980s, a second decline in the late 2000s, and stable but low values since 2007 and slight increases in the recent years.

SCRS/2018/056 – The document presents an overall summary of the fishing activities of the European and assimilated purse seine and bait boat fleets operating in the eastern Atlantic Ocean over the period 1991-2017. We describe the annual changes in fleet technical characteristics (carrying capacity, size), fishing effort (fishing and searching days), extent of fishing grounds, catches and nominal Catch per Unit Effort by species, as well as the average individual weight by species. Maps are also presented indicating the fishing effort distribution in the Atlantic, as well as the spatio-temporal distribution of European and assimilated purse seine catches in 2017 compared to previous years (2010-2016).

SCRS/2018/057 – En este documento se presentan datos de la flota española, estrategias de pesca, zonas de pesca, capturas de las especies objetivo, esfuerzos, rendimientos (CPUEs), coberturas de muestreos y distribuciones de talla de las especies objetivo y accesorias de la flota atunera de cerco y de la flota de cañeros de cebo vivo que faena en el Océano Atlántico Tropical. El número de barcos de cerco que operó durante este último año se mantuvo en los mismos términos que durante 2016 y la captura total disminuyó durante 2017. En éste último año, se realizaron dos veces más lances a objeto que a banco libre. En términos de porcentaje más del 80 % correspondió a Objetos y menos del 20 % a Banco Libre. Los pesos medios de los ejemplares capturados han sido: para rabil 5,7 kg (3,3 kg objeto y 16 kg banco libre); para el listado 1,8 kg (1,79 kg objeto y 2,09 kg banco libre) y para patudo 3,4 kg (3,29kg objeto y 24,3 kg banco libre). El rabil (YFT) presentó una talla modal de captura 42 cm a Objeto (OB) y tres tallas modales de 44 cm, 52 cm, 150 cm para las capturas a Banco libre (FS) en 2017. El listado (SKJ) una talla modal de captura, 64 cm para Objeto (OB) y una talla modal de 68 cm para Banco libre (FS) en 2017. El patudo (BET) una única talla modal de captura 40 cm para Objeto (OB) y dos tallas modales de 42 cm y 146 cm para Banco libre (FS) en 2017.

SCRS/2018/058 – This document is a preliminary version of a report from a collaborative longline CPUE analysis workshop, to be held during the week prior to the bigeye tuna data preparatory workshop. It contains background information and describes methods, but contains no results. In April 2018 a collaborative study was conducted between national scientists with expertise in Chinese, Japanese, Korean, Taiwanese, and USA longline fleets, and an independent scientist. The meetings addressed Terms of Reference covering several important issues related to bigeye tuna CPUE indices in the Atlantic Ocean. The study was funded by the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the International Seafood Sustainability Foundation (ISSF).

SCRS/2018/060 – Not provided by the authors.

SCRS/2018/061 – e document présente le sexe ratio du patudo en fonction de la taille des individus capturés par les thoniers senneurs dans l'océan Atlantique-Est. Il décrit son évolution dans le temps et le pattern spatial à partir des données historiques et récentes collectées au port de pêche d'Abidjan. Ce document met en évidence un sexe ratio qui est globalement en faveur des femelles (SR=0,525). Il montre également que le sexe ratio est indépendant de la zone et de la saisonnalité de la pêche. Même si la proportion de mâles semble être plus importante dans les échantillons pour les individus de plus de 150 cm, la régression logistique montre plutôt un effet non significatif de la taille des spécimens sur le sexe ratio.

SCRS/2018/062 – Tunas are an important fisheries resource which occurs seasonally in the waters of Madeira archipelago. Both Madeiran and Azorean fleets operate in the region, with the Azorean fleet having a higher proportion of landings in recent years. Since 2015, most fishing events have concentrated in Madeira EEZ, especially near the islands. Bigeye tuna is the most important species with consistent landings between years. Since 2014, albacore has been the second most landed species, overtaking skipjack. Recent data on bluefin are also presented, although landings are quite restricted due to regulations applied as part of the ongoing recovery plan for this species. Seasonality and length composition of landings of the main tuna species for the period 2010 – 2017 are also presented.

SCRS/P/2018/022 – Not provided by the authors.
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