ATLANTIC BLUEFIN TUNA SPECIES GROUP MEETING SUMMARY REPORT (25-28 SEPTEMBER 2018)

Anonymous

SUMMARY

This presents the results of the SCRS Bluefin tuna Working Group. A series of scientific papers on biology, tagging, fishery indicators and other matters pertinent to the working group were presented. The Group provided valuable feedback on the papers that will assist authors in conducting further work in 2019.

RÉSUMÉ

Le présent document expose les résultats du Groupe d'espèces sur le thon rouge. Une série de documents scientifiques sur la biologie, le marquage, les indicateurs des pêcheries et d'autres questions intéressant le Groupe d'espèces ont été présentés. Le Groupe a formulé des commentaires avisés sur les documents qui aideront les auteurs à approfondir leurs travaux en 2019.

RESUMEN

Este documento presenta los resultados del Grupo de especies de atún rojo. Se ha presentado una serie de documentos científicos sobre biología, marcado, indicadores pesqueros y otros temas relacionados con el trabajo del Grupo. El Grupo realizó comentarios sobre los documentos que ayudarán a los autores a continuar su trabajo en 2019.

KEYWORDS

Bluefin tuna, growth, biology

1. Introduction

This presents the results of the SCRS Bluefin tuna Working Group. A series of scientific papers on biology, tagging, fishery indicators and other matters pertinent to the working group were presented. The Group provided valuable feedback on the papers that will assist authors in conducting further work in 2019.

The general structure of this report is to present short summaries of the documents that have been provided by each of the authors and then a general discussion of the papers.

2. Review of fishery indicators

Several papers were presented on indices, surveys an

SCRS/P/2018/050 and SCRS/2018/180

Updated indices of abundance were presented for 2 Canadian fishery dependent indices (GSL, SWNS) and one fishery independent index (acoustic) along with trends in the age and size composition of the fish caught in the areas defined by the indices. The acoustic index continues to show an increasing trend and both the GSL and SWNS indices exhibit high catch rates consistent with those observed in the past 7 years. The size and age data indicate a changing proportion of old to large fish in the catch with a considerable decline of large fish in the southern Gulf of St. Lawrence and an increase in large fish in the Atlantic area.

SCRS/P/2018/051

Researchers from SOCIB, IEO and NOAA presented the advances on the monitoring of larval abundances in the Balearic spawning ground. The latest larval abundance index was provided in 2017 for the bluefin tuna assessment. At that time, the larval index provided information on abundances for the periods 2001-2005 and from 2012-2015, showing an increase trend from the first to the second period. Since then, ichthyoplankton surveys have been conducted in 2016, 2017 and 2018. Length structures, necessary for standardization of the abundances are now available for 2016, and the nominal CPUA was provided (number of larvae at 2mm / m^2). The nominal CPUA indicates that larval abundances for the period 2012-2016 vary around a mean with no increasing pattern on abundances. Nominal CPUAs have to be standardized to provide a definitive larval index.

SCRS/P/2018/062

Geographical variation in larval fitness, in relation to temperature and habitat use, could be a useful method to improve our understanding of recruitment and develop better indices of annual recruitment. Based on the assumption that growth and survival of tuna larvae are influenced by temperature, the authors apply a biological model using the temperature-related growth expressions and a size dependent survival function for the larvae to a time-series of spatially-explicit temperature data for the Western Mediterranean, from Strait of Gibraltar to 6º East, which includes the major recognized bluefin tuna Eastern stock spawning areas, the Balearic sea. The results show that areas with high probabilities of larval survival coincide with those that would be considered as optimal based on other data sources (ichthyoplankton surveys, spawning female locations from commercial fisheries data and adult tracking data). There was a good match between the survival index and the recruitment indices from standardized CPUE fisheries data. These results have implications on our understanding of the recruitment process of the eastern stock of Atlantic bluefin tuna, since they suggest that the combined effects of the temporal and spatial variability of the environment drive the recruitment success.

SCRS/2018/120

The document presents the recovery of bluefin tuna presence in the Black Sea and in adjacent areas. The disappearance of the bluefin tuna from the Black Sea at the early beginning of the ‘80s was one of the major distribution problems of this species in the last decades. Lacking any official data, the GBYP conducted a difficult research for detecting the possible presence of bluefin tuna in the area. This document provides all the available and detailed evidences about the recent presence of the bluefin tuna in several parts of the Black Sea and the Marmara Sea in the last decade, which is a very positive fact and shows the recovery of the species in one of the historical distribution areas. The document includes also the most updated information about the Turkish traps in the Marmara Sea and in the Straits.

SCRS/2018/129

In addition to the 2017 update of the French aerial survey, the document describes the procedure employed to derive school size estimates from the videos and presents preliminary results for an index integrating this new information. Robustness to school type assignment and school size variability are investigated through bootstrap approaches. The results show distinct surfaces for the different school types and that including school sizes into the index leads to a comparable long-term trend, but with higher values for 2009-2012 than without including the school surfaces.

SCRS/2018/145

In the Eastern temperate North Atlantic, the Bay of Biscay is a well-known summer feeding area for juvenile bluefin tunas (ages 1 to 4). An acoustic survey was performed in the Bay of Biscay during July 2015, 2016 and 2017 on-board a baitboat fishing vessel, using a long-range 90kHz sonar and a SIMRAD EK60 38kHz scientific echosounder. The survey followed systematic transects throughout the fishing ground defined according to bluefin tuna catch locations by baitboats in the summers 2000 to 2011. Along these transects, all bluefin tuna detections by sonar and echosounder were recorded. In each aggregation, no-kill fishing events or direct observations through stereoscopic camera were conducted to verify the species as well as to sample the sizes of the bluefin individuals. The spatial distribution of detected bluefin schools is shown, and the estimated number and size of individuals in the detected schools is provided. The goal of this survey is to produce an acoustic, fishery independent abundance index in the Bay of Biscay for the stock assessment. The detected abundance and distribution of bluefin tuna is analyzed by size-group and in terms of spatial variability.

SCRS/2018/165

The document reported on the update with 2017 data to the standardized joint CPUE index for bluefin tuna (*Thunnus thynnus*) caught by Moroccan and Portuguese traps since 1998. Standardized CPUEs were estimated with Generalized Linear Mixed Models (GLMMs) with Negative Binomial distribution, and using the factors year, month and trapID/location. The single time series standardized CPUEs (covering the full period) followed in general the nominal CPUE trends, with relatively low values and a flat period until 2009, followed by increased values for the more recent years. However, on the split analysis the standardized CPUE curve for the most recent period (2012-2017) did not follow the nominal CPUE trend.

SCRS/2018/175

The document presents the results of the ICCAT GBYP aerial survey carried out in June 2018. While in areas C, E and G there is no clear trend in the study period (2010-2018), area A shows an increasing trend from 19,002 in 2015, 71,520 in 2017 and 254,552 in 2018. However, the total abundance estimate for 2018 (361,995) is very similar to 2017 (346,272). The detection functions fitted for each area pointed out the differences in searching behaviour between professional spotters and scientific spotters, and between professional spotters of each area suggesting the need to consider an inter-calibration test in the future.

SCRS/2018/135

The document presents the updated CPUE series of the Balfegó joint fishing fleet and catch at age data based on skippers´ visual estimation (2003-2018) and obtained from stereo cameras (2013-2018). The results showed that catch rates remained at high levels since 2013 showing similar trends of Japan longline index. The age structure, based on stereo cameras size estimates, has not changed since 2013 showing a normal distribution around age 10.

SCRS/P/2018/055

This presents an update for three rod and reel indices up to 2017, as well as the update for the longline index up to 2018, split and non-split, and an update for the Gulf of Mexico Larval index up to 2017.

Discussion of indices

For the western stock, the update for 7 fisheries dependent indices and two fisheries independent indices was presented. Noting some of the conflicting signals in the Western indices. The group stressed the importance of trying to account for potential ecosystem effects that may alter availability to the gear, movement or distribution.

For the eastern stock, the updates for two fisheries independent and two fisheries dependent indices were presented. SCRS/2018/129 presented the update of the French aerial survey up to 2017, which displayed a smaller density than in 2016, equivalent to 2014, even though 2017 is second to 2016 in school numbers. The detection function should be further evaluated. The document also presented preliminary results about an improved version of the index including school surface estimates instead of bare school numbers. The group noted that other species or young BFT individuals could also be around in this area. SCRS/2018/165 presented the update for the Portuguese and Moroccan traps indices, split and not split, up to 2017. The nominal cpue displayed a continuous increase since 2012 but the standardized split index had extremely high variance. The group noted that the further work to evaluate the time series of data from these trap fisheries to determine the most appropriate method to treat the data as indices should be conducted. It was suggested to use influence plots to identify influential model factors. One potential factor to consider in evaluating these data may be that this index mixes fish entering and exiting the Mediterranean. SCRS/2018/051 presented the larval index from the western Mediterranean. The update has yet to be done up to 2017 and 2018, for which the data are available. The group noted that in addition to address the standardization issue linked to the change in gear, the standardization should also evaluate interannual changes in the spatial distribution of the spawning stock within and among the main spawning areas relative to the coverage of the larval survey. It was suggested to look into using the GBYP aerial surveys to estimate the proportion of the spawning biomass covered by this index as well as others that may be limited in spatial and temporal coverage. The group also noted that yearly changes in growth and natural mortality could affect the standardization to 2mm larvae.

Other documents presented potential new fisheries independent and dependent indices or information relevant to the index section. SCRS/2018/120 presented information about the catch of BFT in the Black Sea after decades of disappearance. SCRS/2018/175 presented the 2018 GBYP aerial survey results. Several aspects related to the improvement of this survey were presented and discussed, related to the detection protocol and school size estimate. SCRS/2018/062 presented a fisheries independent index for recruitment based on larval survival. The group noted that the year to year larval mortality obtained from this index could be integrated into the western Mediterranean larval index to improve the SSB estimate obtained from it. SCRS/2018/135 presented a fisheries dependent index based on Purse seiners in the western Mediterranean. The index displayed a good correlation to the Japanese Longline index, which displayed an increase. SCRS/2018/145 presented a potential fisheries independent index based on an acoustic survey in the Bay of Biscay. The Group suggested to run a transect outside of the fished areas as a test of the representativeness of the survey coverage. The survey is within the appropriate season for BFT in this area, summer feeding ground, and species identification is made through stereocameras, single beam sonar and sampling. It now amounts to 4 years of data for 3 different age classes. The depth distribution of the fish can change with oceanography; as for other indices, environmental effects should be considered or accounted for in the index interpretation.

3. Review of biology (ageing, reproduction, tagging and stock distribution

Numerous documents were submitted to the biology section. These documents are grouped by subject.

Species general biology

SCRS/2018/156 compares BFT life-history parameters with those of other scombrid species. The natural mortality rate, length at maturity and somatic growth rate are not anomalous and were comparable to other taxonomically related species.

SCRS/2018/179 reports Danish research on bluefin tuna from 2000, even though the species has been rare around Denmark for 50-60 years until ca. 2015. The main topics addressed are population dynamics, migration behaviour, distribution and habitat use, electronic tagging studies of migration behaviour, modelling methods for analysis of eTags datasets, advanced migration model frameworks, recruitment processes, trophic interactions and oceanographic forecasting of bluefin tuna habitats

SCRS/2018/115 presents the results of an assessment of the representativeness of Canada's biological sampling program. The sampling program was evaluated on its ability to achieve similar proportions as the commercial landings on both a temporal and a size of fish basis for main fleets. Sampling is considered very good since 2010 with the cooperation of fishing industry. Authors suggest that this approach could serve as a template for the assessment of sample representativeness in other BFT fisheries. A meeting participant proposed to include gonads sampling.

Geographical distribution

SCRS/2018/122 reviews geographical distribution of catches and assumptions that led to the establishment of two management units for bluefin tuna, and pointed out the lack of information for some areas as the central south Atlantic, particularly the assignment of Japanese longline catches off Brazil to the western management unit. The author suggested that doing the assessment (or the MSE) under a single stock hypothesis could be informative.

SCRS/2018/121 reports information on bluefin tuna fisheries in Lebanon. Lebanon is not an ICCAT CPC and there is very little information on bluefin tuna and other ICCAT species catches. Lebanon is a member of GFCM, but it did not report catches of ICCAT species there either. There are large sport and some artisanal fisheries within 6 miles of the Lebanese coast that operate for two thirds of the year. Artisanal fishermen land several species under the same common name making it difficult to estimate catch. The possibility of tagging and obtaining biological samples from the sport fishery was suggested.

SCRS/2018/123 reports catches of YOY BFT in southern Spanish Atlantic waters in purse seine fisheries for sardine and anchovy and horse mackerel hand line fisheries. Oceanographic conditions were suitable for the bluefin tuna spawning in southern Spanish Atlantic waters and these YOY could have originated from tuna kept in fattening cages in the bay of Cadiz. A participant in the meeting also suggested the possibility of the origin of YOY from fattening practices in Portuguese traps.

SCRS/2018/120 provides evidences about the presence of bluefin tuna in several parts of the Black Sea and the Marmara Sea in the last decade, indicating the return of the species to one of the historical distribution areas. It is now regularly caught, including very big fishes. The Black Sea is considered a feeding area since eggs from Mediterranean bluefin cannot float in the Black Sea; this would does not preclude spawning from locally adapted bluefin tuna however. Historical variations of catches in Mediterranean tuna traps may also be due to fluctuations in stock size and the reappearance of bluefin tuna in one of its original area of distribution may suggest an increase in abundance.

SCRS/2018/163 presents a forecast system to predict the summer distribution of habitat suitable for bluefin tuna in the North Atlantic up to a year in advance. Modern climate/oceanographic models can make skillful predictions of oceanic conditions. Authors take advantage of this skill to make predictions of bluefin tuna thermal habitat and discuss the applications of these forecasts for use in understanding the biology of the species. It was also suggested to use this approach in the standardization of CPUE indices to account for environmental influence.

Growth: direct ageing, length weight-relationships, growth in farms

SCRS/2018/126 presents a review of the otolith reading protocol to reduce the bias in juvenile age estimates detected in the 2017 stock assessment. Otolith absolute age has been validated but age estimations for younger ages remain uncertain due to the frequent appearance of numerous sub-annual bands. The new protocol uses age estimates from the first dorsal fin ray (spine) to identify the growth increments in the otoliths removed from the same young specimen. Paired structures with identical age estimates were used to create a template and establish criteria for reading annual increments of juvenile bluefin otoliths.

SCRS/2018/127 provides the findings from an exchange involving 14 experienced otolith readers, which was conducted to verify if the new reading procedure minimized the difference between otolith and spine readings. The results showed that there is a good agreement in the first five years, but from age 5, otoliths ages tended to be higher than spine age. The use of annual band measurements has shown to be a good tool for the control of the quality of age estimates. The results indicate that we are progressing in the recognition of the deposition pattern of the first annuli. Authors recommend carrying out an ageing workshop to achieve the tasks identified as necessary.

In the following discussion it was suggested to look at modal length distribution of catches to help identifying the first 3 age-classes. It was noted that having a bias in ageing is not a problem if a bias vector is available to correct age estimates from the age length keys. There was only a one-year bias, but it is important to correct for it to track cohorts. It was noted that a one-year difference for a 5-year-old is more important than a one-year difference for a 35 years old tuna. The influence of adjusting the age to date of capture and edge type was noted, but it was clarified that the June 1 adjustment does not consider edge type.

SCRS/2018/137 presents equations of the length-length (SFL-CFL) and length-weight (SFL-RWT) relationships based on 5-years national sampling activities in the Mediterranean (Strait of Sicily). Samples come from traps and longline landings sampled in May and June and obtained from spawning fish. Findings were compared with the various equations available. It was commented that it was a valuable contribution for the improvement of the information about body condition of spawning BFT, but that the differences in weight between the new estimates and those adopted by ICCAT differed by only 2%.

SCRS/2018/154 provides growth rates in caged tuna in the Adriatic (Croatia). By applying the stereoscopic camera measuring system, this study has shown that small tuna farmed in Croatia for approximately 18 months had increased their body weight up to 467 %, while after 30 months of farming, body weight increased by up to 585%. The body weight increases were related to husbandry strategies and to environmental conditions. Impact of different zootechnical conditions on farms on fish growth need to be further studied.

Tagging activities

SCRS/2018/128 describes two tagging operations for eTags carried off Malta in May and June 2018. The first operation was carried out in a farming cage to set-up the tagging protocol, whereas the second operation took place during the purse seine fishing season in real fishing conditions and on freshly caught fish. During these two operations, 6 large tunas were tagged on-deck in less than 2 minutes. The time spent from the time the tuna took the bait to its release back to sea ranged between 10 to 20 minutes. The tag retention times are encouraging given that releases occurred due to recapture and failure of the release system of the tag. The one remaining fish has currently been 135 days at large. The number of recaptures, at least 2 over 5 tags, point towards a high fishing mortality in the Mediterranean. A technical GBYP workshop was proposed to standardize tagging protocols, to design tagging activity for spatial modeling and to try to solve problems related with premature deployments. Acoustic telemetry was also suggested to obtain a relatively continuous record of fish movements.

SCRS/2018/173 presents preliminary analysis of ICCAT GBYP eTags concerning depth and temperature preferences. It shows the benefits of having clean and formatted electronic tags data stored in a relational database in advance of carrying out the analysis. The analyses showed fluctuations of mean depth and temperature parameters in relation to time of the day, time of the year, location and maturity. In-depth analysis of eTag datasets is yet to be performed. It was noted that different types of eTags allow different approaches for modeling BFT displacements. Validation of data also needs to consider sensors drift.

SCRS/2018/174 presents a software application that has been developed for displaying multiple tag paths, providing options for filtering and grouping according to several features. Some concerns were raised about e-tags data availability. The application was considered a useful tool and some improvements were suggested.

SCRS/2018/164 reports preliminary results of an ICCAT GBYP eTag program for bluefin tuna in the Skagerrak in mid-September, 2017. This is the first time that eTag data storage have been applied to bluefin tuna in northern European waters. In total 18 large tunas (mean = 232 cm) were tagged, measured and sampled for genetic studies. Tunas were captured by volunteer anglers using rod-reel fishing methods.

SCRS/2018/178 describes tagging activities in the same area between Denmark and Sweden during 2018. A variety of tags were deployed on 91 large (mean length 246 cm curved fork length) bluefin tuna captured by volunteer rod-reel anglers during August 25-Sept. 6. The tags deployed were PSAT (N = 11), acoustic (N = 2), accelerometer (N = 2) and spaghetti (N = 91). The utility of acoustic tags was stressed to take advantage of world-wide network of acoustic receiver arrays. Fish fighting time during the tagging was also considered in order to reduce tagging mortality.

Maturity

SCRS/2018/172 presents the main results and conclusions from an independent review of the methods used to estimate reproductive parameters for eastern and western stocks of Atlantic bluefin tuna. The review found that methodological differences exist between studies to estimate proportion mature/spawning at age and that validation is required. Research recommendations provided included the potential to obtain an unbiased maturity ogive for both stocks through a well-designed, length stratified, sampling program on winter feeding grounds, when both immature and mature females are present.

This issue will be discussed further at a GBYP workshop in November 2018. The author states that it should be possible to determine if a female has spawned by the presence of markers in histological gonad preparations, even after several months, but cannot back-calculate the time of spawning. It was discussed that the current estimated maturity at age may be biased due to sampling difficulties, because it is expected that small/young fish caught in the spawning area during the spawning season are more likely to be mature, but these may represent only a small proportion of that size/age class in the whole population as most will be outside the spawning areas. The contribution of the oldest females was also pointed out since they may produce more eggs of better quality than smaller females. However, it was noted that for Pacific bluefin, the highest contribution is by middle aged fish, not linearly increasing with age. It was suggested that if a joint maturity study for East/West stocks was possible, it would be important to collect the otoliths along with the gonads to obtain age and stock ID from micro-constituents.

SCRS/2018/144 reports spontaneous spawning activities of sea-cage farmed bluefin tuna in the Adriatic Sea. Tuna farms in Croatia are supplied with juvenile fish (8-30 kg) and practice prolonged farming period (18 - 32 months). This study highlights the fact that farmed BFT are capable of completing reproductive cycle in captivity and that eggs supplied by the farmed BFT could have positive effect on recruitment of BFT in the Adriatic Sea.

Others

SCRS/2018/130. Changing dynamics for bluefin tuna in the eastern Atlantic Ocean and Mediterranean Sea necessitate an update of capacity estimates for the fishery. Catch rates sanctioned by the SCRS over the past decade were combined with vessels from CPCs' past (2008-2018) as recorded in their 2018 fishing plans to calculate a range of capacity estimates. The wide range of results suggests that the SCRS should revisit its best estimates of fishing capacity by gear class to ensure they reflect current population and fishery trends.

4. Report of GBYP

GBYP is currently ongoing its phase 8, which will end in February 2019. The program activities being developed or launched from October 2017 to September 2018 (last part Phase 7 and first part of Phase 8) and their main results were presented in document SCRS/2018/171, as well as an outline of the GBYP working plan for Phase 9.

5. Report on MSE

Butterworth D.S., Fernandez C., and Carruthers T. 2019. Chair and Rapporteurs' report of bluefin MSE technical group meeting over 24-25 September 2018. ICCAT Coll. Vol. Sci. Pap. 75(6) 1576-1586.

Acknowledgements

The SCRS BFT working group acknowledges the support of the ICCAT Secretariat in facilitating the work of the Group and in helping to produce this report and the Executive Summary.