

REPORT OF THE 2018 ICCAT SUB-COMMITTEE ON ECOSYSTEMS MEETING*(Madrid, Spain 4-8 June, 2018)*

“The results, conclusions and recommendations contained in this Report only reflect the view of the Species/Working Group/Sub-Committee. Therefore, these should be considered preliminary until the SCRS adopts them at its annual Plenary meeting and the Commission revise them at its Annual meeting.

Accordingly, ICCAT reserves the right to comment, object and endorse this Report, until it is finally adopted by the Commission.”

1. Opening, adoption of agenda and meeting arrangements

The meeting was held at the ICCAT Secretariat in Madrid, 4-8 June 2018. The convener of the Sub-Committee on Ecosystems, Dr. Alex Hanke (Canada) and interim By-Catch convener Dr. Andres Domingo opened the meeting and welcomed the participants. The Conveners then described the objectives and logistics of the meeting. Mr. Driss Meski (ICCAT Executive Secretary) addressed the Sub-Committee, welcomed the participants and highlighted the importance of the issues to be discussed aiming the work of the different SCRS Species Groups. He also announced that the new ICCAT By-catch Coordinator will be Dr. Nathan Taylor (Canada), which will join the Secretariat in August. Finally, Mr. Meski informed the Sub-Committee of the ongoing discussions at OSPAR, regarding the possible implementation of a large marine protected Area in the North Central Atlantic and on possible impacts on ICCAT fisheries. The Co-conveners 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 and presentations given at the meeting is attached as **Appendix 3**. The abstracts of SCRS documents and presentations are included in **Appendix 4**. The following served as rapporteurs:

<i>Sections</i>	<i>Rapporteur</i>
Items 1, 11	M. Neves dos Santos
Item 2.1	B. Luckhurst
Item 2.2	A. Hanke
Item 2.3	M.-J. Juan-Jordá
Item 2.4	N. Gutierrez, R. Coelho and S. Tsuji
Item 3	M. Ortiz
Item 4	C. Palma and M. Ortiz
Item 5	S. Jimenez, Y. Inoue and A. Wolfaardt
Item 6	K. Oshima and G. Diaz
Item 7	F. Poisson and S. Jimenez
Item 8	D. Macias and J.C. Baez
Item 9, 10	A. Hanke and A. Domingo

2. Ecosystems Based Fisheries Management**2.1 Review progress on developing new indicators for all ecological components of ICCAT's EBFM framework (i.e. target species, by-catch, habitat and trophic relationships)**

Document SCRS/2018/067 used the Driver-Pressure-State-Impact-Response (DPSIR) approach to show that it can be extended to develop a common understanding of how human activities affect the Atlantic ecosystem and in particular the Sargasso Sea. The study proposes indicators that can be used to assess the state of the Sargasso Sea, to monitor the impact of human activity on the Atlantic ecosystem, and then discuss ways how these can be validated and how management based upon them can be implemented.

The Sub-Committee noted that the DPSIR framework is a useful communication tool as well as a tool to organize and frame issues. It was also noted that there is value for ICCAT working and collaborating with other RFMOs and organizations such as the Regional Sea conventions on common issues. Therefore, it is critical to identify those overlapping issues so these institutions can work together.

Document SCRS/2018/077 (part 1) summarized properties of success in operationalizing the ecosystem approach from other regions of the world which could be adopted by ICCAT. It also provided a list of candidate ecosystem indicators to monitor the broader impacts of ICCAT fisheries on pelagic ecosystems. A ranked list of proposed indicators, drawn from a published indicator criteria outline, was presented. The indicator criteria were used to score the proposed indicators according to their scientific basis, ecosystem relevance, responsiveness to pressure and data availability among other factors. These scores were then used to rank the relevance of the indicators.

The Sub-Committee noted that the operationalization of the ecosystem approach can be facilitated with the involvement of ICCAT Commissioners in the development of ecosystem products such as the ecosystem report card. The ICCAT Dialogue Meetings between Scientists and Managers is a good example and provides a forum to build understanding and communication about ecosystem products.

As biodiversity indices and size-based community indices ranked relatively high in the indicator analysis, the Sub-Committee encouraged the development of these indicators since they have the potential to be calculated using observer datasets.

Document SCRS/2018/077 (part 2) proposed six potential ecoregions within the Atlantic Ocean which could be used to guide region-based ecosystem plans, assessments and research. This proposal is intended to create and foster discussion in ICCAT on ecologically meaningful spatial units to facilitate the implementation and the operationalization of an EAFM (Ecosystem Approach to Fisheries Management) in ICCAT. Additionally, it presented the key elements of a pilot ecosystem plan to be developed for one case study region, the Atlantic Tropical Ecoregion. Ultimately, the products created as a result of this study aim to facilitate the linkage between ecosystem science and fisheries management.

The proposal was well received by the Sub-Committee that noted that the species-indicator analysis to inform the boundaries of the ecoregions was based on catch data. The species indicator analysis was conducted using both catch-based and CPUE longline data. As the results from both the CPUE and catch-based indicator analyses were consistent, the final analysis was presented using the catch-based indicators. The LL CPUE-based analysis excluded important species (e.g. skipjack tuna) as they are not targeted by LL fisheries. There are also difficulties in combining CPUEs from different gear types (longline and purse seine) into a joint indicator analysis.

The core distributions of the majority of the tuna species were informative in delineating the boundaries of the ecoregions. In contrast, the sub-committee noted that other species such as billfishes, which have a much broader core distributions, were less informative in relation the boundaries of the ecoregions. The definition of the ecoregions is intended to guide ecosystem planning and advice for the remaining ecosystems components.

The ecoregion analysis is also informed by the spatial patterns of major fleets and fisheries types. The sub-committee questioned the value of using the fleet's spatial patterns but it was explained that the ecoregions are not only ecologically meaningful but should be also practical from a fisheries management perspective. The addition of spatial patterns of major fisheries in relation to ecoregions can help make the ecosystem approach more operational. The SCECO discussed whether the three longline fisheries included (Japan, EU-Spain and Chinese Taipei longliners) were representative of the rest of the ICCAT LL fleets. It was explained that these three fleets were chosen because they are the three largest fleets based on total catches and on their large spatial range. Given their importance, they were used to inform the boundaries of the ecoregions. The differentiation between shallow and deep-setting longlines within fleets is an important factor which needs to be taken into account.

The Sub-Committee suggested dividing the proposed southern subtropical ecoregion into two ecoregions, similar to the two ecoregions proposed in the northern hemisphere. It was noted that the fishing pressure is very different between the subtropical and temperate areas in the southern hemisphere. The ecological differences recommends splitting the South Atlantic area.

The document SCRS/2018/077 (part 2) also introduced the key elements to be developed in a pilot ecosystem plan for a case study region - the Atlantic Tropical Ecoregion. The intent of using the ecoregions is to guide region-based ecosystem plans, ecosystem assessments and ecosystem research. The sub-committee supported the development of this case study and pilot ecosystem plan to test the utility of using ecoregions. It also supported the idea of using this pilot study as a tool to test several of the ideas proposed in the EU project. The sub-committee discussed the fact that the large number of ecoregions proposed might increase the amount of work required to develop potential ecosystem plans. It was noted that the pilot ecosystem plan will only include the purse seine and longline fisheries operating in the Tropical Atlantic Ecoregion. It will exclude other gears and fisheries such as coastal fisheries that might also be relevant in the tropical ecoregion. Ecosystem plans should be treated as living documents, and ideally should be revised and updated every five to ten years, to give the opportunity to add new fisheries, research and information as it becomes available.

2.2 Feedback on Concept Note to inform rapporteurs of Species Groups regarding the development of an ecosystem report card, along with the justification and implementation plan

During the Species Working Group Meeting the Chair of the Sub-Committee on Statistics allowed for a presentation by the Ecosystems Sub-committee Co-chair on the development of an ecosystem report card for ICCAT and the implementation plan. The Working Group rapporteurs were informed that the Sub-committee on Ecosystems needs the Species Groups to be engaged in developing content for ecosystem report cards and an Ecosystem Based Fisheries Management plan and to think of ways to improve regular communication across Groups. They were also informed of the Sub-committee on Ecosystems plan to conduct regular assessments, provide executive summaries on the state of ecosystem components that support ICCAT fisheries based on the assessments and to elevate the importance/relevance of ecosystem data in assessment and management processes. Following the presentation the Species Working Group rapporteurs were invited to:

- Participate in a Group/s working on the draft report;
- Propose goals, questions and indicators for each component that relates to their species;
- Propose a way to define the ecoregions;
- Comply with requests;
- Review the draft report;
- Integrate ecosystem considerations into the assessments
- Provide ideas for improving regular communication across Groups

There were no concerns about the concept of developing a report card or suggestions regarding the proposed plan. Two rapporteurs have subsequently assisted with the development of indicators for components of the report card.

2.3 Feedback on the introduction of the Report Card and progress on an EBFM plan presented to managers at the 2018 Dialogue with Science and Managers Meeting (SWGSM)

There was one presentation under Agenda Point 9 of the Dialogue Meeting “Feedback on road map to implement EBFM: current status and the way forward”. The main objectives and expected outcomes of an ongoing EU project¹ relevant to the operationalization of EBFM were presented. This EU project has specifically three main objectives: (1) Provide a list of ecosystem indicators (and guidance for associated reference points) to monitor the broader impacts of fisheries targeting Highly Migratory Species (HMS) on the pelagic ecosystem; (2) Propose area-based assessment units or ecoregions with meaningful ecological boundaries for HMS and its fisheries to guide the development of ecosystem plans and assessments; and (3) Develop a pilot ecosystem plan for one chosen ecoregion within the ICCAT Convention Area.

The EU project was well received by managers and scientists, and the presenter received interesting questions and suggestions. The SWGSM liked the idea of developing a pilot ecosystem plan for one ecoregion presented within the ICCAT Convention Area to progress on how best to provide advice at an ecosystem level. The SWGSM also anticipated some potential challenges when developing the ecosystem overviews since there is very little knowledge on the food web dynamics and species interactions in the ecoregion

¹ The EU project uses the term Ecosystem Approach to Fisheries Management (EAFM) following the international adopted FAO definition, and uses it interchangeably with the term Ecosystem Based Fisheries Management (EBFM). However, it is acknowledged that some institutions and countries define differently and differentiate between the two terms, EAFM and EBFM.

selected. It was noted that the ecosystem plan can be used as a tool to describe where we are, where we want to go and how to get there. The SWGSM also commented that the ecosystem approach to fisheries management process on paper looks very ambitious but that at the end it is hard to put it in practice and operationalize it. It was noted that the project team very much agrees with the challenges. The SWGSM also commented that the EBFM always tries to cover many aspects of the ecosystem, e.g. monitor a large number of species. It was noted that EBFM is not about understanding and monitoring all the elements and components of an ecosystem, it is about identifying the main elements that need to be monitored and prioritizing them.

The Chair of the SCRS also summarized the efforts of the Sub-committee in developing an ecosystem report card for the ICCAT Convention area.

2.4 Review the progress on the assessment of components of the Ecosystem Report Card for ICCAT and develop a preliminary draft

Fishing pressure

No formal paper or presentation was introduced but ICCAT Secretariat provided a summary of the information on fishing fleets and capacity available up to 2015. Particularly, information on number of vessels, estimates of fishing effort and their relationships between licensed vessels and effective/active effort, including the relations between Task I FC and Task II CE reported by CPCs, as well as Effdis with estimates of efforts in hooks for longline and days at sea for purse seine fisheries were presented.

The Sub-Committee noted that these data and requirements have evolved with time, being more complete for main commercially important species and for major fleets. These include (1) LL, (2) PS, (3) mixed, which involves mostly baitboats, (4) traps only for bluefin, and (5) artisanal which includes target of major tuna species as well as other by-catch species. Information on artisanal fisheries is limited but there are currently two projects being implemented in West Africa and the Caribbean to improve information on catches and fleets, at least at the meta-data level. These reports will be available by the end of the year.

The Secretariat noted that information on fishing capacity for major fisheries (as reported in Task I) is summarized in the Statistical Bulletin. Section 6 summarizes information on fleet number, size, and gear type from 1970 to 2015. The following Task I fishing capacity data is in Excel format available in the Web: (1) Number of vessels reported by CPCs by gear type (including traditional gears and some recreational information as well as historical trawl information); (2) Number of vessels that are registered for a particular gear (not all CPCs provide this information). The Secretariat noted that not all vessels with permits are active each year, therefore the numbers included should be interpreted as the total potential fishing capacity.

For PS, the number of vessels has been increasing due to higher reporting. Also the fishing capacity of this fleet has increased. In 2014 and 2015, a gear discrimination occurred (unclassified to PS) resulting in a better resolution of the fleet composition in terms of GRT. The estimate of standard unit of fishing capacity for the longline fleets is complex as involve diverse types of fleets and fishing operations.

Since 2014, the Secretariat has attempted to verify that the number of vessels, vessels size, etc. match the catch and effort information. The Secretariat noted that in order to better characterize the fishing activity and capacity, an effort has been made to match the nominal catches for all reported tuna with Task II catch/effort data (what proportion of total catch comes from each fishing unit, which includes vessels number, size, and other effort units such as number of hooks, etc.). The Secretariat noted that the information on fleet sizes, fleet composition, and estimations of fishing effort associated with each fleet (nominal fishing days) is not obligatory therefore may be under-estimated.

The Sub-committee further noted that other type of information may be available to improve the estimates of fishing capacity. This includes VMS data for certain fleets (collected under compliance requirements but agreed to be used for scientific purposes, particularly for bluefin tuna in Med, East Atlantic but yet not approved for tropical tunas). Other types of fishing pressure information includes estimates of the distribution of reported catches in 5x5 grids (Catdis), and distribution of total fishing effort in 5x5 grids (Effdis).

The Secretariat cautioned about the use of the available data on fishing capacity, especially for years 2014 and 2015 where the number of LL vessels doubled. Vessels reported are >20 m LOA, but many other <20m LOA have been included, therefore there is a mischaracterization of the fishing capacity that might have caused the spike in 2014 and 2015. In addition, the apparent increase in fishing capacity in LL due to greater number of vessels reported does not correspond with data on the number of hooks deployed that is decreasing and consequently needs revision.

It was noted that there are 3 periods for which the fleet characteristics recorded differ: (1) up 2001, (2) from 2002-2013; and (3) 2014-2015. Differences arose from the type of requests made by the Commission and attempts to merge the same information in one single reporting form. While the information has been improved, it cannot provide a consistent estimate of the total fishing capacity of active vessels in the ICCAT region across all 3 periods.

The Secretariat noted that due to the voluntary nature of the reporting of the fishing capacity data, some underreporting may be occurring. Therefore, fishing pressure might not be estimated from fishing capacity. Instead, fishing mortality estimated from an assessment might be a better source of information for that particular indicator.

The Sub-committee concluded that estimation of total fishing pressure is highly complex and requires a detailed analysis and knowledge of the fleets, including the nature of the fishing operations and gear characteristics. There was support to keep this indicator in place, but it should be discussed what the best data to inform this indicator should be (overall fishing capacity or effort, fishing mortality, etc.).

Seabirds

No formal presentation or paper was presented under this agenda item, however relevant information was provided by papers presented under item 4.1.1; in particular the ABNJ process toward achieving the integrated estimation as a part of the report on the ABNJ seabird meeting held in Cuzco in February 2018 and the seabird data integration efforts conducted in a collaborative process framework by several CPCs.

The Sub-committee indicated its expectation that the ongoing activity under the ABNJ Project would succeed in delivering the integrated and agreed estimation on the extent and density of seabird catch by longlines in the southern hemisphere as well as an evaluation of the effectiveness of by-catch mitigation measures by February 2019. It also indicated its preference to develop relevant eco-card indicators based on those outputs. The Sub-committee inquired about the potential to use the sea bird data assembled by the CPCs process to produce indicators for the seabird component of the ecosystem report card and were informed that there is the intention to contribute.

Marine mammals

An indicator for the marine mammal component of the ecosystem report card was provided in SCRS/2018/072 and reviewed by the Sub-committee.

The Sub-committee noted that the data for the example comes from Canada data only and then uses Task II catch/effort information for the North Atlantic to scale the interactions. It was also noted that in the example provided the total number of interactions declined coincidentally with the decline of fishing effort. It was questioned if there were some mitigation measures being effective besides the reduction of effort (total number of hooks).

In addition it was noted that currently there is no data available in ICCAT to inform an indicator of marine mammal interactions; therefore, it needs to be provided by CPCs. The example provided used only data from Canada but would be very difficult to use comprehensive data as currently ICCAT does not require information on marine mammal interactions.

Currently, this indicator reflects the impacts of a single fleet and future work must include other regions. It was suggested that fleet distribution of effort from VMS coupled with the overlap of the spatial distribution of marine mammals could inform on the fleet/mammal interactions that are of greatest concern.

The Sub-committee also noted that in the specific case of marine mammals there are some interactions that do not result in capture or entanglement, as some species often predate on the catches and bait. Though these types of interactions are not harmful to the marine mammals, they do represent a problem to fishermen and some type of depredation rate series could be considered to reflect the impact.

Currently the observer data (reported in ST-09) has not been used, as that data is confidential and not available for general use. The Secretariat will look into ways to analyze and share this confidential information or to work directly with CPCs willing to share the data that is reported in these forms. However, it was noted that specifically for marine mammals the definition of "interaction" is not clear, as it can include actual catches/entanglements or simple interactions such as depredation events, depending on how data is submitted by each CPC.

The Sub-committee recommended using by-catch rates from each fleet submitted by CPCs as they can inform on the impact of mitigation measures.

The Sub-committee noted the importance of considering other fleets. Most discussions relate to longline fisheries but in some regions the interactions with purse seines can be more important and need to be quantified.

The Sub-committee recognized that different approaches are currently used for developing indicators for each by-catch species (turtles, mammals, seabirds) and suggested that a consistent approach and data requirements be considered when developing indicators for all of them. This can shed some light on what priorities should be given to data collection for each Group.

Sea turtles

Document SCRS/2018/071 provided an indicator of sea turtle interactions that was developed for the sea turtle component of the ecosystem report card and reviewed by the Sub-committee.

The Sub-committee noted that the inclusion of independent estimates of abundance helped to interpret the trends in interactions and suggested that an independent estimate of abundance for other by-catch species accompany the interaction indicator. One advantage of the sea turtle data is that nesting information can provide this type of abundance trend, which can then be used to put CPUE and/or catch trends into context. However, the Sub-Committee cautioned regarding the use of nesting data to reflect the impact of fishing pressure, as nesting locations might be very far from ICCAT fishing pressure and might be impacted by many other factors that are not related to ICCAT fisheries. Consequently, this type of external data should be used mostly as an external abundance index to provide context to the CPUEs but not necessarily to be used as an indicator by itself.

Non-retained sharks

Document SCRS/2018/076 presented some preliminary thoughts on the feasibility of developing indicators for non-retained sharks for incorporation in an ecosystem report card. At this point the data currently available at ICCAT (Task I and Task II) are not usable to provide informative time series indicators for non-retained sharks. Potential future indicators will require the use of detailed fishery observer data. Data reported by the ST-09 forms could provide some data but this has not been explored. Some options to test the suitability of this data are 1) estimate species-specific total mortality, taking into account dead discards and any known post-release mortality; 2) calculate species-specific relative indices of abundance and trends in size by sex; and 3) incorporation of life history data.

The Sub-committee noted that the main reasons for non-retention of sharks are: due to ICCAT regulations, low value, and/or no-retentions due to national legislation. It was agreed to start with the species that have no-retention based on the ICCAT Regulations, meaning that the list of species would be the oceanic whitetip, silky shark, bigeye thresher and hammerheads (except *Sphyrna tiburo*).

The v then discussed if it was possible for a single species to represent the fishery impacts experienced by the non-retained "sharks" in general. It did not seem appropriate as different species have different biology (productivity) and are susceptible to different fleets/gears and are subject to different selectivities. It was agreed that as a starting point the Group could use the latest sharks ERA to determine the most vulnerable

species (Cortés, *et al.*, 2015), noting however, that those ERAs were created only for longline and that other fleets such as purse seine and coastal fisheries have not yet been considered. It was therefore agreed that the exercise could start, for example, with bigeye thresher for the longline fleets and silky shark for the purse seine fleets.

Another major point raised related to how often the indicators would have to be updated for non retained sharks given the workload of the Sharks Species Group.

In terms of a workplan for progressing on this item, the Sub-committee requested that the Sharks Species Group revise the Tolotti *et al.* (2017) paper and particularly the methodology used. This document presents abundance indicators for oceanic whitetip that might also be applied to silky shark from purse seine fisheries. It was also requested for the Sharks Species Group to try to develop a standardized CPUE for bigeye thresher from longlines that could be used as an indicator, noting however that such abundance indices do not provide any information on the size structure, sex structure, etc.

Species that are retained and assessed

Document SCRS/2018/069 presented examples of indicators based on biomass and fishing mortality ratios (B/B_{MSY} and F/F_{MSY}) for species that are retained and assessed. In general it is possible to see declines in the status of the assessed stocks from 1975 until the mid-1990s and early 2000s when recovery to near 1975 levels begins. Declines and increases in the F ratio occur prior to a corresponding change in the B ratio.

The Sub-Committee noted that such indicators are useful and informative, especially the plots using the B and F ratio trajectories using traffic light color codes, because they are already used in advice provided to the Commission. A general comment on this was made regarding the definition of "cautious" and "critical" zones for B and F ratios, which need to be carefully considered. The values used at this point for those thresholds are examples and might be changed as defined by the SCRS or the Commission in the future.

The Sub-Committee also noted that in those plots we are only showing point estimates and that they do not acknowledge the underlying uncertainties in the models. Also, for those cases where several models were being used for advice, the trajectory was the median. Despite the summarized nature of the data used in the indicator, the indicator was informative and there might be ways in the future to represent the uncertainties.

In terms of data availability to update this work, the data rules at ICCAT state that all the base cases final models are kept in historical repositories that can then be accessed by request. For each stock assessment there are "data rapporteurs" responsible to make sure the final model files used for the final advice are in that repository.

Species that are retained but not assessed

Document SCRS/2018/070 presented candidate indicators for ICCAT species that are retained but not currently assessed. A large number of species are caught in ICCAT's fisheries (181) but only a small subset of these undergoes an assessment (12). ICCAT has been increasing the number of species included in the Task I data since 1980. The number of unassessed species reported in the Task I data have also been increasing since 1980 and yet the unassessed species biomass remains a relatively constant fraction of the assessed species biomass (~80%).

The Sub-committee noted several issues related to species usually retained but not assessed that warrant consideration. Notably, some of the species are in the ICCAT Convention but are not assessed (e.g., small tunas), while others are not in the ICCAT Convention but are retained (e.g., oilfish, etc.). The latter group is not necessarily consistently reported in Task I. Species that are always discarded are not relevant here.

The Sub-committee commented that an indicator based on the unassessed biomass of retained species will provide a different perspective than one based on the number of unassessed retained species. The indicator based on biomass is expected to be relatively positive because a large fraction of the total biomass comes from species for which there are assessments (tunas, swordfish, main sharks, etc.) but they represent a very small fraction of the total number of species that appear in Task I. However many of these non-assessed species are not part of the ICCAT Convention and there is not really an expectation to conduct assessments

on them in the future. So for, those species not included in the ICCAT Convention the goals and objective for conservation are different from those in the ICCAT Convention and will require a different indicator(s) if they are determined to be an important part of the ecosystem reporting.

The Sub-committee also noted that in some cases species are assessed by CPCs, particularly those that represent local populations, and should not be considered in this indicator development. Another consideration was that, of the 181 species represented, there was a huge effort by the Sharks Species Group to remove species from the database that don't occur in the Atlantic or are demersal species unlikely to interact with ICCAT fisheries. Additionally, there are many cases of bony fish species and other taxa that can be coding errors, or that interact only very occasionally with ICCAT fisheries and might not be very important to consider here. So it was concluded that there need to be some filtering and review of the species list using criteria like the consecutive years reported or the maximum quantity reported.

Finally, the Sub-Committee agreed that the indicator should be restricted to the retained species and should track the biomass of the unassessed portion relative to the total. Increases in this ratio could indicate that unassessed species like the small tunas are of increased importance to the fisheries and should therefore be assessed; while decrease in this ratio might warn of a collapse in those populations.

Socio-economic aspects

Document SCRS/2018/68 demonstrated that economic indicators could be compiled with publicly available information from various organizations, including the FAO, World Bank, and UN Statistics Department; however, the indicators presented were among the easiest to compile. The document proposed to modify the initial goal to “ensure the overall sustainable of socio-economic benefit obtained from ICCAT resources”, in order to make a more direct link with ICCAT fishery management. This new definition was consequently less explicit about the social aspects. Further clarification of the Commission’s goals would help to define the focus of indicators to be selected.

The value of assembling data for the entire region was acknowledged but it was pointed out that the proposed indicators did not address the question of differences in socio-economic benefits and reliance among the countries as well as among fisheries within a certain country (e.g. the economic benefit of e.g. bluefin tuna for the US is completely different than the economic benefits for a small-scale fleet in West Africa). It was clarified that the exercise was designed to provide high-level macro indicators and that it was important to distinguish between a macro indicator to monitor the overall situation and others that could provide a more in-depth socio-economic analysis on fisheries-specific or country-specific benefits. In general, the latter would require further detailed information that is potentially only available within a country, and are better suited to be conducted at a country level with a different approach. Similarly, the analysis of the socio-economic aspects of chartering and/or access agreements with foreign vessels, cost-profit analysis and an analysis on the allocation of socio-economic benefits through a value chain would require additional information and a different approach and more appropriate independent country level research.

Noting that the assessment was not addressing the social aspects, several difficulties in handling the social aspect were explained including: i) a lack of standard definition suitable for describing the social reliance of small scale fishers, in particular, due to e.g. their characteristics of seasonality, multi-species multi-gear operations, tendency to engage in multiple occupations (e.g. agriculture, processing, marketing) in addition to fishing, and involvement of foreign labors, and ii) a lack of corresponding information.

Both indicators presented indicated an overall increasing trend except in the last few years. The increasing trend was explained to be a function inflation and improvement in reporting practices. The inflation effect could be adjusted using the data disseminated from the World Bank though it would require substantial work. The causes of the recent decline were discussed and related to a shift of species composition toward lower valued species and a decline of purchasing power.

The rationale to develop an indicator for socio-economic aspect was questioned, due to lack of relevant reference in the Convention. It was noted that the eco-card aims to support the implementation of the Ecosystem-based Fishery management approach (EBFM) where the importance to monitor impacts to social and economic status of the related population was emphasized even though there is no mandate for ICCAT to manage the socio-economic aspects.

An industry representative raised the issue that socio-economic benefits are not only important for local fishers but also for the industry, and the expertise to develop these might be beyond the capacity of this Sub-committee. Additionally it was suggested that a body outside of ICCAT might be better equipped to develop the socio-economic indicators.

Trophic relationships component

Document SCRS/2018/073 paper proposed a list of candidate indicators to monitor the state of the food web and trophic relationships of ICCAT species. Two of the proposed indicators (mean trophic level and the mean maximum length of species) were calculated for the ICCAT convention area and for major ecoregions within the convention area. Both indicators were calculated using fisheries catch data and were chosen because of the data availability and for their ease of calculation. The data needs and challenges in interpreting the indicators were highlighted.

The Sub-committee discussed several caveats for the indicators presented. First, the mean trophic level index only included nice species of tunas and billfishes, all top predatory species, therefore it was noted that it only covered a small fraction of the species in the food web. It was noted that sometimes the marine trophic index is used to monitor only the top predators by including species with trophic levels above 3.25 and it is used to test the idea of “fishing down” is occurring in the system. This cutoff point for the marine trophic index excludes the lower trophic level species with high biomass, which can be more affected by bottom up environmental processes. The Sub-Committee discussed the limited potential use of this indicator at its current state for the small number of species included. The reason only nice species were included in the computation of both indicators is that the CATDIS data sets, on which the analysis was based, only contains the necessary information for the nine principal tuna and billfishes species. Retained sharks and small tunas were excluded as they lack the spatial information associated with their catches.

Second, the Sub-committee also noted that the mean trophic index is calculated with landings data, instead of survey data or observer data that can provide fishery independent information on relative abundances, and should be treated as a pressure indicator to monitor changes in the state of the food web. The mean trophic index, when based on landings data, is supposed to measure the change in mean trophic level of fisheries landings in a region.

Third, the Sub-committee noted that the trophic level information used for each species can have a large impact on the overall estimate of the indicator. The current version of the indicator used the trophic level information at the species level available in the ICCAT species manual or Fishbase, and it was noted that a better review exercise could provide better estimates of the trophic level of the species. A preference for trophic level values based on stable isotope analysis was indicated. It was also recommended that stock level estimates of the trophic level and maximum length be used in the future. This elucidates the larger effort required to conduct regional assessments since each regional assessment should use and be informed by its unique fisheries, species and environmental characteristics.

The Sub-committee noted the limitation of usefulness of the mean maximum length indicator. The Sub-committee suggested exploring the potential utility of the large fish indicator, one of the candidate indicators in the list, which monitors the proportion of large fish in a population, over time for a group of fish species. The large fish indicator is commonly monitored in coastal systems and is estimated based on survey data. Independent scientific surveys are not commonly conducted or are available for highly migratory species in oceanic systems. The Sub-committee suggested exploring the Task II catch at size data set and its potential utility to develop size-based indicators at the community level similar to the large fish indicator (LFI). The Task II data (catch at size data) can be disaggregated by region, species and fleet.

The Sub-committee also discussed about the potential use of the indicators of trophic levels, since they, in principle, might have no impact on the status of the assessed stocks. They might not be useful for a tactical (short-term) management of these ICCAT species, but provide key information for establishing a more strategic management, since they reflect changes in ecosystems’ (or the food web) dynamics that might affect the dynamics of each of the individual species in the long term.

The Sub-committee also pointed how the observer data sets are underutilized to support the development of ecosystem indicators. It was noted there is existing work on biodiversity indicators estimated using observer data. The Sub-Committee encouraged the continuation of such work and encourage it to be presented at future Subcommittee meetings.

Habitat component

An indicator for the habitat component of the ecosystem report card, provided in SCRS/2018/082, was reviewed by the Sub-committee.

The Sub-committee discussed whether this type of work belongs in the habitat component of the report card. It was noted that the work presented would be more appropriately presented to a species Working Group since it relates to the conditions at the spawning grounds of particular species, mainly the Atlantic Bluefin tuna. It was proposed that the monitoring of larger scale ocean-wide environmental or oceanographic indicators would fit better within the environmental component of the ecosystem report card. The Sub-committee was reminded that the initial goal of the habitat component was to minimize the impact of fisheries on critical habitats, and it was agreed that this goal was worth keeping and reporting on in the ecosystem report card. While the temperature and salinity indicators provided in the presented study did not meet the original objective, it was felt that they did provide useful insight into the pressures on recruitment processes. Further, it was noted that these indicators were very region specific and could easily be developed for other regions provided the data was available.

Further discussions relative to the Ecosystem Report Card Process

Prior to the review of assessment documents, the Sub-committee were presented with an indicator checklist (**Table 1**) which is intended to guide the evaluation of the indicators. Following the review, the Sub-committee concluded that, while the checklist would provide a useful tool for evaluating the indicators, it was premature to begin the process at this time.

The Sub-committee finalized the format/structure of the first ecosystem report card and selected the indicators to be used for each of the components and agreed to finalize this document a month before the September 2018 SCRS meeting.

The Sub-committee also discussed the scheduling and logistics of future ecosystem assessments and agreed that until the content and format of the ecosystem report card had become stable, reviews will be frequent. Trends for some indicators might warrant frequent updates as would the availability of modified or improved indicators. Once stability is achieved, the Sub-committee will determine what will be the future plan for updating all components of the Report Card.

The lack of appropriate expertise may require external involvement. However, it was noted that some indicators would be easier to update than others and that participation may increase once the report card becomes accepted. The recent appointment of a By-catch Coordinator was noted indicating that the Coordinator would continue to support the work of the Sub-committee. The Sub-committee acknowledged that with funding, it would be possible to contract out certain activities where necessary. It was also suggested that if model based indicators were used it would be possible to predict indicator status into the future thereby filling gaps in reporting. Lastly the Sub-committee recognized that the By-catch Coordinator could be tasked with identifying synergies with other RFMOs to support work on common issues.

3. Ecology and habitat

3.1 Review information on the trophic ecology and habitat of pelagic ecosystems that are important and unique for ICCAT species in the Convention area

No papers were reviewed in this section of the agenda.

4. Data used for vy-catch analyses

The list of by-catch species associated with ICCAT fishing activities for which Ecosystem Indicators need to be developed, was one of the main concerns of the Sub-committee. A preliminary study carried out by the Sub-Committee, using the Task I nominal catches (1950-2017) grouped by species and decade, identified nearly 180 species (including higher taxa groups). The Sub-committee used several filters to identify non-assessed species, excluding higher taxa groups, and eliminating species already dropped from the ICCAT official species lists. This resulted in a reduction to less than 100 species of teleost fish reported as potentially interacting with ICCAT fisheries. This preliminary list does not yet include an additional 44 species of seabirds to be review and 6 species of sea turtles. Altogether, the Group considers that, the final number of species in this preliminary list is still too high and further reduction is required. The Sub-Committee proposed to explore the use of a catch criteria (e.g. last two decades of total catches) "cut-off" value to reduce this preliminary list even further.

4.1 Update of ST09 form

The current form ST09 National Observer Programme data was adopted and approved in 2017. The current format addressed some of the concerns regarding data confidentiality expressed by CPCs and the complexity of the prior versions of the form. Therefore, it is expected that at least in the next couple of years, CPCs will provide the observer data in consistent and complete manner. The Secretariat will compile comments and notes from CPCs and provide a summary to this Sub-committee, to evaluate the form and make suggested changes if need it. The Secretariat informed, that due to the changes in the form in latest years, a formal database can not yet be developed.

5. Seabirds

5.1 Feedback on collaborative process of assessing the impact of longline fisheries on by-catch of seabirds

Document SCRS/2018/075 provided a summary of report from the Common Oceans Project Seabird By-catch Assessment Workshop held in February 2018 in Peru. The main goal of the project is to estimate the total seabird by-catch in southern hemisphere by the pelagic longline fisheries from 2012-2016.

The Sub-committee noted that that the focus of the process to date has been on investigating the type of data currently available, the quality and limitations of the data, suitable methodological approaches and discussing the views of data owners regarding how best to proceed. The project will be using three main approaches to estimate the total seabird mortality to compare and contrast methods, including: i) A ratio-based estimate generated by the Project Team using publicly available data or best estimates provided by each participating country; ii) geospatial estimates of mortality generated by participating countries with their own data, possibly using procedures being developed collaboratively with the Project Team, and iii) a Spatially Explicit Fisheries Risk Assessment (SEFRA) conducted in collaboration between participating countries and Dragonfly Data Science consultants based in New Zealand. Further intersessional work is planned before the final workshop to assist countries with analyses, if requested. The final workshop is scheduled to take place in February 2019. The results of the workshop will be presented to the Sub-Committee for consideration in the Report Card on Seabird.

Document SCRS/2018/083 provided an update on the collaborative work underway to assess seabird by-catch in the pelagic longline fleets operating in the South Atlantic and Indian Oceans.

The Sub-Committee noted that the objectives of this process are: 1) to determine the spatio-temporal patterns of seabird by-catch, 2) to estimate the seabird by-catch at the lowest possible taxonomic level and 3) subject to the data that are available, to gain knowledge on the performance of mitigation measures. On the basis of the most recent workshop (in April 2018), the project participants presented preliminary results relative to Objective 1. Seabird by-catch varied both spatially and temporally. By-catch rates tends to be lowest North 25° S. Exploratory analyses only considering the longline sets with seabird captures, indicate that catch rates peaked around 35°S and 40° S and increased from deeper to shallower waters. The preliminary results also show a strong relationship between bycatch rates and moon phases, and the illuminated fraction of the moon. The Sub-Committee recognized the value of the dataset that has been compiled and the outcomes of the preliminary analysis, including to determine the variables that should be used in the models to estimate by-catch.

The Sub-Committee commended the collaborative approach adopted in the both seabird by-catch assessment initiatives, and encouraged ongoing and further collaboration to progress the objectives of these processes. The Sub-committee encouraged CPCs with southern hemisphere longline fishing fleets that overlap with albatrosses and petrels that were not already engaged in these initiatives to participate actively in the processes, and contribute towards the assessments.

5.2 Review of progress on seabird interaction estimations and mitigation

Document SCRS/2018/085 presents an overview of the seabird by-catch associated with the Spanish longline fleet in the Atlantic Ocean.

The Sub-committee noted that few seabirds were captured and that a large proportion of the total mortality was from a single trip in the south-western Atlantic. The Sub-committee asked which factors could lead to this specific case of high by-catch rate. Although this was addressed in the document, the author explained that the fishing activity of the Spanish fleet is low in the areas of high seabird density. In addition, the Spanish fleet sets at night targeting swordfish, and use the minimum deck light during longline setting operations.

Document SCRS/2018/074 provided the latest advice from the Agreement on the Conservation of Albatrosses and Petrels (ACAP) for reducing the impact of pelagic longline fishing operations on seabirds. ACAP continues to recommend that the most effective way to reduce seabird by-catch in pelagic longline fisheries is to use the following three best practice measures simultaneously: branch line weighting, night setting and bird scaring lines. Alternatively, the use of one of two rated hook-shielding devices is recommended.

The Sub-committee noted that it had previously (in 2016) considered and endorsed ACAP's updated advice regarding line-weighting specifications. It was recommended that the scientific papers on the hook-shielding devices be provided to the Sub-committee as soon as they become available. The Sub-committee encouraged all CPCs with fisheries that overlap with albatrosses and petrels to actively participate in the work of ACAP and its Seabird By-catch Working Group.

Document SCRS/2018/078 presented the results of a recently published study on the effectiveness of hook pods at reducing seabird by-catch in pelagic longline fisheries. The findings indicated that hook pods do not negatively affect catch rate of target species and could make a major contribution to halting the decline of many seabird populations if adopted as a mitigation measure by the pelagic longline fishing industry.

All hook types used were circle hooks size 15/0 and 16/0. The current cost of a hook pod used in this study is about 13,000 US \$ for 1000 devices. This is less than the annual cost of chemical light sticks, although the Sub-committee noted that not all fleets use light sticks. The presenter explained that the hook pod capsule includes a weight and that the hook pod can be attached at any place along the leader. In response to a question regarding the casting speed, it was informed that 100 hooks can be cast in about 20 minutes, similar to the normal "American" style operation.

Document SCRS/2018/086 presented hook pod-mini trials conducted in Brazilian pelagic longline fishing operations from 2011 to 2017. The results of the study reinforce the hook pod-mini as an effective seabird by-catch mitigation measure that is suitable and durable under commercial fishing conditions.

The Sub-committee noted that the maximum depth at which the current hook pod can be set to open down to 20m depth, but not any deeper. The Sub-committee further noted that from a scientific perspective, the hook pod has been shown to be highly effective at reducing seabird bycatch, and noted that the re-usability of the pods is a positive attribute. The Sub-committee encouraged further research on the use and effectiveness of hook pods in other ICCAT longline fisheries. It was noted that the main costs would be related to initial cost and persistence of the hook pods, and that the 0.5% of breaking rate must be taken into account. The presenter explained that in Brazil, once the fisherman got used to the hook pods, they were easily integrated into their fishing operations. It was noted that information on practical aspects of usage among different fleets would be useful, and that it would be important to collect information on the longer term use and durability of the hook pods in commercial fleets.

The Sub-Committee noted that there was no additional information provided on the other hook-shielding device, the Smart Tuna Hook, and encouraged further information to be provided when it becomes available.

6. Sea turtles

6.1 *Discussion on progress towards scientific collaboration among researchers of ICCAT CPCs to elaborate on the results obtained to date regarding knowledge of the impact of the fisheries on sea turtles*

Document SCRS/2018/080 presented the report of the first meeting on collaborative work to evaluate the incidental capture of sea turtles in pelagic longline fleets operating in the Atlantic Ocean. The document described the future objectives and the main approaches that will be addressed with respect to them. Future objectives were 1) to estimate the total interactions of sea turtles, 2) to assess the impact of incidental mortality on populations, and 3) to evaluate the effectiveness of mitigation measures and influences on catch rates for target/non-target species. The integrated data from Brazil, Japan and Uruguay, consist of observer data and showed reasonable spatial coverage, however some gaps were also recognized.

The Sub-committee recognized the importance of this collaborative work and noted attentions paid to data confidentiality issues when set-by-set observer data is to be shared. Some CPC(s) indicated a willingness to join this collaborative work. Simultaneously, it was pointed out that some important information such as hook type, hook size and bait type were not listed in the minimum data requirement determined in the first meeting. It was also pointed out that it would be preferable if the data from fleets operating in the Mediterranean could also be shared. The Sub-committee inquired about the representativeness of the observer data being used. It was explained that observer coverage varied by fleet and year. The Sub-committee was very supportive of this ongoing effort and congratulated the team for the work that so far has been accomplished.

Document SCRS/2018/P/036 described the loggerhead by-catch by the Spanish longline fleet in the Western Mediterranean and how six different longline configurations impact the sea turtle by-catch. The Group asked clarification on the configurations of the non-surface longlines. It was discussed that the semi-pelagic and bottom longlines are set deeper than the foraging depth of the sea turtles and as such they have the lowest by-catch rates. However, these longlines resulted in higher direct mortality. In general, the study showed a declining trend in sea turtle by-catch during the study period that was the result of changes in the gear configurations over time.

Document SCRS/2018/071 presented an assessment of sea turtle interactions with longline gear in the North Atlantic prepared using observer data from the Canadian and U.S. longline fleets. The document proposed the use of nesting data as a potential indicator to include in the Ecosystem Report Card. The Sub-committee discussed the merit of the proposal and raised a series of concerns. Among them, the fact that nesting trends are related to many factors others than the potential impact of ICCAT fisheries and also the time lag that exists between nesting and being caught in the foraging grounds. In addition, the population of origin of sea turtles nesting in the same area could be very different which adds additional noise to the data.

The Sub-committee agreed that the use of nesting trends as an indicator might not be the best approach.

7. **Mitigation measures for by-catch and mortality in fisheries: Intra and interspecific effects of the measures**

Document SCRS/2018/084 presented an assessment of the effect of two seabird mitigation measures (tori lines and line-weighting) for pelagic longline fisheries in 13 threatened, protected and/or by-caught species, including elasmobranchs, teleosts, sea turtles and fur seals.

The Sub-committee noted that in some cases, the use of a by-catch mitigation method that achieves large reductions in catch rates of one at-risk species or group could negatively impact other taxa. Therefore, dedicated studies are needed to demonstrate that by-catch mitigation methods do not increase catch and mortality of other at-risk groups. The research reported that the use of tori line and branch line weighting (60 and 65g at 1m from the hook) do not negatively affect the captures of any of the species considered.

The Sub-Committee asked for clarifications about the high number of sharks caught during the tori line experiments in the non-tori line treatment group. The author explained that longline sets with and without a tori line were deployed on a randomized order. This may partially explain the high catch rates observed of some shark species in the non-tori line treatment. The author explained that besides preventing bait loss, the tori lines are unlikely to affect the catch of species captured underwater during the longline soak, suggesting that other potential confounding factors may have influenced this result.

8. Fish species caught as cy-catch but not considered by other Species Groups

The SCRS/2018/079 presented the list of fish species recorded by the tropical Spanish purse seiners operating in the Atlantic Ocean. During the period of study the authors observed an increment in the number of species of fish recorded. This increment could be due to three reasons: 1) an improvement in the quality of the data (improvements in observer training on species identification) 2) errors in the data base and/or 3) changes in the fishing strategy towards more coastal sets.

The Sub-Committee discussed the possibility of retaining frozen samples of rare or unidentified individuals and to revise identification of those species that represent a significant volume in the by-catch.

The Sub-Committee discussed the need to pay more attention to some by-catch species that have commercial value and are not considered by any of the SCRS species group (eg. *Lampris guttatus*, *Lepidocybium flavobrunneum*). These species are an important component of the ecosystem and are also part of the landings of different fleets.

9. Other matters

9.1 Integration of the Sub-Committee on Ecosystems with other Species/Working Groups

The Sub-committee discussed possible mechanisms for enhancing the communication with the other Working Groups and suggested alternatives such as a dedicated timeslot during the Species Group meetings. Ultimately, it was agreed that the best alternative was for the different Working Groups to include in their annual meetings, an item that reports on the work and discussions related to the ecosystem in order to facilitate the dissemination of information that may inform the assessment of single species. Thereafter, the bycatch coordinator and the subcommittee should integrate new information and present a summary to the SCRS on the new Ecosystem information. Furthermore, it was agreed that the Secretariat in collaboration with the subcommittee update and revise the contents of the ICCAT Information on By-Catch of Tuna Fisheries section in the ICCAT web page providing links data sources related to environment, ecosystem based management projects, etc.

9.2 Elaboration of Terms of Reference for a proposed Call for tender to develop “An Inventory of Best Available Science on By-catch Mitigation Measures across Taxa”

The Sub-Committee considered the response(s) to the recommendations of the second ICCAT performance reviewers relevant to this Sub-Committee (**Table 2**). During the discussions it was observed that these recommended actions had been already partially developed. As regards to items 53/55, namely “... and involve increased observer coverage deemed sufficient to estimate turtle and seabird mortality by all major fleets”, in the past, the SCRS (Babcock *et al.* 2004) estimated the level of observer coverage required to sufficiently estimate the number of interactions with rarely encountered species. The required levels are high (above 80% coverage). Consequently, it is not practical to implement them for all the main fleets. The current observer coverage requirement of 5% is rarely achieved and not all fleets have implemented observer programs. Therefore, the Sub-committee encouraged that current observer requirements to be met by all CPCs, namely through the complete reporting across all fleets. The SCRS has already estimated previous levels of longline gear interaction with seabirds and sea turtles using the available data. The SCRS is carrying out collaborative work among the CPCs to update and improve the previous estimates.

10. Recommendations

10.1 General recommendations

To the SCRS

The Sub-committee recommended that the:

1. Secretariat develop a database based on the current version of the ST09 form, provided that this form remains unchanged, so that its utility in supporting indicator development can be assessed.
2. SCRS include web access B and F ratio time series, or proxy, on its “Stock Assessments and Executive Summaries” page. Furthermore, it is recommended the Species Working Groups provide these ratios for the base case models in an Excel file and that guidelines be prepared to clarify the role of the data rapporteur.
3. Different Working Groups include in their annual meetings, an item that reports on the work and discussions related to the ecosystem in order to facilitate the dissemination of information that may inform the assessment of single species. This information is to be reviewed by the groups. Furthermore, it is recommended that ICCAT provide web support (data portal) to facilitate the exchange of relevant data.
4. Secretariat explore collaborations with other RFMOs and management bodies, who have responsibility for implementing EBFM within the Atlantic and other regions.
5. Next meeting of the Dialogue between Scientists and Managers Working Group (SWGSM) include an agenda item on the implementation of an EBFM framework for ICCAT.

For Research

6. Various collaborative efforts to assemble and analyze observer shark, seabird and sea turtle by-catch data are active. The Sub-committee encouraged national scientists to collaborate with these data gathering initiatives including the seabird component of the Common Oceans Tuna project and the collaborative work being done by ICCAT CPCs on seabirds and sea turtles.
7. The Sub-committee recommended a further review of investigations into the best way to regionalize the components of the ecosystem report card. It also recommends reviewing case studies that demonstrate the implantation of EBFM principles.
8. The Sub-committee recommended that a terms of reference be developed suitable for a call for tender that will support the implementation of an ecosystem based management plan for ICCAT.
9. The Sub-committee recommended to investigate the development of fisheries independent and model based indicators.
10. The Sub-committee recommends the continuation of work on by-catch mitigation measures.

10.2 Recommendations with financial implications

11. The Sub-Committee requested financial assistance to support the attendance of five to seven CPC scientists at a collaborative workshop to evaluate the impact of ICCAT fisheries on seabirds. This is in support of an ongoing process that will continue over the coming years.
12. The Sub-Committee requested financial assistance to support the attendance of three to five CPC scientists at a collaborative workshop to evaluate the impact of ICCAT fisheries on sea turtles. This is in support of an ongoing process that will continue over the coming years.

11. Adoption of the report and closure

The report was adopted and the meeting was adjourned.

References

- Babcock, E.A., Hudson, C.G., Pikitch, E.K. 2004. How much observer coverage is enough to adequately estimate by-catch? <https://oceana.org/reports/how-much-observer-coverage-enough-adequately-estimate-bycatch>
- Cortés, E., Domingo, A., Miller, P., Forselledo, R., Mas, F., Arocha, F., Campana, S., Coelho, R., Da Silva, C., Holtzhausen, H., Keene, K., Lucena, F., Ramirez, K., Santos, M.N., Semba-Murakami, Y., Yokawa, K. 2015. Expanded ecological risk assessment of pelagic sharks caught in Atlantic pelagic longline fisheries. *Collect. Vol. Sci. Pap. ICCAT*, 71(6): 2637-2688.
- Tolotti, M.T., Capello, M., Bach, P., Murua, H., Alayón, P.P., Mendez, V.R., Dagorn, L., 2017. Using FADs to estimate a population trend for the oceanic whitetip shark in the Atlantic Ocean. Document SCRS/2017/165 (withdrawn).

Table 1. Checklist for the evaluation of Ecosystem Report Card indicators.

Component Questions	Habitat	Trophic	Mammal	Socio Eco	Sea bird	Sea turtle	Assessed	Not Assessed	Sharks	Fishing
Goal What is the conceptual management objective to be reflected in the report	Ensuring that the tuna fisheries will have minimal impacts on critical habitat	Ensuring that ICCAT fisheries will have minimal impacts on the structure and function of the communities.	Minimizing the interactions and mortality as practically as possible	Ensure overall sustainability of socio-economic benefits obtained from the ICCAT resources.	Minimizing the interactions and mortality as practically as possible	Minimizing the interactions and mortality as practically as possible	Ensuring long-term sustainability and optimum utilization of the retained stocks	Ensuring long-term sustainability and optimum utilization of the unassessed retained species in the Convention.	Minimizing the interactions and mortality as practically as possible	Monitor the pressures that affect the state of the different ecosystem components
Objective What is the question that can be represented by an indicator(s)	Whether ICCAT fisheries impact on critical habitat	Whether trophic interactions and inter dependencies involving species that are affected by fishing are maintained	Determine if the interaction rates are being reduced.	Determine if the proportion of CPCs with decreasing year on year cash earned and production value is reduced	Whether the number of interactions and/or total mortality is reduced	Determine if the BPUE estimates for TTL and DKK is increasing.	Determine if the status of retained assessed stocks, based on biomass and fishing ratio indicators, is improving.	Determine if the harvest fraction of all unassessed retained species in the Convention is increased.	Whether the number of interactions and/or total mortality is reduced	Determine if the number of active PS vessels per category and number of hooks deployed by LL is increasing.
Indicator <ul style="list-style-type: none"> • What is the indicator? • Scientific basis? • Responsive to pressure? • Ecosystem relevance? • Does it achieve the objective? • Possible to set targets? 										

SUB-COMMITTEE ON ECOSYSTEMS MEETING – MADRID 2018

<ul style="list-style-type: none"> • State alternative indicators? 										
Data <ul style="list-style-type: none"> • Does the data exist? • Where does it reside? • Is it readily accessible? • How to improve access? 										
Capacity & Expertise <ul style="list-style-type: none"> • Level of participation • Knowledge of participants 										
Regions <ul style="list-style-type: none"> • Data conforms to ICCAT regions • Data conforms to Pelagic regions • Regionalize? 										
Secretariat <ul style="list-style-type: none"> • Is support required? • Type? 										

Table 2. List of recommendations from the second ICCAT performance review. Proposed actions to be taken or already taken and comments. **Yellow** - Progress/requiring additional work; **Green** - Completed/significant progress made

Chapter	Recommendations	LEAD	SCRS Secondary	Timeframe	Proposed Next Steps	Observations/ Comments	Action to be taken, or already taken	Completion status following annual meeting	Comments
Seaturtles	52. The Panel considers that this issue affects all tuna RFMOs, and knowledge and experience should continue to be pooled between the RFMOs.	SCRS		S/M	Refer to SCRS to engage as appropriate with other tRFMOs and gather and evaluate relevant information.	Should be considered within Kobe process.			
	53. The Panel noted that there are no reliable estimates of the mortality caused by longlines on these species and recommends that a time-limited program be designed to estimate seabird and turtle mortality in ICCAT longline fisheries. This programme should be of at least one year duration and involve increased observer coverage deemed sufficient to estimate turtle and seabird mortality by all major fleets. Such increased observer coverage would also provide information on the impact of ICCAT fisheries on other components of the ecosystem.	SCRS		M	Refer to SCRS to assess the rationale for this recommendation and if necessary and appropriate, to consider development of a program of data collection for the fisheries concerned.	Some work in this area is already ongoing within SCRS.	Commission to continue financial support for the ongoing collaborative work among Scientist specifically for sea turtle interactions Commission to encourage the participation of other CPCs in this collaborative process		The SCRS estimate of the level of coverage required to estimate the number of interactions with rare species is above 85%, in contrast to the current requirement of 5% which is not fully achieved. The first priority is for all CPCs to fulfil the current observer requirement with complete reporting to ICCAT.

SUB-COMMITTEE ON ECOSYSTEMS MEETING – MADRID 2018

	55. The Panel considers that this issue affects all tuna RFMOs, and knowledge and experience should continue to be pooled between the RFMOs.	SCRS		S	Refer to SCRS to engage as appropriate with other tRFMOs and gather and evaluate relevant information.	Should be considered within Kobe process.			
Seabirds	56. The Panel reiterates its recommendation on a time-limited programme to estimate seabird and turtle mortality in ICCAT longline fisheries.	SCRS		M	See recommendation 53 above for proposed action.		Commission to continue financial support for the ongoing collaborative work among Scientist specifically for sea birds interactions Commission to encourage the participation of other CPCs in this collaborative process		The SCRS estimate of the level of coverage required to estimate the number of interactions with rare species is above 85%, in contrast to the current requirement of 5% which is not fully achieved. The first priority is for all CPCs to fulfil the current observer requirement with complete reporting to ICCAT.
Seabirds	54. The Panel commends ICCAT on the measures it has introduced to date and recommends that it pursues its stated goal of further reducing bird mortality through the refinement of existing mitigation measures.	PA4	SCRS	S/M	Refer to Panel 4 for consideration based on input from SCRS, as needed.				

Agenda

1. Opening, adoption of the Agenda and meeting arrangements
2. *Ecosystems*
 Ecosystems Based Fisheries Management
 - 2.1 Review progress on developing new indicators for all ecological components of ICCAT's EBFM framework (i.e. target species, by-catch, habitat and trophic relationships)
 - 2.2 Feedback on Concept Note to inform rapporteurs of Species Groups regarding the development of an ecosystem report card, along with the justification and implementation plan
 - 2.3 Feedback on the introduction of the Report Card and progress on an EBFM plan presented to managers at the 2018 Dialogue with Science and Managers Meeting
 - 2.4 Review the progress on the assessment of components of the Ecosystem Report Card for ICCAT and develop a preliminary draft
3. Ecology and habitat
 - 3.1 Review information on the trophic ecology and habitat of pelagic ecosystems that are important and unique for ICCAT species in the Convention area
4. *By-catch*
 Data used for by-catch analyses
 - 4.1 Update of ST09 forms
5. Seabirds
 - 5.1 Feedback on collaborative process of assessing the impact of longline fisheries on by-catch of seabirds
 - 5.1.1 Review of progress on seabird interaction estimations and mitigation.
 - 5.1.2 Progress on assessing effectiveness of Rec. 11-09
6. Sea turtles
 - 6.1 Discussion on progress towards scientific collaboration among researchers of ICCAT CPCs to elaborate on the results obtained to date regarding knowledge of the impact of the fisheries on sea turtles
7. Mitigation measures for bycatch and mortality in fisheries: Intra and interspecific effects of the measures
8. Fish species caught as by-catch but not considered by other Species Groups
9. Other matters
 - 9.1 Integration of the Sub-Committee on Ecosystems with other Species Working Groups
 - 9.2 Elaboration of Terms of Reference for a proposed Call for tender to develop "An Inventory of Best Available Science on Bycatch Mitigation Measures across Taxa"
10. Recommendations
 - 10.1 General recommendations
 - 10.2 Recommendations with financial implications
11. Adoption of the report and closure

List of Participants

CONTRACTING PARTIES

ANGOLA

André António, Miguel

Instituto Nacional de Investigaçao Pesqueira, Avenida Mortala Mohamed, CP 2601 Ilha de Luanda
Tel: +244 926 270 399, Fax: +244 230 9731, E-Mail: amiguelandre4@gmail.com

Dos Santos Gourgel, Ana Patricia

Ministério das Pescas e do Mar, Avenida 4 Fev. N. 30 - Edificio Atlantico - Caixa postal 83, Luanda
Tel: +244 916 633 799, E-Mail: patcristal2@gmail.com

BRAZIL

Neves, Tatiana

Projeto Albatroz, Rua Marechal Hermes, 35, CEP:11.025-040 Santos Sau Paulo
Tel: +55 13 3324 6008, Fax: +55 13 3324 6008, E-Mail: tneves@projetoalbatroz.org.br

CANADA

Hanke, Alexander

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

EUROPEAN UNION

Andonegi, Eider

AZTI, Txatxarramendi ugarte a z/g, 48395 Bizkaia Sukarrieta, España
Tel: +34 661 630 221, E-Mail: eandonegi@azti.es

Báez Barrionuevo, José Carlos

Instituto Español de Oceanografía, Centro Oceanográfico de Canarias, Dársena Pesquera parcela 8, Santa Cruz de Tenerife, 38120, España
Tel: +34 669 498 227, E-Mail: josecarlos.baez@ieo.es

Coelho, Rui

Portuguese Institute for the Ocean and Atmosphere, I.P. (IPMA), Avenida 5 de Outubro, s/n, 8700-305 Olhão, Portugal
Tel: +351 289 700 504, E-Mail: rpcoelho@ipma.pt

Fernández Costa, Jose Ramón

Ministerio de Economía y Competitividad, Instituto Español de Oceanografía - C. Costero de A Coruña, Paseo Marítimo Alcalde Francisco Vázquez, 10 - P.O. Box 130, 15001 A Coruña, España
Tel: +34 981 205 362, Fax: +34 981 229 077, E-Mail: jose.costa@ieo.es

Juan-Jordá, María Jose

AZTI, Marine Research Division, Herrera Kaia, Portualdea z/g, E-20110 Pasaisa Gipuzkoa, España
Tel: +34 671 072900, E-Mail: mjuanjorda@gmail.com

Macías López, Ángel David

Ministerio de Economía y Competitividad, Instituto Español de Oceanografía, C.O. de Málaga, Puerto pesquero s/n, 29640 Fuengirola Málaga, España
Tel: +34 952 197 124, Fax: +34 952 463 808, E-Mail: david.macias@ieo.

Poisson, François

IFREMER - l'Unité Halieutique Méditerranée (HM) UMR - Ecosystème Marin Exploité (EME), Avenue Jean Monet, B.P. 171, 34203 Sète, France
Tel: +33 499 57 32 45; +33 679 05 73 83, E-Mail: francois.poisson@ifremer.fr; fpoisson@ifremer.fr

JAPAN

Aoki, Masahiro

Japanese Embassy in Spain, C/ Serrano 109, 28006 Madrid, España
Tel: +34 91 590 7621, Fax: +34 91 590 1329, E-Mail: masahiro.aoki@mofa.go.jp

Inoue, Yukiko

Assistant Researcher, Ecologically Related Species Group, Tuna and Skipjack Resources Division, National Research Institute of Far Seas Fisheries, 5-7-1 Orido, Shimuzu-Ku, Shizuoka-City, Shizuoka 424-8633
Tel: +81 543 36 6046, Fax: +81 543 35 9642, E-Mail: yuinoue@affrc.go.jp

Katsuyama, Kiyoshi

Advisor, International Division, Japan Tuna Fisheries Co-operative Association, 2-31-1, Koto-ku, Tokyo 135-0034
Tel: +81 3 5646 2382, Fax: +81 3 5646 2652, E-Mail: katsuyama@japantuna.or.jp

Miwa, Takeshi

Assistant Director, International Affairs Division, Resources Management Department, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries, 1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-8907
Tel: +81 3 3502 8460, Fax: +81 3 3504 2649, E-Mail: takeshi_miwa090@maff.go.jp

Oshima, Kazuhiro

Chief of Ecologically Related Species Group, National Research Institute of Far Seas Fisheries, Japan Fisheries Research and Education Agency, 5-7-1, Orido, Shizuoka Shimizu-ku 424-8633
Tel: +81 543 36 6047, Fax: +81 543 35 9642, E-Mail: oshimaka@affrc.go.jp

Tsuji, Sachiko

Researcher, National Research Institute of Far Seas Fisheries, Japan Fisheries Research and Education Agency, 5-7-1 Orido Shimizu Shizuoka, 424-8633
Tel: +81 543 366 000, E-Mail: sachiko27tsuji@gmail.com

TUNISIA

Zarrad, Rafik

Institut National des Sciences et Technologies de la Mer (INSTM), BP 138 Ezzahra, Mahdia 5199
Tel: +216 73 688 602, Fax: +216 73 688 604, E-Mail: rafik.zarrad@instm.rnrt.tn; rafik.zarrad@gmail.com

UNITED KINGDOM (OVERSEAS TERRITORIES)

Kell, Laurence

Centre for Environmental Policy, Imperial College London, London SW7 1 N
Tel: +44 751 707 1190, E-Mail: laurie@seaplusplus.co.uk

Luckhurst, Brian

2-4 Via della Chiesa, Acqualoreto, 05023 Umbria, Italy
Tel: +39 339 119 1384, E-Mail: brian.luckhurst@gmail.com

Yates, Oliver

Centre for Environment Fisheries and Aquaculture Science (CEFAS), Pakefield Road, Lowestoft, NR33 OHT
Tel: +44 1502 521 376, E-Mail: oliver.yates@cefasc.co.uk

UNITED STATES

Díaz, Guillermo

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

URUGUAY

Domingo, Andrés

Director Nacional, Dirección Nacional de Recursos Acuáticos - DINARA, Laboratorio de Recursos Pelágicos, Constituyente 1497, 11200 Montevideo
Tel: +5982 400 46 89, Fax: +5982 401 32 16, E-Mail: adomingo@dinara.gub.uy; direcciongeneral@dinara.gub.uy

OBSERVERS FROM INTERGOVERNMENTAL ORGANIZATIONS

AGREEMENT ON THE CONSERVATION OF ALBATROSSES & PETRELS - ACAP

Wolfaardt, Anton

Convenor of ACAP's Seabird Bycatch Working Group, Agreement on the Conservation of Albatrosses and Petrels (ACAP), Level 2, 119 Macquarie Street, Hobart, 7000 Tasmania, Australia
Tel: +61 3 6165 6674, E-Mail: acwolfaardt@gmail.com

FOOD AND AGRICULTURE ORGANIZATION - FAO

Gutiérrez de los Santos, Nicolás Luis

Fisheries Resources Officer, Fisheries and Aquaculture Resources Use and Conservation Division. FAO, Viale delle Terme di Caracalla, 00153 Rome, Italy
Tel: +39 06 570 56563, E-Mail: nicolas.gutierrez@fao.org

OBSERVERS FROM NON-GOVERNMENTAL ORGANIZATIONS

BIRDLIFE INTERNATIONAL - BI

Gianuca, Dimas

Birdlife, The David Attenborough Building, Pembroke Street, Cambridge CB2 3QZ, United Kingdom
Tel: +44 1223 277 218, E-Mail: dgianuca@projetoalbatroz.org.br

Winnard, Stephanie

Birdlife International, RSPB, The Lodge, Sandy, Bedfordshire, SG19 2DL, United Kingdom
Tel: +44 1767 693 063, E-Mail: stephanie.winnard@rspb.org.uk

ICCAT Secretariat

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

Neves dos Santos, Miguel

Ortiz, Mauricio

Palma, Carlos

Kimoto, Ai

Mayor, Carlos

ICCAT GUEST

Jiménez Cardozo, Sebastián

List of Papers and Presentations

Reference	Title	Authors
SCRS/2018/067	Extending the indicator-based ecosystem report card to the Atlantic ecosystem; a preliminary example based on the Sargasso Sea	Kell L.T., and Luckhurst B.
SCRS/2018/068	Socio-economic aspects of the iccat fisheries	Tsuji S., and Sabarros P.
SCRS/2018/069	Indicators for ICCAT species that are retained and assessed	Hanke A.R., Juan-Jordá M.J., and Coelho R.
SCRS/2018/070	Indicators for ICCAT species that are retained but not currently assessed	Hanke A.R., and de Bruyn P.
SCRS/2018/071	An assessment of marine turtles interactions with longline gear in the North Atlantic Ocean	Swimmer Y., and Hanke A.
SCRS/2018/072	An assessment of marine mammal interactions with longline gear in the North Atlantic Ocean	Hanke A.R., and de Bruyn P.
SCRS/2018/073	A proposal of ecosystem indicators to monitor the trophic relationships component for the ICCAT ecosystem report card	Juan-Jordá M.J., Zarrad R., and Hanke A.
SCRS/2018/074	ACAP advice for reducing the impact of pelagic longline fishing operations on seabirds	Wolfaardt A., and ACAP Seabird Bycatch Working Group
SCRS/2018/075	Update on the seabird component of the Common Oceans tuna project – seabird bycatch assessment workshop	Abraham E., Carneiro A., Fahmi Z., Inoue Y., Kathena J.N., Kim D.N., Lee S.I., Maree B., Oshima K., Parsa M., Rice J., Sant'Ana R., Sharma R., Small C., Tsuji S., Wanless R., Winker H., and Wolfaardt A.
SCRS/2018/076	Thoughts for developing a potential indicator for non-retained sharks in support of an ecosystem report card	Cortés E., Coelho R., Domingo A., (and Tolotti M.)
SCRS/2018/077	Selecting ecosystem indicators for fisheries targeting highly migratory species	Juan-Jordá M.J., and Murua H. (on behalf of consortium members)
SCRS/2018/078	At-sea trialling of the HOOKPOD: a 'one-stop' mitigation solution for seabird bycatch in pelagic longline fisheries	Sullivan B.J., Kibel B., Kibel P., Yates O., Potts J.M., Ingham B., Domingo A., Gianuca D., Jiménez S., Lebepe B., Maree B.A., Neves T., Peppes F., Rasehlomi F., Silva-Costa A., and Wanless R.M.
SCRS/2018/079	Listado de especies de peces (excluyendo túnidos) capturadas de forma accesoria por la flota de cerco tropical española en el área ICCAT	Báez J.C., Pascual-Alayón P., Ramos M.L., and Abascal F.J.
SCRS/2018/080	Report of collaborative work to assess sea turtle bycatch in pelagic longline fleets operated in the Atlantic Ocean	Oshima K., Giffoni B., Forselledo R., Sales G., and Domingo A.
SCRS/2018/082	Environmental variability in three major Mediterranean tuna spawning grounds	Alvarez-Berastegui D., Mourre B., Saber S., Ortiz de Urbina J., Macías D., and Reglero P.
SCRS/2018/083	Report of the Workshop II: Collaborative work to assess seabird bycatch in pelagic longline fleets (South Atlantic and Indian Oceans)	Anon.
SCRS/2018/084	Effects of the best practices to reduce seabird bycatch in pelagic longline fisheries on other threatened, protected and bycaught megafauna species	Jiménez S., Forselledo R., and Domingo A.
SCRS/2018/085	Observations on interaction between seabirds and the Spanish surface longline fishery targeting swordfish in the Atlantic Ocean during the period 1993-2017	Fernández-Costa J., Ramos-Cartelle A., Carroceda A., and Mejuto J.
SCRS/2018/086	HOOKPOD trials in Brazilian pelagic longline fishery, from 2011 to 2017	Gianuca D., Costa A., Sampaio G.C., Neves T.
SCRS/P/2018/036	Longline bycatch of loggerhead sea turtle in the Western Mediterranean (2000-2016)	Báez J.C., Macías D., García-Barcelona S., and Camiñas J.A.

SCRS Documents and Presentations abstracts as provided by the authors

SCRS/2018/067 - To facilitate the implementation of Ecosystem-Based Fisheries Management (EBFM) the Sub-Committee on Ecosystems has developed an indicator-based ecosystem report card. A main objective of this new tool is to improve dialogue between scientists and managers and increase the awareness of the state of the different ecosystem components managed by ICCAT. The Sargasso Sea is a major component of the ICCAT convention area and provides a variety of ecosystem services to ICCAT and other Regional Fisheries Management Organisations (RFMOs) in the Atlantic region. Ecosystem services include a variety of products such as fish for food, but also processes that regulate and maintain our environment and cultural experiences. The ecosystem report card was developed using a Driver-Pressure-State-Impact-Response (DPSIR) approach. We show how this approach can be extended to develop a common understanding of how human activities affect the Atlantic ecosystem. We do this by proposing indicators that can be used to assess the state of the Sargasso Sea, to monitor the impact of human activity on the Atlantic ecosystem, and then discuss ways how these can be validated and management based on them can be implemented.

SCRS/2018/068 – The paper presented the results of preliminary attempts of seeking for indicators of reflecting socio-economic benefits and reliance on ICCAT resources. It was proposed to modify the socio-economic goal “to ensure overall sustainability of socio-economic benefits obtained from the ICCAT resources” to strengthen a linkage with the ICCAT management. Five indicators were examined for 2014 and two indicators were compiled for the period of 1980 and after due to convenience of integration of overall results. The paper is intended to provide materials for discussion and decision making at ICCAT’s 2018 Sub-committee on Ecosystems meeting.

SCRS/2018/069 – Several indicators are proposed for describing the status of ICCAT’s assessed stocks. Indicators based on biomass and fishing mortality ratios (B/B_{MSY} and F/F_{MSY}) show declines in the status of the assessed stocks from 1975 until the mid-1990s and early 2000s when recovery to near 1975 levels begins. Declines and increases in the F ratio occur prior to a corresponding change in the B ratio.

SCRS/2018/070 – A large number of species are caught in ICCAT’s fisheries (181) but only a small subset of these undergoes an assessment (12). ICCAT has been increasing the number of species included in the Task I data since 198. The number of unassessed species reported in the Task I data have also been increasing since 1980 and yet the unassessed species biomass remains a relatively constant fraction of the assessed species biomass (~80%).

SCRS/2018/071 – The assessment of marine turtle interactions with ICCAT fisheries was restricted to loggerhead and leatherback turtle captures by U.S. longliners and nesting data from beaches bordering the north Atlantic and Gulf of Mexico. The nesting data provided useful context for interpreting the trend in captures which appeared to vary independent of the trend in nest number.

SCRS/2018/072 – A spatial model was fit to the interactions of the Canadian longline fleet with marine mammals. The model was used to predict the total annual interactions from 1982 to 2017 using the north Atlantic monthly longline effort obtained from ICCAT’s Task II catch and effort database. Estimated interactions declined in the past 5 years to near the low levels of the late 1980s and early 1990s while fishing effort remained relatively constant until the most recent 4 years when it declined to a 30 year low.

SCRS/2018/073 – A list of candidate indicators is proposed to monitor the state of the foodweb and trophic relationships of ICCAT species. Two of the proposed indicators are calculated for major ecoregions within the ICCAT convention area. The indicators calculated are the mean trophic level and the mean maximum length of fishes, and both these indicators were calculated based on fisheries catch data. Data needs and challenges are also highlighted.

SCRS/2018/074 – The incidental mortality of seabirds, mostly albatrosses and petrels, in longline fisheries continues to be a serious global concern and was the major reason for the establishment of the Agreement on the Conservation of Albatrosses and Petrels (ACAP). ACAP routinely reviews the scientific literature regarding seabird bycatch mitigation in fisheries, and on the basis of these reviews updates its best practice advice. The most recent review was conducted in September 2017, and this document presents the outcome of that review and the summary advice pertaining to best practice measures for mitigating seabird bycatch.

ACAP has confirmed that a combination of weighted branch lines, bird scaring lines and night setting remains the best practice approach to mitigate seabird bycatch in pelagic longline fisheries. In addition, ACAP has since 2016 also endorsed the inclusion in the list of best practice mitigation measures of two hook-shielding devices. These devices encase the point and barb of baited hooks until a prescribed depth or immersion time has been reached (set to correspond to a depth beyond the diving range of most seabirds) thus preventing seabirds gaining access to the hook and becoming hooked during line setting. On the basis of the September 2017 review, the only update to the ACAP best practice advice for reducing bycatch of seabirds in pelagic longline fisheries related to recommendations concerning the aerial extent, streamer line configuration, attachment height and weak link of bird scaring lines for small (<35m) vessels.

SCRS/2018/075 – This paper provides the outcomes of the Common Oceans Seabird Bycatch Data Preparation Workshop held in early 2018. The Project Team and workshop attendees revised the objectives and approaches to achieve the project goal. The assessment will now focus exclusively on estimating total seabird bycatch, or N, (which is a fisheries performance metric) and the species- or population-level consequences thereof. Three distinct, but linked, approaches were agreed: i) A ratio-based estimate of N generated by the Project Team, using publicly available data or best estimates provided by each participating country; ii) geospatial estimates of N generated by participating countries with their own data, possibly using procedures being developed collaboratively with the Project Team; iii) a Spatially Explicit Fisheries Risk Assessment (SEFRA) conducted in collaboration between participating countries and Dragonfly Data Science consultants based in New Zealand. Further intersessional work is planned before the final workshop to assist countries with analyses, if requested. The scale of this evaluation effort will be limited to the Southern Hemisphere.

SCRS/2018/076 – Some preliminary thoughts on the feasibility of developing indicators for non-retained sharks for incorporation in an ecosystem report card are described in this document.

SCRS/2018/077 – The ICCAT resolution 15-11 and the 2015-2020 SCRS Science Strategic Plan support advancing the Ecosystem Approach to Fisheries Management (EAFM) within ICCAT to provide ecosystem advice to the Commission. Yet this aspiration has not provided practical guidance on how to make it operational. The Specific Contract N0 2 “selecting ecosystem indicators for fisheries targeting highly migratory species-” under the Framework Contract - EASME/EMFF/2016/008 provisions of Scientific Advice for Fisheries Beyond EU Waters- addresses some scientific impediments and provides solutions that shall support the implementation of an EAFM through collaboration and consultation with ICCAT. Here, we present some preliminary results of this project with the objective of seeking collaboration and broad consultation with the ICCAT scientific community. First, we summarize properties of success from other regions of the world in operationalizing the ecosystem approach which could be transferred to ICCAT. Second, we provide a list of candidate ecosystem indicators to monitor the broader impacts of ICCAT fisheries on the pelagic ecosystem. Third, we propose six potential ecoregions within the Atlantic Ocean which could be used to guide region-based ecosystem plans, assessments and research. Fourth, we present the key elements of a pilot ecosystem plan to be developed for one case study region. Ultimately, the products created throughout in this study aim to facilitate the linkage between ecosystem science and fisheries management as well as facilitate the process to operationalize an EAFM in ICCAT.

SCRS/2018/078 – Bycatch in pelagic longline fisheries is one of the most pervasive sources of mortality of seabirds, threatening several species with extinction. We conducted 18 at-sea trials between 2011-2015 onboard pelagic longliners in Australian, Brazilian and South African waters using a recently designed seabird bycatch mitigation device. The ‘Hookpod’ is a polycarbonate capsule that encases the point and barb of baited hooks to prevent seabirds from becoming hooked during line-setting operations. The assessment was based on efficacy (i.e., reducing seabird bycatch without impacting target catch rate) and practicality (i.e., how the Hookpod fitted into fishing operations). We recorded a single seabird mortality on the Hookpod branchlines (0.04 birds/1000 hooks) compared to 24 on the control (0.8 birds/1000 hooks). No difference in catchability of target species between Hookpod and control treatments was detected. These findings demonstrate that Hookpods do not negatively affect catch rate of target species and could make a major contribution to halting the decline of many seabird populations if adopted as a mitigation measure by the pelagic longline fishing industry. Published as Sullivan et al 2017, *Anim. Conserv.* 21:159-167.

SCRS/2018/079 – The main aim of the present study is to show a checklist of fish bycatches (excluding tuna species) by the Spanish tropical purse seine fleet in the ICCAT area. A total of 68 species of fish (excluding tuna species) have been identified during the study period. Three taxa that need confirmation have also been identified (*Kajikia audax*, *Makaira mazara* and *Zanclus cornutus*).

SCRS/2018/080 – The ICCAT-SCECO planned to discuss initiation of a collaborative works of sea turtles bycatch in the upcoming meeting held in 4-8 June. A collaborative work by researchers on seabird bycatch in the Atlantic and Indian Oceans already have been initiated since 2017. The collaborative works on sea turtles is expected to be progressed through similar process through agreement among researchers from countries concerned. A meeting on sea turtle process was held concurrently with that on seabird in DINARA, Uruguay from 16 to 20 April. The meeting had five participants from Brazil, Japan and Uruguay (Table 1). The Participants acknowledged that this meeting is an important starting point to construct future collaborative works on sea turtles where many countries involving the ICCAT-SCECO join. In this meeting the Participants discussed future goals of this process and works towards the upcoming ICCAT-SCECO meeting.

SCRS/2018/082 – We propose four different environmental indicators, three related to temperature variability in three major spawning grounds of tuna species in the Mediterranean, and one related to the salinity variability in the Balearic Sea. These indicators show the annual variability of environmental parameters affecting growth and survival of tuna eggs and larval. The indicators are intended to provide quick access to assessment working groups and fisheries scientist to identify potentially anomalous years.

SCRS/2018/083 – A collaborative work to assess seabird bycatch in the pelagic longline fleets operating in the South Atlantic (SAO) and Indian (IO) Oceans from an entirely scientific perspective was conceived by researchers from several national fleets during the Inter-sessional Meeting of the Sub-committee on Ecosystems of ICCAT, in September 2016. The objectives of this process were: 1) to determine the spatio-temporal patterns of seabird bycatch, 2) to estimate the seabird bycatch (at the lowest possible taxonomic level) and data permitting, 3) to gain knowledge on the performance of mitigation measures. Since than two workshops were held. The workshop II was held in Montevideo (Uruguay), between 16-20 of April 2018. This report summarises its results. Additional observer data from the observer programmes of South Africa (SAO and IO) and Portugal (SAO) were submitted. The main objectives of the workshop II were to compile the raw data of each country in a single dataset and to perform the analyses concerning the objective 1).

SCRS/2018/084 – The bycatch in pelagic longline fisheries is one of main conservation problems for albatrosses and many petrels. Currently, it is unknown whether the existing best practices to mitigate seabird bycatch in these fisheries do not create a problem for other vulnerable taxa by increasing their captures. Here, we assessed the effect of two seabird mitigation measures for pelagic longline fisheries in 13 threatened, protected and/or bycaught species, including elasmobranchs, teleosts, sea turtles and fur seals. Analyses were from two experimental studies assessing the effect of a bird scaring line (BSL) and branch line weighting on these taxa in Uruguay. Fifty-one longline sets with a BSL (52,371 hooks) and 49 sets without a BSL (50,613 hooks) were deployed on a randomized order. In turn, 224 paired longline sections (75 vs. 75 hooks; totalizing 33,710 hooks), with control branch lines (75g at 4.5m of the hook) vs. experimental branch lines (60g or 65g 1m from the hook), were deployed in 109 longline sets. The BSL use did not negatively affect the captures of any of the species addressed. Similarly, no detectable differences in the captures were recorded in our branch line weighting study. However, the effect of the branch line weighting in the capture of Porbeagle shark (*Lamna nasus*) remains unclear and requires further research. Ours is the first study to report that effective measures to reduce seabird bycatch in pelagic longline fisheries do not negatively affect the capture of other non-target taxa. We strongly encourage researchers to conduct similar studies to elucidate potential regional and across fleets or fisheries differences in the effect of seabird mitigation measures in other vulnerable taxa, as well as the effect that mitigation measures for other taxa may have on seabirds.

SCRS/2018/085 – A total of 7.6 million hooks targeting swordfish using night setting surface longline style were scientifically observed during the 1993-2017 period in broad areas of the North and South Atlantic in relation to the interaction with seabirds. The areas observed correspond to those with greater historical fishing intensity by this fleet in the Atlantic. A total of 38 individual seabirds interacted with the total observed hooks during the 25-year period. 74% of the interactions occurred in a single trip made in 1995 under non-standard fishing operations in areas in which other vessels-trips-years had few or null interactions. 13% of the interactions occurred in a fishing prospecting survey carried out in southern areas

where this fleet does not carry out regular fishing activity. The generally oceanic fishing areas, the type of nocturnal style, the low lighting during the set, together with the type of fishing practice regularly carried out by the vessels, were identified as probably being the main factors to explain the generally zero or low interaction with seabirds in most of the Atlantic fishing areas and trips observed.

SCRS/2018/086 – The Hookpod, which is a hook-shielding device, was trialled in pelagic longline fisheries off southern Brazil. In 2011-2013 Hookpod was tested against control gear, when 21 birds were killed in control hooks (BPUE = 2.35), while one with the Hookpod (BPUE = 0.11), a 95% reduction in bycatch despite the equivalent operational conditions. In 2017, the Hookpod-mini, which is lighter than the previous version, was trialled without control treatment, showing the same bycatch rate (0.10) observed in the Hookpod treatment in the previous trials, despite the higher seabird abundance. Considering all 14 trips conducted between 2011 and 2017, a total of 25 birds were killed in 23,837 control hooks (BPUE = 1.05) and five in 50,078 Hookpod branchlines (BPUE = 0.10), which represented 90% bycatch reduction of the most challenging areas to deter seabirds from being hooked. The 0.55% rate of damage to Hookpod-mini represents an acceptable loss related to the wear and tear of fishing gear. These results reinforce the Hookpod as an effective seabird bycatch mitigation measure that is suitable and durable under commercial fishing conditions.

SCRS/P/2018/036 – The Spanish surface longline fleet is continually introducing technological and strategic innovations to improve the economic benefits of the fishery. These innovations lead to high variability in fishing gear and operational strategies from year to year. Since 2000 to the present, the traditional métier home-base surface longline targeting swordfish has been gradually modified or in other cases replaced by other métiers, and in most vessels it has been replaced by a new deeper semipelagic longline targeting the same species. The main result of this study is that loggerhead turtle bycatch by the Spanish surface fleets using different longline métiers has significantly decreased during the last 8 years of the study period. Although a significant number of management measures were implemented during this period, the observed decrease in turtle bycatch was not due to their implementation; rather, it was due to the indirect effect of the introduction of changes in technology and fishing strategies in the fleets in the attempt to improve their economic objectives.