2014 INTER-SESSIONAL MEETING OF THE

SUB-COMMITTEE ON ECOSYSTEMS

(Olhão, Portugal, 1-5 September 2014)

1. Opening, adoption of Agenda and meeting arrangements

The Meeting was held at the *Real Marina Hotel and Spa* in Olhão, Portugal from September 1 to 5, 2014. The Sub-Committee on Ecosystems and by-catch co-conveners, Dr. Shannon L. Cass-Calay (USA) and Dr. Alex Hanke (Canada) welcomed the group and thanked the Instituto Portugues do Mare e da Atmosfera (IPMA) for agreeing to host the 2014 meeting. The conveners then described the objectives and logistics of the meeting. The agenda was adopted with minor changes (**Appendix 1**).

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

Section	*Rapporteurs*
Item 1, 12	P. de Bruyn
Item 2	T. Trott
Item 3	M-J. Juan Jorda
Item 4	F. Forrestal
Item 5	S. Cass-Calay, T. Nalovic, A. Domingo, P. de Bruyn
Item 6	S. Cass-Calay
Item 7	S. Cass-Calay.
Item 8	C. Small, A. Wolfaardt
Item 9	G. Diaz
Item 10	S.Clarke, T. Nalovic, S. Cass-Calay
Item 11	P. de Bruyn

2. Assess the importance of the Sargasso Sea ecosystem to ICCAT species as per Resolution 12-12

Following the Sub-Committee's 2013 recommendation "that the working group continue its collaboration with the Sargasso Sea Alliance with regard to the analysis of the ecological importance of the Sargasso Sea for tuna and tuna-like species and ecologically associated species", two papers were presented in this regard at this year's meeting.

Document SCRS/2014/120 provides information on the pelagic habitat of the Sargasso Sea and the feeding ecology and diet of a total of 15 different fish predators whose distributions include the Sargasso Sea. These species are divided into four groups that broadly correspond with ICCAT species groupings: Group 1 – Principal tuna species including yellowfin tuna, albacore tuna, bigeye tuna, bluefin tuna and skipjack tuna, Group 2 – Swordfish and billfishes including blue marlin, white marlin and sailfish, Group 3 – Small tunas including wahoo, blackfin tuna, Little tunny (Atlantic black skipjack tuna) and dolphinfish, and Group 4 – Pelagic sharks including shortfin mako and blue shark. Values from stable isotope analysis of nitrogen in tissue samples as well as stomach contents analysis are used to estimate trophic position (TP) for each species listed above and a preliminary pelagic food web of the Sargasso Sea is proposed. All of these species have TP values equal to or greater than 4.0 with the exception of skipjack tuna (3.8). Large swordfish are the top-ranked predator (TP = 5.1) followed by white marlin (4.9). Small swordfish and two other species - blue marlin and bigeye tuna - follow with the same TP (4.8). Large ommastrephid squid have a TP of 4.7 ranking them at a similar trophic level to other large fish predators. Squids are shown to be an important element of this food web in the role of both predator and prey. The significance of Sargassum in relation to the feeding habits and ecology of these predators is discussed as is the importance of Sargassum habitat for some prey species, e.g. flyingfishes.

The Sub-Committee noted that the main ecological significance of the species managed by ICCAT was that many of the species are amongst the top predators in this pelagic ecosystem. There was an acknowledgment, though, that there was less understanding on the intricacies of the food web at the prey level (i.e. mid-level prey species – squids, juvenile scombrids, crustaceans, etc.). It was pointed out that the information as presented

could also be used to characterize other areas of the Atlantic Ocean. The author, however, stated that while the proposed food web was a pelagic food web and so could be broadly transferable to other oceanic areas, the uniqueness of the Sargasso Sea was the link between the Sargassum as an important reproductive habitat for flying fishes and the significance of flyingfishes as a principal prey group for tunas and billfishes but these relationships were not quantified. It was notedthat clarity was needed regarding the importance of squid in the diets of these top predators, as it is possible that some squid in stomach contents analysis may be the result of predators eating squid as discards from other fisheries in the same area. However, it was pointed out that this is unlikely to be a significant issue. It was also pointed out that the size of the predators in the trophic web needed to be taken into account as their diet and trophic positions change as they grow. This was explicitly demonstrated with swordfish in the food web as small swordfish (=< 150 cm FL) were ranked at a lower trophic position than large specimens (> 150 cm FL).

Document SCRS/2014/119 provided an analysis of the catch data in the ICCAT database (CATDIS) for the principal tuna species namely, yellowfin tuna, albacore tuna, bigeye tuna, bluefin tuna and skipjack tuna as well as swordfish taken in the Sargasso Sea for a 20 year period (1992-2011). These data have been compiled from a total of eleven ICCAT 5x5 degree reporting squares within the Sargasso Sea Alliance (SSA) study area; all of these squares are exclusively in international waters with the exception of Bermuda's EEZ. Relatively low catch levels were reported in the 1990s for almost all of the above species but there was a generally increasing catch trend during the last decade of the analysis. The results of this analysis indicate that the Sargasso Sea (SSA Area) was not a significant fishing area for any of the six species presented here as average annual catch levels for the reference period are under 3% of the respective species stock totals for all of these species. Amongst the five tuna species, the reported catch of skipjack tuna in the area is insignificant.

The Sub-Committee noted that the low catches reported from the Sargasso Sea may be due, in part, to the selection of the reporting squares as it is known that, for example, Japanese fishermen fish along the subtropical convergence zone in the Sargasso Sea and that the fishing areas may shift in response to the location of this zone. The Sub-Committee therefore thought that it would be useful to investigate changes that may have occurred in the oceanography of the region for the presented time series. They also thought it would be constructive to determine the annual level of fishing effort (number of hooks deployed) in the Sargasso Sea. However, caution was advised regarding the interpretation of CPUE data as it is often raised from small samples and may not represent accurate estimates of abundance.

The Sub-Committee recognized that these papers represented substantial progress toward informing the Commission on the ecological importance of the Sargasso Sea for tuna and tuna-like species (Appendix 4) but also offered the following items to direct future work:

1. Clarify the reasons for the low catch of ICCAT species within the Sargasso Sea (e.g. whether this is due to the selected reporting squares, whether the Sargassum creates difficulties for fishing, low fishing effort etc.).
2. Provide a monthly summary of the landings from the Sargasso Sea to assess seasonal trends. .
3. Use available PSAT tagging data to attempt to determine residence time of species within the Sargasso Sea.
4. Compare the landings from the Sargasso Sea area relative to the total stock area.
5. Determine if available data supports the assumption that the Sargasso Sea is a relatively productive area.
6. Determine if there are indicators that can be derived from the Sargasso Sea ecosystem that are responsive to fluctuations in recruitment of ICCAT species.
7. Estimate biomass of target species from length-frequency data derived from the Sargasso Sea.
8. Examine CPUE trends of species in selected reporting squares versus areas outside of these squares.
9. Emphasize the dependence of ICCAT target and by-catch species (marine turtles) on Sargassum.

3. Review the progress that has been made in implementing ecosystem approaches in enhanced stocks assessments (e.g. multispecies models) or EBFM.

A presentation entitled "The Gulf of Mexico Integrated Ecosystem Assessment Program" was presented to the Group. This presentation was made to help guide a discussion on the identification of management goals and objectives for Ecosystem Based Fisheries Management (EBFM). and update the group on the progress of the Gulf of Mexico Integrated Ecosystem Assessment program. Specifically, the presentation was intended to provide examples of EBFM goals and objectives used by other management bodies. The main point of the

presentation was to emphasize the fact that before an effective EBFM program could be successfully adopted, a clear statement of EBFM goals and objectives needs to be identified. Ideally the identification of goals should originate from the managers. However, to help instigate this process, it is often times helpful for the scientific advisory body, in this case the Sub-Committee on Ecosystems, to provide the managers with appropriate and realistic conceptual management objectives to get started. These goals can be used to further discussion between the managers and scientists and to further refine the scope of the objectives. Once established, indicators, that will be used to track the progress relative to the objectives, can be determined.

The Sub-Committee was interested in the progress of the Gulf of Mexico Integrated Ecosystem Assessment program, and recognized the value of providing managers with simple ecosystem management objectives to initiate discussion and exchange ideas towards defining ecosystem goals to guide the incorporation of ecosystem considerations into management decisions in the context of ICCAT tuna fisheries. The Sub-Committee indicated that it is important to start developing a set of potential ecosystem objectives to guide the development of indicators to monitor the different ecological components of an ecosystem approach to fisheries management. . It was pointed out that it is important to align the objectives with management concerns, and focus and prepare products that are directly linked to current management interests.

The Sub-Committee recognized that the work being conducted in the Lenfest Ocean Program may be of interest to the group. This program focuses on the environmental, economic and social impacts of fishing and fisheries management, and supports marine research that informs policy decisions about the marine environment. The Lenfest Ocean Program Fishery Ecosystem Task Force is working to create a practical "blueprint" that managers can use to make ecosystem-based fisheries management more operational. There was interest in following the work of the Fishery Ecosystem Task Force.

The Sub-Committee was concerned that ecosystem objectives are often defined as big abstract statements which are difficult to understand, making them impractical to implement. Learning from past experiences in other scientific working groups and settings, the Sub-Committee advised that ecosystem objectives need to be easy to understand and achievable. There is a need to continue working to show how higher order conceptual ecosystem objectives can be supported by, and related to, more operational sub-objectives (unpacked objectives) to facilitate the development of indicators to track ecosystem change.

The Sub-Committee discussed the value of harvest control rules as a tool to start incorporating ecosystem consideration in the management of target species. Experiences from ongoing work in other tuna RFMOs suggest that realistic harvest control rules and associated management strategy evaluations can be difficult to construct in data poor situations.. In these cases, the Sub-Committee advises taking small steps and using simple frameworks to design and test harvest control rules and recommends seeking collaborations with other tuna RFMOs on the development of harvest control rules that account for ecosystem considerations.

A summary of the 2015-2020 SCRS Science Strategic Plan was presented to the Sub-Committee in order to inform the group of the proposed research priorities, goals and objectives that will directly or indirectly impact the ongoing work of the Sub-Committee. This Strategic plan will be revised in the next SCRS meeting and presented to the Commission for approval. The Sub-Committee noted it is important that this Science Strategic Plan is accepted by the Commission to guide future efforts of the Group towards the implementation of an ecosystem approach to fisheries management in ICCAT.

Document SCRS/2014/126 stated that Tuna and billfish species, the structure of their communities and food webs they form provide and sustain important high-sea ecosystem services for human wellbeing. There are increasing expectations for RFMOs to implement an ecosystem based management approach to ensure the sustainability of catches without compromising the structure and function of marine ecosystems and ensuring the delivery of ecosystem services. Here, we construct an idealized Driver- Pressure-State-Ecosystem Services-Response (DPSER) conceptual ecological model to highlight how this planning tool could potentially be used as a framework to implement an ecosystem approach in tuna RFMOs. We then conduct a preliminary review, based on the DPSER conceptual model, to assess the progress in applying an ecosystem approach to fisheries management in two tuna RFMOs as two case studies (ICCAT and IATTC). We seek to identify what type of research approaches are currently used in each RFMO and identify data and methodological needs, as well as limitations in capacities that hinder the implementation on an ecosystem approach. Both IATTC and ICCAT have taken steps to apply an ecosystem approach to fisheries management, yet the extent of their ecosystem-related research activities and programs differ markedly and occur under different fundamental research and institutional structures. Both tuna RFMOs have a long list of management measures and actions to mitigate the effects of fishing on target and by-catch species including sensitive species and no measures to account for

the impacts of fishing on the food web structure and trophic relationships and protections of sensitive habitats. The management measures in place to mitigate the impacts of fishing on by-catch and sensitive species have by large not been linked to pre-agreed operational objectives and associated indicators, and are not activated when a predefined threshold is exceeded. In the future, we intend to evaluate the performance and progress of the five tuna RFMOs in applying an ecosystem approach to fisheries management to seek to find synergies and examples of good practices and opportunities that can be transferred across them.

The Sub-Committee valued the importance of starting a discussion of what would be the main ecological elements to be considered in a strategic plan to start implementing an ecosystem approach to fisheries management in ICCAT. The presentation highlighted that the following four ecological elements (target species, by-catch, trophic relationships and habitats) are mostly used in practice to address and apply the ecosystem approach to fisheries management in other RFMOs. The Sub-Committee requested additional reviews that evaluate the progress in applying an ecosystem approach in the other tuna RFMOs. These future reviews should identify examples of good practices and opportunities that can be adopted. Yet, the Sub-Committee also noted that while it may be valuable to conduct a review involving the five tuna RFMOs it was also mentioned that in some aspects it would be wise not to follow the example of the other RFMOs too closely due to the uniqueness and peculiarities of each geographic region.

The presentation indicated that the IATTC has produced a larger volume of ecosystem-related research outputs in support of an ecosystem approach to fisheries, which might be the result of having a large group of permanent staff and a larger network of solid collaborations with local research institutions, universities and diverse research entities. It also indicated that the smaller volume of ecosystem-research products produced by the Sub-Committee on Ecosystems might be smaller due to the relatively small group of permanent staff at the ICCAT Secretariat, and the intermittent support of national scientists and limited input from local research institutions and universities. The Sub-Committee highlighted the value of how the Sub-Committee on Ecosystems meetings operate and are conducted every year. These are open to the participation of scientists from several nationalities and international organizations.

The presentation pointed out that ICCAT does not have an extensive regional observer program in place to monitor by-catch species such as the one in place in IATTC for purse seine fisheries. The Sub-Committee pointed out that ICCAT does have several national observer programs that operate well in the ICCAT convention area and have made great progress in quantifying the fishing impacts on by-catch species. Also, it was mentioned that ICCAT has made progress to address ecosystem issues by hiring a by-catch coordinator.

The presentation pointed out that although ICCAT has management measures and actions in place to mitigate the effects of fishing on by-catch species, these management measures have not been generally linked to pre-agreed operational by-catch objectives and associated indicators, and are not activated when a predefined threshold is exceeded. The Sub-Committee noted that although ICCAT has no clear by-catch objectives stated in its convention, some ICCAT conservation and management measures related to by-catch are directed efforts to mitigate impacts of fishing on seabirds, sharks and turtles.

Following the ecosystem based fisheries management (EBFM) presentations; the Group determined that it was important to involve the Commission in developing conceptual management objectives for the major ecosystem elements in order to progress on the development of a generic EBFM framework. Consequently, the Group developed conceptual objectives for 4 ecological elements of a reporting framework that would align with ICCAT's organizational structure and mandate (Figure 1). Further, examples showing how the higher order objectives relate to operational objectives and relevant state indicators, reference levels and management actions were derived (Figures 2, 3, 4). It was proposed that an appropriate venue where this information could be vetted would be the 2015 meeting of the Standing Working Group to enhance the dialogue between Science and fisheries Managers (SWGSM).

4. Explore environmental factors that affect the global distribution of highly migratory fish and their productivity.

Document SCRS/13/161 was presented to the Sub-Committee, which dealt with incorporating ecosystem indicators in the stock assessment of North Atlantic Swordfish. Observations of opposing trends in abundance for northern Swordfish suggested the possibility of a shift in abundance from warm, southern latitudes to cooler, more northern latitudes. Several of the observed indices of abundance changed sharply in direction from negative to positive, while others showed an opposite change. The observed changes in the direction of the abundance indices correspond with changes in trends in the size of the Atlantic Warm Pool (AWP), the change

in sign of the Atlantic Multidecadal Oscillation (AMO), and the North Atlantic Oscillation (NAO). To quantify a possible relation between the changes in abundance and the various candidate environmental indices, the assessment model was fit by allowing area specific catchabilities (q) to be modulated by the AMO and estimated an associated slope parameter that described the relationship between the AMO and residuals of the fit to the CPUE time series. Many of the CPUE slope parameters were significantly different from zero, and the pattern of the slope parameters suggested an east-west difference that was spatially and temporally coherent with that of the NAO and other correlated oceanographic environmental indicators.

The Sub-Committee agreed with one of the main conclusions of the presentation that using area-specific CPUEs rather than flag-specific CPUEs, could significantly improve the indexes used in the swordfish assessment. However, there was concern how this could be achieved taking into account data confidentiality considerations. It was noted that this approach has been already discussed with regard to Western bluefin tuna and other ICCAT stocks. Some options mentioned included determining what information was necessary for the analyses and providing the required data to a few researchers via cloud computing under pre-agreed confidentiality rules. Appropriate indicators would need to be species or fishery specific, for instance, examining dissolved oxygen levels for tropical tunas.

The Sub-Committee also discussed the variety of environmental indicators available and the danger of finding correlations with short-term data that may not reflect the long-term patterns. It was noted that often environmental indicators are subjected to a higher level of scrutiny than CPUEs, which in some cases have high levels of uncertainty.

Some of the variation observed with respect to changing environmental indicators might also be a result of a strong year-class present in the fishery, and if this is the case, an age-structured approach would be more appropriate to examine the productivity of the stock. It was discussed whether there was an offset between number and size of swordfish and it was noted that the full stock assessment was age-based with length-based selectivity and would be able to discern this.

Another point was raised that different fleets target different species and this consideration should be incorporated into the analysis, perhaps with examining hook depth and catchability differences. It was also discussed that SST in the higher latitudes may not as closely reflect what is occurring in the water column, as it does in the tropics. Additionally, the seasonal presence of swordfish catches distributed by latitude may be more related to the seasonal movement of the fishing fleet than to the temporal spatial distribution of the stock. Analysis of data from other fleets might help resolve this concern as different fleets operate on different time scales.

The Sub-Committee discussed the utility of adding the AMO into swordfish stock assessments. The Sub-Committee noted that the addition of the AMO in sensitivity runs during the last SWO assessment did not change the status of the stock, but decreased the uncertainty surrounding the determination of the stock status. The recommendation from this body was that appropriate environmental indicators be explored for incorporation into stock assessments in upcoming years. Additionally, the choice of using a running average of the AMO was discussed and it was noted that other oceanographic indicators could be explored.

The Sub-Committee also discussed whether similar patterns were observed in other migratory species and it was noted that bluefin tuna CPUE appear to be undergoing a comparable northern shift, perhaps as a result of range changes in forage fish. Noting that animals are sensitive to changes in temperature, the use of examining CPUEs by area would allow scientists to study varying patterns. However, this would entail examining differences in skipper behavior and fleet strategies.

A presentation was made that provided evidence of climate-driven ecosystem reorganization in the Gulf of Mexico. While the present study was focused on this one particular region, the purpose was to showcase an analysis framework that could be useful for moving forward an ecosystem approach to fisheries management in other regions. In the Gulf of Mexico study, multivariate analyses were carried out on a compilation of over 100 indicators representing physical, biological, and economic aspects of the ecosystem. Results suggest that an ecosystem-wide reorganization occurred in the mid-1990s. Further analysis of fishery landings composition data indicate a major shift in the late-1970s coincident with the advent of U.S. national fisheries management policy, as well as significant shifts in the mid-1960s and the mid-1990s. These latter shifts are aligned with changes in the AMO. Several examples of the emerging understanding of the AMO on the Atlantic Ocean were highlighted. Recognizing the existence of such ecosystem shifts, as well as their potential effects on stock dynamics, are a first step toward accounting for environmental effects in stock assessments.

The discussion following the presentation centered on the feasibility and logistical considerations in enacting a similar exercise in other regions. It was noted the main constraint in building the matrix of indicators was data collection, after the appropriate indictors had been identified. The Sub-Committee noted that some of the raw data was only available through the individual investigators that initially had done the specific research for each indicator. As a result of this, updating certain indicators on an annual basis for management purposes could potentially be problematic. It was noted that this analysis had provided a workable and useful framework for other organizations to use as a starting point.

The process of finding specific indicators was discussed and it was noted that experts in each field were consulted as to what would be the most appropriate and informative indicators. It was noted that there was an optimal number of individual indicators as too many would cause the output to be too unwieldy to be useful and too few would provide a coarser analysis. The initial indicators chosen to represent the Driver, Pressure, State, Impact and Response (DPSIR) framework were eventually split by spatial and intra-annual differences so the data set was larger than initially envisioned. The Sub-Committee urged caution with the regard to the use of landings data from earlier decades as a signal of management effects on the region as management shifts results in changes to an entire fishery rather than individual species and that those landing statistics could be incomplete. Additionally, anthropogenic effects can take many forms, as in the case of changes in market preference and is not always the result of management changes. It was noted that both managed and unmanaged species were included in the analysis to help overcome the former limitation.

The Sub-Committee learned that the report will be updated as conditions and management objectives shift. Consequently, new indicators may have to be selected. It was noted that the indicators provided in the report would potentially be helpful for outside researchers to identify possible patterns and signals in their data. The Sub-Committee recognized that the most useful process would be for managers to set objectives, and indicators could be developed that would best inform management decisions, rather than already having indicators in place and trying to link appropriate objectives to them.

Document SCRS/2014/125 focused on the use of state space construction techniques to make short-term forecasts of recruitment strength in Bluefin tuna stocks globally. A brief introduction of the methods was provided. State space reconstruction techniques are non-parametric and make no assumptions about functional relationships, and therefore are useful for describing environment-recruitment relationships which can be highly nonlinear in nature. The study found that sea surface temperature (SST), which has previously been associated with larval growth and survival rates, can be used to improve one-year ahead forecasts of bluefin tuna recruitment. This result was found for three areas, the Balearic Archipelago (Mediterranean Stock), an area east of Chinese Taipei, and an area within the Sea of Japan (North Pacific Stock). Analysis was also attempted for the Gulf of Mexico spawning stock, but the relatively short time series affected forecast reliability. Importantly, it was also found that state-space reconstruction can provide better forecasts than assuming the recruitment level expected by the stock-recruitment relationship. State-space reconstruction is expected to be useful when recruitment is poorly estimated by traditional methods, including instances where new cohorts have not yet entered the fishery.

The Sub-Committee noted that this was very interesting and could be a helpful approach. The discussion then focused on how far into the future the model predictions could be made. As with many predictive models, predictability begins to degrade the further into the future predictions are made. A concern was raised as to how to calculate the confidence intervals and the presenter noted the author would examine this point.
A clarification was made regarding the inclusion of SST in the forecast, noting that SST offers only slight (but significant) improvements in predictability but this does not indicate that SST is doing most of the driving in the model. Further work is being done on including additional variables such as indicators related to eddy activity, as using SST as a contributor does not preclude other variables from being considered. An analysis of the western Atlantic bluefin tuna stock in the Gulf of Mexico will also be carried out with additional data sources discussed in the meeting.

5. Review the inputs to the Sea Turtle Ecological Risk Assessment (ERA), ensuring the best possible information is available

5.1: Productivity

Productivity information for sea turtles was provided by several CPCs to improve the Sea Turtle Ecological Risk Assessment (ERA) in an effort to increase the potential utility of the ERA in order to inform the Commission on

the impact of ICCAT fisheries on sea turtles. This information was made available to the Sub-Committee with the agreement that the information would not be used for any purpose except as intended (i.e. to parameterize the ICCAT Sea Turtle ERA) without the express permission of the CPC that submitted the data. The Sub-Committee was also made aware of detailed nesting data provided by the International Convention for the Protection and Conservation of Sea Turtles (IAC). We acknowledged the usefulness of this information, and thank the IAC for their generous collaboration.

After reviewing the available data and ancillary information, the Sub-Committee agreed that, at this time, there was insufficient information to proceed with the Sea Turtle ERA. Additionally, there was a discussion that required analysis of submitted data was not a task to be undertaken during this meeting, but best inter-sessionally given the complexities of the disparate data sets. Therefore, the productivity information provided by CPCs was not further evaluated. Susceptibility data, which was also gathered by CPCs, was not discussed at all. However, it will be retained by the Secretariat and should be used (with CPC consent) to inform future analyses.

5.2 Sea turtle Susceptibility

The document SCRS/2014/083 provided information about the Turtle by-catch recorded by the Venezuelan Pelagic Longline Observer Program (VPLOP) sponsored by ICCAT's Enhanced Research Program for Billfish was reported for the period 1991-2013. A total of 99 turtles representing five species were reported, of which the majority were *D. coriacea* (74.75%), followed by *C. mydas* (12.12%), and the remaining three the species (*C. caretta, E. imbricata, L. olivacea*) represented under 10% of the proportion of the turtles caught during the time period analyzed. Total sea turtle BPUE for all years combined in the Caribbean Sea and adjacent Atlantic waters estimated from the VPLOP was 0.002898 sea turtles/hooks×1000. Most of the fishing effort observed was concentrated in the Caribbean Sea during the whole time period, but the spatial distribution of fishing effort was separated into two time periods for the purpose of the present analysis, due to a shift in fishing operations after 1999, when the fleet shifted its target entirely towards tropical tuna species and dropping its swordfish fishing operations after 1999. The spatial distribution of all sea turtles species reported by the VPLOP during the early period, the majority (47) of the sea turtles caught in the Caribbean Sea were where the highest concentration of fishing effort occurred and only several (3) were caught in the Atlantic side; while in the late period, sea turtle by-catch was reduced and spread out in the Caribbean Sea (30), and it was increased in the Atlantic side (16) in areas of higher fishing effort concentration. However, it is noteworthy that regardless of the fact that the observed fishing effort of the Venezuelan longline fleet is concentrated around areas of important sea turtle nesting sites, the by-catch catch rates (BPUE) of sea turtles estimated in this document are low in comparison to other neighboring areas.

In general the BPUE on observed sets was found to be very low. This was despite the fact that part of the observed effort occurred in front of known nesting beaches. This low by-catch rate may have been due to the fact that the observer program did not originally include sea turtle observations as part of its mandate. It was reported, however, that probably 80% of all turtle sightings were recorded despite this lack of mandate. It was suggested that the catches should be raised to address the fact that only observed trips recorded sea turtle interactions.

The SCRS/2014/064 paper describes encounters of five species of marine turtles (*C. caretta, D. coriacea, L. olivacea, L. kempii, C. mydas*) observed during surface longline fishery in North Atlantic areas (10º-30º N / 15º-35º W) in the 1997-2012 period. A total of 544982 hooks were analyzed; 7.5% came from an experimental cruise which had purposely selected this zone to test the effect of different hook and bait types on by-catch rates of marine turtles. The remainder originated from observations made during routine commercial fishing operations. A total of 438 encounters with marine turtles were recorded over the course of these years, either because the animals bit the bait-hook or because they became entangled in the branchlines. Of these, 89% were released alive. The interaction and mortality rates for species, areas and years combined were 8.0E-04 and 9.0E-05 individuals per hook, respectively. These rates were, however, lower when only recordings from regular commercial fishing were considered. It should not be assumed that the resulting rates are representative of or can be extrapolated to other fishing zones.

The presenters noted that the SST interval found during all the sets observed (with or without interaction) ranged between 18º-29ºC. The Sub-Committee acknowledged that overall results were within expectations, corresponding to the temperature range in which the species are encountered. The difficulties in extrapolating the data were acknowledged (i.e. changes in turtle migratory patterns and fleet activities).

In document SCRS/2014/127 presented an update of standardization the BCPUE in loggerhead sea turtle by

Uruguayan and Brazilian longline fleets based on information from the observer programs of both countries between 1998 and 2012. Thirty three percent of the total sets had reported by-catch of loggerhead sea turtles. Thus, to deal with the excess of zeros, the CPUE was modeled by Generalized Linear Mixed Models using a Delta Lognormal approach. The variables used in the model took into account spatial and temporal variations as well as characteristics of the longline. The standardized and nominal loggerhead CPUE series showed similar trends as previous estimations although the time series were updated and some variations in the models were incorporated.

The importance of having more series to try to relate the trends in captures of loggerhead turtles to observed trends of nesting behavior on nesting beaches was noted. It was also suggested that the analysis should be conducted by fleet instead of joining them as information is available for five Brazilian longline series, and one Uruguay series.

A document (Fossette et al. 2014) was presented describing that large oceanic migrants play important roles in ecosystems, yet many species are of conservation concern as a result of anthropogenic threats, of which incidental capture by fisheries is frequently identified. The last large populations of the leatherback turtle, *Dermochelys coriacea*, occur in the Atlantic Ocean, but inter- actions with industrial fisheries could jeopardize recent positive population trends, making by-catch mitigation a priority. Here, we perform the first pan- Atlantic analysis of spatio-temporal distribution of the leatherback turtle and ascertain overlap with longline fishing effort. Data suggest that the Atlantic probably consists of two regional management units: northern and southern (the latter including turtles breeding in South Africa). Although turtles and fisheries show highly diverse distributions, we highlight nine areas ofhigh susceptibility to potential by-catch (four in the northern Atlantic and five in the southern/equatorial Atlantic) that are worthy of further targeted investigation and mitigation. These are reinforced by reports of leatherback by-catch at eight of these sites. International collaborative efforts are needed, especially from nations hosting regions where susceptibility to by-catch is likely to be high within their exclusive economic zone (northern Atlantic: Cape Verde, Gambia, Guinea Bissau, Mauritania, Senegal, Spain, USA and Western Sahara; southern Atlantic: Angola, Brazil, Namibia and UK) and from nations fishing in these high-susceptibility areas, including those located in international waters.

It was noted that a similar presentation was presented to Sub-Committee in 2013. The Sub-Committee acknowledged the importance of the work. It was however noted that it covers just one of the five species to be assessed. Moreover it was observed that most data were comprised of adult females which therefore only reflects the behavior of a particular portion of the population and may not be representative of the population as a whole. It was reported that different levels of aggregation of the data are available and can be presented (by season, quarter or year). The Sub-Committee suggested that presenting the information as catch rates rather than number of interactions would be more useful, but this data is often not available.

A member of the TALCIN group proposed to the Sub-Committee to collaborate on the design of a pamphlet to communicate TALCIN results and ICCATs recommendations to reduce turtle by-catch in the longline fishery. The Sub-Committee noted that ICCAT recognizes the interaction with stakeholders is important. This interaction, however, is needed in a wider context, not at a species specific level. This initiative could thus be discussed with national scientists.

Document SCRS-14-128 presented an initial analysis and some recommendations to adopt appropriated management units to understanding the interactions of marine turtles in oceanic area used by ICCAT's fisheries, mainly longline. For this, was evaluated the feasibility of using Regional Management Units for marine turtles (Wallace et al, 2010), as a methodological basis, for use in an Ecological Risk Assessment for marine turtles planned by the ICCAT SCECO. Despite the RMUs contribute appropriately with the understanding of key aspects of marine turtle populations; this analysis indicates that the marine turtle RMUs does not cover all requirements to define management units to the ICCAT fisheries. Considering that the longline fishing are compose of different kind of fisheries, using distinct fishery strategies and operate in distinct areas, these fisheries interact with marine turtle mixed stocks in foraging and developmental areas. Thus, the authors recommend ICCAT adopt the "Fishery" as the principal concept to define Management Unit (rather than sea turtle RMUs) in order to understand and reduce marine turtle interactions in the ICCAT fisheries.

The Sub-Committee acknowledged this alternate approach to addressing management units for turtle populations and agreed that as ICCAT manages fisheries, a unit based on fleets rather than the previously proposed RMUs may be more appropriate in this context.

ABNJ tuna project - Technical Coordinator Sharks and Bycatch made a brief presentation on a forthcoming FAO

Technical Paper entitled "Bycatch in Longline Fisheries for Tuna and Tuna-like Species: a Global Review of Status and Mitigation Measures". The document contains a chapter on sea turtles and is available at https://wcpfc.int/node/18990.

6. Review the suggestions made in Section 9.3 and 9.4 of the 2013 Sub-Committee on Ecosystems Report and incorporating these improvements where possible/relevant.

After reviewing the available data and ancillary information, the Sub-Committee agreed that, at this time, there was insufficient information to proceed with the sea turtle ERA. However, the recommended improvements (Section 9.3 and 9.4 of the 2013 Sub-Committee on Ecosystems Report) to the preliminary sea turtle ERA (SCRS-13-134) are still considered relevant, and should be used to inform the structure and parameterization of future attempts to develop an ICCAT ERA for sea turtles. Furthermore, ICCAT by-catch data collection forms should retain sufficient detail to support the recommended structure of the ERA, and other by-catch analyses.

7. Provide revised advice based on the updated ERA.

The Sub-Committee reviewed the information compiled and/or provided (from CPCs, contractors and from the literature) to inform the Sea Turtle ERA since our efforts began in 2012.

The Sub-Committee briefly reviewed three documents prepared as a result of the short-term contract awarded to Rui Coelho in 2012. Document SCRS/2012/049 included a review of the literature and data currently available to assess the impacts of ICCAT-fisheries on sea turtle populations, including interactions with ICCAT fisheries and non-ICCAT fisheries that operate within the ICCAT convention area (e.g. trawl and nets). Document SCRS/2012/050 describes information on some of the currently available methodological approaches to analyze interactions and impacts of fisheries on sea turtle populations. The document mostly emphasized methods for standardizing catch/by-catch per unit effort time series. Document SCRS/2012/051 included a review of sea turtle mitigation measures across the five tRFMOs and other fisheries management organizations.

The Sub-Committee also recalled that a preliminary ICCAT Sea Turtle ERA was contracted (SCRS-13-134) and delivered in 2013. A preliminary version of the ERA was reviewed by the Sub-Committee and a comprehensive set of short and long-term recommendations to improve the ERA were elaborated (Sections 9.3 and 9.4 of the 2013 Report). However, the scope of the contract did not permit extensive revisions to the ERA, and the SCRS decided that the results were insufficient to inform the Commission at that time.

Since 2012, the Sub-Committee has also received a significant number of documents and datasets from CPCs that pertain to sea turtle by-catch, by-catch rates, by-catch mortality, safe-release protocols, by-catch mitigation techniques, productivity parameters (e.g. nesting data, age of reproduction), susceptibility (e.g. intercepts by size, depth, time of day, disposition of intercepted turtles). As a whole this body of work represents a significant contribution to the Sub-committee's effort to assess the impact of ICCAT fisheries on sea turtles.

Nevertheless, after reviewing the available data and ancillary information, the Sub-Committee agreed that at this time, there was insufficient information to improve the sea turtle ERA developed in 2013. Consequently, the Sub-Committee agreed that at the present time, an ERA for sea turtles, in isolation, was not the most appropriate tool to assess the impact of ICCAT fisheries on sea turtles. Therefore, the Sub-Committee agreed on a plan to continue to assess the impact of ICCAT fisheries on sea turtles pursuant to [Rec. 10-09]. Specifically, the Sub-Committee proposes to:

1. Complete draft by-catch data collection forms and support their adoption.
2. Update EFFDIS for longline gear, and facilitate the development of similar products for the other major gear types.
3. Compare by-catch rates of ICCAT fisheries to the spatial distribution of effort by major gear types
4. Develop "best practice" guidance for the extrapolation of total by-catch.
5. Continue to evaluate approaches used to conduct impact assessments for by-catch species.
6. Continue to evaluate by-catch mitigation techniques and safe release practices, and recommend revisions to management regulations if warranted.
7. Collect and review data for future impact assessments. Specifically on:
    a. By-catch rates
    b. Total extrapolated by-catch
    c. Post-release mortality and methods of estimation Size composition

The Sub-Committee will continue to advise the Commission when new information becomes available with regard to the impact of ICCAT fisheries on sea turtles.

8. Review seabird by-catch mitigation measures as described in Rec 11-09

Reid et al. (2013) presented data on the non-breeding distribution of the Critically Endangered Tristan albatross, a species identified as high risk under the ICCAT seabird assessment. This fills a previous data gap. Non-breeding birds ranged further than breeding birds. Most (86%) non-breeding distribution was in the South Atlantic, but it extended across the southern Indian Ocean. Birds were also distributed in the Atlantic east of 0°E and between 25°S to 15°S, an area not covered by Rec 11-09. These new tracking data, and other new tracking data held in the Global Procellariiform Tracking Database would be useful to feed into the planned review of Rec 11-09.

Document SCRS-14-121 discussed that the five tuna regional fishery management organizations (RFMOs) have established requirements for their pelagic longline vessels to use seabird by-catch mitigation measures in most areas overlapping with albatrosses, petrels, and other seabirds impacted by by-catch, and have plans to monitor and review the effectiveness of these measures. However, methodologies or criteria for undertaking such reviews have not yet been defined. This paper summarizes the preliminary views of an ACAP (Agreement on the Conservation of Albatrosses and Petrels) intersessional group that has been formed to discuss what the minimum elements may be for such reviews. This paper recommends the following four elements should be part of monitoring the effectiveness of the seabird conservation measures adopted by ICCAT in 2009 (Rec 11-09):

1. The extent to which the tuna RFMO seabird conservation and management measure(s) reflects 'best practice' for pelagic longline fisheries, and has appropriate spatial, temporal and vessel application.
2. The availability and quality of the data available for the review.
3. The degree of implementation by vessels (compliance).
4. Analysis and monitoring of seabird by-catch levels over time, most likely including
    a. Reported by-catch rates (birds per 1000 hooks)
    b. Total number of birds killed per tuna RFMO per year

In addition, the paper recommends adoption of harmonized review methods across tuna RFMOs, in addition to ongoing efforts to harmonize tuna RFMO by-catch data collection, reporting and storage mechanisms.

The Sub-Committee noted that paragraph 8 of Rec 11-09 requires the SCRS to conduct a review in 2015 of the efficacy of Rec 11-09. It also noted that, since Rec 11-09 came fully into force in July 2013, a 2015 assessment would only be able to use one full year of data, which was unlikely to be adequate. However, it was agreed that there was useful work that should be started in 2015.

It was agreed that, in addition to the elements outlined in SCRS 2014/121, the process to develop the methodology for the review should include the identification of candidate indicators that can be used to monitor progress. It was also noted that a review will need to consider gaps and limitations in the levels of observer coverage, and the review would need sufficient flexibility to account for this.

It was agreed that the key elements to be progressed in 2015 should be:

- Review the extent to which the by-catch mitigation requirements in Rec 11-09 reflect current best practice for pelagic longline fisheries, and the spatial, temporal and vessel applicability of Rec 11-09
- Request and review new data on seabird by-catch rates
- Develop indicators for monitoring Rec 11-09 over time
- Update the EFFDIS database

SC-ECO noted that Rec 11-09 and Rec 10-10 require CPCs to collect and report data on seabird by-catch and by-catch mitigation measures, and that these data are essential for the review of Rec 11-09. It was also noted that the observer data submission forms being developed by the ICCAT Secretariat will provide a mechanism to report the necessary data that will form part of the review. Paragraph 7 of Rec 11-09 requires CPCs to collect and report data to the Secretariat on how they are implementing the required mitigation measures. Since these data relate to compliance, the Secretariat collates these data and submit them to SC STAT and the Commission

for review.

The Sub-Committee recognized the trans-oceanic habitat of some seabird species, which necessitates evaluation of mitigation effects across ocean basins and through collaboration with other tRFMOs. The Commission for the Conservation of Southern Bluefin Tuna (CCSBT) is holding a workshop in November 2014 to develop review methods. Scientists from outside of CCSBT, including members of the ICCAT SC-ECO, have been invited to attend. The Sub-Committee highlighted the value of ensuring linkages between the CCSBT workshop as a mechanism to consider trans-oceanic scale analysis, and the process to develop the ICCAT review, and recommended that the By-catch Co-ordinator attend the workshop. It was agreed that outputs of the CCSBT workshop should be considered in the process to develop ICCAT's seabird review process.

9. Observer forms

Document SCRS-14-099 pointed out that the number of species being reported to the ICCAT Secretariat is increasing annually due to an increased focus on by-caught species. As such it has been necessary to revise and update the ICCAT list of species to accommodate these changes as well as to take into account updated taxonomic revisions. This document provides an updated list of by-catch species along with associated reporting codes. It is the intention of the ICCAT Secretariat for the Standing Committee on Ecosystems and By-catch to discuss the revisions and approve and official list for use in the ICCAT statistical databases.

It was requested that the Species list should be revised by members of the Sub-Committee and that any suggested revisions should be conveyed to the Secretariat prior to the 2015 SCECO meeting. It was also agree by the Sub-committee that it is often difficult to identify seabirds to the species level. As such it was requested that the forms also cater for the submission of data at a lower taxonomic resolution.

The Secretariat introduced newly developed observer data reporting forms for:

1. Seabird and Sea turtle interactions
2. Catch and effort data including vessel information, fishing characteristics, biological data, and tagging (Appendix 5).

The Sub-Committee reviewed the forms and discussed issues related to how these forms could accommodate the reporting of both aggregated and non-aggregated data.

The Sub-Committee recognized that there was an overlap between the seabird-sea turtle forms and the more complete observer data forms and, therefore, the use of all these forms would result in double reporting. Hence, the Sub-Committee proposed only to use the more complete observer data form.

It was made clear that the forms in their current format are just a way for CPCs to report data and the intention is not to prescribe or limit the information that can be collected by the different national observer programs. The Sub-Committee discussed that the observer forms require highly detailed information and that many CPCs will be unable to report on every single requested field. Furthermore, the Sub-Committee expressed some concerns that the high level of detailed information that is being requested might result in the reporting of low quality data. It was agreed that the forms will be revaluated in 3 years and that, based on the gained experience and reported data, they will be changed and simplified if necessary.

The Sub-Committee also discussed if the reporting of aggregated data will hamper the ability of the SCRS to conduct analysis of the reported observer data. The Sub-Committee was in agreement that detailed analysis of observer data should preferably be conducted by national scientists and that the goal of these forms was to comply with the Commission's request that observer data be reported by CPCs to the Secretariat. However, this does not preclude the SCRS from using these data for stock assessment and by-catch review purposes. Concerns were raised that country's data confidentiality rules might limit certain CPCs ability to report data for some specific strata. It was acknowledged that even though this is a very real possibility, the Commissions' recommendation takes into consideration data reporting restrictions that can result from CPCs data confidentiality rules.

The Sub-Committee provided a series of recommendations to improve the current version of the form like including figures of the different gear types identifying the different gear sections/parts for which information is being requested, and, where appropriate, include drop-down menus to facilitate the understanding and provision of the required information.

Finally, the Sub-Committee agreed to present these forms with the suggested changes/improvements to the SCRS for their adoption. Once the forms are formally approved, the Subcommittee strongly suggests that CPCs use these forms to report both current and historical observer data.

10. Other Matters

The ABNJ Tuna Project – Technical Coordinator Sharks and By-catch, introduced the Areas Beyond National Jurisdiction (ABNJ) Tuna Project which is a GEF (Global Environment Facility)-funded, FAO-implemented programme of work designed to maintain the sustainability of tuna fisheries and protect biodiversity. The project focuses on partnerships of RFMOs, private sector and civil society organisations to support the work of the t-RFMOs in the spirit of the Kobe process of global collaboration. There are 19 partners in the project including all of the t-RFMOs, and the project represents a 30 million USD contribution from GEF alongside a commitment of 150 million USD co-financing from partners. The project is structured around three components: i) supporting the systematic application of a precautionary approach and an ecosystem approach; ii) reducing IUU fishing and improving compliance, and iii) mitigating adverse impacts of by-catch on biodiversity. With regard specifically to ICCAT's participation in the project, discussions are underway regarding ABNJ tuna project funding for development of ICCAT's electronic catch documentation system, and ABNJ tuna project funding has supported the management-science dialogue held by ICCAT on 26-28 May.

The ABNJ Technical Coordinator Sharks and By-catch drew participants' attention to two specific opportunities for ICCAT to access funds for activities under the ABNJ tuna project framework. The first involves the implementation of the ecosystem-based fisheries management principle within ICCAT. FAO will initiate work in this area by preparing a guidance document which will describe principles and approaches. ICCAT is invited to participate in this effort, for example to contribute to and/or review the document, and then potentially to formulate a proposal to implement some of the principles or approaches within ICCAT management systems. The second opportunity involves accessing ABNJ tuna project funds to support by-catch mitigation workshops at which confidentially-held data can be contributed to a joint analysis while data ownership is maintained, with only the results of the workshops made publicly available. If ICCAT is interested in organizing such a workshop, for example for sea turtles, the ICCAT Sub-Committee on Ecosystems is encouraged to work with the ABNJ Technical Coordinator for Sharks and By-catch to develop a proposal. The relationship between the activities of the Kobe Technical Working Group-By-catch, chaired by Simon Nicol, and the planned work of the ABNJ Tuna Project were highlighted. More information on some of the shark and by-catch components of the ABNJ Tuna Project, and the connection between these components and the Kobe TWG-By-catch activities is available at https://wcpfc.int/node/19021.

The Sub-Committee asked for further clarification on how the topics of the ABNJ workshop would be decided and what the Sub-Committee would need to do to obtain funding to hold the workshops as ICCAT meetings. The ABNJ Technical Coordinator Sharks and By-catch explained that if interest can be noted in the meeting report that she could work with the Secretariat to put forward a proposal. Sub-Committee members considered that this represents an excellent opportunity.

The Sub-Committee also reviewed a document (SCRS/2014/124) that summarized information on reflex impairment as a measure of delayed mortality in a tuna purse-seine by-catch species, and in particular the grey triggerfish (*Balistes capriscus*). The use of fish aggregation devices (FADs) in tropical tuna fisheries can lead to inadvertent capture of several teleost species, including several members of the family Balistidae, that are released as discards from fishing vessels. To reduce ecosystem effects of fishing, managers aim to minimize mortality of these discards. Measurements of blood plasma parameters are often used to estimate delayed mortality in discard species but this method can have inconsistent results. By contrast, reflex impairment as a measure of fish condition, has been used to predict delayed mortality in several fish species. *Balistes capriscus*, a commonly discarded species in the tropical tuna purse seine fishery, was collected in near-shore Miami waters and held at the University of Miami Experimental Hatchery. Baseline reflexes were measured and fish were exposed to air in 4 minute intervals to simulate stress experienced during capture. Reflexes were quantified immediately following stress treatments and fish were held for 7 days to observe if delayed mortality occurred. Significant reflex impairment was observed after 8, 12, and 16 min of air exposure. Delayed mortality was recorded after 8 and 16 minutes of air exposure. The relationship between air and reflex impairment was significant as was the relationship between reflex impairment and mortality. A Bayesian logit model was also developed to predict mortality in fish given both air exposure and impaired reflexes using uninformative priors.

The Sub-Commitee acknowledged the work conducted to assess delayed mortality rates for this by-catch species and the utility of applying this approach to other by-catch species where applicable. It was also noted that

additional field trials will be conducted on board a Spanish purse seiner in the Gulf of Guinea.

The Sub-Committee also reviewed the sea turtle by-catch mitigation recommendations as proposed in 2013 and adopted by the Commission [Rec. 13-11]. The Sub-Committee agreed that the present by-catch mitigation measures [Rec. 13-11] are an improvement over the previous guidance [Rec. 10-09], and are acceptable at this time. The Sub-Committee discussed whether mandating the use of basket-lifts to haul large turtles from the water and remove non-swallowed hooks could reduce indirect mortality in comparison to cutting the line as near to the hook as possible without removing the turtle from the water. However, the Sub-Committee acknowledged that the large baskets required may not be practical on smaller vessels. Furthermore, the Sub-Committee agreed to continue to review and improve recommendations for by-catch mitigation as new information becomes available.

Lastly, the Sub-Committee reevaluated its committee structure given the increased demand for advice pertaining to EBFM and by-catch topics. The Sub-Committee agreed that its current structure be retained for the time being, but recognized that the increased work load may soon require new approaches including:

1) Inter-sessional work to encourage submission of documents and data pertaining to the agenda.
2) Longer meetings
3) Concurrent but separate meetings, or break-out sessions.

11. Recommendations

1. Consistent with the recommendation by the Working Group on Stock Assessment Methods (and other WGs), the use of conventional environmental factors should be explored and incorporated when appropriate in assessments of stocks.
2. An update of the EffDIS dataset is critical. Many tasks have been assigned to the SCRS which are reliant on this dataset, especially with regard to by-catch evaluations.
3. Investigate the best ways for extrapolating and raising by-catch data. This may require several different methods according to the quality of available data. CPCs are requested to provide documents explaining how they raise their by-catch data.
4. Summarise the existing information on by-catch rates of sea turtles by the PS fisheries (including incidental FAD entanglement).
5. Develop a strategic research plan for the SC ECO in accordance with the SCRS strategic plan.
6. The ICCAT By-catch coordinator will liaise with other tRFMOs to collaborate on seabird issues. This collaboration should include his participation at the November 2014 seabird meeting of the CCSBT SMMTG.
7. In accordance with the provisions of the proposed 2015-2020 SCRS Strategic Plan the SCECO recommends to enhance the Ecosystem Approach to Fisheries Management (EAFM) advice using the opportunity provided by the ABNJ tuna project.
8. Continue collaboration with the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) on matters of mutual interest and benefit.
9. The newly created observer data collection forms have now been approved by the Sub-Committee. CPCs are obliged to use these new forms to report their by-catch data (Rec 10-10) for use by the SCECO once they have been approved by the SCRS.
10. The conceptual management objectives on EBFM developed by the Sub-Committee should be presented to the 2015 meeting of Standing Working Group to enhance the dialogue between Science and fisheries Managers (SWGSM) in order to explain the importance of these considerations and to receive input from the commission.
11. The SCECO will develop a workplan for a potential workshop on by-catch species to be submitted to the ABNJ tuna project as a candidate proposal for a funded workshop.
12. Continue to participate in the KOBE Process (TWG-By-catch) efforts to harmonise data collection from observer data programmes.

12. Adoption of the report and closure

The report was adopted during the meeting. The Conveners thanked IPMA, the Secretariat and participants for their hard work.

The meeting was adjourned.

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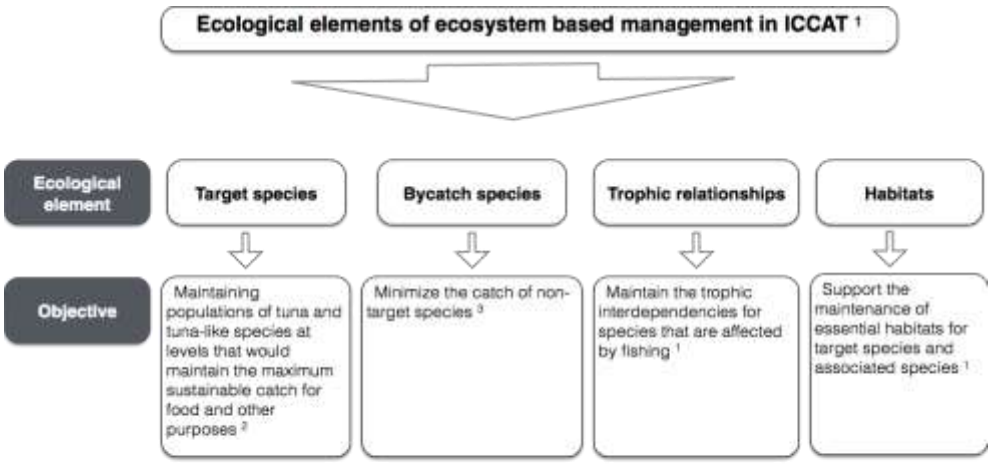

Figure 1. Ecological elements of ecosystem based management in ICCAT.

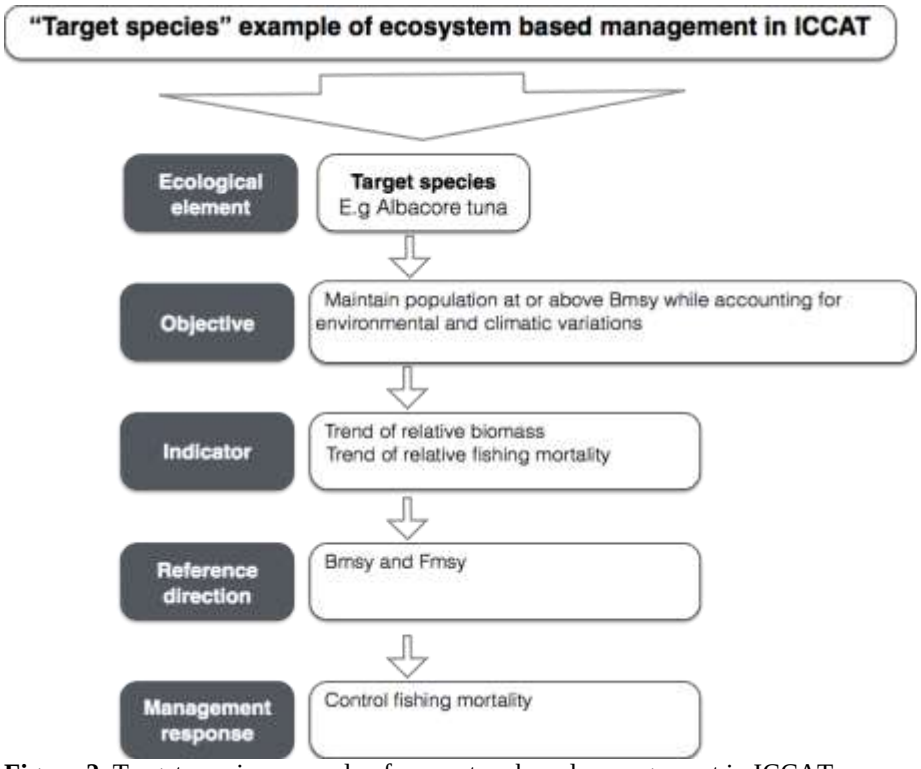

Figure 2. Target species example of ecosystem based management in ICCAT

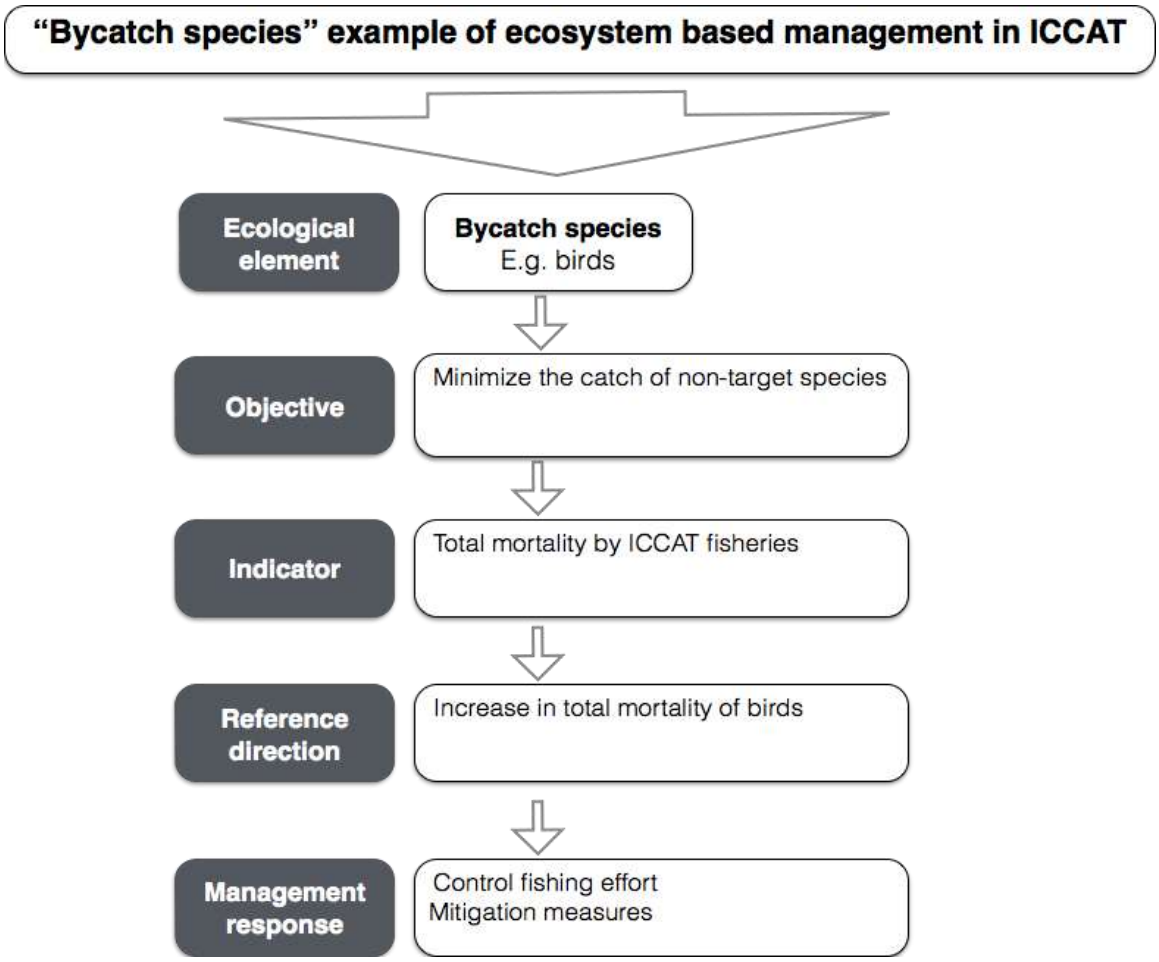

Figure 3 Bycatch species example of ecosystem based management in ICCAT

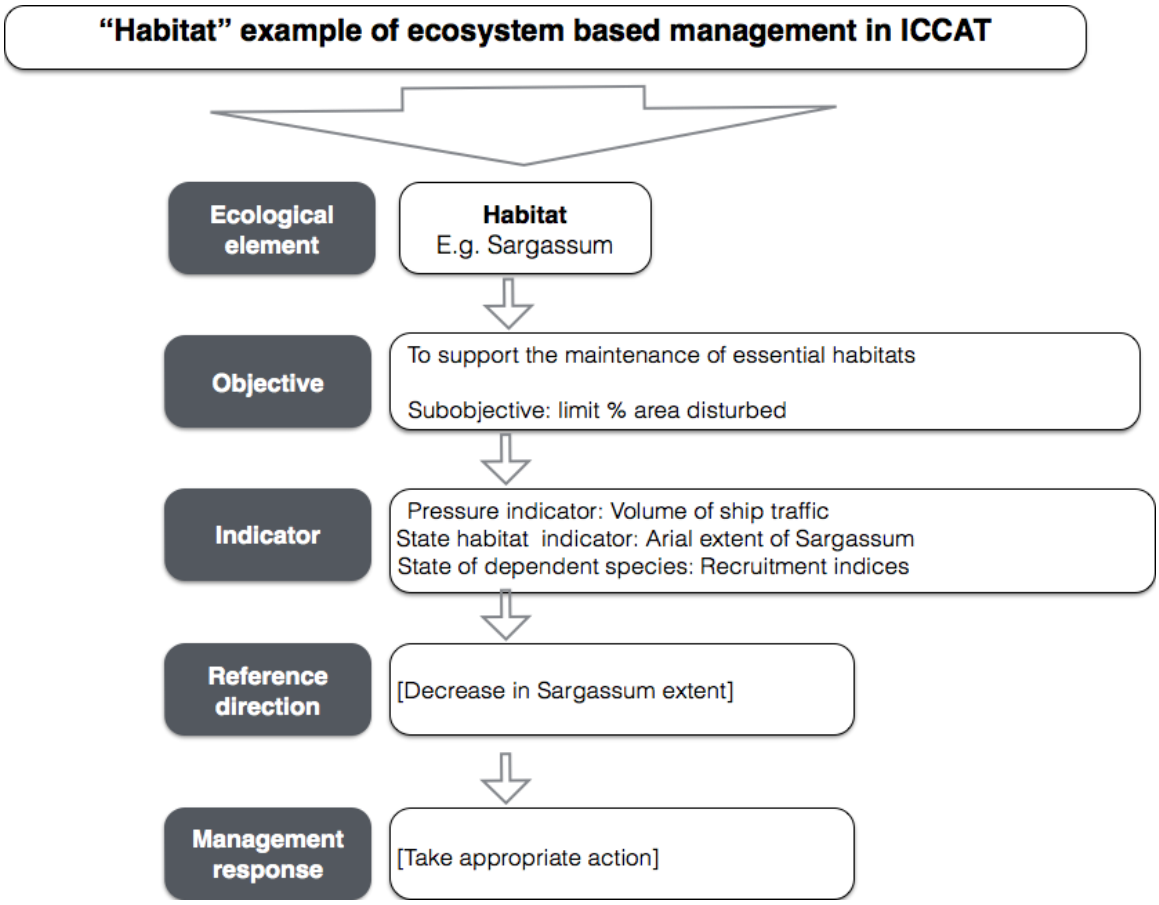

Figure 4 Habitat example of ecosystem based management in ICCAT

Appendix 1

2014 Inter-Sessional Meeting of the Sub-Committee on Ecosystems
(*Olhão, Portugal, 1-5 September 2014*)

Agenda

1. Opening, adoption of Agenda and meeting arrangements

Part I: Ecosystem

2. Assess the importance of the Sargasso Sea ecosystem to ICCAT species as per Resolution 12-12.
3. Review the progress that has been made in implementing ecosystem approaches in enhanced stock assessments (e.g. multispecies models) or EBFM.
4. Explore environmental factors that affect the global distribution of highly migratory fish and their productivity.

Part II: By-catch

5. Review the inputs to the ERA, ensuring the best possible information is available on:
   - 5.1 Productivity
     - 5.1.1 Population size, recent population trends
     - 5.1.2 Maximum age, age at reproduction
     - 5.1.3 Reproductive characteristics
     - 5.1.4 Survivorship/Natural Mortality
   - 5.2 Susceptibility
     - 5.2.1 Horizontal and vertical distribution of species
     - 5.2.2 Horizontal and vertical distribution of fishing gears
     - 5.2.3 Selectivity/length frequencies,
     - 5.2.4 Post-capture mortality
6. Review the suggestions made in Section 9.3 and 9.4 of the 2013 Sub-Committee on Ecosystems Report and incorporating these improvements where possible/relevant.
7. Provide revised advice based on the updated ERA.
8. Review seabird by-catch mitigation measures as described in Rec. 11-09.
9. Observer forms
10. Other matters
11. Recommendations
12. Adoption of the report and closure

Appendix 2

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Appendix 3

LIST OF DOCUMENTS

SCRS/2014/064	Sea turtle encounters in the surface longline fishery in North Atlantic areas: 10º-30º N / 15º-35º W. García-Cortés B., Ramos-Cartelle A., Carroceda A. and Mejuto J.
SCRS/2014/083	Turtle by-catch in the southeastern Caribbean Sea and adjacent Atlantic waters caught by Venezuelan pelagic longline fishery: period 1991-2013. Arocha, F., Marcano L. and Silva J.
SCRS/2014/099	Updated Species List for By-Catch Caught in ICCAT Fisheries . de Bruyn P. and Palma C.
SCRS/2014/119	Analysis of ICCAT reported catches of tunas and swordfish in the Sargasso Sea (1992-2011). Luckhurst B.E.
SCRS/2014/120	A preliminary food web of the pelagic environment of the Sargasso Sea with a focus on the fish species of interest to ICCAT. Luckhurst B.E.
SCRS/2014/121	Preliminary identification of minimum elements to review the effectiveness of seabird bycatch mitigation regulations in tuna RFMOs. ACAP Intersessional Group (Contributors: C. Small, A. Wolfaardt, G. Tuck, I. Debski, W. Papworth, Mi Ae Kim)
SCRS/2014/122	Foraging range and habitat associations of non-breeding Tristan albatrosses: overlap with fisheries and implications for conservation. Timothy A. Reid, Ross M. Wanless, Geoff M. Hilton, Richard A. Phillips, Peter G. Ryan
SCRS/2014/124	Reflex impairment as a measure of delayed mortality in a tuna purse-seine bycatch species, grey triggerfish (Balistes capriscus). Forrestal F.
SCRS/2014/126	Preliminary Review Of Iccat And Iattc Progress In Applying An Ecosystem Approach To Fisheries Management. Maria José Juan-Jordá, Haritz Arrizabalaga, Nicholas Dulvy, Andy Cooper and Hilario Murua
SCRS/2014/127	Update of standardized catch rates of loggerhead sea turtles, caretta caretta, caught by uruguayan and brazilian longline fleets (1998-2012).Maite Pons, Bruno Giffoni, Gilberto Sales, Philip Miller and Andres Domingo
SCRS/2014/128	Management Units: Challenges To Promote Understanding And Conservation Of Marine Turtles In Oceanic Areas. Gilberto Sales, Mariana Britto, Fernando N. Fiedler, Bruno Giffoni, Andrés Domingo, Nilamon Leite, Philip Miller

Appendix 4

Response to Resolution 12-12 regarding the ecological importance of the Sargasso Sea to tuna and tuna-

like species and ecologically associated species

The Group was requested by the Commission (Res. 12-12) to examine the available data and information concerning the Sargasso Sea and its ecological importance to tuna and tuna-like species and ecologically associated species. Working paper SCRS/2013/132 provided an inventory and ecology of 16 fish species of interest to ICCAT in the Sargasso Sea. This work has been summarized as a table that relates important life history parameters of ICCAT species to their dependence on the Sargasso Sea ecosystem. Working paper SCRS/2014/120 provided a preliminary pelagic food web for the Sargasso Sea ecosystem that illustrated the dependencies of the ICCAT species on common prey species like squid, and also flying fishes, which use Sargassum as a reproductive habitat. Finally, SCRS/2014/119 summarized the annual removals by species from the Sargasso Sea relative to total removals from the relavent stock of each species. Based on these contributions, the Group prepared a workplan to continue assessing the importancr of the Sargasso Sea in respose to Resolution 12-12

Appendix 5

Proposed observer data collection forms

1) Vessel information Tab

VesselID	Vessel type	Home port	Main fishing gear	Gross tonnage	Length	Blast freezer capacity	Fish Storage Capacity	Acoustic equipment	Position fixing equipment	VMS type	No. of screws

2) Trip Information Tab

Vessel ID	Cruise ID	Operation ID	Fishing Captain	Number of crew	Flag state	Depart Date	Depart Port	Return Date	Return Port	Quarter or month (For aggregated submissions)	No. Of days in fishing area	No. of trips (Aggregated submissions)	No. Of days fished	Searching days	Target species	No of sets/drifts	No. Of hooks/panels	No of sets/drifts observed/sampled	No. Of hooks/panels observed/sampled	Number of null sets or hauls	Accompanying vessel (Y/N)

3) Fishing Activity Tab

a) General

Flag state	Operation ID	Cruise ID	Main fishing gear	Haul/set number	Year	Fishing quarter or month (For aggregated submissions)	Month	Day	Location Stratification (1 x 1, 5 x 5 or other)	Geo position start (Exact coordinates or square ID)	Geo position end (Exact coordinates or square ID)	Start time of set	End time of set	Trans-shipment activity

b) Longline

Type	Line setter (Y/N)	Bait casting machine (Y/N)	Line Hauler (Y/N)	Mainline material	Mainline length	Mainline diameter	Total no. of sets (1 if set by set information provided)	Total no. Of hooks deployed	No. Hooks per basket	Hook type	Hook size	Branch line number	Branch line material	Branch line diameter	Leader number	Leader material	Leader diameter	Mitigation measures

c) Purse seine

Max net length	Power block make and model	Stretched mesh size	Supply vessel (Y/N)	Number of speedboats	Helicopter present (Y/N)	Supply vessel name	Purse winch make and model	No. Of buoys per type at embarkation	Mitigation measures	Total no. of sets (1 if set by set information provided)

4) Harvest details

Operation ID	Species ID	Catch Number	Catch Weight	Discard alive	Discard dead

5) Biology

SpecimenID	Species ID	Operation ID	Length	Length Type	Length Unit	Weight	Weight type	Condition (dead, alive)	Released (Y/N)