2013 INTER-SESSIONAL MEETING OF THE SUB-COMMITTEE ON ECOSYSTEMS

(Madrid, Spain – July 1 to 5, 2013)

1. Opening, adoption of Agenda and meeting arrangements

The Meeting was held at the offices of the ICCAT Secretariat in Madrid, Spain from July 1-5, 2013. On behalf of the ICCAT Secretariat, Dr. Paul de Bruyn welcomed the group. The Sub-Committee on Ecosystems Co-Conveners, Dr. Shannon L. Cass-Calay (USA) and Dr. Alex Hanke (Canada) then described the objectives and logistics of the meeting. The Agenda was adopted with 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*
Items 1, 10-11, 14	S. Cass-Calay
Items 2-5	A. Hanke
Item 6	A. Hanke, P. de Bruyn,
Item 7	P. de Bruyn
Item 8	A. Domingo, B. Giffoni
Item 9	T. Nalovic, P. de Bruyn
Item 12	T. Trott
Item 13	J. Pereria

Part I: Ecosystem

The agenda as adopted by the Group included three sections considered significant to the process of implementing an EBFM approach for which no new information was provided. These sections were 2, 3 and 4 and were entitled respectively: a) Review of new information on the implementation of ecosystem effects in enhanced stock assessments; b) Review of new information on models that quantify ecosystem dynamics and predict the impact of perturbations on its components; and c) Review of new information on models that quantify ecosystem dynamics and predict the impact of perturbations on its components.

It is not clear why there was a lack of participation in this section but the Group felt it may have something to do with the limited capacity by CPCs to participate in this sub-committee. Alternatively, we may lack the expertise in the SCRS to fully participate in this branch of science. The Group recommends that this be integrated in the strategic plan of the SCRS in the future so that we might increase the capacity to deal with the demands of developing the tools that will allow the implementation of the EBFM approach.

Section 5. Review new information on the implementation of ecosystem based management principles

Document SCRS/2013/137 covered the Ecological risk assessment (ERA) as a method for tracking the implementation of an ecosystem approach to fisheries (EAF) management in southern Africa (the Namibian experience).

The ERA method, which is qualitative, has the support of southern African countries (Namibia, South Africa and Angola) through the Benguela Current Commission (BCC), with the assistance of WWF-South Africa and FAO EAF Nansen project. The method was chosen as it is simple and has structured guidelines for tracking EAF implementations. ERA helped in identifying issues and prioritizing them. The method provided clear objectives and issues for some of the fisheries in the Benguela Current Region.

Steps required towards addressing issues/risk are recommended and regular reviews are needed to assess whether progress is being made in addressing the issues. One advantage of the ERA approach is that the method can aid consensus on different issues from a diversity of stakeholders. A total of six (6) Namibian fisheries were assessed using this methodology and 4 ERA -reviews were conducted.

The Group was interested in the new approach and recognized that the author could provide valuable guidance with respect to the unpacking exercise initiated during the meeting and reported on in section 7. Continued collaboration with the representatives of the Ministry of Fisheries and Marine Resources of Namibia is recommended.

6. Review progress on the development of a test case for implementing ecosystem based fishery management

Document SCRS/2013/132 provided information on the biology and ecology of a total of 18 different fish species whose distributions include the Sargasso Sea. These species are divided into four groups that 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, Atlantic black skipjack tuna (Little Tunny) and dolphinfish, and Group 4 – Sharks including shortfin mako, blue shark, porbeagle, bigeye thresher and basking shark. For each species, information and data was provided on distribution, fishery landings, migration and movement patterns, reproduction, age and growth, food and feeding habits and ecology in relation to oceanographic parameters, primarily water temperature. The importance of Sargassum as essential fish habitat was discussed and was linked to the feeding habits of tunas and other pelagic predators. Flying fishes are an important prey species in the diet of tunas and billfishes and, as they are largely dependent on Sargassum mats as spawning habitat, the Sargasso Sea plays a fundamental role in the trophic web of highly migratory, pelagic species in the northwest Atlantic. An evaluation of existing information suggests that the importance of the Sargasso Sea to various pelagic species rests mainly with its status in relation to one or more of the following: migratory route, spawning area, nursery area, feeding area, overwintering ground or pupping area.

The group noted that ICCAT Resolution 12-12 on the Sargasso Sea states:

> 1. The SCRS will examine the available data and information concerning the Sargasso Sea and its ecological importance to tuna and tuna-like species and ecologically associated species.
> 2. The SCRS will provide an update on the progress of this work in 2014 and report back to the Commission with its findings in 2015.

Regarding point 1, a preliminary review of available data and information from the Sargasso Sea habitat including tuna and other ICCAT species catches has been provided and so studies on the importance of this region can be initiated. The group noted that a more extensive research of this ecosystem and its importance as essential habitat for tunas and tuna-like species would require an integrated collaboration of the SCRS with scientific groups specializing in the Sargasso Sea. The Group concluded that in order to accomplish objective 2, it would require a work plan, collaborative research and meetings to properly assess the importance of the Sargasso Sea as essential habitat for ICCAT tuna species. The Group felt that this task would not be accomplished before 2015. The Group recommends continuing the contact with Sargasso Sea research teams and the UK-Bermuda scientists to develop a scientific collaborative plan to accomplish objective 2 of Res [12-12]. Additionally, the Group recognized that the above work is providing a useful foundation for adopting this region as a basis for a case study in implementing the Ecosystem Based Fisheries Management (EBFM) approach within ICCAT and this collaboration should continue to be supported.

The Group was requested by the Rapporteur to determine how we might address point 1 of Resolution 12-12. Working paper SCRS/2013/132 provided a 46 page inventory and ecology of fish species of interest to ICCAT in the Sargasso Sea. With a view to being able to assess the relative significance of this ecosystem to ICCAT species, the Group asked that the detail of the report be reflected in a table that relates important life history parameters to their dependence on the Sargasso Sea ecosystem. As an exercise the Group determined the relevant parameters and evaluated each species dependencies using a presence/absence scoring system. **Table 1** represents a preliminary assessment of the importance of the ecosystem and is also intended to be the basis for a more quantitative evaluation of the data. It was recommended by the Group that those future evaluations:

1. Reflect the absence of information.
2. Clearly define the component of each species (population or stock management unit) the assessment applies to.
3. Define a rational scoring system for each of the parameters and map them to a common scale.
4. Characterize each of the life history parameters used.
5. Show catch of each species within the area relative to its catch in the management unit that encompasses it.

7. Discuss ways of including ecosystem values in the standardization and assessment of ICCAT assessed stocks.

The Rapporteur of the Ecosystem Based Fisheries Management (EBFM) sub-group of the SC-ECO provided the Group with a presentation that outlined a methodology for developing a sustainable development reporting system. The reporting system is part of an ecosystem based fisheries management framework and it explicitly links the conceptual objectives of management to operational objectives. The methodology translates conceptual objectives into operational objectives through a process termed unpacking. Unpacking involves subdividing higher order conceptual objectives into its components and further subdividing the components until an operational objective can be defined. The operational objective is then associated with a measurable indicator and reference point to facilitate reporting and provoking management action. It was shown how these status indicators could be part of an indicator system that is more explicit about the nature of the management action.
The sub-committee observed that it would be beneficial for the SC-ECO to obtain some guidance on operational objectives from the Commission. It was noted that The SCRS strategic plan is a form of unpacking procedure. This more detailed unpacking could be framed within that process including strategies of how to accomplish the various tasks identified to operationalise EBFM. The SCRS needs to ascertain what information is currently available and how it can be used in an EBFM context. The potential use of the Sargasso Sea as a case study is promising as it provides an example on how to structure the work in order to inform the Commission. It was again noted that dialogue with the Commission is fundamental to the process although the process can be initiated in the interim, with the SCRS explaining its proposed methodology and plan to the Commission (including data needs).

The group decided to conduct an example in unpacking using a template provided by the Rapporteur of the Ecosystem Based Fisheries Management (EBFM) sub-group. The template was re-organised and modified to suite the specific needs of ICCAT regarding the unpacking procedure. It was stressed that this was an exercise to familiarise the SC-ECO with the process. Much more in depth analysis and modification of the template would be necessary to obtain a finished product suitable for informing the Commission. This initial unpacking exercise is included in **Appendix 4**.

There was some discussion following this exercise as to whether it should be conducted generically for the whole ICCAT area, or using a case study (Sargasso Sea). For this initial exercise it was decided that it should be generic for ICCAT species rather than the Sargasso Sea only, as although this may mask the complicated nature of the study, it could provide a generic framework for considering EBFM in the ICCAT context.

On conducting the exercise, the SC-ECO made several observations regarding the process.

1) Resolving community level components is fairly complicated. In this example the group decided to move on to the species level components.
2) Populating the species list should be prioritised based on ICCAT species of interest. This will be an ICCAT management issue after all. Although non-ICCAT species must be considered, they can be brought in at a lower level.
3) It must be considered that other RFMOs are also involved in the management of fish stocks in the region (e.g. NAFO).
4) The difficulty/complexity and time required in conducting this unpacking exercise was noted and it was acknowledged that if a workshop or working group was needed to conduct this work for management purposes, it could require significant time and effort.
5) It was noted that several terms used in the template, such as “Maintain population diversity” need to be rephrased to better fit the ICCAT situation. The term “unpacking” was also noted as being new to many participants. Rather than using terms such as “maintain” or “conserve” it was suggested that it may be better to try to “understand” or “monitor” these factors. This is especially relevant for factors over which management would have little or no control, such as environmental factors.

Due to the difficulty in running through the unpacking exercise in plenary, the group was later asked to send comments on the unpacking exercise to the rapporteur of the group who incorporated these comments into a table.

The following additional observations were made on the exercise:

- The unpacking can’t be developed in a general way. It needs to be separated on a regional basis.

- The exercise needs to focus on EBFM. Integrated management is too broad a starting point and the scope needs to be limited so that it does not stray too far from EBFM.
- Link local issues to national and international vision to have the support of the stakeholders and public
- Identified missing aspects related to fisheries not accounted for in the exercise
    - Collection of bait
    - Loss of gear
    - Garbage
- The word usage does not capture the dynamic nature of the ecosystem. It applies static terms to describe an objective when the system is dynamic.
- The list of indicators must be concise, justified and include reference points to guide management. The framework must be easy for managers to deal with.
- Missing Components;
    - Biophysical
    - Socioeconomic
- Framework must be adaptive.
- The framework must deal with the uncertainty in the management of the objectives.
- It must recognize that we control the human impacts not the ecosystem.
- Involvement of appropriate experts where expertise is lacking is crucial in developing the framework. To this end, it was suggested that a small task force could put together ideas to present to commission. E.g. what is scope, what are problems, what are solutions?

The Sargasso Sea Alliance expressed their willingness and readiness to contribute to the process of conducting a case study building on the wealth of information they are already collecting on ecosystems. They clearly stated that there is no expectation for the SCRS to conduct all the work required, but rather proposed a collaboration to conduct the study building on the information presented in SCRS/2013/132.

The discussion was then focused on a case study using the Sargasso Sea. The components of this study are presented in **Table 2.**

Part II: By-catch

8. Review of the inputs used for the preliminary Ecological Risk Assessment (ERA)

Information from the observer programs of Brazil and Uruguay (1998-2010), as well as other efforts related to different aspects considered in the analysis of productivity and susceptibility (PSA) of sea turtles is summarized in document SCRS/2013/130. Five species of sea turtles are found in the Western South Atlantic, Loggerhead (*Caretta caretta*), Leatherback (*Dermochelys coriacea*), Hawksbill (*Eretmochelys imbricata*), Olive ridley (*Lepidochelys olivacea*) and Green turtle (*Chelonia myda*). All of them nest in Brazil, in either continental or insular areas. A growing number of nests and nesting females has been observed for Loggerhead, Leatherback and Olive ridley turtles in recent years. Authors explored the spatial information regarding incidental catches of different species of sea turtles, relative to the areas covered by the PSA. The effort of both fleets ranged from 0.02% to a 6.75% of the total ICCAT effort for the same area. These areas (Regional Management Units or RMUs), in some cases are smaller than those defined with catches. On the other hand some RMUs, did not consider mixed stocks which have been identified by some authors.

Information from satellite telemetry for species that interact with longlines, and existing regional information about gear selectivity for Loggerhead and Leatherback turtles is also summarized. This could be useful to inform the Susceptability component of the ERA.

The authors of the document suggested the possibility of using CPUE, or total catch of sea turtles for replacing the RMU, as these had a greater distribution. Moreover they expressed concern that the RMU did not, in some cases, consider the diversity on nesting beaches, which comprise of multi-species nesting areas. It was also discussed that the possibility of separating the longline fleet into shallow and deep components could be done, and the use of satellite telemetry data could be included, both of which would introduce into the ERA the "encounterability" of the species and gear. Another aspect discussed was the possibility of using existing selectivity data as this would improve aspects of susceptibility within the PSA.

9. Ecological Risk Assessment (ERA)

9.1 Presentation of preliminary ERA

Document SCRS/2013/134 (appendix ERA) presented a review of the ERA conducted for sea turtles impacted by ICCAT fisheries. Sea turtles are highly philopatric to natal beaches. This has led to the development of genetically distinctive populations within most species, defined by broad geographic zones. These are generally referred to as Regional Management Units (RMUs). It is appropriate to manage threatening processes at the level of the RMU. However, many turtle species migrate or disperse widely at sea. There are thus large areas where RMUs from a single species overlap. Assigning a turtle encountered at sea to an RMU is currently virtually impossible, because they are indistinguishable. We have conducted this assessment at the level of the RMU, including attempting to assign bycatch information to RMUs whenever possible. There are 22 RMUs from six turtle species in the ICCAT region; nomenclature used here for RMUs is as follows: the species binomial initials identify each species (e.g. *Caretta caretta* = Cc, *Chelonia mydas* = Cm, etc.). the region of provenance follows (e.g. Atlantic = At, Indian = In), and geographic region identified the broad areas where the RMU occurs = NW, SE. Thus Cc-AtNW is the loggerhead population from the Atlantic Northwest.

The objective of this ERA is to assess the risk to turtles from the impacts of tuna fishing in ICCAT region. It is a Level 2 (semi-quantitative) assessment, conducted within a Productivity-Susceptibility Assessment (or PSA) framework, at the level of the RMU. A PSA uses turtle life-history traits (to provide an indication of productivity (and therefore resilience to fishing impacts), and fishing parameters to account for susceptibility of different groups to capture by different gear types. In this method, all parameters are scored low, medium or high. Parameters can be up- or down-weighted; values are then summed and the resultant score rescaled to 1-3 for both productivity (P) and susceptibility (S). The vulnerability of each RMU to each gear type is then calculated according to the formula

$$V = \sqrt{(P-3)^2 + (S-1)^2}$$

The methodology calls for data deficiencies to be scored according to the precautionary principle. There were many productivity parameters for which no data were available, and these were scored as 1 (low productivity). For the susceptibility assessment, nine parameters were originally identified. However only two of these could be adequately addressed – RMU overlap with the ICCAT region, and an estimate of annual turtle bycatch mortality. Mortality estimates were available for longlining and purse seining, but no data were available for gillnetting, and this is not considered further.

9.2 Discussion of preliminary ERA

To clarify the process of the ERA it was explained that the information that comes out of this exercise is the property of the sub-committee and will not be published at this stage. It was acknowledged that this work is ongoing and it is anticipated that many collaborators will be included in future formulations of the ERA (and other models). Only once this collaboration has been finalized and all authors/contributors fully included and acknowledged, could this work be published by consent of the secretariat and the SCRS (such was done with the sharks ERA). The group acknowledged the importance of this analysis as a preliminary step towards addressing the commission request to assess the impact of ICCAT fisheries on sea turtle populations.

This is the first time an ERA for sea turtles has been conducted within the SC-ECO. It was acknowledged that it is a difficult exercise because of the very different life history of sea turtles when compared to sharks, sea birds and teleost fish for which ERAs have been conducted by the SCRS. Turtles are impacted by many factors including land based activities and not just ICCAT fisheries. The initial work of the SC-ECO is to provide information and guide revisions of the ERA in the short term, and later to take ownership of the work and improve the model through expert collaboration and input.

Discussion of the ERA presentation occurred and can be loosely categorized under the following headings:

Quality of data

The calls for data on sea turtles in 2012 and 2013 had a relatively limited response, with fewer than 20 countries submitting information on sea turtle interactions. All data was provided to the sea turtle ERA contractors, with confidentiality maintained. The group agreed that in order to fully address the commission's request, CPCs need to submit data on sea turtle interactions where available as the ERA had to draw inferences from other oceans as

well as make extrapolations based on the few data that were provided, which may provide a distorted picture of what is actually occurring and may bias the provision of advice on the model. The group expressed concern that areas being highlighted as being at risk are in fact areas for which data is available, whereas data poor regions may not be receiving the attention they require. Although the ERA did try and account for this problem, it could be resolved by expert collaboration which could fill many data gaps. During the meeting several scientists presented updated and more complete data (catch rates, observer programme summaries, and satellite tracking data) that highlight the importance of incorporating this additional data in the future analysis (ref presentations which provided updated information). The estimation of total by-catch numbers needs to be revisited using the more complete by-catch information as well as revised estimation procedures.

Use of Regional management units (RMU)

There was concern that the use of RMUs may not be the most appropriate way to structure the model and that the risk should rather be evaluated for key regions in which the fleets interact with sea turtle populations. Other methods of structuring the model could be investigated. There was especially concern over RMUs which encompass large regions but have relatively few nesting sites. The RMU approach does not always account for disparities in the sizes of the breeding populations within each region.

Seasonality

The SC-ECO noted the importance of the seasonal characteristics of longline fishing effort and that this should be accounted for in the analysis. Tracking data, disaggregated by season could address this issue, in connection with available observer data on interactions. A potential problem is that the CPUE studies aren't always related to seasonal data. Lack of data makes this work difficult. Most of the data used in the study comes from the document created in 2012 by Coelho (2012). Associated data on turtle bycatch is sometimes missing.

Longline fishing characteristics

The group noted that shallow longline sets were more likely to interact with turtles than deep sets. This was due to the overlap in the sea turtle vertical distribution and the depth of the fishing gear. It was suggested to separate the LL deep sets from the LL shallow sets to account for the difference in sea turtle mortality between these two fleet sectors. This information is available from the sharks ERA conducted in 2012.

Turtle tracking data

The ERA contractors noted the problem that although they had maps of sea turtle tracks, they did not have access to the actual data regarding these movements and thus were not able to include much of this information in the current ERA. Also, the available tracking data is mostly for post nesting females from nesting beaches, not juveniles and males. The group debated how many tags are needed to have confidence in the turtle movement and discussed whether confidence in the tracks could be weighted.

Turtle productivity and mortality (natural, fishing, post release)

The suitability of the proxies for natural mortality and fishing mortality were discussed. The issue was raised that the use of female breeding numbers in the proxy for Z (total mortality) may not be appropriate and that other sources of mortality should be investigated including from available literature and direct observations of M (natural mortality) based on nesting site fidelity and natal beach tagging of females conducted over extended time periods. Regarding F (fishing mortality) estimates, post release survival is difficult to determine for sea turtles. For all estimates of mortality, further investigation of the available literature is required to obtain additional estimates of these parameters. For example, a longline boat crew may remove a hook and release a turtle and the observer could record this as a live release when in fact the turtle does not survive.. The value of post release mortality for different sea turtles in different fleets needs to be further investigated.

Including coastal fisheries

The SC-ECO acknowledged the importance of including the impact of coastal fisheries in the ICCAT convention area on sea turtles. The SC-ECO recognised the necessity of incorporating different gears, and selectivity (size, species, etc) for these fisheries. In particular the need to include gillnets in the analysis was noted. Currently there is not enough information on bycatch from fisheries in the ICCAT convention area to address this sector, although further expert collaboration may provide information useful for this assessment.

9.3 List of changes/improvements to be made to final ERA

After the initial discussion of the ecological risk assessment it was largely acknowledged that an ecological risk assessment could provide a tool for the SCRS to evaluate the relative risk of ICCAT fishing gears on Sea Turtle populations. All files used to conduct the ERA were provided to the SC-ECO in order to provide a transparent tool the SC-ECO could use to explore the input data, model structure and parameterization of the ERA, and make recommendations for its improvement. The SC-ECO recognized that this approach was a valuable first step in addressing the commission's request, although further work was necessary to modify and improve the assessment. It was acknowledged that this ERA is the start of a process which will require collaboration and refinement in order to provide management advice for sea turtle populations affected by ICCAT fisheries. To that end, the SC-ECO discussed and outlined recommendations to be evaluated, and revisions to be undertaken in the short (before 9/2013), medium (2014-2015) and long-term (2015). Short term recommendations are intended to be incorporated in an updated ERA produced by the ERA contractors prior to the SCRS meeting in September, whilst medium and long term suggestions will be incorporated in future iterations of the ERA by a collaborative effort within the SC-ECO.

The ERA, as currently structured, examines the risk by gear (LL-PS.) X Species X RMU.

In order to improve the ERA the group made the following recommendations:

1) Short Term (2013, prior to the SCRS Plenary)
    a. Participating CPC experts to pass comments to the authors for consideration and summarization. The authors would prepare a short response in September.
    b. The LL fleet should be further classified into LL-deep and LL-shallow – The EFFDIS estimates developed for the Shark ERA will be used for this purpose.
    c. Stratify the fleet and by-catch information by season. Explore the loss of data and the effect on the analysis. This will likely demonstrate the need for additional seasonal information.
    d. Conduct a GAP analysis to identify fleets/places where the data is lacking and where additional research efforts are required. It is important to identify CPCs that reported zero turtle bycatch or who did not make any report at all and do not have national observer programs, as they may in fact encounter sea turtles but have no data collection mechanisms to report them.
    e. The proxies for mortality (natural and fishery induced) need to be revisited. The risk levels should also be reclassified (ie what is low, medium and high risk). Alternative other proxies of mortality should be explored, including estimates from available literature. It is recommended to use standardized indices of catch per effort from major ICCAT longline fleets where available.

2) Mid Term (2014 – 2015)
    a. Identify important data inputs (e.g. bycatch per unit effort BPUE, bycatch data by species including release mortality estimates) needed to improve the ERA analysis and assemble for use – if necessary, data could be aggregated at the spatial scale of the RMU or other spatial unit determined by expert consultation.
    b. Obtain detailed satellite data. Determine vertical overlap of longline fisheries and turtles.
    c. Determine night vs. daytime fishing effort. This information is already integrated into the Shark ERA and will be provided by the authors of that study.
    d. Use available information on the size of turtles caught by the different fleets in the susceptibility component of the ERA analysis.
    e. Include information about large areas with low rates of capture by sea turtle species.
    f. Include information about confidence in BPUE estimates (e.g. CV, level of observer coverage) and determine how representative the observer coverage is of the fishing operations.
    g. Assemble additional satellite tracking information where possible (such as from seaturtle.org).
    h. Consider the inclusion of "number of nesting beaches" and the number/density of nests on those beaches as a component in the productivity portion of the ERA.
    i. Include an analysis of where Turtles spend the most time (e.g. Kernel Density) using sat tracking information where possible.

3) Long Term > 2015
    a. Obtain information about coastal observer programs, and explore other ways to estimate artisanal fishing effort and bycatch (e.g. contact other groups that conduct similar work – NGOs/research

institutes etc). This is especially relevant for gillnet fisheries which may have a significant impact on sea turtle populations.

b. Risk (as considered within the ERA) is defined the product of the magnitude of the adverse consequences of the hazard and the likelihood of the effect. The identification of hazard, the likelihood and the consequences are all terms characterised by, described with and measured with various types and degrees of uncertainty. Although it is impossible to identify all uncertainties, The scientific credibility, accuracy and integrity' of a risk assessment hinges on the quality of its uncertainty analysis (Burgman, 2005). Therefore appropriate methods to identify, describe and subsequently address the various forms uncertainty should be developed in the future.

10. Review sea turtle available bycatch mitigation and safe-release protocols measures, and make recommendations as necessary

This topic was evaluated at the 2013 meeting of the Sub-Committee on Ecosystems, and previously at the 2011 and 2012 meetings. The relevant documents and reports discussed at previous meetings are summarized in **Table 3**. The 2011 SC-ECO meeting also reviewed a summary (Anon. 2012) of the available literature pertaining to by-catch mitigation for sea turtles.

New documents were also considered on by-catch mitigation and safe-release protocols.

SCRS/2013/129 presented a circle hook experiment conducted on a Taiwanese longline fishing vessel in the tropical Atlantic Ocean. The experiment was conducted from September 2012 to May 2013 between 2ºS and 12 ºS and 17ºW and 26ºW. Traditional tuna and circle hooks were sequentially alternated throughout the experimental portion of the set with a 1:1 ratio. Fisheries observers monitored 200 sets, 36 turtles were hooked and an additional 19 were entangled in the mainline, branch line or buoy line. Randomization tests showed there were no significant differences for sea turtle catch rates by hook type (p=1.000), but there was a significantly higher catch rate of bigeye tuna (p=0.0002), yellowfin tuna (p= 0.0045), swordfish (p=0.0001), and blue sharks (p= 0.0209) on circle hooks as compared to traditional tuna hooks. Significantly higher catch rates were observed for albacore (p=0.0010) and spearfish (p=0.0097) caught on tuna hooks as compared to circle hooks.

The Sub-Committee noted that release mortality during this study was high relative to the bycatch rates of the Taiwanese fleet as a whole, but the author stated that this study occurred in an area and time where bycatch rates are higher than average. The study indicated that catch rates of circle-like hooks and J-like hooks were equal, but that survival was higher on circle hooks.

Document SCRS/2013/131 analyzed the data obtained by the Spanish Institute of Oceanography (IEO) sampling program and logbooks from the Spanish longline fleet fishing swordfish in the Mediterranean Sea for 2011 and 2012. This fleet has three components: surface longline, semi-pelagic longline and deep longline with different by-catch rate and consequently with different impact in the sea turtle populations. Swordfish is the target species with more than the 80% of the total catch (range 82%-93%). In 2004 a pilot study was conducted using 10 different types of hooks (J and circle), four baits and different longline depth. The results of this study showed that the impact of longlines on sea turtle is mainly dependent on the depth of the gear, although area and seasonal effects are also significant. Results also showed that the impact of this fishery on sea turtles can be considered low over the year.

The Sub-committee noted that the catches of turtles are low for sets at all depths and inquired about the type of hook being used. The author indicated that #1 J hooks are being used in the fishery. It was also stated that experiments had been conducted with circle hooks but were not continued due to the decrease in catches of swordfish and the difficulty of the fishermen in releasing the turtles from this gear.

The group also considered work described previously (Sales et al, 2010) regarding the effectiveness of circle hooks for the mitigation of sea turtle bycatch and capture of target species in Brazilian pelagic longline fishery. Between 2004 and 2008 the performance of 18/0 10º offset non ring circle hooks was compared with 9/0 J non ring hooks (control) in the Brazilian pelagic longline fishery targeting swordfish, tuna and sharks. During this experiment 26 trips, 229 sets and 145,828 hooks were set alternating circle and 'J' hooks and using mackerel (*Scomber japonicus*) as bait. A total of 60 different species, including turtles and seabirds, were caught. Statistical analyses (Mantel-Haenszel χ^2 tests) of species with at least 20 individuals caught were performed. Circle hooks resulted in a significant catch decrease for loggerhead *Caretta caretta* (55%) and leatherback *Dermochelys coriacea* (65%) sea turtles. Use of circle hooks resulted in increased capture rates of tunas (bigeye *Thunnus obesus* and albacore *Thunnus. alalunga*), and sharks (blue *Prionace glauca* and requiem sharks of the

genus Carcharinus). There was no difference in the capture of yellowfin tuna (*Thunnus albacares*), shortfin mako shark (*Isurus oxyrinchus*), hammerhead sharks (*Sphyrna lewini* and *S. zygaena*). On the other hand, the capture rate of swordfish (*Xiphias gladius*) decreased significantly when using circle hooks. Additionally, use of circle hooks significantly decreased capture rates of bycatch species, such as pelagic stingrays (*Pteroplatytrygon violacea*) and white marlin (*Tetrapturus albidus*). Circle hooks performed similar to J hooks with respect to many species, and increased captures of marketable species such Atlantic pomfret (*Brama brama*), escolar (*Lepidocybium flavobrunneum*), and mackeral shark (*Lamna nasus*). Results demonstrate the effectiveness of circle hooks for the conservation of loggerhead and leatherback sea turtles, improving the capture rates of most target species, and significantly reducing the bycatch of the most common species, the pelagic stingray, thus economically improving this fishery.

The group inquired about the cause of differences in catch rates on circle-hooks versus J-hooks observed in this study, but not in SCRS/2013/129. The author noted that there was a difference in the gear configuration used during the studies, the rings on hooks. These are used in the Taiwanese fishery, but not in Brazil. The group also noted that although the studies did not agree that circle hooks reduced the catch rates of sea turtles, they did agree that the use of circle hooks reduced bycatch mortality, likely because sea turtles more frequently swallow J-hooks. A second difference in gear configuration was also noted; the distance between floats and branchlines was shorter in the Brazilian longline fishery than in the Taiwanese fishery. It was not clear how these influenced catch rates, but the author noted that shorter branchlines imply a shallower set, which could improve survival of sea turtles.

Document SCRS/2013/128 presented the preliminary incidental catch rates of sea turtle of Taiwanese longline fleets in the Atlantic Ocean. The data collected from 16,352 observed sets and 46.0 million hooks. Seven hundred and sixty-one turtles were caught. The major incidental catch species was leatherback (59.9%), olive Ridley turtle (26.9%) and loggerhead turtles (8.1%). Most sea turtles were hooked (58.9%). Most leatherback and olive ridley turtles were caught in tropical areas, especially in the Gulf of Guinea. Loggerhead was caught not only in tropical areas but also in southwest Atlantic Ocean. The nominal incidental catch rate was 0.018 per 1000 hooks in average and ranged from 0.0012-0.0219 per 1000 hooks by area.

The Sub-committee noted that the data used in the analyses were from the whole Atlantic Ocean and suggested that analyses should be further refined using the area and seasonal components. It was also noted that the proportion of observed sets that reported bycatch was very low, and it was suggested that a negative binomial or Poisson distribution should be used for the data instead of a normal distribution. The author also stated that the gear used in Tropical Areas for these vessels is different than that used in the northern and southern areas as the target species is bigeye tuna. The Sub-committee inquired about the location of hooking on the turtles. While the author indicated that this was not always recorded, it was also stated that leatherbacks are often hooked on the flipper rather than the mouth because they do not eat bait.

11. Response to the Commission regarding Rec. 10-09 (Recommendation by ICCAT on the By-Catch of Sea Turtles in ICCAT Fisheries)

In 2010, the Commission recommended that:

1) SCRS initiate an assessment of the impact of the incidental catch of sea turtles resulting from ICCAT fisheries as soon as possible and no later than 2013 [Rec. 10-09; Paragraph 5].
2) After the initial assessment is complete and the results presented to the Commission, SCRS shall advise the Commission on the timing of future assessments [Rec. 10-09; Paragraph 5]
3) The SCRS shall also provide advice to the Commission on approaches for mitigating sea turtle by-catch in ICCAT fisheries, including reducing the number of interactions and/or the mortality associated with those interactions [Rec. 10-09; Paragraph 4].
4) As appropriate, the Commission and its CPCs should, individually and collectively, engage in capacity building efforts and other cooperative activities to support the effective implementation of this recommendation, including entering into cooperative arrangements with other appropriate international bodies.

With regard to the mitigation of sea turtle bycatch in ICCAT fisheries, the SCRS recommends the following:

1) The SCRS reiterates the previous Commission recommendations [10-09] that:

a. Purse seine vessels operating in the ICCAT Convention area avoid encircling sea turtles to the extent practicable, release encircled or entangled sea turtles, including on FADs, when feasible, and report interactions between purse seines and/or FADs and sea turtles.
b. Pelagic longline vessels operating in the ICCAT Convention area carry on board safe-handling, disentanglement and release equipment capable of releasing sea turtles in a manner that maximizes the probability of their survival.
c. Fishermen on pelagic longline vessels flagged to that CPC operating under their flag use the equipment specified in item b (above) to maximize the probability of sea turtle survival and are trained in safe-handling and release techniques.
d. CPCs include in their Annual Reports other relevant actions taken to implement FAO's Guidelines to Reduce Sea Turtle Mortality in Fishing Operations with respect to ICCAT fisheries.

2) Furthermore, to reduce by-catch mortality of sea turtles, the SCRS specifically recommends that:

a. Regarding safe-handling practices:
i. When a turtle is to be removed from the water, an appropriate basket lift or dip-net be used to bring aboard sea turtles that are hooked or entangled in gear. No turtle should be hauled from the water by a fishing line attached to, or entangled upon the body of a turtle.
ii. Vessel operators or crew assess the condition of sea turtles that are caught or entangled prior to release. Those turtles that are not able to swim, unconscious or unresponsive should be brought/maintained onboard and assisted in a manner consistent with maximizing their survival prior to release. These practices are described further in the FAO's Guidelines to Reduce Sea Turtle Mortality in Fishing Operations.
iii. That turtles handled in fishing operations or by national observer programs (e.g. tagging activities) be handled in a manner consistent with the FAO's Guidelines to Reduce Sea Turtle Mortality in Fishing Operations.

b. Regarding the use of line cutters:
i. Longline vessels carry on board line-cutters and use these when safe de-hooking is not possible to release sea turtles.
ii. Other types of vessels that use gear that may entangle sea turtles should carry on board line-cutters and use these tools to safely remove gear, and release sea turtles.

c. Regarding the use of de-hooking devices:
i. Longline vessels carry on board de-hooking devices to effectively and safely remove hooks from sea turtles. The Sub-Committee also recommends that when a hook is swallowed, no attempt be made to remove the hook. Instead, the line should be cut as close to the hook as possible.

With regard to the assessment of impact of ICCAT fisheries on sea turtles, the SCRS initiated an Ecological Risk Assessment (ERA) for sea turtles in 2013. Progress to date includes:

3) In 2013 ICCAT provided a short-term contract that supported the development of a preliminary ERA for sea turtles species encountered by ICCAT fisheries. The ERA used data provided to the Secretariat by CPCs in 2011 and 2012, and as collated under a short-term contract funded by ICCAT in 2012 and other data sources compiled by the contractor.
4) At its Intersessional meeting in 2013, the Sub-Committee on Ecosystems reviewed the ERA progress to date and made important recommendations to improve the assessment over the short (before 10/2013), medium (2014-2015) and long-term (2015+), including a request for updated/additional data from the CPCs
5) The SCRS will continue to improve the ERA and will advise the Commission on its plan for future sea turtle impact analyses at the 2014 meeting.

12. Other matters

12.1 Presentations

A presentation was given on bycatch of turtles by the Morrocan fleet. Interviews conducted with Moroccan tuna vessel fishermen from 2008 to 2011 revealed that one turtle was encountered every 90 to 100 fishing days. Fishing days per trip range from 1 to 3 days but seeing the technical characteristics of the boats, they are generally less than 24 hr. Out of a sample of 100 boats specializing in tuna fishing south of Agadir within the Moroccan EEZ, it was determined that five in every six boats that fishes observes a turtle. The catch rates of turtles in this fishery are one turtle for every 20 fishing days. In this zone, turtles captured are immediately

released. The results from the national observer program on shark captures onboard longline vessels have indicated that turtles are not present or their interactions are insignificant in this fishery. Morocco proposes to lead an awareness campaign with the different operators in the region for the protection of marine turtles.

Document SCRS/2013/133 presented results on the Trans-Atlantic Leatherback INitiative (TALCIN). The second phase of this work provided the first ocean-scale analysis of spatio-temporal distribution of the leatherback turtle, based on electronic tagging, as well as ascertaining overlap with longline fishing effort. Data suggest that the Atlantic likely consists of two regional management units: northern and southern (the latter including turtles from South Africa). Although turtles and fisheries show highly diverse distributions, the authors highlight nine areas of high susceptibility to bycatch (four in the North Atlantic and five in the South/Equatorial Atlantic) that are worthy of further targeted investigation. These are reinforced by reports of leatherback bycatch at eight of the sites (Document SCRS/2013/133).

The Sub-committee noted that an analysis was conducted on the overlap of high fishing-pressure areas with leatherback habitat by quarter, and it was suggested that the Ecological Risk Assessment for sea turtles could use a similar approach. The Group also noted that leatherback habitat use could overlap with high and low fisheries production areas. In this regard, it was suggested that this information should be compared to observer data to determine whether there is any correlation. The Sub-committee recommended that further comparisons could be conducted of leatherback high-use areas with shallow water longline sets and deep water longline sets, using analyses as developed in the shark Ecological Risk Assessment.

Document SCRS/2013/135 (Sightings and abundance of marine turtles in Azores) presented an analysis of the marine turtle sightings and observation effort by the observers onboard the Azores tuna baitboat fleet. A total of 1823 trips were observed from 2001 to 2012, and 25903 surveys with a mean duration of 15 minutes were performed. Occasional turtle sightings, from 1998 to 2000, are also given. For the loggerhead sightings and observation effort in the Azores area for 2001 to 2012 data, a relative index of abundance was estimated by a General Linear Model approach (GLM). The analysis shows that after the low sightings per unit of effort in 2001, the abundance index reached its highest level in 2002 and decreased in the following years and remained stable after 2008 to present. Information on leatherback and green turtle observations in the Azores area were also given. The information collected in Madeira area, for some years and months, included the number of surveys and loggerheads sighted. Nominal indices (all species and areas) and Standardized Spue (Sightings per unit effort) for loggerheads in the Azores are also included. This is the only fishery independent index on the high seas.

The Sub-committee noted that the ability to sight turtles may be affected by factors such as sea state, cloud cover and the angle from which observers are searching, and that this should be incorporated into the analysis. It was also noted that there has been a documented increase in the numbers of turtles on the nesting beaches in the USA, and as it is known that these turtles can migrate to the Azores, the committee thought that it would be interesting to see if sightings in the Azores increase in future years. The presenter shared further information on the results of genetic analysis conducted, which confirms that 100% of the turtles around the Azores come from the USA and Mexico. It was noted that this information did not correspond to the RMU CcATLNE area according to Wallace et. al. 2010. The Sub-committee recommended that an additional useful analysis would be to determine turtle growth rate using tag recovery data.

SCRS/2013/138 describes an approach to collaborative research in fisheries science capacity building. The author listed the benefits of collaborative fisheries research – 1) enhanced credibility and legitimacy of the scientific findings in the minds of stakeholders, with potential to increase acceptability of management actions; 2) innovative and adopted fishing gear and practices that reduce bycatch and minimize habitat impact from fishing; 3) greater mutual understanding and trust among partners; and 4) opportunities to integrate diverse sources of knowledge about the coastal and marine environment. The author stated that the collaborative research approach has been increasingly adopted by government, industry and associations and conservation organizations, such as The Nature Conservancy and in WWF's Smart Gear program.

The author elaborated on a new collaborative fisheries research fellowship program initiated at the Virginia Institute of Marine Science. The author noted that the fellow could benefit from collaboration with an expert in tuna-fisheries and bycatch and invited the Sub-committee to consider collaborating through this program. The Sub-committee thought that this proposal was an interesting approach, and a good opportunity to build external support and collaborative research capacities with scientists, industry, managers and NGOs. The Sub-Committee discussed that the VIMS fellow should contact the head of delegation of the appropriate CPC to participate in future meetings of the SCRS.

12.2 Progress toward harmonization of data collection forms for longline observer programs

During its 2012 meeting, the SC-ECO recommended that ICCAT coordinate with the tRFMO By-catch Joint Technical Working Group (BJTWG) in order to assume a leadership role in developing minimum standards for harmonised longline observer data collection for the tRFMOs. The ICCAT Secretariat has since contacted Simon Nicol, the Chair of that group, and a process has begun to collate the forms for data collection activities of the Longline observer programs of ICCAT, WCPFC, IATTC, IOTC and CCSBT. Since ICCAT does not directly coordinate large-scale observer programs, it is necessary to communicate and cooperate with national observer programs. To that end, the Secretariat has contacted the coordinators of the national longline observer programs that operate in the ICCAT Convention Area in order to obtain their data collection forms. These will then be used to identify and recommend minimum data collection standards.

13. Recommendations

The Sub-Committee recognized the excellent work conducted by Drs. Andrea Angel, Ross Wanless and Ronel Nel in compiling a preliminary Ecological Risk Assessment (ERA) for sea turtles. Their preparatory work has expedited the work of the Sub-Committee and has provided an excellent foundation for the ongoing impact assessment of sea turtle by-catch in ICCAT fisheries. The Sub-Committee acknowledged the value of this ICCAT initiative to provide financial support to hire experts to contribute to the SCRS's work and strongly recommended continuing with these productive activities.

Ecosystems

- The Sub-Committee recognized the value of the unpacking exercise to define SCRS ecosystem objectives. It is recommended that the SC-ECO Co-Convener develop a survey to populate a list of conceptual EBFM objectives to be distributed to the SCRS Officers. The Co-Convener will collate the results prior to SCRS Plenary.
- It is recommended that travel funds be allocated to support the participation of external experts to help develop the scientific tools required to implement EBFM approaches.
- It is recommended 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.

By-catch

The Sub-Committee recommends that the SCRS contribute to the collaborative fisheries research approaches through the involvement of stakeholders in initiatives that address potential ICCAT fisheries interactions with bycatch species.

ERA for Sea Turtles

- CPCs should provide by-catch data according to Task 2 standards. If that is not possible, the Sub-committee recommends to CPC's that data concerning sea turtle bycatch be provided by species, with spatial and seasonal information (e.g. 5X5) that would allow assignment toto the RMU and quarter.
- The Sub-Committee recognizes the need to include information on artisanal fisheries that operate within the ICCAT Convention area and encourages CPCs to submit relevant information.
- The Sub-Committee recommends that supplemental tagging (including electronic and conventional) of sea turtles be conducted and information on those experiments be made available to the Sub-committee.
- The Sub-Committee recommends that genetic studies on sea turtles be conducted to better understand which populations are being impacted by ICCAT fisheries, and that information on those experiments be made available to the Sub-Committee.

Bycatch Mitigation for Sea Turtles

- The Sub-Committee reiterates the Commission recommendations as adopted in Rec. 10-09.
- Furthermore, to reduce by-catch mortality of sea turtles, the SCRS specifically recommends that:
    - Regarding safe-handling practices:

- When a turtle is to be removed from the water, an appropriate basket lift or dip-net be used to bring aboard sea turtles that are hooked or entangled in gear. No turtle should be hauled from the water by a fishing line attached to, or entangled upon the body of a turtle.
- Vessel operators or crew assess the condition of sea turtles that are caught or entangled prior to release. Those turtles that are not able to swim, unconscious or unresponsive should be brought/maintained onboard and assisted in a manner consistent with maximizing their survival prior to release. These practices are described further in the FAO's Guidelines to Reduce Sea Turtle Mortality in Fishing Operations.
- That turtles handled in fishing operations or by national observer programs (e.g. tagging activities) be handled in a manner consistent with the FAO's Guidelines to Reduce Sea Turtle Mortality in Fishing Operations.

o Regarding the use of line cutters:
- Longline vessels carry on board line-cutters and use these when safe de-hooking is not possible to release sea turtles.
- Other types of vessels that use gear that may entangle sea turtles should carry on board line-cutters and use these tools to safely remove gear, and release sea turtles.

o Regarding the use of de-hooking devices:
- Longline vessels carry on board de-hooking devices to effectively and safely remove hooks from sea turtles. The Sub-Committee also recommends that when a hook is swallowed, no attempt be made to remove the hook. Instead, the line should be cut as close to the hook as possible.

13. Adoption of the report and closure

The report was adopted during the meeting as well as the work plan of the Sub-Committee for 2014. The Co-Conveners thanked the Secretariat and the participants for their hard work and dedication. The Co-Conveners also thanked Andrea Angel, Ross Wanless and Ronel Nel for assisting the group with important progress towards an Ecological Risk Assessment of sea turtles that interact with ICCAT fisheries, and also the Secretariat for funding this vital work.

The meeting was adjourned.

Following the SC-ECO meeting, the Inter-American Convention for the Conservation and Protection of Sea Turtles expressed their readiness to contribute to the improvement of the ERA for sea turtles providing information on the "number of nesting beaches" and the number/density of nests on those beaches as a component in the productivity portion of the ERA. This information is currently available for all IAC countries from 2005-2013 and can be found on the IAC Annual reports on the IAC website http://www.iacseaturtle.org/informes.htm.

Literature cited

Burgman MA, 2005. Risks and decisions for conservation and environmental management. Cambridge University Press, Cambridge, UK, 314.

Table 1 Preliminary assessment of the ecological importance of the Sargasso Sea to tunas and tuna-like species and to ecologically associated species. Reproduction: 1) Direct evidence of spawning in area 2) Presumed spawning in area. Migration: Moves into or through area during annual movements or migrations. Feeding: Uses area for foraging. Life History Cycle: Uses area in one or more phases of its life history cycle. Catch: Sargasso Sea and Atlantic, reference year 2009. AP = analysis pending; NF = no fishery.

Species	Reproduction		Migration	Feeding	Life history cycle	Sargasso Sea Catch t (2009)	Atlantic Catch (t) by stock (2009)	% of total Atlantic Catch
	Direct	Presumed						
W. Bluefin	No	Unknown	Yes	Yes	Yes	47	1.980	2.4
Yellowfin	No	Yes	Yes	Yes	Yes	224	18.835	1.2
Albacore	No	Yes	Yes	Yes	Yes	103	81.613	0.1
Bigeye	No	Yes	Yes	Yes	Yes	24	15.383	0.2
Skipjack	No	Probably	Probably	Probably	Probably	6	27.149	0
Swordfish	No	Yes	Yes	Yes	Yes	446	12.277	3.6
Blue marlin	Yes	N/A	Yes	Yes	Yes	1	1.530	0.1
White marlin	No	Yes	Yes	Yes	Yes	1	180	0.6
Sailfish	No	Probably	Probably	Probably	Probably	35	1.415	2.5
Wahoo	Yes	N/A	Yes	Yes	Yes	AP		
Blackfin tuna	No	Yes	Yes	Yes	Yes	AP		
Atl. black skipjack tuna	No	Yes	Yes	Yes	Yes	AP		
Dolphinfish	No	Yes	Yes	Yes	Yes	AP		
Shortfinmako	No	Yes	Yes	Yes	Yes	AP		
Blue shark	No	Yes	Yes	Yes	Yes	AP		
Porbeagle shark	No	Unknown	Yes	Yes	Yes	AP		
Bigeye thresher shark	No	Unknown	Probably	Probably	Probably	AP		
Basking shark	No	Unknown	Yes	Probably	Unknown	NF		

Table 2: Elements of the Sargasso Sea Ecosystem

1. Abiotic elements
1.1 Oceanographic
1.1.1 Gyre/s
1.1.2 Eddies
1.1.3 Currents
(1) Gulf Stream (GS North Wall)
1.1.4 Temperature
(1) Sea Surface
(a) Atlantic Warm pool or WHWP
(b) Atlantic Multi decadal oscillation
(2) Water Column
1.1.5 pH
1.1.6 Dissolved Oxygen
(1) Horizontal
(2) Vertical
1.1.7 Salinity
1.1.8 Turbidity
1.2 Climatic
1.2.1 Wind velocity
1.2.2 ENSO (El Nino Southern Oscillation)
1.2.3 NAO
1.2.4 Hurricane frequency
1.3 Geomorphology
(1) Eg. Seamounts and ridges causing upwelling etc.
2. Biotic elements
2.1 Fishery species
2.1.1 Retained species
(1) Target species
(a) Species i
(i) Stock j
1. Abundance
2. Distribution
3. All removals (including discards)
4. IUU (catch by illegal, unreported and unregulated fisheries)
(ii) Stock k
(iii) Stock l
(2) Non target species
(a) Species m
(b) Species n
(3) Bait collection
2.1.2 Non retained species (Those species caught or directly impacted by the fishery but not used)
(1) Protected or special species
(a) Mammals
(b) Seabirds
(c) Turtles
(d) Some sharks
(2) General discarded species
(a) Species o
(b) Species p
2.2 Other biota
2.2.1 Macro algae
(1) Eg. Sargassum mats
2.2.2 Phytoplankton
2.2.3 Zooplankton
2.2.4 Ichthyoplankton
2.2.5 Other fish species (forage species)
2.3 Habitat
2.3.1 Pelagic
(1) Sargassum mats

2.3.2 Benthic
2.4 Biodiversity and Interactions
2.4.1 Species richness
(1) Species abundance (i.e. the abundance of each species)
2.4.2 Impacts on environment
(1) Ecosystem structure
  (a) Ghost fishing
  (b) Discarding/Provisioning
  (c) Habitat (FADs)
(2) General environment
  (a) Waste disposal
  (b) Water quality
3. Human elements
3.1 Impacts on environment
3.2 Community Well Being
3.2.1 Cultural Heritage
3.2.2 Industry
(1) Tuna fishing
  (a) Income
  (b) Capacity
  (c) Employment
(2) Tuna processing
  (a) Income
  (b) Employment
3.2.3 General Community
(1) Food
(2) Infrastructure
(3) Fees
3.3 Administration
3.4 Management
3.4.1 Research Institutions
3.4.2 NGOs
3.4.3 RFMOs
3.4.4 Consultation
4. Economic elements
5. Elements not necessarily applicable to the Sargasso Sea
5.1.1 Rainfall amount

Table 3 SCRS documents pertaining to by-catch mitigation and safe-release protocols presented to the 2011 and 2012 Sub-Committee on Ecosystems meetings.

SCRS/2011/057	Movements of Juvenile Loggerhead Turtles in the Southwestern Atlantic Ocean. C. Barceló, A. Domingo, P. Miller, L. Ortega, B. Giffoni, G.Sales, L.McNaughton, M. Marcovaldi, S.S. Heppell and Y. Swimmer.
SCRS/2011/058	Setting deeper, catching fewer? Sea turtle by-catch on deep set pelagic longlines in Uruguayan Waters. P. Miller, M. Pons, A. Domingo
SCRS/2011/059	"J" hooks vs. "C" hooks in the Uruguayan monofilament longline fishery. A. Domingo, M. Pons, P. Miller, C. Barceló, S. Jiménez and Y.Swimmer.
SCRS/2011/060	Spatio-temporal correlation between leatherback turtles and industrial fisheries in the Atlantic Ocean. Fossette S, Coyne MS, Augowet E, Broderick AC, Chacon D, Domingo A, Eckert SA, vans D, Felix ML, Formia A, Godley BJ, Hays GC, Kelle L, López-Mendilaharsu M, Luschi P, Miller P, Nalovic MA, Nougessono S, NSafou M, Parnell RJ, Prosdocimi L, Sounguet GP, Turny A, Verhage B, Witt MJ, Georges J-Y.
SCRS/2011/067	Testing new designs of fish drifting fish aggregating device (DFAD) in Eastern Atlantic to reduce turtle and shark mortality. Franco, J., Moreno, G., Lopez. J., and Sancristobal, I.
SCRS/2011/068	Review of actions by Brazil in meeting the Rec. 10-09 and FAO Guidelines to reduce sea turtle mortality in fishing operations. N. de Oliveira L. Júnior, B. Giffoni, F. Niemeyer Fiedler and G. Sales

SCRS/2012/051	A review of sea turtle mitigation measures across the five tRFMOs and other fisheries management organizations. Coelho, R., Fernández-Carvalho, J. and N. Santos, M.
SCRS/2012/085	Groupe Tortues Marines France- bycatch group activities in French waters. Claro, F., Sacchi ,J. and Poisson, F.
SCRS/2012/089	Effects of hook and bait on turtles bycatch in a southern Atlantic pelagic longline fishery. Neves Santos, M., Coelho, R. and Fernández Carvalho, J.
SCRS/2012/090	Preliminary results on the use of 17/0 circle hooks and mackerel on sea turtles bycatch in a north-eastern tropical Atlantic swordfish longline fishery. Neves Santos, M., Coelho, R. and Amorim, S.J.

Appendix 1

AGENDA

1. Opening, adoption of Agenda and meeting arrangements

Part I: Ecosystem

2. Review of new information on the implementation of ecosystem effects in enhanced stock assessments.

3. Review of new information on models that quantify ecosystem dynamics and predict the impact of perturbations on its components.

4. Review of new information on the use of indicators to quantitatively or qualitatively reflect the health of an ecosystem and its fishery, ecological, economic and social components.

5. Review new information on the implementation of ecosystem based fishery management principles.

6. Review progress on the development of a test case for implementing ecosystem based fishery management .

7. Discuss ways of including ecosystem values in the standardization and assessment of ICCAT assessed stocks.

Part II: By-catch

8. Review of the inputs used for the preliminary Ecological Risk Assessment (ERA)
   8.1 Productivity
   8.2 Susceptibility
9. Ecological Risk Assessment (ERA)
   9.1 Presentation of preliminary ERA
   9.2 Discussion of preliminary ERA
   9.3 List of changes/improvements to be made to final ERA
10. Review sea turtle available bycatch mitigation and safe-release protocols measures, and make recommendations as necessary.
11. Prepare response to the Commission regarding Rec. 10-09 (Recommendation by ICCAT on the By-Catch of Sea Turtles in ICCAT Fisheries).
12. Other matters
13. Recommendations
14. Adoption of the report and closure

Appendix 2

LIST OF PARTICIPANTS

SCRS CHAIRMAN

Santiago Burrutxaga, Josu
Head of Tuna Research Area, AZTI-Tecnalia, Txatxarramendi z/g, 48395 Sukarrieta (Bizkaia), Spain
Tel: +34 94 6574000 (Ext. 497); 664303631, Fax:+34 94 6572555, E-Mail: jsantiago@azti.es

CONTRACTING PARTIES

Algerie

Bouhadja, Mohamed Amene
Centre National de Recherche et de Développement de la Pêche et de l'Aquaculture (CNRDPA)
Tel: +213 557 531207, Fax: E-Mail: Bouhadja.amine@gmail.com

Brazil

De Barros Giffoni, Bruno
Rua Anotnio Athanazio, 273, Jardim Paula Nobre, 11680-000 Ubatuba, SP
Tel: +55 123 833 5966, Fax: +55123 83 26202, E-Mail: bruno@tamar.org.br

De OliveiraLeite, Nilamon
Centro Nacional de Conservaçao e Manejo das Tartarugas Marinhas, Av. Paulino Muller, 1111, Jucutu Quara, 29040-715 Vitória/ES
Tel: +55 27 32221417, Fax: E-Mail: nilamon@tamar.org.br

Canada

Hanke, Alex
Scientific, St. Andrews Biological Station/ Biological Station, Fisheries and Oceans Canada531 Brandy Cove Road,
St. Andrews New Brunswick E5B 2L9
Tel: +1 506 529 4665, Fax: +1 506 529 5862, E-Mail: alex.hanke@dfo-mpo.gc.ca

European Union

Carroceda Carballal, Aránzazu
Ministerio de Economía y Competitividad, Instituto Español de Oceanografía - C.O. de A Coruña, Paseo Marítimo
Alcalde Francisco Vázquez, 10 - P.O. Box 130, 15001 A Coruña, ESPAÑA
Tel: +34 981 21 8151, Fax: +34 981 229 077, E-Mail: arancha.carroceda@co.ieo.es

De la Serna Ernst, José Miguel
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: delaserna@ma.ieo.es

Fernández Costa, José 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: +34 981 218 151, Fax: +34 981 229 077, E-Mail: jose.costa@co.ieo.es

Ortiz de Urbina, José María
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: urbina@ma.ieo.es

Pereira, Joao Gil
Universidade dos Açores, Departamento de Oceanografia e Pescas9900 Horta, PORTUGAL
Tel: +351 292 200 406, Fax: +351 292 200 411, E-Mail: pereira@uac.pt

Japan

Inoue, Yukiko
Assistant Researcher, Ecologically Related Species Group, Tuna and Skipjack Resources Division, National Research Institute of Far Seas Fisheries5-7-1 Orido, Shimuzu-Ku, Shizuoka-City, Shizuoka 424-8633
Tel: +81 543 36 6046, Fax: +81 543 35 9642, E-Mail: yuinoue@affrc.go.jp

Minami, Hiroshi
Chef of Ecologically Related Species Group, Tuna and Skipjack Resources Division,, National Research Institute of
Far Seas Fisheries, 5-7-1 -Orido, Shimizu-ku, Shizuoka-City, Shizuoka 424-8633
Tel: +81 54 336 6000, Fax: +81 54 335 9642, E-Mail: hminami@affrc.go.jp

Ochi, Daisuke
Ecologically Related Species Section, Tropical Tuna Resources Division, National Research Institute of Far Seas Fisheries, 5-7-1- Orido, Shimuzu-Ku, Shizuoka 424-8633
Tel: +81 543 36 6047, Fax: +81 543 35 9642, E-Mail: otthii@affrc.go.jp

Maroc

El Marhoume, Samira
Ingénieur à la Division de la Protection des Ressources Halieutiques, Service de l'Application de la Réglementation
et de la Police Administrative, Département de la Pêche Maritime, BP 476, Agdal, Rabat
Tel: +212 066 137 9157, Fax: +212 0637 688089, E-Mail: elmarhoum@mpm.gov.ma

Namibia

Iitembu, Johannes Angala
Ministry of Fishery and Marine Resources, National Marine Research and information Centre, Strand Street, Swakopmund
Tel: +264 644 101 000, Fax: +264 644 4385, E-Mail: jaiitembu@mfmr.gov.na

Uanivi, Uatjavi
Minstry of Fishereis and Marine Resources, Directorete Resource Management, Strand Street, Swakopmund
Tel: +264 64 410 1176, Fax: +264 64 404 385, E-Mail: uuanivi@mfmr.gov.na

South Africa

Angel, Andrea
Private consultant, 65 Putney Rd., Kenilworth, Cape Town
Tel: +2721 6712967, Fax: E-Mail: andreaangel.g@gmail.com

U.K.(O.T.)

Luckhurst, Brian
Consultant, 2-4 Via della Chiesa, 05020 Acqualoreto (TR) Umbria, ITALIA
Tel: +39 0744 958 667, E-Mail: brian.luckhurst@gmail.com

Trott, Tammy M.
Senior Marine Resources Officer, Department of Environmental Protection, #3 Coney Island Road, CR04 St. George's
BERMUDA
Tel: +441 293 5600, Fax: +441 293 2716, E-Mail: ttrott@gov.bm

United States

Cass-Calay, Shannon
NOAA Fisheries, Southeast Fisheries Center, Sustainable Fisheries Division, 75 Virginia Beach Drive, Miami Florida 33149
Tel: +1 305 361 4231, Fax: +1 305 361 4562, E-Mail: shannon.calay@noaa.gov

Nalovic, Michel A.
Collaborative Research in Fisheries Science Fellow, Virginia Institute of Marine Science1208 Greste Rd., Gloucester Point, VA 23062
Tel: +504 520 0930, Fax: E-Mail: manalovic@vims.edu

Uruguay
Domingo, Andrés
Dirección Nacional de Recursos Acuáticos - DINARA, Laboratorio de Recursos PelágicosConstituyente 1497, 11200 Montevideo
Tel: +5982 400 46 89, Fax: +5982 41 32 16, E-Mail: adomingo@dinara.gub.uy

OBSERVERS/OBSERVATEURS/OBSERVADORES

Cooperating non-Contracting Parties, Entities/Fishing Entities

Chinese Taipei

Huang, Julia Hsiang-Wen
Associate Professor, Institute of Marine Affairs and Resources Management, National Taiwan Ocean University, 2 Pei-Ning Road, 20224 Keelung
Tel: +886 2 2462 2192, Fax: +886 2 2463 3986, E-Mail: julia@ntou.edu.tw

ICCAT SECRETARIAT
c/ Corazón de María 8 – 6 y 7 Planta, 28002 Madrid
Tel: +34 91 4165600; Fax: +34 91 4152612; E-Mail:Info@iccat.int

Pallarés, Pilar
Ortiz, Mauricio
Kell, Laurence
De Bruyn, Paul

Appendix 3

LIST OF DOCUMENTS

SCRS/2013/128	Understanding incidental catch of sea turtle of Taiwanese longline fleets in the Atlantic ocean. Huang H.
SCRS/2013/129	Circle hook effectiveness for catch of target species and incidental catch of sea turtles on a Taiwanese longline fishing vessel in the tropical Atlantic Ocean. Huang H., Swimme Y.r, Bigelow K.,Gutierrez A. and Foster D.
SCRS/2013/130	Incidental captures of sea turtles by Brazilian and Uruguayan longline fishery (1998 - 2010). Giffoni B., Leite N., Miller P., Pons M., Sales G. and Domingo A.

SCRS/2013/131 Estimación de las interacciones de las pesquerías de grandes pelágicos en el Mediterráneo y Estrecho de Gibraltar con mamíferos, tortugas y aves marinas.Proyecto de mitigación de estas interacciones. de la Serna J.M.; Macias D. and Ortiz J.M.

SCRS/2013/132 Inventory and Ecology of Fish Species of Interest to ICCAT in the Sargasso Sea. Luckhurst B.E.

SCRS/2013/133 Pan-oceanic analysis of the overlap of a large migrant with pelagic longline fisheries. Fossette S., Witt M.J., Miller P., Nalovic M.A., Albareda D., Almeida A.P., Broderick A.C., Chacón-Chaverri D., Coyne M.S., Domingo A., Eckert S., Evans D., Fallabrino A., Ferraroli S., Formia A., Giffoni B., Hays G.C., Hughes G., Kelle L., Leslie A., López-Mendilaharsu M., Luschi P., Prosdocimi L., Rodriguez-Heredia S., Turny A., Verhage B. and Godley B.J.

SCRS/2013/134 Draft Ecological Risk Assessment of sea turtles to tuna fishing in the ICCAT región. Angel A., Nel R., Wanless R.M., Mellet B., Harris L. and Wilson I.

SCRS/2013/135 Sightings and abundance of marine turtles in Azores. Pereira J. G.

SCRS/2013/137 Tracking EAF/EBF implementation with Ecological Risk Assessment (ERA) : The Namibian experience. Iitembu J.A. and Uanivi U.

SCRS/2013/138 TALCIN / VASG CFR Fellowship. Hartley T.

Appendix 4

UNPACKING EXERCISE

The results of an unpacking exercise conducted by the Sub-Committee on Ecosystems are shown in the table below. The table demonstrates how high order conceptual management objectives are translated into low order operational objectives. These outcomes are intended to form the basis of an ecosystem based fisheries management and reporting framework.

Level	Conceptual Objectives
1	Conserve Ecosystem Components
2	Conserve Community Diversity
3	Conserve Benthic Communities
	further unpacking required
3	Conserve Pelagic Community
	further unpacking required
2	Conserve Species Diversity
3	Maintain continued existence of all species within the management area
4	Manage exploitation of target species
5	Minimize ghost fishing
6	further definition required
5	Maintain ICCAT populations at MSY
6	Maintain species x above conservation limits
4	Minimize incidental catches of non-target species
5	Limit bycatch of species x managed by rFMO
5	eg Limit catch of porbeagle in NW Atlantic
5	Limit bycatch of species y not managed by rFMO
5	eg Limit catch of porbeagle in South Atlantic
5	eg Limit catch of forage species
4	Protect species at risk
5	Minimize bycatch of turtles
5	Minimize bycatch of seabirds
5	Minimize bycatch of marine mammals
5	Minimize bycatch of sharks
2	Maintain Population Integrity
3	Maintain continued existence of all populations within management area
4	Maintain spawning components
4	Ensure no spawning component is eliminated by fishing
5	Distribute fishing over spawning component
1	Conserve Components Role
2	Maintain Primary Productivity
3	Not relevant to fishing activity
2	Maintain Trophic Structure
3	Further unpacking required
2	Maintain Productivity of Populations
3	Manage exploitation of target species
4	Control overall exploitation rate
4	Ensure appropriate size selectivity of fishery
4	Prevent disturbance of fish when spawning
1	Monitor Components of Support System
2	Monitor Climatic Properties
	Monitor longterm properties
	Monitor short term properties
2	Monitor Oceanographic Properties
	Monitor longterm properties
	Monitor short term properties