

**2011 INTER-SESSIONAL MEETING OF THE
SUB-COMMITTEE ON ECOSYSTEMS**
(Miami, Florida, United States – May 9 to 13, 2011)

1. Opening, adoption of Agenda and meeting arrangements

The Meeting was held at the University of Miami, Rosenstiel School of Marine and Atmospheric Science in Miami, Florida from May 9 to May 13, 2011. Dr. Shannon L. Cass-Calay (NOAA-SEFSC) and Dr. David Die (UM/RSMAS), on behalf of the ICCAT Secretariat, NOAA Fisheries and the University of Miami, opened the meeting and welcomed participants (“the Sub-Committee”).

Dr. Shannon Cass-Calay (USA), meeting Chairperson, then proceeded to review the Agenda which 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:

<i>Section</i>	<i>Rapporteurs</i>
Item 1	S. Cass-Calay
Item 2	T. Carruthers and A. Hanke
Item 3	A. Wolfaardt
Item 4	S. Cass-Calay
Item 5	J. Walter, S. Cass-Calay
Item 6	K. Yokawa
Item 7	S. Cass-Calay

2. Review of new information regarding ecosystems and ecosystem modeling approaches

Four papers were presented describing spatial population dynamics modeling (SCRS\2011\054), optimization of spatial fishing effort (SCRS\2011\055), the precision of by-catch estimates with changing observer coverage (SCRS\2011\063) and habitat changes due to ocean temperature. In addition to these papers, the Sub-Committee engaged in a discussion on the role of ecosystem indicators and the ecological approach to fisheries management.

2.1 Ecosystem modeling approaches

Document SCRS\2011\054 describes the formulation and simulation testing of a spatial surplus production model that provides a basis with which to undertake multi-species, multi-area stock assessments. Movement between areas is parameterized using a simple gravity model that includes a ‘residency’ parameter that determines the degree of stock mixing among areas. The model is simple in order to (1) accommodate non-target species that typically have fewer available data, and (2) minimize computational demand to enable simulation evaluation of spatial management strategies. This model showed that careful consideration of spatial catch and effort data can provide the basis for simple yet reliable spatial stock assessments. If simple spatial dynamics can be assumed, tagging data are not required to reliably estimate spatial distribution and movement. When applied to eight stocks of Atlantic tuna and billfish the model tracks regional catch data relatively well by approximating local depletions and exchange among high abundance areas. In addition to this simulation work a software package ‘SEMIPRO’ was submitted to ICCAT that includes executable, user guide, data formatting and example files.

Document SCRS\2011\055 showed that if it can be assumed that the spatial dynamics of stocks can be approximated by a spatial production model (SEMIPRO), then it is possible to impute fishing effort of different gear types and determine a spatial mosaic of fishing effort across gears that best meets management objectives for multiple stocks. However such an exercise reveals that spatial effort solutions may lack credibility without relatively fine scale spatial disaggregation of fishing, a complex management objective function and constraints over the maximum rate of regional effort change. It was noted that while these conditions may not be satisfied, the method can still provide useful guidance and/or highlight areas of concern.

The Group recognized the utility of this approach and acknowledged that the model could make use of more tagging data to support the estimation of more detailed and credible movement scenarios. Further, it was acknowledged that an age-structured population model would lend the approach more credibility. In terms of flexibility, the model could predict historical effort and it would be possible to evaluate species interactions. Also, the model could theoretically accommodate by-catch species such as seabirds and sea turtles.

Document SCRS\2011\063 described the mean and precision of CPUE estimates for 120 species under a range of observer coverage scenarios. Of the 120 species, 34 could not be identified to the species level. The precision of the estimates was based on 10,000 randomly sampled data sets resampled from Japanese longline data from the ICCAT convention area recorded between 1997 and 2009. These data represent over 29 million hooks and 416 thousand fish. The mean CPUE was relatively stable over the range of observer coverage for common fish species like the tunas, but the mean decreased with declining coverage for rarely caught species like sharks. The Coefficient of Variation (CV), used to describe the change in precision of observed CPUE, increased with decreasing observer coverage for all species. However, this effect was more pronounced for rarely caught species.

It was noted that observers typically find it difficult to identify the rarely caught species which exacerbates the problem of getting precise estimates of catch rates when coverage is low. It was also noted that the CV was not an appropriate metric for describing precision in the estimate of mean catch rate and that the standard error can be more easily interpreted. Given that the sample unit was the set, it was indicated that potential pseudo-replication effects due to non-independence among the sets (spatially and or temporally) would result in underestimation in the variance of catch rate observations. The Group concluded that the technique was interesting and useful and could provide a basis for answering questions about recovery plans and determining the consequences of management plans.

A presentation on the Ecosystems Approach to Fisheries management (EAF) was discussed. The Group considered this presentation in the context of how it might apply to ICCAT in light of the Commissions discussions on the future of ICCAT. The Group recognized that moving towards the EAF may help to account for the ecological complexity of the Atlantic ecosystem.

The Group noted that there is an important distinction between the technical part of the EAF approach and the multi-sectoral resource management decision making associated with it.

It was noted that greater clarity regarding the Commission's EAF goals and definitions would help to direct available resources and maximize the relevance of work produced by the Sub-Committee on Ecosystems.

Where possible it would be instructive to review examples of management initiatives that adopted an EAF approach and where possible learn from these.

The Group underlined the need to engage with and involve scientists outside of the SCRS in order to aid in the implementation of the EAF approach. For example, we will require oceanographers to provide information on trends in physical oceanographic variables.

The migration to an EAF approach requires an evolutionary transition rather than a replacement of the current management framework.

2.2 Integration of ecosystem indicators

The results of oceanographic and climatological models (Stramma, et al. *In review*) that describe habitat compression of billfish caused by an expanding oxygen minimum zone (OMZ) were presented to the Group. The authors adopted a dissolved oxygen threshold of 3.5 mL L^{-1} as a lower habitat boundary limit for tropical billfishes and tunas based on stress and lethality symptoms reported for tropical pelagic fishes in the literature. This level of dissolved oxygen is hypoxic to many fish and was shown to be occurring at increasingly shallower depths in the southern Atlantic Ocean since 1960. The spatial extent of this hypoxic zone has been expanding and now reaches from Africa to South America, covering a surface area at 100 m depths roughly the size of continental United States. The expansion of the ocean scale OMZ represents a 15-20% loss in habitat since 1960. Fishing effort was shown to occur within the area affected by the OMZ with increasing intensity since 1960 and there was also a corresponding trend for removals of billfish from this area during this period. It is hypothesized that habitat compression is concentrating fish in the surface mixed layer where they are more vulnerable to

fishing. Consequently, this increase in vulnerability should be considered in the assessment and management of affected species, for example, when standardizing CPUE. The Sub-Committee agreed that improving the spatial-temporal resolution of the OMZ would increase its usefulness in CPUE standardization.

The Sub-Committee was also presented with a critical account of using mean trophic level (MTL) as an indicator of the health of the ecosystem. An introductory paper on MTL (Pauly *et al.* 1998) (1) summarized that MTL of the catch was declining, (2) that this was related to the MTL of the ecosystem, and (3) that this could be a useful indicator. Using simple examples it was demonstrated that there could be exploitation scenarios for tuna and billfish where the MTL of the ecosystem might be a misleading indicator (even if it could be measured). It was highlighted that by definition MTL may not respond to changes in traditional concepts of biodiversity (e.g. species richness) and sustainability (e.g. MSY reference points). It was concluded that caution should be taken in adopting indicators and that they be subject to simulation evaluation prior to implementation in the field. In conjunction with the presentation, a recent paper (Branch *et al.* 2010) was reviewed in which the MTL was found to be misleading in a variety of ecosystems.

The Sub-Committee also noted that greater clarity in Commission objectives regarding the ecosystem approach to fisheries would help to best direct available resources and maximize the relevance of the work of the Sub-Committee.

3. Research on seabird by-catch mitigation measures

Document SCRS/2011/53 presented information on the abundance and distribution of Mediterranean Cory's shearwater by-catch in the Spanish commercial Mediterranean longline fisheries. The aim of this study was to identify the principal factors that influence this by-catch and to understand how they could be controlled. Data used in this study were recorded by the IEO (Instituto Español de Oceanografía) through an onboard observer program. During the 10 years covered in this study (2000-2009), a total of 2587 fishing sets were observed (5,398,297 hooks), in which 80 birds were caught in 30 fishing operations. A logistic model was constructed in which the independent variables were related to technical characteristics of the fishery, geographical location, seasonality, and interactions with other fisheries. In addition, classification trees were developed to obtain different scenarios to manage the principal factors affecting Cory's shearwater by-catch. Of the variables considered, the most significant was the number of hooks per set and the interaction with other fisheries (mainly trawlers). Limiting the number of hooks per set to < 2500 and/or limiting the fishing activity of surface longlines to working days could substantially reduce seabird by-catch without reducing the fishery profitability, and it will also reduce the fishing pressure on the swordfish stock.

Document SCRS/2011/62 introduced the Japanese activities to develop seabird by-catch mitigation measures and their scientific evaluation. Japanese longline skippers have developed and deployed effective seabird by-catch mitigation measures for longline fishing operations, including tori-lines, weighted branchlines, and others. These measures have been assessed by Japanese scientists to evaluate their effectiveness. Future plans of Japan to reduce incidental mortality of seabirds in pelagic longline fisheries were also presented. Efforts will continue to assess the effectiveness of these by-catch mitigation measures through several field experiments and data analysis, and the results will be reported and published in the meetings of each tuna RFMO or scientific journals.

Document SCRS/2011/064 presented results from a study that compared the performance of weighted and un-weighted branchlines deployed with revised "hybrid" tori lines (designed to reduce tori line – float line foulings) on two Japanese vessels participating in the 2010 tuna joint venture fishery in the South African EEZ. The mass and position of weights ultimately used to weight branchlines in this study (65 to 70 g within 3 to 3.5 m of the hook) deviated considerably from that called for in the original research proposal to the South African government – 60 g within 2 m from the hook. This study provides compelling evidence that branchline weighting is highly effective at preventing seabird attacks within the 100 m aerial extent of streamer lines, excluding most seabird attacks within the 100 m aerial extent and allowing none between the two hybrid streamer lines in a white-chinned petrel dominated system. The higher rate of tangling of weighted branchlines relative to un-weighted branchlines is the only remaining barrier to make branchline weighting a practical mitigation measure. Despite being lighter and positioned further away from the hook in this 2010 experiment, the branchline-weighting configuration used in this study proved highly effective and safe. Branchline weighting requirements should strive to encourage continued innovation by allowing some degree of flexibility. The study concluded that the simultaneous use of paired hybrid tori lines, weighted branchlines, and night setting represents a best-practice seabird mitigation in the South African EEZ and other white-chinned petrel dominated systems.

Document SCRS/2011/065 presented information on the distribution of seabird by-catch across the ICCAT area based on data collected by Japanese observers from 1997-2009. The main objective of this study was to guide the process to introduce effective by-catch mitigation measures in high risk areas. Higher CPUEs of albatrosses and petrels were mainly observed in the area south of 30°S from April to September, where strict mitigation measures should be used. Higher CPUEs of some albatrosses and petrels were also estimated for the area off of Namibia from October to December, which indicates that strict mitigation measures should also be used in this area during the austral summer. The CPUE levels north of 30°S was relatively low in comparison with the area south of 30°S and few albatrosses and petrels were caught in the north. The Sub-Committee noted that the data presented by Japan represents a very useful contribution towards our understanding of seabird by-catch in the ICCAT Convention area. The Sub-Committee also noted that it is important to consider all fishing fleets collectively, and that there are still substantial by-catch data gaps. The Sub-Committee discussed particularly discussed the high risk area identified. It was felt that there were insufficient data to suggest that the area between 20° and 30° S was of lower risk, and so agreed that previous recommendations highlighting the areas south of 20° S as being of high risk should remain. The Sub-Committee encourages further research to clarify this result. Further, the Sub-Committee re-iterated that it is important for by-catch data to be collected and presented by all countries, and highlighted the need for further analysis, combining seabird tracking, distribution and by-catch data, to help fill these gaps. The Group noted the importance of understanding the foraging ecology and behaviour of seabirds and how this influences the nature of interactions between seabirds and fishing vessels.

Document SCRS/2011/066 presented the results of research conducted in Brazil in 2010 to assess the efficacy of different line weighting schemes used in combination with tori lines in reducing seabird by-catch. The different line-weighting regimes tested included weights of 60 g and 75 g, placed 2 m and 5.5 m from the hooks. The lines with weights placed at 2 m from the hooks sank faster in each of the 0-2 m, 2-4 m and 4-6 m depth strata categories assessed than in the lines which had weights placed at 5.5 m from the hooks. These differences were statistically significantly for all strata except for the 0-2 m and 4-6 m depth strata in the lines with 75g. During 1,420 minutes of direct observation during setting operations, 312 bird attacks on baited hooks were recorded. The mean attack rate during line setting operations was significantly lower for sets with tori line protection than those without. There were more seabird attacks of hooks on lines with weights at 5.5 m than on lines with weights at 2 meters from the hooks, and the attack rate was zero on first 75 m astern when fishermen use a tori line and lines with weights placed at 2 m from the hook. No seabird by-catch was recorded during the 55 experimental sets. In total 2,807 target prey individuals of 12 taxa were caught. Albacore tuna (*Thunnus albacares*) was the most abundant prey caught (n = 1522), followed by blue sharks (*Prionace glauca*) (n = 476). These two species constituted 71% of all captures, and tunas and sharks constituted 93% of the captures. There were no significant differences between the CPUE of the main target species under both treatments. This research was conducted by Projeto Albatroz, with support of Petrobras Ambiental Program, Albatross Task Force Program and Ministry of Fisheries and Aquaculture of Brazil.

Brazil also reported the adoption, by the Brazilian Government, of Inter-ministerial Normative Instruction no. 04 of 15th of April of 2011, which requires the use of tori lines and weights of at least 60g place at 2 meters from the hooks for all pelagic long line vessels fishing south of 20° S. The technical specifications of this legislation were based on recent research conducted on Brazilian vessels. It was noted that in terms of mitigation, the regulation goes beyond ICCAT Recommendation 07/07, and is consistent with recommendations from the Sub-Committee in 2009 and 2010, in that it requires a combination of mitigation measures for all pelagic longline vessels fishing south of 20°S.

Document SCRS/2011/061 evaluates the extent to which deeper-diving seabirds (e.g. *Procellaria aequinoctialis*, *Procellaria conspicillata* and *Puffinus gravis*) increase the susceptibility of albatross by-catch in pelagic longline fisheries. Primary attacks (where the bait is taken directly by the bird), and secondary bait attacks (where diving species bring the bait to the surface where it is subsequently taken by another bird) (albatross), were quantified in 48 sets (mean 187 ± 122 observed hooks per set). The access order of each species in multiple attacks was recorded and taken into account. A total of 384 bait attacks were observed of which 260 consisted only of primary attacks and 124 were multiple attacks. The study indicates that multiple attacks were the largest source of by-catch (at least 24 of 31 cases) for albatrosses. The diving petrels increased by 55% the ultimate catch of albatrosses. The study highlights that mitigation measures should consider the first 50m from the boat as a critical area to protect. In turn, measures to increase bait sink rates should be applied to reduce petrel attacks at a greater distance from the stern of the vessel and to prevent secondary attacks by albatrosses. This work shows that there are inter-specific effects influencing the likelihood of seabird by-catch, and highlights the importance of conducting observations of attacks of bait during the setting to better understand the nature and extent of by-catch.

Document SCRS/2011/056 described and reviewed advances in the field of pelagic seabird by-catch mitigation, occurring over the past two years. Results from various trials demonstrated that a combination of mitigation measures must be used to optimally minimise seabird by-catch. Evidence suggests that the use of tori lines, line weighting, and night setting in combination will be the most effective means of reducing seabird by-catch in pelagic longline fisheries. Several trials comparing the efficacy of tori line designs have led to the conclusion that conventional, mixed and light tori lines could all be effective in reducing seabird by-catch, when used in combination with other measures. While there is currently no single optimal tori line design for pelagic longliners, several broad characteristics were identified. In particular, the sinking of baited hooks within the aerial extent of the tori line (~100m) was critical in determining the effectiveness of the mitigation. The aerial protection of hooks entering the water immediately astern of the vessel was important, as seabird attacks on baited hooks were greatest within the first 50 m astern. Finally the report concluded that optimal line weighting regimes may vary between vessels but the critical element determining efficacy in by-catch reduction was the sinking of baited hooks below the diving depth of seabirds (~10m) within the aerial extent of the tori line deployed (~100m), thus ensuring their continual protection until outside the area of risk.

The Sub-Committee noted that the key findings reinforced previous recommendations from the Sub-Committee in 2009 and 2010 that the combined use of tori lines, line weighting and night setting would be the most effective way to minimise seabird by-catch in pelagic longline fisheries.

It was reported that the Seabird By-catch Working Group of ACAP (Agreement on the Conservation of Albatrosses and Petrels) will be meeting in August 2011, when they will be reviewing all of the recent seabird by-catch mitigation research with the aim of producing updated advice. The Sub-Committee noted that it would be useful to have this advice and other relevant information presented at the ICCAT SCRS meeting in September 2011. The draft agenda for this meeting is provided in **Appendix 4**.

It was reported that the ACAP Workshop of National Observer Programs will be held in Itajaí, Brazil in November 2011, involving Uruguay, Brazil and Argentina. The main objective of this workshop will be to identify potential collaborations between the countries to strengthen the seabird by-catch data collection protocols and the production of information from those programs. The Sub-Committee indicated that it would also be useful to have the results of this workshop presented at the Sub-Committee meeting in 2012.

Information on the collection of seabird by-catch data in the U.S. Atlantic pelagic longline fleet was also presented to the Sub-Committee. The U.S. Seabird By-catch Project was initiated in 2004 to improve the seabird by-catch information collected by the Pelagic Observers Program (POP) for the U.S. Atlantic pelagic longline fleet, and to estimate the total annual seabird by-catch of the fleet. A more detailed report of the presentation is provided in **Appendix 5**.

4. Response to Recommendation 10-09, sea turtle by-catch mitigation

4.1 Summarize data submitted to ICCAT by CPCs

The Sub-Committee reviewed the data reporting requirements of Rec. 10-09, specifically that each CPC shall collect and annually report to ICCAT starting no later than 2012 information on the interactions of its fleet with sea turtles in ICCAT fisheries.

The Sub-Committee recognized that Rec. 10-09 requires data submission no later than 2012, and therefore recommended that a thorough review of the available data be conducted in 2012. Recommendations regarding the use of this data for assessing the impact of ICCAT fisheries on sea turtles will also be made at that time.

4.2 CPC reports regarding the implementation of FAO's "Guidelines to Reduce Sea Turtle Mortality in Fishing Operations"

The United States presented its technical guidance with regard to the FAO's "Guidelines to Reduce Sea Turtle Mortality in Fishing Operations. NOAA Technical Memorandum NMFS-SEFSC-580, "Careful release protocols for sea turtle release with minimal injury," provides a detailed description of gear removal tools and techniques to remove fishing gear from incidentally captured sea turtles. During sea turtle mitigation experiments conducted in the Atlantic Ocean in 2001-2003, participating pelagic longline vessel captains and fishery observers were interviewed to discuss the efficacy of various gear removal tools. Based on field testing and user feedback, the

tools were revised and these protocols were developed. This document is intended for education and outreach, and it will be updated as new tools and techniques are developed, tested and approved. The careful release protocols include handling guidelines for turtles which cannot be boated and those turtles brought onboard. Design standards and schematic diagrams for release equipment, release placards for marine turtles and mammals, a resuscitation placard and an identification guide are provided. NOAA Technical Memorandum NMFS-SEFSC-580 is available at: http://www.sefsc.noaa.gov/turtles/TM_NMFS_SEFSC_580_2010.pdf.

4.3 Sea turtle by-catch in ICCAT fisheries

Document SCRS/2011/057 provided a characterization of the broad-scale behavioral patterns, inter-seasonal variability, and general high use areas for juvenile loggerhead turtles in the southwestern Atlantic Ocean. Satellite tracking data obtained from 26 individuals showed that the high use areas for the tracked turtles were over the continental shelf and slope within the Uruguayan and Brazilian EEZs, and also in international waters between the Rio Grande Rise and the continental slope off of southern Brazil. When tracked movements are considered with the distribution and elevated by-catch levels of juvenile loggerheads in the SW Atlantic Ocean, as reported by previous studies, the results of this study clearly define the waters off southern Brazil and Uruguay as the first identified juvenile loggerhead developmental high use area in the South Atlantic. This demonstrates the need to focus further tri-national and international collaborative efforts in research and management of sea turtles in this region of the world. It was noted that other species of sea turtles as well as both juvenile and adult leatherback turtles are intercepted by the longline fishery in this region. The Sub-Committee also inquired as to the location of the nesting beaches. It was indicated that this varies for the areas studied. In some areas sea turtles nested primarily off the coast of Brazil, in other study areas sea turtles nested in many areas of the Atlantic and Mediterranean, including Brazil, Florida and Greece.

Document SCRS/2011/058 provides information on sea turtle by-catch in deep set pelagic longlines operating within the Uruguayan EEZ. The study, based on 100% scientific observer coverage on 689 sets (1,622,552 hooks), showed that sea turtle CPUE on deep set longline was found to be lower than that of the traditionally employed shallow set longlines operating in the region. However, this difference was less than the 10 to 1 ratio that was previously proposed. The results also indicated that deep set pelagic longlines can achieve CPUE values that are of great concern. The results also showed that the idea that pelagic longliners targeting tuna with deep set longlines do catch fewer sea turtles needs to be considered with caution as their use does not necessarily imply that low levels of sea turtle by-catch can be achieved in all situations. The study concluded that in order to properly estimate the impact of pelagic longline fisheries on sea turtles further research needs to be conducted to determine the factors that affect the sea turtle catchability. Failing to do so will prevent the removal of biases associated with the already reported relative abundances. The Sub-Committee discussed the average depth of the deep-sets compared to the depth distribution of the sea turtles. The study indicated that the deep-sets were below the general depth distribution (as reported) of the sea turtles. The Sub-Committee noted that depth ranges may be underestimated if maximum depth excursions are of short duration, and that the depth distribution of sea turtles may not be same as reflected by the vertical CPUE pattern. The Sub-Committee also noted that while higher intercept mortality might be expected on the deeper sets, this was not investigated by the authors.

Document SCRS/2011/059 presented information on the effect of the hook type on the capture and length composition of sea turtles, seabirds, and fishes in pelagic longline vessels operating in Uruguayan waters. During 61 sets made in 7 fishing trips between August 2008 and December 2010, comparisons on catches were done between two consecutive sections of the gear each with a hook type (10° offset 18/0 “C” against the conventional “J” 9/0 non-offset). A total of 108 pairs and 39,822 hooks were observed in the entire experiment (50% J y 50% C). The overall catch was higher for C hooks (2,134 individuals) relative to J hooks (1,176). Tuna catch was higher in C hooks, and regarding commercially important shark species, a higher catch was observed using C hooks. In the case of swordfish, caution is required as it is a main target species and the results suggest a decrease in CPUE with a change from J to C hook. For loggerhead turtles a non-significant decrease in their capture with C hooks relative to J hooks of approximately 25% was observed. The lengths of the different species analyzed showed no difference between hook types. The study concluded that more research is needed to better assess the effect of using circle hooks on the capture, injuries and mortality of loggerhead, and also on the catch of many other species (e.g. some tunas, condrichthyans and seabirds) particularly swordfish. The Sub-Committee noted that the results of this document are similar to many that have been presented recently, including several at the 2011 International Circle Hook Symposium, and emphasized that the 25% reduction in CPUE of sea turtles when using circle hooks, while not statistically significant, should be investigated. It was noted that while the sea turtle catch rates were lower, the by-catch mortality was higher for circle-hooks, although this result was also not statistically significant. The Sub-Committee also inquired regarding additional experimental factors that might exist (e.g. bait selection, day-night) that were not fully accounted for.

Document SCRS/2011/067 described a new design of drifting floating aggregation device (DFAD) being tested in eastern Atlantic waters with the objective of reducing turtle and shark mortality without reducing fish aggregation efficacy. The different designs of the experimental DFAD are almost entirely biodegradable with bamboo and sisal lines as main components. Nine experimental DFADs with a preliminary design were set in November 2010 and their fish aggregation biomass has been monitored since then. Another 35 experimental DFADs with a different design will be tested in May 2011. The Sub-Committee noted that the largest aggregation biomass reported by a DFAD was 17 tonnes and questioned whether this was comparable to the biomass under a traditional FAD. Since this is an experimental procedure, that comparison was not available at this time. The presenter also reported that electronic discrimination of the aggregated biomass is currently being examined to determine the species composition. If that procedure is successful, the current and historical species composition could be determined.

Document SCRS/2011/068 describes several actions developed by the Brazilian National Center for Conservation and Management of Marine Turtles (TAMAR Project) to reduce the capture and death of sea turtles by various fisheries, including monitoring, research, development of mitigation measures, support to sustainable fisheries and participation in negotiation forums. Aiming at reducing the rates of incidental catch of sea turtles in oceanic fisheries and at increasing their survival post-capture, TAMAR Project has been adopting measures to implement the ICCAT's Recommendation 10-09 and the FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations. This document presented the main recommendations proposed by these two documents and the actions that are being developed in Brazil to meet them, such as the increase in the number of longline trips covered by observers on board; the promotion and implementation of the use of circle hooks and other mitigation measures in the longline fleet; the training of captains and crewmembers to better handle the sea turtles that are caught; the continuation of the partnership with fishermen and local communities and the cooperation with foreign institutions and other countries in the South Atlantic.

The Sub-Committee noted that the effect of by-catch mitigation measures are important and must be considered in stock assessment procedures, including the estimation of relative indices of abundance. The Sub-Committee also noted the importance of the large number of small coastal vessels (300-400) which fish off Brazil and agreed that this source of by-catch is important to consider, and that these vessels lack adequate observer coverage or monitoring due to their small size.

A presentation by Uruguay described the spatial-temporal correlation between leatherback turtles and pelagic longline fisheries in the Atlantic Ocean being developed by a group of researchers from many countries, who have been working on an initiative called TALCIN (Trans Atlantic Leatherback Conservation Initiative). Based on satellite tracking data of 110 individuals, the group identified high use areas in the Atlantic Ocean. Using pelagic longline fishing effort information from the ICCAT Task II CE database, it was shown that some leatherback's high-use areas overlap with areas with high fishing effort, which may suggest potential high by-catch rates in these areas. Analysis of the temporal distribution of both the fisheries and the sea turtles are the next important step of the analysis. The TALCIN group seeks to involve stakeholders from local governments and RFMOs to use their results to develop and adopt consistent mitigation measures to reduce leatherback turtle by-catch.

The Sub-Committee noted that this analysis was similar to what was done for seabirds and suggested that the study could be improved by the use of longline effort estimates developed by the Secretariat, that include all fleets. It was also discussed that his approach has its limitations because by-catch mortality may differ significantly between fleets and gear configurations and the difficulties to characterize the fishing effort of the coastal fisheries.

The United States provided a review of factors affecting post-release mortality. A summary of the presentation follows. While most sea turtles are released alive from U.S. pelagic longline gear, post-release mortality has been documented. Both the fishing line and the fishing hooks pose problems for sea turtles. Harm from gear left on the animals may include tissue damage, infection, and digestive track blockage. Hooks may perforate internal organs or vessels; in some cases hooks become encapsulated or are expelled. Trailing line, a major source of mortality, can encircle a limb, restrict circulation, and cut deeply into the tissue, and eventually cause loss of function. Ingested line may irritate the lining of the gastrointestinal track and cause death by torsion (involution) or intussusception (telescoping of the gut tube), cutting off circulation. The presenter also discussed a set of criteria developed and used in the U.S. to estimate post-release mortality, and a table that was developed which categorized and ranked hook location and/or entanglement, and considered the amount of gear remaining on the animal at release. A more detailed summary of this presentation and the development and use of the post-release mortality table is found in **Appendix 6**.

The Sub-Committee discussed the difficulty in determining whether by-catch of sea turtles (or any by-catch species) represents a significant risk to the population. It was noted that often very little information exists to make this determination.

4.4 Capacity building efforts and other cooperative activities to support implementation of Rec. 10-09

Uruguay described the TALCIN (Trans Atlantic Leatherback Conservation Initiative) program, which is a collaboration of scientists from many nations, fisheries organizations, universities and non-government conservation organizations.

5. Other matters

5.1 Recommended reorganization of the SC-ECO

The Sub-Committee considered several other matters during the meeting. The first of which was several options for reorganization of the Sub-Committee which included maintaining the status quo, creating separate by-catch and ecosystems sub-committees or maintaining one sub-committee but assigning two rapporteurs. The third option was considered the most preferable as it maintains the integrity of the current Working Group while creating separate rapporteurs to promote ecosystem and by-catch considerations within the existing structure. The Group felt that, despite the current high by-catch workload, maintaining the integrity of the Sub-Committee best preserved the critical number of participation from national scientists, non-governmental organizations and academic researchers. The Group expects that the Ecosystem rapporteur, with support from national scientists, would have the responsibility to seek collaboration from experts in the field and enhance the capabilities of the Sub-Committee. A working plan of the integration of Ecosystem Based Fisheries Management (EBFM) into the ICCAT assessment and management processes will be prepared by the Ecosystems rapporteur. Likewise, the By-catch rapporteur, with the support of national scientists, would be responsible for identifying experts in the field of by-catch research. At this time, the Sub-Committee expects that the Group would continue to meet concurrently.

5.2 Recommendation regarding the By-catch Coordinator position

The second matter was a revision of the By-catch Coordinator job description. The Sub-Committee felt that the most effective contribution was to document a list of desired skills and responsibilities for the position and to leave the drafting of the position advertisement to the Secretariat. The Sub-Committee recommended that the Secretariat use the free advertising provided by various list servers to ensure a broad dissemination of the advertisement. The following describes the recommendations of the Sub-Committee regarding this position:

Duties and responsibilities

1. ESSENTIAL- Coordinate collection of by-catch data by CPCs, including the implementation of standardized reporting practices facilitating data collection and reporting to the SCRS.
2. ESSENTIAL- Coordinate and assist with the inclusion of by-catch information into the ICCAT databases.
3. ESSENTIAL- Work in close collaboration with the Sub-Committee on Ecosystems and other Species Groups as required (e.g. query database, provide estimates of by-catch and advise regarding appropriate useage of data).
4. ESSENTIAL- Assist to update the *ICCAT Manual* (e.g. Prepare materials to facilitate identification and standardization of data collection protocols for by-catch species).
5. (ESSENTIAL) - Participation in multi-disciplinary teams and committees to develop methods to assess magnitude of by-catch and to evaluate methods for by-catch mitigation.
6. (ESSENTIAL) Assist in the maintenance of the by-catch database within the Secretariat.

Qualifications and experience

1. ESSENTIAL. University degree in one of the following: Fisheries Science, Marine Biology, Natural Sciences, Biological Sciences or Environmental Sciences or closely related fields. Plus demonstrated post-graduate experience.
2. ESSENTIAL. Experience in handling of by-catch data, and at least one of the following: knowledge of fishing technology, by-catch mitigation or the principles of ecosystem based fishery management.
3. ESSENTIAL. Demonstrable experience in database management and related software or computer programming languages.
4. ESSENTIAL. An understanding of scientific problems related to by-catch, and an ability to communicate these to a general audience orally and in writing.
5. ESSENTIAL. Knowledge of the fisheries for tuna and tuna like species.
6. ESSENTIAL. Ability to work well under pressure and to work effectively and harmoniously with people of different national and cultural backgrounds.
7. ESSENTIAL. Excellent working knowledge of one of ICCAT's three official languages (English, French and Spanish). If the candidate is not a Spanish native speaker, the ability to communicate in that language is also desirable.
8. ESSENTIAL. Applicants should be willing and able to travel frequently to other countries, including remote areas.
9. ESSENTIAL. Coursework in statistics and demonstrable experience with statistical analysis of large datasets.
10. DESIRABLE. Experience in ecosystem modeling, fisheries stock assessments and the development of management advice based on scientific studies.
11. DESIRABLE. Experience working within multi-disciplinary teams.

5.3 The 2011 Joint Tuna-RFMO Technical Working Group on By-catch, July 2011

The third matter was a discussion of the Secretariat's working plan for the joint Tuna-RFMO Technical Working Group Meeting on By-catch that will occur in July 2011, in La Jolla, California, USA, just prior to the Kobe III Meeting. An objective of this meeting is to discuss the standardization of by-catch data collection and reporting practices across tuna RFMOs. The SCRS Chair presented the working plan of the Secretariat with regard to this meeting (**Appendix 7**).

The Sub-Committee supported the working plan, and it was noted that collaboration across tuna RMFOs is complicated by a reluctance to change existing observer program methodologies and reporting practices. However, the Sub-Committee generally agreed that efforts to facilitate data sharing need not replace existing methodologies and encouraged the collaboration among tuna RFMOs in this respect.

The Sub-Committee discussed the plan to limit the number of by-catch species to be included in the database. While the Sub-Committee recognized the costs associated with using an extensive list (e.g. capacity of data storage, analytical workload, inability to correctly identify some species, increased need for training and identification tools), the Sub-Committee indicated that the metric used to create the list should consider ecological importance as well as abundance. The Sub-Committee suggested that the previously performed Ecological Risk Assessment might be informative in the development of any list of by-catch species.

The Sub-Committee also discussed the analytical difficulties associated with rare species. It is well established that rarely encountered species and low observer coverage levels will result in imprecise estimates of by-catch. However, it was also noted that data on rare species can be useful to examine overall effects across fleets, and direct efforts to enhance sampling on species groups of concern.

The Sub-Committee also recommended that the Secretariat attempt to collate user manuals or protocols describing data collection from CPC observer programs. Also, an attempt should be made to identify historical changes to the data collection protocols that might complicate data analyses and interpretation.

5.4 A Presentation by the Sargasso Sea Alliance

The Sub-Committee reviewed a presentation by the Government of Bermuda on behalf of the Sargasso Sea Alliance. A summary of their presentation can be found in **Appendix 8**. The Sargasso Sea Alliance noted that, in 2005, ICCAT passed Resolution 05-11 on Pelagic *Sargassum* requesting Contracting Parties and others to provide to the SCRS information and data on activities that impact pelagic *Sargassum* in the Convention area on the high seas, directly or indirectly, with particular emphasis on the Sargasso Sea. As a result, the SCRS was asked to examine available and accessible information and data on the status of pelagic *Sargassum* and its ecological importance to tuna and tuna-like species.

In 2006, the Sub-Committee on Ecosystems noted in this regard that there was no information on the matter. It therefore recommended that scientists from the Contracting Parties provide available information to the Sub-Committee, which would facilitate giving a response to the Commission (ICCAT Report 2006-2007, Appendix 10, item 6). In the light of the 2005 ICCAT Resolution, the 2006 recommendation from the Sub-Committee on Ecosystems, and the information provided by the Sargasso Sea Alliance (**Appendix 8**) at this meeting, the Sub-Committee encouraged scientists from Contracting Parties to examine the available data to better assess the importance of pelagic *Sargassum* to tuna and tuna-like species.

5.5 Feedback from the Circle Hook Symposium

The 1st International Circle Hook Symposium was held May 4-6 in Miami, USA with the participation of 160 attendees from 20 different countries. A total of 46 oral presentations and 31 posters were presented during the symposium. The Symposium was structured into six different sessions: (1) Circle Hooks and Commercial Fisheries, (2) Circle Hooks and Recreational Fisheries, (3) Circle Hooks and Sharks, (4) Circle Hooks and Sea Turtles, (5) Circle Hooks and Human Dimensions, and (6) Circle Hooks, Assessment and Management. The presentations and discussions reflected the difficulties with respect to defining what a circle hook is and the need to find a standardized definition of circle hooks. During the symposium it was evident that the wide variety of hook shapes and sizes, experimental designs, model factors, and statistical techniques used in circle hook research make meaningful comparisons among studies very difficult. The results of the many research presented at the symposium reaffirmed that circle hook performance is dependent upon many factors. However, it was shown that in general when circle hooks are used with the right combination of factors such as size of hook and bait they do tend to have either a neutral or positive conservation effect while not negatively impacting catch rates of target species. But, a number of studies did show a reduction in catch rates for swordfish and dolphin fish, and the presented studies showed mixed results with respect to sharks. Several presentations showed the advantage of NGOs, fishers, and government organizations working together to advance the use of circle hooks in artisanal fisheries. This approach has been very successful in the Eastern Pacific Ocean (EPO).

5.6 Work plan for the assessment of the impact of ICCAT fisheries on sea turtles – as described in Rec. 10-09 and to begin in 2012

The Sub-Committee discussed upcoming data requirements and activities related to Rec. 10-09, the assessment of the impact of ICCAT fisheries on sea turtles. The Group agreed that the following activities are essential to successfully conduct the impact assessment beginning in 2012. The tentative working plan is as follows:

1. During 2011:
 - a. The convener of the Sub-Committee on Ecosystems, with support of the Sub-Committee and National Scientists, will collect, review, and summarize assessments of the impact of fisheries on by-catch species, including sea turtles and will identify experts in these topics.
 - b. The Sub-Committee will request that the Secretariat update the longline fishing effort file maintaining as much detail as possible (e.g. area fished, depth of fishing).
 - c. The convener of the Sub-Committee on Ecosystems, with support of the Sub-Committee and National Scientists, will collect information on existing sea turtle by-catch mitigation measures.
 - d. The convener of the Sub-Committee on Ecosystems, with support of the Sub-Committee and National Scientists, will collect information regarding the quantification of post-interaction mortality.

2. Before 2012 SC-ECO Meeting
 - a. The convener of the Sub-Committee on Ecosystems, with support of the Secretariat, will contact CPCs to encourage submission of catch rate series for the various fisheries that interact with sea turtles.
 - b. The convener of the Sub-Committee on Ecosystems will seek out the participation of experts on the assessment of by-catch species and sea turtles.
3. 2012 SC-ECO Meeting – Data preparation
 - a. The Sub-Committee will:
 - i. Review the available data and identify gaps in knowledge.
 - ii. Review methods used to extrapolate total by-catch using data from the reporting fleets.
 - iii. Review methods to estimate post-release mortality.
 - iv. Review methodologies to assess the impact of fisheries on by-catch species
 1. Review data requirements and assumptions of each method
 2. Identify models that may be possible, and appropriate to implement given the available data.
 3. Recommend model approaches
4. 2013 SC-ECO Meeting – Begin analyses
 - a. The Sub-Committee will initiate analyses using the approaches recommended in 2012. This process must begin in 2013, but may not be possible to complete in 2013.

6. Recommendations

1. The Sub-Committee recommends that observer by-catch rates should be estimated with an estimate of standard error which is a measure of certainty over the mean catch rate that is easier to interpret statistically.
2. The Sub-Committee recommends that guidelines for the presentation and analysis of by-catch statistics be developed in conjunction with the Working Group of Stock Assessment Method (WGSAM) and that these guidelines be made available as part of the *ICCAT Manual*. Furthermore, the Sub-Committee should work with WGSAM to evaluate how these data can be used as part of a risk management advice framework.
3. Encourage CPCs to use the results from the ecological risk assessment (e.g., Cortés et al, 2010 and SCRS/2009/058) initiated by the Sub-Committee, to prioritize the collection of information on those species most at risk.
4. The Sub-Committee recommended that National Scientists continue the study of robust indicators for by-catch species, especially for low occurrence species.
5. The Sub-Committee recommends continuing the research on measures to mitigate by-catch in ICCAT fisheries. The research should include the effect of mitigation measures on both by-catch and target species, as well as safety and feasibility of measures.
6. The Sub-Committee noted with satisfaction the amount of research that has been conducted to assess the efficacy of seabird by-catch mitigation measures since the last meeting. The Sub-Committee also noted that the key findings reinforced previous recommendations from the Sub-Committee that the combined use of tori lines, line weighting and night setting would be the most effective way to reduce seabird by-catch in pelagic longline fisheries.
7. A variety of tori line designs and line weighting regimes were shown to be effective at reducing seabird by-catch when used in combination. Based on the research presented, the Sub-Committee recommends that seabird bycatch mitigation measures ensure the sinking of baited hooks below the diving depth of seabirds within the aerial extent and protection of the tori lines.

8. The Sub-Committee re-iterated the need for all CPCs to collect and provide by-catch data to the SCRS, and highlighted the need for further analysis combining species distribution and by-catch data to fill existing data gaps, and to monitor levels and impacts of by-catch.
9. With regard to sea turtle by-catch mitigation, the Sub-Committee reminds the obligations of CPCs to provide the by-catch information as required in Rec. 10-09 in 2012.
10. The Sub-Committee recommends the evaluation of ecosystem indicators for use as part of Ecosystem Based Fisheries Management (EBFM) framework.
11. The Sub-Committee considered the need to restructure the Sub-Committee on Ecosystems to better meet the need to consider EBFM approaches. After a consideration of the costs and benefits associated with reorganizations, it is recommended that the Sub-Committee Ecosystems will continue to provide advice on EBFM and on by-catch assessment and mitigation. However, the leadership of the Sub-Committee will be restructured to include two section rapporteurs, one responsible for by-catch assessment and mitigation, and the second for EBFM.
12. The Sub-Committee noted that the By-catch Coordinator position remains unfilled and strongly recommends that this position be recruited promptly. The Sub-Committee also recommended modifications to the job description (Section 5) to better reflect its needs at this time, and to facilitate the ability to recruit an individual with the appropriate skills.
13. The Sub-Committee recommends that national scientists from CPCs provide available information which would facilitate to provide a response to the Commission regarding Resolution 05-11.
14. The Sub-Committee recommends that National Scientists collaborate with physical oceanographers to identify large scale oceanographic and climatological trends for the interest of SCRS. The Sub-Committee also recommends that methods be evaluated to incorporate oceanographic and climatological data in the estimation of relative abundance.
15. Given that mitigation measures potentially affect the catch rates of target and non target species, the Sub-Committee recommends that national scientists consider these and other technological factors in the estimation of relative abundance.
16. The Sub-Committee recommends that the Secretariat attempt to collate user manuals or protocols describing data collection from CPC observer programs. Also, an attempt should be made to identify historical changes to the data collection protocols that might complicate data analyses and interpretation.

7. Adoption of the report and closure

The report was adopted during the meeting. The Chair thanked UM.RSMAS, CUFER, NMFS, the Secretariat and participants for their hard work.

The meeting was adjourned.

8. Literature cited

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Appendix 1

AGENDA

1. Opening, adoption of agenda and meeting arrangements
2. Review of new information, presented to the SCRS, regarding ecosystems and ecosystem modeling approaches
 - 2.1 Ecosystem modeling approaches
 - 2.2 Integration of ecosystem indicators (e.g. Large-scale oceanic and atmospheric indicators, local and regional physical and biological indicators)
3. Research on by-catch mitigation measures
 - 3.1 Bycatch mitigation measures in the ICCAT convention area
 - 3.2 Review of 2011 International Circle-Hook Symposium
 - 3.2.1 General conclusions
 - 3.2.2 General recommendations
4. Response to Rec. 10-09, Sea Turtle by-catch mitigation
 - 4.1 Summarize data submitted to ICCAT by CPCs
 - 4.2 CPC reports regarding the implementation of Recommendation 10-09 and FAO's "Guidelines to Reduce Sea Turtle Mortality in Fishing Operations."
 - 4.3 Approaches for reducing turtle by-catch in ICCAT fisheries
 - 4.4 Capacity building efforts and other cooperative activities to support implementation of Rec.10-09
5. Other matters
6. Recommendations

Appendix 2

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Appendix 3

LIST OF DOCUMENTS

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- SCRS/2011/064 Preliminary Report of 2010 Weighted Branchline Trials in the Tuna Joint Venture Fishery in the South African EEZ. Melvin E., Guy T. and Sato N.

- SCRS/2011/065 Distribution of seabird by-catch using data collected by Japanese observers in 1997-2009 in the ICCAT area. Inoue Y., Yokawa K., Minami H., Ochi D., Sato N. and Katsumata N.
- SCRS/2011/066 The effect of leaded swivel position and light toriline on bird attack rates in Brazilian pelagic longline. Gianuca D., Peppes F., César J.H. and Neves T.
- 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

Appendix 4

AGENDA OF THE ACAP (AGREEMENT ON THE CONSERVATION OF ALBATROSSES AND PETRELS) FOURTH MEETING OF SEABIRD BY-CATCH WORKING GROUP, TO BE HELD IN GUAYAQUIL, ECUADOR, 22-24 AUGUST 2011

1. Pelagic longline by-catch mitigation

- Review recent developments in mitigation research and update relevant Annexes of AC 5 Report:
 - Annex 6 - Review of seabird by-catch mitigation measures for pelagic longline fisheries; and;
 - Annex 7 - Summary advice statement for reducing impact of pelagic longline gear on seabirds.
- Consider priorities for mitigation research.

2. Trawl by-catch mitigation

- Review recent developments in mitigation research and update relevant Annexes of AC 5 Report:
 - Annex 8 - Review of seabird by-catch mitigation measures for trawl fisheries; and;
 - Annex 9 - Summary advice statement for reducing impact of pelagic and demersal trawl gear on seabirds.
- Consider priorities for mitigation research.

3. Demersal longline by-catch mitigation

- Review recent developments in mitigation research and update relevant Annexes of AC 5 Report:
 - Annex 10 - Review of seabird by-catch mitigation measures for demersal longline fishing; and;
 - Annex 11 - Summary advice statement for reducing impact of demersal longlines on seabirds.
- Consider priorities for mitigation research.

4. Gillnet by-catch mitigation

- Consider approaches to mitigation in gillnet fisheries, and establish priorities for research.

5. Artisanal fisheries

- Characterization of artisanal fisheries in South America and their interaction with populations of albatrosses and petrels.

6. Review of by-catch data provided by Parties

- Review by-catch data received from Parties as part of their Report on the Implementation of the Agreement, and consider:
 - How this information should be conveyed succinctly to the Meeting of Parties.
 - How information collection and analysis can be improved.

7. By-catch data collection

- Consider data collection requirements from RFMOs and other non-Party sources to improve knowledge of fishery impacts on ACAP-listed species.

8. Indicators

- Application of ACAP's prioritisation framework to Seabird By-catch Working Group work.

10. Coordination of activities relating to RFMOs

- Reports from ACAP observers at recent meetings.
- 'Kobe 3' By-catch Working Group report (La Jolla, July 2011— if available).
- 'Kobe 3' Meeting report (La Jolla, July 2011 - if available).
- Review coordination of ACAP activities at RFMO meetings and consider recommended approach for key RFMOs with respect to:
 - Seabird measures and their revision;
 - Ecological risk assessments; and
 - Data collection and observer programs.
- Consider how to assimilate new mitigation information into ACAP Mitigation Advice intersessionally (including mitigation fact sheets), particularly given 18 months time frame before next SBWG & AC Meetings.

10. FAO IPOA/NPOA-seabirds

- Review of development and implementation of NPOA by States.
- Adoption of FAO international guidelines for by-catch management and reduction of discards.

11. Seabird by-catch mitigation fact sheets

- Review and update mitigation fact sheets during the course of the meeting.
- Update on progress with translation of fact sheets.

12. Global procellariiform tracking database

- Update on BirdLife Global Tracking Database

13. Risk assessment

- Update on risk assessments carried out by tRFMOs to date.
- An assessment of seabird-fishery interactions in the Atlantic Ocean.
- The justification, design and implementation of Ecological Risk Assessments of the effects of fishing on seabirds.

14. SBWG Work Programme

- Review and update relevant sections of the Advisory Committee Work Programme 2010-2012, noting progress achieved, both inter-sessionally and at the meeting.

Appendix 5

REPORT OF THE UNITED STATES SEABIRD BY-CATCH PROJECT

Joan A. Browder
NOAA National Marine Fisheries Service
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A Seabird By-catch Project was initiated at the Southeast Fisheries Science Center in Miami in 2004 with funding from the NOAA National Marine Fisheries Service National Seabird By-catch Program. The objectives of the Project are: (1) to improve the information collected about the seabird by-catch of the U.S. Atlantic pelagic longline fleet that is collected by the Pelagic Observers Program (POP), and (2) to estimate the total annual seabird by-catch of the fleet on the basis of the observer records.

Seabird by-catch has been recorded by observers along with other by-catch data since 1992; however, identifications often were absent from the records prior to 2004. In collaboration with the POP, we initiated a seabird-identification training program that took advantage of opportunities when observers were brought together for other training. For the training sessions, we developed training materials, acquired reference books

for use by observers, and brought in skins and mounts from cooperating museums. More than 40 observers operating along the Atlantic seaboard and in the Gulf of Mexico have received our training. Prior to 2004, only 35% (42/117) of the seabird by-catch was identified to species, although a few were recorded as “gulls” or “shearwaters”. From 2004 through 2010, over 91% (30/33) were identified to species. In the period 1992-2003, only three species (and a storm petrel not identified to species) were documented as part of the seabird by-catch of the fleet. From 2004-2009 another four species were added to the list of documented species. The complete list includes Greater shearwater, Cory’s shearwater, Northern gannet, Laughing gull, Herring gull, Great black-backed gull, Brown pelican, and the storm petrel. As of the end of 2010, observers documented a by-catch of 150 birds.

Among the reference materials used in observer seabird training is a compilation of information about seabird species known to occur in the western North Atlantic (Lee 2009). This training manual was prepared for this project by David Lee, a western Atlantic seabird expert and retired curator of the North Carolina Museum of Natural Sciences. The species profiles document includes all the species identified in a multi-year ship-board survey of seabirds foraging near the shelf break off North Carolina (Lee 1999), as well as some additional species known to occur in the western North Atlantic. The seabird species profiles report is designed not so much to aid in identification but to make observers and others more knowledgeable about western North Atlantic seabirds. The report is available at the website wicbirds.net.

The observed seabird by-catch of the U.S. pelagic longline fleet is a small figure by almost any comparison, and zero-inflated data are even more of a problem than with other by-catch taxa or seabird data from other fleets. Analysis of the seabird data has been conducted at Virginia Polytechnic Institute.

Reports by Hata (2006a, 2006b, 2007) provide the first estimates of the seabird by-catch produced by the SEFSC seabird project. Hata calculated annual seabird takes following methodology used to estimate sea turtle and marine mammal takes (Yeung, 1999). This method assumes a delta-distribution for calculating mean catch per effort and variance. Mean catches were combined using a stratified random sampling design, where POP effort was treated as the sample, and mean catches per set were extrapolated to the population of logbook effort. Reporting areas with no reported seabird take were excluded and areas with similar levels of take were combined providing five strata for the estimation. Hata (2005) estimated annual takes not only for the years with observer data, 1992-2004, 5, and 6 but also for earlier years of fleet operation (1986-1991) when effort data but no observer data were available. In an analysis of the effect of different variables, Hata (2006a) found that sets with extra line weights caught significantly fewer birds (0.003 birds/set) than sets without extra line weights (0.03 birds/set). Observer data of 1992-2006 indicated an average catch rate of 0.015 birds/set or 0.022 birds/hooks (Hata 2007). The catch rate was greatest in the NEC at 0.073 birds/set and 0.091 birds/hook. Annual estimates of total fleet seabird by-catch 1992-2006 ranged from zero in 1996 (when no bird catch was observed) to 1109 in 1997 and averaged 219 birds (Hata 2007).

In another product of our seabird by-catch project, Winter et al. (in review) prepared estimates of annual seabird by-catch for the period 1992-2008 using eight different models (each actually a combination of two models, a model of the probability of a bird by-catch and a model of the number of birds caught on positive sets), including the delta-log normal of Yeung (1999) and Hata (2007), with and without combined areas as strata. Predictions with their “best” model (GLM with log-normal applied to the positive model) ranged from zero (1996) to 625 (1997) with an annual average of 133 birds by-caught. The model used the continuous variables latitude and longitude rather than fishing strata as geographic variables.

Another recent product of the SEFSC seabird by-catch project was a presentation at the recent Circle Hook Symposium in Miami (Li et al. 2011) in which both hook type and hook size were evaluated for their effect on the probability of catching a bird and the number of birds caught on positive sets. Ten variations on input variables for the two models (probability and quantity) were used. Hook size was the strongest factor influencing the probability of catching a bird and hook type was the strongest factor influencing the number of birds caught on sets that caught birds. The probability of catching a bird was lowest on the two circle hook sizes tested and circle hooks caught fewer birds on the positive sets. Other factors that had significant effects on either the probability of catching a bird or the number of birds caught on positive sets (or both) were fishing area, fishing season, time of set (day or night), target fish species, set speed, and soak duration.

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Appendix 6

A REVIEW OF FACTORS AFFECTING POST-RELEASE MORTALITY OF SEA TURTLES

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While most sea turtles are released alive from pelagic longline gear, post-release mortality has been documented. Both the fishing line and the fishing hooks pose problems for sea turtles. Harm from gear left on the animals may include tissue damage, infection, and digestive track blockage. Hooks may perforate internal organs or vessels; in some cases hooks become encapsulated or are expelled. Trailing line can encircle a limb, restrict circulation, and cut deeply into the tissue, and eventually cause loss of function. Ingested line may irritate the lining of the gastrointestinal track and cause death by torsion (involution) or intussusception (telescoping of the gut tube), cutting off its circulation (Watson et al. 2005).

A set of criteria to estimate post-release mortality was developed in 2001 (see pages 313-335 in NMFS SEFSC 2001). In 2004, a panel of experts was convened to (1) present recent information on post-interaction mortality, (2) review the best scientific information available on the topic, and (3) receive individual technical input (Ryder et al. 2006). The goal was not to reach consensus (due to FACA), but to provide information to revise the February 2001 criteria, if appropriate. The structure of table was developed by a subset of the group, which comprised mainly veterinarians. They categorized and ranked hook location and/or entanglement and then considered the amount of gear remaining on the animal at release. There was almost no empirical data to populate the table. Thus, expert input from each individual in the full group was provided, and was reviewed by NMFS to populate the cells of the table with mortality values. Values ranged from 5% for cheloniids (hardshell turtles) hooked externally and released with all gear removed (10% for Dermochelyids) to 85% mortality for cheloniids released still entangled in line (95% for Demochelyids).

A draft of the table was the basis of the Epperly and Boggs (2004) analysis of the post-hooking mortality associated with animals caught on 9/0 J-hooks and 18/0 circle hooks during the 2002-2003 NED experiments (Watson et al. 2005). Careful handling and release gear was developed also during those experiments. The gear-removal performance of the vessels during the experiments was exemplary and formed the basis of the goals set for both the Atlantic U.S. fleet and Hawaii-based shallow set fleet when those fisheries were re-opened in 2004 and the conservation value of switching from J-hooks to circle hooks was evaluated in the ensuing Biological Opinions for both fisheries.

Since the 2004 workshop, there have been a few papers published addressing the topic. Swimmer et al. (2006) concluded that olive ridley turtles from the eastern tropical Pacific “that were lightly hooked and handled properly survive and generally behave normally following interactions with shallow-set longline gear”. Sasso and Epperly (2007) found no difference in survival between lightly hooked control loggerhead turtles dip netted from the surface of the Grand Banks (N. Atlantic Ocean) and lightly hooked turtles and estimated the annual survival rate as 0.814 (95% CI=0.557-0.939). Mediterranean researchers concluded that turtles hooked in the mouth or upper esophagus likely had a higher survival than animals hooked in the lower esophagus or stomach and that the average mortality of a turtle caught by drifting longline was probably greater than 30% (Casale et al. 2008). Recently, Spanish researchers reported on the fate of 11 deeply-hooked turtles brought to them for rehabilitation in Barcelona. For two years there was no intervention. During that time, 5 of the 11 turtles passed their hooks spontaneously. After two years, the remaining turtles underwent an endoscopic procedure during which hooks were removed from most. They found no significant lesions and concluded that a hook lodged in the esophagus of a turtle may cause minimal damage or distress over the long term.

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**SUMMARY REPORT OF A MEETING HELD APRIL 25, 2011 AT THE
ICCAT SECRETARIAT TO DISCUSS TO WORKING PLAN FOR THE ICCAT
SECRETARIAT WITH REGARD TO THE JOINT TUNA RFMO
BY-CATCH TECHNICAL WORKING GROUP MEETING**

Participants: Josu Santiago, Andrés Domingo, Mauricio Ortiz and Pilar Pallarés (“Group”)

During the blue marlin assessment meeting, an informal meeting was held to discuss about the contribution of ICCAT to the first meeting of the By-catch Joint Technical Working Group and to draft a workplan to be developed in advance to the meeting. This draft workplan will be discussed with the Convener of the Sub-Committee on Ecosystems.

The Group reviewed the terms of reference of the By-catch Joint Technical Working Group and decided that:

- The Secretariat will prepare a document/presentation summarizing the work conducted by ICCAT on by-catch issues. This document will include:
 - The evolution of the SCRS structure (By-catch group, Sub-Committee on Ecosystems....) in response to the increasing requests on by-catch issues.
 - The increasing request of ICCAT on by-catch data (incorporation of sharks data into the Task I and Task II requests and other by-catch data request) (This part would partially response to items 1 to 4 of the terms of reference).
 - Assessments conducted by the SCRS on billfish, sharks and sea birds (this part would partially response to items 2 to 4 and 6 of the terms of reference).
 - Ecological Risk Analyses conducted and planned on sharks (this part would partially response to items 3 and 4 of the terms of reference).
 - Active recommendations regarding data request, management measures or mitigation measures on by-catch (this part would partially response to items 2 to 4 of the terms of reference)
 - Other research conducted or planned on by-catch (response to item 6)
 - Review and presentation of current Metadata on by-catch from J. Cooper contract
- The Secretariat will identify the CPCs which are currently conducting observer programs and will request information on the structure of the data base they are using for observer data. This information will allow the Secretariat to identify the main data fields and to draft a requesting by-catch data form for the main gears. This activity will response to item 1 of the terms of reference and to the recommendation made by the Sub-Committee on Ecosystems in 2010.

The Group also discussed on the need of establishing a limit on the list of by-catch species to be considered. This limit should be established on the basis of the human and material resources on both the SCRS and the secretariat. The Group agreed that the collaboration with organization focused on by-catch group of species such as sea birds or sea turtles would be the best approach to response to future Commission and/or other entities request regarding by-catch species not entirely consider by ICCAT. The Group recommend to maintain the scientific participation with organization focused on by-catch in particular for the interpretation and provision of tuna fisheries effort and related estimates provided by the SCRS and the Secretariat.

**SUMMARY OF SARGASSO SEA ALLIANCE
PRESENTATION TO THE SUB-COMMITTEE**

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The Sargasso Sea is a distinctive area of openocean situated within the North Atlantic Subtropical Gyre, bounded on all sides by major ocean currents. It contains the world's only self-sustaining community of holopelagic algae, dominated by *Sargassum natans* and *S. fluitans* (SAFMC 2002). The ecology and life-history patterns of many oceanic species are adapted to the unique habitats provided by *Sargassum*. The Sargasso Sea is a feeding ground for commercially important pelagic fishes such as swordfish bluefin tuna, yellowfin tuna, albacore tuna, white marlin, blue marlin, wahoo, dolphinfish and jacks (family Carangidae)(Casazza and Ross 2008, Coston-Clements et al. 1991, Dooley 1972, Fedoryako 1980, Gibbs and Collette 1959, Manooch and Hogarth 1983, Manooch and Mason 1983, Manooch et al. 1984, SAFMC 2002). It is also a migratory route for bluefin tuna (Block et al. 2001, Block et al. 2005), leatherback (James et al 2005) and loggerhead turtles (Bolten 2003, Mansfield et al. 2009) and a spawning site for white marlin (Arocha et al. 2005, 2007), blue marlin (Luckhurst et al. 2006, SAFMC 2002) and albacore tuna (Le Gall 1974, Nishikawa et al. 1985). *Sargassum* serves as a nursery ground and juvenile habitat for at least four threatened and endangered turtle species (Carr and Mylen 1980, Carr 1987, Schwartz 1988, Manzella and Williams 1991).

Most of the Sargasso Sea is in the high seas, and only a small portion is under national jurisdiction, within the Exclusive Economic Zone of Bermuda. Direct threats to the Sargasso Sea include commercial collection of *Sargassum* weed and impacts associated with fishing (Hemphill 2005, SAFMC 2002, Pauly and Watson 2005). Indirect threats include vessel traffic and pollution from ship discharges, tar (Burns and Teal 1973, Wade and Quinn 1975, Butler 1983, SAFMC 2002) and plastics (Carpenter and Smith 1972, Law et al. 2010). Recognizing the importance of this area and the need to protect it, the Government of Bermuda with international partners is leading an international initiative to explore ways to enhance protection of the Sargasso Sea. It aims to build an international partnership that will secure recognition of the ecological significance of the Sargasso Sea and the threats that it faces; to use existing regional, sectoral and international organizations to secure a range of protective measures for all or parts of the Sargasso Sea to address key threats, to develop a management plan for the Sargasso Sea; and to use the process as an example of what can and cannot be delivered through existing institutions in areas beyond national jurisdiction.

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