2013 INTER-SESSIONAL MEETING OF THE TROPICAL TUNA SPECIES GROUP

(Tenerife, Spain - March 18 to 21, 2013)

1. Opening, adoption of Agenda and meeting arrangements

The Meeting was held at the *Centro Oceanografico de Canarias* of the *Instituto Español de Oceanografía* (IEO), in Tenerife from March 18 to 21. Dr. Pilar Pallarés, Assistant Executive Secretary of ICCAT, opened the meeting. Dr. Pallarés welcomed participants and thanked the IEO for hosting the meeting and providing the Group with all the logistic arrangements of the excellent new Center in Canary Islands. Dr. Joao Pereira, General Rapporteur of Tropical Tunas Species Groups, chaired the meeting.

The Agenda (**Appendix 1**) was adopted with some changes. The List of Participants is included in **Appendix 2**. The List of Documents presented at the meeting is attached as **Appendix 3**.

Dr. Pereira reminded the Tropical Tunas Species Group (hereafter "The Group") that the objective of the meeting was defined in the 2012 Work Plan for Tropical Species approved by the SCRS (ICCAT, 2013a).

The following participants served as rapporteurs:

P. Pallarés	Items 1, 6 and 7
D. Die, C. Brown, J.P. Hallier, J. Million, A. Fonteneau	Item 2
G. Scott, D. Gaertner	Item 3
J. Santiago	Item 4
J. Pereira	Item 5

2. Revision and update of the AOTTP prepared in 2010

2.1 Summary of the development of the AOTTP program

Compared to the Pacific and to the Indian Ocean, the tagging effort in the Atlantic Ocean has been very low. Some key biological parameters that are required to support stock assessments are missing or poorly known and the recent level of exploitation of the three tropical tuna species remains uncertain. Therefore, in 2010, the SCRS proposed an Atlantic Ocean Tropical Tuna Tagging Program (AOTTP). This new program is intended to cover the whole Atlantic Ocean and with a funding level comparable to the large-scale tuna tagging projects of the Pacific and Indian Oceans. At the 2012 SCRS it was decided that to accelerate the development of this proposal the Tropical Tunas Species Group would examine lessons from the Indian Ocean Tuna Tagging Program (IOTTP), develop specific objectives for the AOTTP and identify, if necessary, terms of reference for a contract in support of the development of the AOTTP. In early 2013, the Tropical Tunas Species Group agreed to invite and fund the participation of Indian Ocean Tuna Tagging Program experts to this inter-sessional meeting. These two experts, Julien Million and Jean Pierre Hallier, presented in detail the lessons learned from the IOTTP and participated in the discussions of the Group.

2.2 Results and lessons from the IOTTP

The Group was informed of the main results from the IOTTP (IOTC, 2012) implemented from 2002 to 2009 and the different aspects that should be taken into account for the development of a similar large-scale tuna tagging program in the Atlantic Ocean. This program was a combination of a large-scale project, the Regional Tuna Tagging Project in the Indian Ocean (RTTP-IO), funded by the DG-Development of the European Union (14 million Euros) and several small-scale operations (Maldives, Indonesia, Mayotte, India, etc.) funded by the DG-Maritime Affairs and Fisheries of the European Union and the Government of Japan. The Indian Ocean Tuna Commission (IOTC) was in charge of the supervision of the RTTP-IO and the implementation of the small-scale operations.

During the IOTTP, more than 200,000 tropical tunas were tagged and released, mainly in the western Indian Ocean and so far, more than 32,000, or 16%, have been recovered and reported. The program showed that while the costs involved in small-scale operations in the Indian Ocean were lower than the large-scale operation (around 35€/tagged fish vs. 85€/tagged fish), the quality of the tagging and recovery information was not as

good, and therefore as of today the data obtained from small-scale operation are of limited use for supporting stock assessments. This highlights the fact that the success of tagging programs should be measured not solely by the number of tagged fish, or the average cost per tagged fish, it should also consider the number of recaptures obtained with useful information and the cost of obtaining these.

The general and specific objectives of the IOTTP were achieved and today, tagging data are routinely used in stock assessment at the IOTC. Analyses of the data have showed new complex growth patterns for yellowfin and bigeye, very different from the previously used von Bertalanffy growth curves, and a lower level of natural mortality. Fast and long-range movements of the three species of tropical tunas in the Indian Ocean were documented. Tuna were reported to travel over 700 nm in short periods of times of less than 1 month.

The following is a list of lessons from the IOTTP that should be taken into account when designing the AOTTP:

- Objectives should be clearly defined.
- The structure, scale and duration of the program should be adapted to these objectives.
- Rules and procedures attached to the funding (e.g., European Development Fund) should be well understood and dealt with in the design phase.
- The timing of the different contracts (i.e., technical assistance, chartered vessel, equipment, etc.) should be well planned.
- Staffing of the program, for both the tagging and recovery phase.
- Access agreement/fishing permits should be requested in advance of the start of the tagging.
- Tagging and recovery procedures should be well defined.
- Publicity and recovery plan should start as soon as the tagging starts, or even before.
- Databases, both for tagging and recovery, should be developed centralized at the ICCAT Secretariat.
- Procedures to link recovery data with logbook data, in particular for purse seine recoveries, should be well defined.
- Tag seeding activities should be implemented throughout the whole duration of the project onboard vessels in the purse seine fishery, as well as other activities to be able to estimate the reporting rate for other fisheries (i.e., longline).

The Group acknowledged the excellent results of the IOTTP, and noted that while releases might have been slightly concentrated in some parts of the western Indian Ocean, the different objectives of the project have been achieved. This was partly due to the Associated School Fishing Technique implemented off the coast of Tanzania, a method developed in the Atlantic Ocean and now routinely used by several fisheries in West Africa, Canaries, Acores, etc.

The Group agreed that the general objective of the AOTTP is similar to that of the RTTP-IO. Therefore, the experience from the IOTTP, particularly the large-scale of the RTTP-IO, would be very useful for the definition of the project and a feasibility study. The Group recognized that the administrative burden of this project on the ICCAT Secretariat would be greatly increased and that it will probably require some support, through or outside of the project. The Group also noted that several potential donors could be approached and that a variety of funding could offer better flexibility and ensure effective utilization of the funds.

Additional conclusions reached by the IOTTP that are particularly relevant to the development of the AOTTP are:

- Tag shedding rates are readily quantifiable from double tagging studies.
- Fish tagged from pole and line vessels are recaptured by the tagging vessel. However, such fish can be released alive when in good condition and rejoin the tagged portion of the stock. Some of these fish were recaptured many times.
- Deployment of fish tagged with satellite tags was not very successful in the IOTTP. However, technology has since improved. Recent experiences in the Gulf of Mexico and previous studies in the Pacific with yellowfin tuna indicate that electronic tags are a feasible option for tropical tunas.

- The comparison of the success of the large- and small-scale components of the IOTTP suggests that it may be better to focus the AOTTP on a subset of fishing fleets for which it is possible to estimate either tag reporting rates and/or ensure a high tag reporting rate.
- The AOTTP should seek the cooperation of countries that have observer programs on board vessels in the area of the ICCAT Convention and invest in ensuring these observers have the right incentives and resources to report tagged fish.
- Seeding experiments to estimate tag reporting rates can be effectively conducted in purse seine vessels, but methods to conduct them in other fleets need to be developed.
- High reward tags commonly used to estimate reporting rates in other fisheries may face problems in fleets where high rewards can create disputes between boat owners, skippers and crew.
- Data generated from such a tagging project should be made public after appropriate provision has been made to eliminate confidential data and the program team has had a reasonable chance to capitalize on their efforts through the production of scientific papers.
- Management of funds provided by the EU is subject to specific constraints and rules that create a significant administrative overhead. The cost of such management should be considered in the design of the AOTTP.
- A feasibility study needs to be conducted as part of the development of the AOTTP. This study needs to investigate all the aspects of the program: administrative, legal, financial and scientific.
- The initial draft of the AOTTP proposal should provide different optional scales at which the program can be implemented. The feasibility study needs to evaluate these options.
- Costs of chartering the pole and line vessels are linked to the opportunity costs of the available vessels which are strongly related to the future prize of pole and line caught tuna.

2.3 Review of objectives and priorities for the AOTTP

The Group used the objectives presented in the 2012 SCRS Report (ICCAT, 2013) as a starting point for the discussions (**Table 1**).

The Group then decided that the AOTTP program should be described as having an overall goal to improve sustainability of tropical tuna resources by providing the best science available to ICCAT (Res. 11-17). This goal will be achieved through the following four objectives:

- Estimating the recent exploitation rates of tropical tuna.
- Determining the extent of interaction between surface and longline fisheries.
- Evaluating the effectiveness of management measures (e.g., time area closures, FAD management, etc.)
- Increasing the capacity for assessment of tropical tunas in the African, Caribbean and Pacific Group of States (ACP) countries.

In order to achieve these goals, the Tropical Tunas Species Group defined a series of specific operational objectives for the program. These objectives were then prioritized by the Group to facilitate the development of the AOTTP. Prioritization was accomplished by grading objectives according to two criteria: the potential benefits provided to stock assessment of tropical tuna, and the feasibility of reaching the objective with the AOTTP. Overall priority was set equal to the lowest of the two ratings assigned. Objectives and corresponding priorities show that (**Table 2**) the highest priorities of this program should be to confirm current assumptions about stock structure of tropical tuna, to estimate area-specific and fleet-specific recent fishing mortality independently of CPUE data, and to estimate age-specific and area-specific tropical tuna growth rates. Additionally important objectives are to estimate age-specific natural mortality and to contribute to the stock assessment for two small tuna species, Atlantic bonito and Atlantic blackfin tuna.

The Group also discussed the best strategy to implement the AOTTP, including the possible sources of funding to support it. After discussion, the Group agreed on a series of actions that need to be achieved to ensure the continued development of the program. It also identified some key groups and individuals that would be responsible to achieve these actions and some possible funding sources to support the different stages of the AOTTP (**Figure 1**).

The Group agreed to the development of terms of reference for a new coordinator for the AOTTP Task Force. This new coordinator will help the AOTTP Task Force accomplish the first steps in the development of the AOTTP (**Table 3**).

The Group agreed that the existing AOTTP Task Force, made up of members from the Tropical Tunas Species Group, needs to identify and communicate with key collaborators in agencies that are potential candidates for funding the two main components of the program, (e.g., DG-MARE and DG-DEVCO, USA, Asian countries members of ICCAT). Details of initial approaches made by the Group to potential funding agencies are provided in **Appendix 4.** Similarly the AOTTP Task Force needs to identify key collaborators in some of the ACP countries so that these collaborators can facilitate the request of letters of support from the government of these countries. The first output from the task force will be a proposal for a feasibility study to support the design of the AOTTP. Given the outputs provided by the feasibility study, the AOTTP task force will develop a second proposal, this one for the implementation of the AOTTP. The proposals for the feasibility study and the AOTTP program may have to proceed together to ensure funding success.

2.4 Development of the Scientific Design of the Tagging Program

An essential component of the feasibility study will be the development of a detailed, realistic scientific design for the program, which will be critical for the evaluation of the operational requirements and costs. NOTE: The framework for this scientific design presented here reflects the discussions of the Group; the AOTTP Task Force may further expand and refine this framework. In general, this design should address the objectives and priorities that are defined by the SCRS, providing an operational plan on how these can be achieved. Estimates should be produced on the precision of the various estimates for different levels of tagging effort, as well as recommendations on optimal numbers, deployment strategies (e.g., gear, time, area) and mix of tags (i.e., conventional, archival – pop-up and internal). Tag deployment strategies and efforts to optimize the recapture and reporting rates should be designed to reflect the total range (both time and area) of the species.

The study should be designed to achieve (or include) the following essential elements:

- A standardization of tagging operations (training/skill of taggers, vessels, etc.).
- Accurate, precise estimates of tagging related mortality, tag shedding, fleet-specific reporting rates.
- Public outreach optimizing the reporting of recaptured tags, with complete information, and the return of recovered archival tags.
- Contingency plans to ensure coverage of fishing grounds not accessible or otherwise unsuitable for the standard tagging operations.

As previously indicated, the AOTTP Task Force may identify additional essential elements.

This design should take into account the logistics involved in carrying out the recommended strategies. For example, although baitboats may generally be the best platform for large-scale tag deployments, baitboat operations are limited by the availability of bait. For some regions, it may be necessary to consider alternatives (e.g., recreational vessels, suitable commercial vessels). Similarly, oceanographic conditions or fish behavior could impact accessibility or catchability in certain areas; such considerations should be taken into account.

For many areas, the predominant fisheries may be those which typically exhibit low reporting rates (e.g., longline). Therefore, public outreach and publicity, including ongoing direct contact with vessel captains, is an extremely important element.

Additionally, pop-up satellite archival tags (PSATs) can play an important role, especially given the low reporting rates expected from many fisheries. Recovery and reporting by a fishing vessel is not necessary in order to obtain such data; these tags transmit summary data (including swimming depth, water temperature, and location estimates) after detaching from the fish. This can provide critical information on tagging mortality, migration rates and stock mixing patterns. Internal archival tags can also collect these data, avoiding potential attachment difficulties, but rely on fisheries for recovery and return. Archival data (pop-up or internal) can also provide the data necessary to identify preferred habitat profiles, as well as important behaviors, which are extremely useful for the interpretation and standardization of abundance indices and fishery trends, and may be essential for future ecosystem-based assessments.

An important underlying principle for this study is that the data collected through activities funded through this program will be made available to ICCAT scientists. This includes electronic archival tag data at the most detailed level of resolution.

As an example of the role that simulation modeling can play in the design of the study, a general capture-recapture tagging model was developed in advance of the meeting and was presented to the Group (SCRS/2013/031). This statistical framework, which can be used for estimating stock mixing, natural mortality and fishing mortality rates, could be applied to a broad range of Atlantic migratory species and adapted to meet various study objectives. The Group commented that the model simulation results seemed optimistic given the simulated sample sizes in comparison to results from the IOTC program. It was noted that one reason for the lower predicted estimate variance compared to observed results from the IOTC was that the simulation applied to an individual cohort and that age-specific migration and region specific natural mortality rates would require a much greater tagging effort due to ageing error.

Additional discussion pointed out that the model approach was different from the IOTC results in that migration rates from electronic tags are incorporated as informative priors to avoid estimation of these rates with mortality rates. The Group also noted that the model should integrate type 2 tag loss (observed to be approximately 5% annually in the IOTC) which would also increase the predicted coefficient of variation of model estimates. The model is flexible in that it is adaptable to incorporate increased complexity (e.g., age-classes, multiple fleets, number of areas) and can utilize information from results of other studies, such as the IOTC tagging program or electronic archival studies, to further refine assumptions and input parameters. The Group considered that this model could be a useful tool for evaluating different hypotheses and the expected effect on parameter estimates under different tagging levels and strategies.

To illustrate the potential utility of electronic archival tagging as part of the overall program, an update on a U.S. program deploying PSATs on yellowfin tuna in the Gulf of Mexico was presented. Since August 2010, this program has deployed 55 PSATs on yellowfin ranging from 100 cm to 160 cm FL; about 80% of the tagged fish had estimated lengths ranging from 130 cm to 150 cm FL. Five (5) fish were caught using rod and reel gear, and brought aboard small vessels for tagging. The remainder was caught on longlines, and nearly all of these were tagged while in the water. Eleven (11) of the tags surfaced after less than 10 days, to a large extent a consequence of the difficulties encountered developing techniques for tagging from a longline vessel, 3 did not report and 4 are not yet scheduled to have reported. The remaining 37 tags tracked the movements of the fish, recording depth, temperature and light levels (for later estimation of location) every ten seconds for durations as long as 172 days, with a median deployment duration of 74 days (16 tags were recovered). Only 3 fish left the Gulf of Mexico, two in June and one in December. Interestingly, the two longest duration tags (155 and 172 days), show movements restricted to a relatively small area (< 300 km) along the edge of the continental shelf and the adjacent slope near the mouth of the Mississippi. An additional 30-35 tags are expected to be deployed on yellowfin in the Gulf of Mexico, including deployments conducted as part of a collaboration between Mexico and the United States to deploy PSATs in Mexican waters in the southwestern Gulf of Mexico.

The Group considered these preliminary results to be interesting, considering the large-scale movements that have been observed using conventional tags (**Figures 2-4**). It was noted that although conventional tag data confirm that yellowfin tuna move from the northwestern Atlantic and Gulf of Mexico to waters near Africa, many questions remain on frequency of those movements, the proportion of the stock involved, and the circumstances under which such movements take place. The preliminary results of this PSAT study provide support to the concept that yellowfin movement patterns are complex. This is not unexpected, but characterization of movements and migrations and quantification of rates is extremely lacking for tropical tuna species. The use of PSATs could provide important information; the Group considered that deployment of electronic tags across time and area strata may enable time-area specific rates to be calculated, even considering the deployment durations that have been achieved to date. If such a deployment across areas was possible it would also help in the estimation of movement rates across regions. It is often the lack of knowledge on these migration rates that makes it difficult to estimate natural mortality from tagging data. Thus, PSAT studies may also be a key for the estimation of natural mortality.

3. Revision and evaluation of Task II catch and effort and size data for the intermediate period considered by the Group

The Group briefly reviewed recommendations it made previously to guide the work of revision and evaluation of statistics by Task Force Ghana (TFG), first made in 2011. Among them were recommendations for

improvements in data collection infrastructure and procedures to fully address data reporting obligations, recommendations for mechanisms for meeting data obligations, as well as technical recommendations for addressing the issues (ICCAT, 2012). While the Group noted that a number of these recommendations were being addressed both by TFG and the Ghanaian administration, presently, there appeared to be elevated concern related to adequate monitoring and control of the Ghanaian fleet possibly resulting in a reduction in market access for tuna caught by Ghana. Even though the Group noted this was mainly a compliance issue, it was suggested that further enhancement of monitoring of the fleet by adopting tools such as electronic observation on the fleet could well provide a sufficient means to validate fleet performance and meet data reporting obligations under the Convention. It was further noted that such a program was envisioned under the soon to be launched FAO/GEF ABNJ[1] program and the Group encouraged collaboration by the Ghanaian administration with that program. Additionally, Group noted that increases in the port sampling staff by the Marine Fisheries Research Division (MFRD) was now allowing improved data collection, but that logistical problems in support of data collection were still occurring, preventing optimal use of staff time and limiting access to vessels in port. It was recommended that increased logistical support was still needed to take full advantage of the available port sampling staff.

3.1 Review of current status of work conducted by the Working Group on the improvement of Ghanaian statistics

SCRS/2013/023 presented progress on the work undertaken related to the improvement on Ghana statistics by Task Force Ghana (TFG). The document described data, methods and hypotheses proposed to refine estimates of Task II (catch and effort and catch-at-size statistics) for the Ghanaian fleet during the period of 1996-2005. This work was carried out under the general guidance of the Tropical Tuna Species Group 2013 Work Plan and as proposed in SCRS/2012/041.

The Group reviewed the work undertaken by TFG, which it found to be of high quality. Upon review, the Group suggested that making maximum use of the available information from the Ghanaian fisheries rather than relying too heavily on the European fleet data as a substitute was a preferable approach to revision of the 1996-2005 Ghana Task II statistics. This approach was subsequently incorporated into the TFG work (so-called Hypothesis 3), which was adopted by the Group. Detailed information on the method followed to estimate the Task II statistics is included in **Appendix 5**.

Estimates of "faux poisson" landed by the Ghanaian fleet were also generated for the period 1996-2005 in SCRS/2013/023 based on samples collected in Abidjan during that period. The Group recommended adoption of these values assuming they had not previously been accounted for in the Ghanaian Task I landings. This will be further investigated by Ghanaian scientists and will be reported at the 2013 SCRS. It is less clear if the landings from the so-called "S" fleet have been incorporated into the Ghanaian Task I reports (1996-2005), since this fleet is monitored and data processed through the European system. The Group recommended this issue be further investigated and steps taken to include the data in the Ghanaian Task I if they are not presently included; conclusions will be reported at the 2013 SCRS.

3.2 Activities conducted within the framework of the Working Plan of collaboration between Ghanaian scientists and IRD as defined by the Tropical Tunas Species Group

Activities concerning the port samplings and introduction/validation of the data

The results of the second mission conducted in Tema in November 2012 by EU experts were presented (SCRS/2013/020). Results of the November 2012 mission revealed that differences in sampling between the ICCAT 'expert' teams and the Ghanaian samplers were no longer apparent as observed in the July 2012 mission in terms of size structure and species composition. The sampling bias detected in July 2012, which has now been addressed, reinforces the assumption that: (1) the proportion of skipjack in the catch was underestimated in recent years; and (2) recommendations provided for undertaking an accurate random sampling of landings were successfully implemented by the MRFD team. SCRS/2013/020 depicts the composition and tasks of the MFRD team in Tema as well as a brief description of some "warnings" produced in the data validation process. It appears that the majority of the "warnings" in the validation process can easily be resolved. Nevertheless, in

[1] Sustainable Management of Tuna Fisheries and Biodiversity Conservation in the Areas Beyond National Jurisdiction (ABNJ) - A 5-year, $27 M Global Environment Facility (GEF) - funded program executed by FAO with implementing partners including WWF, NOAA, ICCAT, CCSBT, IATTC, WCPFC, IOTC, ISSF, BirdLife International, Ghana, and others, designed to promote efficient and sustainable management of fisheries resources and biodiversity conservation in the ABNJ, in accordance with the global targets agreed in international forums. - See more at: http://iwlearn.net/iw-projects/4581

some cases the data entry and validation process does not permit accounting for situations when the Ghanaian data from purse seiner sets are made in collaboration with a baitboat.

The document gives some advice for future treatments to improve the data entry and validation process, such as T3 software (which allows correcting logbook information with sampling data and, if necessary, performing some time-area strata substitutions). This treatment as well as the updates of data entry and validation process should be done in 2013 as part of the IRD-Ghana work plan adopted by the SCRS (ICCAT, 2013b). It was also suggested that the Ghanaian team update the AVDTH version 3.2 to a new version that includes Ghanaian-specific fishery characteristics.

Criteria to be considered in the processing of the most recent data (up to 2006)

Based on information in SCRS/2013/022, the Group discussed the ongoing development of T3-Ghana software. It was mentioned that in case of the lack of some data (e.g., in 2007), T3-Ghana will not solve this problem. Because some stock assessments will be conducted in 2014, the Group considered that the situation of the recent Ghanaian statistics should be clarified before the 2013 SCRS meeting and requested an update on when this software will be operative. The Group was informed that this point will be discussed during the annual meeting conducted between EU tuna scientists and African partners including Ghanaian scientists, in April 2013. The Group considered that the continuation of this collaboration has high priority and requested to be informed of progress realized on the issue within the framework of the IRD-MFRD collaboration plan. Considering this, the Group decided to wait for the result of the April meeting to further discuss implementation of T3 in Ghana. Progress will be communicated by mail to the ICCAT Secretariat and the Chairs of SCRS and the Tropical Tunas Species Group.

4. Responses to the Commission

4.1 FADs Management Plan

The *Recommendation by ICCAT on a Multi-Annual Conservation and Management Program for Bigeye and Yellowfin Tunas* [Rec. 11-01] requests the Secretariat to report on the content of the FAD Management Plans to SCRS for review at each annual meeting. The FAD Management Plan as currently defined comprises a mandatory component (number of FADs to be deployed per vessel; description of FAD characteristics and FAD markings), and an optional component.

In 2012, six flag States submitted FAD Management Plans and only three of these included the mandatory information, such as the number of FADs to be deployed per vessel. Besides being incomplete, the information received in these Management Plans was not considered by the SCRS to be useful for stock assessment or for improving the Committee's ability to advise the Commission.

For this reason, the Committee recommended that the Commission revisit the requirements for FAD monitoring included in the [Rec. 11-01] (paragraphs 17-19 and Annexes 1 and 2 of the Recommendation). In this respect, two primary types of information were identified to be collected and reported: An inventory of FADs and FAD activity (“FAD logbook”: FAD markings, deployment, retrievals, etc.), and a record of encounters of fishing (and supply) vessels with the FADs (“Fishing logbook”: visits to FADs and catches from sets made on the FADs). And these two types of information should be linked through the FAD ID or marking.

The Group regrets that no progress has been made regarding the modification of Rec. 11-01 during the 2012 Commission meeting. The Group reiterates that the Commission should revisit the requirements for FAD monitoring included in [Rec. 11-01] in the terms defined by the SCRS in 2012 that were included in the proposal by the Chairman of the Panel 1 “Draft Recommendation by ICCAT Amending the Recommendation on a Multi-Annual Conservation and Management Program for Bigeye and Yellowfin tunas”.

Document SCRS/2013/029 presented the FAD Management Plan put in place by the Spanish fisheries administration in collaboration with the Spanish Institute of Oceanography which is obligatory for their freezer purse seine fleet targeting tropical tuna in the Atlantic, Indian and Pacific Oceans. **Table 4** shows the format for FAD inventory, including all information pertaining to the type, shape and material of the object and type of buoy. Each object and buoy is marked so that it can be followed throughout its lifetime. **Table 5** shows the format for gathering information on activity over FADs. This form contains an identification field for the FAD in

order to connect it to the inventory form. Other fields are provided for buoy identification, information about the activity over the object (fishery, visit, loss, change of buoy, etc.), date and time, position and (in the event of a set) estimated total of tuna and bycatch.

The Group considers this experience as a very positive reference for FAD fishery monitoring and that it could be used as an example to be followed by other purse seine fleets operating in the Atlantic. The authors explained that a common ID system was defined to facilitate the monitoring and that the supply vessels are also integrated within the Plan. It was also mentioned that other countries are instituting similar systems (e.g., Ghana). The Group noted that it will be necessary that the SCRS analyze ways to deal with the advancements in the collection and archival of this type of information through the Sub-Committee of Statistics.

The Group noted that some national scientists have been working with satellite tracking of FADs (VMS/echosounder) which seen to show good promise in developing techniques for further monitoring stock status. The Group encourages further development and collaboration between scientist and fishing organizations in investigations and the use of these data and techniques.

4.2 Evaluation of the port sampling plan aimed at collecting fishery data for BET, YFT and SKJ that are caught in the geographical area of the area/time closure developed by the SCRS in 2012

Recommendation 11-01 requested the SCRS to develop, by 2012, a Port Sampling Plan aimed at collecting fishery data for bigeye, yellowfin, and skipjack tunas that are caught in the geographical area of the area/time closure.

The SCRS developed a Port Sampling Plan in 2012 in line with the existing multi-species sampling programs in Abidjan (for sampling and monitoring the European and associated fleets) and in Tema (for the component of the Ghanaian and other fleets landing in this port). According to paragraph 32 of [Rec. 11-01], beginning in 2013, the port sampling program had to be implemented in landing or transhipment ports.

In 2012 the SCRS identified some fundamental aspects that had to be solved in order to implement the sampling plan: (a) the reinforcement of the sampling teams working in Abidjan and Tema; (b) to ensure that all vessels from any flag landing in each landing port are sampled according with the established sampling scheme; and (c) to guarantee that the sampling teams can access to all vessels landing at port, independently of their flag and including cargo vessels.

The Group received information about the collaborative activities that were and are being conducted for the improvement of port sampling and data collection. It was noted that the sampling team in Tema has been reinforced in 2013 which is resulting in better monitoring of the landings during the period of the moratoria. There remain some problems in accessing logbooks of Ghanaian vessels landing in Abidjan together with some difficulties in accessing data from foreign flagged vessels landing in Tema, which should be resolved.

According to the information available to the Group, the coverage by observers onboard the EU and associated fleets and the Ghanaian fleet during the moratoria was almost complete, with the exception of one Ghanaian purse seiner.

5. Recommendations

1. The Group recommends that Ghana continue the efforts to improve the capabilities to monitor the activities of its fleet in order to guarantee the necessary coverage for the collection of the required statistical data. Such monitoring should include at-sea observations, sampling catches, as well as collection of complete and accurate fishing logbooks from all vessels.

2. In view of the importance of the catches of tropical tunas made in association with FADs, the Group reiterates the recommendation of expanding the request on FADs information of Rec. 11-01 to include the collection of detail data as proposed by the SCRS in 2012. It is also recommended that the SCRS analyze the progress on the FAD data collection in the future and discuss the ways of transmission of these data for incorporation in the ICCAT database or assessments.

3. Recognizing that the collection of data on fishing operations associated with FADs is considered as a priority by the different tuna RFMOs, it is recommended that a common format for data collection be developed based on existing experience in order to harmonize it.

4. It is also recommended that the information from VMS of tropical tuna fleets be made available to national and ICCAT scientists in the highest resolution available. The Group notes that such information is important for scientific evaluations and assessment although not necessary in real time and that a delay of one year could be sufficient for scientific utilization.

5. The Group recommends further evaluations of enhanced fleet monitoring be conducted, including the adoption of tools such as onboard electronic observation to complement the work of human observers onboard.

6. Recognizing the improvement in the Ghanaian data collection and processing the ~~WG~~ Group strongly recommends reinforcing the implementation of the IRD-MFRD collaboration plan with the full participation of the Ghanaian scientists in the process.

7. The Group recommends issuing a service contract according to the Terms of Reference specified in **Table 3**.

6. Other matters

No other matters were discussed.

7. Adoption of the report and closure

The Chairman thanked the participants of the meeting for the hard work conducted and the *Instituto Español de Oceanografía* for hosting the meeting and for the assistance provided. The report was adopted and the meeting adjourned.

References

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ICCAT 2013b, Revision of Ghanaian Statistics. (Addendum 1 to Appendix 5). *In* Report for Biennial Period, 2012-13, Part I (2012) – Vol. 2 – SCRS: 230-231.

IOTC 2012, Indian Ocean Tagging Symposium. http://www.iotc.org/English/symposium.php

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Table 1. Objectives of AOTTP as presented in 2010 (ICCAT, 2011a).

- The extent of movements of the three main tropical tunas species (yellowfin, skipjack and bigeye) throughout the entire Atlantic Ocean and its potential effect on the revision of the present stock structure hypothesis;
- The recent levels of exploitation across the entire range of the stocks and to reduce uncertainties in parameter estimates (with special attention to integrated stock assessment models that can potentially incorporate capture-recaptures data);
- The improvement of age- and area-specific population parameters (e.g., natural mortality by age/size, movement rates, sex- and area- specific growth etc) as well as their geographical and inter-annual variability (for instance by comparison with results obtained during historical tagging programs.)
- The level of interaction between surface and longline fisheries throughout the Atlantic Ocean; specifically for bigeye and yellowfin tuna (assuming an improvement of the recovery rate of tags on longliners);
- The interactions between the 3 major tuna species in terms of a multispecies approach of stock assessment, their habitat uses and their respective integration in habitat based model;
- The effect of the use of FADs by purse seiner in the Gulf of Guinea on the movement patterns and biology of skipjack (at all ages) and of juveniles bigeye and yellowfin, as in the associated school fishing technique in some bait boat fisheries (the "ecological trap" hypothesis), as well as the residence time of tunas around seamounts and other features;
- Characterizing and quantifying the effects of environmental factors on the movements and behaviors of each species, which may be size-dependent;
- The analysis of survival rates for released fish in case of size-catch regulation.

Table 2. List of operational objectives for AOTTP, ratings of importance for stock assessment and feasibility of reaching objective with tagging program and overall priority of each objective.

Operational objective	*Description*	*Ratings*		*Priority*
		Stock status	*Feasibility*	
Movements and stock structure	Confirm current stock structure for tropical tunas by studying their movements.	High	High	High
Fishing mortality	Estimate recent fishing mortality rates in a way that is not dependent on catch and CPUE.	High	High	High
Growth	Estimate age-area-sex specific growth rates.	High	High	High
Natural mortality	Estimate age-specific natural mortality rates.	High	Medium	High/Medium
Assessment of small tunas	Contribute to the assessment of Atlantic blackfin tuna and Atlantic bonito.	High	Medium	Medium
Environmental factors	Study the link between environmental conditions and distribution and abundance of tropical tunas.	Medium	Medium	Medium

Habitat and behavior	Describe the habitat used by tropical tunas to help in the interpretation of relative abundance indices derived from CPUE.	Medium	Low	Low
Interactions between tropical tunas	Determine whether fishery productivity of tropical tunas is independent of the productivity of each stock.	Low	High	Low
Survival rates for released fish	Estimate the survival of tropical tuna after release from fishing operations.	Low	High	Low
FADs	Determine whether the use of FADs changes the ecology and population dynamics of tropical tunas.	Medium	Low	Low
Spawning	Improve knowledge on spawning patterns for tropical tunas.	Low	Low	Low

Table 3. Draft Terms of Reference for Coordinator of AOTTP Task Force.

Requirements:

- At least 3 years of experience managing and implementing a large tagging program for marine fish in developing countries.
- Knowledge of tropical tuna fisheries.

Duties:

- Coordinate the AOTTP task force in the development of a proposal for a feasibility study to support the design of the AOTTP.
- Work with collaborators at potential donor agencies and ACP countries to seek support for the funding of the feasibility study.
- Coordinate and development of revised draft of the AOTTP proposal.
- Work with collaborators at EU and ACP countries to seek support for the funding of the AOTTP proposal.

Deliverables

- Present a revised draft of the AOTTP proposal to the 2013 SCRS annual meeting on the status of development.
- Report on type of interactions with potential donor agencies and ACP countries to the 2013 SCRS annual meeting.
- Proposal for feasibility study delivered to the SCRS 2013 annual meeting.

Duration of contract: 6 months, effort 3 months
Start of the contract: May 1, 2013
Possible funding sources: AOTTP funding program seed funds

Table 4. Format for FAD inventory (introduced in 2013).

ANEX I: Inventory

Vessel		Registration	

FAD					FAD Dimensions			Rabo/Tail					Identification associated buoy	Type of associated buoy	Withdrawal or loss of FAD
Identification	Description	Material			width (m)	length (m)	height (cm)	depth (m)	material			mesh (mm)			

Table 5. Format for collecting information on activity over FADs (introduced in 2013).

ACTIVITY REGISTER

Vessel: _____ Registration: _____

Date	*Time*	*FAD identification*	*Buoy identification*	*Activity*	*Position*		*Estimation of school (ton)*	*Estimation of accidental bycatch*				*Observations*
					Lat	*Long*		*Group*	*In no. specimens or weight (t)*	*No./W*	*No. specimens released alive*	
D/M/Y	**H/Min**				**Degree/Min**	**Degree/Min**						

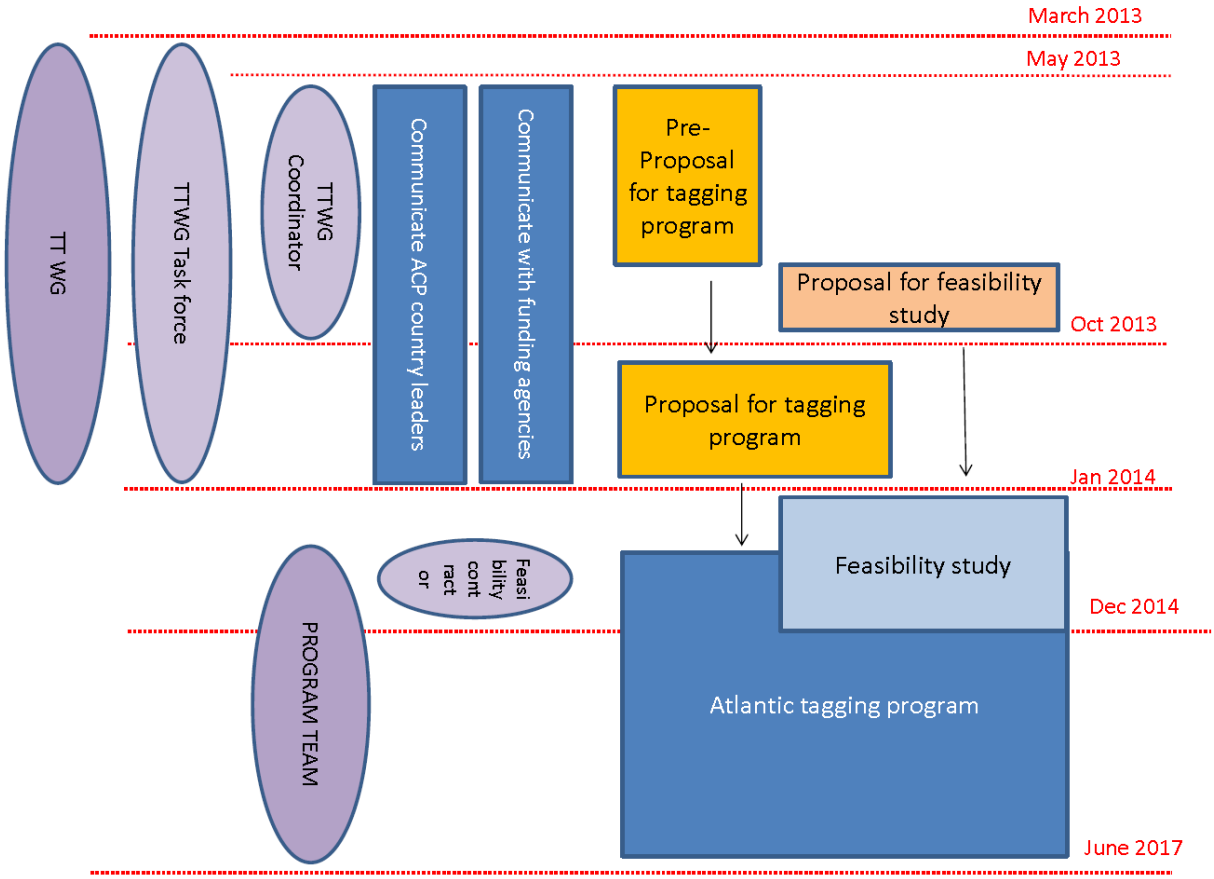
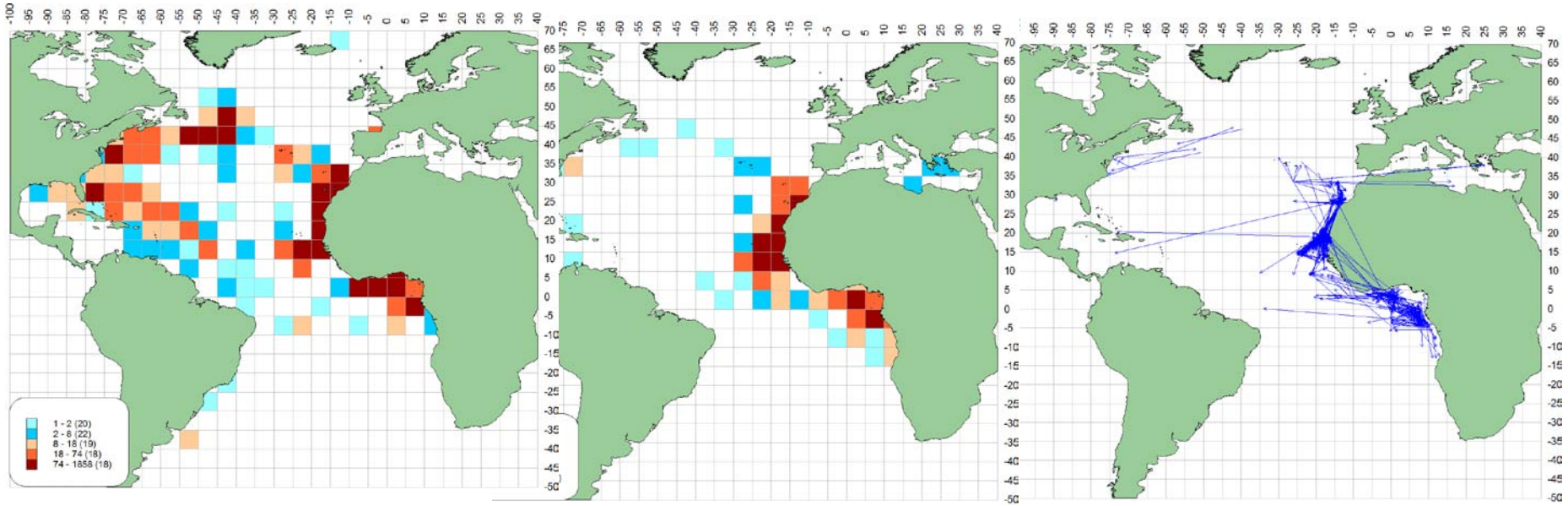


Figure 1. Flowchart describing the schedule of development, major actors (ovals), main activities (blue boxes), outputs (orange boxes).

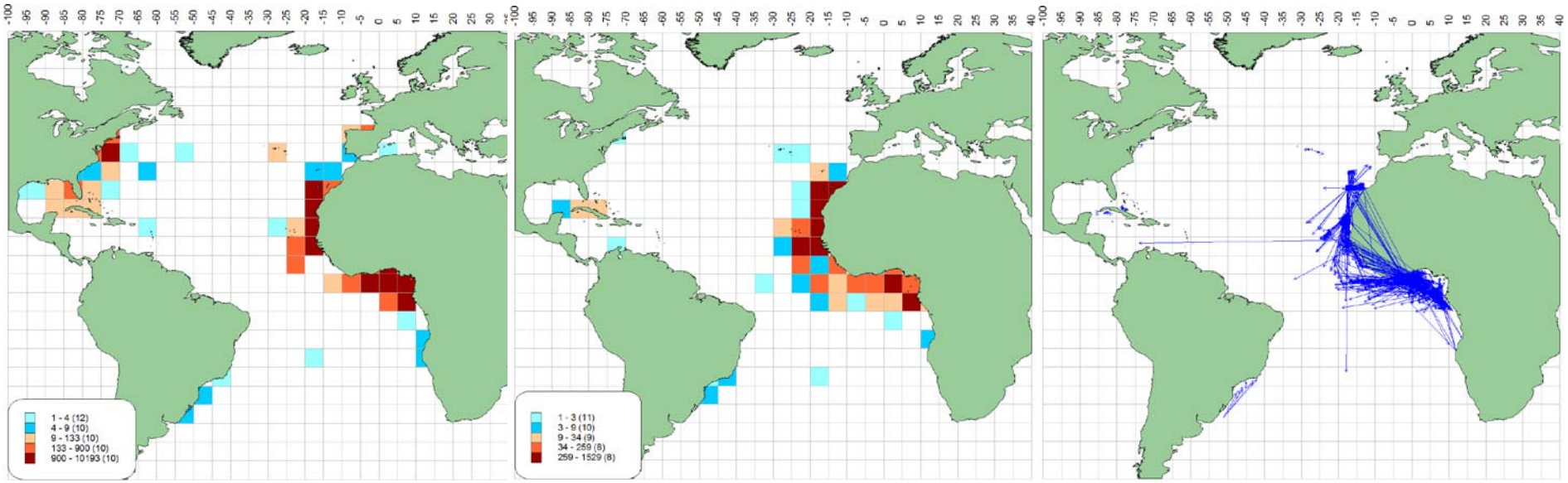


a)-Density of releases.

b)-Density of recoveries.

c)- Straight displacement between release and recovery locations.

Figure 2. BET. Location of releases and recoveries.

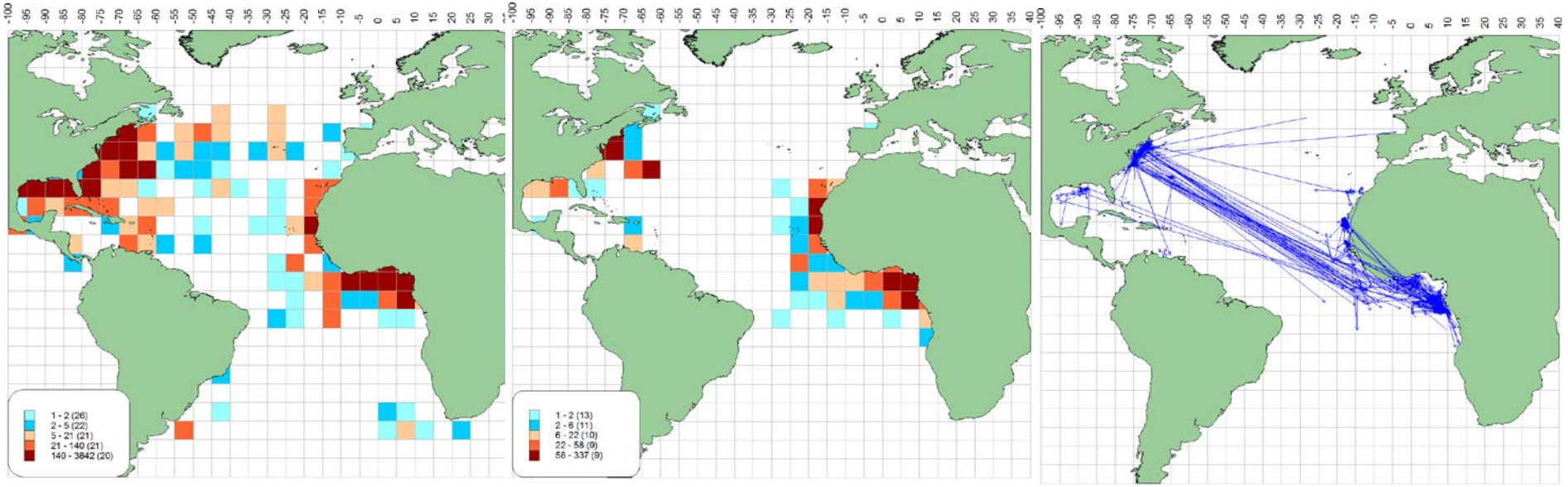


a)-Density of SKJ releases.

b)-Density of SKJ recoveries.

c)- Straight displacement between release and recovery locations.

Figure 3. SKJ. Location of releases and recoveries.



a)-Density of releases.

b)-Density of recoveries.

c)- Straight displacement between release and recovery locations.

Figure 4. YFT. Location of releases and recoveries.

Appendix 1

AGENDA

1. Opening, adoption of Agenda and meeting arrangements
2. Revision and update of the AOTTP prepared in 2010
   - 2.1 Revision of the AOTTP program
   - 2.2 Analyses of the IOTTP development and results
   - 2.3 Definition of new objectives and priorities
   - 2.4 Definition of the ToR for the Call for Tenders for the development of a detailed program
3. Review of current status of work conducted by the Working Group on the improvement of Ghanaian statistics.
   - 3.1 Revision and evaluation of Task II catch and effort and size data for the intermediate period considered by the group, including:
     - 3.1.1 Methods used to estimate the species composition
     - 3.1.2 Methods used to estimate catch at size data, including substitution criteria
     - 3.1.3 Methods used to incorporate "faux poisons" data
   - 3.2 Revision of activities conducted under the collaboration plan between Ghanaian and IRD scientists defined by the Tropical Species Group
     - 3.2.1 Activities on port sampling and data entry and validation
     - 3.2.2 Criteria to consider in the treatment of the most recent data (since 2006)
4. Responses to the Commission on
   - 4.1 FADs Management Plan
   - 4.2 Evaluation of the port sampling plan aimed at collecting fishery data for BET, YFT and SKJ that are caught in the geographical area of the area/time closure developed by the SCRS in 2012.
5. Recommendations
6. Other matters
7. Adoption of the report and closure

Appendix 2

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Appendix 3

LIST OF DOCUMENTS

SCRS/2013/020	Preliminary report for the data processing training course in Tema, November 2012. Damiano, A., Rojo, V. and Barrigah, S.
SCRS/2013/022	New TASK2 (catch & effort, catch at size) statistics estimated in 2013 for the Ghanaian fleet during the 1996-2005 period. Fonteneau, A., Bannerman, P., Ayivi, S. and Nordstrom, V.
SCRS/2013/026	Catch characteristics of tropical tuna caught by Korean tuna longline fishery in the Atlantic Ocean. Yoon, S.C., Kim, Z.G., Lee, S., Park, H. and Lee, D.W.
SCRS/2013/029	EU/Spain Fish Aggregating Device Management Plan. Delgado de Molina, A., Ariz, J., Santana, J.C. and Rodriguez, S.
SCRS/2013/031	A simulated capture-recapture model for estimating mortality and stock mixing rates of migratory Atlantic fishes. Lauretta, M.V.

Appendix 4

POTENTIAL SOURCE OF FUNDING FOR THE ICCAT TAGGING PROGRAM

In 2010 the SCRS proposed an Atlantic Ocean Tropical Tuna Tagging Programme (AOTTP) with an overall budget of around 11.4 million Euros during five years. Potential sources of funding of this programme remains widely uncertain today, but this funding would preferably be obtained from a combination of various funding sources and countries that are interested by the conservation of tropical tunas, for instance from: (1) the United States that has already been providing to ICCAT a special fund of $62,500 to promote this tagging program; (2) from the EU that has expressed its great interest for the realisation of this tagging program, (3) from the private sector; and (4) from other ICCAT member countries or (5) external sources (ICCAT, 2011b).

The EU appears to be the main source of potential "core funding", because of various converging causes:

- ✓ The EU Directorate General for Development and Cooperation (DEVCO) has been the main funding source of various large scale tagging programs in the western Pacific and Indian Oceans. The cost of these programs being similar to the planned cost of the ICCAT tagging program. This DG has expressed its firm interest in the conservation of fishery resources in developing countries at a regional scale in the Atlantic. The success of its two most recent tagging programs by the IOTC and WCPFC has been important for DG DEVCO, since their results are visible at an international scale.

- ✓ The EU DG DEVCO is in charge of supporting the development and sustainable growth of the ACP countries and developing states. A total of 17 ACP countries of the Lome Agreement with EU are members of ICCAT[2] and interested by the conservation and efficient management of tropical tuna resources. The importance of tuna resources for many ACP countries in both sides of the Atlantic is an additional factor for the EU to consider funding the ICCAT tagging program.

- ✓ The EU DG DEVCO will launch in January 2014 its 11th FED program (funding program) that could be used to fund the ICCAT tagging program, using funds that are targeting regional levels and development matters of general interest for several ACP countries (as in the Indian Ocean). However, this type of funding can only be initiated from formal request by several interested ACP countries send to DG DEVCO (in the Indian Ocean, the IOTC Tagging Program was launched following the request by two countries: Seychelles and Mauritius). There is no doubt that several of the ACP countries members of ICCAT have great socio economic interest for the conservation and the sustainable exploitation of tropical tunas.

- ✓ In 2011, the EU clearly supported this financing channel within ICCAT and encouraged CPCs to coordinate their efforts with EU delegations in their countries to try to mobilize the necessary funds to implement this program.

- ✓ Total cost of these large scale tagging programs are high. However, they are a necessary investment allowing improving a safe management of highly valuable resources. In fact, the cost of large scale tagging program, that should be done every 10 years, appears to be very limited compared to the value of the catches and to the results and benefits expected from a successful large scale tagging program: for instance the landing value of tropical tunas in the Atlantic during a 10 years period can be estimated at about 1,000 million Euros (based on Tokyo and Bangkok market prices 2012)..

[2] Angola, Barbados, Belize, Cap-Vert, Côte d'Ivoire, Gabon, Ghana, Guinea Ecuatorial, Guinée Rep, Mauritanie, Namibia, São Tomé e Principe, Senegal, Sierra Leone, South Africa, St Vincent and The Grenadines, Trinidad and Tobago.

Appendix 5

REVISION OF GHANAIAN STATISTICAL FOR THE 1996-2005 PERIOD

The method and hypothesis leading to the revision of Ghanaian Task II C/E and size data that have been accepted by the Tropical Tunas Species Group as well as their results are described in detail in document SCRS/2012/022. This document also summarizes the main results that should be used to do future stock assessment for the yellowfin, skipjack and bigeye tuna stocks, and these best results are compared to the results that have been obtained using various alternate hypothesis in the data processing used to estimate corrected and extrapolated Ghanaian C/E and CAS statistics during the 1995-2005 period.

The main parameters and working hypotheses used in the data processing approved by the Group can be summarized as following:

- Total Ghanaian yearly catches by gear are identical to levels of catches submitted by Ghana to ICCAT, but assuming in 2004 a total catch of 77824 tons (instead of the ICCAT 55619 tons).
- All data processing have been stratified in 3 areas (2 coastal and 1 offshore), 2 gears (BB and PS), 3 fleets (A, P and S) and by quarter.
- Total catches by 1° square, quarter and areas of A & P fleets have been entirely estimated by strata substitution, based on the logbook data of these two fleets during the 2006-2010 period (assuming that the fishing patterns and their seasonality were identical during the two periods).
- The S-Fleet C/E and CAS statistics have been estimated independently by EU scientists as a component of the EU PS fleet, and these results have been already submitted to the ICCAT Secretariat.
- Large yellowfin and large bigeye (at sizes over 1m) have been added to the Ghanaian size samples of Ghanaian PS, in proportion of their numbers sampled each year in the EU PS FAD landings (but only for catches South of 6°N).
- Species composition has been estimated in two successive steps: (1) the yearly amount of skipjack has been first estimated from the few Ghanaian log books available each year (based on the fact that percentages of skipjack are very similar in the EU PS FAD multispecies samples and in Ghanaian logbooks); (2) the relative amount of yellowfin and bigeye in the Ghanaian catches have been estimated based on the percentages of the two species in the Ghanaian multi-species size samples (based on the hypothesis that there was no bias in the sampling of these two species).
- Catch by species and CAS of tunas landed in the Abidjan "*faux poissons*" market have been estimated and incorporated in the new Ghanaian data set of the 1996-2005 period (corresponding to an average of 1760 tons).
- Quarterly CAS of the three species has been estimated using a quarterly extrapolation of Ghanaian size samples (corrected for their missing large fishes, by gear, but without geographical area) to the total catches of each species, and adding the estimated quarterly CAS of "*faux poissons*".
- Fishery C/E and CAS data have been estimated for the year fishing 1996 using the present method; these results should be used by ICCAT scientists, instead of the corresponding 2011 data.

The main results of these calculations are given in the **Appendix-Table 1** comparing the present yearly catches by species of Ghanaian fleet and the same information based on present results approved by the Group and in the **Appendix-Table 2** comparing the average Ghanaian catch at size of the three species used in recent stock assessment and accepted now.

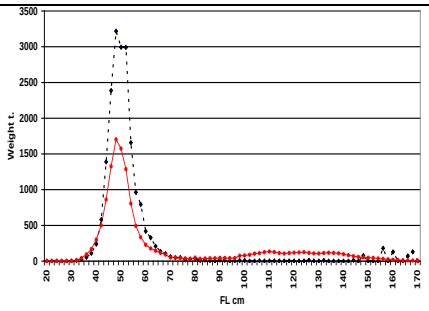
The catch-at-size (CAS) distributions obtained for the three main tropical species (YFT, SKJ and BET) are shown in **Appendix-Figure 1**.

Appendix-Table 1a. Yearly catches by species of the Ghanaian fleets (ICCAT Task I) (before correction of the 2004 catches).

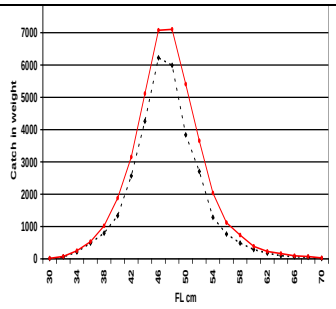
year	YFT	SKJ	BET	Total
1996	11 720	19 602	5 805	37 127
1997	15 437	26 336	9 828	51 601
1998	17 656	34 182	13 369	65 207
1999	25 268	40 215	17 763	83 246
2000	17 662	28 973	5 909	52 544
2001	33 545	42 488	12 041	88 074
2002	23 673	30 498	7 105	61 276
2003	18 457	24 596	13 557	56 610
2004	15 053	25 726	14 900	55 679
2005	17 492	44 671	13 916	76 079
Average	**19 596**	**31 729**	**11 419**	**62 744**

Appendix-Table 1b. Corrected yearly catches by species of the Ghanaian fleets (ICCAT Task I) now approved by the WG (after correction of the 2004 catches).

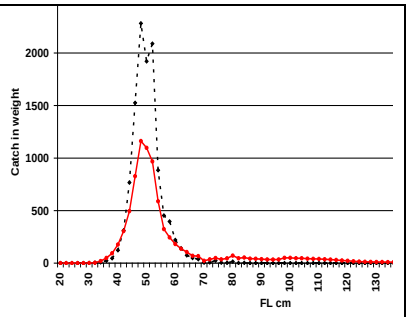
Year	YFT	SKJ	BET	Total
1996	8 182	24 205	4 751	37 138
1997	15 080	26 364	10 165	51 609
1998	13 222	41 840	10 155	65 216
1999	20 815	52 024	10 416	83 255
2000	12 304	34 980	5 269	52 553
2001	23 392	55 475	9 214	88 081
2002	18 100	37 570	5 611	61 280
2003	15 002	32 977	8 646	56 624
2004	14 044	46 030	17 744	77 817
2005	13 019	54 209	8 860	76 089
Average	**15 316**	**40 567**	**9 083**	**64 966**



Appendix-Figure 1a. Average CAS of YFT Ghanaian catches during the 1996-2005 period (dotted line: old CAS).



Appendix-Figure 1b. Average CAS of SKJ Ghanaian catches during the 1996-2005 period.



Appendix-Figure 1c. Average CAS of BET Ghanaian catches during the 1996-2005 period.