**ISG6 – Review of the Shark Research Plan**

**Task: review the shark research plan (**<https://www.wcpfc.int/node/21717>**) and recommend any changes to the list of projects or the stock assessment schedule with particular reference to 2017.**

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**ISG noted the following ongoing or planned work:**

* ABNJ Tuna Project (see WCPFC-SC12-2016/RP-ABNJ-01) which runs through Jan 2019:
  + The southern hemisphere porbeagle assessment will be completed in early 2017
  + The Pacific-wide bigeye thresher assessment will be completed shortly
  + Two further Pacific-wide shark stock assessments (TBD) are planned (indicative budget: 100,000 USD@)
  + A post-release mortality tagging study (indicative budget: 250,000 USD)
  + A pair of international workshops planned to focus on post-release mortality tagging sampling designs and analysis (first planned for Jan 2017; all funding allocated to travel for developing coastal States and invited experts)
* ISC Shark Working Group (see WCPFC-SC12-2016/GN-IP-02):
  + A north Pacific blue shark assessment is in progress for completion in 2017
  + A north Pacific shortfin mako shark assessment is planned for 2018
* JIMAR, NOAA and ISSF are conducting a study of post-release mortality under different handling and discard practices for blue, silky, oceanic whitetip and bigeye thresher sharks (n=112 tags with n=51 deployed to date; see WCPFC-SC12-2016/EB-WP-07)
* IATTC is conducting a post-release mortality study of silky sharks in Ecuador and Costa Rica (n=34) with EU funding
* NOAA, SPC and ABNJ are conducting a post-release mortality tagging study of whale sharks in Papua New Guinea (n=10, none deployed yet)
* Researchers from James Cook University are proposing to tag and take genetic samples from 20 silky and 20 oceanic whitetip sharks in the Cook Islands to evaluate the effectiveness of spatial management measures (see WCPFC-SC12-2016/EB-IP-15)
* ISSF is conducting work on FADs and sharks including entanglement and safe release

**Table 1. SC12:ISG6 proposed schedule of analyses and stock assessments under the WCPFC Shark Research Plan. Project outlines are provided for some items (marked with #) and the funding source for projects in 2017 are provided in brackets. Tuna assessment schedule is for information only.**

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| **Species** | **Stock** | **Last assessment** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Bigeye tuna | WCPO | 2014 |  | X |  |  | X |
| Pacific-wide | - |  |  |  |  |  |
| Skipjack tuna | WCPO | 2014 | X |  |  | X |  |
| Yellowfin tuna | WCPO | 2014 |  | X |  |  | X |
| Albacore | South Pacific | 2012 |  |  | X |  |  |
| Striped marlin | Southwest Pacific | 2012 |  |  | X |  |  |
| Northwest Pacific | 2012 |  |  | X? |  |  |
| Swordfish | Southwest Pacific | 2013 |  | X |  |  |  |
| Silky shark | WCPO | 2013 |  |  |  |  |  |
| Pacific-wide | - |  | Assessment (#2) (unfunded) |  | Stock discrimination? | Stock discrimination? |
| Oceanic whitetip shark | WCPO | 2012 |  |  |  | Assessment (if data supports)  (WCPFC) |  |
|  |  |  |  |  |  |  |
| Blue shark | Southwest Pacific | - | Assessment  SC12-SA-WP-08  SC12-SA-WP-09 |  |  |  |  |
| South Pacific-wide |  |  |  |  |  |  |
| Northwest Pacific | 2014 |  | Assessment (ISC)  Participation in ISC NP blue shark stock assessment activities (#4)  (WCPFC? or unfunded) |  |  |  |
| Mako shark  (shortfin) | Southwest Pacific | - |  |  | Assessment (if data supports) |  |  |
| Northwest Pacific | 2015 (Indicator analysis) |  |  | Assessment  (ISC) |  |  |
| Porbeagle | Pacific-wide (southern hemisphere) | - |  | Assessment (to be submitted to SC13)  (ABNJ) |  |  |  |
| Bigeye thresher |  | - |  |  |  |  |  |
| Pacific-wide | - | Assessment  (to be submitted to SC13) |  |  |  |  |
| Hammerhead | WCPO | - |  |  | Update catch history?  Biological research to determine species specific age, growth and reproductive parameters? | Stock discrimination ?  Biological research to determine species specific age, growth and reproductive parameters? | Stock discrimination ?  Biological research to determine species specific age, growth and reproductive parameters? |
| Pacific-wide | - |  |  |  |  |  |
| Whaleshark | WCPO | - |  |  | Stock discrimination ? | Stock discrimination ? |  |
| Pacific-wide | - |  |  |  |  |  |
| General shark work | WCPO |  | Develop proposed limit reference points for elasmobranchs (#8)  (WCPFC) | Review of shark data and modelling framework to support stock assessments (#5) (WCPFC)  Post-release mortality studies (#3)  (ABNJ + EU)  Operational planning for shark biological data improvement (#7) (unfunded) | Assess spawner recruit relationships?;  SRP mid-term review? | Updated indicator analysis? | Develop a 2021-2025 shark research plan to be presented to SC16 in 2020? |

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| **Sheet Number** | 1 |
| **Project** | South Pacific-wide blue shark assessment |
| **Objectives** | Revisit the 2016 South Pacific blue shark assessment, using the full year to resolve some of the existing issues and expand the scope to the entire South Pacific, thereby developing new methods and producing results that can be used for management. |
| **Rationale** | * Builds upon the momentum of SPC’s 2016 work to complete the assessment and provide information for management * Leverages ABNJ funds to incorporate Eastern Pacific data * Results will be more realistic and robust if EPO catches are considered * Will complement the North Pacific-wide assessment by ISC * Provides the opportunity to apply other models useful for sharks |
| **Assumptions** | * Eastern Pacific data can be accessed and will improve estimation * Models such as SS3 or BSP can be applied * Existing assessment can be improved with an additional year’s work * SPC’s workload would allow them to lead this assessment |
| **Scope** | Revise the existing South Pacific blue shark stock assessment (WCPFC-SC12-2016/SA-WP-08) so that it addresses the following key points:   * Covers the entire range of fishing impact on the stock, i.e. accounts for Eastern Pacific fisheries * Applies at least 2 stock assessment models, at least one of which was applied in the most recent ISC North Pacific blue shark assessment, i.e. BSP or SS3 * Modifies the models as necessary to account for the special characteristics of sharks, i.e. stock-recruit functions, prior on K, etc. * Conduct further work on rescuing, mining, accessing or estimating catch, effort, catch rate and other useful historical data from all sources * Monitor developments in the ISC North Pacific blue shark assessment to share and benefit from methods innovations * Prepare a revised assessment for SC13 |
| **Budget** | 1 FTE at SPC (ABNJ can contribute up to 100,000 USD with priority on EPO extension work) |

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| **Sheet Number** | 2 |
| **Project** | Update of silky shark status as a Pacific-wide assessment |
| **Objectives** | Revisit the 2013 silky shark assessment working with IATTC\* to explore stock definitions and new methods to account for potential regional patterns across the Pacific. |
| **Rationale** | * This species has been identified by both WCPFC and IATTC as being depleted and in need of management (and is currently proposed for CITES) * Assessment of this species is a priority shark research topic for IATTC * Leverages ABNJ funds * Four years have passed since the last WCPO assessment and two years since the implementation of WCPFC no-retention measures * Builds on previous assessment work for this species * Promotes useful cooperation with IATTC |
| **Assumptions** | * Much of the existing data are readily available * SPC and IATTC can collaborate and share data * Combined data prep work identifies a viable Pacific-wide assessment strategy * No-retention measures have not seriously degraded the information content of recent data * SPC workload can support undertaking this work |
| **Scope** | Revisit the existing silky shark assessment (WCPFC-SC9-2013/SA-WP-03) in collaboration with IATTC to improve methods, increase understanding of data strengths and weaknesses, and update stock status. Specifically:   * Explore a combined data set to determine appropriate methods * Explore ways of developing purse seine-based indices of abundance for WCPO data * Compare WCPO and IATTC indices of abundance that overlap in time and space in order to evaluate trends and define stock boundaries * Update WCPO LL catch estimates and abundance indices using recent observer data * Re-run SS3 model to compare to 2013 results * Consider what might be appropriate limit reference points * Prepare a report containing the above results for SC13 |
| **Budget** | 1 FTE at SPC (ABNJ can contribute up to 100,000 USD with priority on EPO extension work) |

\* subject to further discussions with IATTC staff scientists

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| **Sheet Number** | 3 |
| **Project** | Post-release mortality tagging study |
| **Objectives** | Obtain better estimates of post-release mortality, especially for oceanic whitetip and silky sharks, across a broader range of longline fisheries. |
| **Rationale** | * The data obtained will be useful for assessments as well as for evaluating the effectiveness of mitigation measures * This work can be focused on the shark species of greatest conservation and management interest * This work can reinforce several ongoing studies in other fisheries (see Preface) * Leverages ABNJ funds (funding already confirmed) |
| **Assumptions** | * Tags can be deployed using observers (thereby avoiding vessel costs) * Sufficient catches by vessels with trained observers onboard * Study design to be developed during an early 2017 workshop to be supported by the ABNJ Tuna Project |
| **Scope** | The ABNJ Tuna Project plans an early 2017 expert workshop to develop a sampling programme. Scope is somewhat flexible in terms of fisheries and species but at present is aimed toward longline fisheries with a priority on oceanic whitetip and silky sharks. It will be important to consider shark condition and handling practices as key factors when attaching tags, i.e. there may be a need for observers to record additional information or use different codes. ABNJ Tuna Project funding has been budgeted to buy up to 50 tags; contributions from other sources could increase the statistical power of the design. Compatibility with similar programmes in other fisheries should be maximized. This work is expected to begin in 2017 and be completed in 2018. |
| **Budget** | ABNJ has 250,000 USD budgeted for this study (other contributions welcome) |

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| **Sheet Number** | 4 |
| **Project** | Participation in ISC North Pacific blue shark stock assessment activities |
| **Objectives** | Contribute to and learn from ISC work toward revising the North Pacific blue shark stock assessment, thereby aiding methods development for other WCPO shark stocks. |
| **Rationale** | * The ISC is currently conducting an update of the North Pacific blue shark stock assessment of 2014 * The ISC assessment would benefit from the contribution of additional blue shark observer data in the North Pacific * Participation in this collaborative stock assessment may lead to the development of new methods and/or new data insights * Cooperation between the WCPFC and its Northern Committee could be strengthened |
| **Assumptions** | * If SPC were available to participate, it would contribute its blue shark data holdings * If the Secretariat or ABNJ participates, fewer data can be contributed * ISC is able and willing to incorporate these contributions to its work * ISC meetings avoid scheduling conflicts with other work |
| **Scope** | Available WCPO data would be compiled, formatted and analysed to produce data products that could be contributed to ISC Shark Working Group (SWG) meetings (no raw data would be contributed; this is similar to the contributions of ISC member countries). It is assumed that participation in two ISC SWG meetings would be required (the FTE estimate is intended to account for travel costs). Total time input including data handling and analysis, ISC SWG meetings and other tasks, and report review is estimated at ~2.5 months. The ISC SWG aims to complete its North Pacific blue shark stock assessment in the first half of 2017. |
| **Budget** | $20,000 |

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| **Sheet Number** | 5 |
| **Project** | Review of shark data and modelling framework to support stock assessments |
| **Objectives** | Implement a review of the data availability, data quality and data gaps for undertaking shark assessments, and the associated need to identify appropriate data assumptions for re-constructing data time-series and appropriate modelling techniques |
| **Rationale** | * Implements recommendations from the South Pacific blue shark, the 2016 SPC data gaps paper and the BDEP paper regarding the need to inspect and clean existing shark data holdings * Assessments usually do not have time for this type of work, and general data management budgets do not provide for this depth of focus * While providing an improved understanding of existing data holdings and their utility for assessments, the project would also improve the modelling framework to be used in shark assessments. |
| **Assumptions** | * Would require either SPC, or a consultant working with SPC, so that all data holdings that are usually accessed for stock assessments can be included. |
| **Scope** | This study should be conducted by a scientist familiar with shark biology and assessment methods (not by a data management generalist). The review should cover all WCPFC key species and include:   * Assess the quality of the data currently held including the spatial and temporal coverage of logbook and observer data, * Identify significant data gaps and the uncertainties which these gaps imply, * Comparing observer and logsheet data with a view to identifying and adjusting for under-reporting, discarding, non-species specific recording and other missing data, * Assess impact of specific shark related CMMs on data quality, * Investigate data reporting patterns by fleet including whether i) annual catches and discards are reported for all key species; ii) whether operational or aggregated logsheet data are provided for all key species; and iii) the extent to which the provided data are estimated and how that might affect their precision, * Identify mechanisms to addressing the current data gaps including identifying potential sources of new historical data, * Identify appropriate data assumptions for re-constructing data time-series and propose methods (e.g. weighting, extrapolation, etc) to adjust for identified biases, * Provide advice on what types of analyses the data can support including advice on appropriate modelling approaches (e.g. CPUE standardisation) where the data is considered sufficient, * Produce a paper containing recommendations, and revised datasets as appropriate, for SC13. |
| **Budget** | $65,000 |

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| **Sheet Number** | 6 |
| **Project** | Operational and management histories for WCPO longline fleets |
| **Objectives** | Compile timelines and brief descriptions for major longline fleets detailing the history of management measures and operational practices |
| **Rationale** | * This project addresses an SC11 (and prior) discussion about how to interpret changes in CPUE indices and the potential biases in constructing indices of stock abundance based on standardised CPUE from various fleets’ data without knowing and adequately accounting for operational and management changes over time. * As indices of stock abundance are one of the key inputs to stock assessment models, adequately accounting for changes in operational practices that may influence CPUE is a high priority. * Australia has produced a simple fleet history that can serve as a template for other CCMs (WCPFC-SC12-2016/SA-IP-11). * These histories would serve as a resource not only for WCPFC analyses but for any analyses of Pacific shark data |
| **Assumptions** | * The information exists and can be located in a reasonable timeframe * CCMs are willing to assist with producing their own fleet histories * Funding is available to assist CCMs in producing their summaries (if they wish) |
| **Scope** | The fleet histories should, in the first instance, focus on longline fleets as it is these data that are often used as indices of stock abundance. Separate fleet histories for purse seine fleets could also be prepared as resources allow. The fleet histories should include details on management measures, fishing strategies, gears and sampling regimes over time. It is anticipated that each history would be up to 3 pages of text with key events described in sequence, with a few key figures and an excel spreadsheet version of the timeline.  A coordinator should be appointed to compile and assist with the fleet histories. For those CCMs that are willing to produce their own fleet histories, the coordinator would just be involved in editing and formatting. For those CCMs that are willing to have a fleet history produced but cannot undertake it themselves the coordinator could assist in writing up information or interviews facilitated by the CCM for approval by the CCM. At a minimum, the coordinator could research and pull together public domain information for each fleet.  A collection of fleet histories would be presented by the coordinator to SC13, with the potential for CCMs to update or replace them over time. |
| **Budget** | $30,000 |

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| **Sheet Number** | 7 |
| **Project** | Operational planning for shark biological data improvement |
| **Objectives** | Collect, review and prioritize a list of biological data gaps for the WCPFC key shark species and propose a scalable and practical plan for filling them |
| **Rationale** | * The Pacific Shark Life History Expert Panel Workshop urged the t-RFMOs to be more proactive in setting a research agenda for life history and stock structure research * ISC and ICCAT have developed mechanisms for this type of work, but there is little shark biological work being done by the WCPFC * Various recommendations for further studies have been made by the Shark Research Plan, various stock assessments and the Expert Panel itself. * The regional observer programme and SPC tissue bank provide opportunities for sample collection and access * It is difficult to begin filling data gaps without a focused, practical plan that can be proposed and costed * This project will develop such a plan, thereby spinning-off implementable projects that can proceed if funded |
| **Assumptions** | * There are cost-effective ways of gathering the necessary data and conducting the appropriate analyses * CCMs may be able to assist with sample collection or other research coordination * SPC or another regional body is willing to act as the focal point * At least some of the projects developed can be funded through WCPFC or other sources |
| **Scope** | Review the Shark Research Plan, shark stock assessments in the WCPO and elsewhere, the report of the Pacific Shark Life History Expert Panel Workshop to develop a list of biological studies necessary to support conservation and management for WCPFC key shark species, potentially including:   * Stock discrimination * Age and growth sampling * Inter-laboratory calibration of ageing methods * Validation/verification of ageing methods * Reproductive sampling * Length-length and length-weight relationships * Movement/migration   Prioritize these studies based on the usefulness of the information, ease of sample access and cost and develop practical plans (including a budget) such that priority studies can proceed as soon as funding is sourced. A minimum of three studies should be fully developed, organized and costed and tabled at SC13. |
| **Budget** | $30,000 |
| **Sheet Number** | 8 |
| **Project** | **Identifying appropriate Limit Reference Points (LRPs) for elasmobranchs within the WCPFC (Scope for Commission approved project)** |
| **Background:**  The Commission endorsed SC11’s request of USD 25,000 for the continued development of limit reference points for elasmobranchs. The Commission tasked SC12 to develop a scope of work to progress this work within the budget allocated for 2016 (Paras 69-70, FAC9 Summary Report). SC12-ISG-2 also supported the project collaborating with the work presently being undertaken by ISC on the development of stock-recruitment relationships and their parameter estimates, such as stock-recruitment steepness for North Pacific blue shark.  **Aim:**  This project is to complete the work initiated by S. Clarke and S. Hoyle and presented to SC10 (as described in SC10-MI-07), and the subsequent work undertaken by the Pacific Shark Life History Expert Panel (as described in SC11-EB-13), to identify and quantify appropriate limit reference points for key shark species in the WCPO.  **Scope of Work:**  This project will facilitate a small workshop of shark and stock assessment experts to undertake the following tasks:   1. For those elasmobranchs which have been evaluated using a stock assessment model, recalculate the risk-based limit reference points (as described in Table 5, SC10-MI-07) using the updated life history information produced by the Shark Life History Expert Panel. 2. For those elasmobranchs which have not been evaluated using a stock assessment model advise on ways of developing an estimate of current fishing mortality (F), for example using catch curves, the method used in the bigeye thresher assessment (SC12-SA-IP-17), or other suitable means. Risk-based LRPs (as described in SC10-MI-07) should then be developed for all WCPFC key shark species. 3. Where the stock-recruitment relationship is highly uncertain, compare Fcurrentto SPR-based LRP such as F60%SPRunfished and discuss any new insights into the recommended estimated LRPs so that the WCPFC Scientific Committee can decided on a case-by-case basis which LRP is most appropriate. 4. Review the use or otherwise of other potential LRPs based on SPR, reduction of recruitment or empirical measures (e.g. catch rate or length values designed to signal unacceptable population states). 5. Advise on any changes or updates to the recommended LRPs in SC10-MI-07 based on new developments, including any suggestions for further technical work before consideration of adoption of LRPs by fishery managers. 6. Review the work presently being undertaken by ISC on the development of stock-recruitment relationships and their parameter estimates, such as stock-recruitment steepness for North Pacific blue shark and assess the applicability of extending this work to other key shark species, especially South Pacific blue shark.   **Output:**  The project will produce a final report which shall be presented to and reviewed by SC13.  Secretariat Support:  The Principal Investigator for the project should liaise with the WCPFC Secretariat to help facilitate and coordinate arrangements for the workshop (e.g. arranging travel for the participants).  **Timing:**  The Commission allocates funds on an annual basis. As such, the project funds would need to be spent or contracted in 2016/17, otherwise the Commission would need to re-approve funding for this project at WCPFC13. | |
| **Budget** | $25,000 (Commission funding approved for 2016) |