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SCIENTIFIC COMMITTEE
FOURTEENTH REGULAR SESSION

Busan, Republic of Korea
8-16 August 2018

An update on development of new identification materials and enhanced training
to observers to support better identification of sharks and rays in observer data

WCPFC-SC14-2018/EB-IP-11

T. Park[1], S. Fukofuka[1], L. Bell[1,2] , S. Clarke[3] and N. Smith[1]

[1] Oceanic Fisheries Programme (OFP), FAME, Pacific Community, Noumea, New Caledonia
[2] Current address: Offshore Section, Ministry of Agriculture and Fisheries, Samoa
[3] Areas Beyond National Jurisdiction (ABNJ, Common Oceans) Tuna Project, Food and Agriculture Organization of the United Nations, Rome, Italy

1   Introduction

The Western and Central Pacific Fisheries Commission (WCPFC), along with the four other tuna Regional Fisheries Management Organizations (t-RFMOs), is a partner in the Areas Beyond National Jurisdiction (ABNJ) – often referred to as Common Oceans – Tuna Project. The objective of this project is to achieve efficient and sustainable management of fisheries resources and biodiversity conservation in marine areas that do not fall under the responsibility of any one country. One set of activities of the GEF-funded ABNJ Tuna Project aims at reducing the impact of tuna fisheries on biodiversity by improving data and assessment methods for sharks thereby promoting their effective management. Within this set of activities, WCPFC is conducting work on Shark Data Improvement and Harmonization. The objective of this component is to work toward developing a practical and consistent approach to monitoring the status of sharks and rays caught by ABNJ tuna fisheries. It focuses on identifying the data deficiencies which inhibit assessment, and thus management, and proposes strategies to obtain more data through field studies and better information return from fisheries. As part of this objective, SPC will deliver new identification materials and enhanced training to observers to support better identification of sharks and rays in observer data. This paper provides an update on progress to date with this work and identifies the work still to be completed. The final outputs of the study are expected to be available for consideration at SC15.

The scope of this particular project involves SPC facilitating the delivery of new identification materials and training to observers to support recent designation of manta and mobula rays as WCPFC key species. In addition, SPC will facilitate enhanced training focused on separating silky sharks from other Carcharhinids, and distinguishing between the three thresher shark species, particularly when fishers cut sharks off the line. Finally, SPC will expand the existing Pacific Island Regional Fishery Observer (PIRFO) shark species guides to include a greater range of species, multiple illustrations per species, and tips for distinguishing between similar species. The project is arranged into two key components – observer training, and ID guides – noting there is some overlap and considerable feedback between them. The enhanced observer-training component activities are limited to the Pacific Island Countries and Territories (PICTs) and will be delivered through the Pacific Island Regional Fisheries Observer (PIRFO) framework. The work of the WCPFC Regional Observer Programme Coordinator with other Regional Observer Programme (ROP) training provides an opportunity for this work to be spread more broadly throughout the Regional Observer Programme (ROP).

2   Identification Guides

In 2017, SPC began a review of its shark identification (ID) guides, with a particular focus on manta/mobulid species ID, separating silky sharks from other Carcharhinids, and distinguishing between the three thresher shark species.

2.1 Key elasmobranch species

As of 2012, the WCPFC had identified 14 key elasmobranch (shark and ray) species[1]. More recently, in 2016, WCPFC added all manta/ mobulid rays to the key species list (Anon., 2017). At that point, most of the WCPFC key elasmobranch species were listed as CITES Appendix II protected species[2]. The taxonomy of the Mobulidae has been recently revised to recognize a single genus *Mobula* (where previously there were two) and eight species (previously 11) (White et al., 2018). The guides will adopt the revised taxonomy and cover all WCPFC key elasmobranch species.

2.2 Current ID guides

Currently SPC produces and distributes two field guides used by observers and industry personnel to improve shark species identification: 'Marine Species Identification Manual for Horizontal Longline Fishermen' (Chapman et al., 2006) and 'Shark Identification in Pacific Tropical Offshore Fisheries' (Anon., 2005). These two guides use essentially the same information and illustrations, with the 'shark guide' a pocket sized generic guide for all pelagic fisheries. Some other more coastal shark species are listed separately in the SPC 'Fisheries Species Identification Manual for Deep-bottom Snapper Fishermen' (Chapman et al., 2008).

The SPC pelagic guides cover 28 species of sharks, the pelagic stingray, manta ray and a generic mobula or devil ray group. They cover all the WCPFC key species and with the exception of porbeagle shark and the individual mobulid species. However, there is limited guidance in the guides for separating similar species, and for separating particular species in specific scenarios (e.g. distinguishing between the three thresher shark species, particularly when fishers cut sharks off the line).

2.3 Initial Review

In an initial review in 2017 of the SPC ID guides (Anon., 2005; Chapman et al., 2006) with respect to species coverage and illustration quality, it was noted that they were based on simple illustrations mostly reproduced from a Hawaiian shark guide poster with some of the original FAO sketches as line drawings. Hence, in many cases the illustrations looked very similar among species and did not highlight sufficient morphological differences. A review of the guides proposed that 19 species needed new or revised illustrations and a further 13 species would benefit from better illustrations. The conclusion of this review was that a more broad revision of the SPC field guides was warranted. Further, a recent FAO/IOTC 'On Board Guide for the Identification of Pelagic Sharks and Rays - Western Indian Ocean' (Ebert, 2014) has developed a key to identify the same shark species. This new guide also combines clear colour illustrations with appropriate line lateral and ventral profiles, and other key morphological features. This guide is considered a model for a refinement of the SPC ID guides and the associated training (see Section 3). In particular, the explanatory information and the simple

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[1] Blue, shortfin mako, longfin mako, silky, oceanic whitetip, common thresher, bigeye thresher, pelagic thresher, porbeagle, smooth hammerhead, scalloped hammerhead, great hammerhead, winghead, and whale shark.

[2] Silky, oceanic whitetip, common thresher, bigeye thresher, pelagic thresher, porbeagle, smooth hammerhead, scalloped hammerhead, great hammerhead, whale shark and all species of manta and devil rays.

taxonomic key approach are considered highly relevant to the work of Regional Observer Programme (ROP) observers, and should be incorporated into the new shark/ray ID guides.

2.4 Work in Progress and Next Steps

2.1.1 Illustrations

FAO has been contacted about use of the material in their guide, and whilst they are supportive of its use, as the illustrations are not owned by FAO they cannot be shared. This leaves two options, contacting the owner of the FAO/IOTC guide illustrations and obtaining copyright, or sourcing new illustrations. Initial attempts to arrange for use of the copyright illustrations have not succeeded, however this will continue to be pursued. Even with access to copyright images, some images need additional work, and a WCPO key needs to be developed. Therefore, an appropriate regional shark/ray species ID guide requires at least some new illustrations, and implementation of an appropriate identification key.

What is proposed under this project is to use an appropriate specialist technical illustrator to develop the required illustrations. Appropriate shark ID specialists will concurrently be used to develop an identification key appropriate to the SPC ID guides in a WCPO context. The key would frame the species ID guide logically with species clearly arranged into species groups in a way that is simple for observers to follow in at-sea conditions. The species identification would utilise colour profiles with line lateral and ventral profiles where appropriate.

This development will progress cognisant of the future potential use of ID guides in 'app' form and their links to and use with electronic reporting tools for the purpose of an interactive approach to improved shark identification. The shark guide will also have a section identifying best practice handling of sharks and/or rays for release.

2.1.2 Peer Review

It is intended that the draft new ID guides will be reviewed in at least two ways, via experts and via fisheries observers. Expert technical review will be sought to ensure species identification is as precise as practical. Where possible, observer training workshops will be used to test the ease of use of the guides in a qualitative context. A select group of senior observers, debriefers and trainers will also be asked to provide structured feedback. Once the ID guides are promulgated in the new (2019) format, additional feedback will occur to further improve them through the standard ROP processes discussed further in Section 3, and directly from PIRFO Observers through the generalised processes in Figure 1.

3 Shark Identification Training refinements

The WCPFC Regional Observer Programme (ROP) includes a range of PICT national programmes and the observer programmes of other WCPFC members. All WCPFC ROP programmes are audited. The WCPFC Regional Observer Programme Coordinator may use that process to assess training on pelagic shark and ray species identification, and provide suggestions for refinements and new training materials. It also is an opportunity for observer programmes to provide feedback on available (and

new) identification materials. All of the materials developed in this project will be made available to the WCPFC Regional Observer Programme Coordinator. The work in this project is focussed on the PIRFO framework in which SPC has direct engagement (e.g. quality assurance, trainer training, and regional training co-ordination) and covers all PICT ROP programmes. Current PIRFO observer training includes detailed training and assessment of pelagic shark species identification for species using the current SPC species identification guides. However, with the additional manta/mobulid identification, better separation of silky sharks from other Carcharhinids, and distinguishing between the three thresher shark species, training will need to be enhanced.

3.1 General approach to training

The general approach to PIRFO training is outlined in Figure 1 (noting the process of training, deployment and refresher training during debriefing is found in all ROP programmes). Training of Observer Trainers is a priority in the first instance, with training on new observer intakes and Debriefers a clear second priority. Through these pathways, enhanced training can be delivered to existing observers as well as new recruits, and ensure the quality of ROP data collection improves overall.

3.2 Pre-testing of key-based approaches

Recognising the superior nature of the FAO guide for the Indian Ocean (Ebert, 2014), in 2017 and early 2018 SPC tested key-based approaches to elasmobranch identification on three PIRFO observer training courses. Although qualitative, the results of that pilot testing suggested new observers found key-based approaches more useful in separating sometimes hard to distinguish species. This pre-testing approach (not only for keys) will continue to be used throughout this project to improve the quality of observer training.

3.3 Enhanced approach to training

Refinement of the PIRFO training pertaining to shark identification will include:

- Inclusion of porbeagle shark and individual mobulid ray species
- Better separation of silky sharks from other Carcharhinids
- Key morphological features by taxonomic group and species
- Use of new shark identification guides (including different images and keys)
- Distinguishing between the three thresher shark species
- Better identification of sharks during cut-off situations in longline fisheries
- Developing improved training materials associated with the new guides, in hardcopy and ultimately interactive electronic format (the latter is likely beyond the life of the current project)
- Explanation of WCPFC shark measures and the role of observers pertaining to:
    - o description of measures regarding shark targeting/mitigation fishing gears, and
    - o description of WCPFC-approved handling and release practices for rays and sharks by species.

Implementation of the refined shark identification will involve all three phases of the PIRFO training system (Figure 1). The approach and materials will be shared with the WCPFC Regional Observer Programme Coordinator.

Tasks include:

- PIRFO training materials will be redeveloped to include all key species, improved illustrations and photos, with a standardised approach to shark identification using a key to distinctive morphological features
- PIRFO training materials will be updated to provide guidance on how to record sharks that are cut free
- Initially the new 'draft' guides, key and usage will be introduced to PIRFO trainers through the PIRFO Trainers' Workshop (next is scheduled for October 2018) and these will be adopted in the PIRFO training and refresher training workshops, and
- Debriefer training will include adopting verification checks of the standardised species identification protocols, and providing feedback to observers during debriefing, and these processes will be adopted into the debriefer training and debriefer refresher training.

Ultimate approval of the PIRFO refinements will be through PIRFO Certification Management Committee and the Regional Observers Coordinators' Workshop (e.g. ROCW19, planned for February 2019). To continuously improve the quality of materials for training and ID, the PIRFO website will also be enhanced to include a species ID library for observers to submit their photos to improve the quality of training materials available (there will be an annual competition for best image to incentivise participation).

4   Summary

Project completion involves two substantive steps. The first is the redevelopment of the shark/ray ID guides as described in Section 2 above. This work is planned for completion by the end of December 2018. This timeframe remains ambitious and might be expedited if key relevant experts are able to engage in the peer review processes. The second is training trainers, debriefers and observers. The first step in this will occur in September/October 2018 with expert input on pelagic shark and ray identification to the PIRFO Trainers workshop. Implementation of improved shark identification guidelines will be based on the new ID guides, with training in the use of the shark identification key. This training will be required for PIRFO Trainers and Debriefers as well as new and existing observers. However, implementation hinges on the development of the new guides and an identification of a morphological key. Thus new species guides are critical to ensuring robust shark identification processes are used by observers in the WCPO.

5   Acknowledgements

This project has required the goodwill, support and hard work of many to get this far noting in particular Deirdre Brogan.

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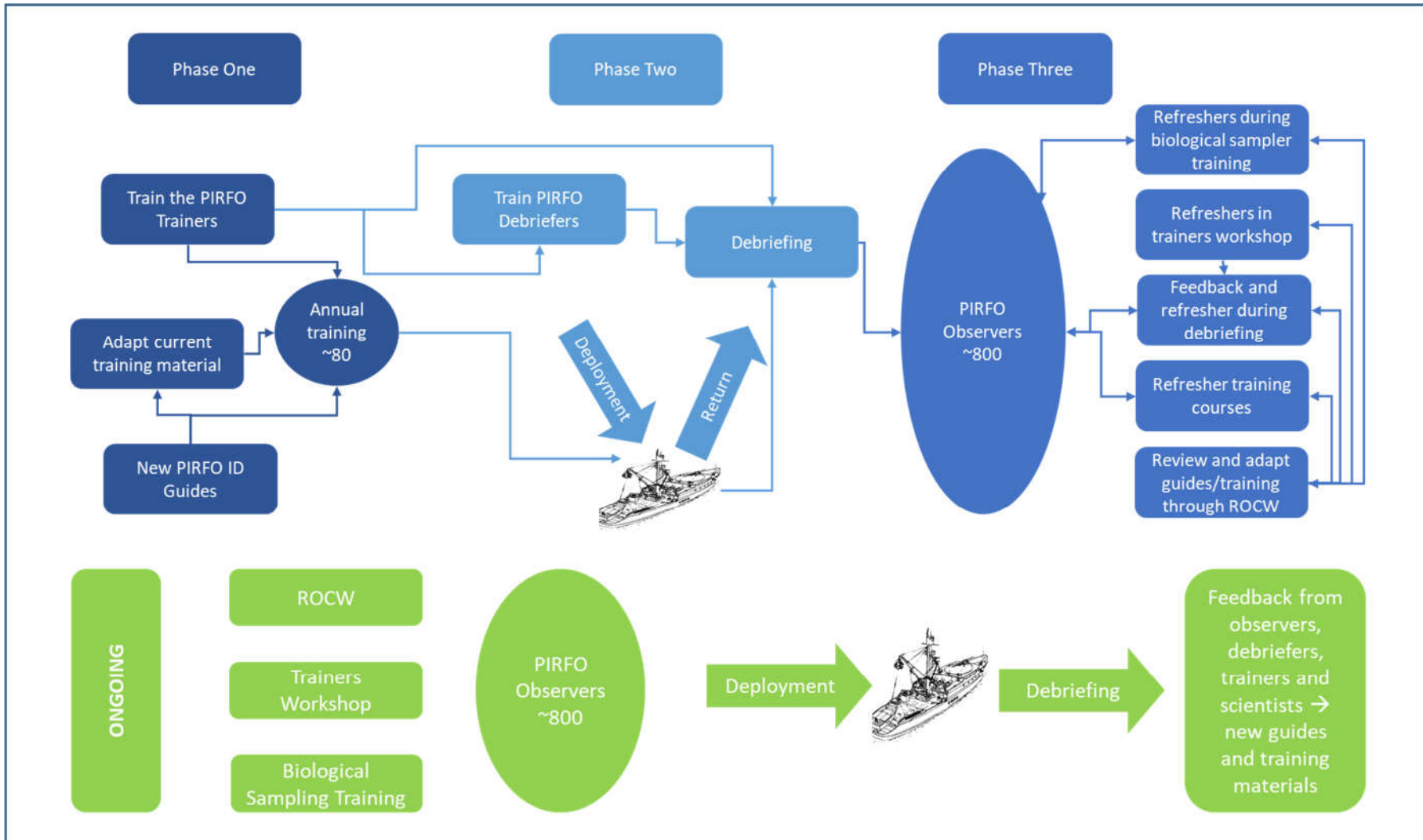
Figure 1: A generalised approach to introducing new ID guides to PIRFO observers, including retraining of existing observers, and feedback loops to improve ID. The initial phase focuses on trainers and new observer cohorts. The second phase focusses on the debriefers and observers whether new or seasoned who are debriefed. The third phase addresses all remaining system components and also identifies feedback loops. A generalised system of iterative improvement is identified in ongoing observer development change.