

**CONCEPT NOTE FOR the 2<sup>nd</sup> IOTC ECOREGION WORKSHOP**  
**“Identification of regions in the IOTC convention area**  
**for supporting the implementation of the ecosystem approach**  
**to fisheries management”**

Maria José Juan-Jordá<sup>1</sup>, Anne-Elise Nieblas<sup>2</sup>, Hilario Murua<sup>3</sup>, Paul De Bruyn<sup>4</sup>, Fabio Fiorellato<sup>4</sup>, Emmanuel Chassot<sup>4</sup>, Sylvain Bonhommeau<sup>5</sup>, Mohammed Koya<sup>6</sup>, Mariana Tolotti<sup>7</sup>

**Abstract**

The Indian Ocean Tuna Commission (IOTC) has committed in principle to operationalize an Ecosystem Approach to Fisheries Management (EAFM) in accordance with internationally agreed standards. Accordingly, the IOTC Working Party on Ecosystems and Bycatch (WPEB) has been working to assess the feasibility of and developing several ecosystem products to inform EAFM implementation in the region. However, in the context of managing highly migratory species such as tunas, billfishes and sharks in the Regional Fisheries Management Organization (RFMOs), the spatial scale at which these ecosystem products should be developed remains largely unexplored. Regionalization of the IOTC convention area into areas or ecoregions that make ecological sense and are large enough to be practical can provide a foundation for developing a wide range of ecosystem products to assist in the production of more integrated ecosystem-based advice to the Commission. The WPEB14 recommended convening a workshop to provide advice on the identification of draft ecoregions to foster discussions on the operationalization of the EAFM in the IOTC convention area. The first IOTC ecoregion workshop took place in September 2019 with the participation of CPC national scientists and external experts. This process resulted in a draft proposal of seven ecoregions within the IOTC convention area which were presented to the WPEB15. The WPEB15 recommended a second IOTC ecoregion workshop to refine the process of ecoregion delineation while considering the expert advice and feedback received in the first workshop and the draft proposal of ecoregions. The second IOTC ecoregion workshop is planned to take place early 2022. This report summarizes the main preparatory work that will be carried out prior to the second IOTC Ecoregion workshop, and it presents the main tasks and expected outputs of this second workshop.

**Keywords**

Ecoregions, ecosystem products, spatial scales, indicators, integrated advice, EAFM

<sup>1</sup> AZTI, Marine Research, Basque Research and Technology Alliance (BRTA), Pasaia, Gipuzkoa, Spain

<sup>2</sup> Company for Open Ocean Observations and Logging, Saint Leu, La Réunion, France

<sup>3</sup> International Sustainable Seafood Foundation, Washington DC, USA

<sup>4</sup> Indian Ocean Tuna Commission, Victoria, Seychelles

<sup>5</sup> IFREMER DOI, La Réunion, France

<sup>6</sup> Pelagic Fisheries Division Central Marine Fisheries Research Institute, India

<sup>7</sup> IRD, France

## Background

For the last 20 years, approaches to support the implementation of the Ecosystem Approach Fisheries Management (EAFM) have been slowly evolving (Skern-Mauritzen et al. 2016). Multiple tools varying in complexity and with different degrees of data requirements and resources have been developed and are now being tested to better incorporate ecosystem information and ecosystem science into the fisheries management decision-making process (Link 2010, Zador et al. 2016). These advances are allowing managers to understand the trade-offs when attempting to achieve their goals. The tools to inform the implementation of the EAFM may include developing (1) “ecosystem risk assessments” to identify the ecological, social and economic risks derived from the fishing activities, (2) “ecosystem status assessments” to summarize historical and possible future effects of environmental and fishing effects of fisheries on the ecosystem, (3) “indicator-based ecosystem report cards” to provide a succinct summary of trends and status of top indicators that best represent the effects of environmental and fishing effects on multiple ecosystem components and (4) “management strategy evaluation” to evaluate the potential outcomes of alternative management actions that account for ecosystems considerations, among many others (Levin et al. 2009, Fletcher et al. 2010, Link 2010, Zador et al. 2016). All over the world, these tools and their derived ecosystem products are being used to formulate more integrated and ecosystem-based advice that can range from being more strategic (broad-scale) to tactical (directed at specific management decisions).

The Indian Ocean Tuna Commission (IOTC) have committed in principle to operationalize an EAFM in accordance with internationally agreed standards. Accordingly, the IOTC Working Party on Ecosystems and Bycatch (WPEB) has been working to assess the feasibility of and developing tools towards informing the implementation of the EAFM in the region. In 2016, the IOTC WPEB initiated discussions on the potential usefulness of developing an indicator-based ecosystem report card for the IOTC region (Juan-Jordá et al. 2016). The IOTC ecosystem report card aims to summarize the historical and possible future effects of the environment and IOTC fisheries on components of the ecosystem by providing a succinct summary of trends and statuses using indicators that best represent the objectives associated with each ecosystem component. However, the ecosystem report card, as well as other ecosystem products aiming to facilitate the operationalization of an EAFM need to be developed at appropriate spatial scales.

Regionalization of the IOTC convention area at scales that make ecological sense and are large enough to be practical can provide a foundation for developing ecosystem products, such as the ecosystem report card, integrated ecosystem assessments and large-scale ecological modeling, to assist in the production of more integrated ecosystem-based advice to the Commission. The identification of spatial units or regions that make ecological sense is an important element of effective ecosystem planning and one of the starting points when operationalizing the EAFM process in a region (Fletcher et al. 2010, Staples et al. 2014). However, in the context of managing highly migratory species such as tunas, billfishes and sharks in the Regional Fisheries Management Organization (RFMOs), the spatial scale at which these scientifically driven ecosystem products should be developed remains largely unexplored.

In 2017, an EU funded project conducted some initial work towards a broad-scale delineation of the ICCAT and IOTC convention areas into ecologically meaningful regions to support the development of tools for EAFM implementation (Juan-Jordá et al. 2019a). Typically, regionalization is a process that aims to partition a broad spatial area into distinct spatial regions, using a range of environmental, oceanographic and biological information. Ideally, this process results in a set of regions, each with relatively homogeneous and predictable ecosystem properties and community of species. However, in the context of fisheries management, it is also important that these regions not only have boundaries that make ecological sense; they also need to be practical to inform fisheries management advice. Accordingly, the EU project developed and tested an evaluation criteria to identify regions, mainly based on: (1) the existing knowledge of biogeographic classifications of the pelagic environment, (2) the spatial distributions of major tuna and billfish species, and (3) the spatial dynamics of the main fishing fleets targeting these species. Based on these evaluation criteria, seven preliminary candidate ecoregions were proposed within the ICCAT convention area (Todorovic et al. 2019), and two preliminary candidate ecoregions were proposed in the IOTC convention area (Juan-Jordá et al. 2019a).

In 2018, this initial work on ecoregion delineation was presented at the IOTC WPEB14, as a conceptual scientific exercise to discuss its potential utility and to explore avenues for future work. The WPEB14 recommended convening a workshop in 2019 to provide advice on the identification of draft ecoregions based on a revised set of criteria and to foster discussions on the operationalization of EBFM in the IOTC convention area (IOTC–WPEB14 2018). This first IOTC ecoregion workshop took place in September 2019 with the participation of CPC national scientists and external experts (Juan-Jordá et al. 2019b). Prior to the workshop, a baseline draft proposal of ecoregions was prepared, which was presented and discussed at the workshop by all the participants (Nieblas et al. 2019). The baseline proposal was used in the workshop to present preliminary analyses and guide discussions towards deriving draft ecoregions within the IOTC convention. This process resulted in a draft proposal of seven ecoregions within the IOTC convention area (Juan-Jordá et al. 2019b). Another important output of this workshop was the constructive and technical discussions that took place in framing the general process of ecoregion delineation, from defining a checklist evaluation criteria, to evaluating data inputs and methods, and examining and refining candidate ecoregions based on expert knowledge within the Indian Ocean. During the workshop, the participants provided valuable feedback on the data sets and methods used to delineate the ecoregions to be considered in future revisions of the work.

The draft proposal of seven ecoregions derived in this first IOTC ecoregion workshop were presented at the WPEB15 in September 2019. The WPEB15 recommended a second IOTC Ecoregion workshop to refine the process considering the expert advice and feedback received in the first IOTC ecoregion workshop (IOTC–WPEB15 2019).

### **Main objectives**

The overall aim of the second IOTC ecoregion workshop is to refine the process of ecoregion delineation considering the expert advice and feedback received at the first IOTC ecoregion workshop, and also prepare a refined draft proposal of ecoregions in the IOTC convention area. This report summarizes the preparatory work to be carried out prior to the second IOTC Ecoregion workshop, and also presents the main tasks to be carried out during the second IOTC ecoregion workshop.

### **Tasks and preparatory work to be carried out prior to second IOTC ecoregion workshop**

**Task 1.** Update the evaluation criteria which identify the factors to be considered when delineating the ecoregions including the relevant ecological factors (biogeographic classifications and species distributions) and social factors (spatial distributions of IOTC fleets) agreed at the first workshop. The evaluation criteria will distinguish between the core criteria used to delineate the ecoregions and any other extra considerations for evaluating ecoregions, and it will also establish the expected qualities of ecoregions.

**Task 2.** Update and refine the catch datasets used in the first workshop for the ecoregion analyses. Based on the feedback received during the first workshop, a revision of the existing IOTC datasets and any other relevant external datasets will be done in terms of availability, quality and completeness. This revision will be used to refine the choice of key data inputs for analyses and deriving a new proposal of draft ecoregions.

**Task 3.** Update and refine the spatial analyses to derive a baseline proposal of draft ecoregions based on the feedback received during the first workshop. This will include (1) refining and updating the calculations of the fidelity and sensitivity indicators to examine species and fisheries composition across multiple biogeographic provinces including several sensitivity analyses and better visualizations to increase interpretability of results, (2) examining the temporal and spatial heterogeneity/ homogeneity of the biogeographic provinces and exploring its effect on the interpretation of the fidelity and sensitivity indicators and subsequent clustering analyses of the provinces, (3) refining the clustering analyses to group biogeographic provinces according to their similarity in terms of species composition, fisheries composition and both species and fishery

composition, and (4) assessing the temporal and spatial heterogeneity/ homogeneity of the resultant defined clusters (potential ecoregions).

**Task 4.** Based on the updated datasets and analyses above, a proposal of baseline ecoregions (with sensitivity analysis) will be presented at the second IOTC ecoregion workshop. The proposal of candidate baseline ecoregions will be discussed, adjusted and refined using the expert knowledge of the participants at the ecoregion workshop.

**Task 5.** A pre-workshop report will be prepared and provided in advance to inform discussions at the second ecoregion workshop.

#### **Tasks planned to be carried out during the 2<sup>nd</sup> IOTC Ecoregion Workshop**

**Task 1.** The pre-workshop preparatory work will be presented and discussed at the workshop. This will provide the preliminary analyses and supporting documentation needed to inform the discussions to refine the process of ecoregion delineation.

**Task 2.** A refined draft proposal of ecoregions in the IOTC convention area will be prepared

**Task 2.** Discuss and refine the proposal of baseline ecoregions (including sensitivity analysis) and adjust it based on expert knowledge

#### **Expected outputs**

- A revised evaluation checklist criteria with the major factors to be considered to guide the development of draft ecoregions;
- A better understanding of the data layers and quantitative methods used for deriving the ecoregions with its strengths and weaknesses;
- A refined proposal of baseline ecoregions (including sensitivity analysis) to be adjusted based on expert knowledge;
- Revised candidate draft ecoregions;
- A workshop report with an executive summary with the main outcomes of the 2<sup>nd</sup> IOTC ecoregion workshop to be presented at the WPEB in 2022

#### **Organization and participants**

A four-day online workshop is planned for the Spring 2022 (dates to be determined).

The workshop aims to gather CPC national scientists and external experts who participated at the first ecoregion workshop as well as other interested participants. The participation of interested participants is welcomed from different institutes and organizations including CPC scientist and external experts.

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