PILOT SAMPLING TO SUPPORT CKMR FOR INDIAN OCEAN YELLOWFIN TUNA IN THE NORTH ARABIAN SEA (PAKISTAN)

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ABSTRACT

This working paper presents a pilot biological sampling initiative led by WWF-Pakistan, in partnership with CSIRO and supported by WWF-Italia and Bolton Food. The project evaluates the feasibility of tissue sampling to support CKMR for Indian Ocean yellowfin tuna in Pakistan's North Arabian Sea. Aligning with IOTC's priority research areas (IOTC 2017), this pilot targets 522 fish specimens across six size classes to contribute to a larger Indian Ocean-wide CKMR project aiming to collect 30,000 samples (Williams et al., 2023). Samples will be collected from gillnet-caught tuna at Karachi, focusing on both juveniles (<50 cm) and adults (>75 cm). Metadata and tissue samples will be extracted under strict quality control and shipped to CSIRO for analysis. This initiative represents Pakistan's contribution to regional science-based management and capacity building for long-term yellowfin sustainability.

INTRODUCTION

Yellowfin tuna (*Thunnus albacares*) supports livelihoods and food security across the Indian Ocean, with catches exceeding 400,000 tonnes annually (ISSF, 2024). Despite a slight rebound in stock status (SB2023 > SBMSY; F2023 < FMSY), the reliability of stock assessments remains challenged by gaps in artisanal CPUE data and uncertainties in population structure (IOTC-SC2024; Cadrin et al., 2023). Traditional CPUE-based models struggle to reflect true abundance (Bravington et al., 2016a), prompting the IOTC's Scientific Committee and WPTT to highlight CKMR as a key research priority since 2017 (IOTC, 2017).

CKMR offers a fishery-independent method to estimate absolute abundance and related metrics through kinship analysis, as demonstrated for southern bluefin and Atlantic bluefin tuna (Hillary et al., 2019; Grewe et al., 2018). This project aims to pilot CKMR sampling in Pakistan to fill critical regional data gaps and support future integration into IOTC stock assessment models.

OBJECTIVES

This project, funded by WWF-Italia in partnership with Bolton Food, seeks to:

- Pilot the implementation of a tissue sampling program to support CKMR in Pakistan.
- Collect and preserve muscle tissue samples from yellowfin tuna for genetic kinship analysis.
- Develop Standard Operating Procedures (SOPs) for biological sampling aligned with CKMR protocols.
- Support regional efforts under IOTC's recommendation to improve the dynamics of yellowfin tuna stock assessment precision.

METHODOLOGY

Sampling Design and Location

• Sampling is conducted at Karachi Fish Harbour, which accounts for approximately 90% of the country's tuna landings (Pakistan National Report, 2019), covering the dominant tuna landing ports.

- Fish caught by gillnets and driftnets are targeted.
- Weekly sampling targets 522 individuals across the following size classes:
 - 70% juveniles (<50 cm)
 - 30% adults (>75 cm)

Sample Processing

- Muscle tissue is extracted in the Marine Fisheries Department's biological lab.
- Metadata includes species, fork length, weight, and gear type.
- Samples follow contamination control protocols and are shipped to CSIRO for DNA quality testing and analysis.

Quality Control

- A subsample (~50 individuals) will be tested for DNA quality and contamination at CSIRO.
- SOPs will be refined based on initial findings.

RELEVANCE TO IOTC SCIENCE AND MANAGEMENT

The IOTC Working Party on Tropical Tunas identified CKMR as a priority research avenue (IOTC, 2017). This pilot directly supports that recommendation and contributes to IOTC's broader 5-year CKMR roadmap (Hillary et al., 2022).

Furthermore, emerging genetic and otolith isotope research suggests population structure within the Indian Ocean (Artetxe-Arrate et al., 2023; Zudaire et al., 2022). This implies current stock assessments may underestimate spatial heterogeneity, particularly between equatorial and northern regions (Grewe et al., 2020). Pakistan's inclusion helps address a long-standing geographic data gap.

The current project supports this by:

- Filling critical data gaps in artisanal YFT fisheries of the North Arabian Sea.
- Contributing to regional CKMR sampling (30,000 samples needed across Indian Ocean).
- Enhancing understanding of stock structure and juvenile-adult linkages in the Arabian Sea.

This will improve scientific advice, particularly in refining spatial management and harvest control rules.

IMPLEMENTATION TIMELINE

Quarter	Key Activities
Q2 2025	Stakeholder consultation, lab setup, equipment procurement
Q3 2025	Field sampling (pre-monsoon), sample extraction and storage
Q4 2025	Field sampling (post-monsoon), sample shipment to CSIRO
Q1 2026	Data sharing, participation in IOTC WPTT, side event at IOTC S30

EXPECTED OUTPUTS

- SOPs for CKMR sampling in Pakistan
- Sample shipment of ~ 500 tissue samples to CSIRO and quality control results
- Policy brief and outreach materials for S30
- Side event at IOTC S30 showcasing CKMR progress based on the results from CSIRO

COLLABORATION AND FUNDING

This project is implemented by WWF-Pakistan in partnership with CSIRO, and supported by WWF-Italia and Bolton Food with a total commitment of €100,000. WWF aims to catalyze further investment in full CKMR deployment across the Indian Ocean.

CONCLUSIONS AND RECOMMENDATIONS

Pakistan's pilot CKMR initiative presents a unique opportunity to integrate small-scale fishery data into the regional stock assessment framework. The project strengthens compliance with IOTC objectives, addresses spatial uncertainties in spawning contributions, and enhances capacity for DNA-based monitoring. It is recommended that:

- WPTT supports scaling biological sampling in CPCs with high gillnet effort.
- WPTT supports the sampling methods used to collect and store muscle tissue.
- WWF be invited to present technical progress at WPTT meetings.

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