

Report of the Pacific Bluefin (PBF) Tuna Research Coordination Meeting

**Southwest Fisheries Science Center
La Jolla, CA**

March 30, 2015

A Pacific Bluefin (PBF) Tuna Research Coordination Meeting was convened at the NOAA, Southwest Fisheries Science Center (SWFSC) on March 30, 2015 by the SWFSC Science and Research Director, Cisco Werner. The objective of the PBF tuna meeting was to promote research awareness, identify research gaps, explore partnerships and build collaborations. Participants included representatives from the NOAA SWFSC and West Coast Regional Office, Pacific Fishery Management Council, California Department of Fish & Wildlife, Inter-American Tropical Tuna Commission (IATTC), Monterey Bay Aquarium, Stanford University, University of British Columbia, Pew Charitable Trusts, Sportfishing Association of California, Ted A. Dunn Marine Consultant, Inc., and Dana Wharf (Annex 1). The proposed agenda for the meeting was considered and adopted with no changes (Annex 2).

1. Status and Update

G. DiNardo presented the objectives, process, structure and accomplishments of the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean (ISC), the Regional Fishery Organization tasked with conducting PBF tuna stock assessments. The ISC is the science provider for the Northern Committee of the Western and Central Pacific Fisheries Commission (WCPFC) and reports its assessments to the WCPFC Scientific Committee (SC). It conducted assessments of Northern PBF tuna as follows: 2010 (update), 2012 (benchmark), and 2014 (update). The next assessment in 2016 will be another benchmark assessment, using updated data and model structure to address issues and questions stemming from an independent review of the 2014 update.

S. Teo presented the 2014 PBF tuna stock assessment and current stock status, as well as a summary of the March 2015 ISSF Stock Assessment Workshop “Characterizing Uncertainty in Stock Assessment and Management Advice”. While there was discussion regarding the use of Eastern Pacific Ocean (EPO) data as a measure of abundance, it was noted that this approach has limited utility, as it is essential to collect data that covers the majority of age classes across the Pacific, particularly adults/spawners.

The group discussed several key issues that should be addressed to advance the current stock assessment model:

- Improved life history information, including age at maturity. Atlantic and South Pacific Bluefin tuna mature at much older ages compared to PBF tuna. A younger maturity schedule could influence population resiliency and stock status.
- Lack of fishery-independent estimates of abundance. Current estimates are derived solely from fishery-dependent estimates that can result in positively biased abundance estimates due to targeting.
- PBF tuna populations are spatially structured, but current assessment models assume a single homogeneous population. Future models should acknowledge this structure.
- The current model cannot predict potential rebuilding trajectories, and we may need a new model for that purpose.

It was noted that the current ISC assessment does not include any assumption of Illegal, Unreported, and Unregulated (IUU) fishing. However, the magnitude of IUU fishing for PBF tuna is believed to be low.

G. Compeán and A. Aires-da-Silva presented the history and status of PBF tuna in the EPO and adopted IATTC management measures. The fishery in the EPO exploits a segment of a pacific-wide stock, and spawning is restricted to the WPO, with migration to the EPO at 1-3 years. Abundance in the EPO depends upon “availability” (abundance of the 1-3 age classes and the proportion of migrants to the EPO). Kitagawa et al. (2007) depicted the PBF tuna seasonal migratory pattern. The EPO fishing opportunity zone is along Baja California, Mexico, but sometimes expands north, providing US fishery access. The US fleet began targeting PBF in the EPO in the early part of 1900s – variability in catch is associated with environmental conditions and important management events (EEZ closures, 1980 embargoes, start of ranching, etc.). Starting in 1996, Mexico began catching PBF tuna to support ranching operations. This is the predominant commercial catch today, largely replacing the US fishery except for recreational catch. For most of the time series, the bulk of the catch is <100 cm in length, though there has been some recent shift to larger sizes in Mexico’s purse seine fishery (mean length of PBF tuna in the US catch was 75 cm; currently the average length is 86 cm). IATTC collects data from observers at Mexican ranches and they are working with the fleet using underwater cameras to track whether there are losses during transfer.

Upcoming activities by international and domestic organizations that potentially affect PBF tuna were presented and discussed. It was noted that the ISC will convene a Management Strategy Evaluation (MSE) Workshop from April 16-17 in Yokohama, Japan, to review the objectives, benefits, and requirements to implement an MSE, as well as recent progress made by tuna Regional Fisheries Management Organizations (RFMOs) towards adopting and implementing the MSE process. Discussions will aim to define the roles of managers, stakeholders and scientists in the MSE process, particularly as they relate to facilitating the completion of an MSE for North Pacific albacore tuna.

2. Commercial Fisheries and Sampling

G. DiNardo described the fisheries in the Western Central Pacific Ocean (WCPO) that catch PBF tuna and the extent of research sampling of PBF tuna. It was noted that the majority of the historical (1952-1980s) PBF tuna catch was associated with the Japanese coastal set net fishery, and U.S. and Japanese purse seine fisheries. In recent years, the majority of the catch was associated with the Mexican, Japanese and Korean purse seine fisheries, and to a lesser extent Taiwanese longline fisheries.

At present, there is very little research being conducted on PBF tuna by the major governments engaged in the fishery. Japan's research sampling of PBF tuna in the WCPO is limited to the collection of tissue samples for genetic analysis, collection of hard parts (otolith) for aging, and limited tagging of juvenile PBF tuna to assess movement. This research is conducted by scientists at the National Research Institute of Far Seas Fisheries (NRIFSF) in Shizuoka, Japan. It was noted that Monterey Bay Aquarium is exploring opportunities to collaborate with Japanese researchers on the tagging of larger PBF within their waters. Japanese scientists at the NRIFSF are also exploring the development of a recruitment index. NOAA is supporting two small projects: collection of tissue samples for genetic analysis and collection of hard part (otolith) for aging. A. Aires-da-Silva described the fisheries in the EPO that catch PBF tuna and summarized research activities in the region.

3. Recreational Fisheries and Sampling

M. Horeczko and S. Teo described the major recreational fisheries harvesting PBF tuna in the EPO, spatiotemporal changes in catch, and the extent and level of sampling associated with the CDFW and SWFSC recreational fishery surveys. K. Franke discussed the benefits of cooperative research and presented components of the Sportfishing Association of California's provisional industry-based PBF tuna survey.

4. Current Research and Science

B. Block and C. Farwell described ongoing PBF tuna research activities of the Tuna Research and Conservation Center (TRCC), including the compilation of the largest PBF tuna dataset from electronic tags (conventional and archival). B. Block explained the scope of research activity in the Atlantic Ocean, and how some of these approaches and models could be ported to the Pacific Ocean. The benefits of large scale multinational tagging programs to advance our understanding of movement and connectivity was discussed, as was the need for better information on life history parameters. These types of large scale, multinational tagging programs could better reflect the complexities of the system, climate impacts, and improve assessment models. Additionally, these types of studies would develop the type of dataset needed to run MSE simulations and demonstrate management tradeoffs. C. Farwell described ongoing research between the Monterey Bay Aquarium and scientists in Japan and Taiwan to collect tissue samples and hard parts via port sampling for genetic and aging analysis. M. Spring noted that current funding for PBF tuna research (including tagging) is almost entirely supported

by the Monterey Bay Aquarium and private philanthropies, and that the Aquarium is re-evaluating funding PBF tuna tagging and other studies in the EPO given the lack of government funding for research; the Aquarium will refer to this research prioritization list in assessing the value of our existing work to conservation measures. The degree to which it provides value to the assessment process will depend on US and other government and private funding contributions, which are currently lacking.

R. Vetter described the utility of using close-kin genetics in future stock assessments and plans for a 2015 workshop at the SWFSC on close-kin genetics to describe the topic, identify benefits of using this approach in future PBF tuna assessments, and outline the requirements for implementation. Some participants noted concerns regarding our understanding of stock structure, potential costs, the need for international cooperation and samples, as well as the time needed to generate results for management.

H. Dewar discussed the utility of using otolith microchemistry markers to assess stock structure and its potential application to PBF tuna, as well as prospective benefits from using foraging studies and associated stable isotope analyses to assess trans-Pacific movements of PBF tuna.

There was discussion on the level of tagging required to assess connectivity and exchange rates between PBF tuna in the WCPO and EPO. While there have been some recaptures in EPO the recapture rate is low, likely due to the low number of tagged fish released, lack of a multinational outreach program about the tagging program, and insufficient incentives to encourage return tags. It was noted that Japanese scientists at the NRIFSF may be starting a new juvenile PBF tuna-tagging project in the Seto Island Sea, but the goal of this project is not known.

5. Next Steps

G. DiNardo led an open discussion to discuss data gaps in our knowledge of PBF tuna and their fisheries, and to identify and prioritize research activities that would advance our understanding of PBF tuna including demographics, stock structure and connectivity, habitat requirements, population dynamics, and stock status. In addition, research activities to address the gaps were identified, discussed, and prioritized. To facilitate PBF tuna research planning, the prioritized activities were categorized based on when the research activities should commence (i.e., start date): short- (1-2 yrs.), medium- (2-5 yrs.), and long-term (2+ yrs.). Associated with each research topic are organizations/groups that have expressed interest in collaborating on the activity. It should be noted there are no funds to support this list of research activities at this time. However, the list of prioritized research topics do provide a blueprint that can be used to secure future funding, as well as providing a list of potential collaborators.

Gap Analysis

Participants identified a suite of gaps in our knowledge of PBF tuna biology and ecology, as well as limitations in data collection and population dynamics modeling. These include (in no particular order):

- The proportion of PBF tuna that migrate from the WCPO to the EPO and back, and how cohort size impacts migrations rates;
- Age-specific residence time of PBF tuna in the EPO;
- The impact of climate change/variability on PBF tuna in the EPO is unclear, in particular:
 - Are the recent high catches of PBF tuna by recreational fishers in CA due to changes in availability or actual increases in population size;
- Spawning sites in the WCPO appear to be shrinking in size. What is its impact on future recruitment;
- Size sampling associated with fisheries do not follow a statistical design;
- The extent of connectivity between the two spawning areas in the WCPO;
- The portion of PBF tuna that migrate to the South Pacific Ocean and their resident time;
- Basic PBF tuna population parameters in the stock assessment model need to be validated, including:
 - Natural mortality
 - Stock-Recruitment relationship (including steepness)
 - Growth
 - Age at maturity and size-at-maturity;
- Relative adult PBF tuna abundance estimates (Catch per Unit Effort - CPUE) in the stock assessment are suspect. Advancing our understanding of PBF tuna stock status requires better estimates;
- Quantification of additional sources of PBF tuna mortality other than known sources of fishing mortality (i.e., IUU).

Priorities

Short-term (1-2 years)

- Improve the stock assessment model
 - Improve fit to data, and input parameters (ISC)
 - Identify management questions that the model could address (WCPFC, IATTC, Non-Governmental Organizations/NGOs)
 - Consider possibility of running alternative (not sensitivity) models (ISC)
 - Improve adult abundance index (ISC)
 - Improve estimates of steepness (ISC)
- Inventory and assess the utility of existing biological sampling/analyses programs. Design collaborative statistically-based biosampling programs for hard parts and tissues via port and at-sea sampling, as well as integrated tagging programs (conventional and satellite) to assess and estimate movement, connectivity, and demographic parameters, with

the goal of improving and advancing population dynamics modeling (ISC, SWFSC, PIFSC, Industry, Academia)

- Develop a strategic plan to acquire needed funding within the U.S. and internationally to support requisite research (SWFSC, PIFSC, ISC, WCRO, NGOs, Industry, Academia, IATTC)
- Determine the impact of climate variability on PBF tuna distribution and abundance in EPO (ISC, SWFSC, Industry, Academia)
- Consider developing a process that allows academia and NGOs to easily pass on research findings to the ISC (ISC)
- Develop a strategy to communicate research findings and progress on potential action items (SWFSC)

Medium term (2-5 years)

- Initiate Management Strategy Evaluation (MSE) activities
 - Requires management input to define management goals (WCPFC, IATTC, NGOs)
 - Continue population and stock assessment model development, and develop framework for applying MSE to PBF tuna (ISC, SWFSC, Academia)

Long term (2+ years)

- Implement a coordinated biological sampling program (see above) for hard parts, tissues, and other requisite biosampling data at ports and on ships, as well as tagging programs (ISC, IATTC, Industry, SWFSC, PIFSC, Academia, State of CA)
 - Determine connectivity between spawning sites
 - Determine exchange rate between the EPO and WCPO and the WCPO and South Pacific
 - Maturity schedule
- Incorporate new data into stock assessments (ISC)

Future meetings

To promote collaborations and ensure dissemination of research findings, participants should attempt to meet twice annually, preferably in February and August. These dates fall prior to influential tuna RFMO meetings where decisions impacting PBF tuna generally occur. In addition, it is suggested that discussions groups associated with major research activities (i.e., biology) be formed to promote collaborations and continue the dialogue.

Annex 1. Meeting agenda.

**Agenda for Pacific Bluefin (PBF) Tuna
Research Coordination Meeting**

Date: Monday, 30 March 2015

Location: Southwest Fisheries Science Center
8901 La Jolla Shores Drive
La Jolla, CA 92037

Dial in: 1-866-879-9953; Participant code: 700.85.61

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Objective: To promote research awareness, identify gaps in PBF tuna research, explore partnerships and build collaborations.

Schedule

10:00am Welcome, opening remarks and introductions (C. Werner)

10:30am Status and Updates

- PBF tuna Status and Assessment Schedule (G. DiNardo, S. Teo, G. Compeán)
- Results of ISSF Workshop (S. Teo)
- Review calendar of upcoming activities [of the ISC, IATTC, NC, WCPFC, PFMC, PICES, Monterey Bay Aquarium]

11:00am Commercial Fisheries and Sampling

- WCPO summary (G. DiNardo)
- EPO summary (A. Da Silva)

11:30am Recreational Fisheries and Sampling

- EPO recreational measures summary (M. Horeczko)
- CDFW and NMFS Sampling of Recreational Fishery (M. Horeczko and S. Teo)
- Size sampling of the recreational fishery catch (K. Franke)

12 noon Working Lunch (brought in) -- Short break

12:30pm Current Research and Science

- Research at TRCC (C. Farwell and B. Block)
- Genetic approaches and plan for a workshop on close-kin genetics (R. Vetter)
- Stock structure and foraging ecology (H. Dewar)

1:30pm **Next steps** – Facilitator: G. DiNardo

Gap Analysis

- Identify gaps in knowledge and possible management questions

Data/Sampling

- Identify and prioritize requisite sampling and research activities to advance or understanding and knowledge of PBF tuna

Biological-Ecological Research

- Identify and prioritize biological and ecological research activities that advance our understanding of PBF tuna, including demographics, stock structure, connectivity (exchange rates), habitat requirements, etc.

Data Integration

- Identify and prioritize modeling activities that contribute to a better understanding of PBF tuna population dynamics, stock status and potential benefits of management measures.

3:30pm **Break**

4:00pm Summary and Conclusions (B. Thom)

5:00pm Adjourn

Annex 2. List of participants.

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