

Identifying the Spatial Stock Structure of Tropical Pacific Tuna Stocks



**An international workshop for invited experts – Noumea, New Caledonia
09th-12th October 2018**

Context

The rich tuna resources of the Western and Central Pacific Ocean (WCPO) supply 60% of the world's tuna. Management of these tuna resources depends in part on better understanding the stock structure of skipjack, yellowfin and bigeye tuna within the Pacific Ocean. There is widespread agreement that uncertainties associated with stock structure of the three main tropical tuna species in the WCPO and EPO (skipjack, yellowfin and bigeye tuna) could have important impacts on the population dynamics models used to assess stock status and evaluate management options.

Current knowledge of stock structure relies mainly on tagging information. A recent joint study by scientists working in the EPO and WCPO has shown that there is evidence for at least three stocks of bigeye tuna across the tropical Pacific (Schaefer et al., 2015). However, conventional tagging cannot inform us on spawning site fidelity and any homing-type (sub) population structuring and the amount and duration of electronic tagging currently available for these species is inadequate for this purpose. Recent advances in molecular genetic technologies promise to transform our knowledge of tuna stock structure, and improve management options for transboundary tuna stocks (e.g. Grewe et al., 2015). In addition, spatial ecosystem population dynamics model (e.g. SEAPODYM) can be used to help explore tuna stock structure, and would benefit from a better understanding of the spatial structure of tuna stocks leading to more robust ecosystem-related advice.

Between the yellowfin work of Grewe et al. (2015) and the results of more recent work on yellowfin, bigeye and skipjack, unequivocal evidence of genetically distinct populations of yellowfin tuna at ocean basin or smaller scales is beginning to emerge. This work demonstrates that with a small subset of markers, provenance of individuals are identifiable with high confidence providing the basis for analysis of population structure. Concurrently traditional approaches generally continue to improve. Understanding the underlying biological mechanisms by which the observed genetic variability occurs will be important in reconciling the stock assessment and management approaches adopted. More specifically, determining the implications for stock assessment requires understanding how the observed natural processes can work in stock assessment models at the scale of the fisheries. There is also the potential for estimating population size directly from genetic data (Bravington et al., 2016). Collectively these drivers argue for an ocean-basin scale research agenda to provide comprehensive descriptions of population structure and implications for stock assessment.

The Workshop



The workshop will identify a research agenda for delineating the spatial structure of tuna stocks that is fit for incorporation into stock assessments and regional tuna management arrangements and which will inform the testing of harvest strategies for robustness to uncertainty in stock spatial structure. The identified future research programme would directly help to reduce uncertainty in stock assessment and ecosystem modelling science. Increasingly the research should provide for independent verification of where fish were caught, and therefore potentially provide a means of verification for chain-of-custody in certified fisheries. The venue is SPC, Noumea, New Caledonia. The workshop is made possible through the support of Conservation International.

Prior to the workshop knowledge on the spatial structure of skipjack, yellowfin and bigeye Pacific tuna stocks and stock structure analytical methods will be compiled into a background paper or series of papers to support the workshop. The workshop itself is intended to assess:

- how best to apply modern genetic technologies to identify the stock structure of these fish including developing a sampling design to address these questions;
- assess how best to incorporate the results into future stock assessment and ecosystem modelling, and inform the testing of candidate harvest strategies.

The workshop will produce a strategic research agenda. In the weeks immediately following the workshop, a report will be developed which incorporates discussions and the research agenda with the pre-workshop literature review content.

Participants

To identify a sound approach for delineating the spatial structure of tuna stocks that is fit for incorporation in stock assessments and regional tuna management arrangements, the workshop invitees will collectively contribute an understanding of: traditional approaches to determining tuna stock structure; modern genetic techniques; the distribution and biology of tuna; the collection of samples from these fisheries at-sea and in-port; the tropical Pacific environment; tropical tuna stock assessments; and, tuna management systems and in particular the developing harvest strategy approach.

Outcomes

The workshop report will be sent to the WCPFC and IATTC Scientific Committees to provide peer review of the work in the context of the business of the WCPFC and IATTC. The results from the future research will be particularly relevant to the roll-out of the WCPFC management strategy evaluation (MSE) for skipjack (and other) tuna in the WCPO. The expected outcome of the workshop is that WCPFC and/or IATTC endorse and seek funding for well-designed research to use genetic analyses and other biological markers to improve the understanding of the spatial structure of tropical Pacific tuna stocks, and how to incorporate this knowledge into future stock assessment and ecosystem models.

Next

We will be confirming participation as soon as possible. A consultancy to undertake the pre-workshop review will be underway shortly. A draft agenda and additional information about the workshop will be provided in August.

References

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- Grewe, P. M., Feutry, P., Hill, P.L., Gunasekara, R. M., Schaefer, K. M., Itano, D. G., Fuller, D. W., Foster, S. D., and Davies, C. D. 2015. Evidence of discrete yellowfin tuna (*Thunnus albacares*) populations demands rethink of management for this globally important resource. *Scientific Reports*, 5: 16916, DOI: 10.1038/srep16916
- Schaefer, K., Fuller, D., Hampton, J., Caillot, S., Leroy, B., and Itano, D. 2015. Movements, dispersion, and mixing of bigeye tuna (*Thunnus obesus*) tagged and released in the equatorial Central Pacific Ocean, with conventional and archival tags. *Fisheries Research*, 161:336–35