

Experimental Designs Employed in SPC WCPO Skipjack Tagging Programs

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Experimental Design

- “An **experimental design** is **defined** as an effective procedure to plan **experiments** such that the data can be analyzed so as the results yield objective and valid conclusions.”
- “**Experimental design** is the process of planning a study to meet specified objectives to ensure that the right type of data and a sufficient sample size and power are available to answer the research questions of interest as clearly and efficiently as possible”

Design or Strategy?

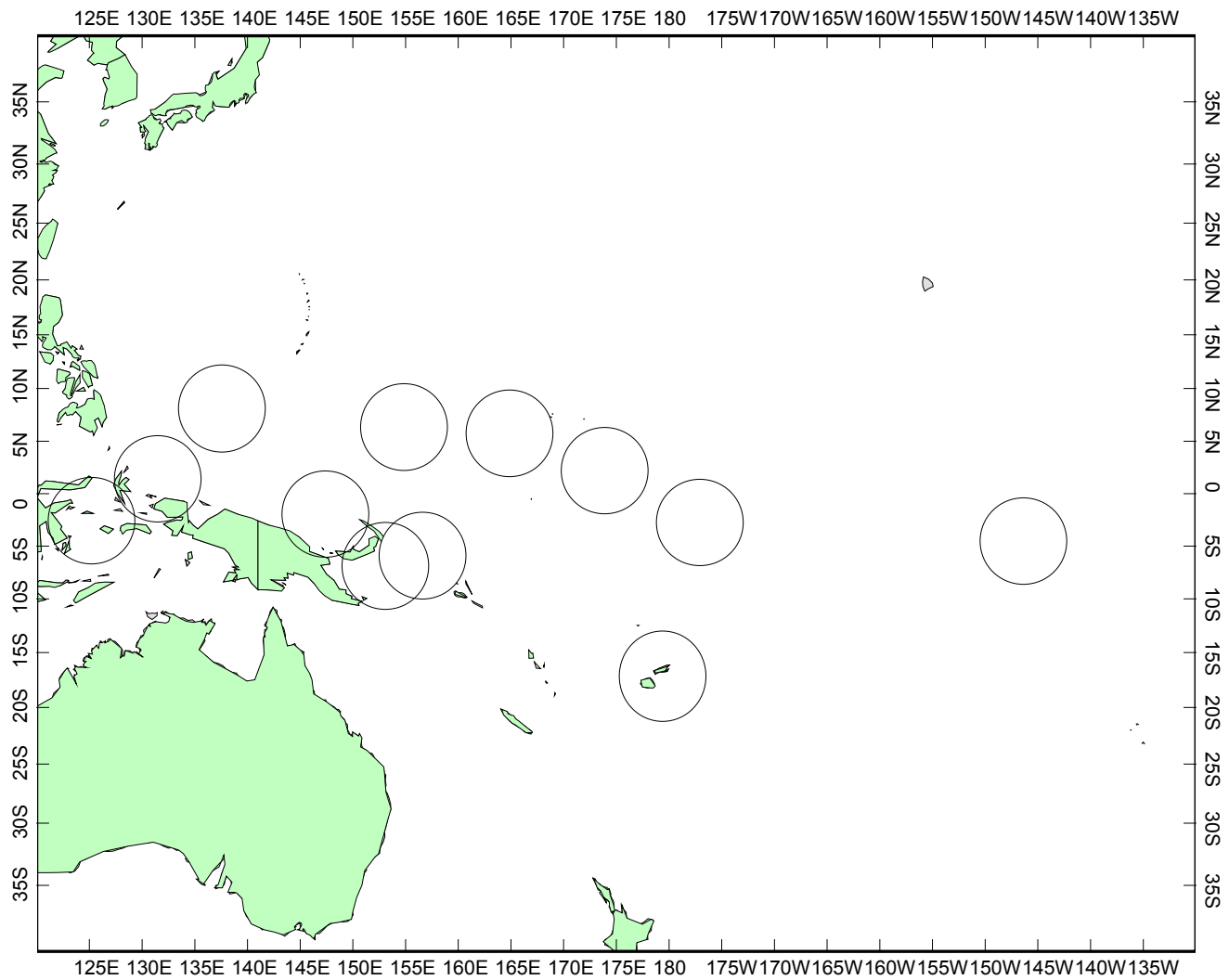
- Tagging programs operate under conditions of high uncertainty (fishing success) that to a large extent cannot be controlled
- Therefore not sensible to have a highly specified “design” – numbers of releases of certain sizes by spatial and temporal strata
- Seems more sensible to have a set of guidelines (or a strategy) that gives the best chance of success

Objectives of Tagging

- Normally we conduct tagging to contribute data to stock assessment or other population models that describe processes such as
 - Recruitment
 - Growth
 - Fishing and natural mortality
 - Movement
- Important to consider the type of model to be used when planning tagging program

Tag Release Design Guidelines

1. The numbers are important. Tag as many as possible – tags are cheap. Running out of tags is a capital offense!
 - Cooperation with industry in provision of live FAD location data can increase chances of success
2. Spatial: distribute tag releases as widely as possible throughout the area of significant fisheries
 - Constraint: may be impossible for one vessel to cover the entire area of the fishery for logistical/safety reasons, including access to baitfish



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 - Try to understand in advance the implications of spatial constraints – simulations can be useful to indicate potential bias and to suggest optimal spatial configuration
 - Consider the spatial configuration of the analytical model to be used

Tag Release Design Guidelines

3. Tag in such a way as to promote mixing
 - Maximize number of aggregations tagged (but not to the extent of limiting tag numbers from a single aggregation)
 - Tag free-schools as much as possible
 - Tag on FADs during periods of commercial fishery FAD closure

Tag Release Design Guidelines

4. Size: tag across the size range of the catch if possible
 - Important for length-increment analysis and size/age-specific mortality estimates
 - Tagging the largest sizes may not always be possible because of selectivity of the fishing gear used for tagging
 - Not fatal – but requires analytical models to be size (or age) structured to account for any systematic difference in size structure of tagged and untagged populations
 - Would be more of a concern if the smaller end of the size range could not be tagged for some reason
 - Can be useful to tag sizes somewhat smaller than size at recruitment, to assist with selectivity and M-at-age estimation

Summary of Key Points

- Maximize release numbers
- Wide spatial distribution
- Promote mixing
- Maximize size range, but tagging small fish more critical