Applications of data resulting from tagging experiments in regional stock assessments - WCPO

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WCPO Stock Assessments

- Use the integrated stock assessment software MULTIFAN-CL (MFCL)
- Combines catch, effort, size, tagging and potentially age-at-length data in the assessments
- Each data set is modelled using a likelihood subject to data weighting assumptions or estimated parameters

Tagging data

- Dynamics of tagged population shared with the untagged population – except during a defined mixing period
- Modelled using a negative binomial likelihood
- A variance term is either assumed or estimated that defines the degree of over-dispersion relative to a Poisson distribution
- This term controls the weight received by the tagging data in the overall fit to the combined data

Treatment of tagging data

```
#
#--------------------------------
#   22 - RELEASE REGION    YEAR    MONTH   Tag_program PTTP
             2         2009         2
0 0 0 0 0 0 0 0 0 0 0.72 0 0 0 13.06 139.06 90.30 273.18 374.41 275.25 124.64 84.55 89.57 130.41 117.27 
#
#
# LENGTH RELEASE   FISHERY   RECAP YEAR  RECAP MONTH  _ NUMBER
          32          5          2009          5          2
          32          9          2009          5          1
          34          5          2009          5          26
          34          5          2009          8          2
          34          5          2010          5          1
          34          6          2009          8          1
          34          9          2009          5          8
          34          9          2009          8          1
          34          13         2009          8          1
          36          5          2009          5          21
          36          5          2009          8          2
          36          5          2010          2          1
          36          9          2009          5          8
          36          13         2009          5          1
          38          4          2009          2          1
          38          5          2009          5          59
          38          5          2009          8          5
          38          5          2009          11          1
          38          9          2009          5          15
          38          13         2009          5          1
          38          13         2009          8          4
```

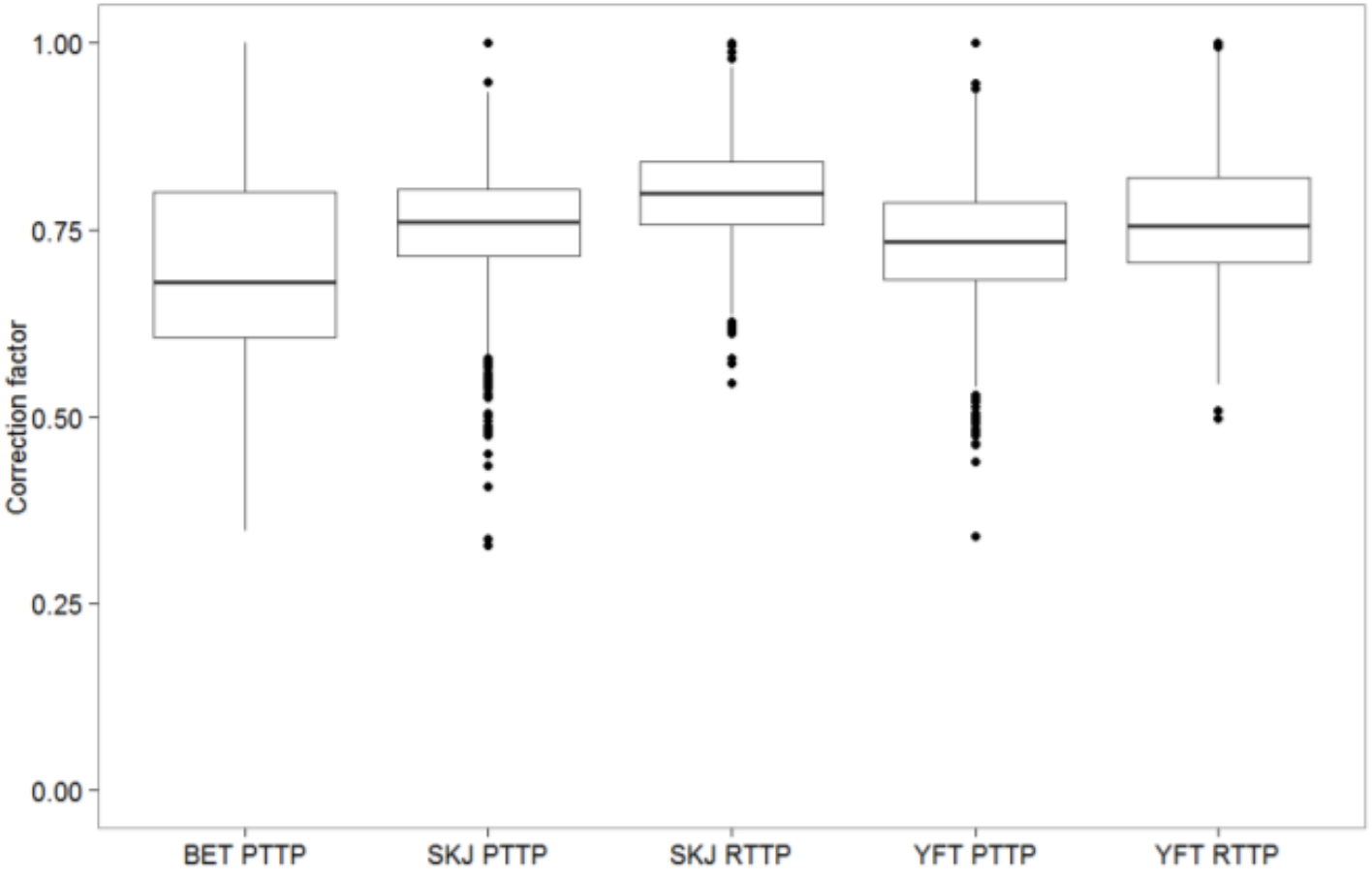
Estimation of effective releases

- Adjustment for recaptures not able to be included in the model because:
  - They occurred outside the model domain
  - They could not be classified to a fishery or time period
- For each tag release group, the number of releases is adjusted downwards for excluded recaptures to preserve the observed recapture proportion
- Adjustment occurs at the finest resolution possible – area, time and length-at-release group

Adjustment for tagging quality

- Correction factors are computed based on the Hoyle et al. model
- These correction factors are computed for each tag release group and adjust release numbers downwards to reflect effective releases by the reference tagger and for good fish condition and tagging quality

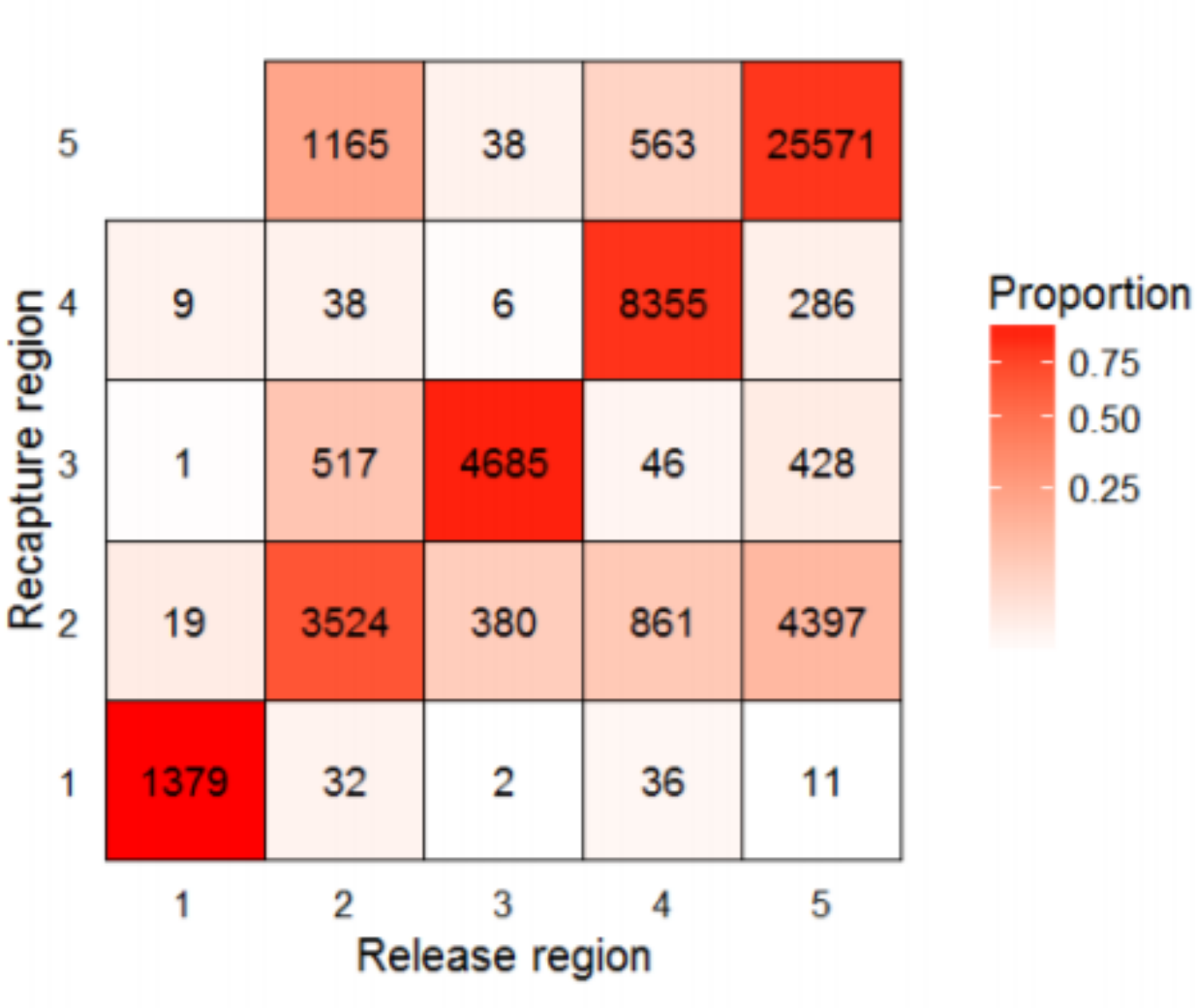
Adjustment for tagging quality



Adjustment for tag shedding

- Effective releases are further adjusted downwards to account for tag shedding based on the double tagging estimates for the reference tagger

Skipjack tag returns by region

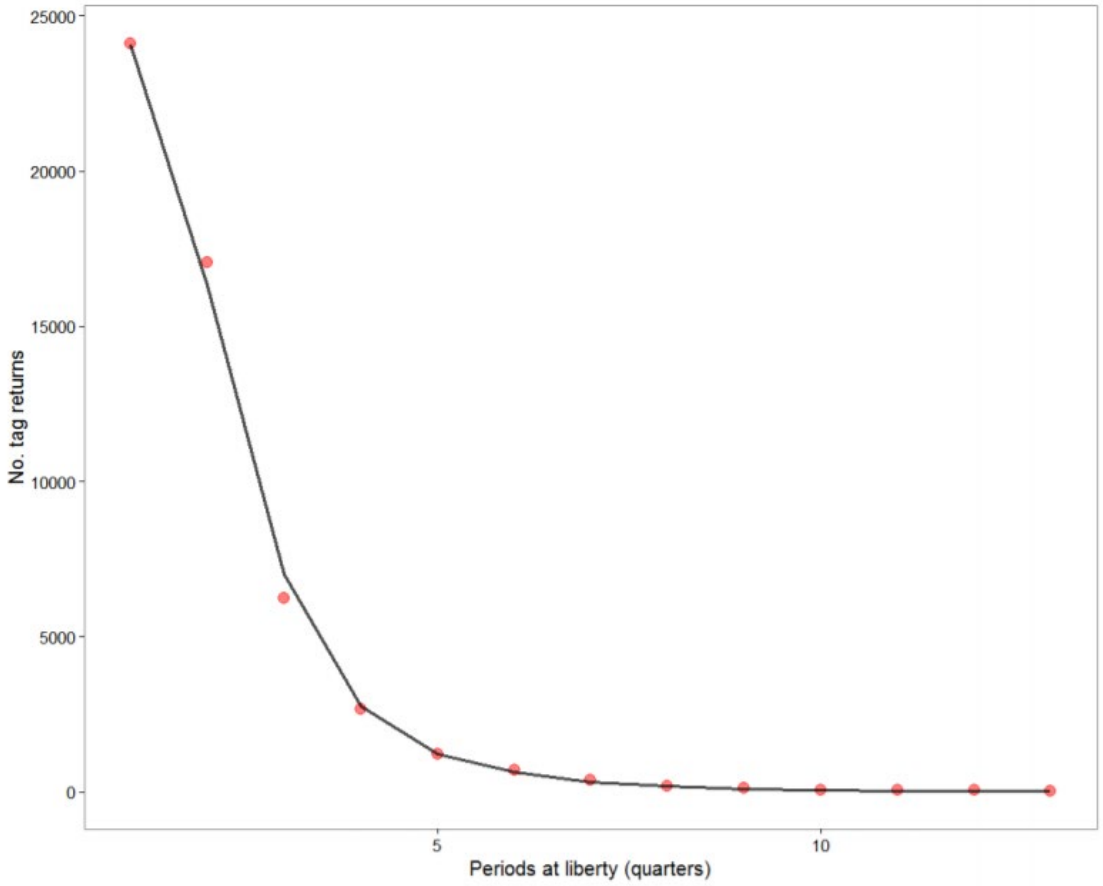


Reporting rate

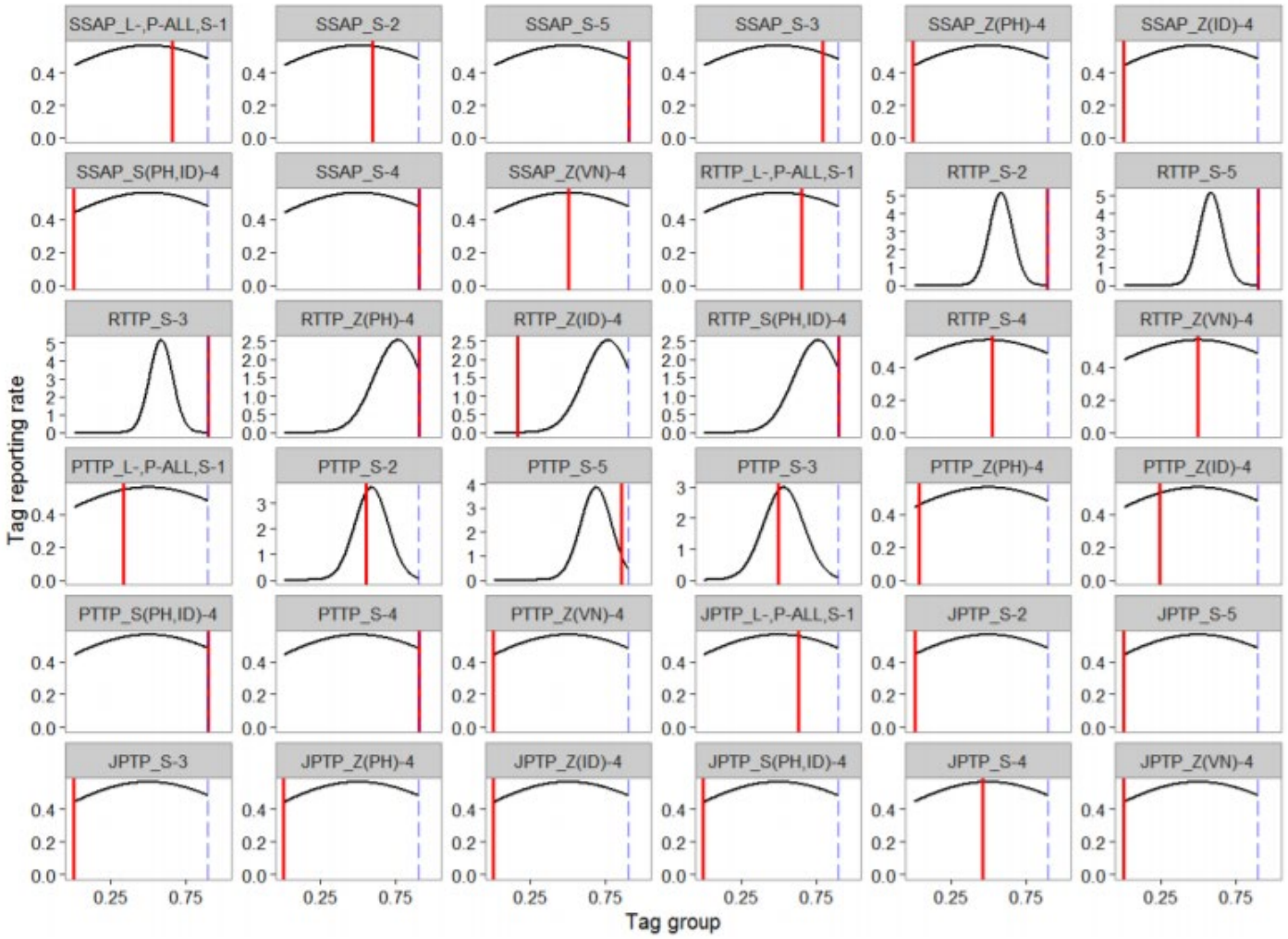
- Reporting rates are defined by fishery and tagging programme
- Reporting rates are treated as estimated parameters in the model constrained by priors based on tag seeding (in most cases), or expert opinion (in a few cases)
- Longline fisheries generally have diffuse priors so that reporting rates are freely estimated based on relative tag returns compared to other fisheries, accounting for catch levels, size of fish and other model parameters

Fits to tagging data

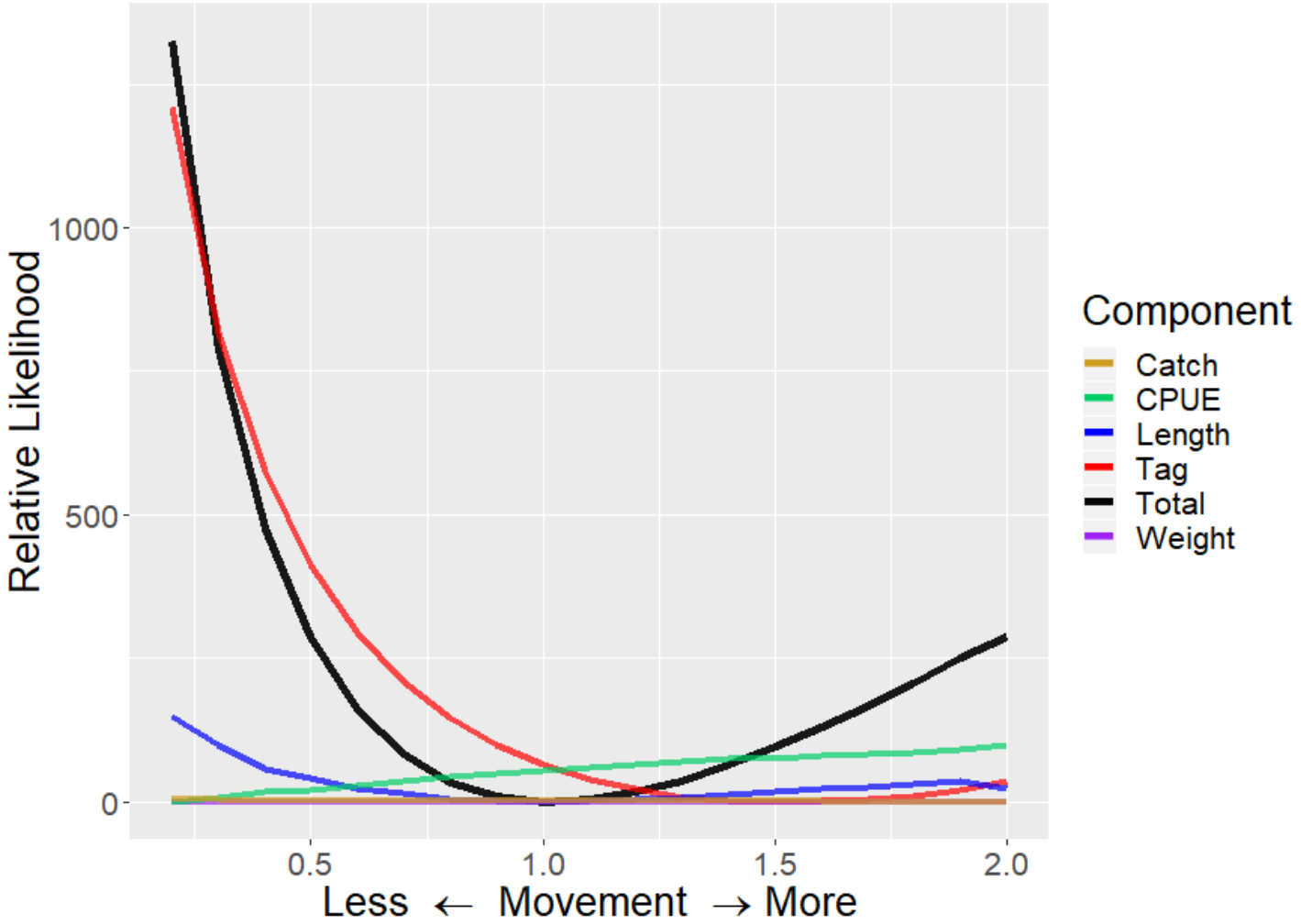
Skipjack – by time at liberty



Reporting rate estimates



Impact of tagging data on movement estimates



Future work

- Use of tag length-increment data to estimate growth
- Allow the tagging data to directly influence only movement – likelihood conditioned on recapture
  - Appropriate in cases where effective releases cannot be estimated or there are tag mixing concerns
  - Tagging does not inform (or bias) mortality estimates