



Outline of the protocol for catch at size (CAS) data for the Chinese Taipei stick-held dip net fishery

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1. Introduction

NPFC-PS members need to submit the catch at size (CAS) data that is necessary for developing age-/size- structured stock assessment model. This report describes the outline of protocol to make the CAS data for the Chinese Taipei saury fishery (CTSF).

2. Data set

Two datasets were used:

- (1) Landed saury catch data for the six CTSF commercial size categories

This dataset was compiled from CTSF logbooks, which are collected and managed by the Overseas Fisheries Development Council (OFDC).

- (2) Saury knob length data for the six CTSF commercial size categories

Samples of saury for each commercial size category were obtained from saury catch boxes in October. The knob lengths of all individuals in the sample boxes were measured and recorded to the nearest 0.1 mm. Two sample fishing vessels were deployed.

3. Procedure for estimation of catch-at-size/age

- 1) *Evaluating the sample size of catch boxes for each size category*

The accumulated number of catch boxes from a sample fishing vessel throughout the fishing season for the six commercial size categories were assumed as nb_i ($i=0\sim 5$). The proportion of catch boxes for the six commercial size categories was estimated as $P_i = 100 * nb_i / \sum nb_i$. The proportions were further simplified to a simplest whole-number ratio, $sn_i = P_i / P_{min}$ ($P_{min} =$ the smallest P_i), as the sample size of catch boxes for each size category. If any P_i was smaller than 7%, its category was excluded from the simplification ratio procedure and the sample size of catch boxes was assigned to 1.

- 2) *Random sampling of catch boxes for each size category and associated fish measurements*

The catch boxes of the six commercial size categories from the sample fishing vessel were randomly sampled, after they were landed at the Kaohsiung Fishing Port, using the amount sn_i . Fish in the sample boxes were counted and knob length was measured for each commercial size category. The knob length data of fish samples from the 2 sample vessels was merged by each commercial size category.

In addition, the mean fish number within each box for the six commercial size categories were recorded as mfn_i .

3) Estimation of saury catch-at-size (CAS) data

From mfn_i and the accumulated numbers of catch boxes (N_i) throughout the fishing season, we can estimate $Fn_i (= mfn_i * N_i)$, i.e., individual fish caught for each commercial size category throughout the fishing season. The knob length data for all fish in each size category was simulated through resampling with $Fn_i / 10,000$ individuals from the knob length data in step (2). The CAS data was estimated by summarizing the knob length data from the six size categories and then subdividing using 1.0 cm intervals.

4) Estimation of saury catch-at-age data

Using an age-length key and the estimated CAS data in step (3), the catch-at-age data of saury caught by the CTSF was estimated.

Since the monthly accumulated numbers of catch boxes by each commercial size category for each $1^\circ \times 1^\circ$ grid can be calculated from the logbook data, the monthly saury catch-at-size/age data for each $1^\circ \times 1^\circ$ grid throughout the whole fishing season can be estimated by using the estimation steps described above. The age-length key derived from the CTSF and that shared by Dr. Suyama are used for the main fishing season and the early fishing season, respectively.

Note: For the 2020 estimator the above procedure, stratified random sampling approach with proportional allocation, was employed (Huang et al., 2021), while for the estimators from 2007-2019 another procedure, stratified random sampling with disproportional allocation and weighting factor, was used and reported in the SSC PS05 and SSC PS06 meetings (Huang et al., 2019; 2020). This change was made to refine the estimator of the Pacific saury catch-at-size/age data.

4. References

- Huang WB, Chang YJ, Hsieh CH. 2019. Enumeration of commercial size category, body length distribution, and age composition of the Pacific saury caught by the Chinese Taipei's saury fishery in 2018. NPFC-2019-SSC PS05-WP03. 6 pp.
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