# Preliminary methods of estimating the catch at size (CAS) based on China's Pacific saury fishery and sampling data

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## 1. Introduction

The saury in the inshore waters has been well studied; however, the biological information of saury in the offshore waters is limited(Huang, Huang, 2015). Catch-at-age and catch-at-size models have commonly used in stock assessment(Truesdell, et al, 2017). In this report, we try to estimate the catch at size, based on China's PS fishery-dependent sampling data.

## 2. Sampling and Pre-processing

5-10 Kilograms of the saury specimens were randomly collected daily in the catches by 1-2 stick-held dip net fishing vessels every year since 2014. The specimens with temporal-spatial information were frozen and stored in the fishing vessel. Then they were all transported to Shanghai Ocean University after the fishing vessel back to the port.

The biological information/data, including body weight (BW, unit: g) and knob length (KnL: distance from the tip of the lower jaw to the posterior end of the muscular knob on the caudal peduncle; Kimura, 1956, unit: mm), was measured in the laboratory.

Catch amount were derived from logbooks of all fishing vessels.

## 3. CAS estimation

CAS of Pacific saury were estimated in three steps.

1) *Body weight fitting*

   Body weight was fitted by Length-weight relationships(Froese, 1998) based on all specimens to reduce the bias of body weight composition in 1cm KnL classes, the formula is:

$$\widehat{BW} = a \times KnL^b \qquad 1\text{-}1$$

2) *Data aggregation*

   Catch amount and fitted body weight composition in 1cm KnL classes were calculate in each month and grid area (1° ×1° ). used to estimate the catch at size.

3) *CAS estimation in each month and grid area*

   The formula is:

$$N_{i,j} = \frac{TC_j \times P_{i,j}}{\widehat{BW_i}} \qquad 1\text{-}2$$

   where *i* is the *i*th class interval of KnL; *j* is the *j*th month and grid area; N is the number of individuals; *P* is the proportion of fitted body weight; *TC* is the catch amount.

## 3. Results

The length-weight relationship was shown in  Fig.1.

The mean of sample bodyweight (red line with small triangles) fluctuated compared with fitted body weight (blue line with small circles) in each class interval, using the data from 161.5°E, 41.5°E in Jun. 2014 as an example (Fig.2).

The catch-at-size in each month and grid area from Jun. to Jul. 2014 were estimated as an example.

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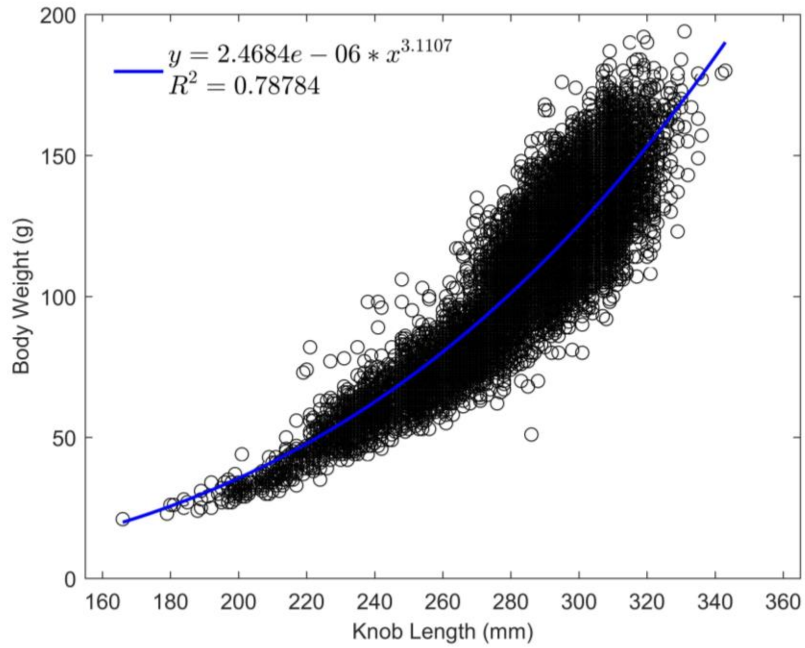


Fig.1 Length-weight relationships of all samples from 2014 to 2018

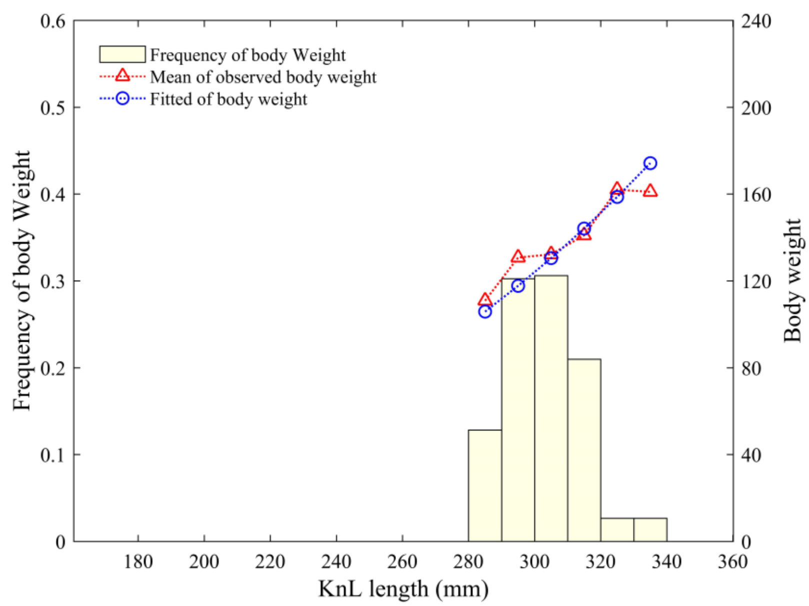


Fig.2 Fitted body weight frequency using the data from 161.5° E, 41.5° E in Jun. 2014