



North Pacific Fisheries Commission

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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

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1. Introduction

In the SSC PS04 meeting, participants reviewed the collection of shared Pacific saury data and noted the need to share foundational biological data (e.g. catch-at-size & catch-at-age data) to enable for the development of comprehensive age-structured stock assessment models. As a first step, it is essential to collect all available information for the estimation of the catch-at-age/size data from the saury fishing fleets in the Northwest Pacific Ocean. This approach will allow for the development of a robust data set and will inform decisions for model construction based on data availability.

In the Chinese Taipei's saury fishery (CTSF), saury catch is separated into market size category boxes onboard according to individual body size. The caught saury is graded by weight into six commercial size categories: *Extra large* (≤ 6 individuals/kg), *No.1* (7-9 individuals/kg), *No.2* (10-12 individuals/kg), *No.3* (13-15 individuals/kg), *No.4* (16-18 individuals/kg), and *No.5* (≥ 19 individuals/kg). Immediately after being graded, saury are subsequently frozen and stored onboard in 10kg capacity boxes. In this study, we measured the knob length and body weight of saury and estimated length frequency distributions and age compositions for each size category to reflect size/age information of saury catch in CTSF.

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2. Materials and methods

Two datasets were used in this study:

(1) 2001-2018 landed catch data from the CTSF in the NWPO acquired from logbooks by the Overseas Fisheries Development Council (OFDC). This dataset included records of daily catch (weight by commercial size category) and fishing effort (number of hauls).

(2) 2007-2018 body length and weight data for each commercial size category. Samples of saury caught in October, the highest catch and/or CPUE month, were obtained annually when the saury was landed at the Kaohsiung Fishing Port. Forty to Sixty individuals were randomly sampled from the catch boxes for each commercial size category, and their knob lengths and body weights were measured to the nearest 0.1 mm and 0.1 g, respectively.

In this study, we used the 2018 datasets to test an approach for estimating the length-frequency distribution and age composition of the saury caught by the CTSF.

3. Results

The landed catch of saury in kilograms for each commercial size category in 2018 is listed in **Table 1**. Mean body weight for each commercial size category, as calculated from the 2018 saury samples (n=250 in total) is also shown in **Table 1**. Therefore, enumeration of catch across commercial size categories by the CTSF in 2018 was estimated in the context of landed catch and mean body weight.

The knob length frequency distribution for the 2018 saury samples, expressed in intervals of 1 cm based on commercial size category, is shown in **Figure 1**. Using the length frequency distribution and the number of individuals in each commercial size category, we estimated the overall length frequency distribution of saury caught by the CTSF in 2018 (**Figure 2**).

Percentages of *age-0* and *age-1* saury for the 2018 saury samples, as expressed in 1 cm intervals representing body length, are shown in **Figure 3**. Within these samples, all of the saury with lengths less than 27 cm and greater than 29 cm were *age-0* and *age-1*, respectively. Using the age percentage values of the samples and the estimated length frequency distribution, we calculated the age composition of saury caught by the CTSF in 2018 (**Figure 4**). Estimated

catch by age, length class, and number of boxes for each market size category within the 2018 saury catch are shown in **Table 2**. The *age-0* and *age-1* saury represented 9.5 % and 90.5 % of the 2018 catch, respectively.

4. Problems to be resolved in future

Although sample data was consistently collected each year in October, this annual sampling frequency may impose limitations, specifically this approach did not allow for the incorporation of potential monthly and vessel’s variations. Additional sampling time and vessel’s points would help to resolve and assess temporal and vessel’s variations in our data, but such an approach would also impose substantial costs. To address this challenge we are developing an image-based measurement approach that can be easily used across multiple months and vessels to measure the knob length of saury directly within commercial boxes (**Figure 5**). It is already well understood that body weight of saury can be estimated in the context of a weight-length relationship, but to apply this approach to images we must first establish a standardized means of accounting for potential distortion of size due to variation in photograph quality. Presently, we are in the process of tackling this issue, and hope that in the future this image-based measurement approach can be used to both enhance the quality of our datasets and also reduce the time and financial limitations currently hindering the acquisition of robust catch assessments.

Table 1. Landed catch, mean fish weight, and estimated number of individuals by commercial size category in the 2018 saury catch. The number in the brackets represents sample size.

Size category	Extra_L	No_1	No_2	No_3	No_4	No_5
Landed catch (kg)	2,125,073	62,186,041	77,974,918	24,633,714	10,769,061	2,777,193
Mean body weight (g/ind.)	142.3 (40)	144.6 (50)	123.3 (40)	100.3 (40)	82.1 (40)	84.2 (40)
Estimated no. of ind.	14,933,756	430,055,609	632,399,985	245,600,337	131,170,044	32,983,289

Table 2. Estimated catch by age, length class, and number of boxes for each market size category within the 2018 saury catch.

Year	Month	Day	Catch (mt)	Effort		Estimated catch (No. of Ind.)	
				Oper. days	hauls	Age-0	Age-1
2018	Oct.	18	180,466	6,235	42,833	141,261,962	1,345,706,058

Estimated catch by length class (No. of Ind.)

KnL(cm)	24≤	25≤	26≤	27≤	28≤	29≤	30≤	31≤	32≤	33≤	34≤
0	15,850,086	29,380,158	95,370,514	120,480,650	425,952,297	447,872,416	283,681,530	68,050,367	330,002	0	

Number of boxes in each market size category

Extra_L	No_1	No_2	No_3	No_4	No_5
204,249	5,978,643	7,487,503	2,335,964	1,021,183	262,659

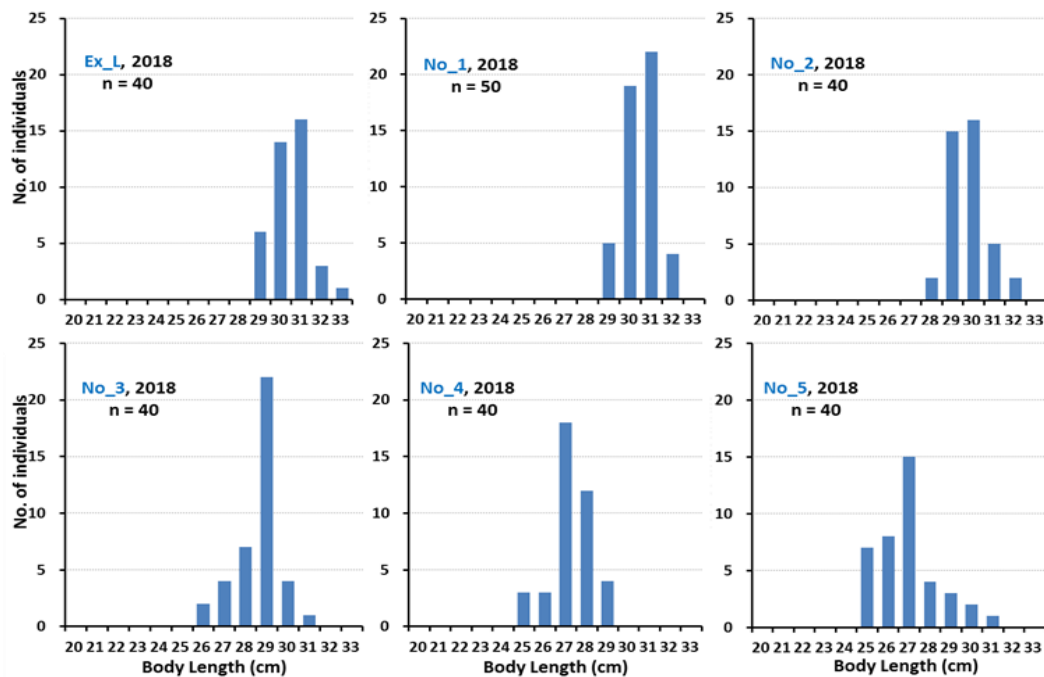


Figure 1. The knob length frequency distribution for the 2018 saury samples as expressed in 1 cm intervals for each commercial size category.

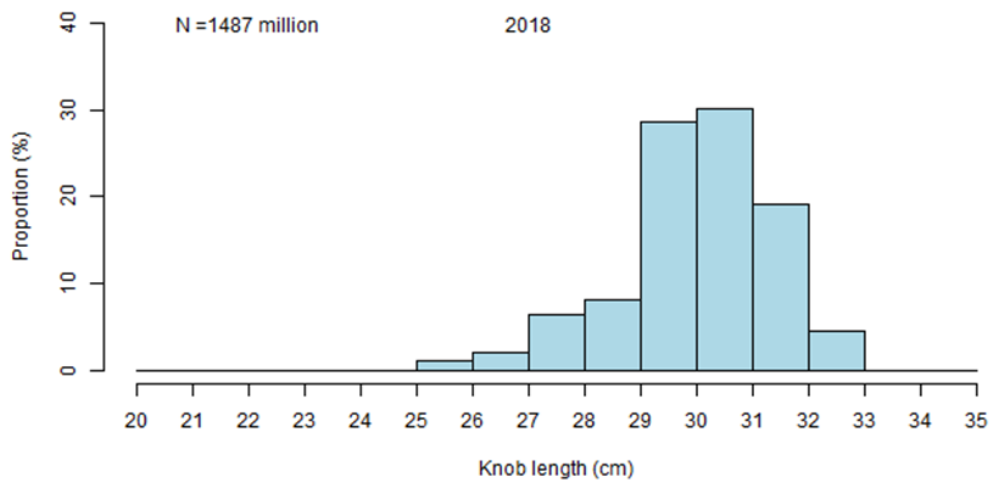


Figure 2. The estimated length frequency distribution for the 2018 saury catch as expressed in 1 cm intervals.

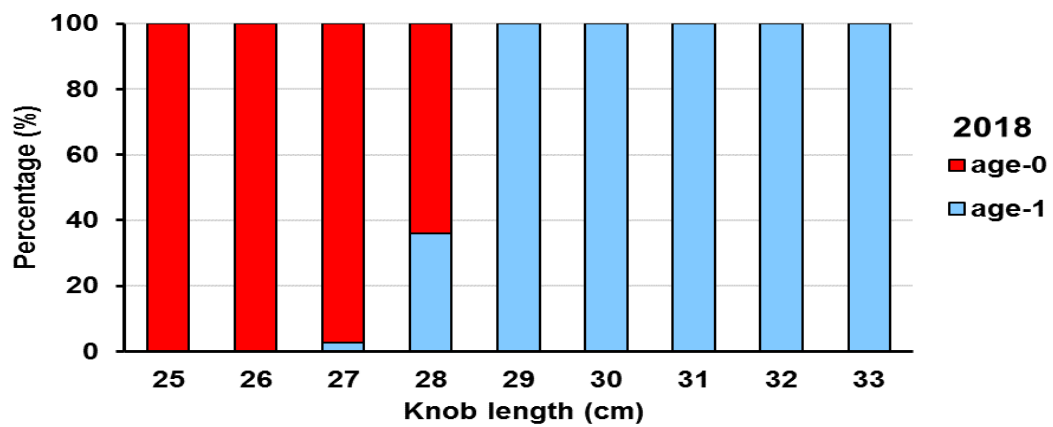


Figure 3. Percentages of *age-0* and *age-1* individuals within the 2018 saury samples by length class as expressed in 1 cm intervals.

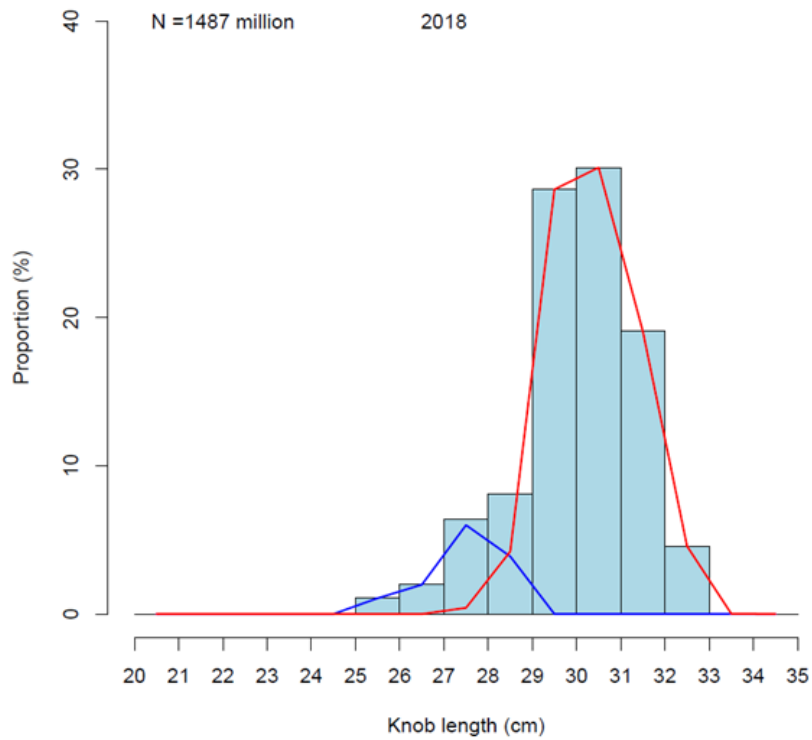


Figure 4. The estimated length frequency distribution and age composition of the 2018 saury catch. Blue and red lines present proportions of the catch for *age-0* and *age-1* saury, respectively.



Figure 5. Example of an image used to calculate knob length of saury; the CD with its envelope is inset as a course scale bar for digital measurement.