



## **Brief Review on Size Distribution of Taiwanese PBF Catch**

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## Introduction

Pacific bluefin tuna (PBF) utilized by Taiwanese longline fishery was all adult fish with average size of around 200 kg. The catch has reached 3,089 mt in 1999 but has continuously declined later on to the lowest record of 213 mt in 2012. Recently the catch has recovered to 483 mt in 2014 and 492 mt (preliminary value) in 2015 (Fig. 1).

Fig. 1 provides both trends of catches in weight and in number during 2001 – 2015. The trends were apparently different (catch in weight was declining faster than in number) indicating the size of fish in the catch has changed in the period. This short paper provides brief review of the size distribution of PBF catches landed in Taiwan.

## The data

Market landing data since 2001 of the three major longline fishing ports in Taiwan: Tungking, Suao, and Singang (in the order of landing amount) were maintained by the Overseas Fisheries Development Council (OFDC) (see Fig. 1 of Chang et al., 2015). Since 2010, additional detailed PBF catch data were available from the catch documentation scheme (CDS). Considering that the CDS provides more detail information on PBF catch and the aggregated weight was consistent with the landing data, the landing data of 2001 – 2009 and the CDS data from 2010 – 2015 were used for this review. Because the 2001 – 2003 landing data contained only landings in weight, a Markov Chain Monte Carlo (MCMC) simulation was performed on the data in advance to obtain landings in number, which was introduced in Chang et al. (2015).

## Results

Fig. 2 shows the fish weight composition by year and by weight category: from less than 150 kg to over 270 kg, with 30 kg interval. With an ad hoc definition of medium size fish as fish smaller than 210 kg and large size fish as fish larger than 210 kg, the catch in early 2000s composed of more medium fish. The ratio of medium fish started to decline since 2004 to the lowest level in 2012 and then started to recover, to a 50% level in 2015. The amount of large fish was relatively stable in this period; therefore, the decline of medium fish was considered as the decrease of availability.

A high percentage of medium fish was observed in 2003, comparing to 2001 and 2002 (Fig. 3). Then the mode showed continuous shift to the right (larger size) until 2013 when more medium fish occurred. Based on CDS data with detail catch position information, the fishing ground off Taiwan could be split into northern fishing ground (North) and southern fishing ground (South) by 24.3°N (Fig. 4). The medium fish has increased both in the North and the South, and then consecutively decreased to a low level during 2009 – 2011 (Fig. 5). The ratio started to increase in 2012 in the North and in 2013 in the South. On the other hand, for the large fish, most of large fish were caught from the South but has shown a declining trend since 2012. For the North, the proportion of large fish has shown a slight increasing trend from the beginning and the trend was more apparent since 2007.

To implement the CDS, additional port samplers were dispatched in the the three fishing ports to measure the PBF landed. Therefore, the length data are more complete than the previous. Fig. 6 shows the length frequency distributions of 2002 – 2015 (calendar year) that were collected by the OFDC port sampling program during 2002 – 2009 and CDS program during 2010 – 2015. The old port sampling data of 2009 – 2012 that were provided to the ISC were also plotted in Fig.

6 for comparison. For 2010, the CDS data has much more samples but has similar mode with the the old data; and for the rest years, they were almost identical. The figure also provides new length distributions of 2014 and 2015 which showed the increase of smaller sized fish <230 cm (around 196 kg, according to the length-weight equation in Hsu et al., 2010)

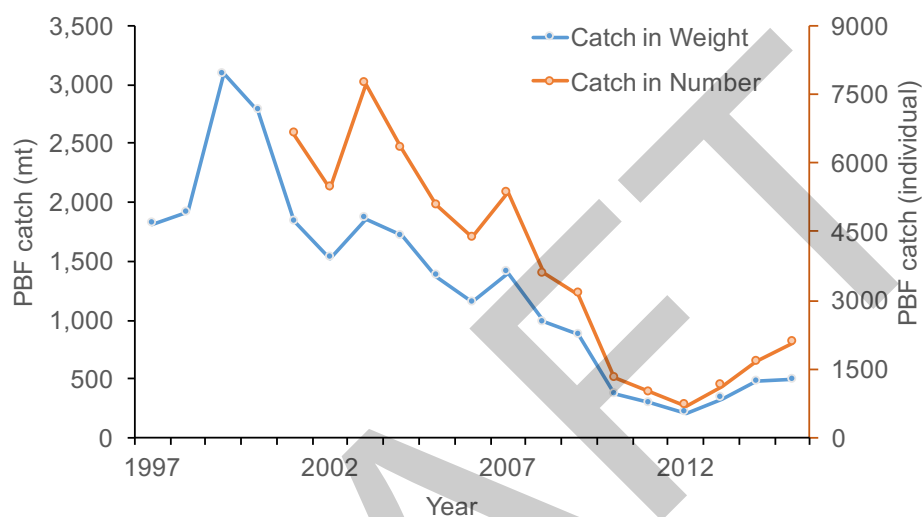


Fig. 1. PBF catch series (in weight and in number) by Taiwan longline fishery during 1997-2015. Data of 2015 is preliminary.

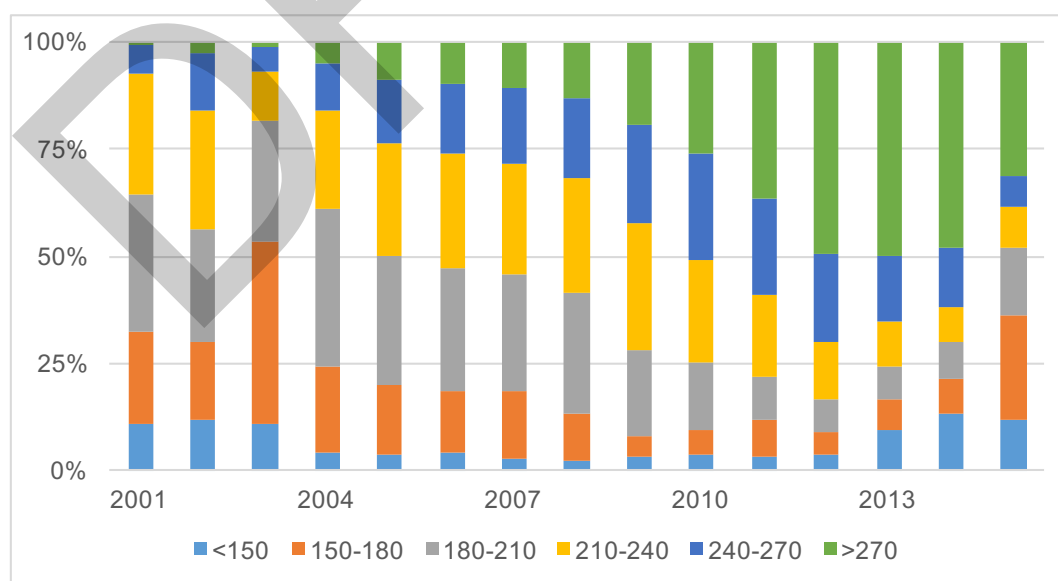


Fig. 2. Weight composition of PBF by year and by weight category for 2001 – 2015. Data of 2015 is preliminary.

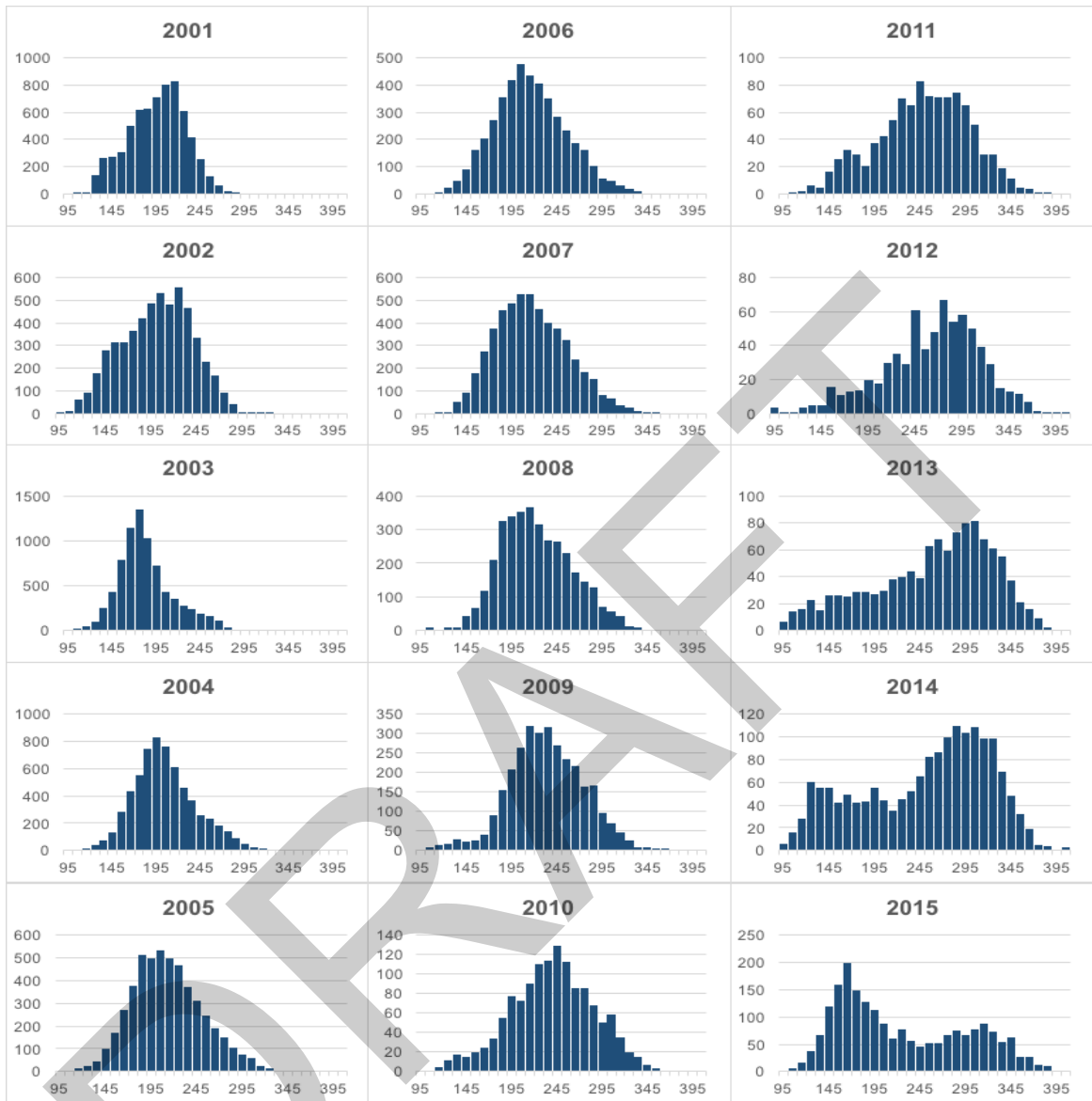


Fig. 3. Weight distributions of PBF landed in Taiwan during 2001 – 2015.

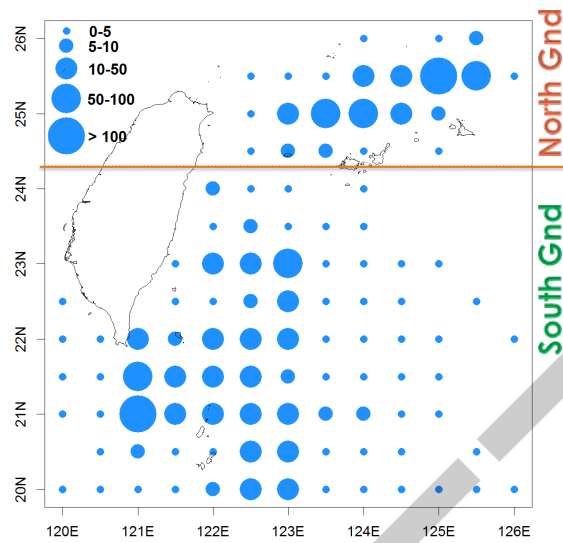


Fig. 4. Average PBF catch distribution off Taiwan for 2010 – 2015 by Taiwanese PBF longliners. The line splits the fishing grounds into southern ground and northern ground by 24.3°N.

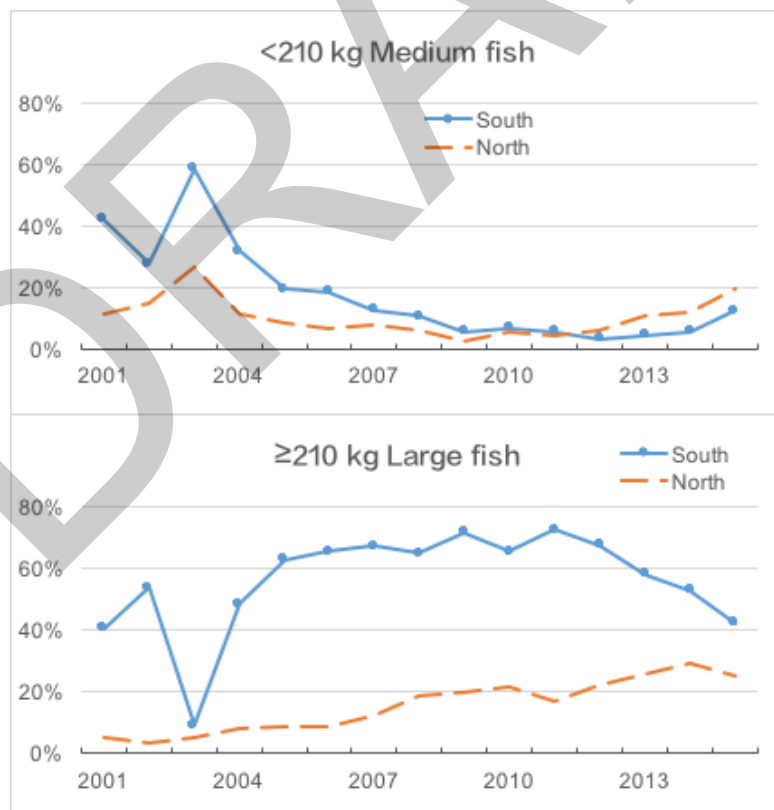


Fig. 5. PBF catch composition by weight category: medium size fish < 210 kg and large size fish  $\geq 210$  kg, and by fishing ground: the North and the South (refer to Fig. 4), for 2001 – 2015.

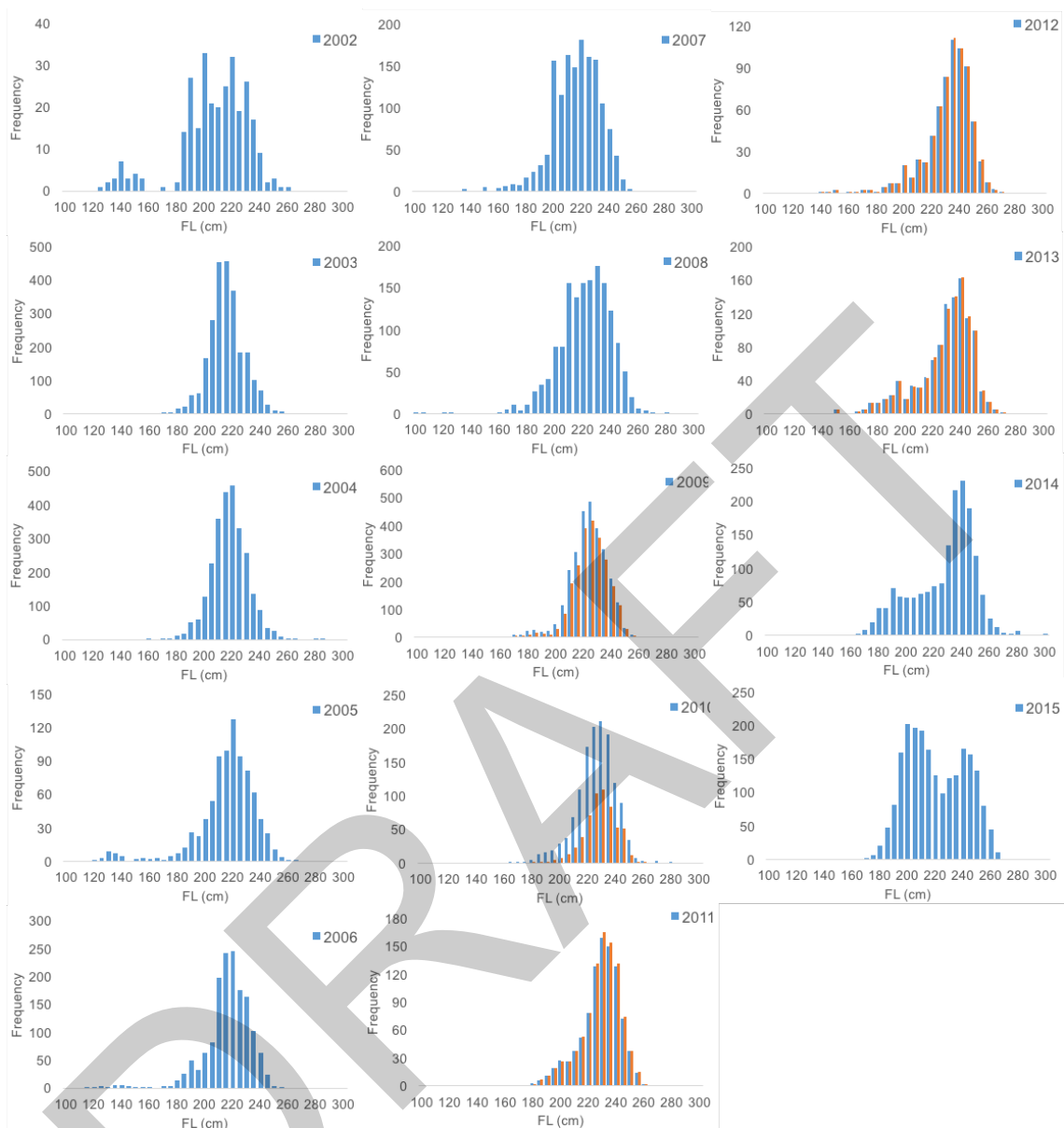


Fig. 6. PBF length frequency distributions of 2002 – 2015 (calendar year) with comparisons of old port sampling data provided to the ISC with new OFDC sampling data and CDS data.

## References

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