



**Preliminary analysis of catch at size for
Pacific bluefin tuna, *Thunnus orientalis* caught by
Korean offshore large purse seiner**

Sang Chul Yoon, Zang Geun Kim, Sung Il Lee and Dong Woo Lee

National Fisheries Research and Development Institute, 216, Gijanghaean-ro,
Gijangseup, Gijanggun, Busan 619-705, KOREA

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Introduction

Pacific bluefin tuna, *Thunnus orientalis* (PBF) has been mostly caught by the offshore large purse seiner (OLPS) in Korean waters. The fishing ground of OLPS is mainly off Jeju Island and seasonally expands to the Yellow Sea and south of the East Sea (Yoon et al., 2012).

In the current stock assessment of the PBF using the Stock Synthesis 3 (SS3), the Korean offshore large purse seiner is categorized into “Flee 2” (Oshima et al., 2014). In this study, preliminary analysis of length and weight data as a step toward providing catch-at-size for PBF caught by Korean offshore large purse seiners (OLPS) was introduced and available length and weight data for PBF caught by OLPS in terms of quantity and quality was reviewed.

Data and method

Length frequency distributions of PBF were analyzed from data which were measured by observers in the Busan Fisheries Cooperative Fish Market from 2004 to 2013. Relationship with body weight (BW) and fork length (FL) of PBF caught by OLPS was estimated from measured body weight and fork length simultaneously in the Busan Fisheries Cooperative Fish Market from 2009 to 2013 (Fig. 1). Quarterly PBF catch data was used by Yoo et al. (2012) from 2004 to 2011, and quarterly catch data from 2012 to 2013 was estimated from catch by OLPS using revised actual box weight of PBF. Number of fish was calculated from quarterly catch data divided into quarterly average weights which were estimated from body weight at fork length and converted weight using relationship with body weight and fork length from 2004 to 2013.

Results

The relationship with body weight and fork length was estimated as $BW=0.0003FL^{2.918}$ ($N = 2,710$) using measured length and body weight data from 2009 to 2013 (Fig. 1). Estimated average body weight of PBF by quarter was ranged as 2.1-16.8kg (AVG : 4.6kg) from 2004 to 2013. Average body weight showed higher than 10kg in 3rd quarter in 2004, 2nd quarter in 2008 and 1st quarter in 2010 (Fig. 2). Among them, that of 1st quarter of 2010 was the most average body weight as 16.8kg.

The PBF quarterly catch was ranged from 1mt (3rd quarter in 2013) to 1,003mt (2nd quarter in 2008) (AVG = 325mt) during 2004-2013 (Fig. 3). Especially, 1mt in 3rd

quarter in 2013 as the lowest quarterly catch during 2004-2013, also annual catch (604mt) of PBF in 2013 was the lowest catch since 2000.

The number of fish estimated from quarterly catch and quarterly average body weight was ranged from approximately 360 (3rd quarter in 2013) to 250,000 fish (1st quarter in 2005) (AVG = 63,122 fish) during 2004-2013 (Fig. 4).

The quarterly number of measured fish was ranged from 51 (4th quarter 2004) to 5,909 fish (1st quarter 2008) (AVG = 1,242 fish) during 2004-2013 (Fig. 5). Coverage rate of the measured fish to the number of fish was ranged from 0.1% (4th quarter 2004) to 26.1% (1st quarter 2008) (AVG = 3.5%) during 2004-2013 (Fig. 6). Coverage rate showed higher than 10% in 3rd quarter in 2008, 4th quarter in 2011 and 3rd quarter in 2013.

Fork length and body weight frequency distribution by year were shown in Fig. 7. In the length frequencies, mean of PBF length was 50-60cm class from 2004 to 2013 except for 2010 and 2011. In 2004, 2008, 2009, 2010 and 2013, three length modes were appeared in the 50cm, 70-80cm and 110cm. During this period (2004, 2008, 2009, 2010 and 2013), two or three weight modes were appeared in the 2kg, 10kg and 30kg weight class. In the next analysis, we will make the length frequency distributions by size category and will estimate of catch at size from the Korean large purse seiner based on the results of this study.

References

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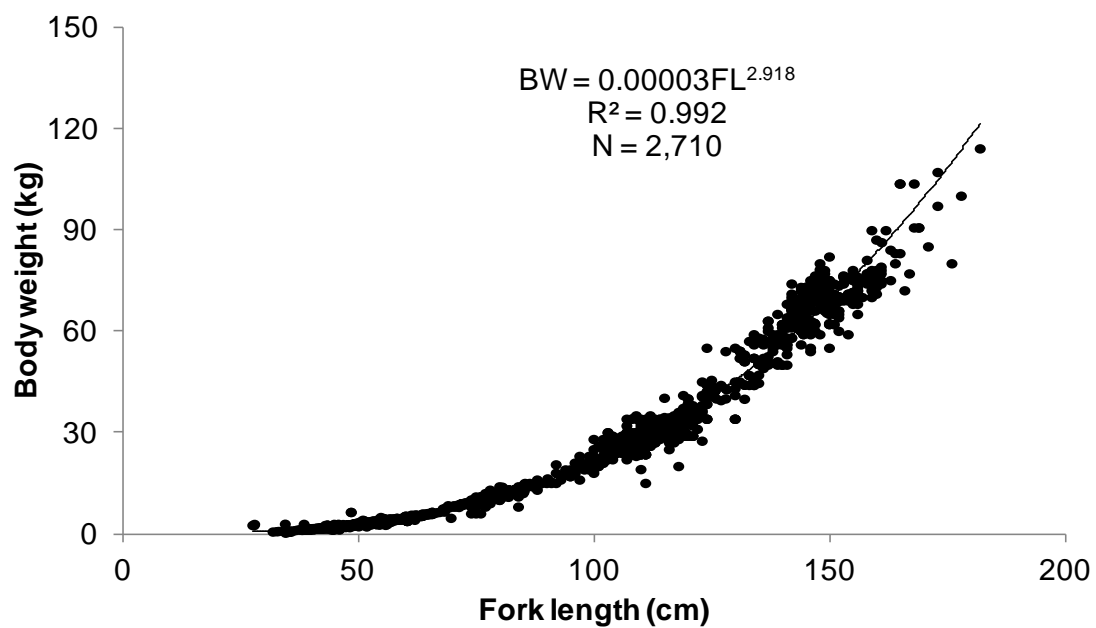


Fig. 1. Relationship with body weight and fork length of PBF caught by Korean offshore large purse seiner from 2009 to 2013.

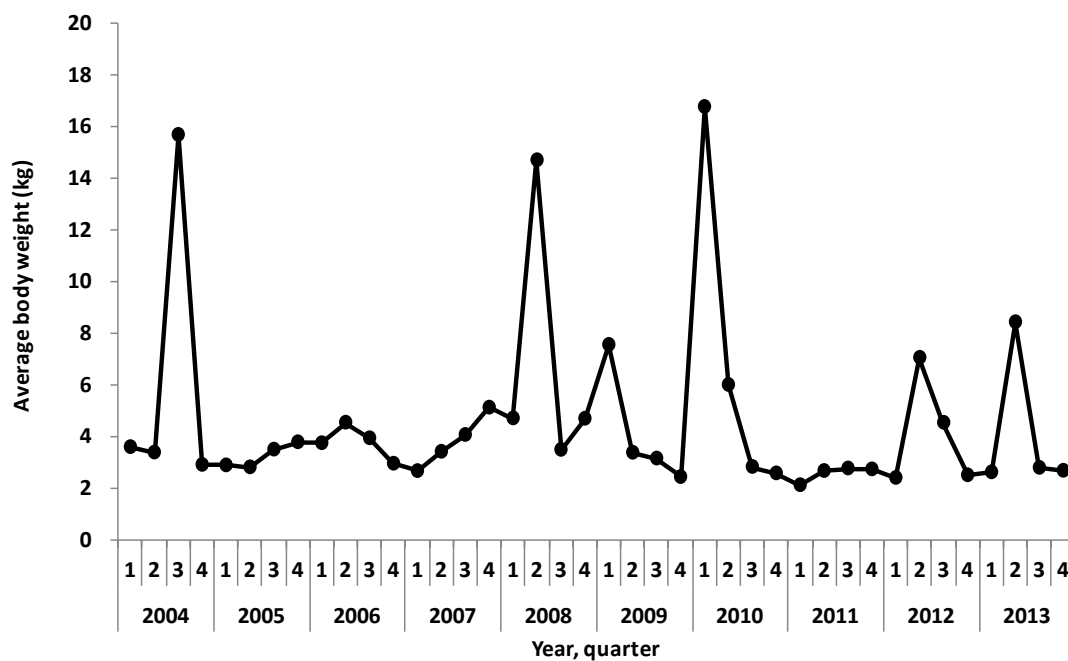


Fig. 2. Variations in average body weight of PBF from 2004 to 2013.

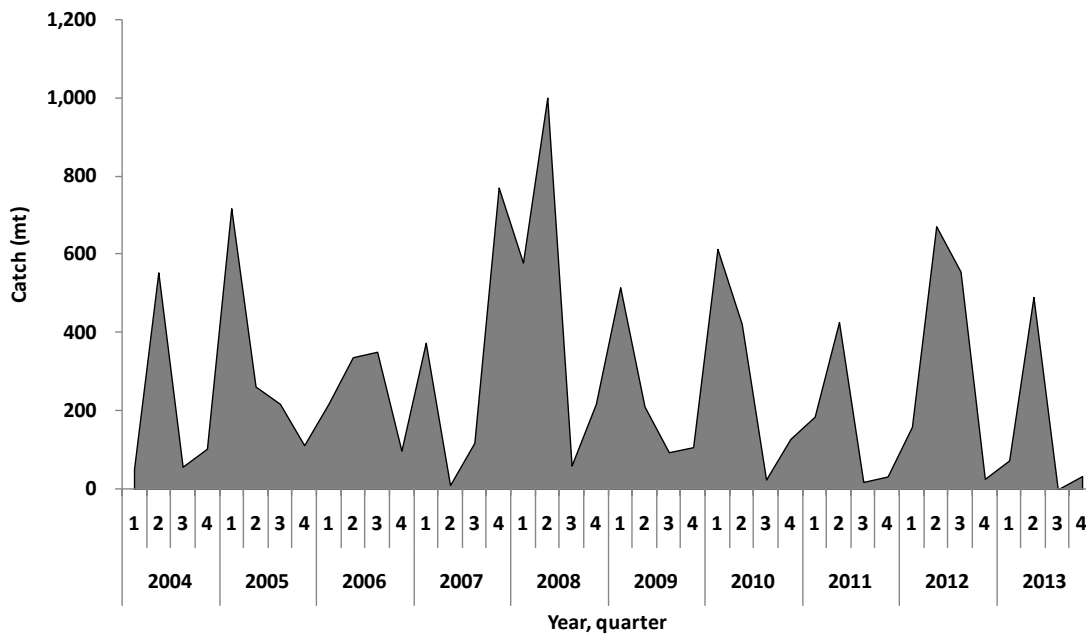


Fig. 3. Variations in quarterly catch of PBF caught by Korean offshore large purser from 2004 to 2013.

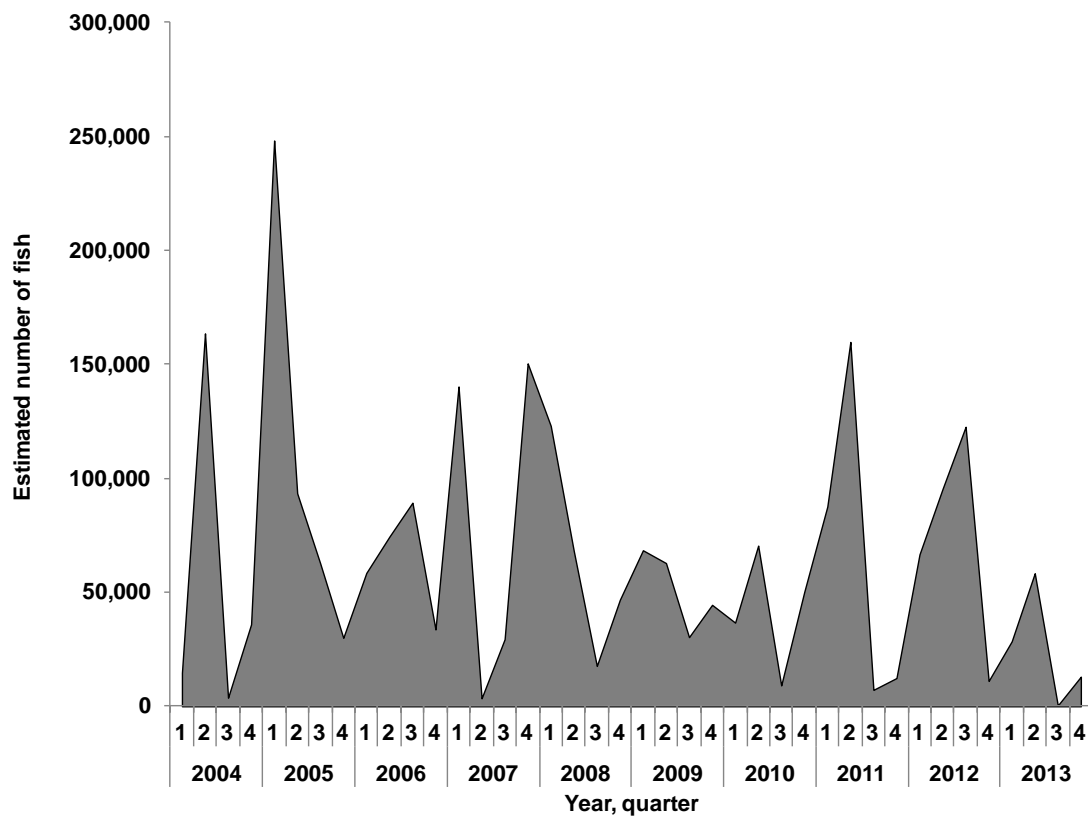


Fig. 4. Variations in quarterly number of PBF caught by Korean offshore large purser from 2004 to 2013.

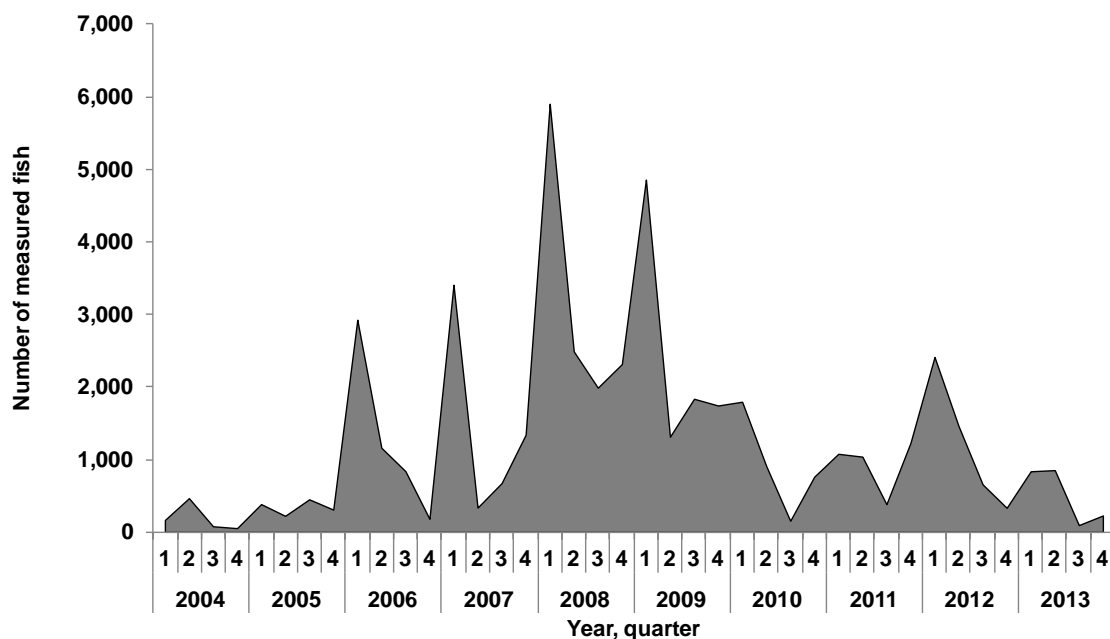


Fig. 5. Variations in quarterly number of measured PBF caught by Korean offshore large pursers from 2004 to 2013.

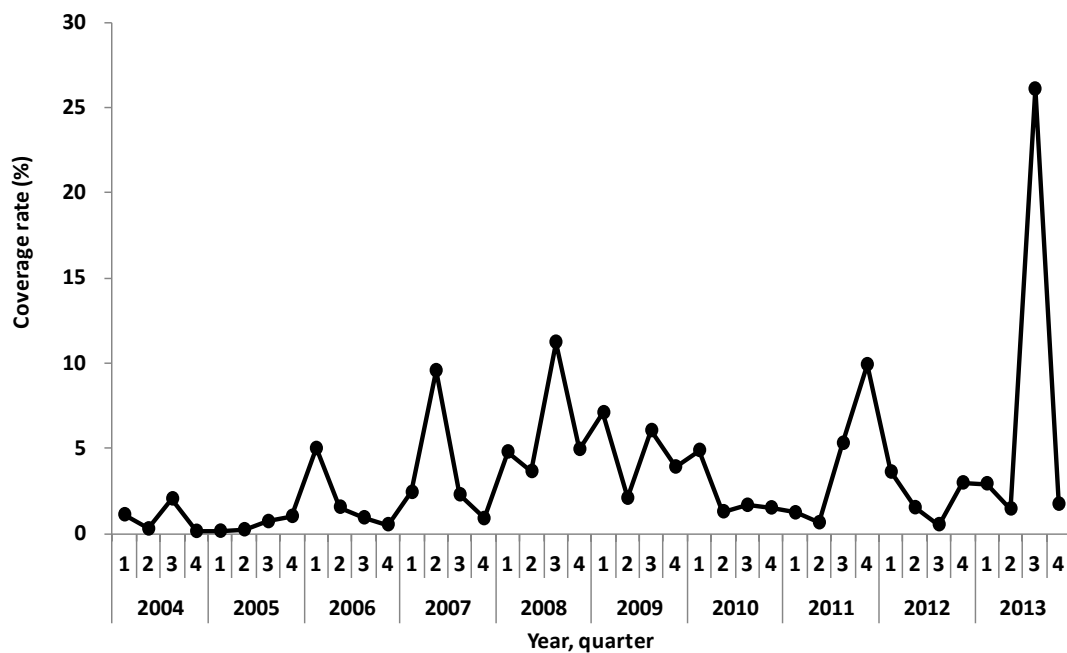


Fig. 6. Variations in coverage rate (%) of the quarterly measured fish to total number of PBF caught by Korean offshore large pursers from 2004 to 2013.

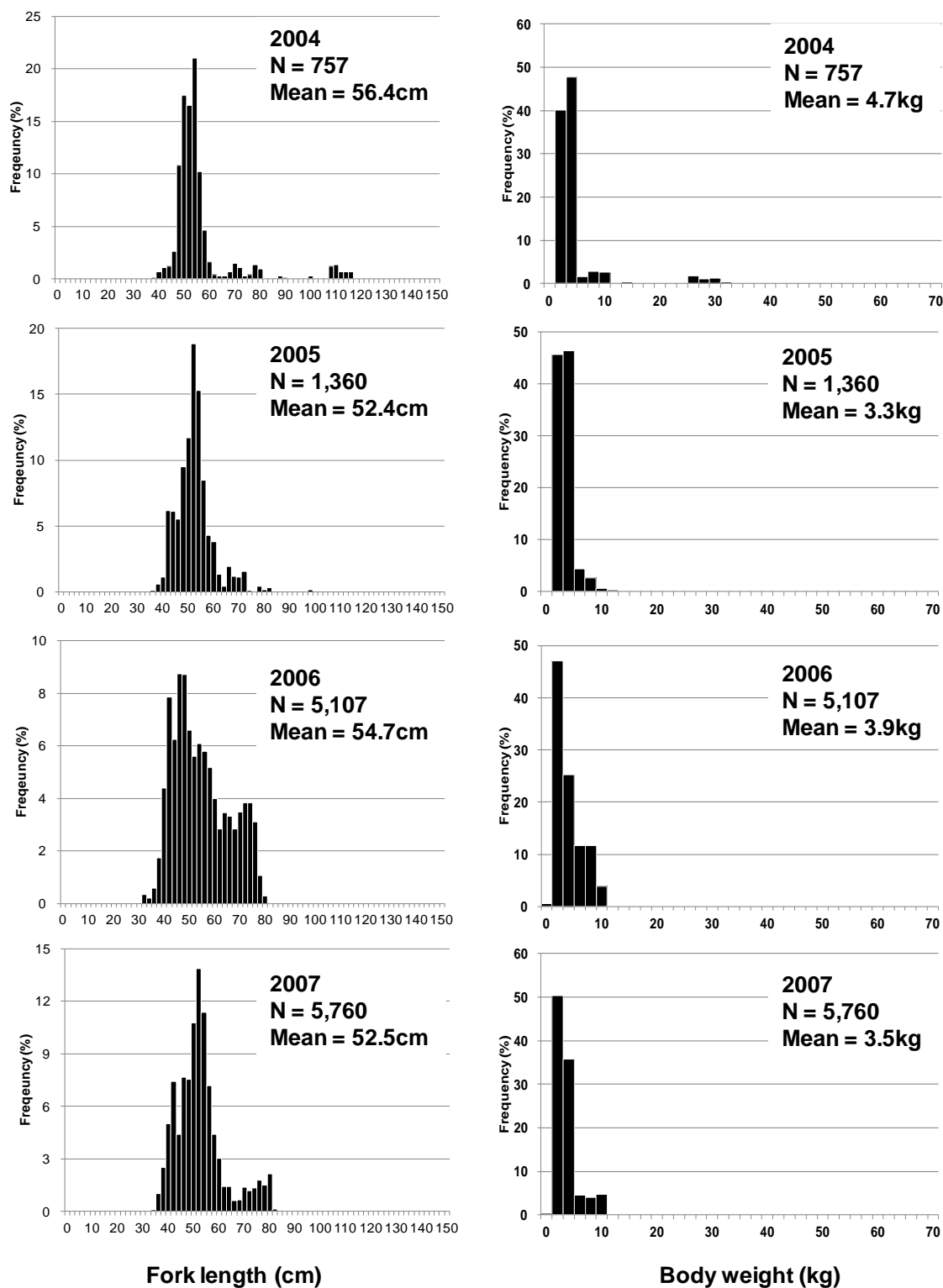


Fig. 7. Yearly fork length and body weight frequency distributions of PBF caught by Korean offshore large purser from 2004 to 2013.

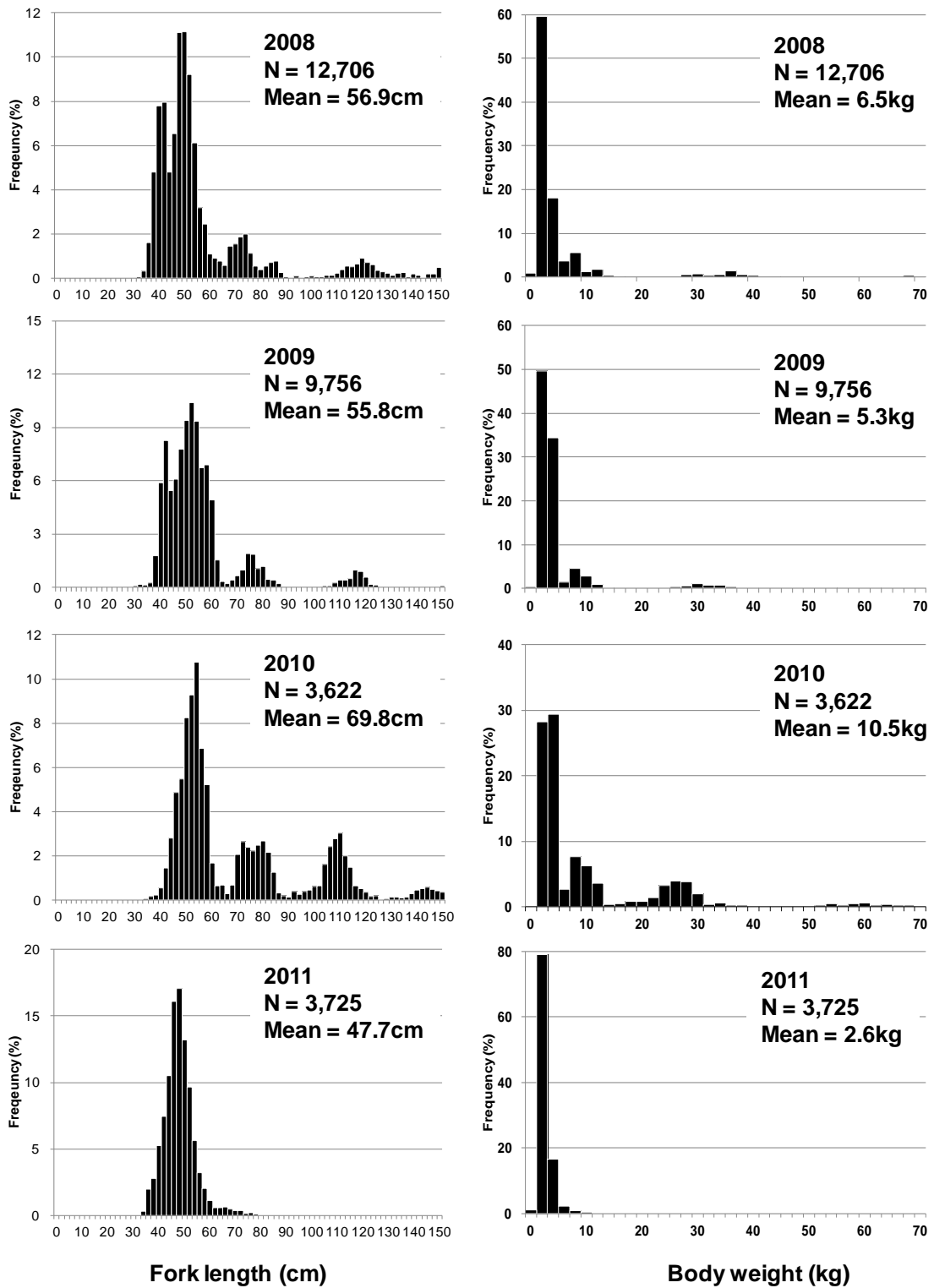


Fig. 7. Continued.

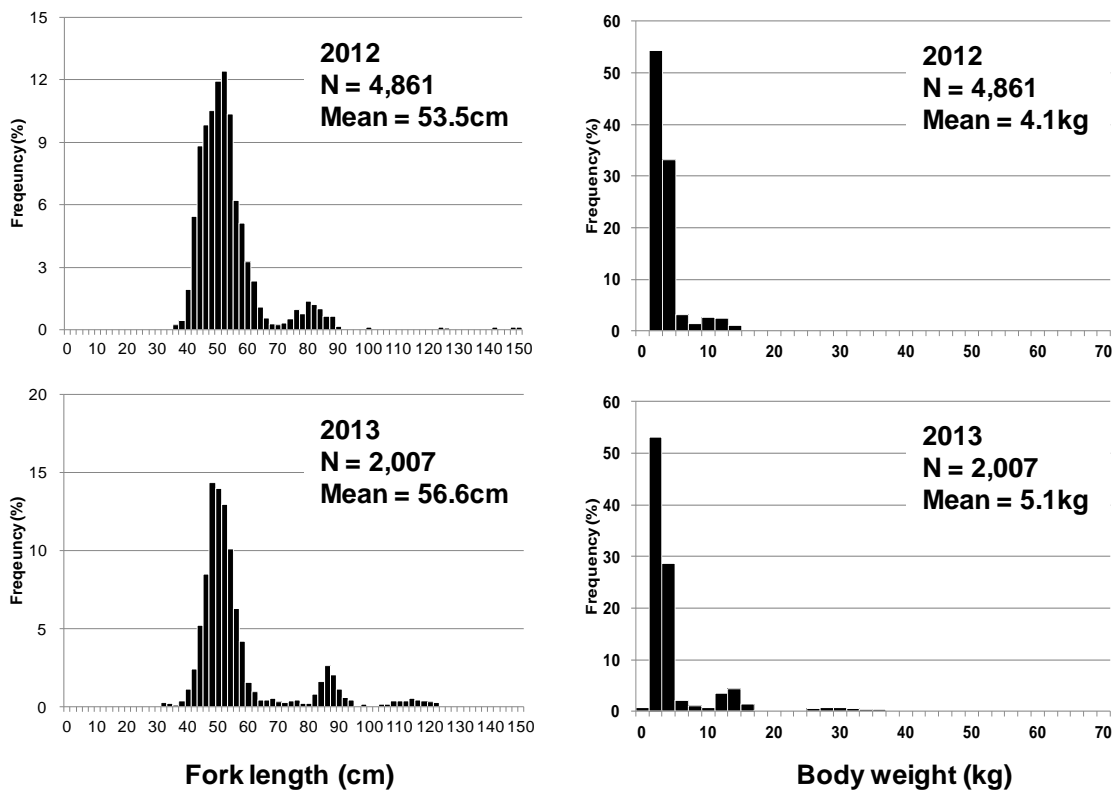


Fig. 7. Continued.

Table 1. Minimum, maximum and mean of PBF length and body weight during 2004-2013

Year	Sample size (N)	Length (cm)			Body weight (kg)		
		Min	Max	Mean	Min	Max	Mean
2004	757	38.9	115.7	56.4	1.3	31.5	4.7
2005	1,360	35.2	98.1	52.4	1.0	19.4	3.3
2006	5,107	31.0	82.4	54.7	0.7	11.7	3.9
2007	5,760	21.7	146.9	52.5	0.2	63.2	3.5
2008	12,706	32.0	243.0	56.9	0.7	274.4	6.5
2009	9,756	30.0	171.0	55.8	0.6	98.4	5.3
2010	3,622	33.0	178.0	69.8	0.8	110.6	10.5
2011	3,725	30.0	182.0	47.7	0.6	118.0	2.6
2012	4,861	34.0	168.0	53.5	0.9	93.4	4.1
2013	2,007	19.0	193.0	56.6	0.2	140.1	5.1