Strength of 2010 year class observed in catch information

Kazuhiro Oshima and Yukio Takeuchi

National Research Institute of Far Sea Fisheries,
Fisheries Agency 5-7-1 Orido, Shimizu, Shizuoka 424-8633, Japan

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Summary

Strength of the 2010 year class was examined in the view of past performance of catch information, relative to the strong cohort which occurred in the past two decades. High catches of Japanese small pelagic purse seine in 2011 suggested this year class was abundant, whereas the catch information from Japanese troll did not indicate that the predominant cohorts went through this fishery. We conclude that the strength of the 2010 year class is above average cohort.

Introduction

It was pointed, in stock assessment on Pacific bluefin tuna (PBF), that the SS3 model provides uncertainties in estimations, such as spawning stock biomass, recruitment of age-0 fish and fishing mortality for the terminal year (Ichinokawa et al. 2010; Iwata et al. 2012). While information on recruitment abundance in the most recent year is important for outlook of the future of PBF stock, the recruitment of the most recent year, in particular, is known to be estimated with a very poor precision. This is because data for the most recent year class is much limited in the stock assessment input data. In this document, we overviewed trends of strong cohorts which occurred in the past two decades using catch information from fisheries targeting juvenile PBF and subsequently refer to strength of the 2010 year class which was recruited in the terminal year for the present stock assessment.

Recruitment abundance of age-0 fish

Time series of recruitment of age-0 fish was estimated with the SS3 model used for PBF stock assessment (Iwata et al. 2012) (Fig. 1). Three strong cohorts, of whom relative abundance was more than twice of the median of historical recruitment, appeared in 1994, 2004 and 2007 in the past two decades. The 1994 year class is known as a prominent strong cohort with few equals in history (Oshima 2007).

Troll CPUE

CPUE from Japanese troll fishery targeting mainly age-0 PBF is used as recruitment abundance index in the stock assessment. Figure 2 shows standardized CPUE time series from this fishery in Nagasaki, Kochi and Wakayama Prefectures estimated by Ichinokawa et al. (2012). Nagasaki includes Tsushima and Goto Islands where troll fishery for PBF is major industry and are located in the East China Sea. On the other hand, in Kochi and Wakayama, troll fishery targets mainly skipjack but PBF is also commonly taken. These are are in the Pacific. In CPUE of Nagasaki, there was a clear peak in 1994, although more moderate peaks occurred since 1980. Meanwhile, in Kochi, CPUE showed remarked increase in 1994 and 2004. Additionally, In Wakayama, CPUE increased in 2004. However, in 2010, apparent increase of CPUE was observed only in Kochi.

Catch

There are the following three major fisheries targeting juvenile PBF: Japanese troll, Japanese small pelagic fish purse seine (JSPelPS) and commercial fishery (purse seine) in the eastern Pacific Ocean (EPOCOMM). Figure 3 shows length frequency distribution of PBF catch from Japanese troll, JSPelPS and EPOCOMM from 2004 to 2011. Japanese troll caught the youngest age group such as ages 0 and 1. Subsequently, JSPelPS caught PBF at age 1. Although age-2 PBF was dominated in PBF catch caught by EPOCOMM, age-1 or age-3 PBF was dominant in 2004, 2008 and 2011.

Annual catches for Japanese troll, JSPelPS and EPOCOMM are shown in Fig. 4. Although calendar years were applied for annual catch for JSPelPS and EPOCOMM, fishing year which starts from 1-July and ends on 30-June was used for annual catch for Japanese troll, because this fishery begins to exploit age-0 fish at a few months old in July and continues catching the same cohort until June in next year. High annual catches were made from 1994, 2004 and 2007 year classes by the Japanese troll indicated that the strong cohorts of these years went through this fishery. High annual catches for JSPelPS occurred consistently with one year lag of increase of recruitment. On the other hand, consistent yearly trend of annual catch for EPOCOMM was difficult to be found, although a peak appeared two year after occurrence of 1994 and 2004 year classes. As for the 2010 year class, the annual catch for Japanese troll was 1,688 metric ton, lower than the average. By contrast, JSPelPS recorded relatively high catch in 2011, the sixth largest catch since 1991.

Figure 5 shows catches for JSPelPS during main fishing season (Jun.-Jul.) from 2000 to 2010. The catch for 2011 yielded by the 2010 year class was the second largest.

Strength of 2010 year class

Upper limit of annual catch was set for JSPelPS operated by fishing vessel of 40 GRT or more in 2011 (Oshima et al. 2012). In fact, catch for PBF by this fishery was restricted in last main fishing season in 2011 (Pers. Comn.). As shown in Fig. 6, the 2010 year class yielded the second largest catch since 2000. Abundance of this year class would result in larger annual catch in 2011 for JSPelPS, if there were not the upper limit of annual catch.

Characteristics of the 2010 year class obtained from catch information of Japanese troll and JSPelPS are as follows:

- ✓ Apparent increase of CPUE from Japanese troll was observed in Kochi in 2010.
- ✓ Relatively high catch of JSPelPS was recorded in 2011 since 1991.
- ✓ The catch in main fishing season of JSPelPS in 2011 was the second largest since 2000.

In past, catches of JSPelPS was also high for 1996, 1999 and 2008 year classes. The recruitment abundance estimated for these year classes by the stock assessment were not predominant but at least above the median (Fig. 1). Consequently, at the present stage, we conclude that the strength of the 2010 year class is above average cohort. In the annual catch for EPOCOMM, high catches were recorded two years after the strong cohort of 1994 and 2004 year classes were recruited. It is expected that annual catch for EPOCOMM derived from the 2010 year class will remarkably increase in 2012, if this cohort is strong as well as the 1994 and 2004 year classes.

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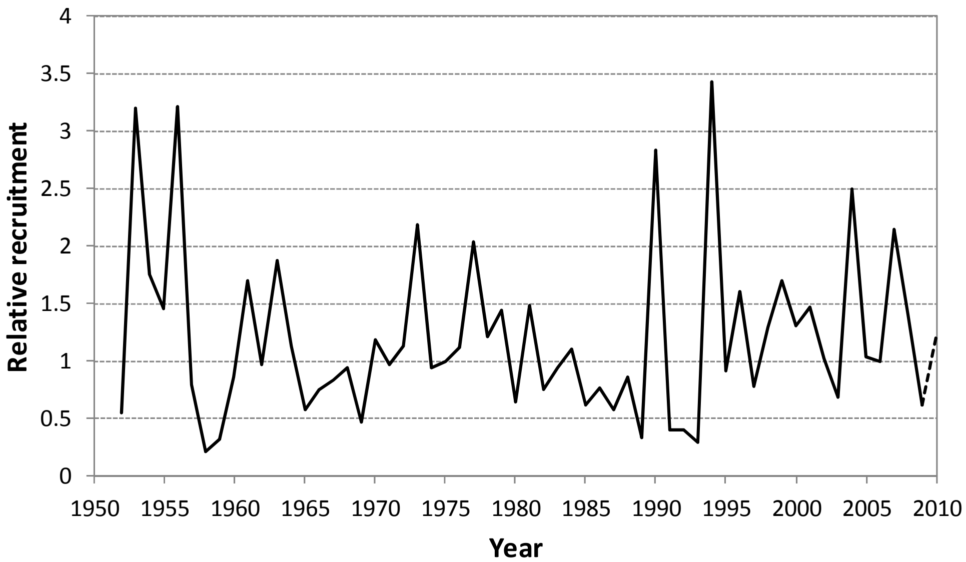

Fig. 1 Yearly changes in relative recruitment, corresponding to ratio for historical median, from 1952 to 2010. Inter-annual fluctuation of recruitment between 2009 and 2010 was shown with broken line because of poor estimation of the SS3 model for final year.

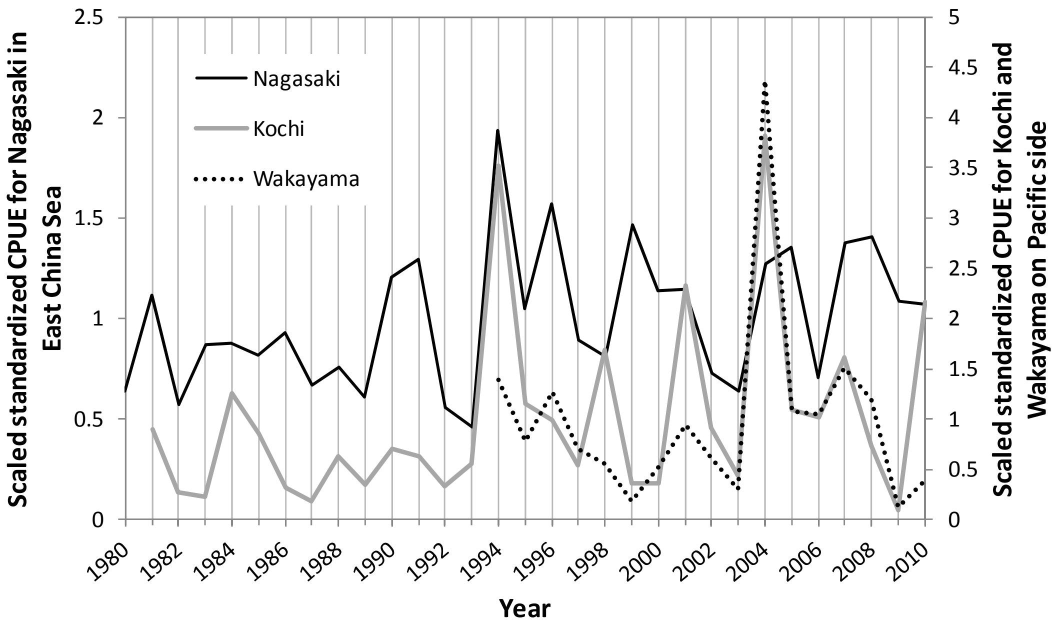

Fig. 2 Japanese troll CPUE time series for Nagasaki, Kochi and Wakayama Prefectures.

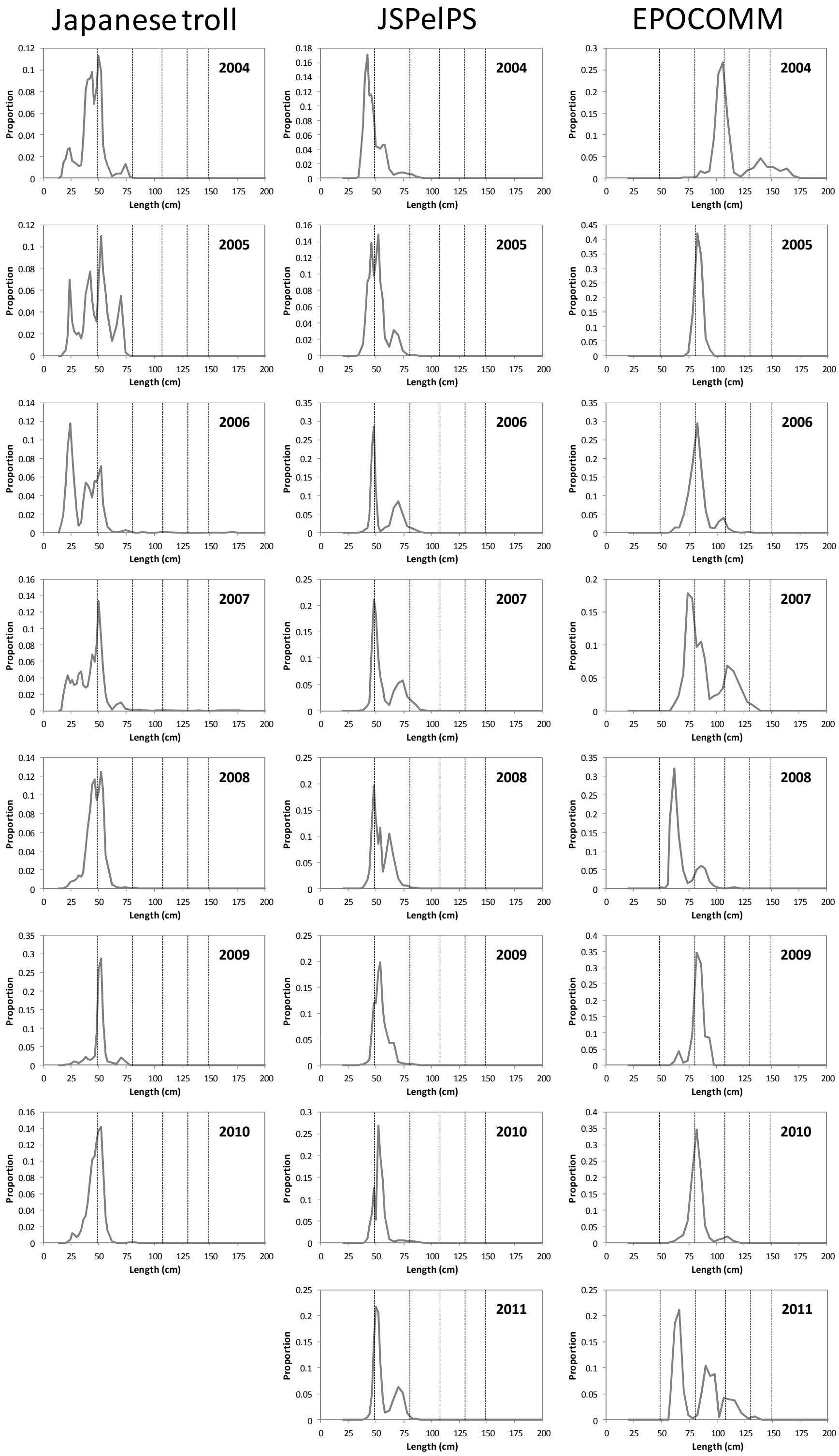

Fig. 3 Length frequency distributions of PBF catch by Japanese troll, Japanese small pelagic fish purse seine (JSPelPS) and EPO commercial fishery. Vertical broken lines indicate mean length by age from 1 yrs old to 5 yrs old estimated with von Bertalanffy growth function by Shimose et al. (2009).

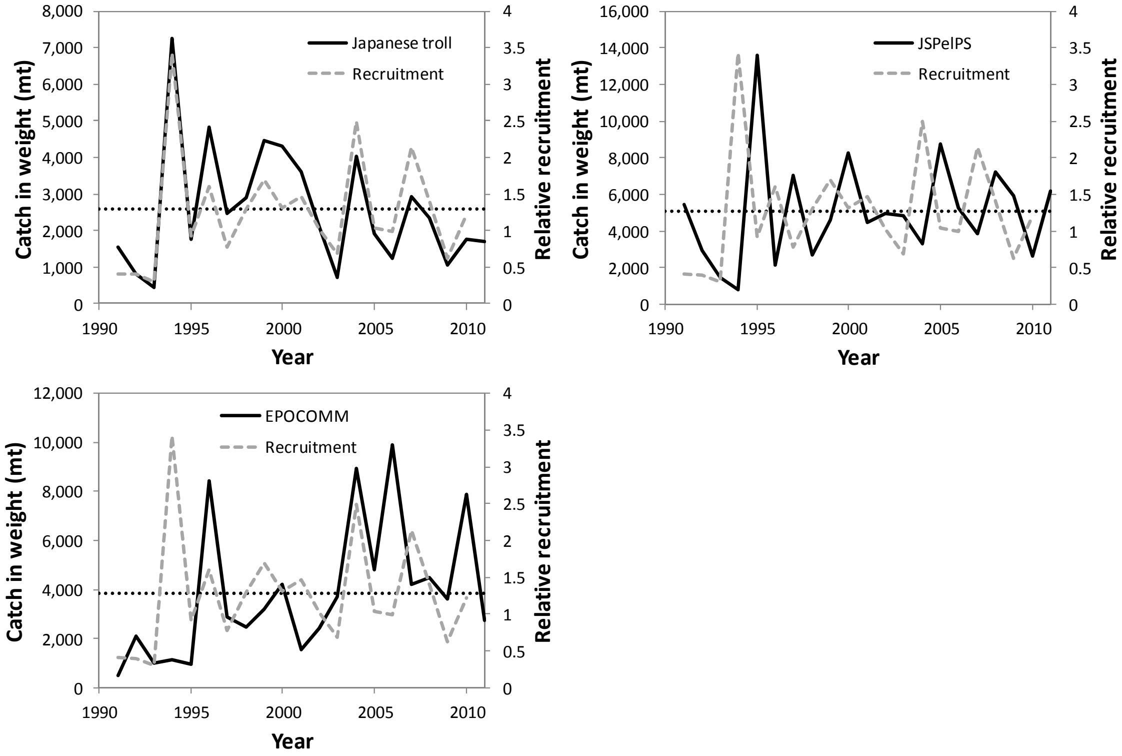

Fig. 4 Yearly changes in catch in weight for Japanese troll (Upper left), JSPelPS (Upper right) and EPO fisheries (Lower left) shown by black solid line. Black dotted line and gray broken line indicate mean annual catch from 1991 to 2011 and annual relative recruitment, respectively.

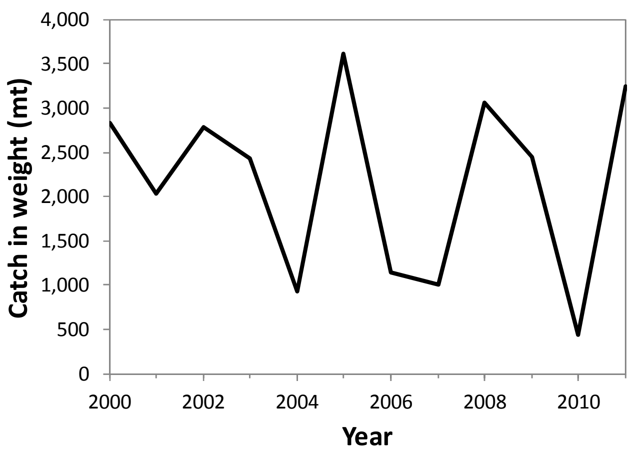

Fig. 5 Catches for JSPelPS during main fishing season (Jun.-Jul.) from 2000 to 2011.