

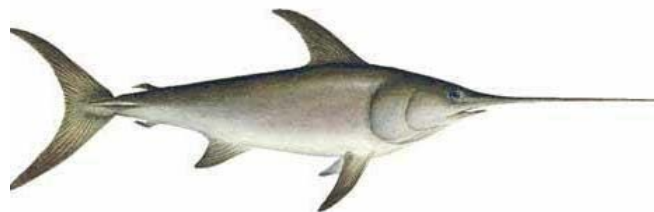
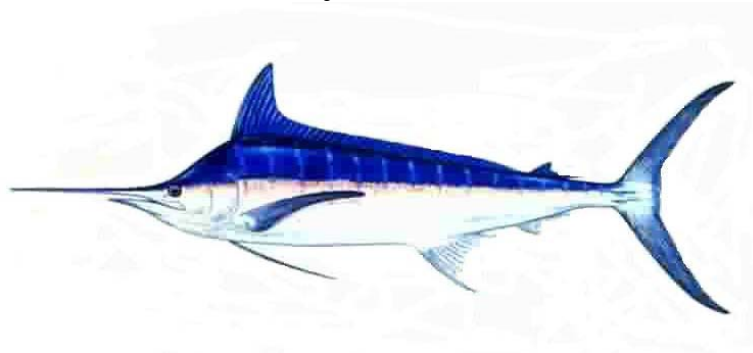


## Biological information and catch rate of striped marlin captured by Chinese observer programme in the Pacific Ocean

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### **Summary**

This report summarizes the biological information and nominal catch rate (CPUE) data for striped marlin *Tetrapturus audax* collected in the Chinese longline observer programs in the tropical central-eastern Pacific Ocean from 2003 to 2010. The minimum size of captured striped marlin was 121 cm LJFL. The sex ratios of captured striped marlin seemed to be temporal and spatial dependent. The CPUEs of striped marlin were lower than 0.001 individuals per 1000 hooks.

### **Introduction**

The distribution pattern of striped marlins (*Tetrapturus audax*) is distinct from other Istiophorid species in that striped marlins tend to prefer more temperate or cooler waters, particularly in the Pacific Ocean (Nakamura 1985). Striped marlins show very high initial growth rates (attaining up to 45% of their maximum size) in the first year of life (Melo-Barrera et al. 2003). Based on archival tagging data, striped marlins spend most time within surface waters (less than 10 m deep), with most dives to about 40 m. Occasional dives have been reported to depths of 40–100 m (Domeier et al. 2003). The stock structure of striped marlin in the Pacific Ocean remains uncertain (Bromhead et al. 2004). A range of stock structures have been proposed for striped marlin in the Pacific Ocean (Graves and McDowell 2003), including a single Pacific-wide stock and a two stock (northern and southern hemisphere) model (Hinton and Bayliff 2002). In this report, we presented the size ranges and catch rates (CPUE) for striped marlins captured in the Chinese longline observer programs in the tropical central-eastern Pacific Ocean since 2003.

### **Materials and methods**

Striped marlins samples were collected by onboard longline scientific observers from eight trips in the tropical Pacific Ocean. Figure 1 showed the set stations of Trips 1-3 and Figure 2-6 showed the set stations of Trips 4-8. Time period operated for each observer trip was given in Table 1. The trips were conducted by deep-set longliners targeting bigeye tuna *Thunnus obesus*.

The observers began to work from the beginning of hauling for each set. The proportion of baskets sampled by observer was overall between 50 and 80% for each set. Striped marlins landed on deck were simply randomly collected and lower jaw –

fork length (LJFL) was measured to the nearest centimeter (cm). Specimen was dissected and sex was identified when possible. Set-specific nominal CPUE (catch number per 1000 hooks) was calculated for each trip and averaged on a monthly base.

### **Results and Discussion**

A total of 116 striped marlin specimens were sampled with size information recorded (Table 1). The minimum size of captured striped marlin was 121 cm LJFL. Nakamura (1985) found that striped marlins are not susceptible to longline fishing gear until about 860 mm LJFL. Sex ratios for six trips were calculated. The sex ratios of captured striped marlins seemed to be temporal and spatial dependent, although the sex ratios were derived from limited sample size and statistical tests were not investigated.

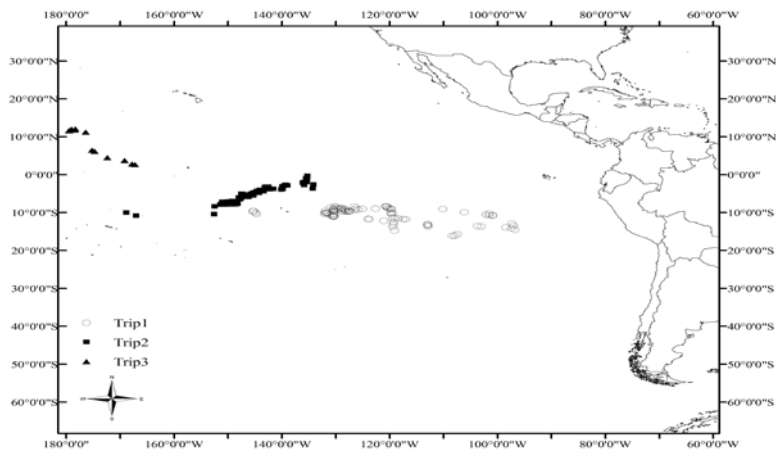
All the observer trips in this study were conducted in the tropical areas. The CPUEs of striped marlin from the eight observer trips were all quite low, i.e. lower than 0.001 individuals per 1000 hooks (Figure 7). Very low CPUE of striped marlin has also been reported by longline fleets in equatorial regions of the Pacific Ocean (10°N–10°S, Nakamura 1985). This is most probably due to their limited distributions in tropical water of the Pacific Ocean. In contrast, high catch rates have been reported adjacent to the Baja coast of the eastern Pacific Ocean (Nakamura 1985; Hinton and Bayliff 2002).

### **References:**

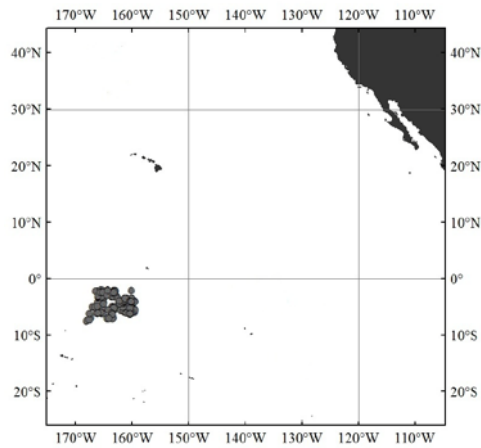
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**Table 1 Individual size ranges (lower-jaw fork length) and sex ratios of striped marlins sampled during eight Chinese longline observer trips**

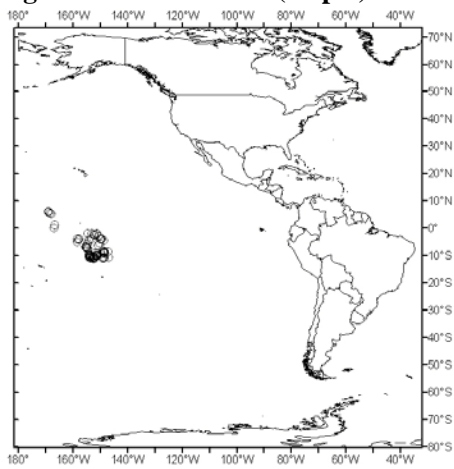
<b>Trip</b>	<b>Capture time</b>	<b>Min. size (cm)</b>	<b>Max. size (cm)</b>	<b>Mean size (cm)</b>	<b>S.D. of size (cm)</b>	<b>Sex ratio (female: male)</b>	<b>Sample size</b>
1	Jul-Nov 2003	123	235	212.1	19.0	1.1	45
2	Feb-Nov 2006	131	245	210.1	25.5	1.3	15
3	May-Jul 2008	131	213	188.3	38.9	-	4
4	Aug-Nov 2009	223	287	246.9	22.8	-	9
5	Oct 2010-Jan 2011	121	227	172.2	39.3	0.3	10
6	Aug-Dec 2010	156	220	190.5	21.8	3.0	13
7	Oct 2010-Jan 2011	175	220	205.7	14.5	2.3	10
8	Nov 2010-Jan 2011	189	217	202.0	8.3	1.0	10



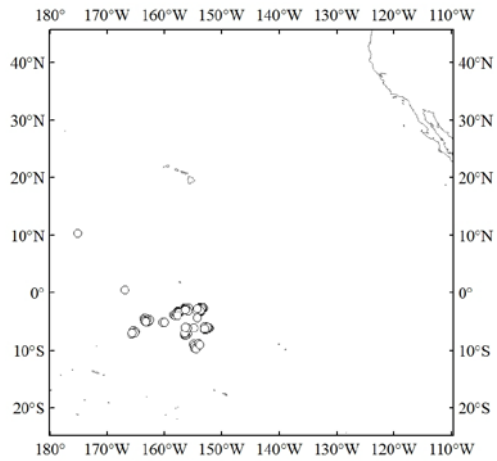
**Figure 1** Set locations of the Chinese longline observer trips in the Pacific Ocean during July-November 2003 (Trip 1), February-November 2006 (Trip 2), and May-July 2008 (Trip 3).



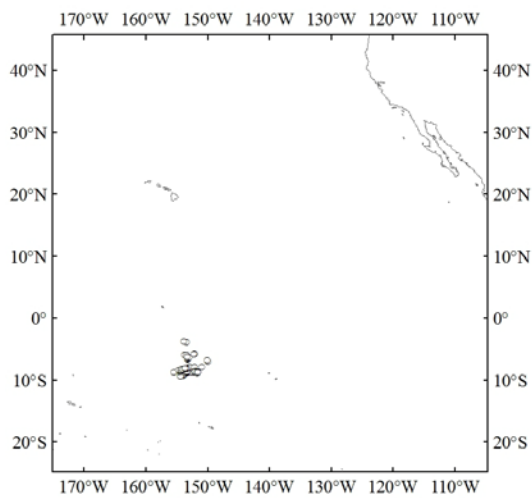
**Figure 2** Set locations of the Chinese longline observer trip in the Pacific Ocean during August-November 2009 (Trip 4)



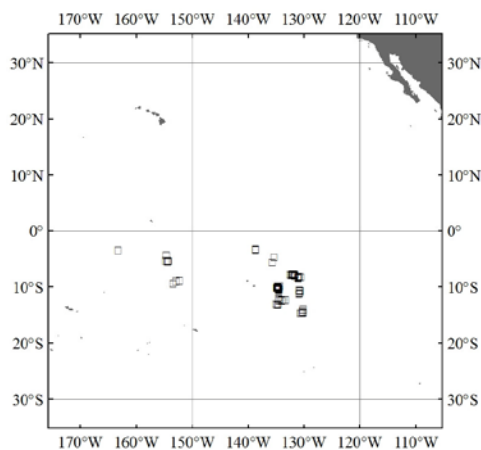
**Figure 3** Set locations of the Chinese longline observer trip in the Pacific Ocean during October 2010-January 2011 (Trip 5)



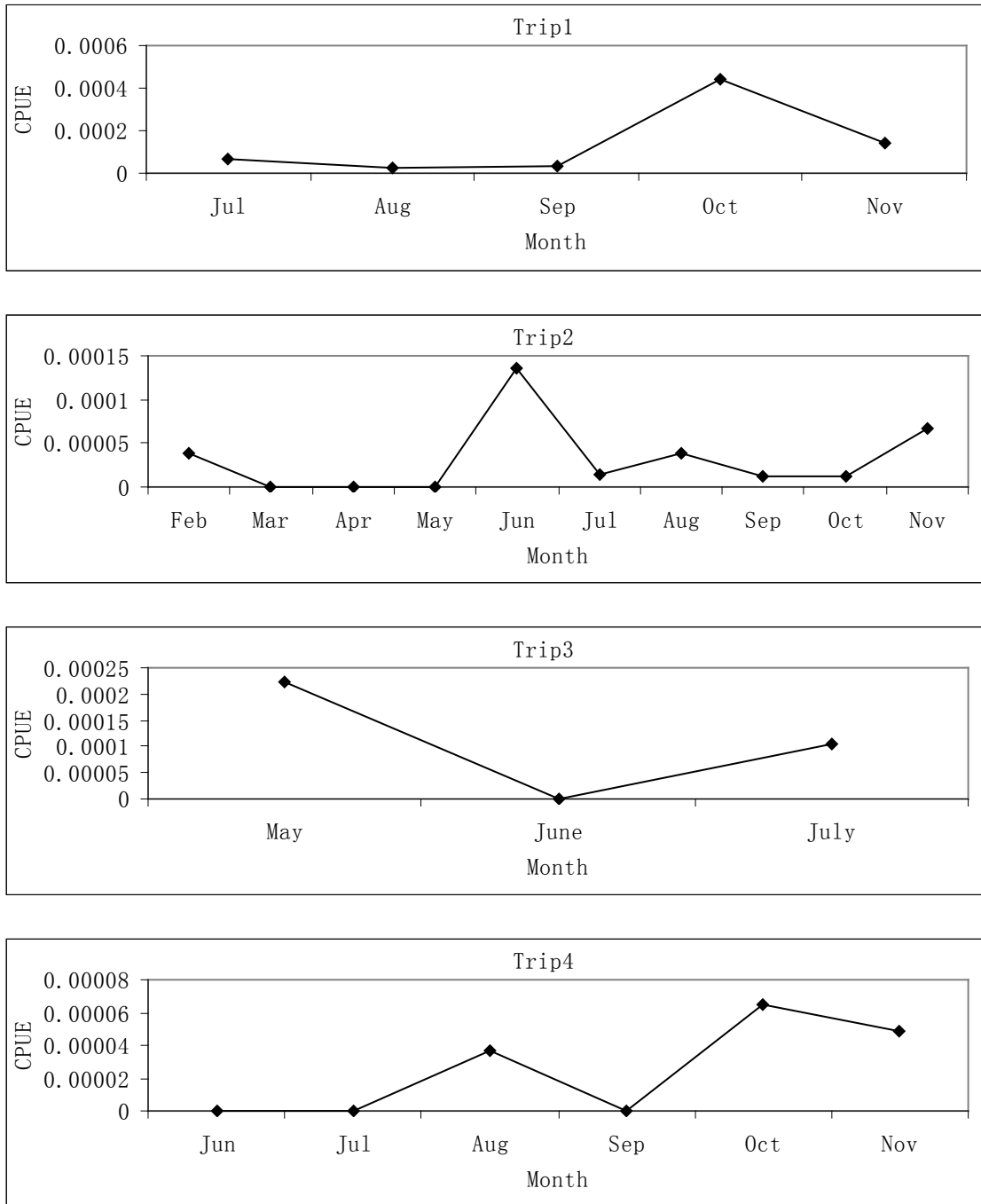
**Figure 4 Set locations of the Chinese longline observer trip in the Pacific Ocean during August-December 2010 (Trip 6)**



**Figure 5 Set locations of the Chinese longline observer trip in the Pacific Ocean during October 2010-January 2011 (Trip 7)**



**Figure 6 Set locations of the Chinese longline observer trip in the Pacific Ocean during November 2010-January 2011 (Trip 8)**



**Figure 7** Monthly averaged CPUE (capture number per 1000 hooks) of striped marlins captured during Chinese longline observer trips

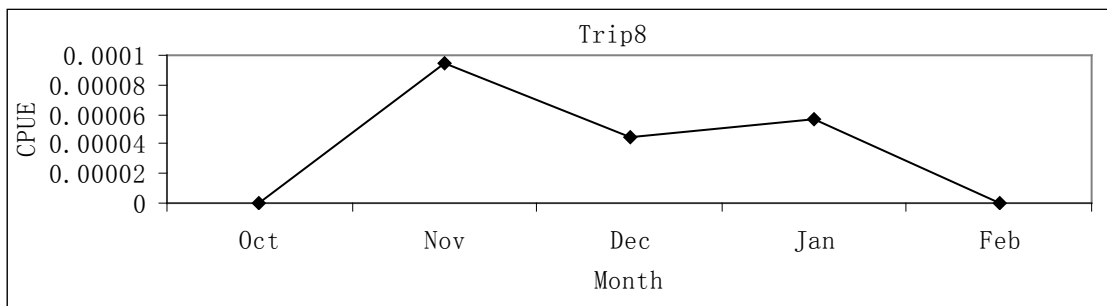
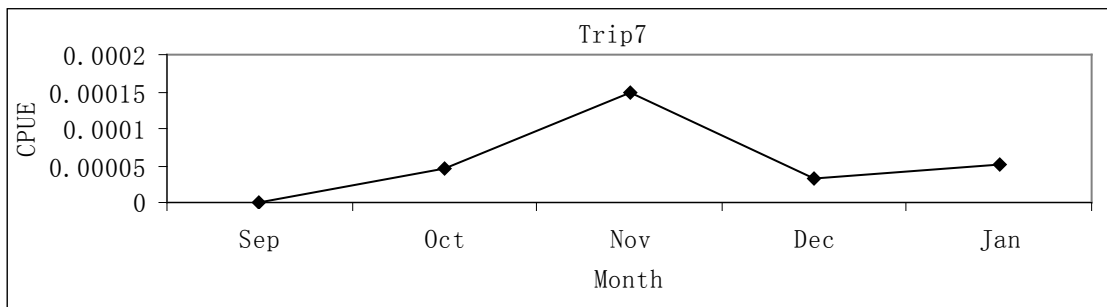
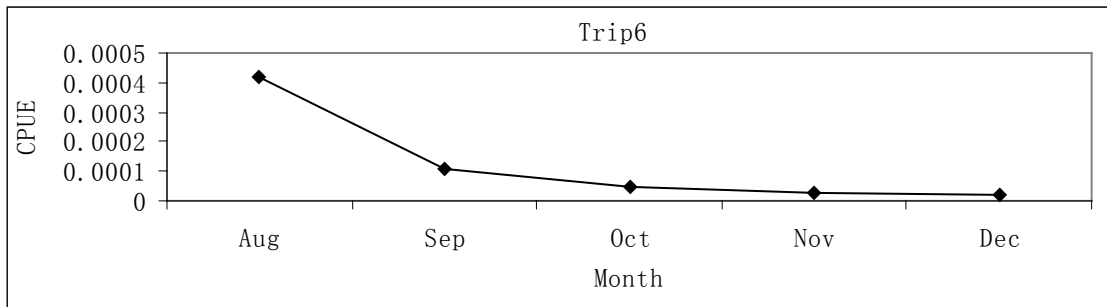
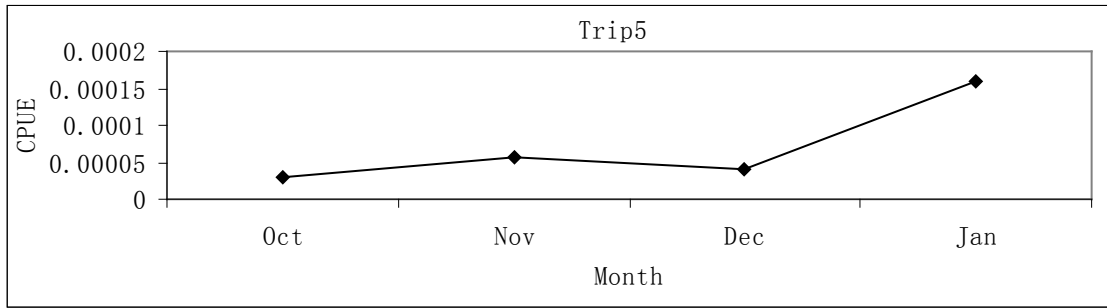


Figure 7 Continued.