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Standardization of longtail tuna (*Thunnus tonggol*) catch rates of drift gillnet fisheries in Sultanate of Oman

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Abstract

Using available longtail tuna nominal catch and effort data from drift gillnet fisheries in Oman (2002-2013), we standardized nominal CPUE (N_CPUE) by GLM. Standardized CPUE (STD_CPUE) suggested that it shows continuous decreasing from 2002-2009 then stabilized in the low level (2010-2013).

Contents

1. Introduction

CPUE is the important information to learn rough trends the stock abundance and also to conduct the stock assessment. In Oman, until last year there were no standardized CPUE studies for neritic tuna. But in the occasion of the project, *"Management of the exploited coastal tuna fisheries resources of the Sultanate of Oman"*, we firstly attempted CPUE standardization for kawakawa (IOTC-2013-WPNT03-31). For this time, we attempt longtail tuna CPUE standardization.

2. Longtail tuna: Ecology, Biology and Fisheries in Oman

The coastline of Oman is about 3,165 km and comprises of Oman Sea and Arabia Sea. Both Seas have unique oceanographic and marine ecosystem features and have rich fisheries resources. Many pelagic species were recoded and longtail is most abundant among coastal tunas.

Ecology

Longtail tuna is the costal, migratory species and exploited by a number of countries in the NW Indian Ocean (Gulf and Oman Sea area) including Yemen, Iran, Oman, UAE, Pakistan and others. (Dudley, 1990). In Oman, longtail tuna is found along the entire coastline (Al-Abdessalaam, 1995). Longtail tuna is a surface-dwelling, neritic species, but not found in turbid low-salinity waters (Randall, 1995), feeds on fishes, crustaceans, and cephalopods (Collette, 2001).

Biology

Sexual maturity is reached when the fish is about 66-67 centimeters in length for male and female, respectively (Tuna project unpublished data). Although sexually mature longtail tuna may be encountered throughout the year, the spawning season is from May to August and the peak was in July (Tuna project unpublished data).

Fisheries

Fisheries in Oman are conducted mainly by 4 types of small-scale traditional fishing vessels, i.e., skiff (fiber glass) (LOA: 8-10m), launch (15-25m), houri and shasha (Plate 1)

(Stengel & Al Harthy, 2002**)**. Major gear for longtail tuna is the drift gillnet. Longtail tuna is a popular food fish in Oman. In Oman, there are some 60 landing sites and 6 six coastal fishing grounds, i.e., Musandam, AL-Batinah, Muscat, AL-Shargyia, AL-Wusta and Dhofar (Fig. 1).

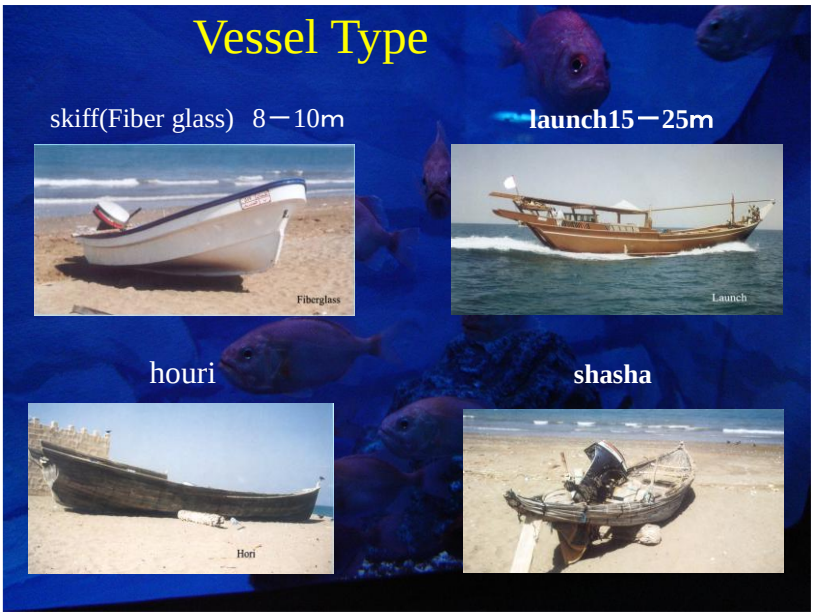

Plate 1 Four types of fishing vessels in Oman

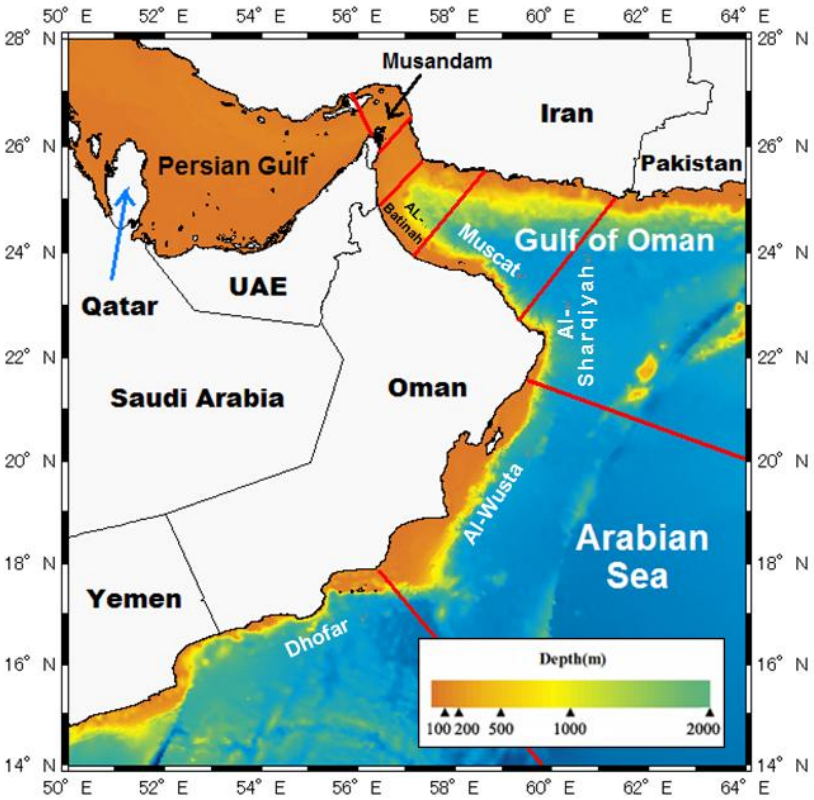

Fig. 1 Six fishing grounds in Oman

Fig. 2 shows catch trends (1997-2013) (GoSO, 2013) which shows the increasing trend from 5,000 to 14,000 tons.

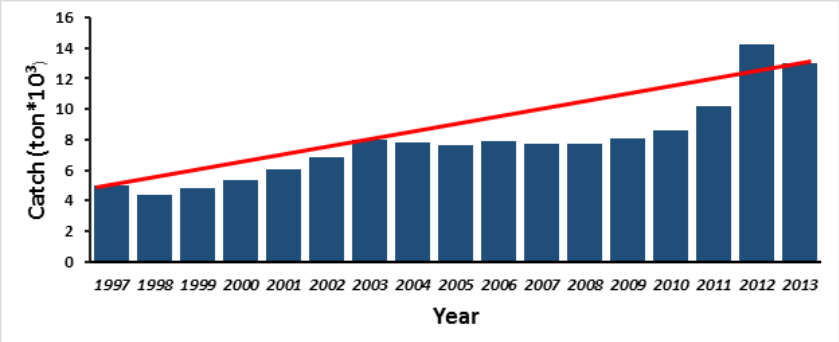

Fig. 2 Longtail tuna catch trends in Oman (1997-2013) (GoSO, 2013)

3. Nominal CPUE

We use longtail tuna catch and effort data (2002-2013) available in the statistical section in the Ministry of Agriculture & Fisheries, Sultanate of Oman. Data in 2013 is not available as it was accidentally deleted during the data processing.

Major gear targeting longtail tuna in Oman is the drift gillnet fisheries using fiber-glass boat and its major longtail tuna fishing ground is Al-Sharqiyah covering both Oman Sea and Arabian Sea. There are longtail tuna catch in other fishing grounds, but numbers of operations by drift gillnet fisheries using fiber-glass boat are much less than in Al-Sharqiyah. Hence we use catch and effort data in Al-Sharqiyah. Fig. 3 shows the nominal longtail tuna CPUE (2002-2013) which is compared with the catch in the NW Indian Ocean.

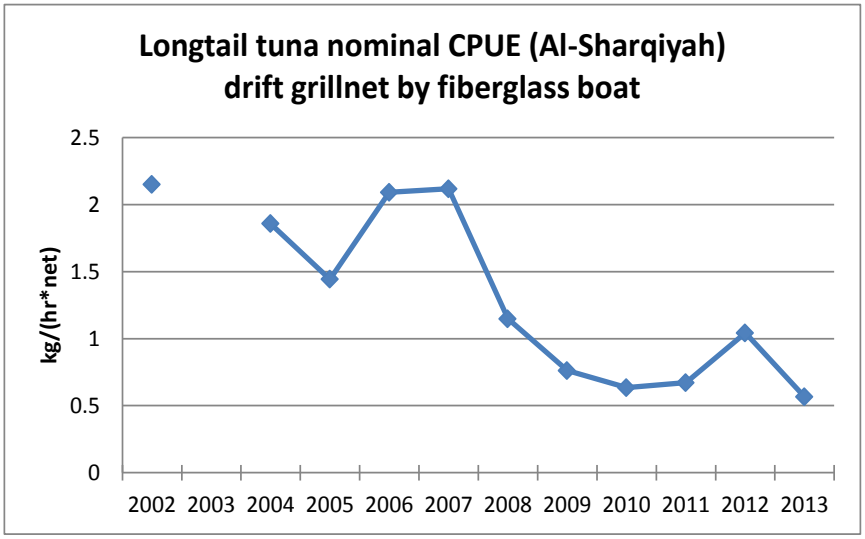

Fig. 3 Trend of longtail tuna nominal CPUE (Al-Sharqiyah, 2002-2013)

4. CPUE standardization

We standardize longtail tuna nominal CPUE of drift gillnet fisheries by fiberglass boat in Al-Sharqiyah using GLM. Our model is described as follows:

Log (CPUE+c) = (mean) + [Y] + [Q] +[Crew] + (error)

*where, CPUE : kg/(gillnet unit*fishing hours) (refer to Table 1, page 11)*

c: 10% of average overall nominal CPUE

Y : effect of year

Q : effect of quarter(season)

Crew: crew (boat size) effect

Box 1 (top) shows results of GLM procedures. Based on ANOVA table, Year and quarter (season) affect nominal CPUE significantly. Box 2 (middle) shows resultant STD_CPUE with 95% confidence intervals made smooth noises in nominal CPUE and show the consistent declining trend, which is a good reflection to the recent sharp decreasing of catch trend. Box 1 (bottom) shows frequency distribution of residuals and QQ plot suggest that GLM is the appropriate method for CPUE standardization.

Based on the GLM analyses, standardized CPUE suggested that and shows the continuous decreasing from 2002-2009 then stabilized in the low level.

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Box 1 Results of GLM for longtail tuna STD_CPUE (Al-Sharqiyah) in drift gillnet fisheries by fiberglass boat. *(top: ANOVA, middle: STD_CPUE and bottom: residuals)*

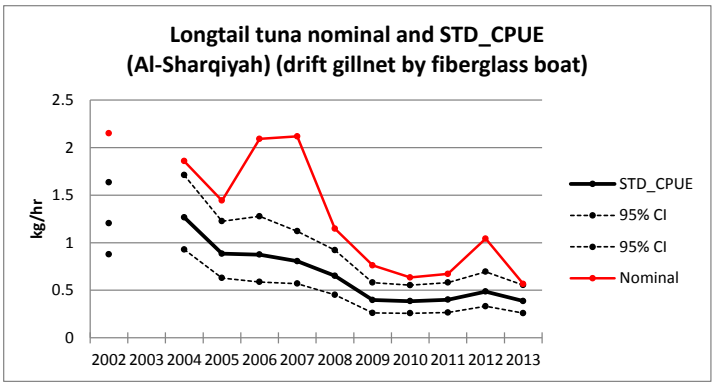
The GLM Procedure

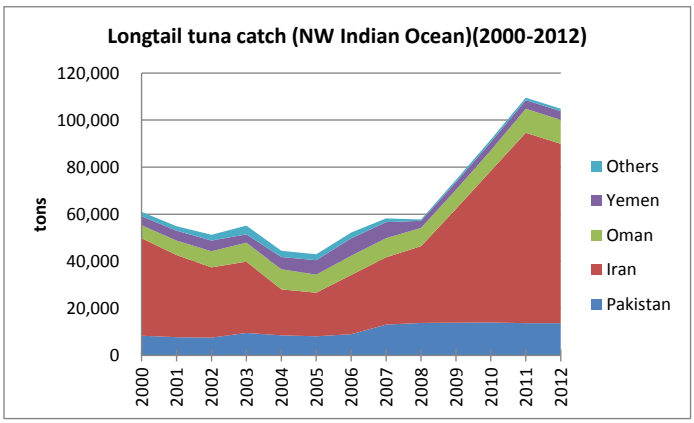
ependent Variable: L_CPUE

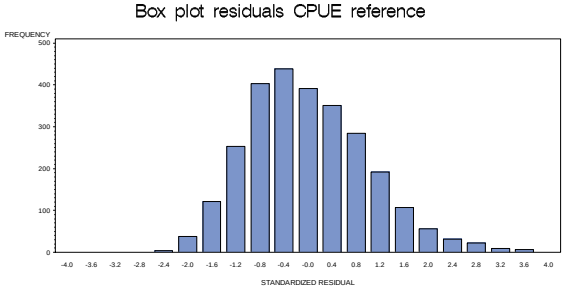
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	22	561.998414	25.545382	33.29	<.0001
Error	2688	2062.589716	0.767332		
Corrected Total	2710	2624.588130			

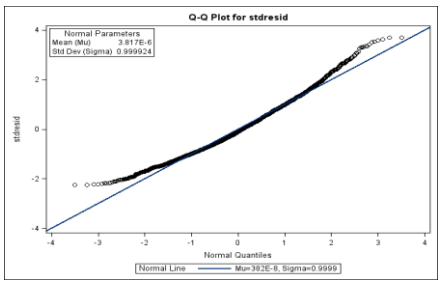
R-Square	Coeff Var	Root MSE	L_CPUE Mean
0.214128	-436.0233	0.875975	-0.200901

Source	DF	Type III SS	Mean Square	F Value	Pr > F
yr	10	396.3105287	39.6310529	51.65	<.0001
q	3	127.8215908	42.6071969	55.53	<.0001
crew	9	52.3305018	5.8145002	7.58	<.0001









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