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CPUE Standardization of *D. gigas* fishery in South-east Pacific Ocean

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CPUE standardization of Chinese *Dosidicus gigas* fishery in South-east Pacific Ocean

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Introduction

Dosidicus gigas fishery is one of the important economic fisheries in the world and also one of the most important oversea fisheries of Chinese Mainland. Chinese squid jigging fleets began to explore this squid in South-east Pacific Ocean in 2001. The Chinese squid jigging vessels are identical with similar catch ability, so vessel was not taken into consideration in this study. According to the fishery-dependent data from year 2003 to year 2014 derived from fishing log and the environment data from satellite remote sensing, we standardized the CPUE of *Dosidicus gigas* by generalized linear model (GLM).

1. Materials and methods

1.1 Fishery-dependent data and environmental data

The fishery-dependent data are derived from China Overseas Fisheries Association. The time series is from year 2003 to year 2014. The data field consists of time, latitude, longitude and yield. The environmental data derived from http://oceanwatch.pifsc.noaa.gov/las/servlets/dataset (NOAA database) include sea surface temperature (SST), sea surface height (SSH) and chlorophyll concentration (CHL). The temporal and spatial resolutions of the data are month and $0.5° \times 0.5°$ (longitude×latitude) respectively.

1.2 Statistical model

GLM was used in this study. The expression of GLM model is as follows:

$$ln(CPUE + \sigma) = k + \sum \ (a_i \times x_i) \ + \varepsilon \qquad (1)$$

where k is intercept, x_i is independent variable and a_i is the coefficient, and ε is the standard error which is assumed as normal distribution with 0 mean. The value of σ is 10% of average CPUE which was added to deal with the 0 value problem. The statistical analysis was processed by R.

2. Results

The dependent variable $ln(CPUE + \sigma)$ was assumed to obey normal distribution (Fig.1). The independent variables LON, LAT, SST, SSH significantly affect the dependent variable ($P<0.05$). The Trends of the standardized CPUE and nominal CPUE are the same. The standardized CPUE was used as an index of stock abundance in stock assessment models.
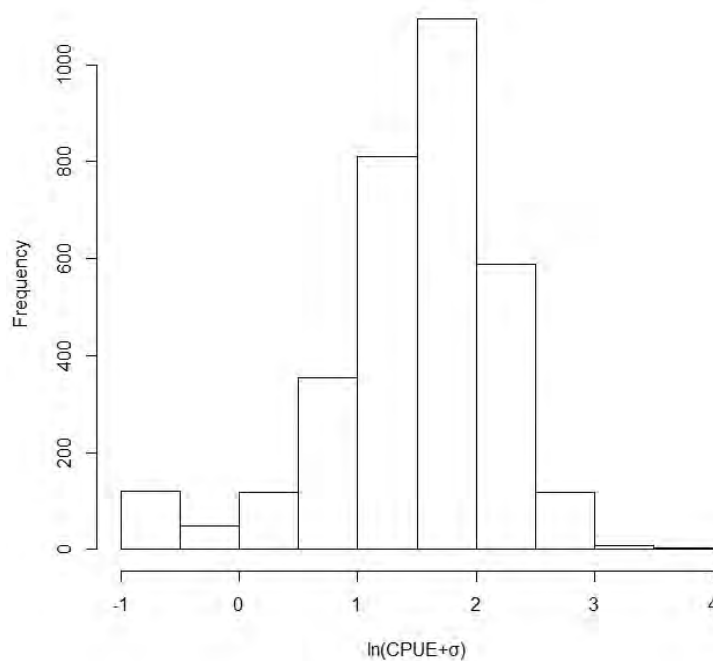
Fig.1 Frequency of $ln(CPUE + \sigma)$

Tab.1 Summary of the GLM model

| Variable	Coefficient	SD	p-value
(Intercept)	1.720	0.667	0.010
Year 2004	0.629	0.066	0.000
Year 2005	0.025	0.023	0.000
Year 2006	0.179	0.079	0.025
Year 2007	-0.320	0.074	0.000
Year 2008	-0.052	0.063	0.403
Year 2009	-0.205	0.062	0.001
Year 2010	0.031	0.059	0.600
Year 2011	-0.013	0.050	0.800
Year 2012	-0.425	0.053	0.000
Year 2013	0.080	0.032	0.000
Year 2014	0.023	0.025	0.023
LON	-0.021	0.007	0.003
LAT	0.017	0.006	0.003
SST	-0.044	0.017	0.011
SSH	-0.008	0.004	0.023
CHA	-0.042	0.026	0.104
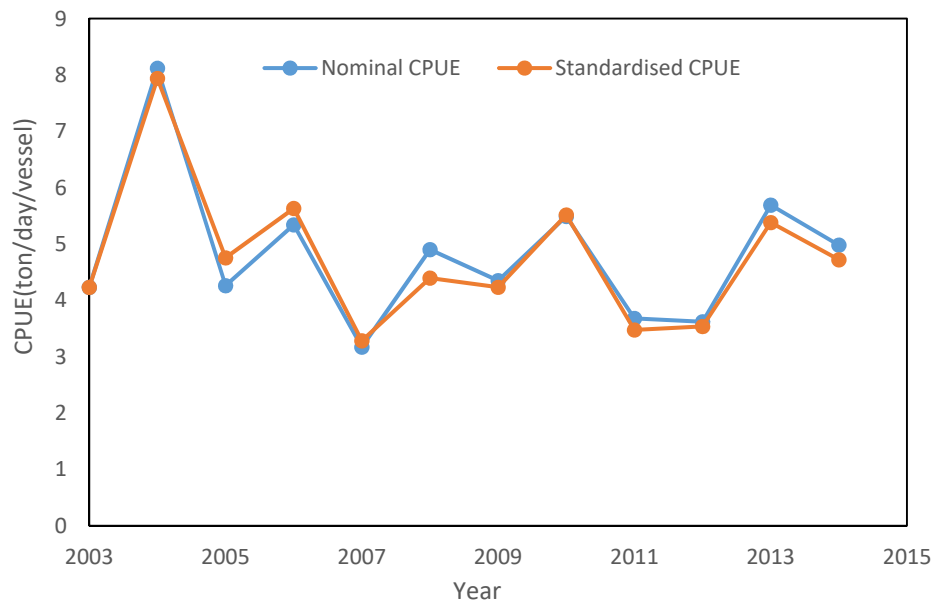
Fig.2 The comparision between Nominal CPUE and standardized CPUE