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Japanese longline CPUE for bigeye tuna in the Indian Ocean standardized by GLM

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Abstract

Standardization of Japanese longline CPUE for bigeye tuna was conducted for 1960-2014 by using GLM (generalized linear model, log normal error structured). Methods of standardization are the same as or similar to those used at IOTC WPTT in 2014 or before. The effects of season (month or quarter), subarea or LT5LN5 (five degree latitude-longitude block), SST (sea surface temperature), NHF (number of hooks between floats) and material of main line, and several interactions between them were used for standardization. The trend of CPUE slightly differed by area, but high jump in 1977 and 1978, slight decrease after that, and increasing trend in the recent few years, but decrease in the latest year are seen as for each area.

1. Introduction

Bigeye tuna is one of main target species for Japanese longline fishery in the Indian Ocean. Its abundance indices are very important for stock assessment of this species because they have high spatial and temporal coverage, and detailed information on catch and effort is available through logbooks.

Satoh and Okamoto (2012) Matsumoto et al. (2013) and Ochi et al. (2014) reported area aggregated annual standardized Japanese longline CPUE for bigeye tuna based on GLM (generalized linear model, log normal error structured) for an indicator of the stock. Also, area specific CPUE for integrated models was reported at the last IOTC WPTT-16 meeting (Ochi et al. 2014). Methods of standardization in this study are the same as above mentioned studies. In this study, area specific and area aggregated CPUEs have been updated for consideration for future stock assessment of bigeye tuna (scheduled in 2016) as well as to provide an indicator of the stock. In addition, an alternative method was also examined for area aggregated CPUE to consider if the trend of CPUE differs depending on standardization methods, as with previous study (Matsumoto et al. 2013).

2. Materials and methods

Area and sub-area definition:

Sub-area definition for area aggregated CPUE used in this study (Fig. 1), which consists of seven areas, is the same as those used in the IOTC bigeye assessment in 2006 (Okamoto and Shono 2006) and in 2010 (Okamoto and Shono 2010), and updated CPUE submitted at 2012 - 2014 IOTC WPTT meetings (Satoh and Okamoto 2012, Matsumoto et al. 2013, Ochi et al. 2014). Main fishing ground of Japanese longline

fishery for bigeye was divided into seven areas and CPUE standardization was done for three cases of area combinations, tropical (areas 1-5), south (areas 6 & 7) and whole (areas 1-7) Indian Ocean. Area 67 in the central south area was not used in this study. Area aggregated CPUE was standardized for each of three area categories, tropical, south and whole Indian Ocean.

Area definition for area specific CPUE used in this study (Fig. 2) was done so that it agrees with areas for stock assessment using integrated models. Fishing ground was divided into three areas: West (tropical area), East (tropical area) and South (subtropical and temperate area).

Environmental factors:

As environmental factors, which are available for the analyzed period of 1960-2014, SST (sea surface temperature) was applied. The original SST data, whose resolution is 1-degree latitude and 1-degree longitude by month from 1946 to 2014, were downloaded from NEAR-GOOS Regional Real Time Data Base of Japan Meteorological Agency (JMA) http://near-goos1.jodc.go.jp/index_j.html. The original data was recompiled into 5 x 5 degrees latitude and longitude by month from 1960 to 2014 using the procedures described in Okamoto et al. (2001), and was used in the analyses. The SST data for November and December in 2014 were replaced by SST data for the same month in 2013 because these data were unreleased in data base.

Catch and effort data used:

The Japanese longline catch (in number) and effort statistics from 1960 up to 2014 were used. The catch and effort data set based on logbook data aggregated by month, 5 x 5 degree square, NHF (the number of hooks between floats), and main line material, were used for the analysis. Data in the strata in which the number of hooks was less than 5000 were not used for analyses. As the NHF information is not available for the period from 1960 to 1974, NHF was regarded to be 5 in this period. Main line material was categorized into two: 1 = Nylon and 2 = other, which is not available before 1993. The main line material was assumed as 'other' from 1975 to 1993 except as NHF was over 18 from 1990 to 1993, in which it was assumed as 'Nylon'.

CPUE standardizations by GLM

CPUEs based on the number of catch were used; (the number of fish caught) / (the number of hooks) * 1000. The model used for GLM analyses (CPUE log normal error structured model) is as follows;

Area aggregated CPUE (annual):

Log [CPUE +const] = μ + year + month + area + NHFC + SST + ML + year*area + month*area + area*NHFC + area*SST + NHFC*ML + error

Area aggregated CPUE (quarterly):

Log [CPUE +const] = μ + year + quarter + area + NHFC + SST + ML + year*quarter *area + area*NHFC

+ area*SST + NHFC*ML + error

Area specific CPUE:

Log [CPUE +const] = μ + year + quarter + NHFC + ML + SST + LT5LN5 + year*quarter + NHFC*ML + error

where

Log: natural logarithm,

CPUE: catch in number of bigeye per 1000 hooks,

const: 10% of overall mean of CPUE,

μ: intercept,

year: effect of year,

month: effect of fishing season (month),

area: effect of sub-area,

NHFC: effect of gear type (class of the number of hooks between floats). The number of hooks between floats (NHF) was divided into 6 classes (NHFC 1: 5-7, NHFC 2: 8-10, NHFC 3: 11-13, NHFC 4: 14-16, NHFC 5: 17-19, NHFC 6: 20-21),

SST: effect of SST (sea surface temperature),

ML: effect of material of main line,

LT5LN5: effect of each latitude 5 degree and longitude 5 degree square,

quarter: effect of fishing season (quarter),

error ~ normal (0, σ^2).

Input variables for the model was selected by a backwards stepwise F-test with a criterion of $P < 0.05$. In the cases in which the factor was not significant as main factor but was significant as interaction with another factor, the main factor was kept in the model.

Effect of year was obtained by the method used in Shono and Ogura (1999) that uses lsmean of Year-Area interaction as the following equation except for area specific CPUE.

$CPUE_i = \Sigma W_j * (\exp(\text{lsmean}(\text{year } i * \text{area } _j)) - \text{constant})$

where $CPUE_i$ = CPUE in year i, W_j = area rate of Area j , ($\Sigma W_j = 1$), lsmean (year*$area_{ij}$) = least square mean of year-area interaction in year i and area j, constant = 10% of overall mean of CPUE. As for area aggregated CPUE in the tropical and whole Indian Ocean which includes Areas 1 and 3, CPUE in 2010 and 2011 was calculated using area rate without Area 1 and Area 1 & 3, respectively because no effort was observed in these year and area due to piracy activities (Fig. 3). Time period of standardization was 1960-2013 for all CPUEs.

As for alternative method, area aggregated CPUE (annual base) was standardized using the effect of LT5LN5 instead of subarea. The model is as follows.

Area aggregated CPUE (annual, with LT5LN5):

Log [CPUE +const] = μ + year + month + LT5LN5 + NHFC + SST + ML + NHFC*ML + error

In this model, SST (integer value) was incorporated as categorical value. The results were compared with those with the effect of subarea. In this model, effect of year was obtained using the following equation.

$CPUE_i$ = exp(lsmean(year i)) - constant

3. Results and discussion

Area aggregated CPUE

Trends of area aggregated CPUE in each region (tropical, south and whole of the Indian Ocean) are shown in Fig. 4. In the tropical Indian Ocean, CPUE slightly decreased from around 9.5 (real scale) in 1960 to 6.5 in 1976. It suddenly jumped up to around 12 in 1977 and 1978 and then it declined and became stable until around 1990 with some fluctuation, after which it had continuously decreased to 3.2 in 2002. CPUE in during 2009-2012 was increasing, and was 6.4 in 2012, but decreased to 4.6 in 2014. The standardized CPUE in the south region also sharply increased (8.4) in 1977 and then showed slightly decreasing trend. It was increasing trend during 2009-2012 (from 1.5 to 2.8) but decreased to 1.5 in 2014. As a result, CPUE in the whole Indian Ocean, which had been in the same level around 5 to 7 until 1976 and suddenly increased around 10 in 1977 and 1978 and after that showed slightly decreasing trend. It was 4.7 in 2012, which is higher than the values of the last decade (2.6 – 4.2). However, CPUE decreased to 3.5 in 2014. Comparatively large difference between standardized and nominal CPUE is seen in the tropical area, though not apparent in the south area. This is considered to be due to the development of fishing gear (deep longline and nylon material) which was pronounced in the tropical area (Satoh and Okamoto, 2012). Large difference between two CPUEs in the tropical area in recent years may be also due to the shift of fishing ground to the east area, where bigeye CPUE is usually higher, by the effect of piracy activities. Results of ANOVA are shown in Table 1, and distributions of the standardized residual and QQ-plot for annual and quarterly CPUE are shown in Fig. 5 and Fig. 6, respectively. Distributions of the standardized residual did not show remarkable difference from the normal distribution. Annual and quarterly values of standardized CPUE by region are listed in Appendix Table 1 and Appendix Table 2, respectively.

Results of ANOVA for annual CPUE with the effect of LT5LN5 in each area are shown in Table 2. ANOVA table indicates that the effect of LT5LN5 was the largest in the tropical and whole areas and the second largest in the south area, indicating that the effect of fishing ground is important. Comparison of CPUE trend with the model for each subarea (**Fig. 7**) indicates that there is not large difference of the trend of CPUE except for a part of the period. This is different trend from the case of yellowfin tuna CPUE by Japanese longline (Ochi et al., 2014). Possible cause of the difference is that subareas for bigeye tuna CPUE are smaller than those for yellowfin tuna hence the effect of fishing ground was well incorporated by using subareas.

Area specific CPUE

Trends of area specific CPUE in each region (east, west and south area) are shown in Fig. 8. Basically the trends for east and west area are similar to that of area aggregated CPUE in the tropical area. CPUE for south area is very close to that of area aggregated CPUE in the south Indian Ocean. Results of ANOVA are shown in Table 3, and the distributions of the standardized residual and QQ-plot are shown in Fig. 9. Distributions of the standardized residual did not show remarkable difference from the normal distribution. Quarterly values of standardized CPUE by region are listed in Appendix Table 2.

4. References

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Shono, H. and M. Ogura, M. (1999): The standardized skipjack CPUE including the effect of searching devices, of the Japanese distant water pole and line fishery in the Western Central Pacific Ocean. ICCAT-SCRS/99/59, p.18

Table 1. ANOVA tables of GLM for bigeye tuna standardized CPUE (area aggregated) for Japanese longline. CV, the coefficient of variation, which describes the amount of variation in the population, is 100 times the standard deviation estimate of the dependent variable (CPUE), Root MSE (Mean Square for Error), divided by the Mean. Left: annual, right: quarterly.

Annual

tropical

RSquare	CV
0.34	31.30

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Model	362	5572.41	15.39	46.98	<.0001
year	54	626.93	11.61	35.44	<.0001
month	11	128.82	11.71	35.74	<.0001
area	4	162.92	40.73	124.32	<.0001
nhfc	5	40.10	8.02	24.48	<.0001
sst	1	16.17	16.17	49.36	<.0001
ML	1	1.88	1.88	5.73	0.0167
year*area	213	588.92	2.76	8.44	<.0001
month*area	44	210.01	4.77	14.57	<.0001
area*nhfc	20	58.96	2.95	9	<.0001
sst*area	4	150.04	37.51	114.49	<.0001
nhfc*ML	5	55.43	11.09	33.84	<.0001

south

RSquare	CV
0.36	77.62

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Model	149	5679.05	38.11	65.36	<.0001
year	54	1024.65	18.98	32.54	<.0001
month	11	619.76	56.34	96.62	<.0001
area	1	0.05	0.05	0.09	0.7679
nhfc	5	74.97	14.99	25.71	<.0001
sst	1	222.96	222.96	382.35	<.0001
ML	1	4.05	4.05	6.95	0.0084
year*area	54	259.60	4.81	8.24	<.0001
month*area	11	47.14	4.29	7.35	<.0001
area*nhfc	5	32.22	6.44	11.05	<.0001
sst*area	1	1.955543	1.955543	3.35	0.0671
nhfc*ML	5	23.12	4.62	7.93	<.0001

whole

RSquare	CV
0.45	39.76

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Model	506	15940.42	31.50	81.26	<.0001
year	54	968.65	17.94	46.27	<.0001
month	11	134.79	12.25	31.61	<.0001
area	6	173.61	28.93	74.63	<.0001
nhfc	5	70.28	14.06	36.26	<.0001
sst	1	6.54	6.54	16.87	<.0001
ML	1	0.20	0.20	0.52	0.4702
year*area	321	1501.42	4.68	12.06	<.0001
month*area	66	768.60	11.65	30.04	<.0001
area*nhfc	30	133.70	4.46	11.5	<.0001
sst*area	6	176.96	29.49	76.08	<.0001
nhfc*ML	5	43.48	8.70	22.43	<.0001

Quarterly

tropical

RSquare	CV
0.39	30.47

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Model	1071	6362.75	5.94	19.14	<.0001
year	54	412.00	7.63	24.58	<.0001
quarter	3	8.09	2.70	8.69	<.0001
area	4	83.70	20.92	67.42	<.0001
nhfc	5	33.91	6.78	21.85	<.0001
sst	1	1.22	1.22	3.94	0.0473
ML	1	2.34	2.34	7.53	0.0061
year*quarter*area	974	1693.06	1.74	5.6	<.0001
area*nhfc	20	49.79	2.49	8.02	<.0001
sst*area	4	75.25	18.81	60.62	<.0001
nhfc*ML	5	56.04	11.21	36.11	<.0001

south

RSquare	CV
0.42	74.39

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Model	449	6653.58	14.82	27.67	<.0001
year	54	702.60	13.01	24.29	<.0001
quarter	3	233.70	77.90	145.45	<.0001
area	1	8.20	8.20	15.31	<.0001
nhfc	5	55.53	11.11	20.74	<.0001
sst	1	403.44	403.44	753.29	<.0001
ML	1	1.37	1.37	2.55	0.1102
year*quarter*area	373	1463.87	3.92	7.33	<.0001
area*nhfc	5	14.66	2.93	5.48	<.0001
sst*area	1	22.06	22.06	41.19	<.0001
nhfc*ML	5	12.378837	2.475767	4.62	0.0003

whole

RSquare	CV
0.50	38.44

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Model	1515	17576.41	11.60	32.02	<.0001
year	54	621.83	11.52	31.78	<.0001
quarter	3	31.83	10.61	29.28	<.0001
area	6	96.22	16.04	44.26	<.0001
nhfc	5	56.00	11.20	30.91	<.0001
sst	1	1.34	1.34	3.7	0.0544
ML	1	0.16	0.16	0.45	0.5011
year*quarter*area	1404	3963.22	2.82	7.79	<.0001
area*nhfc	30	95.51	3.18	8.79	<.0001
sst*area	6	119.31	19.88	54.88	<.0001
nhfc*ML	5	36.92	7.38	20.38	<.0001

Table 2. ANOVA tables of GLM for bigeye tuna standardized CPUE (area aggregated, with LT5LN5 instead of subareas) for Japanese longline. CV, the coefficient of variation, which describes the amount of variation in the population, is 100 times the standard deviation estimate of the dependent variable (CPUE), Root MSE (Mean Square for Error), divided by the Mean.

Annual with LT5LN5

tropical

RSquare	CV				
0.34	31.30				
Source	DF	Type III SS	Mean Square	F Value	Pr > F
Model	0.336	31.30411	0.572377	1.8284	0
year	54	849.20	15.73	48	<.0001
month	11	104.22	9.47	28.92	<.0001
LT5LN5	80	2299.75	28.75	87.75	<.0001
nhfc	5	11.63	2.33	7.1	<.0001
sst	7	71.57	10.22	31.21	<.0001
ML	1	0.35	0.35	1.07	0.3018
nhfc*ML	5	46.90	9.38	28.63	<.0001

south

RSquare	CV				
0.39	76.03				
Source	DF	Type III SS	Mean Square	F Value	Pr > F
Model	138	6078.45506	44.04678	78.73	<.0001
year	54	887.31	16.43	29.37	<.0001
month	11	557.39	50.67	90.58	<.0001
LT5LN5	46	913.10	19.85	35.48	<.0001
nhfc	5	43.86	8.77	15.68	<.0001
sst	16	33.35	2.08	3.73	<.0001
ML	1	3.92	3.92	7.00	0.01
nhfc*ML	5	19.78	3.96	7.07	<.0001

whole

RSquare	CV				
0.43	40.51				
Source	DF	Type III SS	Mean Square	F Value	Pr > F
Model	219	15080.28	68.86	171.07	<.0001
year	54	1224.37	22.67	56.33	<.0001
month	11	196.05	17.82	44.28	<.0001
LT5LN5	127	6730.95	53.00	131.67	<.0001
nhfc	5	8.80	1.76	4.37	0.0006
sst	16	261.96	16.37	40.67	<.0001
ML	1	0.27	0.27	0.68	0.4104
nhfc*ML	5	62.49	12.50	31.05	<.0001

Table 3. ANOVA tables of GLM for bigeye tuna standardized CPUE (area specific, quarterly) for Japanese longline. CV, the coefficient of variation, which describes the amount of variation in the population, is 100 times the standard deviation estimate of the dependent variable (CPUE), Root MSE (Mean Square for Error), divided by the Mean.

East

RSquare	CV				
0.29	26.92				
Source	DF	Type III SS	Mean Square	F Value	Pr > F
Model	269	1612.62	5.99	20.64	<.0001
year	54	404.31	7.49	25.77	<.0001
quarter	3	12.31	4.10	14.12	<.0001
nhfc	5	15.98	3.20	11	<.0001
ML	1	0.13	0.13	0.44	0.5066
sst	1	7.19	7.19	24.74	<.0001
LT5LN5	39	462.65	11.86	40.84	<.0001
year*quarter	161	290.80	1.81	6.22	<.0001
nhfc*ML	5	10.99	2.20	7.56	<.0001

West

RSquare	CV				
0.40	33.53				
Source	DF	Type III SS	Mean Square	F Value	Pr > F
Model	265	4280.20	16.15	49.82	<.0001
year	54	481.92	8.92	27.53	<.0001
quarter	3	59.36	19.79	61.04	<.0001
nhfc	5	5.90	1.18	3.64	0.0027
ML	1	0.62	0.62	1.9	0.1678
sst	1	4.61	4.61	14.21	0.0002
LT5LN5	40	936.54	23.41	72.22	<.0001
year*quarter	156	391.87	2.51	7.75	<.0001
nhfc*ML	5	24.25	4.85	14.96	<.0001

South

RSquare	CV				
0.41	74.62				
Source	DF	Type III SS	Mean Square	F Value	Pr > F
Model	277	6423.74	23.19	42.88	<.0001
year	54	721.02	13.35	24.69	<.0001
quarter	3	327.00	109.00	201.57	<.0001
nhfc	5	44.54	8.91	16.47	<.0001
ML	1	2.99	2.99	5.52	0.0188
sst	1	41.52	41.52	76.77	<.0001
LT5LN5	46	986.18	21.44	39.65	<.0001
year*quarter	162	558.60	3.45	6.38	<.0001
nhfc*ML	5	17.06	3.41	6.31	<.0001

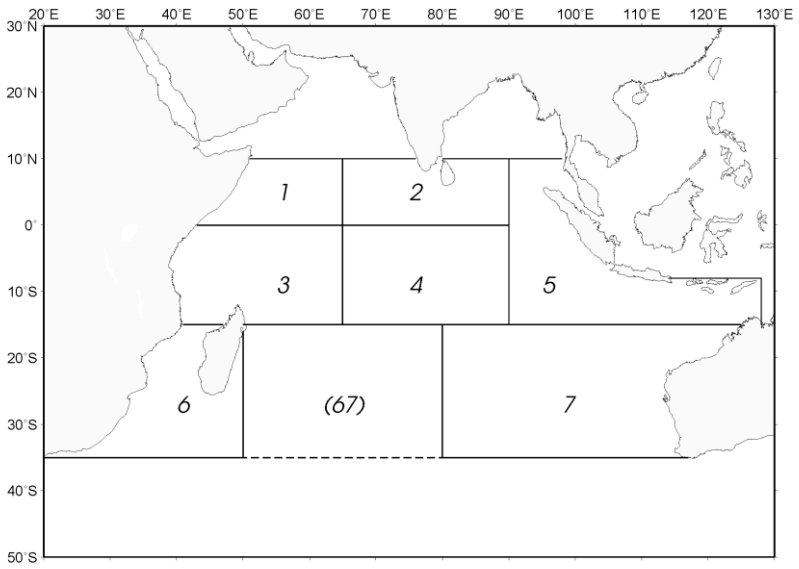


Fig. 1. Definition of sub-areas for area aggregated CPUE used in this study. The tropical, south and whole Indian Ocean regions in this paper consist of areas 1-5, areas 6-7 and areas1-7, respectively. Area 67 was not used in this study.

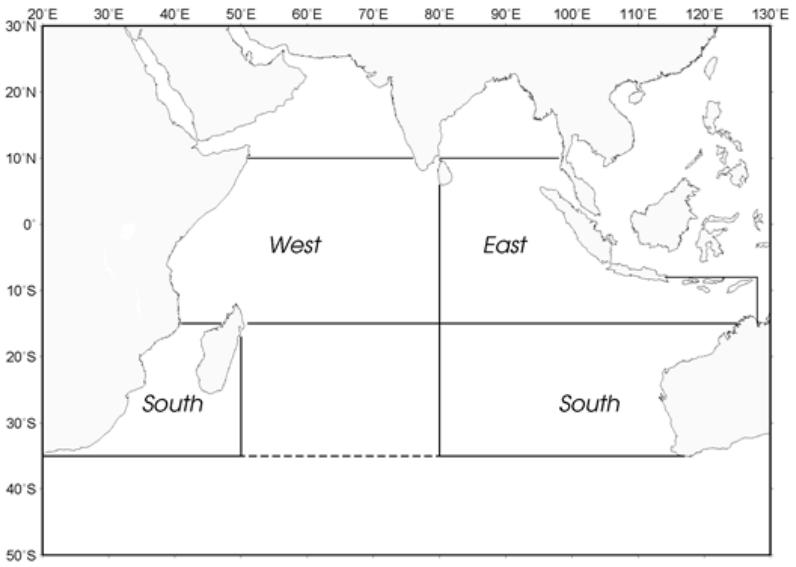


Fig. 2. Another definition of areas for area specific CPUE formatted for integrated model.

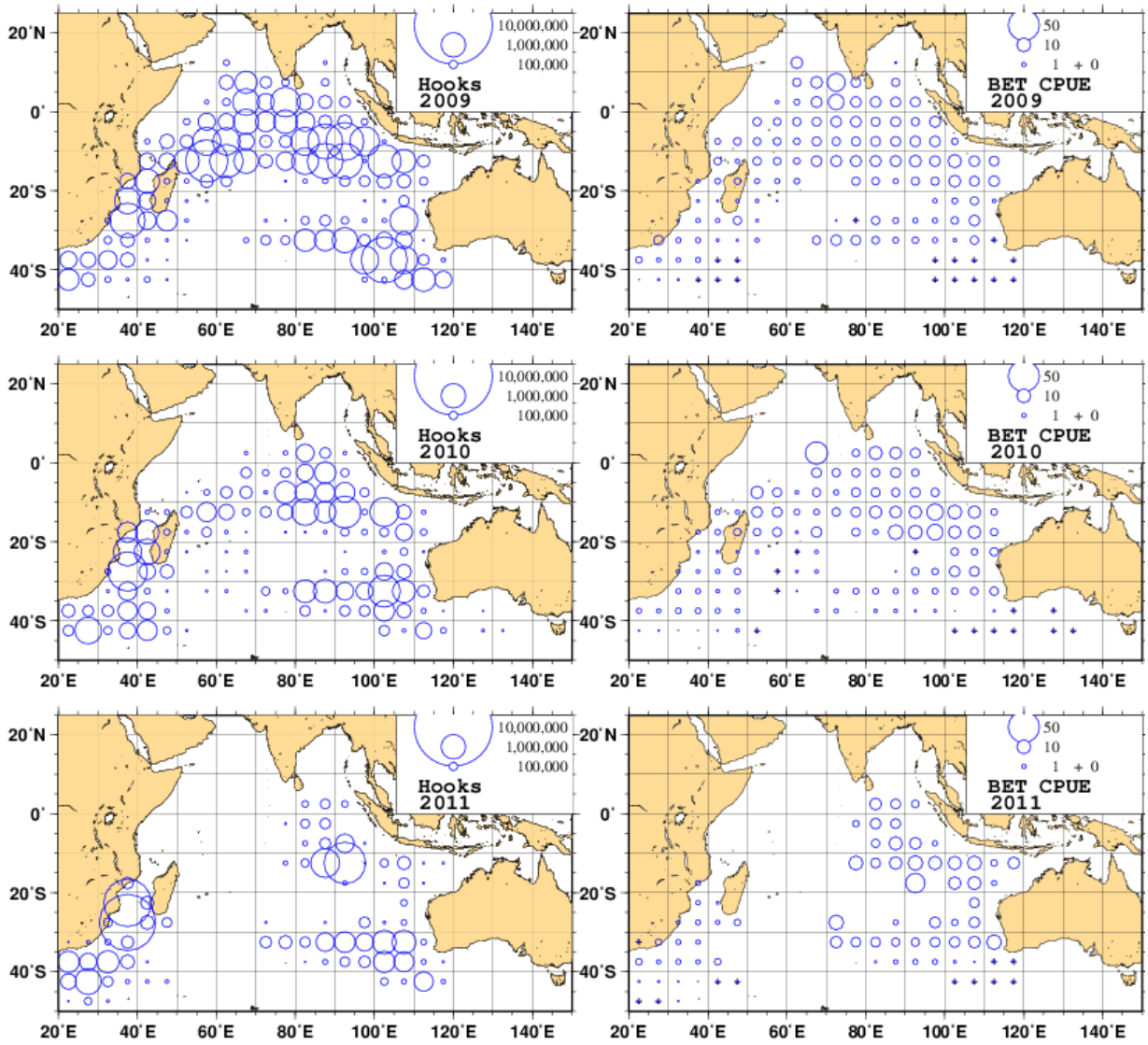


Fig. 3. Geographical distribution of fishing effort by Japanese longline in recent years.

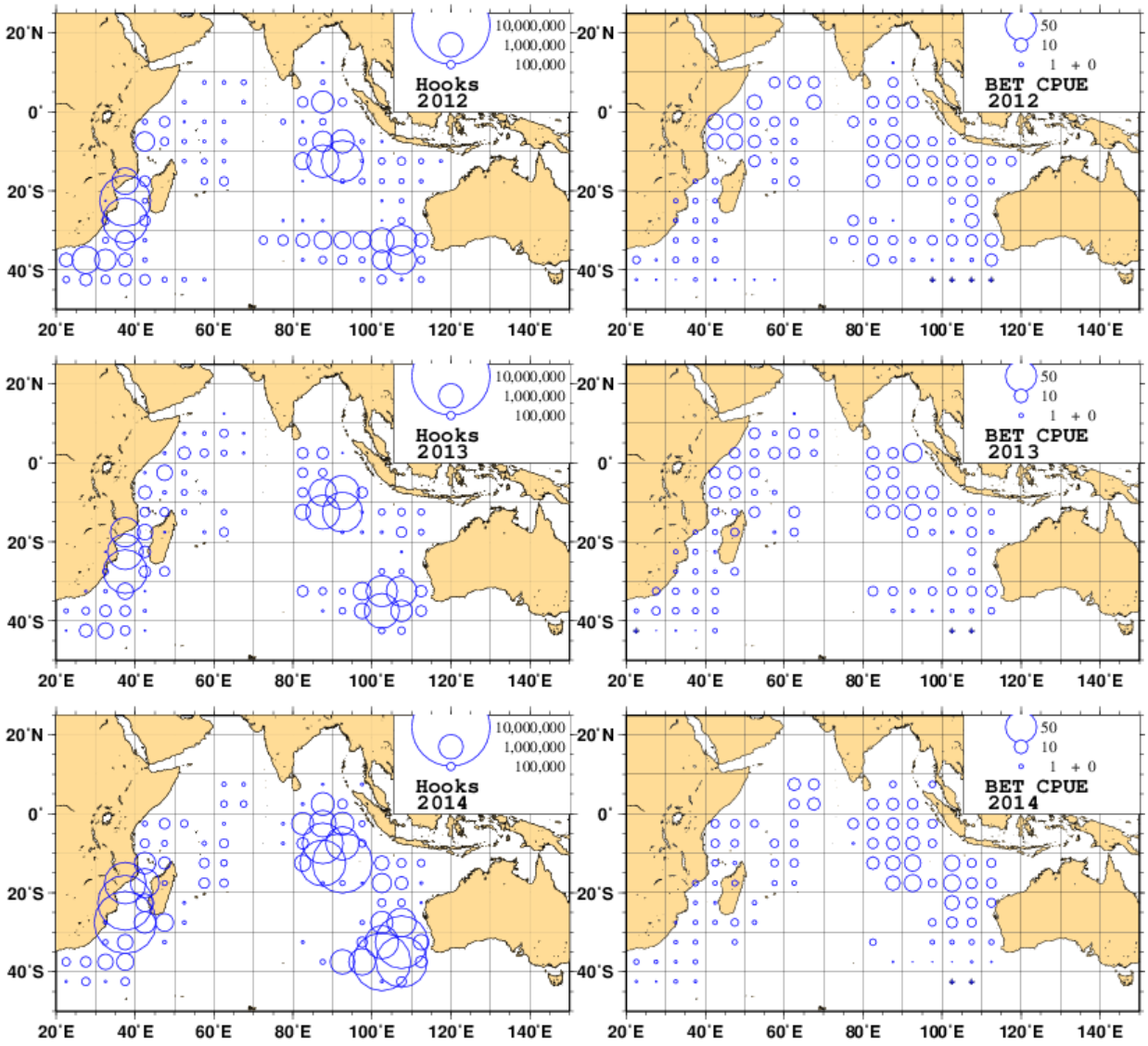


Fig. 3. Geographical distribution of fishing effort by Japanese longline in recent years. (continued)

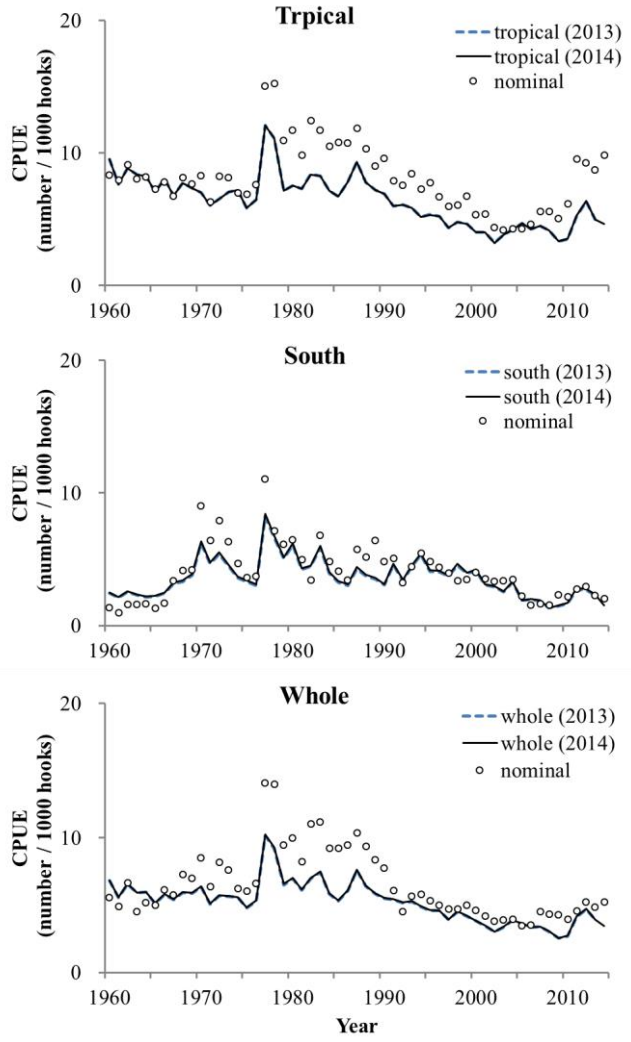
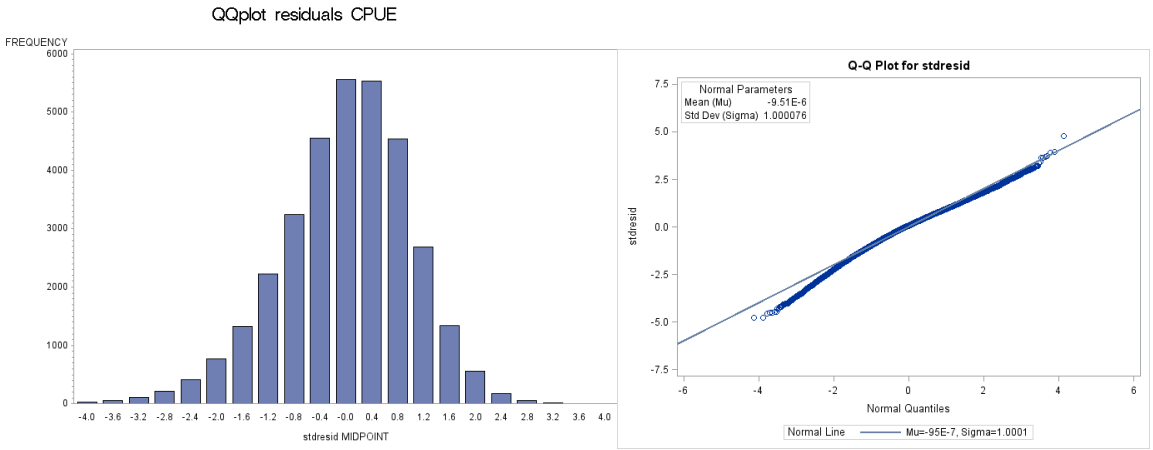


Fig. 4. Comparison of area aggregated annual (left) and quarterly (right) CPUE series of bigeye. Standardized CPUE created in 2015 (solid line), nominal CPUE (open circle), and standardized CPUE created in 2014 (dashed line: Ochi el al., 2014) of Japanese longline for the tropical (top), south (middle) and whole (bottom) Indian Ocean.

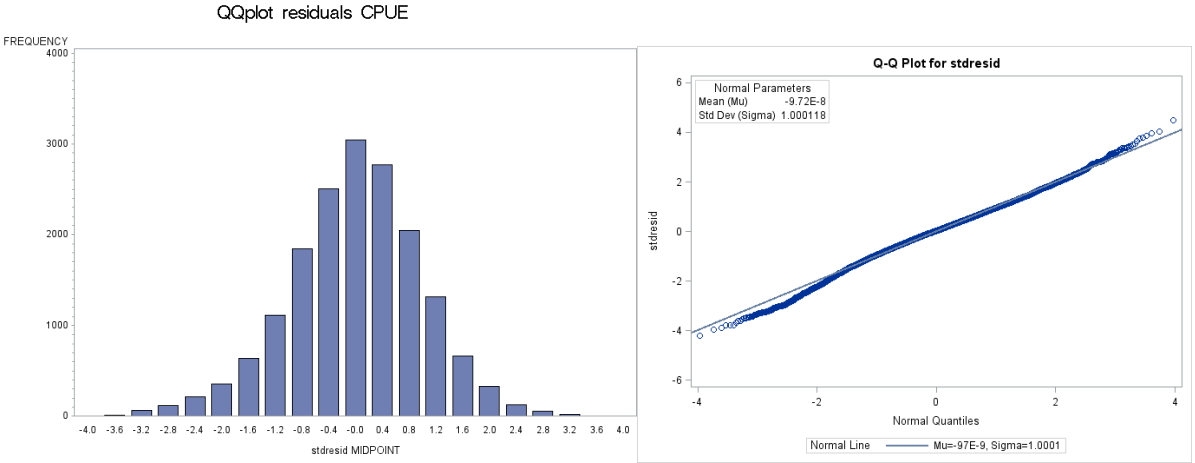
1960-2014 Year based

Tropical area



1960-2014 Year based

South area



1960-2014 Year based

Whole area

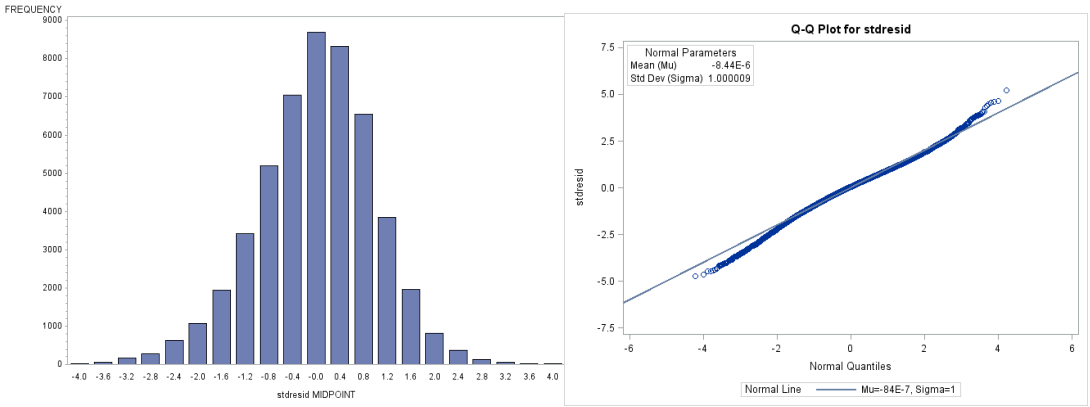
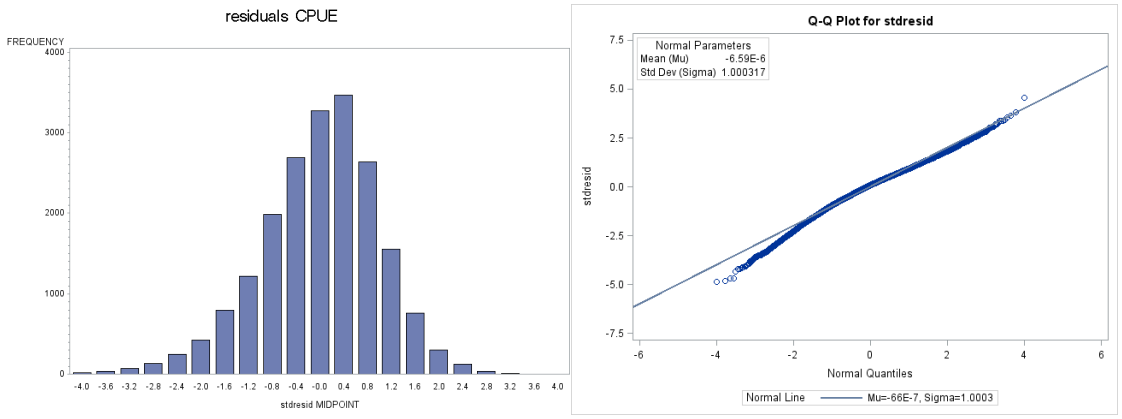


Fig. 5. Standardized residuals of area aggregated annual CPUE standardization.

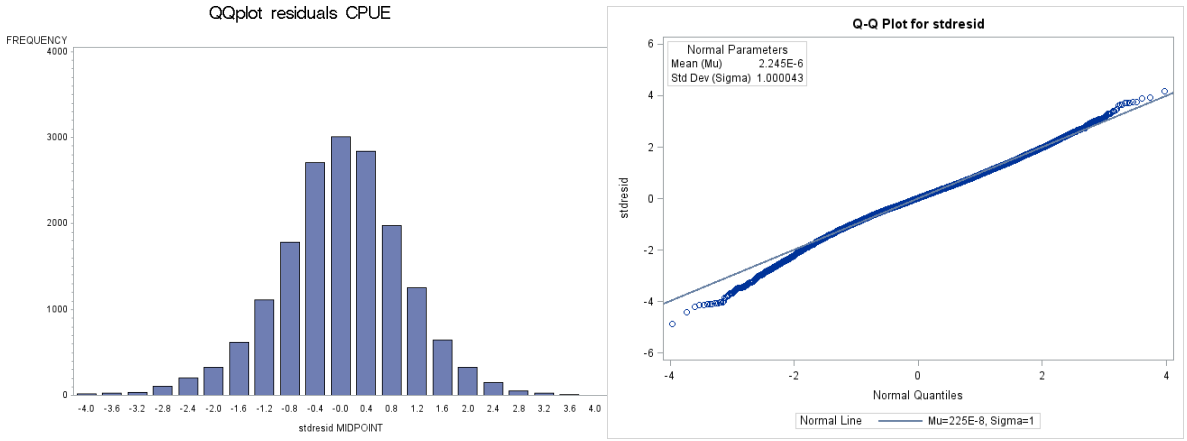
1960-2014 quarter based

Tropical area



1960-2014 quarter based

South area



1960-2014 quarter based

Whole area

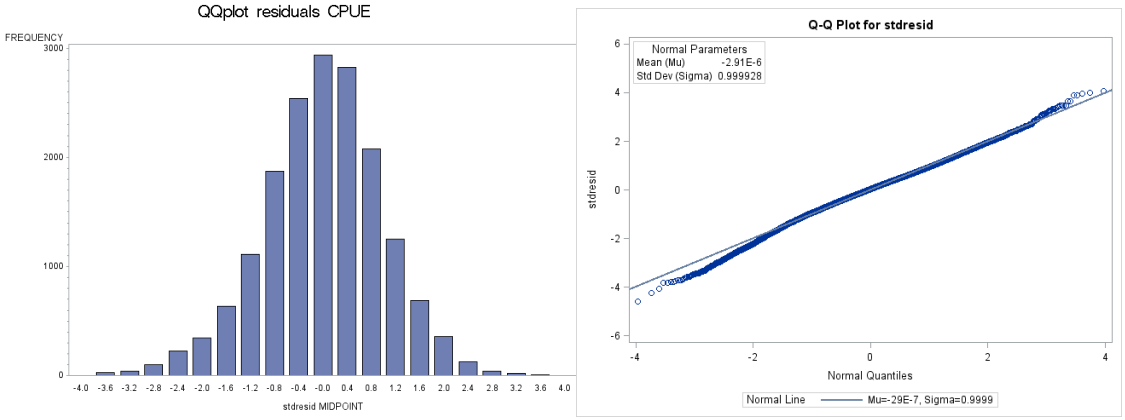


Fig. 6. Standardized residuals of area aggregated quarterly CPUE standardization.

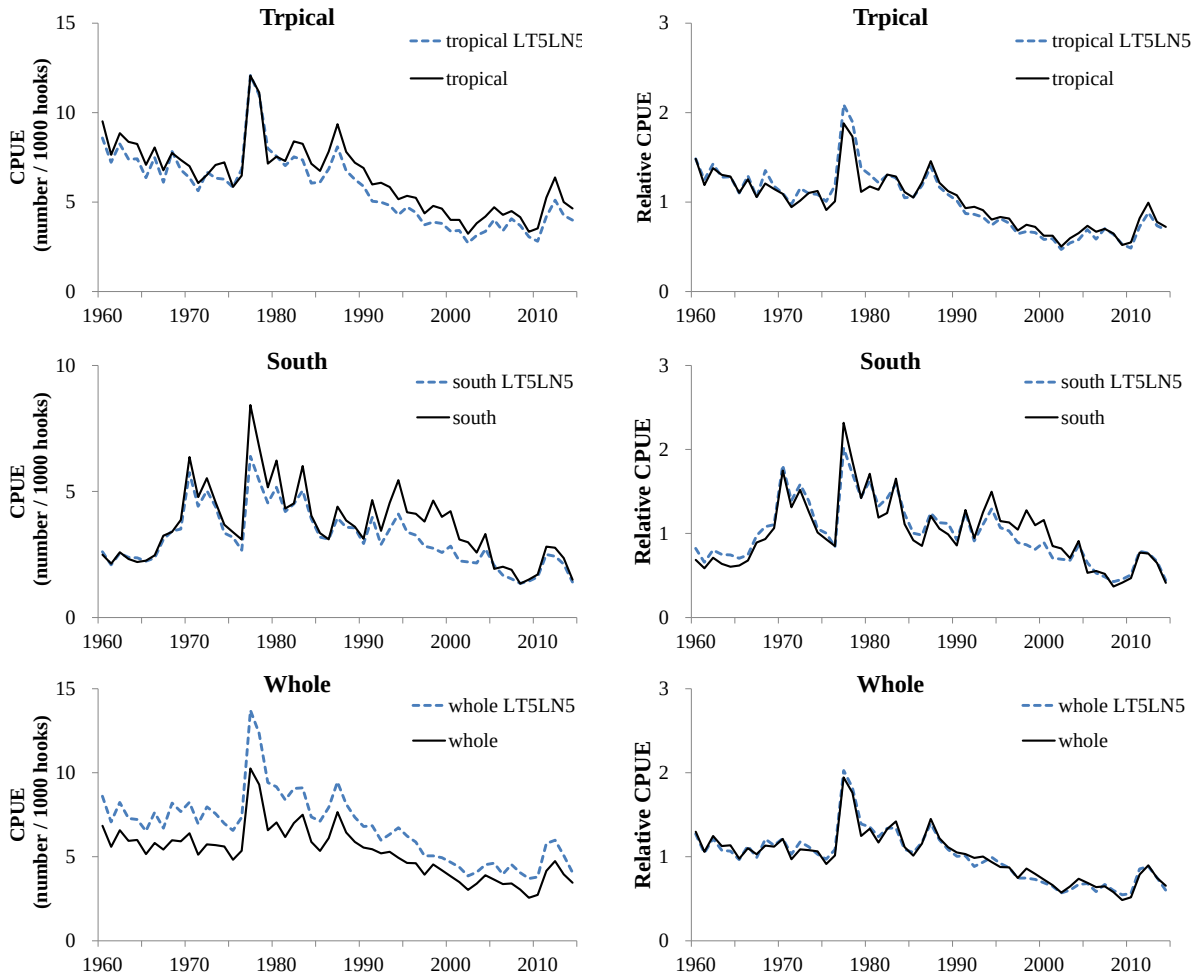


Fig. 7. Comparison of area aggregated CPUE series of bigeye between the model including subarea effect and that including LT5LN5 effect. Left: real scale, right: relative scale.

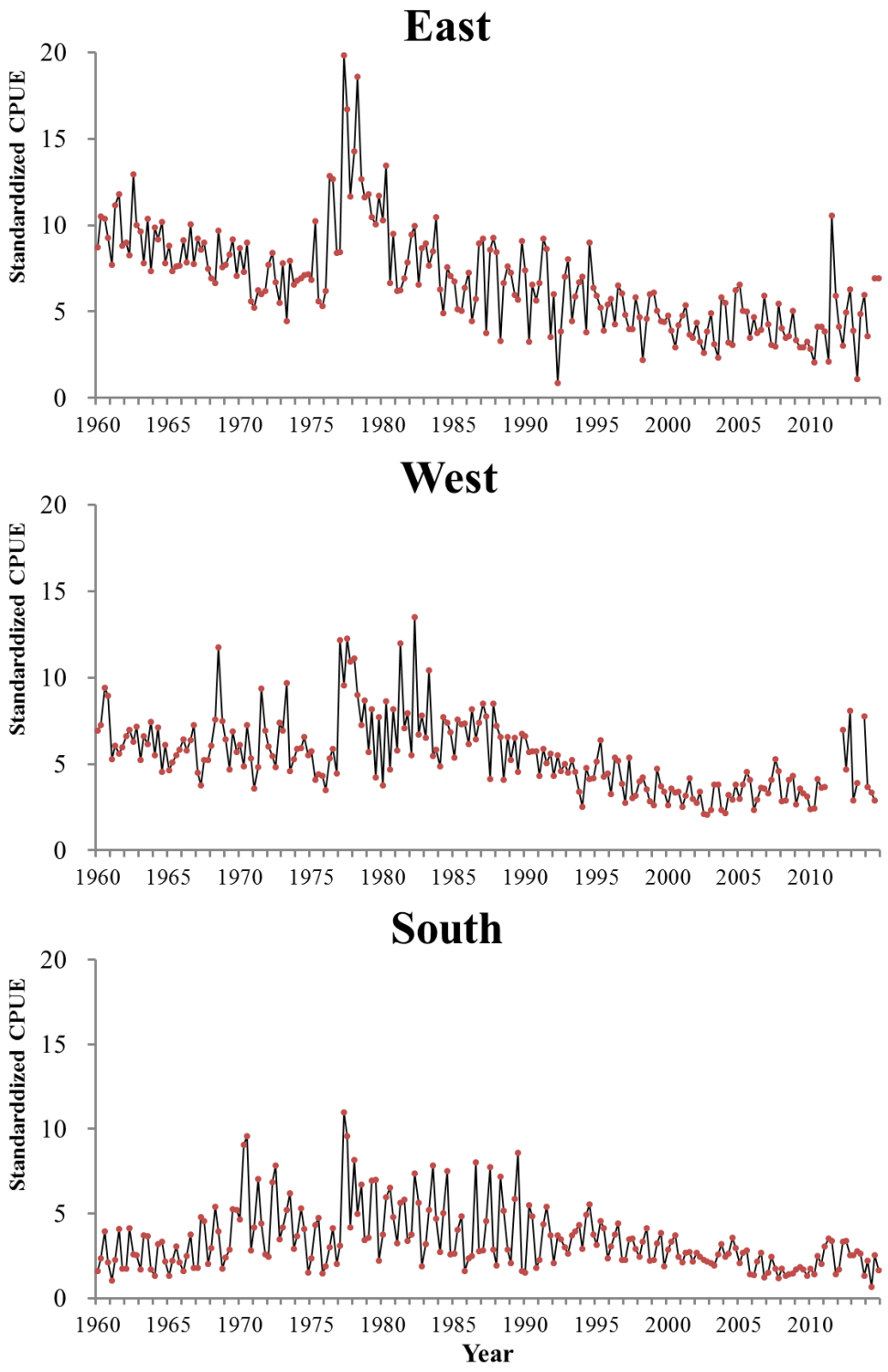
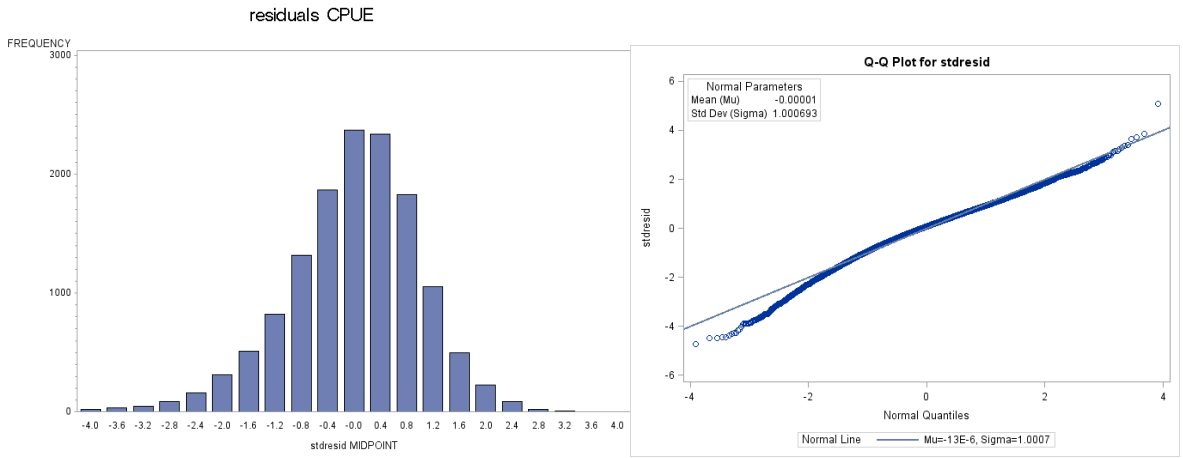


Fig. 8. Comparison of area specific quarterly CPUE series of bigeye tuna by Japanese longline for the east (top), west (middle) and south (bottom) area.

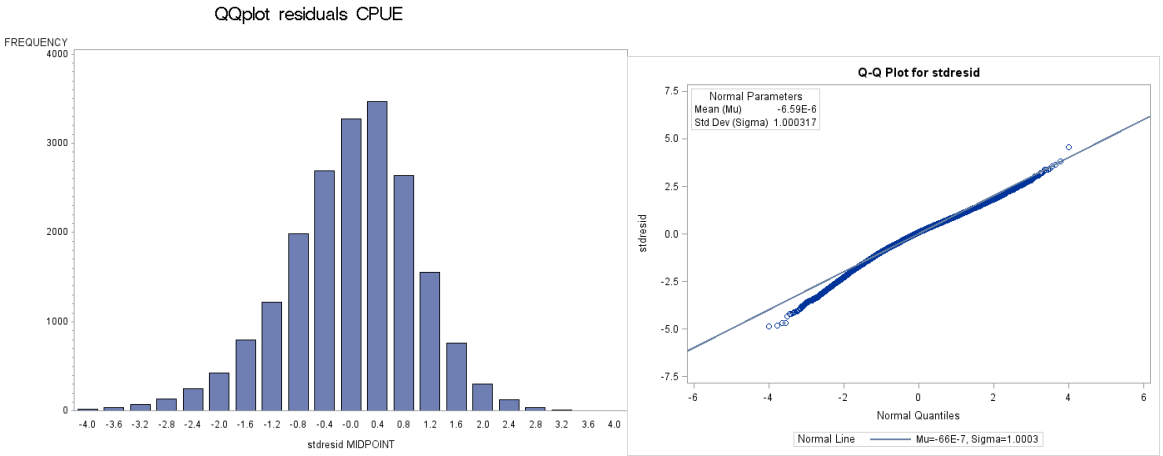
1960-2014 quarter based

East area



1960-2014 quarter based

West area



1960-2014 quarter based

South area

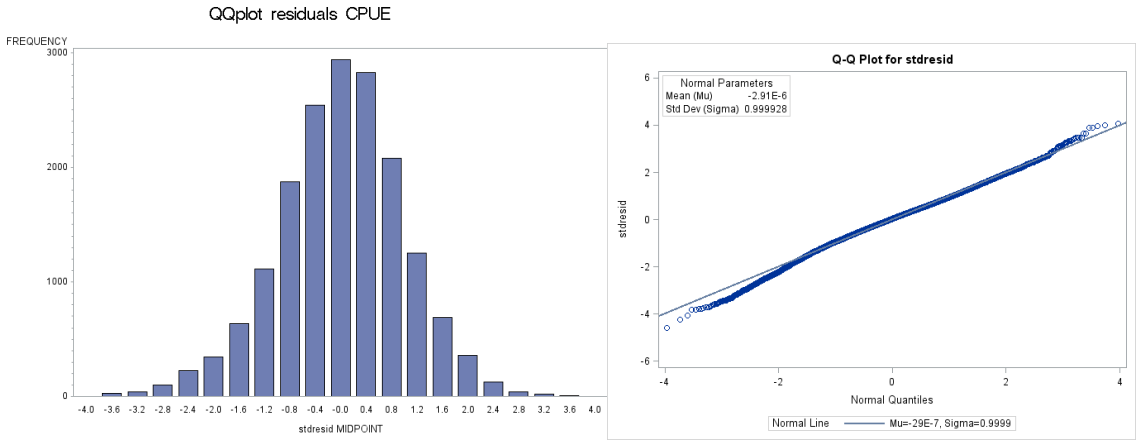


Fig. 9. Standardized residuals of area specific quarterly CPUE standardization.

Appendix Table 1. Annual value of area aggregated standardized bigeye tuna CPUE in the tropical, south and whole Indian Ocean for 1960-2014 expressed in real and relative scale in which the average from 1960 to 2014 is 1.0, with squared standard error of log CPUE (= CV of CPUE).

tropical				**south**				**whole**			
year	CPUE	dev_t	Relative CPUE	year	CPUE	dev_t	Relative CPUE	year	CPUE	dev_t	Relative CPUE
1960	9.515	0.001	1.482	1960	2.493	0.007	0.685	1960	6.844	0.001	1.297
1961	7.643	0.001	1.191	1961	2.132	0.005	0.586	1961	5.588	0.001	1.059
1962	8.849	0.001	1.379	1962	2.585	0.004	0.711	1962	6.577	0.001	1.246
1963	8.367	0.001	1.304	1963	2.324	0.004	0.639	1963	5.947	0.001	1.127
1964	8.248	0.001	1.285	1964	2.199	0.004	0.605	1964	5.999	0.001	1.137
1965	7.080	0.001	1.103	1965	2.253	0.003	0.619	1965	5.160	0.001	0.978
1966	8.050	0.001	1.254	1966	2.468	0.004	0.678	1966	5.816	0.001	1.102
1967	6.776	0.001	1.056	1967	3.245	0.003	0.892	1967	5.431	0.001	1.029
1968	7.747	0.001	1.207	1968	3.397	0.003	0.934	1968	5.979	0.001	1.133
1969	7.351	0.001	1.145	1969	3.870	0.003	1.064	1969	5.914	0.001	1.121
1970	7.004	0.001	1.091	1970	6.364	0.003	1.749	1970	6.400	0.001	1.213
1971	6.057	0.001	0.944	1971	4.777	0.003	1.313	1971	5.119	0.001	0.970
1972	6.512	0.001	1.015	1972	5.526	0.007	1.519	1972	5.736	0.001	1.087
1973	7.070	0.001	1.101	1973	4.580	0.005	1.259	1973	5.687	0.001	1.078
1974	7.217	0.001	1.124	1974	3.681	0.004	1.012	1974	5.613	0.001	1.064
1975	5.849	0.001	0.911	1975	3.382	0.004	0.930	1975	4.819	0.001	0.913
1976	6.474	0.002	1.009	1976	3.093	0.011	0.850	1976	5.361	0.002	1.016
1977	12.067	0.003	1.880	1977	8.429	0.017	2.317	1977	10.259	0.003	1.944
1978	11.117	0.001	1.732	1978	6.763	0.007	1.859	1978	9.294	0.001	1.761
1979	7.146	0.003	1.113	1979	5.167	0.006	1.420	1979	6.578	0.002	1.247
1980	7.544	0.002	1.175	1980	6.226	0.006	1.711	1980	7.037	0.001	1.334
1981	7.295	0.001	1.136	1981	4.324	0.004	1.189	1981	6.174	0.001	1.170
1982	8.387	0.001	1.307	1982	4.523	0.007	1.243	1982	7.007	0.001	1.328
1983	8.255	0.001	1.286	1983	6.012	0.006	1.652	1983	7.502	0.001	1.422
1984	7.137	0.001	1.112	1984	4.044	0.004	1.111	1984	5.881	0.001	1.114
1985	6.743	0.001	1.051	1985	3.346	0.004	0.920	1985	5.352	0.001	1.014
1986	7.823	0.001	1.219	1986	3.100	0.005	0.852	1986	6.107	0.001	1.157
1987	9.351	0.001	1.457	1987	4.397	0.005	1.209	1987	7.655	0.001	1.451
1988	7.805	0.001	1.216	1988	3.848	0.007	1.058	1988	6.441	0.001	1.221
1989	7.199	0.001	1.122	1989	3.598	0.007	0.989	1989	5.878	0.001	1.114
1990	6.901	0.001	1.075	1990	3.121	0.005	0.858	1990	5.548	0.001	1.051
1991	5.980	0.001	0.932	1991	4.656	0.002	1.280	1991	5.447	0.001	1.032
1992	6.074	0.002	0.946	1992	3.439	0.004	0.945	1992	5.206	0.001	0.987
1993	5.841	0.001	0.910	1993	4.550	0.002	1.251	1993	5.294	0.001	1.003
1994	5.160	0.001	0.804	1994	5.446	0.001	1.497	1994	4.942	0.001	0.937
1995	5.349	0.001	0.833	1995	4.175	0.001	1.147	1995	4.628	0.001	0.877
1996	5.239	0.001	0.816	1996	4.114	0.001	1.131	1996	4.610	0.000	0.874
1997	4.372	0.000	0.681	1997	3.807	0.001	1.046	1997	3.939	0.000	0.746
1998	4.786	0.000	0.746	1998	4.640	0.002	1.275	1998	4.538	0.001	0.860
1999	4.633	0.000	0.722	1999	3.994	0.002	1.098	1999	4.197	0.000	0.795
2000	4.003	0.000	0.624	2000	4.218	0.001	1.159	2000	3.844	0.000	0.728
2001	3.998	0.001	0.623	2001	3.095	0.001	0.851	2001	3.495	0.000	0.662
2002	3.224	0.000	0.502	2002	2.987	0.001	0.821	2002	3.028	0.000	0.574
2003	3.816	0.001	0.595	2003	2.572	0.003	0.707	2003	3.405	0.001	0.645
2004	4.192	0.001	0.653	2004	3.314	0.003	0.911	2004	3.899	0.001	0.739
2005	4.712	0.001	0.734	2005	1.931	0.003	0.531	2005	3.636	0.001	0.689
2006	4.283	0.001	0.667	2006	2.012	0.003	0.553	2006	3.373	0.001	0.639
2007	4.496	0.000	0.701	2007	1.891	0.003	0.520	2007	3.413	0.001	0.647
2008	4.158	0.000	0.648	2008	1.343	0.002	0.369	2008	3.051	0.000	0.578
2009	3.338	0.001	0.520	2009	1.508	0.002	0.415	2009	2.558	0.001	0.485
2010	3.523	0.001	0.549	2010	1.704	0.002	0.468	2010	2.727	0.001	0.517
2011	5.256	0.005	0.819	2011	2.810	0.003	0.772	2011	4.165	0.002	0.789
2012	6.373	0.003	0.993	2012	2.769	0.003	0.761	2012	4.741	0.002	0.898
2013	4.999	0.002	0.779	2013	2.360	0.004	0.649	2013	3.949	0.001	0.748
2014	4.639	0.008	0.723	2014	1.499	0.003	0.412	2014	3.456	0.004	0.655

Appendix Table 2. Quarterly value of area aggregated standardized bigeye tuna CPUE in the tropical, south and whole Indian Ocean for 1960-2014 expressed in real and relative scale in which the average from 1960 to 2014 is 1.0, with squared standard error of log CPUE (= CV of CPUE). (= CV of CPUE).

		Tropical			South			Whole		
year	quarter	CPUE	dev_t	relative	CPUE	dev_t	relative	CPUE	dev_t	relative
1960	1	8.854	0.003	1.431	1.234	0.009	0.312	6.237	0.002	1.168
1960	2	9.220	0.003	1.490	2.859	0.073	0.723	7.135	0.008	1.336
1960	3	9.491	0.007	1.533	3.903	0.031	0.987	7.520	0.006	1.408
1960	4	11.153	0.004	1.802	2.071	0.016	0.524	7.964	0.003	1.491
1961	1	7.172	0.003	1.159	0.786	0.008	0.199	4.974	0.002	0.931
1961	2	9.055	0.005	1.463	1.786	0.029	0.452	6.853	0.005	1.283
1961	3	7.946	0.007	1.284	3.814	0.029	0.965	6.615	0.006	1.238
1961	4	5.869	0.006	0.948	1.769	0.009	0.447	4.696	0.004	0.879
1962	1	8.861	0.003	1.432	1.838	0.010	0.465	6.376	0.002	1.194
1962	2	7.942	0.002	1.283	3.294	0.030	0.833	6.317	0.004	1.183
1962	3	8.314	0.005	1.343	2.659	0.022	0.672	6.840	0.004	1.280
1962	4	9.004	0.002	1.455	2.577	0.009	0.652	6.853	0.002	1.283
1963	1	8.574	0.002	1.385	1.749	0.007	0.442	6.250	0.002	1.170
1963	2	7.473	0.003	1.207	2.715	0.059	0.686	5.714	0.007	1.070
1963	3	8.290	0.012	1.339	3.737	0.017	0.945	6.779	0.007	1.269
1963	4	9.995	0.009	1.615	1.696	0.008	0.429	6.914	0.005	1.294
1964	1	8.615	0.003	1.392	1.628	0.009	0.412	6.296	0.002	1.179
1964	2	8.929	0.002	1.443	3.189	0.058	0.806	7.017	0.006	1.313
1964	3	7.648	0.006	1.236	3.518	0.032	0.890	6.346	0.006	1.188
1964	4	7.102	0.007	1.147	2.107	0.007	0.533	5.375	0.004	1.006
1965	1	7.266	0.002	1.174	1.953	0.010	0.494	5.420	0.002	1.015
1965	2	6.679	0.002	1.079	2.330	0.026	0.589	5.179	0.003	0.969
1965	3	6.681	0.003	1.080	4.041	0.013	1.022	5.646	0.003	1.057
1965	4	7.617	0.002	1.231	2.128	0.009	0.538	5.681	0.002	1.064
1966	1	8.888	0.002	1.436	1.716	0.012	0.434	6.445	0.002	1.206
1966	2	6.725	0.002	1.087	2.521	0.058	0.637	5.245	0.006	0.982
1966	3	8.312	0.002	1.343	3.482	0.048	0.880	6.680	0.005	1.251
1966	4	8.679	0.002	1.402	1.860	0.007	0.470	6.217	0.001	1.164
1967	1	7.290	0.002	1.178	1.879	0.007	0.475	5.556	0.001	1.040
1967	2	6.363	0.002	1.028	5.659	0.008	1.431	6.130	0.001	1.148
1967	3	6.372	0.003	1.030	5.177	0.008	1.309	5.976	0.002	1.119
1967	4	6.571	0.002	1.062	2.033	0.007	0.514	5.027	0.002	0.941
1968	1	7.307	0.003	1.181	3.492	0.016	0.883	5.876	0.003	1.100
1968	2	7.152	0.003	1.156	6.087	0.011	1.539	6.518	0.002	1.220
1968	3	9.172	0.011	1.482	5.173	0.007	1.308	7.677	0.006	1.437
1968	4	7.945	0.002	1.284	1.852	0.008	0.468	5.786	0.002	1.083
1969	1	7.947	0.002	1.284	2.188	0.009	0.553	5.920	0.002	1.108
1969	2	6.341	0.002	1.025	1.907	0.013	0.482	4.982	0.002	0.933
1969	3	7.334	0.003	1.185	8.387	0.008	2.121	7.408	0.002	1.387
1969	4	7.825	0.002	1.264	6.414	0.018	1.622	7.087	0.003	1.327
1970	1	7.758	0.003	1.254	4.415	0.032	1.116	6.495	0.004	1.216
1970	2	5.897	0.003	0.953	12.143	0.009	3.071	7.459	0.002	1.396
1970	3	6.700	0.007	1.083	11.528	0.007	2.915	8.133	0.004	1.523
1970	4	6.857	0.003	1.108	2.985	0.007	0.755	5.312	0.002	0.994
1971	1	4.741	0.002	0.766	3.943	0.010	0.997	4.218	0.002	0.789
1971	2	6.083	0.002	0.983	7.277	0.010	1.840	6.148	0.002	1.151
1971	3	8.192	0.005	1.324	4.680	0.010	1.183	6.629	0.003	1.241
1971	4	8.082	0.003	1.306	2.867	0.018	0.725	6.015	0.003	1.126
1972	1	6.910	0.004	1.117	1.123	0.145	0.284	5.026	0.015	0.941
1972	2	6.730	0.005	1.087	7.082	0.018	1.791	6.617	0.004	1.239
1972	3	5.855	0.003	0.946	8.261	0.017	2.089	6.199	0.003	1.160
1972	4	6.565	0.022	1.061	4.079	0.021	1.031	5.353	0.012	1.002
1973	1	7.989	0.008	1.291	2.963	0.291	0.749	6.013	0.031	1.126
1973	2	7.758	0.012	1.254	5.600	0.024	1.416	6.438	0.008	1.205
1973	3	6.552	0.004	1.059	6.308	0.013	1.595	6.246	0.003	1.169
1973	4	6.146	0.005	0.993	3.052	0.010	0.772	5.049	0.003	0.945
1974	1	7.175	0.003	1.159	3.145	0.013	0.795	5.656	0.003	1.059
1974	2	4.803	0.004	0.776	5.466	0.011	1.382	4.785	0.003	0.896
1974	3	7.408	0.004	1.197	4.554	0.011	1.152	6.217	0.003	1.164
1974	4	6.996	0.004	1.130	1.710	0.013	0.432	5.216	0.003	0.976
1975	1	5.203	0.007	0.841	2.706	0.024	0.684	4.397	0.005	0.823
1975	2	4.993	0.014	0.807	4.951	0.012	1.252	4.924	0.007	0.922
1975	3	5.796	0.003	0.937	4.813	0.010	1.217	5.255	0.002	0.984
1975	4	5.531	0.004	0.894	1.386	0.022	0.350	4.097	0.004	0.767
1976	1	5.375	0.004	0.868	1.279	0.144	0.323	4.131	0.015	0.773
1976	2	5.065	0.011	0.818	3.824	0.040	0.967	4.792	0.009	0.897
1976	3	6.605	0.018	1.067	3.939	0.035	0.996	5.876	0.011	1.100
1976	4	4.505	0.011	0.728	1.402	0.141	0.355	3.864	0.018	0.723
1977	1	9.182	0.007	1.484	4.596	0.089	1.162	7.459	0.011	1.396
1977	2	9.067	0.026	1.465	16.105	0.049	4.072	11.212	0.017	2.099
1977	3	10.281	0.011	1.661	10.401	0.070	2.630	10.461	0.012	1.958
1977	4	11.746	0.006	1.898	4.616	0.060	1.167	9.218	0.008	1.725

Appendix Table 2. Quarterly value of area aggregated standardized bigeye tuna CPUE in the tropical, south and whole Indian Ocean for 1960-2014 expressed in real and relative scale in which the average from 1960 to 2014 is 1.0, with squared standard error of log CPUE (= CV of CPUE). (= CV of CPUE).(continued)

		Tropical			South			Whole		
year	quarter	CPUE	dev_t	relative	CPUE	dev_t	relative	CPUE	dev_t	relative
1978	1	9.344	0.002	1.510	11.537	0.035	2.917	9.715	0.004	1.819
1978	2	10.892	0.012	1.760	6.586	0.022	1.665	9.544	0.008	1.787
1978	3	8.939	0.008	1.444	7.361	0.030	1.861	8.517	0.007	1.594
1978	4	9.892	0.005	1.598	3.973	0.036	1.005	8.073	0.005	1.511
1979	1	7.654	0.005	1.237	2.783	0.028	0.704	6.358	0.005	1.190
1979	2	6.536	0.005	1.056	8.992	0.018	2.274	7.274	0.004	1.362
1979	3	5.874	0.007	0.949	7.049	0.020	1.782	6.249	0.005	1.170
1979	4	5.747	0.003	0.929	2.267	0.032	0.573	4.798	0.004	0.898
1980	1	5.733	0.020	0.926	6.129	0.049	1.550	5.982	0.014	1.120
1980	2	8.762	0.022	1.416	7.866	0.032	1.989	8.461	0.013	1.584
1980	3	6.205	0.019	1.003	7.287	0.026	1.843	6.490	0.011	1.215
1980	4	8.842	0.004	1.429	5.042	0.015	1.275	7.689	0.003	1.439
1981	1	6.689	0.005	1.081	2.333	0.018	0.590	5.291	0.004	0.990
1981	2	6.823	0.010	1.102	6.233	0.028	1.576	6.587	0.007	1.233
1981	3	7.087	0.006	1.145	5.614	0.014	1.420	6.520	0.004	1.220
1981	4	8.189	0.003	1.323	3.356	0.013	0.849	6.703	0.002	1.255
1982	1	8.498	0.003	1.373	2.348	0.021	0.594	6.718	0.003	1.258
1982	2	11.490	0.010	1.856	14.882	0.036	3.763	12.401	0.008	2.321
1982	3	7.612	0.003	1.230	7.653	0.029	1.935	7.455	0.004	1.396
1982	4	9.053	0.002	1.463	1.351	0.019	0.342	6.689	0.003	1.252
1983	1	8.598	0.002	1.389	3.314	0.025	0.838	7.182	0.003	1.344
1983	2	5.511	0.002	0.890	6.683	0.025	1.690	5.730	0.003	1.073
1983	3	7.793	0.007	1.259	8.736	0.016	2.209	8.089	0.005	1.514
1983	4	7.692	0.004	1.243	5.021	0.016	1.270	6.960	0.003	1.303
1984	1	6.275	0.003	1.014	2.432	0.011	0.615	5.116	0.003	0.958
1984	2	4.715	0.009	0.762	7.529	0.021	1.904	5.288	0.006	0.990
1984	3	8.493	0.004	1.372	7.355	0.018	1.860	7.937	0.004	1.486
1984	4	7.340	0.008	1.186	2.411	0.010	0.610	5.734	0.005	1.073
1985	1	6.739	0.002	1.089	2.444	0.014	0.618	5.404	0.002	1.012
1985	2	5.938	0.012	0.959	4.579	0.010	1.158	5.457	0.006	1.022
1985	3	7.513	0.004	1.214	4.758	0.014	1.203	6.441	0.003	1.206
1985	4	6.985	0.005	1.129	1.492	0.019	0.377	5.169	0.004	0.968
1986	1	7.585	0.001	1.226	2.343	0.008	0.593	6.026	0.001	1.128
1986	2	6.363	0.006	1.028	2.749	0.019	0.695	5.087	0.005	0.952
1986	3	6.205	0.008	1.003	5.534	0.074	1.399	5.800	0.010	1.086
1986	4	9.291	0.002	1.501	2.126	0.026	0.537	7.120	0.003	1.333
1987	1	10.353	0.001	1.673	3.025	0.008	0.765	8.177	0.001	1.531
1987	2	5.677	0.006	0.917	5.206	0.032	1.316	5.146	0.006	0.963
1987	3	8.325	0.027	1.345	7.564	0.031	1.913	7.954	0.015	1.489
1987	4	9.294	0.002	1.502	3.062	0.016	0.774	7.441	0.003	1.393
1988	1	8.564	0.002	1.384	1.805	0.017	0.456	6.541	0.002	1.224
1988	2	2.352	0.004	0.380	6.975	0.024	1.764	3.350	0.004	0.627
1988	3	6.268	0.009	1.013	4.894	0.058	1.238	5.897	0.010	1.104
1988	4	8.354	0.003	1.350	3.579	0.026	0.905	6.893	0.004	1.290
1989	1	6.852	0.002	1.107	2.073	0.017	0.524	5.390	0.003	1.009
1989	2	5.983	0.010	0.967	4.657	0.034	1.178	5.511	0.008	1.032
1989	3	6.347	0.015	1.025	6.879	0.050	1.740	6.266	0.012	1.173
1989	4	8.942	0.004	1.445	2.038	0.022	0.515	6.958	0.004	1.302
1990	1	7.733	0.002	1.249	1.634	0.011	0.413	5.932	0.002	1.110
1990	2	3.881	0.020	0.627	4.680	0.097	1.183	3.661	0.018	0.685
1990	3	7.287	0.012	1.177	4.954	0.009	1.253	6.528	0.006	1.222
1990	4	6.421	0.003	1.038	2.041	0.034	0.516	5.023	0.004	0.940
1991	1	6.655	0.002	1.075	2.764	0.011	0.699	5.639	0.002	1.056
1991	2	7.049	0.014	1.139	4.462	0.016	1.128	6.320	0.008	1.183
1991	3	7.236	0.010	1.169	5.742	0.005	1.452	6.799	0.005	1.273
1991	4	5.307	0.005	0.857	4.715	0.005	1.192	4.857	0.003	0.909
1992	1	6.213	0.004	1.004	2.098	0.014	0.531	5.063	0.003	0.948
1992	2	3.357	0.030	0.542	4.371	0.014	1.105	3.475	0.015	0.651
1992	3	4.748	0.016	0.767	2.871	0.014	0.726	4.148	0.009	0.777
1992	4	7.375	0.004	1.192	3.406	0.013	0.861	6.230	0.003	1.166
1993	1	7.173	0.007	1.159	3.710	0.018	0.938	6.049	0.005	1.132
1993	2	4.652	0.014	0.752	5.522	0.013	1.396	4.674	0.008	0.875
1993	3	5.903	0.008	0.954	4.281	0.004	1.082	5.281	0.004	0.989
1993	4	5.448	0.003	0.880	5.185	0.008	1.311	5.300	0.002	0.992
1994	1	5.475	0.003	0.885	4.505	0.006	1.139	5.049	0.002	0.945
1994	2	3.855	0.018	0.623	6.174	0.005	1.561	4.192	0.009	0.785
1994	3	6.493	0.011	1.049	6.343	0.003	1.604	6.162	0.005	1.154
1994	4	5.840	0.002	0.944	4.531	0.004	1.146	5.090	0.001	0.953

Appendix Table 2. Quarterly value of area aggregated standardized bigeye tuna CPUE in the tropical, south and whole Indian Ocean for 1960-2014 expressed in real and relative scale in which the average from 1960 to 2014 is 1.0, with squared standard error of log CPUE (= CV of CPUE). (= CV of CPUE).(continued)

		Tropical			South			Whole		
year	quarter	CPUE	dev_t	relative	CPUE	dev_t	relative	CPUE	dev_t	relative
1995	1	6.254	0.003	1.011	3.745	0.003	0.947	5.151	0.002	0.964
1995	2	5.682	0.022	0.918	5.766	0.003	1.458	5.439	0.010	1.018
1995	3	4.642	0.008	0.750	4.722	0.002	1.194	4.295	0.004	0.804
1995	4	5.563	0.002	0.899	2.836	0.004	0.717	4.470	0.001	0.837
1996	1	5.643	0.002	0.912	4.096	0.003	1.036	4.884	0.001	0.914
1996	2	4.638	0.008	0.749	5.099	0.003	1.289	4.444	0.004	0.832
1996	3	6.520	0.014	1.054	4.854	0.002	1.227	5.826	0.007	1.091
1996	4	5.371	0.001	0.868	2.519	0.003	0.637	4.363	0.001	0.817
1997	1	4.794	0.001	0.775	3.031	0.012	0.766	4.107	0.002	0.769
1997	2	4.866	0.007	0.786	4.601	0.005	1.164	4.419	0.004	0.827
1997	3	3.575	0.003	0.578	4.181	0.002	1.057	3.516	0.002	0.658
1997	4	4.594	0.001	0.742	3.730	0.003	0.943	4.099	0.001	0.767
1998	1	5.055	0.001	0.817	5.289	0.016	1.337	4.871	0.002	0.912
1998	2	3.939	0.005	0.636	4.297	0.007	1.087	3.703	0.003	0.693
1998	3	4.984	0.004	0.805	5.055	0.007	1.278	4.778	0.002	0.894
1998	4	4.790	0.002	0.774	4.458	0.005	1.127	4.559	0.001	0.853
1999	1	5.355	0.001	0.865	5.181	0.009	1.310	5.054	0.002	0.946
1999	2	5.996	0.004	0.969	4.876	0.006	1.233	5.306	0.003	0.993
1999	3	4.454	0.003	0.720	4.533	0.005	1.146	4.258	0.002	0.797
1999	4	4.272	0.002	0.690	2.643	0.008	0.668	3.631	0.002	0.680
2000	1	4.521	0.001	0.730	5.039	0.007	1.274	4.474	0.001	0.837
2000	2	4.177	0.002	0.675	4.668	0.005	1.181	4.064	0.001	0.761
2000	3	3.403	0.006	0.550	5.086	0.003	1.286	3.744	0.003	0.701
2000	4	4.302	0.002	0.695	3.012	0.006	0.762	3.722	0.002	0.697
2001	1	3.868	0.002	0.625	3.549	0.005	0.897	3.664	0.001	0.686
2001	2	5.075	0.002	0.820	3.694	0.004	0.934	4.432	0.002	0.830
2001	3	4.605	0.004	0.744	3.356	0.002	0.849	3.853	0.002	0.721
2001	4	3.697	0.003	0.597	2.531	0.003	0.640	3.106	0.002	0.581
2002	1	4.261	0.002	0.688	4.458	0.004	1.127	4.166	0.001	0.780
2002	2	3.678	0.003	0.594	3.591	0.007	0.908	3.447	0.002	0.645
2002	3	2.592	0.002	0.419	2.506	0.003	0.634	2.425	0.001	0.454
2002	4	3.058	0.001	0.494	2.573	0.005	0.651	2.829	0.001	0.530
2003	1	3.843	0.002	0.621	3.240	0.023	0.819	3.616	0.003	0.677
2003	2	4.254	0.008	0.687	1.915	0.012	0.484	3.284	0.005	0.615
2003	3	2.509	0.014	0.405	2.725	0.005	0.689	2.462	0.007	0.461
2003	4	4.267	0.005	0.689	3.813	0.011	0.964	4.136	0.003	0.774
2004	1	4.370	0.002	0.706	7.054	0.018	1.784	5.071	0.003	0.949
2004	2	3.629	0.005	0.586	2.647	0.019	0.669	3.270	0.004	0.612
2004	3	3.378	0.003	0.546	3.196	0.006	0.808	3.256	0.002	0.610
2004	4	5.666	0.009	0.915	3.200	0.008	0.809	4.691	0.005	0.878
2005	1	5.370	0.003	0.868	2.615	0.011	0.661	4.326	0.002	0.810
2005	2	4.896	0.009	0.791	2.056	0.041	0.520	3.815	0.008	0.714
2005	3	5.372	0.013	0.868	2.535	0.012	0.641	4.170	0.007	0.781
2005	4	3.935	0.005	0.636	1.153	0.006	0.291	2.852	0.003	0.534
2006	1	3.815	0.002	0.616	1.127	0.006	0.285	2.813	0.002	0.526
2006	2	3.694	0.004	0.597	1.319	0.019	0.333	2.762	0.004	0.517
2006	3	4.131	0.004	0.667	3.991	0.007	1.009	3.909	0.003	0.732
2006	4	5.295	0.001	0.856	1.478	0.018	0.374	3.895	0.002	0.729
2007	1	4.180	0.001	0.675	0.653	0.026	0.165	2.878	0.003	0.539
2007	2	4.019	0.002	0.649	3.094	0.007	0.782	3.482	0.002	0.652
2007	3	5.147	0.004	0.832	2.253	0.005	0.570	3.830	0.002	0.717
2007	4	5.825	0.003	0.941	1.298	0.019	0.328	4.172	0.003	0.781
2008	1	3.942	0.001	0.637	1.914	0.015	0.484	3.115	0.002	0.583
2008	2	2.849	0.005	0.460	1.250	0.004	0.316	2.107	0.003	0.394
2008	3	4.021	0.006	0.650	1.546	0.005	0.391	3.064	0.003	0.574
2008	4	5.016	0.002	0.810	1.887	0.019	0.477	3.853	0.003	0.721
2009	1	3.256	0.001	0.526	2.220	0.025	0.561	2.806	0.003	0.525
2009	2	3.515	0.003	0.568	1.784	0.007	0.451	2.735	0.002	0.512
2009	3	3.687	0.007	0.596	1.862	0.004	0.471	2.903	0.004	0.544
2009	4	2.724	0.008	0.440	1.150	0.025	0.291	2.195	0.006	0.411
2010	1	3.283	0.002	0.530	1.507	0.013	0.381	2.461	0.002	0.461
2010	2	5.224	0.044	0.844	1.467	0.005	0.371	3.405	0.020	0.637
2010	3	2.667	0.009	0.431	2.595	0.005	0.656	2.635	0.005	0.493
2010	4	3.946	0.013	0.637	6.457	0.030	1.633	4.664	0.009	0.873

Appendix Table 2. Quarterly value of area aggregated standardized bigeye tuna CPUE in the tropical, south and whole Indian Ocean for 1960-2014 expressed in real and relative scale in which the average from 1960 to 2014 is 1.0, with squared standard error of log CPUE (= CV of CPUE). (= CV of CPUE).(continued)

		Tropical			South			Whole		
year	quarter	CPUE	dev_t	relative	CPUE	dev_t	relative	CPUE	dev_t	relative
2011	1	5.117	0.007	0.827	2.547	0.042	0.644	3.883	0.009	0.727
2011	2	1.655	0.043	0.267	3.111	0.008	0.787	2.149	0.016	0.402
2011	3	3.886	0.027	0.628	3.877	0.009	0.980	4.101	0.010	0.768
2011	4	5.894	0.005	0.952	3.029	0.049	0.766	4.648	0.009	0.870
2012	1	3.447	0.004	0.557	0.870	0.048	0.220	2.504	0.006	0.469
2012	2	4.397	0.024	0.710	3.098	0.007	0.783	3.391	0.012	0.635
2012	3	6.847	0.027	1.106	4.333	0.010	1.096	5.574	0.014	1.043
2012	4	7.178	0.006	1.160	0.473	0.003	0.120	4.771	0.003	0.893
2013	1	4.024	0.004	0.650	1.436	0.037	0.363	2.956	0.005	0.553
2013	2	2.363	0.033	0.382	2.882	0.006	0.729	2.339	0.016	0.438
2013	3	3.330	0.008	0.538	2.747	0.012	0.695	3.165	0.005	0.592
2013	4	5.723	0.004	0.925	0.264	0.001	0.067	3.972	0.002	0.744
2014	1	3.039	0.003	0.491	5.252	0.283	1.328	3.512	0.028	0.657
2014	2	1.751	0.008	0.283	0.883	0.009	0.223	1.129	0.005	0.211
2014	3	3.951	0.010	0.638	2.874	0.006	0.727	3.645	0.005	0.682
2014	4	4.234	0.004	0.684	17.468	0.283	4.417	8.292	0.028	1.552

Appendix Table 2. Quarterly value of area specific standardized bigeye tuna CPUE in the east, west and south Indian Ocean for 1960-2014 expressed in real and relative scale in which the average from 1960 to 2014 is 1.0, with squared standard error of log CPUE (= CV of CPUE).

		East			West			South		
year	quarter	CPUE	dev_t	relative	CPUE	dev_t	relative	CPUE	dev_t	relative
1960	1	8.7234	0.0062	1.287	6.927	0.007	1.267	1.602	0.018	0.467
1960	2	10.4991	0.0059	1.549	7.238	0.007	1.324	2.330	0.055	0.679
1960	3	10.3791	0.0102	1.531	9.416	0.011	1.722	3.930	0.030	1.146
1960	4	9.2873	0.0083	1.370	8.960	0.007	1.639	2.120	0.013	0.618
1961	1	7.7028	0.0078	1.136	5.294	0.007	0.968	1.034	0.016	0.302
1961	2	11.1584	0.0100	1.646	6.062	0.008	1.109	2.259	0.055	0.659
1961	3	11.7973	0.0119	1.740	5.609	0.011	1.026	4.069	0.021	1.186
1961	4	8.8166	0.0070	1.300	5.944	0.008	1.087	1.726	0.010	0.503
1962	1	8.9881	0.0060	1.326	6.626	0.006	1.212	1.740	0.010	0.507
1962	2	8.2345	0.0065	1.215	6.996	0.005	1.280	4.145	0.016	1.209
1962	3	12.9443	0.0059	1.909	6.290	0.011	1.150	2.566	0.010	0.748
1962	4	10.0001	0.0049	1.475	7.180	0.004	1.313	2.555	0.009	0.745
1963	1	9.6373	0.0048	1.421	5.245	0.005	0.959	1.694	0.007	0.494
1963	2	7.8115	0.0069	1.152	6.589	0.006	1.205	3.688	0.022	1.075
1963	3	10.3738	0.0072	1.530	6.135	0.023	1.122	3.661	0.011	1.067
1963	4	7.3218	0.0059	1.080	7.422	0.006	1.357	1.684	0.008	0.491
1964	1	9.8542	0.0069	1.453	5.497	0.005	1.005	1.309	0.009	0.382
1964	2	9.1859	0.0064	1.355	7.099	0.003	1.298	3.180	0.014	0.927
1964	3	10.1893	0.0050	1.503	4.556	0.008	0.833	3.324	0.008	0.969
1964	4	7.7757	0.0051	1.147	6.121	0.004	1.119	2.172	0.008	0.633
1965	1	8.8117	0.0053	1.300	4.656	0.003	0.852	1.311	0.010	0.382
1965	2	7.3438	0.0050	1.083	5.095	0.003	0.932	2.195	0.018	0.640
1965	3	7.6152	0.0053	1.123	5.515	0.005	1.009	3.045	0.008	0.888
1965	4	7.6654	0.0054	1.131	5.830	0.004	1.066	2.115	0.009	0.617
1966	1	9.133	0.0052	1.347	6.411	0.003	1.173	1.606	0.010	0.468
1966	2	7.8307	0.0062	1.155	5.772	0.003	1.056	2.467	0.014	0.719
1966	3	10.0557	0.0052	1.483	6.371	0.004	1.165	3.774	0.012	1.100
1966	4	7.7571	0.0050	1.144	7.268	0.003	1.329	1.775	0.007	0.517
1967	1	9.2234	0.0054	1.360	4.502	0.003	0.823	1.786	0.007	0.521
1967	2	8.5715	0.0048	1.264	3.769	0.003	0.689	4.801	0.006	1.400
1967	3	9.0042	0.0052	1.328	5.245	0.005	0.959	4.537	0.007	1.323
1967	4	7.4654	0.0059	1.101	5.215	0.004	0.954	2.001	0.008	0.583
1968	1	6.9229	0.0049	1.021	6.044	0.004	1.105	2.949	0.010	0.860
1968	2	6.6578	0.0062	0.982	7.563	0.004	1.383	5.402	0.008	1.575
1968	3	9.7007	0.0051	1.431	11.765	0.005	2.152	3.959	0.007	1.154
1968	4	7.571	0.0051	1.117	7.497	0.004	1.371	1.738	0.008	0.507
1969	1	7.6839	0.0056	1.133	6.434	0.003	1.177	2.391	0.008	0.697
1969	2	8.3054	0.0053	1.225	4.694	0.004	0.858	2.846	0.008	0.830
1969	3	9.1698	0.0066	1.353	6.884	0.005	1.259	5.257	0.008	1.533
1969	4	7.046	0.0064	1.039	5.708	0.004	1.044	5.208	0.013	1.518
1970	1	8.6595	0.0060	1.277	6.115	0.004	1.118	4.656	0.030	1.357
1970	2	7.2976	0.0067	1.076	4.872	0.006	0.891	9.052	0.009	2.639
1970	3	8.9807	0.0047	1.325	7.253	0.019	1.327	9.557	0.008	2.786
1970	4	5.5773	0.0051	0.823	5.305	0.005	0.970	2.826	0.007	0.824
1971	1	5.2114	0.0051	0.769	3.566	0.004	0.652	4.186	0.010	1.220
1971	2	6.2156	0.0053	0.917	4.832	0.005	0.884	7.020	0.008	2.047
1971	3	5.9879	0.0061	0.883	9.368	0.007	1.713	4.409	0.008	1.285
1971	4	6.2105	0.0111	0.916	6.913	0.005	1.264	2.591	0.013	0.755
1972	1	7.7181	0.0096	1.138	6.002	0.005	1.098	2.456	0.050	0.716
1972	2	8.3978	0.0084	1.239	5.457	0.006	0.998	6.872	0.018	2.003
1972	3	6.6762	0.0128	0.985	4.805	0.005	0.879	7.855	0.017	2.290
1972	4	5.5167	0.0288	0.814	7.372	0.006	1.348	3.478	0.021	1.014
1973	1	7.7796	0.0102	1.147	6.912	0.007	1.264	4.199	0.110	1.224
1973	2	4.4439	0.0128	0.655	9.705	0.010	1.775	5.189	0.022	1.513
1973	3	7.9374	0.0083	1.171	4.575	0.007	0.837	6.216	0.013	1.812
1973	4	6.5503	0.0071	0.966	5.293	0.008	0.968	2.932	0.010	0.855
1974	1	6.7819	0.0057	1.000	5.866	0.008	1.073	3.653	0.012	1.065
1974	2	6.9085	0.0074	1.019	5.944	0.010	1.087	5.281	0.011	1.540
1974	3	7.1027	0.0058	1.048	6.578	0.007	1.203	4.073	0.010	1.187
1974	4	7.1628	0.0055	1.056	5.514	0.008	1.008	1.490	0.012	0.434
1975	1	6.8336	0.0049	1.008	5.740	0.009	1.050	2.333	0.025	0.680
1975	2	10.244	0.0047	1.511	4.075	0.011	0.745	4.333	0.011	1.263
1975	3	5.6036	0.0064	0.827	4.404	0.006	0.805	4.751	0.010	1.385
1975	4	5.3239	0.0093	0.785	4.313	0.007	0.789	1.436	0.021	0.419
1976	1	6.2065	0.0097	0.915	3.471	0.007	0.635	1.867	0.030	0.544
1976	2	12.8544	0.0076	1.896	5.318	0.013	0.973	2.996	0.039	0.873
1976	3	12.6458	0.0119	1.865	5.886	0.023	1.076	4.138	0.025	1.206
1976	4	8.3744	0.0174	1.235	4.453	0.034	0.814	2.034	0.273	0.593
1977	1	8.4523	0.0125	1.247	12.158	0.018	2.224	3.117	0.079	0.909
1977	2	19.8476	0.0100	2.927	9.564	0.028	1.749	10.961	0.046	3.196
1977	3	16.6886	0.0073	2.462	12.248	0.022	2.240	9.554	0.051	2.785
1977	4	11.6499	0.0095	1.718	10.930	0.007	1.999	4.184	0.035	1.220

Appendix Table 2. Quarterly value of area specific standardized bigeye tuna CPUE in the east, west and south Indian Ocean for 1960-2014 expressed in real and relative scale in which the average from 1960 to 2014 is 1.0, with squared standard error of log CPUE (= CV of CPUE).(continued)

s		East			West			South		
year	quarter	CPUE	dev_t	relative	CPUE	dev_t	relative	CPUE	dev_t	relative
1978	1	14.2566	0.0066	2.103	11.109	0.004	2.032	1978	1	8.163
1978	2	18.5716	0.0070	2.739	9.020	0.004	1.650	1978	2	4.986
1978	3	12.6479	0.0044	1.866	7.259	0.011	1.328	1978	3	6.711
1978	4	11.6023	0.0063	1.711	8.668	0.009	1.585	1978	4	3.419
1979	1	11.7868	0.0066	1.739	5.691	0.007	1.041	1979	1	3.550
1979	2	10.4606	0.0133	1.543	8.175	0.012	1.495	1979	2	6.961
1979	3	10.0377	0.0114	1.481	4.204	0.011	0.769	1979	3	6.978
1979	4	11.72	0.0054	1.729	7.706	0.033	1.409	1979	4	2.223
1980	1	10.2731	0.0058	1.515	3.751	0.011	0.686	1980	1	3.769
1980	2	13.4516	0.0095	1.984	8.609	0.010	1.575	1980	2	5.940
1980	3	6.6461	0.0074	0.980	4.669	0.028	0.854	1980	3	6.527
1980	4	9.5054	0.0090	1.402	8.152	0.005	1.491	1980	4	4.784
1981	1	6.2057	0.0078	0.915	5.793	0.004	1.060	1981	1	3.248
1981	2	6.2267	0.0117	0.918	11.983	0.010	2.192	1981	2	5.640
1981	3	6.9338	0.0228	1.023	7.059	0.007	1.291	1981	3	5.812
1981	4	7.825	0.0070	1.154	7.950	0.004	1.454	1981	4	3.390
1982	1	9.4292	0.0076	1.391	5.490	0.003	1.004	1982	1	3.735
1982	2	9.9556	0.0117	1.468	13.482	0.007	2.466	1982	2	7.380
1982	3	6.5421	0.0084	0.965	6.711	0.006	1.227	1982	3	5.635
1982	4	8.6894	0.0064	1.282	7.802	0.003	1.427	1982	4	1.887
1983	1	8.9573	0.0054	1.321	6.501	0.002	1.189	1983	1	3.177
1983	2	7.6673	0.0153	1.131	10.419	0.005	1.906	1983	2	5.215
1983	3	8.4844	0.0046	1.251	5.447	0.007	0.996	1983	3	7.833
1983	4	10.4771	0.0059	1.545	5.834	0.005	1.067	1983	4	4.689
1984	1	6.2929	0.0058	0.928	4.853	0.004	0.888	1984	1	2.717
1984	2	4.8944	0.0090	0.722	7.718	0.006	1.412	1984	2	5.043
1984	3	7.5807	0.0061	1.118	7.377	0.008	1.349	1984	3	7.514
1984	4	7.0744	0.0067	1.043	6.837	0.007	1.250	1984	4	2.578
1985	1	6.7225	0.0046	0.992	5.363	0.004	0.981	1985	1	2.654
1985	2	5.1201	0.0080	0.755	7.582	0.006	1.387	1985	2	4.017
1985	3	5.0475	0.0061	0.744	7.317	0.005	1.338	1985	3	4.846
1985	4	6.3551	0.0103	0.937	7.336	0.004	1.342	1985	4	1.601
1986	1	7.2513	0.0039	1.070	6.138	0.002	1.123	1986	1	2.359
1986	2	4.4325	0.0190	0.654	8.191	0.004	1.498	1986	2	2.497
1986	3	5.715	0.0087	0.843	6.438	0.007	1.177	1986	3	8.039
1986	4	8.9384	0.0065	1.318	7.398	0.003	1.353	1986	4	2.767
1987	1	9.2019	0.0043	1.357	8.511	0.003	1.557	1987	1	2.801
1987	2	3.7574	0.0604	0.554	7.757	0.005	1.419	1987	2	4.574
1987	3	8.5883	0.0283	1.267	4.147	0.013	0.759	1987	3	7.745
1987	4	9.2551	0.0057	1.365	8.495	0.004	1.554	1987	4	2.863
1988	1	8.4318	0.0055	1.244	7.186	0.003	1.314	1988	1	1.914
1988	2	3.2785	0.0994	0.484	6.586	0.006	1.204	1988	2	7.160
1988	3	6.6308	0.0151	0.978	4.075	0.009	0.745	1988	3	5.159
1988	4	7.5941	0.0060	1.120	6.568	0.004	1.201	1988	4	2.864
1989	1	7.2544	0.0073	1.070	5.221	0.003	0.955	1989	1	2.075
1989	2	5.951	0.0228	0.878	6.536	0.006	1.195	1989	2	5.885
1989	3	5.6873	0.0130	0.839	4.530	0.025	0.829	1989	3	8.579
1989	4	9.0746	0.0097	1.338	6.746	0.007	1.234	1989	4	1.593
1990	1	7.4	0.0054	1.091	6.625	0.004	1.212	1990	1	1.508
1990	2	3.2386	0.2938	0.478	5.675	0.007	1.038	1990	2	5.469
1990	3	6.5512	0.0180	0.966	5.724	0.014	1.047	1990	3	4.813
1990	4	5.6206	0.0056	0.829	5.736	0.006	1.049	1990	4	1.797
1991	1	6.6534	0.0049	0.981	4.322	0.004	0.790	1991	1	2.264
1991	2	9.2117	0.0311	1.359	5.891	0.013	1.077	1991	2	4.345
1991	3	8.6423	0.0435	1.275	5.067	0.012	0.927	1991	3	5.394
1991	4	3.5224	0.0088	0.520	5.593	0.009	1.023	1991	4	3.704
1992	1	6.0133	0.0096	0.887	4.324	0.007	0.791	1992	1	2.067
1992	2	0.8605	0.2931	0.127	5.498	0.009	1.006	1992	2	3.698
1992	3	3.8709	0.0505	0.571	4.584	0.028	0.838	1992	3	3.453
1992	4	7.0217	0.0139	1.036	5.012	0.007	0.917	1992	4	3.007
1993	1	8.0359	0.0073	1.185	4.487	0.008	0.821	1993	1	2.637
1993	2	4.4662	0.0381	0.659	5.221	0.007	0.955	1993	2	3.716
1993	3	5.8881	0.0139	0.868	4.557	0.011	0.833	1993	3	3.929
1993	4	6.6931	0.0121	0.987	3.408	0.004	0.623	1993	4	4.333
1994	1	7.0303	0.0064	1.037	2.530	0.004	0.463	1994	1	2.919
1994	2	3.7912	0.1476	0.559	4.759	0.005	0.870	1994	2	4.941
1994	3	9.0129	0.0225	1.329	4.129	0.014	0.755	1994	3	5.556
1994	4	6.3629	0.0084	0.939	4.191	0.003	0.766	1994	4	3.742

Appendix Table 2. Quarterly value of area specific standardized bigeye tuna CPUE in the east, west and south Indian Ocean for 1960-2014 expressed in real and relative scale in which the average from 1960 to 2014 is 1.0, with squared standard error of log CPUE (= CV of CPUE).(continued)

		East			West			South		
year	quarter	CPUE	dev_t	relative	CPUE	dev_t	relative	CPUE	dev_t	relative
1995	1	5.9094	0.0051	0.872	5.141	0.005	0.940	3.142	0.003	0.916
1995	2	5.2349	0.0200	0.772	6.359	0.010	1.163	4.568	0.002	1.332
1995	3	3.8971	0.0107	0.575	4.285	0.014	0.784	4.135	0.002	1.205
1995	4	5.3908	0.0051	0.795	4.455	0.003	0.815	2.343	0.003	0.683
1996	1	5.7396	0.0047	0.847	3.275	0.003	0.599	3.034	0.003	0.885
1996	2	4.2795	0.0199	0.631	5.365	0.005	0.981	3.748	0.002	1.093
1996	3	6.508	0.0260	0.960	5.186	0.005	0.948	4.416	0.002	1.288
1996	4	6.0562	0.0054	0.893	3.873	0.002	0.708	2.255	0.003	0.657
1997	1	4.8293	0.0035	0.712	2.739	0.002	0.501	2.265	0.003	0.660
1997	2	4.0001	0.0340	0.590	5.348	0.003	0.978	3.467	0.003	1.011
1997	3	3.9906	0.0097	0.589	3.023	0.004	0.553	3.539	0.002	1.032
1997	4	5.8448	0.0041	0.862	3.176	0.002	0.581	2.900	0.003	0.845
1998	1	4.6753	0.0039	0.690	3.991	0.001	0.730	2.429	0.004	0.708
1998	2	2.2012	0.0135	0.325	4.219	0.002	0.772	3.312	0.004	0.966
1998	3	4.5977	0.0125	0.678	3.521	0.004	0.644	4.150	0.004	1.210
1998	4	6.0241	0.0047	0.889	2.860	0.003	0.523	2.218	0.004	0.647
1999	1	6.1034	0.0041	0.900	2.629	0.003	0.481	2.240	0.004	0.653
1999	2	5.0306	0.0114	0.742	4.708	0.007	0.861	3.259	0.004	0.950
1999	3	4.4671	0.0051	0.659	3.699	0.006	0.677	3.856	0.004	1.124
1999	4	4.4077	0.0037	0.650	3.380	0.002	0.618	1.887	0.005	0.550
2000	1	4.7519	0.0041	0.701	2.630	0.002	0.481	2.869	0.005	0.837
2000	2	3.8716	0.0039	0.571	3.573	0.004	0.654	3.322	0.004	0.968
2000	3	2.9285	0.0066	0.432	3.362	0.005	0.615	3.686	0.003	1.075
2000	4	4.2318	0.0066	0.624	3.401	0.003	0.622	2.426	0.005	0.707
2001	1	4.7685	0.0036	0.703	2.506	0.003	0.458	2.130	0.004	0.621
2001	2	5.3822	0.0058	0.794	3.159	0.004	0.578	2.691	0.004	0.785
2001	3	3.6767	0.0064	0.542	4.174	0.005	0.763	2.743	0.003	0.800
2001	4	3.4609	0.0060	0.510	2.971	0.004	0.543	2.140	0.004	0.624
2002	1	4.37	0.0062	0.645	2.772	0.002	0.507	2.655	0.004	0.774
2002	2	3.2415	0.0097	0.478	3.383	0.003	0.619	2.428	0.006	0.708
2002	3	2.6198	0.0067	0.386	2.095	0.003	0.383	2.257	0.003	0.658
2002	4	3.8359	0.0033	0.566	2.051	0.002	0.375	2.149	0.005	0.626
2003	1	4.8952	0.0045	0.722	2.361	0.002	0.432	2.064	0.008	0.602
2003	2	3.1137	0.0282	0.459	3.809	0.004	0.697	1.927	0.010	0.562
2003	3	2.3537	0.0125	0.347	3.827	0.006	0.700	2.580	0.005	0.752
2003	4	5.8444	0.0064	0.862	2.351	0.002	0.430	3.212	0.011	0.936
2004	1	5.5147	0.0067	0.813	2.138	0.002	0.391	2.444	0.007	0.712
2004	2	3.2185	0.0170	0.475	3.222	0.003	0.589	2.621	0.011	0.764
2004	3	3.0905	0.0083	0.456	2.931	0.003	0.536	3.557	0.004	1.037
2004	4	6.2136	0.0049	0.916	3.806	0.002	0.696	2.970	0.007	0.866
2005	1	6.5355	0.0079	0.964	2.964	0.001	0.542	2.053	0.006	0.598
2005	2	5.0522	0.0180	0.745	3.800	0.002	0.695	2.695	0.009	0.786
2005	3	4.9939	0.0282	0.737	4.549	0.002	0.832	2.796	0.006	0.815
2005	4	3.5025	0.0134	0.517	4.089	0.001	0.748	1.418	0.005	0.413
2006	1	4.6942	0.0053	0.692	2.358	0.001	0.431	1.378	0.004	0.402
2006	2	3.7398	0.0078	0.552	2.914	0.001	0.533	2.171	0.006	0.633
2006	3	3.9347	0.0058	0.580	3.606	0.003	0.659	2.694	0.006	0.785
2006	4	5.9326	0.0047	0.875	3.584	0.001	0.655	1.228	0.007	0.358
2007	1	4.2556	0.0038	0.628	3.285	0.001	0.601	1.503	0.006	0.438
2007	2	3.0466	0.0066	0.449	4.077	0.001	0.746	2.437	0.005	0.710
2007	3	2.9592	0.0077	0.436	5.266	0.002	0.963	1.762	0.005	0.514
2007	4	5.4723	0.0046	0.807	4.595	0.002	0.840	1.180	0.010	0.344
2008	1	4.0214	0.0045	0.593	2.861	0.002	0.523	1.752	0.006	0.511
2008	2	3.4951	0.0110	0.516	2.888	0.002	0.528	1.341	0.005	0.391
2008	3	3.5697	0.0103	0.527	4.107	0.002	0.751	1.425	0.006	0.415
2008	4	5.0585	0.0039	0.746	4.322	0.002	0.790	1.449	0.006	0.423
2009	1	3.3479	0.0036	0.494	2.651	0.001	0.485	1.687	0.008	0.492
2009	2	2.9143	0.0084	0.430	3.559	0.002	0.651	1.851	0.007	0.540
2009	3	2.9317	0.0071	0.432	3.292	0.007	0.602	1.681	0.005	0.490
2009	4	3.2565	0.0037	0.480	3.111	0.006	0.569	1.326	0.013	0.387
2010	1	2.8513	0.0042	0.421	2.391	0.004	0.437	1.737	0.008	0.506
2010	2	2.0446	0.0201	0.302	2.448	0.010	0.448	1.413	0.006	0.412
2010	3	4.1061	0.0212	0.606	4.140	0.041	0.757	2.477	0.005	0.722
2010	4	4.1268	0.0061	0.609	3.610	0.024	0.660	2.038	0.011	0.594

Appendix Table 2. Quarterly value of area specific standardized bigeye tuna CPUE in the east, west and south Indian Ocean for 1960-2014 expressed in real and relative scale in which the average from 1960 to 2014 is 1.0, with squared standard error of log CPUE (= CV of CPUE). (continued)

		East			West			South		
year	quarter	CPUE	dev_t	relative	CPUE	dev_t	relative	CPUE	dev_t	relative
2011	1	3.8388	0.0071	0.566	3.650	0.163	0.668	3.044	0.020	0.888
2011	2	2.0913	0.0991	0.308				3.539	0.008	1.032
2011	3	10.5356	0.1480	1.554				3.384	0.009	0.987
2011	4	5.9006	0.0087	0.870				1.426	0.019	0.416
2012	1	4.1434	0.0091	0.611				1.708	0.014	0.498
2012	2	3.0023	0.1477	0.443	6.978	0.054	1.276	3.346	0.006	0.976
2012	3	4.9578	0.0310	0.731	4.698	0.025	0.859	3.374	0.010	0.984
2012	4	6.2753	0.0072	0.926	8.066	0.017	1.475	2.516	0.037	0.734
2013	1	3.8756	0.0072	0.572	2.894	0.013	0.529	2.536	0.014	0.739
2013	2	1.0985	0.1475	0.162	3.899	0.013	0.713	2.754	0.007	0.803
2013	3	4.8624	0.0199	0.717				2.624	0.012	0.765
2013	4	5.9456	0.0049	0.877	7.760	0.066	1.419	1.328	0.019	0.387
2014	1	3.5905	0.0085	0.530	3.682	0.028	0.673	2.227	0.011	0.649
2014	2				3.371	0.033	0.616	0.666	0.010	0.194
2014	3	6.9033	0.0225	1.018	2.880	0.047	0.527	2.535	0.006	0.739
2014	4	6.9237	0.0139	1.021				1.645	0.026	0.480