

Japanese longline CPUE for yellowfin tuna in the Indian Ocean up to 2010 standardized by general linear model

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Abstract

Japanese longline CPUE for yellowfin tuna was standardized up to 2010 by GLM (CPUE-LogNormal error structured model). Number of hooks between float (NHF) and material of main line and branch line were applied in the model to standardize the change of the catchability which has been derived by fishing gear configuration. In order avoid the bias of CPUE trend which may be caused by critical decrease of effort in the northwestern Indian Ocean, scenario in which area 2 was not included was also applied and the results were compared.

Quarterly and annual CPUEs in the main fishing ground and whole Indian Ocean were standardized to provide abundance index for yellowfin assessment using standard models in the IOTC WPTT in 2011. Additionally, quarterly CPUE in each area in each of five areas in the whole Indian Ocean was also standardized for the assessment using integrated assessment models such as Multifan-CL and SS3.

Basically, standardized CPUE including and excluding Area2 in the model showed similar trend. In the main fishing ground, CPUE continuously decreased from around 15 (real scale) in early 1960s to around 5.0 in 1974, and was kept in same level until 1990 with jump to 12.0 in 1977. Thereafter, it declined to about 3.0 in 1994 and has been kept in the low level with fluctuation between about 2 and 3 until 2007. After that, the CPUE declined to historical low level, 1.24 in 2008, 1.18 in 2009 and 1.54 in 2010. As this declining trend in the recent year was detected in both model including and excluding Area 2 where the piracy activity has been increasing since 2007 the recent declining trend would be reflecting actual change in abundance rather than change in CPUE derived from shift of fishing ground and/or decreased effort caused by increased piracy activity. The trend of standardized CPUE for whole Indian Ocean was similar to that of main fishing ground, and also shows remarkable decrease in the last three years. Quarterly CPUE trends for main and whole Indian Ocean were similar to that of annual CPUE.

Trends of CPUEs of each area were relatively similar, i.e. large decline to middle 1970s, relatively stable trend until around 1991 and steadily declining trend thereafter. Applying LT5LN5 factor in the model showed relatively large effect on the CPUE trend for area 3 and 4 in which the declining trend until around 1990 was steeper in the model without LT5LN5. Then, the CPUE trend derived from the model with LT5LN5 caused relatively flat trend throughout period analyzed.

1. Introduction

Japanese longline CPUE for yellowfin tuna was standardized by Generalized Linear Model up to 2010. Methods of standardization were equivalent to those used for the last yellowfin assessment (Okamoto and Shono, 2010). Number of hooks between float (NHF) and material of main line and branch line were applied in the model to standardize the change of the catchability which has been derived by fishing gear configuration. Area definition used was the same as that used in 2010 analysis.

Since 2007, activity of Piracy off Somalia has increased and spread to whole northwestern Indian Ocean. Japanese longline effort in the Indian Ocean, northwestern part especially, has rapidly decreased to avoid the piracy attack. In the IOTC WPTT meeting of last year, concern of the effect of the decreased effort on the CPUE trend of the longline fishery was recognized. Okamoto (2011) estimated the regional effect of the decreased longline effort on the CPUE trend in the Indian Ocean, and suggested that the decreased effort in northwestern Indian Ocean has no more been able to represent the

CPUE trend in this region. Therefore, in this study, CPUE trends were calculated for both cases including and excluding Area 2 and resulted trends were compared.

2. Materials and methods

General linear model (GLM) was applied to standardize the Japanese longline CPUE for yellowfin tuna. Principally, the model used for the standardization in this paper is equivalent to that used in the yellowfin assessment last year (Okamoto and Shono, 2010). In this standardization, any environmental factor was not applied in the model.

Area definition:

Area definition used in this study which consists of five areas was as same as that used in the yellowfin assessment in IOTC WPTT 2010 (Fig. 1), although area 1 has not been used because of too little effort in this area. CPUE was standardized for main fishing ground (Area 2, 3 and 5) and whole Indian Ocean (Area 2 - 5) and for both areas excluding Area2.

Catch and effort data used:

The Japanese longline catch (in number) and effort statistics from 1963 up to 2010 were used. Data used in this study was the catch and effort data sets aggregated by month, 1-degree square, NHF (the number of hooks between floats), and main and branch line material. As the NHF information does not available for the period from 1960 to 1974, NHF was regarded to be 5 in this period. Main and branch line material was classified into two categories, 1 = Nylon and 2 = other. Although this information on the materials has been collected since 1994, the nylon material was started to be used by distant water longliner in the tropical Indian Ocean in around the late 1980s and spread quickly in the early 1990s (Okamoto 2005). And it seems that the larger number of NHF than 17 or 18 would become possible to be used as a result of introduction of the new material. Therefore, the material of NHF 17 or larger was assumed to be nylon since 1990.

GLM (Generalized Linear Model)

CPUE based on the catch in number was used. CPUE is calculated as “the number of caught fish / the number of hooks * 1000” As the model for standardizing CPUE, CPUE-LogNormal error structured model was used. The followings are the initial model for each analysis. Basing on the result of ANOVA (type III SS), non-significant effects were removed in step-wise from the initial model based on the F-value ($p < 0.05$). In the cases in which the factor is not significant as main factor but is significant as interaction with other factor, the main factor was kept in the model.

Annual and quarterly CPUE was standardized for main fishing ground (Area 2, 3 and 5) and whole Indian Ocean (Area 2-5) for three time series, 1963-2010, 1968-2010 and 1980-2010. In addition, quarterly CPUE was also standardized for each of five areas for 1963-2010 in order to provide CPUE index used for assessment using Multifan-CL software and Stock Synthesis 3 (SS3). In this case, the model in which explanatory factor of each 5 degree latitude and 5 degree longitude square was also applied.

- Initial Model for Year based CPUE standardization in the main fishing ground and whole Indian Ocean for 1963 through 2010

$$\text{Log}(\text{CPUE} + \text{const}) = \mu + \text{YR} + \text{QT} + \text{AREA} + \text{NHFCL} + \text{ML} + \text{BL} + \text{YR} * \text{QT} + \text{QT} * \text{AREA} + \text{YR} * \text{AREA} + \text{AREA} * \text{NHFCL} + \text{NHFCL} * \text{ML} + \text{NHFCL} * \text{BL}$$

- Initial Model for Quarter based CPUE standardization in the main fishing ground and whole Indian Ocean for 1963 through 2010

$\text{Log (CPUE+const)} = \mu + \text{YR} + \text{QT} + \text{AREA} + \text{NHFCL} + \text{ML} + \text{BL} + \text{YR} * \text{QT} * \text{AREA} + \text{AREA} * \text{NHFCL} + \text{NHFCL} * \text{ML} + \text{NHFCL} * \text{BL}$

- **Initial Model for quarter based CPUE standardization in each area from 1963 to 2010 (excluding explanatory factor of each latitude 5 degree and longitude 5 degree square)**

$\text{Log (CPUE+const)} = \mu + \text{YR} + \text{QT} + \text{NHFCL} + \text{ML} + \text{BL} + \text{YR} * \text{QT} + \text{NHFCL} * \text{ML} + \text{NHFCL} * \text{BL}$

- **Initial Model for quarter based CPUE standardization in each area from 1963 to 2010 (including explanatory factor of each latitude 5 degree and longitude 5 degree square)**

$\text{Log (CPUE+const)} = \mu + \text{YR} + \text{QT} + \text{NHFCL} + \text{ML} + \text{BL} + \text{LT5LN5} + \text{YR} * \text{QT} + \text{NHFCL} * \text{ML} + \text{NHFCL} * \text{BL}$

Where Log : natural logarithm,

CPUE : catch in number of bigeye per 1000 hooks,

Const : 10% of overall mean of CPUE

μ : overall mean,

YR : effect of year,

QT : effect of fishing season (quarter)

Area: effect of area,

NHFCL : effect of gear type (category of the number of hooks between floats),

MLD: effect of MLD (mixing layer depth),

ML : effect of material of main line,

BL : effect of material of branch line,

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

YR*QT : interaction term between year and quarter,

QT*Area: interaction term between quarter and area,

YR*Area: interaction term between year and area,

Area*NHFCL: interaction term between area and gear type,

NHFCL*ML: interaction term between material of gear type and main line,

NHFCL*BL: interaction term between material of gear type and branch line,

YR*QT*Area : interaction term between year, quarter and Area,

e : error term.

The number of hooks between float (NHF) was divided into 6 classes (NHFCL 1: 5-7, NHFCL 2: 8-10, NHFCL 3: 11-13, NHFCL 4: 14-16, NHFCL 5: 17-19, NHFCL 6: 20-21) as later explanation.

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

$$\text{CPUE}_i = \sum W_j * (\exp(\text{lsmean}(\text{Year } i * \text{Area } j)) - \text{constant})$$

Where CPUE_i = CPUE in year i ,

W_j = Area rate of Area j , ($\sum W_j = 1$),

lsmean(Year*Area $_{ij}$) = least square mean of Year-Area interaction in Year i and Area j (As for the quarter based CPUE, least square mean of Year*Quarter*Area was used instead),

constant = 10% of overall mean of CPUE.

3. Results and discussion

CPUE standardizations by GLM:

The yellowfin CPUEs (catch in number per 1000 hooks) in year and quarter bases were standardized for the period from 1963 to 2010 by GLM (CPUE-LogNormal error structured model) for each of area categories, main fishing ground (Area 2, 3 and 5 or Area 3 and 5) and whole Indian Ocean (Areas 2-5, or area 3-5). Results of ANOVA and distributions of the standard residual for both of annual and quarterly CPUE for main and whole Indian Ocean were shown in Tables 1-4 and Figs. 2 and 3, respectively. As all explanatory factors included in the initial models were effective significantly in all cases, final models were equal to the initial models as a result. In all cases, standard residual did not show remarkable difference from the normal distribution (Figs. 4 and 5).

Trends of annual CPUEs for main fishing ground in the Indian Ocean (with and without Area2) and whole Indian Ocean (with and without Area 2) standardized from 1963 to 2010 were shown in Fig. 2 in real scale overlaying nominal CPUE and in relative scale. Basically, standardized CPUE including and excluding Area2 in the model showed similar trend. In the main fishing ground, CPUE continuously decreased from around 15 (real scale) in early 1960s to around 5.0 in 1974, and was kept in same level until 1990 with jump to 12.0 in 1977. Thereafter, it declined to about 3.0 in 1994 and has been kept in the low level with fluctuation between about 2 and 3 until 2007. After that, the CPUE declined to historical low level, 1.24 in 2008, 1.18 in 2009 and 1.54 in 2010. As this declining trend in the recent year was detected in both model including and excluding Area 2 where the piracy activity has been increasing since 2007 the recent declining trend would be reflecting actual change in abundance rather than change in CPUE derived from shift of fishing ground and/or decreased effort caused by increased piracy activity. The trend of standardized CPUE for whole Indian Ocean was similar to that of main fishing ground, and also shows remarkable decrease in the last three years. Quarterly CPUE trends for main and whole Indian Ocean were basically similar to that of annual CPUE (Fig. 3).

In order to provide CPUE index used in Multifan-CL and SS3 analyses, quarterly CPUE of each five areas were separately standardized for the period from 1963 to 2010 as described in the materials and method section. Quarterly CPUE standardized by the model with LT5LN5 and without LT5LN5 for each area were shown in Fig. 6 and 7, respectively in real scale overlaying nominal CPUE and in relative scale. ANOVA tables and standard residuals were shown in Table 2 and Fig. 8, respectively. In order to compare both CPUEs (with and without LT5LN5) easily, year based CPUE for both model was calculated and shown in Fig. 9. Trends of CPUEs of each area were relatively similar, i.e. large decline to middle 1970s, relatively stable trend until around 1991 and steadily declining trend thereafter. Applying LT5LN5 factor in the model showed relatively large effect on the CPUE trend for area 3 and 4 in which the declining trend until around 1990 was steeper in the model without LT5LN5. Then, the CPUE trend derived from the model with LT5LN5 caused relatively flat trend throughout period analyzed. Regarding the LT5LN5 in the model, author has a concern if it is appropriate to apply it in the model because time period covered by each LT5LN5 would be different depending on the fishing distribution of each year or each period although the stock status should be different in each period. Therefore, the applying this explanatory factor in the model without considering interaction with period may cause bias in the resulted CPUE trend.

Annual and quarterly CPUE standardized for main and whole Indian Ocean and quarterly CPUE standardized for each of five areas were listed in Appendix Table 1 - 6, respectively, in real and relative scales with variation for three time series, 1963-2010, 1968-2010 and 1980-2010. Quarterly value of yellowfin CPUE standardized from 1963-2010 for each of five areas applying Model 2010 with and without LT5LN5 expressed in real scale and relative scale with variance were listed in Appendix Table 7 and 8, respectively.

Effect of each explanatory factors in the model

Trends of CPUE standardized for each of quarter, NHFCL, gear (main-line and branch-line) materials and interaction of NHFCL and gear materials were shown in Figs.11. L1 data set and main Indian Ocean were used for this analysis. CPUE was highest in 1st and 4th Quarter. Regarding NHFCL, CPUE was almost same level around 3.0 for NHFCL 1 through 5, while that of NHFCL 6 is largest about 4.5. As for the gear materials of both of branch and main-lines, Nylon showed about 10% higher CPUE than other material. Since the combinations of NHFCL with gear materials did show clear difference in CPUE between nylon non-nylon for both of main and branch line, largest NHFCL shows highest CPUE for both material categories.

4. Recerences

- 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. 18p
- Okamoto, H. and Shono, H. (2010): Japanese longline CPUE for yellowfin tuna in the Indian Ocean up to 2009 standardized by general linear model. IOTC 2010/WPTT12/30. 27 pp.
- Okamoto, H. (2011): Preliminary analysis of the effect of the Piracy activity in the northwestern Indian Ocean on the CPUE trend of bigeye and yellowfin. IOTC 2011/WPTT13/ XX. XXpp.

Table 1. ANOVA table of GLM for year based CPUE standardization for main fishing ground (upper: with area2, bottom: without area2) in the Indian Ocean for three time series, 1963-2010, 1968-2010 and 1980-2010.

1963-2010 Year base (1 degree X 1 degree X month)							1968-2010 Year base (1 degree X 1 degree X month)							1980-2010 Year base (1 degree X 1 degree X month)						
Main Fishing Ground (Area 2&3&5)							Main Fishing Ground (Area 2&3&5)							Main Fishing Ground (Area 2&3&5)						
Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	320	68170.229	213.032	255.230	<.0001	0.313745	Model	290	55436.207	191.159	212.120	<.0001	0.283691	Model	218	39630.116	181.790	189.650	<.0001	0.24505
						CV =														CV =
yr	47	11416.9885	242.91465	291.03	<.0001	59.95105	yr	42	19125.1027	455.35959	505.29	<.0001	68.43595	yr	30	5225.62041	174.187347	181.72	<.0001	79.39503
qt	3	3379.99407	1126.66469	1349.81	<.0001		qt	3	5372.5845	1790.8615	1987.24	<.0001		qt	3	3016.40616	1005.468719	1048.96	<.0001	
area	2	2065.23681	1032.6184	1237.14	<.0001		area	2	6351.13169	3175.56584	3523.79	<.0001		area	2	1790.82731	895.413657	934.14	<.0001	
nhfcl	5	526.92771	105.38554	126.26	<.0001		nhfcl	5	2238.13961	447.62792	496.71	<.0001		nhfcl	5	564.433549	112.88671	117.77	<.0001	
bl	1	19.99898	19.99898	23.96	<.0001		bl	1	522.76782	522.76782	580.09	<.0001		bl	1	21.258534	21.258534	22.18	<.0001	
ml	1	141.7687	141.7687	169.85	<.0001		ml	1	326.72989	326.72989	362.56	<.0001		ml	1	164.566108	164.566108	171.68	<.0001	
yr*qt	141	4816.95305	34.16279	40.93	<.0001		yr*qt	126	5506.47816	43.70221	48.49	<.0001		yr*qt	90	3714.66187	41.274021	43.06	<.0001	
qt*area	6	5248.28226	874.71371	1047.96	<.0001		qt*area	6	6843.0217	1140.50362	1265.57	<.0001		qt*area	6	5646.63024	941.105039	981.81	<.0001	
yr*area	94	5106.54904	54.32499	65.08	<.0001		yr*area	84	7371.73405	87.75874	97.38	<.0001		yr*area	60	2367.28031	39.454672	41.16	<.0001	
area*nhfcl	10	737.48226	73.74823	88.35	<.0001		area*nhfcl	10	1170.4929	117.04929	129.88	<.0001		area*nhfcl	10	773.113021	77.311302	80.66	<.0001	
nhfcl*ml	5	279.23991	55.84798	66.91	<.0001		nhfcl*ml	5	548.51216	109.70243	121.73	<.0001		nhfcl*ml	5	321.949467	64.389893	67.17	<.0001	
nhfcl*bl	5	56.95779	11.39156	13.65	<.0001		nhfcl*bl	5	59.51208	11.90242	13.21	<.0001		nhfcl*bl	5	62.865449	12.57309	13.12	<.0001	

1963-2010 Year base (1 degree X 1 degree X month)							1968-2010 Year base (1 degree X 1 degree X month)							1980-2010 Year base (1 degree X 1 degree X month)						
Main Fishing Ground (Area 3&5)							Main Fishing Ground (Area 3&5)							Main Fishing Ground (Area 3&5)						
Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	264	42539.593	161.135	177.600	<.0001	0.311205	Model	284	302743.537	1065.998	1052.010	<.0001	0.288854	Model	179	28749.904	160.614	158.630	<.0001	0.276349
						CV =														CV =
yr	47	6928.46907	147.414236	162.47	<.0001	72.72007	yr	42	4942.92833	117.68877	120.25	<.0001	84.52376	yr	30	3313.85869	110.461956	109.1	<.0001	97.51582
qt	3	4541.56257	1513.854189	1668.5	<.0001		qt	3	4232.8174	1410.939135	1441.66	<.0001		qt	3	3309.30185	1103.100616	1089.49	<.0001	
area	1	1324.01796	1324.017963	1459.27	<.0001		area	1	1303.46578	1303.465776	1331.85	<.0001		area	1	1276.05779	1276.057785	1260.31	<.0001	
nhfcl	5	389.07654	77.815308	85.76	<.0001		nhfcl	5	407.268074	81.453615	83.23	<.0001		nhfcl	5	407.675122	81.535024	80.53	<.0001	
bl	1	14.619995	14.619995	16.11	<.0001		bl	1	13.034311	13.034311	13.32	0.0003		bl	1	12.967752	12.967752	12.81	0.0003	
ml	1	74.376388	74.376388	81.97	<.0001		ml	1	82.284057	82.284057	84.08	<.0001		ml	1	90.259005	90.259005	89.15	<.0001	
yr*qt	141	3612.34455	25.619465	28.24	<.0001		yr*qt	126	3377.8343	26.808209	27.39	<.0001		yr*qt	90	2580.61039	28.673449	28.32	<.0001	
qt*area	3	3685.2323	1228.410768	1353.9	<.0001		qt*area	3	4219.82576	1406.608587	1437.23	<.0001		qt*area	3	4161.2836	1387.094534	1369.98	<.0001	
yr*area	47	2728.7084	58.057626	63.99	<.0001		yr*area	42	2509.42554	59.748227	61.05	<.0001		yr*area	30	925.98653	30.866218	30.49	<.0001	
area*nhfcl	5	639.427581	127.885516	140.95	<.0001		area*nhfcl	5	689.282108	137.856422	140.86	<.0001		area*nhfcl	5	619.383686	123.876737	122.35	<.0001	
nhfcl*ml	5	214.17664	42.835328	47.21	<.0001		nhfcl*ml	5	229.295363	45.859073	46.86	<.0001		nhfcl*ml	5	250.194459	50.038892	49.42	<.0001	
nhfcl*bl	5	36.805424	7.361085	8.11	<.0001		nhfcl*bl	5	36.680228	7.336046	7.5	<.0001		nhfcl*bl	5	37.17399	7.434798	7.34	<.0001	

Table 2. ANOVA table of GLM for year based CPUE standardization for whole Indian Ocean (upper: with area2, bottom: without area2) for three time series, 1963-2010, 1968-2010 and 1980-2010.

1963-2010 Year base (1 degree X 1 degree X month) Whole Indian (Area 2-5)							1968-2010 Year base (1 degree X 1 degree X month) Whole Indian (Area 2-5)							1980-2010 Year base (1 degree X 1 degree X month) Whole Indian (Area 2-5)									
Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=			
Model	376	163590.195		435.080	505.590	<.0001	0.449888	Model	341	139078.463		407.855	442.860	<.0001	0.426606	Model	257	109137.393		424.659	443.800	<.0001	0.410892
						CV =							CV =								CV =		
yr	47	13833.7638	294.3354	342.03	<.0001	81.38157	yr	42	10633.4579	253.17757	274.91	<.0001	96.41237	yr	30	6625.68749	220.85625	230.81	<.0001	115.9614			
qt	3	4197.35501	1399.11834	1625.85	<.0001		qt	3	4571.75085	1523.91695	1654.72	<.0001		qt	3	4128.52279	1376.17426	1438.21	<.0001				
area	3	8766.76289	2922.2543	3395.81	<.0001		area	3	9334.01371	3111.3379	3378.39	<.0001		area	3	10990.1048	3663.36825	3828.5	<.0001				
nhfcl	5	529.7048	105.94096	123.11	<.0001		nhfcl	5	554.90891	110.98178	120.51	<.0001		nhfcl	5	575.1792	115.03584	120.22	<.0001				
bl	1	47.81976	47.81976	55.57	<.0001		bl	1	46.55989	46.55989	50.56	<.0001		bl	1	50.06665	50.06665	52.32	<.0001				
ml	1	81.35553	81.35553	94.54	<.0001		ml	1	91.98815	91.98815	99.88	<.0001		ml	1	97.08701	97.08701	101.46	<.0001				
yr*qt	141	5364.27883	38.04453	44.21	<.0001		yr*qt	126	4996.9983	39.65872	43.06	<.0001		yr*qt	90	4054.72318	45.05248	47.08	<.0001				
qt*area	9	6743.78526	749.30947	870.74	<.0001		qt*area	9	7566.31556	840.70173	912.86	<.0001		qt*area	9	7354.47041	817.16338	854	<.0001				
yr*area	141	7857.48196	55.72682	64.76	<.0001		yr*area	126	7644.14019	60.66778	65.87	<.0001		yr*area	90	3103.45484	34.48283	36.04	<.0001				
area*nhfcl	15	949.95834	63.33056	73.59	<.0001		area*nhfcl	15	1022.05245	68.13683	73.99	<.0001		area*nhfcl	15	994.75616	66.31708	69.31	<.0001				
nhfcl*ml	5	389.76389	77.95278	90.59	<.0001		nhfcl*ml	5	419.91153	83.98231	91.19	<.0001		nhfcl*ml	5	456.75952	91.3519	95.47	<.0001				
nhfcl*bl	5	87.15129	17.43026	20.25	<.0001		nhfcl*bl	5	92.98768	18.59754	20.19	<.0001		nhfcl*bl	5	100.60768	20.12154	21.03	<.0001				

1963-2010 Year base (1 degree X 1 degree X month) Whole Indian (Area 3-5)							1968-2010 Year base (1 degree X 1 degree X month) Whole Indian (Area 3-5)							1980-2010 Year base (1 degree X 1 degree X month) Whole Indian (Area 3-5)									
Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=			
Model	320	122269.245		382.091	396.410	<.0001	0.445981	Model	341	139078.463		407.855	442.860	<.0001	0.426606	Model	218	86027.603		394.622	383.710	<.0001	0.430826
						CV =							CV =								CV =		
yr	47	10638.2397	226.34553	234.83	<.0001	129.8307	yr	42	10633.4579	253.17757	274.91	<.0001	96.41237	yr	30	5300.58849	176.686283	171.8	<.0001	218.1531			
qt	3	5766.79216	1922.26405	1994.31	<.0001		qt	3	4571.75085	1523.91695	1654.72	<.0001		qt	3	5004.73182	1668.243941	1622.11	<.0001				
area	2	6755.84563	3377.92282	3504.52	<.0001		area	3	9334.01371	3111.3379	3378.39	<.0001		area	2	9756.64567	4878.322836	4743.41	<.0001				
nhfcl	5	493.44649	98.6893	102.39	<.0001		nhfcl	5	554.90891	110.98178	120.51	<.0001		nhfcl	5	521.627159	104.325432	101.44	<.0001				
bl	1	45.04671	45.04671	46.73	<.0001		bl	1	46.55989	46.55989	50.56	<.0001		bl	1	42.089484	42.089484	40.93	<.0001				
ml	1	21.97109	21.97109	22.79	<.0001		ml	1	91.98815	91.98815	99.88	<.0001		ml	1	29.642862	29.642862	28.82	<.0001				
yr*qt	141	4720.26951	33.47709	34.73	<.0001		yr*qt	126	4996.9983	39.65872	43.06	<.0001		yr*qt	90	3144.17675	34.935297	33.97	<.0001				
qt*area	6	5614.59481	935.7658	970.84	<.0001		qt*area	9	7566.31556	840.70173	912.86	<.0001		qt*area	6	6438.86972	1073.144954	1043.47	<.0001				
yr*area	94	4686.97962	49.86149	51.73	<.0001		yr*area	126	7644.14019	60.66778	65.87	<.0001		yr*area	60	1691.25263	28.187544	27.41	<.0001				
area*nhfcl	10	864.14129	86.41413	89.65	<.0001		area*nhfcl	15	1022.05245	68.13683	73.99	<.0001		area*nhfcl	10	863.339236	86.333924	83.95	<.0001				
nhfcl*ml	5	280.20273	56.04055	58.14	<.0001		nhfcl*ml	5	419.91153	83.98231	91.19	<.0001		nhfcl*ml	5	335.586601	67.11732	65.26	<.0001				
nhfcl*bl	5	64.66467	12.93293	13.42	<.0001		nhfcl*bl	5	92.98768	18.59754	20.19	<.0001		nhfcl*bl	5	71.978269	14.395654	14	<.0001				

Table 3. ANOVA table of GLM for quarter based CPUE standardization for main fishing ground (upper: with area2, bottom: without area2) in the Indian Ocean for three time series, 1963-2010, 1968-2010 and 1980-2010.

1963-2010 Quarter base (1 degree X 1 degree X month) Main Fishing Ground (Area 2&3&5)							1968-2010 Quarter base (1 degree X 1 degree X month) Main Fishing Ground (Area 2&3&5)							1980-2010 Quarter base (1 degree X 1 degree X month) Main Fishing Ground (Area 2&3&5)						
Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	602	74078.129	123.053	153.270	<.0001	0.340936	Model	542	60870.750	112.308	129.450	<.0001	0.311502	Model	398	43839.171	110.149	118.850	<.0001	0.271077
						CV =														CV =
yr	47	9527.70115	202.71705	252.49	<.0001	58.7978	yr	42	7501.59604	178.60943	205.87	<.0001	67.14877	yr	30	4153.3421	138.44474	149.38	<.0001	78.06966
qt	3	2529.85771	843.2859	1050.33	<.0001		qt	3	2430.17347	810.05782	933.68	<.0001		qt	3	2267.42614	755.80871	815.5	<.0001	
area	2	1446.44759	723.22379	900.79	<.0001		area	2	1451.83258	725.91629	836.7	<.0001		area	2	1166.88808	583.44404	629.52	<.0001	
nhfcl	5	481.78959	96.35792	120.02	<.0001		nhfcl	5	513.2363	102.64726	118.31	<.0001		nhfcl	5	527.46632	105.49326	113.82	<.0001	
bl	1	16.42849	16.42849	20.46	<.0001		bl	1	17.55708	17.55708	20.24	<.0001		bl	1	19.47332	19.47332	21.01	<.0001	
ml	1	135.54329	135.54329	168.82	<.0001		ml	1	145.7863	145.7863	168.03	<.0001		ml	1	159.21757	159.21757	171.79	<.0001	
yr*qt*area	523	22253.3861	42.5495	53	<.0001		yr*qt*area	468	21957.8066	46.91839	54.08	<.0001		yr*qt*area	336	16828.1258	50.08371	54.04	<.0001	
area*nhfcl	10	725.69177	72.56918	90.39	<.0001		area*nhfcl	10	776.55681	77.65568	89.51	<.0001		area*nhfcl	10	768.61712	76.86171	82.93	<.0001	
nhfcl*ml	5	241.69665	48.33933	60.21	<.0001		nhfcl*ml	5	255.91605	51.18321	58.99	<.0001		nhfcl*ml	5	279.02806	55.80561	60.21	<.0001	
nhfcl*bl	5	44.5476	8.90952	11.1	<.0001		nhfcl*bl	5	47.16242	9.43248	10.87	<.0001		nhfcl*bl	5	51.03286	10.20657	11.01	<.0001	

1963-2010 Quarter base (1 degree X 1 degree X month) Main Fishing Ground (Area 3&5)							1968-2010 Quarter base (1 degree X 1 degree X month) Main Fishing Ground (Area 3&5)							1980-2010 Quarter base (1 degree X 1 degree X month) Main Fishing Ground (Area 3&5)						
Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	405	45889.948	113.309	129.320	<.0001	0.335715	Model	365	38678.745	105.969	111.800	<.0001	0.312248	Model	269	30787.510	114.452	116.040	<.0001	0.295935
						CV =														CV =
yr	47	6249.06564	132.95884	151.74	<.0001	71.46308	yr	42	4580.54894	109.06069	115.06	<.0001	83.18014	yr	30	3123.97757	104.13259	105.58	<.0001	96.24539
qt	3	3634.63787	1211.54596	1382.7	<.0001		qt	3	3564.26714	1188.08905	1253.49	<.0001		qt	3	2935.19888	978.39963	992.01	<.0001	
area	1	1039.3958	1039.3958	1186.23	<.0001		area	1	1036.19375	1036.19375	1093.23	<.0001		area	1	972.26231	972.26231	985.78	<.0001	
nhfcl	5	368.91319	73.78264	84.21	<.0001		nhfcl	5	390.81397	78.16279	82.47	<.0001		nhfcl	5	394.45264	78.89053	79.99	<.0001	
bl	1	11.07237	11.07237	12.64	0.0004		bl	1	11.78274	11.78274	12.43	0.0004		bl	1	13.12502	13.12502	13.31	0.0003	
ml	1	78.21014	78.21014	89.26	<.0001		ml	1	83.95502	83.95502	88.58	<.0001		ml	1	91.79601	91.79601	93.07	<.0001	
yr*qt*area	332	14828.657	44.66463	50.97	<.0001		yr*qt*area	297	14307.1711	48.17229	50.82	<.0001		yr*qt*area	213	10842.5753	50.90411	51.61	<.0001	
area*nhfcl	5	659.97839	131.99568	150.64	<.0001		area*nhfcl	5	700.89499	140.179	147.9	<.0001		area*nhfcl	5	652.69157	130.53831	132.35	<.0001	
nhfcl*ml	5	216.42517	43.28503	49.4	<.0001		nhfcl*ml	5	228.12064	45.62413	48.14	<.0001		nhfcl*ml	5	246.06168	49.21234	49.9	<.0001	
nhfcl*bl	5	29.63388	5.92678	6.76	<.0001		nhfcl*bl	5	31.21113	6.24223	6.59	<.0001		nhfcl*bl	5	33.41288	6.68258	6.78	<.0001	

Table 4. ANOVA table of GLM for quarter based CPUE standardization for whole Indian Ocean (upper: with area2, bottom: without area2) for three time series, 1963-2010, 1968-2010 and 1980-2010.

1963-2010 Quarter base (1 degree X 1 degree X month)							1968-2010 Quarter base (1 degree X 1 degree X month)							1980-2010 Quarter base (1 degree X 1 degree X month)						
Whole Indian (Area 2-5)							Whole Indian (Area 2-5)							Whole Indian (Area 2-5)						
Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	799	173831.196	217.561	265.970	<.0001	0.478052	Model	719	147913.603	205.721	234.020	<.0001	0.453706	Model	527	115870.645	219.868	239.720	<.0001	0.436242
						CV =														
yr	47	10860.570	231.076	282.500	<.0001	79.34321	yr	42	8435.079	200.835	228.470	<.0001	94.19415	yr	30	4923.391	164.113	178.930	<.0001	113.5328
qt	3	3336.936	1112.312	1359.830	<.0001		qt	3	3640.924	1213.641	1380.610	<.0001		qt	3	3383.173	1127.724	1229.520	<.0001	
area	3	7724.893	2574.964	3147.960	<.0001		area	3	8306.362	2768.787	3149.700	<.0001		area	3	9953.119	3317.706	3617.180	<.0001	
nhfcl	5	433.485	86.697	105.990	<.0001		nhfcl	5	467.984	93.597	106.470	<.0001		nhfcl	5	482.906	96.581	105.300	<.0001	
bl	1	39.077	39.077	47.770	<.0001		bl	1	41.918	41.918	47.680	<.0001		bl	1	45.287	45.287	49.370	<.0001	
ml	1	86.364	86.364	105.580	<.0001		ml	1	92.649	92.649	105.400	<.0001		ml	1	101.407	101.407	110.560	<.0001	
yr*qt*area	714	31589.141	44.242	54.090	<.0001		yr*qt*area	639	29932.062	46.842	53.290	<.0001		yr*qt*area	459	21879.455	47.668	51.970	<.0001	
area*nhfcl	15	957.096	63.806	78.000	<.0001		area*nhfcl	15	1024.743	68.316	77.710	<.0001		area*nhfcl	15	1021.236	68.082	74.230	<.0001	
nhfcl*ml	5	325.164	65.033	79.500	<.0001		nhfcl*ml	5	346.209	69.242	78.770	<.0001		nhfcl*ml	5	379.669	75.934	82.790	<.0001	
nhfcl*bl	5	73.953	14.791	18.080	<.0001		nhfcl*bl	5	79.055	15.811	17.990	<.0001		nhfcl*bl	5	87.202	17.440	19.010	<.0001	

1963-2010 Quarter base (1 degree X 1 degree X month)							1968-2010 Quarter base (1 degree X 1 degree X month)							1980-2010 Quarter base (1 degree X 1 degree X month)						
Whole Indian (Area 3-5)							Whole Indian (Area 3-5)							Whole Indian (Area 3-5)						
Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=	Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	602	130208.974	216.294	236.350	<.0001	0.474942	Model	719	147913.603	205.721	234.020	<.0001	0.453706	Model	527	115870.645	219.868	239.720	<.0001	0.436242
						CV =														
yr	47	8580.779	182.570	199.500	<.0001	126.5051	yr	42	8435.079	200.835	228.470	<.0001	94.19415	yr	30	4923.391	164.113	178.930	<.0001	113.5328
qt	3	4601.452	1533.817	1676.070	<.0001		qt	3	3640.924	1213.641	1380.610	<.0001		qt	3	3383.173	1127.724	1229.520	<.0001	
area	2	6468.679	3234.340	3534.300	<.0001		area	3	8306.362	2768.787	3149.700	<.0001		area	3	9953.119	3317.706	3617.180	<.0001	
nhfcl	5	413.917	82.783	90.460	<.0001		nhfcl	5	467.984	93.597	106.470	<.0001		nhfcl	5	482.906	96.581	105.300	<.0001	
bl	1	34.355	34.355	37.540	<.0001		bl	1	41.918	41.918	47.680	<.0001		bl	1	45.287	45.287	49.370	<.0001	
ml	1	27.060	27.060	29.570	<.0001		ml	1	92.649	92.649	105.400	<.0001		ml	1	101.407	101.407	110.560	<.0001	
yr*qt*area	523	24418.911	46.690	51.020	<.0001		yr*qt*area	639	29932.062	46.842	53.290	<.0001		yr*qt*area	459	21879.455	47.668	51.970	<.0001	
area*nhfcl	10	907.206	90.721	99.130	<.0001		area*nhfcl	15	1024.743	68.316	77.710	<.0001		area*nhfcl	15	1021.236	68.082	74.230	<.0001	
nhfcl*ml	5	264.922	52.984	57.900	<.0001		nhfcl*ml	5	346.209	69.242	78.770	<.0001		nhfcl*ml	5	379.669	75.934	82.790	<.0001	
nhfcl*bl	5	61.346	12.269	13.410	<.0001		nhfcl*bl	5	79.055	15.811	17.990	<.0001		nhfcl*bl	5	87.202	17.440	19.010	<.0001	

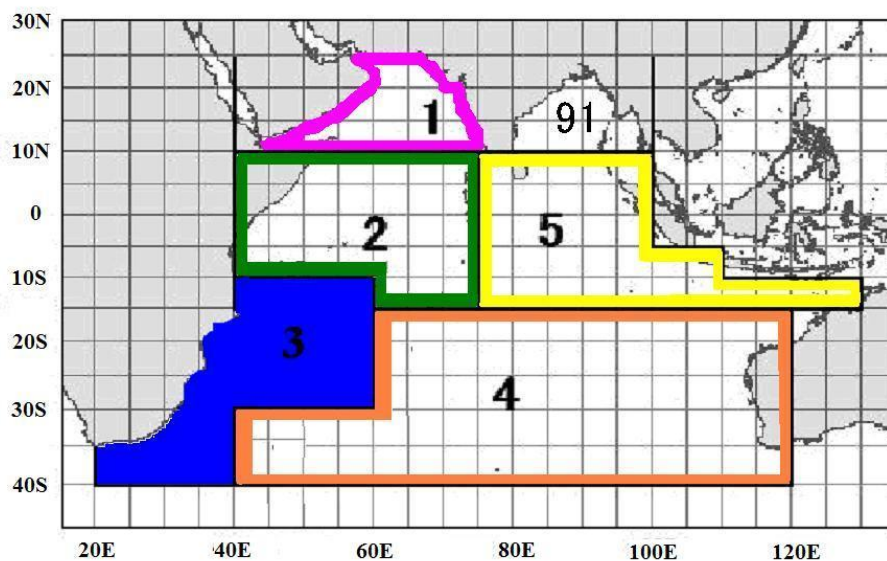


Fig. 1. Definition of sub-areas used in this study. Main fishing ground (areas 2, 3 and 5) and whole Indian Ocean (sub-areas 2-5) categories in this paper.

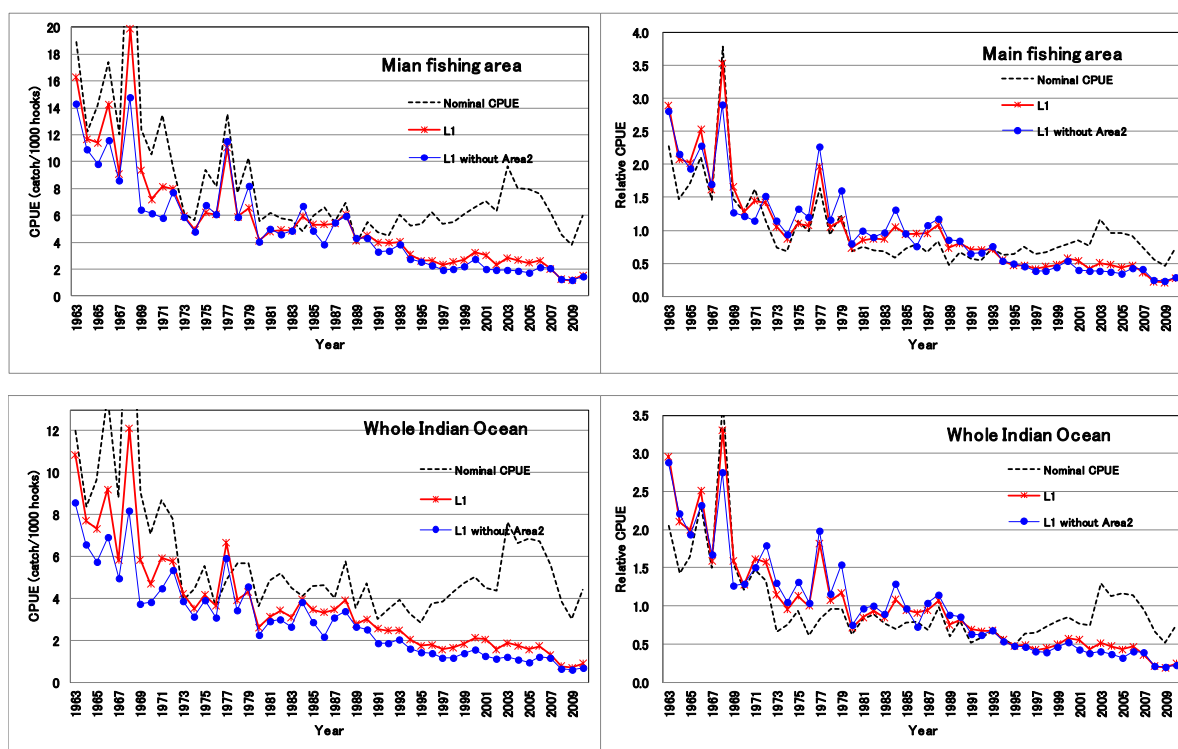


Fig. 2. Annual based CPUE in number from 1963 to 2010 standardized for main fishing ground (top) and whole (bottom) Indian Ocean expressed in real (left figure) and relative (right figure) scale overlaid with nominal CPUE.

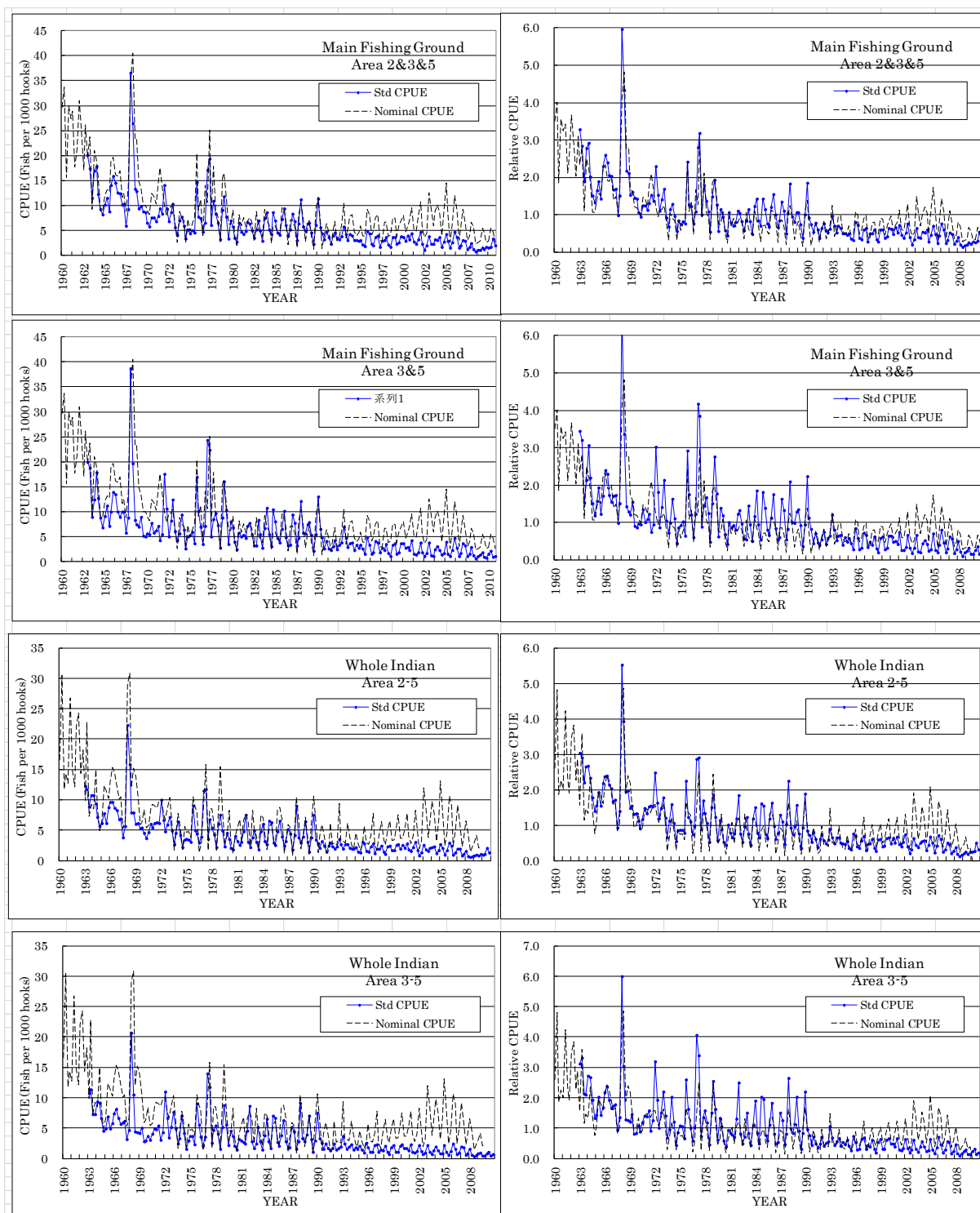
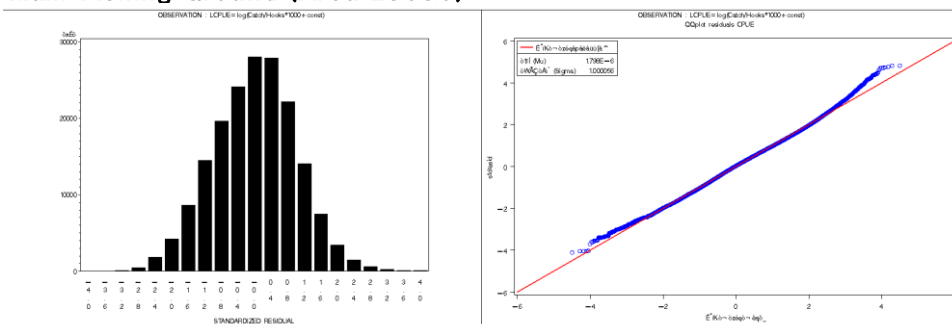
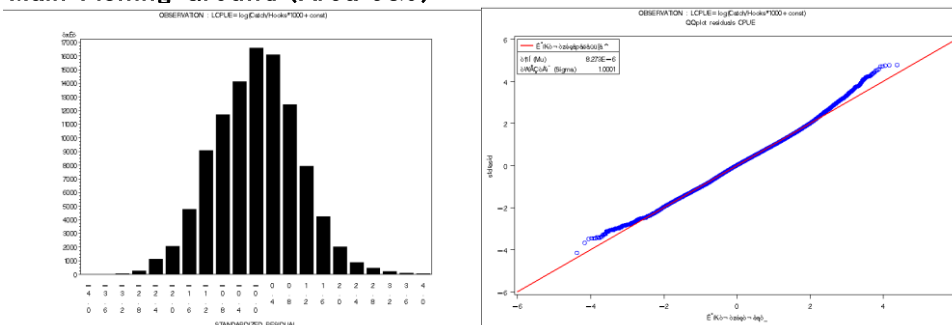


Fig. 3. Quarter based CPUE in number from 1963 to 2010 standardized for main fishing ground (with and without area 2) and whole Indian Ocean (with and without area 2) expressed in relative (left figure) and real (right figure) scale overlaid with nominal CPUE.

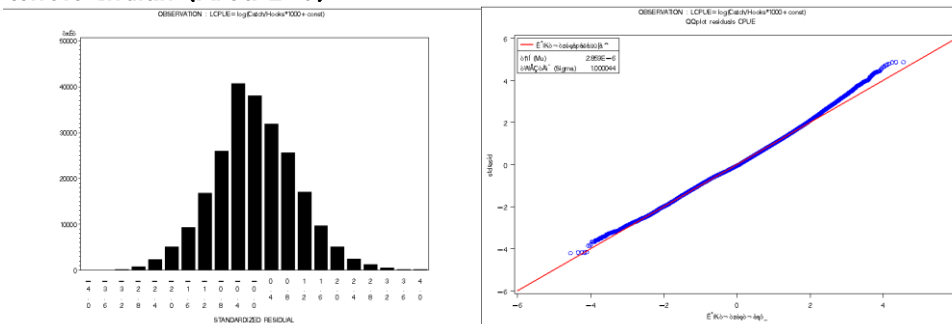
**1963-2010 Year base (1 degree X 1 degree X month)
Main Fishing Ground (Area 2&3&5)**



**1963-2010 Year base (1 degree X 1 degree X month)
Main Fishing Ground (Area 3&5)**



**1963-2010 Year base (1 degree X 1 degree X month)
Whole Indian (Area 2-5)**



**1963-2010 Year base (1 degree X 1 degree X month)
Whole Indian (Area 3-5)**

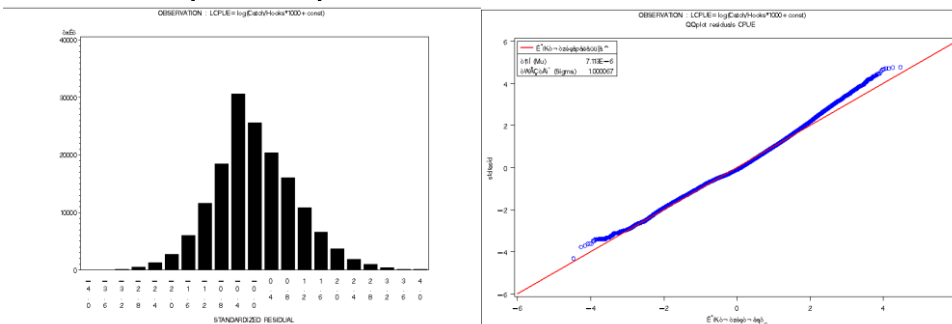
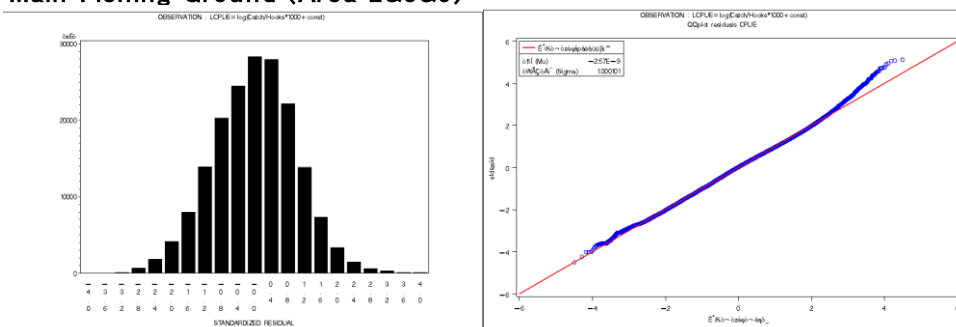
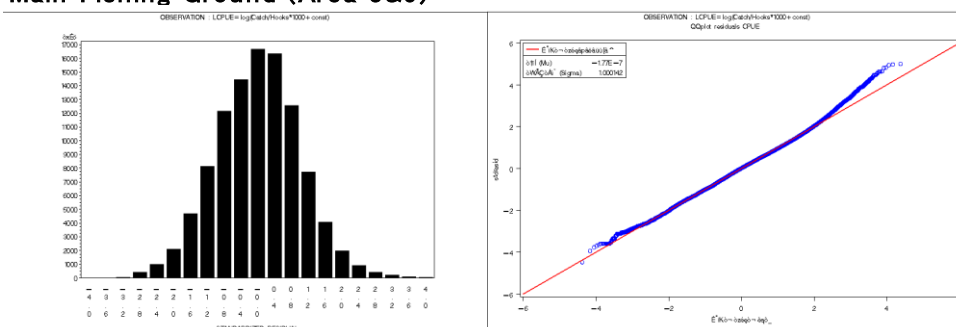


Fig. 4 Standardized residuals of annual based CPUE standardization for main fishing ground (with and without area 2) and whole Indian Ocean (with and without area 2).

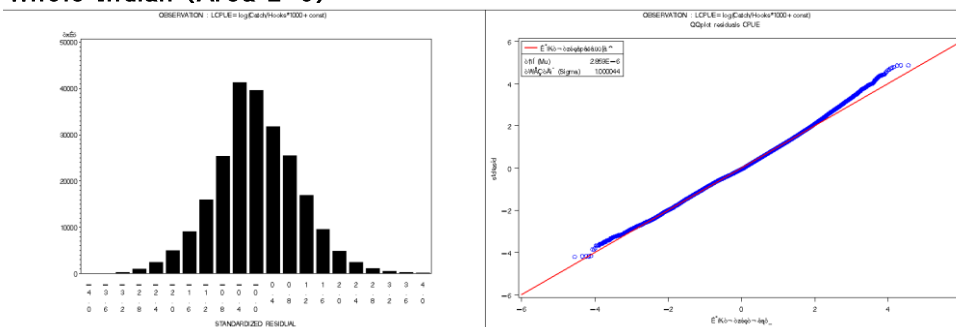
**1963-2010 Quarter base (1 degree X 1 degree X month)
Main Fishing Ground (Area 2&3&5)**



**1963-2010 Quarter base (1 degree X 1 degree X month)
Main Fishing Ground (Area 3&5)**



**1963-2010 Quarter base (1 degree X 1 degree X month)
Whole Indian (Area 2-5)**



**1963-2010 Quarter base (1 degree X 1 degree X month)
Whole Indian (Area 3-5)**

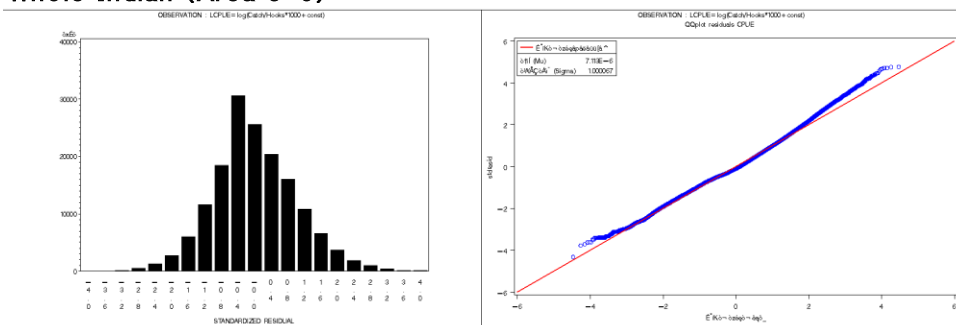


Fig. 5 Standardized residuals of quarter based CPUE standardization for main fishing ground (with and without area 2) and whole Indian Ocean (with and without area 2).

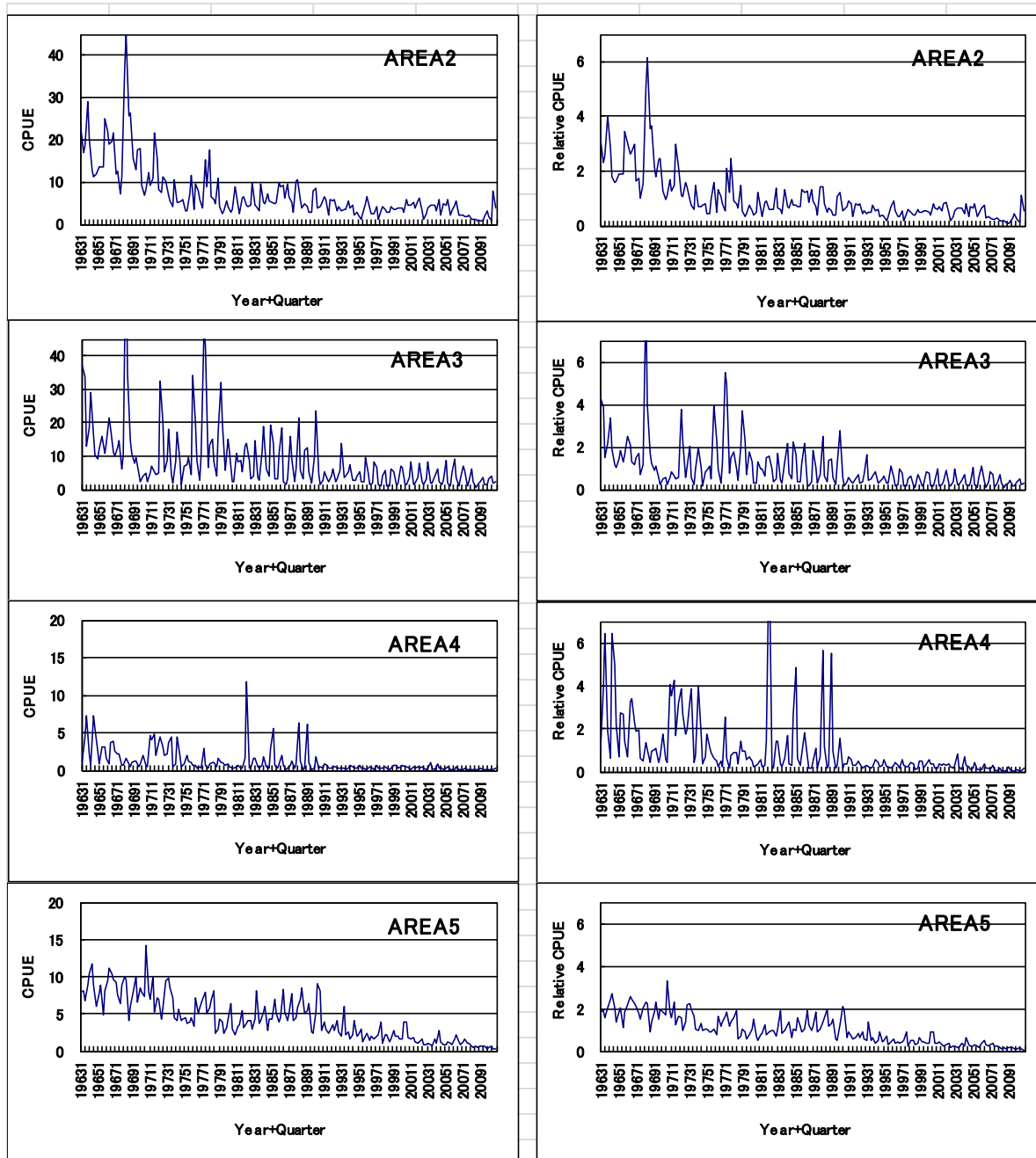


Fig. 6. Standardized quarter based CPUE in number from 1963 to 2010 for each five areas applying Model 2010 (without LT5LN5) expressed in relative (left figure) and real (right figure) scale.

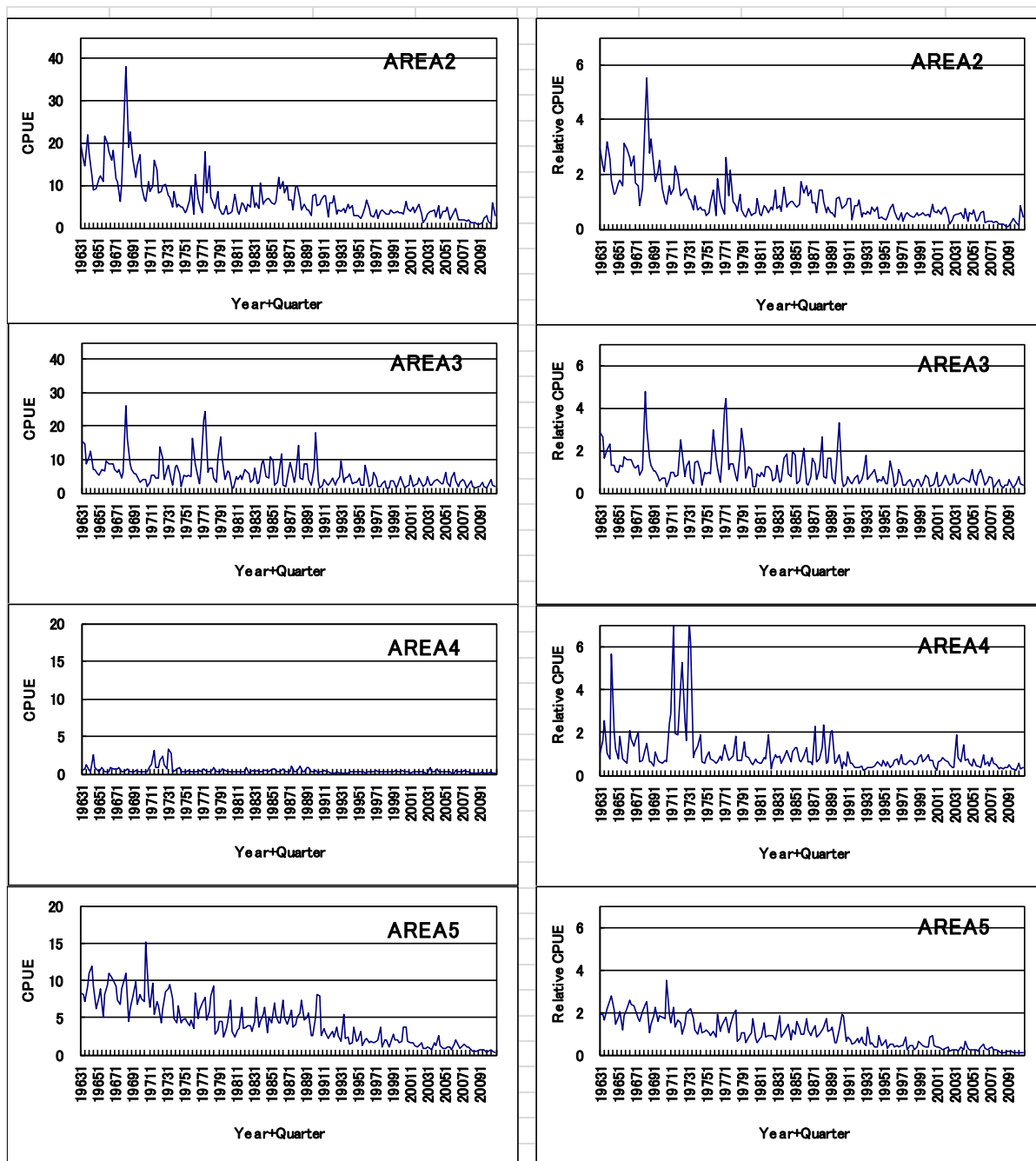


Fig. 7. Standardized quarter based CPUE in number from 1963 to 2010 for each five areas applying Model 2010 with LT5LN5 expressed in relative (left figure) and real (right figure) scale.

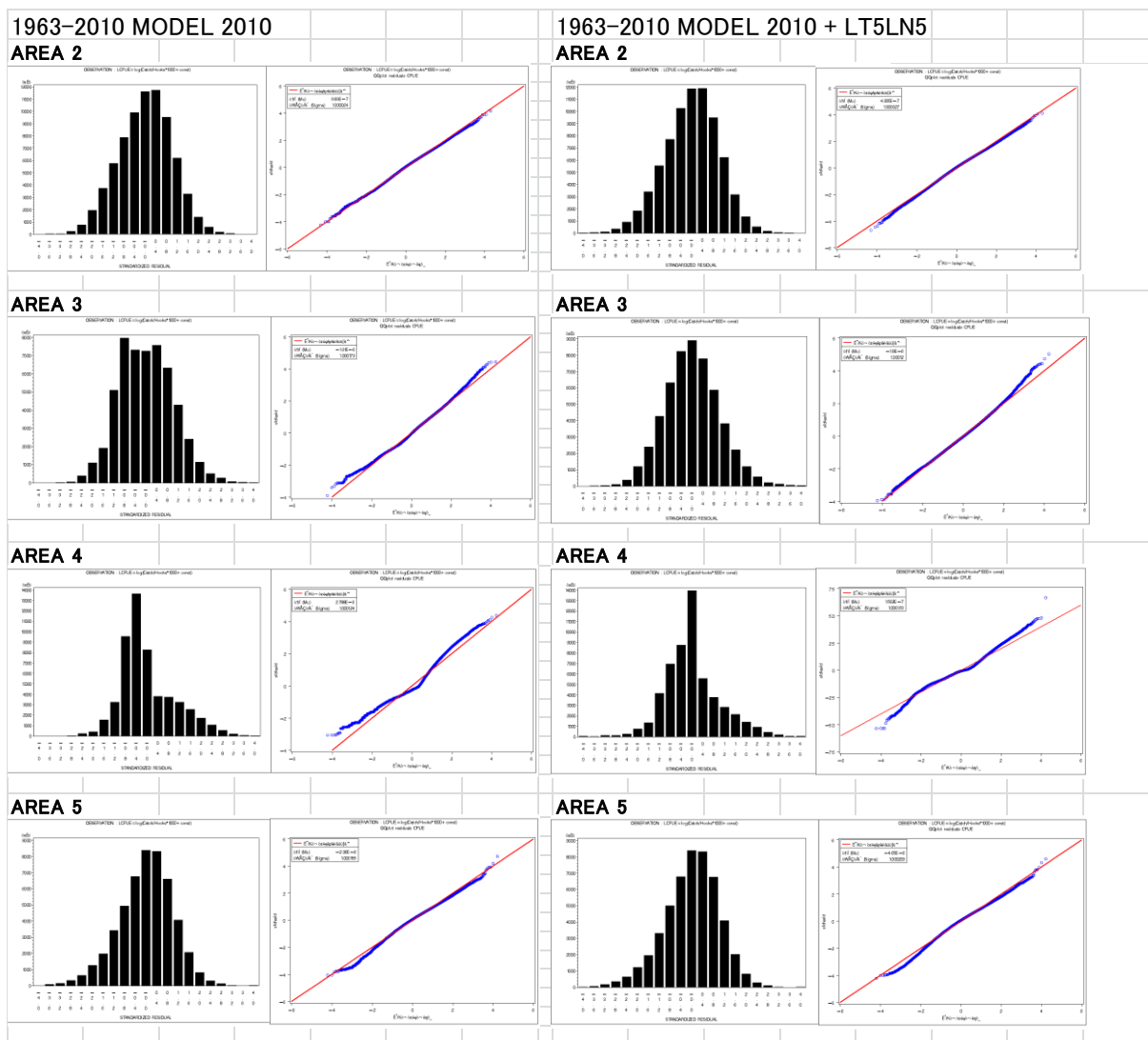


Fig. 8. Standardized residuals of quarter based CPUE standardization for each of five areas applying Model 2010 with and without LT5LN5 expressed as histograms and QQ plots.

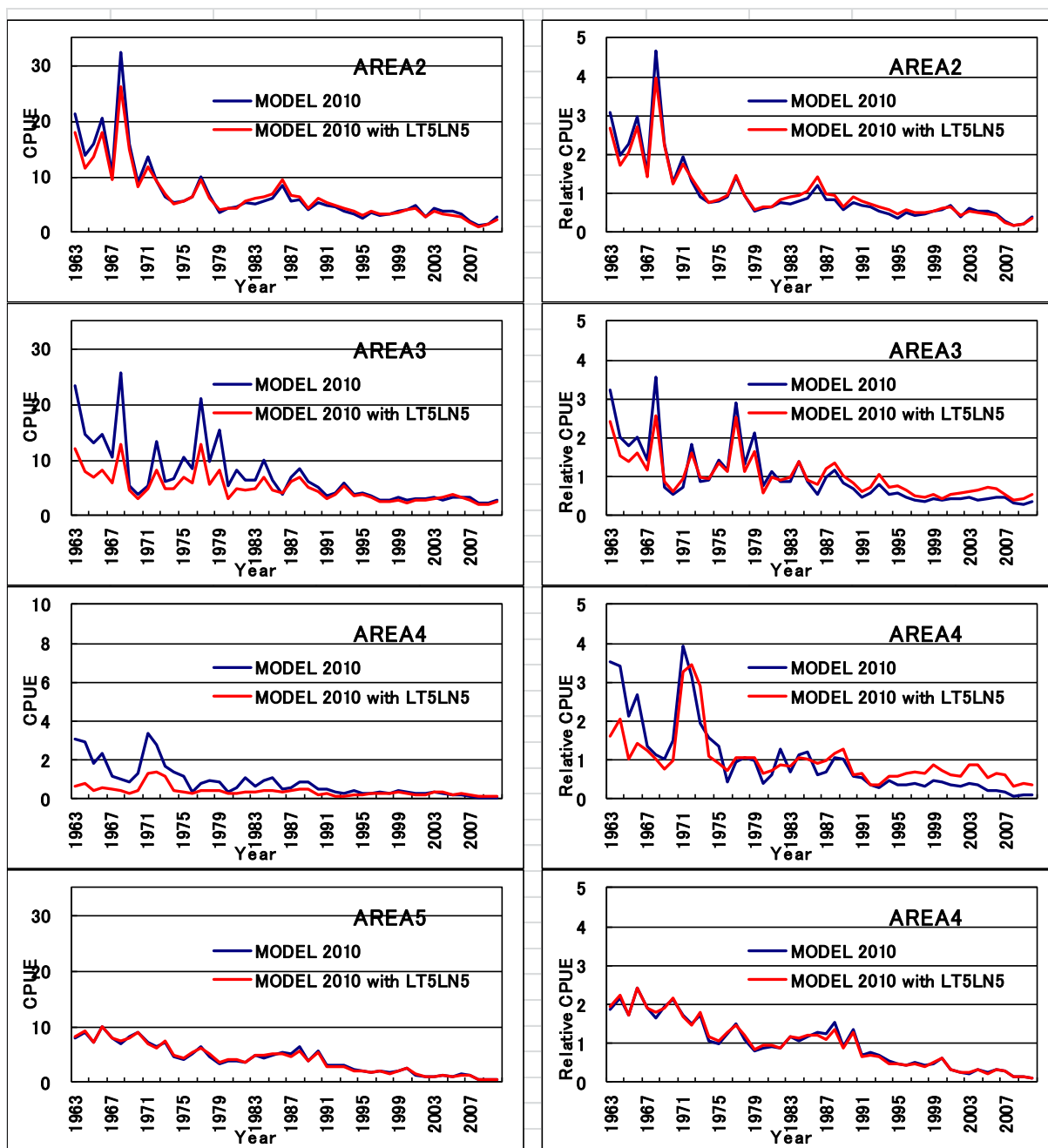


Fig. 9. Standardized quarter based CPUE in number from 1963 to 2010 for each five areas applying Model 2010 with and without LT5LN5 expressed in relative (left figure) and real (right figure) scale.

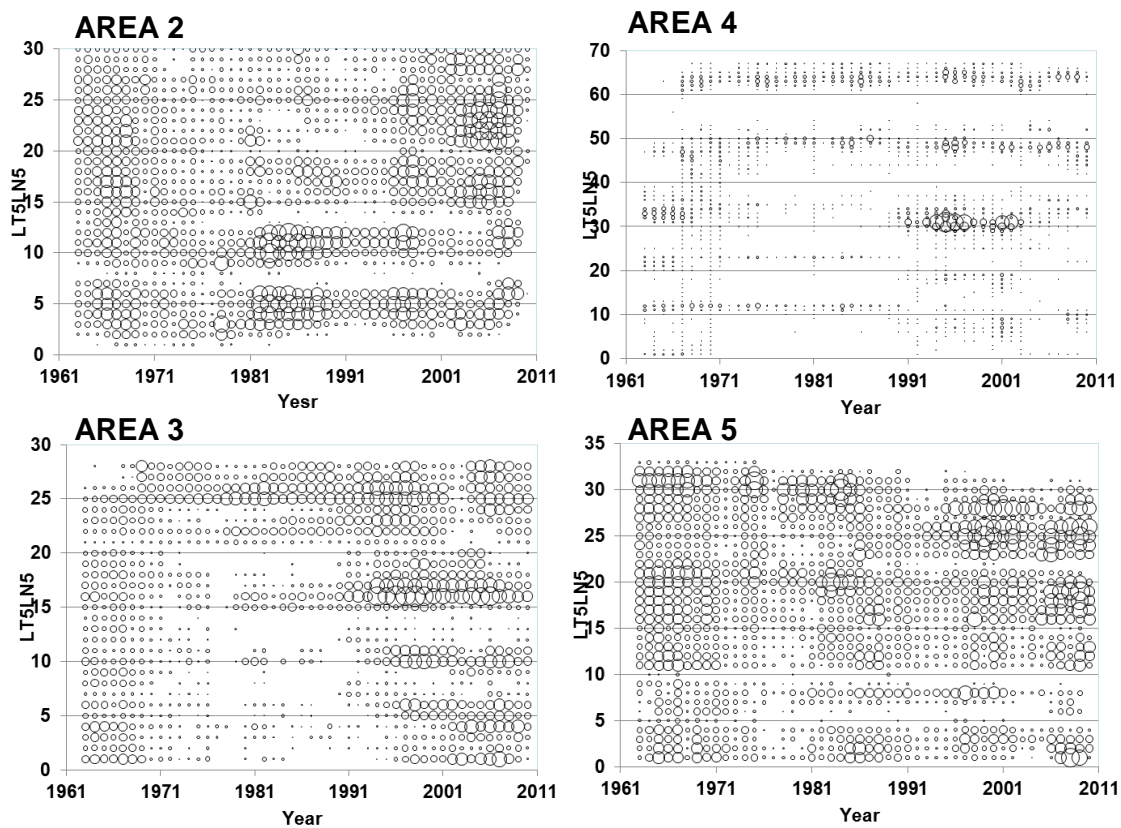
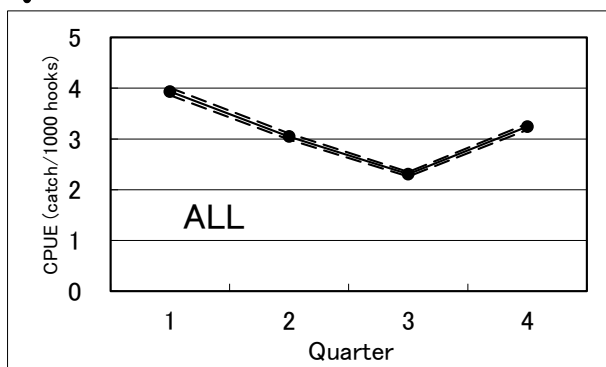
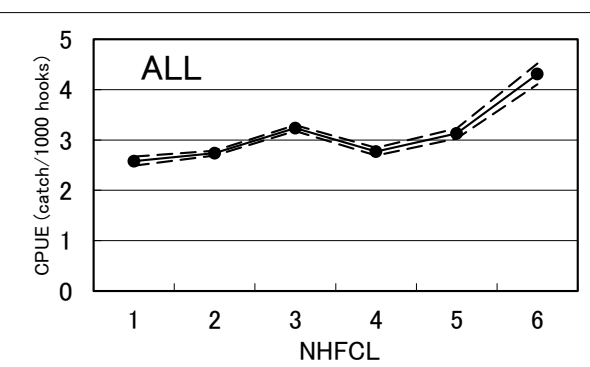


Fig. 10. Historical change in the number of observation of each LT5LN5 factor in each area.

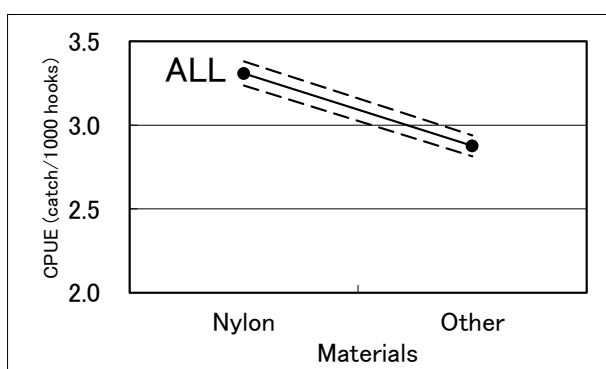
Quarter



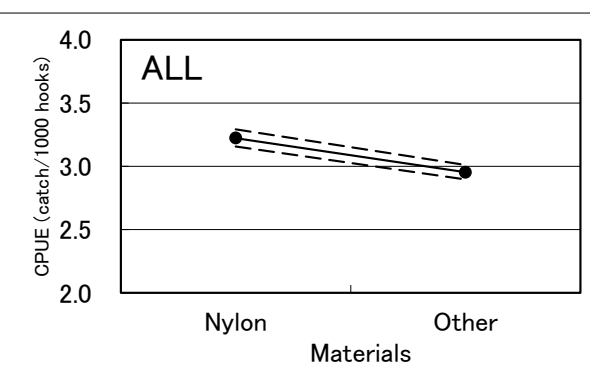
NHFCL



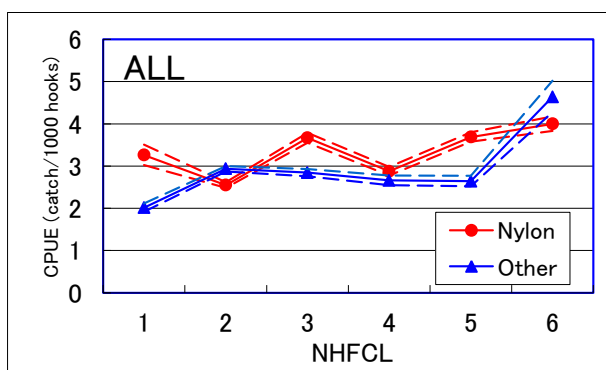
Mainline materials



Branchline materials



NHFCL*Mainline materials



NHFCL*Branchline materials

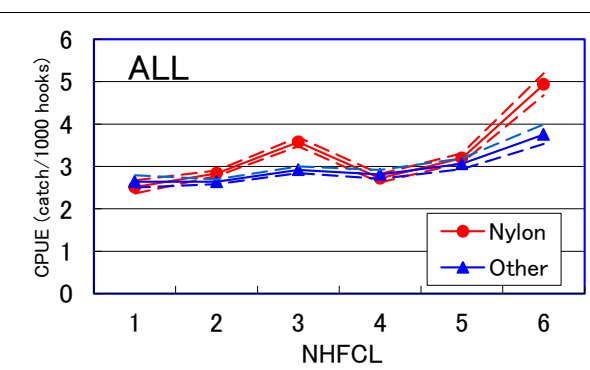


Fig. 11. Trends of CPUE standardized for each of quarter, NHFCL, gear (main-line and branch-line) materials and interaction of NHFCL and gear materials.

Appendix table 1. Annual value of yellowfin CPUE standardized for main fishing ground and whole Indian Ocean with and without area 2 for 1963-2010 expressed in real and relative scale in which the average of each period is 1.0, and variance.

Main (Area2&3&5) 1963-2010				Main (Area3&5) 1963-2010				Whole (Area2-5) 1963-2010				Whole (Area3-5) 1963-2010			
year	cpue_p	dev t	Relative CPUE	year	cpue_p	dev t	Relative CPUE	year	cpue_p	dev t	Relative CPUE	year	cpue_p	dev t	Relative CPUE
1960				1960				1960				1960			
1961				1961				1961				1961			
1962				1962				1962				1962			
1963	16.2767	0.0004	2.8927	1963	14.2781	0.0007	2.8162	1963	10.8403	0.0004	2.9584	1963	8.5508	0.0006	2.8797
1964	11.6800	0.0004	2.0758	1964	10.9378	0.0006	2.1573	1964	7.6991	0.0003	2.1011	1964	6.5709	0.0005	2.2129
1965	11.4031	0.0004	2.0266	1965	9.8244	0.0006	1.9377	1965	7.3111	0.0003	1.9952	1965	5.7414	0.0005	1.9335
1966	14.2497	0.0003	2.5325	1966	11.5990	0.0006	2.2878	1966	9.1960	0.0003	2.5096	1966	6.9061	0.0005	2.3258
1967	9.0683	0.0003	1.6116	1967	8.6186	0.0005	1.6999	1967	5.8124	0.0002	1.5862	1967	4.9518	0.0004	1.6676
1968	19.8886	0.0004	3.5346	1968	14.7637	0.0007	2.9120	1968	12.1103	0.0003	3.3049	1968	8.1589	0.0004	2.7477
1969	9.3622	0.0004	1.6639	1969	6.4480	0.0007	1.2718	1969	5.8337	0.0003	1.5920	1969	3.7512	0.0004	1.2633
1970	7.1930	0.0005	1.2784	1970	6.1313	0.0008	1.2093	1970	4.6763	0.0003	1.2762	1970	3.8169	0.0005	1.2854
1971	8.1500	0.0005	1.4484	1971	5.7850	0.0009	1.1410	1971	5.9177	0.0003	1.6150	1971	4.4773	0.0005	1.5078
1972	7.9796	0.0007	1.4182	1972	7.7429	0.0015	1.5272	1972	5.7731	0.0007	1.5755	1972	5.3365	0.0012	1.7972
1973	5.9311	0.0008	1.0541	1973	5.8445	0.0014	1.1528	1973	4.1957	0.0005	1.1450	1973	3.8673	0.0009	1.3024
1974	4.9246	0.0005	0.8752	1974	4.7781	0.0009	0.9424	1974	3.4941	0.0004	0.9536	1974	3.1208	0.0006	1.0510
1975	6.1819	0.0005	1.0987	1975	6.7347	0.0009	1.3283	1975	4.1450	0.0004	1.1312	1975	3.9076	0.0006	1.3160
1976	6.0480	0.0009	1.0749	1976	6.0914	0.0015	1.2015	1976	3.6566	0.0006	0.9979	1976	3.0964	0.0010	1.0428
1977	11.0316	0.0016	1.9606	1977	11.5313	0.0035	2.2744	1977	6.6401	0.0009	1.8121	1977	5.8944	0.0016	1.9851
1978	5.8947	0.0006	1.0476	1978	5.9016	0.0013	1.1640	1978	3.9186	0.0005	1.0694	1978	3.4274	0.0008	1.1543
1979	6.5264	0.0007	1.1599	1979	8.1547	0.0012	1.6084	1979	4.3003	0.0006	1.1736	1979	4.5749	0.0009	1.5407
1980	4.1341	0.0005	0.7347	1980	4.0177	0.0009	0.7924	1980	2.5999	0.0005	0.7095	1980	2.2296	0.0008	0.7509
1981	4.7950	0.0004	0.8522	1981	5.0232	0.0009	0.9908	1981	3.1040	0.0004	0.8471	1981	2.8832	0.0007	0.9710
1982	4.9178	0.0004	0.8740	1982	4.5749	0.0008	0.9023	1982	3.4235	0.0005	0.9343	1982	2.9760	0.0009	1.0022
1983	4.8654	0.0004	0.8647	1983	4.8627	0.0009	0.9591	1983	3.0884	0.0004	0.8428	1983	2.6406	0.0007	0.8893
1984	5.9159	0.0004	1.0514	1984	6.6771	0.0008	1.3170	1984	3.9608	0.0003	1.0809	1984	3.8235	0.0005	1.2876
1985	5.3056	0.0003	0.9429	1985	4.8551	0.0007	0.9576	1985	3.4644	0.0003	0.9454	1985	2.8785	0.0005	0.9694
1986	5.3227	0.0003	0.9460	1986	3.8418	0.0008	0.7577	1986	3.3246	0.0003	0.9073	1986	2.1480	0.0006	0.7234
1987	5.3795	0.0004	0.9561	1987	5.4883	0.0012	1.0825	1987	3.4592	0.0004	0.9440	1987	3.0857	0.0007	1.0392
1988	6.0917	0.0004	1.0826	1988	5.9161	0.0009	1.1669	1988	3.9205	0.0004	1.0699	1988	3.3870	0.0008	1.1406
1989	4.1258	0.0005	0.7332	1989	4.3094	0.0011	0.8500	1989	2.7532	0.0006	0.7514	1989	2.6304	0.0009	0.8859
1990	4.5244	0.0005	0.8041	1990	4.2867	0.0010	0.8455	1990	2.9942	0.0004	0.8171	1990	2.5292	0.0007	0.8518
1991	3.9733	0.0006	0.7061	1991	3.2750	0.0011	0.6460	1991	2.5480	0.0004	0.6954	1991	1.8754	0.0006	0.6316
1992	3.9570	0.0007	0.7032	1992	3.3238	0.0015	0.6556	1992	2.4490	0.0005	0.6683	1992	1.8335	0.0008	0.6175
1993	4.0240	0.0006	0.7152	1993	3.8270	0.0011	0.7548	1993	2.4662	0.0004	0.6730	1993	2.0287	0.0006	0.6832
1994	3.0833	0.0005	0.5480	1994	2.7267	0.0010	0.5378	1994	2.0320	0.0003	0.5545	1994	1.5931	0.0004	0.5365
1995	2.6127	0.0004	0.4643	1995	2.5244	0.0007	0.4979	1995	1.7350	0.0002	0.4735	1995	1.3972	0.0003	0.4705
1996	2.6397	0.0003	0.4691	1996	2.2893	0.0007	0.4515	1996	1.7851	0.0002	0.4872	1996	1.3732	0.0003	0.4624
1997	2.3199	0.0002	0.4123	1997	1.9482	0.0004	0.3843	1997	1.5572	0.0002	0.4250	1997	1.1763	0.0003	0.3961
1998	2.5150	0.0002	0.4470	1998	1.9722	0.0004	0.3890	1998	1.6422	0.0002	0.4482	1998	1.1507	0.0003	0.3875
1999	2.6819	0.0002	0.4766	1999	2.2206	0.0003	0.4380	1999	1.8198	0.0002	0.4966	1999	1.3603	0.0003	0.4581
2000	3.2227	0.0002	0.5727	2000	2.7128	0.0003	0.5351	2000	2.1081	0.0002	0.5753	2000	1.5462	0.0003	0.5207
2001	3.0349	0.0003	0.5394	2001	2.0087	0.0004	0.3962	2001	2.0364	0.0002	0.5557	2001	1.2518	0.0003	0.4216
2002	2.3225	0.0002	0.4128	2002	1.9212	0.0005	0.3789	2002	1.5677	0.0002	0.4278	2002	1.1341	0.0003	0.3819
2003	2.8262	0.0003	0.5023	2003	1.9585	0.0007	0.3863	2003	1.8741	0.0003	0.5114	2003	1.1984	0.0005	0.4036
2004	2.6672	0.0003	0.4740	2004	1.8644	0.0006	0.3677	2004	1.7261	0.0003	0.4711	2004	1.0774	0.0004	0.3628
2005	2.4415	0.0003	0.4339	2005	1.7381	0.0007	0.3428	2005	1.5677	0.0003	0.4278	2005	0.9575	0.0005	0.3225
2006	2.6319	0.0002	0.4677	2006	2.1346	0.0003	0.4210	2006	1.7047	0.0002	0.4652	2006	1.1918	0.0004	0.4014
2007	2.0039	0.0002	0.3561	2007	2.0670	0.0004	0.4077	2007	1.3081	0.0003	0.3570	2007	1.1507	0.0004	0.3875
2008	1.2383	0.0002	0.2201	2008	1.2150	0.0004	0.2396	2008	0.7598	0.0002	0.2074	2008	0.6268	0.0004	0.2111
2009	1.1780	0.0002	0.2094	2009	1.1921	0.0004	0.2351	2009	0.6945	0.0002	0.1895	2009	0.5818	0.0004	0.1959
2010	1.5431	0.0008	0.2742	2010	1.4233	0.0006	0.2807	2010	0.8916	0.0005	0.2433	2010	0.6630	0.0005	0.2233

Appendix table 2. Annual value of yellowfin CPUE standardized for main fishing ground and whole Indian Ocean with and without area 2 for 1968-2010 expressed in real and relative scale in which the average of each period is 1.0, and variance.

Main (Area2&3&5) 1968-2010				Main (Area3&5) 1968-2010				Whole (Area2-5) 1968-2010				Whole (Area3-5) 1968-2010			
year	cpue_p	dev t	Relative CPUE	year	cpue_p	dev t	Relative CPUE	year	cpue_p	dev t	Relative CPUE	year	cpue_p	dev t	Relative CPUE
1960				1960				1960				1960			
1961				1961				1961				1961			
1962				1962				1962				1962			
1963				1963				1963				1963			
1964				1964				1964				1964			
1965				1965				1965				1965			
1966				1966				1966				1966			
1967				1967				1967				1967			
1968	20.0812	0.0004	4.1709	1968	15.0030	0.0008	3.4186	1968	12.1807	0.0003	3.8892	1968	8.2362	0.0004	3.2207
1969	9.3562	0.0004	1.9433	1969	6.4136	0.0007	1.4614	1969	5.8157	0.0003	1.8569	1969	3.7118	0.0005	1.4515
1970	7.1785	0.0005	1.4910	1970	6.0945	0.0009	1.3887	1970	4.6479	0.0004	1.4841	1970	3.7690	0.0005	1.4738
1971	8.0986	0.0005	1.6821	1971	5.7147	0.0010	1.3022	1971	5.8885	0.0004	1.8802	1971	4.4424	0.0005	1.7372
1972	7.9311	0.0008	1.6473	1972	7.6683	0.0016	1.7473	1972	5.7597	0.0007	1.8390	1972	5.3264	0.0012	2.0828
1973	5.8889	0.0008	1.2231	1973	5.8104	0.0016	1.3240	1973	4.1656	0.0006	1.3301	1973	3.8431	0.0009	1.5028
1974	4.8811	0.0006	1.0138	1974	4.7341	0.0010	1.0787	1974	3.4533	0.0004	1.1026	1974	3.0839	0.0006	1.2059
1975	6.1560	0.0006	1.2786	1975	6.7507	0.0010	1.5382	1975	4.1103	0.0004	1.3124	1975	3.8896	0.0006	1.5210
1976	5.9951	0.0009	1.2452	1976	6.0343	0.0016	1.3750	1976	3.6143	0.0007	1.1540	1976	3.0516	0.0010	1.1933
1977	11.0500	0.0017	2.2951	1977	11.6071	0.0037	2.6448	1977	6.6166	0.0010	2.1127	1977	5.8960	0.0017	2.3055
1978	5.8591	0.0006	1.2170	1978	5.8957	0.0014	1.3434	1978	3.8921	0.0005	1.2427	1978	3.4089	0.0009	1.3330
1979	6.5049	0.0007	1.3511	1979	8.1521	0.0012	1.8576	1979	4.2810	0.0006	1.3669	1979	4.5619	0.0009	1.7839
1980	4.0932	0.0006	0.8502	1980	3.9841	0.0010	0.9078	1980	2.5696	0.0005	0.8205	1980	2.2009	0.0008	0.8606
1981	4.7834	0.0005	0.9935	1981	5.0394	0.0010	1.1483	1981	3.0915	0.0004	0.9871	1981	2.8793	0.0007	1.1259
1982	4.8925	0.0004	1.0162	1982	4.5744	0.0009	1.0423	1982	3.3901	0.0006	1.0824	1982	2.9532	0.0010	1.1548
1983	4.8367	0.0004	1.0046	1983	4.8563	0.0010	1.1066	1983	3.0676	0.0004	0.9795	1983	2.6352	0.0007	1.0304
1984	5.9045	0.0004	1.2264	1984	6.6950	0.0008	1.5255	1984	3.9422	0.0004	1.2587	1984	3.8172	0.0006	1.4927
1985	5.3096	0.0003	1.1028	1985	4.8917	0.0008	1.1146	1985	3.4704	0.0003	1.1081	1985	2.9056	0.0005	1.1362
1986	5.3282	0.0004	1.1067	1986	3.8834	0.0008	0.8849	1986	3.3215	0.0003	1.0605	1986	2.1644	0.0006	0.8464
1987	5.4091	0.0005	1.1235	1987	5.6183	0.0013	1.2802	1987	3.4677	0.0004	1.1072	1987	3.1548	0.0007	1.2336
1988	6.1356	0.0004	1.2744	1988	6.0512	0.0010	1.3788	1988	3.9421	0.0005	1.2587	1988	3.4594	0.0008	1.3528
1989	4.1263	0.0006	0.8570	1989	4.3470	0.0011	0.9905	1989	2.7435	0.0006	0.8760	1989	2.6361	0.0010	1.0308
1990	4.5432	0.0005	0.9436	1990	4.3639	0.0010	0.9944	1990	2.9942	0.0005	0.9560	1990	2.5579	0.0008	1.0002
1991	4.0004	0.0006	0.8309	1991	3.3431	0.0011	0.7618	1991	2.5834	0.0004	0.8249	1991	1.9204	0.0006	0.7509
1992	3.9863	0.0008	0.8280	1992	3.4003	0.0016	0.7748	1992	2.4728	0.0005	0.7896	1992	1.8838	0.0008	0.7366
1993	4.0382	0.0006	0.8388	1993	3.8807	0.0012	0.8843	1993	2.4767	0.0004	0.7908	1993	2.0611	0.0007	0.8060
1994	3.0996	0.0005	0.6438	1994	2.7793	0.0011	0.6333	1994	2.0459	0.0003	0.6532	1994	1.6255	0.0005	0.6356
1995	2.6184	0.0004	0.5439	1995	2.5483	0.0007	0.5807	1995	1.7423	0.0002	0.5563	1995	1.4134	0.0003	0.5527
1996	2.6405	0.0004	0.5484	1996	2.3203	0.0007	0.5287	1996	1.7895	0.0002	0.5714	1996	1.3994	0.0003	0.5472
1997	2.3088	0.0002	0.4795	1997	1.9723	0.0005	0.4494	1997	1.5583	0.0002	0.4976	1997	1.1974	0.0003	0.4682
1998	2.4933	0.0002	0.5179	1998	1.9796	0.0004	0.4511	1998	1.6373	0.0002	0.5228	1998	1.1631	0.0004	0.4548
1999	2.6682	0.0002	0.5542	1999	2.2124	0.0004	0.5041	1999	1.8139	0.0002	0.5792	1999	1.3585	0.0003	0.5312
2000	3.1762	0.0002	0.6597	2000	2.6633	0.0004	0.6069	2000	2.0879	0.0002	0.6667	2000	1.5258	0.0003	0.5966
2001	2.9927	0.0003	0.6216	2001	1.9734	0.0005	0.4497	2001	2.0148	0.0002	0.6433	2001	1.2394	0.0003	0.4847
2002	2.2928	0.0003	0.4762	2002	1.9050	0.0005	0.4341	2002	1.5497	0.0002	0.4948	2002	1.1252	0.0003	0.4400
2003	2.7992	0.0003	0.5814	2003	1.9597	0.0007	0.4465	2003	1.8653	0.0003	0.5956	2003	1.2059	0.0005	0.4716
2004	2.6412	0.0003	0.5486	2004	1.8572	0.0006	0.4232	2004	1.7169	0.0003	0.5482	2004	1.0773	0.0005	0.4213
2005	2.4225	0.0003	0.5032	2005	1.7356	0.0008	0.3955	2005	1.5569	0.0003	0.4971	2005	0.9589	0.0006	0.3750
2006	2.6081	0.0002	0.5417	2006	2.1265	0.0004	0.4845	2006	1.6877	0.0003	0.5389	2006	1.1857	0.0004	0.4637
2007	1.9842	0.0002	0.4121	2007	2.0569	0.0004	0.4687	2007	1.3012	0.0003	0.4155	2007	1.1500	0.0005	0.4497
2008	1.2202	0.0002	0.2534	2008	1.2082	0.0004	0.2753	2008	0.7553	0.0002	0.2412	2008	0.6286	0.0004	0.2458
2009	1.1636	0.0002	0.2417	2009	1.1829	0.0004	0.2695	2009	0.6964	0.0003	0.2224	2009	0.5880	0.0004	0.2299
2010	1.5278	0.0009	0.3173	2010	1.4222	0.0007	0.3241	2010	0.8930	0.0005	0.2851	2010	0.6724	0.0005	0.2629

Appendix table 3. Annual value of yellowfin CPUE standardized for main fishing ground and whole Indian Ocean with and without area 2 for 1980-2010 expressed in real and relative scale in which the average of each period is 1.0, and variance.

Main (Area2&3&5) 1980–2010				Main (Area3&5) 1980–2010				Whole (Area2–5) 1980–2010				Whole (Area3–5) 1980–2010			
year	cpue p	dev t	Relative CPUE	year	cpue p	dev t	Relative CPUE	year	cpue p	dev t	Relative CPUE	year	cpue p	dev t	Relative CPUE
1960				1960				1960				1960			
1961				1961				1961				1961			
1962				1962				1962				1962			
1963				1963				1963				1963			
1964				1964				1964				1964			
1965				1965				1965				1965			
1966				1966				1966				1966			
1967				1967				1967				1967			
1968				1968				1968				1968			
1969				1969				1969				1969			
1970				1970				1970				1970			
1971				1971				1971				1971			
1972				1972				1972				1972			
1973				1973				1973				1973			
1974				1974				1974				1974			
1975				1975				1975				1975			
1976				1976				1976				1976			
1977				1977				1977				1977			
1978				1978				1978				1978			
1979				1979				1979				1979			
1980	4.0141	0.0006	1.1644	1980	3.9405	0.0011	1.2321	1980	2.5046	0.0005	1.1250	1980	2.1583	0.0008	1.1875
1981	4.7526	0.0005	1.3786	1981	5.0482	0.0010	1.5785	1981	3.0437	0.0004	1.3672	1981	2.8561	0.0007	1.5714
1982	4.8424	0.0004	1.4047	1982	4.5700	0.0009	1.4290	1982	3.3175	0.0006	1.4902	1982	2.9096	0.0010	1.6008
1983	4.7522	0.0004	1.3785	1983	4.8360	0.0010	1.5122	1983	2.9936	0.0004	1.3447	1983	2.5903	0.0007	1.4252
1984	5.8423	0.0004	1.6947	1984	6.6704	0.0009	2.0858	1984	3.8729	0.0004	1.7397	1984	3.7664	0.0006	2.0722
1985	5.2941	0.0004	1.5357	1985	4.9150	0.0008	1.5369	1985	3.4311	0.0003	1.5412	1985	2.8907	0.0005	1.5905
1986	5.3219	0.0004	1.5438	1986	3.9221	0.0008	1.2264	1986	3.2879	0.0004	1.4769	1986	2.1550	0.0006	1.1856
1987	5.4063	0.0005	1.5683	1987	5.7577	0.0013	1.8004	1987	3.4405	0.0004	1.5454	1987	3.1795	0.0007	1.7493
1988	6.1569	0.0004	1.7860	1988	6.2134	0.0011	1.9429	1988	3.9204	0.0005	1.7610	1988	3.4941	0.0008	1.9224
1989	4.0863	0.0006	1.1854	1989	4.3835	0.0012	1.3707	1989	2.6965	0.0006	1.2112	1989	2.6272	0.0010	1.4455
1990	4.5361	0.0005	1.3158	1990	4.4549	0.0011	1.3930	1990	2.9630	0.0005	1.3309	1990	2.5697	0.0008	1.4138
1991	3.9983	0.0007	1.1598	1991	3.4131	0.0012	1.0672	1991	2.5634	0.0004	1.1515	1991	1.9349	0.0006	1.0645
1992	3.9792	0.0008	1.1543	1992	3.4746	0.0016	1.0865	1992	2.4485	0.0005	1.0998	1992	1.9030	0.0008	1.0470
1993	4.0302	0.0006	1.1691	1993	3.9278	0.0013	1.2282	1993	2.4626	0.0004	1.1062	1993	2.0818	0.0007	1.1454
1994	3.0828	0.0006	0.8943	1994	2.8155	0.0012	0.8804	1994	2.0173	0.0003	0.9061	1994	1.6275	0.0005	0.8954
1995	2.5977	0.0005	0.7536	1995	2.5628	0.0008	0.8014	1995	1.7145	0.0002	0.7701	1995	1.4111	0.0003	0.7764
1996	2.6179	0.0004	0.7594	1996	2.3316	0.0008	0.7291	1996	1.7586	0.0002	0.7899	1996	1.3890	0.0003	0.7642
1997	2.2741	0.0002	0.6597	1997	1.9804	0.0005	0.6192	1997	1.5242	0.0002	0.6846	1997	1.1875	0.0003	0.6534
1998	2.4403	0.0002	0.7079	1998	1.9686	0.0004	0.6156	1998	1.5965	0.0002	0.7171	1998	1.1481	0.0004	0.6317
1999	2.6283	0.0002	0.7624	1999	2.1959	0.0004	0.6866	1999	1.7748	0.0002	0.7972	1999	1.3339	0.0003	0.7339
2000	3.0926	0.0002	0.8971	2000	2.5893	0.0004	0.8096	2000	2.0260	0.0002	0.9100	2000	1.4804	0.0003	0.8145
2001	2.9227	0.0003	0.8478	2001	1.9186	0.0005	0.5999	2001	1.9644	0.0002	0.8824	2001	1.2077	0.0003	0.6645
2002	2.2340	0.0003	0.6480	2002	1.8769	0.0006	0.5869	2002	1.5046	0.0002	0.6759	2002	1.1020	0.0003	0.6063
2003	2.7447	0.0004	0.7962	2003	1.9464	0.0008	0.6086	2003	1.8210	0.0003	0.8180	2003	1.1906	0.0005	0.6550
2004	2.5765	0.0003	0.7474	2004	1.8364	0.0007	0.5742	2004	1.6696	0.0003	0.7500	2004	1.0577	0.0005	0.5819
2005	2.3756	0.0004	0.6891	2005	1.7127	0.0008	0.5355	2005	1.5242	0.0003	0.6846	2005	0.9462	0.0006	0.5206
2006	2.5523	0.0002	0.7404	2006	2.1050	0.0004	0.6582	2006	1.6480	0.0003	0.7403	2006	1.1711	0.0004	0.6443
2007	1.9402	0.0002	0.5628	2007	2.0258	0.0004	0.6334	2007	1.2658	0.0003	0.5686	2007	1.1282	0.0005	0.6207
2008	1.1834	0.0002	0.3433	2008	1.1873	0.0004	0.3713	2008	0.7289	0.0002	0.3274	2008	0.6122	0.0004	0.3368
2009	1.1196	0.0003	0.3248	2009	1.1596	0.0004	0.3626	2009	0.6702	0.0003	0.3010	2009	0.5758	0.0004	0.3168
2010	1.4710	0.0010	0.4267	2010	1.4001	0.0007	0.4378	2010	0.8592	0.0005	0.3859	2010	0.6589	0.0005	0.3625

Appendix table 4. Quarter value of yellowfin CPUE standardized for main fishing ground with and without area 2 in the Indian Ocean for 1963-2010 expressed which the average of each period is 1.0, and variance.

**Quarterly CPUE (using L1 data set: 1 degree X 1 degree X month)
1963–2010**

Year	Quarter	Main Fishing Ground (Area2&3&5)			Main Fishing Ground (Area3&5)			Whole Indian Ocean (Area2–5)			Whole Indian Ocean (Area3–5)		
		CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE	CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE
1960	1												
1960	2												
1960	3												
1960	4												
1961	1												
1961	2												
1961	3												
1961	4												
1962	1												
1962	2												
1962	3												
1962	4												
1963	1	20.0511	0.0010	3.2798	12.2512	0.0009	1.6973	20.0213	0.0019	3.4377	10.7722	0.0014	3.1269
1963	2	17.3934	0.0013	2.8451	11.7365	0.0041	1.6260	18.7033	0.0022	3.2114	11.3776	0.0070	3.3026
1963	3	11.5413	0.0025	1.8879	8.9091	0.0015	1.2343	8.9294	0.0020	1.5332	7.2821	0.0016	2.1138
1963	4	16.9701	0.0012	2.7759	10.6836	0.0008	1.4802	12.4075	0.0021	2.1304	7.2501	0.0013	2.1045
1964	1	17.8559	0.0012	2.9208	10.7859	0.0009	1.4943	17.8160	0.0022	3.0590	9.4000	0.0014	2.7286
1964	2	12.3131	0.0010	2.0141	9.3608	0.0021	1.2969	12.7826	0.0020	2.1948	9.1821	0.0036	2.6653
1964	3	9.2020	0.0011	1.5052	7.1657	0.0013	0.9928	8.7504	0.0011	1.5025	6.6571	0.0019	1.9324
1964	4	8.1309	0.0008	1.3300	5.6400	0.0006	0.7814	6.8706	0.0013	1.1797	4.5658	0.0009	1.3253
1965	1	10.1236	0.0009	1.6560	6.1946	0.0007	0.8582	9.0852	0.0017	1.5599	4.9079	0.0011	1.4246
1965	2	11.5040	0.0010	1.8818	7.7469	0.0022	1.0733	11.2336	0.0020	1.9288	6.9290	0.0038	2.0113
1965	3	8.7703	0.0010	1.4346	6.2011	0.0011	0.8591	7.0938	0.0015	1.2180	4.9260	0.0017	1.4299
1965	4	14.0629	0.0010	2.3003	8.7624	0.0007	1.2140	9.9455	0.0018	1.7077	5.7391	0.0010	1.6659
1966	1	15.8278	0.0015	2.5890	9.5847	0.0010	1.3279	13.9177	0.0033	2.3897	7.4435	0.0016	2.1607
1966	2	14.5964	0.0009	2.3876	9.6618	0.0022	1.3386	13.4169	0.0018	2.3037	8.1891	0.0037	2.3771
1966	3	12.5765	0.0009	2.0572	8.6278	0.0012	1.1953	10.0138	0.0015	1.7194	6.6534	0.0019	1.9313
1966	4	12.4335	0.0007	2.0338	8.1957	0.0006	1.1355	8.9565	0.0014	1.5378	5.6826	0.0009	1.6495
1967	1	10.1690	0.0007	1.6634	6.7168	0.0006	0.9306	9.9628	0.0013	1.7106	5.9523	0.0010	1.7278
1967	2	10.3799	0.0006	1.6979	6.9214	0.0006	0.9589	10.0213	0.0010	1.7207	6.0829	0.0010	1.7657
1967	3	5.9770	0.0009	0.9777	3.7719	0.0006	0.5226	5.7412	0.0014	0.9858	3.2076	0.0009	0.9311
1967	4	9.1794	0.0009	1.5015	5.6035	0.0006	0.7763	8.7381	0.0018	1.5003	4.6501	0.0009	1.3498
1968	1	36.4934	0.0012	5.9694	22.2638	0.0009	3.0845	38.6865	0.0024	6.6425	20.6304	0.0014	5.9885
1968	2	26.4520	0.0011	4.3269	15.8662	0.0008	2.1982	19.6219	0.0023	3.3691	10.4672	0.0013	3.0384
1968	3	13.2633	0.0011	2.1695	7.8690	0.0007	1.0902	8.3318	0.0021	1.4306	4.4076	0.0010	1.2794
1968	4	12.8812	0.0010	2.1070	7.9031	0.0007	1.0949	7.4769	0.0020	1.2838	4.2973	0.0010	1.2474
1969	1	9.3846	0.0008	1.5351	5.9742	0.0009	0.8277	7.0388	0.0016	1.2086	4.1262	0.0015	1.1977
1969	2	9.8451	0.0009	1.6104	6.2026	0.0008	0.8593	8.9873	0.0016	1.5431	5.0449	0.0012	1.4644
1969	3	8.7784	0.0012	1.4359	5.2703	0.0007	0.7302	5.2216	0.0023	0.8966	2.8140	0.0011	0.8168
1969	4	8.6748	0.0013	1.4190	5.3633	0.0009	0.7431	4.9853	0.0024	0.8560	2.8830	0.0013	0.8369
1970	1	6.4738	0.0013	1.0589	4.5442	0.0015	0.6296	5.5568	0.0024	0.9541	3.6847	0.0024	1.0696
1970	2	5.7754	0.0014	0.9447	3.6302	0.0010	0.5029	5.5185	0.0024	0.9475	3.0450	0.0014	0.8839
1970	3	7.6195	0.0024	1.2464	4.6474	0.0012	0.6439	7.7940	0.0022	1.3382	4.0777	0.0012	1.1836
1970	4	7.5867	0.0013	1.2410	5.9749	0.0008	0.8278	5.8396	0.0024	1.0027	4.8579	0.0012	1.4101
1971	1	6.9059	0.0011	1.1296	5.3395	0.0010	0.7398	6.2683	0.0019	1.0763	4.7815	0.0016	1.3879
1971	2	7.9547	0.0017	1.3012	6.1635	0.0010	0.8539	7.0753	0.0030	1.2148	5.4494	0.0015	1.5818
1971	3	9.3664	0.0016	1.5321	6.2074	0.0009	0.8600	4.3050	0.0030	0.7392	3.0977	0.0013	0.8992
1971	4	8.3329	0.0021	1.3630	6.0975	0.0013	0.8448	5.4400	0.0043	0.9341	4.2786	0.0021	1.2420
1972	1	14.0749	0.0022	2.3023	9.9912	0.0148	1.3842	17.6007	0.0044	3.0221	10.9888	0.0258	3.1898
1972	2	9.3483	0.0027	1.5291	6.6086	0.0026	0.9156	10.5807	0.0055	1.8167	6.6627	0.0042	1.9340
1972	3	6.7783	0.0022	1.1088	4.7929	0.0015	0.6640	4.9682	0.0046	0.8530	3.4522	0.0024	1.0021
1972	4	8.5859	0.0039	1.4044	5.9515	0.0026	0.8245	8.1567	0.0084	1.4005	5.1654	0.0043	1.4994
1973	1	10.3336	0.0030	1.6903	7.1911	0.0072	0.9963	12.3849	0.0056	2.1265	7.6066	0.0121	2.2080
1973	2	5.6688	0.0033	0.9273	4.8436	0.0024	0.6711	6.0201	0.0063	1.0337	4.8677	0.0037	1.4130
1973	3	4.0974	0.0028	0.6702	2.6384	0.0016	0.3655	4.2092	0.0057	0.7227	2.3618	0.0025	0.6856
1973	4	6.9919	0.0019	1.1437	4.4924	0.0011	0.6224	5.6804	0.0034	0.9753	3.3198	0.0016	0.9637
1974	1	7.8037	0.0016	1.2765	6.3928	0.0015	0.8857	9.4574	0.0027	1.6239	6.9822	0.0024	2.0267
1974	2	5.8587	0.0026	0.9583	4.2092	0.0015	0.5832	6.4240	0.0048	1.1030	4.1429	0.0022	1.2026
1974	3	3.3937	0.0016	0.5551	2.1574	0.0010	0.2989	2.5810	0.0028	0.4432	1.4977	0.0015	0.4347
1974	4	5.1115	0.0013	0.8361	3.3515	0.0012	0.4643	5.0442	0.0020	0.8661	2.9355	0.0017	0.8521

Appendix table 4. Continued.

Year	Quarter	Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1-5)			Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1-5)		
		Relative		CPUE	Tropical		Relative	Relative		CPUE	Tropical		Relative
		CPUE	t-dev		CPUE	t-dev		CPUE	t-dev		CPUE	t-dev	
1975	1	4.4887	0.0023	0.7342	3.5106	0.0019	0.7997	5.3596	0.0044	0.9203	3.7183	0.0030	1.0793
1975	2	4.9690	0.0023	0.8128	3.4688	0.0013	0.7902	5.9308	0.0040	1.0183	3.6099	0.0019	1.0479
1975	3	4.6202	0.0010	0.7557	3.1025	0.0007	0.7068	3.6637	0.0018	0.6291	2.2955	0.0011	0.6663
1975	4	14.7412	0.0018	2.4113	9.0252	0.0012	2.0559	16.9725	0.0034	2.9142	8.9681	0.0018	2.6032
1976	1	7.7664	0.0016	1.2704	4.9242	0.0048	1.1217	10.2330	0.0028	1.7570	5.5626	0.0082	1.6147
1976	2	7.5085	0.0035	1.2282	4.4144	0.0028	1.0056	6.9649	0.0069	1.1959	3.4921	0.0045	1.0137
1976	3	4.6777	0.0038	0.7652	2.9740	0.0019	0.6775	3.5037	0.0052	0.6016	2.0414	0.0023	0.5926
1976	4	6.5599	0.0056	1.0730	3.8928	0.0029	0.8868	7.0742	0.0076	1.2147	3.5576	0.0034	1.0327
1977	1	17.1164	0.0063	2.7998	11.5366	0.0065	2.6280	24.2749	0.0113	4.1680	13.9837	0.0102	4.0591
1977	2	19.4226	0.0167	3.1770	11.7399	0.0087	2.6744	22.4224	0.0371	3.8500	11.7060	0.0143	3.3979
1977	3	6.1526	0.0037	1.0064	3.5830	0.0020	0.8162	5.0862	0.0053	0.8733	2.4905	0.0025	0.7229
1977	4	10.9494	0.0067	1.7910	6.7956	0.0033	1.5480	8.4249	0.0153	1.4466	4.6410	0.0055	1.3472
1978	1	8.3766	0.0019	1.3702	5.3804	0.0031	1.2257	9.7217	0.0043	1.6692	5.4264	0.0053	1.5751
1978	2	6.5837	0.0046	1.0769	4.2409	0.0025	0.9661	7.2284	0.0108	1.2411	4.0295	0.0043	1.1697
1978	3	3.2878	0.0022	0.5378	2.1205	0.0014	0.4831	2.7346	0.0023	0.4695	1.5606	0.0016	0.4530
1978	4	9.1398	0.0025	1.4950	6.0489	0.0018	1.3779	8.7619	0.0049	1.5044	5.1580	0.0029	1.4972
1979	1	11.7812	0.0017	1.9271	7.5405	0.0035	1.7177	16.0338	0.0032	2.7530	8.7697	0.0058	2.5456
1979	2	7.6835	0.0030	1.2568	4.8980	0.0024	1.1158	10.3158	0.0054	1.7712	5.5826	0.0037	1.6205
1979	3	3.3603	0.0023	0.5497	2.2990	0.0014	0.5237	3.5445	0.0040	0.6086	2.1121	0.0020	0.6131
1979	4	6.9622	0.0033	1.1388	4.5707	0.0023	1.0412	8.0435	0.0042	1.3811	4.5824	0.0030	1.3301
1980	1	5.7480	0.0016	0.9402	3.5692	0.0038	0.8131	6.8424	0.0028	1.1749	3.6394	0.0063	1.0564
1980	2	3.4795	0.0024	0.5692	2.1014	0.0029	0.4787	3.9968	0.0047	0.6863	2.0365	0.0047	0.5911
1980	3	2.7135	0.0025	0.4439	1.7389	0.0016	0.3961	2.4312	0.0024	0.4174	1.3678	0.0017	0.3970
1980	4	6.4722	0.0020	1.0587	4.0380	0.0013	0.9199	5.7836	0.0042	0.9931	3.1750	0.0020	0.9216
1981	1	4.7246	0.0010	0.7728	3.1063	0.0017	0.7076	5.0452	0.0021	0.8663	2.9039	0.0029	0.8429
1981	2	4.2931	0.0020	0.7022	2.5880	0.0026	0.5895	5.3323	0.0038	0.9156	2.7046	0.0042	0.7851
1981	3	4.9448	0.0024	0.8088	3.0224	0.0013	0.6885	4.6564	0.0048	0.7995	2.4387	0.0020	0.7079
1981	4	6.7270	0.0016	1.1004	4.7723	0.0012	1.0871	7.1066	0.0034	1.2202	4.5142	0.0019	1.3104
1982	1	6.3774	0.0010	1.0432	7.4631	0.0021	1.7001	7.6895	0.0020	1.3203	8.5863	0.0036	2.4924
1982	2	5.0348	0.0020	0.8236	3.0077	0.0055	0.6852	5.5527	0.0042	0.9534	2.7982	0.0094	0.8122
1982	3	3.5255	0.0011	0.5767	2.1131	0.0011	0.4814	3.2288	0.0021	0.5544	1.6396	0.0018	0.4759
1982	4	5.1355	0.0015	0.8400	3.7865	0.0020	0.8626	3.1420	0.0034	0.5395	2.4751	0.0033	0.7185
1983	1	6.9348	0.0011	1.1344	4.8986	0.0029	1.1159	8.4053	0.0025	1.4432	5.1762	0.0050	1.5025
1983	2	4.9524	0.0031	0.8101	3.0425	0.0021	0.6931	5.4671	0.0071	0.9387	2.8448	0.0037	0.8258
1983	3	2.9107	0.0011	0.4761	1.7732	0.0009	0.4039	2.8386	0.0014	0.4874	1.4745	0.0012	0.4280
1983	4	7.4838	0.0017	1.2242	4.7549	0.0014	1.0832	6.7265	0.0036	1.1550	3.7378	0.0022	1.0850
1984	1	8.6718	0.0012	1.4185	6.0627	0.0014	1.3811	10.7875	0.0026	1.8522	6.5448	0.0024	1.8998
1984	2	5.1784	0.0021	0.8471	3.1497	0.0014	0.7175	5.5039	0.0046	0.9450	2.8346	0.0023	0.8228
1984	3	4.2704	0.0011	0.6985	2.6364	0.0009	0.6006	3.1168	0.0015	0.5352	1.6860	0.0013	0.4894
1984	4	8.6546	0.0015	1.4157	6.5054	0.0011	1.4819	10.5095	0.0031	1.8045	6.9819	0.0018	2.0267
1985	1	6.9629	0.0011	1.1390	6.2142	0.0018	1.4156	8.0843	0.0023	1.3881	6.6749	0.0031	1.9375
1985	2	4.6499	0.0014	0.7606	2.9679	0.0009	0.6761	4.6884	0.0028	0.8050	2.6119	0.0015	0.7582
1985	3	4.1328	0.0008	0.6760	2.5348	0.0007	0.5774	3.8344	0.0015	0.6584	2.0204	0.0011	0.5865
1985	4	7.2983	0.0018	1.1938	4.7756	0.0014	1.0879	6.5151	0.0041	1.1187	3.8384	0.0024	1.1142
1986	1	9.4426	0.0007	1.5446	6.5412	0.0009	1.4901	10.1963	0.0015	1.7507	6.2937	0.0016	1.8269
1986	2	6.0655	0.0021	0.9922	3.8880	0.0025	0.8857	4.8616	0.0047	0.8347	2.7941	0.0043	0.8111
1986	3	4.0466	0.0013	0.6619	2.4255	0.0009	0.5525	3.1701	0.0023	0.5443	1.6267	0.0013	0.4722
1986	4	5.1940	0.0026	0.8496	3.1325	0.0014	0.7136	3.4405	0.0059	0.5907	1.7974	0.0024	0.5217
1987	1	8.2730	0.0011	1.3533	5.2081	0.0009	1.1864	9.4512	0.0023	1.6228	5.1311	0.0015	1.4894
1987	2	6.7786	0.0115	1.1088	4.4226	0.0067	1.0075	7.7301	0.0275	1.3273	4.3446	0.0116	1.2611
1987	3	2.9979	0.0036	0.4904	1.8293	0.0018	0.4167	3.1417	0.0072	0.5394	1.6132	0.0027	0.4683
1987	4	6.3902	0.0016	1.0453	4.1329	0.0012	0.9415	4.7823	0.0031	0.8211	2.8057	0.0019	0.8144

Appendix table 4. Continued.

Year	Quarter	Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1-5)			Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1-5)		
		CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE	CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE
1988	1	11.2383	0.0011	1.8383	9.0299	0.0019	3.4343	12.1808	0.0025	2.0915	9.0924	0.0033	2.6393
1988	2	5.7373	0.0113	0.9385	3.7706	0.0061	1.4340	5.7796	0.0271	0.9924	3.3497	0.0106	0.9723
1988	3	4.9313	0.0016	0.8066	2.9336	0.0012	1.1157	5.7014	0.0027	0.9789	2.8516	0.0018	0.8277
1988	4	6.4383	0.0015	1.0531	3.9183	0.0014	1.4902	7.4670	0.0030	1.2821	3.8656	0.0023	1.1221
1989	1	6.4683	0.0017	1.0580	6.3300	0.0023	2.4074	7.8619	0.0037	1.3499	6.9670	0.0040	2.0223
1989	2	4.5494	0.0032	0.7442	3.0589	0.0050	1.1634	5.3961	0.0071	0.9265	3.1283	0.0085	0.9081
1989	3	2.2836	0.0041	0.3735	1.4057	0.0024	0.5346	2.1120	0.0032	0.3626	1.1019	0.0023	0.3199
1989	4	6.1450	0.0020	1.0052	3.7630	0.0016	1.4312	5.4592	0.0037	0.9374	2.8821	0.0024	0.8366
1990	1	11.3564	0.0011	1.8576	7.5684	0.0011	2.8784	12.9807	0.0021	2.2288	7.5577	0.0018	2.1938
1990	2	5.6566	0.0050	0.9253	3.3688	0.0066	1.2812	6.5525	0.0111	1.1251	3.2708	0.0112	0.9494
1990	3	4.4944	0.0028	0.7352	2.8341	0.0015	1.0779	4.8215	0.0031	0.8279	2.6057	0.0016	0.7564
1990	4	3.2224	0.0024	0.5271	2.0764	0.0018	0.7897	2.5769	0.0050	0.4425	1.4901	0.0030	0.4325
1991	1	4.7889	0.0010	0.7833	3.1899	0.0014	1.2132	4.0809	0.0020	0.7007	2.4653	0.0023	0.7156
1991	2	3.6975	0.0060	0.6048	2.4655	0.0039	0.9377	2.6847	0.0119	0.4610	1.6585	0.0061	0.4814
1991	3	2.2863	0.0038	0.3740	1.4834	0.0017	0.5642	2.2762	0.0064	0.3908	1.2680	0.0022	0.3681
1991	4	3.9004	0.0027	0.6380	2.4326	0.0013	0.9252	3.0729	0.0039	0.5276	1.6810	0.0016	0.4879
1992	1	4.6384	0.0014	0.7587	2.9636	0.0019	1.1271	4.3295	0.0023	0.7434	2.3976	0.0030	0.6960
1992	2	3.5523	0.0204	0.5811	2.2884	0.0086	0.8703	2.4521	0.0480	0.4210	1.4327	0.0146	0.4159
1992	3	3.1954	0.0062	0.5227	1.9391	0.0029	0.7375	3.3351	0.0081	0.5726	1.7212	0.0031	0.4996
1992	4	3.8285	0.0037	0.6262	2.3309	0.0019	0.8865	3.7725	0.0080	0.6477	1.9632	0.0031	0.5699
1993	1	5.8539	0.0015	0.9575	3.5991	0.0030	1.3688	7.0461	0.0024	1.2098	3.6593	0.0049	1.0622
1993	2	4.3140	0.0065	0.7057	2.6509	0.0039	1.0082	4.6796	0.0149	0.8035	2.3816	0.0066	0.6913
1993	3	3.1274	0.0023	0.5116	1.8927	0.0011	0.7198	2.9682	0.0039	0.5096	1.5042	0.0015	0.4366
1993	4	4.2781	0.0030	0.6998	2.6218	0.0015	0.9971	3.6677	0.0067	0.6297	1.9196	0.0024	0.5572
1994	1	3.9034	0.0010	0.6385	2.6490	0.0010	1.0075	3.8806	0.0018	0.6663	2.2960	0.0015	0.6665
1994	2	3.0277	0.0394	0.4953	2.0239	0.0152	0.7697	2.2841	0.0952	0.3922	1.3776	0.0265	0.3999
1994	3	3.0616	0.0051	0.5008	1.9419	0.0022	0.7385	3.4322	0.0101	0.5893	1.8046	0.0032	0.5238
1994	4	2.8444	0.0014	0.4653	1.8741	0.0007	0.7128	2.7468	0.0029	0.4716	1.5572	0.0011	0.4520
1995	1	3.0483	0.0010	0.4986	2.1692	0.0006	0.8250	3.4081	0.0015	0.5852	2.1091	0.0008	0.6122
1995	2	2.1649	0.0038	0.3541	1.4134	0.0017	0.5375	2.5808	0.0076	0.4431	1.4066	0.0026	0.4083
1995	3	1.8775	0.0027	0.3071	1.2496	0.0012	0.4753	1.5600	0.0032	0.2679	0.9116	0.0011	0.2646
1995	4	4.9144	0.0015	0.8039	3.0516	0.0007	1.1606	4.8525	0.0031	0.8332	2.5518	0.0011	0.7407
1996	1	4.4401	0.0008	0.7263	2.8222	0.0005	1.0733	3.3502	0.0013	0.5752	1.8506	0.0008	0.5372
1996	2	2.3364	0.0055	0.3822	1.6101	0.0023	0.6124	1.5528	0.0127	0.2666	1.0181	0.0039	0.2955
1996	3	2.0257	0.0027	0.3314	1.3789	0.0012	0.5244	1.8284	0.0057	0.3139	1.0934	0.0018	0.3174
1996	4	3.6164	0.0009	0.5916	2.2665	0.0005	0.8620	4.1644	0.0018	0.7150	2.1884	0.0008	0.6352
1997	1	3.9372	0.0004	0.6440	2.7495	0.0012	1.0457	3.8379	0.0007	0.6590	2.3577	0.0020	0.6844
1997	2	1.6993	0.0049	0.2780	1.1494	0.0023	0.4371	1.9093	0.0117	0.3278	1.0953	0.0039	0.3179
1997	3	2.9803	0.0013	0.4875	1.8715	0.0006	0.7118	2.7381	0.0026	0.4701	1.4601	0.0010	0.4238
1997	4	2.9980	0.0006	0.4904	1.9303	0.0005	0.7341	2.2930	0.0012	0.3937	1.2923	0.0007	0.3751
1998	1	3.6174	0.0004	0.5917	2.4279	0.0015	0.9234	3.5516	0.0007	0.6098	2.0710	0.0026	0.6012
1998	2	2.1084	0.0015	0.3449	1.4442	0.0011	0.5493	1.7365	0.0035	0.2982	1.0732	0.0019	0.3115
1998	3	1.7310	0.0011	0.2831	1.0926	0.0007	0.4155	1.1487	0.0021	0.1972	0.6321	0.0010	0.1835
1998	4	3.6657	0.0006	0.5996	2.3265	0.0006	0.8848	3.3503	0.0011	0.5753	1.8194	0.0009	0.5281
1999	1	3.6141	0.0006	0.5912	2.4567	0.0010	0.9343	3.6305	0.0009	0.6234	2.1499	0.0016	0.6241
1999	2	2.2730	0.0015	0.3718	1.6221	0.0010	0.6169	1.5901	0.0025	0.2730	1.0921	0.0015	0.3170
1999	3	2.5968	0.0010	0.4248	1.6504	0.0006	0.6277	1.8675	0.0012	0.3207	1.0314	0.0007	0.2994
1999	4	3.8401	0.0005	0.6281	2.5223	0.0008	0.9593	3.7109	0.0008	0.6372	2.1085	0.0012	0.6120
2000	1	3.7338	0.0005	0.6108	2.6237	0.0011	0.9979	3.7263	0.0009	0.6398	2.2992	0.0018	0.6674
2000	2	2.9035	0.0008	0.4749	1.9406	0.0007	0.7381	2.8176	0.0012	0.4838	1.6360	0.0010	0.4749
2000	3	3.9692	0.0009	0.6493	2.5493	0.0006	0.9696	2.9358	0.0014	0.5041	1.6402	0.0008	0.4761
2000	4	3.1601	0.0009	0.5169	2.0028	0.0008	0.7617	2.3735	0.0016	0.4075	1.2929	0.0012	0.3753

Appendix table 4. Continued.

Year	Quarter	Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1-5)			Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1-5)		
		CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE	CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE
2001	1	4.4150	0.0007	0.7222	2.7465	0.0008	1.7414	4.3226	0.0009	0.7422	2.2637	0.0011	0.6571
2001	2	2.7459	0.0010	0.4492	1.8507	0.0008	1.1734	1.5289	0.0017	0.2625	0.9944	0.0012	0.2886
2001	3	2.3031	0.0012	0.3767	1.5538	0.0006	0.9852	1.4240	0.0018	0.2445	0.9005	0.0008	0.2614
2001	4	3.2158	0.0011	0.5260	2.1384	0.0006	1.3558	1.8979	0.0021	0.3259	1.1788	0.0009	0.3422
2002	1	4.6825	0.0009	0.7659	3.0035	0.0008	1.9043	3.8473	0.0018	0.6606	2.1473	0.0013	0.6233
2002	2	2.3824	0.0016	0.3897	1.6211	0.0012	1.0278	1.8551	0.0033	0.3185	1.1449	0.0020	0.3323
2002	3	1.1689	0.0010	0.1912	0.8109	0.0006	0.5141	1.0700	0.0017	0.1837	0.6600	0.0008	0.1916
2002	4	2.0203	0.0006	0.3305	1.2853	0.0005	0.8149	1.7831	0.0013	0.3062	0.9685	0.0007	0.2811
2003	1	3.8840	0.0006	0.6353	2.4989	0.0019	1.5844	3.8342	0.0011	0.6583	2.1112	0.0033	0.6128
2003	2	2.3653	0.0037	0.3869	1.7915	0.0025	1.1359	1.2238	0.0084	0.2101	1.0655	0.0042	0.3093
2003	3	2.3451	0.0020	0.3836	1.5414	0.0011	0.9773	1.1414	0.0040	0.1960	0.7298	0.0016	0.2118
2003	4	3.2255	0.0009	0.5276	2.0118	0.0007	1.2756	2.4938	0.0020	0.4282	1.3359	0.0011	0.3878
2004	1	3.1341	0.0008	0.5127	2.1923	0.0028	1.3900	3.0352	0.0017	0.5211	1.8927	0.0048	0.5494
2004	2	3.6244	0.0023	0.5929	2.2908	0.0017	1.4525	2.3640	0.0051	0.4059	1.3229	0.0029	0.3840
2004	3	1.7211	0.0011	0.2815	1.1552	0.0007	0.7324	1.4071	0.0021	0.2416	0.8406	0.0011	0.2440
2004	4	2.7919	0.0007	0.4567	1.7184	0.0007	1.0895	1.6336	0.0015	0.2805	0.8642	0.0011	0.2509
2005	1	4.2667	0.0007	0.6979	2.6853	0.0012	1.7026	4.0445	0.0016	0.6944	2.1666	0.0020	0.6289
2005	2	2.9403	0.0018	0.4810	1.9974	0.0018	1.2664	1.5020	0.0041	0.2579	1.0085	0.0030	0.2927
2005	3	1.4824	0.0024	0.2425	0.9343	0.0015	0.5924	1.0838	0.0054	0.1861	0.5901	0.0026	0.1713
2005	4	2.6557	0.0010	0.4344	1.6337	0.0007	1.0358	2.3578	0.0021	0.4048	1.2201	0.0012	0.3542
2006	1	4.6671	0.0005	0.7634	2.8772	0.0008	1.8243	4.6683	0.0010	0.8016	2.4319	0.0014	0.7059
2006	2	3.7144	0.0008	0.6076	2.4093	0.0019	1.5276	2.7103	0.0017	0.4654	1.5793	0.0033	0.4584
2006	3	1.4822	0.0007	0.2424	0.9493	0.0006	0.6019	1.1054	0.0012	0.1898	0.6217	0.0010	0.1805
2006	4	1.9653	0.0005	0.3215	1.2665	0.0008	0.8030	1.7701	0.0009	0.3039	0.9802	0.0014	0.2845
2007	1	3.1305	0.0004	0.5121	1.9827	0.0023	1.2571	3.6179	0.0008	0.6212	1.9381	0.0040	0.5626
2007	2	2.8609	0.0007	0.4680	1.8703	0.0011	1.1858	3.2902	0.0014	0.5649	1.8284	0.0018	0.5307
2007	3	1.2990	0.0009	0.2125	0.8357	0.0006	0.5299	1.0322	0.0017	0.1772	0.5749	0.0010	0.1669
2007	4	1.7644	0.0006	0.2886	1.0889	0.0011	0.6904	1.5547	0.0012	0.2669	0.8098	0.0018	0.2351
2008	1	2.4147	0.0005	0.3950	1.5450	0.0015	0.9796	2.9176	0.0009	0.5010	1.5739	0.0026	0.4569
2008	2	1.2337	0.0010	0.2018	0.7302	0.0007	0.4630	1.2101	0.0021	0.2078	0.5954	0.0012	0.1728
2008	3	0.8461	0.0009	0.1384	0.5148	0.0006	0.3264	0.5905	0.0016	0.1014	0.3011	0.0009	0.0874
2008	4	1.0765	0.0005	0.1761	0.6572	0.0010	0.4167	1.1463	0.0008	0.1968	0.5901	0.0017	0.1713
2009	1	1.1709	0.0004	0.1915	0.8241	0.0032	0.5225	1.3640	0.0007	0.2342	0.8122	0.0055	0.2358
2009	2	1.5938	0.0009	0.2607	0.9876	0.0007	0.6262	1.8526	0.0016	0.3181	0.9677	0.0012	0.2809
2009	3	1.2876	0.0018	0.2106	0.7665	0.0009	0.4860	0.9431	0.0016	0.1619	0.4606	0.0008	0.1337
2009	4	1.6439	0.0013	0.2689	0.9963	0.0015	0.6317	0.8354	0.0010	0.1434	0.4341	0.0020	0.1260
2010	1	1.6164	0.0016	0.2644	0.9680	0.0017	0.6138	1.5383	0.0010	0.2641	0.7756	0.0021	0.2251
2010	2	1.7479	0.0028	0.2859	1.0602	0.0013	0.6722	2.0977	0.0036	0.3602	1.0643	0.0014	0.3089
2010	3	3.3188	0.0113	0.5429	2.0235	0.0046	1.2830	0.9042	0.0062	0.1553	0.4608	0.0023	0.1338
2010	4	1.9972	0.0065	0.3267	1.2730	0.0060	0.8071	1.0905	0.0015	0.1872	0.6303	0.0067	0.1830

Appendix table 5. Quarter value of yellowfin CPUE standardized for main fishing ground with and without area 2 in the Indian Ocean for 1968-2010 expressed in real and relative scale in which the average of each period is 1.0, and variance.

Year	Quarter	Main Fishing Ground (Area2&3&5)			Main Fishing Ground (Area3&5)			Whole Indian Ocean (Area2-5)			Whole Indian Ocean (Area3-5)		
		CPUE	t-dev	Relative CPUE	CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE
1960	1												
1960	2												
1960	3												
1960	4												
1961	1												
1961	2												
1961	3												
1961	4												
1962	1												
1962	2												
1962	3												
1962	4												
1963	1												
1963	2												
1963	3												
1963	4												
1964	1												
1964	2												
1964	3												
1964	4												
1965	1												
1965	2												
1965	3												
1965	4												
1966	1												
1966	2												
1966	3												
1966	4												
1967	1												
1967	2												
1967	3												
1967	4												
1968	1	37.0282	0.0013	6.9019	39.3534	0.0026	7.5729	22.5464	0.0009	6.3861	20.9524	0.0015	6.8894
1968	2	26.6675	0.0012	4.9707	19.8184	0.0024	3.8137	15.9622	0.0009	4.5212	10.5554	0.0014	3.4708
1968	3	13.3128	0.0012	2.4814	8.3625	0.0023	1.6092	7.8798	0.0007	2.2319	4.4144	0.0011	1.4515
1968	4	12.9375	0.0011	2.4115	7.5105	0.0021	1.4453	7.9140	0.0007	2.2416	4.3009	0.0011	1.4142
1969	1	9.4007	0.0009	1.7522	7.0445	0.0017	1.3556	5.9611	0.0010	1.6884	4.1098	0.0016	1.3514
1969	2	9.8720	0.0010	1.8401	9.0164	0.0018	1.7351	6.2051	0.0009	1.7575	5.0501	0.0013	1.6605
1969	3	8.7738	0.0013	1.6354	5.1900	0.0025	0.9987	5.2502	0.0008	1.4871	2.7859	0.0012	0.9160
1969	4	8.6786	0.0014	1.6177	4.9613	0.0026	0.9547	5.3464	0.0009	1.5143	2.8565	0.0014	0.9393
1970	1	6.4568	0.0014	1.2035	5.5320	0.0026	1.0645	4.5174	0.0016	1.2795	3.6575	0.0026	1.2026
1970	2	5.7617	0.0016	1.0740	5.5077	0.0026	1.0599	3.6085	0.0010	1.0221	3.0269	0.0015	0.9953
1970	3	7.6122	0.0026	1.4189	7.7844	0.0024	1.4980	4.6270	0.0013	1.3106	4.0571	0.0012	1.3340
1970	4	7.5791	0.0014	1.4127	5.8239	0.0026	1.1207	5.9669	0.0009	1.6901	4.8524	0.0013	1.5955
1971	1	6.8999	0.0012	1.2861	6.2730	0.0021	1.2071	5.3366	0.0011	1.5116	4.7906	0.0018	1.5752
1971	2	7.9031	0.0018	1.4731	7.0397	0.0032	1.3547	6.1334	0.0011	1.7372	5.4384	0.0016	1.7882
1971	3	9.3625	0.0018	1.7451	4.2606	0.0032	0.8199	6.1805	0.0009	1.7506	3.0572	0.0014	1.0052
1971	4	8.3183	0.0022	1.5505	5.4081	0.0047	1.0407	6.0797	0.0014	1.7220	4.2595	0.0023	1.4006
1972	1	14.2469	0.0023	2.6556	17.8529	0.0048	3.4355	10.0852	0.0159	2.8566	11.1137	0.0276	3.6543
1972	2	9.3788	0.0029	1.7482	10.6279	0.0059	2.0452	6.6146	0.0027	1.8735	6.6756	0.0045	2.1950
1972	3	6.7309	0.0024	1.2546	4.8962	0.0049	0.9422	4.7396	0.0016	1.3425	3.3921	0.0026	1.1154
1972	4	8.5772	0.0042	1.5988	8.1405	0.0091	1.5665	5.9236	0.0028	1.6778	5.1354	0.0046	1.6886
1973	1	10.3787	0.0032	1.9345	12.4592	0.0061	2.3976	7.2204	0.0077	2.0451	7.6523	0.0130	2.5162
1973	2	5.6291	0.0035	1.0492	5.9811	0.0068	1.1510	4.8160	0.0026	1.3641	4.8461	0.0040	1.5935
1973	3	4.0641	0.0031	0.7575	4.1810	0.0062	0.8046	2.6042	0.0017	0.7376	2.3323	0.0026	0.7669
1973	4	6.9816	0.0020	1.3013	5.6662	0.0037	1.0904	4.4650	0.0012	1.2647	3.2921	0.0018	1.0825
1974	1	7.8814	0.0017	1.4691	9.5795	0.0030	1.8434	6.4273	0.0016	1.8205	7.0354	0.0026	2.3133
1974	2	5.8507	0.0028	1.0905	6.4273	0.0052	1.2368	4.1916	0.0016	1.1872	4.1322	0.0023	1.3587
1974	3	3.3604	0.0017	0.6264	2.5472	0.0030	0.4902	2.1274	0.0011	0.6026	1.4706	0.0016	0.4836
1974	4	5.0968	0.0014	0.9500	5.0327	0.0022	0.9685	3.3283	0.0013	0.9427	2.9146	0.0018	0.9584

Appendix table 5. Continued.

Year	Quarter	Main Fishing Ground (Area2&3&5)			Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1–5)			Whole Indian Ocean (Area1–5)		
		CPUE	t-dev	Relative CPUE	CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE
1975	1	4.4832	0.0025	0.8356	5.3701	0.0048	1.0334	3.4892	0.0020	0.9883	3.7040	0.0032	1.2179
1975	2	4.9538	0.0025	0.9234	5.9288	0.0043	1.1409	3.4463	0.0014	0.9761	3.5945	0.0020	1.1819
1975	3	4.5661	0.0011	0.8511	3.6019	0.0019	0.6931	3.0559	0.0008	0.8656	2.2501	0.0012	0.7399
1975	4	14.8571	0.0019	2.7693	17.1457	0.0037	3.2994	9.0737	0.0013	2.5701	9.0377	0.0020	2.9717
1976	1	7.8392	0.0017	1.4612	10.3587	0.0030	1.9934	4.9527	0.0052	1.4028	5.6112	0.0088	1.8450
1976	2	7.4732	0.0037	1.3930	6.9274	0.0075	1.3331	4.3816	0.0030	1.2411	3.4620	0.0048	1.1384
1976	3	4.6300	0.0041	0.8630	3.4621	0.0056	0.6662	2.9293	0.0020	0.8297	2.0044	0.0024	0.6591
1976	4	6.5139	0.0060	1.2142	7.0323	0.0082	1.3532	3.8539	0.0031	1.0916	3.5241	0.0037	1.1588
1977	1	17.4012	0.0068	3.2435	24.6943	0.0122	4.7520	11.6862	0.0069	3.3100	14.1799	0.0110	4.6625
1977	2	19.6300	0.0181	3.6589	22.7093	0.0402	4.3700	11.8452	0.0094	3.3551	11.8385	0.0153	3.8927
1977	3	6.0758	0.0040	1.1325	5.0058	0.0057	0.9633	3.5281	0.0021	0.9993	2.4419	0.0026	0.8029
1977	4	10.9477	0.0072	2.0406	8.4194	0.0166	1.6202	6.7705	0.0035	1.9177	4.6161	0.0059	1.5178
1978	1	8.4272	0.0021	1.5708	9.8224	0.0047	1.8902	5.3975	0.0033	1.5288	5.4650	0.0056	1.7970
1978	2	6.5572	0.0050	1.2222	7.2122	0.0117	1.3879	4.2139	0.0027	1.1936	4.0096	0.0046	1.3184
1978	3	3.2346	0.0024	0.6029	2.6809	0.0025	0.5159	2.0770	0.0015	0.5883	1.5210	0.0017	0.5001
1978	4	9.1083	0.0028	1.6977	8.7425	0.0053	1.6823	6.0078	0.0020	1.7017	5.1246	0.0031	1.6850
1979	1	11.9273	0.0018	2.2232	16.2647	0.0035	3.1299	7.6107	0.0037	2.1557	8.8708	0.0063	2.9168
1979	2	7.7039	0.0032	1.4360	10.3620	0.0059	1.9940	4.9019	0.0026	1.3884	5.5963	0.0039	1.8401
1979	3	3.3047	0.0024	0.6160	3.4926	0.0044	0.6721	2.2490	0.0015	0.6370	2.0672	0.0022	0.6797
1979	4	7.0129	0.0035	1.3072	8.1274	0.0045	1.5640	4.5837	0.0024	1.2983	4.6078	0.0032	1.5151
1980	1	5.7507	0.0017	1.0719	6.8694	0.0030	1.3219	3.5630	0.0041	1.0092	3.6449	0.0068	1.1985
1980	2	3.4427	0.0026	0.6417	3.9675	0.0050	0.7635	2.0734	0.0031	0.5873	2.0148	0.0051	0.6625
1980	3	2.6720	0.0027	0.4980	2.3983	0.0026	0.4615	1.7033	0.0017	0.4824	1.3397	0.0019	0.4405
1980	4	6.4961	0.0022	1.2108	5.8291	0.0046	1.1217	4.0388	0.0014	1.1440	3.1855	0.0022	1.0474
1981	1	4.7208	0.0011	0.8799	5.0625	0.0023	0.9742	3.0897	0.0018	0.8751	2.8979	0.0031	0.9529
1981	2	4.2643	0.0022	0.7948	5.3134	0.0041	1.0225	2.5644	0.0028	0.7263	2.6872	0.0045	0.8836
1981	3	4.8979	0.0026	0.9129	4.6197	0.0051	0.8890	2.9830	0.0014	0.8449	2.4082	0.0021	0.7918
1981	4	6.7528	0.0018	1.2587	7.1538	0.0036	1.3766	4.7638	0.0013	1.3493	4.5135	0.0021	1.4841
1982	1	6.4030	0.0011	1.1935	7.7561	0.0022	1.4925	7.5245	0.0022	2.1313	8.6813	0.0038	2.8545
1982	2	4.9950	0.0022	0.9310	5.5227	0.0045	1.0627	2.9761	0.0059	0.8430	2.7739	0.0100	0.9121
1982	3	3.4733	0.0012	0.6474	3.1821	0.0023	0.6123	2.0752	0.0012	0.5878	1.6091	0.0019	0.5291
1982	4	5.1031	0.0017	0.9512	3.1085	0.0037	0.5982	3.7453	0.0021	1.0608	2.4363	0.0036	0.8011
1983	1	6.9810	0.0012	1.3012	8.4878	0.0027	1.6333	4.9052	0.0031	1.3894	5.1966	0.0053	1.7087
1983	2	4.9065	0.0033	0.9145	5.4264	0.0077	1.0442	3.0069	0.0023	0.8517	2.8153	0.0039	0.9257
1983	3	2.8577	0.0011	0.5327	2.7934	0.0015	0.5375	1.7352	0.0010	0.4915	1.4448	0.0013	0.4751
1983	4	7.4484	0.0019	1.3883	6.6926	0.0039	1.2879	4.7132	0.0015	1.3350	3.6997	0.0024	1.2165
1984	1	8.7531	0.0013	1.6315	10.9178	0.0028	2.1009	6.0893	0.0015	1.7248	6.5898	0.0025	2.1668
1984	2	5.1266	0.0023	0.9556	5.4565	0.0050	1.0500	3.1109	0.0015	0.8811	2.8015	0.0025	0.9212
1984	3	4.2296	0.0012	0.7884	3.0743	0.0017	0.5916	2.6012	0.0010	0.7368	1.6540	0.0014	0.5439
1984	4	8.7356	0.0016	1.6283	10.6353	0.0033	2.0466	6.5351	0.0012	1.8510	7.0278	0.0019	2.3108
1985	1	6.9981	0.0012	1.3044	8.1547	0.0024	1.5692	6.2307	0.0020	1.7648	6.7085	0.0034	2.2058
1985	2	4.6199	0.0015	0.8611	4.6692	0.0030	0.8985	2.9428	0.0010	0.8335	2.5946	0.0016	0.8531
1985	3	4.0926	0.0009	0.7628	3.8039	0.0017	0.7320	2.5015	0.0007	0.7085	1.9951	0.0011	0.6560
1985	4	7.3278	0.0020	1.3659	6.5657	0.0044	1.2635	4.7761	0.0015	1.3528	3.8484	0.0026	1.2654
1986	1	9.5015	0.0008	1.7710	10.2935	0.0016	1.9808	6.5542	0.0010	1.8564	6.3215	0.0017	2.0786
1986	2	6.0354	0.0023	1.1250	4.8350	0.0051	0.9304	3.8557	0.0027	1.0921	2.7664	0.0046	0.9096
1986	3	4.0186	0.0014	0.7490	3.1446	0.0024	0.6051	2.4012	0.0010	0.6801	1.6067	0.0014	0.5283
1986	4	5.1713	0.0028	0.9639	3.4160	0.0064	0.6574	3.1083	0.0015	0.8804	1.7755	0.0026	0.5838
1987	1	8.3238	0.0012	1.5515	9.5357	0.0025	1.8350	5.2222	0.0010	1.4792	5.1587	0.0017	1.6963
1987	2	6.7605	0.0124	1.2601	7.7224	0.0297	1.4860	4.4020	0.0072	1.2468	4.3301	0.0124	1.4238
1987	3	2.9612	0.0038	0.5520	3.1052	0.0078	0.5975	1.8010	0.0019	0.5101	1.5878	0.0029	0.5221
1987	4	6.3658	0.0017	1.1866	4.7554	0.0034	0.9151	4.0992	0.0013	1.1611	2.7732	0.0020	0.9119

Appendix table 5. Continued.

Year	Quarter	Main Fishing Ground (Area2&3&5)			Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1-5)			Whole Indian Ocean (Area1-5)		
		CPUE	t-dev	Relative CPUE	CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE
1988	1	11.3373	0.0012	2.1132	12.3307	0.0027	2.3728	9.0815	0.0020	2.5723	9.1662	0.0035	3.0140
1988	2	5.6960	0.0123	1.0617	5.7458	0.0293	1.1057	3.7393	0.0066	1.0591	3.3257	0.0113	1.0935
1988	3	4.9033	0.0018	0.9140	5.6848	0.0029	1.0939	2.9093	0.0013	0.8240	2.8350	0.0019	0.9322
1988	4	6.4450	0.0016	1.2013	7.4949	0.0032	1.4423	3.9115	0.0015	1.1079	3.8687	0.0024	1.2721
1989	1	6.4753	0.0018	1.2070	7.8929	0.0040	1.5189	6.3144	0.0025	1.7885	6.9610	0.0042	2.2889
1989	2	4.5223	0.0035	0.8429	5.3741	0.0077	1.0342	3.0356	0.0053	0.8598	3.1092	0.0091	1.0223
1989	3	2.2475	0.0044	0.4189	2.0771	0.0035	0.3997	1.3783	0.0026	0.3904	1.0781	0.0025	0.3545
1989	4	6.1161	0.0022	1.1400	5.4349	0.0041	1.0459	3.7342	0.0017	1.0577	2.8587	0.0026	0.9400
1990	1	11.4482	0.0012	2.1339	13.1225	0.0023	2.5252	7.6007	0.0012	2.1528	7.6087	0.0019	2.5018
1990	2	5.6168	0.0054	1.0469	6.5235	0.0120	1.2553	3.3356	0.0071	0.9448	3.2458	0.0121	1.0673
1990	3	4.4746	0.0031	0.8340	4.8151	0.0033	0.9266	2.8112	0.0016	0.7963	2.5903	0.0017	0.8517
1990	4	3.2039	0.0026	0.5972	2.5631	0.0054	0.4932	2.0554	0.0020	0.5822	1.4728	0.0032	0.4843
1991	1	4.7606	0.0011	0.8874	4.0592	0.0021	0.7811	3.1595	0.0015	0.8949	2.4397	0.0025	0.8022
1991	2	3.6660	0.0065	0.6833	2.6565	0.0128	0.5112	2.4384	0.0042	0.6907	1.6351	0.0065	0.5376
1991	3	2.2492	0.0041	0.4192	2.2402	0.0070	0.4311	1.4543	0.0018	0.4119	1.2420	0.0024	0.4084
1991	4	3.8602	0.0029	0.7195	3.0515	0.0042	0.5872	2.4015	0.0014	0.6802	1.6630	0.0017	0.5468
1992	1	4.5947	0.0015	0.8564	4.2966	0.0025	0.8268	2.9272	0.0020	0.8291	2.3696	0.0032	0.7792
1992	2	3.5012	0.0220	0.6526	2.4050	0.0519	0.4628	2.2484	0.0092	0.6368	1.3986	0.0157	0.4599
1992	3	3.1531	0.0067	0.5877	3.3065	0.0087	0.6363	1.9072	0.0031	0.5402	1.7001	0.0033	0.5590
1992	4	3.7947	0.0040	0.7073	3.7523	0.0087	0.7221	2.3049	0.0021	0.6528	1.9470	0.0033	0.6402
1993	1	5.8279	0.0016	1.0863	7.0312	0.0026	1.3530	3.5723	0.0032	1.0118	3.6395	0.0053	1.1967
1993	2	4.2586	0.0071	0.7938	4.6257	0.0162	0.8901	2.6088	0.0042	0.7389	2.3443	0.0071	0.7708
1993	3	3.0830	0.0025	0.5747	2.9267	0.0042	0.5632	1.8611	0.0012	0.5271	1.4778	0.0016	0.4859
1993	4	4.2404	0.0032	0.7904	3.6432	0.0072	0.7011	2.5939	0.0016	0.7347	1.9020	0.0026	0.6254
1994	1	3.8561	0.0011	0.7188	3.8455	0.0020	0.7400	2.6087	0.0010	0.7389	2.2644	0.0016	0.7446
1994	2	2.9937	0.0426	0.5580	2.2620	0.1030	0.4353	1.9950	0.0164	0.5651	1.3562	0.0284	0.4459
1994	3	3.0259	0.0055	0.5640	3.4040	0.0109	0.6550	1.9146	0.0023	0.5423	1.7829	0.0034	0.5862
1994	4	2.8051	0.0016	0.5229	2.7124	0.0031	0.5220	1.8437	0.0008	0.5222	1.5319	0.0012	0.5037
1995	1	3.0125	0.0011	0.5615	3.3767	0.0016	0.6498	2.1353	0.0007	0.6048	2.0793	0.0009	0.6837
1995	2	2.1317	0.0041	0.3973	2.5416	0.0082	0.4891	1.3875	0.0019	0.3930	1.3798	0.0028	0.4537
1995	3	1.8401	0.0029	0.3430	1.5278	0.0034	0.2940	1.2217	0.0012	0.3460	0.8890	0.0012	0.2923
1995	4	4.8641	0.0016	0.9066	4.8114	0.0034	0.9259	3.0196	0.0008	0.8553	2.5288	0.0012	0.8315
1996	1	4.3812	0.0009	0.8166	3.3041	0.0014	0.6358	2.7818	0.0006	0.7879	1.8211	0.0008	0.5988
1996	2	2.2925	0.0060	0.4273	1.5197	0.0137	0.2924	1.5773	0.0025	0.4468	0.9942	0.0041	0.3269
1996	3	1.9928	0.0030	0.3714	1.7999	0.0062	0.3464	1.3525	0.0013	0.3831	1.0714	0.0020	0.3523
1996	4	3.5696	0.0009	0.6654	4.1214	0.0019	0.7931	2.2345	0.0005	0.6329	2.1621	0.0009	0.7109
1997	1	3.8831	0.0005	0.7238	3.7927	0.0008	0.7298	2.7036	0.0013	0.7658	2.3202	0.0022	0.7629
1997	2	1.6737	0.0053	0.3120	1.8866	0.0126	0.3630	1.1297	0.0025	0.3200	1.0786	0.0042	0.3547
1997	3	2.9352	0.0015	0.5471	2.7024	0.0028	0.5200	1.8401	0.0007	0.5212	1.4368	0.0010	0.4724
1997	4	2.9587	0.0006	0.5515	2.2616	0.0013	0.4352	1.9023	0.0005	0.5388	1.2710	0.0008	0.4179
1998	1	3.5719	0.0004	0.6658	3.5107	0.0008	0.6756	2.3941	0.0016	0.6781	2.0427	0.0028	0.6717
1998	2	2.0694	0.0017	0.3857	1.7044	0.0038	0.3280	1.4149	0.0012	0.4008	1.0503	0.0021	0.3454
1998	3	1.7005	0.0012	0.3170	1.1247	0.0023	0.2164	1.0718	0.0007	0.3036	0.6170	0.0011	0.2029
1998	4	3.6211	0.0007	0.6750	3.3151	0.0012	0.6379	2.2948	0.0006	0.6500	1.7958	0.0009	0.5905
1999	1	3.5647	0.0006	0.6644	3.5839	0.0009	0.6897	2.4186	0.0011	0.6851	2.1167	0.0017	0.6960
1999	2	2.2411	0.0016	0.4177	1.5598	0.0028	0.3002	1.5965	0.0011	0.4522	1.0691	0.0016	0.3515
1999	3	2.5579	0.0010	0.4768	1.8345	0.0013	0.3530	1.6231	0.0006	0.4597	1.0098	0.0008	0.3320
1999	4	3.7952	0.0005	0.7074	3.6705	0.0009	0.7063	2.4891	0.0008	0.7050	2.0803	0.0013	0.6840
2000	1	3.6931	0.0005	0.6884	3.6937	0.0010	0.7108	2.5871	0.0011	0.7328	2.2693	0.0019	0.7462
2000	2	2.8641	0.0009	0.5339	2.7820	0.0012	0.5353	1.9112	0.0007	0.5413	1.6109	0.0010	0.5297
2000	3	3.9209	0.0010	0.7308	2.8949	0.0015	0.5571	2.5139	0.0006	0.7120	1.6116	0.0008	0.5299
2000	4	3.1193	0.0009	0.5814	2.3385	0.0017	0.4500	1.9749	0.0008	0.5594	1.2707	0.0013	0.4178

Appendix table 5. Continued.

Year	Quarter	Main Fishing Ground (Area2&3&5)			Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1-5)			Whole Indian Ocean (Area1-5)					
		Relative		CPUE	Relative		CPUE	Tropical		CPUE	Relative		CPUE	Tropical		CPUE
		CPUE	t-dev		CPUE	t-dev		CPUE	t-dev		CPUE	t-dev		CPUE	t-dev	
2001	1	4.3651	0.0008	0.8136	4.2772	0.0009	0.8231	2.7151	0.0008	0.7690	2.2382	0.0012	0.7360			
2001	2	2.7095	0.0011	0.5050	1.5010	0.0019	0.2888	1.8231	0.0009	0.5164	0.9733	0.0013	0.3200			
2001	3	2.2593	0.0013	0.4211	1.3903	0.0020	0.2675	1.5214	0.0007	0.4309	0.8762	0.0008	0.2881			
2001	4	3.1700	0.0012	0.5909	1.8665	0.0022	0.3592	2.1045	0.0006	0.5961	1.1550	0.0009	0.3798			
2002	1	4.6295	0.0010	0.8629	3.8083	0.0020	0.7328	2.9681	0.0008	0.8407	2.1226	0.0013	0.6979			
2002	2	2.3424	0.0017	0.4366	1.8206	0.0036	0.3503	1.5909	0.0013	0.4506	1.1200	0.0022	0.3683			
2002	3	1.1416	0.0011	0.2128	1.0449	0.0018	0.2011	0.7903	0.0006	0.2238	0.6424	0.0008	0.2112			
2002	4	1.9807	0.0007	0.3692	1.7490	0.0014	0.3366	1.2585	0.0005	0.3565	0.9475	0.0008	0.3116			
2003	1	3.8215	0.0007	0.7123	3.7797	0.0012	0.7273	2.4579	0.0021	0.6962	2.0791	0.0036	0.6836			
2003	2	2.3169	0.0040	0.4319	1.1943	0.0091	0.2298	1.7527	0.0027	0.4964	1.0385	0.0045	0.3415			
2003	3	2.3071	0.0022	0.4300	1.1183	0.0044	0.2152	1.5132	0.0011	0.4286	0.7117	0.0017	0.2340			
2003	4	3.1820	0.0010	0.5931	2.4654	0.0021	0.4744	1.9826	0.0007	0.5616	1.3176	0.0012	0.4332			
2004	1	3.0869	0.0009	0.5754	2.9926	0.0019	0.5759	2.1602	0.0030	0.6119	1.8662	0.0052	0.6136			
2004	2	3.5661	0.0025	0.6647	2.3236	0.0055	0.4471	2.2525	0.0018	0.6380	1.2980	0.0031	0.4268			
2004	3	1.6931	0.0012	0.3156	1.3842	0.0023	0.2664	1.1333	0.0008	0.3210	0.8227	0.0012	0.2705			
2004	4	2.7463	0.0008	0.5119	1.6033	0.0016	0.3085	1.6892	0.0016	0.4785	0.8463	0.0011	0.2783			
2005	1	4.2114	0.0008	0.7850	3.9996	0.0017	0.7697	2.6497	0.0013	0.7505	2.1407	0.0022	0.7039			
2005	2	2.8986	0.0020	0.5403	1.4739	0.0044	0.2836	1.9641	0.0019	0.5563	0.9843	0.0033	0.3237			
2005	3	1.4622	0.0026	0.2725	1.0696	0.0059	0.2058	0.9200	0.0016	0.2606	0.5802	0.0028	0.1908			
2005	4	2.6195	0.0010	0.4883	2.3245	0.0023	0.4473	1.6108	0.0008	0.4562	1.2015	0.0013	0.3951			
2006	1	4.6235	0.0005	0.8618	4.6335	0.0011	0.8916	2.8514	0.0009	0.8076	2.4144	0.0015	0.7939			
2006	2	3.6772	0.0008	0.6854	2.6855	0.0018	0.5168	2.3844	0.0021	0.6754	1.5631	0.0035	0.5140			
2006	3	1.4602	0.0008	0.2722	1.0892	0.0013	0.2096	0.9334	0.0007	0.2644	0.6101	0.0010	0.2006			
2006	4	1.9374	0.0005	0.3611	1.7445	0.0010	0.3357	1.2459	0.0009	0.3529	0.9627	0.0015	0.3165			
2007	1	3.0932	0.0004	0.5766	3.5843	0.0009	0.6897	1.9574	0.0025	0.5544	1.9179	0.0043	0.6306			
2007	2	2.8255	0.0007	0.5267	3.2547	0.0016	0.6263	1.8456	0.0011	0.5228	1.8064	0.0020	0.5940			
2007	3	1.2768	0.0009	0.2380	1.0129	0.0018	0.1949	0.8203	0.0007	0.2323	0.5624	0.0011	0.1849			
2007	4	1.7401	0.0007	0.3243	1.5332	0.0013	0.2950	1.0734	0.0012	0.3040	0.7975	0.0019	0.2622			
2008	1	2.3852	0.0005	0.4446	2.8891	0.0010	0.5560	1.5256	0.0016	0.4321	1.5572	0.0028	0.5120			
2008	2	1.2101	0.0010	0.2256	1.1926	0.0022	0.2295	0.7170	0.0008	0.2031	0.5873	0.0013	0.1931			
2008	3	0.8305	0.0009	0.1548	0.5801	0.0017	0.1116	0.5045	0.0006	0.1429	0.2948	0.0010	0.0969			
2008	4	1.0598	0.0006	0.1975	1.1318	0.0009	0.2178	0.6471	0.0011	0.1833	0.5824	0.0018	0.1915			
2009	1	1.1537	0.0004	0.2150	1.3471	0.0008	0.2592	0.8091	0.0034	0.2292	0.7989	0.0059	0.2627			
2009	2	1.5637	0.0010	0.2915	1.8244	0.0018	0.3511	0.9695	0.0008	0.2746	0.9530	0.0013	0.3134			
2009	3	1.2627	0.0020	0.2354	0.9228	0.0017	0.1776	0.7518	0.0010	0.2129	0.4502	0.0009	0.1480			
2009	4	1.6173	0.0014	0.3015	0.8221	0.0011	0.1582	0.9802	0.0016	0.2776	0.4266	0.0022	0.1403			
2010	1	1.5852	0.0018	0.2955	1.5139	0.0011	0.2913	0.9497	0.0018	0.2690	0.7629	0.0023	0.2509			
2010	2	1.7159	0.0030	0.3198	2.0638	0.0039	0.3971	1.0410	0.0014	0.2949	1.0467	0.0015	0.3442			
2010	3	3.2864	0.0123	0.6126	0.8872	0.0067	0.1707	2.0049	0.0050	0.5679	0.4521	0.0025	0.1487			
2010	4	1.9685	0.0070	0.3669	1.0754	0.0016	0.2069	1.2553	0.0065	0.3556	0.6211	0.0071	0.2042			

Appendix table 6. Quarter value of yellowfin CPUE standardized for main fishing ground with and without area 2 in the Indian Ocean for 1980-2010 expressed in real and relative scale in which the average of each period is 1.0, and variance.

Year	Quarter	Main Fishing Ground (Area2&3&5)			Main Fishing Ground (Area3&5)			Whole Indian Ocean (Area2-5)			Whole Indian Ocean (Area3-5)		
		CPUE	t-dev	Relative CPUE	CPUE	t-dev	Relative CPUE	CPUE	t-dev	Relative CPUE	CPUE	t-dev	Relative CPUE
1975	1												
1975	2												
1975	3												
1975	4												
1976	1												
1976	2												
1976	3												
1976	4												
1977	1												
1977	2												
1977	3												
1977	4												
1978	1												
1978	2												
1978	3												
1978	4												
1979	1												
1979	2												
1979	3												
1979	4												
1980	1	5.7598	0.0018	1.4953	6.9243	0.0032	1.8546	3.5487	0.0042	1.3954	3.6496	0.0068	1.6832
1980	2	3.3719	0.0028	0.8754	3.9086	0.0053	1.0469	2.0216	0.0032	0.7949	1.9729	0.0051	0.9099
1980	3	2.6082	0.0029	0.6771	2.3511	0.0028	0.6297	1.6483	0.0017	0.6481	1.2969	0.0019	0.5981
1980	4	6.5436	0.0024	1.6988	5.9138	0.0047	1.5839	4.0409	0.0014	1.5890	3.1993	0.0022	1.4755
1981	1	4.7199	0.0012	1.2253	5.1004	0.0024	1.3661	3.0614	0.0019	1.2038	2.8866	0.0031	1.3313
1981	2	4.2262	0.0023	1.0972	5.3030	0.0042	1.4203	2.5304	0.0029	0.9950	2.6660	0.0046	1.2296
1981	3	4.8109	0.0028	1.2490	4.5519	0.0054	1.2192	2.9138	0.0015	1.1457	2.3531	0.0021	1.0853
1981	4	6.7936	0.0019	1.7637	7.2303	0.0038	1.9365	4.7407	0.0013	1.8641	4.4991	0.0021	2.0750
1982	1	6.4577	0.0011	1.6765	7.8757	0.0023	2.1094	7.5606	0.0023	2.9729	8.7294	0.0039	4.0261
1982	2	4.9428	0.0023	1.2832	5.4966	0.0047	1.4722	2.9315	0.0061	1.1527	2.7423	0.0101	1.2647
1982	3	3.4021	0.0013	0.8832	3.1282	0.0024	0.8378	2.0227	0.0012	0.7954	1.5691	0.0019	0.7237
1982	4	5.0659	0.0018	1.3152	3.0742	0.0039	0.8234	3.6822	0.0022	1.4479	2.3753	0.0036	1.0955
1983	1	7.0711	0.0013	1.8357	8.6304	0.0028	2.3115	4.9140	0.0032	1.9323	5.2184	0.0054	2.4068
1983	2	4.8722	0.0035	1.2649	5.4238	0.0080	1.4527	2.9707	0.0024	1.1681	2.7957	0.0040	1.2894
1983	3	2.7900	0.0012	0.7243	2.7462	0.0016	0.7355	1.6840	0.0010	0.6622	1.4087	0.0013	0.6497
1983	4	7.4191	0.0020	1.9261	6.6752	0.0041	1.7879	4.6626	0.0015	1.8334	3.6533	0.0024	1.6849
1984	1	8.9162	0.0014	2.3147	11.1609	0.0029	2.9893	6.1340	0.0016	2.4120	6.6537	0.0025	3.0688
1984	2	5.0557	0.0025	1.3125	5.3993	0.0052	1.4461	3.0565	0.0016	1.2019	2.7562	0.0025	1.2712
1984	3	4.1869	0.0012	1.0870	3.0347	0.0017	0.8128	2.5604	0.0010	1.0068	1.6157	0.0014	0.7452
1984	4	8.8929	0.0017	2.3087	10.8583	0.0034	2.9083	6.5849	0.0013	2.5893	7.0893	0.0019	3.2696
1985	1	7.0713	0.0012	1.8358	8.2775	0.0025	2.2170	6.2369	0.0021	2.4524	6.7226	0.0034	3.1005
1985	2	4.5776	0.0016	1.1884	4.6379	0.0032	1.2422	2.9044	0.0010	1.1420	2.5618	0.0016	1.1815
1985	3	4.0539	0.0010	1.0524	3.7899	0.0017	1.0151	2.4638	0.0008	0.9688	1.9699	0.0011	0.9085
1985	4	7.4047	0.0021	1.9223	6.6718	0.0046	1.7870	4.7879	0.0016	1.8827	3.8645	0.0026	1.7823
1986	1	9.6219	0.0008	2.4979	10.4625	0.0017	2.8022	6.5768	0.0010	2.5861	6.3509	0.0017	2.9291
1986	2	6.0024	0.0024	1.5583	4.7984	0.0053	1.2852	3.8139	0.0028	1.4997	2.7228	0.0046	1.2558
1986	3	3.9942	0.0014	1.0369	3.1224	0.0025	0.8363	2.3755	0.0010	0.9341	1.5820	0.0015	0.7296
1986	4	5.1659	0.0030	1.3411	3.4076	0.0067	0.9127	3.0905	0.0016	1.2152	1.7542	0.0026	0.8090
1987	1	8.4366	0.0012	2.1902	9.6928	0.0026	2.5961	5.2565	0.0010	2.0669	5.2017	0.0017	2.3991
1987	2	6.7615	0.0132	1.7554	7.7490	0.0310	2.0755	4.3810	0.0075	1.7227	4.3162	0.0125	1.9906
1987	3	2.9304	0.0041	0.7608	3.0842	0.0081	0.8261	1.7717	0.0020	0.6967	1.5652	0.0030	0.7219
1987	4	6.3615	0.0018	1.6515	4.7416	0.0035	1.2700	4.0656	0.0013	1.5987	2.7329	0.0020	1.2605

Appendix table 6. Continued.

Year	Quarter	Main Fishing Ground (Area2&3&5)			Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1-5)			Whole Indian Ocean (Area1-5)		
		CPUE	t-dev	Relative	CPUE	t-dev	Relative	Tropical	t-dev	Relative	Tropical	t-dev	Relative
				CPUE			CPUE			CPUE			CPUE
1988	1	11.5430	0.0013	2.9967	12.6003	0.0028	3.3748	9.1457	0.0021	3.5962	9.2297	0.0035	4.2568
1988	2	5.6591	0.0131	1.4692	5.7275	0.0305	1.5340	3.7018	0.0069	1.4556	3.2944	0.0114	1.5194
1988	3	4.8991	0.0019	1.2719	5.7105	0.0031	1.5295	2.8945	0.0014	1.1382	2.8336	0.0020	1.3069
1988	4	6.4869	0.0017	1.6841	7.5729	0.0033	2.0283	3.9143	0.0016	1.5392	3.8830	0.0024	1.7909
1989	1	6.5042	0.0019	1.6886	7.9545	0.0042	2.1305	6.2772	0.0026	2.4683	6.9273	0.0043	3.1949
1989	2	4.5094	0.0037	1.1707	5.3835	0.0080	1.4419	3.0085	0.0056	1.1830	3.0906	0.0092	1.4254
1989	3	2.2041	0.0047	0.5722	2.0435	0.0036	0.5473	1.3431	0.0027	0.5281	1.0500	0.0025	0.4842
1989	4	6.0963	0.0024	1.5827	5.4185	0.0042	1.4513	3.7046	0.0017	1.4567	2.8286	0.0026	1.3045
1990	1	11.6425	0.0013	3.0225	13.3846	0.0024	3.5849	7.6633	0.0012	3.0133	7.6800	0.0019	3.5420
1990	2	5.5963	0.0057	1.4529	6.5378	0.0125	1.7511	3.3090	0.0074	1.3012	3.2355	0.0121	1.4922
1990	3	4.4819	0.0033	1.1635	4.8530	0.0035	1.2998	2.7963	0.0017	1.0995	2.5892	0.0017	1.1941
1990	4	3.1947	0.0027	0.8294	2.5609	0.0056	0.6859	2.0337	0.0021	0.7997	1.4532	0.0032	0.6702
1991	1	4.7416	0.0012	1.2310	4.0499	0.0022	1.0847	3.1243	0.0016	1.2285	2.4062	0.0025	1.1097
1991	2	3.6402	0.0069	0.9450	2.6399	0.0133	0.7071	2.4074	0.0044	0.9466	1.6062	0.0066	0.7408
1991	3	2.2103	0.0044	0.5738	2.2115	0.0073	0.5923	1.4191	0.0019	0.5580	1.2131	0.0024	0.5595
1991	4	3.8208	0.0031	0.9919	3.0431	0.0044	0.8151	2.3679	0.0015	0.9311	1.6442	0.0017	0.7583
1992	1	4.5493	0.0016	1.1810	4.2723	0.0026	1.1443	2.8855	0.0021	1.1346	2.3386	0.0032	1.0786
1992	2	3.4456	0.0235	0.8945	2.3629	0.0541	0.6329	2.2019	0.0096	0.8658	1.3618	0.0158	0.6281
1992	3	3.1101	0.0072	0.8074	3.2964	0.0091	0.8829	1.8701	0.0032	0.7354	1.6824	0.0033	0.7759
1992	4	3.7538	0.0043	0.9745	3.7326	0.0090	0.9997	2.2707	0.0021	0.8929	1.9245	0.0033	0.8876
1993	1	5.7938	0.0017	1.5041	7.0185	0.0027	1.8798	3.5325	0.0034	1.3890	3.6095	0.0053	1.6647
1993	2	4.1941	0.0076	1.0888	4.5838	0.0168	1.2277	2.5574	0.0044	1.0056	2.3074	0.0072	1.0642
1993	3	3.0258	0.0026	0.7855	2.8843	0.0044	0.7725	1.8212	0.0013	0.7161	1.4493	0.0017	0.6684
1993	4	4.1957	0.0035	1.0892	3.6218	0.0075	0.9701	2.5616	0.0016	1.0073	1.8825	0.0026	0.8682
1994	1	3.7913	0.0012	0.9843	3.8037	0.0021	1.0188	2.5521	0.0011	1.0035	2.2219	0.0016	1.0247
1994	2	2.9553	0.0455	0.7672	2.2488	0.1071	0.6023	1.9583	0.0171	0.7700	1.3334	0.0286	0.6150
1994	3	2.9795	0.0058	0.7735	3.3786	0.0114	0.9049	1.8787	0.0024	0.7387	1.7609	0.0034	0.8121
1994	4	2.7509	0.0017	0.7142	2.6722	0.0033	0.7157	1.8016	0.0008	0.7084	1.4998	0.0012	0.6917
1995	1	2.9629	0.0012	0.7692	3.3398	0.0017	0.8945	2.0878	0.0007	0.8209	2.0408	0.0009	0.9412
1995	2	2.0918	0.0044	0.5431	2.5043	0.0086	0.6707	1.3554	0.0020	0.5330	1.3517	0.0028	0.6234
1995	3	1.7858	0.0031	0.4636	1.4853	0.0036	0.3978	1.1823	0.0013	0.4649	0.8592	0.0012	0.3963
1995	4	4.7957	0.0017	1.2450	4.7644	0.0035	1.2761	2.9762	0.0008	1.1703	2.4990	0.0012	1.1526
1996	1	4.2961	0.0009	1.1153	3.2439	0.0015	0.8688	2.7262	0.0006	1.0720	1.7827	0.0008	0.8222
1996	2	2.2297	0.0064	0.5789	1.4775	0.0143	0.3957	1.5320	0.0026	0.6024	0.9625	0.0042	0.4439
1996	3	1.9491	0.0032	0.5060	1.7688	0.0065	0.4738	1.3181	0.0013	0.5183	1.0474	0.0020	0.4831
1996	4	3.5030	0.0010	0.9094	4.0678	0.0020	1.0895	2.1894	0.0006	0.8609	2.1277	0.0009	0.9813
1997	1	3.8026	0.0005	0.9872	3.7307	0.0008	0.9992	2.6393	0.0014	1.0378	2.2711	0.0022	1.0474
1997	2	1.6378	0.0057	0.4252	1.8594	0.0131	0.4980	1.1025	0.0026	0.4335	1.0585	0.0042	0.4882
1997	3	2.8753	0.0016	0.7465	2.6654	0.0029	0.7139	1.7996	0.0007	0.7076	1.4110	0.0010	0.6508
1997	4	2.9017	0.0007	0.7533	2.2221	0.0013	0.5952	1.8630	0.0005	0.7326	1.2436	0.0008	0.5735
1998	1	3.5054	0.0004	0.9100	3.4578	0.0008	0.9261	2.3460	0.0017	0.9225	2.0057	0.0028	0.9250
1998	2	2.0144	0.0018	0.5230	1.6653	0.0039	0.4460	1.3752	0.0013	0.5408	1.0220	0.0021	0.4714
1998	3	1.6569	0.0013	0.4301	1.0947	0.0024	0.2932	1.0435	0.0008	0.4103	0.5980	0.0011	0.2758
1998	4	3.5566	0.0007	0.9233	3.2705	0.0012	0.8760	2.2506	0.0006	0.8850	1.7645	0.0009	0.8138
1999	1	3.4944	0.0007	0.9072	3.5273	0.0010	0.9447	2.3669	0.0011	0.9307	2.0758	0.0017	0.9574
1999	2	2.1974	0.0017	0.5705	1.5257	0.0029	0.4086	1.5627	0.0011	0.6145	1.0423	0.0016	0.4807
1999	3	2.5028	0.0011	0.6498	1.7952	0.0013	0.4808	1.5862	0.0007	0.6237	0.9836	0.0008	0.4537
1999	4	3.7285	0.0005	0.9680	3.6178	0.0009	0.9690	2.4411	0.0008	0.9599	2.0424	0.0013	0.9420
2000	1	3.6344	0.0006	0.9435	3.6518	0.0010	0.9781	2.5360	0.0012	0.9972	2.2302	0.0019	1.0286
2000	2	2.8097	0.0009	0.7294	2.7407	0.0013	0.7341	1.8721	0.0008	0.7361	1.5813	0.0010	0.7293
2000	3	3.8564	0.0011	1.0012	2.8500	0.0016	0.7633	2.4695	0.0006	0.9710	1.5802	0.0008	0.7288
2000	4	3.0625	0.0010	0.7951	2.2971	0.0018	0.6152	1.9376	0.0009	0.7619	1.2440	0.0013	0.5737

Appendix table 6. Contingued.

Year	Quarter	Main Fishing Ground (Area2&3&5)			Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1–5)			Whole Indian Ocean (Area1–5)		
		CPUE	t-dev	Relative CPUE	CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE
2001	1	4.2936	0.0008	1.1147	4.2200	0.0010	1.1303	2.6710	0.0009	1.0503	2.2046	0.0012	1.0168
2001	2	2.6600	0.0011	0.6906	1.4693	0.0020	0.3935	1.7877	0.0009	0.7030	0.9488	0.0013	0.4376
2001	3	2.1981	0.0014	0.5706	1.3500	0.0021	0.3616	1.4785	0.0007	0.5814	0.8480	0.0008	0.3911
2001	4	3.1054	0.0013	0.8062	1.8283	0.0023	0.4897	2.0591	0.0007	0.8097	1.1259	0.0009	0.5193
2002	1	4.5522	0.0011	1.1818	3.7577	0.0020	1.0065	2.9184	0.0009	1.1476	2.0896	0.0014	0.9638
2002	2	2.2837	0.0018	0.5929	1.7758	0.0037	0.4756	1.5492	0.0014	0.6092	1.0888	0.0022	0.5022
2002	3	1.1023	0.0012	0.2862	1.0137	0.0019	0.2715	0.7619	0.0006	0.2996	0.6207	0.0008	0.2863
2002	4	1.9233	0.0007	0.4993	1.7053	0.0014	0.4567	1.2211	0.0005	0.4802	0.9206	0.0008	0.4246
2003	1	3.7300	0.0007	0.9683	3.7088	0.0013	0.9934	2.3998	0.0022	0.9436	2.0365	0.0036	0.9393
2003	2	2.2485	0.0043	0.5837	1.1588	0.0095	0.3104	1.7023	0.0028	0.6694	1.0082	0.0046	0.4650
2003	3	2.2515	0.0023	0.5845	1.0888	0.0046	0.2916	1.4747	0.0012	0.5799	0.6887	0.0017	0.3176
2003	4	3.1196	0.0011	0.8099	2.4302	0.0022	0.6509	1.9415	0.0008	0.7634	1.2932	0.0012	0.5964
2004	1	3.0182	0.0009	0.7836	2.9374	0.0019	0.7867	2.1149	0.0031	0.8316	1.8315	0.0052	0.8447
2004	2	3.4879	0.0027	0.9055	2.2805	0.0058	0.6108	2.2041	0.0019	0.8667	1.2713	0.0031	0.5863
2004	3	1.6528	0.0013	0.4291	1.3553	0.0023	0.3630	1.1031	0.0008	0.4338	0.8007	0.0012	0.3693
2004	4	2.6802	0.0009	0.6958	1.5645	0.0016	0.4190	1.6490	0.0007	0.6484	0.8232	0.0011	0.3797
2005	1	4.1289	0.0009	1.0719	3.9394	0.0018	1.0551	2.5979	0.0013	1.0215	2.1044	0.0022	0.9706
2005	2	2.8390	0.0021	0.7370	1.4385	0.0046	0.3853	1.9195	0.0020	0.7548	0.9546	0.0033	0.4403
2005	3	1.4308	0.0028	0.3714	1.0482	0.0061	0.2807	0.8991	0.0017	0.3535	0.5661	0.0028	0.2611
2005	4	2.5663	0.0011	0.6662	2.2810	0.0024	0.6109	1.5779	0.0008	0.6204	1.1762	0.0013	0.5425
2006	1	4.5586	0.0006	1.1835	4.5877	0.0011	1.2288	2.8130	0.0009	1.1061	2.3878	0.0015	1.1013
2006	2	3.6239	0.0009	0.9408	2.6551	0.0019	0.7111	2.3500	0.0021	0.9241	1.5420	0.0036	0.7112
2006	3	1.4278	0.0008	0.3707	1.0682	0.0014	0.2861	0.9115	0.0007	0.3584	0.5955	0.0010	0.2746
2006	4	1.8967	0.0006	0.4924	1.7115	0.0010	0.4584	1.2172	0.0009	0.4786	0.9404	0.0015	0.4337
2007	1	3.0381	0.0005	0.7887	3.5400	0.0009	0.9481	1.9209	0.0026	0.7553	1.8902	0.0043	0.8718
2007	2	2.7738	0.0008	0.7201	3.2098	0.0016	0.8597	1.8105	0.0012	0.7119	1.7779	0.0020	0.8200
2007	3	1.2446	0.0010	0.3231	0.9891	0.0019	0.2649	0.7989	0.0007	0.3141	0.5473	0.0011	0.2524
2007	4	1.7042	0.0007	0.4424	1.5058	0.0013	0.4033	1.0510	0.0012	0.4133	0.7813	0.0019	0.3604
2008	1	2.3404	0.0006	0.6076	2.8510	0.0010	0.7636	1.4964	0.0017	0.5884	1.5337	0.0028	0.7073
2008	2	1.1752	0.0011	0.3051	1.1696	0.0023	0.3133	0.6984	0.0008	0.2746	0.5765	0.0013	0.2659
2008	3	0.8079	0.0010	0.2097	0.5672	0.0018	0.1519	0.4905	0.0007	0.1929	0.2870	0.0010	0.1324
2008	4	1.0349	0.0006	0.2687	1.1122	0.0010	0.2979	0.6324	0.0011	0.2487	0.5716	0.0018	0.2636
2009	1	1.1277	0.0005	0.2928	1.3247	0.0008	0.3548	0.7875	0.0036	0.3097	0.7813	0.0060	0.3604
2009	2	1.5196	0.0010	0.3945	1.7878	0.0019	0.4788	0.9440	0.0008	0.3712	0.9339	0.0013	0.4307
2009	3	1.2265	0.0021	0.3184	0.8964	0.0018	0.2401	0.7318	0.0010	0.2878	0.4374	0.0009	0.2017
2009	4	1.5788	0.0015	0.4099	0.8048	0.0012	0.2156	0.9583	0.0017	0.3768	0.4168	0.0022	0.1922
2010	1	1.5391	0.0019	0.3996	1.4816	0.0011	0.3968	0.9241	0.0019	0.3634	0.7466	0.0023	0.3444
2010	2	1.6677	0.0032	0.4330	2.0194	0.0040	0.5409	1.0134	0.0015	0.3985	1.0244	0.0015	0.4724
2010	3	3.2400	0.0131	0.8411	0.8651	0.0070	0.2317	1.9806	0.0052	0.7788	0.4407	0.0025	0.2033
2010	4	1.9267	0.0075	0.5002	1.0552	0.0017	0.2826	1.2311	0.0067	0.4841	0.6089	0.0072	0.2808

Appendix table 7. Quarterly value of yellowfin CPUE standardized from 1963-2010 for each of five areas applying Model 2010 without LT5LN5 expressed in real scale and relative scale with variance.

yr	qt	AREA2				AREA3				AREA4				AREA5			
		CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative
1963	1	22.89	0.0026	0.0514	3.1547	36.99	0.0066	0.0812	4.2861	1.26	0.0064	0.0798	1.1184	7.81	0.0025	0.0500	1.8082
1963	2	16.85	0.0039	0.0627	2.3229	33.73	0.0069	0.0829	3.9086	4.45	0.0456	0.2134	3.9411	8.10	0.0032	0.0564	1.8754
1963	3	18.71	0.0142	0.1192	2.5792	12.87	0.0042	0.0651	1.4915	7.26	0.0075	0.0868	6.4227	6.77	0.0036	0.0596	1.5685
1963	4	29.16	0.0030	0.0547	4.0197	18.56	0.0064	0.0801	2.1511	2.13	0.0054	0.0733	1.8817	8.87	0.0030	0.0548	2.0524
1964	1	20.37	0.0028	0.0528	2.8079	29.08	0.0073	0.0856	3.3694	0.68	0.0060	0.0775	0.5984	10.46	0.0029	0.0541	2.4226
1964	2	12.89	0.0022	0.0465	1.7771	16.37	0.0056	0.0748	1.8972	7.31	0.0221	0.1485	6.4712	11.66	0.0030	0.0550	2.6995
1964	3	11.38	0.0057	0.0758	1.5686	10.23	0.0027	0.0520	1.1850	5.63	0.0116	0.1077	4.9862	8.88	0.0021	0.0463	2.0561
1964	4	11.94	0.0027	0.0515	1.6460	9.19	0.0038	0.0614	1.0653	2.52	0.0041	0.0639	2.2324	5.99	0.0021	0.0457	1.3859
1965	1	13.68	0.0021	0.0456	1.8856	12.31	0.0067	0.0819	1.4267	0.76	0.0051	0.0716	0.6750	7.80	0.0020	0.0447	1.8070
1965	2	13.58	0.0023	0.0483	1.8714	15.96	0.0090	0.0948	1.8490	3.07	0.0233	0.1525	2.7193	8.88	0.0019	0.0432	2.0565
1965	3	13.60	0.0034	0.0582	1.8739	10.94	0.0036	0.0600	1.2681	3.06	0.0093	0.0963	2.7063	4.87	0.0027	0.0523	1.1264
1965	4	24.93	0.0029	0.0539	3.4367	13.88	0.0053	0.0730	1.6083	1.57	0.0042	0.0651	1.3892	8.05	0.0027	0.0515	1.8628
1966	1	22.14	0.0019	0.0433	3.0518	21.43	0.0165	0.1285	2.4832	0.77	0.0055	0.0738	0.6852	9.38	0.0022	0.0466	2.1719
1966	2	19.02	0.0018	0.0428	2.6210	18.37	0.0048	0.0696	2.1283	3.70	0.0233	0.1525	3.2781	11.17	0.0029	0.0543	2.5863
1966	3	19.78	0.0027	0.0518	2.7263	11.42	0.0034	0.0585	1.3238	3.82	0.0107	0.1033	3.3836	10.39	0.0027	0.0519	2.4060
1966	4	21.62	0.0019	0.0433	2.9796	10.00	0.0041	0.0641	1.1591	2.59	0.0038	0.0618	2.2902	9.53	0.0023	0.0480	2.2072
1967	1	11.90	0.0017	0.0411	1.6408	12.73	0.0048	0.0690	1.4751	2.15	0.0049	0.0702	1.9037	9.16	0.0019	0.0435	2.1197
1967	2	12.47	0.0020	0.0449	1.7195	14.68	0.0032	0.0563	1.7008	2.22	0.0052	0.0723	1.9608	7.56	0.0018	0.0419	1.7502
1967	3	7.24	0.0030	0.0547	0.9975	6.07	0.0032	0.0561	0.7030	0.70	0.0041	0.0636	0.6165	6.41	0.0027	0.0520	1.4841
1967	4	11.24	0.0023	0.0476	1.5488	10.28	0.0043	0.0656	1.1914	0.57	0.0033	0.0570	0.5027	8.88	0.0031	0.0552	2.0568
1968	1	36.67	0.0021	0.0457	5.0541	77.14	0.0120	0.1094	8.9396	1.56	0.0056	0.0750	1.3813	9.95	0.0019	0.0435	2.3033
1968	2	44.69	0.0022	0.0470	6.1602	34.40	0.0059	0.0765	3.9865	1.17	0.0051	0.0716	1.0313	9.68	0.0036	0.0599	2.2404
1968	3	25.71	0.0027	0.0523	3.5439	14.80	0.0044	0.0667	1.7146	0.51	0.0036	0.0598	0.4481	4.02	0.0038	0.0612	0.9298
1968	4	26.41	0.0021	0.0459	3.6397	10.67	0.0063	0.0791	1.2360	1.05	0.0040	0.0633	0.9263	5.93	0.0028	0.0527	1.3724
1969	1	15.66	0.0020	0.0445	2.1580	7.67	0.0052	0.0724	0.8886	1.15	0.0081	0.0900	1.0180	7.81	0.0023	0.0475	1.8089
1969	2	12.87	0.0028	0.0529	1.7745	9.61	0.0047	0.0688	1.1142	1.24	0.0060	0.0775	1.0979	10.06	0.0026	0.0508	2.3283
1969	3	17.59	0.0029	0.0538	2.4243	4.81	0.0036	0.0601	0.5575	0.51	0.0039	0.0625	0.4487	6.62	0.0045	0.0668	1.5319
1969	4	17.82	0.0030	0.0544	2.4564	2.18	0.0062	0.0790	0.2524	0.81	0.0051	0.0712	0.7180	8.46	0.0038	0.0619	1.9596
1970	1	9.18	0.0030	0.0550	1.2655	4.20	0.0095	0.0977	0.4872	1.95	0.0129	0.1135	1.7216	7.89	0.0026	0.0506	1.8271
1970	2	6.99	0.0043	0.0652	0.9637	4.70	0.0078	0.0882	0.5447	0.61	0.0057	0.0758	0.5426	7.26	0.0033	0.0572	1.6800
1970	3	8.07	0.0129	0.1136	1.1117	2.30	0.0084	0.0919	0.2665	0.49	0.0044	0.0666	0.4316	14.15	0.0025	0.0503	3.2754
1970	4	12.31	0.0032	0.0569	1.6972	4.88	0.0093	0.0962	0.5652	4.57	0.0045	0.0668	4.0415	7.87	0.0027	0.0522	1.8226

Appendix table 7. Continued.

yr	qt	AREA2				AREA3				AREA4				AREA5			
		CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative
1971	1	9.16	0.0029	0.0540	1.2622	6.93	0.0061	0.0779	0.8028	4.01	0.0083	0.0910	3.5509	6.88	0.0028	0.0526	1.5921
1971	2	10.83	0.0042	0.0651	1.4929	5.49	0.0119	0.1089	0.6357	4.81	0.0051	0.0710	4.2571	9.92	0.0031	0.0559	2.2959
1971	3	21.56	0.0038	0.0617	2.9711	4.28	0.0089	0.0941	0.4958	1.91	0.0037	0.0604	1.6895	5.31	0.0042	0.0648	1.2287
1971	4	15.65	0.0030	0.0548	2.1571	4.78	0.0150	0.1225	0.5538	3.64	0.0071	0.0843	3.2247	7.15	0.0051	0.0712	1.6545
1972	1	8.23	0.0035	0.0594	1.1346	32.66	0.0172	0.1313	3.7849	4.37	0.1743	0.4175	3.8709	6.89	0.0045	0.0669	1.5944
1972	2	7.60	0.0041	0.0637	1.0475	20.03	0.0227	0.1508	2.3212	3.02	0.0196	0.1398	2.6761	4.20	0.0051	0.0710	0.9722
1972	3	11.33	0.0035	0.0595	1.5620	5.14	0.0073	0.0856	0.5962	1.94	0.0087	0.0935	1.7173	5.85	0.0083	0.0911	1.3545
1972	4	10.38	0.0041	0.0638	1.4305	8.69	0.0146	0.1210	1.0069	2.22	0.0149	0.1221	1.9688	9.36	0.0145	0.1203	2.1659
1973	1	6.98	0.0062	0.0790	0.9617	17.83	0.0223	0.1493	2.0664	3.67	0.0753	0.2744	3.2458	9.71	0.0055	0.0742	2.2492
1973	2	5.43	0.0061	0.0780	0.7481	4.64	0.0172	0.1313	0.5382	4.35	0.0148	0.1216	3.8495	8.48	0.0088	0.0936	1.9644
1973	3	4.31	0.0047	0.0683	0.5947	1.85	0.0072	0.0849	0.2143	0.52	0.0069	0.0832	0.4563	7.19	0.0109	0.1042	1.6642
1973	4	10.66	0.0045	0.0672	1.4687	8.39	0.0092	0.0958	0.9717	0.89	0.0054	0.0732	0.7879	4.48	0.0051	0.0714	1.0365
1974	1	5.26	0.0043	0.0652	0.7244	17.13	0.0109	0.1044	1.9850	4.48	0.0121	0.1101	3.9684	4.10	0.0029	0.0540	0.9498
1974	2	5.25	0.0052	0.0720	0.7240	8.85	0.0146	0.1210	1.0257	2.01	0.0066	0.0812	1.7760	5.54	0.0064	0.0799	1.2818
1974	3	5.59	0.0039	0.0626	0.7707	1.46	0.0071	0.0840	0.1692	0.44	0.0058	0.0759	0.3919	4.12	0.0044	0.0666	0.9533
1974	4	5.81	0.0048	0.0692	0.8002	6.97	0.0068	0.0823	0.8079	0.79	0.0087	0.0933	0.7016	4.38	0.0027	0.0518	1.0138
1975	1	3.10	0.0047	0.0682	0.4269	7.51	0.0237	0.1540	0.8705	1.94	0.0131	0.1143	1.7204	4.48	0.0023	0.0477	1.0377
1975	2	3.34	0.0060	0.0773	0.4609	9.73	0.0150	0.1225	1.1278	1.30	0.0062	0.0784	1.1517	3.75	0.0043	0.0657	0.8685
1975	3	7.13	0.0030	0.0548	0.9829	4.43	0.0055	0.0744	0.5132	1.00	0.0047	0.0684	0.8848	3.94	0.0026	0.0513	0.9122
1975	4	11.61	0.0036	0.0600	1.6001	34.15	0.0130	0.1141	3.9573	0.73	0.0069	0.0828	0.6475	4.56	0.0037	0.0609	1.0551
1976	1	3.40	0.0044	0.0663	0.4688	19.76	0.0079	0.0887	2.2895	0.58	0.0530	0.2302	0.5144	3.42	0.0040	0.0635	0.7917
1976	2	9.43	0.0056	0.0748	1.2995	8.60	0.0259	0.1609	0.9967	0.28	0.0188	0.1372	0.2441	7.06	0.0072	0.0850	1.6342
1976	3	7.84	0.0142	0.1192	1.0805	2.68	0.0084	0.0916	0.3100	0.56	0.0065	0.0804	0.4952	4.98	0.0093	0.0963	1.1523
1976	4	5.97	0.0207	0.1438	0.8232	10.41	0.0253	0.1591	1.2063	0.26	0.0100	0.0997	0.2322	5.77	0.0089	0.0946	1.3368
1977	1	3.77	0.0143	0.1195	0.5203	47.70	0.0467	0.2161	5.5280	2.90	0.0513	0.2265	2.5673	6.99	0.0097	0.0987	1.6183
1977	2	15.25	0.0129	0.1136	2.1018	43.14	0.0564	0.2374	4.9994	0.72	0.0304	0.1744	0.6332	7.97	0.0646	0.2542	1.8456
1977	3	8.96	0.0133	0.1155	1.2348	6.78	0.0094	0.0970	0.7852	0.21	0.0077	0.0876	0.1823	4.98	0.0092	0.0957	1.1522
1977	4	17.74	0.0037	0.0607	2.4452	13.18	0.0309	0.1757	1.5273	0.84	0.0100	0.1000	0.7468	5.85	0.0244	0.1561	1.3539
1978	1	6.59	0.0015	0.0389	0.9086	15.11	0.0107	0.1036	1.7507	1.02	0.0293	0.1713	0.9028	6.76	0.0066	0.0811	1.5641
1978	2	5.76	0.0021	0.0456	0.7932	8.14	0.0172	0.1313	0.9438	1.03	0.0103	0.1012	0.9158	8.19	0.0189	0.1375	1.8957
1978	3	4.77	0.0107	0.1036	0.6578	3.87	0.0098	0.0988	0.4480	0.42	0.0071	0.0841	0.3730	2.45	0.0024	0.0485	0.5667
1978	4	10.86	0.0050	0.0704	1.4974	17.31	0.0192	0.1386	2.0065	1.57	0.0114	0.1067	1.3919	2.99	0.0048	0.0696	0.6932

Appendix table 7. Continued.

yr	qt	AREA2				AREA3				AREA4				AREA5			
		CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative
1979	1	4.04	0.0035	0.0592	0.5568	31.96	0.0076	0.0869	3.7036	1.05	0.0356	0.1886	0.9257	4.34	0.0052	0.0722	1.0042
1979	2	2.55	0.0067	0.0820	0.3518	19.78	0.0175	0.1323	2.2924	1.05	0.0159	0.1260	0.9303	4.00	0.0067	0.0821	0.9260
1979	3	3.21	0.0054	0.0735	0.4419	5.75	0.0076	0.0870	0.6668	0.66	0.0069	0.0830	0.5817	2.41	0.0070	0.0835	0.5590
1979	4	5.56	0.0133	0.1155	0.7669	15.04	0.0148	0.1215	1.7425	0.81	0.0133	0.1155	0.7126	3.19	0.0048	0.0692	0.7375
1980	1	4.03	0.0042	0.0646	0.5561	11.23	0.0056	0.0747	1.3010	0.53	0.0398	0.1996	0.4673	4.32	0.0049	0.0699	1.0005
1980	2	2.71	0.0044	0.0663	0.3732	2.48	0.0158	0.1258	0.2873	0.23	0.0248	0.1575	0.2007	6.41	0.0056	0.0745	1.4830
1980	3	3.63	0.0126	0.1123	0.5001	2.54	0.0068	0.0822	0.2939	0.31	0.0081	0.0899	0.2719	2.99	0.0037	0.0606	0.6918
1980	4	8.87	0.0030	0.0546	1.2224	10.99	0.0162	0.1271	1.2736	0.44	0.0067	0.0816	0.3894	2.23	0.0044	0.0662	0.5162
1981	1	4.64	0.0017	0.0417	0.6390	8.08	0.0049	0.0697	0.9362	0.61	0.0169	0.1301	0.5435	3.33	0.0036	0.0596	0.7703
1981	2	2.40	0.0043	0.0657	0.3302	8.61	0.0106	0.1030	0.9974	0.24	0.0230	0.1517	0.2136	3.60	0.0053	0.0731	0.8340
1981	3	6.12	0.0040	0.0635	0.8436	5.25	0.0050	0.0706	0.6086	0.34	0.0053	0.0728	0.2986	5.46	0.0095	0.0976	1.2638
1981	4	6.70	0.0024	0.0490	0.9232	12.84	0.0145	0.1202	1.4885	1.58	0.0076	0.0874	1.3950	3.20	0.0031	0.0557	0.7411
1982	1	4.37	0.0016	0.0397	0.6018	13.76	0.0048	0.0690	1.5945	11.83	0.0217	0.1473	10.4705	3.75	0.0035	0.0588	0.8687
1982	2	4.34	0.0030	0.0551	0.5977	8.63	0.0097	0.0983	0.9996	0.23	0.0587	0.2423	0.2061	4.08	0.0066	0.0810	0.9442
1982	3	4.50	0.0022	0.0471	0.6199	3.07	0.0042	0.0650	0.3560	0.20	0.0088	0.0940	0.1790	4.12	0.0039	0.0621	0.9530
1982	4	10.04	0.0016	0.0396	1.3842	4.16	0.0145	0.1203	0.4819	1.63	0.0174	0.1321	1.4431	3.00	0.0032	0.0566	0.6951
1983	1	4.54	0.0011	0.0338	0.6251	14.47	0.0115	0.1072	1.6768	1.63	0.0308	0.1754	1.4405	4.38	0.0022	0.0471	1.0139
1983	2	4.25	0.0015	0.0391	0.5863	3.46	0.0211	0.1451	0.4004	0.45	0.0127	0.1127	0.3956	8.09	0.0092	0.0960	1.8738
1983	3	3.32	0.0043	0.0655	0.4577	2.58	0.0053	0.0727	0.2993	0.23	0.0065	0.0805	0.2067	3.74	0.0019	0.0430	0.8652
1983	4	9.68	0.0022	0.0468	1.3339	11.24	0.0174	0.1318	1.3020	0.74	0.0092	0.0959	0.6577	4.11	0.0027	0.0517	0.9511
1984	1	5.14	0.0016	0.0405	0.7080	18.81	0.0120	0.1093	2.1802	1.88	0.0121	0.1099	1.6664	5.21	0.0022	0.0471	1.2059
1984	2	4.79	0.0025	0.0497	0.6603	6.34	0.0203	0.1425	0.7342	0.41	0.0078	0.0884	0.3667	6.03	0.0039	0.0620	1.3952
1984	3	7.13	0.0041	0.0643	0.9833	4.19	0.0050	0.0705	0.4851	0.32	0.0067	0.0816	0.2832	2.83	0.0022	0.0469	0.6547
1984	4	5.61	0.0024	0.0493	0.7728	19.14	0.0134	0.1156	2.2185	3.02	0.0072	0.0850	2.6720	4.32	0.0027	0.0524	1.0008
1985	1	5.31	0.0016	0.0394	0.7317	13.87	0.0117	0.1081	1.6072	5.47	0.0183	0.1354	4.8445	4.22	0.0015	0.0391	0.9762
1985	2	4.95	0.0021	0.0457	0.6821	3.40	0.0085	0.0923	0.3935	0.70	0.0055	0.0743	0.6165	6.86	0.0039	0.0622	1.5884
1985	3	5.19	0.0022	0.0465	0.7156	3.10	0.0039	0.0628	0.3587	0.30	0.0049	0.0700	0.2654	5.10	0.0026	0.0508	1.1809
1985	4	9.78	0.0015	0.0382	1.3475	10.72	0.0148	0.1217	1.2424	0.91	0.0094	0.0969	0.8083	3.83	0.0046	0.0678	0.8861
1986	1	8.81	0.0012	0.0349	1.2137	18.50	0.0073	0.0854	2.1443	2.07	0.0086	0.0929	1.8298	4.41	0.0013	0.0365	1.0207
1986	2	9.18	0.0019	0.0439	1.2656	2.15	0.0078	0.0886	0.2495	0.75	0.0216	0.1471	0.6654	8.25	0.0084	0.0914	1.9099
1986	3	6.33	0.0030	0.0551	0.8723	1.46	0.0046	0.0681	0.1691	0.18	0.0056	0.0746	0.1553	5.26	0.0040	0.0631	1.2186
1986	4	9.46	0.0019	0.0430	1.3042	3.21	0.0326	0.1806	0.3717	0.22	0.0059	0.0767	0.1923	4.16	0.0026	0.0505	0.9620

Appendix table 7. Continued.

yr	qt	AREA2				AREA3				AREA4				AREA5			
		CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative
1987	1	6.52	0.0013	0.0357	0.8989	15.91	0.0118	0.1088	1.8442	0.58	0.0068	0.0825	0.5128	5.07	0.0017	0.0408	1.1737
1987	2	5.24	0.0019	0.0432	0.7226	9.09	0.0106	0.1031	1.0531	1.21	0.0298	0.1725	1.0688	7.80	0.0587	0.2422	1.8058
1987	3	2.96	0.0053	0.0727	0.4078	2.54	0.0039	0.0621	0.2948	0.20	0.0059	0.0770	0.1805	4.02	0.0154	0.1239	0.9313
1987	4	10.27	0.0028	0.0526	1.4150	6.09	0.0156	0.1249	0.7060	0.78	0.0075	0.0867	0.6913	4.50	0.0021	0.0458	1.0427
1988	1	10.42	0.0013	0.0362	1.4360	21.59	0.0128	0.1131	2.5020	6.40	0.0187	0.1366	5.6641	5.78	0.0017	0.0414	1.3389
1988	2	6.01	0.0021	0.0459	0.8288	5.58	0.0081	0.0901	0.6468	1.27	0.0232	0.1522	1.1249	6.86	0.0587	0.2424	1.5883
1988	3	3.73	0.0046	0.0682	0.5144	3.32	0.0038	0.0617	0.3852	0.17	0.0080	0.0892	0.1508	8.52	0.0053	0.0725	1.9734
1988	4	4.79	0.0026	0.0506	0.6596	11.66	0.0143	0.1195	1.3512	0.30	0.0106	0.1031	0.2662	4.98	0.0022	0.0470	1.1530
1989	1	4.07	0.0014	0.0374	0.5615	12.46	0.0163	0.1276	1.4439	6.21	0.0212	0.1457	5.4969	5.51	0.0033	0.0571	1.2747
1989	2	2.98	0.0030	0.0546	0.4104	5.12	0.0075	0.0869	0.5934	1.08	0.0468	0.2164	0.9534	6.40	0.0139	0.1179	1.4816
1989	3	2.77	0.0232	0.1522	0.3816	1.88	0.0037	0.0606	0.2175	0.18	0.0108	0.1041	0.1565	2.58	0.0064	0.0800	0.5964
1989	4	7.82	0.0045	0.0670	1.0784	10.03	0.0117	0.1083	1.1619	0.36	0.0101	0.1005	0.3172	2.29	0.0048	0.0694	0.5295
1990	1	8.73	0.0022	0.0469	1.2027	23.71	0.0096	0.0982	2.7476	1.74	0.0089	0.0945	1.5366	5.19	0.0020	0.0443	1.2025
1990	2	4.02	0.0037	0.0607	0.5545	4.78	0.0083	0.0913	0.5534	0.20	0.0587	0.2422	0.1765	8.97	0.0226	0.1504	2.0770
1990	3	4.32	0.0135	0.1160	0.5960	1.61	0.0035	0.0594	0.1870	0.40	0.0058	0.0759	0.3569	8.09	0.0062	0.0785	1.8728
1990	4	4.97	0.0031	0.0552	0.6856	2.94	0.0251	0.1585	0.3403	0.37	0.0121	0.1101	0.3318	2.68	0.0029	0.0541	0.6214
1991	1	6.58	0.0020	0.0453	0.9065	5.15	0.0076	0.0874	0.5974	0.82	0.0129	0.1137	0.7232	3.90	0.0023	0.0481	0.9037
1991	2	5.78	0.0096	0.0981	0.7962	3.02	0.0057	0.0756	0.3501	0.67	0.0207	0.1438	0.5904	2.88	0.0252	0.1587	0.6676
1991	3	2.34	0.0099	0.0995	0.3226	2.43	0.0031	0.0559	0.2812	0.32	0.0038	0.0612	0.2832	2.46	0.0139	0.1178	0.5698
1991	4	5.73	0.0095	0.0973	0.7894	4.05	0.0142	0.1190	0.4696	0.31	0.0038	0.0617	0.2763	2.71	0.0044	0.0662	0.6264
1992	1	5.40	0.0039	0.0625	0.7439	6.10	0.0048	0.0695	0.7073	0.53	0.0169	0.1300	0.4675	3.60	0.0040	0.0633	0.8341
1992	2	5.98	0.0057	0.0757	0.8237	2.45	0.0040	0.0633	0.2844	0.45	0.0119	0.1091	0.3947	2.79	0.1072	0.3273	0.6452
1992	3	3.06	0.0247	0.1571	0.4212	3.21	0.0022	0.0470	0.3718	0.20	0.0067	0.0820	0.1800	4.03	0.0179	0.1337	0.9331
1992	4	4.04	0.0036	0.0599	0.5563	5.84	0.0307	0.1752	0.6769	0.23	0.0068	0.0827	0.2008	2.52	0.0078	0.0884	0.5846
1993	1	3.31	0.0046	0.0676	0.4556	13.88	0.0057	0.0755	1.6081	0.32	0.0308	0.1756	0.2860	2.02	0.0037	0.0608	0.4667
1993	2	3.42	0.0035	0.0595	0.4714	3.53	0.0047	0.0684	0.4085	0.28	0.0187	0.1368	0.2493	6.03	0.0324	0.1799	1.3966
1993	3	3.59	0.0059	0.0766	0.4943	4.11	0.0025	0.0503	0.4767	0.18	0.0038	0.0616	0.1559	2.26	0.0082	0.0907	0.5234
1993	4	5.46	0.0024	0.0492	0.7532	5.38	0.0269	0.1640	0.6236	0.26	0.0045	0.0673	0.2303	2.62	0.0061	0.0778	0.6070
1994	1	3.92	0.0023	0.0482	0.5401	7.27	0.0032	0.0563	0.8421	0.61	0.0075	0.0865	0.5367	1.57	0.0032	0.0568	0.3624
1994	2	4.48	0.0032	0.0565	0.6179	2.65	0.0018	0.0427	0.3074	0.51	0.0052	0.0720	0.4527	2.17	0.2157	0.4644	0.5034
1994	3	2.31	0.0077	0.0879	0.3181	2.95	0.0017	0.0410	0.3418	0.27	0.0034	0.0583	0.2398	4.02	0.0224	0.1498	0.9301
1994	4	2.88	0.0022	0.0472	0.3974	4.12	0.0069	0.0833	0.4778	0.35	0.0025	0.0500	0.3119	1.93	0.0044	0.0667	0.4475

Appendix table 7. Continued.

yr	qt	AREA2				AREA3				AREA4				AREA5			
		CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative
1995	1	2.31	0.0036	0.0597	0.3181	5.32	0.0024	0.0489	0.6165	0.64	0.0034	0.0579	0.5621	2.17	0.0028	0.0530	0.5015
1995	2	1.15	0.0058	0.0762	0.1590	2.36	0.0019	0.0441	0.2735	0.27	0.0041	0.0643	0.2413	3.04	0.0169	0.1302	0.7047
1995	3	2.47	0.0118	0.1088	0.3404	2.36	0.0023	0.0482	0.2738	0.26	0.0019	0.0436	0.2331	1.15	0.0067	0.0816	0.2668
1995	4	5.01	0.0020	0.0443	0.6900	9.39	0.0123	0.1110	1.0882	0.17	0.0020	0.0445	0.1506	1.95	0.0031	0.0553	0.4517
1996	1	6.52	0.0022	0.0471	0.8992	4.94	0.0019	0.0440	0.5722	0.34	0.0033	0.0573	0.2997	2.32	0.0026	0.0506	0.5383
1996	2	3.79	0.0029	0.0536	0.5218	1.57	0.0020	0.0449	0.1821	0.45	0.0033	0.0574	0.3970	1.49	0.0282	0.1679	0.3453
1996	3	2.47	0.0033	0.0575	0.3405	1.93	0.0017	0.0414	0.2238	0.33	0.0023	0.0483	0.2919	1.91	0.0127	0.1126	0.4414
1996	4	2.44	0.0012	0.0341	0.3365	8.14	0.0039	0.0625	0.9436	0.17	0.0025	0.0504	0.1531	1.59	0.0029	0.0541	0.3688
1997	1	4.09	0.0013	0.0356	0.5637	6.68	0.0017	0.0416	0.7736	0.62	0.0133	0.1153	0.5460	1.98	0.0013	0.0366	0.4587
1997	2	1.23	0.0013	0.0359	0.1699	1.42	0.0019	0.0439	0.1646	0.33	0.0058	0.0759	0.2916	2.11	0.0261	0.1614	0.4874
1997	3	3.33	0.0024	0.0488	0.4588	1.20	0.0018	0.0426	0.1385	0.25	0.0020	0.0449	0.2169	3.89	0.0056	0.0745	0.9015
1997	4	4.26	0.0009	0.0294	0.5877	4.23	0.0028	0.0529	0.4907	0.25	0.0032	0.0565	0.2230	1.03	0.0020	0.0450	0.2382
1998	1	3.63	0.0008	0.0275	0.5006	5.68	0.0016	0.0395	0.6582	0.51	0.0171	0.1309	0.4497	2.15	0.0013	0.0366	0.4985
1998	2	2.73	0.0010	0.0314	0.3757	1.16	0.0019	0.0431	0.1343	0.38	0.0073	0.0856	0.3322	2.18	0.0075	0.0865	0.5038
1998	3	2.81	0.0021	0.0456	0.3878	1.08	0.0018	0.0428	0.1256	0.13	0.0035	0.0593	0.1141	1.23	0.0045	0.0671	0.2846
1998	4	4.19	0.0017	0.0409	0.5777	6.00	0.0024	0.0492	0.6957	0.22	0.0042	0.0647	0.1925	1.67	0.0020	0.0442	0.3873
1999	1	3.43	0.0020	0.0448	0.4728	5.16	0.0020	0.0443	0.5980	0.57	0.0101	0.1007	0.5027	2.78	0.0016	0.0398	0.6432
1999	2	3.55	0.0039	0.0624	0.4899	1.25	0.0022	0.0464	0.1454	0.59	0.0058	0.0758	0.5234	1.96	0.0053	0.0729	0.4546
1999	3	3.98	0.0040	0.0632	0.5490	1.91	0.0024	0.0494	0.2213	0.20	0.0033	0.0577	0.1807	1.97	0.0021	0.0460	0.4560
1999	4	3.92	0.0012	0.0346	0.5408	6.97	0.0026	0.0515	0.8073	0.39	0.0076	0.0870	0.3420	1.57	0.0012	0.0344	0.3629
2000	1	3.70	0.0011	0.0335	0.5099	6.66	0.0023	0.0477	0.7713	0.65	0.0113	0.1062	0.5772	1.71	0.0015	0.0389	0.3957
2000	2	2.99	0.0028	0.0531	0.4127	1.30	0.0038	0.0614	0.1509	0.43	0.0049	0.0699	0.3788	3.91	0.0016	0.0402	0.9050
2000	3	5.86	0.0030	0.0545	0.8082	1.64	0.0025	0.0505	0.1899	0.38	0.0031	0.0557	0.3343	3.90	0.0026	0.0514	0.9040
2000	4	4.60	0.0018	0.0423	0.6346	3.51	0.0030	0.0548	0.4072	0.20	0.0061	0.0780	0.1782	1.72	0.0028	0.0530	0.3991
2001	1	4.49	0.0032	0.0568	0.6188	8.43	0.0024	0.0486	0.9764	0.15	0.0067	0.0816	0.1335	1.64	0.0015	0.0380	0.3794
2001	2	5.05	0.0024	0.0489	0.6962	1.41	0.0041	0.0638	0.1637	0.43	0.0057	0.0752	0.3847	1.76	0.0028	0.0533	0.4069
2001	3	3.98	0.0037	0.0612	0.5488	1.85	0.0025	0.0497	0.2140	0.36	0.0022	0.0471	0.3225	1.26	0.0036	0.0600	0.2906
2001	4	5.65	0.0023	0.0484	0.7783	3.44	0.0037	0.0611	0.3985	0.39	0.0026	0.0506	0.3479	0.96	0.0037	0.0604	0.2227
2002	1	6.16	0.0015	0.0385	0.8486	7.83	0.0020	0.0449	0.9074	0.37	0.0057	0.0755	0.3281	1.22	0.0037	0.0607	0.2813
2002	2	3.30	0.0022	0.0468	0.4549	2.23	0.0046	0.0675	0.2579	0.40	0.0083	0.0913	0.3571	1.65	0.0062	0.0785	0.3815
2002	3	1.27	0.0027	0.0518	0.1753	1.62	0.0030	0.0552	0.1877	0.24	0.0025	0.0503	0.2102	0.80	0.0031	0.0556	0.1843
2002	4	2.41	0.0010	0.0316	0.3319	3.25	0.0056	0.0749	0.3765	0.15	0.0031	0.0554	0.1347	0.89	0.0013	0.0355	0.2060

Appendix table 7. Continued.

yr	qt	AREA2				AREA3				AREA4				AREA5			
		CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative
2003	1	3.83	0.0013	0.0363	0.5279	8.24	0.0025	0.0500	0.9547	0.34	0.0217	0.1472	0.3020	0.96	0.0020	0.0444	0.2226
2003	2	4.57	0.0020	0.0444	0.6299	1.96	0.0047	0.0688	0.2266	0.96	0.0144	0.1198	0.8507	0.84	0.0177	0.1331	0.1953
2003	3	4.64	0.0030	0.0548	0.6401	1.85	0.0037	0.0611	0.2143	0.27	0.0040	0.0630	0.2427	0.69	0.0082	0.0903	0.1593
2003	4	4.60	0.0011	0.0327	0.6345	3.96	0.0058	0.0765	0.4588	0.13	0.0046	0.0681	0.1136	1.58	0.0027	0.0521	0.3660
2004	1	3.23	0.0010	0.0322	0.4457	6.05	0.0025	0.0499	0.7010	0.80	0.0312	0.1765	0.7063	1.05	0.0033	0.0578	0.2438
2004	2	5.94	0.0018	0.0422	0.8192	2.16	0.0042	0.0650	0.2503	0.35	0.0109	0.1044	0.3056	2.73	0.0104	0.1019	0.6311
2004	3	2.30	0.0022	0.0467	0.3165	1.65	0.0018	0.0425	0.1913	0.26	0.0040	0.0632	0.2290	1.32	0.0044	0.0662	0.3052
2004	4	5.00	0.0013	0.0365	0.6892	2.78	0.0033	0.0574	0.3217	0.10	0.0050	0.0708	0.0922	0.91	0.0025	0.0496	0.2096
2005	1	4.64	0.0009	0.0296	0.6395	8.66	0.0024	0.0485	1.0037	0.19	0.0117	0.1082	0.1691	0.94	0.0030	0.0550	0.2179
2005	2	5.75	0.0012	0.0351	0.7921	1.98	0.0026	0.0514	0.2289	0.47	0.0141	0.1188	0.4125	1.23	0.0086	0.0927	0.2843
2005	3	2.27	0.0014	0.0377	0.3127	1.04	0.0016	0.0401	0.1209	0.11	0.0082	0.0904	0.0985	1.12	0.0120	0.1095	0.2602
2005	4	3.08	0.0009	0.0301	0.4239	4.70	0.0033	0.0573	0.5446	0.08	0.0046	0.0679	0.0669	0.80	0.0039	0.0626	0.1858
2006	1	4.59	0.0008	0.0290	0.6320	9.26	0.0021	0.0454	1.0729	0.09	0.0087	0.0932	0.0783	1.53	0.0018	0.0426	0.3544
2006	2	5.51	0.0008	0.0274	0.7599	3.41	0.0020	0.0445	0.3957	0.44	0.0208	0.1441	0.3854	2.24	0.0033	0.0571	0.5183
2006	3	2.17	0.0018	0.0422	0.2992	0.99	0.0017	0.0410	0.1147	0.16	0.0048	0.0695	0.1427	1.22	0.0025	0.0495	0.2832
2006	4	2.27	0.0009	0.0308	0.3122	3.08	0.0021	0.0458	0.3565	0.15	0.0085	0.0923	0.1345	0.94	0.0017	0.0409	0.2179
2007	1	2.08	0.0007	0.0269	0.2861	7.13	0.0019	0.0435	0.8267	0.14	0.0269	0.1639	0.1237	1.27	0.0015	0.0381	0.2937
2007	2	1.85	0.0006	0.0247	0.2548	5.76	0.0028	0.0529	0.6679	0.31	0.0105	0.1026	0.2784	1.66	0.0026	0.0506	0.3836
2007	3	1.76	0.0015	0.0392	0.2423	0.96	0.0019	0.0433	0.1117	0.13	0.0042	0.0652	0.1174	1.12	0.0034	0.0582	0.2587
2007	4	2.09	0.0011	0.0337	0.2887	2.33	0.0036	0.0599	0.2700	0.07	0.0108	0.1039	0.0620	1.06	0.0017	0.0415	0.2461
2008	1	1.30	0.0012	0.0340	0.1795	6.11	0.0026	0.0511	0.7078	0.16	0.0169	0.1301	0.1443	0.74	0.0014	0.0378	0.1723
2008	2	1.26	0.0009	0.0303	0.1733	2.33	0.0039	0.0621	0.2695	0.05	0.0051	0.0714	0.0452	0.51	0.0036	0.0603	0.1188
2008	3	1.32	0.0019	0.0438	0.1820	0.60	0.0025	0.0500	0.0701	0.04	0.0037	0.0605	0.0318	0.62	0.0030	0.0549	0.1442
2008	4	0.92	0.0015	0.0381	0.1261	2.12	0.0024	0.0495	0.2460	0.05	0.0104	0.1021	0.0468	0.50	0.0014	0.0370	0.1162
2009	1	0.71	0.0010	0.0313	0.0976	2.50	0.0025	0.0498	0.2901	0.24	0.0385	0.1963	0.2099	0.61	0.0011	0.0330	0.1412
2009	2	1.00	0.0018	0.0426	0.1374	3.55	0.0047	0.0682	0.4118	0.10	0.0055	0.0741	0.0927	0.73	0.0024	0.0491	0.1689
2009	3	1.90	0.0099	0.0994	0.2619	1.44	0.0034	0.0586	0.1669	0.04	0.0031	0.0557	0.0348	0.64	0.0027	0.0521	0.1478
2009	4	3.21	0.0075	0.0867	0.4427	1.62	0.0044	0.0665	0.1879	0.05	0.0126	0.1122	0.0484	0.33	0.0011	0.0338	0.0760
2010	1	1.72	0.0103	0.1014	0.2368	3.04	0.0032	0.0568	0.3519	0.07	0.0137	0.1171	0.0661	0.56	0.0014	0.0371	0.1307
2010	2	0.95	0.0111	0.1055	0.1309	4.23	0.0057	0.0754	0.4903	0.07	0.0035	0.0595	0.0659	0.70	0.0064	0.0797	0.1625
2010	3	8.02	0.0733	0.2708	1.1057	1.78	0.0047	0.0683	0.2058	0.04	0.0045	0.0673	0.0381	0.34	0.0127	0.1126	0.0797
2010	4	3.77	0.0489	0.2212	0.5201	2.33	0.0046	0.0677	0.2704	0.19	0.0445	0.2110	0.1696	0.28	0.0021	0.0462	0.0647

Appendix table 8. Quarterly value of yellowfin CPUE standardized from 1963-2010 for each of five areas applying Model 2010 with LT5LN5 expressed in real scale and relative scale with variance.

yr	qt	AREA2				AREA3				AREA4				AREA5			
		CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative
1963	1	20.03	0.0025	0.0495	2.9135	15.41	0.0052	0.0720	2.8180	0.46	0.0042	0.0645	1.0222	8.24	0.0025	0.0498	1.9080
1963	2	15.97	0.0036	0.0603	2.3229	14.50	0.0054	0.0735	2.6524	0.74	0.0283	0.1681	1.6494	8.10	0.0031	0.0560	1.8748
1963	3	14.52	0.0131	0.1143	2.1116	8.83	0.0033	0.0577	1.6145	1.14	0.0050	0.0706	2.5407	7.10	0.0035	0.0592	1.6436
1963	4	21.88	0.0028	0.0528	3.1825	10.95	0.0051	0.0714	2.0024	0.46	0.0036	0.0597	1.0339	9.24	0.0030	0.0544	2.1394
1964	1	17.58	0.0026	0.0508	2.5579	12.54	0.0058	0.0761	2.2939	0.34	0.0039	0.0623	0.7521	10.96	0.0029	0.0539	2.5376
1964	2	12.15	0.0020	0.0449	1.7670	7.12	0.0044	0.0664	1.3020	2.53	0.0138	0.1176	5.6360	11.98	0.0030	0.0546	2.7737
1964	3	8.78	0.0053	0.0728	1.2768	7.21	0.0021	0.0462	1.3186	0.91	0.0074	0.0862	2.0260	9.21	0.0021	0.0461	2.1329
1964	4	9.24	0.0025	0.0497	1.3440	5.77	0.0031	0.0557	1.0559	0.54	0.0028	0.0526	1.2147	6.15	0.0021	0.0455	1.4246
1965	1	11.73	0.0019	0.0440	1.7071	5.29	0.0053	0.0731	0.9677	0.33	0.0034	0.0579	0.7269	7.76	0.0020	0.0446	1.7963
1965	2	12.40	0.0022	0.0467	1.8031	7.20	0.0070	0.0839	1.3163	0.82	0.0145	0.1204	1.8201	8.81	0.0019	0.0431	2.0408
1965	3	10.83	0.0031	0.0560	1.5754	6.76	0.0028	0.0532	1.2368	0.35	0.0060	0.0777	0.7711	5.09	0.0027	0.0521	1.1791
1965	4	21.68	0.0027	0.0520	3.1544	9.38	0.0043	0.0658	1.7162	0.30	0.0029	0.0534	0.6701	8.05	0.0026	0.0513	1.8644
1966	1	20.06	0.0017	0.0418	2.9180	8.54	0.0129	0.1135	1.5616	0.26	0.0036	0.0596	0.5685	9.38	0.0022	0.0465	2.1729
1966	2	17.88	0.0017	0.0413	2.6004	8.56	0.0038	0.0618	1.5650	0.93	0.0147	0.1212	2.0708	11.03	0.0029	0.0540	2.5536
1966	3	15.96	0.0025	0.0499	2.3216	8.71	0.0027	0.0521	1.5930	0.75	0.0070	0.0834	1.6622	10.30	0.0027	0.0517	2.3853
1966	4	18.25	0.0017	0.0418	2.6542	6.88	0.0033	0.0579	1.2585	0.60	0.0025	0.0503	1.3334	9.92	0.0023	0.0479	2.2965
1967	1	11.65	0.0016	0.0396	1.6945	6.21	0.0038	0.0613	1.1357	0.74	0.0032	0.0568	1.6445	9.19	0.0019	0.0433	2.1282
1967	2	10.96	0.0019	0.0433	1.5950	7.12	0.0025	0.0501	1.3018	0.90	0.0034	0.0581	2.0157	7.39	0.0018	0.0419	1.7109
1967	3	6.06	0.0028	0.0526	0.8815	4.53	0.0025	0.0499	0.8285	0.28	0.0026	0.0511	0.6350	6.74	0.0027	0.0515	1.5610
1967	4	10.33	0.0021	0.0459	1.5026	6.09	0.0035	0.0589	1.1134	0.30	0.0022	0.0464	0.6659	8.81	0.0030	0.0548	2.0402
1968	1	29.18	0.0019	0.0442	4.2449	26.03	0.0095	0.0975	4.7616	0.56	0.0036	0.0603	1.2515	10.16	0.0019	0.0434	2.3536
1968	2	37.97	0.0021	0.0454	5.5234	16.55	0.0046	0.0677	3.0269	0.66	0.0033	0.0578	1.4793	10.92	0.0035	0.0595	2.5284
1968	3	19.04	0.0026	0.0505	2.7694	8.86	0.0035	0.0591	1.6196	0.28	0.0024	0.0484	0.6312	4.56	0.0037	0.0610	1.0562
1968	4	22.54	0.0020	0.0442	3.2794	7.18	0.0050	0.0706	1.3128	0.27	0.0027	0.0514	0.6087	6.14	0.0028	0.0525	1.4212
1969	1	15.83	0.0018	0.0428	2.3029	5.54	0.0041	0.0639	1.0140	0.20	0.0052	0.0719	0.4553	7.92	0.0022	0.0473	1.8347
1969	2	12.06	0.0026	0.0510	1.7546	5.76	0.0037	0.0608	1.0537	0.50	0.0039	0.0621	1.1069	9.72	0.0026	0.0506	2.2516
1969	3	14.51	0.0027	0.0519	2.1107	4.20	0.0028	0.0530	0.7673	0.31	0.0025	0.0504	0.6876	6.71	0.0044	0.0662	1.5540
1969	4	17.40	0.0027	0.0523	2.5313	3.01	0.0048	0.0696	0.5507	0.28	0.0033	0.0573	0.6174	8.03	0.0038	0.0614	1.8603
1970	1	10.04	0.0028	0.0529	1.4602	3.98	0.0074	0.0860	0.7280	0.24	0.0082	0.0906	0.5323	7.49	0.0026	0.0505	1.7353
1970	2	6.84	0.0039	0.0628	0.9947	3.84	0.0060	0.0778	0.7018	0.31	0.0037	0.0606	0.6920	7.21	0.0032	0.0569	1.6695
1970	3	6.32	0.0118	0.1088	0.9195	1.77	0.0066	0.0809	0.3241	0.29	0.0029	0.0535	0.6370	15.14	0.0025	0.0502	3.5049
1970	4	10.98	0.0030	0.0547	1.5966	3.38	0.0072	0.0849	0.6175	1.09	0.0029	0.0542	2.4211	8.20	0.0027	0.0520	1.8995

Appendix table 8. Continued.

yr	qt	AREA2				AREA3				AREA4				AREA5			
		CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative
1971	1	8.61	0.0027	0.0520	1.2530	5.14	0.0047	0.0687	0.9394	1.28	0.0053	0.0728	2.8530	6.47	0.0027	0.0523	1.4983
1971	2	10.04	0.0039	0.0625	1.4601	5.16	0.0092	0.0959	0.9429	3.12	0.0033	0.0570	6.9453	9.62	0.0031	0.0555	2.2265
1971	3	15.96	0.0035	0.0595	2.3218	4.26	0.0069	0.0829	0.7798	0.88	0.0024	0.0488	1.9652	5.47	0.0041	0.0642	1.2673
1971	4	13.54	0.0028	0.0527	1.9694	4.57	0.0116	0.1078	0.8362	0.83	0.0046	0.0676	1.8535	7.11	0.0050	0.0705	1.6470
1972	1	8.28	0.0033	0.0571	1.2044	13.74	0.0134	0.1157	2.5133	1.88	0.1071	0.3273	4.1800	6.48	0.0044	0.0663	1.5002
1972	2	8.71	0.0038	0.0613	1.2671	10.44	0.0177	0.1329	1.9087	2.37	0.0122	0.1103	5.2751	4.24	0.0050	0.0705	0.9821
1972	3	9.80	0.0033	0.0572	1.4256	4.22	0.0057	0.0755	0.7724	1.14	0.0055	0.0743	2.5487	6.20	0.0081	0.0900	1.4359
1972	4	10.24	0.0038	0.0613	1.4892	6.90	0.0114	0.1066	1.2627	0.73	0.0093	0.0966	1.6374	8.52	0.0141	0.1188	1.9736
1973	1	7.63	0.0057	0.0757	1.1104	8.30	0.0173	0.1315	1.5175	3.21	0.0477	0.2183	7.1634	8.94	0.0054	0.0734	2.0695
1973	2	7.36	0.0056	0.0750	1.0714	3.91	0.0134	0.1156	0.7156	2.78	0.0093	0.0966	6.1993	9.50	0.0086	0.0926	2.1985
1973	3	4.85	0.0043	0.0657	0.7054	2.21	0.0056	0.0749	0.4047	0.37	0.0044	0.0662	0.8235	7.46	0.0106	0.1028	1.7276
1973	4	8.51	0.0042	0.0647	1.2375	7.97	0.0071	0.0844	1.4581	0.48	0.0034	0.0587	1.0717	4.94	0.0050	0.0707	1.1432
1974	1	4.82	0.0039	0.0627	0.7018	8.21	0.0085	0.0921	1.5024	0.61	0.0077	0.0879	1.3545	4.25	0.0029	0.0536	0.9829
1974	2	5.67	0.0048	0.0691	0.8247	5.80	0.0114	0.1066	1.0610	0.86	0.0042	0.0648	1.9087	6.50	0.0063	0.0791	1.5061
1974	3	4.84	0.0036	0.0602	0.7039	2.08	0.0055	0.0741	0.3797	0.27	0.0037	0.0606	0.5974	4.33	0.0044	0.0661	1.0024
1974	4	4.87	0.0044	0.0665	0.7078	5.26	0.0053	0.0725	0.9628	0.25	0.0055	0.0744	0.5507	4.62	0.0027	0.0516	1.0698
1975	1	3.49	0.0043	0.0658	0.5070	4.82	0.0184	0.1356	0.8813	0.36	0.0083	0.0910	0.8074	4.91	0.0023	0.0475	1.1371
1975	2	4.12	0.0055	0.0744	0.5996	5.29	0.0117	0.1080	0.9681	0.49	0.0040	0.0628	1.0997	4.42	0.0043	0.0654	1.0242
1975	3	6.67	0.0028	0.0528	0.9703	4.96	0.0043	0.0657	0.9067	0.34	0.0030	0.0551	0.7598	3.86	0.0026	0.0511	0.8935
1975	4	9.86	0.0033	0.0577	1.4337	16.25	0.0102	0.1008	2.9721	0.31	0.0044	0.0663	0.6972	4.71	0.0037	0.0604	1.0900
1976	1	3.31	0.0040	0.0636	0.4815	8.81	0.0061	0.0784	1.6119	0.25	0.0329	0.1815	0.5526	3.54	0.0040	0.0629	0.8203
1976	2	12.61	0.0052	0.0721	1.8341	6.41	0.0201	0.1416	1.1724	0.28	0.0117	0.1081	0.6131	8.19	0.0071	0.0842	1.8972
1976	3	6.84	0.0130	0.1142	0.9953	2.56	0.0065	0.0807	0.4675	0.39	0.0041	0.0642	0.8782	4.78	0.0091	0.0951	1.1061
1976	4	5.66	0.0190	0.1379	0.8236	7.40	0.0196	0.1401	1.3532	0.31	0.0063	0.0795	0.6928	6.00	0.0087	0.0934	1.3887
1977	1	3.64	0.0131	0.1145	0.5295	21.85	0.0362	0.1902	3.9954	0.65	0.0318	0.1782	1.4434	6.94	0.0095	0.0974	1.6058
1977	2	18.11	0.0118	0.1089	2.6344	24.41	0.0436	0.2089	4.4651	0.52	0.0189	0.1376	1.1603	7.69	0.0625	0.2501	1.7806
1977	3	8.21	0.0123	0.1108	1.1947	6.19	0.0073	0.0857	1.1329	0.30	0.0049	0.0699	0.6644	4.57	0.0089	0.0944	1.0586
1977	4	14.66	0.0034	0.0583	2.1324	7.61	0.0240	0.1548	1.3926	0.34	0.0063	0.0795	0.7595	5.88	0.0236	0.1537	1.3623
1978	1	7.08	0.0015	0.0381	1.0293	7.39	0.0084	0.0917	1.3510	0.40	0.0183	0.1354	0.9020	7.92	0.0065	0.0804	1.8343
1978	2	5.71	0.0020	0.0442	0.8300	4.28	0.0134	0.1158	0.7823	0.83	0.0066	0.0809	1.8457	9.20	0.0184	0.1355	2.1305
1978	3	4.39	0.0098	0.0992	0.6393	2.99	0.0076	0.0873	0.5460	0.31	0.0045	0.0670	0.6952	2.74	0.0023	0.0484	0.6338
1978	4	8.60	0.0046	0.0676	1.2516	10.35	0.0149	0.1222	1.8925	0.32	0.0072	0.0850	0.7219	3.25	0.0048	0.0690	0.7532

Appendix table 8. Continued.

yr	qt	AREA2				AREA3				AREA4				AREA5			
		CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative
1979	1	4.65	0.0033	0.0572	0.6770	16.71	0.0059	0.0770	3.0558	0.31	0.0221	0.1485	0.6852	4.39	0.0051	0.0714	1.0162
1979	2	3.35	0.0062	0.0787	0.4872	10.44	0.0136	0.1167	1.9096	0.69	0.0100	0.1000	1.5300	4.38	0.0066	0.0812	1.0147
1979	3	3.12	0.0050	0.0705	0.4533	3.91	0.0059	0.0770	0.7143	0.41	0.0044	0.0663	0.9045	2.41	0.0068	0.0826	0.5575
1979	4	5.18	0.0123	0.1107	0.7543	6.74	0.0115	0.1073	1.2331	0.37	0.0084	0.0915	0.8347	3.53	0.0047	0.0687	0.8162
1980	1	3.21	0.0039	0.0622	0.4670	5.95	0.0044	0.0662	1.0885	0.25	0.0249	0.1578	0.5539	4.44	0.0048	0.0693	1.0277
1980	2	3.64	0.0041	0.0638	0.5299	1.46	0.0123	0.1109	0.2675	0.21	0.0154	0.1242	0.4626	7.39	0.0055	0.0740	1.7115
1980	3	3.99	0.0116	0.1076	0.5799	1.49	0.0053	0.0728	0.2731	0.33	0.0051	0.0716	0.7430	3.22	0.0036	0.0602	0.7467
1980	4	7.77	0.0028	0.0526	1.1297	4.96	0.0126	0.1121	0.9065	0.27	0.0043	0.0652	0.5949	2.47	0.0043	0.0656	0.5729
1981	1	3.73	0.0016	0.0405	0.5425	4.19	0.0038	0.0617	0.7665	0.26	0.0106	0.1031	0.5750	3.33	0.0035	0.0591	0.7719
1981	2	3.29	0.0040	0.0633	0.4785	5.32	0.0083	0.0909	0.9724	0.26	0.0143	0.1197	0.5735	3.57	0.0052	0.0724	0.8276
1981	3	5.74	0.0037	0.0611	0.8355	4.03	0.0039	0.0625	0.7377	0.37	0.0034	0.0583	0.8175	6.36	0.0093	0.0964	1.4733
1981	4	5.52	0.0022	0.0473	0.8025	6.84	0.0112	0.1060	1.2511	0.35	0.0049	0.0700	0.7801	3.53	0.0031	0.0554	0.8166
1982	1	3.95	0.0015	0.0385	0.5739	6.57	0.0037	0.0611	1.2013	0.85	0.0138	0.1174	1.8920	3.80	0.0034	0.0584	0.8789
1982	2	5.41	0.0028	0.0532	0.7863	5.67	0.0075	0.0868	1.0362	0.13	0.0362	0.1902	0.2942	3.82	0.0065	0.0803	0.8834
1982	3	4.74	0.0021	0.0455	0.6901	3.07	0.0033	0.0576	0.5615	0.27	0.0056	0.0747	0.6046	3.93	0.0038	0.0618	0.9089
1982	4	9.89	0.0015	0.0384	1.4393	4.01	0.0112	0.1060	0.7329	0.44	0.0109	0.1046	0.9856	3.13	0.0032	0.0562	0.7245
1983	1	5.00	0.0011	0.0329	0.7271	7.28	0.0090	0.0948	1.3322	0.37	0.0192	0.1385	0.8318	4.39	0.0022	0.0470	1.0164
1983	2	5.91	0.0015	0.0383	0.8602	2.77	0.0163	0.1278	0.5065	0.40	0.0080	0.0894	0.9023	7.78	0.0090	0.0950	1.8014
1983	3	4.39	0.0040	0.0630	0.6379	3.05	0.0041	0.0643	0.5581	0.26	0.0041	0.0644	0.5794	3.67	0.0019	0.0430	0.8501
1983	4	10.51	0.0020	0.0452	1.5293	8.85	0.0135	0.1160	1.6191	0.37	0.0058	0.0763	0.8350	4.50	0.0027	0.0515	1.0421
1984	1	5.54	0.0015	0.0392	0.8058	10.11	0.0093	0.0965	1.8496	0.52	0.0076	0.0873	1.1508	5.52	0.0022	0.0471	1.2788
1984	2	6.08	0.0023	0.0482	0.8846	4.75	0.0158	0.1256	0.8688	0.44	0.0050	0.0705	0.9811	6.33	0.0038	0.0616	1.4653
1984	3	6.80	0.0038	0.0618	0.9898	4.35	0.0039	0.0624	0.7952	0.29	0.0043	0.0653	0.6526	2.95	0.0022	0.0469	0.6836
1984	4	6.96	0.0023	0.0477	1.0128	10.90	0.0104	0.1020	1.9938	0.49	0.0047	0.0689	1.0939	4.98	0.0027	0.0524	1.1533
1985	1	5.83	0.0015	0.0383	0.8482	9.70	0.0091	0.0953	1.7738	0.57	0.0116	0.1075	1.2701	4.20	0.0015	0.0393	0.9723
1985	2	5.49	0.0020	0.0444	0.7992	2.22	0.0066	0.0815	0.4066	0.58	0.0036	0.0598	1.2996	6.91	0.0038	0.0617	1.5994
1985	3	6.09	0.0020	0.0450	0.8853	3.02	0.0031	0.0556	0.5530	0.32	0.0032	0.0562	0.7156	5.24	0.0026	0.0506	1.2137
1985	4	12.09	0.0014	0.0371	1.7585	5.87	0.0115	0.1074	1.0727	0.27	0.0060	0.0773	0.6026	4.28	0.0045	0.0674	0.9914
1986	1	9.23	0.0011	0.0338	1.3427	11.62	0.0057	0.0755	2.1251	0.39	0.0055	0.0744	0.8743	4.19	0.0014	0.0368	0.9713
1986	2	10.94	0.0018	0.0426	1.5909	2.31	0.0061	0.0782	0.4218	0.58	0.0134	0.1159	1.2958	7.39	0.0082	0.0903	1.7100
1986	3	8.30	0.0028	0.0532	1.2071	2.01	0.0036	0.0603	0.3684	0.27	0.0036	0.0599	0.6126	5.06	0.0039	0.0625	1.1705
1986	4	9.87	0.0017	0.0416	1.4360	4.25	0.0253	0.1589	0.7775	0.27	0.0038	0.0615	0.6053	4.02	0.0025	0.0503	0.9309

Appendix table 8. Continued.

yr	qt	AREA2				AREA3				AREA4				AREA5			
		CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative
1987	1	6.68	0.0012	0.0346	0.9715	8.94	0.0092	0.0959	1.6358	0.23	0.0045	0.0670	0.5182	4.61	0.0017	0.0409	1.0673
1987	2	6.49	0.0018	0.0419	0.9444	7.43	0.0083	0.0910	1.3596	1.02	0.0185	0.1359	2.2841	5.91	0.0569	0.2385	1.3693
1987	3	4.17	0.0049	0.0700	0.6061	3.31	0.0030	0.0551	0.6060	0.29	0.0038	0.0616	0.6419	3.70	0.0149	0.1221	0.8569
1987	4	9.95	0.0026	0.0506	1.4476	5.90	0.0121	0.1100	1.0796	0.33	0.0048	0.0693	0.7270	4.19	0.0021	0.0458	0.9696
1988	1	9.96	0.0012	0.0352	1.4493	14.41	0.0100	0.0998	2.6361	0.59	0.0118	0.1087	1.3043	5.14	0.0017	0.0416	1.1898
1988	2	6.78	0.0020	0.0446	0.9856	4.34	0.0063	0.0796	0.7938	1.04	0.0144	0.1201	2.3196	5.64	0.0569	0.2386	1.3064
1988	3	4.15	0.0043	0.0655	0.6041	3.89	0.0030	0.0547	0.7121	0.26	0.0051	0.0710	0.5736	7.37	0.0052	0.0720	1.7067
1988	4	5.55	0.0024	0.0488	0.8075	8.78	0.0111	0.1053	1.6053	0.28	0.0067	0.0817	0.6293	4.69	0.0022	0.0469	1.0866
1989	1	4.07	0.0013	0.0363	0.5925	8.78	0.0127	0.1128	1.6057	0.90	0.0134	0.1157	2.0051	5.01	0.0032	0.0568	1.1602
1989	2	4.04	0.0028	0.0527	0.5871	3.91	0.0059	0.0767	0.7143	0.92	0.0289	0.1700	2.0616	5.66	0.0135	0.1163	1.3110
1989	3	2.91	0.0212	0.1457	0.4239	2.49	0.0029	0.0537	0.4553	0.26	0.0068	0.0825	0.5848	2.59	0.0062	0.0789	0.5998
1989	4	7.58	0.0041	0.0644	1.1028	7.26	0.0091	0.0956	1.3276	0.29	0.0063	0.0796	0.6462	2.55	0.0047	0.0685	0.5916
1990	1	8.00	0.0021	0.0454	1.1631	18.14	0.0075	0.0867	3.3176	0.42	0.0057	0.0753	0.9320	4.97	0.0020	0.0442	1.1506
1990	2	5.14	0.0034	0.0585	0.7477	3.57	0.0065	0.0806	0.6527	0.13	0.0362	0.1904	0.2978	8.10	0.0220	0.1482	1.8748
1990	3	5.52	0.0124	0.1112	0.8029	1.61	0.0028	0.0525	0.2950	0.30	0.0037	0.0607	0.6604	7.87	0.0060	0.0776	1.8226
1990	4	6.38	0.0028	0.0533	0.9283	2.51	0.0195	0.1395	0.4598	0.20	0.0076	0.0874	0.4524	2.64	0.0029	0.0538	0.6116
1991	1	7.52	0.0019	0.0438	1.0943	4.03	0.0059	0.0771	0.7378	0.50	0.0081	0.0901	1.1127	3.48	0.0023	0.0481	0.8065
1991	2	7.60	0.0088	0.0940	1.1056	2.89	0.0045	0.0667	0.5284	0.24	0.0129	0.1136	0.5429	3.01	0.0245	0.1564	0.6980
1991	3	2.49	0.0091	0.0954	0.3615	2.28	0.0024	0.0495	0.4163	0.25	0.0024	0.0492	0.5652	2.23	0.0135	0.1161	0.5159
1991	4	5.89	0.0087	0.0932	0.8572	3.82	0.0110	0.1049	0.6984	0.15	0.0025	0.0501	0.3416	2.51	0.0043	0.0656	0.5805
1992	1	5.84	0.0036	0.0601	0.8499	4.55	0.0038	0.0615	0.8321	0.16	0.0107	0.1032	0.3613	3.23	0.0039	0.0628	0.7471
1992	2	7.39	0.0053	0.0728	1.0752	2.44	0.0031	0.0559	0.4461	0.17	0.0075	0.0866	0.3761	2.32	0.1037	0.3220	0.5376
1992	3	3.04	0.0226	0.1504	0.4416	3.52	0.0017	0.0416	0.6443	0.19	0.0043	0.0652	0.4343	3.68	0.0174	0.1317	0.8518
1992	4	4.12	0.0033	0.0576	0.5996	4.88	0.0238	0.1541	0.8918	0.10	0.0044	0.0661	0.2291	2.52	0.0076	0.0873	0.5840
1993	1	3.84	0.0042	0.0650	0.5590	9.53	0.0044	0.0667	1.7431	0.14	0.0191	0.1382	0.3131	1.89	0.0037	0.0605	0.4386
1993	2	4.38	0.0033	0.0574	0.6371	3.34	0.0036	0.0604	0.6110	0.16	0.0116	0.1079	0.3627	5.50	0.0314	0.1772	1.2735
1993	3	3.65	0.0054	0.0736	0.5316	4.59	0.0020	0.0446	0.8394	0.15	0.0025	0.0497	0.3415	2.16	0.0080	0.0896	0.4993
1993	4	5.49	0.0023	0.0475	0.7982	5.07	0.0208	0.1443	0.9275	0.17	0.0030	0.0545	0.3700	2.46	0.0059	0.0770	0.5687
1994	1	4.44	0.0022	0.0465	0.6453	5.93	0.0025	0.0500	1.0840	0.20	0.0048	0.0691	0.4388	1.46	0.0032	0.0567	0.3374
1994	2	5.37	0.0030	0.0545	0.7813	2.82	0.0014	0.0380	0.5149	0.29	0.0034	0.0578	0.6559	1.61	0.2089	0.4570	0.3720
1994	3	2.81	0.0071	0.0843	0.4090	3.39	0.0013	0.0365	0.6201	0.25	0.0022	0.0472	0.5633	3.78	0.0218	0.1477	0.8743
1994	4	2.99	0.0021	0.0456	0.4355	3.22	0.0054	0.0734	0.5881	0.21	0.0017	0.0413	0.4622	1.87	0.0044	0.0661	0.4333

Appendix table 8. Continued.

yr	qt	AREA2				AREA3				AREA4				AREA5			
		CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative
1995	1	2.71	0.0033	0.0574	0.3939	4.32	0.0019	0.0435	0.7896	0.31	0.0022	0.0472	0.6953	2.03	0.0028	0.0529	0.4703
1995	2	2.19	0.0054	0.0733	0.3179	2.46	0.0015	0.0391	0.4504	0.19	0.0027	0.0519	0.4304	3.11	0.0165	0.1282	0.7199
1995	3	2.86	0.0109	0.1043	0.4156	2.49	0.0018	0.0428	0.4559	0.28	0.0013	0.0362	0.6207	1.21	0.0065	0.0807	0.2808
1995	4	5.01	0.0018	0.0428	0.7293	8.14	0.0095	0.0977	1.4881	0.17	0.0014	0.0370	0.3879	2.03	0.0030	0.0551	0.4702
1996	1	6.39	0.0021	0.0455	0.9302	4.40	0.0015	0.0393	0.8041	0.22	0.0022	0.0466	0.5014	2.16	0.0026	0.0506	0.4997
1996	2	4.46	0.0027	0.0518	0.6491	1.77	0.0016	0.0400	0.3245	0.32	0.0022	0.0466	0.7218	1.57	0.0274	0.1654	0.3644
1996	3	2.76	0.0031	0.0554	0.4014	2.57	0.0014	0.0368	0.4703	0.35	0.0016	0.0396	0.7697	1.75	0.0123	0.1110	0.4050
1996	4	2.46	0.0011	0.0331	0.3585	6.01	0.0031	0.0554	1.0994	0.22	0.0017	0.0413	0.4934	1.61	0.0029	0.0540	0.3720
1997	1	4.10	0.0012	0.0345	0.5961	4.26	0.0014	0.0373	0.7798	0.42	0.0084	0.0915	0.9261	1.78	0.0014	0.0373	0.4123
1997	2	2.09	0.0012	0.0352	0.3039	1.85	0.0015	0.0390	0.3380	0.25	0.0037	0.0608	0.5674	1.95	0.0253	0.1589	0.4523
1997	3	3.75	0.0022	0.0472	0.5448	1.92	0.0014	0.0379	0.3512	0.23	0.0014	0.0373	0.5231	3.67	0.0054	0.0737	0.8491
1997	4	4.12	0.0008	0.0286	0.6000	2.75	0.0022	0.0469	0.5037	0.26	0.0021	0.0461	0.5891	1.08	0.0020	0.0451	0.2506
1998	1	3.52	0.0007	0.0268	0.5121	3.61	0.0013	0.0354	0.6610	0.31	0.0107	0.1035	0.6833	1.97	0.0014	0.0370	0.4568
1998	2	3.20	0.0009	0.0306	0.4659	1.60	0.0015	0.0384	0.2935	0.29	0.0047	0.0682	0.6403	1.93	0.0073	0.0855	0.4470
1998	3	3.06	0.0019	0.0441	0.4445	1.58	0.0015	0.0381	0.2896	0.23	0.0023	0.0479	0.5055	1.05	0.0044	0.0666	0.2440
1998	4	4.04	0.0016	0.0395	0.5871	3.50	0.0019	0.0438	0.6404	0.24	0.0027	0.0522	0.5435	1.71	0.0020	0.0443	0.3966
1999	1	3.37	0.0019	0.0432	0.4908	3.57	0.0016	0.0395	0.6522	0.37	0.0064	0.0799	0.8168	2.81	0.0016	0.0402	0.6506
1999	2	3.63	0.0036	0.0601	0.5284	1.67	0.0017	0.0415	0.3063	0.42	0.0037	0.0609	0.9361	2.08	0.0052	0.0721	0.4806
1999	3	3.96	0.0037	0.0608	0.5754	2.20	0.0019	0.0438	0.4016	0.29	0.0022	0.0467	0.6503	2.00	0.0021	0.0461	0.4634
1999	4	3.44	0.0011	0.0336	0.5006	4.69	0.0021	0.0458	0.8584	0.34	0.0048	0.0694	0.7501	1.58	0.0012	0.0349	0.3657
2000	1	3.64	0.0011	0.0325	0.5291	3.77	0.0018	0.0427	0.6895	0.42	0.0071	0.0843	0.9370	1.73	0.0016	0.0394	0.3999
2000	2	3.17	0.0026	0.0511	0.4616	1.55	0.0030	0.0544	0.2828	0.30	0.0032	0.0564	0.6686	3.65	0.0016	0.0404	0.8447
2000	3	6.14	0.0028	0.0526	0.8932	1.87	0.0020	0.0448	0.3426	0.32	0.0021	0.0454	0.7201	3.75	0.0026	0.0512	0.8686
2000	4	4.38	0.0017	0.0409	0.6379	2.40	0.0024	0.0487	0.4387	0.19	0.0039	0.0625	0.4304	1.77	0.0028	0.0528	0.4096
2001	1	4.03	0.0030	0.0547	0.5858	5.42	0.0019	0.0435	0.9920	0.10	0.0043	0.0655	0.2222	1.66	0.0015	0.0384	0.3851
2001	2	4.92	0.0022	0.0471	0.7160	1.78	0.0032	0.0565	0.3258	0.29	0.0037	0.0605	0.6374	1.67	0.0028	0.0531	0.3875
2001	3	3.69	0.0035	0.0588	0.5368	2.18	0.0019	0.0441	0.3979	0.31	0.0015	0.0390	0.6945	1.33	0.0036	0.0596	0.3072
2001	4	4.92	0.0022	0.0467	0.7161	2.74	0.0029	0.0540	0.5013	0.36	0.0017	0.0416	0.8019	1.02	0.0036	0.0601	0.2359
2002	1	5.62	0.0014	0.0373	0.8182	4.51	0.0016	0.0404	0.8255	0.30	0.0037	0.0607	0.6751	1.21	0.0037	0.0604	0.2799
2002	2	3.29	0.0020	0.0451	0.4779	2.69	0.0036	0.0598	0.4929	0.27	0.0053	0.0728	0.5999	1.66	0.0060	0.0776	0.3844
2002	3	1.27	0.0025	0.0499	0.1849	1.97	0.0024	0.0490	0.3595	0.22	0.0017	0.0412	0.4884	0.83	0.0031	0.0554	0.1926
2002	4	2.32	0.0010	0.0309	0.3368	2.82	0.0044	0.0664	0.5158	0.18	0.0020	0.0451	0.3941	0.92	0.0013	0.0360	0.2123

Appendix table 8. Continued.

yr	qt	AREA2				AREA3				AREA4				AREA5			
		CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative	CPUE	Dev	std_err	Relative
2003	1	3.33	0.0012	0.0353	0.4837	4.86	0.0020	0.0449	0.8881	0.15	0.0136	0.1164	0.3339	1.02	0.0020	0.0445	0.2359
2003	2	3.89	0.0018	0.0429	0.5654	2.54	0.0037	0.0611	0.4649	0.85	0.0090	0.0947	1.8996	0.88	0.0172	0.1312	0.2046
2003	3	3.70	0.0028	0.0529	0.5389	2.20	0.0029	0.0543	0.4018	0.37	0.0026	0.0509	0.8144	0.74	0.0080	0.0892	0.1705
2003	4	4.04	0.0010	0.0319	0.5872	3.48	0.0046	0.0678	0.6369	0.27	0.0031	0.0552	0.5950	1.53	0.0027	0.0519	0.3540
2004	1	2.65	0.0010	0.0313	0.3854	3.98	0.0020	0.0447	0.7283	0.63	0.0193	0.1390	1.4008	1.15	0.0033	0.0575	0.2651
2004	2	5.28	0.0017	0.0408	0.7676	3.49	0.0033	0.0576	0.6383	0.31	0.0071	0.0843	0.6815	2.62	0.0101	0.1006	0.6064
2004	3	2.06	0.0020	0.0451	0.2991	2.95	0.0014	0.0379	0.5403	0.33	0.0026	0.0509	0.7369	1.23	0.0043	0.0656	0.2843
2004	4	3.95	0.0013	0.0356	0.5741	2.73	0.0026	0.0512	0.4990	0.24	0.0033	0.0571	0.5306	0.91	0.0025	0.0495	0.2114
2005	1	3.77	0.0008	0.0290	0.5482	6.06	0.0019	0.0435	1.1078	0.19	0.0074	0.0860	0.4259	0.87	0.0030	0.0549	0.2022
2005	2	4.96	0.0012	0.0341	0.7215	3.33	0.0021	0.0458	0.6089	0.35	0.0091	0.0952	0.7728	1.10	0.0084	0.0915	0.2538
2005	3	1.80	0.0013	0.0366	0.2618	1.96	0.0013	0.0360	0.3582	0.19	0.0052	0.0720	0.4294	1.04	0.0117	0.1081	0.2416
2005	4	2.42	0.0009	0.0295	0.3514	4.65	0.0026	0.0509	0.8513	0.18	0.0030	0.0547	0.4007	0.69	0.0039	0.0624	0.1588
2006	1	3.94	0.0008	0.0284	0.5733	6.00	0.0017	0.0407	1.0978	0.17	0.0056	0.0745	0.3857	1.45	0.0019	0.0430	0.3347
2006	2	4.54	0.0007	0.0270	0.6597	3.51	0.0016	0.0396	0.6414	0.43	0.0130	0.1141	0.9679	2.08	0.0032	0.0568	0.4822
2006	3	1.75	0.0017	0.0410	0.2539	1.98	0.0014	0.0368	0.3626	0.23	0.0032	0.0562	0.5102	1.18	0.0024	0.0494	0.2723
2006	4	1.86	0.0009	0.0301	0.2699	3.07	0.0017	0.0410	0.5617	0.29	0.0054	0.0734	0.6520	0.93	0.0017	0.0412	0.2158
2007	1	1.91	0.0007	0.0264	0.2781	4.18	0.0015	0.0392	0.7647	0.20	0.0167	0.1293	0.4356	1.24	0.0015	0.0383	0.2873
2007	2	1.80	0.0006	0.0242	0.2618	3.67	0.0022	0.0471	0.6711	0.38	0.0066	0.0815	0.8537	1.47	0.0026	0.0505	0.3395
2007	3	1.53	0.0015	0.0381	0.2225	1.41	0.0015	0.0387	0.2576	0.24	0.0028	0.0526	0.5300	1.06	0.0033	0.0578	0.2464
2007	4	1.94	0.0011	0.0328	0.2816	2.44	0.0028	0.0532	0.4464	0.21	0.0069	0.0828	0.4778	1.07	0.0017	0.0417	0.2481
2008	1	1.12	0.0011	0.0331	0.1634	3.63	0.0021	0.0457	0.6642	0.13	0.0106	0.1031	0.2833	0.74	0.0015	0.0382	0.1716
2008	2	1.33	0.0009	0.0295	0.1929	2.07	0.0030	0.0549	0.3790	0.15	0.0033	0.0575	0.3436	0.44	0.0036	0.0603	0.1013
2008	3	1.13	0.0018	0.0424	0.1642	1.28	0.0020	0.0447	0.2340	0.12	0.0024	0.0493	0.2677	0.53	0.0030	0.0548	0.1221
2008	4	0.87	0.0014	0.0369	0.1264	1.88	0.0019	0.0440	0.3439	0.16	0.0066	0.0814	0.3590	0.53	0.0014	0.0375	0.1220
2009	1	0.69	0.0009	0.0305	0.1008	2.05	0.0020	0.0445	0.3747	0.16	0.0241	0.1551	0.3529	0.61	0.0011	0.0334	0.1421
2009	2	1.03	0.0017	0.0413	0.1499	3.32	0.0037	0.0605	0.6071	0.21	0.0036	0.0602	0.4702	0.61	0.0024	0.0490	0.1414
2009	3	2.05	0.0091	0.0954	0.2977	2.00	0.0027	0.0519	0.3664	0.13	0.0021	0.0457	0.2921	0.63	0.0027	0.0519	0.1461
2009	4	2.84	0.0070	0.0836	0.4128	1.46	0.0035	0.0590	0.2666	0.14	0.0079	0.0891	0.3134	0.33	0.0012	0.0344	0.0764
2010	1	1.62	0.0095	0.0973	0.2350	2.37	0.0025	0.0505	0.4344	0.11	0.0086	0.0930	0.2491	0.55	0.0014	0.0374	0.1267
2010	2	0.91	0.0103	0.1013	0.1322	4.21	0.0044	0.0666	0.7695	0.24	0.0024	0.0487	0.5286	0.58	0.0062	0.0790	0.1332
2010	3	5.98	0.0673	0.2593	0.8702	2.46	0.0036	0.0604	0.4500	0.13	0.0030	0.0545	0.2841	0.44	0.0124	0.1112	0.1011
2010	4	2.95	0.0450	0.2120	0.4297	2.04	0.0036	0.0599	0.3728	0.16	0.0279	0.1671	0.3567	0.30	0.0022	0.0465	0.0693