Standardization of annual and quarterly CPUE for yellowfin tuna caught by Japanese longline fishery in the Indian Ocean up to 2008 using general linear model

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Abstract

Japanese longline CPUE for yellowfin tuna was standardized up to 2008 by GLM (CPUE-LogNormal error structured model) which SST (Sea Surface Temperature) was included in the model as oceanographic factor. 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. 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, such as ASPM and SS2, in the IOTC WPTT in 2009. Additionally, quarterly CPUE in each area in each of five areas in the whole Indian Ocean was also standardized for the assessment using Multifan-CL.

In the main fishing ground, CPUE continuously decreased from around 28.7 (real scale) in 1960 to 10.5 in 1972, and was kept in same level until 1988. Thereafter, it declined to about 4.5 in 1994 and has been kept in the low level with fluctuation between 3.3 and 4.6 until 2006. After that, the CPUE in 2007 was much lower level as 3.0 and that in 2008 was estimated to be extremely low, about 2.0 although the data of 2008 is preliminary. 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 two years.

1. Introduction

Japanese longline CPUE for yellowfin tuna was standardized by Generalized Linear Model up to 2008. Methods of standardization was basically equivalent to those used for yellowfin assessment in 2008 (Okamoto and Shono 2008). SST (Sea Surface Temperature) was included in the model as oceanographic factor. 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 slightly modified from that used last year as determined in 25 September 2009 through e-mail discussion among IOTC relating scientists and secretariat.

2. Materials and methods

Principally, the model used for the standardization in this paper is the same as that used in the yellowfin assessment last year (Okamoto and Shono, 2008).

Area definition:

Area definition used in this study which consists of five areas was basically same as that used in the yellowfin assessment in IOTC WPTT 2008 with slight modification at boundary between are 2, 3 and 4 (Fig. 1).

Annual and quarterly CPUE was standardized for main fishing ground (Area 2, 3 and 5) and whole Indian Ocean (Area 1-5). In addition, quarterly CPUE was also standardized for each of five areas for assessment using Multifan-CL software.

Environmental factors:

As environmental factors, which are available for the analyzed period from 1960 to 2008, SST (Sea Surface Temperature) was applied. The original SST data, whose resolution is 1-degree latitude and 1-degree longitude by month from 1946 to 2004, was downloaded from NEAR-GOOS Regional Real Time Data Base of Japan Meteorological Agency (JMA).

http://goos.kishou.go.jp/rrtdb/database.html

It is necessary to get password to access the data retrieving system. The original data was recompiled into 5-degree latitude and 5-latitude longitude by month from 1960 to 2008 using the procedures described in Okamoto et al. (2001), and used in the analyses.

Catch and effort data used:

The Japanese longline catch (in number) and effort statistics from 1960 up to 2008 were used. 2008 data is preliminary. The catch and effort data set aggregated by month, 5-degree square, NHF (the number of hooks between floats), and main and branch line material, was used for the analysis. Data in strata in which the number of hooks was less than 5000 were not used for analyses. 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 was 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 ($p<0.05$).

- Initial Model for Year based CPUE standardization in the main fishing ground and whole Indian Ocean for 1960 through 2007

Log (CPUE+const)= μ +YR +QT +AREA +NHFCL +ML +BL +SST +SST2 +SST3 +YR*QT +QT*AREA +YR*AREA +AREA*NHFCL +NHFCL*ML +NHFCL*BL +AREA*SST +YR*SST

- Initial Model for Quarter based CPUE standardization in the main fishing ground and whole Indian Ocean for 1960 through 2008

Log (CPUE+const)= μ +YR +QT +AREA +NHFCL +ML +BL +SST +SST2 +SST3 +YR*QT*AREA +AREA*NHFCL +NHFCL*ML +NHFCL*BL +AREA*SST +YR*SST

- Initial Model for quarter based CPUE standardization in each area for whole Indian Ocean from 1960 through 2008

Log (CPUE+const)= μ +YR +QT + NHFCL +ML +BL +SST +SST2 +SST3 +YR*QT +NHFCL*ML +NHFCL*BL +YR*SST

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),
SST : effect of SST (as a continuous variable),
SST2 : effect of SST2 (=SST x SST, as a continuous variable),
SST3 : effect of SST3 (=SST x SST x SST, as a continuous variable),
MLD: effect of MLD (mixing layer depth),
ML : effect of material of main line,
BL : effect of material of branch line,
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,
Area*SST : interaction term between area and SST,
YR*SST : interaction term between year and SST,
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.

$$CPUEi = \Sigma\ Wj * (\exp(lsmean(Year\ i * Area\ j)) - constant)$$

Where CPUEi = CPUE in year i,
Wj = Area rate of Area j , (Σ Wj = 1),
lsmean(Year*Areaij) = 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 CPUE (catch in number per 1000 hooks) was standardized by GLM (CPUE-LogNormal error structured model) for each of area categories, main fishing ground (Area 2, 3 and 5), whole Indian Ocean (Areas 1 – 5), and each of five areas as described in the materials and method section.

Trends of annual CPUEs for main fishing ground in the Indian Ocean (Area 2, 3 and 5) and whole Indian Ocean from 1960 through 2008 were shown in Fig. 2 in real scale overlaying nominal CPUE and in relative scale. In the main fishing ground, CPUE continuously decreased from around 28.7 (real scale) in 1960 to 10.5 in 1972, and was kept in same level until 1988. Thereafter, it declined to about 4.5 in 1994 and has been kept in the

low level with fluctuation between 3.3 and 4.6 until 2006. After that, the CPUE in 2007 was much lower level as 3.0 and that in 2008 was estimated to be extremely low, about 2.0 although the data of 2008 is preliminary. 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 two years. Quarterly CPUE trends for main and whole Indian Ocean were basically similar to that of annual CPUE (Fig. 3). 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 and 2 and Figs. 4 and 5, respectively. In all cases, standard residual did not show remarkable difference from the normal distribution.

Quarterly CPUEs for each of five areas were shown in Fig. 6 in real and relative scale overlaid with nominal CPUE. The declining trend in the last two years seems to be conspicuous at the tropical region, area 2 and 4. As for quarter based standardized CPUE in each area, distributions of the standard residual did not show remarkable difference from the normal distribution (Fig. 7).

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, 2 and 3, respectively, in real and relative scales with variation.

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., Miyabe, N., and Matsumoto, T. (2001): GLM analyses for standardization of Japanese longline CPUE for bigeye tuna in the Indian Ocean applying environmental factors. IOTC/TTWP/01/21, 38p.

Okamoto, H. (2005): Recent trend of Japanese longline fishery in the Indian Ocean with special reference to the targeting. Is the target shifting from bigeye to yellowfin? IOTC/WPTT/05/11, 15pp.

Okamoto, H. and Shono, H. (2008): Standardization of annual and quarterly CPUE for yellowfin tuna caught by Japanese longline fishery in the Indian Ocean up to 2007 using general linear model. IOTC/WPTT/08/19. 22 pp.

Table 1. ANOVA table of GLM for year based CPUE for main (top) and whole (bottom) Indian Ocean from 1960 to 2008

1960-2008 Year base
Main Fishing Ground (Area 2&3&5)

Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	379	14301.784	37.736	61.320	<.0001	0.394899
						CV =
yr	48	431.799	8.996	14.620	<.0001	46.3505
qt	3	112.740	37.580	61.070	<.0001	
area	2	274.287	137.143	222.860	<.0001	
nhfcl	5	133.898	26.780	43.520	<.0001	
bl	1	3.246	3.246	5.270	0.0217	
ml	1	31.551	31.551	51.270	<.0001	
sst	1	18.847	18.847	30.630	<.0001	
sst2	1	98.489	98.489	160.040	<.0001	
sst3	1	122.705	122.705	199.400	<.0001	
yr*qt	144	818.343	5.683	9.230	<.0001	
qt*area	6	205.773	34.296	55.730	<.0001	
yr*area	96	921.676	9.601	15.600	<.0001	
area*nhfcl	10	123.419	12.342	20.060	<.0001	
nhfcl*ml	5	67.629	13.526	21.980	<.0001	
nhfcl*bl	5	26.909	5.382	8.750	<.0001	
sst*area	2	305.877	152.938	248.520	<.0001	
sst*yr	48	369.509	7.698	12.510	<.0001	

1960-2008 Year base
Whole Indian (Area 1-5)

Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	489	36471.201	74.583	120.840	<.0001	0.558369
						CV =
yr	48	409.252	8.526	13.810	<.0001	59.5504
qt	3	6.482	2.161	3.500	0.0147	
area	4	736.801	184.200	298.450	<.0001	
nhfcl	5	26.735	5.347	8.660	<.0001	
bl	1	6.434	6.434	10.420	0.0012	
ml	1	21.393	21.393	34.660	<.0001	
sst	1	19.855	19.855	32.170	<.0001	
sst2	1	112.339	112.339	182.020	<.0001	
sst3	1	178.461	178.461	289.150	<.0001	
yr*qt	144	842.471	5.850	9.480	<.0001	
qt*area	12	617.494	51.458	83.370	<.0001	
yr*area	186	1743.262	9.372	15.190	<.0001	
area*nhfcl	20	188.970	9.448	15.310	<.0001	
nhfcl*ml	5	95.272	19.054	30.870	<.0001	
nhfcl*bl	5	41.551	8.310	13.460	<.0001	
sst*area	4	538.330	134.583	218.060	<.0001	
sst*yr	48	496.399	10.342	16.760	<.0001	

Table 2. ANOVA table of GLM for quarter based CPUE for main (top) and whole (bottom) Indian Ocean from 1960 to 2008

1960-2008 Quarter base Main Fishing Ground (Area 2&3&5)						
Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	666	15405.849	23.132	39.260	<.0001	0.425385
						CV =
yr	48	394.235189	8.213233	13.94	<.0001	45.3509
qt	3	95.176193	31.725398	53.85	<.0001	
area	2	281.960848	140.980424	239.3	<.0001	
nhfcl	5	125.059292	25.011858	42.46	<.0001	
bl	1	2.612352	2.612352	4.43	0.0352	
ml	1	31.164294	31.164294	52.9	<.0001	
sst	1	17.817821	17.817821	30.24	<.0001	
sst2	1	98.133961	98.133961	166.57	<.0001	
sst3	1	120.09852	120.09852	203.86	<.0001	
yr*qt*area	533	3252.38077	6.102028	10.36	<.0001	
area*nhfcl	10	121.791026	12.179103	20.67	<.0001	
nhfcl*ml	5	59.645478	11.929096	20.25	<.0001	
nhfcl*bl	5	21.96186	4.392372	7.46	<.0001	
sst*area	2	311.199275	155.599638	264.12	<.0001	
sst*yr	48	348.82941	7.267279	12.34	<.0001	

1960-2008 Quarter base Whole Indian (Area 1-5)						
Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	953	38125.289	40.006	68.080	<.0001	0.583693
						CV =
yr	48	384.229	8.005	13.620	<.0001	58.107
qt	3	20.130	6.710	11.420	<.0001	
area	4	643.315	160.829	273.690	<.0001	
nhfcl	5	25.665	5.133	8.740	<.0001	
bl	1	5.747	5.747	9.780	0.0018	
ml	1	21.689	21.689	36.910	<.0001	
sst	1	22.958	22.958	39.070	<.0001	
sst2	1	95.998	95.998	163.360	<.0001	
sst3	1	145.724	145.724	247.990	<.0001	
yr*qt*area	806	5110.739	6.341	10.790	<.0001	
area*nhfcl	20	186.274	9.314	15.850	<.0001	
nhfcl*ml	5	79.168	15.834	26.940	<.0001	
nhfcl*bl	5	35.599	7.120	12.120	<.0001	
sst*area	4	471.933	117.983	200.780	<.0001	
sst*yr	48	469.517	9.782	16.650	<.0001	

Table 3. ANOVA table of GLM for quarter based CPUE for each of five areas 1-5 in whole Indian Ocean from 1960 to 2008

1960-2008 Quarter base

Area 1

Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	117	392.589	3.355	8.580	<.0001	0.745
						CV =
yr	37	29.089	0.786	2.010	0.001	52.085
qt						
nhfc1						
bl						
ml	1	1.682	1.682	4.300	0.039	
sst						
sst2						
sst3						
yr*qt	36	52.677	1.463	3.740	<.0001	
nhfc1*ml						
nhfc1*bl						
sst*yr	37	33.675	0.910	2.330	<.0001	

Area 2

Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	261	4018.035	15.395	31.280	<.0001	0.374
						CV =
yr	48	94.305	1.965	3.990	<.0001	35.898
qt	3	79.707	26.569	53.990	<.0001	
nhfc1	5	50.322	10.064	20.450	<.0001	
bl	1	2.924	2.924	5.940	0.015	
ml						
sst						
sst2						
sst3						
yr*qt	144	659.751	4.582	9.310	<.0001	
nhfc1*ml	6	22.790	3.798	7.720	<.0001	
nhfc1*bl	5	8.842	1.768	3.590	0.003	
sst*yr	49	118.682	2.422	4.920	<.0001	

Area 3

Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	263	6005.691	22.835	27.240	<.0001	0.392
						CV =
yr	48	542.348	11.299	13.480	<.0001	56.083
qt	3	92.279	30.760	36.700	<.0001	
nhfc1	5	139.893	27.979	33.380	<.0001	
bl						
ml	1	5.174	5.174	6.170	0.013	
sst	1	24.977	24.977	29.800	<.0001	
sst2	1	65.602	65.602	78.270	<.0001	
sst3	1	114.150	114.150	136.190	<.0001	
yr*qt	144	849.028	5.896	7.030	<.0001	
nhfc1*ml	5	74.997	14.999	17.900	<.0001	
nhfc1*bl	6	19.972	3.329	3.970	0.0006	
sst*yr	48	464.941	9.686	11.560	<.0001	

Area 4

Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	261	11825.059	45.307	49.900	<.0001	0.553
						CV =
yr	48	376.380	7.841	8.640	<.0001	-150.353
qt	3	327.105	109.035	120.100	<.0001	
nhfc1	5	60.765	12.153	13.390	<.0001	
bl						
ml	1	24.538	24.538	27.030	<.0001	
sst	1	239.022	239.022	263.280	<.0001	
sst2						
sst3	1	23.577	23.577	25.970	<.0001	
yr*qt	143	678.840	4.747	5.230	<.0001	
nhfc1*ml	5	39.934	7.987	8.800	<.0001	
nhfc1*bl	6	89.811	14.968	16.490	<.0001	
sst*yr	48	680.226	14.171	15.610	<.0001	

Area 5

Source	DF	Type III SS	Mean Square	F Value	Pr > F	R-Square=
Model	262	4730.662	18.056	45.670	<.0001	0.535
						CV =
yr	48	89.531	1.865	4.720	<.0001	45.103
qt	3	26.456	8.819	22.300	<.0001	
nhfc1	5	19.530	3.906	9.880	<.0001	
bl	1	7.971	7.971	20.160	<.0001	
ml						
sst	1	8.221	8.221	20.790	<.0001	
sst2	1	3.724	3.724	9.420	0.002	
sst3	1	3.722	3.722	9.410	0.002	
yr*qt	143	310.015	2.168	5.480	<.0001	
nhfc1*ml	6	21.411	3.568	9.030	<.0001	
nhfc1*bl	5	13.068	2.614	6.610	<.0001	
sst*yr	48	102.352	2.132	5.390	<.0001	

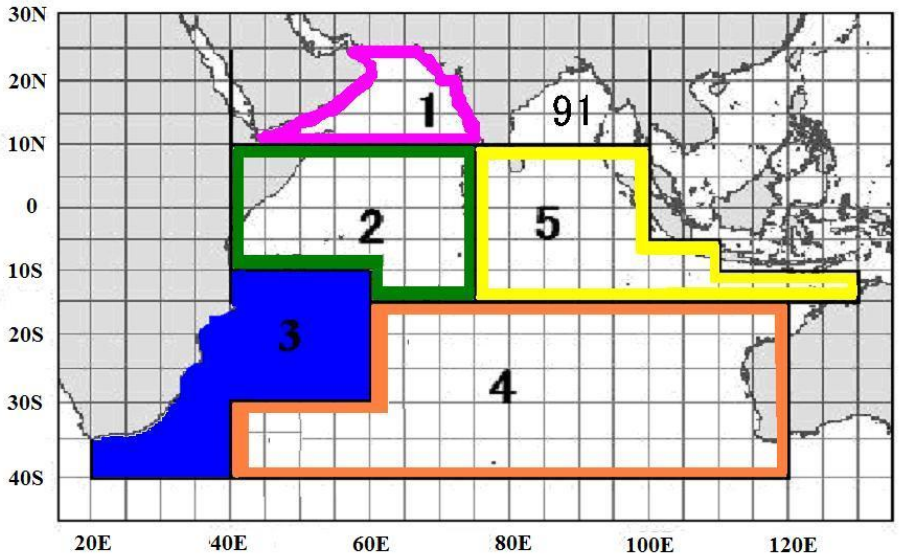

Fig. 1. Definition of sub-areas used in this study. Main fishing ground (areas 2, 3 and 5) and whole Indian Ocean (sub-areas 1-5) categories in this paper.

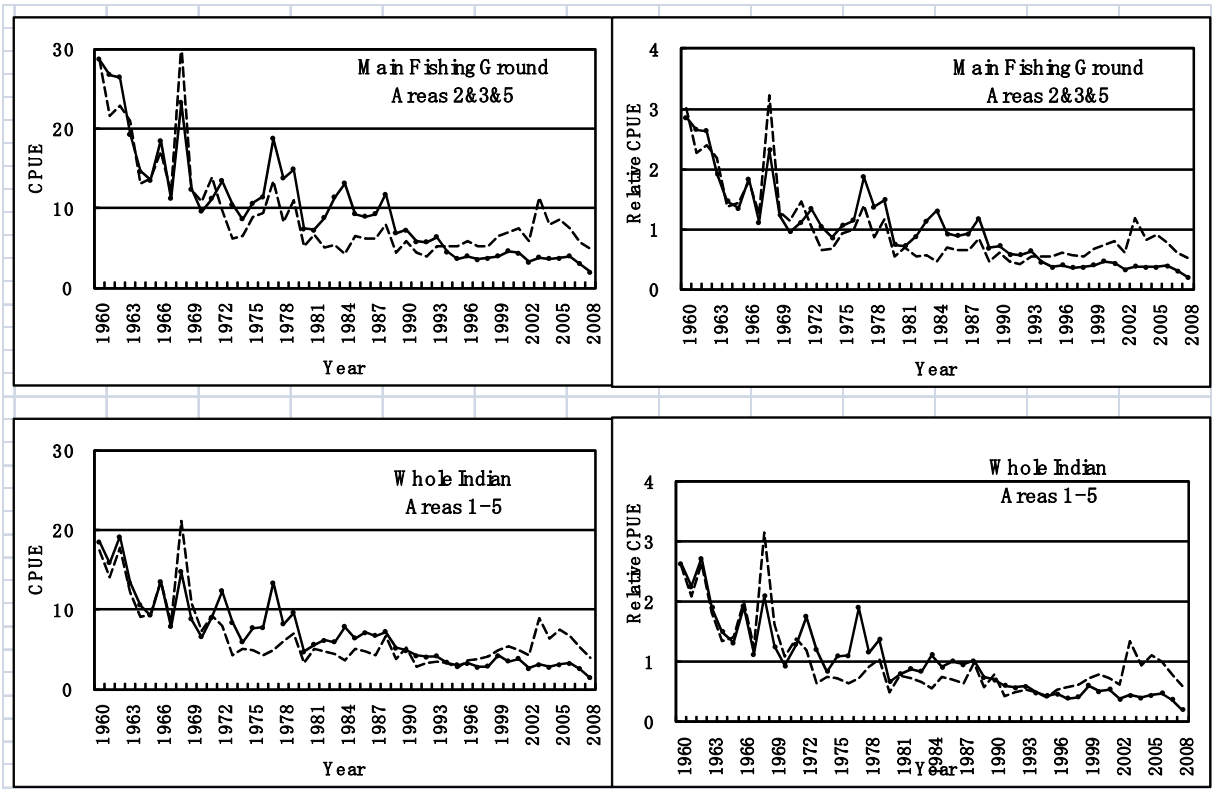

Fig. 2. Standardized annual based CPUE in number from 1960 to 2008 for main fishing ground (top) and whole (bottom) Indian Ocean expressed in relative (left figure) and real (right figure) scale overlaid with nominal CPUE.

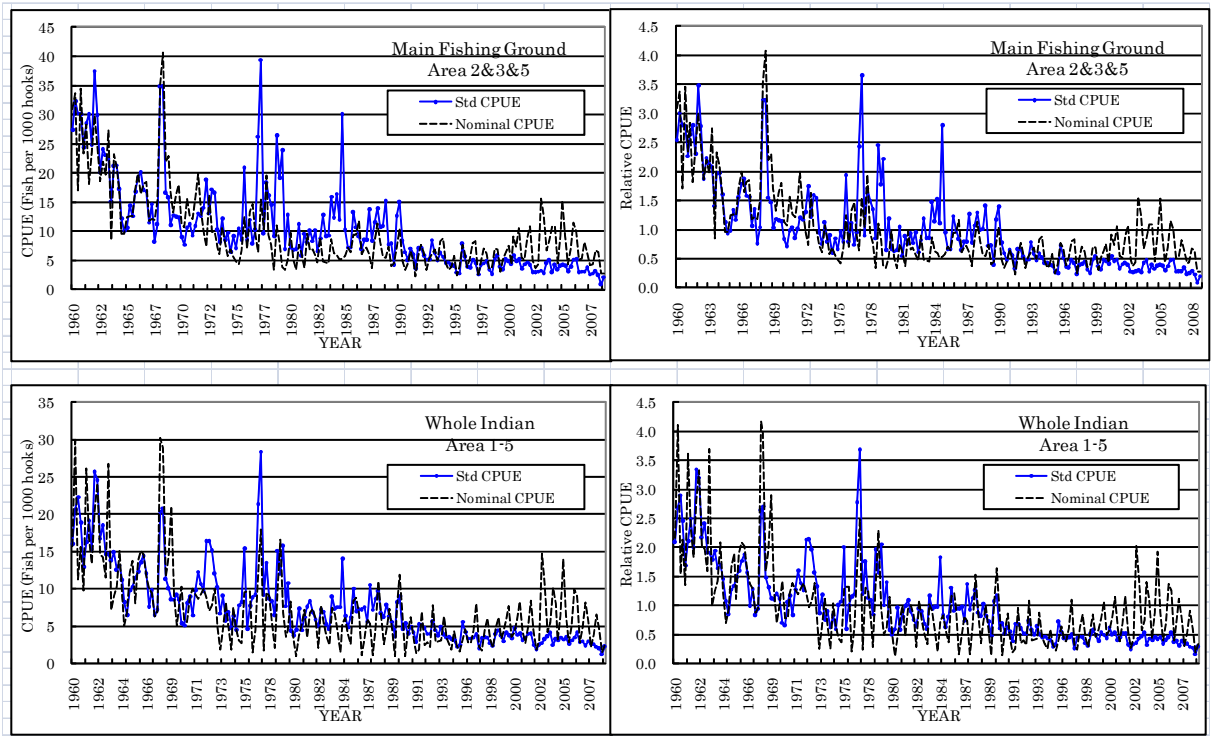

Fig. 3. Standardized quarter based CPUE in number from 1960 to 2008 for main fishing ground (top) and whole (bottom) Indian Ocean expressed in relative (left figure) and real (right figure) scale overlaid with nominal CPUE.

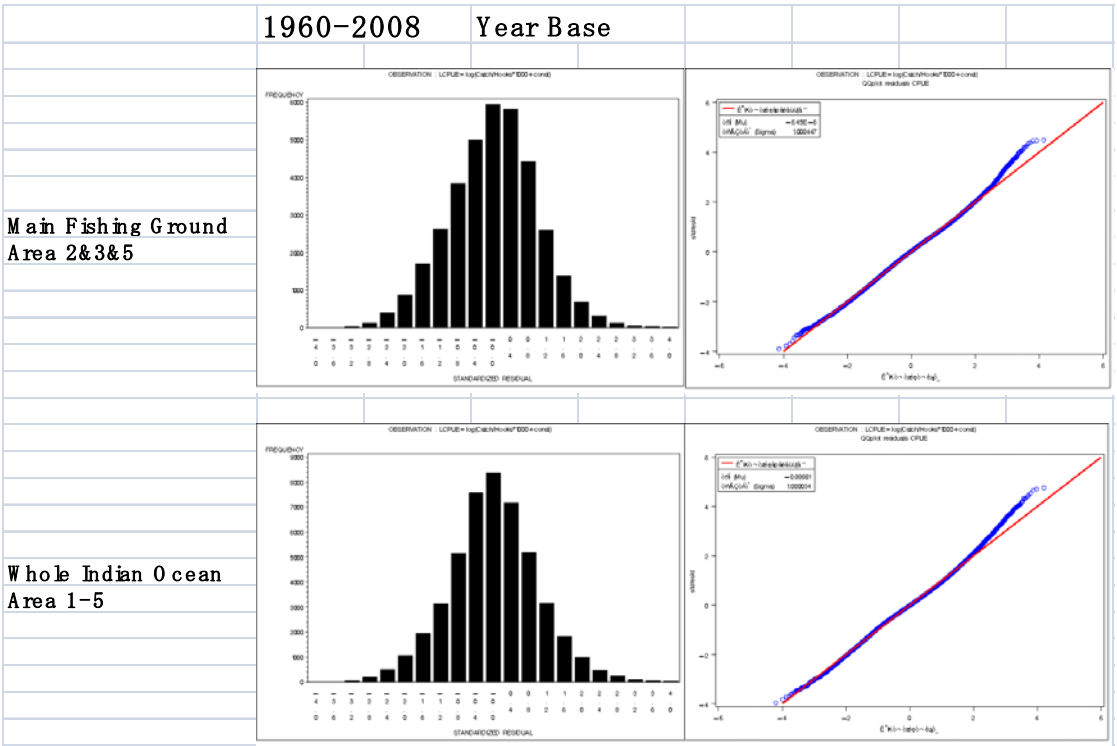

Fig. 4 Standardized residuals of annual based CPUE standardization for main fishing ground (top) and whole (bottom) Indian Ocean

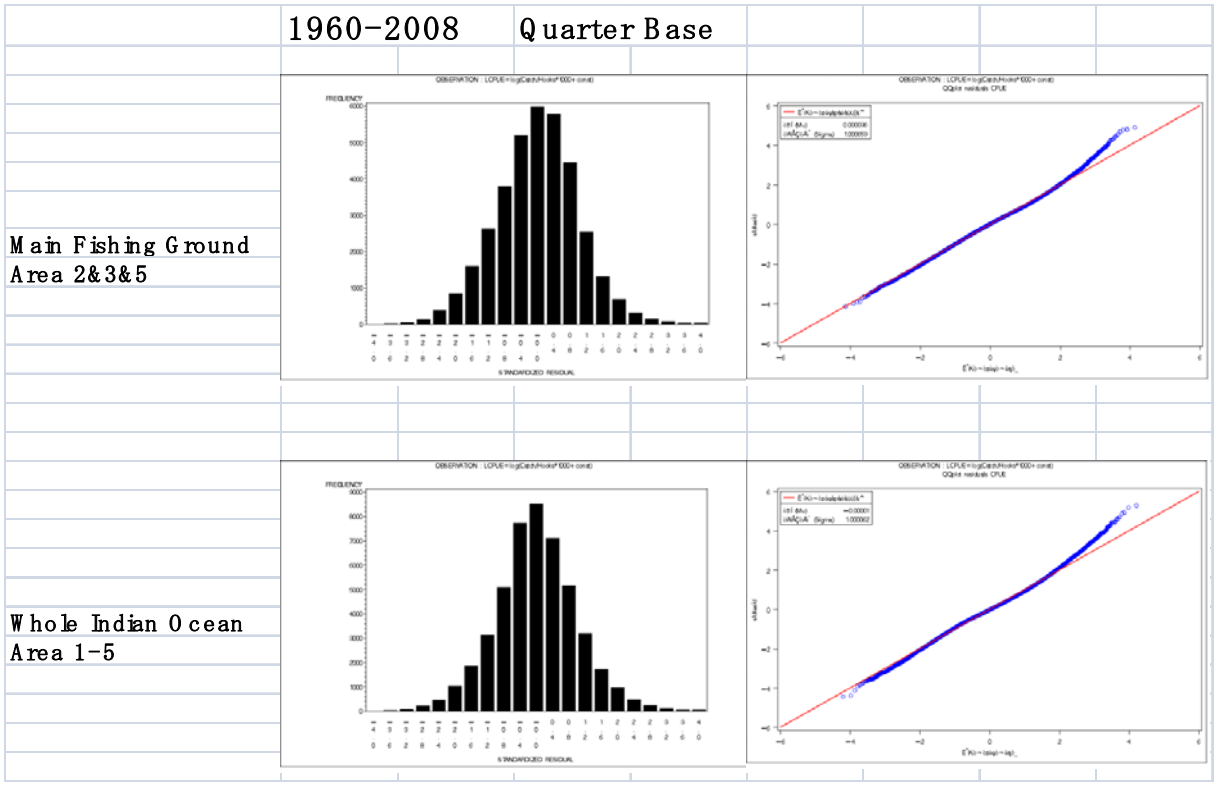

Fig. 5. Standardized residuals of quarter based CPUE standardization for main fishing ground (top) and whole (bottom) Indian Ocean

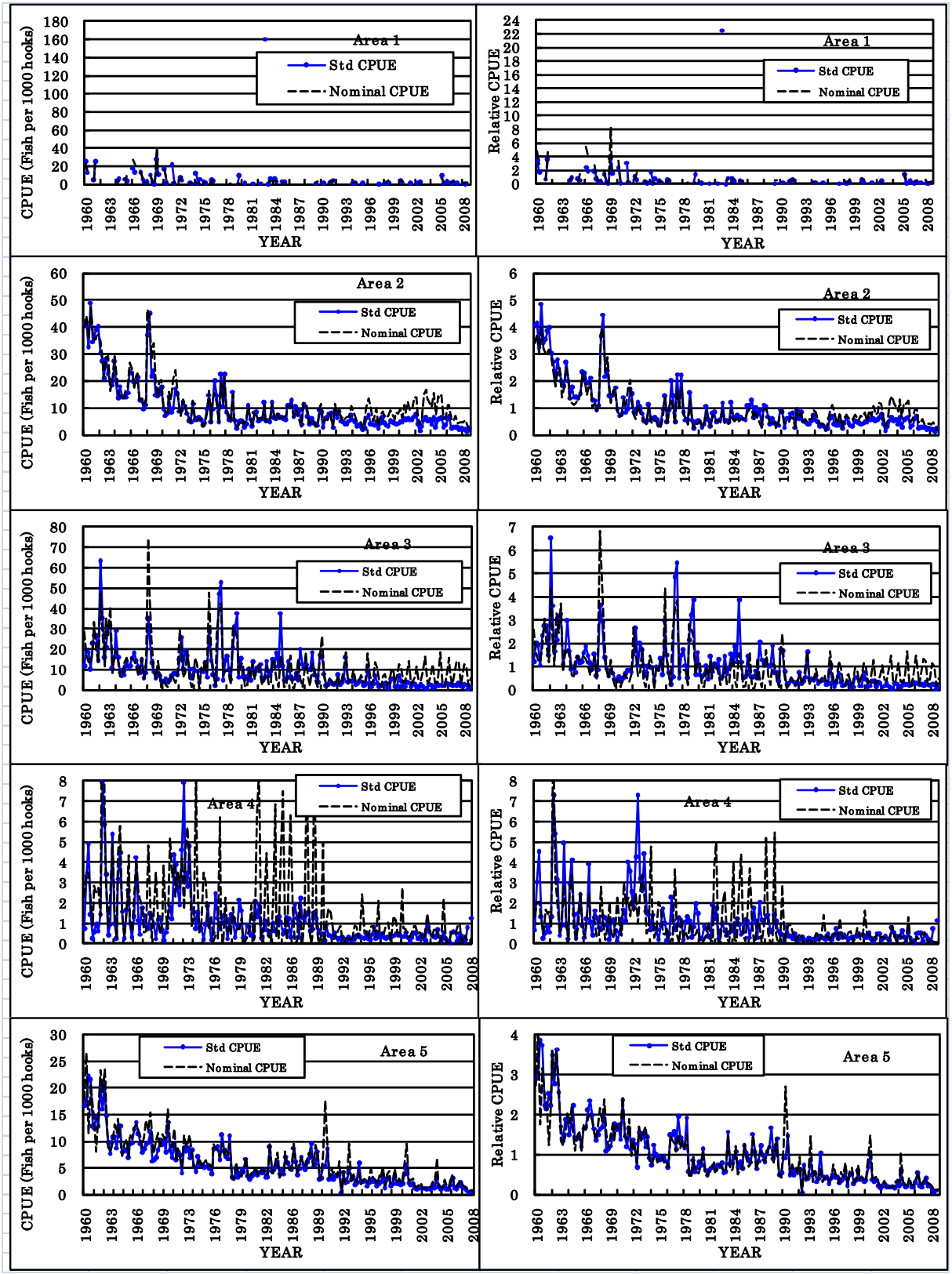

Fig. 6. Standardized quarter based CPUE in number from 1960 to 2008 for each five areas in whole Indian Ocean expressed in relative (left figure) and real (right figure) scale overlaid with nominal CPUE.

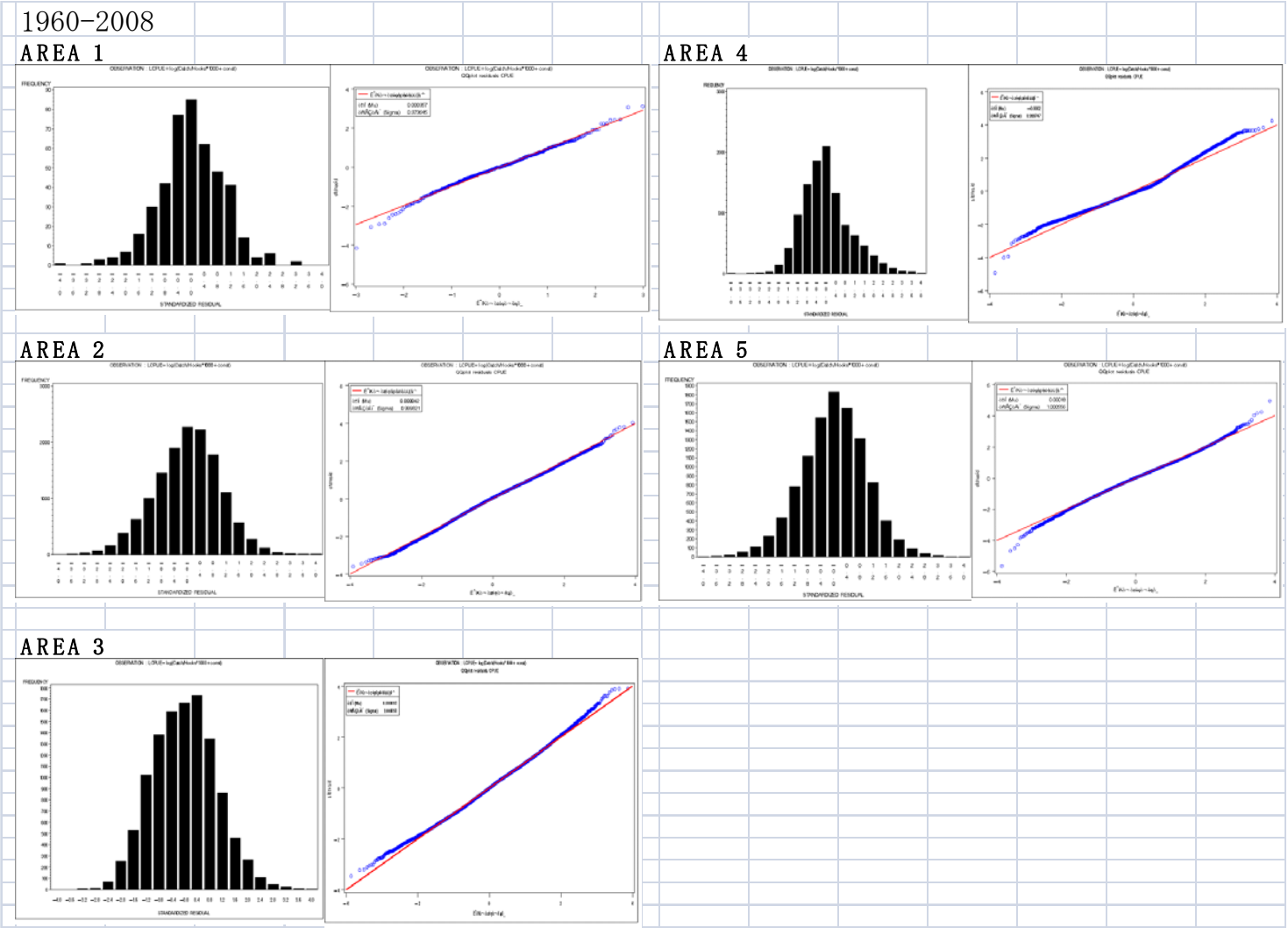

Fig. 7. Standardized residuals of quarter based CPUE standardization for each of five areas in whole Indian Ocean expressed as histograms and QQ plots.

Appendix table 1. Annual value of standardized yellowfin CPUE in main and whole Indian Ocean for 1960-2007 expressed in real and relative scale in which the average of each period is 1.0, and variance.

Main (Area2&3&5) 1960-2008			
year	cpue_p	dev_t	Relative CPUE
1960	28.7060	0.0042	2.8553
1961	26.7178	0.0038	2.6575
1962	26.4190	0.0022	2.6278
1963	19.3087	0.0023	1.9206
1964	14.6571	0.0022	1.4579
1965	13.5309	0.0020	1.3459
1966	18.4618	0.0020	1.8363
1967	11.2206	0.0016	1.1161
1968	23.2192	0.0022	2.3095
1969	12.3955	0.0020	1.2329
1970	9.6054	0.0030	0.9554
1971	11.1842	0.0028	1.1124
1972	13.4297	0.0043	1.3358
1973	10.4572	0.0046	1.0401
1974	8.5889	0.0032	0.8543
1975	10.6300	0.0039	1.0573
1976	11.4646	0.0041	1.1403
1977	18.7229	0.0150	1.8623
1978	13.7596	0.0060	1.3686
1979	14.8822	0.0048	1.4803
1980	7.4106	0.0029	0.7371
1981	7.2490	0.0021	0.7210
1982	8.7839	0.0019	0.8737
1983	11.3883	0.0035	1.1327
1984	13.1460	0.0028	1.3076
1985	9.2977	0.0029	0.9248
1986	8.9523	0.0023	0.8904
1987	9.2839	0.0023	0.9234
1988	11.7857	0.0032	1.1723
1989	6.8862	0.0031	0.6849
1990	7.2343	0.0030	0.7196
1991	5.8328	0.0024	0.5802
1992	5.7168	0.0027	0.5686
1993	6.3372	0.0023	0.6303
1994	4.5446	0.0016	0.4520
1995	3.6693	0.0012	0.3650
1996	3.9828	0.0010	0.3962
1997	3.5983	0.0007	0.3579
1998	3.7326	0.0008	0.3713
1999	3.9997	0.0008	0.3978
2000	4.6153	0.0008	0.4591
2001	4.3546	0.0009	0.4331

Whole (Area1-5) 1960-2008			
year	cpue_p	dev_t	Relative CPUE
1960	18.5096	0.0035	2.6245
1961	15.8315	0.0041	2.2447
1962	19.1278	0.0019	2.7121
1963	13.3520	0.0019	1.8932
1964	10.5355	0.0029	1.4938
1965	9.2710	0.0026	1.3145
1966	13.5072	0.0024	1.9152
1967	7.8548	0.0018	1.1137
1968	14.7153	0.0024	2.0865
1969	8.8043	0.0021	1.2484
1970	6.5733	0.0024	0.9320
1971	9.0131	0.0026	1.2780
1972	12.3397	0.0050	1.7496
1973	8.3832	0.0040	1.1887
1974	5.8938	0.0029	0.8357
1975	7.6524	0.0025	1.0850
1976	7.7131	0.0049	1.0936
1977	13.3870	0.0079	1.8981
1978	8.1446	0.0039	1.1548
1979	9.5975	0.0043	1.3608
1980	4.6611	0.0044	0.6609
1981	5.6001	0.0042	0.7940
1982	6.1597	0.0036	0.8734
1983	5.8795	0.0030	0.8337
1984	7.8210	0.0024	1.1089
1985	6.3541	0.0032	0.9009
1986	7.0973	0.0034	1.0063
1987	6.7037	0.0020	0.9505
1988	7.1446	0.0065	1.0130
1989	5.2122	0.0036	0.7390
1990	4.8773	0.0031	0.6916
1991	4.2000	0.0023	0.5955
1992	4.0142	0.0018	0.5692
1993	4.1662	0.0058	0.5907
1994	3.3653	0.0015	0.4772
1995	2.9973	0.0016	0.4250
1996	3.2259	0.0048	0.4574
1997	2.7439	0.0011	0.3891
1998	2.8553	0.0013	0.4049
1999	4.2021	0.0046	0.5958
2000	3.5272	0.0012	0.5001
2001	3.8011	0.0021	0.5390

2002	3.2792	0.0009	0.3262	2002	2.6323	0.0021	0.3732
2003	3.8295	0.0011	0.3809	2003	3.0673	0.0013	0.4349
2004	3.6577	0.0010	0.3638	2004	2.7871	0.0012	0.3952
2005	3.7342	0.0010	0.3714	2005	3.0675	0.0020	0.4349
2006	3.9500	0.0007	0.3929	2006	3.2776	0.0018	0.4647
2007	3.0231	0.0007	0.3007	2007	2.5513	0.0017	0.3617
2008	1.9937	0.0039	0.1983	2008	1.3831	0.0085	0.1961

Appendix table 2. Quartely value of standardized yellowfin CPUE in main and whole Indian Ocean for 1960-2007 expressed in real and relative scale in which the average of each period is 1.0, and variance.

		Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1-5)		
Year	Quarter			Relative	Tropical		Relative
		CPUE	t-dev	CPUE	CPUE	t-dev	CPUE
1960	1	27.3632	0.0214	2.5402	16.0558	0.0111	2.0891
1960	2	32.3691	0.0232	3.0049	20.6273	0.0186	2.6840
1960	3	30.1900	0.0108	2.8026	22.2864	0.0083	2.8999
1960	4	30.0742	0.0090	2.7919	18.9015	0.0066	2.4594
1961	1	24.4291	0.0546	2.2678	12.9739	0.0234	1.6881
1961	2	28.4894	0.0193	2.6448	16.2402	0.0199	2.1131
1961	3	30.1188	0.0110	2.7960	19.1377	0.0154	2.4902
1961	4	24.7810	0.0072	2.3005	15.3233	0.0051	1.9938
1962	1	37.4607	0.0067	3.4776	25.6955	0.0058	3.3434
1962	2	29.9594	0.0055	2.7812	24.5991	0.0108	3.2008
1962	3	20.1697	0.0076	1.8724	16.7122	0.0075	2.1746
1962	4	24.0622	0.0050	2.2338	18.5324	0.0046	2.4114
1963	1	23.0285	0.0050	2.1378	14.6667	0.0048	1.9084
1963	2	22.4459	0.0066	2.0837	14.6676	0.0178	1.9085
1963	3	15.1344	0.0128	1.4050	13.7838	0.0091	1.7935
1963	4	21.2244	0.0066	1.9703	14.9039	0.0052	1.9393
1964	1	21.3040	0.0076	1.9777	12.5985	0.0065	1.6393
1964	2	17.2462	0.0058	1.6010	13.1024	0.0108	1.7049
1964	3	12.1712	0.0074	1.1299	11.1935	0.0085	1.4565
1964	4	10.1361	0.0050	0.9410	8.2123	0.0044	1.0686
1965	1	10.6614	0.0048	0.9897	6.5313	0.0052	0.8498
1965	2	14.4474	0.0059	1.3412	9.7800	0.0088	1.2726
1965	3	12.6006	0.0059	1.1698	10.2688	0.0063	1.3362
1965	4	16.8407	0.0059	1.5634	11.4520	0.0046	1.4901
1966	1	19.2758	0.0066	1.7894	12.2909	0.0055	1.5993
1966	2	20.2019	0.0054	1.8754	13.5757	0.0109	1.7664
1966	3	17.0682	0.0052	1.5845	14.4303	0.0067	1.8776
1966	4	16.8883	0.0045	1.5678	12.0775	0.0037	1.5715
1967	1	11.5007	0.0038	1.0677	7.6295	0.0036	0.9927
1967	2	14.6499	0.0039	1.3600	9.8476	0.0040	1.2813
1967	3	8.2733	0.0048	0.7680	6.4530	0.0073	0.8397
1967	4	11.2368	0.0048	1.0432	7.2234	0.0054	0.9399
1968	1	34.8817	0.0071	3.2382	20.2955	0.0048	2.6408
1968	2	34.8077	0.0059	3.2313	20.7856	0.0052	2.7046
1968	3	16.6765	0.0074	1.5481	11.3558	0.0081	1.4776
1968	4	15.8402	0.0052	1.4705	10.1180	0.0072	1.3165
1969	1	11.1316	0.0041	1.0334	8.6044	0.0043	1.1196
1969	2	12.7384	0.0054	1.1826	8.5266	0.0045	1.1095
1969	3	12.5190	0.0061	1.1622	9.2388	0.0043	1.2021
1969	4	12.3629	0.0064	1.1477	8.5461	0.0044	1.1120
1970	1	9.0580	0.0061	0.8409	5.3596	0.0061	0.6974
1970	2	7.6596	0.0083	0.7111	5.0615	0.0057	0.6586
1970	3	10.6503	0.0116	0.9887	8.1399	0.0070	1.0591
1970	4	11.2385	0.0065	1.0433	8.9894	0.0044	1.1697
1971	1	9.2621	0.0047	0.8598	6.4299	0.0052	0.8366
1971	2	10.9705	0.0084	1.0184	9.7991	0.0061	1.2750
1971	3	13.0634	0.0096	1.2127	12.2683	0.0056	1.5963
1971	4	12.5961	0.0098	1.1693	10.6524	0.0074	1.3861
1972	1	14.0228	0.0093	1.3018	9.7427	0.0309	1.2677
1972	2	18.8138	0.0132	1.7466	16.3844	0.0104	2.1319
1972	3	13.0856	0.0102	1.2148	16.4268	0.0094	2.1374
1972	4	17.2123	0.0153	1.5979	15.1261	0.0122	1.9682
1973	1	16.6640	0.0121	1.5470	12.0467	0.0279	1.5675
1973	2	10.2854	0.0155	0.9548	10.1722	0.0093	1.3236
1973	3	8.1625	0.0117	0.7578	6.6744	0.0085	0.8685
1973	4	12.1577	0.0085	1.1286	9.0706	0.0065	1.1802
1974	1	8.5282	0.0070	0.7917	5.7678	0.0082	0.7505
1974	2	9.7406	0.0125	0.9043	6.8980	0.0068	0.8976
1974	3	6.4680	0.0101	0.6004	4.7821	0.0071	0.6222

1974	4	9.1423	0.0072	0.8487	6.3867	0.0073	0.8310

Appendix table 2. Continued.

		Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1-5)		
Year	Quarter	CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE
1975	1	7.1428	0.0089	0.6631	4.5203	0.0077	0.5882
1975	2	10.4395	0.0107	0.9691	7.7852	0.0058	1.0130
1975	3	8.5146	0.0072	0.7904	8.2105	0.0044	1.0683
1975	4	20.8930	0.0089	1.9396	15.4059	0.0065	2.0046
1976	1	8.6015	0.0059	0.7985	4.5937	0.0191	0.5977
1976	2	11.9820	0.0179	1.1123	7.7139	0.0130	1.0037
1976	3	7.9718	0.0201	0.7401	8.8694	0.0116	1.1541
1976	4	10.2556	0.0287	0.9521	9.1852	0.0176	1.1952
1977	1	26.2244	0.0296	2.4345	21.3785	0.0214	2.7817
1977	2	39.3959	0.0683	3.6573	28.3533	0.0302	3.6893
1977	3	9.7020	0.0367	0.9007	9.2208	0.0171	1.1998
1977	4	18.4110	0.0241	1.7092	13.4958	0.0130	1.7560
1978	1	16.1833	0.0084	1.5024	8.6999	0.0102	1.1320
1978	2	14.5778	0.0197	1.3533	8.3585	0.0100	1.0876
1978	3	9.1395	0.0157	0.8485	6.4921	0.0102	0.8447
1978	4	26.4874	0.0146	2.4589	15.0880	0.0078	1.9632
1979	1	19.1801	0.0071	1.7806	11.9945	0.0091	1.5607
1979	2	23.8789	0.0155	2.2168	15.7789	0.0100	2.0531
1979	3	6.9931	0.0147	0.6492	7.6846	0.0107	0.9999
1979	4	12.7957	0.0155	1.1879	10.7747	0.0102	1.4020
1980	1	7.1923	0.0066	0.6677	4.4196	0.0180	0.5751
1980	2	6.7647	0.0129	0.6280	3.7737	0.0113	0.4910
1980	3	6.9962	0.0141	0.6495	4.5032	0.0087	0.5859
1980	4	11.2664	0.0079	1.0459	7.3609	0.0060	0.9578
1981	1	5.9072	0.0037	0.5484	4.4410	0.0059	0.5779
1981	2	9.5804	0.0085	0.8894	6.1876	0.0106	0.8051
1981	3	8.1444	0.0098	0.7561	7.6431	0.0072	0.9945
1981	4	10.1434	0.0059	0.9416	8.3519	0.0049	1.0867
1982	1	8.3119	0.0035	0.7716	6.8773	0.0078	0.8949
1982	2	10.2402	0.0087	0.9506	5.8364	0.0130	0.7594
1982	3	6.5965	0.0070	0.6124	4.9733	0.0081	0.6471
1982	4	8.8174	0.0068	0.8186	7.2556	0.0092	0.9441
1983	1	12.8098	0.0054	1.1892	6.9259	0.0079	0.9012
1983	2	9.2395	0.0122	0.8577	5.2702	0.0087	0.6857
1983	3	9.2804	0.0086	0.8615	4.6125	0.0065	0.6002
1983	4	15.9237	0.0068	1.4783	8.9535	0.0048	1.1650
1984	1	12.3781	0.0043	1.1491	7.3000	0.0055	0.9499
1984	2	16.4148	0.0117	1.5238	7.5376	0.0062	0.9808
1984	3	11.9759	0.0087	1.1118	7.5379	0.0055	0.9808
1984	4	30.0929	0.0084	2.7936	14.0588	0.0040	1.8293
1985	1	10.2641	0.0045	0.9529	6.3986	0.0079	0.8326
1985	2	7.1946	0.0077	0.6679	4.8313	0.0062	0.6286
1985	3	7.2029	0.0066	0.6687	6.1740	0.0052	0.8033
1985	4	13.2815	0.0079	1.2330	10.0092	0.0058	1.3024
1986	1	10.6999	0.0032	0.9933	6.9748	0.0041	0.9075
1986	2	9.0942	0.0097	0.8442	7.2346	0.0078	0.9414
1986	3	7.0029	0.0083	0.6501	7.2479	0.0086	0.9431
1986	4	8.5076	0.0103	0.7898	7.5558	0.0079	0.9831
1987	1	8.6034	0.0036	0.7987	5.6081	0.0037	0.7297
1987	2	13.7499	0.0246	1.2765	10.5258	0.0165	1.3696
1987	3	8.4176	0.0143	0.7814	7.1566	0.0094	0.9312
1987	4	11.5534	0.0068	1.0725	8.6744	0.0051	1.1287
1988	1	13.9622	0.0049	1.2962	9.6818	0.0064	1.2598
1988	2	10.7250	0.0285	0.9956	6.7033	0.0190	0.8722
1988	3	10.9424	0.0102	1.0158	6.2741	0.0102	0.8164
1988	4	15.2518	0.0080	1.4159	7.8736	0.0077	1.0245
1989	1	7.7918	0.0048	0.7233	6.3042	0.0065	0.8203
1989	2	7.8756	0.0125	0.7311	5.5574	0.0153	0.7231
1989	3	4.2935	0.0159	0.3986	3.6434	0.0152	0.4741

1989	4	12.7102	0.0104	1.1799	8.2601	0.0080	1.0748

Appendix table 2. Continued.

		Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1-5)		
Year	Quarter	CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE
1990	1	15.0866	0.0048	1.4005	9.0151	0.0041	1.1730
1990	2	8.4333	0.0351	0.7829	4.6214	0.0387	0.6013
1990	3	6.4380	0.0112	0.5977	5.3517	0.0075	0.6964
1990	4	5.1219	0.0069	0.4755	4.0063	0.0093	0.5213
1991	1	7.0498	0.0037	0.6545	4.8927	0.0051	0.6366
1991	2	6.0339	0.0131	0.5601	4.1769	0.0090	0.5435
1991	3	3.6054	0.0118	0.3347	2.9393	0.0090	0.3825
1991	4	7.1458	0.0072	0.6634	5.2704	0.0040	0.6858
1992	1	7.1308	0.0046	0.6620	5.1834	0.0045	0.6745
1992	2	5.8359	0.0891	0.5418	4.7370	0.0355	0.6164
1992	3	5.1633	0.0188	0.4793	3.9595	0.0104	0.5152
1992	4	5.2442	0.0094	0.4868	3.9603	0.0062	0.5153
1993	1	8.4622	0.0047	0.7856	5.6519	0.0072	0.7354
1993	2	6.3018	0.0129	0.5850	4.4443	0.0114	0.5783
1993	3	5.0255	0.0084	0.4665	3.7759	0.0059	0.4913
1993	4	6.3238	0.0077	0.5871	4.9169	0.0047	0.6398
1994	1	5.6042	0.0029	0.5203	3.8549	0.0058	0.5016
1994	2	4.6126	0.0234	0.4282	3.4739	0.0091	0.4520
1994	3	4.6484	0.0101	0.4315	3.5217	0.0050	0.4582
1994	4	4.2373	0.0039	0.3934	3.2827	0.0022	0.4271
1995	1	4.1550	0.0027	0.3857	3.1192	0.0018	0.4059
1995	2	2.9121	0.0079	0.2703	2.2088	0.0042	0.2874
1995	3	2.7837	0.0066	0.2584	2.4690	0.0033	0.3213
1995	4	7.8948	0.0035	0.7329	5.5717	0.0021	0.7250
1996	1	5.7070	0.0020	0.5298	4.2088	0.0015	0.5476
1996	2	3.9160	0.0089	0.3635	3.3429	0.0042	0.4350
1996	3	3.7704	0.0070	0.3500	3.3399	0.0037	0.4346
1996	4	5.1569	0.0022	0.4787	3.4431	0.0050	0.4480
1997	1	4.5962	0.0014	0.4267	3.9232	0.0032	0.5105
1997	2	2.5910	0.0099	0.2405	1.9931	0.0049	0.2593
1997	3	4.2483	0.0037	0.3944	3.3730	0.0022	0.4389
1997	4	4.4967	0.0016	0.4174	3.5222	0.0016	0.4583
1998	1	4.8930	0.0014	0.4542	3.4408	0.0042	0.4477
1998	2	3.4716	0.0037	0.3223	2.6936	0.0031	0.3505
1998	3	2.7246	0.0038	0.2529	2.3454	0.0044	0.3052
1998	4	5.2358	0.0021	0.4861	3.9667	0.0021	0.5161
1999	1	5.8458	0.0021	0.5427	4.4479	0.0027	0.5788
1999	2	4.0091	0.0048	0.3722	3.7790	0.0066	0.4917
1999	3	3.4813	0.0032	0.3232	2.9627	0.0028	0.3855
1999	4	5.2191	0.0016	0.4845	4.1408	0.0025	0.5388
2000	1	4.8864	0.0017	0.4536	3.7929	0.0039	0.4935
2000	2	4.4770	0.0027	0.4156	3.3541	0.0025	0.4364
2000	3	5.8837	0.0035	0.5462	4.7794	0.0023	0.6219
2000	4	4.9303	0.0028	0.4577	3.8249	0.0025	0.4977
2001	1	5.2245	0.0023	0.4850	4.0546	0.0022	0.5276
2001	2	3.5735	0.0034	0.3317	3.1270	0.0035	0.4069
2001	3	4.3407	0.0038	0.4030	3.4485	0.0021	0.4487
2001	4	4.6760	0.0030	0.4341	3.9715	0.0019	0.5168
2002	1	4.3081	0.0027	0.3999	4.0349	0.0021	0.5250
2002	2	2.9967	0.0043	0.2782	2.4728	0.0046	0.3218
2002	3	2.9612	0.0032	0.2749	1.8943	0.0052	0.2465
2002	4	3.1118	0.0021	0.2889	2.5637	0.0019	0.3336
2003	1	3.2731	0.0025	0.3039	2.7162	0.0054	0.3534
2003	2	2.8864	0.0104	0.2680	3.2882	0.0067	0.4279
2003	3	4.6308	0.0060	0.4299	3.6266	0.0043	0.4719
2003	4	5.0971	0.0029	0.4732	4.0988	0.0040	0.5333
2004	1	3.0002	0.0026	0.2785	2.4462	0.0060	0.3183
2004	2	4.2265	0.0061	0.3924	3.3019	0.0053	0.4296
2004	3	3.5368	0.0033	0.3283	3.1396	0.0031	0.4085
2004	4	4.0762	0.0023	0.3784	3.4417	0.0037	0.4478

Appendix table 2. Continued.

Year	Quarter	Main Fishing Ground (Area2&3&5)			Whole Indian Ocean (Area1-5)		
		CPUE	t-dev	Relative CPUE	Tropical CPUE	t-dev	Relative CPUE
2005	1	4.2832	0.0024	0.3976	3.2122	0.0040	0.4180
2005	2	4.1639	0.0045	0.3866	3.4890	0.0051	0.4540
2005	3	3.2131	0.0061	0.2983	2.6230	0.0078	0.3413
2005	4	3.9967	0.0031	0.3710	3.0963	0.0035	0.4029
2006	1	5.1458	0.0017	0.4777	3.4772	0.0043	0.4524
2006	2	5.2406	0.0025	0.4865	4.1122	0.0048	0.5351
2006	3	2.9815	0.0025	0.2768	2.8374	0.0045	0.3692
2006	4	3.0818	0.0017	0.2861	2.9504	0.0048	0.3839
2007	1	3.0696	0.0015	0.2850	2.3640	0.0078	0.3076
2007	2	3.7508	0.0022	0.3482	2.9757	0.0034	0.3872
2007	3	2.6170	0.0028	0.2429	2.6032	0.0030	0.3387
2007	4	2.7711	0.0021	0.2573	2.5951	0.0043	0.3377
2008	1	3.1878	0.0039	0.2959	2.1993	0.0095	0.2862
2008	2	2.4872	0.0272	0.2309	2.0614	0.0910	0.2682
2008	3	0.9294	0.0635	0.0863	1.2114	0.0596	0.1576
2008	4	2.1606	0.0859	0.2006	2.2778	0.1798	0.2964

Appendix table 3. Quarterly value of standardized yellowfin CPUE for each of five areas in whole Indian Ocean from 1960-2008 expressed in real scale and relative scale with variance.

Year	Quarter	AREA 1			AREA 2			AREA 3			AREA 4			AREA 5		
		CPUE	Dev	Relative CPUE	CPUE	Dev	Relative CPUE	CPUE	Dev	Relative CPUE	CPUE	Dev	Relative CPUE	CPUE	Dev	Relative CPUE
1960	1	24.9710	0.0900	3.5037	40.9615	0.0129	4.0567	11.8587	0.4086	1.2225	0.7302	0.0716	0.6730	16.6888	0.0100	2.8931
1960	2	12.5390	0.5100	1.7593	41.9569	0.0142	4.1552	19.4192	0.2819	2.0019	3.3029	0.0985	3.0442	17.6340	0.0110	3.0570
1960	3				32.6671	0.0387	3.2352	18.3938	0.0454	1.8962	4.9002	0.0429	4.5164	22.2007	0.0186	3.8486
1960	4				48.9586	0.0186	4.8487	10.1826	0.0569	1.0497	1.4436	0.0415	1.3306	21.5599	0.0140	3.7375
1961	1	4.7780	0.6200	0.6704	34.4303	0.0134	3.4098	22.7707	0.9575	2.3474	0.2817	0.0838	0.2596	12.8895	0.0116	2.2345
1961	2	25.4740	0.2200	3.5742	35.8438	0.0176	3.5498	26.8071	0.2483	2.7635	0.5961	0.1825	0.5494	12.3889	0.0162	2.1477
1961	3				39.0706	0.0377	3.8694	26.7962	0.0377	2.7624	0.9449	0.1088	0.8709	14.5879	0.0252	2.5289
1961	4				40.1668	0.0166	3.9780	14.3556	0.0444	1.4799	0.6166	0.0541	0.5683	12.8900	0.0137	2.2346
1962	1				30.3752	0.0110	3.0082	63.3120	0.0895	6.5267	1.4576	0.0697	1.3435	20.1392	0.0082	3.4912
1962	2				27.5075	0.0116	2.7242	35.1474	0.0409	3.6233	7.9299	0.1056	7.3088	16.0412	0.0099	2.7808
1962	3				20.8951	0.0328	2.0694	16.0254	0.0209	1.6520	5.8724	0.0428	5.4124	20.9426	0.0118	3.6305
1962	4				28.2595	0.0107	2.7987	20.8051	0.0273	2.1447	3.4023	0.0448	3.1358	14.7814	0.0088	2.5624
1963	1				22.6116	0.0108	2.2394	30.8910	0.0579	3.1845	0.4275	0.0521	0.3940	9.8294	0.0079	1.7040
1963	2				20.1039	0.0144	1.9910	31.7667	0.0452	3.2747	0.9775	0.1829	0.9009	7.6926	0.0114	1.3336
1963	3				18.2695	0.0586	1.8093	10.6977	0.0301	1.1028	5.3970	0.0383	4.9743	10.8447	0.0153	1.8800
1963	4				27.2524	0.0150	2.6990	15.9398	0.0305	1.6432	0.9882	0.0440	0.9108	10.8086	0.0124	1.8737
1964	1	3.7350	0.1200	0.5241	20.1690	0.0138	1.9975	28.9791	0.0720	2.9874	0.2512	0.0441	0.2315	8.6729	0.0141	1.5035
1964	2	6.1750	0.1200	0.8664	13.6546	0.0113	1.3523	16.1283	0.0338	1.6626	3.1709	0.1009	2.9226	10.9120	0.0107	1.8917
1964	3				17.9173	0.0398	1.7745	8.6339	0.0209	0.8900	4.4828	0.0518	4.1316	12.8299	0.0105	2.2241
1964	4				14.0610	0.0187	1.3925	9.6371	0.0218	0.9935	1.5703	0.0298	1.4473	7.9087	0.0104	1.3710
1965	1	5.4160	0.1900	0.7599	14.1634	0.0100	1.4027	7.2511	0.0497	0.7475	0.2714	0.0364	0.2502	8.1942	0.0078	1.4205
1965	2	3.7230	0.0900	0.5224	13.8705	0.0112	1.3737	13.4980	0.0441	1.3915	1.6581	0.0709	1.5282	8.4024	0.0081	1.4566
1965	3				15.4957	0.0181	1.5346	11.4369	0.0204	1.1790	2.6407	0.0398	2.4338	6.9211	0.0137	1.1998
1965	4				23.4988	0.0131	2.3272	11.8318	0.0323	1.2197	0.9849	0.0241	0.9077	9.5165	0.0106	1.6497
1966	1	17.2600	0.1000	2.4217	23.0723	0.0097	2.2850	15.3300	0.0706	1.5803	0.3123	0.0349	0.2879	9.6888	0.0082	1.6796
1966	2	13.1640	0.0400	1.8470	19.6140	0.0094	1.9425	18.1550	0.0277	1.8716	1.3443	0.0969	1.2390	12.2198	0.0104	2.1184
1966	3				19.6136	0.0168	1.9425	14.2411	0.0199	1.4681	4.2454	0.0405	3.9129	13.5471	0.0121	2.3485
1966	4				21.3307	0.0106	2.1125	11.2338	0.0230	1.1581	1.1466	0.0225	1.0567	11.4285	0.0094	1.9812
1967	1	13.4620	0.0700	1.8888	12.9424	0.0096	1.2818	8.4731	0.0279	0.8735	0.4519	0.0262	0.4165	9.4965	0.0072	1.6463
1967	2	5.4610	0.0200	0.7662	12.7977	0.0095	1.2674	15.0617	0.0184	1.5527	1.7640	0.0205	1.6258	7.8724	0.0080	1.3647
1967	3	2.3950	0.5000	0.3360	9.4683	0.0161	0.9377	6.0237	0.0191	0.6210	1.3831	0.0196	1.2748	8.6155	0.0131	1.4935
1967	4	2.3200	0.2000	0.3255	11.0450	0.0101	1.0939	8.3454	0.0249	0.8603	0.8596	0.0160	0.7923	9.4577	0.0103	1.6395
1968	1				37.0305	0.0119	3.6674	35.2493	0.0823	3.6338	0.7630	0.0234	0.7033	9.6791	0.0081	1.6779
1968	2	10.2500	0.0400	1.4382	44.9678	0.0118	4.4534	28.5786	0.0249	2.9461	1.4839	0.0218	1.3677	11.7895	0.0122	2.0438
1968	3	2.5640	1.1900	0.3598	21.7203	0.0329	2.1511	13.4742	0.0232	1.3890	1.3867	0.0186	1.2781	6.2498	0.0201	1.0834
1968	4	0.3070	0.4100	0.0431	23.9956	0.0112	2.3764	8.7789	0.0249	0.9050	0.9915	0.0170	0.9138	6.5572	0.0106	1.1367
1969	1	27.2210	0.0700	3.8194	14.7244	0.0092	1.4582	5.6740	0.0237	0.5849	0.2486	0.0313	0.2291	7.0118	0.0091	1.2155
1969	2	10.8920	0.0200	1.5282	14.5044	0.0149	1.4365	8.2238	0.0207	0.8478	1.1566	0.0199	1.0660	8.3658	0.0145	1.4503
1969	3				15.1151	0.0201	1.4969	7.0525	0.0226	0.7270	1.2860	0.0166	1.1852	10.1905	0.0151	1.7666
1969	4				17.7338	0.0117	1.7563	4.2744	0.0398	0.4406	0.6827	0.0197	0.6293	9.3443	0.0102	1.6199

Appendix table 3. Continued.

Year	Quarter	AREA 1			AREA 2			AREA 3			AREA 4			AREA 5		
		CPUE	Dev	Relative CPUE	CPUE	Dev	Relative CPUE	CPUE	Dev	Relative CPUE	CPUE	Dev	Relative CPUE	CPUE	Dev	Relative CPUE
1970	1	16.8180	0.0600	2.3597	9.7024	0.0125	0.9609	3.9699	0.0383	0.4092	0.1487	0.0516	0.1371	10.0252	0.0095	1.7379
1970	2	1.2180	0.0200	0.1709	7.1084	0.0191	0.7040	5.4827	0.0411	0.5652	0.5639	0.0230	0.5198	7.9537	0.0118	1.3788
1970	3				7.8542	0.0604	0.7778	3.6039	0.0470	0.3715	1.3153	0.0206	1.2123	13.5930	0.0136	2.3564
1970	4				14.0468	0.0146	1.3911	4.8514	0.0372	0.5001	1.8181	0.0219	1.6757	8.4035	0.0111	1.4568
1971	1	21.8760	0.2600	3.0694	8.3497	0.0106	0.8269	6.8584	0.0269	0.7070	1.2168	0.0369	1.1215	6.9341	0.0091	1.2021
1971	2	1.3160	0.0400	0.1846	9.8167	0.0154	0.9722	8.1715	0.0509	0.8424	4.3731	0.0243	4.0306	9.6049	0.0121	1.6651
1971	3				17.0845	0.0385	1.6920	8.1341	0.0549	0.8385	3.8841	0.0169	3.5799	6.5100	0.0160	1.1285
1971	4				15.3294	0.0135	1.5182	7.4324	0.0648	0.7662	2.7696	0.0365	2.5526	7.9226	0.0182	1.3734
1972	1	7.3460	0.2800	1.0307	8.6006	0.0136	0.8518	14.7580	0.0849	1.5214	1.8978	0.3085	1.7492	7.3031	0.0133	1.2660
1972	2	4.0610	0.0400	0.5698	9.2193	0.0230	0.9130	25.9447	0.0878	2.6746	4.6164	0.0455	4.2548	3.9807	0.0196	0.6901
1972	3				12.2745	0.0147	1.2156	10.2419	0.0395	1.0558	7.9183	0.0370	7.2980	8.9196	0.0309	1.5463
1972	4				10.6846	0.0159	1.0582	19.3714	0.0708	1.9969	3.4629	0.0547	3.1917	8.1443	0.0357	1.4119
1973	1				7.9005	0.0191	0.7824	16.8334	0.0957	1.7353	2.8385	0.2310	2.6161	8.8360	0.0189	1.5318
1973	2	1.8380	0.0600	0.2579	5.3008	0.0270	0.5250	10.0198	0.0754	1.0329	4.7996	0.0377	4.4237	6.8229	0.0370	1.1828
1973	3	0.7200	0.6100	0.1010	4.9446	0.0183	0.4897	5.7596	0.0489	0.5937	1.7240	0.0295	1.5890	8.3129	0.0239	1.4411
1973	4				11.4459	0.0182	1.1336	9.9622	0.0401	1.0270	1.5359	0.0259	1.4156	5.2903	0.0136	0.9171
1974	1	12.2710	0.5600	1.7217	5.5313	0.0187	0.5478	9.3695	0.0626	0.9659	0.7478	0.0511	0.6892	4.2611	0.0104	0.7387
1974	2	1.0960	0.0400	0.1538	6.2754	0.0230	0.6215	9.3021	0.0562	0.9589	1.5391	0.0208	1.4186	7.1713	0.0219	1.2432
1974	3	5.5410	0.6700	0.7775	6.5023	0.0251	0.6440	3.7278	0.0625	0.3843	0.8241	0.0226	0.7595	5.7712	0.0160	1.0005
1974	4				5.7483	0.0229	0.5693	9.6531	0.0355	0.9951	0.7407	0.0421	0.6827	5.4869	0.0108	0.9512
1975	1	3.1680	0.2900	0.4445	3.5870	0.0196	0.3552	8.7151	0.0785	0.8984	0.2230	0.0511	0.2055	5.0803	0.0073	0.8807
1975	2	1.4310	0.0300	0.2008	4.5608	0.0182	0.4517	13.1888	0.0636	1.3596	0.9593	0.0217	0.8841	5.2557	0.0144	0.9111
1975	3				9.4951	0.0164	0.9404	6.1884	0.0455	0.6379	1.8798	0.0184	1.7325	5.5481	0.0096	0.9618
1975	4				14.6888	0.0192	1.4547	28.8076	0.0660	2.9697	1.1111	0.0303	1.0241	4.8125	0.0111	0.8343
1976	1	4.9590	0.7700	0.6958	4.7830	0.0215	0.4737	14.5282	0.0475	1.4977	0.1832	0.1611	0.1689	3.9412	0.0119	0.6832
1976	2	3.2020	0.0400	0.4493	9.4245	0.0254	0.9334	7.3341	0.1251	0.7561	0.5222	0.0631	0.4813	8.6001	0.0205	1.4909
1976	3				20.1953	0.0811	2.0001	2.2614	0.0749	0.2331	2.4827	0.0313	2.2882	8.6709	0.0409	1.5031
1976	4				14.5940	0.0977	1.4453	5.3462	0.1492	0.5511	1.2485	0.0579	1.1507	9.0602	0.0306	1.5706
1977	1				4.9075	0.0390	0.4860	47.1410	0.2395	4.8596	0.7576	0.1509	0.6982	6.5181	0.0175	1.1299
1977	2				22.5769	0.0513	2.2359	52.8183	0.1634	5.4449	0.9989	0.0874	0.9207	11.2765	0.2019	1.9548
1977	3				10.3756	0.0775	1.0276	4.8953	0.2653	0.5046	1.3942	0.0534	1.2850	8.1758	0.0401	1.4173
1977	4				22.4875	0.0129	2.2271	14.5126	0.1318	1.4961	1.1331	0.0351	1.0443	7.2259	0.0534	1.2527
1978	1				8.5209	0.0064	0.8439	16.6033	0.0378	1.7116	0.2474	0.0750	0.2280	6.6734	0.0151	1.1569
1978	2				5.5547	0.0069	0.5501	10.2015	0.1029	1.0516	1.1620	0.0349	1.0709	11.0634	0.0456	1.9179
1978	3				5.9110	0.0282	0.5854	5.0010	0.1785	0.5155	1.4312	0.0252	1.3191	3.3000	0.0187	0.5721
1978	4				15.8929	0.0159	1.5740	20.8490	0.1329	2.1493	1.2182	0.0352	1.1228	3.0733	0.0163	0.5328
1979	1				5.4919	0.0135	0.5439	31.2204	0.0238	3.2184	0.3300	0.0717	0.3042	4.9405	0.0138	0.8565
1979	2	-0.0610	0.8200	-0.0086	2.3102	0.0275	0.2288	37.6187	0.0763	3.8780	0.9028	0.0400	0.8321	3.2718	0.0251	0.5672
1979	3	9.7260	6.7300	1.3646	4.8409	0.0290	0.4794	6.2146	0.0826	0.6406	2.1543	0.0296	1.9855	3.8477	0.0276	0.6670
1979	4				5.4696	0.0506	0.5417	15.6393	0.0656	1.6122	1.6228	0.0379	1.4957	4.6894	0.0152	0.8129

Appendix table 3. Continued.

		AREA 1			AREA 2			AREA 3			AREA 4			AREA 5		
Year	Quarter			Relative			Relative			Relative			Relative			Relative
		CPUE	Dev	CPUE	CPUE	Dev	CPUE	CPUE	Dev	CPUE	CPUE	Dev	CPUE	CPUE	Dev	CPUE
1980	1				4.9289	0.0195	0.4881	6.2357	0.0262	0.6428	0.3010	0.1561	0.2774	4.2172	0.0134	0.7311
1980	2	1.0550	0.1500	0.1480	2.8673	0.0263	0.2840	5.1313	0.0717	0.5290	0.2937	0.0654	0.2707	6.6390	0.0171	1.1509
1980	3				3.9420	0.0458	0.3904	6.3858	0.0720	0.6583	0.9191	0.0329	0.8471	3.5391	0.0112	0.6135
1980	4				10.7742	0.0108	1.0670	9.9772	0.0724	1.0285	0.8281	0.0211	0.7632	2.8888	0.0117	0.5008
1981	1				5.7932	0.0060	0.5737	4.6575	0.0191	0.4801	0.4103	0.0443	0.3782	3.5125	0.0088	0.6089
1981	2	0.4680	0.2000	0.0657	3.1844	0.0204	0.3154	13.9053	0.0379	1.4335	0.3603	0.0639	0.3321	3.8737	0.0155	0.6715
1981	3				8.2160	0.0174	0.8137	7.4368	0.0296	0.7666	2.0915	0.0280	1.9277	4.0810	0.0326	0.7075
1981	4				8.4863	0.0082	0.8404	10.9821	0.0512	1.1321	1.3355	0.0229	1.2309	3.6015	0.0075	0.6243
1982	1				4.9961	0.0059	0.4948	9.5117	0.0181	0.9805	1.9024	0.1034	1.7534	4.2171	0.0086	0.7311
1982	2	0.4170	2.1000	0.0585	5.5225	0.0155	0.5469	12.6208	0.0396	1.3010	0.2675	0.0871	0.2466	4.0748	0.0182	0.7064
1982	3				5.9155	0.0101	0.5858	4.8292	0.0417	0.4978	0.6936	0.0451	0.6393	4.5473	0.0110	0.7883
1982	4	160.1440	8.7800	22.4697	12.0367	0.0058	1.1921	5.7258	0.0585	0.5903	1.1376	0.0388	1.0485	3.1604	0.0073	0.5479
1983	1				5.2684	0.0043	0.5218	14.1378	0.0400	1.4574	0.6683	0.0726	0.6160	3.3017	0.0078	0.5724
1983	2	0.0330	37.1400	0.0046	5.4502	0.0126	0.5398	6.7086	0.0787	0.6916	0.4382	0.0432	0.4039	9.0080	0.0215	1.5616
1983	3	6.0380	4.3500	0.8472	4.9251	0.0143	0.4878	9.1598	0.0692	0.9443	0.5808	0.0225	0.5353	4.4167	0.0048	0.7657
1983	4				12.1375	0.0080	1.2020	14.8977	0.0497	1.5358	1.0121	0.0238	0.9328	4.6760	0.0069	0.8106
1984	1	5.9210	0.2100	0.8308	6.4538	0.0078	0.6392	11.4522	0.0368	1.1806	0.6569	0.0271	0.6054	5.3644	0.0063	0.9299
1984	2	3.1840	0.1400	0.4467	6.0772	0.0130	0.6019	18.0356	0.0908	1.8592	0.6071	0.0212	0.5595	6.2175	0.0116	1.0778
1984	3				7.2920	0.0168	0.7222	11.6078	0.0620	1.1966	1.3190	0.0268	1.2157	3.9158	0.0083	0.6788
1984	4				6.6637	0.0109	0.6599	37.5334	0.0592	3.8692	1.0505	0.0222	0.9682	4.7699	0.0077	0.8269
1985	1	2.8720	6.5400	0.4030	6.5538	0.0069	0.6491	11.6067	0.0407	1.1965	0.4869	0.0480	0.4488	3.7765	0.0050	0.6547
1985	2	2.4720	0.5700	0.3468	5.8440	0.0109	0.5788	4.8191	0.0404	0.4968	0.6283	0.0205	0.5791	7.0871	0.0101	1.2286
1985	3				5.6093	0.0098	0.5555	5.5666	0.0392	0.5738	1.2956	0.0236	1.1941	5.9809	0.0083	1.0368
1985	4				10.9802	0.0060	1.0874	13.8853	0.0538	1.4314	1.2226	0.0277	1.1268	5.0995	0.0122	0.8840
1986	1	-0.5300	18.5800	-0.0744	10.8897	0.0046	1.0785	6.1481	0.0412	0.6338	0.3198	0.0299	0.2948	4.6497	0.0036	0.8061
1986	2				12.9557	0.0097	1.2831	5.2214	0.0430	0.5383	1.0741	0.0388	0.9900	8.6981	0.0197	1.5079
1986	3				6.5779	0.0125	0.6514	5.5724	0.0606	0.5744	1.9142	0.0422	1.7643	6.1007	0.0109	1.0576
1986	4				10.3421	0.0056	1.0242	7.9390	0.1164	0.8184	1.2512	0.0309	1.1532	3.7021	0.0062	0.6418
1987	1				7.7518	0.0049	0.7677	4.6832	0.0493	0.4828	0.3256	0.0251	0.3001	4.7888	0.0040	0.8302
1987	2				9.1249	0.0125	0.9037	19.9551	0.0521	2.0571	2.2301	0.0740	2.0554	7.0651	0.0886	1.2248
1987	3				3.8872	0.0247	0.3850	12.4562	0.0484	1.2841	1.2775	0.0322	1.1775	5.6342	0.0275	0.9767
1987	4				11.2429	0.0078	1.1135	10.9025	0.0526	1.1239	1.0837	0.0201	0.9988	4.7610	0.0055	0.8253
1988	1				10.4859	0.0069	1.0385	12.4212	0.0488	1.2805	1.4281	0.0783	1.3162	6.0957	0.0071	1.0567
1988	2				6.7596	0.0176	0.6694	9.9460	0.0388	1.0253	1.5390	0.0645	1.4185	6.8552	0.1086	1.1884
1988	3				4.0948	0.0176	0.4055	10.1054	0.0426	1.0417	0.6314	0.0470	0.5820	9.6635	0.0136	1.6752
1988	4				6.1310	0.0091	0.6072	18.3964	0.0595	1.8964	0.7166	0.0337	0.6605	5.1988	0.0055	0.9012
1989	1				4.4200	0.0051	0.4377	7.1970	0.0552	0.7419	1.5469	0.0849	1.4257	5.7406	0.0074	0.9952
1989	2	0.4370	1.6500	0.0613	4.2098	0.0148	0.4169	7.1164	0.0350	0.7336	1.2246	0.1061	1.1287	8.0856	0.0348	1.4017
1989	3	-0.0940	8.0300	-0.0132	3.4563	0.0519	0.3423	3.6805	0.0527	0.3794	0.6558	0.0590	0.6045	2.8533	0.0166	0.4946

1989	4				9.3298	0.0119	0.9240	17.0337	0.0598	1.7560	0.5115	0.0320	0.4714	3.1313	0.0111	0.5428

Appendix table 3. Continued.

		AREA 1			AREA 2			AREA 3			AREA 4			AREA 5		
Year	Quarter			Relative			Relative			Relative			Relative			Relative
		CPUE	Dev	CPUE	CPUE	Dev	CPUE	CPUE	Dev	CPUE	CPUE	Dev	CPUE	CPUE	Dev	CPUE
1990	1				8.4335	0.0094	0.8352	16.1768	0.0355	1.6676	0.4851	0.0344	0.4471	5.2628	0.0058	0.9123
1990	2	1.4110	0.0700	0.1980	2.6968	0.0201	0.2671	7.7726	0.0381	0.8013	0.1512	0.3072	0.1394	5.2938	0.1341	0.9177
1990	3				6.0388	0.0276	0.5981	2.1845	0.0267	0.2252	0.9048	0.0230	0.8339	8.5198	0.0191	1.4770
1990	4				6.3467	0.0098	0.6286	2.8214	0.0576	0.2909	0.4135	0.0603	0.3811	2.8257	0.0060	0.4899
1991	1	1.9040	0.2700	0.2671	7.8944	0.0083	0.7818	4.1327	0.0234	0.4260	0.3986	0.0317	0.3674	3.4421	0.0064	0.5967
1991	2	2.9580	0.4500	0.4150	8.0928	0.0416	0.8015	3.3308	0.0194	0.3434	0.2865	0.0476	0.2640	2.7674	0.0395	0.4797
1991	3	4.2160	0.7000	0.5915	2.6129	0.0230	0.2588	2.3895	0.0125	0.2463	0.5278	0.0136	0.4865	3.5172	0.0362	0.6097
1991	4				9.3506	0.0212	0.9260	3.2696	0.0362	0.3371	0.2870	0.0109	0.2645	3.4523	0.0093	0.5985
1992	1				6.1858	0.0123	0.6126	7.3141	0.0184	0.7540	0.2103	0.0401	0.1938	3.6427	0.0101	0.6315
1992	2				8.5924	0.0228	0.8510	2.4888	0.0120	0.2566	0.2743	0.0316	0.2528	0.2789	0.4033	0.0483
1992	3				5.0272	0.0718	0.4979	3.6954	0.0112	0.3809	0.3519	0.0260	0.3244	4.2200	0.0563	0.7316
1992	4				4.6990	0.0103	0.4654	5.2098	0.0639	0.5371	0.2022	0.0203	0.1864	2.2453	0.0200	0.3892
1993	1				4.0820	0.0128	0.4043	15.8565	0.0216	1.6346	0.1598	0.0609	0.1473	2.4010	0.0082	0.4162
1993	2				3.9271	0.0220	0.3889	3.9493	0.0126	0.4071	0.3144	0.0350	0.2898	4.9929	0.0452	0.8655
1993	3				5.0915	0.0184	0.5042	4.4086	0.0196	0.4545	0.2129	0.0169	0.1962	2.8857	0.0193	0.5003
1993	4				7.3808	0.0068	0.7310	4.0642	0.0579	0.4190	0.2128	0.0154	0.1962	3.2468	0.0142	0.5629
1994	1	1.4350	0.7300	0.2013	5.4580	0.0057	0.5405	5.8620	0.0104	0.6043	0.2108	0.0200	0.1943	1.8258	0.0074	0.3165
1994	2	1.4110	0.0500	0.1980	4.9551	0.0139	0.4907	2.6973	0.0049	0.2781	0.3657	0.0125	0.3371	2.2826	0.1024	0.3957
1994	3				3.1992	0.0212	0.3168	3.3210	0.0086	0.3424	0.4258	0.0100	0.3924	6.0005	0.0312	1.0402
1994	4				3.6814	0.0054	0.3646	4.0980	0.0185	0.4225	0.3180	0.0077	0.2931	2.5972	0.0109	0.4502
1995	1				3.2661	0.0090	0.3235	4.0566	0.0083	0.4182	0.2937	0.0116	0.2707	2.4098	0.0053	0.4178
1995	2	1.4840	0.2200	0.2082	1.9913	0.0270	0.1972	2.0807	0.0051	0.2145	0.2505	0.0103	0.2308	2.5543	0.0255	0.4428
1995	3				2.5328	0.0240	0.2508	2.6424	0.0078	0.2724	0.5310	0.0066	0.4894	1.5574	0.0152	0.2700
1995	4				6.1789	0.0046	0.6119	10.5963	0.0260	1.0923	0.2572	0.0062	0.2371	2.3416	0.0060	0.4059
1996	1				7.1709	0.0052	0.7102	3.1276	0.0076	0.3224	0.1999	0.0103	0.1843	2.9056	0.0049	0.5037
1996	2				4.1294	0.0116	0.4090	1.3537	0.0050	0.1395	0.4601	0.0091	0.4241	2.5455	0.0352	0.4413
1996	3				3.7924	0.0084	0.3756	2.9152	0.0069	0.3005	0.7927	0.0083	0.7306	2.5028	0.0245	0.4339
1996	4				3.4275	0.0034	0.3394	6.7696	0.0105	0.6979	0.2763	0.0077	0.2546	1.6468	0.0060	0.2855
1997	1				4.9687	0.0038	0.4921	3.1406	0.0077	0.3238	0.5452	0.0303	0.5025	2.0773	0.0031	0.3601
1997	2	0.3840	0.1100	0.0539	2.4910	0.0066	0.2467	1.5139	0.0056	0.1561	0.3270	0.0138	0.3014	2.4049	0.0427	0.4169
1997	3				4.2589	0.0059	0.4218	2.0968	0.0084	0.2162	0.4679	0.0070	0.4313	3.4439	0.0102	0.5970
1997	4				6.3483	0.0030	0.6287	2.9486	0.0080	0.3040	0.3266	0.0081	0.3010	1.2688	0.0044	0.2200
1998	1	0.6400	0.0500	0.0898	4.5518	0.0046	0.4508	3.2040	0.0086	0.3303	0.2463	0.0434	0.2270	2.8861	0.0038	0.5003
1998	2	1.0360	0.1200	0.1454	3.4503	0.0076	0.3417	1.0890	0.0057	0.1123	0.3266	0.0161	0.3010	3.0739	0.0144	0.5329
1998	3	1.8040	0.2300	0.2531	3.3163	0.0064	0.3284	1.1940	0.0079	0.1231	0.3490	0.0125	0.3216	1.5992	0.0102	0.2772
1998	4				5.1862	0.0053	0.5136	5.1595	0.0080	0.5319	0.3674	0.0109	0.3387	2.0379	0.0047	0.3533
1999	1				4.9649	0.0061	0.4917	5.1557	0.0100	0.5315	0.4078	0.0233	0.3759	3.4657	0.0042	0.6008
1999	2				4.5370	0.0117	0.4493	1.5937	0.0066	0.1643	0.4925	0.0171	0.4540	2.1379	0.0130	0.3706

1999	3	3.8777	0.0101	0.3840	1.5298	0.0098	0.1577	0.4881	0.0121	0.4498	2.2900	0.0068	0.3970
1999	4	4.2757	0.0043	0.4234	7.1811	0.0091	0.7403	0.4498	0.0182	0.4146	1.8383	0.0034	0.3187

Appendix table 3. Continued.

		AREA 1			AREA 2			AREA 3			AREA 4			AREA 5		
Year	Quarter			Relative			Relative			Relative			Relative			Relative
		CPUE	Dev	CPUE	CPUE	Dev	CPUE	CPUE	Dev	CPUE	CPUE	Dev	CPUE	CPUE	Dev	CPUE
2000	1	4.1720	0.4400	0.5854	4.8256	0.0029	0.4779	4.4199	0.0152	0.4556	0.3485	0.0231	0.3212	2.0457	0.0037	0.3546
2000	2	1.6980	0.0700	0.2382	4.8817	0.0085	0.4835	1.4357	0.0113	0.1480	0.3418	0.0138	0.3150	3.9262	0.0039	0.6806
2000	3				6.0487	0.0104	0.5990	1.5834	0.0117	0.1632	0.5628	0.0094	0.5187	5.6585	0.0069	0.9809
2000	4				5.4735	0.0052	0.5421	3.6139	0.0112	0.3725	0.2846	0.0137	0.2623	2.1506	0.0066	0.3728
2001	1				6.0516	0.0080	0.5993	3.5109	0.0163	0.3619	0.0994	0.0174	0.0916	1.9365	0.0031	0.3357
2001	2	1.2560	1.0000	0.1762	5.3913	0.0093	0.5339	1.2672	0.0130	0.1306	0.2879	0.0137	0.2653	2.1362	0.0070	0.3703
2001	3				5.7542	0.0135	0.5699	3.0318	0.0110	0.3125	0.5441	0.0067	0.5015	1.2986	0.0075	0.2251
2001	4				6.5944	0.0062	0.6531	2.8011	0.0147	0.2888	0.5179	0.0077	0.4773	0.9962	0.0065	0.1727
2002	1				7.5938	0.0043	0.7521	1.1083	0.0217	0.1143	0.2446	0.0151	0.2255	1.3061	0.0072	0.2264
2002	2	1.2500	0.7000	0.1754	4.0765	0.0066	0.4037	1.5449	0.0150	0.1593	0.3230	0.0179	0.2977	1.4246	0.0121	0.2470
2002	3	2.7990	9.8100	0.3927	1.4496	0.0078	0.1436	2.6233	0.0095	0.2704	0.4098	0.0074	0.3777	1.1230	0.0085	0.1947
2002	4				3.2353	0.0031	0.3204	1.6173	0.0218	0.1667	0.2562	0.0085	0.2362	1.1327	0.0032	0.1964
2003	1				5.4835	0.0043	0.5431	0.8885	0.0294	0.0916	0.1743	0.0556	0.1606	1.0698	0.0068	0.1855
2003	2				6.6727	0.0086	0.6608	0.5483	0.0196	0.0565	0.8650	0.0285	0.7973	1.1847	0.0415	0.2054
2003	3				5.0339	0.0151	0.4985	2.7406	0.0124	0.2825	0.6043	0.0138	0.5570	0.9740	0.0189	0.1688
2003	4				5.7354	0.0044	0.5680	2.4169	0.0228	0.2492	0.4039	0.0189	0.3722	1.8319	0.0072	0.3176
2004	1				3.8040	0.0032	0.3767	1.4466	0.0165	0.1491	0.3817	0.0577	0.3518	1.2611	0.0083	0.2186
2004	2				6.3956	0.0057	0.6334	1.2434	0.0144	0.1282	0.3333	0.0331	0.3072	3.4256	0.0238	0.5938
2004	3				2.8539	0.0073	0.2826	3.0348	0.0076	0.3128	0.7109	0.0134	0.6552	1.5116	0.0092	0.2620
2004	4				5.6461	0.0041	0.5592	2.2360	0.0117	0.2305	0.3549	0.0210	0.3271	1.0797	0.0054	0.1872
2005	1				6.0616	0.0028	0.6003	2.3150	0.0149	0.2386	0.1265	0.0347	0.1166	1.2226	0.0095	0.2119
2005	2	9.5880	0.3100	1.3453	6.6981	0.0040	0.6634	1.9335	0.0081	0.1993	0.5613	0.0325	0.5173	1.7528	0.0167	0.3039
2005	3	1.2360	1.1200	0.1734	2.8245	0.0068	0.2797	2.2861	0.0078	0.2357	0.2707	0.0245	0.2495	1.0463	0.0287	0.1814
2005	4				3.4978	0.0027	0.3464	3.1282	0.0111	0.3225	0.1422	0.0173	0.1310	1.0520	0.0121	0.1824
2006	1	2.7620	2.8400	0.3875	5.8480	0.0024	0.5792	3.0033	0.0135	0.3096	0.0612	0.0224	0.0564	1.7696	0.0046	0.3068
2006	2				6.9269	0.0025	0.6860	2.8427	0.0077	0.2930	0.5584	0.0363	0.5146	3.1183	0.0086	0.5406
2006	3	1.0790	3.3000	0.1514	2.5139	0.0068	0.2490	2.1709	0.0080	0.2238	0.5781	0.0149	0.5328	1.2704	0.0061	0.2202
2006	4	2.1980	0.5800	0.3084	2.7188	0.0027	0.2693	2.3611	0.0082	0.2434	0.5628	0.0263	0.5188	1.0711	0.0051	0.1857
2007	1				2.8470	0.0026	0.2820	1.8179	0.0140	0.1874	0.1294	0.0738	0.1193	1.6971	0.0038	0.2942
2007	2	1.5630	0.0400	0.2193	2.9258	0.0034	0.2898	3.0568	0.0106	0.3151	0.5011	0.0199	0.4619	2.3276	0.0081	0.4035
2007	3				1.8384	0.0060	0.1821	1.9833	0.0079	0.2045	0.3772	0.0137	0.3477	1.3296	0.0072	0.2305
2007	4				2.5057	0.0037	0.2482	1.6728	0.0134	0.1724	0.2279	0.0294	0.2101	1.1846	0.0045	0.2054
2008	1	0.7890	0.2500	0.1107	1.9216	0.0053	0.1903	2.5057	0.0710	0.2583	0.0776	0.1224	0.0715	0.9113	0.0099	0.1580
2008	2	0.1560	0.2000	0.0219	2.2724	0.0092	0.2250	2.3420	0.0614	0.2414	0.7952	0.9121	0.7329	0.3303	0.1633	0.0573
2008	3				1.0874	0.0428	0.1077	0.2440	0.5150	0.0252				0.5565	0.1309	0.0965
2008	4				2.3247	0.1689	0.2302	1.2797	0.1224	0.1319	1.2454	0.9120	1.1479			