Addendum to “SEDAR 38-10”: New South Atlantic logbook index based upon revised mixing zone definition and new indices for the Gulf and South Atlantic using only trolling gear

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Addendum to "SEDAR 38-10": New South Atlantic logbook index based upon revised mixing zone definition and new indices for the Gulf and South Atlantic using only trolling gear

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Summary

This document presents revised indices for use in SEDAR 38 derived from the commercial logbooks. After the SEDAR 38 data workshop the revised mixing zone definition required revising the Atlantic logbook indices and the DW recommended constructing both Atlantic and Gulf indices from trolling only trips. The revised and recommended indices for the Atlantic (Index 7) and Gulf (Index 8) use only trolling trips and span the fishing years 1998/99 to 2012/13 for the Atlantic and fishing years 1995/96 to 2012-13 in the Gulf. The initial years (1993-1997) were removed due to incomplete reporting of logbooks. Indices constructed from trolling trips showed less divergence from nominal values indicative of being less influenced by variable ratios of trolling to handline trips from year to year and it was considered that trolling only trips were more appropriate reflections of relative abundance of king mackerel.

Introduction

During the SEDAR 38 data workshop the life history working group reevaluated the "winter mixing zone" to extend the South Atlantic stock definition down to the Miami-Dade-Monroe county line during the November-April time period. The Gulf stock was extended to the north side of the Florida Keys in the November-April time period. The only remaining 'mixing zone' was Monroe county from south of the keys to the Miami-Dade line. This change is stock definition required revising the South Atlantic index to include samples down to the Miami Dade-Monroe county line. The DW panel also requested model runs limiting index construction to only using trolling gear. Additionally a revision to index 4 was conducted to add the previously significant factor of 'gear' that was missing from the model presented in SEDAR38DW10.

Methods

Revising the South Atlantic stock definition involved including data down to the Miami-Dade-Monroe county line (Figure 1). To best approximate this definition samples from the original winter mixing zone were added to the South Atlantic, with the exception that samples from November-April from areas 2479-2482 were excluded as these would be in the new winter mixing zone (see Figure 1 in SEDAR38 DW 10). The second change was to remove handline gear so that the Gulf and South Atlantic models were constructed with only trolling gear.

Eight different index treatments have been constructed for SEDAR 38. Five of the indices were presented in SEDAR38DW11 and three are presented here. For clarity, all 8 are reviewed here as follows:

- Index 1. Gulf of Mexico, calendar year
- Index 2. Mixing zone only, calendar year, 1993-2012.
- Index 3. Atlantic, calendar year, Flagler-Volusia North (no mixing) 1993-2012.

- Index 4. Gulf of Mexico, fishing year, handline and troll.
- Index 5. Atlantic, fishing year, handline and troll, plus old mixing zone during April-Oct (1993-2012)
- Index 6. Atlantic, fishing year, handline and troll,plus new mixing during April-Oct (1993-2012)
- Index 7. Atlantic, fishing year, plus new mixing during April-Oct, trolling only (1993-2012)
- Index 8. Gulf of Mexico, fishing year, trolling only (1995-2012)

The index treatments (6-8) presented in this document were requested to evaluate both the effects of the new mixing zone which now encompasses the waters south of the Florida Keys to the Miami-Dade – Monroe county line from November – March. This, much smaller, mixing zone substantially increases the number of samples for the Atlantic indices (6 and 7).

During data webinar discussions there was concern over use of **(number of lines fished*number of hooks per line*total hours fished)** as the unit of effort measurement. To address these concerns, several additional analyses were conducted. Nominal CPUE values were calculated on a per trip and on the original units of effort for both the Gulf and South Atlantic to evaluate differences.

Results and Discussion

Deviance tables used to select the final models are shown in Tables 1-4. The final models for indices 4and 6-8 are given below:

The final models for Index 4. (GOM –FY) were:

Proportion positive = Fyear gear hrs_fished numgear1 area1 season effort1 away1
lgcpue = Fyear away1 gear target effort1

Index 6. (SA new mixing –FY) were:

Proportion positive ~ Fyear crew1 gear area1 area1*season
logCPUE ~ Fyear crew1 effort1 area1 hrs_fished target *Fyear*area1*

The interaction effect of *Fyear*area1* was significant but the model did not converge, necessitating dropping these effects.

The final models for Index 7. (SA new mixing –FY only trolling) were:

Proportion positive ~ Fyear effort1 crew1 numgear1 area1 ves_len

The interaction effects of area1*season were significant but the model did not converge, necessitating dropping these effects.

logCPUE ~ Fyear crew1 effort1 hrs_fished area1 target numgear1

The interaction effects of *Fyear*area1* were significant but the model did not converge, necessitating dropping these effects

For Index 8 it was necessary to drop years 1993-1994 as there were only 5 observations of trolling gear prior to 1995. The final models for Index 8. (Gulf –FY only trolling) were:

success = Fyear crew1 numgear1 area1 *Fyear*crew1 Fyear*effort1 Fyear*area1*

lgcpue = Fyear target effort1 area1 numgear1 effort1 hrs_fished away1 Fyear*season

The random effect of Fyear*season did not converge, necessitating dropping these effects.
Parameter estimates for all models are shown in tables 5-12. Relative nominal CPUE, number of trips, proportion positive trips, and relative abundance indices are provided in Tables 13-16.
Plots of the proportion and lognormal models mean values and raw residuals versus model factors are shown in Figures 2-4. These diagnostic plots indicate that most residual plots did not show substantial pattern except that gear type (trolling or handline) displayed some odd patterns, particularly in the pre-1998 time period, indicating further evidence that it may be desirable to drop years pre-1998. Prior to 1998 the logbook reporting was not mandatory so the voluntary reports may not have been representative of the overall CPUE. Diagnostic plots for the lognormal component of the models showing the frequency distribution of log(CPUE) on positive trips and the cumulative normalized residuals (QQ-Plot) from the lognormal model are shown in figures 5-8. Those diagnostic plots indicate that the fit of the data to the lognormal and binomial models was acceptable. There were some outliers among these data, however, and the frequency distribution of log(CPUE) from the Gulf of Mexico and South Atlantic data differed somewhat from the expected normal distribution.

Note that 2013 values are calculated here but as the data for the 2013 SA fishing year (2013 may still be incomplete), it is not recommended to use 2013 values.

The revised GOM index (Figure 9) is very similar to the continuity version of the index and not dissimilar from the initial presentation of this index in SEDAR38-DW10. The only difference is that the model was refit and some different model factors including gear were included in the final models. There is a noteworthy deviation of the index from nominal values in the early part of the time series and also in the last four years.

The Atlantic index (Index 6, Figure 10) was re-estimated to include the new mixing zone. The best approximation of this was to remove observations from Monroe county in the winter (Nov-April). This index is similar to index 5 (Atl, old mixing zone) with a correlation of 78%.

The Atlantic index was also estimated for trolling gear only (Index 7, Figure 11). This index is quite similar to Index 6 (Atl, trolling and handline) with a correlation of 86% after 1997 (Figure 13). This high correlation means that the two indices are largely interchangeable, if the index is used for the years 1998-2012. In the early time series the two indices are quite different, likely due to the incomplete reporting of logbooks (or gear type) prior to 1998.

The Gulf of Mexico index was estimated for trolling gear only (Index 8, Figure 12. This index is similar to Index 4 (GOM, trolling and handline) with a correlation of 67% after 1997 (Figure 14).

There was little difference in the South Atlantic nominal CPUE when effort was calculated by trip or by Hooks*lines*hours (Figure 15) and the correlation in the two calculated vectors was 93% for the Atlantic. For the Gulf the two effort measures still produced correlated indices but the correlation was much weaker, perhaps due to the higher potential for multi-day trips where the number of hours fished varies in the Gulf. The average number of hours fished in the Gulf varied by year ranging from 13-20 hours for trolling trips from 1997-2013, whereas in the Atlantic the number of hours fished was relatively constant between 7-8.4 hours for the same time period. Hence it is likely recommended to use effort, measured in hours to determine CPUE, particularly for the Gulf where the length of a trip shows substantial variation over time.

Index recommendations

The Data workshop recommendations for these indices was to only use the years 1998-2012 due to incomplete reporting prior to 1998. Given the high correlation between the troll only and the troll and handline indices for both regions for the years 1998-2012, the two constructions are likely interchangeable and this decision should simply be based upon which gear type is likely to give a more appropriate signal of relative abundance. The data workshop indicated that trolling only was likely to give the best signal, which would them make index 7 (Atlantic, new mixing, troll only) and index 8 (GOM, Troll only) the indices for use in the stock assessment. In addition, as both indices derived from Trolling only show much higher correlation with the nominal values this indicates that they require less model standardization to account for imbalance due to changing fractions of handline and trolling trips. Hence trolling only is likely to be a more robust fishing method from which to derive an index. The data workshop indicated that trolling only was likely to give the best signal, which would them make index 7 (Atlantic, new mixing, troll only) and index 8 (GOM, Troll only) the indices for use in the stock assessment.

A final comment should be made regarding a pattern in the South Atlantic. The index calculated for the Atlantic exclusive of the old mixing zone (Index 3 in SEDAR38DW10) shows a long term and severe decline whereas the index calculated for just the mixing zone (Index 2 in SEDAR38DW10). By including trips in the mixing zone, and further extending the mixing zone, the latest version of the Atlantic index now is essentially a mixture of the Mixing zone and the Atlantic only, and the increase up until 2010 in the mixing zone appears to balance the long-term declines in the Atlantic. It clearly appears that there is a mix of signals between the two regions, which may be due to different dynamics. If, in fact, the new, expanded mixing zone is representative of the Atlantic stock as assumed by the Data workshop participants then it appears that the mixing zone part of the Atlantic stock is maintaining relatively high CPUE rates while the non-mixing zone part is not. While year*area interaction affects were significant in model testing, the models did not converge with these interactions, necessitating them being dropped from the model. But, to the extent that subsidy from the GOM might inflate CPUE in the mixing zone, particularly in cold years such as 2010, the index calculated for the Atlantic, outside of the mixing zone (Index 3) could be considered as a sensitivity index, but it will need to be calculated by fishing year.

Table 1. Index 4 (GOM -FY) Deviance table analysis to choose model factors and interactions. Factors and interactions were included if they reduced the deviance by 5% or more of the total explained deviance. Factors highlighted in yellow were included in the models. Note that year was always included in model even if it did not meet the 5% criterion.

Model factors positive catch rates values	d.f.	Residual deviance	Change in deviance	% of total deviance	*p*
Intercept		70460.6			
ves_len	2	69300.9	1159.8	2.0%	< 0.001
season	3	69032.4	268.4	0.5%	Fyear
Fyear	21	67627.5	1404.9	2.4%	away1
away1	3	57226.2	10401.3	17.8%	gear
gear	1	53381.4	3844.8	6.6%	target
target	3	23730.7	29650.6	50.7%	effort1
area1	8	21216.1	2514.7	4.3%	< 0.001
crew1	3	20922.9	293.2	0.5%	< 0.001
effort1	4	14020.3	6902.6	11.8%	< 0.001
hrs_fished	5	12857.0	1163.3	2.0%	< 0.001
numgear1	3	12213.1	643.9	1.1%	< 0.001
Fyear*target	60	12075.5	137.6	0.2%	< 0.001
season*Fyear	21	12049.4	26.1	0.0%	< 0.001
Fyear*effort1	80	12005.1	44.3	0.1%	< 0.001
Fyear*numgear1	60	11994.8	10.3	0.0%	< 0.001
season*area1	9	11992.0	2.8	0.0%	< 0.001
Fyear*crew1	60	11986.4	5.6	0.0%	< 0.001

Model factors prop positive rates values	d.f.	Residual deviance	Change in deviance	% of total deviance	*p*
Intercept		35960.3			
ves_len	2	35909.9	50.4	0.3%	< 0.001
hrs_fished	5	34894.9	1014.9	6.6%	< 0.001
crew1	3	34465.5	429.4	2.8%	< 0.001
Fyear	21	34266.3	199.2	1.3%	< 0.001
away1	3	32855.7	1410.7	9.1%	< 0.001
numgear1	3	30902.7	1953.0	12.7%	< 0.001
area1	8	29006.8	1895.9	12.3%	< 0.001
effort1	4	26864.7	2142.1	13.9%	< 0.001
gear	1	22439.4	4425.3	28.7%	< 0.001
season	3	21360.1	1079.3	7.0%	< 0.001
Fyear*gear	20	21263.6	96.5	0.6%	< 0.001
Fyear*away1	63	21100.6	163.0	1.1%	< 0.001
Fyear*numgear1	63	21087.1	13.5	0.1%	< 0.001
Fyear*effort1	84	20994.0	93.1	0.6%	< 0.001
Fyear*season	48	20918.0	76.0	0.5%	< 0.001
Fyear*area1	163	20528.6	389.4	2.5%	< 0.001

Table 2. Index 6 (SA new mixing -FY) Deviance table analysis to choose model factors and interactions. Factors and interactions were included if they reduced the deviance by 5% or more of the total explained deviance. Factors highlighted in yellow were included in the models. Note that year was always included in model even if it did not meet the 5% criterion.

Model factors positive catch rates values	d.f.	Residual deviance	Change in deviance	% of total deviance	*p*
Intercept		465757.1			
ves_len	2	455243.1	10514.0	3.9%	< 0.001
season	3	447837.2	7405.9	2.8%	< 0.001
gear	1	444262.4	3574.8	1.3%	< 0.001
numgear1	2	440038.5	4223.9	1.6%	< 0.001
Fyear	21	431107.8	8930.7	3.3%	< 0.001
crew1	2	392389.7	38718.1	14.4%	< 0.001
effort1	2	376485.4	15904.4	5.9%	< 0.001
area1	14	346326.6	30158.7	11.2%	< 0.001
hrs_fished	5	329940.4	16386.2	6.1%	< 0.001
target	3	236157.3	93783.1	34.9%	< 0.001
away1	3	223566.3	12591.0	4.7%	< 0.001
Fyear*crew1	42	222502.1	1064.2	0.4%	< 0.001
Fyear*target	63	222470.1	32.0	0.0%	< 0.001
Fyear*ves_len	44	221513.6	956.5	0.4%	< 0.001
Fyear*gear	22	220638.0	875.6	0.3%	< 0.001
Fyear*area1	307	206409.1	14228.9	5.3%	< 0.001
area1*season	59	203137.2	3271.8	1.2%	< 0.001
Fyear*numgear1	44	196735.8	6401.5	2.4%	< 0.001

Model factors prop positive rates values	d.f.	Residual deviance	Change in deviance	% of total deviance	*p*
Intercept		432588.8			
ves_len	2	431755.0	833.8	0.6%	< 0.001
season	3	431650.9	104.1	0.1%	< 0.001
effort1	2	430482.9	1168.0	0.8%	< 0.001
hrs_fished	5	426093.1	4389.8	2.9%	< 0.001
away1	3	425692.3	400.9	0.3%	< 0.001
Fyear	21	423851.5	1840.8	1.2%	< 0.001
crew1	2	403441.0	20410.5	13.5%	< 0.001
numgear1	2	403108.8	332.2	0.2%	< 0.001
gear	1	334125.0	68983.8	45.7%	< 0.001
area1	14	304353.7	29771.3	19.7%	< 0.001
Fyear*gear	21	303963.1	390.6	0.3%	< 0.001
Fyear*ves_len	44	303386.5	576.6	0.4%	< 0.001
Fyear*crew1	42	303316.6	69.9	0.0%	< 0.001
Fyear*numgear1	44	299259.6	4057.0	2.7%	< 0.001
Fyear*area1	294	296353.3	2906.3	1.9%	< 0.001
area1*season	45	281751.7	14601.6	9.7%	< 0.001

Table 3. Index 7 (SA new mixing –FY trolling only). Deviance table analysis to choose model factors and interactions. Factors and interactions were included if they reduced the deviance by 5% or more of the total explained deviance. Factors highlighted in yellow were included in the models.Note that year was always included in model even if it did not meet the 5% criterion.

Model factors prop positive rates values	d.f.	Residual deviance	Change in deviance	% of total deviance	*p*
Intercept		76962.0			
hrs_fished	5	76707.7	254.2	1.5%	< 0.001
away1	3	76607.8	99.9	0.6%	< 0.001
Fyear	20	75859.1	748.7	4.4%	< 0.001
effort1	2	74750.5	1108.6	6.6%	< 0.001
crew1	2	73761.7	988.8	5.9%	< 0.001
numgear1	2	72605.6	1156.1	6.9%	< 0.001
area1	14	67872.4	4733.2	28.1%	< 0.001
season	3	67838.6	33.7	0.2%	< 0.001
ves_len	2	67475.2	363.5	2.2%	< 0.001
Fyear*numgear1	40	67090.9	384.3	2.3%	< 0.001
Fyear*ves_len	40	67073.2	17.6	0.1%	< 0.001
Fyear*crew1	40	67054.1	19.1	0.1%	< 0.001
Fyear*area1	278	65365.5	1688.6	10.0%	< 0.001
area1*season	41	60131.1	5234.4	31.1%	< 0.001

Model factors positive catch rates values	d.f.	Residual deviance	Change in deviance	% of total deviance	*p*
Intercept		151956.5			
away1	3	151810.6	145.9	0.2%	< 0.001
crew1	2	151503.4	307.2	0.4%	< 0.001
hrs_fished	5	151438.8	64.5	0.1%	< 0.001
ves_len	2	149949.6	1489.2	2.1%	< 0.001
Fyear	21	146545.7	3403.8	4.9%	< 0.001
season	3	136410.2	10135.5	14.5%	< 0.001
effort1	2	118166.9	18243.3	26.1%	< 0.001
area1	14	111883.9	6283.1	9.0%	< 0.001
target	3	91746.5	20137.4	28.8%	< 0.001
numgear1	2	84230.9	7515.6	10.8%	< 0.001
Fyear*target	63	83966.4	264.6	0.4%	< 0.001
Fyear*numgear1	42	83956.8	9.6	0.0%	< 0.001
season*area1	41	82256.3	1700.5	2.4%	< 0.001
Fyear*area1	287	82130.0	126.3	0.2%	< 0.001

Table 4. Index 8 (Gulf –FY no HL). Deviance table analysis to choose model factors and interactions. Factors and interactions were included if they reduced the deviance by 5% or more of the total explained deviance. Factors highlighted in yellow were included in the models.Note that year was always included in model even if it did not meet the 5% criterion.

Model factors prop positive rates values	d.f.	Residual deviance	Change in deviance	% of total deviance	*p*
Intercept		1734.9			
ves_len	2	1730.3	4.6	0.9%	< 0.001
effort1	3	1719.1	11.2	2.2%	< 0.001
Fyear	15	1679.7	39.4	7.6%	< 0.001
away1	3	1670.2	9.5	1.8%	< 0.001
hrs_fished	5	1656.9	13.3	2.6%	< 0.001
crew1	3	1618.3	38.5	7.5%	< 0.001
numgear1	3	1505.1	113.3	21.9%	< 0.001
area1	8	1421.7	83.4	16.1%	< 0.001
season	3	1405.2	16.5	3.2%	< 0.001
Fyear*crew1	42	1329.5	75.7	14.6%	< 0.001
Fyear*ves_len	31	1322.5	6.9	1.3%	< 0.001
Fyear*numgear1	41	1320.0	2.5	0.5%	< 0.001
Fyear*away1	48	1314.9	5.1	1.0%	< 0.001
area1*season	18	1312.6	2.3	0.4%	< 0.001
Fyear*effort1	37	1280.7	32.0	6.2%	< 0.001
Fyear*hrs_fished	80	1255.5	25.1	4.9%	< 0.001
Fyear*area1	110	1218.0	37.5	7.3%	< 0.001

Model factors positive catch rates values	d.f.	Residual deviance	Change in deviance	% of total deviance	*p*
Intercept		9097.2			
ves_len	2	9093.9	3.3	0.1%	< 0.001
away1	3	8827.9	266.1	6.7%	< 0.001
season	3	8727.0	100.9	2.6%	< 0.001
Fyear	14	8596.5	130.5	3.3%	< 0.001
target	3	8037.9	558.7	14.2%	< 0.001
crew1	3	7932.4	105.5	2.7%	< 0.001
area1	8	6987.7	944.6	23.9%	< 0.001
effort1	3	6127.3	860.5	21.8%	< 0.001
hrs_fished	5	5847.8	279.5	7.1%	< 0.001
numgear1	3	5632.3	215.4	5.5%	< 0.001
Fyear*target	32	5576.0	56.3	1.4%	< 0.001
Fyear*effort1	32	5528.5	47.5	1.2%	< 0.001
Fyear*numgear1	39	5449.3	79.2	2.0%	< 0.001
Fyear*crew1	40	5443.7	5.7	0.1%	< 0.001
Fyear*hrs_fished	70	5368.3	75.4	1.9%	< 0.001
Fyear*season	32	5149.5	218.8	5.5%	< 0.001

Table 5. Index 4 (revised, new model fit), GOM new mixing -FY table of fixed effects for the proportion positive model.

Solution for Fixed Effects

Effect	*gear*	*hrs_fished*	*numgear1*	*area1*	*effort1*	*away1*	*Fyear*	*season*	*Estimate*	*Standard Error*	*DF*	*t Value*	*Pr > |t|*
Intercept									1.7183	0.3467	2967	4.96	<.0001
Fyear							1992		-1.4195	1.5099	2967	-0.94	0.3472
Fyear							1993		-0.3223	0.3387	2967	-0.95	0.3413
Fyear							1994		0.1559	0.3282	2967	0.48	0.6348
Fyear							1995		0.2964	0.3261	2967	0.91	0.3634
Fyear							1996		0.04286	0.3205	2967	0.13	0.8936
Fyear							1997		0.4821	0.3128	2967	1.54	0.1234
Fyear							1998		0.3603	0.3107	2967	1.16	0.2463
Fyear							1999		0.4105	0.3100	2967	1.32	0.1856
Fyear							2000		0.8469	0.3131	2967	2.71	0.0069
Fyear							2001		-0.1009	0.3062	2967	-0.33	0.7418
Fyear							2002		0.2397	0.3068	2967	0.78	0.4347
Fyear							2003		0.2154	0.3114	2967	0.69	0.4892
Fyear							2004		-0.09527	0.3088	2967	-0.31	0.7577
Fyear							2005		-0.5054	0.3167	2967	-1.60	0.1106
Fyear							2006		-0.07015	0.3111	2967	-0.23	0.8216
Fyear							2007		0.4596	0.3116	2967	1.47	0.1403
Fyear							2008		0.3318	0.3090	2967	1.07	0.2830
Fyear							2009		0.8597	0.3162	2967	2.72	0.0066
Fyear							2010		0.5084	0.3291	2967	1.55	0.1224
Fyear							2011		0.2863	0.3363	2967	0.85	0.3947
Fyear							2012		0.6651	0.3367	2967	1.98	0.0483
Fyear							2013		0	.	.	.	.
gear	H								-3.8059	0.1321	440	-28.81	<.0001
gear	TR								0	.	.	.	.
hrs_fished		12-24							0.2122	0.08684	4366	2.44	0.0146
hrs_fished		24-48							0.3057	0.1059	4366	2.89	0.0039
hrs_fished		6-8							0.06255	0.07153	4366	0.87	0.3819
hrs_fished		8-12							0.02814	0.07161	4366	0.39	0.6944
hrs_fished		>48							0.3202	0.1202	4366	2.66	0.0078
hrs_fished		le 6							0	.	.	.	.
numgear1			3						0.4198	0.09832	1419	4.27	<.0001
numgear1			4						0.1436	0.09092	1419	1.58	0.1144
numgear1			1-2						-0.1476	0.09868	1419	-1.50	0.1349
numgear1			5-7						0	.	.	.	.
area1				8					0.8167	0.08739	908	9.35	<.0001
area1				9					0.7797	0.1083	908	7.20	<.0001
area1				13					1.2307	0.1233	908	9.98	<.0001
area1				10-12					1.1817	0.1198	908	9.86	<.0001
area1				14-15					1.9779	0.1367	908	14.47	<.0001
area1				16-17					1.1945	0.1460	908	8.18	<.0001
area1				18-21					1.1703	0.1657	908	7.06	<.0001
area1				3-5					-0.4004	0.1213	908	-3.30	0.0010
area1				6-7					0	.	.	.	.
season								1	-1.8359	0.08629	2172	-21.28	<.0001
season								2	-0.6927	0.08884	2172	-7.80	<.0001
season								3	0.1978	0.04801	2172	4.12	<.0001
season								4	0	.	.	.	.
effort1					1				0.6307	0.06479	1332	9.73	<.0001
effort1					2				0.5167	0.07085	1332	7.29	<.0001
effort1					11-15				-0.8299	0.09822	1332	-8.45	<.0001
effort1					16-20				-0.9085	0.1098	1332	-8.28	<.0001

Solution for Fixed Effects

Effect	gear	hrs_fished	numgear1	area1	effort1	away1	Fyear	season	Estimate	Standard Error	DF	t Value	Pr > |t|
effort1					3-10				0	.	.	.	.
away1						1			0.3147	0.1038	3077	3.03	0.0025
away1						2			0.2106	0.08267	3077	2.55	0.0109
away1						3			0.1551	0.06590	3077	2.35	0.0187
away1						4-10			0	.	.	.	.

Table 6. Index 4 (revised, new model fit), GOM new mixing -FY table of fixed effects for the lognormal submodel

Solution for Fixed Effects

Effect	away1	gear	effort1	Fyear	target	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper
Intercept						0.9171	0.1591	2257	5.76	<.0001	0.05	0.6052	1.2291
Fyear				1992		-0.8463	1.1367	2257	-0.74	0.4566	0.05	-3.0755	1.3828
Fyear				1993		-0.1493	0.2085	2257	-0.72	0.4740	0.05	-0.5583	0.2596
Fyear				1994		-0.1687	0.1940	2257	-0.87	0.3846	0.05	-0.5491	0.2117
Fyear				1995		-0.03420	0.1878	2257	-0.18	0.8555	0.05	-0.4024	0.3340
Fyear				1996		-0.09819	0.1786	2257	-0.55	0.5824	0.05	-0.4483	0.2520
Fyear				1997		0.1164	0.1738	2257	0.67	0.5031	0.05	-0.2244	0.4572
Fyear				1998		0.1002	0.1728	2257	0.58	0.5622	0.05	-0.2387	0.4391
Fyear				1999		-0.04950	0.1711	2257	-0.29	0.7724	0.05	-0.3850	0.2860
Fyear				2000		-0.05820	0.1707	2257	-0.34	0.7332	0.05	-0.3930	0.2766
Fyear				2001		0.02682	0.1708	2257	0.16	0.8752	0.05	-0.3081	0.3617
Fyear				2002		0.02287	0.1697	2257	0.13	0.8928	0.05	-0.3098	0.3556
Fyear				2003		-0.02714	0.1732	2257	-0.16	0.8755	0.05	-0.3667	0.3124
Fyear				2004		-0.01934	0.1741	2257	-0.11	0.9116	0.05	-0.3607	0.3220
Fyear				2005		-0.07182	0.1787	2257	-0.40	0.6878	0.05	-0.4223	0.2787
Fyear				2006		0.01481	0.1755	2257	0.08	0.9327	0.05	-0.3294	0.3590
Fyear				2007		0.1186	0.1756	2257	0.68	0.4995	0.05	-0.2258	0.4630
Fyear				2008		-0.06162	0.1751	2257	-0.35	0.7249	0.05	-0.4049	0.2817
Fyear				2009		0.1659	0.1737	2257	0.96	0.3396	0.05	-0.1747	0.5064
Fyear				2010		0.3658	0.1849	2257	1.98	0.0480	0.05	0.003160	0.7285
Fyear				2011		0.3144	0.1875	2257	1.68	0.0938	0.05	-0.05336	0.6821
Fyear				2012		0.3184	0.1865	2257	1.71	0.0880	0.05	-0.04739	0.6843
Fyear				2013		0	.	.	.	.	.	.	.
away1	1					0.3372	0.03145	1752	10.72	<.0001	0.05	0.2755	0.3989
away1	2					0.4183	0.03026	1752	13.83	<.0001	0.05	0.3590	0.4777
away1	3					0.2651	0.03046	1752	8.70	<.0001	0.05	0.2054	0.3248
away1	4-10					0	.	.	.	.	.	.	.
gear		H				-0.06496	0.03327	251	-1.95	0.0520	0.05	-0.1305	0.000567
gear		TR				0	.	.	.	.	.	.	.
target					1	-3.3272	0.03513	996	-94.72	<.0001	0.05	-3.3961	-3.2583
target					2	-1.1448	0.04556	996	-25.13	<.0001	0.05	-1.2342	-1.0554
target					3	-0.5758	0.04040	996	-14.25	<.0001	0.05	-0.6551	-0.4965
target					4	0	.	.	.	.	.	.	.
effort1			1			1.3591	0.03624	591	37.50	<.0001	0.05	1.2879	1.4303
effort1			2			0.6062	0.03987	591	15.20	<.0001	0.05	0.5279	0.6845
effort1			11-15			-1.2411	0.06556	591	-18.93	<.0001	0.05	-1.3699	-1.1124
effort1			16-20			-1.7961	0.07484	591	-24.00	<.0001	0.05	-1.9431	-1.6491
effort1			3-10			0	.	.	.	.	.	.	.

Table 7. Index 6 (SA new mixing -FY) table of fixed effects for the proportion positive model.

Solution for Fixed Effects

Effect	gear	area1	crew1	Fyear	season	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper
Intercept						2.5985	0.1235	12E3	21.05	<.0001	0.05	2.3565	2.8405
Fyear				1993		0.2030	0.1174	12E3	1.73	0.0837	0.05	-0.02704	0.4330
Fyear				1994		0.2293	0.1137	12E3	2.02	0.0438	0.05	0.006369	0.4523
Fyear				1995		0.4317	0.1115	12E3	3.87	0.0001	0.05	0.2131	0.6503
Fyear				1996		-0.2037	0.1103	12E3	-1.85	0.0648	0.05	-0.4200	0.01254
Fyear				1997		0.2732	0.1070	12E3	2.55	0.0107	0.05	0.06337	0.4830
Fyear				1998		0.2434	0.1037	12E3	2.35	0.0189	0.05	0.04011	0.4467
Fyear				1999		0.3598	0.1037	12E3	3.47	0.0005	0.05	0.1566	0.5631
Fyear				2000		0.5006	0.1034	12E3	4.84	<.0001	0.05	0.2978	0.7034
Fyear				2001		0.5891	0.1028	12E3	5.73	<.0001	0.05	0.3876	0.7906
Fyear				2002		0.6006	0.1029	12E3	5.84	<.0001	0.05	0.3990	0.8023
Fyear				2003		0.4859	0.1035	12E3	4.70	<.0001	0.05	0.2831	0.6887
Fyear				2004		0.5496	0.1034	12E3	5.32	<.0001	0.05	0.3469	0.7523
Fyear				2005		0.6073	0.1042	12E3	5.83	<.0001	0.05	0.4032	0.8115
Fyear				2006		0.6839	0.1040	12E3	6.57	<.0001	0.05	0.4799	0.8878
Fyear				2007		0.4820	0.1036	12E3	4.65	<.0001	0.05	0.2788	0.6851
Fyear				2008		0.5826	0.1038	12E3	5.62	<.0001	0.05	0.3792	0.7860
Fyear				2009		0.4542	0.1044	12E3	4.35	<.0001	0.05	0.2495	0.6589
Fyear				2010		0.4003	0.1059	12E3	3.78	0.0002	0.05	0.1927	0.6078
Fyear				2011		0.2780	0.1074	12E3	2.59	0.0097	0.05	0.06738	0.4885
Fyear				2012		0.1631	0.1094	12E3	1.49	0.1361	0.05	-0.05138	0.3777
Fyear				2013		0	.	.	.	.	.	.	.
gear	H					-2.6056	0.02050	2714	-127.12	<.0001	0.05	-2.6458	-2.5654
gear	TR					0	.	.	.	.	.	.	.
crew1			1			-0.1362	0.02117	7511	-6.43	<.0001	0.05	-0.1777	-0.09468
crew1			2			-0.1449	0.01749	7511	-8.29	<.0001	0.05	-0.1792	-0.1106
crew1			3+			0	.	.	.	.	.	.	.
area1		3				-0.2277	0.1763	4014	-1.29	0.1966	0.05	-0.5732	0.1179
area1		2481				-1.9922	0.09553	4014	-20.85	<.0001	0.05	-2.1795	-1.8049
area1		2680				-1.4028	0.1044	4014	-13.44	<.0001	0.05	-1.6074	-1.1982
area1		1-2,2482				-1.1562	0.09359	4014	-12.35	<.0001	0.05	-1.3397	-0.9727
area1		2479-2480				-1.6334	0.1003	4014	-16.28	<.0001	0.05	-1.8300	-1.4367
area1		2575-2580				-0.3139	0.09626	4014	-3.26	0.0011	0.05	-0.5026	-0.1251
area1		2674-2679				-1.7802	0.09697	4014	-18.36	<.0001	0.05	-1.9703	-1.5901
area1		2777-2779				-1.7611	0.1051	4014	-16.76	<.0001	0.05	-1.9671	-1.5551
area1		2780-2781				-1.6363	0.09108	4014	-17.96	<.0001	0.05	-1.8149	-1.4578
area1		2842-2981				0.04941	0.09621	4014	0.51	0.6076	0.05	-0.1392	0.2380
area1		3075-3280				-0.5989	0.09780	4014	-6.12	<.0001	0.05	-0.7907	-0.4072
area1		3370-3379				-0.4314	0.09349	4014	-4.61	<.0001	0.05	-0.6147	-0.2481
area1		3470-3476				-0.8396	0.09890	4014	-8.49	<.0001	0.05	-1.0335	-0.6457
area1		3477-3478				-1.2572	0.1088	4014	-11.55	<.0001	0.05	-1.4705	-1.0438
area1		3570-3677				0	.	.	.	.	.	.	.
*area1*season*		3			1	-0.06595	0.1410	24E3	-0.47	0.6401	0.05	-0.3424	0.2105
*area1*season*		3			2	-1.0673	0.1775	24E3	-6.01	<.0001	0.05	-1.4152	-0.7194
*area1*season*		3			3	-2.2755	0.2385	24E3	-9.54	<.0001	0.05	-2.7429	-1.8080
*area1*season*		3			4	0	.	.	.	.	.	.	.
*area1*season*		2481			1	0.5478	0.03789	24E3	14.46	<.0001	0.05	0.4735	0.6221
*area1*season*		2481			2	-1.2849	0.05284	24E3	-24.32	<.0001	0.05	-1.3884	-1.1813
*area1*season*		2481			3	-1.6187	0.06877	24E3	-23.54	<.0001	0.05	-1.7535	-1.4839
*area1*season*		2481			4	0	.	.	.	.	.	.	.
*area1*season*		2680			1	0.4483	0.05888	24E3	7.61	<.0001	0.05	0.3329	0.5637
*area1*season*		2680			2	1.6668	0.05773	24E3	28.87	<.0001	0.05	1.5537	1.7799
*area1*season*		2680			3	1.0934	0.05776	24E3	18.93	<.0001	0.05	0.9802	1.2066
*area1*season*		2680			4	0	.	.	.	.	.	.	.
*area1*season*		1-2,2482			1	0.5710	0.03963	24E3	14.41	<.0001	0.05	0.4933	0.6487
*area1*season*		1-2,2482			2	-0.9790	0.04759	24E3	-20.57	<.0001	0.05	-1.0723	-0.8858
*area1*season*		1-2,2482			3	-1.3531	0.05540	24E3	-24.42	<.0001	0.05	-1.4616	-1.2445
*area1*season*		1-2,2482			4	0	.	.	.	.	.	.	.
*area1*season*		2479-2480			1	0.05539	0.04906	24E3	1.13	0.2589	0.05	-0.04077	0.1515
*area1*season*		2479-2480			2	-1.0845	0.05784	24E3	-18.75	<.0001	0.05	-1.1978	-0.9711
*area1*season*		2479-2480			3	-0.7611	0.05700	24E3	-13.35	<.0001	0.05	-0.8729	-0.6494
*area1*season*		2479-2480			4	0	.	.	.	.	.	.	.

Solution for Fixed Effects

Effect	gear	area1	crew1	Fyear	season	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper
area1*season		2575-2580			1	-0.05232	0.04708	24E3	-1.11	0.2665	0.05	-0.1446	0.03996
area1*season		2575-2580			2	-0.06450	0.04437	24E3	-1.45	0.1460	0.05	-0.1515	0.02246
area1*season		2575-2580			3	-0.3612	0.04280	24E3	-8.44	<.0001	0.05	-0.4451	-0.2773
area1*season		2575-2580			4	0	.	.	.	.	.	.	.
area1*season		2674-2679			1	0.7485	0.04394	24E3	17.04	<.0001	0.05	0.6624	0.8346
area1*season		2674-2679			2	2.1547	0.04303	24E3	50.07	<.0001	0.05	2.0704	2.2391
area1*season		2674-2679			3	1.3872	0.04276	24E3	32.44	<.0001	0.05	1.3033	1.4710
area1*season		2674-2679			4	0	.	.	.	.	.	.	.
area1*season		2777-2779			1	0.7299	0.06141	24E3	11.89	<.0001	0.05	0.6096	0.8503
area1*season		2777-2779			2	1.7007	0.06067	24E3	28.03	<.0001	0.05	1.5818	1.8196
area1*season		2777-2779			3	1.3177	0.06101	24E3	21.60	<.0001	0.05	1.1981	1.4373
area1*season		2777-2779			4	0	.	.	.	.	.	.	.
area1*season		2780-2781			1	0.3746	0.03456	24E3	10.84	<.0001	0.05	0.3068	0.4423
area1*season		2780-2781			2	1.8493	0.03670	24E3	50.40	<.0001	0.05	1.7774	1.9213
area1*season		2780-2781			3	1.5260	0.03710	24E3	41.13	<.0001	0.05	1.4533	1.5987
area1*season		2780-2781			4	0	.	.	.	.	.	.	.
area1*season		2842-2981			1	-0.5272	0.04451	24E3	-11.85	<.0001	0.05	-0.6145	-0.4400
area1*season		2842-2981			2	-0.4691	0.04659	24E3	-10.07	<.0001	0.05	-0.5604	-0.3778
area1*season		2842-2981			3	-0.4938	0.04670	24E3	-10.57	<.0001	0.05	-0.5853	-0.4022
area1*season		2842-2981			4	0	.	.	.	.	.	.	.
area1*season		3075-3280			1	-1.2133	0.05811	24E3	-20.88	<.0001	0.05	-1.3272	-1.0994
area1*season		3075-3280			2	0.04298	0.05184	24E3	0.83	0.4070	0.05	-0.05862	0.1446
area1*season		3075-3280			3	0.1337	0.04844	24E3	2.76	0.0058	0.05	0.03874	0.2286
area1*season		3075-3280			4	0	.	.	.	.	.	.	.
area1*season		3370-3379			1	-0.6870	0.04844	24E3	-14.18	<.0001	0.05	-0.7819	-0.5920
area1*season		3370-3379			2	-0.2260	0.04445	24E3	-5.08	<.0001	0.05	-0.3131	-0.1388
area1*season		3370-3379			3	-0.2062	0.04197	24E3	-4.91	<.0001	0.05	-0.2885	-0.1239
area1*season		3370-3379			4	0	.	.	.	.	.	.	.
area1*season		3470-3476			1	-0.6291	0.06777	24E3	-9.28	<.0001	0.05	-0.7619	-0.4962
area1*season		3470-3476			2	-0.4511	0.05933	24E3	-7.60	<.0001	0.05	-0.5674	-0.3349
area1*season		3470-3476			3	-0.4795	0.05528	24E3	-8.67	<.0001	0.05	-0.5879	-0.3712
area1*season		3470-3476			4	0	.	.	.	.	.	.	.
area1*season		3477-3478			1	-0.00221	0.07262	24E3	-0.03	0.9757	0.05	-0.1445	0.1401
area1*season		3477-3478			2	0.1047	0.06628	24E3	1.58	0.1141	0.05	-0.02518	0.2346
area1*season		3477-3478			3	0.06584	0.06222	24E3	1.06	0.2900	0.05	-0.05612	0.1878
area1*season		3477-3478			4	0	.	.	.	.	.	.	.
area1*season		3570-3677			1	-1.2644	0.08742	24E3	-14.46	<.0001	0.05	-1.4357	-1.0930
area1*season		3570-3677			2	-2.0172	0.07607	24E3	-26.52	<.0001	0.05	-2.1663	-1.8681
area1*season		3570-3677			3	-1.7371	0.07418	24E3	-23.42	<.0001	0.05	-1.8825	-1.5917
area1*season		3570-3677			4	0	.	.	.	.	.	.	.

Table 8. Index 6 (SA new mixing -FY) table of fixed effects for the lognormal model.

Solution for Fixed Effects

Effect	crew1	effort1	hrs_fished	area1	Fyear	target	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha
Intercept							0.7135	0.06116	1E4	11.67	<.0001	0.05
Fyear					1993		0.1773	0.07224	1E4	2.45	0.0141	0.05
Fyear					1994		0.2075	0.06866	1E4	3.02	0.0025	0.05
Fyear					1995		0.1295	0.06732	1E4	1.92	0.0545	0.05
Fyear					1996		0.2462	0.06589	1E4	3.74	0.0002	0.05
Fyear					1997		0.1542	0.06289	1E4	2.45	0.0143	0.05
Fyear					1998		0.1340	0.06132	1E4	2.19	0.0288	0.05
Fyear					1999		0.09747	0.06099	1E4	1.60	0.1100	0.05
Fyear					2000		0.09809	0.06084	1E4	1.61	0.1069	0.05
Fyear					2001		0.07118	0.06064	1E4	1.17	0.2405	0.05
Fyear					2002		0.09552	0.06067	1E4	1.57	0.1154	0.05
Fyear					2003		0.1599	0.06100	1E4	2.62	0.0088	0.05
Fyear					2004		0.2386	0.06098	1E4	3.91	<.0001	0.05
Fyear					2005		0.1916	0.06125	1E4	3.13	0.0018	0.05
Fyear					2006		0.2446	0.06117	1E4	4.00	<.0001	0.05
Fyear					2007		0.2479	0.06104	1E4	4.06	<.0001	0.05
Fyear					2008		0.2771	0.06118	1E4	4.53	<.0001	0.05
Fyear					2009		0.3156	0.06162	1E4	5.12	<.0001	0.05
Fyear					2010		0.3138	0.06281	1E4	5.00	<.0001	0.05
Fyear					2011		0.2918	0.06359	1E4	4.59	<.0001	0.05
Fyear					2012		0.1494	0.06459	1E4	2.31	0.0207	0.05
Fyear					2013		0	.	.	.	.	.
crew1	1						0.04724	0.01394	4359	3.39	0.0007	0.05
crew1	2						0.1519	0.01230	4359	12.35	<.0001	0.05
crew1	3+						0	.	.	.	.	.
effort1		1					1.3527	0.01417	3005	95.49	<.0001	0.05
effort1		2					0.5714	0.01438	3005	39.72	<.0001	0.05
effort1		3-20					0	.	.	.	.	.
hrs_fished			12-24				-0.1248	0.01358	11E3	-9.18	<.0001	0.05
hrs_fished			24-48				-0.6695	0.01898	11E3	-35.28	<.0001	0.05
hrs_fished			6-8				0.09474	0.006140	11E3	15.43	<.0001	0.05
hrs_fished			8-12				0.1342	0.008382	11E3	16.01	<.0001	0.05
hrs_fished			>48				-1.2242	0.02321	11E3	-52.75	<.0001	0.05
hrs_fished			le 6				0	.	.	.	.	.
area1				3			0.4266	0.06566	2472	6.50	<.0001	0.05
area1				2481			0.02430	0.03595	2472	0.68	0.4991	0.05
area1				2680			-0.1062	0.03471	2472	-3.06	0.0022	0.05
area1				1-2,2482			0.5473	0.03386	2472	16.16	<.0001	0.05
area1				2479-2480			0.009540	0.04147	2472	0.23	0.8181	0.05
area1				2575-2580			-0.1521	0.03555	2472	-4.28	<.0001	0.05
area1				2674-2679			0.008241	0.03180	2472	0.26	0.7955	0.05
area1				2777-2779			-0.05304	0.03451	2472	-1.54	0.1244	0.05
area1				2780-2781			-0.07084	0.03065	2472	-2.31	0.0209	0.05
area1				2842-2981			0.02833	0.03072	2472	0.92	0.3565	0.05
area1				3075-3280			-0.3112	0.03738	2472	-8.33	<.0001	0.05
area1				3370-3379			-0.2801	0.03146	2472	-8.90	<.0001	0.05
area1				3470-3476			-0.2435	0.03719	2472	-6.55	<.0001	0.05
area1				3477-3478			-0.1147	0.03992	2472	-2.87	0.0041	0.05
area1				3570-3677			0	.	.	.	.	.
target						1	-2.5382	0.009330	1E4	-272.03	<.0001	0.05
target						2	-1.2806	0.009962	1E4	-128.54	<.0001	0.05
target						3	-0.6848	0.008025	1E4	-85.33	<.0001	0.05
target						4	0	.	.	.	.	.

Table 9. Index 7 (SA new mixing -FY) table of fixed effects for the proportion positive model.

Solution for Fixed Effects

Effect	numgear1	area1	crew1	ves_len	Fyear	season	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha
Intercept							0.4885	0.1945	5139	2.51	0.0121	0.05
Fyear					1993		0.2705	0.2719	5139	0.99	0.3198	0.05
Fyear					1994		0.7371	0.2844	5139	2.59	0.0096	0.05
Fyear					1995		-0.03362	0.2359	5139	-0.14	0.8867	0.05
Fyear					1996		0.7430	0.2514	5139	2.96	0.0031	0.05
Fyear					1997		0.8911	0.2208	5139	4.04	<.0001	0.05
Fyear					1998		0.7999	0.2014	5139	3.97	<.0001	0.05
Fyear					1999		0.3720	0.1937	5139	1.92	0.0549	0.05
Fyear					2000		0.3302	0.1925	5139	1.72	0.0863	0.05
Fyear					2001		0.4310	0.1948	5139	2.21	0.0270	0.05
Fyear					2002		0.7423	0.2023	5139	3.67	0.0002	0.05
Fyear					2003		0.6967	0.2039	5139	3.42	0.0006	0.05
Fyear					2004		0.7729	0.2083	5139	3.71	0.0002	0.05
Fyear					2005		0.6796	0.2075	5139	3.28	0.0011	0.05
Fyear					2006		0.8983	0.2128	5139	4.22	<.0001	0.05
Fyear					2007		0.5730	0.2014	5139	2.84	0.0045	0.05
Fyear					2008		0.9102	0.2075	5139	4.39	<.0001	0.05
Fyear					2009		0.3760	0.1983	5139	1.90	0.0580	0.05
Fyear					2010		0.6002	0.2071	5139	2.90	0.0038	0.05
Fyear					2011		0.6647	0.2077	5139	3.20	0.0014	0.05
Fyear					2012		0.5528	0.2121	5139	2.61	0.0092	0.05
Fyear					2013		0	.	.	.	.	.
crew1			1				0.5140	0.05873	1913	8.75	<.0001	0.05
crew1			2				0.3900	0.05407	1913	7.21	<.0001	0.05
crew1			3+				0	.	.	.	.	.
area1		3					2.7038	0.5725	1342	4.72	<.0001	0.05
area1		2481					-0.4822	0.1105	1342	-4.37	<.0001	0.05
area1		2680					0.7437	0.1129	1342	6.59	<.0001	0.05
area1		1-2,2482					0.7904	0.1273	1342	6.21	<.0001	0.05
area1		2479-2480					-0.9274	0.1333	1342	-6.96	<.0001	0.05
area1		2575-2580					-0.5182	0.1249	1342	-4.15	<.0001	0.05
area1		2674-2679					0.4758	0.1000	1342	4.76	<.0001	0.05
area1		2777-2779					0.7299	0.1101	1342	6.63	<.0001	0.05
area1		2780-2781					0.1533	0.09089	1342	1.69	0.0919	0.05
area1		2842-2981					0.8009	0.09551	1342	8.39	<.0001	0.05
area1		3075-3280					0.3159	0.1854	1342	1.70	0.0886	0.05
area1		3370-3379					0.8623	0.1055	1342	8.18	<.0001	0.05
area1		3470-3476					0.2825	0.1145	1342	2.47	0.0137	0.05
area1		3477-3478					1.1087	0.1455	1342	7.62	<.0001	0.05
area1		3570-3677					0	.	.	.	.	.
ves_len				>30-le35			0.01706	0.06708	5139	0.25	0.7993	0.05
ves_len				>35			-0.01974	0.08041	5139	-0.25	0.8061	0.05
ves_len				le30			0	.	.	.	.	.
numgear1	3						0.1279	0.04802	1628	2.66	0.0078	0.05
numgear1	1-2						-0.8271	0.04863	1628	-17.01	<.0001	0.05
numgear1	4-7						0	.	.	.	.	.
season						1	0.05893	0.02354	6969	2.50	0.0123	0.05
season						2	0.2695	0.02408	6969	11.19	<.0001	0.05
season						3	0.3643	0.02525	6969	14.43	<.0001	0.05
season						4	0	.	.	.	.	.

Table 10. Index 7 (SA new mixing –FY, no HL) table of fixed effects for the lognormal model.

Solution for Fixed Effects

Effect	crew1	effort1	hrs_fished	area1	numgear1	Fyear	target	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha
Intercept								0.6546	0.07859	4752	8.33	<.0001	0.05
Fyear						1993		0.09910	0.1135	4752	0.87	0.3828	0.05
Fyear						1994		0.2064	0.1090	4752	1.89	0.0584	0.05
Fyear						1995		0.1394	0.1024	4752	1.36	0.1735	0.05
Fyear						1996		0.4256	0.09840	4752	4.33	<.0001	0.05
Fyear						1997		0.2600	0.08402	4752	3.09	0.0020	0.05
Fyear						1998		0.1840	0.07954	4752	2.31	0.0207	0.05
Fyear						1999		0.1520	0.07904	4752	1.92	0.0545	0.05
Fyear						2000		0.1328	0.07887	4752	1.68	0.0924	0.05
Fyear						2001		0.1193	0.07903	4752	1.51	0.1313	0.05
Fyear						2002		0.1786	0.07954	4752	2.25	0.0248	0.05
Fyear						2003		0.2703	0.07992	4752	3.38	0.0007	0.05
Fyear						2004		0.3677	0.08021	4752	4.58	<.0001	0.05
Fyear						2005		0.3402	0.08104	4752	4.20	<.0001	0.05
Fyear						2006		0.4170	0.08123	4752	5.13	<.0001	0.05
Fyear						2007		0.4122	0.07951	4752	5.18	<.0001	0.05
Fyear						2008		0.3870	0.07925	4752	4.88	<.0001	0.05
Fyear						2009		0.3992	0.07995	4752	4.99	<.0001	0.05
Fyear						2010		0.3491	0.08168	4752	4.27	<.0001	0.05
Fyear						2011		0.3813	0.08154	4752	4.68	<.0001	0.05
Fyear						2012		0.1974	0.08300	4752	2.38	0.0174	0.05
Fyear						2013		0	.	.	.	.	.
crew1	1							-0.09966	0.02395	1669	-4.16	<.0001	0.05
crew1	2							0.06766	0.02252	1669	3.00	0.0027	0.05
crew1	3+							0	.	.	.	.	.
effort1		1						1.2705	0.01965	1169	64.65	<.0001	0.05
effort1		2						0.4914	0.02100	1169	23.40	<.0001	0.05
effort1		3-20						0	.	.	.	.	.
hrs_fished			12-24					0.07294	0.01839	5121	3.97	<.0001	0.05
hrs_fished			24-48					-0.1182	0.03851	5121	-3.07	0.0022	0.05
hrs_fished			6-8					0.1441	0.007446	5121	19.36	<.0001	0.05
hrs_fished			8-12					0.2170	0.01042	5121	20.83	<.0001	0.05
hrs_fished			>48					-0.3147	0.08598	5121	-3.66	0.0003	0.05
hrs_fished			le 6					0	.	.	.	.	.
area1				3				0.3453	0.07689	1232	4.49	<.0001	0.05
area1				2481				-0.3706	0.05494	1232	-6.75	<.0001	0.05
area1				2680				-0.6710	0.04042	1232	-16.60	<.0001	0.05
area1				1-2,2482				0.1608	0.04810	1232	3.34	0.0009	0.05
area1				2479-2480				-0.6114	0.07353	1232	-8.31	<.0001	0.05
area1				2575-2580				-0.9136	0.05872	1232	-15.56	<.0001	0.05
area1				2674-2679				-0.5783	0.03677	1232	-15.73	<.0001	0.05
area1				2777-2779				-0.6108	0.03868	1232	-15.79	<.0001	0.05
area1				2780-2781				-0.5451	0.03395	1232	-16.06	<.0001	0.05
area1				2842-2981				-0.4357	0.03372	1232	-12.92	<.0001	0.05
area1				3075-3280				-0.5424	0.06990	1232	-7.76	<.0001	0.05
area1				3370-3379				-0.3612	0.03513	1232	-10.28	<.0001	0.05
area1				3470-3476				-0.4180	0.04707	1232	-8.88	<.0001	0.05
area1				3477-3478				-0.2583	0.04409	1232	-5.86	<.0001	0.05
area1				3570-3677				0	.	.	.	.	.
target							1	-2.3130	0.01883	4058	-122.81	<.0001	0.05
target							2	-1.3346	0.01494	4058	-89.36	<.0001	0.05
target							3	-0.7027	0.01029	4058	-68.27	<.0001	0.05
target							4	0	.	.	.	.	.
numgear1					3			0.3987	0.01678	1329	23.76	<.0001	0.05

Solution for Fixed Effects

Effect	*crew1*	*effort1*	*hrs_fished*	*area1*	*numgear1*	*Fyear*	*target*	*Estimate*	*Standard Error*	*DF*	*t Value*	*Pr > |t|*	*Alpha*
numgear1					1-2			0.9320	0.01981	1329	47.05	<.0001	0.05
numgear1					4-7			0	.	.	.	.	.

Table 11. Index 8 (Gulf –only trolling) table of fixed effects for the proportion positive model.

Solution for Fixed Effects

Effect	crew1	area1	numgear1	Fyear	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper
Intercept					1.6758	0.8990	50	1.86	0.0682	0.05	-0.1299	3.4815
Fyear				1995	-0.5929	1.0359	50	-0.57	0.5696	0.05	-2.6735	1.4877
Fyear				1996	0.6486	1.0001	50	0.65	0.5196	0.05	-1.3602	2.6574
Fyear				1997	-0.2873	0.8615	50	-0.33	0.7401	0.05	-2.0176	1.4430
Fyear				1998	-0.4319	0.8447	50	-0.51	0.6114	0.05	-2.1285	1.2646
Fyear				1999	1.3468	1.0347	50	1.30	0.1990	0.05	-0.7316	3.4251
Fyear				2000	-0.1835	0.8415	50	-0.22	0.8282	0.05	-1.8737	1.5066
Fyear				2001	-0.4018	0.8259	50	-0.49	0.6287	0.05	-2.0607	1.2570
Fyear				2002	0.3954	0.9266	50	0.43	0.6714	0.05	-1.4657	2.2566
Fyear				2003	-0.3659	0.8513	50	-0.43	0.6692	0.05	-2.0757	1.3440
Fyear				2004	0.2695	0.9860	50	0.27	0.7857	0.05	-1.7109	2.2500
Fyear				2005	-0.5320	0.9452	50	-0.56	0.5760	0.05	-2.4305	1.3664
Fyear				2006	-0.4881	0.8709	50	-0.56	0.5777	0.05	-2.2373	1.2612
Fyear				2007	-0.7741	0.8354	50	-0.93	0.3585	0.05	-2.4520	0.9037
Fyear				2008	-0.7440	0.8262	50	-0.90	0.3722	0.05	-2.4034	0.9154
Fyear				2009	-0.03665	0.8789	50	-0.04	0.9669	0.05	-1.8019	1.7286
Fyear				2010	-0.2551	0.9239	50	-0.28	0.7836	0.05	-2.1109	1.6007
Fyear				2011	-1.0682	0.8691	50	-1.23	0.2248	0.05	-2.8138	0.6773
Fyear				2012	0	.	.	.	.	.	.	.
crew1	1				2.7606	0.3642	50	7.58	<.0001	0.05	2.0290	3.4922
crew1	2				2.1515	0.3428	50	6.28	<.0001	0.05	1.4630	2.8401
crew1	3				1.1455	0.3430	50	3.34	0.0016	0.05	0.4567	1.8344
crew1	4+				0	.	.	.	.	.	.	.
numgear1			1-2		-0.9299	0.4928	7422	-1.89	0.0592	0.05	-1.8960	0.03617
numgear1			3		0.6551	0.5120	7422	1.28	0.2008	0.05	-0.3485	1.6587
numgear1			4		-0.09890	0.4747	7422	-0.21	0.8350	0.05	-1.0294	0.8316
numgear1			5-7		0	.	.	.	.	.	.	.
area1		10-12			0.1045	0.5469	127	0.19	0.8488	0.05	-0.9778	1.1868
area1		13			1.0198	0.5092	127	2.00	0.0473	0.05	0.01214	2.0275
area1		14-15			0.9254	0.4645	127	1.99	0.0485	0.05	0.006232	1.8447
area1		16-17			1.5025	0.6030	127	2.49	0.0140	0.05	0.3093	2.6956
area1		18-21			0.2363	0.9273	127	0.25	0.7993	0.05	-1.5986	2.0711
area1		3-5			-0.7332	0.4299	127	-1.71	0.0905	0.05	-1.5838	0.1175
area1		6-7			0.1333	0.6707	127	0.20	0.8427	0.05	-1.1938	1.4605
area1		8			-0.2963	0.3983	127	-0.74	0.4583	0.05	-1.0844	0.4918
area1		9			0	.	.	.	.	.	.	.

Table 12. Index 8 (GOM, only trolling) table of fixed effects for the lognormal model.

Solution for Fixed Effects

Effect	away1	area1	effort1	numgear1	hrs_fished	Fyear	target	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha
Intercept								0.7900	0.1531	925	5.16	<.0001	0.05
Fyear						1995		-0.03959	0.1777	925	-0.22	0.8238	0.05
Fyear						1996		-0.1401	0.1402	925	-1.00	0.3178	0.05
Fyear						1997		0.08958	0.1342	925	0.67	0.5046	0.05
Fyear						1998		-0.00614	0.1317	925	-0.05	0.9629	0.05
Fyear						1999		-0.2652	0.1271	925	-2.09	0.0372	0.05
Fyear						2000		-0.3036	0.1279	925	-2.37	0.0178	0.05
Fyear						2001		-0.2845	0.1262	925	-2.25	0.0244	0.05
Fyear						2002		-0.3101	0.1265	925	-2.45	0.0145	0.05
Fyear						2003		-0.2770	0.1306	925	-2.12	0.0341	0.05
Fyear						2004		-0.2791	0.1346	925	-2.07	0.0384	0.05
Fyear						2005		-0.1593	0.1447	925	-1.10	0.2712	0.05

Solution for Fixed Effects

Effect	*away1*	*area1*	*effort1*	*numgear1*	*hrs_fished*	*Fyear*	*target*	*Estimate*	*Standard Error*	*DF*	*t Value*	*Pr > |t|*	*Alpha*
Fyear						2006		-0.1799	0.1376	925	-1.31	0.1913	0.05
Fyear						2007		-0.1161	0.1383	925	-0.84	0.4016	0.05
Fyear						2008		-0.1377	0.1385	925	-0.99	0.3204	0.05
Fyear						2009		-0.04263	0.1354	925	-0.31	0.7529	0.05
Fyear						2010		0.1704	0.1491	925	1.14	0.2532	0.05
Fyear						2011		-0.02949	0.1507	925	-0.20	0.8449	0.05
Fyear						2012		0	.	.	.	.	.
target							1	-2.3679	0.1599	137	-14.80	<.0001	0.05
target							2	-1.3557	0.1027	137	-13.21	<.0001	0.05
target							3	-0.5258	0.05945	137	-8.84	<.0001	0.05
target							4	0	.	.	.	.	.
effort1			1					1.2304	0.04939	132	24.91	<.0001	0.05
effort1			11-20					-1.1037	0.1781	132	-6.20	<.0001	0.05
effort1			2					0.4672	0.05674	132	8.23	<.0001	0.05
effort1			3-10					0	.	.	.	.	.
area1		10-12						0.7862	0.06267	283	12.55	<.0001	0.05
area1		13						0.9879	0.05164	283	19.13	<.0001	0.05
area1		14-15						1.0343	0.04893	283	21.14	<.0001	0.05
area1		16-17						1.0062	0.06347	283	15.85	<.0001	0.05
area1		18-21						0.9660	0.1695	283	5.70	<.0001	0.05
area1		3-5						0.4287	0.07700	283	5.57	<.0001	0.05
area1		6-7						0.5043	0.09227	283	5.47	<.0001	0.05
area1		8						0.1958	0.04910	283	3.99	<.0001	0.05
area1		9						0	.	.	.	.	.
numgear1				1-2				0.7225	0.08783	199	8.23	<.0001	0.05
numgear1				3				0.5270	0.08255	199	6.38	<.0001	0.05
numgear1				4				0.1852	0.08133	199	2.28	0.0238	0.05
numgear1				5-7				0	.	.	.	.	.
hrs_fished					12-24			0.04196	0.04509	1150	0.93	0.3523	0.05
hrs_fished					24-48			-0.2633	0.05801	1150	-4.54	<.0001	0.05
hrs_fished					6-8			0.1498	0.03234	1150	4.63	<.0001	0.05
hrs_fished					8-12			0.2235	0.03442	1150	6.49	<.0001	0.05
hrs_fished					>48			-0.5462	0.08930	1150	-6.12	<.0001	0.05
hrs_fished					le 6			0	.	.	.	.	.
away1	1							-0.2740	0.06124	816	-4.47	<.0001	0.05
away1	2							-0.2068	0.05146	816	-4.02	<.0001	0.05
away1	3							-0.1306	0.04272	816	-3.06	0.0023	0.05
away1	4-10							0	.	.	.	.	.

Table 13. Index 4 (revised, new model fit), GOM new mixing -FY CPUE and other information. Years in italics are not recommended for model inclusion.

Fishing YEAR	CPUE	Lower 95% CI (Index)	Upper 95% CI (Index)	CV	SE	Trips	Relative Nominal CPUE	Obs % positive	Est % positive	Obs CPUE pos-itives	Est CPUE pos-itives
1993-1994	*0.678*	*0.456*	*1.009*	*0.201*	*0.491*	*406*	*1.624*	*27.8%*	*56.6%*	*5.83*	*4.33*
1994-1995	*0.773*	*0.563*	*1.063*	*0.160*	*0.447*	*507*	*2.339*	*36.5%*	*65.7%*	*6.41*	*4.25*
1995-1996	*0.926*	*0.693*	*1.238*	*0.146*	*0.488*	*680*	*3.511*	*37.1%*	*68.5%*	*9.47*	*4.89*
1996-1997	*0.802*	*0.612*	*1.050*	*0.135*	*0.392*	*991*	*5.048*	*52.4%*	*63.1%*	*9.64*	*4.59*
1997-1998	*1.141*	*0.917*	*1.420*	*0.110*	*0.452*	*1255*	*8.324*	*50.7%*	*72.4%*	*16.43*	*5.70*
1998-1999	1.081	0.867	1.348	0.110	0.431	1444	5.808	46.4%	69.7%	12.52	5.60
1999-2000	0.947	0.768	1.168	0.105	0.359	1677	8.092	56.8%	70.9%	14.24	4.83
2000-2001	1.046	0.864	1.267	0.096	0.362	1279	9.168	73.3%	78.9%	12.51	4.79
2001-2002	0.859	0.683	1.081	0.115	0.358	1726	6.687	56.5%	59.6%	11.84	5.21
2002-2003	0.966	0.784	1.190	0.105	0.365	1654	7.448	61.0%	67.3%	12.21	5.19
2003-2004	0.911	0.725	1.145	0.115	0.377	1446	8.611	66.7%	67.0%	12.90	4.92
2004-2005	0.757	0.592	0.968	0.123	0.337	2121	5.317	39.7%	57.6%	13.39	4.75
2005-2006	0.690	0.516	0.922	0.146	0.363	1598	6.609	37.7%	51.8%	17.54	4.81
2006-2007	0.929	0.730	1.183	0.121	0.407	1757	7.111	48.0%	63.8%	14.80	5.26
2007-2008	1.109	0.886	1.387	0.112	0.450	1676	7.586	50.8%	70.8%	14.94	5.66
2008-2009	0.966	0.772	1.209	0.112	0.392	1811	7.905	50.1%	70.4%	15.78	4.95
2009-2010	1.350	1.098	1.661	0.104	0.506	1075	12.494	76.7%	80.6%	16.28	6.05
2010-2011	1.470	1.123	1.923	0.135	0.717	927	23.830	60.1%	72.8%	39.66	7.29
2011-2012	1.302	0.968	1.753	0.149	0.702	752	16.682	71.3%	68.5%	23.41	6.87
2012-2013	1.468	1.120	1.923	0.136	0.719	802	16.616	79.1%	76.2%	21.02	6.95
2013-2014	*0.828*	*0.527*	*1.300*	*0.229*	*0.684*	*250*	*10.103*	*60.8%*	*62.2%*	*16.62*	*4.81*

Table 14. Index 6, SA new mixing -FY CPUE and other information. Years in italics are not recommended for model inclusion.

Fishing YEAR	CPUE	Lower 95% CI (Index)	Upper 95% CI (Index)	CV	SE	Trips	Relative Nominal CPUE	Obs % positive	Est % positive	Obs CPUE pos-itives	Est CPUE pos-itives
1993-1994	*0.925*	*0.821*	*1.042*	*0.059*	*0.215*	*6466*	*0.351*	*36.0%*	*58.1%*	*2.10*	*6.24*
1994-1995	*0.964*	*0.867*	*1.073*	*0.053*	*0.202*	*8061*	*0.409*	*34.1%*	*58.7%*	*2.45*	*6.43*
1995-1996	*0.965*	*0.875*	*1.065*	*0.049*	*0.186*	*8621*	*0.406*	*36.8%*	*63.5%*	*2.43*	*5.95*
1996-1997	*0.819*	*0.737*	*0.910*	*0.053*	*0.169*	*10361*	*0.418*	*32.1%*	*48.0%*	*2.51*	*6.69*
1997-1998	0.931	0.855	1.014	0.043	0.155	12460	0.598	42.6%	59.8%	3.59	6.10
1998-1999	0.901	0.834	0.974	0.039	0.137	19937	0.848	58.0%	59.0%	5.08	5.98
1999-2000	0.910	0.844	0.981	0.038	0.134	19272	0.772	55.2%	61.8%	4.63	5.76
2000-2001	0.959	0.892	1.031	0.036	0.136	19167	0.775	57.4%	65.1%	4.65	5.77
2001-2002	0.962	0.896	1.032	0.035	0.133	19920	0.831	56.1%	67.1%	4.98	5.61
2002-2003	0.989	0.922	1.061	0.035	0.137	19841	0.954	59.1%	67.3%	5.72	5.75
2003-2004	1.015	0.943	1.092	0.037	0.146	18997	1.307	59.0%	64.8%	7.84	6.14
2004-2005	1.122	1.044	1.206	0.036	0.159	17887	1.378	56.0%	66.2%	8.26	6.64
2005-2006	1.091	1.014	1.174	0.037	0.157	15785	1.214	55.8%	67.5%	7.27	6.33
2006-2007	1.179	1.097	1.267	0.036	0.167	17392	1.484	60.4%	69.1%	8.89	6.68
2007-2008	1.106	1.028	1.191	0.037	0.160	18117	1.278	58.1%	64.7%	7.66	6.70
2008-2009	1.179	1.096	1.269	0.037	0.169	18307	1.518	62.8%	66.9%	9.10	6.90
2009-2010	1.172	1.086	1.265	0.038	0.176	18118	1.600	59.9%	64.0%	9.59	7.17
2010-2011	1.147	1.057	1.245	0.041	0.184	15477	1.758	60.7%	62.8%	10.54	7.15
2011-2012	1.070	0.981	1.168	0.044	0.183	13322	1.331	53.2%	59.9%	7.98	7.00
2012-2013	0.885	0.806	0.972	0.047	0.163	11204	1.089	52.0%	57.1%	6.53	6.07
2013-2014	*0.708*	*0.618*	*0.810*	*0.068*	*0.187*	*3890*	*0.682*	*42.8%*	*53.1%*	*4.09*	*5.22*

Table 15. Index 7, SA new mixing –FY, no hl CPUE and other information. Years in red italics are not recommended for model inclusion.

Fishing YEAR	CPUE	Lower 95% CI (Index)	Upper 95% CI (Index)	CV	SE	Trips	Relative Nominal CPUE	Obs % positive	Est % positive	Obs CPUE pos-itives	Est CPUE pos-itives
1993-1994	*0.803*	*0.659*	*0.980*	*0.100*	*0.544*	*706*	*0.622*	*81.6%*	*81.3%*	*6.37*	*6.72*
1994-1995	*0.962*	*0.804*	*1.151*	*0.090*	*0.589*	*830*	*0.812*	*72.7%*	*87.4%*	*8.32*	*7.49*
1995-1996	*0.785*	*0.661*	*0.934*	*0.087*	*0.463*	*1125*	*0.743*	*72.7%*	*76.2%*	*7.61*	*7.01*
1996-1997	*1.200*	*1.033*	*1.394*	*0.075*	*0.613*	*1057*	*1.019*	*78.2%*	*87.4%*	*10.44*	*9.33*
1997-1998	*1.036*	*0.933*	*1.150*	*0.052*	*0.368*	*2595*	*0.948*	*85.1%*	*89.0%*	*9.70*	*7.92*
1998-1999	0.951	0.871	1.038	0.044	0.283	8537	0.866	91.9%	88.1%	8.87	7.34
1999-2000	0.866	0.792	0.946	0.044	0.261	7940	0.768	88.6%	82.8%	7.86	7.11
2000-2001	0.843	0.772	0.921	0.044	0.253	8400	0.742	87.8%	82.2%	7.60	6.97
2001-2002	0.846	0.775	0.924	0.044	0.254	8071	0.817	88.9%	83.6%	8.37	6.88
2002-2003	0.939	0.860	1.026	0.044	0.282	8186	0.831	91.8%	87.4%	8.51	7.30
2003-2004	1.023	0.935	1.120	0.045	0.314	7725	1.078	91.3%	86.9%	11.04	8.00
2004-2005	1.139	1.039	1.247	0.046	0.353	6313	1.170	91.1%	87.8%	11.99	8.82
2005-2006	1.095	0.995	1.203	0.047	0.353	5622	1.106	88.8%	86.7%	11.33	8.58
2006-2007	1.214	1.105	1.333	0.047	0.389	6533	1.255	91.2%	89.1%	12.85	9.27
2007-2008	1.159	1.060	1.268	0.045	0.354	6701	1.186	90.5%	85.5%	12.15	9.22
2008-2009	1.179	1.082	1.286	0.043	0.347	7438	1.254	92.4%	89.2%	12.85	8.99
2009-2010	1.109	1.010	1.217	0.047	0.352	7165	1.270	87.9%	82.8%	13.00	9.10
2010-2011	1.092	0.990	1.205	0.049	0.365	6259	1.498	87.8%	85.8%	15.34	8.66
2011-2012	1.138	1.033	1.254	0.048	0.375	4971	1.261	85.5%	86.6%	12.92	8.94
2012-2013	0.932	0.840	1.034	0.052	0.329	4217	1.006	86.8%	85.2%	10.30	7.44
2013-2014	*0.689*	*0.588*	*0.807*	*0.079*	*0.371*	*996*	*0.747*	*81.3%*	*76.8%*	*7.65*	*6.10*

Table 16. Index 8, Gulf of Mexico FY trolling only and other.

Fishing YEAR	CPUE	Lower 95% CI (Index)	Upper 95% CI (Index)	CV	SE	Trips	Relative Nominal CPUE	Obs % positive	Est % positive	Obs CPUE pos-itives	Est CPUE pos-itives
1995-1996	1.058	0.784	1.427	0.151	2.175	81	23.718	95.1%	94.2%	24.95	15.32
1996-1997	1.003	0.829	1.213	0.095	1.306	271	15.324	97.8%	98.3%	15.67	13.92
1997-1998	1.232	1.033	1.470	0.088	1.484	315	26.329	96.5%	95.8%	27.28	17.56
1998-1999	1.113	0.939	1.319	0.085	1.293	353	18.070	96.6%	95.2%	18.71	15.95
1999-2000	0.895	0.771	1.039	0.075	0.911	614	16.067	99.3%	99.2%	16.17	12.32
2000-2001	0.835	0.715	0.975	0.078	0.886	548	14.568	96.4%	96.0%	15.12	11.86
2001-2002	0.845	0.726	0.984	0.076	0.880	588	13.708	96.1%	95.3%	14.27	12.10
2002-2003	0.843	0.726	0.980	0.075	0.866	557	17.692	98.9%	97.5%	17.88	11.80
2003-2004	0.849	0.720	1.002	0.083	0.960	600	15.829	97.5%	95.8%	16.23	12.10
2004-2005	0.854	0.717	1.017	0.088	1.020	457	19.937	97.8%	96.8%	20.38	12.04
2005-2006	0.927	0.755	1.138	0.103	1.300	342	24.535	98.8%	95.8%	24.82	13.19
2006-2007	0.911	0.746	1.114	0.101	1.250	459	20.340	92.8%	90.5%	21.92	13.75
2007-2008	1.015	0.844	1.220	0.092	1.278	478	21.245	98.1%	96.9%	21.65	14.30
2008-2009	0.976	0.805	1.183	0.097	1.288	473	21.043	95.6%	92.9%	22.02	14.33
2009-2010	1.120	0.933	1.344	0.091	1.397	409	20.093	98.0%	97.2%	20.49	15.71
2010-2011	1.335	1.072	1.664	0.110	2.013	336	47.995	97.9%	95.8%	49.02	19.01
2011-2012	1.043	0.821	1.326	0.120	1.712	333	25.854	97.0%	91.3%	26.65	15.58
2012-2013	1.146	0.929	1.413	0.105	1.644	422	23.522	98.6%	96.9%	23.86	16.13

Figure 1. New mixing zone definition.

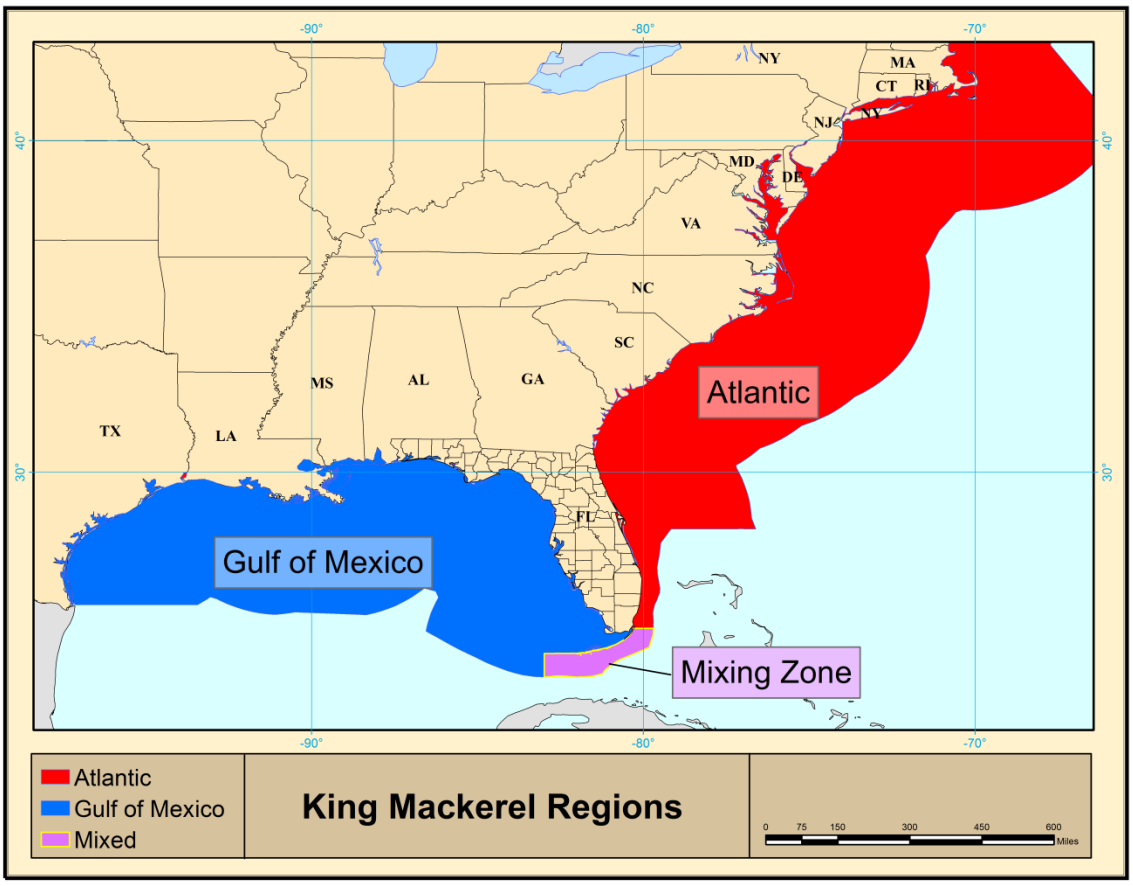


Figure 2. Index 4 (Revised).

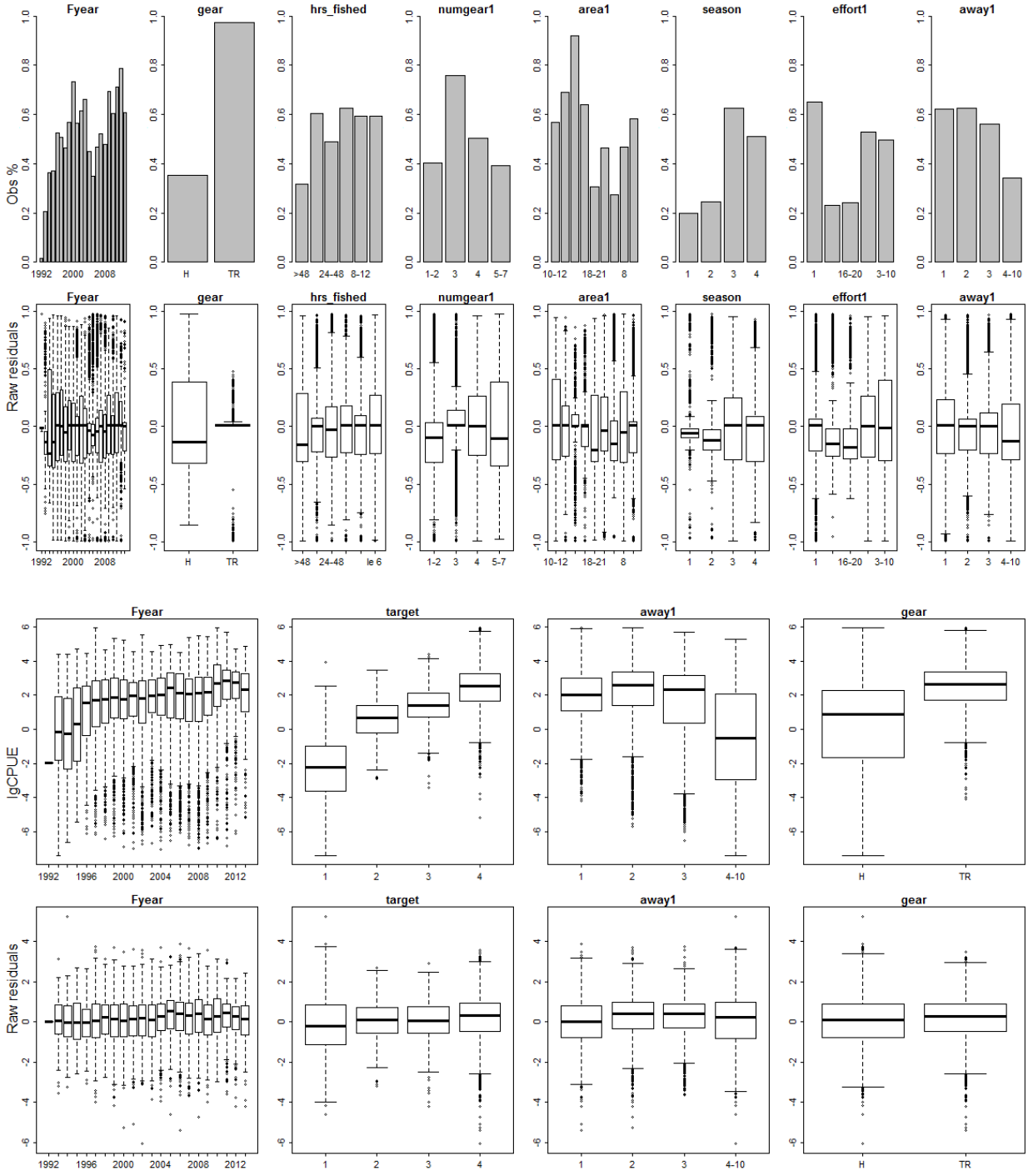


Figure 2. Index 6. SA zone proportion positive and lognormal models raw residuals versus model factors.

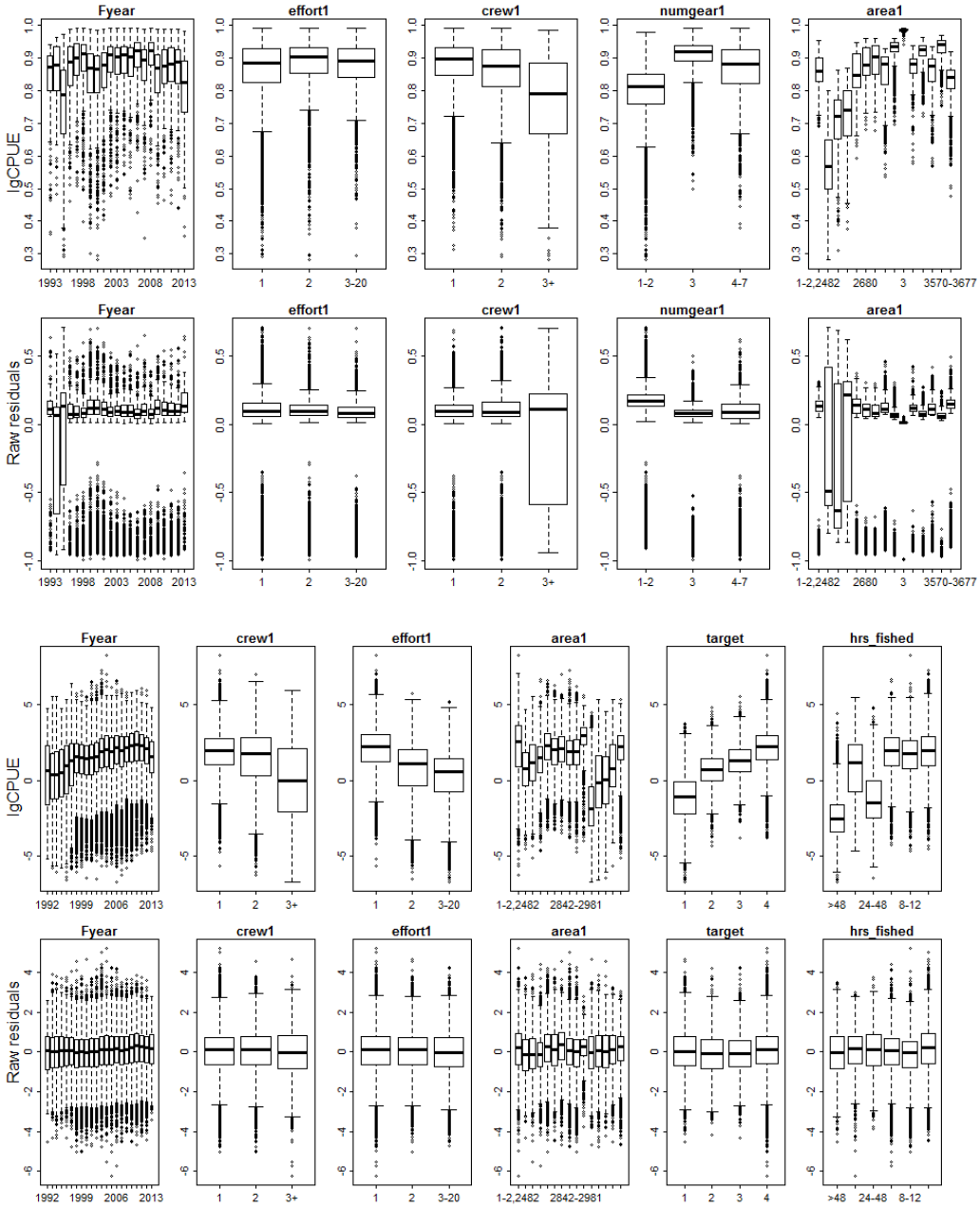


Figure 3. Index 7. SA zone proportion positive and lognormal models raw residuals versus model factors.

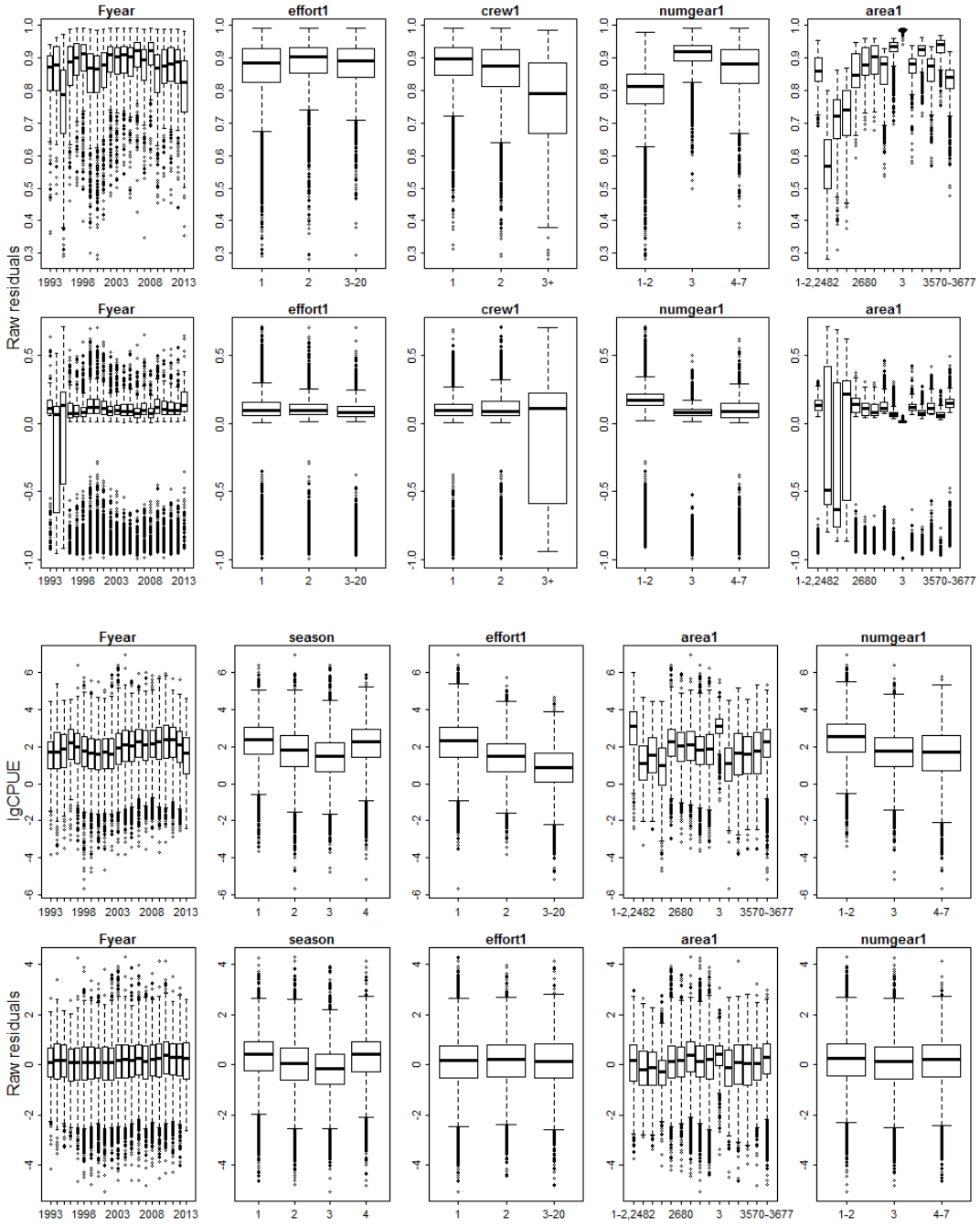


Figure 4. Index 8. GOM proportion positive and lognormal models raw residuals versus model factors.

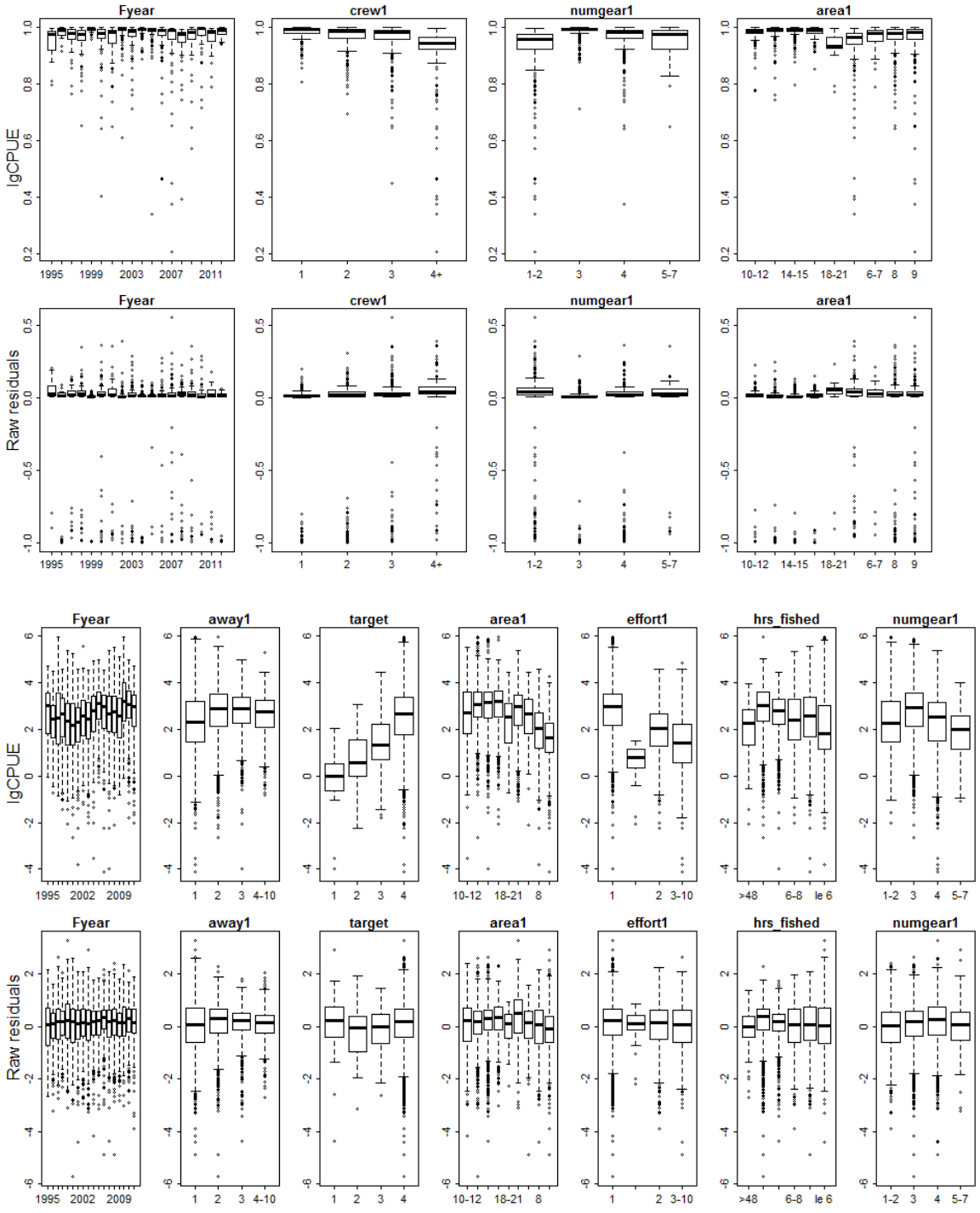


Figure 5. Index 4 Diagnostic plots for the lognormal component of the GOM FY 1993-2013 king mackerel commercial hook and line gear model: **A**) the frequency distribution of log(CPUE) on positive trips, **B**) the cumulative normalized residuals (QQ-Plot) from the lognormal model. The red line is the expected normal distribution.

A. **B.**

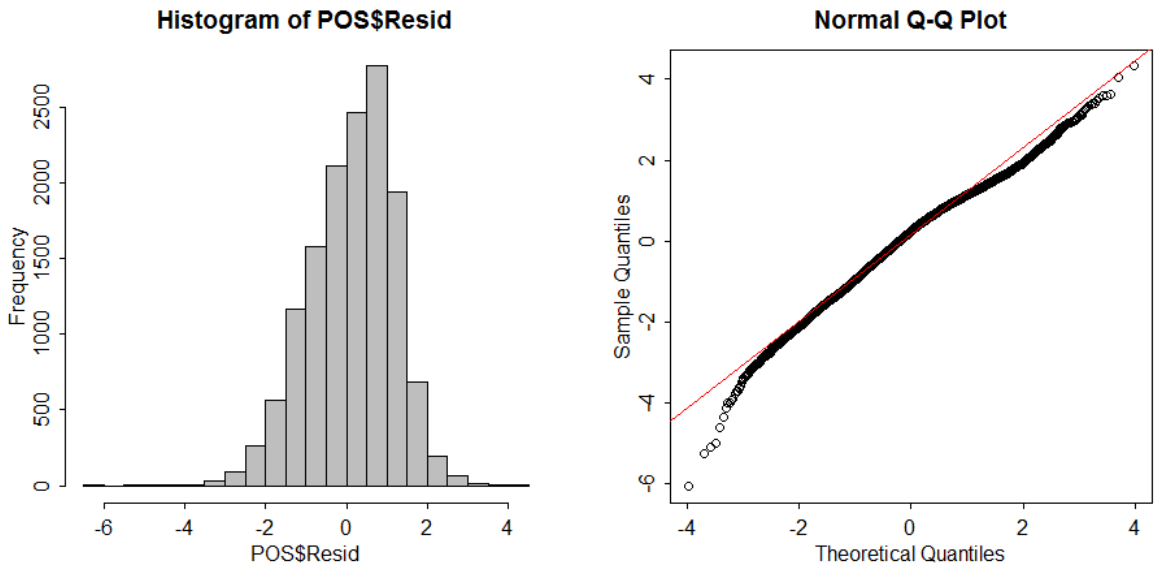


Figure 6. Index 6 Diagnostic plots for the lognormal component of the ATL 1993-2013 king mackerel commercial hook and line gear model: **A**) the frequency distribution of log(CPUE) on positive trips, **B**) the cumulative normalized residuals (QQ-Plot) from the lognormal model. The red line is the expected normal distribution.

B. **B.**

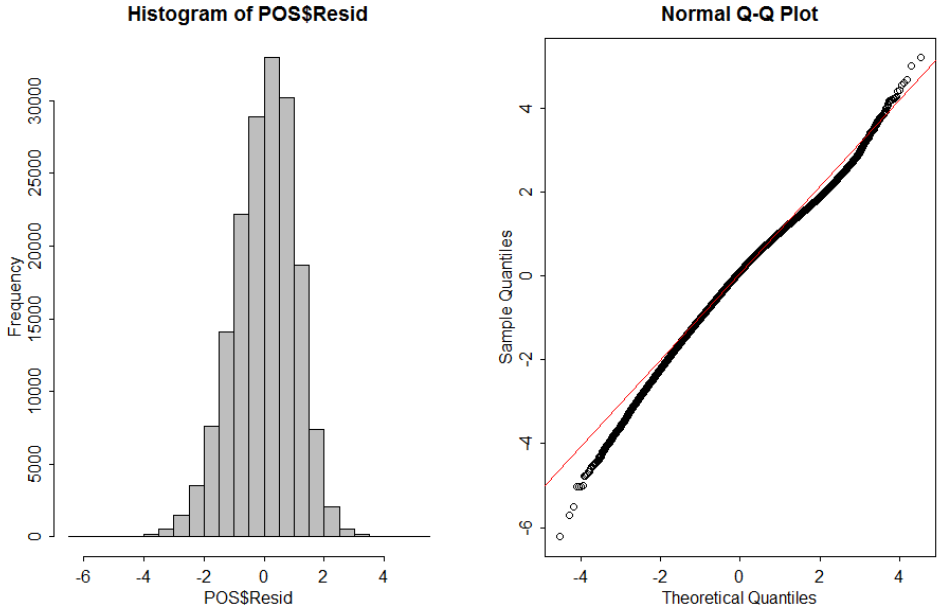
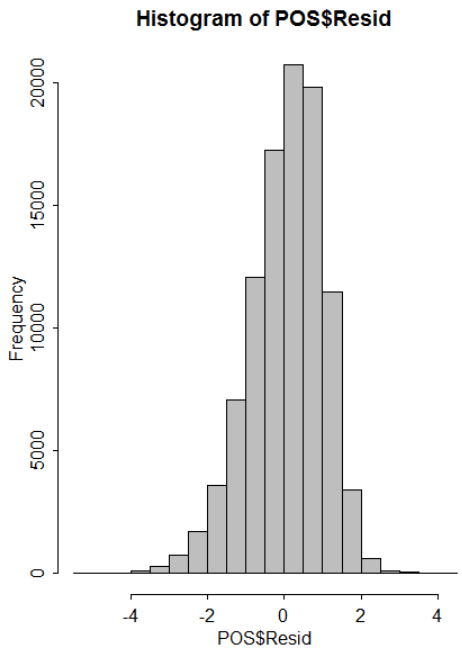


Figure 7. Index 7. Diagnostic plots for the lognormal component of the ATL 1993-2013 king mackerel commercial hook and line gear model: **A**) the frequency distribution of log(CPUE) on positive trips, **B**) the cumulative normalized residuals (QQ-Plot) from the lognormal model. The red line is the expected normal distribution.

A.



B.

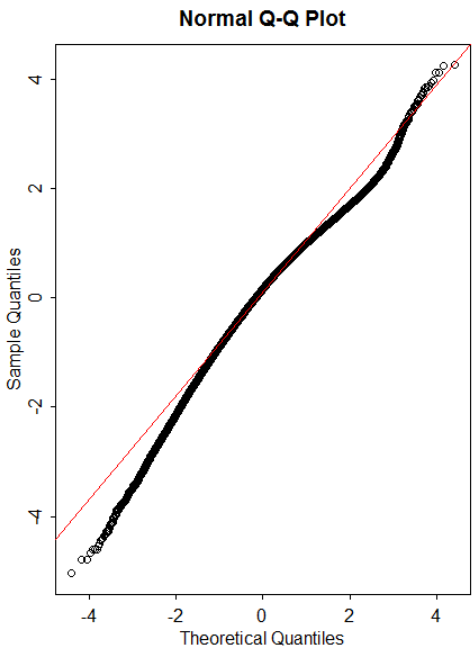
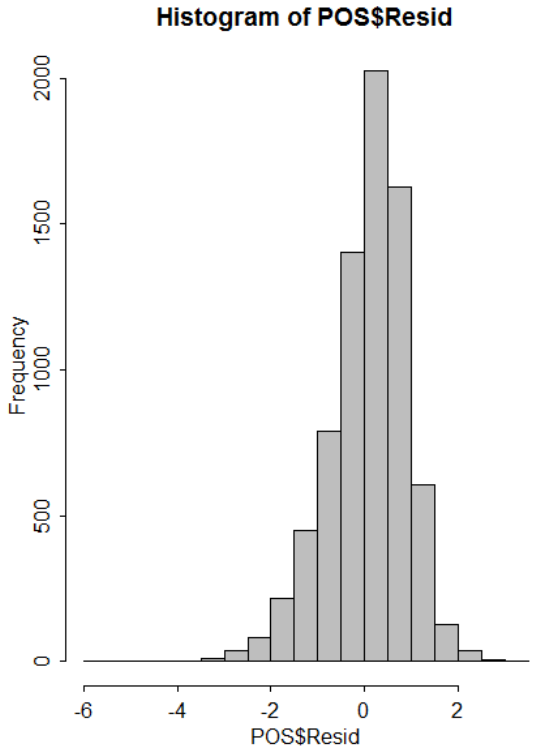


Figure 8. Index 8. Diagnostic plots for the lognormal component of the Gulf of Mexico 1995-2013 king mackerel trolling only index: **A**) the frequency distribution of log(CPUE) on positive trips, **B**) the cumulative normalized residuals (QQ-Plot) from the lognormal model. The red line is the expected normal distribution.

A.



B.

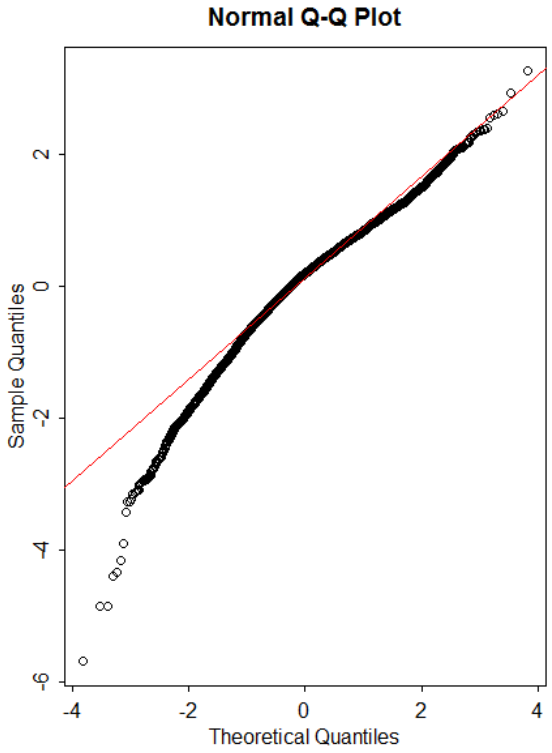


Figure 9. Index 4, Gulf of Mexico, fishing year (1993-2013) nominal CPUE (solid circles), standardized CPUE (orange line) and upper and lower 95% confidence limitsd. The green line is the continuity version that uses calendar year.

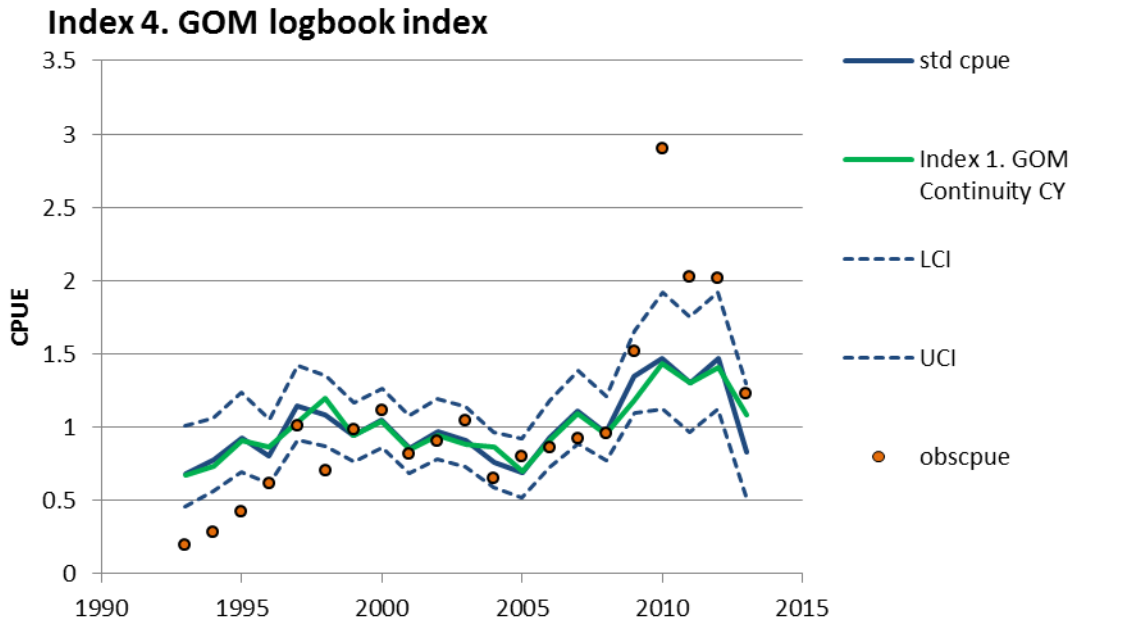


Figure 10. Index 6, New mixing zone definition of Atlantic king mackerel (1993-2013) nominal CPUE (solid circles), standardized CPUE (orange line) and upper and lower 95% confidence limits. The blue line is the Atlantic with the old definition of the mixing zone (Collier-Monroe-Flagler/Volusia line) for both handline and trolling gear. The green line and green points are the continuity Atlantic index and nominal values (Index 3) which is calculated only from data from the Atlantic from North of the Flagler-Volusia county line.

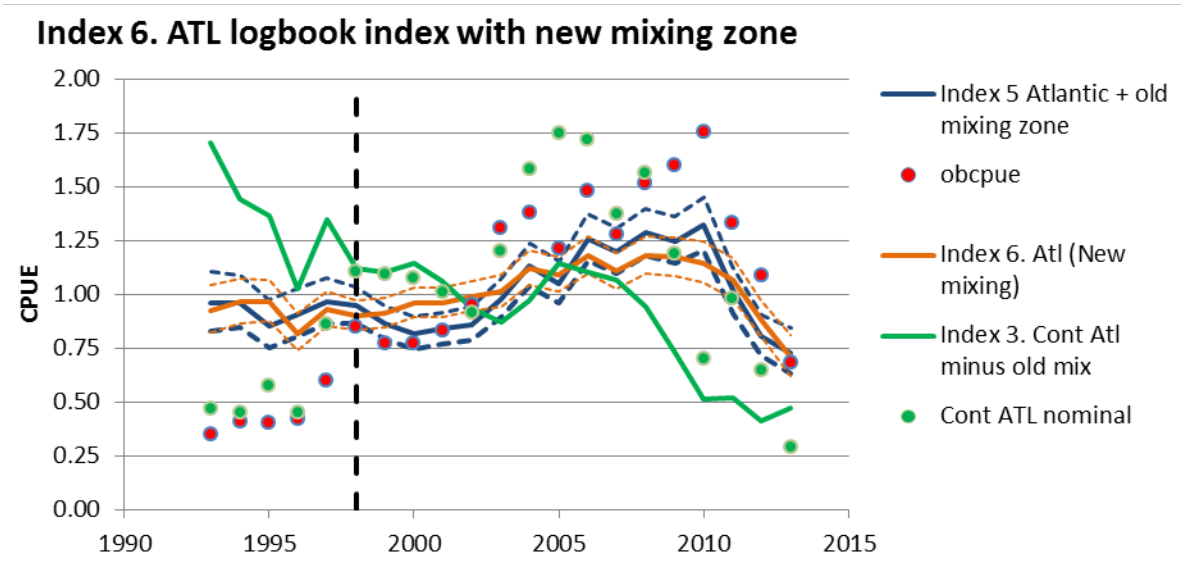


Figure 11. Index 7, king mackerel (1993-2013) nominal CPUE (solid circles), standardized CPUE (blue line) and upper and lower 95% confidence limits for vessels fishing trolling gear only in the Atlantic by fishing year contrasted with Index 6. Atlantic, new mix troll and handline.

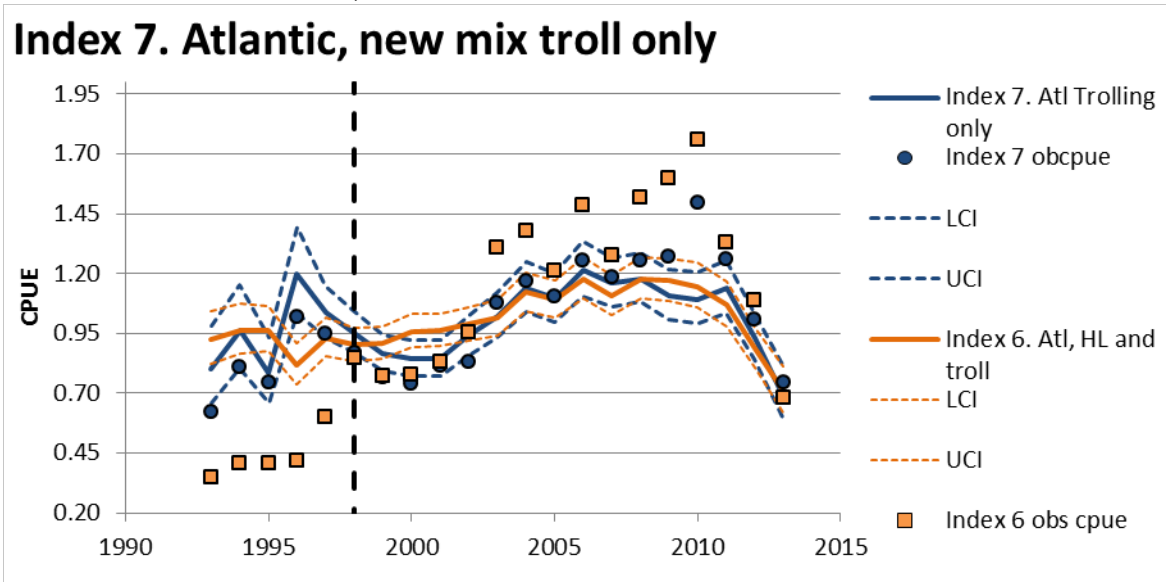


Figure 12. Index 8, king mackerel (1993-2013) nominal CPUE (solid circles) and standardized CPUE (blue line) and upper and lower 95% confidence limits (dashed lines) for trolling gear only in the Gulf of Mexico by fishing year contrasted with the same index but for trolling and handline gear (index 4).

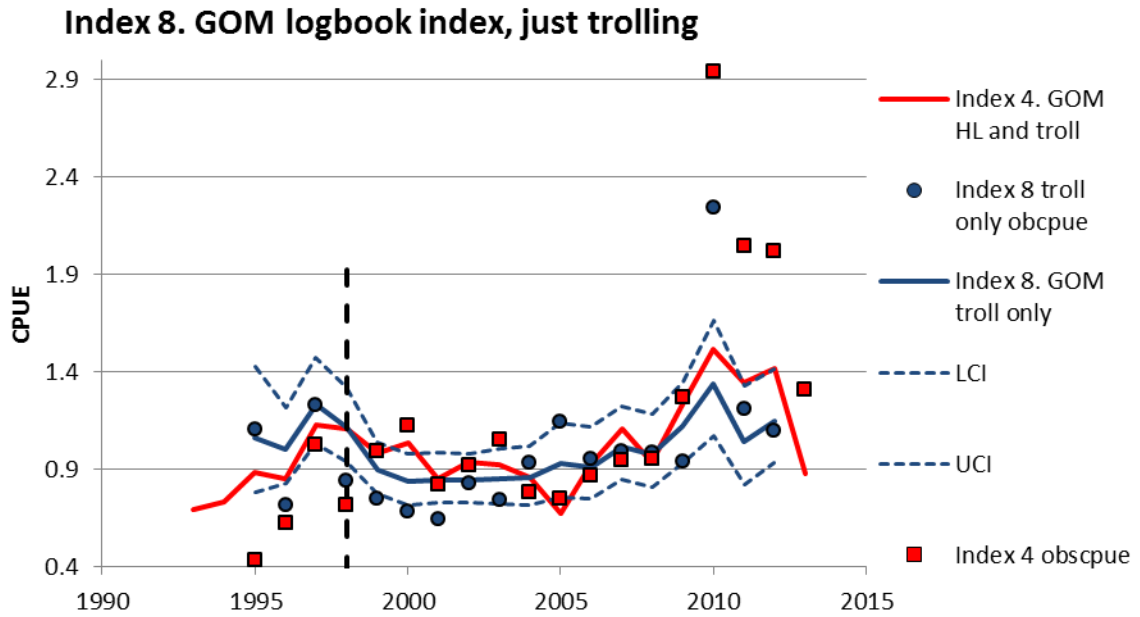


Figure 13. Index 6 (ATL HL and trolling) and Index 7 (ATL just trolling). Post 1997, the correlation is 86%.

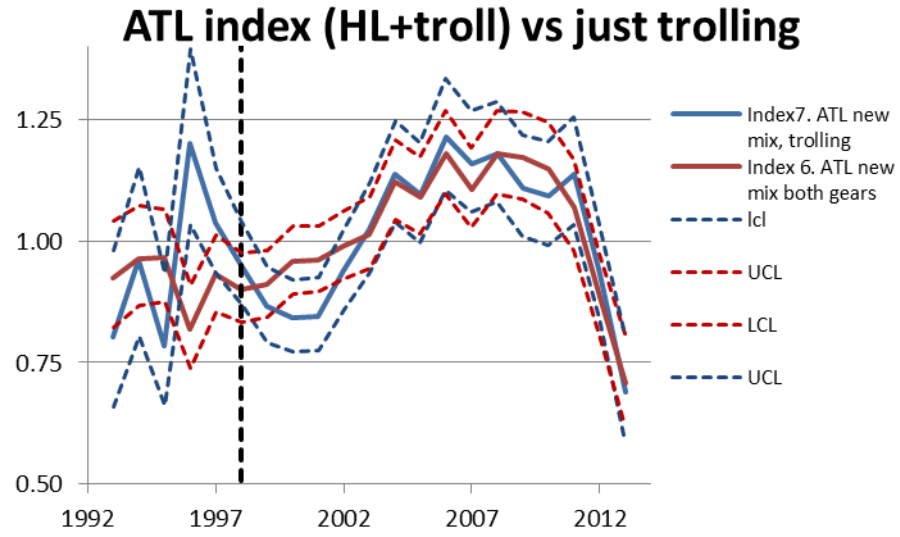


Figure 14. Index 4 (GOM FY HL and trolling) and Index 8 (GOM FY just trolling). Post 1997, the correlation 67%.

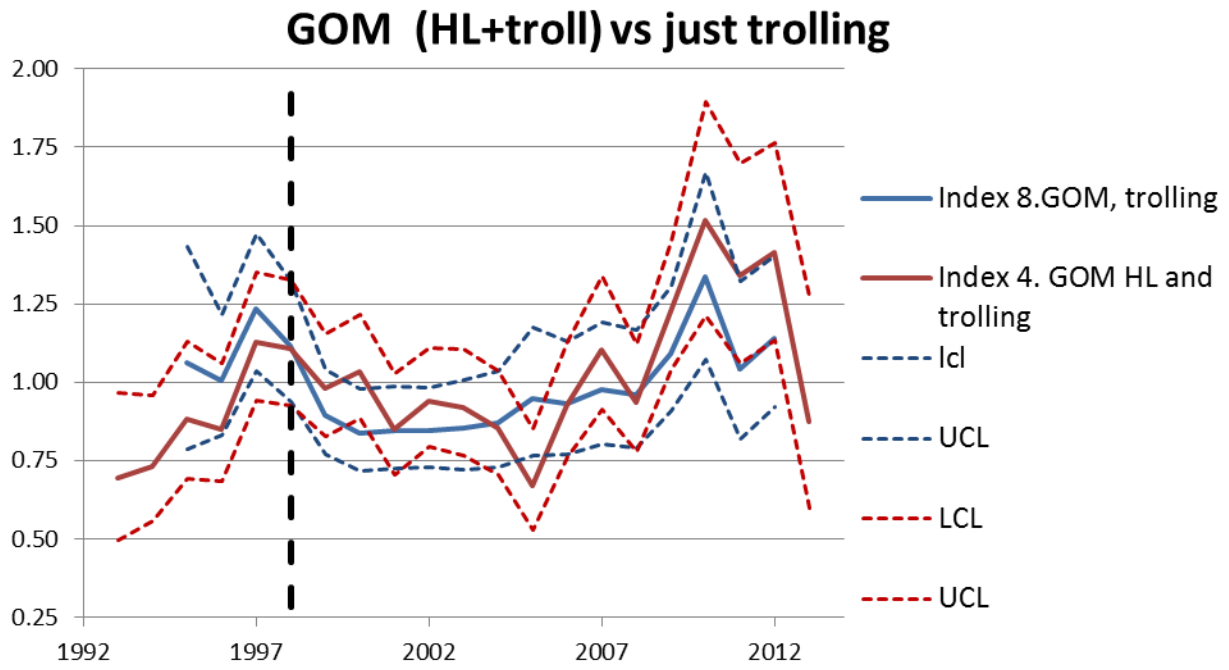
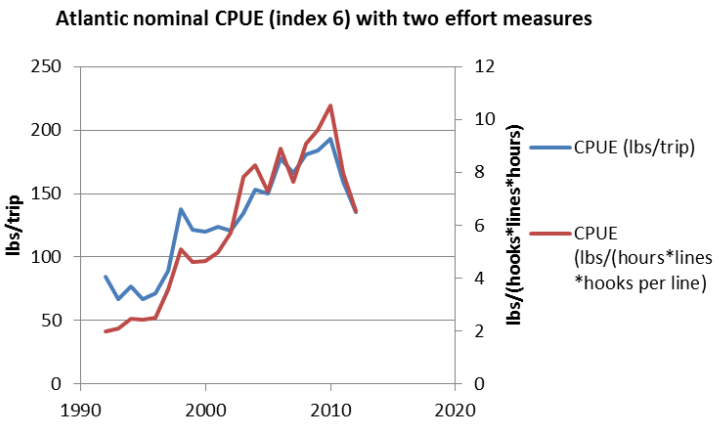


Figure 15. a. Evaluation of Atlantic nominal CPUE (index 6, new mixing zone) calculated per trip and per Hooks*lines*hours). b. correlation between nominal values calculated for both effort measures.



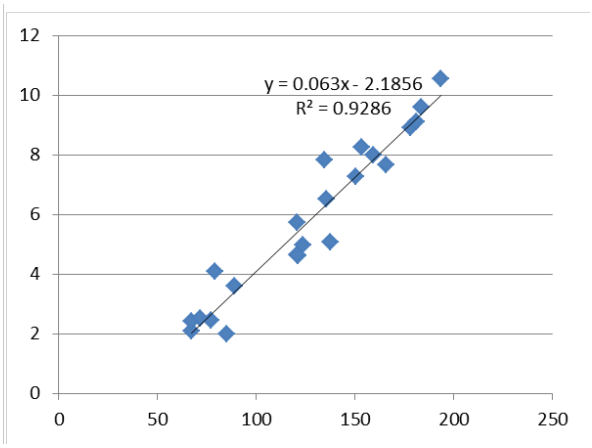


Figure 16. a. Evaluation of Gulf nominal CPUE (index 4) calculated per trip and per Hooks*lines*hours). b. correlation between nominal values calculated for both effort measures.