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Update of CPUE of Jack mackerel for center-south area of Chile

Cristian Canales

Update of CPUE of Jack mackerel (*Trachurus murphy*) at center-south area off Chile 1983-2015.

By Cristian Canales (cristian.canales@ifop.cl)
IFOP, Chile

1. Introduction

The stock assessment of jack mackerel is the most important scientific activity carried out by the Scientific Committee of the South Pacific Regional Fisheries Management Organization (SPRFMO). This activity implies the analysis of several information sets provided by the members of this organization, being the Catch per Unit of Effort (CPUE) one of these sets. CPUE is an abundance index and in this sense its update is very important because it gives the stock assessment model an important support in order to precise the population trend, particularly for recent years. In order to evaluate the CPUE variability, it is necessary to consider an appropriate statistical analysis which permits to explore the main factors that determine this variability, being one of these the year effect commonly considered as abundance index. In this report, the CPUE modelling work for jack mackerel, corresponding to the purse seine fleet at the center-south area off Chile (Fleet 2) between 1983 and 2015, is informed.

2. Materials and Methods

The fishing logbooks of the purse seine fleet in the center-south area off Chile from 1983 to 2014 were analyzed. The area has been divided in 9 sub-zones based on 3 latitudinal strata: 32°10'S - 34°50'S, 34°50'S - 38°00'S and 38°00'S - 47°00'S, and 3 ranges of distance from the coast: 0-100 mn; 101-200 mn; and >200 mn. (**Fig. 1**). Also, the fleet has been constituted by 10 groups based on its hauling capacity: <250 m3; 250-350 m3; 351-500 m3; 501-600 m3; 601-750 m3; 751-850 m3; 851-910 m3; 911-1.100 m3; 1.101-1.500 m3 and 1.501-2.071 m3, while the intra annual variability was modeled in base of quarters. The unit of effort corresponds to the hauling capacity displaced by days out of port (m3 x dop) and CPUE is the rate between the catch by trip in tons, and the effort unit.

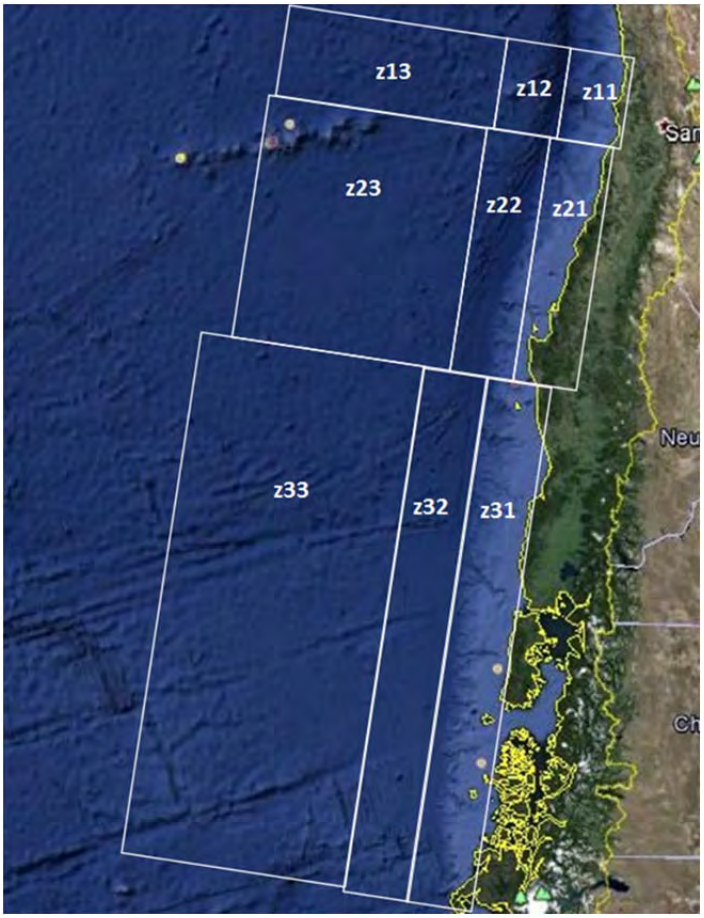

Figure 1. Spatial representation of Jack mackerel fishing zones at center-south area off Chile.

The CPUE analysis is based on a Generalized Lineal Model (GLM; McCullagh & Nelder, 1989). Following the proposal of Stefánsson (1996), Welsh et al. (1996) and Fletcher et al. (2005), the data without catches are analyzed independently of trips with catches following a Delta model where the estimator of abundance index corresponds to the product between expected value of non-zeros values of CPUE and the catch success, this last defined as the expected proportion of non-zeros values of CPUE over the total data. A deviance analysis was conducted to evaluate the significance of each effect and three models were defined:

Table 1.

GLM models applied to jack mackerel data at center-south area off Chile

Modelo	Response variable	Family	Link function
1	log(CPUE)	Gauss	Identity
2	CPUE	Gamma	Log
3	Catch success (P)	Binomial	logit

3. Results

The spatial and temporal distribution of fishing effort indicates that together with an increase of catches, fishing effort gradually covers more remote areas far from the coast and, at the end of 90's, the fleet had more participation outside the EEZ south-central Chile (**Table 2**). This operation outside the EEZ had its peak between 2008 and 2011 with fishing trips over six days as average, a situation that radically changed in the most recent years when the most important fishing areas were within the EEZ and mainly north of 38° S.

The models' coefficients are given in **Tables 3, 4** and **5**. The CPUE model that considered the Gama link function (Model 2) explained the CPUE variability in a better way than the model of the log-CPUE based on canonical link function (model 1). With the first of these, the explanation of the total deviance reached 21% (**Table 6**). Independently of the CPUE's model and while all factors were significant (p-value <0.025), the quarter and year effects were the factors with the greatest impact in the explanation of the total deviance, while in the catch success model, the quarter and zone were the most significant factors (**Fig. 3, Table 7**).

The combination of CPUE models and success of catches allowed to estimate an annual abundance index, and shows that the population's reduction had been occurring until the middle of the 90's (**Fig. 3**). After a transient stability, in 2006 the population starts a new decline until 2011 and reached the lowest value equivalent to 12% of the CPUE recorded in 1983.

4. Conclusions

The abundance signal in central-south area off Chile indicates that after a sharp decline until 1998, the jack mackerel stock remained temporarily at stable levels until 2006, and then experienced a significant reduction which has been maintained to date although the important availability changes observed in 2012.

5. Bibliography

Canales C. 2014. CPUE of Jack mackerel at the center-south area off Chile 1983-2014. SC-02-JM-11 rev1, 2th SC Meeting SPRFMO. 16 pp.

McCullagh, P. and Nelder, J. 1989. Generalized linear models. Chapman and hall. London. 511 pp.

Ortiz, M and F. Arocha. 2004. Alternative error distribution models for the standardization of catch rates of non-target species from a pelagic longline fishery: billfish species in the Venezuelan tuna longline fishery. Fisheries Research. 70: 275-297.

Pennington. M. 1983. Efficient estimators of abundance for fish and plankton surveys. Biometrics 39:281-286.

Stefánsson, G. 1996. Analysis of groundfish survey abundance data: combining the glm y delta approaches. Ices Journal of Marine Science, 53: 577 – 588 p.

Table 2.

Fishing effort representation by year and fishing zone. Bars represent the effort's relative distribution.

	Distance from coast (nautical miles)								
	0-100 mn			100-200 mn			> 200 mn		
	Z11	Z21	Z31	Z12	Z22	Z32	Z13	Z23	Z33
1981	0%	100%	0%	0%	0%	0%	0%	0%	0%
1982	0%	100%	0%	0%	0%	0%	0%	0%	0%
1983	0%	99%	0%	0%	0%	0%	0%	1%	0%
1984	0%	100%	0%	0%	0%	0%	0%	0%	0%
1985	0%	100%	0%	0%	0%	0%	0%	0%	0%
1986	0%	100%	0%	0%	0%	0%	0%	0%	0%
1987	0%	100%	0%	0%	0%	0%	0%	0%	0%
1988	1%	99%	0%	0%	0%	0%	0%	0%	0%
1989	1%	98%	1%	0%	0%	0%	0%	0%	0%
1990	11%	86%	2%	0%	0%	0%	0%	0%	0%
1991	11%	86%	3%	0%	1%	0%	0%	0%	0%
1992	17%	71%	8%	1%	3%	0%	0%	0%	0%
1993	16%	62%	11%	1%	8%	1%	0%	1%	0%
1994	19%	52%	21%	2%	5%	2%	0%	0%	0%
1995	26%	49%	9%	9%	6%	0%	0%	1%	0%
1996	9%	63%	13%	6%	7%	1%	1%	0%	0%
1997	6%	56%	23%	0%	2%	1%	1%	10%	0%
1998	1%	44%	46%	0%	1%	4%	0%	3%	0%
1999	5%	47%	34%	1%	11%	2%	0%	0%	0%
2000	1%	56%	19%	0%	15%	5%	0%	4%	0%
2001	3%	67%	25%	0%	4%	0%	0%	0%	0%
2002	6%	38%	33%	1%	11%	8%	0%	1%	2%
2003	1%	24%	22%	0%	18%	5%	5%	17%	8%
2004	7%	25%	39%	0%	2%	3%	6%	9%	9%
2005	26%	13%	18%	2%	1%	10%	10%	10%	11%
2006	15%	17%	16%	5%	19%	12%	5%	4%	7%
2007	15%	7%	13%	3%	6%	11%	9%	25%	11%
2008	16%	3%	6%	1%	1%	6%	1%	15%	51%
2009	18%	12%	4%	7%	10%	2%	1%	8%	40%
2010	26%	7%	8%	3%	1%	0%	0%	6%	48%
2011	37%	9%	19%	3%	0%	2%	0%	1%	29%
2012	9%	59%	6%	11%	15%	0%	0%	0%	0%
2013	21%	33%	2%	20%	25%	0%	0%	0%	0%
2014	17%	20%	19%	3%	31%	8%	0%	1%	1%
2015	41%	4%	1%	37%	8%	0%	1%	0%	8%

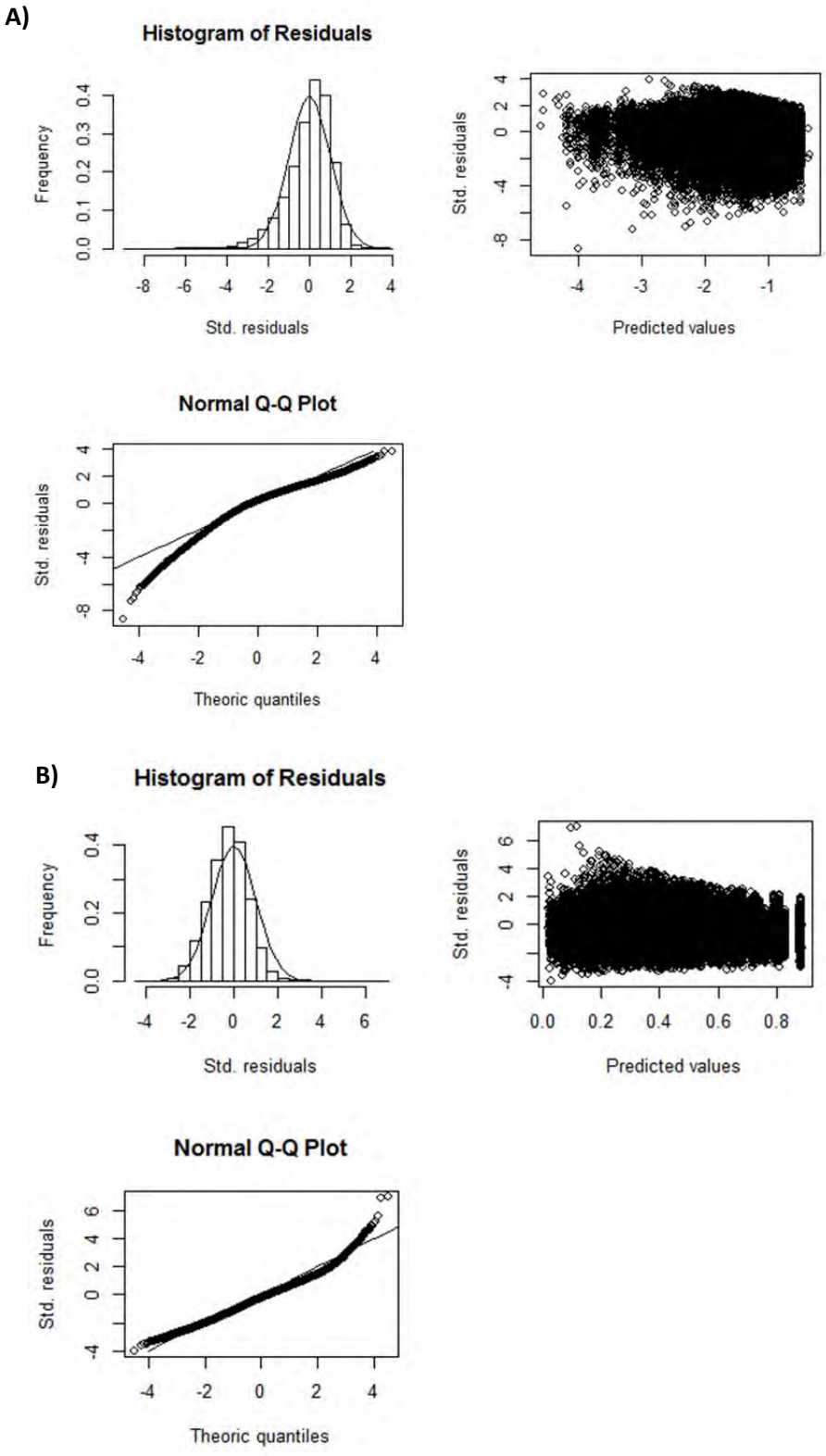

Figura 2. Residual distribution and QQ plot. A) model logCPUE-Gaussian. B) model CPUE-Gama.

Table 3. GLM coefficient for log_CPUE of jack mackerel. Family=Gaussian, Link=Identity

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.440642	0.041771	-10.549	< 2e-16	***
year1983	-0.114092	0.041616	-2.742	0.00612	**
year1984	-0.206675	0.041887	-4.934	8.06e-07	***
year1985	-0.352451	0.041686	-8.455	< 2e-16	***
year1986	-0.542020	0.041542	-13.048	< 2e-16	***
year1987	-0.343392	0.041673	-8.240	< 2e-16	***
year1988	-0.473142	0.041903	-11.291	< 2e-16	***
year1989	-0.508209	0.041909	-12.126	< 2e-16	***
year1990	-0.696446	0.041816	-16.655	< 2e-16	***
year1991	-0.564902	0.042104	-13.417	< 2e-16	***
year1992	-0.606409	0.042554	-14.250	< 2e-16	***
year1993	-0.770664	0.042729	-18.036	< 2e-16	***
year1994	-0.668396	0.042756	-15.633	< 2e-16	***
year1995	-0.780926	0.042847	-18.226	< 2e-16	***
year1996	-0.823997	0.043340	-19.012	< 2e-16	***
year1997	-1.100853	0.042989	-25.608	< 2e-16	***
year1998	-1.141871	0.044948	-25.404	< 2e-16	***
year1999	-1.098001	0.046489	-23.618	< 2e-16	***
year2000	-1.128081	0.046697	-24.158	< 2e-16	***
year2001	-0.897052	0.046698	-19.210	< 2e-16	***
year2002	-1.113526	0.048195	-23.105	< 2e-16	***
year2003	-1.142442	0.048438	-23.586	< 2e-16	***
year2004	-0.997407	0.048829	-20.426	< 2e-16	***
year2005	-1.062082	0.050462	-21.047	< 2e-16	***
year2006	-1.029415	0.051137	-20.130	< 2e-16	***
year2007	-1.363507	0.051479	-26.487	< 2e-16	***
year2008	-1.848245	0.058399	-31.649	< 2e-16	***
year2009	-2.056619	0.055985	-36.735	< 2e-16	***
year2010	-2.518278	0.071547	-35.197	< 2e-16	***
year2011	-2.936173	0.066883	-43.900	< 2e-16	***
year2012	-1.593058	0.063965	-24.905	< 2e-16	***
year2013	-1.818602	0.064234	-28.312	< 2e-16	***
year2014	-2.023406	0.063413	-31.909	< 2e-16	***
year2015	-2.253177	0.084452	-26.680	< 2e-16	***
quarter2	0.143091	0.007067	20.249	< 2e-16	***
quarter3	-0.109907	0.007726	-14.225	< 2e-16	***
quarter4	-0.523120	0.009079	-57.619	< 2e-16	***
zone12	0.015651	0.025134	0.623	0.53347	
zone13	-0.261125	0.043019	-6.070	1.28e-09	***
zone21	-0.089071	0.011730	-7.594	3.13e-14	***
zone22	-0.007286	0.018555	-0.393	0.69456	
zone23	-0.159036	0.029514	-5.389	7.11e-08	***
zone31	-0.322176	0.014206	-22.679	< 2e-16	***
zone32	-0.178539	0.028375	-6.292	3.14e-10	***
zone33	-0.173895	0.030553	-5.692	1.26e-08	***

```
hc2          0.022046   0.012192   1.808  0.07057 .
hc3         -0.011940   0.011381  -1.049  0.29414
hc4         -0.134814   0.015048  -8.959  < 2e-16 ***
hc5         -0.162592   0.012938 -12.567  < 2e-16 ***
hc6         -0.317946   0.017779 -17.883  < 2e-16 ***
hc7         -0.252923   0.018793 -13.458  < 2e-16 ***
hc8         -0.186357   0.015514 -12.012  < 2e-16 ***
hc9         -0.310203   0.016082 -19.288  < 2e-16 ***
hc10         -0.356171   0.018414 -19.343  < 2e-16 ***
```

(Dispersion parameter for gaussian family taken to be 1.104557)

```
    Null deviance: 203257  on 147922  degrees of freedom
Residual deviance: 163330  on 147869  degrees of freedom
AIC: 434553
```

Table 4. GLM coefficient for CPUE of jack mackerel. Family=Gama, Link=log

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.145913	0.035656	-4.092	4.27e-05	***
year1983	-0.005971	0.035523	-0.168	0.86651	
year1984	-0.092418	0.035755	-2.585	0.00975	**
year1985	-0.212887	0.035583	-5.983	2.20e-09	***
year1986	-0.377141	0.035460	-10.636	< 2e-16	***
year1987	-0.201874	0.035572	-5.675	1.39e-08	***
year1988	-0.324014	0.035768	-9.059	< 2e-16	***
year1989	-0.338801	0.035774	-9.471	< 2e-16	***
year1990	-0.483708	0.035694	-13.552	< 2e-16	***
year1991	-0.371986	0.035940	-10.350	< 2e-16	***
year1992	-0.441253	0.036324	-12.148	< 2e-16	***
year1993	-0.548740	0.036474	-15.045	< 2e-16	***
year1994	-0.472213	0.036497	-12.939	< 2e-16	***
year1995	-0.577054	0.036574	-15.778	< 2e-16	***
year1996	-0.568015	0.036995	-15.354	< 2e-16	***
year1997	-0.759954	0.036695	-20.710	< 2e-16	***
year1998	-0.924586	0.038367	-24.098	< 2e-16	***
year1999	-0.901725	0.039683	-22.723	< 2e-16	***
year2000	-0.925191	0.039860	-23.211	< 2e-16	***
year2001	-0.740412	0.039861	-18.575	< 2e-16	***
year2002	-0.870543	0.041139	-21.161	< 2e-16	***
year2003	-0.993993	0.041347	-24.040	< 2e-16	***
year2004	-0.908334	0.041681	-21.793	< 2e-16	***
year2005	-0.997363	0.043075	-23.154	< 2e-16	***
year2006	-0.906720	0.043651	-20.772	< 2e-16	***
year2007	-1.189446	0.043942	-27.068	< 2e-16	***
year2008	-1.553912	0.049849	-31.172	< 2e-16	***
year2009	-1.735773	0.047789	-36.322	< 2e-16	***
year2010	-2.025290	0.061073	-33.162	< 2e-16	***
year2011	-2.604117	0.057091	-45.613	< 2e-16	***
year2012	-1.475315	0.054600	-27.020	< 2e-16	***
year2013	-1.655341	0.054830	-30.190	< 2e-16	***
year2014	-1.834530	0.054129	-33.892	< 2e-16	***
year2015	-2.031886	0.072088	-28.186	< 2e-16	***
quarter2	0.104677	0.006032	17.353	< 2e-16	***
quarter3	-0.064881	0.006595	-9.838	< 2e-16	***
quarter4	-0.381250	0.007750	-49.194	< 2e-16	***
zone12	-0.117660	0.021454	-5.484	4.16e-08	***
zone13	-0.436376	0.036721	-11.884	< 2e-16	***
zone21	-0.077076	0.010012	-7.698	1.39e-14	***
zone22	-0.102894	0.015838	-6.496	8.25e-11	***
zone23	-0.301559	0.025193	-11.970	< 2e-16	***
zone31	-0.340235	0.012126	-28.058	< 2e-16	***
zone32	-0.317281	0.024221	-13.099	< 2e-16	***
zone33	-0.374126	0.026080	-14.345	< 2e-16	***
hc2	-0.006256	0.010407	-0.601	0.54778	

```
hc3        -0.060374   0.009715  -6.214 5.16e-10 ***
hc4        -0.210198   0.012845 -16.364  < 2e-16 ***
hc5        -0.246595   0.011043 -22.329  < 2e-16 ***
hc6        -0.391695   0.015176 -25.810  < 2e-16 ***
hc7        -0.358598   0.016042 -22.354  < 2e-16 ***
hc8        -0.312345   0.013243 -23.586  < 2e-16 ***
hc9        -0.424393   0.013728 -30.915  < 2e-16 ***
hc10        -0.477773   0.015718 -30.396  < 2e-16 ***

(Dispersion parameter for Gamma family taken to be 0.8048177)

    Null deviance: 159242  on 147922  degrees of freedom
Residual deviance: 125333  on 147869  degrees of freedom
AIC: -3904.1
```

Table 5. GLM coefficient for catch success of jack mackerel.

Coefficients:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-2.72102	0.06986	-38.948	< 2e-16	***
year1983	-0.66089	0.03592	-18.398	< 2e-16	***
year1984	-0.86568	0.03660	-23.650	< 2e-16	***
year1985	-1.19661	0.03453	-34.651	< 2e-16	***
year1986	-1.13373	0.03457	-32.799	< 2e-16	***
year1987	-1.10132	0.03532	-31.183	< 2e-16	***
year1988	-1.29233	0.03545	-36.458	< 2e-16	***
year1989	-1.16002	0.03634	-31.919	< 2e-16	***
year1990	-1.42952	0.03531	-40.481	< 2e-16	***
year1991	-1.10072	0.03751	-29.346	< 2e-16	***
year1992	-1.43129	0.03819	-37.476	< 2e-16	***
year1993	-1.49389	0.03932	-37.994	< 2e-16	***
year1994	-1.17957	0.04210	-28.018	< 2e-16	***
year1995	-1.22496	0.04147	-29.536	< 2e-16	***
year1996	-1.11806	0.04583	-24.398	< 2e-16	***
year1997	-0.84685	0.04575	-18.510	< 2e-16	***
year1998	-0.16741	0.07186	-2.330	0.0198	*
year1999	2.04518	0.10548	19.388	< 2e-16	***
year2000	1.06546	0.11184	9.527	< 2e-16	***
year2001	2.42252	0.12063	20.082	< 2e-16	***
year2002	2.55110	0.10793	23.636	< 2e-16	***
year2003	1.91258	0.12705	15.054	< 2e-16	***
year2004	1.84124	0.14068	13.088	< 2e-16	***
year2005	1.89711	0.14869	12.759	< 2e-16	***
year2006	2.64151	0.20583	12.834	< 2e-16	***
year2007	2.45508	0.13590	18.065	< 2e-16	***
year2008	1.00635	0.13664	7.365	1.77e-13	***
year2009	0.61163	0.15096	4.052	5.09e-05	***
year2010	0.06908	0.20039	0.345	0.7303	
year2011	0.44363	0.20182	2.198	0.0279	*
year2012	0.69912	0.25182	2.776	0.0055	**
year2013	-0.35714	0.21558	-1.657	0.0976	.
year2014	11.03842	36.99771	0.298	0.7654	
year2015	10.95200	58.18043	0.188	0.8507	
quarter2	0.03769	0.01470	2.563	0.0104	*
quarter3	-0.42877	0.01472	-29.132	< 2e-16	***
quarter4	-0.86253	0.01558	-55.354	< 2e-16	***
zone11	4.31301	0.06746	63.931	< 2e-16	***
zone12	5.66117	0.11341	49.919	< 2e-16	***
zone13	3.62173	0.14218	25.472	< 2e-16	***
zone21	4.38685	0.06485	67.646	< 2e-16	***
zone22	5.80750	0.09244	62.822	< 2e-16	***
zone23	2.22329	0.07339	30.293	< 2e-16	***
zone31	5.36368	0.07171	74.797	< 2e-16	***
zone32	6.42759	0.22244	28.896	< 2e-16	***
zone33	6.09809	0.38660	15.774	< 2e-16	***

hc2	0.37785	0.01876	20.146	< 2e-16 ***
hc3	0.58421	0.01789	32.647	< 2e-16 ***
hc4	0.78751	0.02596	30.340	< 2e-16 ***
hc5	0.92969	0.02187	42.512	< 2e-16 ***
hc6	1.14824	0.03632	31.617	< 2e-16 ***
hc7	0.97490	0.03876	25.152	< 2e-16 ***
hc8	1.23140	0.03264	37.724	< 2e-16 ***
hc9	1.44614	0.03778	38.275	< 2e-16 ***
hc10	1.44444	0.05540	26.074	< 2e-16 ***

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 242169 on 210670 degrees of freedom
Residual deviance: 211177 on 210616 degrees of freedom
AIC: 211287

Table 6. Analysis of Deviance. GLM for CPUE and catch success of jack mackerel (hc is hold capacity)

Response log(CPUE): Family=Gaussian, Link="Identity"

Terms added sequentially (first to last)

	Df	Deviance	Resid. Df	Resid. Dev	F	Pr(>F)
NULL			147922	203257		
year	33	31443.8	147889	171813	862.65	< 2.2e-16 ***
quarter	3	6282.1	147886	165531	1895.81	< 2.2e-16 ***
zone	8	1148.7	147878	164382	130.00	< 2.2e-16 ***
hc	9	1052.6	147869	163330	105.88	< 2.2e-16 ***

Response CPUE: Family=Gamma, Link="log"

Terms added sequentially (first to last)

	Df	Deviance	Resid. Df	Resid. Dev	F	Pr(>F)
NULL			147922	159242		
year	33	27936.8	147889	131305	1051.88	< 2.2e-16 ***
quarter	3	3056.9	147886	128248	1266.09	< 2.2e-16 ***
zone	8	1461.9	147878	126786	227.05	< 2.2e-16 ***
hc	9	1453.0	147869	125333	200.60	< 2.2e-16 ***

Response catch success: Family=Binomial, Link="logit"

Terms added sequentially (first to last)

	Df	Deviance	Resid. Df	Resid. Dev	Pr(>Chi)
NULL			210670	242169	
year	33	10502.3	210637	231666	< 2.2e-16 ***
trim	1	2966.7	210636	228700	< 2.2e-16 ***
zone	9	13960.2	210627	214739	< 2.2e-16 ***
hc	9	2943.4	210618	211796	< 2.2e-16 ***

Table 7. Single term deletions. GLM for CPUE and catch success of jack mackerel (hc is hold capacity).

Response log(CPUE): Family=Gaussian, Link="Identity"

```
Model:
log(CPUE1) ~ year + quarter + zone + hc
        Df Deviance    AIC  F value    Pr(>F)
<none>       163330 434553
year    33   172358 442446  247.675 < 2.2e-16 ***
quarter  3   169395 439941 1830.335 < 2.2e-16 ***
zone     8   164156 435284   93.472 < 2.2e-16 ***
hc       9   164382 435486  105.885 < 2.2e-16 ***
```

Response CPUE: Family=Gamma, Link="log"

```
Model:
CPUE1 ~ year + quarter + zone + hc
        Df Deviance     AIC F value    Pr(>F)
<none>       125333 -3904.1
year    33   131621  3842.1  224.78 < 2.2e-16 ***
quarter  3   128288  -239.1 1161.90 < 2.2e-16 ***
zone     8   126293 -2727.9  141.50 < 2.2e-16 ***
hc       9   126786 -2116.6  190.48 < 2.2e-16 ***
```

Response catch success: Family=Binomial, Link="logit"
F test assumes 'quasibinomial' family.

```
Model:
p_pesca ~ year + trim + zone + hc
       Df Deviance    AIC F value    Pr(>F)
<none>       211796 211902
year   33   219035 219075  218.13 < 2.2e-16 ***
quarter 1   215378 215482 3561.61 < 2.2e-16 ***
zone    9   224365 224453 1388.74 < 2.2e-16 ***
hc      9   214739 214827  325.22 < 2.2e-16 ***
```

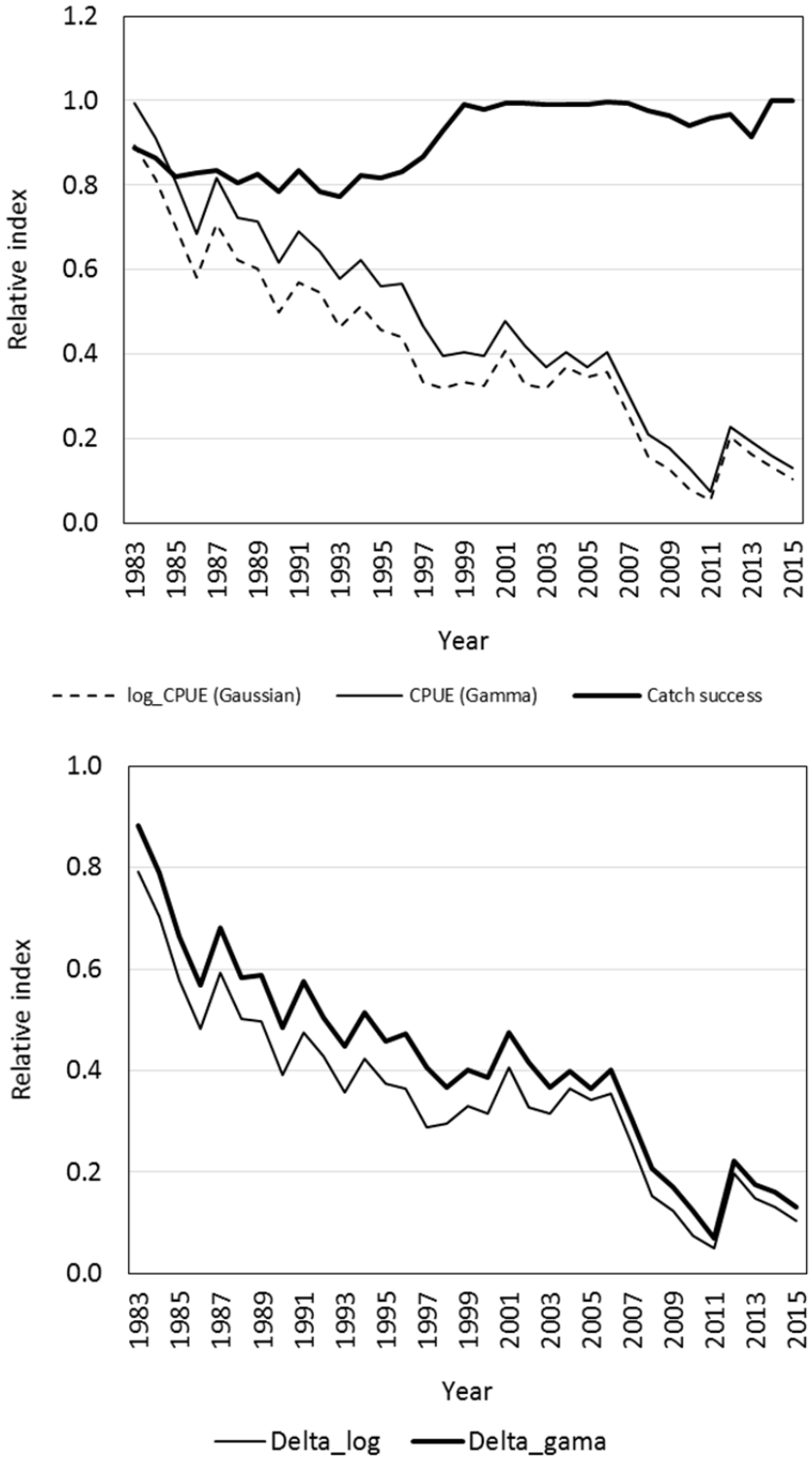

Figure 3. CPUE relative and proportion of days with catch (catch success) (upper panel) and abundance index (lower panel) of jack mackerel 1983-2015.

Table 8.

Summary of information from logbooks, catch success and standardized CPUE of jack mackerel at the south-central area off Chile 1983-2015.

Year	Total trips	Trips with catches	Days out port (average)	Catch success	relative CPUE	
					delta-log	delta-gama
1983	9246	6370	0.61	0.89	0.50	0.99
1984	8839	6058	0.63	0.86	0.46	0.91
1985	12008	7475	0.63	0.82	0.37	0.81
1986	13189	8681	0.74	0.83	0.32	0.69
1987	12902	8846	0.72	0.83	0.40	0.82
1988	13411	8900	0.73	0.81	0.35	0.72
1989	13262	9402	0.80	0.83	0.35	0.71
1990	15788	10290	0.85	0.78	0.28	0.62
1991	13221	9839	1.01	0.83	0.34	0.69
1992	11156	7731	1.36	0.78	0.29	0.64
1993	10230	7249	1.60	0.77	0.26	0.58
1994	10242	8216	1.74	0.82	0.29	0.62
1995	11449	9050	1.76	0.82	0.27	0.56
1996	7858	6389	1.96	0.83	0.27	0.57
1997	9676	7434	1.92	0.87	0.19	0.47
1998	4440	3863	2.38	0.93	0.17	0.40
1999	2968	2678	2.41	0.99	0.17	0.41
2000	2738	2577	2.17	0.98	0.18	0.40
2001	2836	2678	2.08	0.99	0.22	0.48
2002	2579	2356	2.82	0.99	0.18	0.42
2003	2201	2084	3.06	0.99	0.17	0.37
2004	2003	1905	3.00	0.99	0.17	0.40
2005	1692	1611	3.27	0.99	0.16	0.37
2006	1505	1469	2.98	1.00	0.19	0.40
2007	1689	1596	3.80	0.99	0.13	0.30
2008	998	851	6.47	0.98	0.08	0.21
2009	1062	934	6.47	0.97	0.07	0.18
2010	452	362	7.60	0.94	0.05	0.13
2011	528	452	6.92	0.96	0.03	0.07
2012	524	490	3.12	0.97	0.11	0.23
2013	513	486	3.48	0.91	0.09	0.19
2014	508	508	4.50	1.00	0.08	0.16
2015	213	213	4.96	1.00	0.07	0.13