The following supplement accompanies the article

Effects of fishing, market price, and climate on two South American clam species

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Supplement. Residual analysis of Generalized Additive Models.

Table S1. *Mesodesma donacium* and *M. mactroides*. Generalized additive model (GAM) for *M. donacium* landings with price and *M. mactroides* abundance with fishing effort. Percent of deviance explained, adjusted r^2 (*$p < 0.001$), Akaike information criterion (AIC), and estimated degrees of freedom (edf) are given. s: spline smoothers; Lan: landings; CCh: Central Chile; NCh: Northern Chile; SCh: Southern Chile; Uy: Uruguay. All models showed a strong relationship between landings (*M. donacium*) or abundance (*M. mactroides*) with price or fishing effort respectively, meaning that they are not independent

Model	*Terms*	*edf*	r^2	*Deviance explained (%)*	*AIC*
GAM NCh	Lan ~s(Price)	4.15	0.24*	34.6	561
GAM CCh	Lan ~s(Price)	5.87	0.66*	72.9	539
GAM SCh	Lan ~s(Price)	5.74	0.62*	69.5	558
GAM Uy	Lan ~s(Fishing effort)	3.32	0.84*	86.4	430

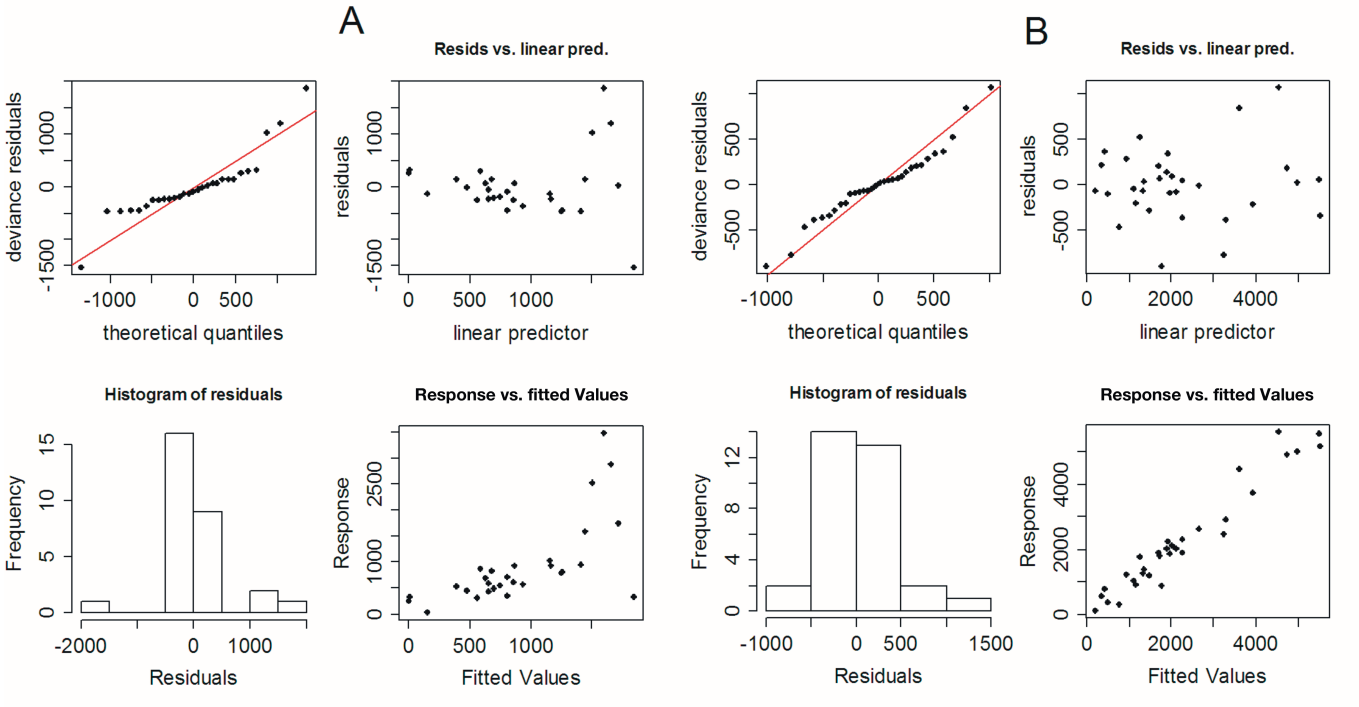

Fig. S1. *Mesodesma donacium*. Residual analysis plot of Peru generalized additive model (GAM) (A) and Northern Chile (NCh) GAM (B). The basic model checking plots of residuals for the Peru GAM (A) shows in the upper left normal theoretical quantiles (Q-Q plot) a clear deviation from the normal assumption in the distribution of the residuals. The upper right plot of residuals versus fitted values (linear predictor) shows that the assumption of constant variance is untenable, confirmed by the lower left histogram of residuals that shows the pattern described in the Q-Q plot: there are too many residuals at the center of the distribution relative to the sides. The response variable against fitted values, shown in the lower right panel, stresses the failure of the constant variance assumption. The observed trend in model residuals suggests that the lack of other predictors preclude model efficiency. The model checking plot of residuals for NCh GAM (B) shows the upper left Q-Q plot close to the straight line, suggesting that the normal distribution assumption of the residuals is reasonable. The upper right plot suggests that variance is roughly constant as the mean increases but some residuals tend to be overspread. The histogram of residuals at the lower left appears quite consistent with normality and the lower right plot of response against fitted values shows a positive linear relationship with a good deal of scatter

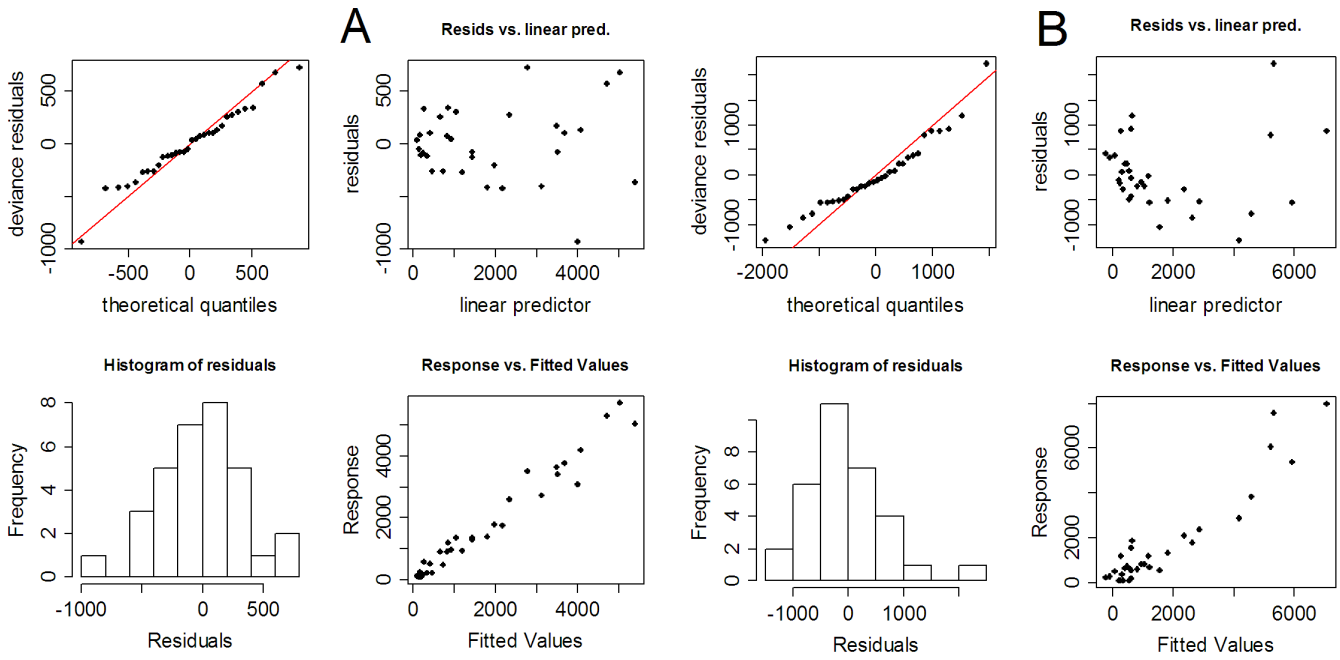

Fig. S2. *Mesodesma donacium*. Residual analysis plots of Central Chile (CCh[1]) generalized additive model (GAM) (A) and Southern Chile (SCh[1]) GAM (B). The basic residual plots for CCh[1] (A) GAM shows the upper left Q-Q plot reasonably close to the straight line, suggesting that the normal distribution assumption of the residuals is reasonable. The upper right plot suggests that variance is nearly constant as the mean increases, showing few high values. The histogram of residuals at the lower left appears quite consistent with normality and the lower right plot of response against fitted values shows an acceptable positive linear relationship with scarce dispersion. The plots of residuals for SCh[1] (B) GAM show the upper left Q-Q plot close to the straight line but some residuals diverge at the tails. The upper right plot shows that the variance of the residuals is not constant. The histogram of residuals at the lower left appears quite consistent with normality and lower right plot of response against fitted values shows a quite acceptable linear relationship

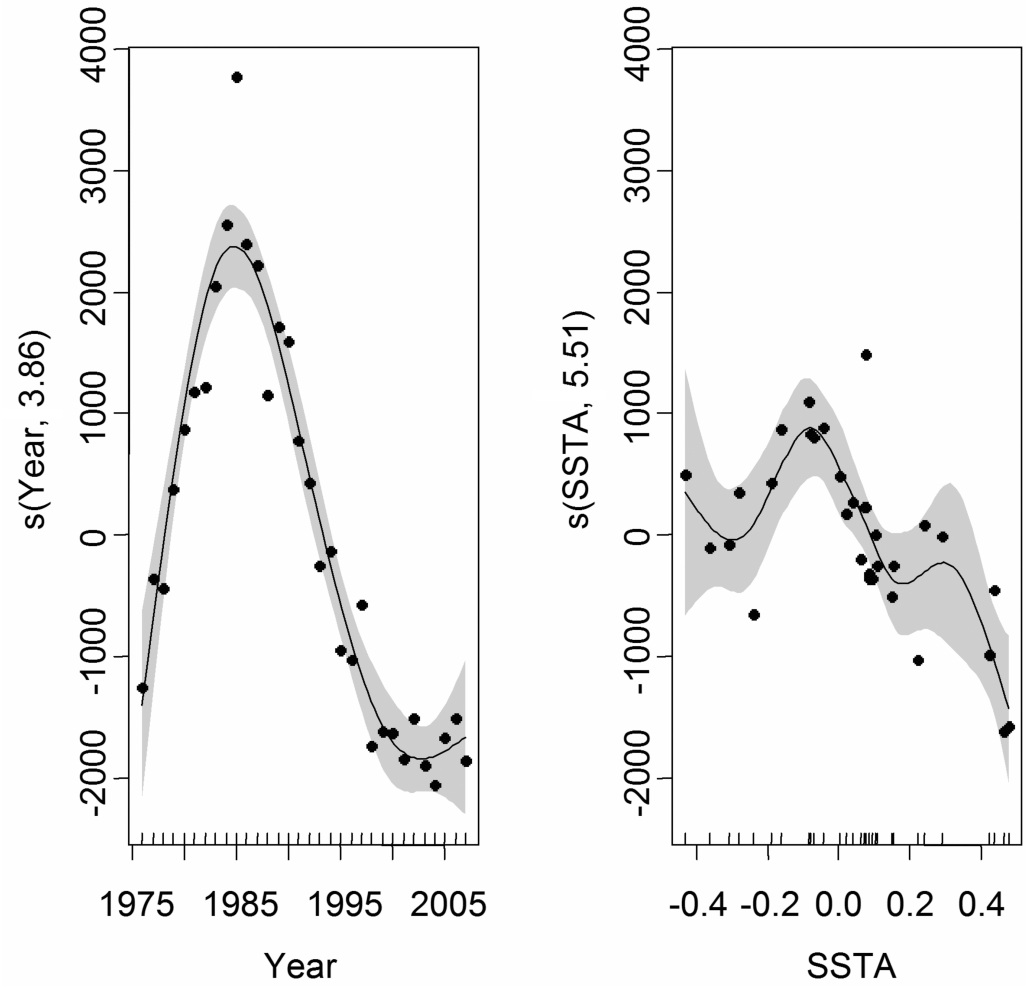

Fig. S3. *Mesodesma donacium*. Estimated model terms showing the partial residuals of landings (solid lines) through time (year), and sea surface temperature anomalies (SSTA) for Central Chile (CCh^3; see Table 1 in the main paper). Shaded areas indicate ±2 SE above and below the estimated smooth curve. Numbers on each *y*-axis are the estimated degrees of freedom of the plotted term (partial residuals of landings). Even though the effect of SSTA was insufficient to change the observed trend in landings, the elimination of market price effect determined a different relationship between partial residuals of landing and SSTA. Partial residuals showed 2 contrasting trends with SSTA: a positive nonlinear relationship with negative SSTA (SSTA > −0.3) and a negative one with positive SSTA

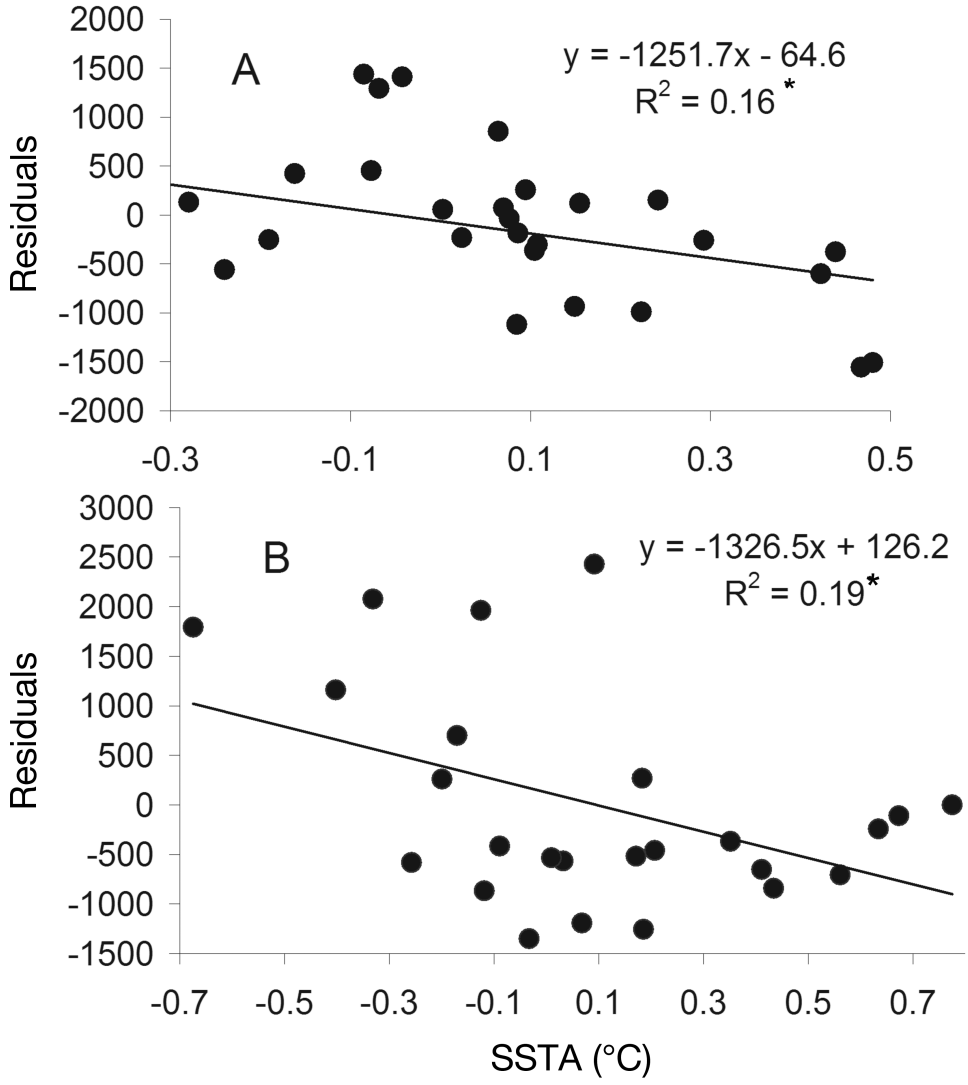

Fig. S4. (A) *Mesodesma donacium*. Central Chile model residuals (with price) relationship with sea surface temperature anomalies (SSTA) and (B) *Mesodesma mactroides*. Uruguay model residuals (with fishing effort) relationship with SSTA. The regression equations correspond to the models fitted between model residuals and SSTA (*$p < 0.05$). These results highlight that the variance not explained by the market price or fishing effort could be explained by the SSTA

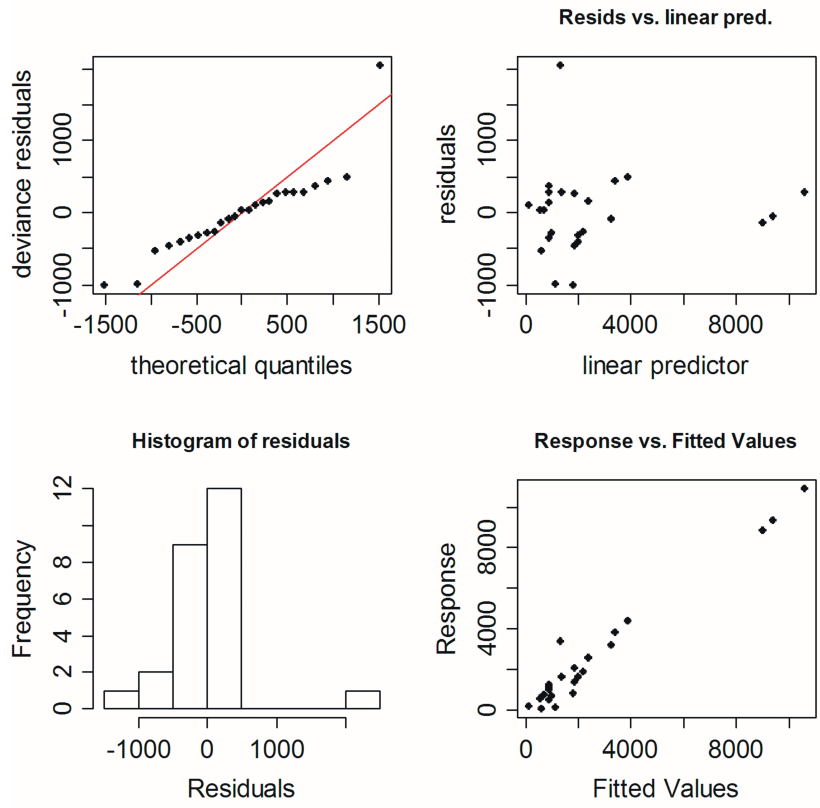

Fig. S5. *Mesodesma mactroides*. Basic model checking plot for the residual analysis of Uruguay generalized additive model (GAM). The model checking plots of residuals for the Rocha GAM shows in the upper left Q-Q plot a clear deviation from the normal assumption in the distribution of the residuals. The upper right plot of residuals versus fitted values (linear predictor) shows that the assumption of constant variance is untenable, confirmed by the lower left histogram of residuals that shows the pattern described in the Q-Q plot: there are too many residuals at the center and left of the distribution relative to the right side. The response variable against fitted values, shown in the lower right panel, displays an acceptable linear relationship with a gap in residuals distribution highlighted before in the frequency distribution of residuals