

APPENDIX A: Upwelling Index

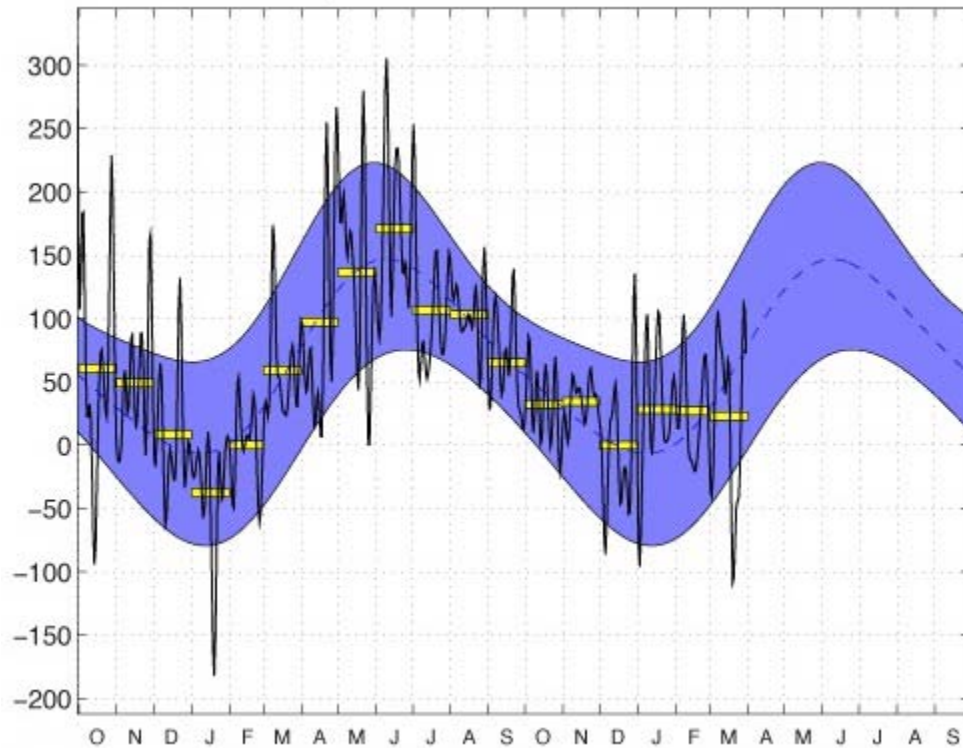


Figure A1. The smoothed daily upwelling index at 36N 122W generated by the Pacific Environmental Fisheries Laboratory, National Oceanic and Atmospheric Administration. Months is on the x-axis (from October 2009 to March 2011) and upwelling index ($\text{m}^3/\text{sec}/100$ meters of coastline) is on the y-axis. Solid line indicates the daily upwelling index, which has been smoothed with a 3-day, 3rd order, forward-reverse Butterworth filter. The dashed line is a biharmonic fit to the daily upwelling index from 1967-1991. The horizontal bars are the monthly mean upwelling index, and the shaded area denotes one standard error around the biharmonic fit. (Graphic from http://www.pfeg.noaa.gov/products/PFEL/modeled/indices/upwelling/NA/daily_upwell_graphs.html)

APPENDIX B: Data Processing Details

Sampling dates using 2-5m bins for median calculation of chl *a* (month/day/year): 9/29/1992, 11/3/1992, 8/16/1995, 6/17/2003, 1/11/2005, 2/23/2005, 3/22/2005, 4/12/2005, 4/18/2005, 5/3/2005, 5/10/2005, 9/7/2005, 10/17/2006, 3/12/2009

Sampling dates using 3-5 m bin for median calculation of chl *a* (month/day/year): 6/21/2005

Sampling dates dropped for median calculation of temperature, salinity, or DO because no data available for the 30-34 m bin (month/day/year): 2/27/1990, 5/30/1990, 12/6/1990, 6/5/1991, 9/30/1991, 12/2/1992, 7/28/1994, 8/30/1994, 9/21/1995, 1/6/1998, 2/18/1998, 5/1/1998, 10/11/1998, 11/10/1998, 1/21/1999, 2/10/1999, 6/7/1999, 4/18/2005, 11/8/2005, 7/17/2006, 11/14/2006, 12/12/2006

APPENDIX C: Standardized residuals vs. fitted value plots

Year-long data

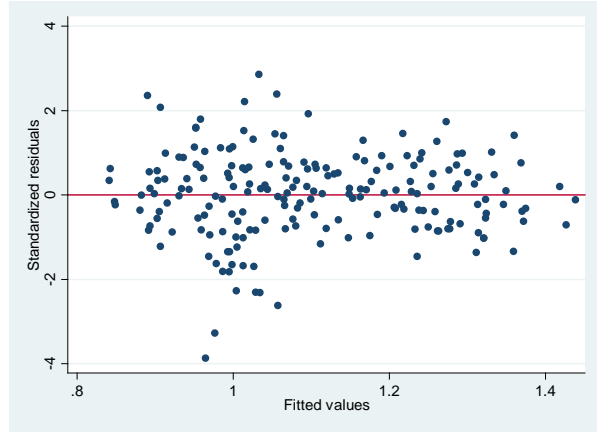
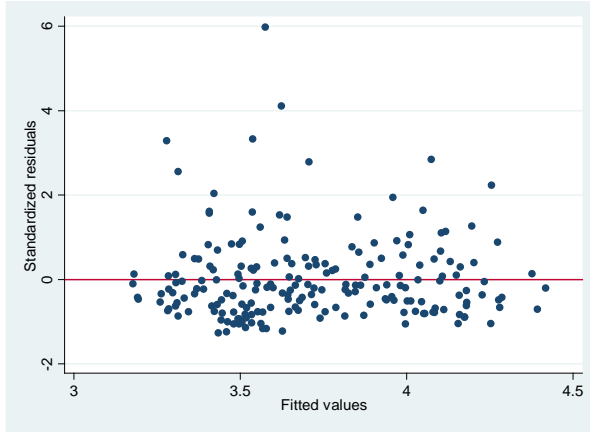
Univariate regressions

Non-transformed chl a

Transformed chl a

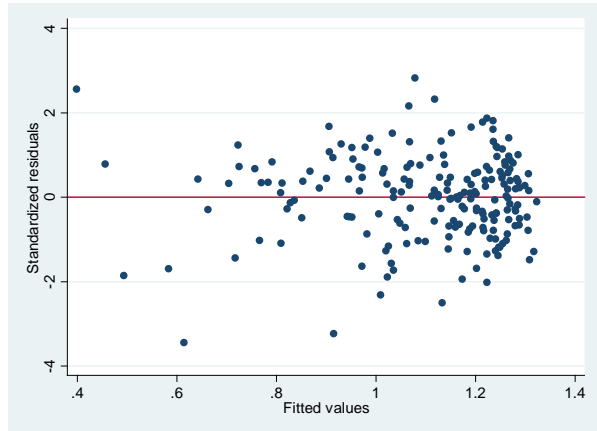
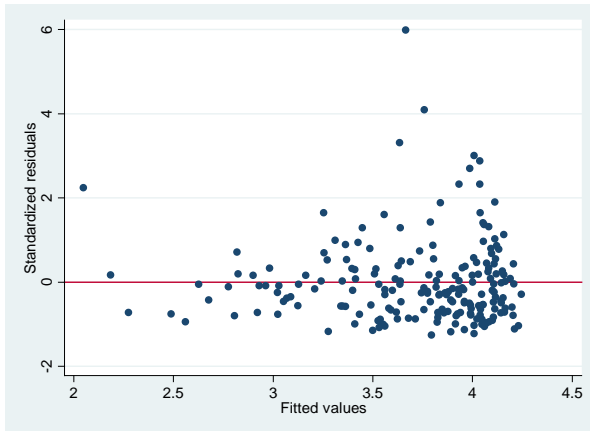
Chl *a* and temperature

ln(chl *a*) and temperature

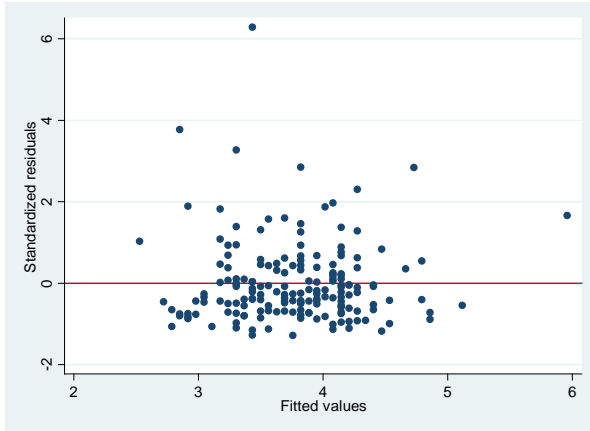


Chl *a* and salinity

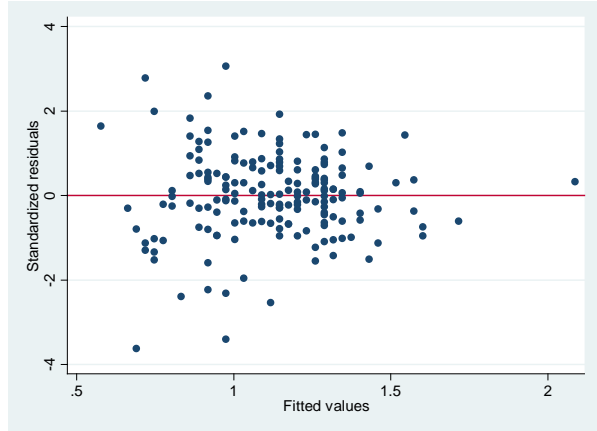
ln(chl *a*) and salinity



Chl *a* and DO

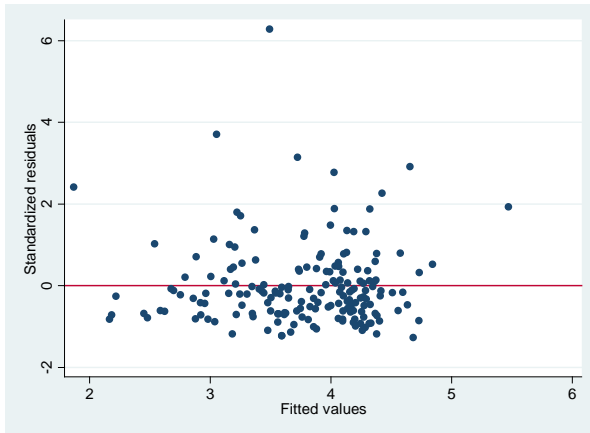


ln(chl *a*) and DO

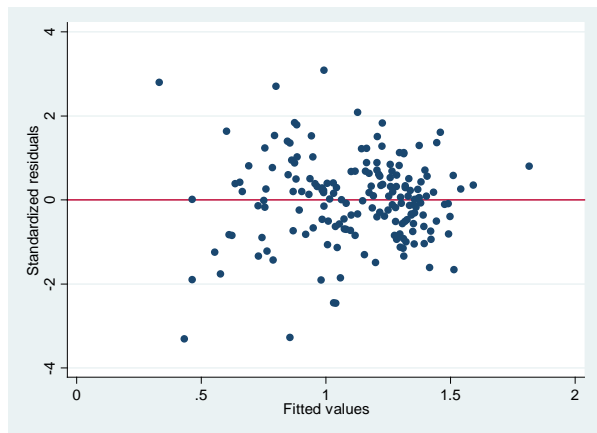


Multiple regression

Non-transformed chl a

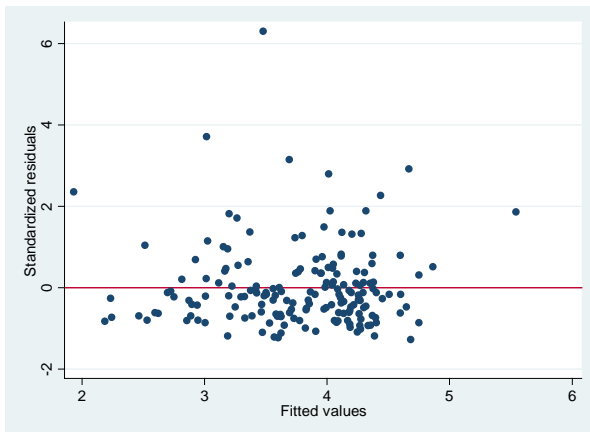


Transformed chl a

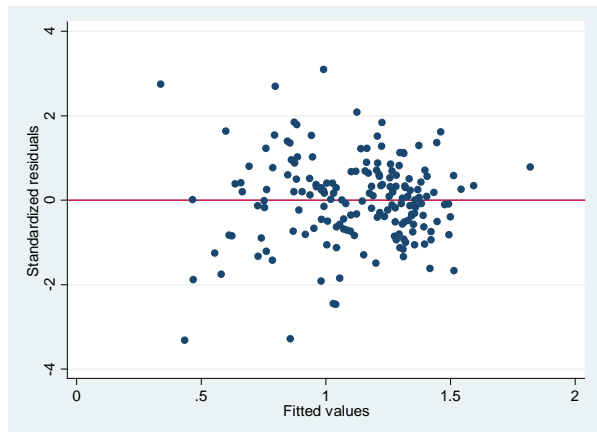


Regression with PCA

Non-transformed chl a



Transformed chl a

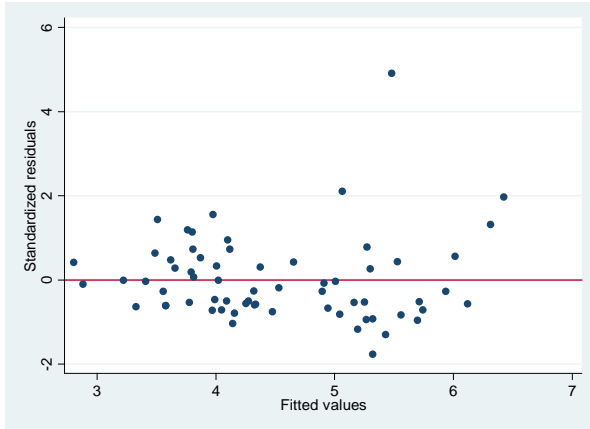


On season data

Univariate regressions

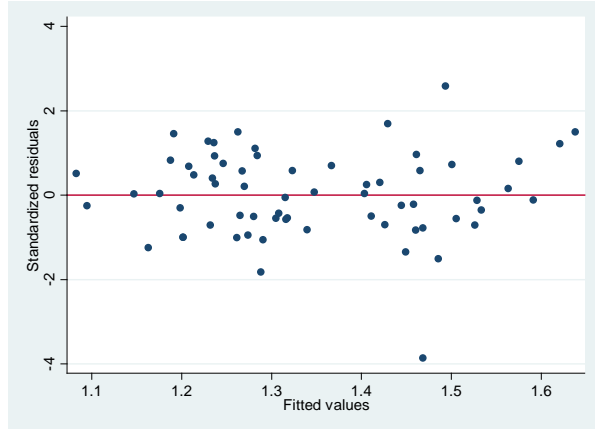
Non-transformed chl a

Chl *a* and temperature

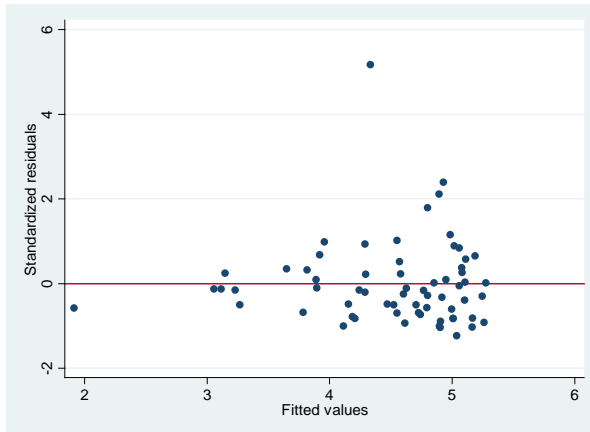


Transformed chl a

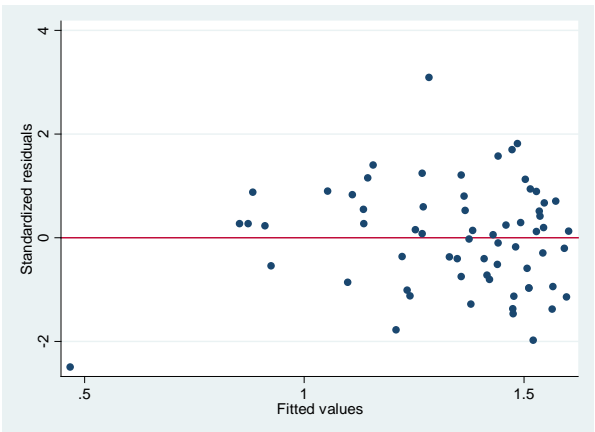
ln(chl *a*) and temperature



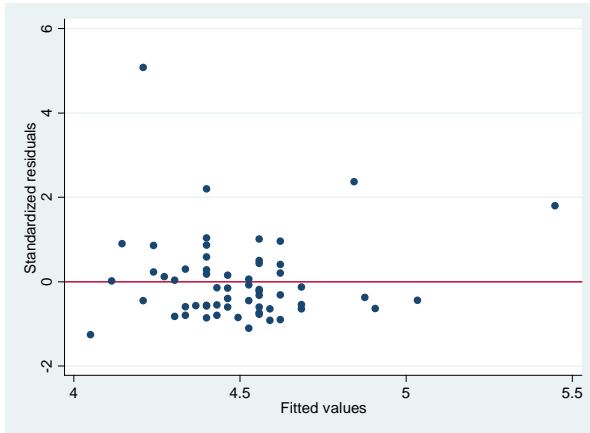
Chl *a* and salinity



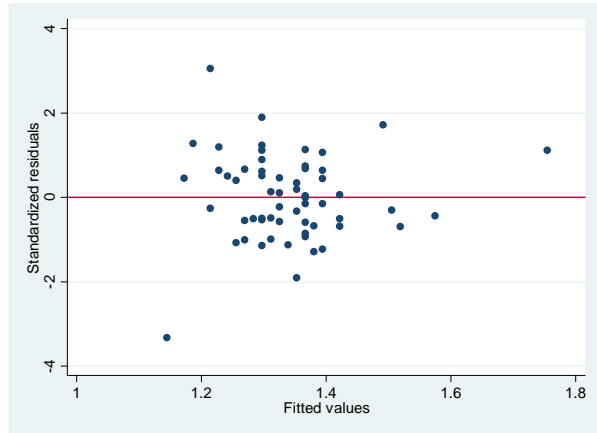
ln(chl *a*) and salinity



Chl *a* and DO

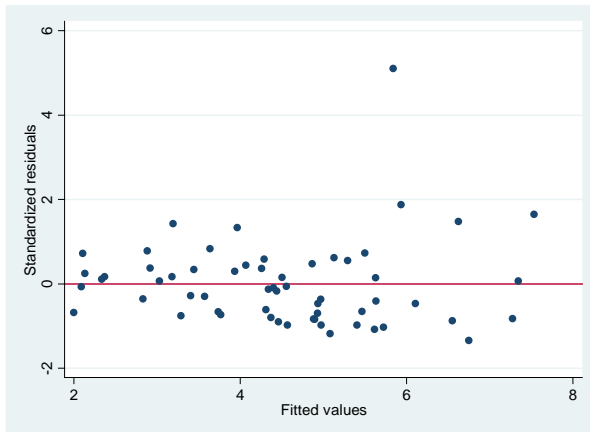


ln(chl *a*) and DO

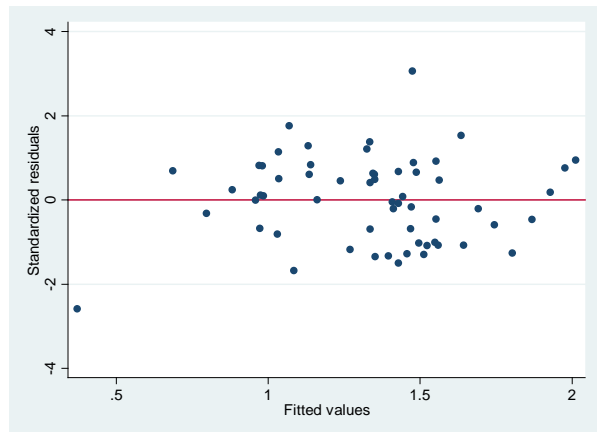


Multiple regression

Non-transformed chl a

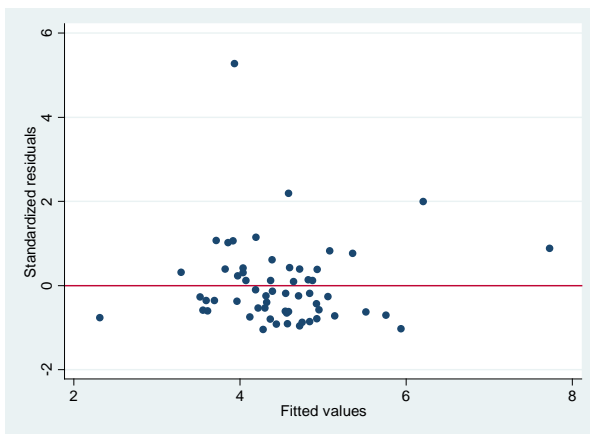


Transformed chl a

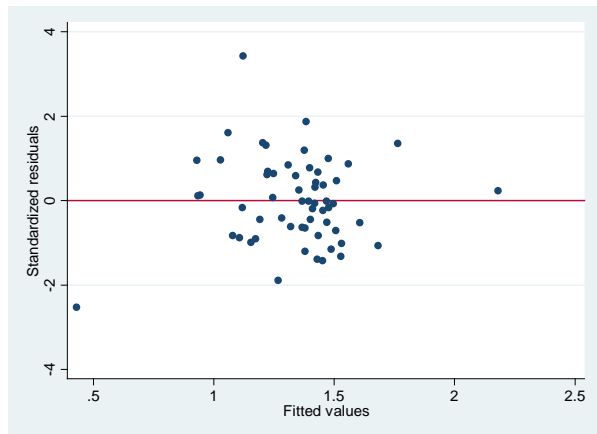


Regression with PCA

Non-transformed chl a



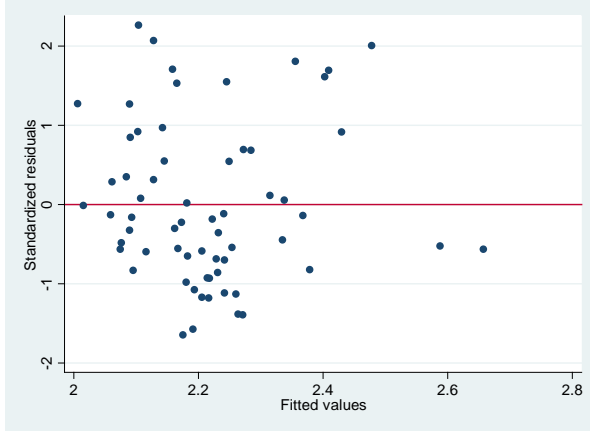
Transformed chl a



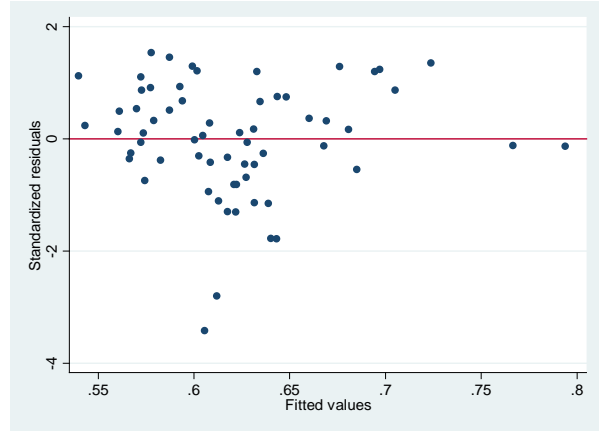
Off season data

Univariate regressions

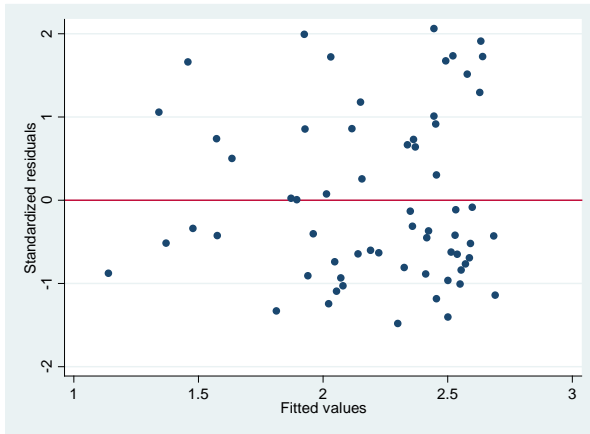
Chl *a* and temperature



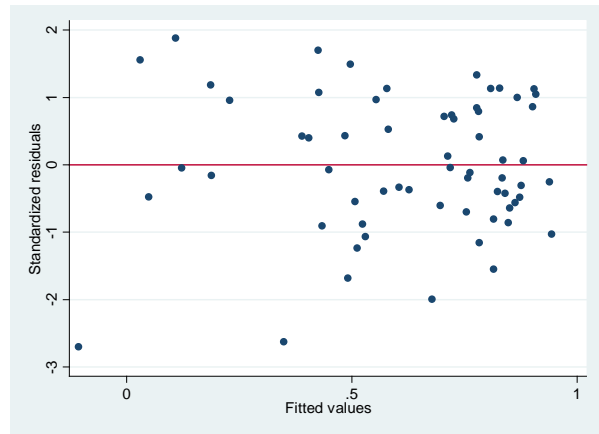
ln(chl *a*) and temperature



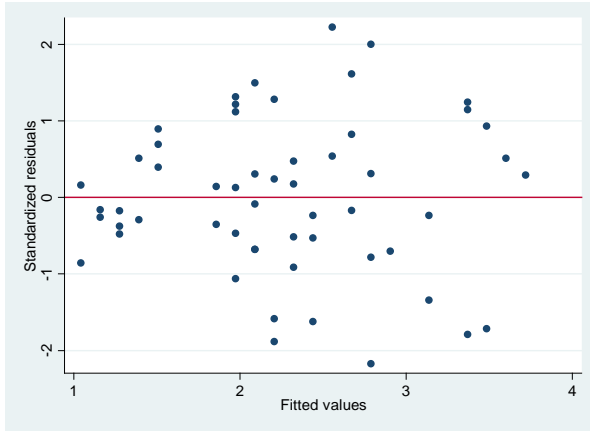
Chl *a* and salinity



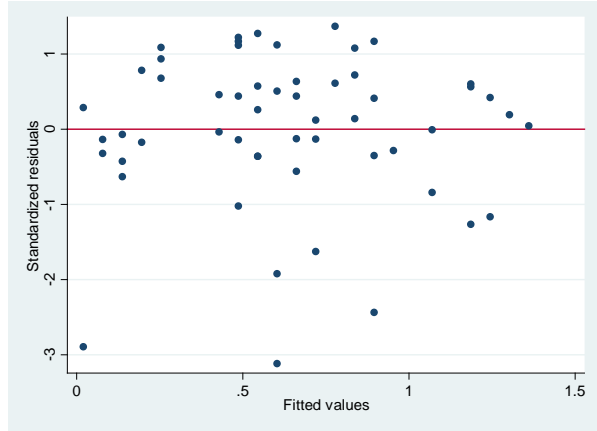
ln(chl *a*) and salinity



Chl *a* and DO

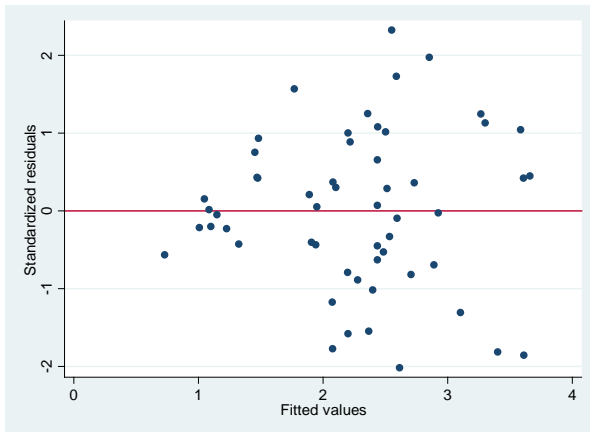


ln(chl *a*) and DO

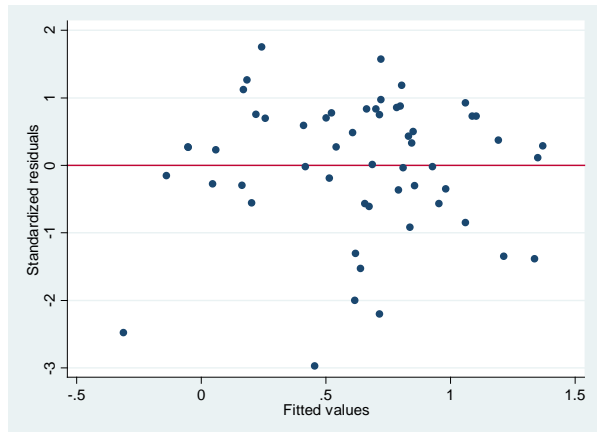


Multiple regression

Non-transformed chl a

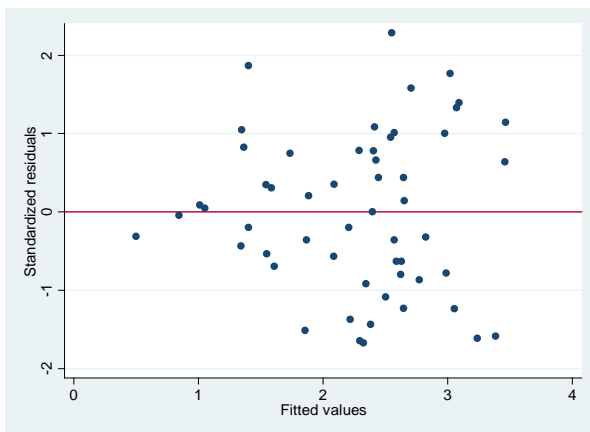


Transformed chl a

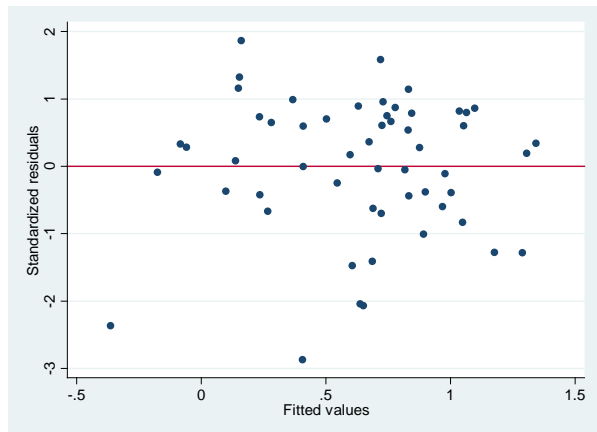


Regression with PCA

Non-transformed chl a



Transformed chl a



APPENDIX D: PCA Details**Table D1. Essential principal components combining temperature, salinity, and DO for all months.**

| Component | Eigenvalue | Proportion | Cumulative |
|-----------|------------|------------|------------|
| pc1 | 1.723 | 0.5745 | 0.5745 |
| pc2 | 0.697 | 0.2325 | 0.8069 |

Equation D1. Eigenvectors for pc1.

$$pc1 = 0.5470 * \text{Temperature} + 0.6023 * \text{Salinity} - 0.5814 * \text{DO}$$

Equation D2. Eigenvectors for pc2.

$$pc2 = 0.8143 * \text{Temperature} - 0.2217 * \text{Salinity} + 0.5364 * \text{DO}$$

Table D2. Essential principal components combining temperature, salinity, and DO for upwelling on season.

| Component | Eigenvalue | Proportion | Cumulative |
|-------------------|------------|------------|------------|
| pc1 _{on} | 1.3551 | 0.4517 | 0.4517 |
| pc2 _{on} | 1.0447 | 0.3382 | 0.7999 |

Equation D3. Eigenvectors for pc1_{on}.

$$pc1_{on} = 0.7276 * \text{Temperature} + 0.4358 * \text{Salinity} + 0.5298 * \text{DO}$$

Equation D4. Eigenvectors for pc2_{on}.

$$pc2_{on} = 0.0185 * \text{Temperature} + 0.7596 * \text{Salinity} - 0.6502 * \text{DO}$$

Table D3. Essential principal components combining temperature, salinity, and DO for upwelling off season.

| Component | Eigenvalue | Proportion | Cumulative |
|--------------------|------------|------------|------------|
| pc1 _{off} | 1.8488 | 0.6162 | 0.6162 |
| pc2 _{off} | 0.7313 | 0.2438 | 0.8600 |

Equation D5. Eigenvectors for pc1_{off}.

$$pc1_{off} = 0.4906 * \text{Temperature} + 0.6135 * \text{Salinity} - 0.6188 * \text{DO}$$

Equation D6. Eigenvectors for pc2_{off}.

$$pc2_{off} = 0.8709 * \text{Temperature} - 0.3684 * \text{Salinity} + 0.3253 * \text{DO}$$

APPENDIX E: Regression Results

Table E1. R^2 and p-values for models tested with non-transformed chl a values. * denotes significant p-value ($p < 0.05$), ** denotes a very significant p-value ($p < 0.01$), *** denotes a highly significant p-value ($p < 0.001$)

| Regression type | Explanatory variable | R^2 | P-value |
|-----------------------|----------------------|--------|----------|
| <i>Year-long data</i> | | | |
| Individual | Temperature | 0.014 | 0.096 |
| | Salinity | 0.029 | 0.016* |
| | DO | 0.042 | 0.006** |
| Multiple | all | 0.057 | -- |
| | Temperature | -- | 0.922 |
| | Salinity | -- | 0.109 |
| | DO | -- | 0.084 |
| PCA | All | 0.057 | -- |
| | pc1 | -- | 0.003** |
| | pc2 | -- | 0.257 |
| <i>On season data</i> | | | |
| Individual | Temperature | 0.0946 | 0.013* |
| | Salinity | 0.0535 | 0.064 |
| | DO | .0060 | 0.561 |
| Multiple | all | 0.221 | -- |
| | Temperature | -- | 0.001*** |
| | Salinity | -- | 0.006** |
| | DO | -- | 0.577 |
| PCA | all | 0.072 | -- |
| | pc1 | -- | 0.244 |
| | pc2 | -- | 0.088 |

Table E2. R^2 and p-values for models tested with $\ln(\text{chl } a)$ values. ** denotes a very significant p-value ($p < 0.01$), *** denotes a highly significant p-value ($p < 0.001$)

| Regression type | Explanatory variable | R^2 | P-value |
|------------------------|----------------------|--------|------------|
| <i>Off season data</i> | | | |
| Individual | Temperature | 0.005 | 0.551 |
| | Salinity | 0.157 | 0.001** |
| | DO | 0.272 | <0.0005*** |
| Multiple | all | 0.333 | -- |
| | Temperature | -- | 0.197 |
| | Salinity | -- | 0.063 |
| | DO | -- | 0.005** |
| PCA | all | 0.3270 | -- |
| | pc1 | -- | <0.0005*** |
| | pc2 | -- | 0.007** |