# Results of residual analyses and a further sensitivity to "outlier" omission of the model to obtain Compliance poaching trends for West Coast rock lobster

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#### Abstract

Residual plots of the model fitted to the Compliance poaching data of Super-area 8+ reported in Brandão and Butterworth (2021) are shown for the case when all data are used in the analysis, as well as for the sensitivity when the largest confiscation records from 2020 are omitted from the analysis. Results are also shown for a further sensitivity in which records with large residuals for the base case model (i.e. the model fitted to all data) are removed from the analysis.

Keywords: Super-area 8+; poaching trends; Pearson residuals; model diagnostics

### Introduction

All results shown here correspond to Super-area 8+ and the preferred approach of upweighting the "old" database contributions to the likelihood. Residual plots of the model fitted to the Compliance poaching data reported in Brandão and Butterworth (2021) are shown for the case when all data are used in the analysis, as well as for the sensitivity when the largest confiscation records from 2020 are omitted from the analysis (one record from the "old" database close to 18 000 and one from the "new" database of over 13 000 lobsters).

A further sensitivity has now been carried out in which records with large residuals for the base case model (i.e. the model fitted to all data) are removed from the analysis. The criterion used was to remove records with a Pearson residual great than two in the "old" database and greater than three in the "new" database. This resulted in seven (out of 150) records being omitted in the "old" database and twelve (out of 443) in the "new" database. All the records removed from the "old" database corresponded to confiscations that were greater than 3 300 lobsters. In the "new" database, all records with confiscations greater than 2 000 lobsters were removed.

### Results

Figure 1 reports the poaching trends relative to 2008 and the three-point smoothing trends for the base case and the two sensitivities. Figure 2 compares the three-point smoothing trends for these three cases. Figures 3 and 4 show the Pearson residuals against predicted values and against time respectively for the analysis fitted to all data. These results for the sensitivity when the largest confiscation records from 2020 are omitted are shown in Figures 5 and 6. Figures 7 and 8 show these results for the sensitivity when records with large residuals are removed from the analysis.

Note that this new sensitivity is somewhat extreme. If results from the original data analysis are to be modified in the light of this result, the modification should likely not be to the full extent indicated by this test.

## Reference

Brandão, A. and Butterworth, D.S. 2021. Compliance poaching trends updated up to 2020 for West Coast rock lobster from modelling the "old" and the "new" database simultaneously. Fisheries/2021/JUNE/SWG-WCRL11.





- modelling of the combined "old" and "new" databases with the "old" database weighted by some factor – the approach now recommended (see text for details); and
- in addition, applying three-point smoothing to the poaching indices from the approach above.

The plots described above are given for **Super-area 8+**. The top plot shows results when all data is used in the analysis, the middle plot shows results for the sensitivity in which the largest confiscation records from 2020 are omitted from the analysis (one record from the "old" dataset close to 18 000 and one from the "new" database of over 13 000 lobsters) and the bottom plot shows results for the sensitivity in which records with an associated large Pearson residuals are omitted (seven from the "old" database and twelve from the "new" database). Results shown are normalised to a 2008 value of 1, as assumed for the 2016 assessment and projections for the first approach, but not the second.



Figure 2. Comparison of the three-point smoothing series for the three analyses as described in Figure 1.



"Old" database

Figure 3. Pearson residuals versus predicted values for the base case (i.e. all data used in the analysis) for Super-area 8+.



Figure 4. Pearson residuals versus time for the base case (i.e. all data used in the analysis) for Superarea 8+.



**Figure 5.** Pearson residual versus predicted values for the sensitivity when the two large confiscation values in 2020 are omitted (one from the "old" database and one from the "new" database).



**Figure 6.** Pearson residual versus time for the sensitivity when the two large confiscation values in 2020 are omitted (one from the "old" database and one from the "new" database).



"Old" database

**Figure 7.** Pearson residual versus predicted for the sensitivity when records with large residuals are omitted (seven from the "old" database and twelve from the "new" database).



**Figure 8.** Pearson residual versus time for the sensitivity when records with large residuals are omitted (seven from the "old" database and twelve from the "new" database).