

Did High Directed Sardine TACs Cause the Rapid Decline in Sardine Abundance?

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A question that has been raised is whether the rapid decline in the sardine abundance after 2002 can be attributed either in part or in full to the relatively large sardine catches in the early part of this decade. One way to consider this question is to compare the projected sardine biomass under the base case sardine assessment, which was fit to the observed catch and survey data from 1984 to 2006 to the predictions from an identical model had there been zero sardine catch from 2000 to 2006.

Method

The last full sardine base case assessment was used for this purpose (Cunningham and Butterworth 2007). The 'short' model excluding the catch-at-length data was used. In the zero catch scenario, the parameters (including recruitment residuals – this is the key assumption, that the multiplicative environmental impact on recruitment relative to the average expected under the stock-recruitment relationship remains the same) were fixed at their values estimated at the posterior mode of the base case. Thus for this scenario the model was not refit to the observed data (since, for example, the survey biomass estimates that were observed were not under a zero catch hypothesis). The objective was to examine what the model would predict had no sardine been caught commercially between 2000 and 2006 given the parameters estimated under the base case assessment in order to establish what the effect the relatively high catches had on the rapid decline in the abundance.

Results

Figure 1 shows the model predicted November 1+ sardine biomass under both the base case assessment with the associated actual catches and the zero catch scenario. Although the biomass trajectory under the zero catch scenario is higher than that for the base case assessment, there is still a rapid decline in the sardine abundance from the peak in 2002. The sardine 1+ biomass under the zero catch scenario is indicated to rise from 6% (in 2001) to 31% (in 2006) higher than that under the base case assessment (Figure 2).

Discussion

Although fishing does have an impact on the sardine resource, these results show that the rapid decline in sardine abundance since 2002 cannot be attributed entirely, or even to any large extent, to the relatively high TACs and catches taken immediately following the turn of the century.

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References

Cunningham, CL and Butterworth DS 2007. Base Case Assessment of the South African Sardine Resource. MCM Document MCM/2007/SEP/SWG-PEL/06. 30pp.

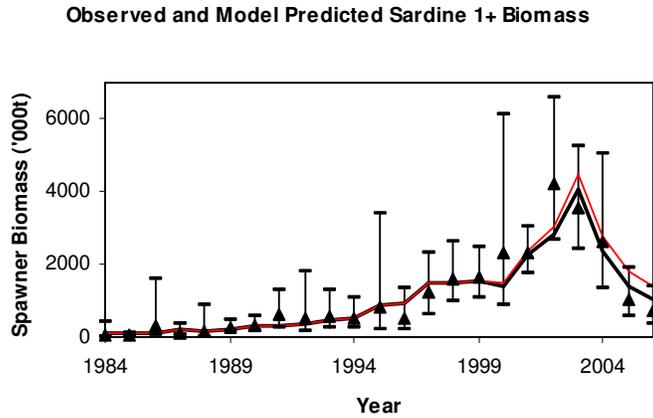


Figure 1. Acoustic survey observed and model predicted November sardine 1+ biomass from 1984 to 2006 for the base case assessment (black solid line) and zero catch scenarios (thin red line). The observed biomass estimates from the surveys are shown with their 95% confidence intervals.

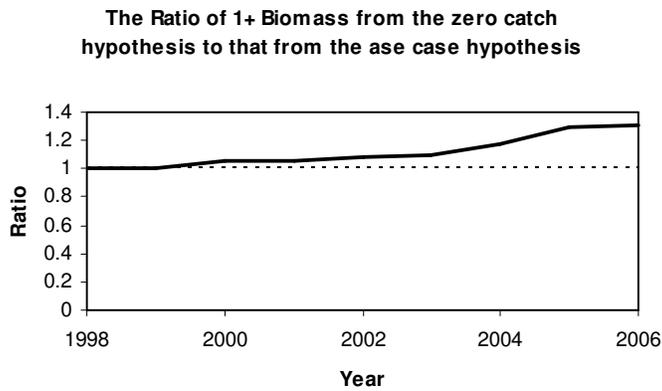


Figure 2. The ratio of the model predicted November sardine 1+ biomass from 1998 to 2006 under the zero catch scenario to that under the base case assessment.