# When would a survey estimate be considered "appreciably outside the bounds predicted in the OMP testing"?

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Background

Anon. (2009), outlining the procedures for deviating from or initiating an early review of the pelagic OMP, was discussed at the Scientific Working Group (Pelagic) on 26th February 2009. The document lists examples as to what might constitute Exceptional Circumstances in the case of sardine and anchovy. One such example was: "Survey estimates of abundance that are appreciably outside the bounds predicted in the OMP testing."
A request was made to develop a rule to determine what determines when a survey estimate is "appreciably outside the bounds predicted in the OMP testing."

Rule

The distributions of November and May survey "observations" simulated during OMP-08 testing are given in Figures 1 and 2, respectively. These distributions consist of 21 000 points each (1000 draws from the posterior distribution and projecting forward for 21 years). Note that, as the CVs of observations are already considered in the simulation testing, these distributions are to be compared directly to the point estimate arising from hydroacoustic surveys (i.e. one does not need to take the CV of that survey into account in the comparison). The histograms (consisting of 25 points each) of historic November and May survey observations are overlayed on these figures for comparative purposes.

The simulated distributions display a long upper tail, likely resulting from the lognormal distribution assumed for recruitment residuals which may not be appropriate far from its centre. For the purposes of determining "Exceptional Circumstances" for early review of the pelagic OMP, the simulated extreme values higher than 5% above the maximum historic observation were thus discarded (i.e. the long upper tail was truncated). The renormalized distributions, ignoring these high values, are given in Figures 3 and 4.

Some percentiles of these renormalized distributions are listed in Table 1.

This matter has already been discussed by the Demersal Scientific Working Group where it was agreed that a survey estimate outside the 99% probability interval would be considered exceptional. Although consistency between Working Groups would be ideal, historic observations have only fallen below the lower 1 percentile

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for sardine (three times), but not at all for anchovy, so such a basis for a rule might be unduly severe, in that it may well fail to pick up genuine "outliers".

Example

Some comparisons are made to the lower tails of the distributions, which matter most in terms of picking up potential problems for the resource.

Historically, some survey estimates have been below the lower 2.5 percentile of the simulated distributions given in Figures 3 and 4:

- Sardine November 1+ biomass was below 181 thousand t 16% of the time (45 thousand t in 1985, 48 thousand t in 1984, 111 thousand t in 1987 and 134 thousand t in 1988)
- Anchovy November 1+ biomass was below 184 thousand t 4% of the time (162 thousand t in 1996).
- Sardine May recruitment was below 1.6 billion 4% of the time (0.44 billion in 1988).
- Anchovy May recruitment has not historically been below 9.7 billion.

Summary and Recommendation

The lower 2.5 percentile seems a reasonable compromise between avoiding false positives (resulting if the threshold were set too low) while keeping the proportion of large false negatives low (resulting if the threshold were set too high).

We therefore recommend that survey observations below the 2.5$^{th}$ percentile or above the 97.5$^{th}$ percentile of the renormalized distributions of observations generated during OMP simulation testing be considered "appreciably outside the bounds predicted in the OMP testing."

References

Anon. (2009) Procedures for Deviating from OMP Output for the Recommendation for a TAC, and for Initiating an OMP Review. MCM Document MCM/2009/SWG-PEL/03. 9pp

**Table 1.** The 1$^{st}$, 2.5$^{th}$, 97.5$^{th}$ and 99$^{th}$ percentile of the renormalized probability density functions of simulated future November 1+ and May recruitment observations. Biomass is given in thousands of tons and recruitment in billions.

| | Percentile | | | |
|---|---|---|---|---|
| Survey | 1$^{st}$ | 2.5$^{th}$ | 97.5$^{th}$ | 99$^{th}$ |
| Sardine November 1+ biomass | 82.6 | 181.0 | 3827.3 | 4149.3 |
| Anchovy November 1+ biomass | 117.3 | 183.9 | 6035.9 | 6603.9 |
| Sardine May recruitment | 0.81 | 1.59 | 50.20 | 57.00 |
| Anchovy May recruitment | 4.32 | 9.70 | 561.05 | 614.15 |

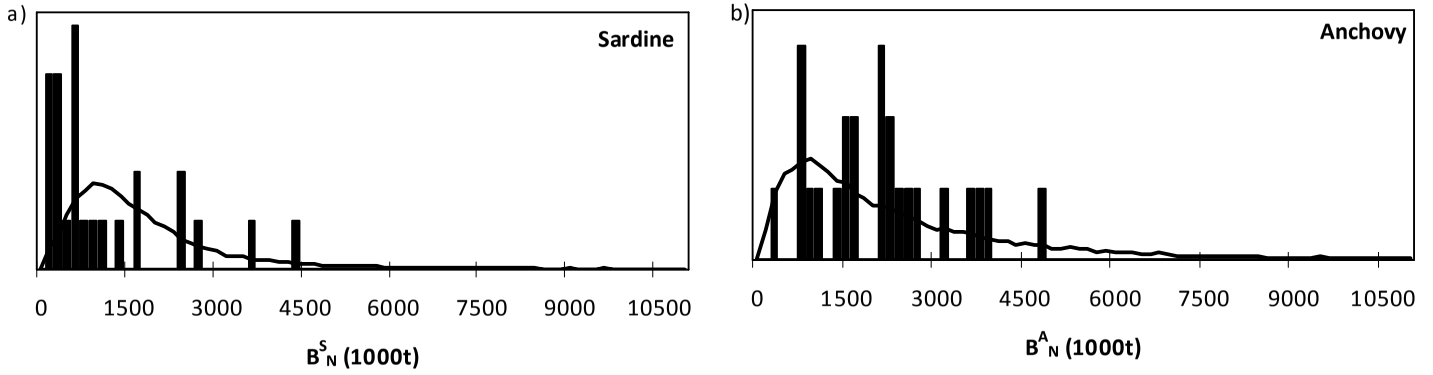


**Figure 1.** The probability distribution function of future a) sardine and b) anchovy November 1+ biomass during the simulation testing of OMP-08. The histograms of historic a) sardine and b) anchovy observations are overlayed.

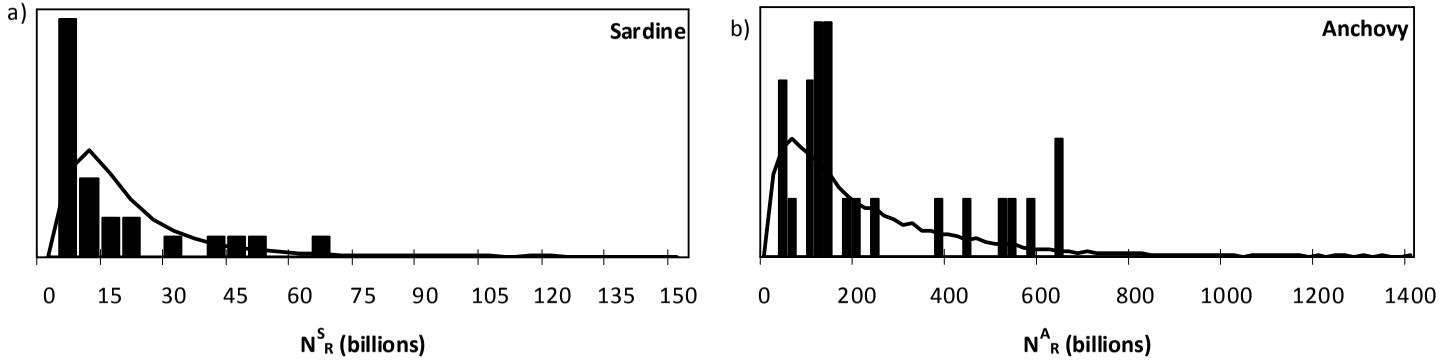


**Figure 2.** The probability distribution function of future a) sardine and b) anchovy May recruitment during the simulation testing of OMP-08. The histograms of historic a) sardine and b) anchovy observations are overlayed.

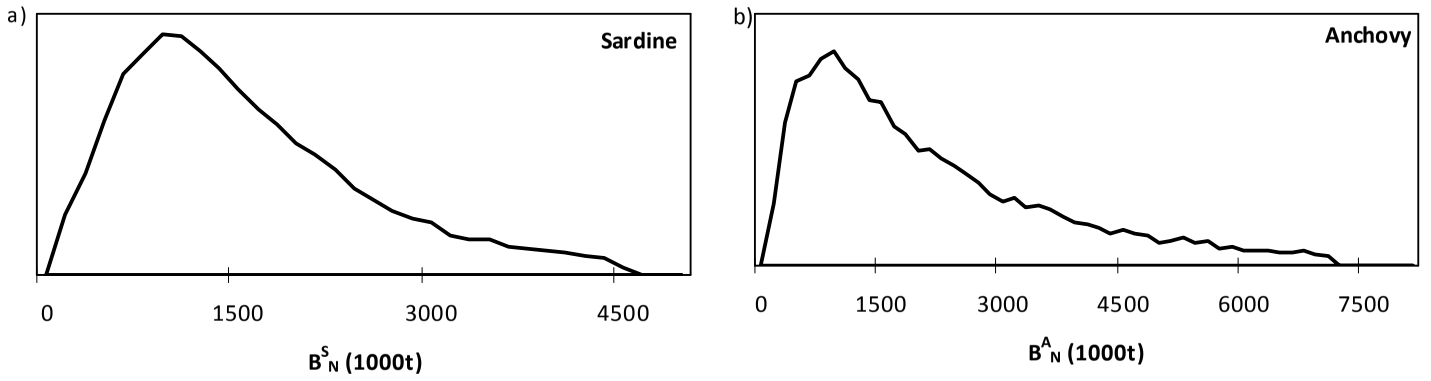


**Figure 3.** The renormalized (after discarding values greater than 1.05 * maximum historic observations) probability distribution function of future a) sardine and b) anchovy November 1+ biomass during the simulation testing of OMP-08.

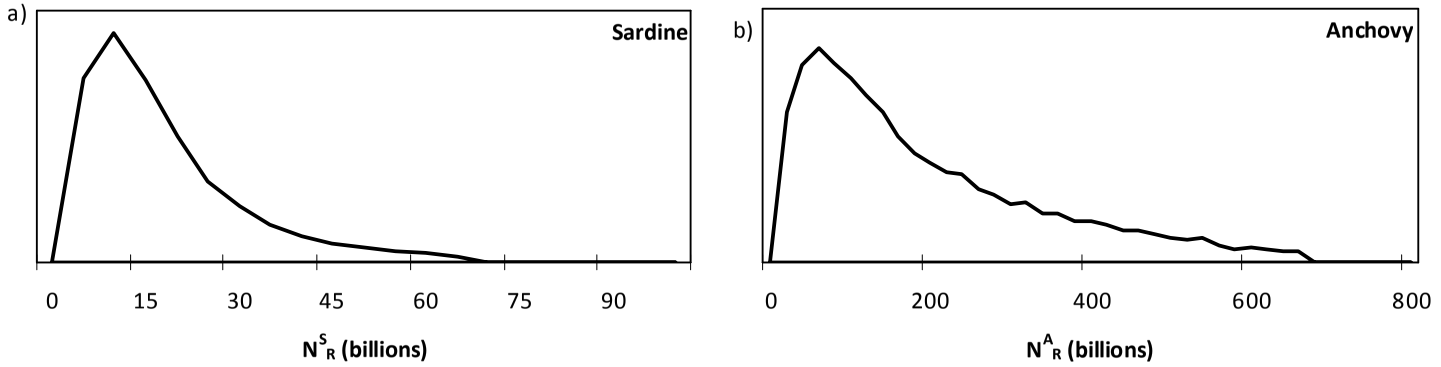


**Figure 4.** The renormalized (after discarding values greater than 1.05 * maximum historic observations) probability distribution function of future a) sardine and b) anchovy May recruitment during the simulation testing of OMP-08.