Sub-area level CVs are calculated based on the method in SC/58/Rep1. CVs based on sampling errors were calculated by Tables 2 and 3 (Case 2) of Kitakado et al. (2005). For example, the sampling CV for block F, $CV_S(N_F)$, is

$$CV_S(N_F) = \sqrt{\frac{(N_{F,\text{closing}}/R)^2 (CV_i(N_{F,\text{closing}})) + CV_i(R) + CV_i(N_{F,\text{closing}})^2}{N_{F,\text{closing}}/R + N_{F,\text{opening}}}}.$$

where $R = 0.727$ (CV(R) = 36.4%) (SC/58/Rep1, annex H). We ignored a correlation for simplicity.

Then, $var_S(N_F) = \{CV_S(N_F) \exp(\mu_F + \sigma_F^2/2)\}^2$ where $\mu_F$ and $\sigma_F$ are extracted from table 1 of SC/58/Rep1, annex H.

Total $CV_T(N_F) = \sqrt{CV^2_S(N_F) + \sigma_F^2}$ for each block, and $var_T(N_F) = \{CV_T(N_F) \exp(\mu_F + \sigma_F^2/2)\}^2$.

For Sub-area 1W = F+G+H, the Sub-area level CVs are calculated as follows:

$$CV_S(N_{FGH}) = \sqrt{\frac{var_T(N_F) + var_T(N_G) + var_T(N_H)}{N_{FGH}}},$$

$$CV_T(N_{FGH}) = \sqrt{\frac{var_T(N_F) + var_T(N_G) + var_T(N_H)}{N_{FGH}}}.$$

### Table 1

<table>
<thead>
<tr>
<th>Sub-area 1W (blocks FGH)</th>
<th>Sub-area 1E (blocks IJK)</th>
<th>Sub-area 2 (blocks LM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$N$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CV$_{\text{sample}}$, %</td>
<td>25.43</td>
<td>24.45</td>
</tr>
<tr>
<td>CV$_{\text{total}}$, %</td>
<td>46.68</td>
<td>51.59</td>
</tr>
<tr>
<td>CV$_{\text{calc}}$, %</td>
<td>39.15</td>
<td>45.42</td>
</tr>
<tr>
<td>$\sigma_F$, %</td>
<td>0.673</td>
<td>0.718</td>
</tr>
<tr>
<td>CV$_{\text{total}}$, %</td>
<td>58.20</td>
<td>65.48</td>
</tr>
<tr>
<td>CV$_{\text{calc}}$, %</td>
<td>52.36</td>
<td>60.75</td>
</tr>
</tbody>
</table>

**REFERENCE**


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**Adjunct 1**

Approximate calculation of Sub-area level additional CVs based on revised abundance estimates for conditioning of ISTs

H. Okamura, T. Kitakado and D.S. Butterworth

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**Adjunct 2**

Estimation of age-at-maturity for female Bryde’s whales

A.E. Punt

Four models were fitted to the data on the maturity-at-age for female Bryde’s whales sampled during JARPN II (table 1 of Bando et al., 2005). The four models are special cases of the following general model:

$$P_a = \left[\frac{\alpha}{1 + \exp[-(a - a_{50})/\delta]}\right]^\beta \tag{1}$$

where $P_a$ is the proportion of animals of age $a$ which are mature;

- $a_{50}$ is the age-at-50%-maturity (if $\alpha = 1$ and $\beta = 1$);
- $\delta$ is the parameter that determines the width of the maturity ogive;
- $\alpha$ is asymptotic fraction of animals which are mature; and
- $\beta$ is a shape parameter.

The model is fitted using a binomial likelihood under the assumption that age and maturity determination are exact (i.e. no measurement error).

Table 1 lists the values for the parameters of Equation (1) for each of the four models and the true age-at-50%-maturity (the age at which a proportion of $\alpha/2$ animals are mature). Fig. 1 shows the fit of the four models to the available data.

Although the model in which $\alpha$ (but not $\beta$) is treated as an estimable parameter provides the most parsimonious representation of the data, the age-at-50%-maturity is robustly estimated to be 6 years. The age-at-first-parturition corresponding to this age-at-maturity is 7 years.

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