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Article Title: Spatio-temporal variability of harbour porpoise life history parameters in the North-east Atlantic

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Supplementary material

S1

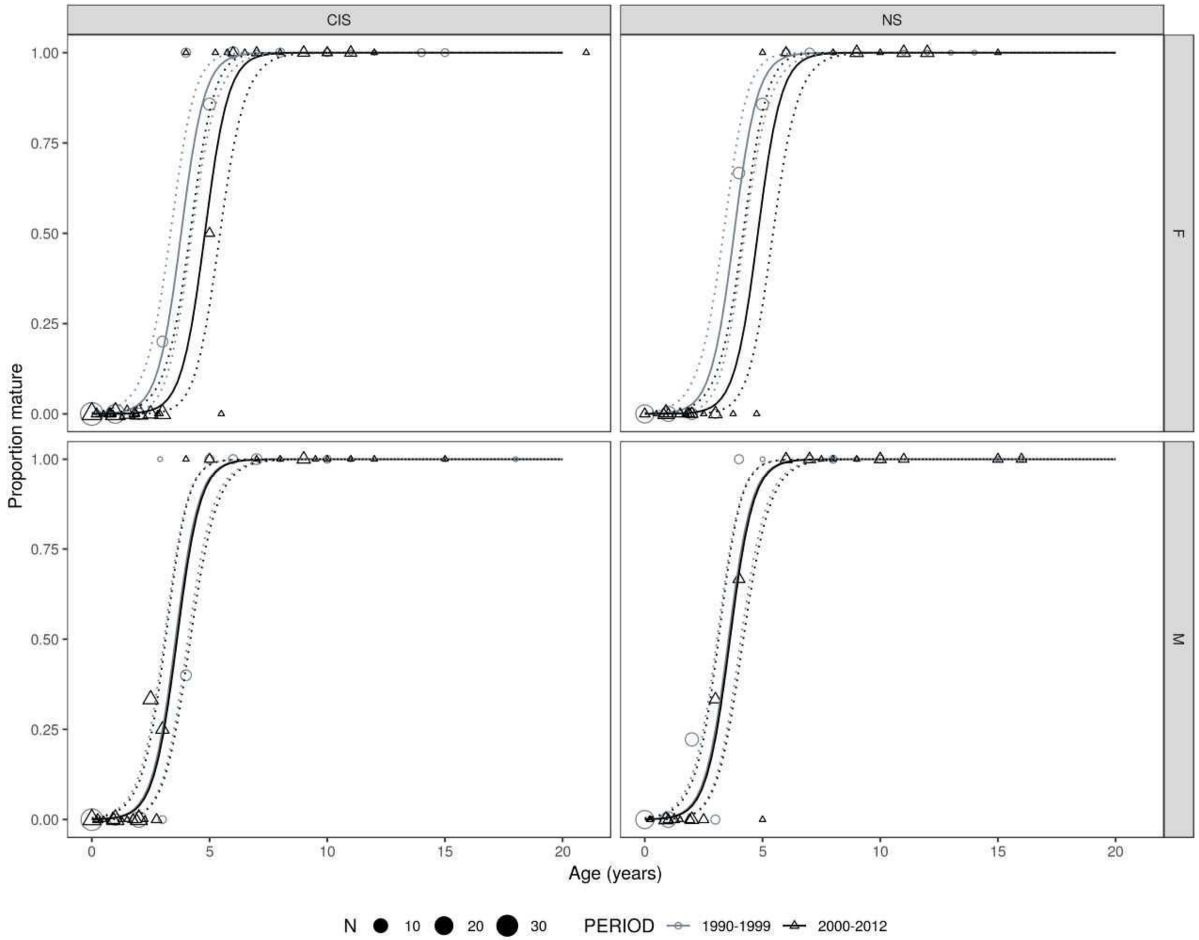

Figure 1. Best fitting age at maturity model fits by management unit, sex and time period. Points are scaled proportional to the number of observations for a given proportion. Solid and dashed curves represent the mean and 95% confidence intervals on the estimated proportion mature, respectively.

S2

Table 1. Sum of fraction of immature method for estimating the average age at attainment of sexual maturity in female harbour porpoises within the cause of death group trauma.

Age class (years)	**Number Immature**	**Number Mature**	**Total in Age Class (N_i)**	**Fraction Immature (p_i)**	**Fraction Mature (q_i)**	$\frac{(p_i q_i)}{N_i-1}$
3	11	1	12	0.92	0.08	0.007
4	1	4	5	0.20	0.80	0.040
5	3	8	11	0.27	0.73	0.020

Table 2. Sum of fraction of immature method for estimating the average age at attainment of sexual maturity in female harbour porpoises within the cause of death group infectious disease.

Age class (years)	**Number Immature**	**Number Mature**	**Total in Age Class (N_i)**	**Fraction Immature (p_i)**	**Fraction Mature (q_i)**	$\frac{(p_i q_i)}{N_i-1}$
4	4	2	1	0.67	0.33	0.111

Table 3. Sum of fraction of immature method for estimating the average age at attainment of sexual maturity in male harbour porpoises within the cause of death group trauma.

Age class (years)	Number Immature	Number Mature	Total in Age Class (N_i)	Fraction Immature (p_i)	Fraction Mature (q_i)	$\frac{(p_i q_i)}{N_i-1}$
2	4	24	28	0.14	0.86	0.005
3	6	1	7	0.86	0.14	0.020
4	2	6	8	0.25	0.75	0.027
5	1	3	4	0.25	0.75	0.063

Table 4. Sum of fraction of immature method for estimating the average age at attainment of sexual maturity in male harbour porpoises within the cause of death group infectious disease.

Age class (years)	Number Immature	Number Mature	Total in Age Class (N_i)	Fraction Immature (p_i)	Fraction Mature (q_i)	$\frac{(p_i q_i)}{N_i-1}$
2	10	1	11	0.91	0.09	0.008
3	2	0	2	1.00	0.00	0.000
4	1	1	2	0.50	0.50	0.250

Table 5. Sum of fraction of immature method for estimating the average age at attainment of sexual maturity in male harbour porpoises within the cause of death group other.

Age class (years)	**Number Immature**	**Number Mature**	**Total in Age Class (N_i)**	**Fraction Immature (p_i)**	**Fraction Mature (q_i)**	$\frac{(p_i q_i)}{N_i-1}$
3	2	1	3	0.67	0.33	0.111
4	1	1	2	0.50	0.50	0.250

S3

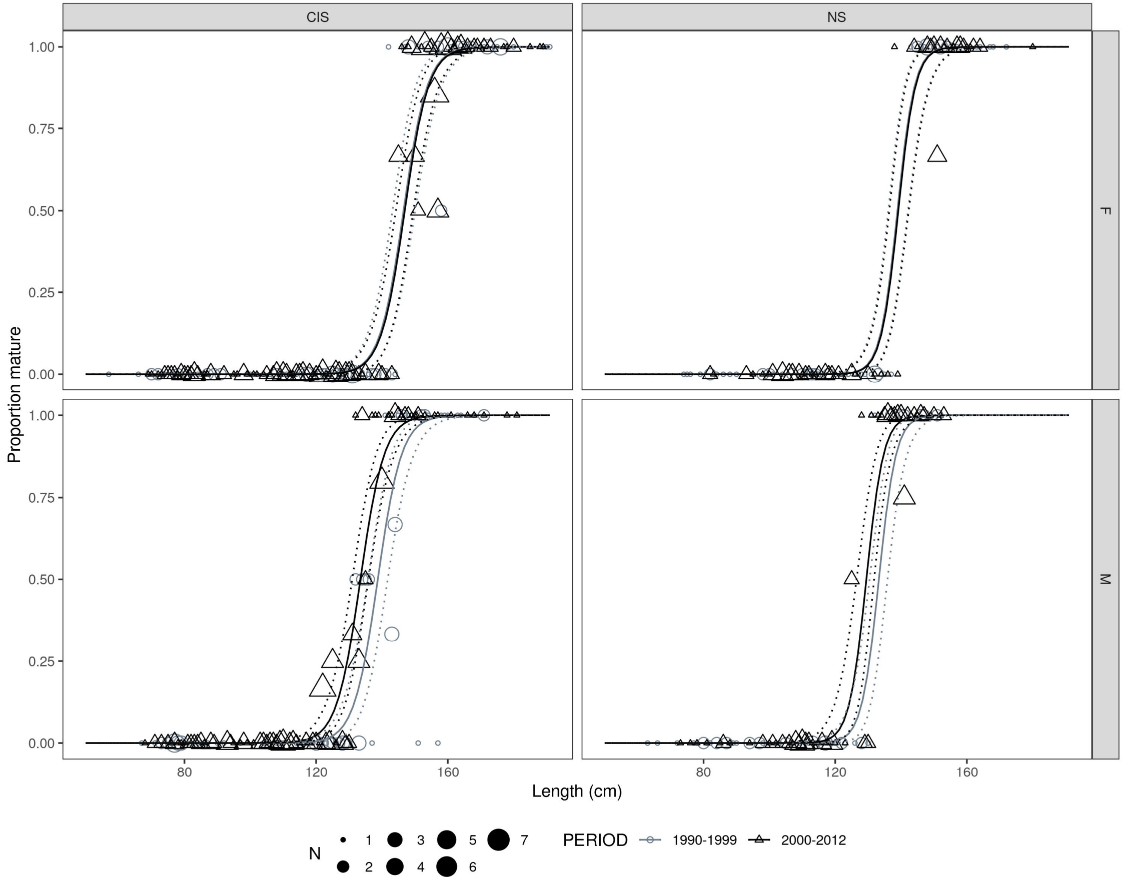

Figure 1. Best fitting length at maturity model fits by management unit, sex and time period. Points are scaled proportional to the number of observations for a given proportion. Solid and dashed curves represent the mean and 95% confidence intervals on the estimated proportion mature, respectively.

S4

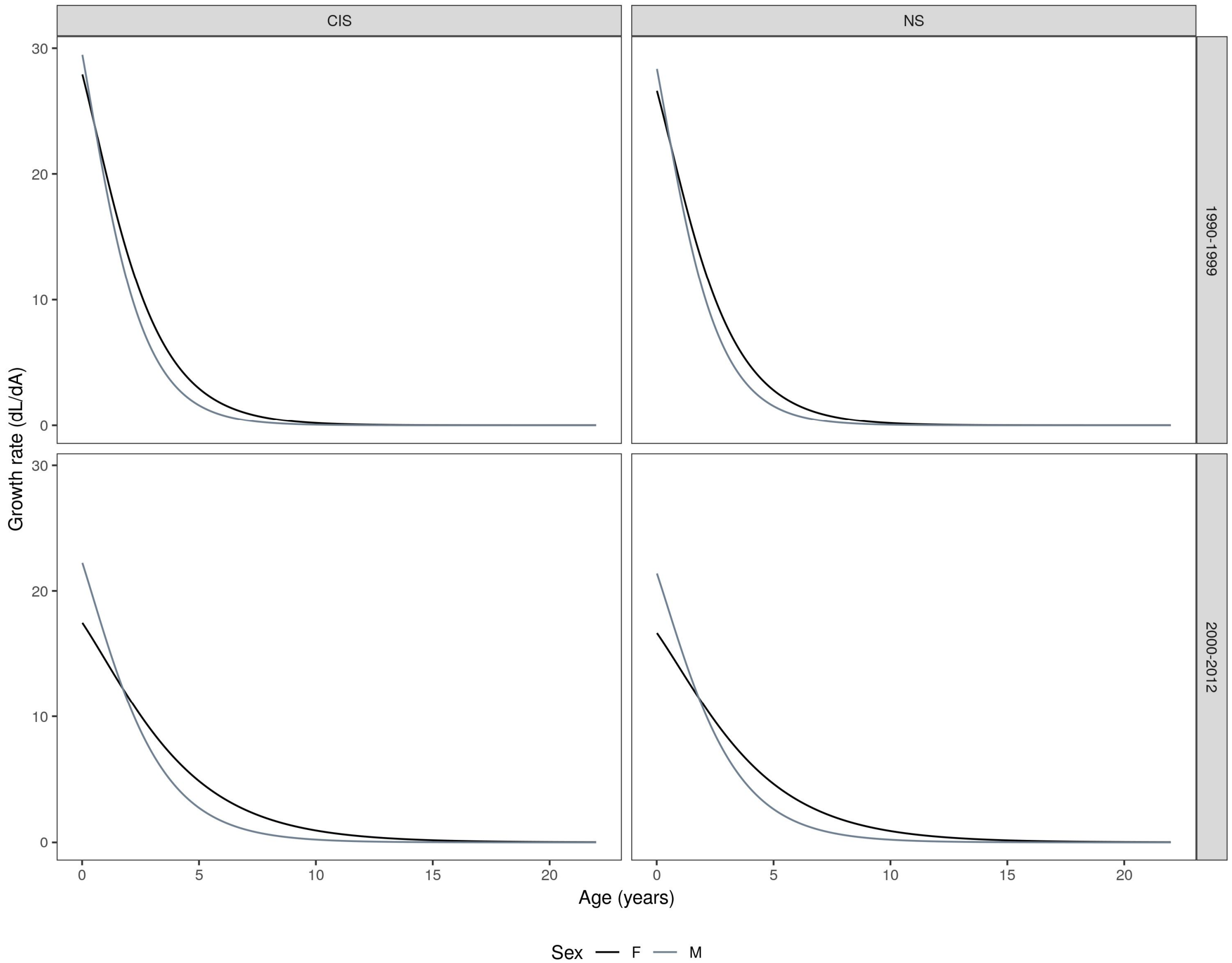

Figure 1. Finite difference approximation to the growth rate (dL/dA) at age in male and female harbour porpoise by management unit, time-period and sex. Each curve shows the derivative of the best fitting Gompertz functions with respect to age.

S5

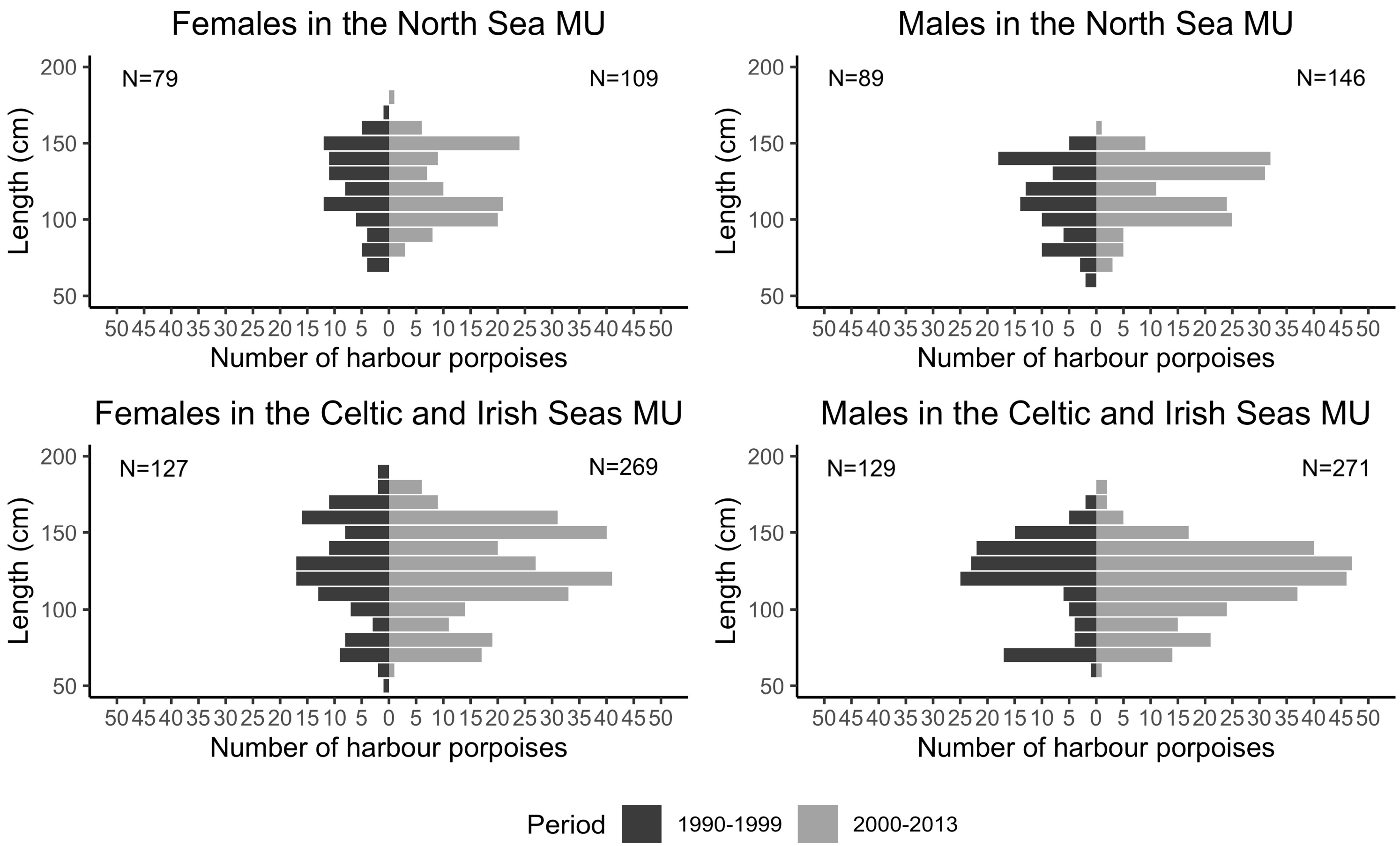

Figure 1: Length-frequency distribution and sample sizes of female and male harbour porpoises sampled within the North Sea MU and Celtic and Irish seas MU during the two time periods, 1990-1999 and 2000-2013.

Maximum body lengths for porpoises in the CIS MU were larger than those observed in the NS MU (191 cm: females CIS; 172 cm: females NS; 181 cm: males CIS; 161 cm: males NS; Table 1), though exceptions were observed. For example, one female porpoise that stranded in the North Sea in period 2, measured 180 cm in length. The larger-sized female porpoise stranded in the eastern English Channel (East Sussex) and may have migrated from the CIS MU, due to its proximity. Three large-sized males were observed in the CIS in period 2, ranging from 178 to 181 cm in length, and all three males stranded along the Cornish coastline, SW coast of the UK between 2001 and 2005. It is possible that these males migrated from more southerly waters, including Iberian waters, where males reach body lengths of 189 cm – and females can reach lengths of 202 cm (Read, 2016).

S6

Table 1: Asymptotic length (A), displacement (b), and growth rate (c) and their respective standard errors (SE) estimated using the Gompertz growth model for female and male harbour porpoises in the North Sea MU and Celtic and Irish Seas MU for the two time periods (and a cohort-based approach), 1990-1999 and 2000-2012.

<table>
<tr><th>MU</th><th>Sex</th><th>Period</th><th>Asymptotic length (A)</th><th>Displacement (b)</th><th>Growth rate (c)</th><th>Asymptotic age</th></tr>
<tr><td rowspan="4">North Sea</td><td rowspan="2">Females</td><td>1990-1999
n = 95</td><td rowspan="2">154.46 cm
SE = 1.91</td><td>0.49
SE = 0.013</td><td rowspan="2">0.44
SE = 0.035</td><td>8.83</td></tr>
<tr><td>2000-2012
n = 28</td><td>0.56
SE = 0.019</td><td>9.14</td></tr>
<tr><td rowspan="2">Males</td><td>1990-1999
n = 109</td><td rowspan="2">141.34 cm
SE = 1.59</td><td>0.49
SE = 0.013</td><td rowspan="2">0.62
SE = 0.046</td><td>6.27</td></tr>
<tr><td>2000-2012
n = 23</td><td>0.56
SE = 0.019</td><td>6.48</td></tr>
<tr><td rowspan="4">Celtic and Irish Seas</td><td rowspan="2">Females</td><td>1990-1999
n = 135</td><td rowspan="2">161.29 cm
SE = 1.85</td><td>0.49
SE = 0.013</td><td rowspan="2">0.44
SE = 0.035</td><td>8.83</td></tr>
<tr><td>2000-2012
n = 56</td><td>0.56
SE = 0.019</td><td>9.14</td></tr>
<tr><td rowspan="2">Males</td><td>1990-1999
n = 140</td><td rowspan="2">146.97 cm
SE = 1.54</td><td>0.49
SE = 0.013</td><td rowspan="2">0.62
SE = 0.046</td><td>6.27</td></tr>
<tr><td>2000-2012
n = 52</td><td>0.56
SE = 0.019</td><td>6.48</td></tr>
</table>

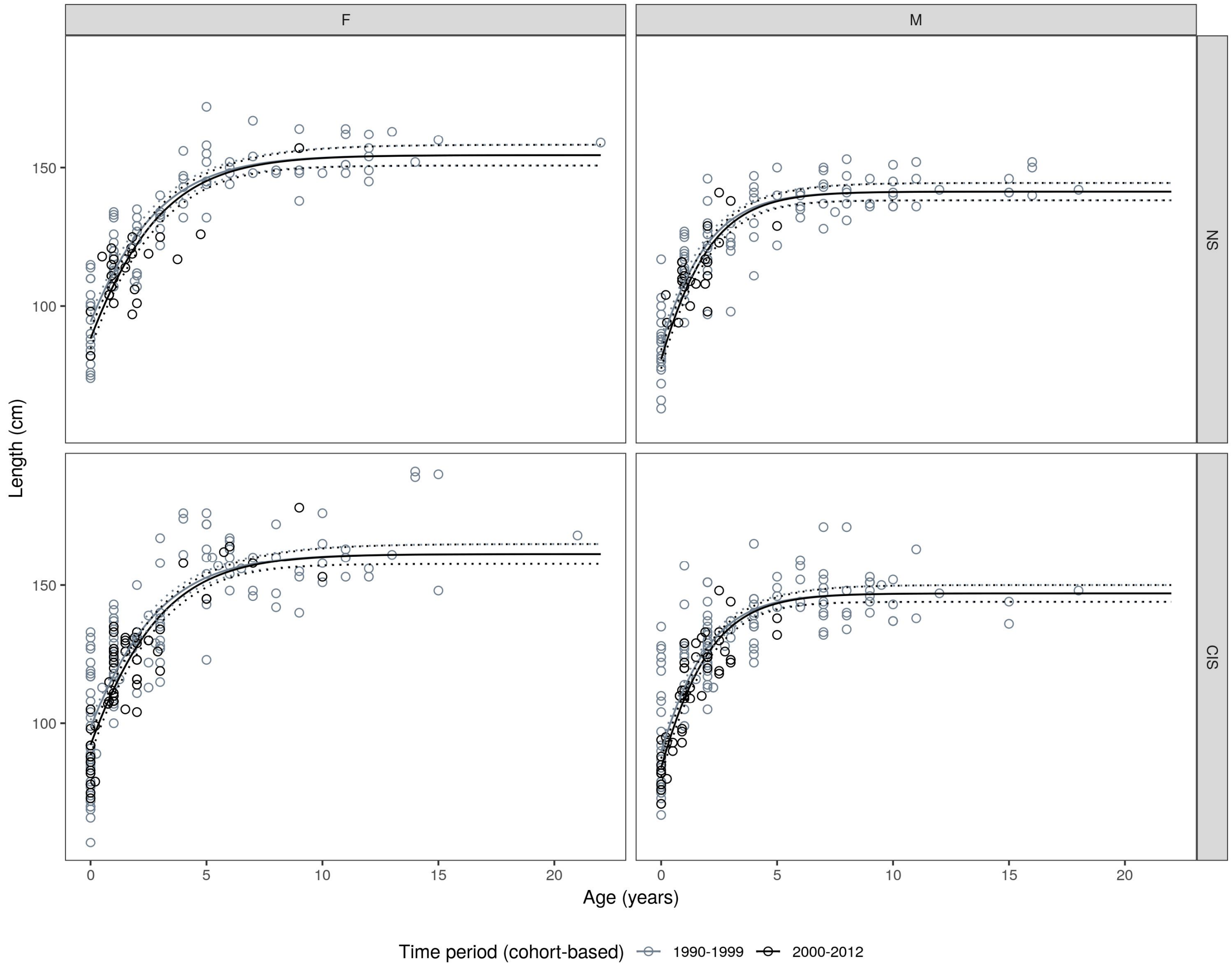

Figure 1. Cohort-based Gompertz growth models fitted to the length-at-age data; fitted by sex, management unit and time period (see Table 1 for n values and growth parameters).