Sub-area	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW	1E	1E	1E	1E	1E	1E	2	2
Sex:	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Boundary	155	155	155	155	155	155	160	160	165	165	165	165	165	165	155	155	160	160	165	165		
Series	B	B	H	H	L	L	B	B	B	B	H	H	L	L	All	All	All	All	All	All	All	All
1975	334	307	334	307	334	307	349	331	358	343	358	343	358	343	153	203	138	179	129	167	227	208
1976	371	423	371	423	371	423	379	446	390	461	390	461	390	461	389	245	381	222	370	207	25	6
1977	164	165	164	165	164	165	182	192	416	371	416	371	416	371	330	278	312	251	78	72	2	7
1978	236	194	304	258	168	130	252	203	274	216	342	280	206	152	205	148	189	139	167	126	8	5
1979	570	499	604	531	537	466	589	517	670	570	704	602	637	537	123	87	104	69	23	16	0	2
1980	401	354	401	354	335	292	401	354	401	354	401	354	335	292	0	0	0	0	0	0	0	0
1981	249	236	324	298	249	236	249	236	249	236	324	298	249	236	0	0	0	0	0	0	0	0
1982	275	207	409	300	275	207	275	207	275	207	409	300	275	207	0	0	0	0	0	0	0	0
1983	403	142	462	161	398	138	403	142	403	142	462	161	398	138	0	0	0	0	0	0	0	0
1984	353	175	542	262	328	153	353	175	353	175	542	262	328	153	0	0	0	0	0	0	0	0
1985	249	108	428	178	225	92	249	108	249	108	428	178	225	92	0	0	0	0	0	0	0	0
1986	217	100	426	196	217	100	217	100	217	100	426	196	217	100	0	0	0	0	0	0	0	0
1987	256	61	444	104	256	61	256	61	256	61	444	104	256	61	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	20	23	20	23	20	23	20	23	20	23	20	23	20	23	0	0	0	0	0	0	0	0
2001	17	33	17	33	17	33	17	33	17	33	17	33	17	33	0	0	0	0	0	0	0	0
2002	17	19	17	19	17	19	25	25	25	25	25	25	25	25	8	6	0	0	0	0	0	0
2003	16	21	16	21	16	21	18	28	19	31	19	31	19	31	3	10	1	3	0	0	0	0
2004	0	0	0	0	0	0	14	24	18	26	18	26	18	26	19	32	5	8	1	6	0	0
2005	21	25	21	25	21	25	21	26	21	29	21	29	21	29	0	4	0	3	0	0	0	0

Adjunct 2

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

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

Sub-area level CVs are calculated based on the method in IWC (2007). CVs based on sampling errors were calculated from Tables 2 and 3 (Case 2) of Kitakado *et al*. (2005). For example, the sampling CV for block F, $CV_S(N_F)$, is

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

where R = 0.727 ($CV(R)$ = 36.4 %) (IWC, 2007, pp.424-25). We ignored a correlation for simplicity.

Then, $\text{var}_S(N_F)=\{CV_S(N_F)\exp(\mu_F+\sigma_F^2/2)\}^2$ where μ_F and σ_F are extracted from Table 1 of IWC (2007, pp.424-25).

Total $CV_T(N_F)=\sqrt{CV_S^2(N_F)+\sigma_A^2}$ for each block, and $\text{var}_T(N_F)=\{CV_T(N_F)\exp(\mu_F+\sigma_F^2/2)\}^2$.

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

$$CV_S(\text{N}_{\text{FGH}})=\frac{\sqrt{\text{var}_S(N_F)+\text{var}_S(N_G)+\text{var}_S(N_H)}}{N_{FGH}},$$

$$CV_T(\text{N}_{\text{FGH}})=\frac{\sqrt{\text{var}_T(N_F)+\text{var}_T(N_G)+\text{var}_T(N_H)}}{N_{FGH}},$$

$$CV_{Add}(\text{N}_{\text{FGH}})=\sqrt{CV_T^2(N_{FGH})-CV_S^2(N_{FGH})}.$$

Table 1

Summary of the sub-area CVs.

	Sub-area 1W (blocks FGH)	Sub-area 1E (blocks IJK)	Sub-area 2 (blocks LM)
N	8,152	10,814	2,860
$CV_{(\text{sampling})}$ %	25.43	24.45	32.80
σ_p=0.673			
$CV_{(\text{Total})}$ %	46.68	51.59	58.29
$CV_{(\text{add})}$ %	39.15	45.42	48.19
σ_p=0.9			
$CV_{(\text{Total})}$ %	58.20	65.48	72.31
$CV_{(\text{add})}$ %	52.36	60.75	64.44

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Adjunct 3

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:

$$P_a = \left[\frac{\alpha}{1+\exp[-(a-a_{50})/\delta]}\right]^{\beta} \qquad \text{(Adj.3.1)}$$

where

P_a is the proportion of animals of age a which are mature,
a_{50} is the age-at-50%-maturity (if α=1 and β=1),
δ is the parameter that determines the width of the maturity ogive,
α is asymptotic fraction of animals which are mature, and
β 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).

The following table lists the values for the parameters of Equation Adj.3.1 for each of the four models and the true age-at-50%-maturity (the age at which a proportion of α/2 animals are mature). Fig. Adj.3.1 shows the fit of the four models to the available data.

Although the model in which α (but not β) 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.

a_{50}	δ	α	β	No. of parameters	$-\ell nL$	Age-at-50%-maturity
5.93	2.07	1	1	2	21.042	5.93 (0.89)
6.21	0.915	0.978	1	3	15.662	6.21 (0.55)
-23.40	2.33	1	212031	3	19.640	5.99 (N/A)
-7.42	1.25	0.999	30066	4	15.619	5.90 (0.51)

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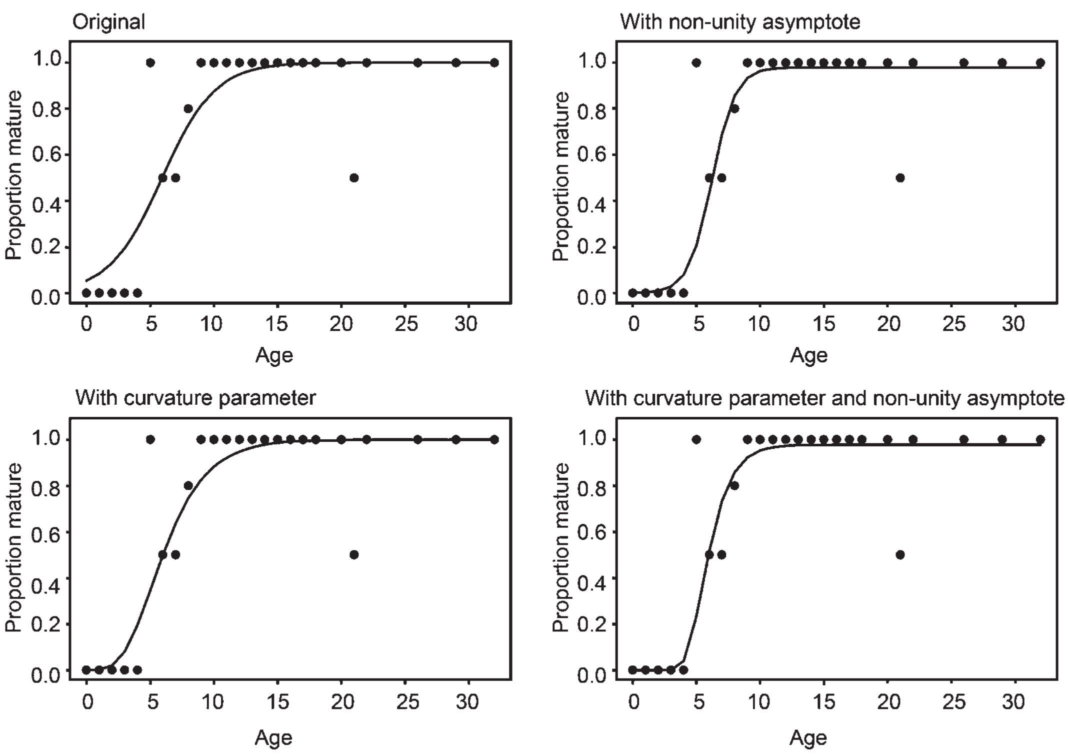

Fig. Adj.3.1. Fits of the four models to the data on maturity-at-age.