Supplementary material for: Kovacs K.M., Citta J., Brown T., Dietz R., Ferguson S., Harwood L., Houde M., Lea E.V., Quakenbush L., Riget F., Rosing-Asvid A., Smith T.G., Svetochev V., Svetocheva O. & Lydersen C. 2021. Variation in body size of ringed seals (*Pusa hispida hispida*) across the circumpolar Arctic: evidence of morphs, ecotypes or simply extreme plasticity? *Polar Research 40*. https://doi.org/10.33265/polar.v40.5753. Correspondence: Correspondence: Kit M. Kovacs, Norwegian Polar Institute, Fram Centre, PO Box 6606 Langnes, NO-9296 Tromsø, Norway. E-mail: kit.kovacs@npolar.no

Determination of female age at sexual maturity

Maturity of females was determined by sectioning ovaries and identifying corpora lutea and corpora albicantia (and in some cases also additionally examining the condition of the uterine horns or finding fetuses in fall samples). Seals that had never ovulated (no corpora lutea or albicantia [and no uterine horn distention, i.e., nulliparous]) were classified as immature and those that had ovulated at least once were classified as mature (primiparous, multiparous or pregnant females).

Regional sampling details

Alaska

Ringed seal morphology and reproductive biology data have been collected from seals harvested in Alaska since the 1950s (see Crawford et al. 2015). Few ringed seals were sampled in the 1990s and analyses show growth rates since 2000 are higher and age-at-maturity is lower than they were during 1950-1990 (Crawford et al. 2015). Because data from the earlier periods do not appear to be representative of current conditions, only data from ringed seals collected since 2000 were used in this study. Five sampling locations (Table 1) had adequate data to be included in this analysis; most seals were sampled during June–November (86%) and data include age, standard length, axillary girth and maturity status for females (Table 1). No information on maturity for males was available.

Western Canadian Arctic

Data on ringed seal morphology and female reproduction used in this study were collected from ringed seals harvested at Ulukhaktok (June–July 1992-2016); Sachs Harbour (July–August 2000-05) and Minto Inlet (1992-99); these collections build upon earlier works (e.g. Smith 1987, Kingsley & Byers 1989). Data included age, standard length, axillary girth and age-at-maturity (Table 1).

Eastern Canadian Arctic

Growth of ringed seals in eastern Canada has been described recently by Ferguson et al. (2018). After analysing patterns of seal growth by the community in which they were harvested, they grouped ringed seals into two regions with similar growth characteristics, a northern region and a southern region (See figure 1 in Ferguson et al. 2018). Because the current study is examining the possibility of local ecotypes, locations were analysed separately herein. Ten sampling locations had adequate data to be included in this study; sampling occurred in all months; approximately half (45%) of all samples were collected during June–November in the open-water season. Data included age, standard length, axillary girth and maturity status of females during the period 1990-2015 (Table 1).

Hudson Bay

Growth of ringed seals in Hudson Bay was also recently described by Ferguson et al. (2018). Three sampling locations had adequate data to be included in this study; sampling occurred in all months; approximately 72% of all samples were collected during the open-water season, 1999-2015. Data included age, length, girth and maturity status for females.

Labrador

Four sampling sites had adequate data to be included in this study (Table 1); sampling occurred between June and December with 67% of all samples collected during June–November, the open water season, 1998-2017. Data included age, length and girth.

Greenland

Ringed seals have been sampled from many communities on both the west and east coasts of Greenland; seven communities had adequate sample sizes for this study, five in western Greenland and two in eastern Greenland (Table 1; Fig. 1). Most seals were sampled in April, May, or June (81%), though seals from all months during 1984-2017 are included. Data included age, length and girth. No maturity data were available.

Svalbard

Ringed seals were sampled during two different two periods in Svalbard (see Lydersen & Gjertz 1987 and Krafft et al. 2006 for details). Seals were collected in 1981 (April–July), 1982 (April-May) and 2002–04 (April–May). Most animals were harvested during the land-fast ice season. Data used in the current study included age, length, girth and age-at-maturity for females (Table 1).

Russia

Data was also available for small ringed seal collections taken in the White and Kara seas (Table 1, Fig. 1). Data for age, length and girth were collected during 1983-2013 in the White Sea and 1984-2005 in the Kara Sea. In the White Sea, most of the seals were collected during July–October during the open-water season. In the Kara Sea, all data were collected in March and April. No data were available for maturity status.

Calculations of asymptotic length

The seven sites (Ulukhaktok, Arviat, Svalbard, Pangnirtung, Sanikiluaq, Minto, Ittoqqortoormiit) with the largest sample sizes were explored to determine how many samples are necessary to approximate results from the full data set. First, the best fitting model, that with the lowest WAIC, was determined for each site and sex using the full data set. Then the data were subsampled 100 times at sample sizes ranging from 10 to 100 in increments of 10. For each comparison, the fit and efficiency were assessed by calculating the coefficient of variation (CV) estimated from the sample, the mean residual between asymptotic length of each subsample and the full dataset, and the probability of coverage from the 95% confidence limits. The probability of coverage should be approximately 0.95, indicating that the 95% confidence limits cover the true mean (i.e., the estimate from the entire data set) in 95% of the simulations. When estimating asymptotic length as the mean length of seals that were $\geq$ 10 years of age, the probability of coverage was determined using t-distributions which have heavy tails when sample sizes are small. Ideally, these two metrics of asymptotic length would be identical; however, this was not always the case in this study. The absolute difference between these estimates ranged from 0.05 cm to 2.95 cm. This is an important consideration when calculating the probability of coverage and residual length. Growth models generally provided a lower CV than the corresponding mean, which will enhance the detection of statistically significant differences between sites or sexes. However, growth models generally had coverage probabilities that are too low until 30 to 140 seals are sampled (randomly, of all ages; Tables S1). When calculating a mean length for smaller sample sizes, the probability of coverage was acceptable for as few as two samples (Table S2), however, this is at the cost of having a relatively high CV and large mean residuals. The mean residual is less than 2 cm when sample sizes are > 12 but range from 2 to over 6 cm for smaller sample sizes. Furthermore, there was no relationship between the variance of the sample and the resulting probability of coverage; this means that the correct sample size cannot be inferred from how much variability exists in the sample.

To simplify simulations, the true growth model was assumed to be the most parsimonious model selected with the entire dataset, before subsampling. To determine if the model averaging algorithm would provide better coverage with small subsamples, it was applied to the case of female ringed seals from Arviat. This was the worst-case scenario among simulation runs

(Supplementary Table S1) and model coverage was not at the 95% level until at least 140 seals were sampled. Similar results were produced for model averaging. More simple models were weighted more heavily at smaller sample sizes, but coverage of confidence intervals (CIs) did not improve.

On the basis of these findings, growth models were fitted only when there were at least 60 samples collected for a given site and sex. This was an adequate sample size for all location/sex combinations (providing 95% coverage in approximately 93% of cases). Females sampled at Arviat (i.e., one out of 14 combinations of sex and site, or 93%) were the exception; with 60 samples, coverage was approximately 80% for females sampled at this site. Simple means for animals over 10 years of age were calculated for sites with less than 60 samples, recognizing that the power to detect statistically significant differences greatly diminished as sample size decreased ($n = 5$ was set as a minimum sample size). Differenced in asymptotic length less than approximately 3 or 4 cm will be generally unreliable and can be attributed to sampling error or simply the choice to use a growth model or a simple mean for any given sampling location.

We model averaged because the best-fit growth models were highly sensitive to how many seals were sampled in the first few age classes and the variability in the lengths of these seals. In effect, the choice of model has more to do with sampling issues than biological ones. As an example, consider male ringed seals at Svalbard. Seals in Svalbard are a good example, because the data show little variance and the models largely agree. When we fit our five models to the data, we find that there is no clear 'best' model. The generalized von Bertalanffy had the largest model weight and the most support; however, the Gompertz and Weibull models have similar support. Note that the individual estimates of asymptotic length (L_inf) were all similar; this is not true for all the data sets, but the Svalbard data are well distributed by age, making the estimation of asymptotic length easy. However, if just some few data points towards the end of the distributions are removed (in our example case, two yearlings and the two oldest seals) and then fit the models again, the generalized von Bertalanffy is no longer the best model. The most parsimonious model changes to a Gompertz and now the generalized von Bertalanffy is the fourth best model. The estimate of asymptotic length is not affected much by the removal of seals at the end of the data series; the change in asymptotic length is < 1% in for all models. However, the change in growth rate is large with changes ranging from about 15 to 34%. These results make sense, because the estimate of asymptotic length relies on very large data sets (basically, all seals older than eight years of age in this example). However, the growth rate is largely dependent on seals 1–3 years of age. The main message is that a very small change to the data in the younger age classes can have a large effect on the choice of model and also on the estimate of growth rate. The model and the growth rate changed after removing as few as two young seals from the sample. Model averaging optimizes our certainty regarding the estimate of asymptotic length, which was the primary data of concern in this study.

Supplementary Table S1. Fit and efficiency of different growth models (i.e., 'model') for estimating asymptotic length (L_{inf}) versus the mean length of seals ≥ 10 years of age in the sample (i.e., 'mean') by sample location and sex. CV and residuals are mean values across 100 simulations; coverage of CIs is calculated as the proportion of simulations with confidence limits that cover the true mean. The row with the least number of samples for which the growth model has 95% coverage is in boldface for each location/sex combination.

Location	Sex	Model	L_{inf} model	L_{inf} mean	Number samples	CV growth model	CV mean	SL[a] residual from model	SL[a] residual from mean	Coverage of model confidence limits	Coverage of mean confidence limits	Average number of seals ≥ 10 in the sample
Ulukhaktok	F	Logistic	123.0	119.8	10	4.5%	6.4%	5.61	2.61	0.78	0.96	6.8
					20	3.7%	6.9%	3.56	1.46	0.88	0.97	14.4
					30	3.7%	6.9%	3.56	1.46	0.89	0.92	21.0
					40	3.3%	6.9%	3.00	1.21	0.92	0.94	28.4
					50	2.9%	7.1%	1.98	1.03	0.91	0.96	35.7
					60	**2.9%**	**7.1%**	**1.98**	**1.03**	**0.94**	**0.95**	**43.3**
					70	2.5%	7.1%	1.95	0.86	0.97	0.97	50.1
					80	2.5%	7.1%	1.95	0.86	0.98	1.00	56.8
					90	2.2%	7.0%	1.99	0.85	0.97	0.99	64.1
					100	2.2%	7.2%	1.87	0.75	0.98	0.97	70.7
Ulukhaktok	M	Schnute-Richards	125.84	125.0	10	4.0%	7.0%	7.09	2.70	0.74	0.96	7.2
					20	3.2%	6.9%	5.31	1.88	0.62	0.96	14.7
					30	2.7%	7.2%	3.59	1.39	0.82	0.97	21.6
					40	2.6%	7.2%	2.57	1.27	0.91	0.96	28.9
					50	**2.4%**	**7.3%**	**2.00**	**1.17**	**0.95**	**0.94**	**36.3**
					60	2.0%	7.2%	1.42	0.95	0.97	0.98	44.1
					70	1.7%	7.3%	1.62	1.10	0.96	0.94	51.3
					80	1.8%	7.4%	1.40	0.88	0.97	0.97	57.5

Location	Sex	Model	L_{inf} model	L_{inf} mean	Number samples	CV growth model	CV mean	SL[a] residual from model	SL[a] residual from mean	Coverage of model confidence limits	Coverage of mean confidence limits	Average number of seals ≥ 10 in the sample
					90	1.5%	7.3%	1.45	0.89	0.94	0.97	65.5
					100	1.3%	7.3%	1.37	0.96	0.89	0.91	71.8
Arviat	F	Gompertz	120.04	117.42	10	3.8%	8.5%	5.32	3.84	0.83	0.94	5.5
					20	3.2%	8.4%	4.71	2.67	0.69	0.97	11.2
					30	3.0%	8.8%	4.58	1.82	0.59	0.96	16.8
					40	3.0%	8.7%	4.27	1.41	0.58	0.97	22.7
					50	3.2%	9.0%	3.63	1.50	0.69	0.97	28.4
					60	3.3%	8.8%	4.10	1.19	0.68	0.98	33.5
					70	3.6%	8.8%	2.69	1.26	0.83	0.97	39.2
					80	3.2%	8.8%	2.99	0.99	0.75	1.00	44.2
					90	3.5%	8.8%	2.87	0.92	0.77	0.99	50.0
					100	3.5%	8.9%	2.59	0.85	0.80	0.98	55.0
					110	3.3%	8.9%	2.53	0.76	0.85	0.99	60.5
					120	3.3%	9.0%	2.48	0.71	0.87	0.99	67.0
					130	3.1%	8.9%	1.77	0.67	0.89	1.00	72.3
					140	**3.4%**	**9.0%**	**1.87**	**0.63**	**0.95**	**1.00**	**77.2**
					150	3.3%	8.9%	1.80	0.50	0.94	1.00	83.3
					160	2.8%	8.9%	1.62	0.52	0.93	1.00	88.2
					170	2.9%	8.9%	1.60	0.46	0.95	1.00	94.0
					180	2.6%	8.9%	1.46	0.40	0.96	1.00	99.9
					190	2.8%	8.9%	1.45	0.39	0.98	1.00	105.5
					200	2.5%	8.9%	1.46	0.35	1.00	1.00	110.5
Arviat	M	Gompertz	120.02	120.07	10	3.8%	7.4%	3.96	3.89	0.89	0.98	4.5
					20	2.7%	7.6%	2.74	2.69	0.93	0.94	9.8
					30	2.3%	8.1%	2.28	1.65	0.93	0.99	14.5

Location	Sex	Model	L_{inf} model	L_{inf} mean	Number samples	CV growth model	CV mean	SL[a] residual from model	SL[a] residual from mean	Coverage of model confidence limits	Coverage of mean confidence limits	Average number of seals ≥ 10 in the sample
					40	2.0%	7.7%	1.94	1.56	0.94	0.98	19.5
					50	1.9%	7.9%	1.86	1.31	0.94	0.97	23.7
					60	**1.8%**	**8.3%**	**1.56**	**1.11**	**0.96**	**0.99**	**28.6**
					70	1.6%	8.3%	1.67	1.11	0.92	0.98	34.5
					80	1.5%	8.2%	1.25	0.95	0.98	1.00	38.9
					90	1.4%	8.1%	1.18	0.90	0.96	0.99	44.1
					100	1.3%	8.2%	1.00	0.76	1.00	1.00	48.9
Svalbard	F	Gompertz	131.71	130.11	10	3.9%	7.5%	5.49	3.29	0.87	0.98	6.5
					20	3.1%	7.5%	4.15	1.97	0.85	0.98	13.1
					30	3.0%	7.6%	3.59	1.64	0.85	0.98	19.0
					40	2.8%	7.7%	3.23	1.58	0.86	0.95	25.7
					50	**2.8%**	**7.9%**	**2.25**	**1.24**	**0.94**	**0.97**	**32.3**
					60	2.5%	7.9%	2.09	1.17	0.97	0.98	38.7
					70	2.2%	7.9%	1.80	1.15	0.99	0.96	45.0
					80	2.0%	7.8%	1.54	0.95	0.99	0.99	50.6
					90	1.9%	7.8%	1.43	0.87	0.97	0.97	58.0
					100	1.7%	7.8%	1.39	0.85	0.97	1.00	64.6
Svalbard	M	GVB	128.46	128.76	10	4.0%	6.8%	2.88	3.52	0.92	0.97	4.9
					20	2.8%	7.2%	2.73	2.48	0.93	0.95	9.9
					30	**2.5%**	**7.4%**	**1.96**	**1.83**	**0.98**	**0.98**	**14.7**
					40	2.3%	7.4%	2.10	1.64	0.96	0.95	19.6
					50	2.1%	7.3%	1.65	1.20	0.97	0.98	24.9
					60	1.9%	7.5%	1.51	1.21	0.98	0.98	30.1
					70	1.8%	7.6%	1.37	0.98	0.99	1.00	34.9
					80	1.7%	7.4%	1.22	0.95	0.98	0.99	40.0

Location	Sex	Model	L_{inf} model	L_{inf} mean	Number samples	CV growth model	CV mean	SL[a] residual from model	SL[a] residual from mean	Coverage of model confidence limits	Coverage of mean confidence limits	Average number of seals ≥ 10 in the sample
					90	1.6%	7.5%	1.12	0.88	1.00	0.98	45.3
					100	1.5%	7.5%	1.10	0.85	1.00	0.99	50.3
Pangnirtung	F	Gompertz	132.88	130.3	10	6.9%	7.6%	13.32	7.43	0.80	0.99	1.3
					20	6.7%	7.2%	9.39	5.09	0.86	0.99	2.5
					30	**6.4%**	**7.7%**	**7.14**	**3.81**	**0.95**	**1.00**	**4.0**
					40	5.4%	7.3%	5.63	3.52	0.96	0.96	5.2
					50	5.1%	7.7%	5.07	3.10	0.95	0.98	6.2
					60	4.7%	7.9%	4.03	2.33	0.99	0.99	7.8
					70	4.2%	7.4%	3.76	2.47	0.99	0.99	8.8
					80	4.0%	7.9%	2.61	1.49	1.00	1.00	10.3
					90	3.7%	8.0%	2.42	1.54	1.00	0.99	11.6
					100	3.4%	7.8%	2.11	1.37	1.00	1.00	13.1
Pangnirtung	M	Schnute-Richards	133.2	132.45	10	4.9%	6.1%	17.49	5.83	0.58	0.98	1.5
					20	5.2%	7.5%	15.30	4.97	0.68	0.99	2.8
					30	6.3%	6.8%	11.09	4.35	0.84	0.99	4.3
					40	6.5%	7.8%	9.26	3.91	0.92	0.97	5.5
					50	**5.3%**	**7.6%**	**5.54**	**3.68**	**0.99**	**0.96**	**6.7**
					60	4.6%	8.5%	3.61	2.80	1.00	0.97	7.9
					70	4.2%	8.6%	2.88	2.49	1.00	0.97	9.4
					80	3.8%	8.4%	2.63	2.05	1.00	0.96	10.7
					90	3.5%	8.5%	2.34	2.06	1.00	0.98	12.2
					100	3.2%	8.5%	1.87	1.59	1.00	0.99	13.6
Sanikiluaq	F	GVB	125.72	127.28	**10**	**4.6%**	**8.9%**	**4.77**	**4.79**	**0.96**	**0.98**	**3.9**
					20	3.7%	9.1%	3.91	3.26	0.96	0.98	7.5

Location	Sex	Model	L_{inf} model	L_{inf} mean	Number samples	CV growth model	CV mean	SL[a] residual from model	SL[a] residual from mean	Coverage of model confidence limits	Coverage of mean confidence limits	Average number of seals ≥ 10 in the sample
					30	3.1%	9.4%	3.32	2.49	0.97	0.97	11.8
					40	3.1%	9.3%	3.19	2.28	0.96	0.97	15.5
					50	3.0%	9.0%	2.67	2.02	0.97	0.97	19.4
					60	2.8%	9.5%	2.71	1.67	0.96	0.99	23.6
					70	2.9%	9.6%	2.34	1.82	0.97	0.99	27.6
					80	2.7%	9.6%	2.19	1.46	0.99	1.00	31.3
					90	2.4%	9.4%	2.13	1.25	0.99	1.00	35.1
					100	2.6%	9.6%	1.81	1.12	0.98	1.00	39.3
Sanikiluaq	M	Schnute-Richards	127.73	127.28	10	4.3%	7.5%	7.86	4.40	0.85	0.99	3.5
					20	3.6%	7.9%	6.87	3.37	0.81	1.00	6.9
					30	3.4%	8.1%	5.02	2.45	0.87	0.98	10.6
					40	2.7%	8.0%	3.83	2.02	0.90	1.00	13.9
					50	**2.5%**	**8.2%**	**2.55**	**1.82**	**0.98**	**0.99**	**17.3**
					60	2.0%	8.3%	1.75	1.61	0.99	1.00	20.5
					70	1.8%	8.1%	1.67	1.57	1.00	1.00	23.7
					80	1.7%	8.3%	1.20	1.22	0.99	1.00	26.8
					90	1.5%	8.1%	1.26	1.39	0.99	0.99	31.1
					100	1.5%	8.3%	1.18	1.19	0.99	0.98	34.0
Minto	F	GVB	131.39	128.44	**10**	**4.0%**	**7.4%**	**3.45**	**2.39**	**0.96**	**0.98**	**8.8**
					20	3.1%	7.3%	2.89	1.56	0.96	0.99	17.9
					30	2.9%	7.2%	2.48	1.24	0.97	0.99	26.4
					40	2.8%	7.5%	2.69	1.14	0.95	0.99	35.7
					50	2.7%	7.6%	2.38	0.94	0.97	1.00	44.1
					60	2.7%	7.6%	2.22	0.84	0.97	1.00	53.4

Location	Sex	Model	L_{inf} model	L_{inf} mean	Number samples	CV growth model	CV mean	SL[a] residual from model	SL[a] residual from mean	Coverage of model confidence limits	Coverage of mean confidence limits	Average number of seals $\geq$ 10 in the sample
					70	2.6%	7.4%	1.86	0.87	0.98	1.00	61.8
					80	2.5%	7.5%	1.99	0.57	0.99	1.00	71.0
					90	2.4%	7.6%	1.48	0.52	0.98	1.00	79.7
					100	2.5%	7.7%	1.49	0.52	0.99	1.00	88.8
Minto	M	Weibull	130.15	129.66	**10**	**3.7%**	**7.1%**	**2.78**	**2.46**	**1.00**	**1.00**	**8.9**
					20	2.9%	7.0%	1.61	1.67	1.00	0.98	18.0
					30	2.6%	7.3%	1.52	1.37	1.00	0.98	27.3
					40	2.3%	7.2%	1.47	1.09	0.99	0.99	35.7
					50	2.0%	7.4%	1.14	0.96	1.00	0.98	45.1
					60	2.2%	7.4%	1.35	1.01	0.99	0.99	54.3
					70	1.9%	7.3%	1.22	0.90	1.00	0.99	63.4
					80	1.8%	7.3%	0.98	0.71	1.00	0.99	72.3
					90	1.6%	7.4%	1.01	0.80	1.00	0.99	81.3
					100	1.5%	7.3%	0.94	0.59	1.00	1.00	90.7
Ittoqqortoormiit	F	GVB	120.09	119.41	**10**	**5.1%**	**9.1%**	**4.83**	**7.70**	**0.95**	**0.99**	**1.3**
					20	3.8%	8.7%	4.14	5.02	0.92	0.98	2.8
					30	3.6%	9.3%	3.97	4.50	0.94	0.98	4.2
					40	3.4%	9.6%	3.64	3.36	0.96	0.98	5.7
					50	3.3%	9.5%	3.34	3.14	0.96	0.98	7.1
					60	3.5%	9.5%	2.77	2.45	0.99	0.99	8.3
					70	3.4%	10.1%	2.27	2.02	1.00	1.00	9.9
					80	3.1%	9.7%	2.26	1.53	1.00	1.00	11.7
					90	3.1%	9.8%	2.03	1.34	1.00	1.00	12.8
					100	3.0%	9.8%	1.62	1.06	1.00	1.00	14.2

Location	Sex	Model	L_{inf} model	L_{inf} mean	Number samples	CV growth model	CV mean	SL[a] residual from model	SL[a] residual from mean	Coverage of model confidence limits	Coverage of mean confidence limits	Average number of seals ≥ 10 in the sample
Ittoqqortoormiit	M	GVB	122.06	123.42	**10**	**4.9%**	**6.7%**	**3.05**	**5.55**	**0.99**	**1.00**	**1.5**
					20	3.8%	6.5%	2.78	4.11	0.98	0.99	3.1
					30	3.7%	6.8%	2.33	2.97	1.00	0.99	4.7
					40	3.3%	7.5%	2.10	2.96	0.98	1.00	6.2
					50	3.2%	7.3%	2.03	2.37	1.00	0.99	7.8
					60	3.0%	7.6%	1.76	2.05	1.00	1.00	9.2
					70	3.2%	7.6%	1.61	1.70	1.00	1.00	10.8
					80	2.9%	7.5%	1.68	1.74	1.00	1.00	12.3
					90	2.9%	7.6%	1.55	1.14	1.00	1.00	14.3
					100	3.0%	7.5%	1.28	1.05	1.00	1.00	15.9
Thule	F	Schnute-Richards	122.12	123.17	10	4.9%	9.1%	10.00	8.29	0.57	0.96	2.1
					20	3.9%	10.7%	8.11	5.45	0.54	0.96	4.2
					30	3.9%	11.0%	6.25	3.54	0.70	1.00	6.5
					40	3.7%	11.8%	5.84	3.35	0.80	0.99	8.5
					50	3.5%	11.3%	3.83	2.94	0.90	0.99	10.7
					60	**3.3%**	**11.4%**	**3.04**	**2.75**	**0.97**	**1.00**	**12.6**
					70	2.7%	11.6%	1.99	2.13	1.00	1.00	14.8
					80	2.4%	11.4%	1.45	1.80	0.99	1.00	17.2
					90	2.2%	11.4%	1.17	1.64	1.00	1.00	19.3
					100	2.1%	11.4%	0.84	1.37	1.00	1.00	21.3
Thule	M	Weibull	125.07	125.48	**10**	**6.2%**	**9.0%**	**5.79**	**7.14**	**0.98**	**0.99**	**1.9**
					20	5.3%	8.8%	5.42	5.65	0.97	0.96	3.8
					30	4.9%	9.8%	4.62	4.31	0.99	0.97	6.1
					40	4.9%	9.4%	3.59	3.10	0.99	0.96	7.9

Location	Sex	Model	L_{inf} model	L_{inf} mean	Number samples	CV growth model	CV mean	SL[a] residual from model	SL[a] residual from mean	Coverage of model confidence limits	Coverage of mean confidence limits	Average number of seals ≥ 10 in the sample
					50	4.5%	9.6%	3.17	2.54	0.97	0.98	9.2
					60	4.7%	10.3%	3.06	2.35	0.97	0.98	11.6
					70	4.5%	10.1%	2.94	2.35	0.98	0.99	13.2
					80	4.6%	10.1%	2.61	1.86	0.97	0.99	14.8
					90	4.4%	10.1%	2.65	1.64	1.00	1.00	17.3
					100	4.5%	10.1%	2.27	1.45	1.00	1.00	19.3

[a] Standard length.

Supplementary Table S2. Mean residual value (cm) and CI coverage when estimating asymptotic length by averaging the length of seals ≥ 10 years of age. The data used here are from all simulations that were used to compare growth models and means (Supplementary Table S1); hence, the number of simulations with each level of samples is random. Coverage probabilities for 95% confidence intervals from t-distributions show adequate coverage for all sample sizes. The mean residual is less than 2 cm when sample sizes are >12 and increase to over 6 cm as sample sizes decline.

Samples	No. of simulations	Average CV	Average residual	Coverage
2	426	7.3%	6.5	0.97
3	525	8.0%	4.5	0.98
4	611	8.1%	4.2	0.97
5	583	8.3%	3.5	0.98
6	603	8.5%	3.3	0.96
7	604	8.3%	3.0	0.97
8	669	8.5%	2.7	0.96
9	664	8.5%	2.6	0.97

Samples	No. of simulations	Average CV	Average residual	Coverage
10	574	8.6%	2.3	0.97
11	562	8.8%	2.2	0.97
12	580	8.8%	2.1	0.97
13	511	8.8%	1.8	0.97
14	559	8.8%	1.7	0.98
15	447	8.8%	1.7	0.99
16	406	8.6%	1.6	0.98
17	410	8.5%	1.7	0.98
18	383	8.7%	1.5	0.99
19	369	8.6%	1.6	0.99
20	310	8.7%	1.6	0.97