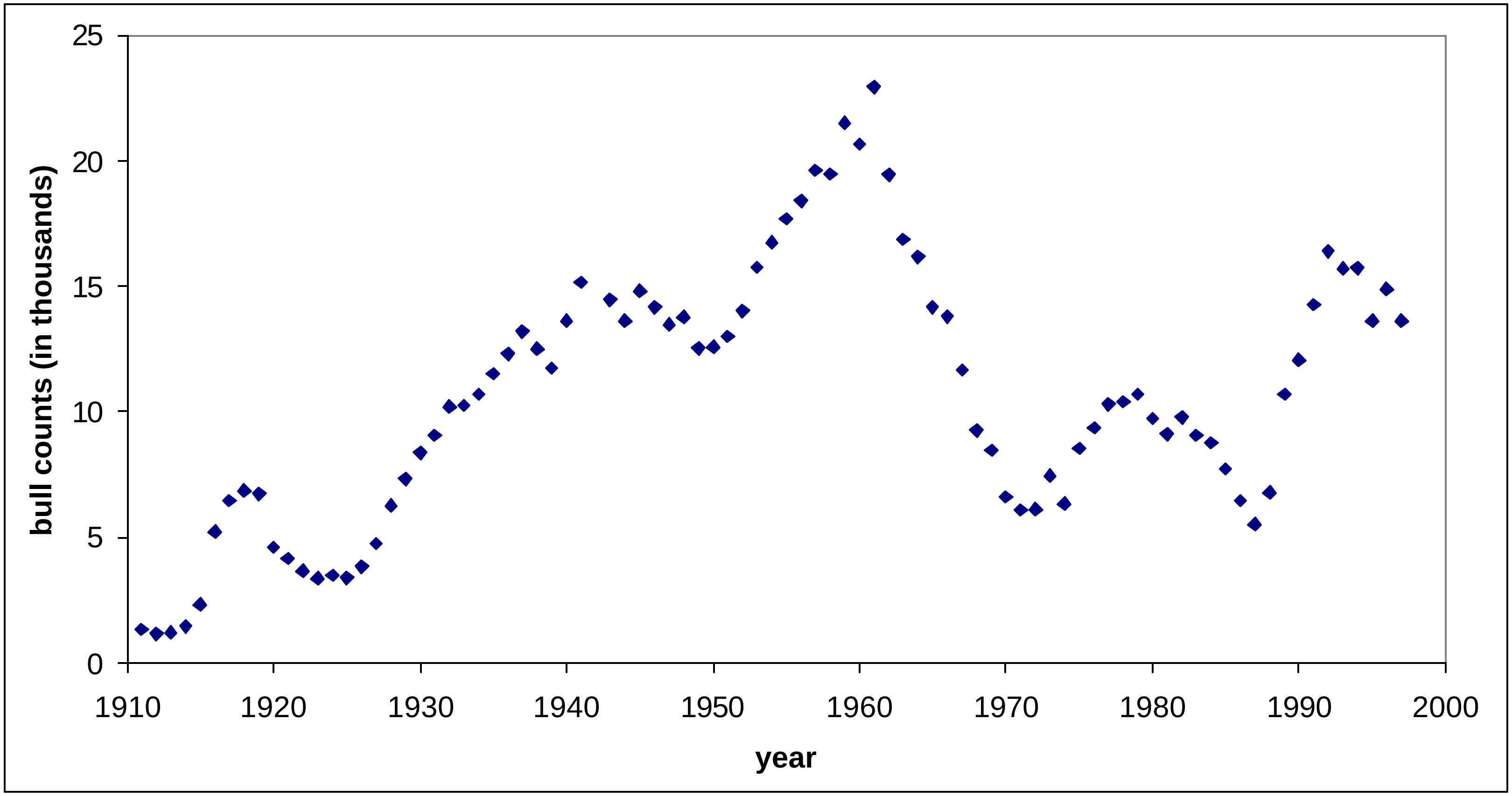

Figure 3.1 Trends in fur seal population, Pribilof Islands, Alaska, during the 20th century based on counts of adult males holding territories (from Lander 1980; Sinclair 1994; Sinclair and Robson 1999; York 1987a).

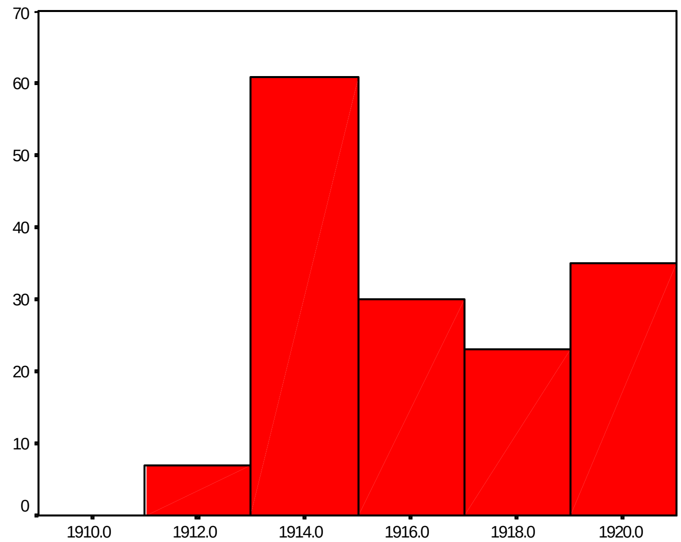

Figure 3.2a Histogram showing the distribution of collection years for specimens from popmin (n = 156).

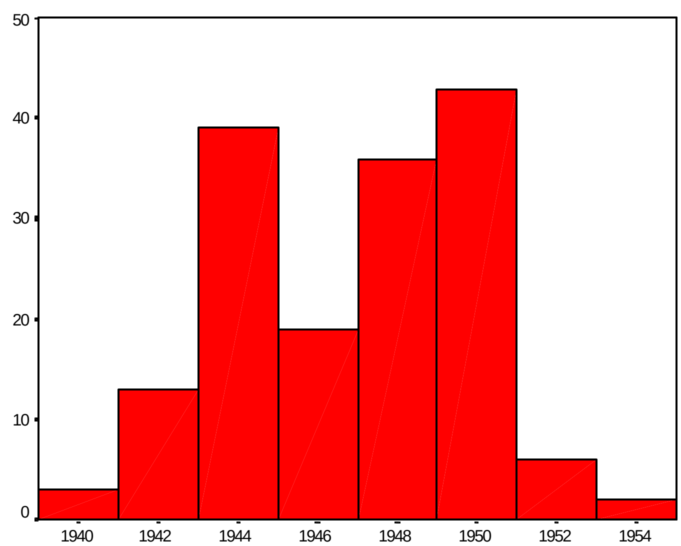

Figure 3.2b Histogram showing the distribution of collection years for specimens from popmax (n = 161).

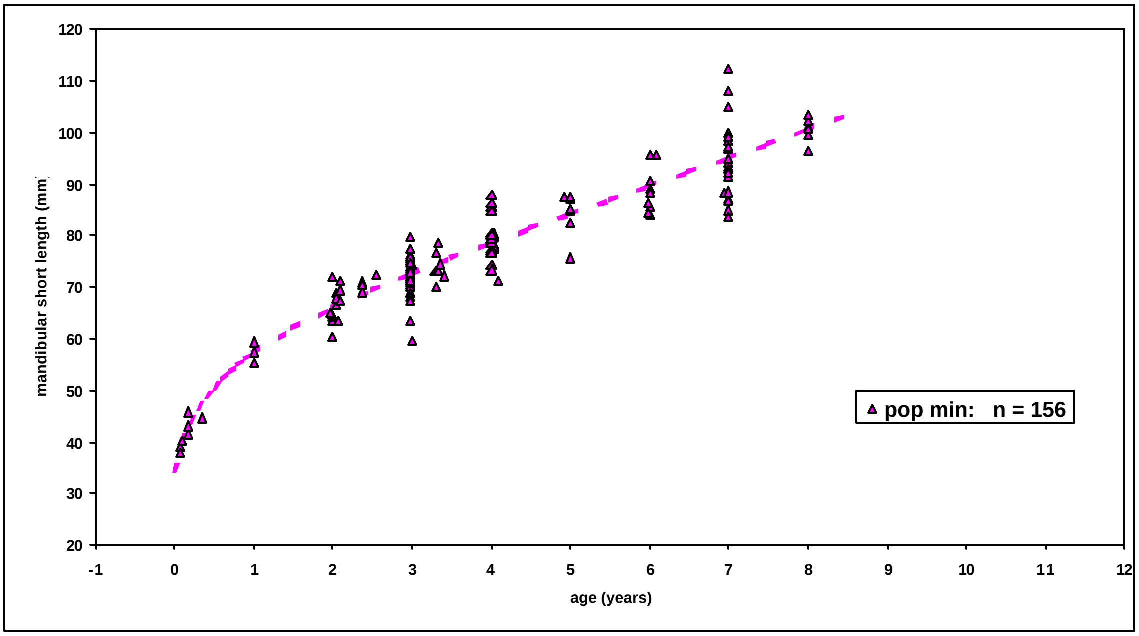

Figure 3.3a Scatter plot of length-at-age data for male fur seals collected between 1911-1920 (popmin), with corresponding von Bertalanffy growth curve.

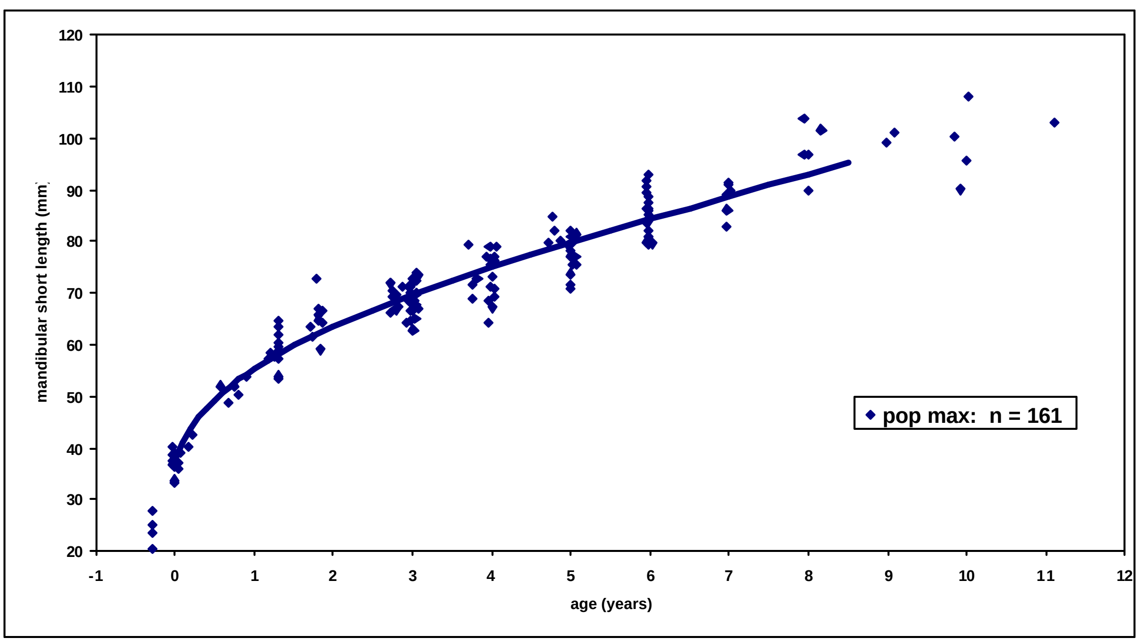

Figure 3.3b Scatter plot of length-at-age data for male fur seals collected between 1940-1955 (popmax), with corresponding von Bertalanffy growth curve.

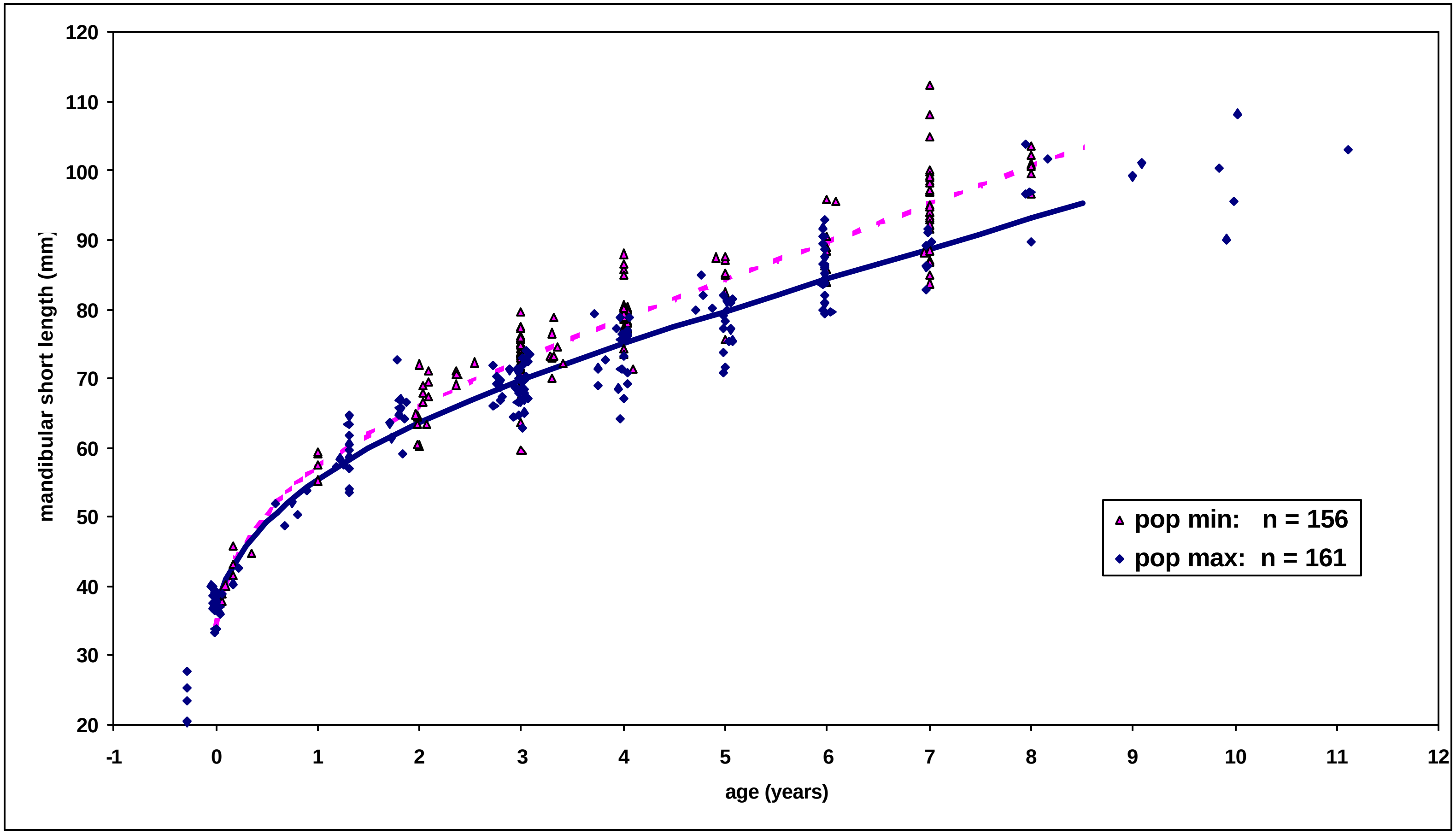

Figure 3.4 Scatter plot of length-at-age data and corresponding von Bertalanffy growth curves for male fur seals collected during popmin (triangles with dashed curve) and popmax (circles with solid curve). See Table 3.2 for parameter estimates and summary statistics.

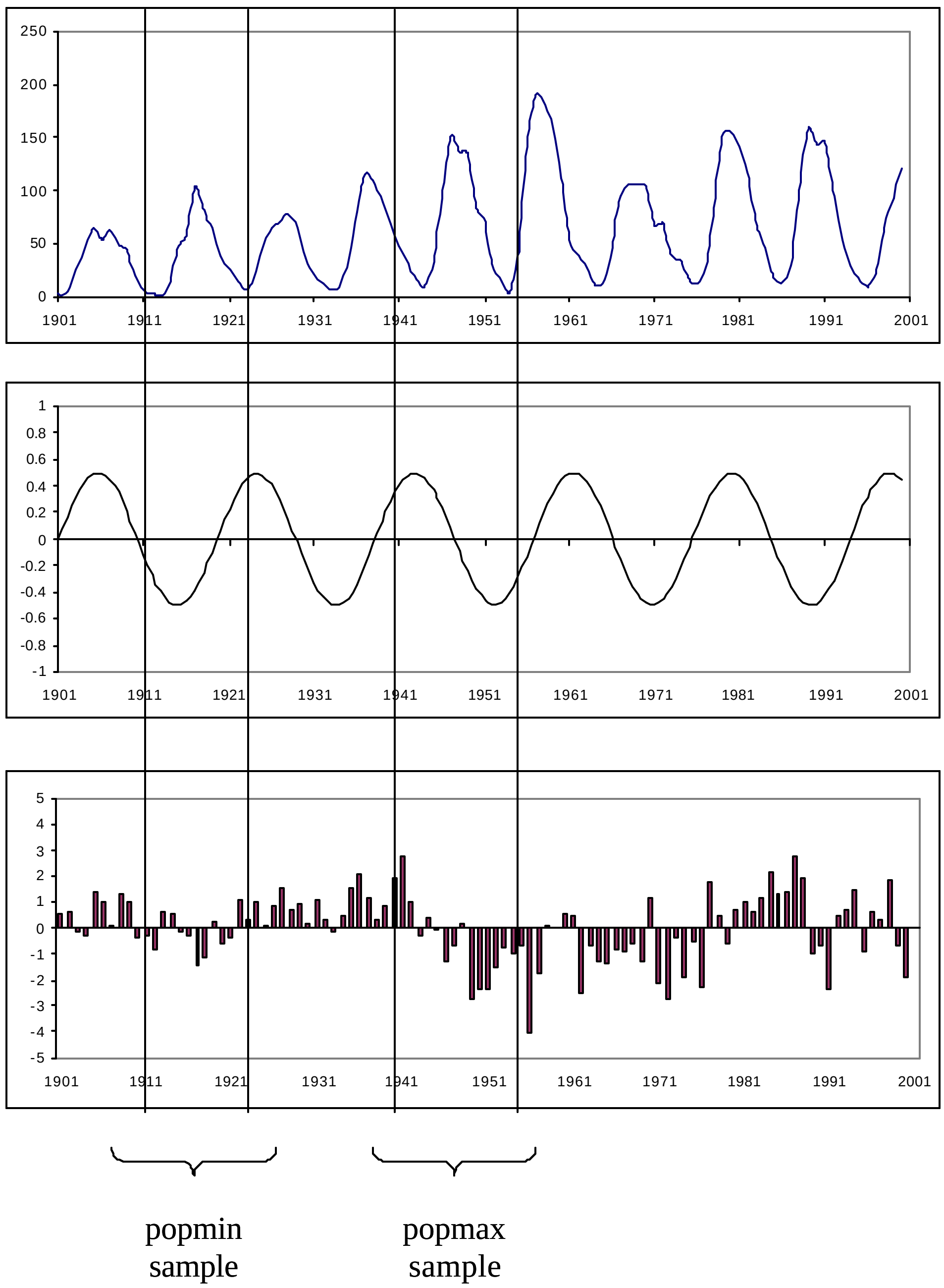

Figure 3.5 Climatic events likely to affect prey availability for fur seals in the eastern North Pacific. Top: average annual sunspot counts, by year (after Waldmeier 1961). Middle: lunar nodal tide cycle, by year (after Parker *et al.* 1995). Bottom: Pacific decadal oscillation index values, by year (after Mantua *et al.* 1997).

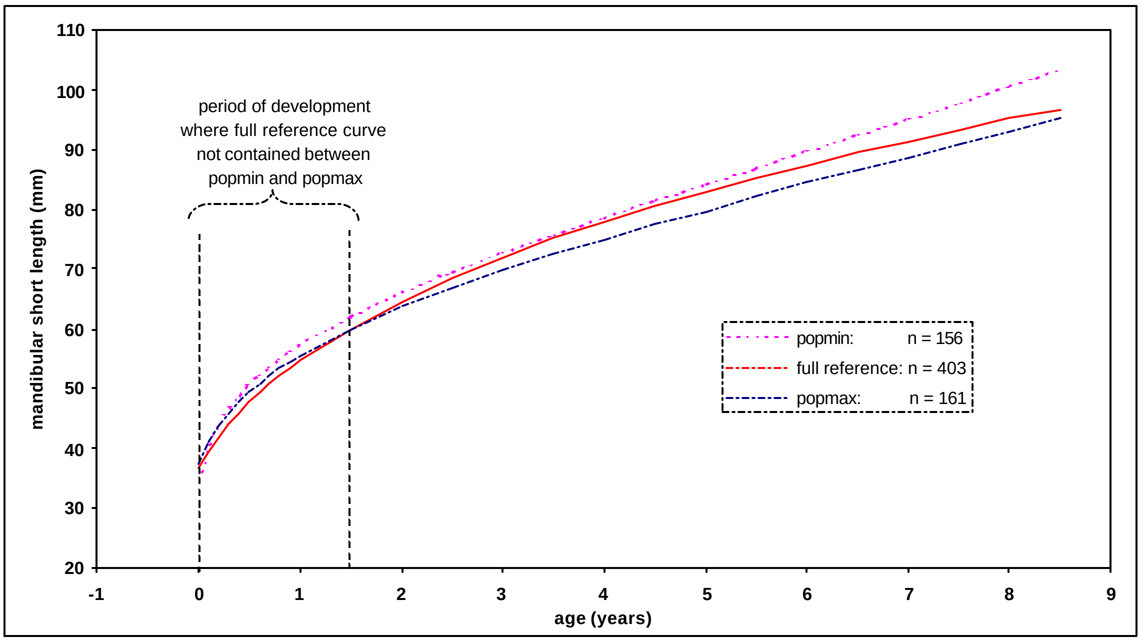

Figure 3.6 Relationship between VB growth curves for popmin, popmax, and the full sample. See Table 3.2 for summary statistics and parameter estimates.

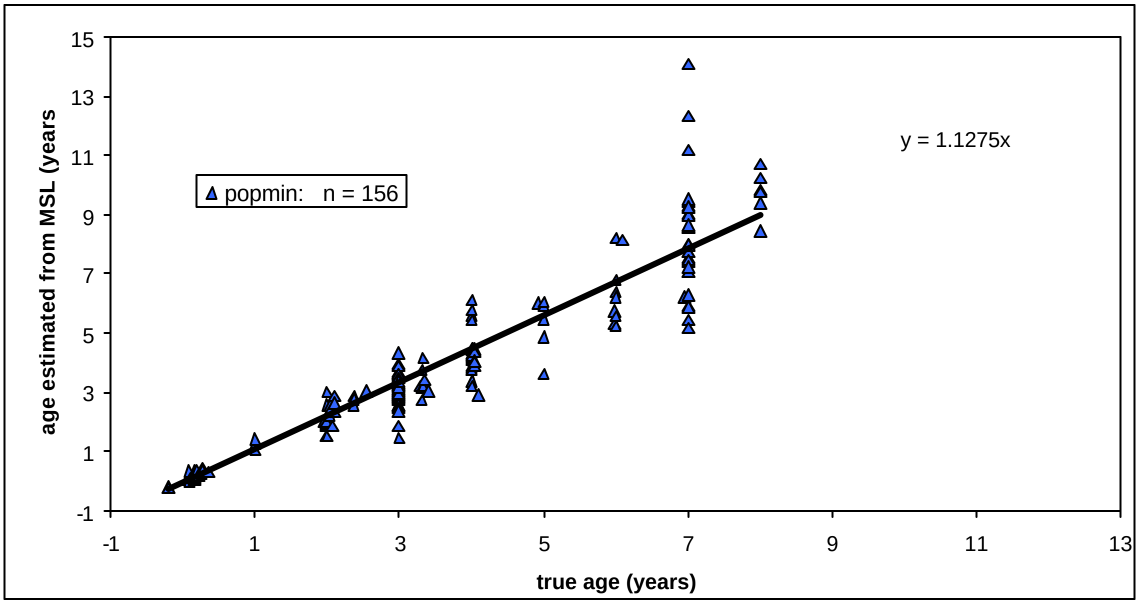

Figure 3.7a Relationship between true age and age estimated from mandibular short length (MSL) for popmin, using the VB growth curve for the full reference sample.

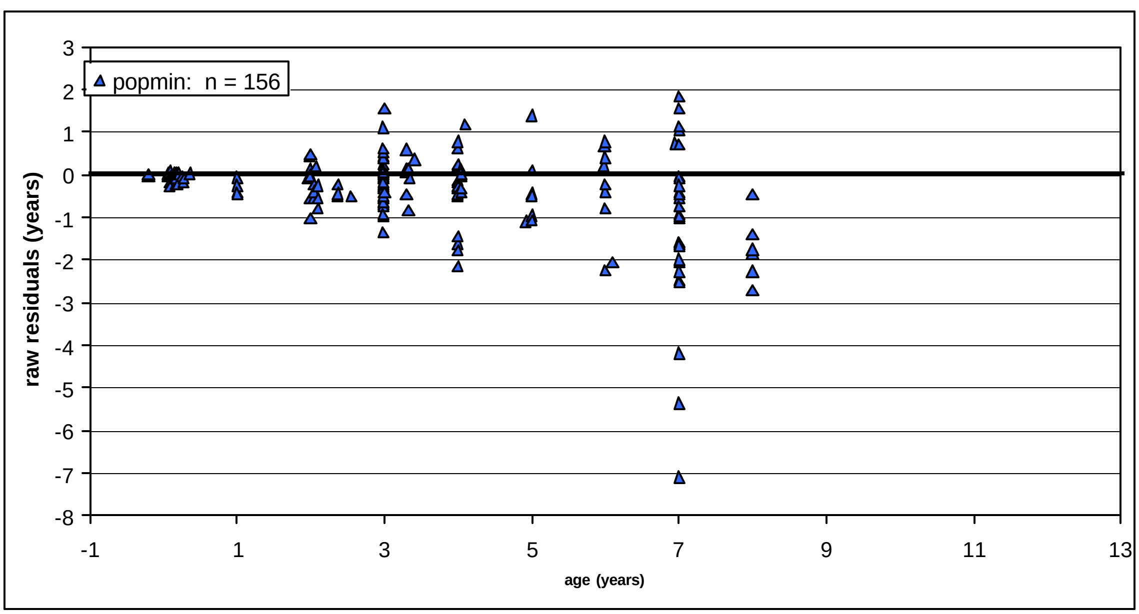

Figure 3.7b Distribution of errors in age estimation (true age – estimated age) for popmin.

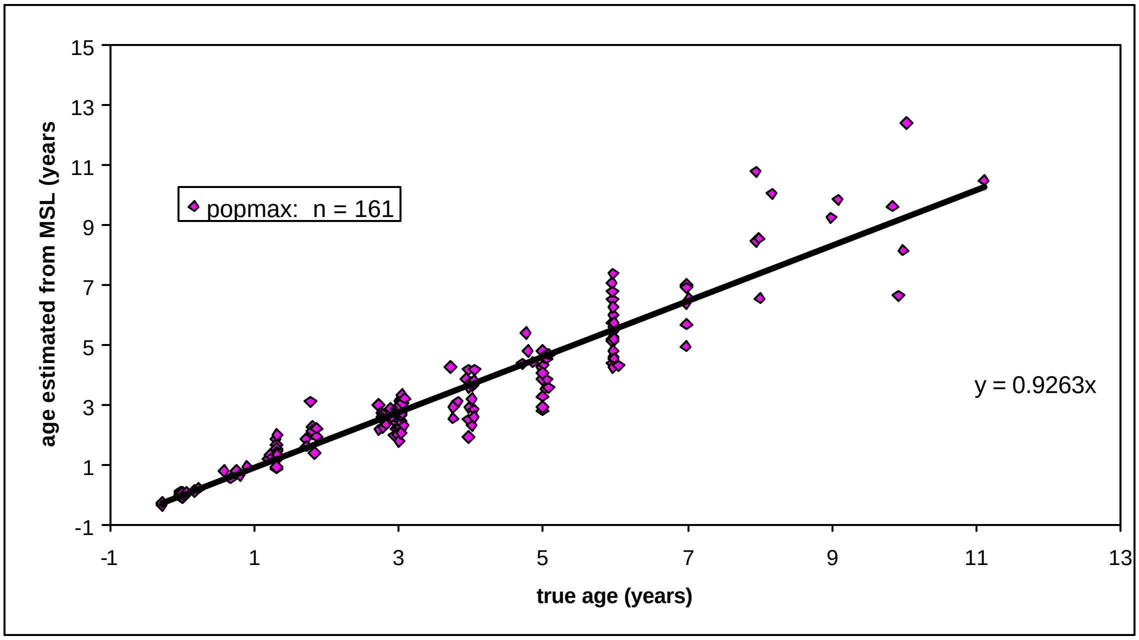

Figure 3.8a Relationship between true age and age estimated from mandibilar short length (MSL) for popmax, using the VB growth curve for the full reference sample.

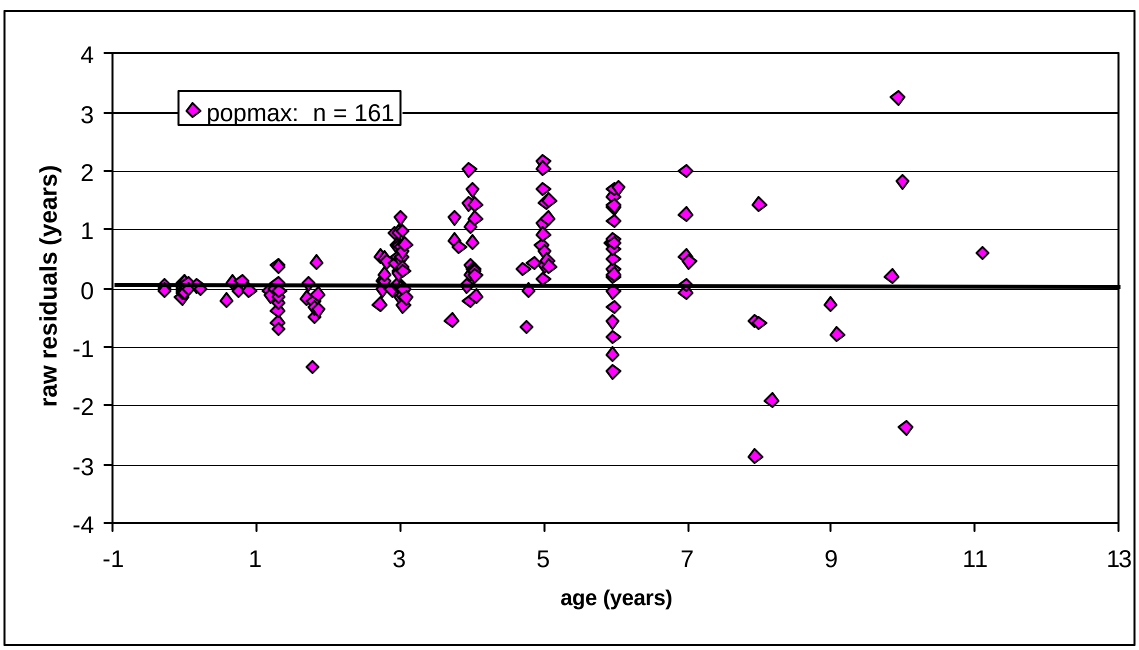

Figure 3.8b Distribution of errors in age estimation (true age – estimated age) for popmax.

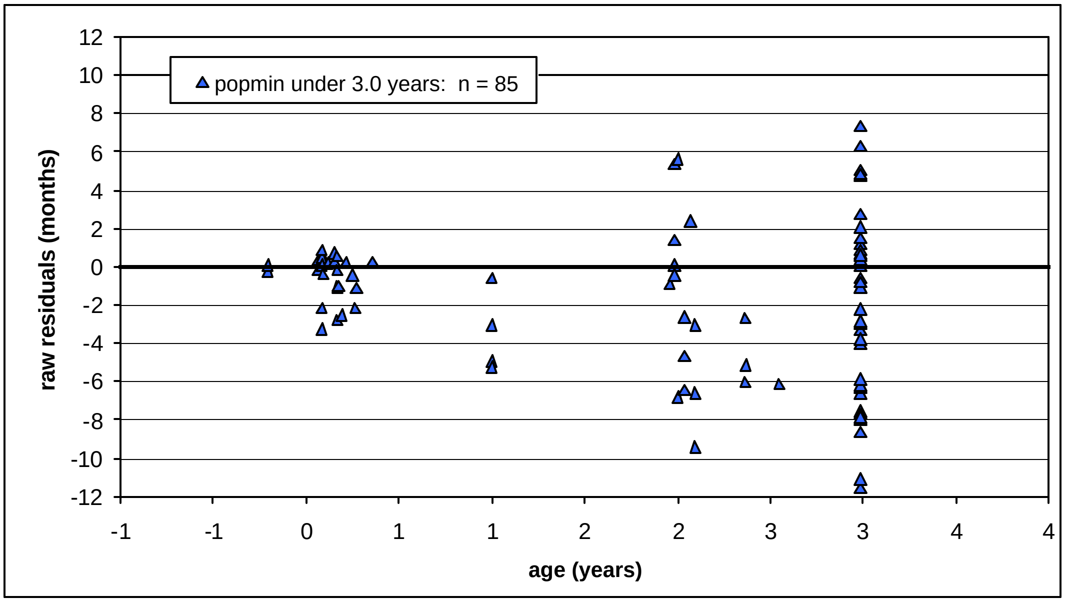

Figure 3.9a Distribution of errors in age estimation (true age – estimated age) for popmin, animals younger than 3.0 years. Note that y-axis is scaled in months.

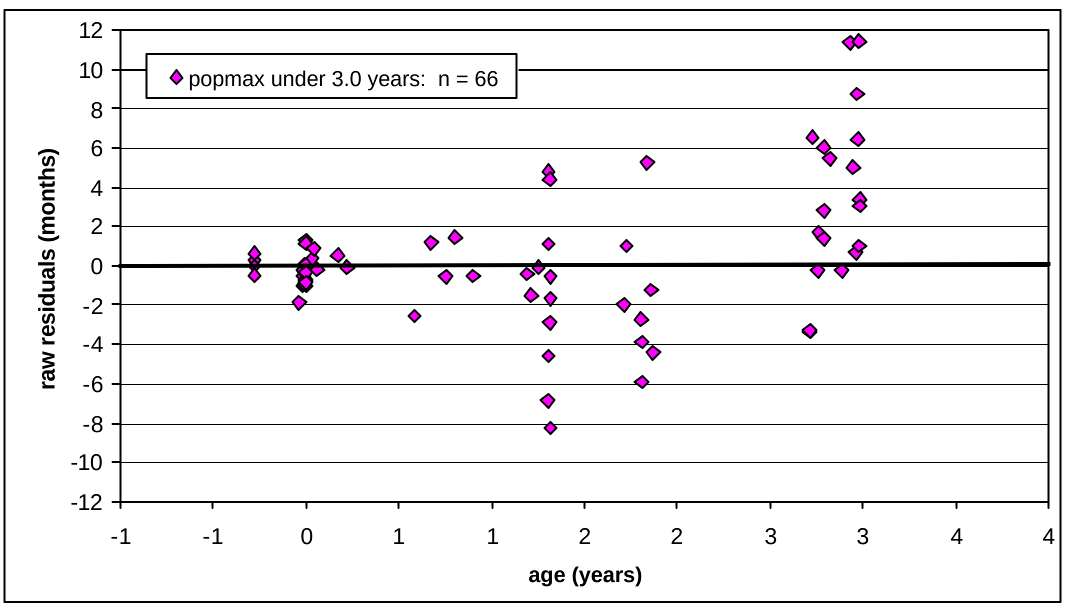

Figure 3.9b Distribution of errors in age estimation (true age – estimated age) for popmax, animals younger than 3.0 years. Note that y-axis is scaled in months.

Table 3.1 Datasets and time periods which have been the focus of previous attempts to document density-dependent responses in northern fur seals.

study	time periods	rationale	measurement used	age classes	sample size
Scheffer 1955	1913-1920	population low	length	3-5 year males	214
			weight	3-6 year males	248
			skull length	5, 6 year males	29
			skull weight	5, 6 year males	27
	1941-1952	population plateau	length	3-5 year males	4753
			weight	3-6 year males	211
			skull length	5, 6 year males	32
			skull weight	5, 6 year males	33
Fowler 1984, 1990	1958-1974	population declining	length vs. population	19 categories, females	16375
			weight vs. population	2 categories, males	5050
			length vs. population	19 categories, females	16375
			weight vs. population	2 categories, males	5050
Baker 1988 Baker and Fowler 1990	1948-1984	pop. fluctuating	tooth weight vs. population	3 year old males	14286
				4 year old males	7852
Trites and Bigg 1992	1958-1962	equal time periods	mass and length	2-5 year males	198
				2-14 year females	3994
	1963-1968		mass and length	2-5 year males	89
				2-14 year females	1241
	1969-1974		mass and length	2-5 year males	91
				2-14 year females	1134
this study	1911-1920	population low	mandible length	0-8 year males	156
	1940-1955	population high	mandible length	0-11 year males	161

Table 3.2 Parameter estimates and summary statistics for von Bertalanffy growth curves generated using Equation 2 (see text) for popmin and popmax. Starting values of 0.0 and 8.0 were used for T_1 and T_2, respectively.

	parameter	estimate	SE	lower CI	upper CI
all reference	y_1	36.867	0.488	35.908	37.826
R^2 = 0.94919	y_2	95.020	0.447	94.141	95.898
n = 405	a	0.001	0.022	-0.043	0.044
	b	3.245	0.199	2.854	3.637
pop min	y_1	34.339	5.880	22.721	45.956
R^2 = 0.91206	y_2	100.610	0.982	98.670	102.551
n = 156	a	-0.283	0.122	-0.524	-0.041
	b	5.697	1.332	3.065	8.329
pop max	y_1	37.417	0.947	35.546	39.289
R^2 = 0.94533	y_2	93.045	0.654	91.753	94.337
n = 161	a	-0.193	0.061	-0.313	-0.073
	b	5.246	0.702	3.859	6.633

Table 3.3 Predicted strength and direction of errors in age-estimation from reference curves depending on the relationship between the relative population levels of the reference and unknown samples.

relative population level of reference sample	relative population level of unknown sample	accuracy of age estimates
popmin	popmin	accurate
	long-term average	under-estimated
	popmax	strongly under-estimated
long-term average	popmin	over-estimated
	long-term average	accurate
	popmax	under-estimated
popmax	popmin	strongly over-estimated
	long-term average	over-estimated
	popmax	accurate

Table 3.4 Regression statistics, by cohort, describing the relationship between true age and age estimation based on calibration of mandible length. Regressions were calculated separately with estimates for the intercept and forcing the regression through the origin.

	estimate	*standard error*	*t stat*	*p-value*	*lower 95%*	*upper 95%*
popmax n = 161 **full model** r^2 = 0.903						
intercept slope	-0.090 0.943	0.109 0.025	-0.823 38.482	0.412 < 0.001	-0.304 0.894	0.125 0.991
through origin r^2 = 0.899						
intercept slope	0.000 0.926	n.a. 0.014	n.a. 66.002	n.a. < 0.001	n.a. 0.899	n.a. 0.954
popmin n = 175 **full model** r^2 = 0.882						
intercept slope	-0.229 1.172	0.142 0.033	-1.611 36.013	0.109 < 0.001	-0.509 1.108	0.051 1.236
through origin r^2 = 0.881						
intercept slope	0.000 1.127	n.a. 0.017	n.a. 65.649	n.a. < 0.001	n.a. 1.094	n.a. 1.161