

Appendix S1. Supplementary tables and figures.

Supporting Information

Table S1. Capture year and reproductive status (frequency in parentheses) of 2,128 polar bears caught (1,518 individuals) in Davis Strait from 2005–2007

Sex/age-class/family status	2005	2006	2007
Female COY	18 (0.03)	38 (0.05)	24 (0.03)
Female yearling	13 (0.02)	32 (0.04)	52 (0.07)
Female subadult (2-5)	35 (0.06)	69 (0.09)	67 (0.09)
Female adult with no cubs	100 (0.18)	94 (0.12)	110 (0.14)
Female adult with 1 COY	20 (0.04)	21 (0.03)	21 (0.03)
Female adult with 2 COY	14 (0.02)	25 (0.03)	17 (0.02)
Female adult with 2 yearlings	11 (0.02)	23 (0.03)	27 (0.03)
Female adult with 1 2-year-old	0 (0)	2 (0)	0 (0)
Male COY	31 (0.05)	35 (0.04)	30 (0.04)
Male yearling	26 (0.05)	35 (0.04)	40 (0.05)
Male subadult (2-5)	41 (0.07)	102 (0.13)	80 (0.1)
Male adult	242 (0.43)	283 (0.36)	283 (0.36)
Total	564	778	786

Table S2. Model selection results for models with $\Delta\text{AICc} \leq 10$, fitted to mark-recapture-recovery data for polar bears in the Davis Strait population (1974–2009). In model names, *timeperiod* denotes estimation of S and r for time blocks: 1974–1978; 1979–1983; 1984–1989; 1994–1998; 1999–2008. *ageclass* refers to survival rates estimated separately for senescent adults (ages 21+), adults (5 – 20 years), subadults (2 – 4 years), COY and yearlings. *Geo* denotes three geographic regions in Davis Strait: ND; CD; and SD. *nonjuv:male* denotes the estimation of parameters that vary between sex for independent polar bears. *femandyoung* differentiates recapture rates of adult females and dependent young (whether adult females have young or not) from other bears. *subadult* denotes separate estimation of capture rate for subadult bears. *Harp* is the annual-varying population estimates of harp seals in the North Atlantic (DFO 2010). *Ice* + ice^2 is the 2nd order effect of mean biweekly summer ice concentration. In models for fidelity, $F(\sim 1)$, indicates that fidelity is fixed at 1. *Time* in the sub-models for p , indicate a difference in p for 2005, and 2006 and 2007 combined

Model	No. parameters	ΔAICc	Model weight	Deviance
S($\sim\text{ageclass}$ + nonjuv:male + timeperiod)p($\sim\text{femandyoung}$ + subadult + Geo)r($\sim\text{Geo}$ + nonjuv:male)F(~ 1)	19	0	0.25	931.67
S($\sim\text{ageclass}$ + nonjuv:male + timeperiod)p($\sim\text{femandyoung}$ + subadult + time + Geo)r($\sim\text{Geo}$ + nonjuv:male)F(~ 1)	20	0.26	0.22	929.90

S(~ageclass + timeperiod + nonjuv:male + Geo)p(~femandyoung + subadult + Geo)r(~Geo + nonjuv:male)F(~1)	21	0.82	0.17	928.42
S(~ageclass + timeperiod + nonjuv:male + Geo)p(~femandyoung + subadult + time + Geo)r(~Geo + nonjuv:male)F(~1)	22	1.12	0.14	926.68
S(~ageclass + nonjuv:male + harp + Geo)p(~femandyoung + subadult + Geo)r(~timeperiod + Geo + nonjuv:male)F(~1)	22	5.49	0.02	931.06
S(~ageclass + nonjuv:male + harp:as.factor(Geo))p(~femandyoung + subadult + Geo)r(~timeperiod + Geo + nonjuv:male)F(~1)	22	5.77	0.01	931.33
S(~ageclass + timeperiod + nonjuv:male + Geo)p(~femandyoung + subadult + Geo)r(~Geo + nonjuv:male)F(~Geo)	24	5.93	0.01	927.42
S(~ageclass + nonjuv:male + harp + Geo)p(~femandyoung + subadult + time + Geo)r(~timeperiod + Geo + nonjuv:male)F(~1)	23	6.01	0.01	929.53
S(~ageclass + nonjuv:male + timeperiod)p(~femandyoung + subadult + Geo)r(~Geo + nonjuv:male)F(~Geo)	22	6.23	0.01	931.81
S(~ageclass + timeperiod + nonjuv:male + Geo)p(~femandyoung + subadult + time + Geo)r(~Geo + nonjuv:male)F(~Geo)	25	6.26	0.01	925.71

S(~ageclass + nonjuv:male + harp:as.factor(Geo))p(~femandyoung + subadult + time + Geo)r(~timeperiod + Geo + nonjuv:male)F(~1)	23	6.26	0.01	929.79
S(~ageclass + nonjuv:male + harp:as.factor(subadult) + harp:as.factor(Geo))p(~femandyoung + subadult + Geo)r(~timeperiod + Geo + nonjuv:male)F(~1)	23	6.31	0.01	929.84
S(~ageclass + nonjuv:male + harp + Geo)p(~femandyoung + subadult + Geo)r(~timeperiod + Geo + juv + nonjuv:male)F(~1)	23	6.50	0.01	930.02
S(~ageclass + nonjuv:male + timeperiod)p(~femandyoung + subadult + time + Geo)r(~Geo + nonjuv:male)F(~Geo)	23	6.62	0.01	930.15
S(~ageclass + nonjuv:male + harp:as.factor(Geo))p(~femandyoung + subadult + Geo)r(~Timeperiod + Geo + juv + nonjuv:male)F(~1)	23	6.80	0.01	930.32
S(~ageclass + nonjuv:male + harp:as.factor(subadult) + harp:as.factor(Geo))p(~femandyoung + subadult + time + Geo)r(~timeperiod + Geo + nonjuv:male)F(~1)	24	6.83	0.01	928.32
S(~ageclass + nonjuv:male + harp + Geo)p(~femandyoung + subadult + time + Geo)r(~timeperiod + Geo + juv + nonjuv:male)F(~1)	24	7.01	0.01	928.50

S(~ageclass + nonjuv:male + harp:as.factor(Geo))p(~femandyoung + subadult + time + Geo)r(~timeperiod + Geo + juv + nonjuv:male)F(~1)	24	7.29	0.01	928.77
S(~ageclass + nonjuv:male + ice + ice ² + harp)p(~femandyoung + subadult + Geo)r(~timeperiod + Geo + nonjuv:male)F(~1)	22	7.91	0.00	933.47
S(~ageclass + nonjuv:male + harp:as.factor(subadult) + harp:as.factor(Geo))p(~femandyoung + subadult + Geo)r(~TimePeriod + Geo + juv + nonjuv:male)F(~1)	24	7.99	0.00	929.47
S(~ageclass + nonjuv:male + ice + ice ² + harp)p(~femandyoung + subadult + time + Geo)r(~TimePeriod + Geo + nonjuv:male)F(~1)	23	8.07	0.00	931.60
S(~ageclass + nonjuv:male + timeperiod)p(~femandyoung + subadult + time + Geo)r(~TimePeriod + Geo + juv + nonjuv:male)F(~Geo)	29	8.43	0.00	919.69
S(~ageclass + nonjuv:male + harp:as.factor(subadult) + harp:as.factor(Geo))p(~femandyoung + subadult + time + Geo)r(~TimePeriod + Geo + juv + nonjuv:male)F(~1)	25	8.50	0.00	927.95

S(~ageclass + nonjuv:male + ice + ice ² + harp)p(~femandyoung + subadult + Geo)r(~timeperiod + Geo + juv + nonjuv:male)F(~1)	23	8.95	0.00	932.48
S(~ageclass + timeperiod + nonjuv:male + Geo)p(~femandyoung + subadult + Geo)r(~timeperiod + Geo + juv + nonjuv:male)F(~Geo)	30	9.09	0.00	918.30
S(~ageclass + nonjuv:male + ice + ice ² + harp)p(~femandyoung + subadult + time + Geo)r(~timeperiod + Geo + juv + nonjuv:male)F(~1)	24	9.11	0.00	930.60
S(~ageclass + timeperiod + nonjuv:male + Geo)p(~femandyoung + subadult + time + Geo)r(~timeperiod + Geo + juv + nonjuv:male)F(~Geo)	31	9.23	0.00	916.39

Table S3. Model-averaged capture probability (p) of marked polar bears in the Davis Strait population, 2005–2007

Region	Age class	Sex	Year	p	95%	95%
					LCL	UCL
Northern Davis Strait	Adult and young	F	2005	0.14	0.07	0.25
			2006 - 2007	0.16	0.11	0.22
	Adult	M	2005	0.26	0.14	0.43
			2006 - 2007	0.30	0.23	0.39
	Subadult		2005	0.19	0.10	0.33
			2006 - 2007	0.22	0.16	0.30
Central Davis Strait	Adult and young	F	2005	0.26	0.15	0.41
			2006 - 2007	0.30	0.26	0.35
	Adult	M	2005	0.44	0.27	0.62
			2006 - 2007	0.49	0.44	0.55
	Subadult		2005	0.34	0.20	0.51
			2006 - 2007	0.39	0.33	0.45
Southern Davis Strait	Adult and young	F	2005	0.27	0.16	0.43
			2006 - 2007	0.32	0.26	0.38
	Adult	M	2005	0.45	0.29	0.63
			2006 - 2007	0.51	0.45	0.58

					95%	95%
Region	Age class	Sex	Year	p	LCL	UCL
	Subadult		2005	0.35	0.21	0.53
			2006 - 2007	0.40	0.33	0.48

Table S4. Model-averaged recovery rates (r) of marked polar bears in Davis Strait from 1974–2008

Time period	Geographic sub-		Recovery			
	region	Age class	Sex	rate	95% LCL	95% UCL
1974 - 1978	Northern Davis					
	Strait	Independent	F	0.16	0.09	0.27
			M	0.29	0.18	0.43
		Dependent		0.16	0.09	0.27
	Central Davis					
	Strait	Independent	F	0.27	0.16	0.42
			M	0.43	0.29	0.58
		Dependent		0.27	0.15	0.42
	Southern Davis					
1979 - 1983	Strait	Independent	F	0.08	0.04	0.15
			M	0.15	0.09	0.25
		Dependent		0.08	0.04	0.15
	Northern Davis					
	Strait	Independent	F	0.16	0.09	0.27
			M	0.28	0.17	0.42
		Dependent		0.16	0.09	0.27
	Central Davis					
	Strait	Independent	F	0.27	0.15	0.42
			M	0.43	0.29	0.58

Time period	Geographic sub-		Recovery			
	region	Age class	Sex	rate	95% LCL	95% UCL
1984 - 1988	Southern Davis	Dependent		0.26	0.15	0.42
		Independent	F	0.08	0.04	0.15
			M	0.15	0.09	0.24
	Northern Davis	Dependent		0.08	0.04	0.15
		Independent	F	0.21	0.06	0.51
			M	0.34	0.13	0.64
	Central Davis	Dependent		0.20	0.06	0.49
		Independent	F	0.32	0.12	0.62
			M	0.48	0.24	0.73
	Southern Davis	Dependent		0.31	0.12	0.60
		Independent	F	0.11	0.02	0.43
			M	0.20	0.05	0.54
1989 - 1993	Strait	Dependent		0.11	0.02	0.40
		Independent	F	0.17	0.05	0.44
			M	0.29	0.14	0.52
	Northern Davis	Dependent		0.17	0.03	0.53

	Geographic sub-			Recovery		
Time period	region	Age class	Sex	rate	95% LCL	95% UCL
1994 - 1998	Central Davis					
	Strait	Independent	F	0.28	0.13	0.50
			M	0.43	0.25	0.63
		Dependent		0.27	0.12	0.51
	Southern Davis					
	Strait	Independent	F	0.09	0.00	0.68
			M	0.16	0.04	0.48
		Dependent		0.09	0.00	0.88
	Northern Davis					
	Strait	Independent	F	0.17	0.08	0.34
			M	0.30	0.16	0.49
		Dependent		0.17	0.08	0.31
	Central Davis					
	Strait	Independent	F	0.28	0.15	0.48
			M	0.45	0.28	0.63
Dependent			0.28	0.15	0.46	
Southern Davis						
Strait	Independent	F	0.09	0.04	0.20	
		M	0.16	0.08	0.31	
	Dependent		0.09	0.04	0.17	
1999 - 2008	Northern Davis	Independent	F	0.16	0.08	0.29

Time period	Geographic sub-		Recovery			
	region	Age class	Sex	rate	95% LCL	95% UCL
Strait						
			M	0.28	0.16	0.44
		Dependent		0.16	0.08	0.28
Central Davis						
	Strait	Independent	F	0.26	0.14	0.44
			M	0.42	0.26	0.59
		Dependent		0.26	0.14	0.43
Southern Davis						
	Strait	Independent	F	0.08	0.04	0.16
			M	0.15	0.09	0.25
		Dependent		0.08	0.04	0.15

Table S5. Abundance estimates of polar bears in the sub-regions of the Davis Strait population, 2005–2007

Region	N	95% LCL	95% UCL
Northern Davis Strait			
2005	468	256	855
2006	446	322	616
2007	452	323	632
Central Davis Strait			
2005	1,112	1036	1,355
2006	1,184	997	1,311
2007	1,143	226	544
Southern Davis Strait			
2005	351	590	833
2006	619	256	855
2007	701	322	616
Davis Strait, Average			
2005-2007	2,158	1,833	2,542

Table S6. Demographic parameters used for estimation of un-harvested and harvested (2:1 male: female harvest) population growth rate for the Davis Strait population from an initial population size of 2,158 (180, SE) in 2007

Parameter	Group	Value (SE)
Mean litter size		1.487 (0.14)
Probability of 1, 2 COY litters		0.51, 0.49
Whole litter survival rate for COY, Yearling		1
Age-specific litter production rate	5	0.543 (0.203)
	6	0.338 (0.976)
	7–27	0.441 (0.107)
Minimum, maximum age of reproduction		5, 27
Maximum age in population		30
Maximum litter size		2
Proportion males at birth		0.547 (0.07)
S_N	COY	0.916 (0.057)
	Yearling	0.934 (0.032)
	Male, 2–4	0.923 (0.034)
	Female, 2–4	0.931 (0.033)
	Male, 5–20	0.955 (0.020)
	Female, 5–20	0.962 (0.019)
	Male, 21–30	0.897 (0.073)

	Female, 21–30	0.911 (0.070)
Sample size of population age structure	Ages 0–30	1,632 (2005–2007)
Sample size of harvest age-relative	Ages 0–30	278 (1990–2006)

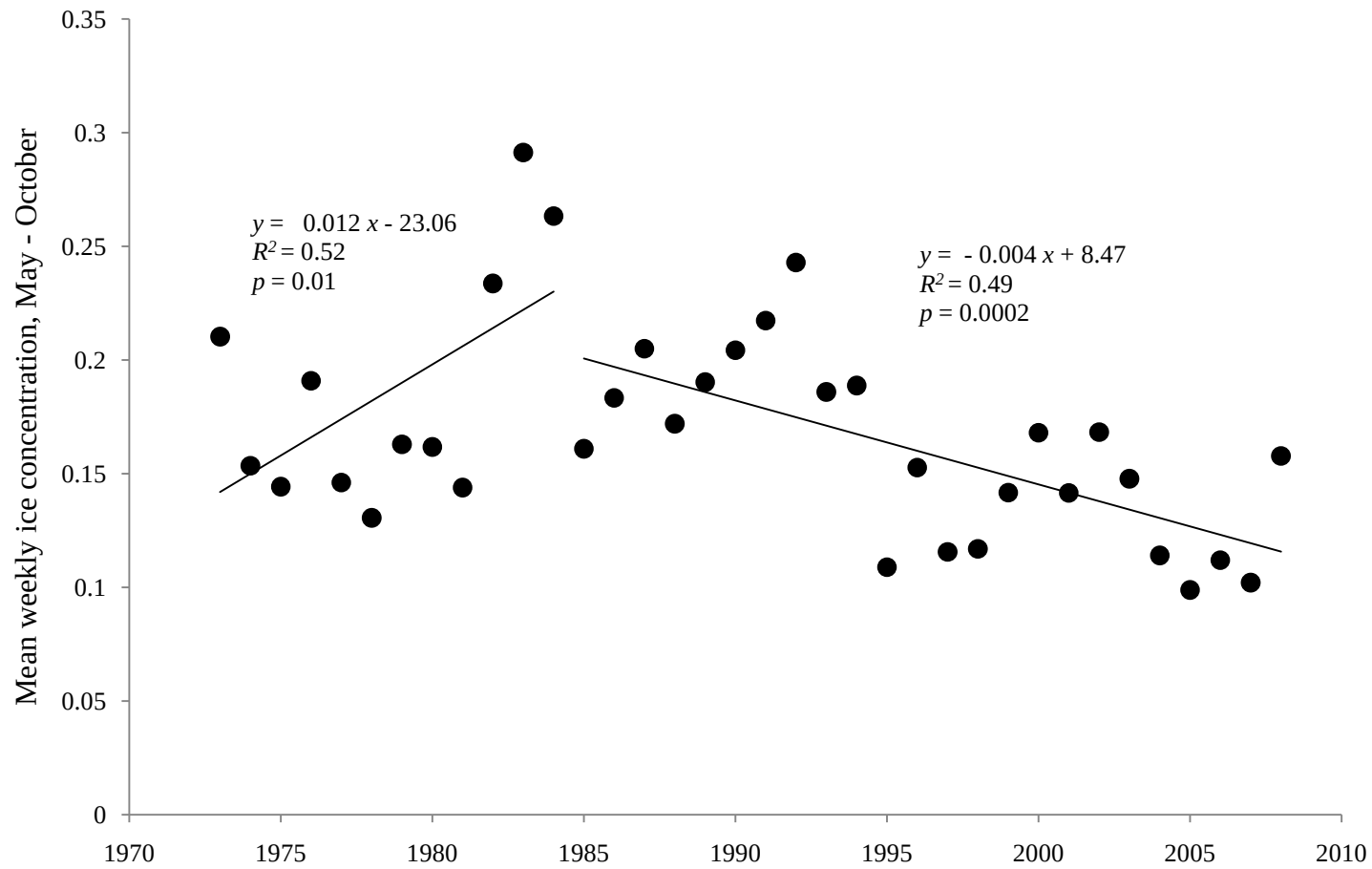


Fig. S1. Break-point regression of mean weekly total ice concentration (May-October) in Davis Strait during the study period.

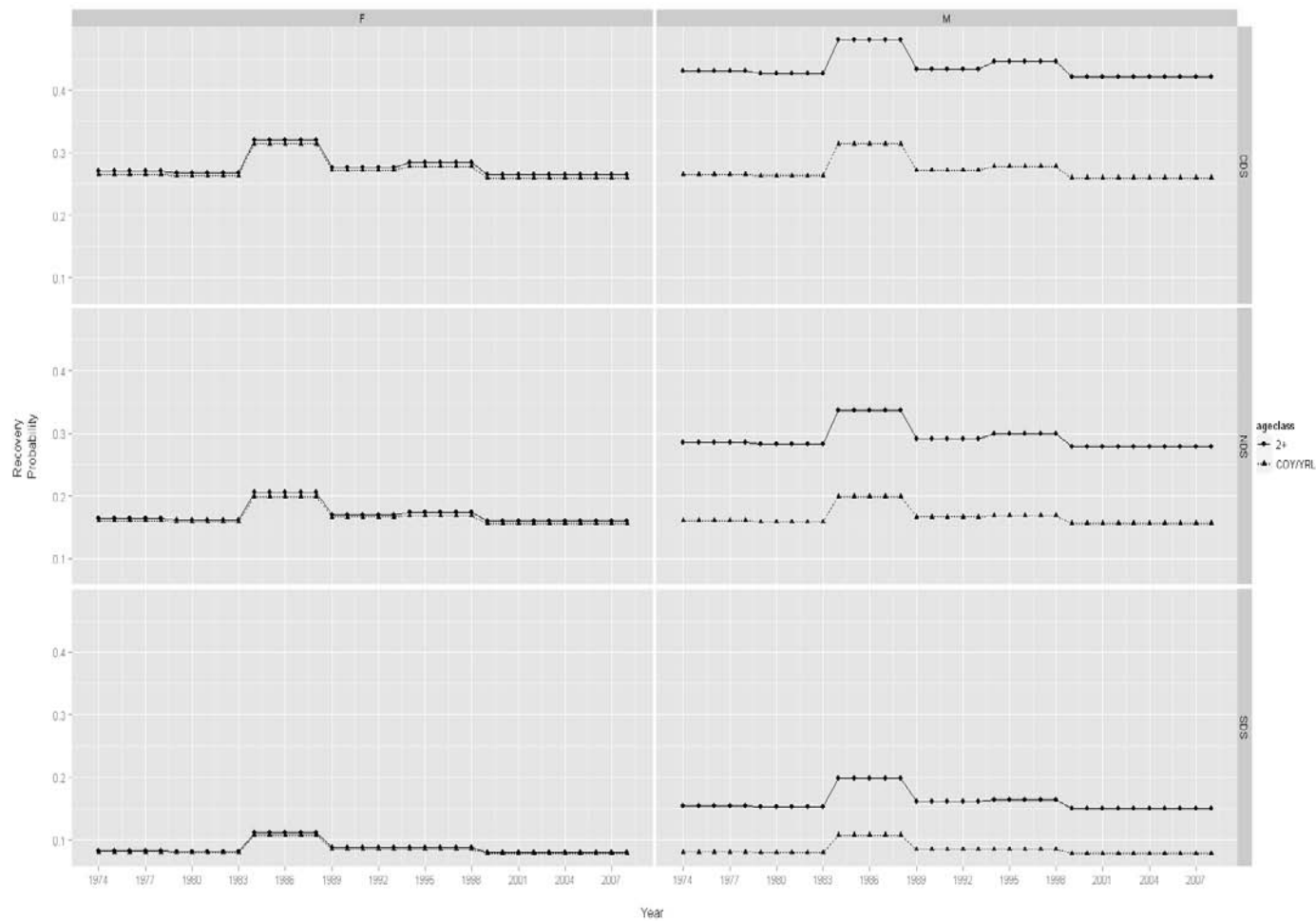


Fig. S2. Recovery rates (r) of marked juvenile and non-juvenile (ages 2+) polar bears in three sub-regions of the Davis Strait population, 1974–2009

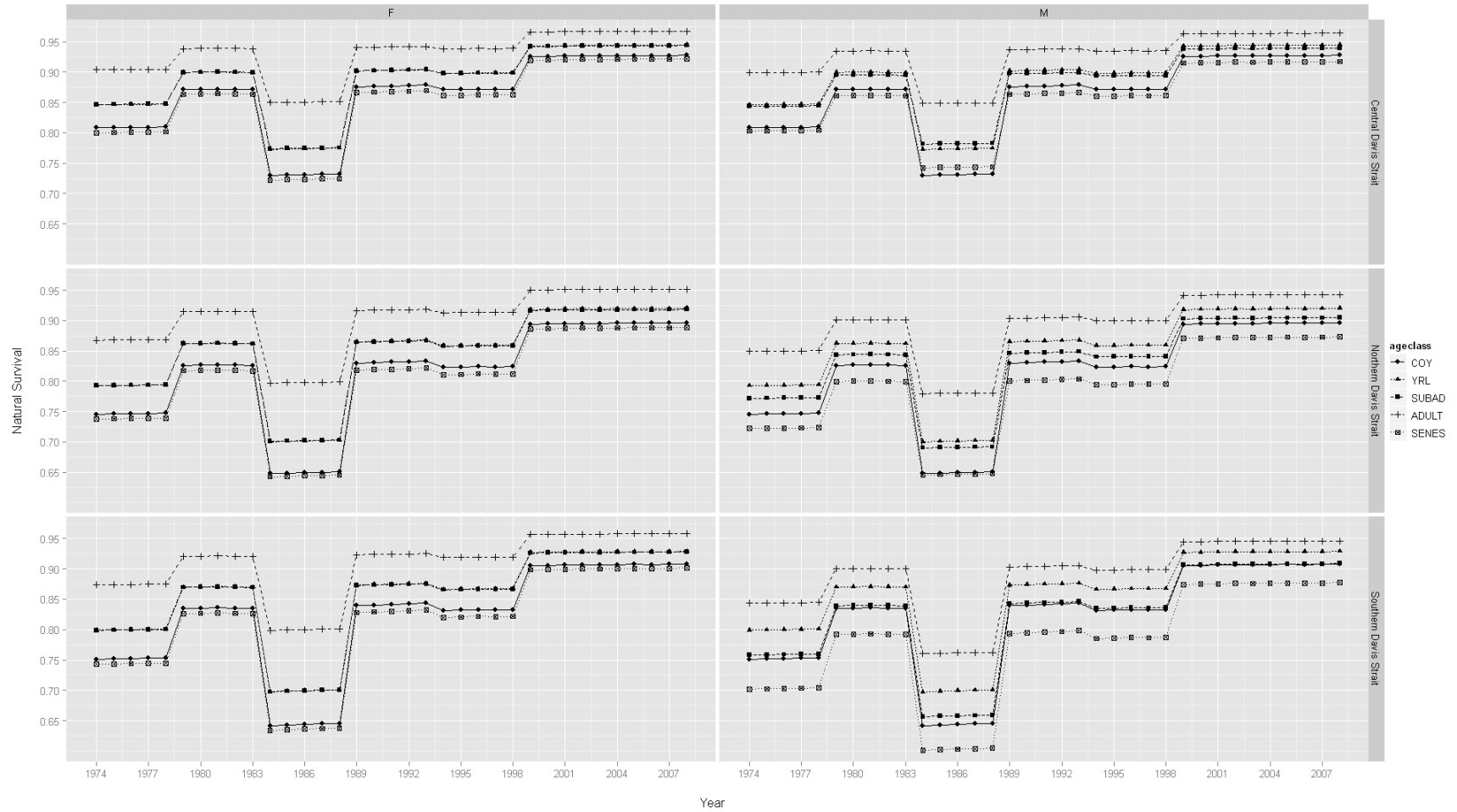


Fig. S3. Natural survival (S_N) of marked polar bears in three sub-regions of the Davis Strait population, 1974–2008

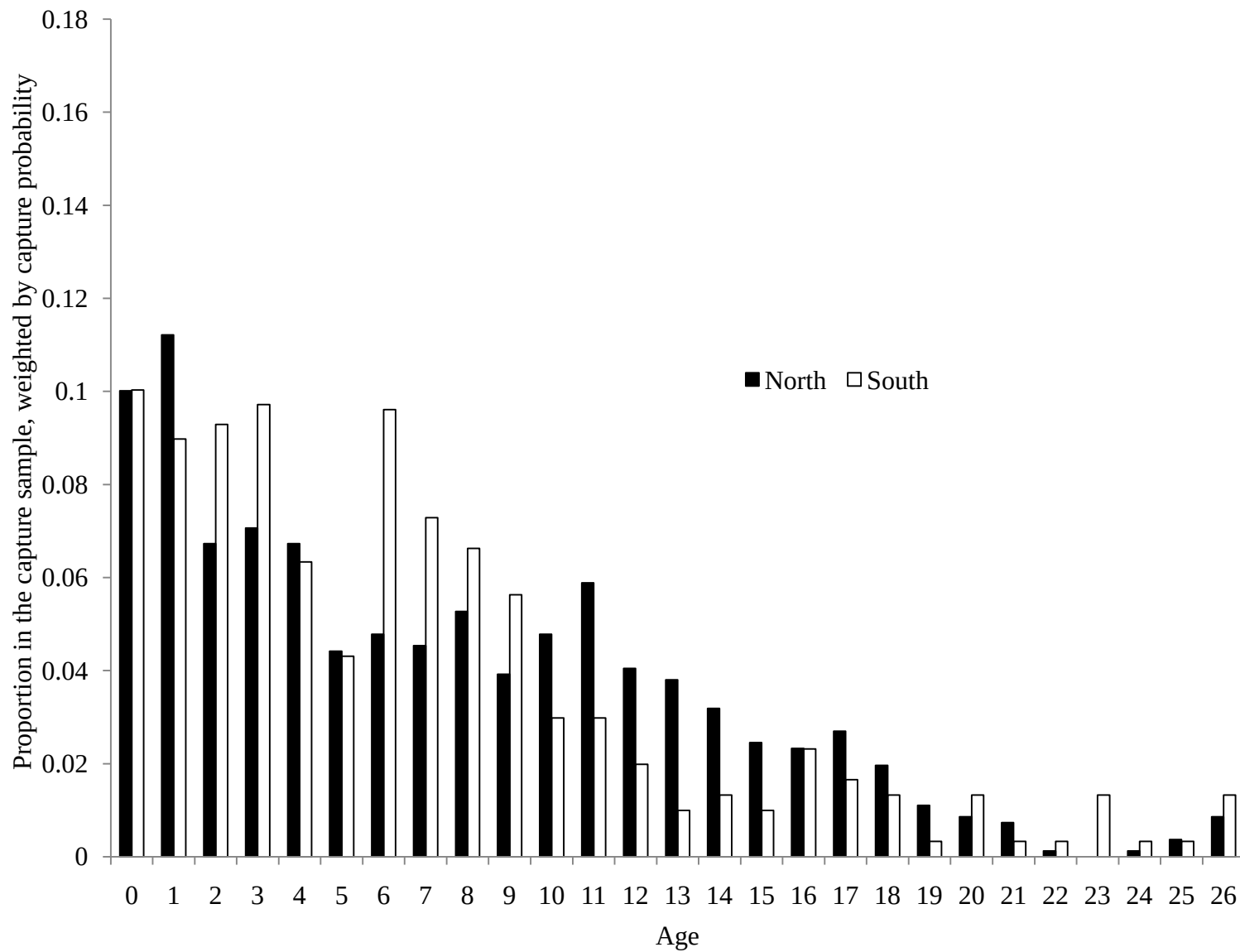


Fig S4. Age structure of male polar bears captured (2005–2007) north and south of Hudson Strait

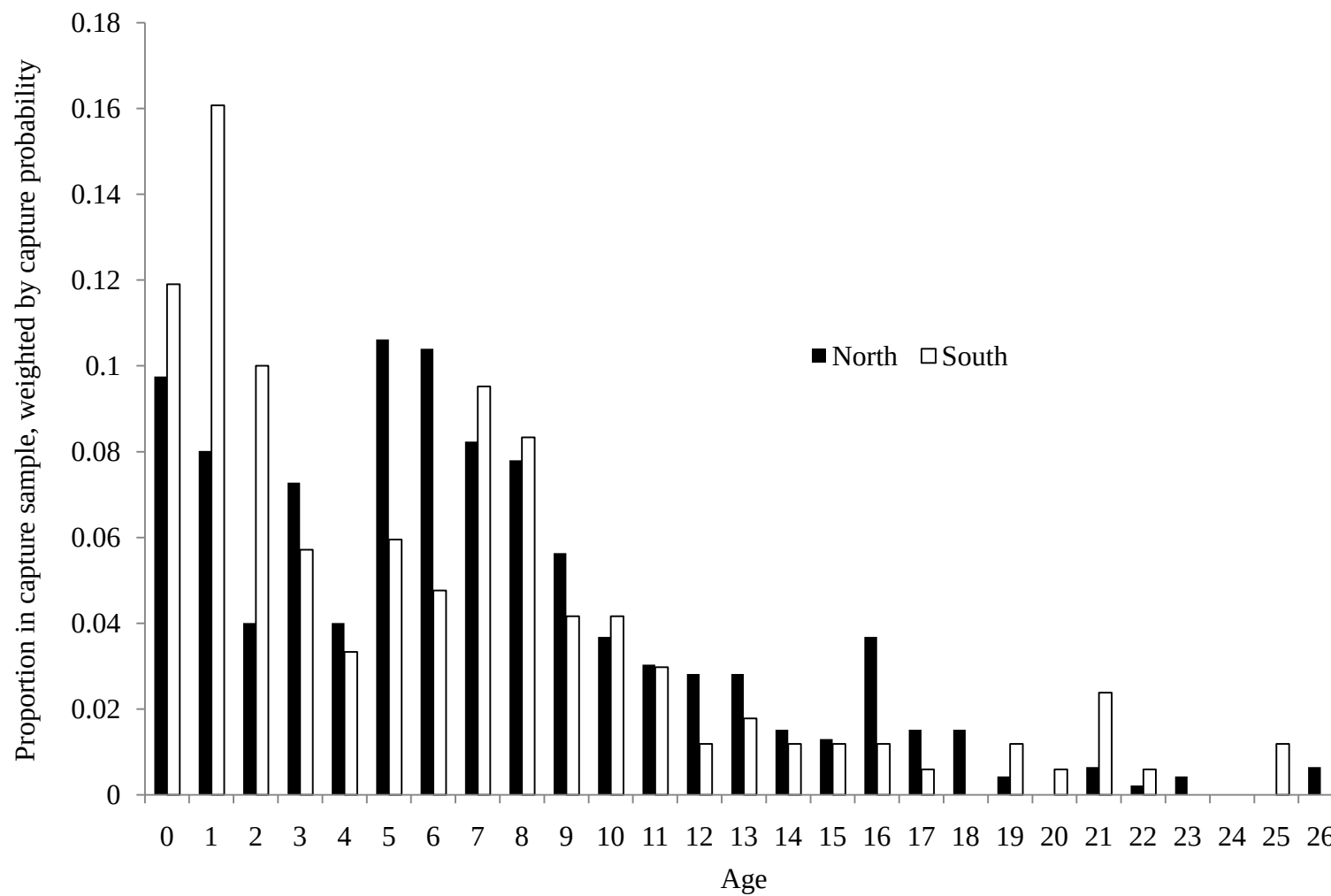


Fig S5. Age structure of female polar bears captured (2005–2007) north and south of Hudson Strait