

**Minimal Population Estimate for Harbor Seals in
Glacier Bay National Park, 1992-2000:
an Addendum of Key Results**

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PROGRESS REPORT TO:

Glacier Bay National Park and Preserve
Resource Management Division
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SUMMARY

This document updates the minimal population estimate (MPE) for harbor seals in Glacier Bay (GB) National Park by incorporating data from shore counts and aerial surveys conducted during summer 2000 into a longterm database (1992-present). Population trend analyses that incorporate environmental and other variables as covariates were not conducted for the period 1992–2000, but such analyses are anticipated for 1992–2001. Detailed information on the study and methods may be found in previous reports (Mathews and Pendleton 1997, Mathews and Pendleton 2000).

Numbers of harbor seals on haulouts (resting areas) in Glacier Bay National Park declined by 34-50% between 1992 and 1999 (Table 1) (Mathews and Pendleton 1999). Until recently, Glacier Bay has had one of the largest breeding colonies of harbor seals in Alaska. This aggregation is found in Johns Hopkins Inlet (JHI), a tidewater glacial fjord where seals rest on icebergs calved from glaciers. From 1992-1999 we counted seals from an elevated shore site in JHI in June during pupping; no surveys were conducted in JHI during June 2000. During August, 1992-2000 we counted seals from shore in JHI and used aerial photography to count seals at terrestrial haulouts throughout the rest of the bay.

From 1992 to 2000, the minimal estimate of seals on icebergs and terrestrial haulouts in GB declined from 6,300 to 3,600 with an apparent steeper decline after 1995 or 1996 (Table 2, Figure 1). The mean of the 3 high counts of seals in JHI did not decline between 1999 and 2000 (mean = 2,574, SD = 108; X = 2,615, SD = 257); however, the maximal number of seals observed on terrestrial haulouts dropped from 1,631 to 975 seals between 1999 and 2000 (Table 2b, Figure 1) despite very good coverage of the survey area in both years (Appendix I). Results of counts at each site from aerial surveys for all years are presented in Appendix I.

Seal numbers in Glacier Bay remain very low relative to the early years of the study.

Literature Cited

- Mathews, E. A., and G. W. Pendleton. 1997. Estimation of trends in abundance of harbor seals at terrestrial and glacial ice haulouts in Glacier Bay National Park, Southeast Alaska. Pages 57-76 in Harbor Seal Investigations in Alaska, Division of Wildlife Conservation, Alaska Department of Fish and Game, Anchorage, AK.
- . 1999. Declining trends in harbor seals (*Phoca vitulina*) at glacial ice and terrestrial haulouts in Glacier Bay National Park, Alaska, 1992-1999 (Abstract). Pages 117. *13th Biennial Conference on the Biology of Marine Mammals*. Society of Marine Mammalogy, Wailea, Maui, Hawaii.
- . 2000. Declining trends in harbor seal (*Phoca vitulina richardsi*) numbers at glacial ice and terrestrial haulouts in Glacier Bay National Park, 1992-1998 (unpublished). 24 pp. Available from Glacier Bay National Park and Preserve, P.O. Box 140, Gustavus, AK 99826.

Table 1. Trends in numbers of harbor seals in Glacier Bay from 1992 to 1999 (Mathews and Pendleton, 1999).

Location and Age Class	Substrate	Period	Trend (% / yr)	SE	95% CI	Overall Trend (% / 7yr)	Important Covariates
JHI Non-pups	Glacial Ice	June	-5.86	0.92	-7.65 : -4.06	-34	date, date ²
JHI All	Glacial Ice	August	-7.52	0.78	-9.06 : -5.98	-42	yr ²
Terrestrial Sites, All	Terrestrial*	August	-9.33	1.9	-13.06 : -5.61	-50	---

(* "Terrestrial" sites include McBride Inlet, an glacial ice site where <200 seals are typically found.)

Table 2. 2a) Mean of highest three counts of seals (excluding pups) in Johns Hopkins Inlet (JHI) from different survey days during June. **2b)** Mean of highest three counts of all seals in JHI from different days during August, and annual high counts from aerial photographic surveys of primarily terrestrial haulouts. The minimal population estimate (MPE) for harbor seals in Glacier Bay is the sum of the JHI mean and terrestrial maximal counts during August. (SE = Standard Error; CV = Coefficient of Variation)

2a)

Johns Hopkins Inlet, Non-Pups: JUNE			
Year	mean of highest 3	SE	CV
1992	2573	22	1%
1993	3657	557	15%
1994	2894	74	3%
1995	2646	65	2%
1996	3667	177	5%
1997	2866	100	3%
1998	2337	152	6%

2b)

Year	JHI (counts from shore)			Terrestrial Sites (aerial surveys)		MPE All Sites
	Mean (high 3)	n, days	CV	Max	n, days	
1992	4470	3	21%	1821	2	6291
1993	3361	2	31%		0	
1994	4046	9	10%	2507	4	6553
1995	4314	13	8%	2457	3	6771
1996	4381	13	8%	1832	5	6213
1997	3851	9	6%	1225	5	5076
1998	3086	14	5%	1374	6	4460
1999	2574	21	4%	1631	8	4205
2000	2615	18	10%	975	6	3590

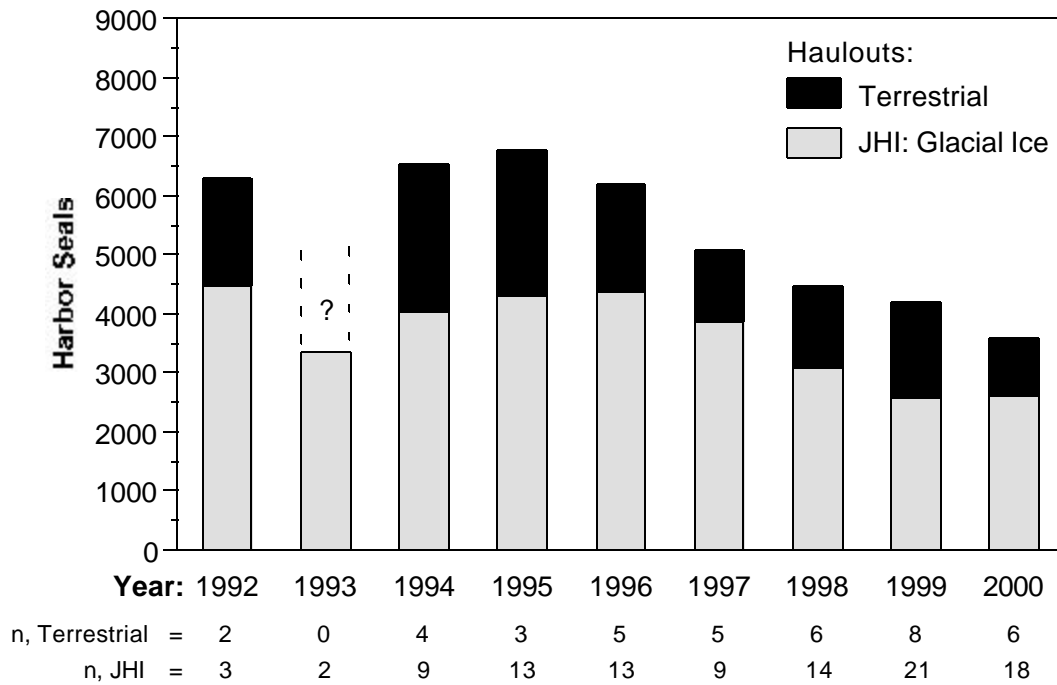


Figure 1. Minimal population estimates (MPE) of the number of harbor seals on haulouts in Glacier Bay during August counts from 1992 to 2000. Data are high counts for aerial surveys of all terrestrial sites and one small glacial ice haulout (= "Terrestrial" sites) and the mean of the three high counts from shore-based surveys of seals on icebergs in Johns Hopkins Inlet (JHI), a tidewater glacial fjord. There were no aerial surveys in 1993. Sample effort (n = days) has increased over the study period.

(Appendix I. Summary of counts of harbor seals from aerial surveys is in a separate Excel File: “Ap1 Aerial Survey 92-00”)

Loc#	Location	All Years	1992		1994				1995			1996				
			27	28	8	10	11	12	1	8	10	11	19	20	29	31
1	Spider Rfs	1522	1094	1017	1522	1489	1252	1271	1163	1077	1037	999		1008	357	703
1.1	Spider Rfs, N	60														
1.2	Spider Rfs, mid	792											777			
1.3	Spider Rfs, S	58														
1.5	Spider W Is	557										0	33	0		
1.6	Spider Is	115														
1.9	Spider NNW Is	515										74	69	83	0	0
2	Boulder	93			0				0	93	0	0	2	54	0	0
3	Eider	0	0	0		0	0	0		0	0	0	0	0	0	0
4	SecretBay	251	0	0	0	0	0	0	0	0	0		20	0		1
5	Hutchins	0	0	0	0	0	0	0	0	0	0		0	0		
6	Link	0	0	0	0	0	0	0	0				0	0		
7	Flapjack	228	61	126	228	0	0	124	194	208	166	194	113	139	10	87
7.1	Flapjack NE	46														
8	Strawberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Sita Rf	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	N Young	0		0	0	0	0	0	0	0	0	0	0	0		0
11	Kidney Stn Rf	139		0	0	0	0	0	0	0	0	0	0	0		
20	Leland S	361	209	243	361		236	0	302	285	341	249		101	65	
20.1	Leland N	0														
21	N Marble	59	0	0	24	26	23	32	59	0	10	0		8		
21.1	N Marble Rk	20								20						
22	WhaleRk	0	0	0					0			0		0		
23	S Marble S	2														
23.1	S Marble N	0	0	0	0	0	0	0	0	0	0			0		
24	SandyCove	70	0	0	0	0	0	70	27	24	40	6		29		
25	Sturgess S	109	0	0	71	60	0	109	81	0	49	11		0		
25.1	Sturgess N	0														
30	Garforth S	26	0	0	18	0	0	0	26	0	0	0		11		
30.1	Garforth N	0														
31	Adams Rk	225		0	0	0	110	99	0	0	0	84				
31.1	Adams E	0														
32	Wachusett E	0		0	0						0					
32.1	Wachusett Outwash	0														
33	Muir Ice	87		87	0											
34	Muir Land	0		0	0											
35	Caroline Sh	6	0	0	0											
36	Sealers	1	0	0	0				0	0	0					
37	McBride Ice	217							6	18						
40	Tidal	0			0	0	0									
41	Queen	25			0					0	0					
42	Rendu	0			0											
43	Tarr Inlet	1			0											
44	JohnsHopkins Ice	0														
44.1	Jaw Pt Ice	0														
45	Reid Ice	0			0											
46	Skidmore W Rk	0														
46.1	Skidmore mid Rk	59	0		0	0	0	32	59	35	0					
47	HughMiller	24	0		0		0	0	24	0	0					
48	BlueMouse	0	0			0	0	0	0	0						
49	Charpentier	0	0			0	0	0	0	0	0					
50	Lone S	138	25	31	82	101	84	138	27	27	0	0				
50.1	Lone N	123	84	114	101	53	59	0	123	74	85	38				43
52	Tyndall	63	0		0				63		51					
53	Geikie Rk Main	288	116	203	74	131	136	184	276	91	288	177				17
53.1	Geikie Rk E	55	0	0	26	0	0	55	27	0	0	0				
55	Lamplugh Ice	0														
56	Russell Islets	0														
60	Drake	0	0	0	0	0	0	0	0	0	0	0				
61	Francis	0	0	0	0	0	0	0	0	0	0	0				
62	Willoughby	0	0	0	0	0	0	0	0	0	0	0	0			
63	Fingers	0	0	0	0	0	0	0	0	0	0	0	0			
64	Berg	0	0		0	0	0	0	0	0	0	0	0			
65	Lars	0			0	0	0	0	0	0	0	0				
Daily Totals =			1992		1994				1995			1996				
			1589	1821	2507	1860	1900	2114	2457	1952	2067	1832	1014	1433	492	791

Loc#	Location	1997					1998						
		17	18	19	21	22	11	20	23	25	26	27	
1	Spider Rfs		75			0							63
1.1	Spider Rfs, N	0		0					0				
1.2	Spider Rfs, mid	0		0		203	127	399	0	277	240		
1.3	Spider Rfs, S	0		0					0				
1.5	Spider W Is	557				0	185	0	190	0	0	0	0
1.6	Spider Is					68	0	0		0	0	0	0
1.9	Spider NNW Is		455	515			0	0	89	0	0	0	0
2	Boulder						0	0	6	0	6	10	
3	Eider						0	0	0	0	0	0	
4	SecretBay		22	25			93	0	132	209	207	251	
5	Hutchins						0	0	0	0	0	0	
6	Link						0	0	0	0	0	0	
7	Flapjack		43	63	42	54	38	11	0	35	52	74	
7.1	Flapjack NE												
8	Strawberry						0		0		0	0	
9	Sita Rf						10	16	0		0	0	
10	N Young						0	0	0	0	0	0	
11	Kidney Stn Rf					62	0	0	74	93	116	139	
20	Leland S	201	177	206	161	112	306	51	68	100	38	97	
20.1	Leland N												
21	N Marble						0	0	0		0	0	
21.1	N Marble Rk			1			0	0	0		0	0	
22	WhaleRk						0	0	0		0	0	
23	S Marble S						0	0	0		0	0	
23.1	S Marble N												
24	SandyCove						10	0	1		0	0	
25	Sturgess S						0	0	0		0	0	
25.1	Sturgess N						0	0	0		0	0	
30	Garforth S						0	0			0	0	
30.1	Garforth N						0	0			0	0	
31	Adams Rk		22	130	132		225	0			223		
31.1	Adams E						0	0			0		
32	Wachusett E						0						
32.1	Wachusett Outwash												
33	Muir Ice												
34	Muir Land												
35	Caroline Sh						0	0			6	0	
36	Sealers						0	0			0	1	
37	McBride Ice	56	155	132	212		143	217			93		
40	Tidal												
41	Queen												
42	Rendu												
43	Tarr Inlet												
44	JohnsHopkins Ice												
44.1	Jaw Pt Ice												
45	Reid Ice												
46	Skidmore W Rk						0	0			0		
46.1	Skidmore mid Rk	38		23			30	20			0		
47	HughMiller						0	0			0		
48	BlueMouse						0	0					
49	Charpentier						0	0					
50	Lone S	27	25	38			0	18			0		
50.1	Lone N				71		36	0			5		
52	Tyndall			18			13	0			11		
53	Geikie Rk Main	92		74	73	105	158	98			44		
53.1	Geikie Rk E						0	0			0		
55	Laplugh Ice												
56	Russell Islets												
60	Drake						0				0		
61	Francis						0				0		
62	Willoughby						0				0		
63	Fingers						0				0		
64	Berg						0				0		
65	Lars						0				0		
Daily Totals =		971	974	1225	691	604	1374	830	560	714	1041	635	

Loc#	Location	1999								2000					
		11	12	14	15	16	17	18	19	2	3	16	17	18	20
1	Spider Rfs														
1.1	Spider Rfs, N	0	0	0	0	0	0	0	0	60	0	0	0	0	0
1.2	Spider Rfs, mid	213	654	741	676	792	411	0	0	59	503	0	0	0	0
1.3	Spider Rfs, S	0	0	12	0	0	58	0	0	0	0	0	0	0	0
1.5	Spider W Is	0	0	0	0	0	96	355	172	0	0	341	509	452	177
1.6	Spider Is	0	0	0	0	0	0	0	115	0	0	0	0	0	0
1.9	Spider NNW Is	0	0	0	0	0	81	249	197	0	0	0	0	0	0
2	Boulder			0	7	6	0	0	20	7	25	0	6	5	0
3	Eider	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	SecretBay	0	0	0	0	0	27	23	0	0	0	66	0	0	117
5	Hutchins	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Link	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Flapjack	116	85	189	219	196	83	197	147	168	172	16	0	55	
7.1	Flapjack NE	0	0	3	2	7	0	0	0	0	0	8	0	0	46
8	Strawberry	0		0	0	0	0								
9	Sita Rf	0	3	0	0	0	0	0	0	0	0	0	0	0	0
10	N Young	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Kidney Stn Rf		0	0	0	0	49	0	0	0	0	105	46	0	89
20	Leland S	101	44	155	193	198	199	188	209	82	95	33	49	17	0
20.1	Leland N	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	N Marble	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21.1	N Marble Rk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	WhaleRk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	S Marble S	2	0	0	0	0	0	0	0	0	0	0	0	0	0
23.1	S Marble N	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	SandyCove	0	0	0	0	0	0	0	0	1	0	0	0	0	0
25	Sturgess S	0	39	42	20	22	23	35	29	15	22	0	0	0	0
25.1	Sturgess N	0	0	0	0		0	0	0	0	0	0	0	0	0
30	Garforth S	0	0	0	0		0	0	0	0	0	0	0	0	0
30.1	Garforth N	0	0	0	0		0	0	0	0	0	0	0	0	0
31	Adams Rk	0	106	187	179	103	148	0	63	98	70	159	141	16	
31.1	Adams E	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	Wachusett E	0	0					0	0	0	0	0	0	0	0
32.1	Wachusett Outwash	0	0		0		0	0	0	0	0	0	0	0	0
33	Muir Ice			0								0			
34	Muir Land														
35	Caroline Sh				0		0			0	0	0			
36	Sealers	0	0	0	0			0	0	0	0	0	0	0	0
37	McBride Ice	127	90	192	172		161	84	129	66	23	90	75	140	
40	Tidal														
41	Queen	0	0										25	19	
42	Rendu												0		
43	Tarr Inlet										1	1	0		
44	JohnsHopkins Ice													0	
44.1	Jaw Pt Ice													0	
45	Reid Ice									0			0	0	
46	Skidmore W Rk	0	0		0		0	0	0	0	0	0	0	0	
46.1	Skidmore mid Rk	0	20		26		29	30	31	1	6	24	0	0	
47	HughMiller	0	0		0		0	0	0	0	0	0	0	0	
48	BlueMouse	0	0							0	0	0	0	0	
49	Charpentier	0						0	0	0		0	0	0	
50	Lone S	98	36		30		32	0	21	36	35	37	37	11	
50.1	Lone N	0	0		0		0	14	0	0	0	0	0	0	
52	Tyndall	0	27					0	0	7	0	7	20	0	
53	Geikie Rk Main	118	72		107		107	131	112	61	5	51	67	37	
53.1	Geikie Rk E	0	0		0		0	0	0	0	0	0	0	0	
55	Lamlugh Ice												0	0	
56	Russell Islets													0	
60	Drake				0			0	0		0				
61	Francis				0			0	0		0				
62	Willoughby				0			0			0			0	
63	Fingers								0	0		0	0	0	
64	Berg								0	0		0	0		
65	Lars														
		1999								2000					
Daily Totals =		775	1176	1521	1631	1324	1504	1306	1245	661	957	938	975	752	429