

BIOLOGICAL MONITORING AT ST. PAUL ISLAND, ALASKA IN 2014



Gregory Thomson, Brie A. Drummond and Marc D. Romano

Key words: *Aethia pusilla*, Bering Sea, black-legged kittiwake, breeding biology, common murre, least auklet, Otter Island, *Phalacrocorax urile*, populations, Pribilof Islands, productivity, red-faced cormorant, red-legged kittiwake, *Rissa brevirostris*, *Rissa tridactyla*, St. Paul Island, thick-billed murre, *Uria aalge*, *Uria lomvia*, Walrus Island.

U.S. Fish and Wildlife Service
Alaska Maritime National Wildlife Refuge
95 Sterling Highway, Suite 1
Homer, AK 99603

December 2014

Cite as: Thomson, G., B.A. Drummond and M.D. Romano. 2014. Biological monitoring at St. Paul Island, Alaska in 2014. U.S. Fish and Wildl. Serv. Rep., AMNWR 2014/12. Homer, Alaska.



Red-faced cormorant number 215 was banded as a chick in 2010.

TABLE OF CONTENTS**Page**

INTRODUCTION.....	1
STUDY AREA	1
METHODS	2
INTERESTING OBSERVATIONS	2
ACKNOWLEDGMENTS.....	3
REFERENCES.....	3
ISLAND MAPS	6
FIGURES AND TABLES.....	8
Northern fulmar.....	9
Populations	9
Red-faced cormorant.....	13
Breeding chronology	13
Reproductive performance.....	17
Populations	23
Chick banding	29
Food habits	35
Common murre.....	37
Breeding chronology	37
Reproductive performance.....	41
Populations	45
Food habits	48
Thick-billed murre	52
Breeding chronology	52
Reproductive performance.....	56
Populations	60
Survival.....	63
Food habits	67
Least auklet	71
Survival.....	71
Food habits	85
Black-legged kittiwake	90
Breeding chronology	90
Reproductive performance.....	94
Chick growth	101
Populations	102
Survival.....	107
Food habits	113
Red-legged kittiwake	116
Breeding chronology	116
Reproductive performance.....	120
Chick growth	127
Populations	128
Food habits	134

TABLE OF CONTENTS (continued)**Page**

Miscellaneous	136
Beach transects	136
COASST surveys	138
Annotated list	142
Plants	155
Sea surface temperature.....	158
Seabird necropsies	160
STAMP program	161
Observations at Otter Island	162
Observations at Walrus Island	168
Details of historic reproductive performance datasets.....	170
Lists of additional banded birds	173
List of diet datasets	176

INTRODUCTION

The Alaska Maritime National Wildlife Refuge (AMNWR) conducts annual ecological monitoring at nine sites throughout Alaska. The objective of this long-term monitoring program is to collect baseline status and trend information for a suite of seabird species representing piscivorous and planktivorous trophic guilds, including key species that serve as indicators of ecosystem health. Members of these guilds include surface feeders and divers feeding in both nearshore and offshore waters. By relating data to environmental conditions and information from other sites, ecosystem processes may be better understood. Data also provide a basis for directing management and research actions, and in assessing effects of management.

St. Paul Island, in the Pribilof Islands in the southeastern Bering Sea, has been an annual monitoring site since 1985. Between 1975 and 1984, the Minerals Management Service (MMS) funded studies to monitor trends in populations and productivity of ledge-nesting seabirds in the Pribilof Islands due to concerns over potential offshore oil development along the continental shelf (Hickey and Craighead 1977, Hunt et al. 1981, Craighead and Oppenheim 1985, Lloyd 1985, Johnson and Baker 1985, Troy and Baker 1985). The U.S. Fish and Wildlife Service purchased most of the seabird nesting areas in the Pribilof Islands between 1982 and 1985. Annual monitoring by AMNWR has occurred in most years since 1985 (Byrd et al. 1985; Byrd 1986, 1987, 1989; Dragoo et al. 1989; Wagner 1989; Fairchild 1991; Climo 1993, 1997; Carten and Calvin 1997; Carten and Sommer 1998; Bittner and Farence 1999; Bittner 2001; Snorek 2001; Howard 2002; Polito and Drew 2003; Wright and Will 2004; Thomson 2006; Thomson and Sapora 2007; Wright et al. 2007; Thomson and Spitler 2008; McClintock et al. 2010; Drummond et al. 2011; Thomson and Drummond 2011, 2012; Thomson and Romano 2013).

The specific monitoring goals in 2014 were to estimate productivity and/or population parameters for six indicator species representing three major feeding guilds: 1) diving fish-feeders (red-faced cormorants [*Phalacrocorax urile*] and common and thick-billed murrelets [*Uria aalge* and *U. lomvia*], 2) surface fish-feeders (black-legged and red-legged kittiwakes [*Rissa tridactyla* and *R. brevirostris*], and 3) surface plankton-feeders (northern fulmars [*Fulmarus glacialis*]). Additional monitoring goals include the description of breeding chronology, food habits, chick growth, and adult survival for one or more of the above species, as well as food habits data for least auklets (diving plankton feeders; *Aethia pusilla*).

Detailed results of the 2014 monitoring program are contained in these appendices and archived at the AMNWR headquarters in Homer, Alaska. Summary data will also be included in the annual Alaska seabird monitoring summary report. Due to occasional reanalysis of some data, correction of typographical errors, and efforts to standardize presentation across sites, some values used in this report have changed from previous versions. The values presented here are considered the cleanest data set available at the time this report was issued and should supersede previous reports.

STUDY AREA

St. Paul Island (57°10'N, 170°15'W) is located in the Pribilof Islands in the southeastern Bering Sea, Alaska (see Figures 1 and 2). Volcanic in origin, the island lies near the outer edge of the continental shelf that runs between Alaska and Russia. Water exchange between the Bering Sea and North Pacific Ocean forms a zone of upwellings and ocean fronts around the continental shelf that is rich in nutrients. These conditions create some of the highest primary productivity rates in the world's oceans (Lewbel 1983), which in turn support one of the highest densities of seabirds on earth (Hood 1981). About 90 km from the other major Pribilof island of St. George, St. Paul is farther north, a greater distance from the

highly-productive shelf break region and closer to the maximum extent of winter pack ice.

Cliffs span approximately 11 km of St. Paul's coastline and reach up to 115 m high, providing breeding habitat to an estimated 250,000 seabirds (Sowls et al. 1978). In addition, St. Paul Island is one of just a few sites where red-legged kittiwakes nest (Byrd and Williams 1993).

METHODS

Personnel: The USFWS field crew at St. Paul Island in 2014 consisted of Greg Thomson and Ryan deRegnier who were on island from 25 May to 31 August.

Data Collection and Analysis: Methods outlined in the refuge monitoring protocols were followed for all of the data collection (Alaska Maritime National Wildlife Refuge 2014). Monitoring plots for kittiwakes, murres, and red-faced cormorants were visited for productivity and chronology every three to five days from pre-laying until fledging, beginning on 31 May and continuing until 28 August. Diet samples were collected from least auklets with noose carpets and mist nets, and red-faced cormorant chicks during chick banding procedures (when 28 chicks were banded). In addition to the seabird work described above, the monitoring crew compiled a species account of all birds and marine mammals seen in 2014. Two "HOBO" water temperature sensors were deployed in English Bay from 3 June to 21 August.

Reproductive success and chronology data for kittiwakes, murres and auklets were summarized using the AMNWR productivity database (historical data for a few years are not summarized by the database because raw nest observation data were not available [1975-1988 and 1993-1995, depending on the species; see Appendices B-E]). Data for cormorants were summarized by hand.

Population data for all species in the current year were summarized using the AMNWR population database; population count data from 1975-2013 have not yet been added to the database and are hand-summarized (these data will be added to and summarized by the database in the future).

Diet data for all species in all years were summarized using the AMNWR diet database (only ongoing diet datasets are presented here; additional diet datasets exist [Appendix I] and may be presented in a consolidated refuge-wide diet report later this year). Presentation of diet data highlights only prey items that make up more than 5% of diets, which differs from past reports. Only frequency of occurrence is presented here (other summary parameters will be added in the future).

Sea surface temperatures were summarized using the AMNWR sea surface temperature database. Data for all other parameters were summarized by hand.

The crew also provided support to other researchers: for Leah Kinney (Alaska Natural Heritage Program), fish from several lakes were collected for a monitoring, biogeography and toxicology study. In partnership with the National Institute of Standards and Technology we collected common and thick-billed murre eggs for the Seabird Tissue Archival and Monitoring Project (STAMP), a long term program designed to track trends in pollutants in northern marine environments using seabird eggs.

INTERESTING OBSERVATIONS

- Boat-based counts of red-faced cormorants in 2014 were higher than 2013 counts, however the

results of the 2014 land-based survey fell 60 % from the previous survey in 2011.

- Twenty-eight red-faced cormorant chicks were banded in 2014 for a total of 310 banded since 2004. Resights of banded birds was again low this year, at 14. Over the years only 58 banded birds been sighted. None of the 37 chicks banded in 2011 have been resighted and only 1 of the 22 birds banded in 2008 have been seen.
- The first observed nesting success of a banded red-faced cormorant occurred in 2014. This bird was banded as a chick on St. Paul Island in 2010, and it successfully fledged a chick in 2014.
- Black-legged kittiwakes experienced the highest productivity in our records for St. Paul, at 0.65 nest sites with chicks fledged per nest start, which ties 1992 productivity record.
- Results of the boat-based and land-based population surveys of red-legged kittiwakes were higher than our previous surveys (2012 and 2013 for boat-based and 2011 for land-based).
- A common murre had the earliest “first hatch date” in our records (10 July), beating the previous record by a week.
- Northern fulmars had the highest population count in our records. It was 130% higher than the last count in 2011, and 39% higher than the pervious record in 1992.
- The rare sighting of a glaucous-winged gull nest with three large chicks was made on Otter Island.
- Sea surface tempertures in August were the highest recorded by USFWS since we began monitoring local ocean tempertures in 1998.

ACKNOWLEDGMENTS

Gary Stanley with the National Oceanographic and Atmospheric Administration (NOAA) gave helpful assistance at our accommodations at the Staff Quarters compound on St. Paul. Scott Schuette, Cory Gregory, and Glen Davis, Bird Guides for the Tanadgusix Corporation Island Tours, directed us to several rare birds they found on the island this year. In addition Scott helped with a red-legged kittiwake boat-based surveys and an Otter Island survey. We are indebted to Michael Cunanan, McKenzie Mudge, Kevin Pietrzak, and Nora Rojek for their help organizing and interpreting some of the data. We also thank the residents of St. Paul for their hospitality. And finially thanks to Ryan deRegnier for his fine work this summer.

REFERENCES

- Alaska Maritime National Wildlife Refuge [AMNWR]. 2014. Standardized protocols for annual seabird monitoring camps at Aiktak, Buldir, Cape Lisburne, Chowiet, St. George, St. Lazaria and St. Paul islands in the Alaska Maritime National Wildlife Refuge in 2014. U.S. Fish and Wildl. Serv. Rep., AMNWR 2014/08. Homer, Alaska.
- Bittner, T. 2001. Results of seabird monitoring at St. Paul Island, Alaska in 2000: summary appendices. U.S. Fish and Wildl. Serv. Rep., AMNWR 01/05. Homer, Alaska.

- Bittner, T. and C. Farence. 1999. Results of seabird monitoring at St. Paul Island, Alaska in 1999: summary appendices. U.S. Fish and Wildl. Serv. Rep., AMNWR 99/08. Homer, Alaska.
- Byrd, G. V. 1986. Results of seabird monitoring in the Pribilof Islands in 1986. U.S. Fish and Wildl. Serv. Rep., AMNWR 86/03. Homer, Alaska.
- Byrd, G. V. 1987. The status of ledge-nesting seabirds in the Pribilof Islands, Alaska, 1976-1987: an executive summary. U.S. Fish and Wildl. Serv. Rep., AMNWR 87/04. Homer, Alaska.
- Byrd, G. V. 1989. Seabirds in the Pribilof Islands, Alaska: trends and monitoring methods. M. S. thesis, University of Idaho, Moscow, Idaho.
- Byrd, G. V., P. R. Sievert, and L. Slater. 1985. Population trends and productivity of fulmars, cormorants, kittiwakes, and murre in the Pribilof Islands, Alaska in 1985. U.S. Fish and Wildl. Serv. Rep., AMNWR 85/02. Homer, Alaska.
- Byrd, G. V. and J. C. Williams. 1993. Red-legged kittiwake (*Rissa brevirostris*). In A. Poole and F. Gill (eds.). The Birds of North America, No. 60. The Academy of Natural Sciences, Philadelphia; The American Ornithologists' Union, Washington D.C.
- Carten, T. M. and M. E. Calvin, Jr. 1997. Results of seabird monitoring at St. Paul Island, Alaska in 1997: summary appendices. U.S. Fish and Wildl. Serv. Rep., AMNWR 97/17. Homer, Alaska.
- Carten, T. M. and E. S. Sommer. 1998. Results of seabird monitoring at St. Paul Island, Alaska in 1998: summary appendices. U.S. Fish and Wildl. Serv. Rep., AMNWR 98/07. Homer, Alaska.
- Climo, L. A. 1993. The status of cliff-nesting seabirds at St. Paul Island, Alaska in 1992. U.S. Fish and Wildl. Serv. Rep., AMNWR 93/15. Homer, Alaska.
- Climo, L. A. 1997. Results of seabird monitoring at St. Paul Island, Alaska in 1996: summary appendices. U.S. Fish and Wildl. Serv. Rep., AMNWR 97/07. Homer, Alaska.
- Craighead, F. L. and J. Oppenheim. 1985. Population estimates and temporal trends of Pribilof Island seabirds. U.S. Dept. Commerce, NOAA, OCSEAP. Final Rep. 30:307-356.
- Dragoo, D. E., B. K. Bain, A. L. SOWLS, and R. F. Chaundy. 1989. The status of cliff nesting seabirds in the Pribilof Islands, Alaska, 1976-1988: a summary. U.S. Fish and Wildl. Serv. Rep., AMNWR 89/01. Homer, Alaska.
- Drummond, B. A., A. L. Larned, and G. Thomson. 2011. Biological monitoring at St. Paul Island, Alaska in 2010 with additional observations at Otter and Walrus Islands. U.S. Fish and Wildl. Serv. Rep., AMNWR 2011/03. Homer, Alaska.
- Fairchild, L. 1991. The status of red-faced cormorants, kittiwakes and murre in the Pribilof Islands, Alaska, summer 1990. U.S. Fish and Wildl. Serv. Rep., AMNWR 91/01. Homer, Alaska.
- Hickey, J. J. and F. L. Craighead. 1977. A census of seabirds on the Pribilof Islands. Environ. Assess. Alaskan Contin. Shelf. Ann. Rep. 2:96-195. NOAA Environ. Res. Lab., Boulder, Colorado.
- Hood, D. W. 1981. Introduction. Pp. iii-xviii in D. W. Hood and J. A. Calder (eds.). The Eastern Bering Sea Shelf: Oceanography and Resources. University of Washington Press, Seattle, Washington.
- Howard, R. 2002. Results of seabird monitoring at St. Paul Island, Alaska in 2002: summary appendices. U.S. Fish and Wildl. Serv. Rep., AMNWR 02/11. Homer, Alaska.
- Hunt, G. L., Z. Eppley, B. Burgeson, and R. Squibb. 1981. Reproductive ecology, foods, and foraging areas of seabirds nesting on the Pribilof Islands, 1975-1979. Environ. Assess. Alaskan Contin. Shelf. Ann. Rep. 12:1-258. NOAA Environ. Res. Lab., Boulder, Colorado.
- Johnson, S. R. and J. S. Baker. 1985. Productivity studies. Pages 191-256 in S. R. Johnson (ed.). Population Estimation, Productivity, and Food Habits of Nesting Seabirds at Cape Pierce and the Pribilof Islands, Bering Sea, Alaska. LGL Ecol. Res. Assoc., Inc., Bryant, Texas.
- Lewbel, G. S. 1983. Bering sea biology: an evaluation of the environmental data base related to Bering Sea oil and gas exploration and development. LGL Alas. Res. Assoc., Inc., Anchorage, Alaska; SOHIO Alas. Petroleum Co., Anchorage, Alaska.
- Lloyd, D. S. 1985. Breeding performance of kittiwakes and murre in relation to oceanographic and meteorological conditions across the shelf of the southeastern Bering Sea. M. S. thesis, University of

- Alaska, Fairbanks, Alaska.
- McClintock, M. E., G. Thomson, and B. A. Drummond. 2010. Biological monitoring at St. Paul Island, Alaska in 2009 with additional observations at Otter and Walrus Islands. U.S. Fish and Wildl. Serv. Rep., AMNWR 2010/06. Homer, Alaska.
- Preeble, E.A, and W.L. McAtee. 1923. Birds and Mammals of the Pribilof Islands, Alaska. North American Fauna No. 46, Bureau of Biological Survey, U.S. Department of Agriculture.
- Polito, M. J. and E. K. Drew. 2003. Results of seabird monitoring at St. Paul Island, Alaska in 2003: summary appendices. U.S. Fish and Wildl. Serv. Rep., AMNWR 03/11. Homer, Alaska.
- Snorek, J. 2001. Results of seabird monitoring at St. Paul Island, Alaska in 2001: summary appendices. U.S. Fish and Wildl. Serv. Rep., AMNWR 01/13. Homer, Alaska.
- Sowls, A. L., S. A. Hatch, and C. J. Lensink. 1978. Catalog of Alaskan seabird colonies. U.S. Fish and Wildl. Serv., FWS/OBS-78/78, Anchorage, Alaska.
- Thomson, G. 2006. Results of seabird monitoring at St. Paul Island, Alaska in 2006: summary appendices. U.S. Fish and Wildl. Serv. Rep., AMNWR 06/09. Homer, Alaska.
- Thomson, G. and B. Drummond. 2011. Biological monitoring at St. Paul Island, Alaska in 2011: summary appendices. U.S. Fish and Wildl. Serv. Rep., AMNWR 2011/14. Homer, Alaska.
- Thomson, G. and B. A. Drummond. 2012. Biological monitoring at St. Paul Island, Alaska in 2012. U.S. Fish and Wildl. Serv. Rep., AMNWR 2012/09. Homer, Alaska.
- Thomson, G. and M.D. Romano. 2013. Biological monitoring at St. Paul Island, Alaska in 2013. U.S. Fish and Wildl. Serv. Rep., AMNWR 2013/10. Homer, Alaska.
- Thomson, G. and S. F. Sabora. 2007. Results of seabird monitoring at St. Paul Island, Alaska in 2007: summary appendices. U.S. Fish and Wildl. Serv. Rep., AMNWR 07/16. Homer, Alaska.
- Thomson, G. L. and L. Spittler 2008. Results of seabird monitoring at St. Paul Island, Alaska in 2008: summary appendices with additional observations at Otter Island and Walrus Island. U.S. Fish and Wildl. Serv. Rep., AMNWR 08/19. Homer, Alaska.
- Troy, D. M. and J. S. Baker. 1985. Population studies. Pp. 34-190 *in* S. R. Johnson (ed.). Population Estimation, Productivity, and Food Habits of Nesting Seabirds at Cape Pierce and the Pribilof Islands, Bering Sea, Alaska. LGL Ecol. Res. Assoc., Inc., Bryant, Texas.
- USFWS. 2000. Standard operating procedures for population inventories: ledge-nesting seabirds. U.S. Fish and Wildl. Serv. Rep. Homer, Alaska.
- Wagner, P. J. 1989. Seabird monitoring: a study of population, productivity, and disturbance factors of cliff-nesting seabirds and observations of Salt Lagoon, St. Paul Island, Alaska, 1989. U.S. Fish and Wildl. Serv. Rep., AMNWR 89/33. Homer, Alaska.
- Wright, S. K. and A. Will. 2004. Results of seabird monitoring at St. Paul Island, Alaska in 2004: summary appendices. U.S. Fish and Wildl. Serv. Unpubl. Rep. Homer, Alaska.
- Wright, S. K., D. Dykstra, D. Wynn, and G. Thomson. 2007. Results of seabird monitoring at St. Paul Island, Alaska in 2005: summary appendices. U.S. Fish and Wildl. Serv. Rep., AMNWR 07/04. Homer, Alaska.

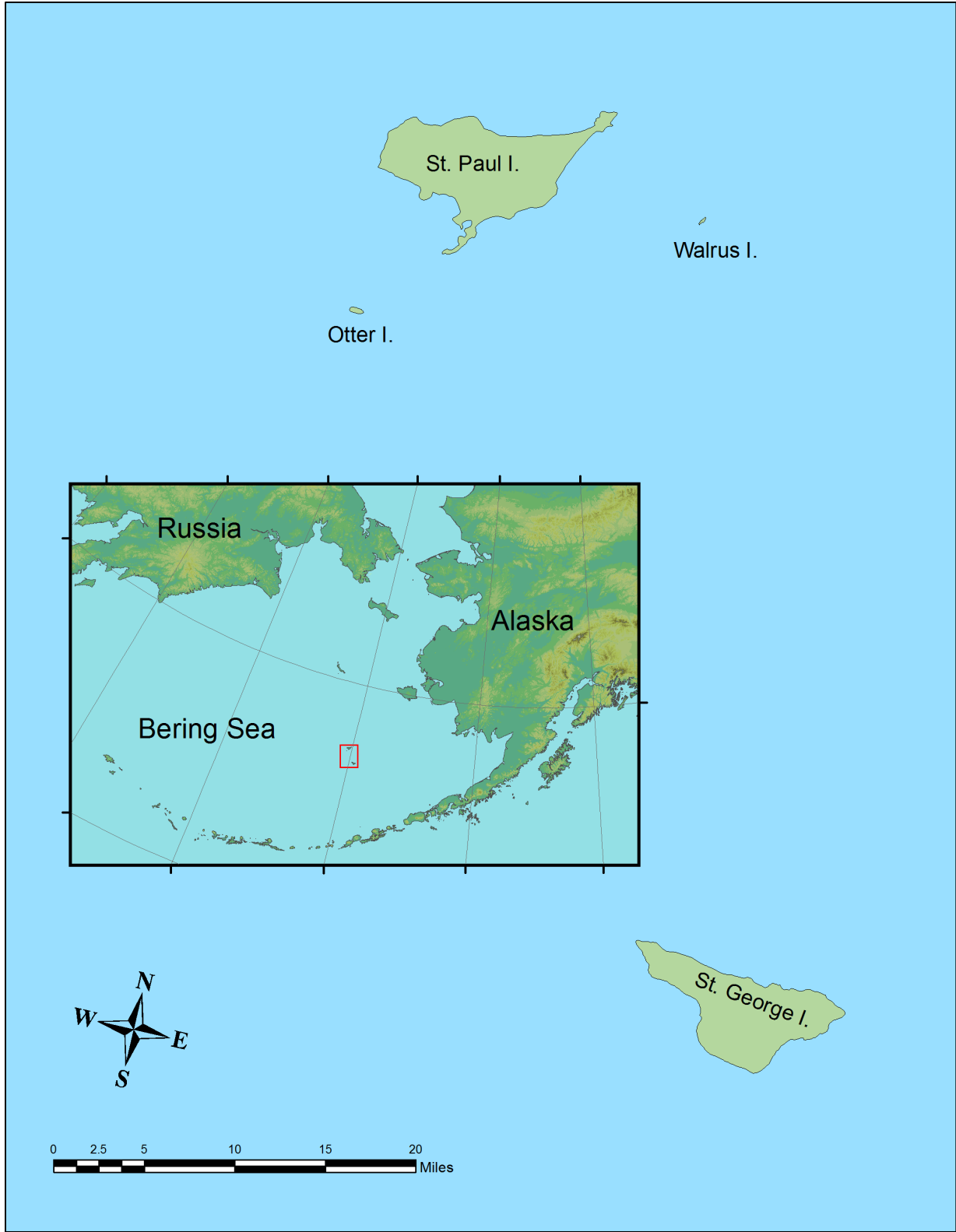


Figure 1. Map of the Pribilof Islands, Alaska.

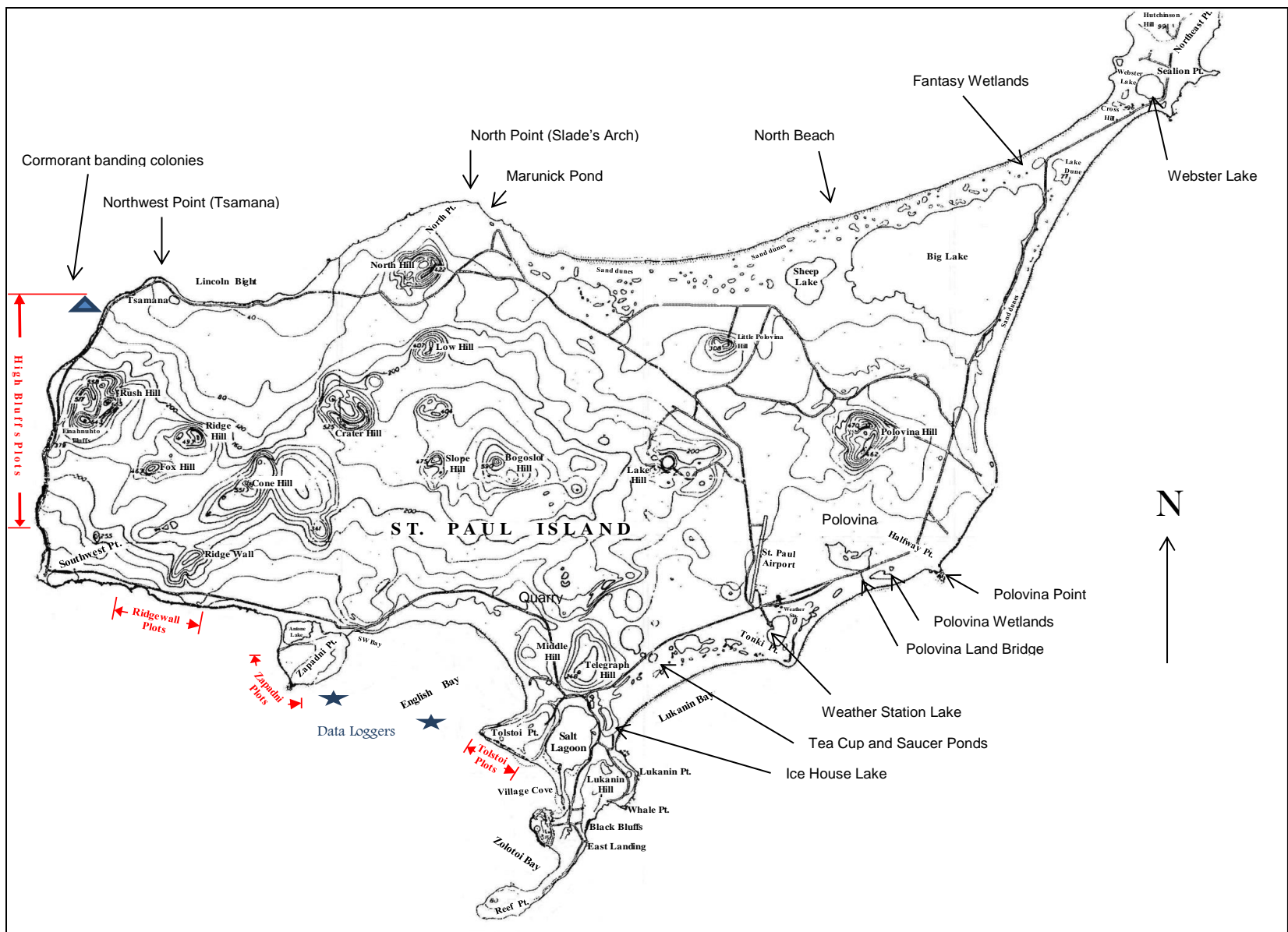


Figure 2. Map of St. Paul Island, Alaska.

FIGURES AND TABLES

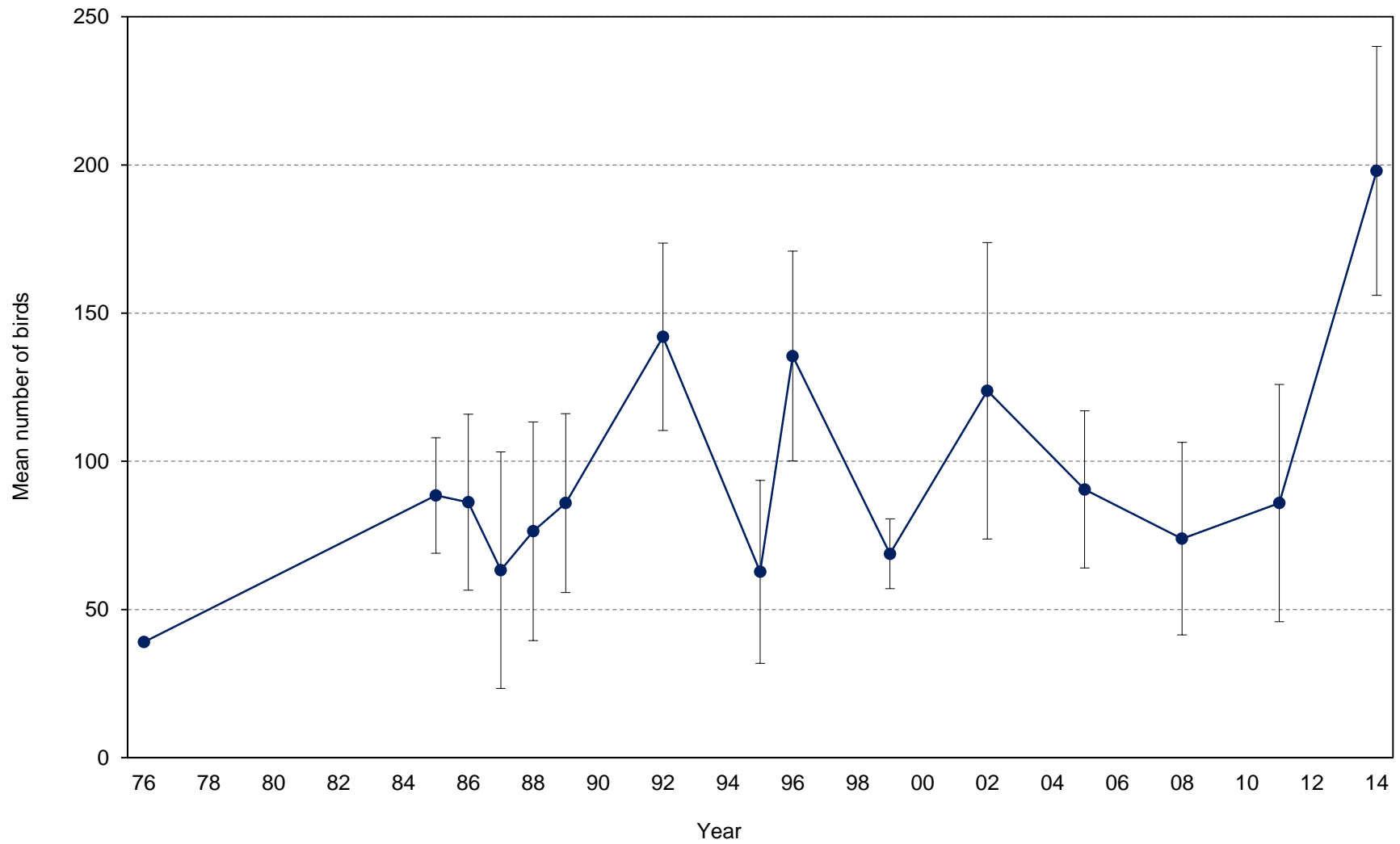


Figure 3. Mean numbers of northern fulmars counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Data from 1982 and 1984 are excluded because not all plots were counted. Error bars represent standard deviation.

Table 1. Numbers of northern fulmars counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. No counts were conducted during years not listed; data from 1982 and 1984 are excluded because not all plots were counted.

Replicate	1976	1985	1986	1987	1988	1989	1992	1995	1996	1999	2002	2005	2008	2011	2014
1	39	95	63	133	116	74	120	37	99	84	68	83	119	47	148
2	-	95	105	72	123	52	159	97	176	69	129	60	64	117	182
3	-	104	129	75	27	124	100	54	94	63	84	68	37	90	178
4	-	60	61	34	73	89	136	-	175	58	117	81	59	165	165
5	-	-	73	43	42	69	191	-	138	57	211	88	50	88	218
6	-	-	-	23	57	62	146	-	131	82	134	114	47	52	220
7	-	-	-	-	97	79	-	-	-	-	-	143	115	51	273
8	-	-	-	-	-	138	-	-	-	-	-	87	100	77	-
Mean	39	89	86	63	76	86	142	63	136	69	124	91	74	86	198
<i>n</i>	1	4	5	6	7	8	6	3	6	6	6	8	8	8	7
SD	-	20	30	40	37	30	32	31	35	12	50	27	33	40	40
First count	17 Jul	xx ^a	6 Jul	9 Jul	12 Jul	17 Jul	12 Jul	9 Jul	10 Jul	7 Jul	8 Jul	11 Jul	1 Jul	6 Jul	Jun 30
Last count	21 Jul	xx	29 Jul	23 Jul	7 Aug	9 Aug	7 Aug	3 Aug	2 Aug	7 Aug	1 Aug	31 Jul	31 Jul	1 Aug	27 Jul

^axx indicates data potentially exist but have not yet been summarized.

Table 2. Numbers of northern fulmars counted on index plots at St. Paul Island, Alaska in 2014.

Plot	Replicate							Mean	SD
	1 30 Jun-2 Jul	2 7-9 Jul	3 10-12 Jul	4 13-15 Jul	5 17-19 Jul	6 21-23 Jul	7 25-27 Jul		
1	0	0	0	0	0	0	0	-	-
2sw	0	0	1	0	0	0	0	-	-
2ne	0	0	0	0	0	0	0	-	-
3	0	0	0	0	0	0	0	-	-
4	0	1	0	0	0	3	1	-	-
5sw	10	7	8	5	21	15	8	-	-
5ne	1	5	1	0	2	2	4	-	-
6 ^a	-	-	-	-	-	-	-	-	-
7	0	0	0	0	0	0	0	-	-
8	3	0	4	4	0	3	5	-	-
9	-	-	-	-	-	-	-	-	-
10	5	0	3	0	4	1	6	-	-
11	0	0	0	0	0	0	0	-	-
12	0	0	0	0	0	0	0	-	-
13	0	4	2	0	1	1	10	-	-
14	6	8	8	6	10	3	11	-	-
15	0	0	0	0	1	1	2	-	-
16 ^a	-	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-	-
18	0	0	0	0	0	0	0	-	-
19top	3	4	8	0	3	5	4	-	-
19btm	0	0	0	0	0	0	0	-	-
20top	0	0	0	0	0	0	0	-	-
20btm	0	0	0	0	0	0	0	-	-
21 ^a	-	-	-	-	-	-	-	-	-
22	16	22	19	23	22	29	27	-	-
23	12	15	8	15	20	15	28	-	-
24	0	0	0	0	0	0	0	-	-
25	0	0	0	0	0	0	0	-	-
26	0	0	0	0	0	0	0	-	-
27	0	4	0	0	0	0	0	-	-
28	0	0	0	0	0	2	4	-	-
29 ^a	-	-	-	-	-	-	-	-	-
29new	1	1	0	1	1	2	1	-	-
30	31	40	25	32	31	29	32	-	-
31	43	59	69	62	78	79	94	-	-
32	15	9	20	17	22	24	32	-	-
33	2	3	2	0	2	6	4	-	-
Total ^b	148	182	178	165	218	220	273	198	42

^aHistorical plots no longer counted.

^bTotals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30.

Table 3. Numbers of northern fulmar adults and chicks counted on Plot 53 at St. Paul, Alaska. No counts were made in 2013.

Year	Adults					Chicks	Date of first count	Date of last count	Date of first chick ^a	Date of max chick count
	Mean	SD	<i>n</i>	Min.	Max.	Max.				
2006	28	13	6	9	45	4	11 Jun	5 Sep	12 Aug	5 Sep
2007	23	7	4	14	32	8	6 Jun	1 Sep	28 Aug	1 Sep
2008	33	16	2	21	44	5	25 Jul	29 Jul	25 Jul	29 Jul
2009	22	11	11	3	43	4	3 Jun	17 Aug	19 Jul	5 Aug
2010	13	5	5	10	21	7	29 Jun	17 Aug	13 Jul	25 Aug
2011	27	12	17	11	48	5	6 Jun	2 Sep	1 Aug	15+19 Aug
2012	24	9	17	11	48	4	7 Jun	21 Aug	20 Jul	12+21 Aug
2013	<i>no data</i>	-	-	-	-	-	-	-	-	-
2014	37	13	18	24	60	13	4 Jun	26 Aug	10 Aug	21 Aug

^aChicks are usually quite large when they are first seen and this date does not correspond to a hatch date.

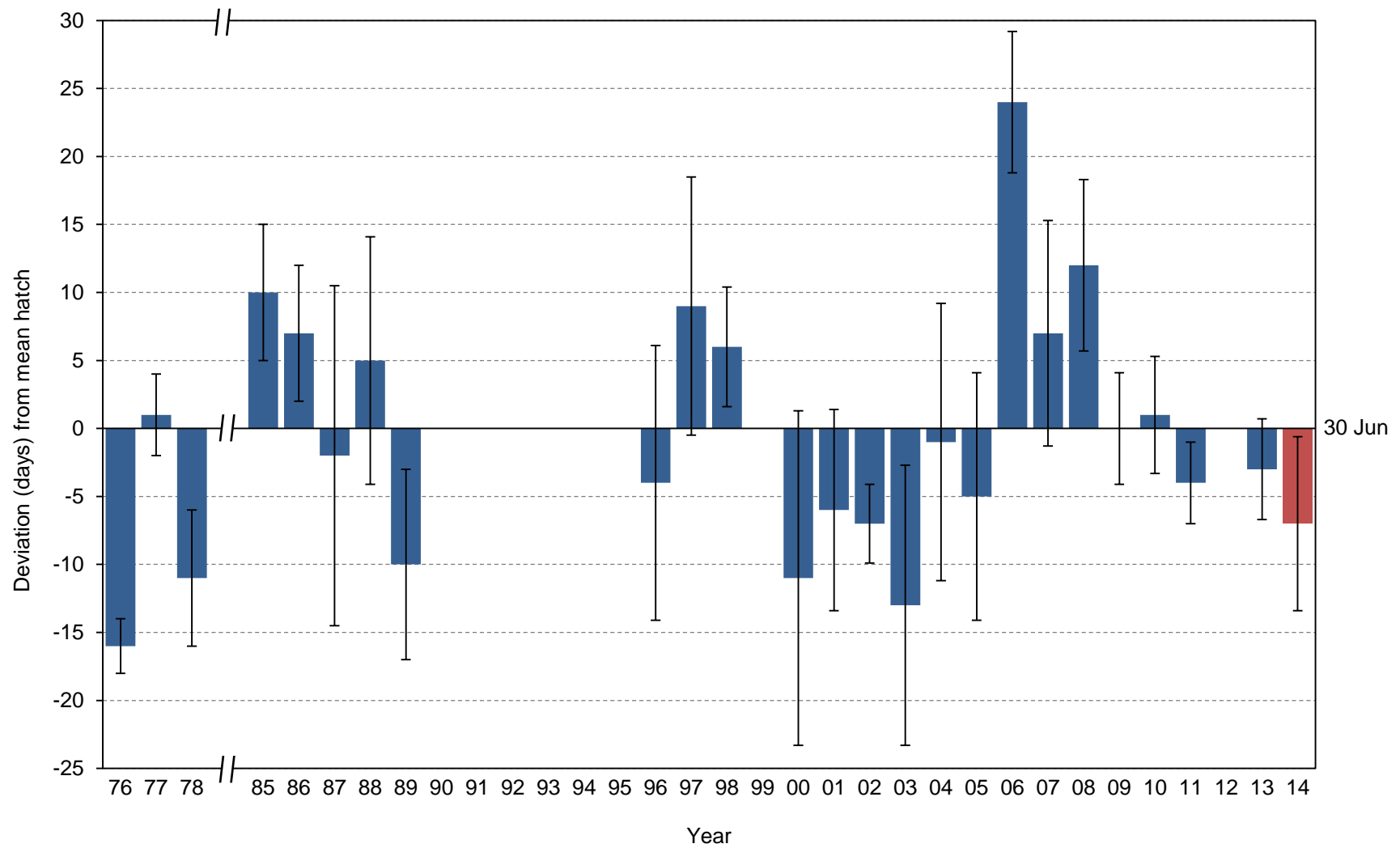


Figure 4. Yearly hatch date deviation (from the 1976-2013 average of 30 June) for red-faced cormorants at St. Paul Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date.

Table 4. Breeding chronology of red-faced cormorants at St. Paul Island, Alaska. Data represent the date of the first chick hatched in each nest.

Year	Mean hatch	SD	n^a	First hatch	Last hatch
1976	13 Jun	2.0	7	-	-
1977	1 Jul	3.0	11	18-21 Jun ^b	12-15 Jul ^b
1978	19 Jun	5.0	7	-	-
1979	<i>no data</i>	-	-	-	-
1980	<i>no data</i>	-	-	-	-
1981	<i>no data</i>	-	-	-	-
1982	<i>no data</i>	-	-	-	-
1983	<i>no data</i>	-	-	-	-
1984	<i>no data</i>	-	-	-	-
1985	10 Jul	5.0	16	3 Jul	17 Jul
1986	7 Jul	5.0	17	-	-
1987	28 Jun	12.5	31	9 Jun	27 Jul
1988	4 Jul	9.1	11	26 Jun	26 Jul
1989	20 Jun	7.0	22	9 Jun	5 Jul
1990	<i>no data</i>	-	-	-	-
1991	<i>no data</i>	-	-	-	-
1992	<i>no data</i>	-	-	-	-
1993	<i>no data</i>	-	-	-	-
1994	<i>no data</i>	-	-	-	-
1995	<i>no data</i>	-	-	-	-
1996	25 Jun	10.1	10	12 Jun	14 Jul
1997	9 Jul	9.5	31	29 Jun	12 Aug
1998	6 Jul	4.4	23	27 Jun	15 Jul
1999	<i>no data</i>	-	-	-	-
2000	18 Jun	12.3	22	6 Jun	10 Jul
2001	24 Jun	7.4	9	17 Jun	10 Jul
2002	23 Jun	2.9	12	18 Jun	25 Jun
2003	17 Jun	10.3	24	5 Jun	21 Jul
2004	28 Jun	10.2	84	10 Jun	28 Jul
2005	25 Jun	9.1	111	8 Jun	28 Jul
2006	24 Jul	5.2	11	19 Jul	2 Aug
2007	7 Jul	8.3	43	24 Jun	4 Aug
2008	11 Jul	6.3	16	2 Jul	22 Jul
2009	30 Jun	4.1	28	25 Jun	13 Jul
2010	1 Jul	4.3	31	24 Jun	12 Jul
2011	26 Jun	3.0	33	21 Jun	5 Jul
2012	<i>no data</i>	-	-	-	-
2013	27 Jun	3.7	16	21 Jun	3 Jul
2014	23 Jun	6.4	16	14 Jun	5 Jul

^aSample sizes for mean hatch dates are a sub-sample of total nests for which egg to chick interval is ≤ 7 days.

^bData available only as range (Hunt et al. 1981).

Table 5. Frequency distribution of hatch dates for red-faced cormorants at St. Paul Island, Alaska. Data represent the date of the first chick hatched in each nest and include only nests in which observations of egg to chick ≤ 7 days. Individual hatch date data are not available before 1987.

Julian date ^a	No. nests hatching on Julian date														
	87	88	89	90	91	92	93	94	95	96	97	98	99	00	
156	-	-	-	no data	no data	no data	no data	no data	no data	-	-	-	no data	-	
157	-	-	-	-	-	-	-	-	-	-	-	-	-	7	
158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
159	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
160	1	-	2	-	-	-	-	-	-	-	-	-	-	1	
161	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
162	-	-	1	-	-	-	-	-	-	-	-	-	-	-	
163	1	-	1	-	-	-	-	-	-	2	-	-	-	-	
164	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
165	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
166	3	-	4	-	-	-	-	-	-	-	-	-	-	-	
167	-	-	-	-	-	-	-	-	-	1	-	-	-	-	
168	-	-	1	-	-	-	-	-	-	-	-	-	-	1	
169	4	-	-	-	-	-	-	-	-	-	-	-	-	1	
170	-	-	3	-	-	-	-	-	-	-	-	-	-	-	
171	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
172	3	-	3	-	-	-	-	-	-	-	-	-	-	-	
173	-	-	-	-	-	-	-	-	-	2	-	-	-	-	
174	-	-	2	-	-	-	-	-	-	-	-	-	-	-	
175	2	-	-	-	-	-	-	-	-	-	-	-	-	1	
176	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
177	-	2	-	-	-	-	-	-	-	-	-	-	-	-	
178	5	2	1	-	-	-	-	-	-	2	-	1	-	-	
179	-	-	-	-	-	-	-	-	-	1	-	-	-	-	
180	-	-	3	-	-	-	-	-	-	-	1	-	-	-	
181	2	3	-	-	-	-	-	-	-	-	1	-	-	3	
182	-	-	-	-	-	-	-	-	-	-	2	3	-	-	
183	-	-	-	-	-	-	-	-	-	-	1	-	-	-	
184	2	-	-	-	-	-	-	-	-	-	5	4	-	-	
185	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
186	-	-	1	-	-	-	-	-	-	1	6	2	-	-	
187	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
188	-	-	-	-	-	-	-	-	-	-	2	4	-	-	
189	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
190	2	3	-	-	-	-	-	-	-	-	1	-	-	-	
191	-	-	-	-	-	-	-	-	-	-	1	6	-	1	
192	-	-	-	-	-	-	-	-	-	-	2	2	-	-	
193	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
194	-	-	-	-	-	-	-	-	-	-	1	-	-	-	
195	-	-	-	-	-	-	-	-	-	1	-	-	-	-	
196	2	-	-	-	-	-	-	-	-	-	2	1	-	-	
197	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
198	-	-	-	-	-	-	-	-	-	-	2	-	-	-	
199	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
201	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
202	-	-	-	-	-	-	-	-	-	-	1	-	-	-	
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
204	-	-	-	-	-	-	-	-	-	-	1	-	-	-	
205	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
206	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
207	-	1	-	-	-	-	-	-	-	-	-	-	-	-	
208	1	-	-	-	-	-	-	-	-	-	1	-	-	-	
209	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
212	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
214	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
216	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
218	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
219	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
222	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
223	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
224	-	-	-	-	-	-	-	-	-	-	1	-	-	-	
<i>n</i>	31	11	22	-	-	-	-	-	-	10	31	23	-	22	

^aJulian dates are adjusted by one day in leap years.

Table 5 (continued). Frequency distribution of hatch dates for red-faced cormorants at St. Paul Island, Alaska. Data represent the date of the first chick hatched in each nest and include only nests in which observations of egg to chick ≤ 7 days. Individual hatch date data are not available before 1987.

Julian date ^a	No. nests hatching on Julian date													
	01	02	03	04	05	06	07	08	09	10	11	12	13	14
156	-	-	1	-	-	-	-	-	-	-	-	<i>no data</i>	-	-
157	-	-	-	-	-	-	-	-	-	-	-	<i>no data</i>	-	-
158	-	-	2	-	-	-	-	-	-	-	-	-	-	-
159	-	-	1	-	1	-	-	-	-	-	-	-	-	-
160	-	-	3	-	-	-	-	-	-	-	-	-	-	-
161	-	-	-	1	1	-	-	-	-	-	-	-	-	-
162	-	-	2	-	1	-	-	-	-	-	-	-	-	-
163	-	-	-	-	1	-	-	-	-	-	-	-	-	-
164	-	-	1	-	-	-	-	-	-	-	-	-	-	-
165	-	-	-	-	1	-	-	-	-	-	-	-	-	3
166	-	-	5	3	8	-	-	-	-	-	-	-	-	-
167	-	-	-	3	6	-	-	-	-	-	-	-	-	-
168	1	-	-	1	2	-	-	-	-	-	-	-	-	-
169	-	1	2	4	7	-	-	-	-	-	-	-	-	-
170	3	2	-	6	6	-	-	-	-	-	-	-	-	2
171	-	-	-	1	4	-	-	-	-	-	-	-	-	1
172	1	-	2	4	7	-	-	-	-	-	3	-	2	-
173	-	1	-	4	2	-	-	-	-	-	-	-	-	2
174	-	-	2	3	5	-	-	-	-	-	-	-	1	1
175	-	-	-	7	9	-	2	-	-	3	11	-	-	-
176	2	8	-	4	5	-	-	-	1	-	1	-	5	-
177	-	-	-	1	2	-	1	-	-	-	3	-	-	-
178	-	-	-	6	6	-	-	-	11	-	7	-	2	4
179	-	-	-	5	7	-	1	-	-	5	-	-	-	-
180	-	-	-	1	3	-	4	-	-	2	6	-	2	-
181	-	-	-	9	2	-	-	-	-	1	-	-	2	1
182	1	-	1	-	2	-	3	-	10	9	1	-	-	1
183	-	-	-	-	1	-	4	2	-	-	-	-	-	-
184	-	-	1	1	4	-	2	-	1	2	-	-	2	-
185	-	-	-	3	-	-	2	1	-	-	-	-	-	-
186	-	-	-	-	4	-	1	1	-	6	1	-	-	1
187	-	-	-	2	1	-	8	1	4	-	-	-	-	-
188	-	-	-	-	1	-	1	-	-	-	-	-	-	-
189	-	-	-	1	-	-	1	-	-	-	-	-	-	-
190	-	-	-	1	4	-	-	3	-	2	-	-	-	-
191	1	-	-	1	2	-	3	1	-	-	-	-	-	-
192	-	-	-	1	1	-	1	-	-	-	-	-	-	-
193	-	-	-	1	-	-	1	-	-	1	-	-	-	-
194	-	-	-	3	1	-	-	-	1	-	-	-	-	-
195	-	-	-	-	1	-	3	2	-	-	-	-	-	-
196	-	-	-	1	-	-	-	-	-	-	-	-	-	-
197	-	-	-	1	-	-	-	2	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	-	-	-	-	-
199	-	-	-	-	1	-	2	1	-	-	-	-	-	-
200	-	-	-	-	-	5	-	-	-	-	-	-	-	-
201	-	-	-	-	-	-	-	1	-	-	-	-	-	-
202	-	-	1	1	-	-	-	-	-	-	-	-	-	-
203	-	-	-	2	-	-	1	1	-	-	-	-	-	-
204	-	-	-	-	1	2	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	1	-	-	-	-	-	-	-
208	-	-	-	-	-	2	-	-	-	-	-	-	-	-
209	-	-	-	2	1	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-	-	-	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	1	-	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	1	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	-	1	-	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-
218	-	-	-	-	-	-	-	-	-	-	-	-	-	-
219	-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	-	-	-	-	-	-	-	-	-	-	-	-	-
223	-	-	-	-	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	9	12	24	84	111	11	43	16	28	31	33	-	16	16

^aJulian dates are adjusted by one day in leap years.

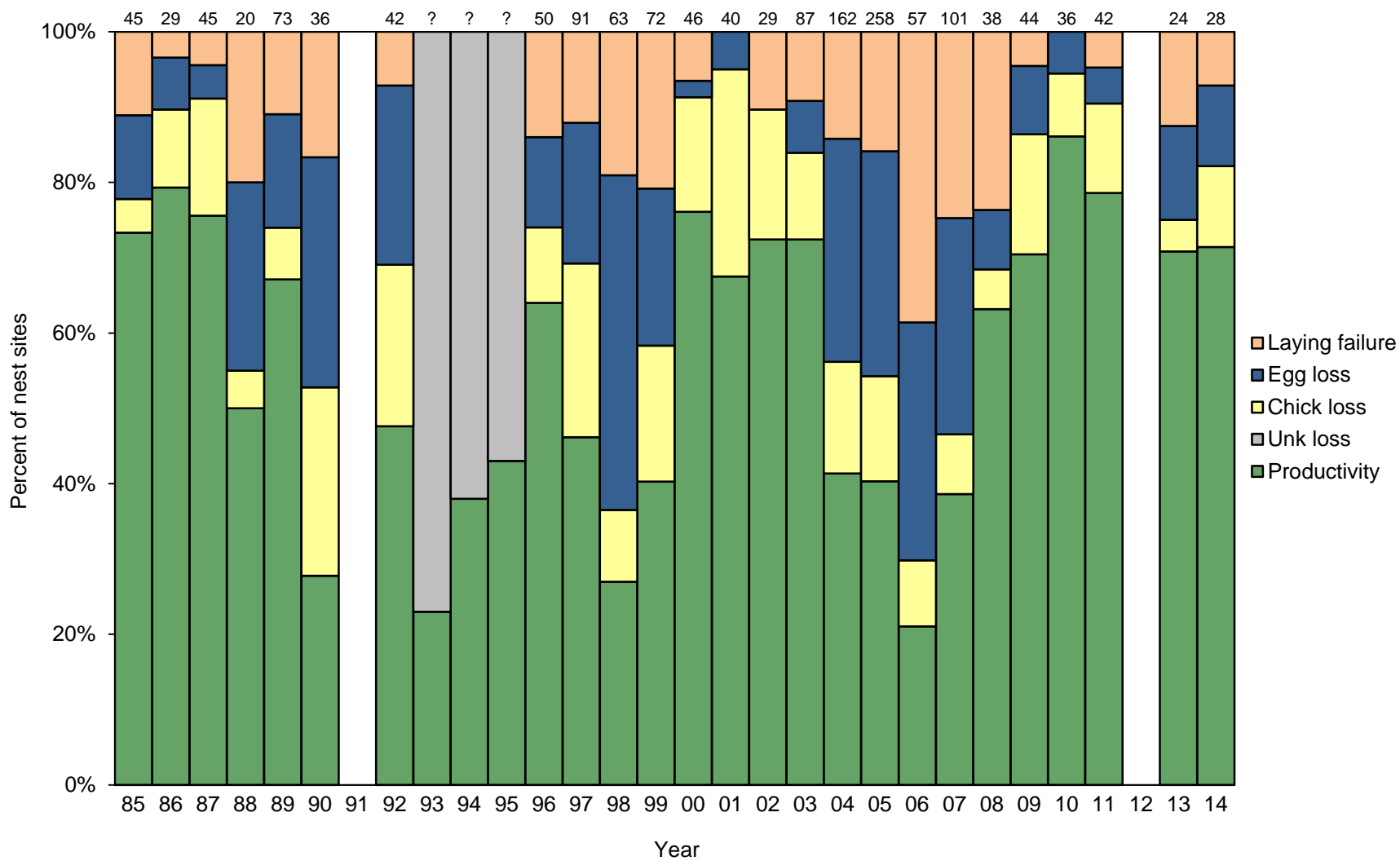


Figure 5. Reproductive performance of red-faced cormorants at St. Paul Island, Alaska. Laying failure=(A-B)/A; Egg loss=(B-D)/A; Chick loss=(D-F)/A; Productivity=F/A, where A=total nest sites; B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (A).

Table 6. Reproductive performance of red-faced cormorants at St. Paul Island, Alaska. Measures of success are based on frequent monitoring of individual nests (as opposed to Boom or Bust methodology presented in Table 7).

Year	Total nest starts	Nest sites w/ eggs	Total eggs	Nest sites w/ chicks	Total chicks	Nest sites w/ chicks fledged	Total chicks fledged	Laying success	Mean clutch size	Nesting success	Hatching success	Chick success	Egg success	Fledging success	Reprod. success	Fledglings /nest start	Prod.
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(B/A)	(C/B)	(D/B)	(E/C)	(G/E)	(G/C)	(F/D)	(F/B)	(G/A)	(F/A)
1975	88	80	-	-	-	-	107	0.90	3.0 ^a	-	0.41	-	-	-	-	1.22	-
1976	82	79	-	-	-	-	120	0.96	2.9 ^a	-	0.33	-	-	-	-	1.46	-
1977	54	51	-	-	-	-	65	0.94	2.8 ^a	-	0.45	-	-	-	-	1.20	-
1978	90	83	-	-	-	-	90	0.92	2.6 ^a	-	0.51	-	-	-	-	1.00	-
1979	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	14	-	-	-	-	0	0	-	-	-	-	0.00	0.00	-	-	0.00	-
1985	45	40	116	35	-	33	76	0.89	2.9	0.88	-	-	0.66	0.94	0.83	1.69	0.73
1986	29	28	77	26	67	23	50	0.97	2.8	0.93	0.87	0.75	0.65	0.88	0.82	1.72	0.79
1987	45	43	-	41	-	34	80	0.96	3.4 ^a	0.95	-	-	-	0.83	0.79	1.78	0.76
1988	20	16	44	11	29	10	23	0.80	2.8	0.69	0.66	0.79	0.52	0.91	0.63	1.15	0.50
1989	73	65	186	54	142	49	121	0.89	2.9	0.83	0.76	0.85	0.65	0.91	0.75	1.66	0.67
1990	36	30	80	19	45	10	23	0.83	2.7	0.63	0.56	0.51	0.29	0.53	0.33	0.64	0.28
1991	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	42	39	121	29	68	20	43	0.93	3.1	0.74	0.56	0.63	0.36	0.69	0.51	1.02	0.48
1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.23 ^b
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.38 ^b
1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.43 ^b
1996	50	43	128	37	100	32	78	0.86	3.0	0.86	0.78	0.78	0.61	0.86	0.74	1.52	0.64
1997	91	80	228	63	131	42	89	0.88	2.9	0.79	0.57	0.68	0.39	0.67	0.53	0.63	0.46
1998	63	51	150	23	63	17	31	0.81	2.9	0.45	0.42	0.49	0.21	0.74	0.33	0.49	0.27
1999	72	57	138	42	88	29	55	0.79	2.4	0.74	0.64	0.63	0.40	0.69	0.51	0.76	0.40
2000	46	43	129	42	120	35	97	0.93	3.0	0.98	0.93	0.81	0.75	0.83	0.81	2.11	0.76
2001	40	40	99	38	87	27	67	1.00	2.5	0.95	0.88	0.77	0.68	0.71	0.68	1.68	0.68
2002	29	26	84	26	75	21	45	0.90	3.2	1.00	0.89	0.60	0.54	0.81	0.81	1.55	0.72
2003	87	79	249	73	215	63	175	0.91	3.2	0.92	0.86	0.81	0.70	0.86	0.80	2.01	0.72
2004	162	139	438	91	257	67	174	0.86	3.2	0.65	0.59	0.68	0.40	0.74	0.48	1.07	0.41
2005	258	217	679	140	381	104	239	0.84	3.1	0.65	0.56	0.63	0.35	0.74	0.48	0.93	0.40
2006	57	35	74	17	34	12	27	0.61	2.1	0.49	0.46	0.79	0.36	0.71	0.34	0.47	0.21

^aValue calculated from smaller sample size.

^bData based on short-duration visits.

Table 6 (continued). Reproductive performance of red-faced cormorants at St. Paul Island, Alaska. Measures of success are based on frequent monitoring of individual nests (as opposed to Boom or Bust methodology presented in Table 7).

Year	Total nest starts	Nest sites w/ eggs	Total eggs	Nest sites w/ chicks	Total chicks	Nest sites w/ chicks fledged	Total chicks fledged	Laying success	Mean clutch size	Nesting success	Hatching success	Chick success	Egg success	Fledging success	Reprod. success	Fledglings /nest start	Prod.
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(B/A)	(C/B)	(D/B)	(E/C)	(G/E)	(G/C)	(F/D)	(F/B)	(G/A)	(F/A)
2007	101	76	205	47	114	39	94	0.75	2.7	0.62	0.56	0.82	0.46	0.83	0.51	0.93	0.39
2008	38	29	87	26	65	24	59	0.76	3.0	0.90	0.75	0.91	0.68	0.92	0.83	1.55	0.63
2009	44	42	128	38	91	31	62	0.95	3.1	0.90	0.71	0.68	0.48	0.82	0.74	1.41	0.70
2010	36	36	122	34	100	31	81	1.00	3.4	0.94	0.82	0.81	0.66	0.91	0.86	2.25	0.86
2011	42	40	133	38	95	33	81	0.95	3.3	0.95	0.71	0.85	0.61	0.87	0.83	1.93	0.79
2012	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2013	24	21	73	18	52	17	46	0.88	3.5	0.86	0.71	0.89	0.63	0.94	0.81	1.92	0.71
2014	28	26	91	23	67	20	58	0.93	3.5	0.88	0.74	0.64	0.64	0.87	0.77	2.07	0.71

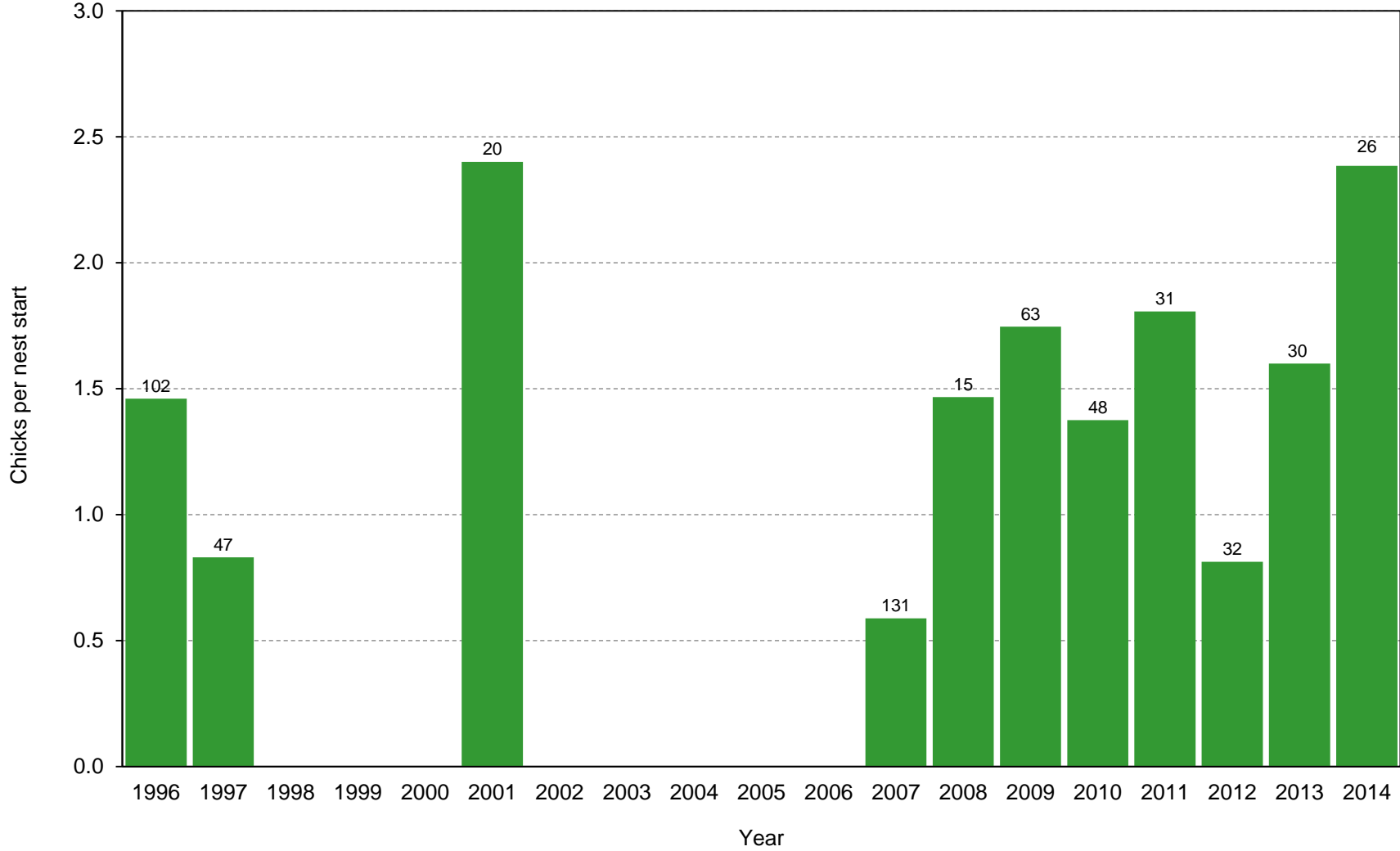


Figure 6. Reproductive performance of red-faced cormorants at St. Paul Island, Alaska, as determined by a Boom or Bust methodology. Success is measured by the number of chicks per nest start (E/A), where E =total chicks and A =total nest starts (including those without chicks). Numbers above columns indicate sample sizes (A).

Table 7. Reproductive performance of red-faced cormorants at St. Paul Island, Alaska, as determined by a Boom or Bust methodology. Measures of success are based on a count of nests (or maximum of several counts) conducted early in the nesting period and a count of large chicks (or maximum of several counts) conducted late in the nesting period.

Year	Total nest starts (A)	Nest sites w/ x chicks ^a :					Nest sites w/ chicks (D)	Total chicks (E)	Mean brood size (E/D)	Prop. nest sites w/ chicks (D/A) ^b	Chicks/nest start (E/A) ^b	Date(s) of nest count	Date(s) of chick count
		1	2	3	4	5							
1996	102	-	-	-	-	-	71	149	2.1	0.70	1.46	xx ^c	xx
1997	47	-	-	-	-	-	26	39	1.5	0.55	0.83	6+13 Jul	8+11 Aug
1998	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
1999	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
2000	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
2001	20	-	-	-	-	-	19	48	2.5	0.95	2.40	xx	xx
2002	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
2003	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
2004	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
2005	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
2006	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
2007	131	21	19	6	0	0	46	77	1.7	0.35	0.59	xx	xx
2008	15	1	2	3	2	0	8	22	2.8	0.53	1.47	xx	xx
2009	63	10	20	16	3	0	49	110	2.2	0.78	1.75	xx	xx
2010	48	9	16	7	1	0	33	66	2.0	0.69	1.38	16+18 Jun	31 Jul+3 Aug
2011	31	7	11	9	0	0	27	56	2.1	0.87	1.80	8 Jun	20 Jul
2012	32	3	5	3	1	0	12	26	2.2	0.38	0.81	5+12+19 Jun	8+16+23 Aug
2013	30	3	3	9	3	0	18	48	2.7	0.60	1.60	5+13+18 June	7+15 Aug
2014	26	1	5	13	3	0	22	62	2.8	0.85	2.38	3+12+23 June	10+20+30 Jul

^aNumbers of chicks may represent a minimum count as not all may have been visible.

^bProportion of nest sites with chicks (D/A) and chicks/nest start (E/A) may be considered maximum potential values of productivity (F/A) and fledglings/nest start (G/A), respectively, based on the assumption that all chicks counted eventually fledge.

^cxx indicates data potentially exist but have not yet been summarized.

Table 8. Reproductive performance of red-faced cormorants at St. Paul Island, Alaska in 2014, as determined by a Boom or Bust methodology.

Date	Total nest starts (A)	Nest sites w/ x chicks ^a :				Nest sites w/ chicks (D)	Total chicks (E)
		1	2	3	4		
Tolstoi							
3 Jun	25	0	0	0	0	0	0
12 Jun	25	0	0	0	0	0	0
23 Jun	26	5	1	0	0	6	7
10 Jul	26	4	3	3	0	10	19
20 Jul	26	1	6	14	0	21	55
30 Jul	26	1	5	13	3	22	62

^aNumbers of chicks may represent a minimum count as not all may have been visible.

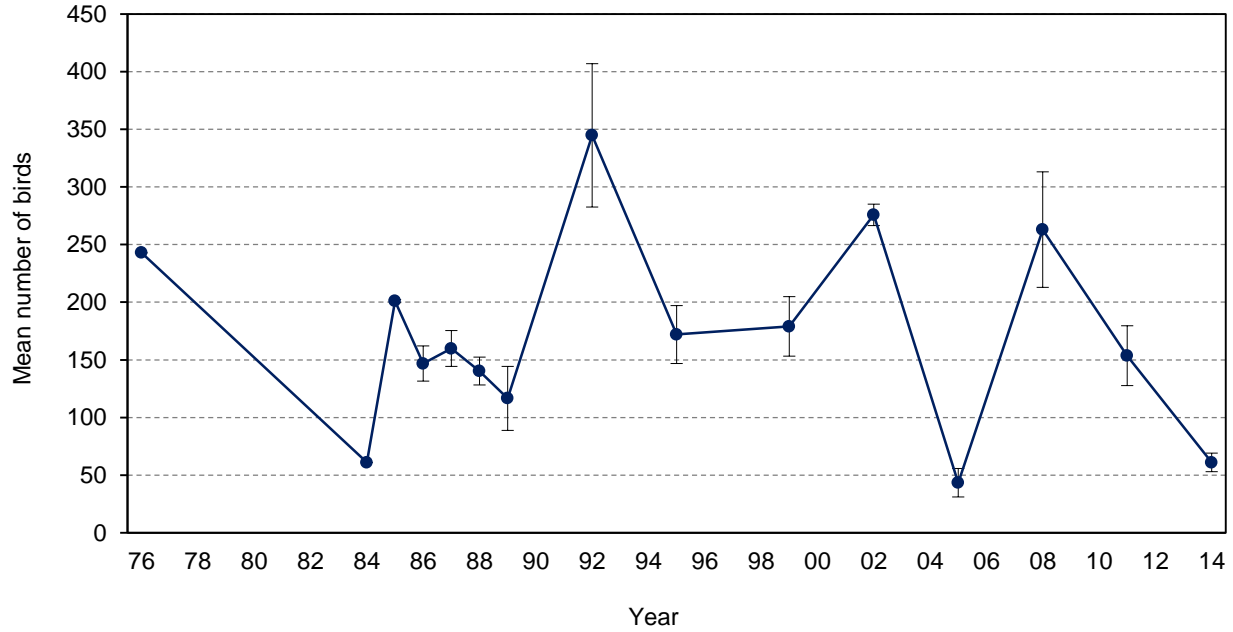


Figure 7. Mean numbers of red-faced cormorants counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Data from 1982 are excluded because not all plots were counted. Error bars represent standard deviation.

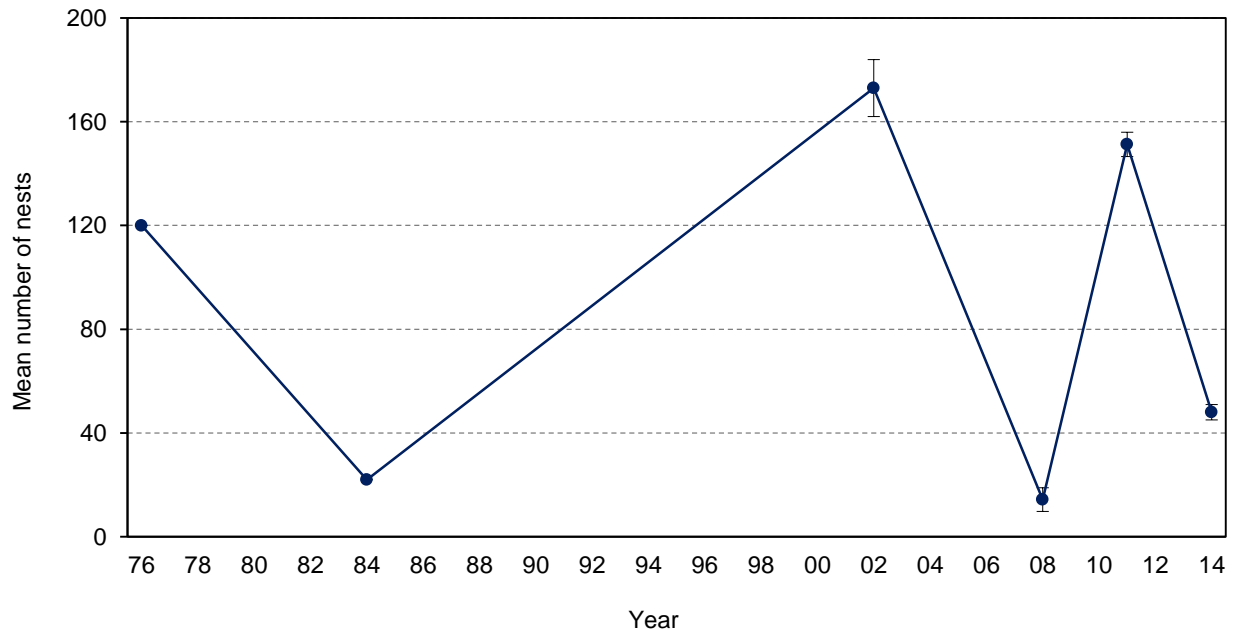


Figure 8. Mean numbers of red-faced cormorant nests counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Data from 1982 are excluded because not all plots were counted. Error bars represent standard deviation.

Table 9. Numbers of red-faced cormorants counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. No counts were conducted during years not listed; data from 1982 are excluded because not all plots were counted.

Replicate	1976	1984	1985	1986	1987	1988	1989	1992	1995	1999	2002	2005	2008	2011	2014
1	243	61	200	148	164	149	123	372	160	216	272	63	340	178	74
2	-	-	200	142	187	137	150	361	201	198	276	49	238	190	63
3	-	-	201	140	163	140	151	425	155	186	291	33	211	176	63
4	-	-	203	132	143	142	135	268	-	146	276	34	249	146	66
5	-	-	-	172	153	141	97	298	-	165	278	32	224	150	60
6	-	-	-	-	149	156	74	-	-	163	262	55	230	113	49
7	-	-	-	-	-	117	98	-	-	-	-	38	276	133	55
8	-	-	-	-	-	-	105	-	-	-	-	-	336	143	-
Mean	243	61	201	147	160	140	117	345	172	179	276	43	263	154	61
<i>n</i>	1	1	4	5	6	7	8	6	3	6	6	7	8	8	7
SD	-	-	1	15	16	12	28	62	25	26	9	12	50	26	8
First count	17 Jul	xx ^a	xx	6 Jul	9 Jul	12 Jul	17 Jul	12 Jul	9 Jul	7 Jul	8 Jul	11 Jul	1 Jul	6 Jul	30 Jun
Last count	21 Jul	xx	xx	29 Jul	23 Jul	7 Aug	9 Aug	7 Aug	3 Aug	7 Aug	1 Aug	31 Jul	31 Jul	1 Aug	27 Jul

^axx indicates data potentially exist but have not yet been summarized.

Table 10. Numbers of red-faced cormorant nests counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. No counts were conducted during years not listed; data from 1982 are excluded because not all plots were counted.

Replicate	1976	1984	1985	1986	1987	1988	1989	1992	1995	1999	2002	2005	2008	2011	2014
1	120	22	xx ^a	xx	xx	xx	xx	xx	xx	xx	166	xx	148	153	50
2	-	-	xx	xx	xx	xx	xx	xx	xx	xx	167	xx	123	155	50
3	-	-	xx	xx	xx	xx	xx	xx	xx	xx	186	xx	117	146	46
4	-	-	xx	xx	xx	xx	xx	xx	-	xx	-	xx	133	-	47
5	-	-	-	xx	xx	xx	xx	xx	-	xx	-	xx	131	-	50
6	-	-	-	-	xx	xx	xx	xx	-	xx	-	xx	142	-	42
7	-	-	-	-	-	xx	xx	-	-	-	-	xx	159	-	49
8	-	-	-	-	-	-	xx	-	-	-	-	xx	173	-	-
Mean	120	22	xx	xx	xx	xx	xx	xx	xx	xx	173	xx	141	151	48
Overall max. ^b	120	22	142	132	138	107	87	314	122	156	194	29	179	155	53
<i>n</i>	1	1	xx	xx	xx	xx	xx	xx	xx	xx	3	xx	8	3	7
SD	-	-	xx	xx	xx	xx	xx	xx	xx	xx	11	xx	19	5	3
First count	17 Jul	xx	xx	xx	xx	xx	xx	xx	xx	xx	8 Jul	11 Jul	1 Jul	6 Jul	30 Jun
Last count	21 Jul	xx	xx	xx	xx	xx	xx	xx	xx	xx	23 Jul	xx	31 Jul	14 Jul	27 Jul

^axx indicates data potentially exist but have not yet been summarized.

^bOverall maximum nest number is the highest nest count on each plot in a year, summed across all plots.

Table 11. Numbers of red-faced cormorants counted on index plots at St. Paul Island, Alaska in 2014.

Plot	Replicate							Mean	SD
	1 30 Jun-2 Jul	2 7-9 Jul	3 10-12 Jul	4 13-15 Jul	5 17-19 Jul	6 21-23 Jul	7 25-27 Jul		
1	0	0	0	0	0	0	0	-	-
2sw	7	4	3	3	5	3	1	-	-
2ne	0	0	0	0	0	0	2	-	-
3	0	0	0	0	0	0	0	-	-
4	0	0	0	0	0	0	0	-	-
5sw	0	0	0	0	1	0	0	-	-
5ne	0	0	0	0	0	0	1	-	-
6 ^a	-	-	-	-	-	-	-	-	-
7	0	0	0	0	0	0	0	-	-
8	0	0	0	0	0	0	0	-	-
9	-	-	-	-	-	-	-	-	-
10	0	0	0	0	0	0	0	-	-
11	0	0	0	0	0	0	0	-	-
12	0	0	0	0	0	0	0	-	-
13	0	0	0	0	0	0	0	-	-
14	0	0	0	0	0	0	0	-	-
15	0	0	0	0	0	0	0	-	-
16 ^a	-	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-	-
18	0	0	0	0	0	0	0	-	-
19top	0	0	0	0	0	0	0	-	-
19btm	0	0	0	0	1	1	0	-	-
20top	0	0	0	0	0	0	0	-	-
20btm	2	0	2	1	1	1	2	-	-
21 ^a	-	-	-	-	-	-	-	-	-
22	0	0	0	0	0	0	1	-	-
23	0	0	0	0	0	0	0	-	-
24	0	0	0	0	0	0	0	-	-
25	0	0	0	0	0	0	0	-	-
26	0	0	0	0	0	0	0	-	-
27	0	0	0	0	0	0	0	-	-
28	0	0	0	0	0	0	0	-	-
29 ^a	-	-	-	-	-	-	-	-	-
29new	0	0	0	0	0	0	0	-	-
30	0	0	0	0	0	0	0	-	-
31	12	6	2	3	2	4	4	-	-
32	30	33	34	39	32	30	26	-	-
33	23	20	22	20	18	10	18	-	-
Total ^b	74	63	63	66	60	49	55	61	8

^aHistorical plots no longer counted.

^bTotals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30.

Table 12. Numbers of red-faced cormorant nests counted on index plots at St. Paul Island, Alaska in 2014.

Plot	Replicate							Mean	SD	Max.
	1 30 Jun-2 Jul	2 7-9 Jul	3 10-12 Jul	4 13-15 Jul	5 17-19 Jul	6 21-23 Jul	7 25-27 Jul			
1	0	0	0	0	0	0	0	-	-	-
2sw	3	3	2	2	3	3	3	-	-	-
2ne	0	0	0	0	0	0	0	-	-	-
3	0	0	0	0	0	0	0	-	-	-
4	0	0	0	0	0	0	0	-	-	-
5sw	0	0	0	0	0	0	0	-	-	-
5ne	0	0	0	0	0	0	0	-	-	-
6 ^a	-	-	-	-	-	-	-	-	-	-
7	0	0	0	0	0	0	0	-	-	-
8	0	0	0	0	0	0	0	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	0	0	0	0	0	0	0	-	-	-
11	0	0	0	0	0	0	0	-	-	-
12	0	0	0	0	0	0	0	-	-	-
13	0	0	0	0	0	0	0	-	-	-
14	0	0	0	0	0	0	0	-	-	-
15	0	0	0	0	0	0	0	-	-	-
16 ^a	-	-	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-	-	-
18	0	0	0	0	0	0	0	-	-	-
19top	0	0	0	0	0	0	0	-	-	-
19btm	0	0	0	0	0	0	0	-	-	-
20top	0	0	0	0	0	0	0	-	-	-
20btm	1	0	1	1	1	1	1	-	-	-
21 ^a	-	-	-	-	-	-	-	-	-	-
22	0	0	0	0	0	0	0	-	-	-
23	0	0	0	0	0	0	0	-	-	-
24	0	0	0	0	0	0	0	-	-	-
25	0	0	0	0	0	0	0	-	-	-
26	0	0	0	0	0	0	0	-	-	-
27	0	0	0	0	0	0	0	-	-	-
28	0	0	0	0	0	0	0	-	-	-
29 ^a	-	-	-	-	-	-	-	-	-	-
29new	0	0	0	0	0	0	0	-	-	-
30	0	0	0	0	0	0	0	-	-	-
31	1	1	1	1	1	1	1	-	-	-
32	25	26	28	28	28	28	28	-	-	-
33	20	20	14	15	17	9	16	-	-	-
Total ^b	50	50	46	47	50	42	49	48	3	53 ^c

^aHistorical plots no longer counted.

^bTotals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30.

^cOverall maximum nest number is the highest nest count on each plot, summed across all plots.

Table 13. Numbers of red-faced (RFCO) and pelagic (PECO) cormorants counted during boat-based surveys on the south and west coast of St. Paul, Alaska^a. No counts were conducted during years not listed.

Year	RFCO adult	RFCO immature	RFCO unk	RFCO nests	RFCO (water)	PECO (land)	PECO (water)
2005	1342	102	96	706	25	47	0
2013	256	6	0	173	66	1	0
2014	247	19	1	217	38	0	1

^aLokanin Point though Reef, not including SeaLion Rock, to NW Point (Segments B-C through L-M, and T-B).

Table 14. Numbers of red-faced (RFCO) and pelagic (PECO) cormorants counted during boat-based surveys of the entire coast of St. Paul, Alaska. No counts were conducted during years not listed.

Year	RFCO adult	RFCO immature	RFCO unk	RFCO nests	RFCO (water)	PECO (land)	PECO (water)
2005	1505	164	411	714	27	87	6
2014	283	56	1	227	52	4	1

Table 15. Total number of red-faced cormorant chicks banded on banding plot at Tsamana, St. Paul Island, Alaska.

Parameter	Year										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total new chicks banded	47	55	0	0	22	31	62	37	18	10	28
Cumulative chicks banded	47	102	102	102	124	155	217	254	272	282	310

Table 16. Fates of cohorts of red-faced cormorants banded as chicks on banding plot at Tsamana, St. Paul Island, Alaska. Data represent fidelity of chicks to the plot from where they fledged and not survival because red-faced cormorants typically move among plots and islands each year. Resights are based on incidental observations only and not a standardized resighting effort. Values in parentheses indicate observations of immature birds and not those of breeding age.

Year	No. chicks banded in year	No. birds resighted in:										Prop. birds resighted in 2014
		05	06	07	08	09	10	11	12	13	14	
2004	47	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.00
2005	55	-	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.00
2006	0	-	-	-	-	-	-	-	-	-	-	-
2007	0	-	-	-	-	-	-	-	-	-	-	-
2008	22	-	-	-	-	0 (1)	0 (0)	0 (0)	0 (0)	0 (0)		0.00
2009	31	-	-	-	-	-	0 (1)	0 (7)	4 (0)	3 (0)	1 (0)	0.03
2010	62	-	-	-	-	-	-	1 (41)	0 (2)	1 (0)	2 (0)	0.03
2011	37	-	-	-	-	-	-	-	0 (0)	0 (0)	0 (0)	0.00
2012	18	-	-	-	-	-	-	-	-	0 (5)	5 (2)	0.39
2013	10	-	-	-	-	-	-	-	-	-	0 (4)	0.40
2014	25	-	-	-	-	-	-	-	-	-	-	-
No. birds seen in current year (A)		0	0	0	0	0 (1)	0 (1)	1 (48)	4 (2)	4 (5)	8 (6)	-

Table 17. Resight history of red-faced cormorants banded as chicks on banding plot at Tsamana, St. Paul Island, Alaska. Data represent number of times birds were resighted each year and include only birds resighted at least once after banding (in subsequent years). Resights are based on incidental observations only and not a standardized resighting effort. Values in parentheses indicate observations of immature birds and not those of breeding age.

Color band		Metal band #	Year banded	Notes	Year resighted									
Color	band #				2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Yellow	115	1018-01294	2008		-	-	-	-	(1)	0	0	0	0	0
Yellow	129	1018-01306	2009		-	-	-	-	-	0	(2)	0	0	0
Yellow	141	1018-01317	2009		-	-	-	-	-	(1)	0	1	1	0
Yellow	144	1018-01320	2009		-	-	-	-	-	0	(2)	0	0	0
Yellow	145	1018-01321	2009		-	-	-	-	-	0	1	0	0	0
Yellow	147	1018-01322	2009		-	-	-	-	-	0	(1)	1	2	2
Yellow	149	1018-01324	2009		-	-	-	-	-	0	(2)	2	0	0
Yellow	151	1018-01326	2009		-	-	-	-	-	0	(1)	0	1	0
Yellow	171	1018-01335	2009		-	-	-	-	-	0	(1)	2	0	0
Yellow	172	1018-01336	2010		-	-	-	-	-	-	(1)	0	0	0
Yellow	173	1018-01337	2010		-	-	-	-	-	-	(3)	0	0	0
Yellow	177	1018-01340	2010		-	-	-	-	-	-	(2)	0	0	0
Yellow	178	1018-01341	2010		-	-	-	-	-	-	(4)	0	0	0
Yellow	179	1018-01342	2010		-	-	-	-	-	-	(2)	0	0	0
Yellow	180	1018-01343	2010		-	-	-	-	-	-	(1)	0	0	0
Yellow	181	1018-01344	2010		-	-	-	-	-	-	(2)	0	0	0
Yellow	182	1018-01345	2010		-	-	-	-	-	-	(3)	0	0	0
Yellow	183	1018-01346	2010		-	-	-	-	-	-	(2)	0	0	0
Yellow	184	1018-01347	2010		-	-	-	-	-	-	(2)	0	0	0
Yellow	187	1018-01349	2010		-	-	-	-	-	-	(1)	0	0	0
Yellow	188	1018-01350	2010		-	-	-	-	-	-	(2)	0	0	0
Yellow	192	1018-01354	2010		-	-	-	-	-	-	(1)	0	0	0
Yellow	194	1018-01355	2010		-	-	-	-	-	-	(3)	0	0	0
Yellow	195	1018-01357	2010		-	-	-	-	-	-	(2)	0	0	0
Yellow	197	1018-01358	2010		-	-	-	-	-	-	(4)	0	0	0
Yellow	199	1018-01360	2010		-	-	-	-	-	-	(2)	0	0	0
Yellow	209	1018-01369	2010		-	-	-	-	-	-	(1)	0	0	0
Yellow	211	1018-01371	2010		-	-	-	-	-	-	(2)	0	0	0
Yellow	214	1018-01375	2010		-	-	-	-	-	-	(2)	0	0	0
Yellow	215	1018-01276	2010		-	-	-	-	-	-	(4)	(2)	1	3

Table 17 (continued). Resight history of red-faced cormorants banded as chicks on banding plot at Tsamana, St. Paul Island, Alaska. Data represent number of times birds were resighted each year and include only birds resighted at least once after banding (in subsequent years). Resights are based on incidental observations only and not a standardized resighting effort. Values in parentheses indicate observations of immature birds and not those of breeding age.

Color band Color	band #	Metal band #	Year banded	Notes	Year resighted									
					2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Yellow	217	1018-01377	2010		-	-	-	-	-	-	(1)	0	0	0
Yellow	218	1018-01379	2010		-	-	-	-	-	-	(5)	0	0	0
Yellow	220	1018-01380	2010		-	-	-	-	-	-	(5)	0	0	0
Yellow	221	1018-01281	2010		-	-	-	-	-	-	(4)	0	0	0
Yellow	222	1018-01382	2010		-	-	-	-	-	-	(4)	0	0	0
Yellow	223	1018-01383	2010		-	-	-	-	-	-	(1)	0	0	0
Yellow	224	1018-01385	2010		-	-	-	-	-	-	(1)	0	0	0
Yellow	225	1018-01384	2010		-	-	-	-	-	-	(5)	0	0	0
Yellow	227	1018-01386	2010		-	-	-	-	-	-	(2)	0	0	2
Yellow	228	1018-01387	2010		-	-	-	-	-	-	0	(5)	0	0
Yellow	230	1018-01389	2010		-	-	-	-	-	-	(1)	0	0	0
Yellow	231	1018-01390	2010		-	-	-	-	-	-	(1)	0	0	0
Yellow	232	1018-01391	2010		-	-	-	-	-	-	(3)	0	0	0
Yellow	233	1018-01392	2010		-	-	-	-	-	-	(2)	0	0	0
Yellow	234	1018-01393	2010		-	-	-	-	-	-	(2)	0	0	0
Yellow	237	1018-01397	2010		-	-	-	-	-	-	(1)	0	0	0
Yellow	291	1018-01436	2012		-	-	-	-	-	-	-	-	(2)	0
Yellow	292	1018-01437	2012		-	-	-	-	-	-	-	-	-	1
Yellow	293	1018-01438	2012		-	-	-	-	-	-	-	-	(2)	5
Yellow	294	1018-01439	2012		-	-	-	-	-	-	-	-	(1)	1
Yellow	299	1018-01443	2012		-	-	-	-	-	-	-	-	-	(1)
Yellow	303	1018-01447	2012		-	-	-	-	-	-	-	-	-	2
Yellow	304	1018-01448	2012		-	-	-	-	-	-	-	-	(2)	(2)
Yellow	305	1018-01449	2012		-	-	-	-	-	-	-	-	(3)	1
Yellow	314	1018-01457	2012		-	-	-	-	-	-	-	-	-	(1)
Yellow	317	1018-01456	2012		-	-	-	-	-	-	-	-	-	(1)
Yellow	318	1018-01459	2012		-	-	-	-	-	-	-	-	-	(1)
Yellow	321	1018-01462	2012		-	-	-	-	-	-	-	-	-	(2)
Total birds resighted ^a					0	0	0	0	0 (1)	0 (1)	1 (42)	4 (2)	4 (5)	8 (6)

^aDoes not include resights of birds banded in resight year.

Table 18. Red-faced cormorant chicks banded on banding plot at Tsamana, St. Paul Island, Alaska. Color bands that have been resighted are underlined (e.g., 141). Birds are not included in resight summaries (Tables 16-17) until they are seen at least once.

Color band		Metal band #	Year banded	Color band		Metal band #	Year banded	Color band		Metal Band #	Year banded
Color	Band #			Color	Band #			Color	Band #		
-	-	778-26751	2004	-	-	778-26793	2004	Yellow	42	1018-01238	2005
-	-	778-26752	2004	-	-	778-26794	2004	Yellow	43	1018-01239	2005
-	-	778-26753	2004	-	-	778-26795	2004	Yellow	44	1018-01240	2005
-	-	778-26754	2004	-	-	778-26796	2004	Yellow	45	1018-01241	2005
-	-	778-26755	2004	-	-	778-26797	2004	Yellow	47	1018-01242	2005
-	-	778-26756	2004	Yellow	1	1018-01201	2005	Yellow	48	1018-01243	2005
-	-	778-26757	2004	Yellow	2	1018-01202	2005	Yellow	49	1018-01244	2005
-	-	778-26758	2004	Yellow	3	1018-01203	2005	Yellow	50	1018-01245	2005
-	-	778-26759	2004	Yellow	4	1018-01204	2005	Yellow	51	1018-01246	2005
-	-	778-26760	2004	Yellow	5	1018-01205	2005	Yellow	52	1018-01247	2005
-	-	778-26761	2004	Yellow	7	1018-01206	2005	Yellow	53	1018-01248	2005
-	-	778-26762	2004	Yellow	8	1018-01207	2005	Yellow	54	1018-01249	2005
-	-	778-26763	2004	Yellow	9	1018-01208	2005	Yellow	55	1018-01250	2005
-	-	778-26764	2004	Yellow	10	1018-01209	2005	Yellow	57	1018-01251	2005
-	-	778-26765	2004	Yellow	11	1018-01210	2005	Yellow	58	1018-01252	2005
-	-	778-26766	2004	Yellow	12	1018-01211	2005	Yellow	59	1018-01253	2005
-	-	778-26767	2004	Yellow	13	1018-01212	2005	Yellow	70	1018-01254	2005
-	-	778-26768	2004	Yellow	14	1018-01213	2005	Yellow	71	1018-01255	2005
-	-	778-26769	2004	Yellow	15	1018-01214	2005	Yellow	103	1018-01283	2008
-	-	778-26770	2004	Yellow	17	1018-01215	2005	Yellow	104	1018-01284	2008
-	-	778-26771	2004	Yellow	18	1018-01216	2005	Yellow	105	1018-01285	2008
-	-	778-26772	2004	Yellow	19	1018-01217	2005	Yellow	107	1018-01286	2008
-	-	778-26773	2004	Yellow	20	1018-01218	2005	Yellow	108	1018-01287	2008
-	-	778-26774	2004	Yellow	21	1018-01219	2005	Yellow	109	1018-01288	2008
-	-	778-26775	2004	Yellow	22	1018-01220	2005	Yellow	110	1018-01289	2008
-	-	778-26776	2004	Yellow	23	1018-01221	2005	Yellow	111	1018-01290	2008
-	-	778-26777	2004	Yellow	24	1018-01222	2005	Yellow	112	1018-01291	2008
-	-	778-26778	2004	Yellow	25	1018-01223	2005	Yellow	113	1018-01292	2008
-	-	778-26779	2004	Yellow	27	1018-01224	2005	Yellow	114	1018-01293	2008
-	-	778-26780	2004	Yellow	28	1018-01225	2005	<u>Yellow</u>	<u>115</u>	<u>1018-01294</u>	<u>2008</u>
-	-	778-26781	2004	Yellow	29	1018-01226	2005	Yellow	117	1018-01295	2008
-	-	778-26782	2004	Yellow	30	1018-01227	2005	Yellow	118	1018-01296	2008
-	-	778-26783	2004	Yellow	31	1018-01228	2005	Yellow	119	1018-01297	2008
-	-	778-26784	2004	Yellow	32	1018-01229	2005	Yellow	120	1018-01298	2008
-	-	778-26785	2004	Yellow	33	1018-01230	2005	Yellow	121	1018-01299	2008
-	-	778-26786	2004	Yellow	34	1018-01231	2005	Yellow	117	1018-01295	2008
-	-	778-26787	2004	Yellow	35	1018-01232	2005	Yellow	118	1018-01296	2008
-	-	778-26788	2004	Yellow	37	1018-01233	2005	Yellow	119	1018-01297	2008
-	-	778-26789	2004	Yellow	38	1018-01234	2005	Yellow	120	1018-01298	2008
-	-	778-26790	2004	Yellow	39	1018-01235	2005	Yellow	122	1018-01300	2008
-	-	778-26791	2004	Yellow	40	1018-01236	2005	Yellow	123	1018-01301	2008
-	-	778-26792	2004	Yellow	41	1018-01237	2005	Yellow	124	1018-01302	2008

Table 18 (continued). Red-faced cormorant chicks banded on banding plot at Tsamana, St. Paul Island, Alaska. Color bands that have been resighted are underlined (e.g., 141). Birds are not included in resight summaries (Tables 16-17) until they are seen at least once.

Color band		Metal band #	Year banded	Color band		Metal band #	Year banded	Color band		Metal Band #	Year banded
Color	Band #			Color	Band #			Color	Band #		
Yellow	125	1018-01303	2008	Yellow	181	1018-01344	2010	Yellow	225	1018-01384	2010
Yellow	127	1018-01304	2008	Yellow	182	1018-01345	2010	Yellow	227	1018-01386	2010
Yellow	128	1018-01305	2009	Yellow	183	1018-01346	2010	Yellow	228	1018-01387	2010
Yellow	129	1018-01306	2009	Yellow	184	1018-01347	2010	Yellow	229	1018-01388	2010
Yellow	130	1018-01307	2009	Yellow	185	1018-01348	2010	Yellow	230	1018-01389	2010
Yellow	131	1018-01308	2009	Yellow	187	1018-01349	2010	Yellow	231	1018-01390	2010
Yellow	132	1018-01309	2009	Yellow	188	1018-01350	2010	Yellow	232	1018-01391	2010
Yellow	133	1018-01310	2009	Yellow	189	1018-01352	2010	Yellow	233	1018-01392	2010
Yellow	134	1018-01311	2009	Yellow	190	1018-01353	2010	Yellow	234	1018-01393	2010
Yellow	135	1018-01312	2009	Yellow	191	1018-01351	2010	Yellow	235	1018-01394	2010
Yellow	137	1018-01313	2009	Yellow	192	1018-01354	2010	Yellow	237	1018-01395	2010
Yellow	138	1018-01314	2009	Yellow	193	1018-01356	2010	Yellow	238	1018-01396	2010
Yellow	139	1018-01315	2009	Yellow	194	1018-01355	2010	Yellow	239	1018-01397	2010
Yellow	140	1018-01316	2009	Yellow	195	1018-01357	2010	Yellow	240	1018-01398	2011
Yellow	141	1018-01317	2009	Yellow	197	1018-01358	2010	Yellow	241	1018-01399	2011
Yellow	142	1018-01318	2009	Yellow	198	1018-01359	2010	Yellow	242	1018-01400	2011
Yellow	143	1018-01319	2009	Yellow	199	1018-01360	2010	Yellow	243	1018-01401	2011
Yellow	144	1018-01320	2009	Yellow	200	1018-01361	2010	Yellow	244	1018-01402	2011
Yellow	145	1018-01321	2009	Yellow	201	1018-01362	2010	Yellow	245	1018-01403	2011
Yellow	147	1018-01322	2009	Yellow	202	1018-01363	2010	Yellow	247	1018-01404	2011
Yellow	148	1018-01323	2009	Yellow	203	1018-01364	2010	Yellow	248	1018-01405	2011
Yellow	149	1018-01324	2009	Yellow	204	1018-01365	2010	Yellow	249	1018-01406	2011
Yellow	150	1018-01325	2009	Yellow	205	1018-01366	2010	Yellow	250	1018-01407	2011
Yellow	151	1018-01326	2009	Yellow	207	1018-01367	2010	Yellow	151	1018-01408	2011
Yellow	152	1018-01332	2009	Yellow	208	1018-01368	2010	Yellow	252	1018-01409	2011
Yellow	153	1018-01327	2009	Yellow	209	1018-01369	2010	Yellow	253	1018-01410	2011
Yellow	154	1018-01328	2009	Yellow	210	1018-01370	2010	Yellow	254	1018-01411	2011
Yellow	155	1018-01329	2009	Yellow	211	1018-01371	2010	Yellow	255	1018-01412	2011
Yellow	157	1018-01330	2009	-	-	1018-01372	2010	Yellow	257	1018-01413	2011
Yellow	158	1018-01331	2009	Yellow	212	1018-01373	2010	Yellow	258	1018-01414	2011
Yellow	159	1018-01333	2009	Yellow	213	1018-01374	2010	Yellow	259	1018-01415	2011
Yellow	170	1018-01334	2009	Yellow	214	1018-01375	2010	Yellow	270	1018-01416	2011
Yellow	171	1018-01335	2009	Yellow	215	1018-01376	2010	Yellow	271	1018-01417	2011
Yellow	172	1018-01336	2010	Yellow	217	1018-01377	2010	Yellow	272	1018-01418	2011
Yellow	173	1018-01337	2010	Yellow	218	1018-01379	2010	Yellow	273	1018-01419	2011
Yellow	174	1018-01338	2010	Yellow	219	1018-01378	2010	Yellow	274	1018-01420	2011
Yellow	175	1018-01339	2010	Yellow	220	1018-01380	2010	Yellow	275	1018-01421	2011
Yellow	177	1018-01340	2010	Yellow	221	1018-01381	2010	Yellow	277	1018-01422	2011
Yellow	178	1018-01341	2010	Yellow	222	1018-01382	2010	Yellow	278	1018-01423	2011
Yellow	179	1018-01342	2010	Yellow	223	1018-01383	2010	Yellow	279	1018-01424	2011
Yellow	180	1018-01343	2010	Yellow	224	1018-01385	2010	Yellow	280	1018-01425	2011

Table 18 (continued). Red-faced cormorant chicks banded on banding plot at Tsamana, St. Paul Island, Alaska. Color bands that have been resighted are underlined (e.g., 141). Birds are not included in resight summaries (Tables 16-17) until they are seen at least once.

Color band		Metal band #	Year banded	Color band		Metal band #	Year banded	Color band		Metal band #	Year banded
Color	Band #			Color	Band #			Color	Band #		
Yellow	281	1018-01426	2011	<u>Yellow</u>	305	1018-01449	2012	Yellow	333	1018-01471	2014
Yellow	282	1018-01427	2011	Yellow	307	1018-01450	2012	Yellow	335	1018-01472	2014
Yellow	283	1018-01428	2011	Yellow	308	1018-01451	2012	Yellow	337	1018-01473	2014
Yellow	284	1018-01429	2011	Yellow	309	1018-01452	2012	Yellow	338	1018-01474	2014
Yellow	285	1018-01430	2011	Yellow	310	1018-01453	2012	Yellow	339	1018-01475	2014
Yellow	287	1018-01431	2011	Yellow	311	1018-01454	2013	Yellow	340	1018-01476	2014
Yellow	288	1018-01433	2011	Yellow	312	1018-01455	2013	Yellow	341	1018-01477	2014
Yellow	289	1018-01434	2011	<u>Yellow</u>	314	1018-01457	2013	Yellow	342	1018-01478	2014
Yellow	290	1018-01435	2011	Yellow	315	1018-01458	2013	Yellow	343	1018-01479	2014
<u>Yellow</u>	291	1018-01436	2012	<u>Yellow</u>	317	1018-01456	2013	Yellow	344	1018-01480	2014
<u>Yellow</u>	292	1018-01437	2012	<u>Yellow</u>	318	1018-01459	2013	Yellow	345	1018-01481	2014
<u>Yellow</u>	293	1018-01438	2012	Yellow	319	1018-01460	2013	Yellow	347	1018-01482	2014
<u>Yellow</u>	294	1018-01439	2012	Yellow	320	1018-01461	2013	Yellow	348	1018-01483	2014
Yellow	295	1018-01440	2012	<u>Yellow</u>	321	1018-01462	2013	Yellow	349	1018-01484	2014
Yellow	297	1018-01441	2012	Yellow	322	1018-01463	2014	Yellow	350	1018-01485	2014
Yellow	298	1018-01442	2012	Yellow	323	1018-01464	2014	Yellow	351	1018-01486	2014
<u>Yellow</u>	299	1018-01443	2012	Yellow	324	1018-01465	2014	Yellow	352	1018-01487	2014
Yellow	300	1018-01444	2012	Yellow	325	1018-01466	2014	Yellow	353	1018-01488	2014
Yellow	301	1018-01445	2012	Yellow	327	1018-01467	2014	Yellow	354	1018-01489	2014
Yellow	302	1018-01446	2012	Yellow	328	1018-01468	2014	Yellow	355	1018-01490	2014
<u>Yellow</u>	303	1018-01447	2012	Yellow	329	1018-01469	2014				
<u>Yellow</u>	304	1018-01448	2012	Yellow	330	1018-01470	2014				

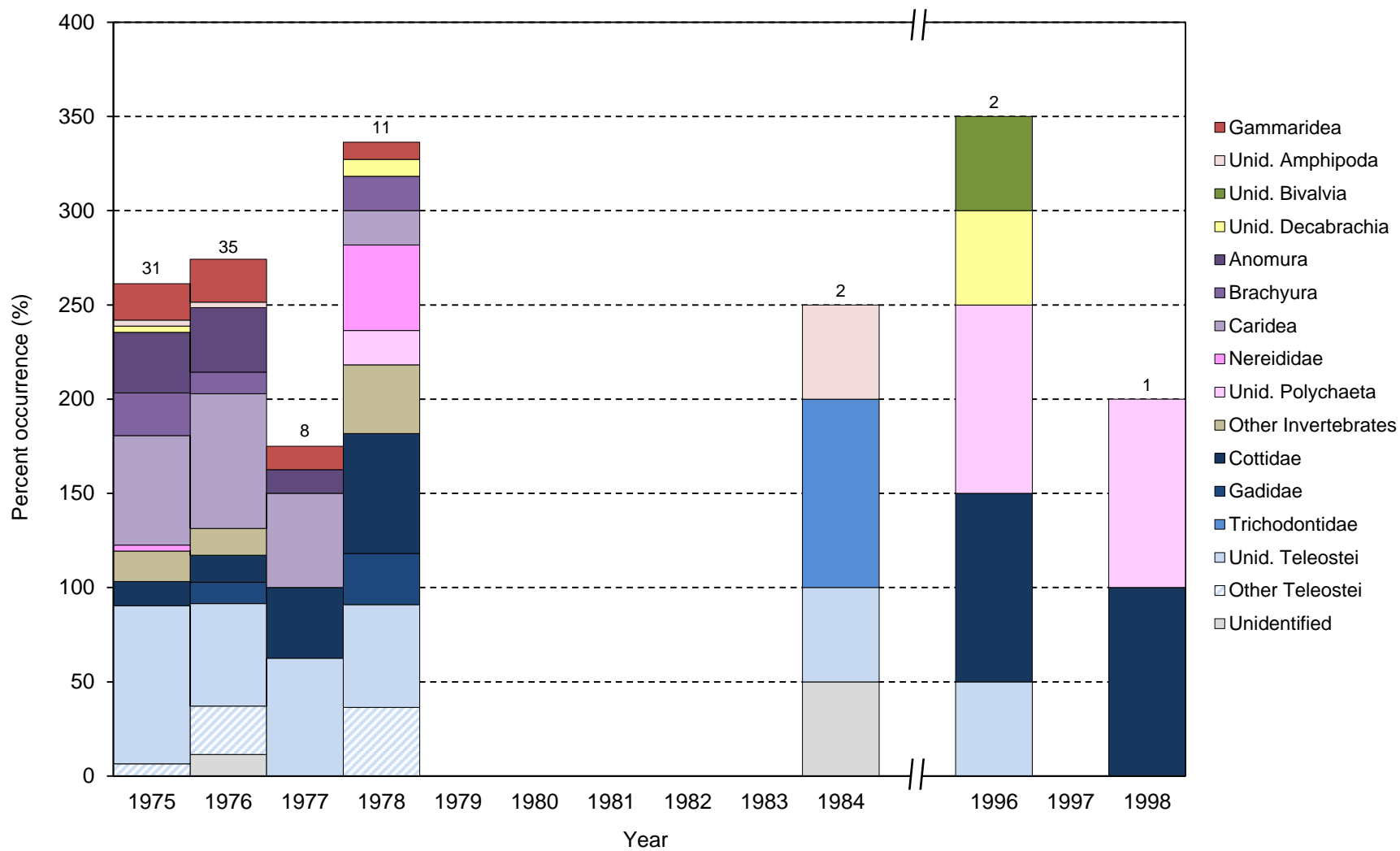


Figure 9. Frequency of occurrence of major prey items in diets of red-faced cormorant chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Numbers above columns indicate sample sizes.

Table 19. Frequency of occurrence of major prey items in diets of red-faced cormorant chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as “others” in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of regurgitations and boluses from adults returning to the colony to feed chicks and regurgitations from chicks themselves. No diet samples were collected in 1979-1983, 1985-1995, 1997 or 1999-2008; samples were collected in 2009-2014 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1975	1976	1977	1978	1984	1996	1998
No. samples	31	35	8	11	2	2	1
Invertebrates	74.2	85.7	50.0	72.7	50.0	100.0	100.0
Amphipoda	54.8	37.1	12.5	9.1	50.0	-	-
Gammaridea	45.2	31.4	12.5	9.1	-	-	-
Unid. Gammaridea	19.4	22.9	12.5	9.1	-	-	-
Other Gammaridea	25.8	8.6	-	-	-	-	-
Unid. Amphipoda	3.2	2.9	-	-	50.0	-	-
Other Amphipoda	6.5	2.9	-	-	-	-	-
Bivalvia	-	-	-	-	-	50.0	-
Unid. Bivalvia	-	-	-	-	-	50.0	-
Cephalopoda	3.2	-	-	9.1	-	50.0	-
Unid. Decabrachia	3.2	-	-	9.1	-	50.0	-
Decapoda	71.0	77.1	50.0	54.5	-	-	-
Anomura	32.3	34.3	12.5	-	-	-	-
<i>Dermaturus mandtii</i>	25.8	28.6	12.5	-	-	-	-
Other Anomura	6.5	5.7	-	-	-	-	-
Brachyura	22.6	11.4	-	18.2	-	-	-
Unid. Brachyura	22.6	11.4	-	18.2	-	-	-
Caridea	58.1	71.4	50.0	18.2	-	-	-
<i>Lebbeus grandimana</i>	19.4	17.1	-	-	-	-	-
<i>L. polaris</i>	3.2	37.1	25.0	-	-	-	-
Unid. Caridea	35.5	42.9	37.5	9.1	-	-	-
Other Caridea	-	11.4	-	9.1	-	-	-
Other Decapoda	6.5	-	-	18.2	-	-	-
Polychaeta	6.5	-	-	45.5	-	100.0	100.0
Nereididae	3.2	-	-	45.5	-	-	-
<i>Nereis</i> spp.	3.2	-	-	45.5	-	-	-
Unid. Polychaeta	-	-	-	18.2	-	100.0	100.0
Other Polychaeta	3.2	-	-	-	-	-	-
Other Invertebrates	16.1	14.3	-	36.4	-	-	-
Fish	100.0	91.4	100.0	100.0	100.0	100.0	100.0
Teleostei	100.0	91.4	100.0	100.0	100.0	100.0	100.0
Cottidae	12.9	14.3	37.5	63.6	-	100.0	100.0
<i>Hemilepidotus jordani</i>	-	-	-	-	-	50.0	-
<i>Myoxocephalus quadricornis</i>	-	-	-	-	-	50.0	-
Unid. Cottidae	12.9	8.6	-	63.6	-	-	100.0
Other Cottidae	-	5.7	37.5	-	-	-	-
Gadidae	-	11.4	-	27.3	-	-	-
Trichodontidae	-	-	-	-	100.0	-	-
<i>Trichodon trichodon</i>	-	-	-	-	100.0	-	-
Unid. Teleostei	83.9	54.3	62.5	54.5	50.0	50.0	-
Other Teleostei	6.5	25.7	-	36.4	-	-	-
Other	-	11.4	-	-	50.0	-	-
Unidentified	-	11.4	-	-	50.0	-	-

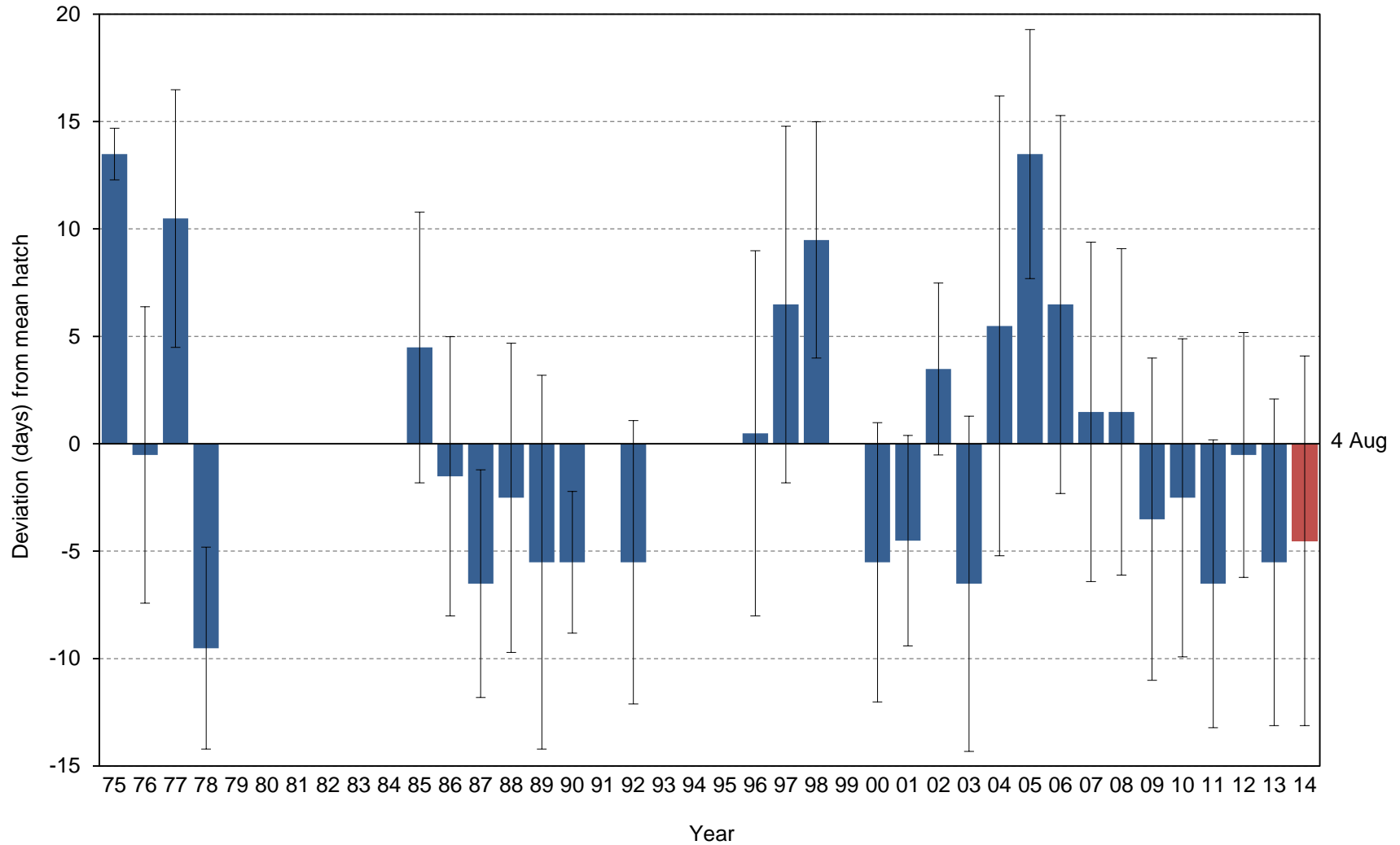


Figure 10. Yearly hatch date deviation (from the 1975-2013 mean of 4 August) for common murrelets at St. Paul Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year.

Table 20. Breeding chronology of common murres at St. Paul Island, Alaska.

Year	Mean hatch	SD	n^a	First hatch	Last hatch	First "jump" ^b
1975	17 Aug	1.2	3	-	-	-
1976	2 Aug	6.9	3	-	-	-
1977	14 Aug	6.0	14	-	-	-
1978	25 Jul	4.7	7	-	-	-
1979	<i>no data</i>	-	-	-	-	-
1980	<i>no data</i>	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-
1984	<i>no data</i>	-	-	-	-	-
1985	8 Aug	6.3	18	28 Jul	17 Aug	15 Aug
1986	2 Aug	6.5	33	xx ^c	xx	xx
1987	28 Jul	5.3	39	xx	xx	xx
1988	31 Jul	7.2	116	xx	xx	xx
1989	29 Jul	8.7	7	23 Jul	18 Aug	12 Aug
1990	29 Jul	3.3	6	25 Jul	4 Aug	10 Aug
1991	<i>no data</i>	-	-	-	-	-
1992	28 Jul	6.6	11	20 Jul	11 Aug	11 Aug
1993	<i>no data</i>	-	-	-	-	-
1994	<i>no data</i>	-	-	-	-	-
1995	<i>no data</i>	-	-	-	-	-
1996	3 Aug	8.5	5	26 Jul	19 Aug	14 Aug
1997	10 Aug	8.3	9	25 Jul	22 Aug	14 Aug
1998	13 Aug	5.5	2	7 Aug	18 Aug	5 Sep
1999	-	-	-	-	-	15 Aug
2000	28 Jul	6.5	10	21 Jul	15 Aug	14 Aug
2001	30 Jul	4.9	26	20 Jul	11 Aug	15 Aug
2002	7 Aug	4.0	10	31 Jul	12 Aug	16 Aug
2003	28 Jul	7.8	42	19 Jul	3 Sep	6 Aug
2004	8 Aug	10.7	37	22 Jul	2 Sep	14 Aug
2005	17 Aug	5.8	7	8 Aug	28 Aug	27 Aug
2006	10 Aug	8.8	30	29 Jul	3 Sep	14 Aug
2007	5 Aug	7.9	35	27 Jul	1 Sep	15 Aug
2008	4 Aug	7.6	44	20 Jul	23 Aug	13 Aug
2009	31 Jul	7.5	53	17 Jul	24 Aug	8 Aug
2010	1 Aug	7.4	50	21 Jul	24 Aug	10 Aug
2011	28 Jul	6.7	24	17 Jul	18 Aug	11 Aug
2012	2 Aug	5.7	17	24 Jul	17 Aug	11 Aug
2013	29 Jul	7.6	33	19 Jul	24 Aug	11 Aug
2014	30 Jul	8.6	39	10 Jul	17 Aug	7 Aug

^aSample sizes for mean hatch dates are a sub-sample of total nests for which egg to chick interval is ≤ 7 days.

^bIn years when no chicks fledged before the field crew left the island at the end of the season, date of first fledge is listed as > the date of last nest check.

^cxx indicates data potentially exist but have not yet been summarized.

Table 21. Frequency distribution of hatch dates for common murres at St. Paul Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. Individual hatch date data are not available before 1985.

Julian date ^a	No. nests hatching on Julian date														
	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
191	-	xx ^b	xx	xx	-	-	no data	-	no data	no data	no data	-	-	-	no data
192	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
193	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
194	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
195	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
196	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
197	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
198	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
199	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
200	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
201	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
202	-	xx	xx	xx	-	-	-	1	-	-	-	-	-	-	-
203	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
204	-	xx	xx	xx	1	-	-	1	-	-	-	-	-	-	-
205	-	xx	xx	xx	1	-	-	1	-	-	-	-	-	-	-
206	-	xx	xx	xx	3	1	-	2	-	-	-	-	1	-	-
207	-	xx	xx	xx	-	1	-	1	-	-	-	-	-	-	-
208	-	xx	xx	xx	-	1	-	1	-	-	-	1	-	-	-
209	1	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
210	-	xx	xx	xx	-	2	-	-	-	-	-	1	-	-	-
211	1	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
212	3	xx	xx	xx	-	-	-	-	-	-	-	-	1	-	-
213	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
214	-	xx	xx	xx	-	-	-	1	-	-	-	2	-	-	-
215	-	xx	xx	xx	1	-	-	-	-	-	-	-	-	-	-
216	-	xx	xx	xx	-	1	-	1	-	-	-	-	-	-	-
217	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
218	4	xx	xx	xx	-	-	-	1	-	-	-	-	-	-	-
219	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	1	-
220	1	xx	xx	xx	-	-	-	-	-	-	-	-	1	-	-
221	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
222	1	xx	xx	xx	-	-	-	-	-	-	-	-	2	-	-
223	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
224	1	xx	xx	xx	-	-	-	1	-	-	-	-	1	-	-
225	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
226	3	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
227	2	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
228	-	xx	xx	xx	-	-	-	-	-	-	-	-	1	-	-
229	1	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
230	-	xx	xx	xx	1	-	-	-	-	-	-	-	-	1	-
231	-	xx	xx	xx	-	-	-	-	-	-	-	-	1	-	-
232	-	xx	xx	xx	-	-	-	-	-	-	-	1	-	-	-
233	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
234	-	xx	xx	xx	-	-	-	-	-	-	-	-	1	-	-
235	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
236	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
237	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
238	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
239	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
240	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
241	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
242	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
243	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
244	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
245	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
246	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	18	33	39	116	7	6	-	11	-	-	-	5	9	2	-

^aJulian dates are adjusted by one day in leap years.

^bxx indicates data potentially exist but have not yet been summarized.

Table 21 (continued). Frequency distribution of hatch dates for common murrelets at St. Paul Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. Individual hatch date data are not available before 1985.

Julian date ^a	No. nests hatching on Julian date														
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
191	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
192	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
194	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
197	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	1	-	1	-	-	2
199	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
200	-	-	-	1	-	-	-	-	-	-	-	2	-	2	4
201	-	1	-	1	-	-	-	-	-	1	-	-	-	-	-
202	-	-	-	5	-	-	-	-	1	3	1	2	-	-	-
203	1	-	-	3	-	-	-	-	-	-	-	-	-	-	-
204	-	1	-	2	1	-	-	-	2	-	1	1	-	4	-
205	-	-	-	2	-	-	-	-	-	-	2	-	-	8	1
206	3	-	-	4	5	-	-	-	1	4	3	-	1	-	-
207	-	1	-	2	-	-	-	-	-	-	3	-	-	-	-
208	1	4	-	2	1	-	-	6	1	7	4	9	-	1	10
209	-	4	-	1	-	-	-	-	-	-	-	-	-	6	3
210	4	-	-	2	1	-	1	1	4	8	6	-	4	-	-
211	-	4	-	2	-	-	-	-	-	-	-	-	-	1	-
212	-	2	1	8	1	-	-	4	3	5	9	6	4	3	-
213	-	2	-	-	-	-	1	-	1	-	-	-	-	-	2
214	-	3	1	1	1	-	2	4	5	11	6	-	-	-	5
215	-	-	-	-	-	-	-	7	-	-	3	-	3	-	-
216	-	-	2	1	5	-	2	1	4	3	3	1	-	4	-
217	-	-	-	2	2	-	4	-	-	-	-	-	2	-	-
218	-	1	-	1	1	-	5	3	6	-	-	-	-	1	4
219	-	-	2	-	-	-	-	2	-	1	-	-	-	-	-
220	-	1	-	-	3	1	3	-	5	2	2	1	1	-	2
221	-	1	-	-	-	-	1	-	1	-	-	-	-	-	-
222	-	-	2	-	2	-	-	1	2	1	1	-	-	-	2
223	-	1	-	1	-	-	1	-	-	-	-	-	-	1	-
224	-	-	2	-	2	-	3	2	1	1	1	-	1	-	-
225	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-
226	-	-	-	-	1	1	2	-	-	-	2	-	-	-	1
227	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-
228	1	-	-	-	1	2	1	-	1	1	1	-	-	-	-
229	-	-	-	-	1	-	-	-	-	-	-	-	-	-	2
230	-	-	-	-	2	-	-	1	1	-	-	1	1	-	-
231	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
232	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-
233	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
234	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
235	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
236	-	-	-	-	2	-	1	-	1	1	2	-	-	1	-
237	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
238	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
239	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
240	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
241	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
242	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
243	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
244	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
245	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
246	-	-	-	1	1	-	2	-	-	-	-	-	-	-	-
<i>n</i>	10	26	10	42	37	7	30	35	44	53	50	24	17	33	39

^aJulian dates are adjusted by one day in leap years.

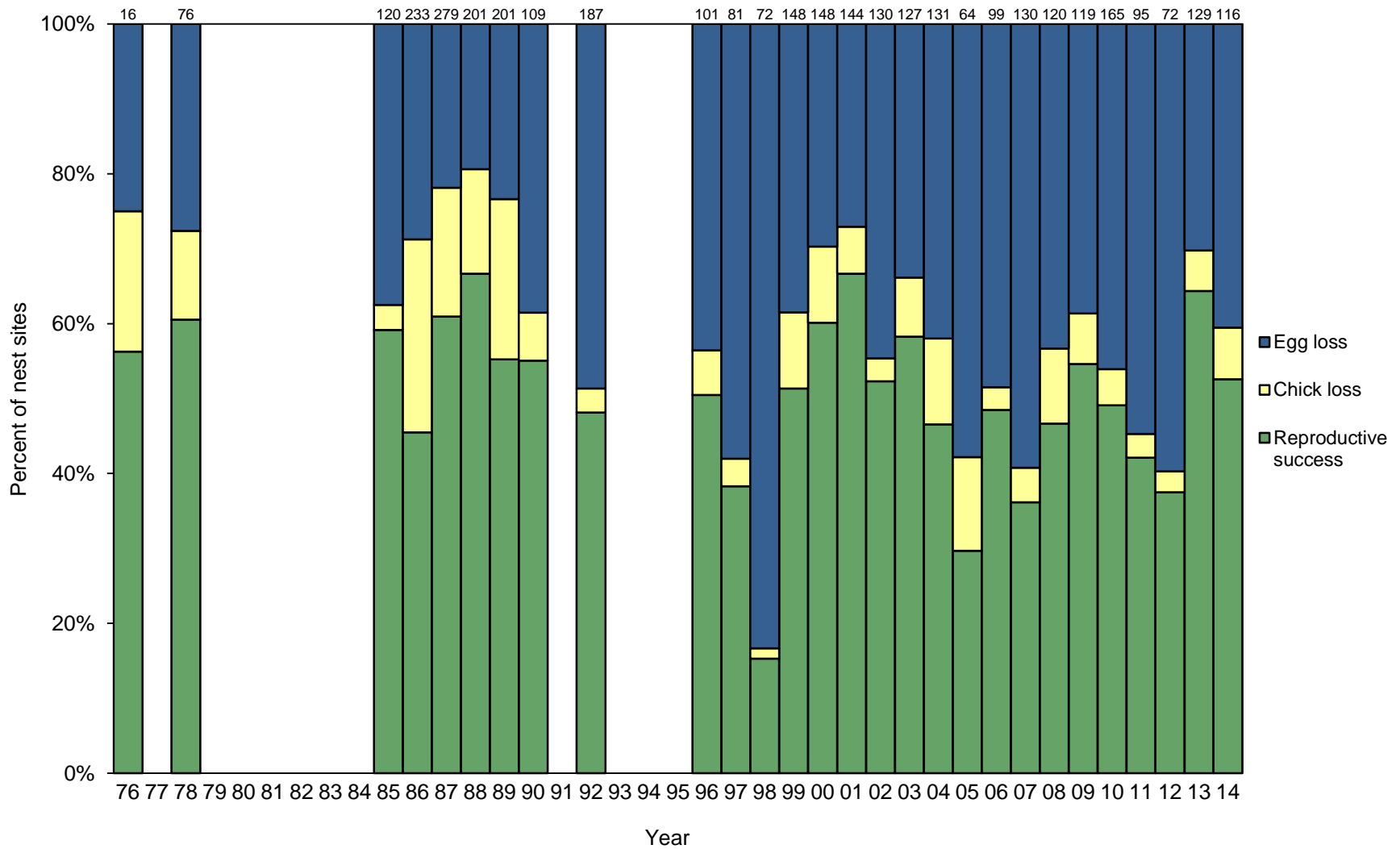


Figure 11. Reproductive performance of common murren at St. Paul Island, Alaska. Egg loss=(B-D)/B; Chick loss=(D-F)/B; Reproductive success=F/B, where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B).

Table 22. Reproductive performance of common murrelets at St. Paul Island, Alaska.

Year	Nest sites w/ eggs (B)	Nest sites w/ chicks (D)	Nest sites w/ chicks fledged (F)	Nesting success (D/B) ^a	Fledging success (F/D) ^b	Reproductive success (F/B)
1975	<i>no data</i>	-	-	-	-	-
1976	16	12	9	0.75	0.75	0.56
1977	<i>no data</i>	-	-	-	-	-
1978	76	55	46	0.72	0.84	0.61
1979	<i>no data</i>	-	-	-	-	-
1980	<i>no data</i>	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-
1984	<i>no data</i>	-	-	-	-	-
1985	120	75	71	0.63	0.95	0.59
1986	233	166	106	0.71	0.64	0.45
1987	279	218	170	0.78	0.78	0.61
1988	201	162	134	0.81	0.83	0.67
1989	201	154	111	0.77	0.72	0.55
1990	109	67	60	0.61	0.90	0.55
1991	<i>no data</i>	-	-	-	-	-
1992	187	96	90	0.51	0.94	0.48
1993	<i>no data</i>	-	-	-	-	-
1994	<i>no data</i>	-	-	-	-	-
1995	<i>no data</i>	-	-	-	-	-
1996	101	57	51	0.56	0.89	0.50
1997	81	34	31	0.42	0.91	0.38
1998	72	12	11	0.17	0.92	0.15
1999	148	91	76	0.61	0.84	0.51
2000	148	104	89	0.70	0.86	0.60
2001	144	105	96	0.73	0.91	0.67
2002	130	72	68	0.55	0.94	0.52
2003	127	84	74	0.66	0.88	0.58
2004	131	76	61	0.58	0.80	0.47
2005	64	27	19	0.42	0.70	0.30
2006	99	51	48	0.52	0.94	0.48
2007	130	53	47	0.41	0.89	0.36
2008	120	68	56	0.57	0.82	0.47
2009	119	73	65	0.61	0.89	0.55
2010	165	89	81	0.54	0.91	0.49
2011	95	43	40	0.45	0.93	0.42
2012	72	29	27	0.40	0.93	0.38
2013	129	90	83	0.70	0.92	0.64
2014	116	69	61	0.59	0.88	0.53

^aFor single-egg species, nesting success (D/B) is the same as hatching success (E/C) because nest sites w/ eggs (B)=total eggs (C) and nest sites w/ chicks (D)=total chicks (E).

^bFor single-egg species, fledging success (F/B) is the same as chick success (G/E) because nest sites w/ chicks (D)=total chicks (E) and nest sites w/ chicks fledged (F)=total chicks fledged (G).

Table 23. Standard deviation in reproductive performance parameters of common murres at St. Paul Island, Alaska. Sampling for murres is clustered by plot except when sample sizes per plot are too small or plot data are not available.

Year	No. plots ^a	Nest sites w/ eggs	Sampling design ^b	Nesting success	Fledging success	Reproductive success
1975	<i>no data</i>	-	-	-	-	-
1976	-	16	Simple random	0.11	0.13	0.12
1977	<i>no data</i>	-	-	-	-	-
1978	-	76	Simple random	0.05	0.05	0.06
1979	<i>no data</i>	-	-	-	-	-
1980	<i>no data</i>	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-
1984	<i>no data</i>	-	-	-	-	-
1985	5	120	Cluster by plot	0.02	0.04	0.03
1986	xx ^c	xx	xx	xx	xx	xx
1987	xx	xx	xx	xx	xx	xx
1988	xx	xx	xx	xx	xx	xx
1989	10	201	Cluster by plot	0.05	0.06	0.05
1990	8	109	Cluster by plot	0.11	0.02	0.10
1991	<i>no data</i>	-	-	-	-	-
1992	8	187	Cluster by plot	0.09	0.04	0.09
1993	<i>no data</i>	-	-	-	-	-
1994	<i>no data</i>	-	-	-	-	-
1995	<i>no data</i>	-	-	-	-	-
1996	5	101	Cluster by plot	0.09	0.04	0.08
1997	4	81	Cluster by plot	0.14	0.05	0.13
1998	3	72	Cluster by plot	<0.01	0.10	0.05
1999	7	148	Cluster by plot	0.03	0.07	0.05
2000	7	148	Cluster by plot	0.04	0.06	0.06
2001	7	144	Cluster by plot	0.05	0.03	0.06
2002	7	130	Cluster by plot	0.04	0.04	0.06
2003	7	127	Cluster by plot	0.03	0.05	0.06
2004	7	131	Cluster by plot	0.08	0.06	0.10
2005	4	64	Cluster by plot	0.08	0.14	0.03
2006	9	99	Cluster by plot	0.04	0.04	0.04
2007	9	130	Cluster by plot	0.08	0.04	0.07
2008	8	120	Cluster by plot	0.09	0.05	0.08
2009	7	119	Cluster by plot	0.05	0.03	0.05
2010	8	165	Cluster by plot	0.09	0.05	0.10
2011	7	95	Cluster by plot	0.11	0.03	0.11
2012	3	72	Cluster by plot	0.14	0.03	0.13
2013	3	129	Cluster by plot	0.01	0.07	0.05
2014	3	116	Cluster by plot	0.08	0.03	0.09

^aPlots that are combined for analysis are counted as a single "plot".

^bFor sampling clustered by plot, values are calculated based on plot as a sample unit; for simple random sampling, values are calculated using $\sqrt{\rho * (1 - \rho) / n}$, where ρ is the success rate and n is the sample size of individual nests.

^cxx indicates data potentially exist but have not yet been summarized.

Table 24. Reproductive performance of common murrelets at St. Paul Island, Alaska in 2014.

Parameter	Plot			Total	SD ^b
	104/86/81 ^a	64/66/67/68 ^a	114/90Low ^a		
Nests w/ eggs (B)	42	37	37	116	-
Nests w/ chicks (D)	26	16	27	69	-
Nests w/ chicks fledged (F)	24	13	24	61	-
Nesting success (D/B) ^c	0.62	0.43	0.73	0.59	0.08
Fledging success (F/D) ^d	0.92	0.81	0.89	0.88	0.03
Reproductive success (F/B)	0.57	0.35	0.65	0.53	0.09

^aPlots were combined for statistical purposes.

^bStandard deviations are calculated based on plot as a sample unit.

^cFor single-egg species, nesting success (D/B) is the same as hatching success (E/C) because nest sites w/ eggs (B)=total eggs (C) and nest sites w/ chicks (D)=total chicks (E).

^dFor single-egg species, fledging success (F/B) is the same as chick success (G/E) because nest sites w/ chicks (D)=total chicks (E) and nest sites w/ chicks fledged (F)=total chicks fledged (G).

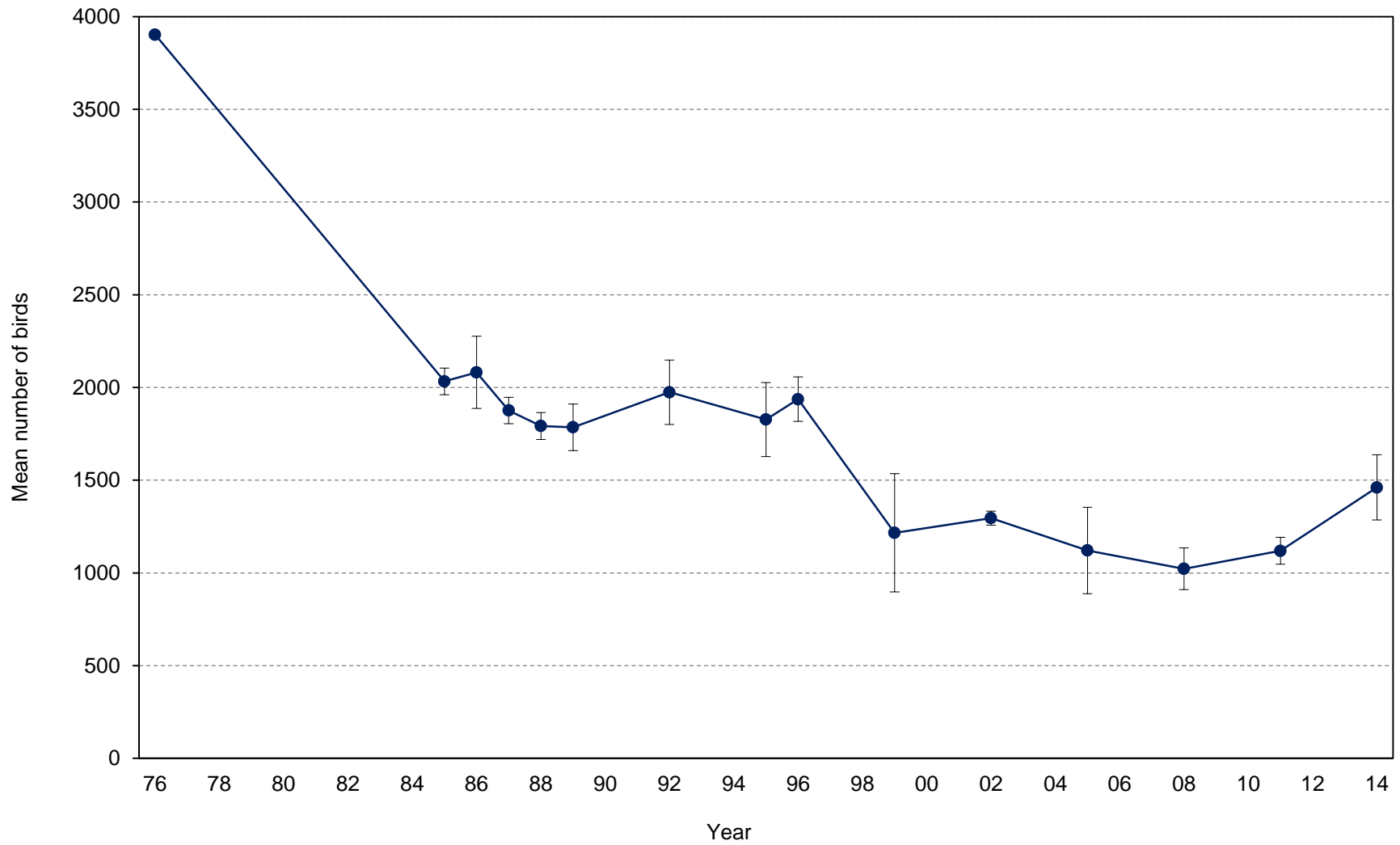


Figure 12. Mean numbers of common murre counted on index at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Data from 1982 and 1984 are excluded because not all plots were counted. Error bars represent standard deviation.

Table 25. Numbers of common murres counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. No counts were conducted during years not listed; data from 1982 and 1984 are excluded because not all plots were counted.

Replicate	1976	1985	1986	1987	1988	1989	1992	1995	1996	1999	2002	2005	2008	2011	2014
1	3903	2071	1808	1798	1688	1847	1858	1681	1999	855	1252	673	993	1249	1336
2	-	2114	1956	1850	1772	1819	1996	1745	1790	1161	1305	924	868	1062	1244
3	-	1962	2178	1853	1742	1688	2092	2055	1843	884	1324	1059	876	1047	1336
4	-	1985	2174	1871	1775	1776	1709	-	1926	1358	1350	1313	980	1139	1575
5	-	-	2289	1873	1838	1576	2203	-	1936	1349	1268	1394	1052	1094	2661
6	-	-	-	2011	1913	1716	1987	-	2129	1691	1274	1190	1139	1148	1612
7	-	-	-	-	1820	1986	-	-	-	-	-	1162	1147	1038	-
8	-	-	-	-	-	1874	-	-	-	-	-	1254	1126	1175	-
Mean	3903	2033	2081	1876	1793	1785	1974	1827	1937	1216	1296	1121	1023	1119	1461
<i>n</i>	1	4	5	6	7	8	6	3	6	6	6	8	8	8	6
SD	-	72	195	72	73	126	174	200	119	318	37	233	113	73	176
First count	17 Jul	xx ^a	6 Jul	9 Jul	12 Jul	17 Jul	12 Jul	9 Jul	10 Jul	7 Jul	8 Jul	11 Jul	1 Jul	6 Jul	7 Jul
Last count	21 Jul	xx	29 Jul	23 Jul	7 Aug	9 Aug	7 Aug	3 Aug	2 Aug	7 Aug	1 Aug	31 Jul	31 Jul	1 Aug	27 Jul

^axx indicates data potentially exist but have not yet been summarized.

Table 26. Numbers of common murres counted on index plots at St. Paul Island, Alaska in 2014.

Plot	Replicate						Mean	SD
	1 7-9 Jul	2 10-12 Jul	3 13-15 Jul	4 17-19 Jul	5 21-23 Jul	6 25-27 Jul		
1	0	0	0	0	0	0	-	-
2sw	0	0	0	0	0	0	-	-
2ne	0	0	0	0	0	0	-	-
3	0	0	0	0	0	0	-	-
4	0	0	0	0	0	0	-	-
5sw	0	0	0	0	0	0	-	-
5ne	0	0	0	0	0	0	-	-
6 ^a	-	-	-	-	-	-	-	-
7	0	0	0	0	0	0	-	-
8	0	0	0	0	0	0	-	-
9	-	-	-	-	-	-	-	-
10	0	0	0	0	0	0	-	-
11	0	0	0	0	0	0	-	-
12	0	0	0	0	0	0	-	-
13	0	0	0	0	0	0	-	-
14	82	88	72	93	96	96	-	-
15	0	0	0	0	0	0	-	-
16 ^a	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-
18	0	0	0	0	0	0	-	-
19top	0	0	0	2	4	0	-	-
19btm	0	0	0	0	0	0	-	-
20top	0	0	0	0	0	0	-	-
20btm	0	6	12	10	12	8	-	-
21 ^a	-	-	-	-	-	-	-	-
22	0	0	0	2	1	0	-	-
23	1	0	0	0	0	0	-	-
24	0	0	0	0	0	0	-	-
25	0	0	0	0	0	0	-	-
26	35	30	32	37	35	40	-	-
27	0	0	0	0	0	0	-	-
28	0	0	0	0	0	0	-	-
29 ^a	-	-	-	-	-	-	-	-
29new	0	0	0	0	0	0	-	-
30	0	0	0	0	0	0	-	-
31	211	228	265	284	298	312	-	-
32	294	296	261	380	419	444	-	-
33	713	596	694	767	796	712	-	-
Total ^b	1336	1244	1336	1575	1661	1612	1461	176

^aHistorical plots no longer counted.

^bTotals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30.

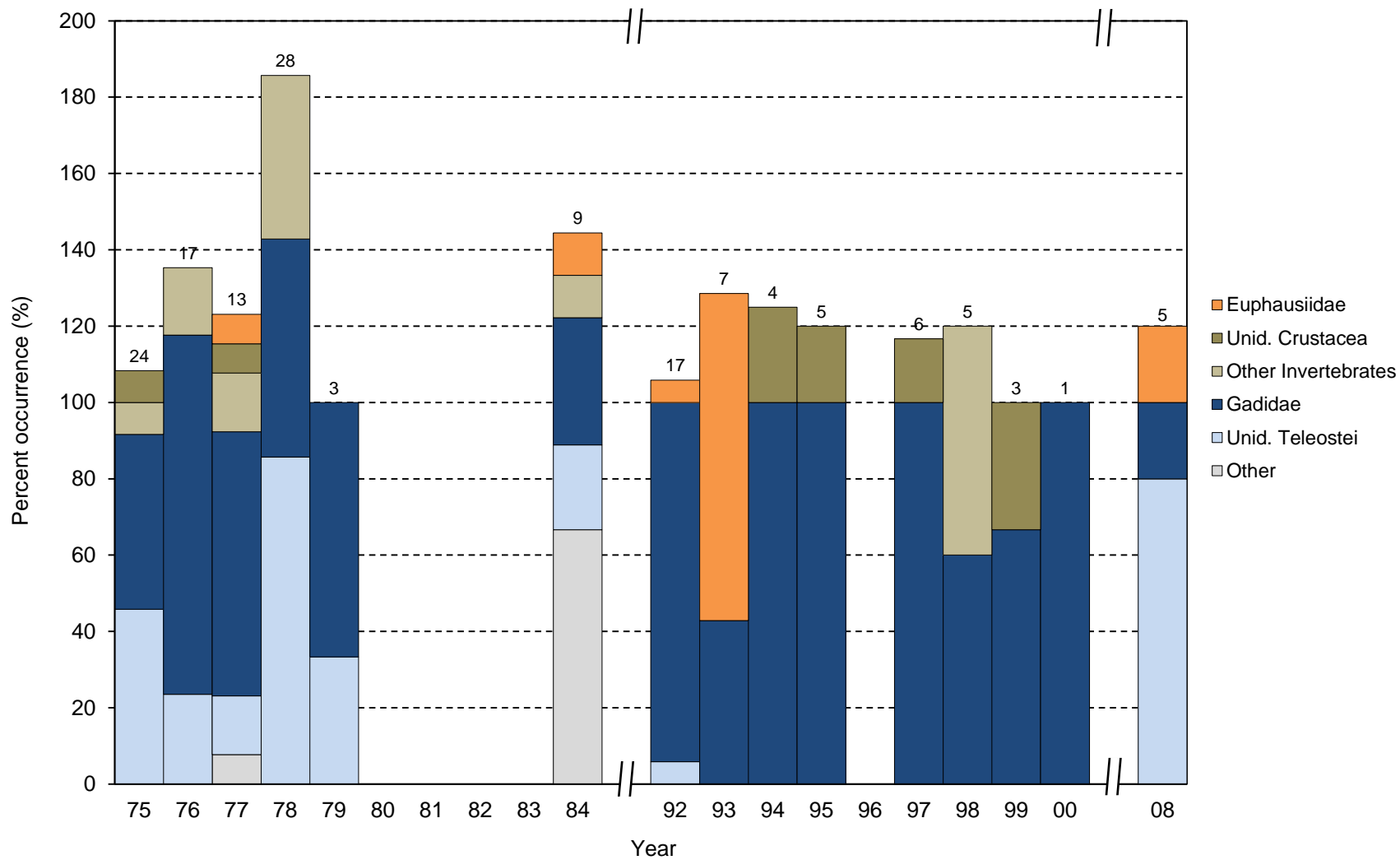


Figure 13. Frequency of occurrence of major prey items in diets of common murre adults at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Numbers above columns indicate sample sizes.

Table 27. Frequency of occurrence of major prey items in diets of common murre adults at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as “others” in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of stomach contents collected from adults near or at the colony. No diet samples were collected in 1980-1983, 1985-1991, 1996, 2001-2007 or after 2008. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1975	1976	1977	1978	1979	1984	1992	1993	1994	1995	1997	1998	1999	2000	2008
No. samples	24	17	13	28	3	9	17	7	4	5	6	5	3	1	5
Invertebrates	16.7	17.6	23.1	42.9	-	11.1	5.9	85.7	25.0	20.0	16.7	60.0	33.3	-	20.0
Euphausiacea	-	-	7.7	-	-	11.1	5.9	85.7	-	-	-	-	-	-	20.0
Euphausiidae	-	-	7.7	-	-	11.1	5.9	85.7	-	-	-	-	-	-	20.0
<i>Thysanoessa</i> spp.	-	-	-	-	-	-	5.9	85.7	-	-	-	-	-	-	-
Other Euphausiidae	-	-	7.7	-	-	11.1	-	-	-	-	-	-	-	-	20.0
Unid. Crustacea	8.3	-	7.7	-	-	-	-	-	25.0	20.0	16.7	-	33.3	-	-
Other Invertebrates	8.3	17.6	15.4	42.9	-	11.1	-	-	-	-	-	60.0	-	-	-
Fish	91.7	100.0	76.9	100.0	100.0	55.6	100.0	42.9	100.0	100.0	100.0	60.0	66.7	100.0	100.0
Teleostei	91.7	100.0	76.9	100.0	100.0	55.6	100.0	42.9	100.0	100.0	100.0	60.0	66.7	100.0	100.0
Gadidae	45.8	94.1	69.2	57.1	66.7	33.3	94.1	42.9	100.0	100.0	100.0	60.0	66.7	100.0	20.0
<i>Gadus chalcogrammus</i>	4.2	17.6	23.1	57.1	33.3	33.3	88.2	42.9	100.0	100.0	100.0	60.0	66.7	100.0	20.0
Other Gadidae	41.7	76.5	46.2	-	33.3	11.1	5.9	14.3	25.0	-	-	-	-	-	-
Unid. Teleostei	45.8	23.5	15.4	85.7	33.3	22.2	5.9	-	-	-	-	-	-	-	80.0
Other Teleostei	-	-	7.7	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	7.7	-	-	66.7	-	-	-	-	-	-	-	-	-
Unidentified	-	-	7.7	-	-	66.7	-	-	-	-	-	-	-	-	-

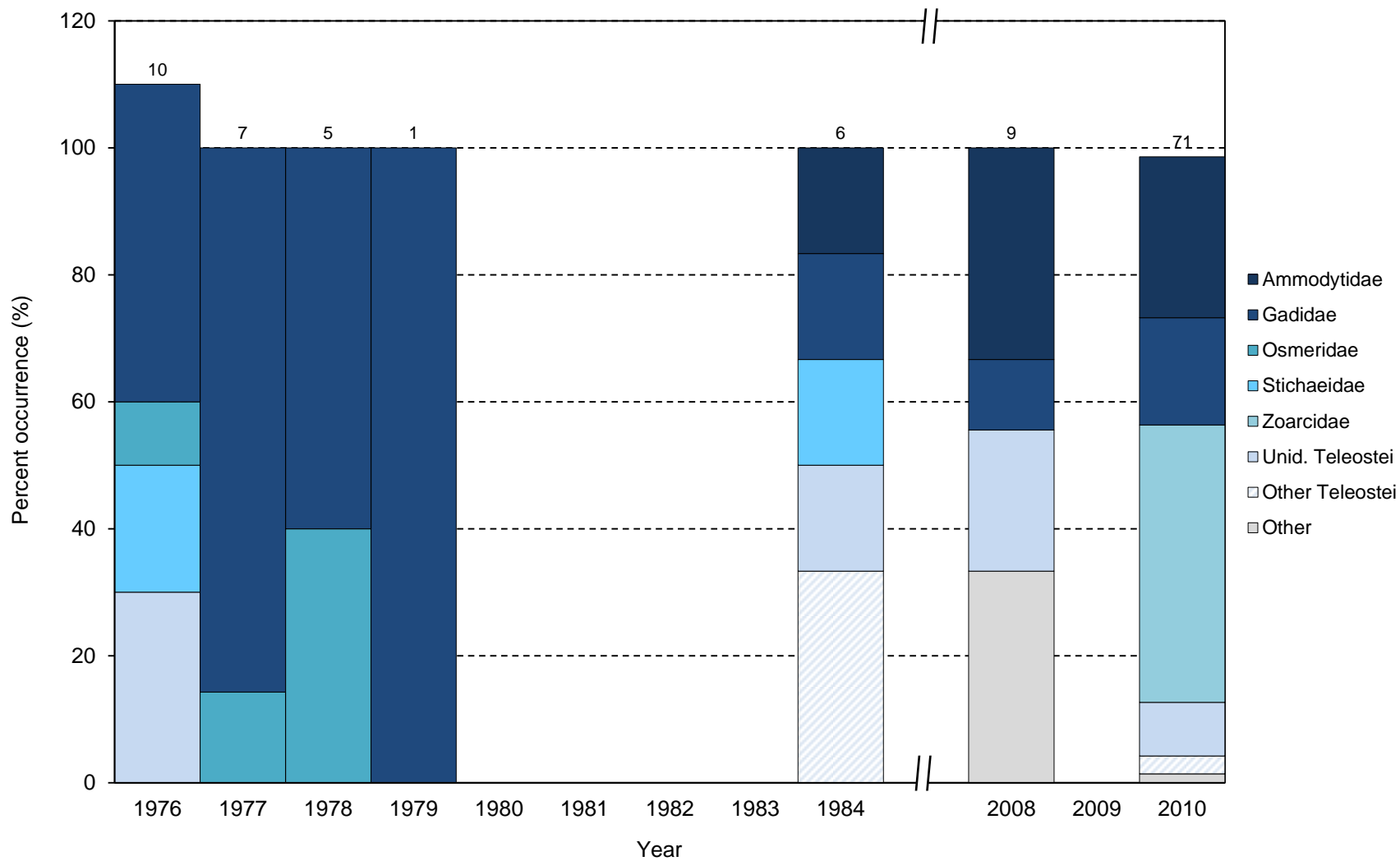


Figure 14. Frequency of occurrence of major prey items in diets of common murre chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Numbers above columns indicate sample sizes.

Table 28. Frequency of occurrence of major prey items in diets of common murre chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as “others” in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of bill loads collected (1976-1984) and observed (2008, 2010) from adults returning to the colony to feed chicks and regurgitations collected from chicks (1976, 1984, 2008). No diet samples were collected in 1979-1983, 1985-2007, 2009 or after 2010. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1976	1977	1978	1979	1984	2008	2010
No. samples	10	7	5	1	6	9	71
Invertebrates	-	-	-	-	-	11.1	1.4
Cephalopoda	-	-	-	-	-	11.1	1.4
Unid. Decabrachia	-	-	-	-	-	11.1	1.4
Fish	100.0	100.0	100.0	100.0	100.0	66.7	97.2
Teleostei	100.0	100.0	100.0	100.0	100.0	66.7	97.2
Agonidae	-	-	-	-	16.7	-	-
Unid. Agonidae	-	-	-	-	16.7	-	-
Ammodytidae	-	-	-	-	16.7	33.3	25.4
<i>Ammodytes hexapterus</i>	-	-	-	-	16.7	33.3	25.4
Bathymasteridae	-	-	-	-	-	-	1.4
<i>Bathymaster signatus</i>	-	-	-	-	-	-	1.4
Cottidae	-	-	-	-	16.7	-	1.4
Unid. Cottidae	-	-	-	-	16.7	-	1.4
Gadidae	50.0	85.7	60.0	100.0	16.7	11.1	16.9
<i>Gadus chalcogrammus</i>	40.0	85.7	60.0	100.0	16.7	-	-
Other Gadidae	10.0	-	-	-	-	11.1	16.9
Osmeridae	10.0	14.3	40.0	-	-	-	-
<i>Mallotus villosus</i>	10.0	14.3	40.0	-	-	-	-
Pleuronectiformes	-	-	-	-	16.7	-	-
<i>Hippoglossoides elassodon</i>	-	-	-	-	16.7	-	-
Stichaeidae	20.0	-	-	-	16.7	-	-
<i>Lumpenus sagitta</i>	-	-	-	-	16.7	-	-
Unid. Stichaeidae	20.0	-	-	-	-	-	-
Zoarcidae	-	-	-	-	-	-	43.7
Unid. Zoarcidae	-	-	-	-	-	-	43.7
Unid. Teleostei	30.0	-	-	-	16.7	22.2	8.5
Other	-	-	-	-	-	33.3	1.4
Unidentified	-	-	-	-	-	33.3	1.4

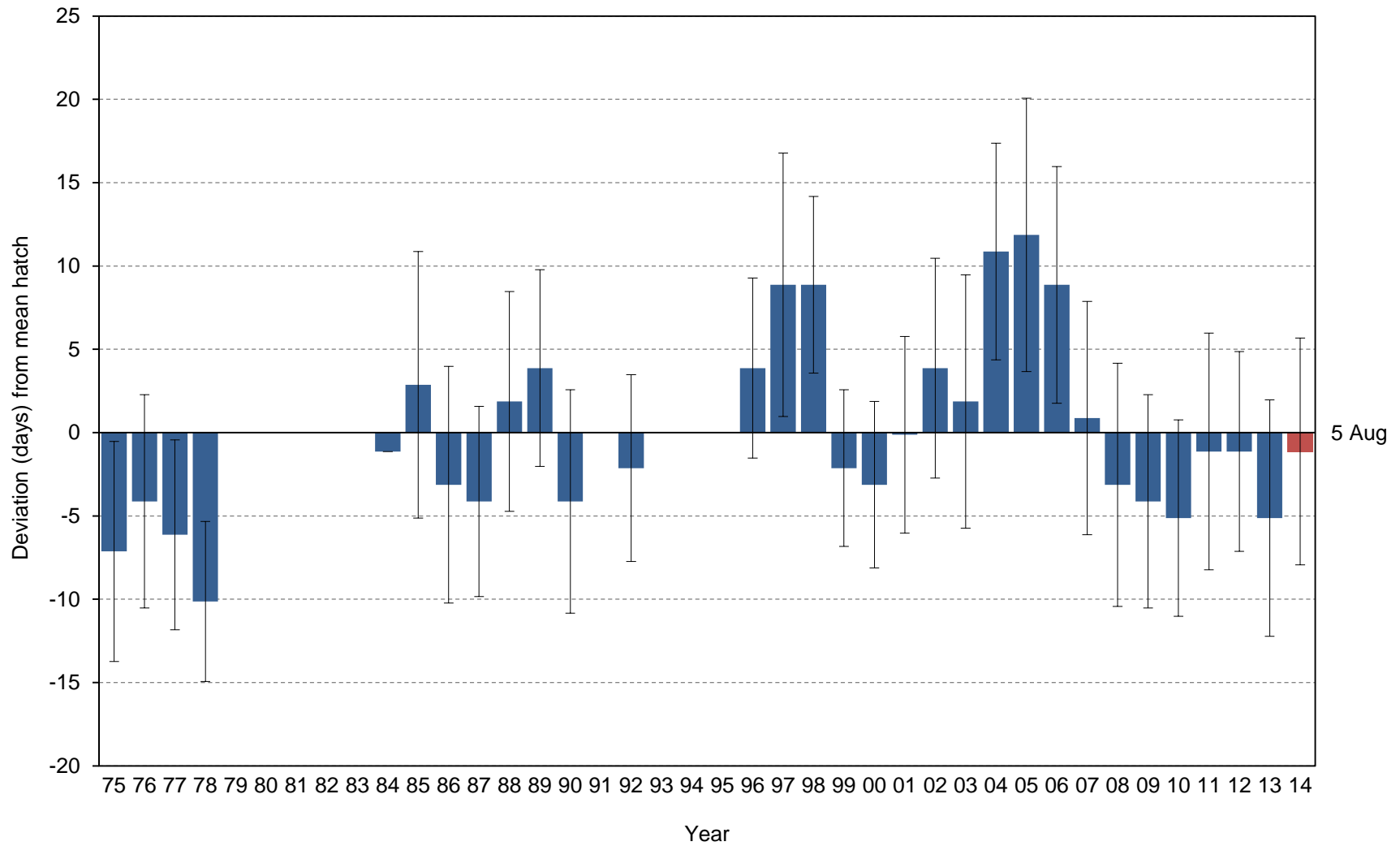


Figure 15. Yearly hatch date deviation (from the 1975-2013 mean of 5 August) for thick-billed murrelets at St. Paul Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year.

Table 29. Breeding chronology of thick-billed murrelets at St. Paul Island, Alaska.

Year	Mean hatch	SD	n^a	First hatch	Last hatch	First "jump" ^b
1975	29 Jul	6.6	23	-	-	-
1976	31 Jul	6.4	83	-	-	-
1977	30 Jul	5.7	34	-	-	-
1978	26 Jul	4.8	50	-	-	-
1979	<i>no data</i>	-	-	-	-	-
1980	<i>no data</i>	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-
1984	3 Aug	0.0	1	3 Aug	-	>12 Aug
1985	8 Aug	8.0	65	27 Jul	24 Aug	15 Aug
1986	2 Aug	7.1	72	xx ^c	xx	xx
1987	1 Aug	5.7	260	xx	xx	xx
1988	6 Aug	6.6	45	xx	xx	xx
1989	9 Aug	5.9	16	31 Jul	20 Aug	15 Aug
1990	1 Aug	6.7	40	23 Jul	16 Aug	10 Aug
1991	<i>no data</i>	-	-	-	-	-
1992	2 Aug	5.6	44	24 Jul	14 Aug	10 Aug
1993	<i>no data</i>	-	-	-	-	-
1994	<i>no data</i>	-	-	-	-	-
1995	<i>no data</i>	-	-	-	-	-
1996	8 Aug	5.4	36	28 Jul	17 Aug	19 Aug
1997	14 Aug	7.9	62	30 Jul	1 Sep	21 Aug
1998	14 Aug	5.3	30	6 Aug	25 Aug	25 Aug
1999	3 Aug	4.7	5	27 Jul	10 Aug	9 Aug
2000	1 Aug	5.0	27	24 Jul	18 Aug	10 Aug
2001	5 Aug	5.9	69	25 Jul	22 Aug	12 Aug
2002	9 Aug	6.6	40	27 Jul	24 Aug	12 Aug
2003	7 Aug	7.6	125	23 Jul	30 Aug	12 Aug
2004	15 Aug	6.5	159	30 Jul	29 Aug	21 Aug
2005	17 Aug	8.2	18	6 Aug	1 Sep	21 Aug
2006	14 Aug	7.1	126	1 Aug	31 Aug	23 Aug
2007	6 Aug	7.0	276	23 Jul	25 Aug	11 Aug
2008	1 Aug	7.3	110	9 Jul	29 Aug	6 Aug
2009	1 Aug	6.4	143	20 Jul	24 Aug	6 Aug
2010	31 Jul	5.9	183	17 Jul	18 Aug	9 Aug
2011	4 Aug	7.1	122	21 Jul	22 Aug	11 Aug
2012	3 Aug	6.0	83	24 Jul	19 Aug	12 Aug
2013	31 Jul	7.1	98	19 Jul	21 Aug	8 Aug
2014	4 Aug	6.8	78	19 Jul	17 Aug	14 Aug

^aSample sizes for mean hatch dates are a sub-sample of total nests for which egg to chick interval is ≤ 7 days.

^bIn years when no chicks fledged before the field crew left the island at the end of the season, date of first fledge is listed as > the date of last nest check.

^cxx indicates data potentially exist but have not yet been summarized.

Table 30. Frequency distribution of hatch dates for thick-billed murres at St. Paul Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. Individual hatch date data are not available before 1984.

Julian date ^a	No. nests hatching on Julian date															
	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
191	-	-	xx ^b	xx	xx	-	-	no data	-	no data	no data	no data	-	-	-	-
192	-	-	xx	xx	xx	-	-	no data	-	no data	no data	no data	-	-	-	-
193	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
194	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
195	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
196	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
197	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
198	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
199	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
200	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
201	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
202	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
203	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
204	-	-	xx	xx	xx	-	1	-	-	-	-	-	-	-	-	-
205	-	-	xx	xx	xx	-	2	-	-	-	-	-	-	-	-	-
206	-	-	xx	xx	xx	-	7	-	2	-	-	-	-	-	-	-
207	-	-	xx	xx	xx	-	-	-	1	-	-	-	-	-	-	-
208	-	5	xx	xx	xx	-	2	-	3	-	-	-	-	-	-	1
209	-	1	xx	xx	xx	-	-	-	2	-	-	-	-	-	-	-
210	-	5	xx	xx	xx	-	7	-	5	-	-	-	1	-	-	-
211	-	2	xx	xx	xx	-	2	-	1	-	-	-	-	1	-	-
212	-	7	xx	xx	xx	1	3	-	4	-	-	-	2	1	-	1
213	-	-	xx	xx	xx	1	1	-	4	-	-	-	1	1	-	-
214	-	-	xx	xx	xx	-	2	-	5	-	-	-	2	2	-	-
215	-	3	xx	xx	xx	-	-	-	1	-	-	-	-	1	-	-
216	1	4	xx	xx	xx	2	3	-	1	-	-	-	3	2	-	1
217	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	1	-	1
218	-	2	xx	xx	xx	3	2	-	7	-	-	-	2	4	1	-
219	-	-	xx	xx	xx	1	-	-	-	-	-	-	-	1	-	-
220	-	3	xx	xx	xx	-	-	-	1	-	-	-	5	3	5	-
221	-	1	xx	xx	xx	2	-	-	-	-	-	-	2	-	-	-
222	-	2	xx	xx	xx	-	1	-	2	-	-	-	2	4	3	1
223	-	3	xx	xx	xx	1	2	-	-	-	-	-	3	4	5	-
224	-	-	xx	xx	xx	1	3	-	2	-	-	-	3	4	2	-
225	-	-	xx	xx	xx	-	1	-	-	-	-	-	2	2	-	-
226	-	8	xx	xx	xx	-	-	-	1	-	-	-	3	1	5	-
227	-	10	xx	xx	xx	-	-	-	2	-	-	-	-	1	-	-
228	-	1	xx	xx	xx	2	1	-	-	-	-	-	1	7	1	-
229	-	2	xx	xx	xx	-	-	-	-	-	-	-	-	2	-	-
230	-	1	xx	xx	xx	-	-	-	-	-	-	-	4	4	3	-
231	-	1	xx	xx	xx	1	-	-	-	-	-	-	-	1	-	-
232	-	-	xx	xx	xx	1	-	-	-	-	-	-	-	1	-	-
233	-	1	xx	xx	xx	-	-	-	-	-	-	-	-	1	1	-
234	-	2	xx	xx	xx	-	-	-	-	-	-	-	-	3	1	-
235	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	3	-	-
236	-	1	xx	xx	xx	-	-	-	-	-	-	-	-	2	2	-
237	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	1	-
238	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	1	-	-
239	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
240	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	1	-	-
241	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
242	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	1	-	-
243	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
244	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	2	-	-
<i>n</i>	1	65	72	260	45	16	40	-	44	-	-	-	36	62	30	5

^aJulian dates are adjusted by one day in leap years.

^bxx indicates data potentially exist but have not yet been summarized.

Table 30 (continued). Frequency distribution of hatch dates for thick-billed murres at St. Paul Island, Alaska. Data include only nests in which observations of egg to chick ≤ 7 days. Individual hatch date data are not available before 1984.

Julian date ^a	No. nests hatching on Julian date														
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
191	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
192	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
194	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
196	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
197	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
198	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
201	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-
202	-	-	-	-	-	-	-	-	-	8	3	4	-	2	-
203	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
204	-	-	-	1	-	-	-	1	5	3	8	1	-	6	1
205	-	-	-	-	-	-	-	-	-	-	20	-	-	16	2
206	1	1	-	2	-	-	-	-	5	15	6	-	1	1	-
207	-	-	-	1	-	-	-	5	-	-	4	-	3	-	-
208	1	5	1	1	-	-	-	24	13	19	16	23	2	4	6
209	1	2	1	2	-	-	-	4	4	-	1	-	1	10	7
210	4	-	-	6	-	-	-	13	6	8	20	6	12	9	1
211	2	1	-	2	-	-	-	-	1	-	-	1	-	-	-
212	1	3	2	19	1	-	-	24	16	9	14	22	14	5	-
213	2	1	-	-	-	-	1	1	6	-	13	-	-	-	15
214	4	16	4	8	-	-	2	17	12	29	14	1	2	12	8
215	4	-	-	-	1	-	-	24	-	10	15	-	10	3	-
216	2	8	3	11	6	-	4	17	9	3	7	5	-	3	2
217	-	4	-	5	1	-	3	1	1	5	-	-	5	-	1
218	3	4	2	8	10	3	9	20	7	10	8	6	7	5	10
219	-	2	4	2	-	-	-	30	-	-	7	11	8	3	-
220	-	4	2	8	9	1	10	18	8	3	11	11	1	5	3
221	-	1	1	-	-	-	6	2	-	-	1	8	-	-	-
222	-	-	3	9	11	1	10	15	1	7	6	2	1	4	2
223	-	7	1	4	1	1	-	-	3	1	-	-	-	-	1
224	1	-	4	9	18	2	13	22	4	7	6	3	8	4	8
225	-	3	1	-	2	-	6	5	-	-	-	6	3	-	-
226	-	2	4	4	14	-	12	-	-	1	-	4	1	-	6
227	-	3	-	-	1	1	1	-	-	-	-	2	-	1	-
228	-	-	-	6	10	-	8	6	2	-	-	-	2	-	2
229	-	-	1	-	-	-	2	4	-	-	-	2	-	-	1
230	-	-	4	9	19	1	1	9	2	-	1	2	1	1	-
231	1	-	-	3	2	-	1	-	-	-	-	1	-	1	-
232	-	1	-	1	14	-	7	4	1	-	-	-	1	-	-
233	-	-	-	-	-	-	4	-	-	-	-	-	-	1	-
234	-	1	1	1	15	1	5	1	1	-	-	1	-	-	-
235	-	-	-	-	6	-	-	5	-	-	-	-	-	-	-
236	-	-	1	1	4	2	12	3	-	1	-	-	-	-	-
237	-	-	-	-	3	2	-	1	-	-	-	-	-	-	-
238	-	-	-	-	7	-	1	-	-	-	-	-	-	-	-
239	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-
240	-	-	-	1	2	2	1	-	-	-	-	-	-	-	-
241	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
242	-	-	-	1	1	-	-	-	1	-	-	-	-	-	-
243	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
244	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	27	69	40	125	159	18	126	276	110	143	183	122	83	98	78

^aJulian dates are adjusted by one day in leap years.

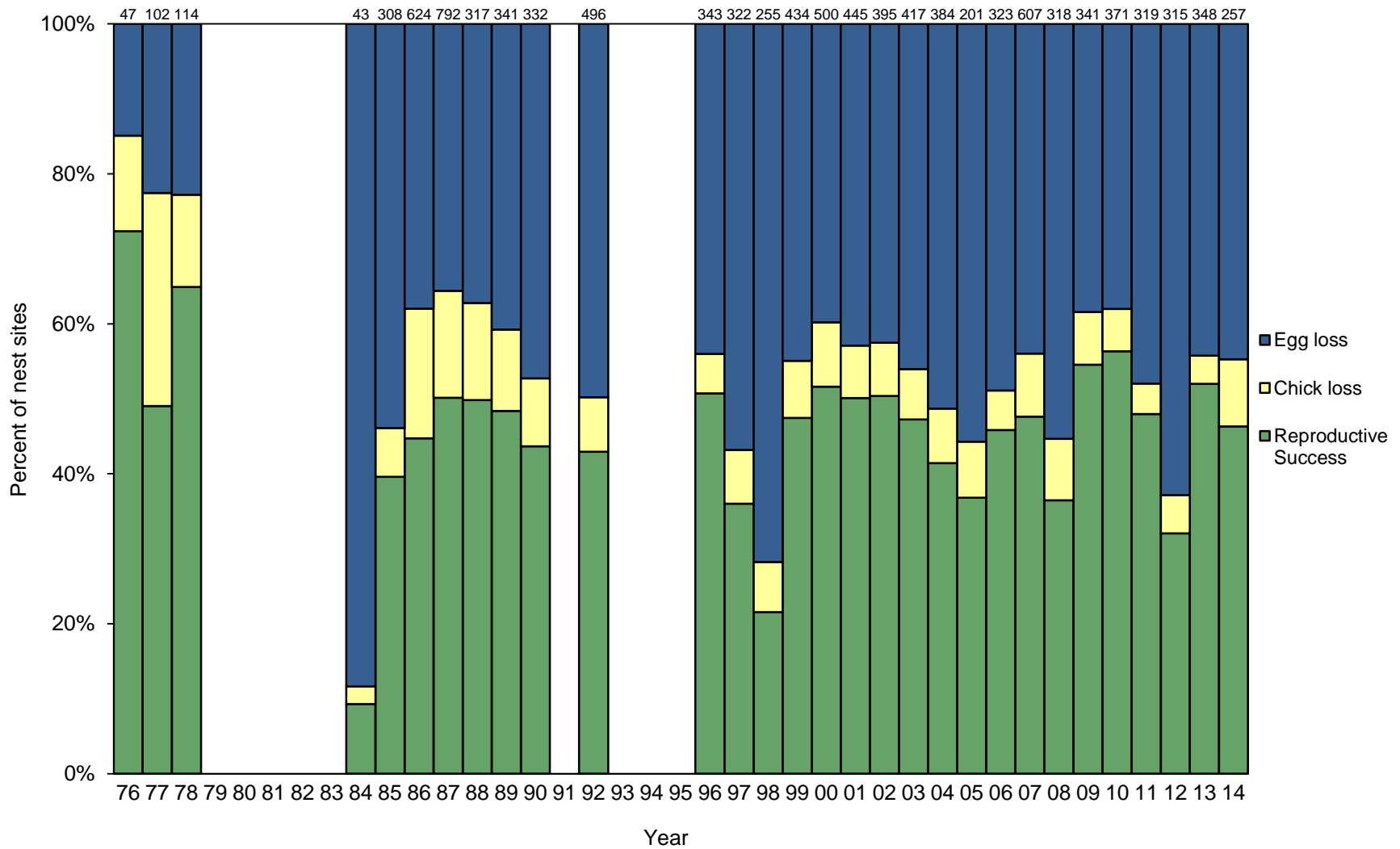


Figure 16. Reproductive performance of thick-billed murrelets at St. Paul Island, Alaska. Egg loss= $(B-D)/B$; Chick loss= $(D-F)/B$; Reproductive success= F/B , where B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (B).

Table 31. Reproductive performance of thick-billed murres at St. Paul Island, Alaska.

Year	Nest sites w/ eggs (B)	Nest sites w/ chicks (D)	Nest sites w/ chicks fledged (F)	Nesting success (D/B) ^a	Fledging success (F/D) ^b	Reproductive success (F/B)
1975	<i>no data</i>	-	-	-	-	-
1976	47	40	34	0.85	0.85 ^d	0.72
1977	102	(79) ^c	(50)	0.75 ^d	0.63 ^d	0.49 ^d
1978	114	(88)	(74)	0.77 ^d	0.84 ^d	0.65 ^d
1979	<i>no data</i>	-	-	-	-	-
1980	<i>no data</i>	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-
1984	43	5	4	0.12	0.80	0.09
1985	308	142	122	0.46	0.86	0.40
1986	624	387	279	0.62	0.72	0.45
1987	792	510	397	0.64	0.78	0.50
1988	317	199	158	0.63	0.79	0.50
1989	341	202	165	0.59	0.82	0.48
1990	332	175	145	0.53	0.83	0.44
1991	<i>no data</i>	-	-	-	-	-
1992	496	249	213	0.50	0.86	0.43
1993	<i>no data</i>	-	-	-	-	-
1994	<i>no data</i>	-	-	-	-	-
1995	<i>no data</i>	-	-	-	-	-
1996	343	192	174	0.56	0.91	0.51
1997	322	139	116	0.43	0.83	0.36
1998	255	72	55	0.28	0.76	0.22
1999	434	239	206	0.55	0.86	0.47
2000	500	301	258	0.60	0.86	0.52
2001	445	254	223	0.57	0.88	0.50
2002	395	227	199	0.57	0.88	0.50
2003	417	225	197	0.54	0.88	0.47
2004	384	187	159	0.49	0.85	0.41
2005	201	89	74	0.44	0.83	0.37
2006	323	165	148	0.51	0.90	0.46
2007	607	340	289	0.56	0.85	0.48
2008	318	142	116	0.45	0.82	0.36
2009	341	210	186	0.62	0.89	0.55
2010	371	230	209	0.62	0.91	0.56
2011	319	166	153	0.52	0.92	0.48
2012	315	117	101	0.37	0.86	0.32
2013	348	194	181	0.56	0.93	0.52
2014	257	142	119	0.55	0.84	0.46

^aFor single-egg species, nesting success (D/B) is the same as hatching success (E/C) because nest sites w/ eggs (B)=total eggs (C) and nest sites w/ chicks (D)=total chicks (E).

^bFor single-egg species, fledging success (F/B) is the same as chick success (G/E) because nest sites w/ chicks (D)=total chicks (E) and nest sites w/ chicks fledged (F)=total chicks fledged (G).

^cValues in parentheses were not reported by original investigators and are estimated from other known parameters.

^dReported values are the midpoint of a range (see Appendix E).

Table 32. Standard deviation in reproductive performance parameters of thick-billed murres at St. Paul Island, Alaska. Sampling for murres is clustered by plot except when sample sizes per plot are too small or plot data are not available.

Year	No. plots ^a	Nest sites w/ eggs	Sampling design ^b	Nesting success	Fledging success	Reproductive success
1975	<i>no data</i>	-	-	-	-	-
1976	-	47	Simple random	0.05	0.06	0.07
1977	-	102	Simple random	- ^c	- ^c	- ^c
1978	-	114	Simple random	- ^c	- ^c	- ^c
1979	<i>no data</i>	-	-	-	-	-
1980	<i>no data</i>	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-
1984	3	43	Cluster by plot	0.03	0.21	0.04
1985	11	308	Cluster by plot	0.05	0.04	0.05
1986	xx ^d	xx	xx	xx	xx	xx
1987	xx	xx	xx	xx	xx	xx
1988	xx	xx	xx	xx	xx	xx
1989	14	341	Cluster by plot	0.06	0.05	0.05
1990	13	332	Cluster by plot	0.05	0.03	0.05
1991	<i>no data</i>	-	-	-	-	-
1992	20	496	Cluster by plot	0.03	0.03	0.03
1993	<i>no data</i>	-	-	-	-	-
1994	<i>no data</i>	-	-	-	-	-
1995	<i>no data</i>	-	-	-	-	-
1996	14	343	Cluster by plot	0.03	0.03	0.03
1997	13	322	Cluster by plot	0.04	0.05	0.05
1998	10	255	Cluster by plot	0.05	0.06	0.04
1999	17	434	Cluster by plot	0.04	0.02	0.04
2000	19	500	Cluster by plot	0.03	0.03	0.03
2001	17	445	Cluster by plot	0.03	0.02	0.03
2002	16	395	Cluster by plot	0.04	0.03	0.05
2003	16	417	Cluster by plot	0.03	0.01	0.03
2004	16	384	Cluster by plot	0.04	0.04	0.04
2005	7	201	Cluster by plot	0.12	0.05	0.11
2006	15	323	Cluster by plot	0.04	0.02	0.04
2007	20	607	Cluster by plot	0.03	0.02	0.03
2008	12	318	Cluster by plot	0.02	0.03	0.02
2009	12	341	Cluster by plot	0.02	0.02	0.03
2010	13	371	Cluster by plot	0.03	0.02	0.04
2011	13	319	Cluster by plot	0.04	0.02	0.04
2012	13	315	Cluster by plot	0.04	0.03	0.03
2013	15	348	Cluster by plot	0.03	0.02	0.03
2014	12	257	Cluster by plot	0.04	0.03	0.03

^aPlots that are combined for analysis are counted as a single "plot".

^bFor sampling clustered by plot, values are calculated based on plot as a sample unit; for simple random sampling, values are calculated using $\sqrt{\rho * (1 - \rho) / n}$, where ρ is the success rate and n is the sample size of individual nests.

^cStandard deviations are not calculated for success values that are midpoint estimates.

^dxx indicates data potentially exist but have not yet been summarized.

Table 33. Reproductive performance of thick-billed murrelets at St. Paul Island, Alaska in 2014.

Parameter	Plot												Total	SD ^b
	104/ 87 ^a	54/ 55 ^a	64/65/ 66 ^a	67/ 68 ^a	85/ 86 ^a	110	114	48	53	80/ 81 ^a	84	89		
Nest sites w/ eggs (B)	26	14	28	30	30	16	27	19	15	17	17	18	257	-
Nest sites w/ chicks (D)	14	5	11	19	18	10	19	5	8	12	9	12	142	-
Nest sites w/ chicks fledged (F)	10	4	10	15	15	9	16	5	6	12	8	9	119	-
Nesting success (D/B) ^c	0.54	0.36	0.39	0.63	0.60	0.63	0.70	0.26	0.53	0.71	0.53	0.67	0.55	0.04
Fledging success (F/D) ^d	0.71	0.80	0.91	0.79	0.83	0.90	0.84	1.00	0.75	1.00	0.89	0.75	0.84	0.03
Reproductive success (F/B)	0.38	0.29	0.36	0.50	0.50	0.56	0.59	0.26	0.40	0.71	0.47	0.50	0.46	0.03

^aPlots were combined for statistical purposes.

^bStandard deviations are calculated based on plot as a sample unit.

^cFor single-egg species, nesting success (D/B) is the same as hatching success (E/C) because nest sites w/ eggs (B)=total eggs (C) and nest sites w/ chicks (D)=total chicks (E).

^dFor single-egg species, fledging success (F/B) is the same as chick success (G/E) because nest sites w/ chicks (D)=total chicks (E) and nest sites w/ chicks fledged (F)=total chicks fledged (G).

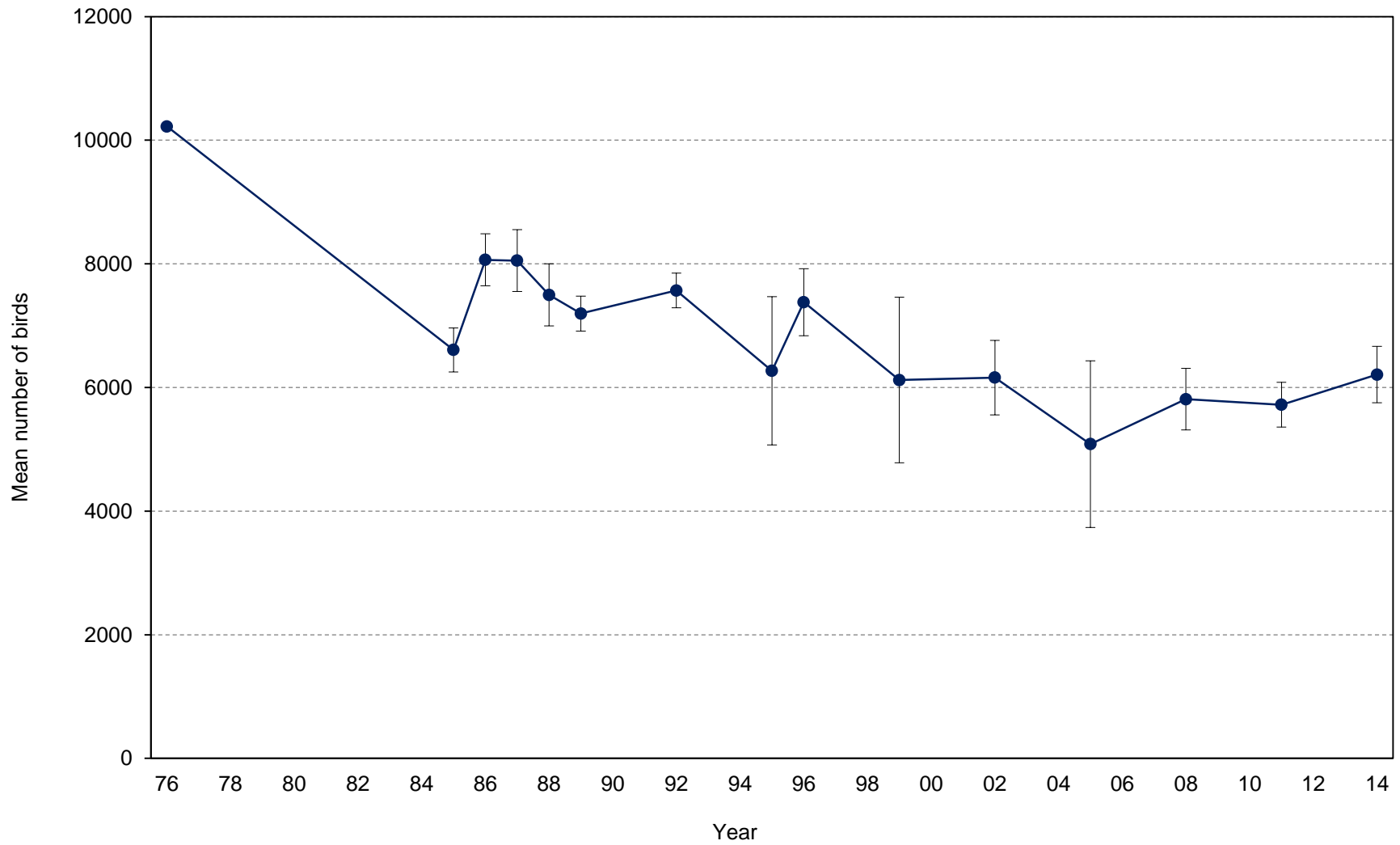


Figure 17. Mean numbers of thick-billed murres counted on index at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Data from 1982 and 1984 are excluded because not all plots were counted. Error bars represent standard deviation.

Table 34. Numbers of thick-billed murres counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. No counts were conducted during years not listed; data from 1982 and 1984 are excluded because not all plots were counted.

Replicate	1976	1985	1986	1987	1988	1989	1992	1995	1996	1999	2002	2005	2008	2011	2014
1	10223	6460	7473	7335	6877	6921	7216	5251	7121	4147	5165	2957	5662	6090	6491
2	-	6478	8295	8152	6966	6904	7511	5966	6513	5139	6109	4156	5451	5886	5647
3	-	6358	8499	7865	7813	6953	7381	7592	7561	5816	6109	3985	5075	6138	5612
4	-	7134	8271	7763	7080	7406	7776	-	7552	7084	7050	4714	6656	5857	6518
5	-	-	7789	8676	7755	7272	7854	-	7388	7750	6282	6223	5645	5771	6370
6	-	-	-	8525	8046	7002	7766	-	8149	6786	6243	6918	6359	5465	6618
7	-	-	-	-	7948	7560	-	-	-	-	-	6078	5784	5049	-
8	-	-	-	-	-	7544	-	-	-	-	-	5639	5849	5510	-
Mean	10223	6608	8065	8053	7498	7195	7581	6270	7381	6120	6160	5084	5810	5721	6209
<i>n</i>	1	4	5	6	7	8	6	3	6	6	6	8	8	8	6
SD	-	355	421	501	502	283	252	1200	543	1340	602	1346	498	363	456
First count	17 Jul	xx ^a	6 Jul	9 Jul	12 Jul	17 Jul	12 Jul	9 Jul	10 Jul	7 Jul	8 Jul	11 Jul	1 Jul	6 Jul	7 Jul
Last count	21 Jul	xx	29 Jul	23 Jul	7 Aug	9 Aug	7 Aug	3 Aug	2 Aug	7 Aug	1 Aug	31 Jul	31 Jul	1 Aug	27 Jul

^axx indicates data potentially exist but have not yet been summarized.

Table 35. Numbers of thick-billed murres counted on index plots at St. Paul Island, Alaska in 2014.

Plot	Replicate						Mean	SD
	1 7-9 Jul	2 10-12 Jul	3 13-15 Jul	4 17-19 Jul	5 21-23 Jul	6 25-27 Jul		
1	5	8	6	13	11	9	-	-
2sw	0	0	0	0	0	0	-	-
2ne	0	0	0	0	0	0	-	-
3	27	32	27	24	30	39	-	-
4	19	17	21	21	27	22	-	-
5sw	176	190	163	212	238	205	-	-
5ne	15	27	29	29	34	43	-	-
6 ^a	-	-	-	-	-	-	-	-
7	25	28	23	28	33	19	-	-
8	24	71	54	45	57	58	-	-
9	-	-	-	-	-	-	-	-
10	128	110	113	118	132	118	-	-
11	23	24	22	22	21	22	-	-
12	87	66	68	83	73	85	-	-
13	94	92	87	113	89	111	-	-
14	398	306	188	288	313	309	-	-
15	55	57	60	48	65	53	-	-
16 ^a	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-
18	39	36	45	55	48	55	-	-
19top	97	60	97	104	103	75	-	-
19btm	181	171	206	200	252	219	-	-
20top	43	40	45	43	41	50	-	-
20btm	46	54	58	45	38	32	-	-
21 ^a	-	-	-	-	-	-	-	-
22	328	223	142	336	321	291	-	-
23	144	129	122	124	105	130	-	-
24	55	39	41	47	56	52	-	-
25	51	34	43	44	34	47	-	-
26	55	49	74	67	64	78	-	-
27	0	0	0	0	0	0	-	-
28	58	41	54	55	54	65	-	-
29 ^a	-	-	-	-	-	-	-	-
29new	81	65	55	77	67	70	-	-
30	51	41	46	36	33	41	-	-
31	1429	1263	1357	1379	1331	1453	-	-
32	1132	984	884	1085	1018	1080	-	-
33	1625	1390	1482	1777	1682	1787	-	-
Total ^b	6491	5647	5612	6518	6370	6618	6209	456

^aHistorical plots no longer counted.

^bTotals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30.

Table 36. Total number of adult thick-billed murres banded on survival plots at St. Paul Island, Alaska. Data include birds banded with alphanumeric color bands and three color band combinations (2008 only).

Parameter	Year						
	2008	2009	2010	2011	2012	2013	2014
New color bands	2	16	33	3	0	0	0
New metal and colors	2	14	29	0	0	0	0
New colors on previous metal-banded bird ^a	0	2	4	3	0	0	0
New color bands replace old color bands ^b	0	0	0	0	0	0	0
Cum. color-banded birds	2	18	51	54	54	54	54

^aBird previously banded with metal band only, caught subsequent year and given color band; adds one bird to number of new color bands.

^bBird previously banded with color band recaptured and given new color band; does not add to number of birds color-banded.

Table 37. Fates of cohorts of adult thick-billed murres banded on survival plots at St. Paul Island, Alaska. Data include birds banded with alphanumeric color bands and three color band combinations (2008 only).

Year	No. birds banded in year	No. birds resighted in:						Prop. birds resighted in 2014
		2009	2010	2011	2012	2013	2014	
2008	2	2	2	1	1	0	0	0.00
2009	15	-	10	9	7	6	6	0.40
2010	33	-	-	23	25	16	18	0.55
2011	2	-	-	-	2	1	2	1.00
2012	0	-	-	-	-	-	-	-
2013	0	-	-	-	-	-	-	-
2014	0 ^a	-	-	-	-	-	-	- ^a
Birds seen in current year (A)		2	12	33	35	23	26	-
Birds potentially alive from prior year (B) ^b		2	17	50	43	40	32	-
Apparent annual survival (A/B) ^c		1.00	0.61	0.63	0.86	0.63	0.81	-
Resighting effort ^d								
Total no. resight days		4	11	22	29	13	26	-
Total no. resight hours		N/A ^e	18.9	11.3	16.9	4.5	N/A	-

^aBirds banded in current year are not resighted until following year and not included in current year totals.

^bValue equals the sum of birds resighted in prior year + birds not resighted in prior year but resighted in future years and thus known to have been alive in prior year + new birds banded in prior year.

^cSurvival should be considered a minimum estimate because it is likely not all birds present were observed each year.

^dResighting effort represents sum of time spent at survival plots and includes only dedicated resighting time, not incidental observations made during other work. Hours are calculated by people-hours: 2 people resighting for 1 hour each = 2 resight hours.

^eN/A indicates total resight hours not recorded.

Table 38. Resight history of adult thick-billed murres banded on survival plots at St. Paul Island, Alaska. Values represent number of times birds were resighted each year. Color codes are recorded as color and # of band for birds banded with alphanumeric color bands, and as colors (in code) of bands on left (L) and right (R) legs for birds banded with three band combinations.

Color band		Metal band #	Year banded	Location banded	Notes	Year resighted					
Color or L leg	Band # or R leg					2009	2010	2011	2012	2013	2014
DG/O	DB	1186-04112	2008	ZD		2	3	0	0	0	0
DG/R	DB	1186-04122	2008	ZD		3	5	1	3	0	0
Yellow	A5	1186-04115	2009	ZD		-	6	3	2	1	1
Yellow	A6	1186-04202	2009	ZD		-	0	3	4	1	1
Yellow	A7	1186-04203	2009	ZD		-	0	8	3	0	0
Yellow	A9	895-12792	2009	ZD		-	2	0	0	0	0
Yellow	A0	1186-04118	2009	ZD		-	5	1	0	0	0
Yellow	C1	895-12791	2009	ZD		-	1	0	1	0	0
Yellow	E1	1186-04223	2009	Z84		-	1	0	0	0	0
Yellow	E2	1186-04224	2009	Z84		-	4	2	3	5	2
Yellow	E3	1186-04225	2009	Z84		-	0	0	0	0	0
Yellow	E4	1186-04226	2009	Z84		-	4	0	0	0	0
Yellow	E5	1186-04784	2010	PZD		-	-	5	3	1	3
Yellow	E7	1186-04786	2010	PZD		-	-	9	8	4	5
Yellow	E0	1186-04766	2010	TO		-	-	1	1	0	0
Yellow	F7	1186-04770	2010	ZD		-	-	2	3	0	1
Yellow	H2	1186-04768	2010	TO		-	-	0	1	0	5
Yellow	H4	1186-04767	2010	TO		-	-	0	0	0	0
Yellow	H5	1186-04783	2010	PZD		-	-	4	3	2	6
Yellow	H6	1186-04785	2010	PZD		-	-	3	0	0	1
Yellow	H0	1186-04769	2010	TO		-	-	0	0	0	0
Yellow	J2	1186-04109	2009	Z84		-	0	5	2	1	1
Yellow	J3	1186-04110	2009	Z84		-	0	1	3	0	0
Yellow	L6	1186-04247	2010	TO		-	-	2	5	1	3
Yellow	L7	1186-04248	2010	TO		-	-	0	0	0	0
Yellow	L8	1186-04249	2010	TO		-	-	0	0	0	0
Yellow	L9	1186-04250	2010	ZD		-	-	6	4	1	3
Yellow	M1	1186-04243	2010	TO		-	-	0	3	1	0
Yellow	M2	1186-04244	2010	TO		-	-	0	0	0	1
Yellow	M3	1186-04245	2010	TO		-	-	4	4	1	0
Yellow	M4	1186-04137	2010	PZD		-	-	5	4	0	0
Yellow	M5	1186-04246	2010	ZD		-	-	1	2	3	0
Yellow	M6	1186-04761	2010	ZD		-	-	0	1	1	0
Yellow	M7	1186-04764	2010	ZD		-	-	6	7	1	2
Yellow	M8	1186-04782	2010	PZD		-	-	11	11	2	7

Table 38 (continued). Resight history of adult thick-billed murres banded on survival plots at St. Paul Island, Alaska. Values represent number of times birds were resighted each year. Color codes are recorded as color and # of band for birds banded with alphanumeric color bands, and as colors (in code) of bands on left (L) and right (R) legs for birds banded with three band combinations.

Codes: Color combos			Location		Resight history						
DB = dark blue		R = red	ZD = Zapadni Dip		0 = not resighted						
DG = dark green		W = white	PZD = Past Zapadni Dip		x = band no longer resightable (dead, removed, etc.)						
O = orange		Y = yellow			Z84 = Zapadni Plot 84 TO = Tolstoi						
Color band		Metal band #	Year banded	Location banded	Notes	Year resighted					
Color or L leg	Band # or R leg					2009	2010	2011	2012	2013	2014
Yellow	M9	1186-04781	2010	ZD		-	-	4	4	1	5
Yellow	M0	895-12797	2010	ZD		-	-	1	1	0	4
Yellow	N1	1186-04229	2010	TO		-	-	2	2	1	2
Yellow	N2	1186-04230	2010	TO		-	-	1	2	0	1
Yellow	N3	1186-04235	2010	TO		-	-	3	4	2	0
Yellow	N4	1186-04236	2010	TO		-	-	1	4	0	0
Yellow	N5	1186-04237	2010	TO		-	-	0	2	0	0
Yellow	N6	1186-04108	2010	PZD		-	-	1	1	1	2
Yellow	N7	1186-04116	2010	ZD		-	-	0	2	0	0
Yellow	N8	1186-04762	2010	ZD		-	-	2	0	0	1
Yellow	N9	1186-04765	2010	ZD		-	-	1	0	0	0
Yellow	N0	1186-04763	2010	ZD		-	-	5	9	4	1
Yellow	P1	1186-04231	2009	Z84		-	0	1	0	0	0
Yellow	P2	1186-04232	2009	Z84		-	1	3	0	0	3
Yellow	P3	1186-04233	2009	Z84		-	0	2	5	1	2
Yellow	P4	1186-04234	2009	Z84		-	1	4	4	1	0
Yellow	R0	846-00195	2011	ZD		-	-	-	5	1	2
Yellow	R7	118-604113	2011	ZD		-	-	-	5	0	5
Yellow	T1	1186-04206	2011	ZD		-	-	-	4	3	0
Total birds resighted						2	11	35	38	24	26

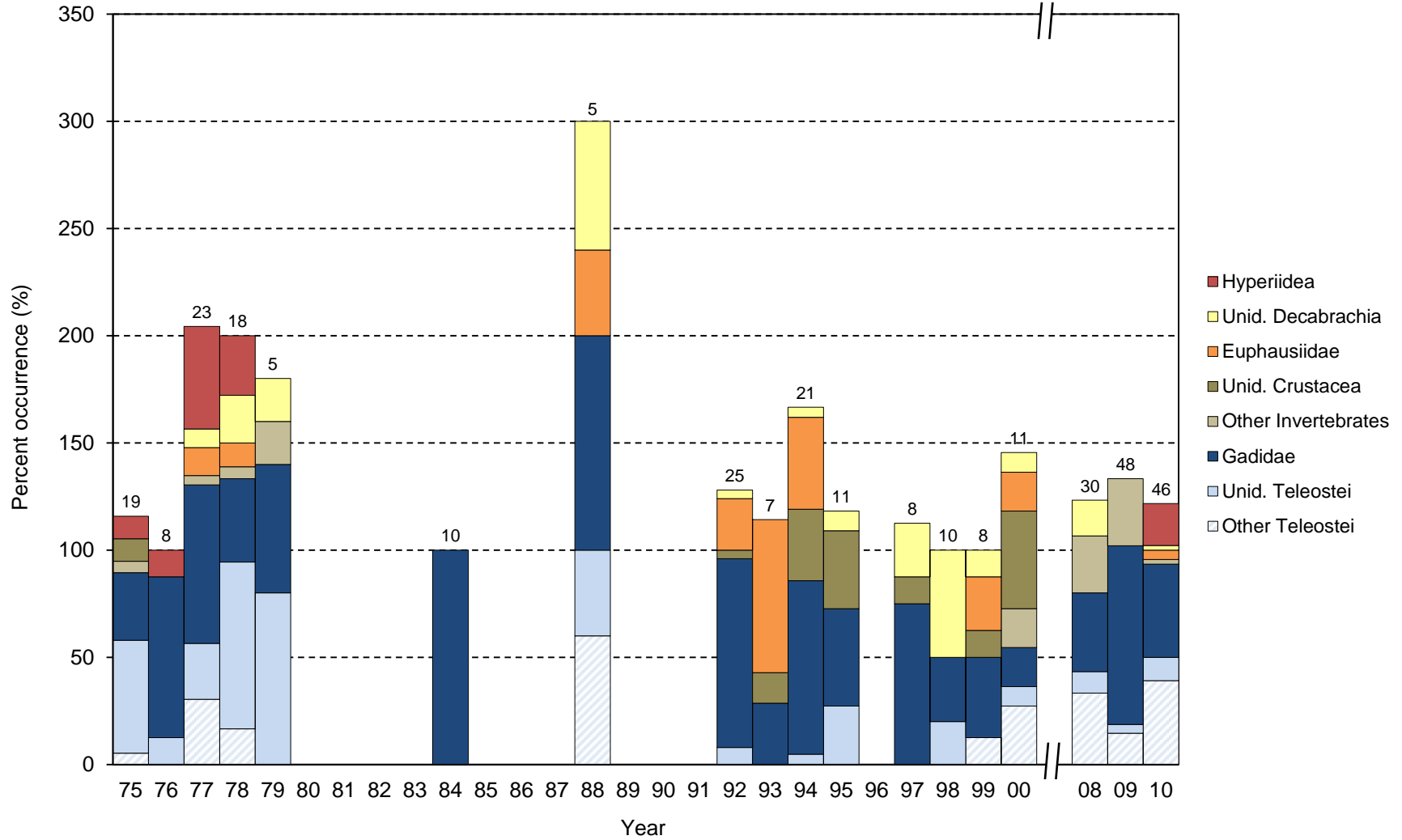


Figure 18. Frequency of occurrence of major prey items in diets of thick-billed murre adults at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Numbers above columns indicate sample sizes.

Table 39. Frequency of occurrence of major prey items in diets of thick-billed murre adults at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as "others" in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of stomach contents collected from adults near or at the colony. No diet samples were collected in 1980-1983, 1985-1987, 1989-1991, 1996, 2001-2007 or after 2010. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1975	1976	1977	1978	1979	1984	1988	1992	1993	1994	1995	1997	1998	1999	2000	2008	2009	2010
No. samples	19	8	23	18	5	10	5	25	7	21	11	8	10	8	11	30	48	46
Invertebrates	26.3	25.0	56.5	44.4	20.0	-	80.0	32.0	85.7	71.4	45.5	37.5	50.0	62.5	72.7	46.7	33.3	34.8
Amphipoda	10.5	25.0	47.8	27.8	-	-	-	-	-	-	-	-	-	12.5	-	6.7	-	28.3
Hyperiidea	10.5	12.5	47.8	27.8	-	-	-	-	-	-	-	-	-	-	-	-	-	19.6
<i>Themisto libellula</i>	5.3	12.5	43.5	27.8	-	-	-	-	-	-	-	-	-	-	-	-	-	13.0
Other Amphipoda	5.3	12.5	-	-	-	-	-	-	-	-	-	-	-	12.5	-	6.7	-	8.7
Cephalopoda	-	-	8.7	22.2	20.0	-	60.0	4.0	-	4.8	9.1	25.0	50.0	12.5	9.1	16.7	4.2	2.2
Unid. Decabrachia	-	-	8.7	22.2	20.0	-	60.0	4.0	-	4.8	9.1	25.0	50.0	12.5	9.1	16.7	-	2.2
Other Cephalopoda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.2	-
Euphausiacea	-	-	13.0	11.1	-	-	40.0	24.0	71.4	42.9	-	-	-	25.0	18.2	-	-	4.3
Euphausiidae	-	-	13.0	11.1	-	-	40.0	24.0	71.4	42.9	-	-	-	25.0	18.2	-	-	4.3
<i>Thysanoessa</i> spp.	-	-	0.0	0.0	-	-	20.0	24.0	71.4	-	-	-	-	-	-	-	-	2.2
Unid. Euphausiidae	-	-	8.7	11.1	-	-	20.0	-	-	42.9	-	-	-	25.0	18.2	-	-	-
Other Euphausiidae	-	-	4.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3
Unid. Crustacea	10.5	-	-	-	-	-	-	4.0	14.3	33.3	36.4	12.5	-	12.5	45.5	-	-	-
Other Invertebrates	5.3	-	4.3	5.6	20.0	-	-	-	-	-	-	-	-	-	18.2	26.7	31.3	2.2
Fish	84.2	75.0	87.0	100.0	100.0	100.0	100.0	92.0	28.6	85.7	72.7	75.0	50.0	50.0	45.5	70.0	93.8	89.1
Teleostei	84.2	75.0	87.0	100.0	100.0	100.0	100.0	92.0	28.6	85.7	72.7	75.0	50.0	50.0	45.5	70.0	93.8	89.1
Gadidae	31.6	75.0	73.9	38.9	60.0	100.0	100.0	88.0	28.6	81.0	45.5	75.0	30.0	37.5	18.2	36.7	83.3	43.5
<i>Gadus chalcogrammus</i>	10.5	25.0	-	38.9	-	50.0	100.0	88.0	28.6	81.0	36.4	75.0	30.0	37.5	18.2	23.3	72.9	19.6
Unid. Gadidae	21.1	62.5	73.9	-	60.0	50.0	40.0	-	-	-	-	-	-	-	-	13.3	-	23.9
Other Gadidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.7	4.3
Unid. Teleostei	52.6	12.5	26.1	77.8	80.0	-	40.0	8.0	-	4.8	27.3	-	20.0	-	9.1	10.0	4.2	10.9
Other Teleostei	5.3	-	30.4	16.7	-	-	60.0	-	-	-	-	-	-	12.5	27.3	33.3	14.6	39.1
Other	5.3	25.0	4.3	-	-	40.0	-	-	-	-	-	-	-	-	-	3.3	-	-

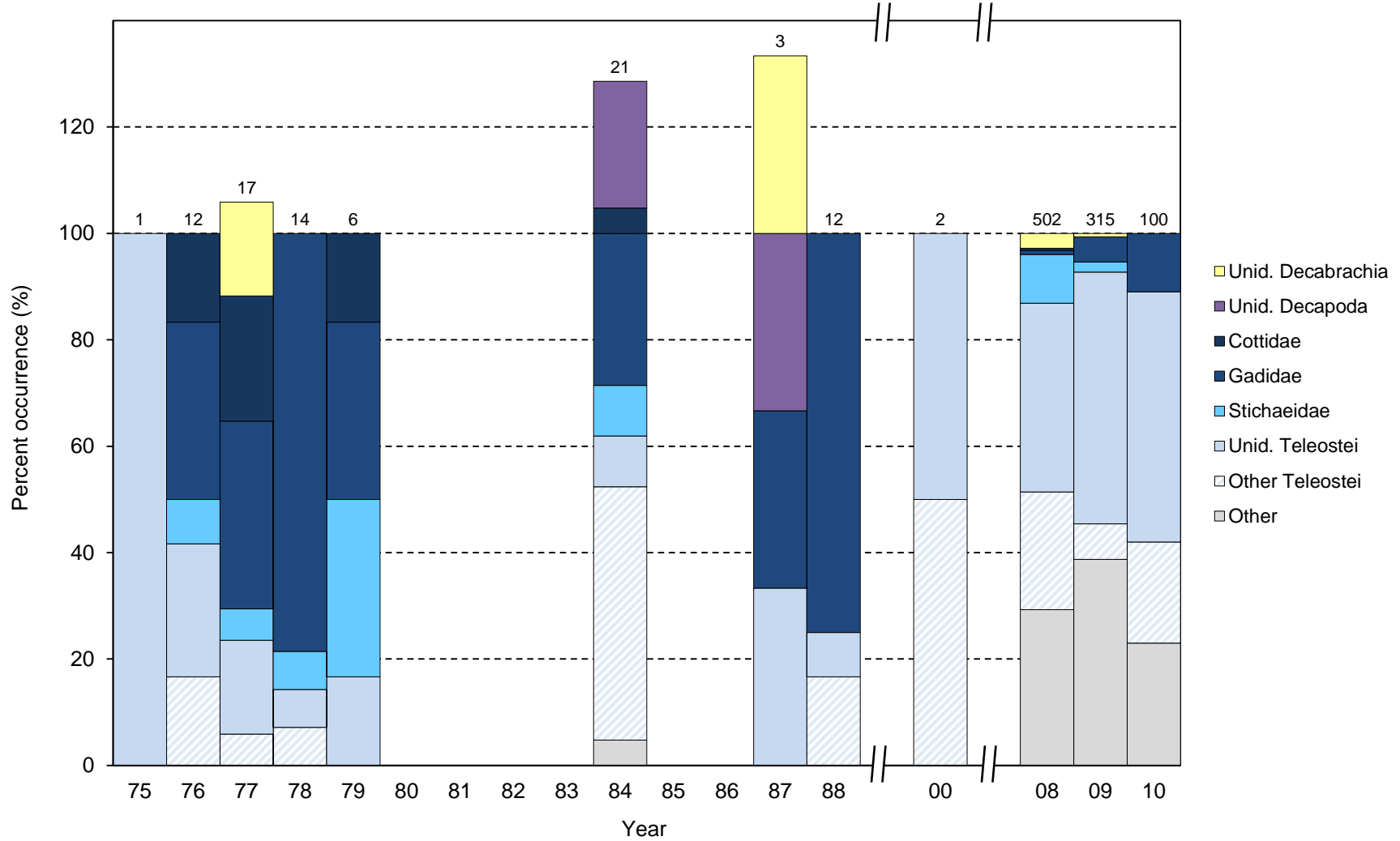


Figure 19. Frequency of occurrence of major prey items in diets of thick-billed murre chick at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Numbers above columns indicate sample sizes.

Table 40. Frequency of occurrence of major prey items in diets of thick-billed murre chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as “others” in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of bill loads collected (1975-1988) and observed (2000- 2010) from adults returning to the colony to feed chicks and regurgitations collected from chicks (1976, 1979-1988). No diet samples were collected in 1980-1983, 1985-1986, 1989-1999 or after 2010. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1975	1976	1977	1978	1979	1984	1987	1988	2000	2008	2009	2010
No. samples	1	12	17	14	6	21	3	12	2	502	315	100
Invertebrates	-	16.7	17.6	-	33.3	33.3	66.7	-	-	2.8	0.6	-
Cephalopoda	-	-	17.6	-	-	-	33.3	-	-	2.8	0.6	-
Unid. Decabrachia	-	-	17.6	-	-	-	33.3	-	-	2.8	0.6	-
Decapoda	-	-	-	-	16.7	23.8	33.3	-	-	-	-	-
Unid. Decapoda	-	-	-	-	-	23.8	33.3	-	-	-	-	-
Other Decapoda	-	-	-	-	16.7	-	-	-	-	-	-	-
Other Invertebrates	-	16.7	-	-	16.7	19.0	-	-	-	-	-	-
Fish	100.0	100.0	82.4	100.0	100.0	100.0	66.7	100.0	100.0	67.9	60.6	77.0
Teleostei	100.0	100.0	82.4	100.0	100.0	100.0	66.7	100.0	100.0	67.9	60.6	77.0
Cottidae	-	16.7	23.5	-	16.7	4.8	-	-	-	0.4	-	-
Gadidae	-	33.3	35.3	78.6	33.3	28.6	33.3	75.0	-	0.8	4.8	11.0
<i>Gadus chalcogrammus</i>	-	25.0	29.4	78.6	33.3	4.8	33.3	66.7	-	0.6	-	-
Other Gadidae	-	8.3	5.9	-	-	23.8	-	8.3	-	0.2	4.8	11.0
Stichaeidae	-	8.3	5.9	7.1	33.3	9.5	-	-	-	9.2	1.9	-
Unid. Teleostei	100.0	25.0	17.6	7.1	16.7	9.5	33.3	8.3	50.0	35.5	47.3	47.0
Other Teleostei	-	16.7	5.9	7.1	-	47.6	-	16.7	50.0	22.1	6.7	19.0
Other	-	-	-	-	-	4.8	-	-	-	29.3	38.7	23.0
Unidentified	-	-	-	-	-	4.8	-	-	-	29.3	38.7	23.0

Table 41. Total number of least auklets banded on survival plot at St. Paul Island, Alaska. Banding dates were not recorded for some birds so these data are presented as a range of potential banding dates (e.g., ≤88). Monitoring of auklet survival ended at St. Paul after 2002 and moved to neighboring St. George Island in 2003.

Parameter	Year																			
	87	≤88	≤89	90	91	≤92	92	93	94	95	≤96	96	≤97	97	98	99	≤00	00	01	02
Total new birds banded	89	74	4	0	0	1	6	0	0	0	1	84	3	82	27	10	1	44	5	0
New color band combinations (adults)	85	59	4	0	0	1	6	0	0	0	1	84	3	82	27	10	1	44	5	0
New color band combinations (subadults)	4	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cum. color-banded birds (adults only)	85	144	148	148	148	149	155	155	155	155	156	240	243	325	352	362	363	407	412	412
Cum. total birds banded (adults and subadults)	89	163	167	167	167	168	174	174	174	174	175	259	262	344	371	381	382	426	431	431

Table 42. Fates of cohorts of least auklets banded on survival plot at St. Paul Island, Alaska. Data do not include birds banded as subadults ($n=19$). Banding dates were not recorded for some birds so these data are presented as a range of potential banding dates (e.g., ≤ 1988). Annual resight effort data are unknown. Monitoring of auklet survival ended at St. Paul after 2002 and moved to neighboring St. George Island in 2003.

Year	No. birds banded in year ^a	No. birds resighted in:																Proportion banded birds alive in 2002
		87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	
1987	85	(85) ^b	67	58	0	0	57	21	0	14	9	13	10	9	7	10	1	0.01
≤ 1988	59		(59)	34	0	0	31	16	0	10	10	13	10	12	3	9	2	0.03
≤ 1989	4			(4)	-	-	2	0	0	2	1	1	1	0	0	0	0	0.00
1990	0				(0)	-	-	-	-	-	-	-	-	-	-	-	-	-
1991	0					(0)	-	-	-	-	-	-	-	-	-	-	-	-
≤ 1992	1						(1)	0	0	0	0	0	0	0	0	0	0	0.00
1992	6						(6)	1	0	2	2	3	1	1	2	1	1	0.17
1993	0							(0)	-	-	-	-	-	-	-	-	-	-
1994	0								(0)	-	-	-	-	-	-	-	-	-
1995	0									(0)	-	-	-	-	-	-	-	-
≤ 1996	1										(1)	1	1	1	1	0	0	0.00
1996	84											(84)	56	34	26	20	16	11
≤ 1997	3												(3)	0	0	0	1	0
1997	82													(82)	46	37	28	18
1998	27														(27)	17	14	14
1999	10															(10)	6	5
≤ 2000	1																(1)	0
2000	44																	(44)
2001	5																	(5)
No. birds seen in current year (A)		-	67	92	-	-	90	38	0	28	22	87	103	103	81	105	59	-
Birds potentially alive from prior year (B) ^c		-	85	144	-	-	148	155	117	94	94	164	223	191	162	165	123	-
Apparent annual survival (A/B) ^d		-	0.79	0.64	-	-	0.61	0.25	0.00	0.30	0.23	0.53	0.46	0.54	0.50	0.64	0.48	-

^aData include only those birds resighted at least once after banding (either in the year of banding or in future years); birds banded but never again seen on the plot are excluded from the survival dataset. Therefore, these values may be less than the total number of birds banded reported in Table 41.

^bNot all birds banded in the current year had the opportunity to be resighted that year because banding often occurred towards the end of the resighting season. Therefore, the number of birds resighted the year they were banded should not be considered an accurate estimate of survival.

^cValue equals the sum of birds resighted in prior year + birds not resighted in prior year but resighted in future years and thus known to have been alive in prior year + new birds banded in prior year. For these purposes, birds banded in ≤ 1996 and 1996 are lumped as birds banded the year prior to 1997; birds banded in ≤ 1997 and 1997 are lumped as birds banded in the year prior to 1998, birds banded in ≤ 2000 and 2000 are lumped as birds banded the year prior to 2001.

^dSurvival should be considered a minimum estimate because it is likely not all birds present were observed each year and, in some years, small numbers of birds with missing bands were observed and could not be individually identified.

Table 43. Resight history of least auklets banded on survival plot at St. Paul Island, Alaska. All birds were banded as adults unless otherwise noted. Data do not include six color-combinations used on duplicate birds, making individual resight history impossible to determine. Monitoring of auklet survival ended at St. Paul after 2002 and moved to neighboring St. George Island in 2003.

Color bands		Metal band #	Year banded	Notes	Year resighted															
L	R				87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
O/BK	R	?	1987		y	y	y	no	no	2+	0	0	2+	2+	0	0	0	0	0	0
LG/DB	O	802-22776	1987		y	y	y	data	data	2+	0	0	0	0	0	0	0	0	0	0
DB/DB	Y	802-27606	1987		y	y	y	-	-	2+	1	0	0	0	0	0	0	0	0	0
DB/Y	Y	802-27607	1987		y	y	y	-	-	2+	0	0	2+	0	2+	2+	0	0	0	0
DB/O	Y	802-27608	1987		y	y	y	-	-	2+	1	0	0	0	0	0	0	0	0	0
DB/R	Y	802-27609	1987		y	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0
DB/BK	Y	802-27610	1987		y	0	0	-	-	0	0	0	0	0	0	0	2+	0	0	0
DG/Y	BK	802-27622	1987		y	y	y	-	-	1	0	0	0	0	0	0	0	0	0	0
R/DG	DG	802-27626	1987		y	y	y	-	-	2+	1	0	0	0	0	0	0	0	0	0
Y/R	BK	802-27630	1987		y	y	y	-	-	2+	1	0	1	2+	2+	2+	2+	2+	2+	0
DB/BK	R	802-27638	1987		y	0	0	-	-	0	0	0	0	0	0	2+	0	0	0	0
R/Y	DG	802-27657	1987		y	y	y	-	-	2+	1	0	0	0	0	0	0	0	0	0
Y/LG	DG	802-27658	1987		y	y	y	-	-	2+	2+	0	0	0	0	0	0	0	0	0
DG/LG	DB	802-27662	1987		y	y	y	-	-	2+	1	0	2+	0	0	0	0	0	0	0
Y/DG	LG	802-27665	1987		y	y	y	-	-	1	0	0	0	0	0	0	0	0	0	0
DG/Y	Y	802-27667	1987		y	0	0	-	-	0	0	0	0	0	0	0	0	0	1	0
DG/DG	R	802-27668	1987		y	y	y	-	-	2+	2+	0	0	0	0	0	0	0	0	0
O/DG	BK	802-27669	1987		y	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0
O/O	O	802-27671	1987		y	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0
BK/O	DG	802-27672	1987		y	y	0	-	-	1	0	0	0	0	0	0	0	0	0	0
R/DB	BK	802-27673	1987		y	y	y	-	-	0	1	0	0	0	0	0	0	0	0	0
Y/DB	BK	802-27674	1987		y	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0
Y/DG	R	802-27681	1987		y	y	y	-	-	0	0	0	1	0	0	0	0	0	0	0
Y/O	O	802-27685	1987		y	y	0	-	-	0	0	0	0	0	0	1	0	0	0	0
DB/DG	O	802-27686	1987		y	y	y	-	-	0	0	0	0	0	0	0	2+	0	0	0
BK/R	O	802-27687	1987		y	0	0	-	-	2+	1	0	0	0	0	0	0	0	0	0
Y/Y	O	802-27689	1987		y	y	0	-	-	0	0	0	0	0	0	2+	0	0	0	0
R/DB	O	802-27691	1987		y	0	0	-	-	1	0	0	0	0	0	0	0	0	0	0
DG/R	O	802-27695	1987		y	y	y	-	-	2+	0	0	1	0	0	0	0	0	0	0
O/DG	O	802-27696	1987		y	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0
DG/DB	LG	802-27741	1987		y	y	y	-	-	2+	1	0	0	0	0	0	0	0	0	0
Y/DB	LG	802-27744	1987		y	0	0	-	-	2+	0	0	0	0	0	0	0	0	0	0
O/DG	DG	802-27745	1987		y	y	y	-	-	2+	1	0	0	0	0	0	0	0	0	0
R/Y	LG	802-27746	1987		y	y	y	-	-	2+	2+	0	0	0	0	0	0	0	0	0
LG/R	DB	802-27758	1987		y	y	y	-	-	2+	0	0	0	0	2+	1	0	2+	0	0
Y/LG	LG	802-27759	1987		y	0	0	-	-	1	0	0	0	0	0	0	0	0	0	0
LG/Y	DB	802-27760	1987		y	y	y	-	-	2+	0	0	0	0	0	0	0	2+	0	1

Table 43 (continued). Resight history of least auklets banded on survival plot at St. Paul Island, Alaska. All birds were banded as adults unless otherwise noted. Data do not include six color-combinations used on duplicate birds, making individual resight history impossible to determine. Monitoring of auklet survival ended at St. Paul after 2002 and moved to neighboring St. George Island in 2003.

Color bands		Metal band #	Year banded	Notes	Year resighted															
L	R				87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
LG/DB	DB	802-27764	1987		y	y	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
DG/LG	R	802-27765	1987		y	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0
LG/O	Y	802-27769	1987		y	0	0	-	-	0	0	0	0	1	0	0	0	0	0	0
O/O	LG	802-58258	1987		y	y	y	-	-	2+	0	0	0	2+	2+	0	0	0	0	0
O/Y	DB	802-58267	1987		y	y	y	-	-	2+	0	0	2+	0	2+	2+	2+	2+	0	0
DB/R	O	802-58283	1987		y	y	y	-	-	2+	2+	0	2+	0	0	0	0	0	0	0
R/R	LG	802-58285	1987		y	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0
BK/DB	O	802-58343	1987		y	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0
O/DG	R	802-58357	1987		y	y	y	-	-	2+	0	0	2+	0	0	0	0	0	0	0
O/Y	LG	802-58361	1987		y	0	0	-	-	1	0	0	0	0	0	0	0	0	0	0
LG/DB	DG	802-58373	1987		y	y	0	-	-	2+	0	0	0	0	0	0	0	2+	0	0
LG/Y	BK	802-58378	1987		y	y	y	-	-	0	0	0	0	0	0	0	0	0	1	0
DB/DB	LG	802-58403	1987		y	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0
LG/LG	Y	802-58408	1987		y	y	y	-	-	2+	0	0	0	0	2+	0	0	0	0	0
LG/BK	Y	802-58409	1987		y	y	y	-	-	2+	2+	0	0	0	0	0	0	0	0	0
DG/LG	LG	802-58410	1987		y	0	0	-	-	0	0	0	0	0	0	0	0	0	0	1
LG/DG	BK	802-58411	1987		y	y	0	-	-	0	0	0	0	0	0	0	0	0	0	1
O/R	BK	802-58419	1987		y	y	y	-	-	2+	2+	0	0	0	0	0	0	0	0	1
O/LG	R	802-58428	1987		y	y	y	-	-	2+	0	0	1	2+	2+	2+	2+	0	0	0
Y/BK	W	802-58432	1987		y	y	y	-	-	0	0	0	0	0	2+	2+	0	0	0	0
DB/O	W	802-58434	1987		y	0	0	-	-	0	0	0	0	0	0	0	0	0	0	2+
DG/DG	LG	802-58438	1987		y	y	0	-	-	0	1	0	0	0	0	0	0	0	0	0
O/BK	W	802-58440	1987		y	y	y	-	-	2+	0	0	1	2+	2+	2+	2+	0	0	0
R/LG	W	802-58444	1987		y	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
DB/DB	W	802-58452	1987		y	y	y	-	-	0	0	0	0	0	0	0	0	0	2+	0
Y/Y	R	802-58458	1987		y	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
W/Y	LG	802-58466	1987		y	y	0	-	-	0	0	0	0	0	0	0	0	0	0	1
W/O	LG	802-58467	1987		y	y	y	-	-	0	0	0	0	0	0	0	0	0	0	1
W/LG	O	802-58468	1987		y	0	0	-	-	1	0	0	0	0	0	0	0	0	0	0
BK/R	BK	802-58471	1987		y	y	y	-	-	2+	1	0	0	0	0	0	0	0	0	0
B/DG	BK	802-58472	1987		y	y	y	-	-	1	0	0	0	0	0	0	0	0	0	0
R/LG	Y	802-58503	1987		y	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0
DG/R	LG	802-58537	1987		y	y	y	-	-	0	0	0	0	0	0	0	0	0	0	1
DG/R	Y	802-58718	1987		y	y	y	-	-	2+	1	0	1	2+	0	0	2+	0	0	0
Y/O	LG	802-58739	1987		y	y	y	-	-	1	0	0	0	0	0	0	0	0	0	0
R/BK	BK	802-58744	1987		y	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0
O/DB	LG	802-58748	1987		y	y	y	-	-	0	0	0	0	0	0	0	0	0	0	1

Table 43 (continued). Resight history of least auklets banded on survival plot at St. Paul Island, Alaska. All birds were banded as adults unless otherwise noted. Data do not include six color-combinations used on duplicate birds, making individual resight history impossible to determine. Monitoring of auklet survival ended at St. Paul after 2002 and moved to neighboring St. George Island in 2003.

Color bands		Metal band #	Year banded	Notes	Year resighted																
L	R				87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	
BK/BK	R	none	1987		y	y	y	-	-	1	0	0	0	0	0	0	0	0	0	0	
DB/DB	R	none	1987		y	y	y	-	-	2+	0	0	0	0	0	0	0	2+	0	0	0
DB/LG	LG	none	1987		y	y	0	-	-	0	0	0	0	0	0	1	0	0	0	0	0
DG/DG	O	none	1987		y	0	0	-	-	0	1	0	0	0	0	0	0	0	0	0	0
DG/O	Y	none	1987		y	y	0	-	-	1	0	0	0	0	0	0	0	0	0	0	0
LG/DB	BK	none	1987		y	y	y	-	-	1	0	0	1	1	0	0	0	0	0	0	0
LG/R	R	none	1987		y	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0	0
LG/Y	DG	none	1987		y	0	y	-	-	0	0	0	0	0	0	0	0	1	0	0	0
R/DB	Y	none	1987		y	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0	0
R/LG	DG	none	1987		y	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0	0
Y/LG	BK	none	1987		y	y	y	-	-	2+	2+	0	1	0	0	0	0	0	0	0	0
R/W	BK	?	≤ 1988		0	y	y	-	-	0	0	0	2+	0	0	0	0	0	0	0	0
W/W	DB	802-58254	≤ 1988		0	y	y	-	-	2+	1	0	0	0	0	0	0	2+	0	0	0
W/DG	W	802-58260	≤ 1988		0	y	y	-	-	1	0	0	0	0	0	0	0	0	0	0	0
W/O	W	802-58261	≤ 1988		0	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0	0
W/LG	W	802-58263	≤ 1988		0	y	0	-	-	0	0	0	0	0	0	0	2+	0	0	0	0
W/BK	W	802-58265	≤ 1988		0	y	0	-	-	0	1	0	0	1	0	0	0	0	0	0	0
W/DB	W	802-58266	≤ 1988		0	y	y	-	-	2+	0	0	2+	2+	0	0	2+	0	0	0	0
DG/W	LG	802-58269	≤ 1988		0	y	y	-	-	0	0	0	0	0	0	0	2+	0	0	0	0
W/Y	DB	802-58270	≤ 1988		0	y	y	-	-	2+	2+	0	0	1	0	0	0	0	0	0	0
R/W	O	802-58271	≤ 1988		0	y	y	-	-	0	1	0	0	0	0	0	0	0	0	0	0
LG/DB	Y	802-58275	≤ 1988		0	y	y	-	-	1	1	0	0	0	0	0	0	0	0	0	0
DB/W	Y	802-58278	≤ 1988		0	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0	0
BK/BK	Y	802-58280	≤ 1988		0	y	0	-	-	2+	1	0	1	0	0	0	0	0	0	0	0
DG/W	DB	802-58282	≤ 1988		0	y	y	-	-	2+	2+	0	2+	2+	2+	2+	2+	2+	0	0	0
DB/LG	O	802-58286	≤ 1988		0	y	y	-	-	2+	0	0	2+	2+	2+	0	0	0	1	0	0
W/DG	O	802-58287	≤ 1988		0	y	0	-	-	0	0	0	0	0	2+	0	0	0	0	0	0
DB/R	LG	802-58288	≤ 1988		0	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0	0
DG/Y	O	802-58292	≤ 1988		0	y	0	-	-	1	0	0	0	0	0	0	0	0	0	0	0
Y/O	R	802-58295	≤ 1988		0	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0	0
BK/LG	LG	802-58296	≤ 1988		0	y	y	-	-	2+	0	0	0	0	0	0	0	0	0	0	0
BK/R	LG	802-58299	≤ 1988		0	y	0	-	-	2+	0	0	0	0	0	0	0	0	0	0	0
R/O	W	802-58315	≤ 1988		0	y	0	-	-	1	0	0	0	0	0	0	0	0	0	0	0
O/DB	DG	802-58317	≤ 1988		0	y	0	-	-	0	0	0	0	0	0	0	0	1	0	0	0
Y/BK	DG	802-58322	≤ 1988		0	y	0	-	-	0	0	0	0	0	0	0	0	0	1	0	0
DG/O	LG	802-58329	≤ 1988		0	y	0	-	-	2+	0	0	0	0	0	0	0	0	0	0	0
BK/W	DB	802-58342	≤ 1988		0	y	y	-	-	1	2+	0	1	1	2+	2+	0	0	0	0	0

Table 43 (continued). Resight history of least auklets banded on survival plot at St. Paul Island, Alaska. All birds were banded as adults unless otherwise noted. Data do not include six color-combinations used on duplicate birds, making individual resight history impossible to determine. Monitoring of auklet survival ended at St. Paul after 2002 and moved to neighboring St. George Island in 2003.

Color bands		Metal band #	Year banded	Notes	Year resighted															
L	R				87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
O/LG	BK	802-58344	≤ 1988		0	y	y	-	-	2+	1	0	0	0	0	0	0	0	0	
W/R	LG	802-58353	≤ 1988		0	y	0	-	-	0	0	0	0	0	0	1	0	0	1	
LG/DG	R	802-58358	≤ 1988		0	y	0	-	-	1	0	0	0	0	0	0	0	0	0	
O/W	BK	802-58371	≤ 1988		0	y	0	-	-	0	0	0	0	0	0	0	0	0	1	
LG/DB	R	802-58375	≤ 1988		0	y	y	-	-	2+	0	0	1	0	0	0	2+	0	0	
LG/BK	O	802-58378	≤ 1988		0	y	0	-	-	0	1	0	0	0	0	0	0	0	0	
Y/O	DB	802-58379	≤ 1988		0	y	0	-	-	0	0	0	0	0	0	0	2+	0	0	
W/BK	O	802-58381	≤ 1988		0	y	0	-	-	0	0	0	0	0	2+	0	0	0	0	
LG/W	R	802-58384	≤ 1988		0	y	0	-	-	0	0	0	0	0	2+	0	0	0	1	
W/R	W	802-58423	≤ 1988		0	y	0	-	-	1	0	0	0	0	2+	0	0	0	0	
DB/LG	DB	802-58435	≤ 1988		0	y	0	-	-	0	0	0	0	0	2+	1	0	0	0	
DB/W	LG	802-58470	≤ 1988		0	y	y	-	-	0	0	0	0	0	2+	2+	0	0	0	
W/W	R	802-58499	≤ 1988		0	y	0	-	-	0	0	0	0	1	0	0	0	0	0	
W/W	DG	802-58500	≤ 1988		0	y	0	-	-	1	0	0	0	0	0	0	0	0	0	
BK/Y	DB	802-58504	≤ 1988		0	y	y	-	-	2+	2+	0	0	0	0	0	0	0	0	
DG/Y	R	802-58509	≤ 1988		0	y	y	-	-	2+	1	0	1	0	0	0	2+	2+	1	
DB/W	DG	802-58513	≤ 1988		0	y	y	-	-	0	0	0	0	1	0	0	2+	0	0	
O/LG	DG	802-58518	≤ 1988		0	y	y	-	-	2+	1	0	0	0	0	0	0	0	0	
LG/W	BK	802-58525	≤ 1988		0	y	y	-	-	0	1	0	0	0	0	0	0	0	0	
LG/W	DB	802-58531	≤ 1988		0	y	y	-	-	2+	2+	0	0	0	0	0	0	0	0	
R/LG	DB	802-58533	≤ 1988		0	y	y	-	-	0	0	0	0	0	1	0	0	0	0	
R/O	BK	802-58547	≤ 1988		0	y	y	-	-	2+	0	0	2+	2+	2+	2+	2+	2+	2+	
W/Y	DG	802-58560	≤ 1988		0	y	y	-	-	2+	0	0	0	0	0	0	0	0	1	
Y/R	DB	802-58561	≤ 1988		0	y	y	-	-	0	0	0	0	0	0	1	0	0	0	
O/W	DB	802-58566	≤ 1988		0	y	y	-	-	0	0	0	0	0	0	0	0	0	2+	
LG/W	O	802-58577	≤ 1988		0	y	y	-	-	2+	0	0	1	0	0	0	0	0	0	
O/DB	O	802-58708	≤ 1988		0	y	0	-	-	0	1	0	0	0	0	0	0	0	0	
Y/R	LG	802-58736	≤ 1988		0	y	y	-	-	0	0	0	0	2+	2+	2+	0	0	0	
DG/W	O	802-58740	≤ 1988		0	y	0	-	-	0	0	0	0	0	0	1	0	0	0	
O/W	O	802-58766	≤ 1988		0	y	0	-	-	1	0	0	0	0	0	0	0	0	0	
W/LG	R	802-58769	≤ 1988		0	y	y	-	-	0	0	0	0	0	2+	0	0	0	0	
DG/W	R	802-58771	≤ 1988		0	y	0	-	-	0	0	0	0	0	0	1	2+	0	0	
O/LG	O	802-58779	≤ 1988		0	y	y	-	-	0	0	0	0	0	0	0	2+	0	0	
DB/DB	DB	802-58344	≤ 1989		0	0	y	-	-	0	0	0	1	0	0	0	0	0	0	
W/BK	BK	802-58345	≤ 1989		0	0	y	-	-	2+	0	0	1	0	2+	2+	0	0	0	
O/DB	DB	802-58356	≤ 1989		0	0	y	-	-	1	0	0	0	0	0	0	0	0	0	
DB/R	DB	802-58383	≤ 1989		0	0	y	-	-	0	0	0	0	1	0	0	0	0	0	

Table 43 (continued). Resight history of least auklets banded on survival plot at St. Paul Island, Alaska. All birds were banded as adults unless otherwise noted. Data do not include six color-combinations used on duplicate birds, making individual resight history impossible to determine. Monitoring of auklet survival ended at St. Paul after 2002 and moved to neighboring St. George Island in 2003.

Color bands		Metal band #	Year banded	Notes	Year resighted															
L	R				87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
O/BK	Y	802-58276	≤ 1992		0	0	0	-	-	1	0	0	0	0	0	0	0	0	0	0
LB/DB	R	802-00301	1992		0	0	0	-	-	2+	0	0	1	2+	2+	0	0	1	0	0
LB/R	Y	802-00302	1992		0	0	0	-	-	2+	0	0	0	0	2+	0	0	0	0	0
LB/Y	DB	802-00308	1992		0	0	0	-	-	2+	2+	0	2+	2+	2+	2+	2+	2+	2+	1
LB/LB	LB	802-00309	1992		0	0	0	-	-	2+	0	0	0	0	0	0	0	0	0	0
Y/LB	Y	802-00310	1992		0	0	0	-	-	2+	0	0	0	0	0	0	0	0	0	0
LB/R	W	802-58386	1992		0	0	0	-	-	2+	0	0	0	0	0	0	0	0	0	0
W/R	DB	?	≤ 1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	1	0	0
Y/LB	R	802-00312	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
R/Y	LB	802-00313	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
DB/R	LB	802-00314	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	2+	1	2+
LB/R	LB	802-00315	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	2+	0	0
DB/W	LB	802-00316	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	2+	0	0	0
LB/R	R	802-00317	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
Y/R	LB	802-00318	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	0	0	0	1
LB/DB	DB	802-00319	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	2+	0	0
W/DB	LB	802-00320	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
R/LB	DB	802-00321	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
R/R	LB	802-00322	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	2+	2+	0
R/LB	LB	802-00323	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	1	0
R/LB	Y	802-00324	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	0	0	0
DB/Y	LB	802-00325	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	0	0	0	0
LB/LB	Y	802-00326	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
LB/LG	LB	802-00327	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	2+	2+	2+
LB/Y	Y	802-00328	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	0	0	0
R/DB	LB	802-00329	1996		0	0	0	-	-	0	0	0	0	2+	0	0	2+	0	0	0
R/LB	R	802-00330	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
DB/LB	W	802-00331	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
W/R	LB	802-00332	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	0	0	0
DB/LB	LB	802-00333	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	2+	0	0
LB/DB	W	802-00334	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
DB/LB	R	802-00335	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
W/LB	R	802-00336	1996		0	0	0	-	-	0	0	0	0	2+	2+	1	0	0	0	0
Y/DB	LB	802-00337	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
Y/LB	DB	802-00338	1996		0	0	0	-	-	0	0	0	0	2+	0	1	2+	0	0	0
W/LB	Y	802-00339	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
DB/LB	Y	802-00340	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	1

Table 43 (continued). Resight history of least auklets banded on survival plot at St. Paul Island, Alaska. All birds were banded as adults unless otherwise noted. Data do not include six color-combinations used on duplicate birds, making individual resight history impossible to determine. Monitoring of auklet survival ended at St. Paul after 2002 and moved to neighboring St. George Island in 2003.

Color bands		Metal band #	Year banded	Notes	Year resighted															
L	R				87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
LB/LB	R	802-00341	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	1	0	0
DB/LB	DB	802-00342	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	2+	2+	1
LB/LB	DB	802-00342	1996		0	0	0	-	-	0	0	0	0	2+	0	0	2+	0	0	0
Y/LB	LB	802-00344	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
W/LB	DB	802-00345	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	0	0	0	0
W/Y	LB	802-00346	1996		0	0	0	-	-	0	0	0	0	2+	0	1	0	0	0	1
DB/DB	LB	802-00347	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
W/LG	LB	802-00348	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	0	0	1	0
LG/LB	R	802-00349	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
Y/LG	LB	802-00350	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
R/LB	LG	802-00351	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
W/LB	LG	802-00352	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
DB/LG	LB	802-00353	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
DB/LB	LG	802-00354	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	0	0	0
LB/LG	R	802-00355	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
LB/LG	DB	802-00356	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	0	0	0	0
Y/LB	LG	802-00357	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
R/LG	LB	802-00358	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
LG/LB	DB	802-00359	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
LB/LG	W	802-00360	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	2+	0	0
LB/R	LG	802-00361	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
LG/LB	LG	802-00362	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
LB/Y	LG	802-00363	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	2+	2+	0
Y/LB	W	802-00364	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
Y/W	LB	802-00365	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
LB/LG	Y	802-00366	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
LB/W	LG	802-00367	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
LG/R	LB	802-00368	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	2+	2+	2+	1
LB/LG	LG	802-00369	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
LB/LB	LG	802-00370	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	0	0	0	0
LG/LB	Y	802-00371	1996		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0	0
LB/DB	LG	802-00372	1996		0	0	0	-	-	0	0	0	0	2+	0	1	0	0	0	0
LB/W	DB	802-00373	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
LG/Y	LB	802-00375	1996		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	0	2+	2+
LG/DB	LB	802-00376	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0
R/W	LB	802-00377	1996		0	0	0	-	-	0	0	0	0	2+	0	1	0	0	0	0
Y/Y	LB	802-00378	1996		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0	0

Table 43 (continued). Resight history of least auklets banded on survival plot at St. Paul Island, Alaska. All birds were banded as adults unless otherwise noted. Data do not include six color-combinations used on duplicate birds, making individual resight history impossible to determine. Monitoring of auklet survival ended at St. Paul after 2002 and moved to neighboring St. George Island in 2003.

Color bands		Metal band #	Year banded	Notes	Year resighted														
L	R				87	88	89	90	91	92	93	94	95	96	97	98	99	00	01
LB/Y	LB	802-00379	1996		0	0	0	-	-	0	0	0	2+	2+	2+	0	0	0	1
LB/DB	LB	802-00380	1996		0	0	0	-	-	0	0	0	2+	0	0	0	0	0	0
LB/W	LB	802-00381	1996		0	0	0	-	-	0	0	0	2+	2+	1	2+	0	0	0
W/LB	LB	802-00382	1996		0	0	0	-	-	0	0	0	2+	2+	2+	2+	2+	1	0
W/W	LB	802-00383	1996		0	0	0	-	-	0	0	0	2+	2+	2+	2+	0	2+	2+
LG/LB	LB	802-00384	1996		0	0	0	-	-	0	0	0	2+	0	1	0	1	0	0
LG/W	LB	802-00385	1996		0	0	0	-	-	0	0	0	2+	2+	2+	2+	2+	1	0
LG/LG	LB	802-00386	1996		0	0	0	-	-	0	0	0	2+	2+	2+	0	1	2+	0
LG/LB	W	802-00387	1996		0	0	0	-	-	0	0	0	2+	0	0	0	0	0	0
LB/Y	R	802-00388	1996		0	0	0	-	-	0	0	0	2+	2+	0	2+	2+	0	0
LB/DB	Y	802-00389	1996		0	0	0	-	-	0	0	0	2+	2+	0	0	0	0	0
LB/R	DB	802-00390	1996		0	0	0	-	-	0	0	0	2+	2+	2+	2+	2+	0	0
LB/Y	W	802-00391	1996		0	0	0	-	-	0	0	0	2+	2+	0	0	0	1	0
LB/W	R	802-00392	1996		0	0	0	-	-	0	0	0	2+	2+	2+	2+	0	2+	1
LB/W	Y	802-00393	1996		0	0	0	-	-	0	0	0	2+	0	1	2+	1	1	0
LB/W	W	802-00394	1996		0	0	0	-	-	0	0	0	2+	2+	2+	2+	1	0	0
LB/LB	W	802-00395	1996		0	0	0	-	-	0	0	0	2+	2+	0	0	0	0	0
W/LB	W	802-00396	1996		0	0	0	-	-	0	0	0	2+	2+	0	0	1	0	0
BK/W	LB	?	≤ 1997		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0
DB/W	DB	?	≤ 1997		0	0	0	-	-	0	0	0	0	2+	0	0	0	1	0
LB/LG	O	?	≤ 1997		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0
W/GY	B	1313-32038	1997		0	0	0	-	-	0	0	0	0	2+	2+	2+	0	0	0
GY/R	W	1313-32039	1997		0	0	0	-	-	0	0	0	0	2+	0	1	0	0	0
R/GY	W	1313-32040	1997		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	2+	0
GY/W	W	1313-32041	1997		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0
GY/R	O	1313-32042	1997		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0
BK/GY	O	1313-32043	1997		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0
GY/Y	O	1313-32044	1997		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	2+	1
GY/R	DB	1313-32045	1997		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	0	0
B/GY	R	1313-32046	1997		0	0	0	-	-	0	0	0	0	2+	0	0	0	0	0
DB/GY	O	1313-32047	1997		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	0	0
GY/DB	R	1313-32048	1997		0	0	0	-	-	0	0	0	0	2+	2+	2+	2+	2+	0
GY/O	R	1313-32049	1997		0	0	0	-	-	0	0	0	0	2+	2+	2+	0	0	0
GY/BK	R	1313-32050	1997		0	0	0	-	-	0	0	0	0	2+	0	2+	0	0	0
R/GY	O	1313-32051	1997		0	0	0	-	-	0	0	0	0	2+	2+	0	0	0	0
W/GY	O	1313-32052	1997		0	0	0	-	-	0	0	0	0	2+	0	2+	0	0	0
GY/DB	O	1313-32053	1997		0	0	0	-	-	0	0	0	0	2+	1	0	0	0	0

Table 43 (continued). Resight history of least auklets banded on survival plot at St. Paul Island, Alaska. All birds were banded as adults unless otherwise noted. Data do not include six color-combinations used on duplicate birds, making individual resight history impossible to determine. Monitoring of auklet survival ended at St. Paul after 2002 and moved to neighboring St. George Island in 2003.

Color bands		Metal band #	Year banded	Notes	Year resighted															
L	R				87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
GY/O	O	1313-32054	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
R/GY	Y	1313-32055	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	1	0	0
R/GY	DG	1313-32056	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
DB/GY	DG	1313-32057	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
Y/GY	DG	1313-32058	1997		0	0	0	-	-	0	0	0	0	0	2+	1	0	0	0	0
BK/GY	DG	1313-32059	1997		0	0	0	-	-	0	0	0	0	0	2+	1	0	0	0	0
W/GY	DG	1313-32060	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	2+	2+
GY/R	DG	1313-32061	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	0	0	0	0
GY/DG	DG	1313-32062	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	0	1	0	0
GY/DB	DG	1313-32063	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
GY/Y	DG	1313-32064	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	0	0
R/GY	DB	1313-32065	1997		0	0	0	-	-	0	0	0	0	0	2+	0	2+	0	0	0
Y/GY	DB	1313-32066	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	0	0
BK/GY	DB	1313-32067	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	2+	0
GY/DB	DB	1313-32068	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	2+	2+
GY/Y	DB	1313-32069	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	0	1	2+	0
GY/BK	DB	1313-32070	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
Y/GY	Y	1313-32071	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	1	0
DG/GY	DB	1313-32072	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
O/GY	DB	1313-32073	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	0	0	0
W/GY	DB	1313-32074	1997		0	0	0	-	-	0	0	0	0	0	2+	1	0	0	0	0
GY/DG	DB	1313-32075	1997		0	0	0	-	-	0	0	0	0	0	2+	0	2+	2+	0	0
GY/O	DB	1313-32076	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	2+	0
O/GY	DG	1313-32077	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	0	0
GY/O	DG	1313-32078	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
GY/BK	DG	1313-32080	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
GY/W	DG	1313-32081	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	0	0
DG/GY	O	1313-32082	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	0	2+	0
GY/BK	O	1313-32083	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
GY/W	O	1313-32084	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
DG/GY	Y	1313-32085	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
O/GY	Y	1313-32086	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
BK/GY	Y	1313-32087	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
GY/R	Y	1313-32088	1997		0	0	0	-	-	0	0	0	0	0	2+	0	2+	0	0	0
GY/DG	Y	1313-32089	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	0	0	0	0
GY/BK	Y	1313-32090	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	0	0	0	0
GY/W	Y	1313-32091	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	2+	0

Table 43 (continued). Resight history of least auklets banded on survival plot at St. Paul Island, Alaska. All birds were banded as adults unless otherwise noted. Data do not include six color-combinations used on duplicate birds, making individual resight history impossible to determine. Monitoring of auklet survival ended at St. Paul after 2002 and moved to neighboring St. George Island in 2003.

Color bands		Metal band #	Year banded	Notes	Year resighted															
L	R				87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
DB/GY	BK	1313-32092	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	0	0
O/GY	BK	1313-32093	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
Y/GY	BK	1313-32094	1997		0	0	0	-	-	0	0	0	0	0	2+	1	0	0	0	0
BK/GY	BK	1313-32095	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	2+	2+
R/GY	R	1313-32374	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
DG/GY	DG	1313-32375	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	0	2+	1
DB/GY	DB	1313-32376	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	0	0	1
Y/GY	R	1313-32377	1997		0	0	0	-	-	0	0	0	0	0	2+	1	0	0	0	0
W/GY	R	1313-32379	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	0	0
GY/DG	R	1313-32380	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
GY/Y	R	1313-32381	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	2+	2+
GY/W	R	1313-32382	1997		0	0	0	-	-	0	0	0	0	0	2+	0	2+	1	2+	0
DB/GY	W	1313-32383	1997		0	0	0	-	-	0	0	0	0	0	2+	1	0	0	0	0
DB/GY	R	1313-32384	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	2+	2+
GY/R	R	1313-32385	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	0	0
DG/GY	W	1313-32386	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
GY/Y	Y	1313-32387	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	1	0	0
GY/W	DB	1313-32389	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
DB/GY	Y	1313-32390	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	1	0
W/GY	Y	1313-32391	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
R/GY	BK	1313-32392	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
DG/GY	BK	1313-32393	1997		0	0	0	-	-	0	0	0	0	0	2+	1	0	1	0	0
O/GY	O	1313-32394	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	2+	0	0
Y/GY	O	1313-32395	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
DG/GY	R	1313-32396	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	0	0	1	0
GY/DG	O	1313-32397	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	2+	0	0	0
GY/DB	Y	1313-32398	1997		0	0	0	-	-	0	0	0	0	0	2+	0	0	0	0	0
O/GY	R	1313-32399	1997		0	0	0	-	-	0	0	0	0	0	2+	1	2+	2+	0	0
GY/O	Y	1313-32400	1997		0	0	0	-	-	0	0	0	0	0	2+	2+	0	0	0	0
O/LB	Y	1313-32096	1998		0	0	0	-	-	0	0	0	0	0	0	2+	0	0	0	0
O/DB	Y	1313-32097	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	2+	0	0
O/Y	Y	1313-32098	1998		0	0	0	-	-	0	0	0	0	0	0	2+	0	0	0	0
O/R	Y	1313-32099	1998		0	0	0	-	-	0	0	0	0	0	0	2+	0	0	0	0
R/R	Y	1313-32100	1998		0	0	0	-	-	0	0	0	0	0	0	2+	0	0	1	0
Y/Y	LG	1313-32118	1998		0	0	0	-	-	0	0	0	0	0	0	2+	0	0	0	0
R/LG	LG	1313-32119	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	2+	0	0
R/W	LG	1313-32120	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	2+	2+	0

Table 43 (continued). Resight history of least auklets banded on survival plot at St. Paul Island, Alaska. All birds were banded as adults unless otherwise noted. Data do not include six color-combinations used on duplicate birds, making individual resight history impossible to determine. Monitoring of auklet survival ended at St. Paul after 2002 and moved to neighboring St. George Island in 2003.

Color bands		Metal band #	Year banded	Notes	Year resighted															
L	R				87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
R/DB	LG	1313-32121	1998		0	0	0	-	-	0	0	0	0	0	0	2+	0	0	0	0
DB/W	R	1313-32122	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	2+	1	0
DB/Y	R	1313-32123	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	2+	1	0
Y/LG	R	1313-32124	1998		0	0	0	-	-	0	0	0	0	0	0	2+	0	0	0	0
Y/W	R	1313-32125	1998		0	0	0	-	-	0	0	0	0	0	0	2+	0	0	1	0
W/W	DG	1313-32126	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	2+	2+	2+
Y/R	W	1313-32127	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	2+	2+	0
Y/LG	DB	1313-32128	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	2+	0	0
Y/W	DB	1313-32129	1998		0	0	0	-	-	0	0	0	0	0	0	2+	0	0	1	0
DB/LG	R	1313-32130	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	0	1	0
LG/W	Y	1313-32131	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	2+	0	0
LG/LG	R	1313-32132	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	2+	2+	0
DG/W	LB	1313-32134	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	2+	2+	2+
DG/BK	LB	1313-32135	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	2+	2+	0
DB/BK	W	1313-32136	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	0	0	0
LB/BK	LB	1313-32137	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	0	0	0
LB/BK	R	1313-32138	1998		0	0	0	-	-	0	0	0	0	0	0	2+	0	0	0	0
Y/DB	DG	1313-32139	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	2+	2+	1
Y/W	Y	1313-32141	1998		0	0	0	-	-	0	0	0	0	0	0	2+	2+	2+	2+	2+
Y/DB	DB	1313-32142	1999		0	0	0	-	-	0	0	0	0	0	0	0	2+	0	0	0
Y/R	Y	1313-32143	1999		0	0	0	-	-	0	0	0	0	0	0	0	2+	0	0	0
DB/W	W	1313-32144	1999		0	0	0	-	-	0	0	0	0	0	0	0	2+	2+	2+	2+
Y/Y	W	1313-32146	1999		0	0	0	-	-	0	0	0	0	0	0	0	2+	2+	2+	2+
Y/LG	W	1313-32147	1999		0	0	0	-	-	0	0	0	0	0	0	0	2+	0	0	0
LG/R	LG	1313-32149	1999		0	0	0	-	-	0	0	0	0	0	0	0	2+	2+	2+	2+
DB/O	DG	1313-32150	1999		0	0	0	-	-	0	0	0	0	0	0	0	2+	0	0	0
DB/Y	DB	1313-32151	1999		0	0	0	-	-	0	0	0	0	0	0	0	2+	2+	2+	2+
LG/Y	LG	1313-32152	1999		0	0	0	-	-	0	0	0	0	0	0	0	2+	2+	1	2+
Y/W	LG	1313-32153	1999		0	0	0	-	-	0	0	0	0	0	0	0	2+	2+	0	0
DB/BK	LB	?	≤ 2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	0	0
Y/B	R	1313-32133	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	0	2+
O/DB	LB	1313-32154	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+
O/LB	LB	1313-32155	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	1
O/W	LB	1313-32156	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+
O/BK	LB	1313-32157	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+
O/LG	LB	1313-32158	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+
LB/DG	BK	1313-32159	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	0

Table 43 (continued). Resight history of least auklets banded on survival plot at St. Paul Island, Alaska. All birds were banded as adults unless otherwise noted. Data do not include six color-combinations used on duplicate birds, making individual resight history impossible to determine. Monitoring of auklet survival ended at St. Paul after 2002 and moved to neighboring St. George Island in 2003.

Color bands		Metal band #	Year banded	Notes	Year resighted															
L	R				87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
LB/Y	BK	1313-32160	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+
LB/W	BK	1313-32161	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	0	0
LB/R	BK	1313-32162	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	0	0
LB/O	BK	1313-32163	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	0	0
DG/R	LB	1313-32164	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+
DG/O	LB	1313-32165	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	0	0
DG/Y	LB	1313-32166	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	0
DG/DB	LB	1313-32167	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	0	0
DG/LB	LB	1313-32168	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+
DG/LG	LB	1313-32169	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	1
O/DB	W	1313-32170	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	0
O/DG	W	1313-32171	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+
O/LB	DB	1313-32172	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	0
O/DG	DB	1313-32173	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	0	0
R/Y	R	1313-32174	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	0
R/DB	R	1313-32175	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	0
DB/R	W	1313-32176	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	0	2+
DB/DG	W	1313-32177	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	0	0
Y/DG	Y	1313-32178	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+
Y/DG	W	1313-32180	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+
Y/R	DG	1313-32181	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	0	0
W/R	R	1313-32182	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	1
DB/Y	W	1313-32183	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+
DB/Y	LG	1313-32184	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	1	0
W/Y	R	1313-32185	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	1
LG/Y	Y	1313-32187	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	0
LG/Y	W	1313-32188	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	0
W/R	Y	1313-32189	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	1
W/Y	Y	1313-32190	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+
DB/LG	Y	1313-32191	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+
DB/R	R	1313-32192	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	0	0
Y/DB	R	1313-32193	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	0	0
Y/DB	W	1313-32194	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	0	0
Y/BK	DB	1313-32297	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	1
R/BK	LB	1313-32298	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	0
R/BK	Y	1313-32299	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+
R/BK	DB	1313-32300	2000		0	0	0	-	-	0	0	0	0	0	0	0	0	2+	2+	2+

Table 43 (continued). Resight history of least auklets banded on survival plot at St. Paul Island, Alaska. All birds were banded as adults unless otherwise noted. Data do not include six color-combinations used on duplicate birds, making individual resight history impossible to determine. Monitoring of auklet survival ended at St. Paul after 2002 and moved to neighboring St. George Island in 2003.

Color bands		Metal band #	Year banded	Notes	Year resighted															
L	R				87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
R/R	R	1313-32201	2001		0	0	0	-	-	0	0	0	0	0	0	0	0	0	2+	2+
R/R	DB	1313-32202	2001		0	0	0	-	-	0	0	0	0	0	0	0	0	0	2+	1
R/Y	Y	1313-32203	2001		0	0	0	-	-	0	0	0	0	0	0	0	0	0	2+	1
R/Y	DB	1313-32204	2001		0	0	0	-	-	0	0	0	0	0	0	0	0	0	2+	0
R/DB	DB	1313-32205	2001		0	0	0	-	-	0	0	0	0	0	0	0	0	0	2+	2+
BK/R	Y	802-58714	≤ 1988	subadult	0	y	0	-	-	0	0	0	0	0	0	0	0	0	1	0
BK/Y	Y	802-58784	≤ 1988	subadult	0	y	y	-	-	0	0	0	0	1	0	0	0	0	0	0
LG/DG	DB	802-58340	≤ 1988	subadult	0	y	0	-	-	0	1	0	0	0	0	0	0	1	1	0
LG/W	W	802-58704	≤ 1988	subadult	0	y	0	-	-	0	0	0	0	0	0	0	1	0	0	0
O/LG	LG	802-58775	≤ 1988	subadult	0	y	0	-	-	2+	0	0	0	0	0	0	0	1	0	0
O/W	R	802-58770	≤ 1988	subadult	0	y	0	-	-	0	0	0	0	0	2+	0	0	0	1	0
R/BK	W	802-58389	≤ 1988	subadult	0	y	0	-	-	0	0	0	0	0	0	0	0	0	1	0
R/DG	W	802-58341	≤ 1988	subadult	0	y	0	-	-	0	0	0	0	0	0	0	0	0	1	0
R/R	W	802-58394	≤ 1988	subadult	0	y	0	-	-	0	0	0	0	0	2+	0	2+	0	0	0
R/Y	W	802-58448	≤ 1987	subadult	y	0	0	-	-	0	0	0	0	0	0	2+	0	0	0	0
W/BK	Y	802-58712	≤ 1988	subadult	0	y	0	-	-	0	0	0	0	0	0	1	0	0	0	0
W/DB	DB	802-58781	≤ 1988	subadult	0	y	0	-	-	0	0	0	0	0	2+	0	0	0	0	1
W/DB	R	802-58745	≤ 1988	subadult	0	y	0	-	-	0	1	0	0	2+	0	0	2+	0	2+	0
W/LG	DB	802-58469	≤ 1987	subadult	y	0	0	-	-	0	0	0	0	2+	1	0	0	0	0	0
W/LG	LG	802-58730	≤ 1988	subadult	0	y	y	-	-	2+	0	0	2+	2+	2+	2+	2+	2+	1	0
W/O	DB	802-58475	≤ 1987	subadult	y	0	0	-	-	0	0	0	0	0	0	0	0	0	1	0
Y/DG	BK	none	≤ 1987	subadult	y	0	0	-	-	2+	0	0	0	0	0	0	0	0	0	0
Y/W	BK	802-58742	≤ 1988	subadult	0	y	0	-	-	0	1	0	0	0	0	0	0	0	0	0
Y/W	W	802-58396	≤ 1988	subadult	0	y	0	-	-	1	0	0	0	0	0	0	0	0	0	0

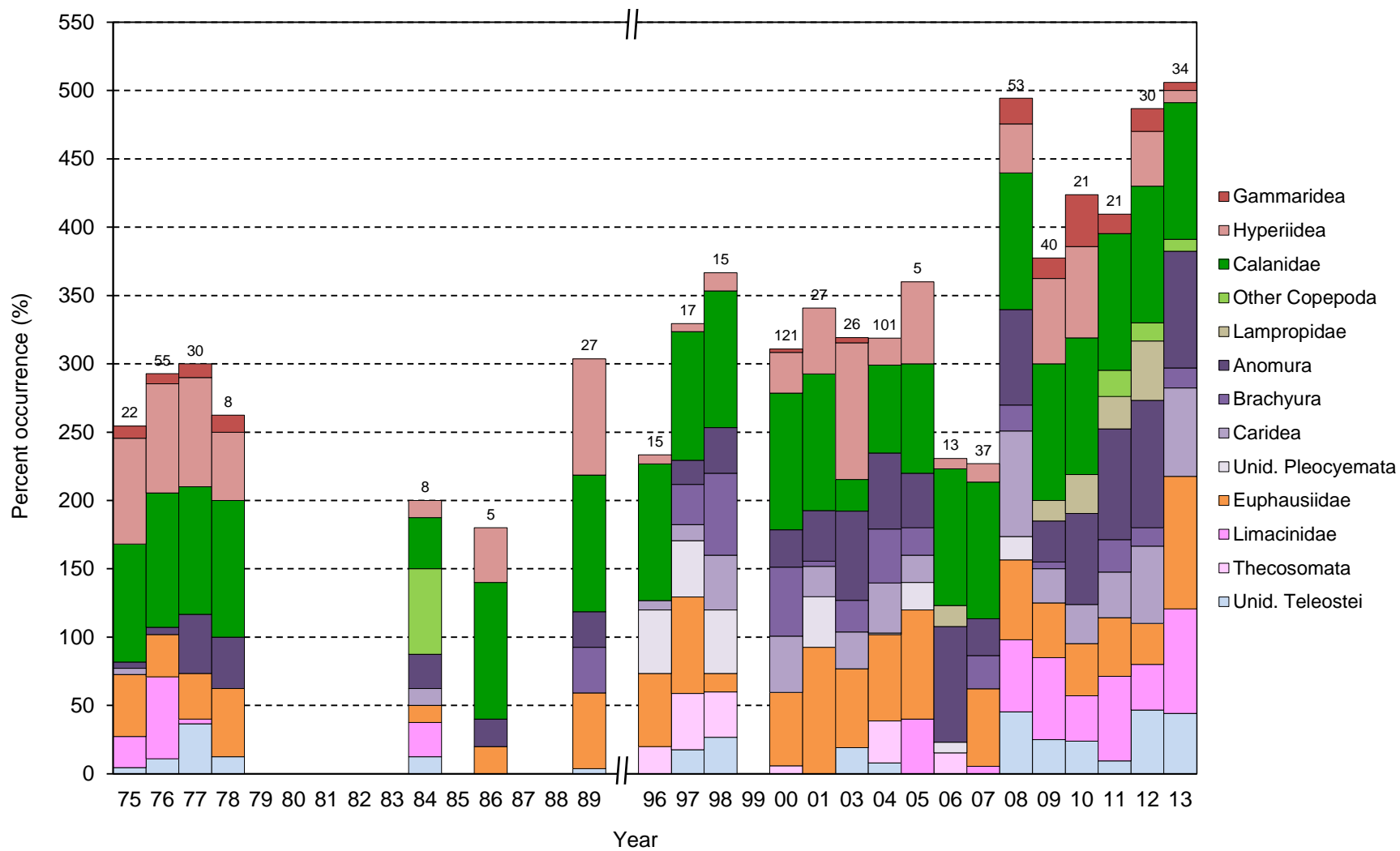


Figure 20. Frequency of occurrence of major prey items in diets of least auklet chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Numbers above columns indicate sample sizes.

Table 44. Frequency of occurrence of major prey items in diets of least auklet chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as "others" in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of regurgitations from adults returning to the colony to feed chicks (1975-1978, 1986-2013) and gular pouch contents from adults collected at or near the colony (1984). No diet samples were collected in 1979-1983, 1985 or 1987-1988, 1990-1995, 1999 or 2002; samples were collected in 2014 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1975	1976	1977	1978	1984	1986	1989	1996	1997	1998	2000	2001
No. samples	22	55	30	8	8	5	27	15	17	15	121	27
Invertebrates	95.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Amphipoda	77.3	83.6	80.0	50.0	25.0	40.0	85.2	6.7	5.9	13.3	31.4	48.1
Gammaridea	9.1	7.3	10.0	12.5	-	-	-	-	-	-	2.5	-
Hyperidea	77.3	80.0	80.0	50.0	12.5	40.0	85.2	6.7	5.9	13.3	29.8	48.1
<i>Hyperoche medusarum</i>	-	29.1	-	12.5	-	-	70.4	-	-	-	-	-
<i>Themisto libellula</i>	68.2	56.4	56.7	25.0	-	-	3.7	-	-	-	29.8	25.9
<i>T. pacifica</i>	-	1.8	-	12.5	-	40.0	14.8	6.7	0.0	13.3	-	-
<i>Themisto</i> spp.	4.5	-	3.3	-	12.5	-	7.4	-	5.9	-	-	25.9
Other Hyperidea	4.5	12.7	30.0	-	-	-	33.3	-	-	-	-	-
Other Amphipoda	-	1.8	-	-	12.5	-	-	-	-	-	-	-
Copepoda	86.4	98.2	93.3	100.0	100.0	100.0	100.0	100.0	94.1	100.0	100.0	100.0
Calanidae	86.4	98.2	93.3	100.0	37.5	100.0	100.0	100.0	94.1	100.0	100.0	100.0
<i>Calanus marshallae</i>	68.2	14.5	-	-	25.0	-	29.6	13.3	88.2	53.3	97.5	100.0
<i>Calanus</i> spp.	18.2	80.0	90.0	50.0	0.0	80.0	-	-	-	-	-	-
<i>Neocalanus cristatus</i>	-	61.8	60.0	100.0	37.5	40.0	100.0	33.3	35.3	46.7	70.2	3.7
<i>N. plumchrus/flemengeri</i>	-	-	-	-	-	-	-	29.6	80.0	64.7	100.0	68.6
<i>N. plumchrus</i>	-	65.5	-	37.5	12.5	-	-	-	-	-	-	-
Unid. Calanidae	-	-	-	-	-	-	3.7	-	-	-	100.0	100.0
Other Calanidae	-	1.8	-	-	-	-	-	-	-	-	-	-
Other Copepoda	-	-	-	-	62.5	-	-	-	-	-	-	-
Cumacea	-	27.3	13.3	25.0	-	-	-	-	-	-	-	-
Lampropidae	-	-	-	-	-	-	-	-	-	-	-	-
Unid. Lampropidae	-	-	-	-	-	-	-	-	-	-	-	-
Other Lampropidae	-	-	-	-	-	-	-	-	-	-	-	-
Other Cumacea	-	27.3	13.3	25.0	-	-	-	-	-	-	-	-
Decapoda	13.6	5.5	43.3	50.0	87.5	20.0	48.1	53.3	58.8	93.3	77.7	63.0
Anomura	4.5	5.5	43.3	37.5	25.0	20.0	25.9	-	17.6	33.3	27.3	37.0
Lithodidae	-	1.8	-	-	25.0	20.0	3.7	-	-	-	-	-
Paguridae	-	-	-	-	-	-	25.9	-	17.6	33.3	27.3	37.0
Unid. Anomura	4.5	3.6	43.3	37.5	12.5	-	-	-	-	-	-	-
Other Anomura	-	-	-	-	-	-	-	-	-	-	-	-
Brachyura	-	-	-	-	-	-	33.3	-	29.4	60.0	50.4	3.7
Atelecyclidae	-	-	-	-	-	-	-	-	-	60.0	-	-
Unid. Brachyura	-	-	-	-	-	-	33.3	-	-	-	50.4	3.7
Other Brachyura	-	-	-	-	-	-	-	-	29.4	-	-	-
Caridea	4.5	-	-	-	12.5	-	-	6.7	11.8	40.0	41.3	22.2
Hippolytidae	-	-	-	-	-	-	-	-	-	-	-	-
Pandalidae	-	-	-	-	-	-	-	-	-	-	-	-
Unid. Caridea	-	-	-	-	12.5	-	-	6.7	11.8	40.0	41.3	22.2
Other Caridea	4.5	-	-	-	-	-	-	-	-	-	-	-
Unid. Pleocyemata	-	-	-	-	-	-	-	46.7	41.2	46.7	-	37.0
Other Decapoda	4.5	-	-	12.5	62.5	-	-	-	-	-	-	-

Table 44 (continued). Frequency of occurrence of major prey items in diets of least auklet chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as "others" in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of regurgitations from adults returning to the colony to feed chicks (1975-1978, 1986-2013) and gular pouch contents from adults collected at or near the colony (1984). No diet samples were collected in 1979-1983, 1985 or 1987-1988, 1990-1995, 1999 or 2002; samples were collected in 2014 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1975	1976	1977	1978	1984	1986	1989	1996	1997	1998	2000	2001
Euphausiacea	45.5	30.9	33.3	50.0	12.5	20.0	55.6	53.3	70.6	13.3	53.7	92.6
Euphausiidae	45.5	30.9	33.3	50.0	12.5	20.0	55.6	53.3	70.6	13.3	53.7	92.6
<i>Thysanoessa inermis</i>	4.5	3.6	3.3	-	12.5	20.0	7.4	-	-	-	-	-
<i>T. raschii</i>	13.6	10.9	6.7	12.5	-	-	44.4	-	-	-	-	-
<i>Thysanoessa</i> spp.	13.6	9.1	6.7	-	-	-	-	53.3	-	-	53.7	48.1
Unid. Euphausiidae	13.6	16.4	23.3	37.5	-	-	33.3	-	70.6	13.3	-	59.3
Other Euphausiidae	-	7.3	-	12.5	-	-	3.7	-	-	-	-	-
Gastropoda	22.7	60.0	3.3	-	50.0	-	3.7	20.0	41.2	33.3	5.8	-
Limacinidae	22.7	60.0	3.3	-	25.0	-	-	-	-	-	-	-
<i>Limacina helicina</i>	22.7	60.0	-	-	25.0	-	-	-	-	-	-	-
<i>Limacina</i> spp.	-	-	3.3	-	-	-	-	-	-	-	-	-
Thecosomata	-	-	-	-	-	-	-	20.0	41.2	33.3	5.8	-
Other Gastropoda	-	-	-	-	25.0	-	3.7	-	-	-	-	-
Other Invertebrates	4.5	-	3.3	-	-	-	-	-	-	-	-	-
Fish	4.5	10.9	36.7	12.5	12.5	20.0	3.7	-	17.6	26.7	-	-
Teleostei	4.5	10.9	36.7	12.5	12.5	20.0	3.7	-	17.6	26.7	-	-
Unid. Teleostei	4.5	10.9	36.7	12.5	12.5	-	3.7	-	17.6	26.7	-	-
Other Teleostei	-	-	-	-	-	20.0	-	-	-	-	-	-
Other	4.5	1.8	3.3	-	50.0	-	-	-	-	-	-	-

Table 44 (continued). Frequency of occurrence of major prey items in diets of least auklet chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as "others" in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of regurgitations from adults returning to the colony to feed chicks (1975-1978, 1986-2013) and gular pouch contents from adults collected at or near the colony (1984). No diet samples were collected in 1979-1983, 1985 or 1987-1988, 1990-1995, 1999 or 2002; samples were collected in 2014 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
No. samples	26	101	5	13	37	53	40	21	21	30	34
Invertebrates	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Amphipoda	100.0	19.8	60.0	7.7	13.5	37.7	70.0	76.2	14.3	46.7	14.7
Gammaridea	3.8	-	-	-	-	18.9	15.0	38.1	14.3	16.7	5.9
Hyperidea	100.0	19.8	60.0	7.7	13.5	35.8	62.5	66.7	-	40.0	8.8
<i>Hyperoche medusarum</i>	53.8	5.0	-	-	-	34.0	-	14.3	-	-	-
<i>Themisto libellula</i>	-	1.0	-	-	-	-	50.0	66.7	-	23.3	-
<i>T. pacifica</i>	73.1	5.9	60.0	-	5.4	1.9	12.5	-	-	10.0	5.9
<i>Themisto</i> spp.	-	8.9	-	7.7	8.1	-	32.5	-	-	-	2.9
Other Hyperidea	23.1	-	-	-	-	-	2.5	19.0	-	13.3	-
Other Amphipoda	-	-	-	-	-	1.9	-	4.8	-	-	-
Copepoda	23.1	64.4	80.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Calanidae	23.1	64.4	80.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<i>Calanus marshallae</i>	11.5	3.0	80.0	38.5	75.7	83.0	95.0	95.2	100.0	100.0	97.1
<i>Calanus</i> spp.	-	-	-	-	-	-	-	-	-	-	-
<i>Neocalanus cristatus</i>	15.4	26.7	-	100.0	97.3	100.0	72.5	81.0	57.1	86.7	32.4
<i>N. plumchrus/flemengeri</i>	3.8	64.4	-	38.5	81.1	98.1	100.0	95.2	100.0	96.7	100.0
<i>N. plumchrus</i>	-	-	-	-	-	-	-	-	-	-	-
Unid. Calanidae	-	-	-	-	91.9	56.6	-	-	-	-	-
Other Calanidae	-	-	-	-	-	-	-	4.8	-	-	-
Other Copepoda	-	-	-	-	-	-	-	-	19.0	13.3	8.8
Cumacea	-	-	-	15.4	-	7.5	15.0	28.6	23.8	43.3	20.6
Lampropidae	-	-	-	15.4	-	-	15.0	28.6	23.8	43.3	-
Unid. Lampropidae	-	-	-	-	-	-	15.0	28.6	23.8	43.3	-
Other Lampropidae	-	-	-	15.4	-	-	-	-	-	-	-
Other Cumacea	-	-	-	-	-	7.5	-	4.8	-	-	20.6
Decapoda	80.8	82.2	60.0	84.6	45.9	92.5	42.5	71.4	95.2	96.7	85.3
Anomura	65.4	55.4	40.0	84.6	27.0	69.8	30.0	66.7	81.0	93.3	85.3
Lithodidae	61.5	32.7	-	-	18.9	1.9	27.5	28.6	71.4	50.0	14.7
Paguridae	57.7	45.5	40.0	84.6	10.8	69.8	10.0	23.8	57.1	93.3	70.6
Unid. Anomura	-	-	-	-	-	-	-	33.3	-	-	-
Other Anomura	-	-	-	-	-	1.9	-	-	9.5	-	76.5
Brachyura	23.1	39.6	20.0	-	24.3	18.9	5.0	-	23.8	13.3	14.7
Atelecyclidae	23.1	39.6	20.0	-	-	3.8	5.0	-	23.8	-	2.9
Unid. Brachyura	-	-	-	-	24.3	15.1	-	-	-	-	-
Other Brachyura	-	-	-	-	-	-	-	-	4.8	13.3	11.8
Caridea	26.9	36.6	20.0	-	-	77.4	25.0	28.6	33.3	56.7	64.7
Hippolytidae	-	-	-	-	-	66.0	5.0	14.3	23.8	50.0	55.9
Pandalidae	26.9	2.0	20.0	-	-	34.0	10.0	9.5	9.5	13.3	44.1
Unid. Caridea	-	35.6	-	-	-	28.3	-	14.3	-	-	-
Other Caridea	-	-	-	-	-	43.4	15.0	-	-	30.0	5.9
Unid. Pleocyemata	-	1.0	20.0	7.7	-	17.0	-	-	-	-	-
Other Decapoda	-	-	-	-	-	-	-	-	-	-	-

Table 44 (continued). Frequency of occurrence of major prey items in diets of least auklet chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as "others" in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of regurgitations from adults returning to the colony to feed chicks (1975-1978, 1986-2013) and gular pouch contents from adults collected at or near the colony (1984). No diet samples were collected in 1979-1983, 1985 or 1987-1988, 1990-1995, 1999 or 2002; samples were collected in 2014 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Euphausiacea	57.7	63.4	80.0	-	56.8	58.5	40.0	38.1	42.9	30.0	97.1
Euphausiidae	57.7	63.4	80.0	-	56.8	58.5	40.0	38.1	42.9	30.0	97.1
<i>Thysanoessa inermis</i>	-	-	20.0	-	-	-	35.0	-	-	-	20.6
<i>T. raschii</i>	26.9	8.9	-	-	-	-	-	-	-	-	-
<i>Thysanoessa</i> spp.	-	23.8	80.0	-	21.6	22.6	-	28.6	42.9	26.7	97.1
Unid. Euphausiidae	34.6	41.6	-	-	48.6	39.6	5.0	9.5	-	-	-
Other Euphausiidae	-	-	-	-	-	-	-	-	-	3.3	-
Gastropoda	-	30.7	40.0	15.4	5.4	52.8	60.0	33.3	61.9	33.3	76.5
Limacinidae	-	-	40.0	-	5.4	52.8	60.0	33.3	61.9	33.3	76.5
<i>Limacina helicina</i>	-	-	40.0	-	5.4	52.8	60.0	33.3	61.9	33.3	76.5
<i>Limacina</i> spp.	-	-	-	-	-	-	-	-	-	-	-
Thecosomata	-	30.7	-	15.4	-	-	-	-	-	-	-
Other Gastropoda	-	-	-	-	-	-	-	-	-	-	-
Other Invertebrates	-	-	-	-	-	7.5	-	-	-	-	-
Fish	23.1	7.9	-	-	-	45.3	25.0	23.8	9.5	46.7	44.1
Teleostei	23.1	7.9	-	-	-	45.3	25.0	23.8	9.5	46.7	44.1
Unid. Teleostei	19.2	7.9	-	-	-	45.3	25.0	23.8	9.5	46.7	44.1
Other Teleostei	3.8	-	-	-	-	-	10.0	-	-	-	-
Other	-	-	-	-	-	3.8	-	-	-	-	-

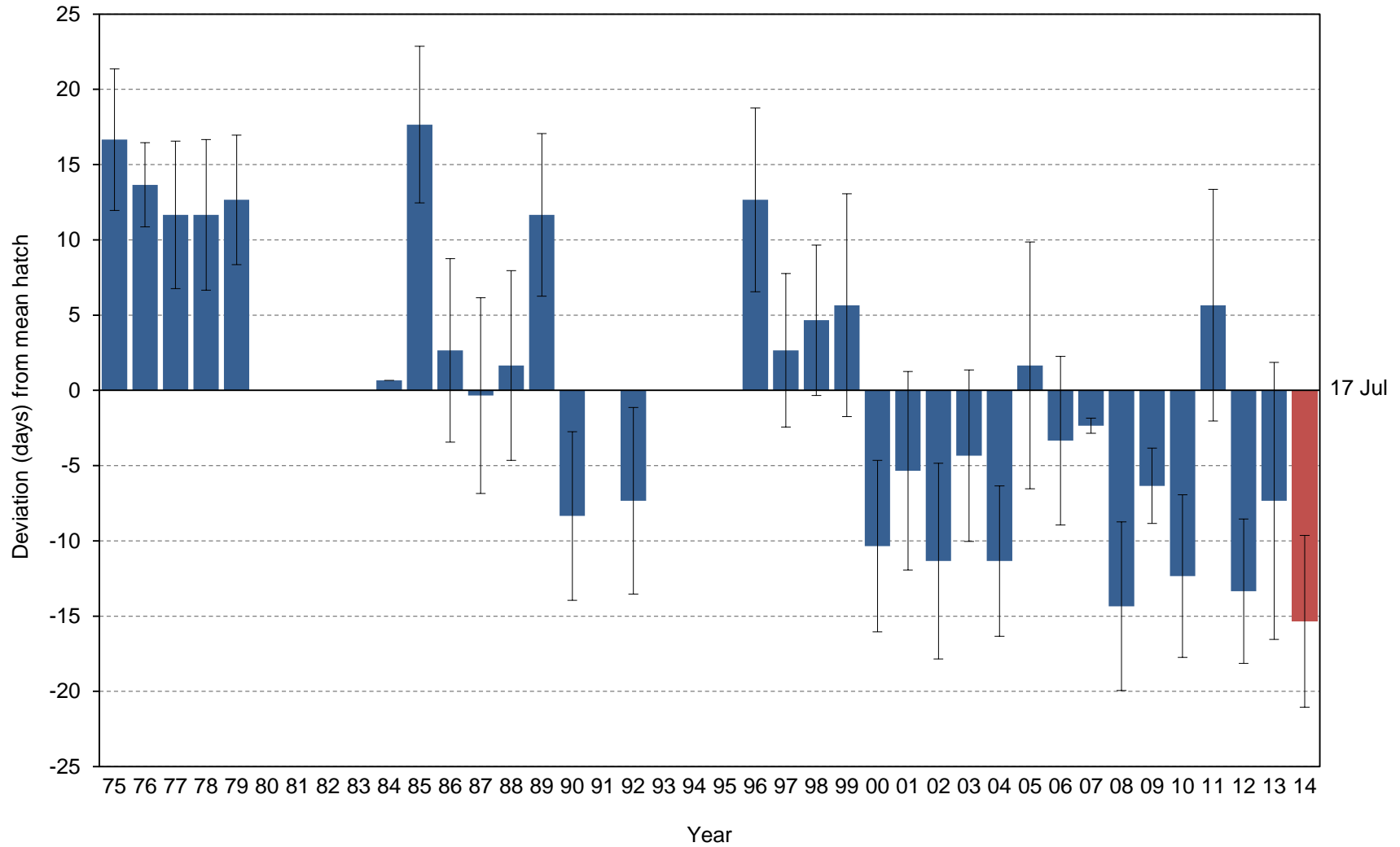


Figure 21. Yearly hatch date deviation (from the 1975-2013 average of 17 July) for black-legged kittiwakes at St. Paul Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; red highlights the current year.

Table 45. Breeding chronology of black-legged kittiwakes at St. Paul Island, Alaska. Data represent the dates of the first egg laid and the first chick hatched in each nest.

Year	Mean lay	SD	<i>n</i> ^a	Mean hatch	SD	<i>n</i> ^b	First lay	First hatch	Last hatch	First fledge ^c
1975	-	-	-	2 Aug	4.7	33	-	-	-	-
1976	-	-	-	29 Jul	2.8	23	-	-	-	-
1977	-	-	-	28 Jul	4.9	60	-	-	-	-
1978	-	-	-	28 Jul	5.0	39	-	-	-	-
1979	-	-	-	29 Jul	4.3	19	-	-	-	-
1980	<i>no data</i>	-	-	-	-	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-	-	-	-	-
1984	26 Jun	7.9	7	16 Jul	0.0	1	16 Jun	16 Jul	-	-
1985	11 Jul	6.9	114	3 Aug	5.2	86	29 Jun	24 Jul	19 Aug	>31 Aug
1986	xx ^d	xx	xx	19 Jul	6.1	229	xx	xx	xx	xx
1987	xx	xx	xx	16 Jul	6.5	148	xx	xx	xx	xx
1988	xx	xx	xx	17 Jul	6.3	113	xx	xx	xx	xx
1989	4 Jul	6.4	155	28 Jul	5.4	31	17 Jun	17 Jul	11 Aug	>30 Aug
1990	17 Jun	5.8	118	8 Jul	5.6	164	11 Jun	23 Jun	24 Jul	5 Aug
1991	<i>no data</i>	-	-	-	-	-	-	-	-	-
1992	13 Jun	6.7	271	8 Jul	6.2	129	5 Jun	28 Jun	7 Aug	12 Aug
1993	<i>no data</i>	-	-	-	-	-	-	-	-	-
1994	<i>no data</i>	-	-	-	-	-	-	-	-	-
1995	<i>no data</i>	-	-	-	-	-	-	-	-	-
1996	1 Jul	7.7	70	28 Jul	6.1	28	13 Jun	11 Jul	7 Aug	29 Aug
1997	22 Jun	5.2	225	19 Jul	5.1	135	7 Jun	4 Jul	4 Aug	23 Aug
1998	23 Jun	5.4	259	21 Jul	5.0	198	13 Jun	20 Jul	6 Aug	24 Aug
1999	25 Jun	4.5	151	22 Jul	7.4	28	15 Jun	13 Jul	12 Aug	23 Aug
2000	10 Jun	5.6	131	5 Jul	5.7	158	1 Jun	22 Jun	5 Aug	1 Aug
2001	16 Jun	5.5	214	11 Jul	6.6	81	5 Jun	24 Jun	27 Jul	20 Aug
2002	8 Jun	5.1	261	5 Jul	6.5	116	1 Jun	25 Jun	4 Aug	11 Aug
2003	16 Jun	6.2	276	12 Jul	5.7	203	30 May	25 Jun	29 Jul	15 Aug
2004	7 Jun	6.1	342	4 Jul	5.0	274	30 May	22 Jun	30 Jul	4 Aug
2005	22 Jun	8.0	228	18 Jul	8.2	58	5 Jun	5 Jul	6 Aug	24 Aug
2006	18 Jun	5.8	318	13 Jul	5.6	120	10 Jun	3 Jul	4 Aug	19 Aug
2007	16 Jun	3.8	206	14 Jul	0.5	2	7 Jun	13 Jul	14 Jul	-
2008	8 Jun	6.7	284	1 Jul	5.6	165	29 May	20 Jun	22 Jul	6 Aug
2009	15 Jun	4.2	338	10 Jul	2.5	23	5 Jun	5 Jul	13 Jul	19 Aug
2010	9 Jun	5.4	260	4 Jul	5.4	207	3 Jun	19 Jun	23 Jul	5 Aug
2011	20 Jun	6.6	153	22 Jul	7.7	5	3 Jun	9 Jul	29 Jul	>29 Aug
2012	9 Jun	5.9	257	2 Jul	4.8	271	31 May	18 Jun	31 Jul	6 Aug
2013	11 Jun	5.6	263	9 Jul	9.2	38	30 May	29 Jun	12 Aug	9 Aug
2014	8 Jun	4.7	146	1 Jul	5.7	241	3 Jun	19 Jun	19 Jul	1 Aug

^aSample sizes for mean lay dates are a sub-sample of total nests for which no egg to egg interval is ≤ 7 days.

^bSample sizes for mean hatch dates are a sub-sample of total nests for which egg to chick interval is ≤ 7 days.

^cIn years when no chicks fledged before the field crew left the island at the end of the season, date of first fledge is listed as > the date of last nest check.

^dxx indicates data potentially exist but have not yet been summarized.

Table 46. Frequency distribution of hatch dates for black-legged kittiwakes at St. Paul Island, Alaska. Data represent the date of the first chick hatched in each nest and include only nests in which observations of egg to chick ≤ 7 days. Individual hatch date data are not available before 1984.

Julian date ^a	No. nests hatching on Julian date															
	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
170	-	-	xx ^b	xx	xx	-	-	no data	-	no data	no data	no data	-	-	-	-
171	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
172	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
173	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
174	-	-	xx	xx	xx	-	1	-	-	-	-	-	-	-	-	-
175	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
176	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
177	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
178	-	-	xx	xx	xx	-	3	-	-	-	-	-	-	-	-	-
179	-	-	xx	xx	xx	-	1	-	-	-	-	-	-	-	-	-
180	-	-	xx	xx	xx	-	8	-	1	-	-	-	-	-	-	-
181	-	-	xx	xx	xx	-	2	-	1	-	-	-	-	-	-	-
182	-	-	xx	xx	xx	-	10	-	6	-	-	-	-	-	-	-
183	-	-	xx	xx	xx	-	-	-	1	-	-	-	-	-	-	-
184	-	-	xx	xx	xx	-	8	-	4	-	-	-	-	-	-	-
185	-	-	xx	xx	xx	-	2	-	2	-	-	-	-	1	-	-
186	-	-	xx	xx	xx	-	22	-	29	-	-	-	-	-	-	-
187	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
188	-	-	xx	xx	xx	-	10	-	13	-	-	-	-	-	-	-
189	-	-	xx	xx	xx	-	-	-	8	-	-	-	-	-	-	-
190	-	-	xx	xx	xx	-	30	-	22	-	-	-	-	-	-	-
191	-	-	xx	xx	xx	-	11	-	1	-	-	-	-	-	3	-
192	-	-	xx	xx	xx	-	14	-	6	-	-	-	-	5	1	-
193	-	-	xx	xx	xx	-	9	-	6	-	-	-	1	-	-	-
194	-	-	xx	xx	xx	-	9	-	8	-	-	-	-	14	10	2
195	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	1	-	3
196	-	-	xx	xx	xx	-	14	-	4	-	-	-	-	14	12	-
197	-	-	xx	xx	xx	-	-	-	1	-	-	-	-	16	7	-
198	1	-	xx	xx	xx	1	2	-	2	-	-	-	-	3	20	2
199	-	-	xx	xx	xx	-	-	-	4	-	-	-	-	-	17	4
200	-	-	xx	xx	xx	2	5	-	2	-	-	-	1	14	29	2
201	-	-	xx	xx	xx	-	-	-	1	-	-	-	-	8	-	-
202	-	-	xx	xx	xx	-	-	-	1	-	-	-	1	18	23	-
203	-	-	xx	xx	xx	-	1	-	1	-	-	-	2	6	1	4
204	-	-	xx	xx	xx	2	1	-	1	-	-	-	-	1	29	4
205	-	2	xx	xx	xx	1	1	-	-	-	-	-	1	18	6	-
206	-	2	xx	xx	xx	4	-	-	1	-	-	-	3	4	12	-
207	-	-	xx	xx	xx	-	-	-	-	-	-	-	1	-	2	-
208	-	8	xx	xx	xx	5	-	-	-	-	-	-	1	6	10	3
209	-	-	xx	xx	xx	1	-	-	2	-	-	-	1	1	1	-
210	-	3	xx	xx	xx	4	-	-	-	-	-	-	4	1	1	-
211	-	8	xx	xx	xx	1	-	-	-	-	-	-	-	1	3	-
212	-	12	xx	xx	xx	2	-	-	-	-	-	-	4	1	6	1
213	-	2	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
214	-	1	xx	xx	xx	3	-	-	-	-	-	-	2	-	3	-
215	-	1	xx	xx	xx	1	-	-	-	-	-	-	-	-	1	-
216	-	26	xx	xx	xx	2	-	-	-	-	-	-	4	2	-	-
217	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
218	-	5	xx	xx	xx	1	-	-	-	-	-	-	-	-	1	2
219	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
220	-	2	xx	xx	xx	-	-	-	1	-	-	-	2	-	-	-
221	-	7	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
222	-	2	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
223	-	-	xx	xx	xx	1	-	-	-	-	-	-	-	-	-	-
224	-	1	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	1
225	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
226	-	2	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
227	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
228	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
229	-	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
230	-	1	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
231	-	1	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	1	86	229	148	113	31	164	-	129	-	-	-	28	135	198	28

^aJulian dates are adjusted by one day in leap years.

^bxx indicates data potentially exist but have not yet been summarized.

Table 46 (continued). Frequency distribution of hatch dates for black-legged kittiwakes at St. Paul Island, Alaska. Data represent the date of the first chick hatched in each nest and include only nests in which observations of egg to chick ≤ 7 days. Individual hatch date data are not available before 1984.

Julian date ^a	No. nests hatching on Julian date														
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
170	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1
171	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
172	-	-	-	-	-	-	-	-	2	-	1	-	1	-	3
173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
174	2	-	-	-	1	-	-	-	4	-	-	-	3	-	11
175	-	1	-	-	-	-	-	-	-	-	4	-	3	-	-
176	3	1	3	1	1	-	-	-	10	-	9	-	2	-	27
177	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-
178	2	1	5	-	8	-	-	-	17	-	5	-	11	-	13
179	-	-	-	-	-	-	-	-	-	-	17	-	-	-	28
180	10	1	15	-	10	-	-	-	18	-	12	-	68	2	30
181	14	-	1	-	-	-	-	-	1	-	-	-	-	9	19
182	5	1	5	2	55	-	-	-	39	-	29	-	12	-	19
183	5	2	12	2	-	-	-	-	3	-	1	-	1	-	-
184	7	3	15	1	44	-	3	-	17	-	15	-	51	3	-
185	5	-	-	-	9	-	-	-	-	-	30	-	12	-	30
186	38	3	14	14	42	1	2	-	11	3	18	-	54	2	8
187	6	5	5	1	20	4	5	-	2	-	-	-	2	-	22
188	2	4	12	21	15	-	1	-	6	1	21	-	16	3	-
189	-	4	2	28	-	-	8	-	-	-	-	-	-	-	-
190	24	3	7	2	24	5	9	-	15	11	10	1	14	-	3
191	8	13	-	12	1	-	17	-	-	-	8	-	-	-	1
192	5	6	2	29	19	5	2	-	6	-	8	-	7	5	2
193	5	-	-	1	-	-	19	-	-	5	12	-	7	-	1
194	9	4	9	25	10	5	7	1	1	3	-	-	-	2	2
195	1	3	-	2	-	-	8	1	1	-	-	-	2	-	-
196	2	12	2	9	5	4	-	-	2	-	2	-	1	-	6
197	-	2	-	-	1	-	15	-	-	-	-	-	1	8	2
198	-	-	-	24	4	6	4	-	3	-	3	1	-	-	-
199	1	-	-	3	-	-	-	-	-	-	-	-	-	-	-
200	2	3	-	5	-	4	6	-	-	-	-	-	-	1	3
201	-	3	-	2	1	-	4	-	-	-	-	-	-	-	-
202	1	1	6	3	3	6	3	-	-	-	-	-	1	1	-
203	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
204	-	1	-	8	-	5	-	-	1	-	1	-	-	-	-
205	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
206	-	2	-	-	-	2	1	-	-	-	-	-	-	-	-
207	-	-	-	1	-	1	-	-	-	-	-	-	-	1	-
208	-	2	-	4	-	-	-	-	-	-	-	2	-	-	-
209	-	-	-	-	-	2	2	-	-	-	-	-	-	-	-
210	-	-	-	1	-	2	-	-	-	-	-	1	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
214	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	1	-	-	2	1	-	-	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
218	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
219	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
223	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
225	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
226	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
227	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
228	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
229	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
231	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	158	81	116	203	274	58	120	2	165	23	207	5	271	38	241

^aJulian dates are adjusted by one day in leap years.

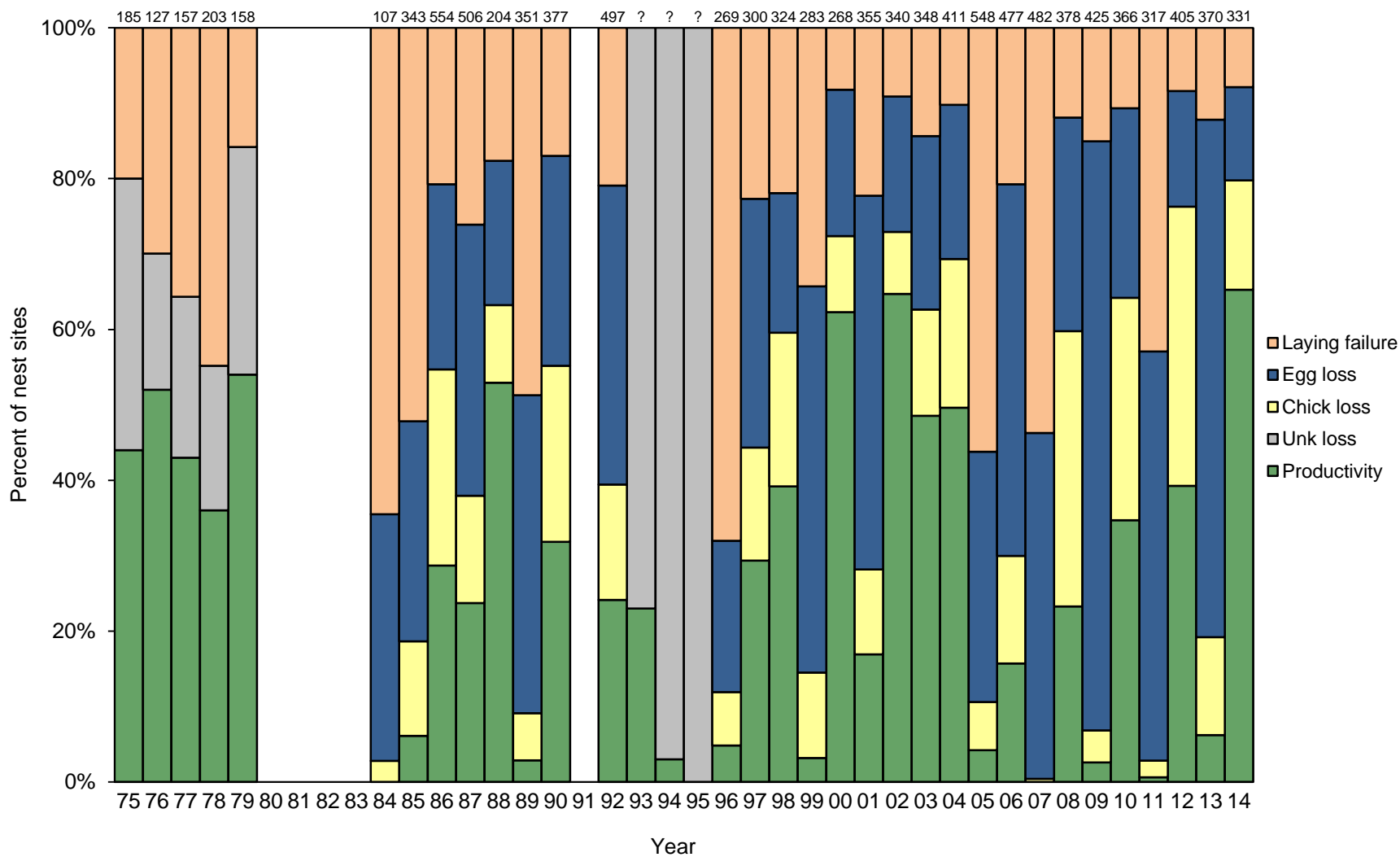


Figure 22. Reproductive performance of black-legged kittiwakes at St. Paul Island, Alaska. Laying failure= $(A-B)/A$; Egg loss= $(B-D)/A$; Chick loss= $(D-F)/A$; Productivity= F/A , where A =total nest sites; B =nest sites with eggs; D =nest sites with chicks; F =nest sites with chicks fledged. Numbers above columns indicate sample sizes (A).

Table 47. Reproductive performance of black-legged kittiwakes at St. Paul Island, Alaska.

Year	Total nest starts	Nest sites w/ eggs	Total eggs	Nest sites w/ chicks	Total chicks	Nest sites w/ chicks fledged	Total chicks fledged	Laying success	Mean clutch size	Nesting success	Hatching success	Chick success	Egg success	Fledging success	Reprod. success	Fledglings /nest start	Prod.
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(B/A)	(C/B)	(D/B)	(E/C)	(G/E)	(G/C)	(F/D)	(F/B)	(G/A)	(F/A)
1975	185	(148) ^a	(204)	-	(145)	-	(81)	(0.80)	1.4 ^b	-	0.71 ^c	0.56 ^c	0.40	-	0.55 ^b	0.44	(0.44)
1976	127	(89)	(131)	-	(105)	-	(66)	(0.70)	1.5 ^b	-	0.80 ^c	0.63 ^c	(0.50)	-	0.74 ^b	0.52	-
1977	157	(101)	(150)	-	(108)	-	(68)	(0.64)	1.5 ^b	-	0.72 ^c	0.63 ^c	0.45	-	0.67 ^b	0.43	-
1978	203	(112)	(149)	-	(118)	-	(73)	(0.55)	1.3 ^b	-	0.79 ^c	0.62 ^c	0.49	-	0.64 ^b	0.36	-
1979	(158)	(133)	(191)	-	(155)	-	(85)	(0.84)	1.5 ^b	-	0.81 ^c	0.55 ^c	0.45	-	0.64 ^b	0.54	-
1980	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	107	38	44	3	4	0	0	0.36	1.2	0.08	0.09	0.00	0.00	0.00	0.00	0.00	0.00
1985	343	164	197	64	73	21	22	0.48	1.2	0.39	0.37	0.30	0.11	0.33	0.13	0.06	0.06
1986	554	439	576	303	333	159	159	0.79	1.3	0.69	0.58	0.48	0.28	0.52	0.36	0.29	0.29
1987	506	374	575	192	240	120	129	0.74	1.5	0.51	0.42	0.54	0.22	0.63	0.32	0.25	0.24
1988	204	168	293	129	177	108	108	0.82	1.7	0.77	0.60	0.61	0.37	0.84	0.64	0.53	0.53
1989	351	180	245	32	41	10	10	0.51	1.4	0.18	0.17	0.24	0.04	0.31	0.06	0.03	0.03
1990	377	313	549	208	288	120	123	0.83	1.8	0.66	0.52	0.43	0.22	0.58	0.38	0.33	0.32
1991	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	497	393	682	196	252	120	123	0.79	1.7	0.50	0.37	0.49	0.18	0.61	0.31	0.25	0.24
1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.23 ^e
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03 ^e
1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00 ^e
1996	269	86	104	32	37	13	13	0.32	1.2	0.37	0.36	0.35	0.13	0.41	0.15	0.05	0.05
1997	300	232	362	133	174	88	88	0.77	1.6	0.57	0.48	0.51	0.24	0.66	0.38	0.29	0.29
1998	324	253	374	193	239	127	128	0.78	1.5	0.76	0.64	0.54	0.34	0.66	0.50	0.40	0.39
1999	283	186	232	41	43	9	9	0.66	1.3	0.22	0.19	0.21	0.04	0.22	0.05	0.03	0.03
2000	268	246	397	194	241	167	173	0.92	1.6	0.79	0.61	0.72	0.44	0.86	0.68	0.65	0.62
2001	355	276	440	100	113	60	60	0.78	1.6	0.36	0.26	0.53	0.14	0.60	0.22	0.17	0.17
2002	340	309	496	248	314	220	246	0.91	1.6	0.80	0.63	0.78	0.50	0.89	0.71	0.72	0.65
2003	348	298	519	218	312	169	201	0.86	1.7	0.73	0.60	0.64	0.39	0.78	0.57	0.58	0.49
2004	411	369	663	285	435	204	229	0.90	1.8	0.77	0.66	0.53	0.35	0.72	0.55	0.56	0.50
2005	548	240	306	58	66	23	26	0.44	1.3	0.24	0.22	0.39	0.08	0.40	0.10	0.05	0.04

^aValues in parentheses were not reported by original investigators and are estimated from other known parameters.

^bValue calculated from smaller sample size.

^cReported values are the midpoint of a range (see Appendix B).

^dxx indicates data potentially exist but have not yet been summarized.

^eData based on short-duration visits (see Appendix B).

Table 47 (continued). Reproductive performance of black-legged kittiwakes at St. Paul Island, Alaska.

Year	Total nest starts (A)	Nest sites w/ eggs (B)	Total eggs (C)	Nest sites w/ chicks (D)	Total chicks (E)	Nest sites w/ chicks fledged (F)	Total chicks fledged (G)	Laying success (B/A)	Mean clutch size (C/B)	Nesting success (D/B)	Hatching success (E/C)	Chick success (G/E)	Egg success (G/C)	Fledging success (F/D)	Reprod. success (F/B)	Fledglings /nest start (G/A)	Prod. (F/A)
2006	477	378	595	143	172	75	75	0.79	1.6	0.38	0.29	0.44	0.13	0.52	0.20	0.16	0.16
2007	482	223	276	2	3	0	0	0.46	1.2	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2008	378	333	588	226	260	88	88	0.88	1.8	0.68	0.44	0.34	0.15	0.39	0.26	0.23	0.23
2009	425	361	551	29	34	11	11	0.85	1.5	0.08	0.06	0.32	0.02	0.38	0.03	0.03	0.03
2010	366	327	582	235	291	127	127	0.89	1.8	0.72	0.50	0.44	0.22	0.54	0.39	0.35	0.35
2011	317	181	223	9	9	2	2	0.57	1.2	0.05	0.04	0.22	0.01	0.22	0.01	0.01	0.01
2012	405	371	670	309	393	159	159	0.92	1.8	0.83	0.59	0.40	0.24	0.51	0.43	0.39	0.39
2013	370	325	482	71	76	23	23	0.88	1.5	0.22	0.16	0.30	0.05	0.32	0.07	0.06	0.06
2014	331	305	561	264	313	216	217	0.92	1.8	0.87	0.56	0.69	0.39	0.82	0.71	0.66	0.65

Table 48. Standard deviation in reproductive performance parameters of black-legged kittiwakes at St. Paul Island, Alaska. Sampling for kittiwakes is clustered by plot except when sample sizes per plot are too small or plot data are not available.

Year	No. plots ^a	Total nest starts	Sampling design ^b	Laying success	Mean clutch size	Nesting success	Hatching success	Chick success	Egg success	Fledging success	Reprod. success	Fledglings /nest start	Prod.
1975	-	185	Simple random	0.03	- ^c	-	- ^c	- ^c	0.03	-	- ^c	0.04	0.04
1976	-	127	Simple random	0.04	- ^c	-	- ^c	- ^c	0.04	-	- ^c	0.04	-
1977	-	157	Simple random	0.04	- ^c	-	- ^c	- ^c	0.04	-	- ^c	0.04	-
1978	-	203	Simple random	0.03	- ^c	-	- ^c	- ^c	0.04	-	- ^c	0.03	-
1979	-	158	Simple random	0.03	- ^c	-	- ^c	- ^c	0.04	-	- ^c	0.04	-
1980	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
1984	6	107	Cluster by plot	0.06	0.03	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00
1985	11	343	Cluster by plot	0.04	0.03	0.06	0.06	0.13	0.06	0.14	0.07	0.04	0.04
1986	xx ^d	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
1987	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
1988	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
1989	16	351	Cluster by plot	0.04	0.05	0.06	0.05	0.07	0.02	0.08	0.03	0.01	0.01
1990	14	377	Cluster by plot	0.03	0.02	0.04	0.03	0.05	0.03	0.06	0.05	0.05	0.05
1991	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
1992	20	497	Cluster by plot	0.02	0.02	0.06	0.05	0.04	0.03	0.06	0.06	0.05	0.05
1993	-	-	-	-	-	-	-	-	-	-	-	-	- ^c
1994	-	-	-	-	-	-	-	-	-	-	-	-	- ^c
1995	-	-	-	-	-	-	-	-	-	-	-	-	- ^c
1996	10	269	Cluster by plot	0.06	0.05	0.06	0.04	0.13	0.06	0.14	0.07	0.03	0.03
1997	12	300	Cluster by plot	0.04	0.05	0.06	0.06	0.06	0.04	0.06	0.06	0.05	0.05
1998	12	324	Cluster by plot	0.04	0.02	0.06	0.06	0.05	0.05	0.05	0.07	0.06	0.06
1999	13	283	Cluster by plot	0.04	0.03	0.04	0.04	0.04	0.01	0.05	0.02	0.01	0.01
2000	11	268	Cluster by plot	0.02	0.04	0.03	0.03	0.02	0.02	0.02	0.03	0.02	0.03
2001	14	355	Cluster by plot	0.02	0.03	0.05	0.04	0.08	0.03	0.09	0.05	0.04	0.04
2002	16	340	Cluster by plot	0.03	0.07	0.05	0.04	0.02	0.03	0.02	0.05	0.06	0.05
2003	15	348	Cluster by plot	0.03	0.04	0.05	0.03	0.04	0.04	0.04	0.06	0.08	0.06
2004	16	411	Cluster by plot	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.04
2005	18	548	Cluster by plot	0.05	0.06	0.06	0.06	0.12	0.04	0.11	0.04	0.02	0.02

^aPlots that are combined for analysis are counted as a single "plot".

^bFor sampling clustered by plot, values are calculated based on plot as a sample unit; for simple random sampling, values are calculated using $\sqrt{\rho * (1 - \rho) / n}$, where ρ is the success rate and n is the sample size of individual nests.

^cStandard deviations are not calculated for success values that are midpoint estimates or based on unknown sample sizes or short-duration visits.

^dxx indicates data potentially exist but have not yet been summarized.

Table 48 (continued). Standard deviation in reproductive performance parameters of black-legged kittiwakes at St. Paul Island, Alaska. Sampling for kittiwakes is clustered by plot except when sample sizes per plot are too small or plot data are not available.

Year	No. plots ^a	Total nest starts	Sampling design ^b	Laying success	Mean clutch size	Nesting success	Hatching success	Chick success	Egg success	Fledging success	Reprod. success	Fledglings /nest start	Prod.
2006	20	477	Cluster by plot	0.03	0.03	0.05	0.04	0.06	0.03	0.08	0.05	0.04	0.04
2007	21	482	Cluster by plot	0.04	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2008	17	378	Cluster by plot	0.03	0.03	0.05	0.04	0.05	0.03	0.06	0.05	0.05	0.05
2009	15	425	Cluster by plot	0.02	0.03	0.02	0.02	0.09	0.01	0.11	0.01	0.01	0.01
2010	13	366	Cluster by plot	0.03	0.03	0.05	0.04	0.06	0.03	0.06	0.06	0.05	0.05
2011	15	317	Cluster by plot	0.05	0.04	0.02	0.01	0.14	0.01	0.14	0.01	<0.01	<0.01
2012	17	405	Cluster by plot	0.01	0.03	0.03	0.02	0.04	0.02	0.04	0.04	0.03	0.03
2013	17	370	Cluster by plot	0.02	0.04	0.04	0.03	0.07	0.02	0.08	0.02	0.02	0.02
2014	15	331	Cluster by plot	0.02	0.02	0.02	0.02	0.05	0.03	0.04	0.05	0.05	0.05

^aPlots that are combined for analysis are counted as a single "plot".

^bFor sampling clustered by plot, values are calculated based on plot as a sample unit; for simple random sampling, values are calculated using $\sqrt{\rho * (1 - \rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

Table 49. Clutch sizes of black-legged kittiwakes at St. Paul Island, Alaska. Sample units consist of total nest sites, not plots.

Year	Total nest starts (A)	Nest sites w/ x eggs:				Nest sites w/ eggs (B)	Total eggs (C)	Mean clutch size (C/B)
		0	1	2	3			
1975	185	-	-	-	-	(148) ^b	(204)	1.4 ^c
1976	127	-	-	-	-	(89)	(131)	1.5 ^c
1977	157	-	-	-	-	(101)	(150)	1.5 ^c
1978	203	-	-	-	-	(112)	(149)	1.3 ^c
1979	(158)	-	-	-	-	(133)	(191)	1.5 ^c
1980	<i>no data</i>	-	-	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-	-	-
1984	107	69	32	6	0	38	44	1.2
1985	343	179	131	33	0	164	197	1.2
1986	xx ^a	xx	xx	xx	xx	xx	xx	xx
1987	xx	xx	xx	xx	xx	xx	xx	xx
1988	xx	xx	xx	xx	xx	xx	xx	xx
1989	351	171	115	65	0	180	245	1.4
1990	377	64	77	236	0	313	549	1.8
1991	<i>no data</i>	-	-	-	-	-	-	-
1992	497	104	105	287	1	393	682	1.7
1993	<i>no data</i>	-	-	-	-	-	-	-
1994	<i>no data</i>	-	-	-	-	-	-	-
1995	<i>no data</i>	-	-	-	-	-	-	-
1996	269	183	68	18	0	86	104	1.2
1997	300	68	102	130	0	232	362	1.6
1998	324	71	133	119	1	253	374	1.5
1999	283	97	140	46	0	186	232	1.3
2000	268	22	95	151	0	246	397	1.6
2001	355	79	112	164	0	276	440	1.6
2002	340	31	127	177	5	309	496	1.6
2003	348	50	77	221	0	298	519	1.7
2004	411	42	76	292	1	369	663	1.8
2005	548	308	174	66	0	240	306	1.3
2006	477	99	162	215	1	378	595	1.6
2007	482	259	170	53	0	223	276	1.2
2008	378	45	78	255	0	333	588	1.8
2009	425	64	171	190	0	361	551	1.5
2010	366	39	73	253	1	327	582	1.8
2011	317	136	140	40	1	181	223	1.2
2012	405	34	75	293	3	371	670	1.8
2013	370	45	168	157	0	325	482	1.5
2014	331	26	49	256	0	305	561	1.8

^axx indicates data potentially exist but have not yet been summarized.

^bValues in parentheses were not reported by original investigators and are estimated from other known parameters.

^cValue calculated from smaller sample size.

Table 50. Reproductive performance of black-legged kittiwakes at St. Paul Island, Alaska in 2014.

Parameter	Plot															Total	SD ^b
	104	54	55	56	64/ 65 ^a	66/ 67 ^a	68	87	110/ 114 ^a	49	50/ 51 ^a	53	89	90	91		
Total nest starts (A)	26	16	17	24	24	23	15	20	30	24	29	12	19	19	33	331	-
Nest sites w/ eggs (B)	24	15	16	23	21	20	15	20	29	22	28	10	18	17	27	305	-
Total eggs (C)	44	30	30	43	40	37	28	35	49	40	53	19	31	30	52	561	-
Nest sites w/ chicks (D)	21	14	13	19	19	16	15	17	24	20	25	10	15	16	20	264	-
Total chicks (E)	23	14	15	20	20	20	17	18	31	25	33	11	19	20	27	313	-
Nest sites w/ chicks fledged (F)	18	12	9	17	19	13	13	15	19	17	24	10	11	10	9	216	-
Total chicks fledged (G)	18	12	9	17	20	13	13	15	19	17	24	10	11	10	9	217	-
Laying success (B/A)	0.92	0.94	0.94	0.96	0.88	0.87	1.00	1.00	0.97	0.92	0.97	0.83	0.95	0.89	0.82	0.92	0.02
Mean clutch size (C/B)	1.8	2.0	1.9	1.9	1.9	1.9	1.9	1.8	1.7	1.8	1.9	1.9	1.7	1.8	1.9	1.8	0.02
Nesting success (D/B)	0.88	0.93	0.81	0.83	0.90	0.80	1.00	0.85	0.83	0.91	0.89	1.00	0.83	0.94	0.74	0.87	0.02
Hatching success (E/C)	0.52	0.47	0.50	0.47	0.50	0.54	0.61	0.51	0.63	0.63	0.62	0.58	0.61	0.67	0.52	0.56	0.02
Chick success (G/E)	0.78	0.86	0.60	0.85	1.00	0.65	0.76	0.83	0.61	0.68	0.73	0.91	0.58	0.50	0.33	0.69	0.05
Egg success (G/C)	0.41	0.40	0.30	0.40	0.50	0.35	0.46	0.43	0.39	0.43	0.45	0.53	0.35	0.33	0.17	0.39	0.03
Fledging success (F/D)	0.86	0.86	0.69	0.89	1.00	0.81	0.87	0.88	0.79	0.85	0.96	1.00	0.73	0.63	0.45	0.82	0.04
Reproductive success (F/B)	0.75	0.80	0.56	0.74	0.90	0.65	0.87	0.75	0.66	0.77	0.86	1.00	0.61	0.59	0.33	0.71	0.05
Fledglings/nest start (G/A)	0.69	0.75	0.53	0.71	0.83	0.57	0.87	0.75	0.63	0.71	0.83	0.83	0.58	0.53	0.27	0.66	0.05
Productivity (F/A)	0.69	0.75	0.53	0.71	0.79	0.57	0.87	0.75	0.63	0.71	0.83	0.83	0.58	0.53	0.27	0.65	0.05

^aPlots were combined for statistical purposes.

^bStandard deviations are calculated based on plot as a sample unit.

Table 51. Mean growth rates of black-legged kittiwake chicks at St. Paul Island, Alaska. Data include chicks measured at least two times during the linear phase of growth. No chicks were measured in 1980-1985, 1988-2002, 2007, 2009 and 2011-2014.

Year	Mass (g/day)				Wing chord (mm/day)				Linear phase definition ^a
	Mean	SD	Range	<i>n</i>	Mean	SD	Range	<i>n</i>	
1975	14.6	2.3	-	34	-	-	-	-	A
1976	12.8	4.9	-	33	-	-	-	-	A
1977	14.5	1.6	-	22	-	-	-	-	A
1978	15.1	2.5	-	16	-	-	-	-	A
1979	16.6	2.9	-	14	-	-	-	-	A
1986	13.9	2.8	xx-xx ^b	10	6.7	1.1	xx-xx	10	unk.
1987	15.5	1.6	xx-xx	11	6.8	0.5	xx-xx	8	unk.
2003	14.8	2.7	9.6-18.4	19	7.3	0.8	4.6-8.5	19	B
2004	15.5	2.8	9.7-20.2	17	7.4	0.9	5.6-8.7	17	B
2005	<i>no data</i>	-	-	-	-	-	-	-	-
2006	11.8	3.1	7.2-16.6	13	5.3	1.3	3.1-7.9	13	C
2008	11.5	-	-	1	4.2	-	-	1	C
2010	15.7	5.1	6.0-24.4	15	4.4	1.7	0.7-6.9	15	C

^aA=linear growth phase defined as period between initial and peak weight measurements of each chick; B=linear growth phase defined as period when chick age 5-25 days; C=chicks of unknown age, linear growth phase determined by visual inspection of individual growth curves.

^bxx indicates data potentially exist but have not yet been summarized.

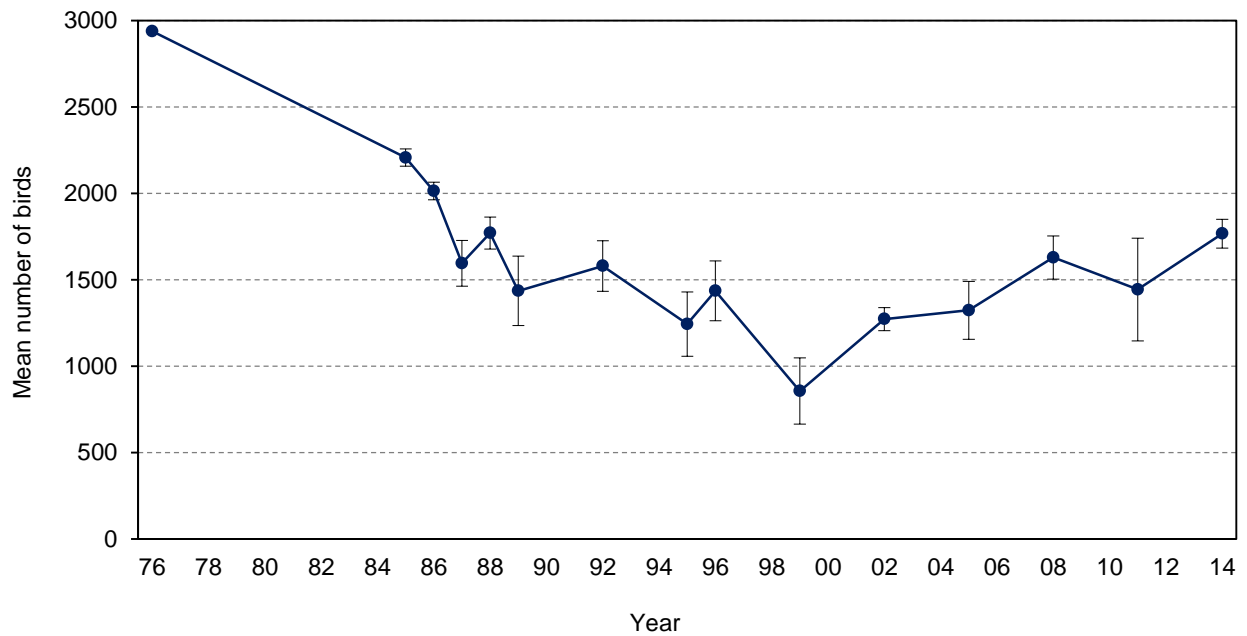


Figure 23. Mean numbers of black-legged kittiwakes counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Data from 1982 and 1984 are excluded because not all plots were counted. Error bars represent standard deviation.

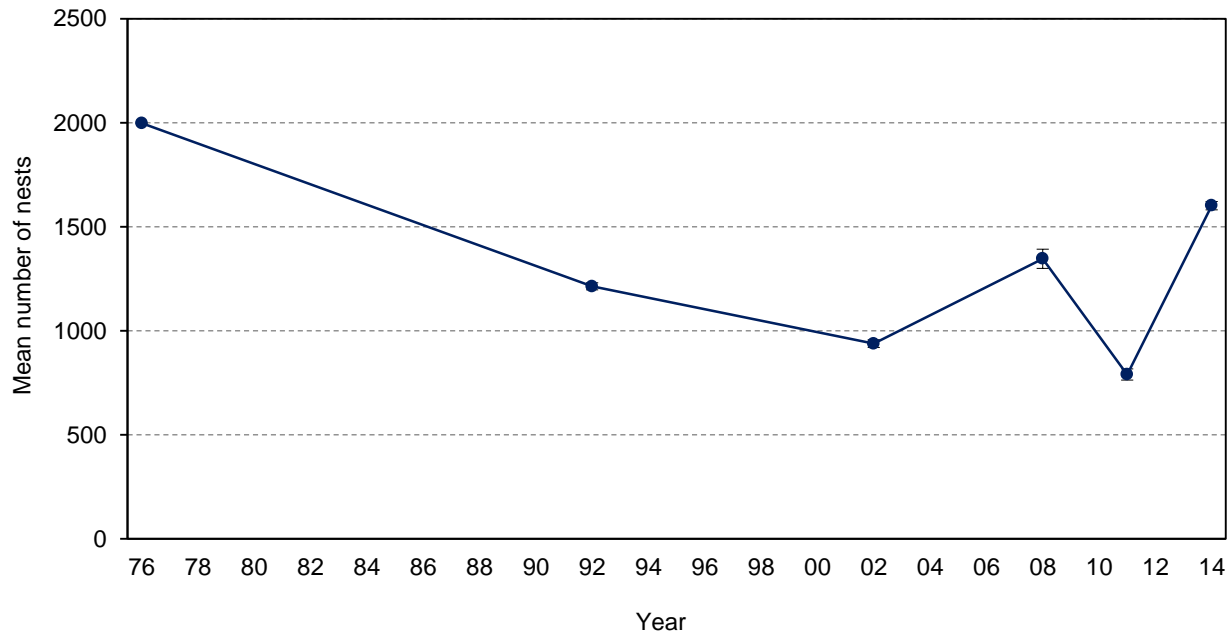


Figure 24. Mean numbers of black-legged kittiwake nests counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Data from 1982 and 1984 are excluded because not all plots were counted. Error bars represent standard deviation.

Table 52. Numbers of black-legged kittiwakes counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. No counts were conducted during years not listed; data from 1982 and 1984 are excluded because not all plots were counted.

Replicate	1976	1985	1986	1987	1988	1989	1992	1995	1996	1999	2002	2005	2008	2011	2014
1	2939	2240	2003	1382	1714	1596	1630	1132	1195	635	1175	1266	1569	1004	1752
2	-	2238	2100	1636	1739	1708	1687	1142	1476	698	1226	1165	1606	1050	1742
3	-	2133	1971	1644	1758	1602	1521	1459	1592	831	1290	1140	1559	1399	1664
4	-	2219	2016	1559	1721	1244	1709	-	1382	803	1299	1353	1507	1508	1695
5	-	-	1979	1568	1666	1220	1314	-	1316	1069	1369	1164	1585	1744	1781
6	-	-	-	1787	1880	1226	1621	-	1657	1102	1278	1568	1572	1380	1818
7	-	-	-	-	1917	1329	-	-	-	-	-	1534	1749	1728	1914
8	-	-	-	-	-	1561	-	-	-	-	-	1398	1886	1740	-
Mean	2939	2208	2014	1596	1771	1436	1580	1244	1436	856	1273	1323	1629	1444	1767
<i>n</i>	1	4	5	6	7	8	6	3	6	6	6	8	8	8	7
SD	-	51	52	133	92	201	146	186	173	191	66	168	125	297	83
First count	17 Jul	xx ^a	6 Jul	9 Jul	12 Jul	17 Jul	12 Jul	9 Jul	10 Jul	7 Jul	8 Jul	11 Jul	1 Jul	6 Jul	30 Jun
Last count	21 Jul	xx	29 Jul	23 Jul	7 Aug	9 Aug	7 Aug	3 Aug	2 Aug	7 Aug	1 Aug	31 Jul	31 Jul	1 Aug	27 Jul

^axx indicates data potentially exist but have not yet been summarized.

Table 53. Numbers of black-legged kittiwake nests counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. No counts were conducted during years not listed; data from 1982 and 1984 are excluded because not all plots were counted.

Replicate	1976	1985	1986	1987	1988	1989	1992	1995	1996	1999	2002	2005	2008	2011	2014
1	1998	xx ^a	xx	xx	xx	xx	1200	<i>no nest count</i>	xx	xx	917	xx	1399	816	1406
2	-	xx	xx	xx	xx	xx	1237		xx	xx	951	xx	1384	792	1451
3	-	xx	xx	xx	xx	xx	1216	-	xx	xx	948	xx	1396	763	1422
4	-	xx	xx	xx	xx	xx	1201	-	xx	xx	-	xx	1357	-	1420
5	-	-	xx	xx	xx	xx	-	-	xx	xx	-	xx	1339	-	1439
6	-	-	-	xx	xx	xx	-	-	xx	xx	-	xx	1316	-	1451
7	-	-	-	-	xx	xx	-	-	-	-	-	xx	1314	-	1459
8	-	-	-	-	-	xx	-	-	-	-	-	xx	1268	-	-
Mean	1998	xx	xx	xx	xx	xx	1214	-	xx	xx	939	xx	1347	790	1435
Overall max. ^b	1998	1569	1959	1521	1399	924	1277	-	940	851	987	441	1496	881	1549
<i>n</i>	1	xx	xx	xx	xx	xx	4	-	xx	xx	3	xx	8	3	7
SD	-	xx	xx	xx	xx	xx	17	-	xx	xx	19	xx	46	27	20
First count	17 Jul	xx	xx	xx	xx	xx	12 Jul	-	xx	xx	8 Jul	11 Jul	1 Jul	6 Jul	30 Jun
Last count	21 Jul	xx	xx	xx	xx	xx	30 Jul	-	xx	xx	23 Jul	xx	31 Jul	14 Jul	27 Jul

^axx indicates data potentially exist but have not yet been summarized.

^bOverall maximum nest number is the highest nest count on each plot in a year, summed across all plots.

Table 54. Numbers of black-legged kittiwakes counted on index plots at St. Paul Island, Alaska in 2014.

Plot	Replicate							Mean	SD
	1 30 Jun-2 Jul	2 7-9 Jul	3 10-12 Jul	4 13-15 Jul	5 17-19 Jul	6 21-23 Jul	7 25-27 Jul		
1	2	4	2	2	3	3	4	-	-
2sw	10	9	5	2	7	5	9	-	-
2ne	10	14	11	9	12	12	8	-	-
3	30	30	24	28	28	29	28	-	-
4	30	29	29	25	27	28	29	-	-
5sw	32	39	34	36	33	37	40	-	-
5ne	5	5	3	2	4	4	2	-	-
6 ^a	-	-	-	-	-	-	-	-	-
7	12	9	5	5	3	4	5	-	-
8	1	1	4	1	2	1	3	-	-
9	-	-	-	-	-	-	-	-	-
10	16	11	11	15	8	9	13	-	-
11	15	15	18	16	14	14	19	-	-
12	51	51	45	46	55	51	47	-	-
13	38	30	36	36	34	35	37	-	-
14	6	7	8	8	9	5	10	-	-
15	11	17	13	12	13	13	20	-	-
16 ^a	-	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-	-
18	20	14	19	20	21	20	27	-	-
19top	26	31	32	29	34	31	36	-	-
19btm	1	1	1	2	1	1	2	-	-
20top	4	3	3	5	4	7	6	-	-
20btm	0	0	0	0	0	0	0	-	-
21 ^a	-	-	-	-	-	-	-	-	-
22	18	17	16	18	17	19	24	-	-
23	24	23	19	24	25	22	23	-	-
24	62	61	46	56	52	54	50	-	-
25	26	18	17	18	21	22	21	-	-
26	20	19	19	20	38	26	27	-	-
27	30	27	23	31	29	25	22	-	-
28	5	4	4	6	4	10	5	-	-
29 ^a	-	-	-	-	-	-	-	-	-
29new	0	0	0	0	1	0	0	-	-
30	6	11	10	9	19	23	26	-	-
31	385	405	387	402	406	410	432	-	-
32	252	260	246	249	267	281	277	-	-
33	604	577	574	563	590	617	662	-	-
Total ^b	1752	1742	1664	1695	1781	1818	1914	1767	83

^aHistorical plots no longer counted.

^bTotals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30.

Table 55. Numbers of black-legged kittiwake nests counted on index plots at St. Paul Island, Alaska in 2014.

Plot	Replicate							Mean	SD	Max.
	1 30 Jun-2 Jul	2 7-9 Jul	3 10-12 Jul	4 13-15 Jul	5 17-19 Jul	6 21-23 Jul	7 25-27 Jul			
1	2	1	2	1	1	1	1	-	-	-
2sw	3	3	3	2	3	2	2	-	-	-
2ne	5	5	6	6	6	6	5	-	-	-
3	17	26	22	23	25	25	22	-	-	-
4	22	22	23	22	19	22	21	-	-	-
5sw	27	32	34	31	30	31	29	-	-	-
5ne	3	0	1	0	0	0	0	-	-	-
6 ^a	-	-	-	-	-	-	-	-	-	-
7	9	8	5	3	3	3	3	-	-	-
8	1	1	4	1	2	1	2	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	9	9	9	11	7	7	8	-	-	-
11	13	14	14	14	12	12	18	-	-	-
12	38	38	38	36	38	34	36	-	-	-
13	30	26	26	30	27	27	27	-	-	-
14	2	5	6	7	6	5	6	-	-	-
15	7	9	9	9	9	10	11	-	-	-
16 ^a	-	-	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-	-	-
18	12	12	12	14	13	16	16	-	-	-
19top	1	1	1	1	1	1	1	-	-	-
19btm	18	24	20	18	20	20	22	-	-	-
20top	0	0	0	0	0	0	0	-	-	-
20btm	3	3	3	3	3	5	5	-	-	-
21 ^a	-	-	-	-	-	-	-	-	-	-
22	14	14	12	15	14	15	16	-	-	-
23	20	20	16	18	19	17	16	-	-	-
24	49	42	39	42	43	42	41	-	-	-
25	15	16	16	16	16	16	16	-	-	-
26	12	15	13	13	15	15	15	-	-	-
27	23	25	23	25	25	24	24	-	-	-
28	3	4	4	4	4	4	4	-	-	-
29 ^a	-	-	-	-	-	-	-	-	-	-
29new	0	0	0	0	0	0	0	-	-	-
30	6	10	10	9	11	13	15	-	-	-
31	320	353	349	330	358	358	369	-	-	-
32	216	223	215	216	230	238	243	-	-	-
33	506	490	487	500	479	481	465	-	-	-
Total ^b	1406	1451	1422	1420	1439	1451	1459	1435	20	1549 ^c

^aHistorical plots no longer counted.

^bTotals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30.

^cOverall maximum nest number is the highest nest count on each plot, summed across all plots.

Table 56. Total number of adult black-legged kittiwakes banded on survival plots at St. Paul Island, Alaska. Data include birds banded with alphanumeric color bands and three color band combinations (2008 only) but not birds historically banded with color bands 1970-1990's.

Parameter	Year						
	2008	2009	2010	2011	2012	2013	2014
New color bands	7	7	78	0	10	0	1
New metal and colors	7	0	54	0	10	0	1
New colors on previous metal-banded bird ^a	0	7	24	0	0	0	0
New color bands replace old color bands ^b	0	0	0	0	0	0	0
Cum. color-banded birds	7	14	92	92	102	102	103

^aBird previously banded with metal band only, caught subsequent year and given color band; adds one bird to number of new color bands.

^bBird previously banded with color band recaptured and given new color band; does not add to number of birds color-banded.

Table 57. Fates of cohorts of adult black-legged kittiwakes banded on survival plots at St. Paul Island, Alaska. Data include birds banded with alphanumeric color bands and three color band combinations (2008 only) but not birds historically banded with color bands 1970-1990's.

Year	No. birds banded in year	No. birds resighted in:						Prop. birds resighted in 2014
		2009	2010	2011	2012	2013	2014	
2008	7	5	3	2	2	3	1	0.14
2009	7	-	4	5	5	1	2	0.29
2010	77	-	-	51	51	40	38	0.49
2011	0	-	-	-	-	-	-	-
2012	10	-	-	-	-	5	3	0.30
2013	0	-	-	-	-	-	-	-
2014	1 ^a	-	-	-	-	-	-	- ^a
Birds seen in current year (A)		5	7	58	58	49	44	-
Birds potentially alive from prior year (B) ^b		7	14	88	78	78	60	-
Apparent annual survival (A/B) ^c		0.71	0.50	0.66	0.74	0.63	0.73	-
Resighting effort ^d								
Total no. resight days		16	14	15	10	8	19	-
Total no. resight hours		N/A ^e	46.0	16.1	8.3	6.0	17.6	-

^aBirds banded in current year are not resighted until following year and not included in current year totals.

^bValue equals the sum of birds resighted in prior year + birds not resighted in prior year but resighted in future years and thus known to have been alive in prior year + new birds banded in prior year.

^cSurvival should be considered a minimum estimate because it is likely not all birds present were observed each year.

^dResighting effort represents sum of time spent at survival plots and includes only dedicated resighting time, not incidental observations made during other work. Hours are calculated by people-hours: 2 people resighting for 1 hour each = 2 resight hours.

^eN/A indicates total resight hours not recorded.

Table 58. Resight history of adult black-legged kittiwakes banded on survival plots at St. Paul Island, Alaska. Data include birds banded with alphanumeric color bands and three color band combinations (2008 only) but not birds historically banded with color combinations 1970-1990's. Values represent number of times birds were resighted each year. Color codes are recorded as color and # of band for birds banded with alphanumeric color bands, and as colors (in code) of bands on left (L) and right (R) legs for birds banded with three band combinations.

Color band		Metal band #	Year banded	Location banded	Notes	Year resighted					
Color or L leg	Band # or R leg					2009	2010	2011	2012	2013	2014
DG/O	GY	974-09358	2008	SW		3	0	0	0	0	0
DG/R	GY	974-09357	2008	SW		0	1	0	1	0	0
O/DB	R	974-09361	2008	SW		2	5	1	2	0	0
O/Y	R	974-09356	2008	SW		0	1	0	0	1	0
R/Y	O	974-09359	2008	SW		2	0	3	0	1	0
R/O	Y	974-09360	2008	SW		3	0	0	0	0	0
Y/GY	DG	974-09362	2008	SW		1	0	0	0	1	1
Yellow	A1	974-09368	2009	SW		-	6	1	1	0	0
Yellow	A4	974-09377	2009	SW		-	0	0	0	0	0
Yellow	A5	974-09366	2009	SW		-	0	1	0	0	0
Yellow	A9	974-09372	2009	SW		-	0	2	3	0	8
Yellow	A0	974-09378	2009	SW		-	5	1	2	1	3
Yellow	C1	794-86629	2009	TS		-	3	3	3	0	0
Yellow	C4	974-09385	2010	TS		-	-	2	2	1	0
Yellow	C5	794-86632	2009	TS		-	2	5	3	0	0
Yellow	C6	794-86641	2010	TS		-	-	5	3	2	3
Yellow	C7	794-86631	2010	TS		-	-	3	0	0	0
Yellow	C8	714-10325	2010	TS		-	-	3	2	1	3
Yellow	C9	714-10330	2010	TS		-	-	0	0	0	0
Yellow	C0	714-10306	2010	TS		-	-	6	2	4	1
Yellow	E1	794-86621	2010	TS		-	-	3	2	1	2
Yellow	E2	974-09386	2010	TS		-	-	0	1	1	0
Yellow	E3	714-10312	2010	TS		-	-	0	0	0	0
Yellow	E6	974-09332	2010	SW		-	-	2	0	0	0
Yellow	E8	974-09380	2010	TS		-	-	2	2	1	2
Yellow	E9	974-09363	2010	SW		-	-	2	1	1	1
Yellow	E0	714-10324	2010	TS		-	-	3	1	0	0
Yellow	F1	714-10369	2010	SW		-	-	1	1	1	0
Yellow	F2	714-10371	2010	SW		-	-	0	2	0	4
Yellow	F3	714-10373	2010	SW		-	-	3	2	0	0
Yellow	F4	714-10375	2010	SW		-	-	0	3	2	3
Yellow	F5	714-10380	2010	SW		-	-	0	0	0	0
Yellow	F6	974-09381	2010	TS		-	-	5	3	3	1
Yellow	F7	714-10381	2010	SW		-	-	1	3	0	1

Table 58 (continued). Resight history of adult black-legged kittiwakes banded on survival plots at St. Paul Island, Alaska. Data include birds banded with alphanumeric color bands and three color band combinations (2008 only) but not birds historically banded with color combinations 1970-1990's. Values represent number of times birds were resighted each year. Color codes are recorded as color and # of band for birds banded with alphanumeric color bands, and as colors (in code) of bands on left (L) and right (R) legs for birds banded with three band combinations.

Codes: Color combos				Location		Resight history					
DB = dark blue		R = red	Y = yellow	SW = Southwest Pt.		0 = not resighted					
DG = dark green		W = white	GY = gray	TS = Tsamana		x = band no longer resightable					
O = orange				TN = Tsamana North		(dead, removed, etc.)					
Color band		Metal band #	Year banded	Location banded	Notes	Year resighted					
Color or L leg	Band # or R leg					2009	2010	2011	2012	2013	2014
Yellow	F8	974-09387	2010	TS		-	-	6	1	3	3
Yellow	F9	974-09384	2010	TS		-	-	3	0	2	2
Yellow	F0	974-09392	2010	TS		-	-	1	1	1	4
Yellow	H1	974-09399	2010	TS		-	-	4	4	6	3
Yellow	H2	974-09400	2010	TN		-	-	0	1	0	0
Yellow	H3	714-10301	2010	TS		-	-	2	0	0	0
Yellow	H4	714-10307	2010	TS		-	-	3	3	4	4
Yellow	H5	714-10303	2010	TS		-	-	5	3	1	4
Yellow	H6	714-10395	2012	SW		-	-	-	-	0	10
Yellow	H7	974-09383	2010	TS		-	-	2	0	2	1
Yellow	H8	714-10305	2010	TS		-	-	2	1	0	2
Yellow	H9	714-10392	2010	TN		-	-	0	1	0	0
Yellow	H0	714-10396	2012	SW		-	-	-	-	1	0
Yellow	J1	714-10346	2010	SW		-	-	1	2	0	0
Yellow	J2	714-10347	2010	SW		-	-	2	0	0	0
Yellow	J3	714-10348	2010	SW		-	-	2	2	0	0
Yellow	J4	714-10349	2010	SW		-	-	2	1	1	4
Yellow	J5	714-10350	2010	SW		-	-	0	0	0	0
Yellow	J6	714-10351	2010	SW		-	-	0	2	1	0
Yellow	J7	714-10352	2010	SW		-	-	1	2	0	0
Yellow	J8	714-10353	2010	TN		-	-	1	0	0	0
Yellow	J9	714-10354	2010	SW		-	-	0	0	0	0
Yellow	J0	714-10356	2010	SW		-	-	3	1	1	4
Yellow	K1	714-10355	2010	SW		-	-	0	0	1	0
Yellow	K2	714-10357	2010	SW		-	-	2	2	1	7
Yellow	K3	714-10358	2010	SW		-	-	0	3	0	0
Yellow	K4	714-10359	2010	SW		-	-	0	0	0	1
Yellow	K5	974-09367	2010	SW		-	-	0	0	0	0
Yellow	K6	714-10360	2010	SW		-	-	0	3	1	1
Yellow	K7	714-10363	2010	SW		-	-	0	0	0	0
Yellow	K8	714-10365	2010	SW		-	-	2	2	2	2
Yellow	K9	714-10368	2010	SW		-	-	1	1	0	0
Yellow	K0	714-10376	2010	SW		-	-	2	4	1	0
Yellow	L1	714-10367	2010	SW		-	-	1	0	1	3

Table 58 (continued). Resight history of adult black-legged kittiwakes banded on survival plots at St. Paul Island, Alaska. Data include birds banded with alphanumeric color bands and three color band combinations (2008 only) but not birds historically banded with color combinations 1970-1990's. Values represent number of times birds were resighted each year. Color codes are recorded as color and # of band for birds banded with alphanumeric color bands, and as colors (in code) of bands on left (L) and right (R) legs for birds banded with three band combinations.

Color band		Metal band #	Year banded	Location banded	Notes	Year resighted					
Color or L leg	Band # or R leg					2009	2010	2011	2012	2013	2014
Yellow	L2	714-10370	2010	SW		-	-	0	0	0	0
Yellow	L3	714-10372	2010	SW		-	-	0	0	0	0
Yellow	L4	714-10378	2010	SW		-	-	0	0	0	1
Yellow	L5	714-10379	2010	SW		-	-	3	2	1	3
Yellow	L6	714-10382	2010	SW		-	-	1	1	0	0
Yellow	L7	0974-09382	2010	TS		-	-	4	2	2	6
Yellow	L8	0974-09388	2010	TS		-	-	5	5	4	5
Yellow	L9	0974-09393	2010	TS		-	-	6	2	4	1
Yellow	L0	0974-09397	2010	TS		-	-	5	4	3	4
Yellow	M1	0974-09390	2010	TS		-	-	2	1	2	1
Yellow	M2	794-86720	2010	TS		-	-	2	0	0	0
Yellow	M3	0974-09396	2010	TS		-	-	3	1	2	1
Yellow	M4	0974-09398	2010	TS		-	-	5	2	3	2
Yellow	M5	0974-09365	2010	SW		-	-	0	3	2	1
Yellow	M6	714-10391	2010	TN		-	-	1	0	0	0
Yellow	M7	714-10393	2010	TN		-	-	2	0	1	0
Yellow	M8	714-10397	2012	SW		-	-	-	-	0	0
Yellow	M9	714-10398	2012	SW		-	-	-	-	1	0
Yellow	M0	714-10399	2012	SW		-	-	-	-	0	0
Yellow	N1	714-10361	2010	SW		-	-	0	1	0	0
Yellow	N2	714-10362	2010	SW		-	-	0	0	0	0
Yellow	N3	714-10364	2010	SW		-	-	0	0	0	0
Yellow	N4	714-10366	2010	SW		-	-	3	3	0	0
Yellow	N5	714-10374	2010	SW		-	-	0	4	0	5
Yellow	N6	714-10377	2010	SW		-	-	0	0	0	0
Yellow	N7	0974-09389	2010	TS		-	-	3	3	3	3
Yellow	N8	0974-09391	2010	TS		-	-	3	1	0	0
Yellow	N9	0974-09394	2010	TS		-	-	2	4	2	3
Yellow	N0	0974-09395	2010	TS		-	-	5	3	1	3
Yellow	T1	714-10400	2012	SW		-	-	-	-	1	0
Yellow	T2	0974-09335	2012	TS		-	-	-	-	1	3
Yellow	T3	0974-09336	2012	TS		-	-	-	-	0	1

Table 58 (continued). Resight history of adult black-legged kittiwakes banded on survival plots at St. Paul Island, Alaska. Data include birds banded with alphanumeric color bands and three color band combinations (2008 only) but not birds historically banded with color combinations 1970-1990's. Values represent number of times birds were resighted each year. Color codes are recorded as color and # of band for birds banded with alphanumeric color bands, and as colors (in code) of bands on left (L) and right (R) legs for birds banded with three band combinations.

Codes: Color combos			Location		Resight history						
DB = dark blue		R = red	Y = yellow		0 = not resighted						
DG = dark green		W = white	GY = gray		x = band no longer resightable						
O = orange					(dead, removed, etc.)						
Color band		Metal band #	Year banded	Location banded	Notes	Year resighted					
Color or L leg	Band # or R leg					2009	2010	2011	2012	2013	2014
Yellow	T4	0974-09337	2012	TS	-	-	-	-	1	9	
Yellow	T5	0974-09338	2012	TS	-	-	-	-	1	0	
Yellow	U1	0974-09339	2014	SW	-	-	-	-	-	?	
Total birds resighted					5	7	60	59	50	45	

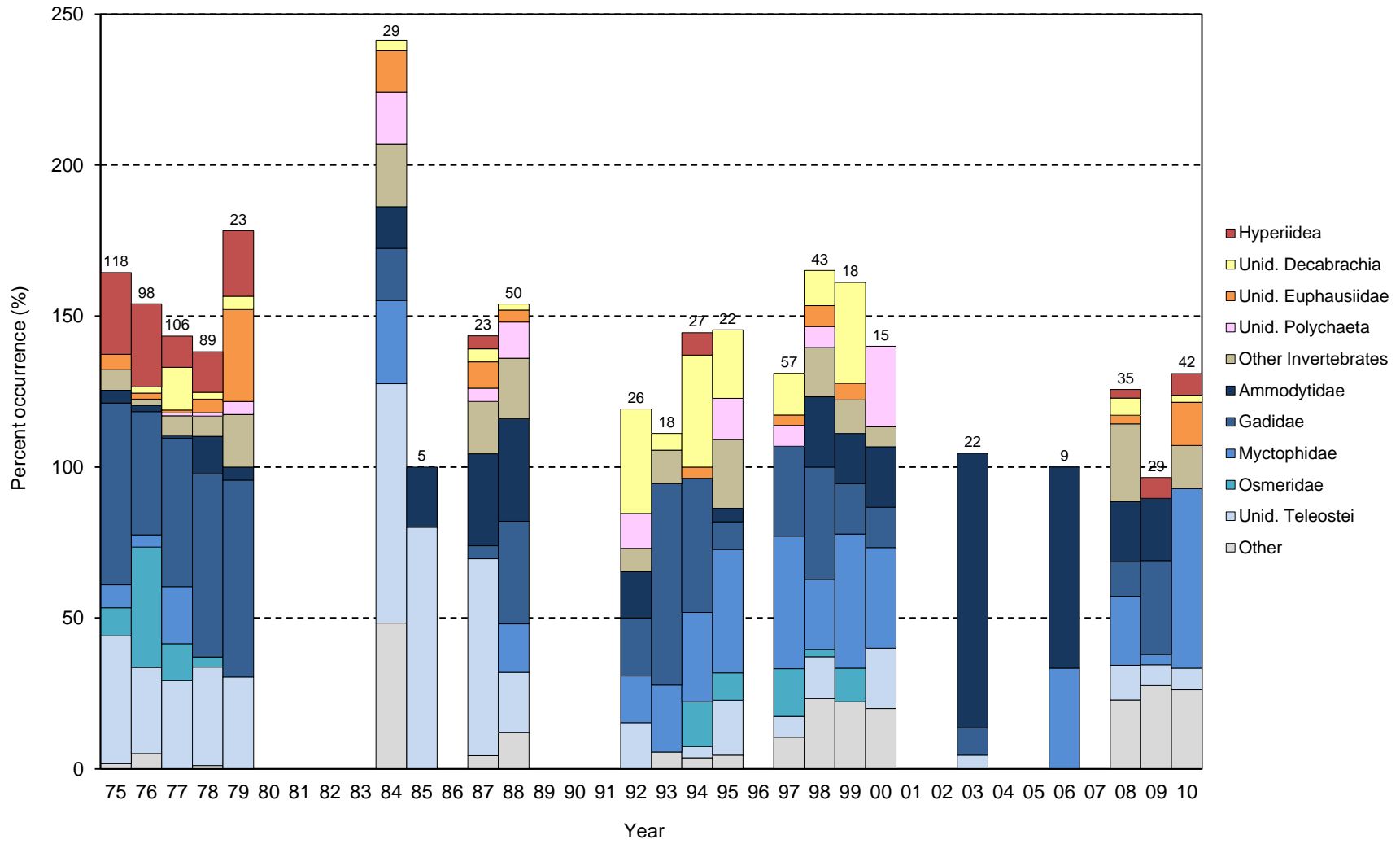


Figure 25. Frequency of occurrence of major prey items in diets of black-legged kittiwake adults and chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey is grouped to family level or higher; only taxa with an among-year average occurrence of at least 5% are shown. Numbers above columns indicate sample sizes.

Table 59. Frequency of occurrence of major prey items in diets of black-legged kittiwake adults and chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as "others" in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of stomach contents from adults and chicks collected at or near the colony, regurgitations from adults returning to the colony to feed chicks and regurgitations from chicks themselves. No diet samples were collected in 1980-1983, 1986, 1989-1991, 1996, 2001-2002, 2004-2005 or 2007; samples were collected in 2010-2014 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1975	1976	1977	1978	1979	1984	1985	1987	1988	1992	1993
No. samples	118	98	106	89	23	29	5	23	50	26	18
Invertebrates	39.0	36.7	39.6	34.8	65.2	65.5	-	43.5	34.0	50.0	22.2
Amphipoda	29.7	32.7	12.3	13.5	21.7	20.7	-	4.3	-	-	11.1
Hyperiidea	27.1	27.6	10.4	13.5	21.7	-	-	4.3	-	-	-
Other Amphipoda	3.4	7.1	1.9	-	-	20.7	-	-	-	-	11.1
Cephalopoda	-	2.0	14.2	2.2	4.3	17.2	-	4.3	2.0	34.6	5.6
Unid. Decabrachia	-	2.0	14.2	2.2	4.3	3.4	-	4.3	2.0	34.6	5.6
Other Cephalopoda	-	-	-	-	-	13.8	-	-	-	-	-
Euphausiacea	8.5	6.1	1.9	6.7	39.1	13.8	-	17.4	4.0	11.5	5.6
Euphausiidae	8.5	6.1	1.9	6.7	39.1	13.8	-	17.4	4.0	11.5	5.6
Unid. Euphausiidae	5.1	2.0	0.9	4.5	30.4	13.8	-	8.7	4.0	-	0.0
Other Euphausiidae	3.4	4.1	0.9	4.5	13.0	-	-	8.7	-	11.5	5.6
Polychaeta	6.8	-	10.4	15.7	13.0	34.5	-	4.3	12.0	11.5	-
Unid. Polychaeta	-	-	0.9	1.1	4.3	17.2	-	4.3	12.0	11.5	-
Other Polychaeta	6.8	-	9.4	14.6	8.7	17.2	-	-	-	-	-
Other Invertebrates	6.8	2.0	6.6	6.7	17.4	20.7	-	17.4	20.0	7.7	11.1
Fish	96.6	89.8	91.5	93.3	95.7	89.7	100.0	95.7	96.0	65.4	83.3
Teleostei	96.6	89.8	91.5	93.3	95.7	89.7	100.0	95.7	96.0	65.4	83.3
Ammodytidae	4.2	2.0	0.9	12.4	4.3	13.8	20.0	30.4	34.0	15.4	-
<i>Ammodytes hexapterus</i>	4.2	2.0	0.9	12.4	4.3	13.8	20.0	30.4	34.0	15.4	-
Gadidae	60.2	40.8	49.1	60.7	65.2	17.2	-	4.3	34.0	19.2	66.7
<i>Gadus chalcogrammus</i>	51.7	24.5	34.9	60.7	65.2	13.8	-	4.3	30.0	19.2	66.7
Other Gadidae	9.3	16.3	14.2	-	-	3.4	-	-	6.0	-	-
Myctophidae	7.6	4.1	18.9	-	-	27.6	-	-	16.0	15.4	22.2
Unid. Myctophidae	7.6	3.1	18.9	-	-	27.6	-	-	16.0	15.4	22.2
Other Myctophidae	-	1.0	-	-	-	-	-	-	-	-	-
Osmeridae	9.3	39.8	12.3	3.4	-	-	-	-	-	-	-
<i>Mallotus villosus</i>	9.3	39.8	12.3	3.4	-	-	-	-	-	-	-
Other Osmeridae	-	-	-	-	-	-	-	-	-	-	-
Unid. Teleostei	42.4	28.6	29.2	32.6	30.4	79.3	80.0	65.2	20.0	15.4	-
Other Teleostei	1.7	1.0	1.9	-	8.7	-	-	-	8.0	-	-
Other	1.7	5.1	-	1.1	-	48.3	-	4.3	12.0	-	5.6
Offal	-	-	-	-	-	13.8	-	-	-	-	-
Other	1.7	5.1	-	1.1	-	41.4	-	4.3	12.0	-	5.6

Table 59 (continued). Frequency of occurrence of major prey items in diets of black-legged kittiwake adults and chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as "others" in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of stomach contents from adults and chicks collected at or near the colony, regurgitations from adults returning to the colony to feed chicks and regurgitations from chicks themselves. No diet samples were collected in 1980-1983, 1986, 1989-1991, 1996, 2001-2002, 2004-2005 or 2007; samples were collected in 2010-2014 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1994	1995	1997	1998	1999	2000	2003	2006	2008	2009	2010
No. samples	27	22	57	43	18	15	22	9	35	29	42
Invertebrates	37.0	54.5	24.6	39.5	50.0	46.7	-	-	42.9	13.8	40.5
Amphipoda	7.4	-	3.5	2.3	5.6	6.7	-	-	14.3	10.3	14.3
Hyperiidea	7.4	-	-	-	-	-	-	-	2.9	6.9	7.1
Other Amphipoda	-	-	3.5	2.3	5.6	6.7	-	-	14.3	3.4	7.1
Cephalopoda	37.0	22.7	14.0	11.6	33.3	6.7	-	-	5.7	-	2.4
Unid. Decabrachia	37.0	22.7	13.8	11.6	33.3	-	-	-	5.7	-	2.4
Other Cephalopoda	-	-	-	-	-	6.7	-	-	-	-	-
Euphausiacea	3.7	-	3.5	7.0	5.6	-	-	-	8.6	3.4	19.0
Euphausiidae	3.7	-	3.5	7.0	5.6	-	-	-	8.6	3.4	19.0
Unid. Euphausiidae	3.7	-	3.4	7.0	5.6	-	-	-	2.9	-	14.3
Other Euphausiidae	-	-	-	-	-	-	-	-	5.7	3.4	7.1
Polychaeta	-	13.6	6.9	7.0	-	26.7	-	-	-	3.4	-
Unid. Polychaeta	-	13.6	6.9	7.0	-	26.7	-	-	-	-	-
Other Polychaeta	-	-	-	-	-	-	-	-	-	3.4	-
Other Invertebrates	-	22.7	-	16.3	11.1	6.7	-	-	25.7	-	14.3
Fish	85.2	72.7	91.2	76.7	77.8	80.0	100.0	100.0	62.9	58.6	76.2
Teleostei	85.2	72.7	91.2	76.7	77.8	80.0	100.0	100.0	62.9	58.6	76.2
Ammodytidae	-	4.5	-	23.3	16.7	20.0	90.9	66.7	20.0	20.7	-
<i>Ammodytes hexapterus</i>	-	4.5	-	23.3	16.7	20.0	90.9	66.7	20.0	20.7	-
Gadidae	44.4	9.1	29.8	37.2	16.7	13.3	9.1	-	11.4	31.0	-
<i>Gadus chalcogrammus</i>	44.4	9.1	29.3	37.2	16.7	13.3	-	-	-	27.6	-
Other Gadidae	-	-	-	-	-	-	9.1	-	11.4	3.4	-
Myctophidae	29.6	40.9	43.9	23.3	44.4	33.3	-	33.3	22.9	3.4	59.5
Unid. Myctophidae	29.6	40.9	43.1	23.3	44.4	33.3	-	33.3	2.9	3.4	40.5
Other Myctophidae	-	-	-	-	-	-	-	-	22.9	-	21.4
Osmeridae	14.8	9.1	15.8	2.3	11.1	-	-	-	-	-	-
<i>Mallotus villosus</i>	14.8	9.1	15.5	2.3	11.1	-	-	-	-	-	-
Other Osmeridae	-	9.1	10.5	-	-	-	-	-	-	-	-
Unid. Teleostei	3.7	18.2	6.9	14.0	-	20.0	4.5	-	11.4	6.9	7.1
Other Teleostei	-	-	7.0	2.3	-	20.0	-	-	8.6	17.2	14.3
Other	3.7	4.5	10.5	23.3	22.2	20.0	-	-	22.9	27.6	26.2
Offal	-	-	1.7	18.6	-	-	-	-	20.0	27.6	26.2
Other	3.7	4.5	8.8	4.7	22.2	20.0	-	-	2.9	3.4	2.4

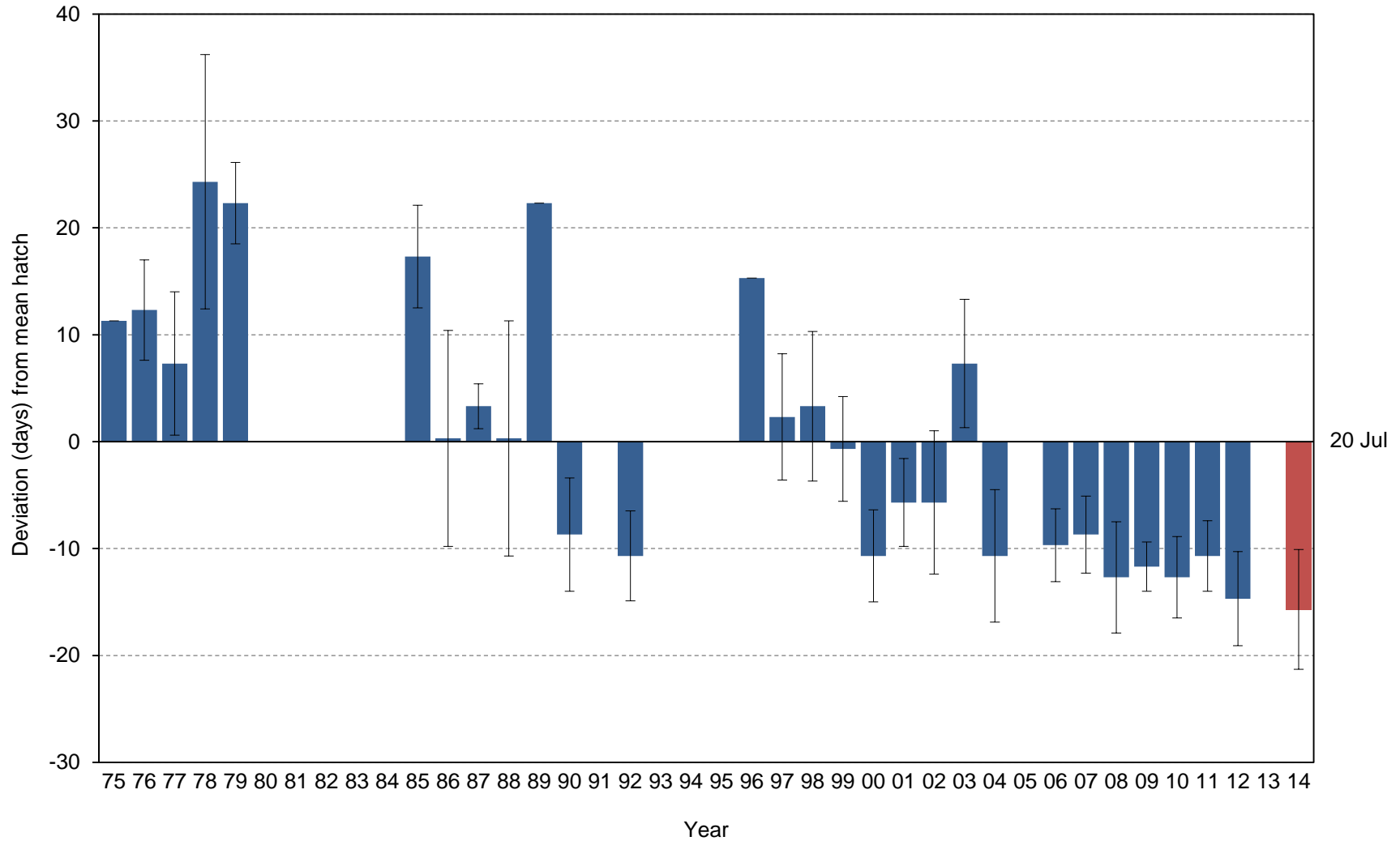


Figure 26. Yearly hatch date deviation (from the 1975-2013 average of 20 July) for red-legged kittiwakes at St. Paul Island, Alaska. Negative values indicate earlier than mean hatch date, positive values indicate later than mean hatch date. Error bars represent standard deviation around each year's mean hatch date; no hatch date data exist for the current year.

Table 60. Breeding chronology of red-legged kittiwakes at St. Paul Island, Alaska. Data represent the dates of the first egg laid and the first chick hatched in each nest.

Year	Mean lay	SD	<i>n</i> ^a	Mean hatch	SD	<i>n</i> ^b	First lay	First hatch	Last hatch	First fledge ^c
1975	-	-	-	31 Jul	0.0	3	-	-	-	-
1976	-	-	-	31 Jul	4.7	41	-	-	-	-
1977	-	-	-	27 Jul	6.7	10	-	-	-	-
1978	-	-	-	13 Aug	11.9	7	-	-	-	-
1979	-	-	-	11 Aug	3.8	12	-	-	-	-
1980	<i>no data</i>	-	-	-	-	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-	-	-	-	-
1984	<i>no data</i>	-	-	-	-	-	-	-	-	-
1985	9 Jul	6.1	9	6 Aug	4.8	5	1 Jul	2 Aug	12 Aug	>29 Aug
1986	xx ^d	xx	xx	20 Jul	10.1	19	xx	xx	xx	xx
1987	xx	xx	xx	23 Jul	2.1	2	xx	xx	xx	xx
1988	xx	xx	xx	19 Jul	11.0	17	xx	xx	xx	xx
1989	15 Jul	2.0	2	11 Aug	0.0	1	13 Jul	11 Aug	-	-
1990	16 Jun	6.9	13	11 Jul	5.3	13	11 Jun	3 Jul	19 Jul	14 Aug
1991	<i>no data</i>	-	-	-	-	-	-	-	-	-
1992	11 Jun	4.2	34	8 Jul	4.2	21	6 Jun	29 Jun	22 Jul	18 Aug
1993	<i>no data</i>	-	-	-	-	-	-	-	-	-
1994	<i>no data</i>	-	-	-	-	-	-	-	-	-
1995	<i>no data</i>	-	-	-	-	-	-	-	-	-
1996	4 Jul	14.3	3	3 Aug	0.0	1	16 Jun	3 Aug	-	-
1997	24 Jun	6.3	20	22 Jul	5.9	11	14 Jun	15 Jul	4 Aug	25 Aug
1998	23 Jun	7.5	26	23 Jul	7.0	22	10 Jun	11 Jul	8 Aug	27 Aug
1999	23 Jun	4.1	22	19 Jul	4.9	13	11 Jun	7 Jul	27 Jul	19 Aug
2000	11 Jun	3.9	22	8 Jul	4.3	23	6 Jun	29 Jun	16 Jul	5 Aug
2001	14 Jun	5.8	18	14 Jul	4.1	9	5 Jun	8 Jul	19 Jul	26 Aug
2002	10 Jun	6.2	30	14 Jul	6.7	6	2 Jun	2 Jul	21 Jul	18 Aug
2003	20 Jun	9.2	19	27 Jul	6.0	6	5 Jun	17 Jul	6 Aug	>31 Aug
2004	11 Jun	7.0	29	8 Jul	6.2	20	31 May	30 Jun	22 Jul	22 Aug
2005	11 Jun	3.7	5	-	-	-	7 Jun	-	-	-
2006	15 Jun	5.7	17	10 Jul	3.4	11	11 Jun	3 Jul	17 Jul	21 Aug
2007	12 Jun	2.6	17	11 Jul	3.6	4	9 Jun	7 Jul	15 Jul	>27 Aug
2008	7 Jun	5.8	15	6 Jul	5.2	15	29 May	26 Jun	18 Jul	20 Aug
2009	12 Jun	4.7	12	8 Jul	2.3	5	7 Jun	5 Jul	12 Jul	>31 Aug
2010	9 Jun	3.4	9	7 Jul	3.8	8	5 Jun	3 Jul	15 Jul	26 Aug
2011	13 Jun	3.7	9	9 Jul	3.3	3	7 Jun	5 Jul	13 Jul	24 Aug
2012	13 Jun	4.5	5	4 Jul	4.4	7	6 Jun	28 Jun	13 Jul	9 Aug
2013 ^e	12 Jun	4.2	16	-	-	-	7 Jun	-	-	7 Aug
2014	10 Jun	2.7	4	4 Jul	5.6	13	7 Jun	28 Jun	16 Jul	9 Aug

^aSample sizes for mean lay dates are a sub-sample of total nests for which no egg to egg interval is ≤ 7 days.

^bSample sizes for mean hatch dates are a sub-sample of total nests for which egg to chick interval is ≤ 7 days.

^cIn years when no chicks fledged before the field crew left the island at the end of the season, date of first fledge is listed as > the date of last nest check.

^dxx indicates data potentially exist but have not yet been summarized.

^eDue to extreme weather conditions, hatch dates were not obtained in 2013.

Table 61. Frequency distribution of hatch dates for red-legged kittiwakes at St. Paul Island, Alaska. Data represent the date of the first chick hatched in each nest and include only nests in which observations of egg to chick ≤ 7 days. Individual hatch date data are not available before 1985.

Julian date ^a	No. nests hatching on Julian date														
	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
178	-	xx ^b	xx	xx	-	-	no data	-	no data	no data	no data	-	-	-	-
179	-	xx	xx	xx	-	-	no data	-	no data	no data	no data	-	-	-	-
180	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
181	-	xx	xx	xx	-	-	-	1	-	-	-	-	-	-	-
182	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
183	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
184	-	xx	xx	xx	-	2	-	-	-	-	-	-	-	-	-
185	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
186	-	xx	xx	xx	-	-	-	3	-	-	-	-	-	-	-
187	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
188	-	xx	xx	xx	-	2	-	1	-	-	-	-	-	-	1
189	-	xx	xx	xx	-	-	-	1	-	-	-	-	-	-	-
190	-	xx	xx	xx	-	2	-	13	-	-	-	-	-	-	-
191	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
192	-	xx	xx	xx	-	1	-	-	-	-	-	-	-	1	-
193	-	xx	xx	xx	-	1	-	-	-	-	-	-	-	-	-
194	-	xx	xx	xx	-	2	-	-	-	-	-	-	-	-	1
195	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
196	-	xx	xx	xx	-	-	-	1	-	-	-	-	2	-	-
197	-	xx	xx	xx	-	-	-	-	-	-	-	-	1	4	-
198	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
199	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	2	-
200	-	xx	xx	xx	-	3	-	-	-	-	-	-	2	3	6
201	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
202	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	1
203	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	1
204	-	xx	xx	xx	-	-	-	1	-	-	-	-	-	5	1
205	-	xx	xx	xx	-	-	-	-	-	-	-	-	2	-	-
206	-	xx	xx	xx	-	-	-	-	-	-	-	-	1	-	1
207	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
208	-	xx	xx	xx	-	-	-	-	-	-	-	-	2	1	1
209	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
210	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
211	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	3	-
212	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	1	-
213	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
214	2	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
215	1	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
216	-	xx	xx	xx	-	-	-	-	-	-	-	1	1	1	-
217	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
218	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
219	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
220	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	1	-
221	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
222	-	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
223	-	xx	xx	xx	1	-	-	-	-	-	-	-	-	-	-
224	2	xx	xx	xx	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	5	19	2	17	1	13	-	21	-	-	-	1	11	22	13

^aJulian dates are adjusted by one day in leap years.

^bDue to extreme weather conditions, hatch dates were not obtained in 2013

Table 61 (continued). Frequency distribution of hatch dates for red-legged kittiwakes at St. Paul Island, Alaska. Data represent the date of the first chick hatched in each nest and include only nests in which observations of egg to chick ≤ 7 days. Individual hatch date data are not available before 1985.

Julian date ^a	No. nests hatching on Julian date														
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
178	-	-	-	-	-	<i>no data</i>	-	-	1	-	-	-	-	<i>no data</i> ^b	-
179	-	-	-	-	-	<i>no data</i>	-	-	-	-	-	-	-	<i>no data</i> ^b	2
180	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
181	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
182	1	-	-	-	2	-	-	-	-	-	-	-	-	-	5
183	-	-	1	-	-	-	-	-	3	-	-	-	-	-	-
184	-	-	-	-	-	-	1	-	1	-	1	-	4	-	-
185	-	-	-	-	2	-	-	-	-	-	3	-	-	-	-
186	7	-	-	-	3	-	-	-	1	1	-	1	-	-	-
187	-	-	-	-	2	-	-	-	1	-	-	-	-	-	3
188	-	-	-	-	3	-	-	2	2	1	2	-	1	-	-
189	-	1	-	-	-	-	3	-	-	-	-	-	-	-	-
190	4	1	1	-	1	-	1	-	3	2	-	1	-	-	-
191	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-
192	4	1	-	-	2	-	-	-	1	-	-	-	-	-	-
193	2	-	-	-	-	-	4	-	-	1	-	-	-	-	-
194	1	2	1	-	1	-	-	1	1	-	-	1	-	-	-
195	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
196	1	-	1	-	1	-	-	1	-	-	1	-	-	-	1
197	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
198	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-
199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	3	-	-	1	-	-	-	1	-	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
206	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
207	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
211	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
218	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
219	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
223	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>n</i>	23	9	6	6	20	-	11	4	14	5	8	3	7	-	13

^aJulian dates are adjusted by one day in leap years.

^bDue to extreme weather conditions, hatch dates were not obtained in 2013

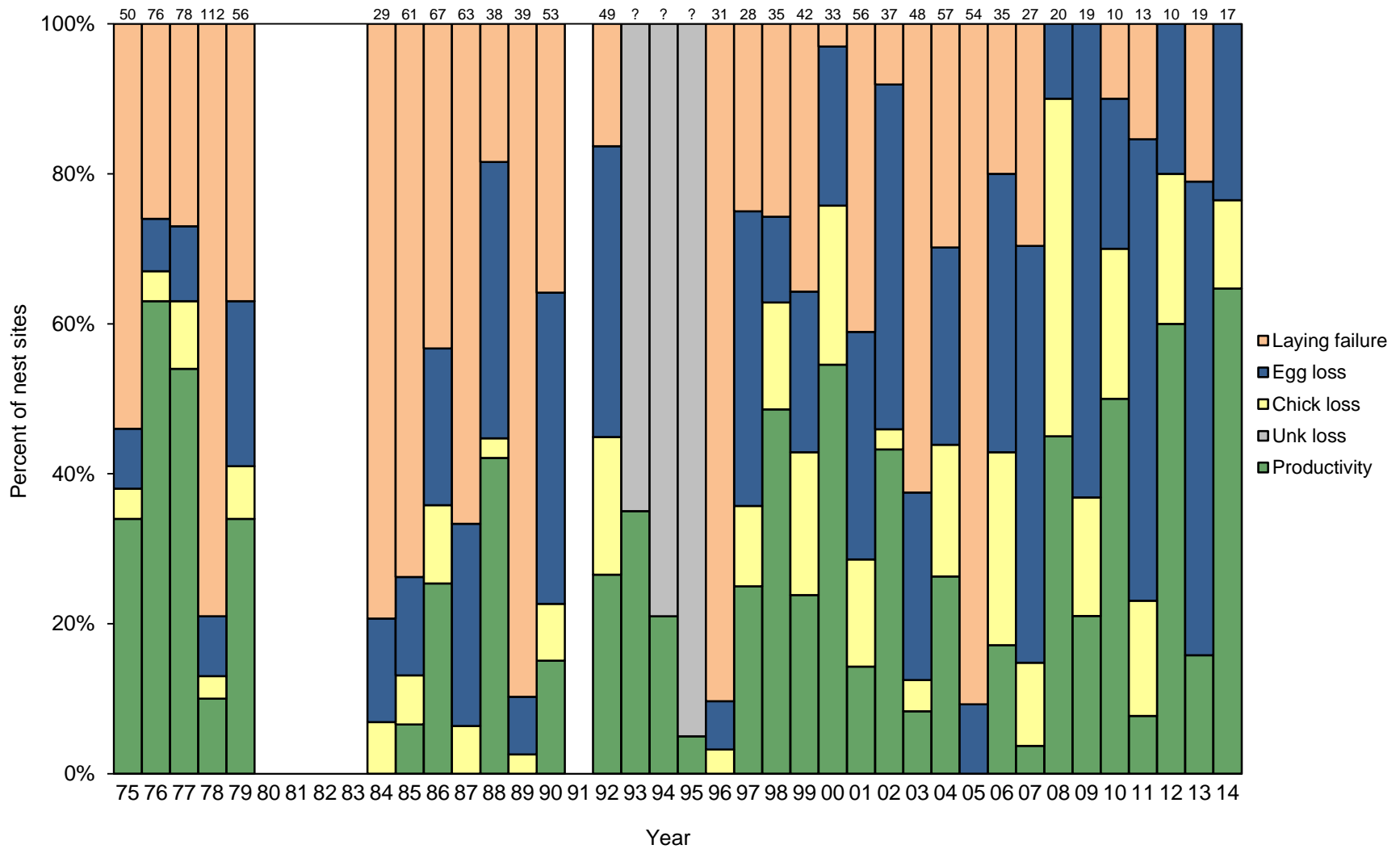


Figure 27. Reproductive performance of red-legged kittiwakes at St. Paul Island, Alaska. Laying failure=(A-B)/A; Egg loss=(B-D)/A; Chick loss=(D-F)/A; Productivity=F/A, where A=total nest sites; B=nest sites with eggs; D=nest sites with chicks; F=nest sites with chicks fledged. Numbers above columns indicate sample sizes (A).

Table 62. Reproductive performance of red-legged kittiwakes at St. Paul Island, Alaska.

Year	Total nest starts	Nest sites w/ eggs	Total eggs	Nest sites w/ chicks	Total chicks	Nest sites w/ chicks fledged	Total chicks fledged	Laying success	Mean clutch size	Nesting success	Hatching success	Chick success	Egg success	Fledging success	Reprod. success	Fledglings /nest start	Prod.
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(B/A)	(C/B)	(D/B)	(E/C)	(G/E)	(G/C)	(F/D)	(F/B)	(G/A)	(F/A)
1975	50	23	-	(19) ^a	-	(17)	-	0.46	-	0.85 ^b	-	-	-	0.88 ^b	0.74	-	0.34
1976	76	56	-	(51)	-	(48)	-	0.74	-	0.91 ^b	-	-	-	0.95 ^b	0.86	-	0.63
1977	78	57	-	(49)	-	(42)	-	0.73	-	0.86 ^b	-	-	-	0.86 ^b	0.74	-	0.54
1978	112	24	-	(15)	-	(11)	-	0.21	-	0.63 ^b	-	-	-	0.73 ^b	0.46	-	0.10
1979	56	(35)	-	(23)	-	(19)	-	0.63	-	0.67 ^b	-	-	-	0.82 ^b	0.54	-	0.34
1980	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	29	6	-	2	-	0	0	0.21	-	0.33	-	-	-	0.00	0.00	0.00	0.00
1985	61	16	17	8	8	4	4	0.26	1.1	0.50	0.47	0.50	0.24	0.50	0.25	0.07	0.07
1986	67	38	xx	24	xx	17	xx	0.57	xx	0.63	xx	xx	xx	0.71	0.45	xx	0.25
1987	63	21	xx	4	xx	0	0	0.33	xx	0.19	xx	xx	xx	0.00	0.00	0.00	0.00
1988	38	31	xx	17	xx	16	xx	0.82	xx	0.55	xx	xx	xx	0.94	0.52	xx	0.42
1989	39	4	4	1	1	0	0	0.10	1.0	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00
1990	53	34	34	12	12	8	8	0.64	1.0	0.35	0.35	0.67	0.24	0.67	0.24	0.15	0.15
1991	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	49	41	41	22	22	13	13	0.84	1.0	0.54	0.54	0.59	0.32	0.59	0.32	0.27	0.27
1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.35 ^d
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.21 ^d
1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05 ^d
1996	31	3	3	1	1	0	0	0.10	1.0	0.33	0.33	0.00	0.00	0.00	0.00	0.00	0.00
1997	28	21	21	10	10	7	7	0.75	1.0	0.48	0.48	0.70	0.33	0.70	0.33	0.25	0.25
1998	35	26	26	22	22	17	17	0.74	1.0	0.85	0.85	0.77	0.65	0.77	0.65	0.49	0.49
1999	42	27	27	18	18	10	10	0.64	1.0	0.67	0.67	0.56	0.37	0.56	0.37	0.24	0.24
2000	33	32	32	25	25	18	18	0.97	1.0	0.78	0.78	0.72	0.56	0.72	0.56	0.55	0.55
2001	56	33	33	16	16	8	8	0.59	1.0	0.48	0.48	0.50	0.24	0.50	0.24	0.14	0.14
2002	37	34	34	17	17	16	16	0.92	1.0	0.50	0.50	0.94	0.47	0.94	0.47	0.43	0.43
2003	48	18	18	6	6	4	4	0.38	1.0	0.33	0.33	0.67	0.22	0.67	0.22	0.08	0.08
2004	57	40	41	25	25	15	15	0.70	1.0	0.63	0.61	0.60	0.37	0.60	0.38	0.26	0.26
2005	54	5	5	0	0	0	0	0.09	1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

^aValues in parentheses were not reported by original investigators and are estimated from other known parameters.

^bReported values are the midpoint of a range (see Appendix C).

^cxx indicates data potentially exist but have not yet been summarized.

^dData based on short-duration visits (see Appendix C).

Table 62 (continued). Reproductive performance of red-legged kittiwakes at St. Paul Island, Alaska.

Year	Total nest starts	Nest sites w/ eggs	Total eggs	Nest sites w/ chicks	Total chicks	Nest sites w/ chicks fledged	Total chicks fledged	Laying success	Mean clutch size	Nesting success	Hatching success	Chick success	Egg success	Fledging success	Reprod. success	Fledglings /nest start	Prod.
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(B/A)	(C/B)	(D/B)	(E/C)	(G/E)	(G/C)	(F/D)	(F/B)	(G/A)	(F/A)
2006	35	28	29	15	15	6	6	0.80	1.0	0.54	0.52	0.40	0.21	0.40	0.21	0.17	0.17
2007	27	19	19	4	4	1	1	0.70	1.0	0.21	0.21	0.25	0.05	0.25	0.05	0.04	0.04
2008	20	20	20	18	18	9	9	1.00	1.0	0.90	0.90	0.50	0.45	0.50	0.45	0.45	0.45
2009	19	19	19	7	7	4	4	1.00	1.0	0.37	0.37	0.57	0.21	0.57	0.21	0.21	0.21
2010	10	9	9	7	7	5	5	0.90	1.0	0.78	0.78	0.71	0.56	0.71	0.56	0.50	0.50
2011	13	11	11	3	3	1	1	0.85	1.0	0.27	0.27	0.33	0.09	0.33	0.09	0.08	0.08
2012	10	10	10	8	8	6	6	1.00	1.0	0.80	0.80	0.75	0.60	0.75	0.60	0.60	0.60
2013	19	15	15	3	3	3	3	0.79	1.0	0.20	0.20	1.00	0.20	1.00	0.20	0.16	0.16
2014	17	17	17	13	13	11	11	1.00	1.0	0.76	0.76	0.85	0.65	0.85	0.65	0.65	0.65

Table 63. Standard deviation in reproductive performance parameters of red-legged kittiwakes at St. Paul Island, Alaska. Sampling for kittiwakes is clustered by plot except when sample sizes per plot are too small or plot data are not available.

Year	No. plots ^a	Total nest starts	Sampling design ^b	Laying success	Mean clutch size	Nesting success	Hatching success	Chick success	Egg success	Fledging success	Reprod. success	Fledglings /nest start	Prod.
1975	-	50	Simple random	0.07	-	- ^c	-	-	-	- ^c	0.09	-	0.07
1976	-	76	Simple random	0.05	-	- ^c	-	-	-	- ^c	0.05	-	0.06
1977	-	78	Simple random	0.05	-	- ^c	-	-	-	- ^c	0.06	-	0.06
1978	-	112	Simple random	0.04	-	- ^c	-	-	-	- ^c	0.10	-	0.03
1979	-	56	Simple random	0.06	-	- ^c	-	-	-	- ^c	0.08	-	0.06
1980	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
1984	-	29	Simple random	0.08	-	-	-	-	-	0.00	0.00	0.00	0.00
1985	14	61	Simple random	0.06	0.06	0.13	0.12	0.18	0.10	0.18	0.11	0.03	0.03
1986	xx ^d	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
1987	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
1988	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
1989	13	39	Simple random	0.05	0.00	0.22	0.22	0.00	0.00	0.00	0.00	0.00	0.00
1990	11	53	Simple random	0.07	0.00	0.08	0.08	0.14	0.07	0.14	0.07	0.05	0.05
1991	<i>no data</i>	-	-	-	-	-	-	-	-	-	-	-	-
1992	12	49	Simple random	0.05	0.00	0.08	0.08	0.10	0.07	0.10	0.07	0.06	0.06
1993	-	-	-	-	-	-	-	-	-	-	-	-	- ^c
1994	-	-	-	-	-	-	-	-	-	-	-	-	- ^c
1995	-	-	-	-	-	-	-	-	-	-	-	-	- ^c
1996	7	31	Simple random	0.05	0.00	0.27	0.27	0.00	0.00	0.00	0.00	0.00	0.00
1997	8	28	Simple random	0.08	0.00	0.11	0.11	0.14	0.10	0.14	0.10	0.08	0.08
1998	9	35	Simple random	0.07	0.00	0.07	0.07	0.09	0.09	0.09	0.09	0.08	0.08
1999	11	42	Simple random	0.07	0.00	0.09	0.09	0.12	0.09	0.12	0.09	0.07	0.07
2000	10	33	Simple random	0.03	0.00	0.07	0.07	0.09	0.09	0.09	0.09	0.09	0.09
2001	14	56	Simple random	0.07	0.00	0.09	0.09	0.13	0.07	0.13	0.07	0.05	0.05
2002	12	37	Simple random	0.04	0.00	0.09	0.09	0.06	0.09	0.06	0.09	0.08	0.08
2003	13	48	Simple random	0.07	0.00	0.11	0.11	0.19	0.10	0.19	0.10	0.04	0.04
2004	16	57	Simple random	0.06	0.03	0.08	0.08	0.10	0.08	0.10	0.08	0.06	0.06
2005	16	54	Simple random	0.04	0.00	0.00	0.00	-	0.00	-	0.00	0.00	0.00

^aPlots that are combined for analysis are counted as a single "plot".

^bFor sampling clustered by plot, values are calculated based on plot as a sample unit; for simple random sampling, values are calculated using $\sqrt{\rho * (1 - \rho) / n}$, where ρ is the success rate and n is the sample size of individual nests.

^cStandard deviations are not calculated for success values that are midpoint estimates or based on short-duration visits.

^dxx indicates data potentially exist but have not yet been summarized.

Table 63 (continued). Standard deviation in reproductive performance parameters of red-legged kittiwakes at St. Paul Island, Alaska. Sampling for kittiwakes is clustered by plot except when sample sizes per plot are too small or plot data are not available.

Year	No. plots ^a	Total nest starts	Sampling design ^b	Laying success	Mean clutch size	Nesting success	Hatching success	Chick success	Egg success	Fledging success	Reprod. success	Fledglings /nest start	Prod.
2006	12	35	Simple random	0.07	0.04	0.09	0.09	0.13	0.08	0.13	0.08	0.06	0.06
2007	10	27	Simple random	0.09	0.00	0.09	0.09	0.22	0.05	0.22	0.05	0.04	0.04
2008	8	20	Simple random	0.00	0.00	0.07	0.07	0.12	0.11	0.12	0.11	0.11	0.11
2009	6	19	Simple random	0.00	0.00	0.11	0.11	0.19	0.09	0.19	0.09	0.09	0.09
2010	4	10	Simple random	0.09	0.00	0.14	0.14	0.17	0.17	0.17	0.17	0.16	0.16
2011	4	13	Simple random	0.10	0.00	0.13	0.13	0.27	0.09	0.27	0.09	0.08	0.08
2012	4	10	Simple random	0.00	0.00	0.13	0.13	0.15	0.16	0.15	0.16	0.16	0.16
2013	5	19	Simple random	0.09	0.00	0.10	0.10	0.00	0.10	0.00	0.10	0.08	0.08
2014	4	17	Simple random	0.00	0.00	0.10	0.10	0.09	0.12	0.09	0.12	0.12	0.12

^aPlots that are combined for analysis are counted as a single "plot".

^bFor sampling clustered by plot, values are calculated based on plot as a sample unit; for simple random sampling, values are calculated using $\sqrt{\rho * (1 - \rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

Table 64. Clutch sizes of red-legged kittiwakes at St. Paul Island, Alaska. Sample units consist of total nest sites, not plots.

Year	Total nest starts (A)	Nest sites w/ x eggs:			Nest sites w/ eggs (B)	Total eggs (C)	Mean clutch size (C/B)
		0	1	2			
1975	50	-	-	-	23	-	-
1976	76	-	-	-	56	-	-
1977	78	-	-	-	57	-	-
1978	112	-	-	-	24	-	-
1979	56	-	-	-	(35) ^a	-	-
1980	<i>no data</i>	-	-	-	-	-	-
1981	<i>no data</i>	-	-	-	-	-	-
1982	<i>no data</i>	-	-	-	-	-	-
1983	<i>no data</i>	-	-	-	-	-	-
1984	29	-	-	-	6	-	-
1985	61	45	15	1	16	17	1.1
1986	67	29	32	0	38	xx ^b	xx
1987	63	47	19	0	21	xx	xx
1988	38	17	41	0	31	xx	xx
1989	39	35	4	0	4	4	1.0
1990	53	19	34	0	34	34	1.0
1991	<i>no data</i>	-	-	-	-	-	-
1992	49	8	41	0	41	41	1.0
1993	<i>no data</i>	-	-	-	-	-	-
1994	<i>no data</i>	-	-	-	-	-	-
1995	<i>no data</i>	-	-	-	-	-	-
1996	31	28	3	0	3	3	1.0
1997	28	7	21	0	21	21	1.0
1998	35	9	26	0	26	26	1.0
1999	42	15	27	0	27	27	1.0
2000	33	1	32	0	32	32	1.0
2001	56	23	33	0	33	33	1.0
2002	37	3	34	0	34	34	1.0
2003	48	30	18	0	18	18	1.0
2004	57	17	39	1	40	41	1.0
2005	54	49	5	0	5	5	1.0
2006	35	7	27	1	28	29	1.0
2007	27	8	19	0	19	19	1.0
2008	20	0	20	0	20	20	1.0
2009	19	0	19	0	19	19	1.0
2010	10	1	9	0	9	9	1.0
2011	13	2	11	0	11	11	1.0
2012	10	0	10	0	10	10	1.0
2013	19	4	15	0	15	15	1.0
2014	17	0	17	0	17	17	1.0

^aValues in parentheses were not reported by original investigators and are estimated from other known parameters.

^bxx indicates data potentially exist but have not yet been summarized.

Table 65. Reproductive performance of red-legged kittiwakes at St. Paul Island, Alaska in 2014.

Parameter	Plot				Total	SD ^a
	115	56	87	53		
Total nest starts (A)	4	7	2	4	17	-
Nest sites w/ eggs (B)	4	7	2	4	17	-
Total eggs (C)	4	7	2	4	17	-
Nest sites w/ chicks (D)	4	4	2	3	13	-
Total chicks (E)	4	4	2	3	13	-
Nest sites w/ fledged chicks (F)	3	4	1	3	11	-
Total fledged chicks (G)	3	4	1	3	11	-
Laying success (B/A)	1.00	1.00	1.00	1.00	1.00	0.00
Mean clutch size (C/B)	1.0	1.0	1.0	1.0	1.0	0.00
Nesting success (D/B)	1.00	0.57	1.00	0.75	0.76	0.10
Hatching success (E/C)	1.00	0.57	1.00	0.75	0.76	0.10
Chick success (G/E)	0.75	1.00	0.50	1.00	0.85	0.09
Egg success (G/C)	0.75	0.57	0.50	0.75	0.65	0.12
Fledging success (F/D)	0.75	1.00	0.50	1.00	0.85	0.09
Reproductive success (F/B)	0.75	0.57	0.50	0.75	0.65	0.12
Fledglings/nest start (G/A)	0.75	0.57	0.50	0.75	0.65	0.12
Productivity (F/A)	0.75	0.57	0.50	0.75	0.65	0.12

^aDue to small sample sizes per plot, standard deviations are calculated based on simple random sampling rather than cluster sampling with ratio estimator spreadsheets. For simple random sampling, values are calculated using $\sqrt{\rho * (1 - \rho)/n}$, where ρ is the success rate and n is the sample size of individual nests.

Table 66. Mean growth rates of red-legged kittiwake chicks at St. Paul Island, Alaska. Data include chicks measured at least two times during the linear phase of growth. No chicks were measured in 1980-2005 or after 2007.

Year	Mass (g/day)				Wing chord (mm/day)				Linear phase definition ^a
	Mean	SD	Range	<i>n</i>	Mean	SD	Range	<i>n</i>	
1976	11.7	1.2	-	4	-	-	-	-	A
1977	13.6	2.5	-	3	-	-	-	-	A
1978	<i>no data</i>	-	-	-	-	-	-	-	-
1979	12.3	-	-	1	-	-	-	-	A
2006	11.0	1.7	9.7-12.9	3	5.2	1.3	3.8-6.0	3	C
2007	9.9	2.9	5.3-13.2	4	3.5	1.3	1.3-4.5	4	C

^aA=linear growth phase defined as period between initial and peak weight measurements of each chick; C=chicks of unknown age, linear growth phase determined by visual inspection of individual growth curves.

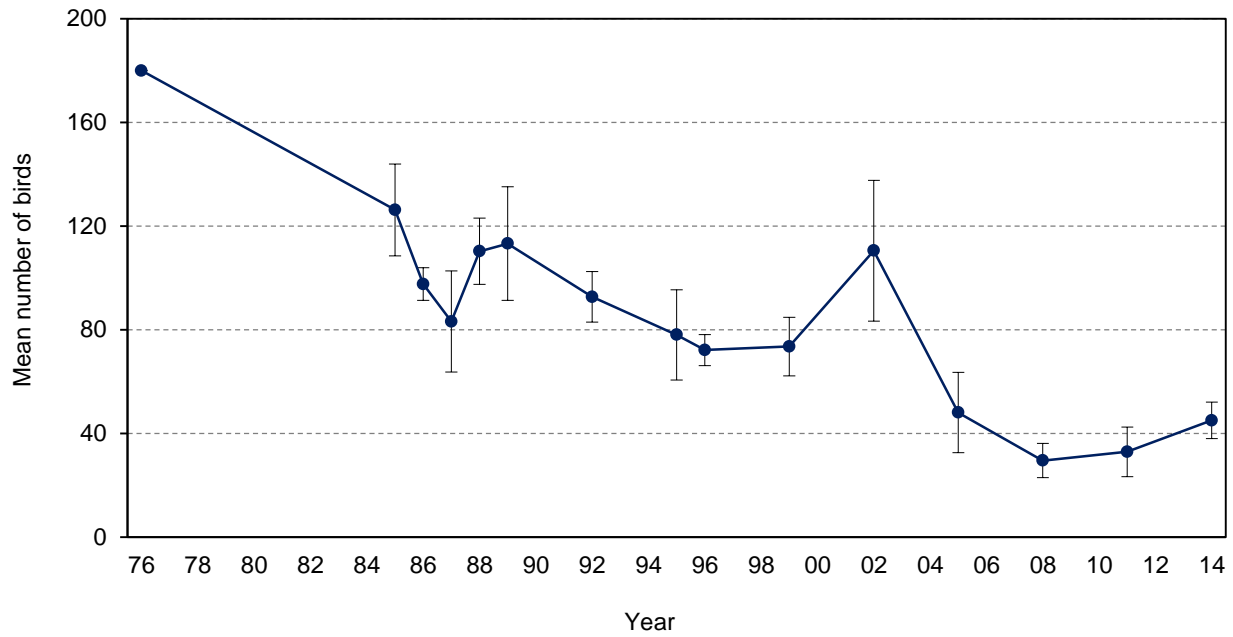


Figure 28. Mean numbers of red-legged kittiwakes counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Data from 1982 and 1984 are excluded because not all plots were counted. Error bars represent standard deviation.

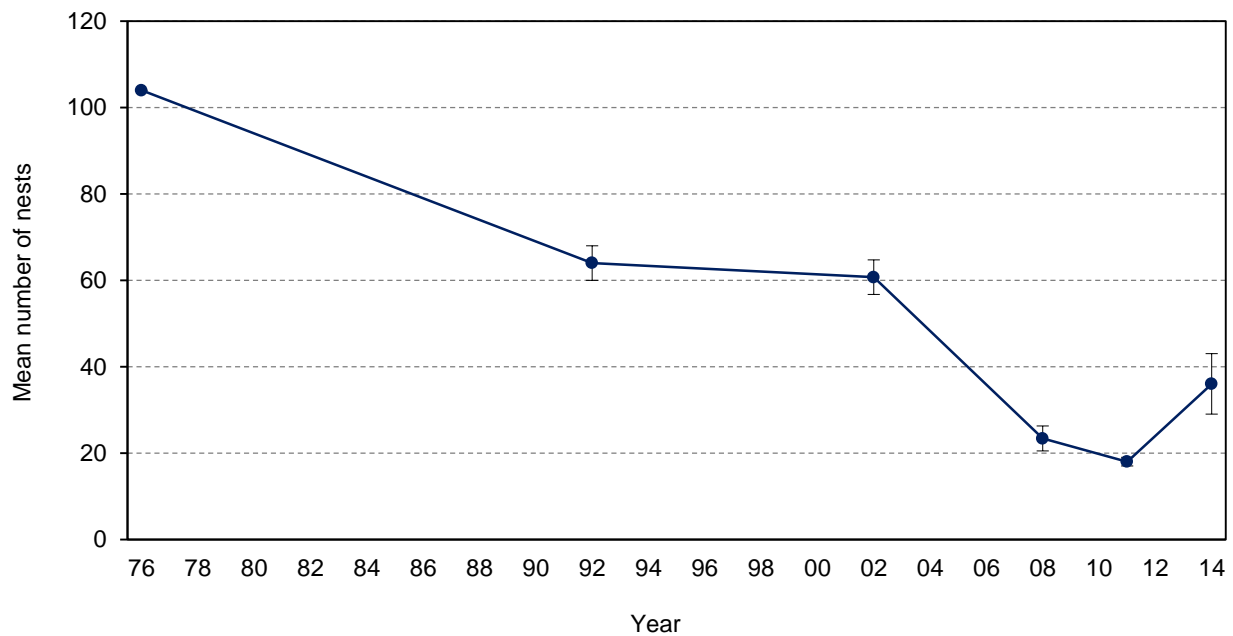


Figure 29. Mean numbers of red-legged kittiwake nests counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. Data from 1982 and 1984 are excluded because not all plots were counted. Error bars represent standard deviation.

Table 67. Numbers of red-legged kittiwakes counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. No counts were conducted during years not listed; data from 1982 and 1984 are excluded because not all plots were counted.

Replicate	1976	1985	1986	1987	1988	1989	1992	1995	1996	1999	2002	2005	2008	2011	2014
1	180	101	106	59	106	80	87	66	62	65	99	40	26	21	36
2	-	142	96	87	108	115	101	70	70	74	87	35	27	23	43
3	-	131	93	78	87	119	104	98	75	66	90	28	24	21	40
4	-	119	91	70	108	123	93	-	71	77	109	40	25	42	40
5	-	135	102	116	122	112	77	-	76	65	161	49	25	38	49
6	-	-	-	89	126	124	94	-	79	94	117	66	31	36	53
7	-	-	-	-	115	85	-	-	-	-	-	73	35	39	52
8	-	-	-	-	-	148	-	-	-	-	-	53	43	43	-
Mean	180	126	98	83	110	113	93	78	72	74	111	48	30	33	45
<i>n</i>	1	5	5	6	7	8	6	3	6	6	6	8	8	8	7
SD	-	16	6	20	13	22	10	17	6	11	27	15	7	10	7
First count	17 Jul	xx ^a	6 Jul	9 Jul	12 Jul	17 Jul	12 Jul	9 Jul	10 Jul	7 Jul	8 Jul	11 Jul	1 Jul	6 Jul	30 Jun
Last count	21 Jul	xx	29 Jul	23 Jul	7 Aug	9 Aug	7 Aug	3 Aug	2 Aug	7 Aug	1 Aug	31 Jul	31 Jul	1 Aug	27 Jul

^axx indicates data potentially exist but have not yet been summarized.

Table 68. Numbers of red-legged kittiwake nests counted on index plots at St. Paul Island, Alaska. Totals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30. No counts were conducted during years not listed; data from 1982 and 1984 are excluded because not all plots were counted.

Replicate	1976	1985	1986	1987	1988	1989	1992	1995	1996	1999	2002	2005	2008	2011	2014
1	104	xx ^a	xx	xx	xx	xx	60	<i>no nest count</i>	xx	xx	65	xx	24	18	29
2	-	xx	xx	xx	xx	xx	65		xx	xx	57	xx	22	19	35
3	-	xx	xx	xx	xx	xx	69	-	xx	xx	60	xx	22	17	37
4	-	xx	xx	xx	xx	xx	61	-	xx	xx	-	xx	22	0 ^b	35
5	-	xx	xx	xx	xx	xx	-	-	xx	xx	-	xx	22	-	39
6	-	-	-	xx	xx	xx	-	-	xx	xx	-	xx	21	-	37
7	-	-	-	-	xx	xx	-	-	-	-	-	xx	24	-	37
8	-	-	-	-	-	xx	-	-	-	-	-	xx	30	-	-
Mean	104	xx	xx	xx	xx	xx	64	-	xx	xx	61	xx	23	18	36
Overall max. ^c	104	104	101	83	79	61	75	-	51	103	74	3	32	21	41
<i>n</i>	1	xx	xx	xx	xx	xx	4	-	xx	xx	3	xx	8	3	7
SD	-	xx	xx	xx	xx	xx	4	-	xx	xx	4	xx	3	1	3
First count	17 Jul	xx	xx	xx	xx	xx	12 Jul	-	xx	xx	8 Jul	11 Jul	1 Jul	6 Jul	30 Jun
Last count	21 Jul	xx	xx	xx	xx	xx	30 Jul	-	xx	xx	23 Jul	xx	31 Jul	17 Jul	27 Jul

^axx indicates data potentially exist but have not yet been summarized.

^bIncomplete count used for maximum nest number but not included in calculation of mean.

^cOverall maximum nest number is the highest nest count on each plot in a year, summed across all plots.

Table 69. Numbers of red-legged kittiwakes counted on index plots at St. Paul Island, Alaska in 2014.

Plot	Replicate							Mean	SD
	1 30 Jun-2 Jul	2 7-9 Jul	3 10-12 Jul	4 13-15 Jul	5 17-19 Jul	6 21-23 Jul	7 25-27 Jul		
1	0	0	0	0	0	0	0	-	-
2sw	0	0	0	0	0	0	0	-	-
2ne	0	0	0	0	0	0	0	-	-
3	0	0	0	0	0	0	0	-	-
4	0	0	0	0	0	0	0	-	-
5sw	0	0	0	0	0	0	0	-	-
5ne	0	0	0	0	0	0	0	-	-
6 ^a	-	-	-	-	-	-	-	-	-
7	0	0	0	0	0	0	0	-	-
8	0	0	0	0	0	0	0	-	-
9	-	-	-	-	-	-	-	-	-
10	0	0	0	0	0	0	0	-	-
11	0	0	0	0	0	0	0	-	-
12	0	0	0	0	0	0	0	-	-
13	0	0	0	0	0	0	0	-	-
14	4	6	5	5	6	9	8	-	-
15	0	0	0	0	0	0	0	-	-
16 ^a	-	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-	-
18	0	0	1	0	0	0	0	-	-
19top	0	0	0	0	0	0	0	-	-
19btm	0	0	0	0	0	0	0	-	-
20top	0	0	0	0	0	0	0	-	-
20btm	0	0	0	0	0	0	0	-	-
21 ^a	-	-	-	-	-	-	-	-	-
22	11	14	12	11	18	15	16	-	-
23	0	0	0	0	0	0	0	-	-
24	0	0	0	0	0	0	0	-	-
25	0	0	0	0	0	0	0	-	-
26	0	0	0	0	0	0	0	-	-
27	7	6	6	6	7	7	6	-	-
28	0	0	0	0	0	0	0	-	-
29 ^a	-	-	-	-	-	-	-	-	-
29new	0	0	0	0	0	0	0	-	-
30	0	0	0	0	0	0	0	-	-
31	12	15	12	13	11	14	15	-	-
32	2	2	4	5	7	8	7	-	-
33	0	0	0	0	0	0	0	-	-
Total ^b	36	43	40	40	49	53	52	45	7

^aHistorical plots no longer counted.

^bTotals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30.

Table 70. Numbers of red-legged kittiwake nests counted on index plots at St. Paul Island, Alaska in 2014.

Plot	Replicate							Mean	SD	Max.
	1 30 Jun-2 Jul	2 7-9 Jul	3 10-12 Jul	4 13-15 Jul	5 17-19 Jul	6 21-23 Jul	7 25-27 Jul			
1	0	0	0	0	0	0	0	-	-	-
2sw	0	0	0	0	0	0	0	-	-	-
2ne	0	0	0	0	0	0	0	-	-	-
3	0	0	0	0	0	0	0	-	-	-
4	0	0	0	0	0	0	0	-	-	-
5sw	0	0	0	0	0	0	0	-	-	-
5ne	0	0	0	0	0	0	0	-	-	-
6 ^a	-	-	-	-	-	-	-	-	-	-
7	0	0	0	0	0	0	0	-	-	-
8	0	0	0	0	0	0	0	-	-	-
9	0	0	0	0	0	0	0	-	-	-
10	0	0	0	0	0	0	0	-	-	-
11	0	0	0	0	0	0	0	-	-	-
12	0	0	0	0	0	0	0	-	-	-
13	0	0	0	0	0	0	0	-	-	-
14	4	5	5	5	5	5	5	-	-	-
15	0	0	0	0	0	0	0	-	-	-
16 ^a	-	-	-	-	-	-	-	-	-	-
17 ^a	-	-	-	-	-	-	-	-	-	-
18	0	0	0	0	0	0	0	-	-	-
19top	0	0	0	0	0	0	0	-	-	-
19btm	0	0	0	0	0	0	0	-	-	-
20top	0	0	0	0	0	0	0	-	-	-
20btm	0	0	0	0	0	0	0	-	-	-
21 ^a	-	-	-	-	-	-	-	-	-	-
22	9	11	11	10	12	9	9	-	-	-
23	0	0	0	0	0	0	0	-	-	-
24	0	0	0	0	0	0	0	-	-	-
25	0	0	0	0	0	0	0	-	-	-
26	0	0	0	0	0	0	0	-	-	-
27	7	6	6	6	6	6	6	-	-	-
28	0	0	0	0	0	0	0	-	-	-
29 ^a	-	-	-	-	-	-	-	-	-	-
29new	0	0	0	0	0	0	0	-	-	-
30	0	0	0	0	0	0	0	-	-	-
31	7	11	11	10	11	12	12	-	-	-
32	2	2	4	4	5	5	5	-	-	-
33	0	0	0	0	0	0	0	-	-	-
Total ^b	29	35	37	35	39	37	37	36	3	41 ^c

^aHistorical plots no longer counted.

^bTotals include all plots except 2ne, 6, 9, 16, 17, 19btm, 20btm, 21, 29, 29new, and 30.

^cOverall maximum nest number is the highest nest count on each plot, summed across all plots.

Table 71. Numbers of red-legged kittiwakes counted by boat during all-island census of St. Paul Island, Alaska. Count area goes from Tsamana at the northwest end of the island to Reef at the southeast end of the island and includes all potential red-legged kittiwake nesting habitat on St. Paul.

Replicate	2010	2011	2012	2013	2014
1	760	<i>no count</i>	953	929 ^a (570) ^b	1571
2	-	-	821	-	1228 (662)
Mean	760	-	887	929 (570)	1400 (662)
<i>n</i>	1	-	2	1	2
SD	0	-	93	0	243
First count	17 Jul	-	7 Jul	12 Jul	5 Jul
Last count	-	-	17 Jul	-	16 Jul

^aDoes not include the segment called Reef. Reef had 5 and 6 red-legged kittiwakes, respectively, in the 2012 counts.

^bTotal nests are shown in parathesis. Nests were not counted in 2010 and 2012.

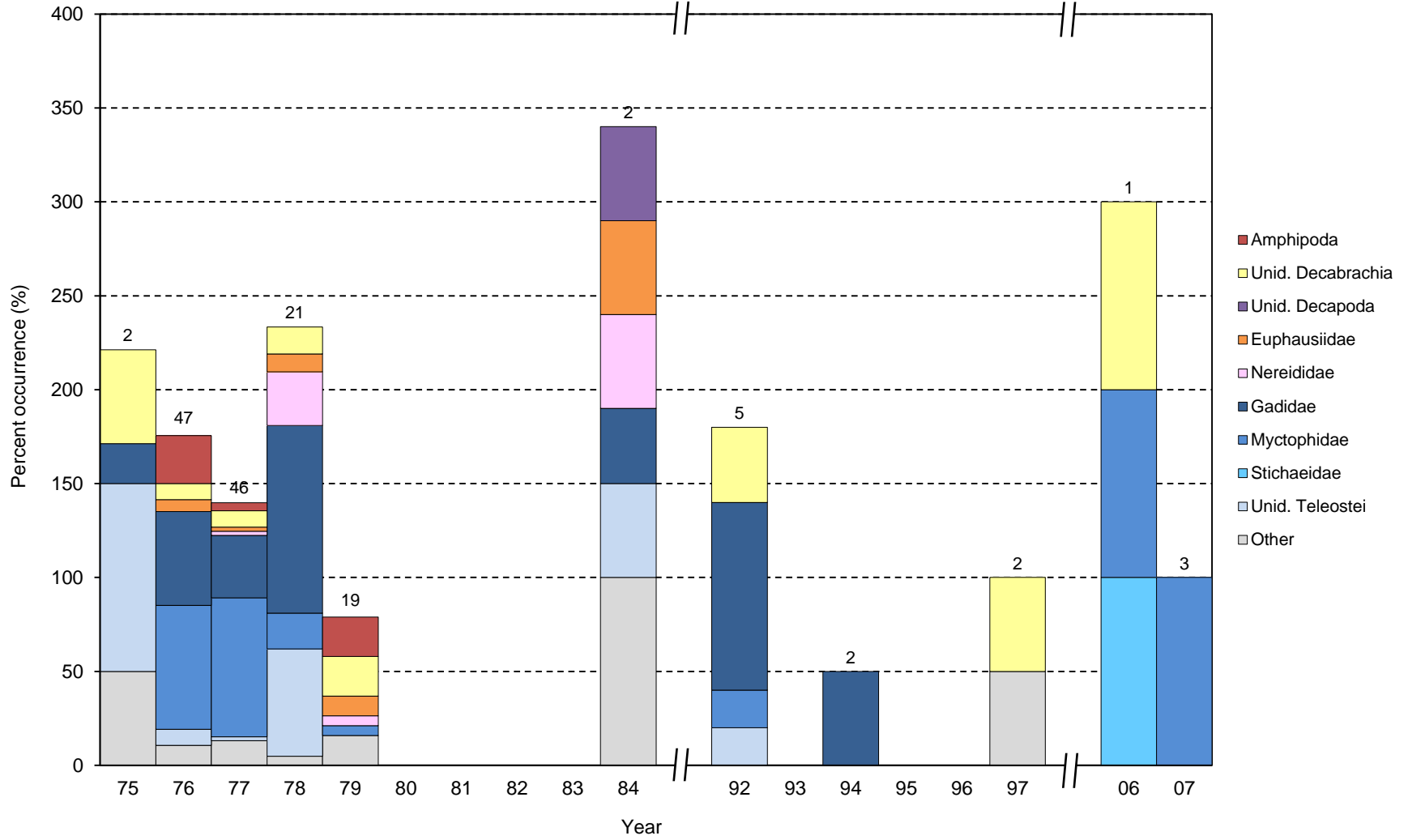


Figure 30. Frequency of occurrence of major prey items in diets of red-legged kittiwake adults and chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Only prey with an among-year average occurrence of at least 5% are shown. Numbers above columns indicate sample sizes.

Table 72. Frequency of occurrence of major prey items in diets of red-legged kittiwake adults and chicks at St. Paul Island, Alaska. Frequency is expressed as the percentage of food samples in which each prey item was present. Prey was identified and measured in the laboratory to lowest taxon possible (some prey items were identified to species while others were only identified to genus, family, order, etc.). Any prey with an among-year average occurrence of at least 5% are shown to the lowest taxonomic level; others are lumped together as "others" in their respective taxonomic group with values in bold showing totals for those taxa. Samples consist of stomach contents from adults collected at or near the colony, regurgitations from adults returning to the colony to feed chicks and regurgitations from chicks themselves. No diet samples were collected in 1980-1983, 1985-1991, 1993, 1995-1996, 1998-2005, 2008-2009 and after 2010; samples were collected in 2010 but have not yet been analyzed. More detailed diet data and prey identifications are available, contact refuge biologists for details.

Prey	1975	1976	1977	1978	1979	1984	1992	1994	1997	2006	2007
No. samples	2	47	46	21	19	2	5	2	2	1	3
Invertebrates	50.0	36.2	15.2	57.1	42.1	100.0	40.0	-	50.0	100.0	-
Amphipoda	-	25.5	4.3	-	21.1	-	-	-	-	-	-
Cephalopoda	50.0	8.5	8.7	14.3	21.1	-	40.0	-	50.0	100.0	-
Unid. Decabrachia	50.0	8.5	8.7	14.3	21.1	-	40.0	-	50.0	100.0	-
Decapoda	-	4.3	-	-	-	50.0	-	-	-	-	-
Unid. Decapoda	-	-	-	-	-	50.0	-	-	-	-	-
Other Decapoda	-	4.3	-	-	-	-	-	-	-	-	-
Euphausiacea	-	6.4	2.2	9.5	10.5	50.0	-	-	-	-	-
Euphausiidae	-	6.4	2.2	9.5	10.5	50.0	-	-	-	-	-
Unid. Euphausiidae	-	4.3	-	9.5	10.5	50.0	-	-	-	-	-
Other Euphausiidae	-	2.1	2.2	-	-	-	-	-	-	-	-
Polychaeta	-	4.3	4.3	33.3	10.5	50.0	-	-	-	-	-
Nereididae	-	-	2.2	28.6	5.3	50.0	-	-	-	-	-
<i>Nereis</i> spp.	-	-	-	28.6	-	50.0	-	-	-	-	-
Other Nereididae	-	-	2.2	-	5.3	-	-	-	-	-	-
Other Polychaeta	-	4.3	2.2	4.8	5.3	-	-	-	-	-	-
Other Invertebrates	-	-	-	9.5	-	-	-	-	-	-	-
Fish	100.0	89.4	97.8	90.5	100.0	50.0	80.0	100.0	50.0	100.0	100.0
Teleostei	100.0	89.4	97.8	90.5	100.0	50.0	80.0	100.0	50.0	100.0	100.0
Gadidae	21.3	50.0	33.3	100.0	-	40.0	100.0	50.0	-	-	-
<i>Gadus chalcogrammus</i>	-	21.3	26.1	23.8	100.0	-	40.0	100.0	50.0	-	-
Other Gadidae	-	-	23.9	9.5	-	-	-	-	-	-	-
Myctophidae	-	66.0	73.9	19.0	5.3	-	20.0	-	-	100.0	100.0
Unid. Myctophidae	-	61.7	73.9	19.0	5.3	-	20.0	-	-	100.0	100.0
Other Myctophidae	-	4.3	-	-	-	-	-	-	-	-	-
Stichaeidae	-	-	-	-	-	-	-	-	-	100.0	-
<i>Leptoclinus maculatus</i>	-	-	-	-	-	-	-	-	-	100.0	-
Unid. Teleostei	100.0	8.5	2.2	57.1	-	50.0	20.0	-	-	-	-
Other Teleostei	-	8.5	-	-	-	-	-	-	-	-	-
Other	50.0	10.6	13.0	4.8	15.8	100.0	-	-	50.0	-	-
Offal	50.0	10.6	13.0	4.8	15.8	-	-	-	50.0	-	-
Plastic	-	-	-	-	-	-	-	-	50.0	-	-
Other	-	-	-	-	-	100.0	-	-	-	-	-

Table 73. Mean numbers of birds detected on beach transect surveys along Lukanin Beach, St. Paul Island, Alaska. Data represent species' presence but not necessarily absence in all years (dashes indicate species not recorded but whether individuals were present and not recorded or not present is unknown). No surveys were conducted in 2004-2009.

Species	2003	2010	2011	2012	2013	2014
Rock sandpiper	6	1	1	0	1	1
Pacific wren	0	0	0	0	0	0
Lapland longspur	22	1	3	7	9	7
Snow bunting	0	0	0	0	0	0
Gray-crowned rosy finch	7	0	1	0	<1	<1
<i>n</i>	5	4	5	5	5	5
First survey	10 Jun	18 Jun	12 Jun	11 Jun	12 Jun	12 Jun
Last survey	30 Jun	30 Jun	19 Jun	18 Jun	26 Jun	24 Jun

Table 74. Mean numbers of birds detected on beach transect surveys along Zapadni Beach, St. Paul Island, Alaska. Data represent species' presence but not necessarily absence in all years (dashes indicate species not recorded but whether individuals were present and not recorded or not present is unknown). No surveys were conducted in 2004-2007.

Species	2003	2008	2009	2010	2011	2012	2013	2014
Rock sandpiper	24	0	<i>no count</i>	1	<1	<i>no count</i>	<i>no count</i>	2
Pacific wren	0	0	-	0	0	-	-	0
Lapland longspur	7	0	-	1	2	-	-	5
Snow bunting	3	0	-	1	1	-	-	0
Gray-crowned rosy finch	69	1	-	12	9	-	-	6
<i>n</i>	5	2	-	4	5	-	-	5
First survey	14 Jun	11 Jun	-	18 Jun	12 Jun	-	-	13 Jun
Last survey	4 Jul	20 Jun	-	29 Jun	18 Jun	-	-	26 Jun

Table 75. Numbers of birds detected on beach transect surveys along Lukanin Beach, St. Paul Island, Alaska in 2014.

Species	Date					Mean	SD
	12 Jun	16 Jun	19 Jun	21 Jun	24 Jun		
Rock sandpiper	3	1	0	0	0	1	1
Pacific wren	0	0	0	0	0	0	0
Lapland longspur	4	15	13	2	1	7	7
Snow bunting	0	0	0	0	0	0	0
Gray-crowned rosy finch	0	0	0	1	0	<1	<1
Start time (AKST)	0800	0840	0755	0825	0820	-	-
End time (AKST)	0819	0900	0815	0845	0840	-	-

Table 76. Numbers of birds detected on beach transect surveys along Zapadni Beach, St. Paul Island, Alaska in 2014.

Species	Date					Mean	SD
	13 Jun	19 Jun	21 Jun	24 Jun	26 Jun		
Rock sandpiper	0	0	8	3	0	2	5
Pacific wren	0	0	0	0	0	0	0
Lapland longspur	5	3	7	5	5	5	1
Snow bunting	0	0	2	0	2	<1	1
Gray-crowned rosy finch	7	7	8	6	4	6	2
Start time (AKST)	0830	0850	0830	0811	0830	-	-
End time (AKST)	0905	0922	0907	0847	0910	-	-

Table 77. Mean numbers of individuals found and encounter rates during COASST surveys along Benson Beach North, St. Paul Island, Alaska. Mean number of individuals comprises the average number of new birds found per survey and do not include birds still present and re-encountered from previous surveys. Encounter rate is defined as the number of all birds (including both new individuals and re-encountered birds) found per km beach surveyed (1 km for Benson Beach North) divided by the number of surveys. Surveys were conducted in 2011-2014 but have not yet been summarized.

Species	2006		2007		2008		2009		2010	
	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate
Northern fulmar	0.4	0.4	0.2	0.3	0.1	0.3	0.3	0.3	-	-
Short-tailed shearwater	-	-	1.2	1.5	0.1	0.3	0.1	0.1	-	-
Leach's storm-petrel	-	-	0.2	0.2	-	-	-	-	-	-
Unidentified petrel	-	-	0.4	0.4	-	-	-	-	-	-
Red-faced cormorant	-	-	0.1	0.2	-	-	-	-	-	-
Common murre	-	-	-	-	-	-	0.1	0.1	-	-
Thick-billed murre	0.2	0.2	-	-	-	-	-	-	-	-
Parakeet auklet	0.2	0.2	-	-	-	-	-	-	-	-
Crested auklet	0.2	0.2	-	-	-	-	-	-	-	-
Unidentified auklet	0.4	0.4	-	-	-	-	-	-	-	-
Unidentified alcid	-	-	0.2	0.2	-	-	0.1	0.1	-	-
Black-legged kittiwake	0.2	0.2	-	-	-	-	-	-	-	-
Unidentified kittiwake	-	-	0.1	0.3	-	-	-	-	-	-
Unidentified bird	-	-	-	-	0.1	0.6	-	-	-	-
All species	1.6	1.6	2.4	3.1	0.4	0.6	0.6	0.6	0.0	0.0
<i>n</i>	5		10		8		16		17	
First survey	7 Jul		12 Feb		1 Jun		26 Feb		6 Jan	
Last survey	15 Dec		12 Sep		24 Nov		23 Dec		30 Dec	

Table 78. Mean numbers of individuals found and encounter rates during COASST surveys along Lukanin South, St. Paul Island, Alaska. Mean number of individuals comprises the average number of new birds found per survey and do not include birds still present and re-encountered from previous surveys. Encounter rate is defined as the number of all birds (including both new individuals and re-encountered birds) found per km beach surveyed (1 km for Lukanin South) divided by the number of surveys. Surveys were conducted in 2011-2014 but have not yet been summarized.

Species	2006		2007		2008		2009		2010	
	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate
Mallard	-	-	-	-	-	-	-	-	0.1	0.1
Northern fulmar	0.1	0.1	0.2	0.2	-	-	0.2	0.2	-	-
Short-tailed shearwater	-	-	0.9	0.9	-	-	0.4	1.4	0.1	0.1
Unidentified shearwater	-	-	-	-	-	-	0.1	0.1	-	-
Fork-tailed storm-petrel	0.1	0.1	-	-	-	-	-	-	-	-
Unidentified petrel	-	-	0.1	0.1	-	-	-	-	-	-
Western sandpiper	-	-	-	-	0.1	0.1	-	-	-	-
Thick-billed murre	-	-	-	-	-	-	0.1	0.1	-	-
Horned puffin	-	-	-	-	-	-	0.1	0.1	-	-
Unidentified auklet	-	-	-	-	-	-	0.2	0.2	-	-
Unidentified alcid	-	-	0.1	0.1	-	-	-	-	-	-
Black-legged kittiwake	-	-	-	-	-	-	0.1	0.1	-	-
Glaucous-winged gull	0.2	0.2	-	-	0.1	0.4	-	-	-	-
Unidentified bird	0.2	0.4	0.1	0.1	-	-	0.1	0.1	-	-
All species			1.4	1.4	0.3	0.5	1.2	1.3	0.1	0.1
<i>n</i>	9		11		8		16		17	
First survey	20 Jun		12 Jan		31 May		30 Apr		5 Feb	
Last survey	15 Dec		12 Sep		12 Dec		31 Dec		23 Dec	

Table 79. Mean numbers of individuals found and encounter rates during COASST surveys along North Beach, St. Paul Island, Alaska. Mean number of individuals comprises the average number of new birds found per survey and do not include birds still present and re-encountered from previous surveys. Encounter rate is defined as the number of all birds (including both new individuals and re-encountered birds) found per km beach surveyed (1 km for North Beach) divided by the number of surveys. Surveys were conducted in 2011-2014 but have not yet been summarized.

Species	2006		2007		2008		2009		2010	
	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate
Northern fulmar	-	-	0.4	0.4	-	-	0.3	0.3	-	-
Sooty shearwater	-	-	-	-	0.8	0.8	-	-	-	-
Short-tailed shearwater	-	-	0.7	0.7	-	-	-	-	-	-
Leach's storm-petrel	-	-	0.1	0.1	-	-	-	-	-	-
Common murre	-	-	-	-	0.1	0.1	-	-	-	-
Thick-billed murre	-	-	0.1	0.1	-	-	-	-	-	-
Unidentified murre	-	-	-	-	0.1	0.1	-	-	-	-
Tufted puffin	-	-	-	-	-	-	-	-	0.1	0.1
Unidentified alcid	-	-	0.1	0.1	-	-	-	-	-	-
Black-legged kittiwake	-	-	-	-	0.1	0.1	0.1	0.1	-	-
Unidentified kittiwake	-	-	-	-	0.1	0.1	-	-	-	-
Glaucous-winged gull	-	-	-	-	-	-	0.1	0.1	0.1	0.1
Unidentified bird	0.1	0.1	-	-	-	-	-	-	-	-
All species	0.1	0.1	1.4	1.4	1.3	1.3	0.4	0.5	0.1	0.1
<i>n</i>	10		10		8		15		17	
First survey	7 Jun		12 Feb		1 Jun		8 May		6 Jan	
Last survey	15 Dec		12 Sep		24 Nov		23 Dec		30 Dec	

Table 80. Mean numbers of individuals found and encounter rates during COASST surveys along Polovina, St. Paul Island, Alaska. Mean number of individuals comprises the average number of new birds found per survey and do not include birds still present and re-encountered from previous surveys. Encounter rate is defined as the number of all birds (including both new individuals and re-encountered birds) found per km beach surveyed (1 km for Polovina) divided by the number of surveys. Surveys were conducted in 2011-2014 but have not yet been summarized.

Species	2006		2007		2008		2009		2010	
	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate	Mean # ind.	Enc. rate
Northern fulmar	0.2	0.2	0.2	0.2	0.1	0.1	-	-	0.1	0.1
Short-tailed shearwater	-	-	0.7	0.9	-	-	0.1	0.1	-	-
Unidentified petrel	-	-	0.1	0.1	-	-	-	-	-	-
Parakeet auklet	-	-	-	-	-	-	-	-	0.1	0.1
Horned puffin	-	-	-	-	-	-	-	-	0.1	0.1
Unidentified alcid	-	-	0.1	0.1	-	-	0.1	0.2	-	-
Black-legged kittiwake	-	-	0.1	0.1	-	-	-	-	-	-
Unidentified kittiwake	-	-	0.2	0.4	-	-	-	-	-	-
Glaucous-winged gull	-	-	0.1	0.2	-	-	-	-	0.1	0.1
All species	0.2	0.2	1.5	1.9	0.1	0.1	0.2	0.2	0.3	0.3
<i>n</i>	6		11		10		17		17	
First survey	8 Jul		12 Jan		31 May		30 Apr		5 Feb	
Last survey	15 Dec		12 Sep		29 Dec		31 Dec		23 Dec	

Abundance categories were defined as follows:

Abundant: annual, sure to see many
Common: annual, sure to see some
Uncommon: annual, likely to see some
Rare: annual but not guaranteed to see any
Irregular: not annual but numerous records
Casual: not annual, only a few records
Accidental: only one or two records ever

Status categories are defined as follows:

Breeder: evidence breeding, either confirmed (observations of current nests, eggs, or chicks; adults carrying nesting materials or food to nests or chicks; recently fledged young; distraction displays) or probably (observations of pairs or territorial behavior)
Resident non-breeder: occurs throughout season but does not breed at site
Migrant: through-migrant, recorded regularly but only during migratory period
Vagrant: recorded outside known breeding, wintering, and migrating range (category added in 2012)

Birds

Brant (*Branta bernicla*). Irregular.migrant One bird was seen on Antone Lake on 4 June and 9 June. Two birds were seen off Marunich 28 August.

Cackling goose (*Branta hutchinsii*). Uncommon migrant. Two birds were at Pump House Lake on 26 May. Two birds were seen at Polovina Lake on 5 June. Two were at Antone Slough and a flock of 13 was at Lincoln Bight on 13 June.

Tundra swan (*Cynus columbianus*). Uncommon migrant. At least four birds were on island throughout the summer. Sightings include a single bird on Antone Lake on 25 May. Sightings of four birds at Antone Lake and Rocky Lake on 4, 11, 13 and 28 June. Four birds were on Antone Lake with two Bewick's swans on 28 August.

Bewick's swan (*Cynus columbianus bewickii*). Irregular migrant. Three birds were on Rocky Lake on 27 May. Three birds were also seen at Anton Lake on 11 June. On the afternoon of 13 June three birds were seen on Anton Lake and then on Rocky Lake in the evening.

Mallard (*Anas platyrhynchos*). Rare migrant. Two males were in Town Marsh on 2 June.

Northern pintail (*Anas acuta*). Common breeder. This species was seen daily throughout the island. There were 12 birds on Pump House Lake on 26 May. A male and female were on Teacup Pond and a male at Lake Hill Lake on 27 May. Four birds were in Town Marsh on 2 June. Six males and at least one female were on Marunich Lake on 4 June. A female with five ducklings was on Anton Lake on 11 June.

Eurasian green-winged teal (*Anas crecca crecca*). Common breeder. At least six birds were on Pump House Lake on 26 June. Four birds were in Town Marsh on 2 June

American green-winged teal (*Anas crecca carolinensis*). Rare migrant. Three birds were on Lake Hill Lake on 27 May.

Greater scaup (*Aythya marila*). Uncommon migrant. Eight males and two females were on Weather Station Lake on 4 July.

Lesser scaup (*Aythya affinis*). Uncommon migrant. One male was seen on Weather Station Lake on 26 May. Two males were on Weather Station Lake on 4 July.

King eider (*Somateria spectabilis*). Uncommon migrant. A female bird was seen off Marunich on 13 June. Three birds were seen in the water off Tsamana on 21 August.

Harlequin duck (*Histrionicus histrionicus*). Abundant migrant. This species is found all along the coast of the island in flocks ranging from a few birds to dozens, including flocks of 20 and 17 in Lincoln Bight on 1 June. On a reef at the east end of Lincoln Bight approximately 81 birds were counted on 5 June and 75 birds were counted there on 13 June. A female was seen in Salt Lagoon on 15 June.

Long-tailed duck (*Clangula hyemalis*). Common breeder. This species is seen daily throughout the island. A male and female were on Teacup Pond and eight more seen on Rocky Lake on 27 May. A male and female were on Pump House Lake and at least 10 birds were on Weather Station Lake on 26 June. A dead bird was found on the road near the airport.

Bufflehead (*Bucephala albeola*). Uncommon migrant. A female bird was on Weather Station Lake on 26 May, and another female was noted on Rocky Lake the next day. Three female birds were on Tsamana Lake on 4 June.

Common loon (*Gavia immer*). Rare migrant. A bird in winter plumage was seen in English Bay on 6 July.

Red-throated loon (*Gavia stellata*). Uncommon migrant. One bird was on Salt Lagoon on 4 June. One bird was seen at Antone Lake on June 13.

Northern fulmar (*Fulmarus glacialis*). Abundant breeder. A bird incubating an egg was seen on Plot 53 on 4 June but gone on 13 June. The first chick on Plot 53 was on 1 August. A one-legged bird was seen at Zapadni on 18 July.

Short-tailed shearwater (*Puffinus tenuirostris*). Uncommon migrant. One bird was near Sea Lion Rock on 19 August.

Red-faced cormorant (*Phalacrocorax urile*). Abundant breeder. The rocky point opposite North Hill known as Slade's Gap (the former Slade's Arch, which collapsed this spring) has long been a roosting spot for cormorants. Here opportunistic counts of this species ranged from 16 to 34 birds between 4 and 19 June. The first nestlings were seen on 16 June. Nesting sites observable from the cliff top at Tolstoi the past few years were vacant this year, although several nests were made lower down on the Tolstoi cliffs. There were new colony sites at Zapadni, with at least 25 nests on west facing cliffs and several more on south facing cliffs, and at Reef, where there were at least 21 nests on 10 June. This species has not nested at Zapadni since 2005 and that year they were found mainly on the south facing cliffs.

Twenty-five red-faced cormorants were banded at Tsamana North, and three banded on low cliffs about 200 meters east of Slade's Gap. On 18 August this spot, which we called the Slade's Gap Colony, had four active nests. Red-faced cormorant band number 215 was on a nest with 3 large chicks. Two days later she had lost two chicks. The chick count per nest on 21 August was three, one, three and two, respectively. Number 215 remaining chick was banded, number 353, along with two chicks nest number 1, on 22 August. Red-faced cormorant number 215 was banded as a chick in 2010 and is the first known nesting success of any red-faced cormorant that we have banded since we began in 2004. In 2012, red-faced cormorant number 171 was on a nest that ultimately was abandoned and destroyed before any

eggs were laid. A total of 28 red-faced cormorants were banded on St. Paul in 2014. Red-faced cormorant band number 147 was at the Slade's Gap Colony on 18 and 21 August but was not on a nest.

Pelagic cormorant (*Phalacrocorax pelagicus*). Uncommon breeder. Six or seven birds were counted at Slade's Gap between 4 on 19 June. A lone bird was at Tolstoi Plot 90Low on 15 August.

Bald eagle (*Haliaeetus leucocephalus*). Casual resident non-breeder. An adult bird was on island most of the summer and sightings included sitting on a pole at the NOAA Staff Quarters compound on 27 May, 30 June, July 12. An adult bird was at Otter Island on 14 June. The eagle flushed the seabirds off plot 49 on 19 June. An adult bird flew by Tolstoi flushing the ledge-nesting seabirds on 19 August and was seen at Anton Lake the next day.

Osprey (*Pandion haliaetus*). Casual migrant. One bird was seen in the harbor on June 6.

Pacific golden plover (*Pluvialis fulva*). Common migrant. In mid-August this species was often seen near the West Cliffs trail and High Bluffs area, including sightings of three on 18 and 21 August.

Semipalmated plover (*Charadrius semipalmatus*). Common breeder. One bird was at Salt Lagoon on 25 May. Four birds were in the Novastashna Wetlands, which were then dry, on 26 May. On 27 May one bird was at Lake Hill.

Common sandpiper (*Actitis hypoleucos*). Uncommon migrant. One bird was seen at Town Marsh on 4 June.

Wandering tattler (*Heteroscelus incanus*). Common migrant. There were two birds seen at Lincoln Bight on 29 May. Two birds were seen below Zapadni Plot 80 on 14 July.

Greater yellowlegs (*Tringa melanoleuca*). Irregular migrant. One bird was at the Antone Lake Slough on 26 May.

Wood sandpiper (*Tringa glareola*). Rare migrant. Two birds were in Town Marsh on 2 June.

Bar-tailed godwit (*Limosa lapponica*). Uncommon migrant. One bird was seen at Salt Lagoon for several days in early June, including 4 and 5 June.

Ruddy turnstone (*Arenaria interpres*). Common migrant. A couple birds were feeding in the kelp with numerous rock sandpipers at Marunich on 4 June. In August there were several sightings of dozens of birds feeding in the kelp with rock sandpipers at Marunich and the beaches adjacent to North Hill. This has been a common observation for at least the last 10 years.

Western sandpiper (*Calidris mauri*). Uncommon migrant. One bird was seen at Tsamana Lake on 21 August.

Red-necked stint (*Calidris ruficollis*). Common migrant. One bird was behind NOAA Staff Quarters on 7 June.

Long-toed stint (*Calidris subminuta*). Casual migrant. One bird was seen in Town Marsh on 2 June.

Least sandpiper (*Calidris minutilla*). Common breeder. One bird was behind NOAA Staff Quarters on 27 and 29 June.

Pectoral sandpiper (*Calidris melanotos*). Uncommon migrant. One bird was seen along the West Cliffs trail on 4 June.

Rock sandpiper (*Calidris ptilocnemis ptilocnemis*). Abundant breeder. This species is found all over the island. Recorded sightings include 10 birds bathing at Lake Hill on 27 May, a pair with four or five chicks was seen near Ridgeway on 9 June. At Marunich numerous birds were seen on 4, 5 and 9 June, and on 13 June approximately 50 birds were bathing in the pond and about 70 were feeding in the kelp on the adjacent beach. A bird with an apparent broken leg was behind NOAA Staff Quarters on 29 June.

Ruff (*Philomachus pugnax*). Uncommon migrant. A juvenile seen August 29 Antone Lake slough.

Red-necked phalarope (*Phalaropus lobatus*). Common breeder. We saw about a dozen birds on Salt Lagoon on 25 May. At least six birds were on Little Polovina Lake on 26 May. Twelve birds were in Town Marsh on 2 June.

Red phalarope (*Phalaropus fulicaria*). Common breeder. One bird in winter plumage was seen Tsamana Lake on 27 August.

Pomarine jaeger (*Stercorarius pomarinus*). Uncommon migrant. A single bird was observed on a near shore rock at Reef on 10 June.

Common murre (*Uria aalge*). Abundant breeder. The first egg was seen on 17 June. The first chick was seen on 13 July. One impressive observation was that of a lone bird making a summer-sault crash landing on the open tundra near population plot 3 on West Cliffs on 9 June. The bird recovered and flew off.

Thick-billed murre (*Uria lomvia*). Abundant breeder. The first egg was seen on 21 June. The first chick was seen on 19 July. Thick-billed murre took about a week longer than common murre to settle in on the breeding cliffs. For instance on 24 June at Plot 114 this species was not present on the cliffs whereas common murre were settled in.

Pigeon guillemot (*Cephus columbia*). Irregular migrant. One bird was seen off shore of Tsamana on 13 June.

Parakeet auklet (*Aethia psittacula*). Abundant breeder. A one-legged bird was resting on at Tolstoi Plot 90 view station on 7 July.

Least auklet (*Aethia pusilla*). Abundant breeder. This species is seen daily and breeds on most boulder beaches.

Crested auklet (*Aethia cristatella*). Abundant breeder. This species is seen daily, though it is not as abundant as least or parakeet auklets. As in previous years, we periodically recorded flocks flying along the Tolstoi cliffs, such as on June 19 when one flock had about 80 birds.

Horned puffin (*Fratercula corniculata*). Abundant breeder. This species is found on the cliffs and adjacent water and was seen daily. Eleven birds were counted on Zapadni's Plot 84 on 30 July. At

Zapadni Plot 80 adults were seen tending two nesting sites, but the birds only were partially visible and contents were never seen. At plot 104 an egg hatched on 20 August but the chick did not fledge. A bird in winter plumage was seen at Northwest Point on 21 August.

Tufted puffin (*Fratercula cirrhata*). Abundant breeder. This species was observed daily. Tufted puffins have little safe habitat for burrow nesting due to the presence of foxes and nest in the cracks and crevices of the cliffs.

Black-legged kittiwake (*Rissa tridactyla*). Abundant breeder. Kittiwakes were on nests when we arrived on 25 May. The first chick was seen on 21 June. This species is found throughout the island.

Red-legged kittiwake (*Rissa brevirostris*). Abundant breeder. This species is seen daily throughout the island. They frequent Weather Station Lake and Tsamana Lake and breed mostly on the lower reaches of High Bluffs cliffs. The first chick was seen on 30 June.

Glaucous-winged gull (*Larus glaucescens*). Abundant breeder. This species is observed daily. An adult flying by the Tolstoi Cliffs cleared the ledges of murrelets on 17 July. A nesting bird was on the lower reaches of the northeast point of Otter Island on 14 June. Large chicks were seen in the vicinity of the nest on 31 July. Preeble and McAtee writing (1923) reported that this species was known to breed on Walrus Island and Sealion Rock, but foxes prevented them from breeding on St. Paul, St. George and Otter Island.

Oriental cuckoo (*Cuculus optatus*). Casual migrant. One bird was seen at Navastashna on 5 June.

Bank swallow (*Riparia riparia*). Rare migrant. At least six birds were flying about the Polovina Land Bridge on 6 June. Another sighting occurred on 29 August over Salt Lagoon.

Pacific wren (*Troglodytes pacifica*). Common breeder. One bird was near plot 114 at Tolstoi on 5 June, 19 June, and 29 July. A bird was seen a Bogoslof Peak on 19 June. A bird was seen on Tolstoi Beach on 10 July and 17 July.

Northern wheatear (*Oenanthe oenanthe*). Rare migrant. One bird was at Southwest Point on 29 August.

Lapland longspur (*Calcarius lapponicus*). Abundant breeder. Multitudes of this species are found all over the island.

Snow bunting (*Plectrophenax nivalis*). Abundant breeder. Seen daily, recorded sightings include least two birds at Lake Hill on 27 May, six birds near Slade's Gap on 4 June, and two at Polovina Hill on 5 June. Numerous juvenile birds were near Southwest Point 19 June.

Gray-crowned rosy finch (*Leucosticta arctoa*). Abundant breeder. Multitudes of this species are found all over the island. Recorded sightings includes 15 to 20 birds at Lake Hill Quarry on 27 May, at least 20 birds around Polovina Hill on 5 June.

Common redpoll (*Acanthis flammea*). Rare migrant. One bird was seen along the West Cliffs four wheeler tract on 19 July.

Mammals

Harbor seal (*Phoca vitulina*). A least seven individuals were seen near Slade's Gap on 1 June. Six were seen near Southwest Point on 6 July.

Northern fur seal (*Callorhinus ursinus*). Evidence of fur seals wandering along the cliff tops at Zapadni and Tolstoi was again noted in 2014, but only once did we have to shoo an animal away from our trail to the productivity plots.

Elephant seal (*Mirounga angustirostris*). A lone male was seen on Zapadni sand beach on 28 June,

Steller's sea lion (*Eumetopias jubatus*). Two males were seen off Tsamana on 29 June. Among the fur seals that haul out on the bench below Zapadni Point, there were one on 25 June, three on 8 July, three on 11 July, and one on 22 July. A carcass, a victim of a local hunter (pers. com.) was observed below Zapadni Point on 26 June. During the red-faced cormorant survey on 6 July six sea lions were counted at Northeast Point, eight counted along the east coast, and 14 counted on Sea Lion Rock.

Pacific walrus (*Odobenus rosmarus*). A headless carcass was washed up a beach near Watson Lake on 6 July.

Orca (*Orcinus orca*). A pod of at least 6 individuals was off shore of Zapadni on 6 June. A pod of five or six was swimming along off shore waters of Sea lion Rock on 16 July. Two were seen from Plot 48 on 18 August.

Reindeer (*Rangifer tarandus*). We counted approximately 272 animals in a herd near Antone Lake on 25 May. The herd was seen again in comparable numbers at Lincoln Bight on 19 June and on 30 June the herd was at Southwest Point.

Arctic fox (*Alopex lagopus*). There was only one active fox den found along the Zapadni cliffs. The loss of three active red-faced cormorant nests below Plot 3 had us puzzled until a fox was seen on the nesting ledge on 26 June. The first pups we saw that were large and mobile were seen on 11 July near the seafood processing plant in the village. Sea Lion Rock had at least two foxes on it on 5 August and 19 August.

Pribilof shrew (*Sorex pribilofensis*). One animal seen briefly amongst boulders on Antone Lake seawall 28 August.

Table 81. Observations and breeding status of birds and selected mammals at St. Paul Island, Alaska. Data represent observations made during the monitoring season only (see dates at end of table) and may not include sightings made by other researchers or community members on the island. Information comes from annotated lists, which were not included in reports prior to 2003, although incidental observations of wildlife were undoubtedly made in 1975-2002. Dashes indicate species not recorded that year but may not necessarily indicate absence from the island during the time period (e.g., species not observed although present, or species not recorded although observed). Species observed only at Otter or Walrus islands and not St. Paul in a given year are noted as "Otter I." and "Walrus I.", respectively.

Codes: B=confirmed breeder, P=probable/possible breeder, X=observed non-breeder X/B?=bred in other years but not specified in current year												
Species	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Bean goose	X	X	-	-	-	-	-	-	-	X	-	-
Greater white-fronted goose	X	X	-	-	-	X	-	-	X	X	-	-
Lesser white-fronted goose	-	-	-	-	-	-	-	-	-	-	X	-
Emperor goose	X	(X) ^a	X	-	Otter I.	X	-	-	-	X	-	-
Snow goose	-	-	X	-	-	Otter I.	-	-	-	X	-	-
Brant	X	X	-	-	X	X	-	-	-	X	-	X
Aleutian cackling goose	X	X	-	X	X	X	X	X	X	X	X	X
Cackling goose	-	X	X	X	-	X	-	-	-	X	-	-
Tundra swan	X	-	-	X	-	-	X	-	X	X	-	X
Bewick's swan	-	-	-	-	-	-	-	-	-	-	-	X
Gadwall	-	-	X	-	-	-	-	-	-	-	-	-
Eurasian wigeon	X	X	-	X	X	X	X	-	X	X	-	-
American wigeon	X	X	-	X	-	-	X	-	-	-	-	-
Mallard	X	X	-	-	-	X	-	X	-	X	X	X
Northern shoveler	X	X	-	X	-	X	X	-	-	-	X	-
Northern pintail	B	B	B	X/B?	X/B?	P	B	X	B	B	B	B
Eurasian green-winged teal (<i>A. c. crecca</i>)	B	B	-	-	X	X	-	-	B	B	B	B
American green-winged teal (<i>A. c. carolinensis</i>)	B	B	-	-	-	X	-	X	P	-	-	P
Green-winged teal (unspecified subsp.)	-	-	B	X	-	B	X	B	-	-	-	-
Canvasback	-	-	X	-	-	-	-	-	-	-	-	-
Common pochard	-	-	-	X	X	-	-	-	-	-	-	-
Ring-necked duck	-	-	X	-	-	-	X	-	X	-	-	-
Tufted duck	X	X	-	X	-	X	X	-	-	-	X	-
Greater scaup	X	X	-	-	X	X	X	X	X	X	X	X
Lesser scaup	-	-	-	-	-	X	-	X	X	-	-	X
Steller's eider	-	(X)	-	X	X	-	-	X	X	X	-	-
King eider	X	X	X	X	X	X	X	X	X	X	-	X
Common eider	-	-	-	-	-	-	-	-	X	-	-	-
Harlequin duck	X	X	X	X	X	X	X	X	X	X	X	X
White-winged scoter	X	X	-	-	-	X	-	-	-	X	-	-
Black scoter	X	X	-	-	-	X	-	-	-	X	X	-
Long-tailed duck	B	B	B	X/B?	X/B?	B	X/B?	B	B	B	B	B
Bufflehead	X	X	-	X	-	X	X	X	X	X	X	X
Common goldeneye	X	X	-	-	-	X	X	-	X	X	-	-
Smew	-	-	-	X	X	-	-	-	-	-	-	-
Common merganser	-	(X)	-	X	X	X	-	-	-	-	-	-

^aData in parentheses were observed only during late-season observations 2 Sep-7 Oct.

Table 81 (continued). Observations and breeding status of birds and selected mammals at St. Paul Island, Alaska. Data represent observations made during the monitoring season only (see dates at end of table) and may not include sightings made by other researchers or community members on the island. Information comes from annotated lists, which were not included in reports prior to 2003, although incidental observations of wildlife were undoubtedly made in 1975-2002. Dashes indicate species not recorded that year but may not necessarily indicate absence from the island during the time period (e.g., species not observed although present, or species not recorded although observed). Species observed only at Otter or Walrus islands and not St. Paul in a given year are noted as "Otter I." and "Walrus I.", respectively.

Codes: B=confirmed breeder, P=probable/possible breeder, X=observed non-breeder X/B?=bred in other years but not specified in current year												
Species	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Red-breasted merganser	X	X	-	-	X	X	X	X	X	X	-	-
Red-throated loon	-	-	-	-	-	-	-	-	-	-	X	X
Pacific loon	X	X	-	-	-	-	X	-	X	X	-	-
Common loon	-	-	X	-	-	X	X	-	-	-	X	X
Yellow-billed loon	X	X	-	-	X	X	-	-	-	X	-	-
Horned grebe	-	X	-	-	-	-	-	-	-	X	-	-
Red-necked grebe	X	-	-	-	X	X	X	-	X	X	-	-
Black-footed albatross	X	-	-	-	-	-	-	-	-	-	-	-
Laysan albatross	-	-	-	-	-	X	-	-	-	-	-	-
Northern fulmar	B	B	B	B	B	B	B	B	B	B	B	B
Mottled petrel	X	-	-	-	-	-	-	-	-	X	X	-
Sooty shearwater	-	-	-	-	X	-	-	-	-	-	-	-
Short-tailed shearwater	X	X	-	X	X	X	X	X	X	X	X	X
Fork-tailed storm-petrel	X	X	-	-	-	X	X	X	-	X	-	-
Leach's storm-petrel	-	-	-	-	X	-	-	-	-	-	-	-
Double-crested cormorant	X	-	-	-	-	-	X	-	-	X	-	-
Red-faced cormorant	B	B	B	B	B	B	B	B	B	B	B	B
Pelagic cormorant	X	X	X	-	-	X	X	X	X	X	X	X
Bald eagle	X	X	X	X	X	X	X	-	X	-	-	X
Osprey	-	-	-	-	-	-	-	-	-	-	-	X
White-tailed eagle	-	-	-	-	-	-	-	-	-	X	X	-
Northern harrier	-	(X) ^a	-	-	-	-	-	-	-	-	-	-
Rough-legged hawk	-	X	-	-	-	-	-	-	-	-	-	-
Eurasian hobby	X	-	-	-	-	-	-	-	-	-	-	-
Gyrfalcon	-	X	-	-	-	X	-	-	-	-	-	-
Peregrine falcon	X	X	-	X	-	-	-	-	-	-	-	-
Sandhill crane	-	(X)	-	X	X	X	X	-	-	-	X	-
Black-bellied plover	X	X	-	-	-	-	-	-	-	-	-	-
American golden-plover	X	-	-	-	-	-	-	-	-	-	-	-
Pacific golden-plover	X	X	-	X	X	X	X	X	X	X	X	X
Lesser sand-(Mongolian) plover	X	X	X	-	-	-	X	-	-	X	-	-
Semipalmated plover	B	B	-	X/B?	X/B?	B	B	P	B	B	B	B
Terek sandpiper	X	-	-	-	-	-	-	-	-	X	-	-
Common sandpiper	X	X	-	-	-	X	-	-	-	-	-	X
Gray-tailed tattler	X	X	X	X	X	X	X	X	X	X	X	-
Wandering tattler	X	X	-	X	X	X	X	X	X	X	X	X

^aData in parentheses were observed only during late-season observations 2 Sep-7 Oct.

Table 81 (continued). Observations and breeding status of birds and selected mammals at St. Paul Island, Alaska. Data represent observations made during the monitoring season only (see dates at end of table) and may not include sightings made by other researchers or community members on the island. Information comes from annotated lists, which were not included in reports prior to 2003, although incidental observations of wildlife were undoubtedly made in 1975-2002. Dashes indicate species not recorded that year but may not necessarily indicate absence from the island during the time period (e.g., species not observed although present, or species not recorded although observed). Species observed only at Otter or Walrus islands and not St. Paul in a given year are noted as "Otter I." and "Walrus I.", respectively.

Codes: B=confirmed breeder, P=probable/possible breeder, X=observed non-breeder X/B?=bred in other years but not specified in current year												
Species	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Spotted redshank	-	(X)	-	-	-	-	-	-	-	-	-	-
Greater yellowlegs	X	(X)	-	X	-	-	-	-	-	-	X	X
Common greenshank	X	X	-	-	-	-	-	-	-	-	-	-
Lesser yellowlegs	X	X	-	-	X	-	-	-	X	-	-	-
Wood sandpiper	X	X	-	-	-	-	X	-	X	X	-	X
Whimbrel	X	X	X	X	-	X	X	X	X	X	-	-
Bristle-thighed curlew	X	X	X	-	-	X	X	X	X	-	X	-
Far-eastern curlew	-	-	-	-	X	-	-	-	-	-	-	-
Black-tailed godwit	-	-	-	-	-	-	X	X	-	-	-	-
Bar-tailed godwit	X	X	-	-	X	X	X	X	X	X	X	X
Ruddy turnstone	X	X	-	X	X	X	X	X	X	X	X	X
Black turnstone	X	-	-	-	-	-	-	-	-	-	-	-
Great knot	-	-	-	-	X	-	-	X	-	-	-	-
Red knot	X	-	-	-	-	-	-	-	-	-	-	-
Sanderling	-	X	X	X	X	X	-	-	-	X	-	-
Semipalmated sandpiper	X	X	X	-	-	X	-	-	-	-	-	-
Western sandpiper	X	X	-	-	X	X	X	X	X	X	-	X
Red-necked stint	X	X	-	X	X	X	X	X	X	X	-	X
Little stint	X	-	-	-	X	-	-	-	-	X	-	-
Temnick's stint	-	-	-	-	-	-	X	-	-	-	-	-
Long-toed stint	X	-	-	-	-	-	-	-	X	-	-	X
Least sandpiper	P	B	-	X/B?	X/B?	B	X/B?	X	X	X	-	X
Baird's sandpiper	X	X	-	-	-	-	-	-	-	X	-	-
Pectoral sandpiper	X	X	-	X	-	X	X	X	X	X	-	X
Sharp-tailed sandpiper	X	X	-	-	X	X	X	X	X	X	-	-
Pribilof rock sandpiper (<i>C. p. ptilocnemis</i>)	B	B	B	B	B	B	B	B	B	B	B	B
Northern rock sandpiper (<i>C. p. tschuktschorum</i>)	X	-	-	-	-	X	-	-	-	X	-	-
Dunlin	X	X	-	X	X	-	X	-	-	-	-	-
Stilt sandpiper	-	-	-	-	-	-	-	-	-	-	X	-
Broad-billed sandpiper	-	-	-	-	-	-	X	-	-	-	-	-
Buff-breasted sandpiper	-	X	X	-	-	X	X	-	-	X	-	-
Ruff	X	X	X	-	X	-	X	X	X	-	-	X
Long-billed dowitcher	X	X	-	-	-	-	X	X	-	X	-	-
Short-billed dowitcher	X	X	-	-	-	X	-	-	-	-	-	-
Jack snipe	-	X	-	-	-	-	-	-	-	-	-	-
Wilson's snipe	-	X	-	-	-	X	-	-	X	X/B?	-	-

^aData in parentheses were observed only during late-season observations 2 Sep-7 Oct.

Table 81 (continued). Observations and breeding status of birds and selected mammals at St. Paul Island, Alaska. Data represent observations made during the monitoring season only (see dates at end of table) and may not include sightings made by other researchers or community members on the island. Information comes from annotated lists, which were not included in reports prior to 2003, although incidental observations of wildlife were undoubtedly made in 1975-2002. Dashes indicate species not recorded that year but may not necessarily indicate absence from the island during the time period (e.g., species not observed although present, or species not recorded although observed). Species observed only at Otter or Walrus islands and not St. Paul in a given year are noted as "Otter I." and "Walrus I.", respectively.

Codes: B=confirmed breeder, P=probable/possible breeder, X=observed non-breeder X/B?=bred in other years but not specified in current year												
Species	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Common snipe	X	X	-	-	-	-	X	-	-	X	-	-
Pin-tailed snipe	-	-	-	-	-	-	-	-	-	X	-	X
Red-necked phalarope	X	B	B	X	X	X	X	B	B	B	X	X
Red phalarope	X	X	-	X	X	X	X	X	P	P	X	X
Pomarine jaeger	X	X	-	X	X	X	X	-	X	X	X	X
Parasitic jaeger	X	X	-	X	X	X	X	-	X	X	X	-
Long-tailed jaeger	X	X	-	-	X	X	X	X	X	X	X	-
Dovekie	-	-	-	-	-	X	Walrus I.	-	-	-	-	-
Common murre	B	B	B	B	B	B	B	B	B	B	B	B
Thick-billed murre	B	B	B	B	B	B	B	B	B	B	B	B
Black guillemot	X	-	-	-	-	-	-	-	-	X	X	X
Pigeon guillemot	X	X	X	X	X	X	X	X	-	X	X	X
Long-billed murrelet	-	X	-	-	-	-	-	-	-	-	-	-
Marbled murrelet	X	X	-	-	-	X	-	-	-	-	-	-
Ancient murrelet	X	X	X	X	X	X	X	X	X	X	X	-
Parakeet auklet	B	B	B	B	B	B	B	B	B	B	B	B
Least auklet	B	B	B	B	B	B	B	B	B	B	B	B
Whiskered auklet	-	-	-	-	X	-	-	-	-	-	-	-
Crested auklet	B	B	B	B	B	B	B	B	B	B	B	B
Rhinoceros auklet	X	X	X	-	X	X	-	-	-	-	-	-
Horned puffin	B	B	B	B	B	B	B	B	B	B	B	B
Tufted puffin	B	B	B	B	B	B	B	B	B	B	B	B
Black-legged kittiwake	B	B	B	B	B	B	B	B	B	B	B	B
Red-legged kittiwake	B	B	B	B	B	B	B	B	B	B	B	B
Sabine's gull	X	X	-	-	X	X	X	-	-	X	-	-
Bonaparte's gull	-	-	-	X	X	-	-	-	-	-	-	-
Black-headed gull	X	X	-	-	-	X	-	-	-	-	-	-
Ross's gull	-	-	-	X	-	-	-	-	-	-	-	-
Franklin's gull	-	-	-	-	-	-	-	-	-	-	X	-
Mew gull	-	-	-	-	X	-	X	-	-	-	-	-
Herring gull	X	X	X	X	X	X	-	-	X	X	-	-
Thayer's gull	-	-	-	-	-	-	-	-	-	X	-	-
Slaty-backed gull	X	X	-	X	X	X	X	-	-	X	X	-
Glaucous-winged gull	X	X	-	X	X	X	X	X	X	X	X	B Otter i.
Glaucous gull	X	X	-	-	X	X	X	-	X	-	X	-
Aleutian tern	X	-	-	-	-	-	-	-	-	X	-	-

^aData in parentheses were observed only during late-season observations 2 Sep-7 Oct.

Table 81 (continued). Observations and breeding status of birds and selected mammals at St. Paul Island, Alaska. Data represent observations made during the monitoring season only (see dates at end of table) and may not include sightings made by other researchers or community members on the island. Information comes from annotated lists, which were not included in reports prior to 2003, although incidental observations of wildlife were undoubtedly made in 1975-2002. Dashes indicate species not recorded that year but may not necessarily indicate absence from the island during the time period (e.g., species not observed although present, or species not recorded although observed). Species observed only at Otter or Walrus islands and not St. Paul in a given year are noted as "Otter I." and "Walrus I.", respectively.

Codes: B=confirmed breeder, P=probable/possible breeder, X=observed non-breeder X/B?=bred in other years but not specified in current year												
Species	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Common tern	-	X	-	-	-	-	X	-	X	-	-	-
Siberian common tern	-	-	-	-	-	-	-	-	-	-	X	-
Arctic tern	X	X	-	-	-	X	X	X	-	X	-	-
Common cuckoo	-	X	X	-	-	-	-	-	-	-	-	-
Oriental cuckoo	-	(X) ^a	-	-	-	-	-	-	-	-	-	X
Snowy owl	X	X	-	X	X	X	-	-	-	-	X	-
Short-eared owl	X	X	-	X	X	X	X	-	X	X	X	-
Brown hawk-owl	-	-	-	-	X	-	-	-	-	-	-	-
Belted kingfisher	X	X	-	-	-	-	-	-	-	-	-	-
Olive-sided flycatcher	X	-	-	-	-	-	-	-	-	-	-	-
Say's phoebe	-	-	X	-	-	-	-	-	-	-	-	-
Eastern kingbird	-	-	-	-	X	-	-	-	-	-	-	-
Northern shrike	-	(X)	-	-	-	-	-	-	-	-	-	-
Warbling vireo	-	(X)	-	-	-	-	-	-	-	-	-	-
Common raven	X	(X)	X	X	X	X	X	X	X	-	X	-
Sky lark	-	(X)	-	-	-	-	-	-	-	-	-	-
Purple martin	X	-	-	-	-	-	-	-	-	-	-	-
Tree swallow	X	X	-	-	-	X	-	-	X	-	-	-
Violet green swallow	-	-	-	-	-	-	-	-	-	X	-	-
Bank swallow	X	X	-	-	X	X	X	X	X	-	-	X
Cliff swallow	-	-	-	-	-	-	-	X	-	-	-	-
Barn swallow	X	X	X	-	-	X	-	-	-	-	-	-
Common house martin	-	-	-	-	-	X	Otter I.	-	-	-	X	-
Red-breasted nuthatch	-	(X)	-	-	-	-	-	X	-	-	-	-
Pacific (formerly winter) wren	B	B	B	-	B	B	B	B	B	B	B	B
Golden-crowned kinglet	-	(X)	-	-	-	-	-	-	-	-	-	-
Ruby-crowned kinglet	-	X	-	-	Walrus I.	-	-	-	-	-	-	-
Wood warbler	-	(X)	-	-	-	-	-	-	-	-	-	-
Arctic warbler	-	(X)	X	-	-	-	-	-	-	-	-	-
Taiga flycatcher	-	-	-	-	-	-	X	-	-	-	-	-
Dark-sided (Siberian) flycatcher	X	X	X	-	-	-	X	-	X	X	-	-
Gray-streaked flycatcher	X	X	X	-	-	-	-	-	-	-	-	-
Siberian rubythroat	X	-	-	-	-	-	-	-	-	-	-	-
Bluethroat	X	-	-	-	-	-	-	-	-	X	-	-
Rufus-tailed robin	-	-	-	-	-	X	-	-	-	-	-	-
Northern wheatear	X	-	X	X	-	X	X	X	-	X	X	X

^aData in parentheses were observed only during late-season observations 2 Sep-7 Oct.

Table 81 (continued). Observations and breeding status of birds and selected mammals at St. Paul Island, Alaska. Data represent observations made during the monitoring season only (see dates at end of table) and may not include sightings made by other researchers or community members on the island. Information comes from annotated lists, which were not included in reports prior to 2003, although incidental observations of wildlife were undoubtedly made 1975-2002. Dashes indicate species not recorded that year but may not necessarily indicate absence from the island during the time period (e.g., species not observed although present, or species not recorded although observed). Species observed only at Otter or Walrus islands and not St. Paul in a given year are noted as "Otter I." and "Walrus I.", respectively.

Codes: B=confirmed breeder, P=probable/possible breeder, X=observed non-breeder X/B?=bred in other years but not specified in current year												
Species	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gray-cheeked thrush	-	X	-	-	-	X	-	-	-	-	-	-
Swainson's thrush	-	(X) ^a	-	-	-	-	-	-	-	-	-	-
Hermit thrush	X	X	-	-	-	-	-	-	-	-	-	-
Eyebrowed thrush	X	X	-	-	-	-	X	-	-	-	-	-
Dusky thrush	X	-	-	-	-	-	-	-	-	-	-	-
American robin	-	(X)	-	-	-	-	-	-	-	X	-	-
Varied thrush	-	(X)	-	-	-	-	-	-	-	-	-	-
Northern mockingbird	-	-	-	-	-	-	-	X	-	-	-	-
Eastern yellow wagtail	X	X	-	-	-	X	X	X	-	-	-	-
Gray wagtail	-	-	-	-	-	X	-	-	-	-	-	-
White (black-backed) wagtail	X	-	-	-	-	-	-	-	-	-	-	-
Olive-backed pipit	X	X	X	-	-	-	-	-	-	-	-	-
American pipit	X	X	-	X	X	X	-	-	-	-	-	-
Red-throated pipit	X	(X)	-	-	-	-	-	-	-	-	-	-
Lapland longspur	B	B	B	B	B	B	B	B	B	B	B	B
Snow bunting	B	B	B	B	B	B	B	B	B	B	B	B
McKay's bunting	-	X	X	-	X	X	-	-	-	-	-	-
Orange-crowned warbler	-	X	-	-	-	-	-	-	-	-	-	-
Yellow warbler	-	X	-	-	-	-	-	-	-	-	-	-
Yellow-rumped warbler	X	(X)	-	-	-	-	-	X	-	-	-	-
Townsend's warbler	-	(X)	-	-	-	-	-	-	-	-	-	-
Northern waterthrush	-	X	-	-	-	-	-	-	-	-	-	-
Wilson's warbler	-	X	-	-	-	-	-	-	-	X	-	-
American tree sparrow	-	X	-	-	-	-	-	-	-	-	-	-
Chipping sparrow	-	(X)	-	-	-	-	-	-	-	-	-	-
Savannah sparrow	-	X	-	-	-	-	-	-	-	X	-	-
Fox sparrow	-	X	-	-	X	-	-	-	-	-	-	-
Lincoln's sparrow	-	(X)	-	-	-	-	-	-	-	-	-	-
White-crowned sparrow	-	(X)	-	-	-	-	-	-	-	-	-	-
Golden-crowned sparrow	-	X	-	-	-	X	-	-	X	X	-	-
Dark-eyed junco	-	X	-	-	-	X	-	-	X	-	-	-
Rustic bunting	X	-	-	-	-	-	X	-	-	-	-	-
Brambling	X	X	-	X	-	-	B	-	-	-	-	-
Gray-crowned rosy-finch	B	B	B	B	B	B	B	B	B	X	B	B
Common rosefinch	-	-	-	-	-	X	X	-	-	-	-	-
Red crossbill	X	X	-	-	-	-	-	-	-	-	-	-

^aData in parentheses were observed only during late-season observations 2 Sep-7 Oct.

Table 81 (continued). Observations and breeding status of birds and selected mammals at St. Paul Island, Alaska. Data represent observations made during the monitoring season only (see dates at end of table) and may not include sightings made by other researchers or community members on the island. Information comes from annotated lists, which were not included in reports prior to 2003, although incidental observations of wildlife were undoubtedly made 1975-2002. Dashes indicate species not recorded that year but may not necessarily indicate absence from the island during the time period (e.g., species not observed although present, or species not recorded although observed). Species observed only at Otter or Walrus islands and not St. Paul in a given year are noted as "Otter I." and "Walrus I.", respectively.

Codes: B=confirmed breeder, P=probable/possible breeder, X=observed non-breeder X/B?=bred in other years but not specified in current year												
Species	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
White-winged crossbill	X	-	-	-	-	-	-	-	-	-	-	-
Common redpoll	B	B	-	-	-	X	X	-	X	X	X	X
Hoary redpoll	X	B	-	X	-	X	X	X	-	-	X	-
Pine siskin	X	-	-	-	-	-	X	-	-	-	-	-
Hawfinch	X	-	-	-	-	-	-	-	-	-	-	-
Sea otter	NR ^b	NR	NR	X	-	-	-	-	X	-	-	-
Elephant seal	NR	NR	NR	-	-	-	-	-	-	-	-	X
Harbor seal	NR	NR	NR	X	X	-	X	X	X	X	X	X
Northern fur seal	NR	NR	NR	B	B	B	B	B	B	X	X	B
Steller's sea lion	NR	NR	NR	-	X	X	X	X	X	X	X	X
Pacific walrus	NR	NR	NR	-	-	-	-	-	X	-	X	-
Orca	NR	NR	NR	X	-	X	-	X	-	X	-	X
Minke whale	NR	NR	NR	-	-	-	-	-	-	-	-	-
Gray whale	NR	NR	NR	-	-	-	-	X	-	-	-	-
Dall's porpoise	NR	NR	NR	-	X	-	-	X	-	-	-	-
Red fox	NR	NR	NR	-	X	B	-	-	-	-	-	-
Arctic fox	NR	NR	NR	-	B	B	B	B	B	B	B	B
Reindeer	NR	NR	NR	-	B	B	B	B	B	B	B	B
Observation dates	14 May- 5 Sep	3 May- 2 Sep	8 May- 5 Sep	24 May- 15 Sep	25 May- 12 Sep	25 May- 12 Sep	25 May- 1 Sep	26 May- 5 Sep	23 May- 4 Sep	26 May- 3 Sep	24 May- 28 Aug	25 May 31 Aug

^aMammals not recorded (NR) in all years.

Table 82. First flowering dates of plants identified on St. Paul Island, Alaska. Data represent the day a fully-opened flower was first observed on the island each year. Dates may be poor indicators of actual phenology because observations of initial flowering events for uncommon or inconspicuous plants may be missed or depend on timing of field crew activities. Identifications are made by field personnel on-island and have not been confirmed by other authorities. Data may potentially exist before 2000 and in 2002-2006 but have not yet been summarized.

Family	Species	Common name	2001	2007	2008	2009	2010	2011	2012	2013	2014
Apiaceae (Umbelliferae)	<i>Angelica lucida</i>	Wild celery	-	21 Jun	12 Jul	16 Jul	<i>no data</i>	13 Jul	6 Jul	11 Jun	22 Jun
	<i>Conioselinum chinense</i>	Hemlock parsley	15 Jul	31 Jul	7 Aug	1 Aug	-	21 Jul	26 Jul	27 Jul	7 Jun
	<i>Ligustocum scotisum</i>	Lovage	27 Jul	-	-	-	-	-	-	-	-
Asteraceae (Compositae)	<i>Achillea borealis</i>	Northern yarrow	13 Jul	19 Jul	12 Jul	16 Jul	-	7 Jul	23 Jul	15 Jul	2 Jul
	<i>Antennaria momocephala</i>	Arctic puss toes	-	19 Jul	-	-	-	-	29 Jul	-	-
	<i>Arnica unalaschensis</i>	Unalaska arnica	-	-	12 Aug	1 Aug	-	14 Aug	-	-	-
	<i>Artemesia arctica</i>	Arctic sage	-	26 Aug	3 Aug	-	-	14 Aug	24 Jul	-	-
	<i>Artemesia globularia</i>	Globe wormwood	-	29 Jun	-	-	-	2 Jul	-	24 Jun	5 Jun
	<i>Artemesia titesii</i>	Northern wormwood	13 Jul	1 Aug	3 Aug	25 Jul	-	14 Jul	25 Jul	25 Jul	7 Jul
	<i>Aster sibiricus</i>	Siberian aster	2 Aug	-	25 Jul	24 Jul	-	23 Jul	29 Jul	26 Jul	4 Jul
	<i>Chrysanthemum arcticum</i>	Arctic daisy	16 Jul	-	23 Jul	24 Jul	-	15 Jul	21 Jul	23 Jul	22 Jun
	<i>Matricaria matricarioides</i>	Pineapple weed	-	-	-	-	-	20 Aug	-	-	-
	<i>Petasites hyperboreus</i>	Sweet coltsfoot	31 May	6 Jun	6 Jun	26 May	-	29 May	7 Jun	30 May	27 May
	<i>Senecio pseudo-arnica</i>	Beach sunflower	16 Jul	1 Aug	1 Aug	29 Jul	-	4 Aug	30 Jul	28 Jul	2 Jul
	<i>Taraxacum ceratophorum</i>	Horned dandelion	-	22 Jun	-	26 Jun	-	21 Jun	-	-	-
	<i>Taraxacum kamtschaticum</i>	Kamchatka dandelion	-	22 Jun	2 Jul	-	-	-	-	-	-
	<i>Taraxacum officinale</i>	Common dandelion	-	18 Jun	27 Jun	11 Jul	-	-	-	-	-
	Boraginaceae	<i>Eritrichium chamissonis</i>	Arctic forget-me-not	2 Aug	23 Jun	1 Jul	-	-	28 Jun	26 Jun	23 Jun
<i>Mertensia maritima</i>		Beach bluebells	-	23 Jun	23 Jul	6 Jul	-	6 Aug	24 Jul	29 Jul	22 Jun
Brassicaceae (Cruciferae)	<i>Barbarea orthoceras</i>	Wintercress	-	-	1 Aug	16 Jul	-	23 Jul	1 Aug	-	-
	<i>Cardamine pratensis angustifolia</i>	Cuckoo flower	13 Jul	9 Jul	22 Jul	3 Jul	-	29 Jun	23 Jul	18 Jul	13 Jun
	<i>Cardamine umbellata</i>	Siberian bittercress	-	24 Jun	12 Jul	-	-	-	6 Jul	4 Jul	13 Jun
	<i>Cochlearia officinalis oblongifolia</i>	Scurvy grass	-	3 Jun	31 May	9 Jun	-	8 Jun	17 Jun	6 Jun	25 May
	<i>Draba aleutica</i>	Aleutian draba	-	-	12 Jul	-	-	-	-	-	-
	<i>Draba borealis</i>	Arctic whitlow-grass	-	23 Jun	10 Jul	16 Jun	-	23 May	25 Jun	6 Jun	26 May
	<i>Draba hyperborea</i>	Northern draba	-	25 May	28 May	-	-	23 May	3 Jun	29 May	25 May
	<i>Draba lactea</i>	Arctic draba	-	-	-	6 Jul	-	-	-	-	-
Campanulaceae	<i>Campanula lasiocarpa</i>	Mountain harebell	2 Aug	5 Aug	12 Aug	26 Jul	-	1 Aug	-	-	10 Jul
	<i>Campanula uniflora</i>	Arctic harebell	-	26 Jun	7 Jun	-	-	1 Aug	29 Jul	27 Jul	9 Jul
Caryophyllaceae	<i>Cerastium beeringianum</i>	Mouse-eared chickweed	-	-	-	3 Jul	-	-	-	7 Jul	-
	<i>Cerastium beeringianum</i> var. <i>grandifolium</i>	Bering Sea chickweed	-	6 Jul	28 Jul	27 Jul	-	20 Aug	-	4 Jul	28 May
	Unid. <i>Cerastium</i> sp.	Unid. chickweed	14 Jun	-	-	-	-	-	-	-	-
	<i>Honckenya peploides</i>	Beach greens	-	20 Jul	12 Jul	-	-	14 Jun	1 Jul	25 Jun	11 Jun
	<i>Minuartia arctica</i>	Arctic sandwort	-	6 Jul	23 Jul	-	-	10 Jul	9 Jul	7 Jul	-
	<i>Silene acaulis</i>	Moss campion	-	3 Jul	22 Jul	26 Jul	-	10 Jul	9 Jul	26 Jun	5 Jun
	<i>Stellaria calycnatha</i>	Northern starwort	-	19 Jul	-	-	-	-	-	-	-
Cornus	<i>Stellaria crassifolia</i>	Fleshy stitchwort	-	-	-	-	-	22 Aug	-	-	13 Jun
	<i>Cornus suecica</i>	Dogwood	-	20 Jul	-	26 Jul	-	10 Jul	18 Jul	14 Jul	9 Jun
Fabaceae (Leguminosae)	<i>Lathyrus maritimus</i>	Beach pea	17 Jun	9 Jul	6 Jul	-	-	1 Jul	2 Jul	23 Jun	22 Jun
	<i>Lupinus nootkatensis</i>	Nootka lupine	31 May	30 May	7 Jun	-	-	29 May	19 Jul	13 Jun	25 May
Fumariaceae	<i>Corydalis pauciflora</i>	Few-flowered corydalis	14 Jun	13 Jun	12 Jun	9 Jun	-	13 Jun	17 Jun	8 Jun	26 May

Table 82 (continued). First flowering dates of plants identified on St. Paul Island, Alaska. Data represent the day a fully-opened flower was first observed on the island each year. Dates may be poor indicators of actual phenology because observations of initial flowering events for uncommon or inconspicuous plants may be missed or depend on timing of field crew activities. Identifications are made by field personnel on-island and have not been confirmed by other authorities. Data may potentially exist before 2000 and in 2002-2006 but have not yet been summarized.

Family	Species	Common name	2001	2007	2008	2009	2010	2011	2012	2013	2014	
Gentianaceae	<i>Gentiana algida</i>	Whitish gentian	2 Aug	7 Aug	12 Aug	1 Aug	<i>no data</i>	11 Aug	12 Aug	27 Jul	18 Jul	
	<i>Gentiana glauca</i>	Glaucoous gentian	-	7 Aug	-	-	-	-	-	-	-	
Geraniaceae	<i>Geranium erianthum</i>	Wild geranium	-	26 Jul	12 Aug	26 Jul	-	10 Jul	31 Jul	7 Jul	22 Jun	
Lilacaea	<i>Fritillaries camschatcensis</i>	Chocolate lily	-	-	25 Jul	-	-	23 Jul	13 Jul	-	23 Jun	
	<i>Lloydia serotina</i>	Alp lily	-	29 Jul	-	-	-	-	-	-	-	
Onagraceae	<i>Streptopus amplexifolius</i>	Twisted stalk	-	-	1 Aug	-	-	23 Jul	24 Jul	-	-	
	<i>Epilobium angustifolium</i>	Large-leaved Fireweed	-	-	-	-	-	-	-	-	12 Aug	
	<i>Epilobium anagallidifolium</i>	Alpine willow herb	-	-	-	-	-	14 Aug	23 Jul	-	-	
	<i>Epilobium hornemannii Behringianum</i>	Bering willow herb	-	26 Jul	-	-	-	20 Aug	-	-	-	
Papaveraceae	<i>Papaver alaskanum</i>	Alaska poppy	7 Jun	15 Jun	21 Jun	-	-	17 Jun	23 Jun	18 Jun	2 Jun	
	<i>Papaver macounii</i>	Macoun's poppy	-	-	-	-	-	-	-	-	-	
Plumbaginaceae	<i>Armeria maritima</i>	Thrift	19 Jun	14 Jul	27 Jun	1 Aug	-	22 Jun	21 Jun	24 Jun	27 May	
Polemoniaceae	<i>Polemonium acutiflorum</i>	Tall Jacob's ladder	17 Jun	5 Aug	3 Jul	11 Jul	-	17 Jun	2 Jul	4 Jul	8 Jun	
	<i>Polemonium acutiflorum macranthum</i>	Northern Jacob's ladder	-	-	-	-	-	-	-	22 Jun	19 Jun	
	<i>Polemonium boreale macranthum</i>	Bluebells	-	20 Jun	-	-	-	-	-	-	-	
Polygonaceae	<i>Polygonum bistora plumosum</i>	Pink plumes	-	5 Aug	-	-	-	-	10 Aug	-	-	
	<i>Polygonum viviparium</i>	Alpine bistort	-	-	-	-	-	17 Jul	-	-	12 Jul	
	<i>Oxyria digyna</i>	Mountain sorrel	-	23 Jun	-	-	-	-	25 Jul	27 Jun	-	
Portulacaceae	<i>Claytonia sarmentosa</i>	Alaska spring beauty	7 Jun	22 Jun	16 Jun	22 Jun	-	9 Jun	18 Jun	12 Jun	26 May	
Primulaceae	<i>Androsace tschuktschorum. lehmanniana</i>	Rock jasmine	-	18 Jun	8 Jun	-	-	11 Jun	18 Jun	12 Jun	25 May	
	<i>Primula tschuktschorum var. arctica</i>	Chukchi primrose	23 May	6 Jun	4 Jun	26 May	-	28 May	7 Jun	21 May	29 May	
	<i>Trientalis europaea arctica</i>	Northern starflower	26 Jun	20 Jul	24 Jul	26 Jul	-	10 Jul	23 Jul	14 Jul	22 Jun	
Pyrolaceae	<i>Pyrola minor</i>	Lesser wintergreen	-	5 Aug	-	1 Aug	-	-	-	-	14 Jul	
Ranunculaceae	<i>Aconitum delphinifolium chamissonianum</i>	Big monkshood	-	15 Jul	20 Jul	-	-	18 Jul	22 Jul	22 Jul	20 Jun	
	<i>Aconitum delphinifolium paradoxum</i>	Little monkshood	-	15 Jul	-	-	-	13 Jul	-	23 Jul	22 Jun	
	Unid. <i>Aconitum</i> sp.	Unid. monkshood	7 Jul	-	-	-	-	-	-	-	-	
	<i>Ranunculus eschscholtzii</i>	Subalpine buttercup	-	24 Jun	-	-	-	-	25 Jun	19 Jun	-	
	<i>Ranunculus pygmaeus</i>	Pigmy buttercup	-	-	-	21 Aug	-	-	-	-	-	
	<i>Ranunculus repans</i>	Creeping spearwort	-	-	-	-	-	14 Aug	1 Aug	-	-	
	<i>Ranunculus sulphureus</i>	Sulphur buttercup	-	2 Jun	2 Jun	26 May	-	9 Jun	11 Jun	31 May	25 May	
	Unid. <i>Ranunculus</i> sp.	Unid. buttercup	6 Jun	-	-	-	-	-	-	-	-	
	Rosaceae	<i>Geum Rossi</i>	Ross' avens	-	3 Jul	12 Jul	16 Jul	-	-	17 Jun	27 Jun	31 May
		<i>Potentilla egedii</i>	Beach cinquefoil	-	-	-	-	-	11 Aug	-	-	-
<i>Potentilla hyperarctica</i>		High Arctic cinquefoil	-	29 Jun	-	16 Jul	-	-	25 Jun	30 Jun	-	
<i>Potentilla uniflora</i>		One-flowered cinquefoil	-	23 Jun	22 Jun	-	-	19 Jun	26 Jun	-	-	
<i>Potentilla villonosa</i>		Cinquefoil	-	20 Jun	2 Jul	10 Jun	-	18 Jun	23 Jun	24 Jun	3 Jun	
Unid. <i>Potentilla</i> sp.		Cinquefoil sp.	7 Jun	-	-	-	-	-	-	-	-	
<i>Rubus arcticus</i>		Nagoonberry	-	1 Jul	22 Aug	1 Aug	-	14 Aug	22 Jul	18 Jul	13 Jun	
<i>Rubus chamaemorus</i>	Cloudberry	-	2 Jul	14 Jul	-	-	7 Jul	6 Jul	8 Jul	2 Jun		
Salicaceae	<i>Sibbaldia procumbens</i>	Sibbaldia	-	5 Aug	-	-	-	-	-	-	-	
	<i>Salix arctica</i>	Arctic willow	-	16 Jun	-	-	-	18 Jun	15 Jun	11 Jun	-	
	<i>Salix reticulata orbicularis</i>	Netleaf willow	-	23 Jun	-	-	-	22 Jun	-	24 Jun	-	

Table 82 (continued). First flowering dates of plants identified on St. Paul Island, Alaska. Data represent the day a fully-opened flower was first observed on the island each year. Dates may be poor indicators of actual phenology because observations of initial flowering events for uncommon or inconspicuous plants may be missed or depend on timing of field crew activities. Identifications are made by field personnel on-island and have not been confirmed by other authorities. Data may potentially exist before 2000 and in 2002-2006 but have not yet been summarized.

Family	Species	Common name	2001	2007	2008	2009	2010	2011	2012	2013	2014
Saxifragaceae	<i>Chrysosplenium wrightii</i>	Bering Sea water carpet	-	3 Jun	-	-	<i>no data</i>	11 Jun	12 Jun	-	27 May
	<i>Saxifraga bracteata</i>	Bracted saxifrage	-	27 Jun	15 Jul	-	-	-	-	18 Jun	3 Jun
	<i>Saxifraga bronchialis</i>	Yellow-spotted saxifrage	-	19 Jul	-	-	-	-	-	-	-
	<i>Saxifraga hieracifolia</i>	Rusty saxifrage	-	22 Jul	-	11 Jul	-	13 Jul	4 Aug	-	9 Jul
	<i>Saxifraga hirculus</i>	Bog saxifraga	-	-	-	14 Jul	-	-	-	-	-
	<i>Saxifraga oppositifolia</i>	Purple mountain saxifraga	-	3 Jun	-	-	-	-	-	-	-
	<i>Saxifraga punctata nelsoniana</i>	Brook saxifraga	-	6 Jul	22 Jun	16 Jul	-	22 Jun	-	24 Jun	9 Jun
	<i>Saxifraga serpyllifolia</i>	Thyme-leaved saxifrage	2 Aug	18 Jul	2 Aug	14 Jul	-	10 Jul	29 Jul	7 Jul	22 Jun
	<i>Saxifraga unalaschensis</i>	Unalaska saxifrage	-	29 Jun	-	-	-	-	-	-	-
	Scrophulariaceae	<i>Lagotis glauca</i>	Weasel snout	26 Jun	26 Jun	30 Jun	22 Jun	-	22 Jun	25 Jun	19 Jun
<i>Pedicularis lanata</i>		Woolly lousewort	17 Jun	1 Jun	22 Jun	10 Jun	-	19 Jun	15 Jun	22 Jun	-
<i>Pedicularis langsdorffii</i> <i>Langsdorffii</i>		Arctic lousewort	-	29 Jun	6 Jul	6 Jul	-	22 Jun	6 Jul	24 Jun	-
<i>Pedicularis sudetica</i> <i>Pacifica</i>		Fern-leaf lousewort	-	9 Jul	1 Jul	6 Jul	-	29 Jun	30 Jun	24 Jun	-
<i>Pedicularis verticillata</i>		Whorled lousewort	-	29 Jun	-	6 Jul	-	28 Jun	4 Jul	4 Jul	-
<i>Veronica serpyllifolia</i>		Thyme-leaf speedwell	-	-	-	-	-	20 Aug	10 Aug	-	7 Jul
<i>Veronica stelleri</i>		Steller's speedwell	-	26 Jul	16 Aug	8 Aug	-	-	10 Aug	-	-
Valerianaceae	<i>Valeriana capitata</i>	Capitate valerian	30 Jun	-	16 Jun	26 Jul	-	19 Jun	22 Jul	5 Jul	13 Jun
Violaceae	<i>Viola langsdorffii</i>	Alaska violet	10 Jun	23 Jun	28 Jun	27 Jun	-	28 Jun	1 Jul	30 Jun	26 May
	<i>Viola epipsila</i> <i>Repens</i>	Marsh violet	-	-	-	-	-	-	20 Jul	24 Jun	26 May

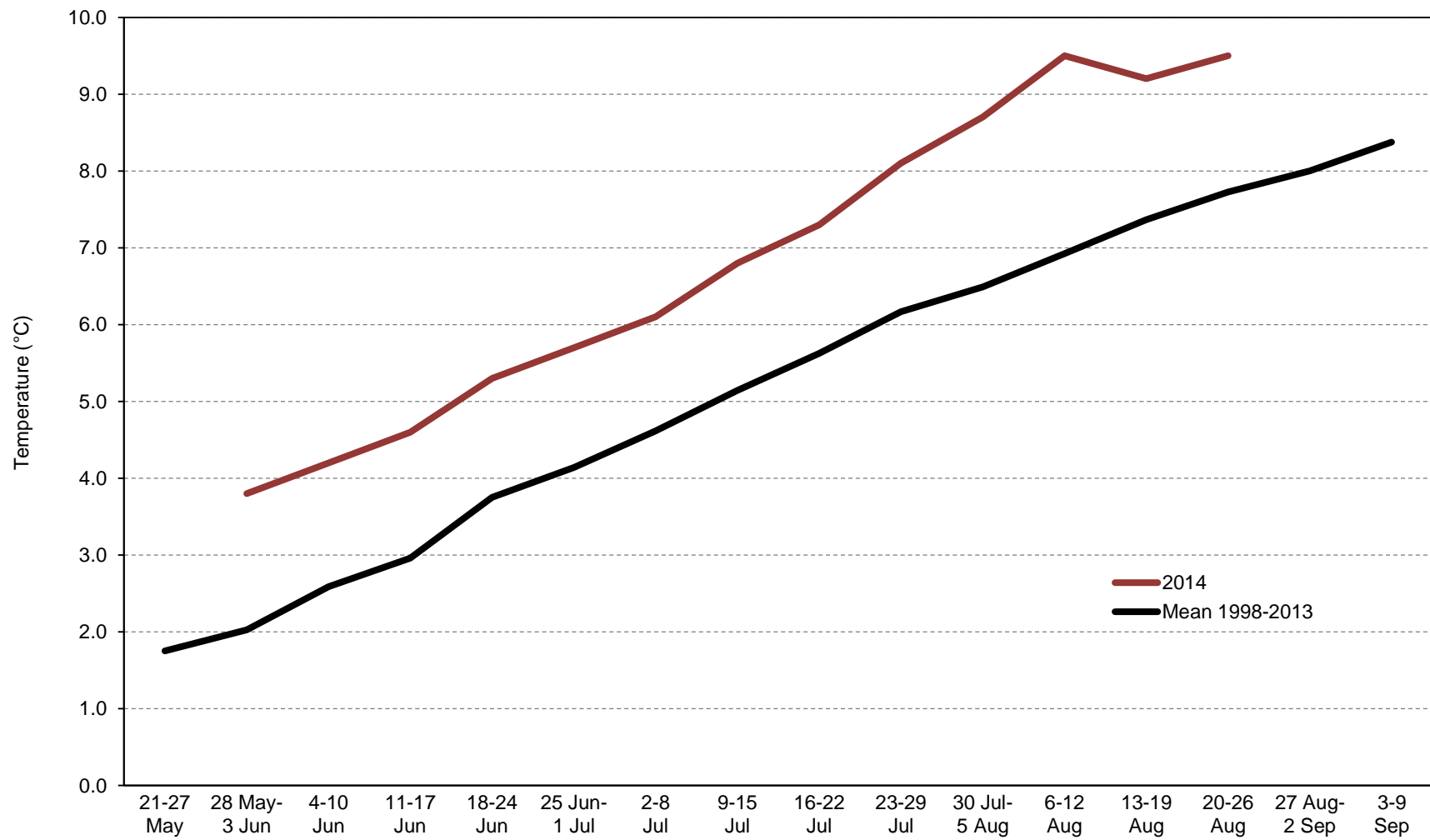


Figure 31. Mean weekly sea surface temperatures (°C) at English Bay, St. Paul Island, Alaska.

Table 83. Mean weekly sea surface temperatures (°C) at English Bay, St. Paul Island, Alaska.

Week	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
21-27 May	-	<i>no data</i>	-	-	-	-	<i>no data</i>	<i>no data</i>	<i>no data</i>	1.4	-	1.8	-	-	-	-	-
28 May-3 Jun	-	<i>no data</i>	-	2.8	-	5.5	<i>no data</i>	<i>no data</i>	<i>no data</i>	2.5	1.3	1.5	0.5	-	1.3	1.3	3.8
4-10 Jun	3.7	-	-	3.4	-	6.0	-	-	-	3.5	1.6	1.9	0.9	2.7	0.8	1.6	4.2
11-17 Jun	4.0	-	-	3.9	4.9	5.9	-	-	-	3.9	2.0	2.6	1.4	3.3	1.2	2.1	4.6
18-24 Jun	4.4	-	4.8	4.7	5.3	6.2	-	-	-	4.2	2.5	3.1	2.0	3.7	2.0	2.7	5.3
25 Jun-1 Jul	4.8	-	5.3	4.8	5.6	6.6	-	-	-	4.2	3.2	3.5	2.3	4.3	2.4	3.0	5.7
2-8 Jul	5.4	-	5.1	5.4	6.2	7.0	-	-	-	5.2	3.7	4.0	2.9	4.8	3.0	3.5	6.1
9-15 Jul	5.9	-	5.4	5.8	6.8	6.9	-	-	-	5.9	4.0	4.6	3.7	5.2	3.5	4.4	6.8
16-22 Jul	6.4	-	6.7	6.4	7.2	7.3	-	-	-	5.8	4.5	5.3	4.1	5.6	4.0	4.8	7.3
23-29 Jul	6.7	-	7.2	6.7	7.4	7.8	-	-	-	7.0	5.1	5.8	4.7	6.2	4.5	5.3	8.1
30 Jul-5 Aug	7.2	-	6.6	6.9	8.2	8.7	-	-	-	6.5	5.5	6.2	5.7	6.5	4.9	5.6	8.7
6-12 Aug	7.8	-	7.2	7.6	8.5	8.9	-	-	-	6.7	5.6	6.7	5.9	6.8	5.2	6.5	9.5
13-19 Aug	8.1	-	8.3	7.9	8.9	8.4	-	-	-	7.3	6.3	7.4	6.1	7.3	5.6	7.3	9.2
20-26 Aug	8.2	-	8.2	8.1	8.8	8.6	-	-	-	8.0	6.8	8.6	6.1	7.6	6.0	-	9.5
27 Aug-2 Sep	-	-	7.1	8.3	-	9.0	-	-	-	7.7	7.2	-	-	-	-	-	-
3-9 Sep	-	-	-	8.5	-	9.0	-	-	-	8.0	7.9	-	-	-	-	-	-

Table 84. Results of seabird necropsies at St. Paul Island, Alaska in 2010. All necropsies were performed by Dr. Terry Spraker from Colorado State University, Fort Collins, Colorado.

ID	Date	Results
10SB-1	6 Jul 2010	Black-legged kittiwake chick, Nest #2, Southwest Point, fair condition, food in ventriculus that appears to be seaweed or some type of grass, yoke sac approximately 1cc diameter and collapsed. Stomach contents collected and tissues were collected for histopathology.
10SB-2	12 Jul 2010	Black-legged kittiwake chick, below nest #13, Southwest Point, fair condition, unknown nest site, yoke sac approximately 1cc diameter and collapsed. Ventriculus empty and tissues were collected for histopathology.
10SB-3	12 Jul 2010	Black-legged kittiwake chick, nest #15, Southwest Point, fair condition, No food in ventriculus. Small amount of yoke sac found. Chick severely autolytic. Tissues were not collected for histopathology.
10SB-4	15 Jul 2010	Black-legged kittiwake chick, nest #2, Northwest Point, fair condition, Small amount of food is present in ventriculus. Small amount of yoke sac found. Chick severely autolytic. Tissues were collected for histopathology.
10SB-5	25 Jul 2010	Two young of the year female red phalaropes were found near Webster Lake. Both were emaciated, had no food in the proventriculus and ventriculus. The breast muscles were severely atrophied. Suspected cause of death was malnutrition. One of the birds did have a small degree of discoloration to the anterior aspects of the lungs. Tissues were saved from both birds but were placed in one jar.
10SB-6	27 Jul 2010	Adult black-legged kittiwake, this bird was found alive on the road near the weather station. There was a large dried laceration of the skin and massive tearing of the pectoral muscles of the left side of the breast. This tearing extended down to the bone. The bird was euthanized. The torn pectoral muscles were dried and the bone was exposed. The remaining pectoral muscles were markedly atrophied. Green staining was present around the vent. The esophagus and crop was not torn. Lungs, heart, brain, and kidneys were within normal limits. The ovary was immature and the bird was estimated to be immature. Diagnosis: Skin and pectoral muscles, severe sharp trauma, with extensive tearing. Comments: This lesion may have been caused by the bird impaling herself into somewhat a sharp object on a tower. Where the bird was found there are multiple towers of all sizes and shapes. Photos were taken.

Table 85. Number of common and thick-billed murre eggs collected for the Seabird Tissue Archival and Monitoring Project (STAMP) at St. Paul Island, Alaska.

Species	Year					
	2009	2010	2011	2012	2013	2014
Common murre	1	12	9	6	10	9
Thick-billed murre	12	15	15	14	11	9



Figure 32. The northeast corner of Otter Island on 31 July 2014. Plots 4 through 9 are in this view.

Table 86. Numbers of black-legged kittiwake adults, nests, and chicks counted on plots at Otter Island, Alaska. No surveys were conducted in 2011-2013.

Plot	2007 ^a						2008 ^a			2009 ^a					
	6 Jul			27 Jul			8 Aug			14 Jun			25 Jul		
	Adults	Nests	Chicks	Adults	Nests	Chicks	Adults	Nests	Chicks	Adults	Nests	Chicks	Adults	Nests	Chicks
1	20	7	0	12	4	0	15	5	0	11	9	0	1	0	0
2	111	56	0	87	21	0	100	70	18	123	104	0	37	10	3
3	11	5	0	11	0	0	4	4	0	12	9	0	3	2	0
4	69	20	0	47	1	0	54	30	11	57	41	0	22	17	5
5	43	7	0	34	7	2	37	17	7	49	37	0	17	11	3
6	28	12	0	38	4	0	41	18	4	20	12	0	12	7	1
7	39	11	0	40	2	1	39	15	2	44	19	0	6	2	1
8	32	7	0	35	3	1	25	10	4	12	3	0	5	2	1
9	39	15	0	46	3	0	41	19	9	35	31	0	17	2	0
Total	392	140	0	350	45	4	356	188	55	363	265	0	120	53	14

^aMean hatch dates on St. Paul were 13 July in 2007, 2 July in 2008, 9 July in 2009, 4 July in 2010, and 1 July in 2014.

Table 86 (continued). Numbers of black-legged kittiwake adults, nests, and chicks counted on plots at Otter Island, Alaska. No surveys were conducted in 2011-2013.

Plot	2010						2014					
	25 Jun			16 Jul			14 Jun			31Jul		
	Adults	Nests	Chicks	Adults	Nests	Chicks	Adults	Nests	Chicks	Adults	Nests	Chicks
1	9	9	0	5	3	0	11	6	0	10	4	4
2	110	98	1	76	57	13	106	104	0	91	75	75
3	7	6	0	13	12	2	22	18	0	18	12	12
4	51	33	0	59	27	3	57	46	0	53	24	24
5	53	38	0	33	18	3	38	32	0	45	29	29
6	47	26	0	27	24	3	34	25	0	29	21	21
7	29	18	0	31	17	3	24	23	0	37	14	14
8	27	20	0	24	15	2	35	29	0	25	7	7
9	35	6	0	27	16	3	38	29	0	47	27	27
Total	368	254	1	295	189	32	365	312	0	355	213	213

^aMean hatch dates on St. Paul were 13 July in 2007, 2 July in 2008, 9 July in 2009, 4 July in 2010, and 1 July in 2014.

Table 87. Numbers of red-legged kittiwake adults, nests, and chicks counted on plots at Otter Island, Alaska. No surveys were conducted in 2011-2013.

Plot	2007 ^a						2008 ^a			2009 ^a					
	6 Jul			27 Jul			8 Aug			14 Jun			25 Jul		
	Adults	Nests	Chicks	Adults	Nests	Chicks	Adults	Nests	Chicks	Adults	Nests	Chicks	Adults	Nests	Chicks
1	2	1	0	3	1	1	0	0	0	0	0	0	0	0	0
2	24	13	0	28	6	0	22	17	12	7	4	0	7	3	3
3	2	1	0	2	0	0	6	6	4	5	1	0	1	1	0
4	14	8	0	15	6	4	13	8	6	5	5	0	13	10	6
5	9	6	0	17	8	4	16	3	3	5	5	0	7	7	4
6	14	5	0	21	8	3	21	7	5	13	6	0	9	5	0
7	23	7	0	33	6	2	18	10	8	8	3	0	11	5	3
8	31	15	1	52	15	10	46	12	6	37	31	0	26	9	4
9	13	5	0	15	4	1	7	0	0	8	5	0	1	1	1
Total	132	61	1	186	54	25	149	63	44	88	60	0	75	41	21

^aMean hatch dates on St. Paul were 13 July in 2007, 2 July in 2008, 9 July in 2009, 7 July in 2010 and 4 July in 2014.

Table 87 (continued). Numbers of red-legged kittiwake adults, nests, and chicks counted on plots at Otter Island, Alaska. No surveys were conducted in 2011-2013

Plot	2010						2014 ^a					
	25 Jun			16 Jul			14 Jun			31 Jul		
	Adults	Nests	Chicks	Adults	Nests	Chicks	Adults	Nests	Chicks	Adults	Nests	Chicks
1	0	0	0	0	0	0	1	1	0	4	1	1
2	15	12	0	15	14	0	31	22	0	22	19	19
3	6	6	0	11	8	1	18	14	0	34	11	11
4	23	14	0	24	13	0	28	27	0	27	16	16
5	10	6	0	12	7	0	10	8	0	23	14	14
6	41	6	0	11	8	2	10	7	0	13	5	5
7	13	8	0	12	4	0	10	7	0	17	8	8
8	43	20	0	44	16	4	26	22	0	35	14	14
9	6	1	0	8	2	1	15	11	0	19	10	10
Total	157	73	0	137	72	8	149	119	0	194	98	98

^aMean hatch dates on St. Paul were 13 July in 2007, 2 July in 2008, 9 July in 2009, 7 July in 2010, and 4 July in 2014.

Table 88. Numbers of red-faced cormorant adults, nests, and chicks counted on plots at Otter Island, Alaska during the summer of 2014. No surveys were conducted in 2011-2013.

Plot	14 Jun			31 Jul			
	Occupied nests	Adults	Nests	Nests w/x # chicks			
				1	2	3	4
1	0	0	0	0	0	0	0
2	1	0	1	0	1	0	0
3	8	6	14	1	7	3	3
4	6	11	10	1	4	3	2
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
Total	15	17	25	2	12	6	5

^aMean hatch date on St. Paul was 23 June.

Table 89. Numbers of birds and marine mammals counted during circumnavigation surveys at Walrus Island, Alaska. Data do not include land-based counts. No surveys were conducted in 2011 or 2013-2014.

Species	2008			2009			2010			2012		
	West	East	Total	West	East	Total	West	East	Total	West	East	Total
Pelagic cormorant	13	0	13	2	0	2	0	0	0	0	0	0
Red-faced cormorant	10	7	17	20	7	27	4	1	5	0	9	9
nests	0	3	3	0	0	0	1	0	1	-	-	-
chicks	0	2	2	-	-	-	0	0	0	-	-	-
Black-legged kittiwake	57	54	111	131	164	295	89	112	201	35	95	125
nests	41	51	92	33	41	74	56	89	145	24	96	120
chicks	11	14	25	-	-	-	0	0	0	-	-	-
Red-legged kittiwake	0	0	0	0	0	0	0	0	0	-	-	-
nests	0	0	0	0	0	0	0	0	0	-	-	-
chicks	0	0	0	-	-	-	0	0	0	-	-	-
Common murre	320	53	373	224	8	232	120	6	126	-	-	-
Thick-billed murre	22	10	32	0	38	38	138	69	207	-	-	-
Unid. murre spp.	0	0	0	154	89	243	29	0	29	70	98	168
Steller's sea lion (adults)	44	44	88	101	70	171	104	28	132	114	61	175
bulls ^a	4	3	7	-	-	-	-	-	-	-	-	-
pups	20	6	26	0	0	0	0	0	0	0	0	0
Harbor seal	1	0	1	0	0	0	1	0	1	0	0	0
Northern fur seal (adults)	0	0	0	0	0	0	0	0	0	0	0	0
pups	0	0	0	0	0	0	0	0	0	0	0	0
Survey date	8 Aug			28 Jul			16 Jul			28 Jul		

^aBulls are included in adult sea lion total. We did not land on Walrus Island.

Table 90. Land-based counts of common murres on Murre Rock, Walrus Island, Alaska. No surveys were conducted in 2011-2014.

	1987	1997	2006	2008	2009	2010
No. birds	1200	880	465	540	591	530

fantisizing



Figure 33. A boat load of murre eggs from Walrus Island. Photo by G. Dallas Hanna circa 1914.

Appendix A. Discrepancies in historic dataset of red-faced cormorant breeding chronology at St. Paul Island, Alaska.

Year	Details
1976	Mean hatch date reported comes from original data (Hunt et al. 1981), which differ from that reported in later refuge reports (Thomson and Sapora 2007, Thomson and Spitzer 2008, McClintock et al. 2010).
1978	Mean hatch date reported comes from original data (Hunt et al. 1981), which differ from that reported in later refuge reports (Thomson and Sapora 2007, Thomson and Spitzer 2008, McClintock et al. 2010).
1986	Mean hatch date reported comes from original data (Byrd 1986), which differ from that reported in later refuge reports (Thomson and Sapora 2007, Thomson and Spitzer 2008, McClintock et al. 2010).
1987	Mean hatch date reported comes from recalculation of raw data, which differ from that reported in earlier refuge reports (Thomson and Sapora 2007, Thomson and Spitzer 2008, McClintock et al. 2010), likely a Julian date calculation error.
1989	Standard deviation reported comes from recalculation of raw data, which differ from that reported in earlier refuge reports (Thomson and Sapora 2007, Thomson and Spitzer 2008, McClintock et al. 2010), likely a mathematical or transcription error.
1996	Mean hatch date and sample size come from recalculation of raw data, which differ from that reported in earlier refuge reports (Thomson and Sapora 2007, Thomson and Spitzer 2008, McClintock et al. 2010), likely a Julian date calculation, mathematical or transcription error.
1998	Mean hatch date reported comes from recalculation of raw data, which differ from that reported in earlier refuge reports (Thomson and Sapora 2007, Thomson and Spitzer 2008, McClintock et al. 2010), likely a Julian date calculation error.
2001	Standard deviation reported comes from recalculation of raw data, which differ from that reported in earlier refuge reports (Thomson and Sapora 2007, Thomson and Spitzer 2008, McClintock et al. 2010), likely a mathematical or transcription error.
2004	Mean hatch date, standard deviation, and sample size come from recalculation of raw data, which differ from that reported in earlier refuge reports (Thomson and Sapora 2007, Thomson and Spitzer 2008, McClintock et al. 2010), likely a Julian date calculation, mathematical or transcription error.
2006	Mean hatch date, standard deviation, and sample size come from recalculation of raw data, which differ from that reported in earlier refuge reports (Thomson and Sapora 2007, Thomson and Spitzer 2008, McClintock et al. 2010), likely a Julian date calculation, mathematical or transcription error.
2008	Standard deviation reported comes from recalculation of raw data, which differ from that reported in earlier refuge reports (Thomson and Spitzer 2008, McClintock et al. 2010), likely a mathematical or transcription error.
2009	Standard deviation reported comes from recalculation of raw data, which differ from that reported in earlier refuge reports (McClintock et al. 2010), likely a mathematical or transcription error.
2010	All data reported comes from recalculation of raw data.

Appendix B. Details of historic dataset of black-legged kittiwake reproductive performance at St. Paul Island, Alaska.

Year	Details
Data summary from original reports; data not resummarized by database because raw nest site data unavailable	
1975	Values reported here come from more recent Hunt et al. 1981 (which differ from values in Hunt et al. 1977, 1978) Mean clutch size (C/B) based on smaller-than-reported sample size Hatching success (E/C) value is midpoint of range (0.60-0.82) presented in original source (Hunt et al. 1981) Chick success (G/E) value is midpoint of range (0.41-0.64) presented in original source (Hunt et al. 1981) Reproductive success (F/B) calculated from known-clutch-size nests only Productivity (F/A) assumed to be same as fledglings/nest start (G/A) because no nests fledged >1 chick (Climo 1993)
1976	Values reported here come from more recent Hunt et al. 1981 (which differ from values in Hunt et al. 1977, 1978) Mean clutch size (C/B) based on smaller-than-reported sample size Hatching success (E/C) value is midpoint of range (0.72-0.88) presented in original source (Hunt et al. 1981) Chick success (G/E) value is midpoint of range (0.57-0.69) presented in original source (Hunt et al. 1981) Reproductive success (F/B) calculated from known-clutch-size nests only
1977	Values reported here come from more recent Hunt et al. 1981 (which differ from values in Hunt et al. 1978) Mean clutch size (C/B) based on smaller-than-reported sample size Hatching success (E/C) value is midpoint of range (0.59-0.85) presented in original source (Hunt et al. 1981) Chick success (G/E) value is midpoint of range (0.52-0.74) presented in original source (Hunt et al. 1981) Reproductive success (F/B) calculated from known-clutch-size nests only
1978	Mean clutch size (C/B) based on smaller-than-reported sample size Hatching success (E/C) value is midpoint of range (0.74-0.84) presented in original source (Hunt et al. 1981) Chick success (G/E) value is midpoint of range (0.58-0.66) presented in original source (Hunt et al. 1981) Reproductive success (F/B) calculated from known-clutch-size nests only
1979	Total nest sites (A) estimated from ratio of known-clutch nests/total nests 1975-1978 (Hunt et al. 1981) Mean clutch size (C/B) based on smaller-than-reported sample size Hatching success (E/C) value is midpoint of range (0.73-0.88) presented in original source (Hunt et al. 1981) Chick success (G/E) value is midpoint of range (0.50-0.60) presented in original source (Hunt et al. 1981) Reproductive success (F/B) calculated from known-clutch-size nests only
1993	Data based on short-term observations
1994	Data based on short-term observations
1995	Data based on short-term observations
Data summary from original reports <i>for now</i>; data not resummarized by database because raw nest site data currently incomplete (missing data from plots 80-93, needs to be found and entered)	
1986	Values reported in successive reports vary; values reported here come from most recent reliable island reports (e.g., Climo 1993, Thomson and Sabora 2007, Thomson and Spitler 2008)
1987	Values reported in successive reports vary; values reported here come from most recent reliable island reports (e.g., Climo 1993, Thomson and Sabora 2007, Thomson and Spitler 2008)
1988	Values from original source (Dragoo et al. 1989)
Data summary from database (summary of original raw nest site data)	
1984-1985, 1989-1992; 1996-current	

Appendix C. Details of historic dataset of red-legged kittiwake reproductive performance at St. Paul Island, Alaska.

Year	Details
Data summary from original reports; data not resummarized by database because raw nest site data unavailable	
1975	Values reported here come from more recent Hunt et al. 1981 (which differ from values in Hunt et al. 1977, 1978) Hatching success (E/C) value is midpoint of range (0.78-0.91) presented in original source (Hunt et al. 1981) Chick success (G/E) value is midpoint of range (0.81-0.94) presented in original source (Hunt et al. 1981)
1976	Values reported here come from more recent Hunt et al. 1981 (which differ from values in Hunt et al. 1977, 1978) Hatching success (E/C) value is midpoint of range (0.88-0.93) presented in original source (Hunt et al. 1981) Chick success (G/E) value is midpoint of range (0.92-0.98) presented in original source (Hunt et al. 1981)
1977	Values reported here come from more recent Hunt et al. 1981 (which differ from values in Hunt et al. 1978) Hatching success (E/C) value is midpoint of range (0.82-0.91) presented in original source (Hunt et al. 1981) Chick success (G/E) value is midpoint of range (0.81-0.89) presented in original source (Hunt et al. 1981)
1978	Hatching success (E/C) value is midpoint of range (0.54-0.71) presented in original source (Hunt et al. 1981) Chick success (G/E) value is a midpoint of range (0.65-0.85) presented in original source (Hunt et al. 1981)
1979	Hatching success (E/C) value is midpoint of range (0.63-0.71) presented in original source (Hunt et al. 1981) Chick success (G/E) value is midpoint of range (0.76-0.81) presented in original source (Hunt et al. 1981) Reproductive success (F/B) calculated from known-clutch-size nests only
1984	Original data presented as a range including nests of unknown fate and multiple ways of calculating success parameters (Johnson and Baker 1985) Values reported here were recalculated (B. Drummond, March 2010) from original report values but using only known-fate nests and not including chicks seen only at end of season
1993	Data based on short-term observations
1994	Data based on short-term observations
1995	Data based on short-term observations
Data summary from original reports for now; data not resummarized by database because raw nest site data currently incomplete (missing data from plots 80-93, needs to be found and entered)	
1986	Values reported in successive reports vary; values reported here come from most recent reliable island reports (e.g., Climo 1993, Thomson and Sapora 2007, Thomson and Spittler 2008)
1987	Values reported in successive reports vary; values reported here come from most recent reliable island reports (e.g., Climo 1993, Thomson and Sapora 2007, Thomson and Spittler 2008) from original source (Byrd 1987)
1988	Values from original source (Dragoo et al. 1989)
Data summary from database (summary of original raw nest site data)	
1985, 1989-1992; 1996-current	

Appendix D. Details of historic dataset of common murre reproductive performance at St. Paul Island, Alaska.

Year	Details
Data summary from original reports; data not resummarized by database because raw nest site data unavailable	
1975	No data to use (all nests monitored were high-disturbance sites; Hunt et al. 1981)
1976	Values reported include only minimal-disturbance sites (Hunt et al. 1981)
1977	No data to use (all nests monitored were high-disturbance sites; Hunt et al. 1981)
1978	Values reported include only minimal-disturbance sites (Hunt et al. 1981)
Data summary from original reports for now; data not resummarized by database because raw nest site data currently incomplete (missing data from plots 80-93, needs to be found and entered)	
1986	Values reported in successive reports vary; values reported here come from most recent reliable island reports (e.g., Climo 1993, Thomson and Sapora 2007, Thomson and Spittler 2008)
1987	Values reported in successive reports vary; values reported here come from most recent reliable island reports (e.g., Climo 1993, Thomson and Sapora 2007, Thomson and Spittler 2008) from original source (Byrd 1987)
1988	Values from original source (Dragoo et al. 1989)
Data summary from database (summary of original raw nest site data)	
1985, 1989-current	

Appendix E. Details of historic dataset of thick-billed murre reproductive performance at St. Paul Island, Alaska.

Year	Details
Data summary from original reports; data not resummarized by database because raw nest site data unavailable	
1975	No data to use (all nests monitored were high-disturbance sites; Hunt et al. 1981)
1976	Values reported include only minimal-disturbance sites (Hunt et al. 1981)
1977	Values reported include only minimal-disturbance sites (Hunt et al. 1981) Values reported here come from more recent Hunt et al. 1981 (which differ from values in Hunt et al. 1978) Nesting success (D/B) value is midpoint of range (0.66-0.84) presented in original source (Hunt et al. 1981) Fledging success (F/B) value is midpoint of range (0.42-0.84) presented in original source (Hunt et al. 1981) Reproductive success (F/B) value is midpoint of range (0.35-0.62) presented in original source (Hunt et al. 1981)
1978	Nesting success (D/B) value is midpoint of range (0.74-0.79) presented in original source (Hunt et al. 1981) Fledging success (F/B) value is midpoint of range (0.0.77-0.91) presented in original source (Hunt et al. 1981) Reproductive success (F/B) value is midpoint of range (0.61-0.68) presented in original source (Hunt et al. 1981)
Data summary from original reports for now; data not resummarized by database because raw nest site data currently incomplete (missing data from plots 80-93, needs to be found and entered)	
1986	Values reported in successive reports vary; values reported here come from most recent reliable island reports (e.g., Climo 1993, Thomson and Sapora 2007, Thomson and Spittler 2008)
1987	Values reported in successive reports vary; values reported here come from most recent reliable island reports (e.g., Climo 1993, Thomson and Sapora 2007, Thomson and Spittler 2008) from original source (Byrd 1987)
1988	Values from original source (Dragoo et al. 1989)
Data summary from database (summary of original raw nest site data)	
1984-1985, 1989-current	

Appendix F. Adult black-legged kittiwakes banded with alphanumeric color bands or three color band combinations outside of survival plots at St. Paul Island, Alaska. Birds were banded as part of the BSIERP project (2008-2010) and are not included in any resight efforts for survival data; this list simply provides a record of these individuals. Color codes are recorded as color and # of band for birds banded with alphanumeric color bands, and as colors (in code) of bands on left (L) and right (R) legs for birds banded with three band combinations.

color combo codes:		DG = dark green	O = orange		
Color band					
Color or L leg	Band # or R leg	Metal band #	Year banded	Location banded	
DG/O	R	0974-09376	2008	Ridgewall Beach	
Yellow	A2	0974-09369	2009	Ridgewall Beach	
Yellow	A3	0974-09374	2009	Ridgewall Beach	
Yellow	C3	714-10309	2009	Tsamana South	
Yellow	E4	714-10390	2010	Tsamana South	
Yellow	E5	714-10314	2010	Tsamana South	

Appendix G. Adult common murrelets banded with alphanumeric color bands or four color band combinations outside of survival plots at St. Paul Island, Alaska. Birds were banded as part of the BSIERP project (2008-2010) and are not included in any resight efforts for survival data; this list simply provides a record of these individuals. Color codes are recorded as color and # of band for birds banded with alphanumeric color bands, and as colors (in code) of bands on left (L) and right (R) legs for birds banded with four band combinations.

Color band		Metal band #	Year banded	Location banded	Color band		Metal band #	Year banded	Location banded
Color or L leg	Band # or R leg				Color or L leg	Band # or R leg			
DB/DB/W	O	1186-04094	2009	Ridgewall	W/DB/DB	O	1186-04034	2008	Tolstoi
DB/GY/R	O	1186-04163	2009	Tolstoi	W/DG/DG	O	1186-04168	2009	Ridgewall
DB/W/R	O	1186-04024	2008	Tolstoi	W/R/W	O	1186-04174	2009	Ridgewall
DB/W/Y	O	1186-04040	2008	Tolstoi	W/W/W	O	1186-04028	2008	Tolstoi
DG/DB/DB	O	1186-04025	2008	Tolstoi	W/GY/DG	O	1186-04167	2009	Ridgewall
DG/O/W	O	1186-04093	2009	Ridgewall	W/GY/R	O	1186-04038	2008	Tolstoi
DG/W/Y	O	1186-04181	2009	Zapadni	Y/R/R	O	1186-04095	2009	Tolstoi
DG/GY/DB	O	1186-04030	2008	Tolstoi	Y/R/W	O	1186-04175	2009	Ridgewall
DG/GY/O	O	1186-04033	2008	Tolstoi	Y/O/Y	O	1186-04162	2009	Tolstoi
R/DG/O	O	1186-04173	2009	Ridgewall	Y/W/DG	O	1186-04066	2009	Tolstoi
R/DG/GY	O	1186-04178	2009	Zapadni	Y/GY/DB	O	1186-04176	2009	Zapadni
R/R/W	O	1186-04036	2008	Tolstoi	Y/GY/O	O	1186-04026	2008	Tolstoi
R/O/DG	O	1186-04104	2009	Tolstoi	GY/DG/DB	O	1186-04096	2009	Tolstoi
R/GY/O	O	1186-04177	2009	Zapadni	GY/DG/W	O	1186-04031	2008	Tolstoi
R/GY/W	O	1186-04039	2008	Tolstoi	GY/DG/Y	O	1186-04180	2009	Zapadni
O/DB/O	O	1186-04092	2009	Ridgewall	GY/R/DB	O	1186-04035	2008	Tolstoi
O/DB/W	O	1186-04029	2008	Tolstoi	GY/R/DG	O	1186-04179	2009	Zapadni
O/R/W	O	1186-04169	2009	Ridgewall	GY/W/DG	O	1186-04027	2008	Tolstoi
O/W/DG	O	1186-04164	2009	Tolstoi	GY/W/O	O	1186-04032	2008	Tolstoi
O/Y/O	O	1186-04037	2008	Tolstoi	GY/Y/DG	O	1186-04091	2009	Tolstoi
O/GY/Y	O	1186-04165	2009	Tolstoi					

Appendix H. Adult thick-billed murres banded with alphanumeric color bands or three color band combinations outside of survival plots at St. Paul Island, Alaska. Birds were banded as part of the BSIERP project (2008-2010) and are not included in any resight efforts for survival data; this list simply provides a record of these individuals. Color codes are recorded as color and # of band for birds banded with alphanumeric color bands, and as colors (in code) of bands on left (L) and right (R) legs for birds banded with four band combinations.

Color band		Metal band #	Year banded	Location banded	Color band		Metal band #	Year banded	Location banded
Color or L leg	Band # or R leg				Color or L leg	Band # or R leg			
DG/R	DG	1186-04045	2008	Tolstoi E	Y/Y	DG	1186-04087	2009	Unknown
DG/R	Y	1186-04053	2008	Tolstoi M/N	Y/Y	Y	1186-04081	2009	Unknown
DG/O	R	1186-04060	2008	Ridgewall	GY/Y	DB	1186-04058	2008	Tolstoi E
DG/W	Y	1186-04012	2008	Zap. Beach	Yellow	A1	1186-04082	2009	Unknown
DG/Y	DB	1186-04015	2008	Zap. Beach	Yellow	A2	1186-04083	2009	Unknown
R/DB	DG	1186-04134	2008	SW Point	Yellow	A3	1186-04084	2009	Unknown
R/DB	R	1186-04048	2008	Tolstoi E	Yellow	A4	1186-04085	2009	Unknown
R/DB	W	1186-04018	2008	Zap. Beach	Yellow	A8	1186-04119	2009	Zapadni 87
R/DB	Y	1186-04046	2008	Tolstoi M/N	Yellow	C2	1186-04211	2009	Ridgewall
R/DG	DB	1186-04043	2008	Tolstoi E	Yellow	C3	1186-04212	2009	Ridgewall
R/DG	DG	1186-04088	2009	Unknown	Yellow	C4	1186-04213	2009	Ridgewall
R/DG	R	1186-04101	2009	Unknown	Yellow	C5	1186-04214	2009	Ridgewall
R/R	DB	1186-04089	2009	Unknown	Yellow	C6	1186-04215	2009	Ridgewall
R/R	R	1186-04080	2009	Unknown	Yellow	C7	1186-04216	2009	Ridgewall
R/R	Y	1186-04100	2009	Unknown	Yellow	C8	1186-04218	2009	Ridgewall
R/O	DG	1186-04021	2008	Zap. Beach	Yellow	C9	1186-04220	2009	Ridgewall
R/O	R	1186-04044	2008	Tolstoi E	Yellow	C0	1186-04221	2009	Tourist Pt.
R/W	DB	1186-04011	2008	Zap. Beach	Yellow	E9	1186-04210	2009	Ridgewall
R/W	DG	1186-04103	2009	Unknown	Yellow	F1	895-12795	2009	Zapadni
R/W	R	1186-04097	2009	Unknown	Yellow	H1	1186-04184	2009	Ridgewall
R/W	Y	1186-04014	2008	Zap. Beach	Yellow	H3	1186-04217	2009	Ridgewall
R/Y	DB	1186-04013	2008	Zap. Beach	Yellow	H8	1186-04222	2009	Ridgewall
R/Y	DG	1186-04132	2008	SW Point	Yellow	H9	1186-04138	2009	Zapadni Pt.
O/DB	R	1186-04120	2008	Zapadni 87	Yellow	J1	1186-04105	2009	Zapadni
O/DG	DG	1186-04063	2008	Ridgewall	Yellow	J4	1186-04061	2009	Ridgewall
O/DG	R	1186-04059	2008	Ridgewall	Yellow	J5	1186-04139	2009	Unknown
O/DG	W	1186-04017	2008	Zap. Beach	Yellow	J6	1186-04143	2009	Unknown
O/DG	Y	1186-04050	2008	Tolstoi M/N	Yellow	J8	1186-04146	2009	Unknown
O/R	DG	1186-04052	2008	Tolstoi M/N	Yellow	J9	1186-04148	2009	Unknown
O/R	DG	1186-04019	2008	Zap. Beach	Yellow	J0	1186-04149	2009	Unknown
O/R	Y	1186-04041	2008	Tolstoi E	Yellow	K1	1186-04150	2009	Unknown
W/R	R	1186-04099	2009	Unknown	Yellow	K2	1186-04151	2009	Unknown
Y/DB	DG	1186-04016	2008	Zap. Beach	Yellow	K3	1186-04152	2009	Unknown
Y/DB	R	1186-04042	2008	Tolstoi E	Yellow	K4	1186-04153	2009	Unknown
Y/DB	O	1186-04133	2008	SW Point	Yellow	K5	1186-04057	2009	Tolstoi E
Y/DG	R	1186-04121	2008	Zapadni 87	Yellow	K6	1186-04154	2009	Unknown
Y/R	DB	1186-04131	2008	SW Point	Yellow	K7	1186-04155	2009	Unknown
Y/R	DG	1186-04051	2008	Tolstoi M/N	Yellow	K8	1186-04156	2009	Unknown
Y/R	W	1186-04102	2009	Unknown	Yellow	K9	1186-04158	2009	Unknown
Y/R	O	1186-04056	2008	Tolstoi E	Yellow	K0	1186-04159	2009	Unknown
Y/R	Y	1186-04047	2008	Tolstoi M/N	Yellow	L1	1186-04160	2009	Unknown
Y/R	Y	1186-04098	2009	Unknown	Yellow	L2	1186-04166	2009	Unknown
Y/O	DB	1186-04125	2008	Ridgewall	Yellow	L3	1186-04171	2009	Unknown
Y/O	W	1186-04020	2008	Zap. Beach	Yellow	L4	1186-04172	2009	Unknown
Y/W	O	1186-04054	2008	Tolstoi M/N	Yellow	L5	1186-04182	2009	Unknown
Y/Y	DB	1186-04090	2009	Unknown					

Appendix I. Diet datasets in the AMNWR diet dataset from St. Paul Island, Alaska.

Species	Recipient	Diet type	Years	In 2014 annual report
Northern fulmar	Adult	Stomach	1978	N
Red-faced cormorant	Adult	Stomach	1975-1979, 1993	N
Red-faced cormorant	Chick	Regurgitation, Bolus	1975-1978, 1984, 1996, 1998, 2009-2013	Y
Red-faced cormorant	Immature	Stomach	1975-1976	N
Common murre	Adult	Stomach, Lavage	1975-1979, 1984, 1992-1995, 1997-2000, 2008	Y
Common murre	Chick	Bill load, Regurgitation, Stomach	1976-1979, 1984, 2008, 2010	Y
Thick-billed murre	Adult	Stomach, Lavage	1975-1979, 1984, 1988, 1992-1995, 1997-2000, 2008-2010	Y
Thick-billed murre	Chick	Bill load, Regurgitation	1976-1979, 1984, 1987-1988, 2000, 2008-2010	Y
Parakeet auklet	Adult	Stomach	1975-1978	N
Parakeet auklet	Chick	Regurgitation, Gular pouch	1976-1977, 1996, 2009	N
Least auklet	Adult	Stomach	1975-1978, 1984	N
Least auklet	Chick	Regurgitation, Gular pouch	1975-1978, 1984, 1986, 1989, 1996-1998, 2000-2001, 2003-2014	Y
Crested auklet	Adult	Stomach	1975-1977	N
Crested auklet	Chick	Regurgitation, Gular pouch	1976-1977, 2009	N
Horned puffin	Adult	Stomach	1975-1979, 1984	N
Horned puffin	Chick	Bill load	1976-1979, 1984	N
Tufted puffin	Adult	Stomach	1975-1979	N
Tufted puffin	Chick	Bill load	1976, 1979	N
Black-legged kittiwake	Adult	Stomach	1975-1979, 1984, 1992-1995, 1997-2000	Y
Black-legged kittiwake	Chick	Regurgitation	1975-1979, 1984-1985, 1987-1988, 1997-1998, 2000, 2003, 2006, 2008-2014	Y
Black-legged kittiwake	Immature	Stomach	1984	Y
Black-legged kittiwake	Adult+chick	Lavage	2008-2009	Y
Red-legged kittiwake	Adult	Stomach	1975-1979, 1984, 1992, 1994, 1997	Y
Red-legged kittiwake	Chick	Regurgitation	1976-1977, 1979, 2006-2007, 2010	Y
Glaucous-winged gull	Adult	Stomach	1978	Y